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CNAS L0570

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, Chi  
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504  
E-mail: cttl@chinattl.com http://www.chinattl.cn

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7layers

Certificate No: Z21-60425

## CALIBRATION CERTIFICATE

Object D2450V2 - SN: 1048

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

Calibration date: October 21, 2021

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  $(22\pm3)^{\circ}\text{C}$  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        | 106277     | 24-Sep-21 (CTTL, No.J21X08326)            | Sep-22                |
| Power sensor NRP8S      | 104291     | 24-Sep-21 (CTTL, No.J21X08326)            | Sep-22                |
| Reference Probe EX3DV4  | SN 7517    | 03-Feb-21(CTTL-SPEAG,No.Z21-60001)        | Feb-22                |
| DAE4                    | SN 1556    | 15-Jan-21(SPEAG,No.DAE4-1556_Jan21)       | Jan-22                |
| Secondary Standards     | ID #       | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration |
| Signal Generator E4438C | MY49071430 | 01-Feb-21 (CTTL, No.J21X00593)            | Jan-22                |
| NetworkAnalyzer E5071C  | MY46110673 | 14-Jan-21 (CTTL, No.J21X00232)            | Jan-22                |

|                | 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: October 27, 2021

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### Glossary:

|       |                                            |
|-------|--------------------------------------------|
| TSL   | tissue simulating liquid                   |
| ConvF | sensitivity in TSL / NORM <sub>x,y,z</sub> |
| 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.

|                                     |                          |             |
|-------------------------------------|--------------------------|-------------|
| <b>DASY Version</b>                 | DASY52                   | V52.10.4    |
| <b>Extrapolation</b>                | Advanced Extrapolation   |             |
| <b>Phantom</b>                      | Triple Flat Phantom 5.1C |             |
| <b>Distance Dipole Center - TSL</b> | 10 mm                    | with Spacer |
| <b>Zoom Scan Resolution</b>         | dx, dy, dz = 5 mm        |             |
| <b>Frequency</b>                    | 2450 MHz $\pm$ 1 MHz     |             |

## Head TSL parameters

The following parameters and calculations were applied.

|                                                | Temperature         | Permittivity   | Conductivity         |
|------------------------------------------------|---------------------|----------------|----------------------|
| <b>Nominal Head TSL parameters</b>             | 22.0 °C             | 39.2           | 1.80 mho/m           |
| <b>Measured Head TSL parameters</b>            | (22.0 $\pm$ 0.2) °C | 39.5 $\pm$ 6 % | 1.81 mho/m $\pm$ 6 % |
| <b>Head TSL temperature change during test</b> | <1.0 °C             | ----           | ----                 |

## SAR result with Head TSL

| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>   | Condition          |                                                |
|---------------------------------------------------------------|--------------------|------------------------------------------------|
| SAR measured                                                  | 250 mW input power | 13.2 W/kg                                      |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>52.8 W/kg <math>\pm</math> 18.8 % (k=2)</b> |
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b> | Condition          |                                                |
| SAR measured                                                  | 250 mW input power | 6.05 W/kg                                      |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>24.2 W/kg <math>\pm</math> 18.7 % (k=2)</b> |



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## Appendix (Additional assessments outside the scope of CNAS L0570)

### Antenna Parameters with Head TSL

|                                      |               |
|--------------------------------------|---------------|
| Impedance, transformed to feed point | 50.6Ω+ 8.39jΩ |
| Return Loss                          | - 21.6dB      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.057 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: 10.21.2021

Test Laboratory: CTTL, Beijing, China

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 1048**

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.809$  S/m;  $\epsilon_r = 39.51$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7517; ConvF(7.34, 7.34, 7.34) @ 2450 MHz; Calibrated: 2021-02-03
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15
- Phantom: MFP\_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

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

Reference Value = 108.6 V/m; Power Drift = -0.02 dB

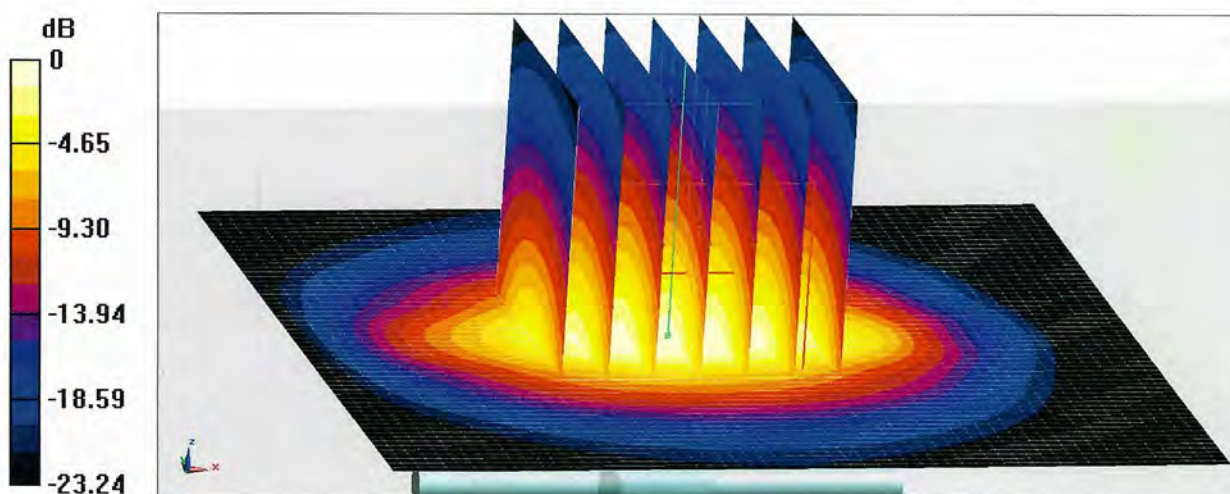
Peak SAR (extrapolated) = 28.0 W/kg

**SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.05 W/kg**

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

Ratio of SAR at M2 to SAR at M1 = 47.1%

Maximum value of SAR (measured) = 22.5 W/kg



0 dB = 22.5 W/kg = 13.52 dBW/kg



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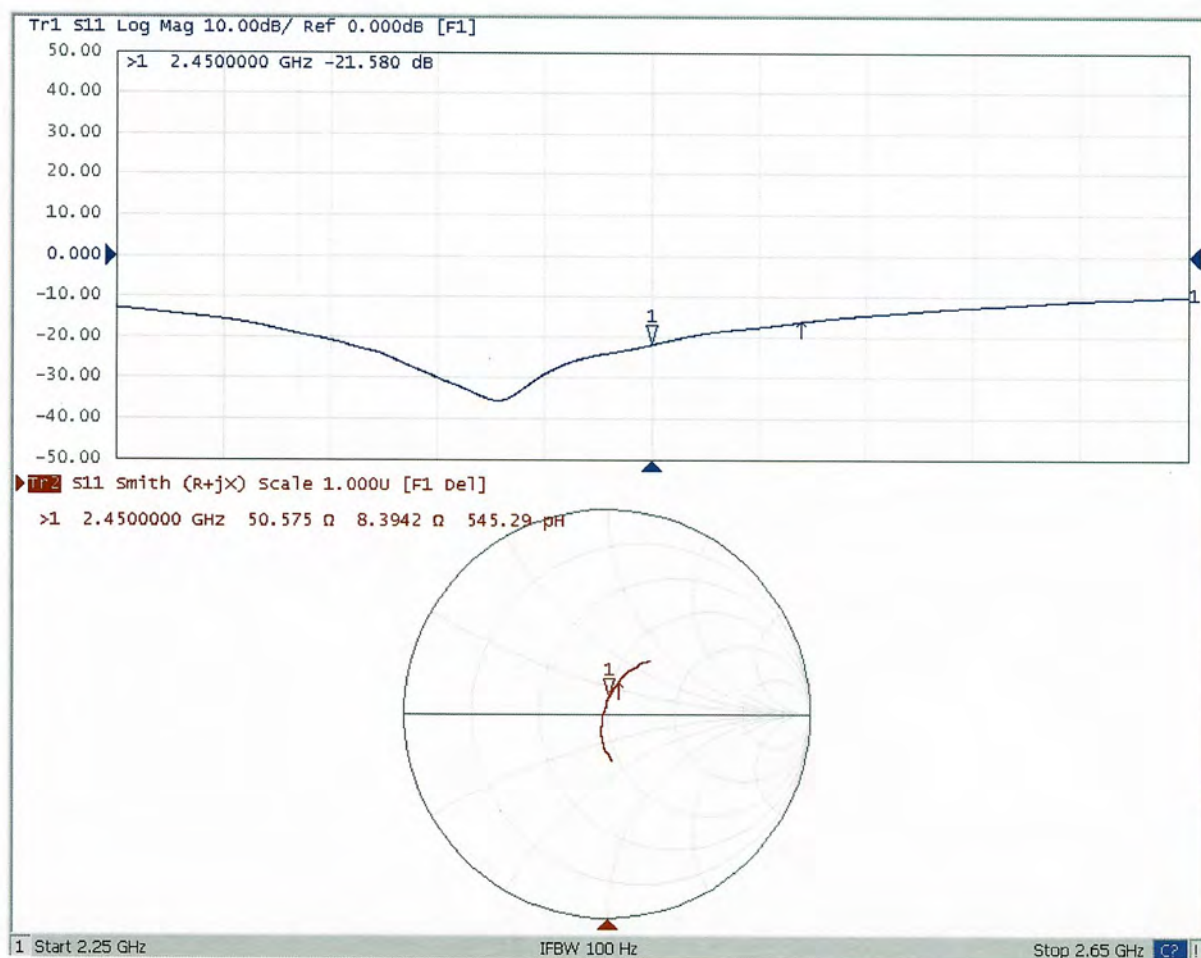
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## Impedance Measurement Plot for Head TSL



## D2450V2 - SN: 1048 Extended Dipole Calibrations

Referring to IEC 62209-1, if dipoles are verified in return loss (<-20dB, 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.

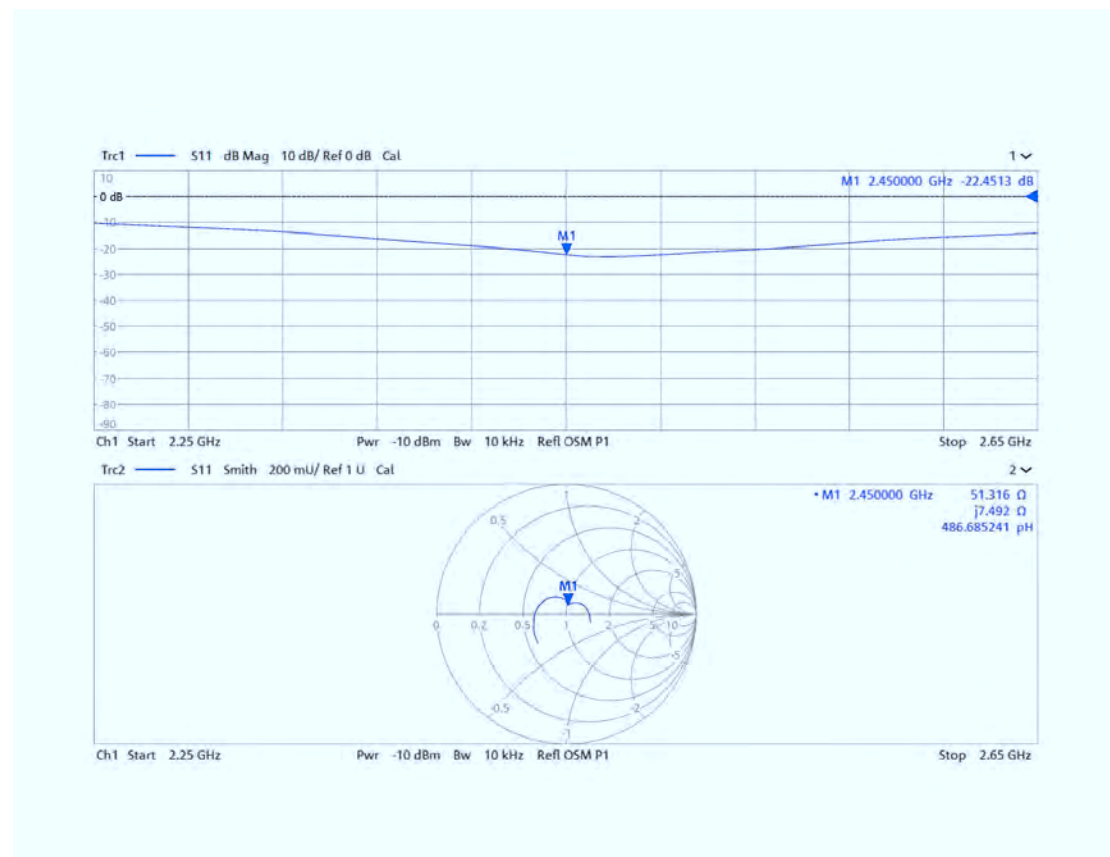
| D2450V2 - SN: 1048  |                  |           |                      |             |                           |             |
|---------------------|------------------|-----------|----------------------|-------------|---------------------------|-------------|
| 2450MHz Head        |                  |           |                      |             |                           |             |
| Date of Measurement | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) | Imaginary Impedance (ohm) | Delta (ohm) |
| 10.21.2021          | -21.6            |           | 50.6                 |             | 8.39                      |             |
| 10.20.2022          | -22.45           | 3.94      | 51.32                | 0.72        | 7.49                      | -0.90       |
| 10.19.2023          | -24.13           | 11.71     | 47.08                | -3.52       | 5.46                      | -2.93       |

### <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>

Head 2450MHz \_2022.10.20

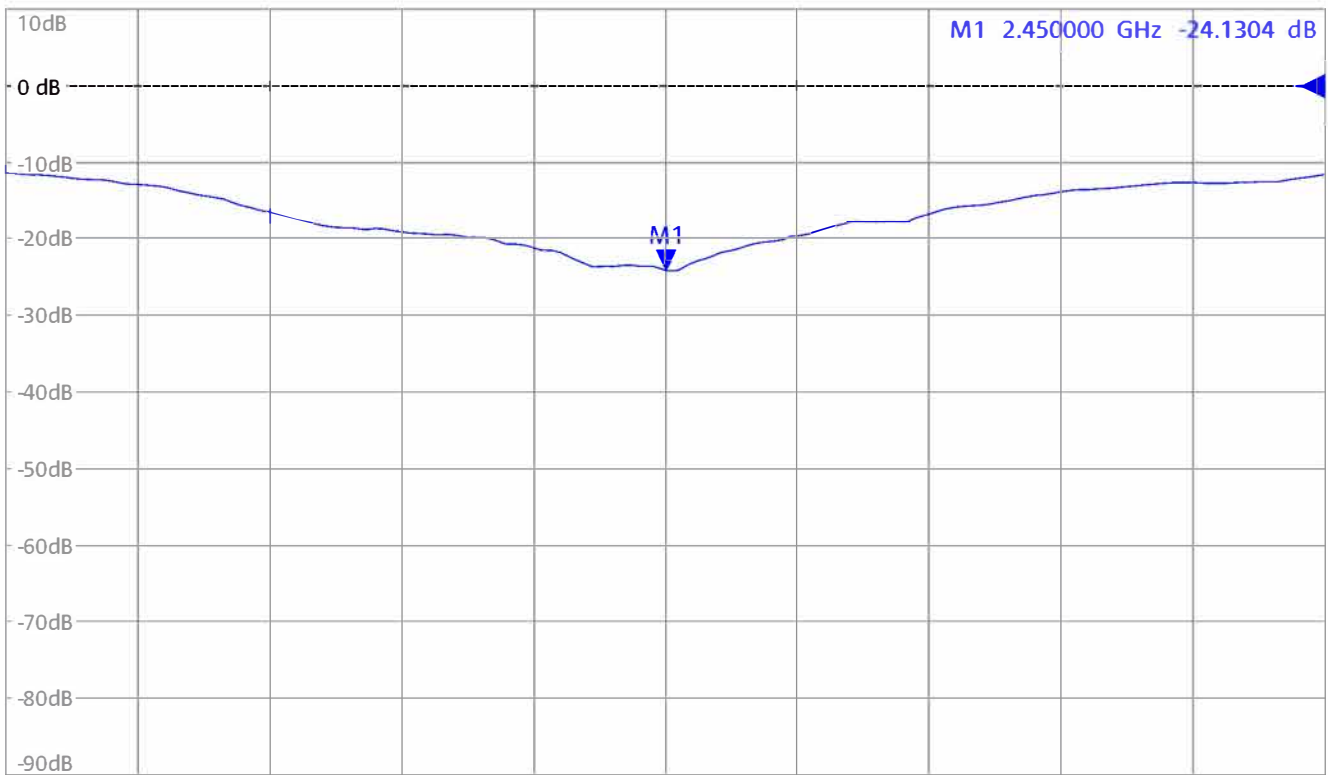


# <Dipole Verification Data>

Head 2450MHz \_2023.10.19

Trc1 — S11 dB Mag 10 dB/ Ref 0 dB Cal

1

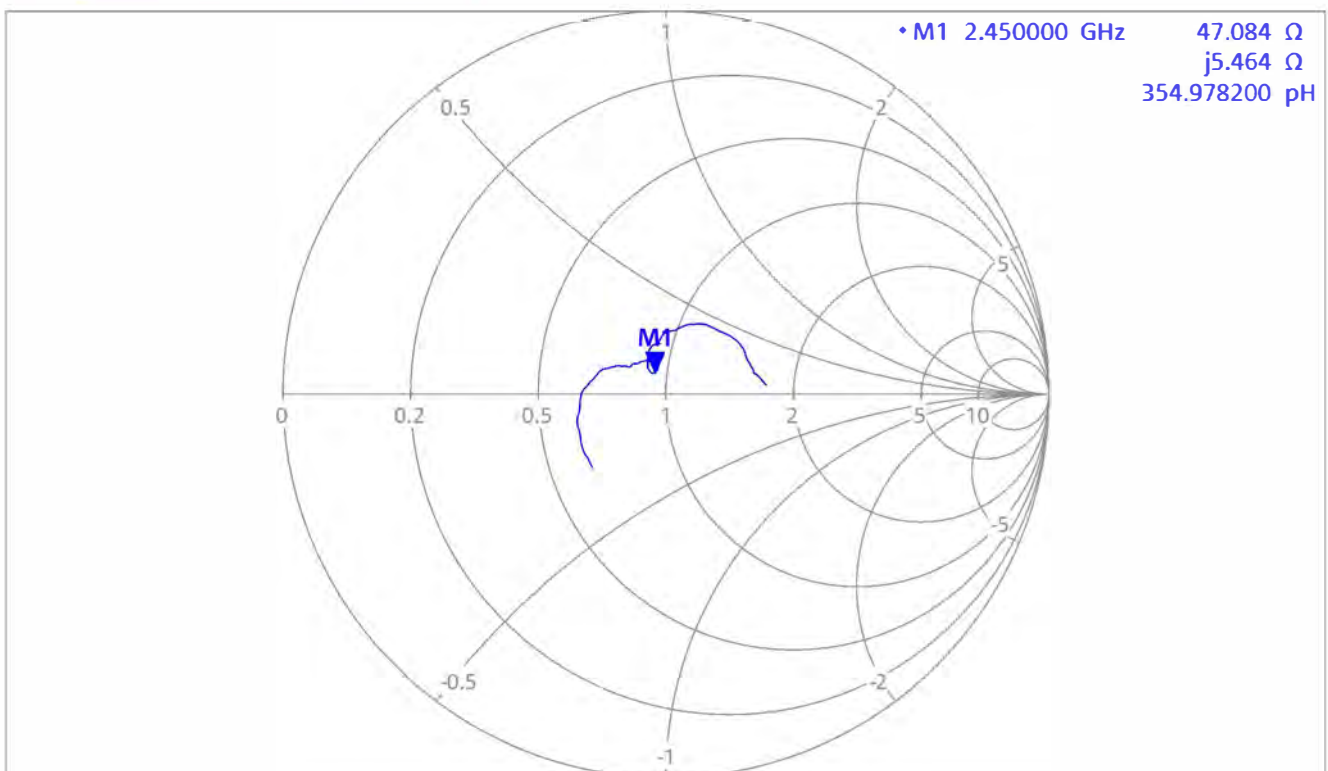


Ch1 Start 2.25 GHz Pwr -10 dBm Bw 10 kHz Refl OSM P1

Stop 2.65 GHz

Trc2 — S11 Smith 200 mU/ Ref 1 U Cal

2



Ch1 Start 2.25 GHz Pwr -10 dBm Bw 10 kHz Refl OSM P1

Stop 2.65 GHz



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Client

7layers

Certificate No: Z21-60431

## CALIBRATION CERTIFICATE

Object D5GHzV2 - SN: 1315

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

Calibration date: October 22, 2021

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  $(22\pm3)^{\circ}\text{C}$  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        | 106277     | 24-Sep-21 (CTTL, No.J21X08326)            | Sep-22                |
| Power sensor NRP8S      | 104291     | 24-Sep-21 (CTTL, No.J21X08326)            | Sep-22                |
| ReferenceProbe EX3DV4   | SN 7517    | 03-Feb-21(CTTL-SPEAG,No.Z21-60001)        | Feb-22                |
| DAE4                    | SN 1556    | 15-Jan-21(SPEAG,No.DAE4-1556_Jan21)       | Jan-22                |
| Secondary Standards     | ID #       | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration |
| Signal Generator E4438C | MY49071430 | 01-Feb-21 (CTTL, No.J21X00593)            | Jan-22                |
| NetworkAnalyzerE5071C   | MY46110673 | 14-Jan-21 (CTTL, No.J21X00232)            | Jan-22                |

|                | 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: October 27, 2021

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#### Glossary:

|       |                                            |
|-------|--------------------------------------------|
| TSL   | tissue simulating liquid                   |
| ConvF | sensitivity in TSL / NORM <sub>x,y,z</sub> |
| 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.

|                                     |                                                                      |                                  |
|-------------------------------------|----------------------------------------------------------------------|----------------------------------|
| <b>DASY Version</b>                 | DASY52                                                               | V52.10.4                         |
| <b>Extrapolation</b>                | Advanced Extrapolation                                               |                                  |
| <b>Phantom</b>                      | Triple Flat Phantom 5.1C                                             |                                  |
| <b>Distance Dipole Center - TSL</b> | 10 mm                                                                | with Spacer                      |
| <b>Zoom Scan Resolution</b>         | dx, dy = 4 mm, dz = 1.4 mm                                           | Graded Ratio = 1.4 (Z direction) |
| <b>Frequency</b>                    | 5250 MHz $\pm$ 1 MHz<br>5600 MHz $\pm$ 1 MHz<br>5750 MHz $\pm$ 1 MHz |                                  |

**Head TSL parameters at 5250 MHz**

The following parameters and calculations were applied.

|                                                | <b>Temperature</b>  | <b>Permittivity</b> | <b>Conductivity</b>  |
|------------------------------------------------|---------------------|---------------------|----------------------|
| <b>Nominal Head TSL parameters</b>             | 22.0 °C             | 35.9                | 4.71 mho/m           |
| <b>Measured Head TSL parameters</b>            | (22.0 $\pm$ 0.2) °C | 36.6 $\pm$ 6 %      | 4.70 mho/m $\pm$ 6 % |
| <b>Head TSL temperature change during test</b> | <1.0 °C             | ----                | ----                 |

**SAR result with Head TSL at 5250 MHz**

|                                                               |                    |                                                |
|---------------------------------------------------------------|--------------------|------------------------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>   | Condition          |                                                |
| SAR measured                                                  | 100 mW input power | 7.66 W/kg                                      |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>76.9 W/kg <math>\pm</math> 24.4 % (k=2)</b> |
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b> | Condition          |                                                |
| SAR measured                                                  | 100 mW input power | 2.20 W/kg                                      |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>22.1 W/kg <math>\pm</math> 24.2 % (k=2)</b> |



### 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 | 36.0 ± 6 %   | 5.08 mho/m ± 6 % |
| Head TSL temperature change during test | <1.0 °C         | ----         | ----             |

### SAR result with Head TSL at 5600 MHz

|                                                               |                    |                                 |
|---------------------------------------------------------------|--------------------|---------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>   | Condition          |                                 |
| SAR measured                                                  | 100 mW input power | 8.17 W/kg                       |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>81.9 W/kg ± 24.4 % (k=2)</b> |
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b> | Condition          |                                 |
| SAR measured                                                  | 100 mW input power | 2.34 W/kg                       |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>23.5 W/kg ± 24.2 % (k=2)</b> |

### 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 | 35.8 ± 6 %   | 5.25 mho/m ± 6 % |
| Head TSL temperature change during test | <1.0 °C         | ----         | ----             |

### SAR result with Head TSL at 5750 MHz

|                                                               |                    |                                 |
|---------------------------------------------------------------|--------------------|---------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>   | Condition          |                                 |
| SAR measured                                                  | 100 mW input power | 7.59 W/kg                       |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>76.1 W/kg ± 24.4 % (k=2)</b> |
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b> | Condition          |                                 |
| SAR measured                                                  | 100 mW input power | 2.16 W/kg                       |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | <b>21.7 W/kg ± 24.2 % (k=2)</b> |



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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 | $50.5\Omega - 3.27j\Omega$ |
| Return Loss                          | - 29.7dB                   |

### Antenna Parameters with Head TSL at 5600 MHz

|                                      |                            |
|--------------------------------------|----------------------------|
| Impedance, transformed to feed point | $54.2\Omega + 0.81j\Omega$ |
| Return Loss                          | - 27.8dB                   |

### Antenna Parameters with Head TSL at 5750 MHz

|                                      |                            |
|--------------------------------------|----------------------------|
| Impedance, transformed to feed point | $49.4\Omega + 1.99j\Omega$ |
| Return Loss                          | - 33.6dB                   |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.098 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: 10.22.2021

Test Laboratory: CTTL, Beijing, China

**DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1315**

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

Medium parameters used:  $f = 5250$  MHz;  $\sigma = 4.704$  S/m;  $\epsilon_r = 36.62$ ;  $\rho = 1000$  kg/m<sup>3</sup>,  
Medium parameters used:  $f = 5600$  MHz;  $\sigma = 5.084$  S/m;  $\epsilon_r = 36$ ;  $\rho = 1000$  kg/m<sup>3</sup>,  
Medium parameters used:  $f = 5750$  MHz;  $\sigma = 5.248$  S/m;  $\epsilon_r = 35.78$ ;  $\rho = 1000$  kg/m<sup>3</sup>,

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7517; ConvF(5.42, 5.42, 5.42) @ 5250 MHz; ConvF(4.75, 4.75, 4.75) @ 5600 MHz; ConvF(4.82, 4.82, 4.82) @ 5750 MHz; Calibrated: 2021-02-03
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15
- Phantom: MFP\_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

**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 = 70.32 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 31.0 W/kg

**SAR(1 g) = 7.66 W/kg; SAR(10 g) = 2.2 W/kg**

Smallest distance from peaks to all points 3 dB below = 7.4 mm

Ratio of SAR at M2 to SAR at M1 = 65%

Maximum value of SAR (measured) = 18.2 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 = 71.09 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 34.9 W/kg

**SAR(1 g) = 8.17 W/kg; SAR(10 g) = 2.34 W/kg**

Smallest distance from peaks to all points 3 dB below = 7.4 mm

Ratio of SAR at M2 to SAR at M1 = 63.3%

Maximum value of SAR (measured) = 19.9 W/kg

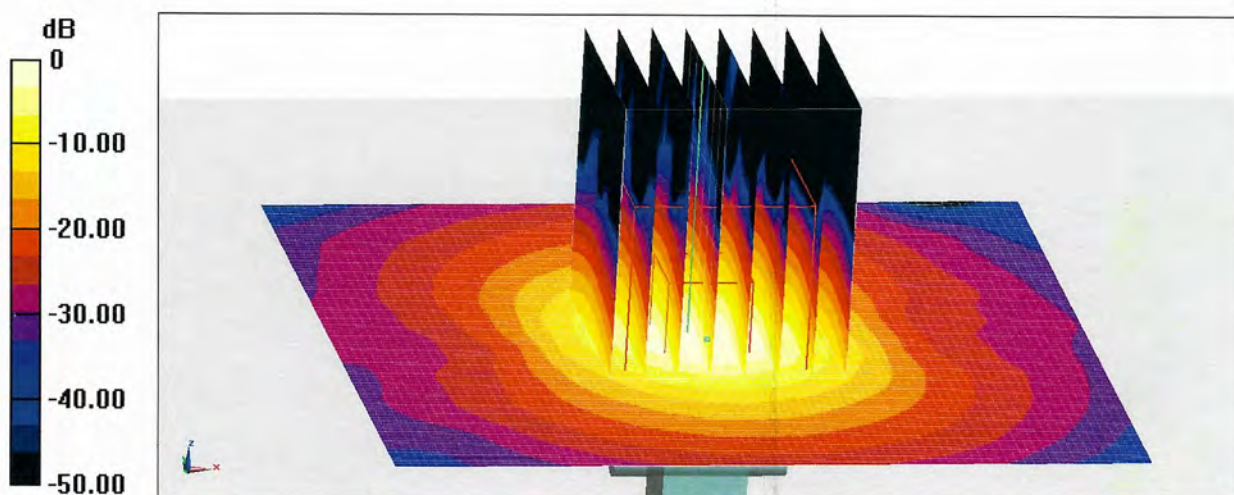


In Collaboration with

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CALIBRATION LABORATORY

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China  
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504  
E-mail: cttl@chinattl.com http://www.chinattl.cn

**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 = 67.72 V/m; Power Drift = -0.03 dB  
Peak SAR (extrapolated) = 33.5 W/kg  
**SAR(1 g) = 7.59 W/kg; SAR(10 g) = 2.16 W/kg**  
Smallest distance from peaks to all points 3 dB below = 7.2 mm  
Ratio of SAR at M2 to SAR at M1 = 62.4%  
Maximum value of SAR (measured) = 18.6 W/kg

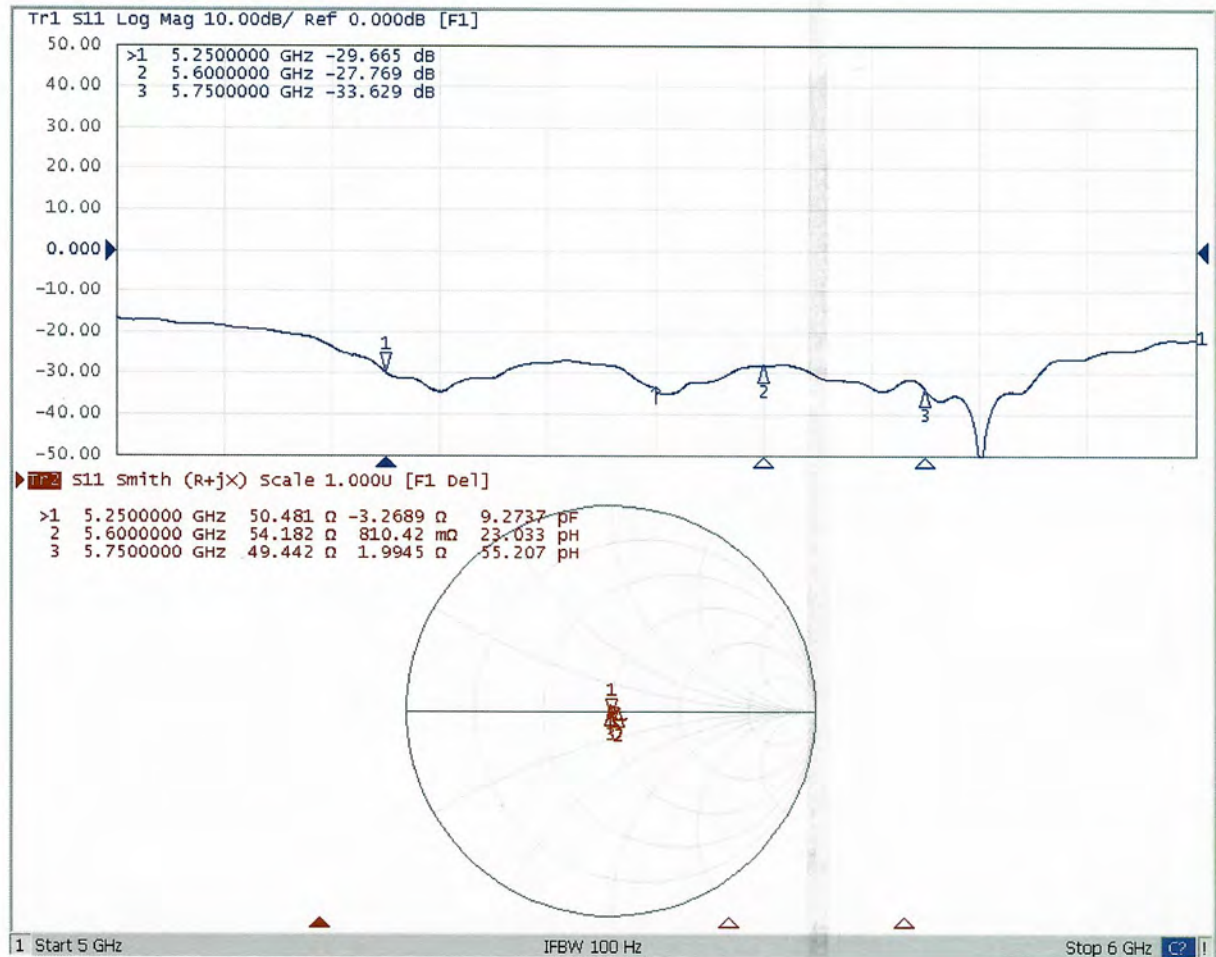




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## Impedance Measurement Plot for Head TSL



## D5GHzV2 - SN: 1315 Extended Dipole Calibrations

Referring to IEC 62209-1, 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.

| D5GHzV2 - SN: 1315  |                  |           |                      |             |                           |             |
|---------------------|------------------|-----------|----------------------|-------------|---------------------------|-------------|
| 5250MHz Head        |                  |           |                      |             |                           |             |
| Date of Measurement | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) | Imaginary Impedance (ohm) | Delta (ohm) |
| 10.22.2021          | -29.7            |           | 50.5                 |             | -3.27                     |             |
| 10.21.2022          | -34.53           | 16.26     | 51.16                | 0.66        | 1.56                      | 4.83        |
| 10.20.2023          | -25.84           | -12.98    | 54.50                | 4.00        | -2.96                     | 0.31        |

| D5GHzV2 - SN: 1315  |                  |           |                      |             |                           |             |
|---------------------|------------------|-----------|----------------------|-------------|---------------------------|-------------|
| 5600MHz Head        |                  |           |                      |             |                           |             |
| Date of Measurement | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) | Imaginary Impedance (ohm) | Delta (ohm) |
| 10.22.2021          | -27.8            |           | 54.2                 |             | 0.81                      |             |
| 10.21.2022          | -31.03           | 11.63     | 49.59                | -4.61       | -2.79                     | -3.60       |
| 10.20.2023          | -26.15           | -5.95     | 54.92                | 0.71        | -1.82                     | -2.63       |

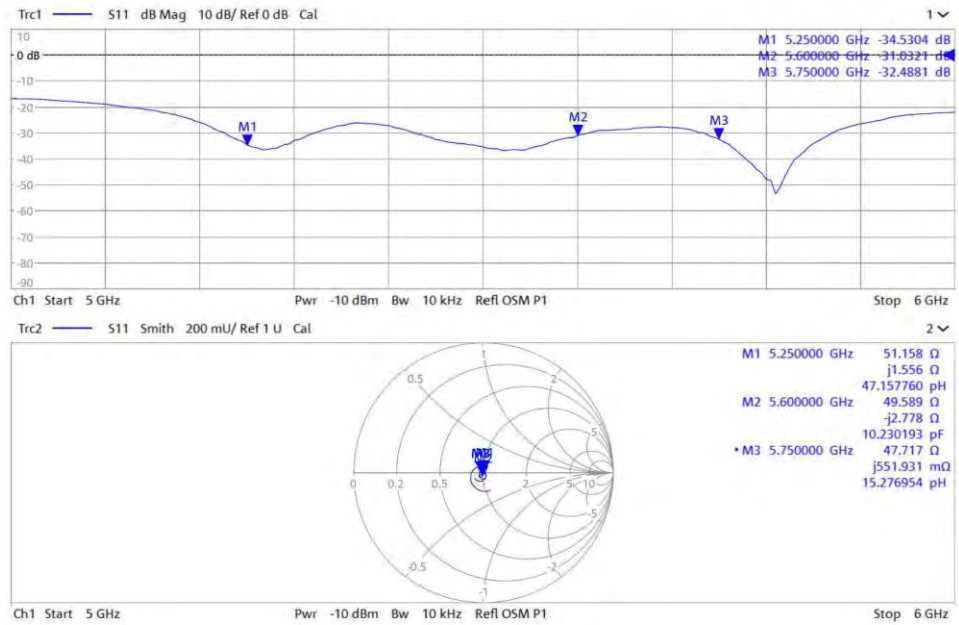
| D5GHzV2 - SN: 1315  |                  |           |                      |             |                           |             |
|---------------------|------------------|-----------|----------------------|-------------|---------------------------|-------------|
| 5750MHz Head        |                  |           |                      |             |                           |             |
| Date of Measurement | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) | Imaginary Impedance (ohm) | Delta (ohm) |
| 10.22.2021          | -33.6            |           | 49.4                 |             | 1.99                      |             |
| 10.21.2022          | -32.49           | -3.31     | 47.72                | -1.68       | 0.55                      | -1.44       |
| 10.20.2023          | -36.43           | 8.41      | 50.87                | 1.47        | 1.34                      | -0.65       |

### <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>

Head 5250-5750MHz \_2022.10.21

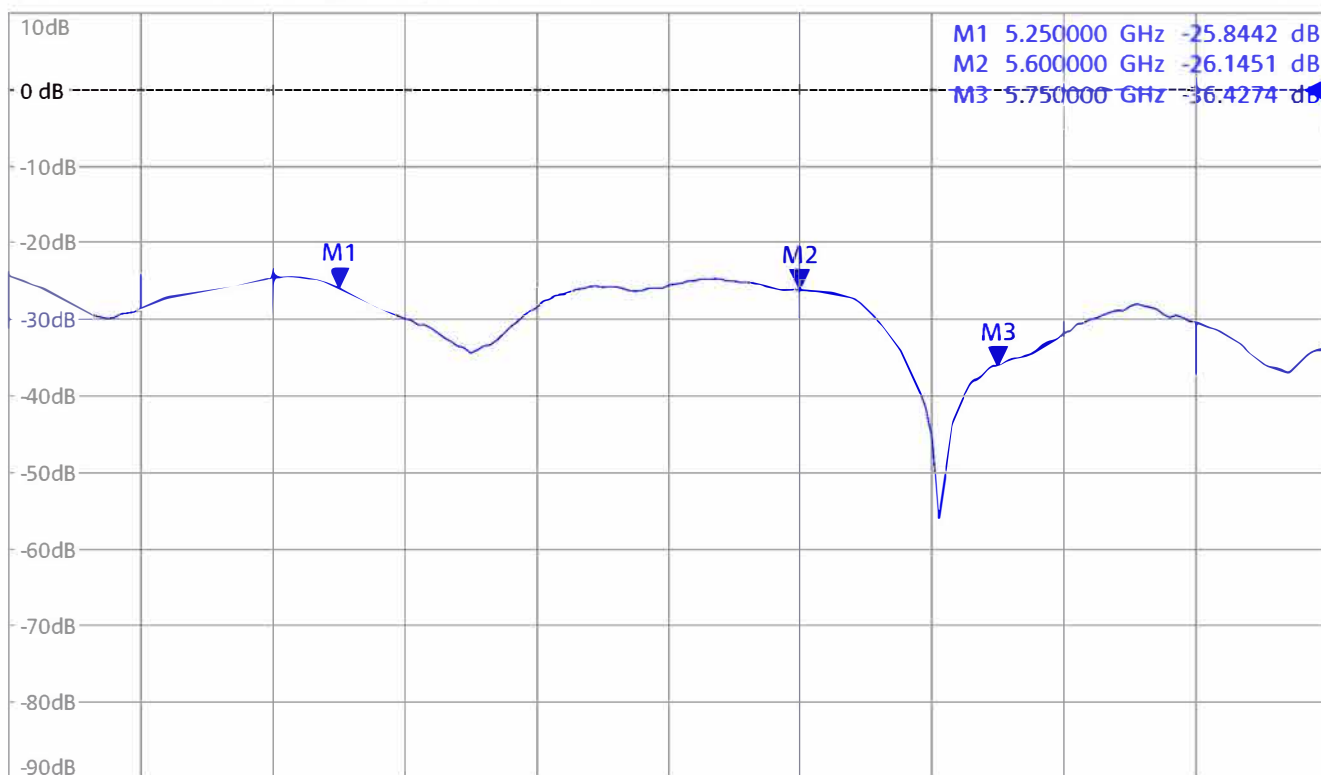


# <Dipole Verification Data>

Head 5250-5750MHz \_2023.10.20

Trc1 — S11 dB Mag 10 dB/ Ref 0 dB Cal

1

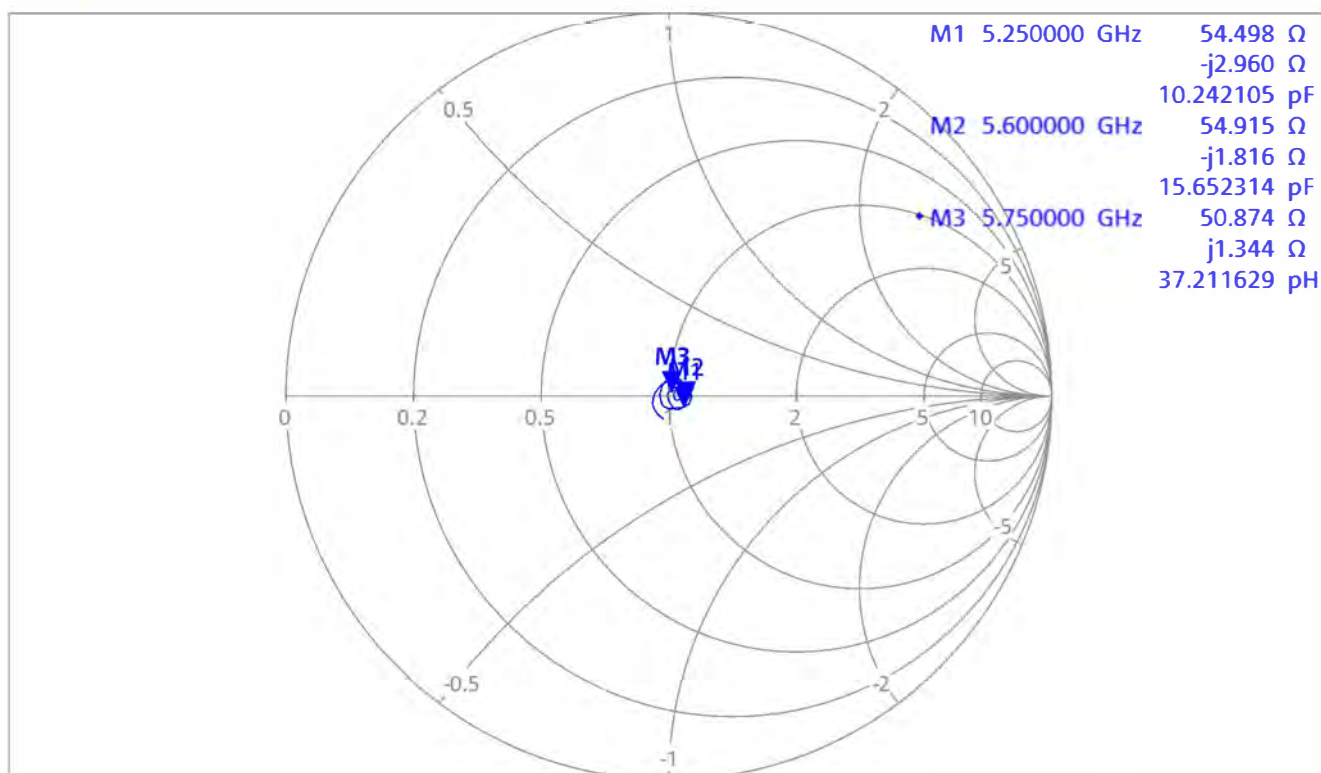


Ch1 Start 5 GHz Pwr -10 dBm Bw 10 kHz Refl OSM P1

Stop 6 GHz

Trc2 — S11 Smith 200 mU/ Ref 1 U Cal

2



Ch1 Start 5 GHz Pwr -10 dBm Bw 10 kHz Refl OSM P1

Stop 6 GHz



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VERITAS

## FCC SAR Test Report



Certificate #6613.01

### Appendix D. Conducted Power Result



## WLAN Sensor Power

| 2.4GHz WLAN | Ant 2         |         |                 |                     |               |
|-------------|---------------|---------|-----------------|---------------------|---------------|
| 2.4GHz WLAN | Mode          | Channel | Frequency (MHz) | Average power (dBm) | Tune-Up Limit |
|             | 802.11b 1Mbps | 1       | 2412            | 13.86               | 15.00         |
|             |               | 6       | 2437            | 13.85               | 15.00         |
|             |               | 11      | 2462            | <b>13.88</b>        | 15.00         |

| 5GHz WLAN   | Ant 2         |         |                 |                     |               |
|-------------|---------------|---------|-----------------|---------------------|---------------|
| 5.2GHz WLAN | Mode          | Channel | Frequency (MHz) | Average power (dBm) | Tune-Up Limit |
|             | 802.11a 6Mbps | 36      | 5180            | 6.47                | 8.00          |
|             |               | 40      | 5200            | 6.49                | 8.00          |
|             |               | 44      | 5220            | 6.52                | 8.00          |
|             |               | 48      | 5240            | <b>6.55</b>         | 8.00          |

| 5GHz WLAN   | Ant 2         |         |                 |                     |               |
|-------------|---------------|---------|-----------------|---------------------|---------------|
| 5.3GHz WLAN | Mode          | Channel | Frequency (MHz) | Average power (dBm) | Tune-Up Limit |
|             | 802.11a 6Mbps | 52      | 5260            | <b>6.67</b>         | 8.00          |
|             |               | 56      | 5280            | 6.60                | 8.00          |
|             |               | 60      | 5300            | 6.34                | 8.00          |
|             |               | 64      | 5320            | 6.30                | 8.00          |

| 5GHz WLAN   | Ant 2         |         |                 |                     |               |
|-------------|---------------|---------|-----------------|---------------------|---------------|
| 5.5GHz WLAN | Mode          | Channel | Frequency (MHz) | Average power (dBm) | Tune-Up Limit |
|             | 802.11a 6Mbps | 100     | 5500            | 7.92                | 9.00          |
|             |               | 116     | 5580            | <b>7.96</b>         | 9.00          |
|             |               | 124     | 5620            | 7.92                | 9.00          |
|             |               | 140     | 5700            | 7.85                | 9.00          |

| 5GHz WLAN   | Ant 2         |         |                 |                     |               |
|-------------|---------------|---------|-----------------|---------------------|---------------|
| 5.8GHz WLAN | Mode          | Channel | Frequency (MHz) | Average power (dBm) | Tune-Up Limit |
|             | 802.11a 6Mbps | 149     | 5745            | 6.54                | 8.00          |
|             |               | 157     | 5785            | <b>6.59</b>         | 8.00          |
|             |               | 165     | 5825            | 6.43                | 8.00          |

| 2.4GHz WLAN | Ant 1+2       |         |                 |                     |               |
|-------------|---------------|---------|-----------------|---------------------|---------------|
| 2.4GHz WLAN | Mode          | Channel | Frequency (MHz) | Average power (dBm) | Tune-Up Limit |
|             | 802.11b 1Mbps | 1       | 2412            | <b>19.68</b>        | 21.00         |
|             |               | 6       | 2437            | 19.64               | 21.00         |
|             |               | 11      | 2462            | 19.30               | 21.00         |

| 5GHz WLAN   | Ant 1+2       |         |                 |                     |               |
|-------------|---------------|---------|-----------------|---------------------|---------------|
| 5.2GHz WLAN | Mode          | Channel | Frequency (MHz) | Average power (dBm) | Tune-Up Limit |
|             | 802.11a 6Mbps | 36      | 5180            | <b>15.95</b>        | 17.00         |
|             |               | 40      | 5200            | 15.95               | 17.00         |
|             |               | 44      | 5220            | 15.91               | 17.00         |
|             |               | 48      | 5240            | 15.65               | 17.00         |

| 5GHz WLAN   | Ant 1+2       |         |                 |                     |               |
|-------------|---------------|---------|-----------------|---------------------|---------------|
| 5.3GHz WLAN | Mode          | Channel | Frequency (MHz) | Average power (dBm) | Tune-Up Limit |
|             | 802.11a 6Mbps | 52      | 5260            | <b>15.49</b>        | 17.00         |
|             |               | 56      | 5280            | 15.42               | 17.00         |
|             |               | 60      | 5300            | 15.14               | 17.00         |
|             |               | 64      | 5320            | 15.02               | 17.00         |

| 5GHz WLAN   | Ant 1+2       |         |                 |                     |               |
|-------------|---------------|---------|-----------------|---------------------|---------------|
| 5.5GHz WLAN | Mode          | Channel | Frequency (MHz) | Average power (dBm) | Tune-Up Limit |
|             | 802.11a 6Mbps | 100     | 5500            | <b>15.13</b>        | 17.00         |
|             |               | 116     | 5580            | 15.07               | 17.00         |
|             |               | 124     | 5620            | 15.09               | 17.00         |
|             |               | 140     | 5700            | 15.02               | 17.00         |

| 5GHz WLAN   | Ant 1+2       |         |                 |                     |               |
|-------------|---------------|---------|-----------------|---------------------|---------------|
| 5.8GHz WLAN | Mode          | Channel | Frequency (MHz) | Average power (dBm) | Tune-Up Limit |
|             | 802.11a 6Mbps | 149     | 5745            | <b>15.35</b>        | 17.00         |
|             |               | 157     | 5785            | 15.13               | 17.00         |
|             |               | 165     | 5825            | 15.12               | 17.00         |