# **Calibration Laboratory of**

Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland





S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

#### Glossary:

TSL

tissue simulating liquid

ConvF N/A sensitivity in TSL / NORM x,y,z not applicable or not measured

#### Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### **Additional Documentation:**

e) DASY4/5 System Handbook

#### **Methods Applied and Interpretation of Parameters:**

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed
  point exactly below the center marking of the flat phantom section, with the arms oriented
  parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole
  positioned under the liquid filled phantom. The impedance stated is transformed from the
  measurement at the SMA connector to the feed point. The Return Loss ensures low
  reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point.
   No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Certificate No: D835V2-4d047\_Mar19 Page 2 of 8

### **Measurement Conditions**

DASY system configuration, as far as not given on page 1.

| DASY Version                 | DASY5                  | V52.10.2    |
|------------------------------|------------------------|-------------|
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 15 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, $dy$ , $dz = 5 mm$ |             |
| Frequency                    | 835 MHz ± 1 MHz        |             |

# **Head TSL parameters**

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 41.5         | 0.90 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 41.9 ± 6 %   | 0.91 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        |              |                  |

# SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 2.37 W/kg                |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 9.42 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 1.54 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 6.13 W/kg ± 16.5 % (k=2) |

**Body TSL parameters**The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 55.2         | 0.97 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 54.3 ± 6 %   | 1.01 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C        | ****         |                  |

# SAR result with Body TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 2.45 W/kg                |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 9.47 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 1.61 W/kg                |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 6.27 W/kg ± 16.5 % (k=2) |

Certificate No: D835V2-4d047\_Mar19 Page 3 of 8

# Appendix (Additional assessments outside the scope of SCS 0108)

#### **Antenna Parameters with Head TSL**

| Impedance, transformed to feed point | 51.4 Ω - 2.6 jΩ |
|--------------------------------------|-----------------|
| Return Loss                          | - 30.7 dB       |

# **Antenna Parameters with Body TSL**

| Impedance, transformed to feed point | 46.8 Ω - 6.1 jΩ |
|--------------------------------------|-----------------|
| Return Loss                          | - 22.9 dB       |

# **General Antenna Parameters and Design**

| Electrical Delay (one direction) | 1.387 ns |
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

#### **Additional EUT Data**

| Manufactured by | SPEAG |
|-----------------|-------|

Certificate No: D835V2-4d047\_Mar19 Page 4 of 8

# **DASY5 Validation Report for Head TSL**

Date: 13.03.2019

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d047

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: f = 835 MHz;  $\sigma = 0.91 \text{ S/m}$ ;  $\varepsilon_r = 41.9$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

### DASY52 Configuration:

• Probe: EX3DV4 - SN7349; ConvF(10, 10, 10) @ 835 MHz; Calibrated: 31.12.2018

• Sensor-Surface: 1.4mm (Mechanical Surface Detection)

• Electronics: DAE4 Sn601; Calibrated: 04.10.2018

• Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001

• DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

# Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

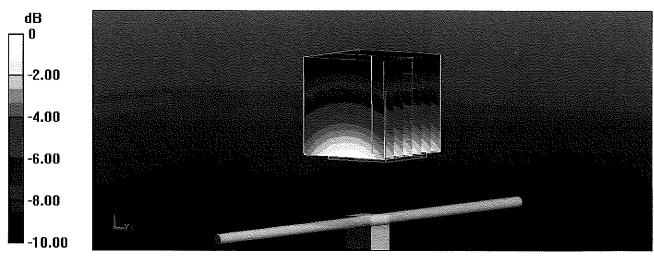
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 62.48 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 3.60 W/kg

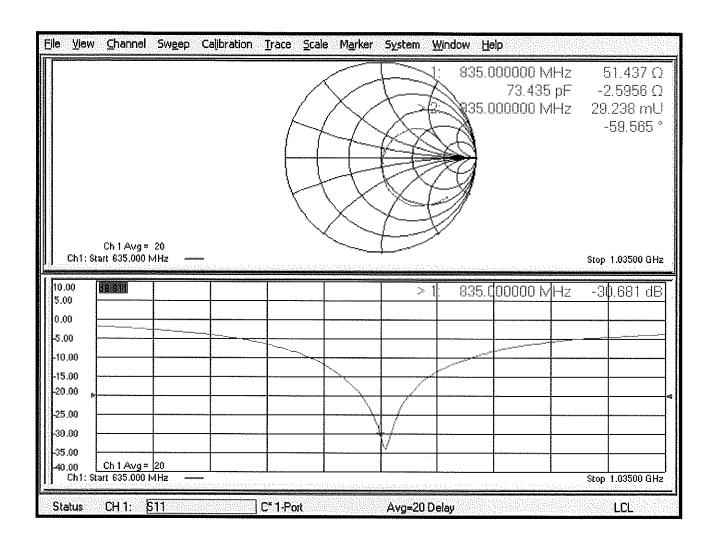
SAR(1 g) = 2.37 W/kg; SAR(10 g) = 1.54 W/kg

Maximum value of SAR (measured) = 3.18 W/kg



0 dB = 3.18 W/kg = 5.02 dBW/kg

# **Impedance Measurement Plot for Head TSL**



# **DASY5 Validation Report for Body TSL**

Date: 13.03.2019

Test Laboratory: SPEAG, Zurich, Switzerland

# DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d047

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: f = 835 MHz;  $\sigma = 1.01$  S/m;  $\varepsilon_r = 54.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

# **DASY52 Configuration:**

Probe: EX3DV4 - SN7349; ConvF(10.15, 10.15, 10.15) @ 835 MHz; Calibrated: 31.12.2018

• Sensor-Surface: 1.4mm (Mechanical Surface Detection)

• Electronics: DAE4 Sn601; Calibrated: 04.10.2018

• Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005

• DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

# Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

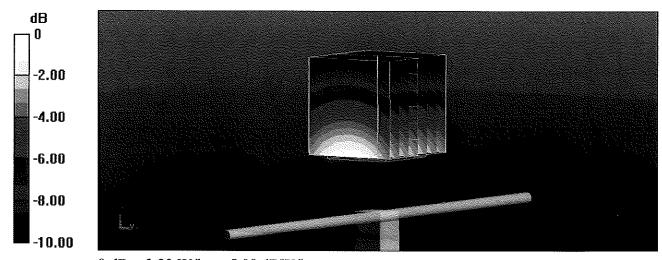
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 60.49 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 3.58 W/kg

SAR(1 g) = 2.45 W/kg; SAR(10 g) = 1.61 W/kg

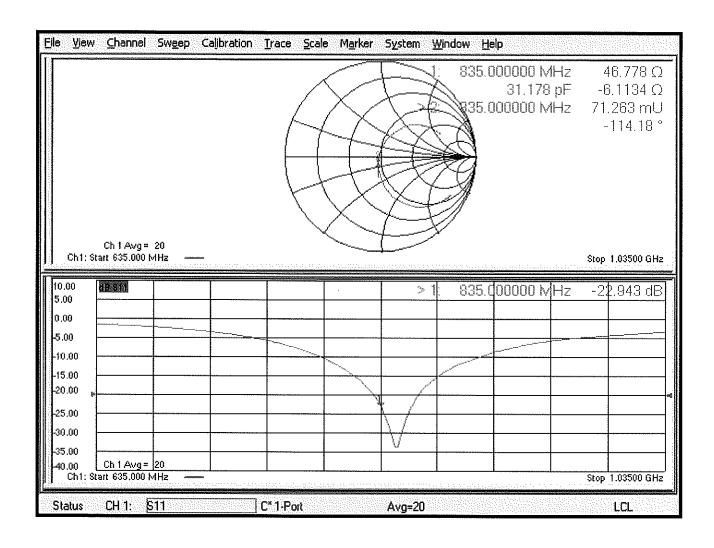
Maximum value of SAR (measured) = 3.23 W/kg



0 dB = 3.23 W/kg = 5.09 dBW/kg

Certificate No: D835V2-4d047\_Mar19

# Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 0108

Client

C Test

Certificate No: D835V2-4d133\_Oct18

| CALIBRATION CERTIFICATE  |  |  |
|--------------------------|--|--|
| Object                   | D835V2:-SN:4d133   |  |
| Calibration procedure(s) | QA GAL-05:v10<br>Galibration procedure for dipole validation kits above 700 MHz<br>ان اعداد ان ان انتخاب |  |
| Calibration date:        | October 19, 2018   |  |

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate,

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards               | ID#                | Cal Date (Certificate No.)        | Scheduled Calibration  |
|---------------------------------|--------------------|-----------------------------------|------------------------|
| Power meter NRP                 | SN: 104778         | 04-Apr-18 (No. 217-02672/02673)   | Apr-19                 |
| Power sensor NRP-Z91            | SN: 103244         | 04-Apr-18 (No. 217-02672)         | Apr-19                 |
| Power sensor NRP-Z91            | SN: 103245         | 04-Apr-18 (No. 217-02673)         | Apr-19                 |
| Reference 20 dB Attenuator      | SN: 5058 (20k)     | 04-Apr-18 (No. 217-02682)         | Apr-19                 |
| Type-N mismatch combination     | SN: 5047.2 / 06327 | 04-Apr-18 (No. 217-02683)         | Apr-19                 |
| Reference Probe EX3DV4          | SN: 7349           | 30-Dec-17 (No. EX3-7349_Dec17)    | Dec-18                 |
| DAE4                            | SN: 601            | 04-Oct-18 (No. DAE4-601_Oct18)    | Oct-19                 |
| Secondary Standards             | ID#                | Check Date (In house)             | Scheduled Check        |
| Power meter EPM-442A            | SN: GB37480704     | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| Power sensor HP 8481A           | SN: US37292783     | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| Power sensor HP 8481A           | SN: MY41092317     | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| RF generator R&S SMT-06         | SN: 100972         | 15-Jun-15 (in house check Oct-18) | In house check: Oct-20 |
| Network Analyzer Agilent E8358A | SN: US41080477     | 31-Mar-14 (in house check Oct-18) | In house check: Oct-19 |
|                                 | Name               | Function                          | Signature              |
| Calibrated by:                  | Manu Seitz         | Laboratory Technician             |                        |
| *                               |                    |                                   | <u> </u>               |
| Approved by:                    | Katja Pokovic      | Technical Manager                 | 2711                   |
|                                 |                    |                                   | 44.47                  |
|                                 |                    |                                   | •                      |
|                                 |                    |                                   |                        |

Issued: October 22, 2018

This calibration certificate shall not be reproduced except In full without written approval of the laboratory.

Certificate No: D835V2-4d133\_Oct18

Page 1 of 8

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- c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
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### **Additional Documentation:**

e) DASY4/5 System Handbook

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- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
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  point exactly below the center marking of the flat phantom section, with the arms oriented
  parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole
  positioned under the liquid filled phantom. The impedance stated is transformed from the
  measurement at the SMA connector to the feed point. The Return Loss ensures low
  reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point.
   No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Certificate No: D835V2-4d133\_Oct18 Page 2 of 8

# **Measurement Conditions**

DASY system configuration, as far as not given on page 1.

| DASY Version                 | DASY5                  | V52.10.2    |
|------------------------------|------------------------|-------------|
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 15 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm      |             |
| Frequency                    | 835 MHz ± 1 MHz        |             |

Head TSL parameters
The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 41.5         | 0.90 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 40.6 ± 6 %   | 0.91 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        |              |                  |

# SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 2.39 W/kg                |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 9.43 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 1.54 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 6.10 W/kg ± 16.5 % (k=2) |

# **Body TSL parameters**

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 55.2         | 0.97 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 54.9 ± 6 %   | 0.98 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C        |              | aif on the tax   |

# SAR result with Body TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 2.46 W/kg                |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 9.75 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 1.61 W/kg                |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 6.40 W/kg ± 16.5 % (k=2) |

Certificate No: D835V2-4d133\_Oct18

# Appendix (Additional assessments outside the scope of SCS 0108)

#### **Antenna Parameters with Head TSL**

| Impedance, transformed to feed point | 50.6 Ω - 2.4 jΩ |
|--------------------------------------|-----------------|
| Return Loss                          | - 32,2 dB       |

# **Antenna Parameters with Body TSL**

| Impedance, transformed to feed point | 45.0 Ω - 6.7 jΩ |
|--------------------------------------|-----------------|
| Return Loss                          | - 21.1 dB       |

# **General Antenna Parameters and Design**

| Electrical Delay (one direction) | 1.397 ns |
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### **Additional EUT Data**

| Manufactured by | SPEAG         |
|-----------------|---------------|
| Manufactured on | July 22, 2011 |

Certificate No: D835V2-4d133\_Oct18 Page 4 of 8

# **DASY5 Validation Report for Head TSL**

Date: 19.10.2018

Test Laboratory: The name of your organization

### DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d133

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: f = 835 MHz;  $\sigma = 0.91$  S/m;  $\varepsilon_r = 40.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

### DASY52 Configuration:

Probe: EX3DV4 - SN7349; ConvF(9.9, 9.9, 9.9) @ 835 MHz; Calibrated: 30.12.2017

• Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn601; Calibrated: 04.10.2018

Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001

• DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

# Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

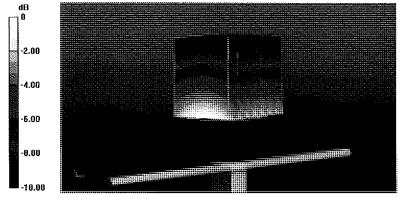
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 63.02 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 3.68 W/kg

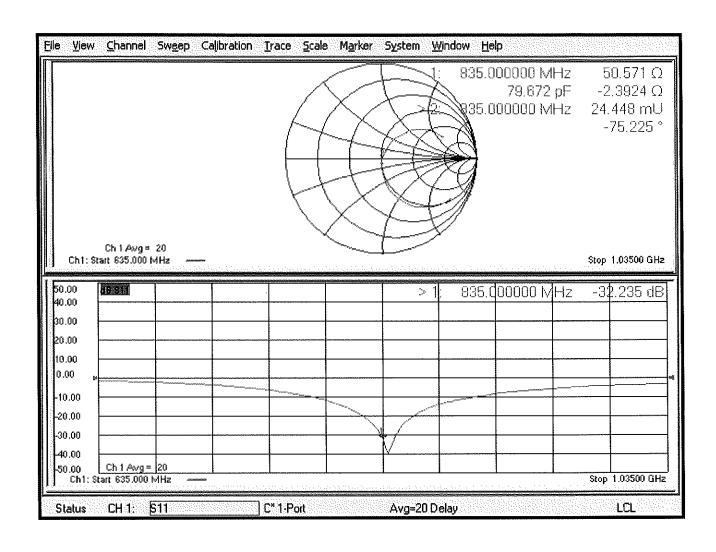
SAR(1 g) = 2.39 W/kg; SAR(10 g) = 1.54 W/kg

Maximum value of SAR (measured) = 3.24 W/kg



0 dB = 3.24 W/kg = 5.11 dBW/kg

# Impedance Measurement Plot for Head TSL



# **DASY5 Validation Report for Body TSL**

Date: 19.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

### **DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d133**

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: f = 835 MHz;  $\sigma = 0.98$  S/m;  $\varepsilon_r = 54.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

# DASY52 Configuration:

Probe: EX3DV4 - SN7349; ConvF(10.05, 10.05, 10.05) @ 835 MHz; Calibrated: 30.12.2017

• Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn601; Calibrated: 04.10.2018

Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005

DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

# Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

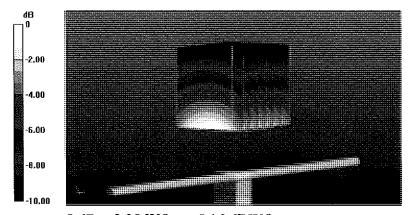
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 61.61 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 3.69 W/kg

SAR(1 g) = 2.46 W/kg; SAR(10 g) = 1.61 W/kg

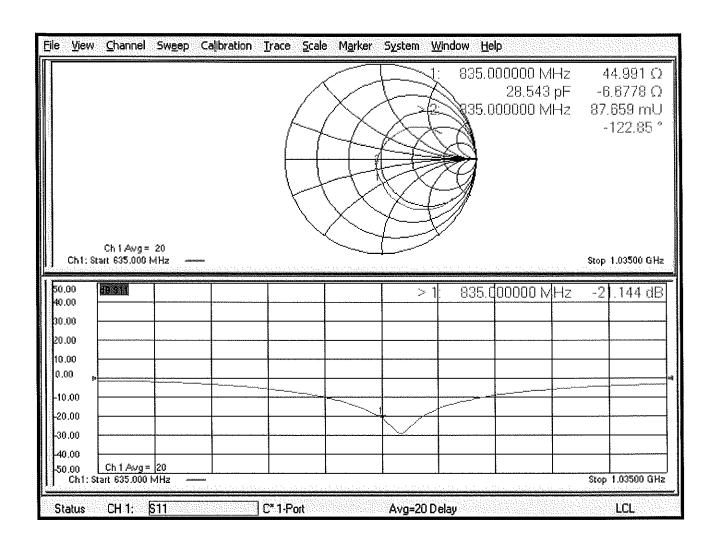
Maximum value of SAR (measured) = 3.28 W/kg



0 dB = 3.28 W/kg = 5.16 dBW/kg

Certificate No: D835V2-4d133\_Oct18

# **Impedance Measurement Plot for Body TSL**



# PCTEST ENGINEERING LABORATORY, INC.



7185 Oakland Mills Road, Columbia, MD 21046 USA Tel. +1.410.290.6652 / Fax +1.410.290.6654 http://www.pctest.com



# **Certification of Calibration**

Object D835V2 – SN:4d133

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Extended Calibration date: October 18, 2019

Description: SAR Validation Dipole at 835 MHz.

Calibration Equipment used:

| Manufacturer          | Model         | Description   | Cal Date   | Cal Interval | Cal Due    | Serial Number |
|-----------------------|---------------|---|------------|--------------|------------|---------------|
| Control Company       | 4040          | Therm./Clock/Humidity Monitor                           | 6/29/2019  | Biennial     | 6/29/2021  | 192291470     |
| Control Company       | 4352          | Ultra Long Stem Thermometer                             | 8/2/2018   | Biennial     | 8/2/2020   | 181334684     |
| Amplifier Research    | 15S1G6        | Amplifier   | CBT        | N/A          | CBT        | 433971        |
| Narda                 | 4772-3        | Attenuator (3dB)  | CBT        | N/A          | CBT        | 9406          |
| Keysight Technologies | 85033E        | Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm) | 7/2/2019   | Annual       | 7/2/2020   | MY53401181    |
| Rohde & Schwarz       | ZNLE6         | Vector Network Analyzer                                 | 10/11/2019 | Annual       | 10/11/2020 | 101307        |
| Mini-Circuits         | BW-N20W5+     | DC to 18 GHz Precision Fixed 20 dB Attenuator           | CBT        | N/A          | CBT        | N/A           |
| SPEAG                 | DAKS-3.5      | Portable Dielectric Assessment Kit                      | 8/13/2019  | Annual       | 8/13/2020  | 1041          |
| Anritsu               | MA2411B       | Pulse Power Sensor                                      | 8/14/2019  | Annual       | 8/14/2020  | 1315051       |
| Anritsu               | MA2411B       | Pulse Power Sensor                                      | 8/8/2019   | Annual       | 8/8/2020   | 1339008       |
| Anritsu               | ML2495A       | Power Meter   | 11/20/2018 | Annual       | 11/20/2019 | 1039008       |
| Agilent               | N5182A        | MXG Vector Signal Generator                             | 8/19/2019  | Annual       | 8/19/2020  | MY47420837    |
| Seekonk               | NC-100        | Torque Wrench   | 5/9/2018   | Biennial     | 5/9/2020   | 22217         |
| Mini-Circuits         | NLP-2950+     | Low Pass Filter DC to 2700 MHz                          | CBT        | N/A          | CBT        | N/A           |
| MiniCircuits          | ZHDC-16-63-S+ | Bidirectional Coupler                                   | CBT        | N/A          | CBT        | N/A           |
| MiniCircuits          | VLF-6000+     | Low Pass Filter   | CBT        | N/A          | CBT        | N/A           |
| SPEAG                 | EX3DV4        | SAR Probe   | 9/19/2019  | Annual       | 9/19/2020  | 7551          |
| SPEAG                 | EX3DV4        | SAR Probe   | 4/24/2019  | Annual       | 4/24/2020  | 7357          |
| SPEAG                 | DAE4          | Dasy Data Acquisition Electronics                       | 9/17/2019  | Annual       | 9/17/2020  | 1333          |
| SPEAG                 | DAE4          | Dasy Data Acquisition Electronics                       | 4/18/2019  | Annual       | 4/18/2020  | 1407          |

Note: CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, amplifier, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path.

# Measurement Uncertainty = ±23% (k=2)

|                | Name              | Function                    | Signature         |
|----------------|-------------------|-----------------------------|-------------------|
| Calibrated By: | Brodie Halbfoster | Team Lead Engineer          | BRODIE HALBFOSTER |
| Approved By:   | Kaitlin O'Keefe   | Senior Technical<br>Manager | 20K               |

| Object:           | Date Issued: | Page 1 of 4 |
|-------------------|--------------|-------------|
| D835V2 - SN:4d133 | 10/18/2019   | Page 1 of 4 |

# **DIPOLE CALIBRATION EXTENSION**

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

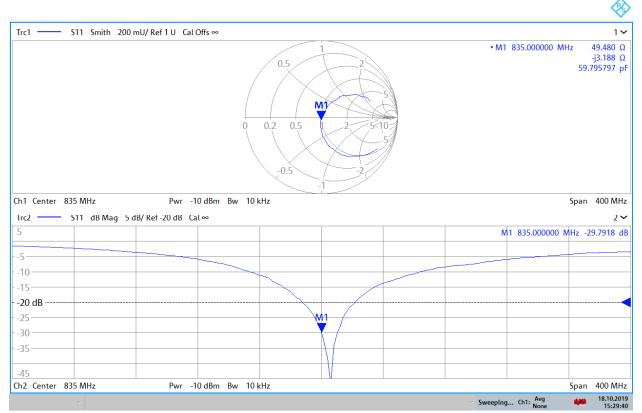
- 1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
- 2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
- 3. The measurement of real or imaginary parts of impedance does not deviate more than  $5\Omega$  from the previous measurement.

The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

| Calibration<br>Date | Extension Date | Certificate<br>Electrical<br>Delay (ns) | Certificate<br>SAR Target<br>Head (1g)<br>W/kg @ 23.0<br>dBm | Head SAR (1g)                                   |       | Certificate<br>SAR Target<br>Head (10g)<br>W/kg @ 23.0<br>dBm | (10a) W/ka @ | Deviation 10g<br>(%) | Certificate<br>Impedance<br>Head (Ohm)<br>Real | Measured<br>Impedance<br>Head (Ohm)<br>Real | Difference<br>(Ohm) Real | Certificate<br>Impedance<br>Head (Ohm)<br>Imaginary | Measured<br>Impedance<br>Head (Ohm)<br>Imaginary | Difference<br>(Ohm)<br>Imaginary | Certificate<br>Return Loss<br>Head (dB) | Measured<br>Return Loss<br>Head (dB) | Deviation (%) | PASS/FAIL |
|---------------------|----------------|---|--|---|-------|---|--------------|----------------------|--|---|--------------------------|---|--|----------------------------------|---|--------------------------------------|---------------|-----------|
| 10/19/2018          | 10/18/2019     | 1.397                                   | 1.886  | 2.03  | 7.64% | 1.22  | 1.32         | 8.20%                | 50.6   | 49.5  | 1.1                      | -2.4  | -3.2   | 0.8                              | -32.2                                   | -29.8                                | 7.50%         | PASS      |
| Calibration<br>Date | Extension Date | Certificate<br>Electrical<br>Delay (ns) | Certificate<br>SAR Target<br>Body (1g)<br>W/kg @ 23.0<br>dBm | Measured<br>Body SAR (1g)<br>W/kg @ 23.0<br>dBm |       | Certificate<br>SAR Target<br>Body (10g)<br>W/kg @ 23.0<br>dBm | (40-) M(4 ©  | Deviation 10g<br>(%) | Certificate<br>Impedance<br>Body (Ohm)<br>Real | Measured<br>Impedance<br>Body (Ohm)<br>Real | Difference<br>(Ohm) Real | Certificate<br>Impedance<br>Body (Ohm)<br>Imaginary | Measured<br>Impedance<br>Body (Ohm)<br>Imaginary | Difference<br>(Ohm)<br>Imaginary | Certificate<br>Return Loss<br>Body (dB) | Measured<br>Return Loss<br>Body (dB) | Deviation (%) | PASS/FAIL |
| 10/19/2018          | 10/18/2019     | 1.397                                   | 1.95   | 2.07  | 6.15% | 1.28  | 1.36         | 6.25%                | 45   | 45.1  | 0.1                      | -6.7  | -5.1   | 1.6                              | -21.1                                   | -22.6                                | -6.90%        | PASS      |

| Object:           | Date Issued: | Page 2 of 4 |
|-------------------|--------------|-------------|
| D835V2 - SN:4d133 | 10/18/2019   | Fage 2 01 4 |

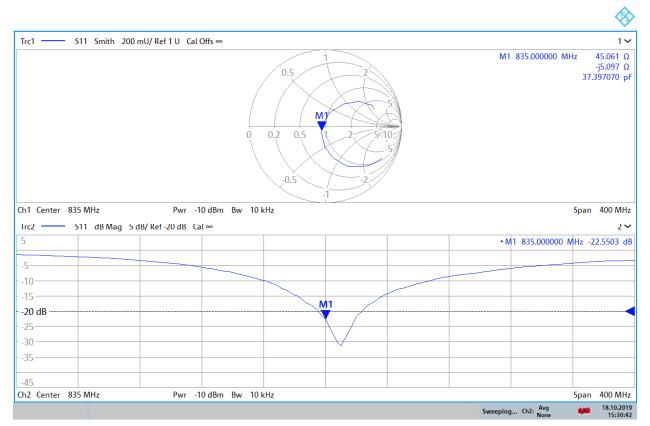
# Impedance & Return-Loss Measurement Plot for Head TSL



15:29:41 18.10.2019

| Object:           | Date Issued: | Page 3 of 4 |
|-------------------|--------------|-------------|
| D835V2 - SN:4d133 | 10/18/2019   | raye 3 01 4 |

# Impedance & Return-Loss Measurement Plot for Body TSL



15:30:43 18.10.2019

| Object:           | Date Issued: | Page 4 of 4 |
|-------------------|--------------|-------------|
| D835V2 - SN:4d133 | 10/18/2019   | Page 4 of 4 |

# Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





S Schweizerischer Kalibrierdienst
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Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Client

PC Test

Certificate No: D1750V2-1148\_May19

# **CALIBRATION CERTIFICATE**

Object

D1750V2 - SN:1148

Calibration procedure(s)

QA CAL-05.v11

Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

05-23-20

Calibration date:

May 15, 2019

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).

The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards               | ID#                | Cal Date (Certificate No.)        | Scheduled Calibration  |
|---------------------------------|--------------------|-----------------------------------|------------------------|
| Power meter NRP                 | SN: 104778         | 03-Apr-19 (No. 217-02892/02893)   | Apr-20                 |
| Power sensor NRP-Z91            | SN: 103244         | 03-Apr-19 (No. 217-02892)         | Apr-20                 |
| Power sensor NRP-Z91            | SN: 103245         | 03-Apr-19 (No. 217-02893)         | Apr-20                 |
| Reference 20 dB Attenuator      | SN: 5058 (20k)     | 04-Apr-19 (No. 217-02894)         | Apr-20                 |
| Type-N mismatch combination     | SN: 5047.2 / 06327 | 04-Apr-19 (No. 217-02895)         | Apr-20                 |
| Reference Probe EX3DV4          | SN: 7349           | 31-Dec-18 (No. EX3-7349_Dec18)    | Dec-19                 |
| DAE4                            | SN: 601            | 30-Apr-19 (No. DAE4-601_Apr19)    | Apr-20                 |
| Secondary Standards             | ID#                | Check Date (in house)             | Scheduled Check        |
| Power meter E4419B              | SN: GB39512475     | 30-Oct-14 (in house check Feb-19) | In house check: Oct-20 |
| Power sensor HP 8481A           | SN: US37292783     | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| Power sensor HP 8481A           | SN: MY41092317     | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| RF generator R&S SMT-06         | SN: 100972         | 15-Jun-15 (in house check Oct-18) | In house check: Oct-20 |
| Network Analyzer Agilent E8358A | SN: US41080477     | 31-Mar-14 (in house check Oct-18) | In house check: Oct-19 |
|                                 | Name               | Function                          | Signature              |
| Calibrated by:                  | Leif Klysner       | Laboratory Technician             | Seif Alem              |
| Approved by:                    | Katja Pokovic      | Technical Manager                 | AAC                    |

Issued: May 15, 2019

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: D1750V2-1148\_May19

# Calibration Laboratory of

Schmid & Partner **Engineering AG** Zeughausstrasse 43, 8004 Zurich, Switzerland





S

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**Swiss Calibration Service** 

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

#### Glossary:

TSL

tissue simulating liquid

ConvF N/A

sensitivity in TSL / NORM x,y,z not applicable or not measured

# Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### Additional Documentation:

e) DASY4/5 System Handbook

#### **Methods Applied and Interpretation of Parameters:**

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Certificate No: D1750V2-1148\_May19 Page 2 of 11

### **Measurement Conditions**

DASY system configuration, as far as not given on page 1.

| DASY Version                 | DASY5                  | V52.10.2    |
|------------------------------|------------------------|-------------|
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 10 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5.0 mm    |             |
| Frequency                    | 1750 MHz ± 1 MHz       |             |

# **Head TSL parameters**

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 40.1         | 1.37 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 40.0 ± 6 %   | 1.34 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        |              |                  |

# SAR result with Head TSL

| SAR averaged over 1 cm³ (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured                              | 250 mW input power | 9.13 W/kg                |
| SAR for nominal Head TSL parameters       | normalized to 1W   | 37.0 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm³ (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured                                | 250 mW input power | 4.83 W/kg                |
| SAR for nominal Head TSL parameters         | normalized to 1W   | 19.5 W/kg ± 16.5 % (k=2) |

# **Body TSL parameters**

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 53.4         | 1.49 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 53.5 ± 6 %   | 1.47 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C        |              |                  |

# **SAR result with Body TSL**

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 9.35 W/kg                |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 37.7 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 4.93 W/kg                |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 19.8 W/kg ± 16.5 % (k=2) |

Certificate No: D1750V2-1148\_May19 Page 3 of 11

# Appendix (Additional assessments outside the scope of SCS 0108)

#### **Antenna Parameters with Head TSL**

| Impedance, transformed to feed point | 51.4 Ω - 0.2 jΩ |
|--------------------------------------|-----------------|
| Return Loss                          | - 37.0 dB       |

# **Antenna Parameters with Body TSL**

| Impedance, transformed to feed point | 47.4 Ω - 0.5 jΩ |
|--------------------------------------|-----------------|
| Return Loss                          | - 31.4 dB       |

### **General Antenna Parameters and Design**

| Electrical Delay (one direction) | 1.222 ns |
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

#### **Additional EUT Data**

| Manufactured by | SPEAG |
|-----------------|-------|

Certificate No: D1750V2-1148\_May19

# Appendix (Additional assessments outside the scope of SCS 0108)

#### **Measurement Conditions**

| DASY system configuration, as far as not given on pa | je 1 | I and 3. |
|--|------|----------|
|--|------|----------|

| Phantom | SAM Head Phantom | For usage with cSAR3DV2-R/L |
|---------|------------------|-----------------------------|
| 1       |                  |                             |

# SAR result with SAM Head (Top)

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 9.38 W/kg                |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 37.9 W/kg ± 17.5 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 5.04 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 20.3 W/kg ± 16.9 % (k=2) |

# SAR result with SAM Head (Mouth)

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 9.34 W/kg                |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 37.8 W/kg ± 17.5 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 5.04 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 20.3 W/kg ± 16.9 % (k=2) |

# SAR result with SAM Head (Neck)

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 9.06 W/kg                |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 36.6 W/kg ± 17.5 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 4.95 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 19.9 W/kg ± 16.9 % (k=2) |

# SAR result with SAM Head (Ear)

| SAR averaged over 1 cm³ (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured                              | 250 mW input power | 7.11 W/kg                |
| SAR for nominal Head TSL parameters       | normalized to 1W   | 28.7 W/kg ± 17.5 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 3.98 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 16.0 W/kg ± 16.9 % (k=2) |

Certificate No: D1750V2-1148\_May19

# **DASY5 Validation Report for Head TSL**

Date: 08.05.2019

Test Laboratory: SPEAG, Zurich, Switzerland

### DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1148

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used: f = 1750 MHz;  $\sigma = 1.34 \text{ S/m}$ ;  $\varepsilon_r = 40$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

#### DASY52 Configuration:

Probe: EX3DV4 - SN7349; ConvF(8.59, 8.59, 8.59) @ 1750 MHz; Calibrated: 31.12.2018

• Sensor-Surface: 1.4mm (Mechanical Surface Detection)

• Electronics: DAE4 Sn601; Calibrated: 30.04.2019

• Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001

DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

# Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

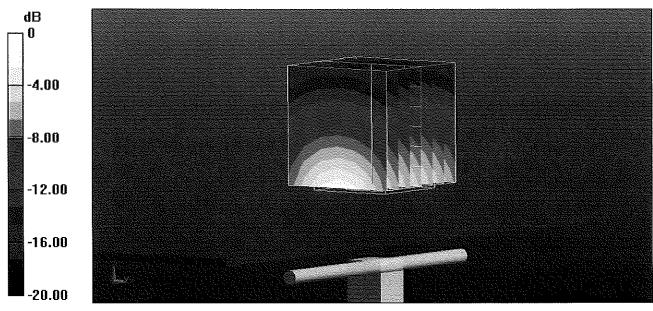
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 107.8 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 16.7 W/kg

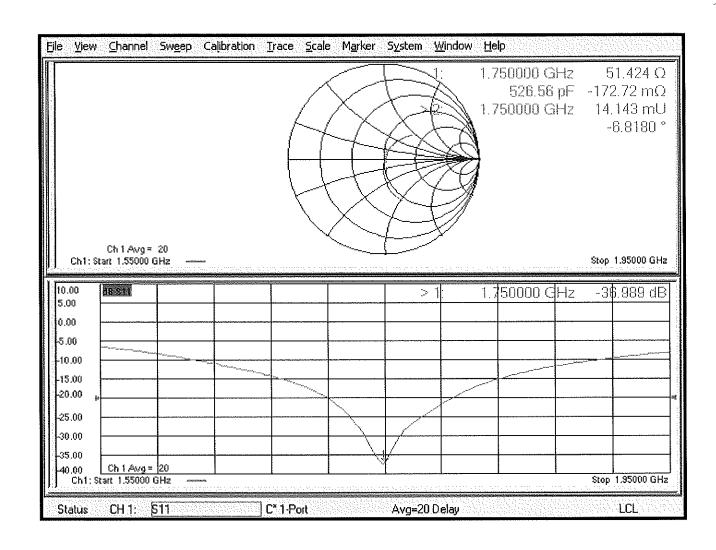
SAR(1 g) = 9.13 W/kg; SAR(10 g) = 4.83 W/kg

Maximum value of SAR (measured) = 14.1 W/kg



0 dB = 14.1 W/kg = 11.49 dBW/kg

# Impedance Measurement Plot for Head TSL



### **DASY5 Validation Report for Body TSL**

Date: 08.05.2019

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1148

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used: f = 1750 MHz;  $\sigma = 1.47 \text{ S/m}$ ;  $\varepsilon_r = 53.5$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

### DASY52 Configuration:

Probe: EX3DV4 - SN7349; ConvF(8.43, 8.43, 8.43) @ 1750 MHz; Calibrated: 31.12.2018

• Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn601; Calibrated: 30.04.2019

Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002

DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

# Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

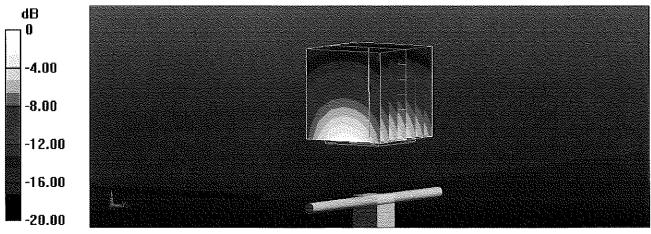
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 103.1 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 17.2 W/kg

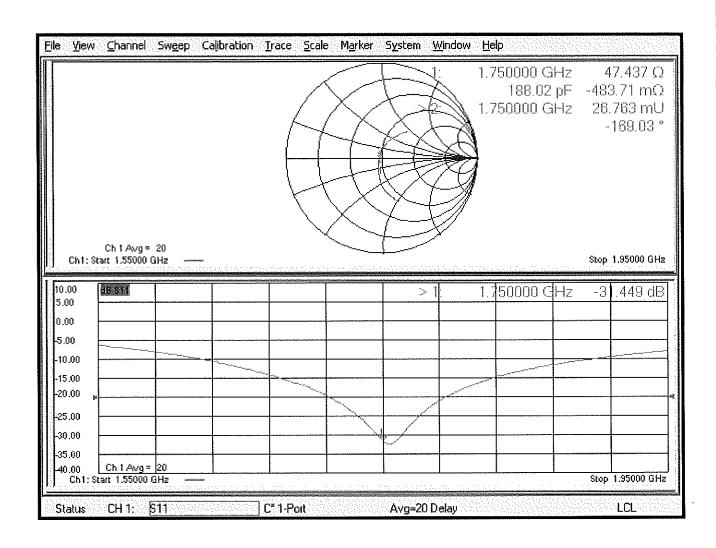
SAR(1 g) = 9.35 W/kg; SAR(10 g) = 4.93 W/kg

Maximum value of SAR (measured) = 14.4 W/kg



0 dB = 14.4 W/kg = 11.58 dBW/kg

# Impedance Measurement Plot for Body TSL



# **DASY5 Validation Report for SAM Head**

Date: 15.05.2019

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1148

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used: f = 1750 MHz;  $\sigma = 1.37 \text{ S/m}$ ;  $\varepsilon_r = 42.1$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

#### DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(8.59, 8.59, 8.59) @ 1750 MHz; Calibrated: 31.12.2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: SAM Head
- DASY52 52.10.2(1495); SEMCAD X 14.6,12(7450)

# SAM Head/Top/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 107.2 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 16.6 W/kg

SAR(1 g) = 9.38 W/kg; SAR(10 g) = 5.04 W/kg

Maximum value of SAR (measured) = 14.2 W/kg

# SAM Head/Mouth/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 104.7 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 16.5 W/kg

SAR(1 g) = 9.34 W/kg; SAR(10 g) = 5.04 W/kg

Maximum value of SAR (measured) = 13.9 W/kg

#### SAM Head/Neck/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 103.3 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 15.5 W/kg

SAR(1 g) = 9.06 W/kg; SAR(10 g) = 4.95 W/kg

Maximum value of SAR (measured) = 13.1 W/kg

#### SAM Head/Ear/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

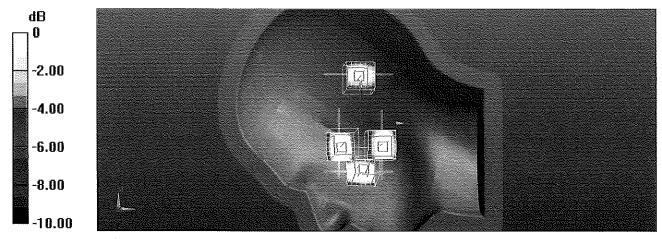
Reference Value = 90.82 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 12.0 W/kg

SAR(1 g) = 7.11 W/kg; SAR(10 g) = 3.98 W/kg

Maximum value of SAR (measured) = 10.2 W/kg

Certificate No: D1750V2-1148\_May19



0 dB = 10.2 W/kg = 10.09 dBW/kg

# Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA

Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client

C Test

Certificate No: D1750V2-1150\_Oct18

| CALIBRATION              | <u> COERTIFICATIE</u>  |
|--------------------------|--|
| Object                   | D1750V2 - SN:1150  |
| Calibration procedure(s) | OA CAL-05 v10 Calibration procedure for dipole validation kits above 700 MHz |
| Calibration date:        | October 22, 2018   |

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).

The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards               | ID#                | Cal Date (Certificate No.)        | Scheduled Calibration  |
|---------------------------------|--------------------|-----------------------------------|------------------------|
| Power meter NRP                 | SN: 104778         | 04-Apr-18 (No. 217-02672/02673)   | Apr-19                 |
| Power sensor NRP-Z91            | SN: 103244         | 04-Apr-18 (No. 217-02672)         | Apr-19                 |
| Power sensor NRP-Z91            | SN: 103245         | 04-Apr-18 (No. 217-02673)         | Apr-19                 |
| Reference 20 dB Attenuator      | SN: 5058 (20k)     | 04-Apr-18 (No. 217-02682)         | Apr-19                 |
| Type-N mismatch combination     | SN: 5047.2 / 06327 | 04-Apr-18 (No. 217-02683)         | Apr-19                 |
| Reference Probe EX3DV4          | SN: 7349           | 30-Dec-17 (No. EX3-7349_Dec17)    | Dsc-18                 |
| DAE4                            | SN: 601            | 04-Oct-18 (No. DAE4-601_Oct18)    | Oct-19                 |
| Secondary Standards             | ID#                | Check Date (in house)             | Scheduled Check        |
| Power meter EPM-442A            | SN: GB37480704     | 07-Oct-15 (in house check Oct-18) | in house check: Oct-20 |
| Power sensor HP 8481A           | SN: US37292783     | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| Power sensor HP 8481A           | SN: MY41092317     | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| RF generator R&S SMT-06         | SN: 100972         | 15-Jun-15 (in house check Oct-18) | In house check: Oct-20 |
| Network Analyzer Agilent E8358A | SN: US41080477     | 31-Mar-14 (in house check Oct-18) | In house check: Oct-19 |
|                                 | Name               | Function                          | Signature              |
| Calibrated by:                  | Michael Weber      | Laboratory Technician             | MNOSET                 |
|                                 |                    |                                   |                        |
| Approved by:                    | Katja Pokovic      | Technical Manager                 | WKC-                   |
|                                 |                    |                                   |                        |
|                                 |                    |                                   |                        |

issued: October 22, 2018

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: D1750V2-1150\_Oct18

Page 1 of 8

# **Calibration Laboratory of**

Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland





Schweizerischer Kalibrierdienst
Service suisse d'étalonnage
Servizio svizzero di taratura
Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

#### Glossarv:

TSL

tissue simulating liquid

ConvF

sensitivity in TSL / NORM x,y,z

N/A

not applicable or not measured

# Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### **Additional Documentation:**

e) DASY4/5 System Handbook

#### **Methods Applied and Interpretation of Parameters:**

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed
  point exactly below the center marking of the flat phantom section, with the arms oriented
  parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole
  positioned under the liquid filled phantom. The impedance stated is transformed from the
  measurement at the SMA connector to the feed point. The Return Loss ensures low
  reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

# **Measurement Conditions**

DASY system configuration, as far as not given on page 1.

| DASY Version                 | DASY5                  | V52.10.2    |
|------------------------------|------------------------|-------------|
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 10 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, $dy$ , $dz = 5 mm$ |             |
| Frequency                    | 1750 MHz ± 1 MHz       |             |

# **Head TSL parameters**

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 40.1         | 1.37 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 38.8 ± 6 %   | 1.33 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        |              |                  |

# SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 9.02 W/kg                |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 36.5 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 4.76 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 19.2 W/kg ± 16.5 % (k=2) |

# **Body TSL parameters**

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 53.4         | 1.49 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 53.5 ± 6 %   | 1.46 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C        |              |                  |

# SAR result with Body TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 9.04 W/kg                |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 36.6 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 4.82 W/kg                |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 19.4 W/kg ± 16.5 % (k=2) |

Certificate No: D1750V2-1150\_Oct18 Page 3 of 8

# Appendix (Additional assessments outside the scope of SCS 0108)

#### **Antenna Parameters with Head TSL**

| Impedance, transformed to feed point | 50.9 Ω - 0.4 jΩ |
|--------------------------------------|-----------------|
| Return Loss                          | - 40.1 dB       |

# **Antenna Parameters with Body TSL**

| Impedance, transformed to feed point | 46.6 Ω - 0.1 jΩ |
|--------------------------------------|-----------------|
| Return Loss                          | - 29.2 dB       |

# **General Antenna Parameters and Design**

| Electrical Delay (one direction) | 1.217 ns |  |
|----------------------------------|----------|--|
|                                  |          |  |

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

# **Additional EUT Data**

| Manufactured by | SPEAG          |
|-----------------|----------------|
| Manufactured on | April 10, 2015 |

# **DASY5 Validation Report for Head TSL**

Date: 22.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1150

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used: f = 1750 MHz;  $\sigma = 1.33 \text{ S/m}$ ;  $\varepsilon_r = 38.8$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

# DASY52 Configuration:

Probe: EX3DV4 - SN7349; ConvF(8.5, 8.5, 8.5) @ 1750 MHz; Calibrated: 30.12.2017

• Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electromics: DAE4 Sn601; Calibrated: 04.10.2018

• Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001

• DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

# Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

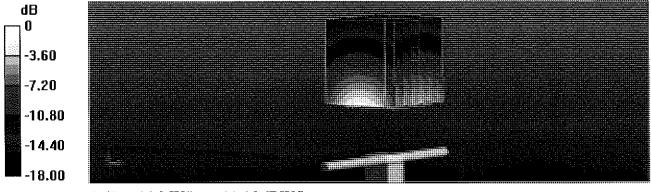
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 108.1 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 16.7 W/kg

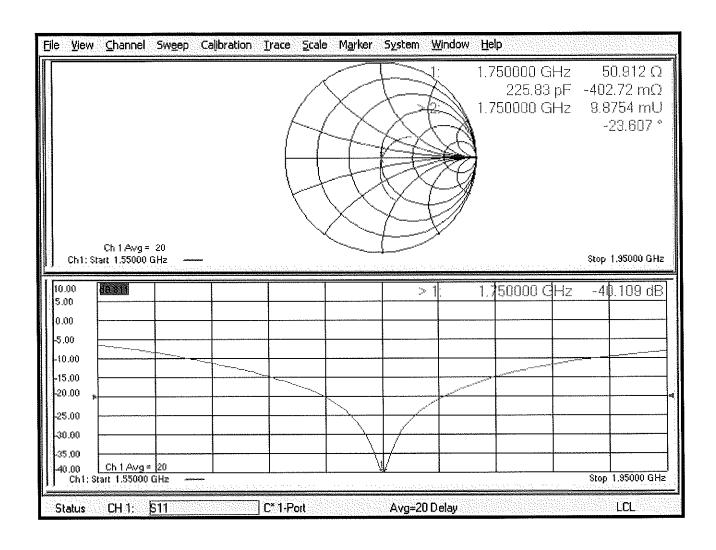
SAR(1 g) = 9.02 W/kg; SAR(10 g) = 4.76 W/kg

Maximum value of SAR (measured) = 14.0 W/kg



0 dB = 14.0 W/kg = 11.46 dBW/kg

# Impedance Measurement Plot for Head TSL



### **DASY5 Validation Report for Body TSL**

Date: 22.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

### DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1150

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used: f = 1750 MHz;  $\sigma = 1.46 \text{ S/m}$ ;  $\varepsilon_r = 53.5$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

#### DASY52 Configuration:

• Probe: EX3DV4 - SN7349; ConvF(8.35, 8.35, 8.35) @ 1750 MHz; Calibrated: 30.12.2017

• Sensor-Surface: 1.4mm (Mechanical Surface Detection)

• Electronics: DAE4 Sn601; Calibrated: 04.10.2018

Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002

DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

## Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

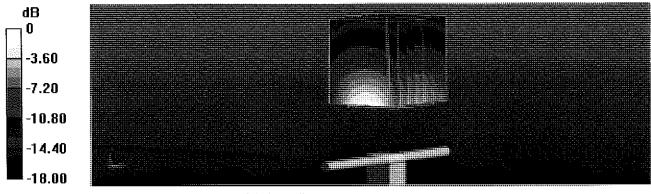
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 102.1 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 16.0 W/kg

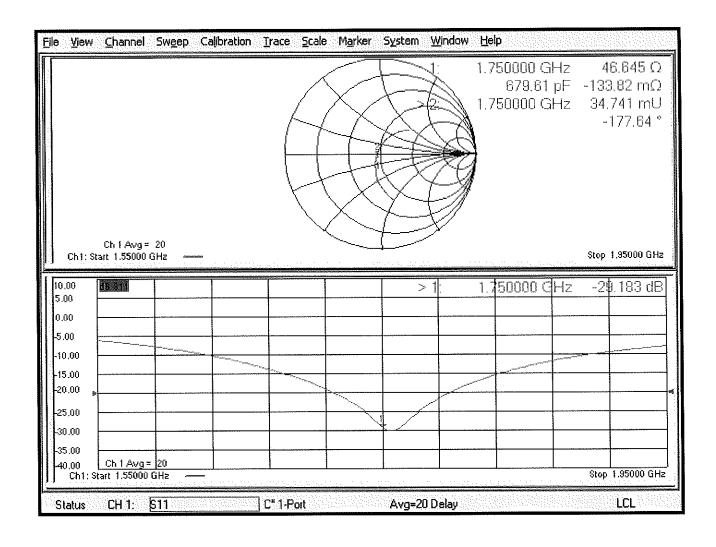
SAR(1 g) = 9.04 W/kg; SAR(10 g) = 4.82 W/kg

Maximum value of SAR (measured) = 13.6 W/kg



0 dB = 13.6 W/kg = 11.34 dBW/kg

# Impedance Measurement Plot for Body TSL



# PCTEST ENGINEERING LABORATORY, INC.



7185 Oakland Mills Road, Columbia, MD 21046 USA Tel. +1.410.290.6652 / Fax +1.410.290.6654 http://www.pctest.com



# **Certification of Calibration**

Object D1750V2 – SN:1150

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Extended Calibration date: October 18, 2019

Description: SAR Validation Dipole at 1750 MHz.

Calibration Equipment used:

| Manufacturer          | Model         | Description   | Cal Date   | Cal Interval | Cal Due    | Serial Number |
|-----------------------|---------------|---|------------|--------------|------------|---------------|
| Control Company       | 4040          | Therm./Clock/Humidity Monitor                           | 6/29/2019  | Biennial     | 6/29/2021  | 192291470     |
| Control Company       | 4352          | Ultra Long Stem Thermometer                             | 8/2/2018   | Biennial     | 8/2/2020   | 181334684     |
| Amplifier Research    | 15S1G6        | Amplifier   | CBT        | N/A          | CBT        | 433971        |
| Narda                 | 4772-3        | Attenuator (3dB)  | CBT        | N/A          | CBT        | 9406          |
| Keysight Technologies | 85033E        | Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm) | 7/2/2019   | Annual       | 7/2/2020   | MY53401181    |
| Rohde & Schwarz       | ZNLE6         | Vector Network Analyzer                                 | 10/11/2019 | Annual       | 10/11/2020 | 101307        |
| Mini-Circuits         | BW-N20W5+     | DC to 18 GHz Precision Fixed 20 dB Attenuator           | CBT        | N/A          | CBT        | N/A           |
| SPEAG                 | DAKS-3.5      | Portable Dielectric Assessment Kit                      | 8/13/2019  | Annual       | 8/13/2020  | 1041          |
| Anritsu               | MA2411B       | Pulse Power Sensor                                      | 8/14/2019  | Annual       | 8/14/2020  | 1315051       |
| Anritsu               | MA2411B       | Pulse Power Sensor                                      | 8/8/2019   | Annual       | 8/8/2020   | 1339008       |
| Anritsu               | ML2495A       | Power Meter   | 11/20/2018 | Annual       | 11/20/2019 | 1039008       |
| Agilent               | N5182A        | MXG Vector Signal Generator                             | 8/19/2019  | Annual       | 8/19/2020  | MY47420837    |
| Seekonk               | NC-100        | Torque Wrench   | 5/9/2018   | Biennial     | 5/9/2020   | 22217         |
| Mini-Circuits         | NLP-2950+     | Low Pass Filter DC to 2700 MHz                          | CBT        | N/A          | CBT        | N/A           |
| MiniCircuits          | ZHDC-16-63-S+ | Bidirectional Coupler                                   | CBT        | N/A          | CBT        | N/A           |
| MiniCircuits          | VLF-6000+     | Low Pass Filter   | CBT        | N/A          | CBT        | N/A           |
| SPEAG                 | EX3DV4        | SAR Probe   | 8/16/2019  | Annual       | 8/16/2020  | 7308          |
| SPEAG                 | EX3DV4        | SAR Probe   | 4/24/2019  | Annual       | 4/24/2020  | 7357          |
| SPEAG                 | DAE4          | Dasy Data Acquisition Electronics                       | 4/18/2019  | Annual       | 4/18/2020  | 1407          |
| SPEAG                 | DAE4          | Dasy Data Acquisition Electronics                       | 8/14/2019  | Annual       | 8/14/2020  | 1450          |

Note: CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, amplifier, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path.

#### Measurement Uncertainty = ±23% (k=2)

|                | Name              | Function                    | Signature         |
|----------------|-------------------|-----------------------------|-------------------|
| Calibrated By: | Brodie Halbfoster | Team Lead Engineer          | BRODIE HALBFOSTER |
| Approved By:   | Kaitlin O'Keefe   | Senior Technical<br>Manager | 20K               |

| Object:           | Date Issued: | Page 1 of 4 |
|-------------------|--------------|-------------|
| D1750V2 - SN:1150 | 10/18/2019   | Page 1 of 4 |

### **DIPOLE CALIBRATION EXTENSION**

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

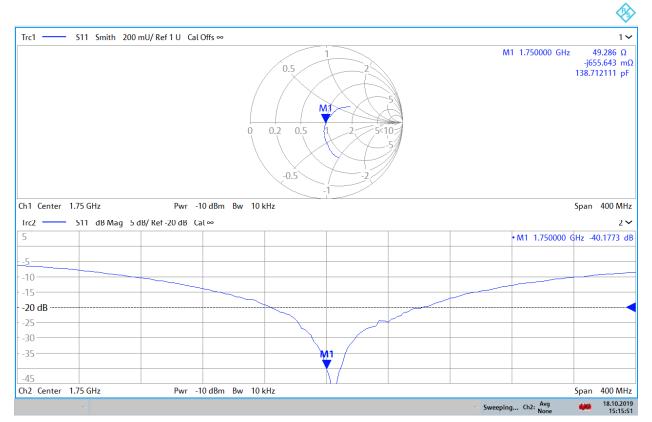
- 1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
- 2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
- 3. The measurement of real or imaginary parts of impedance does not deviate more than  $5\Omega$  from the previous measurement.

The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

| Calibration<br>Date | Extension Date | Certificate<br>Electrical<br>Delay (ns) | Certificate<br>SAR Target<br>Head (1g)<br>W/kg @ 20.0<br>dBm | Measured<br>Head SAR (1g)<br>W/kg @ 20.0<br>dBm |       | Certificate<br>SAR Target<br>Head (10g)<br>W/kg @ 20.0<br>dBm | (10a) W/ka @ | Deviation 10g<br>(%) | Certificate<br>Impedance<br>Head (Ohm)<br>Real | Measured<br>Impedance<br>Head (Ohm)<br>Real | Difference<br>(Ohm) Real | Certificate<br>Impedance<br>Head (Ohm)<br>Imaginary | Measured<br>Impedance<br>Head (Ohm)<br>Imaginary | Difference<br>(Ohm)<br>Imaginary | Certificate<br>Return Loss<br>Head (dB) | Measured<br>Return Loss<br>Head (dB) | Deviation (%) | PASS/FAIL |
|---------------------|----------------|---|--|---|-------|---|--------------|----------------------|--|---|--------------------------|---|--|----------------------------------|---|--------------------------------------|---------------|-----------|
| 10/22/2018          | 10/18/2019     | 1.217                                   | 3.65   | 3.8   | 4.11% | 1.92  | 2            | 4.17%                | 50.9   | 49.3  | 1.6                      | 0.4   | -0.7   | 1.1                              | -40.1                                   | -40.2                                | -0.20%        | PASS      |
| Calibration<br>Date | Extension Date | Certificate<br>Electrical<br>Delay (ns) | Certificate<br>SAR Target<br>Body (1g)<br>W/kg @ 20.0<br>dBm | Measured<br>Body SAR (1g)<br>W/kg @ 20.0<br>dBm |       | Certificate<br>SAR Target<br>Body (10g)<br>W/kg @ 20.0<br>dBm | (10a) W/ka @ | Deviation 10g<br>(%) | Certificate<br>Impedance<br>Body (Ohm)<br>Real | Measured<br>Impedance<br>Body (Ohm)<br>Real | Difference<br>(Ohm) Real | Certificate<br>Impedance<br>Body (Ohm)<br>Imaginary | Measured<br>Impedance<br>Body (Ohm)<br>Imaginary | Difference<br>(Ohm)<br>Imaginary | Certificate<br>Return Loss<br>Body (dB) | Measured<br>Return Loss<br>Body (dB) | Deviation (%) | PASS/FAIL |
| 10/22/2018          | 10/18/2019     | 1.217                                   | 3.66   | 3.82  | 4.37% | 1.94  | 2.02         | 4.12%                | 46.6   | 44.7  | 1.9                      | -0.1  | -0.8   | 0.7                              | -29.2                                   | -25                                  | 14.40%        | PASS      |

| Object:           | Date Issued: | Page 2 of 4 |  |
|-------------------|--------------|-------------|--|
| D1750V2 - SN:1150 | 10/18/2019   | Fage 2 01 4 |  |

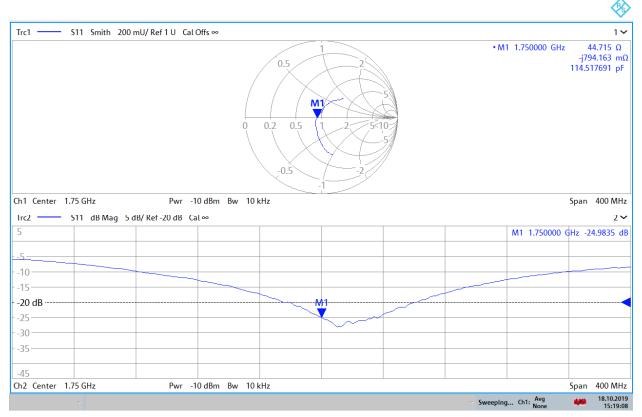
#### Impedance & Return-Loss Measurement Plot for Head TSL



15:15:52 18.10.2019

| Object:           | Date Issued: | Page 3 of 4 |
|-------------------|--------------|-------------|
| D1750V2 - SN:1150 | 10/18/2019   | raye 3 01 4 |

### Impedance & Return-Loss Measurement Plot for Body TSL



15:19:09 18.10.2019

| Object:           | Date Issued: | Page 4 of 4 |
|-------------------|--------------|-------------|
| D1750V2 - SN:1150 | 10/18/2019   | Page 4 of 4 |

# Calibration Laboratory of Schmid & Partner

**Engineering AG** Zeughausstrasse 43, 8004 Zurich, Switzerland





C

Schweizerischer Kalibrierdienst Service sulsse d'étalonnage Servizio svizzero di taratura **Swiss Calibration Service** 

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates Accreditation No.: SCS 0108

Client

Certificate No: D1900V2-5d080\_Oct18

| CALIBRATION C                       |                           |   |                                   |
|-------------------------------------|---------------------------|---|-----------------------------------|
| Dbject                              | D1900V2 - SN:50           | 1080  |                                   |
| Calibration procedure(s)            | QA CAL-05 v10             |   |                                   |
|                                     | Calibration proce         | dure for dipole validation kits al              | DOVE 700 WITZ                     |
|                                     |                           |   | BN                                |
| Calibration date:                   | October 23, 2018          |   | BN 10-30-2018 BN 10-30-2018       |
|                                     |                           |   | BNV                               |
|                                     | •                         | onal standards, which realize the physical      | units of theasurements (51). 10 - |
| he measurements and the uncert      | aintles with confidence p | robability are given on the following pages     | and are part of the certificate.  |
| All calibrations have been conducte | ed in the closed laborato | y facility; environment temperature (22 $\pm$ 3 | s)°C and humidity < 70%.          |
| Calibration Equipment used (M&TE    | aritical for calibration  |   |                                   |
| Salibration Editibulant read (Motte | conicarior campianory     |   |                                   |
| Primary Standards                   | ID#                       | Cal Date (Certificate No.)                      | Scheduled Calibration             |
| Power meter NRP                     | SN: 104778                | 04-Apr-18 (No. 217-02672/02673)                 | Apr-19                            |
| Power sensor NRP-Z91                | SN: 103244                | 04-Apr-18 (No. 217-02672)                       | Apr-19                            |
| Power sensor NRP-Z91                | <b>S</b> N: 103245        | 04-Apr-18 (No. 217-02673)                       | Apr-19                            |
| Reference 20 dB Attenuator          | SN: 5058 (20k)            | 04-Apr-18 (No. 217-02682)                       | Apr-19                            |
| ype-N mismatch combination          | SN: 5047.2 / 06327        | 04-Apr-18 (No. 217-02683)                       | Apr-19                            |
| Reference Probe EX3DV4              | SN: 7349                  | 30-Dec-17 (No. EX3-7349_Dec17)                  | Dec-18 ·                          |
| DAE4                                | SN: 601                   | 04-Oct-18 (No. DAE4-601_Oct18)                  | Oct-19                            |
| Secondary Standards                 | ID#                       | Check Date (in house)                           | Scheduled Check                   |
| Power meter EPM-442A                | SN: GB37480704            | 07-Oct-15 (in house check Oct-18)               | In house check: Oct-20            |
| Power sensor HP 8481A               | SN: US37292783            | 07-Oct-15 (in house check Oct-18)               | In house check: Oct-20            |
| Power sensor HP 8481A               | SN: MY41092317            | 07-Oct-15 (in house check Oct-18)               | In house check: Oct-20            |
| RF generator R&S SMT-06             | SN: 100972                | 15-Jun-15 (in house check Oct-18)               | in house check: Oct-20            |
| Network Analyzer Agilent E8358A     | SN: US41080477            | 31-Mar-14 (in house check Oct-18)               | In house check: Oct-19            |
|                                     | Name                      | Function  | Signature                         |
| Calibrated by:                      | Jeton Kastrati            | Laboratory Technician                           | te la                             |
| Approved by:                        | Katja Pokovic             | Technical Manager                               |                                   |
|                                     |                           |   | Issued: October 23, 2018          |

Certificate No: D1900V2-5d080\_Oct18

Page 1 of 8

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

### **Calibration Laboratory of**

Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland





S Schweizerischer Kalibrierdienst
Service suisse d'étalonnage
Servizio svizzero di taratura
Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

#### Glossary:

TSL tissue simulating liquid

ConvF sensitivity in TSL / NORM x,y,z N/A not applicable or not measured

### Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### **Additional Documentation:**

e) DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole
  positioned under the liquid filled phantom. The impedance stated is transformed from the
  measurement at the SMA connector to the feed point. The Return Loss ensures low
  reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Certificate No: D1900V2-5d080\_Oct18 Page 2 of 8

### **Measurement Conditions**

DASY system configuration, as far as not given on page 1.

| DASY Version                 | DASY5                  | V52.10.2    |
|------------------------------|------------------------|-------------|
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 10 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm      |             |
| Frequency                    | 1900 MHz ± 1 MHz       |             |

# **Head TSL parameters**

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 40.0         | 1.40 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 40.3 ± 6 %   | 1.40 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        | do to to     |                  |

### SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 9.93 W/kg                |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 39.8 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 5.18 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 20.7 W/kg ± 16.5 % (k=2) |

# **Body TSL parameters**

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 53.3         | 1.52 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 52.9 ± 6 %   | 1.47 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C        |              |                  |

# **SAR result with Body TSL**

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          | , , , , , ,              |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 9.62 W/kg                |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 39.2 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 5.09 W/kg                |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 20.6 W/kg ± 16.5 % (k=2) |

Certificate No: D1900V2-5d080\_Oct18

### Appendix (Additional assessments outside the scope of SCS 0108)

#### Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 52.5 Ω + 7.9 jΩ |  |  |  |  |  |
|--------------------------------------|-----------------|--|--|--|--|--|
| Return Loss                          | - 21.8 dB       |  |  |  |  |  |

## **Antenna Parameters with Body TSL**

| Impedance, transformed to feed point | 48.1 Ω + 8.1 jΩ |
|--------------------------------------|-----------------|
| Return Loss                          | - 21.5 dB       |

### **General Antenna Parameters and Design**

| Electrical Delay (one direction) | 1.193 ns |  |
|----------------------------------|----------|--|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

#### **Additional EUT Data**

| Manufactured by | SPEAG         |
|-----------------|---------------|
| Manufactured on | June 28, 2006 |

Certificate No: D1900V2-5d080\_Oct18

### **DASY5 Validation Report for Head TSL**

Date: 23.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

### DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d080

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: f = 1900 MHz;  $\sigma = 1.4 \text{ S/m}$ ;  $\varepsilon_r = 40.3$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

#### DASY52 Configuration:

Probe: EX3DV4 - SN7349; ConvF(8.18, 8.18, 8.18) @ 1900 MHz; Calibrated: 30.12.2017

• Sensor-Surface: 1.4mm (Mechanical Surface Detection)

• Electronics: DAE4 Sn601; Calibrated: 04.10.2018

• Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001

• DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

## Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

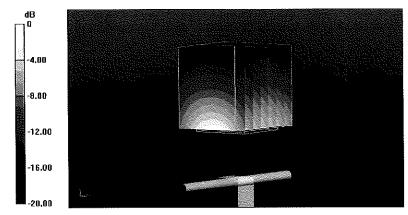
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 110.0 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 18.7 W/kg

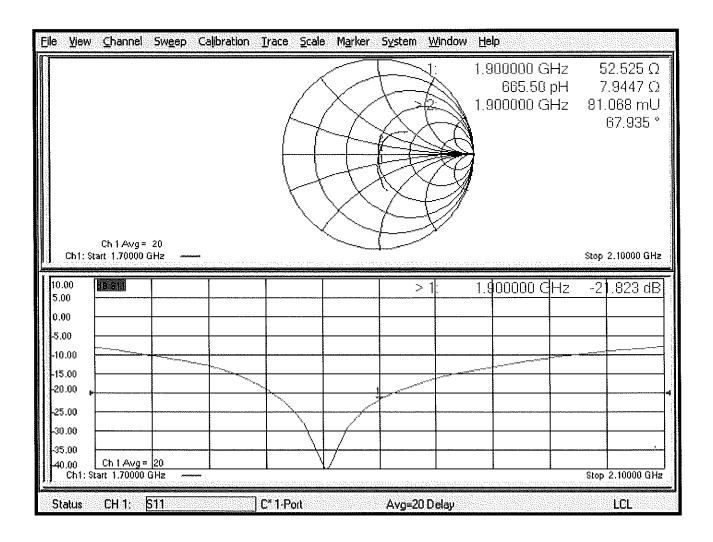
SAR(1 g) = 9.93 W/kg; SAR(10 g) = 5.18 W/kg

Maximum value of SAR (measured) = 15.6 W/kg



0 dB = 15.6 W/kg = 11.93 dBW/kg

# Impedance Measurement Plot for Head TSL



### **DASY5 Validation Report for Body TSL**

Date: 23.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

#### DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d080

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: f = 1900 MHz;  $\sigma = 1.47 \text{ S/m}$ ;  $\varepsilon_r = 52.9$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

### DASY52 Configuration:

Probe: EX3DV4 - SN7349; ConvF(8.15, 8.15, 8.15) @ 1900 MHz; Calibrated: 30.12.2017

• Sensor-Surface: 1.4mm (Mechanical Surface Detection)

• Electronics: DAE4 Sn601; Calibrated: 04.10.2018

Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002

• DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

## Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

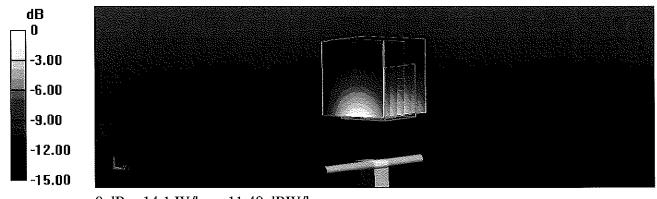
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 99.86 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 17.3 W/kg

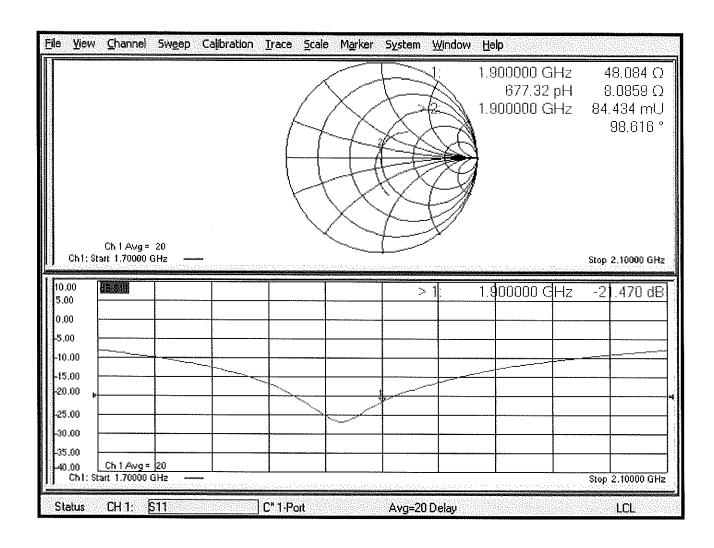
SAR(1 g) = 9.62 W/kg; SAR(10 g) = 5.09 W/kg

Maximum value of SAR (measured) = 14.1 W/kg



0 dB = 14.1 W/kg = 11.49 dBW/kg

# Impedance Measurement Plot for Body TSL



# PCTEST ENGINEERING LABORATORY, INC.



7185 Oakland Mills Road, Columbia, MD 21046 USA Tel. +1.410.290.6652 / Fax +1.410.290.6654 http://www.pctest.com



# **Certification of Calibration**

Object D1900V2 – SN:5d080

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Extended Calibration date: October 18, 2019

Description: SAR Validation Dipole at 1900 MHz.

Calibration Equipment used:

| Manufacturer          | Model         | Description   | Cal Date   | Cal Interval | Cal Due    | Serial Number |
|-----------------------|---------------|---|------------|--------------|------------|---------------|
| Control Company       | 4040          | Therm./Clock/Humidity Monitor                           | 6/29/2019  | Biennial     | 6/29/2021  | 192291470     |
| Control Company       | 4352          | Ultra Long Stem Thermometer                             | 8/2/2018   | Biennial     | 8/2/2020   | 181334684     |
| Amplifier Research    | 15S1G6        | Amplifier   | CBT        | N/A          | CBT        | 433971        |
| Narda                 | 4772-3        | Attenuator (3dB)  | CBT        | N/A          | CBT        | 9406          |
| Keysight Technologies | 85033E        | Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm) | 7/2/2019   | Annual       | 7/2/2020   | MY53401181    |
| Rohde & Schwarz       | ZNLE6         | Vector Network Analyzer                                 | 10/11/2019 | Annual       | 10/11/2020 | 101307        |
| Mini-Circuits         | BW-N20W5+     | DC to 18 GHz Precision Fixed 20 dB Attenuator           | CBT        | N/A          | CBT        | N/A           |
| SPEAG                 | DAKS-3.5      | Portable Dielectric Assessment Kit                      | 8/13/2019  | Annual       | 8/13/2020  | 1041          |
| Anritsu               | MA2411B       | Pulse Power Sensor                                      | 8/14/2019  | Annual       | 8/14/2020  | 1315051       |
| Anritsu               | MA2411B       | Pulse Power Sensor                                      | 8/8/2019   | Annual       | 8/8/2020   | 1339008       |
| Anritsu               | ML2495A       | Power Meter   | 11/20/2018 | Annual       | 11/20/2019 | 1039008       |
| Agilent               | N5182A        | MXG Vector Signal Generator                             | 8/19/2019  | Annual       | 8/19/2020  | MY47420837    |
| Seekonk               | NC-100        | Torque Wrench   | 5/9/2018   | Biennial     | 5/9/2020   | 22217         |
| Mini-Circuits         | NLP-2950+     | Low Pass Filter DC to 2700 MHz                          | CBT        | N/A          | CBT        | N/A           |
| MiniCircuits          | ZHDC-16-63-S+ | Bidirectional Coupler                                   | CBT        | N/A          | CBT        | N/A           |
| MiniCircuits          | VLF-6000+     | Low Pass Filter   | CBT        | N/A          | CBT        | N/A           |
| SPEAG                 | EX3DV4        | SAR Probe   | 2/19/2019  | Annual       | 2/19/2020  | 3914          |
| SPEAG                 | EX3DV4        | SAR Probe   | 5/16/2019  | Annual       | 5/16/2020  | 7406          |
| SPEAG                 | DAE4          | Dasy Data Acquisition Electronics                       | 5/8/2019   | Annual       | 5/8/2020   | 859           |
| SPEAG                 | DAE4          | Dasy Data Acquisition Electronics                       | 2/14/2019  | Annual       | 2/14/2020  | 1272          |

Note: CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, amplifier, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path.

#### Measurement Uncertainty = ±23% (k=2)

|                | Name              | Function                    | Signature         |
|----------------|-------------------|-----------------------------|-------------------|
| Calibrated By: | Brodie Halbfoster | Team Lead Engineer          | BRODIE HALBFOSTER |
| Approved By:   | Kaitlin O'Keefe   | Senior Technical<br>Manager | 20K               |

| Object:             | Date Issued: | Page 1 of 4 |
|---------------------|--------------|-------------|
| D1900V2 - SN: 5d080 | 10/18/2019   | Page 1 of 4 |

### **DIPOLE CALIBRATION EXTENSION**

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

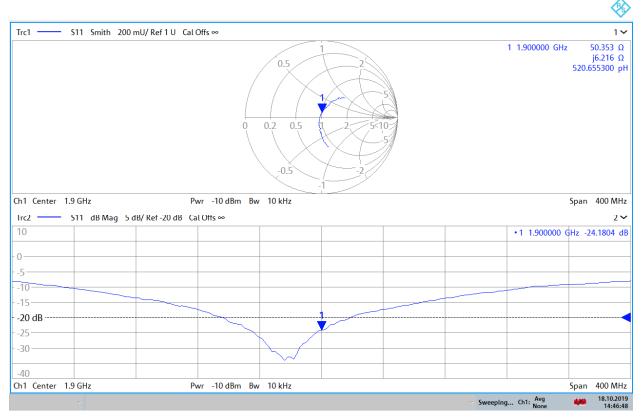
- 1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
- 2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
- 3. The measurement of real or imaginary parts of impedance does not deviate more than  $5\Omega$  from the previous measurement.

The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

| Calibration<br>Date | Extension Date | Certificate<br>Electrical<br>Delay (ns) |      | Measured<br>Head SAR (1g)<br>W/kg @ 20.0<br>dBm | (0/)  | Certificate<br>SAR Target<br>Head (10g)<br>W/kg @ 20.0<br>dBm | (40-) M(4 G)  | Deviation 10g<br>(%) |      | Measured<br>Impedance<br>Head (Ohm)<br>Real | Difference<br>(Ohm) Real | Certificate<br>Impedance<br>Head (Ohm)<br>Imaginary | Measured<br>Impedance<br>Head (Ohm)<br>Imaginary | Difference<br>(Ohm)<br>Imaginary | Certificate<br>Return Loss<br>Head (dB) | Measured<br>Return Loss<br>Head (dB) | Deviation (%) | PASS/FAIL |
|---------------------|----------------|---|------|---|-------|---|---------------|----------------------|------|---|--------------------------|---|--|----------------------------------|---|--------------------------------------|---------------|-----------|
| 10/23/2018          | 10/18/2019     | 1.193                                   | 3.98 | 4.16  | 4.52% | 2.07  | 2.13          | 2.90%                | 52.5 | 50.4  | 2.1                      | 7.9   | 6.2  | 1.7                              | -21.8                                   | -24.2                                | -10.90%       | PASS      |
| Calibration<br>Date | Extension Date | Certificate<br>Electrical<br>Delay (ns) |      | Measured<br>Body SAR (1g)<br>W/kg @ 20.0<br>dBm | (0/)  |   | (40-) M(4 (-) | Deviation 10g<br>(%) |      | Measured<br>Impedance<br>Body (Ohm)<br>Real | Difference<br>(Ohm) Real | Certificate<br>Impedance<br>Body (Ohm)<br>Imaginary | Measured<br>Impedance<br>Body (Ohm)<br>Imaginary | Difference<br>(Ohm)<br>Imaginary | Certificate<br>Return Loss<br>Body (dB) | Measured<br>Return Loss<br>Body (dB) | Deviation (%) | PASS/FAIL |
| 10/23/2018          | 10/18/2019     | 1.193                                   | 3.92 | 4.21  | 7.40% | 2.06  | 2.16          | 4.85%                | 48.1 | 46.5  | 1.6                      | 8.1   | 6.6  | 1.5                              | -21.5                                   | -22.2                                | -3.40%        | PASS      |

| Object:             | Date Issued: | Page 2 of 4 |
|---------------------|--------------|-------------|
| D1900V2 - SN: 5d080 | 10/18/2019   | raye 2 01 4 |

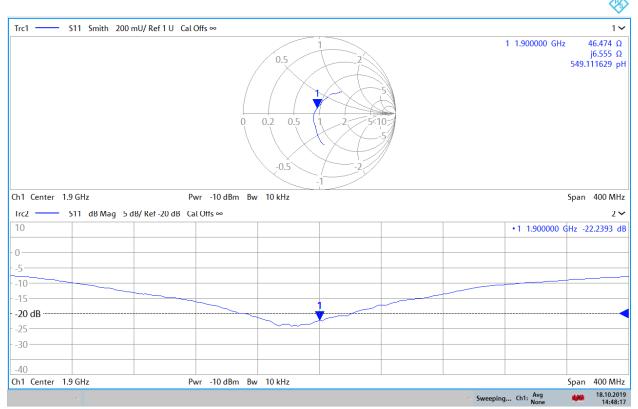
### Impedance & Return-Loss Measurement Plot for Head TSL



14:46:49 18.10.2019

| Object:             | Date Issued: | Page 3 of 4 |
|---------------------|--------------|-------------|
| D1900V2 - SN: 5d080 | 10/18/2019   | rage 3 01 4 |

### Impedance & Return-Loss Measurement Plot for Body TSL



14:48:18 18.10.2019

| Object:             | Date Issued: | Page 4 of 4 |
|---------------------|--------------|-------------|
| D1900V2 - SN: 5d080 | 10/18/2019   | Page 4 of 4 |

# Calibration Laboratory of

Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurlch, Switzerland





S Schweizerischer Kalibrierdienst
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Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client

PC Test

Certificate No: D1900V2=5d148\_Feb19

|  |   | .Ce   | milicate No: E/1900V/2-50 148 FED 19   |
|--|---|---|--|
| CALIBRATION C  | ERTIFICATI  |   |  |
| Object   | D1900V2 - SN:5  | d148  |  |
| Calibration procedure(s)   | QA CAL-05.v11<br>Calibration Proc                         | edure for SAR Validation  | Sources between 0.7-3 GHz  |
| Calibration date:  | February 21, 20   | <b>(9</b>   | Physical units of measurements (SI). $0.2-26-2$  |
| This calibration certificate docume<br>The measurements and the uncert | nts the traceability to nat<br>tainties with confidence p | ional standards, which realize the p<br>probability are given on the followin | physical units of measurements (SI). 02-26-2<br>g pages and are part of the certificate. |
| All calibrations have been conduct                                     |   |   |  |
| Calibration Equipment used (M&TE                                       | E critical for calibration)                               |   |  |
| Primary Standards  | ID#   | Cal Date (Certificate No.)  | Scheduled Callbration  |
| Power meter NRP  | SN: 104778  | 04-Apr-18 (No. 217-02672/0267   | 73) Apr-19   |
| Power sensor NRP-Z91   | SN: 103244  | 04-Apr-18 (No. 217-02672)   | Apr-19   |
| Power sensor NRP-Z91   | SN: 103245  | 04-Apr-18 (No. 217-02673)   | Apr-19   |
| Reference 20 dB Attenuator   | SN: 5058 (20k)  | 04-Apr-18 (No. 217-02682)   | Apr-19   |
| ype-N mlsmatch combination   | SN: 5047.2 / 06327  | 04-Apr-18 (No. 217-02683)   | Apr-19   |
| Reference Probe EX3DV4   | SN: 7349  | 31-Dec-18 (No. EX3-7349_Dec   |  |
| DAE4   | SN: 601   | 04-Oct-18 (No. DAE4-601_Oct1  | · · · · · · · · · · · · · · · · · · ·  |
| Secondary Standards  | ID#   | Check Date (in house)   | Scheduled Check  |
| ower meter E4419B  | SN: GB39512475  | 07-Oct-15 (in house check Feb-  | *·····································   |
| ower sensor HP 8481A   | SN: US37292783  | 07-Oct-15 (in house check Oct-  | ,  |
| ower sensor HP 8481A   | SN: MY41092317  | 07-Oct-15 (In house check Oct-  | ,  |
| RF generator R&S SMT-06  | SN: 100972  | 15-Jun-15 (in house check Oct-  |  |
| Network Analyzer Agilent E8358A  | SN: US41080477  | 31-Mar-14 (in house check Oct-  | ·  |
|  | Nome  | سر  |  |
| Colibrated but   | Name  | Function  | Signature  |
| Calibrated by:   | Manu Seltz  | Laboratory Technici   | lan J  |
| Approved by:   | Kalja Pokovic   | Technical Manager   |  |
|  |   |   |  |
| <b></b> 40   |   |   | Issued: February 21, 2019  |

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: D1900V2-5d148\_Feb19

Page 1 of 8

### **Calibration Laboratory of**

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S Schweizerischer Kalibrierdienst
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Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

#### Glossary:

TSL

tissue simulating liquid

ConvF N/A sensitivity in TSL / NORM x,y,z

not applicable or not measured

## Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### **Additional Documentation:**

e) DASY4/5 System Handbook

#### **Methods Applied and Interpretation of Parameters:**

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed
  point exactly below the center marking of the flat phantom section, with the arms oriented
  parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole
  positioned under the liquid filled phantom. The impedance stated is transformed from the
  measurement at the SMA connector to the feed point. The Return Loss ensures low
  reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point.
   No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Certificate No: D1900V2-5d148\_Feb19

Page 2 of 8

### **Measurement Conditions**

DASY system configuration, as far as not given on page 1.

| DASY Version                 | DASY5                  | V52.10.2    |
|------------------------------|------------------------|-------------|
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 10 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, $dy$ , $dz = 5 mm$ |             |
| Frequency                    | 1900 MHz ± 1 MHz       |             |

# **Head TSL parameters**

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 40.0         | 1.40 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 40.9 ± 6 %   | 1.38 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        |              |                  |

### SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 9.65 W/kg                |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 39.1 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 5.05 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 20.4 W/kg ± 16.5 % (k=2) |

# **Body TSL parameters**

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 53.3         | 1.52 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 53.6 ± 6 %   | 1.47 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C        |              |                  |

# SAR result with Body TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 9.56 W/kg                |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 39.1 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 5.05 W/kg                |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 20.5 W/kg ± 16.5 % (k=2) |

# Appendix (Additional assessments outside the scope of SCS 0108)

#### Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 51.8 Ω + 6.8 jΩ |
|--------------------------------------|-----------------|
| Return Loss                          | - 23.2 dB       |

# **Antenna Parameters with Body TSL**

| Impedance, transformed to feed point | 48.4 Ω + 7.8 jΩ |
|--------------------------------------|-----------------|
| Return Loss                          | - 21.9 dB       |

### General Antenna Parameters and Design

| Electrical Delay (one direction) | 4 4 <b>=</b> 0 |
|----------------------------------|----------------|
| Licetical Delay (one direction)  | 1.170 ns       |
|                                  |                |

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

#### **Additional EUT Data**

| Manufactured by | SPEAG |
|-----------------|-------|
| -               |       |

### **DASY5 Validation Report for Head TSL**

Date: 21.02,2019

Test Laboratory: SPEAG, Zurich, Switzerland

# DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d148

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: f = 1900 MHz;  $\sigma = 1.38 \text{ S/m}$ ;  $\varepsilon_r = 40.9$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

#### **DASY52 Configuration:**

Probe: EX3DV4 - SN7349; ConvF(8.26, 8.26, 8.26) @ 1900 MHz; Calibrated: 31.12.2018

• Sensor-Surface: 1.4mm (Mechanical Surface Detection)

• Electronics: DAE4 Sn601; Calibrated: 04.10.2018

Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001

DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

# Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

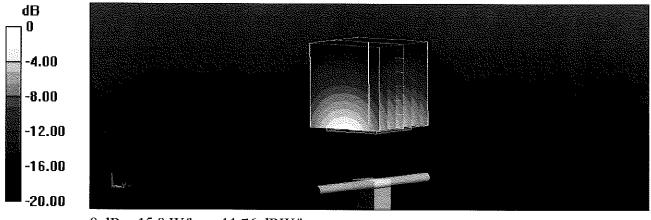
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 109.4 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 17.8 W/kg

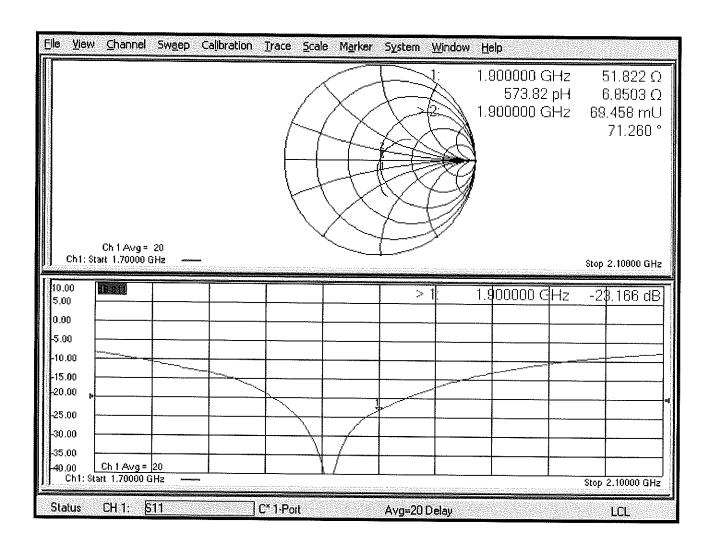
SAR(1 g) = 9.65 W/kg; SAR(10 g) = 5.05 W/kg

Maximum value of SAR (measured) = 15.0 W/kg



0 dB = 15.0 W/kg = 11.76 dBW/kg

# Impedance Measurement Plot for Head TSL



### **DASY5 Validation Report for Body TSL**

Date: 21.02.2019

Test Laboratory: SPEAG, Zurich, Switzerland

# DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d148

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: f = 1900 MHz;  $\sigma = 1.47 \text{ S/m}$ ;  $\varepsilon_r = 53.6$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

### DASY52 Configuration:

Probe: EX3DV4 - SN7349; ConvF(8.23, 8.23, 8.23) @ 1900 MHz; Calibrated: 31.12.2018

• Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn601; Calibrated: 04.10,2018

Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002

DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

# Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

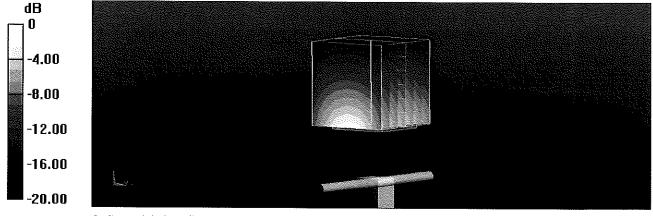
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 103.7 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 17.0 W/kg

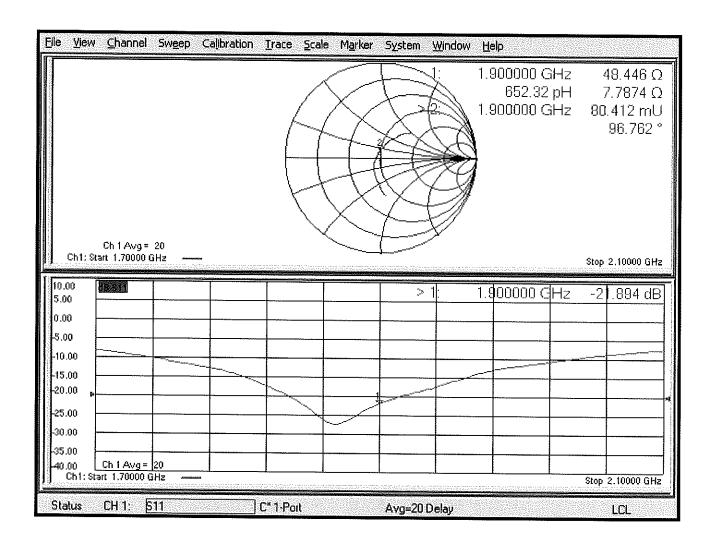
SAR(1 g) = 9.56 W/kg; SAR(10 g) = 5.05 W/kg

Maximum value of SAR (measured) = 14.4 W/kg



0 dB = 14.4 W/kg = 11.58 dBW/kg

# Impedance Measurement Plot for Body TSL



#### **PCTEST**



7185 Oakland Mills Road, Columbia, MD 21046 USA Tel. +1.410.290.6652 / Fax +1.410.290.6654 http://www.pctest.com



# **Certification of Calibration**

Object D1900V2 – SN: 5d148

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Extension Calibration date: 2/21/2020

Description: SAR Validation Dipole at 1900 MHz.

Calibration Equipment used:

| Manufacturer          | Model         | Description   | Cal Date   | Cal Interval | Cal Due    | Serial Number |
|-----------------------|---------------|---|------------|--------------|------------|---------------|
| Control Company       | 4040          | Therm./Clock/Humidity Monitor                           | 6/29/2019  | Biennial     | 6/29/2021  | 192291470     |
| Control Company       | 4352          | Ultra Long Stem Thermometer                             | 8/2/2018   | Biennial     | 8/2/2020   | 181334684     |
| Amplifier Research    | 15S1G6        | Amplifier   | CBT        | N/A          | CBT        | 433971        |
| Narda                 | 4772-3        | Attenuator (3dB)  | CBT        | N/A          | CBT        | 9406          |
| Keysight Technologies | 85033E        | Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm) | 7/2/2019   | Annual       | 7/2/2020   | MY53401181    |
| Rohde & Schwarz       | ZNLE6         | Vector Network Analyzer                                 | 10/11/2019 | Annual       | 10/11/2020 | 101307        |
| Mini-Circuits         | BW-N20W5+     | DC to 18 GHz Precision Fixed 20 dB Attenuator           | CBT        | N/A          | CBT        | N/A           |
| SPEAG                 | DAKS-3.5      | Portable DAK  | 9/10/2019  | Annual       | 9/10/2020  | 1045          |
| Anritsu               | MA2411B       | Pulse Power Sensor                                      | 8/14/2019  | Annual       | 8/14/2020  | 1315051       |
| Anritsu               | MA2411B       | Pulse Power Sensor                                      | 8/8/2019   | Annual       | 8/8/2020   | 1339008       |
| Anritsu               | ML2495A       | Power Meter   | 12/17/2019 | Annual       | 12/17/2020 | 941001        |
| Agilent               | N5182A        | MXG Vector Signal Generator                             | 8/19/2019  | Annual       | 8/19/2020  | MY47420837    |
| Seekonk               | NC-100        | Torque Wrench   | 5/9/2018   | Biennial     | 5/9/2020   | 22217         |
| MiniCircuits          | ZHDC-16-63-S+ | Bidirectional Coupler                                   | CBT        | N/A          | CBT        | N/A           |
| MiniCircuits          | VLF-6000+     | Low Pass Filter   | CBT        | N/A          | CBT        | N/A           |
| SPEAG                 | EX3DV4        | SAR Probe   | 9/19/2019  | Annual       | 9/19/2020  | 7551          |
| SPEAG                 | EX3DV4        | SAR Probe   | 7/16/2019  | Annual       | 7/16/2020  | 7410          |
| SPEAG                 | DAE4          | Dasy Data Acquisition Electronics                       | 9/17/2019  | Annual       | 9/17/2020  | 1333          |
| SPEAG                 | DAE4          | Dasy Data Acquisition Electronics                       | 7/11/2019  | Annual       | 7/11/2020  | 1322          |

# Measurement Uncertainty = ±23% (k=2)

|                | Name              | Function                    | Signature         |
|----------------|-------------------|-----------------------------|-------------------|
| Calibrated By: | Brodie Halbfoster | Test Engineer               | BRODIE HALBFOSTER |
| Approved By:   | Kaitlin O'Keefe   | Senior Technical<br>Manager | 306               |

| Object:             | Date Issued: | Page 1 of 4 |
|---------------------|--------------|-------------|
| D1900V2 - SN: 5d148 | 02/21/2020   | Page 1 of 4 |

# **DIPOLE CALIBRATION EXTENSION**

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

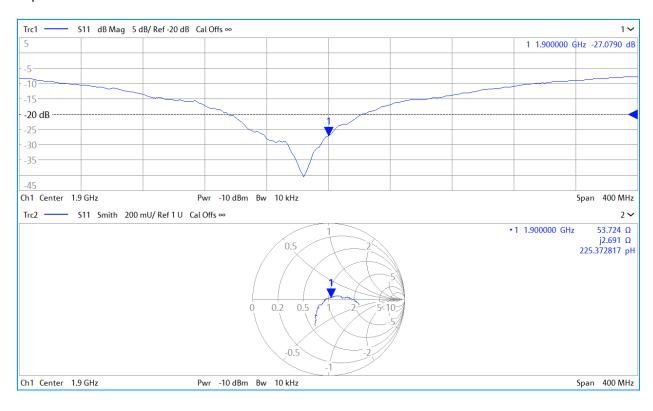
- 1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
- 2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
- 3. The measurement of real or imaginary parts of impedance does not deviate more than  $5\Omega$  from the previous measurement.

The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

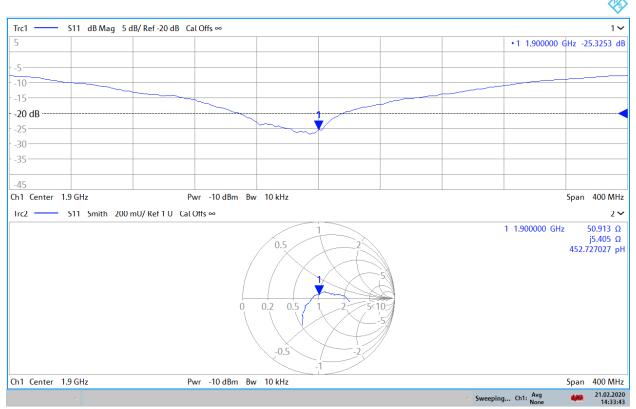
| Calibration<br>Date | Extension Date | Certificate<br>Electrical<br>Delay (ns) | Certificate<br>SAR Target<br>Head (1g)<br>W/kg @ 20.0<br>dBm | Measured<br>Head SAR (1g)<br>W/kg @ 20.0<br>dBm | (0/)  | Certificate<br>SAR Target<br>Head (10g)<br>W/kg @ 20.0<br>dBm | (40-) M(4 © | Deviation 10g<br>(%) | Certificate<br>Impedance<br>Head (Ohm)<br>Real | Measured<br>Impedance<br>Head (Ohm)<br>Real | Difference<br>(Ohm) Real | Certificate<br>Impedance<br>Head (Ohm)<br>Imaginary | Measured<br>Impedance<br>Head (Ohm)<br>Imaginary | Difference<br>(Ohm)<br>Imaginary | Certificate<br>Return Loss<br>Head (dB) | Measured<br>Return Loss<br>Head (dB) | Deviation (%) | PASS/FAIL |
|---------------------|----------------|---|--|---|-------|---|-------------|----------------------|--|---|--------------------------|---|--|----------------------------------|---|--------------------------------------|---------------|-----------|
| 2/21/2019           | 2/21/2020      | 1.17                                    | 3.91   | 4.15  | 6.14% | 2.04  | 2.13        | 4.41%                | 51.8   | 53.7  | 1.9                      | 6.8   | 2.7  | 4.1                              | -23.2                                   | -27.1                                | -16.70%       | PASS      |
| Calibration<br>Date | Extension Date | Certificate<br>Electrical<br>Delay (ns) | Certificate<br>SAR Target<br>Body (1g)<br>W/kg @ 20.0<br>dBm | Measured<br>Body SAR (1g)<br>W/kg @ 20.0<br>dBm | (0/)  | Certificate<br>SAR Target<br>Body (10g)<br>W/kg @ 20.0<br>dBm | (40-) M(4 @ | Deviation 10g<br>(%) |  | Measured<br>Impedance<br>Body (Ohm)<br>Real | Difference<br>(Ohm) Real | Certificate<br>Impedance<br>Body (Ohm)<br>Imaginary | Measured<br>Impedance<br>Body (Ohm)<br>Imaginary | Difference<br>(Ohm)<br>Imaginary | Certificate<br>Return Loss<br>Body (dB) | Measured<br>Return Loss<br>Body (dB) | Deviation (%) | PASS/FAIL |
| 2/21/2019           | 2/21/2020      | 1.17                                    | 3.91   | 4.06  | 3.84% | 2.05  | 2.08        | 1.46%                | 48.4   | 50.9  | 2.5                      | 7.8   | 5.4  | 2.4                              | -21.9                                   | -25.3                                | -15.60%       | PASS      |

| Object:             | Date Issued: | Page 2 of 4 |  |
|---------------------|--------------|-------------|--|
| D1900V2 - SN: 5d148 | 02/21/2020   | Faye 2 01 4 |  |

#### Impedance & Return-Loss Measurement Plot for Head TSL



### Impedance & Return-Loss Measurement Plot for Body TSL



14:33:44 21.02.2020

| Object:             | Date Issued: | Page 4 of 4 |
|---------------------|--------------|-------------|
| D1900V2 - SN: 5d148 | 02/21/2020   | Page 4 of 4 |

### Calibration Laboratory of

Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland





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Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA

Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client

**PC Test** 

Certificate No: D1900V2-5d149\_Oct18

| Object   | D1900V2-SN:50  | 1149   |  |
|--|--|--|--|
|  | and the challenge of th |  |  |
| Calibration procedure(s)   | QA CAL-05.v10  | dura for dipola validation bits abo  | wo 700 MB→   |
|  | Gailbrailon proce  | dure for dipole validation kits abo  | IVE 700 MITZ   |
|  |  |  | $\rho_{ m N}V$   |
|  | Total Control of the  |  | BNV<br>10-30-2018<br>10-20-20  |
| Calibration date:  | October 23, 2018   | 3  | 10-30-   |
|  |  |  | BNY  |
| The state of the s |  |  | 10-20-1  |
|  | •  | ional standards, which realize the physical uni  | • •  |
| he measurements and the uncert   | tainties with confidence p   | robability are given on the following pages an   | d are part of the certificate.   |
| All actibrations have been analyst   |  |  | O I b I-da- 2700/  |
| ui caidiations have been conque  | ed in the closed laborato  | ry facility: environment temperature (22 ± 3)°C  | Jana numidity < 70%.   |
| Colibration Equipment used (MRT)   | E critical for calibration)  |  |  |
| Jaudiauon Equipinen used (Mai)   |  |  |  |
| Januarion Equipment used (Math   | E crided for calibrationy  |  |  |
| , ,  | ID#  | Cal Date (Certificate No.)   | Scheduled Calibration  |
| Primary Standards  | 1  | Cal Date (Certificate No.) 04-Apr-18 (No. 217-02672/02673)   | Scheduled Calibration Apr-19   |
| Primary Standards Power meter NRP  | ID#  |  |  |
| Primary Standards<br>Power meter NRP<br>Power sensor NRP-Z91   | ID#<br>SN: 104778  | 04-Apr-18 (No. 217-02672/02673)  | Apr-19   |
| Primary Standards<br>Power meter NRP<br>Power sensor NRP-Z91<br>Power sensor NRP-Z91   | ID #<br>SN: 104778<br>SN: 103244   | 04-Apr-18 (No. 217-02672/02673)<br>04-Apr-18 (No. 217-02672)   | Apr-19<br>Apr-19   |
| Calibration Equipment used (M&TI Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination  | ID #<br>SN: 104778<br>SN: 103244<br>SN: 103245   | 04-Apr-18 (No. 217-02672/02673)<br>04-Apr-18 (No. 217-02672)<br>04-Apr-18 (No. 217-02673)  | Apr-19<br>Apr-19<br>Apr-19   |
| Primary Standards<br>Power meter NRP<br>Power sensor NRP-Z91<br>Power sensor NRP-Z91<br>Reference 20 dB Attenuator   | ID #<br>SN: 104778<br>SN: 103244<br>SN: 103245<br>SN: 5058 (20k)   | 04-Apr-18 (No. 217-02672/02673)<br>04-Apr-18 (No. 217-02672)<br>04-Apr-18 (No. 217-02673)<br>04-Apr-18 (No. 217-02682)   | Apr-19<br>Apr-19<br>Apr-19<br>Apr-19   |
| Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4  | ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327  | 04-Apr-18 (No. 217-02672/02673)<br>04-Apr-18 (No. 217-02672)<br>04-Apr-18 (No. 217-02673)<br>04-Apr-18 (No. 217-02682)<br>04-Apr-18 (No. 217-02683)  | Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19   |
| Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4   | ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7349 SN: 601   | 04-Apr-18 (No. 217-02672/02673) 04-Apr-18 (No. 217-02672) 04-Apr-18 (No. 217-02673) 04-Apr-18 (No. 217-02682) 04-Apr-18 (No. 217-02683) 30-Dec-17 (No. EX3-7349_Dec17) 04-Oct-18 (No. DAE4-601_Oct18)  | Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Dec-18<br>Oct-19   |
| Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards   | ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7349 SN: 601   | 04-Apr-18 (No. 217-02672/02673) 04-Apr-18 (No. 217-02672) 04-Apr-18 (No. 217-02673) 04-Apr-18 (No. 217-02682) 04-Apr-18 (No. 217-02683) 30-Dec-17 (No. EX3-7349_Dec17) 04-Oct-18 (No. DAE4-601_Oct18) Check Date (in house)  | Apr-19 Apr-19 Apr-19 Apr-19 Apr-19 Apr-19 Dec-18 Oct-19 Scheduled Check  |
| Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4  Secondary Standards Power meter EPM-442A   | ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7349 SN: 601 ID # SN: GB37480704   | 04-Apr-18 (No. 217-02672/02673) 04-Apr-18 (No. 217-02672) 04-Apr-18 (No. 217-02673) 04-Apr-18 (No. 217-02682) 04-Apr-18 (No. 217-02683) 30-Dec-17 (No. EX3-7349_Dec17) 04-Oct-18 (No. DAE4-601_Oct18)  Check Date (in house)   | Apr-19 Apr-19 Apr-19 Apr-19 Apr-19 Apr-19 Dec-18 Oct-19 Scheduled Check In house check: Oct-20   |
| Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 8481A  | ID #  SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7349 SN: 601  ID #  SN: GB37480704 SN: US37292783   | 04-Apr-18 (No. 217-02672/02673) 04-Apr-18 (No. 217-02672) 04-Apr-18 (No. 217-02673) 04-Apr-18 (No. 217-02682) 04-Apr-18 (No. 217-02682) 04-Apr-18 (No. 217-02683) 30-Dec-17 (No. EX3-7349_Dec17) 04-Oct-18 (No. DAE4-601_Oct18)  Check Date (in house) 07-Oct-15 (in house check Oct-18)   | Apr-19 Apr-19 Apr-19 Apr-19 Apr-19 Apr-19 Dec-18 Oct-19 Scheduled Check In house check: Oct-20 In house check: Oct-20  |
| Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 8481A  | ID #  SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7349 SN: 601  ID #  SN: GB37480704 SN: US37292783 SN: MY41092317  | 04-Apr-18 (No. 217-02672/02673) 04-Apr-18 (No. 217-02672) 04-Apr-18 (No. 217-02673) 04-Apr-18 (No. 217-02682) 04-Apr-18 (No. 217-02682) 04-Apr-18 (No. 217-02683) 30-Dec-17 (No. EX3-7349_Dec17) 04-Oct-18 (No. DAE4-601_Oct18)  Check Date (in house) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18)   | Apr-19 Apr-19 Apr-19 Apr-19 Apr-19 Apr-19 Dec-18 Oct-19 Scheduled Check In house check: Oct-20 In house check: Oct-20 In house check: Oct-20   |
| Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Recondary Standards Power meter EPM-442A Power sensor HP 8481A Recomer sensor HP 8481A Recomer sensor HP 8481A Recomer sensor HP 8481A  | ID #  SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7349 SN: 601  ID #  SN: GB37480704 SN: US37292783 SN: MY41092317 SN: 100972   | 04-Apr-18 (No. 217-02672/02673) 04-Apr-18 (No. 217-02672) 04-Apr-18 (No. 217-02673) 04-Apr-18 (No. 217-02682) 04-Apr-18 (No. 217-02682) 04-Apr-18 (No. 217-02683) 30-Dec-17 (No. EX3-7349_Dec17) 04-Oct-18 (No. DAE4-601_Oct18)  Check Date (in house) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18) 15-Jun-15 (in house check Oct-18)         | Apr-19 Apr-19 Apr-19 Apr-19 Apr-19 Apr-19 Dec-18 Oct-19  Scheduled Check In house check: Oct-20                        |
| Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06   | ID #  SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7349 SN: 601  ID #  SN: GB37480704 SN: US37292783 SN: MY41092317 SN: 100972   | 04-Apr-18 (No. 217-02672/02673) 04-Apr-18 (No. 217-02672) 04-Apr-18 (No. 217-02673) 04-Apr-18 (No. 217-02682) 04-Apr-18 (No. 217-02682) 04-Apr-18 (No. 217-02683) 30-Dec-17 (No. EX3-7349_Dec17) 04-Oct-18 (No. DAE4-601_Oct18)  Check Date (in house) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18)   | Apr-19 Apr-19 Apr-19 Apr-19 Apr-19 Apr-19 Dec-18 Oct-19 Scheduled Check In house check: Oct-20 In house check: Oct-20 In house check: Oct-20   |
| Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Recondary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06  | ID #  SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7349 SN: 601  ID #  SN: GB37480704 SN: US37292783 SN: MY41092317 SN: 100972   | 04-Apr-18 (No. 217-02672/02673) 04-Apr-18 (No. 217-02672) 04-Apr-18 (No. 217-02673) 04-Apr-18 (No. 217-02682) 04-Apr-18 (No. 217-02682) 04-Apr-18 (No. 217-02683) 30-Dec-17 (No. EX3-7349_Dec17) 04-Oct-18 (No. DAE4-601_Oct18)  Check Date (in house) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18) 15-Jun-15 (in house check Oct-18)         | Apr-19 Apr-19 Apr-19 Apr-19 Apr-19 Apr-19 Dec-18 Oct-19  Scheduled Check In house check: Oct-20                        |
| Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Recondary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A  | ID #  SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7349 SN: 601  ID #  SN: GB37480704 SN: US37292783 SN: MY41092317 SN: 100972 SN: US41080477  | 04-Apr-18 (No. 217-02672/02673) 04-Apr-18 (No. 217-02672) 04-Apr-18 (No. 217-02673) 04-Apr-18 (No. 217-02682) 04-Apr-18 (No. 217-02683) 30-Dec-17 (No. EX3-7349_Dec17) 04-Oct-18 (No. DAE4-601_Oct18)  Check Date (in house) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18) 15-Jun-15 (in house check Oct-18) 31-Mar-14 (in house check Oct-18) | Apr-19 Apr-19 Apr-19 Apr-19 Apr-19 Apr-19 Dec-18 Oct-19  Scheduled Check In house check: Oct-20 In house check: Oct-19 |
| Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 8481A  | ID #  SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7349 SN: 601  ID #  SN: GB37480704 SN: US37292783 SN: MY41092317 SN: 100972 SN: US41080477  Name  | 04-Apr-18 (No. 217-02672/02673) 04-Apr-18 (No. 217-02672) 04-Apr-18 (No. 217-02673) 04-Apr-18 (No. 217-02682) 04-Apr-18 (No. 217-02683) 30-Dec-17 (No. EX3-7349_Dec17) 04-Oct-18 (No. DAE4-601_Oct18)  Check Date (in house) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18) 15-Jun-15 (in house check Oct-18) 31-Mar-14 (in house check Oct-18) | Apr-19 Apr-19 Apr-19 Apr-19 Apr-19 Apr-19 Dec-18 Oct-19  Scheduled Check In house check: Oct-20 In house check: Oct-19 |
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Certificate No: D1900V2-5d149\_Oct18

Page 1 of 8

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

## **Calibration Laboratory of**

Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland





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Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA

Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL

tissue simulating liquid

ConvF N/A sensitivity in TSL / NORM x,y,z

not applicable or not measured

# Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### **Additional Documentation:**

e) DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed
  point exactly below the center marking of the flat phantom section, with the arms oriented
  parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole
  positioned under the liquid filled phantom. The impedance stated is transformed from the
  measurement at the SMA connector to the feed point. The Return Loss ensures low
  reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

#### **Measurement Conditions**

DASY system configuration, as far as not given on page 1.

| DASY Version                 | DASY5                  | V52.10.2    |
|------------------------------|------------------------|-------------|
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 10 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, $dy$ , $dz = 5 mm$ |             |
| Frequency                    | 1900 MHz ± 1 MHz       |             |

# **Head TSL parameters**

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 40.0         | 1.40 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 40.3 ± 6 %   | 1.40 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        |              | MALE             |

### SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 9.80 W/kg                |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 39.3 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 5.11 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 20.5 W/kg ± 16.5 % (k=2) |

### **Body TSL parameters**

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 53.3         | 1.52 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 52.9 ± 6 %   | 1.47 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C        |              |                  |

# **SAR result with Body TSL**

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 9.68 W/kg                |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 39.4 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 5.11 W/kg                |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 20.7 W/kg ± 16.5 % (k=2) |

### Appendix (Additional assessments outside the scope of SCS 0108)

#### **Antenna Parameters with Head TSL**

| Impedance, transformed to feed point | 52.9 Ω + 6.3 jΩ |
|--------------------------------------|-----------------|
| Return Loss                          | - 23.4 dB       |

### **Antenna Parameters with Body TSL**

| Impedance, transformed to feed point | 48.5 Ω + 8.2 jΩ |
|--------------------------------------|-----------------|
| Return Loss                          | - 21.5 dB       |

### **General Antenna Parameters and Design**

| Electrical Delay (one direction) | 1.193 ns |
|----------------------------------|----------|
|                                  |          |

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

#### **Additional EUT Data**

| Manufactured by | SPEAG          |
|-----------------|----------------|
| Manufactured on | March 11, 2011 |

Certificate No: D1900V2-5d149\_Oct18

### **DASY5 Validation Report for Head TSL**

Date: 23.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

# DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d149

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: f = 1900 MHz;  $\sigma = 1.4 \text{ S/m}$ ;  $\varepsilon_r = 40.3$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

#### DASY52 Configuration:

Probe: EX3DV4 - SN7349; ConvF(8.18, 8.18, 8.18) @ 1900 MHz; Calibrated: 30.12.2017

• Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn601; Calibrated: 04.10.2018

Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001

DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

### Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

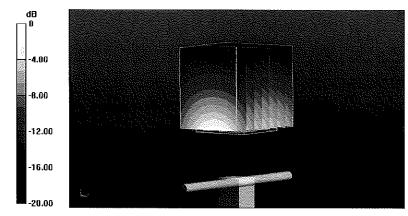
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 110.0 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 18.5 W/kg

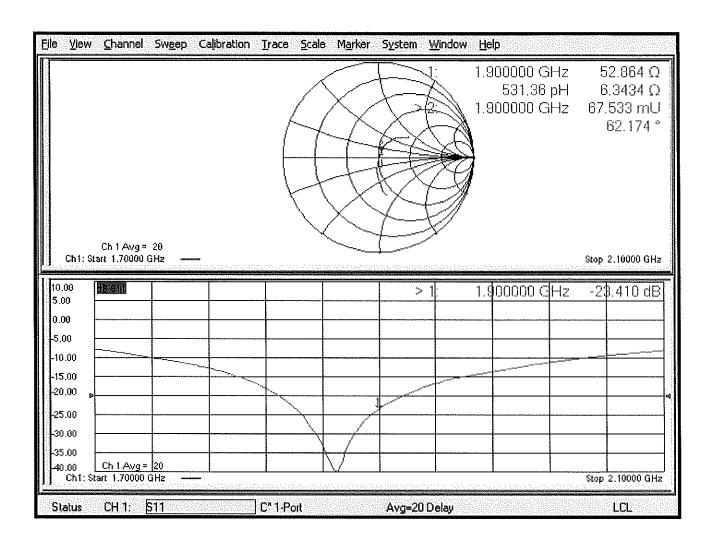
SAR(1 g) = 9.8 W/kg; SAR(10 g) = 5.11 W/kg

Maximum value of SAR (measured) = 15.4 W/kg



0 dB = 15.4 W/kg = 11.88 dBW/kg

# Impedance Measurement Plot for Head TSL



#### **DASY5 Validation Report for Body TSL**

Date: 23,10,2018

Test Laboratory: SPEAG, Zurich, Switzerland

### DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d149

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: f = 1900 MHz;  $\sigma = 1.47 \text{ S/m}$ ;  $\varepsilon_r = 52.9$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

#### DASY52 Configuration:

Probe: EX3DV4 - SN7349; ConvF(8.15, 8.15, 8.15) @ 1900 MHz; Calibrated: 30.12.2017

• Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn601; Calibrated: 04.10.2018

• Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002

• DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

### Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

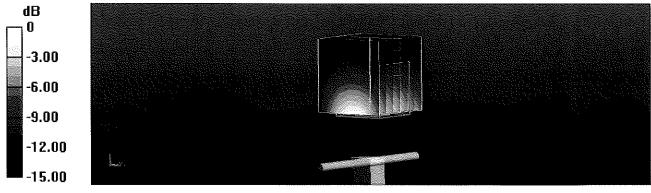
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 103.1 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 17.5 W/kg

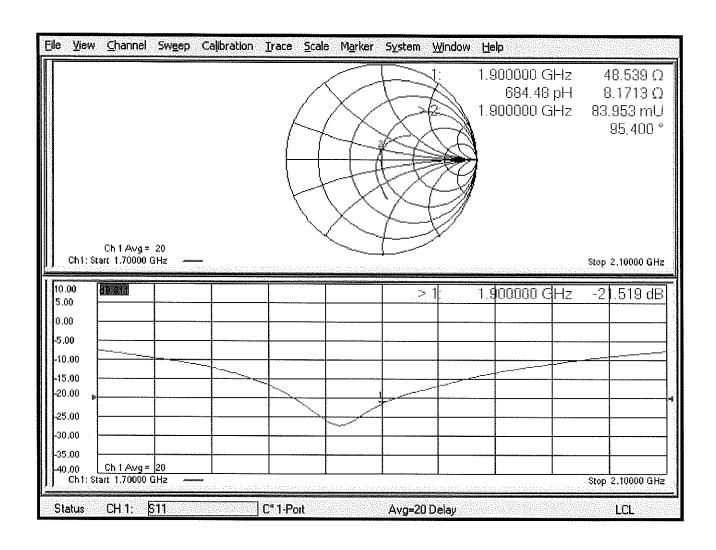
SAR(1 g) = 9.68 W/kg; SAR(10 g) = 5.11 W/kg

Maximum value of SAR (measured) = 14.2 W/kg



0 dB = 14.2 W/kg = 11.52 dBW/kg

### Impedance Measurement Plot for Body TSL



### PCTEST ENGINEERING LABORATORY, INC.



7185 Oakland Mills Road, Columbia, MD 21046 USA Tel. +1.410.290.6652 / Fax +1.410.290.6654 http://www.pctest.com



# **Certification of Calibration**

Object D1900V2 – SN:5d149

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Extended Calibration date: October 18, 2019

Description: SAR Validation Dipole at 1900 MHz.

Calibration Equipment used:

| Manufacturer          | Model         | Description   | Cal Date   | Cal Interval | Cal Due    | Serial Number |
|-----------------------|---------------|---|------------|--------------|------------|---------------|
| Control Company       | 4040          | Therm./Clock/Humidity Monitor                           | 6/29/2019  | Biennial     | 6/29/2021  | 192291470     |
| Control Company       | 4352          | Ultra Long Stem Thermometer                             | 8/2/2018   | Biennial     | 8/2/2020   | 181334684     |
| Amplifier Research    | 15S1G6        | Amplifier   | CBT        | N/A          | CBT        | 433971        |
| Narda                 | 4772-3        | Attenuator (3dB)  | CBT        | N/A          | CBT        | 9406          |
| Keysight Technologies | 85033E        | Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm) | 7/2/2019   | Annual       | 7/2/2020   | MY53401181    |
| Rohde & Schwarz       | ZNLE6         | Vector Network Analyzer                                 | 10/11/2019 | Annual       | 10/11/2020 | 101307        |
| Mini-Circuits         | BW-N20W5+     | DC to 18 GHz Precision Fixed 20 dB Attenuator           | CBT        | N/A          | CBT        | N/A           |
| SPEAG                 | DAKS-3.5      | Portable Dielectric Assessment Kit                      | 8/13/2019  | Annual       | 8/13/2020  | 1041          |
| Anritsu               | MA2411B       | Pulse Power Sensor                                      | 8/14/2019  | Annual       | 8/14/2020  | 1315051       |
| Anritsu               | MA2411B       | Pulse Power Sensor                                      | 8/8/2019   | Annual       | 8/8/2020   | 1339008       |
| Anritsu               | ML2495A       | Power Meter   | 11/20/2018 | Annual       | 11/20/2019 | 1039008       |
| Agilent               | N5182A        | MXG Vector Signal Generator                             | 8/19/2019  | Annual       | 8/19/2020  | MY47420837    |
| Seekonk               | NC-100        | Torque Wrench   | 5/9/2018   | Biennial     | 5/9/2020   | 22217         |
| Mini-Circuits         | NLP-2950+     | Low Pass Filter DC to 2700 MHz                          | CBT        | N/A          | CBT        | N/A           |
| MiniCircuits          | ZHDC-16-63-S+ | Bidirectional Coupler                                   | CBT        | N/A          | CBT        | N/A           |
| MiniCircuits          | VLF-6000+     | Low Pass Filter   | CBT        | N/A          | CBT        | N/A           |
| SPEAG                 | EX3DV4        | SAR Probe   | 2/19/2019  | Annual       | 2/19/2020  | 3914          |
| SPEAG                 | EX3DV4        | SAR Probe   | 5/16/2019  | Annual       | 5/16/2020  | 7406          |
| SPEAG                 | DAE4          | Dasy Data Acquisition Electronics                       | 5/8/2019   | Annual       | 5/8/2020   | 859           |
| SPEAG                 | DAE4          | Dasy Data Acquisition Electronics                       | 2/14/2019  | Annual       | 2/14/2020  | 1272          |

Note: CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, amplifier, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path.

### Measurement Uncertainty = ±23% (k=2)

|                | Name              | Function                    | Signature         |
|----------------|-------------------|-----------------------------|-------------------|
| Calibrated By: | Brodie Halbfoster | Team Lead Engineer          | BRODIE HALBFOSTER |
| Approved By:   | Kaitlin O'Keefe   | Senior Technical<br>Manager | 304               |

| Object:             | Date Issued: | Page 1 of 4 |
|---------------------|--------------|-------------|
| D1900V2 - SN: 5d149 | 10/18/2019   | Page 1 of 4 |

### **DIPOLE CALIBRATION EXTENSION**

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

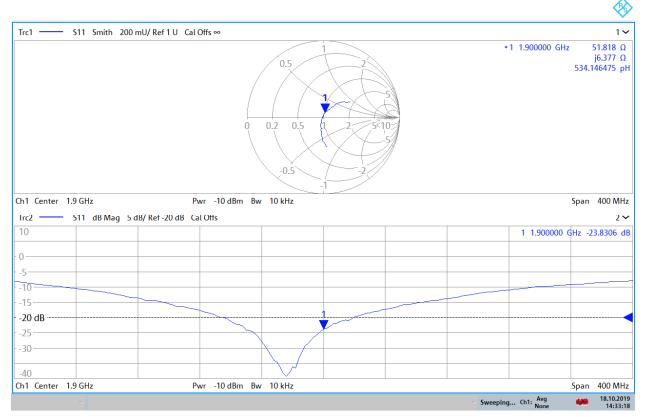
- 1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
- 2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
- 3. The measurement of real or imaginary parts of impedance does not deviate more than  $5\Omega$  from the previous measurement.

The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

| Calibration<br>Date | Extension Date | Certificate<br>Electrical<br>Delay (ns) | Certificate<br>SAR Target<br>Head (1g)<br>W/kg @ 20.0<br>dBm | Head SAR (1g)                                   |                     | Certificate<br>SAR Target<br>Head (10g)<br>W/kg @ 20.0<br>dBm | (10a) W/ka @ | Deviation 10g<br>(%) | Certificate<br>Impedance<br>Head (Ohm)<br>Real | Measured<br>Impedance<br>Head (Ohm)<br>Real | Difference<br>(Ohm) Real | Certificate<br>Impedance<br>Head (Ohm)<br>Imaginary | Measured<br>Impedance<br>Head (Ohm)<br>Imaginary | Difference<br>(Ohm)<br>Imaginary | Certificate<br>Return Loss<br>Head (dB) | Measured<br>Return Loss<br>Head (dB) | Deviation (%) | PASS/FAIL |
|---------------------|----------------|---|--|---|---------------------|---|--------------|----------------------|--|---|--------------------------|---|--|----------------------------------|---|--------------------------------------|---------------|-----------|
| 10/23/2018          | 10/18/2019     | 1.193                                   | 3.93   | 4.24  | 7.89%               | 2.05  | 2.18         | 6.34%                | 52.9   | 51.8  | 1.1                      | 6.3   | 6.4  | 0.1                              | -23.4                                   | -23.8                                | -1.80%        | Pass      |
| Calibration<br>Date | Extension Date | Certificate<br>Electrical<br>Delay (ns) | Certificate<br>SAR Target<br>Body (1g)<br>W/kg @ 20.0<br>dBm | Measured<br>Body SAR (1g)<br>W/kg @ 20.0<br>dBm | Deviation 1g<br>(%) | Certificate<br>SAR Target<br>Body (10g)<br>W/kg @ 20.0<br>dBm | (40-) M(4 ©  | Deviation 10g<br>(%) | Certificate<br>Impedance<br>Body (Ohm)<br>Real | Measured<br>Impedance<br>Body (Ohm)<br>Real | Difference<br>(Ohm) Real | Certificate<br>Impedance<br>Body (Ohm)<br>Imaginary | Measured<br>Impedance<br>Body (Ohm)<br>Imaginary | Difference<br>(Ohm)<br>Imaginary | Certificate<br>Return Loss<br>Body (dB) | Measured<br>Return Loss<br>Body (dB) | Deviation (%) | PASS/FAIL |
| 10/23/2018          | 10/18/2019     | 1.193                                   | 3.94   | 4.2   | 6.60%               | 2.07  | 2.15         | 3.86%                | 48.5   | 48.4  | 0.1                      | 8.2   | 7.6  | 0.6                              | -21.5                                   | -22.1                                | -2.60%        | PASS      |

| Object:             | Date Issued: | Page 2 of 4 |
|---------------------|--------------|-------------|
| D1900V2 - SN: 5d149 | 10/18/2019   | Fage 2 01 4 |

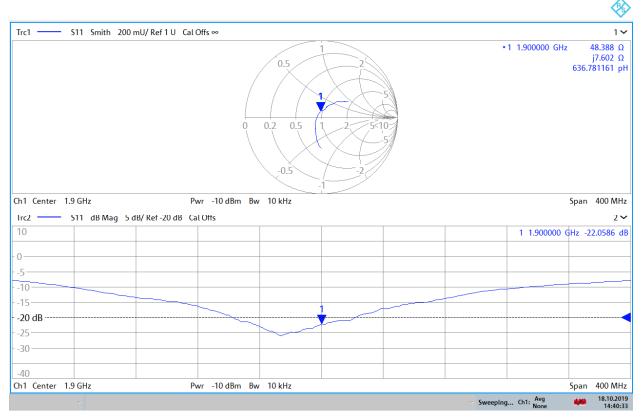
#### Impedance & Return-Loss Measurement Plot for Head TSL



14:33:19 18.10.2019

| Object:             | Date Issued: | Page 3 of 4 |
|---------------------|--------------|-------------|
| D1900V2 - SN: 5d149 | 10/18/2019   | Page 3 of 4 |

### Impedance & Return-Loss Measurement Plot for Body TSL



14:40:34 18.10.2019

| Object:             | Date Issued: | Page 4 of 4 |
|---------------------|--------------|-------------|
| D1900V2 - SN: 5d149 | 10/18/2019   | Page 4 of 4 |

# Calibration Laboratory of Schmid & Partner







Schweizerischer Kalibrierdienst S Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client

**PC Test** 

Certificate No: D2300V2-1073\_Aug18

### BRATION CERTIFICATE

Object

D2300V2 - SN:1073

Calibration procedure(s)

QA CAL-05.v10

Calibration procedure for dipole validation kits above 700 MHz

Calibration date:

August 13, 2018

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^{\circ}$ C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards               | ID#  | Cal Date (Certificate No.)               | Scheduled Calibration  |
|---------------------------------|--|--|------------------------|
| Power meter NRP                 | SN: 104778   | 04-Apr-18 (No. 217-02672/02673)          |                        |
| Power sensor NRP-Z91            | SN: 103244   | 04-Apr-18 (No. 217-02672)                | Apr-19                 |
| Power sensor NRP-Z91            | SN: 103245   | 04-Apr-18 (No. 217-02673)                | Apr-19                 |
| Reference 20 dB Attenuator      | SN: 5058 (20k)   | 04-Apr-18 (No. 217-02682)                | Apr-19                 |
| Type-N mismatch combination     | SN: 5047.2 / 06327   | 04-Apr-18 (No. 217-02683)                | Apr-19                 |
| Reference Probe EX3DV4          | SN: 7349   |  | Apr-19                 |
| DAE4                            | SN: 601  | 30-Dec-17 (No. EX3-7349_Dec17)           | Dec-18                 |
|                                 | SIN, 60  | 26-Oct-17 (No. DAE4-601_Oct17)           | Oct-18                 |
| Secondary Standards             | ID#  | Charle Date (In f.                       |                        |
| Power meter EPM-442A            | +  | Check Date (in house)                    | Scheduled Check        |
| Power sensor HP 8481A           | SN: GB37480704   | 07-Oct-15 (in house check Oct-16)        | In house check: Oct-18 |
| 1                               | SN: US37292783   | 07-Oct-15 (iπ house check Oct-16)        | In house check: Oct-18 |
| Power sensor HP 8481A           | SN: MY41092317   | 07-Oct-15 (in house check Oct-16)        | In house check: Oct-18 |
| RF generator R&S SMT-06         | SN: 100972   | 15-Jun-15 (in house check Oct-16)        | Iπ house check: Oct-18 |
| Network Analyzer Agilent E8358A | SN: US41080477   | 31-Mar-14 (in house check Oct-17)        | In house check: Oct-18 |
|                                 | Name   | Function                                 | Signature              |
| Calibrated by:                  | Michael Weber  | Laboratory Technician                    |                        |
|                                 |  |  | 17.110°E)              |
| Approved by:                    | Katja Pokovic  | Technical Manager                        | and the                |
|                                 | And the Control of th | en e | Jak cos                |

Issued: August 13, 2018

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### Calibration Laboratory of

Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland





S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage

Servizio svizzero di taratura Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA

Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL

tissue simulating liquid

ConvF

sensitivity in TSL / NORM x,y,z

N/A not applicable or not measured

# Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

### Additional Documentation:

e) DASY4/5 System Handbook

# Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end
  of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed
  point exactly below the center marking of the flat phantom section, with the arms oriented
  parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole
  positioned under the liquid filled phantom. The impedance stated is transformed from the
  measurement at the SMA connector to the feed point. The Return Loss ensures low
  reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Certificate No: D2300V2-1073\_Aug18

Page 2 of 8

### **Measurement Conditions**

DASY system configuration, as far as not given on page 1.

| DASY Version                 | DASY5                  | V52.10.1    |
|------------------------------|------------------------|-------------|
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 10 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm      |             |
| Frequency                    | 2300 MHz ± 1 MHz       |             |

# **Head TSL parameters**

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 39.5         | 1.67 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 38.2 ± 6 %   | 1.70 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        |              |                  |

### **SAR result with Head TSL**

| SAR averaged over 1 cm³ (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured                              | 250 mW input power | 12.5 W/kg                |
| SAR for nominal Head TSL parameters       | normalized to 1W   | 49.2 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 6.02 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 23.8 W/kg ± 16.5 % (k=2) |

# **Body TSL parameters**

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 52.9         | 1.81 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 52.2 ± 6 %   | 1.85 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C        |              |                  |

# SAR result with Body TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 12.1 W/kg                |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 47.7 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 5.86 W/kg                |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 23.2 W/kg ± 16.5 % (k=2) |

# Appendix (Additional assessments outside the scope of SCS 0108)

### Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 50.1 Ω - 5.2 jΩ |
|--------------------------------------|-----------------|
| Return Loss                          | - 25.7 dB       |

# **Antenna Parameters with Body TSL**

| Impedance, transformed to feed point | 45.5 Ω - 4.1 jΩ |
|--------------------------------------|-----------------|
| Return Loss                          | - 23.9 dB       |

### General Antenna Parameters and Design

| Electrical Delay (one direction) 1.171 ns | Fleet-te-I Del ( P. d. )         |            |
|---|----------------------------------|------------|
| 1.17 ( 115                                | Electrical Delay (one direction) | 1 171 pc   |
|   |                                  | 1.17 ( 115 |

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

#### Additional EUT Data

| Manufactured by | SPEAG             |
|-----------------|-------------------|
| Manufactured on | November 16, 2015 |

Certificate No: D2300V2-1073\_Aug18

# **DASY5 Validation Report for Head TSL**

Date: 13.08.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2300 MHz; Type: D2300V2; Serial: D2300V2 - SN: 1073

Communication System: UID 0 - CW; Frequency: 2300 MHz

Medium parameters used: f = 2300 MHz;  $\sigma = 1.7$  S/m;  $\epsilon_r = 38.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

#### DASY52 Configuration:

Probe: EX3DV4 - SN7349; ConvF(8.08, 8.08, 8.08) @ 2300 MHz; Calibrated: 30.12.2017

• Sensor-Surface: 1.4mm (Mechanical Surface Detection)

• Electronics: DAE4 Sn601; Calibrated: 26.10.2017

Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001

DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

# Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 115.9 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 24.1 W/kg

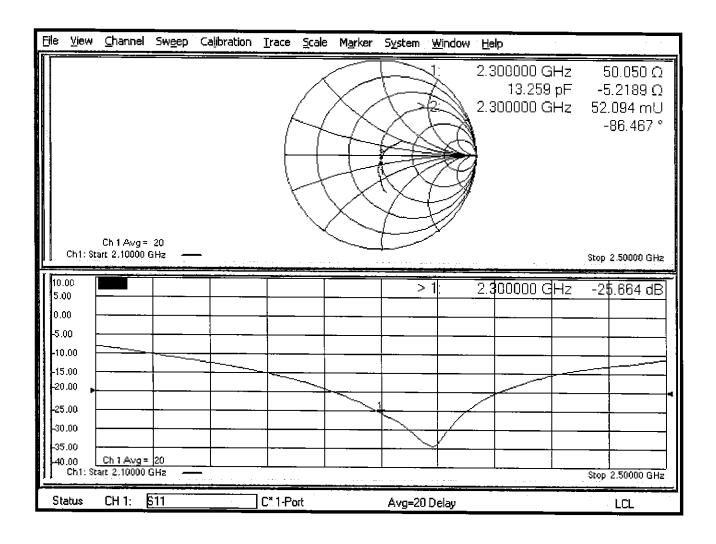
SAR(1 g) = 12.5 W/kg; SAR(10 g) = 6.02 W/kg

Maximum value of SAR (measured) = 20.2 W/kg



0 dB = 20.2 W/kg = 13.05 dBW/kg

### Impedance Measurement Plot for Head TSL



### **DASY5 Validation Report for Body TSL**

Date: 13.08.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2300 MHz; Type: D2300V2; Serial: D2300V2 - SN: 1073

Communication System: UID 0 - CW; Frequency: 2300 MHz

Medium parameters used: f = 2300 MHz;  $\sigma = 1.85$  S/m;  $\epsilon_r = 52.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

#### DASY52 Configuration:

Probe: EX3DV4 - SN7349; ConvF(8.08, 8.08, 8.08) @ 2300 MHz; Calibrated: 30.12.2017

• Sensor-Surface: 1.4mm (Mechanical Surface Detection)

• Electronics: DAE4 Sn601; Calibrated: 26.10.2017

Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002

DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

# Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

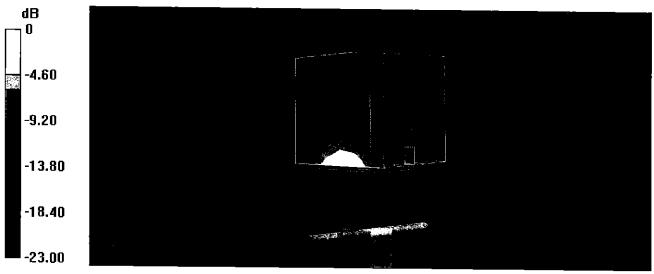
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 107.5 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 22.9 W/kg

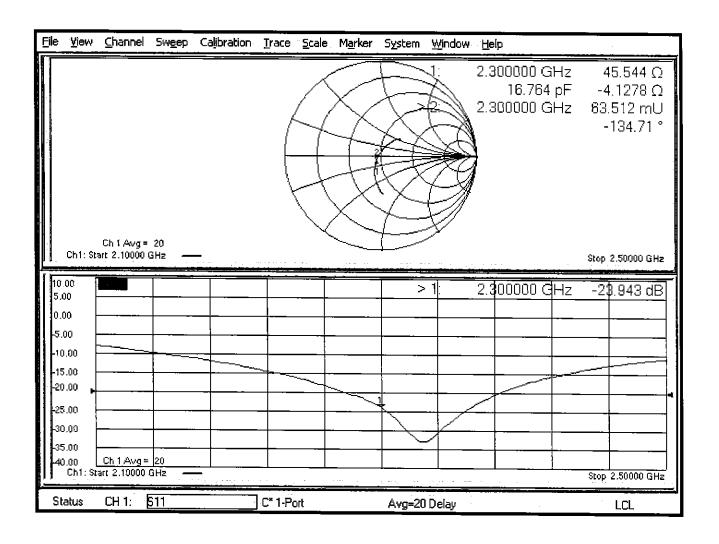
SAR(1 g) = 12.1 W/kg; SAR(10 g) = 5.86 W/kg

Maximum value of SAR (measured) = 19.1 W/kg



0 dB = 19.1 W/kg = 12.81 dBW/kg

# Impedance Measurement Plot for Body TSL



### PCTEST ENGINEERING LABORATORY, INC.



7185 Oakland Mills Road, Columbia, MD 21046 USA Tel. +1.410.290.6652 / Fax +1.410.290.6654 http://www.pctest.com



# **Certification of Calibration**

Object D2300V2 – SN: 1073

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Calibration date: 08/09/2019

Description: SAR Validation Dipole at 2300 MHz.

Calibration Equipment used:

| Manufacturer          | Model     | Description   | Cal Date   | Cal Interval | Cal Due    | Serial Number |
|-----------------------|-----------|---|------------|--------------|------------|---------------|
| Agilent               | 8753ES    | S-Parameter Network Analyzer                            | 10/2/2018  | Annual       | 10/2/2019  | US39170118    |
| Agilent               | N5182A    | MXG Vector Signal Generator                             | 6/27/2019  | Annual       | 6/27/2020  | US46240505    |
| Amplifier Research    | 15S1G6    | Amplifier   | CBT        | N/A          | CBT        | 343972        |
| Anritsu               | ML2495A   | Power Meter   | 10/21/2018 | Annual       | 10/21/2019 | 941001        |
| Anritsu               | MA2411B   | Pulse Power Sensor                                      | 10/30/2018 | Annual       | 10/30/2019 | 1207470       |
| Anritsu               | MA2411B   | Pulse Power Sensor                                      | 11/20/2018 | Annual       | 11/20/2019 | 1339007       |
| Control Company       | 4040      | Temperature / Humidity Monitor                          | 2/28/2018  | Biennial     | 2/28/2020  | 150761911     |
| Control Company       | 4352      | Ultra Long Stem Thermometer                             | 2/28/2018  | Biennial     | 2/28/2020  | 170330160     |
| Keysight              | 772D      | Dual Directional Coupler                                | CBT        | N/A          | CBT        | MY52180215    |
| Keysight Technologies | 85033E    | Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm) | 7/2/2019   | Annual       | 7/2/2020   | MY53401181    |
| Mini-Circuits         | BW-N20W5+ | DC to 18 GHz Precision Fixed 20 dB Attenuator           | CBT        | N/A          | CBT        | N/A           |
| Mini-Circuits         | NLP-2950+ | Low Pass Filter DC to 2700 MHz                          | CBT        | N/A          | CBT        | N/A           |
| Narda                 | 4772-3    | Attenuator (3dB)  | CBT        | N/A          | CBT        | 9406          |
| Pasternack            | PE2209-10 | Bidirectional Coupler                                   | CBT        | N/A          | CBT        | N/A           |
| Pasternack            | NC-100    | Torque Wrench   | 5/23/2018  | Biennial     | 5/23/2020  | N/A           |
| SPEAG                 | EX3DV4    | SAR Probe   | 2/19/2019  | Annual       | 2/19/2020  | 7417          |
| SPEAG                 | DAE4      | Dasy Data Acquisition Electronics                       | 2/13/2019  | Annual       | 2/13/2020  | 665           |
| SPEAG                 | EX3DV4    | SAR Probe   | 7/15/2019  | Annual       | 7/15/2020  | 7547          |
| SPEAG                 | DAE4      | Dasy Data Acquisition Electronics                       | 7/11/2019  | Annual       | 7/11/2020  | 1323          |
| SPEAG                 | DAK-3.5   | Dielectric Assessment Kit                               | 9/11/2018  | Annual       | 9/11/2019  | 1091          |

### Measurement Uncertainty = $\pm 23\%$ (k=2)

|                | Name              | Function                    | Signature         |
|----------------|-------------------|-----------------------------|-------------------|
| Calibrated By: | Brodie Halbfoster | Test Engineer               | BRODIE HALBFOSTER |
| Approved By:   | Kaitlin O'Keefe   | Senior Technical<br>Manager | XIK-              |

| Object:            | Date Issued: | Page 1 of 4 |
|--------------------|--------------|-------------|
| D2300V2 – SN: 1073 | 08/09/2019   | Page 1 of 4 |

### **DIPOLE CALIBRATION EXTENSION**

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

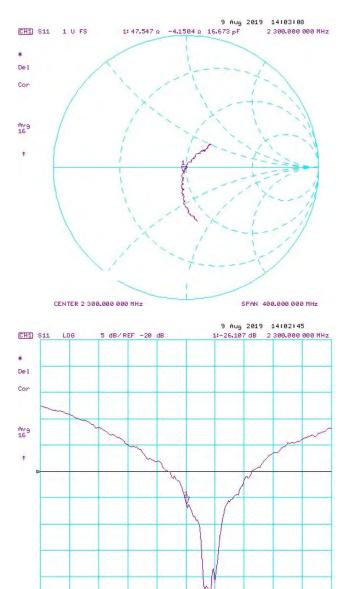
- 1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
- 2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
- 3. The measurement of real or imaginary parts of impedance does not deviate more than  $5\Omega$  from the previous measurement.

The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

| Calibration<br>Date | Extension Date | Certificate<br>Electrical<br>Delay (ns) | Certificate<br>SAR Target<br>Head (1g)<br>W/kg @ 20.0<br>dBm | Measured<br>Head SAR (1g)<br>W/kg @ 20.0<br>dBm | (0/)                | Certificate<br>SAR Target<br>Head (10g)<br>W/kg @ 20.0<br>dBm | (40-) M(4 (C)                                    | Deviation 10g<br>(%) | Certificate<br>Impedance<br>Head (Ohm)<br>Real | Measured<br>Impedance<br>Head (Ohm)<br>Real | Difference<br>(Ohm) Real | Certificate<br>Impedance<br>Head (Ohm)<br>Imaginary | Measured<br>Impedance<br>Head (Ohm)<br>Imaginary | Difference<br>(Ohm)<br>Imaginary | Certificate<br>Return Loss<br>Head (dB) | Measured<br>Return Loss<br>Head (dB) | Deviation (%) | PASS/FAIL |
|---------------------|----------------|---|--|---|---------------------|---|--|----------------------|--|---|--------------------------|---|--|----------------------------------|---|--------------------------------------|---------------|-----------|
| 8/13/2018           | 8/9/2019       | 1.171                                   | 4.92   | 5.21  | 5.89%               | 2.38  | 2.49   | 4.62%                | 50.1   | 47.5  | 2.6                      | -5.2  | -4.2   | 1                                | -25.7                                   | -26.1                                | -1.60%        | PASS      |
| Calibration<br>Date | Extension Date | Certificate<br>Electrical<br>Delay (ns) |  | Measured<br>Body SAR (1g)<br>W/kg @ 20.0<br>dBm | Deviation 1g<br>(%) | Certificate<br>SAR Target<br>Body (10g)<br>W/kg @ 20.0<br>dBm | Measured<br>Body SAR<br>(10g) W/kg @<br>20.0 dBm | Deviation 10g<br>(%) | Certificate<br>Impedance<br>Body (Ohm)<br>Real | Measured<br>Impedance<br>Body (Ohm)<br>Real | Difference<br>(Ohm) Real | Certificate<br>Impedance<br>Body (Ohm)<br>Imaginary | Measured<br>Impedance<br>Body (Ohm)<br>Imaginary | Difference<br>(Ohm)<br>Imaginary | Certificate<br>Return Loss<br>Body (dB) | Measured<br>Return Loss<br>Body (dB) | Deviation (%) | PASS/FAIL |
| 8/13/2018           | 8/9/2019       | 1.171                                   | 4.77   | 5.05  | 5.87%               | 2.32  | 2.4  | 3.45%                | 45.5   | 44.4  | 1.1                      | -4.1  | -3.3   | 0.8                              | -23.9                                   | -23.2                                | 2.80%         | PASS      |

| Object:            | Date Issued: | Page 2 of 4 |  |
|--------------------|--------------|-------------|--|
| D2300V2 – SN: 1073 | 08/09/2019   | Fage 2 01 4 |  |

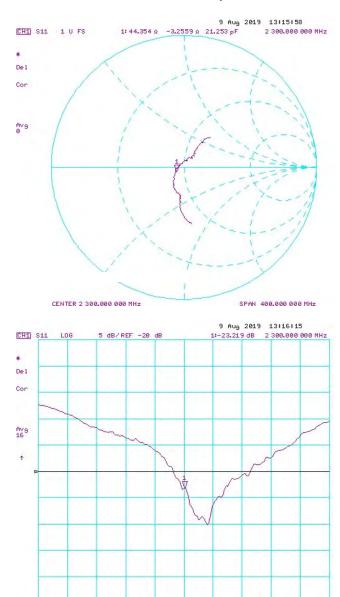
### Impedance & Return-Loss Measurement Plot for Head TSL



CENTER 2 300.000 000 MHz

SPAN 400.000 000 MHz

### Impedance & Return-Loss Measurement Plot for Body TSL



CENTER 2 300.000 000 MHz

SPAN 400.000 000 MHz

## **Calibration Laboratory of**

Schmid & Partner **Engineering AG** Zeughausstrasse 43, 8004 Zurich, Switzerland





Schweizerischer Kalibrierdienst S Service suisse d'étalonnage Servizio svizzero di taratura S **Swiss Calibration Service** 

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

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Client

**PC Test** 

Certificate No: D2450V2-719 Aug19

# CALIBRATION CERTIFICATE

Object D2450V2 - SN:719

QA CAL-05.v11 Calibration procedure(s)

Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

Calibration date:

August 14, 2019

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards               | ID#                | Cal Date (Certificate No.)        | Scheduled Calibration  |
|---------------------------------|--------------------|-----------------------------------|------------------------|
| Power meter NRP                 | SN: 104778         | 03-Apr-19 (No. 217-02892/02893)   | Apr-20                 |
| Power sensor NRP-Z91            | SN: 103244         | 03-Apr-19 (No. 217-02892)         | Apr-20                 |
| Power sensor NRP-Z91            | SN: 103245         | 03-Apr-19 (No. 217-02893)         | Apr-20                 |
| Reference 20 dB Attenuator      | SN: 5058 (20k)     | 04-Apr-19 (No. 217-02894)         | Apr-20                 |
| Type-N mismatch combination     | SN: 5047.2 / 06327 | 04-Apr-19 (No. 217-02895)         | Apr-20                 |
| Reference Probe EX3DV4          | SN: 7349           | 29-May-19 (No. EX3-7349_May19)    | May-20                 |
| DAE4                            | SN: 601            | 30-Apr-19 (No. DAE4-601_Apr19)    | Apr-20                 |
| Secondary Standards             | ID#                | Check Date (in house)             | Scheduled Check        |
| Power meter E4419B              | SN: GB39512475     | 30-Oct-14 (in house check Feb-19) | In house check: Oct-20 |
| Power sensor HP 8481A           | SN: US37292783     | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| Power sensor HP 8481A           | SN: MY41092317     | 07-Oct-15 (in house check Oct-18) | In house check: Oct-20 |
| RF generator R&S SMT-06         | SN: 100972         | 15-Jun-15 (in house check Oct-18) | In house check: Oct-20 |
| Network Analyzer Agilent E8358A | SN: US41080477     | 31-Mar-14 (in house check Oct-18) | In house check: Oct-19 |
|                                 | Name               | Function                          | Signature 1            |
| Calibrated by:                  | Claudio Leubler    | Laboratory Technician             |                        |
| Approved by:                    | Katja Pokovic      | Technical Manager                 |                        |

Issued: August 15, 2019

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Certificate No: D2450V2-719\_Aug19

Page 1 of 8

### **Calibration Laboratory of**

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Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland





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Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service

Accreditation No.: SCS 0108

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#### Glossary:

TSL

tissue simulating liquid

ConvF

sensitivity in TSL / NORM x,y,z

N/A not applicable or not measured

#### Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### **Additional Documentation:**

Certificate No: D2450V2-719\_Aug19

e) DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed
  point exactly below the center marking of the flat phantom section, with the arms oriented
  parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole
  positioned under the liquid filled phantom. The impedance stated is transformed from the
  measurement at the SMA connector to the feed point. The Return Loss ensures low
  reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point.
   No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

### **Measurement Conditions**

DASY system configuration, as far as not given on page 1.

| DASY Version                 | DASY5                  | V52.10.2    |
|------------------------------|------------------------|-------------|
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   |             |
| Distance Dipole Center - TSL | 10 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, $dy$ , $dz = 5 mm$ |             |
| Frequency                    | 2450 MHz ± 1 MHz       |             |

### **Head TSL parameters**

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 39.2         | 1.80 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 37.8 ± 6 %   | 1.83 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        | A 44 4       |                  |

### SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 13.5 W/kg                |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 53.1 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 6.25 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 24.7 W/kg ± 16.5 % (k=2) |

#### **Body TSL parameters**

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 52.7         | 1.95 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 50.8 ± 6 %   | 2.01 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C        |              |                  |

### SAR result with Body TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 13.0 W/kg                |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 50.8 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 6.09 W/kg                |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 24.0 W/kg ± 16.5 % (k=2) |

Certificate No: D2450V2-719\_Aug19 Page 3 of 8

### Appendix (Additional assessments outside the scope of SCS 0108)

#### **Antenna Parameters with Head TSL**

| Impedance, transformed to feed point | 54.6 Ω + 5.6 jΩ |
|--------------------------------------|-----------------|
| Return Loss                          | - 23.2 dB       |

### **Antenna Parameters with Body TSL**

| Impedance, transformed to feed point | 51.0 Ω + 8.4 jΩ |
|--------------------------------------|-----------------|
| Return Loss                          | - 21.6 dB       |

#### **General Antenna Parameters and Design**

| Electrical Delay (one direction) | 1.150 ns |
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

#### **Additional EUT Data**

| Manufactured by | SPEAG |  |
|-----------------|-------|--|

Certificate No: D2450V2-719\_Aug19

#### **DASY5 Validation Report for Head TSL**

Date: 14.08.2019

Test Laboratory: SPEAG, Zurich, Switzerland

#### **DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:719**

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used: f = 2450 MHz;  $\sigma = 1.83 \text{ S/m}$ ;  $\varepsilon_r = 37.8$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

#### DASY52 Configuration:

Probe: EX3DV4 - SN7349; ConvF(7.9, 7.9, 7.9) @ 2450 MHz; Calibrated: 29.05.2019

• Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn601; Calibrated: 30.04.2019

• Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001

DASY52 52.10.2(1504); SEMCAD X 14.6.12(7470)

### Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

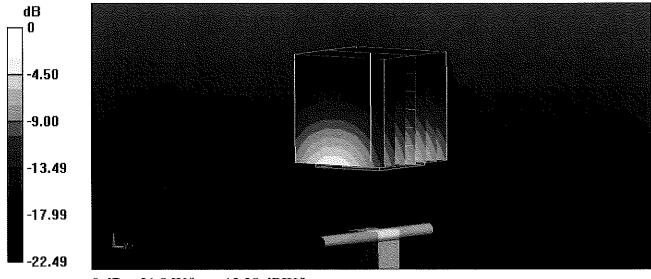
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 117.1 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 26.6 W/kg

SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.25 W/kg

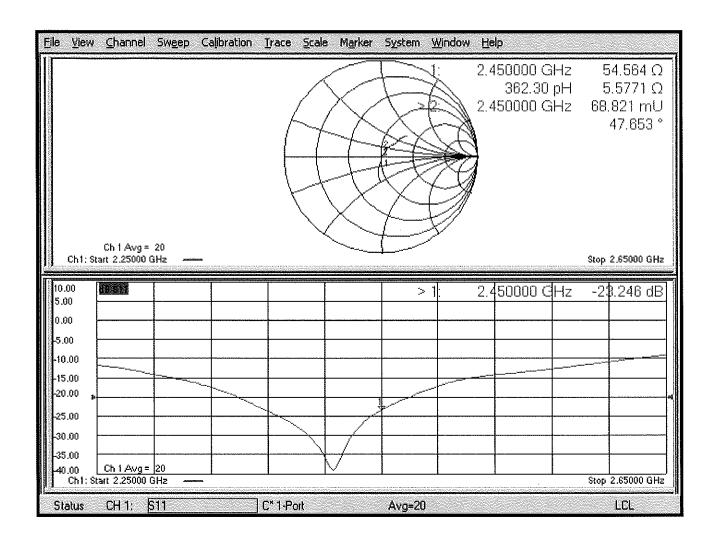
Maximum value of SAR (measured) = 21.8 W/kg



0 dB = 21.8 W/kg = 13.38 dBW/kg

Certificate No: D2450V2-719\_Aug19

### Impedance Measurement Plot for Head TSL



### **DASY5 Validation Report for Body TSL**

Date: 14.08.2019

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:719

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used: f = 2450 MHz;  $\sigma = 2.01 \text{ S/m}$ ;  $\varepsilon_r = 50.8$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

#### DASY52 Configuration:

Probe: EX3DV4 - SN7349; ConvF(7.94, 7.94, 7.94) @ 2450 MHz; Calibrated: 29.05.2019

• Sensor-Surface: 1.4mm (Mechanical Surface Detection)

• Electronics: DAE4 Sn601; Calibrated: 30.04.2019

Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002

DASY52 52.10.2(1504); SEMCAD X 14.6.12(7470)

# Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

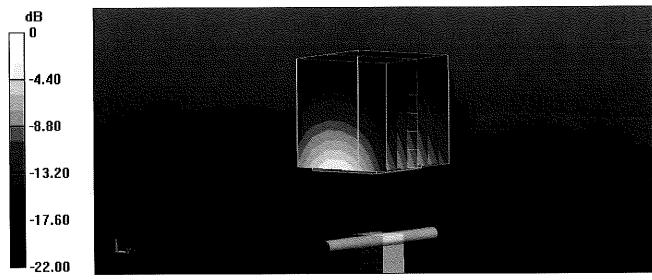
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 105.2 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 25.6 W/kg

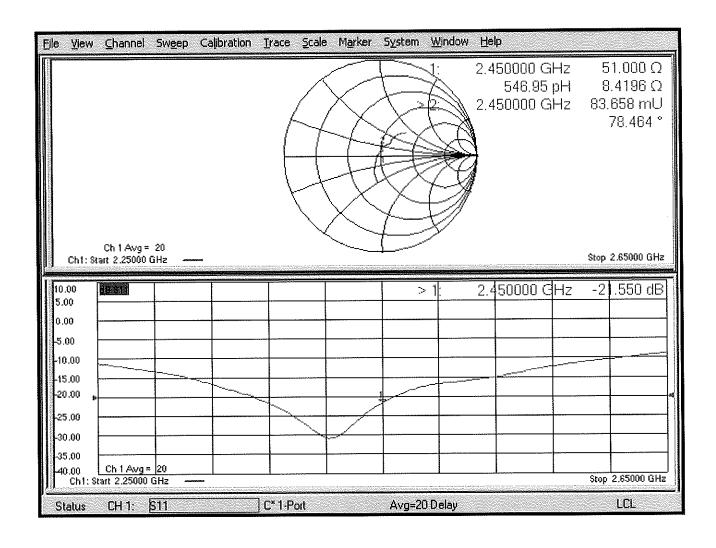
SAR(1 g) = 13 W/kg; SAR(10 g) = 6.09 W/kg

Maximum value of SAR (measured) = 20.0 W/kg



0 dB = 20.0 W/kg = 13.01 dBW/kg

### Impedance Measurement Plot for Body TSL



#### Calibration Laboratory of Schmid & Partner Engineering AG

Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





S Schweizerischer Kallbrierdienst
C Service sulsse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA

Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client

**PC Test** 

Certificate No: D2450V2-797\_Sep17

|   | CERTIFICATI   |  | •  |
|---|---|--|--|
| Object  | D2450V2 - SN:7  | 97   |  |
| Callbration procedure(s)  | QA CAL-05.v9<br>Calibration proce   | edure for dipole validation kits abo   | (o)o)  |
| Callbration date:   | September 11, 2   | 017  | Extended PMV<br>9/20/2   |
| The measurements and the unce   | rtainties with confidence p   | ional standards, which realize the physical un<br>probability are given on the following pages ar  | ilts of measurements (SI). BNV<br>ad are part of the certificate.  |
| All Caudrations have been conduc  | cted in the closed laborato   | ry facility: environment temperature (22 $\pm$ 3)°(  | C and humidity < 70%.  |
|   |   |  |  |
| Calibration Equipment used (M&  | TE critical for calibration)  |  |  |
|   | FE critical for calibration)  | Cal Date (Certificate No.)   | Scheduled Calibration  |
| Primary Standards<br>Power meler NRP  |   | Cal Date (Certificate No.) 04-Apr-17 (No. 217-02521/02522)   | Scheduled Calibration Apr-18   |
| Primary Standards<br>Power meler NRP  | 1D #  |  | Apr-18   |
| Primary Standards<br>Power meler NRP<br>Power sensor NRP-Z91  | ID #<br>SN: 104778  | 04-Apr-17 (No. 217-02521/02522)  | Apr-18   |
| Primary Standards<br>Power meter NRP<br>Power sensor NRP-Z91<br>Power sensor NRP-Z91<br>Reference 20 dB Attenuator  | ID #<br>SN: 104778<br>SN: 103244  | 04-Apr-17 (No. 217-02521/02522)<br>04-Apr-17 (No. 217-02521)   | Apr-18<br>Apr-18 . î.<br>Apr-18  |
| Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination  | ID #<br>SN: 104778<br>SN: 103244<br>SN: 103245  | 04-Apr-17 (No. 217-02521/02522)<br>04-Apr-17 (No. 217-02521)<br>04-Apr-17 (No. 217-02522)  | Apr-18<br>Apr-18 a   |
| Primary Standards Power meler NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4   | ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k)  | 04-Apr-17 (No. 217-02521/02522)<br>04-Apr-17 (No. 217-02521)<br>04-Apr-17 (No. 217-02522)<br>07-Apr-17 (No. 217-02528)   | Apr-18<br>Apr-18 :<br>Apr-16<br>Apr-18   |
| Primary Standards Power meler NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4   | ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327   | 04-Apr-17 (No. 217-02521/02522)<br>04-Apr-17 (No. 217-02521)<br>04-Apr-17 (No. 217-02522)<br>07-Apr-17 (No. 217-02528)<br>07-Apr-17 (No. 217-02529)  | Apr-18<br>Apr-18 : a<br>Apr-18<br>Apr-18<br>Apr-18   |
| Primary Standards Power meier NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4  | ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7349  | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02529) 07-Apr-17 (No. 217-02529) 31-May-17 (No. EX3-7349_May17) 28-Mar-17 (No. DAE4-601_Mar17)  | Apr-18 Apr-18 Apr-16 Apr-16 Apr-18 Apr-18 Apr-18 May-18 May-18   |
| Primary Standards Power meler NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards  | ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7349 SN: 601  | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02528) 07-Apr-17 (No. 217-02529) 07-Apr-17 (No. EX3-7349_May17) 28-Mar-17 (No. DAE4-601_Mar17)  | Apr-18 Apr-18 Apr-16 Apr-16 Apr-18 Apr-18 May-18 May-18 Mar-18   |
| Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter EPM-442A   | ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7349 SN: 601  | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02529) 07-Apr-17 (No. 217-02529) 31-May-17 (No. EX3-7349_May17) 28-Mar-17 (No. DAE4-601_Mar17) Check Date (in house)  | Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 May-18 Mar-18 Scheduled Check In house check: Oct-18   |
| Primary Standards Power meler NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 8481A   | ID # SN: 104779 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7349 SN: 601 ID # SN: GB37480704  | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02529) 07-Apr-17 (No. 217-02529) 31-May-17 (No. EX3-7349_May17) 28-Mar-17 (No. DAE4-601_Mar17)  Check Date (in house) 07-Oct-15 (in house check Oct-16)   | Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 May-18 Mar-18 Scheduled Check In house check: Oct-18 In house check: Oct-18  |
| Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 8481A   | ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7349 SN: 601 ID # SN: GB37480704 SN: US37292783                           | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02529) 07-Apr-17 (No. 217-02529) 31-May-17 (No. EX3-7349_May17) 28-Mar-17 (No. DAE4-601_Mar17)  Check Date (in house) 07-Oct-15 (in house check Oct-16) 07-Oct-15 (in house check Oct-16)                                   | Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 May-18 Mar-18 Scheduled Check In house check: Oct-18 In house check: Oct-18  |
| Primary Standards Power meler NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06   | ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7349 SN: 601 ID # SN: GB37480704 SN: US37292783 SN: MY41092317            | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02529) 07-Apr-17 (No. 217-02529) 31-May-17 (No. EX3-7349_May17) 28-Mar-17 (No. DAE4-601_Mar17)  Check Date (in house) 07-Oct-15 (in house check Oct-16)   | Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 May-18 Mar-18 Scheduled Check In house check: Oct-18 In house check: Oct-18  |
| Calibration Equipment used (M&T Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter EPM-442A Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-08 Network Analyzer HP 8753E | ID # SN: 104778 SN: 103244 SN: 103245 SN: 5058 (20k) SN: 5047.2 / 06327 SN: 7349 SN: 601 ID # SN: GB37480704 SN: US37292783 SN: MY41092317 SN: 100972 | 04-Apr-17 (No. 217-02521/02522) 04-Apr-17 (No. 217-02521) 04-Apr-17 (No. 217-02522) 07-Apr-17 (No. 217-02529) 07-Apr-17 (No. 217-02529) 31-May-17 (No. EX3-7349_May17) 28-Mar-17 (No. DAE4-601_Mar17)  Check Date (in house) 07-Oct-15 (in house check Oct-16) 07-Oct-15 (in house check Oct-16) 15-Jun-15 (in house check Oct-16) | Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 Apr-18 May-18 Mar-18 Scheduled Check In house check: Oct-18 |

Issued: September 11, 2017

Certificate No: D2450V2-797\_Sep17

Katja Pokovic

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Approved by:

Technical Manager

### **Calibration Laboratory of**

Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





Schweizerlscher Kalibrierdienst S Service suisse d'étalonnage C Servizio svizzero di taratura **Swiss Calibration Service** 

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

#### Glossarv:

TSL

tissue simulating liquid

ConvF

sensitivity in TSL / NORM x,v,z

N/A

not applicable or not measured

### Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### Additional Documentation:

e) DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

# **Measurement Conditions**

DASY system configuration, as far as not given on page 1.

| DASY Version                 | DASY5                  | V52.10.0    |
|------------------------------|------------------------|-------------|
| Extrapolation                | Advanced Extrapolation |             |
| Phantom                      | Modular Flat Phantom   | -           |
| Distance Dipole Center - TSL | 10 mm                  | with Spacer |
| Zoom Scan Resolution         | dx, $dy$ , $dz = 5 mm$ |             |
| Frequency                    | 2450 MHz ± 1 MHz       |             |

# **Head TSL parameters**

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 39.2         | 1.80 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 37.8 ± 6 %   | 1.86 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        | -            | Mhana            |

### SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 13.5 W/kg                |
| SAR for nominal Head TSL parameters                   | normalized to 1W   | 52.7 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 6.28 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 24.8 W/kg ± 16.5 % (k=2) |

### **Body TSL parameters**

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 52.7         | 1.95 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 51.9 ± 6 %   | 2.04 mho/m ± 6 % |
| Body TSL temperature change during test | < 0.5 °C        | N.S. o. o.   |                  |

# SAR result with Body TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 13.1 W/kg                |
| SAR for nominal Body TSL parameters                   | normalized to 1W   | 51.1 W/kg ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 250 mW input power | 6.14 W/kg                |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 24.2 W/kg ± 16.5 % (k=2) |

### Appendix (Additional assessments outside the scope of SCS 0108)

#### Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 53.8 Ω + 7.4 jΩ |
|--------------------------------------|-----------------|
| Return Loss                          | - 21.9 dB       |

#### **Antenna Parameters with Body TSL**

| Impedance, transformed to feed point | 49.7 Ω + 9.1 jΩ |
|--------------------------------------|-----------------|
| Return Loss                          | - 20,9 dB       |

#### General Antenna Parameters and Design

|                                    | <u>,</u>     |
|------------------------------------|--------------|
|                                    |              |
| I Floatrical Delay (one direction) | l 1.152 ns l |
| Electrical Delay (one direction)   | I 1.152 ns I |
|                                    | *******      |
|                                    |              |

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

#### **Additional EUT Data**

| Manufactured by | SPEAG            |
|-----------------|------------------|
| Manufactured on | January 24, 2006 |

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#### **DASY5 Validation Report for Head TSL**

Date: 11.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 797

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used: f = 2450 MHz;  $\sigma = 1.86$  S/m;  $\varepsilon_r = 37.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

#### DASY52 Configuration:

• Probe: EX3DV4 - SN7349; ConvF(8.12, 8.12, 8.12); Calibrated: 31.05.2017;

• Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn601; Calibrated: 28.03.2017

Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001

DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

### Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 113.5 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 26.9 W/kg

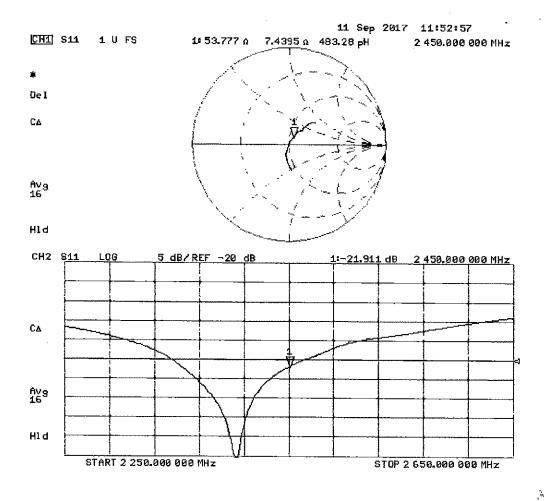
SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.28 W/kg

Maximum value of SAR (measured) = 21.6 W/kg



0 dB = 21.6 W/kg = 13.34 dBW/kg

# Impedance Measurement Plot for Head TSL



### **DASY5 Validation Report for Body TSL**

Date: 11.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 797

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used: f = 2450 MHz;  $\sigma = 2.04$  S/m;  $\epsilon_r = 51.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

#### **DASY52 Configuration:**

Probe: EX3DV4 - SN7349; ConvF(8.1, 8.1, 8.1); Calibrated: 31.05.2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn601; Calibrated: 28.03.2017

Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002

DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

# Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

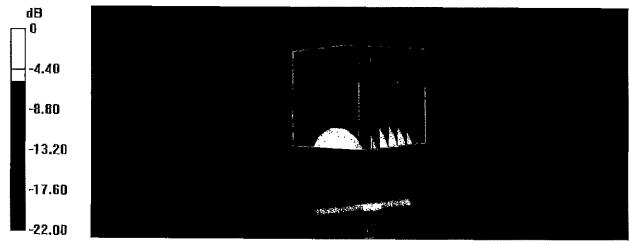
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 105.4 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 25.6 W/kg

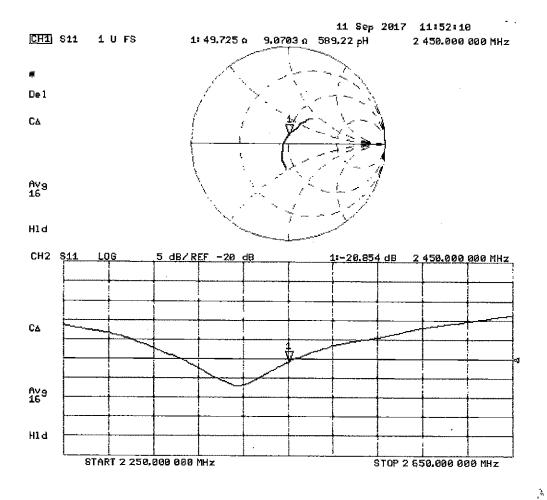
SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.14 W/kg

Maximum value of SAR (measured) = 20.3 W/kg



0 dB = 20.3 W/kg = 13.07 dBW/kg

# Impedance Measurement Plot for Body TSL



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# PCTEST ENGINEERING LABORATORY, INC. 7185 Oakland Mills Road, Columbia, MD



7185 Oakland Mills Road, Columbia, MD 21046 USA Tel. +1.410.290.6652 / Fax +1.410.290.6654 http://www.pctest.com



# **Certification of Calibration**

Object

D2450V2 - SN: 797

Calibration procedure(s)

Procedure for Calibration Extension for SAR Dipoles.

**Extended Calibration date:** 

September 11, 2018

Description:

SAR Validation Dipole at 2450 MHz.

Calibration Equipment used:

| Manufacturer          | Model     | Description   | Cal Date   | Cal Interval | Cal Due    | Serial Number |
|-----------------------|-----------|---|------------|--------------|------------|---------------|
| Control Company       | 4040      | Therm./Clock/Humidity Monitor                           | 3/31/2017  | Blennial     | 3/31/2019  | 170232394     |
| Control Company       | 4352      | Ultra Long Stem Thermometer                             | 5/2/2017   | 8iennial     | 5/2/2019   | 170330156     |
| Amplifler Research    | 15S1G6    | Amplifler   | CBT        | N/A          | CBT        | 433971        |
| Narda                 | 4772-3    | Attenuator (3dB)  | CBT        | N/A          | CBT        | 9406          |
| Keysight              | 7720      | Dual Directional Coupler                                | CBT        | N/A          | CBT        | MY52180215    |
| Keysight Technologies | 85033E    | Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm) | 6/4/2018   | Annual       | 6/4/2019   | MY53401181    |
| Agilent               | 8753ES    | S-Parameter Vector Network Analyzer                     | 8/30/2018  | Annuai       | 8/30/2019  | MY40003841    |
| Mini-Circuits         | BW-N20W5+ | DC to 18 GHz Precision Fixed 20 dB Attenuator           | CBT        | N/A          | CBT        | N/A           |
| SPEAG                 | DAK-3.5   | Dielectric Assessment Kit                               | 5/15/2018  | Annual       | 5/15/2019  | 1070          |
| SPEAG                 | EX3DV4    | SAR Probe   | 7/20/2018  | Annual       | 7/20/2019  | 7410          |
| SPEAG                 | DAE4      | Dasy Data Acquisition Electronics                       | 7/11/2018  | Annual       | 7/11/2019  | 1322          |
| SPEAG                 | ES3DV3    | SAR Probe   | 3/13/2018  | Annual       | 3/13/2019  | 3319          |
| SPEAG                 | DAE4      | Dasy Data Acquisition Electronics                       | 3/7/2018   | Annual       | 3/7/2019   | 1368          |
| Anritsu               | MA2411B   | Pulse Power Sensor                                      | 3/2/2018   | Annual       | 3/2/2019   | 1207364       |
| Anritsu               | MA2411B   | Pulse Power Sensor                                      | 3/2/2018   | Annual       | 3/2/2019   | 1339018       |
| Anritsu               | ML2495A   | Power Meter   | 10/22/2017 | Annual       | 10/22/2018 | 1328004       |
| Agllent               | N5182A    | MXG Vector Signal Generator                             | 4/18/2018  | Annual       | 4/18/2019  | MY47420800    |
| Seekonk               | NC-100    | Torque Wrench   | 7/11/2018  | Annual       | 7/11/2019  | . N/A         |
| MiniCircuits          | VLF-6000+ | Low Pass Filter   | CBT        | N/A          | СВТ        | N/A           |
| Narda                 | 4014C-6   | 4 - 8 GHz SMA 6 dB Directional Coupler                  | CBT        | N/A          | CBT        | N/A           |

Note: CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, amplifier, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path.

#### Measurement Uncertainty = $\pm 23\%$ (k=2)

|                | Name              | Function                    | Signature         |
|----------------|-------------------|-----------------------------|-------------------|
| Calibrated By: | Brodie Halbfoster | Team Lead Engineer          | BROPTE HALBFOSTER |
| Approved By:   | Kaitlin O'Keefe   | Senior Technical<br>Manager | 204               |

| Object:           | Date Issued: | Page 1 of 4 |
|-------------------|--------------|-------------|
| D2450V2 - SN: 797 | 09/11/2018   | Page 1 of 4 |

### **DIPOLE CALIBRATION EXTENSION**

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

- 1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
- 2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
- 3. The measurement of real or imaginary parts of impedance does not deviate more than  $5\Omega$  from the previous measurement.

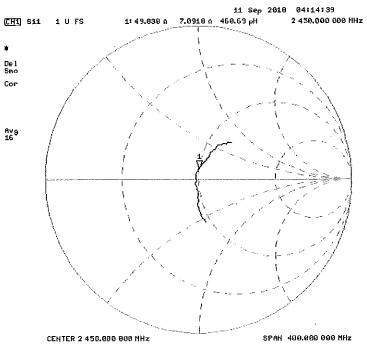
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

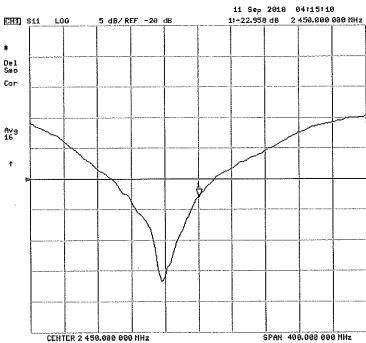
| Calibration<br>Date | Extension Date |       | Certificate<br>SAR Target<br>Head (1g)<br>W/kg @ 20.0<br>dBm | Measured<br>Head SAR (1g)<br>W/kg @ 20.0<br>dBm | (%)   | Certificate<br>SAR Target<br>Head (10g)<br>W/kg @ 20.0<br>dBm | (10a) W/ka @ | Deviation 10g<br>(%) |      |      |   |     |     | Difference<br>(Ohm)<br>Imaginary | Certificate<br>Return Loss<br>Head (dB) | Measured<br>Return Loss<br>Head (dB) | Deviation (%) | PASS/FAIL |
|---------------------|----------------|-------|--|---|-------|---|--------------|----------------------|------|------|---|-----|-----|----------------------------------|---|--------------------------------------|---------------|-----------|
| 9/11/2017           | 9/11/2018      | 1.152 | 5.27   | 5.52  | 4.74% | 2.48  | 2.54         | 2.42%                | 53.8 | 49.8 | 4 | 7.4 | 7.1 | 0.3                              | -21.9                                   | -23                                  | -4.80%        | PASS      |

|   | Calibration<br>Date | Extension Date | Certificate<br>Electrical<br>Delay (ns) | Certificate<br>SAR Target<br>Body (1g)<br>W/kg @ 20.0<br>dBm | Body SAR (1g) | (%)   | Certificate<br>SAR Target<br>Body (10g)<br>W/kg @ 20.0<br>dBm | Measured<br>Body SAR<br>(10g) W/kg @<br>20.0 dBm | Deviation 10g<br>(%) |      | Measured<br>Impedance<br>Body (Ohm)<br>Real | Difference<br>(Ohm) Real | Certificate<br>Impedance<br>Body (Ohm)<br>Imaginary | Measured<br>Impedance<br>Body (Ohm)<br>Imaginary | Difference<br>(Ohm)<br>Imaginary | Certificate<br>Return Loss<br>Body (dB) | Measured<br>Return Loss<br>Body (dB) | Deviation (%) | PASS/FAIL |
|---|---------------------|----------------|---|--|---------------|-------|---|--|----------------------|------|---|--------------------------|---|--|----------------------------------|---|--------------------------------------|---------------|-----------|
| ſ | 9/11/2017           | 9/11/2018      | 1.152                                   | 5.11   | 5.17          | 1.17% | 2.42  | 2.37   | -2.07%               | 49.7 | 49.8  | 0.1                      | 9.1   | 7.2  | 1.9                              | -20.9                                   | -22.6                                | -8.20%        | PASS      |
|   |                     |                |   | •  |               |       |   |  |                      |      |   |                          |   |  |                                  |   |                                      |               |           |

| Object:           | Date Issued: | Page 2 of 4 |
|-------------------|--------------|-------------|
| D2450V2 – SN: 797 | 09/11/2018   | Fage 2 01 4 |

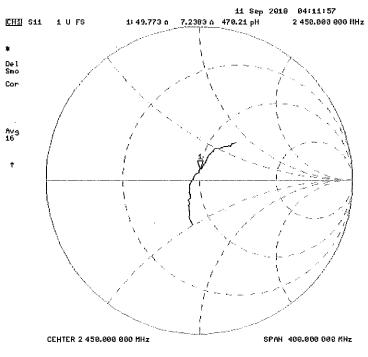
### Impedance & Return-Loss Measurement Plot for Head TSL

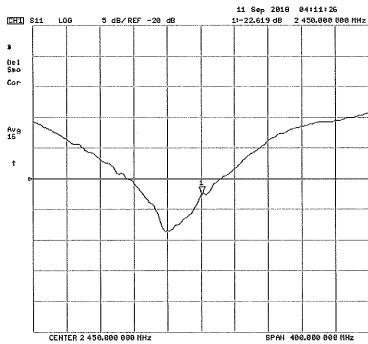




| Object:         | Date Issued: | Page 3 of 4  |
|-----------------|--------------|--------------|
| D2450V2 SN: 797 | 09/11/2018   | r ago o or r |

### Impedance & Return-Loss Measurement Plot for Body TSL





| Object:           | Date Issued: | Page 4 of 4 |
|-------------------|--------------|-------------|
| D2450V2 - SN: 797 | 09/11/2018   | Page 4 of 4 |

### PCTEST ENGINEERING LABORATORY, INC.



7185 Oakland Mills Road, Columbia, MD 21046 USA Tel. +1.410.290.6652 / Fax +1.410.290.6654 http://www.pctest.com



# **Certification of Calibration**

Object D2450V2 – SN: 797

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Extended Calibration date: September 9, 2019

Description: SAR Validation Dipole at 2450 MHz.

Calibration Equipment used:

| Manufacturer          | Model     | Description   | Cal Date   | Cal Interval | Cal Due    | Serial Number |
|-----------------------|-----------|---|------------|--------------|------------|---------------|
| Agilent               | 8753ES    | S-Parameter Network Analyzer                            | 10/2/2018  | Annual       | 10/2/2019  | US39170118    |
| Agilent               | N5182A    | MXG Vector Signal Generator                             | 6/27/2019  | Annual       | 6/27/2020  | US46240505    |
| Amplifier Research    | 15S1G6    | Amplifier   | CBT        | N/A          | CBT        | 343972        |
| Anritsu               | ML2495A   | Power Meter   | 10/21/2018 | Annual       | 10/21/2019 | 941001        |
| Anritsu               | MA2411B   | Pulse Power Sensor                                      | 10/30/2018 | Annual       | 10/30/2019 | 1207470       |
| Anritsu               | MA2411B   | Pulse Power Sensor                                      | 11/20/2018 | Annual       | 11/20/2019 | 1339007       |
| Control Company       | 4040      | Temperature / Humidity Monitor                          | 2/28/2018  | Biennial     | 2/28/2020  | 150761911     |
| Control Company       | 4352      | Ultra Long Stem Thermometer                             | 2/28/2018  | Biennial     | 2/28/2020  | 170330160     |
| Keysight              | 772D      | Dual Directional Coupler                                | CBT        | N/A          | CBT        | MY52180215    |
| Keysight Technologies | 85033E    | Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm) | 7/2/2019   | Annual       | 7/2/2020   | MY53401181    |
| Mini-Circuits         | BW-N20W5+ | DC to 18 GHz Precision Fixed 20 dB Attenuator           | CBT        | N/A          | CBT        | N/A           |
| Mini-Circuits         | NLP-2950+ | Low Pass Filter DC to 2700 MHz                          | CBT        | N/A          | CBT        | N/A           |
| Narda                 | 4772-3    | Attenuator (3dB)  | CBT        | N/A          | CBT        | 9406          |
| Pasternack            | PE2209-10 | Bidirectional Coupler                                   | CBT        | N/A          | CBT        | N/A           |
| Pasternack            | NC-100    | Torque Wrench   | 5/23/2018  | Biennial     | 5/23/2020  | N/A           |
| SPEAG                 | EX3DV4    | SAR Probe   | 2/19/2019  | Annual       | 2/19/2020  | 7417          |
| SPEAG                 | DAE4      | Dasy Data Acquisition Electronics                       | 2/13/2019  | Annual       | 2/13/2020  | 665           |
| SPEAG                 | EX3DV4    | SAR Probe   | 7/15/2019  | Annual       | 7/15/2020  | 7547          |
| SPEAG                 | DAE4      | Dasy Data Acquisition Electronics                       | 7/11/2019  | Annual       | 7/11/2020  | 1323          |
| SPEAG                 | DAK-3.5   | Dielectric Assessment Kit                               | 9/11/2018  | Annual       | 9/11/2019  | 1091          |

Note: CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, amplifier, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path.

### Measurement Uncertainty = ±23% (k=2)

|                | Name              | Function                    | Signature         |
|----------------|-------------------|-----------------------------|-------------------|
| Calibrated By: | Brodie Halbfoster | Team Lead Engineer          | BRODIE HALBFOSTER |
| Approved By:   | Kaitlin O'Keefe   | Senior Technical<br>Manager | 20K-              |

| Object:           | Date Issued: | Page 1 of 4 |
|-------------------|--------------|-------------|
| D2450V2 - SN: 797 | 09/9/2019    | Page 1 of 4 |

### **DIPOLE CALIBRATION EXTENSION**

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

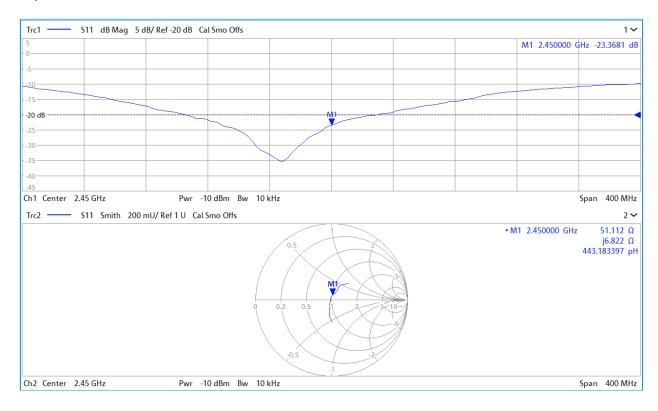
- 1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
- 2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
- 3. The measurement of real or imaginary parts of impedance does not deviate more than  $5\Omega$  from the previous measurement.

The following dipole was checked to pass the above 3 requirements to have 3-year calibration period from the calibration date:

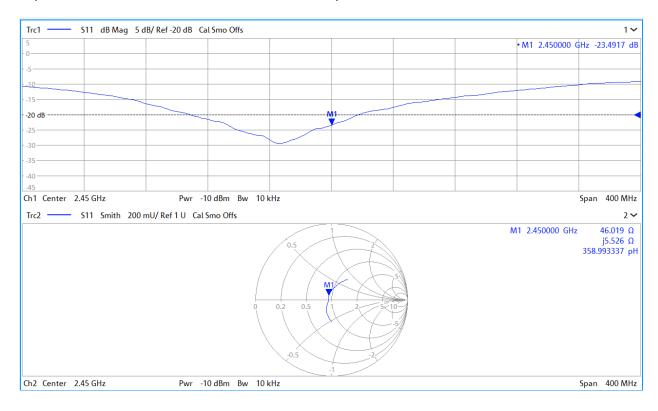
| Calibration<br>Date | Extension Date |       | Certificate<br>SAR Target<br>Head (1g)<br>W/kg @ 20.0<br>dBm | Measured<br>Head SAR (1g)<br>W/kg @ 20.0<br>dBm | (0/)   |   | (40-) M(4 G)  | Deviation 10g<br>(%) | Certificate<br>Impedance<br>Head (Ohm)<br>Real | Measured<br>Impedance<br>Head (Ohm)<br>Real | Difference<br>(Ohm) Real | Certificate<br>Impedance<br>Head (Ohm)<br>Imaginary | Measured<br>Impedance<br>Head (Ohm)<br>Imaginary | Difference<br>(Ohm)<br>Imaginary | Certificate<br>Return Loss<br>Head (dB) | Measured<br>Return Loss<br>Head (dB) | Deviation (%) | PASS/FAIL |
|---------------------|----------------|-------|--|---|--------|---|---------------|----------------------|--|---|--------------------------|---|--|----------------------------------|---|--------------------------------------|---------------|-----------|
| 9/11/2017           | 9/9/2019       | 1.152 | 5.27   | 5.19  | -1.52% | 2.48  | 2.41          | -2.82%               | 53.8   | 51.1  | 2.7                      | 7.4   | 6.8  | 0.6                              | -21.9                                   | -23.4                                | -6.70%        | PASS      |
| Calibration<br>Date | Extension Date |       | Certificate<br>SAR Target<br>Body (1g)<br>W/kg @ 20.0<br>dBm | Measured<br>Body SAR (1g)<br>W/kg @ 20.0<br>dBm | (0/)   | Certificate<br>SAR Target<br>Body (10g)<br>W/kg @ 20.0<br>dBm | (40-) M(4 (-) | Deviation 10g<br>(%) | Certificate<br>Impedance<br>Body (Ohm)<br>Real | Measured<br>Impedance<br>Body (Ohm)<br>Real | Difference<br>(Ohm) Real | Certificate<br>Impedance<br>Body (Ohm)<br>Imaginary | Measured<br>Impedance<br>Body (Ohm)<br>Imaginary | Difference<br>(Ohm)<br>Imaginary | Certificate<br>Return Loss<br>Body (dB) | Measured<br>Return Loss<br>Body (dB) | Deviation (%) | PASS/FAIL |
| 9/11/2017           | 9/9/2019       | 1.152 | 5.11   | 5.17  | 1.17%  | 2.42  | 2.38          | -1.65%               | 49.7   | 46  | 3.7                      | 9.1   | 5.5  | 3.6                              | -20.9                                   | -23.5                                | -12.40%       | PASS      |

| Object:           | Date Issued: | Page 2 of 4 |
|-------------------|--------------|-------------|
| D2450V2 – SN: 797 | 09/9/2019    | Fage 2 01 4 |

### Impedance & Return-Loss Measurement Plot for Head TSL



### Impedance & Return-Loss Measurement Plot for Body TSL



### Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





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Swiss Calibration Service

Accreditation No.: SCS 0108

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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Client

**PC Test** 

Certificate No: EX3-3589\_Jan20

## CALIBRATION CERTIFICATE

Object

EX3DV4 - SN:3589

Calibration procedure(s)

QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v7 Calibration procedure for dosimetric E-field probes

BN 02-2020

Calibration date:

January 21, 2020

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | 1D               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|------------------|-----------------------------------|------------------------|
| Power meter NRP            | SN: 104778       | 03-Apr-19 (No. 217-02892/02893)   | Apr-20                 |
| Power sensor NRP-Z91       | SN: 103244       | 03-Apr-19 (No. 217-02892)         | Apr-20                 |
| Power sensor NRP-Z91       | SN: 103245       | 03-Apr-19 (No. 217-02893)         | Apr-20                 |
| Reference 20 dB Attenuator | SN: S5277 (20x)  | 04-Apr-19 (No. 217-02894)         | Apr-20                 |
| DAE4                       | SN: 660          | 27-Dec-19 (No. DAE4-660_Dec19)    | Dec-20                 |
| Reference Probe ES3DV2     | SN: 3013         | 31-Dec-18 (No. ES3-3013_Dec19)    | Dec-20                 |
| Secondary Standards        | ID               | Check Date (in house)             | Scheduled Check        |
| Power meter E4419B         | SN: GB41293874   | 06-Apr-16 (in house check Jun-18) | In house check: Jun-20 |
| Power sensor E4412A        | SN: MY41498087   | 06-Apr-16 (in house check Jun-18) | In house check: Jun-20 |
| Power sensor E4412A        | SN: 000110210    | 06-Apr-16 (in house check Jun-18) | In house check: Jun-20 |
| RF generator HP 8648C      | SN: US3642U01700 | 04-Aug-99 (in house check Jun-18) | In house check: Jun-20 |
| Network Analyzer E8358A    | SN: US41080477   | 31-Mar-14 (in house check Oct-19) | In house check: Oct-20 |

Calibrated by:

Leif Klysner

Laboratory Technician

Approved by:

Katja Pokovic

Technical Manager

Issued: January 21, 2020

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

## Calibration Laboratory of

Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland





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Accreditation No.: SCS 0108

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Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL NORMx,y,z tissue simulating liquid sensitivity in free space

ConvF DCP sensitivity in TSL / NORMx,y,z diode compression point

CF A, B, C, D crest factor (1/duty\_cycle) of the RF signal modulation dependent linearization parameters

Polarization φ

φ rotation around probe axis

Polarization 9

9 rotation around an axis that is in the plane normal to probe axis (at measurement center),

i.e., 9 = 0 is normal to probe axis

Connector Angle

information used in DASY system to align probe sensor X to the robot coordinate system

### Calibration is Performed According to the Following Standards:

 a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

b) IEC 62209-1, ", "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from handheld and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016

c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010

d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### Methods Applied and Interpretation of Parameters:

 NORMx,y,z: Assessed for E-field polarization θ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E²-field uncertainty inside TSL (see below ConvF).

NORM(f)x,y,z = NORMx,y,z \* frequency\_response (see Frequency Response Chart). This linearization is
implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included
in the stated uncertainty of ConvF.

DCPx,y,z: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.

 PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics

• Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.

• ConvF and Boundary Effect Parameters: Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORMx,y,z \* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.

• Spherical isotropy (3D deviation from isotropy): in a field of low gradients realized using a flat phantom exposed by a patch antenna.

• Sensor Offset: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Connector Angle: The angle is assessed using the information gained by determining the NORMx (no uncertainty required).

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3589

**Basic Calibration Parameters** 

EX3DV4 - SN:3589

|                          | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|--------------------------|----------|----------|----------|-----------|
| Norm $(\mu V/(V/m)^2)^A$ | 0.44     | 0.40     | 0.39     | ± 10.1 %  |
| DCP (mV) <sup>B</sup>    | 101.5    | 97.7     | 97.9     |           |

| UID    | ion Results for Modulation Communication System Name |   | A<br>dB | B<br>dBõV | С     | D<br>dB  | VR<br>mV | Max<br>dev. | Max<br>Unc <sup>E</sup><br>(k=2) |
|--------|--|---|---------|-----------|-------|----------|----------|-------------|----------------------------------|
| 0      | CW   | Х | 0.00    | 0.00      | 1.00  | 00,0     | 138.1    | ± 3.5 %     | ± 4.7 %                          |
|        |  | Υ | 0.00    | 0.00      | 1.00  |          | 148.9    | 1           |                                  |
|        |  | Z | 0.00    | 0.00      | 1.00  |          | 137.1    |             |                                  |
| 10352- | Pulse Waveform (200Hz, 10%)                          | Х | 20.00   | 93.40     | 23.88 | 10.00    | 60.0     | ± 1.9 %     | ± 9.6 %                          |
| AAA    | ,              | Y | 20.00   | 90.04     | 21.55 |          | 60.0     |             |                                  |
|        |  | Z | 20.00   | 93.40     | 23.50 |          | 60.0     |             |                                  |
| 10353- | Pulse Waveform (200Hz, 20%)                          | X | 20.00   | 93.53     | 22.66 | 6.99     | 80.0     | ± 1.0 %     | ± 9.6 %                          |
| AAA    |  | Y | 20.00   | 90.11     | 20.16 |          | 80.0     |             |                                  |
|        |  | Z | 20.00   | 93.36     | 22.20 |          | 80.0     |             |                                  |
| 10354- | Pulse Waveform (200Hz, 40%)                          | X | 20.00   | 95.38     | 22.01 | 3.98     | 95.0     | ± 1.0 %     | ± 9.6 %                          |
| AAA    | · ·  | Υ | 20.00   | 88.87     | 17.82 |          | 95.0     |             |                                  |
|        |  | Z | 20.00   | 94.79     | 21.35 |          | 95.0     |             |                                  |
| 10355- | Pulse Waveform (200Hz, 60%)                          | X | 20.00   | 102.43    | 23.98 | 2.22     | 120.0    | ± 1.1 %     | ± 9.6 %                          |
| AAA    | · · ·  | Y | 20.00   | 86.64     | 15.26 | <u> </u> | 120.0    |             |                                  |
|        |  | Z | 20.00   | 97.99     | 21.51 |          | 120.0    |             |                                  |
| 10387- | QPSK Waveform, 1 MHz                                 | X | 0.93    | 64.33     | 11.56 | 0.00     | 150.0    | ± 3.3 %     | ± 9.6 %                          |
| AAA    |  | Y | 0.54    | 60.00     | 7.11  |          | 150.0    | ]           |                                  |
|        |  | Z | 0.68    | 61.48     | 9.17  |          | 150.0    |             |                                  |
| 10388- | QPSK Waveform, 10 MHz                                | X | 2.38    | 69.01     | 16.27 | 0.00     | 150.0    | ± 1.3 %     | ± 9.6 %                          |
| AAA    |  | Υ | 2.02    | 66.96     | 14.92 | ]        | 150.0    | ]           |                                  |
|        |  | Z | 2.15    | 67.54     | 15.53 |          | 150.0    |             |                                  |
| 10396- | 64-QAM Waveform, 100 kHz                             | X | 3.79    | 73.46     | 20.06 | 3.01     | 150.0    | ± 0.6 %     | ± 9.6 %                          |
| AAA    |  | Υ | 3.12    | 69.91     | 18.24 | ]        | 150.0    |             |                                  |
|        |  | Z | 4.11    | 75.05     | 20.59 |          | 150.0    |             |                                  |
| 10399- | 64-QAM Waveform, 40 MHz                              | X | 3.59    | 67.56     | 16.03 | 0.00     | 150.0    | ± 2.5 %     | ± 9.6 %                          |
| AAA    |  | Y | 3.37    | 66.67     | 15.43 | 1        | 150.0    | 1           | 1                                |
|        |  | Z | 3.46    | 66.93     | 15.67 |          | 150.0    |             |                                  |
| 10414- | WLAN CCDF, 64-QAM, 40MHz                             | Χ | 4.95    | 65.82     | 15.63 | 0,00     | 150.0    | ± 4.6 %     | ± 9.6 %                          |
| AAA    |  | Υ | 4.77    | 65.46     | 15.41 |          | 150.0    |             |                                  |
|        |  | Z | 4.80    | 65.52     | 15.45 |          | 150.0    | ļ           |                                  |

Note: For details on UID parameters see Appendix

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

A The uncertainties of Norm X,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Pages 5 and 6).
 B Numerical linearization parameter: uncertainty not required.
 E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3589

**Sensor Model Parameters** 

EX3DV4-SN:3589

|   | C1<br>fF | C2<br>fF | α<br>V <sup>-1</sup> | T1<br>ms.V <sup>-2</sup> | T2<br>ms.V <sup>-1</sup> | T3<br>ms | T4<br>V <sup>-2</sup> | T5<br>V <sup>-1</sup> | Т6   |
|---|----------|----------|----------------------|--------------------------|--------------------------|----------|-----------------------|-----------------------|------|
| Х | 52.5     | 386.65   | 34.73                | 26.61                    | 1.15                     | 5.10     | 1.30                  | 0.45                  | 1.01 |
| Y | 44.4     | 339.10   | 36.93                | 20.74                    | 1.47                     | 5.06     | 0.00                  | 0.71                  | 1.01 |
| Z | 44.1     | 325.90   | 34.85                | 22.88                    | 1.09                     | 5.07     | 1.71                  | 0.36                  | 1.01 |

#### **Other Probe Parameters**

| Sensor Arrangement                            | Triangular |
|---|------------|
| Connector Angle (°)                           | -32.6      |
| Mechanical Surface Detection Mode             | enabled    |
| Optical Surface Detection Mode                | disabled   |
| Probe Overall Length                          | 337 mm     |
| Probe Body Diameter                           | 10 mm      |
| Tip Length                                    | 9 mm       |
| Tip Diameter                                  | 2.5 mm     |
| Probe Tip to Sensor X Calibration Point       | 1 mm       |
| Probe Tip to Sensor Y Calibration Point       | 1 mm       |
| Probe Tip to Sensor Z Calibration Point       | 1 mm       |
| Recommended Measurement Distance from Surface | 1.4 mm     |

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3589

### Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative<br>Permittivity <sup>F</sup> | Conductivity (S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup><br>(mm) | Unc<br>(k=2) |
|----------------------|---------------------------------------|---------------------------------|---------|---------|---------|--------------------|----------------------------|--------------|
| 750                  | 41.9                                  | 0.89                            | 8.70    | 8.70    | 8.70    | 0.38               | 1.00                       | ± 12.0 %     |
| 835                  | 41.5                                  | 0.90                            | 8.58    | 8.58    | 8.58    | 0.47               | 0.80                       | ± 12.0 %     |
| 1750                 | 40.1                                  | 1.37                            | 7.55    | 7.55    | 7.55    | 0.52               | 0.87                       | ± 12.0 %     |
| 1900                 | 40.0                                  | 1.40                            | 7.25    | 7.25    | 7.25    | 0.43               | 0.87                       | ± 12.0 %     |
| 2300                 | 39.5                                  | 1.67                            | 7.11    | 7.11    | 7.11    | 0.45               | 0.86                       | ± 12.0 %     |
| 2450                 | 39.2                                  | 1.80                            | 6.85    | 6.85    | 6.85    | 0.47               | 0.85                       | ± 12.0 %     |
| 2600                 | 39.0                                  | 1.96                            | 6.60    | 6.60    | 6.60    | 0.41               | 0.86                       | ± 12.0 %     |

<sup>&</sup>lt;sup>c</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>6</sup> MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz.

F At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

G Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is

Galpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

### DASY/EASY - Parameters of Probe: EX3DV4 - SN:3589

### Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative<br>Permittivity <sup>F</sup> | Conductivity (S/m) F | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup><br>(mm) | Unc<br>(k=2) |
|----------------------|---------------------------------------|----------------------|---------|---------|---------|--------------------|----------------------------|--------------|
| 750                  | 55.5                                  | 0.96                 | 8.49    | 8.49    | 8.49    | 0.49               | 0.81                       | ± 12.0 %     |
| 835                  | 55.2                                  | 0.97                 | 8.27    | 8.27    | 8.27    | 0.29               | 1.03                       | ± 12.0 %     |
| 1750                 | 53.4                                  | 1.49                 | 6.93    | 6.93    | 6.93    | 0.41               | 0.87                       | ± 12.0 %     |
| 1900                 | 53.3                                  | 1.52                 | 6.72    | 6.72    | 6.72    | 0.35               | 0.87                       | ± 12.0 %     |
| 2300                 | 52.9                                  | 1.81                 | 6.62    | 6.62    | 6.62    | 0.34               | 0.86                       | ± 12.0 %     |
| 2450                 | 52.7                                  | 1.95                 | 6.60    | 6.60    | 6.60    | 0.40               | 0.86                       | ± 12.0 %     |
| 2600                 | 52.5                                  | 2.16                 | 6.35    | 6.35    | 6.35    | 0.37               | 0.90                       | ± 12.0 %     |

<sup>&</sup>lt;sup>c</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz.

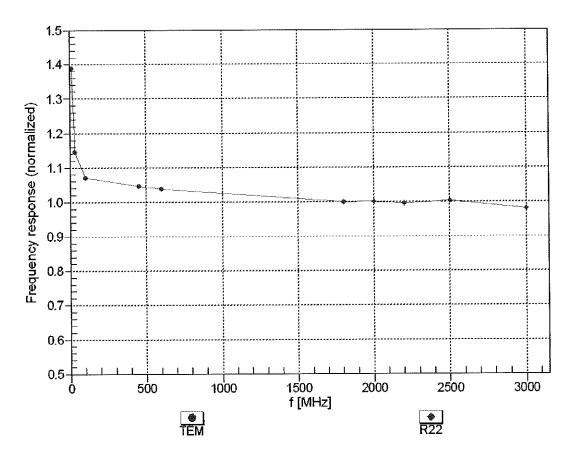
F At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to

measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of

the ConvF uncertainty for indicated target tissue parameters.

Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

# Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)

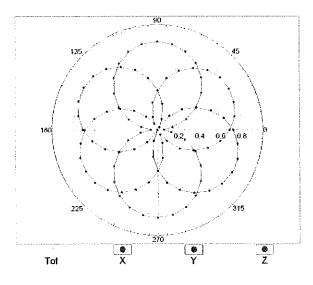


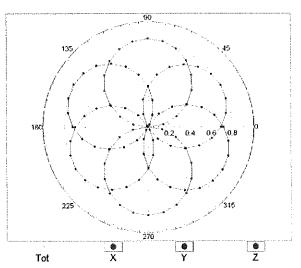
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

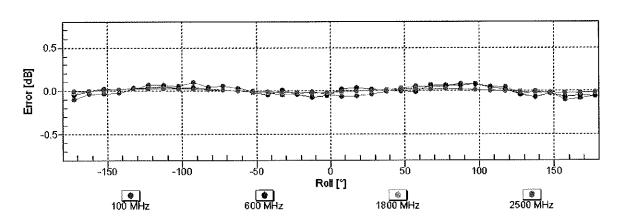
# Receiving Pattern ( $\phi$ ), $\theta = 0^{\circ}$

f=600 MHz,TEM

f=1800 MHz,R22

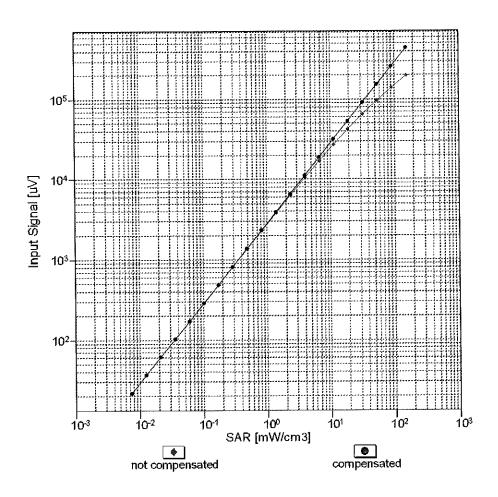


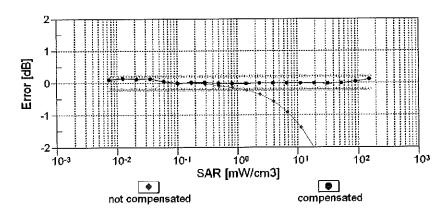




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

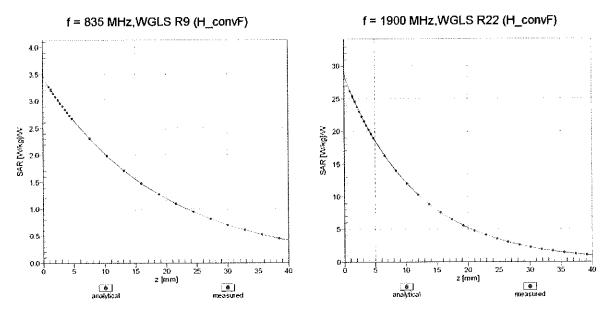
# Dynamic Range f(SAR<sub>head</sub>) (TEM ceil , f<sub>eval</sub>= 1900 MHz)



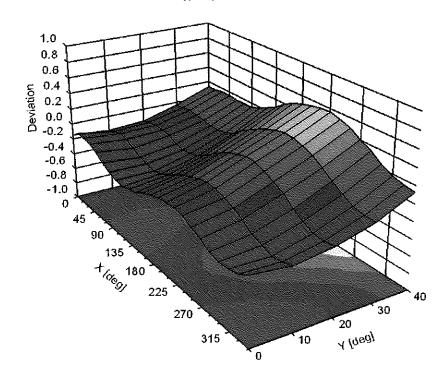


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

## **Conversion Factor Assessment**



Deviation from Isotropy in Liquid Error (φ, 9), f = 900 MHz



# **Appendix: Modulation Calibration Parameters**

| UID            | Rev | Communication System Name   | Group     | PAR<br>(dB) | Unc <sup>E</sup><br>(k=2) |
|----------------|-----|---|-----------|-------------|---------------------------|
| 0              |     | CW  | CW        | 0.00        | ± 4.7 %                   |
| 10010          | CAA | SAR Validation (Square, 100ms, 10ms)  | Test      | 10.00       | ± 9.6 %                   |
| 10011          | CAB | UMTS-FDD (WCDMA)  | WCDMA     | 2.91        | ±9.6%                     |
| 10012          | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)  | WLAN      | 1.87        | ± 9.6 %                   |
| 10013          | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)   | WLAN      | 9.46        | ±9.6 %                    |
| 10021          | DAC | GSM-FDD (TDMA, GMSK)  | GSM       | 9.39        | ± 9.6 %                   |
| 10023          | DAC | GPRS-FDD (TDMA, GMSK, TN 0)   | GSM       | 9.57        | ± 9.6 %                   |
| 10024          | DAC | GPRS-FDD (TDMA, GMSK, TN 0-1)   | GSM       | 6.56        | ± 9.6 %                   |
| 10025          | DAC | EDGE-FDD (TDMA, 8PSK, TN 0)   | GSM       | 12.62       | ±9.6%                     |
| 10026          | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-1)   | GSM       | 9.55        | ±9.6%                     |
| 10027          | DAC | GPRS-FDD (TDMA, GMSK, TN 0-1-2)   | GSM       | 4.80        | ±9.6%                     |
| 10028          | DAC | GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)   | GSM       | 3.55        | ±9.6 %                    |
| 10029          | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-1-2)   | GSM       | 7.78        | ±9.6 %                    |
| 10030          | CAA | IEEE 802.15.1 Bluetooth (GFSK, DH1)   | Bluetooth | 5.30        | ± 9.6 %                   |
| 10031          | CAA | IEEE 802.15.1 Bluetooth (GFSK, DH3)   | Bluetooth | 1.87        | ± 9.6 %                   |
| 10032          | CAA | IEEE 802.15.1 Bluetooth (GFSK, DH5)   | Bluetooth | 1.16        | ± 9.6 %                   |
| 10033          | CAA | IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH1)   | Bluetooth | 7.74        | ± 9.6 %                   |
| 10034          | CAA | IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH3)   | Bluetooth | 4.53        | ± 9.6 %                   |
| 10035          | CAA | IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH5)   | Bluetooth | 3.83        | ± 9.6 %                   |
| 10036          | CAA | IEEE 802.15.1 Bluetooth (8-DPSK, DH1)   | Bluetooth | 8.01        | ± 9.6 %                   |
| 10037          | CAA | IEEE 802.15.1 Bluetooth (8-DPSK, DH3)   | Bluetooth | 4.77        | ± 9.6 %                   |
| 10038          | CAA | IEEE 802.15.1 Bluetooth (8-DPSK, DH5)   | Bluetooth | 4.10        | ± 9.6 %                   |
| 10039          | CAB | CDMA2000 (1xRTT, RC1)   | CDMA2000  | 4.57        | ± 9.6 %                   |
| 10042          | CAB | IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Halfrate)   | AMPS      | 7.78        | ± 9.6 %                   |
| 10044          | CAA | IS-91/EIA/TIA-553 FDD (FDMA, FM)  | AMPS      | 0.00        |                           |
| 10048          | CAA | DECT (TDD, TDMA/FDM, GFSK, Full Slot, 24)   | DECT      | 13.80       | ± 9.6 %                   |
| 10049          | CAA | DECT (TDD, TDMA/FDM, GFSK, Double Slot, 12)   | DECT      | 10.79       | ± 9.6 %                   |
| 10056          | CAA | UMTS-TDD (TD-SCDMA, 1.28 Mcps)  | TD-SCDMA  |             | ± 9.6 %                   |
| 10058          | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3)   |           | 11.01       | ± 9.6 %                   |
| 10059          | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps)  | GSM       | 6.52        | ± 9.6 %                   |
| 10060          | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps)  | WLAN      | 2.12        | ± 9.6 %                   |
| 10061          | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 3.5 Mbps)  | WLAN      | 2.83        | ± 9.6 %                   |
| 10062          | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)  | WLAN      | 3.60        | ±9.6%                     |
| 10063          | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps)  | WLAN      | 8.68        | ±9.6 %                    |
| 10064          | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps)  | WLAN      | 8.63        | ±9.6 %                    |
| 10065          | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps)   | WLAN      | 9.09        | ±9.6%                     |
| 10066          | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 16 Mbps)   | WLAN      | 9.00        | ±9.6%                     |
| 10067          | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps)   | WLAN      | 9.38        | ± 9.6 %                   |
| 10068          | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps)   | WLAN      | 10.12       | ±9.6%                     |
| 10069          | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps)   | WLAN      | 10.24       | ± 9.6 %                   |
| 10071          | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 9 Mbps)   | WLAN      | 10.56       | ± 9.6 %                   |
| 10071          | CAB | IEEE 802.11g WIFI 2.4 GHz (DSSS/OFDM, 9 MDps)   | WLAN      | 9.83        | ± 9.6 %                   |
| 10072          | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 12 Mbps) IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 18 Mbps) | WLAN      | 9.62        | ± 9.6 %                   |
| 10073          | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 18 Mbps) IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 24 Mbps) | WLAN      | 9.94        | ± 9.6 %                   |
| 10074          | CAB | IEEE 802 11g WIEI 2.4 OH- (DOSSIOFDM, 24 MDPS)  | WLAN      | 10.30       | ± 9.6 %                   |
| 10075          | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 36 Mbps)  | WLAN      | 10.77       | ± 9.6 %                   |
| 10076          | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 48 Mbps)  | WLAN      | 10.94       | ± 9.6 %                   |
| 10077          | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)  | WLAN      | 11.00       | ± 9.6 %                   |
| 10082          |     | CDMA2000 (1xRTT, RC3)   | CDMA2000  | 3.97        | ± 9.6 %                   |
|                | CAB | IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Fullrate)   | AMPS      | 4.77        | ± 9.6 %                   |
| 10090          | DAC | GPRS-FDD (TDMA, GMSK, TN 0-4)   | GSM       | 6.56        | ± 9.6 %                   |
| 10097<br>10098 | CAB | UMTS-FDD (HSDPA)  | WCDMA     | 3.98        | ± 9.6 %                   |
|                | CAB | UMTS-FDD (HSUPA, Subtest 2)   | WCDMA     | 3,98        | ± 9.6 %                   |
| 10099          | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-4)   | GSM       | 9.55        | ± 9.6 %                   |
| 10100          | CAE | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)  | LTE-FDD   | 5.67        | ± 9.6 %                   |
| 10101          | CAE | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)  | LTE-FDD   | 6.42        | ± 9.6 %                   |
| 10102          | CAE | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)  | LTE-FDD   | 6.60        | ± 9.6 %                   |
| 10103          | CAG | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)  | LTE-TDD   | 9.29        | ± 9.6 %                   |
| 10104          | CAG | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)  | LTE-TDD   | 9.97        | ± 9.6 %                   |
| 10105          | CAG | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)  | LTE-TDD   | 10.01       | ± 9.6 %                   |
| 10108          | CAG | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)  | LTE-FDD   | 5.80        | ± 9.6 %                   |

EX3DV4- SN:3589 January 21, 2020

| 40400          |     | LTE EDD (OO EDMA 4000/ DD 40 MILE 40 OAM)  | LITE EDD           | 6.42          | ± 9.6 %            |
|----------------|-----|--|--------------------|---------------|--------------------|
| 10109          | CAG | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)   | LTE-FDD<br>LTE-FDD | 6.43<br>5.75  | ± 9.6 %            |
| 10110          | CAG | LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK) LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)    | LTE-FDD            | 6.44          | ± 9.6 %            |
| 10112          | CAG | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)   | LTE-FDD            | 6.59          | ± 9.6 %            |
| 10112          | CAG | LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)  | LTE-FDD            | 6.62          | ± 9.6 %            |
| 10114          | CAC | IEEE 802,11n (HT Greenfield, 13.5 Mbps, BPSK)  | WLAN               | 8.10          | ± 9.6 %            |
| 10115          | CAC | IEEE 802.11n (HT Greenfield, 81 Mbps, 16-QAM)  | WLAN               | 8.46          | ± 9.6 %            |
| 10116          | CAC | IEEE 802.11n (HT Greenfield, 135 Mbps, 64-QAM)                                       | WLAN               | 8.15          | ± 9.6 %            |
| 10117          | CAC | IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)   | WLAN               | 8.07          | ± 9.6 %            |
| 10118          | CAC | IEEE 802.11n (HT Mixed, 81 Mbps, 16-QAM)   | WLAN               | 8.59          | ± 9.6 %            |
| 10119          | CAC | IEEE 802.11n (HT Mixed, 135 Mbps, 64-QAM)  | WLAN               | 8.13          | ± 9.6 %            |
| 10140          | CAE | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)   | LTE-FDD            | 6.49          | ± 9.6 %            |
| 10141          | CAE | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)   | LTE-FDD            | 6.53          | ± 9.6 %            |
| 10142          | CAE | LTE-FDD (SC-FDMA, 100% RB, 3 MHz, QPSK)  | LTE-FDD            | 5.73          | ± 9.6 %            |
| 10143          | CAE | LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)  | LTE-FDD            | 6.35          | ± 9.6 %            |
| 10144          | CAE | LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)  | LTE-FDD            | 6.65          | ± 9.6 %            |
| 10145          | CAF | LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)  | LTE-FDD            | 5.76          | ± 9.6 %            |
| 10146          | CAF | LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)  | LTE-FDD            | 6.41          | ± 9.6 %            |
| 10147          | CAF | LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)  | LTE-FDD            | 6.72          | ± 9.6 %            |
| 10149          | CAE | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)  | LTE-FDD            | 6.42          | ± 9.6 %            |
| 10150          | CAE | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)  | LTE-FDD<br>LTE-TDD | 6.60<br>9.28  | ± 9.6 %<br>± 9.6 % |
| 10151          | CAG | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)  |                    | 9.28          | ± 9.6 %            |
| 10152          | CAG | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)  LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM) | LTE-TDD            | 10.05         | ± 9.6 %            |
| 10153          | CAG | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)  | LTE-FDD            | 5.75          | ± 9.6 %            |
| 10154<br>10155 | CAG | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)  | LTE-FDD            | 6.43          | ± 9.6 %            |
| 10156          | CAG | LTE-FDD (SC-FDMA, 50% RB, 5 MHz, QPSK)   | LTE-FDD            | 5.79          | ± 9.6 %            |
| 10157          | CAG | LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)   | LTE-FDD            | 6.49          | ± 9.6 %            |
| 10158          | CAG | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)  | LTE-FDD            | 6.62          | ± 9.6 %            |
| 10159          | CAG | LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)   | LTE-FDD            | 6.56          | ±9.6%              |
| 10160          | CAE | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)  | LTE-FDD            | 5.82          | ± 9.6 %            |
| 10161          | CAE | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)  | LTE-FDD            | 6.43          | ± 9.6 %            |
| 10162          | CAE | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)  | LTE-FDD            | 6.58          | ±9.6 %             |
| 10166          | CAF | LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)   | LTE-FDD            | 5.46          | ± 9.6 %            |
| 10167          | CAF | LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)   | LTE-FDD            | 6.21          | ±9.6%              |
| 10168          | CAF | LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)   | LTE-FDD            | 6.79          | ± 9.6 %            |
| 10169          | CAE | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)  | LTE-FDD            | 5.73          | ± 9.6 %            |
| 10170          | CAE | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)  | LTE-FDD            | 6.52          | ± 9.6 %            |
| 10171          | AAE | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)  | LTE-FDD            | 6.49          | ± 9.6 %            |
| 10172          | CAG | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)  | LTE-TDD            | 9.21          | ± 9.6 %            |
| 10173          | CAG | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)  | LTE-TDD            | 9.48          | ± 9.6 %            |
| 10174          | CAG | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)  | LTE-TDD<br>LTE-FDD | 10.25<br>5.72 | ± 9.6 %<br>± 9.6 % |
| 10175          |     | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)  | LTE-FDD            | 6.52          | ± 9.6 %            |
| 10176          | CAG | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)  | LTE-FDD            | 5.73          | ± 9.6 %            |
| 10177          | CAI | LTE-FDD (SC-FDMA, 1 RB, 5 MHz, QPSK) LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)          | LTE-FDD            | 6,52          | ± 9.6 %            |
| 10178          | CAG | LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 10-QAM)   | LTE-FDD            | 6.50          | ± 9.6 %            |
| 10179          | CAG | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)  | LTE-FDD            | 6.50          | ± 9.6 %            |
| 10181          | CAE | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)  | LTE-FDD            | 5.72          | ± 9.6 %            |
| 10182          | CAE | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)  | LTE-FDD            | 6.52          | ± 9.6 %            |
| 10183          | AAD | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)  | LTE-FDD            | 6.50          | ± 9.6 %            |
| 10184          | CAE | LTE-FDD (SC-FDMA, 1 RB, 3 MHz, QPSK)   | LTE-FDD            | 5.73          | ± 9.6 %            |
| 10185          | CAE | LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)   | LTE-FDD            | 6.51          | ± 9.6 %            |
| 10186          | AAE | LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)   | LTE-FDD            | 6.50          | ± 9.6 %            |
| 10187          | CAF | LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)   | LTE-FDD            | 5.73          | ± 9.6 %            |
| 10188          | CAF | LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)   | LTE-FDD            | 6.52          | ± 9.6 %            |
| 10189          | AAF | LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)   | LTE-FDD            | 6.50          | ± 9.6 %            |
| 10193          | CAC | IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)   | WLAN               | 8.09          | ± 9.6 %            |
| 10194          | CAC | IEEE 802.11n (HT Greenfield, 39 Mbps, 16-QAM)  | WLAN               | 8.12          | ± 9.6 %            |
| 10195          | CAC | IEEE 802.11n (HT Greenfield, 65 Mbps, 64-QAM)  | WLAN               | 8.21          | ± 9.6 %            |
| 10196          | CAC | IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)  | WLAN               | 8.10          | ±9.6%              |
| 10197          | CAC | IEEE 802.11n (HT Mixed, 39 Mbps, 16-QAM)   | WLAN               | 8.13          | ±9.6 %             |
| 10198          | CAC | IEEE 802.11n (HT Mixed, 65 Mbps, 64-QAM)   | WLAN<br>WLAN       | 8.27<br>8.03  | ± 9.6 %<br>± 9.6 % |
| 10219          | CAC | IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)  | VALAM              | 1 0.03        | 1 7 9.0 /0         |

Certificate No: EX3-3589\_Jan20

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|-------|-----|---|------------|-------|---------|
| 10220 | CAC | IEEE 802.11n (HT Mixed, 43.3 Mbps, 16-QAM)  | WLAN       | 8.13  | ± 9.6 % |
| 10221 | CAC | IEEE 802.11n (HT Mixed, 72.2 Mbps, 64-QAM)  | WLAN       | 8.27  | ± 9.6 % |
| 10222 | CAC | IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)      | WLAN       | 8.06  | ± 9.6 % |
| 10223 | CAC | IEEE 802.11n (HT Mixed, 90 Mbps, 16-QAM)    | WLAN       | 8.48  | ± 9.6 % |
| 10224 | CAC | IEEE 802.11n (HT Mixed, 150 Mbps, 64-QAM)   | WLAN       | 8.08  | ± 9.6 % |
| 10225 | CAB | UMTS-FDD (HSPA+)                            | WCDMA      | 5.97  | ± 9.6 % |
| 10226 | CAB | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)    | LTE-TDD    | 9.49  | ± 9.6 % |
| 10227 | CAB | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)    | LTE-TDD    | 10.26 | ± 9.6 % |
| 10228 | CAB | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)      | LTE-TDD    | 9,22  | ± 9.6 % |
| 10229 | CAD | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)      | LTE-TDD    | 9.48  | ± 9.6 % |
| 10230 | CAD | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)      | LTE-TDD    | 10.25 | ± 9.6 % |
| 10231 | CAD | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK)        | LTE-TDD    | 9.19  | ± 9.6 % |
| 10232 | CAG | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)      | LTE-TDD    | 9.48  | ± 9.6 % |
| 10233 | CAG | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)      | LTE-TDD    | 10.25 | ± 9.6 % |
| 10234 | CAG | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK)        | LTE-TDD    | 9.21  | ± 9.6 % |
| 10235 | CAG | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)     | LTE-TDD    | 9.48  | ± 9.6 % |
| 10236 | CAG | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)     | LTE-TDD    | 10.25 | ± 9.6 % |
| 10237 | CAG | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)       | LTE-TDD    | 9.21  | ±9.6%   |
| 10238 | CAF | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)     | LTE-TDD    | 9.48  | ± 9.6 % |
| 10239 | CAF | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)     | LTE-TDD    | 10.25 | ± 9.6 % |
| 10240 | CAF | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK)       | LTE-TDD    | 9.21  | ± 9.6 % |
| 10241 | CAB | LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)  | LTE-TDD    | 9.82  | ± 9.6 % |
| 10242 | CAB | LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)  | LTE-TDD    | 9.86  | ±9.6%   |
| 10243 | CAB | LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)    | LTE-TDD    | 9.46  | ± 9.6 % |
| 10244 | CAD | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)    | LTE-TDD    | 10.06 | ± 9.6 % |
| 10245 | CAD | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)    | LTE-TDD    | 10.06 | ±9.6%   |
| 10246 | CAD | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK)      | LTE-TDD    | 9.30  | ± 9.6 % |
| 10247 | CAG | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)    | LTE-TDD    | 9.91  | ± 9.6 % |
| 10248 | CAG | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)    | LTE-TDD    | 10.09 | ±9.6%   |
| 10249 | CAG | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK)      | LTE-TDD    | 9.29  | ± 9.6 % |
| 10250 | CAG | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)   | LTE-TDD    | 9.81  | ±9.6%   |
| 10251 | CAG | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)   | LTE-TDD    | 10.17 | ± 9.6 % |
| 10252 | CAG | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)     | LTE-TDD    | 9.24  | ± 9.6 % |
| 10253 | CAF | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)   | LTE-TDD    | 9.90  | ± 9.6 % |
| 10254 | CAF | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)   | LTE-TDD    | 10.14 | ± 9.6 % |
| 10255 | CAF | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK)     | LTE-TDD    | 9.20  | ±9.6%   |
| 10256 | CAB | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM) | LTE-TDD    | 9.96  | ± 9.6 % |
| 10257 | CAB | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM) | LTE-TDD    | 10.08 | ±9.6%   |
| 10258 | CAB | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)   | LTE-TDD    | 9.34  | ±9.6%   |
| 10259 | CAD | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)   | LTE-TDD    | 9.98  | ± 9.6 % |
| 10260 | CAD | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)   | LTE-TDD    | 9.97  | ±9.6%   |
| 10261 | CAD | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK)     | LTE-TDD    | 9.24  | ± 9.6 % |
| 10262 |     | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)   | LTE-TDD    | 9.83  | ± 9.6 % |
| 10263 | CAG | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)   | LTE-TDD    | 10.16 | ± 9.6 % |
| 10264 | CAG | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK)     | LTE-TDD    | 9.23  | ± 9.6 % |
| 10265 | CAG | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)  | LTE-TDD    | 9.92  | ± 9.6 % |
| 10266 | CAG | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)  | LTE-TDD    | 10.07 | ± 9.6 % |
| 10267 | CAG | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)    | LTE-TDD    | 9.30  | ± 9.6 % |
| 10268 | CAF | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)  | LTE-TDD    | 10.06 | ± 9.6 % |
| 10269 | CAF | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)  | LTE-TDD    | 10.13 | ± 9.6 % |
| 10270 | CAF | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK)    | LTE-TDD    | 9.58  | ± 9.6 % |
| 10274 | CAB | UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)   | WCDMA      | 4.87  | ± 9.6 % |
| 10275 | CAB | UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)    | WCDMA      | 3.96  | ± 9.6 % |
| 10277 | CAA | PHS (QPSK)                                  | PHS        | 11.81 | ± 9.6 % |
| 10278 | CAA | PHS (QPSK, BW 884MHz, Rolloff 0.5)          | PHS        | 11.81 | ± 9.6 % |
| 10279 | CAA | PHS (QPSK, BW 884MHz, Rolloff 0.38)         | PHS        | 12.18 | ± 9.6 % |
| 10290 | AAB | CDMA2000, RC1, SO55, Full Rate              | CDMA2000   | 3.91  | ± 9.6 % |
| 10291 | AAB | CDMA2000, RC3, SO55, Full Rate              | CDMA2000   | 3.46  | ± 9.6 % |
| 10292 | AAB | CDMA2000, RC3, SO32, Full Rate              | CDMA2000   | 3.39  | ± 9.6 % |
| 10293 | AAB | CDMA2000, RC3, SO3, Full Rate               | CDMA2000   | 3.50  | ± 9.6 % |
| 10295 | AAB | CDMA2000, RC1, SO3, 1/8th Rate 25 fr.       | CDMA2000   | 12.49 | ± 9.6 % |
| 10297 | AAD | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)     | LTE-FDD    | 5.81  | ± 9.6 % |
| 10298 | AAD | LTE-FDD (SC-FDMA, 50% RB, 3 MHz, QPSK)      | LTE-FDD    | 5.72  | ± 9.6 % |
| 10299 | AAD | LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)    | LTE-FDD    | 6.39  | ± 9.6 % |
|       |     |   |            |       |         |

EX3DV4-- SN:3589 January 21, 2020

| 10300          | AAD       | LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)                          | LTE-FDD                 | 6.60         | +069/              |
|----------------|-----------|---|-------------------------|--------------|--------------------|
| 10300          | AAA       | IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, QPSK, PUSC)                | WiMAX                   | 12.03        | ± 9.6 %<br>± 9.6 % |
| 10301          | AAA       | IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, QPSK, PUSC, 3 CTRL         | WiMAX                   | 12.03        | ± 9.6 %            |
| 10302          | AAA       | symbols)  | VVIIVIAX                | 12.57        | I 9.0 %            |
| 10303          | AAA       | IEEE 802.16e WIMAX (31:15, 5ms, 10MHz, 64QAM, PUSC)               | WiMAX                   | 12.52        | ±9.6 %             |
| 10303          | AAA       | IEEE 802.16e WIMAX (31.15, 511s, 10MHz, 64QAM, PUSC)              | WiMAX                   | 11.86        | ± 9.6 %            |
| 10304          | AAA       | IEEE 802.16e WIMAX (29.16, 5115, 10MHz, 64QAM, PUSC)              | WIMAX                   | 15.24        | ± 9.6 %            |
| 10303          | ^^~       | symbols)  | VVIIVIAA                | 10.24        | E 9.0 %            |
| 10306          | AAA       | IEEE 802.16e WIMAX (29:18, 10ms, 10MHz, 64QAM, PUSC, 18           | WiMAX                   | 14.67        | ± 9.6 %            |
| 10000          | 70707     | symbols)  | A A HANA                | 14.07        | 2 9.0 /0           |
| 10307          | AAA       | IEEE 802.16e WIMAX (29:18, 10ms, 10MHz, QPSK, PUSC, 18            | WIMAX                   | 14.49        | ± 9.6 %            |
| 10007          | / / / / / | symbols)  | *********               | 14.40        | 2 0.0 %            |
| 10308          | AAA       | IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 16QAM, PUSC)              | WiMAX                   | 14.46        | ± 9.6 %            |
| 10309          | AAA       | IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 16QAM, AMC 2x3, 18        | WIMAX                   | 14.58        | ± 9.6 %            |
|                |           | symbols)  |                         | 1            | - 515 76           |
| 10310          | AAA       | IEEE 802.16e WIMAX (29:18, 10ms, 10MHz, QPSK, AMC 2x3, 18         | WiMAX                   | 14.57        | ± 9.6 %            |
|                |           | symbols)  |                         |              |                    |
| 10311          | AAD       | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)                          | LTE-FDD                 | 6.06         | ±9.6%              |
| 10313          | AAA       | IDEN 1:3  | IDEN                    | 10.51        | ± 9.6 %            |
| 10314          | AAA       | IDEN 1:6  | IDEN                    | 13.48        | ±9.6%              |
| 10315          | AAB       | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)         | WLAN                    | 1.71         | ± 9.6 %            |
| 10316          | AAB       | IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle)     | WLAN                    | 8.36         | ±9.6 %             |
| 10317          | AAC       | IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc duty cycle)           | WLAN                    | 8.36         | ±9.6%              |
| 10352          | AAA       | Pulse Waveform (200Hz, 10%)                                       | Generic                 | 10.00        | ± 9.6 %            |
| 10353          | AAA       | Pulse Waveform (200Hz, 20%)                                       | Generic                 | 6.99         | ± 9.6 %            |
| 10354          | AAA       | Pulse Waveform (200Hz, 40%)                                       | Generic                 | 3.98         | ± 9.6 %            |
| 10355          | AAA       | Pulse Waveform (200Hz, 60%)                                       | Generic                 | 2.22         | ± 9.6 %            |
| 10356          | AAA       | Pulse Waveform (200Hz, 80%)                                       | Generic                 | 0.97         | ± 9.6 %            |
| 10387          | AAA       | QPSK Waveform, 1 MHz  | Generic                 | 5.10         | ±9.6%              |
| 10388          | AAA       | QPSK Waveform, 10 MHz   | Generic                 | 5.22         | ± 9.6 %            |
| 10396          | AAA       | 64-QAM Waveform, 100 kHz  | Generic                 | 6.27         | ± 9.6 %            |
| 10399          | AAA       | 64-QAM Waveform, 40 MHz   | Generic                 | 6.27         | ± 9.6 %            |
| 10400          | AAD       | IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)               | WLAN                    | 8.37         | ±9.6 %             |
| 10401          | AAD       | IEEE 802.11ac WiFi (40MHz, 64-QAM, 99pc duty cycle)               | WLAN                    | 8.60         | ±9.6 %             |
| 10402          | AAD       | IEEE 802.11ac WiFi (80MHz, 64-QAM, 99pc duty cycle)               | WLAN                    | 8.53         | ±9.6 %             |
| 10403          | AAB       | CDMA2000 (1xEV-DO, Rev. 0)  | CDMA2000                | 3.76         | ± 9.6 %            |
| 10404          | AAB       | CDMA2000 (1xEV-DO, Rev. A)  | CDMA2000                | 3.77         | ± 9.6 %            |
| 10406          | AAB       | CDMA2000, RC3, SO32, SCH0, Full Rate                              | CDMA2000                | 5.22         | ±9.6 %             |
| 10410          | AAG       | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL                          | LTE-TDD                 | 7.82         | ±9.6%              |
|                |           | Subframe=2,3,4,7,8,9, Subframe Conf=4)                            |                         | .,           |                    |
| 10414          | AAA       | WLAN CCDF, 64-QAM, 40MHz  | Generic                 | 8,54         | ± 9.6 %            |
| 10415          | AAA       | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)         | WLAN                    | 1.54         | ± 9.6 %            |
| 10416          | AAA       | IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)     | WLAN                    | 8.23         | ± 9.6 %            |
| 10417          | AAB       | IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle)         | WLAN                    | 8.23         | ± 9.6 %            |
| 10418          | AAA       | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle,    | WLAN                    | 8.14         | ± 9.6 %            |
| 40415          |           | Long preambule)   | 1211 231                |              |                    |
| 10419          | AAA       | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle,    | WLAN                    | 8.19         | ± 9.6 %            |
| 40400          | 105       | Short preambule)  | 140 44                  |              |                    |
| 10422          | AAB       | IEEE 802.11n (HT Greenfield, 7.2 Mbps, BPSK)                      | WLAN                    | 8.32         | ± 9.6 %            |
| 10423          | AAB       | IEEE 802.11n (HT Greenfield, 43.3 Mbps, 16-QAM)                   | WLAN                    | 8.47         | ± 9.6 %            |
| 10424          | AAB       | IEEE 802.11n (HT Greenfield, 72.2 Mbps, 64-QAM)                   | WLAN                    | 8.40         | ± 9.6 %            |
| 10425          | AAB       | IEEE 802.11n (HT Greenfield, 15 Mbps, BPSK)                       | WLAN                    | 8.41         | ± 9.6 %            |
| 10426          | AAB       | IEEE 802.11n (HT Greenfield, 90 Mbps, 16-QAM)                     | WLAN                    | 8.45         | ± 9.6 %            |
| 10427          | AAB       | IEEE 802.11n (HT Greenfield, 150 Mbps, 64-QAM)                    | WLAN                    | 8.41         | ± 9.6 %            |
| 10430          | AAD       | LTE-FDD (OFDMA, 5 MHz, E-TM 3.1)                                  | LTE-FDD                 | 8.28         | ± 9.6 %            |
| 10431          | AAD       | LTE-FDD (OFDMA, 10 MHz, E-TM 3.1)                                 | LTE-FDD                 | 8.38         | ±9.6%              |
| 10432          | AAC       | LTE-FDD (OFDMA, 15 MHz, E-TM 3.1)                                 | LTE-FDD                 | 8.34         | ± 9.6 %            |
| 10433<br>10434 | AAC       | LTE-FDD (OFDMA, 20 MHz, E-TM 3.1)                                 | LTE-FDD                 | 8.34         | ± 9.6 %            |
|                |           | W-CDMA (BS Test Model 1, 64 DPCH)                                 | WCDMA                   | 8.60         | ± 9.6 %            |
| 10435          | AAF       | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9) | LTE-TDD                 | 7.82         | ± 9.6 %            |
| 10447          | AAD       | LTE-FDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)                    | LTE-FDD                 | 7.50         | 1000               |
| 10447          | AAD       | LTE-FDD (OFDMA, 3 MHz, E-TM 3.1, Clipping 44%)                    | LTE-FDD                 | 7.56<br>7.53 | ±9.6 %<br>±9.6 %   |
| 10448          | AAC       | LTE-FDD (OFDMA, 10 MHz, E-TM 3.1, Cliping 44%)                    | LTE-FDD                 | 7.53         |                    |
| 10449          | AAC       | LTE-FDD (OFDMA, 13 MHz, E-TM 3.1, Clipping 44%)                   | LTE-FDD                 | 7.48         | ±9.6 %<br>±9.6 %   |
| LUADII         |           |   | -   -     -     -     - | 1.40         |                    |

| 10451 | AAA | W-CDMA (BS Test Model 1, 64 DPCH, Clipping 44%)                       | WCDMA    | 7.59  | ± 9.6 % |
|-------|-----|---|----------|-------|---------|
| 10453 | AAD | Validation (Square, 10ms, 1ms)  | Test     | 10.00 | ± 9.6 % |
| 10456 | AAB | IEEE 802.11ac WiFi (160MHz, 64-QAM, 99pc duty cycle)                  | WLAN     | 8.63  | ± 9.6 % |
| 10457 | AAA | UMTS-FDD (DC-HSDPA)   | WCDMA    | 6.62  | ± 9.6 % |
| 10458 | AAA | CDMA2000 (1xEV-DO, Rev. B, 2 carriers)                                | CDMA2000 | 6.55  | ± 9.6 % |
| 10459 | AAA | CDMA2000 (1xEV-DO, Rev. B, 3 carriers)                                | CDMA2000 | 8.25  | ±9.6 %  |
| 10460 | AAA | UMTS-FDD (WCDMA, AMR)   | WCDMA    | 2.39  | ± 9.6 % |
| 10461 | AAB | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK, UL                             | LTE-TDD  | 7.82  | ± 9.6 % |
|       |     | Subframe=2,3,4,7,8,9)   |          |       |         |
| 10462 | AAB | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9)  | LTE-TDD  | 8.30  | ± 9.6 % |
| 10463 | AAB | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM, UL<br>Subframe=2,3,4,7,8,9)  | LTE-TDD  | 8.56  | ± 9.6 % |
| 10464 | AAC | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9)      | LTE-TDD  | 7.82  | ± 9.6 % |
| 10465 | AAC | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9)    | LTE-TDD  | 8.32  | ± 9.6 % |
| 10466 | AAC | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM, UL                             | LTE-TDD  | 8.57  | ± 9.6 % |
| 10107 |     | Subframe=2,3,4,7,8,9)   |          |       |         |
| 10467 | AAF | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9)      | LTE-TDD  | 7.82  | ± 9.6 % |
| 10468 | AAF | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9)    | LTE-TDD  | 8.32  | ± 9.6 % |
| 10469 | AAF | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM, UL<br>Subframe=2,3,4,7,8,9)    | LTE-TDD  | 8.56  | ± 9.6 % |
| 10470 | AAF | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9)     | LTE-TDD  | 7.82  | ± 9.6 % |
| 10471 | AAF | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM, UL                            | LTE-TDD  | 8.32  | ± 9.6 % |
| 10472 | AAF | Subframe=2,3,4,7,8,9)  LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM, UL     | LTE-TDD  | 8.57  | ± 9.6 % |
| 10473 | AAE | Subframe=2,3,4,7,8,9) LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK, UL        | LTE-TDD  | 7.82  | ± 9.6 % |
| 10474 | AAE | Subframe=2,3,4,7,8,9)  LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM, UL     | LTE-TDD  | 8.32  | ± 9.6 % |
| 10475 | AAE | Subframe=2,3,4,7,8,9) LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM, UL      | LTE-TDD  | 8.57  | ± 9.6 % |
| 10477 | AAF | Subframe=2,3,4,7,8,9)  LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM, UL     | LTE-TDD  | 8.32  | ± 9.6 % |
| 10478 | AAF | Subframe=2,3,4,7,8,9) LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM, UL      | LTE-TDD  | 8.57  | ± 9.6 % |
| 10479 | AAB | Subframe=2,3,4,7,8,9)  LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK, UL    | LTE-TDD  | 7.74  | ± 9.6 % |
| 10480 | AAB | Subframe=2,3,4,7,8,9) LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM, UL   | LTE-TDD  | 8.18  | ± 9.6 % |
| 10481 | AAB | Subframe=2,3,4,7,8,9) LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM, UL   | LTE-TDD  | 8.45  | ± 9.6 % |
| 10482 | AAC | Subframe=2,3,4,7,8,9) LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK, UL       | LTE-TDD  | 7.71  | ± 9.6 % |
| 10483 | AAC | Subframe=2,3,4,7,8,9)<br>LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM, UL  | LTE-TDD  | 8.39  | ± 9.6 % |
| 10484 | AAC | Subframe=2,3,4,7,8,9)  LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM, UL    | LTE-TDD  | 8.47  | ± 9.6 % |
| 10485 | AAF | Subframe=2,3,4,7,8,9)  LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK, UL      |          |       |         |
|       |     | Subframe=2,3,4,7,8,9)   | LTE-TDD  | 7.59  | ±9.6%   |
| 10486 | AAF | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9)  | LTE-TDD  | 8.38  | ±9.6 %  |
| 10487 | AAF | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM, UL<br>Subframe=2,3,4,7,8,9)  | LTE-TDD  | 8.60  | ±9.6%   |
| 10488 | AAF | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9)   | LTE-TDD  | 7.70  | ± 9.6 % |
| 10489 | AAF | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9) | LTE-TDD  | 8.31  | ±9.6 %  |
| 10490 | AAF | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM, UL<br>Subframe=2,3,4,7,8,9) | LTE-TDD  | 8.54  | ± 9.6 % |
|       | AAE | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK, UL                            | LTE-TDD  | 7.74  | ± 9.6 % |

EX3DV4-- SN:3589 January 21, 2020

|       |     | Subframe=2,3,4,7,8,9)   |         |      |         |
|-------|-----|---|---------|------|---------|
| 10492 | AAE | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9)   | LTE-TDD | 8,41 | ± 9.6 % |
| 10493 | AAE | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM, UL<br>Subframe=2,3,4,7,8,9)   | LTE-TDD | 8.55 | ± 9.6 % |
| 10494 | AAF | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9)     | LTE-TDD | 7.74 | ± 9.6 % |
| 10495 | AAF | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9)   | LTE-TDD | 8.37 | ± 9.6 % |
| 10496 | AAF | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM, UL<br>Subframe=2,3,4,7,8,9)   | LTE-TDD | 8.54 | ± 9.6 % |
| 10497 | AAB | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9)   | LTE-TDD | 7.67 | ± 9.6 % |
| 10498 | AAB | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9) | LTE-TDD | 8.40 | ± 9.6 % |
| 10499 | AAB | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM, UL<br>Subframe=2,3,4,7,8,9) | LTE-TDD | 8.68 | ± 9.6 % |
| 10500 | AAC | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9)     | LTE-TDD | 7.67 | ± 9.6 % |
| 10501 | AAC | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9)   | LTE-TDD | 8.44 | ± 9.6 % |
| 10502 | AAC | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM, UL<br>Subframe=2,3,4,7,8,9)   | LTE-TDD | 8.52 | ± 9.6 % |
| 10503 | AAF | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9)     | LTE-TDD | 7.72 | ±9.6 %  |
| 10504 | AAF | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9)   | LTE-TDD | 8.31 | ±9.6 %  |
| 10505 | AAF | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM, UL<br>Subframe=2,3,4,7,8,9)   | LTE-TDD | 8.54 | ± 9.6 % |
| 10506 | AAF | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9)    | LTE-TDD | 7.74 | ± 9.6 % |
| 10507 | AAF | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9)  | LTE-TDD | 8.36 | ± 9.6 % |
| 10508 | AAF | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM, UL<br>Subframe=2,3,4,7,8,9)  | LTE-TDD | 8.55 | ± 9.6 % |
| 10509 | AAE | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9)    | LTE-TDD | 7.99 | ± 9.6 % |
| 10510 | AAE | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9)  | LTE-TDD | 8.49 | ± 9.6 % |
| 10511 | AAE | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM, UL<br>Subframe=2,3,4,7,8,9)  | LTE-TDD | 8.51 | ± 9.6 % |
| 10512 | AAF | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9)    | LTE-TDD | 7.74 | ± 9.6 % |
| 10513 | AAF | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9)  | LTE-TDD | 8.42 | ± 9.6 % |
| 10514 | AAF | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL<br>Subframe=2,3,4,7,8,9)  | LTE-TDD | 8.45 | ± 9.6 % |
| 10515 | AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 99pc duty cycle)               | WLAN    | 1.58 | ±9.6%   |
| 10516 | AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 99pc duty cycle)             | WLAN    | 1.57 | ± 9.6 % |
| 10517 | AAA | IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 99pc duty cycle)              | WLAN    | 1.58 | ± 9.6 % |
| 10518 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc duty cycle)               | WLAN    | 8.23 | ± 9.6 % |
| 10519 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 99pc duty cycle)              | WLAN    | 8.39 | ± 9.6 % |
| 10520 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 99pc duty cycle)              | WLAN    | 8.12 | ± 9.6 % |
| 10521 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 99pc duty cycle)              | WLAN    | 7.97 | ± 9.6 % |
| 10522 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 99pc duty cycle)              | WLAN    | 8.45 | ±9.6%   |
| 10523 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc duty cycle)              | WLAN    | 8.08 | ± 9.6 % |
| 10524 | AAB | IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)              | WLAN    | 8.27 | ± 9.6 % |
| 10525 | AAB | IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)                       | WLAN    | 8.36 | ± 9.6 % |
| 10526 | AAB | IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)                       | WLAN    | 8.42 | ± 9.6 % |
| 10527 | AAB | IEEE 802.11ac WiFi (20MHz, MCS2, 99pc duty cycle)                       | WLAN    | 8.21 | ± 9.6 % |
| 10528 | AAB | IEEE 802.11ac WiFi (20MHz, MCS3, 99pc duty cycle)                       | WLAN    | 8.36 | ± 9.6 % |
| 10529 | AAB | IEEE 802.11ac WiFi (20MHz, MCS4, 99pc duty cycle)                       | WLAN    | 8.36 | ± 9.6 % |
| 10531 | AAB | IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)                       | WLAN    | 8.43 | ± 9.6 % |
| 10532 | AAB | IEEE 802.11ac WiFi (20MHz, MCS7, 99pc duty cycle)                       | WLAN    | 8.29 | ± 9.6 % |
| 10533 | AAB | IEEE 802.11ac WiFi (20MHz, MCS8, 99pc duty cycle)                       | WLAN    | 8.38 | ± 9.6 % |

| 19353   AAB  |        |             | 2  |                |   |              |
|--|--------|-------------|--|----------------|---|--------------|
| 10537   AAB   IEEE 802.11se Wilf (ADMHz, MCS3, 99pc duty cycle)   WLAN   8.42   4.9.6 %  | 10534  | AAB         | IEEE 802.11ac WiFi (40MHz, MCS0, 99pc duty cycle)          | WLAN           | 8.45                                    | ± 9.6 %      |
| 1953   |        | AAB         |  | WLAN           | 8.45                                    | ± 9.6 %      |
| 1959a   AAB  |        | AAB         | IEEE 802.11ac WiFi (40MHz, MCS2, 99pc duty cycle)          | WLAN           | 8.32                                    | ± 9.6 %      |
| 1958a   AAB  | 10537  | AAB         | IEEE 802.11ac WiFi (40MHz, MCS3, 99pc duty cycle)          | WLAN           | 8.44                                    |              |
| 19540   AAB   IEEE 802.11ac WiFF (40MHz, MCSR, 99pc duty cycle)  | 10538  | AAB         | IEEE 802.11ac WiFi (40MHz, MCS4, 99pc duty cycle)          | WLAN           | 8.54                                    |              |
| 10541   AAB   IEEE 802.11ac WFF (40MHz, MCSR, 99pc duty cycle)   | 10540  | AAB         |  | WLAN           | 8.39                                    |              |
| 10543   AAB   IEEE 802.11ac WIFF (40MHz, MCS8, 99bc duty cycle)  | 10541  | AAB         | IEEE 802.11ac WiFi (40MHz, MCS7, 99pc duty cycle)          |                | 8.46                                    |              |
| 10544   AAB   IEEE 802.11ac WIFI (40MHz, MCS9, 990c duty cycle)  | 10542  | AAB         |  |                |   |              |
| 19544   AAB   IEEE 802.11ac WIFI (80MHz, MCS0, 99bc duly cycle)  |        | AAB         |  |                |   |              |
| 19545   AAB   IEEE 802.11ac WIFF (80MHz, MCS1, 99pc duty cycle)   WLAN   8.15   ± 9.6 %   19547   AAB   IEEE 802.11ac WIFF (80MHz, MCS2, 99pc duty cycle)   WLAN   8.15   ± 9.6 %   19547   AAB   IEEE 802.11ac WIFF (80MHz, MCS3, 99pc duty cycle)   WLAN   8.37   ± 9.6 %   19550   AAB   IEEE 802.11ac WIFF (80MHz, MCS4, 99pc duty cycle)   WLAN   8.38   ± 9.6 %   19550   AAB   IEEE 802.11ac WIFF (80MHz, MCS6, 99pc duty cycle)   WLAN   8.38   ± 9.6 %   19550   AAB   IEEE 802.11ac WIFF (80MHz, MCS6, 99pc duty cycle)   WLAN   8.38   ± 9.6 %   19550   AAB   IEEE 802.11ac WIFF (80MHz, MCS6, 99pc duty cycle)   WLAN   8.45   ± 9.6 %   19550   AAB   IEEE 802.11ac WIFF (80MHz, MCS6, 99pc duty cycle)   WLAN   8.45   ± 9.6 %   19550   AAB   IEEE 802.11ac WIFF (80MHz, MCS6, 99pc duty cycle)   WLAN   8.45   ± 9.6 %   19550   AAC   IEEE 802.11ac WIFF (80MHz, MCS6, 99pc duty cycle)   WLAN   8.45   ± 9.6 %   19550   AAC   IEEE 802.11ac WIFF (80MHz, MCS6, 99pc duty cycle)   WLAN   8.47   ± 9.6 %   19550   AAC   IEEE 802.11ac WIFF (80MHz, MCS6, 99pc duty cycle)   WLAN   8.47   ± 9.6 %   19550   AAC   IEEE 802.11ac WIFF (80MHz, MCS6, 99pc duty cycle)   WLAN   8.57   ± 9.6 %   19550   AAC   IEEE 802.11ac WIFF (80MHz, MCS6, 99pc duty cycle)   WLAN   8.50   ± 9.6 %   19550   AAC   IEEE 802.11ac WIFF (80MHz, MCS6, 99pc duty cycle)   WLAN   8.50   ± 9.6 %   19550   AAC   IEEE 802.11ac WIFF (80MHz, MCS6, 99pc duty cycle)   WLAN   8.52   ± 9.6 %   19550   AAC   IEEE 802.11ac WIFF (80MHz, MCS6, 99pc duty cycle)   WLAN   8.52   ± 9.6 %   19550   AAC   IEEE 802.11ac WIFF (80MHz, MCS6, 99pc duty cycle)   WLAN   8.52   ± 9.6 %   19550   AAC   IEEE 802.11ac WIFF (80MHz, MCS6, 99pc duty cycle)   WLAN   8.51   ± 9.6 %   19550   AAC   IEEE 802.11ac WIFF (80MHz, MCS6, 99pc duty cycle)   WLAN   8.50   ± 9.6 %   19550   AAA   IEEE 802.11ac WIFF (80MHz, MCS6, 99pc duty cycle)   WLAN   8.60   ± 9.6 %   19550   AAA   IEEE 802.11ac WIFF (80MHz, MCS6, 99pc duty cycle)   WLAN   8.60   ± 9.6 %   19550   AAA   IEEE 802.11ac WIFF (80MHz, MCS6, 99pc duty cycle)  |        | ~           |  |                |   |              |
| 19546   AAB   IEEE 802.11ac WIFI (80MHz, MCS2, 99pc duly cycle)   WLAN   8.45   ± 9.6 %   19547   AAB   IEEE 802.11ac WIFI (80MHz, MCS3, 99pc duly cycle)   WLAN   8.47   ± 9.6 %   19548   AAB   IEEE 802.11ac WIFI (80MHz, MCS4, 99pc duly cycle)   WLAN   8.37   ± 9.6 %   19551   AAB   IEEE 802.11ac WIFI (80MHz, MCS7, 99pc duly cycle)   WLAN   8.38   ± 9.6 %   19551   AAB   IEEE 802.11ac WIFI (80MHz, MCS7, 99pc duly cycle)   WLAN   8.42   ± 9.5 %   19552   AAB   IEEE 802.11ac WIFI (80MHz, MCS7, 99pc duly cycle)   WLAN   8.42   ± 9.5 %   19553   AAB   IEEE 802.11ac WIFI (80MHz, MCS9, 99pc duly cycle)   WLAN   8.42   ± 9.5 %   19553   AAC   IEEE 802.11ac WIFI (80MHz, MCS9, 99pc duly cycle)   WLAN   8.43   ± 9.6 %   19556   AAC   IEEE 802.11ac WIFI (80MHz, MCS9, 99pc duly cycle)   WLAN   8.48   ± 9.6 %   19556   AAC   IEEE 802.11ac WIFI (196MHz, MCS9, 99pc duly cycle)   WLAN   8.47   ± 9.6 %   19556   AAC   IEEE 802.11ac WIFI (196MHz, MCS9, 99pc duly cycle)   WLAN   8.50   ± 9.6 %   19556   AAC   IEEE 802.11ac WIFI (196MHz, MCS9, 99pc duly cycle)   WLAN   8.50   ± 9.6 %   19556   AAC   IEEE 802.11ac WIFI (196MHz, MCS9, 99pc duly cycle)   WLAN   8.50   ± 9.6 %   19556   AAC   IEEE 802.11ac WIFI (196MHz, MCS9, 99pc duly cycle)   WLAN   8.50   ± 9.6 %   19556   AAC   IEEE 802.11ac WIFI (196MHz, MCS9, 99pc duly cycle)   WLAN   8.51   ± 9.6 %   19556   AAC   IEEE 802.11ac WIFI (196MHz, MCS9, 99pc duly cycle)   WLAN   8.51   ± 9.6 %   19566   AAC   IEEE 802.11ac WIFI (196MHz, MCS9, 99pc duly cycle)   WLAN   8.73   ± 9.6 %   19566   AAA   IEEE 802.11ac WIFI (196MHz, MCS9, 99pc duly cycle)   WLAN   8.75   ± 9.6 %   19566   AAA   IEEE 802.11ac WIFI (196MHz, MCS9, 99pc duly cycle)   WLAN   8.75   ± 9.6 %   19566   AAA   IEEE 802.11ac WIFI (196MHz, MCS9, 99pc duly cycle)   WLAN   8.37   ± 9.6 %   19566   AAA   IEEE 802.11ac WIFI (196MHz, MCS9, 99pc duly cycle)   WLAN   8.37   ± 9.6 %   19566   AAA   IEEE 802.11ac WIFI (196MHz, MCS9, 99pc duly cycle)   WLAN   8.30   ± 9.6 %   19566   AAA   IEEE 802.11ac WIFI (196MHz, MCS9, 99p |        |             |  |                |   |              |
| 19547   AAB   IEEE 802.11ac WiFi (30MHz, MCS3, 39pc duty cycle)   WLAN   8.49   4.96 %   1958   19 |        |             |  |                |   |              |
| 19548   AAB   IEEE 802.11ac WFF (60MHz, MCS4, 99pc duty cycle)   WLAN   8.37   ± 9.6 %   10550   AAB   IEEE 802.11ac WFF (60MHz, MCS4, 99pc duty cycle)   WLAN   8.38   ± 9.6 %   10551   AAB   IEEE 802.11ac WFF (80MHz, MCS5, 99pc duty cycle)   WLAN   8.40   ± 9.6 %   10553   AAB   IEEE 802.11ac WFF (80MHz, MCS5, 99pc duty cycle)   WLAN   8.42   ± 9.6 %   10554   AAC   IEEE 802.11ac WFF (80MHz, MCS5, 99pc duty cycle)   WLAN   8.45   ± 9.6 %   10554   AAC   IEEE 802.11ac WFF (80MHz, MCS5, 99pc duty cycle)   WLAN   8.48   ± 9.6 %   10555   AAC   IEEE 802.11ac WFF (80MHz, MCS5, 99pc duty cycle)   WLAN   8.48   ± 9.6 %   10556   AAC   IEEE 802.11ac WFF (80MHz, MCS5, 99pc duty cycle)   WLAN   8.50   ± 9.6 %   10556   AAC   IEEE 802.11ac WFF (80MHz, MCS5, 99pc duty cycle)   WLAN   8.50   ± 9.6 %   10556   AAC   IEEE 802.11ac WFF (160MHz, MCS5, 99pc duty cycle)   WLAN   8.50   ± 9.6 %   10556   AAC   IEEE 802.11ac WFF (160MHz, MCS5, 99pc duty cycle)   WLAN   8.50   ± 9.6 %   10556   AAC   IEEE 802.11ac WFF (160MHz, MCS6, 99pc duty cycle)   WLAN   8.51   ± 9.6 %   10556   AAC   IEEE 802.11ac WFF (160MHz, MCS6, 99pc duty cycle)   WLAN   8.61   ± 9.6 %   10566   AAC   IEEE 802.11ac WFF (160MHz, MCS6, 99pc duty cycle)   WLAN   8.51   ± 9.6 %   10566   AAC   IEEE 802.11ac WFF (160MHz, MCS6, 99pc duty cycle)   WLAN   8.56   ± 9.6 %   10566   AAA   IEEE 802.11ac WFF (160MHz, MCS6, 99pc duty cycle)   WLAN   8.73   ± 9.6 %   10566   AAA   IEEE 802.11ac WFF (160MHz, MCS6, 99pc duty cycle)   WLAN   8.75   ± 9.6 %   10566   AAA   IEEE 802.11ac WFF (160MHz, MCS6, 99pc duty cycle)   WLAN   8.75   ± 9.6 %   10566   AAA   IEEE 802.11ac WFF (160MHz, MCS6, 99pc duty cycle)   WLAN   8.25   ± 9.6 %   10566   AAA   IEEE 802.11ac WFF (160MHz, MCS6, 99pc duty cycle)   WLAN   8.37   ± 9.6 %   10566   AAA   IEEE 802.11ac WFF (160MHz, MCS6, 99pc duty cycle)   WLAN   8.37   ± 9.6 %   10566   AAA   IEEE 802.11ac WFF (160MHz, MCS6, 99pc duty cycle)   WLAN   8.30   ± 9.6 %   10566   AAA   IEEE 802.11ac WFF (160MHz, MCS6, 99pc duty cycle)   WLAN    |        | <del></del> |  |                |   |              |
| 10550  |        |             |  |                |   |              |
| 10551   AAB   IEEE 802.11ac WiFI (80MHz, MCS7, 99pc duty cycle)   WILAN   8.40   ±9.6 %   10553   AAB   IEEE 802.11ac WiFI (80MHz, MCS9, 99pc duty cycle)   WILAN   8.42   ±9.6 %   10553   AAB   IEEE 802.11ac WiFI (80MHz, MCS9, 99pc duty cycle)   WILAN   8.45   ±9.6 %   10554   AAC   IEEE 802.11ac WiFI (100MHz, MCS9, 99pc duty cycle)   WILAN   8.45   ±9.6 %   10556   AAC   IEEE 802.11ac WiFI (100MHz, MCS9, 99pc duty cycle)   WILAN   8.45   ±9.6 %   10556   AAC   IEEE 802.11ac WiFI (100MHz, MCS1, 99pc duty cycle)   WILAN   8.50   ±9.6 %   10556   AAC   IEEE 802.11ac WiFI (100MHz, MCS1, 99pc duty cycle)   WILAN   8.50   ±9.6 %   10556   AAC   IEEE 802.11ac WiFI (100MHz, MCS1, 99pc duty cycle)   WILAN   8.61   ±9.6 %   10556   AAC   IEEE 802.11ac WiFI (100MHz, MCS1, 99pc duty cycle)   WILAN   8.61   ±9.6 %   10566   AAC   IEEE 802.11ac WiFI (160MHz, MCS1, 99pc duty cycle)   WILAN   8.63   ±9.6 %   10566   AAC   IEEE 802.11ac WiFI (160MHz, MCS1, 99pc duty cycle)   WILAN   8.56   ±9.6 %   10566   AAC   IEEE 802.11ac WiFI (160MHz, MCS1, 99pc duty cycle)   WILAN   8.56   ±9.6 %   10566   AAC   IEEE 802.11ac WiFI (160MHz, MCS1, 99pc duty cycle)   WILAN   8.56   ±9.6 %   10566   AAC   IEEE 802.11ac WiFI (160MHz, MCS1, 99pc duty cycle)   WILAN   8.57   ±9.6 %   10566   AAA   IEEE 802.11ac WiFI (150MHz, MCS1, 99pc duty cycle)   WILAN   8.25   ±9.6 %   10566   AAA   IEEE 802.11g WiFI 2.4 GHz (DSSS-OFDM, 12 Mbps, 99pc duty   WILAN   8.25   ±9.6 %   10566   AAA   IEEE 802.11g WiFI 2.4 GHz (DSSS-OFDM, 12 Mbps, 99pc duty   WILAN   8.45   ±9.6 %   10566   AAA   IEEE 802.11g WiFI 2.4 GHz (DSSS-OFDM, 12 Mbps, 99pc duty   WILAN   8.30   ±9.6 %   10566   AAA   IEEE 802.11g WiFI 2.4 GHz (DSSS-OFDM, 48 Mbps, 99pc duty   WILAN   8.30   ±9.6 %   10566   AAA   IEEE 802.11g WiFI 2.4 GHz (DSSS-OFDM, 54 Mbps, 99pc duty   WILAN   8.30   ±9.6 %   10576   AAA   IEEE 802.11g WiFI 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty   WILAN   8.30   ±9.6 %   10576   AAA   IEEE 802.11g WiFI 2.4 GHz (DSSS-OFDM, 9 Mbps, 90pc duty   WILAN   8.50   ±9.6 %   1056 |        | <del></del> | IEEE 902.11ac WiFi (90MHz, MCSC, 00pc duty cycle)          |                |   |              |
| 10552   AAB   IEEE 802.11ac WiFi (80MHz, MCS9, 99pc duty cycle)   WiLAN   8.45   ± 9.6 %   10554   AAC   IEEE 802.11ac WiFi (80MHz, MCS0, 99pc duty cycle)   WiLAN   8.45   ± 9.6 %   10554   AAC   IEEE 802.11ac WiFi (160MHz, MCS0, 99pc duty cycle)   WILAN   8.47   ± 9.6 %   10555   AAC   IEEE 802.11ac WiFi (160MHz, MCS1, 99pc duty cycle)   WILAN   8.47   ± 9.6 %   10556   AAC   IEEE 802.11ac WiFi (160MHz, MCS1, 99pc duty cycle)   WILAN   8.47   ± 9.6 %   10557   AAC   IEEE 802.11ac WiFi (160MHz, MCS1, 99pc duty cycle)   WILAN   8.50   ± 9.6 %   10558   AAC   IEEE 802.11ac WiFi (160MHz, MCS3, 99pc duty cycle)   WILAN   8.50   ± 9.6 %   10550   AAC   IEEE 802.11ac WiFi (160MHz, MCS4, 99pc duty cycle)   WILAN   8.50   ± 9.6 %   10560   AAC   IEEE 802.11ac WiFi (160MHz, MCS4, 99pc duty cycle)   WILAN   8.50   ± 9.6 %   10560   AAC   IEEE 802.11ac WiFi (160MHz, MCS4, 99pc duty cycle)   WILAN   8.56   ± 9.6 %   10564   AAC   IEEE 802.11ac WiFi (160MHz, MCS5, 99pc duty cycle)   WILAN   8.69   ± 9.6 %   10564   AAA   IEEE 802.11ac WiFi (160MHz, MCS8, 99pc duty cycle)   WILAN   8.77   ± 9.6 %   10565   AAA   IEEE 802.11ac WiFi (160MHz, MCS8, 99pc duty cycle)   WILAN   8.25   ± 9.6 %   10566   AAA   IEEE 802.11ac WiFi (160MHz, MCS8, 99pc duty cycle)   WILAN   8.25   ± 9.6 %   10566   AAA   IEEE 802.11ac WiFi (160MHz, MCS8, 99pc duty cycle)   WILAN   8.27   ± 9.6 %   10566   AAA   IEEE 802.11ac WiFi (160MHz, MCS8, 99pc duty cycle)   WILAN   8.45   ± 9.6 %   10566   AAA   IEEE 802.11ac WiFi (160MHz, MCS8, 99pc duty cycle)   WILAN   8.45   ± 9.6 %   10567   AAA   IEEE 802.11ac WiFi (160MHz, MCS8, 99pc duty cycle)   WILAN   8.40   ± 9.6 %   10567   AAA   IEEE 802.11b WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 99pc duty   WILAN   8.30   ± 9.6 %   10568   AAA   IEEE 802.11b WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 99pc duty   WILAN   8.30   ± 9.6 %   10573   AAA   IEEE 802.11b WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty   WILAN   8.50   ± 9.6 %   10573   AAA   IEEE 802.11b WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty   WILAN   8.50   ± 9.6 %  |        | 4           |  |                |   |              |
| 19553   AAB   IEEE 802.11ac WiFI (80MHz, MCS9, 99pc duty cycle)   WILAN   8.45   |        | 1           |  |                |   |              |
| 10554  |        | <del></del> |  |                |   |              |
| 10555  |        |             |  |                |   |              |
| 10556  |        |             |  |                |   |              |
| 10557   AAC   IEEE 802.11ac WiFi (160MHz, MCS3, 99pc duty cycle)   |        |             |  | WLAN           | 8.47                                    |              |
| 10558  |        |             | IEEE 802.11ac WiFi (160MHz, MCS2, 99pc duty cycle)         | WLAN           | 8.50                                    | ± 9.6 %      |
| 10560  |        |             |  |                | 8.52                                    | ± 9.6 %      |
| 10561  |        | AAC         | IEEE 802.11ac WiFi (160MHz, MCS4, 99pc duty cycle)         | WLAN           | 8.61                                    | ± 9.6 %      |
| 10561   AAC   IEEE 802.11ac WiFi (160MHz, MCSR, 99pc duty cycle)   WLAN   8.56   ± 9.6 %   10562   AAC   IEEE 802.11ac WiFi (160MHz, MCSR, 99pc duty cycle)   WLAN   8.69   ± 9.6 %   10564   AAC   IEEE 802.11ac WiFi (160MHz, MCSR, 99pc duty cycle)   WLAN   8.77   ± 9.6 %   10564   AAA   IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 99pc duty cycle)   WLAN   8.25   ± 9.6 %   cycle)   Cycle)   WLAN   8.45   ± 9.6 %   cycle)   WLAN   8.46   ± 9.6 %   cycle)   WLAN   8.00   ± 9.6 %   cycle)   WLAN   8.37   ± 9.6 %   cycle)   WLAN   8.30   ± 9.6 %   cycle)   WLAN   1.99   ± 9.6 %   cycle)   WLAN   1.98   ± 9.6 %   cycle)   cycle)   WLAN   1.98   ± 9.6 %   cycle)   cycle)   WLAN   1.98   ± 9.6 %   cycle)   cycle)   WLAN   8.60   ± 9.6 %   cycle)   cycle)   WLAN   8.60   ± 9.6 %   cycle)   cycle)   WLAN   8.60   ± 9.6 %   cycle)   cycle)   WLAN   8.60  | 10560  | AAC         | IEEE 802.11ac WiFi (160MHz, MCS6, 99pc duty cycle)         | WLAN           | 8.73                                    | ± 9.6 %      |
| 10562  | 10561  | AAC         |  |                |   |              |
| 10563  |        |             |  |                |   |              |
| 10564  |        |             |  |                |   |              |
| 10565   AAA   IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 99pc duty cycle)   WLAN   8.45   ± 9.6 % cycle)   |        |             |  |                |   |              |
| 10565  |        |             |  | 1,00           | 0.20                                    |              |
| 10566  | 10565  | AAA         |  | WLAN           | 8.45                                    | +96%         |
| 10566  |        | ' ' ' '     |  | 11011          | 0.40                                    | 20.0 /8      |
| Cycle   Cycle   LEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 99pc duty cycle)   WLAN   EEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 99pc duty cycle)   WLAN   EEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 99pc duty cycle)   WLAN   EEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 99pc duty cycle)   WLAN   EEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 99pc duty cycle)   WLAN   EEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 90pc duty cycle)   WLAN   EEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 90pc duty cycle)   WLAN   EEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 90pc duty cycle)   WLAN   EEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 90pc duty cycle)   WLAN   EEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 90pc duty cycle)   WLAN   EEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 90pc duty cycle)   WLAN   EEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 90pc duty cycle)   WLAN   EEE 802.11g WiFi 2.4 GHz (DSSS, 5.5 Mbps, 90pc duty cycle)   WLAN   EEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty cycle)   WLAN   EEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty   WLAN   8.59   ± 9.6 %   cycle)   EEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 90pc duty   WLAN   8.60   ± 9.6 %   cycle)   EEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 90pc duty   WLAN   8.70   ± 9.6 %   cycle)   EEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 90pc duty   WLAN   8.70   ± 9.6 %   cycle)   EEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 90pc duty   WLAN   8.70   ± 9.6 %   cycle)   EEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc duty   WLAN   8.36   ± 9.6 %   cycle)   EEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc duty   WLAN   8.76   ± 9.6 %   cycle)   EEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 90pc duty   WLAN   8.76   ± 9.6 %   cycle)   EEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty   WLAN   8.76   ± 9.6 %   cycle)   EEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty   WLAN   8.60   ± 9.6 %   cycle)   EEE 802.11g WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty   Cycle)   WLAN   8.60   ± 9.6 %   cycle)   EEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty   Cycle | 10566  | AAA         |  | WLAN           | 8 13                                    | +96%         |
| 10567  |        | ' ' ' '     |  | 110 "          | 0.10                                    | ±0.0 /0      |
| 10568  | 10567  | ΔΔΔ         |  | 10/1 AN        | 8.00                                    | +96%         |
| 10568  | 1.0007 | ' ' ' '     |  | 110"           | 0.00                                    | ±0.0 /0      |
| Cycle   10569  | 10568  | AAA         |  | \Λ/Ι ΔΝ        | 8 37                                    | +96%         |
| 10569  | 10000  | 1,000       |  | W.DAIN         | 0.57                                    | ± 0.0 /0     |
| Cycle   10570  | 10569  | AAA         | IEEE 802 11g WiEi 2 4 GHz (DSSS-OEDM 48 Mbps, 99pc duty    | WLAN           | 8 10                                    | +96%         |
| 10570  | 10000  | 1,,,,       |  | 412/11         | 0.10                                    | 20.0 /8      |
| Cycle   Cycl | 10570  | ΔΔΔ         |  | M/LAN          | 8.30                                    | +96%         |
| 10571         AAA         IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 90pc duty cycle)         WLAN         1.99         ± 9.6 %           10572         AAA         IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 90pc duty cycle)         WLAN         1.99         ± 9.6 %           10573         AAA         IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 90pc duty cycle)         WLAN         1.98         ± 9.6 %           10574         AAA         IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 90pc duty cycle)         WLAN         1.98         ± 9.6 %           10575         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty cycle)         WLAN         8.59         ± 9.6 %           10576         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 90pc duty cycle)         WLAN         8.60         ± 9.6 %           10577         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 90pc duty cycle)         WLAN         8.70         ± 9.6 %           10578         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 90pc duty cycle)         WLAN         8.49         ± 9.6 %           10579         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 90pc duty cycle)         WLAN         8.36         ± 9.6 %           10580         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc duty cycle)         WLAN  | 10070  | 1,000       |  | AAFUIA         | 0.50                                    | 1 2.0 %      |
| 10572         AAA         IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 90pc duty cycle)         WLAN         1.99         ± 9.6 %           10573         AAA         IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 90pc duty cycle)         WLAN         1.98         ± 9.6 %           10574         AAA         IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 90pc duty cycle)         WLAN         1.98         ± 9.6 %           10575         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty cycle)         WLAN         8.59         ± 9.6 %           10576         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 90pc duty cycle)         WLAN         8.60         ± 9.6 %           10577         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 90pc duty cycle)         WLAN         8.70         ± 9.6 %           10578         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 90pc duty cycle)         WLAN         8.49         ± 9.6 %           10579         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 90pc duty cycle)         WLAN         8.36         ± 9.6 %           10580         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc duty cycle)         WLAN         8.35         ± 9.6 %           10581         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty cycle) <t< td=""><td>10571</td><td></td><td></td><td>\\\/\ \\ \\\\\</td><td>1.00</td><td>+06%</td></t<>  | 10571  |             |  | \\\/\ \\ \\\\\ | 1.00                                    | +06%         |
| 10573         AAA         IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 90pc duty cycle)         WLAN         1.98         ± 9.6 %           10574         AAA         IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 90pc duty cycle)         WLAN         1.98         ± 9.6 %           10575         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty cycle)         WLAN         8.59         ± 9.6 %           10576         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 90pc duty cycle)         WLAN         8.60         ± 9.6 %           10577         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 90pc duty cycle)         WLAN         8.70         ± 9.6 %           10578         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 90pc duty cycle)         WLAN         8.49         ± 9.6 %           10579         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 90pc duty cycle)         WLAN         8.36         ± 9.6 %           10580         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc duty cycle)         WLAN         8.76         ± 9.6 %           10581         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty cycle)         WLAN         8.67         ± 9.6 %           10582         AAA         IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle) <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td></t<>   |        |             |  |                |   |              |
| 10574         AAA         IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 90pc duty cycle)         WLAN         1.98         ± 9.6 %           10575         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty cycle)         WLAN         8.59         ± 9.6 %           10576         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 90pc duty cycle)         WLAN         8.60         ± 9.6 %           10577         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 90pc duty cycle)         WLAN         8.70         ± 9.6 %           10578         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 90pc duty cycle)         WLAN         8.49         ± 9.6 %           10579         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 90pc duty cycle)         WLAN         8.36         ± 9.6 %           10580         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc duty cycle)         WLAN         8.76         ± 9.6 %           10581         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 90pc duty cycle)         WLAN         8.35         ± 9.6 %           10582         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty cycle)         WLAN         8.67         ± 9.6 %           10583         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)   |        |             |  |                |   | <del>}</del> |
| 10575         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty cycle)         WLAN         8.59         ± 9.6 %           10576         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 90pc duty cycle)         WLAN         8.60         ± 9.6 %           10577         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 90pc duty cycle)         WLAN         8.70         ± 9.6 %           10578         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 90pc duty cycle)         WLAN         8.49         ± 9.6 %           10579         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 90pc duty cycle)         WLAN         8.36         ± 9.6 %           10580         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc duty cycle)         WLAN         8.76         ± 9.6 %           10581         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 90pc duty cycle)         WLAN         8.35         ± 9.6 %           10582         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty cycle)         WLAN         8.67         ± 9.6 %           10583         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty cycle)         WLAN         8.60         ± 9.6 %           10585         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)   |        |             |  |                |   |              |
| Cycle   10576  |        |             |  |                |   | <del>}</del> |
| 10576         AAA         IÉEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 90pc duty cycle)         WLAN         8.60         ± 9.6 %           10577         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 90pc duty cycle)         WLAN         8.70         ± 9.6 %           10578         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 90pc duty cycle)         WLAN         8.49         ± 9.6 %           10579         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 90pc duty cycle)         WLAN         8.36         ± 9.6 %           10580         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc duty cycle)         WLAN         8.76         ± 9.6 %           10581         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 90pc duty cycle)         WLAN         8.35         ± 9.6 %           10582         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty cycle)         WLAN         8.67         ± 9.6 %           10583         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)         WLAN         8.59         ± 9.6 %           10584         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)         WLAN         8.60         ± 9.6 %           10585         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle) <t< td=""><td>100/0</td><td>  AAAA</td><td></td><td>WLAN</td><td>8.59</td><td>±9.6%</td></t<>   | 100/0  | AAAA        |  | WLAN           | 8.59                                    | ±9.6%        |
| Cycle  | 40570  | A A A       |  | LA/: AB:       | 1 2 5 2                                 | 1000         |
| 10577         AAA         IÉEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 90pc duty cycle)         WLAN         8.70         ± 9.6 %           10578         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 90pc duty cycle)         WLAN         8.49         ± 9.6 %           10579         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 90pc duty cycle)         WLAN         8.36         ± 9.6 %           10580         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc duty cycle)         WLAN         8.76         ± 9.6 %           10581         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 90pc duty cycle)         WLAN         8.35         ± 9.6 %           10582         AAA         IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty cycle)         WLAN         8.67         ± 9.6 %           10583         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)         WLAN         8.59         ± 9.6 %           10584         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)         WLAN         8.60         ± 9.6 %           10585         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)         WLAN         8.70         ± 9.6 %  | 105/6  | AAA         |  | WLAN           | 8.60                                    | ±9.6%        |
| Cycle   10578  | 40577  |             |  | 14/1           | <del> </del>                            |              |
| 10578       AAA       IÉEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 90pc duty cycle)       WLAN       8.49       ± 9.6 %         10579       AAA       IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 90pc duty cycle)       WLAN       8.36       ± 9.6 %         10580       AAA       IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc duty cycle)       WLAN       8.76       ± 9.6 %         10581       AAA       IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 90pc duty cycle)       WLAN       8.35       ± 9.6 %         10582       AAA       IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty cycle)       WLAN       8.67       ± 9.6 %         10583       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)       WLAN       8.59       ± 9.6 %         10584       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)       WLAN       8.60       ± 9.6 %         10585       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)       WLAN       8.70       ± 9.6 %  | 105//  | AAA         |  | WLAN           | 8.70                                    | ± 9.6 %      |
| Cycle   10579   AAA   IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 90pc duty cycle)   WLAN   8.36  |        | <b></b>     |  |                |   |              |
| 10579       AAA       IÉEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 90pc duty cycle)       WLAN       8.36       ± 9.6 %         10580       AAA       IÉEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc duty cycle)       WLAN       8.76       ± 9.6 %         10581       AAA       IÉEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 90pc duty cycle)       WLAN       8.35       ± 9.6 %         10582       AAA       IÉEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty cycle)       WLAN       8.67       ± 9.6 %         10583       AAB       IÉEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)       WLAN       8.59       ± 9.6 %         10584       AAB       IÉEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty cycle)       WLAN       8.60       ± 9.6 %         10585       AAB       IÉEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)       WLAN       8.70       ± 9.6 %   | 10578  | AAA         |  | WLAN           | 8.49                                    | ± 9.6 %      |
| Cycle     10580   AAA     IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc duty cycle     WLAN   8.76   ± 9.6 %   cycle   |        |             |  |                |   |              |
| 10580       AAA       IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc duty cycle)       WLAN       8.76       ± 9.6 %         10581       AAA       IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 90pc duty cycle)       WLAN       8.35       ± 9.6 %         10582       AAA       IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty cycle)       WLAN       8.67       ± 9.6 %         10583       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)       WLAN       8.59       ± 9.6 %         10584       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty cycle)       WLAN       8.60       ± 9.6 %         10585       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)       WLAN       8.70       ± 9.6 %   | 10579  | AAA         |  | WLAN           | 8.36                                    | ± 9.6 %      |
| Cycle     10581   AAA     IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 90pc duty cycle     WLAN   8.35   ± 9.6 %   cycle   |        |             |  |                |   |              |
| 10581       AAA       IÉEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 90pc duty cycle)       WLAN       8.35       ± 9.6 %         10582       AAA       IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty cycle)       WLAN       8.67       ± 9.6 %         10583       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)       WLAN       8.59       ± 9.6 %         10584       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty cycle)       WLAN       8.60       ± 9.6 %         10585       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)       WLAN       8.70       ± 9.6 %   | 10580  | AAA         |  | WLAN           | 8.76                                    | ±9.6 %       |
| Cycle     10582   AAA     IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty cycle   WLAN   8.67   ± 9.6 % cycle     10583   AAB     IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle   WLAN   8.59   ± 9.6 %   10584   AAB     IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty cycle   WLAN   8.60   ± 9.6 %   10585   AAB     IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle   WLAN   8.70   ± 9.6 %   10585   AAB     IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle   WLAN   8.70   ± 9.6 %   10585   AAB     IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle   WLAN   8.70   ± 9.6 %   10585   AAB     IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle   WLAN   10585   1058 |        | 1           |  |                |   | ļ            |
| 10582       AAA       IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty cycle)       WLAN       8.67       ± 9.6 %         10583       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)       WLAN       8.59       ± 9.6 %         10584       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty cycle)       WLAN       8.60       ± 9.6 %         10585       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)       WLAN       8.70       ± 9.6 %   | 10581  | AAA         |  | WLAN           | 8.35                                    | ± 9.6 %      |
| cycle)         10583         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)         WLAN         8.59         ± 9.6 %           10584         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty cycle)         WLAN         8.60         ± 9.6 %           10585         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)         WLAN         8.70         ± 9.6 %  |        |             |  |                | *************************************** |              |
| 10583         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)         WLAN         8.59         ± 9.6 %           10584         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty cycle)         WLAN         8.60         ± 9.6 %           10585         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)         WLAN         8.70         ± 9.6 %   | 10582  | AAA         |  | WLAN           | 8.67                                    | ± 9.6 %      |
| 10584         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty cycle)         WLAN         8.60         ± 9.6 %           10585         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)         WLAN         8.70         ± 9.6 %   |        | ļ           |  |                | 1                                       |              |
| 10585   AAB   IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)   WLAN   8.70   ± 9.6 %   |        |             |  |                | 8.59                                    | ± 9.6 %      |
| 10585   AAB   IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)   WLAN   8.70   ± 9.6 %   |        |             |  |                | 8.60                                    | ± 9.6 %      |
|  |        | AAB         |  | WLAN           | 8.70                                    | ±9.6%        |
|  | 10586  | AAB         | IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 90pc duty cycle) | WLAN           | 8.49                                    | ±9.6%        |

EX3DV4- SN:3589 January 21, 2020

| 10987   AAB  | F     |               |  | ·····   |   |         |
|--|-------|---------------|--|---------|---|---------|
| 19599   AAB  | 10587 | AAB           | IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 90pc duty cycle) | WLAN    | 8.36                                    | ±9.6 %  |
| 19590   AAB  |       | AAB           |  | WLAN    | 8.76                                    | ± 9.6 % |
| 19591   AAB  |       | AAB           | IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 90pc duty cycle) | WLAN    | 8.35                                    | ± 9.6 % |
| 19592  | 10590 | AAB           |  | WLAN    | 8.67                                    | ± 9.6 % |
| 19594 AB   EEE 802.11n (HT Mixed, 20MHz, MCS2, 90pc duty cycle)  | 10591 | AAB           | IEEE 802.11n (HT Mixed, 20MHz, MCS0, 90pc duty cycle)      | WLAN    | 8.63                                    | ± 9.6 % |
| 10595   AAB   EEE 802.11n (HT Mixed, 20MHz, MCS3, 90pc duty cycle)   | 10592 | AAB           | IEEE 802.11n (HT Mixed, 20MHz, MCS1, 90pc duty cycle)      | WLAN    | 8.79                                    | ± 9.6 % |
| 10699  | 10593 | AAB           | IEEE 802.11n (HT Mixed, 20MHz, MCS2, 90pc duty cycle)      | WLAN    | 8,64                                    |         |
| 10595   AAB   EEE 802.111 (HT Mixed, 20MHz, MCS4, 90pc duty cycle)   | 10594 | AAB           |  | WLAN    | 8.74                                    |         |
| 16599   AAB   IEEE 802.11n (HT Mixed, 20MHz, MCSS, 90pc duty cycle)   WLAN   8.71   ± 9.6 %   16599   AAB   IEEE 802.11n (HT Mixed, 20MHz, MCS7, 90pc duty cycle)   WLAN   8.50   ± 9.6 %   16599   AAB   IEEE 802.11n (HT Mixed, 40MHz, MCS7, 90pc duty cycle)   WLAN   8.50   ± 9.6 %   16599   AAB   IEEE 802.11n (HT Mixed, 40MHz, MCS1, 90pc duty cycle)   WLAN   8.80   ± 9.6 %   16500   AAB   IEEE 802.11n (HT Mixed, 40MHz, MCS1, 90pc duty cycle)   WLAN   8.82   ± 9.6 %   16500   AAB   IEEE 802.11n (HT Mixed, 40MHz, MCS2, 90pc duty cycle)   WLAN   8.82   ± 9.6 %   16500   AAB   IEEE 802.11n (HT Mixed, 40MHz, MCS2, 90pc duty cycle)   WLAN   8.84   ± 9.6 %   16500   AAB   IEEE 802.11n (HT Mixed, 40MHz, MCS2, 90pc duty cycle)   WLAN   8.84   ± 9.6 %   16500   AAB   IEEE 802.11n (HT Mixed, 40MHz, MCS2, 90pc duty cycle)   WLAN   8.76   ± 9.6 %   16500   AAB   IEEE 802.11n (HT Mixed, 40MHz, MCS2, 90pc duty cycle)   WLAN   8.76   ± 9.6 %   16500   AAB   IEEE 802.11n (HT Mixed, 40MHz, MCS2, 90pc duty cycle)   WLAN   8.77   ± 9.6 %   16500   AAB   IEEE 802.11n (HT Mixed, 40MHz, MCS2, 90pc duty cycle)   WLAN   8.62   ± 9.6 %   16500   AAB   IEEE 802.11n (HT Mixed, 40MHz, MCS2, 90pc duty cycle)   WLAN   8.62   ± 9.6 %   16500   AAB   IEEE 802.11n (HT Mixed, 40MHz, MCS2, 90pc duty cycle)   WLAN   8.62   ± 9.6 %   16500   AAB   IEEE 802.11n (WH Mixed, 40MHz, MCS2, 90pc duty cycle)   WLAN   8.62   ± 9.6 %   16500   AAB   IEEE 802.11n (WH Mixed, 40MHz, MCS2, 90pc duty cycle)   WLAN   8.67   ± 9.6 %   16500   AAB   IEEE 802.11n (WH Mixed, 40MHz, MCS2, 90pc duty cycle)   WLAN   8.67   ± 9.6 %   16500   AAB   IEEE 802.11n (WH Mixed, 40MHz, MCS3, 90pc duty cycle)   WLAN   8.67   ± 9.6 %   16500   AAB   IEEE 802.11n (WH Mixed, 40MHz, MCS3, 90pc duty cycle)   WLAN   8.67   ± 9.6 %   16500   AAB   IEEE 802.11n (WH Mixed, 40MHz, MCS3, 90pc duty cycle)   WLAN   8.67   ± 9.6 %   16500   AAB   IEEE 802.11n (WH Mixed, 40MHz, MCS3, 90pc duty cycle)   WLAN   8.67   ± 9.6 %   16500   AAB   IEEE 802.11n (WH Mixed, 40MHz, MCS3, 90pc duty cycle)    | 10595 | AAB           | IEEE 802.11n (HT Mixed, 20MHz, MCS4, 90pc duty cycle)      | WLAN    | 8.74                                    |         |
| 19598   AAB  | 10596 | AAB           |  | WLAN    | 8.71                                    |         |
| 10599  | 10597 | AAB           |  |         |   |         |
| 10599  |       | AAB           |  |         |   |         |
| 10000  | 10599 |               |  |         |   |         |
| 10601   AAB  |       |               |  |         |   |         |
| 19802  AAB   IEEE 802.11n (HT Mixed, 40MHz, MCS3, 90pc duty cycle)   WLAN   8.94   ±9.6 %   19804  AAB   IEEE 802.11n (HT Mixed, 40MHz, MCS6, 90pc duty cycle)   WLAN   8.76   ±9.6 %   19804  AAB   IEEE 802.11n (HT Mixed, 40MHz, MCS6, 90pc duty cycle)   WLAN   8.76   ±9.6 %   19805  AAB   IEEE 802.11n (HT Mixed, 40MHz, MCS6, 90pc duty cycle)   WLAN   8.82   ±9.8 %   19806  AAB   IEEE 802.11n (HT Mixed, 40MHz, MCS6, 90pc duty cycle)   WLAN   8.82   ±9.8 %   19806  AAB   IEEE 802.11n (HT Mixed, 40MHz, MCS6, 90pc duty cycle)   WLAN   8.84   ±9.6 %   19806  AAB   IEEE 802.11ac WiFi (20MHz, MCS1, 90pc duty cycle)   WLAN   8.64   ±9.6 %   19806  AAB   IEEE 802.11ac WiFi (20MHz, MCS1, 90pc duty cycle)   WLAN   8.77   ±9.6 %   19806  AAB   IEEE 802.11ac WiFi (20MHz, MCS1, 90pc duty cycle)   WLAN   8.77   ±9.6 %   19806  AAB   IEEE 802.11ac WiFi (20MHz, MCS2, 90pc duty cycle)   WLAN   8.78   ±9.6 %   19816  AAB   IEEE 802.11ac WiFi (20MHz, MCS3, 90pc duty cycle)   WLAN   8.78   ±9.6 %   19816  AAB   IEEE 802.11ac WiFi (20MHz, MCS3, 90pc duty cycle)   WLAN   8.70   ±9.6 %   19816  AAB   IEEE 802.11ac WiFi (20MHz, MCS6, 90pc duty cycle)   WLAN   8.70   ±9.6 %   19816  AAB   IEEE 802.11ac WiFi (20MHz, MCS6, 90pc duty cycle)   WLAN   8.70   ±9.6 %   19816  AAB   IEEE 802.11ac WiFi (20MHz, MCS6, 90pc duty cycle)   WLAN   8.94   ±9.6 %   19816  AAB   IEEE 802.11ac WiFi (20MHz, MCS6, 90pc duty cycle)   WLAN   8.59   ±9.6 %   19816  AAB   IEEE 802.11ac WiFi (20MHz, MCS6, 90pc duty cycle)   WLAN   8.82   ±9.6 %   19816  AAB   IEEE 802.11ac WiFi (40MHz, MCS6, 90pc duty cycle)   WLAN   8.82   ±9.6 %   19816  AAB   IEEE 802.11ac WiFi (40MHz, MCS6, 90pc duty cycle)   WLAN   8.82   ±9.6 %   19816  AAB   IEEE 802.11ac WiFi (40MHz, MCS6, 90pc duty cycle)   WLAN   8.83   ±9.6 %   19816  AAB   IEEE 802.11ac WiFi (40MHz, MCS6, 90pc duty cycle)   WLAN   8.85   ±9.6 %   19826  AAB   IEEE 802.11ac WiFi (40MHz, MCS6, 90pc duty cycle)   WLAN   8.86   ±9.6 %   19826  AAB   IEEE 802.11ac WiFi (40MHz, MCS6, 90pc duty cycle)   WLAN   8.86   ±9.6  | 10601 | AAB           |  |         |   |         |
| 10603   AAB     IEEE 802.11n (HT Mixed, 40MHz, MCS4, 90pc duty cycle)  |       |               |  |         |   |         |
| 10606  | ***   |               |  |         |   |         |
| 10606  | 10604 |               |  |         |   |         |
| 10806  |       |               |  |         |   |         |
| 10807  |       |               |  |         |   |         |
| 10608  |       |               |  |         |   |         |
| 10609  |       |               | <del>                                      </del>          |         |   |         |
| 10610  |       |               |  |         |   |         |
| 10611  |       |               |  | ***     |   |         |
| 10612  |       |               |  |         |   |         |
| 10813  |       |               |  |         |   |         |
| 10614   AAB   IEEE 802.11ac WiFi (20MHz, MCSR, 90pc duty cycle)   WLAN   8.59  | ·     |               |  |         |   |         |
| 10615   AAB   IEEE 802.11ac WIFI (20MHz, MCS8, 90pc duty cycle)   WLAN   8.82  |       |               |  |         |   |         |
| 10616   AAB   IEEE 802.11ac WiFi (40MHz, MCS0, 90pc duty cycle)   WLAN   8.82   ± 9.6 %   10617   AAB   IEEE 802.11ac WiFi (40MHz, MCS1, 90pc duty cycle)   WLAN   8.58   ± 9.6 %   10618   AAB   IEEE 802.11ac WiFi (40MHz, MCS2, 90pc duty cycle)   WLAN   8.58   ± 9.6 %   10619   AAB   IEEE 802.11ac WiFi (40MHz, MCS3, 90pc duty cycle)   WLAN   8.68   ± 9.6 %   10620   AAB   IEEE 802.11ac WiFi (40MHz, MCS3, 90pc duty cycle)   WLAN   8.77   ± 9.6 %   10620   AAB   IEEE 802.11ac WiFi (40MHz, MCS3, 90pc duty cycle)   WLAN   8.77   ± 9.6 %   10621   AAB   IEEE 802.11ac WiFi (40MHz, MCS3, 90pc duty cycle)   WLAN   8.77   ± 9.6 %   10622   AAB   IEEE 802.11ac WiFi (40MHz, MCS6, 90pc duty cycle)   WLAN   8.68   ± 9.5 %   10623   AAB   IEEE 802.11ac WiFi (40MHz, MCS6, 90pc duty cycle)   WLAN   8.82   ± 9.6 %   10624   AAB   IEEE 802.11ac WiFi (40MHz, MCS7, 90pc duty cycle)   WLAN   8.96   ± 9.6 %   10625   AAB   IEEE 802.11ac WiFi (40MHz, MCS9, 90pc duty cycle)   WLAN   8.96   ± 9.6 %   10626   AAB   IEEE 802.11ac WiFi (40MHz, MCS9, 90pc duty cycle)   WLAN   8.96   ± 9.6 %   10626   AAB   IEEE 802.11ac WiFi (40MHz, MCS9, 90pc duty cycle)   WLAN   8.83   ± 9.6 %   10627   AAB   IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)   WLAN   8.83   ± 9.6 %   10628   AAB   IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)   WLAN   8.84   ± 9.6 %   10628   AAB   IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)   WLAN   8.85   ± 9.6 %   10629   AAB   IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)   WLAN   8.85   ± 9.6 %   10630   AAB   IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)   WLAN   8.85   ± 9.6 %   10631   AAB   IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)   WLAN   8.81   ± 9.6 %   10633   AAB   IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)   WLAN   8.81   ± 9.6 %   10634   AAB   IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)   WLAN   8.81   ± 9.6 %   10634   AAB   IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)   WLAN   8.81   ± 9.6 %   10634   AAB   IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)  |       |               |  |         |   |         |
| 10617   AAB  |       |               |  |         |   |         |
| 10618  |       |               |  |         |   |         |
| 10619  |       | <del></del>   |  |         |   |         |
| 10620  |       |               |  |         |   |         |
| 10621   AAB   IEEE 802.11ac WiFi (40MHz, MCS5, 90pc duty cycle)   WLAN   8.77   ± 9.6 %  |       |               |  |         |   |         |
| 10622   AAB   IEEE 802.11ac WiFi (40MHz, MCS6, 90pc duty cycle)   WLAN   8.68   ± 9.6 %   10623   AAB   IEEE 802.11ac WiFi (40MHz, MCS7, 90pc duty cycle)   WLAN   8.92   ± 9.6 %   10624   AAB   IEEE 802.11ac WiFi (40MHz, MCS8, 90pc duty cycle)   WLAN   8.96   ± 9.6 %   10625   AAB   IEEE 802.11ac WiFi (40MHz, MCS9, 90pc duty cycle)   WLAN   8.96   ± 9.6 %   10626   AAB   IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)   WLAN   8.83   ± 9.6 %   10626   AAB   IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)   WLAN   8.83   ± 9.6 %   10627   AAB   IEEE 802.11ac WiFi (80MHz, MCS1, 90pc duty cycle)   WLAN   8.81   ± 9.6 %   10628   AAB   IEEE 802.11ac WiFi (80MHz, MCS2, 90pc duty cycle)   WLAN   8.71   ± 9.6 %   10629   AAB   IEEE 802.11ac WiFi (80MHz, MCS3, 90pc duty cycle)   WLAN   8.71   ± 9.6 %   10630   AAB   IEEE 802.11ac WiFi (80MHz, MCS3, 90pc duty cycle)   WLAN   8.72   ± 9.6 %   10631   AAB   IEEE 802.11ac WiFi (80MHz, MCS4, 90pc duty cycle)   WLAN   8.72   ± 9.6 %   10633   AAB   IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)   WLAN   8.74   ± 9.6 %   10633   AAB   IEEE 802.11ac WiFi (80MHz, MCS6, 90pc duty cycle)   WLAN   8.74   ± 9.6 %   10634   AAB   IEEE 802.11ac WiFi (80MHz, MCS6, 90pc duty cycle)   WLAN   8.83   ± 9.6 %   10634   AAB   IEEE 802.11ac WiFi (80MHz, MCS6, 90pc duty cycle)   WLAN   8.80   ± 9.6 %   10636   AAC   IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)   WLAN   8.81   ± 9.6 %   10636   AAC   IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)   WLAN   8.81   ± 9.6 %   10638   AAC   IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)   WLAN   8.85   ± 9.6 %   10638   AAC   IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)   WLAN   8.86   ± 9.6 %   10638   AAC   IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)   WLAN   8.86   ± 9.6 %   10642   AAC   IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)   WLAN   8.89   ± 9.6 %   10644   AAC   IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)   WLAN   8.98   ± 9.6 %   10646   AAG   IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty  |       |               |  |         |   |         |
| 10623   AAB   IEEE 802.11ac WiFi (40MHz, MCS7, 90pc duty cycle)   WLAN   8.82  |       |               |  |         |   |         |
| 10624   AAB   IEEE 802.11ac WiFi (40MHz, MCS8, 90pc duty cycle)   WLAN   8.96   ± 9.6 %   10625   AAB   IEEE 802.11ac WiFi (40MHz, MCS9, 90pc duty cycle)   WLAN   8.96   ± 9.6 %   10626   AAB   IEEE 802.11ac WiFi (80MHz, MCS0, 90pc duty cycle)   WLAN   8.83   ± 9.6 %   10627   AAB   IEEE 802.11ac WiFi (80MHz, MCS1, 90pc duty cycle)   WLAN   8.88   ± 9.6 %   10628   AAB   IEEE 802.11ac WiFi (80MHz, MCS2, 90pc duty cycle)   WLAN   8.71   ± 9.6 %   10629   AAB   IEEE 802.11ac WiFi (80MHz, MCS2, 90pc duty cycle)   WLAN   8.85   ± 9.6 %   10630   AAB   IEEE 802.11ac WiFi (80MHz, MCS4, 90pc duty cycle)   WLAN   8.71   ± 9.6 %   10631   AAB   IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)   WLAN   8.72   ± 9.6 %   10631   AAB   IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)   WLAN   8.74   ± 9.6 %   10633   AAB   IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)   WLAN   8.83   ± 9.6 %   10634   AAB   IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)   WLAN   8.83   ± 9.6 %   10635   AAB   IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)   WLAN   8.80   ± 9.6 %   10636   AAC   IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)   WLAN   8.81   ± 9.6 %   10636   AAC   IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)   WLAN   8.81   ± 9.6 %   10637   AAC   IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)   WLAN   8.87   ± 9.6 %   10638   AAC   IEEE 802.11ac WiFi (160MHz, MCS1, 90pc duty cycle)   WLAN   8.86   ± 9.6 %   10641   AAC   IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)   WLAN   8.85   ± 9.6 %   10644   AAC   IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)   WLAN   8.85   ± 9.6 %   10644   AAC   IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)   WLAN   8.89   ± 9.6 %   10644   AAC   IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)   WLAN   8.89   ± 9.6 %   10644   AAC   IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)   WLAN   8.89   ± 9.6 %   10644   AAC   IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)   WLAN   8.89   ± 9.6 %   10644   AAC   IEEE 802.11ac WiFi (160MHz, MCS3, 90pc dut |       |               |  |         |   |         |
| 10625   AAB   IEEE 802.11ac WiFi (40MHz, MCS9, 90pc duty cycle)   WLAN   8.96   ± 9.6 %   10626   AAB   IEEE 802.11ac WiFi (80MHz, MCS0, 90pc duty cycle)   WLAN   8.83   ± 9.6 %   10627   AAB   IEEE 802.11ac WiFi (80MHz, MCS1, 90pc duty cycle)   WLAN   8.88   ± 9.6 %   10628   AAB   IEEE 802.11ac WiFi (80MHz, MCS2, 90pc duty cycle)   WLAN   8.71   ± 9.6 %   10629   AAB   IEEE 802.11ac WiFi (80MHz, MCS3, 90pc duty cycle)   WLAN   8.85   ± 9.6 %   10630   AAB   IEEE 802.11ac WiFi (80MHz, MCS3, 90pc duty cycle)   WLAN   8.72   ± 9.6 %   10631   AAB   IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)   WLAN   8.74   ± 9.6 %   10632   AAB   IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)   WLAN   8.74   ± 9.6 %   10633   AAB   IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)   WLAN   8.83   ± 9.6 %   10634   AAB   IEEE 802.11ac WiFi (80MHz, MCS7, 90pc duty cycle)   WLAN   8.83   ± 9.6 %   10634   AAB   IEEE 802.11ac WiFi (80MHz, MCS7, 90pc duty cycle)   WLAN   8.80   ± 9.6 %   10635   AAB   IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)   WLAN   8.80   ± 9.6 %   10636   AAC   IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)   WLAN   8.81   ± 9.6 %   10637   AAC   IEEE 802.11ac WiFi (160MHz, MCS0, 90pc duty cycle)   WLAN   8.83   ± 9.6 %   10638   AAC   IEEE 802.11ac WiFi (160MHz, MCS1, 90pc duty cycle)   WLAN   8.86   ± 9.6 %   10640   AAC   IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)   WLAN   8.85   ± 9.6 %   10641   AAC   IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)   WLAN   8.85   ± 9.6 %   10642   AAC   IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)   WLAN   8.98   ± 9.6 %   10644   AAC   IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)   WLAN   8.98   ± 9.6 %   10644   AAC   IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)   WLAN   8.98   ± 9.6 %   10644   AAC   IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)   WLAN   8.99   ± 9.6 %   10646   AAG   IEEE 802.11ac WiFi (160MHz, MCS4, 90pc duty cycle)   WLAN   9.06   ± 9.6 %   10646   AAG   IEEE 802.11ac WiFi (160Mtz, MCS4, 90pc d |       |               |  |         |   |         |
| 10626  |       | · †······     |  |         | ·                                       |         |
| 10627   AAB   IEEE 802.11ac WiFi (80MHz, MCS1, 90pc duty cycle)   WLAN   8.88   ± 9.6 %  | ~~~~  | <del></del>   |  |         |   |         |
| 10628         AAB         IEEE 802.11ac WiFi (80MHz, MCS2, 90pc duty cycle)         WLAN         8.71         ± 9.6 %           10629         AAB         IEEE 802.11ac WiFi (80MHz, MCS3, 90pc duty cycle)         WLAN         8.85         ± 9.6 %           10630         AAB         IEEE 802.11ac WiFi (80MHz, MCS4, 90pc duty cycle)         WLAN         8.72         ± 9.6 %           10631         AAB         IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)         WLAN         8.74         ± 9.6 %           10632         AAB         IEEE 802.11ac WiFi (80MHz, MCS6, 90pc duty cycle)         WLAN         8.74         ± 9.6 %           10633         AAB         IEEE 802.11ac WiFi (80MHz, MCS7, 90pc duty cycle)         WLAN         8.83         ± 9.6 %           10634         AAB         IEEE 802.11ac WiFi (80MHz, MCS8, 90pc duty cycle)         WLAN         8.80         ± 9.6 %           10635         AAB         IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)         WLAN         8.81         ± 9.6 %           10636         AAC         IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)         WLAN         8.81         ± 9.6 %           10637         AAC         IEEE 802.11ac WiFi (160MHz, MCS2, 90pc duty cycle)         WLAN         8.86         ± 9.6 %           10638         AAC  |       | <del>-{</del> |  |         |   |         |
| 10629         AAB         IEEE 802.11ac WiFi (80MHz, MCS3, 90pc duty cycle)         WLAN         8.85         ± 9.6 %           10630         AAB         IEEE 802.11ac WiFi (80MHz, MCS4, 90pc duty cycle)         WLAN         8.72         ± 9.6 %           10631         AAB         IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)         WLAN         8.81         ± 9.6 %           10632         AAB         IEEE 802.11ac WiFi (80MHz, MCS6, 90pc duty cycle)         WLAN         8.74         ± 9.6 %           10633         AAB         IEEE 802.11ac WiFi (80MHz, MCS6, 90pc duty cycle)         WLAN         8.83         ± 9.6 %           10634         AAB         IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)         WLAN         8.80         ± 9.6 %           10635         AAB         IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)         WLAN         8.81         ± 9.6 %           10636         AAC         IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)         WLAN         8.83         ± 9.6 %           10637         AAC         IEEE 802.11ac WiFi (160MHz, MCS1, 90pc duty cycle)         WLAN         8.86         ± 9.6 %           10638         AAC         IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)         WLAN         8.85         ± 9.6 %           10640         AAC <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>   |       |               |  |         |   |         |
| 10630         AAB         IEEE 802.11ac WiFi (80MHz, MCS4, 90pc duty cycle)         WLAN         8.72         ± 9.6 %           10631         AAB         IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)         WLAN         8.81         ± 9.6 %           10632         AAB         IEEE 802.11ac WiFi (80MHz, MCS6, 90pc duty cycle)         WLAN         8.74         ± 9.6 %           10633         AAB         IEEE 802.11ac WiFi (80MHz, MCS7, 90pc duty cycle)         WLAN         8.83         ± 9.6 %           10634         AAB         IEEE 802.11ac WiFi (80MHz, MCS8, 90pc duty cycle)         WLAN         8.80         ± 9.6 %           10635         AAB         IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)         WLAN         8.81         ± 9.6 %           10636         AAC         IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)         WLAN         8.83         ± 9.6 %           10637         AAC         IEEE 802.11ac WiFi (160MHz, MCS1, 90pc duty cycle)         WLAN         8.79         ± 9.6 %           10638         AAC         IEEE 802.11ac WiFi (160MHz, MCS4, 90pc duty cycle)         WLAN         8.85         ± 9.6 %           10640         AAC         IEEE 802.11ac WiFi (160MHz, MCS4, 90pc duty cycle)         WLAN         8.98         ± 9.6 %           10641         AAC <td></td> <td></td> <td>IEEE 002.11ac WiFi (00MHz, MCS2, 90pc duty cycle)</td> <td></td> <td></td> <td></td>   |       |               | IEEE 002.11ac WiFi (00MHz, MCS2, 90pc duty cycle)          |         |   |         |
| 10631         AAB         IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)         WLAN         8.81         ± 9.6 %           10632         AAB         IEEE 802.11ac WiFi (80MHz, MCS6, 90pc duty cycle)         WLAN         8.74         ± 9.6 %           10633         AAB         IEEE 802.11ac WiFi (80MHz, MCS7, 90pc duty cycle)         WLAN         8.83         ± 9.6 %           10634         AAB         IEEE 802.11ac WiFi (80MHz, MCS8, 90pc duty cycle)         WLAN         8.81         ± 9.6 %           10635         AAB         IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)         WLAN         8.81         ± 9.6 %           10636         AAC         IEEE 802.11ac WiFi (160MHz, MCS1, 90pc duty cycle)         WLAN         8.83         ± 9.6 %           10637         AAC         IEEE 802.11ac WiFi (160MHz, MCS1, 90pc duty cycle)         WLAN         8.79         ± 9.6 %           10638         AAC         IEEE 802.11ac WiFi (160MHz, MCS2, 90pc duty cycle)         WLAN         8.85         ± 9.6 %           10639         AAC         IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)         WLAN         8.85         ± 9.6 %           10640         AAC         IEEE 802.11ac WiFi (160MHz, MCS5, 90pc duty cycle)         WLAN         9.06         ± 9.6 %           10642         AAC<   |       | ,             | IEEE 002.11ag WiFi (00MHz, MCS3, 90pc duty cycle)          |         |   |         |
| 10632         AAB         IEEE 802.11ac WiFi (80MHz, MCS6, 90pc duty cycle)         WLAN         8.74         ±9.6 %           10633         AAB         IEEE 802.11ac WiFi (80MHz, MCS7, 90pc duty cycle)         WLAN         8.83         ±9.6 %           10634         AAB         IEEE 802.11ac WiFi (80MHz, MCS8, 90pc duty cycle)         WLAN         8.80         ±9.6 %           10635         AAB         IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)         WLAN         8.81         ±9.6 %           10636         AAC         IEEE 802.11ac WiFi (160MHz, MCS0, 90pc duty cycle)         WLAN         8.79         ±9.6 %           10637         AAC         IEEE 802.11ac WiFi (160MHz, MCS1, 90pc duty cycle)         WLAN         8.86         ±9.6 %           10638         AAC         IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)         WLAN         8.86         ±9.6 %           10639         AAC         IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)         WLAN         8.85         ±9.6 %           10640         AAC         IEEE 802.11ac WiFi (160MHz, MCS5, 90pc duty cycle)         WLAN         8.98         ±9.6 %           10641         AAC         IEEE 802.11ac WiFi (160MHz, MCS6, 90pc duty cycle)         WLAN         9.06         ±9.6 %           10642         AAC  | ~~~~  |               |  |         |   |         |
| 10633       AAB       IEEE 802.11ac WiFi (80MHz, MCS7, 90pc duty cycle)       WLAN       8.83       ±9.6 %         10634       AAB       IEEE 802.11ac WiFi (80MHz, MCS8, 90pc duty cycle)       WLAN       8.80       ±9.6 %         10635       AAB       IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)       WLAN       8.81       ±9.6 %         10636       AAC       IEEE 802.11ac WiFi (160MHz, MCS0, 90pc duty cycle)       WLAN       8.79       ±9.6 %         10637       AAC       IEEE 802.11ac WiFi (160MHz, MCS1, 90pc duty cycle)       WLAN       8.86       ±9.6 %         10638       AAC       IEEE 802.11ac WiFi (160MHz, MCS2, 90pc duty cycle)       WLAN       8.86       ±9.6 %         10639       AAC       IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)       WLAN       8.85       ±9.6 %         10640       AAC       IEEE 802.11ac WiFi (160MHz, MCS5, 90pc duty cycle)       WLAN       9.06       ±9.6 %         10641       AAC       IEEE 802.11ac WiFi (160MHz, MCS6, 90pc duty cycle)       WLAN       9.06       ±9.6 %         10642       AAC       IEEE 802.11ac WiFi (160MHz, MCS7, 90pc duty cycle)       WLAN       9.06       ±9.6 %         10643       AAC       IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)       WLAN       9.05       ±9   |       |               |  |         |   |         |
| 10634       AAB       IEEE 802.11ac WiFi (80MHz, MCS8, 90pc duty cycle)       WLAN       8.80       ± 9.6 %         10635       AAB       IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)       WLAN       8.81       ± 9.6 %         10636       AAC       IEEE 802.11ac WiFi (160MHz, MCS0, 90pc duty cycle)       WLAN       8.83       ± 9.6 %         10637       AAC       IEEE 802.11ac WiFi (160MHz, MCS1, 90pc duty cycle)       WLAN       8.79       ± 9.6 %         10638       AAC       IEEE 802.11ac WiFi (160MHz, MCS2, 90pc duty cycle)       WLAN       8.86       ± 9.6 %         10639       AAC       IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)       WLAN       8.85       ± 9.6 %         10640       AAC       IEEE 802.11ac WiFi (160MHz, MCS4, 90pc duty cycle)       WLAN       8.98       ± 9.6 %         10641       AAC       IEEE 802.11ac WiFi (160MHz, MCS5, 90pc duty cycle)       WLAN       9.06       ± 9.6 %         10642       AAC       IEEE 802.11ac WiFi (160MHz, MCS7, 90pc duty cycle)       WLAN       8.89       ± 9.6 %         10643       AAC       IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)       WLAN       9.05       ± 9.6 %         10644       AAC       IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)       WLAN       9.05   |       |               |  |         |   |         |
| 10635       AAB       IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)       WLAN       8.81       ±9.6 %         10636       AAC       IEEE 802.11ac WiFi (160MHz, MCS0, 90pc duty cycle)       WLAN       8.83       ±9.6 %         10637       AAC       IEEE 802.11ac WiFi (160MHz, MCS1, 90pc duty cycle)       WLAN       8.79       ±9.6 %         10638       AAC       IEEE 802.11ac WiFi (160MHz, MCS2, 90pc duty cycle)       WLAN       8.86       ±9.6 %         10639       AAC       IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)       WLAN       8.85       ±9.6 %         10640       AAC       IEEE 802.11ac WiFi (160MHz, MCS4, 90pc duty cycle)       WLAN       8.98       ±9.6 %         10641       AAC       IEEE 802.11ac WiFi (160MHz, MCS5, 90pc duty cycle)       WLAN       9.06       ±9.6 %         10642       AAC       IEEE 802.11ac WiFi (160MHz, MCS6, 90pc duty cycle)       WLAN       9.06       ±9.6 %         10643       AAC       IEEE 802.11ac WiFi (160MHz, MCS7, 90pc duty cycle)       WLAN       8.89       ±9.6 %         10644       AAC       IEEE 802.11ac WiFi (160MHz, MCS8, 90pc duty cycle)       WLAN       9.05       ±9.6 %         10645       AAC       IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)       WLAN       9.05  |       |               |  |         | *************************************** |         |
| 10636         AAC         IEEE 802.11ac WiFi (160MHz, MCS0, 90pc duty cycle)         WLAN         8.83         ± 9.6 %           10637         AAC         IEEE 802.11ac WiFi (160MHz, MCS1, 90pc duty cycle)         WLAN         8.79         ± 9.6 %           10638         AAC         IEEE 802.11ac WiFi (160MHz, MCS2, 90pc duty cycle)         WLAN         8.86         ± 9.6 %           10639         AAC         IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)         WLAN         8.85         ± 9.6 %           10640         AAC         IEEE 802.11ac WiFi (160MHz, MCS4, 90pc duty cycle)         WLAN         8.98         ± 9.6 %           10641         AAC         IEEE 802.11ac WiFi (160MHz, MCS5, 90pc duty cycle)         WLAN         9.06         ± 9.6 %           10642         AAC         IEEE 802.11ac WiFi (160MHz, MCS6, 90pc duty cycle)         WLAN         9.06         ± 9.6 %           10643         AAC         IEEE 802.11ac WiFi (160MHz, MCS7, 90pc duty cycle)         WLAN         8.89         ± 9.6 %           10644         AAC         IEEE 802.11ac WiFi (160MHz, MCS8, 90pc duty cycle)         WLAN         9.05         ± 9.6 %           10645         AAC         IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)         WLAN         9.05         ± 9.6 %           10646  |       |               |  | ****    |   |         |
| 10637         AAC         IEEE 802.11ac WiFi (160MHz, MCS1, 90pc duty cycle)         WLAN         8.79         ± 9.6 %           10638         AAC         IEEE 802.11ac WiFi (160MHz, MCS2, 90pc duty cycle)         WLAN         8.86         ± 9.6 %           10639         AAC         IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)         WLAN         8.85         ± 9.6 %           10640         AAC         IEEE 802.11ac WiFi (160MHz, MCS4, 90pc duty cycle)         WLAN         8.98         ± 9.6 %           10641         AAC         IEEE 802.11ac WiFi (160MHz, MCS5, 90pc duty cycle)         WLAN         9.06         ± 9.6 %           10642         AAC         IEEE 802.11ac WiFi (160MHz, MCS6, 90pc duty cycle)         WLAN         9.06         ± 9.6 %           10643         AAC         IEEE 802.11ac WiFi (160MHz, MCS7, 90pc duty cycle)         WLAN         8.89         ± 9.6 %           10644         AAC         IEEE 802.11ac WiFi (160MHz, MCS8, 90pc duty cycle)         WLAN         9.05         ± 9.6 %           10645         AAC         IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)         WLAN         9.05         ± 9.6 %           10646         AAG         LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,7)         LTE-TDD         11.96         ± 9.6 %           10647   |       |               |  |         |   |         |
| 10638         AAC         IEEE 802.11ac WiFi (160MHz, MCS2, 90pc duty cycle)         WLAN         8.86         ± 9.6 %           10639         AAC         IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)         WLAN         8.85         ± 9.6 %           10640         AAC         IEEE 802.11ac WiFi (160MHz, MCS4, 90pc duty cycle)         WLAN         8.98         ± 9.6 %           10641         AAC         IEEE 802.11ac WiFi (160MHz, MCS5, 90pc duty cycle)         WLAN         9.06         ± 9.6 %           10642         AAC         IEEE 802.11ac WiFi (160MHz, MCS6, 90pc duty cycle)         WLAN         9.06         ± 9.6 %           10643         AAC         IEEE 802.11ac WiFi (160MHz, MCS7, 90pc duty cycle)         WLAN         8.89         ± 9.6 %           10644         AAC         IEEE 802.11ac WiFi (160MHz, MCS8, 90pc duty cycle)         WLAN         9.05         ± 9.6 %           10645         AAC         IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)         WLAN         9.05         ± 9.6 %           10646         AAG         LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,7)         LTE-TDD         11.96         ± 9.6 %           10647         AAF         LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,7)         LTE-TDD         11.96         ± 9.6 %           10648 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>   |       |               |  |         |   |         |
| 10639         AAC         IEEE 802.11ac WiFi (160MHz, MCS3, 90pc duty cycle)         WLAN         8.85         ± 9.6 %           10640         AAC         IEEE 802.11ac WiFi (160MHz, MCS4, 90pc duty cycle)         WLAN         8.98         ± 9.6 %           10641         AAC         IEEE 802.11ac WiFi (160MHz, MCS5, 90pc duty cycle)         WLAN         9.06         ± 9.6 %           10642         AAC         IEEE 802.11ac WiFi (160MHz, MCS6, 90pc duty cycle)         WLAN         9.06         ± 9.6 %           10643         AAC         IEEE 802.11ac WiFi (160MHz, MCS7, 90pc duty cycle)         WLAN         8.89         ± 9.6 %           10644         AAC         IEEE 802.11ac WiFi (160MHz, MCS8, 90pc duty cycle)         WLAN         9.05         ± 9.6 %           10645         AAC         IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)         WLAN         9.11         ± 9.6 %           10646         AAG         LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,7)         LTE-TDD         11.96         ± 9.6 %           10647         AAF         LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,7)         LTE-TDD         11.96         ± 9.6 %           10648         AAA         CDMA2000 (1x Advanced)         CDMA2000         3.45         ± 9.6 %           10652         AAE   |       |               |  |         |   |         |
| 10640         AAC         IEEE 802.11ac WiFi (160MHz, MCS4, 90pc duty cycle)         WLAN         8.98         ± 9.6 %           10641         AAC         IEEE 802.11ac WiFi (160MHz, MCS5, 90pc duty cycle)         WLAN         9.06         ± 9.6 %           10642         AAC         IEEE 802.11ac WiFi (160MHz, MCS6, 90pc duty cycle)         WLAN         9.06         ± 9.6 %           10643         AAC         IEEE 802.11ac WiFi (160MHz, MCS7, 90pc duty cycle)         WLAN         8.89         ± 9.6 %           10644         AAC         IEEE 802.11ac WiFi (160MHz, MCS8, 90pc duty cycle)         WLAN         9.05         ± 9.6 %           10645         AAC         IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)         WLAN         9.11         ± 9.6 %           10646         AAG         LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,7)         LTE-TDD         11.96         ± 9.6 %           10647         AAF         LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,7)         LTE-TDD         11.96         ± 9.6 %           10648         AAA         CDMA2000 (1x Advanced)         CDMA2000         3.45         ± 9.6 %           10652         AAE         LTE-TDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)         LTE-TDD         6.91         ± 9.6 %  |       |               |  |         |   |         |
| 10641       AAC       IEEE 802.11ac WiFi (160MHz, MCS5, 90pc duty cycle)       WLAN       9.06       ± 9.6 %         10642       AAC       IEEE 802.11ac WiFi (160MHz, MCS6, 90pc duty cycle)       WLAN       9.06       ± 9.6 %         10643       AAC       IEEE 802.11ac WiFi (160MHz, MCS7, 90pc duty cycle)       WLAN       8.89       ± 9.6 %         10644       AAC       IEEE 802.11ac WiFi (160MHz, MCS8, 90pc duty cycle)       WLAN       9.05       ± 9.6 %         10645       AAC       IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)       WLAN       9.11       ± 9.6 %         10646       AAG       LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,7)       LTE-TDD       11.96       ± 9.6 %         10647       AAF       LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,7)       LTE-TDD       11.96       ± 9.6 %         10648       AAA       CDMA2000 (1x Advanced)       CDMA2000       3.45       ± 9.6 %         10652       AAE       LTE-TDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)       LTE-TDD       6.91       ± 9.6 %   |       |               |  |         |   |         |
| 10642       AAC       IEEE 802.11ac WiFi (160MHz, MCS6, 90pc duty cycle)       WLAN       9.06       ± 9.6 %         10643       AAC       IEEE 802.11ac WiFi (160MHz, MCS7, 90pc duty cycle)       WLAN       8.89       ± 9.6 %         10644       AAC       IEEE 802.11ac WiFi (160MHz, MCS8, 90pc duty cycle)       WLAN       9.05       ± 9.6 %         10645       AAC       IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)       WLAN       9.11       ± 9.6 %         10646       AAG       LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,7)       LTE-TDD       11.96       ± 9.6 %         10647       AAF       LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,7)       LTE-TDD       11.96       ± 9.6 %         10648       AAA       CDMA2000 (1x Advanced)       CDMA2000       3.45       ± 9.6 %         10652       AAE       LTE-TDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)       LTE-TDD       6.91       ± 9.6 %  |       |               | IEEE 802.11ac WIFI (160MHz, MCS4, 90pc duty cycle)         |         |   |         |
| 10643         AAC         IEEE 802.11ac WiFi (160MHz, MCS7, 90pc duty cycle)         WLAN         8.89         ± 9.6 %           10644         AAC         IEEE 802.11ac WiFi (160MHz, MCS8, 90pc duty cycle)         WLAN         9.05         ± 9.6 %           10645         AAC         IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)         WLAN         9.11         ± 9.6 %           10646         AAG         LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,7)         LTE-TDD         11.96         ± 9.6 %           10647         AAF         LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,7)         LTE-TDD         11.96         ± 9.6 %           10648         AAA         CDMA2000 (1x Advanced)         CDMA2000         3.45         ± 9.6 %           10652         AAE         LTE-TDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)         LTE-TDD         6.91         ± 9.6 %   |       |               |  |         |   |         |
| 10644         AAC         IEEE 802.11ac WiFi (160MHz, MCS8, 90pc duty cycle)         WLAN         9.05         ± 9.6 %           10645         AAC         IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)         WLAN         9.11         ± 9.6 %           10646         AAG         LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,7)         LTE-TDD         11.96         ± 9.6 %           10647         AAF         LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,7)         LTE-TDD         11.96         ± 9.6 %           10648         AAA         CDMA2000 (1x Advanced)         CDMA2000         3.45         ± 9.6 %           10652         AAE         LTE-TDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)         LTE-TDD         6.91         ± 9.6 %  |       |               |  |         |   |         |
| 10645         AAC         IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)         WLAN         9.11         ± 9.6 %           10646         AAG         LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,7)         LTE-TDD         11.96         ± 9.6 %           10647         AAF         LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,7)         LTE-TDD         11.96         ± 9.6 %           10648         AAA         CDMA2000 (1x Advanced)         CDMA2000         3.45         ± 9.6 %           10652         AAE         LTE-TDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)         LTE-TDD         6.91         ± 9.6 %   |       |               |  |         |   |         |
| 10646         AAG         LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,7)         LTE-TDD         11.96         ± 9.6 %           10647         AAF         LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,7)         LTE-TDD         11.96         ± 9.6 %           10648         AAA         CDMA2000 (1x Advanced)         CDMA2000         3.45         ± 9.6 %           10652         AAE         LTE-TDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)         LTE-TDD         6.91         ± 9.6 %  |       |               |  | ······  |   |         |
| 10647         AAF         LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,7)         LTE-TDD         11.96         ± 9.6 %           10648         AAA         CDMA2000 (1x Advanced)         CDMA2000         3.45         ± 9.6 %           10652         AAE         LTE-TDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)         LTE-TDD         6.91         ± 9.6 %  |       |               |  |         |   |         |
| 10648         AAA         CDMA2000 (1x Advanced)         CDMA2000         3.45         ± 9.6 %           10652         AAE         LTE-TDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)         LTE-TDD         6.91         ± 9.6 %   |       |               |  |         |   |         |
| 10652 AAE LTE-TDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%) LTE-TDD 6.91 ± 9.6 %  |       |               |  |         |   |         |
|  |       |               |  |         |   |         |
| 10653   AAE   LTE-TDD (OFDMA, 10 MHz, E-TM 3.1, Clipping 44%)   LTE-TDD   7.42   ± 9.6 %   |       |               |  |         |   |         |
|  | 10653 | AAE           | LTE-TOD (OFDMA, 10 MHz, E-TM 3.1, Clipping 44%)            | LTE-TDD | 7.42                                    | ± 9.6 % |

| 100555   | 10654                                   | AAD  | LITE TOD (OFDMA 45 MULE E TM 2.4 Office and 4.00) | T. TE TOD   | T 0 00                                  |         |
|--|---|--|---|-------------|---|---------|
| 10688  |   |  | LTE-TDD (OFDMA, 15 MHz, E-TM 3.1, Clipping 44%)   | LTE-TDD     | 6.96                                    | ± 9.6 % |
| 19659  |   |  |   |             |   |         |
| 19660   AAA   Pulse Waveform (2001+z, 60%)   Test   2.2 ± 9.6 %     19661   AAA   Pulse Waveform (2001+z, 60%)   Test   2.2 ± 9.6 %     19670   AAA   Bluefooth Low Energy   Bluefooth   19.6 %     19671   AAA   Bluefooth Low Energy   Bluefooth   19.8 %     19671   AAA   Bluefooth Low Energy   Bluefooth   19.8 %     19671   AAA   Bluefooth Low Energy   Bluefooth   19.8 %     19672   AAA   Bluefooth Low Energy   Bluefooth   19.8 %     19673   AAA   BLEE 802.11ax (20MHz, MCS1, 90pc duty cycle)   WLAN   8.78   ± 9.6 %     19673   AAA   BLEE 802.11ax (20MHz, MCS1, 90pc duty cycle)   WLAN   8.78   ± 9.6 %     19673   AAA   BLEE 802.11ax (20MHz, MCS1, 90pc duty cycle)   WLAN   8.78   ± 9.6 %     19676   AAA   BLEE 802.11ax (20MHz, MCS1, 90pc duty cycle)   WLAN   8.78   ± 9.6 %     19677   AAA   BLEE 802.11ax (20MHz, MCS1, 90pc duty cycle)   WLAN   8.73   ± 9.6 %     19678   AAA   BLEE 802.11ax (20MHz, MCS1, 90pc duty cycle)   WLAN   8.73   ± 9.6 %     19679   AAA   BLEE 802.11ax (20MHz, MCS1, 90pc duty cycle)   WLAN   8.73   ± 9.6 %     19680   AAA   BLEE 802.11ax (20MHz, MCS1, 90pc duty cycle)   WLAN   8.89   ± 9.6 %     19680   AAA   BLEE 802.11ax (20MHz, MCS1, 90pc duty cycle)   WLAN   8.89   ± 9.6 %     19680   AAA   BLEE 802.11ax (20MHz, MCS1, 90pc duty cycle)   WLAN   8.89   ± 9.6 %     19680   AAA   BLEE 802.11ax (20MHz, MCS1, 90pc duty cycle)   WLAN   8.60   ± 9.6 %     19680   AAA   BLEE 802.11ax (20MHz, MCS1, 90pc duty cycle)   WLAN   8.62   ± 9.6 %     19680   AAA   BLEE 802.11ax (20MHz, MCS1, 90pc duty cycle)   WLAN   8.62   ± 9.6 %     19680   AAA   BLEE 802.11ax (20MHz, MCS1, 90pc duty cycle)   WLAN   8.62   ± 9.6 %     19680   AAA   BLEE 802.11ax (20MHz, MCS1, 90pc duty cycle)   WLAN   8.62   ± 9.6 %     19680   AAA   BLEE 802.11ax (20MHz, MCS1, 90pc duty cycle)   WLAN   8.62   ± 9.6 %     19680   AAA   BLEE 802.11ax (20MHz, MCS1, 90pc duty cycle)   WLAN   8.62   ± 9.6 %     19680   AAA   BLEE 802.11ax (20MHz, MCS1, 90pc duty cycle)   WLAN   8.62   ± 9.6 %     19680   AAA   BLEE 802.11ax (20MHz, MCS1,  |   |  |   | <del></del> |   |         |
| 19661   AAA   Pulse Waveform (2001tz, 60%)   Test   9.27 ± 9.6 %   19670   AAA   Pulse Waveform (2001tz, 80%)   Test   9.9 f. % 19.6 %   19670   AAA   Pulse Waveform (2001tz, 80%)   Test   9.9 f. % 19.6 %   19670   AAA   BEE 602.11ax (20MHz, MCS1, 90pc duty cycle)   WLAN   9.9 f. 9.6 %   19672   AAA   IEEE 602.11ax (20MHz, MCS2, 90pc duty cycle)   WLAN   8.67   ± 9.6 %   19673   AAA   IEEE 602.11ax (20MHz, MCS2, 90pc duty cycle)   WLAN   8.67   ± 9.6 %   19674   AAA   IEEE 602.11ax (20MHz, MCS3, 90pc duty cycle)   WLAN   8.74   ± 9.6 %   19675   AAA   IEEE 602.11ax (20MHz, MCS3, 90pc duty cycle)   WLAN   8.74   ± 9.6 %   19676   AAA   IEEE 602.11ax (20MHz, MCS3, 90pc duty cycle)   WLAN   8.77   ± 9.6 %   19676   AAA   IEEE 602.11ax (20MHz, MCS3, 90pc duty cycle)   WLAN   8.77   ± 9.6 %   19677   AAA   IEEE 602.11ax (20MHz, MCS6, 90pc duty cycle)   WLAN   8.77   ± 9.6 %   19679   AAA   IEEE 602.11ax (20MHz, MCS6, 90pc duty cycle)   WLAN   8.78   ± 9.6 %   19679   AAA   IEEE 602.11ax (20MHz, MCS9, 90pc duty cycle)   WLAN   8.80   ± 9.6 %   19680   AAA   IEEE 602.11ax (20MHz, MCS9, 90pc duty cycle)   WLAN   8.80   ± 9.6 %   19680   AAA   IEEE 602.11ax (20MHz, MCS9, 90pc duty cycle)   WLAN   8.80   ± 9.6 %   19680   AAA   IEEE 602.11ax (20MHz, MCS9, 90pc duty cycle)   WLAN   8.80   ± 9.6 %   19680   AAA   IEEE 602.11ax (20MHz, MCS9, 90pc duty cycle)   WLAN   8.80   ± 9.6 %   19680   AAA   IEEE 602.11ax (20MHz, MCS9, 90pc duty cycle)   WLAN   8.80   ± 9.6 %   19680   AAA   IEEE 602.11ax (20MHz, MCS9, 90pc duty cycle)   WLAN   8.20   ± 9.6 %   19680   AAA   IEEE 602.11ax (20MHz, MCS9, 90pc duty cycle)   WLAN   8.20   ± 9.6 %   19680   AAA   IEEE 602.11ax (20MHz, MCS9, 90pc duty cycle)   WLAN   8.20   ± 9.6 %   19680   AAA   IEEE 602.11ax (20MHz, MCS9, 90pc duty cycle)   WLAN   8.20   ± 9.6 %   19680   AAA   IEEE 602.11ax (20MHz, MCS9, 90pc duty cycle)   WLAN   8.20   ± 9.6 %   19680   AAA   IEEE 602.11ax (20MHz, MCS9, 90pc duty cycle)   WLAN   8.20   ± 9.6 %   19680   AAA   IEEE 602.11ax (20MHz, MCS9, 90pc duty cyc |   |  | Pulse waveform (200Hz, 20%)                       |             |   |         |
| 19892  |   | <del>}</del>                                       |   | ***         |   |         |
| 10871  |   |  |   |             |   |         |
| 10672  |   |  |   |             |   |         |
| 19672  |   |  | Bluetooth Low Energy                              |             |   | ± 9.6 % |
| 10673  |   |  |   |             | 9.09                                    |         |
| 10074  |   |  | IEEE 802.11ax (20MHz, MCS1, 90pc duty cycle)      |             | 8.57                                    |         |
| 10076  |   |  | IEEE 802.11ax (20MHz, MCS2, 90pc duty cycle)      |             | 8.78                                    | ± 9.6 % |
| 10076  |   | · <del></del>                                      | IEEE 802.11ax (20MHz, MCS3, 90pc duty cycle)      |             | 8.74                                    | ±9.6%   |
| 10677  |   |  | IEEE 802.11ax (20MHz, MCS4, 90pc duty cycle)      | WLAN        | 8.90                                    |         |
| 10677  |   |  | IEEE 802.11ax (20MHz, MCS5, 90pc duty cycle)      | WLAN        | 8.77                                    | ±9.6%   |
| 10678  |   | AAA  | IEEE 802.11ax (20MHz, MCS6, 90pc duty cycle)      | WLAN        | 8.73                                    |         |
| 10679   AAA  | }                                       | AAA  | IEEE 802.11ax (20MHz, MCS7, 90pc duty cycle)      | WLAN        | 8.78                                    |         |
| 10680  |   | AAA  | IEEE 802.11ax (20MHz, MCS8, 90pc duty cycle)      |             |   |         |
| 10881  |   | AAA  |   |             |   |         |
| 10882  | 10681                                   | AAA  |   |             | · <del>-</del>                          |         |
| 10883  | 10682                                   | AAA  |   |             |   |         |
| 10684  | 10683                                   |  |   |             |   |         |
| 10885  |   |  | IEEE 802,11ax (20MHz, MCS1, 99pc duty cycle)      |             |   |         |
| 10686  |   | +  | IEEE 802,11ax (20MHz, MCS2, 99nc duty cycle)      |             |   |         |
| 10687   AAA   IEEE 802.11ax (20MHz, MCS4, 99pc duty cycle)   |   |  |   |             | <del>-</del>                            |         |
| 10688  |   | ·  |   |             | ·                                       |         |
| 10689  |   |  |   |             |   |         |
| 10690  |   |  |   |             |   |         |
| 10691  |   |  | IEEE 802.11ax (20MHz, MCS7, 00ng duty cycle)      |             |   |         |
| 10692  |   |  | IEEE 802.11ax (20MHz, MCS2, 99pc duty cycle)      |             |   |         |
| 10693  |   |  |   |             |   |         |
| 10694  |   |  |   |             |   |         |
| 10695  |   | <del>!                                      </del> | IEEE 802.11ax (20MHz, MCS10, 99pc duty cycle)     |             |   |         |
| 10696  |   |  |   |             |   |         |
| 10697  |   |  |   |             |   |         |
| 10698  |   |  |   |             |   |         |
| 10699  |   |  |   |             |   |         |
| 10700   AAA   IEEE 802.11ax (40MHz, MCS6, 90pc duty cycle)   | *************************************** |  |   |             | ·                                       |         |
| 10701   AAA   IEEE 802.11ax (40MHz, MCS6, 90pc duty cycle)   |   |  | IEEE 802.11ax (40MHz, MCS4, 90pc duty cycle)      |             |   |         |
| 10702  |   |  |   |             |   |         |
| 10703  |   |  |   | WLAN        | 8.86                                    | ± 9.6 % |
| 10704   AAA   IEEE 802.11ax (40MHz, MCS9, 90pc duty cycle)   |   |  |   |             | 8.70                                    | ± 9.6 % |
| 10705         AAA         IEEE 802.11ax (40MHz, MCS10, 90pc duty cycle)         WLAN         8.69         ± 9.6 %           10706         AAA         IEEE 802.11ax (40MHz, MCS11, 90pc duty cycle)         WLAN         8.66         ± 9.6 %           10707         AAA         IEEE 802.11ax (40MHz, MCS0, 99pc duty cycle)         WLAN         8.32         ± 9.6 %           10708         AAA         IEEE 802.11ax (40MHz, MCS1, 99pc duty cycle)         WLAN         8.55         ± 9.6 %           10709         AAA         IEEE 802.11ax (40MHz, MCS3, 99pc duty cycle)         WLAN         8.33         ± 9.6 %           10710         AAA         IEEE 802.11ax (40MHz, MCS3, 99pc duty cycle)         WLAN         8.29         ± 9.6 %           10711         AAA         IEEE 802.11ax (40MHz, MCS3, 99pc duty cycle)         WLAN         8.39         ± 9.6 %           10712         AAA         IEEE 802.11ax (40MHz, MCS5, 99pc duty cycle)         WLAN         8.39         ± 9.6 %           10713         AAA         IEEE 802.11ax (40MHz, MCS6, 99pc duty cycle)         WLAN         8.33         ± 9.6 %           10715         AAA         IEEE 802.11ax (40MHz, MCS7, 99pc duty cycle)         WLAN         8.45         ± 9.6 %           10715         AAA         IEEE 802.11ax (40MHz, MCS1, 99pc duty  |   |  |   | WLAN        | 8.82                                    | ± 9.6 % |
| 10706         AAA         IEEE 802.11ax (40MHz, MCS11, 90pc duty cycle)         WLAN         8.66         ± 9.6 %           10707         AAA         IEEE 802.11ax (40MHz, MCS0, 99pc duty cycle)         WLAN         8.32         ± 9.6 %           10708         AAA         IEEE 802.11ax (40MHz, MCS1, 99pc duty cycle)         WLAN         8.55         ± 9.6 %           10709         AAA         IEEE 802.11ax (40MHz, MCS2, 99pc duty cycle)         WLAN         8.33         ± 9.6 %           10710         AAA         IEEE 802.11ax (40MHz, MCS3, 99pc duty cycle)         WLAN         8.29         ± 9.6 %           10711         AAA         IEEE 802.11ax (40MHz, MCS4, 99pc duty cycle)         WLAN         8.39         ± 9.6 %           10712         AAA         IEEE 802.11ax (40MHz, MCS5, 99pc duty cycle)         WLAN         8.39         ± 9.6 %           10713         AAA         IEEE 802.11ax (40MHz, MCS6, 99pc duty cycle)         WLAN         8.33         ± 9.6 %           10714         AAA         IEEE 802.11ax (40MHz, MCS7, 99pc duty cycle)         WLAN         8.26         ± 9.6 %           10715         AAA         IEEE 802.11ax (40MHz, MCS9, 99pc duty cycle)         WLAN         8.45         ± 9.6 %           10716         AAA         IEEE 802.11ax (40MHz, MCS1, 99pc duty   |   | AAA  |   | WLAN        | 8.56                                    | ±9.6 %  |
| 10706         AAA         IEEE 802.11ax (40MHz, MCS1, 99pc duty cycle)         WLAN         8.66         ± 9.6 %           10707         AAA         IEEE 802.11ax (40MHz, MCS0, 99pc duty cycle)         WLAN         8.32         ± 9.6 %           10708         AAA         IEEE 802.11ax (40MHz, MCS1, 99pc duty cycle)         WLAN         8.55         ± 9.6 %           10710         AAA         IEEE 802.11ax (40MHz, MCS2, 99pc duty cycle)         WLAN         8.33         ± 9.6 %           10711         AAA         IEEE 802.11ax (40MHz, MCS3, 99pc duty cycle)         WLAN         8.39         ± 9.6 %           10712         AAA         IEEE 802.11ax (40MHz, MCS4, 99pc duty cycle)         WLAN         8.67         ± 9.6 %           10713         AAA         IEEE 802.11ax (40MHz, MCS5, 99pc duty cycle)         WLAN         8.33         ± 9.6 %           10713         AAA         IEEE 802.11ax (40MHz, MCS6, 99pc duty cycle)         WLAN         8.33         ± 9.6 %           10714         AAA         IEEE 802.11ax (40MHz, MCS9, 99pc duty cycle)         WLAN         8.26         ± 9.6 %           10715         AAA         IEEE 802.11ax (40MHz, MCS9, 99pc duty cycle)         WLAN         8.45         ± 9.6 %           10715         AAA         IEEE 802.11ax (40MHz, MCS9, 90pc duty c  | 10705                                   | AAA  | IEEE 802.11ax (40MHz, MCS10, 90pc duty cycle)     | WLAN        | 8.69                                    | ± 9.6 % |
| 10707         AAA         IEEE 802.11ax (40MHz, MCS0, 99pc duty cycle)         WLAN         8.32         ± 9.6 %           10708         AAA         IEEE 802.11ax (40MHz, MCS1, 99pc duty cycle)         WLAN         8.55         ± 9.6 %           10709         AAA         IEEE 802.11ax (40MHz, MCS2, 99pc duty cycle)         WLAN         8.33         ± 9.6 %           10710         AAA         IEEE 802.11ax (40MHz, MCS3, 99pc duty cycle)         WLAN         8.29         ± 9.6 %           10711         AAA         IEEE 802.11ax (40MHz, MCS4, 99pc duty cycle)         WLAN         8.39         ± 9.6 %           10712         AAA         IEEE 802.11ax (40MHz, MCS5, 99pc duty cycle)         WLAN         8.67         ± 9.6 %           10713         AAA         IEEE 802.11ax (40MHz, MCS6, 99pc duty cycle)         WLAN         8.33         ± 9.6 %           10714         AAA         IEEE 802.11ax (40MHz, MCS7, 99pc duty cycle)         WLAN         8.26         ± 9.6 %           10715         AAA         IEEE 802.11ax (40MHz, MCS9, 99pc duty cycle)         WLAN         8.45         ± 9.6 %           10716         AAA         IEEE 802.11ax (40MHz, MCS1, 99pc duty cycle)         WLAN         8.48         ± 9.6 %           10718         AAA         IEEE 802.11ax (40MHz, MCS1, 90pc duty c  | 10706                                   | AAA  | IEEE 802.11ax (40MHz, MCS11, 90pc duty cycle)     | WLAN        |   |         |
| 10708         AAA         IEEE 802.11ax (40MHz, MCS1, 99pc duty cycle)         WLAN         8.55         ± 9.6 %           10709         AAA         IEEE 802.11ax (40MHz, MCS2, 99pc duty cycle)         WLAN         8.33         ± 9.6 %           10710         AAA         IEEE 802.11ax (40MHz, MCS3, 99pc duty cycle)         WLAN         8.29         ± 9.6 %           10711         AAA         IEEE 802.11ax (40MHz, MCS4, 99pc duty cycle)         WLAN         8.39         ± 9.6 %           10712         AAA         IEEE 802.11ax (40MHz, MCS5, 99pc duty cycle)         WLAN         8.67         ± 9.6 %           10713         AAA         IEEE 802.11ax (40MHz, MCS6, 99pc duty cycle)         WLAN         8.33         ± 9.6 %           10714         AAA         IEEE 802.11ax (40MHz, MCS7, 99pc duty cycle)         WLAN         8.26         ± 9.6 %           10715         AAA         IEEE 802.11ax (40MHz, MCS8, 99pc duty cycle)         WLAN         8.45         ± 9.6 %           10716         AAA         IEEE 802.11ax (40MHz, MCS10, 99pc duty cycle)         WLAN         8.30         ± 9.6 %           10717         AAA         IEEE 802.11ax (40MHz, MCS11, 99pc duty cycle)         WLAN         8.48         ± 9.6 %           10718         AAA         IEEE 802.11ax (80MHz, MCS0, 90pc duty  |   |  | IEEE 802.11ax (40MHz, MCS0, 99pc duty cycle)      |             |   |         |
| 10709         AAA         IEEE 802.11ax (40MHz, MCS2, 99pc duty cycle)         WLAN         8.33         ± 9.6 %           10710         AAA         IEEE 802.11ax (40MHz, MCS3, 99pc duty cycle)         WLAN         8.29         ± 9.6 %           10711         AAA         IEEE 802.11ax (40MHz, MCS4, 99pc duty cycle)         WLAN         8.39         ± 9.6 %           10712         AAA         IEEE 802.11ax (40MHz, MCS5, 99pc duty cycle)         WLAN         8.67         ± 9.6 %           10713         AAA         IEEE 802.11ax (40MHz, MCS6, 99pc duty cycle)         WLAN         8.33         ± 9.6 %           10714         AAA         IEEE 802.11ax (40MHz, MCS7, 99pc duty cycle)         WLAN         8.26         ± 9.6 %           10715         AAA         IEEE 802.11ax (40MHz, MCS8, 99pc duty cycle)         WLAN         8.45         ± 9.6 %           10716         AAA         IEEE 802.11ax (40MHz, MCS9, 99pc duty cycle)         WLAN         8.30         ± 9.6 %           10717         AAA         IEEE 802.11ax (40MHz, MCS10, 99pc duty cycle)         WLAN         8.48         ± 9.6 %           10718         AAA         IEEE 802.11ax (80MHz, MCS0, 90pc duty cycle)         WLAN         8.24         ± 9.6 %           10720         AAA         IEEE 802.11ax (80MHz, MCS1, 90pc duty   | 10708                                   | AAA  |   |             |   |         |
| 10710         AAA         IEEE 802.11ax (40MHz, MCS3, 99pc duty cycle)         WLAN         8.29         ± 9.6 %           10711         AAA         IEEE 802.11ax (40MHz, MCS4, 99pc duty cycle)         WLAN         8.39         ± 9.6 %           10712         AAA         IEEE 802.11ax (40MHz, MCS5, 99pc duty cycle)         WLAN         8.67         ± 9.6 %           10713         AAA         IEEE 802.11ax (40MHz, MCS6, 99pc duty cycle)         WLAN         8.33         ± 9.6 %           10714         AAA         IEEE 802.11ax (40MHz, MCS7, 99pc duty cycle)         WLAN         8.26         ± 9.6 %           10715         AAA         IEEE 802.11ax (40MHz, MCS8, 99pc duty cycle)         WLAN         8.45         ± 9.6 %           10716         AAA         IEEE 802.11ax (40MHz, MCS9, 99pc duty cycle)         WLAN         8.30         ± 9.6 %           10717         AAA         IEEE 802.11ax (40MHz, MCS10, 99pc duty cycle)         WLAN         8.48         ± 9.6 %           10718         AAA         IEEE 802.11ax (40MHz, MCS11, 99pc duty cycle)         WLAN         8.24         ± 9.6 %           10720         AAA         IEEE 802.11ax (80MHz, MCS0, 90pc duty cycle)         WLAN         8.87         ± 9.6 %           10721         AAA         IEEE 802.11ax (80MHz, MCS3, 90pc duty  | 10709                                   |  |   |             | *************************************** |         |
| 10711       AAA       IEEE 802.11ax (40MHz, MCS4, 99pc duty cycle)       WLAN       8.39       ± 9.6 %         10712       AAA       IEEE 802.11ax (40MHz, MCS5, 99pc duty cycle)       WLAN       8.67       ± 9.6 %         10713       AAA       IEEE 802.11ax (40MHz, MCS6, 99pc duty cycle)       WLAN       8.33       ± 9.6 %         10714       AAA       IEEE 802.11ax (40MHz, MCS7, 99pc duty cycle)       WLAN       8.26       ± 9.6 %         10715       AAA       IEEE 802.11ax (40MHz, MCS8, 99pc duty cycle)       WLAN       8.45       ± 9.6 %         10716       AAA       IEEE 802.11ax (40MHz, MCS9, 99pc duty cycle)       WLAN       8.30       ± 9.6 %         10717       AAA       IEEE 802.11ax (40MHz, MCS10, 99pc duty cycle)       WLAN       8.48       ± 9.6 %         10718       AAA       IEEE 802.11ax (40MHz, MCS11, 99pc duty cycle)       WLAN       8.24       ± 9.6 %         10719       AAA       IEEE 802.11ax (80MHz, MCS0, 90pc duty cycle)       WLAN       8.81       ± 9.6 %         10720       AAA       IEEE 802.11ax (80MHz, MCS2, 90pc duty cycle)       WLAN       8.76       ± 9.6 %         10722       AAA       IEEE 802.11ax (80MHz, MCS3, 90pc duty cycle)       WLAN       8.70       ± 9.6 %         10724   |   |  |   |             |   |         |
| 10712         AAA         IEEE 802.11ax (40MHz, MCS5, 99pc duty cycle)         WLAN         8.67         ± 9.6 %           10713         AAA         IEEE 802.11ax (40MHz, MCS6, 99pc duty cycle)         WLAN         8.33         ± 9.6 %           10714         AAA         IEEE 802.11ax (40MHz, MCS7, 99pc duty cycle)         WLAN         8.26         ± 9.6 %           10715         AAA         IEEE 802.11ax (40MHz, MCS8, 99pc duty cycle)         WLAN         8.45         ± 9.6 %           10716         AAA         IEEE 802.11ax (40MHz, MCS9, 99pc duty cycle)         WLAN         8.30         ± 9.6 %           10717         AAA         IEEE 802.11ax (40MHz, MCS10, 99pc duty cycle)         WLAN         8.48         ± 9.6 %           10718         AAA         IEEE 802.11ax (40MHz, MCS11, 99pc duty cycle)         WLAN         8.24         ± 9.6 %           10719         AAA         IEEE 802.11ax (80MHz, MCS0, 90pc duty cycle)         WLAN         8.81         ± 9.6 %           10720         AAA         IEEE 802.11ax (80MHz, MCS2, 90pc duty cycle)         WLAN         8.76         ± 9.6 %           10721         AAA         IEEE 802.11ax (80MHz, MCS3, 90pc duty cycle)         WLAN         8.55         ± 9.6 %           10723         AAA         IEEE 802.11ax (80MHz, MCS4, 90pc duty  |   |  |   |             |   |         |
| 10713         AAA         IEEE 802.11ax (40MHz, MCS6, 99pc duty cycle)         WLAN         8.33         ± 9.6 %           10714         AAA         IEEE 802.11ax (40MHz, MCS7, 99pc duty cycle)         WLAN         8.26         ± 9.6 %           10715         AAA         IEEE 802.11ax (40MHz, MCS8, 99pc duty cycle)         WLAN         8.45         ± 9.6 %           10716         AAA         IEEE 802.11ax (40MHz, MCS9, 99pc duty cycle)         WLAN         8.30         ± 9.6 %           10717         AAA         IEEE 802.11ax (40MHz, MCS10, 99pc duty cycle)         WLAN         8.48         ± 9.6 %           10718         AAA         IEEE 802.11ax (40MHz, MCS11, 99pc duty cycle)         WLAN         8.24         ± 9.6 %           10719         AAA         IEEE 802.11ax (80MHz, MCS0, 90pc duty cycle)         WLAN         8.81         ± 9.6 %           10720         AAA         IEEE 802.11ax (80MHz, MCS1, 90pc duty cycle)         WLAN         8.76         ± 9.6 %           10721         AAA         IEEE 802.11ax (80MHz, MCS3, 90pc duty cycle)         WLAN         8.55         ± 9.6 %           10723         AAA         IEEE 802.11ax (80MHz, MCS4, 90pc duty cycle)         WLAN         8.70         ± 9.6 %           10724         AAA         IEEE 802.11ax (80MHz, MCS5, 90pc duty  |   |  |   |             |   |         |
| 10714       AAA       IEEE 802.11ax (40MHz, MCS7, 99pc duty cycle)       WLAN       8.26       ± 9.6 %         10715       AAA       IEEE 802.11ax (40MHz, MCS8, 99pc duty cycle)       WLAN       8.45       ± 9.6 %         10716       AAA       IEEE 802.11ax (40MHz, MCS9, 99pc duty cycle)       WLAN       8.30       ± 9.6 %         10717       AAA       IEEE 802.11ax (40MHz, MCS10, 99pc duty cycle)       WLAN       8.48       ± 9.6 %         10718       AAA       IEEE 802.11ax (40MHz, MCS11, 99pc duty cycle)       WLAN       8.24       ± 9.6 %         10719       AAA       IEEE 802.11ax (80MHz, MCS0, 90pc duty cycle)       WLAN       8.81       ± 9.6 %         10720       AAA       IEEE 802.11ax (80MHz, MCS1, 90pc duty cycle)       WLAN       8.76       ± 9.6 %         10721       AAA       IEEE 802.11ax (80MHz, MCS3, 90pc duty cycle)       WLAN       8.76       ± 9.6 %         10722       AAA       IEEE 802.11ax (80MHz, MCS4, 90pc duty cycle)       WLAN       8.70       ± 9.6 %         10724       AAA       IEEE 802.11ax (80MHz, MCS5, 90pc duty cycle)       WLAN       8.70       ± 9.6 %         10725       AAA       IEEE 802.11ax (80MHz, MCS6, 90pc duty cycle)       WLAN       8.74       ± 9.6 %   |   |  |   |             |   |         |
| 10715       AAA       IEEE 802.11ax (40MHz, MCS8, 99pc duty cycle)       WLAN       8.45       ± 9.6 %         10716       AAA       IEEE 802.11ax (40MHz, MCS9, 99pc duty cycle)       WLAN       8.30       ± 9.6 %         10717       AAA       IEEE 802.11ax (40MHz, MCS10, 99pc duty cycle)       WLAN       8.48       ± 9.6 %         10718       AAA       IEEE 802.11ax (40MHz, MCS11, 99pc duty cycle)       WLAN       8.24       ± 9.6 %         10719       AAA       IEEE 802.11ax (80MHz, MCS0, 90pc duty cycle)       WLAN       8.81       ± 9.6 %         10720       AAA       IEEE 802.11ax (80MHz, MCS1, 90pc duty cycle)       WLAN       8.76       ± 9.6 %         10721       AAA       IEEE 802.11ax (80MHz, MCS2, 90pc duty cycle)       WLAN       8.76       ± 9.6 %         10722       AAA       IEEE 802.11ax (80MHz, MCS3, 90pc duty cycle)       WLAN       8.55       ± 9.6 %         10723       AAA       IEEE 802.11ax (80MHz, MCS4, 90pc duty cycle)       WLAN       8.70       ± 9.6 %         10724       AAA       IEEE 802.11ax (80MHz, MCS5, 90pc duty cycle)       WLAN       8.90       ± 9.6 %         10725       AAA       IEEE 802.11ax (80MHz, MCS6, 90pc duty cycle)       WLAN       8.74       ± 9.6 %   |   |  | IEEE 802.11ax (40MHz, MCS7, 99nc duty cycle)      |             |   |         |
| 10716         AAA         IEEE 802.11ax (40MHz, MCS9, 99pc duty cycle)         WLAN         8.30         ± 9.6 %           10717         AAA         IEEE 802.11ax (40MHz, MCS10, 99pc duty cycle)         WLAN         8.48         ± 9.6 %           10718         AAA         IEEE 802.11ax (40MHz, MCS11, 99pc duty cycle)         WLAN         8.24         ± 9.6 %           10719         AAA         IEEE 802.11ax (80MHz, MCS0, 90pc duty cycle)         WLAN         8.81         ± 9.6 %           10720         AAA         IEEE 802.11ax (80MHz, MCS1, 90pc duty cycle)         WLAN         8.87         ± 9.6 %           10721         AAA         IEEE 802.11ax (80MHz, MCS2, 90pc duty cycle)         WLAN         8.76         ± 9.6 %           10722         AAA         IEEE 802.11ax (80MHz, MCS3, 90pc duty cycle)         WLAN         8.55         ± 9.6 %           10723         AAA         IEEE 802.11ax (80MHz, MCS4, 90pc duty cycle)         WLAN         8.70         ± 9.6 %           10724         AAA         IEEE 802.11ax (80MHz, MCS5, 90pc duty cycle)         WLAN         8.90         ± 9.6 %           10725         AAA         IEEE 802.11ax (80MHz, MCS6, 90pc duty cycle)         WLAN         8.74         ± 9.6 %  |   |  |   |             |   |         |
| 10717       AAA       IEEE 802.11ax (40MHz, MCS10, 99pc duty cycle)       WLAN       8.48       ± 9.6 %         10718       AAA       IEEE 802.11ax (40MHz, MCS11, 99pc duty cycle)       WLAN       8.24       ± 9.6 %         10719       AAA       IEEE 802.11ax (80MHz, MCS0, 90pc duty cycle)       WLAN       8.81       ± 9.6 %         10720       AAA       IEEE 802.11ax (80MHz, MCS1, 90pc duty cycle)       WLAN       8.76       ± 9.6 %         10721       AAA       IEEE 802.11ax (80MHz, MCS2, 90pc duty cycle)       WLAN       8.76       ± 9.6 %         10722       AAA       IEEE 802.11ax (80MHz, MCS3, 90pc duty cycle)       WLAN       8.55       ± 9.6 %         10723       AAA       IEEE 802.11ax (80MHz, MCS4, 90pc duty cycle)       WLAN       8.70       ± 9.6 %         10724       AAA       IEEE 802.11ax (80MHz, MCS5, 90pc duty cycle)       WLAN       8.90       ± 9.6 %         10725       AAA       IEEE 802.11ax (80MHz, MCS6, 90pc duty cycle)       WLAN       8.74       ± 9.6 %   |   | ***************************************            |   |             |   |         |
| 10718       AAA       IEEE 802.11ax (40MHz, MCS11, 99pc duty cycle)       WLAN       8.24       ± 9.6 %         10719       AAA       IEEE 802.11ax (80MHz, MCS0, 90pc duty cycle)       WLAN       8.81       ± 9.6 %         10720       AAA       IEEE 802.11ax (80MHz, MCS1, 90pc duty cycle)       WLAN       8.87       ± 9.6 %         10721       AAA       IEEE 802.11ax (80MHz, MCS2, 90pc duty cycle)       WLAN       8.76       ± 9.6 %         10722       AAA       IEEE 802.11ax (80MHz, MCS3, 90pc duty cycle)       WLAN       8.55       ± 9.6 %         10723       AAA       IEEE 802.11ax (80MHz, MCS4, 90pc duty cycle)       WLAN       8.70       ± 9.6 %         10724       AAA       IEEE 802.11ax (80MHz, MCS5, 90pc duty cycle)       WLAN       8.90       ± 9.6 %         10725       AAA       IEEE 802.11ax (80MHz, MCS6, 90pc duty cycle)       WLAN       8.74       ± 9.6 %   |   |  |   |             |   |         |
| 10719         AAA         IEEE 802.11ax (80MHz, MCS0, 90pc duty cycle)         WLAN         8.81         ± 9.6 %           10720         AAA         IEEE 802.11ax (80MHz, MCS1, 90pc duty cycle)         WLAN         8.87         ± 9.6 %           10721         AAA         IEEE 802.11ax (80MHz, MCS2, 90pc duty cycle)         WLAN         8.76         ± 9.6 %           10722         AAA         IEEE 802.11ax (80MHz, MCS3, 90pc duty cycle)         WLAN         8.55         ± 9.6 %           10723         AAA         IEEE 802.11ax (80MHz, MCS4, 90pc duty cycle)         WLAN         8.70         ± 9.6 %           10724         AAA         IEEE 802.11ax (80MHz, MCS5, 90pc duty cycle)         WLAN         8.90         ± 9.6 %           10725         AAA         IEEE 802.11ax (80MHz, MCS6, 90pc duty cycle)         WLAN         8.74         ± 9.6 %   |   |  |   |             |   |         |
| 10720       AAA       IEEE 802.11ax (80MHz, MCS1, 90pc duty cycle)       WLAN       8.87       ± 9.6 %         10721       AAA       IEEE 802.11ax (80MHz, MCS2, 90pc duty cycle)       WLAN       8.76       ± 9.6 %         10722       AAA       IEEE 802.11ax (80MHz, MCS3, 90pc duty cycle)       WLAN       8.55       ± 9.6 %         10723       AAA       IEEE 802.11ax (80MHz, MCS4, 90pc duty cycle)       WLAN       8.70       ± 9.6 %         10724       AAA       IEEE 802.11ax (80MHz, MCS5, 90pc duty cycle)       WLAN       8.90       ± 9.6 %         10725       AAA       IEEE 802.11ax (80MHz, MCS6, 90pc duty cycle)       WLAN       8.74       ± 9.6 %  |   |  |   |             |   |         |
| 10721       AAA       IEEE 802.11ax (80MHz, MCS2, 90pc duty cycle)       WLAN       8.76       ± 9.6 %         10722       AAA       IEEE 802.11ax (80MHz, MCS3, 90pc duty cycle)       WLAN       8.55       ± 9.6 %         10723       AAA       IEEE 802.11ax (80MHz, MCS4, 90pc duty cycle)       WLAN       8.70       ± 9.6 %         10724       AAA       IEEE 802.11ax (80MHz, MCS5, 90pc duty cycle)       WLAN       8.90       ± 9.6 %         10725       AAA       IEEE 802.11ax (80MHz, MCS6, 90pc duty cycle)       WLAN       8.74       ± 9.6 %   |   |  |   |             |   |         |
| 10722       AAA       IEEE 802.11ax (80MHz, MCS3, 90pc duty cycle)       WLAN       8.55       ± 9.6 %         10723       AAA       IEEE 802.11ax (80MHz, MCS4, 90pc duty cycle)       WLAN       8.70       ± 9.6 %         10724       AAA       IEEE 802.11ax (80MHz, MCS5, 90pc duty cycle)       WLAN       8.90       ± 9.6 %         10725       AAA       IEEE 802.11ax (80MHz, MCS6, 90pc duty cycle)       WLAN       8.74       ± 9.6 %  |   |  | TEEE OUZ. Flax (OUNITZ, INCO 1, SUPC GUTY CYCIE)  |             |   |         |
| 10723       AAA       IEEE 802.11ax (80MHz, MCS4, 90pc duty cycle)       WLAN       8.70       ± 9.6 %         10724       AAA       IEEE 802.11ax (80MHz, MCS5, 90pc duty cycle)       WLAN       8.90       ± 9.6 %         10725       AAA       IEEE 802.11ax (80MHz, MCS6, 90pc duty cycle)       WLAN       8.74       ± 9.6 %   |   |  | IEEE 902 44ov (90MUz, MOS2, 90pc QUIV CYCIE)      |             |   |         |
| 10724         AAA         IEEE 802.11ax (80MHz, MCS5, 90pc duty cycle)         WLAN         8.90         ± 9.6 %           10725         AAA         IEEE 802.11ax (80MHz, MCS6, 90pc duty cycle)         WLAN         8.74         ± 9.6 %  |   |  |   |             |   |         |
| 10725 AAA IEEE 802.11ax (80MHz, MCS6, 90pc duty cycle) WLAN 8.74 ± 9.6 %   |   |  |   |             |   |         |
|  |   |  |   |             |   |         |
| 10726   AAA   IEEE 802.118X (80MHz, MCS7, 90pc duty cycle)   WLAN   8.72   ± 9.6 %   |   |  |   |             |   |         |
|  | 10726                                   | AAA  | IEEE 802.TTax (80MHz, MCS7, 90pc duty cycle)      | WLAN        | 8.72                                    | ± 9.6 % |

EX3DV4- SN:3589 January 21, 2020

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|---------|----------|--|-------------|------|----------|
| 10727   | AAA      | IEEE 802.11ax (80MHz, MCS8, 90pc duty cycle)   | WLAN        | 8.66 | ± 9.6 %  |
| 10728   | AAA      | IEEE 802.11ax (80MHz, MCS9, 90pc duty cycle)   | WLAN        | 8.65 | ± 9.6 %  |
| 10729   | AAA      | IEEE 802.11ax (80MHz, MCS10, 90pc duty cycle)  | WLAN        | 8.64 | ± 9.6 %  |
| 10730   | AAA      | IEEE 802.11ax (80MHz, MCS11, 90pc duty cycle)  | WLAN        | 8.67 | ±9.6%    |
| 10731   | AAA      | IEEE 802.11ax (80MHz, MCS0, 99pc duty cycle)   | WLAN        | 8.42 | ± 9.6 %  |
| 10732   | AAA      | IEEE 802.11ax (80MHz, MCS1, 99pc duty cycle)   | WLAN        | 8.46 | ± 9.6 %  |
| 10733   | AAA      | IEEE 802.11ax (80MHz, MCS2, 99pc duty cycle)   | WLAN        | 8.40 | ± 9.6 %  |
| 10734   | AAA      | IEEE 802.11ax (80MHz, MCS3, 99pc duty cycle)   | WLAN        | 8.25 | ± 9.6 %  |
|         |          |  |             |      |          |
| 10735   | AAA      | IEEE 802.11ax (80MHz, MCS4, 99pc duty cycle)   | WLAN        | 8.33 | ±9.6 %   |
| 10736   | AAA      | IEEE 802.11ax (80MHz, MCS5, 99pc duty cycle)   | WLAN        | 8.27 | ± 9.6 %  |
| 10737   | AAA      | IEEE 802.11ax (80MHz, MCS6, 99pc duty cycle)   | WLAN        | 8.36 | ± 9.6 %  |
| 10738   | AAA      | IEEE 802.11ax (80MHz, MCS7, 99pc duty cycle)   | WLAN        | 8.42 | ± 9.6 %  |
| 10739   | AAA      | IEEE 802.11ax (80MHz, MCS8, 99pc duty cycle)   | WLAN        | 8.29 | ± 9.6 %  |
| 10740   | AAA      | IEEE 802.11ax (80MHz, MCS9, 99pc duty cycle)   | WLAN        | 8,48 | ±9.6%    |
| 10741   | AAA      | IEEE 802.11ax (80MHz, MCS10, 99pc duty cycle)  | WLAN        | 8.40 | ± 9.6 %  |
| 10742   | AAA      | IEEE 802.11ax (80MHz, MCS11, 99pc duty cycle)  | WLAN        | 8.43 | ± 9.6 %  |
|         |          |  |             |      |          |
| 10743   | AAA      | IEEE 802.11ax (160MHz, MCS0, 90pc duty cycle)  | WLAN        | 8.94 | ± 9.6 %  |
| 10744   | AAA      | IEEE 802.11ax (160MHz, MCS1, 90pc duty cycle)  | WLAN        | 9.16 | ±9.6%    |
| 10745   | AAA      | IEEE 802.11ax (160MHz, MCS2, 90pc duty cycle)  | WLAN        | 8.93 | ± 9.6 %  |
| 10746   | AAA      | IEEE 802.11ax (160MHz, MCS3, 90pc duty cycle)  | WLAN        | 9.11 | ±9.6%    |
| 10747   | AAA      | IEEE 802.11ax (160MHz, MCS4, 90pc duty cycle)  | WLAN        | 9.04 | ± 9.6 %  |
| 10748   | AAA      | IEEE 802.11ax (160MHz, MCS5, 90pc duty cycle)  | WLAN        | 8.93 | ±9.6%    |
| 10749   | AAA      | IEEE 802.11ax (160MHz, MCS6, 90pc duty cycle)  | WLAN        | 8.90 | ± 9.6 %  |
|         |          | TEEL OOZ. 1 TAX ( TOURITZ, WOOD, SUPE GBLY GYCR)   |             |      |          |
| 10750   | AAA      | IEEE 802.11ax (160MHz, MCS7, 90pc duty cycle)  | WLAN        | 8.79 | ± 9.6 %  |
| 10751   | AAA      | IEEE 802.11ax (160MHz, MCS8, 90pc duty cycle)  | WLAN        | 8.82 | ± 9.6 %  |
| 10752   | AAA      | IEEE 802.11ax (160MHz, MCS9, 90pc duty cycle)  | WLAN        | 8.81 | ± 9.6 %  |
| 10753   | AAA      | IEEE 802.11ax (160MHz, MCS10, 90pc duty cycle)   | WLAN        | 9.00 | ±9.6 %   |
| 10754   | AAA      | IEEE 802.11ax (160MHz, MCS11, 90pc duty cycle)   | WLAN        | 8.94 | ± 9.6 %  |
| 10755   | AAA      | IEEE 802.11ax (160MHz, MCS0, 99pc duty cycle)  | WLAN        | 8.64 | ±9.6 %   |
| 10756   | AAA      | IEEE 802.11ax (160MHz, MCS1, 99pc duty cycle)  | WLAN        | 8.77 | ± 9.6 %  |
| 10757   | AAA      | IEEE 802.11ax (160MHz, MCS2, 99pc duty cycle)  | WLAN        | 8.77 | ± 9.6 %  |
|         |          |  |             |      |          |
| 10758   | AAA      | IEEE 802.11ax (160MHz, MCS3, 99pc duty cycle)  | WLAN        | 8.69 | ±9.6%    |
| 10759   | AAA      | IEEE 802.11ax (160MHz, MCS4, 99pc duty cycle)  | WLAN        | 8.58 | ± 9.6 %  |
| 10760   | AAA      | IEEE 802.11ax (160MHz, MCS5, 99pc duty cycle)  | WLAN        | 8.49 | ± 9.6 %  |
| 10761   | AAA      | IEEE 802.11ax (160MHz, MCS6, 99pc duty cycle)  | WLAN        | 8.58 | ± 9.6 %  |
| 10762   | AAA      | IEEE 802.11ax (160MHz, MCS7, 99pc duty cycle)  | WLAN        | 8.49 | ± 9.6 %  |
| 10763   | AAA      | IEEE 802.11ax (160MHz, MCS8, 99pc duty cycle)  | WLAN        | 8.53 | ±9.6%    |
| 10764   | AAA      | IEEE 802.11ax (160MHz, MCS9, 99pc duty cycle)  | WLAN        | 8.54 | ± 9.6 %  |
| 10765   | AAA      | IEEE 802.11ax (160MHz, MCS10, 99pc duty cycle)   | WLAN        | 8,54 | ± 9.6 %  |
| 10766   |          |  | WLAN        |      | ± 9.6 %  |
|         | AAA      | IEEE 802.11ax (160MHz, MCS11, 99pc duty cycle)   |             | 8.51 |          |
| 10767   | AAB      | 5G NR (CP-OFDM, 1 RB, 5 MHz, QPSK, 15 kHz)   | 5G NR FR1   | 7.99 | ± 9.6 %  |
|         | <u> </u> |  | TDD         |      |          |
| 10768   | AAB      | 5G NR (CP-OFDM, 1 RB, 10 MHz, QPSK, 15 kHz)  | 5G NR FR1   | 8.01 | ± 9.6 %  |
|         |          |  | TDD         |      |          |
| 10769   | AAB      | 5G NR (CP-OFDM, 1 RB, 15 MHz, QPSK, 15 kHz)  | 5G NR FR1   | 8.01 | ± 9.6 %  |
| 1       | 1        | ,  | TDD         |      | 1        |
| 10770   | AAB      | 5G NR (CP-OFDM, 1 RB, 20 MHz, QPSK, 15 kHz)  | 5G NR FR1   | 8.02 | ± 9.6 %  |
| 1 10770 | /2/0     | O THE (OT "OT DIM, TIND, 20 MITE, OF ON, TO KIE)   | TDD         | 0.02 | 20.0 /6  |
| 40774   | 0.00     | EC ND (CD OEDM 4 DD OE MILL ODOK 45 L41-)  |             | 0.00 | + O C 0/ |
| 10771   | AAB      | 5G NR (CP-OFDM, 1 RB, 25 MHz, QPSK, 15 kHz)  | 5G NR FR1   | 8.02 | ± 9.6 %  |
|         |          |  | TDD         |      | <u> </u> |
| 10772   | AAB      | 5G NR (CP-OFDM, 1 RB, 30 MHz, QPSK, 15 kHz)  | 5G NR FR1   | 8.23 | ± 9.6 %  |
|         |          |  | TDD         |      |          |
| 10773   | AAB      | 5G NR (CP-OFDM, 1 RB, 40 MHz, QPSK, 15 kHz)  | 5G NR FR1   | 8.03 | ± 9.6 %  |
|         |          |  | TDD         | İ    | 1        |
| 10774   | AAB      | 5G NR (CP-OFDM, 1 RB, 50 MHz, QPSK, 15 kHz)  | 5G NR FR1   | 8.02 | ± 9.6 %  |
|         | . " ,"   | OF THE OF BRIDE THE BUILDING OF STATE | TDD         | 5.02 | /        |
| 10770   | AAB      | 5G NR (CP-OFDM, 50% RB, 10 MHz, QPSK, 15 kHz)  |             | 8.30 | 1069/    |
| 10776   | AAB      | 5G NR (CP-OFDIN, 50% RB, 10 MHZ, QPSK, 15 KHZ)   | 5G NR FR1   | 8.30 | ± 9.6 %  |
|         |          |  | TDD         |      |          |
| 10778   | AAB      | 5G NR (CP-OFDM, 50% RB, 20 MHz, QPSK, 15 kHz)  | 5G NR FR1   | 8.34 | ± 9.6 %  |
|         |          |  | TDD         |      |          |
| 10780   | AAB      | 5G NR (CP-OFDM, 50% RB, 30 MHz, QPSK, 15 kHz)  | 5G NR FR1   | 8.38 | ±9.6 %   |
|         |          |  | TDD         |      |          |
| 10781   | AAB      | 5G NR (CP-OFDM, 50% RB, 40 MHz, QPSK, 15 kHz)  | 5G NR FR1   | 8.38 | ± 9.6 %  |
| 1       |          |  | TDD         |      |          |
| 10782   | AAB      | 5G NR (CP-OFDM, 50% RB, 50 MHz, QPSK, 15 kHz)  | 5G NR FR1   | 8.43 | ± 9.6 %  |
| 10102   | 1,000    | 1 00 mm (Or Or Divi, 00 /0 MD, 00 MHZ, Qr ON, 10 MHZ)  | Too willing | 0.70 | 1 0.0 /0 |

|       |     |  | TDD              |      |         |
|-------|-----|--|------------------|------|---------|
| 10783 | AAB | 5G NR (CP-OFDM, 100% RB, 5 MHz, QPSK, 15 kHz)  | 5G NR FR1<br>TDD | 8.31 | ± 9.6 % |
| 10784 | AAB | 5G NR (CP-OFDM, 100% RB, 10 MHz, QPSK, 15 kHz) | 5G NR FR1<br>TDD | 8,29 | ± 9.6 % |
| 10785 | AAB | 5G NR (CP-OFDM, 100% RB, 15 MHz, QPSK, 15 kHz) | 5G NR FR1<br>TDD | 8.40 | ± 9.6 % |
| 10786 | AAB | 5G NR (CP-OFDM, 100% RB, 20 MHz, QPSK, 15 kHz) | 5G NR FR1<br>TDD | 8.35 | ± 9.6 % |
| 10787 | AAB | 5G NR (CP-OFDM, 100% RB, 25 MHz, QPSK, 15 kHz) | 5G NR FR1<br>TDD | 8.44 | ± 9.6 % |
| 10788 | AAB | 5G NR (CP-OFDM, 100% RB, 30 MHz, QPSK, 15 kHz) | 5G NR FR1        | 8.39 | ± 9.6 % |
| 10789 | AAB | 5G NR (CP-OFDM, 100% RB, 40 MHz, QPSK, 15 kHz) | 5G NR FR1        | 8.37 | ± 9.6 % |
| 10790 | AAB | 5G NR (CP-OFDM, 100% RB, 50 MHz, QPSK, 15 kHz) | 5G NR FR1        | 8.39 | ± 9.6 % |
| 10791 | AAB | 5G NR (CP-OFDM, 1 RB, 5 MHz, QPSK, 30 kHz)     | 5G NR FR1        | 7.83 | ± 9.6 % |
| 10792 | AAB | 5G NR (CP-OFDM, 1 RB, 10 MHz, QPSK, 30 kHz)    | 5G NR FR1        | 7.92 | ± 9.6 % |
| 10793 | AAB | 5G NR (CP-OFDM, 1 RB, 15 MHz, QPSK, 30 kHz)    | 5G NR FR1        | 7.95 | ± 9.6 % |
| 10794 | AAB | 5G NR (CP-OFDM, 1 RB, 20 MHz, QPSK, 30 kHz)    | TDD<br>5G NR FR1 | 7.82 | ± 9.6 % |
| 10795 | AAB | 5G NR (CP-OFDM, 1 RB, 25 MHz, QPSK, 30 kHz)    | TDD<br>5G NR FR1 | 7.84 | ±9.6%   |
| 10796 | AAB | 5G NR (CP-OFDM, 1 RB, 30 MHz, QPSK, 30 kHz)    | TDD<br>5G NR FR1 | 7.82 | ± 9.6 % |
| 10797 | AAB | 5G NR (CP-OFDM, 1 RB, 40 MHz, QPSK, 30 kHz)    | 5G NR FR1        | 8.01 | ± 9.6 % |
| 10798 | AAB | 5G NR (CP-OFDM, 1 RB, 50 MHz, QPSK, 30 kHz)    | TDD<br>5G NR FR1 | 7.89 | ± 9.6 % |
| 10799 | AAB | 5G NR (CP-OFDM, 1 RB, 60 MHz, QPSK, 30 kHz)    | TDD<br>5G NR FR1 | 7.93 | ± 9.6 % |
| 10801 | AAB | 5G NR (CP-OFDM, 1 RB, 80 MHz, QPSK, 30 kHz)    | TDD<br>5G NR FR1 | 7.89 | ± 9.6 % |
| 10802 | AAB | 5G NR (CP-OFDM, 1 RB, 90 MHz, QPSK, 30 kHz)    | TDD<br>5G NR FR1 | 7.87 | ± 9.6 % |
| 10803 | AAB | 5G NR (CP-OFDM, 1 RB, 100 MHz, QPSK, 30 kHz)   | TDD<br>5G NR FR1 | 7.93 | ± 9.6 % |
| 10805 | AAB | 5G NR (CP-OFDM, 50% RB, 10 MHz, QPSK, 30 kHz)  | TDD<br>5G NR FR1 | 8.34 | ± 9.6 % |
| 10806 | AAB | 5G NR (CP-OFDM, 50% RB, 15 MHz, QPSK, 30 kHz)  | TDD<br>5G NR FR1 | 8.37 | ± 9.6 % |
| 10809 | AAB | 5G NR (CP-OFDM, 50% RB, 30 MHz, QPSK, 30 kHz)  | TDD<br>5G NR FR1 | 8.34 | ± 9.6 % |
| 10810 | AAB | 5G NR (CP-OFDM, 50% RB, 40 MHz, QPSK, 30 kHz)  | TDD<br>5G NR FR1 | 8.34 | ± 9.6 % |
| 10812 | AAB | 5G NR (CP-OFDM, 50% RB, 60 MHz, QPSK, 30 kHz)  | TDD<br>5G NR FR1 | 8.35 | ± 9.6 % |
| 10817 | AAB | 5G NR (CP-OFDM, 100% RB, 5 MHz, QPSK, 30 kHz)  | TDD<br>5G NR FR1 | 8.35 | ± 9.6 % |
| 10818 | AAB | 5G NR (CP-OFDM, 100% RB, 10 MHz, QPSK, 30 kHz) | TDD 5G NR FR1    | 8.34 | ±9.6 %  |
| 10819 | AAB | 5G NR (CP-OFDM, 100% RB, 15 MHz, QPSK, 30 kHz) | TDD 5G NR FR1    | 8.33 | ± 9.6 % |
| 10820 | AAB | 5G NR (CP-OFDM, 100% RB, 20 MHz, QPSK, 30 kHz) | TDD 5G NR FR1    | 8.30 | ± 9.6 % |
| 10821 | AAB | 5G NR (CP-OFDM, 100% RB, 25 MHz, QPSK, 30 kHz) | TDD 5G NR FR1    | 8.41 | ± 9.6 % |
| 10822 | AAB | 5G NR (CP-OFDM, 100% RB, 30 MHz, QPSK, 30 kHz) | TDD 5G NR FR1    | 8.41 | ± 9.6 % |
|       | AAB | 5G NR (CP-OFDM, 100% RB, 40 MHz, QPSK, 30 kHz) | TDD              |      |         |
| 10823 |     |  | 5G NR FR1<br>TDD | 8.36 | ± 9.6 % |
| 10824 | AAB | 5G NR (CP-OFDM, 100% RB, 50 MHz, QPSK, 30 kHz) | 5G NR FR1        | 8.39 | ± 9.6 % |

|       | 1   |   | TDD                     | *************************************** |         |
|-------|-----|---|-------------------------|---|---------|
| 10825 | AAB | 5G NR (CP-OFDM, 100% RB, 60 MHz, QPSK, 30 kHz)      | 5G NR FR1               | 8,41                                    | ± 9.6 % |
| 10827 | AAB | 5G NR (CP-OFDM, 100% RB, 80 MHz, QPSK, 30 kHz)      | 5G NR FR1               | 8.42                                    | ± 9.6 % |
| 10828 | AAB | 5G NR (CP-OFDM, 100% RB, 90 MHz, QPSK, 30 kHz)      | 5G NR FR1               | 8.43                                    | ± 9.6 % |
| 10829 | AAB | 5G NR (CP-OFDM, 100% RB, 100 MHz, QPSK, 30 kHz)     | 5G NR FR1<br>TDD        | 8.40                                    | ± 9.6 % |
| 10830 | AAB | 5G NR (CP-OFDM, 1 RB, 10 MHz, QPSK, 60 kHz)         | 5G NR FR1               | 7.63                                    | ± 9.6 % |
| 10831 | AAB | 5G NR (CP-OFDM, 1 RB, 15 MHz, QPSK, 60 kHz)         | 5G NR FR1               | 7.73                                    | ± 9.6 % |
| 10832 | AAB | 5G NR (CP-OFDM, 1 RB, 20 MHz, QPSK, 60 kHz)         | 5G NR FR1<br>TDD        | 7.74                                    | ± 9.6 % |
| 10833 | AAB | 5G NR (CP-OFDM, 1 RB, 25 MHz, QPSK, 60 kHz)         | 5G NR FR1               | 7.70                                    | ± 9.6 % |
| 10834 | AAB | 5G NR (CP-OFDM, 1 RB, 30 MHz, QPSK, 60 kHz)         | 5G NR FR1<br>TDD        | 7.75                                    | ± 9.6 % |
| 10835 | AAB | 5G NR (CP-OFDM, 1 RB, 40 MHz, QPSK, 60 kHz)         | 5G NR FR1               | 7.70                                    | ± 9.6 % |
| 10836 | AAB | 5G NR (CP-OFDM, 1 RB, 50 MHz, QPSK, 60 kHz)         | 5G NR FR1               | 7.66                                    | ± 9.6 % |
| 10837 | AAB | 5G NR (CP-OFDM, 1 RB, 60 MHz, QPSK, 60 kHz)         | 5G NR FR1               | 7.68                                    | ± 9.6 % |
| 10839 | AAB | 5G NR (CP-OFDM, 1 RB, 80 MHz, QPSK, 60 kHz)         | 5G NR FR1               | 7.70                                    | ± 9.6 % |
| 10840 | AAB | 5G NR (CP-OFDM, 1 RB, 90 MHz, QPSK, 60 kHz)         | 5G NR FR1               | 7.67                                    | ± 9.6 % |
| 10841 | AAB | 5G NR (CP-OFDM, 1 RB, 100 MHz, QPSK, 60 kHz)        | TDD<br>5G NR FR1        | 7.71                                    | ± 9.6 % |
| 10843 | AAB | 5G NR (CP-OFDM, 50% RB, 15 MHz, QPSK, 60 kHz)       | TDD<br>5G NR FR1        | 8.49                                    | ± 9.6 % |
| 10844 | AAB | 5G NR (CP-OFDM, 50% RB, 20 MHz, QPSK, 60 kHz)       | 5G NR FR1               | 8.34                                    | ± 9.6 % |
| 10846 | AAB | 5G NR (CP-OFDM, 50% RB, 30 MHz, QPSK, 60 kHz)       | 5G NR FR1               | 8.41                                    | ± 9.6 % |
| 10854 | AAB | 5G NR (CP-OFDM, 100% RB, 10 MHz, QPSK, 60 kHz)      | TDD<br>5G NR FR1<br>TDD | 8.34                                    | ± 9.6 % |
| 10855 | AAB | 5G NR (CP-OFDM, 100% RB, 15 MHz, QPSK, 60 kHz)      | 5G NR FR1               | 8.36                                    | ± 9.6 % |
| 10856 | AAB | 5G NR (CP-OFDM, 100% RB, 20 MHz, QPSK, 60 kHz)      | 5G NR FR1               | 8.37                                    | ± 9.6 % |
| 10857 | AAB | 5G NR (CP-OFDM, 100% RB, 25 MHz, QPSK, 60 kHz)      | 5G NR FR1               | 8.35                                    | ± 9.6 % |
| 10858 | AAB | 5G NR (CP-OFDM, 100% RB, 30 MHz, QPSK, 60 kHz)      | 5G NR FR1               | 8.36                                    | ± 9.6 % |
| 10859 | AAB | 5G NR (CP-OFDM, 100% RB, 40 MHz, QPSK, 60 kHz)      | TDD<br>5G NR FR1        | 8.34                                    | ± 9.6 % |
| 10860 | AAB | 5G NR (CP-OFDM, 100% RB, 50 MHz, QPSK, 60 kHz)      | 5G NR FR1<br>TDD        | 8.41                                    | ± 9.6 % |
| 10861 | AAB | 5G NR (CP-OFDM, 100% RB, 60 MHz, QPSK, 60 kHz)      | 5G NR FR1               | 8.40                                    | ± 9.6 % |
| 10863 | AAB | 5G NR (CP-OFDM, 100% RB, 80 MHz, QPSK, 60 kHz)      | 5G NR FR1               | 8.41                                    | ± 9.6 % |
| 10864 | AAB | 5G NR (CP-OFDM, 100% RB, 90 MHz, QPSK, 60 kHz)      | TDD<br>5G NR FR1        | 8.37                                    | ± 9.6 % |
| 10865 | AAB | 5G NR (CP-OFDM, 100% RB, 100 MHz, QPSK, 60 kHz)     | 5G NR FR1               | 8.41                                    | ± 9.6 % |
| 10866 | AAB | 5G NR (DFT-s-OFDM, 1 RB, 100 MHz, QPSK, 30 kHz)     | 5G NR FR1               | 5.68                                    | ± 9.6 % |
| 10868 | AAB | 5G NR (DFT-s-OFDM, 100% RB, 100 MHz, QPSK, 30 kHz)  | 5G NR FR1<br>TDD        | 5.89                                    | ± 9.6 % |
| 10869 | AAC | 5G NR (DFT-s-OFDM, 1 RB, 100 MHz, QPSK, 120 kHz)    | 5G NR FR2               | 5.75                                    | ± 9.6 % |
| 10870 | AAC | 5G NR (DFT-s-OFDM, 100% RB, 100 MHz, QPSK, 120 kHz) | 5G NR FR2               | 5.86                                    | ± 9.6 % |

|       |     |  | TDD              | 1    | T       |
|-------|-----|--|------------------|------|---------|
| 10871 | AAC | 5G NR (DFT-s-OFDM, 1 RB, 100 MHz, 16QAM, 120 kHz)    | 5G NR FR2        |      | 1       |
| 40070 |     | '  | TDD              | 5.75 | ± 9.6 % |
| 10872 | AAC | 5G NR (DFT-s-OFDM, 100% RB, 100 MHz, 16QAM, 120 kHz) | 5G NR FR2<br>TDD | 6.52 | ± 9.6 % |
| 10873 | AAC | 5G NR (DFT-s-OFDM, 1 RB, 100 MHz, 64QAM, 120 kHz)    | 5G NR FR2        | 6.61 | ± 9.6 % |
| 10874 | AAC | 5G NR (DFT-s-OFDM, 100% RB, 100 MHz, 64QAM, 120 kHz) | 5G NR FR2<br>TDD | 6.65 | ± 9.6 % |
| 10875 | AAC | 5G NR (CP-OFDM, 1 RB, 100 MHz, QPSK, 120 kHz)        | 5G NR FR2<br>TDD | 7.78 | ± 9.6 % |
| 10876 | AAC | 5G NR (CP-OFDM, 100% RB, 100 MHz, QPSK, 120 kHz)     | 5G NR FR2        | 8.39 | ± 9.6 % |
| 10877 | AAC | 5G NR (CP-OFDM, 1 RB, 100 MHz, 16QAM, 120 kHz)       | 5G NR FR2        | 7.95 | ± 9.6 % |
| 10878 | AAC | 5G NR (CP-OFDM, 100% RB, 100 MHz, 16QAM, 120 kHz)    | 5G NR FR2        | 8.41 | ± 9.6 % |
| 10879 | AAC | 5G NR (CP-OFDM, 1 RB, 100 MHz, 64QAM, 120 kHz)       | 5G NR FR2        | 8.12 | ± 9.6 % |
| 10880 | AAC | 5G NR (CP-OFDM, 100% RB, 100 MHz, 64QAM, 120 kHz)    | 5G NR FR2        | 8.38 | ± 9.6 % |
| 10881 | AAC | 5G NR (DFT-s-OFDM, 1 RB, 50 MHz, QPSK, 120 kHz)      | 5G NR FR2        | 5.75 | ± 9.6 % |
| 10882 | AAC | 5G NR (DFT-s-OFDM, 100% RB, 50 MHz, QPSK, 120 kHz)   | 5G NR FR2        | 5.96 | ±9.6%   |
| 10883 | AAC | 5G NR (DFT-s-OFDM, 1 RB, 50 MHz, 16QAM, 120 kHz)     | 5G NR FR2        | 6.57 | ± 9.6 % |
| 10884 | AAC | 5G NR (DFT-s-OFDM, 100% RB, 50 MHz, 16QAM, 120 kHz)  | TDD<br>5G NR FR2 | 6.53 | ± 9.6 % |
| 10885 | AAC | 5G NR (DFT-s-OFDM, 1 RB, 50 MHz, 64QAM, 120 kHz)     | TDD<br>5G NR FR2 | 6.61 | ± 9.6 % |
| 10886 | AAC | 5G NR (DFT-s-OFDM, 100% RB, 50 MHz, 64QAM, 120 kHz)  | TDD<br>5G NR FR2 | 6.65 | ± 9.6 % |
| 10887 | AAC | 5G NR (CP-OFDM, 1 RB, 50 MHz, QPSK, 120 kHz)         | TDD<br>5G NR FR2 | 7.78 | ± 9.6 % |
| 10888 | AAC | 5G NR (CP-OFDM, 100% RB, 50 MHz, QPSK, 120 kHz)      | 5G NR FR2        | 8.35 | ± 9.6 % |
| 10889 | AAC | 5G NR (CP-OFDM, 1 RB, 50 MHz, 16QAM, 120 kHz)        | TDD 5G NR FR2    | 8.02 | ± 9.6 % |
| 10890 | AAC | 5G NR (CP-OFDM, 100% RB, 50 MHz, 16QAM, 120 kHz)     | TDD<br>5G NR FR2 | 8.40 | ± 9.6 % |
| 10891 | AAC | 5G NR (CP-OFDM, 1 RB, 50 MHz, 64QAM, 120 kHz)        | TDD<br>5G NR FR2 | 8.13 | ± 9.6 % |
| 10892 | AAC | 5G NR (CP-OFDM, 100% RB, 50 MHz, 64QAM, 120 kHz)     | 5G NR FR2<br>TDD | 8.41 | ± 9.6 % |

<sup>&</sup>lt;sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

# Calibration Laboratory of Schmid & Partner

Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA

Multilateral Agreement for the recognition of calibration certificates

Client

**PC Test** 

Certificate No: EX3-7357\_Apr19

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## **CALIBRATION CERTIFICATE**

Object

EX3DV4 - SN:7357

Calibration procedure(s)

QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v5, QA CAL-23.v5,

QA CAL-25.v7

Calibration procedure for dosimetric E-field probes

BN 4-29-2010

Calibration date:

April 24, 2019

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|------------------|-----------------------------------|------------------------|
| Power meter NRP            | SN: 104778       | 03-Apr-19 (No. 217-02892/02893)   | Apr-20                 |
| Power sensor NRP-Z91       | SN: 103244       | 03-Apr-19 (No. 217-02892)         | Apr-20                 |
| Power sensor NRP-Z91       | SN: 103245       | 03-Apr-19 (No. 217-02893)         | Apr-20                 |
| Reference 20 dB Attenuator | SN: S5277 (20x)  | 04-Apr-19 (No. 217-02894)         | Apr-20                 |
| DAE4                       | SN: 660          | 19-Dec-18 (No. DAE4-660_Dec18)    | Dec-19                 |
| Reference Probe ES3DV2     | SN: 3013         | 31-Dec-18 (No. ES3-3013_Dec18)    | Dec-19                 |
| Secondary Standards        | (D               | Check Date (in house)             | Scheduled Check        |
| Power meter E4419B         | SN: GB41293874   | 06-Apr-16 (in house check Jun-18) | In house check: Jun-20 |
| Power sensor E4412A        | SN: MY41498087   | 06-Apr-16 (in house check Jun-18) | In house check; Jun-20 |
| Power sensor E4412A        | SN: 000110210    | 06-Apr-16 (in house check Jun-18) | In house check: Jun-20 |
| RF generator HP 8648C      | SN: US3642U01700 | 04-Aug-99 (in house check Jun-18) | In house check: Jun-20 |
| Network Analyzer E8358A    | SN: US41080477   | 31-Mar-14 (in house check Oct-18) | In house check: Oct-19 |

Calibrated by:

Claudio Leubler

Claudio Leubler

Laboratory Technician

Approved by:

Katja Pokovic

Technical Manager

Issued: April 24, 2019

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

### Calibration Laboratory of

Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland





S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL NORMx,y,z tissue simulating liquid sensitivity in free space

ConvF DCP sensitivity in TSL / NORMx,y,z diode compression point

CF A, B, C, D crest factor (1/duty\_cycle) of the RF signal modulation dependent linearization parameters

Polarization φ

φ rotation around probe axis

Polarization 9

9 rotation around an axis that is in the plane normal to probe axis (at measurement center),

i.e., 9 = 0 is normal to probe axis

Connector Angle

information used in DASY system to align probe sensor X to the robot coordinate system

### Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, ", "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from handheld and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### Methods Applied and Interpretation of Parameters:

- NORMx,y,z: Assessed for E-field polarization 9 = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide).
   NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)x,y,z = NORMx,y,z \* frequency\_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCPx,y,z: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters: Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORMx,y,z \* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy): in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle: The angle is assessed using the information gained by determining the NORMx (no uncertainty required).

EX3DV4 - SN:7357

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:7357

### **Basic Calibration Parameters**

|                               | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|-------------------------------|----------|----------|----------|-----------|
| Norm (μV/(V/m)²) <sup>A</sup> | 0.37     | 0.48     | 0.41     | ± 10.1 %  |
| DCP (mV) <sup>B</sup>         | 87.5     | 101.0    | 95.2     |           |

Calibration Results for Modulation Response

| UID             | Communication System Name   |   | A<br>dB | B<br>dBõV | С     | D<br>dB | VR<br>mV | Max<br>dev. | Max<br>Unc <sup>E</sup><br>(k=2) |
|-----------------|-----------------------------|---|---------|-----------|-------|---------|----------|-------------|----------------------------------|
| 0               | CW                          | Х | 0.00    | 0.00      | 1.00  | 0.00    | 175.5    | ± 2.7 %     | ± 4.7 %                          |
|                 |                             | Y | 0.00    | 0.00      | 1.00  | 1       | 162.7    |             |                                  |
|                 |                             | Z | 0.00    | 0.00      | 1.00  | 1       | 160.1    |             |                                  |
| 10352-          | Pulse Waveform (200Hz, 10%) | Х | 1.63    | 60.99     | 8.59  | 10.00   | 60.0     | ± 3.2 %     | ± 9.6 %                          |
| AAA             | · ·                         | Υ | 15.00   | 88.78     | 20.10 |         | 60.0     |             |                                  |
|                 |                             | Z | 1.92    | 62,77     | 9.39  | 1       | 60.0     |             |                                  |
| 10353-          | Pulse Waveform (200Hz, 20%) | Х | 1.28    | 62.05     | 7.66  | 6.99    | 80.0     | ± 2.1 %     | ± 9.6 %                          |
| AAA             |                             | Y | 15.00   | 92.12     | 20.60 |         | 80.0     |             |                                  |
|                 |                             | Z | 1.44    | 63.37     | 8.24  | 1       | 80.0     |             |                                  |
| 10354-          | Pulse Waveform (200Hz, 40%) | X | 0.53    | 60.00     | 5.08  | 3.98    | 95.0     | ± 1.2 %     | ± 9.6 %                          |
| AAA             |                             | Y | 15.00   | 98.74     | 22.38 |         | 95.0     |             |                                  |
|                 |                             | Z | 0.50    | 60.00     | 4.96  |         | 95.0     |             |                                  |
| 10355-  <br>AAA | Pulse Waveform (200Hz, 60%) | X | 0.34    | 60.00     | 3.46  | 2.22    | 120.0    | ± 1.3 %     | ± 9.6 %                          |
|                 |                             | Y | 15.00   | 122.09    | 31.59 |         | 120.0    |             |                                  |
|                 | <u> </u>                    | Z | 0.32    | 60.00     | 3.17  |         | 120.0    |             |                                  |
| 10387-          | QPSK Waveform, 1 MHz        | Х | 0.47    | 60.00     | 5.85  | 0.00    | 150.0    | ± 3.4 %     | ± 9.6 %                          |
| AAA             |                             | Υ | 0.84    | 63.60     | 10.73 |         | 150.0    |             |                                  |
|                 |                             | Z | 0.47    | 60.00     | 5.64  |         | 150.0    |             |                                  |
| 10388-          | QPSK Waveform, 10 MHz       | X | 2.22    | 69.17     | 16.45 | 0.00    | 150.0    | ± 1.2 %     | ± 9.6 %                          |
| AAA             |                             | Υ | 2.39    | 69.28     | 16.48 |         | 150.0    |             |                                  |
|                 |                             | Z | 2.05    | 67.86     | 15.44 | 1       | 150.0    |             |                                  |
| 10396-          | 64-QAM Waveform, 100 kHz    | Х | 1.74    | 66.32     | 18.65 | 3.01    | 150.0    | ± 6.4 %     | ± 9.6 %                          |
| AAA             |                             | Υ | 3.21    | 72.13     | 19.45 |         | 150.0    |             |                                  |
|                 |                             | Z | 2.50    | 68.64     | 18.00 |         | 150.0    |             |                                  |
| 10399-          | 64-QAM Waveform, 40 MHz     | X | 3.50    | 67.46     | 16.21 | 0.00    | 150.0    | ± 2.5 %     | ± 9.6 %                          |
| AAA             |                             | Υ | 3.59    | 67.57     | 16.11 |         | 150.0    |             |                                  |
|                 |                             | Z | 3.40    | 67.11     | 15.75 |         | 150.0    |             |                                  |
| 10414-          | WLAN CCDF, 64-QAM, 40MHz    | Х | 4.79    | 65.80     | 15.93 | 0.00    | 150.0    | ± 4.6 %     | ± 9.6 %                          |
| AAA             |                             | Υ | 4.92    | 65.80     | 15.71 | ]       | 150.0    |             |                                  |
|                 |                             | Z | 4.73    | 65.72     | 15.66 |         | 150.0    |             |                                  |

Note: For details on UID parameters see Appendix

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

A The uncertainties of Norm X,Y,Z do not affect the E²-field uncertainty inside TSL (see Pages 5 and 6).

B Numerical linearization parameter: uncertainty not required.

C Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:7357

### **Sensor Model Parameters**

|   | C1<br>fF | C2<br>fF | α<br>V <sup>-1</sup> | T1<br>ms.V <sup>-2</sup> | T2<br>ms.V <sup>-1</sup> | T3<br>ms | T4<br>V <sup>-2</sup> | T5<br>V <sup>-1</sup> | Т6   |
|---|----------|----------|----------------------|--------------------------|--------------------------|----------|-----------------------|-----------------------|------|
| X | 37.3     | 299.85   | 40.64                | 5.98                     | 0.77                     | 5.00     | 0.00                  | 0.00                  | 1.02 |
| Υ | 48.9     | 366.83   | 35.90                | 10.43                    | 0.11                     | 5.09     | 1.58                  | 0.24                  | 1.01 |
| Z | 37.8     | 294.77   | 38.42                | 5.12                     | 0.55                     | 5.04     | 0.00                  | 0.43                  | 1.01 |

### **Other Probe Parameters**

| Sensor Arrangement                            | Triangular |
|---|------------|
| Connector Angle (°)                           | 14.2       |
| Mechanical Surface Detection Mode             | enabled    |
| Optical Surface Detection Mode                | disabled   |
| Probe Overall Length                          | 337 mm     |
| Probe Body Diameter                           | 10 mm      |
| Tip Length                                    | 9 mm       |
| Tip Diameter                                  | 2.5 mm     |
| Probe Tip to Sensor X Calibration Point       | 1 mm       |
| Probe Tip to Sensor Y Calibration Point       | 1 mm       |
| Probe Tip to Sensor Z Calibration Point       | 1 mm       |
| Recommended Measurement Distance from Surface | 1.4 mm     |

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:7357

### Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative<br>Permittivity <sup>F</sup> | Conductivity (S/m) F | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup><br>(mm) | Unc<br>(k=2) |
|----------------------|---------------------------------------|----------------------|---------|---------|---------|--------------------|----------------------------|--------------|
| 64                   | 54.2                                  | 0.75                 | 14.77   | 14.77   | 14.77   | 0.00               | 1.00                       | ± 13.3 %     |
| 750                  | 41.9                                  | 0.89                 | 10.26   | 10.26   | 10.26   | 0.45               | 0.95                       | ± 12.0 %     |
| 835                  | 41.5                                  | 0.90                 | 9.91    | 9.91    | 9.91    | 0.53               | 0.85                       | ± 12.0 %     |
| 1750                 | 40.1                                  | 1.37                 | 8.69    | 8.69    | 8.69    | 0.35               | 0.80                       | ± 12.0 %     |
| 1900                 | 40.0                                  | 1.40                 | 8.26    | 8.26    | 8.26    | 0.33               | 0.84                       | ± 12.0 %     |
| 2300                 | 39.5                                  | 1.67                 | 7.70    | 7.70    | 7.70    | 0.33               | 0.85                       | ± 12.0 %     |
| 2450                 | 39.2                                  | 1.80                 | 7.57    | 7.57    | 7.57    | 0.39               | 0.85                       | ± 12.0 %     |
| 2600                 | 39.0                                  | 1.96                 | 7.31    | 7.31    | 7.31    | 0.40               | 0.80                       | ± 12.0 %     |
| 5250                 | 35.9                                  | 4.71                 | 5.45    | 5.45    | 5.45    | 0.40               | 1.80                       | ± 13.1 %     |
| 5600                 | 35.5                                  | 5.07                 | 4.85    | 4.85    | 4.85    | 0.40               | 1.80                       | ± 13.1 %     |
| 5750                 | 35.4                                  | 5.22                 | 5.06    | 5.06    | 5.06    | 0.40               | 1.80                       | ± 13.1 %     |

<sup>&</sup>lt;sup>c</sup> Frequency validity above 300 MHz of  $\pm$  100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to  $\pm$  50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is  $\pm$  10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to  $\pm$  110 MHz.

<sup>6</sup> MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz.

F At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

the ConvF uncertainty for indicated target tissue parameters.

Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:7357

### Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative<br>Permittivity <sup>F</sup> | Conductivity<br>(S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>6</sup><br>(mm) | Unc<br>(k=2) |
|----------------------|---------------------------------------|------------------------------------|---------|---------|---------|--------------------|----------------------------|--------------|
| 750                  | 55.5                                  | 0.96                               | 10.19   | 10.19   | 10.19   | 0.37               | 0.96                       | ± 12.0 %     |
| 835                  | 55.2                                  | 0.97                               | 9.95    | 9.95    | 9.95    | 0.47               | 0.80                       | ± 12.0 %     |
| 1750                 | 53.4                                  | 1.49                               | 8.26    | 8.26    | 8.26    | 0.35               | 0.85                       | ± 12.0 %     |
| 1900                 | 53.3                                  | 1.52                               | 7.93    | 7.93    | 7.93    | 0.32               | 0.90                       | ± 12.0 %     |
| 2300                 | 52.9                                  | 1.81                               | 7.72    | 7.72    | 7.72    | 0.30               | 0.85                       | ± 12.0 %     |
| 2450                 | 52.7                                  | 1.95                               | 7.59    | 7.59    | 7.59    | 0.35               | 0.86                       | ± 12.0 %     |
| 2600                 | 52.5                                  | 2.16                               | 7.39    | 7.39    | 7.39    | 0.32               | 0.89                       | ± 12.0 %     |
| 5250                 | 48.9                                  | 5.36                               | 4.61    | 4.61    | 4.61    | 0.50               | 1.90                       | ± 13.1 %     |
| 5600                 | 48.5                                  | 5.77                               | 4.03    | 4.03    | 4.03    | 0.50               | 1.90                       | ± 13.1 %     |
| 5750                 | 48.3                                  | 5.94                               | 4.15    | 4.15    | 4.15    | 0.50               | 1.90                       | ± 13.1 %     |

<sup>&</sup>lt;sup>c</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz.

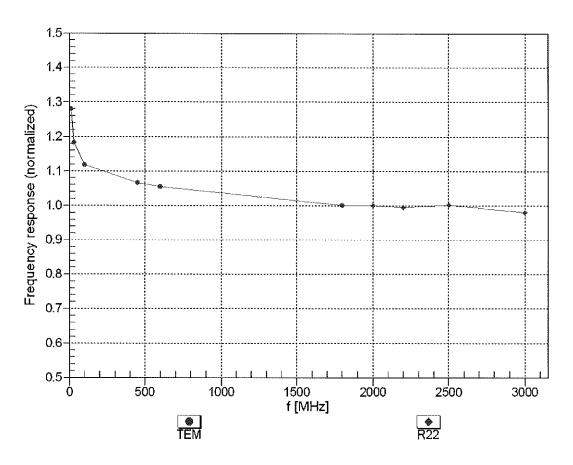
F At frequencies below 3 GHz, the validity of tissue parameters (e and a) can be relayed to ± 10% if liquid comprehensition formula is applied to

F At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

the ConvF uncertainty for indicated target tissue parameters.

Galpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

# Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)

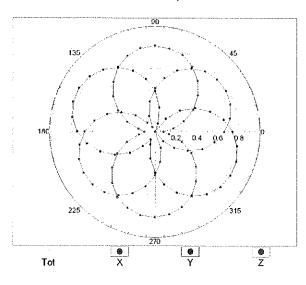


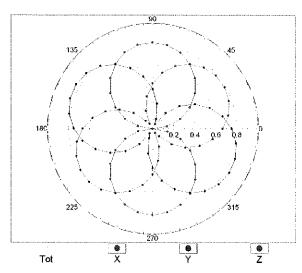
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

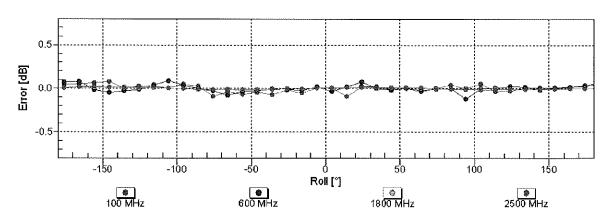
# Receiving Pattern ( $\phi$ ), $\vartheta = 0^{\circ}$

f=600 MHz,TEM

f=1800 MHz,R22

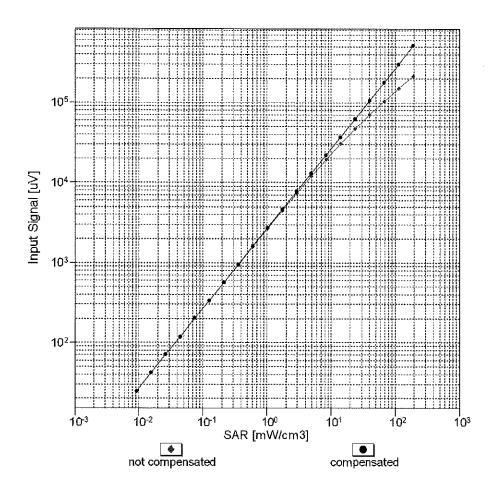


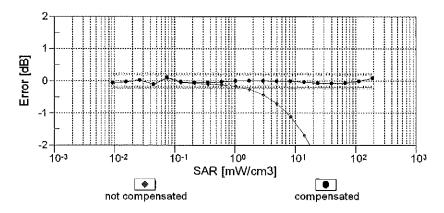




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

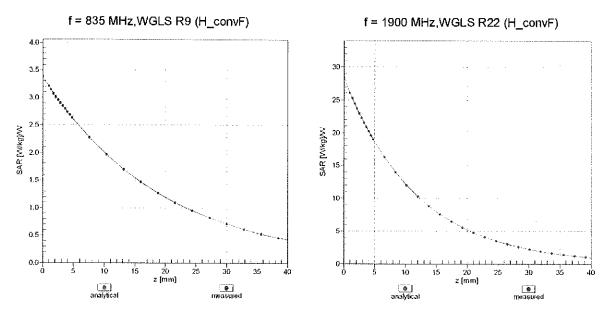
## Dynamic Range f(SAR<sub>head</sub>) (TEM cell , f<sub>eval</sub>= 1900 MHz)



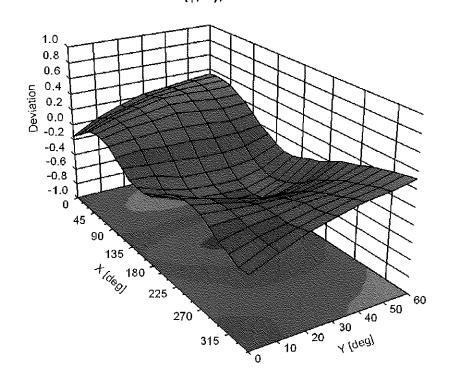


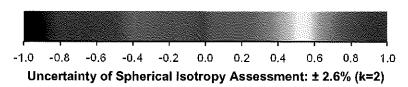
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

## **Conversion Factor Assessment**



**Deviation from Isotropy in Liquid** Error (φ, θ), f = 900 MHz





## **Appendix: Modulation Calibration Parameters**

| UID            | Rev | Communication System Name  | Group       | PAR<br>(dB)  | Unc <sup>E</sup><br>(k=2) |
|----------------|-----|--|-------------|--------------|---------------------------|
| 0              |     | CW   | CW          | 0.00         | ± 4.7 %                   |
| 10010          | CAA | SAR Validation (Square, 100ms, 10ms)   | Test        | 10.00        | ± 9.6 %                   |
| 10011          | CAB | UMTS-FDD (WCDMA)   | WCDMA       | 2.91         | ± 9.6 %                   |
| 10012          | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)   | WLAN        | 1.87         | ± 9.6 %                   |
| 10013          | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)  | WLAN        | 9.46         | ± 9.6 %                   |
| 10021          | DAC | GSM-FDD (TDMA, GMSK)   | GSM         | 9.39         | ±9.6%                     |
| 10023          | DAC | GPRS-FDD (TDMA, GMSK, TN 0)  | GSM         | 9.57         | ± 9.6 %                   |
| 10024          | DAC | GPRS-FDD (TDMA, GMSK, TN 0-1)  | GSM         | 6.56         | ± 9.6 %                   |
| 10025          | DAC | EDGE-FDD (TDMA, 8PSK, TN 0)  | GSM         | 12.62        | ±9.6%                     |
| 10026          | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-1)  | GSM         | 9.55         | ±9.6%                     |
| 10027          | DAC | GPRS-FDD (TDMA, GMSK, TN 0-1-2)  | GSM         | 4.80         | ± 9.6 %                   |
| 10028          | DAC | GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)  | GSM         | 3.55         | ± 9.6 %                   |
| 10029          | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-1-2)  | GSM         | 7.78         | ± 9.6 %                   |
| 10030          | CAA | IEEE 802.15.1 Bluetooth (GFSK, DH1)  | Bluetooth   | 5.30         | ± 9.6 %                   |
| 10031          | CAA | IEEE 802.15.1 Bluetooth (GFSK, DH3)  | Bluetooth   | 1.87         | ± 9.6 %                   |
| 10032          | CAA | IEEE 802.15.1 Bluetooth (GFSK, DH5)  | Bluetooth   | 1.16         | ±9.6%                     |
| 10033          | CAA | IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH1)  | Bluetooth   | 7.74         | ±96%                      |
| 10034          | CAA | IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH3)  | Bluetooth   | 4.53         | ±9.6%                     |
| 10035          | CAA | IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH5)  | Bluetooth   | 3.83         | ±9.6%                     |
| 10036          | CAA | IEEE 802.15.1 Bluetooth (8-DPSK, DH1)  | Bluetooth   | 8.01         | ±9.6 %                    |
| 10037          | CAA | IEEE 802.15.1 Bluetooth (8-DPSK, DH3)  | Bluetooth   | 4.77         | ±9.6 %                    |
| 10038          | CAA | IEEE 802.15.1 Bluetooth (8-DPSK, DH5)  | Bluetooth   | 4.10         | ±9.6 %                    |
| 10039          | CAB | CDMA2000 (1xRTT, RC1)  | CDMA2000    | 4.57         | ± 9.6 %                   |
| 10042          | CAB | IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Halfrate)                                  | AMPS        | 7.78         | ± 9.6 %                   |
| 10044          | CAA | IS-91/EIA/TIA-553 FDD (FDMA, FM)   | AMPS        | 0.00         | ±9.6 %                    |
| 10048          | CAA | DECT (TDD, TDMA/FDM, GFSK, Full Slot, 24)  | DECT        | 13.80        | ± 9.6 %                   |
| 10049          | CAA | DECT (TDD, TDMA/FDM, GFSK, Double Slot, 12)  | DECT        | 10.79        | ±9.6%                     |
| 10056          | CAA | UMTS-TDD (TD-SCDMA, 1.28 Mcps)   | TD-SCDMA    | 11.01        | ±9.6 %                    |
| 10058          | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3)  | GSM<br>WLAN | 6.52         | ± 9.6 %                   |
| 10059<br>10060 | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps)   | WLAN        | 2.12<br>2.83 | ± 9.6 %<br>± 9.6 %        |
| 10060          | CAB | IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps) IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps) | WLAN        | 3.60         | ± 9.6 %                   |
| 10061          | CAC | IEEE 802.11a/h WiFi 5 GHz (DS35, 11 Mbps)  | WLAN        | 8.68         | ± 9.6 %                   |
| 10062          | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)   | WLAN        | 8.63         | ± 9.6 %                   |
| 10063          | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps)  | WLAN        | 9.09         | ± 9.6 %                   |
| 10065          | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps)  | WLAN        | 9.00         | ± 9.6 %                   |
| 10066          | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 16 Mbps)  | WLAN        | 9.38         | ± 9.6 %                   |
| 10067          | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps)  | WLAN        | 10.12        | ± 9.6 %                   |
| 10068          | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps)  | WLAN        | 10.24        | ± 9.6 %                   |
| 10069          | CAC | IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps)  | WLAN        | 10.56        | ± 9.6 %                   |
| 10071          | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 9 Mbps)  | WLAN        | 9.83         | ±9.6 %                    |
| 10071          | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 12 Mbps)                                       | WLAN        | 9.62         | ± 9.6 %                   |
| 10073          | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 18 Mbps)                                       | WLAN        | 9.94         | ± 9.6 %                   |
| 10074          | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 24 Mbps)                                       | WLAN        | 10.30        | ± 9.6 %                   |
| 10075          | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 36 Mbps)                                       | WLAN        | 10.77        | ±9.6 %                    |
| 10076          | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 48 Mbps)                                       | WLAN        | 10.94        | ±9.6%                     |
| 10077          | CAB | IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)                                       | WLAN        | 11.00        | ±9.6 %                    |
| 10081          | CAB | CDMA2000 (1xRTT, RC3)  | CDMA2000    | 3.97         | ± 9.6 %                   |
| 10082          | CAB | IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Fullrate)                                  | AMPS        | 4.77         | ± 9.6 %                   |
| 10090          | DAC | GPRS-FDD (TDMA, GMSK, TN 0-4)  | GSM         | 6.56         | ± 9.6 %                   |
| 10097          | CAB | UMTS-FDD (HSDPA)   | WCDMA       | 3.98         | ± 9.6 %                   |
| 10098          | CAB | UMTS-FDD (HSUPA, Subtest 2)  | WCDMA       | 3.98         | ± 9.6 %                   |
| 10099          | DAC | EDGE-FDD (TDMA, 8PSK, TN 0-4)  | GSM         | 9.55         | ± 9.6 %                   |
| 10100          | CAE | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)   | LTE-FDD     | 5.67         | ± 9.6 %                   |
| 10101          | CAE | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)   | LTE-FDD     | 6.42         | ± 9.6 %                   |
| 10102          | CAE | LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)   | LTE-FDD     | 6.60         | ± 9.6 %                   |
| 10103          | CAG | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)   | LTE-TDD     | 9.29         | ± 9.6 %                   |
| 10104          | CAG | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)   | LTE-TDD     | 9.97         | ± 9.6 %                   |
| 10105          | CAG | LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)   | LTE-TDD     | 10.01        | ± 9.6 %                   |
| 10100          | CAG | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)   |             |              |                           |

|       |     |  |         |             | ,       |
|-------|-----|--|---------|-------------|---------|
| 10109 | CAG | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)     | LTE-FDD | 6.43        | ± 9.6 % |
| 10110 | CAG | LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)        | LTE-FDD | 5.75        | ± 9.6 % |
| 10111 | CAG | LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)      | LTE-FDD | 6.44        | ± 9.6 % |
| 10112 | CAG | LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)     | LTE-FDD | 6.59        | ± 9.6 % |
| 10113 | CAG | LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)      | LTE-FDD |             |         |
| 10114 | CAC | IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)  | ****    | 6.62        | ± 9.6 % |
| 10115 | CAC |  | WLAN    | 8.10        | ± 9.6 % |
|       |     | IEEE 802.11n (HT Greenfield, 81 Mbps, 16-QAM)  | WLAN    | 8.46        | ± 9.6 % |
| 10116 | CAC | IEEE 802.11n (HT Greenfield, 135 Mbps, 64-QAM) | WLAN    | 8.15        | ± 9.6 % |
| 10117 | CAC | IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)       | WLAN    | 8.07        | ± 9.6 % |
| 10118 | CAC | IEEE 802.11n (HT Mixed, 81 Mbps, 16-QAM)       | WLAN    | 8.59        | ± 9.6 % |
| 10119 | CAC | IEEE 802.11n (HT Mixed, 135 Mbps, 64-QAM)      | WLAN    | 8.13        | ± 9.6 % |
| 10140 | CAE | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)     | LTE-FDD | 6.49        | ± 9.6 % |
| 10141 | CAE | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)     | LTE-FDD | 6.53        | ± 9.6 % |
| 10142 | CAE | LTE-FDD (SC-FDMA, 100% RB, 3 MHz, QPSK)        | LTE-FDD | 5.73        | ±9.6%   |
| 10143 | CAE | LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)      | LTE-FDD | 6.35        | ± 9.6 % |
| 10144 | CAE | LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)      | LTE-FDD | 6.65        | ± 9.6 % |
| 10145 | CAF | LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)      | LTE-FDD | 5.76        | ± 9.6 % |
| 10146 | CAF | LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)    | LTE-FDD | 6.41        |         |
| 10147 | CAF | LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)    |         |             | ± 9.6 % |
| 10149 | CAE | LTE EDD (SC EDMA 50% PB 20 MHz 46 OAM)         | LTE-FDD | 6.72        | ± 9.6 % |
| 10149 | CAE | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)      | LTE-FDD | 6.42        | ± 9.6 % |
| 10150 | ·   | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)      | LTE-FDD | 6.60        | ± 9.6 % |
|       | CAG | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)        | LTE-TDD | 9.28        | ± 9.6 % |
| 10152 | CAG | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)      | LTE-TDD | 9.92        | ± 9.6 % |
| 10153 | CAG | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)      | LTE-TDD | 10.05       | ± 9.6 % |
| 10154 | CAG | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)        | LTE-FDD | 5.75        | ± 9.6 % |
| 10155 | CAG | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)      | LTE-FDD | 6.43        | ± 9.6 % |
| 10156 | CAG | LTE-FDD (SC-FDMA, 50% RB, 5 MHz, QPSK)         | LTE-FDD | 5.79        | ± 9.6 % |
| 10157 | CAG | LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)       | LTE-FDD | 6.49        | ± 9.6 % |
| 10158 | CAG | LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)      | LTE-FDD | 6.62        | ± 9.6 % |
| 10159 | CAG | LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)       | LTE-FDD | 6.56        | ± 9.6 % |
| 10160 | CAE | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)        | LTE-FDD |             |         |
| 10161 | CAE | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)      |         | 5.82        | ± 9.6 % |
| 10162 | CAE | LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)      | LTE-FDD | 6.43        | ± 9.6 % |
| 10166 | CAF |  | LTE-FDD | 6.58        | ± 9.6 % |
| 10167 | CAF | LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)       | LTE-FDD | 5.46        | ± 9.6 % |
|       | -   | LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)     | LTE-FDD | 6.21        | ± 9.6 % |
| 10168 | CAF | LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)     | LTE-FDD | 6.79        | ±9.6 %  |
| 10169 | CAE | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)          | LTE-FDD | 5.73        | ±9.6%   |
| 10170 | CAE | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)        | LTE-FDD | 6.52        | ±9.6%   |
| 10171 | AAE | LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)        | LTE-FDD | 6.49        | ± 9.6 % |
| 10172 | CAG | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)          | LTE-TDD | 9.21        | ± 9.6 % |
| 10173 | CAG | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)        | LTE-TDD | 9.48        | ±9.6%   |
| 10174 | CAG | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)        | LTE-TDD | 10.25       | ± 9.6 % |
| 10175 | CAG | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)          | LTE-FDD | 5.72        | ± 9.6 % |
| 10176 | CAG | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)        | LTE-FDD | 6.52        | ± 9.6 % |
| 10177 | CAI | LTE-FDD (SC-FDMA, 1 RB, 5 MHz, QPSK)           | LTE-FDD | <del></del> |         |
| 10178 | CAG | LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)         | LTE-FDD | 5.73        | ±9.6%   |
| 10179 | CAG | LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)        |         | 6.52        | ±9.6%   |
| 10180 | CAG | LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)         | LTE-FDD | 6.50        | ± 9.6 % |
| 10181 | CAE | LITE FOD (SC FOMA 4 DR 45 MUL ODOM)            | LTE-FDD | 6.50        | ±9.6%   |
|       |     | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)          | LTE-FDD | 5.72        | ± 9.6 % |
| 10182 | CAE | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)        | LTE-FDD | 6.52        | ± 9.6 % |
| 10183 | AAD | LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)        | LTE-FDD | 6.50        | ± 9.6 % |
| 10184 | CAE | LTE-FDD (SC-FDMA, 1 RB, 3 MHz, QPSK)           | LTE-FDD | 5.73        | ± 9.6 % |
| 10185 | CAE | LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)         | LTE-FDD | 6.51        | ± 9.6 % |
| 10186 | AAE | LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)         | LTE-FDD | 6.50        | ± 9.6 % |
| 10187 | CAF | LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)         | LTE-FDD | 5.73        | ±9.6 %  |
| 10188 | CAF | LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)       | LTE-FDD | 6.52        | ± 9.6 % |
| 10189 | AAF | LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)       | LTE-FDD | 6.50        | ± 9.6 % |
| 10193 | CAC | IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)   | WLAN    | 8.09        | ± 9.6 % |
| 10194 | CAC | IEEE 802.11n (HT Greenfield, 39 Mbps, 16-QAM)  |         |             |         |
| 10195 | CAC | IEEE 802.11n (HT Greenfield, 65 Mbps, 64-QAM)  | WLAN    | 8.12        | ±9.6%   |
| 10196 | CAC | IEEE 802.11n (HT Greenlieid, 65 Mbps, 64-QAM)  | WLAN    | 8.21        | ± 9.6 % |
| 10190 | CAC |  | WLAN    | 8.10        | ± 9.6 % |
|       |     | IEEE 802.11n (HT Mixed, 39 Mbps, 16-QAM)       | WLAN    | 8.13        | ±9.6%   |
| 10198 | CAC | IEEE 802.11n (HT Mixed, 65 Mbps, 64-QAM)       | WLAN    | 8.27        | ± 9.6 % |
| 10219 | CAC | IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)        | WLAN    | 8.03        | ± 9.6 % |
|       |     |  |         |             |         |

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|----------------|------------|--|----------------------|---------------|--------------------|
| 10220          | CAC        | IEEE 802.11n (HT Mixed, 43.3 Mbps, 16-QAM)   | WLAN                 | 8.13          | ± 9.6 %            |
| 10221          | CAC        | IEEE 802.11n (HT Mixed, 72.2 Mbps, 64-QAM)   | WLAN                 | 8.27          | ± 9.6 %            |
| 10222          | CAC        | IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)   | WLAN WLAN            | 8.06<br>8.48  | ± 9.6 %<br>± 9.6 % |
| 10223          | CAC        | IEEE 802.11n (HT Mixed, 90 Mbps, 16-QAM) IEEE 802.11n (HT Mixed, 150 Mbps, 64-QAM) | WLAN                 | 8.08          | ±9.6 %             |
| 10225          | CAB        | UMTS-FDD (HSPA+)   | WCDMA ·              | 5.97          | ± 9.6 %            |
| 10226          | CAA        | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)   | LTE-TDD              | 9.49          | ± 9.6 %            |
| 10227          | CAA        | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)   | LTE-TDD              | 10.26         | ± 9.6 %            |
| 10228          | CAA        | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)   | LTE-TDD              | 9.22          | ±9.6 %             |
| 10229          | CAC        | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)   | LTE-TDD              | 9,48          | ±9.6 %             |
| 10230          | CAC        | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)   | LTE-TDD              | 10.25         | ± 9.6 %            |
| 10231          | CAC        | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK)   | LTE-TDD              | 9,19          | ± 9.6 %            |
| 10232          | CAF        | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)   | LTE-TDD              | 9.48          | ± 9.6 %            |
| 10233          | CAF        | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)   | LTE-TDD              | 10.25         | ± 9.6 %            |
| 10234          | CAF        | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK)   | LTE-TDD              | 9.21          | ±9.6%              |
| 10235          | CAF        | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)  | LTE-TDD              | 9.48          | ±9.6%              |
| 10236          | CAF        | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)  | LTE-TDD              | 10.25         | ± 9.6 %            |
| 10237          | CAF        | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)  | LTE-TDD              | 9.21          | ± 9.6 %            |
| 10238          | CAF        | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)  | LTE-TDD              | 9.48          | ± 9.6 %            |
| 10239          | CAF        | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)  | LTE-TDD              | 10.25         | ± 9.6 %            |
| 10240          | CAF        | LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK)  | LTE-TDD              | 9.21          | ± 9.6 %            |
| 10241          | CAA        | LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)   | LTE-TDD              | 9.82          | ± 9.6 %            |
| 10242          | CAA        | LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)   | LTE-TDD              | 9.86          | ±9.6 %             |
| 10243          | CAA        | LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)   | LTE-TDD              | 9.46          | ± 9.6 %            |
| 10244          | CAC        | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)   | LTE-TDD              | 10.06         | ±9.6%              |
| 10245          | CAC        | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)   | LTE-TDD              | 10.06         | ± 9.6 %            |
| 10246          | CAC        | LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK)   | LTE-TDD              | 9.30          | ±9.6 %             |
| 10247          | CAF        | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)   | LTE-TDD              | 9.91          | ±9.6 %<br>±9.6 %   |
| 10248          | CAF        | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)   | LTE-TDD<br>LTE-TDD   | 10.09<br>9.29 | ± 9.6 %            |
| 10249<br>10250 | CAF        | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK) LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)   | LTE-TDD              | 9.81          | ± 9.6 %            |
| 10250          | CAF        | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)  | LTE-TOD              | 10.17         | ±9.6 %             |
| 10251          | CAF        | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)  | LTE-TOD              | 9.24          | ± 9.6 %            |
| 10252          | CAF        | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)  | LTE-TDD              | 9.90          | ± 9.6 %            |
| 10254          | CAF        | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)  | LTE-TDD              | 10.14         | ± 9.6 %            |
| 10255          | CAF        | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK)  | LTE-TDD              | 9.20          | ± 9.6 %            |
| 10256          | CAA        | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)  | LTE-TDD              | 9.96          | ± 9.6 %            |
| 10257          | CAA        | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)  | LTE-TDD              | 10.08         | ± 9.6 %            |
| 10258          | CAA        | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)  | LTE-TDD              | 9.34          | ±9.6%              |
| 10259          | CAC        | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)  | LTE-TDD              | 9.98          | ±9.6%              |
| 10260          | CAC        | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)  | LTE-TDD              | 9.97          | ±9.6%              |
| 10261          | CAC        | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK)  | LTE-TDD              | 9.24          | ±9.6%              |
| 10262          | CAF        | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)  | LTE-TDD              | 9.83          | ±9.6 %             |
| 10263          | CAF        | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)  | LTE-TDD              | 10.16         | ± 9.6 %            |
| 10264          | CAF        | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK)  | LTE-TDD              | 9.23          | ± 9.6 %            |
| 10265          | CAF        | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)   | LTE-TDD              | 9.92          | ± 9.6 %            |
| 10266          | CAF        | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)   | LTE-TDD              | 10.07         | ± 9.6 %            |
| 10267          | CAF        | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)   | LTE-TDD              | 9.30          | ± 9.6 %            |
| 10268          | CAF        | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)   | LTE-TDD              | 10.06         | ± 9.6 %            |
| 10269          | CAF        | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)   | LTE-TDD              | 10.13         | ± 9.6 %            |
| 10270          | CAF        | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK)   | LTE-TDD              | 9.58          | ± 9.6 %            |
| 10274          | CAB        | UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)  | WCDMA                | 4.87          | ± 9.6 %            |
| 10275          | CAB        | UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)   | WCDMA                | 3,96          | ± 9.6 %            |
| 10277          | CAA        | PHS (QPSK)   | PHS                  | 11.81         | ± 9.6 %            |
| 10278          | CAA        | PHS (QPSK, BW 884MHz, Rolloff 0.5)   | PHS                  | 11.81         | ± 9.6 %            |
| 10279          | CAA        | PHS (QPSK, BW 884MHz, Rolloff 0.38)  | PHS<br>CDMA2000      | 12.18<br>3.91 | ± 9.6 %<br>± 9.6 % |
| 10290<br>10291 | AAB<br>AAB | CDMA2000, RC1, SO55, Full Rate  CDMA2000, RC3, SO55, Full Rate                     | CDMA2000<br>CDMA2000 | 3.46          | ± 9.6 %            |
| 10291          | AAB        | CDMA2000, RC3, SO33, Full Rate   | CDMA2000<br>CDMA2000 | 3.39          | ± 9.6 %            |
| 10292          | AAB        | CDMA2000, RC3, SO32, Full Rate   | CDMA2000             | 3.50          | ± 9.6 %            |
| 10295          | AAB        | CDMA2000, RC3, SO3, Pull Rate CDMA2000, RC1, SO3, 1/8th Rate 25 fr.                | CDMA2000             | 12.49         | ± 9.6 %            |
| 10293          | AAD        | LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)  | LTE-FDD              | 5.81          | ± 9.6 %            |
| 10297          | AAD        | LTE-FDD (SC-FDMA, 30 % RB, 3 MHz, QPSK)  | LTE-FDD              | 5.72          | ± 9.6 %            |
| 10299          | AAD        | LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)   | LTE-FDD              | 6.39          | ± 9.6 %            |
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| 10300<br>10301 | AAD        | LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)   | LTE-FDD                               | 6.60         | ± 9.6 %            |
| 10301          | AAA        | IEEE 802.16e WIMAX (29:18, 5ms, 10MHz, QPSK, PUSC) IEEE 802.16e WIMAX (29:18, 5ms, 10MHz, QPSK, PUSC, 3 CTRL | WiMAX<br>WiMAX                        | 12.03        | ± 9.6 %            |
| 10302          | ~~~        | symbols)   | WINAX                                 | 12.57        | ± 9.6 %            |
| 10303          | AAA        | IEEE 802.16e WiMAX (31:15, 5ms, 10MHz, 64QAM, PUSC)  | WiMAX                                 | 12.52        | ± 9.6 %            |
| 10304          | AAA        | IEEE 802.16e WIMAX (29:18, 5ms, 10MHz, 64QAM, PUSC)  | WIMAX                                 | 11.86        | ± 9.6 %            |
| 10305          | AAA        | IEEE 802.16e WiMAX (31:15, 10ms, 10MHz, 64QAM, PUSC, 15  | WIMAX                                 | 15.24        | ± 9.6 %            |
|                |            | symbols)   | , , , , , , , , , , , , , , , , , , , | 10.21        | 20.070             |
| 10306          | AAA        | IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 64QAM, PUSC, 18  | WIMAX                                 | 14.67        | ± 9.6 %            |
|                |            | symbols)   |                                       |              | ,                  |
| 10307          | AAA        | IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, QPSK, PUSC, 18   | WiMAX                                 | 14.49        | ± 9.6 %            |
| 40000          |            | symbols)   |                                       |              |                    |
| 10308          | AAA        | IEEE 802.16e WIMAX (29:18, 10ms, 10MHz, 16QAM, PUSC)   | WiMAX                                 | 14.46        | ± 9.6 %            |
| 10309          | AAA        | IEEE 802.16e WIMAX (29:18, 10ms, 10MHz, 16QAM, AMC 2x3, 18   | WIMAX                                 | 14.58        | ± 9.6 %            |
| 10310          | AAA        | symbols)<br>  IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, QPSK, AMC 2x3, 18                                      | 18034036                              | 44 67        |                    |
| 10010          | 1          | symbols)   | WiMAX                                 | 14.57        | ± 9.6 %            |
| 10311          | AAD        | LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)   | LTE-FDD                               | 6.06         | ± 9.6 %            |
| 10313          | AAA        | iDEN 1:3   | iDEN .                                | 10.51        | ± 9.6 %            |
| 10314          | AAA        | iDEN 1:6   | IDEN                                  | 13.48        | ± 9.6 %            |
| 10315          | AAB        | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)  | WLAN                                  | 1.71         | ± 9.6 %            |
| 10316          | AAB        | IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle)  | WLAN                                  | 8.36         | ± 9.6 %            |
| 10317          | AAC        | IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc duty cycle)  | WLAN                                  | 8.36         | ± 9.6 %            |
| 10352          | AAA        | Pulse Waveform (200Hz, 10%)  | Generic                               | 10.00        | ± 9.6 %            |
| 10353          | AAA        | Pulse Waveform (200Hz, 20%)  | Generic                               | 6.99         | ± 9.6 %            |
| 10354          | AAA        | Pulse Waveform (200Hz, 40%)  | Generic                               | 3.98         | ± 9.6 %            |
| 10355          | AAA        | Pulse Waveform (200Hz, 60%)  | Generic                               | 2.22         | ± 9.6 %            |
| 10356          | AAA        | Pulse Waveform (200Hz, 80%)  | Generic                               | 0.97         | ±9.6%              |
| 10387          | AAA        | QPSK Waveform, 1 MHz   | Generic                               | 5.10         | ± 9.6 %            |
| 10388          | AAA        | QPSK Waveform, 10 MHz  | Generic                               | 5.22         | ± 9.6 %            |
| 10396<br>10399 | AAA        | 64-QAM Waveform, 100 kHz   | Generic                               | 6.27         | ± 9.6 %            |
| 10399          | AAA<br>AAD | 64-QAM Waveform, 40 MHz  | Generic                               | 6.27         | ± 9.6 %            |
| 10400          | AAD        | IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle) IEEE 802.11ac WiFi (40MHz, 64-QAM, 99pc duty cycle)      | WLAN                                  | 8.37         | ± 9.6 %            |
| 10401          | AAD        | IEEE 802.11ac WiFi (40MHz, 64-QAM, 99pc duty cycle)  | WLAN<br>WLAN                          | 8.60<br>8.53 | ± 9.6 %            |
| 10403          | AAB        | CDMA2000 (1xEV-DO, Rev. 0)   | CDMA2000                              | 3.76         | ± 9.6 %<br>± 9.6 % |
| 10404          | AAB        | CDMA2000 (1xEV-DO, Rev. A)   | CDMA2000                              | 3.77         | ± 9.6 %            |
| 10406          | AAB        | CDMA2000, RC3, SO32, SCH0, Full Rate   | CDMA2000                              | 5.22         | ± 9.6 %            |
| 10410          | AAF        | LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL   | LTE-TDD                               | 7.82         | ± 9.6 %            |
|                |            | Subframe=2,3,4,7,8,9, Subframe Conf=4)   |                                       | 1.02         | ± 0.0 /0           |
| 10414          | AAA        | WLAN CCDF, 64-QAM, 40MHz   | Generic                               | 8.54         | ± 9.6 %            |
| 10415          | AAA        | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)  | WLAN                                  | 1.54         | ± 9.6 %            |
| 10416          | AAA        | IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)  | WLAN                                  | 8.23         | ± 9.6 %            |
| 10417          | AAB        | IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle)  | WLAN                                  | 8.23         | ± 9.6 %            |
| 10418          | AAA        | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle,   | WLAN                                  | 8.14         | ± 9.6 %            |
| 10419          | AAA        | Long preambule) IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle,                               | 1841 631                              | 0.10         | 10000              |
| 10413          | \_\_\\     | Short preambule)   | WLAN                                  | 8.19         | ± 9.6 %            |
| 10422          | AAB        | IEEE 802.11n (HT Greenfield, 7.2 Mbps, BPSK)   | WLAN                                  | 0 20         | 1060/              |
| 10423          | AAB        | IEEE 802.11n (HT Greenfield, 7.2 Mbps, 16-QAM)   | WLAN                                  | 8.32<br>8.47 | ±9.6%              |
| 10424          | AAB        | IEEE 802.11n (HT Greenfield, 72.2 Mbps, 64-QAM)  | WLAN                                  | 8.40         | ± 9.6 %<br>± 9.6 % |
| 10425          | AAB        | IEEE 802.11n (HT Greenfield, 15 Mbps, BPSK)  | WLAN                                  | 8.41         | ±9.6%              |
| 10426          | AAB        | IEEE 802.11n (HT Greenfield, 90 Mbps, 16-QAM)  | WLAN                                  | 8.45         | ±9.6%              |
| 10427          | AAB        | IEEE 802.11n (HT Greenfield, 150 Mbps, 64-QAM)   | WLAN                                  | 8.41         | ± 9.6 %            |
| 10430          | AAD        | LTE-FDD (OFDMA, 5 MHz, E-TM 3.1)   | LTE-FDD                               | 8.28         | ± 9.6 %            |
| 10431          | AAD        | LTE-FDD (OFDMA, 10 MHz, E-TM 3.1)  | LTE-FDD                               | 8.38         | ± 9.6 %            |
| 10432          | AAC        | LTE-FDD (OFDMA, 15 MHz, E-TM 3.1)  | LTE-FDD                               | 8.34         | ±9.6 %             |
| 10433          | AAC        | LTE-FDD (OFDMA, 20 MHz, E-TM 3.1)  | LTE-FDD                               | 8.34         | ± 9.6 %            |
| 10434          | AAA        | W-CDMA (BS Test Model 1, 64 DPCH)  | WCDMA                                 | 8.60         | ± 9.6 %            |
| 10435          | AAF        | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL   | LTE-TDD                               | 7.82         | ± 9.6 %            |
| 10447          | A A D      | Subframe=2,3,4,7,8,9)  |                                       |              |                    |
| 10447<br>10448 | AAD        | LTE-FDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)   | LTE-FDD                               | 7.56         | ± 9.6 %            |
| 10448          | AAD<br>AAC | LTE-FDD (OFDMA, 10 MHz, E-TM 3.1, Clippin 44%) LTE-FDD (OFDMA, 15 MHz, E-TM 3.1, Cliping 44%)                | LTE-FDD                               | 7.53         | ± 9.6 %            |
| 10449          | AAC        | LTE-FDD (OFDMA, 15 MHz, E-1M 3.1, Clipping 44%)  LTE-FDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%)             | LTE-FDD                               | 7.51         | ±9.6 %             |
| 10-700         | 11/10      | ETE TOO (OF DIVIN, 20 WITZ, ETTW 3.1, CHIPPING 44%)  | LTE-FDD                               | 7.48         | ± 9.6 %            |

| 10451 | AAA | W-CDMA (BS Test Model 1, 64 DPCH, Clipping 44%)                       | WCDMA    | 7.59 | ± 9.6 % |
|-------|-----|---|----------|------|---------|
| 10456 | AAB | IEEE 802.11ac WiFi (160MHz, 64-QAM, 99pc duty cycle)                  | WLAN     | 8.63 | ± 9.6 % |
| 10457 | AAA | UMTS-FDD (DC-HSDPA)   | WCDMA    | 6.62 | ± 9.6 % |
| 10458 | AAA | CDMA2000 (1xEV-DO, Rev. B, 2 carriers)                                | CDMA2000 | 6.55 | ± 9.6 % |
| 10459 | AAA | CDMA2000 (1xEV-DO, Rev. B, 3 carriers)                                | CDMA2000 | 8.25 | ± 9.6 % |
| 10460 | AAA | UMTS-FDD (WCDMA, AMR)   | WCDMA    | 2.39 | ±9.6 %  |
| 10461 | AAA | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK, UL                             | LTE-TDD  | 7.82 | ±9.6 %  |
|       |     | Subframe=2,3,4,7,8,9)   |          |      |         |
| 10462 | AAA | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9)  | LTE-TDD  | 8.30 | ± 9.6 % |
| 10463 | AAA | LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM, UL<br>Subframe=2,3,4,7,8,9)  | LTE-TDD  | 8.56 | ± 9,6 % |
| 10464 | AAB | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9)      | LTE-TDD  | 7.82 | ± 9.6 % |
| 10465 | AAB | LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM, UL                             | LTE-TDD  | 8.32 | ± 9.6 % |
| 10466 | AAB | Subframe=2,3,4,7,8,9)  LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM, UL      | LTE-TDD  | 8.57 | ± 9.6 % |
| 10467 | AAE | Subframe=2,3,4,7,8,9)  LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL        | LTE-TDD  | 7.82 | ± 9.6 % |
| 10468 | AAE | Subframe=2,3,4,7,8,9)  LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM, UL.     | LTE-TDD  | 8.32 | ± 9.6 % |
| 10469 | AAE | Subframe=2,3,4,7,8,9)  LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM, UL      | LTE-TDD  | 8.56 | ± 9.6 % |
| 10470 | AAE | Subframe=2,3,4,7,8,9) LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL        | LTE-TDD  | 7.82 | ± 9.6 % |
| 10471 | AAE | Subframe=2,3,4,7,8,9)  LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM, UL     | LTE-TDD  | 8.32 | ± 9.6 % |
| 10472 | AAE | Subframe=2,3,4,7,8,9)  LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM, UL     | LTE-TDD  | 8.57 | ± 9.6 % |
| 10473 | AAE | Subframe=2,3,4,7,8,9)  LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK, UL       | LTE-TDD  | 7.82 | ± 9.6 % |
| 10474 | AAE | Subframe=2,3,4,7,8,9)  LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM, UL     | LTE-TDD  | 8.32 | ± 9.6 % |
| 10475 | AAE | Subframe=2,3,4,7,8,9)  LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM, UL     | LTE-TDD  | 8.57 | ± 9.6 % |
| 10477 | AAF | Subframe=2,3,4,7,8,9)  LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM, UL     | LTE-TDD  | 8.32 | ± 9.6 % |
| 10478 | AAF | Subframe=2,3,4,7,8,9)  LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM, UL     | LTE-TDD  | 8.57 | ± 9.6 % |
| 10479 | AAA | Subframe=2,3,4,7,8,9)  LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK, UL    | LTE-TDD  | 7.74 | ± 9.6 % |
| 10480 | AAA | Subframe=2,3,4,7,8,9)  LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM, UL  | LTE-TDD  | 8.18 | ± 9.6 % |
| 10481 | AAA | Subframe=2,3,4,7,8,9)  LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM, UL  | LTE-TDD  | 8.45 | ± 9.6 % |
| 10482 | AAB | Subframe=2,3,4,7,8,9) LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK, UL       | LTE-TDD  | 7.71 | ± 9.6 % |
| 10483 | AAB | Subframe=2,3,4,7,8,9)  LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM, UL    | LTE-TDD  | 8.39 | ± 9.6 % |
| 10484 | AAB | Subframe=2,3,4,7,8,9)  LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM, UL    | LTE-TDD  | 8.47 | ± 9.6 % |
| 10485 | AAE | Subframe=2,3,4,7,8,9)  LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK, UL      | LTE-TDD  | 7.59 | ± 9.6 % |
|       |     | Subframe=2,3,4,7,8,9)  LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM, UL    | LTE-TDD  | 8.38 | ± 9.6 % |
| 10486 | AAE | Subframe=2,3,4,7,8,9)   |          |      |         |
| 10487 | AAE | LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)     | LTE-TDD  | 8.60 | ± 9.6 % |
| 10488 | AAE | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9)   | LTE-TDD  | 7.70 | ± 9.6 % |
| 10489 | AAE | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM, UL<br>Subframe=2,3,4,7,8,9) | LTE-TDD  | 8.31 | ± 9.6 % |
| 10490 | AAE | LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM, UL<br>Subframe=2,3,4,7,8,9) | LTE-TDD  | 8.54 | ± 9.6 % |
| 10491 | AAE | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9)   | LTE-TDD  | 7.74 | ± 9.6 % |

| 10492  |       |              |  |         |      |         |
|--|-------|--------------|--|---------|------|---------|
| 1949a  | 10492 | AAE          | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM, UL                         | LTE-TDD | 8.41 | ± 9.6 % |
| 19494  | 10493 | AAE          | LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM, UL                         | LTE-TDD | 8.55 | ± 9.6 % |
| 10496  | 10494 | AAF          | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK, UL                           | LTE-TDD | 7.74 | ± 9.6 % |
| 10496  | 10495 | AAF          | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM, UL                         | LTE-TDD | 8.37 | ± 9.6 % |
| 1049  AAA  | 10496 | AAF          | LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM, UL                         | LTE-TDD | 8.54 | ± 9.6 % |
| 10498  | 10497 | AAA          | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK, UL                         | LTE-TDD | 7.67 | ± 9.6 % |
| 10499  | 10498 | AAA          | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM, UL                       | LTE-TDD | 8.40 | ± 9.6 % |
| 10500  | 10499 | AAA          | LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM, UL                       | LTE-TDD | 8.68 | ± 9.6 % |
| 10501   AAB   LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM, UL   LTE-TDD   6.44   ± 9.6 %   Subframe=2,3.4,7.8,9)     10502   AAB   LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM, UL   LTE-TDD   7.72   ± 9.6 %   Subframe=2,3.4,7.8,9)     10503   AAE   LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK, UL   LTE-TDD   7.72   ± 9.6 %   Subframe=2,3.4,7.8,9)     10504   AE   LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM, UL   LTE-TDD   8.31   ± 9.6 %   Subframe=2,3.4,7.8,9)     10505   AE   LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM, UL   LTE-TDD   8.54   ± 9.6 %   Subframe=2,3.4,7.8,9)     10506   AE   LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK, UL   LTE-TDD   7.74   ± 9.6 %   Subframe=2,3.4,7.8,9)     10507   AAE   LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK, UL   LTE-TDD   8.36   ± 9.6 %   Subframe=2,3.4,7.8,9)     10508   AAE   LTE-TDD (SC-FDMA, 100% RB, 10 MHz, GP-QAM, UL   LTE-TDD   8.56   ± 9.6 %   Subframe=2,3.4,7.8,9)     10509   AAE   LTE-TDD (SC-FDMA, 100% RB, 10 MHz, GP-QAM, UL   LTE-TDD   8.55   ± 9.6 %   Subframe=2,3.4,7.8,9)     10510   AAE   LTE-TDD (SC-FDMA, 100% RB, 15 MHz, GP-QAM, UL   LTE-TDD   8.55   ± 9.6 %   Subframe=2,3.4,7.8,9)     10511   AAE   LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM, UL   LTE-TDD   8.49   ± 9.6 %   Subframe=2,3.4,7.8,9)     10512   AAF   LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM, UL   LTE-TDD   8.49   ± 9.6 %   Subframe=2,3.4,7.8,9)     10513   AAF   LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL   LTE-TDD   8.49   ± 9.6 %   Subframe=2,3.4,7.8,9)     10514   AAF   LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL   LTE-TDD   8.42   ± 9.6 %   Subframe=2,3.4,7.8,9)     10515   AAA   LEEE 802.11b WiFl 2.4 GHz (DSSS, 2 Mbps, 99pc duty cycle)   WLAN   1.57   ± 9.6 %   Subframe=2,3.4,7.8,9)     10516   AAA   LEEE 802.11b WiFl 5.4 GHz (DSSS, 5 Mbps, 99pc duty cycle)   WLAN   1.57   ± 9.6 %   Subframe=2,3.4,7.8,9)     10517   AAA   LEEE 802.11b WiFl 5.4 GHz (DSSS, 5 Mbps, 99pc duty cycle)   WLAN   1.58   ± 9.6 %   Subframe=2,3.4,7.8,9)   Subframe=2,3.4,7.8,9)   Subframe=2,3.4,7.8,9   Subframe=2,3.4,7.8,9   Subframe | 10500 | AAB          | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK, UL                           | LTE-TDD | 7.67 | ± 9.6 % |
| 10502  | 10501 | AAB          | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM, UL                         | LTE-TDD | 8.44 | ± 9.6 % |
| 10503  | 10502 | AAB          | LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM, UL                         | LTE-TDD | 8.52 | ± 9.6 % |
| 10504  | 10503 | AAE          | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK, UL                           | LTE-TDD | 7.72 | ± 9.6 % |
| 10505  | 10504 |              | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM, UL                         | LTE-TDD | 8.31 | ± 9.6 % |
| Subframe=2,3,4,7,8,9    LTE-TDD   S.36   ± 9.6 %   Subframe=2,3,4,7,8,9    Subframe=2,3,4,7,8,9    Subframe=2,3,4,7,8,9    LTE-TDD   SC-FDMA, 100% RB, 10 MHz, 64-QAM, UL   LTE-TDD   S.55   ± 9.6 %   Subframe=2,3,4,7,8,9    Subframe=2,3,4,7,8,9    LTE-TDD   SC-FDMA, 100% RB, 15 MHz, QPSK, UL   LTE-TDD   T.99   ± 9.6 %   Subframe=2,3,4,7,8,9    Subframe=2,3,4,7,8,9    LTE-TDD   SC-FDMA, 100% RB, 15 MHz, 16-QAM, UL   LTE-TDD   S.49   ± 9.6 %   Subframe=2,3,4,7,8,9    Subframe=2,3,4,7,8,9    Subframe=2,3,4,7,8,9    LTE-TDD   SC-FDMA, 100% RB, 15 MHz, 64-QAM, UL   LTE-TDD   S.51   ± 9.6 %   Subframe=2,3,4,7,8,9    Subframe=2, | 10505 | AAE          | LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM, UL                         | LTE-TDD | 8.54 | ± 9.6 % |
| 10507  | 10506 | AAE          | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK, UL                          | LTE-TDD | 7.74 | ± 9.6 % |
| Subframe=2,3,4,7,8,9   LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9   ± 9.6 % Subframe=2,3,4,7,8,9   LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9   ± 9.6 % Subframe=2,3,4,7,8,9   LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM, UL LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM, UL LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9   LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM, UL LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM, UL LTE-TDD  |       | AAE          | LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM, UL                        | LTE-TDD | 8.36 | ± 9.6 % |
| Subframe=2,3,4,7,8,9    LTE-TDD   S.49   ±9.6 %   Subframe=2,3,4,7,8,9    LTE-TDD   S.51   ±9.6 %   Subframe=2,3,4,7,8,9    LTE-TDD   S.52   ±9.6 %   Subframe=2,3,4,7,8,9    LTE-TDD   S.42   ±9.6 %   Subframe=2,3,4,7,8,9    LTE-TDD   S.53   ±9.6 %   Subframe=2,3,4,7,8,9    LTE-TDD   S.45   ±9.6 %   Subframe=2,3,4,7,8,9    LEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 99pc duty cycle)   WLAN   1.58   ±9.6 %   Subframe=2,3,4,7,8,9    LEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 99pc duty cycle)   WLAN   1.58   ±9.6 %   Subframe=2,3,4,7,8,9    LEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc duty cycle)   WLAN   S.23   ±9.6 %   Subframe=2,3,4,7,8,9    LEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 99pc duty cycle)   WLAN   S.39   ±9.6 %   Subframe=2,3,4,7,8,9    LEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc duty cycle)   WLAN   S.45   ±9.6 %   Subframe=2,3,4,7,8,9    LEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc duty cycle)   WLAN   S.45   ±9.6 %   Subframe=2,3,4,7,8,9    LEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)   WLAN   S.46   ±9.6 %   Subframe=2,3,4,7,8,9    LEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)   WLAN   S.46   ±9.6 %   Subframe=2,3,4,7,8,9    LEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)   WLAN   S.46   ±9.6 %   Subframe=2,3,4,7,8,9    |       | AAE          | Subframe=2,3,4,7,8,9)  | LTE-TDD | 8.55 | ±9.6 %  |
| Subframe=2,3,4,7,8,9    LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)   LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)   LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)   LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)   LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)   LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)   LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)   LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)   LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)   LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)   LEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 99pc duty cycle)   WLAN  |       | AAE          | LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK, UL<br>Subframe=2,3,4,7,8,9) | LTE-TDD | 7.99 | ± 9.6 % |
| Subframe=2,3,4,7,8,9   |       | AAE          | Subframe=2,3,4,7,8,9)  | LTE-TDD | 8.49 | ±9.6 %  |
| Subframe=2,3,4,7,8,9    LTE-TDD   S.42   |       |              | Subframe=2,3,4,7,8,9)  | LTE-TDD | 8.51 | ±9.6%   |
| Subframe=2,3,4,7,8,9    LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)   LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)   LTE-TDD  |       |              | Subframe=2,3,4,7,8,9)  | LTE-TDD | 7.74 | ± 9.6 % |
| Subframe=2,3,4,7,8,9    1.0515   |       | AAF          | Subframe=2,3,4,7,8,9)  | LTE-TDD | 8.42 | ± 9.6 % |
| 10516         AAA         IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 99pc duty cycle)         WLAN         1.57         ± 9.6 %           10517         AAA         IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 99pc duty cycle)         WLAN         1.58         ± 9.6 %           10518         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc duty cycle)         WLAN         8.23         ± 9.6 %           10519         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 99pc duty cycle)         WLAN         8.39         ± 9.6 %           10520         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 99pc duty cycle)         WLAN         8.12         ± 9.6 %           10521         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 99pc duty cycle)         WLAN         7.97         ± 9.6 %           10522         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 99pc duty cycle)         WLAN         8.45         ± 9.6 %           10523         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc duty cycle)         WLAN         8.08         ± 9.6 %           10524         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)         WLAN         8.27         ± 9.6 %           10525         AAB         IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)         WLAN         8.36   |       | AAF          | Subframe=2,3,4,7,8,9)  | LTE-TDD | 8.45 | ± 9.6 % |
| 10516         AAA         IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 99pc duty cycle)         WLAN         1.57         ± 9.6 %           10517         AAA         IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 99pc duty cycle)         WLAN         1.58         ± 9.6 %           10518         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc duty cycle)         WLAN         8.23         ± 9.6 %           10519         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 99pc duty cycle)         WLAN         8.39         ± 9.6 %           10520         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 99pc duty cycle)         WLAN         8.12         ± 9.6 %           10521         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 99pc duty cycle)         WLAN         7.97         ± 9.6 %           10522         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 99pc duty cycle)         WLAN         8.45         ± 9.6 %           10523         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc duty cycle)         WLAN         8.08         ± 9.6 %           10524         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)         WLAN         8.27         ± 9.6 %           10525         AAB         IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)         WLAN         8.36   |       |              | IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 99pc duty cycle)            | WLAN    | 1.58 | ±9.6 %  |
| 10517         AAA         IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 99pc duty cycle)         WLAN         1.58         ± 9.6 %           10518         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc duty cycle)         WLAN         8.23         ± 9.6 %           10519         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 99pc duty cycle)         WLAN         8.39         ± 9.6 %           10520         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 99pc duty cycle)         WLAN         8.12         ± 9.6 %           10521         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 99pc duty cycle)         WLAN         7.97         ± 9.6 %           10522         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 99pc duty cycle)         WLAN         8.45         ± 9.6 %           10523         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc duty cycle)         WLAN         8.08         ± 9.6 %           10524         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)         WLAN         8.27         ± 9.6 %           10525         AAB         IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)         WLAN         8.36         ± 9.6 %           10526         AAB         IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)         WLAN         8.21         ± 9.6   |       |              | IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 99pc duty cycle)          |         | 1.57 |         |
| 10518         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc duty cycle)         WLAN         8.23         ± 9.6 %           10519         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 99pc duty cycle)         WLAN         8.39         ± 9.6 %           10520         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 99pc duty cycle)         WLAN         8.12         ± 9.6 %           10521         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 99pc duty cycle)         WLAN         7.97         ± 9.6 %           10522         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 99pc duty cycle)         WLAN         8.45         ± 9.6 %           10523         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc duty cycle)         WLAN         8.08         ± 9.6 %           10524         AAB         IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)         WLAN         8.27         ± 9.6 %           10525         AAB         IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)         WLAN         8.36         ± 9.6 %           10526         AAB         IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)         WLAN         8.21         ± 9.6 %           10527         AAB         IEEE 802.11ac WiFi (20MHz, MCS3, 99pc duty cycle)         WLAN         8.36         ± 9.6 %  |       | <del>1</del> | IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 99pc duty cycle)           |         | 1.58 | ± 9.6 % |
| 10520       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 99pc duty cycle)       WLAN       8.12       ± 9.6 %         10521       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 99pc duty cycle)       WLAN       7.97       ± 9.6 %         10522       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 99pc duty cycle)       WLAN       8.45       ± 9.6 %         10523       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc duty cycle)       WLAN       8.08       ± 9.6 %         10524       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)       WLAN       8.27       ± 9.6 %         10525       AAB       IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)       WLAN       8.36       ± 9.6 %         10526       AAB       IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)       WLAN       8.42       ± 9.6 %         10527       AAB       IEEE 802.11ac WiFi (20MHz, MCS3, 99pc duty cycle)       WLAN       8.21       ± 9.6 %         10528       AAB       IEEE 802.11ac WiFi (20MHz, MCS4, 99pc duty cycle)       WLAN       8.36       ± 9.6 %         10531       AAB       IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)       WLAN       8.43       ± 9.6 %         10533       AAB       IEEE 802.11ac WiFi (20MHz, MCS7, 99pc duty cycle)   |       |              | IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc duty cycle)            |         | 8.23 |         |
| 10520       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 99pc duty cycle)       WLAN       8.12       ± 9.6 %         10521       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 99pc duty cycle)       WLAN       7.97       ± 9.6 %         10522       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 99pc duty cycle)       WLAN       8.45       ± 9.6 %         10523       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc duty cycle)       WLAN       8.08       ± 9.6 %         10524       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)       WLAN       8.27       ± 9.6 %         10525       AAB       IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)       WLAN       8.36       ± 9.6 %         10526       AAB       IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)       WLAN       8.42       ± 9.6 %         10527       AAB       IEEE 802.11ac WiFi (20MHz, MCS2, 99pc duty cycle)       WLAN       8.21       ± 9.6 %         10528       AAB       IEEE 802.11ac WiFi (20MHz, MCS3, 99pc duty cycle)       WLAN       8.36       ± 9.6 %         10529       AAB       IEEE 802.11ac WiFi (20MHz, MCS4, 99pc duty cycle)       WLAN       8.36       ± 9.6 %         10531       AAB       IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)   |       |              | IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 99pc duty cycle)           | WLAN    | 8.39 | ± 9.6 % |
| 10521       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 99pc duty cycle)       WLAN       7.97       ± 9.6 %         10522       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 99pc duty cycle)       WLAN       8.45       ± 9.6 %         10523       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc duty cycle)       WLAN       8.08       ± 9.6 %         10524       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)       WLAN       8.27       ± 9.6 %         10525       AAB       IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)       WLAN       8.36       ± 9.6 %         10526       AAB       IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)       WLAN       8.42       ± 9.6 %         10527       AAB       IEEE 802.11ac WiFi (20MHz, MCS2, 99pc duty cycle)       WLAN       8.21       ± 9.6 %         10528       AAB       IEEE 802.11ac WiFi (20MHz, MCS3, 99pc duty cycle)       WLAN       8.36       ± 9.6 %         10529       AAB       IEEE 802.11ac WiFi (20MHz, MCS4, 99pc duty cycle)       WLAN       8.36       ± 9.6 %         10531       AAB       IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)       WLAN       8.43       ± 9.6 %         10533       AAB       IEEE 802.11ac WiFi (20MHz, MCS7, 99pc duty cycle)       WLAN   |       |              | IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 99pc duty cycle)           |         | -    |         |
| 10522       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 99pc duty cycle)       WLAN       8.45       ± 9.6 %         10523       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc duty cycle)       WLAN       8.08       ± 9.6 %         10524       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)       WLAN       8.27       ± 9.6 %         10525       AAB       IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)       WLAN       8.36       ± 9.6 %         10526       AAB       IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)       WLAN       8.42       ± 9.6 %         10527       AAB       IEEE 802.11ac WiFi (20MHz, MCS2, 99pc duty cycle)       WLAN       8.21       ± 9.6 %         10528       AAB       IEEE 802.11ac WiFi (20MHz, MCS3, 99pc duty cycle)       WLAN       8.36       ± 9.6 %         10529       AAB       IEEE 802.11ac WiFi (20MHz, MCS4, 99pc duty cycle)       WLAN       8.36       ± 9.6 %         10531       AAB       IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)       WLAN       8.43       ± 9.6 %         10532       AAB       IEEE 802.11ac WiFi (20MHz, MCS7, 99pc duty cycle)       WLAN       8.29       ± 9.6 %         10533       AAB       IEEE 802.11ac WiFi (20MHz, MCS8, 99pc duty cycle)       WLAN  |       |              |  |         |      |         |
| 10523       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc duty cycle)       WLAN       8.08       ± 9.6 %         10524       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)       WLAN       8.27       ± 9.6 %         10525       AAB       IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)       WLAN       8.36       ± 9.6 %         10526       AAB       IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)       WLAN       8.42       ± 9.6 %         10527       AAB       IEEE 802.11ac WiFi (20MHz, MCS2, 99pc duty cycle)       WLAN       8.21       ± 9.6 %         10528       AAB       IEEE 802.11ac WiFi (20MHz, MCS3, 99pc duty cycle)       WLAN       8.36       ± 9.6 %         10529       AAB       IEEE 802.11ac WiFi (20MHz, MCS4, 99pc duty cycle)       WLAN       8.36       ± 9.6 %         10531       AAB       IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)       WLAN       8.43       ± 9.6 %         10532       AAB       IEEE 802.11ac WiFi (20MHz, MCS7, 99pc duty cycle)       WLAN       8.29       ± 9.6 %         10533       AAB       IEEE 802.11ac WiFi (20MHz, MCS8, 99pc duty cycle)       WLAN       8.38       ± 9.6 %  |       |              |  | WLAN    | 8.45 |         |
| 10524       AAB       IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)       WLAN       8.27       ± 9.6 %         10525       AAB       IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)       WLAN       8.36       ± 9.6 %         10526       AAB       IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)       WLAN       8.42       ± 9.6 %         10527       AAB       IEEE 802.11ac WiFi (20MHz, MCS2, 99pc duty cycle)       WLAN       8.21       ± 9.6 %         10528       AAB       IEEE 802.11ac WiFi (20MHz, MCS3, 99pc duty cycle)       WLAN       8.36       ± 9.6 %         10529       AAB       IEEE 802.11ac WiFi (20MHz, MCS4, 99pc duty cycle)       WLAN       8.36       ± 9.6 %         10531       AAB       IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)       WLAN       8.43       ± 9.6 %         10532       AAB       IEEE 802.11ac WiFi (20MHz, MCS7, 99pc duty cycle)       WLAN       8.29       ± 9.6 %         10533       AAB       IEEE 802.11ac WiFi (20MHz, MCS8, 99pc duty cycle)       WLAN       8.38       ± 9.6 %   |       |              | IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc duty cycle)           | WLAN    |      |         |
| 10525         AAB         IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)         WLAN         8.36         ± 9.6 %           10526         AAB         IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)         WLAN         8.42         ± 9.6 %           10527         AAB         IEEE 802.11ac WiFi (20MHz, MCS2, 99pc duty cycle)         WLAN         8.21         ± 9.6 %           10528         AAB         IEEE 802.11ac WiFi (20MHz, MCS3, 99pc duty cycle)         WLAN         8.36         ± 9.6 %           10529         AAB         IEEE 802.11ac WiFi (20MHz, MCS4, 99pc duty cycle)         WLAN         8.36         ± 9.6 %           10531         AAB         IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)         WLAN         8.43         ± 9.6 %           10532         AAB         IEEE 802.11ac WiFi (20MHz, MCS7, 99pc duty cycle)         WLAN         8.29         ± 9.6 %           10533         AAB         IEEE 802.11ac WiFi (20MHz, MCS8, 99pc duty cycle)         WLAN         8.38         ± 9.6 %  |       |              | IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)           |         |      |         |
| 10526         AAB         IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)         WLAN         8.42         ± 9.6 %           10527         AAB         IEEE 802.11ac WiFi (20MHz, MCS2, 99pc duty cycle)         WLAN         8.21         ± 9.6 %           10528         AAB         IEEE 802.11ac WiFi (20MHz, MCS3, 99pc duty cycle)         WLAN         8.36         ± 9.6 %           10529         AAB         IEEE 802.11ac WiFi (20MHz, MCS4, 99pc duty cycle)         WLAN         8.36         ± 9.6 %           10531         AAB         IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)         WLAN         8.43         ± 9.6 %           10532         AAB         IEEE 802.11ac WiFi (20MHz, MCS7, 99pc duty cycle)         WLAN         8.29         ± 9.6 %           10533         AAB         IEEE 802.11ac WiFi (20MHz, MCS8, 99pc duty cycle)         WLAN         8.38         ± 9.6 %  |       |              | IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)                    |         |      |         |
| 10527       AAB       IEEE 802.11ac WiFi (20MHz, MCS2, 99pc duty cycle)       WLAN       8.21       ± 9.6 %         10528       AAB       IEEE 802.11ac WiFi (20MHz, MCS3, 99pc duty cycle)       WLAN       8.36       ± 9.6 %         10529       AAB       IEEE 802.11ac WiFi (20MHz, MCS4, 99pc duty cycle)       WLAN       8.36       ± 9.6 %         10531       AAB       IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)       WLAN       8.43       ± 9.6 %         10532       AAB       IEEE 802.11ac WiFi (20MHz, MCS7, 99pc duty cycle)       WLAN       8.29       ± 9.6 %         10533       AAB       IEEE 802.11ac WiFi (20MHz, MCS8, 99pc duty cycle)       WLAN       8.38       ± 9.6 %  |       |              | IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)                    |         | 8.42 |         |
| 10528         AAB         IEEE 802.11ac WiFi (20MHz, MCS3, 99pc duty cycle)         WLAN         8.36         ± 9.6 %           10529         AAB         IEEE 802.11ac WiFi (20MHz, MCS4, 99pc duty cycle)         WLAN         8.36         ± 9.6 %           10531         AAB         IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)         WLAN         8.43         ± 9.6 %           10532         AAB         IEEE 802.11ac WiFi (20MHz, MCS7, 99pc duty cycle)         WLAN         8.29         ± 9.6 %           10533         AAB         IEEE 802.11ac WiFi (20MHz, MCS8, 99pc duty cycle)         WLAN         8.38         ± 9.6 %  |       |              | IEEE 802.11ac WiFi (20MHz, MCS2, 99pc duty cycle)                    |         | 8.21 |         |
| 10529         AAB         IEEE 802.11ac WiFi (20MHz, MCS4, 99pc duty cycle)         WLAN         8.36         ± 9.6 %           10531         AAB         IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)         WLAN         8.43         ± 9.6 %           10532         AAB         IEEE 802.11ac WiFi (20MHz, MCS7, 99pc duty cycle)         WLAN         8.29         ± 9.6 %           10533         AAB         IEEE 802.11ac WiFi (20MHz, MCS8, 99pc duty cycle)         WLAN         8.38         ± 9.6 %  |       |              |  |         | 8.36 | ± 9.6 % |
| 10531         AAB         IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)         WLAN         8.43         ± 9.6 %           10532         AAB         IEEE 802.11ac WiFi (20MHz, MCS7, 99pc duty cycle)         WLAN         8.29         ± 9.6 %           10533         AAB         IEEE 802.11ac WiFi (20MHz, MCS8, 99pc duty cycle)         WLAN         8.38         ± 9.6 %  |       |              |  |         | 8.36 | ± 9.6 % |
| 10533 AAB IEEE 802.11ac WiFi (20MHz, MCS8, 99pc duty cycle) WLAN 8.38 ± 9.6 %  |       |              | IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)                    |         |      |         |
| 10F04  |       |              | IEEE 802.11ac WiFi (20MHz, MCS7, 99pc duty cycle)                    |         |      |         |
| 10004   AAD   IEEE 802.T1ac WIFI (40MHz, MCS0, 99pc duty cycle)   WLAN   8.45   ± 9.6 %  |       |              |  |         |      |         |
|  | 10034 | AAB          | LIEEE 802.11ac WiFi (40MHz, MCS0, 99pc duty cycle)                   | WLAN    | 8.45 | ± 9.6 % |

| 40505 | 1 4 4 5 |   | 1 1411 453 | 0.45   |         |
|-------|---------|---|------------|--------|---------|
| 10535 | AAB     | IEEE 802.11ac WiFi (40MHz, MCS1, 99pc duty cycle)               | WLAN       | 8.45   | ± 9.6 % |
| 10536 | AAB     | IEEE 802.11ac WiFi (40MHz, MCS2, 99pc duty cycle)               | WLAN       | 8.32   | ±9.6 %  |
| 10537 | AAB     | IEEE 802.11ac WIFi (40MHz, MCS3, 99pc duty cycle)               | WLAN       | 8.44   | ±96%    |
| 10538 | AAB     | IEEE 802.11ac WiFi (40MHz, MCS4, 99pc duty cycle)               | WLAN       | 8.54   | ± 9.6 % |
| 10540 | AAB     | IEEE 802.11ac WiFi (40MHz, MCS6, 99pc duty cycle)               | WLAN       | 8.39   | ±9.6 %  |
| 10541 | AAB     | IEEE 802.11ac WiFi (40MHz, MCS7, 99pc duty cycle)               | WLAN       | 8.46   | ± 9.6 % |
| 10542 | AAB     | IEEE 802.11ac WiFi (40MHz, MCS8, 99pc duty cycle)               | WLAN       | 8.65   | ± 9.6 % |
| 10543 | AAB     | IEEE 802.11ac WiFi (40MHz, MCS9, 99pc duty cycle)               | WLAN       | 8.65   | ±9.6%   |
| 10544 | AAB     | IEEE 802.11ac WiFi (80MHz, MCS0, 99pc duty cycle)               | WLAN       | 8.47   | ± 9.6 % |
| 10545 | AAB     | IEEE 802.11ac WiFi (80MHz, MCS1, 99pc duty cycle)               | WLAN       | 8.55   | ±9.6%   |
| 10546 | AAB     | IEEE 802.11ac WiFi (80MHz, MCS2, 99pc duty cycle)               | WLAN       | 8.35   | ± 9.6 % |
| 10547 | AAB     | IEEE 802.11ac WiFi (80MHz, MCS3, 99pc duty cycle)               | WLAN       | 8.49   | ± 9.6 % |
| 10548 | AAB     | IEEE 802.11ac WiFi (80MHz, MCS4, 99pc duty cycle)               | WLAN       | 8.37   | ± 9.6 % |
| 10550 | AAB     | IEEE 802.11ac WiFi (80MHz, MCS6, 99pc duty cycle)               | WLAN       | 8.38   | ± 9.6 % |
| 10551 | AAB     | IEEE 802.11ac WiFi (80MHz, MCS7, 99pc duty cycle)               | WLAN       | 8.50   | ± 9.6 % |
| 10552 | AAB     | IEEE 802.11ac WiFi (80MHz, MCS8, 99pc duty cycle)               | WLAN       | 8.42   | ± 9.6 % |
| 10553 | AAB     | IEEE 802.11ac WiFi (80MHz, MCS9, 99pc duty cycle)               | WLAN       | 8.45   | ± 9.6 % |
| 10554 | AAC     | IEEE 802.11ac WiFi (160MHz, MCS0, 99pc duty cycle)              | WLAN       | 8.48   | ± 9.6 % |
| 10555 | AAC     | IEEE 802.11ac WiFi (160MHz, MCS1, 99pc duty cycle)              | WLAN       | 8.47   | ±9.6 %  |
| 10556 | AAC     | IEEE 802.11ac WiFi (160MHz, MCS2, 99pc duty cycle)              | WLAN       | 8.50   | ±9.6%   |
| 10557 | AAC     | IEEE 802.11ac WiFi (160MHz, MCS3, 99pc duty cycle)              | WLAN       | 8.52   | ±9.6 %  |
| 10558 | AAC     | IEEE 802.11ac WiFi (160MHz, MCS4, 99pc duty cycle)              | WLAN       | 8.61   | ±9.6 %  |
| 10560 | AAC     | IEEE 802.11ac WiFi (160MHz, MCS6, 99pc duty cycle)              | WLAN       | 8.73   | ±9.6 %  |
| 10561 | AAC     | IEEE 802.11ac WiFi (160MHz, MCS7, 99pc duty cycle)              | WLAN       | 8.56   | ±9.6%   |
| 10562 | AAC     | IEEE 802.11ac WiFi (160MHz, MCS8, 99pc duty cycle)              | WLAN       | 8.69   | ±9.6 %  |
| 10563 | AAC     | IEEE 802.11ac WiFi (160MHz, MCS9, 99pc duty cycle)              | WLAN       | 8.77   | ± 9.6 % |
| 10564 | AAA     | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 99pc duty         | WLAN       | 8.25   | ± 9.6 % |
|       | ' ' ' ' | cycle)  |            |        |         |
| 10565 | AAA     | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 99pc duty cycle) | WLAN       | 8.45   | ± 9.6 % |
| 10566 | AAA     | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 99pc duty        | WLAN       | 8.13   | ± 9.6 % |
| 40507 | 1 A A A | cycle)  | 10/1 A N I | - 0.00 | 1000    |
| 10567 | AAA     | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 99pc duty        | WLAN       | 8.00   | ± 9.6 % |
| 40500 |         | cycle)  | 1071 0.01  | 0.07   | 1000    |
| 10568 | AAA     | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 99pc duty        | WLAN       | 8.37   | ±9.6 %  |
| 40500 | ^ ^     | cycle)  | WLAN       | 8.10   | +0.6.9/ |
| 10569 | AAA     | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 99pc duty        | WLAIN      | 0.10   | ± 9.6 % |
| 40E70 | ^ ^     | cycle)  | MI ANI     | 1 0 00 | +06%    |
| 10570 | AAA     | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 99pc duty        | WLAN       | 8.30   | ± 9.6 % |
| 40574 | 1       | cycle)  | 100 001    | 4.00   | 1000    |
| 10571 | AAA     | IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 90pc duty cycle)       | WLAN       | 1.99   | ±9.6%   |
| 10572 | AAA     | IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 90pc duty cycle)       | WLAN       | 1.99   | ±9.6%   |
| 10573 | AAA     | IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 90pc duty cycle)     | WLAN       | 1.98   | ± 9.6 % |
| 10574 | AAA     | IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 90pc duty cycle)      | WLAN       | 1.98   | ± 9.6 % |
| 10575 | AAA     | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty         | WLAN       | 8.59   | ± 9.6 % |
| 10576 | 1 ^ ^ ^ | cycle) IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 90pc duty  | WLAN       | 9 60   | +0.6%   |
| 10076 | AAA     | , , , , , ,   | VVLAIN     | 8.60   | ± 9.6 % |
| 10577 | AAA     | cycle) IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 90pc duty | WLAN       | 970    | ± 9.6 % |
| 100// | AAA     |   | MATWIA     | 8.70   | ± 9.0 % |
| 10570 | 000     | cycle) IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 90pc duty | VALL AND   | 0.40   | ± 9.6 % |
| 10578 | AAA     |   | WLAN       | 8.49   | T 9.0 % |
| 40570 | A A A   | cycle)  | JAM ANI    | 0.00   | 1069/   |
| 10579 | AAA     | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 90pc duty        | WLAN       | 8.36   | ±9.6 %  |
| 40500 | 1       | cycle)  | 30/1 0 0 1 | 0.70   | 10.60/  |
| 10580 | AAA     | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc duty        | WLAN       | 8.76   | ± 9.6 % |
| 40504 |         | cycle)  | 14/1 431   |        | 1069    |
| 10581 | AAA     | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 90pc duty        | WLAN       | 8.35   | ± 9.6 % |
| 10500 | 1       | cycle)  | 14/1 4 5 1 |        |         |
| 10582 | AAA     | IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty        | WLAN       | 8.67   | ± 9.6 % |
| 40500 |         | cycle)  | 18/1 811   |        | 1.000   |
| 10583 | AAB     | IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)       | WLAN       | 8.59   | ± 9.6 % |
| 10584 | AAB     | IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty cycle)       | WLAN       | 8.60   | ± 9.6 % |
| 10585 | AAB     | IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)      | WLAN       | 8.70   | ± 9.6 % |
| 10586 | AAB     | IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 90pc duty cycle)      | WLAN       | 8.49   | ± 9.6 % |
| 10587 | AAB     | IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 90pc duty cycle)      | WLAN       | 8.36   | ± 9.6 % |
|       |         |   |            |        |         |

| 10500 | T :        |  |          |       |         |
|-------|------------|--|----------|-------|---------|
| 10588 | AAB        | IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 90pc duty cycle) | WLAN     | 8.76  | ± 9.6 % |
| 10589 | AAB        | IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 90pc duty cycle) | WLAN     | 8.35  | ± 9.6 % |
| 10590 | AAB        | IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 90pc duty cycle) | WLAN     | 8.67  | ± 9.6 % |
| 10591 | AAB        | IEEE 802.11n (HT Mixed, 20MHz, MCS0, 90pc duty cycle)      | WLAN     | 8.63  | ±9.6 %  |
| 10592 | AAB        | IEEE 802.11n (HT Mixed, 20MHz, MCS1, 90pc duty cycle)      | WLAN     | 8.79  | ± 9.6 % |
| 10593 | AAB        | IEEE 802.11n (HT Mixed, 20MHz, MCS2, 90pc duty cycle)      | WLAN     | 8.64  | ± 9.6 % |
| 10594 | AAB        | IEEE 802.11n (HT Mixed, 20MHz, MCS3, 90pc duty cycle)      | WLAN     | 8.74  | ± 9.6 % |
| 10595 | AAB        | IEEE 802.11n (HT Mixed, 20MHz, MCS4, 90pc duty cycle)      | WLAN     | 8.74  | ± 9.6 % |
| 10596 | AAB        | IEEE 802.11n (HT Mixed, 20MHz, MCS5, 90pc duty cycle)      | WLAN     | 8.71  | ± 9.6 % |
| 10597 | AAB        | IEEE 802.11n (HT Mixed, 20MHz, MCS6, 90pc duty cycle)      | WLAN     | 8.72  | ± 9.6 % |
| 10598 | AAB        | IEEE 802.11n (HT Mixed, 20MHz, MCS7, 90pc duty cycle)      | WLAN     | 8.50  | ± 9.6 % |
| 10599 | AAB        | IEEE 802.11n (HT Mixed, 40MHz, MCS0, 90pc duty cycle)      | WLAN     | 8.79  | ± 9.6 % |
| 10600 | AAB        | IEEE 802.11n (HT Mixed, 40MHz, MCS1, 90pc duty cycle)      | WLAN     | 8.88  | ± 9.6 % |
| 10601 | AAB        | IEEE 802.11n (HT Mixed, 40MHz, MCS2, 90pc duty cycle)      | WLAN     | 8.82  | ± 9.6 % |
| 10602 | AAB        | IEEE 802.11n (HT Mixed, 40MHz, MCS3, 90pc duty cycle)      | WLAN     | 8.94  | ± 9.6 % |
| 10603 | AAB        | IEEE 802.11n (HT Mixed, 40MHz, MCS4, 90pc duty cycle)      | WLAN     | 9.03  | ± 9.6 % |
| 10604 | AAB        | IEEE 802.11n (HT Mixed, 40MHz, MCS5, 90pc duty cycle)      | WLAN     | 8.76  | ± 9.6 % |
| 10605 | AAB        | IEEE 802.11n (HT Mixed, 40MHz, MCS6, 90pc duty cycle)      | WLAN     | 8.97  | ± 9.6 % |
| 10606 | AAB        | IEEE 802.11n (HT Mixed, 40MHz, MCS7, 90pc duty cycle)      | WLAN     |       |         |
| 10607 | AAB        | IEEE 802.11ac WiFi (20MHz, MCS0, 90pc duty cycle)          |          | 8.82  | ± 9.6 % |
| 10608 | AAB        | IEEE 802.11ac WiFi (20MHz, MCS0, 90pc duty cycle)          | WLAN     | 8.64  | ± 9.6 % |
| 10609 | AAB        | IEEE 802.11ac WiFi (20MHz, MCS1, 90pc duty cycle)          | WLAN     | 8.77  | ± 9.6 % |
| 10610 |            | TEEE 002.1 fac Wiri (20MHz, NICS2, 90pc duty cycle)        | WLAN     | 8.57  | ±9.6%   |
| 10610 | AAB<br>AAB | IEEE 802.11ac WiFi (20MHz, MCS3, 90pc duty cycle)          | WLAN     | 8.78  | ± 9.6 % |
|       |            | IEEE 802.11ac WiFi (20MHz, MCS4, 90pc duty cycle)          | WLAN     | 8.70  | ±9.6 %  |
| 10612 | AAB        | IEEE 802.11ac WiFi (20MHz, MCS5, 90pc duty cycle)          | WLAN     | 8.77  | ± 9.6 % |
| 10613 | AAB        | IEEE 802.11ac WiFi (20MHz, MCS6, 90pc duty cycle)          | WLAN     | 8.94  | ± 9.6 % |
| 10614 | AAB        | IEEE 802.11ac WiFi (20MHz, MCS7, 90pc duty cycle)          | WLAN     | 8.59  | ± 9.6 % |
| 10615 | AAB        | IEEE 802.11ac WiFi (20MHz, MCS8, 90pc duty cycle)          | WLAN     | 8.82  | ±9.6 %  |
| 10616 | AAB        | IEEE 802.11ac WiFi (40MHz, MCS0, 90pc duty cycle)          | WLAN     | 8.82  | ± 9.6 % |
| 10617 | AAB        | IEEE 802.11ac WiFi (40MHz, MCS1, 90pc duty cycle)          | WLAN     | 8.81  | ±9.6%   |
| 10618 | AAB        | IEEE 802.11ac WiFi (40MHz, MCS2, 90pc duty cycle)          | WLAN     | 8.58  | ± 9.6 % |
| 10619 | AAB        | IEEE 802.11ac WiFi (40MHz, MCS3, 90pc duty cycle)          | WLAN     | 8.86  | ± 9.6 % |
| 10620 | AAB        | IEEE 802.11ac WiFi (40MHz, MCS4, 90pc duty cycle)          | WLAN     | 8.87  | ±9.6%   |
| 10621 | AAB        | IEEE 802.11ac WiFi (40MHz, MCS5, 90pc duty cycle)          | WLAN     | 8.77  | ± 9,6 % |
| 10622 | AAB        | IEEE 802.11ac WiFi (40MHz, MCS6, 90pc duty cycle)          | WLAN     | 8.68  | ±9.6%   |
| 10623 | AAB        | IEEE 802.11ac WiFi (40MHz, MCS7, 90pc duty cycle)          | WLAN     | 8.82  | ± 9.6 % |
| 10624 | AAB        | IEEE 802.11ac WiFi (40MHz, MCS8, 90pc duty cycle)          | WLAN     | 8.96  | ± 9.6 % |
| 10625 | AAB        | IEEE 802.11ac WiFi (40MHz, MCS9, 90pc duty cycle)          | WLAN     | 8.96  | ±9.6 %  |
| 10626 | AAB        | IEEE 802.11ac WiFi (80MHz, MCS0, 90pc duty cycle)          | WLAN     | 8.83  | ± 9.6 % |
| 10627 | AAB        | IEEE 802.11ac WiFi (80MHz, MCS1, 90pc duty cycle)          | WLAN     | 8.88  | ± 9.6 % |
| 10628 | AAB        | IEEE 802.11ac WiFi (80MHz, MCS2, 90pc duty cycle)          | WLAN     | 8.71  | ± 9.6 % |
| 10629 | AAB        | IEEE 802.11ac WiFi (80MHz, MCS3, 90pc duty cycle)          | WLAN     | 8.85  | ± 9.6 % |
| 10630 | AAB        | IEEE 802.11ac WiFi (80MHz, MCS4, 90pc duty cycle)          | WLAN     | 8.72  | ± 9.6 % |
| 10631 | AAB        | IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)          | WLAN     | 8.81  | ± 9.6 % |
| 10632 | AAB        | IEEE 802.11ac WiFi (80MHz, MCS6, 90pc duty cycle)          | WLAN     | 8.74  | ± 9.6 % |
| 10633 | AAB        | IEEE 802.11ac WiFi (80MHz, MCS7, 90pc duty cycle)          | WLAN     | 8.83  | ± 9.6 % |
| 10634 | AAB        | IEEE 802.11ac WiFi (80MHz, MCS8, 90pc duty cycle)          | WLAN     | 8.80  |         |
| 10635 | AAB        | IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)          | WLAN     |       | ± 9.6 % |
| 10636 | AAC        | IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)         |          | 8.81  | ± 9.6 % |
| 10637 | AAC        | IEEE 802.11ac WiFi (160MHz, MCS1, 90pc duty cycle)         | WLAN     | 8.83  | ± 9.6 % |
| 10638 | AAC        | IEEE 802.11ac WiFi (160MHz, MCS1, 90pc duty cycle)         | WLAN     | 8.79  | ± 9.6 % |
| 10639 | AAC        | IEEE 802.11ac WiFi (160MHz, MCS2, 90pc duty cycle)         | WLAN     | 8.86  | ± 9.6 % |
| 10640 | AAC        | TEEE 802.11ac WIFT (TOUWITZ, WCS3, SUPC OUTY CYCIE)        | WLAN     | 8.85  | ± 9.6 % |
| 10641 | AAC        | IEEE 802.11ac WiFi (160MHz, MCS4, 90pc duty cycle)         | WLAN     | 8.98  | ± 9.6 % |
| 10641 |            | IEEE 802.11ac WiFi (160MHz, MCS5, 90pc duty cycle)         | WLAN     | 9.06  | ± 9.6 % |
| 10642 | AAC        | IEEE 802.11ac WiFi (160MHz, MCS6, 90pc duty cycle)         | WLAN     | 9.06  | ± 9,6 % |
|       | AAC        | IEEE 802.11ac WiFi (160MHz, MCS7, 90pc duty cycle)         | WLAN     | 8.89  | ± 9,6 % |
| 10644 | AAC        | IEEE 802.11ac WiFi (160MHz, MCS8, 90pc duty cycle)         | WLAN     | 9.05  | ±9.6%   |
| 10645 | AAC        | IEEE 802.11ac WiFi (160MHz, MCS9, 90pc duty cycle)         | WLAN     | 9.11  | ± 9.6 % |
| 10646 | AAF        | LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,7)      | LTE-TDD  | 11.96 | ± 9.6 % |
| 10647 | AAF        | LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,7)     | LTE-TDD  | 11.96 | ± 9.6 % |
| 10648 | AAA        | CDMA2000 (1x Advanced)                                     | CDMA2000 | 3.45  | ±9.6%   |
| 10652 | AAD        | LTE-TDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)             | LTE-TDD  | 6.91  | ±9.6%   |
| 10653 | AAD        | LTE-TDD (OFDMA, 10 MHz, E-TM 3.1, Clipping 44%)            | LTE-TDD  | 7.42  | ± 9.6 % |
| 10654 | AAD        | LTE-TDD (OFDMA, 15 MHz, E-TM 3.1, Clipping 44%)            | LTE-TDD  | 6.96  | ± 9.6 % |
|       |            |  |          |       |         |

| 10655 | AAE          | LTE-TDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%)         | LITE TOD  | 7.04  | 1000    |
|-------|--------------|---|-----------|-------|---------|
| 10658 | AAA          | Pulse Waveform (200Hz, 10%)                             | LTE-TDD   | 7.21  | ±9.6 %  |
| 10659 | AAA          | Pulse Waveform (200Hz, 10%)                             | Test      | 10.00 | ± 9.6 % |
| 10660 | AAA          |   | Test      | 6.99  | ±9.6 %  |
| 10661 | AAA          | Pulse Waveform (200Hz, 40%)                             | Test      | 3.98  | ±9.6 %  |
| 10662 | AAA          | Pulse Waveform (200Hz, 60%) Pulse Waveform (200Hz, 80%) | Test      | 2.22  | ±9.6 %  |
| 10670 | AAA          | <u> </u>  | Test      | 0.97  | ±9.6 %  |
|       |              | Bluetooth Low Energy                                    | Bluetooth | 2.19  | ±9.6 %  |
| 10671 | AAA          | IEEE 802.11ax (20MHz, MCS0, 90pc duty cycle)            | WLAN      | 9.09  | ± 9.6 % |
| 10672 | AAA          | IEEE 802.11ax (20MHz, MCS1, 90pc duty cycle)            | WLAN      | 8.57  | ± 9.6 % |
| 10673 | AAA          | IEEE 802.11ax (20MHz, MCS2, 90pc duty cycle)            | WLAN      | 8.78  | ± 9.6 % |
| 10674 | AAA          | IEEE 802.11ax (20MHz, MCS3, 90pc duty cycle)            | WLAN      | 8.74  | ±9.6 %  |
| 10675 | AAA          | IEEE 802.11ax (20MHz, MCS4, 90pc duty cycle)            | WLAN      | 8.90  | ± 9.6 % |
| 10676 | AAA          | IEEE 802.11ax (20MHz, MCS5, 90pc duty cycle)            | WLAN      | 8.77  | ± 9.6 % |
| 10677 | AAA          | IEEE 802.11ax (20MHz, MCS6, 90pc duty cycle)            | WLAN      | 8.73  | ± 9.6 % |
| 10678 | AAA          | IEEE 802.11ax (20MHz, MCS7, 90pc duty cycle)            | WLAN      | 8.78  | ± 9.6 % |
| 10679 | AAA          | IEEE 802.11ax (20MHz, MCS8, 90pc duty cycle)            | WLAN      | 8.89  | ± 9.6 % |
| 10680 | AAA          | IEEE 802.11ax (20MHz, MCS9, 90pc duty cycle)            | WLAN      | 8.80  | ± 9.6 % |
| 10681 | AAA          | IEEE 802.11ax (20MHz, MCS10, 90pc duty cycle)           | WLAN      | 8.62  | ± 9.6 % |
| 10682 | AAA          | IEEE 802.11ax (20MHz, MCS11, 90pc duty cycle)           | WLAN      | 8.83  | ± 9.6 % |
| 10683 | AAA          | IEEE 802.11ax (20MHz, MCS0, 99pc duty cycle)            | WLAN      | 8.42  | ± 9.6 % |
| 10684 | AAA          | IEEE 802.11ax (20MHz, MCS1, 99pc duty cycle)            | WLAN      | 8.26  | ± 9.6 % |
| 10685 | AAA          | IEEE 802.11ax (20MHz, MCS2, 99pc duty cycle)            | WLAN      | 8.33  | ± 9.6 % |
| 10686 | AAA          | IEEE 802.11ax (20MHz, MCS3, 99pc duty cycle)            | WLAN      | 8.28  | ± 9.6 % |
| 10687 | AAA          | IEEE 802.11ax (20MHz, MCS4, 99pc duty cycle)            | WLAN      | 8.45  | ±9.6 %  |
| 10688 | AAA          | IEEE 802.11ax (20MHz, MCS5, 99pc duty cycle)            |           |       |         |
| 10689 | AAA          | IEEE 802.11ax (20MHz, MCS6, 99pc duty cycle)            | WLAN      | 8.29  | ± 9.6 % |
| 10690 | AAA          | IEEE 802.11ax (20MHz, MCS7, 99pc duty cycle)            | WLAN      | 8.55  | ±9.6 %  |
| 10691 | AAA          |   | WLAN      | 8.29  | ±9.6%   |
| 10691 | <del>}</del> | IEEE 802.11ax (20MHz, MCS8, 99pc duty cycle)            | WLAN      | 8.25  | ±9.6 %  |
|       | AAA          | IEEE 802.11ax (20MHz, MCS9, 99pc duty cycle)            | WLAN      | 8.29  | ±9.6 %  |
| 10693 | AAA          | IEEE 802.11ax (20MHz, MCS10, 99pc duty cycle)           | WLAN      | 8.25  | ±9.6%   |
| 10694 | AAA          | IEEE 802.11ax (20MHz, MCS11, 99pc duty cycle)           | WLAN      | 8.57  | ± 9.6 % |
| 10695 | AAA          | IEEE 802.11ax (40MHz, MCS0, 90pc duty cycle)            | WLAN      | 8.78  | ± 9.6 % |
| 10696 | AAA          | IEEE 802.11ax (40MHz, MCS1, 90pc duty cycle)            | WLAN      | 8.91  | ± 9.6 % |
| 10697 | AAA          | IEEE 802.11ax (40MHz, MCS2, 90pc duty cycle)            | WLAN      | 8.61  | ± 9.6 % |
| 10698 | AAA          | IEEE 802.11ax (40MHz, MCS3, 90pc duty cycle)            | WLAN      | 8.89  | ± 9.6 % |
| 10699 | AAA          | IEEE 802.11ax (40MHz, MCS4, 90pc duty cycle)            | WLAN      | 8.82  | ± 9.6 % |
| 10700 | AAA          | IEEE 802.11ax (40MHz, MCS5, 90pc duty cycle)            | WLAN      | 8.73  | ± 9.6 % |
| 10701 | AAA          | IEEE 802.11ax (40MHz, MCS6, 90pc duty cycle)            | WLAN      | 8.86  | ± 9.6 % |
| 10702 | AAA          | IEEE 802.11ax (40MHz, MCS7, 90pc duty cycle)            | WLAN      | 8.70  | ±9.6 %  |
| 10703 | AAA          | IEEE 802.11ax (40MHz, MCS8, 90pc duty cycle)            | WLAN      | 8.82  | ± 9.6 % |
| 10704 | AAA          | IEEE 802.11ax (40MHz, MCS9, 90pc duty cycle)            | WLAN      | 8.56  | ± 9.6 % |
| 10705 | AAA          | IEEE 802.11ax (40MHz, MCS10, 90pc duty cycle)           | WLAN      | 8.69  | ± 9.6 % |
| 10706 | AAA          | IEEE 802.11ax (40MHz, MCS11, 90pc duty cycle)           | WLAN      | 8.66  | ± 9.6 % |
| 10707 | AAA          | IEEE 802.11ax (40MHz, MCS0, 99pc duty cycle)            | WLAN      | 8.32  | ± 9.6 % |
| 10708 | AAA          | IEEE 802.11ax (40MHz, MCS1, 99pc duty cycle)            | WLAN      | 8.55  | ± 9.6 % |
| 10709 | AAA          | IEEE 802.11ax (40MHz, MCS2, 99pc duty cycle)            | WLAN      | 8.33  | ± 9.6 % |
| 10710 | AAA          | IEEE 802.11ax (40MHz, MCS3, 99pc duty cycle)            | WLAN      | 8.29  | ±9.6 %  |
| 10711 | AAA          | IEEE 802.11ax (40MHz, MCS4, 99pc duty cycle)            |           |       |         |
| 10712 | AAA          | IEEE 802.11ax (40MHz, MCS5, 99pc duty cycle)            | WLAN      | 8.39  | ± 9.6 % |
| 10712 | AAA          |   | WLAN      | 8.67  | ± 9.6 % |
| 10713 |              | IEEE 802.11ax (40MHz, MCS6, 99pc duty cycle)            | WLAN      | 8.33  | ± 9.6 % |
|       | AAA          | IEEE 802.11ax (40MHz, MCS7, 99pc duty cycle)            | WLAN      | 8.26  | ± 9.6 % |
| 10715 | AAA          | IEEE 802.11ax (40MHz, MCS8, 99pc duty cycle)            | WLAN      | 8.45  | ± 9.6 % |
| 10716 | AAA          | IEEE 802.11ax (40MHz, MCS9, 99pc duty cycle)            | WLAN      | 8.30  | ± 9.6 % |
| 10717 | AAA          | IEEE 802.11ax (40MHz, MCS10, 99pc duty cycle)           | WLAN      | 8.48  | ± 9.6 % |
| 10718 | AAA          | IEEE 802.11ax (40MHz, MCS11, 99pc duty cycle)           | WLAN      | 8.24  | ± 9.6 % |
| 10719 | AAA          | IEEE 802.11ax (80MHz, MCS0, 90pc duty cycle)            | WLAN      | 8.81  | ± 9.6 % |
| 10720 | AAA          | IEEE 802.11ax (80MHz, MCS1, 90pc duty cycle)            | WLAN      | 8.87  | ± 9.6 % |
| 10721 | AAA          | IEEE 802.11ax (80MHz, MCS2, 90pc duty cycle)            | WLAN      | 8.76  | ±9.6 %  |
| 10722 | AAA          | IEEE 802.11ax (80MHz, MCS3, 90pc duty cycle)            | WLAN      | 8.55  | ±9.6 %  |
| 10723 | AAA          | IEEE 802.11ax (80MHz, MCS4, 90pc duty cycle)            | WLAN      | 8.70  | ±9.6%   |
| 10724 | AAA          | IEEE 802.11ax (80MHz, MCS5, 90pc duty cycle)            | WLAN      | 8.90  | ± 9.6 % |
| 10725 | AAA          | IEEE 802.11ax (80MHz, MCS6, 90pc duty cycle)            | WLAN      | 8.74  | ± 9.6 % |
| 10726 | AAA          | IEEE 802.11ax (80MHz, MCS7, 90pc duty cycle)            | WLAN      | 8.72  | ± 9.6 % |
| 10727 | AAA          | IEEE 802.11ax (80MHz, MCS8, 90pc duty cycle)            | WLAN      | 8.66  | ± 9.6 % |
|       |              | ,, -, -, -, -, -, -, -, -, -, -, -, -, -,               |           |       | 5.5 76  |

| 10728 | AAA | IEEE 802.11ax (80MHz, MCS9, 90pc duty cycle)   | WLAN | 8.65 | ± 9.6 % |
|-------|-----|--|------|------|---------|
| 10729 | AAA | IEEE 802.11ax (80MHz, MCS10, 90pc duty cycle)  | WLAN | 8.64 | ± 9.6 % |
| 10730 | AAA | IEEE 802.11ax (80MHz, MCS11, 90pc duty cycle)  | WLAN | 8.67 | ± 9.6 % |
| 10731 | AAA | IEEE 802.11ax (80MHz, MCS0, 99pc duty cycle)   | WLAN | 8.42 | ± 9.6 % |
| 10732 | AAA | IEEE 802.11ax (60MHz, MCS1, 99pc duty cycle)   | WLAN | 8,46 | ± 9.6 % |
| 10733 | AAA | IEEE 802.11ax (80MHz, MCS2, 99pc duty cycle)   | WLAN | 8.40 | ± 9.6 % |
| 10734 | AAA | IEEE 802.11ax (80MHz, MCS3, 99pc duty cycle)   | WLAN | 8.25 | ± 9.6 % |
| 10735 | AAA | IEEE 802.11ax (80MHz, MCS4, 99pc duty cycle)   | WLAN | 8.33 | ± 9.6 % |
| 10736 | AAA | IEEE 802.11ax (80MHz, MCS5, 99pc duty cycle)   | WLAN | 8.27 | ± 9.6 % |
| 10737 | AAA | IEEE 802.11ax (80MHz, MCS6, 99pc duty cycle)   | WLAN | 8.36 | ± 9.6 % |
| 10738 | AAA | IEEE 802.11ax (80MHz, MCS7, 99pc duty cycle)   | WLAN | 8.42 | ± 9.6 % |
| 10739 | AAA | IEEE 802.11ax (80MHz, MCS8, 99pc duty cycle)   | WLAN | 8.29 | ± 9.6 % |
| 10740 | AAA | IEEE 802.11ax (80MHz, MCS9, 99pc duty cycle)   | WLAN | 8.48 | ± 9.6 % |
| 10741 | AAA | IEEE 802.11ax (80MHz, MCS10, 99pc duty cycle)  | WLAN | 8.40 | ± 9.6 % |
| 10742 | AAA | IEEE 802.11ax (80MHz, MCS11, 99pc duty cycle)  | WLAN | 8.43 | ± 9.6 % |
| 10743 | AAA | IEEE 802.11ax (160MHz, MCS0, 90pc duty cycle)  | WLAN | 8.94 | ± 9.6 % |
| 10744 | AAA | IEEE 802.11ax (160MHz, MCS1, 90pc duty cycle)  | WLAN | 9.16 | ± 9.6 % |
| 10745 | AAA | IEEE 802.11ax (160MHz, MCS2, 90pc duty cycle)  | WLAN | 8.93 | ± 9.6 % |
| 10746 | AAA | IEEE 802.11ax (160MHz, MCS3, 90pc duty cycle)  | WLAN | 9.11 | ± 9.6 % |
| 10747 | AAA | IEEE 802.11ax (160MHz, MCS4, 90pc duty cycle)  | WLAN | 9.04 | ± 9.6 % |
| 10748 | AAA | IEEE 802.11ax (160MHz, MCS5, 90pc duty cycle)  | WLAN | 8.93 | ± 9.6 % |
| 10749 | AAA | IEEE 802.11ax (160MHz, MCS6, 90pc duty cycle)  | WLAN | 8.90 | ± 9.6 % |
| 10750 | AAA | IEEE 802.11ax (160MHz, MCS7, 90pc duty cycle)  | WLAN | 8.79 | ± 9.6 % |
| 10751 | AAA | IEEE 802.11ax (160MHz, MCS8, 90pc duty cycle)  | WLAN | 8.82 | ± 9.6 % |
| 10752 | AAA | IEEE 802.11ax (160MHz, MCS9, 90pc duty cycle)  | WLAN | 8.81 | ± 9.6 % |
| 10753 | AAA | IEEE 802.11ax (160MHz, MCS10, 90pc duty cycle) | WLAN | 9.00 | ± 9.6 % |
| 10754 | AAA | IEEE 802.11ax (160MHz, MCS11, 90pc duty cycle) | WLAN | 8.94 | ± 9.6 % |
| 10755 | AAA | IEEE 802.11ax (160MHz, MCS0, 99pc duty cycle)  | WLAN | 8.64 | ± 9.6 % |
| 10756 | AAA | IEEE 802.11ax (160MHz, MCS1, 99pc duty cycle)  | WLAN | 8.77 | ± 9.6 % |
| 10757 | AAA | IEEE 802.11ax (160MHz, MCS2, 99pc duty cycle)  | WLAN | 8.77 | ± 9.6 % |
| 10758 | AAA | IEEE 802.11ax (160MHz, MCS3, 99pc duty cycle)  | WLAN | 8.69 | ± 9.6 % |
| 10759 | AAA | IEEE 802.11ax (160MHz, MCS4, 99pc duty cycle)  | WLAN | 8.58 | ±9.6 %  |
| 10760 | AAA | IEEE 802.11ax (160MHz, MCS5, 99pc duty cycle)  | WLAN | 8.49 | ± 9.6 % |
| 10761 | AAA | IEEE 802.11ax (160MHz, MCS6, 99pc duty cycle)  | WLAN | 8.58 | ± 9.6 % |
| 10762 | AAA | IEEE 802.11ax (160MHz, MCS7, 99pc duty cycle)  | WLAN | 8.49 | ± 9.6 % |
| 10763 | AAA | IEEE 802.11ax (160MHz, MCS8, 99pc duty cycle)  | WLAN | 8.53 | ± 9.6 % |
| 10764 | AAA | IEEE 802.11ax (160MHz, MCS9, 99pc duty cycle)  | WLAN | 8.54 | ± 9.6 % |
| 10765 | AAA | IEEE 802.11ax (160MHz, MCS10, 99pc duty cycle) | WLAN | 8.54 | ± 9.6 % |
| 10766 | AAA | IEEE 802.11ax (160MHz, MCS11, 99pc duty cycle) | WLAN | 8.51 | ± 9.6 % |

<sup>&</sup>lt;sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

#### **Calibration Laboratory of**

Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland





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Accreditation No.: SCS 0108

Client

**PC Test** 

Certificate No: EX3-7406\_May19

## **CALIBRATION CERTIFICATE**

Object

EX3DV4 - SN:7406

Calibration procedure(s)

QA CAL-01.v9, QA CAL-14.v5, QA CAL-23.v5, QA CAL-25.v7

Calibration procedure for dosimetric E-field probes

Calibration date:

May 16, 2019

BN 23-2010

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID               | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|------------------|-----------------------------------|------------------------|
| Power meter NRP            | SN: 104778       | 03-Apr-19 (No. 217-02892/02893)   | Apr-20                 |
| Power sensor NRP-Z91       | SN: 103244       | 03-Apr-19 (No. 217-02892)         | Apr-20                 |
| Power sensor NRP-Z91       | SN: 103245       | 03-Apr-19 (No. 217-02893)         | Apr-20                 |
| Reference 20 dB Attenuator | SN: S5277 (20x)  | 04-Apr-19 (No. 217-02894)         | Apr-20                 |
| DAE4                       | SN: 660          | 19-Dec-18 (No. DAE4-660_Dec18)    | Dec-19                 |
| Reference Probe ES3DV2     | SN: 3013         | 31-Dec-18 (No. ES3-3013_Dec18)    | Dec-19                 |
| Secondary Standards        | ID               | Check Date (in house)             | Scheduled Check        |
| Power meter E4419B         | SN: GB41293874   | 06-Apr-16 (in house check Jun-18) | In house check: Jun-20 |
| Power sensor E4412A        | SN: MY41498087   | 06-Apr-16 (in house check Jun-18) | In house check: Jun-20 |
| Power sensor E4412A        | SN: 000110210    | 06-Apr-16 (in house check Jun-18) | In house check: Jun-20 |
| RF generator HP 8648C      | SN: US3642U01700 | 04-Aug-99 (in house check Jun-18) | In house check; Jun-20 |
| Network Analyzer E8358A    | SN: US41080477   | 31-Mar-14 (in house check Oct-18) | In house check: Oct-19 |

Calibrated by:

Name

Function

Michael Weber

Laboratory Technician

Signature

Approved by:

Katja Pokovic

Technical Manager

Issued: May 16, 2019

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

#### Calibration Laboratory of

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Glossary:

TSL NORMx,v,z tissue simulating liquid sensitivity in free space

ConvF DCP sensitivity in TSL / NORMx,y,z diode compression point

CF A, B, C, D crest factor (1/duty\_cycle) of the RF signal modulation dependent linearization parameters

Polarization φ

φ rotation around probe axis

Polarization 8

9 rotation around an axis that is in the plane normal to probe axis (at measurement center),

i.e., 9 = 0 is normal to probe axis

Connector Angle

information used in DASY system to align probe sensor X to the robot coordinate system

#### Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- Techniques", June 2013
  b) IEC 62209-1, ", "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from handheld and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### Methods Applied and Interpretation of Parameters:

- NORMx,y,z: Assessed for E-field polarization 9 = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)x,y,z = NORMx,y,z \* frequency\_response (see Frequency Response Chart). This linearization is
  implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included
  in the stated uncertainty of ConvF.
- DCPx,y,z: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters: Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORMx,y,z \* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy): in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle: The angle is assessed using the information gained by determining the NORMx (no uncertainty required).

**Basic Calibration Parameters** 

|                               | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|-------------------------------|----------|----------|----------|-----------|
| Norm (μV/(V/m)²) <sup>A</sup> | 0.46     | 0.43     | 0.45     | ± 10.1 %  |
| DCP (mV) <sup>B</sup>         | 102.8    | 102.2    | 100.4    |           |

Calibration Results for Modulation Response

| UID           | Communication System Name        |   | A<br>dB | B<br>dBõV | С     | D<br>dB | VR<br>mV | Max<br>dev. | Max<br>Unc <sup>E</sup><br>(k=2) |
|---------------|----------------------------------|---|---------|-----------|-------|---------|----------|-------------|----------------------------------|
| 0             | CW                               | Х | 0.00    | 0.00      | 1.00  | 0.00    | 182.0    | ± 2.7 %     | ± 4.7 %                          |
|               |                                  | Y | 0.00    | 0.00      | 1.00  | 1       | 172.4    | 1 /         | /0                               |
| ****          |                                  | Z | 0.00    | 0.00      | 1.00  |         | 174.6    | [           |                                  |
| 10352-        | Pulse Waveform (200Hz, 10%)      | Х | 6.76    | 76.02     | 14.93 | 10.00   | 60.0     | ± 2.7 %     | ± 9.6 %                          |
| AAA           |                                  | Y | 6.25    | 75.48     | 14.76 |         | 60.0     |             |                                  |
|               |                                  | Z | 15.00   | 84.32     | 17.62 |         | 60.0     | 1           |                                  |
| 10353-        | Pulse Waveform (200Hz, 20%)      | Х | 15.00   | 85.05     | 16.36 | 6.99    | 80.0     | ± 1.9 %     | ± 9.6 %                          |
| AAA           |                                  | Υ | 15.00   | 85.57     | 16.70 |         | 80.0     |             |                                  |
|               |                                  | Z | 15.00   | 85.96     | 16.90 |         | 80.0     | 1           |                                  |
| 10354-        | Pulse Waveform (200Hz, 40%)      | Х | 15.00   | 83.48     | 13.87 | 3.98    | 95.0     | ± 1.3 %     | ± 9.6 %                          |
| AAA           |                                  | Y | 15.00   | 88.48     | 16.53 |         | 95.0     |             | 1 /6                             |
|               |                                  | Z | 15.00   | 85.80     | 15.05 |         | 95.0     | 1           |                                  |
| 10355-        | Pulse Waveform (200Hz, 60%)      | Х | 0.28    | 60.00     | 4.49  | 2.22    | 120.0    | ± 1.3 %     | ±9.6 %                           |
| AAA           |                                  | Υ | 15.00   | 95.23     | 18.20 |         | 120.0    |             |                                  |
|               |                                  | Z | 0.39    | 62.12     | 5.82  |         | 120.0    | 1           |                                  |
| 10387-        | QPSK Waveform, 1 MHz             | X | 0.46    | 60.00     | 5.77  | 0.00    | 150.0    | ± 3.7 %     | ± 9.6 %                          |
| AAA           |                                  | Υ | 14.25   | 443.18    | 61.66 |         | 150.0    |             |                                  |
|               |                                  | Z | 0.48    | 60.00     | 6.06  |         | 150.0    |             |                                  |
| 10388-        | QPSK Waveform, 10 MHz            | Х | 2.03    | 67.70     | 15.44 | 0.00    | 150.0    | ± 1.2 %     | ± 9.6 %                          |
| AAA           | 1                                | Υ | 2.30    | 72.35     | 18.27 |         | 150.0    |             |                                  |
|               |                                  | Z | 2.07    | 67.89     | 15.68 |         | 150.0    | :           |                                  |
| 10396-        | 64-QAM Waveform, 100 kHz         | X | 2.49    | 68.06     | 17.57 | 3.01    | 150.0    | ± 1.6 %     | ± 9.6 %                          |
| AAA           |                                  | Y | 1.98    | 66.67     | 17.49 |         | 150.0    |             |                                  |
|               |                                  | Z | 2.52    | 68,32     | 17.86 |         | 150.0    |             |                                  |
| 10399-<br>AAA | 64-QAM Waveform, 40 MHz          | Х | 3.39    | 67.06     | 15.71 | 0.00    | 150.0    | ± 2.2 %     | ± 9.6 %                          |
|               |                                  | Υ | 3.39    | 68.23     | 16.67 |         | 150.0    |             |                                  |
| 45.00         |                                  | Z | 3.40    | 67.01     | 15.79 |         | 150.0    |             |                                  |
| 10414-        | WLAN CCDF, 64-QAM, 40MHz         | Х | 4.70    | 65.74     | 15.61 | 0.00    | 150.0    | ± 4.1 %     | ± 9.6 %                          |
| AAA           |                                  | Y | 4.47    | 66.54     | 16.20 |         | 150.0    |             |                                  |
|               | details on LUD parameters and Am | Z | 4.70    | 65.63     | 15.63 |         | 150.0    |             |                                  |

Note: For details on UID parameters see Appendix

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

A The uncertainties of Norm X,Y,Z do not affect the E²-field uncertainty inside TSL (see Pages 5 and 6).

B Numerical linearization parameter: uncertainty not required.

E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

#### **Sensor Model Parameters**

|   | C1<br>fF | C2<br>fF | α<br>V <sup>-1</sup> | T1<br>ms.V <sup>-2</sup> | T2<br>ms.V <sup>-1</sup> | T3<br>ms | T4<br>V <sup>-2</sup> | T5<br>V <sup>-1</sup> | Т6   |
|---|----------|----------|----------------------|--------------------------|--------------------------|----------|-----------------------|-----------------------|------|
| X | 34.8     | 265.14   | 36.82                | 6.17                     | 0.37                     | 5.06     | 0.00                  | 0.44                  | 1.01 |
| Y | 19.8     | 147.90   | 35.69                | 7.11                     | 0.37                     | 5.03     | 0.00                  | 0.19                  | 1.00 |
| Z | 35.4     | 271.85   | 37.42                | 5.60                     | 0.38                     | 5.06     | 0.15                  | 0.41                  | 1.01 |

#### **Other Probe Parameters**

| Sensor Arrangement                            | Triangular |
|---|------------|
| Connector Angle (°)                           | 27.5       |
| Mechanical Surface Detection Mode             | enabled    |
| Optical Surface Detection Mode                | disabled   |
| Probe Overall Length                          | 337 mm     |
| Probe Body Diameter                           | 10 mm      |
| Tip Length                                    | 9 mm       |
| Tip Diameter                                  | 2.5 mm     |
| Probe Tip to Sensor X Calibration Point       | 1 mm       |
| Probe Tip to Sensor Y Calibration Point       | 1 mm       |
| Probe Tip to Sensor Z Calibration Point       | 1 mm       |
| Recommended Measurement Distance from Surface | 1.4 mm     |

#### Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) <sup>C</sup> | Relative<br>Permittivity <sup>F</sup> | Conductivity<br>(S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup><br>(mm) | Unc<br>(k=2) |
|----------------------|---------------------------------------|------------------------------------|---------|---------|---------|--------------------|----------------------------|--------------|
| 30                   | 55.0                                  | 0.75                               | 16.10   | 16.10   | 16.10   | 0.00               | 1.00                       | ± 13.3 %     |
| 750                  | 41.9                                  | 0.89                               | 10.26   | 10.26   | 10.26   | 0.44               | 0.93                       | ± 12.0 %     |
| 835                  | 41.5                                  | 0.90                               | 9.78    | 9.78    | 9.78    | 0.44               | 0.91                       | ± 12.0 %     |
| 1750                 | 40.1                                  | 1.37                               | 8.57    | 8.57    | 8.57    | 0.39               | 0.80                       | ± 12.0 %     |
| 1900                 | 40.0                                  | 1.40                               | 8.18    | 8.18    | 8.18    | 0.39               | 0.80                       | ± 12.0 %     |
| 2300                 | 39.5                                  | 1.67                               | 8.06    | 8.06    | 8.06    | 0.33               | 0.87                       | ± 12.0 %     |
| 2450                 | 39.2                                  | 1.80                               | 7.67    | 7.67    | 7.67    | 0.37               | 0.87                       | ± 12.0 %     |
| 2600                 | 39.0                                  | 1.96                               | 7.44    | 7.44    | 7.44    | 0.40               | 0.88                       | ± 12.0 %     |
| 5250                 | 35.9                                  | 4.71                               | 5.54    | 5.54    | 5.54    | 0.40               | 1.80                       | ± 13.1 %     |
| 5600                 | 35.5                                  | 5.07                               | 4.94    | 4.94    | 4.94    | 0.40               | 1.80                       | ± 13.1 %     |
| 5750                 | 35.4                                  | 5.22                               | 5.23    | 5.23    | 5.23    | 0.40               | 1.80                       | ± 13.1 %     |

<sup>&</sup>lt;sup>c</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to  $\pm$  110 MHz. F At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to  $\pm$  10% if liquid compensation formula is applied to

measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to  $\pm$  5%. The uncertainty is the RSS of

the ConvF uncertainty for indicated target tissue parameters.

Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## Calibration Parameter Determined in Body Tissue Simulating Media

| The state of the s |                                       |                                    |         |         |         |                    |                            |              |
|--|---------------------------------------|------------------------------------|---------|---------|---------|--------------------|----------------------------|--------------|
| f (MHz) <sup>c</sup>   | Relative<br>Permittivity <sup>F</sup> | Conductivity<br>(S/m) <sup>F</sup> | ConvF X | ConvF Y | ConvF Z | Alpha <sup>G</sup> | Depth <sup>G</sup><br>(mm) | Unc<br>(k=2) |
| 750  | 55.5                                  | 0.96                               | 10.05   | 10.05   | 10.05   | 0.50               | 0.80                       | ± 12.0 %     |
| 835  | 55.2                                  | 0.97                               | 9.78    | 9.78    | 9.78    | 0.40               | 0.93                       | ± 12.0 %     |
| 1750   | 53.4                                  | 1.49                               | 8.13    | 8.13    | 8.13    | 0.43               | 0.80                       | ± 12.0 %     |
| 1900   | 53.3                                  | 1.52                               | 7.95    | 7.95    | 7.95    | 0.38               | 0.85                       | ± 12.0 %     |
| 2300   | 52.9                                  | 1.81                               | 7.76    | 7.76    | 7.76    | 0.44               | 0.85                       | ± 12.0 %     |
| 2450   | 52.7                                  | 1.95                               | 7.54    | 7.54    | 7.54    | 0.37               | 0.88                       | ± 12.0 %     |
| 2600   | 52.5                                  | 2.16                               | 7.47    | 7.47    | 7.47    | 0.25               | 1.05                       | ± 12.0 %     |
| 5250   | 48.9                                  | 5.36                               | 5.08    | 5.08    | 5.08    | 0.50               | 1.90                       | ± 13.1 %     |
| 5600   | 48.5                                  | 5.77                               | 4.37    | 4.37    | 4.37    | 0.50               | 1.90                       | ± 13.1 %     |
| 5750   | 48.3                                  | 5.94                               | 4.53    | 4.53    | 4.53    | 0.50               | 1.90                       | ± 13.1 %     |

<sup>&</sup>lt;sup>c</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz.

F At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to

measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to  $\pm$  5%. The uncertainty is the RSS of

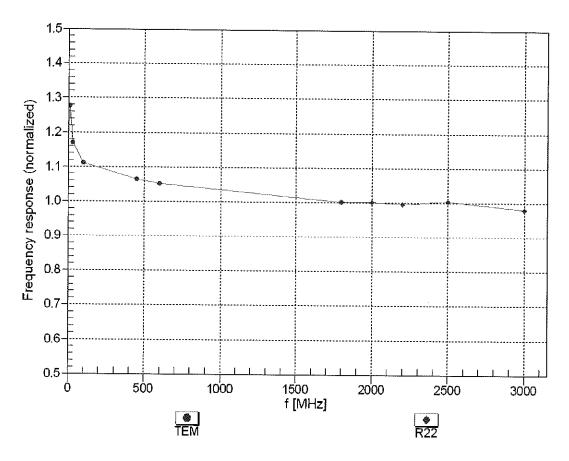
the ConvF uncertainty for indicated target tissue parameters.

A requestion of the convF uncertainty for indicated target tissue parameters.

A lipha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

# Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)

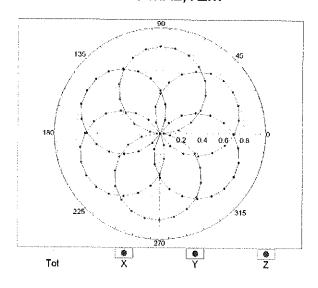


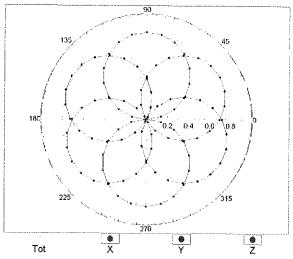
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

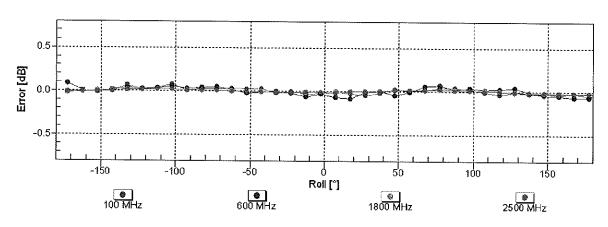
# Receiving Pattern ( $\phi$ ), $\vartheta = 0^{\circ}$

f=600 MHz,TEM

f=1800 MHz,R22

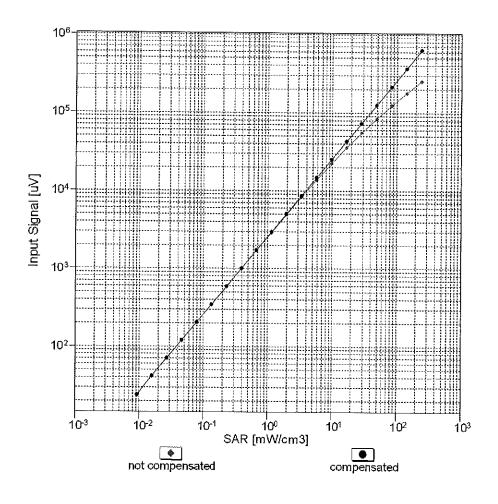


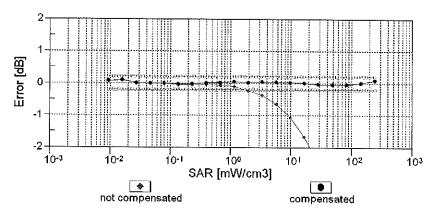




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

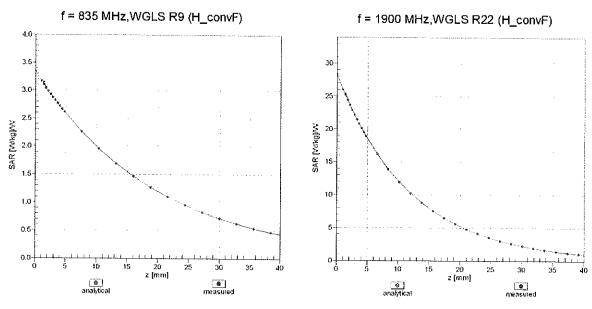
# Dynamic Range f(SAR<sub>head</sub>) (TEM cell , f<sub>eval</sub>= 1900 MHz)





Uncertainty of Linearity Assessment: ± 0.6% (k=2)

## **Conversion Factor Assessment**



Deviation from Isotropy in Liquid Error (φ, θ), f = 900 MHz

