## 3700 MHz Dipole Calibration Certificate

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

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Accreditation No.: **SCS 0108**

Client **CTTL (Auden)**

Certificate No: **D3700V2-1004_Jul22**

# CALIBRATION CERTIFICATE

Object: D3700V2 - SN:1004

Calibration procedure(s): QA CAL-22.v6
Calibration Procedure for SAR Validation Sources between 3-10 GHz

Calibration date: July 01, 2022

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter NRP | SN: 104778 | 04-Apr-22 (No. 217-03525/03524) | Apr-23 |
| Power sensor NRP-Z91 | SN: 103244 | 04-Apr-22 (No. 217-03524) | Apr-23 |
| Power sensor NRP-Z91 | SN: 103245 | 04-Apr-22 (No. 217-03525) | Apr-23 |
| Reference 20 dB Attenuator | SN: BH9394 (20k) | 04-Apr-22 (No. 217-03527) | Apr-23 |
| Type-N mismatch combination | SN: 310982 / 06327 | 04-Apr-22 (No. 217-03528) | Apr-23 |
| Reference Probe EX3DV4 | SN: 3503 | 08-Mar-22 (No. EX3-3503_Mar22) | Mar-23 |
| DAE4 | SN: 601 | 02-May-22 (No. DAE4-601_May22) | May-23 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power meter E4419B | SN: GB39512475 | 30-Oct-14 (in house check Oct-20) | In house check: Oct-22 |
| Power sensor HP 8481A | SN: US37292783 | 07-Oct-15 (in house check Oct-20) | In house check: Oct-22 |
| Power sensor HP 8481A | SN: MY41093315 | 07-Oct-15 (in house check Oct-20) | In house check: Oct-22 |
| RF generator R&S SMT-06 | SN: 100972 | 15-Jun-15 (in house check Oct-20) | In house check: Oct-22 |
| Network Analyzer Agilent E8358A | SN: US41080477 | 31-Mar-14 (in house check Oct-20) | In house check: Oct-22 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Joanna Lleshaj | Laboratory Technician | |
| Approved by: | Sven Kühn | Technical Manager | |

Issued: July 11, 2022





 

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Accreditation No.: **SCS 0108**

**Glossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A | not applicable or not measured |

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

a) IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**Additional Documentation:**

c) DASY 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 source is mounted in a touch configuration below the center marking of the flat phantom.
- *Return Loss:* This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. 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** | DASY52 | V52.10.4 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom V5.0 | |
| **Distance Dipole Center - TSL** | 10 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy = 4.0 mm, dz = 1.4 mm | Graded Ratio = 1.4 (Z direction) |
| **Frequency** | 3700 MHz ± 1 MHz<br>3800 MHz ± 1 MHz | |

## Head TSL parameters at 3700 MHz

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 37.7 | 3.12 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 37.0 ± 6 % | 3.07 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL at 3700 MHz

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 6.74 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **67.3 W/kg ± 19.9 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.44 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **24.4 W/kg ± 19.5 % (k=2)** |

## Head TSL parameters at 3800 MHz

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 37.6 | 3.22 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 36.8 ± 6 % | 3.15 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL at 3800 MHz

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 6.57 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **65.7 W/kg ± 19.9 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.40 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **23.9 W/kg ± 19.5 % (k=2)** |



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

### Antenna Parameters with Head TSL at 3700 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 48.6 Ω - 6.6 jΩ |
| Return Loss | - 23.3 dB |

### Antenna Parameters with Head TSL at 3800 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 57.5 Ω - 5.9 jΩ |
| Return Loss | - 21.0 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.138 ns |

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

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



## DASY5 Validation Report for Head TSL

Date: 01.07.2022

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 3700 MHz; Type: D3700V2; Serial: D3700V2 - SN:1004**

Communication System: UID 0 - CW; Frequency: 3700 MHz, Frequency: 3800 MHz
Medium parameters used: f = 3700 MHz; $\sigma$ = 3.07 S/m; $\varepsilon_r$ = 37; $\rho$ = 1000 kg/m$^3$ ,
Medium parameters used: f = 3800 MHz; $\sigma$ = 3.15 S/m; $\varepsilon_r$ = 36.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(7.73, 7.73, 7.73) @ 3700 MHz, ConvF(7.73, 7.73, 7.73) @ 3800 MHz; Calibrated: 08.03.2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.05.2022
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

**Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm, f=3700MHz/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 69.98 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 19.1 W/kg
**SAR(1 g) = 6.74 W/kg; SAR(10 g) = 2.44 W/kg**
Smallest distance from peaks to all points 3 dB below = 8 mm
Ratio of SAR at M2 to SAR at M1 = 73.9%
Maximum value of SAR (measured) = 13.1 W/kg

**Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm, f=3800MHz/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 68.05 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 18.9 W/kg
**SAR(1 g) = 6.57 W/kg; SAR(10 g) = 2.40 W/kg**
Smallest distance from peaks to all points 3 dB below = 8.2 mm
Ratio of SAR at M2 to SAR at M1 = 73.1%
Maximum value of SAR (measured) = 13.0 W/kg



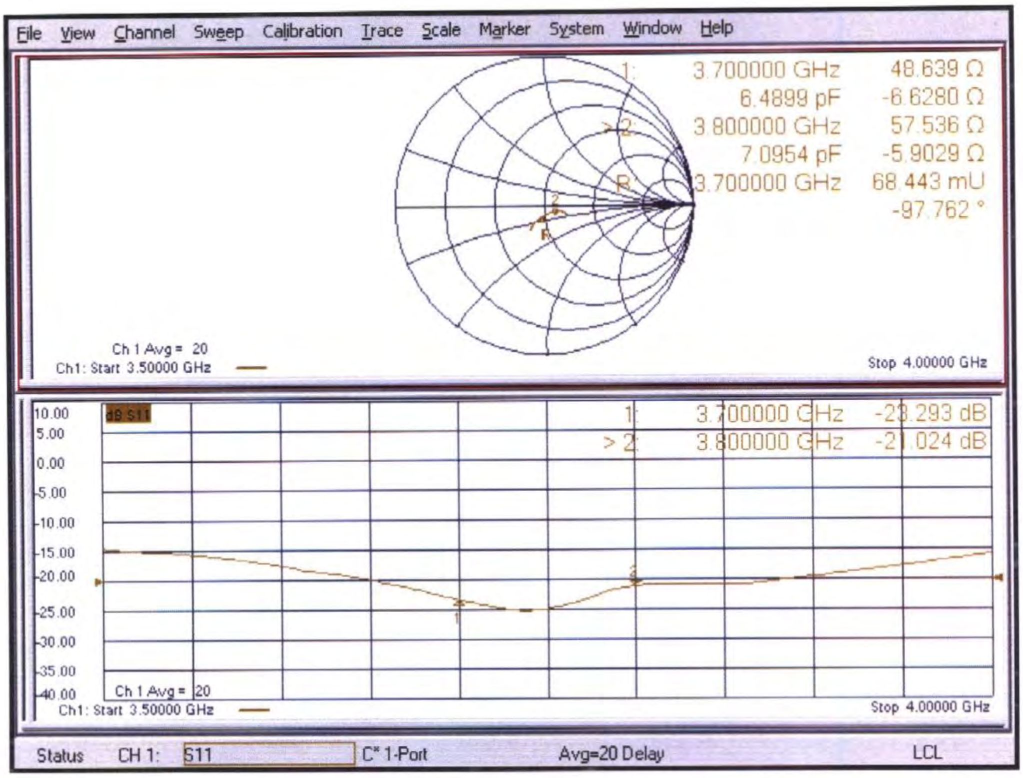
 


0 dB = 13.1 W/kg = 11.17 dBW/kg



## Impedance Measurement Plot for Head TSL




Certificate No: D3700V2-1004_Jul22 Page 7 of 7

## 3900 MHz Dipole Calibration Certificate

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Accreditation No.: **SCS 0108**

Client **CTTL (Auden)**

Certificate No: **D3900V2-1024_Jul22**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D3900V2 - SN:1024 |
| Calibration procedure(s) | QA CAL-22.v6<br>Calibration Procedure for SAR Validation Sources between 3-10 GHz |
| Calibration date: | July 01, 2022 |

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter NRP | SN: 104778 | 04-Apr-22 (No. 217-03525/03524) | Apr-23 |
| Power sensor NRP-Z91 | SN: 103244 | 04-Apr-22 (No. 217-03524) | Apr-23 |
| Power sensor NRP-Z91 | SN: 103245 | 04-Apr-22 (No. 217-03525) | Apr-23 |
| Reference 20 dB Attenuator | SN: BH9394 (20k) | 04-Apr-22 (No. 217-03527) | Apr-23 |
| Type-N mismatch combination | SN: 310982 / 06327 | 04-Apr-22 (No. 217-03528) | Apr-23 |
| Reference Probe EX3DV4 | SN: 3503 | 08-Mar-22 (No. EX3-3503_Mar22) | Mar-23 |
| DAE4 | SN: 601 | 02-May-22 (No. DAE4-601_May22) | May-23 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power meter E4419B | SN: GB39512475 | 30-Oct-14 (in house check Oct-20) | In house check: Oct-22 |
| Power sensor HP 8481A | SN: US37292783 | 07-Oct-15 (in house check Oct-20) | In house check: Oct-22 |
| Power sensor HP 8481A | SN: MY41093315 | 07-Oct-15 (in house check Oct-20) | In house check: Oct-22 |
| RF generator R&S SMT-06 | SN: 100972 | 15-Jun-15 (in house check Oct-20) | In house check: Oct-22 |
| Network Analyzer Agilent E8358A | SN: US41080477 | 31-Mar-14 (in house check Oct-20) | In house check: Oct-22 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Joanna Lleshaj | Laboratory Technician | |
| Approved by: | Sven Kühn | Technical Manager | |

Issued: July 11, 2022

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



 

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Accreditation No.: **SCS 0108**

## Glossary:

| | |
|---|---|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A | not applicable or not measured |

## Calibration is Performed According to the Following Standards:

a) IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

## Additional Documentation:

c) DASY 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 source is mounted in a touch configuration below the center marking of the flat phantom.
- *Return Loss:* This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. 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** | DASY52 | V52.10.4 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom V5.0 | |
| **Distance Dipole Center - TSL** | 10 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy = 4.0 mm, dz = 1.4 mm | Graded Ratio = 1.4 (Z direction) |
| **Frequency** | 3900 MHz ± 1 MHz<br>4000 MHz ± 1 MHz<br>4100 MHz ± 1 MHz | |

## Head TSL parameters at 3900 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 37.5 | 3.32 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 36.7 ± 6 % | 3.24 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL at 3900 MHz

| **SAR averaged over 1 $cm^3$ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 6.96 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **69.6 W/kg ± 19.9 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.42 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **24.1 W/kg ± 19.5 % (k=2)** |

## Head TSL parameters at 4000 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 37.4 | 3.43 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 36.6 ± 6 % | 3.33 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL at 4000 MHz

| **SAR averaged over 1 $cm^3$ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 6.82 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **68.2 W/kg ± 19.9 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.38 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **23.6 W/kg ± 19.5 % (k=2)** |



## Head TSL parameters at 4100 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 37.2 | 3.53 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 36.5 ± 6 % | 3.41 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL at 4100 MHz

| **SAR averaged over 1 $cm^3$ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 6.82 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **68.3 W/kg ± 19.9 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.37 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **23.6 W/kg ± 19.5 % (k=2)** |



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

### Antenna Parameters with Head TSL at 3900 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 46.3 Ω - 6.6 jΩ |
| Return Loss | - 22.1 dB |

### Antenna Parameters with Head TSL at 4000 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 52.1 Ω - 2.7 jΩ |
| Return Loss | - 29.5 dB |

### Antenna Parameters with Head TSL at 4100 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 59.8 Ω - 1.9 jΩ |
| Return Loss | - 20.8 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.107 ns |

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

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



## DASY5 Validation Report for Head TSL

Date: 01.07.2022

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 3900 MHz; Type: D3900V2; Serial: D3900V2 - SN:1024**

Communication System: UID 0 - CW; Frequency: 3900 MHz, Frequency: 4000 MHz, Frequency: 4100 MHz
Medium parameters used: f = 3900 MHz; $\sigma$ = 3.24 S/m; $\varepsilon_r$ = 36.7; $\rho$ = 1000 kg/m$^3$ ,
Medium parameters used: f = 4000 MHz; $\sigma$ = 3.33 S/m; $\varepsilon_r$ = 36.6; $\rho$ = 1000 kg/m$^3$ ,
Medium parameters used: f = 4100 MHz; $\sigma$ = 3.41 S/m; $\varepsilon_r$ = 36.5; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(7.39, 7.39, 7.39) @ 3900 MHz, ConvF(7.39, 7.39, 7.39) @ 4000 MHz, ConvF(7.26, 7.26, 7.26) @ 4100 MHz; Calibrated: 08.03.2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.05.2022
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

**Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm, f=3900MHz/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 71.06 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 20.0 W/kg
**SAR(1 g) = 6.96 W/kg; SAR(10 g) = 2.42 W/kg**
Smallest distance from peaks to all points 3 dB below = 8 mm
Ratio of SAR at M2 to SAR at M1 = 74.2%
Maximum value of SAR (measured) = 13.9 W/kg

**Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm, f=4000MHz/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 71.32 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 20.0 W/kg
**SAR(1 g) = 6.82 W/kg; SAR(10 g) = 2.38 W/kg**
Smallest distance from peaks to all points 3 dB below = 8 mm
Ratio of SAR at M2 to SAR at M1 = 73.6%
Maximum value of SAR (measured) = 13.8 W/kg



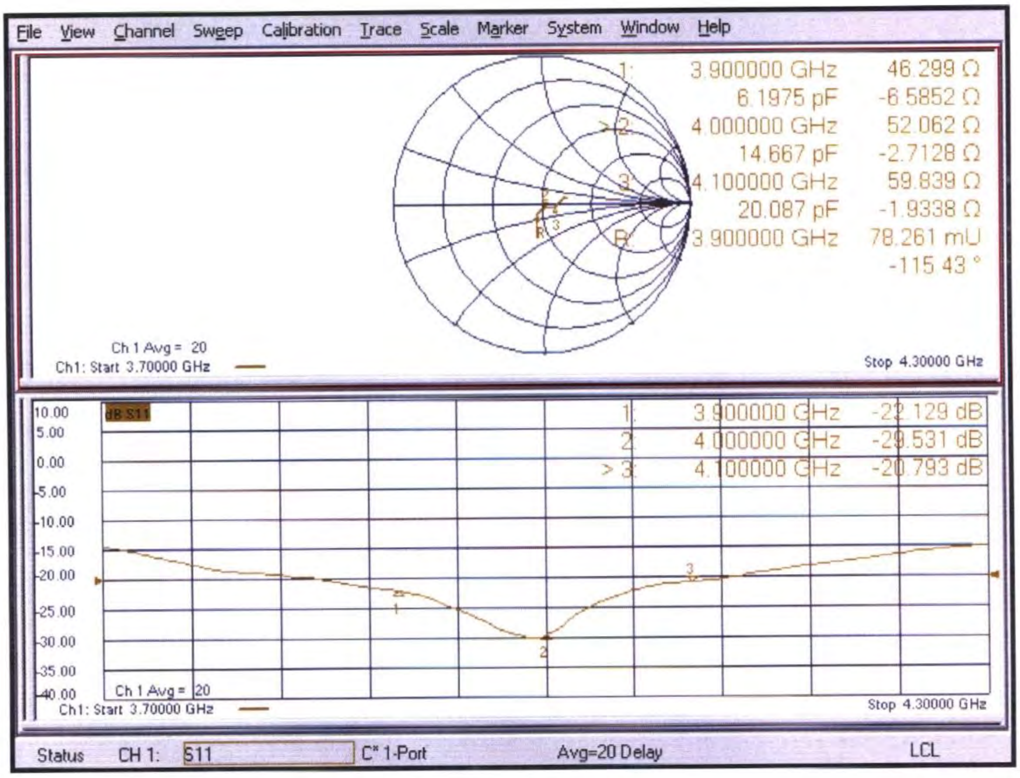
**Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm, f=4100MHz/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 69.19 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 19.7 W/kg
**SAR(1 g) = 6.82 W/kg; SAR(10 g) = 2.37 W/kg**
Smallest distance from peaks to all points 3 dB below = 8 mm
Ratio of SAR at M2 to SAR at M1 = 74.2%
Maximum value of SAR (measured) = 13.7 W/kg


0 dB = 13.9 W/kg = 11.43 dBW/kg



**Impedance Measurement Plot for Head TSL**




Certificate No: D3900V2-1024_Jul22 Page 8 of 8

## 5 GHz Dipole Calibration Certificate

**Calibration Laboratory of**
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Accredited by the Swiss Accreditation Service (SAS)
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Accreditation No.: **SCS 0108**

Client **CTTL (Auden)**

Certificate No: **D5GHzV2-1060_Jul22**

# CALIBRATION CERTIFICATE

Object: D5GHzV2 - SN:1060

Calibration procedure(s): QA CAL-22.v6
Calibration Procedure for SAR Validation Sources between 3-10 GHz

Calibration date: July 05, 2022

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter NRP | SN: 104778 | 04-Apr-22 (No. 217-03525/03524) | Apr-23 |
| Power sensor NRP-Z91 | SN: 103244 | 04-Apr-22 (No. 217-03524) | Apr-23 |
| Power sensor NRP-Z91 | SN: 103245 | 04-Apr-22 (No. 217-03525) | Apr-23 |
| Reference 20 dB Attenuator | SN: BH9394 (20k) | 04-Apr-22 (No. 217-03527) | Apr-23 |
| Type-N mismatch combination | SN: 310982 / 06327 | 04-Apr-22 (No. 217-03528) | Apr-23 |
| Reference Probe EX3DV4 | SN: 3503 | 08-Mar-22 (No. EX3-3503_Mar22) | Mar-23 |
| DAE4 | SN: 601 | 02-May-22 (No. DAE4-601_May22) | May-23 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power meter E4419B | SN: GB39512475 | 30-Oct-14 (in house check Oct-20) | In house check: Oct-22 |
| Power sensor HP 8481A | SN: US37292783 | 07-Oct-15 (in house check Oct-20) | In house check: Oct-22 |
| Power sensor HP 8481A | SN: MY41093315 | 07-Oct-15 (in house check Oct-20) | In house check: Oct-22 |
| RF generator R&S SMT-06 | SN: 100972 | 15-Jun-15 (in house check Oct-20) | In house check: Oct-22 |
| Network Analyzer Agilent E8358A | SN: US41080477 | 31-Mar-14 (in house check Oct-20) | In house check: Oct-22 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Aidonia Georgiadou | Laboratory Technician | |
| Approved by: | Sven Kühn | Technical Manager | |

Issued: July 8, 2022

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



 

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

**S** Schweizerischer Kalibrierdienst
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**S** Swiss Calibration Service

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

Accreditation No.: **SCS 0108**

## Glossary:

| | |
|---|---|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORM x,y,z |
| N/A | not applicable or not measured |

## Calibration is Performed According to the Following Standards:

a) IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

## Additional Documentation:

c) DASY 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 source is mounted in a touch configuration below the center marking of the flat phantom.
- *Return Loss:* This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. 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** | DASY52 | V52.10.4 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom V5.0 | |
| **Distance Dipole Center - TSL** | 10 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy = 4.0 mm, dz = 1.4 mm | Graded Ratio = 1.4 (Z direction) |
| **Frequency** | 5200 MHz ± 1 MHz<br>5250 MHz ± 1 MHz<br>5300 MHz ± 1 MHz<br>5500 MHz ± 1 MHz<br>5600 MHz ± 1 MHz<br>5750 MHz ± 1 MHz<br>5800 MHz ± 1 MHz | |

## Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 36.0 | 4.66 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 34.9 ± 6 % | 4.50 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL at 5200 MHz

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 7.84 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **77.8 W/kg ± 19.9 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.26 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **22.3 W/kg ± 19.5 % (k=2)** |



## 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 ± 0.2) °C | 34.8 ± 6 % | 4.55 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °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 | 7.87 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **78.1 W/kg ± 19.9 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.25 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **22.3 W/kg ± 19.5 % (k=2)** |

## Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 35.9 | 4.76 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 34.7 ± 6 % | 4.60 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL at 5300 MHz

| **SAR averaged over 1 $cm^3$ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 8.17 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **81.1 W/kg ± 19.9 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.33 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **23.1 W/kg ± 19.5 % (k=2)** |



### Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 35.6 | 4.96 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 34.4 ± 6 % | 4.80 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

### SAR result with Head TSL at 5500 MHz

| **SAR averaged over 1 $cm^3$ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 8.60 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **85.3 W/kg ± 19.9 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.44 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **24.1 W/kg ± 19.5 % (k=2)** |

### 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 | 34.3 ± 6 % | 4.90 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °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 | 8.39 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **83.2 W/kg ± 19.9 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.40 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **23.7 W/kg ± 19.5 % (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 | 34.1 ± 6 % | 5.05 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °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 | 8.12 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **80.4 W/kg ± 19.9 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.31 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **22.8 W/kg ± 19.5 % (k=2)** |

## Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 35.3 | 5.27 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 34.0 ± 6 % | 5.10 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL at 5800 MHz

| **SAR averaged over 1 $cm^3$ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 100 mW input power | 8.27 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **82.0 W/kg ± 19.9 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 100 mW input power | 2.34 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **23.1 W/kg ± 19.5 % (k=2)** |



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

**Antenna Parameters with Head TSL at 5200 MHz**

| | |
|---|---|
| Impedance, transformed to feed point | 49.4 Ω - 6.5 jΩ |
| Return Loss | - 23.7 dB |

**Antenna Parameters with Head TSL at 5250 MHz**

| | |
|---|---|
| Impedance, transformed to feed point | 47.7 Ω - 5.5 jΩ |
| Return Loss | - 24.3 dB |

**Antenna Parameters with Head TSL at 5300 MHz**

| | |
|---|---|
| Impedance, transformed to feed point | 46.2 Ω - 3.2 jΩ |
| Return Loss | - 25.8 dB |

**Antenna Parameters with Head TSL at 5500 MHz**

| | |
|---|---|
| Impedance, transformed to feed point | 50.0 Ω - 3.1 jΩ |
| Return Loss | - 30.1 dB |

**Antenna Parameters with Head TSL at 5600 MHz**

| | |
|---|---|
| Impedance, transformed to feed point | 53.6 Ω + 0.5 jΩ |
| Return Loss | - 29.2 dB |



### Antenna Parameters with Head TSL at 5750 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 51.9 Ω - 1.7 jΩ |
| Return Loss | - 32.1 dB |

### Antenna Parameters with Head TSL at 5800 MHz

| | |
|---|---|
| Impedance, transformed to feed point | 51.2 Ω - 3.2 jΩ |
| Return Loss | - 29.5 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.202 ns |

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

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

## DASY5 Validation Report for Head TSL

Date: 05.07.2022

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1060**

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5250 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; $\sigma$ = 4.50 S/m; $\varepsilon_r$ = 34.9; $\rho$ = 1000 kg/m$^3$ ,
Medium parameters used: f = 5250 MHz; $\sigma$ = 4.55 S/m; $\varepsilon_r$ = 34.8; $\rho$ = 1000 kg/m$^3$ ,
Medium parameters used: f = 5300 MHz; $\sigma$ = 4.60 S/m; $\varepsilon_r$ = 34.7; $\rho$ = 1000 kg/m$^3$ ,
Medium parameters used: f = 5500 MHz; $\sigma$ = 4.80 S/m; $\varepsilon_r$ = 34.4; $\rho$ = 1000 kg/m$^3$ ,
Medium parameters used: f = 5600 MHz; $\sigma$ = 4.90 S/m; $\varepsilon_r$ = 34.3; $\rho$ = 1000 kg/m$^3$ ,
Medium parameters used: f = 5750 MHz; $\sigma$ = 5.05 S/m; $\varepsilon_r$ = 34.1; $\rho$ = 1000 kg/m$^3$ ,
Medium parameters used: f = 5800 MHz; $\sigma$ = 5.10 S/m; $\varepsilon_r$ = 34.0; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.8, 5.8, 5.8) @ 5200 MHz, ConvF(5.5, 5.5, 5.5) @ 5250 MHz, ConvF(5.49, 5.49, 5.49) @ 5300 MHz, ConvF(5.25, 5.25, 5.25) @ 5500 MHz, ConvF(5.1, 5.1, 5.1) @ 5600 MHz, ConvF(5.08, 5.08, 5.08) @ 5750 MHz, ConvF(5.01, 5.01, 5.01) @ 5800 MHz; Calibrated: 08.03.2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.05.2022
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 74.40 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 27.9 W/kg
**SAR(1 g) = 7.84 W/kg; SAR(10 g) = 2.26 W/kg**
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 69.1%
Maximum value of SAR (measured) = 17.6 W/kg

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 75.86 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 27.1 W/kg
**SAR(1 g) = 7.87 W/kg; SAR(10 g) = 2.25 W/kg**
Smallest distance from peaks to all points 3 dB below = 6.8 mm
Ratio of SAR at M2 to SAR at M1 = 69.8%
Maximum value of SAR (measured) = 17.4 W/kg



**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 77.09 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 28.9 W/kg
**SAR(1 g) = 8.17 W/kg; SAR(10 g) = 2.33 W/kg**
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 68.9%
Maximum value of SAR (measured) = 18.3 W/kg

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 76.69 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 32.9 W/kg
**SAR(1 g) = 8.60 W/kg; SAR(10 g) = 2.44 W/kg**
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 66.4%
Maximum value of SAR (measured) = 19.8 W/kg

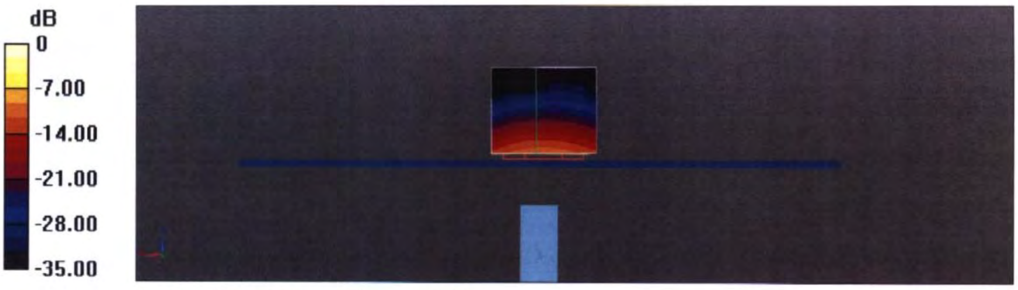
**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 76.44 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 31.2 W/kg
**SAR(1 g) = 8.39 W/kg; SAR(10 g) = 2.40 W/kg**
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 67.3%
Maximum value of SAR (measured) = 19.3 W/kg

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 73.53 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 31.8 W/kg
**SAR(1 g) = 8.12 W/kg; SAR(10 g) = 2.31 W/kg**
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 65.4%
Maximum value of SAR (measured) = 19.0 W/kg

**Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 74.35 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 32.9 W/kg
**SAR(1 g) = 8.27 W/kg; SAR(10 g) = 2.34 W/kg**
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 65.2%
Maximum value of SAR (measured) = 19.4 W/kg



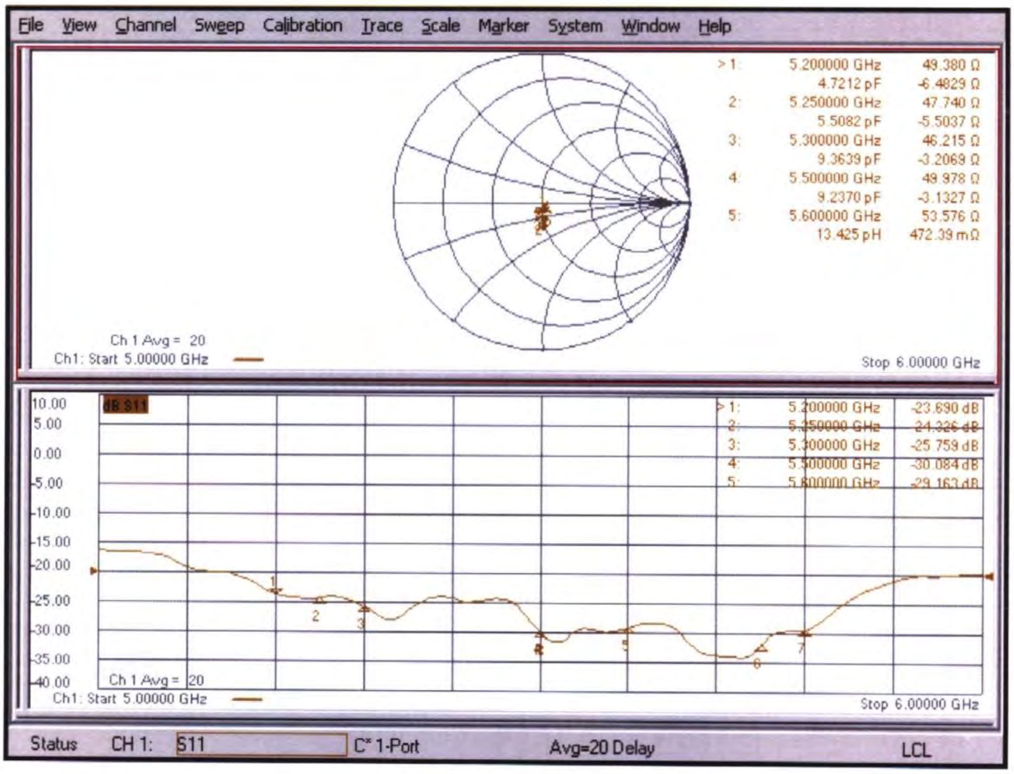



0 dB = 19.8 W/kg = 12.96 dBW/kg



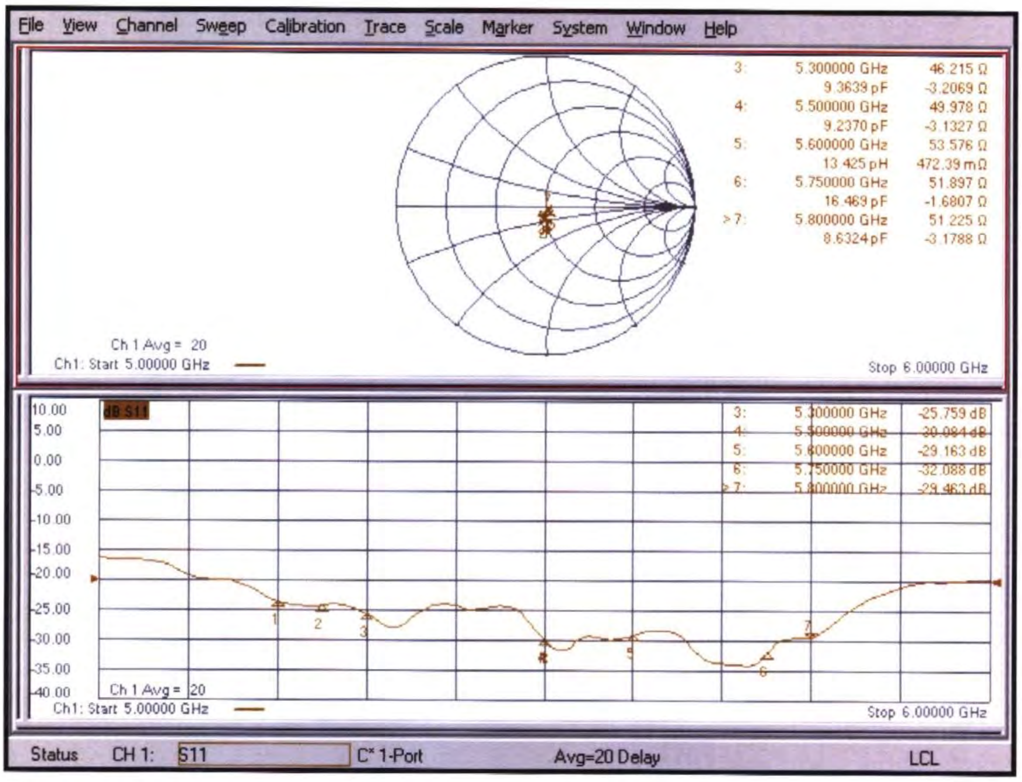
## Impedance Measurement Plot for Head TSL (5200, 5250, 5300, 5500, 5600 MHz)




Certificate No: D5GHzV2-1060_Jul22 Page 12 of 13

**Impedance Measurement Plot for Head TSL (5300, 5500, 5600, 5750, 5800 MHz)**



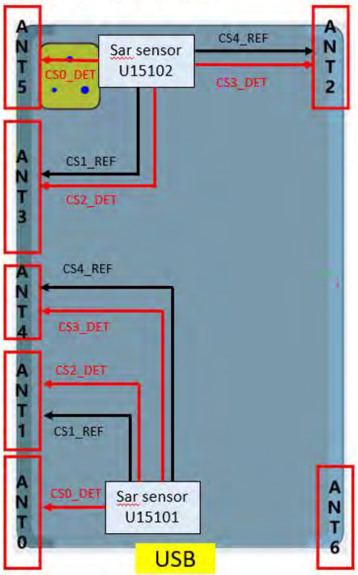

Certificate No: D5GHzV2-1060_Jul22 Page 13 of 13

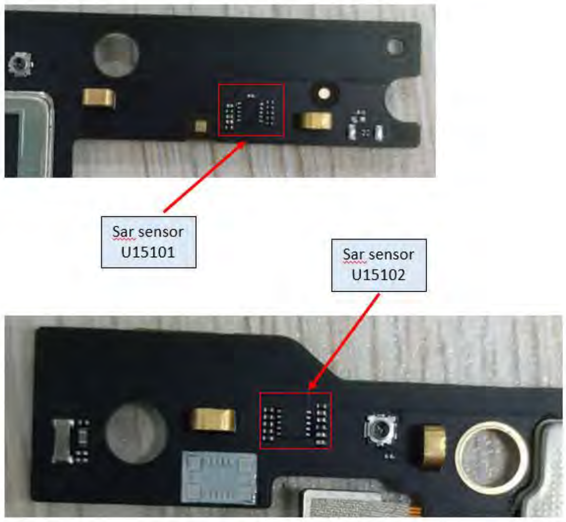
 

# ANNEX I Sensor Triggering Data Summary

SAR sensor position

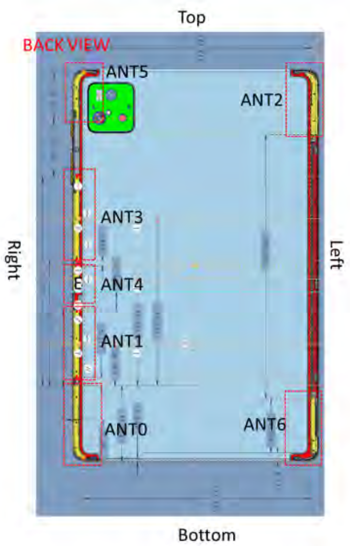
The SAR sensor is connected to each antenna through a hardware circuit, so it obtains the antenna induction signal by itself, and the detection position is the sensor position. as the picture shows:



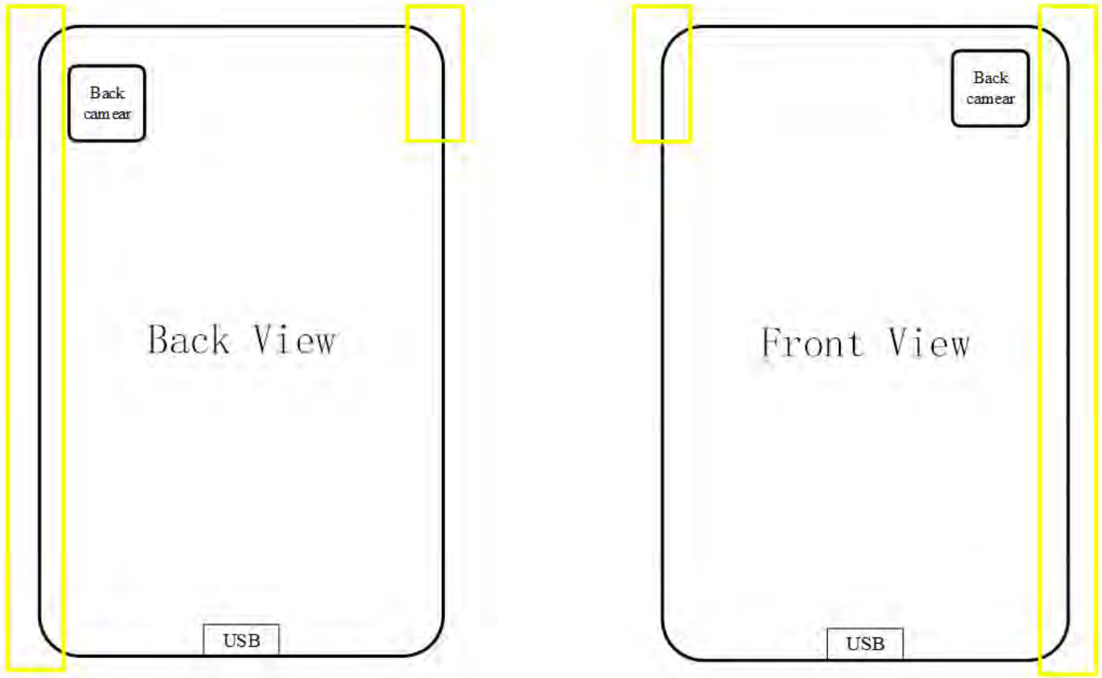

SAR sensor trigger distance

The SAR sensor is connected to each antenna through a hardware circuit, so it obtains the antenna induction signal by itself, and the detection position is the sensor position. as the picture shows:

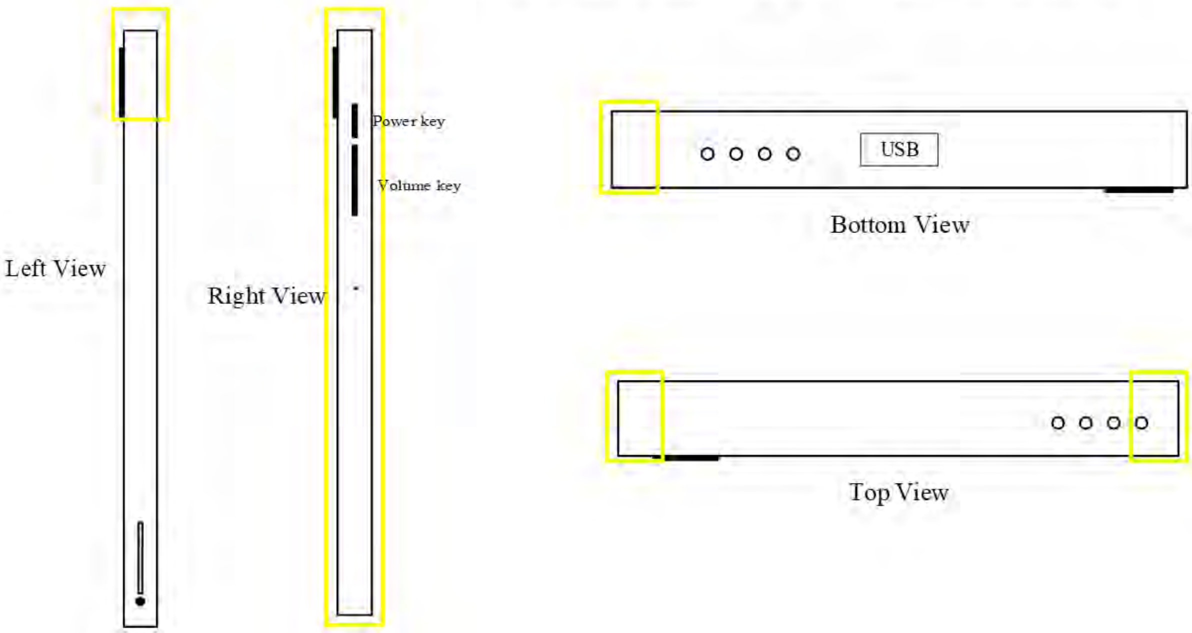



| Distance test (mm) | CHx | CH0 | CH1 | CH2 | CH3 | CH4 | CH5 |
|---|---|---|---|---|---|---|---|
| | CSx | U15101_CS0 | U15101_CS2 | U15102_CS3 | U15102_CS2 | U15101_CS3 | U15102_CS0 |
| | ANTx | ANT0 | ANT1 | ANT2 | ANT3 | ANT4 | ANT5 |
| Front | | 10 | 10 | 10 | 10 | 10 | 10 |
| Back | | 16 | 16 | 16 | 16 | 16 | 16 |
| Top | | NA | NA | 16 | NA | NA | 16 |
| Bottom | | 16 | NA | NA | NA | NA | NA |
| Left | | NA | NA | 16 | NA | NA | NA |
| Right | | 16 | 16 | NA | 21 | 21 | 16 |

SAR Sensor Trigger region      Trigger area in yellow box




SAR Sensor Trigger region      Trigger area in yellow box



Per FCC KDB Publication 616217 D04v01r02, this device was tested by the manufacturer to determine the proximity sensor triggering distances for the rear and bottom edge of the device. The measured output power within ±5mm of the triggering points (or until touching the phantom) is included for rear and each applicable edge.

To ensure all production units are compliant it is necessary to test SAR at a distance 1mm less than the smallest distance from the device and SAR phantom (determined from these triggering tests according to the KDB 616217 D04v01r02) with the device at maximum output power without power reduction. These SAR tests are included in addition to the SAR tests for the device touching the SAR phantom, with reduced power.

**ANT0：**

**Rear**

Moving device toward the phantom:

| sensor near or far(KDB 616217 6.2.6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **21** | **20** | **19** | **18** | **17** | **16** | **15** | **14** | **13** | **12** | **11** |
| Main antenna | Far | Far | Far | Far | Far | Near | Near | Near | Near | Near | Near |

Moving device away from the phantom:

| sensor near or far(KDB 616217 6.2.6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** |
| Main antenna | Near | Near | Near | Near | Near | Near | Far | Far | Far | Far | Far |

**Bottom Edge**

Moving device toward the phantom:

| sensor near or far(KDB 616217 6.2.6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **21** | **20** | **19** | **18** | **17** | **16** | **15** | **14** | **13** | **12** | **11** |
| Main antenna | Far | Far | Far | Far | Far | Near | Near | Near | Near | Near | Near |

Moving device away from the phantom:

| sensor near or far(KDB 616217 6.2.6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** |
| Main antenna | Near | Near | Near | Near | Near | Near | Far | Far | Far | Far | Far |

**Right Edge**

Moving device toward the phantom:

| sensor near or far(KDB 616217 6.2.6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **21** | **20** | **19** | **18** | **17** | **16** | **15** | **14** | **13** | **12** | **11** |
| Main antenna | Far | Far | Far | Far | Far | Near | Near | Near | Near | Near | Near |

Moving device away from the phantom:

| sensor near or far(KDB 616217 6.2.6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** |
| Main antenna | Near | Near | Near | Near | Near | Near | Far | Far | Far | Far | Far |

**ANT1：**

**Rear**

Moving device toward the phantom:

| sensor near or far(KDB 616217 6.2.6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **21** | **20** | **19** | **18** | **17** | **16** | **15** | **14** | **13** | **12** | **11** |
| Main antenna | Far | Far | Far | Far | Far | Near | Near | Near | Near | Near | Near |

Moving device away from the phantom:

| sensor near or far(KDB 616217 6.2.6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** |
| Main antenna | Near | Near | Near | Near | Near | Near | Far | Far | Far | Far | Far |

**Right Edge**

Moving device toward the phantom:

| sensor near or far(KDB 616217 6.2.6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **21** | **20** | **19** | **18** | **17** | **16** | **15** | **14** | **13** | **12** | **11** |
| Main antenna | Far | Far | Far | Far | Far | Near | Near | Near | Near | Near | Near |

Moving device away from the phantom:

| sensor near or far(KDB 616217 6.2.6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** |
| Main antenna | Near | Near | Near | Near | Near | Near | Far | Far | Far | Far | Far |

**ANT3：**

**Rear**

Moving device toward the phantom:

| sensor near or far(KDB 616217 6.2.6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **21** | **20** | **19** | **18** | **17** | **16** | **15** | **14** | **13** | **12** | **11** |
| Main antenna | Far | Far | Far | Far | Far | Near | Near | Near | Near | Near | Near |

Moving device away from the phantom:

| sensor near or far(KDB 616217 6.2.6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** |
| Main antenna | Near | Near | Near | Near | Near | Near | Far | Far | Far | Far | Far |

**Right Edge**

Moving device toward the phantom:

| sensor near or far(KDB 616217 6.2.6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **26** | **25** | **24** | **23** | **22** | **21** | **20** | **19** | **18** | **17** | **16** |
| Main antenna | Far | Far | Far | Far | Far | Near | Near | Near | Near | Near | Near |

Moving device away from the phantom:

| sensor near or far(KDB 616217 6.2.6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **16** | **17** | **18** | **19** | **20** | **21** | **22** | **23** | **24** | **25** | **26** |
| Main antenna | Near | Near | Near | Near | Near | Near | Far | Far | Far | Far | Far |

**ANT4：**

**Rear**

Moving device toward the phantom:

| sensor near or far(KDB 616217 6.2.6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **21** | **20** | **19** | **18** | **17** | **16** | **15** | **14** | **13** | **12** | **11** |
| Main antenna | Far | Far | Far | Far | Far | Near | Near | Near | Near | Near | Near |

Moving device away from the phantom:

| sensor near or far(KDB 616217 6.2.6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** |
| Main antenna | Near | Near | Near | Near | Near | Near | Far | Far | Far | Far | Far |

**Right Edge**

Moving device toward the phantom:

| sensor near or far(KDB 616217 6.2.6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **26** | **25** | **24** | **23** | **22** | **21** | **20** | **19** | **18** | **17** | **16** |
| Main antenna | Far | Far | Far | Far | Far | Near | Near | Near | Near | Near | Near |

Moving device away from the phantom:

| sensor near or far(KDB 616217 6.2.6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **16** | **17** | **18** | **19** | **20** | **21** | **22** | **23** | **24** | **25** | **26** |
| Main antenna | Near | Near | Near | Near | Near | Near | Far | Far | Far | Far | Far |

**ANT5：**

**Rear**

Moving device toward the phantom:

| sensor near or far(KDB 616217 6.2.6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **21** | **20** | **19** | **18** | **17** | **16** | **15** | **14** | **13** | **12** | **11** |
| Main antenna | Far | Far | Far | Far | Far | Near | Near | Near | Near | Near | Near |

Moving device away from the phantom:

| sensor near or far(KDB 616217 6.2.6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** |
| Main antenna | Near | Near | Near | Near | Near | Near | Far | Far | Far | Far | Far |

**Bottom Edge**

Moving device toward the phantom:

| sensor near or far(KDB 616217 6.2.6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **21** | **20** | **19** | **18** | **17** | **16** | **15** | **14** | **13** | **12** | **11** |
| Main antenna | Far | Far | Far | Far | Far | Near | Near | Near | Near | Near | Near |

Moving device away from the phantom:

| sensor near or far(KDB 616217 6.2.6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** |
| Main antenna | Near | Near | Near | Near | Near | Near | Far | Far | Far | Far | Far |

**Right Edge**

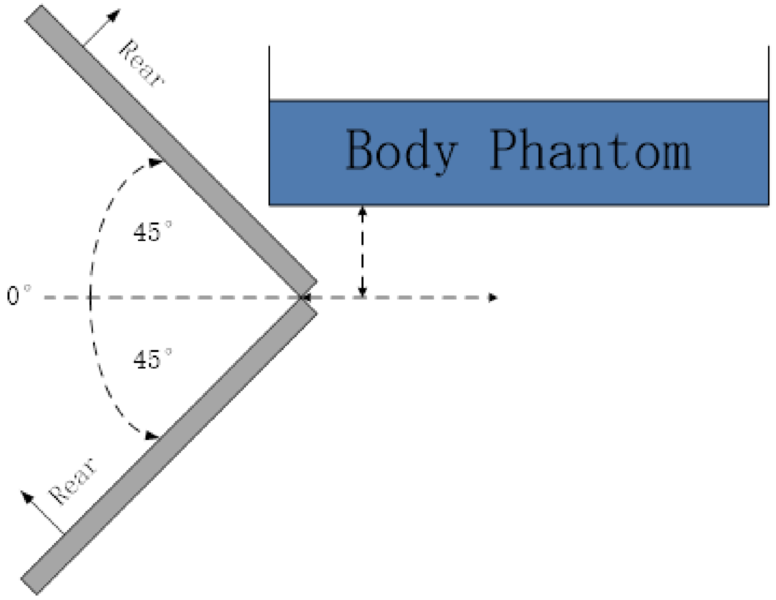
Moving device toward the phantom:

| sensor near or far(KDB 616217 6.2.6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **21** | **20** | **19** | **18** | **17** | **16** | **15** | **14** | **13** | **12** | **11** |
| Main antenna | Far | Far | Far | Far | Far | Near | Near | Near | Near | Near | Near |

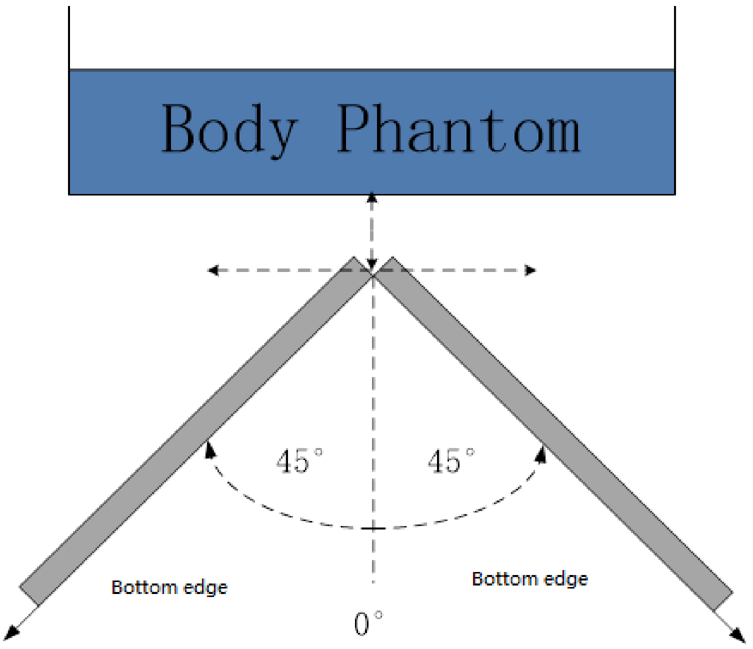
Moving device away from the phantom:

| sensor near or far(KDB 616217 6.2.6) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Distance [mm]** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** |
| Main antenna | Near | Near | Near | Near | Near | Near | Far | Far | Far | Far | Far |

Per FCC KDB Publication 616217 D04v01r02, the influence of table tilt angles to proximity sensor triggering is determined by positioning each edge that contains a transmitting antenna, perpendicular to the flat phantom, at the smallest sensor triggering test distance by rotating the device around the edge next to the phantom in ≤ 10° increments until the tablet is ±45° or more from the vertical position at 0°.

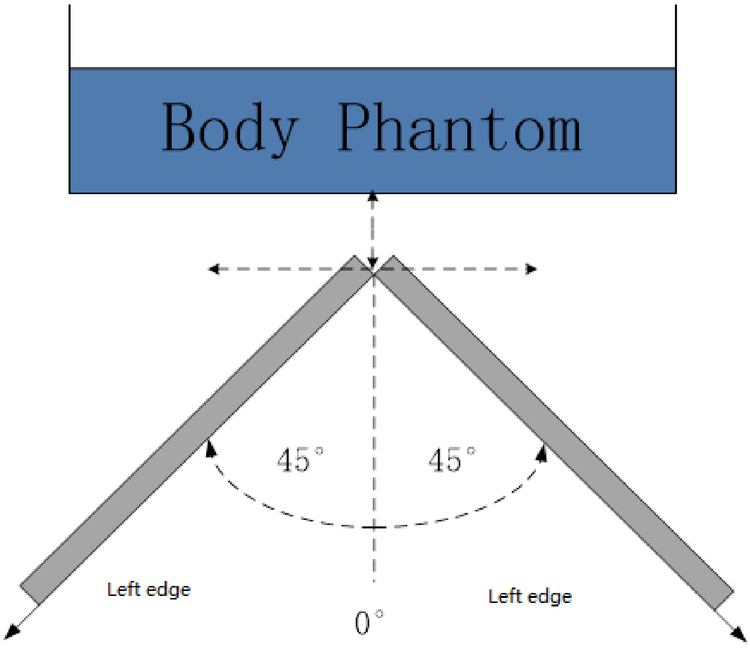



**The front/rear evaluation**




**The top/bottom edge evaluation**




**The right edge evaluation**

Based on the above evaluation, we come to the conclusion that the sensor triggering is not released and normal maximum output power is not restored within the ±45° range at the smallest sensor triggering test distance declared by manufacturer.

## ANNEX J Accreditation Certificate

United States Department of Commerce
National Institute of Standards and Technology

NVLAP® ilac-MRA

# Certificate of Accreditation to ISO/IEC 17025:2017

**NVLAP LAB CODE: 600118-0**

**Telecommunication Technology Labs, CAICT**
Beijing
China

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:*

**Electromagnetic Compatibility & Telecommunications**

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).*

2022-10-01 through 2023-09-30
*Effective Dates*

*For the National Voluntary Laboratory Accreditation Program*