

EX3DV4 Sn:3708 (7/7)

EX3DV4- SN:3708		October 22, 2019	
Model	Power	Power	Power
AA6	IEEE 802.11ac WPI (20MHz, MCS5, 30sp duty cycle)	A	4.30 18.80 18.10 0.40 130.0 99.9 %
		Y	4.50 18.76 18.16 130.0
		Z	4.30 18.80 18.10 130.0
10000- AA6	IEEE 802.11ac WPI (20MHz, MCS1, 30sp duty cycle)	X	4.43 18.58 18.24 0.48 130.0 99.9 %
		Y	4.46 18.56 18.30 130.0
		Z	4.34 18.58 18.50 130.0
10000- AA6	IEEE 802.11ac WPI (20MHz, MCS2, 30sp duty cycle)	X	4.33 18.50 18.40 0.48 130.0 99.9 %
		Y	4.54 18.40 18.12 130.0
		Z	4.44 18.48 18.78 130.0
10010- AA6	IEEE 802.11ac WPI (20MHz, MCS3, 30sp duty cycle)	X	4.36 18.21 18.20 0.46 130.0 99.9 %
		Y	4.50 18.50 18.50 130.0
		Z	4.48 18.50 18.50 130.0
10011- AA6	IEEE 802.11ac WPI (20MHz, MCS4, 30sp duty cycle)	X	4.29 18.57 18.00 0.48 130.0 99.9 %
		Y	4.51 18.59 18.13 130.0
		Z	4.48 18.54 18.72 130.0
10012- AA6	IEEE 802.11ac WPI (20MHz, MCS8, 30sp duty cycle)	X	4.38 18.68 18.18 0.48 130.0 99.9 %
		Y	4.51 18.59 18.13 130.0
		Z	4.30 18.66 18.30 130.0
10013- AA6	IEEE 802.11ac WPI (20MHz, MCS6, 30sp duty cycle)	X	4.27 18.86 18.09 0.49 130.0 99.9 %
		Y	4.52 18.57 18.30 130.0
		Z	4.38 18.79 18.66 130.0
10014- AA6	IEEE 802.11ac WPI (20MHz, MCS7, 30sp duty cycle)	X	4.29 18.17 18.21 0.48 130.0 99.9 %
		Y	4.13 18.83 18.30 130.0
		Z	4.30 18.88 18.96 130.0
10015- AA6	IEEE 802.11ac WPI (20MHz, MCS9, 30sp duty cycle)	X	4.27 18.72 18.70 0.50 130.0 99.9 %
		Y	4.50 18.18 18.68 130.0
		Z	4.38 18.88 18.52 130.0
10016- AA6	IEEE 802.11ac WPI (20MHz, MCS10, 30sp duty cycle)	X	4.28 18.30 18.24 0.48 130.0 99.9 %
		Y	4.30 18.54 18.28 130.0
		Z	4.12 18.84 18.28 130.0
10017- AA6	IEEE 802.11ac WPI (20MHz, MCS11, 30sp duty cycle)	X	4.30 18.37 18.00 0.50 130.0 99.9 %
		Y	4.14 18.99 18.34 130.0
		Z	4.28 18.50 18.40 130.0
10018- AA6	IEEE 802.11ac WPI (20MHz, MCS12, 30sp duty cycle)	X	4.34 18.38 18.40 0.48 130.0 99.9 %
		Y	4.08 18.77 18.40 130.0
		Z	4.00 18.84 18.11 130.0
10019- AA6	IEEE 802.11ac WPI (20MHz, MCS13, 30sp duty cycle)	X	4.30 18.33 18.30 0.48 130.0 99.9 %
		Y	4.08 18.52 18.30 130.0
		Z	4.07 18.50 18.50 130.0
10020- AA6	IEEE 802.11ac WPI (20MHz, MCS14, 30sp duty cycle)	X	4.28 18.33 18.50 0.48 130.0 99.9 %
		Y	4.18 18.60 18.28 130.0
		Z	4.09 18.11 18.98 130.0
10021- AA6	IEEE 802.11ac WPI (20MHz, MCS15, 30sp duty cycle)	X	4.21 18.30 18.50 0.48 130.0 99.9 %
		Y	4.18 18.52 18.48 130.0
		Z	4.18 18.57 18.50 130.0
10022- AA6	IEEE 802.11ac WPI (20MHz, MCS16, 30sp duty cycle)	X	4.31 18.40 18.00 0.48 130.0 99.9 %
		Y	4.18 18.82 18.50 130.0
		Z	4.09 18.37 18.28 130.0

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Model	Power	Power	Power
AA6	IEEE 802.11ac WPI (20MHz, MCS4, 30sp duty cycle)	A	4.09 18.78 18.80 0.48 130.0 99.9 %
		Y	4.18 18.78 18.28 130.0
		Z	4.28 18.78 18.50 130.0
10040- AA6	IEEE 802.11ac WPI (20MHz, MCS4, 30sp duty cycle)	X	4.20 18.55 18.30 0.48 130.0 99.9 %
		Y	4.05 18.13 18.30 130.0
		Z	4.28 18.78 18.13 130.0
10041- AA6	IEEE 802.11ac WPI (20MHz, MCS5, 30sp duty cycle)	X	4.20 18.55 18.30 0.48 130.0 99.9 %
		Y	4.01 18.50 18.30 130.0
		Z	4.22 18.50 18.30 130.0
10042- AA6	IEEE 802.11ac WPI (20MHz, MCS6, 30sp duty cycle)	X	4.24 18.60 18.30 0.48 130.0 99.9 %
		Y	4.00 18.28 18.88 130.0
		Z	4.20 18.55 18.50 130.0
10043- AA6	IEEE 802.11ac WPI (20MHz, MCS7, 30sp duty cycle)	X	4.23 18.02 18.25 0.48 130.0 99.9 %
		Y	4.00 18.02 18.25 130.0
		Z	4.20 18.50 18.50 130.0
10044- AA6	IEEE 802.11ac WPI (20MHz, MCS8, 30sp duty cycle)	X	4.23 18.14 18.30 0.48 130.0 99.9 %
		Y	4.00 18.02 18.25 130.0
		Z	4.20 18.50 18.50 130.0
10045- AA6	IEEE 802.11ac WPI (20MHz, MCS9, 30sp duty cycle)	X	4.18 18.41 18.33 0.48 130.0 99.9 %
		Y	4.02 18.25 18.48 130.0
		Z	4.20 18.50 18.50 130.0
10046- AAP	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL, SF=6, normal CP)	X	0.54 18.83 18.00 0.30 80.0 99.9 %
		Y	18.22 18.00 18.45 80.0
		Z	18.42 18.83 18.28 80.0
10047- AAP	LTE-TDD (SC-FDMA, 1 RB, 30 MHz, QPSK, UL, SF=6, normal CP)	X	0.54 18.27 18.00 0.30 80.0 99.9 %
		Y	18.94 18.45 18.78 80.0
		Z	18.34 18.27 18.85 80.0
10048- AAA	CDMA2000 (1X Advantech)	X	0.30 18.00 18.00 0.00 100.0 99.9 %
		Y	18.88 18.84 18.84 100.0
		Z	18.11 18.00 18.11 100.0
10049- AAD	1780 MHz GSM800 (GSM, E-UTRA, Class 1A)	X	0.00 18.00 18.00 0.00 100.0 99.9 %
		Y	18.99 18.38 18.48 80.0
		Z	18.29 18.84 18.99 80.0
10050- AAE	1780 MHz GSM800 (GSM, E-UTRA, Class 1A)	X	0.00 18.00 18.00 0.00 100.0 99.9 %
		Y	18.99 18.38 18.48 80.0
		Z	18.29 18.84 18.99 80.0
10051- AAD	1780 MHz GSM800 (GSM, E-UTRA, Class 1A)	X	0.00 18.00 18.00 0.00 100.0 99.9 %
		Y	18.99 18.38 18.48 80.0
		Z	18.29 18.84 18.99 80.0
10052- AAA	Pulse Waveform (300kHz, 10%)	X	0.00 18.00 18.00 0.00 100.0 99.9 %
		Y	18.99 18.38 18.48 80.0
		Z	18.29 18.84 18.99 80.0
10053- AAA	Pulse Waveform (300kHz, 10%)	X	0.00 18.00 18.00 0.00 100.0 99.9 %
		Y	18.99 18.38 18.48 80.0
		Z	18.29 18.84 18.99 80.0

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D835V2 Sn:4d023

<div style="text-align: center;"> <p>In Collaboration with <b>S P E A G</b> CALIBRATION LABORATORY</p> <p>中国认可 国际互认 CALIBRATION CNAS L5070</p> </div> <p>Client: <b>SRTC</b> Certificate No: <b>Z17-97135</b></p> <p><b>CALIBRATION CERTIFICATE</b></p> <p>Object: <b>D835V2 - SN-48023</b></p> <p>Calibration Procedure(s): <b>FT-Z11-003-01</b> Calibration Procedures for dipole validation kits</p> <p>Calibration date: <b>September 13, 2017</b></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±1)°C and humidity&lt;math&gt;70\%&lt;/math&gt;.</p> <p>Calibration Equipment used (M&amp;E 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 NRV0</td> <td>102196</td> <td>02-Mar-17 (CTTL, No.J17X01254)</td> <td>Mar-18</td> </tr> <tr> <td>Power sensor NRV-Z5</td> <td>100598</td> <td>03-Mar-17 (CTTL, No.J17X01254)</td> <td>Mar-18</td> </tr> <tr> <td>Reference Probe EX3D/4</td> <td>SN 7433</td> <td>28-Sep-16 (SPEAG, No EX3-7433_Sep16)</td> <td>Sep-17</td> </tr> <tr> <td>DAE4</td> <td>SN 1331</td> <td>19-Jan-17 (CTTL, SPEAG, No.Z17-97015)</td> <td>Jan-18</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>MY49071430</td> <td>13-Jan-17 (CTTL, No.J17X00286)</td> <td>Jan-18</td> </tr> <tr> <td>Network Analyser E8071C</td> <td>MY46110673</td> <td>13-Jan-17 (CTTL, No.J17X00286)</td> <td>Jan-18</td> </tr> </tbody> </table> <p>Calibrated by: <b>Zhao Jing</b> SAR Test Engineer</p> <p>Reviewed by: <b>Yu Zongying</b> SAR Test Engineer</p> <p>Approved by: <b>Qi Chanyuan</b> SAR Project Leader</p> <p style="text-align: right;">Issued: September 16, 2017</p> <p style="text-align: center;">This calibration certificate shall not be reproduced except in full without written approval of the laboratory.</p> <p>Certificate No: Z17-97135 Page 1 of 8</p>	Primary Standards	ID #	Cal Date/Calibrated by, Certificate No.	Scheduled Calibration	Power Meter NRV0	102196	02-Mar-17 (CTTL, No.J17X01254)	Mar-18	Power sensor NRV-Z5	100598	03-Mar-17 (CTTL, No.J17X01254)	Mar-18	Reference Probe EX3D/4	SN 7433	28-Sep-16 (SPEAG, No EX3-7433_Sep16)	Sep-17	DAE4	SN 1331	19-Jan-17 (CTTL, SPEAG, No.Z17-97015)	Jan-18	Secondary Standards	ID #	Cal Date/Calibrated by, Certificate No.	Scheduled Calibration	Signal Generator E4438C	MY49071430	13-Jan-17 (CTTL, No.J17X00286)	Jan-18	Network Analyser E8071C	MY46110673	13-Jan-17 (CTTL, No.J17X00286)	Jan-18	<div style="text-align: center;"> <p>In Collaboration with <b>S P E A G</b> CALIBRATION LABORATORY</p> <p>中国认可 国际互认 CALIBRATION CNAS L5070</p> </div> <p>Glossary:</p> <p>TSL: Issue simulating liquid</p> <p>ConF: sensitivity in TSL: NQR2Mx.y.z</p> <p>N/A: not applicable or not measured</p> <p><b>Calibration is Performed According to the Following Standards:</b></p> <ol style="list-style-type: none"> <li>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</li> <li>IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016</li> <li>IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010</li> <li>KDB965664, SAR Measurement Requirements for 100 MHz to 6 GHz</li> </ol> <p><b>Additional Documentation:</b></p> <ol style="list-style-type: none"> <li>DASY4/5 System Handbook</li> </ol> <p><b>Methods Applied and Interpretation of Parameters:</b></p> <ul style="list-style-type: none"> <li><b>Measurement Conditions:</b> 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.</li> <li><b>Antenna Parameters with TSL:</b> 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.</li> <li><b>Feed Point Impedance and Return Loss:</b> 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.</li> <li><b>Electrical Delay:</b> One-way delay between the SMA connector and the antenna feed point. No uncertainty required.</li> <li><b>SAR measured:</b> SAR measured at the stated antenna input power.</li> <li><b>SAR normalized:</b> SAR as measured, normalized to an input power of 1 W at the antenna connector.</li> <li><b>SAR for nominal TSL parameters:</b> The measured TSL parameters are used to calculate the nominal SAR result.</li> </ul> <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>Certificate No: Z17-97135 Page 2 of 8</p>
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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>41.5</td> <td>0.90 mho/m</td> </tr> <tr> <td>Measured Head TSL parameters</td> <td>(22.0 ± 0.2) °C</td> <td>41.3 ± 6 %</td> <td>0.90 mho/m ± 6 %</td> </tr> <tr> <td>Head TSL temperature change during test</td> <td>&lt;math&gt;1.0\text{ }^{\circ}\text{C}&lt;/math&gt;</td> <td>---</td> <td>---</td> </tr> </tbody> </table> <p><b>SAR result with Head TSL</b></p> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</td> <td>Condition</td> <td></td> </tr> <tr> <td>SAR measured</td> <td>250 mW input power</td> <td>2.35 mW / g</td> </tr> <tr> <td>SAR for nominal Head TSL parameters</td> <td>normalized to 1W</td> <td>9.37 mW (g ± 18.8 % (k=2))</td> </tr> <tr> <td>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</td> <td>Condition</td> <td></td> </tr> <tr> <td>SAR measured</td> <td>250 mW input power</td> <td>1.52 mW / g</td> </tr> <tr> <td>SAR for nominal Head TSL parameters</td> <td>normalized to 1W</td> <td>6.06 mW (g ± 18.7 % (k=2))</td> </tr> </table> <p><b>Body TSL parameters</b> 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 Body TSL parameters</td> <td>22.0 °C</td> <td>55.2</td> <td>0.97 mho/m</td> </tr> <tr> <td>Measured Body TSL parameters</td> <td>(22.0 ± 0.2) °C</td> <td>55.7 ± 6 %</td> <td>0.96 mho/m ± 6 %</td> </tr> <tr> <td>Body TSL temperature change during test</td> <td>&lt;math&gt;1.0\text{ }^{\circ}\text{C}&lt;/math&gt;</td> <td>---</td> <td>---</td> </tr> </tbody> </table> <p><b>SAR result with Body TSL</b></p> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</td> <td>Condition</td> <td></td> </tr> <tr> <td>SAR measured</td> <td>250 mW input power</td> <td>2.34 mW / g</td> </tr> <tr> <td>SAR for nominal Body TSL parameters</td> <td>normalized to 1W</td> <td>9.47 mW (g ± 18.8 % (k=2))</td> </tr> <tr> <td>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</td> <td>Condition</td> <td></td> </tr> <tr> <td>SAR measured</td> <td>250 mW input power</td> <td>1.53 mW / g</td> </tr> <tr> <td>SAR for nominal Body TSL parameters</td> <td>normalized to 1W</td> <td>6.17 mW (g ± 18.7 % (k=2))</td> </tr> </table> <p>Certificate No: Z17-97135 Page 3 of 8</p>	DASY Version	DASY92	52.10.0.1446	Extrapolation	Advanced Extrapolation		Phantom	Triple Flat Phantom S.1C		Distance Dipole Center - TSL	15 mm	with Spacer	Zoom Scan Resolution	dx, dy, dz = 5 mm		Frequency	835 MHz ± 1 MHz			Temperature	Permittivity	Conductivity	Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m	Measured Head TSL parameters	(22.0 ± 0.2) °C	41.3 ± 6 %	0.90 mho/m ± 6 %	Head TSL temperature change during test	<math>1.0\text{ }^{\circ}\text{C}</math>	---	---	SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition		SAR measured	250 mW input power	2.35 mW / g	SAR for nominal Head TSL parameters	normalized to 1W	9.37 mW (g ± 18.8 % (k=2))	SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	Condition		SAR measured	250 mW input power	1.52 mW / g	SAR for nominal Head TSL parameters	normalized to 1W	6.06 mW (g ± 18.7 % (k=2))		Temperature	Permittivity	Conductivity	Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m	Measured Body TSL parameters	(22.0 ± 0.2) °C	55.7 ± 6 %	0.96 mho/m ± 6 %	Body TSL temperature change during test	<math>1.0\text{ }^{\circ}\text{C}</math>	---	---	SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition		SAR measured	250 mW input power	2.34 mW / g	SAR for nominal Body TSL parameters	normalized to 1W	9.47 mW (g ± 18.8 % (k=2))	SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	Condition		SAR measured	250 mW input power	1.53 mW / g	SAR for nominal Body TSL parameters	normalized to 1W	6.17 mW (g ± 18.7 % (k=2))	<div style="text-align: center;"> <p>In Collaboration with <b>S P E A G</b> CALIBRATION LABORATORY</p> <p>中国认可 国际互认 CALIBRATION CNAS L5070</p> </div> <p>Address: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China Tel: +86-10-4239633-2079 Fax: +86-10-4239633-2504 E-mail: cti@chinafl.com http://www.chinafl.com</p> <p><b>Appendix (Additional assessments outside the scope of CNAS L5070)</b></p> <p><b>Antenna Parameters with Head TSL</b></p> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>Impedance, transformed to feed point</td> <td>51.00-2.79jΩ</td> </tr> <tr> <td>Return Loss</td> <td>-30.76dB</td> </tr> </table> <p><b>Antenna Parameters with Body TSL</b></p> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>Impedance, transformed to feed point</td> <td>46.60-3.61jΩ</td> </tr> <tr> <td>Return Loss</td> <td>-25.8dB</td> </tr> </table> <p><b>General Antenna Parameters and Design</b></p> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>Electrical Delay (one direction)</td> <td>1.495 ns</td> </tr> </table> <p>After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint 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 feedpoint may be damaged.</p> <p><b>Additional EUT Data</b></p> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>Manufactured by</td> <td>SPEAG</td> </tr> </table> <p>Certificate No: Z17-97135 Page 4 of 8</p>	Impedance, transformed to feed point	51.00-2.79jΩ	Return Loss	-30.76dB	Impedance, transformed to feed point	46.60-3.61jΩ	Return Loss	-25.8dB	Electrical Delay (one direction)	1.495 ns	Manufactured by	SPEAG
DASY Version	DASY92	52.10.0.1446																																																																																																	
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Zoom Scan Resolution	dx, dy, dz = 5 mm																																																																																																		
Frequency	835 MHz ± 1 MHz																																																																																																		
	Temperature	Permittivity	Conductivity																																																																																																
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m																																																																																																
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.3 ± 6 %	0.90 mho/m ± 6 %																																																																																																
Head TSL temperature change during test	<math>1.0\text{ }^{\circ}\text{C}</math>	---	---																																																																																																
SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition																																																																																																		
SAR measured	250 mW input power	2.35 mW / g																																																																																																	
SAR for nominal Head TSL parameters	normalized to 1W	9.37 mW (g ± 18.8 % (k=2))																																																																																																	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	Condition																																																																																																		
SAR measured	250 mW input power	1.52 mW / g																																																																																																	
SAR for nominal Head TSL parameters	normalized to 1W	6.06 mW (g ± 18.7 % (k=2))																																																																																																	
	Temperature	Permittivity	Conductivity																																																																																																
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m																																																																																																
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.7 ± 6 %	0.96 mho/m ± 6 %																																																																																																
Body TSL temperature change during test	<math>1.0\text{ }^{\circ}\text{C}</math>	---	---																																																																																																
SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition																																																																																																		
SAR measured	250 mW input power	2.34 mW / g																																																																																																	
SAR for nominal Body TSL parameters	normalized to 1W	9.47 mW (g ± 18.8 % (k=2))																																																																																																	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	Condition																																																																																																		
SAR measured	250 mW input power	1.53 mW / g																																																																																																	
SAR for nominal Body TSL parameters	normalized to 1W	6.17 mW (g ± 18.7 % (k=2))																																																																																																	
Impedance, transformed to feed point	51.00-2.79jΩ																																																																																																		
Return Loss	-30.76dB																																																																																																		
Impedance, transformed to feed point	46.60-3.61jΩ																																																																																																		
Return Loss	-25.8dB																																																																																																		
Electrical Delay (one direction)	1.495 ns																																																																																																		
Manufactured by	SPEAG																																																																																																		

D835V2 Sn:4d023

In Collaboration with  
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Address: No. 51 Xuyuan Road, Haidian District, Beijing, 100191, China  
Tel: +86-10-42304633-2079 Fax: +86-10-42304633-2504  
E-mail: cti@china.ttl.com http://www.china.ttl.com

**DASY5 Validation Report for Head TSL** Date: 09.13.2017  
Test Laboratory: CTTL, Beijing, China  
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d023  
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.903 \text{ S/m}$ ;  $\epsilon_r = 41.34$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Left Section  
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)  
DASY5 Configuration:

- Probe: EX3DV4 - SN7433; ConvF(9.82, 9.82, 9.82); Calibrated: 9/26/2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DA4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version: 14.6.10 (7417)

Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm  
Reference Value = 56.28V/m; Power Drift = -0.02 dB  
Peak SAR (extrapolated) = 3.66 W/kg  
SAR(1 g) = 2.35 W/kg; SAR(10 g) = 1.52 W/kg  
Maximum value of SAR (measured) = 3.21 W/kg

Certificate No: Z17-97135 Page 1 of 8

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**Impedance Measurement Plot for Head TSL**

Certificate No: Z17-97135 Page 4 of 8

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E-mail: cti@china.ttl.com http://www.china.ttl.com

**DASY5 Validation Report for Body TSL** Date: 09.13.2017  
Test Laboratory: CTTL, Beijing, China  
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d023  
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.958 \text{ S/m}$ ;  $\epsilon_r = 55.68$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Center Section  
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)  
DASY5 Configuration:

- Probe: EX3DV4 - SN7433; ConvF(9.5.9.5, 9.5); Calibrated: 9/26/2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DA4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version: 14.6.10 (7417)

Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm  
Reference Value = 56.17 V/m; Power Drift = -0.01 dB  
Peak SAR (extrapolated) = 3.57 W/kg  
SAR(1 g) = 2.34 W/kg; SAR(10 g) = 1.53 W/kg  
Maximum value of SAR (measured) = 3.15 W/kg

Certificate No: Z17-97135 Page 7 of 8

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**Impedance Measurement Plot for Body TSL**

Certificate No: Z17-97135 Page 8 of 8

D1800V2 Sn:2d084

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校准  
CNAS 16570

Client: **SRTC** Certificate No: **Z17-97138**

**CALIBRATION CERTIFICATE**

Object: D1800V2 - SN: 2d084

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

Calibration date: September 15, 2017

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	102196	02-Mar-17 (CTTL No.J17X01254)	Mar-18
Power sensor NRP-Z91	100596	02-Mar-17 (CTTL No.J17X01254)	Mar-18
Reference Probe EX3D/V4	SN 7433	26-Sep-16(SPEAG No EX3-7433_Sep16)	Sep-17
DAE4	SN 1331	19-Jan-17(CTTL-SPEAG No Z17-97015)	Jan-18

Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4439C	MY49071430	13-Jan-17 (CTTL No.J17X00285)	Jan-18
Network Analyzer E5071C	MY46110673	13-Jan-17 (CTTL No.J17X00285)	Jan-18

Calibrated by:	Name	Function	Signature
	Zhao Jing	SAR Test Engineer	
Reviewed by:	Yu Zongying	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	

Issued: September 18, 2017  
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

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

**Calibration is Performed According to the Following Standards:**  
a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices. Measurement Techniques", June 2013  
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005  
c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010  
d) KDB85664, SAR Measurement Requirements for 100 MHz to 6 GHz

**Additional Documentation:**  
e) DASy4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

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

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

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E-mail: cti@china.ttl.com http://www.china.ttl.com

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

DASy Version	DASy52	52.10.0.1446
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1800 MHz ± 1 MHz	

**Head TSL parameters**  
The following parameters and calculations were applied:

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.4 ± 6 %	1.42 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	---	---

**SAR result with Head TSL**

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.79 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	38.9 mW / g ± 18.8 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.12 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	20.4 mW / g ± 18.7 % (k=2)

**Body TSL parameters**  
The following parameters and calculations were applied:

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.8 ± 6 %	1.50 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	---	---

**SAR result with Body TSL**

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.84 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	39.7 mW / g ± 18.8 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.18 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	20.8 mW / g ± 18.7 % (k=2)

Certificate No: Z17-97138 Page 3 of 8

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**Appendix (Additional assessments outside the scope of CNAS 16570)**

**Antenna Parameters with Head TSL**

Impedance, transformed to feed point	49.3j - 1.55jΩ
Return Loss	- 35.4dB

**Antenna Parameters with Body TSL**

Impedance, transformed to feed point	46.0j - 1.32jΩ
Return Loss	- 27.1dB

**General Antenna Parameters and Design**

Electrical Delay (one direction)	1.316 ns
----------------------------------	----------

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

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

**Additional EUT Data**

Manufactured by	SPEAG
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Certificate No: Z17-97138 Page 4 of 8

D1800V2 Sn:2d084

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Tel: +86-10-6259633-2079 Fax: +86-10-6259633-2504  
E-mail: cti@chinatml.com http://www.chinatml.com

DASY5 Validation Report for Head TSL Date: 09.15.2017  
Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 2d084  
Communication System: U/D 0, CW; Frequency: 1800 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1800$  MHz;  $\sigma = 1.423$  S/m;  $\epsilon_r = 40.77$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Left Section  
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN7433; ConvF(7.97, 7.97); Calibrated: 9/26/2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:  
dx=5mm, dy=5mm, dz=5mm  
Reference Value = 93.90 V/m; Power Drift = 0.01 dB  
Peak SAR (extrapolated) = 18.7 W/kg  
SAR(1 g) = 9.79 W/kg; SAR(10 g) = 5.12 W/kg  
Maximum value of SAR (measured) = 15.5 W/kg

0 dB = 15.5 W/kg = 11.90 dBW/kg

Certificate No: Z17-07138 Page 5 of 8

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Impedance Measurement Plot for Head TSL

Certificate No: Z17-07138 Page 6 of 8

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Tel: +86-10-6259633-2079 Fax: +86-10-6259633-2504  
E-mail: cti@chinatml.com http://www.chinatml.com

DASY5 Validation Report for Body TSL Date: 09.14.2017  
Test Laboratory: CTTL, Beijing, China

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 2d084  
Communication System: U/D 0, CW; Frequency: 1800 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 1800$  MHz;  $\sigma = 1.503$  S/m;  $\epsilon_r = 53.79$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Center Section  
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN7433; ConvF(7.75, 7.75, 7.75); Calibrated: 9/26/2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7413)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:  
dx=5mm, dy=5mm, dz=5mm  
Reference Value = 97.57 V/m; Power Drift = -0.02 dB  
Peak SAR (extrapolated) = 18.0 W/kg  
SAR(1 g) = 9.84 W/kg; SAR(10 g) = 5.18 W/kg  
Maximum value of SAR (measured) = 15.2 W/kg

0 dB = 15.2 W/kg = 11.82 dBW/kg

Certificate No: Z17-07138 Page 7 of 8

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Impedance Measurement Plot for Body TSL

Certificate No: Z17-07138 Page 8 of 8

D2000V2 Sn:1009



Client: SRTC Certificate No: Z18-97021

### CALIBRATION CERTIFICATE

Object: D2000V2 - SN: 1009

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

Calibration date: February 1, 2018

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 (MATE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	102196	02-Mar-17 (CTTL, No.J17X01254)	Mar-18
Power sensor NRV-Z5	100596	02-Mar-17 (CTTL, No.J17X01254)	Mar-18
Reference Probe EX3D14	SN 7454	12-Sep-17(SPEAG, No.EX3-7464_Sep17)	Sep-18
DAE4	SN 1525	02-Oct-17(SPEAG, No.DAE4-1525_Oct17)	Oct-18

Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	23-Jan-18 (CTTL, No.J18X00560)	Jan-19
Network Analyzer E6071C	MY46110673	24-Jan-18 (CTTL, No.J18X00561)	Jan-19

Calibrated by: Zhao Jing SAR Test Engineer

Reviewed by: Lin Hao SAR Test Engineer

Approved by: Qi Dianyan SAR Project Leader

Issued: February 4, 2018

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Certificate No: Z18-97021 Page 1 of 4



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

Calibration is Performed According to the Following Standards:  
a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013  
b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2018  
c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010  
d) KDB656564, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:  
e) DAS4/5 System Handbook

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

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

Certificate No: Z18-97021 Page 2 of 4



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

DASY Version	DASY52	52.10.0.1448
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	2000 MHz ± 1 MHz	

Head TSL parameters  
The following parameters and calculations were applied:

Temperature	Permittivity	Conductivity	
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.9 ± 6 %	1.42 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm <sup>2</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	40.3 mW / g ± 18.8 % (k=2)
SAR averaged over 10 cm <sup>2</sup> (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.17 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	20.5 mW / g ± 18.7 % (k=2)

Body TSL parameters  
The following parameters and calculations were applied:

Temperature	Permittivity	Conductivity	
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.8 ± 6 %	1.56 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	---	---

SAR result with Body TSL

SAR averaged over 1 cm <sup>2</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.3 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	40.3 mW / g ± 18.8 % (k=2)
SAR averaged over 10 cm <sup>2</sup> (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.18 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	20.4 mW / g ± 18.7 % (k=2)

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.8C- 2.08jΩ
Return Loss	- 33.6dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.3C- 1.63jΩ
Return Loss	- 27.5dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.047 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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

Additional EUT Data

Manufactured by	SPEAG
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Certificate No: Z18-97021 Page 4 of 4

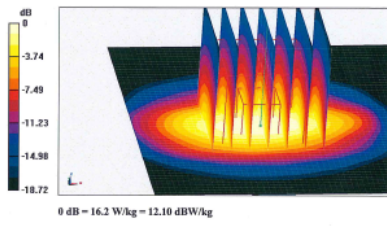
D2000V2 Sn:1009



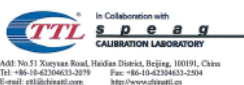
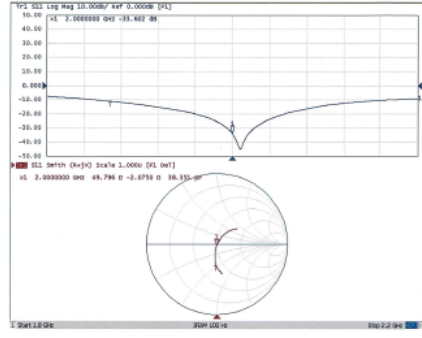
**DASY5 Validation Report for Head TSL** Date: 02.01.2018  
Test Laboratory: CTTL, Beijing, China  
**DUT: Dipole 2000 MHz; Type: D2000V2; Serial: D2000V2 - SN: 1009**  
Communication System: UID 0, CW; Frequency: 2000 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 2000$  MHz;  $\sigma = 1.416$  S/m;  $\epsilon_r = 38.89$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Left Section  
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)  
DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(8.39, 8.39, 8.39); Calibrated: 9/12/2017,
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DA64 Sn1525; Calibrated: 10/2/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

**System Performance Check/Zoom Scan (7x7x7) (7x7x7) Cube 0: Measurement grid:**  
 $d_x=5$ mm,  $d_y=5$ mm,  $d_z=5$ mm  
Reference Value = 95.98 V/m; Power Drift = -0.03 dB  
Peak SAR (extrapolated) = 19.7 W/kg  
**SAR(1 g) = 10.2 W/kg; SAR(10 g) = 5.17 W/kg**  
Maximum value of SAR (measured) = 16.2 W/kg



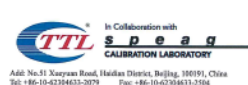
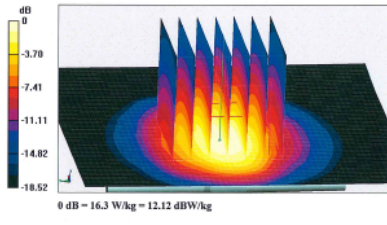
**Impedance Measurement Plot for Head TSL**



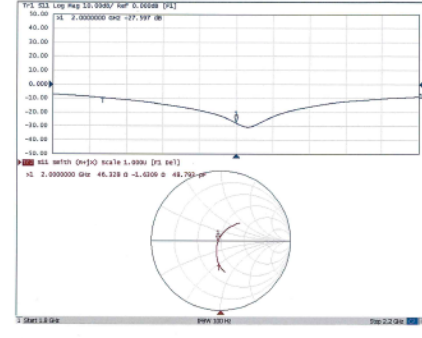
**DASY5 Validation Report for Body TSL** Date: 02.01.2018  
Test Laboratory: CTTL, Beijing, China  
**DUT: Dipole 2000 MHz; Type: D2000V2; Serial: D2000V2 - SN: 1009**  
Communication System: UID 0, CW; Frequency: 2000 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 2000$  MHz;  $\sigma = 1.564$  S/m;  $\epsilon_r = 51.83$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Center Section  
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)  
DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(8.24,8.24,8.24); Calibrated: 9/12/2017,
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DA64 Sn1525; Calibrated: 10/2/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

**System Performance Check/Zoom Scan (7x7x7) (7x7x7) Cube 0: Measurement grid:**  
 $d_x=5$ mm,  $d_y=5$ mm,  $d_z=5$ mm  
Reference Value = 93.84 V/m; Power Drift = 0.02 dB  
Peak SAR (extrapolated) = 19.7 W/kg  
**SAR(1 g) = 10.3 W/kg; SAR(10 g) = 5.18 W/kg**  
Maximum value of SAR (measured) = 16.3 W/kg



**Impedance Measurement Plot for Body TSL**



D2450V2 Sn:738



Client: **SRTC** Certificate No: **Z17-97140**

CALIBRATION CERTIFICATE			
Object	D2450V2 - SN: 738		
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits		
Calibration date:	September 18, 2017		
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 NRVD	102196	02-Mar-17 (CITL No.J17X01254)	Mar-18
Power sensor NRV-Z5	100596	02-Mar-17 (CITL No.J17X01254)	Mar-18
Reference Probe EX3DV4 DAE4	SN 7433	26-Sep-16(SPEAG No EX3-7433_Sep16)	Sep-17
	SN 1331	19-Jan-17(CITL-SPEAG No Z17-97015)	Jan-18
Secondary Standards	ID #	Cal Date(Calibrated by Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	13-Jan-17 (CITL No.J17X00285)	Jan-18
Network Analyzer E5071C	MY46110673	13-Jan-17 (CITL No.J17X00285)	Jan-18
Calibrated by:	Name	Function	Signature
	Zhao Jing	SAR Test Engineer	
Reviewed by:	Yu Zongying	SAR Test Engineer	
Approved by:	Qi Dianyuan	SAR Project Leader	
Issued: September 21, 2017			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			

Certificate No: Z17-97140 Page 1 of 8



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

Calibration is Performed According to the Following Standards:  
a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013  
b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016  
c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010  
d) KDB655664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:  
e) DASY4/5 System Handbook

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

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

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Measurement Conditions

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

DASY Version	DASY52	52.10.0.1448
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom S.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.7 ± 6 %	1.79 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	---	---

SAR result with Head TSL

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

Body TSL parameters

The following parameters and calculations were applied

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.5 ± 6 %	1.98 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	---	---

SAR result with Body TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	52.3 mW / g ± 18.8 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	6.10 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	24.3 mW / g ± 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	51.30+ j 5.92Ω
Return Loss	- 24.5dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.6Ω+ j 6.38Ω
Return Loss	- 23.1dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.268 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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

Additional EUT Data

Manufactured by	SPEAG
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Certificate No: Z17-97140 Page 4 of 8



D2450V2 Sn:738

In Collaboration with  
**TTL** **s p e a g**  
CALIBRATION LABORATORY

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E-mail: cti@china.ttl.com http://www.chinatitl.cn

**DASY5 Validation Report for Head TSL** Date: 09.18.2017  
Test Laboratory: CTTL, Beijing, China  
**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 738**  
Communication System: UTD 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.788$  S/m;  $\alpha = 38.07$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Left Section  
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)  
DASY5 Configuration:

- Probe: EX3DV4 - SN7433; ConvF(7.45, 7.45, 7.45); Calibrated: 9/26/2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DA14 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

**Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm**  
Reference Value = 102.1 V/m; Power Drift = -0.01 dB  
Peak SAR (extrapolated) = 27.8 W/kg  
SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.1 W/kg  
Maximum value of SAR (measured) = 22.0 W/kg

0 dB = 22.0 W/kg = 13.42 dBW/kg

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E-mail: cti@china.ttl.com http://www.chinatitl.cn

**Impedance Measurement Plot for Head TSL**

Certificate No: Z17-97140 Page 8 of 8

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E-mail: cti@china.ttl.com http://www.chinatitl.cn

**DASY5 Validation Report for Body TSL** Date: 09.18.2017  
Test Laboratory: CTTL, Beijing, China  
**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 738**  
Communication System: UTD 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.983$  S/m;  $\epsilon_r = 52.51$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Center Section  
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)  
DASY5 Configuration:

- Probe: EX3DV4 - SN7433; ConvF(7.46, 7.46, 7.46); Calibrated: 9/26/2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DA14 Sn1331; Calibrated: 1/19/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

**Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm**  
Reference Value = 96.41 V/m; Power Drift = -0.03 dB  
Peak SAR (extrapolated) = 27.8 W/kg  
SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.1 W/kg  
Maximum value of SAR (measured) = 22.3 W/kg

0 dB = 22.3 W/kg = 13.48 dBW/kg

Certificate No: Z17-97140 Page 7 of 8

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E-mail: cti@china.ttl.com http://www.chinatitl.cn

**Impedance Measurement Plot for Body TSL**

Certificate No: Z17-97140 Page 8 of 8

-----End of the test report-----