

D1900V2, Serial No. 5d182 Extended Dipole Calibrations

Referring to KDB 865664 D01 v01r02, if dipoles are verified in return loss ($< -20\text{dB}$, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

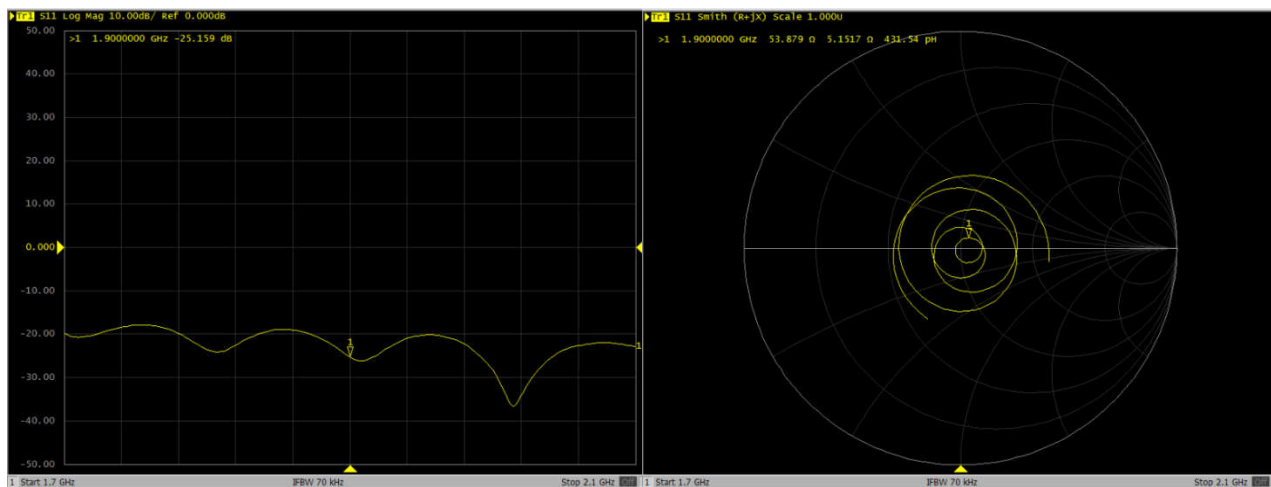
D1900V2 – serial no. 5d182												
	1900 Head						1900 Body					
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
2018.12.7	-25		52.1		5.35		-24		48.9		6.19	
2019.11.25	-25.2	-0.8	53.9	1.8	5.15	-0.2	-24.2	-0.8	48.7	-0.2	5.93	-0.26
2020.11.25	-25.8	3.2	52.6	0.5	4.56	-0.79	-24.2	-0.8	49.6	0.7	6.11	-0.08

<Justification of the extended calibration>

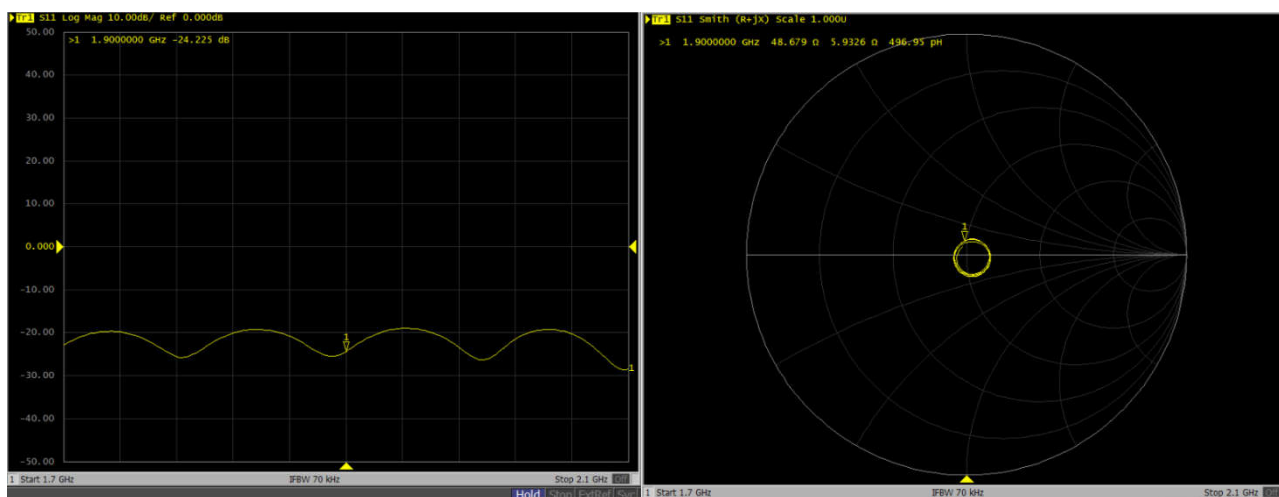
The return loss is $< -20\text{dB}$, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

Dipole Verification Data> D1900V2, serial no. 5d182

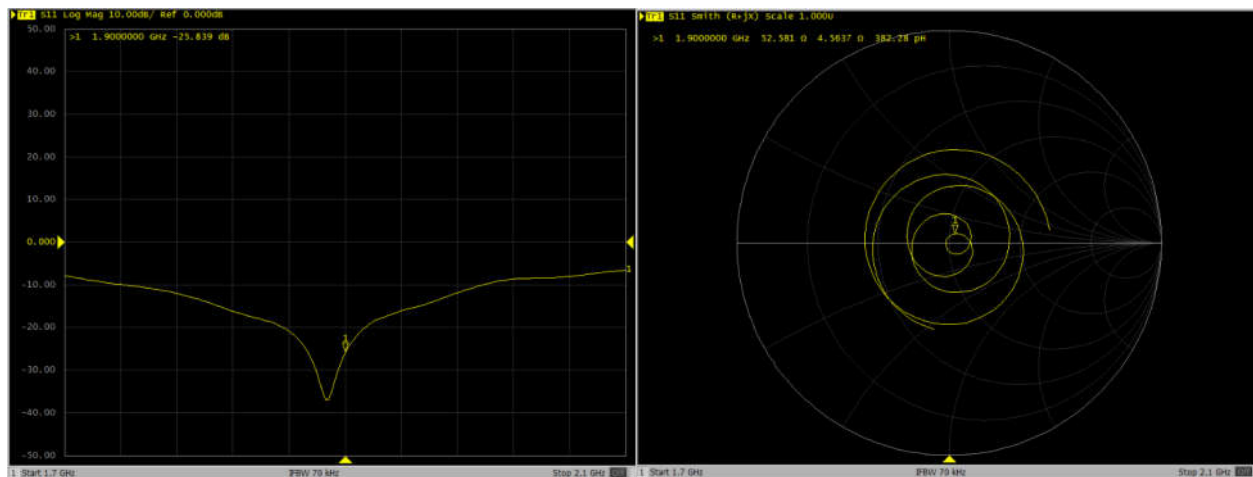
1900MHz – Head---2019.11.25



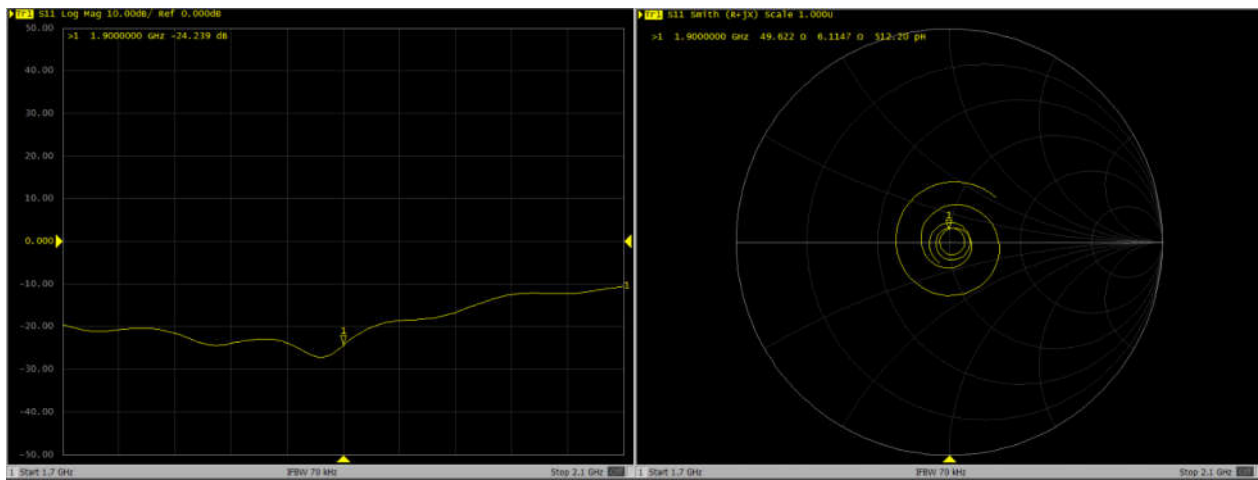
1900MHz – Body---2019.11.25



1900MHz – Head---2020.11.25



1900MHz – Body----2020.11.25





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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **Sporton**

Certificate No: **D2450V2-924_Sep20**

CALIBRATION CERTIFICATE

Object **D2450V2 - SN:924**

Calibration procedure(s) **QA CAL-05.v11
Calibration Procedure for SAR Validation Sources between 0.7-3 GHz**

Calibration date: **September 02, 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 $(22 \pm 3)^{\circ}\text{C}$ 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	01-Apr-20 (No. 217-03100/03101)	Apr-21
Power sensor NRP-Z91	SN: 103244	01-Apr-20 (No. 217-03100)	Apr-21
Power sensor NRP-Z91	SN: 103245	01-Apr-20 (No. 217-03101)	Apr-21
Reference 20 dB Attenuator	SN: BH9394 (20k)	31-Mar-20 (No. 217-03106)	Apr-21
Type-N mismatch combination	SN: 310982 / 06327	31-Mar-20 (No. 217-03104)	Apr-21
Reference Probe EX3DV4	SN: 7349	29-Jun-20 (No. EX3-7349_Jun20)	Jun-21
DAE4	SN: 601	27-Dec-19 (No. DAE4-601_Dec19)	Dec-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-19)	In house check: Oct-20

Calibrated by: **Jeffrey Katzman** Function: **Laboratory Technician**

Approved by: **Katja Pokovic** Technical Manager

Signature

Issued: September 2, 2020

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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:

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

Additional Documentation:

- 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	V52.10.4
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 $\pm$ 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 $\pm$ 0.2) °C	38.9 $\pm$ 6 %	1.84 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.0 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	51.4 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.04 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.0 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.9 Ω + 7.2 j Ω
Return Loss	- 22.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.155 ns
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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
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Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:924

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

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.84$ S/m; $\epsilon_r = 38.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.74, 7.74, 7.74) @ 2450 MHz; Calibrated: 29.06.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.12.2019
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

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 = 115.2 V/m; Power Drift = -0.05 dB

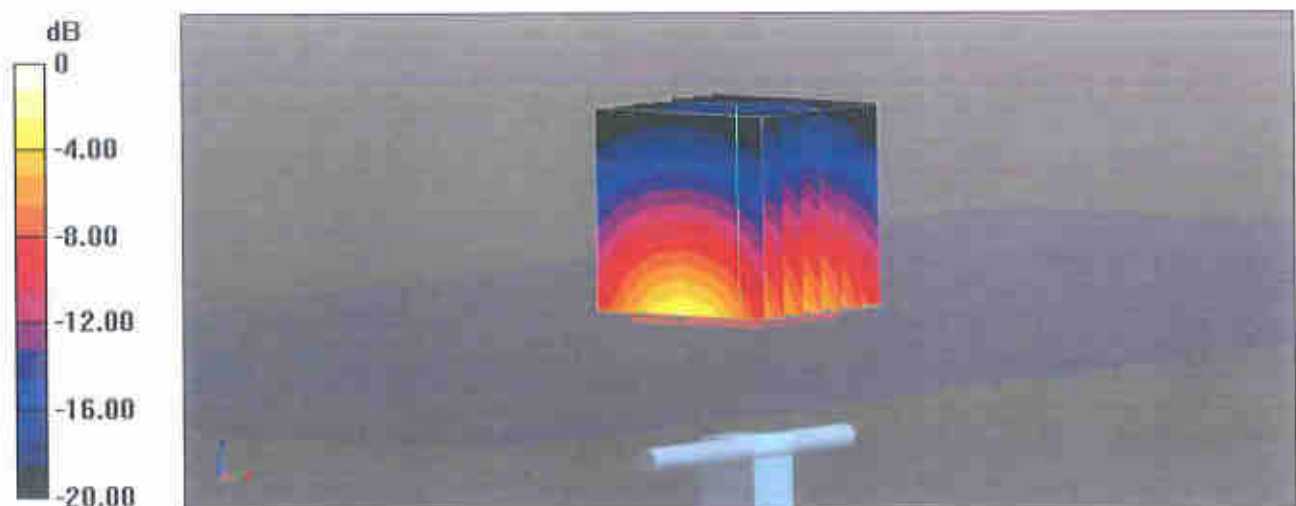
Peak SAR (extrapolated) = 25.4 W/kg

SAR(1 g) = 13.0 W/kg; SAR(10 g) = 6.04 W/kg

Smallest distance from peaks to all points 3 dB below = 9 mm

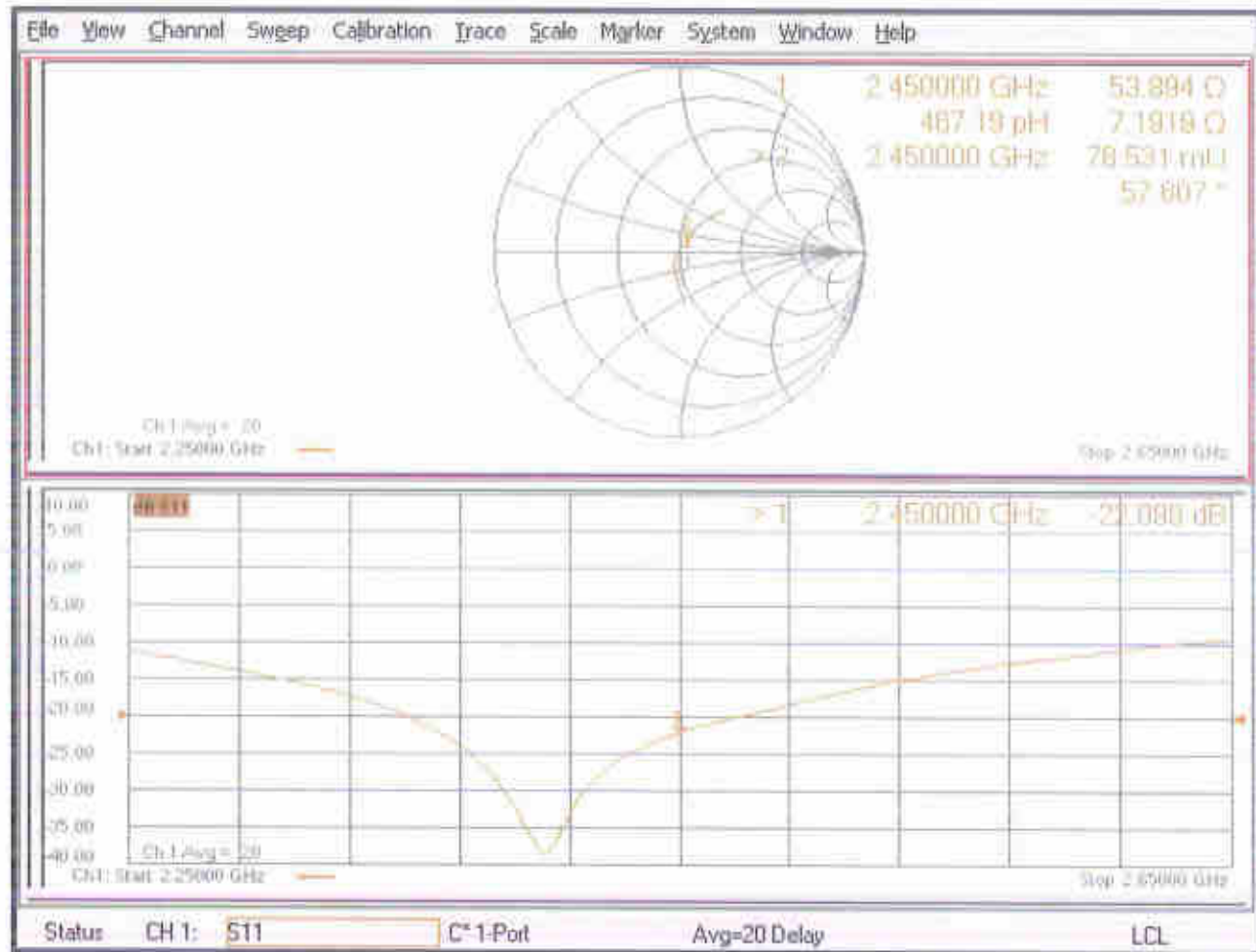
Ratio of SAR at M2 to SAR at M1 = 51%

Maximum value of SAR (measured) = 21.2 W/kg



0 dB = 21.2 W/kg = 13.26 dBW/kg

Impedance Measurement Plot for Head TSL





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Client **Sporton**

Certificate No: **Z18-60537**

CALIBRATION CERTIFICATE

Object **D2600V2 - SN: 1070**

Calibration Procedure(s) **FF-Z11-003-01**
Calibration Procedures for dipole validation kits

Calibration date: **December 7, 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(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	102196	07-Mar-18 (CTTL, No.J18X01510)	Mar-19
Power sensor NRV-Z5	100596	07-Mar-18 (CTTL, No.J18X01510)	Mar-19
Reference Probe EX3DV4	SN 7514	27-Aug-18(SPEAG,No.EX3-7514_Aug18)	Aug-19
DAE4	SN 1555	20-Aug-18(SPEAG,No.DAE4-1555_Aug18)	Aug-19
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	23-Jan-18 (CTTL, No.J18X00560)	Jan-19
Network Analyzer E5071C	MY46110673	24-Jan-18 (CTTL, No.J18X00561)	Jan-19

	Name	Function
Calibrated by:	Zhao Jing	SAR Test Engineer
Reviewed by:	Lin Hao	SAR Test Engineer
Approved by:	Qi Dianyuan	SAR Project Leader

Signature



Issued: December 10, 2018

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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:

- 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
- IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

- 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%.



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Measurement Conditions

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

DASY Version	DASY52	52.10.2.1495
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.1 $\pm$ 6 %	1.93 mho/m $\pm$ 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.4 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	58.1 mW / g $\pm$ 18.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.50 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	26.1 mW / g $\pm$ 18.7 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.5	2.16 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	51.0 $\pm$ 6 %	2.18 mho/m $\pm$ 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.8 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	54.6 mW / g $\pm$ 18.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	6.18 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	24.6 mW / g $\pm$ 18.7 % (k=2)



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Appendix(Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.6Ω- 6.33jΩ
Return Loss	- 23.7dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	44.8Ω- 5.36jΩ
Return Loss	- 22.1dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.015 ns
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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
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DASY5 Validation Report for Head TSL

Date: 12.06.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1070

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2600$ MHz; $\sigma = 1.926$ S/m; $\epsilon_r = 39.1$; $\rho = 1000$ kg/m³

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7514; ConvF(6.92, 6.92, 6.92) @ 2600 MHz; Calibrated: 8/27/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/20/2018
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

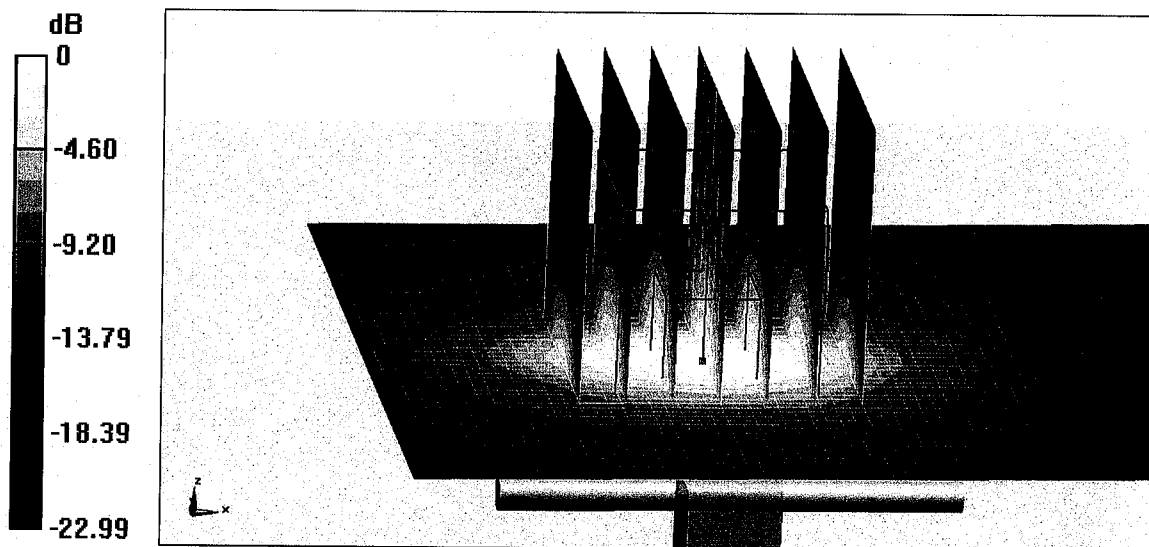
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 99.07 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 31.1 W/kg

SAR(1 g) = 14.4 W/kg; SAR(10 g) = 6.5 W/kg

Maximum value of SAR (measured) = 24.7 W/kg

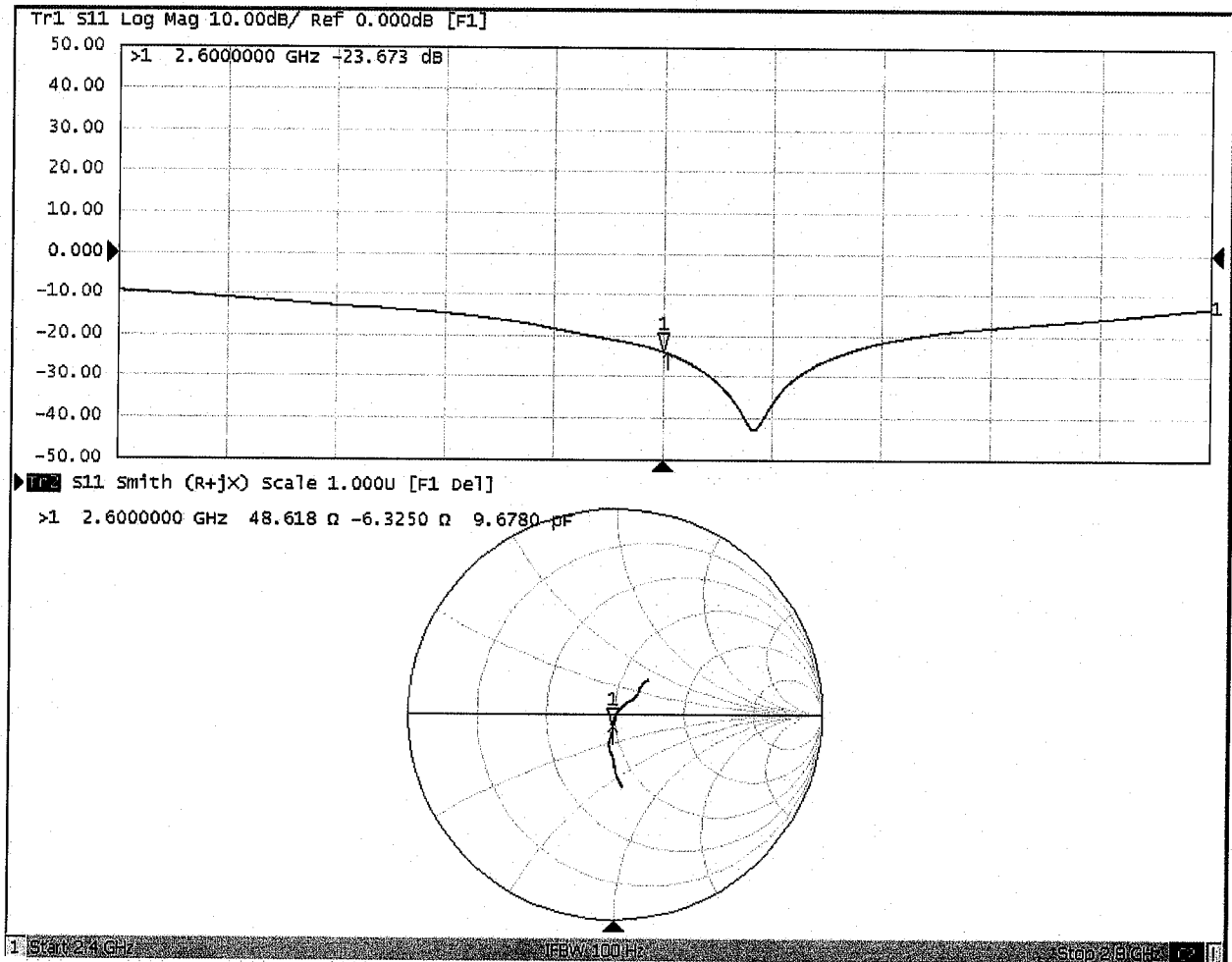


0 dB = 24.7 W/kg = 13.93 dBW/kg



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Impedance Measurement Plot for Head TSL





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DASY5 Validation Report for Body TSL

Date: 12.06.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1070

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2600$ MHz; $\sigma = 2.181$ S/m; $\epsilon_r = 51.03$; $\rho = 1000$ kg/m³

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7514; ConvF(7.06, 7.06, 7.06) @ 2600 MHz; Calibrated: 8/27/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/20/2018
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

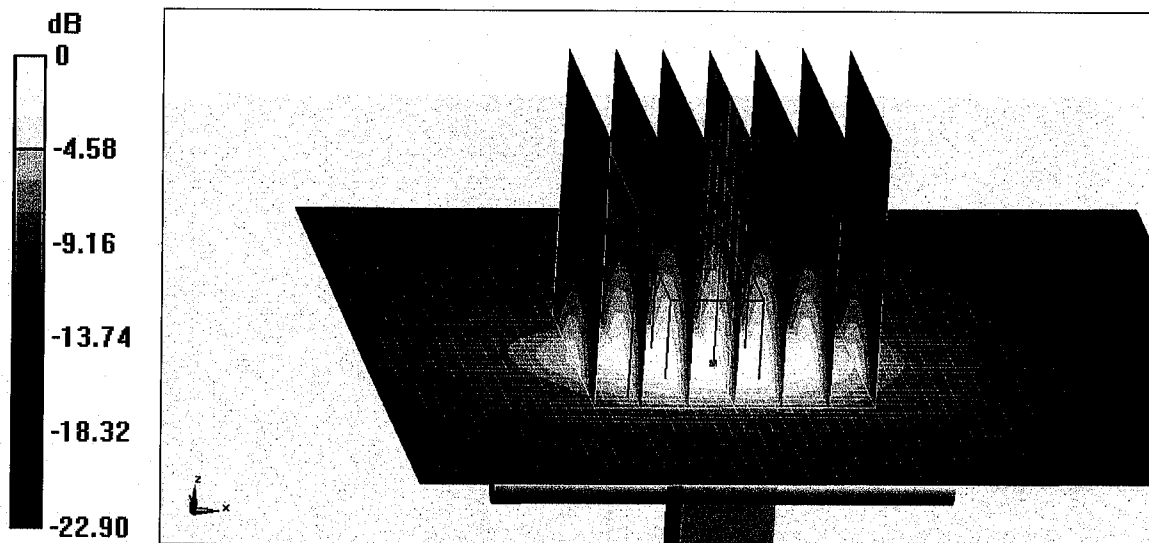
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 87.90 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 29.5 W/kg

SAR(1 g) = 13.8 W/kg; SAR(10 g) = 6.18 W/kg

Maximum value of SAR (measured) = 23.6 W/kg

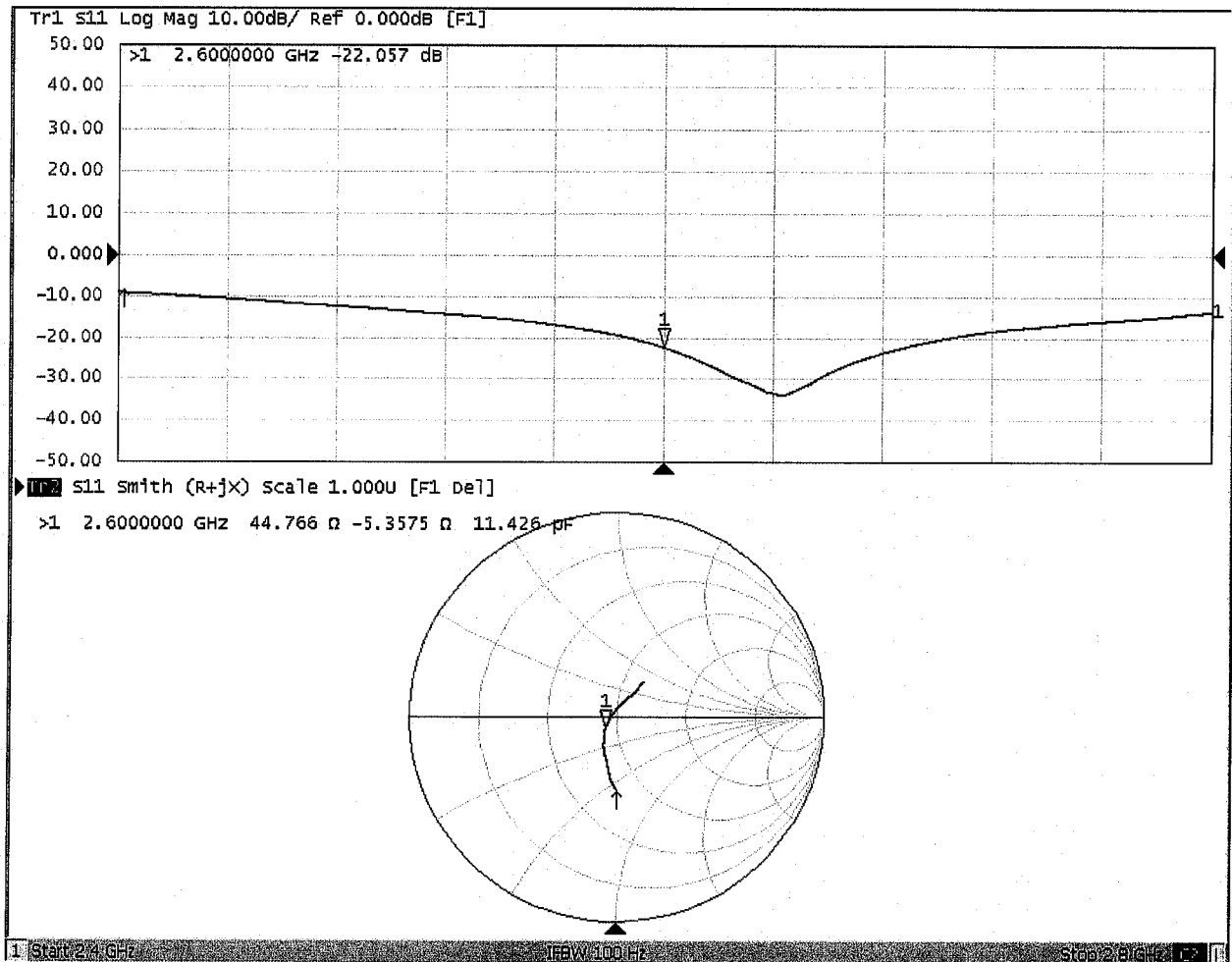


0 dB = 23.6 W/kg = 13.73 dBW/kg



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Impedance Measurement Plot for Body TSL



D2600V2, Serial No. 1070 Extended Dipole Calibrations

Referring to KDB 865664 D01 v01r02, if dipoles are verified in return loss ($< -20\text{dB}$, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

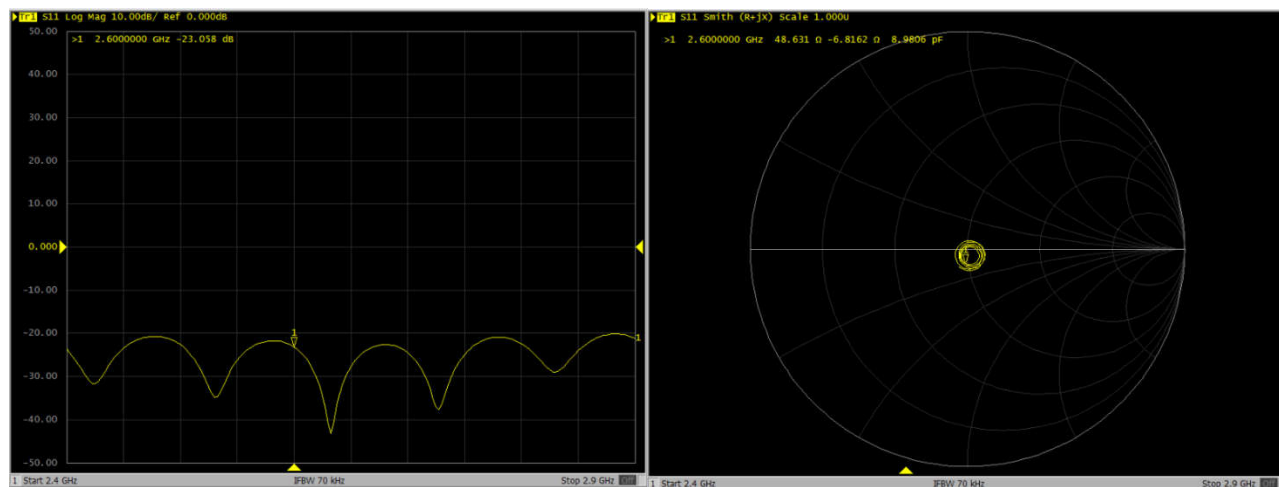
D2600V2 – serial no. 1070												
	2600 Head						2600 Body					
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
2018.12.7	-23.7		48.6		-6.33		-22.1		44.8		-5.36	
2019.11.25	-23.1	2.5	48.6	0	-6.82	-0.49	-22.0	0.5	45.3	0.5	-4.65	0.71
2020.11.25	-23.5	0.8	48.8	0.2	-5.93	0.4	-22.0	0.5	44.5	-0.3	-5.04	0.32

<Justification of the extended calibration>

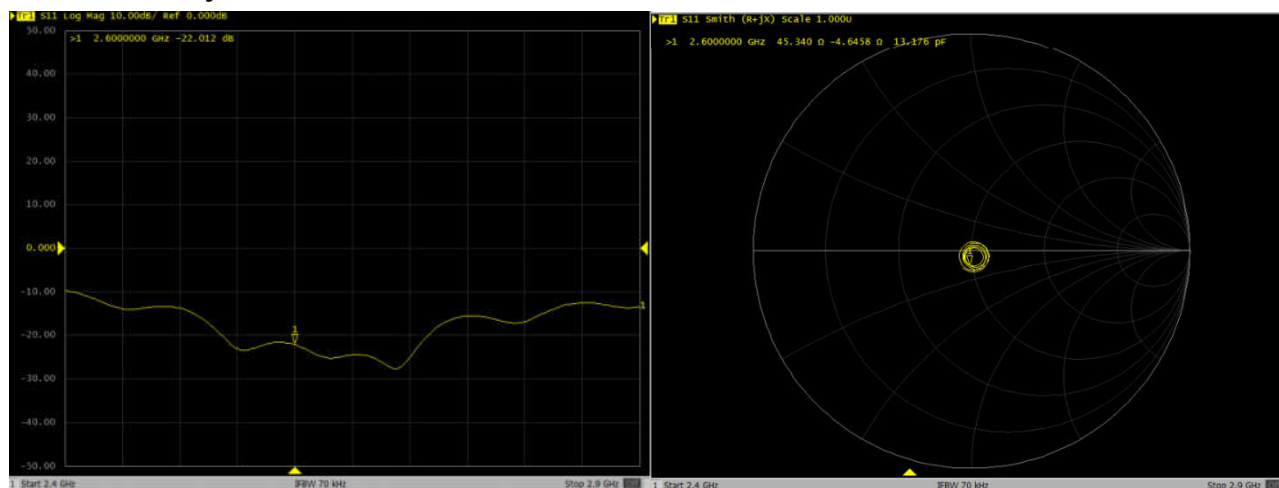
The return loss is $< -20\text{dB}$, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

Dipole Verification Data> D2600V2, serial no. 1070

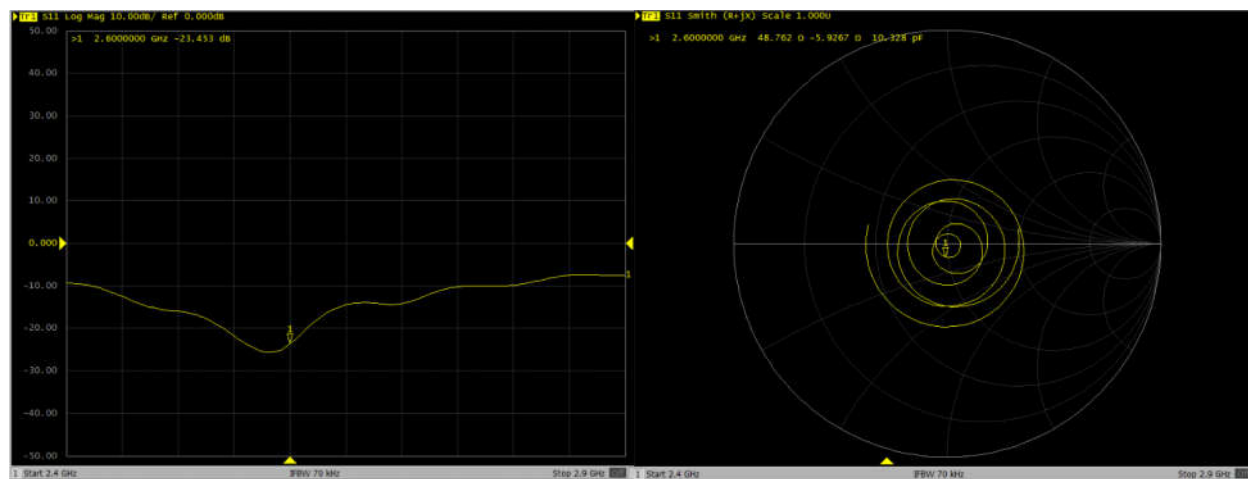
2600MHz – Head----2019.11.25



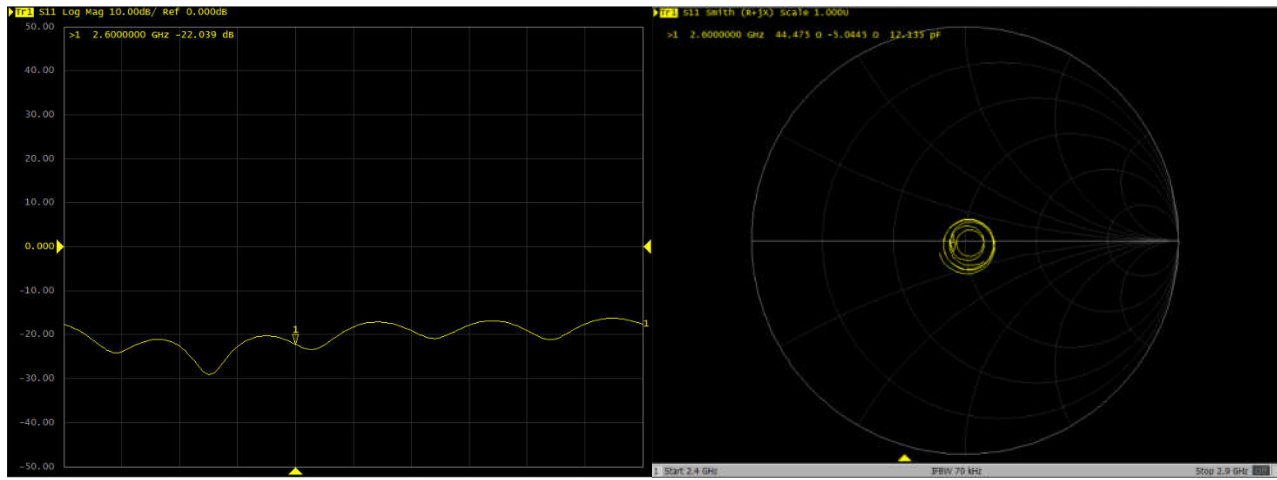
2600MHz – Body----2019.11.25



2600MHz – Head----2020.11.25



2600MHz – Body----2020.11.25





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Client

Sporton

Certificate No: **Z18-60259**

CALIBRATION CERTIFICATE

Object **D5GHzV2 - SN: 1167**

Calibration Procedure(s) **FF-Z11-003-01**
Calibration Procedures for dipole validation kits

Calibration date: **August 03, 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(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	102083	01-Nov-17 (CTTL, No.J17X08756)	Oct-18
Power sensor NRP-Z91	100542	01-Nov-17 (CTTL, No.J17X08756)	Oct-18
ReferenceProbe EX3DV4	SN 7464	12-Sep-17(SPEAG,No.EX3-7464_Sep17)	Sep-18
DAE4	SN 1524	13-Sep-17(SPEAG,No.DAE4-1524_Sep17)	Sep-18
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	23-Jan-18 (CTTL, No.J18X00560)	Jan-19
NetworkAnalyzerE5071C	MY46110673	24-Jan-18 (CTTL, No.J18X00561)	Jan-19

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: August 6, 2018

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



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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:

- 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
- IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

- 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%.



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Measurement Conditions

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

DASY Version	DASY52	52.10.1.1476
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5250 MHz $\pm$ 1 MHz 5600 MHz $\pm$ 1 MHz 5750 MHz $\pm$ 1 MHz	

Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.71 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	35.9 $\pm$ 6 %	4.82 mho/m $\pm$ 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.69 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	77.0 mW / g $\pm$ 24.4 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.20 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	22.0 mW / g $\pm$ 24.2 % (k=2)



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Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.1 ± 6 %	5.18 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.09 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	80.8 mW / g ± 24.4 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.32 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	23.2 mW / g ± 24.2 % (k=2)

Head TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.4	5.22 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.9 ± 6 %	5.37 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL at 5750 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.70 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	76.9 mW / g ± 24.4 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.17 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	21.6 mW / g ± 24.2 % (k=2)



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Body TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.36 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	48.4 ± 6 %	5.32 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL at 5250 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.46 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	74.4 mW /g ± 24.4 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	100 mW input power	2.10 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	20.9 mW /g ± 24.2 % (k=2)

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.7 ± 6 %	5.79 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.73 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	77.1 mW /g ± 24.4 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	100 mW input power	2.16 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	21.5 mW /g ± 24.2 % (k=2)



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Body TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.3	5.94 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	48.5 ± 6 %	5.93 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL at 5750 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.43 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	74.3 mW /g ± 24.4 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR measured	100 mW input power	2.08 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	20.8 mW /g ± 24.2 % (k=2)



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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL at 5250 MHz

Impedance, transformed to feed point	50.3 Ω - 9.42j Ω
Return Loss	- 20.6dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	58.1 Ω - 7.15j Ω
Return Loss	- 20.0dB

Antenna Parameters with Head TSL at 5750 MHz

Impedance, transformed to feed point	53.5 Ω - 7.66j Ω
Return Loss	- 21.8dB

Antenna Parameters with Body TSL at 5250 MHz

Impedance, transformed to feed point	49.5 Ω - 7.40j Ω
Return Loss	- 22.6dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	58.0 Ω - 6.37j Ω
Return Loss	- 20.5dB

Antenna Parameters with Body TSL at 5750 MHz

Impedance, transformed to feed point	54.5 Ω - 7.07j Ω
Return Loss	- 21.9dB



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General Antenna Parameters and Design

Electrical Delay (one direction)	1.065 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
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DASY5 Validation Report for Head TSL

Date: 07.27.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1167

Communication System: CW; Frequency: 5250 MHz, Frequency: 5600 MHz,
Frequency: 5750 MHz,

Medium parameters used: $f = 5250$ MHz; $\sigma = 4.822$ S/m; $\epsilon_r = 35.92$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5600$ MHz; $\sigma = 5.184$ S/m; $\epsilon_r = 35.14$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5750$ MHz; $\sigma = 5.365$ S/m; $\epsilon_r = 34.88$; $\rho = 1000$ kg/m³,

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(5.68, 5.68, 5.68) @ 5250 MHz; Calibrated: 9/12/2017, ConvF(4.98, 4.98, 4.98) @ 5600 MHz; Calibrated: 9/12/2017, ConvF(5.04, 5.04, 5.04) @ 5750 MHz; Calibrated: 9/12/2017,
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1524; Calibrated: 9/13/2017
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Dipole Calibration /Pin=100mW, d=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.09 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 32.4 W/kg
SAR(1 g) = 7.69 W/kg; SAR(10 g) = 2.2 W/kg
Maximum value of SAR (measured) = 18.0 W/kg

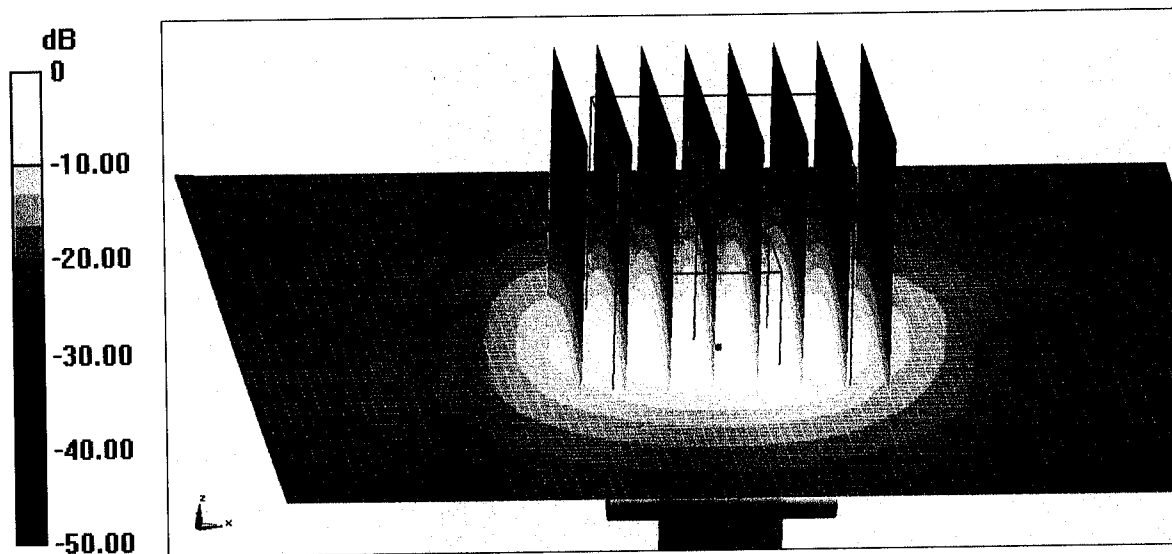
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Reference Value = 63.53 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 36.2 W/kg
SAR(1 g) = 8.09 W/kg; SAR(10 g) = 2.32 W/kg
Maximum value of SAR (measured) = 19.7 W/kg

Dipole Calibration /Pin=100mW, d=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.79 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 36.2 W/kg
SAR(1 g) = 7.7 W/kg; SAR(10 g) = 2.17 W/kg
Maximum value of SAR (measured) = 19.0 W/kg



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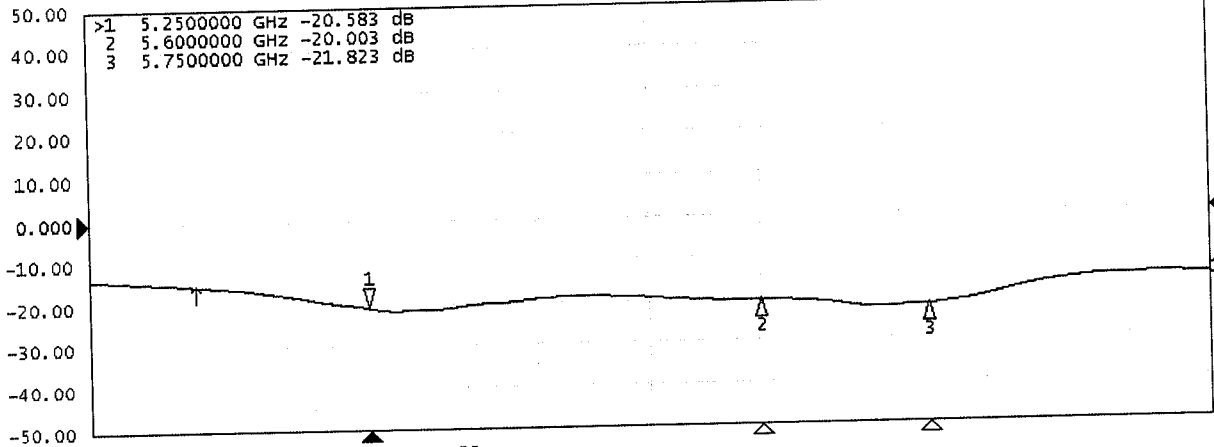
0 dB = 19.0 W/kg = 12.79 dBW/kg



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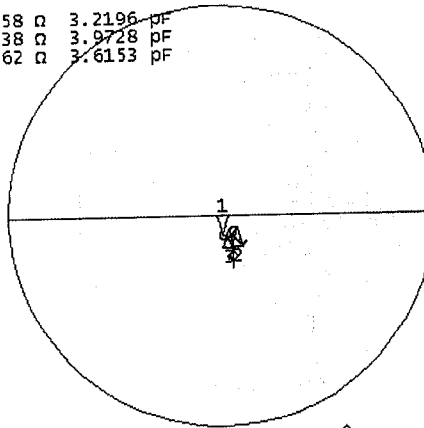
Impedance Measurement Plot for Head TSL

Tr1 S11 Log Mag 10.00dB/ Ref 0.000dB [F1]



Tr2 S11 Smith (R+jX) scale 1.000U [F1 Del]

>1	5.2500000 GHz	50.314 Ω	-9.4158 Ω	3.2196 pF
2	5.6000000 GHz	58.136 Ω	-7.1538 Ω	3.9728 pF
3	5.7500000 GHz	53.485 Ω	-7.6562 Ω	3.6153 pF





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Date: 08.02.2018

DASY5 Validation Report for Body TSL

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1167

Communication System: CW; Frequency: 5250 MHz, Frequency: 5600 MHz,
Frequency: 5750 MHz,

Medium parameters used: $f = 5250$ MHz; $\sigma = 5.316$ S/m; $\epsilon_r = 48.42$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5600$ MHz; $\sigma = 5.789$ S/m; $\epsilon_r = 47.7$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5750$ MHz; $\sigma = 5.926$ S/m; $\epsilon_r = 48.45$; $\rho = 1000$ kg/m³,

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(5.29, 5.29, 5.29) @ 5250 MHz; Calibrated: 9/12/2017, ConvF(4.5, 4.5, 4.5) @ 5600 MHz; Calibrated: 9/12/2017, ConvF(4.59, 4.59, 4.59) @ 5750 MHz; Calibrated: 9/12/2017,
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1524; Calibrated: 9/13/2017
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

Dipole Calibration /Pin=100mW, d=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.14 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 31.9 W/kg
SAR(1 g) = 7.46 W/kg; SAR(10 g) = 2.1 W/kg
Maximum value of SAR (measured) = 17.6 W/kg

Dipole Calibration /Pin=100mW, d=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 62.32 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 36.3 W/kg
SAR(1 g) = 7.73 W/kg; SAR(10 g) = 2.16 W/kg
Maximum value of SAR (measured) = 19.1 W/kg

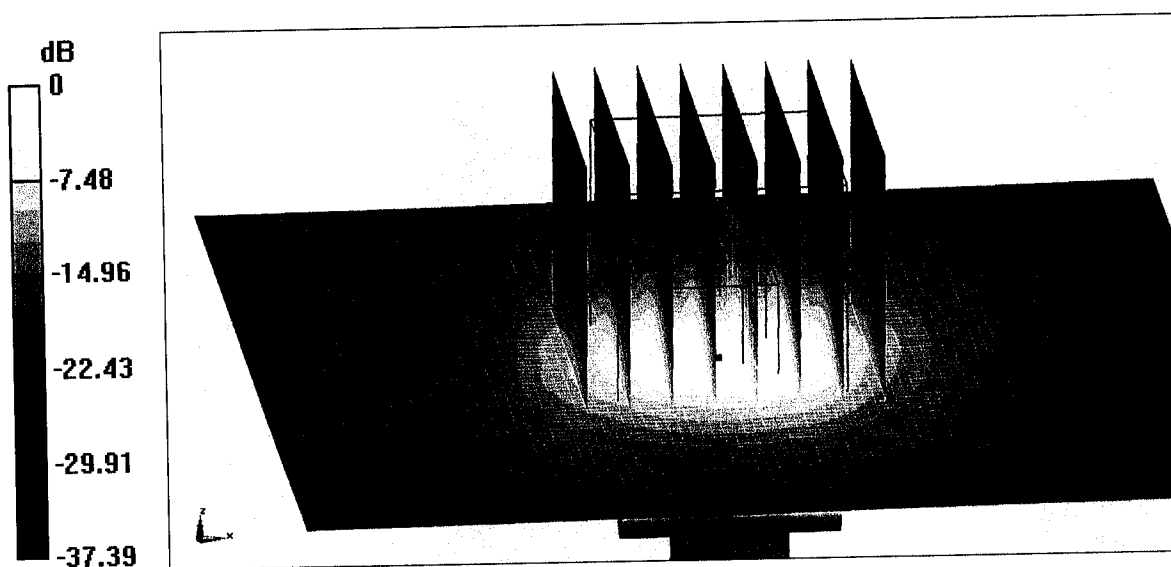
Dipole Calibration /Pin=100mW, d=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.99 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 35.2 W/kg
SAR(1 g) = 7.43 W/kg; SAR(10 g) = 2.08 W/kg
Maximum value of SAR (measured) = 18.0 W/kg



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0 dB = 18.0 W/kg = 12.55 dBW/kg



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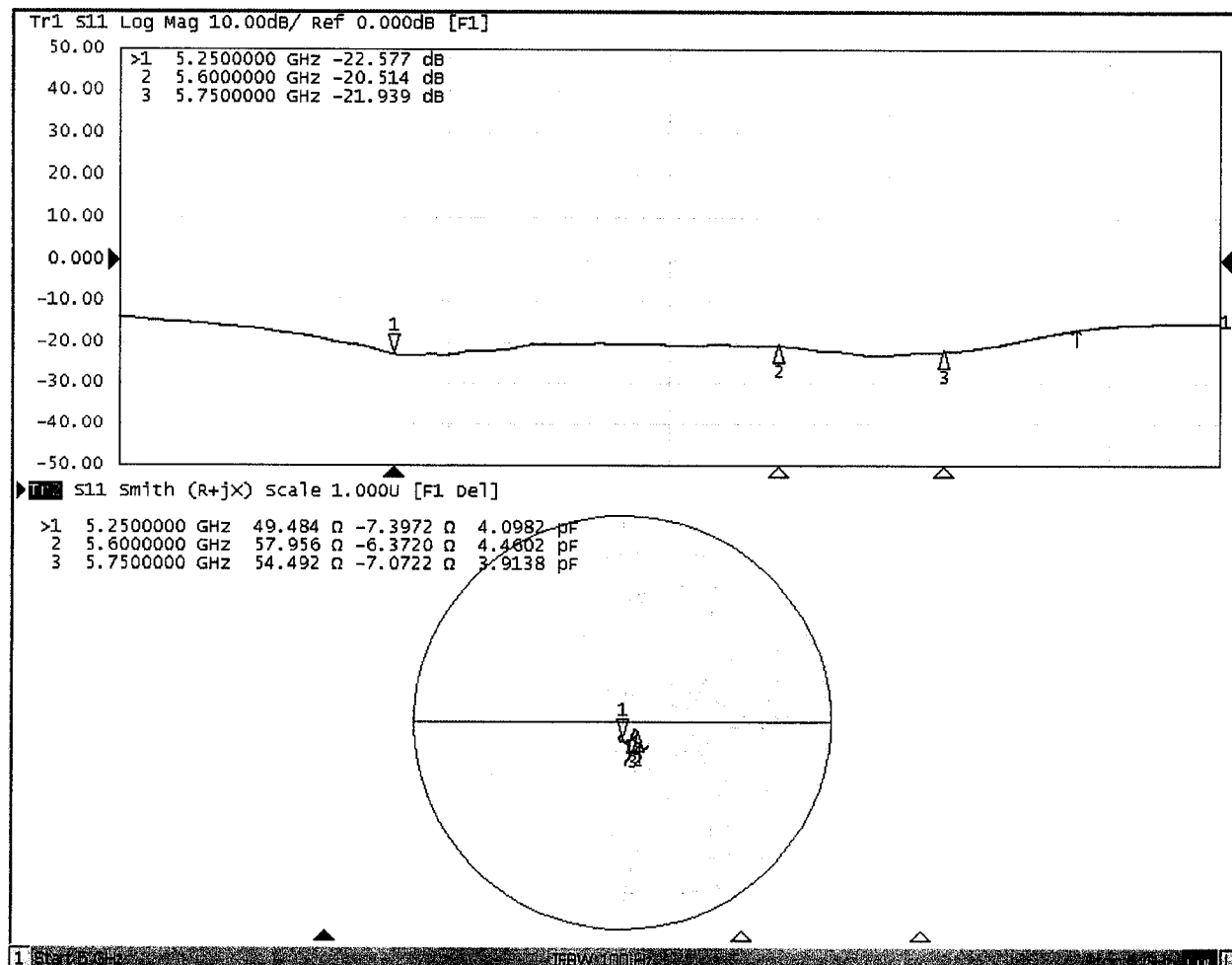
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Impedance Measurement Plot for Body TSL





D5GHzV3, Serial No. 1167 Extended Dipole Calibrations

Referring to KDB 865664 D01 v01r02, if dipoles are verified in return loss ($< -20\text{dB}$, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

5250MHz

D5GHzV3 – serial no. 1167												
	5250 Head						5250 Body					
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
2018.08.03	-20.6		50.3		-9.42		-22.6		49.5		-7.40	
2019.10.30	-20.3	1.5	50.9	0.6	-9.72	-0.3	-22.4	0.9	48.2	-1.3	-7.25	0.15
2020.10.30	-20.7	-0.05	50.19	-0.11	-9.09	0.33	-23.1	-2.2	50.2	0.7	-7.03	0.37

5600MHz

D5GHzV3 – serial no. 1167												
	5600 Head						5600 Body					
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
2018.08.03	-20.0		58.1		-7.15		-20.5		58.0		-6.37	
2019.10.30	-20.1	-0.5	57.4	-0.7	-7.63	-0.48	-20.4	0.5	57.7	-0.3	-6.87	-0.5
2020.10.30	-19.99	0.05	58.2	0.1	-7.13	0.02	-20.1	1.95	58.9	0.9	-5.96	0.41

5750MHz

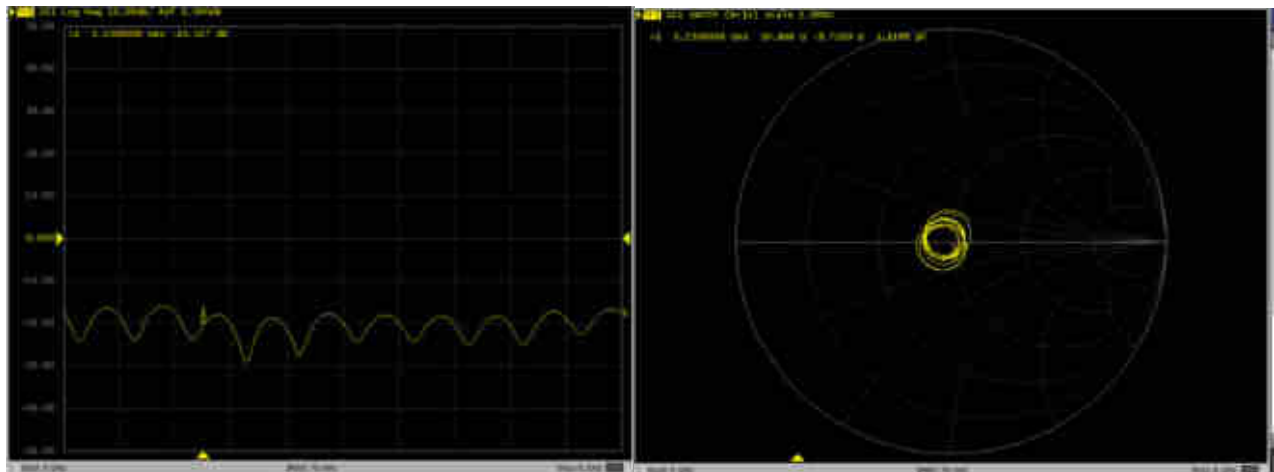
D5GHzV3 – serial no. 1167												
	5750 Head						5750 Body					
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
2018.08.03	-21.8		53.5		-7.66		-21.9		54.5		-7.07	
2019.10.30	-21.1	3.2	53.0	-0.5	-8.58	-0.92	-21.6	1.4	55.2	0.7	-7.04	0.03
2020.10.30	-21.9	0.05	53.2	-0.3	-7.35	0.31	-21.6	1.4	54.2	-0.3	-7.60	-0.53

<Justification of the extended calibration>

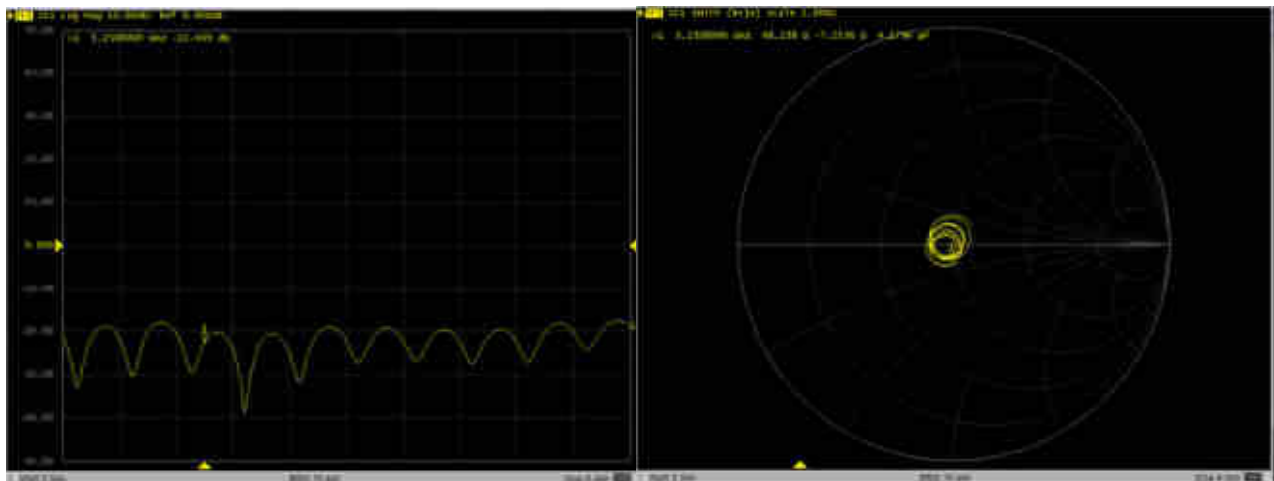
The return loss is < -20dB, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

Dipole Verification Data> D5GHzV3, serial no. 1167

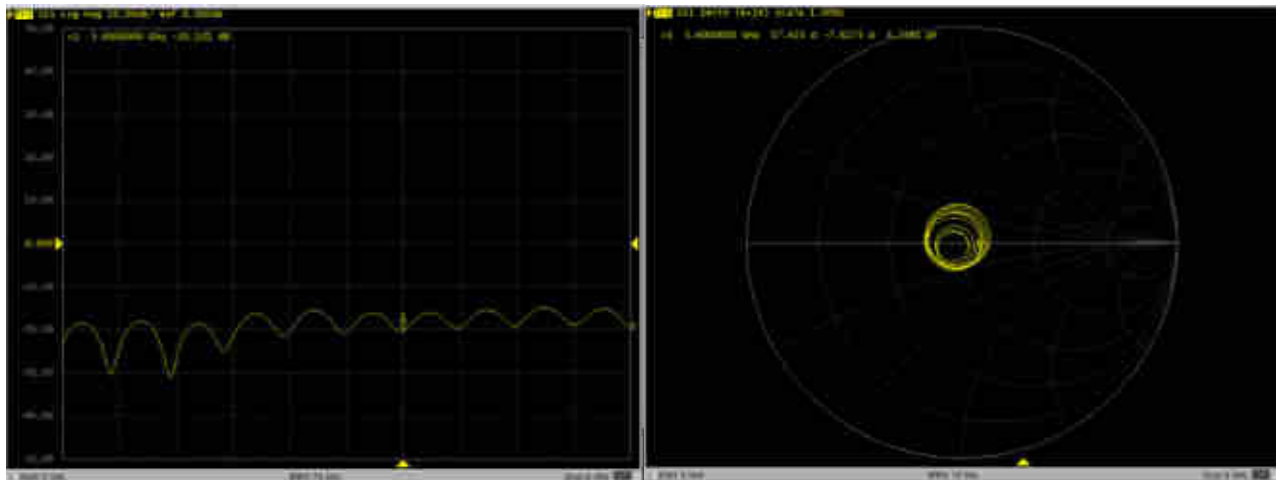
5250MHz – Head----2019.10.30



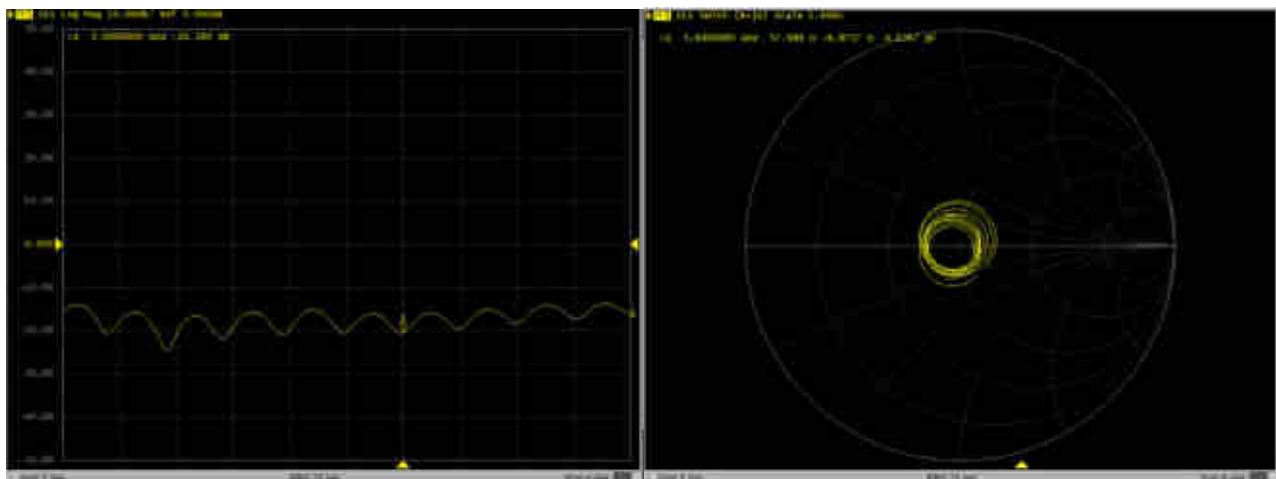
5250MHz – Body----2019.10.30



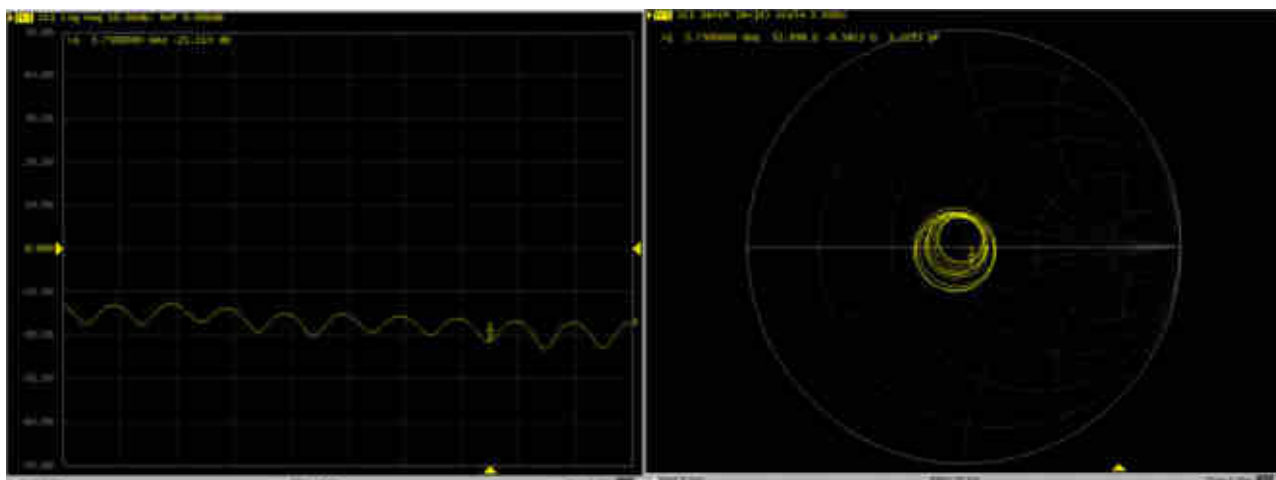
5600MHz – Head----2019.10.30



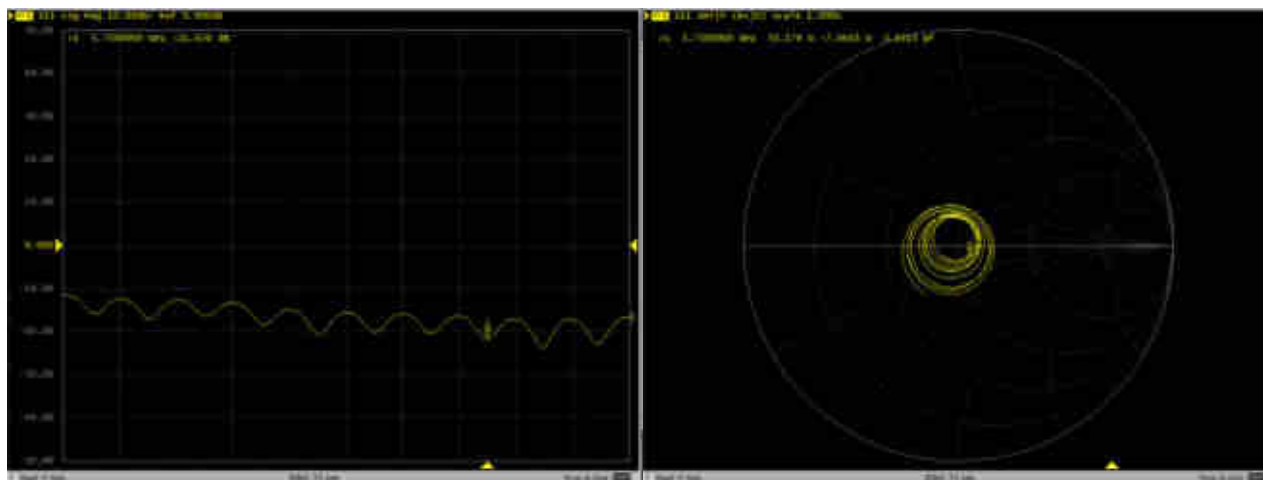
5600MHz – Body----2019.10.30



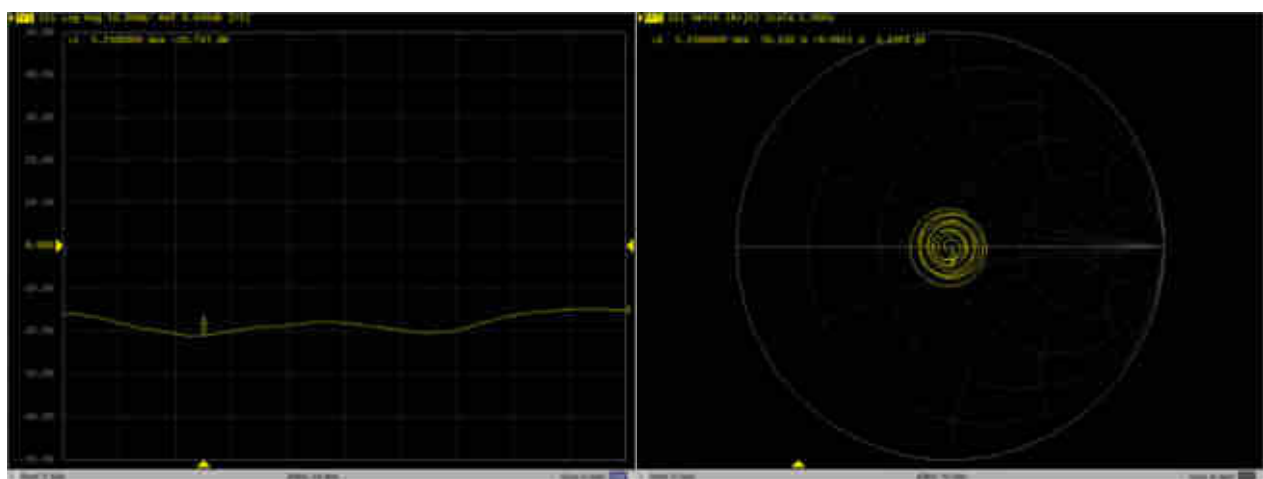
5750MHz – Head----2019.10.30



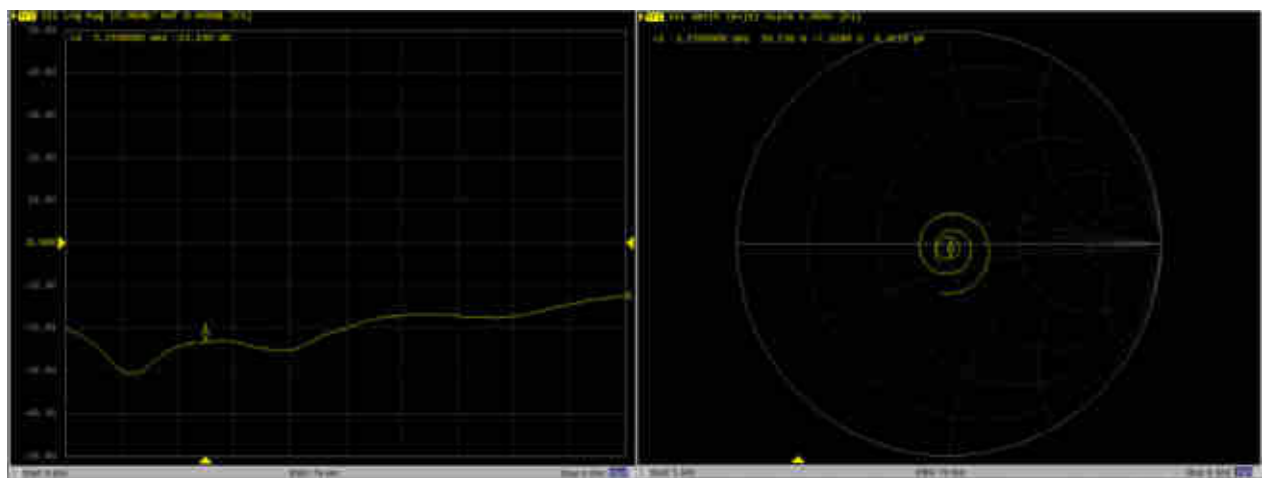
5750MHz – Body----2019.10.30



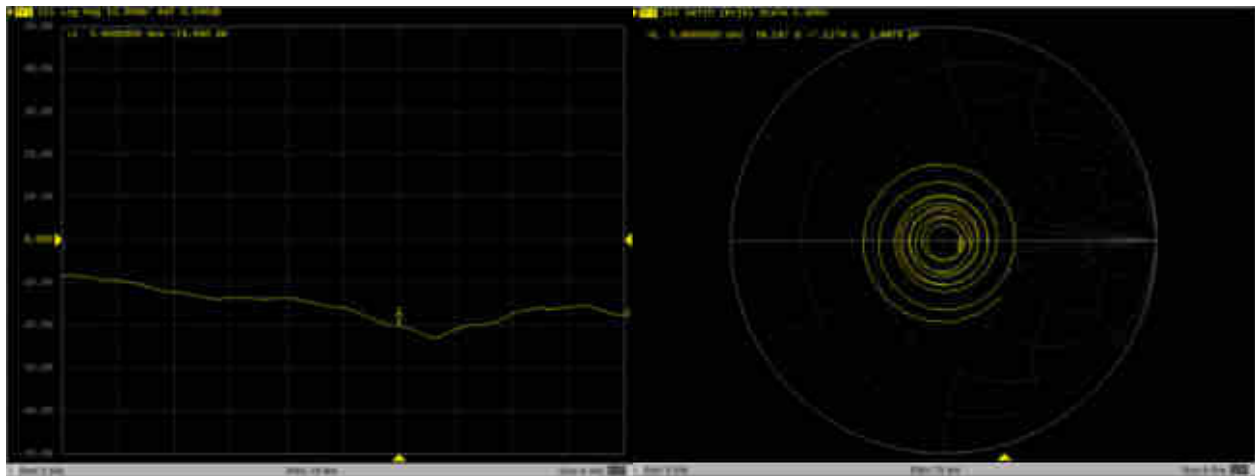
5250MHz – Head----2020.10.30



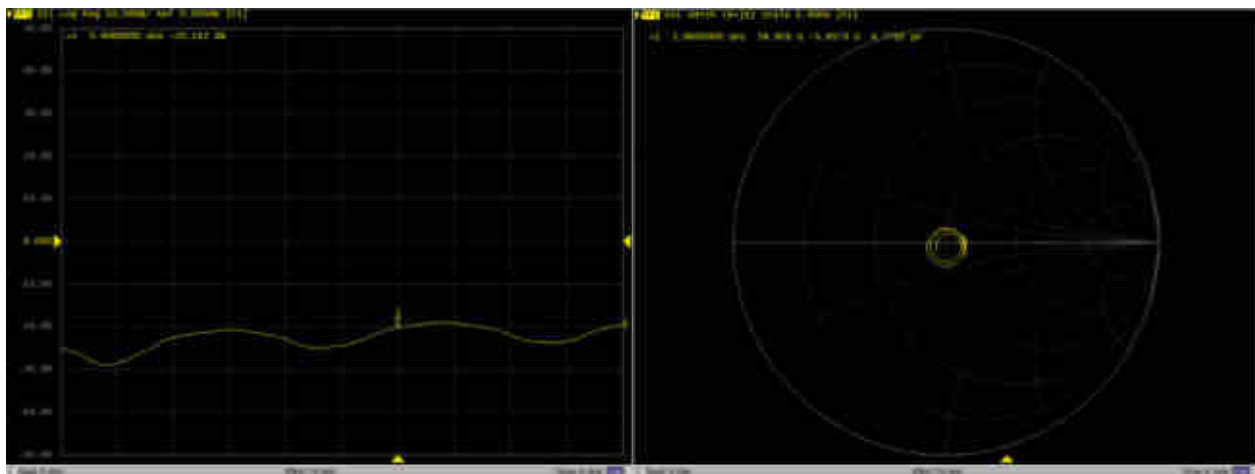
5250MHz – Body----2020.10.30



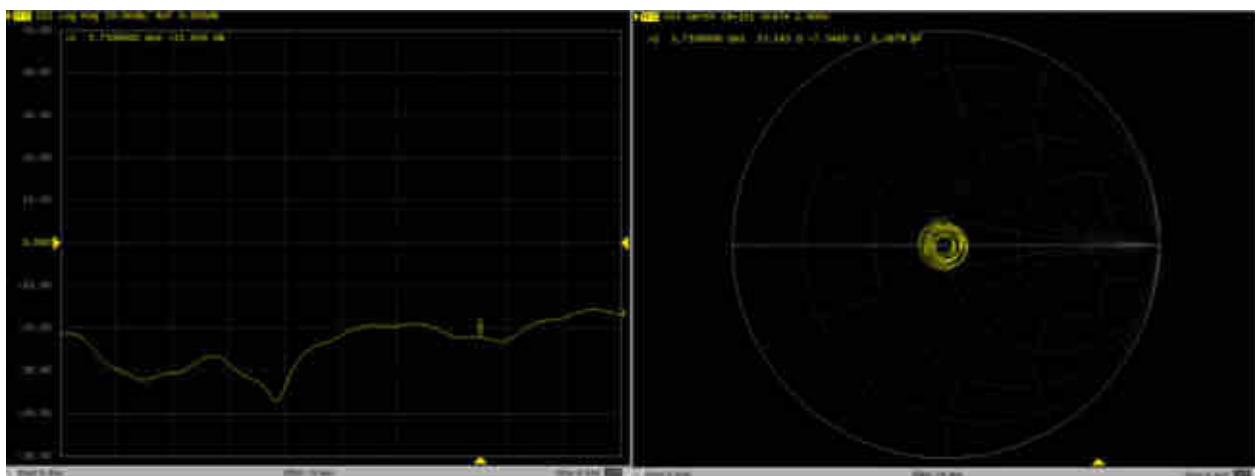
5600MHz – Head----2020.10.30



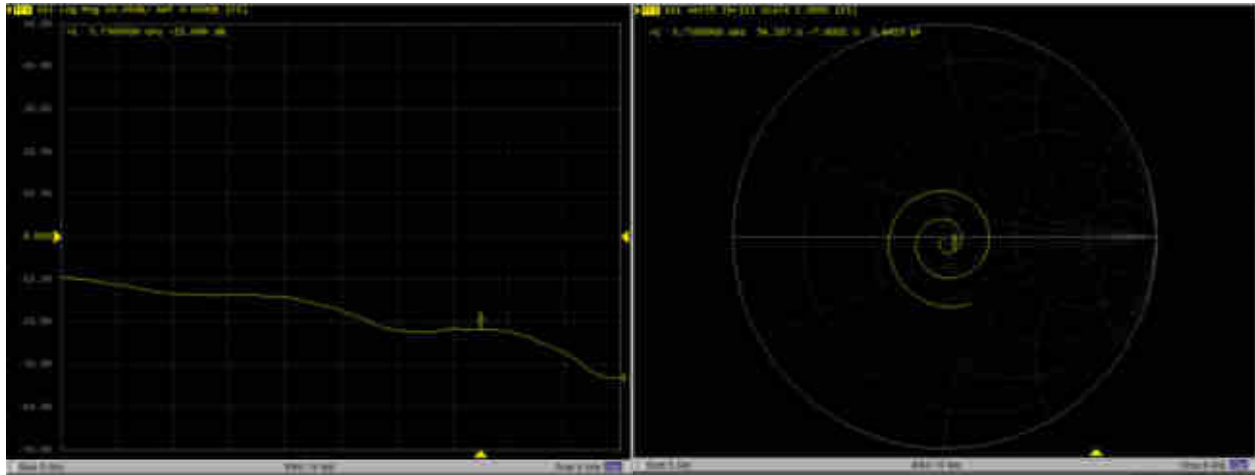
5600MHz – Body----2020.10.30



5750MHz – Head----2020.10.30



5750MHz – Body----2020.10.30





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Accreditation No.: **SCS 0108**

Client **Auden**

Certificate No: **DAE3-528_Mar20**

CALIBRATION CERTIFICATE

Object **DAE3 - SD 000 D03 AA - SN: 528**

Calibration procedure(s) **QA CAL-06.v30**
Calibration procedure for the data acquisition electronics (DAE)

Calibration date: **March 16, 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 $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	03-Sep-19 (No:25949)	Sep-20
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Auto DAE Calibration Unit	SE UWS 053 AA 1001	09-Jan-20 (in house check)	In house check: Jan-21
Calibrator Box V2.1	SE UMS 006 AA 1002	09-Jan-20 (in house check)	In house check: Jan-21

Calibrated by:	Name	Function	Signature
	Eric Hainfeld	Laboratory Technician	
Approved by:	Name	Function	Signature
	Sven Kühn	Deputy Manager	

Issued: March 16, 2020

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Accreditation No.: **SCS 0108**

Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle:* The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
 - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
 - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
 - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
 - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
 - *Input Offset Measurement:* Output voltage and statistical results over a large number of zero voltage measurements.
 - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
 - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
 - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
 - *Power consumption:* Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1 μ V , full range = -100...+300 mV

Low Range: 1LSB = 61 nV , full range = -1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.513 $\pm$ 0.02% (k=2)	404.615 $\pm$ 0.02% (k=2)	404.537 $\pm$ 0.02% (k=2)
Low Range	3.97109 $\pm$ 1.50% (k=2)	3.95930 $\pm$ 1.50% (k=2)	3.96568 $\pm$ 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	50.0 $^{\circ}$ $\pm$ 1 $^{\circ}$
---	------------------------------------

Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	200037.58	3.28	0.00
Channel X	+ Input	20009.65	3.92	0.02
Channel X	- Input	-20001.89	3.62	-0.02
Channel Y	+ Input	200037.90	3.50	0.00
Channel Y	+ Input	20005.83	0.31	0.00
Channel Y	- Input	-20005.73	-0.03	0.00
Channel Z	+ Input	200033.51	-0.62	-0.00
Channel Z	+ Input	20006.48	0.89	0.00
Channel Z	- Input	-20006.01	-0.27	0.00

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2001.68	0.24	0.01
Channel X	+ Input	201.09	-0.22	-0.11
Channel X	- Input	-198.93	-0.12	0.06
Channel Y	+ Input	2001.70	0.49	0.02
Channel Y	+ Input	200.70	-0.24	-0.12
Channel Y	- Input	-199.76	-0.76	0.38
Channel Z	+ Input	2001.03	-0.04	-0.00
Channel Z	+ Input	201.25	0.40	0.20
Channel Z	- Input	-199.29	-0.32	0.16

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	9.59	7.82
	- 200	-7.34	-8.76
Channel Y	200	14.74	14.93
	- 200	-16.81	-17.15
Channel Z	200	-3.39	-3.82
	- 200	3.03	3.16

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	3.19	-1.66
Channel Y	200	6.79	-	4.73
Channel Z	200	7.16	5.28	-

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	15972	16183
Channel Y	15900	16376
Channel Z	16167	15841

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Input 10M Ω

	Average (μ V)	min. Offset (μ V)	max. Offset (μ V)	Std. Deviation (μ V)
Channel X	1.19	0.18	2.38	0.46
Channel Y	0.15	-1.39	1.24	0.47
Channel Z	0.36	-1.22	1.42	0.42

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9



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Client **Sporton**

Certificate No: **EX3-3819_Apr20**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3819**

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: **April 30, 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 $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104775	01-Apr-20 (No. 217-03100/03101)	Apr-21
Power sensor NRP-Z91	SN: 103244	01-Apr-20 (No. 217-03100)	Apr-21
Power sensor NRP-Z91	SN: 103245	01-Apr-20 (No. 217-03101)	Apr-21
Reference 20 dB Attenuator	SN: CC2552 (20x)	31-Mar-20 (No. 217-03106)	Apr-21
DAE4	SN: 660	27-Dec-19 (No. DAE4-660_Dec19)	Dec-20
Reference Probe ES3DV2	SN: 3013	31-Dec-19 (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: MY41496087	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

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	
			Issued: April 30, 2020
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Accreditation No.: SCS 0108

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Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization θ	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\theta \approx 0$ 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:

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

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\theta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values; i.e., the uncertainties of NORM_{x,y,z} does not affect the E^2 -field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z} = NORM_{x,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.
- DCP_{x,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
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; D_{x,y,z}; VR_{x,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 $f \leq 800$ 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 NORM_{x,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 NORM_x (no uncertainty required).

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3819

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.46	0.41	0.46	± 10.1 %
DCP (mV) ^B	104.6	101.5	102.0	

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B dB/ μV	C	D dB	VR mV	Max dev.	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	156.7	± 3.5 %	± 4.7 %
		Y	0.0	0.0	1.0		148.5		
		Z	0.0	0.0	1.0		139.2		

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 Page 5).

^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:3819

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	113.9
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:3819

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^c	Relative Permittivity ^f	Conductivity (S/m) ^f	ConvF X	ConvF Y	ConvF Z	Alpha ^g	Depth ^g (mm)	Unc (k=2)
750	41.9	0.89	9.64	9.64	9.64	0.52	0.80	± 12.0 %
835	41.5	0.90	9.39	9.39	9.39	0.50	0.80	± 12.0 %
900	41.5	0.97	9.26	9.26	9.26	0.39	0.96	± 12.0 %
1750	40.1	1.37	8.43	8.43	8.43	0.34	0.80	± 12.0 %
1900	40.0	1.40	8.10	8.10	8.10	0.37	0.80	± 12.0 %
2000	40.0	1.40	7.95	7.95	7.95	0.30	0.88	± 12.0 %
2300	39.5	1.67	7.66	7.66	7.66	0.32	0.90	± 12.0 %
2450	39.2	1.80	7.42	7.42	7.42	0.38	0.90	± 12.0 %
2600	39.0	1.96	7.22	7.22	7.22	0.38	0.90	± 12.0 %
3300	38.2	2.71	6.91	6.91	6.91	0.20	1.20	± 14.0 %
3500	37.9	2.91	6.84	6.84	6.84	0.25	1.20	± 14.0 %
3700	37.7	3.12	6.75	6.75	6.75	0.25	1.25	± 14.0 %
3900	37.5	3.32	6.40	6.40	6.40	0.30	1.60	± 14.0 %
4100	37.2	3.53	6.39	6.39	6.39	0.30	1.60	± 14.0 %
4400	36.9	3.84	6.07	6.07	6.07	0.30	1.60	± 14.0 %
4600	36.7	4.04	5.98	5.98	5.98	0.30	1.70	± 14.0 %
4800	36.4	4.25	5.88	5.88	5.88	0.45	1.80	± 14.0 %
4950	36.3	4.40	5.72	5.72	5.72	0.45	1.80	± 14.0 %
5250	35.9	4.71	5.02	5.02	5.02	0.40	1.80	± 14.0 %
5600	35.5	5.07	4.56	4.56	4.56	0.40	1.80	± 14.0 %
5750	35.4	5.22	4.63	4.63	4.63	0.40	1.80	± 14.0 %

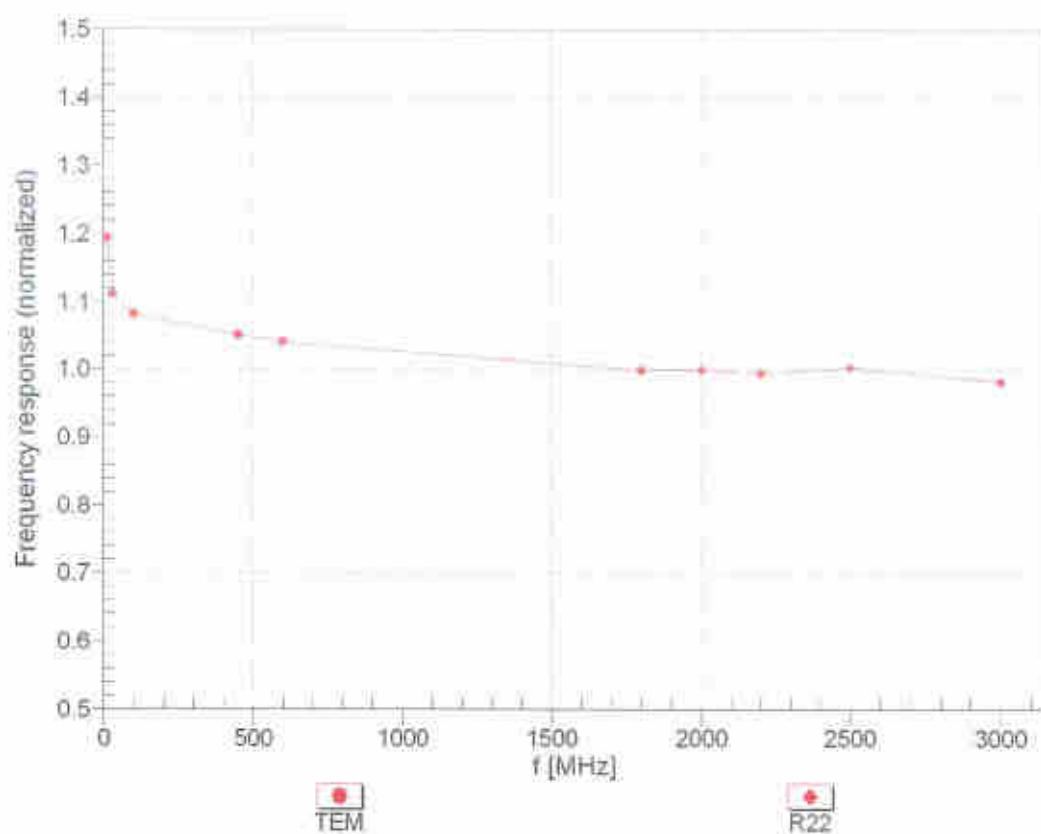
^c Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 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 up to 6 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. 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 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)



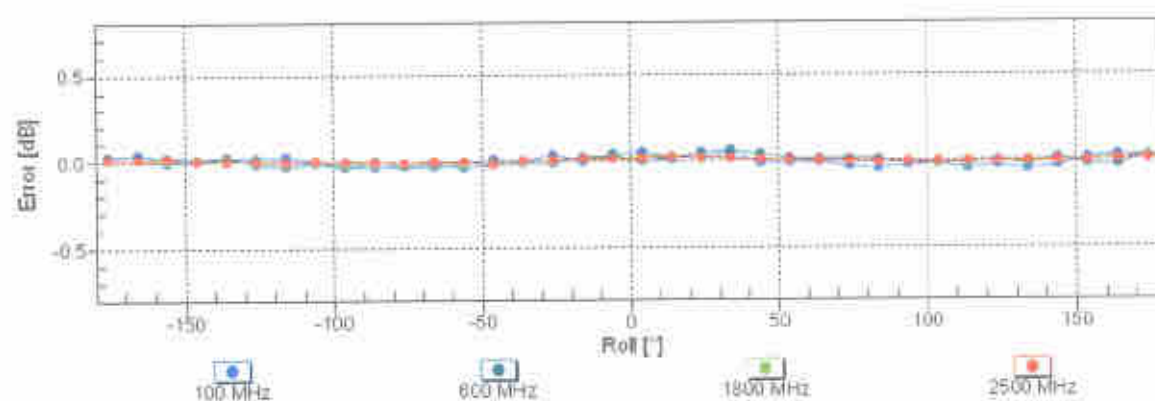
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

Receiving Pattern (ϕ), $\theta = 0^\circ$

f=600 MHz,TEM

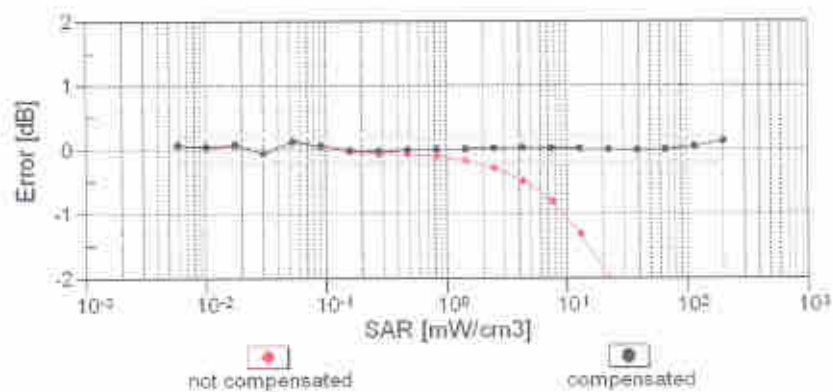
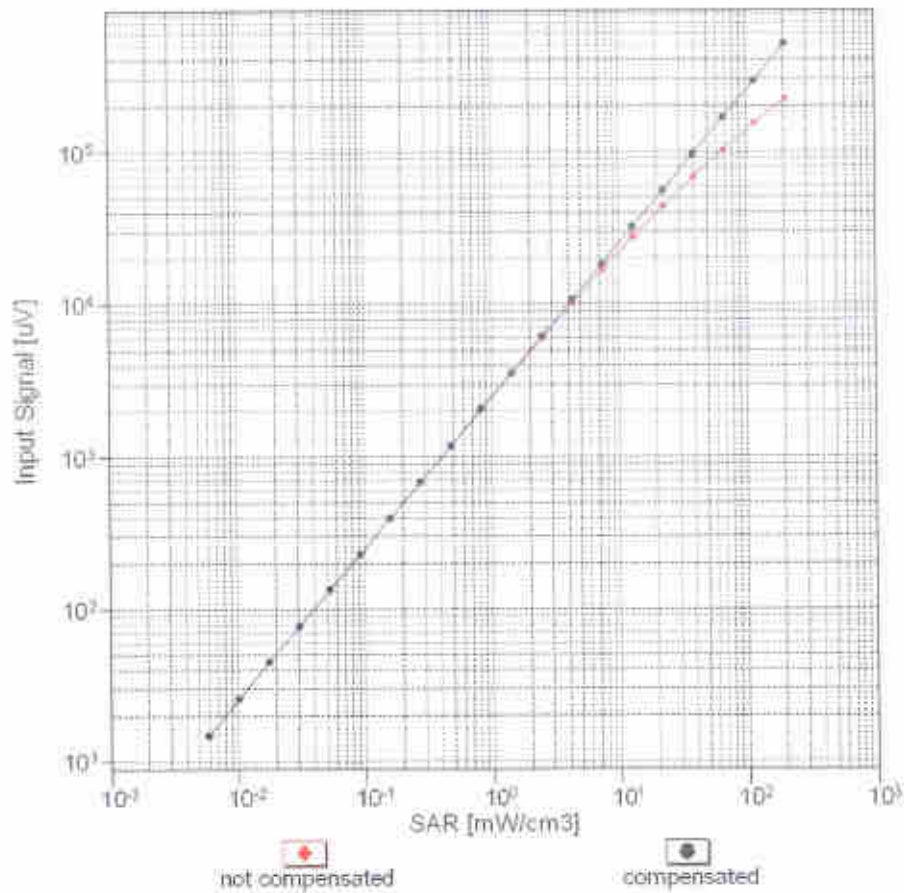


f=1800 MHz,R22



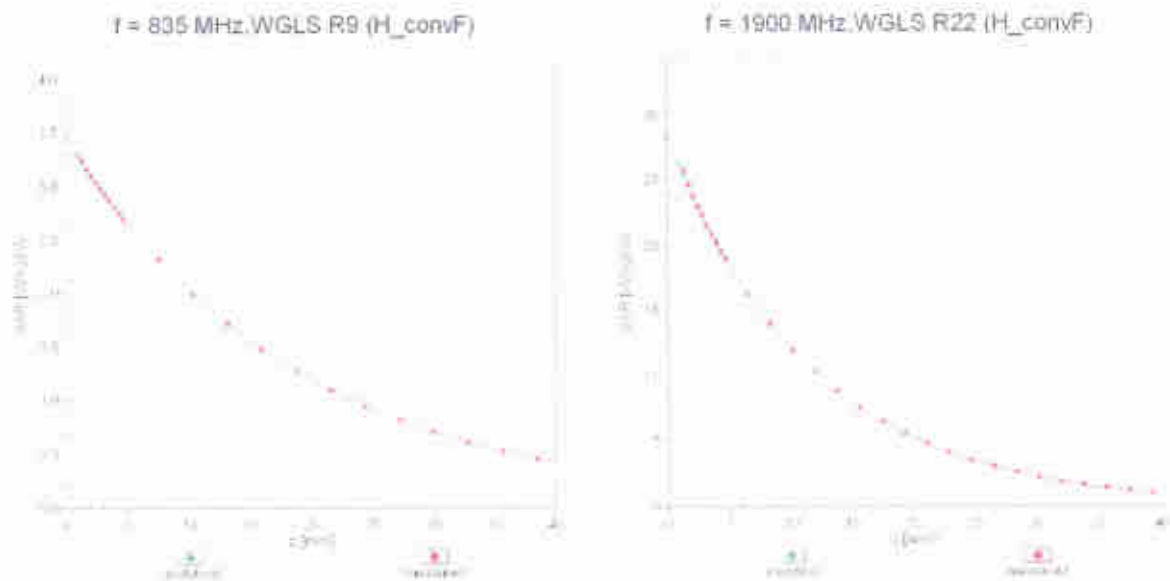
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range $f(\text{SAR}_{\text{head}})$ (TEM cell, $f_{\text{eval}} = 1900 \text{ MHz}$)



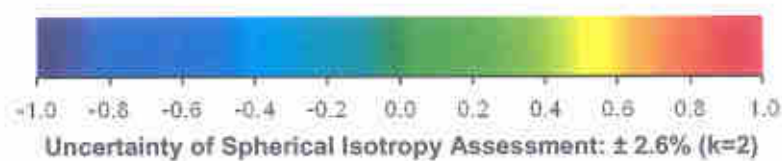
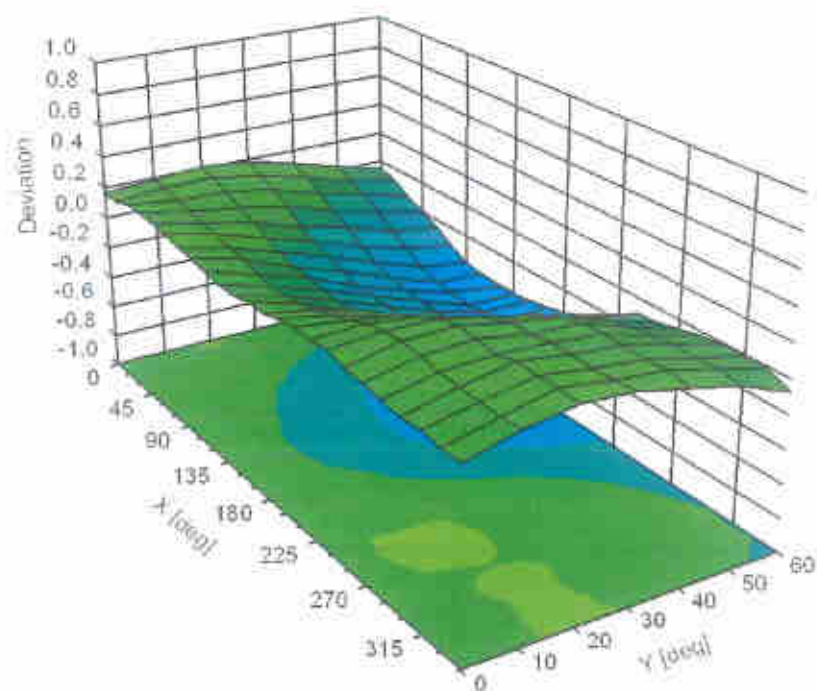
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, θ), $f = 900 \text{ MHz}$





Appendix E. Conducted RF Output Power Table

The detailed power tables are shown as follows.

Full Power Mode – UAT

GSM850		Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame Average Power (dBm)			Tune-up Limit (dBm)
Tx Channel	Frequency (MHz)	126	189	251		126	189	251	
		834.2	836.4	848.8		834.2	836.4	848.8	
GSM 1 Tx slot	32.57	32.34	32.58	34.00	23.57	23.34	23.58	25.00	
GPRS 1 Tx slot	32.48	32.23	32.49	34.00	23.48	23.23	23.49	25.00	
GPRS 2 Tx slots	30.12	29.98	30.11	31.50	24.12	23.96	24.11	25.50	
GPRS 3 Tx slots	28.41	28.56	28.52	30.00	24.15	24.30	24.26	25.74	
GPRS 4 Tx slots	27.35	27.51	27.13	28.50	24.35	24.51	24.13	25.50	
EDGE 1 Tx slot	25.62	25.73	25.51	27.50	16.62	16.73	16.51	18.50	
EDGE 2 Tx slots	23.92	24.08	23.76	25.50	17.92	18.08	17.76	19.50	
EDGE 3 Tx slots	22.67	22.63	22.69	24.50	18.41	18.37	18.43	20.24	
EDGE 4 Tx slots	22.27	22.24	22.40	24.00	19.27	19.24	19.40	21.00	

GSM1900		Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame Average Power (dBm)			Tune-up Limit (dBm)
Tx Channel	Frequency (MHz)	512	661	810		512	661	810	
		1850.2	1860	1909.8		1850.2	1860	1909.8	
GSM 1 Tx slot	28.81	28.64	28.79	30.50	19.81	19.64	19.79	21.50	
GPRS 1 Tx slot	28.71	28.55	28.71	30.50	19.73	19.56	19.71	21.50	
GPRS 2 Tx slots	26.23	26.48	26.27	28.00	20.23	20.48	20.27	22.00	
GPRS 3 Tx slots	25.41	25.33	25.21	27.00	21.15	21.07	20.95	22.74	
GPRS 4 Tx slots	24.17	24.28	24.27	25.50	21.17	21.35	21.27	22.50	
EDGE 1 Tx slot	25.19	25.06	25.19	27.00	16.19	16.06	16.19	18.00	
EDGE 2 Tx slots	23.17	23.32	23.24	25.00	17.17	17.32	17.24	19.00	
EDGE 3 Tx slots	22.12	22.37	22.23	24.00	17.86	18.11	17.87	19.74	
EDGE 4 Tx slots	21.08	21.03	21.12	23.00	18.08	18.03	18.12	20.00	

Band		WCDMA II			Tune-up Limit (dBm)	WCDMA IV			Tune-up Limit (dBm)	WCDMA V			Tune-up Limit (dBm)
Tx Channel	Rx Channel	9262	9400	9538		1312	1413	1513		4132	4182	4233	
Frequency (MHz)		1852.4	1860	1907.6		1537	1638	1738		4497	4497	4498	
						1712.4	1732.6	1752.8		826.4	836.4	846.8	
3GPP Rel 98	AMR 12.2Kbps	23.83	23.93	23.88	25.00	23.88	23.84	23.76	25.00	23.81	23.89	23.85	25.00
3GPP Rel 98	RMRC 12.2Kbps	23.84	23.96	23.89	25.00	23.90	23.88	23.83	25.00	23.84	23.90	23.86	25.00
3GPP Rel 6	HSDPA Subtest-1	22.43	22.59	22.80	24.00	22.50	22.60	22.70	24.00	23.33	23.33	23.30	24.00
3GPP Rel 6	HSDPA Subtest-2	22.44	22.61	22.59	24.00	22.49	22.59	22.71	24.00	23.31	23.25	23.32	24.00
3GPP Rel 6	HSDPA Subtest-3	21.94	22.09	22.12	23.50	22.04	22.11	22.19	23.50	22.88	22.85	22.83	23.50
3GPP Rel 6	HSDPA Subtest-4	21.88	22.06	22.09	23.50	21.98	22.17	22.20	23.50	22.88	22.82	22.80	23.50
3GPP Rel 6	DC-HSDPA Subtest-1	22.50	22.66	22.85	24.00	22.56	22.65	22.77	24.00	23.43	23.40	23.38	24.00
3GPP Rel 6	DC-HSDPA Subtest-2	22.53	22.68	22.84	24.00	22.59	22.66	22.81	24.00	23.42	23.36	23.44	24.00
3GPP Rel 6	DC-HSDPA Subtest-3	22.04	22.17	22.20	23.50	22.14	22.21	22.29	23.50	22.95	22.94	22.93	23.50
3GPP Rel 6	DC-HSDPA Subtest-4	21.95	22.13	22.16	23.50	22.08	22.26	22.30	23.50	22.98	22.90	22.92	23.50
3GPP Rel 6	HSUPA Subtest-1	22.38	22.60	22.67	24.00	22.45	22.64	22.76	24.00	23.01	23.33	23.27	24.00
3GPP Rel 6	HSUPA Subtest-2	20.45	20.62	20.63	22.00	20.51	20.62	20.72	22.00	21.05	21.29	21.26	22.00
3GPP Rel 6	HSUPA Subtest-3	21.42	21.57	21.62	23.00	21.44	21.65	21.75	23.00	21.80	21.91	22.24	23.00
3GPP Rel 6	HSUPA Subtest-4	20.43	20.61	20.66	22.00	20.35	20.59	20.76	22.00	21.24	21.29	21.24	22.00
3GPP Rel 6	HSUPA Subtest-5	22.40	22.55	22.60	24.00	22.23	22.80	22.20	24.00	22.80	23.30	23.29	24.00
3GPP Rel 7	HSIPA+ (15QAM) Subtest-1	20.38	20.52	20.84	22.00	20.13	20.52	20.25	22.00	20.87	20.82	20.91	22.00

Reduced Power level 1 for Head – UAT

TX Channel	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame Average Power (dBm)			Tune-up Limit (dBm)
	126	189	251		263	189	251	
Frequency (MHz)	1634.2	1590.4	1648.8		824.2	836.4	1648.8	
GSM 1 Tx slot	30.30	30.39	30.62	31.00	21.30	21.39	21.62	22.00
GPRS 1 Tx slot	30.38	30.28	30.58	31.00	21.38	21.28	21.58	22.00
GPRS 2 Tx slots	27.22	27.30	27.80	28.50	21.22	21.30	21.80	22.30
GPRS 3 Tx slots	25.70	25.80	25.78	27.00	21.44	21.54	21.52	22.74
GPRS 4 Tx slots	24.25	24.22	24.31	25.50	21.25	21.22	21.31	22.50
EDGE 1 Tx slot	25.62	25.73	25.51	27.50	16.62	16.73	16.51	18.50
EDGE 2 Tx slots	23.92	24.08	23.76	25.50	17.92	18.08	17.76	19.50
EDGE 3 Tx slots	22.67	22.63	22.69	24.50	18.41	18.37	18.43	20.24
EDGE 4 Tx slots	22.27	22.24	22.40	24.00	19.27	19.24	19.40	21.00

TX Channel	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame Average Power (dBm)			Tune-up Limit (dBm)
	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM 1 Tx slot	22.66	22.72	22.68	23.10	13.66	13.72	13.68	14.10
GPRS 1 Tx slot	22.51	22.42	22.66	23.10	13.51	13.42	13.66	14.10
GPRS 2 Tx slots	19.64	19.66	19.51	20.60	13.64	13.66	13.51	14.60
GPRS 3 Tx slots	18.36	18.30	18.21	19.60	14.10	14.04	13.95	15.34
GPRS 4 Tx slots	16.80	16.86	16.76	18.10	13.80	13.86	13.76	15.10
EDGE 1 Tx slot	22.59	22.66	22.51	24.00	13.59	13.66	13.51	15.00
EDGE 2 Tx slots	19.50	19.59	19.57	21.00	13.50	13.59	13.57	15.00
EDGE 3 Tx slots	17.50	17.68	17.50	19.00	13.24	13.62	13.24	14.74
EDGE 4 Tx slots	16.60	16.50	16.50	18.00	13.60	13.50	13.50	15.00

Band		WCDMA II			Tune-up Limit (dBm)	WCDMA IV			Tune-up Limit (dBm)	WCDMA V			Tune-up Limit (dBm)
TX Channel		9262	9400	9538		1312	1413	1513		4132	4182	4233	
Rx Channel		8652	8900	9098		1537	1638	1748		4497	4497	4468	
Frequency (MHz)		1852.4	1880	1907.6		1712.4	1732.6	1752.8		826.4	836.4	846.8	
3GPP Rel 98	AMR 12.2Kbps	13.59	13.63	13.62	14.90	15.62	15.54	15.51	16.70	22.00	22.11	22.05	22.60
3GPP Rel 98	RMTC 12.2Kbps	13.60	13.68	13.67	14.90	15.67	15.58	15.55	16.70	22.01	22.13	22.06	22.60
3GPP Rel 6	HSDPA Subtest-1	12.57	12.63	12.69	13.90	14.44	14.52	14.61	15.70	21.03	20.92	20.96	21.60
3GPP Rel 6	HSDPA Subtest-2	12.55	12.67	12.69	13.90	14.41	14.47	14.58	15.70	21.03	20.93	20.96	21.60
3GPP Rel 6	HSDPA Subtest-3	12.11	12.15	12.16	13.40	13.91	13.99	14.09	15.20	20.55	20.51	20.49	21.10
3GPP Rel 6	HSDPA Subtest-4	12.05	12.18	12.14	13.40	13.92	13.94	14.08	15.20	20.44	20.43	20.46	21.10
3GPP Rel 6	DC-HSDPA Subtest-1	12.47	12.62	12.61	13.90	14.43	14.49	14.55	15.70	21.02	20.94	20.93	21.60
3GPP Rel 6	DC-HSDPA Subtest-2	12.52	12.63	12.63	13.90	14.00	14.42	14.52	15.70	21.00	20.91	20.92	21.60
3GPP Rel 6	DC-HSDPA Subtest-3	12.14	12.11	12.13	13.40	13.90	13.94	14.03	15.20	20.53	20.46	20.45	21.10
3GPP Rel 6	DC-HSDPA Subtest-4	12.02	12.14	12.09	13.40	13.89	13.92	14.02	15.20	20.42	20.41	20.43	21.10
3GPP Rel 6	HSUPA Subtest-1	12.43	12.62	12.63	13.90	14.15	14.34	14.46	15.70	20.81	21.07	20.97	21.60
3GPP Rel 6	HSUPA Subtest-2	10.49	10.65	10.67	11.90	12.24	12.32	12.48	13.70	18.77	18.92	18.92	19.60
3GPP Rel 6	HSUPA Subtest-3	11.52	11.60	11.65	12.90	13.18	13.37	13.49	14.70	19.53	19.60	19.52	20.60
3GPP Rel 6	HSUPA Subtest-4	10.48	10.67	10.69	11.90	12.02	12.33	12.49	13.70	18.97	18.95	18.94	19.60
3GPP Rel 6	HSUPA Subtest-5	12.52	12.59	12.68	13.90	13.92	14.34	13.95	15.70	20.52	21.03	20.95	21.60
3GPP Rel 7	HSPA+ (16QAM) Subtest-1	10.44	10.53	10.67	11.90	11.93	12.25	11.98	13.70	18.38	18.57	18.62	19.60

Reduced Power level 2 for Head – UAT

TX Channel	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame Average Power (dBm)			Tune-up Limit (dBm)
	126	189	251		528	109	251	
Frequency (MHz)	1654.2	1593.4	1448.8		824.2	836.4	848.8	
GSM 1 Tx slot	29.01	29.11	29.32	30.50	20.01	20.11	20.32	21.50
GPRS 1 Tx slot	29.02	28.84	29.11	30.50	20.02	19.84	20.11	21.50
GPRS 2 Tx slots	28.92	28.49	28.80	27.50	20.02	20.49	20.80	21.50
GPRS 3 Tx slots	24.92	25.17	24.97	26.00	20.86	20.91	20.71	21.74
GPRS 4 Tx slots	23.84	23.77	24.13	24.50	20.84	20.77	21.13	21.50
EDGE 1 Tx slot	22.46	22.41	22.12	24.00	13.46	13.41	13.12	15.00
EDGE 2 Tx slots	20.95	20.75	20.22	22.00	14.65	14.75	14.22	16.00
EDGE 3 Tx slots	19.28	19.36	19.22	21.00	15.02	15.10	14.96	16.74
EDGE 4 Tx slots	18.82	18.69	18.66	20.50	15.82	15.69	15.66	17.50

TX Channel	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame Average Power (dBm)			Tune-up Limit (dBm)
	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM 1 Tx slot	22.66	22.72	22.66	23.10	13.66	13.72	13.66	14.10
GPRS 1 Tx slot	22.51	22.42	22.66	23.10	13.51	13.42	13.66	14.10
GPRS 2 Tx slots	19.64	19.86	19.51	20.60	13.64	13.86	13.51	14.60
GPRS 3 Tx slots	18.36	18.30	18.21	19.60	14.10	14.04	13.95	15.34
GPRS 4 Tx slots	16.80	16.96	16.76	18.10	13.80	13.96	13.76	15.10
EDGE 1 Tx slot	22.59	22.66	22.51	24.00	13.59	13.66	13.51	15.00
EDGE 2 Tx slots	19.50	19.59	19.57	21.00	13.50	13.59	13.57	15.00
EDGE 3 Tx slots	17.50	17.68	17.50	19.00	13.24	13.62	13.24	14.74
EDGE 4 Tx slots	16.60	16.50	16.50	18.00	13.60	13.50	13.50	15.00

Band		WCDMA II			Tune-up Limit (dBm)	WCDMA IV			Tune-up Limit (dBm)	WCDMA V			Tune-up Limit (dBm)
TX Channel		9262	9400	9538		1312	1413	1513		4132	4182	4233	
Rx Channel		8652	8900	9098		1537	1638	1738		4497	4497	4468	
Frequency (MHz)		1852.4	1880	1907.6		1712.4	1732.6	1752.8		826.4	836.4	846.8	
3GPP Rel 98	AMR 12.2Kbps	13.59	13.63	13.62	14.90	15.62	15.54	15.51	16.70	19.71	19.86	19.80	20.90
3GPP Rel 98	RMTC 12.2Kbps	13.60	13.68	13.67	14.90	15.67	15.58	15.55	16.70	19.74	19.87	19.82	20.90
3GPP Rel 6	HSDPA Subtest-1	12.57	12.63	12.69	13.90	14.44	14.52	14.61	15.70	19.32	19.23	19.26	19.90
3GPP Rel 6	HSDPA Subtest-2	12.55	12.67	12.69	13.90	14.41	14.47	14.58	15.70	19.32	19.25	19.26	19.90
3GPP Rel 6	HSDPA Subtest-3	12.11	12.15	12.16	13.40	13.91	13.99	14.09	15.20	16.82	16.75	16.75	19.40
3GPP Rel 6	HSDPA Subtest-4	12.05	12.18	12.14	13.40	13.92	13.94	14.08	15.20	16.86	16.73	16.79	19.40
3GPP Rel 6	DC-HSDPA Subtest-1	12.47	12.62	12.61	13.90	14.43	14.49	14.55	15.70	19.30	19.11	19.16	19.90
3GPP Rel 6	DC-HSDPA Subtest-2	12.52	12.63	12.63	13.90	14.00	14.42	14.52	15.70	19.29	19.21	19.22	19.90
3GPP Rel 6	DC-HSDPA Subtest-3	12.14	12.11	12.13	13.40	13.90	13.94	14.03	15.20	16.85	16.71	16.77	19.40
3GPP Rel 6	DC-HSDPA Subtest-4	12.02	12.14	12.09	13.40	13.89	13.92	14.02	15.20	16.79	16.70	16.75	19.40
3GPP Rel 6	HSUPA Subtest-1	12.43	12.62	12.63	13.90	14.15	14.34	14.46	15.70	19.31	19.21	19.23	19.90
3GPP Rel 6	HSUPA Subtest-2	10.49	10.65	10.67	11.90	12.24	12.32	12.48	13.70	17.21	17.18	17.21	17.90
3GPP Rel 6	HSUPA Subtest-3	11.52	11.60	11.65	12.90	13.18	13.37	13.49	14.70	18.12	18.11	18.25	18.90
3GPP Rel 6	HSUPA Subtest-4	10.48	10.67	10.69	11.90	12.02	12.33	12.49	13.70	17.23	17.19	17.22	17.90
3GPP Rel 6	HSUPA Subtest-5	12.52	12.59	12.68	13.90	13.92	14.34	13.95	15.70	19.19	19.20	19.20	19.90
3GPP Rel 7	HSiPA+ (15QAM) Subtest-1	10.44	10.53	10.67	11.90	11.93	12.25	11.98	13.70	17.32	17.48	17.38	17.90

Reduced power for Hotspot on-UAT

GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame Average Power (dBm)			Tune-up Limit (dBm)
	512	861	810		512	861	810	
TX Channel	1850.2	1880	1909.8	1850.2	1880	1909.8		
Frequency (MHz)	23.88	23.55	23.42	24.90	14.88	14.55	14.42	15.90
GSM 1 Tx slot	23.39	23.21	23.24	24.90	14.39	14.21	14.24	15.90
GPRS 1 Tx slot	21.32	21.41	21.28	22.40	15.32	15.41	15.28	16.40
GPRS 2 Tx slots	20.45	20.35	20.24	21.40	16.19	16.09	15.98	17.14
GPRS 3 Tx slots	19.31	19.44	19.48	19.90	16.31	16.44	16.48	16.90
GPRS 4 Tx slots	20.12	20.72	20.22	22.00	11.12	11.72	11.22	13.00
EDGE 1 Tx slot	18.09	18.02	18.32	20.00	12.09	12.02	12.32	14.00
EDGE 2 Tx slots	17.58	17.78	17.26	19.00	13.32	13.52	13.00	14.74
EDGE 4 Tx slots	15.55	15.82	15.66	17.50	12.55	12.82	12.66	14.50

Band	WCDMA II			Tune-up Limit (dBm)	WCDMA IV			Tune-up Limit (dBm)
	9262	9400	9638		1312	1413	1513	
TX Channel	9962	9800	9638	1337	1638	1738		
Frequency (MHz)	1852.4	1880	1907.4	1722.4	1752.6	1782.6		
3GPP Rel 99 AMR 12.2Kbps	16.80	16.92	16.77	17.90	18.33	18.30	18.24	19.50
3GPP Rel 99 RMC 12.2Kbps	16.81	16.99	16.84	17.90	18.37	18.32	18.29	19.50
3GPP Rel 6 HSDPA Subtest-1	15.41	15.57	15.62	16.90	17.04	17.06	17.14	18.50
3GPP Rel 6 HSDPA Subtest-2	15.36	15.56	15.59	16.90	17.00	17.04	17.08	18.50
3GPP Rel 6 HSDPA Subtest-3	14.87	15.07	15.05	16.40	16.49	16.56	16.61	18.00
3GPP Rel 6 HSDPA Subtest-4	14.93	15.06	15.13	16.40	16.54	16.63	16.63	18.00
3GPP Rel 8 DC-HSPA Subtest-1	15.95	15.63	15.62	16.90	17.09	17.11	17.24	18.50
3GPP Rel 8 DC-HSPA Subtest-2	15.51	15.02	15.59	16.90	17.03	17.12	17.31	18.50
3GPP Rel 8 DC-HSPA Subtest-3	15.01	15.11	15.22	16.40	16.67	16.70	16.77	18.00
3GPP Rel 8 DC-HSPA Subtest-4	14.95	15.17	15.19	16.40	16.48	16.68	16.72	18.00
3GPP Rel 6 HSUPA Subtest-1	15.38	15.58	15.66	16.90	16.80	17.11	17.23	18.50
3GPP Rel 6 HSUPA Subtest-2	13.47	13.63	13.59	14.90	15.01	15.18	15.19	16.50
3GPP Rel 6 HSUPA Subtest-3	14.44	14.52	14.66	15.90	15.92	16.17	16.24	17.50
3GPP Rel 6 HSUPA Subtest-4	13.42	13.55	13.71	14.90	14.85	15.09	15.26	16.50
3GPP Rel 6 HSUPA Subtest-5	15.40	15.60	15.70	16.90	16.73	17.14	16.70	18.50
3GPP Rel 7 HSPA+ (16QAM) Subtest-1	13.42	13.44	13.53	14.90	14.73	15.00	14.78	16.50

Reduced power for Sensor on-UAT

GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame Average Power (dBm)			Tune-up Limit (dBm)
	512	861	810		512	861	810	
TX Channel	1850.2	1880	1909.8	1850.2	1880	1909.8		
Frequency (MHz)	23.88	23.55	23.42	24.90	14.88	14.55	14.42	15.90
GSM 1 Tx slot	23.39	23.21	23.24	24.90	14.39	14.21	14.24	15.90
GPRS 2 Tx slots	21.32	21.41	21.28	22.40	15.32	15.41	15.28	16.40
GPRS 3 Tx slots	20.45	20.35	20.24	21.40	16.19	16.09	15.98	17.14
GPRS 4 Tx slots	19.31	19.44	19.48	19.90	16.31	16.44	16.48	16.90
EDGE 1 Tx slot	20.12	20.72	20.22	22.00	11.12	11.72	11.22	13.00
EDGE 2 Tx slots	18.09	18.02	18.32	20.00	12.09	12.02	12.32	14.00
EDGE 3 Tx slots	17.58	17.78	17.26	19.00	13.32	13.52	13.00	14.74
EDGE 4 Tx slots	15.55	15.82	15.66	17.50	12.55	12.82	12.66	14.50

Band	WCDMA II			Tune-up Limit (dBm)	WCDMA IV			Tune-up Limit (dBm)
	9262	9400	9638		1312	1413	1513	
TX Channel	9952	9900	9638	1337	1638	1738		
Frequency (MHz)	1852.4	1880	1907.4	1712.4	1735.6	1752.6		
3GPP Rel 99	AMR 12.2Kbps	19.50	19.55	19.61	20.90	20.21	20.11	20.15
3GPP Rel 99	RMIC 12.2Kbps	19.51	19.72	19.64	20.90	20.32	20.21	20.19
3GPP Rel 6	HSDPA Subtest-1	18.54	18.60	18.67	18.90	18.19	18.25	18.33
3GPP Rel 6	HSDPA Subtest-2	18.55	18.60	18.65	18.90	18.20	18.23	18.31
3GPP Rel 6	HSDPA Subtest-3	18.02	18.08	18.21	18.40	18.69	18.74	18.80
3GPP Rel 6	HSDPA Subtest-4	18.02	18.16	18.16	18.40	18.66	18.77	18.83
3GPP Rel 8	DC-HSPA Subtest-1	18.44	18.52	18.66	19.90	18.15	18.22	18.29
3GPP Rel 8	DC-HSPA Subtest-2	18.53	18.61	18.67	19.90	18.16	18.21	18.16
3GPP Rel 8	DC-HSDPA Subtest-3	18.00	18.03	18.15	18.40	18.68	18.72	18.77
3GPP Rel 8	DC-HSDPA Subtest-4	18.04	18.12	18.11	18.40	18.52	18.79	18.85
3GPP Rel 6	HSUPA Subtest-1	18.50	18.58	18.65	19.90	18.21	18.24	18.37
3GPP Rel 6	HSUPA Subtest-2	16.53	16.62	16.64	17.90	17.22	17.21	17.40
3GPP Rel 6	HSUPA Subtest-3	17.47	17.65	17.60	18.90	18.25	18.22	18.38
3GPP Rel 6	HSUPA Subtest-4	16.49	16.62	16.61	17.90	17.14	17.23	17.33
3GPP Rel 6	HSUPA Subtest-5	18.50	18.60	18.70	19.90	18.20	18.30	18.30
3GPP Rel 7	HSPA+ (16QAM) Subtest-1	16.66	16.72	16.88	17.90	17.15	17.27	17.44

Full Power Mode - LAT

GSM850		Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame Average Power (dBm)			Tune-up Limit (dBm)
TX Channel		126	189	251		528	109	251	
Frequency (MHz)		164.2	168.4	168.8		824.2	836.4	1448.8	
GSM 1 Tx slot	32.78	32.81	32.82	34.00	23.78	23.81	23.82	25.00	
GPRS 1 Tx slot	32.71	32.72	32.82	34.00	23.71	23.72	23.82	25.00	
GPRS 2 Tx slots	30.69	30.68	30.30	31.50	24.69	24.66	24.50	25.50	
GPRS 3 Tx slots	29.12	29.27	28.87	30.00	24.86	25.01	24.81	25.74	
GPRS 4 Tx slots	27.82	27.88	27.93	28.50	24.82	24.88	24.93	25.50	
EDGE 1 Tx slot	25.88	25.81	25.79	27.50	16.88	16.81	16.79	18.50	
EDGE 2 Tx slots	24.04	24.09	24.32	25.50	10.04	10.08	10.32	19.50	
EDGE 3 Tx slots	22.53	22.56	22.63	24.50	16.27	16.30	16.37	20.24	
EDGE 4 Tx slots	22.19	22.34	22.24	24.00	16.19	16.34	16.24	21.00	

GSM1900		Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame Average Power (dBm)			Tune-up Limit (dBm)
TX Channel		512	661	810		512	661	810	
Frequency (MHz)		1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM 1 Tx slot	26.34	26.32	26.46	30.50	20.34	20.32	20.46	21.50	
GPRS 1 Tx slot	26.31	26.25	26.45	30.50	20.33	20.28	20.45	21.50	
GPRS 2 Tx slots	26.45	26.34	26.12	28.00	20.45	20.34	20.12	22.00	
GPRS 3 Tx slots	25.43	25.30	25.12	27.00	21.17	21.04	20.86	22.74	
GPRS 4 Tx slots	24.35	24.10	24.06	25.50	21.35	21.10	21.06	22.50	
EDGE 1 Tx slot	23.66	23.67	25.51	27.00	16.66	16.67	16.51	18.00	
EDGE 2 Tx slots	23.26	23.15	23.21	25.00	17.26	17.15	17.21	19.00	
EDGE 3 Tx slots	22.05	22.06	22.09	24.00	17.79	17.80	17.83	19.74	
EDGE 4 Tx slots	21.03	21.02	21.11	23.00	16.03	16.02	16.11	20.00	

Band		WCDMA II			Tune-up Limit (dBm)	WCDMA IV			Tune-up Limit (dBm)	WCDMA V			Tune-up Limit (dBm)
TX Channel		9262	9400	9538		1312	1413	1513		4132	4182	4233	
Rx Channel		8652	8800	8998		1537	1638	1748		4497	4497	4468	
Frequency (MHz)		1852.4	1880	1907.6		1712.4	1732.6	1752.8		826.4	836.4	846.8	
3GPP Rel 98	AMR 12.2Kbps	24.18	24.31	24.27	25.00	24.06	24.06	24.02	25.00	24.07	24.10	24.04	25.00
3GPP Rel 98	RM-C 12.2Kbps	24.21	24.33	24.30	25.00	24.16	24.09	24.04	25.00	24.09	24.11	24.05	25.00
3GPP Rel 6	HS-PA Subtest-1	23.25	23.37	23.31	24.00	23.16	23.12	23.12	24.00	23.10	23.12	23.04	24.00
3GPP Rel 6	HS-PA Subtest-2	23.26	23.33	23.32	24.00	23.14	23.16	23.10	24.00	23.08	23.12	22.80	24.00
3GPP Rel 6	HS-PA Subtest-3	22.41	22.91	22.78	23.50	22.70	22.62	23.50	22.54	22.61	22.52	23.50	
3GPP Rel 6	HS-PA Subtest-4	22.77	22.87	22.77	23.50	22.65	22.60	23.50	22.58	22.58	22.57	22.58	23.50
3GPP Rel 6	DC-HS-PA Subtest-1	23.30	23.42	23.35	24.00	23.21	23.17	23.16	24.00	23.19	23.20	23.10	24.00
3GPP Rel 6	DC-HS-PA Subtest-2	23.31	23.42	23.41	24.00	23.16	23.15	23.16	24.00	23.15	23.22	22.89	24.00
3GPP Rel 6	DC-HS-PA Subtest-3	22.50	23.02	22.87	23.50	22.78	22.79	22.70	23.50	22.62	22.71	22.64	23.50
3GPP Rel 6	DC-HS-PA Subtest-4	22.82	22.94	22.85	23.50	22.74	22.64	22.65	23.50	22.67	22.66	22.67	23.50
3GPP Rel 6	HS-UPA Subtest-1	23.26	23.44	23.36	24.00	23.23	23.18	23.16	24.00	23.08	23.09	23.07	24.00
3GPP Rel 6	HS-UPA Subtest-2	21.26	21.31	21.38	22.00	21.17	21.20	21.13	22.00	21.07	21.12	21.00	22.00
3GPP Rel 6	HS-UPA Subtest-3	22.24	22.36	22.34	23.00	22.17	22.19	22.13	23.00	22.06	22.10	22.07	23.00
3GPP Rel 6	HS-UPA Subtest-4	21.26	21.47	21.38	22.00	21.16	21.16	21.16	22.00	21.08	21.08	21.06	22.00
3GPP Rel 6	HS-UPA Subtest-5	23.30	23.46	23.40	24.00	23.20	23.20	23.10	24.00	23.10	23.10	23.10	24.00
3GPP Rel 7	HS-PA+ (15QAM) Subtest-1	21.10	21.14	21.02	22.00	21.11	21.04	21.07	22.00	21.00	20.99	20.95	22.00

Reduced power for Hotspot on-LAT

GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame Average Power (dBm)			Tune-up Limit (dBm)
	512	861	810		512	861	810	
TX Channel	1850.2	1880	1909.8	1850.2	1880	1909.8		
Frequency (MHz)	28.92	28.92	28.91	30.00	19.92	19.92	19.91	21.00
GSM 1 Tx slot	28.45	28.72	28.40	30.00	19.45	19.72	19.40	21.00
GPRS 2 Tx slots	25.48	26.09	25.84	29.90	19.48	20.09	19.84	20.90
GPRS 3 Tx slots	24.29	24.17	23.58	25.40	20.03	19.91	19.32	21.14
GPRS 4 Tx slots	22.82	22.61	22.01	23.90	19.82	19.61	19.01	20.90
EDGE 1 Tx slot	25.88	25.81	25.79	27.50	18.88	18.81	18.79	18.50
EDGE 2 Tx slots	23.58	23.30	23.48	25.00	17.58	17.30	17.48	19.00
EDGE 3 Tx slots	22.05	22.00	22.17	24.00	17.79	17.74	17.91	18.74
EDGE 4 Tx slots	20.69	20.65	20.58	22.40	17.69	17.65	17.58	19.40

Band	WCDMA II			Tune-up Limit (dBm)	WCDMA IV			Tune-up Limit (dBm)	
	TX Channel	9262	9400		9638	1312	1413		1513
Rx Channel	9662	9800	9638	1337	1438	1738			
Frequency (MHz)	1852.4	1880	1907.4	1722.4	1752.6	1752.6			
3GPP Rel 99	AMR 12.2Kbps	21.28	21.35	21.33	21.80	20.81	20.48	20.45	21.00
3GPP Rel 99	RMC 12.2Kbps	21.33	21.41	21.35	21.80	20.63	20.53	20.48	21.00
3GPP Rel 6	HSUPA Subtest-1	20.15	20.21	20.15	20.80	19.44	19.37	19.27	20.00
3GPP Rel 6	HSUPA Subtest-2	20.15	20.22	20.13	20.80	19.42	19.37	19.28	20.00
3GPP Rel 6	HSUPA Subtest-3	19.71	19.32	19.60	20.30	18.95	18.88	18.76	19.50
3GPP Rel 6	HSUPA Subtest-4	19.67	19.76	19.63	20.30	18.96	18.89	18.79	19.50
3GPP Rel 6	DC-HSUPA Subtest-1	20.11	20.12	20.18	20.80	19.41	19.32	19.24	20.00
3GPP Rel 6	DC-HSDPA Subtest-2	20.16	20.12	20.19	20.80	19.38	19.29	19.22	20.00
3GPP Rel 6	DC-HSDPA Subtest-3	19.76	19.31	19.64	20.30	18.94	18.89	18.78	19.50
3GPP Rel 6	DC-HSDPA Subtest-4	19.61	19.72	19.69	20.30	18.91	18.83	18.72	19.50
3GPP Rel 6	HSUPA Subtest-1	20.20	20.18	20.15	20.80	19.47	19.38	19.25	20.00
3GPP Rel 6	HSUPA Subtest-2	18.17	18.20	18.14	18.80	17.45	17.40	17.34	18.00
3GPP Rel 6	HSUPA Subtest-3	19.17	19.21	19.14	19.60	18.47	18.38	18.29	19.00
3GPP Rel 6	HSUPA Subtest-4	18.13	18.17	18.12	18.80	17.46	17.41	17.30	18.00
3GPP Rel 6	HSUPA Subtest-5	20.10	20.20	20.20	20.80	19.50	19.40	19.30	20.00
3GPP Rel 7	HSPA+ (16QAM) Subtest-1	17.92	17.99	17.77	18.80	17.21	17.19	17.18	18.00

Reduced power for Sensor on-LAT

Band	WCDMA II			Tune-up Limit (dBm)	WCDMA IV			Tune-up Limit (dBm)
	TX Channel	9262	9400	9538	1312	1413	1513	
	Rx Channel	9662	9800	9938	1537	1638	1738	
	Frequency (MHz)	1852.4	1880	1907.6	1712.4	1732.6	1752.6	
3GPP Rel 99	AMR 12.7Kbps	21.28	21.55	21.33	21.80	20.61	20.48	20.45
3GPP Rel 99	RMC 12.7Kbps	21.33	21.41	21.35	21.80	20.63	20.53	20.48
3GPP Rel 6	HS-DS-SS Subtest-1	20.15	20.21	20.15	20.80	19.44	19.37	19.27
3GPP Rel 6	HS-DS-SS Subtest-2	20.19	20.22	20.13	20.80	19.42	19.37	19.26
3GPP Rel 6	HS-DS-SS Subtest-3	19.71	19.32	19.60	20.30	18.95	18.88	18.76
3GPP Rel 6	HS-DS-SS Subtest-4	19.67	19.76	19.63	20.30	18.96	18.89	18.79
3GPP Rel 8	DC-HS-SS Subtest-1	20.11	20.12	20.18	20.80	19.41	19.32	19.24
3GPP Rel 8	DC-HS-SS Subtest-2	20.16	20.12	20.19	20.80	19.38	19.29	19.22
3GPP Rel 8	DC-HS-SS Subtest-3	19.76	19.31	19.64	20.30	18.54	18.89	18.78
3GPP Rel 8	DC-HS-SS Subtest-4	19.61	19.72	19.69	20.30	18.91	18.83	18.72
3GPP Rel 6	HS-UPA Subtest-1	20.20	20.18	20.15	20.80	19.47	19.38	19.25
3GPP Rel 6	HS-UPA Subtest-2	18.17	18.20	18.14	18.80	17.45	17.40	17.34
3GPP Rel 6	HS-UPA Subtest-3	19.17	19.21	19.14	19.80	18.47	18.38	18.29
3GPP Rel 6	HS-UPA Subtest-4	18.13	18.17	18.12	18.80	17.48	17.41	17.30
3GPP Rel 6	HS-UPA Subtest-5	20.10	20.20	20.20	20.80	19.50	19.40	19.30
3GPP Rel 7	HSPA+ (16QAM) Subtest-1	17.82	17.99	17.77	18.80	17.21	17.19	17.18

Intra Band UL CA Power for UAT

CA_41C											
Combination 20MHz+20MHz (100RB+100RB)											
PCC Channel	SCC Channel	Modulation	PCC		SCC		Total RB Size	Target MPR Level (dB)	Power Reduction	Measured Power (dBm)	Tune up Power (dBm)
			RB Size	RB offset	RB Size	RB offset					
39750	39948	QPSK	1	49	0	0	1	0	Full	23.61	25.00
40185	40383	QPSK	1	49	0	0	1	0	Full	23.39	25.00
40620	40422	QPSK	1	49	0	0	1	0	Full	23.68	25.00
41055	40857	QPSK	1	49	0	0	1	0	Full	23.69	25.00
41490	41292	QPSK	1	49	0	0	1	0	Full	23.64	25.00
39750	39948	QPSK	1	99	1	0	2	0	Reduced Level 1/2	18.25	19.20
40185	40383	QPSK	1	99	1	0	2	0	Reduced Level 1/2	18.37	19.20
40620	40422	QPSK	1	0	1	99	2	0	Reduced Level 1/2	18.43	19.20
41055	40857	QPSK	1	0	1	99	2	0	Reduced Level 1/2	18.45	19.20
41490	41292	QPSK	1	0	1	99	2	0	Reduced Level 1/2	18.42	19.20
39750	39948	QPSK	1	99	1	0	2	0	Hotspot on	20.24	21.50
40185	40383	QPSK	1	99	1	0	2	0	Hotspot on	20.33	21.50
40620	40422	QPSK	1	0	1	99	2	0	Hotspot on	20.29	21.50
41055	40857	QPSK	1	0	1	99	2	0	Hotspot on	20.36	21.50
41490	41292	QPSK	1	0	1	99	2	0	Hotspot on	20.29	21.50
39750	39948	QPSK	1	99	1	0	2	0	Sensor on	22.39	23.70
40185	40383	QPSK	1	99	1	0	2	0	Sensor on	22.53	23.70
40620	40422	QPSK	1	0	1	99	2	0	Sensor on	22.48	23.70
41055	40857	QPSK	1	0	1	99	2	0	Sensor on	22.55	23.70
41490	41292	QPSK	1	0	1	99	2	0	Sensor on	22.48	23.70

Intra Band UL CA Power for LAT

CA_41C											
Combination 20MHz+20MHz (100RB+100RB)											
PCC Channel	SCC Channel	Modulation	PCC		SCC		Total RB Size	Target MPR Level (dB)	Power Reduction	Measured Power (dBm)	Tune up Power (dBm)
			RB Size	RB offset	RB Size	RB offset					
39750	39948	QPSK	1	49	0	0	1	0	Full	23.94	25.00
40185	40383	QPSK	1	49	0	0	1	0	Full	23.73	25.00
40620	40422	QPSK	1	49	0	0	1	0	Full	23.78	25.00
41055	40857	QPSK	1	49	0	0	1	0	Full	24.15	25.00
41490	41292	QPSK	1	49	0	0	1	0	Full	23.99	25.00
39750	39948	QPSK	1	99	1	0	2	0	Hotspot on	22.84	24.20
40185	40383	QPSK	1	99	1	0	2	0	Hotspot on	22.75	24.20
40620	40422	QPSK	1	0	1	99	2	0	Hotspot on	22.88	24.20
41055	40857	QPSK	1	0	1	99	2	0	Hotspot on	22.92	24.20
41490	41292	QPSK	1	0	1	99	2	0	Hotspot on	22.90	24.20



DL CA Power

Full Power															
2CC															
Configure		CA Configuration (BCS)	PCC						SCC				Power		
			LTE Band	BW (MHz)	UL Freq. (MHz)	UL Channel	Mod.	UL# RB	UL RB Offset	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	With CA Tx.Power (dBm)	W/O CA Tx.Power (dBm)
		CA_25A-41A	25	20	1905	26590	QPSK	1	0	41	20	2593	40620	23.82	23.84
		CA_26A-41A	26	15	84.5	26965	QPSK	1	0	41	20	2593	40620	23.60	23.94
Inter-Band	Non-Contiguous	CA_41A-41A	41	20	2593	40620	QPSK	1	49	41	5	2498.5	39675	23.33	23.95
	Contiguous	CA_66B	66	15	1717.5	132047	QPSK	1	49	66	5	2126.80	66604	23.60	23.85

3CC																			
Configure		CA Configuration (BCS)	PCC							SCC1				SCC2				Power	
			LTE Band	BW (MHz)	UL Freq. (MHz)	UL Channel	Mod.	UL# RB	UL RB Offset	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	With CA Tx.Power (dBm)	W/O CA Tx.Power (dBm)
Inter-Band		CA_2A-2A-4A	2	20	1880	18900	QPSK	1	49	2	5	1987.5	1175	4	20	2132.5	2175	23.52	23.83
		CA_2A-2A-12A	2	20	1880	18900	QPSK	1	49	2	5	1987.5	1175	12	10	737.5	5095	23.42	23.83
		CA_2A-2A-66A	2	20	1880	18900	QPSK	1	49	2	5	1987.5	1175	66	20	2155	66886	23.58	23.83
		CA_2A-2A-71A	2	20	1880	18900	QPSK	1	49	2	5	1987.5	1175	71	20	637	68786	23.62	23.83
		CA_2A-4A-4A	2	20	1880	18900	QPSK	1	49	4	20	2132.5	2175	4	5	2152.5	2375	23.82	23.83
		CA_2A-4A-5A	2	20	1880	18900	QPSK	1	49	4	20	2132.5	2175	5	10	881.5	2525	23.77	23.83
		CA_2A-4A-12A	2	20	1880	18900	QPSK	1	49	4	20	2132.5	2175	12	10	737.5	5095	23.79	23.83
		CA_2A-4A-71A	2	20	1880	18900	QPSK	1	49	4	20	2132.5	2175	71	20	637	68786	23.73	23.83
		CA_2A-5A-66A	2	20	1880	18900	QPSK	1	49	5	10	881.5	2525	66	20	2155	66886	23.80	23.83
		CA_2A-12A-66A	2	20	1880	18900	QPSK	1	49	12	10	737.5	5095	66	20	2155	66886	23.66	23.83
		CA_2A-66A-66A	2	20	1880	18900	QPSK	1	49	66	20	2155	66886	66	5	2197.5	67311	23.76	23.83
		CA_2A-66A-71A	2	20	1880	18900	QPSK	1	49	66	20	2155	66886	71	20	637	68786	23.78	23.83
		CA_2A-66C	2	20	1880	18900	QPSK	1	49	66	20	2155	66886	66	20	2174.8	67084	23.81	23.83
		CA_2C-66A	2	20	1880	18900	QPSK	1	49	2	20	1979.8	1098	66	20	2155	66886	23.71	23.83
		CA_4A-4A-12A	4	20	1720	20050	QPSK	1	0	4	5	2152.5	2375	12	10	737.5	5095	23.70	23.82
		CA_4A-4A-71A	4	20	1720	20050	QPSK	1	0	4	5	2152.5	2375	71	20	637	68786	23.77	23.82
		CA_12A-66A-66A	12	10	707.5	23095	QPSK	1	0	66	20	2155	66886	66	5	2197.5	67311	24.16	24.08
		CA_12A-66C	12	10	707.5	23095	QPSK	1	0	66	20	2155	66886	66	20	2174.8	67084	24.26	24.08
		CA_25A-25A-26A	25	20	1905	26590	QPSK	1	0	25	5	1932.5	8065	26	5	876.5	8865	23.55	23.84
		CA_25A-41C	25	20	1905	26590	QPSK	1	0	41	20	2660.2	41292	41	20	2680	41490	23.77	23.84
	CA_66A-66A-71A	66	20	1720	132072	QPSK	1	49	66	5	2177.5	67111	71	20	637	68786	23.82	23.85	
	CA_66C-71A	66	20	1720	132072	QPSK	1	49	66	20	2189.8	67234	71	20	637	68786	23.74	23.85	
Intra-Band	Non-Contiguous	CA_41A-41C	41	20	2593	40620	QPSK	1	49	41	5	2498.2	39675	41	20	2509.9	39792	23.95	23.95
		CA_41D	41	20	2593	40620	QPSK	1	49	41	20	2525.8	39948	41	20	2545.6	40146	23.87	23.95

n66_Ant 1									
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)	
Channel				344000	349000	354000	25.2	0.0	
Frequency (MHz)				1720	1745	1770			
20	PI2 BPSK	1	1	23.38	23.52	23.44	25.2	0.0	
20	PI2 BPSK	1	53	23.32	23.46	23.39			
20	PI2 BPSK	1	104	23.35	23.48	23.42			
20	PI2 BPSK	50	0	22.86	23.01	22.96	24.7	0.5	
20	PI2 BPSK	50	28	23.36	23.46	23.43	25.2	0.0	
20	PI2 BPSK	50	56	22.88	23.03	23.01	24.7	0.5	
20	PI2 BPSK	100	0	22.86	23.01	22.94			
20	QPSK	1	1	23.29	23.45	23.38			
20	QPSK	1	53	23.26	23.43	23.32	25.2	0.0	
20	QPSK	1	104	23.28	23.44	23.35			
20	QPSK	50	0	22.85	22.44	22.86	24.2	1.0	
20	QPSK	50	28	23.26	23.25	23.24	25.2	0.0	
20	QPSK	50	56	22.32	22.46	22.36	24.2	1.0	
20	QPSK	100	0	22.27	22.40	22.37	24.2	1.0	
20	16QAM	1	1	22.27	22.46	22.28	24.2	1.0	
20	64QAM	1	1	20.83	20.96	20.84	22.7	2.5	
20	256QAM	1	1	18.76	18.83	18.83	20.7	4.5	
Channel				343500	349000	354500	Tune-up limit (dBm)	MPR (dB)	
Frequency (MHz)				1717.5	1745	1772.5			
15	PI2 BPSK	1	1	23.26	23.39	23.32	25.2	0.0	
Channel				343000	349000	355000	Tune-up limit (dBm)	MPR (dB)	
Frequency (MHz)				1715	1745	1775			
10	PI2 BPSK	1	1	23.34	23.47	23.44	25.2	0.0	
Channel				342500	349000	355500	Tune-up limit (dBm)	MPR (dB)	
Frequency (MHz)				1712.5	1744	1777.5			
5	PI2 BPSK	1	1	23.31	23.50	23.42	25.2	0.0	

n71_Ant 1									
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)	
Channel				134600	136100	137600	25.2	0.0	
Frequency (MHz)				673	680.5	688			
20	PI2 BPSK	1	1	24.46	24.36	24.34	25.2	0.0	
20	PI2 BPSK	1	53	24.35	24.33	24.21			
20	PI2 BPSK	1	104	24.36	24.16	24.06			
20	PI2 BPSK	50	0	23.78	23.73	23.71	24.7	0.5	
20	PI2 BPSK	50	28	24.36	24.26	24.18	25.2	0.0	
20	PI2 BPSK	50	56	23.76	23.70	23.51	24.7	0.5	
20	PI2 BPSK	100	0	23.67	23.64	23.71			
20	QPSK	1	1	24.38	24.31	24.26			
20	QPSK	1	53	24.23	24.26	23.98	25.2	0.0	
20	QPSK	1	104	24.25	24.06	23.82			
20	QPSK	50	0	22.60	23.10	23.14	24.2	1.0	
20	QPSK	50	28	23.76	24.16	23.74	25.2	0.0	
20	QPSK	50	56	23.16	23.01	22.84	24.2	1.0	
20	QPSK	100	0	23.00	22.98	22.82	24.2	1.0	
20	16QAM	1	1	23.31	23.09	23.28	24.2	1.0	
20	64QAM	1	1	21.89	21.72	21.84	22.7	2.5	
20	256QAM	1	1	19.65	19.64	19.49	20.7	4.5	
Channel				134100	136100	138100	Tune-up limit (dBm)	MPR (dB)	
Frequency (MHz)				670.5	680.5	690.5			
15	PI2 BPSK	1	1	24.40	24.42	24.29	25.2	0.0	
Channel				133600	136100	138600	Tune-up limit (dBm)	MPR (dB)	
Frequency (MHz)				666	680.5	693			
10	PI2 BPSK	1	1	24.44	24.42	24.41	25.2	0.0	
Channel				133100	136100	139100	Tune-up limit (dBm)	MPR (dB)	
Frequency (MHz)				663.5	680.5	696.5			
5	PI2 BPSK	1	1	24.45	24.42	24.36	25.2	0.0	

n66_Ant 0									
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)	
Channel				344000	349000	354000	25.2	0.0	
Frequency (MHz)				1720	1745	1770			
20	PI2 BPSK	1	1	24.00	24.02	23.99	25.2	0.0	
20	PI2 BPSK	1	53	23.96	23.97	23.94			
20	PI2 BPSK	1	104	23.97	23.95	23.93			
20	PI2 BPSK	50	0	23.46	23.51	23.44	24.7	0.5	
20	PI2 BPSK	50	28	23.93	23.97	23.90	25.2	0.0	
20	PI2 BPSK	50	56	23.46	23.52	23.42	24.7	0.5	
20	PI2 BPSK	100	0	23.46	23.51	23.44			
20	QPSK	1	1	23.96	23.94	23.94			
20	QPSK	1	53	23.88	23.89	23.88	25.2	0.0	
20	QPSK	1	104	23.92	23.92	23.90			
20	QPSK	50	0	22.56	22.74	22.81	24.2	1.0	
20	QPSK	50	28	23.52	23.68	23.69	25.2	0.0	
20	QPSK	50	56	22.75	22.86	22.84	24.2	1.0	
20	QPSK	100	0	22.68	22.76	22.90	24.2	1.0	
20	16QAM	1	1	22.81	22.83	22.76	24.2	1.0	
20	64QAM	1	1	21.65	21.73	21.67	22.7	2.5	
20	256QAM	1	1	19.64	19.34	19.35	20.7	4.5	
Channel				343500	349000	354500	Tune-up limit (dBm)	MPR (dB)	
Frequency (MHz)				1717.5	1745	1772.5			
15	PI2 BPSK	1	1	23.98	23.90	23.80	25.2	0.0	
Channel				343000	349000	355000	Tune-up limit (dBm)	MPR (dB)	
Frequency (MHz)				1715	1745	1775			
10	PI2 BPSK	1	1	23.98	23.96	23.97	25.2	0.0	
Channel				342500	349000	355500	Tune-up limit (dBm)	MPR (dB)	
Frequency (MHz)				1712.5	1744	1777.5			
5	PI2 BPSK	1	1	24.01	23.99	23.91	25.2	0.0	

n71_Ant 0									
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)	
Channel				134600	136100	137600	25.2	0.0	
Frequency (MHz)				673	680.5	688			
20	PI2 BPSK	1	1	24.20	24.18	24.16	25.2	0.0	
20	PI2 BPSK	1	53	24.12	24.10	23.91			
20	PI2 BPSK	1	104	24.10	23.91	23.86			
20	PI2 BPSK	50	0	22.80	23.51	23.47	24.7	0.5	
20	PI2 BPSK	50	28	24.07	24.01	23.86	25.2	0.0	
20	PI2 BPSK	50	56	23.58	23.47	23.39	24.7	0.5	
20	PI2 BPSK	100	0	23.60	23.51	23.46			
20	QPSK	1	1	24.13	24.08	24.11			
20	QPSK	1	53	24.04	24.01	23.84	25.2	0.0	
20	QPSK	1	104	24.02	23.68	23.40			
20	QPSK	50	0	22.49	22.73	22.86	24.2	1.0	
20	QPSK	50	28	23.43	23.92	23.55	25.2	0.0	
20	QPSK	50	56	22.89	22.81	22.28	24.2	1.0	
20	QPSK	100	0	22.76	22.78	22.48	24.2	1.0	
20	16QAM	1	1	23.02	22.96	22.99	24.2	1.0	
20	64QAM	1	1	21.69	21.81	21.83	22.7	2.5	
20	256QAM	1	1	19.53	19.48	19.32	20.7	4.5	
Channel				134100	136100	138100	Tune-up limit (dBm)	MPR (dB)	
Frequency (MHz)				670.5	680.5	690.5			
15	PI2 BPSK	1	1	24.17	24.07	24.12	25.2	0.0	
Channel				133600	136100	138600	Tune-up limit (dBm)	MPR (dB)	
Frequency (MHz)				668	680.5	693			
10	PI2 BPSK	1	1	24.15	24.16	24.14	25.2	0.0	
Channel				133100	136100	139100	Tune-up limit (dBm)	MPR (dB)	
Frequency (MHz)				665.5	680.5	695.5			
5	PI2 BPSK	1	1	24.13	24.18	24.04	25.2	0.0	

n66_Ant 1								
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				344000	349000	354000	16.0	0.0
Frequency (MHz)				1720	1745	1770		
20	Pl2 BPSK	1	1	14.79	14.90	14.74	16.0	0.0
20	Pl2 BPSK	1	53	14.67	14.69	14.59		
20	Pl2 BPSK	1	104	14.72	14.74	14.64		
20	Pl2 BPSK	50	0	14.57	14.60	14.57	16.0	0.0
20	Pl2 BPSK	50	28	14.70	14.65	14.72	16.0	0.0
20	Pl2 BPSK	50	56	14.55	14.63	14.60	16.0	0.0
20	Pl2 BPSK	100	0	14.56	14.76	14.60	16.0	0.0
20	QPSK	1	1	14.64	14.68	14.64		
20	QPSK	1	53	14.62	14.64	14.62		
20	QPSK	1	104	14.70	14.72	14.66	16.0	0.0
20	QPSK	50	0	14.60	14.66	14.58		
20	QPSK	50	28	14.56	14.63	14.59		
20	QPSK	50	56	14.64	14.66	14.61	16.0	0.0
20	QPSK	100	0	14.56	14.62	14.55	16.0	0.0
20	16QAM	1	1	14.76	14.79	14.71	16.0	0.0
20	64QAM	1	1	14.73	14.76	14.60	16.0	0.0
20	256QAM	1	1	14.50	14.57	14.33	16.0	0.0
Channel				343500	349000	354500	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1717.5	1745	1772.5		
15	Pl2 BPSK	1	1	14.68	14.69	14.54	16.0	0.0
Channel				343000	349000	355000	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1715	1745	1775		
10	Pl2 BPSK	1	1	14.67	14.72	14.59	16.0	0.0
Channel				342500	349000	355500	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				1712.5	1745	1777.5		
5	Pl2 BPSK	1	1	14.69	14.71	14.48	16.0	0.0

n66_Ant 1									
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)	
Channel				344000	349000	354000	16.0	0.0	
Frequency (MHz)				1720	1745	1770			
20	PI2 BPSK	1	1	14.79	14.90	14.74	16.0	0.0	
20	PI2 BPSK	1	53	14.67	14.69	14.59			
20	PI2 BPSK	1	104	14.72	14.74	14.64			
20	PI2 BPSK	50	0	14.57	14.60	14.57	16.0	0.0	
20	PI2 BPSK	50	28	14.70	14.85	14.72	16.0	0.0	
20	PI2 BPSK	50	56	14.55	14.63	14.60	16.0	0.0	
20	PI2 BPSK	100	0	14.56	14.70	14.60			
20	QPSK	1	1	14.64	14.69	14.64	16.0	0.0	
20	QPSK	1	53	14.62	14.64	14.62			
20	QPSK	1	104	14.70	14.72	14.66			
20	QPSK	50	0	14.60	14.66	14.58	16.0	0.0	
20	QPSK	50	28	14.56	14.63	14.59	16.0	0.0	
20	QPSK	50	56	14.64	14.66	14.61	16.0	0.0	
20	QPSK	100	0	14.56	14.62	14.55	16.0	0.0	
20	16QAM	1	1	14.76	14.79	14.71	16.0	0.0	
20	64QAM	1	1	14.73	14.76	14.60	16.0	0.0	
20	256QAM	1	1	14.50	14.57	14.33	16.0	0.0	
Channel				343500	349000	354500	Tune-up limit (dBm)	MPR (dB)	
Frequency (MHz)				1717.5	1745	1772.5			
15	PI2 BPSK	1	1	14.68	14.69	14.54	16.0	0.0	
Channel				351000	349000	355000	Tune-up limit (dBm)	MPR (dB)	
Frequency (MHz)				1715	1745	1775			
10	PI2 BPSK	1	1	14.67	14.72	14.59	16.0	0.0	
Channel				342500	349000	355500	Tune-up limit (dBm)	MPR (dB)	
Frequency (MHz)				1712.5	1745	1777.5			
5	PI2 BPSK	1	1	14.69	14.71	14.48	16.0	0.0	

n71_Ant 1									
BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)	
Channel				134600	136100	137600	23.0	0.0	
Frequency (MHz)				673	680.5	688			
20	PI2 BPSK	1	1	22.45	22.34	22.33	23.0	0.0	
20	PI2 BPSK	1	53	22.38	22.31	22.29			
20	PI2 BPSK	1	104	22.35	22.18	22.15			
20	PI2 BPSK	50	0	22.32	22.21	22.20	23.0	0.0	
20	PI2 BPSK	50	28	22.38	22.31	22.30	23.0	0.0	
20	PI2 BPSK	50	56	22.30	22.23	22.24	23.0	0.0	
20	PI2 BPSK	100	0	22.40	22.36	22.23			
20	QPSK	1	1	22.42	22.36	22.38	23.0	0.0	
20	QPSK	1	53	22.36	22.31	22.24			
20	QPSK	1	104	22.26	22.23	22.24			
20	QPSK	50	0	22.37	22.35	22.30	23.0	0.0	
20	QPSK	50	28	22.36	22.32	22.25	23.0	0.0	
20	QPSK	50	56	22.28	22.25	22.26	23.0	0.0	
20	QPSK	100	0	22.32	22.29	22.27	23.0	0.0	
20	16QAM	1	1	22.44	22.38	22.36	23.0	0.0	
20	64QAM	1	1	22.03	21.99	21.95	22.5	0.5	
20	256QAM	1	1	19.86	19.78	19.71	20.5	2.5	
Channel				134100	136100	138100	Tune-up limit (dBm)	MPR (dB)	
Frequency (MHz)				670.5	680.5	690.5			
15	PI2 BPSK	1	1	22.41	22.30	22.23	23.0	0.0	
Channel				133500	136100	138600	Tune-up limit (dBm)	MPR (dB)	
Frequency (MHz)				666	680.5	693			
10	PI2 BPSK	1	1	22.35	22.33	22.21	23.0	0.0	
Channel				133100	136100	139100	Tune-up limit (dBm)	MPR (dB)	
Frequency (MHz)				664.5	680.5	696.5			
5	PI2 BPSK	1	1	22.34	22.30	22.26	23.0	0.0	



Reduced Power level 1 for Hotspot

5.8GHz WLAN				Art. 1		
5.8GHz WLAN	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
	802.11a 6Mbps	149	5745	13.33	15.00	98.28
		157	5785	13.34	15.00	
		165	5825	13.53	15.00	
	802.11n-HT20 MCS0	149	5745	13.16	15.00	99.30
		157	5785	13.11	15.00	
		165	5825	13.31	15.00	
	802.11n-HT40 MCS0	151	5755	13.85	15.50	97.73
		159	5795	13.95	15.50	
		149	5745	13.15	14.90	98.88
	802.11ac-VHT20 MCS0	157	5785	13.09	14.90	
		165	5825	13.33	14.90	
	802.11ac-VHT40 MCS0	151	5755	13.50	15.50	97.73
		159	5795	13.56	15.50	
		155	5775	13.95	15.30	95.29

Reduced Power level 2 for Hotspot

2.4GHz WLAN				Ant 1		
Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	
2.4GHz WLAN	802.11b 1Mbps	1	2412	14.70	16.00	100.00
		6	2437	15.60	17.00	
		11	2462	14.80	16.00	
	802.11g 6Mbps	1	2412	13.90	15.00	98.28
		6	2437	14.90	16.00	
		11	2462	13.00	14.00	
	802.11n-HT20 MCS0	1	2412	12.90	14.00	98.16
		6	2437	15.00	16.00	
		11	2462	13.10	14.00	
	802.11n-HT40 MCS0	3	2422	10.90	12.00	94.91
		6	2437	12.10	13.00	
		9	2452	10.80	12.00	
	802.11ac-VHT20 MCS0	1	2412	12.80	14.00	97.80
		6	2437	14.90	16.00	
		11	2462	13.00	14.00	
	802.11ac-VHT40 MCS0	3	2422	10.80	12.00	94.93
		6	2437	12.00	13.00	
		9	2452	10.70	12.00	

5.2GHz WLAN				Ant 1		
Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	
5.2GHz WLAN	802.11a 6Mbps	36	5180	13.03	14.50	98.28
		40	5200	12.98	14.50	
		44	5220	13.41	14.50	
		48	5240	13.16	14.50	
	802.11n-HT20 MCS0	36	5180	12.84	14.50	99.30
		40	5200	12.80	14.50	
		44	5220	13.24	14.50	
		48	5240	12.96	14.50	
	802.11n-HT40 MCS0	38	5190	13.34	14.50	97.73
		46	5230	13.88	14.50	
	802.11ac-VHT20 MCS0	36	5180	12.80	14.50	98.88
		40	5200	12.79	14.50	
		44	5220	13.21	14.50	
		48	5240	12.94	14.50	
	802.11ac-VHT40 MCS0	38	5190	13.33	14.50	97.73
		46	5230	13.40	14.50	
	802.11ac-VHT50 MCS0	42	5210	13.83	14.30	95.29

5.8GHz WLAN				Ant 1		
Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %	
5.8GHz WLAN	802.11a 6Mbps	149	5745	10.33	12.00	98.28
		157	5785	10.34	12.00	
		165	5825	10.53	12.00	
	802.11n-HT20 MCS0	149	5745	10.16	12.00	99.30
		157	5785	10.11	12.00	
		165	5825	10.31	12.00	
	802.11n-HT40 MCS0	151	5755	10.52	12.50	97.73
		159	5785	10.57	12.50	
	802.11ac-VHT20 MCS0	149	5745	10.15	11.90	98.88
		157	5785	10.09	11.90	
		165	5825	10.33	11.90	
	802.11ac-VHT40 MCS0	151	5755	10.50	12.50	97.73
		159	5795	10.56	12.50	
	802.11ac-VHT50 MCS0	155	5775	10.95	12.30	95.29

