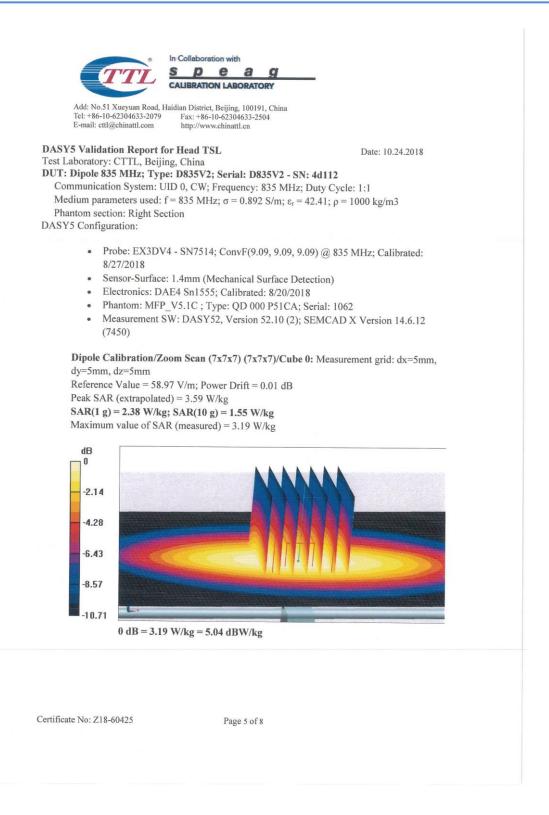


| TTT S P | TION LAB | ag | _ | | |
|--|---|------------------------------------|-----------------------------|--------|---|
| Add: No.51 Xueyuan Road, Haidian Dist Tel: +86-10-62304633-2079 Fax: +1 E-mail: ettl@chinattl.com http://v | rict, Beijing 86-10-62304 www.chinatt | 4633-2504 | | | |
| DASY system configuration, as far as not | t aiven on | nage 1 | | | |
| DASY Version | | DASY52 | | 5 | 2.10.2.1495 |
| Extrapolation | Advance | ed Extrapolation | | | |
| Phantom | | at Phantom 5.1C | | | |
| Distance Dipole Center - TSL | | 15 mm | | | with Craner |
| Zoom Scan Resolution | | | | | with Spacer |
| | Strong of the | y, dz = 5 mm | | | |
| Frequency | 835 1 | MHz ± 1 MHz | | | |
| ead TSL parameters | | | | | |
| The following parameters and calculations | s were ap | olied. Temperature | Permitti | vity | Conductivity |
| Nominal Head TSL parameters | | 22.0 °C | 41.5 | vity | |
| | | | | | 0.90 mho/m |
| Measured Head TSL parameters | | 22.0 ± 0.2) °C | 42.4 ± 0 | 6 % | 0.89 mho/m ± 6 % |
| Head TSL temperature change during | g test | <1.0 °C | | | |
| SAR averaged over 1 cm ³ (1 g) of Her | ad TO | Condi | tion | 1 | |
| SAR measured | ad ISL | 250 mW in | | | 2.29 mal/// m |
| | | | | | 2.38 mW / g |
| SAR for nominal Head TSL parameters | | | Condition | | nW /g ± 18.8 % (k=2 |
| SAR averaged over 10 cm ³ (10 g) of H | Head TSL | | | - | |
| SAR measured | | 250 mW input power | | | 1.55 mW / g |
| SAR for nominal Head TSL parameters | | normalize | zed to 1W 6.25 | | nW /g ± 18.7 % (k=2 |
| ody TSL parameters The following parameters and calculations | | lied. | Permitti | vitv | Conductivity |
| Nominal Body TSL parameters | | 22.0 °C | 55.2 | | 0.97 mho/m |
| Measured Body TSL parameters | (2 | 2.0 ± 0.2) °C | 55.3 ± 6 | s % | 0.96 mho/m ± 6 % |
| | | , | | | |
| Body TSL temperature change during | test | <1.0 °C | | | |
| Body TSL temperature change during | j test | <1.0 °C | | | |
| | | <1.0 °C Condit | ion | | |
| R result with Body TSL | | | | | 2.42 mW / g |
| AR result with Body TSL SAR averaged over 1 cm ³ (1 g) of Bod | | Condit | out power | 9.75 n | |
| AR result with Body TSL SAR averaged over 1 cm ³ (1 g) of Boo SAR measured | dy TSL | Condit 250 mW inj | out power d to 1W | 9.75 n | |
| AR result with Body TSL SAR averaged over 1 cm ³ (1 g) of Boo SAR measured SAR for nominal Body TSL parameters | dy TSL | Condit 250 mW inj normalizer | out power d to 1W ion | 9.75 n | 2.42 mW / g nW /g ± 18.8 % (k=2 1.59 mW / g |

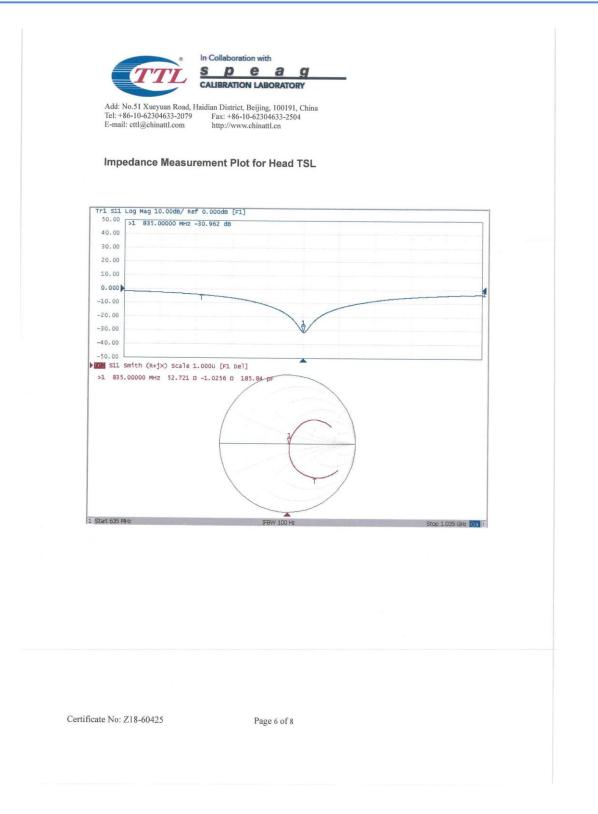


| Add: No.51 Xueyuan Road, Haidian Tel: +86-10-62304633-2079 Fr E-mail: ctt@chinattl.com h Appendix (Additional assess Antenna Parameters with He | x::+86-10-62304633-2 tp://www.chinattl.cn sments outside ad TSL | 91, China 504 |
|--|---|---|
| Impedance, transformed to feed po | pint | 52.7Ω- 1.03jΩ |
| Antenna Parameters with Bo | dy TSL | - 31.0dB |
| Impedance, transformed to feed po | pint | 49.2Ω- 6.11jΩ |
| Return Loss | | - 24.1dB |
| General Antenna Parameters | and Design | 1.265 ns |
| of the dipoles, small end caps are a | dded to the dinole | ha is therefore short-circuited for DC-signals. On some arms in order to improve matching when loaded |
| of the dipoles, small end caps are a loccording to the position as explain. ffected by this change. The overall lo excessive force must be applied onnections near the feedpoint may | dded to the dipole ed in the "Measure dipole length is st to the dipole arms | arms in order to improve matching when loaded |
| of the dipoles, small end caps are a according to the position as explain. Affected by this change. The overall to excessive force must be applied connections near the feedpoint may | dded to the dipole ed in the "Measure dipole length is st to the dipole arms | arms in order to improve matching when loaded ement Conditions" paragraph. The SAR data are not ill according to the Standard |
| of the dipoles, small end caps are a according to the position as explain. affected by this change. The overall No excessive force must be applied connections near the feedpoint may Additional EUT Data | dded to the dipole ed in the "Measure dipole length is st to the dipole arms | arms in order to improve matching when loaded ement Conditions" paragraph. The SAR data are not ill according to the Standard. , because they might bend or the soldered |
| of the dipoles, small end caps are a according to the position as explain. affected by this change. The overall to excessive force must be applied connections near the feedpoint may Additional EUT Data | dded to the dipole ed in the "Measure dipole length is st to the dipole arms | arms in order to improve matching when loaded ement Conditions" paragraph. The SAR data are not ill according to the Standard. s, because they might bend or the soldered SPEAG |

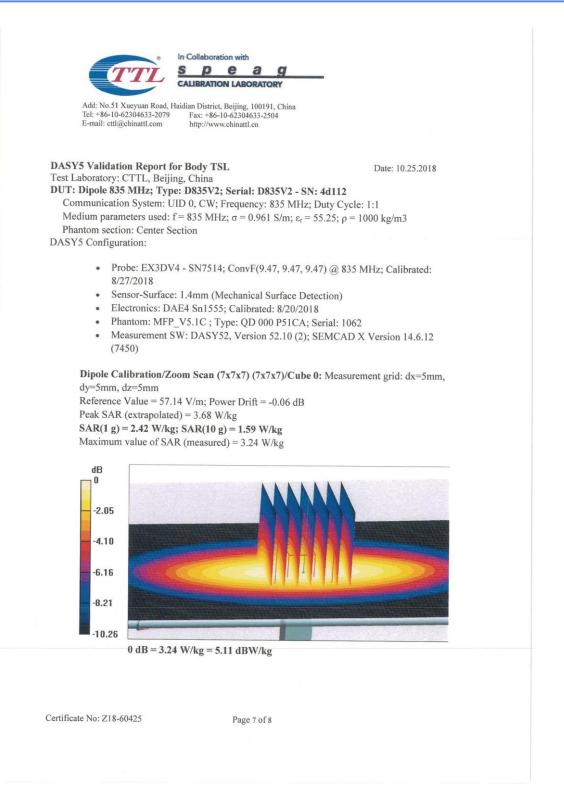




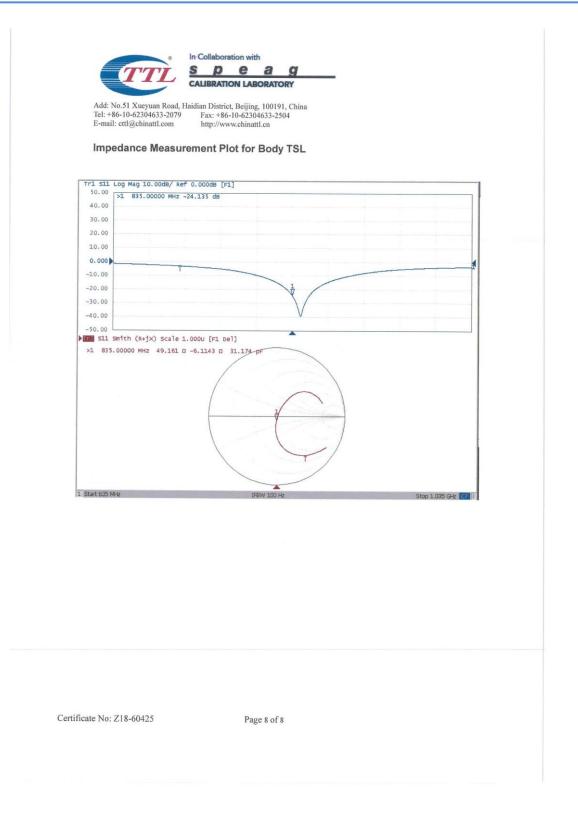














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| Tel: +86-10-623046 E-mail: cttl@chinat | | 86-10-62304633-2504 www.chinattl.cn | adalahat | | CNAS L057 |
| Client CTT | L-CQ | C | ertificate No: | Z17-97253 | |
| CALIBRATION CI | ERTIFICAT | E | | | |
| Object | 5 (0 0 0 | | | | |
| Object | D1900 | /2 - SN: 5d151 | | | |
| Calibration Procedure(s) | FE-711 | -003-01 | | | |
| | | tion Procedures for dig | ole validation kits | | |
| Collibration data: | | | | | |
| Calibration date: | Decem | ber 6, 2017 | | | |
| name and are part of the ac | asurements and | | | | |
| All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 | (M&TE critical fo ID # 102196 100596 SN 3617 | the closed laboratory or calibration) Cal Date(Calibrated 02-Mar-17 (CTTL, N 02-Mar-17 (CTTL, N 23-Jan-17(SPEAG,N | by, Certificate No. o.J17X01254) o.J17X01254) lo.EX3-3617_Jan1 |) Schedule M 7) J | ed Calibration lar-18 lar-18 an-18 |
| All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRVD Power sensor NRV-Z5 | (M&TE critical for ID # 102196 100596 | the closed laboratory or calibration) Cal Date(Calibrated 02-Mar-17 (CTTL, N 02-Mar-17 (CTTL, N | by, Certificate No. o.J17X01254) o.J17X01254) lo.EX3-3617_Jan1 |) Schedule M 7) J | ed Calibration lar-18 lar-18 |
| All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE3 Secondary Standards | Conducted in (M&TE critical for 102196) 100296 SN 3617 SN 536 ID # | the closed laboratory or calibration) Cal Date(Calibrated 02-Mar-17 (CTTL, N 02-Mar-17 (CTTL, N 23-Jan-17(SPEAG,N 09-Oct-17(CTTL-SP Cal Date(Calibrated | by, Certificate No. o.J17X01254) o.J17X01254) lo.EX3-3617_Jan1 EAG,No.Z17-97198 by, Certificate No.) |) Schedule M 7) J 8) C | ed Calibration lar-18 lar-18 an-18 |
| All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE3 | Conducted in (M&TE critical for 102196) 100596 SN 3617 SN 536 ID # MY49071430 | the closed laboratory or calibration) Cal Date(Calibrated 02-Mar-17 (CTTL, N 02-Mar-17 (CTTL, N 23-Jan-17(SPEAG,N 09-Oct-17(CTTL-SP | by, Certificate No. o.J17X01254) o.J17X01254) lo.EX3-3617_Jan1 EAG,No.Z17-97198 by, Certificate No.) o.J17X00286) |) Schedule N 7) J 8) C Schedule J | ed Calibration lar-18 lar-18 an-18 Dot-18 |
| Power sensor NRV-Z5 Reference Probe EX3DV4 DAE3 Secondary Standards Signal Generator E4438C | Conducted in (M&TE critical for 102196) 100596 SN 3617 SN 536 ID # MY49071430 | the closed laboratory or calibration) Cal Date(Calibrated 02-Mar-17 (CTTL, N 02-Mar-17 (CTTL, N 23-Jan-17(CTTL-SP Cal Date(Calibrated 13-Jan-17 (CTTL, N | by, Certificate No. o.J17X01254) o.J17X01254) lo.EX3-3617_Jan1 EAG,No.Z17-97198 by, Certificate No.) o.J17X00286) |) Schedule M 7) J 8) C Schedule J J | ed Calibration lar-18 lar-18 an-18 Dct-18 ed Calibration an-18 |
| All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE3 Secondary Standards Signal Generator E4438C Network Analyzer E5071C | ertificate. conducted in (M&TE critical for 102196 100596 SN 3617 SN 536 ID # MY49071430 MY46110673 | the closed laboratory or calibration) Cal Date(Calibrated 02-Mar-17 (CTTL, N 02-Mar-17 (CTTL, N 23-Jan-17 (CTTL-SP Cal Date(Calibrated 13-Jan-17 (CTTL, N 13-Jan-17 (CTTL, N | by, Certificate No. o.J17X01254) o.J17X01254) lo.EX3-3617_Jan1 EAG,No.Z17-97198 by, Certificate No.) o.J17X00286) o.J17X00285) |) Schedule M 7) J 8) C Schedule J J | ed Calibration lar-18 lar-18 an-18 Oct-18 ed Calibration an-18 an-18 |
| All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE3 Secondary Standards Signal Generator E4438C | ertificate. conducted in (M&TE critical for 102196 100596 SN 3617 SN 536 ID # MY49071430 MY46110673 Name | the closed laboratory or calibration) Cal Date(Calibrated 02-Mar-17 (CTTL, N 02-Mar-17 (CTTL, N 23-Jan-17 (CTTL-SP Cal Date(Calibrated 13-Jan-17 (CTTL, N 13-Jan-17 (CTTL, N Function | by, Certificate No. o.J17X01254) o.J17X01254) lo.EX3-3617_Jan1 EAG,No.Z17-97198 by, Certificate No.) o.J17X00286) o.J17X00285) |) Schedule M 7) J 8) C Schedule J J | ed Calibration lar-18 lar-18 an-18 Oct-18 ed Calibration an-18 an-18 |

Page 1 of 8





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lossary: TSL ConvF

N/A

tissue simulating liquid sensitivity in TSL / NORMx,y,z not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for 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%.

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Measurement Conditions

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

| DASY Version | DASY52 | 52.10.0.1446 |
|------------------------------|--------------------------|--------------|
| 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 |
|-----------------|----------------------------|---|
| 22.0 °C | 40.0 | 1.40 mho/m |
| (22.0 ± 0.2) °C | 39.4 ± 6 % | 1.41 mho/m ± 6 % |
| <1.0 °C | | |
| | 22.0 °C (22.0 ± 0.2) °C | 22.0 °C 40.0 (22.0 ± 0.2) °C 39.4 ± 6 % |

SAR result with Head TSL

| SAR averaged over 1 cm^3 (1 g) of Head TSL | Condition | |
|--|--------------------|---------------------------|
| SAR measured | 250 mW input power | 10.2 mW / g |
| SAR for nominal Head TSL parameters | normalized to 1W | 40.5 mW /g ± 18.8 % (k=2) |
| SAR averaged over 10 cm^3 (10 g) of Head TSL | Condition | |
| SAR measured | 250 mW input power | 5.30 mW / g |
| SAR for nominal Head TSL parameters | normalized to 1W | 21.1 mW /g ± 18.7 % (k=2) |

Body TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters | 22.0 °C | 53.3 | 1.52 mho/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 52.9 ± 6 % | 1.54 mho/m ± 6 % |
| Body TSL temperature change during test | <1.0 °C | | |

SAR result with Body TSL

| SAR averaged over 1 cm^3 (1 g) of Body TSL | Condition | |
|--|--------------------|---------------------------|
| SAR measured | 250 mW input power | 10.2 mW / g |
| SAR for nominal Body TSL parameters | normalized to 1W | 40.4 mW /g ± 18.8 % (k=2) |
| SAR averaged over 10 cm^3 (10 g) of Body TSL | Condition | |
| SAR measured | 250 mW input power | 5.34 mW / g |
| SAR for nominal Body TSL parameters | normalized to 1W | 21.2 mW /g ± 18.7 % (k=2) |

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ian District, Beijing, 100191, Chir Fax: +86-10-62304633-2504 http://www.chinattl.cn

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 51.8Ω+ 5.34jΩ | |
|--------------------------------------|---------------|--|
| Return Loss | - 25.2dB | |

Antenna Parameters with Body TSL

| Impedance, transformed to feed point | 48.3Ω+ 5.41jΩ | |
|--------------------------------------|---------------|--|
| Return Loss | - 24.8dB | |

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 Test Laboratory: CTTL, Beijing, China

Date: 12.06.2017

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d151 Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1 Medium parameters used: f = 1900 MHz; $\sigma = 1.409 \text{ S/m}$; $\epsilon r = 39.36$; $\rho = 1000 \text{ kg/m3}$ Phantom section: Center Section

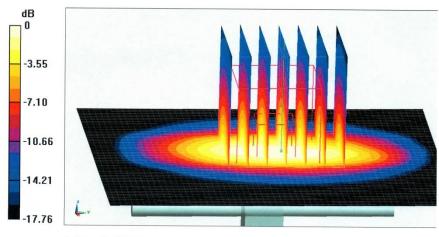
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 SN3617; ConvF(8.26, 8.26, 8.26); Calibrated: 1/23/2017; .
- . Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn536; Calibrated: 10/9/2017 .
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 101.8 V/m; Power Drift = 0.02 dB Peak SAR (extrapolated) = 19.3 W/kg SAR(1 g) = 10.2 W/kg; SAR(10 g) = 5.3 W/kg Maximum value of SAR (measured) = 15.9 W/kg



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

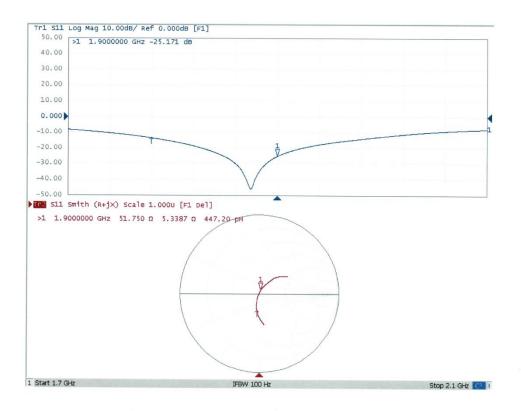
Certificate No: Z17-97253

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Impedance Measurement Plot for Head TSL



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

Date: 12.06.2017

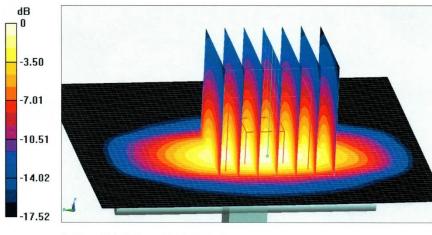
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d151 Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1 Medium parameters used: f = 1900 MHz; $\sigma = 1.542$ S/m; $\varepsilon_r = 52.89$; $\rho = 1000$ kg/m³ Phantom section: Left Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 SN3617; ConvF(7.95, 7.95, 7.95); Calibrated: 1/23/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn536; Calibrated: 10/9/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 93.74 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 18.7 W/kg SAR(1 g) = 10.2 W/kg; SAR(10 g) = 5.34 W/kg Maximum value of SAR (measured) = 15.8 W/kg



0 dB = 15.8 W/kg = 11.99 dBW/kg

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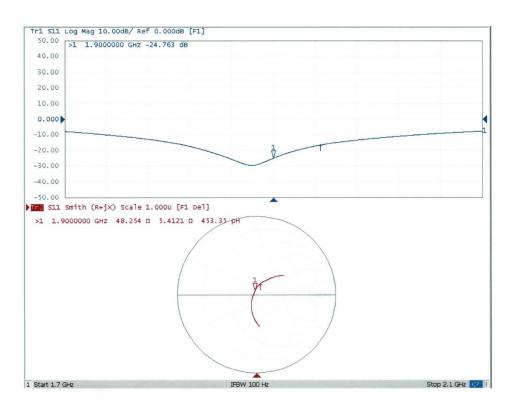


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Impedance Measurement Plot for Body TSL



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| Object | D2450 | V2 - SN: 858 | | | |
| Calibration Procedure(s) | | | | | |
| Calibration Procedure(s) | | 1-003-01 | | | |
| | Calibra | ation Procedures for dipo | ble validation kits | | |
| Calibration date: | Octobe | er 26, 2018 | | | |
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| measurements(SI). The me | asurements and | | | | |
| pages and are part of the c | eruncate. | | | | |
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| humidity<70%. | | | | | |
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| Collibration Equipment uses | MOTE aritical f | | | | |
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| | I (M&TE critical f | or calibration) Cal Date(Calibrated b | by, Certificate No.) | Scheduled | Calibration |
| Primary Standards Power Meter NRVD | | Cal Date(Calibrated b 01-Nov-17 (CTTL, No | J17X08756) | | Calibrationt-18 |
| Primary Standards Power Meter NRVD Power sensor NRV-Z5 | ID # 102083 100542 | Cal Date(Calibrated b 01-Nov-17 (CTTL, No 01-Nov-17 (CTTL, No | J17X08756) J17X08756) | Oc | t-18 t-18 |
| Primary Standards Power Meter NRVD | ID # 102083 100542 SN 7514 | Cal Date(Calibrated b 01-Nov-17 (CTTL, No 01-Nov-17 (CTTL, No 27-Aug-18(SPEAG,No | J17X08756) J17X08756) D.EX3-7514_Aug18 | Oc Oc) Aug | t-18 t-18 g-19 |
| Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 | ID # 102083 100542 | Cal Date(Calibrated b 01-Nov-17 (CTTL, No 01-Nov-17 (CTTL, No | J17X08756) J17X08756) D.EX3-7514_Aug18 | Oc Oc) Aug | t-18 t-18 |
| Power sensor NRV-Z5 Reference Probe EX3DV4 | ID # 102083 100542 SN 7514 | Cal Date(Calibrated b 01-Nov-17 (CTTL, No 01-Nov-17 (CTTL, No 27-Aug-18(SPEAG,No | J17X08756) J17X08756) DEX3-7514_Aug18 DAE4-1555_Aug1 | Oc Oc) Aug | t-18 t-18 g-19 g-19 |
| Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C | ID # 102083 100542 SN 7514 SN 1555 ID # MY49071430 | Cal Date(Calibrated b 01-Nov-17 (CTTL, No 01-Nov-17 (CTTL, No 27-Aug-18(SPEAG,No 20-Aug-18(SPEAG,No Cal Date(Calibrated b 23-Jan-18 (CTTL, No. | J17X08756) J17X08756) b.EX3-7514_Aug18 b.DAE4-1555_Aug1 y, Certificate No.) J18X00560) | Oc Oc) Aug (8) Aug Scheduled Jan | t-18 t-18 g-19 g-19 Calibration i-19 |
| Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE4 Secondary Standards | ID # 102083 100542 SN 7514 SN 1555 ID # | Cal Date(Calibrated b 01-Nov-17 (CTTL, No 01-Nov-17 (CTTL, No 27-Aug-18(SPEAG,No 20-Aug-18(SPEAG,No Cal Date(Calibrated b 23-Jan-18 (CTTL, No. | J17X08756) J17X08756) b.EX3-7514_Aug18 b.DAE4-1555_Aug1 y, Certificate No.) J18X00560) | Oc Oc) Aug (8) Aug Scheduled | t-18 t-18 g-19 g-19 Calibration i-19 |
| Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C | ID # 102083 100542 SN 7514 SN 1555 ID # MY49071430 MY46110673 | Cal Date(Calibrated b 01-Nov-17 (CTTL, No 01-Nov-17 (CTTL, No 27-Aug-18(SPEAG,No 20-Aug-18(SPEAG,No Cal Date(Calibrated b 23-Jan-18 (CTTL, No. 24-Jan-18 (CTTL, No. | J17X08756) J17X08756) b.EX3-7514_Aug18 b.DAE4-1555_Aug1 y, Certificate No.) J18X00560) | Oc Oc) Aug 8) Aug Scheduled Jan Jan | t-18 t-18 g-19 g-19 Calibration I-19 I-19 |
| Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C | ID # 102083 100542 SN 7514 SN 1555 ID # MY49071430 MY46110673 Name | Cal Date(Calibrated E 01-Nov-17 (CTTL, No 01-Nov-17 (CTTL, No 27-Aug-18(SPEAG,No 20-Aug-18(SPEAG,No Cal Date(Calibrated by 23-Jan-18 (CTTL, No. 24-Jan-18 (CTTL, No. | J17X08756) J17X08756) DEX3-7514_Aug18 DAE4-1555_Aug1 y, Certificate No.) J18X00560) J18X00561) | Oc Oc) Aug (8) Aug Scheduled Jan | t-18 t-18 g-19 g-19 Calibration I-19 I-19 |
| Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C | ID # 102083 100542 SN 7514 SN 1555 ID # MY49071430 MY46110673 | Cal Date(Calibrated b 01-Nov-17 (CTTL, No 01-Nov-17 (CTTL, No 27-Aug-18(SPEAG,No 20-Aug-18(SPEAG,No Cal Date(Calibrated b 23-Jan-18 (CTTL, No. 24-Jan-18 (CTTL, No. | J17X08756) J17X08756) DEX3-7514_Aug18 DAE4-1555_Aug1 y, Certificate No.) J18X00560) J18X00561) | Oc Oc) Aug 8) Aug Scheduled Jan Jan | t-18 t-18 g-19 g-19 Calibration I-19 I-19 |
| Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C | ID # 102083 100542 SN 7514 SN 1555 ID # MY49071430 MY46110673 Name | Cal Date(Calibrated E 01-Nov-17 (CTTL, No 01-Nov-17 (CTTL, No 27-Aug-18(SPEAG,No 20-Aug-18(SPEAG,No Cal Date(Calibrated by 23-Jan-18 (CTTL, No. 24-Jan-18 (CTTL, No. | J17X08756) J17X08756) DEX3-7514_Aug18 DAE4-1555_Aug1 y, Certificate No.) J18X00560) J18X00561) | Oc Oc) Aug 8) Aug Scheduled Jan Jan | t-18 t-18 g-19 g-19 Calibration I-19 I-19 |
| Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C Calibrated by: Reviewed by: | ID # 102083 100542 SN 7514 SN 1555 ID # MY49071430 MY46110673 Name Zhao Jing | Cal Date(Calibrated E 01-Nov-17 (CTTL, No 01-Nov-17 (CTTL, No 27-Aug-18(SPEAG,No 20-Aug-18(SPEAG,No Cal Date(Calibrated by 23-Jan-18 (CTTL, No. 24-Jan-18 (CTTL, No. Function SAR Test Engine | J17X08756) J17X08756) DEX3-7514_Aug18 DAE4-1555_Aug1 y, Certificate No.) J18X00560) J18X00561) Der | Oc Oc) Aug 8) Aug Scheduled Jan Jan | t-18 t-18 g-19 g-19 Calibration i-19 i-19 |
| Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C Calibrated by: Reviewed by: Approved by: | ID # 102083 100542 SN 7514 SN 1555 ID # MY49071430 MY46110673 Name Zhao Jing Lin Hao Qi Dianyuan | Cal Date(Calibrated E 01-Nov-17 (CTTL, No 01-Nov-17 (CTTL, No 27-Aug-18(SPEAG,No 20-Aug-18(SPEAG,No Cal Date(Calibrated b 23-Jan-18 (CTTL, No. 24-Jan-18 (CTTL, No. Function SAR Test Engine SAR Test Engine SAR Project Lea | J17X08756) J17X08756) DEX3-7514_Aug18 DAE4-1555_Aug1 y, Certificate No.) J18X00560) J18X00561) Deer Deer Deer Beer | Oc Oc) Aug 8) Aug Scheduled Jan Jan Signat Kor Kor Kor Signat | t-18 t-18 j-19 j-19 Calibration i-19 i-19 |
| Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C Calibrated by: Reviewed by: Approved by: | ID # 102083 100542 SN 7514 SN 1555 ID # MY49071430 MY46110673 Name Zhao Jing Lin Hao Qi Dianyuan | Cal Date(Calibrated E 01-Nov-17 (CTTL, No 01-Nov-17 (CTTL, No 27-Aug-18(SPEAG,No 20-Aug-18(SPEAG,No Cal Date(Calibrated b 23-Jan-18 (CTTL, No. 24-Jan-18 (CTTL, No. Function SAR Test Engine SAR Test Engine SAR Project Lea | J17X08756) J17X08756) DEX3-7514_Aug18 DAE4-1555_Aug1 y, Certificate No.) J18X00560) J18X00561) Deer Deer Deer Beer | Oc Oc) Aug 8) Aug Scheduled Jan Jan Signat Kor Kor Kor Signat | t-18 t-18 j-19 j-19 Calibration i-19 i-19 |
| Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C | ID # 102083 100542 SN 7514 SN 1555 ID # MY49071430 MY46110673 Name Zhao Jing Lin Hao Qi Dianyuan | Cal Date(Calibrated E 01-Nov-17 (CTTL, No 01-Nov-17 (CTTL, No 27-Aug-18(SPEAG,No 20-Aug-18(SPEAG,No Cal Date(Calibrated b 23-Jan-18 (CTTL, No. 24-Jan-18 (CTTL, No. Function SAR Test Engine SAR Test Engine SAR Project Lea | J17X08756) J17X08756) DEX3-7514_Aug18 DAE4-1555_Aug1 y, Certificate No.) J18X00560) J18X00561) Deer Deer Deer Beer | Oc Oc) Aug 8) Aug Scheduled Jan Jan Signat Kor Kor Kor Signat | t-18 t-18 j-19 j-19 Calibration i-19 i-19 |







Glossary:

| TSL | |
|-------|--|
| ConvF | |
| N/A | |

tissue simulating liquid sensitivity in TSL / NORMx,y,z not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for 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: Z18-60430





In Collaboration with spea g CALIBRATION LABORATORY

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 Fax: +86-10-62304633-2504

 E-mail: cttl@chinattl.com
 http://www.chinattl.cn

Measurement Conditions

| DASY Version | DASY52 | 52.10.2.1495 |
|------------------------------|--------------------------|--------------|
| Extrapolation | Advanced Extrapolation | |
| Phantom | Triple Flat Phantom 5.1C | |
| Distance Dipole Center - TSL | 10 mm | with Spacer |
| Zoom Scan Resolution | dx, dy, dz = 5 mm | |
| Frequency | 2450 MHz ± 1 MHz | |

Head TSL parameters

The following parameters and calculations were applied.

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

| SAR averaged over 1 cm^3 (1 g) of Head TSL | Condition | |
|---|--------------------|---------------------------|
| SAR measured | 250 mW input power | 13.1 mW / g |
| SAR for nominal Head TSL parameters | normalized to 1W | 52.4 mW /g ± 18.8 % (k=2) |
| SAR averaged over 10 cm ³ (10 g) of Head TSL | Condition | |
| SAR measured | 250 mW input power | 6.10 mW / g |
| SAR for nominal Head TSL parameters | normalized to 1W | 24.4 mW /g ± 18.7 % (k=2) |

Body TSL parameters

| V. 41. | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters | 22.0 °C | 52.7 | 1.95 mho/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 52.8 ± 6 % | 2.01 mho/m ± 6 % |
| Body TSL temperature change during test | <1.0 °C | | |

SAR result with Body TSL

| SAR averaged over 1 cm^3 (1 g) of Body TSL | Condition | |
|---|--------------------|---------------------------|
| SAR measured | 250 mW input power | 12.8 mW / g |
| SAR for nominal Body TSL parameters | normalized to 1W | 50.5 mW /g ± 18.8 % (k=2) |
| SAR averaged over 10 cm ³ (10 g) of Body TSL | Condition | |
| SAR measured | 250 mW input power | 5.92 mW / g |
| SAR for nominal Body TSL parameters | normalized to 1W | 23.5 mW /g ± 18.7 % (k=2) |

Certificate No: Z18-60430





Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 52.3Ω+ 5.46 jΩ |
|--------------------------------------|----------------|
| Return Loss | - 24.7dB |

g

Antenna Parameters with Body TSL

| Impedance, transformed to feed point | 49.7Ω+ 7.26 jΩ | |
|--------------------------------------|----------------|--|
| Return Loss | - 22.8dB | |

General Antenna Parameters and Design

| Electrical Delay (one direction) | 1.022 ns | |
|----------------------------------|----------|--|
|----------------------------------|----------|--|

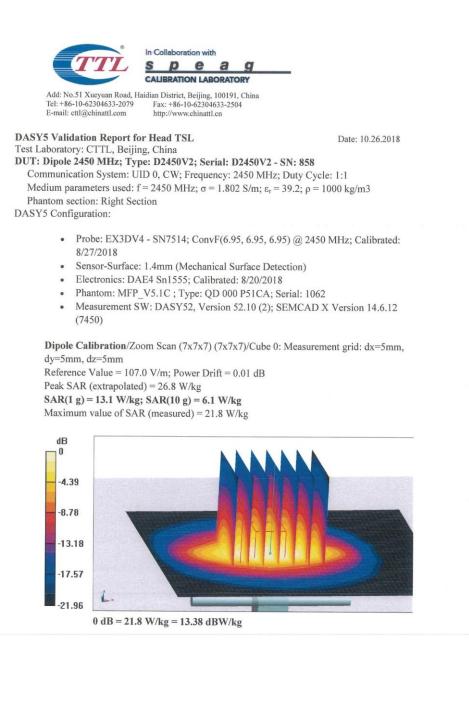
After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly or the dipole of 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

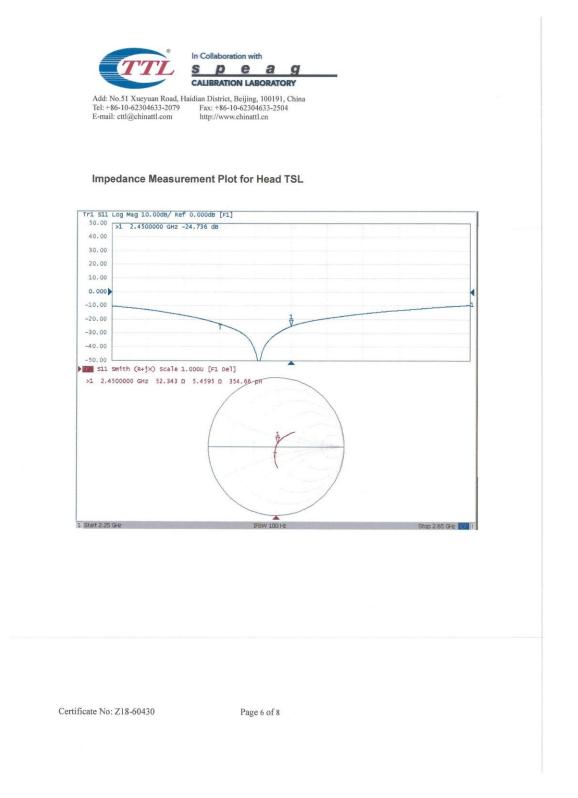
| Manufactured by | | SPEAG | |
|---------------------|-------------|-------|--|
| | | | |
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| icate No: Z18-60430 | Page 4 of 8 | | |



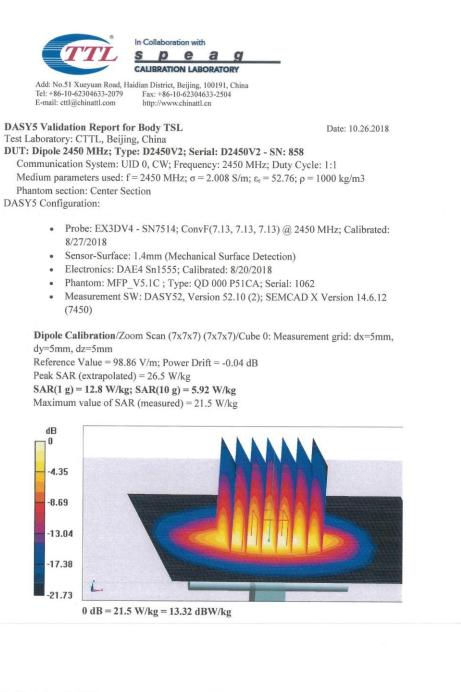


Page 5 of 8



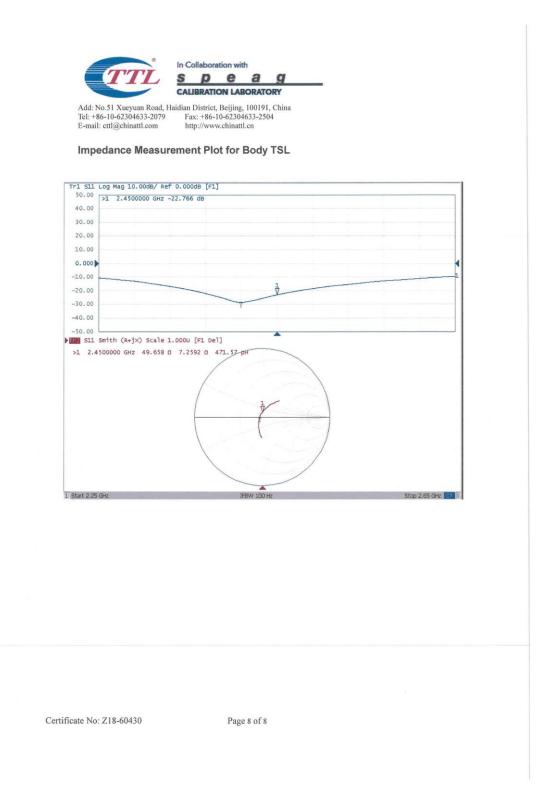






Page 7 of 8







| | CALIBRA | TION LABORATORY | CNAS 国际互认 |
|--|--|--|--|
| Add: No.51 Xueyu Tel: +86-10-62304 E-mail: cttl@china | 533-2079 Fax: - | strict, Beijing, 100191, China +86-10-62304633-2504 /www.chinattl.cn | CALIBRATIO CNAS L0570 |
| Client ECI1 | | | Z18-60431 |
| CALIBRATION C | | | |
| Object | D2600 | V2 - SN: 1031 | |
| Calibration Procedure(s) | FF-Z11 | 1-003-01 | |
| | Calibra | ation Procedures for dipole validation kits | |
| Calibration date: | Novem | ber 1, 2018 | |
| | asurements and | traceability to national standards, which the uncertainties with confidence probabil | |
| All adjibrations have been | conducted in | the closed laboratory facility: environme | ant temperature/22+21% and |
| | conducted in | the closed laboratory lacinty, environme | and temperature(2213) C and |
| numidity<70%. | | | ent temperature(2213) C and |
| numidity<70%. Calibration Equipment used | | | Scheduled Calibration |
| numidity<70%. Calibration Equipment used | (M&TE critical f | or calibration) | |
| numidity<70%. Calibration Equipment used Primary Standards Power Meter NRVD Power sensor NRV-Z5 | (M&TE critical fo ID # 102196 100596 | or calibration) Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
| numidity<70%. Calibration Equipment used Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 | (M&TE critical fo ID # 102196 100596 | or calibration) Cal Date(Calibrated by, Certificate No.) 07-Mar-18 (CTTL, No.J18X01510) | Scheduled Calibration Mar-19 Mar-19 |
| numidity<70%. Calibration Equipment used Primary Standards Power Meter NRVD Power sensor NRV-Z5 | (M&TE critical fo ID # 102196 100596 | Cal Date(Calibrated by, Certificate No.) 07-Mar-18 (CTTL, No.J18X01510) 07-Mar-18 (CTTL, No.J18X01510) | Scheduled Calibration Mar-19 Mar-19 3) Aug-19 |
| numidity<70%. Calibration Equipment used Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 | (M&TE critical fr ID # 102196 100596 SN 7514 | Or calibration) Cal Date(Calibrated by, Certificate No.) 07-Mar-18 (CTTL, No.J18X01510) 07-Mar-18 (CTTL, No.J18X01510) 27-Aug-18(SPEAG,No.EX3-7514_Aug18 20-Aug-18(SPEAG,No.DAE4-1555_Aug7 | Scheduled Calibration Mar-19 Mar-19 3) Aug-19 |
| numidity<70%. Calibration Equipment used Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE4 | (M&TE critical fr 102196 100596 SN 7514 SN 1555 | Cal Date(Calibrated by, Certificate No.) 07-Mar-18 (CTTL, No.J18X01510) 07-Mar-18 (CTTL, No.J18X01510) 27-Aug-18(SPEAG,No.EX3-7514_Aug18 | Scheduled Calibration Mar-19 Mar-19 3) Aug-19 18) Aug-19 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE4 Secondary Standards | (M&TE critical fr 102196 100596 SN 7514 SN 1555 ID # | Cal Date(Calibrated by, Certificate No.) 07-Mar-18 (CTTL, No.J18X01510) 07-Mar-18 (CTTL, No.J18X01510) 27-Aug-18(SPEAG,No.EX3-7514_Aug18 20-Aug-18(SPEAG,No.DAE4-1555_Aug Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration Mar-19 Mar-19 3) Aug-19 18) Aug-19 Scheduled Calibration |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C | (M&TE critical fr 102196 100596 SN 7514 SN 1555 ID # MY49071430 | Cal Date(Calibrated by, Certificate No.) 07-Mar-18 (CTTL, No.J18X01510) 07-Mar-18 (CTTL, No.J18X01510) 27-Aug-18(SPEAG,No.EX3-7514_Aug18 20-Aug-18(SPEAG,No.DAE4-1555_Aug Cal Date(Calibrated by, Certificate No.) 23-Jan-18 (CTTL, No.J18X00560) | Scheduled Calibration Mar-19 Mar-19 3) Aug-19 18) Aug-19 Scheduled Calibration Jan-19 Jan-19 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C Network Analyzer E5071C | (M&TE critical fr 102196 100596 SN 7514 SN 1555 ID # MY49071430 MY46110673 | Cal Date(Calibrated by, Certificate No.) 07-Mar-18 (CTTL, No.J18X01510) 07-Mar-18 (CTTL, No.J18X01510) 27-Aug-18(SPEAG,No.EX3-7514_Aug18 20-Aug-18(SPEAG,No.DAE4-1555_Aug Cal Date(Calibrated by, Certificate No.) 23-Jan-18 (CTTL, No.J18X00560) 24-Jan-18 (CTTL, No.J18X00561) | Scheduled Calibration Mar-19 Mar-19 3) Aug-19 18) Aug-19 Scheduled Calibration Jan-19 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C Network Analyzer E5071C | (M&TE critical fi 102196 100596 SN 7514 SN 1555 ID # MY49071430 MY46110673 Name | Cal Date(Calibrated by, Certificate No.) 07-Mar-18 (CTTL, No.J18X01510) 07-Mar-18 (CTTL, No.J18X01510) 27-Aug-18(SPEAG,No.EX3-7514_Aug18 20-Aug-18(SPEAG,No.DAE4-1555_Aug18 Cal Date(Calibrated by, Certificate No.) 23-Jan-18 (CTTL, No.J18X00560) 24-Jan-18 (CTTL, No.J18X00561) Function | Scheduled Calibration Mar-19 Mar-19 3) Aug-19 18) Aug-19 Scheduled Calibration Jan-19 Jan-19 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C Network Analyzer E5071C Calibrated by: Reviewed by: | (M&TE critical fr ID # 102196 100596 SN 7514 SN 1555 ID # MY49071430 MY46110673 Name Zhao Jing | Cal Date(Calibrated by, Certificate No.) 07-Mar-18 (CTTL, No.J18X01510) 07-Mar-18 (CTTL, No.J18X01510) 27-Aug-18(SPEAG,No.EX3-7514_Aug18 20-Aug-18(SPEAG,No.DAE4-1555_Aug7 Cal Date(Calibrated by, Certificate No.) 23-Jan-18 (CTTL, No.J18X00560) 24-Jan-18 (CTTL, No.J18X00561) Function SAR Test Engineer | Scheduled Calibration Mar-19 Mar-19 3) Aug-19 18) Aug-19 Scheduled Calibration Jan-19 Jan-19 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C Network Analyzer E5071C Calibrated by: Reviewed by: Approved by: | (M&TE critical fi 102196 100596 SN 7514 SN 1555 ID # MY49071430 MY46110673 Name Zhao Jing Lin Hao Qi Dianyuan | Cal Date(Calibrated by, Certificate No.) 07-Mar-18 (CTTL, No.J18X01510) 07-Mar-18 (CTTL, No.J18X01510) 27-Aug-18 (SPEAG, No.EX3-7514_Aug18 20-Aug-18 (SPEAG, No.DAE4-1555_Aug2 Cal Date(Calibrated by, Certificate No.) 23-Jan-18 (CTTL, No.J18X00560) 24-Jan-18 (CTTL, No.J18X00561) Function SAR Test Engineer SAR Test Engineer SAR Project Leader | Scheduled Calibration Mar-19 Mar-19 3) Aug-19 18) Aug-19 Scheduled Calibration Jan-19 Jan-19 Jan-19 Jan-19 Jan-19 Signature |



TSL

N/A



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Glossary: tissue simulating liquid ConvF sensitivity in TSL / NORMx,y,z not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for 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: Z18-60431



| - | Sector Statements | 8 |
|---|-------------------|----|
| | T | TT |
| _ | | |
| - | | - |
| | | |



Measurement Conditions

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

Head TSL parameters The following parameters and calculations were applied.

| the following parameters and calculations were | applieu. | | | |
|--|-------------------------|-----------|--------|----------------------|
| | Temperature | Permitt | ivity | Conductivity |
| Nominal Head TSL parameters | 22.0 °C | 39.0 | | 1.96 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 39.1 ± | 6 % | 1.94 mho/m ± 6 % |
| Head TSL temperature change during test | <1.0 °C | | | |
| R result with Head TSL | | | | |
| SAR averaged over 1 cm^3 (1 g) of Head TSL | Condi | tion | | |
| SAR measured | 250 mW in | put power | | 14.2 mW / g |
| SAR for nominal Head TSL parameters | normalize | ed to 1W | 57.2 | mW /g ± 18.8 % (k=2) |
| SAR averaged over 10 cm^3 (10 g) of Head T | SL Condi | tion | | |
| SAR measured | 250 mW in | put power | | 6.33 mW / g |
| SAR for nominal Head TSL parameters | normalize | ed to 1W | 25.4 | mW /g ± 18.7 % (k=2) |
| The following parameters and calculations were | applied. Temperature | Permitt | vity | Conductivity |
| Nominal Body TSL parameters | 22.0 °C | 52.5 | , | 2.16 mho/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 52.7 ± | 6 % | 2.21 mho/m ± 6 % |
| Body TSL temperature change during test | <1.0 °C | | | |
| R result with Body TSL | | 1 | | |
| SAR averaged over 1 cm^3 (1 g) of Body TSL | . Condi | tion | | |
| SAR measured | 250 mW in | put power | | 13.7 mW / g |
| SAR for nominal Body TSL parameters | normalize | d to 1W | 54.3 1 | mW /g ± 18.8 % (k=2) |
| SAR averaged over 10 cm^3 (10 g) of Body T | SL Condit | lion | | |
| SAR measured | 250 mW in | put power | | 6.06 mW / g |
| SAR for nominal Body TSL parameters | normalize | d to 1W | 24.1 1 | mW /g ± 18.7 % (k=2) |
| | | | | |

Certificate No: Z18-60431





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Appendix(Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 48.5Ω- 4.69jΩ |
|--------------------------------------|---------------|
| Return Loss | - 26.0dB |

Antenna Parameters with Body TSL

| Impedance, transformed to feed point | 46.9Ω- 4.36jΩ | |
|--------------------------------------|---------------|--|
| Return Loss | - 25.1dB | |

General Antenna Parameters and Design

| Electrical Delay (one direction) | 1.015 ns | |
|----------------------------------|----------|--|
|----------------------------------|----------|--|

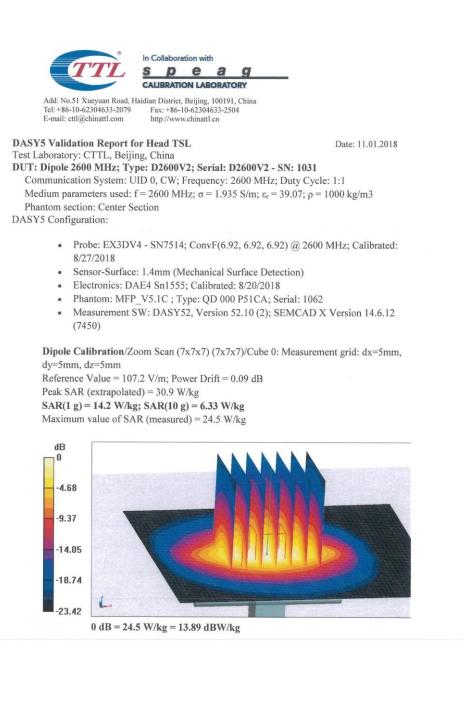
After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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

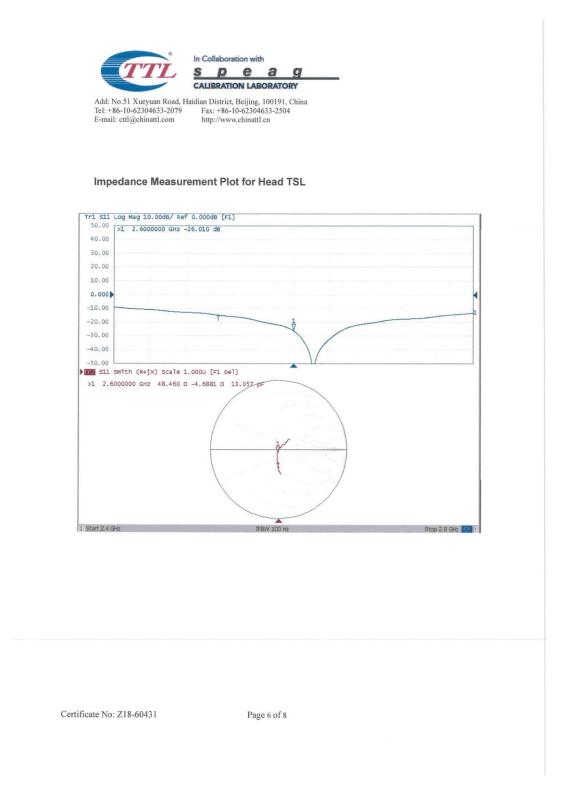
| Manufactured by | | SPEAG | |
|-----------------------|-------------|-------|--|
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| ificate No: Z18-60431 | Page 4 of 8 | | |



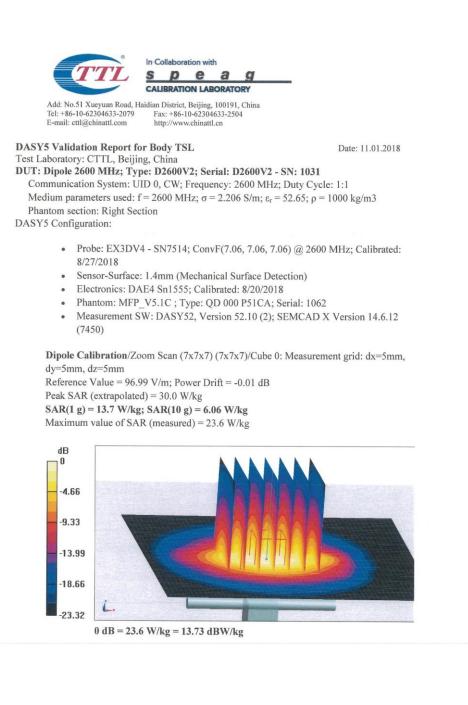


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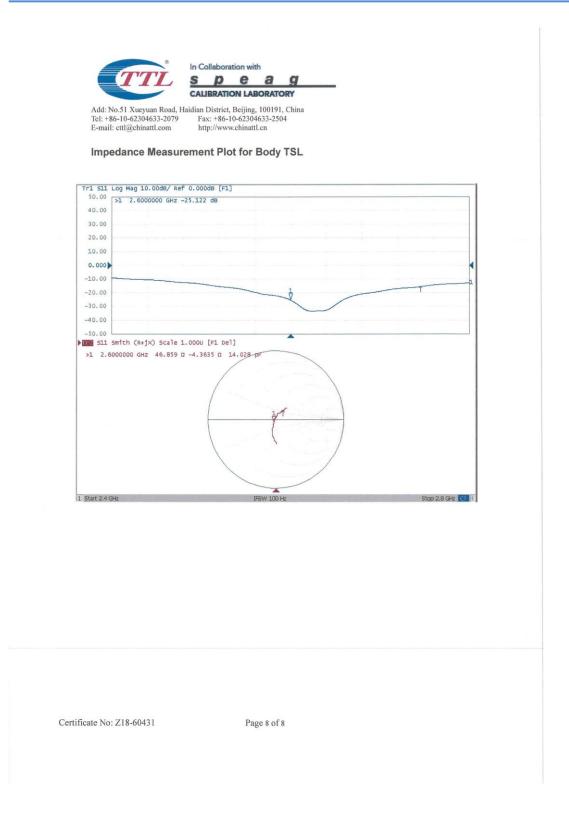






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| ECIT | |
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| | |

| Add: No.51 Xueyu Tel: +86-10-62304 | | TION LABORATORY strict, Beijing, 100191, China +86-10-62304633-2504 | 中国认可 国际互认 校准 CALIBRATION CNAS L0570 |
|--|---|---|---|
| E-mail: cttl@china | ttl.com http: | //www.chinattl.cn | |
| Client ECI | | | 218-60042 |
| CALIBRATION C | ERTIFICA | IE | |
| Object | D5GH | zV2 - SN: 1172 | |
| Calibration Procedure(s) | | 1-003-01 ation Procedures for dipole validation kits | |
| Calibration date: | March | 30, 2018 | |
| measurements(SI). The me pages and are part of the ce | asurements and ertificate. | traceability to national standards, which m the uncertainties with confidence probabilit the closed laboratory facility: environmen | y are given on the following |
| Calibration Equipment used | I (M&TE critical f | or calibration) | |
| Primary Standards | ID # | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
| | | | Scheduled Calibration |
| Power Meter NRP2 | 102083 | 01-Nov-17 (CTTL, No.J17X08756) | Oct-18 |
| Power sensor NRP-Z91 | 100542 | 01-Nov-17 (CTTL, No.J17X08756) 01-Nov-17 (CTTL, No.J17X08756) | Oct-18 Oct-18 |
| Power sensor NRP-Z91 ReferenceProbe EX3DV4 | 100542 SN 7464 | 01-Nov-17 (CTTL, No.J17X08756) 01-Nov-17 (CTTL, No.J17X08756) 12-Sep-17(SPEAG,No.EX3-7464_Sep17) | Oct-18 Oct-18 Sep-18 |
| Power sensor NRP-Z91 | 100542 | 01-Nov-17 (CTTL, No.J17X08756) 01-Nov-17 (CTTL, No.J17X08756) | Oct-18 Oct-18 Sep-18 |
| Power sensor NRP-Z91 ReferenceProbe EX3DV4 | 100542 SN 7464 | 01-Nov-17 (CTTL, No.J17X08756) 01-Nov-17 (CTTL, No.J17X08756) 12-Sep-17(SPEAG,No.EX3-7464_Sep17) | Oct-18 Oct-18 Sep-18 |
| Power sensor NRP-Z91 ReferenceProbe EX3DV4 DAE4 | 100542 SN 7464 SN 1525 | 01-Nov-17 (CTTL, No.J17X08756) 01-Nov-17 (CTTL, No.J17X08756) 12-Sep-17(SPEAG,No.EX3-7464_Sep17) 02-Oct-17(SPEAG,No.DAE4-1525_Oct17) | Oct-18 Oct-18 Sep-18) Oct-18 |
| Power sensor NRP-Z91 ReferenceProbe EX3DV4 DAE4 Secondary Standards | 100542 SN 7464 SN 1525 ID # | 01-Nov-17 (CTTL, No.J17X08756) 01-Nov-17 (CTTL, No.J17X08756) 12-Sep-17(SPEAG,No.EX3-7464_Sep17) 02-Oct-17(SPEAG,No.DAE4-1525_Oct17) Cal Date(Calibrated by, Certificate No.) | Oct-18 Oct-18 Sep-18) Oct-18 Scheduled Calibration |
| Power sensor NRP-Z91 ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzerE5071C | 100542 SN 7464 SN 1525 ID # MY49071430 | 01-Nov-17 (CTTL, No.J17X08756) 01-Nov-17 (CTTL, No.J17X08756) 12-Sep-17(SPEAG,No.EX3-7464_Sep17) 02-Oct-17(SPEAG,No.DAE4-1525_Oct17) Cal Date(Calibrated by, Certificate No.) 23-Jan-18 (CTTL, No.J18X00560) | Oct-18 Oct-18 Sep-18) Oct-18 Scheduled Calibration Jan-19 |
| Power sensor NRP-Z91 ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzerE5071C | 100542 SN 7464 SN 1525 ID # MY49071430 MY46110673 | 01-Nov-17 (CTTL, No.J17X08756) 01-Nov-17 (CTTL, No.J17X08756) 12-Sep-17(SPEAG,No.EX3-7464_Sep17) 02-Oct-17(SPEAG,No.DAE4-1525_Oct17) Cal Date(Calibrated by, Certificate No.) 23-Jan-18 (CTTL, No.J18X00560) 24-Jan-18 (CTTL, No.J18X00561) | Oct-18 Oct-18 Sep-18) Oct-18 Scheduled Calibration Jan-19 Jan-19 |
| Power sensor NRP-Z91 ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzerE5071C Calibrated by: | 100542 SN 7464 SN 1525 ID # MY49071430 MY46110673 Name | 01-Nov-17 (CTTL, No.J17X08756) 01-Nov-17 (CTTL, No.J17X08756) 12-Sep-17(SPEAG,No.EX3-7464_Sep17) 02-Oct-17(SPEAG,No.DAE4-1525_Oct17) Cal Date(Calibrated by, Certificate No.) 23-Jan-18 (CTTL, No.J18X00560) 24-Jan-18 (CTTL, No.J18X00561) Function | Oct-18 Oct-18 Sep-18) Oct-18 Scheduled Calibration Jan-19 Jan-19 |
| Power sensor NRP-Z91 ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C | 100542 SN 7464 SN 1525 ID # MY49071430 MY46110673 Name Zhao Jing | 01-Nov-17 (CTTL, No.J17X08756) 01-Nov-17 (CTTL, No.J17X08756) 12-Sep-17(SPEAG,No.EX3-7464_Sep17) 02-Oct-17(SPEAG,No.DAE4-1525_Oct17) Cal Date(Calibrated by, Certificate No.) 23-Jan-18 (CTTL, No.J18X00560) 24-Jan-18 (CTTL, No.J18X00561) Function SAR Test Engineer | Oct-18 Oct-18 Sep-18) Oct-18 Scheduled Calibration Jan-19 Jan-19 |
| Power sensor NRP-Z91 ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzerE5071C Calibrated by: Reviewed by: Approved by: | 100542 SN 7464 SN 1525 ID # MY49071430 MY46110673 Name Zhao Jing Lin Hao Qi Dianyuan | 01-Nov-17 (CTTL, No.J17X08756) 01-Nov-17 (CTTL, No.J17X08756) 12-Sep-17(SPEAG,No.EX3-7464_Sep17) 02-Oct-17(SPEAG,No.DAE4-1525_Oct17) Cal Date(Calibrated by, Certificate No.) 23-Jan-18 (CTTL, No.J18X00560) 24-Jan-18 (CTTL, No.J18X00561) Function SAR Test Engineer SAR Test Engineer SAR Project Leader Issued: Apri | Oct-18 Oct-18 Sep-18 Oct-18 Scheduled Calibration Jan-19 Jan-19 Jan-19 Jan-19 |
| Power sensor NRP-Z91 ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzerE5071C Calibrated by: Reviewed by: Approved by: | 100542 SN 7464 SN 1525 ID # MY49071430 MY46110673 Name Zhao Jing Lin Hao Qi Dianyuan | 01-Nov-17 (CTTL, No.J17X08756) 01-Nov-17 (CTTL, No.J17X08756) 12-Sep-17(SPEAG,No.EX3-7464_Sep17) 02-Oct-17(SPEAG,No.DAE4-1525_Oct17) Cal Date(Calibrated by, Certificate No.) 23-Jan-18 (CTTL, No.J18X00560) 24-Jan-18 (CTTL, No.J18X00561) Function SAR Test Engineer SAR Test Engineer SAR Project Leader | Oct-18 Oct-18 Sep-18 Oct-18 Scheduled Calibration Jan-19 Jan-19 Jan-19 Jan-19 |





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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. 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: 718-60042