

Appendix C for KSCR220700113401

Calibration Certificate

| Object | Apply | No | Model | SN | Calibration Date |
|--------|-------------------------------------|----|---------|--------|------------------|
| Dipole | <input type="checkbox"/> | 1 | CLA150 | 4025 | 2021/04/26 |
| | <input type="checkbox"/> | 2 | D450V3 | 1103 | 2021/04/21 |
| | <input type="checkbox"/> | 3 | D750V3 | 1188 | 2022/03/29 |
| | <input checked="" type="checkbox"/> | 4 | D835V2 | 4d114 | 2022/03/31 |
| | <input type="checkbox"/> | 5 | D900V2 | 1d079 | 2022/06/07 |
| | <input type="checkbox"/> | 6 | D1800V2 | 2d170 | 2022/03/31 |
| | <input type="checkbox"/> | 7 | D1900V2 | 5d1136 | 2022/06/07 |
| | <input type="checkbox"/> | 8 | D2000V2 | 1041 | 2022/06/06 |
| | <input checked="" type="checkbox"/> | 9 | D2300V2 | 1096 | 2022/03/31 |
| | <input checked="" type="checkbox"/> | 10 | D2450V2 | 817 | 2022/04/01 |
| | <input checked="" type="checkbox"/> | 11 | D2600V2 | 1158 | 2022/03/31 |
| | <input type="checkbox"/> | 12 | D5GHzV2 | 1095 | 2022/06/01 |
| DAE | <input checked="" type="checkbox"/> | 13 | DAE4 | 1245 | 2022/05/30 |
| Probe | <input checked="" type="checkbox"/> | 14 | EX3DV4 | 7346 | 2022/03/30 |



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 中国·江苏·昆山市留学生创业园伟业路10号 邮编 215300 t(86-512)57355888 f(86-512)57370818 sgs.china@sgs.com

1 Dipole

1.1 CLA150 - SN 4025

| <p>Calibration Laboratory of Schmid & Partner Engineering AG Zürcherstrasse 43, 8004 Zurich, Switzerland</p> <p>Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates</p> <p>Client: SGS-CN (Auden) Certificate No.: CLA150-4025_Apr21</p> <p style="text-align: right;">Accreditation No.: SCS 0108</p> <hr/> <p style="text-align: center;">CALIBRATION CERTIFICATE</p> <p>Object: CLA150 - SN: 4025</p> <p>Calibration procedure(s): QA CAL-15.v9 Calibration Procedure for SAR Validation Sources below 700 MHz</p> <p>Calibration date: April 26, 2021</p> <p>The calibration certificate documents the traceability to national standards, which reflect the physical units of measurement (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.</p> <p>All calibrations have been conducted in the enclosed laboratory facility; environment temperature (22 ± 3°C and humidity < 70%).</p> <p>Calibration Equipment Used (M&TE: critical for calibration)</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Primary Standards</th> <th>ID #</th> <th>Cal Date (Certificate No.)</th> <th>Schedule / Calibration</th> </tr> </thead> <tbody> <tr> <td>Power meter NRP</td> <td>SN: 10476</td> <td>09-Apr-21 (No. 217-03091.03292)</td> <td>Apr-22</td> </tr> <tr> <td>Power sensor NRP Z01</td> <td>SN: 103345</td> <td>09-Apr-21 (No. 217-03051)</td> <td>Apr-22</td> </tr> <tr> <td>Power sensor NRP Z01</td> <td>SN: 103345</td> <td>09-Apr-21 (No. 217-03052)</td> <td>Apr-22</td> </tr> <tr> <td>Reference 20 dB Attenuator</td> <td>SN: C22662 (20d)</td> <td>09-Apr-21 (No. 217-03343)</td> <td>Apr-22</td> </tr> <tr> <td>Type-N mismatch combination</td> <td>SN: 310957 / 00397</td> <td>09-Apr-21 (No. 217-03344)</td> <td>Apr-22</td> </tr> <tr> <td>Reference Probe EX3004 (DIE4)</td> <td>SN: 3877</td> <td>30-Dec-20 (No. 13X3877_Dec20)</td> <td>Dec-21</td> </tr> <tr> <td></td> <td>SN: 663</td> <td>15-Jan-20 (No. 13X6568_Jan20)</td> <td>Jan-21</td> </tr> </tbody> </table> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Secondary Standards</th> <th>ID #</th> <th>Check Date (in house)</th> <th>Scheduled Check</th> </tr> </thead> <tbody> <tr> <td>Power meter S4418E</td> <td>SN: G34139322</td> <td>05-Apr-19 (in house check Jun-20)</td> <td>11 house check Jun-22</td> </tr> <tr> <td>Power sensor E411A</td> <td>SN: M41498087</td> <td>06-Apr-16 (in house check Jun-20)</td> <td>11 house check Jun-22</td> </tr> <tr> <td>Power sensor E411A</td> <td>SN: 00010210</td> <td>06-Apr-19 (in house check Jun-20)</td> <td>11 house check Jun-22</td> </tr> <tr> <td>RF generator HP 8594C</td> <td>SN: U5040201700</td> <td>06-Apr-19 (in house check Jun-20)</td> <td>11 house check Jun-22</td> </tr> <tr> <td>Network Analyzer PNA BNA</td> <td>SN: U541005477</td> <td>31-Mar-14 (in house check Oct-20)</td> <td>11 house check Dec-21</td> </tr> </tbody> </table> <p>Calibrated by: Jarhey Katsman Function: Laboratory Technician Signature: <i>[Signature]</i></p> <p>Approved by: Kajko Polovic Technical Manager <i>[Signature]</i></p> <p style="text-align: right;">Issued: April 26, 2021</p> <p>This calibration certificate shall not be reproduced except in full without written approval of the laboratory.</p> <p>Certificate No: CLA150-4025_Apr21 Page 1 of 6</p> | Primary Standards | ID # | Cal Date (Certificate No.) | Schedule / Calibration | Power meter NRP | SN: 10476 | 09-Apr-21 (No. 217-03091.03292) | Apr-22 | Power sensor NRP Z01 | SN: 103345 | 09-Apr-21 (No. 217-03051) | Apr-22 | Power sensor NRP Z01 | SN: 103345 | 09-Apr-21 (No. 217-03052) | Apr-22 | Reference 20 dB Attenuator | SN: C22662 (20d) | 09-Apr-21 (No. 217-03343) | Apr-22 | Type-N mismatch combination | SN: 310957 / 00397 | 09-Apr-21 (No. 217-03344) | Apr-22 | Reference Probe EX3004 (DIE4) | SN: 3877 | 30-Dec-20 (No. 13X3877_Dec20) | Dec-21 | | SN: 663 | 15-Jan-20 (No. 13X6568_Jan20) | Jan-21 | Secondary Standards | ID # | Check Date (in house) | Scheduled Check | Power meter S4418E | SN: G34139322 | 05-Apr-19 (in house check Jun-20) | 11 house check Jun-22 | Power sensor E411A | SN: M41498087 | 06-Apr-16 (in house check Jun-20) | 11 house check Jun-22 | Power sensor E411A | SN: 00010210 | 06-Apr-19 (in house check Jun-20) | 11 house check Jun-22 | RF generator HP 8594C | SN: U5040201700 | 06-Apr-19 (in house check Jun-20) | 11 house check Jun-22 | Network Analyzer PNA BNA | SN: U541005477 | 31-Mar-14 (in house check Oct-20) | 11 house check Dec-21 | <p>Calibration Laboratory of Schmid & Partner Engineering AG Zürcherstrasse 43, 8004 Zurich, Switzerland</p> <p>Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates</p> <p>Accreditation No.: SCS 0108</p> <hr/> <p>Glossary:</p> <p>TSL: Issue simulating liquid sensitivity in TSL; NORM x,y,z</p> <p>ConvF: not applicable or not measured</p> <p>N/A: not applicable or not measured</p> <p>Calibration is Performed According to the Following Standards:</p> <ol style="list-style-type: none"> IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013 IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016 IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010 KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz" <p>Additional Documentation:</p> <ol style="list-style-type: none"> DASY4/5 System Handbook <p>Methods Applied and Interpretation of Parameters:</p> <ul style="list-style-type: none"> Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in this certificate are valid at the frequency indicated. Antenna Parameters with TSL: The source is mounted in a touch configuration below the center marking of the flat phantom. Return Loss: This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. No uncertainty required. SAR measured: SAR measured at the stated antenna input power. SAR for nominal TSL parameters: 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. <p>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%.</p> <hr/> <p>Certificate No: CLA150-4025_Apr21 Page 2 of 6</p> | | |
|---|------------------------------|-----------------------------------|----------------------------|------------------------|------------------------|-----------|---------------------------------|------------------|-----------------------------|-----------------|---------------------------|--------|----------------------|------------------------------|----------------------------------|-----------|----------------------------|------------------|---------------------------|-------------|-----------------------------|--------------------|-----------------------------|---------|-------------------------------|------------|-------------------------------|-----------------|------------|------------------|---|----------|---------------------|------|---|-----------------|--------------------|---------------|-----------------------------------|-----------------------|-------------------------------------|------------------|-----------------------------------|---|--------------------|--------------|-----------------------------------|-----------------------|-----------------------|-------------------------------------|-----------------------------------|--------------------------|--|--------------------------------------|-----------------------------------|-----------------------|--|-----------------|-------|
| Primary Standards | ID # | Cal Date (Certificate No.) | Schedule / Calibration | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power meter NRP | SN: 10476 | 09-Apr-21 (No. 217-03091.03292) | Apr-22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power sensor NRP Z01 | SN: 103345 | 09-Apr-21 (No. 217-03051) | Apr-22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power sensor NRP Z01 | SN: 103345 | 09-Apr-21 (No. 217-03052) | Apr-22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Reference 20 dB Attenuator | SN: C22662 (20d) | 09-Apr-21 (No. 217-03343) | Apr-22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type-N mismatch combination | SN: 310957 / 00397 | 09-Apr-21 (No. 217-03344) | Apr-22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Reference Probe EX3004 (DIE4) | SN: 3877 | 30-Dec-20 (No. 13X3877_Dec20) | Dec-21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | SN: 663 | 15-Jan-20 (No. 13X6568_Jan20) | Jan-21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Secondary Standards | ID # | Check Date (in house) | Scheduled Check | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power meter S4418E | SN: G34139322 | 05-Apr-19 (in house check Jun-20) | 11 house check Jun-22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power sensor E411A | SN: M41498087 | 06-Apr-16 (in house check Jun-20) | 11 house check Jun-22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power sensor E411A | SN: 00010210 | 06-Apr-19 (in house check Jun-20) | 11 house check Jun-22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RF generator HP 8594C | SN: U5040201700 | 06-Apr-19 (in house check Jun-20) | 11 house check Jun-22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Network Analyzer PNA BNA | SN: U541005477 | 31-Mar-14 (in house check Oct-20) | 11 house check Dec-21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Measurement Conditions DASY system configuration, as far as not given on page 1.</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>DASY Version</th> <th>DASY5</th> <th>V52.10.4</th> </tr> </thead> <tbody> <tr> <td>Extrapolation</td> <td>Advanced Extrapolation</td> <td></td> </tr> <tr> <td>Phantom</td> <td>ELN Flat Phantom</td> <td>Shell thickness: 2 ± 0.2 mm</td> </tr> <tr> <td>EUT Positioning</td> <td>Touch Position</td> <td></td> </tr> <tr> <td>Zoom Scan Resolution</td> <td>dx, dy = 4.0 mm, dz = 1.4 mm</td> <td>Graded Ratio = 1.4 (Z direction)</td> </tr> <tr> <td>Frequency</td> <td>150 MHz ± 1 MHz</td> <td></td> </tr> </tbody> </table> <p>Head TSL parameters The following parameters and calculations were applied.</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Temperature</th> <th>Permittivity</th> <th>Conductivity</th> </tr> </thead> <tbody> <tr> <td>Nominal Head TSL parameters</td> <td>22.0 °C</td> <td>52.3</td> <td>0.75 mho/m</td> </tr> <tr> <td>Measured Head TSL parameters</td> <td>(22.0 ± 0.2) °C</td> <td>51.1 ± 6 %</td> <td>0.75 mho/m ± 6 %</td> </tr> <tr> <td>Head TSL temperature change during test</td> <td>< 0.5 °C</td> <td>---</td> <td>---</td> </tr> </tbody> </table> <p>SAR result with Head TSL</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>SAR averaged over 1 cm³ (1 g) of Head TSL</th> <th>Condition</th> <th></th> </tr> </thead> <tbody> <tr> <td>SAR measured</td> <td>1 W input power</td> <td>3.90 W/kg</td> </tr> <tr> <td>SAR for nominal Head TSL parameters</td> <td>normalized to 1W</td> <td>3.88 W/kg ± 18.4 % (k=2)</td> </tr> </tbody> </table> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>SAR averaged over 10 cm³ (10 g) of Head TSL</th> <th>condition</th> <th></th> </tr> </thead> <tbody> <tr> <td>SAR measured</td> <td>1 W input power</td> <td>2.60 W/kg</td> </tr> <tr> <td>SAR for nominal Head TSL parameters</td> <td>normalized to 1W</td> <td>2.59 W/kg ± 18.0 % (k=2)</td> </tr> </tbody> </table> <hr/> <p>Certificate No: CLA150-4025_Apr21 Page 3 of 6</p> | DASY Version | DASY5 | V52.10.4 | Extrapolation | Advanced Extrapolation | | Phantom | ELN Flat Phantom | Shell thickness: 2 ± 0.2 mm | EUT Positioning | Touch Position | | Zoom Scan Resolution | dx, dy = 4.0 mm, dz = 1.4 mm | Graded Ratio = 1.4 (Z direction) | Frequency | 150 MHz ± 1 MHz | | | Temperature | Permittivity | Conductivity | Nominal Head TSL parameters | 22.0 °C | 52.3 | 0.75 mho/m | Measured Head TSL parameters | (22.0 ± 0.2) °C | 51.1 ± 6 % | 0.75 mho/m ± 6 % | Head TSL temperature change during test | < 0.5 °C | --- | --- | SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition | | SAR measured | 1 W input power | 3.90 W/kg | SAR for nominal Head TSL parameters | normalized to 1W | 3.88 W/kg ± 18.4 % (k=2) | SAR averaged over 10 cm ³ (10 g) of Head TSL | condition | | SAR measured | 1 W input power | 2.60 W/kg | SAR for nominal Head TSL parameters | normalized to 1W | 2.59 W/kg ± 18.0 % (k=2) | <p>Appendix (Additional assessments outside the scope of SCS 0108)</p> <p>Antenna Parameters with Head TSL</p> <table border="1" style="width:100%; border-collapse: collapse;"> <tbody> <tr> <td>Impedance, transformed to feed point</td> <td>47.9 Ω ± 1.5 Ω</td> </tr> <tr> <td>Return Loss</td> <td>-31.4 dB</td> </tr> </tbody> </table> <p>Additional EUT Data</p> <table border="1" style="width:100%; border-collapse: collapse;"> <tbody> <tr> <td>Manufactured by</td> <td>SPEAG</td> </tr> </tbody> </table> <hr/> <p>Certificate No: CLA150-4025_Apr21 Page 4 of 6</p> | Impedance, transformed to feed point | 47.9 Ω ± 1.5 Ω | Return Loss | -31.4 dB | Manufactured by | SPEAG |
| DASY Version | DASY5 | V52.10.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Extrapolation | Advanced Extrapolation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phantom | ELN Flat Phantom | Shell thickness: 2 ± 0.2 mm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EUT Positioning | Touch Position | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Zoom Scan Resolution | dx, dy = 4.0 mm, dz = 1.4 mm | Graded Ratio = 1.4 (Z direction) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | 150 MHz ± 1 MHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Temperature | Permittivity | Conductivity | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Nominal Head TSL parameters | 22.0 °C | 52.3 | 0.75 mho/m | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 51.1 ± 6 % | 0.75 mho/m ± 6 % | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Head TSL temperature change during test | < 0.5 °C | --- | --- | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR measured | 1 W input power | 3.90 W/kg | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR for nominal Head TSL parameters | normalized to 1W | 3.88 W/kg ± 18.4 % (k=2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR averaged over 10 cm ³ (10 g) of Head TSL | condition | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR measured | 1 W input power | 2.60 W/kg | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR for nominal Head TSL parameters | normalized to 1W | 2.59 W/kg ± 18.0 % (k=2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Impedance, transformed to feed point | 47.9 Ω ± 1.5 Ω | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Return Loss | -31.4 dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Manufactured by | SPEAG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



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DASY5 Validation Report for Head TSL

Date: 26.04.2021

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: CLA150; Type: CLA150; Serial: CLA150 - SN: 4025

Communication System: UTD 0, CW, Frequency: 150 MHz
 Medium parameters used: $f = 150 \text{ MHz}$; $\sigma = 0.76 \text{ S/m}$; $\epsilon = 51.1$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section
 Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3877; ConvF(12.51, 12.51, 12.51) @ 150 MHz; Calibrated: 30.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DA54 Snt54; Calibrated: 26.06.2020
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP.1003
- DASY52.52.10.4(1527); SEMCAD X 14.6.14(7483)

CLA Calibration for HSL-LF Tissue/CLA150, touch configuration, Pin=1W/Zoom Scan, dist=1.4mm (8x10x8)/Tube 0; Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
 Reference Value = 85.93 W/m; Power Drift = -0.02 dB
 Peak SAR (extrapolated) = 7.36 W/kg
SAR(1 g) = 3.90 W/kg; SAR(10 g) = 2.60 W/kg
 Smallest distance from peaks to all points 3 dB below: Larger than measurement grid (> 30mm)
 Ratio of SAR at M2 to SAR at M1 = 80.4%
 Maximum value of SAR (measured) = 5.48 W/kg

Certificate No: CLA150-4025_Apr21 Page 6 of 6

Certificate No: CLA150-4025_Apr21 Page 6 of 6

1.2 D450V3 - SN 1103

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

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Client: **SGS-CN (Aiden)** Certificate No: **D450V3-1103_Apr21**

CALIBRATION CERTIFICATE

Object: **D450V3 - SN: 1103**

Calibration procedure(s): **QA CAL-15_V9**
 Calibration Procedure for SAR Validation Sources below 700 MHz

Calibration date: **April 21, 2021**

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

All calibrations have been conducted in the closed laboratory facility: environmental temperature (22 ± 2) °C and humidity < 75%.

Calibration Equipment used (MPE critical for calibration)

| Primary Standards | ID # | Exp. Date (Certificate No.) | Scheduled Calibration |
|------------------------------|------------------|--------------------------------|-----------------------|
| Power Meter NRP1 | SN: 104779 | 09-Apr-21 (No. 217-030710320) | Apr-22 |
| Power sensor NRP1-Z91 | SN: 103244 | 09-Apr-21 (No. 217-03251) | Apr-22 |
| Power sensor NRP1-Z91 | SN: 103245 | 09-Apr-21 (No. 217-03259) | Apr-22 |
| Reference 20 dB Attenuator | SN: C2352 (20) | 09-Apr-21 (No. 173-0343) | Apr-22 |
| Type-A impedance combination | SN: 310827/06327 | 09-Apr-21 (No. 173-0344) | Apr-22 |
| Reference Probe EPC05A | SN: 3077 | 30-Dec-20 (No. E33-2077_De20) | Dec-21 |
| DAEA | SN: 604 | 05-Jun-20 (No. DAE4-664_Jun20) | Jun-21 |

Secondary Standards

| ID # | Check Date (in House) | Scheduled Check |
|---------------------------------|---|-----------------------|
| Power meter E4418B | SN: GB41200274 09-Apr-19 (In house check Jun-20) | In house check Jun-22 |
| Power sensor E4412A | SN: MY41496097 09-Apr-19 (In house check Jun-20) | In house check Jun-22 |
| Power sensor E4412A | SN: 00010210 09-Apr-19 (In house check Jun-20) | In house check Jun-22 |
| HP generator HP 8448C | SN: US340601100 06-Aug-19 (In house check Jun-20) | In house check Jun-22 |
| Network Analyzer Agilent E8358A | SN: US41980477 31-Mar-14 (In house check Oct-20) | In house check Oct-21 |

Calibrated by: **Christoph Linder** (Function: Laboratory Technician)

Approved by: **Katja Frensch** (Function: Technical Manager)

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

Certificate No: D450V3-1103_Apr21 Page 1 of 6

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

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Client: **SGS-CN (Aiden)** Certificate No: **D450V3-1103_Apr21**

Glossary:

TSL: Issue simulating liquid sensitivity in TSL / NORM x,y,z

ConvF: not applicable or not measured

N/A: not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2015
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 605664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Certificate No: D450V3-1103_Apr21 Page 2 of 6



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(86-512)57355888 (86-512)57370818 www.sgs.com.cn
 (86-512)57355888 (86-512)57370818 sgs.china@sgs.com

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

| | | |
|------------------------------|------------------------|-----------------------------|
| DASY Version | DASY5 | V82.10.4 |
| Extrapolation | Advanced Extrapolation | |
| Phantom | ELJ Flat Phantom | Shell thickness: 2 ± 0.2 mm |
| Distance Dipole Center - TSL | 15 mm | with Spacer |
| Zoom Scan Resolution | dx, dy, dz = 5 mm | |
| Frequency | 450 MHz ± 1 MHz | |

Head TSL parameters
The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters | 22.0 °C | 43.5 | 0.57 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 43.1 ± 0.6 % | 0.57 mho/m ± 0 % |
| Head TSL temperature change during test | < 0.5 °C | --- | --- |

SAR result with Head TSL

| SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 250 mW input power | 1.14 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 4.55 W/kg ± 18.1 % (k=2) |

| SAR averaged over 10 cm ³ (10 g) of Head TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 250 mW input power | 0.757 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 3.06 W/kg ± 17.6 % (k=2) |

Certificate No: D450V3-1103_Apr21 Page 3 of 6

Appendix (Additional assessments outside the scope of SCS 0106)

Antenna Parameters with Head TSL

| | |
|--------------------------------------|-----------------|
| Impedance, transformed to feed point | 57.1 Ω - 2.6 jΩ |
| Return Loss | -23.0 dB |

General Antenna Parameters and Design

| | |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.346 ns |
|----------------------------------|----------|

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured. The dipole is made of standard straight 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 set 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 |
|-----------------|-------|

Certificate No: D450V3-1103_Apr21 Page 4 of 6

DASY5 Validation Report for Head TSL

Test Laboratory: SPEAG, Zurich, Switzerland Date: 21.04.2021

DUT: Dipole 450 MHz; Type: D450V3; Serial: D450V3 - SN:1103

Communication System: UTD 0 - CW; Frequency: 450 MHz
Medium parameters used: $f = 450 \text{ MHz}$, $n = 0.87 \text{ Sin}$, $\epsilon_r = 43.1$, $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

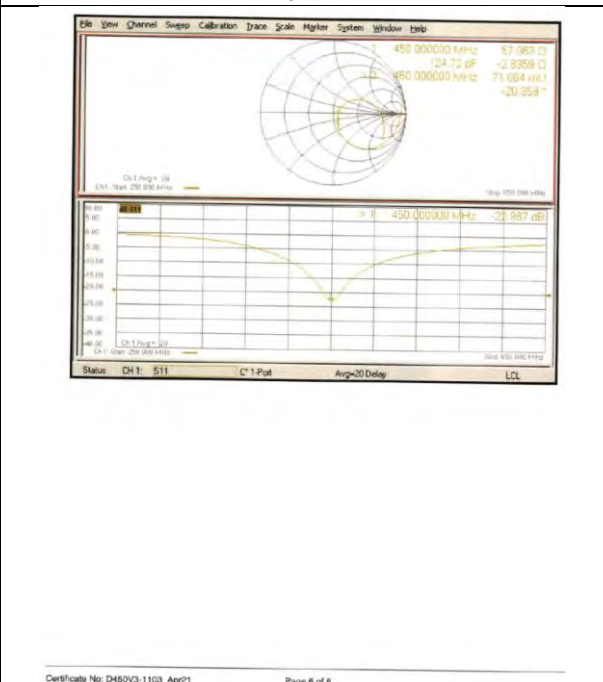
DASY52 Configuration:

- Probe: EX3DV4 - SN3877; ConvF [10.64, 10.64, 10.64] @ 450 MHz; Calibrated: 30.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 26.06.2020
- Phantom: ELJ v4.0; Type: QDOVA001BB; Serial: TP:1003
- DASY52: 10.4 (1527); SEMCAD X (4.6.14/7483)

Dipole Calibration for Head Tissue/d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 39.18 W/m; Power Dift = -0.08 dB
Peak SAR (extrapolated) = 1.76 W/kg
SAR(1g) = 1.14 W/kg; SAR(10g) = 0.767 W/kg
Smallest distance from peaks to all points: 3 dB below: Larger than measurement grid
Ratio of SAR at M2 to SAR at M1 = 64.9%
Maximum value of SAR (measured) = 1.53 W/kg

0 dB = 1.53 W/kg = 1.85 dBW/kg

Certificate No: D450V3-1103_Apr21 Page 5 of 6



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(86-512)57355888 (86-512)57370818 sgs.china@sgs.com

1.3 D750V3 - SN 1188

| <p>Client: SGS-CN Certificate No: Z22-60103</p> <p>CALIBRATION CERTIFICATE</p> <p>Object: D750V3 - SN: 1188</p> <p>Calibration Procedure(s): FF-Z11-003-01 Calibration Procedures for dipole validation kits</p> <p>Calibration date: March 29, 2022</p> <p>This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.</p> <p>All calibrations have been conducted in the closed laboratory facility; environment temperature (23±3)°C and humidity <70%.</p> <p>Calibration Equipment used (M&TE critical for calibration)</p> <table border="1"> <thead> <tr> <th>Primary Standards</th> <th>ID #</th> <th>Cal Date (Calibrated by Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Power Meter NRP2</td> <td>104277</td> <td>24-Sep-21 (CITL No. J21X08328)</td> <td>Sep-22</td> </tr> <tr> <td>Power sensor NRP8S</td> <td>104291</td> <td>24-Sep-21 (CITL No. J21X08328)</td> <td>Sep-22</td> </tr> <tr> <td>Reference Probe EX30V4</td> <td>SN 7307</td> <td>26-May-21 (SPEAG No. EX3-7307_May21)</td> <td>May-22</td> </tr> <tr> <td>DAE4</td> <td>SN 1556</td> <td>12-Jan-22 (CITL-SPEAG No. Z22-60007)</td> <td>Jan-23</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Secondary Standards</th> <th>ID #</th> <th>Cal Date (Calibrated by Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Signal Generator S4436C</td> <td>MY48071430</td> <td>13-Jan-22 (CITL No. J22X00409)</td> <td>Jan-23</td> </tr> <tr> <td>Network Analyzer E5071C</td> <td>MY46110673</td> <td>14-Jan-22 (CITL No. J22X00409)</td> <td>Jan-23</td> </tr> </tbody> </table> <p>Calibrated by: Zhao Jing SAR Test Engineer</p> <p>Reviewed by: Lin Hao SAR Test Engineer</p> <p>Approved by: Qi Dianyun SAR Project Leader</p> <p>Issued: April 3, 2022</p> <p>This calibration certificate shall not be reproduced except in full without written approval of the laboratory.</p> <p>Certificate No: Z22-60103 Page 1 of 6</p> | Primary Standards | ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration | Power Meter NRP2 | 104277 | 24-Sep-21 (CITL No. J21X08328) | Sep-22 | Power sensor NRP8S | 104291 | 24-Sep-21 (CITL No. J21X08328) | Sep-22 | Reference Probe EX30V4 | SN 7307 | 26-May-21 (SPEAG No. EX3-7307_May21) | May-22 | DAE4 | SN 1556 | 12-Jan-22 (CITL-SPEAG No. Z22-60007) | Jan-23 | Secondary Standards | ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration | Signal Generator S4436C | MY48071430 | 13-Jan-22 (CITL No. J22X00409) | Jan-23 | Network Analyzer E5071C | MY46110673 | 14-Jan-22 (CITL No. J22X00409) | Jan-23 | <p>Glossary:</p> <p>TSL Issue simulating liquid</p> <p>ConVF sensitivity in TSL / NORMx,y,z</p> <p>N/A not applicable or not measured</p> <p>Calibration is Performed According to the Following Standards:</p> <p>a) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices-Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020</p> <p>b) KDB 855654, "SAR Measurement Requirements for 100 MHz to 6 GHz"</p> <p>Additional Documentation:</p> <p>c) DASY4/5 System Handbook</p> <p>Methods Applied and Interpretation of Parameters:</p> <ul style="list-style-type: none"> 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. <p>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%.</p> <p>Certificate No: Z22-60103 Page 2 of 6</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--------------------------|--|--|-----------------------|------------------------|--------|--------------------------------|--------------------------|--------------------|------------------------------|--------------------------------|-------------|------------------------|-------------------|--------------------------------------|-----------|-----------------|---------|--------------------------------------|-------------|---------------------|--------------|--|-----------------------|-------------------------|------------|--------------------------------|-----------------|-------------------------|------------------|---|---------|--|--|---|-----------|--|--------------|--------------------|-----------|-------------------------------------|------------------|---------------------------------|---|-----------|--|--------------|--------------------|-----------|-------------------------------------|------------------|---------------------------------|---|--------------------------------------|----------------|-------------|---------|----------------------------------|----------|-----------------|-------|
| Primary Standards | ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power Meter NRP2 | 104277 | 24-Sep-21 (CITL No. J21X08328) | Sep-22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power sensor NRP8S | 104291 | 24-Sep-21 (CITL No. J21X08328) | Sep-22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Reference Probe EX30V4 | SN 7307 | 26-May-21 (SPEAG No. EX3-7307_May21) | May-22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DAE4 | SN 1556 | 12-Jan-22 (CITL-SPEAG No. Z22-60007) | Jan-23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Secondary Standards | ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Signal Generator S4436C | MY48071430 | 13-Jan-22 (CITL No. J22X00409) | Jan-23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Network Analyzer E5071C | MY46110673 | 14-Jan-22 (CITL No. J22X00409) | Jan-23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Measurement Conditions</p> <p>DASY system configuration, as far as not given on page 1</p> <table border="1"> <thead> <tr> <th>DASY Version</th> <th>DASY52</th> <th>V52.10.4</th> </tr> </thead> <tbody> <tr> <td>Extrapolation</td> <td>Advanced Extrapolation</td> <td></td> </tr> <tr> <td>Phantom</td> <td>Triple Flat Phantom 5.1C</td> <td></td> </tr> <tr> <td>Distance Dipole Center - TSL</td> <td>15 mm</td> <td>with Spacer</td> </tr> <tr> <td>Zoom Scan Resolution</td> <td>dx, dy, dz = 5 mm</td> <td></td> </tr> <tr> <td>Frequency</td> <td>750 MHz ± 1 MHz</td> <td></td> </tr> </tbody> </table> <p>Head TSL parameters</p> <p>The following parameters and calculations were applied:</p> <table border="1"> <thead> <tr> <th></th> <th>Temperature</th> <th>Permittivity</th> <th>Conductivity</th> </tr> </thead> <tbody> <tr> <td>Nominal Head TSL parameters</td> <td>22.0 °C</td> <td>42.0</td> <td>0.90 mho/m</td> </tr> <tr> <td>Measured Head TSL parameters</td> <td>(22.0 ± 0.2) °C</td> <td>41.4 ± 0.5 %</td> <td>0.89 mho/m ± 0 %</td> </tr> <tr> <td>Head TSL temperature change during test</td> <td><1.0 °C</td> <td></td> <td></td> </tr> </tbody> </table> <p>SAR result with Head TSL</p> <table border="1"> <thead> <tr> <th>SAR averaged over 1 cm² (1 g) of Head TSL</th> <th>Condition</th> <th></th> </tr> </thead> <tbody> <tr> <td>SAR measured</td> <td>250 mW input power</td> <td>2.07 W/kg</td> </tr> <tr> <td>SAR for nominal Head TSL parameters</td> <td>normalized to 1W</td> <td>8.27 W/kg ± 18.8 % (k=2)</td> </tr> <tr> <td>SAR averaged over 10 cm² (10 g) of Head TSL</td> <th>Condition</th> <th></th> </tr> <tr> <td>SAR measured</td> <td>250 mW input power</td> <td>1.37 W/kg</td> </tr> <tr> <td>SAR for nominal Head TSL parameters</td> <td>normalized to 1W</td> <td>5.48 W/kg ± 18.7 % (k=2)</td> </tr> </tbody> </table> <p>Certificate No: Z22-60103 Page 3 of 6</p> | DASY Version | DASY52 | V52.10.4 | Extrapolation | Advanced Extrapolation | | Phantom | Triple Flat Phantom 5.1C | | Distance Dipole Center - TSL | 15 mm | with Spacer | Zoom Scan Resolution | dx, dy, dz = 5 mm | | Frequency | 750 MHz ± 1 MHz | | | Temperature | Permittivity | Conductivity | Nominal Head TSL parameters | 22.0 °C | 42.0 | 0.90 mho/m | Measured Head TSL parameters | (22.0 ± 0.2) °C | 41.4 ± 0.5 % | 0.89 mho/m ± 0 % | Head TSL temperature change during test | <1.0 °C | | | SAR averaged over 1 cm ² (1 g) of Head TSL | Condition | | SAR measured | 250 mW input power | 2.07 W/kg | SAR for nominal Head TSL parameters | normalized to 1W | 8.27 W/kg ± 18.8 % (k=2) | SAR averaged over 10 cm ² (10 g) of Head TSL | Condition | | SAR measured | 250 mW input power | 1.37 W/kg | SAR for nominal Head TSL parameters | normalized to 1W | 5.48 W/kg ± 18.7 % (k=2) | <p>Appendix (Additional assessments outside the scope of CNAS L0570)</p> <p>Antenna Parameters with Head TSL</p> <table border="1"> <thead> <tr> <th>Impedance, transformed to head point</th> <th>53.60 - 1.13jΩ</th> </tr> </thead> <tbody> <tr> <td>Return Loss</td> <td>-28.7dB</td> </tr> </tbody> </table> <p>General Antenna Parameters and Design</p> <table border="1"> <thead> <tr> <th>Electrical Delay (one direction)</th> <th>0.947 ns</th> </tr> </thead> </table> <p>After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point can be measured.</p> <p>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 placed according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feed-point may be damaged.</p> <p>Additional EUT Data</p> <table border="1"> <thead> <tr> <th>Manufactured by</th> <th>SPEAG</th> </tr> </thead> </table> <p>Certificate No: Z22-60103 Page 4 of 6</p> | Impedance, transformed to head point | 53.60 - 1.13jΩ | Return Loss | -28.7dB | Electrical Delay (one direction) | 0.947 ns | Manufactured by | SPEAG |
| DASY Version | DASY52 | V52.10.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Extrapolation | Advanced Extrapolation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phantom | Triple Flat Phantom 5.1C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Distance Dipole Center - TSL | 15 mm | with Spacer | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Zoom Scan Resolution | dx, dy, dz = 5 mm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | 750 MHz ± 1 MHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Temperature | Permittivity | Conductivity | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Nominal Head TSL parameters | 22.0 °C | 42.0 | 0.90 mho/m | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 41.4 ± 0.5 % | 0.89 mho/m ± 0 % | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Head TSL temperature change during test | <1.0 °C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR averaged over 1 cm ² (1 g) of Head TSL | Condition | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR measured | 250 mW input power | 2.07 W/kg | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR for nominal Head TSL parameters | normalized to 1W | 8.27 W/kg ± 18.8 % (k=2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR averaged over 10 cm ² (10 g) of Head TSL | Condition | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR measured | 250 mW input power | 1.37 W/kg | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR for nominal Head TSL parameters | normalized to 1W | 5.48 W/kg ± 18.7 % (k=2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Impedance, transformed to head point | 53.60 - 1.13jΩ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Return Loss | -28.7dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Electrical Delay (one direction) | 0.947 ns | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Manufactured by | SPEAG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



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 In Collaboration with **CAICT**

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 E-mail: cti@chinaul.com http://www.chinaul.com

DASY5 Validation Report for Head TSL Date: 2022-03-29
 Test Laboratory: CTTL, Beijing, China
DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1188
 Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.888 \text{ S/m}$; $\epsilon_r = 41.36$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Right Section
 Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
 DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(10.31, 10.31, 10.31) @ 750 MHz; Calibrated: 2021-05-26
- Sense-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2022-01-12
- Phantom: MFP_N51C (204kg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52.52.10.4(1535); SEMCAD-X (4.6.14(7501))

Dipole Calibration/Zoom Scan (7x7x7) (7x7x7) Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
 Reference Value = 55.06 V/m; Power Drift = 0.00 dB
 Peak SAR (extrapolated) = 2.07 W/kg
 SAR(1 g) = 2.07 W/kg; SAR(10 g) = 1.37 W/kg
 Smallest distance from peaks to all points 3 dB below = 18.9 mm
 Ratio of SAR at M2 to SAR at M1 = 67.1%
 Maximum value of SAR (measured) = 2.74 W/kg

0 dB = 2.74 W/kg = 4.38 dBW/kg

Certificate No: Z22-60103 Page 5 of 6

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Impedance Measurement Plot for Head TSL

Certificate No: Z22-60103 Page 6 of 6

1.4 D835V2 - SN 4d114

TTL Speaq Calibration Laboratory
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Client: **SGS-CN** Certificate No: **Z22-60104**

CALIBRATION CERTIFICATE

Object: D835V2 - SN: 4d114
 Calibration Procedure(s): FF-Z11-003-01
 Calibration Procedures for dipole validation kits
 Calibration date: March 31, 2022

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration |
|------------------------|---------|---|-----------------------|
| Power Meter NRP2 | 106277 | 24-Sep-21 (CTTL, No.J21X08326) | Sep-22 |
| Power sensor NRPBS | 104281 | 24-Sep-21 (CTTL, No.J21X08326) | Sep-22 |
| Reference Probe EX3DV4 | SN 7307 | 26-May-21(SPEAG No. EX3-7307_May21) | May-22 |
| DAE4 | SN 1556 | 12-Jan-22(CTTL-SPEAG No. Z22-60007) | Jan-23 |

| Secondary Standards | ID # | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration |
|-------------------------|------------|---|-----------------------|
| Signal Generator E4438C | MY49071430 | 13-Jan-22 (CTTL, No.J22X00409) | Jan-23 |
| Network Analyzer E5071C | MY48110873 | 14-Jan-22 (CTTL, No.J22X00406) | Jan-23 |

Calibrated by: Zhao Jing, SAR Test Engineer
 Reviewed by: Lin Hao, SAR Test Engineer
 Approved by: Qi Dianyuan, SAR Project Leader

Signature: [Signatures]
 Issued: April 6, 2022

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

Calibration is Performed According to the Following Standards:
 a) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020
 b) KDB 685864, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:
 c) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Certificate No: Z22-60104 Page 2 of 6



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Measurement Conditions
 DASY system configuration, as far as not given on page 1

| | | |
|------------------------------|--------------------------|-------------|
| DASY Version | DASY52 | VS2 10.4 |
| Extrapolation | Advanced Extrapolation | |
| Phantom | Triple Flat Phantom 5.1C | |
| Distance Dipole Center - TSL | 15 mm | with Spacer |
| Zoom Scan Resolution | dx, dy, dz = 5 mm | |
| Frequency | 835 MHz ± 1 MHz | |

Head TSL parameters
 The following parameters and calculations were applied:

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|--------------------|
| Nominal Head TSL parameters | 22.0 °C | 41.5 | 0.90 nhm/cm |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 41.0 ± 0.6 | 0.91 nhm/cm ± 0.6% |
| Head TSL temperature change during last | <+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 | 2.37 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 6.40 W/kg ± 18.6% (k=2) |
| SAR averaged over 10 cm ³ (10 g) of Head TSL | Condition | |
| SAR measured | 250 mW input power | 1.54 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 6.12 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 | 48.7Ω - j22Ω |
| Return Loss | -25.5dB |

General Antenna Parameters and Design

| | |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.307 ns |
|----------------------------------|----------|

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is set according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feed-point may be damaged.

Additional EUT Data

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

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DASY5 Validation Report for Head TSL
 Test Laboratory: CTTL, Beijing, China
 DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 40114
 Communication System: UFD 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
 Medium parameters used: F = 835 MHz; σ = 0.907 S/m; ε_r = 40.98; ρ = 1000 kg/m³
 Phantom section: Right Section
 Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
 DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(10,13, 10,13) @ 835 MHz; Calibrated: 2021-05-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DA-E4 Sn1556; Calibrated: 2022-01-12
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52 52.10.4(153); SEMCAD X 14.6.14(7501)

Dipole Calibration/Zoom Scan (7x7x7) (7x7x7) Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
 Reference Value = 57.88 V/m; Power Drift = 0.04 dB
 Peak SAR (extrapolated) = 3.56 W/kg
 SAR(1 g) = 2.37 W/kg; SAR(10 g) = 1.54 W/kg
 Smallest distance from peaks to all points 3 dB below = 15.8 mm
 Ratio of SAR at M2 to SAR at M1 = 66.2%
 Maximum value of SAR (measured) = 3.17 W/kg

0 dB = 3.17 W/kg = 5.01 dBW/kg

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Impedance Measurement Plot for Head TSL

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1.5 D900V2 - SN 1d079

| <div style="text-align: center;"> </div> <p style="font-size: small;">Add: No.52 HuaYuanRoad, Haidian District, Beijing, 100191 Tel: +86-10-42216633-3117 E-mail: csi@sgs.com.cn http://www.sgs.com.cn</p> <p style="text-align: center;">Client: SGS-CN Certificate No: Z22-60184</p> <h3 style="text-align: center;">CALIBRATION CERTIFICATE</h3> <p>Object: D900V2 - SN: 1d079</p> <p>Calibration Procedure(s): FF-Z11-003-01 Calibration Procedures for dipole validation kits</p> <p>Calibration date: June 7, 2022</p> <p>The calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.</p> <p>All calibrations have been conducted in the closed laboratory facility, environment temperature (22±3)°C and humidity 70%.</p> <p>Calibration Equipment used (M&TE critical for calibration)</p> <table border="1" style="width: 100%; font-size: x-small;"> <thead> <tr> <th>Primary Standards</th> <th>ID #</th> <th>Cal Date (Calibrated by Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Power Meter NRP2</td> <td>106277</td> <td>24-Sep-21 (CTTL No. J21X08326)</td> <td>Sep-22</td> </tr> <tr> <td>Power sensor NRP8S</td> <td>104291</td> <td>24-Sep-21 (CTTL No. J21X08326)</td> <td>Sep-22</td> </tr> <tr> <td>Reference Probe EX3DV4</td> <td>SN 7464</td> <td>26-Jan-22 (SPEAG No. EX3-7464_Jan22)</td> <td>Jan-23</td> </tr> <tr> <td>DAEA</td> <td>SN 1566</td> <td>12-Jan-22 (CTTL-SPEAG No. Z22-60007)</td> <td>Jan-23</td> </tr> </tbody> </table> <table border="1" style="width: 100%; font-size: x-small;"> <thead> <tr> <th>Secondary Standards</th> <th>ID #</th> <th>Cal Date (Calibrated by Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Signal Generator E4438C</td> <td>MV48071430</td> <td>13-Jan-22 (CTTL No. J22X00409)</td> <td>Jan-23</td> </tr> <tr> <td>Network Analyzer E5071C</td> <td>MV48110473</td> <td>14-Jan-22 (CTTL No. J22X00409)</td> <td>Jan-23</td> </tr> </tbody> </table> <table border="1" style="width: 100%; font-size: x-small;"> <thead> <tr> <th>Calibrated by:</th> <th>Name</th> <th>Function</th> <th>Signature</th> </tr> </thead> <tbody> <tr> <td>Reviewed by:</td> <td>Lin Hao</td> <td>SAR Test Engineer</td> <td></td> </tr> <tr> <td>Approved by:</td> <td>Qi Dianyuan</td> <td>SAR Project Leader</td> <td></td> </tr> </tbody> </table> <p style="font-size: x-small;">The calibration certificate shall not be reproduced except in full without written approval of the laboratory.</p> <p style="font-size: x-small;">Certificate No: Z22-60184 Page 1 of 4</p> | Primary Standards | ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration | Power Meter NRP2 | 106277 | 24-Sep-21 (CTTL No. J21X08326) | Sep-22 | Power sensor NRP8S | 104291 | 24-Sep-21 (CTTL No. J21X08326) | Sep-22 | Reference Probe EX3DV4 | SN 7464 | 26-Jan-22 (SPEAG No. EX3-7464_Jan22) | Jan-23 | DAEA | SN 1566 | 12-Jan-22 (CTTL-SPEAG No. Z22-60007) | Jan-23 | Secondary Standards | ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration | Signal Generator E4438C | MV48071430 | 13-Jan-22 (CTTL No. J22X00409) | Jan-23 | Network Analyzer E5071C | MV48110473 | 14-Jan-22 (CTTL No. J22X00409) | Jan-23 | Calibrated by: | Name | Function | Signature | Reviewed by: | Lin Hao | SAR Test Engineer | | Approved by: | Qi Dianyuan | SAR Project Leader | | <div style="text-align: center;"> </div> <p style="font-size: small;">Add: No.52 HuaYuanRoad, Haidian District, Beijing, 100191 Tel: +86-10-42216633-3117 E-mail: csi@sgs.com.cn http://www.sgs.com.cn</p> <p>Glossary: TSL: liquid simulating liquid ConvF: sensitivity in TSL / NORM.y.z NVA: not applicable or not measured</p> <p>Calibration is Performed According to the Following Standards: a) IEC/IEEE 62209-1529, "Measurement Procedures for the Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices-Part 1529: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020 b) KDB 865684, "SAR Measurement Requirements for 100 MHz to 6 GHz"</p> <p>Additional Documentation: c) DASy4S System Handbook</p> <p>Methods Applied and Interpretation of Parameters:</p> <ul style="list-style-type: none"> • 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 assumes 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. <div style="border: 1px solid black; padding: 5px; font-size: x-small;"> <p>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%.</p> </div> <p style="font-size: x-small;">Certificate No: Z22-60184 Page 1 of 4</p> | | | | | | | | | | | | | | | | |
|---|--------------------------|--|--|-----------------------|------------------------|--------|--------------------------------|--------------------------|--------------------|------------------------------|--------------------------------|-------------|------------------------|-------------------|--------------------------------------|-----------|-----------------|---------|--------------------------------------|-------------|---------------------|--------------|--|-----------------------|-------------------------|------------|--------------------------------|-----------------|-------------------------|------------------|---|----------|----------------|------|---|-----------|--------------|--------------|--------------------|-------------|-------------------------------------|------------------|--------------------------|---|--|--|--------------|--------------------|-------------|-------------------------------------|------------------|--------------------------|---|--------------------------------------|------------------|-------------|----------|-----------------------------------|----------|-----------------|-------|
| Primary Standards | ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power Meter NRP2 | 106277 | 24-Sep-21 (CTTL No. J21X08326) | Sep-22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power sensor NRP8S | 104291 | 24-Sep-21 (CTTL No. J21X08326) | Sep-22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Reference Probe EX3DV4 | SN 7464 | 26-Jan-22 (SPEAG No. EX3-7464_Jan22) | Jan-23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DAEA | SN 1566 | 12-Jan-22 (CTTL-SPEAG No. Z22-60007) | Jan-23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Secondary Standards | ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Signal Generator E4438C | MV48071430 | 13-Jan-22 (CTTL No. J22X00409) | Jan-23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Network Analyzer E5071C | MV48110473 | 14-Jan-22 (CTTL No. J22X00409) | Jan-23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Calibrated by: | Name | Function | Signature | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Reviewed by: | Lin Hao | SAR Test Engineer | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Approved by: | Qi Dianyuan | SAR Project Leader | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <div style="text-align: center;"> </div> <p style="font-size: small;">Add: No.52 HuaYuanRoad, Haidian District, Beijing, 100191 Tel: +86-10-42216633-3117 E-mail: csi@sgs.com.cn http://www.sgs.com.cn</p> <p>Measurement Conditions DASy system configuration, as far as not given on page 1</p> <table border="1" style="width: 100%; font-size: x-small;"> <thead> <tr> <th>DASy Version</th> <th>DASy22</th> <th>52.10.4</th> </tr> </thead> <tbody> <tr> <td>Extrapolation</td> <td>Advanced Extrapolation</td> <td></td> </tr> <tr> <td>Phantom</td> <td>Triple Flat Phantom 5.1C</td> <td></td> </tr> <tr> <td>Distance Dipole Center - TSL</td> <td>15 mm</td> <td>with Spacer</td> </tr> <tr> <td>Zoom Scan Resolution</td> <td>0x, dy, dz = 5 mm</td> <td></td> </tr> <tr> <td>Frequency</td> <td>300 MHz ± 1 MHz</td> <td></td> </tr> </tbody> </table> <p>Head TSL parameters The following parameters and calculations were applied:</p> <table border="1" style="width: 100%; font-size: x-small;"> <thead> <tr> <th>Nominal Head TSL parameters</th> <th>Temperature</th> <th>Permittivity</th> <th>Conductivity</th> </tr> </thead> <tbody> <tr> <td></td> <td>22.0 °C</td> <td>41.5</td> <td>0.97 mho/m</td> </tr> <tr> <td>Measured Head TSL parameters</td> <td>(22.0 ± 0.2) °C</td> <td>42.1 ± 6 %</td> <td>0.98 mho/m ± 6 %</td> </tr> <tr> <td>Head TSL temperature change during test</td> <td><±1.0 °C</td> <td></td> <td></td> </tr> </tbody> </table> <p>SAR result with Head TSL</p> <table border="1" style="width: 100%; font-size: x-small;"> <thead> <tr> <th>SAR averaged over 1 cm³ (1 g) of Head TSL</th> <th>Condition</th> <th></th> </tr> </thead> <tbody> <tr> <td>SAR measured</td> <td>250 mW input power</td> <td>2.75 (W/kg)</td> </tr> <tr> <td>SAR for nominal Head TSL parameters</td> <td>normalized to 1W</td> <td>11.0 W/kg ± 18.8 % (k=2)</td> </tr> <tr> <td>SAR averaged over 10 cm³ (10 g) of Head TSL</td> <td>Condition</td> <td></td> </tr> <tr> <td>SAR measured</td> <td>250 mW input power</td> <td>1.75 (W/kg)</td> </tr> <tr> <td>SAR for nominal Head TSL parameters</td> <td>normalized to 1W</td> <td>7.09 W/kg ± 16.7 % (k=2)</td> </tr> </tbody> </table> <p style="font-size: x-small;">Certificate No: Z22-60184 Page 1 of 4</p> | DASy Version | DASy22 | 52.10.4 | Extrapolation | Advanced Extrapolation | | Phantom | Triple Flat Phantom 5.1C | | Distance Dipole Center - TSL | 15 mm | with Spacer | Zoom Scan Resolution | 0x, dy, dz = 5 mm | | Frequency | 300 MHz ± 1 MHz | | Nominal Head TSL parameters | Temperature | Permittivity | Conductivity | | 22.0 °C | 41.5 | 0.97 mho/m | Measured Head TSL parameters | (22.0 ± 0.2) °C | 42.1 ± 6 % | 0.98 mho/m ± 6 % | Head TSL temperature change during test | <±1.0 °C | | | SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition | | SAR measured | 250 mW input power | 2.75 (W/kg) | SAR for nominal Head TSL parameters | normalized to 1W | 11.0 W/kg ± 18.8 % (k=2) | SAR averaged over 10 cm ³ (10 g) of Head TSL | Condition | | SAR measured | 250 mW input power | 1.75 (W/kg) | SAR for nominal Head TSL parameters | normalized to 1W | 7.09 W/kg ± 16.7 % (k=2) | <div style="text-align: center;"> </div> <p style="font-size: small;">Add: No.52 HuaYuanRoad, Haidian District, Beijing, 100191 Tel: +86-10-42216633-3117 E-mail: csi@sgs.com.cn http://www.sgs.com.cn</p> <p>Appendix (Additional assessments outside the scope of CNAS L6070)</p> <p>Antenna Parameters with Head TSL</p> <table border="1" style="width: 100%; font-size: x-small;"> <tbody> <tr> <td>Impedance, transformed to feed point</td> <td>48 (1.0 - 8.4j)Ω</td> </tr> <tr> <td>Return Loss</td> <td>-23.3 dB</td> </tr> </tbody> </table> <p>General Antenna Parameters and Design</p> <table border="1" style="width: 100%; font-size: x-small;"> <tbody> <tr> <td>Electrical Delay (line direction)</td> <td>1.312 ns</td> </tr> </tbody> </table> <p>After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point can be measured.</p> <p>The dipole is made of standard semi-rigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feed-point may be damaged.</p> <p>Additional EUT Data</p> <table border="1" style="width: 100%; font-size: x-small;"> <tbody> <tr> <td>Manufactured by</td> <td>SPEAG</td> </tr> </tbody> </table> <p style="font-size: x-small;">Certificate No: Z22-60184 Page 1 of 6</p> | Impedance, transformed to feed point | 48 (1.0 - 8.4j)Ω | Return Loss | -23.3 dB | Electrical Delay (line direction) | 1.312 ns | Manufactured by | SPEAG |
| DASy Version | DASy22 | 52.10.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Extrapolation | Advanced Extrapolation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phantom | Triple Flat Phantom 5.1C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Distance Dipole Center - TSL | 15 mm | with Spacer | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Zoom Scan Resolution | 0x, dy, dz = 5 mm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | 300 MHz ± 1 MHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Nominal Head TSL parameters | Temperature | Permittivity | Conductivity | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 22.0 °C | 41.5 | 0.97 mho/m | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 42.1 ± 6 % | 0.98 mho/m ± 6 % | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Head TSL temperature change during test | <±1.0 °C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR measured | 250 mW input power | 2.75 (W/kg) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR for nominal Head TSL parameters | normalized to 1W | 11.0 W/kg ± 18.8 % (k=2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR averaged over 10 cm ³ (10 g) of Head TSL | Condition | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR measured | 250 mW input power | 1.75 (W/kg) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR for nominal Head TSL parameters | normalized to 1W | 7.09 W/kg ± 16.7 % (k=2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Impedance, transformed to feed point | 48 (1.0 - 8.4j)Ω | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Return Loss | -23.3 dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Electrical Delay (line direction) | 1.312 ns | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Manufactured by | SPEAG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



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Attention: To check the authenticity of testing / inspection report & certificate, please contact us at telephone: (86-755) 8307 1443, or email: CN.Doccheck@sgs.com

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DASY5 Validation Report for Head TSL Date: 2022-06-07

Test Laboratory: TTL, Beijing, China

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN: 14079

Communication System: UTD 0, CW; Frequency: 900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 900 \text{ MHz}$; $\sigma = 0.98 \text{ S/m}$; $\epsilon_r = 42.65$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(9.72, 9.72) @ 900 MHz; Calibrated: 2022-01-26
- Sensor-Surface: LAmn (Mechanical Surface Detection)
- Electronic: DAE4 SN1556; Calibrated: 2022-01-12
- Phantom: MFP_V5.1C (2dlog probe kit); Type: QD 000 P51 Cx; Serial: 1062
- DASY52.10.4(1535); SEMCAD X 14.6.14(7501)

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

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

Peak SAR (extrapolated) = 4.20 W/kg

SAR(1g) = 2.79 W/kg; SAR(10g) = 1.78 W/kg

Smallest distance from peaks to all points 3 dB below = 16 mm

Ratio of SAR at M2 to SAR at M1 = 65.8%

Maximum value of SAR (measured) = 3.71 W/kg

0 dB = 3.71 W/kg = 5.69 dBW/kg

Certificate No: Z22-60184 Page 9 of 6

Address: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
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Impedance Measurement Plot for Head TSL

Certificate No: Z22-60184 Page 9 of 6

1.6 D1800V2 - SN 2d170

Address: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-4230603-2117
E-mail: emc@sgs.com.cn
<http://www.sgs.com.cn>

中国认可
国际互认
CALIBRATION
CNAS 1871

Client: **SGS-CN** Certificate No: **Z22-60105**

CALIBRATION CERTIFICATE

Object: **D1800V2 - SN: 2d170**

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

Calibration date: **March 31, 2022**

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

All calibrations have been conducted in the closed laboratory facility, environment temperature (23±1)°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 | 108277 | 24-Sep-21 (CITL No.J21X08326) | Sep-22 |
| Power sensor NRP6S | 104291 | 24-Sep-21 (CITL No.J21X08326) | Sep-22 |
| Reference Probe EX3DV4 | SN 7307 | 26-May-21 (SPEAG No.EX3-7307_May21) | May-22 |
| DAE4 | SN 1556 | 12-Jan-22 (CITL-SPEAG No.Z22-60007) | Jan-23 |

| Secondary Standards | ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration |
|-------------------------|------------|--|-----------------------|
| Signal Generator E4438C | MY48071430 | 13-Jan-22 (CITL No.J22X00409) | Jan-23 |
| Network Analyzer E5071C | MY48110873 | 14-Jan-22 (CITL No.J22X00409) | Jan-23 |

Calibrated by: **Zhao Jing** SAR Test Engineer

Reviewed by: **Lin Hao** SAR Test Engineer

Approved by: **Qi Diqiyuan** SAR Project Leader

Issued: April 6, 2022

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Certificate No: Z22-60105 Page 1 of 6

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Glossary:

TSL: tissue simulating liquid

ConvF: sensitivity in TSL / NORM_{x,y,z}

N/A: not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020
- KDB 855684, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Certificate No: Z22-60105 Page 1 of 6



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|---|--|--------------------------|------------------|---------------|------------------------|--|---------|--------------------------|--|------------------------------|-------|-------------|----------------------|-------------------|--|-----------|------------------|--|--|-------------|--------------|--------------|-----------------------------|---------|------|------------|------------------------------|---------------|------------|------------------|---|----------|---|---|---|-----------|--|--------------|--------------------|-----------|-------------------------------------|------------------|--------------------------|---|-----------|--|--------------|--------------------|-----------|-------------------------------------|------------------|--------------------------|--|--------------------------------------|----------------|-------------|---------|----------------------------------|----------|-----------------|-------|
| <p>TTL Speag CALIBRATION LABORATORY</p> <p>In Collaboration with CAICT</p> <p>Address: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-42304633-2079 Fax: +86-10-42304633-2504 E-mail: cti@chinaeui.com http://www.chinaeui.com</p> <p>Measurement Conditions DASY System configuration, as far as not given on page 1.</p> <table border="1"> <tr> <td>DASY Version</td> <td>DASY52</td> <td>52.10.4</td> </tr> <tr> <td>Extrapolation</td> <td>Advanced Extrapolation</td> <td></td> </tr> <tr> <td>Phantom</td> <td>Triple Flat Phantom 5.1C</td> <td></td> </tr> <tr> <td>Distance Dipole Center - TSL</td> <td>10 mm</td> <td>with Spacer</td> </tr> <tr> <td>Zoom Scan Resolution</td> <td>dx, dy, dz = 5 mm</td> <td></td> </tr> <tr> <td>Frequency</td> <td>1800 MHz ± 1 MHz</td> <td></td> </tr> </table> <p>Head TSL parameters The following parameters and calculations were applied:</p> <table border="1"> <tr> <td></td> <td>Temperature</td> <td>Permittivity</td> <td>Conductivity</td> </tr> <tr> <td>Nominal Head TSL parameters</td> <td>22.0 °C</td> <td>40.0</td> <td>1.40 mho/m</td> </tr> <tr> <td>Measured Head TSL parameters</td> <td>22.0 ± 0.2 °C</td> <td>40.8 ± 8 %</td> <td>1.41 mho/m ± 8 %</td> </tr> <tr> <td>Head TSL temperature change during test</td> <td>< 1.0 °C</td> <td>—</td> <td>—</td> </tr> </table> <p>SAR result with Head TSL</p> <table border="1"> <tr> <td>SAR averaged over 1 cm³ (1 g) of Head TSL</td> <td>Condition</td> <td></td> </tr> <tr> <td>SAR measured</td> <td>250 mW input power</td> <td>9.73 W/kg</td> </tr> <tr> <td>SAR for nominal Head TSL parameters</td> <td>normalized to 1W</td> <td>38.9 W/kg ± 18.8 % (k=2)</td> </tr> <tr> <td>SAR averaged over 10 cm³ (10 g) of Head TSL</td> <td>Condition</td> <td></td> </tr> <tr> <td>SAR measured</td> <td>250 mW input power</td> <td>5.11 W/kg</td> </tr> <tr> <td>SAR for nominal Head TSL parameters</td> <td>normalized to 1W</td> <td>20.4 W/kg ± 18.7 % (k=2)</td> </tr> </table> <p>Certificate No: Z22-60105 Page 3 of 6</p> | DASY Version | DASY52 | 52.10.4 | 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 | 1800 MHz ± 1 MHz | | | 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 | 40.8 ± 8 % | 1.41 mho/m ± 8 % | Head TSL temperature change during test | < 1.0 °C | — | — | SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition | | SAR measured | 250 mW input power | 9.73 W/kg | SAR for nominal Head TSL parameters | normalized to 1W | 38.9 W/kg ± 18.8 % (k=2) | SAR averaged over 10 cm ³ (10 g) of Head TSL | Condition | | SAR measured | 250 mW input power | 5.11 W/kg | SAR for nominal Head TSL parameters | normalized to 1W | 20.4 W/kg ± 18.7 % (k=2) | <p>TTL Speag CALIBRATION LABORATORY</p> <p>In Collaboration with CAICT</p> <p>Address: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-42304633-2079 Fax: +86-10-42304633-2504 E-mail: cti@chinaeui.com http://www.chinaeui.com</p> <p>Appendix (Additional assessments outside the scope of CNAS L0570)</p> <p>Antenna Parameters with Head TSL</p> <table border="1"> <tr> <td>Impedance, transformed to feed point</td> <td>47.90 - 2.54jΩ</td> </tr> <tr> <td>Return Loss</td> <td>-29.4dB</td> </tr> </table> <p>General Antenna Parameters and Design</p> <table border="1"> <tr> <td>Electrical Delay (one direction)</td> <td>1.116 ns</td> </tr> </table> <p>After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point can be measured.</p> <p>The dipole is made of standard semi-rigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feed-point may be damaged.</p> <p>Additional EUT Data</p> <table border="1"> <tr> <td>Manufactured by</td> <td>SPEAG</td> </tr> </table> <p>Certificate No: Z22-60105 Page 4 of 6</p> | Impedance, transformed to feed point | 47.90 - 2.54jΩ | Return Loss | -29.4dB | Electrical Delay (one direction) | 1.116 ns | Manufactured by | SPEAG |
| DASY Version | DASY52 | 52.10.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 | 1800 MHz ± 1 MHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 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 | 40.8 ± 8 % | 1.41 mho/m ± 8 % | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Head TSL temperature change during test | < 1.0 °C | — | — | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR measured | 250 mW input power | 9.73 W/kg | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR for nominal Head TSL parameters | normalized to 1W | 38.9 W/kg ± 18.8 % (k=2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR averaged over 10 cm ³ (10 g) of Head TSL | Condition | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR measured | 250 mW input power | 5.11 W/kg | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR for nominal Head TSL parameters | normalized to 1W | 20.4 W/kg ± 18.7 % (k=2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Impedance, transformed to feed point | 47.90 - 2.54jΩ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Return Loss | -29.4dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Electrical Delay (one direction) | 1.116 ns | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Manufactured by | SPEAG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>TTL Speag CALIBRATION LABORATORY</p> <p>In Collaboration with CAICT</p> <p>Address: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-42304633-2079 Fax: +86-10-42304633-2504 E-mail: cti@chinaeui.com http://www.chinaeui.com</p> <p>DASY5 Validation Report for Head TSL Date: 2022-03-31</p> <p>Test Laboratory: CTTL, Beijing, China</p> <p>DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 2d170</p> <p>Communication System: UID 0, CW; Frequency: 1800 MHz; Duty Cycle: 1:1</p> <p>Medium parameters used: $f = 1800 \text{ MHz}$; $\sigma = 1.41 \text{ S/m}$; $\epsilon = 40.62$; $\rho = 1000 \text{ kg/m}^3$</p> <p>Phantom section: Right Section</p> <p>Measurement Standard: DASY5 (IEEE/ANSI C63.19-2007)</p> <p>DASY5 Configuration:</p> <ul style="list-style-type: none"> Probe: EX3DV4 - SN7307; ConvF(8.34, 8.34, 8.34) @ 1800 MHz; Calibrated: 2021-05-26 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DAE4 Sn1556; Calibrated: 2022-01-12 Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062 DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501) <p>Dipole Calibration/Zoom Scan (7x7x7)(7x7x7)Cube Ø: Measurement grid: dx=5mm, dy=5mm, dz=5mm</p> <p>Reference Value = 98.14 V/m; Power Drift = 0.03 dB</p> <p>Peak SAR (extrapolated) = 18.2 W/kg</p> <p>SAR(1 g) = 9.73 W/kg; SAR(10 g) = 5.11 W/kg</p> <p>Smallest distance from peaks to all points 3 dB below = 10 mm</p> <p>Ratio of SAR at M2 to SAR at M1 = 54%</p> <p>Maximum value of SAR (measured) = 15.2 W/kg</p> <p>0 dB = 15.2 W/kg = 11.82 dBW/kg</p> <p>Certificate No: Z22-60105 Page 5 of 6</p> | <p>TTL Speag CALIBRATION LABORATORY</p> <p>In Collaboration with CAICT</p> <p>Address: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-42304633-2079 Fax: +86-10-42304633-2504 E-mail: cti@chinaeui.com http://www.chinaeui.com</p> <p>Impedance Measurement Plot for Head TSL</p> <p>Certificate No: Z22-60105 Page 6 of 6</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



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1.7 D1900V2 - SN 5d136

| <p>Client: SGS-CN Certificate No: Z22-60185</p> <h3>CALIBRATION CERTIFICATE</h3> <p>Object: D1900V2 - SN: 5d136</p> <p>Calibration Procedure(s): FF-Z11-003-01 Calibration Procedures for dipole validation kits</p> <p>Calibration date: June 7, 2022</p> <p>The calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.</p> <p>All calibrations have been conducted in the closed laboratory facility, environment temperature (23±0.1) and humidity <math>70\%</math>.</p> <p>Calibration Equipment used (M&E critical for calibration)</p> <table border="1"> <thead> <tr> <th>Primary Standards</th> <th>ID #</th> <th>Cal Date (Calibrated by Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Power Meter NRP2</td> <td>106277</td> <td>24-Sep-21 (CTTL No. J21X08326)</td> <td>Sep-22</td> </tr> <tr> <td>Power Sensor NRP65</td> <td>104291</td> <td>24-Sep-21 (CTTL No. J21X08326)</td> <td>Sep-22</td> </tr> <tr> <td>Reference Probe EXSDV4</td> <td>SN 7464</td> <td>28-Jan-22 (SPEAG No. EX3-7464_Jan22)</td> <td>Jan-23</td> </tr> <tr> <td>DSEA</td> <td>SN 1658</td> <td>12-Jan-22 (CTTL-SPEAG No. Z22-60007)</td> <td>Jan-23</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Secondary Standards</th> <th>ID #</th> <th>Cal Date (Calibrated by Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Signal Generator E4438C</td> <td>MY48071430</td> <td>13-Jan-22 (CTTL No. J22X00409)</td> <td>Jan-23</td> </tr> <tr> <td>Network Analyser E5071C</td> <td>MY48110073</td> <td>14-Jan-22 (CTTL No. J22X00406)</td> <td>Jan-23</td> </tr> </tbody> </table> <p>Calibrated by: Zhao Jing, SAR Test Engineer</p> <p>Reviewed by: Lin Hao, SAR Test Engineer</p> <p>Approved by: Qi Danyuan, SAR Project Leader</p> <p>Issued: June 13, 2022</p> <p>The calibration certificate shall not be reproduced except in full without written approval of the laboratory.</p> <p>Certificate No: Z22-60185 Page 1 of 4</p> | Primary Standards | ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration | Power Meter NRP2 | 106277 | 24-Sep-21 (CTTL No. J21X08326) | Sep-22 | Power Sensor NRP65 | 104291 | 24-Sep-21 (CTTL No. J21X08326) | Sep-22 | Reference Probe EXSDV4 | SN 7464 | 28-Jan-22 (SPEAG No. EX3-7464_Jan22) | Jan-23 | DSEA | SN 1658 | 12-Jan-22 (CTTL-SPEAG No. Z22-60007) | Jan-23 | Secondary Standards | ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration | Signal Generator E4438C | MY48071430 | 13-Jan-22 (CTTL No. J22X00409) | Jan-23 | Network Analyser E5071C | MY48110073 | 14-Jan-22 (CTTL No. J22X00406) | Jan-23 | <p>Glossary:</p> <p>TSL: tissue simulating liquid</p> <p>ConvF: sensitivity in TSL / NORMx.y.z</p> <p>N/A: not applicable or not measured</p> <p>Calibration is Performed According to the Following Standards:</p> <p>a) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-Held and Body-Mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020</p> <p>b) KDB 855884, "SAR Measurement Requirements for 100 MHz to 6 GHz"</p> <p>Additional Documentation:</p> <p>c) DASYS System Handbook</p> <p>Methods Applied and Interpretation of Parameters:</p> <ul style="list-style-type: none"> 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 status 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. <p>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%.</p> <p>Certificate No: Z22-60185 Page 2 of 4</p> | | | | | | | | | | | | | | | | | | | | | | | | |
|---|-------------------------|--|--|-----------------------|------------------------|--------|--------------------------------|-------------------------|--------------------|------------------------------|--------------------------------|-------------|------------------------|-------------------|--------------------------------------|-----------|------------------|---------|--------------------------------------|-------------|---------------------|--------------|--|-----------------------|-------------------------|-------------------|---|---------|-------------------------|------------|---|-----------|---|--------------|--------------------|-----------|-------------------------------------|------------------|--------------------------|---|-----------|--|--------------|--------------------|-----------|-------------------------------------|------------------|--------------------------|---|--------------------------------------|-----------------|-------------|--------|----------------------------------|----------|-----------------|-------|
| Primary Standards | ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power Meter NRP2 | 106277 | 24-Sep-21 (CTTL No. J21X08326) | Sep-22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power Sensor NRP65 | 104291 | 24-Sep-21 (CTTL No. J21X08326) | Sep-22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Reference Probe EXSDV4 | SN 7464 | 28-Jan-22 (SPEAG No. EX3-7464_Jan22) | Jan-23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DSEA | SN 1658 | 12-Jan-22 (CTTL-SPEAG No. Z22-60007) | Jan-23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Secondary Standards | ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Signal Generator E4438C | MY48071430 | 13-Jan-22 (CTTL No. J22X00409) | Jan-23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Network Analyser E5071C | MY48110073 | 14-Jan-22 (CTTL No. J22X00406) | Jan-23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Measurement Conditions</p> <p>DASY system configuration, as far as not given on page 1:</p> <table border="1"> <thead> <tr> <th>DASY Version</th> <th>DASY52</th> <th>52.10.4</th> </tr> </thead> <tbody> <tr> <td>Extrapolation</td> <td>Advanced Extrapolation</td> <td></td> </tr> <tr> <td>Phantom</td> <td>Tribe Flat Phantom 5.1C</td> <td></td> </tr> <tr> <td>Distance Dipole Center - TSL</td> <td>10 mm</td> <td>with Spacer</td> </tr> <tr> <td>Zoom Scan Resolution</td> <td>dx, dy, dz = 5 mm</td> <td></td> </tr> <tr> <td>Frequency</td> <td>1900 MHz ± 1 kHz</td> <td></td> </tr> </tbody> </table> <p>Head TSL parameters</p> <p>The following parameters and calculations were applied:</p> <table border="1"> <thead> <tr> <th>Nominal Head TSL parameters</th> <th>Temperature</th> <th>Permittivity</th> <th>Conductivity</th> </tr> </thead> <tbody> <tr> <td>Measured Head TSL parameters</td> <td>(22.0 ± 0.2) °C</td> <td>39.9 ± 0.5 %</td> <td>1.38 mS/m ± 0.5 %</td> </tr> <tr> <td>Head TSL temperature change during test</td> <td>+1.0 °C</td> <td></td> <td></td> </tr> </tbody> </table> <p>SAR result with Head TSL</p> <table border="1"> <thead> <tr> <th>SAR averaged over 1 cm² (1 g) of Head TSL</th> <th>Condition</th> <th></th> </tr> </thead> <tbody> <tr> <td>SAR measured</td> <td>250 mW input power</td> <td>3.65 W/kg</td> </tr> <tr> <td>SAR for nominal Head TSL parameters</td> <td>normalized to 1W</td> <td>40.0 W/kg ± 16.8 % (k=2)</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>SAR averaged over 10 cm² (10 g) of Head TSL</th> <th>Condition</th> <th></th> </tr> </thead> <tbody> <tr> <td>SAR measured</td> <td>250 mW input power</td> <td>5.18 W/kg</td> </tr> <tr> <td>SAR for nominal Head TSL parameters</td> <td>normalized to 1W</td> <td>20.0 W/kg ± 16.7 % (k=2)</td> </tr> </tbody> </table> <p>Certificate No: Z22-60185 Page 3 of 4</p> | DASY Version | DASY52 | 52.10.4 | Extrapolation | Advanced Extrapolation | | Phantom | Tribe Flat Phantom 5.1C | | Distance Dipole Center - TSL | 10 mm | with Spacer | Zoom Scan Resolution | dx, dy, dz = 5 mm | | Frequency | 1900 MHz ± 1 kHz | | Nominal Head TSL parameters | Temperature | Permittivity | Conductivity | Measured Head TSL parameters | (22.0 ± 0.2) °C | 39.9 ± 0.5 % | 1.38 mS/m ± 0.5 % | Head TSL temperature change during test | +1.0 °C | | | SAR averaged over 1 cm ² (1 g) of Head TSL | Condition | | SAR measured | 250 mW input power | 3.65 W/kg | SAR for nominal Head TSL parameters | normalized to 1W | 40.0 W/kg ± 16.8 % (k=2) | SAR averaged over 10 cm ² (10 g) of Head TSL | Condition | | SAR measured | 250 mW input power | 5.18 W/kg | SAR for nominal Head TSL parameters | normalized to 1W | 20.0 W/kg ± 16.7 % (k=2) | <p>Appendix (Additional assessments outside the scope of CNAS L0570)</p> <h3>Antenna Parameters with Head TSL</h3> <table border="1"> <tbody> <tr> <td>Impedance, transformed to feed point</td> <td>51.5Ω ± 1.5Ω(j)</td> </tr> <tr> <td>Return Loss</td> <td>22.4dB</td> </tr> </tbody> </table> <h3>General Antenna Parameters and Design</h3> <table border="1"> <tbody> <tr> <td>Electrical Delay (one direction)</td> <td>1.109 ns</td> </tr> </tbody> </table> <p>After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point can be measured.</p> <p>The dipole is made of standard semi-rigid 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 specified in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feed-point may be damaged.</p> <h3>Additional EUT Data</h3> <table border="1"> <tbody> <tr> <td>Manufactured by</td> <td>SPEAG</td> </tr> </tbody> </table> <p>Certificate No: Z22-60185 Page 4 of 4</p> | Impedance, transformed to feed point | 51.5Ω ± 1.5Ω(j) | Return Loss | 22.4dB | Electrical Delay (one direction) | 1.109 ns | Manufactured by | SPEAG |
| DASY Version | DASY52 | 52.10.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Extrapolation | Advanced Extrapolation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phantom | Tribe Flat Phantom 5.1C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Distance Dipole Center - TSL | 10 mm | with Spacer | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Zoom Scan Resolution | dx, dy, dz = 5 mm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | 1900 MHz ± 1 kHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Nominal Head TSL parameters | Temperature | Permittivity | Conductivity | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 39.9 ± 0.5 % | 1.38 mS/m ± 0.5 % | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Head TSL temperature change during test | +1.0 °C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR averaged over 1 cm ² (1 g) of Head TSL | Condition | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR measured | 250 mW input power | 3.65 W/kg | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR for nominal Head TSL parameters | normalized to 1W | 40.0 W/kg ± 16.8 % (k=2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR averaged over 10 cm ² (10 g) of Head TSL | Condition | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR measured | 250 mW input power | 5.18 W/kg | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR for nominal Head TSL parameters | normalized to 1W | 20.0 W/kg ± 16.7 % (k=2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Impedance, transformed to feed point | 51.5Ω ± 1.5Ω(j) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Return Loss | 22.4dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Electrical Delay (one direction) | 1.109 ns | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Manufactured by | SPEAG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

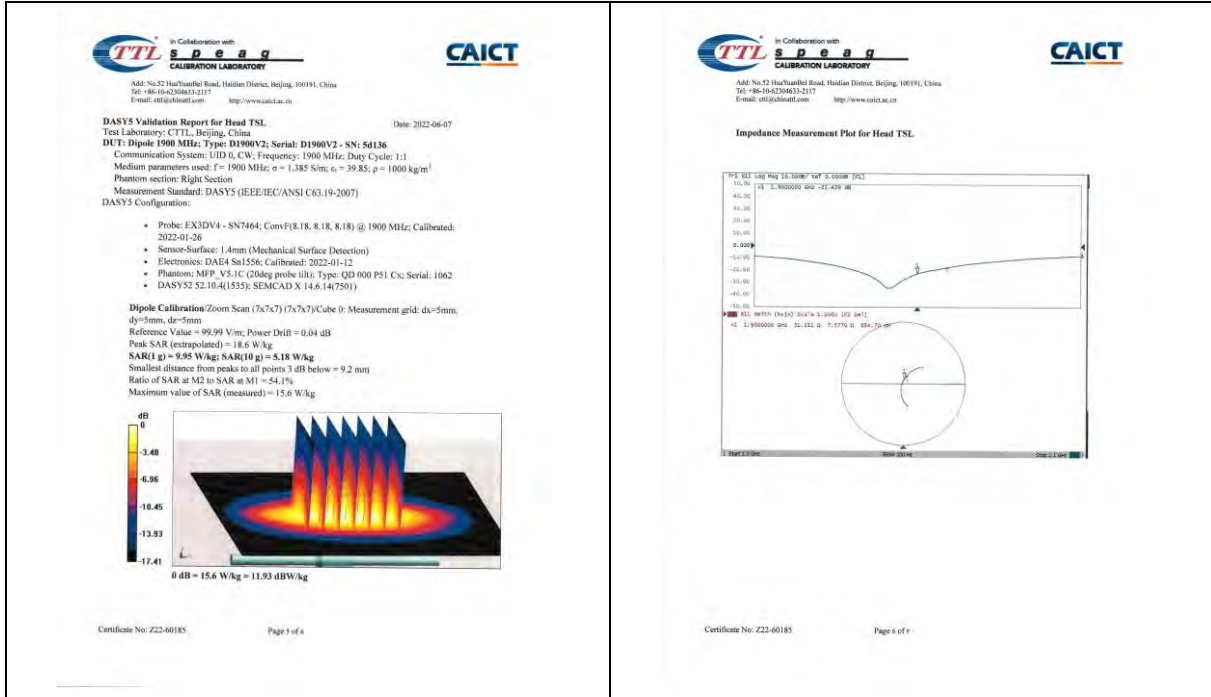


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1.8 D2000V2 - SN 1041

Client: **SGS-CN** Certificate No: **Z22-60186**

CALIBRATION CERTIFICATE

Object: D2000V2 - SN 1041

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

Calibration date: June 6, 2022

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration |
|------------------------|---------|--|-----------------------|
| Power Meter NRP2 | 106277 | 24-Sep-21 (CITL No. J21-K06328) | Sep-22 |
| Power sensor NRP2S | 104291 | 24-Sep-21 (CITL No. J21-K06328) | Sep-22 |
| Reference Probe EX3DVA | SN 7464 | 26-Jan-22 (SPEAG No. EX3-7464-Jan22) | Jan-23 |
| DAEA | SN 1556 | 12-Jan-22 (CITL-SPEAG No. Z22-60007) | Jan-23 |

| Secondary Standards | ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration |
|-------------------------|------------|--|-----------------------|
| Signal Generator E4438C | MY49071430 | 13-Jan-22 (CITL No. J22X00408) | Jan-23 |
| Network Analyzer E5071C | MY46110673 | 14-Jan-22 (CITL No. J22X00408) | Jan-23 |

Calibrated by: Zhao Jing, SAR Test Engineer

Reviewed by: Lin Hao, SAR Test Engineer

Approved by: Qi Dianyan, SAR Project Leader

Issued: June 13, 2022

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Certificate No: Z22-60186 Page 1 of 6

Glossary:

TSL: Issue simulating liquid

Copy#: sensitivity in TSL / INORMx.y.z

N/A: not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices: Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020
- KDB 955664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY4/S 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: Z22-60186 Page 2 of 6



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 E-mail: emc@sgs.com.cn

Measurement Conditions
 DASYS system configuration, as for as not given on page 1.

| | | |
|------------------------------|---------------------------|-------------|
| DASY Version | DASYV2 | 52.10.4 |
| Extrapolation | Advanced Extrapolation | |
| Phantom | Triple Flat Phantom S.I.C | |
| Distance Dipole Center - TSL | 10 mm | with Spacer |
| Zoom Scan Resolution | dx, dy, dz ± 5 mm | |
| Frequency | 2000 MHz ± 1 MHz | |

Head TSL parameters
 The following parameters and calculations were applied:

| | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|---------------------|
| Nominal Head TSL parameters | 22.9 °C | 40.0' | 1.40 mho/cm |
| Measured Head TSL parameters | (22.2 ± 0.2) °C | 40.2 ± 0.5 % | 1.36 mho/cm ± 0.6 % |
| Head TSL temperature change during test | -1.0 °C | | |

SAR result with Head TSL

| SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition | |
|---|--------------------|--------------------------|
| SAR measured | 250 mW input power | 10.4 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 41.8 W/kg ± 18.8 % (k=2) |
| SAR averaged over 10 cm ³ (10 g) of Head TSL | Condition | |
| SAR measured | 250 mW input power | 5.30 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 21.3 W/kg ± 18.7 % (k=2) |

Certificate No: Z23-60186 Page 3 of 6

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Appendix (Additional assessments outside the scope of CNAS L6570)

Antenna Parameters with Head TSL

| | |
|--------------------------------------|-----------------|
| Impedance: transformed to feed point | 48.40 ± 0.74(j) |
| Return Loss | -34.8dB |

General Antenna Parameters and Design

| | |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.086 ns |
|----------------------------------|----------|

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

The dipole is made of standard serrivigco 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 caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feed-point may be damaged.

Additional EUT Data

| | |
|-----------------|-------|
| Manufactured by | BPEAG |
|-----------------|-------|

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DASY5 Validation Report for Head TSL
 Date: 2022-06-06
 Test Laboratory: CTTL, Beijing, China
 DUT: Dipole 2000 MHz; Type: D2000V2; Serial: D2000V2 - SN: 1041
 Communication System: UFD 0; CW; Frequency: 2000 MHz; Duty Cycle: 1:1
 Medium parameters used: f = 2000 MHz; σ = 1.392 S/m; ε = 40.21; ρ = 1000 kg/m³
 Phantom section: Right Section
 Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
 DASY5 Configuration:

- Probe: EX3DV4 - SN7464; Conv(F:2, R:2, S:2) @ 2000 MHz; Calibrated: 2022-01-26
- Sensor Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DA64 Sn1556; Calibrated: 2022-01-12
- Phantom: MFP_V5.I.C (20dkg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY5: S2.10.6(A1535); SEMCAD X.14.6.14(7501)

Dipole Calibration/Zoom Scan (7x7x7) (7x7x7); Cube @ Measurement grid: dx=5mm, dy=5mm, dz=5mm
 Reference Value = 103.4 V/m; Power DirB = 0.03 dB
 Peak SAR (extrapolated) = 19.6 W/kg
 SAR(1 g) = 10.4 W/kg; SAR(10 g) = 5.3 W/kg
 Smallest distance from peaks to all points 3 dB below = 9.1 mm
 Ratio of SAR at M2 to SAR at M1 = 53.0%

Maximum value of SAR (measured) = 16.3 W/kg

0 dB = 16.3 W/kg = 12.12 dBW/kg

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Impedance Measurement Plot for Head TSL

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1.9 D2300V2 - SN 1096

| | | | |
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| <p>Client: SGS-CN Certificate No: Z22-60106</p> | | | |
| <p>CALIBRATION CERTIFICATE</p> | | | |
| Object | D2300V2 - SN 1096 | | |
| Calibration Procedure(s) | FF-Z11-003-01 Calibration Procedures for dipole validation kits | | |
| Calibration date: | March 31, 2022 | | |
| <p>This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)°C and humidity <70%.</p> <p>Calibration Equipment used (M&TE critical for calibration)</p> | | | |
| Primary Standards | ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration |
| Power Meter NRP2 | 108277 | 24-Sep-21 (CTTL No.J21X08328) | Sep-22 |
| Power sensor NRP8S | 104291 | 24-Sep-21 (CTTL No.J21X08328) | Sep-22 |
| Reference Probe EK30V4 DAE4 | SN 7307 SN 1556 | 26-May-21 (SPEAG No.EK3-7307_May21) 12-Jan-22 (CTTL-SPEAG No.Z22-600007) | May-22 Jan-23 |
| Secondary Standards | ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration |
| Signal Generator E4438C | MY49071430 | 13-Jan-22 (CTTL No.J22X00406) | Jan-23 |
| Network Analyzer E5071C | MY46110673 | 14-Jan-22 (CTTL No.J22X00406) | Jan-23 |
| Calibrated by: | Name | Function | Signature |
| | Zhao Jing | SAR Test Engineer | |
| Reviewed by: | Lin Hao | SAR Test Engineer | |
| Approved by: | Qi Dianyan | SAR Project Leader | |
| <p>This calibration certificate shall not be reproduced except in full without written approval of the laboratory.</p> | | | |
| Certificate No: Z22-60106 | | Page 1 of 6 | |

| | | | |
|---|--------------------------|--|------------------|
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| <p>Measurement Conditions DASY system configuration, as far as not given on page 1</p> | | | |
| DASY Version | DASY2 | 52.10.4 | |
| Extrapolation | Advanced Extrapolation | | |
| Phantom | Triple Flat Phantom 5 1G | | |
| Distance Dipole Center - TSL | 10 mm | with Spacer | |
| Zoom Scan Resolution | dx, dy, dz = 5 mm | | |
| Frequency | 2300 MHz ± 1 MHz | | |
| <p>Head TSL parameters The following parameters and calculations were applied:</p> | | | |
| | Temperature | Permittivity | Conductivity |
| Nominal Head TSL parameters | 22.0 °C | 39.5 | 1.67 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 39.8 ± 9 % | 1.70 mho/m ± 6 % |
| Head TSL temperature change during test | <1.0 °C | | |
| <p>SAR result with Head TSL</p> | | | |
| SAR averaged over 1 cm ³ (1g) of Head TSL | Condition | | |
| SAR measured | 250 mW input power | 12.4 W/kg | |
| SAR for nominal Head TSL parameters | normalized to 1W | 48.2 W/kg ± 18.8 % (k=2) | |
| SAR averaged over 10 cm ³ (10g) of Head TSL | Condition | | |
| SAR measured | 250 mW input power | 5.88 W/kg | |
| SAR for nominal Head TSL parameters | normalized to 1W | 32.4 W/kg ± 18.7 % (k=2) | |
| <p>Appendix (Additional assessments outside the scope of CNAS L0570)</p> | | | |
| <p>Antenna Parameters with Head TSL</p> | | | |
| Impedance, transformed to feed point | 49.20; 4.59(j) | | |
| Return Loss | -26.9dB | | |
| <p>General Antenna Parameters and Design</p> | | | |
| Electrical Delay (one direction) | 1.083 ns | | |
| <p>After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point can be measured.</p> <p>The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feed-point may be damaged.</p> | | | |
| <p>Additional EUT Data</p> | | | |
| Manufactured by | SPEAG | | |
| Certificate No: Z22-60106 | | Page 2 of 6 | |

| | | | |
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| <p>Measurement Conditions DASY system configuration, as far as not given on page 1</p> | | | |
| DASY Version | DASY2 | 52.10.4 | |
| Extrapolation | Advanced Extrapolation | | |
| Phantom | Triple Flat Phantom 5 1G | | |
| Distance Dipole Center - TSL | 10 mm | with Spacer | |
| Zoom Scan Resolution | dx, dy, dz = 5 mm | | |
| Frequency | 2300 MHz ± 1 MHz | | |
| <p>Head TSL parameters The following parameters and calculations were applied:</p> | | | |
| | Temperature | Permittivity | Conductivity |
| Nominal Head TSL parameters | 22.0 °C | 39.5 | 1.67 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 39.8 ± 9 % | 1.70 mho/m ± 6 % |
| Head TSL temperature change during test | <1.0 °C | | |
| <p>SAR result with Head TSL</p> | | | |
| SAR averaged over 1 cm ³ (1g) of Head TSL | Condition | | |
| SAR measured | 250 mW input power | 12.4 W/kg | |
| SAR for nominal Head TSL parameters | normalized to 1W | 48.2 W/kg ± 18.8 % (k=2) | |
| SAR averaged over 10 cm ³ (10g) of Head TSL | Condition | | |
| SAR measured | 250 mW input power | 5.88 W/kg | |
| SAR for nominal Head TSL parameters | normalized to 1W | 32.4 W/kg ± 18.7 % (k=2) | |
| <p>Appendix (Additional assessments outside the scope of CNAS L0570)</p> | | | |
| <p>Antenna Parameters with Head TSL</p> | | | |
| Impedance, transformed to feed point | 49.20; 4.59(j) | | |
| Return Loss | -26.9dB | | |
| <p>General Antenna Parameters and Design</p> | | | |
| Electrical Delay (one direction) | 1.083 ns | | |
| <p>After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point can be measured.</p> <p>The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feed-point may be damaged.</p> | | | |
| <p>Additional EUT Data</p> | | | |
| Manufactured by | SPEAG | | |
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| | | | |
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| <p>Measurement Conditions DASY system configuration, as far as not given on page 1</p> | | | |
| DASY Version | DASY2 | 52.10.4 | |
| Extrapolation | Advanced Extrapolation | | |
| Phantom | Triple Flat Phantom 5 1G | | |
| Distance Dipole Center - TSL | 10 mm | with Spacer | |
| Zoom Scan Resolution | dx, dy, dz = 5 mm | | |
| Frequency | 2300 MHz ± 1 MHz | | |
| <p>Head TSL parameters The following parameters and calculations were applied:</p> | | | |
| | Temperature | Permittivity | Conductivity |
| Nominal Head TSL parameters | 22.0 °C | 39.5 | 1.67 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 39.8 ± 9 % | 1.70 mho/m ± 6 % |
| Head TSL temperature change during test | <1.0 °C | | |
| <p>SAR result with Head TSL</p> | | | |
| SAR averaged over 1 cm ³ (1g) of Head TSL | Condition | | |
| SAR measured | 250 mW input power | 12.4 W/kg | |
| SAR for nominal Head TSL parameters | normalized to 1W | 48.2 W/kg ± 18.8 % (k=2) | |
| SAR averaged over 10 cm ³ (10g) of Head TSL | Condition | | |
| SAR measured | 250 mW input power | 5.88 W/kg | |
| SAR for nominal Head TSL parameters | normalized to 1W | 32.4 W/kg ± 18.7 % (k=2) | |
| <p>Appendix (Additional assessments outside the scope of CNAS L0570)</p> | | | |
| <p>Antenna Parameters with Head TSL</p> | | | |
| Impedance, transformed to feed point | 49.20; 4.59(j) | | |
| Return Loss | -26.9dB | | |
| <p>General Antenna Parameters and Design</p> | | | |
| Electrical Delay (one direction) | 1.083 ns | | |
| <p>After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point can be measured.</p> <p>The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feed-point may be damaged.</p> | | | |
| <p>Additional EUT Data</p> | | | |
| Manufactured by | SPEAG | | |
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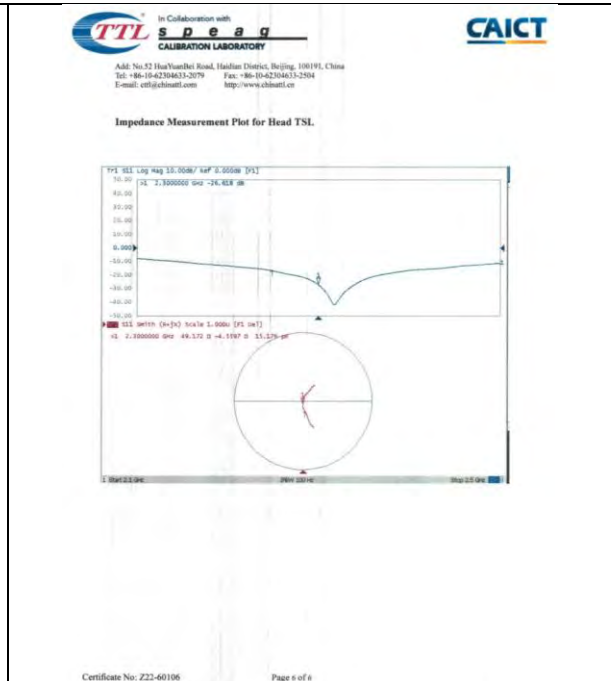
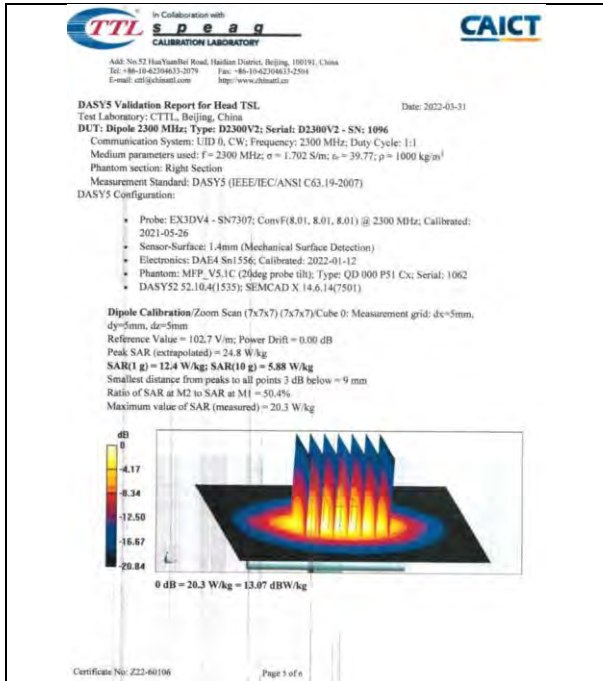


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1.10 D2450V2 - SN 817

Client: SGS-CN Certificate No: Z22-60107

CALIBRATION CERTIFICATE

Object: D2450V2 - SN 817
 Calibration Procedure(s): FF-Z11-003-01
 Calibration date: April 1, 2022

Primary Standards

| ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration |
|---------------------------------|--|-----------------------|
| Power Meter: NRP2 108277 | 24-Sep-21 (CTTL No.J21X08320) | Sep-22 |
| Power sensor: NRP8S 104291 | 24-Sep-21 (CTTL No.J21X08320) | Sep-22 |
| Reference Probe: EX3DV4 SN 7307 | 25-May-21(SPEAG.No.EX3-7307_May21) | May-22 |
| DAE4 SN 1556 | 12-Jan-22(CTTL-SPEAG.No.Z22-60007) | Jan-23 |

Secondary Standards

| ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration |
|-------------------------------------|--|-----------------------|
| Signal Generator: E4438C MY4007430 | 13-Jan-22 (CTTL No. J22X00400) | Jan-23 |
| Network Analyzer: E5071C MY46110873 | 14-Jan-22 (CTTL No. J22X00406) | Jan-23 |

Calibrated by: Zhao Jing (SAR Test Engineer)
 Reviewed by: Lin Hao (SAR Test Engineer)
 Approved by: Qi Dianyan (SAR Project Leader)

Glossary:
 TSL: tissue simulating liquid
 ConvF: sensitivity in TSL / NORMix.y.z
 N/A: not applicable or not measured

Calibration is Performed According to the Following Standards:
 a) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020
 b) KDB 656684, "SAR Measurement Requirements for 100 MHz to 5 GHz"

Additional Documentation:
 c) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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



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Measurement Conditions
 DASYS 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 | 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:

| | | | |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters | Temperature | Permittivity | Conductivity |
| Measured Head TSL parameters | 22.0 °C | 39.2 | 1.80 mho/m |
| Head TSL temperature change during test | (22.0 ± 0.2) °C | 39.5 ± 6 % | 1.79 mho/m ± 6 % |

SAR result with Head TSL

| | | |
|---|--------------------|--------------------------|
| SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition | |
| SAR measured | 250 mW input power | 13.2 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 53.0 W/kg ± 18.8 % (k=2) |
| SAR averaged over 10 cm ³ (10 g) of Head TSL | Condition | |
| SAR measured | 250 mW input power | 6.15 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | 24.7 W/kg ± 18.7 % (k=2) |

Certificate No: Z22-60107 Page 3 of 6

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

| | |
|--------------------------------------|---------------|
| Impedance, transformed to feed point | 52.10 ± 3.20Ω |
| Return Loss | -26.5dB |

General Antenna Parameters and Design

| | |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.086 ns |
|----------------------------------|----------|

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

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

Additional EUT Data

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

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DASY5 Validation Report for Head TSL Date: 2022-04-01

Test Laboratory: CTTL, Beijing, China
 DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 817
 Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
 Medium parameters used: f = 2450 MHz; σ = 1.79 S/m; ε = 39.52; ρ = 1000 kg/m³
 Phantom section: Right Section
 Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
 DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(7.75, 7.75) @ 2450 MHz; Calibrated: 2021-05-26
- Sensor-Surface: 1 Arm (Mechanical Surface Detection)
- Electronics: DA54 Snt156; Calibrated: 2022-01-12
- Phantom: MFP_V5.1C (20kg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration/Zoom Scan (7x7x7) (7x7x7) Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
 Reference Value = 104.6 V/m; Power Drift = -0.03 dB
 Peak SAR (extrapolated) = 27.0 W/kg
 SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.15 W/kg
 Smallest distance from peaks to all points 3 dB below = 8.9 mm
 Ratio of SAR at M2 to SAR at M1 = -49.2%
 Maximum value of SAR (measured) = 22.1 W/kg

0 dB = 22.1 W/kg = 13.44 dBW/kg

Certificate No: Z22-60107 Page 5 of 6

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Impedance Measurement Plot for Head TSL

Certificate No: Z22-60107 Page 6 of 6



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1.11 D2600V2 - SN 1158

| <div style="text-align: center;"> </div> <p> Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-42304633-2912 Fax: +86-10-42304633-2904 E-mail: csi@sgs.com.cn http://www.china-sgs.com </p> <p> Client: SGS-CN Certificate No: Z22-60108 </p> <p>CALIBRATION CERTIFICATE</p> <p> Object: D2600V2 - SN 1158 </p> <p> Calibration Procedure(s): FF-Z11-003-01 Calibration Procedures for dipole validation kits </p> <p> Calibration date: March 31, 2022 </p> <p> This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate. </p> <p> All calibrations have been conducted in the closed laboratory facility: environment temperature (23±3)°C and humidity<70%. </p> <p> Calibration Equipment used (M&TE critical for calibration) </p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Primary Standards</th> <th>ID #</th> <th>Cal Date (Calibrated by Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Power Meter NRP2</td> <td>102577</td> <td>24-Sep-21 (CTTL No.J21X08326)</td> <td>Sep-22</td> </tr> <tr> <td>Power sensor NRP8S</td> <td>104291</td> <td>24-Sep-21 (CTTL No.J21X08326)</td> <td>Sep-22</td> </tr> <tr> <td>Reference Probe EX301VA</td> <td>SN 7307</td> <td>26-May-21(SPEAG.No.EX3-7307_May21)</td> <td>May-22</td> </tr> <tr> <td>DAE4</td> <td>SN 1556</td> <td>12-Jan-22(CTTL-SPEAG.No.Z22-60007)</td> <td>Jan-23</td> </tr> </tbody> </table> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Secondary Standards</th> <th>ID #</th> <th>Cal Date (Calibrated by Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Signal Generator E4438C</td> <td>MY49671430</td> <td>13-Jan-22 (CTTL No.Z22X0409)</td> <td>Jan-23</td> </tr> <tr> <td>Network Analyzer E5071C</td> <td>MY48110673</td> <td>14-Jan-22 (CTTL No.Z22X0406)</td> <td>Jan-23</td> </tr> </tbody> </table> <p> Calibrated by: Zhao Jing SAR Test Engineer </p> <p> Reviewed by: Lin Hao SAR Test Engineer </p> <p> Approved by: Qi Dianyuan SAR Project Leader </p> <p style="text-align: right;"> Issued: April 6, 2022 </p> <p> This calibration certificate shall not be reproduced except in full without written approval of the laboratory. </p> <p style="font-size: small;"> Certificate No: Z22-60108 Page 1 of 6 </p> | Primary Standards | ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration | Power Meter NRP2 | 102577 | 24-Sep-21 (CTTL No.J21X08326) | Sep-22 | Power sensor NRP8S | 104291 | 24-Sep-21 (CTTL No.J21X08326) | Sep-22 | Reference Probe EX301VA | SN 7307 | 26-May-21(SPEAG.No.EX3-7307_May21) | May-22 | DAE4 | SN 1556 | 12-Jan-22(CTTL-SPEAG.No.Z22-60007) | Jan-23 | Secondary Standards | ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration | Signal Generator E4438C | MY49671430 | 13-Jan-22 (CTTL No.Z22X0409) | Jan-23 | Network Analyzer E5071C | MY48110673 | 14-Jan-22 (CTTL No.Z22X0406) | Jan-23 | <div style="text-align: center;"> </div> <p> Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-42304633-2919 Fax: +86-10-42304633-2904 E-mail: csi@sgs.com.cn http://www.china-sgs.com </p> <p> Glossary: TSL: tissue simulating liquid ConvF: sensitivity in TSL / NORMx.y.z N/A: not applicable or not measured </p> <p> Calibration is Performed According to the Following Standards: a) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020 b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz" c) DASY4/S System Handbook </p> <p> Methods Applied and Interpretation of Parameters: </p> <ul style="list-style-type: none"> 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. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>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%.</p> </div> <p style="font-size: small;"> Certificate No: Z22-60108 Page 2 of 6 </p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--------------------------|--|--|-----------------------|------------------------|--------|-------------------------------|--------------------------|--------------------|------------------------------|-------------------------------|-------------|-------------------------|-------------------|------------------------------------|-----------|------------------|---------|------------------------------------|-------------|---------------------|--------------|--|-----------------------|-------------------------|------------|------------------------------|-----------------|-------------------------|------------------|---|---------|---|---|---|-----------|--|--------------|--------------------|-----------|-------------------------------------|------------------|--------------------------|---|-----------|--|--------------|--------------------|-----------|-------------------------------------|------------------|--------------------------|--|--------------------------------------|---------------|-------------|---------|----------------------------------|----------|-----------------|-------|
| Primary Standards | ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power Meter NRP2 | 102577 | 24-Sep-21 (CTTL No.J21X08326) | Sep-22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power sensor NRP8S | 104291 | 24-Sep-21 (CTTL No.J21X08326) | Sep-22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Reference Probe EX301VA | SN 7307 | 26-May-21(SPEAG.No.EX3-7307_May21) | May-22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DAE4 | SN 1556 | 12-Jan-22(CTTL-SPEAG.No.Z22-60007) | Jan-23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Secondary Standards | ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Signal Generator E4438C | MY49671430 | 13-Jan-22 (CTTL No.Z22X0409) | Jan-23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Network Analyzer E5071C | MY48110673 | 14-Jan-22 (CTTL No.Z22X0406) | Jan-23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <div style="text-align: center;"> </div> <p> Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-42304633-3079 Fax: +86-10-42304633-2904 E-mail: csi@sgs.com.cn http://www.china-sgs.com </p> <p> Measurement Conditions DASY system configuration, as far as not given on page 1. </p> <table border="1" style="width:100%; border-collapse: collapse;"> <tbody> <tr> <td>DASY Version</td> <td>DASY32</td> <td>52.10.4</td> </tr> <tr> <td>Extrapolation</td> <td>Advanced Extrapolation</td> <td></td> </tr> <tr> <td>Phantom</td> <td>Triple Flat Phantom 5.1C</td> <td></td> </tr> <tr> <td>Distance Dipole Center - TSL</td> <td>10 mm</td> <td>with Spacer</td> </tr> <tr> <td>Zoom Scan Resolution</td> <td>5x, 6y, 6z = 5 mm</td> <td></td> </tr> <tr> <td>Frequency</td> <td>2600 MHz ± 1 MHz</td> <td></td> </tr> </tbody> </table> <p> Head TSL parameters The following parameters and calculations were applied. </p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Temperature</th> <th>Permittivity</th> <th>Conductivity</th> </tr> </thead> <tbody> <tr> <td>Nominal Head TSL parameters</td> <td>22.0 °C</td> <td>38.0</td> <td>1.96 mho/m</td> </tr> <tr> <td>Measured Head TSL parameters</td> <td>(22.0 ± 0.2) °C</td> <td>38.7 ± 0.5 %</td> <td>1.96 mho/m ± 6 %</td> </tr> <tr> <td>Head TSL temperature change during test</td> <td><1.0 °C</td> <td>—</td> <td>—</td> </tr> </tbody> </table> <p> SAR result with Head TSL </p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>SAR averaged over 1 cm² (1 g) of Head TSL</th> <th>Condition</th> <th></th> </tr> </thead> <tbody> <tr> <td>SAR measured</td> <td>250 mW input power</td> <td>13.7 W/kg</td> </tr> <tr> <td>SAR for nominal Head TSL parameters</td> <td>normalized to 1W</td> <td>54.8 W/kg ± 18.8 % (k=2)</td> </tr> <tr> <td>SAR averaged over 10 cm² (10 g) of Head TSL</td> <td>Condition</td> <td></td> </tr> <tr> <td>SAR measured</td> <td>250 mW input power</td> <td>8.12 W/kg</td> </tr> <tr> <td>SAR for nominal Head TSL parameters</td> <td>normalized to 1W</td> <td>24.5 W/kg ± 18.7 % (k=2)</td> </tr> </tbody> </table> <p style="font-size: small;"> Certificate No: Z22-60108 Page 3 of 6 </p> | DASY Version | DASY32 | 52.10.4 | Extrapolation | Advanced Extrapolation | | Phantom | Triple Flat Phantom 5.1C | | Distance Dipole Center - TSL | 10 mm | with Spacer | Zoom Scan Resolution | 5x, 6y, 6z = 5 mm | | Frequency | 2600 MHz ± 1 MHz | | | Temperature | Permittivity | Conductivity | Nominal Head TSL parameters | 22.0 °C | 38.0 | 1.96 mho/m | Measured Head TSL parameters | (22.0 ± 0.2) °C | 38.7 ± 0.5 % | 1.96 mho/m ± 6 % | Head TSL temperature change during test | <1.0 °C | — | — | SAR averaged over 1 cm ² (1 g) of Head TSL | Condition | | SAR measured | 250 mW input power | 13.7 W/kg | SAR for nominal Head TSL parameters | normalized to 1W | 54.8 W/kg ± 18.8 % (k=2) | SAR averaged over 10 cm ² (10 g) of Head TSL | Condition | | SAR measured | 250 mW input power | 8.12 W/kg | SAR for nominal Head TSL parameters | normalized to 1W | 24.5 W/kg ± 18.7 % (k=2) | <div style="text-align: center;"> </div> <p> Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-42304633-3079 Fax: +86-10-42304633-2904 E-mail: csi@sgs.com.cn http://www.china-sgs.com </p> <p> Appendix (Additional assessments outside the scope of CNAS L0570) </p> <p> Antenna Parameters with Head TSL </p> <table border="1" style="width:100%; border-collapse: collapse;"> <tbody> <tr> <td>Impedance, transformed to feed point</td> <td>49.9C- 6.49jΩ</td> </tr> <tr> <td>Return Loss</td> <td>-23.9dB</td> </tr> </tbody> </table> <p> General Antenna Parameters and Design </p> <table border="1" style="width:100%; border-collapse: collapse;"> <tbody> <tr> <td>Electrical Delay (one direction)</td> <td>1.053 ns</td> </tr> </tbody> </table> <p> After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point can be measured. </p> <p> The dipole is made of standard semi-rigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feed-point may be damaged. </p> <p> Additional EUT Data </p> <table border="1" style="width:100%; border-collapse: collapse;"> <tbody> <tr> <td>Manufactured by</td> <td>SPEAG</td> </tr> </tbody> </table> <p style="font-size: small;"> Certificate No: Z22-60108 Page 4 of 6 </p> | Impedance, transformed to feed point | 49.9C- 6.49jΩ | Return Loss | -23.9dB | Electrical Delay (one direction) | 1.053 ns | Manufactured by | SPEAG |
| DASY Version | DASY32 | 52.10.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Extrapolation | Advanced Extrapolation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phantom | Triple Flat Phantom 5.1C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Distance Dipole Center - TSL | 10 mm | with Spacer | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Zoom Scan Resolution | 5x, 6y, 6z = 5 mm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | 2600 MHz ± 1 MHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Temperature | Permittivity | Conductivity | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Nominal Head TSL parameters | 22.0 °C | 38.0 | 1.96 mho/m | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 38.7 ± 0.5 % | 1.96 mho/m ± 6 % | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Head TSL temperature change during test | <1.0 °C | — | — | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR averaged over 1 cm ² (1 g) of Head TSL | Condition | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR measured | 250 mW input power | 13.7 W/kg | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR for nominal Head TSL parameters | normalized to 1W | 54.8 W/kg ± 18.8 % (k=2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR averaged over 10 cm ² (10 g) of Head TSL | Condition | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR measured | 250 mW input power | 8.12 W/kg | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SAR for nominal Head TSL parameters | normalized to 1W | 24.5 W/kg ± 18.7 % (k=2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Impedance, transformed to feed point | 49.9C- 6.49jΩ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Return Loss | -23.9dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Electrical Delay (one direction) | 1.053 ns | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Manufactured by | SPEAG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



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Attention: To check the authenticity of testing/inspection report & certificate, please contact us at telephone: (86-755) 8307 1443, or email: CN.Doccheck@sgs.com

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 中国·江苏·昆山市留学院创业园伟业路10号 邮编 215300 t(86-512)57355888 f(86-512)57370818 sgs.china@sgs.com

In Collaboration with **TTL Speaq** CALIBRATION LABORATORY and **CAICT**

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DASY5 Validation Report for Head TSL Date: 2022-03-31

Test Laboratory: CTTL, Beijing, China
DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1158
Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 2600$ MHz; $\sigma = 1.955$ S/m; $\epsilon_r = 38.68$; $\rho = 1000$ kg/m³
Phantom section: Right Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(7.5, 7.5, 7.5) @ 2600 MHz; Calibrated: 2021-05-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2022-01-12
- Phantom: MFP V5.1C (20deg probe tilt); Type: QD 000 P5) Cx; Serial: 1062
- DASY52.52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration/Zoom Scan (7x7x7) (7x7x7) Cube @ Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 103.3 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 29.0 W/kg
SAR(1 g) = 13.7 W/kg; SAR(10 g) = 6.12 W/kg
Smallest distance from peaks to all points 3 dB below = 8.9 mm
Ratio of SAR at M2 to SAR at M1 = 47.5%
Maximum value of SAR (measured) = 23.4 W/kg

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

Certificate No: Z22-60108 Page 1 of 6

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Impedance Measurement Plot for Head TSL

Certificate No: Z22-60108 Page 6 of 6

1.12 D5GHZV2 - SN 1095

In Collaboration with **TTL Speaq** CALIBRATION LABORATORY, **CNAS**, and **CAICT**

Address: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62104613 E-mail: csl@ttspeaq.com http://www.ttspeaq.com

Client: **SGS-CN** Certificate No: **Z22-60187**

CALIBRATION CERTIFICATE

Object: D5GHZV2 - SN: 1095

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

Calibration date: June 1, 2022

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

All calibrations have been conducted in the closed laboratory facility; environment temperature (23±1)°C and humidity <70%.

Calibration Equipment used (MSTE critical for calibration)

| Primary Standards | ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration |
|------------------------|---------|--|-----------------------|
| Power Meter NRP2 | 106277 | 24-Sep-21 (CTTL No.J211008326) | Sep-22 |
| Power sensor NRP85 | 104291 | 24-Sep-21 (CTTL No.J211008326) | Sep-22 |
| Reference Probe EX3DV4 | SN 7464 | 26-Jan-22(SPEAG No EX3-7484_Jan22) | Jan-23 |
| DAE4 | SN 1556 | 12-Jan-22(CTTL-SPEAG No Z22-60007) | Jan-23 |

| Secondary Standards | ID # | Cal Date (Calibrated by Certificate No.) | Scheduled Calibration |
|-------------------------|------------|--|-----------------------|
| Signal Generator E4438C | MY48071430 | 13-Jan-22 (CTTL No. J22X00406) | Jan-23 |
| Network Analyzer E5071C | MY46110873 | 14-Jan-22 (CTTL No. J22X00406) | Jan-23 |

Calibrated by: Zhao Jing, SAR Test Engineer

Reviewed by: Lin Hao, SAR Test Engineer

Approved by: Qi Dianyan, SAR Project Leader

Issued: June 6, 2022

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

Certificate No: Z22-60187 Page 1 of 10

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Glossary:

- TSL: Issue simulating liquid
- CompF: sensitivity in TSL: 1/MORMx,y,z
- N/A: not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEC/IEEE 62209-1528, "Measurement Procedure for the Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020
- KDB 665664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY5 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 station 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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E-mail: ttt@ttml.com.cn http://www.ttml.com.cn

Measurement Conditions
DA857 system configuration, see for as not given on page 1.

| | | |
|------------------------------|---|------------------------------------|
| DA857 Version | DA85V2 | 32,10,4 |
| Extrapolation | Advanced Extrapolation | |
| Phantom | Triple Flat Phantom S,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 | 500 MHz ± 1 MHz 6300 MHz ± 1 MHz 3500 MHz ± 1 MHz 5600 MHz ± 1 MHz | |

Head TSL parameters at 5200MHz
The following parameters and calculations were applied:

| Nominal Head TSL parameters | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| | 22.0 °C | 35.9 | 4.68 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 35.4 ± 0.5 % | 4.42 mho/m ± 6 % |
| Head TSL temperature change during test | -1.0 °C | — | — |

SAR result with Head TSL at 5200MHz

| SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition |
|---|--|
| SAR measured | 250 mW input power 7.75 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W 77.8 W/kg ± 24.4 % (k=2) |
| SAR averaged over 10 cm ³ (10 g) of Head TSL | Condition |
| SAR measured | 250 mW input power 2.22 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W 22.1 W/kg ± 24.2 % (k=2) |

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Head TSL parameters at 5300MHz
The following parameters and calculations were applied:

| Nominal Head TSL parameters | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| | 22.0 °C | 35.9 | 4.76 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 35.2 ± 0.5 % | 4.73 mho/m ± 6 % |
| Head TSL temperature change during test | -1.0 °C | — | — |

SAR result with Head TSL at 5300MHz

| SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition |
|---|--|
| SAR measured | 100 mW input power 7.84 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W 78.1 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 22.6 W/kg ± 24.2 % (k=2) |

Head TSL parameters at 5500MHz
The following parameters and calculations were applied:

| Nominal Head TSL parameters | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| | 22.0 °C | 35.8 | 4.88 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 34.8 ± 0.5 % | 4.84 mho/m ± 6 % |
| Head TSL temperature change during test | -1.0 °C | — | — |

SAR result with Head TSL at 5500MHz

| SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition |
|---|--|
| SAR measured | 100 mW input power 8.26 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W 82.6 W/kg ± 24.4 % (k=2) |
| SAR averaged over 10 cm ³ (10 g) of Head TSL | Condition |
| SAR measured | 100 mW input power 2.34 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W 23.3 W/kg ± 24.2 % (k=2) |

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Head TSL parameters at 5600MHz
The following parameters and calculations were applied:

| Nominal Head TSL parameters | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| | 22.0 °C | 35.5 | 5.07 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 34.7 ± 0.5 % | 5.05 mho/m ± 6 % |
| Head TSL temperature change during test | -1.0 °C | — | — |

SAR result with Head TSL at 5600MHz

| SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition |
|---|--|
| SAR measured | 100 mW input power 8.12 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W 80.8 W/kg ± 24.4 % (k=2) |
| SAR averaged over 10 cm ³ (10 g) of Head TSL | Condition |
| SAR measured | 100 mW input power 2.38 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W 22.9 W/kg ± 24.2 % (k=2) |

Head TSL parameters at 5800MHz
The following parameters and calculations were applied:

| Nominal Head TSL parameters | Temperature | Permittivity | Conductivity |
|---|-----------------|--------------|------------------|
| | 22.0 °C | 35.3 | 5.27 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 34.4 ± 0.5 % | 5.25 mho/m ± 6 % |
| Head TSL temperature change during test | -1.0 °C | — | — |

SAR result with Head TSL at 5800MHz

| SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition |
|---|--|
| SAR measured | 100 mW input power 7.71 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W 76.7 W/kg ± 24.4 % (k=2) |
| SAR averaged over 10 cm ³ (10 g) of Head TSL | Condition |
| SAR measured | 100 mW input power 2.16 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W 21.6 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 5200MHz

| | |
|--------------------------------------|--------------|
| Impedance, transformed to feed point | 46.10-5.03jΩ |
| Return Loss | -23.6dB |

Antenna Parameters with Head TSL at 5300MHz

| | |
|--------------------------------------|--------------|
| Impedance, transformed to feed point | 47.80-2.42jΩ |
| Return Loss | -23.5dB |

Antenna Parameters with Head TSL at 5500MHz

| | |
|--------------------------------------|--------------|
| Impedance, transformed to feed point | 50.30-4.36jΩ |
| Return Loss | -27.4dB |

Antenna Parameters with Head TSL at 5600MHz

| | |
|--------------------------------------|--------------|
| Impedance, transformed to feed point | 54.80-4.89jΩ |
| Return Loss | -24.6dB |

Antenna Parameters with Head TSL at 5800MHz

| | |
|--------------------------------------|--------------|
| Impedance, transformed to feed point | 51.50-5.61jΩ |
| Return Loss | -24.6dB |

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| | |
|--|---|
| <p>TTL Calibration Laboratory CAICT</p> <p>Address: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-62302117 E-mail: cti@ttsnet.com</p> <p>General Antenna Parameters and Design</p> <p>Electrical Delay (one direction): 1.101 ns</p> <p>After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point can be measured.</p> <p>The dipole is made of standard semirigid coaxial cable. The carrier 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.</p> <p>No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feed-point may be damaged.</p> <p>Additional EUT Data</p> <p>Manufactured by: SPEAQ</p> <p>Certificate No: Z22-60187 Page 1 of 10</p> | <p>TTL Calibration Laboratory CAICT</p> <p>Address: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-62302117 E-mail: cti@ttsnet.com</p> <p>DASY5 Validation Report for Head TSL</p> <p>Test Laboratory: CTTL, Beijing, China DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1095 Communication System: CW; Frequency: 5200 MHz; Frequency: 5300 MHz; Frequency: 5500 MHz; Frequency: 5600 MHz; Frequency: 5800 MHz; Duty Cycle: 1:1 Medium parameters used: f = 5200 MHz; $\sigma = 4.82$ S/m; $\epsilon = 35.39$; $\rho = 1000$ kg/m³ Medium parameters used: f = 5300 MHz; $\sigma = 4.73$ S/m; $\epsilon = 35.19$; $\rho = 1000$ kg/m³ Medium parameters used: f = 5500 MHz; $\sigma = 4.939$ S/m; $\epsilon = 34.83$; $\rho = 1000$ kg/m³ Medium parameters used: f = 5600 MHz; $\sigma = 5.051$ S/m; $\epsilon = 34.89$; $\rho = 1000$ kg/m³ Medium parameters used: f = 5800 MHz; $\sigma = 5.247$ S/m; $\epsilon = 34.42$; $\rho = 1000$ kg/m³ Phantom section: Right Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C38.16-2007) DASY5 Configuration:</p> <ul style="list-style-type: none"> Probe: EX3DV4 - SN7484; ConvF(5, 6, 5, 6) @ 5200 MHz; ConvF(5, 32, 5, 32, 5, 32) @ 5300 MHz; ConvF(5, 11, 5, 11, 5, 11) @ 5500 MHz; ConvF(4, 9, 4, 9, 4, 9) @ 5800 MHz; ConvF(5, 5, 5) @ 5600 MHz; Calibrated: 2022-01-26 Sensor-Surface: 1.4mm (Mechanical Surface Detection) Electronics: DA84 Sn1556; Calibrated: 2022-01-12 Phantom: MFP_V5-1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062 DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501) <p>Dipole Calibration /Pin=100mW, d=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0; Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Reference Value = 60.80 V/m; Power Drift = -0.06 dB Peak SAR (extrapolated) = 29.8 W/kg SAR(1 g) = 7.73 W/kg; SAR(10 g) = 2.22 W/kg Smallest distance from peaks to all points 3 dB below = 7.2 mm Ratio of SAR at M2 to SAR at M1 = 66.8% Maximum value of SAR (measured) = 19.3 W/kg</p> <p>Dipole Calibration /Pin=100mW, d=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0; Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Reference Value = 61.08 V/m; Power Drift = -0.07 dB Peak SAR (extrapolated) = 31.5 W/kg SAR(1 g) = 7.94 W/kg; SAR(10 g) = 2.27 W/kg Smallest distance from peaks to all points 3 dB below = 7.2 mm Ratio of SAR at M2 to SAR at M1 = 65.5% Maximum value of SAR (measured) = 19.0 W/kg</p> <p>Certificate No: Z22-60187 Page 4 of 10</p> |
| <p>TTL Calibration Laboratory CAICT</p> <p>Address: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-62302117 E-mail: cti@ttsnet.com</p> <p>Dipole Calibration /Pin=100mW, d=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0; Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Reference Value = 61.92 V/m; Power Drift = -0.08 dB Peak SAR (extrapolated) = 34.7 W/kg SAR(1 g) = 8.28 W/kg; SAR(10 g) = 2.34 W/kg Smallest distance from peaks to all points 3 dB below = 7.2 mm Ratio of SAR at M2 to SAR at M1 = 63.9% Maximum value of SAR (measured) = 20.2 W/kg</p> <p>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 = 65.08 V/m; Power Drift = -0.07 dB Peak SAR (extrapolated) = 35.3 W/kg SAR(1 g) = 8.12 W/kg; SAR(10 g) = 2.3 W/kg Smallest distance from peaks to all points 3 dB below = 7.2 mm Ratio of SAR at M2 to SAR at M1 = 62.5% Maximum value of SAR (measured) = 19.1 W/kg</p> <p>Dipole Calibration /Pin=100mW, d=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0; Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Reference Value = 62.13 V/m; Power Drift = -0.06 dB Peak SAR (extrapolated) = 34.8 W/kg SAR(1 g) = 7.71 W/kg; SAR(10 g) = 2.16 W/kg Smallest distance from peaks to all points 3 dB below = 7.2 mm Ratio of SAR at M2 to SAR at M1 = 61.6% Maximum value of SAR (measured) = 18.7 W/kg</p> <p>Certificate No: Z22-60187 Page 10 of 10</p> | <p>TTL Calibration Laboratory CAICT</p> <p>Address: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-62302117 E-mail: cti@ttsnet.com</p> <p>Impedance Measurement Plot for Head TSL</p> <p>Certificate No: Z22-60187 Page 10 of 10</p> |



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2 DAE4 - SN 1245

| <p>S P E A G</p> <p>IMPORTANT NOTICE</p> <p>USAGE OF THE DAE4</p> <p>The DAE unit is a delicate, high precision instrument and requires careful treatment by the user. There are no serviceable parts inside the DAE. Special attention shall be given to the following points:</p> <p>Battery Exchange: The battery cover of the DAE4 unit is fixed using a screw, over tightening the screw may cause the threads inside the DAE to wear out.</p> <p>Shipping of the DAE: Before shipping the DAE to SPEAG for calibration, remove the batteries and pack the DAE in an anti-static bag. This anti-static bag shall then be packed into a larger box or container which protects the DAE from impacts during transportation. The package shall be marked to indicate that a fragile instrument is inside.</p> <p>E-Stop Failures: Touch detection may be malfunctioning due to broken magnets in the E-stop. Rough handling of the E-stop may lead to damage of these magnets. Touch and collision errors are often caused by dust and dirt accumulated in the E-stop. To prevent E-stop failure, the customer should always mount the probe to the DAE carefully and keep the DAE unit in a non-dusty environment if not used for measurements.</p> <p>Repair: Minor repairs are performed at no extra cost during the annual calibration. However, SPEAG reserves the right to charge for any repair especially if rough professional handling caused the defect.</p> <p>DASY Configuration Files: Since the exact values of the DAE input resistances, as measured during the calibration procedure of a DAE unit, are not used by the DASY software, a nominal value of 500 MOhm is given in the corresponding configuration file.</p> <p>Important Note: Warranty and calibration is void if the DAE unit is disassembled partly or fully by the Customer.</p> <p>Important Note: Never attempt to grease or oil the E-stop assembly. Cleaning and readjusting of the E-stop assembly is allowed by certified SPEAG personnel only and is part of the annual calibration procedure.</p> <p>Important Note: To prevent damage of the DAE probe connector pins, use great care when installing the probe to the DAE. Carefully connect the probe with the connector notch oriented in the mating position. Avoid any rotational movement of the probe body versus the DAE while turning the locking nut of the connector. The same care shall be used when disconnecting the probe from the DAE.</p> <p>TN_EH100306AE_DAE4.docx 07.03.2019</p> | <p>Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland</p> <p>S Schweizerischer Kalibrierdienst C Service suisse d'étalonnage S Servizio svizzero di taratura S Swiss Calibration Service</p> <p>Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates</p> <p>Accreditation No.: SCS 0108</p> <p>Client: SGS-CN (Auden) Certificate No.: DAE4-1245_May22</p> <p>CALIBRATION CERTIFICATE</p> <p>Object: DAE4 - SD 000 D04 BM - SN: 1245</p> <p>Calibration procedure(s): QA CAL-06 v30 Calibration procedure for the data acquisition electronics (DAE)</p> <p>Calibration date: May 30, 2022</p> <p>This calibration certificate documents the traceability to national standards, which realize the physical units of measurement (SI). The measurement and the uncertainties with confidence probability are given on the following pages and are part of the certificate.</p> <p>All calibrations have been conducted in the closed laboratory facility, environment temperature (22 ± 1)°C and humidity < 70%.</p> <p>Calibration Equipment used (MATE critical for calibration)</p> <table border="1"> <thead> <tr> <th>Primary Standards</th> <th>ID #</th> <th>Due Date (Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Kelvin Multimeter Type 2001</td> <td>SN: SE10276</td> <td>31-Aug-21 (No:31368)</td> <td>Aug-22</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Secondary Standards</th> <th>ID #</th> <th>Check Date (in hours)</th> <th>Scheduled Check</th> </tr> </thead> <tbody> <tr> <td>Auto DAE Calibration Unit</td> <td>SE_LMS_05A_AA_1001</td> <td>24-Jan-22 (in house check)</td> <td>In house check Jan-22</td> </tr> <tr> <td>Calibration box V1.1</td> <td>SE_LMS_006_AA_1002</td> <td>24-Jan-22 (in house check)</td> <td>In house check Jan-22</td> </tr> </tbody> </table> <p>Calibrated by: Dominique Sailer (Name) Laboratory Technician (Function) <i>[Signature]</i> (Signature)</p> <p>Approved by: Steen Kuhn (Name) Technical Manager (Function) <i>[Signature]</i> (Signature)</p> <p>Issued: May 30, 2022</p> <p>This calibration certificate shall not be reproduced except in full without written approval of the laboratory.</p> <p>Certificate No: DAE4-1245_May22 Page 1 of 5</p> | Primary Standards | ID # | Due Date (Certificate No.) | Scheduled Calibration | Kelvin Multimeter Type 2001 | SN: SE10276 | 31-Aug-21 (No:31368) | Aug-22 | Secondary Standards | ID # | Check Date (in hours) | Scheduled Check | Auto DAE Calibration Unit | SE_LMS_05A_AA_1001 | 24-Jan-22 (in house check) | In house check Jan-22 | Calibration box V1.1 | SE_LMS_006_AA_1002 | 24-Jan-22 (in house check) | In house check Jan-22 |
|--|---|----------------------------|-----------------------|----------------------------|-----------------------|-----------------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------|-----------------------|-----------------------|---|--------------------|----------------------------|-----------------------|----------------------|--------------------|----------------------------|-----------------------|
| Primary Standards | ID # | Due Date (Certificate No.) | Scheduled Calibration | | | | | | | | | | | | | | | | | | |
| Kelvin Multimeter Type 2001 | SN: SE10276 | 31-Aug-21 (No:31368) | Aug-22 | | | | | | | | | | | | | | | | | | |
| Secondary Standards | ID # | Check Date (in hours) | Scheduled Check | | | | | | | | | | | | | | | | | | |
| Auto DAE Calibration Unit | SE_LMS_05A_AA_1001 | 24-Jan-22 (in house check) | In house check Jan-22 | | | | | | | | | | | | | | | | | | |
| Calibration box V1.1 | SE_LMS_006_AA_1002 | 24-Jan-22 (in house check) | In house check Jan-22 | | | | | | | | | | | | | | | | | | |
| <p>Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland</p> <p>S Schweizerischer Kalibrierdienst C Service suisse d'étalonnage S Servizio svizzero di taratura S Swiss Calibration Service</p> <p>Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates</p> <p>Accreditation No.: SCS 0108</p> <p>Glossary</p> <p>DAE: data acquisition electronics Connector angle: information used in DASY system to align probe sensor X to the robot coordinate system.</p> <p>Methods Applied and Interpretation of Parameters</p> <ul style="list-style-type: none"> DC Voltage Measurement: Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range. Connector angle: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required. The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty. <ul style="list-style-type: none"> DC Voltage Measurement Linearity: Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement. Common mode sensitivity: Influence of a positive or negative common mode voltage on the differential measurement. Channel separation: Influence of a voltage on the neighbor channels not subject to an input voltage. AD Converter Values with inputs stored: Values on the internal AD converter corresponding to zero input voltage. Input Offset Measurement: Output voltage and statistical results over a large number of zero voltage measurements. Input Offset Current: Typical value for information; Maximum channel input offset current, not considering the input resistance. Input resistance: Typical value for information; DAE input resistance at the connector, during internal auto-zeroing and during measurement. Low Battery Alarm Voltage: Typical value for information. Below this voltage, a battery alarm signal is generated. Power consumption: Typical value for information. Supply currents in various operating modes. <p>Certificate No: DAE4-1245_May22 Page 2 of 5</p> | <p>DC Voltage Measurement</p> <p>AD - Converter Resolution nominal High Range: 1LSB = 6.1µV, full range = -100...+50 mV Low Range: 1LSB = 61µV, full range = -1...+3mV DASY measurement parameters: Auto Zero-Time: 3 sec; Measuring time: 3 sec</p> <table border="1"> <thead> <tr> <th>Calibration Factors</th> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>High Range</td> <td>405.265 ± 0.02% (k=2)</td> <td>403.974 ± 0.02% (k=2)</td> <td>406.092 ± 0.02% (k=2)</td> </tr> <tr> <td>Low Range</td> <td>3.99534 ± 1.50% (k=2)</td> <td>3.99508 ± 1.50% (k=2)</td> <td>4.01015 ± 1.50% (k=2)</td> </tr> </tbody> </table> <p>Connector Angle</p> <table border="1"> <thead> <tr> <th>Connector Angle to be used in DASY system</th> <th>30.0° ± 1°</th> </tr> </thead> </table> <p>Certificate No: DAE4-1245_May22 Page 3 of 5</p> | Calibration Factors | X | Y | Z | High Range | 405.265 ± 0.02% (k=2) | 403.974 ± 0.02% (k=2) | 406.092 ± 0.02% (k=2) | Low Range | 3.99534 ± 1.50% (k=2) | 3.99508 ± 1.50% (k=2) | 4.01015 ± 1.50% (k=2) | Connector Angle to be used in DASY system | 30.0° ± 1° | | | | | | |
| Calibration Factors | X | Y | Z | | | | | | | | | | | | | | | | | | |
| High Range | 405.265 ± 0.02% (k=2) | 403.974 ± 0.02% (k=2) | 406.092 ± 0.02% (k=2) | | | | | | | | | | | | | | | | | | |
| Low Range | 3.99534 ± 1.50% (k=2) | 3.99508 ± 1.50% (k=2) | 4.01015 ± 1.50% (k=2) | | | | | | | | | | | | | | | | | | |
| Connector Angle to be used in DASY system | 30.0° ± 1° | | | | | | | | | | | | | | | | | | | | |



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Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

| High Range | Reading (µV) | Difference (µV) | Error (%) |
|-------------------|--------------|-----------------|-----------|
| Channel X + Input | 19994.45 | 1.52 | 0.00 |
| Channel X + Input | 20004.58 | 2.22 | 0.01 |
| Channel X - Input | -20000.14 | 1.12 | -0.01 |
| Channel Y + Input | 19994.72 | 1.58 | 0.00 |
| Channel Y + Input | 20001.22 | -1.00 | -0.00 |
| Channel Y - Input | -20003.05 | -1.57 | 0.01 |
| Channel Z + Input | 19992.84 | 0.19 | 0.00 |
| Channel Z + Input | 20003.09 | 0.58 | 0.00 |
| Channel Z - Input | -20001.73 | -0.27 | 0.00 |

| Low Range | Reading (µV) | Difference (µV) | Error (%) |
|-------------------|--------------|-----------------|-----------|
| Channel X + Input | 2001.91 | 0.41 | 0.02 |
| Channel X + Input | 202.54 | 0.65 | 0.32 |
| Channel X - Input | -197.86 | 0.07 | -0.04 |
| Channel Y + Input | 2002.05 | 0.58 | 0.03 |
| Channel Y + Input | 201.27 | -0.57 | -0.28 |
| Channel Y - Input | -199.23 | -0.06 | 0.03 |
| Channel Z + Input | 2001.36 | 0.08 | 0.00 |
| Channel Z + Input | 200.09 | -1.53 | -0.76 |
| Channel Z - Input | -199.89 | -1.57 | 0.79 |

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| Common mode Input Voltage (mV) | High Range Average Reading (µV) | Low Range Average Reading (µV) |
|--------------------------------|---------------------------------|--------------------------------|
| Channel X | -3.87 | -7.69 |
| -200 | 9.12 | 7.79 |
| Channel Y | -8.68 | -9.28 |
| -200 | 8.52 | 6.36 |
| Channel Z | -5.36 | -5.80 |
| -200 | 3.58 | 3.08 |

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| Input Voltage (mV) | Channel X (µV) | Channel Y (µV) | Channel Z (µV) | |
|--------------------|----------------|----------------|----------------|-------|
| Channel X | 200 | - | 4.07 | -3.14 |
| Channel Y | 200 | 9.36 | - | 4.27 |
| Channel Z | 200 | 10.11 | 7.14 | - |

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4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| | High Range (LSB) | Low Range (LSB) |
|-----------|------------------|-----------------|
| Channel X | 15984 | 17040 |
| Channel Y | 16562 | 16768 |
| Channel Z | 16035 | 15668 |

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| Input 10MΩ | Average (µV) | min. Offset (µV) | max. Offset (µV) | Std. Deviation (µV) |
|------------|--------------|------------------|------------------|---------------------|
| Channel X | 1.00 | -0.15 | 1.93 | 0.45 |
| Channel Y | -0.18 | -1.28 | 0.94 | 0.45 |
| Channel Z | -0.58 | -2.61 | 0.58 | 0.60 |

6. Input Offset Current

Nominal input circuitry offset current on all channels: $-25nA$

7. Input Resistance (Typical values for information)

| | Zeroing (MΩm) | Measuring (MΩm) |
|-----------|---------------|-----------------|
| Channel X | 200 | 200 |
| Channel Y | 200 | 200 |
| Channel Z | 200 | 200 |

8. Low Battery Alarm Voltage (Typical values for information)

| Typical values | Alarm Level (VDC) |
|----------------|-------------------|
| Supply (+ Vcc) | +7.9 |
| Supply (- Vcc) | -7.6 |

9. Power Consumption (Typical values for information)

| Typical values | Switched off (mA) | Stand by (mA) | Transmitting (mA) |
|----------------|-------------------|---------------|-------------------|
| Supply (+ Vcc) | +0.01 | +8 | +14 |
| Supply (- Vcc) | -0.01 | -8 | -9 |

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3 EX3DV4 - SN 7346

Calibration Laboratory of Schmid & Partner Engineering AG
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Client: **Auden** Certificate No: **EX3-7346_Mar22**

CALIBRATION CERTIFICATE

Object: **EX3DV4 - SN 7346**

Customer equipment: **QA CAL-01 v9; QA CAL-14 v6; QA CAL-23 v5; QA CAL-25 v7**
Calibration procedure for domestic E-field probes

Calibration date: **March 30, 2022**

This calibration certificate documents the laboratory's national standards, which realize the physical units of measurement (SI). The measurement and the uncertainties with confidence probability are given on the following pages and are part of this certificate.

All calibrations have been conducted in the closed laboratory facility, environment temperature (22 ± 0.1°C and humidity = 70%).

Calibration Equipment used (MKT) (suitable for calibration):

| Primary Standards | SI | Cal Date (Certificate No.) | Scheduled Calibration |
|----------------------------|----------------|-------------------------------|-----------------------|
| Power meter MPP | SR 10079 | 09-Apr-21 (No. 211-0201-0302) | Apr-22 |
| Power source MPP-29 | SR 10324 | 09-Apr-21 (No. 211-0201-0301) | Apr-22 |
| Power source MPP-291 | SR 10324 | 09-Apr-21 (No. 211-0201-0302) | Apr-22 |
| Reference 200 mV generator | SR 02282 (200) | 09-Apr-21 (No. 211-0201-0303) | Apr-22 |
| DASY | SR 460 | 13-Dec-21 (No. 048-0463-0401) | Dec-22 |
| Reference Probe ESD02 | SR 3913 | 07-Dec-21 (No. 033-3013-0401) | Dec-22 |

Secondary Standards

| SI | Check Date (in house) | Scheduled Date | |
|--------------------------|-----------------------|-----------------------------------|-----------------------|
| Power source E412B | SR 024126704 | 09-Apr-21 (in house check Jan-22) | in house check Jan-22 |
| Power source E412A | SR 141436847 | 08-Apr-21 (in house check Jan-22) | in house check Jan-22 |
| Power source E412A | SR 000101010 | 08-Apr-21 (in house check Jan-22) | in house check Jan-22 |
| RF generator HP 8447A | SR 0549431700 | 04-Apr-21 (in house check Jan-22) | in house check Jan-22 |
| Network Analyzer B 8700A | SR 154109477 | 01-Mar-14 (in house check Dec-22) | in house check Dec-22 |

Calibrated by: **Steven Keller** Function: **Calibration Technician** Signature: *[Signature]*

Approved by: **Steven Keller** Function: **Quality Manager** Signature: *[Signature]*

This calibration certificate shall not be reproduced, copied or in whole without written approval of the laboratory.

Certificate No: EX3-7346_Mar22 Page 1 of 14

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Client: **Auden** Certificate No: **EX3-7346_Mar22**

Glossary:

- TSL: traceability to the SI
- NORM(x,y,z): sensitivity in three space
- DCP: crest factor (100µs cycle) of the RF signal
- A, B, C, D: modulation dependent polarization parameters
- Polarization: rotation around probe axis
- Connector Angle: rotation around an axis that is in the plane normal to probe axis (in measurement center), i.e. θ is 0 is normal to probe axis
- Connector Angle: information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

- IEC 61010-1:2011, Measurement Procedure for the Assessment of Specific Absorption Rate (SAR) of Human Exposure to Radio Frequency Fields From Hand-Held and Body-Worn Wireless Communication Devices Part 1:0101, Human Models, Implementation and Procedures (Frequency Range of 4 MHz to 10 GHz), October 2020
- ISO 9001:2015, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- NORM(x,y,z): Assessed for E-field polarization $\theta = 0$ (if $\theta = 0$ 1000 MHz in TEM-cell; $\theta = 1800$ MHz: R22 waveguide), NORM(x,y,z) are only intermediate values, i.e. the uncertainties of NORM(x,y,z) does not affect the E-field uncertainty (see TSL, see below, ConfF)
- NORM(x,y,z) = NORM(x,y,z) * frequency response (see Frequency Response Chart). The linearity of the response is indicated in the stated uncertainty of ConfF
- DCP(x,y,z): DCP are numerical characterization parameters assessed based on the data of power sweep with CW signal (no uncertainty required), DCP does not depend on frequency nor media
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- Any(x,y,z): ConfF, DCP, DCP(x,y,z), V(x,y,z), A, B, C, D are numerical characterization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. V(x,y,z) is the maximum calibration range expressed in RMS voltage across the probe
- ConfF and Frequency Offset Parameters: Assessed in flat phantom using E-Field (or Temperature) Transfer Standard for f = 600 MHz and inside waveguide using analytical field distributions based on power measurements for f = 1800 MHz. The same values are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are DASY parameters that are not calibrated but determined based on the data of power sweep with CW signal. The uncertainty in TSL corresponds to NORM(x,y,z) * ConfF; uncertainty the uncertainty corresponds to flat gain for ConfF. A frequency deviation ConfF is used in DASY version 8.4 and higher which allows assessing this validity from 50 MHz to 100 MHz
- Spurious activity: (SD-revision from sensitivity) in a field of view gradient resistant using a flat phantom exposed by a patch antenna
- Sensor Offset: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (see probe axis), no tolerance required
- Connector Angle: The angle is assessed using the information given by minimizing the NORM(x,y,z) uncertainty (required)

Certificate No: EX3-7346_Mar22 Page 2 of 14



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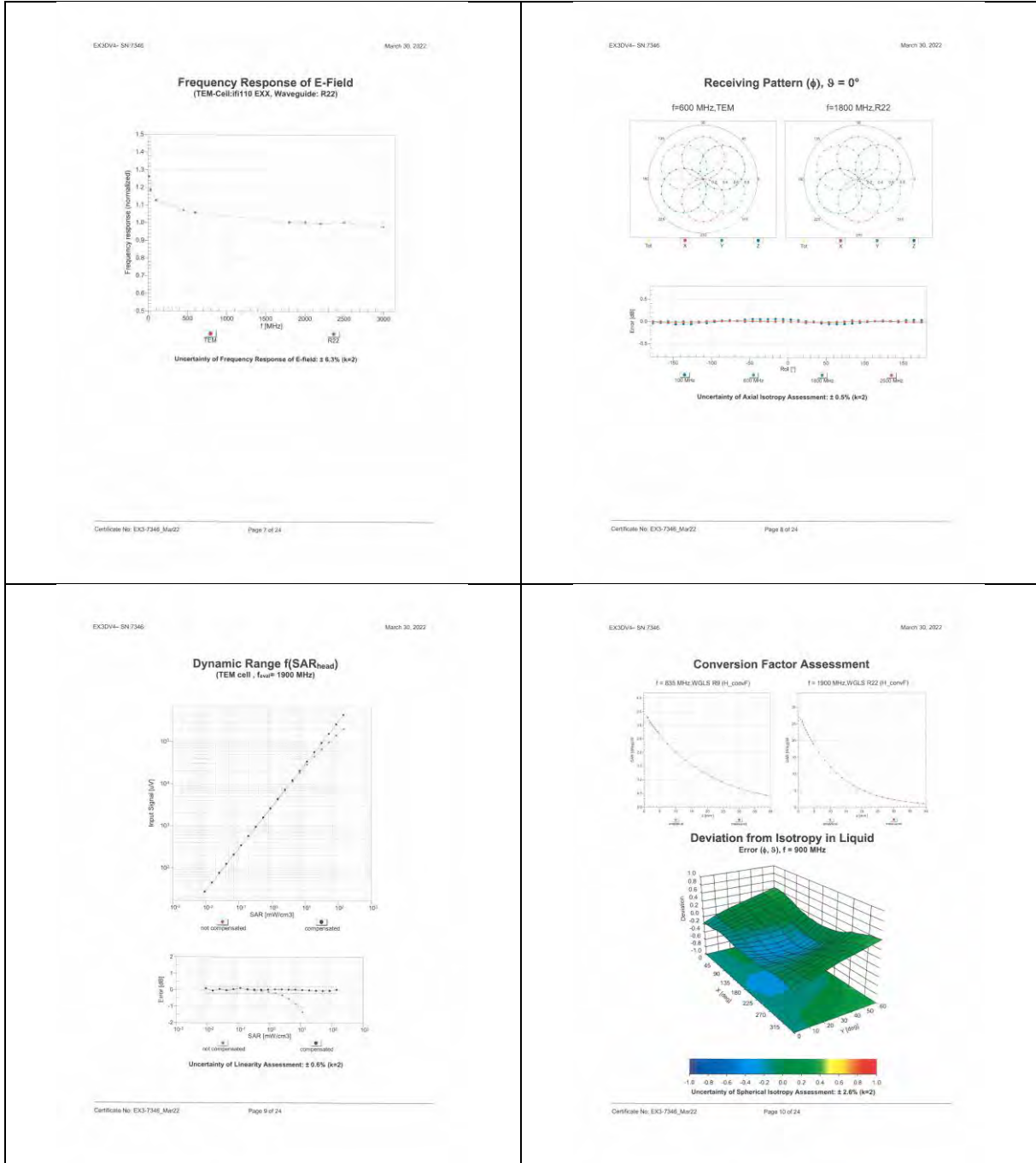
| <p>EX3DV4 - SN:7346 March 30, 2022</p> <p>DASY/EASY - Parameters of Probe: EX3DV4 - SN:7346</p> <p>Basic Calibration Parameters</p> <table border="1"> <thead> <tr> <th>Parameter</th> <th>Series X</th> <th>Series Y</th> <th>Series Z</th> <th>Unc. (k=2)</th> </tr> </thead> <tbody> <tr> <td>Norm. $\Delta V(V/mV)^2$</td> <td>0.45</td> <td>0.47</td> <td>0.61</td> <td>± 10.1%</td> </tr> <tr> <td>DCP (mV/V)</td> <td>101.4</td> <td>106.0</td> <td>108.9</td> <td></td> </tr> </tbody> </table> <p>Calibration Results for Modulation Response</p> <table border="1"> <thead> <tr> <th>UID</th> <th>Communication System Name</th> <th>dB</th> <th>dB</th> <th>dB</th> <th>dB</th> <th>dB</th> <th>dB</th> <th>Max. Unc. (k=2)</th> </tr> </thead> <tbody> <tr> <td>T005</td> <td>Fluke Waveform (200Hz, 10%)</td> <td>X</td> <td>0.00</td> <td>0.00</td> <td>1.00</td> <td>0.00</td> <td>143.9</td> <td>± 0.0%</td> </tr> <tr> <td>AAA</td> <td></td> <td>Y</td> <td>0.00</td> <td>0.00</td> <td>1.00</td> <td>0.00</td> <td>199.3</td> <td></td> </tr> <tr> <td></td> <td></td> <td>Z</td> <td>0.00</td> <td>0.00</td> <td>1.00</td> <td>0.00</td> <td>143.9</td> <td></td> </tr> <tr> <td>T005</td> <td>Fluke Waveform (200Hz, 10%)</td> <td>X</td> <td>3.33</td> <td>68.99</td> <td>11.08</td> <td>10.00</td> <td>86.0</td> <td>± 8.8%</td> </tr> <tr> <td>AAA</td> <td></td> <td>Y</td> <td>4.03</td> <td>79.70</td> <td>12.35</td> <td>10.00</td> <td>86.0</td> <td></td> </tr> <tr> <td></td> <td></td> <td>Z</td> <td>1.63</td> <td>64.25</td> <td>6.76</td> <td>10.00</td> <td>86.0</td> <td></td> </tr> <tr> <td>T005</td> <td>Fluke Waveform (200Hz, 20%)</td> <td>X</td> <td>3.00</td> <td>79.65</td> <td>11.31</td> <td>8.89</td> <td>80.0</td> <td>± 2.4%</td> </tr> <tr> <td>AAA</td> <td></td> <td>Y</td> <td>11.31</td> <td>81.32</td> <td>18.72</td> <td>10.00</td> <td>88.0</td> <td></td> </tr> <tr> <td></td> <td></td> <td>Z</td> <td>3.83</td> <td>69.90</td> <td>5.11</td> <td>10.00</td> <td>86.0</td> <td></td> </tr> <tr> <td>T005</td> <td>Fluke Waveform (200Hz, 40%)</td> <td>X</td> <td>7.41</td> <td>79.85</td> <td>12.61</td> <td>3.88</td> <td>85.0</td> <td>± 8.7%</td> </tr> <tr> <td>AAA</td> <td></td> <td>Y</td> <td>26.90</td> <td>81.62</td> <td>18.51</td> <td>10.00</td> <td>95.0</td> <td></td> </tr> <tr> <td></td> <td></td> <td>Z</td> <td>0.18</td> <td>138.39</td> <td>0.01</td> <td>10.00</td> <td>95.0</td> <td></td> </tr> <tr> <td>T005</td> <td>Fluke Waveform (200Hz, 80%)</td> <td>X</td> <td>2.72</td> <td>75.13</td> <td>9.50</td> <td>2.22</td> <td>126.9</td> <td>± 11.7%</td> </tr> <tr> <td>AAA</td> <td></td> <td>Y</td> <td>20.90</td> <td>81.58</td> <td>16.29</td> <td>10.00</td> <td>120.0</td> <td></td> </tr> <tr> <td></td> <td></td> <td>Z</td> <td>1.94</td> <td>126.51</td> <td>16.87</td> <td>10.00</td> <td>120.0</td> <td></td> </tr> <tr> <td>T005</td> <td>QPRK Waveform 1 MHz</td> <td>X</td> <td>1.47</td> <td>84.88</td> <td>13.82</td> <td>1.00</td> <td>150.0</td> <td>± 4.7%</td> </tr> <tr> <td>AAA</td> <td></td> <td>Y</td> <td>1.56</td> <td>88.27</td> <td>14.65</td> <td>0.00</td> <td>150.0</td> <td></td> </tr> <tr> <td></td> <td></td> <td>Z</td> <td>3.45</td> <td>81.88</td> <td>13.05</td> <td>10.00</td> <td>150.0</td> <td></td> </tr> <tr> <td>T005</td> <td>QPRK Waveform 10 MHz</td> <td>X</td> <td>2.08</td> <td>87.33</td> <td>13.38</td> <td>10.00</td> <td>150.0</td> <td>± 11.1%</td> </tr> <tr> <td>AAA</td> <td></td> <td>Y</td> <td>2.24</td> <td>94.75</td> <td>13.58</td> <td>10.00</td> <td>150.0</td> <td></td> </tr> <tr> <td></td> <td></td> <td>Z</td> <td>2.63</td> <td>88.51</td> <td>13.26</td> <td>0.01</td> <td>150.0</td> <td></td> </tr> <tr> <td>T005</td> <td>64-QAM Waveform, 500 MHz</td> <td>X</td> <td>2.63</td> <td>88.51</td> <td>13.26</td> <td>0.01</td> <td>150.0</td> <td>± 11.5%</td> </tr> <tr> <td>AAA</td> <td></td> <td>Y</td> <td>2.72</td> <td>89.16</td> <td>13.46</td> <td>0.00</td> <td>150.0</td> <td></td> </tr> <tr> <td></td> <td></td> <td>Z</td> <td>1.78</td> <td>84.72</td> <td>13.99</td> <td>10.00</td> <td>150.0</td> <td></td> </tr> <tr> <td>T005</td> <td>64-QAM Waveform, 40 Mhz</td> <td>X</td> <td>1.38</td> <td>86.82</td> <td>13.05</td> <td>0.00</td> <td>150.0</td> <td>± 8.8%</td> </tr> <tr> <td>AAA</td> <td></td> <td>Y</td> <td>1.38</td> <td>86.82</td> <td>13.05</td> <td>0.00</td> <td>150.0</td> <td></td> </tr> <tr> <td></td> <td></td> <td>Z</td> <td>2.70</td> <td>86.72</td> <td>14.74</td> <td>10.00</td> <td>150.0</td> <td></td> </tr> <tr> <td>T014</td> <td>WLAN CC001 64-QAM 4096Q</td> <td>X</td> <td>4.71</td> <td>85.35</td> <td>12.77</td> <td>0.00</td> <td>150.0</td> <td>± 3.0%</td> </tr> <tr> <td>AAA</td> <td></td> <td>Y</td> <td>4.70</td> <td>85.54</td> <td>13.41</td> <td>10.00</td> <td>150.0</td> <td></td> </tr> <tr> <td></td> <td></td> <td>Z</td> <td>3.83</td> <td>86.16</td> <td>15.26</td> <td>10.00</td> <td>150.0</td> <td></td> </tr> </tbody> </table> <p>Note: For details on UID parameters see Appendix.</p> <p>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%.</p> <p>1) The uncertainties of Norm. ΔV, ΔV, ΔV do not affect the ΔV head uncertainty within 1% (see Page 21 of 24).</p> <p>2) Numerical simulation parameter - uncertainty not required.</p> <p>3) Uncertainty is determined using the ΔV (Standard Error) based upon the ΔV (Standard Error) distribution and is determined to be the square root of the sum of the squares of the ΔV values.</p> <p>Certificate No: EX3-7346_Mar22 Page 3 of 34</p> | Parameter | Series X | Series Y | Series Z | Unc. (k=2) | Norm. $\Delta V(V/mV)^2$ | 0.45 | 0.47 | 0.61 | ± 10.1% | DCP (mV/V) | 101.4 | 106.0 | 108.9 | | UID | Communication System Name | dB | dB | dB | dB | dB | dB | Max. Unc. (k=2) | T005 | Fluke Waveform (200Hz, 10%) | X | 0.00 | 0.00 | 1.00 | 0.00 | 143.9 | ± 0.0% | AAA | | Y | 0.00 | 0.00 | 1.00 | 0.00 | 199.3 | | | | Z | 0.00 | 0.00 | 1.00 | 0.00 | 143.9 | | T005 | Fluke Waveform (200Hz, 10%) | X | 3.33 | 68.99 | 11.08 | 10.00 | 86.0 | ± 8.8% | AAA | | Y | 4.03 | 79.70 | 12.35 | 10.00 | 86.0 | | | | Z | 1.63 | 64.25 | 6.76 | 10.00 | 86.0 | | T005 | Fluke Waveform (200Hz, 20%) | X | 3.00 | 79.65 | 11.31 | 8.89 | 80.0 | ± 2.4% | AAA | | Y | 11.31 | 81.32 | 18.72 | 10.00 | 88.0 | | | | Z | 3.83 | 69.90 | 5.11 | 10.00 | 86.0 | | T005 | Fluke Waveform (200Hz, 40%) | X | 7.41 | 79.85 | 12.61 | 3.88 | 85.0 | ± 8.7% | AAA | | Y | 26.90 | 81.62 | 18.51 | 10.00 | 95.0 | | | | Z | 0.18 | 138.39 | 0.01 | 10.00 | 95.0 | | T005 | Fluke Waveform (200Hz, 80%) | X | 2.72 | 75.13 | 9.50 | 2.22 | 126.9 | ± 11.7% | AAA | | Y | 20.90 | 81.58 | 16.29 | 10.00 | 120.0 | | | | Z | 1.94 | 126.51 | 16.87 | 10.00 | 120.0 | | T005 | QPRK Waveform 1 MHz | X | 1.47 | 84.88 | 13.82 | 1.00 | 150.0 | ± 4.7% | AAA | | Y | 1.56 | 88.27 | 14.65 | 0.00 | 150.0 | | | | Z | 3.45 | 81.88 | 13.05 | 10.00 | 150.0 | | T005 | QPRK Waveform 10 MHz | X | 2.08 | 87.33 | 13.38 | 10.00 | 150.0 | ± 11.1% | AAA | | Y | 2.24 | 94.75 | 13.58 | 10.00 | 150.0 | | | | Z | 2.63 | 88.51 | 13.26 | 0.01 | 150.0 | | T005 | 64-QAM Waveform, 500 MHz | X | 2.63 | 88.51 | 13.26 | 0.01 | 150.0 | ± 11.5% | AAA | | Y | 2.72 | 89.16 | 13.46 | 0.00 | 150.0 | | | | Z | 1.78 | 84.72 | 13.99 | 10.00 | 150.0 | | T005 | 64-QAM Waveform, 40 Mhz | X | 1.38 | 86.82 | 13.05 | 0.00 | 150.0 | ± 8.8% | AAA | | Y | 1.38 | 86.82 | 13.05 | 0.00 | 150.0 | | | | Z | 2.70 | 86.72 | 14.74 | 10.00 | 150.0 | | T014 | WLAN CC001 64-QAM 4096Q | X | 4.71 | 85.35 | 12.77 | 0.00 | 150.0 | ± 3.0% | AAA | | Y | 4.70 | 85.54 | 13.41 | 10.00 | 150.0 | | | | Z | 3.83 | 86.16 | 15.26 | 10.00 | 150.0 | | <p>EX3DV4 - SN:7346 March 30, 2022</p> <p>DASY/EASY - Parameters of Probe: EX3DV4 - SN:7346</p> <p>Sensor Model Parameters</p> <table border="1"> <thead> <tr> <th>CT</th> <th>C2</th> <th>T1</th> <th>T2</th> <th>T3</th> <th>T4</th> <th>T5</th> <th>T6</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>39.2</td> <td>291.80</td> <td>35.10</td> <td>5.63</td> <td>0.03</td> <td>5.02</td> <td>1.42</td> </tr> <tr> <td>Y</td> <td>37.1</td> <td>270.84</td> <td>34.12</td> <td>6.29</td> <td>0.00</td> <td>5.01</td> <td>1.82</td> </tr> <tr> <td>Z</td> <td>9.7</td> <td>69.74</td> <td>33.37</td> <td>4.96</td> <td>0.00</td> <td>4.94</td> <td>0.61</td> </tr> </tbody> </table> <p>Other Probe Parameters</p> <table border="1"> <thead> <tr> <th>Parameter</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Sensor Arrangement</td> <td>Triangular</td> </tr> <tr> <td>Connector Angle (°)</td> <td>-166.1</td> </tr> <tr> <td>Mechanical Surface Detection Mode</td> <td>enabled</td> </tr> <tr> <td>Optical Surface Detection Mode</td> <td>disabled</td> </tr> <tr> <td>Probe Overall Length</td> <td>237 mm</td> </tr> <tr> <td>Probe Body Diameter</td> <td>10 mm</td> </tr> <tr> <td>Tip Length</td> <td>9 mm</td> </tr> <tr> <td>Tip Diameter</td> <td>2.5 mm</td> </tr> <tr> <td>Probe Tip to Sensor X Calibration Point</td> <td>1 mm</td> </tr> <tr> <td>Probe Tip to Sensor Y Calibration Point</td> <td>1 mm</td> </tr> <tr> <td>Probe Tip to Sensor Z Calibration Point</td> <td>1 mm</td> </tr> <tr> <td>Recommended Measurement Distance from Surface</td> <td>1.4 mm</td> </tr> </tbody> </table> <p>Note: Measurement distance from surface can be increased to 3-4 mm for an Area Scan job.</p> <p>Certificate No: EX3-7346_Mar22 Page 4 of 34</p> | CT | C2 | T1 | T2 | T3 | T4 | T5 | T6 | X | 39.2 | 291.80 | 35.10 | 5.63 | 0.03 | 5.02 | 1.42 | Y | 37.1 | 270.84 | 34.12 | 6.29 | 0.00 | 5.01 | 1.82 | Z | 9.7 | 69.74 | 33.37 | 4.96 | 0.00 | 4.94 | 0.61 | Parameter | Value | Sensor Arrangement | Triangular | Connector Angle (°) | -166.1 | Mechanical Surface Detection Mode | enabled | Optical Surface Detection Mode | disabled | Probe Overall Length | 237 mm | Probe Body Diameter | 10 mm | Tip Length | 9 mm | Tip Diameter | 2.5 mm | Probe Tip to Sensor X Calibration Point | 1 mm | Probe Tip to Sensor Y Calibration Point | 1 mm | Probe Tip to Sensor Z Calibration Point | 1 mm | Recommended Measurement Distance from Surface | 1.4 mm |
|--|------------------------------------|------------------------------------|---------------------------------|------------|------------|--------------------------|-------------------------|-------------------------|------------|---------|------------|-------|-------|-------|-------|------|---------------------------|---------|-----|------|------|-------|-------|-----------------|------|-----------------------------|---------|------|------|------|-------|-------|--------|------|------|---------|------|------|------|------|-------|------|------|------|---------|------|------|------|------|-------|------|------|-----------------------------|---------|------|-------|-------|-------|------|--------|------|------|---------|------|-------|-------|-------|------|------|------|------|---------|------|-------|------|-------|------|------|------|-----------------------------|---------|------|-------|-------|------|------|--------|------|------|---------|-------|-------|-------|-------|------|------|------|------|---------|------|-------|------|-------|------|------|------|-----------------------------|---------|------|-------|-------|------|------|--------|------|------|---------|-------|-------|-------|-------|------|------|------|------|---------|------|--------|------|-------|------|------|------|-----------------------------|---------|------|-------|------|------|-------|---------|------|------|---------|-------|-------|-------|-------|-------|------|------|------|---------|------|--------|-------|-------|-------|------|------|---------------------|---------|------|-------|-------|------|-------|--------|------|------|---------|------|-------|-------|------|-------|------|------|------|---------|------|-------|-------|-------|-------|------|------|----------------------|---------|------|-------|-------|-------|-------|---------|------|------|---------|------|-------|-------|-------|-------|------|------|------|---------|------|-------|-------|------|-------|------|------|--------------------------|---------|------|-------|-------|------|-------|---------|------|------|---------|------|-------|-------|------|-------|------|------|------|---------|---|---------|------------------------------------|---------------------------------|---------|---------|---------|-------------------------|-------------------------|------------|-------|-------|------|-------|--------|------|------|------|---------|-------|-------|------|-------|--|--|--|---|------|-------|-------|-------|-------|--|------|-------------------------|---|------|-------|-------|------|-------|--------|-----|--|---|------|-------|-------|-------|-------|--|--|--|---|------|-------|-------|-------|-------|--|--|----|----|----|----|----|----|----|----|---|------|--------|-------|------|------|------|------|---|------|--------|-------|------|------|------|------|---|-----|-------|-------|------|------|------|------|-----------|-------|--------------------|------------|---------------------|--------|-----------------------------------|---------|--------------------------------|----------|----------------------|--------|---------------------|-------|------------|------|--------------|--------|---|------|---|------|---|------|---|--------|
| Parameter | Series X | Series Y | Series Z | Unc. (k=2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Norm. $\Delta V(V/mV)^2$ | 0.45 | 0.47 | 0.61 | ± 10.1% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DCP (mV/V) | 101.4 | 106.0 | 108.9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| UID | Communication System Name | dB | dB | dB | dB | dB | dB | Max. Unc. (k=2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T005 | Fluke Waveform (200Hz, 10%) | X | 0.00 | 0.00 | 1.00 | 0.00 | 143.9 | ± 0.0% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AAA | | Y | 0.00 | 0.00 | 1.00 | 0.00 | 199.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Z | 0.00 | 0.00 | 1.00 | 0.00 | 143.9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T005 | Fluke Waveform (200Hz, 10%) | X | 3.33 | 68.99 | 11.08 | 10.00 | 86.0 | ± 8.8% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AAA | | Y | 4.03 | 79.70 | 12.35 | 10.00 | 86.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Z | 1.63 | 64.25 | 6.76 | 10.00 | 86.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T005 | Fluke Waveform (200Hz, 20%) | X | 3.00 | 79.65 | 11.31 | 8.89 | 80.0 | ± 2.4% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AAA | | Y | 11.31 | 81.32 | 18.72 | 10.00 | 88.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Z | 3.83 | 69.90 | 5.11 | 10.00 | 86.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T005 | Fluke Waveform (200Hz, 40%) | X | 7.41 | 79.85 | 12.61 | 3.88 | 85.0 | ± 8.7% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AAA | | Y | 26.90 | 81.62 | 18.51 | 10.00 | 95.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Z | 0.18 | 138.39 | 0.01 | 10.00 | 95.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T005 | Fluke Waveform (200Hz, 80%) | X | 2.72 | 75.13 | 9.50 | 2.22 | 126.9 | ± 11.7% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AAA | | Y | 20.90 | 81.58 | 16.29 | 10.00 | 120.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Z | 1.94 | 126.51 | 16.87 | 10.00 | 120.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T005 | QPRK Waveform 1 MHz | X | 1.47 | 84.88 | 13.82 | 1.00 | 150.0 | ± 4.7% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AAA | | Y | 1.56 | 88.27 | 14.65 | 0.00 | 150.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Z | 3.45 | 81.88 | 13.05 | 10.00 | 150.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T005 | QPRK Waveform 10 MHz | X | 2.08 | 87.33 | 13.38 | 10.00 | 150.0 | ± 11.1% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AAA | | Y | 2.24 | 94.75 | 13.58 | 10.00 | 150.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Z | 2.63 | 88.51 | 13.26 | 0.01 | 150.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T005 | 64-QAM Waveform, 500 MHz | X | 2.63 | 88.51 | 13.26 | 0.01 | 150.0 | ± 11.5% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AAA | | Y | 2.72 | 89.16 | 13.46 | 0.00 | 150.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Z | 1.78 | 84.72 | 13.99 | 10.00 | 150.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T005 | 64-QAM Waveform, 40 Mhz | X | 1.38 | 86.82 | 13.05 | 0.00 | 150.0 | ± 8.8% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AAA | | Y | 1.38 | 86.82 | 13.05 | 0.00 | 150.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Z | 2.70 | 86.72 | 14.74 | 10.00 | 150.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T014 | WLAN CC001 64-QAM 4096Q | X | 4.71 | 85.35 | 12.77 | 0.00 | 150.0 | ± 3.0% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AAA | | Y | 4.70 | 85.54 | 13.41 | 10.00 | 150.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Z | 3.83 | 86.16 | 15.26 | 10.00 | 150.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CT | C2 | T1 | T2 | T3 | T4 | T5 | T6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| X | 39.2 | 291.80 | 35.10 | 5.63 | 0.03 | 5.02 | 1.42 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Y | 37.1 | 270.84 | 34.12 | 6.29 | 0.00 | 5.01 | 1.82 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Z | 9.7 | 69.74 | 33.37 | 4.96 | 0.00 | 4.94 | 0.61 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Parameter | Value | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sensor Arrangement | Triangular | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Connector Angle (°) | -166.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mechanical Surface Detection Mode | enabled | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Optical Surface Detection Mode | disabled | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Probe Overall Length | 237 mm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Probe Body Diameter | 10 mm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tip Length | 9 mm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tip Diameter | 2.5 mm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Probe Tip to Sensor X Calibration Point | 1 mm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Probe Tip to Sensor Y Calibration Point | 1 mm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Probe Tip to Sensor Z Calibration Point | 1 mm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Recommended Measurement Distance from Surface | 1.4 mm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>EX3DV4 - SN:7346 March 30, 2022</p> <p>DASY/EASY - Parameters of Probe: EX3DV4 - SN:7346</p> <p>Calibration Parameter Determined in Head Tissue Simulating Media</p> <table border="1"> <thead> <tr> <th>f (MHz)</th> <th>Relative Permittivity¹</th> <th>Conductivity (S/m)²</th> <th>CompF X</th> <th>CompF Y</th> <th>CompF Z</th> <th>Alpha³</th> <th>Depth⁴ (mm)</th> <th>Unc. (k=2)</th> </tr> </thead> <tbody> <tr> <td>750</td> <td>41.9</td> <td>0.09</td> <td>10.56</td> <td>10.56</td> <td>10.56</td> <td>0.55</td> <td>0.85</td> <td>± 12.0%</td> </tr> <tr> <td>835</td> <td>41.5</td> <td>0.90</td> <td>10.12</td> <td>10.12</td> <td>10.12</td> <td>0.42</td> <td>0.96</td> <td>± 12.0%</td> </tr> <tr> <td>900</td> <td>41.5</td> <td>0.97</td> <td>10.10</td> <td>10.10</td> <td>10.10</td> <td>0.53</td> <td>0.80</td> <td>± 12.0%</td> </tr> <tr> <td>1450</td> <td>40.5</td> <td>1.20</td> <td>9.26</td> <td>9.26</td> <td>9.26</td> <td>0.50</td> <td>0.80</td> <td>± 12.0%</td> </tr> <tr> <td>1750</td> <td>40.1</td> <td>1.37</td> <td>8.83</td> <td>8.83</td> <td>8.83</td> <td>0.34</td> <td>0.86</td> <td>± 12.0%</td> </tr> <tr> <td>1900</td> <td>40.0</td> <td>1.40</td> <td>8.48</td> <td>8.48</td> <td>8.48</td> <td>0.35</td> <td>0.95</td> <td>± 12.0%</td> </tr> <tr> <td>2000</td> <td>40.0</td> <td>1.40</td> <td>8.35</td> <td>8.35</td> <td>8.35</td> <td>0.34</td> <td>0.88</td> <td>± 12.0%</td> </tr> <tr> <td>2300</td> <td>39.5</td> <td>1.67</td> <td>7.86</td> <td>7.86</td> <td>7.86</td> <td>0.39</td> <td>0.90</td> <td>± 12.0%</td> </tr> <tr> <td>2450</td> <td>39.2</td> <td>1.80</td> <td>7.63</td> <td>7.63</td> <td>7.63</td> <td>0.41</td> <td>0.90</td> <td>± 12.0%</td> </tr> <tr> <td>2600</td> <td>39.0</td> <td>1.96</td> <td>7.33</td> <td>7.33</td> <td>7.33</td> <td>0.44</td> <td>0.90</td> <td>± 12.0%</td> </tr> <tr> <td>3300</td> <td>38.2</td> <td>2.71</td> <td>7.15</td> <td>7.15</td> <td>7.15</td> <td>0.30</td> <td>1.35</td> <td>± 13.1%</td> </tr> <tr> <td>3500</td> <td>37.9</td> <td>2.91</td> <td>7.14</td> <td>7.14</td> <td>7.14</td> <td>0.30</td> <td>1.35</td> <td>± 13.1%</td> </tr> <tr> <td>3700</td> <td>37.7</td> <td>3.12</td> <td>6.85</td> <td>6.85</td> <td>6.85</td> <td>0.30</td> <td>1.35</td> <td>± 13.1%</td> </tr> <tr> <td>3900</td> <td>37.5</td> <td>3.32</td> <td>6.71</td> <td>6.71</td> <td>6.71</td> <td>0.40</td> <td>1.60</td> <td>± 13.1%</td> </tr> <tr> <td>4100</td> <td>37.2</td> <td>3.53</td> <td>6.58</td> <td>6.58</td> <td>6.58</td> <td>0.40</td> <td>1.60</td> <td>± 13.1%</td> </tr> <tr> <td>4200</td> <td>37.1</td> <td>3.63</td> <td>6.30</td> <td>6.30</td> <td>6.30</td> <td>0.40</td> <td>1.70</td> <td>± 13.1%</td> </tr> <tr> <td>4400</td> <td>36.9</td> <td>3.84</td> <td>6.24</td> <td>6.24</td> <td>6.24</td> <td>0.40</td> <td>1.70</td> <td>± 13.1%</td> </tr> <tr> <td>4600</td> <td>36.7</td> <td>4.04</td> <td>6.11</td> <td>6.11</td> <td>6.11</td> <td>0.40</td> <td>1.70</td> <td>± 13.1%</td> </tr> <tr> <td>4800</td> <td>36.4</td> <td>4.25</td> <td>6.08</td> <td>6.08</td> <td>6.08</td> <td>0.40</td> <td>1.80</td> <td>± 13.1%</td> </tr> <tr> <td>4900</td> <td>36.3</td> <td>4.40</td> <td>5.84</td> <td>5.84</td> <td>5.84</td> <td>0.40</td> <td>1.80</td> <td>± 13.1%</td> </tr> <tr> <td>5200</td> <td>36.0</td> <td>4.66</td> <td>5.25</td> <td>5.25</td> <td>5.25</td> <td>0.40</td> <td>1.80</td> <td>± 13.1%</td> </tr> <tr> <td>5300</td> <td>35.9</td> <td>4.78</td> <td>5.12</td> <td>5.12</td> <td>5.12</td> <td>0.40</td> <td>1.80</td> <td>± 13.1%</td> </tr> <tr> <td>5500</td> <td>35.6</td> <td>4.98</td> <td>4.85</td> <td>4.85</td> <td>4.85</td> <td>0.40</td> <td>1.80</td> <td>± 13.1%</td> </tr> <tr> <td>5800</td> <td>35.5</td> <td>5.07</td> <td>4.70</td> <td>4.70</td> <td>4.70</td> <td>0.40</td> <td>1.80</td> <td>± 13.1%</td> </tr> <tr> <td>5900</td> <td>35.3</td> <td>5.27</td> <td>4.75</td> <td>4.75</td> <td>4.75</td> <td>0.40</td> <td>1.80</td> <td>± 13.1%</td> </tr> </tbody> </table> <p>1) Frequency validity above 300 MHz and ≤ 100 MHz only applies for DASY v4.4 and higher (see Page 21, slide 4) is restricted to ≤ 50 MHz. The uncertainty is the RMS of the Conf. uncertainty at calibration frequency and the uncertainty for the measured frequency validity below 300 MHz is ± 10, ± 20, ± 30 and ± 40 MHz for Conf. assessments at 20, 44, 128, 150 and 220 MHz respectively. Validity of Conf. assessed at 9 MHz and 9 MHz, and Conf. assessed at 10 MHz is ± 10 MHz. Frequency validity can be extended to ≤ 100 MHz.</p> <p>2) All frequencies below 3 GHz, the validity of tissue parameters ϵ_r and σ can be related to $\pm 10\%$. A liquid compensation formula is applied to measured S-parameters. All frequencies above 3 GHz, the validity of tissue parameters ϵ_r and σ is restricted to $\pm 5\%$. The uncertainty is the RMS of the Conf. uncertainty for indicated target tissue parameters.</p> <p>3) Alpha values are determined during calibration. SPCAC warrants that the remaining deviation due to the boundary effect after compensation is always less than $\pm 1\%$ for frequencies below 3 GHz and below $\pm 2\%$ for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.</p> <p>4) Depth is determined during calibration. SPCAC warrants that the remaining deviation due to the boundary effect after compensation is always less than $\pm 1\%$ for frequencies below 3 GHz and below $\pm 2\%$ for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.</p> <p>Certificate No: EX3-7346_Mar22 Page 5 of 34</p> | f (MHz) | Relative Permittivity ¹ | Conductivity (S/m) ² | CompF X | CompF Y | CompF Z | Alpha ³ | Depth ⁴ (mm) | Unc. (k=2) | 750 | 41.9 | 0.09 | 10.56 | 10.56 | 10.56 | 0.55 | 0.85 | ± 12.0% | 835 | 41.5 | 0.90 | 10.12 | 10.12 | 10.12 | 0.42 | 0.96 | ± 12.0% | 900 | 41.5 | 0.97 | 10.10 | 10.10 | 10.10 | 0.53 | 0.80 | ± 12.0% | 1450 | 40.5 | 1.20 | 9.26 | 9.26 | 9.26 | 0.50 | 0.80 | ± 12.0% | 1750 | 40.1 | 1.37 | 8.83 | 8.83 | 8.83 | 0.34 | 0.86 | ± 12.0% | 1900 | 40.0 | 1.40 | 8.48 | 8.48 | 8.48 | 0.35 | 0.95 | ± 12.0% | 2000 | 40.0 | 1.40 | 8.35 | 8.35 | 8.35 | 0.34 | 0.88 | ± 12.0% | 2300 | 39.5 | 1.67 | 7.86 | 7.86 | 7.86 | 0.39 | 0.90 | ± 12.0% | 2450 | 39.2 | 1.80 | 7.63 | 7.63 | 7.63 | 0.41 | 0.90 | ± 12.0% | 2600 | 39.0 | 1.96 | 7.33 | 7.33 | 7.33 | 0.44 | 0.90 | ± 12.0% | 3300 | 38.2 | 2.71 | 7.15 | 7.15 | 7.15 | 0.30 | 1.35 | ± 13.1% | 3500 | 37.9 | 2.91 | 7.14 | 7.14 | 7.14 | 0.30 | 1.35 | ± 13.1% | 3700 | 37.7 | 3.12 | 6.85 | 6.85 | 6.85 | 0.30 | 1.35 | ± 13.1% | 3900 | 37.5 | 3.32 | 6.71 | 6.71 | 6.71 | 0.40 | 1.60 | ± 13.1% | 4100 | 37.2 | 3.53 | 6.58 | 6.58 | 6.58 | 0.40 | 1.60 | ± 13.1% | 4200 | 37.1 | 3.63 | 6.30 | 6.30 | 6.30 | 0.40 | 1.70 | ± 13.1% | 4400 | 36.9 | 3.84 | 6.24 | 6.24 | 6.24 | 0.40 | 1.70 | ± 13.1% | 4600 | 36.7 | 4.04 | 6.11 | 6.11 | 6.11 | 0.40 | 1.70 | ± 13.1% | 4800 | 36.4 | 4.25 | 6.08 | 6.08 | 6.08 | 0.40 | 1.80 | ± 13.1% | 4900 | 36.3 | 4.40 | 5.84 | 5.84 | 5.84 | 0.40 | 1.80 | ± 13.1% | 5200 | 36.0 | 4.66 | 5.25 | 5.25 | 5.25 | 0.40 | 1.80 | ± 13.1% | 5300 | 35.9 | 4.78 | 5.12 | 5.12 | 5.12 | 0.40 | 1.80 | ± 13.1% | 5500 | 35.6 | 4.98 | 4.85 | 4.85 | 4.85 | 0.40 | 1.80 | ± 13.1% | 5800 | 35.5 | 5.07 | 4.70 | 4.70 | 4.70 | 0.40 | 1.80 | ± 13.1% | 5900 | 35.3 | 5.27 | 4.75 | 4.75 | 4.75 | 0.40 | 1.80 | ± 13.1% | <p>EX3DV4 - SN:7346 March 30, 2022</p> <p>DASY/EASY - Parameters of Probe: EX3DV4 - SN:7346</p> <p>Calibration Parameter Determined in Head Tissue Simulating Media</p> <table border="1"> <thead> <tr> <th>f (MHz)</th> <th>Relative Permittivity¹</th> <th>Conductivity (S/m)²</th> <th>CompF X</th> <th>CompF Y</th> <th>CompF Z</th> <th>Alpha³</th> <th>Depth⁴ (mm)</th> <th>Unc. (k=2)</th> </tr> </thead> <tbody> <tr> <td>6500</td> <td>34.5</td> <td>6.07</td> <td>5.30</td> <td>5.30</td> <td>5.30</td> <td>0.20</td> <td>2.50</td> <td>± 18.0%</td> </tr> </tbody> </table> <p>1) Frequency validity above 3 GHz is ± 100 MHz. The uncertainty is the RMS of the Conf. uncertainty at calibration frequency and the uncertainty for the measured frequency band.</p> <p>2) As frequencies $6-10$ GHz, the validity of tissue parameters ϵ_r and σ can be related to $\pm 10\%$. A liquid compensation formula is applied to measured S-parameters. The uncertainty is the RMS of the Conf. uncertainty for indicated target tissue parameters.</p> <p>3) Alpha values are determined during calibration. SPCAC warrants that the remaining deviation due to the boundary effect after compensation is always less than $\pm 1\%$ for frequencies below 3 GHz and below $\pm 2\%$ for frequencies between 3-6 GHz and below $\pm 4\%$ for frequencies between 6-10 GHz at any distance larger than half the probe tip diameter from the boundary.</p> <p>4) Depth is determined during calibration. SPCAC warrants that the remaining deviation due to the boundary effect after compensation is always less than $\pm 1\%$ for frequencies below 3 GHz and below $\pm 2\%$ for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.</p> <p>Certificate No: EX3-7346_Mar22 Page 6 of 34</p> | f (MHz) | Relative Permittivity ¹ | Conductivity (S/m) ² | CompF X | CompF Y | CompF Z | Alpha ³ | Depth ⁴ (mm) | Unc. (k=2) | 6500 | 34.5 | 6.07 | 5.30 | 5.30 | 5.30 | 0.20 | 2.50 | ± 18.0% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| f (MHz) | Relative Permittivity ¹ | Conductivity (S/m) ² | CompF X | CompF Y | CompF Z | Alpha ³ | Depth ⁴ (mm) | Unc. (k=2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 750 | 41.9 | 0.09 | 10.56 | 10.56 | 10.56 | 0.55 | 0.85 | ± 12.0% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 835 | 41.5 | 0.90 | 10.12 | 10.12 | 10.12 | 0.42 | 0.96 | ± 12.0% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 900 | 41.5 | 0.97 | 10.10 | 10.10 | 10.10 | 0.53 | 0.80 | ± 12.0% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1450 | 40.5 | 1.20 | 9.26 | 9.26 | 9.26 | 0.50 | 0.80 | ± 12.0% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1750 | 40.1 | 1.37 | 8.83 | 8.83 | 8.83 | 0.34 | 0.86 | ± 12.0% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1900 | 40.0 | 1.40 | 8.48 | 8.48 | 8.48 | 0.35 | 0.95 | ± 12.0% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2000 | 40.0 | 1.40 | 8.35 | 8.35 | 8.35 | 0.34 | 0.88 | ± 12.0% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2300 | 39.5 | 1.67 | 7.86 | 7.86 | 7.86 | 0.39 | 0.90 | ± 12.0% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2450 | 39.2 | 1.80 | 7.63 | 7.63 | 7.63 | 0.41 | 0.90 | ± 12.0% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2600 | 39.0 | 1.96 | 7.33 | 7.33 | 7.33 | 0.44 | 0.90 | ± 12.0% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3300 | 38.2 | 2.71 | 7.15 | 7.15 | 7.15 | 0.30 | 1.35 | ± 13.1% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3500 | 37.9 | 2.91 | 7.14 | 7.14 | 7.14 | 0.30 | 1.35 | ± 13.1% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3700 | 37.7 | 3.12 | 6.85 | 6.85 | 6.85 | 0.30 | 1.35 | ± 13.1% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3900 | 37.5 | 3.32 | 6.71 | 6.71 | 6.71 | 0.40 | 1.60 | ± 13.1% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4100 | 37.2 | 3.53 | 6.58 | 6.58 | 6.58 | 0.40 | 1.60 | ± 13.1% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4200 | 37.1 | 3.63 | 6.30 | 6.30 | 6.30 | 0.40 | 1.70 | ± 13.1% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4400 | 36.9 | 3.84 | 6.24 | 6.24 | 6.24 | 0.40 | 1.70 | ± 13.1% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4600 | 36.7 | 4.04 | 6.11 | 6.11 | 6.11 | 0.40 | 1.70 | ± 13.1% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4800 | 36.4 | 4.25 | 6.08 | 6.08 | 6.08 | 0.40 | 1.80 | ± 13.1% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4900 | 36.3 | 4.40 | 5.84 | 5.84 | 5.84 | 0.40 | 1.80 | ± 13.1% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5200 | 36.0 | 4.66 | 5.25 | 5.25 | 5.25 | 0.40 | 1.80 | ± 13.1% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5300 | 35.9 | 4.78 | 5.12 | 5.12 | 5.12 | 0.40 | 1.80 | ± 13.1% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5500 | 35.6 | 4.98 | 4.85 | 4.85 | 4.85 | 0.40 | 1.80 | ± 13.1% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5800 | 35.5 | 5.07 | 4.70 | 4.70 | 4.70 | 0.40 | 1.80 | ± 13.1% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5900 | 35.3 | 5.27 | 4.75 | 4.75 | 4.75 | 0.40 | 1.80 | ± 13.1% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| f (MHz) | Relative Permittivity ¹ | Conductivity (S/m) ² | CompF X | CompF Y | CompF Z | Alpha ³ | Depth ⁴ (mm) | Unc. (k=2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6500 | 34.5 | 6.07 | 5.30 | 5.30 | 5.30 | 0.20 | 2.50 | ± 18.0% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



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Table with columns: Item No., Description, Standard, Method, Result, and Date. Includes items like 10414 AAA, 10415 AAA, etc.

Table with columns: Item No., Description, Standard, Method, Result, and Date. Includes items like 10489 AAF, 10490 AAF, etc.

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Certificate No: EX3-7346_Mar22 Page 16 of 24

Table with columns: Item No., Description, Standard, Method, Result, and Date. Includes items like 10467 AAC, 10468 AAC, etc.

Table with columns: Item No., Description, Standard, Method, Result, and Date. Includes items like 10605 AAC, 10606 AAC, etc.

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| | |
|---|---|
| <p>EX3D14-- SN 7346</p> <p>March 30, 2022</p> <p>15985 AAA 50 NR DL (CP-QPOM, TM 3.1, 40 MHz, 64-QAM, 30 MHz) SG NR FR1 TDD 9.54 ± 9.8 %</p> <p>15986 AAA 50 NR DL (CP-QPOM, TM 3.1, 50 MHz, 64-QAM, 30 MHz) SG NR FR1 TDD 9.50 ± 9.8 %</p> <p>15987 AAA 50 NR DL (CP-QPOM, TM 3.1, 60 MHz, 64-QAM, 30 MHz) SG NR FR1 TDD 9.53 ± 9.8 %</p> <p>15988 AAA 50 NR DL (CP-QPOM, TM 3.1, 70 MHz, 64-QAM, 30 MHz) SG NR FR1 TDD 9.38 ± 9.8 %</p> <p>15989 AAA 50 NR DL (CP-QPOM, TM 3.1, 80 MHz, 64-QAM, 30 MHz) SG NR FR1 TDD 9.33 ± 9.8 %</p> <p>15990 AAA 50 NR DL (CP-QPOM, TM 3.1, 90 MHz, 64-QAM, 30 MHz) SG NR FR1 TDD 9.52 ± 9.8 %</p> <p>¹ Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.</p> | <p>EX3D14-- SN 7346</p> <p>March 30, 2022</p> <p>15985 AAA 50 NR DL (CP-QPOM, TM 3.1, 40 MHz, 64-QAM, 30 MHz) SG NR FR1 TDD 9.54 ± 9.8 %</p> <p>15986 AAA 50 NR DL (CP-QPOM, TM 3.1, 50 MHz, 64-QAM, 30 MHz) SG NR FR1 TDD 9.50 ± 9.8 %</p> <p>15987 AAA 50 NR DL (CP-QPOM, TM 3.1, 60 MHz, 64-QAM, 30 MHz) SG NR FR1 TDD 9.53 ± 9.8 %</p> <p>15988 AAA 50 NR DL (CP-QPOM, TM 3.1, 70 MHz, 64-QAM, 30 MHz) SG NR FR1 TDD 9.38 ± 9.8 %</p> <p>15989 AAA 50 NR DL (CP-QPOM, TM 3.1, 80 MHz, 64-QAM, 30 MHz) SG NR FR1 TDD 9.33 ± 9.8 %</p> <p>15990 AAA 50 NR DL (CP-QPOM, TM 3.1, 90 MHz, 64-QAM, 30 MHz) SG NR FR1 TDD 9.52 ± 9.8 %</p> <p>¹ Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.</p> |
|---|---|

4 Impedance and return loss

| Dipole CLA150 SN 4025 | | | | |
|-----------------------|-----------------|-----|---------------|----|
| Head Liquid | | | | |
| Date of Measurement | Return Loss(dB) | Δ % | Impedance (Ω) | ΔΩ |
| 2021/4/26 | -31.4 | / | 47.8 | / |
| Dipole D450V3 SN 1103 | | | | |
| Head Liquid | | | | |
| Date of Measurement | Return Loss(dB) | Δ % | Impedance (Ω) | ΔΩ |
| 2021/4/21 | -23 | / | 57.1 | / |



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