APPENDIX D: RELEVANT PAGES FROM DAE&

DIPOLE VALIDATION KIT REPORT(S)

| 11 | <u>I</u> s p | | 中国认可国际互认 |
|--|--|---|--|
| Add: No.52 HuaYu Tel: +86-10-623046 E-mail: ettl@chinat | 533-2079 Fax: | n District, Beijing, 100191, Chi +86-10-62304633-2504 //www.chinattl.en | CALIBRATIO CNAS L0570 |
| Client SMQ | 0 | Certificate No: Z | 21-60302 |
| CALIBRATION CI | ERTIFICAT | ſE | |
| Object | D835V | /2 - SN: 4d141 | |
| Calibration Procedure(s) | | 1-003-01 ation Procedures for dipole validation kits | |
| Calibration date: | August | t 31, 2021 | |
| All calibrations have been | conducted in t | the closed laboratory facility: environment | temperature (22±3)°C and |
| All calibrations have been humidity<70%. Calibration Equipment used | | | temperature (22±3)°C and |
| humidity<70%. Calibration Equipment used Primary Standards | | | temperature (22±3)*C and Scheduled Calibration |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 | (M&TE critical f ID # 106277 | Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) | |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S | (M&TE critical f ID # 106277 104291 | Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) | Scheduled Calibration Sep-21 Sep-21 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 | (M&TE critical f ID # 106277 104291 SN 7517 | Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) 03-Feb-21(CTTL-SPEAG,No.Z21-60001) | Scheduled Calibration Sep-21 Sep-21 Feb-22 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S | (M&TE critical f ID # 106277 104291 | Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) | Scheduled Calibration Sep-21 Sep-21 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 | (M&TE critical f ID # 106277 104291 SN 7517 | Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) 03-Feb-21(CTTL-SPEAG,No.Z21-60001) | Scheduled Calibration Sep-21 Sep-21 Feb-22 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE3 Secondary Standards Signal Generator E4438C | (M&TE critical f ID # 106277 104291 SN 7517 SN 536 ID # MY49071430 | Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) 03-Feb-21(CTTL-SPEAG,No.Z21-60001) 06-Nov-20(CTTL-SPEAG,No.Z20-60452) Cal Date (Calibrated by, Certificate No.) 01-Feb-21 (CTTL, No.J21X00593) | Scheduled Calibration Sep-21 Sep-21 Feb-22 Nov-21 Scheduled Calibration Jan-22 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE3 Secondary Standards | (M&TE critical f ID # 106277 104291 SN 7517 SN 536 ID # MY49071430 MY46110673 | Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) 03-Feb-21 (CTTL-SPEAG,No.Z21-60001) 06-Nov-20(CTTL-SPEAG,No.Z20-60452) Cal Date (Calibrated by, Certificate No.) 01-Feb-21 (CTTL, No.J21X00593) 14-Jan-21 (CTTL, No.J21X00232) | Scheduled Calibration Sep-21 Sep-21 Feb-22 Nov-21 Scheduled Calibration Jan-22 Jan-22 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE3 Secondary Standards Signal Generator E4438C | (M&TE critical f ID # 106277 104291 SN 7517 SN 536 ID # MY49071430 | Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) 03-Feb-21(CTTL-SPEAG,No.Z21-60001) 06-Nov-20(CTTL-SPEAG,No.Z20-60452) Cal Date (Calibrated by, Certificate No.) 01-Feb-21 (CTTL, No.J21X00593) 14-Jan-21 (CTTL, No.J21X00232) Function | Scheduled Calibration Sep-21 Sep-21 Feb-22 Nov-21 Scheduled Calibration Jan-22 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE3 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C | (M&TE critical f ID # 106277 104291 SN 7517 SN 536 ID # MY49071430 MY46110673 Name | Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) 03-Feb-21 (CTTL-SPEAG,No.Z21-60001) 06-Nov-20(CTTL-SPEAG,No.Z20-60452) Cal Date (Calibrated by, Certificate No.) 01-Feb-21 (CTTL, No.J21X00593) 14-Jan-21 (CTTL, No.J21X00232) | Scheduled Calibration Sep-21 Sep-21 Feb-22 Nov-21 Scheduled Calibration Jan-22 Jan-22 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE3 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C | (M&TE critical f ID # 106277 104291 SN 7517 SN 536 ID # MY49071430 MY49071430 MY46110673 Name Zhao Jing | Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) 03-Feb-21(CTTL-SPEAG,No.Z21-60001) 06-Nov-20(CTTL-SPEAG,No.Z20-60452) 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-21 Sep-21 Feb-22 Nov-21 Scheduled Calibration Jan-22 Jan-22 |

Page 1 of 6



Glossary:

| 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: Z21-60302

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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.

| 2996 | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters | 22.0 °C | 41.5 | 0.90 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 41.7 ± 6 % | 0.88 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 | 2.36 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 9.58 W/kg ± 18.8 % (k=2) |
| SAR averaged over 10 cm^3 (10 g) of Head TSL | Condition | |
| SAR measured | 250 mW input power | 1.53 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 6.19 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 | 50.6Ω- 6.50jΩ | |
|--------------------------------------|---------------|--|
| Return Loss | - 23.8dB | |

General Antenna Parameters and Design

| Electrical Delay (one direction) | 1.299 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 DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d141 Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1 Medium parameters used: f = 835 MHz; $\sigma = 0.884$ S/m; $\varepsilon_r = 41.66$; $\rho = 1000$ kg/m³ Phantom section: Right Section

DASY5 Configuration:

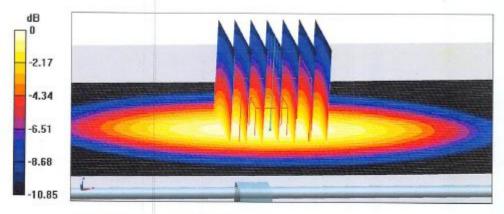
Probe: EX3DV4 - SN7517; ConvF(9.81, 9.81, 9.81) @ 835 MHz; Calibrated; . 2021-02-03

Date: 08.31.2021

- Sensor-Surface: 1.4mm (Mechanical Surface Detection) .
- Electronics: DAE3 Sn536; Calibrated: 2020-11-06
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 . (7483)

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

Reference Value = 59.32 V/m; Power Drift = -0.07 dB Peak SAR (extrapolated) = 3.73 W/kg SAR(1 g) = 2.36 W/kg; SAR(10 g) = 1.53 W/kg Smallest distance from peaks to all points 3 dB below = 18 mm Ratio of SAR at M2 to SAR at M1 = 63,4% Maximum value of SAR (measured) = 3.25 W/kg



0 dB = 3.25 W/kg = 5.12 dBW/kg

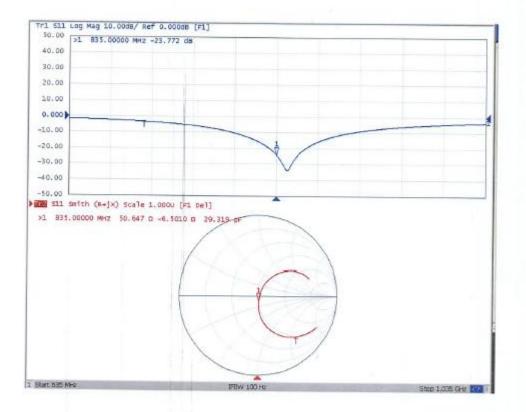
Certificate No: Z21-60302

Page 5 of 6



Add: No.52 Hua YuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-62304633-2079 E-mail: ettl@chinattl.com

Impedance Measurement Plot for Head TSL



Certificate No: Z21-60302

Page 6 of 6

| | TL S A | e a g | 中国认可国际互认 |
|--|------------------------|---|---|
| Add: No 52 HunVi | | ATION LABORATORY | NAS 校准 CALIBRATIO |
| Tel: +86-10-62304 E-mail: ettl@china | 633-2079 Fax: | +86-10-62304633-2504 | CNAS L0570 |
| Client SM | Q | Certificate No: Z | 21-60303 |
| CALIBRATION C | ERTIFICA | TE | |
| Object | D900\ | /2 - SN:1d077 | |
| Calibration Procedure(s) | | 1-003-01 | |
| Calibration date: | | ation Procedures for dipole validation kits | |
| This calibration Certificate measurements (SI). The me pages and are part of the c | easurements and | traceability to national standards, which re I the uncertainties with confidence probability | alize the physical units of are given on the following |
| All calibrations have been humidity<70%. | conducted in | the closed laboratory facility: environment | temperature (22±3)°C and |
| Calibration Equipment used | I (M&TE critical f | or calibration) | |
| Primary Standards | ID # | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
| Power Meter NRP2 | 106277 | 23-Sep-20 (CTTL, No.J20X08336) | Sep-21 |
| Power sensor NRP8S Reference Probe EX3DV4 | 104291 SN 7517 | 23-Sep-20 (CTTL, No.J20X08336) | Sep-21 |
| DAE3 | SN 536 | 03-Feb-21(CTTL-SPEAG,No.Z21-60001) 06-Nov-20(CTTL-SPEAG,No.Z20-60452) | Feb-22 Nov-21 |
| Secondary Standards | ID# | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
| Signal Generator E4438C | MY49071430 | 01-Feb-21 (CTTL, No.J21X00593) | Jan-22 |
| NetworkAnalyzer E5071C | MY46110673 | 14-Jan-21 (CTTL, No.J21X00232) | Jan-22 |
| | Name | Function | Signature |
| | | | 1.4 |
| Calibrated by: | Zhao Jing | SAR Test Engineer | 201- |
| | Zhao Jing Lin Hao | SAR Test Engineer | 林兆 |
| Calibrated by: Reviewed by: Approved by: | | | 1000 林治 えの |
| Reviewed by: Approved by: | Lin Hao Qi Dianyuan | SAR Test Engineer | 数型 林子路 ま 31, 2021 of the laboratory. |



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", February 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: Z21-60303

Page 2 of 6



Measurement Conditions

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

| DASY Version | DASY52 | 52.10.4 |
|------------------------------|--------------------------|-------------|
| 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 | 900 MHz ± 1 MHz | |

Head TSL parameters The following parameters and calculations were applied.

| Temperature | Permittivity | Conductivity |
|-----------------|----------------------------|--|
| 22.0 °C | 41.5 | 0.97 mho/m |
| (22.0 ± 0.2) °C | 41.2 ± 6 % | 0.96 mho/m ± 6 % |
| <1.0 °C | | |
| | 22.0 °C (22.0 ± 0.2) °C | 22.0 °C 41.5 (22.0 ± 0.2) °C 41.2 ± 6 % |

SAR result with Head TSL

| Condition | |
|--------------------|---|
| 250 mW input power | 2.72 W/kg |
| normalized to 1W | 10.9 W/kg ± 18.8 % (k=2) |
| Condition | |
| 250 mW input power | 1.74 W/kg |
| normalized to 1W | 7.00 W/kg ± 18.7 % (k=2) |
| | 250 mW input power normalized to 1W Condition 250 mW input power |

Certificate No: Z21-60303

Page 3 of 6



Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 49.8Ω- 5.06jΩ | |
|--------------------------------------|---------------|--|
| Return Loss | - 25.9dB | |

General Antenna Parameters and Design

| Electrical Delay (one direction) | 1.316 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 semingid 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 | |
|----------------------|-------------|-------|--|
| | 1 | | |
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| | | | |
| 5 | | | |
| ficate No: Z21-60303 | Page 4 of 6 | | |
| | | | |



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

Date: 08.27.2021

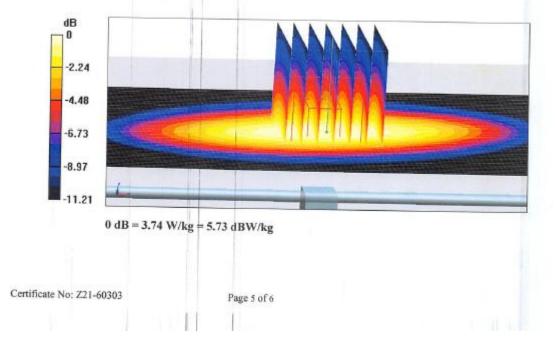
DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN: 1d077 Communication System: UID 0, CW; Frequency: 900 MHz; Duty Cycle: 1:1 Medium parameters used: f = 900 MHz; $\sigma = 0.96$ S/m; $\epsilon_r = 41.22$; $\rho = 1000$ kg/m³ Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 SN7517; ConvF(9.4, 9.4, 9.4) @ 900 MHz; Calibrated: 2021-02-03
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn536; Calibrated: 2020-11-06
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

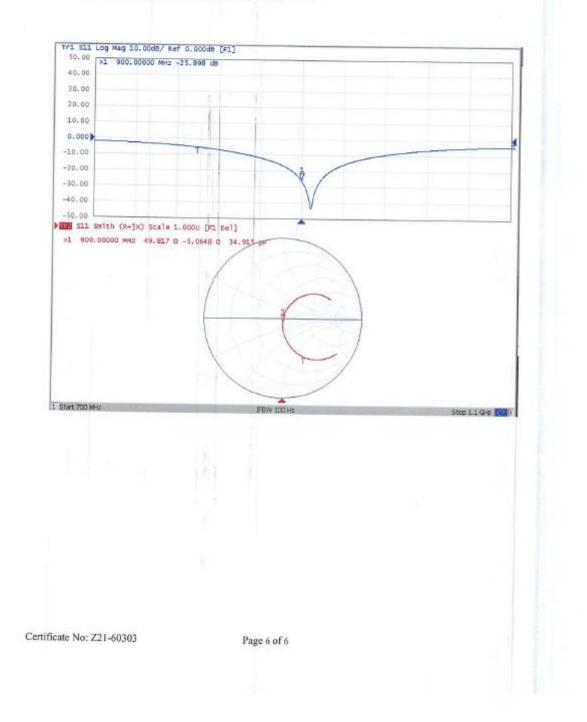
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 61.13 V/m; Power Drift = -0.06 dB Peak SAR (extrapolated) = 4.31 W/kg SAR(1 g) = 2.72 W/kg; SAR(10 g) = 1.74 W/kg Smallest distance from peaks to all points 3 dB below = 17 mm Ratio of SAR at M2 to SAR at M1 = 63.1% Maximum value of SAR (measured) = 3.74 W/kg





Impedance Measurement Plot for Head TSL



| | L s p | e a g | 中国认可国际互认 |
|---|--|--|--|
| Add; No.51 Xueyua Tel: +86-10-623046 E-mail: cttl@chinatt | n Road, Haidian Dist 33-2079 Fax: + | TON LABORATORY trict, Beijing, 100191, China 86-10-62304633-2504 www.chinattl.cn | 校准 CALIBRATIO CNAS L0570 |
| Client SMQ | 100 million 100 | Certificate No: Z20 | -60038 |
| CALIBRATION CE | ERTIFICAT | E | |
| Object | D1750 | /2 - SN: 1108 | |
| Calibration Procedure(s) | FF-Z11 | 003.01 | |
| | | tion Procedures for dipole validation kits | |
| Calibration date: | January | / 3, 2020 | |
| pages and are part of the ce | rtificate. | the uncertainties with confidence probability the closed laboratory facility: environment | |
| Calibration Equipment used | (M&TE critical fo | | Scheduled Calibration |
| Calibration Equipment used | | Cal Date(Calibrated by, Certificate No.) 11-Apr-19 (CTTL, No.J19X02605) | Scheduled Calibration Apr-20 |
| Calibration Equipment used Primary Standards | ID # | Cal Date(Calibrated by, Certificate No.) | |
| Calibration Equipment used Primary Standards Power Meter NRP2 | ID # 106276 101369 | Cal Date(Calibrated by, Certificate No.) 11-Apr-19 (CTTL, No.J19X02605) | Apr-20 |
| Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A | ID # 106276 101369 | Cal Date(Calibrated by, Certificate No.) 11-Apr-19 (CTTL, No.J19X02605) 11-Apr-19 (CTTL, No.J19X02605) | Apr-20 Apr-20 |
| Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 | ID # 106276 101369 SN 3617 | Cal Date(Calibrated by, Certificate No.) 11-Apr-19 (CTTL, No.J19X02605) 11-Apr-19 (CTTL, No.J19X02605) 31-Jan-19(SPEAG,No.EX3-3617_Jan19) | Apr-20 Apr-20 Jan-20 Aug-20 |
| Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4 | ID # 106276 101369 SN 3617 SN 1555 | Cal Date(Calibrated by, Certificate No.) 11-Apr-19 (CTTL, No.J19X02605) 11-Apr-19 (CTTL, No.J19X02605) 31-Jan-19(SPEAG,No.EX3-3617_Jan19) 22-Aug-19(CTTL-SPEAG,No.Z19-60295) | Apr-20 Apr-20 Jan-20 Aug-20 |
| Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4 Secondary Standards | ID # 106276 101369 SN 3617 SN 1555 ID # | Cal Date(Calibrated by, Certificate No.) 11-Apr-19 (CTTL, No.J19X02605) 11-Apr-19 (CTTL, No.J19X02605) 31-Jan-19(SPEAG,No.EX3-3617_Jan19) 22-Aug-19(CTTL-SPEAG,No.Z19-60295) Cal Date(Calibrated by, Certificate No.) | Apr-20 Apr-20 Jan-20 Aug-20 Scheduled Calibration |
| Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C | ID # 106276 101369 SN 3617 SN 1555 ID # MY49071430 | Cal Date(Calibrated by, Certificate No.) 11-Apr-19 (CTTL, No.J19X02605) 11-Apr-19 (CTTL, No.J19X02605) 31-Jan-19(SPEAG,No.EX3-3617_Jan19) 22-Aug-19(CTTL-SPEAG,No.Z19-60295) Cal Date(Calibrated by, Certificate No.) 23-Jan-19 (CTTL, No.J19X00336) | Apr-20 Apr-20 Jan-20 Aug-20 Scheduled Calibration Jan-20 |
| Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C | ID # 106276 101369 SN 3617 SN 1555 ID # MY49071430 MY46110673 | Cal Date(Calibrated by, Certificate No.) 11-Apr-19 (CTTL, No.J19X02605) 11-Apr-19 (CTTL, No.J19X02605) 31-Jan-19(SPEAG,No.EX3-3617_Jan19) 22-Aug-19(CTTL-SPEAG,No.Z19-60295) Cal Date(Calibrated by, Certificate No.) 23-Jan-19 (CTTL, No.J19X00336) 24-Jan-19 (CTTL, No.J19X00547) | Apr-20 Apr-20 Jan-20 Aug-20 Scheduled Calibration Jan-20 Jan-20 |
| Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C | ID # 106276 101369 SN 3617 SN 1555 ID # MY49071430 MY46110673 Name | Cal Date(Calibrated by, Certificate No.) 11-Apr-19 (CTTL, No.J19X02605) 11-Apr-19 (CTTL, No.J19X02605) 31-Jan-19(SPEAG,No.EX3-3617_Jan19) 22-Aug-19(CTTL-SPEAG,No.Z19-60295) Cal Date(Calibrated by, Certificate No.) 23-Jan-19 (CTTL, No.J19X00336) 24-Jan-19 (CTTL, No.J19X00547) Function | Apr-20 Apr-20 Jan-20 Aug-20 Scheduled Calibration Jan-20 Jan-20 |
| Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C Calibrated by: Reviewed by: | ID # 106276 101369 SN 3617 SN 1555 ID # MY49071430 MY46110673 Name Zhao Jing | Cal Date(Calibrated by, Certificate No.) 11-Apr-19 (CTTL, No.J19X02605) 11-Apr-19 (CTTL, No.J19X02605) 31-Jan-19(SPEAG,No.EX3-3617_Jan19) 22-Aug-19(CTTL-SPEAG,No.Z19-60295) Cal Date(Calibrated by, Certificate No.) 23-Jan-19 (CTTL, No.J19X00336) 24-Jan-19 (CTTL, No.J19X00547) Function SAR Test Engineer | Apr-20 Apr-20 Jan-20 Aug-20 Scheduled Calibration Jan-20 Jan-20 |
| Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C | ID # 106276 101369 SN 3617 SN 1555 ID # MY49071430 MY46110673 Name Zhao Jing Lin Hao | Cal Date(Calibrated by, Certificate No.) 11-Apr-19 (CTTL, No.J19X02605) 11-Apr-19 (CTTL, No.J19X02605) 31-Jan-19(SPEAG,No.EX3-3617_Jan19) 22-Aug-19(CTTL-SPEAG,No.Z19-60295) Cal Date(Calibrated by, Certificate No.) 23-Jan-19 (CTTL, No.J19X00336) 24-Jan-19 (CTTL, No.J19X00547) Function SAR Test Engineer SAR Test Engineer | Apr-20 Apr-20 Jan-20 Aug-20 Scheduled Calibration Jan-20 Jan-20 Signature |

Certificate No: Z20-60038

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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: Z20-60038

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Measurement Conditions

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

| DASY Version | DASY52 | V52.10.3 |
|------------------------------|--------------------------|-------------|
| 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 | 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 | 40.5 ± 6 % | 1.37 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 | 8.89 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 35.7 W/kg ± 18.8 % (k=2) |
| SAR averaged over 10 cm ³ (10 g) of Head TSL | Condition | |
| SAR measured | 250 mW input power | 4.69 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 18.8 W/kg ± 18.7 % (k=2) |

Body TSL parameters The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters | 22.0 °C | 53.4 | 1.49 mho/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 53.6 ± 6 % | 1.50 mho/m ± 6 % |
| Body TSL temperature change during test | <1.0 °C | تعلته | |

SAR result with Body TSL

| SAR averaged over 1 cm ³ (1 g) of Body TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 250 mW input power | 9.23 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 36.8 W/kg ± 18.8 % (k=2) |
| SAR averaged over 10 cm ³ (10 g) of Body TSL | Condition | |
| SAR measured | 250 mW input power | 4.89 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 19.5 W/kg ± 18.7 % (k=2) |

Certificate No: Z20-60038

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 http://www.chinattl.cn

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 49.2Ω- 0.65 jΩ | |
|--------------------------------------|----------------|--|
| Return Loss | - 39.7 dB | |

Antenna Parameters with Body TSL

| Impedance, transformed to feed point | 45.8Ω- 1.02 jΩ | |
|--------------------------------------|----------------|--|
| Return Loss | - 26.8 dB | |

General Antenna Parameters and Design

| Electrical Delay (one direction) | 1.084 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: 01.03.2020

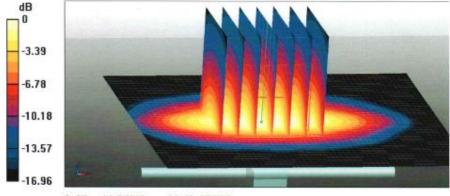
DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1108 Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1 Medium parameters used: f = 1750 MHz; $\sigma = 1.365$ S/m; $\varepsilon_r = 40.52$; $\rho = 1000$ kg/m3 Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 SN3617; ConvF(8.38, 8.38, 8.38) @ 1750 MHz; Calibrated: 1/31/2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/22/2019
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

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

Reference Value = 97.57 V/m; Power Drift = 0.00 dB Peak SAR (extrapolated) = 16.7 W/kg SAR(1 g) = 8.89 W/kg; SAR(10 g) = 4.69 W/kg Smallest distance from peaks to all points 3 dB below = 10 mm Ratio of SAR at M2 to SAR at M1 = 54% Maximum value of SAR (measured) = 13.9 W/kg



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

Certificate No: Z20-60038

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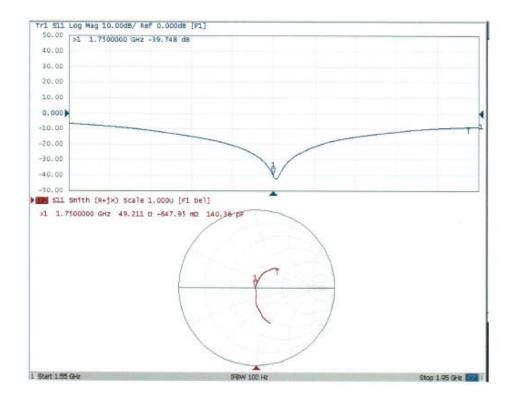


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Impedance Measurement Plot for Head TSL



Certificate No: Z20-60038

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

Date: 01.03.2020

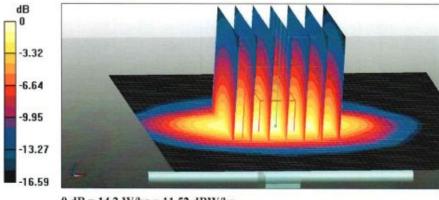
DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1108 Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1 Medium parameters used: f = 1750 MHz; σ = 1.499 S/m; ε_r = 53.62; ρ = 1000 kg/m3 Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 SN3617; ConvF(8.03, 8.03, 8.03) @ 1750 MHz; Calibrated: 1/31/2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/22/2019
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 89.57 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 16.8 W/kg SAR(1 g) = 9.23 W/kg; SAR(10 g) = 4.89 W/kg Smallest distance from peaks to all points 3 dB below = 9.2 mm Ratio of SAR at M2 to SAR at M1 = 55.7% Maximum value of SAR (measured) = 14.2 W/kg



0 dB = 14.2 W/kg = 11.52 dBW/kg

Certificate No: Z20-60038

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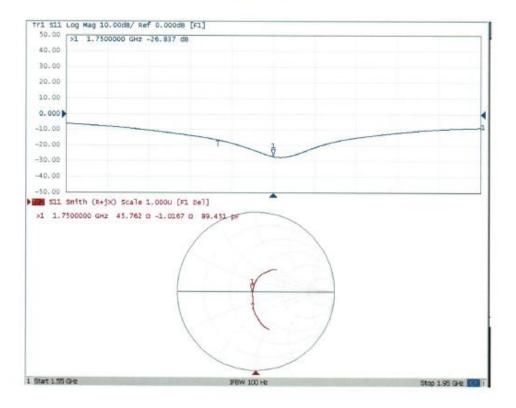


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Impedance Measurement Plot for Body TSL



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|--|--|---|--|
| Tel: +86-10-62304 E-mail: cttl@chini | 4633-2079 Fax: attl.com http: | n District, Beijing, 100191, Chi +86-10-62304633-2504 //www.chinattLen | CALIBRATIO CNAS L0570 |
| Client SMC | | | 21-60306 |
| CALIBRATION | ERTIFICA | IE | |
| Object | D2450 | VV2 - SN: 818 | |
| Calibration Procedure(s) | FF-Z1 | 1-003-01 | |
| | Calibra | ation Procedures for dipole validation kits | |
| Calibration date: | Augus | t 26, 2021 | |
| All collection to the | 1000 AL 1100 AL 1000 | 20 m | |
| All calibrations have been humidity<70%, Calibration Equipment used | | the closed laboratory facility: environment | temperature (22±3)°C and |
| humidity<70%. Calibration Equipment used Primary Standards | | | temperature (22±3)°C and Scheduled Calibration |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 | ID # 106277 | or calibration) Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) | |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S | ID # 106277 104291 | Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) | Scheduled Calibration Sep-21 Sep-21 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 | ID # 106277 104291 | or calibration) Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) | Scheduled Calibration Sep-21 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 | ID # 106277 104291 SN 7517 | or calibration) Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) 03-Feb-21(CTTL-SPEAG,No.Z21-60001) 06-Nov-20(CTTL-SPEAG,No.Z20-60452) | Scheduled Calibration Sep-21 Sep-21 Feb-22 Nov-21 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE3 | ID # 106277 104291 SN 7517 SN 536 | Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) 03-Feb-21(CTTL-SPEAG,No.Z21-60001) | Scheduled Calibration Sep-21 Sep-21 Feb-22 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE3 Secondary Standards | ID # 106277 104291 SN 7517 SN 536 ID # | Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) 03-Feb-21(CTTL-SPEAG,No.Z21-60001) 06-Nov-20(CTTL-SPEAG,No.Z20-60452) Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration Sep-21 Sep-21 Feb-22 Nov-21 Scheduled Calibration |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE3 Secondary Standards Signal Generator E4438C | ID # 106277 104291 SN 7517 SN 536 ID # MY49071430 MY46110673 | Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) 03-Feb-21(CTTL-SPEAG,No.Z21-60001) 06-Nov-20(CTTL-SPEAG,No.Z20-60452) Cal Date (Calibrated by, Certificate No.) 01-Feb-21 (CTTL, No.J21X00593) 14-Jan-21 (CTTL, No.J21X00232) | Scheduled Calibration Sep-21 Sep-21 Feb-22 Nov-21 Scheduled Calibration Jan-22 Jan-22 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE3 Secondary Standards Signal Generator E4438C | ID # 106277 104291 SN 7517 SN 536 ID # MY49071430 | Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) 03-Feb-21(CTTL-SPEAG,No.Z21-60001) 06-Nov-20(CTTL-SPEAG,No.Z20-60452) Cal Date (Calibrated by, Certificate No.) 01-Feb-21 (CTTL, No.J21X00593) | Scheduled Calibration Sep-21 Sep-21 Feb-22 Nov-21 Scheduled Calibration Jan-22 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE3 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C | d (M&TE critical f ID # 106277 104291 SN 7517 SN 536 ID # MY49071430 MY46110673 Name | Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) 03-Feb-21(CTTL-SPEAG,No.Z21-60001) 06-Nov-20(CTTL-SPEAG,No.Z20-60452) Cal Date (Calibrated by, Certificate No.) 01-Feb-21 (CTTL, No.J21X00593) 14-Jan-21 (CTTL, No.J21X00232) Function | Scheduled Calibration Sep-21 Sep-21 Feb-22 Nov-21 Scheduled Calibration Jan-22 Jan-22 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE3 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C | d (M&TE critical f ID # 106277 104291 SN 7517 SN 536 ID # MY49071430 MY46110673 Name Zhao Jing | Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) 03-Feb-21(CTTL-SPEAG,No.Z21-60001) 06-Nov-20(CTTL-SPEAG,No.Z20-60452) 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-21 Sep-21 Feb-22 Nov-21 Scheduled Calibration Jan-22 Jan-22 |



Glossary:

| oroodary. | |
|-----------|--------------------------------|
| 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: Z21-60306

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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 | 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 |
|-----------------|----------------------------|---|
| 22.0 °C | 39.2 | 1.80 mho/m |
| (22.0 ± 0.2) °C | 40.0 ± 6 % | 1.77 mho/m ± 6 % |
| <1.0 °C | | |
| | 22.0 °C (22.0 ± 0.2) °C | 22.0 °C 39.2 (22.0 ± 0.2) °C 40.0 ± 6 % |

SAR result with Head TSL

| SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 250 mW input power | 12.9 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 52.2 W/kg ± 18.8 % (k=2) |
| SAR averaged over 10 cm^3 (10 g) of Head TSL | Condition | |
| SAR measured | 250 mW input power | 5.91 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 23.8 W/kg ± 18.7 % (k=2) |

Certificate No: Z21-60306

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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+ 3.89jΩ | |
|--------------------------------------|---------------|--|
| Return Loss | - 25.7dB | |

General Antenna Parameters and Design

| Electrical Delay (one direction) | 1.071 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: Z21-60306 | Page 4 of 6 | | | |
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E-mail: cttl@chinattl.com http://www.chinattl.cn

DASY5 Validation Report for Head TSL

Date: 08.26.2021

Test Laboratory: CTTL, Beijing, China DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 818 Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1 Medium parameters used: f = 2450 MHz; $\sigma = 1.772 \text{ S/m}$; $\epsilon_r = 40.04$; $\rho = 1000 \text{ kg/m}^3$ Phantom section: Right Section DASY5 Configuration:

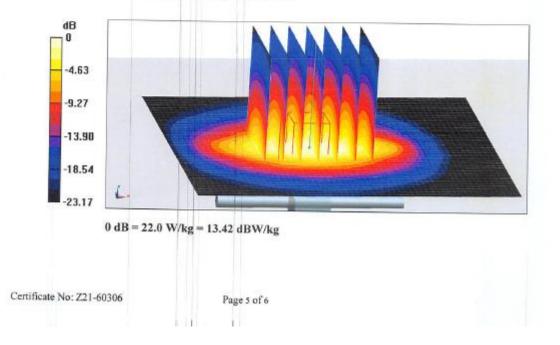
- Probe: EX3DV4 SN7517; ConvF(7.34, 7.34, 7.34) @ 2450 MHz; Calibrated: 2021-02-03
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn536; Calibrated: 2020-11-06
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- · Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

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

Reference Value = 107.9 V/m; Power Drift = -0.02 dB Peak SAR (extrapolated) = 27.4 W/kg

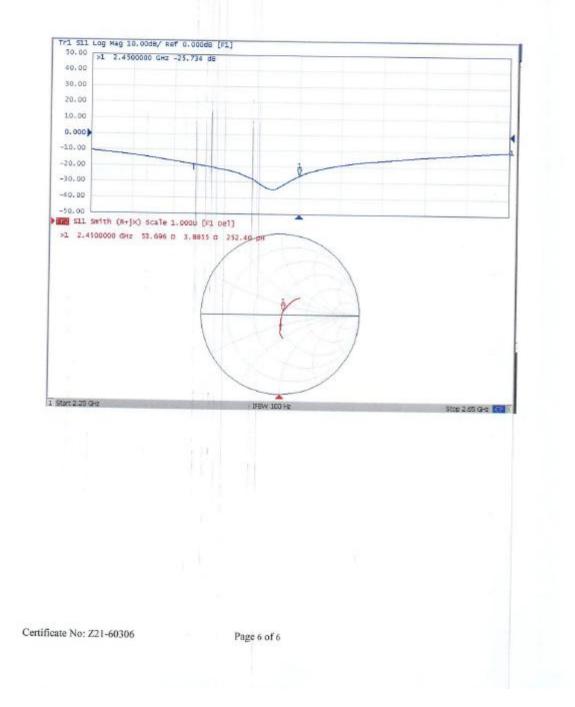
SAR(1 g) = 12.9 W/kg; SAR(10 g) = 5.91 W/kg

Smallest distance from peaks to all points 3 dB below = 9 mm Ratio of SAR at M2 to SAR at M1 = 46.9% Maximum value of SAR (measured) = 22.0 W/kg





Impedance Measurement Plot for Head TSL



| | - | In Collaboration with | h | maninho | | के विशेष जा |
|-------------------|--|---|-------------|---|-------------|---------------------------|
| _ | TTL | spe | ag | | | 中国认可国际互认 |
| | - | CALIBRATION LAB | ORATORY | lac-MRA | CNAS | 校准 |
| Tel: +1 | No.51 Xueyuan Road 86-10-62304633-207 I: ettl@chinattl.com | Haidian District, Beljin 9 Fax: +86-10-623 http://www.china | 04633-2504 | 2000 | - | CALIBRATION CNAS L0570 |
| Client | SMQ | | | Certificate No: | Z20-60040 | |
| CALIBRAT | ION CERT | IFICATE | | | | |
| Object | | D2600V2 - SN: | 1074 | | | |
| Calibration Proce | dure(s) | FF-Z11-003-01 | | | | |
| | | Calibration Proc | cedures for | dipole validation kits | | |
| Calibration date: | | January 2, 2020 | 0 | | | |
| | I). The measure | ments and the unce | | nal standards, which ith confidence proba | | |

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
|---------------------------------|-------------------|--|-----------------------|
| Power Meter NRP2 | 106276 | 11-Apr-19 (CTTL, No.J19X02605) | Apr-20 |
| Power sensor NRP6A | 101369 | 11-Apr-19 (CTTL, No.J19X02605) | Apr-20 |
| Reference Probe EX3DV4 | SN 3617 | 31-Jan-19(SPEAG,No.EX3-3617_Jan19) | Jan-20 |
| DAE4 | SN 1555 | 22-Aug-19(CTTL-SPEAG,No.Z19-60295) |) Aug-20 |
| Secondary Standards | ID# | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
| Signal Generator E4438C | MY49071430 | 23-Jan-19 (CTTL, No.J19X00336) | Jan-20 |
| Network Analyzer E5071C | MY46110673 | 24-Jan-19 (CTTL, No.J19X00547) | Jan-20 |
| | Name | Function | Signature |
| Calibrated by: | Zhao Jing | SAR Test Engineer | 221 |
| Reviewed by: | Lin Hao | SAR Test Engineer | 三林的 |
| Approved by: | Qi Dianyuan | SAR Project Leader | and the |
| | | Issued: Ja | nuary 8, 2020 |
| This calibration certificate sh | all not be repro- | duced except in full without written approva | al of the laboratory. |

Certificate No: Z20-60040

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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: Z20-60040

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Measurement Conditions

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

| DASY Version | DASY52 | V52.10.3 |
|------------------------------|--------------------------|-------------|
| 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.

| | 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 | 38.5 ± 6 % | 1.94 mho/m ± 6 % |
| Head TSL temperature change during test | <1.0 °C | | |

SAR result with Head TSL

| SAR averaged over 1 cm3 (1 g) of Head TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 250 mW input power | 14.2 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 56.9 W/kg ± 18.8 % (k=2) |
| SAR averaged over 10 cm ³ (10 g) of Head TSL | Condition | |
| SAR measured | 250 mW input power | 6.29 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 25.2 W/kg ± 18.7 % (k=2) |

Body TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters | 22.0 °C | 52.5 | 2.16 mho/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 52.7 ± 6 % | 2.15 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 | 13.6 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 54.6 W/kg ± 18.8 % (k=2) |
| SAR averaged over 10 cm3 (10 g) of Body TSL | Condition | |
| SAR measured | 250 mW input power | 6.02 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 24.1 W/kg ± 18.7 % (k=2) |

Certificate No: Z20-60040

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Appendix(Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 49.1Ω- 6.89jΩ |
|--------------------------------------|---------------|
| Return Loss | - 23.1dB |

Antenna Parameters with Body TSL

| Impedance, transformed to feed point | 46.2Ω- 5.65jΩ | |
|--------------------------------------|---------------|--|
| Return Loss | - 23.0dB | |

General Antenna Parameters and Design

| Electrical Delay (one direction) | 1.012 ns | |
|----------------------------------|----------|--|
|----------------------------------|----------|--|

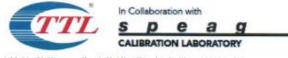
After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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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 Fax: +86-10-62304633-2504

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

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

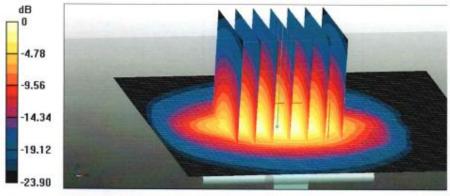
Date: 01.02.2020

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1074 Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1 Medium parameters used: f = 2600 MHz; $\sigma = 1.943$ S/m; $\varepsilon_r = 38.52$; p = 1000 kg/m3 Phantom section: Center Section DASY5 Configuration:

- Probe: EX3DV4 SN3617; ConvF(7.19, 7.19, 7.19) @ 2600 MHz; Calibrated: 1/31/2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/22/2019
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

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

Reference Value = 103.8 V/m; Power Drift = 0.04 dB Peak SAR (extrapolated) = 30.9 W/kg SAR(1 g) = 14.2 W/kg; SAR(10 g) = 6.29 W/kg Smallest distance from peaks to all points 3 dB below = 9 mm Ratio of SAR at M2 to SAR at M1 = 46.4% Maximum value of SAR (measured) = 24.4 W/kg



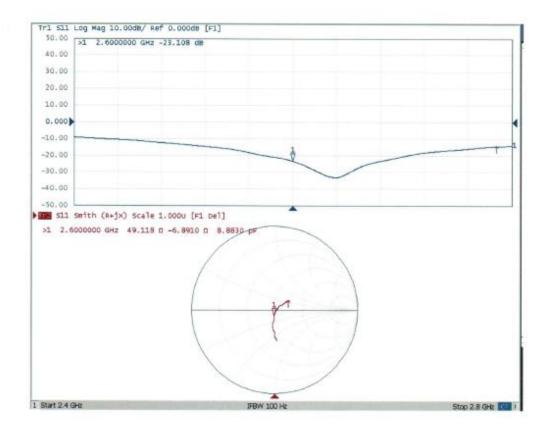
0 dB = 24.4 W/kg = 13.87 dBW/kg

Certificate No: Z20-60040

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Impedance Measurement Plot for Head TSL



Certificate No: Z20-60040

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DASY5 Validation Report for Body TSL

Date: 01.02.2020

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1074

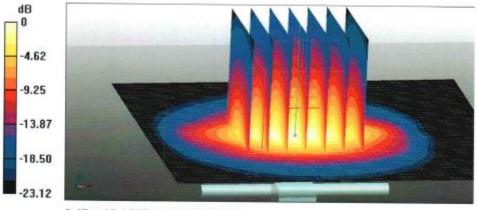
Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1 Medium parameters used: f = 2600 MHz; $\sigma = 2.145$ S/m; $\epsilon_r = 52.74$; $\rho = 1000$ kg/m3 Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 SN3617; ConvF(7.49, 7.49, 7.49) @ 2600 MHz; Calibrated: 1/31/2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/22/2019
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

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

Reference Value = 95.00 V/m; Power Drift = 0.05 dB Peak SAR (extrapolated) = 29.4 W/kg SAR(1 g) = 13.6 W/kg; SAR(10 g) = 6.02 W/kg Smallest distance from peaks to all points 3 dB below = 8 mm Ratio of SAR at M2 to SAR at M1 = 47.2% Maximum value of SAR (measured) = 23.4 W/kg



0 dB = 23.4 W/kg = 13.69 dBW/kg

Certificate No: Z20-60040

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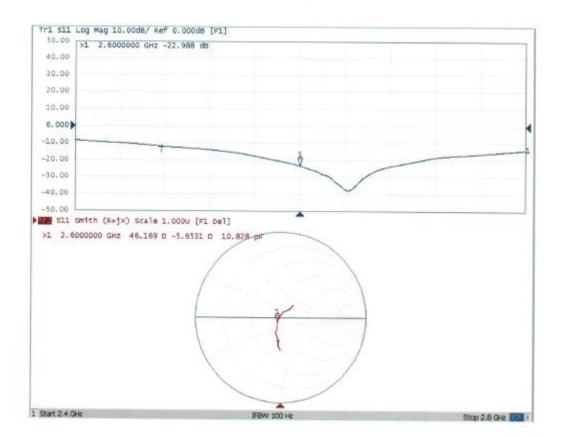


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Impedance Measurement Plot for Body TSL



Certificate No: Z20-60040

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|---|--|--|---|
| | | 3 | CNAS 校准 CALIBRATION |
| Tel: +86-10-6230465 | 33-2512 Fax: + | trict, Beijing, 100191, China 344444 | CNAS L0570 |
| E-mail: ettl@chinatt | | www.chinattl.cn Certificate No: | Z20-60041 |
| Cilent | | | 220-00041 |
| CALIBRATION CE | RTIFICAT | E | |
| Object | D5GHz | V2 - SN: 1185 | |
| Calibration Procedure(s) | EE 711 | -003-01 | |
| | | tion Procedures for dipole validation kits | |
| O-Ib-rates data | | | |
| Calibration date: | Decem | ber 31, 2019 | |
| pages and are part of the ce | rtificate. | the uncertainties with confidence probabi the closed laboratory facility: environm | |
| Calibration Equipment used | (M&TE critical f | or calibration) | |
| | (M&TE critical f | |) Scheduled Calibration |
| Calibration Equipment used Primary Standards Power Meter NRP2 | | Cal Date(Calibrated by, Certificate No.) 11-Apr-19 (CTTL, No.J19X02605) | Scheduled Calibration Apr-20 |
| Primary Standards | ID# | Cal Date(Calibrated by, Certificate No.) | |
| Primary Standards Power Meter NRP2 | ID# 106276 | Cal Date(Calibrated by, Certificate No.) 11-Apr-19 (CTTL, No.J19X02605) | Apr-20 Apr-20 |
| Primary Standards Power Meter NRP2 Power sensor NRP6A | ID# 106276 101369 | Cal Date(Calibrated by, Certificate No.) 11-Apr-19 (CTTL, No.J19X02605) 11-Apr-19 (CTTL, No.J19X02605) | Apr-20 Apr-20) Jan-20 |
| Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4 | ID # 106276 101369 SN 3617 SN 1555 | Cal Date(Calibrated by, Certificate No.) 11-Apr-19 (CTTL, No.J19X02605) 11-Apr-19 (CTTL, No.J19X02605) 31-Jan-19(SPEAG,No.EX3-3617_Jan19 22-Aug-19(CTTL-SPEAG,No.Z19-60298 | Apr-20 Apr-20 9) Jan-20 5) Aug-20 |
| Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4 Secondary Standards | ID # 106276 101369 SN 3617 | Cal Date(Calibrated by, Certificate No.) 11-Apr-19 (CTTL, No.J19X02605) 11-Apr-19 (CTTL, No.J19X02605) 31-Jan-19 (SPEAG, No.EX3-3617_Jan19 22-Aug-19 (CTTL-SPEAG, No.Z19-6029 Cal Date(Calibrated by, Certificate No.) | Apr-20 Apr-20) Jan-20 |
| Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4 | ID # 106276 101369 SN 3617 SN 1555 ID # | Cal Date(Calibrated by, Certificate No.) 11-Apr-19 (CTTL, No.J19X02605) 11-Apr-19 (CTTL, No.J19X02605) 31-Jan-19(SPEAG,No.EX3-3617_Jan19 22-Aug-19(CTTL-SPEAG,No.Z19-60298 | Apr-20 Apr-20) Jan-20 5) Aug-20 Scheduled Calibration |
| Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C | ID # 106276 101369 SN 3617 SN 1555 ID # MY49071430 MY46110673 | Cal Date(Calibrated by, Certificate No.) 11-Apr-19 (CTTL, No.J19X02605) 11-Apr-19 (CTTL, No.J19X02605) 31-Jan-19(SPEAG,No.EX3-3617_Jan19 22-Aug-19(CTTL-SPEAG,No.Z19-60295 Cal Date(Calibrated by, Certificate No.) 23-Jan-19 (CTTL, No.J19X00336) 24-Jan-19 (CTTL, No.J19X00547) | Apr-20 Apr-20 3) Jan-20 5) Aug-20 Scheduled Calibration Jan-20 Jan-20 |
| Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C | ID # 106276 101369 SN 3617 SN 1555 ID # MY49071430 MY46110673 Name | Cal Date(Calibrated by, Certificate No.) 11-Apr-19 (CTTL, No.J19X02605) 11-Apr-19 (CTTL, No.J19X02605) 31-Jan-19 (SPEAG, No.EX3-3617_Jan19 22-Aug-19 (CTTL-SPEAG, No.Z19-60293 Cal Date(Calibrated by, Certificate No.) 23-Jan-19 (CTTL, No.J19X00336) 24-Jan-19 (CTTL, No.J19X00547) Function | Apr-20 Apr-20 3) Jan-20 5) Aug-20 Scheduled Calibration Jan-20 |
| Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzerE5071C | ID # 106276 101369 SN 3617 SN 1555 ID # MY49071430 MY46110673 | Cal Date(Calibrated by, Certificate No.) 11-Apr-19 (CTTL, No.J19X02605) 11-Apr-19 (CTTL, No.J19X02605) 31-Jan-19(SPEAG,No.EX3-3617_Jan19 22-Aug-19(CTTL-SPEAG,No.Z19-60295 Cal Date(Calibrated by, Certificate No.) 23-Jan-19 (CTTL, No.J19X00336) 24-Jan-19 (CTTL, No.J19X00547) | Apr-20 Apr-20 3) Jan-20 5) Aug-20 Scheduled Calibration Jan-20 Jan-20 |
| Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzerE5071C | ID # 106276 101369 SN 3617 SN 1555 ID # MY49071430 MY46110673 Name | Cal Date(Calibrated by, Certificate No.) 11-Apr-19 (CTTL, No.J19X02605) 11-Apr-19 (CTTL, No.J19X02605) 31-Jan-19 (SPEAG, No.EX3-3617_Jan19 22-Aug-19 (CTTL-SPEAG, No.Z19-60293 Cal Date(Calibrated by, Certificate No.) 23-Jan-19 (CTTL, No.J19X00336) 24-Jan-19 (CTTL, No.J19X00547) Function | Apr-20 Apr-20 3) Jan-20 5) Aug-20 Scheduled Calibration Jan-20 Jan-20 |
| Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzerE5071C Calibrated by: | ID # 106276 101369 SN 3617 SN 1555 ID # MY49071430 MY46110673 Name Zhao Jing | Cal Date(Calibrated by, Certificate No.) 11-Apr-19 (CTTL, No.J19X02605) 11-Apr-19 (CTTL, No.J19X02605) 31-Jan-19 (SPEAG, No.EX3-3617_Jan19 22-Aug-19 (CTTL-SPEAG, No.Z19-60298 Cal Date(Calibrated by, Certificate No.) 23-Jan-19 (CTTL, No.J19X00336) 24-Jan-19 (CTTL, No.J19X00547) Function SAR Test Engineer | Apr-20 Apr-20 3) Jan-20 5) Aug-20 Scheduled Calibration Jan-20 Jan-20 |
| Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzerE5071C Calibrated by: Reviewed by: | ID # 106276 101369 SN 3617 SN 1555 ID # MY49071430 MY46110673 Name Zhao Jing Lin Hao | Cal Date(Calibrated by, Certificate No.) 11-Apr-19 (CTTL, No.J19X02605) 11-Apr-19 (CTTL, No.J19X02605) 31-Jan-19 (SPEAG, No.EX3-3617_Jan19 22-Aug-19 (CTTL-SPEAG, No.Z19-60298 Cal Date(Calibrated by, Certificate No.) 23-Jan-19 (CTTL, No.J19X00336) 24-Jan-19 (CTTL, No.J19X00547) Function SAR Test Engineer SAR Test Engineer SAR Project Leader | Apr-20 Apr-20 3) Jan-20 5) Aug-20 Scheduled Calibration Jan-20 Jan-20 |

Certificate No: Z20-60041

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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: Z20-60041

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Measurement Conditions

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

| DASY Version | DASY52 | V52.10.3 |
|------------------------------|--|----------------------------------|
| Extrapolation | Advanced Extrapolation | |
| Phantom | Triple Flat Phantom 5.1C | |
| Distance Dipole Center - TSL | 10 mm | with Spacer |
| Zoom Scan Resolution | dx, dy = 4 mm, dz = 1.4 mm | Graded Ratio = 1.4 (Z direction) |
| Frequency | 5250 MHz ± 1 MHz 5600 MHz ± 1 MHz 5750 MHz ± 1 MHz | |

Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters | 22.0 °C | 35.9 | 4.71 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 36.8 ± 6 % | 4.65 mho/m ± 6 % |
| Head TSL temperature change during test | <1.0 °C | | |

SAR result with Head TSL at 5250 MHz

| SAR averaged over 1 cm^3 (1 g) of Head TSL | Condition | |
|--|--------------------|--------------------------|
| SAR measured | 100 mW input power | 7.61 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 76.5 W/kg ± 24.4 % (k=2) |
| SAR averaged over 10 cm^3 (10 g) of Head TSL | Condition | |
| SAR measured | 100 mW input power | 2.17 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 21.8 W/kg ± 24.2 % (k=2) |

Certificate No: Z20-60041

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Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters | 22.0 °C | 35.5 | 5.07 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 36.2 ± 6 % | 5.03 mho/m ± 6 % |
| Head TSL temperature change during test | <1.0 °C | 1000 | |

SAR result with Head TSL at 5600 MHz

| SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | 7.99 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 80.2 W/kg ± 24.4 % (k=2) |
| SAR averaged over 10 cm ³ (10 g) of Head TSL | Condition | |
| SAR measured | 100 mW input power | 2.27 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 22.8 W/kg ± 24.2 % (k=2) |

Head TSL parameters at 5750 MHz The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters | 22.0 °C | 35.4 | 5.22 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 36.0 ± 6 % | 5.19 mho/m ± 6 % |
| Head TSL temperature change during test | <1.0 °C | | |

SAR result with Head TSL at 5750 MHz

| SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | 7.80 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 78.2 W/kg ± 24.4 % (k=2) |
| SAR averaged over 10 cm ³ (10 g) of Head TSL | Condition | |
| SAR measured | 100 mW input power | 2.21 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 22.2 W/kg ± 24.2 % (k=2) |

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Body TSL parameters at 5250 MHz

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters | 22.0 °C | 48.9 | 5.36 mho/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 48.7 ± 6 % | 5.32 mho/m ± 6 % |
| Body TSL temperature change during test | <1.0 °C | | |

SAR result with Body TSL at 5250 MHz

| SAR averaged over 1 cm^3 (1 g) of Body TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | 7.43 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 74.2 W/kg ± 24.4 % (k=2) |
| SAR averaged over 10 cm ³ (10 g) of Body TSL | Condition | |
| SAR measured | 100 mW input power | 2.08 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 20.8 W/kg ± 24.2 % (k=2) |

Body TSL parameters at 5600 MHz The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters | 22.0 °C | 48.5 | 5.77 mho/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 48.0 ± 6 % | 5.79 mho/m ± 6 % |
| Body TSL temperature change during test | <1.0 °C | | |

SAR result with Body TSL at 5600 MHz

| SAR averaged over 1 cm ³ (1 g) of Body TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | 7.70 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 76.9 W/kg ± 24.4 % (k=2) |
| SAR averaged over 10 cm ³ (10 g) of Body TSL | Condition | |
| SAR measured | 100 mW input power | 2.17 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 21.7 W/kg ± 24.2 % (k=2) |

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Body TSL parameters at 5750 MHz The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters | 22.0 °C | 48.3 | 5.94 mho/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 47.7 ± 6 % | 6.02 mho/m ± 6 % |
| Body TSL temperature change during test | <1.0 °C | | |

SAR result with Body TSL at 5750 MHz

| SAR averaged over 1 cm^3 (1 g) of Body TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 100 mW input power | 7.30 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 72.9 W/kg ± 24.4 % (k=2) |
| SAR averaged over 10 cm ³ (10 g) of Body TSL | Condition | |
| SAR measured | 100 mW input power | 2.03 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | 20.2 W/kg ± 24.2 % (k=2) |

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL at 5250 MHz

| Impedance, transformed to feed point | 49.3Ω - 5.08jΩ | |
|--------------------------------------|----------------|--|
| Return Loss | - 25.8dB | |

Antenna Parameters with Head TSL at 5600 MHz

| Impedance, transformed to feed point | 55.2Ω - 2.17jΩ | |
|--------------------------------------|----------------|--|
| Return Loss | - 25.5dB | |

Antenna Parameters with Head TSL at 5750 MHz

| Impedance, transformed to feed point | 55.6Ω - 0.52jΩ | |
|--------------------------------------|----------------|--|
| Return Loss | - 25.5dB | |

Antenna Parameters with Body TSL at 5250 MHz

| Impedance, transformed to feed point | 49.3Ω - 3.89jΩ | |
|--------------------------------------|----------------|--|
| Return Loss | - 28.0dB | |

Antenna Parameters with Body TSL at 5600 MHz

| Impedance, transformed to feed point | 53.9Ω - 2.71jΩ | |
|--------------------------------------|----------------|--|
| Return Loss | - 26.7dB | |

Antenna Parameters with Body TSL at 5750 MHz

| Impedance, transformed to feed point | 55.8Ω - 2.17jΩ | |
|--------------------------------------|----------------|--|
| Return Loss | - 24.7dB | |



General Antenna Parameters and Design

| Electrical Delay (one direction) | 1.066 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: 12.31.2019

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1185

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

Medium parameters used: f = 5250 MHz; σ = 4.652 S/m; ϵ_r = 36.81; ρ = 1000 kg/m3, Medium parameters used: f = 5600 MHz; σ = 5.027 S/m; ϵ_r = 36.19; ρ = 1000 kg/m3, Medium parameters used: f = 5750 MHz; σ = 5.19 S/m; ϵ_r = 35.96; ρ = 1000 kg/m3,

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 SN3617; ConvF(5.39, 5.39, 5.39) @ 5250 MHz; ConvF(5.06, 5.06, 5.06) @ 5600 MHz; ConvF(5.07, 5.07, 5.07) @ 5750 MHz; Calibrated: 1/31/2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/22/2019
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

Dipole Calibration /Pin=100mW, d=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 64.41 V/m; Power Drift = -0.02 dB Peak SAR (extrapolated) = 31.5 W/kg SAR(1 g) = 7.61 W/kg; SAR(10 g) = 2.17 W/kg Smallest distance from peaks to all points 3 dB below = 7.2 mm Ratio of SAR at M2 to SAR at M1 = 65.3% Maximum value of SAR (measured) = 18.1 W/kg

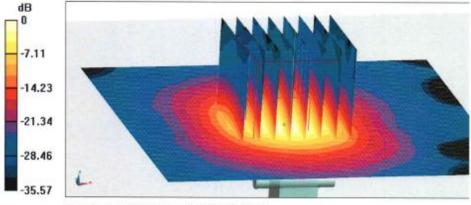
Dipole Calibration /Pin=100mW, d=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 64.02 V/m; Power Drift = -0.01 dB Peak SAR (extrapolated) = 36.2 W/kg SAR(1 g) = 7.99 W/kg; SAR(10 g) = 2.27 W/kg Smallest distance from peaks to all points 3 dB below = 7.4 mm Ratio of SAR at M2 to SAR at M1 = 62.7% Maximum value of SAR (measured) = 19.5 W/kg

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Dipole Calibration /Pin=100mW, d=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 63.14 V/m; Power Drift = 0.01 dB Peak SAR (extrapolated) = 36.9 W/kg SAR(1 g) = 7.8 W/kg; SAR(10 g) = 2.21 W/kg Smallest distance from peaks to all points 3 dB below = 7.5 mm Ratio of SAR at M2 to SAR at M1 = 59.5% Maximum value of SAR (measured) = 19.3 W/kg



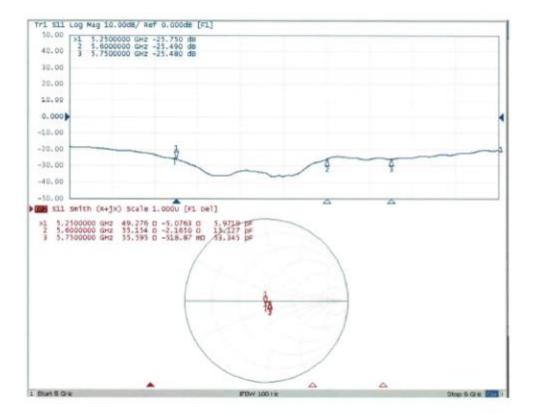
0 dB = 19.3 W/kg = 12.86 dBW/kg

Certificate No: Z20-60041

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Impedance Measurement Plot for Head TSL



Certificate No: Z20-60041

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DASY5 Validation Report for Body TSL

Date: 12.30.2019

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1185

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

Medium parameters used: f = 5250 MHz; σ = 5.317 S/m; ϵ_r = 48.69; ρ = 1000 kg/m3, Medium parameters used: f = 5600 MHz; σ = 5.79 S/m; ϵ_r = 48.02; ρ = 1000 kg/m3, Medium parameters used: f = 5750 MHz; σ = 6.019 S/m; ϵ_r = 47.69; ρ = 1000 kg/m3,

Phantom section: Right Section

DASY5 Configuration:

- Probe: SN3617; ConvF(4.76, 4.76, 4.76) @ 5250 MHz; ConvF(4.23, 4.23, 4.23)
 @ 5600 MHz; ConvF(4.36, 4.36, 4.36) @ 5750 MHz; Calibrated: 1/31/2019,
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/22/2019
- Phantom: MFP_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

Dipole Calibration /Pin=100mW, d=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 66.27 V/m; Power Drift = -0.04 dB Peak SAR (extrapolated) = 29.5 W/kg SAR(1 g) = 7.43 W/kg; SAR(10 g) = 2.08 W/kg Smallest distance from peaks to all points 3 dB below = 7.2 mm Ratio of SAR at M2 to SAR at M1 = 65.1% Maximum value of SAR (measured) = 17.5 W/kg

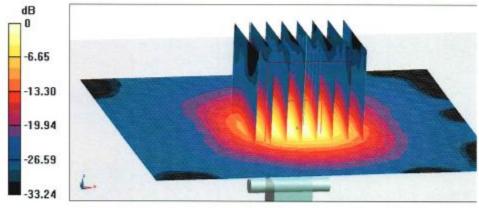
Dipole Calibration /Pin=100mW, d=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 66.02 V/m; Power Drift = -0.01 dB Peak SAR (extrapolated) = 34.0 W/kg SAR(1 g) = 7.7 W/kg; SAR(10 g) = 2.17 W/kg Smallest distance from peaks to all points 3 dB below = 7.2 mm Ratio of SAR at M2 to SAR at M1 = 61.7% Maximum value of SAR (measured) = 18.8 W/kg

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Dipole Calibration /Pin=100mW, d=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 63.40 V/m; Power Drift = -0.01 dB Peak SAR (extrapolated) = 34.0 W/kg SAR(1 g) = 7.3 W/kg; SAR(10 g) = 2.03 W/kg Smallest distance from peaks to all points 3 dB below = 7.4 mm Ratio of SAR at M2 to SAR at M1 = 59.9% Maximum value of SAR (measured) = 18.1 W/kg



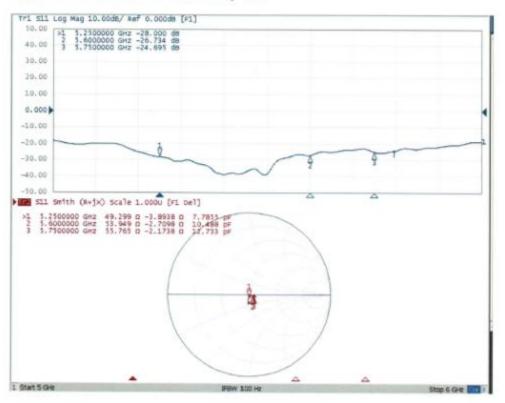
0 dB = 18.1 W/kg = 12.58 dBW/kg

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Impedance Measurement Plot for Body TSL



Certificate No: Z20-60041

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|--|--|--|--|
| Add: No.52 Hus Yu Tel: +86-10-62304 E-mail: ettl@china | anBei Road, Haidian 633-2079 Fax: | District, Beijing, 100191, Chi +86-10-62304633-2504 /www.ehinattl.en | 校准 CALIBRATIC CNAS L057 |
| Client SM | Q | Certificate No: Z2 | 21-60305 |
| CALIBRATION C | ERTIFICAT | ΓE | |
| Object | D1900 | V2 - SN: 5d162 | |
| Calibration Procedure(s) | | -003-01 | |
| | Calibra | ation Procedures for dipole validation kits | |
| Calibration date: | Septen | nber 1, 2021 | |
| | | | |
| All calibrations have been humidity<70%. Calibration Equipment used | | the closed laboratory facility; environment i or calibration) | temperature (22±3)℃ and |
| numidity<70%. Calibration Equipment used | | | |
| numidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 | (M&TE critical fi ID # 106277 | or calibration) Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) | |
| numidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S | (M&TE critical fi ID # 106277 104291 | Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) | Scheduled Calibration Sep-21 Sep-21 |
| numidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 | (M&TE critical fi ID # 106277 104291 | or calibration) Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) 03-Feb-21(CTTL-SPEAG,No.Z21-60001) | Scheduled Calibration Sep-21 Sep-21 Feb-22 |
| numidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 | (M&TE critical fi ID # 106277 104291 SN 7517 SN 1556 | or calibration) Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) 03-Feb-21(CTTL-SPEAG,No.Z21-60001) 15-Jan-21(SPEAG,No.DAE4-1556_Jan21) | Scheduled Calibration Sep-21 Sep-21 Feb-22 Jan-22 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards | (M&TE critical fi ID # 106277 104291 SN 7517 SN 1556 ID # | or calibration) Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) 03-Feb-21(CTTL-SPEAG,No.Z21-60001) 15-Jan-21(SPEAG,No.DAE4-1556_Jan21) Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration Sep-21 Sep-21 Feb-22 Jan-22 Scheduled Calibration |
| numidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 | (M&TE critical fi ID # 106277 104291 SN 7517 SN 1556 | or calibration) Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) 03-Feb-21(CTTL-SPEAG,No.Z21-60001) 15-Jan-21(SPEAG,No.DAE4-1556_Jan21) | Scheduled Calibration Sep-21 Sep-21 Feb-22 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C | (M&TE critical fi ID # 106277 104291 SN 7517 SN 1556 ID # MY49071430 | or calibration) Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) 03-Feb-21 (CTTL-SPEAG,No.Z21-60001) 15-Jan-21 (SPEAG,No.DAE4-1556_Jan21) Cal Date (Calibrated by, Certificate No.) 01-Feb-21 (CTTL, No.J21X00593) | Scheduled Calibration Sep-21 Sep-21 Feb-22 Jan-22 Scheduled Calibration Jan-22 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C | (M&TE critical fi ID # 106277 104291 SN 7517 SN 1556 ID # MY49071430 MY46110673 | Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) 03-Feb-21 (CTTL-SPEAG,No.Z21-60001) 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-21 Sep-21 Feb-22 Jan-22 Scheduled Calibration Jan-22 Jan-22 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C | (M&TE critical fi ID # 106277 104291 SN 7517 SN 1556 ID # MY49071430 MY46110673 Name | Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) 03-Feb-21 (CTTL-SPEAG,No.Z21-60001) 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-21 Sep-21 Feb-22 Jan-22 Scheduled Calibration Jan-22 Jan-22 |
| humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C | (M&TE critical fi ID # 106277 104291 SN 7517 SN 1556 ID # MY49071430 MY46110673 Name Zhao Jing | Cal Date (Calibrated by, Certificate No.) 23-Sep-20 (CTTL, No.J20X08336) 23-Sep-20 (CTTL, No.J20X08336) 03-Feb-21 (CTTL-SPEAG,No.Z21-80001) 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-21 Sep-21 Feb-22 Jan-22 Scheduled Calibration Jan-22 Jan-22 |

Certificate No: Z21-60305

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lossary:

| lossaly. | |
|----------|--------------------------------|
| 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

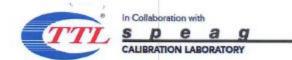
Methods Applied and Interpretation of Parameters:

- 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: Z21-60305

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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 | 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 | 40.6 ± 6 % | 1.39 mho/m ± 6 % |
| Head TSL temperature change during test | <1.0 *C | 1 | |

SAR result with Head TSL

| SAR averaged over 1 cm^3 (1 g) of Head TSL | Condition | |
|--|--------------------|--------------------------|
| SAR measured | 250 mW input power | 9.83 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 39.7 W/kg ± 18.8 % (k=2) |
| SAR averaged over 10 cm^3 (10 g) of Head TSL | Condition | |
| SAR measured | 250 mW input power | 5.01 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 | 54.4Ω+ 4.86jΩ | 1 |
|--------------------------------------|---------------|---|
| Return Loss | - 24.1dB | |

General Antenna Parameters and Design

| Electrical Delay (one direction) | 1.103 ns | 0 |
|----------------------------------|----------|---|
|----------------------------------|----------|---|

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



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

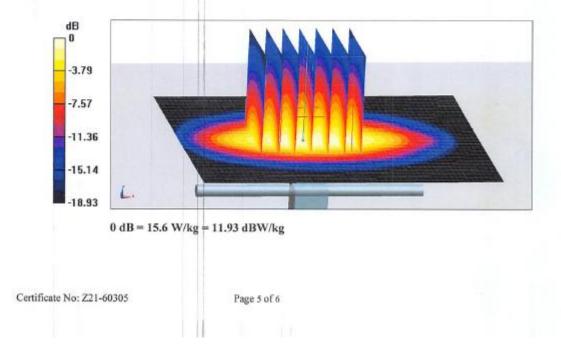
Date: 09.01.2021

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d162 Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1 Medium parameters used: f = 1900 MHz; $\sigma = 1.385$ S/m; $\epsilon_r = 40.6$; $\rho = 1000$ kg/m³ Phantom section: Right Section

DASY5 Configuration:

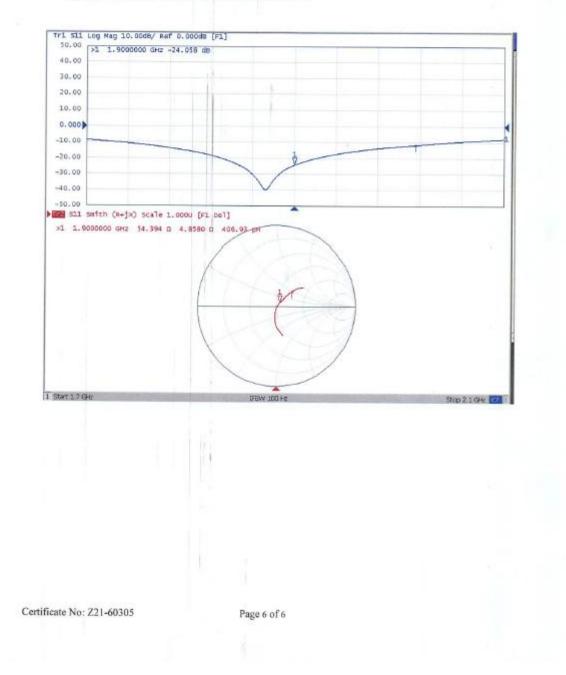
- Probe: EX3DV4 SN7517; ConvF(7.81, 7.81, 7.81) @ 1900 MHz; Calibrated: 2021-02-03
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 103.2 V/m; Power Drift = -0.01 dB Peak SAR (extrapolated) = 19.1 W/kg SAR(1 g) = 9.83 W/kg; SAR(10 g) = 5.01 W/kg Smallest distance from peaks to all points 3 dB below = 10 mm Ratio of SAR at M2 to SAR at M1 = 51.8% Maximum value of SAR (measured) = 15.6 W/kg





Impedance Measurement Plot for Head TSL



| | CALIBRA | TION LABORATORY | NAS 樹际互认 |
|---|--|--|--|
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| E-mail: cttl@china Client SM0 | and a second sec | //www.chinattl.cn Certificate No: Z2 | 1-60304 |
| CALIBRATION C | | | |
| Dbject | D1800 | V2 - SN: 2d171 | |
| Calibration Procedure(s) | FE 744 | 1 200 04 | |
| | | I-003-01 ation Procedures for dipole validation kits | |
| Calibration date: | | | |
| andration date. | Septen | nber 1, 2021 | 1 |
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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%.

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Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504 E-mail: ettl@ehinattLeom http://www.ehinattLeo

Measurement Conditions

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

| DASY52 | V52.10.4 |
|--------------------------|--|
| Advanced Extrapolation | |
| Triple Flat Phantom 5.1C | |
| 10 mm | with Spacer |
| dx, dy, dz = 5 mm | |
| 1800 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 | 40.0 | 1.40 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 39.9 ± 6 % | 1.39 mho/m ± 6 % |
| Head TSL temperature change during test | <1.0 °C | | - |

SAR result with Head TSL

| SAR averaged over 1 cm3 (1 g) of Head TSL | Condition | |
|--|--------------------|--------------------------|
| SAR measured | 250 mW input power | 9.57 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 38.4 W/kg ± 18.8 % (k=2) |
| SAR averaged over 10 cm^3 (10 g) of Head TSL | Condition | |
| SAR measured | 250 mW input power | 4.94 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 19.8 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 | 49.8Ω- 2.36jΩ | |
|--------------------------------------|---------------|--|
| Return Loss | - 32.5dB | |

General Antenna Parameters and Design

| Electrical Delay (one direction) | 1.120 ns |
|----------------------------------|----------|
| | |

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

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

Additional EUT Data

| Manufactured by | | SPEAG | |
|-----------------------|-------------|-------|--|
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DASY5 Validation Report for Head TSL

Date: 09.01.2021

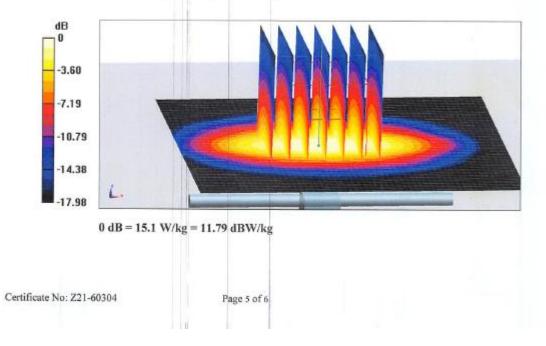
Test Laboratory: CTTL, Beijing, China **DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 2d171** Communication System: UID 0, CW; Frequency: 1800 MHz; Duty Cycle: 1:1 Medium parameters used: f = 1800 MHz; $\sigma = 1.39$ S/m; $\epsilon_r = 39.92$; $\rho = 1000$ kg/m³ Phantom section: Right Section DASY5 Configuration:

- Probe: EX3DV4 SN7517; ConvF(8.22, 8.22, 8.22) @ 1800 MHz; Calibrated: 2021-02-03
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 100.9 V/m; Power Drift = 0.00 dB Peak SAR (extrapolated) = 18.4 W/kg SAR(1 g) = 9.57 W/kg; SAR(10 g) = 4.94 W/kg

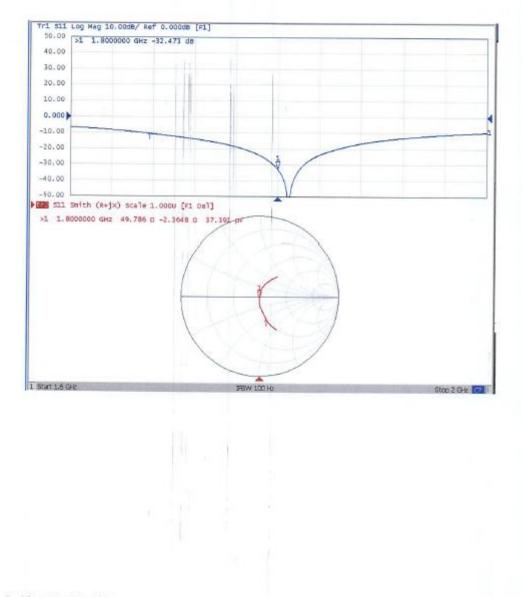
Smallest distance from peaks to all points 3 dB below = 10 mm Ratio of SAR at M2 to SAR at M1 = 52.3%

Maximum value of SAR (measured) = 15.1 W/kg





Impedance Measurement Plot for Head TSL



Certificate No: Z21-60304

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