| | | <u>Appendix C</u> | Report No. : FA49 |
|---|---|--|--|
| T | TL s | Aboration with | 中国认可国际互认 |
| Add: No.52 Hua Tel: +86-10-623 E-mail: cttl@chi | nYuanBei Road, Haid 04633-2079 Fax | RATION LABORATORY dian District, Beijing, 100191, Cl x: +86-10-62304633-2504 p://www.chinattl.cn | 校准 CALIBRATION CNAS L0570 |
| Client Sp | oorton | Certificate No: | Z21-60550 |
| CALIBRATION (| CERTIFICA | TE | |
| | | | |
| Object | D750 | 0V3 - SN: 1099 | 100 M |
| Calibration Procedure(s) | | | |
| Calibration Procedure(s) | FF-Z | 11-003-01 | 9 |
| | Calibr | ration Procedures for dipole validation kits | |
| Calibration date: | | mber 15, 2021 | |
| The second | | | |
| measurements (SI). The m pages and are part of the c | leasurements an | e traceability to national standards, which nd the uncertainties with confidence probabil | realize the physical units of lity are given on the following |
| All calibrations have been | n conducted in | the closed laboratory facility: environment | nt temperature (22+3)°C and |
| numidity<70%. | | identy: environmen | (2210) C and |
| numidity<70%. | | environmen | |
| | | | |
| Calibration Equipment used | d (M&TE critical | for calibration) | |
| Calibration Equipment used | d (M&TE critical | for calibration) Cal Date (Calibrated by, Certificate No.) | |
| Calibration Equipment used Primary Standards Power Meter NRP2 | d (M&TE critical ID # 106277 | for calibration) Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) | |
| Calibration Equipment used rimary Standards Power Meter NRP2 Power sensor NRP8S | ID # 106277 104291 | for calibration) Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) | Scheduled Calibration Sep-22 Sep-22 |
| Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 | d (M&TE critical ID # 106277 104291 | for calibration) Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-May-21(SPEAG,No.EX3-7307_May21 | Scheduled Calibration Sep-22 Sep-22) May-22 |
| Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 | ID # 106277 104291 SN 7307 | for calibration) Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) | Scheduled Calibration Sep-22 Sep-22) May-22 |
| Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards | ID # 106277 104291 SN 7307 SN 1556 ID # | for calibration) Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-May-21(SPEAG,No.EX3-7307_May21 15-Jan-21(SPEAG,No.DAE4-1556_Jan21 Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration Sep-22 Sep-22) May-22 I) Jan-22 |
| Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C | ID # 106277 104291 SN 7307 SN 1556 ID # MY49071430 | for calibration) Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-May-21(SPEAG,No.EX3-7307_May21 15-Jan-21(SPEAG,No.DAE4-1556_Jan21 Cal Date (Calibrated by, Certificate No.) 01-Feb-21 (CTTL, No.J21X00593) | Scheduled Calibration Sep-22 Sep-22) May-22 |
| Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C | ID # 106277 104291 SN 7307 SN 1556 ID # | for calibration) Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-May-21(SPEAG,No.EX3-7307_May21 15-Jan-21(SPEAG,No.DAE4-1556_Jan21 Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration Sep-22 Sep-22) May-22 1) Jan-22 Scheduled Calibration |
| Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C | ID # 106277 104291 SN 7307 SN 1556 ID # MY49071430 MY46110673 | for calibration) Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-May-21(SPEAG,No.EX3-7307_May21 15-Jan-21(SPEAG,No.DAE4-1556_Jan21 Cal Date (Calibrated by, Certificate No.) 01-Feb-21 (CTTL, No.J21X00593) | Scheduled Calibration Sep-22 Sep-22) May-22 1) Jan-22 Scheduled Calibration Jan-22 |
| Calibration Equipment used Trimary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C | ID # 106277 104291 SN 7307 SN 1556 ID # MY49071430 | for calibration) Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-May-21(SPEAG,No.EX3-7307_May21 15-Jan-21(SPEAG,No.DAE4-1556_Jan21 Cal Date (Calibrated by, Certificate No.) 01-Feb-21 (CTTL, No.J21X00593) | Scheduled Calibration Sep-22 Sep-22) May-22 1) Jan-22 Scheduled Calibration Jan-22 |
| Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C | ID # 106277 104291 SN 7307 SN 1556 ID # MY49071430 MY46110673 | for calibration) Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-May-21(SPEAG,No.EX3-7307_May21 15-Jan-21(SPEAG,No.DAE4-1556_Jan21 Cal Date (Calibrated by, Certificate No.) 01-Feb-21 (CTTL, No.J21X00593) 14-Jan-21 (CTTL, No.J21X00232) | Scheduled Calibration Sep-22 Sep-22) May-22 I) Jan-22 Scheduled Calibration Jan-22 Jan-22 |
| Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C | ID # 106277 104291 SN 7307 SN 1556 ID # MY49071430 MY46110673 Name Zhao Jing | for calibration) Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-May-21(SPEAG,No.EX3-7307_May21 15-Jan-21(SPEAG,No.DAE4-1556_Jan21 Cal Date (Calibrated by, Certificate No.) 01-Feb-21 (CTTL, No.J21X00593) 14-Jan-21 (CTTL, No.J21X00232) Function SAR Test Engineer | Scheduled Calibration Sep-22 Sep-22) May-22 I) Jan-22 Scheduled Calibration Jan-22 Jan-22 |
| Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C | ID # 106277 104291 SN 7307 SN 1556 ID # MY49071430 MY46110673 Name | for calibration) Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-May-21(SPEAG,No.EX3-7307_May21 15-Jan-21(SPEAG,No.DAE4-1556_Jan21 Cal Date (Calibrated by, Certificate No.) 01-Feb-21 (CTTL, No.J21X00593) 14-Jan-21 (CTTL, No.J21X00232) Function | Scheduled Calibration Sep-22 Sep-22) May-22 I) Jan-22 Scheduled Calibration Jan-22 Jan-22 |
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| Calibration Equipment used rimary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 DAE4 Decondary Standards Signal Generator E4438C NetworkAnalyzer E5071C | ID # 106277 104291 SN 7307 SN 1556 ID # MY49071430 MY46110673 Name Zhao Jing Lin Hao | for calibration) Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-May-21(SPEAG,No.EX3-7307_May21 15-Jan-21(SPEAG,No.DAE4-1556_Jan21 Cal Date (Calibrated by, Certificate No.) 01-Feb-21 (CTTL, No.J21X00593) 14-Jan-21 (CTTL, No.J21X00232) Function SAR Test Engineer | Scheduled Calibration Sep-22 Sep-22) May-22 I) Jan-22 Scheduled Calibration Jan-22 Jan-22 |
| Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C alibrated by: eviewed by: | ID # 106277 104291 SN 7307 SN 1556 ID # MY49071430 MY46110673 Name Zhao Jing Lin Hao Qi Dianyuan | for calibration) Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-May-21 (SPEAG, No.EX3-7307_May21 15-Jan-21 (SPEAG, No.DAE4-1556_Jan21 Cal Date (Calibrated by, Certificate No.) 01-Feb-21 (CTTL, No.J21X00593) 14-Jan-21 (CTTL, No.J21X00232) Function SAR Test Engineer SAR Test Engineer SAR Project Leader | Scheduled Calibration Sep-22 Sep-22) May-22) Jan-22 Scheduled Calibration Jan-22 Jan-22 Jan-22 |



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Glossary:

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

Calibration is Performed According to the Following Standards:

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

Appendix C

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- b) 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
- c) 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
- d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Certificate No: Z21-60550

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Measurement Conditions

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

| DASY Version | DASY52 | V52.10.4 |
|------------------------------|--------------------------|-------------|
| Extrapolation | Advanced Extrapolation | |
| Phantom | Triple Flat Phantom 5.1C | |
| Distance Dipole Center - TSL | 15 mm | with Spacer |
| Zoom Scan Resolution | dx, dy, dz = 5 mm | |
| Frequency | 750 MHz ± 1 MHz | 1 |

Head TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters | 22.0 °C | 42.0 | 0.90 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 41.1 ± 6 % | 0.90 mho/m ± 6 % |
| Head TSL temperature change during test | <1.0 °C | | |

SAR result with Head TSL

| SAR averaged over 1 cm^3 (1 g) of Head TSL | Condition | |
|--|--------------------|--------------------------|
| SAR measured | 250 mW input power | 2.17 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 8.54 W/kg ± 18.8 % (k=2) |
| SAR averaged over 10 cm^3 (10 g) of Head TSL | Condition | |
| SAR measured | 250 mW input power | 1.43 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 5.65 W/kg ± 18.7 % (k=2) |



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Appendix (Additional assessments outside the scope of CNAS L0570)

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Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 55.0Ω+ 0.78jΩ |
|--------------------------------------|---------------|
| Return Loss | - 26.4dB |

Appendix C

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General Antenna Parameters and Design

| Electrical Delay (one direction) | 0.942 ns |
|----------------------------------|-----------|
| | 0.042 113 |

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

Test Laboratory: CTTL, Beijing, China

Date: 2021-12-15

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1099 Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1 Medium parameters used: f = 750 MHz; $\sigma = 0.904$ S/m; $\varepsilon_r = 41.1$; $\rho = 1000$ kg/m³ Phantom section: Right Section

Appendix C

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007) DASY5 Configuration:

- Probe: EX3DV4 SN7307; ConvF(10.31, 10.31, 10.31) @ 750 MHz; Calibrated: 2021-05-26
- 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
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

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

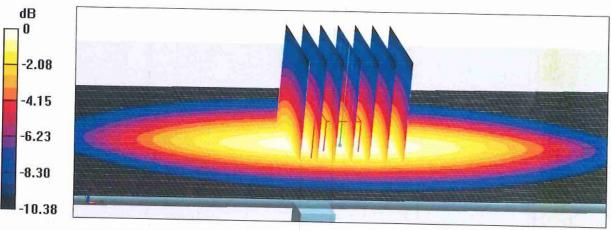
Reference Value = 56.18 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.25 W/kg

SAR(1 g) = 2.17 W/kg; SAR(10 g) = 1.43 W/kg

Smallest distance from peaks to all points 3 dB below: Larger than measurement grid (> 15 mm)

Ratio of SAR at M2 to SAR at M1 = 66.5%Maximum value of SAR (measured) = 2.89 W/kg



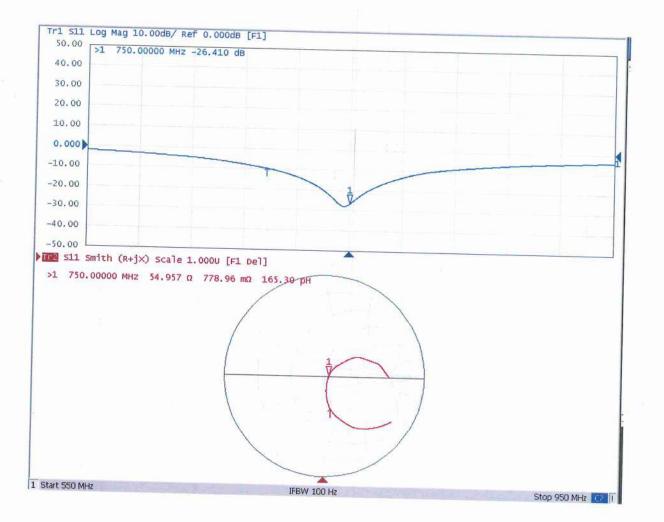
0 dB = 2.89 W/kg = 4.61 dBW/kg

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Impedance Measurement Plot for Head TSL



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D750V3, Serial No. 1099 Extended Dipole Calibrations

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.

| | | | D750V3 – serial no. 109 | 9 | | |
|-------------|-------------|-------|-------------------------|-------|---------------------|-------|
| | 750 Head | | | | | |
| Date of | Return-Loss | Delta | Real Impedance | Delta | Imaginary Impedance | Delta |
| Measurement | (dB) | (%) | (ohm) | (ohm) | (ohm) | (ohm) |
| 2021.12.15 | -26.4 | | 55 | | 0.78 | |
| 2022.12.14 | -26.6 | 0.9% | 54.6 | 0.4 | 1.6 | -0.82 |
| 2023.12.14 | -26.2 | -0.9% | 55.04 | -0.04 | -1.15 | 1.93 |

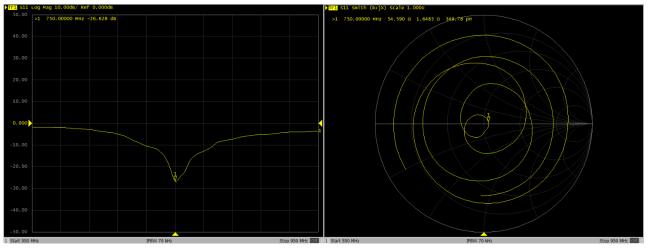
<Justification of the extended calibration>

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.



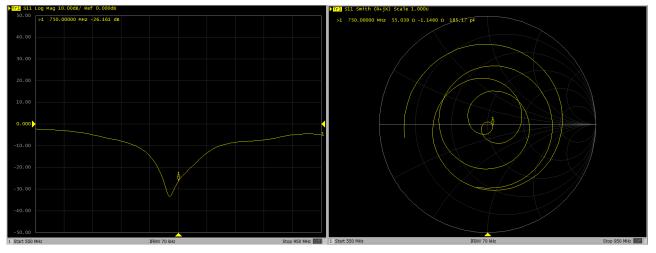
Dipole Verification Data> D750V3, serial no. 1099

750MHz - Head----2022.12.14



750MHz - Head----2023.12.14

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| | | | | <u>Appendix C</u> | | | Rep | ort No. : FA491 |
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| | | Contraction of the local division of the loc | - | ABORATORY | | 6 | | 国际互认 |
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| Tel: +86-10-6230 E-mail: cttl@chin | 4633-2079 | Fax: + | 86-10-6 | , Beijing, 100191, C 52304633-2504 iinattl.cn | Chi The adalation | | | CALIBRATION CNAS L0570 |
| Client Spor | ton | 1.2.2 | 16.4 | (| Certificate No: | Z21 | -60551 | |
| CALIBRATION C | ERTIF | ICAT | Е | No. | | | | 1.4.1 |
| Object | | DODENIC | | 4.14.00 | | | | |
| | | D835V2 | - 5N | 40162 | | | | |
| Calibration Procedure(s) | | FF-Z11- | 003-0 | 1 | | | | |
| | | | | | pole validation kits | | | |
| Calibration date: | | Decemb | | | | • | | |
| | | | | | | | | |
| This calibration Certificate | documen | ts the tr | aceat | pility to nationa | l standards, whic | h reali: | ze the phys | ical units of |
| measurements (SI). The mo pages and are part of the c | easureme | nts and t | the un | certainties with | confidence proba | ability ar | re given on t | the following |
| ages and are part of the c | entificate. | | | | | | | |
| All calibrations have been | n conducte | ed in th | e clos | sed laboratory | facility: onvironm | ant ta | | |
| umidity<70%. | | | 0 0100 | aboratory | acinty. environn | ient tei | mperature (| (22±3)°C and |
| | | | | | | | | |
| Calibration Equipment used | d (M&TE c | ritical for | calibr | ration) | | | | |
| Primony Chandende | | | | | | | | |
| rimary Standards Power Meter NRP2 | ID # | | | | by, Certificate No | o.) | Scheduled | Calibration |
| Power sensor NRP8S | 106277 | | | p-21 (CTTL, No | | | Se | p-22 |
| Reference Probe EX3DV4 | The second s | 7 | 24-5e 26-Ma | p-21 (CTTL, No | D.J21X08326) | ~ ~ ~ | | p-22 |
| DAE4 | SN 155 | | | | lo.EX3-7307_May p.DAE4-1556_Jar | | | ay-22 |
| | | | | | 5.0AC4-1000_0al | 121) | Jar | 1-22 |
| Secondary Standards | ID# | (| Cal Da | ate (Calibrated | by, Certificate No. |) | Scheduled (| Calibration |
| Signal Generator E4438C | MY4907 | /1430 (| | b-21 (CTTL, No | | / | 2007 | 1-22 |
| NetworkAnalyzer E5071C | MY4611 | 0673 1 | 14-Jar | n-21 (CTTL, No | .J21X00232) | | | 1-22 |
| | | | ie. | | | | | |
| | Name | | | Function | | | Signatu | Ire |
| alibrated by: | Zhao Jing | 3 | S | SAR Test Engin | eer | | 94 | |
| eviewed by: | | | | | FIG2E ST SE | | Q.12 | 1-22 |
| eviewed by. | Lin Hao | | S | SAR Test Engin | eer | | 林游 | > |
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| nis calibration certificate sh Certificate No: Z21-60551 | | reproduc | | cept in full with e 1 of 6 | Issued: D out written approv | ecemb /al of th | er 24, 2021 le laboratory | |



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Glossary:

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

Calibration is Performed According to the Following Standards:

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

Appendix C

- b) 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
- c) 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
- d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Certificate No: Z21-60551



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Measurement Conditions

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

| DASY Version | DASY52 | V52.10.4 |
|------------------------------|--------------------------|-------------|
| Extrapolation | Advanced Extrapolation | |
| Phantom | Triple Flat Phantom 5.1C | |
| Distance Dipole Center - TSL | 15 mm | with Spacer |
| Zoom Scan Resolution | dx, dy, dz = 5 mm | |
| Frequency | 835 MHz ± 1 MHz | |

Head TSL parameters

The following parameters and calculations were applied.

| Temperature | Permittivity | Conductivity |
|-----------------|----------------------------|---|
| 22.0 °C | 41.5 | 0.90 mho/m |
| (22.0 ± 0.2) °C | 40.8 ± 6 % | 0.91 mho/m ± 6 % |
| <1.0 °C | | |
| | 22.0 °C (22.0 ± 0.2) °C | 22.0 °C 41.5 (22.0 ± 0.2) °C 40.8 ± 6 % |

SAR result with Head TSL

| SAR averaged over 1 cm^3 (1 g) of Head TSL | Condition | |
|--|--------------------|--------------------------|
| SAR measured | 250 mW input power | 2.44 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 9.64 W/kg ± 18.8 % (k=2) |
| SAR averaged over 10 cm^3 (10 g) of Head TSL | Condition | <u> </u> |
| SAR measured | 250 mW input power | 1.58 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 6.26 W/kg ± 18.7 % (k=2) |



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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 53.7Ω- 2.20jΩ | ٦ |
|--------------------------------------|---------------|---|
| Return Loss | - 27.7dB | - |

General Antenna Parameters and Design

| Electrical Delay (one direction) | 1246 mg |
|----------------------------------|----------|
| | 1.346 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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| | | |
| | | |
| | | |
| | | |
| | | |
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| | | |



DASY5 Validation Report for Head TSL

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China

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Date: 2021-12-17

Test Laboratory: CTTL, Beijing, China **DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d162** Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1 Medium parameters used: f = 835 MHz; $\sigma = 0.91$ S/m; $\varepsilon_r = 40.77$; $\rho = 1000$ kg/m³ Phantom section: Right Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 SN7307; ConvF(10.13, 10.13, 10.13) @ 835 MHz; Calibrated: 2021-05-26
- 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
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

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

Reference Value = 59.81 V/m; Power Drift = -0.01 dB

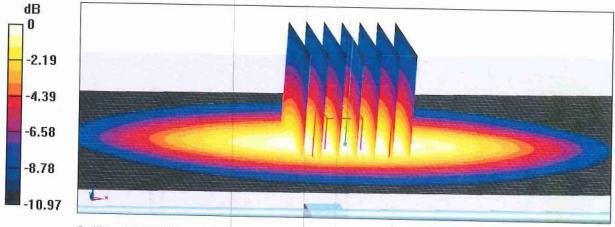
Peak SAR (extrapolated) = 3.70 W/kg

SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.58 W/kg

Smallest distance from peaks to all points 3 dB below = 20.5 mm

Ratio of SAR at M2 to SAR at M1 = 65.7%

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



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

Page 5 of 6



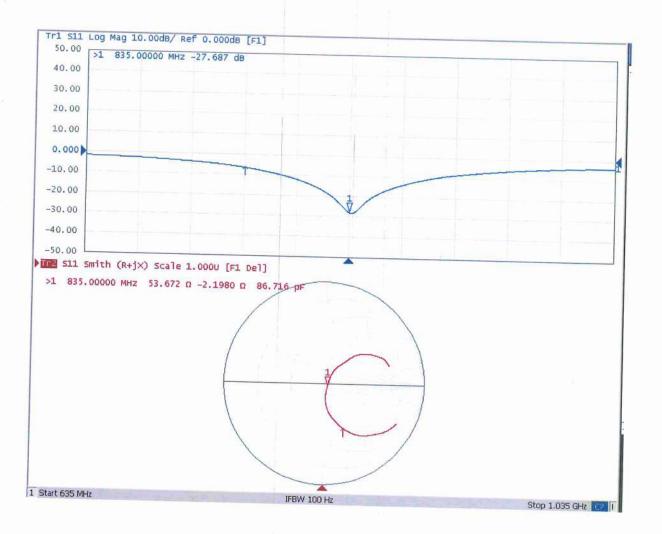
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D

Impedance Measurement Plot for Head TSL





D835V2, Serial No. 4d162 Extended Dipole Calibrations

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.

| D835V2 – serial no. 4d162 | | | | | | |
|---------------------------|-------------|--|-------|-------|-------|-------|
| | 835 Head | | | | | |
| Date of | Return-Loss | Return-Loss Delta Real Impedance Delta Imaginary Impedance Delta | | | | |
| Measurement | (dB) | (%) | (ohm) | (ohm) | (ohm) | (ohm) |
| 2021.12.17 | -27.7 | | 53.7 | | -2.2 | |
| 2022.12.16 | -27.7 | 0.0% | 52.2 | 1.5 | -3.6 | 1.4 |
| 2023.12.16 | -27.9 | 0.7% | 53.3 | 0.4 | -2.5 | 0.3 |

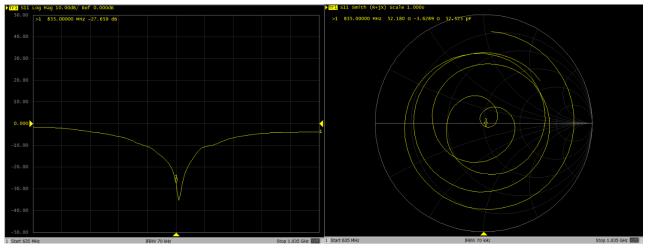
<Justification of the extended calibration>

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.

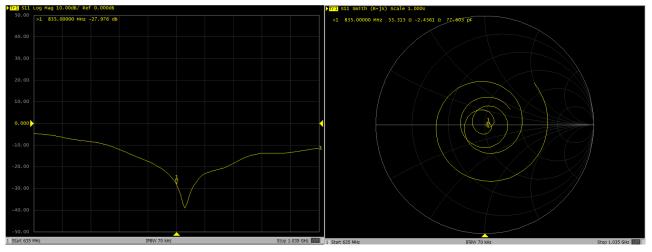


Dipole Verification Data> 835V2, serial no. 4d162

835MHz - Head----2022.12.16



835MHz - Head----2023.12.16



Calibration Laboratory of Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland

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

Client Sporton

Certificate No: D1750V2-1090_Feb22

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Schweizerischer Kalibrierdienst

Service suisse d'étalonnage

Servizio svizzero di taratura

Swiss Calibration Service

Accreditation No.: SCS 0108

CALIBRATION CERTIFICATE

| Object | D1750V2 - SN:10 | 200 | Andreastic street, providently | | |
|--|--|--|--|--|--|
| Object | D1750V2 - 5N. TC | 190 | and the second | | |
| | | | | | |
| Calibration procedure(s) | QA CAL-05.v11 | | 100000000000000000000000000000000000000 | | |
| | Calibration Procedure for SAR Validation Sources between 0.7-3 GHz | | | | |
| | Gampiation 11000 | date for exit validation douroes | between our o anz | | |
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| | | | the second s | | |
| Calibration date: | February 24, 202 | 0 | design of the second se | | |
| Galibiation date. | 1 coluary 24, 202 | ٤ | | | |
| | | | | | |
| This calibration cartificate documen | to the treeschility to not | onal standards, which realize the physical uni | | | |
| | | robability are given on the following pages and | | | |
| The measurements and the uncerta | anties with confidence pi | obability are given on the following pages and | b are part of the certificate. | | |
| All collibrations have been conducted | | | | | |
| All calibrations have been conducte | o in the closed laborator | y facility: environment temperature (22 \pm 3)°C | and humidity < 70%. | | |
| Collibration Fourier at used (MATE | and the state of the state of | | | | |
| Calibration Equipment used (M&TE | critical for calibration) | | | | |
| Primary Standards | ID # | Col Data (Cartificate No.) | Colored and Collingation | | |
| Power meter NRP | SN: 104778 | Cal Date (Certificate No.) | Scheduled Calibration | | |
| Power sensor NRP-Z91 | SN: 103244 | 09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) | Apr-22 | | |
| Power sensor NRP-Z91 | SN: 103245 | 09-Apr-21 (No. 217-03291) | Apr-22 | | |
| Reference 20 dB Attenuator | SN: BH9394 (20k) | 09-Apr-21 (No. 217-03243) | Apr-22 Apr-22 | | |
| Type-N mismatch combination | SN: 310982 / 06327 | 09-Apr-21 (No. 217-03344) | Apr-22 Apr-22 | | |
| Reference Probe EX3DV4 | SN: 7349 | 31-Dec-21 (No. EX3-7349_Dec21) | Dec-22 | | |
| DAE4 | SN: 601 | 01-Nov-21 (No. DAE4-601_Nov21) | Nov-22 | | |
| | | | NOV-22 | | |
| 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 | 1110.1 - | | |
| | 1000000 - C-1-2 (-2-20)- (-2- | | Apart 3 | | |
| 1 | | | A 16 | | |
| Approved by: | Niels Kuster | Quality Manager | 1 man | | |
| | | | | | |
| | | | V./ | | |
| | | e e e e e e e e e e e e e e e e e e e | Issued: March 3, 2022 | | |
| This calibration certificate shall not | be reproduced except in | full without written approval of the laboratory. | and an analy a state of the faith for | | |
| | | and the second of the second of the | | | |

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





S Schweizerischer Kalibrierdienst

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

Accreditation No.: SCS 0108

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

Glossary:

| TSL | tissue simulating liquid |
|-------|---------------------------------|
| ConvF | 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 | |
| Distance Dipole Center - TSL | 10 mm | with Spacer |
| Zoom Scan Resolution | dx, dy, dz = 5 mm | |
| Frequency | 1750 MHz ± 1 MHz | |

Head TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters | 22.0 °C | 40.1 | 1.37 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 40.4 ± 6 % | 1.35 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C | | |

SAR result with Head TSL

| SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition | |
|---|---------------------------------|--------------------------|
| SAR measured | 250 mW input power | 9.14 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 37.0 W/kg ± 17.0 % (k=2) |
| | A) | |
| SAR averaged over 10 cm ³ (10 g) of Head TSL | condition | |
| SAR averaged over 10 cm ³ (10 g) of Head TSL SAR measured | condition 250 mW input power | 4.84 W/kg |

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 49.9 Ω - 1.4 jΩ | |
|--------------------------------------|-----------------|--|
| Return Loss | - 37.1 dB | |

General Antenna Parameters and Design

| Electrical Delay (one direction) | 1.221 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: 24.02.2022

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1090

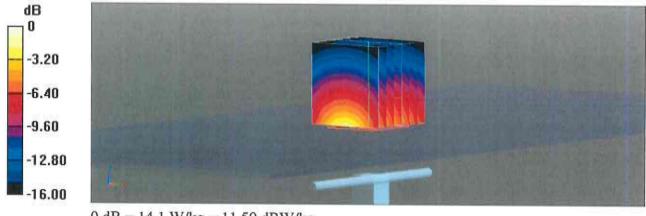
Communication System: UID 0 - CW; Frequency: 1750 MHz Medium parameters used: f = 1750 MHz; σ = 1.35 S/m; ϵ_r = 40.4; ρ = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(8.67, 8.67, 8.67) @ 1750 MHz; Calibrated: 31.12.2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 01.11.2021
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

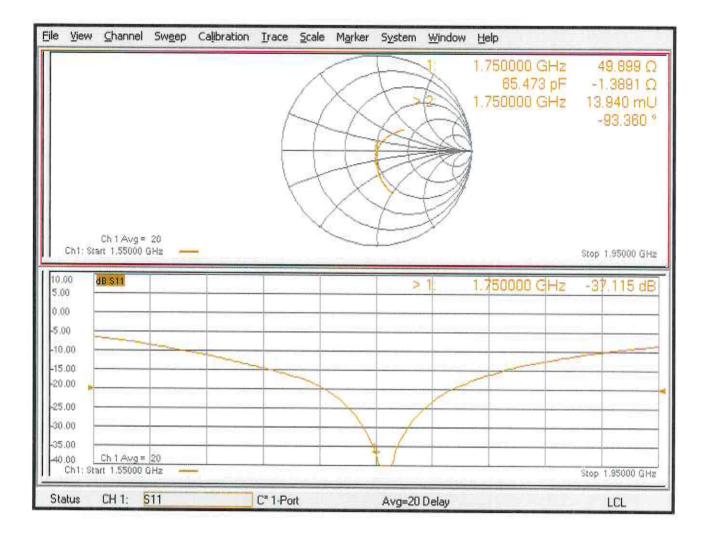
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 106.9 V/m; Power Drift = 0.03 dB Peak SAR (extrapolated) = 16.7 W/kg SAR(1 g) = 9.14 W/kg; SAR(10 g) = 4.84 W/kg Smallest distance from peaks to all points 3 dB below = 10 mm Ratio of SAR at M2 to SAR at M1 = 55% Maximum value of SAR (measured) = 14.1 W/kg



0 dB = 14.1 W/kg = 11.50 dBW/kg

Impedance Measurement Plot for Head TSL



D1750V2, Serial No. 1090 Extended Dipole Calibrations

If dipoles are verified in return loss (<-20dB, within 20% of prior

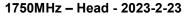
calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

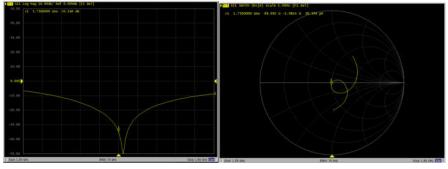
| D1750V2 – serial no. 1090 | | | | | | | | |
|---------------------------|---------------------|--------------|----------------------------|----------------|---------------------------------|----------------|--|--|
| 1750 Head | | | | | | | | |
| Date of Measurement | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) | Imaginary Impedance (ohm) | Delta (ohm) | | |
| 2022.2.24 | -37.115 | | 49.899 | | -1.3891 | | | |
| 2023.2.23 | -35.184 | -5.2 | 49.092 | 0.807 | -2.9814 | 1.5923 | | |
| 2024.2.23 | -36.717 | -1.07 | 50.143 | -0.244 | -1.4581 | 0.069 | | |

<Justification of the extended calibration>

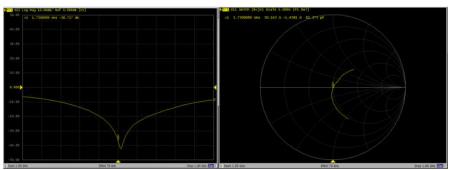
The return loss is < -20dB, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

Dipole Verification Data> D1750V2, serial no. 1090





1750MHz - Head - 2024-2-23



| | | | Appendix C | | Rep | ort No. : FA49180 |
|---|--------------------|-------------------|---|--|--|---------------------------------|
| T | CALIBR | D ATION | e a g | Hac MRA | CNAS | 中国认可 国际互认 校准 |
| Add: No.52 HuaY Tel: +86-10-62304 E-mail: cttl@chin | 가자 남겨서 | +86-10 | ict, Beijing, 100191 0-62304633-2504 .chinattl.cn | , Chi | | CALIBRATION CNAS L0570 |
| Client Sp | orton | 1.8 | | Certificate No: | Z21-60553 | |
| CALIBRATION C | ERTIFICA | TE | 1974 - P | | | |
| | | i in | | | | |
| Object | D1900 |)V2 - | SN: 5d182 | | | |
| Calibration Procedure(s) | FF-Z1 | 1 000 | 04 | | | |
| | | | | dinala validation Lite | | |
| | Calibra | ation | Flocedules lor | dipole validation kits | | |
| Calibration date: | Decen | nber 2 | 20, 2021 | | | |
| This calibration Certificate measurements (SI). The me pages and are part of the co | easurements and | trace | eability to nation uncertainties wi | nal standards, which th confidence probal | n realize the phy pility are given on | sical units of the following |
| All calibrations have been humidity<70%. | conducted in | the c | losed laborator | y facility: environm | ent temperature | (22±3)°C and |
| Calibration Equipment used | I (M&TE critical f | or cal | libration) | | 64 | |
| Primary Standards | ID # | Ca | l Date (Calibrat | ed by, Certificate No | .) Scheduler | Calibration |
| Power Meter NRP2 | 106277 | 12101 | | No.J21X08326) | | ep-22 |
| Power sensor NRP8S | 104291 | 24-9 | Sep-21 (CTTL, | No.J21X08326) | | ep-22 |
| Reference Probe EX3DV4 | | | | ,No.EX3-7307_May | 21) M | ay-22 |
| DAE4 | SN 1556 | 15 | Jan-21(SPEAG, | No.DAE4-1556_Jan | 21) Ja | n-22 |
| Secondary Standards | 10 # | ~ . | | | | |
| Signal Generator E4438C | ID # MY49071430 | | | d by, Certificate No.) | Scheduled | Calibration |
| NetworkAnalyzer E5071C | MY46110673 | | Jan-21 (CTTL, I | No.J21X00593) No.J21X00232) | | in-22 in-22 |
| | Name | | Function | | Signat | ure |
| Calibrated by: | Zhao Jing | | SAR Test Eng | lineer | 4.4 | |
| Reviewed by: | Lin Hao | | SAR Test Eng | lineer | the star | 6 |
| Approved by: | Qi Dianyuan | | SAR Project I | eader | da | |
| | | | | Issued: D | ecember 27, 2021 | da, 51 7 |
| This calibration certificate sh | all not be reprod | uced | except in full w | ithout written approv | al of the laborator | у. |
| Certificate No: Z21-60553 | | | Page 1 of 6 | | | |



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lossary:

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

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for 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
- c) 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
- d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Certificate No: Z21-60553

Page 2 of 6



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S

Measurement Conditions

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

| DASY Version | DASY52 | V52.10.4 |
|------------------------------|--------------------------|-------------|
| Extrapolation | Advanced Extrapolation | |
| Phantom | Triple Flat Phantom 5.1C | |
| Distance Dipole Center - TSL | 10 mm | with Spacer |
| Zoom Scan Resolution | dx, dy, dz = 5 mm | |
| Frequency | 1900 MHz ± 1 MHz | |

Head TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity | |
|---|-----------------|--------------|------------------|--|
| Nominal Head TSL parameters | 22.0 °C | 40.0 | 1.40 mho/m | |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 39.4 ± 6 % | 1.41 mho/m ± 6 % | |
| Head TSL temperature change during test | <1.0 °C | | | |

SAR result with Head TSL

| SAR averaged over 1 cm^3 (1 g) of Head TSL | Condition | |
|--|--------------------|--------------------------|
| SAR measured | 250 mW input power | 10.0 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 39.6 W/kg ± 18.8 % (k=2) |
| SAR averaged over 10 cm^3 (10 g) of Head TSL | Condition | |
| SAR measured | 250 mW input power | 5.07 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 20.2 W/kg ± 18.7 % (k=2) |



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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 54.3Ω+ 6.57ϳΩ |
|--------------------------------------|---------------|
| Return Loss | - 22.5dB |

General Antenna Parameters and Design

| 1.112 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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Certificate No: Z21-60553

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CALIBRATION LABORATORY

DASY5 Validation Report for Head TSL Test Laboratory: CTTL, Beijing, China

Date: 2021-12-20

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d182 Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1 Medium parameters used: f = 1900 MHz; $\sigma = 1.414 \text{ S/m}$; $\epsilon_r = 39.36$; $\rho = 1000 \text{ kg/m}^3$ Phantom section: Right Section

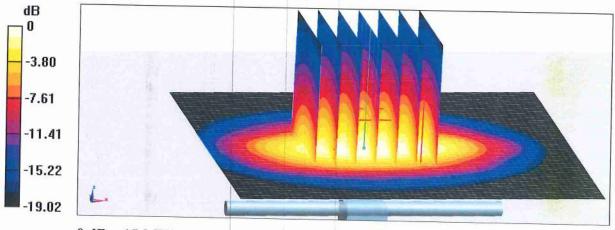
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 SN7307; ConvF(8.32, 8.32, 8.32) @ 1900 MHz; Calibrated: 2021-05-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection) 0
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15 .
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062 0
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501) 0

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

dx=5mm, dy=5mm, dz=5mm Reference Value = 101.3 V/m; Power Drift = -0.01 dB Peak SAR (extrapolated) = 19.6 W/kg SAR(1 g) = 10 W/kg; SAR(10 g) = 5.07 W/kg Smallest distance from peaks to all points 3 dB below = 10 mm Ratio of SAR at M2 to SAR at M1 = 51%Maximum value of SAR (measured) = 15.9 W/kg

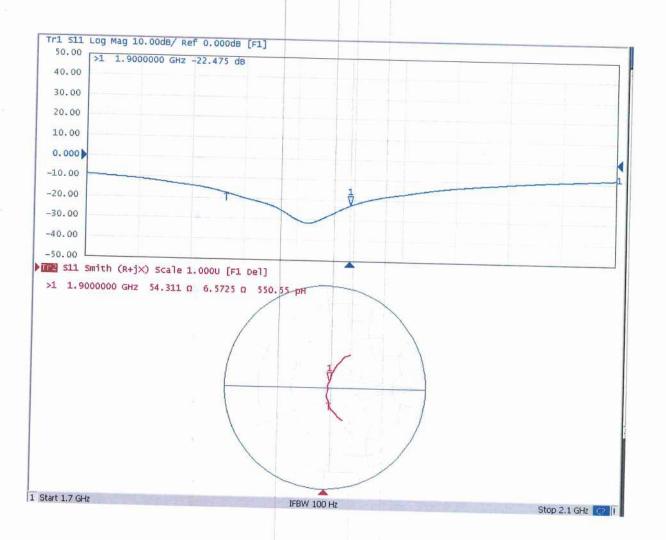


0 dB = 15.9 W/kg = 12.01 dBW/kg



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Impedance Measurement Plot for Head TSL



Certificate No: Z21-60553

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D1900V2, Serial No. 5d182 Extended Dipole Calibrations

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.

| D1900V2 – serial no. 5d182 | | | | | | | |
|----------------------------|-------------|--|-------|-------|-------|-------|--|
| | | 1900 Head | | | | | |
| Date of | Return-Loss | Return-Loss Delta Real Impedance Delta Imaginary Impedance Delta | | | | | |
| Measurement | (dB) | (%) | (ohm) | (ohm) | (ohm) | (ohm) | |
| 2021.12.20 | -22.5 | | 54.3 | | 6.57 | | |
| 2022.12.19 | -22.5 | 0.0% | 53.7 | 0.6 | 6.9 | -0.33 | |
| 2023.12.19 | -22.1 | -1.8% | 56.4 | -2.1 | 4 | 2.57 | |

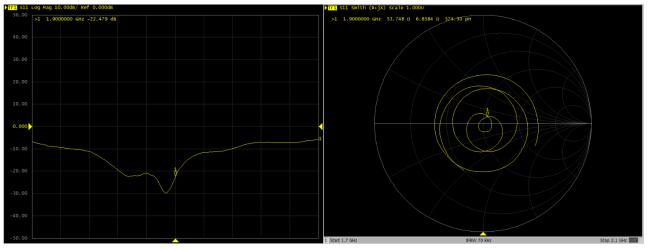
<Justification of the extended calibration>

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.

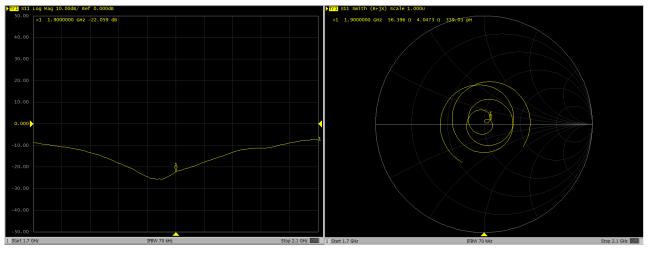


Dipole Verification Data> D1900V2, serial no. 5d182

1900MHz - Head----2022.12.19



1900MHz - Head----2023.12.19







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Client

Sporton

Certificate No:

23J02Z80115

| CALIBRATION CE | RTIFICAT | E | |
|---|--|---|-------------------------------------|
| Object | D2450\ | /2 - SN: 924 | |
| Calibration Procedure(s) | FF-Z11 | -003-01 tion Procedures for dipole validation kits | |
| Calibration date: | | ber 3, 2023 | |
| measurements (SI). The me pages and are part of the ce | asurements and rtificate. conducted in t | raceability to national standards, which rea the uncertainties with confidence probability he closed laboratory facility: environment | are given on the following |
| Primary Standards | ID # | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration |
| Power Meter NRP2 | 106276 | 15-May-23 (CTTL, No.J23X04183) | May-24 |
| Power sensor NRP6A | 101369 | 15-May-23 (CTTL, No.J23X04183) | May-24 |
| Reference Probe EX3DV4 | SN 7464 | 19-Jan-23(CTTL-SPEAG,No.Z22-60565) | Jan-24 |
| DAE4 | SN 1556 | 11-Jan-23(CTTL-SPEAG,No.Z23-60034) | Jan-24 |
| Secondary Standards | ID# | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration |
| Signal Generator E4438C | MY49071430 | 05-Jan-23 (CTTL, No. J23X00107) | Jan-24 |
| NetworkAnalyzer E5071C | MY46110673 | 10-Jan-23 (CTTL, No. J23X00104) | Jan-24 |
| | Name | Function | Signature |
| Calibrated by: | Zhao Jing | SAR Test Engineer | 表意 |
| Reviewed by: | Lin Hao | SAR Test Engineer | 17.7% |
| Approved by: | Qi Dianyuan | SAR Project Leader | top |
| This calibration certificate sh | all not be repro | Issued: Nove duced except in full without written approval o | ember 7, 2023 of the laboratory. |





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Glossary:

| TSL | tissue simulating liquid |
|-------|--------------------------------|
| ConvF | sensitivity in TSL / NORMx,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-mounted 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) 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.

| DASY52 | 52.10.4 |
|--------------------------|--|
| Advanced Extrapolation | |
| Triple Flat Phantom 5.1C | |
| 10 mm | with Spacer |
| dx, dy, dz = 5 mm | |
| 2450 MHz ± 1 MHz | |
| | Advanced Extrapolation Triple Flat Phantom 5.1C 10 mm dx, dy, dz = 5 mm |

Head TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters | 22.0 °C | 39.2 | 1.80 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 38.8 ± 6 % | 1.83 mho/m ± 6 % |
| Head TSL temperature change during test | <1.0 °C | | |

SAR result with Head TSL

| SAR averaged over 1 cm^3 (1 g) of Head TSL | Condition | |
|--|--------------------|--------------------------|
| SAR measured | 250 mW input power | 13.2 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 52.3 W/kg ± 18.8 % (k=2) |
| SAR averaged over 10 cm^3 (10 g) of Head TSL | Condition | |
| SAR measured | 250 mW input power | 6.17 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 24.5 W/kg ± 18.7 % (k=2) |





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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 50.2Ω+ 7.23jΩ | |
|--------------------------------------|---------------|--|
| Return Loss | - 22.9dB | |

General Antenna Parameters and Design

| Electrical Delay (one direction) | 1.061 ns |
|----------------------------------|----------|
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point 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 feed-point may be damaged.

Additional EUT Data

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



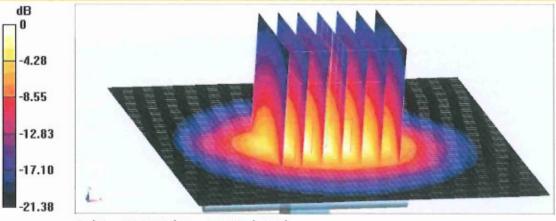


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DASY5 Validation Report for Head TSLDate: 2023-11-03Test Laboratory: CTTL, Beijing, ChinaDUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 924Communication System: UID 0, CW; Frequency: 2450 MHzMedium parameters used: f = 2450 MHz; $\sigma = 1.827$ S/m; $\varepsilon_r = 38.76$; $\rho = 1000$ kg/m³Phantom section: Right SectionMeasurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)DASY5 Configuration:Date: 2023-11-03

- Probe: EX3DV4 SN7464; ConvF(7.67, 7.67, 7.67) @ 2450 MHz; Calibrated: 2023-01-19
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2023-01-11
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 101.5 V/m; Power Drift = -0.05 dB Peak SAR (extrapolated) = 27.3 W/kg **SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.17 W/kg** Smallest distance from peaks to all points 3 dB below = 8.9 mm Ratio of SAR at M2 to SAR at M1 = 49.1% Maximum value of SAR (measured) = 22.2 W/kg



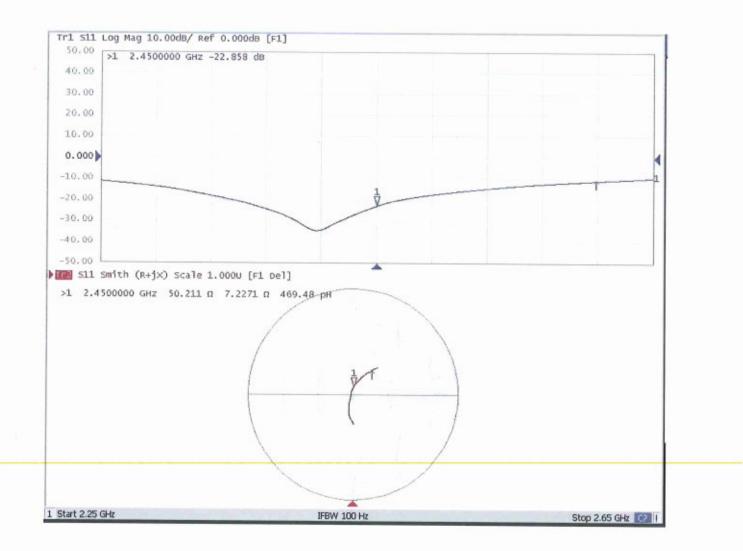
0 dB = 22.2 W/kg = 13.46 dBW/kg





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Impedance Measurement Plot for Head TSL





D2450V2, Serial No. 924 Extended Dipole Calibrations

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 – serial no. 92 | 24 | | |
|-------------|-------------|-------|-------------------------|-------|---------------------|-------|
| | | | 2450 | Head | | |
| Date of | Return-Loss | Delta | Real Impedance | Delta | Imaginary Impedance | Delta |
| Measurement | (dB) | (%) | (ohm) | (ohm) | (ohm) | (ohm) |
| 2023.11.3 | -22.9 | | 50.2 | | 7.2 | |
| 2024.11.2 | -23.2 | 1.5% | 51.6 | -1.4 | 6.3 | 0.9 |
| | | | | | | |

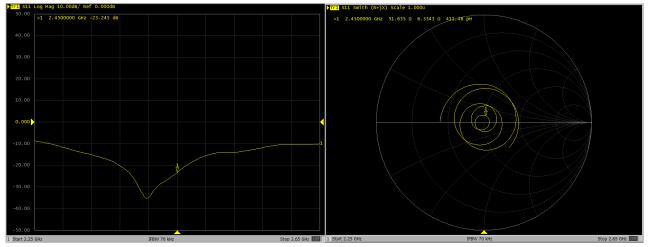
<Justification of the extended calibration>

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> 2450V2, serial no. 924

2450MHz - Head----2024.11.2



| | | <u>Appendix C</u> | | Rep | oort No. : FA49180 |
|--|---|--|----------------------|---------------------|---------------------------|
| T | Note Note Note Note Note Note Note Note | oration with | anter Contraction | | 中国认可 |
| | CALIBRA | TION LABORATORY | Hac-MRA | CALAG | 国际互认 |
| Add: No.52 Huay | | District, Beijing, 100191, C | | GNAS | 校准 |
| Tel: +86-10-6230 E-mail: cttl@chin | 4633-2079 Fax: - | +86-10-62304633-2504 /www.chinattl.cn | ni iliandalala | | CALIBRATION CNAS L0570 |
| 1 | orton | | Certificate No: | Z21-60554 | |
| CALIBRATION C | ERTIFICAT | | | | |
| | LINITIOAT | E | | the start the | |
| Object | D2600 | V2 - SN: 1070 | | | |
| | | | | | |
| Calibration Procedure(s) | FF-Z11 | -003-01 | | | |
| | | tion Procedures for di | pole validation kits | | |
| Calibration date: | | | | | |
| | Decem | ber 20, 2021 | | | |
| This calibration Certificate | documents the | traceability to nationa | I standards, which | n realize the phys | sical units of |
| measurements (SI). The m | easurements and | the uncertainties with | confidence probal | oility are given on | the following |
| pages and are part of the c | ertificate. | | | 12 | 3 |
| All calibrations have been | conducted in t | | | | |
| All calibrations have been humidity<70%. | | he closed laboratory | facility: environme | ent temperature | (22±3)°C and |
| encennenador - London outer | | | | | = |
| Calibration Equipment used | I (M&TE critical fo | or calibration) | | | |
| | | | | | |
| Primary Standards | ID # | Cal Date (Calibrated | | .) Scheduled | I Calibration |
| Power Meter NRP2 Power sensor NRP8S | 106277 | 24-Sep-21 (CTTL, No | | Se | ep-22 |
| Reference Probe EX3DV4 | 104291 SN 7307 | 24-Sep-21 (CTTL, No | | Se | ep-22 |
| DAE4 | SN 1556 | 26-May-21(SPEAG,N | | | ay-22 |
| | 0111000 | 15-Jan-21(SPEAG,N | 0.DAE4-1556_Jan | 21) Ja | n-22 |
| Secondary Standards | ID# | Cal Date (Calibrated | by. Certificate No | Scheduled | Calibration |
| Signal Generator E4438C | MY49071430 | 01-Feb-21 (CTTL, No | | | in-22 |
| Network Analyzer E5071C | MY46110673 | 14-Jan-21 (CTTL, No | | | in-22 |
| | | | | 517394 | |
| | Name | Function | | | |
| Calibrated by: | Zhao Jing | | the street | Signat | ure |
| | Zhao Jing | SAR Test Engin | leer | 3/21 | 20 |
| Reviewed by: | Lin Hao | SAR Test Engin | leer | the 2k | E ST. |
| pproved by: | | | The state of the | where | 2 2 2 |
| Approved by: | Qi Dianyuan | SAR Project Le | ader | dea | |
| | | | | | |
| his calibration certificate sh | all not be reprodu | iced except in full with | Issued: De | ecember 27, 2021 | 630 |
| 8 | | | out written approv | al of the laborator | у. |
| | | | | | |
| Certificate No: Z21-60554 | | Page 1 of 6 | | | |
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CALIBRATION LABORATORY

In Collaboration with

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Appendix C

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Glossary:

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

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for 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
- c) 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
- d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole . positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point. 0 No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna . connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

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

Certificate No: Z21-60554

Page 2 of 6



In Collaboration with S D C A G CALIBRATION LABORATORY

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Measurement Conditions

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

| DASY Version | DASY52 | V52.10.4 |
|------------------------------|--------------------------|-------------|
| Extrapolation | Advanced Extrapolation | 102.10.4 |
| Phantom | Triple Flat Phantom 5.1C | |
| Distance Dipole Center - TSL | 10 mm | with Spacer |
| Zoom Scan Resolution | dx, dy, dz = 5 mm | |
| Frequency | 2600 MHz ± 1 MHz | |

Head TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters | 22.0 °C | 39.0 | 1.96 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 40.1 ± 6 % | 1.97 mho/m ± 6 % |
| Head TSL temperature change during test | <1.0 °C | | |

SAR result with Head TSL

| Condition | | |
|--------------------|---|--|
| 250 mW input power | 14.0 W/kg | |
| normalized to 1W | | |
| Condition | | |
| 250 mW input power | 6.14 W/kg | |
| normalized to 1W | 24.6 W/kg ± 18.7 % (k=2) | |
| | 250 mW input power normalized to 1W Condition 250 mW input power | |