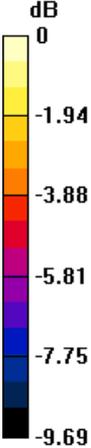
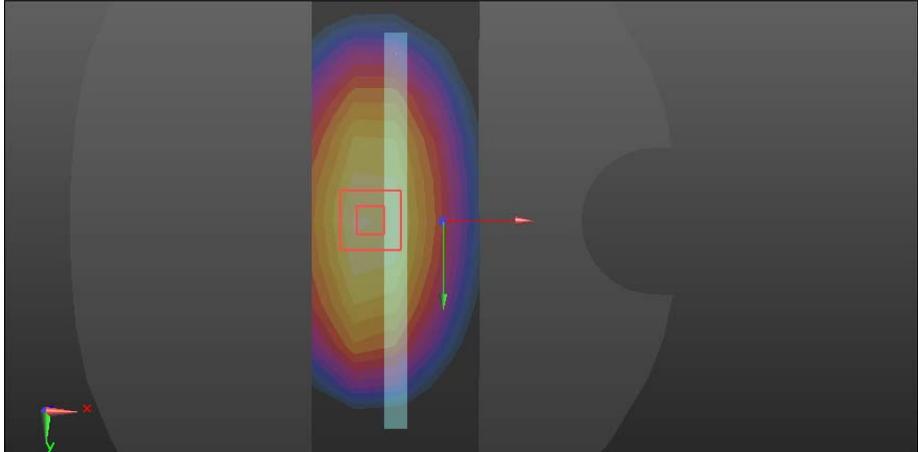
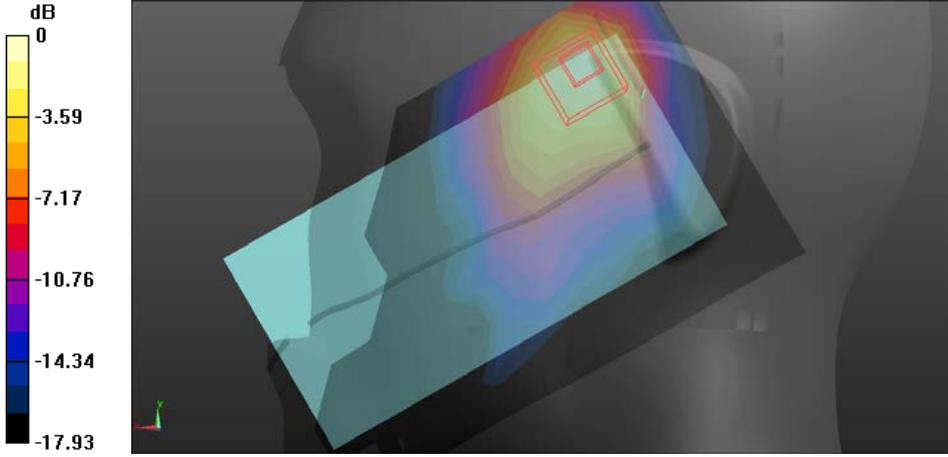


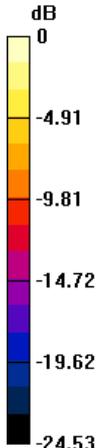
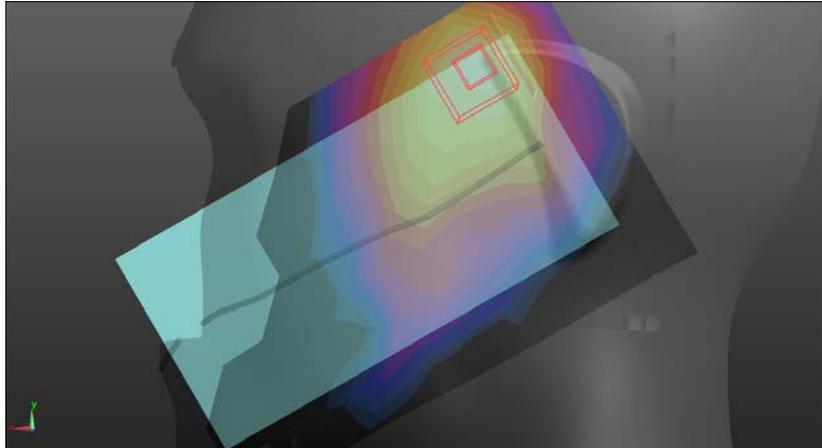
FLAT	EDGE3
Communication System: UID 0, LTE Band 13 (0); Frequency: 782 MHz;Duty Cycle: 1:1 Medium parameters used (interpolated): $f = 782 \text{ MHz}$ ; $\sigma = 0.926 \text{ S/m}$ ; $\epsilon_r = 41.412$ ; $\rho = 1000 \text{ kg/m}^3$	
Phantom section: Flat Section	
DASY5 Configuration:	
<ul style="list-style-type: none"> <li>• Probe: ES3DV3 - SN3127; ConvF(6.55, 6.55, 6.55); Calibrated: 2016/8/29;</li> <li>• Sensor-Surface: 4mm (Mechanical Surface Detection)</li> <li>• Electronics: DAE4 Sn546; Calibrated: 2016/8/22</li> <li>• Phantom: Twin-SAM 1559; Type: QD 000 P40 CD; Serial: 1559</li> <li>• Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)</li> </ul>	
<b>Flat-Section MSL LTE band13 HOT/LTE Band13 edge3/Area Scan (5x13x1):</b>	
Measurement grid: dx=15mm, dy=15mm	
Maximum value of SAR (measured) = 0.149 W/kg	
<b>Flat-Section MSL LTE band13 HOT/LTE Band13 edge3/Zoom Scan</b>	
<b>(7x7x7)/Cube 0:</b> Measurement grid: dx=5mm, dy=5mm, dz=5mm	
Reference Value = 12.49 V/m; Power Drift = 0.10 dB	
Peak SAR (extrapolated) = 0.225 W/kg	
<b>SAR(1 g) = 0.153 W/kg; SAR(10 g) = 0.102 W/kg</b>	
Maximum value of SAR (measured) = 0.168 W/kg	
<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p><b>dB</b></p>  <p>0 -1.94 -3.88 -5.81 -7.75 -9.69</p> </div> <div style="flex-grow: 1;">  </div> </div> <p style="text-align: center;">0 dB = 0.168 W/kg = -7.75 dBW/kg</p>	

FLAT	EDGE4
<p>Communication System: UID 0, LTE Band 13 (0); Frequency: 782 MHz;Duty Cycle: 1:1 Medium parameters used (interpolated): <math>f = 782 \text{ MHz}</math>; <math>\sigma = 0.926 \text{ S/m}</math>; <math>\epsilon_r = 41.412</math>; <math>\rho = 1000 \text{ kg/m}^3</math></p>	
<p>Phantom section: Flat Section</p>	
<p>DASY5 Configuration:</p>	
<ul style="list-style-type: none"> <li>• Probe: ES3DV3 - SN3127; ConvF(6.55, 6.55, 6.55); Calibrated: 2016/8/29;</li> <li>• Sensor-Surface: 4mm (Mechanical Surface Detection)</li> <li>• Electronics: DAE4 Sn546; Calibrated: 2016/8/22</li> <li>• Phantom: Twin-SAM 1559; Type: QD 000 P40 CD; Serial: 1559</li> <li>• Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)</li> </ul>	
<p><b>Flat-Section MSL LTE band13 HOT/LTE Band13 edge4/Area Scan (5x13x1):</b></p>	
<p>Measurement grid: dx=15mm, dy=15mm</p>	
<p>Maximum value of SAR (measured) = 0.0982 W/kg</p>	
<p><b>Flat-Section MSL LTE band13 HOT/LTE Band13 edge4/Zoom Scan</b></p>	
<p><b>(7x7x7)/Cube 0:</b> Measurement grid: dx=5mm, dy=5mm, dz=5mm</p>	
<p>Reference Value = 9.578 V/m; Power Drift = 0.07 dB</p>	
<p>Peak SAR (extrapolated) = 0.144 W/kg</p>	
<p><b>SAR(1 g) = 0.099 W/kg; SAR(10 g) = 0.067 W/kg</b></p>	
<p>Maximum value of SAR (measured) = 0.106 W/kg</p>	
<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p><b>dB</b></p> <p>0 -1.98 -3.96 -5.95 -7.93 -9.91</p> </div> <div> </div> </div> <p style="text-align: center;">0 dB = 0.106 W/kg = -9.75 dBW/kg</p>	

**WIFI (802.11B/Head)**

Left Side	Cheek
<p>Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps);            Frequency: 2412 MHz; Duty Cycle: 1:1.53815            Medium parameters used (interpolated): <math>f = 2412</math> MHz; <math>\sigma = 1.738</math> S/m; <math>\epsilon_r = 39.289</math>;  <math>\rho = 1000</math> kg/m<sup>3</sup>            Phantom section: Left Section</p>	
<p>DASY5 Configuration:</p>	
<ul style="list-style-type: none"> <li>• Probe: ES3DV3 - SN3127; ConvF(4.61, 4.61, 4.61); Calibrated: 2016/8/29;</li> <li>• Sensor-Surface: 4mm (Mechanical Surface Detection)</li> <li>• Electronics: DAE4 Sn546; Calibrated: 2016/8/22</li> <li>• Phantom: 1660; Type: QD 000 P40 CD; Serial: xxxx</li> <li>• Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)</li> </ul>	
<p><b>Head-Section Left HSL WIFI/WIFI touch L new 2/Area Scan (8x13x1):</b></p>	
<p>Measurement grid: dx=15mm, dy=15mm            Maximum value of SAR (measured) = 0.322 W/kg</p>	
<p><b>Head-Section Left HSL WIFI/WIFI touch L new 2/Zoom Scan (7x7x7)/Cube</b></p>	
<p><b>0:</b> Measurement grid: dx=5mm, dy=5mm, dz=5mm            Reference Value = 5.819 V/m; Power Drift = -0.01 dB            Peak SAR (extrapolated) = 0.638 W/kg  <b>SAR(1 g) = 0.296 W/kg; SAR(10 g) = 0.148 W/kg</b>            Maximum value of SAR (measured) = 0.321 W/kg</p>	
	
<p>0 dB = 0.321 W/kg = -4.93 dBW/kg</p>	

Left Side	Cheek
<p>Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps);            Frequency: 2437 MHz; Duty Cycle: 1:1.53815            Medium parameters used (interpolated): <math>f = 2437</math> MHz; <math>\sigma = 1.782</math> S/m; <math>\epsilon_r = 39.236</math>;  <math>\rho = 1000</math> kg/m<sup>3</sup>            Phantom section: Left Section</p> <p>DASY5 Configuration:</p> <ul style="list-style-type: none"> <li>• Probe: ES3DV3 - SN3127; ConvF(4.61, 4.61, 4.61); Calibrated: 2016/8/29;</li> <li>• Sensor-Surface: 4mm (Mechanical Surface Detection)</li> <li>• Electronics: DAE4 Sn546; Calibrated: 2016/8/22</li> <li>• Phantom: 1660; Type: QD 000 P40 CD; Serial: xxxx</li> <li>• Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)</li> </ul> <p><b>Head-Section Left HSL WIFI/WIFI touch M new/Area Scan (8x13x1):</b></p> <p>Measurement grid: dx=15mm, dy=15mm            Maximum value of SAR (measured) = 0.605 W/kg</p> <p><b>Head-Section Left HSL WIFI/WIFI touch M new/Zoom Scan (7x7x7)/Cube 0:</b></p> <p>Measurement grid: dx=5mm, dy=5mm, dz=5mm            Reference Value = 7.959 V/m; Power Drift = 0.19 dB            Peak SAR (extrapolated) = 1.32 W/kg  <b>SAR(1 g) = 0.603 W/kg; SAR(10 g) = 0.295 W/kg</b>            Maximum value of SAR (measured) = 0.660 W/kg</p> <div data-bbox="319 1444 1268 1904"> </div>	

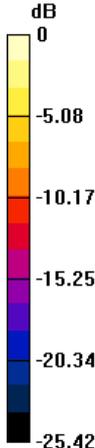
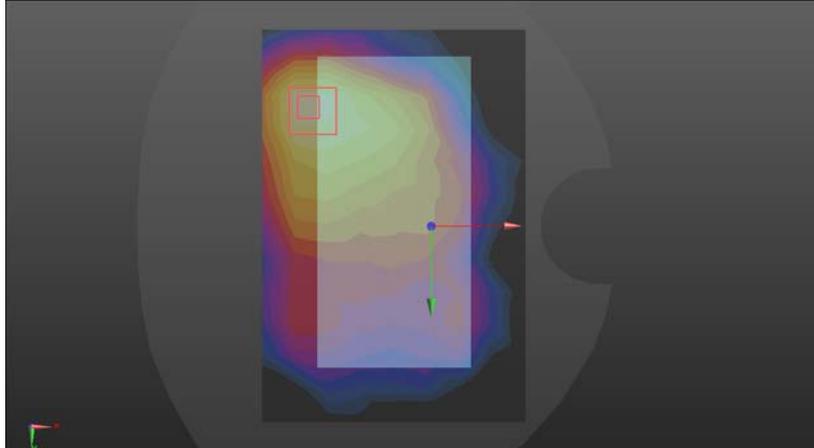
Left Side	Cheek
<p>Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps);            Frequency: 2462 MHz; Duty Cycle: 1:1.53815            Medium parameters used (interpolated): <math>f = 2462</math> MHz; <math>\sigma = 1.791</math> S/m; <math>\epsilon_r = 39.17</math>; <math>\rho = 1000</math> kg/m<sup>3</sup>            Phantom section: Left Section</p>	
<p>DASY5 Configuration:</p> <ul style="list-style-type: none"> <li>Probe: ES3DV3 - SN3127; ConvF(4.61, 4.61, 4.61); Calibrated: 2016/8/29;</li> <li>Sensor-Surface: 4mm (Mechanical Surface Detection)</li> <li>Electronics: DAE4 Sn546; Calibrated: 2016/8/22</li> <li>Phantom: 1660; Type: QD 000 P40 CD; Serial: xxxx</li> <li>Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)</li> </ul> <p><b>Head-Section Left HSL WIFI/WIFI touch H new 2 2/Area Scan (8x13x1):</b></p> <p>Measurement grid: dx=15mm, dy=15mm            Maximum value of SAR (measured) = 0.377 W/kg</p> <p><b>Head-Section Left HSL WIFI/WIFI touch H new 2 2/Zoom Scan (7x7x7)/Cube</b></p> <p><b>0:</b> Measurement grid: dx=5mm, dy=5mm, dz=5mm</p> <p>Reference Value = 6.133 V/m; Power Drift = 0.08 dB            Peak SAR (extrapolated) = 0.782 W/kg  <b>SAR(1 g) = 0.360 W/kg; SAR(10 g) = 0.176 W/kg</b>            Maximum value of SAR (measured) = 0.394 W/kg</p>	
<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p>dB</p>  </div> <div>  </div> </div> <p style="text-align: center;">0 dB = 0.394 W/kg = -4.05 dBW/kg</p>	

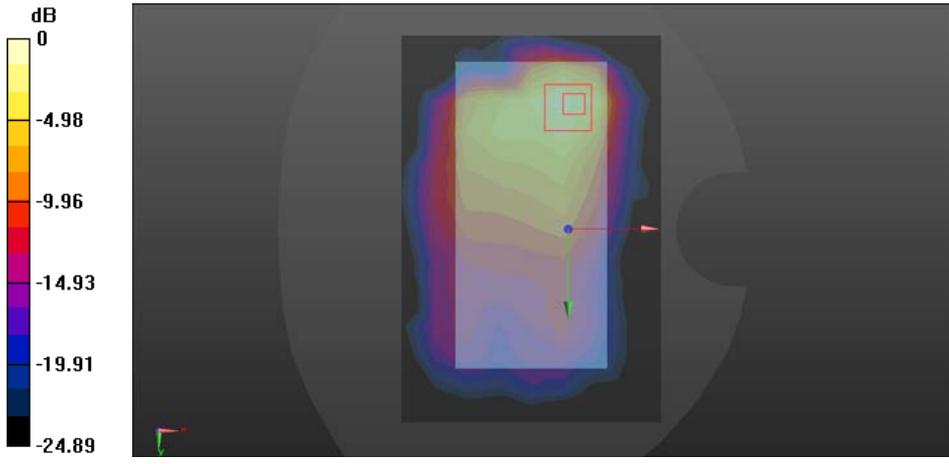
Left Side	Tilt
<p>Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps);            Frequency: 2437 MHz; Duty Cycle: 1:1.53815            Medium parameters used (interpolated): <math>f = 2437</math> MHz; <math>\sigma = 1.782</math> S/m; <math>\epsilon_r = 39.236</math>;  <math>\rho = 1000</math> kg/m<sup>3</sup>            Phantom section: Left Section</p> <p>DASY5 Configuration:</p> <ul style="list-style-type: none"> <li>• Probe: ES3DV3 - SN3127; ConvF(4.61, 4.61, 4.61); Calibrated: 2016/8/29;</li> <li>• Sensor-Surface: 4mm (Mechanical Surface Detection)</li> <li>• Electronics: DAE4 Sn546; Calibrated: 2016/8/22</li> <li>• Phantom: 1660; Type: QD 000 P40 CD; Serial: xxxx</li> <li>• Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)</li> </ul> <p><b>Head-Section Left HSL WIFI/WIFI tilt M/Area Scan (8x13x1):</b> Measurement            grid: dx=15mm, dy=15mm            Maximum value of SAR (measured) = 0.451 W/kg</p> <p><b>Head-Section Left HSL WIFI/WIFI tilt M/Zoom Scan (7x7x7)/Cube 0:</b>            Measurement grid: dx=5mm, dy=5mm, dz=5mm            Reference Value = 11.44 V/m; Power Drift = -0.01 dB            Peak SAR (extrapolated) = 1.17 W/kg  <b>SAR(1 g) = 0.517 W/kg; SAR(10 g) = 0.232 W/kg</b>            Maximum value of SAR (measured) = 0.573 W/kg</p> <div data-bbox="319 1444 1268 1904"> </div> <p>0 dB = 0.573 W/kg = -2.42 dBW/kg</p>	

Right Side	Cheek
<p>Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Frequency: 2437 MHz;Duty Cycle: 1:1.53815 Medium parameters used (interpolated): <math>f = 2437</math> MHz; <math>\sigma = 1.782</math> S/m; <math>\epsilon_r = 39.236</math>; <math>\rho = 1000</math> kg/m<sup>3</sup> Phantom section: Right Section</p> <p>DASY5 Configuration:</p> <ul style="list-style-type: none"> <li>Probe: ES3DV3 - SN3127; ConvF(4.61, 4.61, 4.61); Calibrated: 2016/8/29;</li> <li>Sensor-Surface: 4mm (Mechanical Surface Detection)</li> <li>Electronics: DAE4 Sn546; Calibrated: 2016/8/22</li> <li>Phantom: 1660; Type: QD 000 P40 CD; Serial: xxxx</li> <li>Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)</li> </ul> <p><b>Head-Section Right HSL WIFI/WIFI touch M/Area Scan (8x13x1):</b></p> <p>Measurement grid: dx=15mm, dy=15mm Maximum value of SAR (measured) = 0.315 W/kg</p> <p><b>Head-Section Right HSL WIFI/WIFI touch M/Zoom Scan (7x7x7)/Cube 0:</b></p> <p>Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 10.55 V/m; Power Drift = 0.17 dB Peak SAR (extrapolated) = 0.618 W/kg <b>SAR(1 g) = 0.325 W/kg; SAR(10 g) = 0.172 W/kg</b> Maximum value of SAR (measured) = 0.359 W/kg</p> <div data-bbox="319 1400 1268 1859"> </div> <p>0 dB = 0.359 W/kg = -4.45 dBW/kg</p>	

Right Side	Tilt
<p>Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Frequency: 2437 MHz;Duty Cycle: 1:1.53815 Medium parameters used (interpolated): <math>f = 2437</math> MHz; <math>\sigma = 1.782</math> S/m; <math>\epsilon_r = 39.236</math>; <math>\rho = 1000</math> kg/m<sup>3</sup> Phantom section: Right Section</p> <p>DASY5 Configuration:</p> <ul style="list-style-type: none"> <li>• Probe: ES3DV3 - SN3127; ConvF(4.61, 4.61, 4.61); Calibrated: 2016/8/29;</li> <li>• Sensor-Surface: 4mm (Mechanical Surface Detection)</li> <li>• Electronics: DAE4 Sn546; Calibrated: 2016/8/22</li> <li>• Phantom: 1660; Type: QD 000 P40 CD; Serial: xxxx</li> <li>• Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)</li> </ul> <p><b>Head-Section Right HSL WIFI/WIFI tilt M/Area Scan (8x13x1):</b> Measurement grid: dx=15mm, dy=15mm Maximum value of SAR (measured) = 0.237 W/kg</p> <p><b>Head-Section Right HSL WIFI/WIFI tilt M/Zoom Scan (7x7x7)/Cube 0:</b> Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 11.00 V/m; Power Drift = 0.10 dB Peak SAR (extrapolated) = 0.530 W/kg <b>SAR(1 g) = 0.261 W/kg; SAR(10 g) = 0.133 W/kg</b> Maximum value of SAR (measured) = 0.292 W/kg</p> <div data-bbox="319 1355 1268 1814"> </div> <p>0 dB = 0.292 W/kg = -5.35 dBW/kg</p>	

**WIFI (802.11B/Flat)**

FLAT	Towards phantom
<p>Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps);            Frequency: 2437 MHz; Duty Cycle: 1:1.53815            Medium parameters used (interpolated): <math>f = 2437</math> MHz; <math>\sigma = 1.883</math> S/m; <math>\epsilon_r = 38.021</math>;  <math>\rho = 1000</math> kg/m<sup>3</sup>            Phantom section: Flat Section</p>	
<p>DASY5 Configuration:</p> <ul style="list-style-type: none"> <li>• Probe: ES3DV3 - SN3127; ConvF(4.61, 4.61, 4.61); Calibrated: 2016/8/29;</li> <li>• Sensor-Surface: 4mm (Mechanical Surface Detection)</li> <li>• Electronics: DAE4 Sn546; Calibrated: 2016/8/22</li> <li>• Phantom: 1660; Type: QD 000 P40 CD; Serial: xxxx</li> <li>• Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)</li> </ul> <p><b>Flat-Section MSL WIFI TP/WIFI TP M/Area Scan (9x13x1):</b> Measurement grid:            dx=15mm, dy=15mm            Maximum value of SAR (measured) = 0.259 W/kg</p> <p><b>Flat-Section MSL WIFI TP/WIFI TP M/Zoom Scan (7x7x7)/Cube 0:</b> Measurement grid: dx=5mm, dy=5mm, dz=5mm            Reference Value = 4.243 V/m; Power Drift = 0.16 dB            Peak SAR (extrapolated) = 0.651 W/kg  <b>SAR(1 g) = 0.297 W/kg; SAR(10 g) = 0.146 W/kg</b>            Maximum value of SAR (measured) = 0.326 W/kg</p>	
<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p><b>dB</b></p>  <p>0 -5.08 -10.17 -15.25 -20.34 -25.42</p> </div> <div style="flex-grow: 1;">  </div> </div> <p style="text-align: center;">0 dB = 0.326 W/kg = -4.87 dBW/kg</p>	

FLAT	Towards ground
<p>Communication System: UID 10012 – CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps);            Frequency: 2437 MHz; Duty Cycle: 1:1.53815            Medium parameters used (interpolated): <math>f = 2437</math> MHz; <math>\sigma = 1.883</math> S/m; <math>\epsilon_r = 38.021</math>;  <math>\rho = 1000</math> kg/m<sup>3</sup>            Phantom section: Flat Section</p>	
<p>DASY5 Configuration:</p> <ul style="list-style-type: none"> <li>• Probe: ES3DV3 – SN3127; ConvF(4.61, 4.61, 4.61); Calibrated: 2016/8/29;</li> <li>• Sensor–Surface: 4mm (Mechanical Surface Detection)</li> <li>• Electronics: DAE4 Sn546; Calibrated: 2016/8/22</li> <li>• Phantom: 1660; Type: QD 000 P40 CD; Serial: xxxx</li> <li>• Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)</li> </ul> <p><b>Flat–Section MSLWIFI TG/WIF TG M/Area Scan (9x13x1):</b> Measurement grid:            dx=15mm, dy=15mm            Maximum value of SAR (measured) = 0.337 W/kg</p> <p><b>Flat–Section MSLWIFI TG/WIF TG M/Zoom Scan (7x7x7)/Cube 0:</b> Measurement            grid: dx=5mm, dy=5mm, dz=5mm            Reference Value = 4.549 V/m; Power Drift = 0.10 dB            Peak SAR (extrapolated) = 0.846 W/kg  <b>SAR(1 g) = 0.345 W/kg; SAR(10 g) = 0.153 W/kg</b>            Maximum value of SAR (measured) = 0.385 W/kg</p>	
 <p>0 dB = 0.385 W/kg = -4.15 dBW/kg</p>	

FLAT	EDGE1
<p>Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Frequency: 2437 MHz;Duty Cycle: 1:1.53815 Medium parameters used (interpolated): <math>f = 2437</math> MHz; <math>\sigma = 1.883</math> S/m; <math>\epsilon_r = 38.021</math>; <math>\rho = 1000</math> kg/m<sup>3</sup> Phantom section: Flat Section</p> <p>DASY5 Configuration:</p> <ul style="list-style-type: none"> <li>• Probe: ES3DV3 - SN3127; ConvF(4.61, 4.61, 4.61); Calibrated: 2016/8/29;</li> <li>• Sensor-Surface: 4mm (Mechanical Surface Detection)</li> <li>• Electronics: DAE4 Sn546; Calibrated: 2016/8/22</li> <li>• Phantom: 1660; Type: QD 000 P40 CD; Serial: xxxx</li> <li>• Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)</li> </ul> <p><b>Flat-Section MSL WIFI HOTSPOT/WIF M edge 1/Area Scan (5x10x1):</b></p> <p>Measurement grid: dx=15mm, dy=15mm Maximum value of SAR (measured) = 0.120 W/kg</p> <p><b>Flat-Section MSL WIFI HOTSPOT/WIF M edge 1/Zoom Scan (7x7x7)/Cube 0:</b></p> <p>Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 5.704 V/m; Power Drift = 0.05 dB Peak SAR (extrapolated) = 0.315 W/kg <b>SAR(1 g) = 0.142 W/kg; SAR(10 g) = 0.064 W/kg</b> Maximum value of SAR (measured) = 0.162 W/kg</p> <div data-bbox="319 1429 1268 1881"> <p>The figure displays a color scale for SAR measurements in dB, ranging from 0 dB (yellow) to -50.00 dB (black). To the right, a field map shows a central vertical rectangular region with a red square highlighting a specific area of interest. The background is dark, indicating lower SAR values.</p> </div> <p>0 dB = 0.162 W/kg = -7.90 dBW/kg</p>	

FLAT	EDGE4
<p>Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Frequency: 2437 MHz;Duty Cycle: 1:1.53815 Medium parameters used (interpolated): <math>f = 2437</math> MHz; <math>\sigma = 1.883</math> S/m; <math>\epsilon_r = 38.021</math>; <math>\rho = 1000</math> kg/m<sup>3</sup> Phantom section: Flat Section</p> <p>DASY5 Configuration:</p> <ul style="list-style-type: none"> <li>Probe: ES3DV3 - SN3127; ConvF(4.61, 4.61, 4.61); Calibrated: 2016/8/29;</li> <li>Sensor-Surface: 4mm (Mechanical Surface Detection)</li> <li>Electronics: DAE4 Sn546; Calibrated: 2016/8/22</li> <li>Phantom: 1660; Type: QD 000 P40 CD; Serial: xxxx</li> <li>Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)</li> </ul> <p><b>Flat-Section MSL WIFI HOTSPOT/WIF M edge 4/Area Scan (5x14x1):</b></p> <p>Measurement grid: dx=15mm, dy=15mm Maximum value of SAR (measured) = 0.0285 W/kg</p> <p><b>Flat-Section MSL WIFI HOTSPOT/WIF M edge 4/Zoom Scan (7x7x7)/Cube 0:</b></p> <p>Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 2.570 V/m; Power Drift = 0.13 dB Peak SAR (extrapolated) = 0.0600 W/kg <b>SAR(1 g) = 0.029 W/kg; SAR(10 g) = 0.015 W/kg</b> Maximum value of SAR (measured) = 0.0327 W/kg</p> <div data-bbox="319 1429 1268 1881"> </div> <p>0 dB = 0.0327 W/kg = -14.85 dBW/kg</p>	

## ANNEX B - RELEVANT PAGES FROM CALIBRATION REPORTS

DAE4 Sn:546

Calibration Laboratory of  
Schmid & Partner  
Engineering AG  
Bühlstrasse 10, 8004 Zurich, Switzerland




Accreditation No.: SCS 0108

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

Client: SRTC (YH4E) Certificate No.: DAE4-546\_Aug16

### CALIBRATION CERTIFICATE

Request: DAE4 - SD-000 D04 (SN: SN: 546)

Calibration procedure(s): DA-CAL-06.v09  
Definition (procedure for the data acquisition electronics (DAE))

Calibration date: August 22, 2016

This calibration certificate documents the possibility to compare standards, which define the physical units of measurement (SI).  
The measurement and the uncertainties with confidence probability given on the following pages are in part of the certificate.

All calibrations have been conducted in the calibration laboratory, environmental conditions (23 ± 0.5°C and humidity < 10%).

Calibration Equipment used (NIST) conform to calibration:

Primary Standard	U-1	U-2	U-3	U-4	U-5	U-6
Reference Standard	1000 V					
Reference Standard	1000 V					

Calibration: Name: Schmid & Partner, Position: Technical Manager, Signature: [Signature]

Approved by: [Signature]

Certificate No: DAE4-546\_Aug16 Page 1 of 5

Calibration Laboratory of  
Schmid & Partner  
Engineering AG  
Bühlstrasse 10, 8004 Zurich, Switzerland




Accreditation No.: SCS 0108

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

### Glossary

DAE: data acquisition electronics  
Connector angle: information used in DASY system to align probe sensor X to the robot coordinate system.

### Methods Applied and Interpretation of Parameters

- 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.
- 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 shorted: 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 of the connector, during internal auto-ranging 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.

Certificate No: DAE4-546\_Aug16 Page 2 of 5

### Appendix (Additional assessments outside the scope of SCS0108)

#### 1. DC Voltage Linearity

High Range	Reading (µV)	Difference (µV)	Error (%)
Channel X + Input	200031.74	-2.15	-0.00
Channel X - Input	20003.66	-0.75	-0.00
Channel X + Input	-20001.68	3.77	-0.02
Channel Y + Input	200021.10	-12.53	-0.01
Channel Y - Input	20002.22	-2.13	-0.01
Channel Y + Input	-20003.78	1.68	-0.01
Channel Z + Input	200025.91	-7.99	-0.00
Channel Z - Input	19999.97	-4.36	-0.02
Channel Z + Input	-20005.55	0.07	-0.00

Low Range	Reading (µV)	Difference (µV)	Error (%)
Channel X + Input	2000.82	-0.12	-0.01
Channel X - Input	201.00	0.23	0.11
Channel X + Input	-198.76	0.38	-0.19
Channel Y + Input	2000.36	-0.29	-0.01
Channel Y - Input	200.22	-0.57	-0.29
Channel Y + Input	-200.24	-0.93	0.47
Channel Z + Input	2000.61	0.13	0.01
Channel Z - Input	199.06	-1.52	-0.76
Channel Z + Input	-201.43	-1.99	1.00

#### 2. Common mode sensitivity

Common mode Input Voltage (mV)	High Range Average Reading (µV)	Low Range Average Reading (µV)
Channel X	200	1.49
	-200	1.41
Channel Y	200	-0.40
	-200	-1.08
Channel Z	200	2.19
	-200	-4.93

#### 3. Channel separation

Input Voltage (mV)	Channel X (µV)	Channel Y (µV)	Channel Z (µV)
Channel X	200	-3.01	-3.43
Channel Y	200	9.77	-1.00
Channel Z	200	5.39	7.00

Certificate No: DAE4-546\_Aug16 Page 4 of 5

#### 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	15845	16442
Channel Y	16150	14493
Channel Z	15907	16531

#### 5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec	Average (µV)	min. Offset (µV)	max. Offset (µV)	Std. Deviation (µV)
Channel X	1.22	0.21	1.94	0.35
Channel Y	0.27	-1.07	1.43	0.50
Channel Z	-0.65	-1.46	0.11	0.35

#### 6. Input Offset Current

Nominal input circuitry offset current on all channels: <250A

#### 7. Input Resistance (Typical values for information)

Channel	Zeroing (MΩ)	Measuring (MΩ)
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 (+ Vec)	+7.9
Supply (- Vec)	-7.6

#### 9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vec)	+0.01	+6	+14
Supply (- Vec)	-0.01	-6	-9

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DAE4 Sn:546

**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	15845	16442
Channel Y	16150	14493
Channel Z	15907	16531

**5. Input Offset Measurement**  
DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec  
Input 10M $\Omega$

	Average ( $\mu$ V)	min. Offset ( $\mu$ V)	max. Offset ( $\mu$ V)	Std. Deviation ( $\mu$ V)
Channel X	1.22	0.21	1.94	0.35
Channel Y	0.27	-1.07	1.43	0.50
Channel Z	-0.65	-1.46	0.11	0.35

**6. Input Offset Current**  
Nominal input circuitry offset current on all channels: <25IA

**7. Input Resistance (Typical values for information)**

	Zeroing (kOhm)	Measuring (MOhm)
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)**

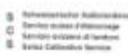
Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	-0.01	-8	-9

Certificate No: DAE4-546\_Aug16

Page 5 of 5

DAE4 Sn:720

Calibration Laboratory of  
Suford & Partner  
Engineering AG  
Reinholdstrasse 11, 8050 Zurich, Switzerland

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

Client: SRTC (YHW) Certificate No: DAE4-720\_Su16

**CALIBRATION CERTIFICATE**

Name: DAE4 - 00 000 DAE 8M - 280-720

Customer procedure: GA CAL-02 v10  
Calibration procedure for the data acquisition electronics (DAE)

Calibration date: October 31, 2016

This calibration certificate documents the traceability to national standards, when stated the physical units of measurements (SI).  
The measurements and the uncertainties with confidence probability are given in the relevant pages and not part of the certificate.  
All calibrations have been conducted in the client's laboratory facility, unless otherwise indicated (SI) or VPE and furnished in 75%.

Calibration Equipment used (SRTC) verified for calibration:

Primary Standard	SI U	SI Unit (Certificate No.)	Expiry Date Calibration
Resistor Network 1 (SI 001)	SI 001	SI 001 (SI 001)	Aug 17
Resistor Network 2 (SI 002)	SI 002	SI 002 (SI 002)	Aug 17
Auto DME Calibration Unit	SI 003	SI 003 (SI 003)	SI 003 (SI 003)
Calibration Span (SI 1)	SI 004	SI 004 (SI 004)	SI 004 (SI 004)

Calibrated by: Name: Dominique Boller, Position: Technician, Signature: 

Remarks: The equipment is being calibrated in accordance with the requirements of the customer.

16.08.2016/08.2016

Certificate No: 12420-02\_2016 Page 1 of 3

DAE4 Sn:720

Calibration Laboratory of  
Schmid & Partner  
Engineering AG  
Engenhauptstrasse 10, 8001 Zurich, Switzerland

Seitbestätigung Kalibrierlabor  
C Bereichs- und Einzelwert-  
bestimmungen in Kalorien  
Seitbestätigung Bereich

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

Accreditation No.: SCS 0108

**Glossary**  
DAE: data acquisition electronics  
Connector angle: Information used in DAEY system to align probe sensor X to the robot  
coordinate system.

- Methods Applied and Interpretation of Parameters**
- DC Voltage Measurement: Calibration Factor assessed for use in DAEY 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.
  - 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 shorted: 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. GAE 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.

**DC Voltage Measurement**  
AD-Converter Resolution nominal  
High Range: 11.99 ± 0.001 V/V full range: -100...+200 mV  
Low Range: 11.99 ± 0.001 V/V full range: -1...+100 mV  
DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	100.000 ± 0.001% (3=1)	104.780 ± 0.001% (3=1)	101.299 ± 0.001% (3=1)
Low Range	0.95042 ± 1.001% (3=1)	0.89407 ± 1.001% (3=1)	0.98650 ± 1.001% (3=1)

**Connector Angle**

Connector angle to be used in DAEY system	88.0 ° ± 1 °
---	--------------

Appendix (Additional assessments outside the scope of SCS0108)

**1. DC Voltage Linearity**

High Range	Reading (µV)	Difference (µV)	Error (%)
Channel X + Input	20000.00	-2.83	-0.00
Channel X + Input	20005.59	1.21	0.01
Channel X - Input	-20002.63	2.74	-0.01
Channel Y + Input	200031.45	-1.44	-0.00
Channel Y + Input	20003.49	-0.90	-0.00
Channel Y - Input	-20003.62	1.72	-0.01
Channel Z + Input	20000.86	-1.63	-0.00
Channel Z + Input	20001.58	-2.67	-0.01
Channel Z - Input	-20009.93	-4.50	0.02

Low Range	Reading (µV)	Difference (µV)	Error (%)
Channel X + Input	1999.86	-0.99	-0.05
Channel X + Input	200.42	-0.42	-0.21
Channel X - Input	-199.45	-0.24	0.12
Channel Y + Input	2000.78	-0.01	-0.00
Channel Y + Input	200.66	-0.06	-0.03
Channel Y - Input	-199.50	-0.28	0.14
Channel Z + Input	2000.45	-0.29	-0.01
Channel Z + Input	199.41	-1.33	-0.66
Channel Z - Input	-200.21	-0.92	0.46

**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 200	-2.59	-3.72
Channel X -200	7.16	5.57
Channel Y 200	15.89	15.62
Channel Y -200	-16.62	-17.01
Channel Z 200	-16.19	-16.08
Channel Z -200	14.56	14.81

**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	0.26	-3.89	-
Channel Y 200	8.74	9.77	-
Channel Z 200	6.38	7.97	-

**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	16156	16521
Channel Y	16178	16048
Channel Z	16424	15774

**5. Input Offset Measurement**  
DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec  
Input 10mA

	Average (µV)	min. Offset (µV)	max. Offset (µV)	Std. Deviation (µV)
Channel X	0.75	-1.14	2.77	0.62
Channel Y	-0.03	-1.04	0.90	0.43
Channel Z	-0.18	-2.07	1.75	0.69

**6. Input Offset Current**  
Nominal input circuitry offset current on all channels: <251A

**7. Input Resistance (Typical values for information)**

	Zeroing (kOhm)	Measuring (MOhm)
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	+6	+14
Supply (- Vcc)	-0.01	-8	-9



ES3DV3 Sn:3127

ES3DV3- SN:3127 August 29, 2016

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3127

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) <sup>c</sup>	Relative Permittivity <sup>d</sup>	Conductivity (S/m) <sup>e</sup>	ConvF X	ConvF Y	ConvF Z	Alpha <sup>g</sup>	Depth <sup>h</sup> (mm)	Unc (k=2)
450	43.5	0.87	6.74	6.74	6.74	0.21	2.30	± 13.3 %
750	41.9	0.89	6.55	6.55	6.55	0.22	1.37	± 12.0 %
900	41.5	0.97	6.20	6.20	6.20	0.54	1.41	± 12.0 %
1450	40.5	1.20	5.44	5.44	5.44	0.80	1.06	± 12.0 %
1810	40.0	1.40	5.15	5.15	5.15	0.80	1.16	± 12.0 %
2000	40.0	1.40	5.11	5.11	5.11	0.68	1.28	± 12.0 %
2300	39.5	1.67	4.83	4.83	4.83	0.80	1.19	± 12.0 %
2450	39.2	1.80	4.61	4.61	4.61	0.67	1.38	± 12.0 %
2600	39.0	1.96	4.40	4.40	4.40	0.70	1.36	± 12.0 %

<sup>c</sup> Frequency validity above 300 MHz of a 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 20, 40, 50 and 70 MHz for ConvF assessments at 30, 60, 120, 150 and 200 MHz respectively. Above 5 GHz frequency validity can be defined to ± 110 MHz.  
<sup>d</sup> At frequencies below 3 GHz, the validity of tissue parameters (y) and (z) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (y) and (z) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.  
<sup>e</sup> Alpha/Depth are determined during calibration. SPLAC warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

ES3DV3- SN:3127 August 29, 2016

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3127

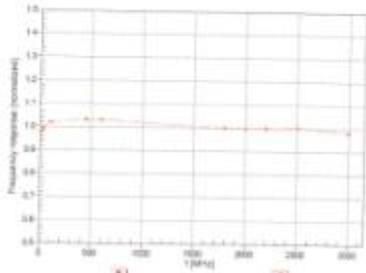
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) <sup>c</sup>	Relative Permittivity <sup>d</sup>	Conductivity (S/m) <sup>e</sup>	ConvF X	ConvF Y	ConvF Z	Alpha <sup>g</sup>	Depth <sup>h</sup> (mm)	Unc (k=2)
450	56.7	0.94	6.99	6.99	6.99	0.12	2.10	± 13.3 %
750	55.5	0.96	6.12	6.12	6.12	0.80	1.14	± 12.0 %
900	55.0	1.05	6.16	6.16	6.16	0.46	1.53	± 12.0 %
1450	54.0	1.30	5.29	5.29	5.29	0.74	1.21	± 12.0 %
1810	53.3	1.52	4.90	4.90	4.90	0.43	1.69	± 12.0 %
2000	53.3	1.52	4.92	4.92	4.92	0.55	1.48	± 12.0 %
2300	52.9	1.81	4.63	4.63	4.63	0.80	1.24	± 12.0 %
2450	52.7	1.95	4.36	4.36	4.36	0.71	1.22	± 12.0 %
2600	52.5	2.16	4.17	4.17	4.17	0.80	1.11	± 12.0 %

<sup>c</sup> Frequency validity above 300 MHz of a 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 20, 40, 50 and 70 MHz for ConvF assessments at 30, 60, 120, 150 and 200 MHz respectively. Above 5 GHz frequency validity can be defined to ± 110 MHz.  
<sup>d</sup> At frequencies below 3 GHz, the validity of tissue parameters (y) and (z) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (y) and (z) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.  
<sup>e</sup> Alpha/Depth are determined during calibration. SPLAC warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

ES3DV3- SN:3127 August 29, 2016

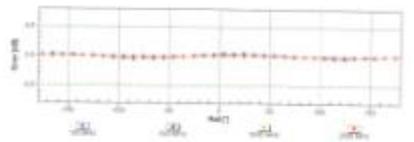
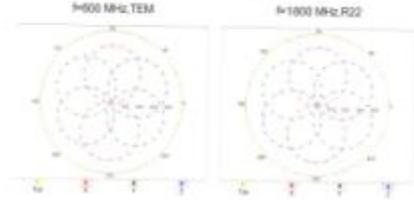
Frequency Response of E-Field  
(EM-C601-0110 EXL Waveguide: R22)



Uncertainty of Frequency Response of E-Field: 4.4.2% (k=2)

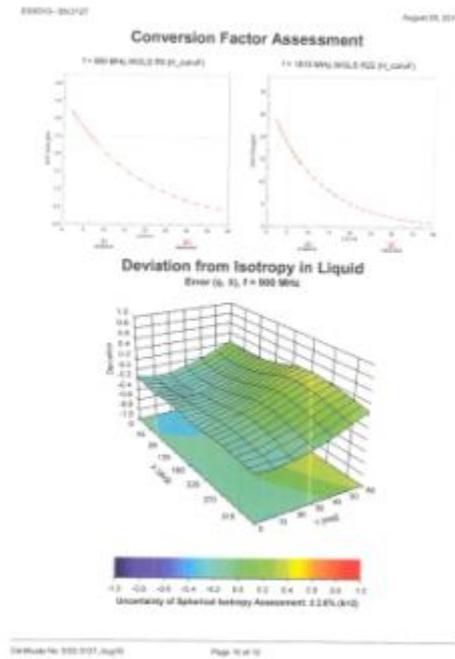
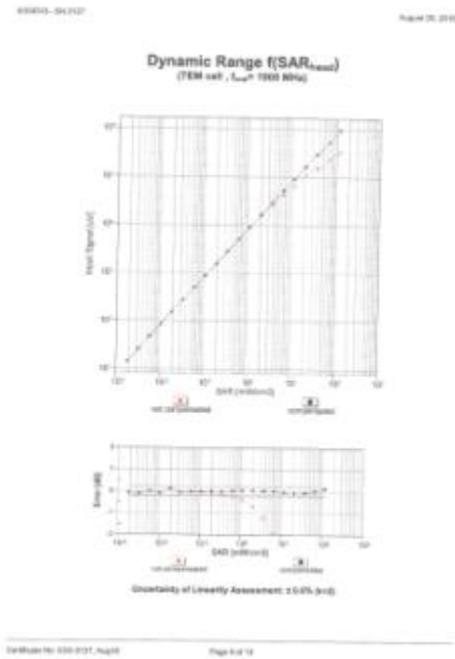
ES3DV3- SN:3127 August 29, 2016

Receiving Pattern (θ), θ = 0°



Uncertainty of Axial Sensitivity Measurement: 0.52% (k=2)

ES3DV3 Sn:3127



ES3DV3 - SN:3127 August 29, 2016

**DASY/EASY - Parameters of Probe: ES3DV3 - SN:3127**

**Other Probe Parameters**

Sensor Arrangement	Triangular
Connector Angle (°)	-15.8
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

Certificate No: ESS3127\_Aug16 Page 11 of 12

ES3DV3 - SN:3127 August 29, 2016

**Appendix: Modulation Calibration Parameters**

Mod	Communication System Name	A	B	C	D	VR	Unc <sup>†</sup>
		dB	dB/μV	dB	dB	mV	(k=2)
0	CW	X 0.0	0.0	1.0	0.00	209.2	±3.3 %
		Y 0.0	0.0	1.0		213.8	
		Z 0.0	0.0	1.0		202.7	
10012-CISB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X 3.29	71.4	20.2	1.87	125.6	±0.7 %
		Y 2.75	67.3	19.9		120.9	
		Z 3.10	70.4	19.7		120.2	
10108-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X 6.43	67.7	20.1	5.80	137.8	±1.4 %
		Y 6.43	67.5	19.7		144.6	
		Z 6.26	67.6	20.0		131.5	
10115-CAC	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X 6.17	67.4	20.0	5.75	134.4	±1.4 %
		Y 6.14	67.0	19.6		145.0	
		Z 6.02	67.0	19.7		128.3	
10154-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X 6.13	67.3	19.9	5.75	133.5	±1.2 %
		Y 6.19	67.3	19.8		140.3	
		Z 6.04	67.1	19.8		128.2	
10168-CISB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X 5.00	66.8	19.8	5.73	117.2	±0.9 %
		Y 5.04	66.9	19.7		120.3	
		Z 4.89	66.5	19.7		111.8	
10175-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X 4.97	66.8	19.7	5.72	117.2	±0.9 %
		Y 4.95	66.3	19.4		120.2	
		Z 4.87	66.5	19.6		111.6	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X 6.51	68.0	20.3	5.81	137.1	±1.4 %
		Y 6.46	67.6	19.9		140.9	
		Z 6.37	67.6	20.0		130.4	

<sup>†</sup> Uncertainty is determined using the max. deviation from linear response accounting rectangular distribution and is expressed for the square of the field value.

Certificate No: ESS3127\_Aug16 Page 12 of 12

EX3DV4 Sn:3708

Calibration Laboratory of Schmid & Partner Engineering AG  
 Accredited by the Swiss Accreditation Service (SAS)  
 The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates  
 Client: SRTC (9944) Certificate No: EX3-0706\_Nov16

**CALIBRATION CERTIFICATE**

Name: EX3DV4 - SN:3708  
 Calibration certificate for: QA CAL 01-40, QA CAL 14-04, QA CAL 22-05, QA CAL 23-04  
 Calibration procedure for electronic E-Field probe  
 Valid until: November 10, 2018

The calibration certificate guarantees the conformity to national standards, unless stated for approval only or restricted to 20. The measurements and the uncertainty with confidence probability are given on the following page and are part of this certificate. An additional traceability link is provided for the traceability facility, measurement temperature (23 ± 0.2°C) and humidity = 70%.

Calibration Equipment used (SRTT) central to calibration:

Equipment	SN	Last date of calibration	Expiration date
Field probe 1001	04_100118	2016-10-10	2017-10-10
Field probe 1002	04_100218	2016-10-10	2017-10-10
Field probe 1003	04_100318	2016-10-10	2017-10-10
Reference 10-40	04_100418	2016-10-10	2017-10-10
Reference 10-05	04_100518	2016-10-10	2017-10-10
Reference 10-04	04_100618	2016-10-10	2017-10-10
Reference 10-03	04_100718	2016-10-10	2017-10-10
Reference 10-02	04_100818	2016-10-10	2017-10-10
Reference 10-01	04_100918	2016-10-10	2017-10-10
Reference 10-00	04_101018	2016-10-10	2017-10-10

Calibrated by: Michael Weber, Technical Manager  
 Valid until: November 10, 2018

Certificate No: EX3-0706\_Nov16 Page 1 of 11

Calibration Laboratory of Schmid & Partner Engineering AG  
 Accredited by the Swiss Accreditation Service (SAS)  
 The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates  
 Client: SRTC (9944) Certificate No: EX3-0706\_Nov16

**Glossary:**

TE: Electric field strength  
 WDRM: 0.5  
 CDF: Coverage Factor  
 A, S, C, D: Measurement parameters  
 Polarization: 0  
 Coverage Angle: Information used in DASY/EASY systems to align probe sensor: 0 is the related coordinate system.

**Calibration is Performed According to the Following Standards:**

- IEC 61010-1:2011, 1000V Approved Practice for Constructing the Probe System Approved Specific Application Rule (SAR) in the Human Near Field Wireless Communications Device: Measurement Technology - Issue 01/13
- IEC 62233-1: "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the user (frequency range of 300 MHz to 3 GHz)", February 2009
- IEC 62233-2: "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 3 GHz)", March 2010
- ISO 9001:2015 "Quality Management Requirements for Organizations" ISO 9001:2015

**Methods Applied and Interpretation of Parameters:**

- WDRM: 0.5: Approved for E-Field polarization 0 = 0.0 ± 900 MHz to 1000 MHz, 1 = 1000 MHz, 0.2: Measurement uncertainty in TE, see below CDF.
- WDRM: 0.5 ± WDRM: 0.5: Frequency, impedance (see Frequency Response Chart). This measurement is implemented in DASY/EASY software systems later than 4.1. The uncertainty of the frequency response is included in the stated uncertainty of CDF.
- CDF: 0.5: CDF are numerical integration parameters assessed based on the data of power sweep with 100 signal for uncertainty required. CDF does not depend on frequency nor height.
- TE: SAR is the Peak to Average Ratio that is not calibrated but determined based on the signal measurement.
- A, S, C, D: A, S, C, D are numerical integration parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor height, with the required calibration range expressed in RMS voltage across the load.
- CDF and Reference (SRTT) Parameters: Assessed in the probe using S-Field (or Temperature Transfer Standard for 1 = 100 MHz) and include uncertainty using analytical field distribution based on power measurement for 1 = 100 MHz. The same setup and field distribution are given. These parameters are used in DASY/EASY software to improve probe accuracy when in the vicinity. The uncertainty in TE, corresponds to WDRM: 0.5. CDF whereby the coverage corresponds to the given CDF. A frequency dependent CDF is used in DASY/EASY 4.4 and higher which allows extending the validity from 30 MHz to 3 GHz.
- Reference voltage (30 deviation from reference) in a field of low problems realized using a flat phantom supported by a metal antenna.
- Sensor Offset: The sensor offset corresponds to the offset of actual measurement center from the probe to ground plane. No tolerance assumed.
- Coverage Angle: The angle is assessed using the information gained by measuring the WDRM: 0.5 uncertainty required.

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EX3DV4 - SN:3708  
 November 10, 2016

**Probe EX3DV4**

**SN:3708**

Manufactured: July 21, 2009  
 Calibrated: November 10, 2016

Calibrated for DASY/EASY Systems  
 (Note: non-compatible with DASY12 system)

Certificate No: EX3-0706\_Nov16 Page 3 of 11

EX3DV4 - SN:3708  
 November 10, 2016

**DASY/EASY - Parameters of Probe: EX3DV4 - SN:3708**

**Basic Calibration Parameters**

Parameter	Result 0	Result 1	Result 2	Unc. (k=2)
Norm. Coverage Factor (CDF)	0.5	0.5	0.5	± 0.15 (1%)
TE (V/m)	10.0	10.0	10.0	± 0.3 (3%)

**Modulation Calibration Parameters**

SN	Modulation System Name	A	B	C	D	VA	VM
		dB	dB/100	dB	dB	dB	dB
1	CS	0	0.0	0.0	0.0	0.0	0.0
1011	UNIFORM (SIGNAL)	0	0.0	0.0	0.0	0.0	0.0
1021	UNIFORM (TONE)	0	0.0	0.0	0.0	0.0	0.0
1031	UNIFORM (TONE)	0	0.0	0.0	0.0	0.0	0.0
1041	UNIFORM (TONE)	0	0.0	0.0	0.0	0.0	0.0
1051	UNIFORM (TONE)	0	0.0	0.0	0.0	0.0	0.0
1061	UNIFORM (TONE)	0	0.0	0.0	0.0	0.0	0.0
1071	UNIFORM (TONE)	0	0.0	0.0	0.0	0.0	0.0
1081	UNIFORM (TONE)	0	0.0	0.0	0.0	0.0	0.0
1091	UNIFORM (TONE)	0	0.0	0.0	0.0	0.0	0.0
1101	UNIFORM (TONE)	0	0.0	0.0	0.0	0.0	0.0

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%.

The uncertainty of item 1.1.2 is not affected by this uncertainty value. The user (page 6) notes:  
 \*Normal distribution assumed, uncertainty not assumed.  
 \*Uncertainty is determined using the first GUM edition. This value requires applying rectangular distribution and is dependent for the type of the modulation.

Certificate No: EX3-0706\_Nov16 Page 4 of 11

EX3DV4 Sn:3708

EX3DV4 - SN:3708 November 10, 2016

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3708

Calibration Parameter Determined in Head Tissue Simulating Media

1.8MHz <sup>1</sup>	Resonance Frequency <sup>2</sup>	Conductivity (S/m) <sup>3</sup>	Coef.F. X	Coef.F. Y	Coef.F. Z	Alpha <sup>4</sup>	Gain <sup>5</sup> (dB)	Unc. (dB)
300	473.2	0.07	0.02	0.04	0.02	0.48	0.90	± 0.2 %
1010	493.2	1.40	7.04	7.04	7.04	0.36	0.90	± 0.2 %
2000	493.2	1.40	7.04	7.04	7.04	0.37	0.89	± 0.2 %
3000	493.2	1.38	7.11	7.11	7.11	0.36	0.89	± 0.2 %
4000	500.0	4.58	2.52	5.03	3.22	0.33	1.00	± 0.1 %
5000	500.0	4.18	3.30	5.93	4.91	0.34	1.00	± 0.1 %
6000	500.0	4.89	3.00	5.00	5.40	0.40	1.00	± 0.1 %
8000	500.0	5.07	4.01	4.01	4.01	0.40	1.00	± 0.1 %
10000	500.0	5.27	3.01	3.01	3.01	0.40	1.00	± 0.1 %

<sup>1</sup>Frequency specific values (50 MHz) of a 100 MHz only applies for (EMF) not a single page (Page 2) also it is referred to a 100 MHz. The uncertainty is the 10% of the Coef.F. parameter of calibration frequency and the uncertainty for the measured frequency band. Frequency values below 200 MHz is 0.1, 20, 40, 60 and 100 MHz for Coef.F. parameters of 0.04, 0.08, 0.16 and 0.32 respectively. Above 200 MHz frequency values will be calculated as 1:10 (dB).

<sup>2</sup>Resonance Center (FC) is the center of the probe and is used to refer to a 10% of gain measurement formula is applied to determine gain factor. As frequency above 1000, the values of the parameters of gain is calculated as 0%. The uncertainty is the 10% of the Coef.F. parameter of calibration frequency and the uncertainty for the measured frequency band. Frequency values below 200 MHz is 0.1, 20, 40, 60 and 100 MHz for Coef.F. parameters of 0.04, 0.08, 0.16 and 0.32 respectively. Above 200 MHz frequency values will be calculated as 1:10 (dB).

<sup>3</sup>Resonance Center (FC) is the center of the probe and is used to refer to a 10% of gain measurement formula is applied to determine gain factor. As frequency above 1000, the values of the parameters of gain is calculated as 0%. The uncertainty is the 10% of the Coef.F. parameter of calibration frequency and the uncertainty for the measured frequency band. Frequency values below 200 MHz is 0.1, 20, 40, 60 and 100 MHz for Coef.F. parameters of 0.04, 0.08, 0.16 and 0.32 respectively. Above 200 MHz frequency values will be calculated as 1:10 (dB).

<sup>4</sup>Resonance Center (FC) is the center of the probe and is used to refer to a 10% of gain measurement formula is applied to determine gain factor. As frequency above 1000, the values of the parameters of gain is calculated as 0%. The uncertainty is the 10% of the Coef.F. parameter of calibration frequency and the uncertainty for the measured frequency band. Frequency values below 200 MHz is 0.1, 20, 40, 60 and 100 MHz for Coef.F. parameters of 0.04, 0.08, 0.16 and 0.32 respectively. Above 200 MHz frequency values will be calculated as 1:10 (dB).

<sup>5</sup>Resonance Center (FC) is the center of the probe and is used to refer to a 10% of gain measurement formula is applied to determine gain factor. As frequency above 1000, the values of the parameters of gain is calculated as 0%. The uncertainty is the 10% of the Coef.F. parameter of calibration frequency and the uncertainty for the measured frequency band. Frequency values below 200 MHz is 0.1, 20, 40, 60 and 100 MHz for Coef.F. parameters of 0.04, 0.08, 0.16 and 0.32 respectively. Above 200 MHz frequency values will be calculated as 1:10 (dB).

EX3DV4 - SN:3708 November 10, 2016

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3708

Calibration Parameter Determined in Body Tissue Simulating Media

1.8MHz <sup>1</sup>	Resonance Frequency <sup>2</sup>	Conductivity (S/m) <sup>3</sup>	Coef.F. X	Coef.F. Y	Coef.F. Z	Alpha <sup>4</sup>	Gain <sup>5</sup> (dB)	Unc. (dB)
300	513.2	0.05	0.01	0.01	0.01	0.48	0.90	± 0.2 %
1010	513.2	1.40	7.79	7.79	7.79	0.44	0.90	± 0.2 %
2000	513.2	1.52	7.71	7.71	7.71	0.43	0.89	± 0.2 %
3000	520.0	1.38	7.27	7.27	7.27	0.40	0.89	± 0.2 %
4000	460.0	3.31	4.52	4.42	4.52	0.46	1.00	± 0.1 %
5000	480.0	3.42	4.27	4.31	4.42	0.46	1.00	± 0.1 %
6000	480.0	3.60	4.07	4.07	4.07	0.50	1.00	± 0.1 %
8000	480.0	5.77	3.66	3.66	3.66	0.40	1.00	± 0.1 %
10000	480.0	6.07	3.11	3.11	3.11	0.40	1.00	± 0.1 %

<sup>1</sup>Frequency specific values (50 MHz) of a 100 MHz only applies for (EMF) not a single page (Page 2) also it is referred to a 100 MHz. The uncertainty is the 10% of the Coef.F. parameter of calibration frequency and the uncertainty for the measured frequency band. Frequency values below 200 MHz is 0.1, 20, 40, 60 and 100 MHz for Coef.F. parameters of 0.04, 0.08, 0.16 and 0.32 respectively. Above 200 MHz frequency values will be calculated as 1:10 (dB).

<sup>2</sup>Resonance Center (FC) is the center of the probe and is used to refer to a 10% of gain measurement formula is applied to determine gain factor. As frequency above 1000, the values of the parameters of gain is calculated as 0%. The uncertainty is the 10% of the Coef.F. parameter of calibration frequency and the uncertainty for the measured frequency band. Frequency values below 200 MHz is 0.1, 20, 40, 60 and 100 MHz for Coef.F. parameters of 0.04, 0.08, 0.16 and 0.32 respectively. Above 200 MHz frequency values will be calculated as 1:10 (dB).

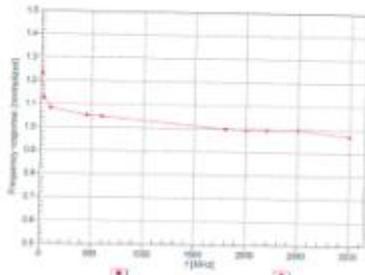
<sup>3</sup>Resonance Center (FC) is the center of the probe and is used to refer to a 10% of gain measurement formula is applied to determine gain factor. As frequency above 1000, the values of the parameters of gain is calculated as 0%. The uncertainty is the 10% of the Coef.F. parameter of calibration frequency and the uncertainty for the measured frequency band. Frequency values below 200 MHz is 0.1, 20, 40, 60 and 100 MHz for Coef.F. parameters of 0.04, 0.08, 0.16 and 0.32 respectively. Above 200 MHz frequency values will be calculated as 1:10 (dB).

<sup>4</sup>Resonance Center (FC) is the center of the probe and is used to refer to a 10% of gain measurement formula is applied to determine gain factor. As frequency above 1000, the values of the parameters of gain is calculated as 0%. The uncertainty is the 10% of the Coef.F. parameter of calibration frequency and the uncertainty for the measured frequency band. Frequency values below 200 MHz is 0.1, 20, 40, 60 and 100 MHz for Coef.F. parameters of 0.04, 0.08, 0.16 and 0.32 respectively. Above 200 MHz frequency values will be calculated as 1:10 (dB).

<sup>5</sup>Resonance Center (FC) is the center of the probe and is used to refer to a 10% of gain measurement formula is applied to determine gain factor. As frequency above 1000, the values of the parameters of gain is calculated as 0%. The uncertainty is the 10% of the Coef.F. parameter of calibration frequency and the uncertainty for the measured frequency band. Frequency values below 200 MHz is 0.1, 20, 40, 60 and 100 MHz for Coef.F. parameters of 0.04, 0.08, 0.16 and 0.32 respectively. Above 200 MHz frequency values will be calculated as 1:10 (dB).

EX3DV4 - SN:3708 November 10, 2016

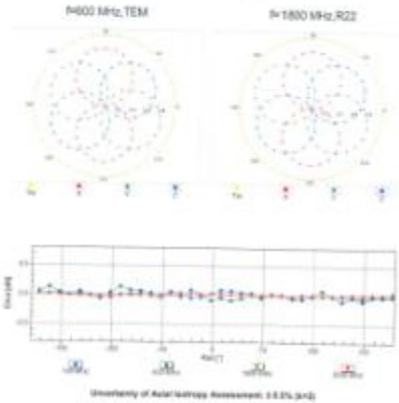
Frequency Response of E-Field  
(TEM-Coil:0110 EXL Waveguide: R22)



Uncertainty of Frequency Response of E-Field: ± 0.2% (k=2)

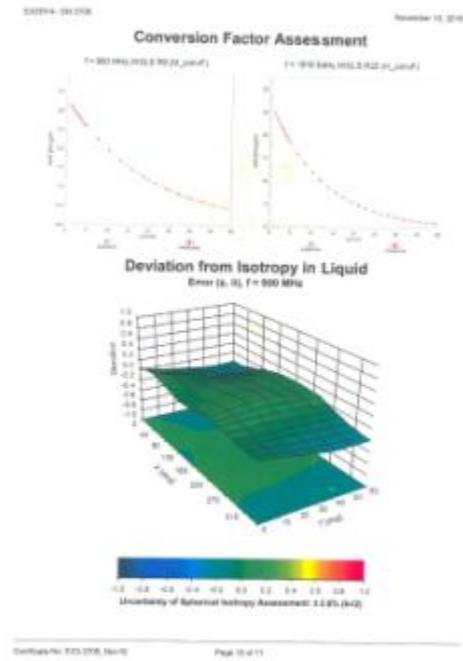
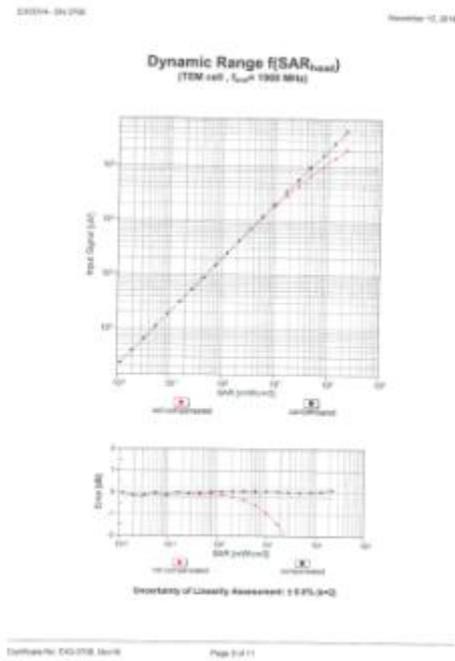
EX3DV4 - SN:3708 November 10, 2016

Receiving Pattern (θ), θ = 0°



Uncertainty of Axial Symmetry Assessment: ± 0.2% (k=2)

EX3DV4 Sn:3708



EX3DV4 - SN:3708 November 10, 2016

**DASY/EASY - Parameters of Probe: EX3DV4 - SN:3708**

**Other Probe Parameters**

Sensor Arrangement	Triangular
Connector Angle (°)	-1.9
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 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



D750V3 Sn:1101

DASY5 Validation Report for Head TSL

Date: 24.10.2016

Test Laboratory: SRFAG, Zurich, Switzerland

EUT: Dipole 750 MHz, Type: D750V3, Serial: D750V3 - SN:1101

Communication System: UED-5 - CW, Frequency: 750 MHz  
Medium parameters used:  $f = 750 \text{ MHz}$ ,  $n = 0.92$  SWS,  $\epsilon_r = 41.1$ ,  $\rho = 0.0004 \text{ g/cm}^3$   
Phantom section: Flat Section

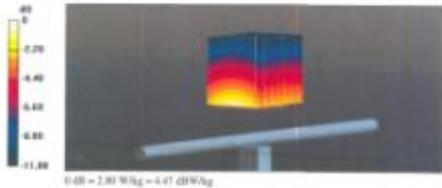
Measurement Standard: DASY5 (REDECC/AND C03.10-2011)

DASY5 Configuration:

- Probe: EXDPV4 - SNT4H, CoaxF10027, H07, H07b, Calibrated: 11.06.2016
- Sensor Surface: 1 Area (Mechanical Surface Detection)
- Electronics: DA24 (a00), Calibrated: 30.12.2015
- Phantom: Flat Phantom 4 H, Type: Q000P00AA, Serial: 1001
- DASY5: 52.8.9.2.201; SIMCAD X 14.6.007372

Dipole Calibration for Head Tissue/Pos:200 mW, d=15mm/Zero Scan (7x7x7)Cube II:

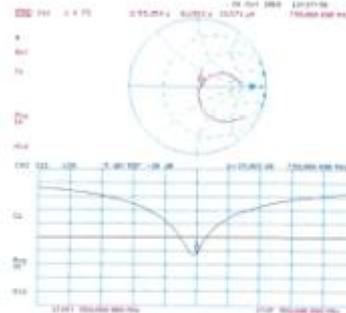
Measurement grid:  $d_x=15\text{mm}$ ,  $d_y=15\text{mm}$ ,  $d_z=15\text{mm}$   
Reference Value = 50.10 V/m, Power Dens = 0.00 dB  
Peak SAR (integrated) = 2.18 W/kg  
SAR(1g) = 2.11 W/kg, SAR(10g) = 1.38 W/kg  
Maximum value of SAR (measured) = 2.80 W/kg



Certificate No: D750V3-1101\_2016

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Impedance Measurement Plot for Head TSL



Certificate No: D750V3-1101\_2016

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DASY5 Validation Report for Body TSL

Date: 24.10.2016

Test Laboratory: SRFAG, Zurich, Switzerland

EUT: Dipole 750 MHz, Type: D750V3, Serial: D750V3 - SN:1101

Communication System: UED-5 - CW, Frequency: 750 MHz  
Medium parameters used:  $f = 750 \text{ MHz}$ ,  $n = 0.97$  SWS,  $\epsilon_r = 35.4$ ,  $\rho = 0.0004 \text{ g/cm}^3$   
Phantom section: Flat Section

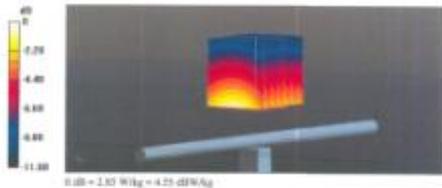
Measurement Standard: DASY5 (REDECC/AND C03.10-2011)

DASY5 Configuration:

- Probe: EXDPV4 - SNT4H, CoaxF1009, 9.09, 9.09b, Calibrated: 11.06.2016
- Sensor Surface: 1 Area (Mechanical Surface Detection)
- Electronics: DA24 (a00), Calibrated: 30.12.2015
- Phantom: Flat Phantom 4 H, Type: Q000P00AA, Serial: 1001
- DASY5: 52.8.9.2.201; SIMCAD X 14.6.007372

Dipole Calibration for Body Tissue/Pos:200 mW, d=15mm/Zero Scan (7x7x7)Cube II:

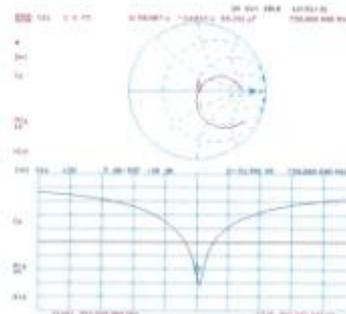
Measurement grid:  $d_x=15\text{mm}$ ,  $d_y=15\text{mm}$ ,  $d_z=15\text{mm}$   
Reference Value = 36.73 V/m, Power Dens = 0.00 dB  
Peak SAR (integrated) = 1.59 W/kg  
SAR(1g) = 1.47 W/kg, SAR(10g) = 1.44 W/kg  
Maximum value of SAR (measured) = 2.40 W/kg



Certificate No: D750V3-1101\_2016

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Impedance Measurement Plot for Body TSL



Certificate No: D750V3-1101\_2016

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D835V2 Sn:4d023

Calibration Laboratory of  
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Engineering AG  
Augustinustrasse 15, 8554 Gaiß, Switzerland

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

Accreditation No.: SCS 0108

Client: SRTC (Fink) Certificate No.: D835V2-4002\_0ct16

### CALIBRATION CERTIFICATE

Head: D835V2 - SR4002

Calibration procedure(s): QA-CAL-05-04  
Calibration procedure for dipole antennas for the range 700 MHz

Calibration date: October 24, 2016

This calibration certificate documents the feasibility to realize standards, which define the physical units of measurement (2).  
The measurement and the comparison with continuous uncertainty are given on the following pages and are part of the certificate.

All calibrations have been conducted in the shielded radiation facility, environmental temperature 22 ± 0.2 °C and humidity < 10%.

Calibration Equipment used (SAS) unless otherwise specified:

Primary Standard	U/e	Exp. Date (if applicable)	Expiration Date/Date
Power meter HP 3597A	SA 10079	04-Apr-16 (No. 211-000000)	Apr-17
Power sensor HP 3597A	SA 10084	04-Apr-16 (No. 211-000000)	Apr-17
Power sensor HP 3597A	SA 10085	04-Apr-16 (No. 211-000000)	Apr-17
Reference 10-dB Attenuator	SA 1008 (204)	05-Apr-16 (No. 211-000000)	Apr-17
Type III frequency counter	SA 3007 (1-00007)	05-Apr-16 (No. 211-000000)	Apr-17
Reference Plane 50Ω/75Ω	SA 100	04-Jun-16 (No. 210-1000_0ct16)	Jun-17
10dB	SA 307	30-Sep-16 (No. 210-1000_0ct16)	Dec-16

Verification Standard	U/e	Check Date (if relevant)	Expiration Date
Power meter HP 3597A	SA 10079/0079	01-Oct-16 (2) Head Check (2) 16	31-head check (2) 16
Power sensor HP 3597A	SA 10084/0084	27-Oct-16 (2) Head Check (2) 16	31-head check (2) 16
Power sensor HP 3597A	SA 10085/0085	27-Oct-16 (2) Head Check (2) 16	31-head check (2) 16
10-dB attenuator HP 3597A	SA 1008 (204)	05-Oct-16 (2) Head Check (2) 16	31-head check (2) 16
Reference plane HP 3597A	SA 100/0000	04-Oct-16 (2) Head Check (2) 16	31-head check (2) 16

Contracting: SRTC Partner  
Schnitz & Partner

Approved by: Adda Kuhnli, Technical Manager

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

Certificate No.: D835V2-4002\_0ct16 Page 1 of 8

Calibration Laboratory of  
Schnitz & Partner  
Engineering AG  
Augustinustrasse 15, 8554 Gaiß, Switzerland

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

Accreditation No.: SCS 0108

Client: SRTC (Fink) Certificate No.: D835V2-4002\_0ct16

### CALIBRATION CERTIFICATE

Head: D835V2 - SR4002

Calibration procedure(s): QA-CAL-05-04  
Calibration procedure for dipole antennas for the range 700 MHz

Calibration date: October 24, 2016

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Power sensor HP 3597A	SA 10084	04-Apr-16 (No. 211-000000)	Apr-17
Power sensor HP 3597A	SA 10085	04-Apr-16 (No. 211-000000)	Apr-17
Reference 10-dB Attenuator	SA 1008 (204)	05-Apr-16 (No. 211-000000)	Apr-17
Type III frequency counter	SA 3007 (1-00007)	05-Apr-16 (No. 211-000000)	Apr-17
Reference Plane 50Ω/75Ω	SA 100	04-Jun-16 (No. 210-1000_0ct16)	Jun-17
10dB	SA 307	30-Sep-16 (No. 210-1000_0ct16)	Dec-16

Verification Standard	U/e	Check Date (if relevant)	Expiration Date
Power meter HP 3597A	SA 10079/0079	01-Oct-16 (2) Head Check (2) 16	31-head check (2) 16
Power sensor HP 3597A	SA 10084/0084	27-Oct-16 (2) Head Check (2) 16	31-head check (2) 16
Power sensor HP 3597A	SA 10085/0085	27-Oct-16 (2) Head Check (2) 16	31-head check (2) 16
10-dB attenuator HP 3597A	SA 1008 (204)	05-Oct-16 (2) Head Check (2) 16	31-head check (2) 16
Reference plane HP 3597A	SA 100/0000	04-Oct-16 (2) Head Check (2) 16	31-head check (2) 16

Contracting: SRTC Partner  
Schnitz & Partner

Approved by: Adda Kuhnli, Technical Manager

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

Certificate No.: D835V2-4002\_0ct16 Page 2 of 8

### Measurement Conditions

SAR1 subject configuration: SA 10079/0079/0084/0085/008

Parameter	Value	Unit
Exposure	Antenna Exposure	W/kg
Phantom	Mobile-Flat Phantom	with liquid
Distance Dipole Center - TSL	15 cm	with liquid
Swave Scan Resolution	0.5 dB, 0.5 °	± 2 mm
Frequency	200 MHz ± 1 MHz	

### Head TSL parameters

The following parameters and calibration were applied:

Parameter	Value	Uncertainty	Conductivity
Measured Head TSL parameters	50 ± 0.1 °C	± 0.2	0.07 W/kg
Measured Head TSL parameters	50 ± 0.1 °C	± 0.2	0.07 W/kg ± 0.5 %
Head TSL temperature change during test	+ 0.2 °C	---	---

### SAR result with Head TSL

Parameter	Value	Condition
SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	200 mW input power	0.47 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	0.46 W/kg ± 17.0 % (Std)

Parameter	Value	Condition
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	Condition	
SAR measured	200 mW input power	1.70 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	0.74 W/kg ± 16.5 % (Std)

### Body TSL parameters

The following parameters and calibration were applied:

Parameter	Value	Uncertainty	Conductivity
Measured Body TSL parameters	33 ± 0.1 °C	± 0.2	0.47 W/kg
Measured Body TSL parameters	33 ± 0.1 °C	± 0.2	0.46 W/kg ± 0.5 %
Body TSL temperature change during test	+ 0.2 °C	---	---

### SAR result with Body TSL

Parameter	Value	Condition
SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	200 mW input power	2.04 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	0.62 W/kg ± 13.0 % (Std)

Parameter	Value	Condition
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	Condition	
SAR measured	200 mW input power	1.00 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	0.33 W/kg ± 16.5 % (Std)

Certificate No.: D835V2-4002\_0ct16 Page 3 of 8

### Appendix (Additional assessments outside the scope of SCS 0108)

#### Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.4 Ω - 1.9 jΩ
Return Loss	-28.4 dB

#### Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.3 Ω - 5.1 jΩ
Return Loss	-25.8 dB

#### General Antenna Parameters and Design

Electrical Delay (one direction)	1.380 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
Manufactured on	December 17, 2004

Certificate No.: D835V2-4002\_0ct16 Page 4 of 8

D835V2 Sn:4d023

DASY5 Validation Report for Head TSL

Date: 26.10.2016

The Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d023

Communication System: UED 0 - CW; Frequency: 835 MHz;  
Medium parameters used:  $f = 835 \text{ MHz}$ ;  $n = 0.95$ ;  $\text{SAR}_0 = 40 \text{ dB}$ ;  $\rho = 1000 \text{ kg/m}^3$   
Fluxion system: Flat Fluxion

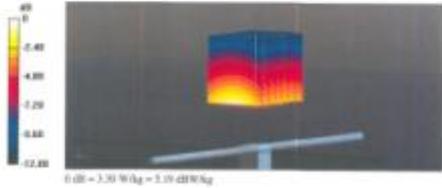
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

- Probe: EXD1V4 - INT348; Coax: FX 32; 9.75; 9.75; Calibrated: 11.06.2016;
- Sensor Surface: 1 Area (Mechanical Surface Detection)
- Electronics: DA24 SetU; Calibrated: 30.12.2015
- Fluxion: Flat Fluxion 4-FL; Type: QD000P93AA; Serial: 1001
- DASY52 52.8.8.01291; SEMCAD X 14.6.1007372

Dipole Calibration for Head Tissue/ $\rho = 1000 \text{ kg/m}^3$ ;  $d = 15 \text{ mm}$ /Zoom Scan (7x7x7)/Cube 8:

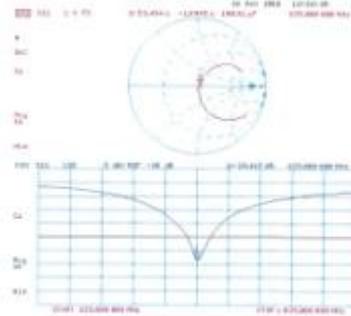
Measurement grid:  $d_x = 5 \text{ mm}$ ;  $d_y = 5 \text{ mm}$ ;  $d_z = 5 \text{ mm}$   
Reference Value = 61.72 V/m; Power Dens = 0.03 dB  
Peak SAR (extrapolated) = 3.72 W/kg  
SAR0 (g) = 3.47 W/kg; SAR0 (p) = 1.89 W/kg  
Maximum value of SAR (measured) = 3.30 W/kg



Certificate No.: 088305-4802\_0016

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Impedance Measurement Plot for Head TSL



Certificate No.: 088305-4802\_0016

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DASY5 Validation Report for Body TSL

Date: 24.10.2016

The Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d023

Communication System: UED 0 - CW; Frequency: 835 MHz;  
Medium parameters used:  $f = 835 \text{ MHz}$ ;  $n = 0.99$ ;  $\text{SAR}_0 = 15 \text{ dB}$ ;  $\rho = 1000 \text{ kg/m}^3$   
Fluxion system: Flat Fluxion

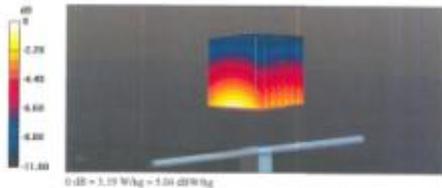
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

- Probe: EXD1V4 - INT348; Coax: FX 32; 9.75; 9.75; Calibrated: 11.06.2016;
- Sensor Surface: 1 Area (Mechanical Surface Detection)
- Electronics: DA24 SetU; Calibrated: 30.12.2015
- Fluxion: Flat Fluxion 4-FL; Type: QD000P93AA; Serial: 1001
- DASY52 52.8.8.01291; SEMCAD X 14.6.1007372

Dipole Calibration for Body Tissue/ $\rho = 1000 \text{ kg/m}^3$ ;  $d = 15 \text{ mm}$ /Zoom Scan (7x7x7)/Cube 8:

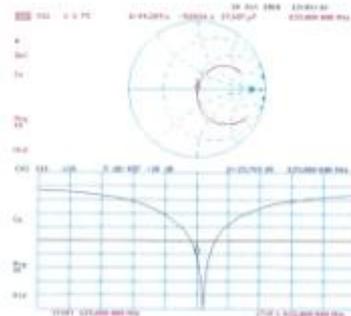
Measurement grid:  $d_x = 5 \text{ mm}$ ;  $d_y = 5 \text{ mm}$ ;  $d_z = 5 \text{ mm}$   
Reference Value = 39.07 V/m; Power Dens = 0.01 dB  
Peak SAR (extrapolated) = 3.76 W/kg  
SAR0 (g) = 2.41 W/kg; SAR0 (p) = 1.8 W/kg  
Maximum value of SAR (measured) = 3.19 W/kg



Certificate No.: 088305-4802\_0016

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Impedance Measurement Plot for Body TSL



Certificate No.: 088305-4802\_0016

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D1900V2 Sn:5d113

Calibration Laboratory of  
Schindl & Partner  
Engineering AG  
Ingenieurstr. 10, 8000 Zurich, Switzerland

Accreditation No.: SCS 0108

Calibration Certificate No.: D1900V2-5d113\_Oct18

### CALIBRATION CERTIFICATE

Client: D1900V2 - SN:5d113

Customer provided: QA CAL-02-v3  
Calibration procedure for dipole antenna kit, 200V, 700 MHz

Calibration date: October 31, 2018

The certificate certifies compliance for the accuracy of reference standards, which under the physical conditions of measurement (2). The measurement and the associated uncertainty, including any given in the following pages and on page 3 of the certificate.

All activities have been conducted in the climate-controlled facility, environmental temperature (20 ± 0.2) °C, humidity < 40%.

Calibration equipment used (MPE's stated for calibration):

Process Parameter	EQ	Top Class Calibration No.	Adjustment Calibration
Power meter HP1	99-180778	06-Apr-16 (No. 211-020808)	Apr-17
Power sensor HP1-20	99-183244	06-Apr-16 (No. 211-020808)	Apr-17
Power sensor HP1-50	99-183245	06-Apr-16 (No. 211-020808)	Apr-17
Reference 50 dB Attenuator	99-180808 (MPE)	06-Apr-16 (No. 211-020808)	Apr-17
Type B frequency counter	99-180810-0-00007	05-Apr-16 (No. 211-020808)	Apr-17
Calibration Probe L20374	99-180809	05-Apr-16 (No. 211-020808, Jan-16)	Apr-17
Load	184-80	05-Oct-16 (No. 208-0101_120115)	Nov-16

Secondary standards (EQ):

Process Parameter	EQ	Class	Next Due to Expiry	Subsequent Calibration
Power meter CPM 400A	99-180780 (MPE)	01-Sep-15 (in House check Oct-16)	In-house check: Oct-16	
Power sensor HP 8000A	99-180781 (MPE)	01-Sep-15 (in House check Oct-16)	In-house check: Oct-16	
Power sensor HP 8000B	99-180782 (MPE)	01-Sep-15 (in House check Oct-16)	In-house check: Oct-16	
HP generator P83 SFA1-05	99-180800	05-Apr-16 (in House check Oct-16)	In-house check: Oct-16	
Reference impedance HP 81000	99-180783 (MPE)	01-Sep-15 (in House check Oct-16)	In-house check: Oct-17	

Calibrated to: Hans-Joerg Schindl, Laboratory Technician

Approved by: Hans-Joerg Schindl, Technical Manager

Certificate No.: D1900V2-5d113\_Oct18 Page 1 of 3

Calibration Laboratory of  
Schindl & Partner  
Engineering AG  
Ingenieurstr. 10, 8000 Zurich, Switzerland

Accreditation No.: SCS 0108

Calibration Certificate No.: D1900V2-5d113\_Oct18

### Glossary:

TSL: linear circulating loop  
Const: sensitivity in TSL, / MCRIF in V/T  
NA: not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEC 61010-1:2010, "IEC Recommended Practices for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2010
- 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 300 MHz to 3 GHz)", February 2005
- 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
- KCE B05584, "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 this 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.: D1900V2-5d113\_Oct18 Page 2 of 3

### Measurement Conditions

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

DASY Version	DASY5	V52.8.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

### Head TSL parameters

The following parameters and calculations were applied:

Parameter	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	53.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.6 ± 6 %	1.39 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

### SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.1 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	40.7 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm³ (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 ± 16.5 % (k=2)

### Body TSL parameters

The following parameters and calculations were applied:

Parameter	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	53.2 ± 6 %	1.48 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	---	---

### SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.80 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	39.8 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.23 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.1 W/kg ± 16.5 % (k=2)

Certificate No.: D1900V2-5d113\_Oct18 Page 3 of 3

### Appendix (Additional assessments outside the scope of SCS 0108)

#### Antenna Parameters with Head TSL

Impedance, transformed to feed point	11.1 Ω ± 0.0 Ω
Return Loss	-23.8 dB

#### Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.0 Ω ± 7.7 Ω
Return Loss	-11.6 dB

#### General Antenna Parameters and Design

Electrical Delay (one direction)	1.00 ns
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After long-term use with 1000W reflected power, only a slight warping of the dipole near the feedpoint can be measured.

The dipole is made of stainless-steel braided cables. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore also suitable for DC signals. On some of the dipole, small stainless-steel clips are added to the dipole arms in order to improve handling when tested according to the problem 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 preventive tests must be performed for the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

#### Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 28, 2008

Certificate No.: D1900V2-5d113\_Oct18 Page 4 of 3

D1900V2 Sn:5d113

DASY5 Validation Report for Head TSL

Date: 31.10.2016

Test Laboratory: SFEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2-SN:5d113

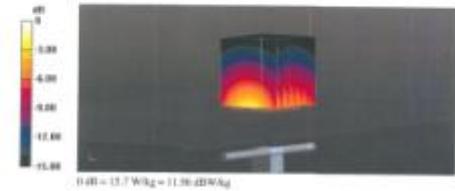
Communication System: UED 0 - CW; Frequency: 1900 MHz  
Medium parameters used:  $\epsilon = 1.29$  Skin,  $\sigma = 40.0$ ,  $\mu = 1000$  kg/m<sup>3</sup>  
Polarization: Flat Surface  
Measurement Standard: DASY5 (IEEE/IEC/ANSI CS 19-2011)

DASY5 Configuration:

- Probe: EXCDIV4 - SN7948; Core(F) 7.05, 7.06, 7.08; Calibrated: 15.06.2016;
- Sensor Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DA04 (a04); Calibrated: 30.12.2015
- Phantom: Flat (Phantom 5.0 (front)); Type: QD000P90AA; Serial: 0002
- DASY5: 52.6.6(120); SEMCAD X 14.6.0(1372)

Dipole Calibration for Head Tissue/Pho=250 wtW, d=10mm/Zoom Scan (7x7x7)Cube R:

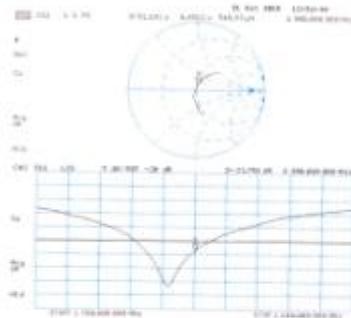
Measurement:  $g_{dB} = 0$  (front),  $d_{r} = 0$  (front),  $d_{\theta} = 5$  (mm)  
Reference Value = 104.3 V/m; Power Dens = 4.02 dB  
Peak SAR (extrapolated) = 19.0 W/kg  
SAR(10 g) = 10.1 W/kg; SAR(10 g) = 5.3 W/kg  
Maximum value of SAR (measured) = 15.7 W/kg



Certificate No.: 0190002-00113\_0016

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Impedance Measurement Plot for Head TSL



Certificate No.: 0190002-00113\_0016

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DASY5 Validation Report for Body TSL

Date: 31.10.2016

Test Laboratory: SFEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2-SN:5d113

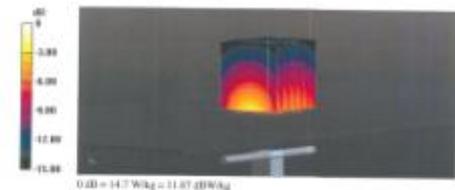
Communication System: UED 0 - CW; Frequency: 1900 MHz  
Medium parameters used:  $\epsilon = 1.44$  Skin,  $\sigma = 55.2$ ,  $\mu = 1000$  kg/m<sup>3</sup>  
Polarization: Flat Surface  
Measurement Standard: DASY5 (IEEE/IEC/ANSI CS 19-2011)

DASY5 Configuration:

- Probe: EXCDIV4 - SN7948; Core(F) 7.05, 7.06, 7.08; Calibrated: 15.06.2016;
- Sensor Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DA04 (a04); Calibrated: 30.12.2015
- Phantom: Flat (Phantom 5.0 (back)); Type: QD000P90AA; Serial: 0002
- DASY5: 52.6.6(120); SEMCAD X 14.6.0(1372)

Dipole Calibration for Body Tissue/Pho=250 wtW, d=10mm/Zoom Scan (7x7x7)Cube R:

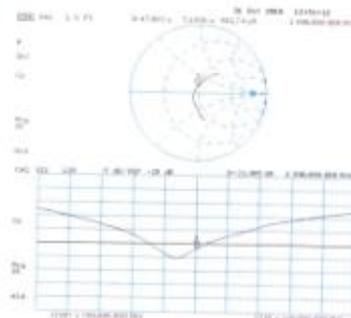
Measurement:  $g_{dB} = 0$  (front),  $d_{r} = 0$  (front),  $d_{\theta} = 5$  (mm)  
Reference Value = 104.3 V/m; Power Dens = 4.02 dB  
Peak SAR (extrapolated) = 17.2 W/kg  
SAR(10 g) = 9.8 W/kg; SAR(10 g) = 5.23 W/kg  
Maximum value of SAR (measured) = 14.3 W/kg



Certificate No.: 0190002-00113\_0016

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Impedance Measurement Plot for Body TSL



Certificate No.: 0190002-00113\_0016

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D2450V2 Sn:738

Calibration Laboratory of Schmid & Partner Engineering AG  
Friedenstrasse 15, 8941 Sulz, Switzerland

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

Reference No.: SCS 0108

Client: SRTC (HWS) Certificate No.: D2450V2-738\_Oct18

### CALIBRATION CERTIFICATE

Name: D2450V2 - 04 738

Calibration procedure: IEC CAL-05-09  
Calibration procedure for dipole antennas with a maximum length of 100 mm

Calibration date: October 25, 2018

This calibration certificate documents the traceability to national standards, which makes the physical units of measurements. The measurements and the associated self-calibration procedure are given in the following pages and part of the certificate.

All measurements were conducted in the shielded laboratory facility, documented temperature (22 ± 0.5 °C) and humidity < 50%.

Calibration equipment used (MPE) relative to calibration:

Calibration Standard	Lot #	Due Date (Reference No.)	Expiration Date
Power meter SPM	SA 100716	30-Apr-18 (SA 11100000000)	Apr-17
Power sensor HP-121	SA 102844	30-Apr-18 (SA 111000000)	Apr-17
Power sensor HP-121	SA 102845	30-Apr-18 (SA 111000000)	Apr-17
Reference 50 Ω Impedance	SA 90091209	30-Apr-18 (SA 111000000)	Apr-17
Type of electrical connection	SA 104111-18-01	30-Apr-18 (SA 111000000)	Apr-17
Reference Power EUT/EMC	SA 7044	30-Apr-18 (SA 111000000)	Apr-17
SAR	SA 901	30-Apr-18 (SA 111000000)	Apr-17

Secondary standards:

Name	Due Date (Reference No.)	Expiration Date
Power meter PMA 0104	SA 104100000	30-Apr-18 (SA 111000000)
Power sensor HP-121-2	SA 102844-002	30-Apr-18 (SA 111000000)
Power sensor HP-121-1	SA 102845-001	30-Apr-18 (SA 111000000)
HP generator HSA SMT 05	SA 100072	30-Apr-18 (SA 111000000)
Reference Impedance HP 0100	SA 102700000	30-Apr-18 (SA 111000000)

Calibrated by: [Signature]

Approved by: [Signature]

Certificate No.: D2450V2-738\_Oct18 Page 1 of 8

Calibration Laboratory of Schmid & Partner Engineering AG  
Friedenstrasse 15, 8941 Sulz, Switzerland

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

Reference No.: SCS 0108

Client: SRTC (HWS) Certificate No.: D2450V2-738\_Oct18

### CALIBRATION CERTIFICATE

Name: D2450V2 - 04 738

Calibration procedure: IEC CAL-05-09  
Calibration procedure for dipole antennas with a maximum length of 100 mm

Calibration date: October 25, 2018

This calibration certificate documents the traceability to national standards, which makes the physical units of measurements. The measurements and the associated self-calibration procedure are given in the following pages and part of the certificate.

All measurements were conducted in the shielded laboratory facility, documented temperature (22 ± 0.5 °C) and humidity < 50%.

Calibration equipment used (MPE) relative to calibration:

Calibration Standard	Lot #	Due Date (Reference No.)	Expiration Date
Power meter SPM	SA 100716	30-Apr-18 (SA 111000000)	Apr-17
Power sensor HP-121	SA 102844	30-Apr-18 (SA 111000000)	Apr-17
Power sensor HP-121	SA 102845	30-Apr-18 (SA 111000000)	Apr-17
Reference 50 Ω Impedance	SA 90091209	30-Apr-18 (SA 111000000)	Apr-17
Type of electrical connection	SA 104111-18-01	30-Apr-18 (SA 111000000)	Apr-17
Reference Power EUT/EMC	SA 7044	30-Apr-18 (SA 111000000)	Apr-17
SAR	SA 901	30-Apr-18 (SA 111000000)	Apr-17

Secondary standards:

Name	Due Date (Reference No.)	Expiration Date
Power meter PMA 0104	SA 104100000	30-Apr-18 (SA 111000000)
Power sensor HP-121-2	SA 102844-002	30-Apr-18 (SA 111000000)
Power sensor HP-121-1	SA 102845-001	30-Apr-18 (SA 111000000)
HP generator HSA SMT 05	SA 100072	30-Apr-18 (SA 111000000)
Reference Impedance HP 0100	SA 102700000	30-Apr-18 (SA 111000000)

Calibrated by: [Signature]

Approved by: [Signature]

Certificate No.: D2450V2-738\_Oct18 Page 2 of 8

#### Measurement Conditions

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

DASY Version	DASYs	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
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:

Parameter	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	38.2 ± 6 %	1.87 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °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
SAR for nominal Head TSL parameters	normalized to 1W
SAR for nominal Head TSL parameters	51.2 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	Condition
SAR measured	250 mW input power
SAR for nominal Head TSL parameters	normalized to 1W
SAR for nominal Head TSL parameters	23.9 W/kg ± 16.5 % (k=2)

#### Body TSL parameters

The following parameters and calculations were applied:

Parameter	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	51.3 ± 6 %	2.02 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °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
SAR for nominal Body TSL parameters	normalized to 1W
SAR for nominal Body TSL parameters	50.8 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	Condition
SAR measured	250 mW input power
SAR for nominal Body TSL parameters	normalized to 1W
SAR for nominal Body TSL parameters	24.0 W/kg ± 16.5 % (k=2)

Certificate No.: D2450V2-738\_Oct18 Page 3 of 8

#### Appendix (Additional assessments outside the scope of SCS 0108)

##### Antenna Parameters with Head TSL

Parameter	Value
Impedance, transformed to feed point	55.8 Ω ± 0.1 Ω
Return Loss	17.3 dB

##### Antenna Parameters with Body TSL

Parameter	Value
Impedance, transformed to feed point	46.7 Ω ± 0.8 Ω
Return Loss	18.5 dB

##### General Antenna Parameters and Design

Parameter	Value
Electrical Delay time (one-way)	1.187 ns

After long-term use with 100W substitution, only a slight warming of the dipole legs (the feedpoint) can be measured. The wires are made of standard average coated cable. The center conductor of the loading line is directly connected to the second arm of the dipole. This antenna is flexible and can be used for SAR measurements. The center of the dipole, small wire loops are added to the dipole arms in order to improve matching when tested 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 additional force must be applied to the dipole arms, because they might bend at the additional connections near the feedpoint may be damaged.

##### Additional EUT Data

Parameter	Value
Manufactured by	SPEAD
Manufactured on	August 05, 2015

Certificate No.: D2450V2-738\_Oct18 Page 4 of 8

D2450V2 Sn:738

DASY5 Validation Report for Head TSL

Date: 25.10.2016

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2-SN:738

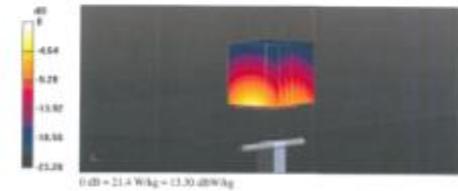
Communication System: UED 0 - CW; Frequency: 2450 MHz  
Medium parameters used:  $f = 2450$  MHz,  $n = 1.875$ ,  $\epsilon = 36.2$ ,  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section  
Measurement Standard: DASY5 (IEEE/CIS/ANSI C63.19-2011)

DASY5 Configuration:

- Probe: EX3DP14 - BN7500; Case(P): 7.72, 7.72; Calibrated: 15.06.2016;
- Sensor Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DA50 5000; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (Inert); Type: QD99P55AA; Serial: 1001
- DASY5: SI 8.8(1250); SEMCAD X 14.4.00(1312)

Dipole Calibration for Head Tissue/ρ=200 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

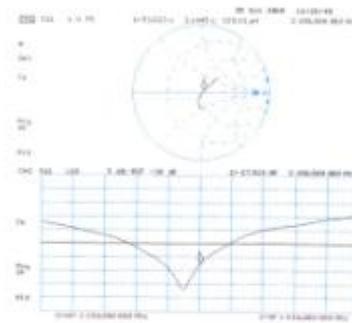
Measurement gain:  $d_0=5$ mm,  $d_1=5$ mm,  $d_2=5$ mm  
Reference Value = 11.7 V/m; Power Dens = 0.00 dB  
Peak SAR (integrated) = 26.4 W/kg  
SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.87 W/kg  
Maximum value of SAR (measured) = 21.4 W/kg



Certificate No.: 20160927-738\_2016

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Impedance Measurement Plot for Head TSL



Certificate No.: 20160927-738\_2016

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DASY5 Validation Report for Body TSL

Date: 25.10.2016

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2-SN:738

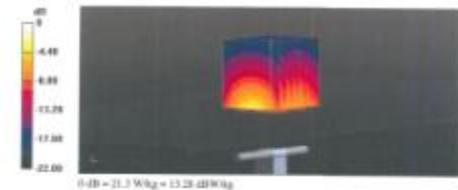
Communication System: UED 0 - CW; Frequency: 2450 MHz  
Medium parameters used:  $f = 2450$  MHz,  $n = 1.875$ ,  $\epsilon = 51.3$ ,  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section  
Measurement Standard: DASY5 (IEEE/CIS/ANSI C63.19-2011)

DASY5 Configuration:

- Probe: EX3DP14 - BN7500; Case(P): 7.76, 7.76, 7.76; Calibrated: 15.06.2016;
- Sensor Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DA50 5000; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (Inert); Type: QD99P55AA; Serial: 1001
- DASY5: SI 8.8(1250); SEMCAD X 14.4.00(1312)

Dipole Calibration for Body Tissue/ρ=200 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

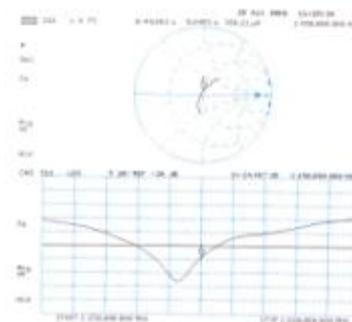
Measurement gain:  $d_0=5$ mm,  $d_1=5$ mm,  $d_2=5$ mm  
Reference Value = 107.3 V/m; Power Dens = 0.00 dB  
Peak SAR (integrated) = 76.0 W/kg  
SAR(1 g) = 13.78 W/kg; SAR(10 g) = 6.88 W/kg  
Maximum value of SAR (measured) = 21.3 W/kg



Certificate No.: 20160927-738\_2016

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Impedance Measurement Plot for Body TSL



Certificate No.: 20160927-738\_2016

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D2600V2 Sn:1089

Calibration Laboratory of  
Schindler & Partner  
Engineering AG  
Zougstrasse 43, 8034 Zurich, Switzerland



S Schweizerischer Kalibrierdienst  
C Swiss Centre for Accreditation  
S Swiss Calibration Service

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  
Accreditation No.: SCS 0108

Client: Sony Mobile CN (Vitec) Certificate No: D2600V2-1089\_Jul16

**CALIBRATION CERTIFICATE**

Object: D2600V2 - SN: 1089

Calibration certificate(s): QA-CAL-05-V9  
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: July 13, 2016

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.

No conditions have been included in the stated laboratory facility, ambient temperature (22 ± 0.5) and humidity <math>\le 75\%</math>.

Calibration Equipment used (MATE except for calibration):

Primary Standard	ID#	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104776	06-Apr-16 (No.: 217-02089-20089)	Apr-17
Power sensor NRP-Z91	SN: 100084	06-Apr-16 (No.: 217-02089)	Apr-17
Power sensor NRP-Z91	SN: 100095	06-Apr-16 (No.: 217-02089)	Apr-17
Reference 20 dB Attenuator	SN: 3658 (20k)	06-Apr-16 (No.: 217-02089)	Apr-17
Feed Point Impedance Comparator	SN: 13412 (30k/3)	19-Apr-16 (No.: 217-02089)	Apr-17
Reference Phase Comparator	SN: 7246	17-Jan-16 (No.: 629-7396-Jul16)	Jan-17
SAR1	SN: 811	30-Mar-15 (No.: 15AE4-811)	Dec-16

Secondary Standards

ID#	Check Date (Certificate No.)	Scheduled Check
Power meter EPM-4 (3)	NO: 108148 (104)	17-Oct-15 (No.: 217-02089)
Power sensor NRP-Z91A	NO: 105136 (13)	17-Oct-15 (No.: 217-02089)
Power sensor NRP-Z91B	NO: 105137 (14)	17-Oct-15 (No.: 217-02089)
Reference Phase Comparator	NO: 100077	17-Jan-16 (No.: 629-7396-Jul16)
SAR1	NO: 148196 (26)	19-Oct-15 (No.: 15AE4-811)

Submitted by: Jovan Kostic, Laboratory Technician

Approved by: Rajko Polovic, Technical Manager

Issue Date: July 14, 2016

Calibration Laboratory of  
Schindler & Partner  
Engineering AG  
Zougstrasse 43, 8034 Zurich, Switzerland



S Schweizerischer Kalibrierdienst  
C Swiss Centre for Accreditation  
S Swiss Calibration Service

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  
Accreditation No.: SCS 0108

Client: Sony Mobile CN (Vitec) Certificate No: D2600V2-1089\_Jul16

**Glossary:**

- TSL: Issue simulating liquid
  - ComF: sensitivity in TSL / IORIM x,y,z
  - SAR: 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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
  - 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 856664, "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 measured value 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%.

**Measurement Conditions**

DASY4 version: TAV15, High SAR

Configuration	Advanced Configuration	Phantom	Distance Dipole Center - TSL	Zoom Scan Resolution	Frequency
	Multi-Layer Flat Phantom	10 mm	with Noise	4x, 4y, 4z (4.5 mm)	2800 MHz ± 1.59%

**Head TSL parameters**

The following parameters and calculations were applied:

Parameter	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	79.0	1.66 mho/m
Measured Head TSL parameters	22.0 ± 0.2 °C	77.5 ± 6 %	2.02 mho/m ± 6 %
Head TSL temperature change during test	<math>\le 0.5</math> °C	---	---

**SAR result with Head TSL**

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	SAR measured	SAR for nominal Head TSL parameters
250 mW input power	14.6 W/kg	normalized to 1W	57.1 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	Condition	SAR measured	SAR for nominal Head TSL parameters
250 mW input power	6.46 W/kg	normalized to 1W	25.5 W/kg ± 16.5 % (k=2)

**Body TSL parameters**

The following parameters and calculations were applied:

Parameter	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.0	2.16 mho/m
Measured Body TSL parameters	22.0 ± 0.2 °C	51.4 ± 6 %	2.20 mho/m ± 6 %
Body TSL temperature change during test	<math>\le 0.5</math> °C	---	---

**SAR result with Body TSL**

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	SAR measured	SAR for nominal Body TSL parameters
100 mW input power	13.6 W/kg	normalized to 1W	53.7 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	Condition <td>SAR measured</td> <td>SAR for nominal Body TSL parameters</td>	SAR measured	SAR for nominal Body TSL parameters
100 mW input power	6.16 W/kg	normalized to 1W	24.1 W/kg ± 16.5 % (k=2)

**Appendix (Additional assessments outside the scope of SCS 0108)**

**Antenna Parameters with Head TSL**

Parameter	Value
Impedance, transformed to feed point	48.5 Ω ± 6.8 Ω
Return Loss	-23.0 dB

**Antenna Parameters with Body TSL**

Parameter	Value
Impedance, transformed to feed point	45.8 Ω ± 6.0 Ω
Return Loss	-22.3 dB

**General Antenna Parameters and Design**

Parameter	Value
Electrical Delay (one direction)	1.146 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 serrated 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**

Parameter	Value
Manufactured by	SPEAC
Manufactured on	March 15, 2014

D2600V2 Sn:1089

DASY5 Validation Report for Head TSL

Date: 11/07/2016

Test Laboratory: SPFAF, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1089

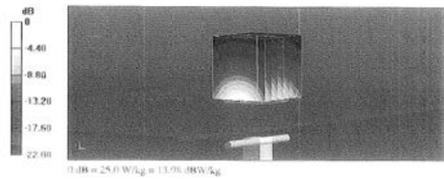
Communication System: UTD 0 - CW; Frequency: 2600 MHz  
Medium parameters used:  $f = 2600 \text{ MHz}$ ;  $n = 2.02 \text{ S/m}$ ;  $\epsilon = 37.5$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section  
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.56, 7.56); Calibrated: 15.06.2016
- Sensor Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 S2.8.8(1258); SEMCAD X 14.6.10(7372)

Dipole Calibration for Head Tissue(Pin=250 mW, d=10mm/Zoom Scan (7x7)/Cube 0):

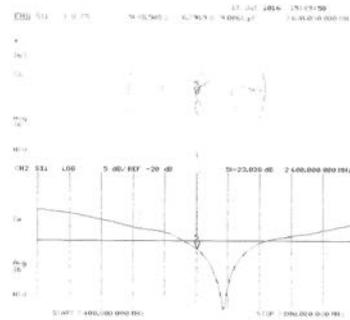
Measurement grid: dx=5mm, dy=5mm, dz=5mm  
Reference Value = 117.2 V/m; Power Drift = 0.01 dB  
Peak SAR (extrapolated) = 11.2 W/kg  
SAR(1 g) = 14.6 W/kg; SAR(10 g) = 6.46 W/kg  
Maximum value of SAR (measured) = 25.0 W/kg



File Name: D:\199\0701-1089\_110716

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Impedance Measurement Plot for Head TSL



File Name: D:\199\0701-1089\_110716

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DASY5 Validation Report for Body TSL

Date: 07/07/2016

Test Laboratory: SPFAF, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1089

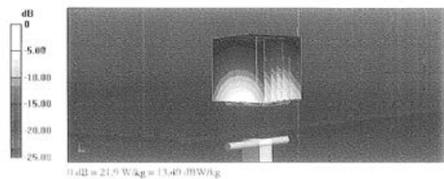
Communication System: UTD 0 - CW; Frequency: 2600 MHz  
Medium parameters used:  $f = 2600 \text{ MHz}$ ;  $n = 2.2 \text{ S/m}$ ;  $\epsilon = 51.4$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section  
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.48, 7.48); Calibrated: 15.06.2016
- Sensor Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 S2.8.8(1258); SEMCAD X 14.6.10(7372)

Dipole Calibration for Body Tissue(Pin=250 mW, d=10mm/Zoom Scan (7x7)/Cube 0):

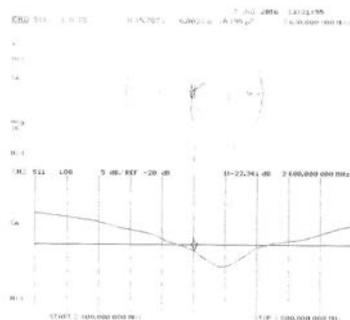
Measurement grid: dx=5mm, dy=5mm, dz=5mm  
Reference Value = 105.3 V/m; Power Drift = -0.07 dB  
Peak SAR (extrapolated) = 27.8 W/kg  
SAR(1 g) = 13.6 W/kg; SAR(10 g) = 6.06 W/kg  
Maximum value of SAR (measured) = 21.9 W/kg



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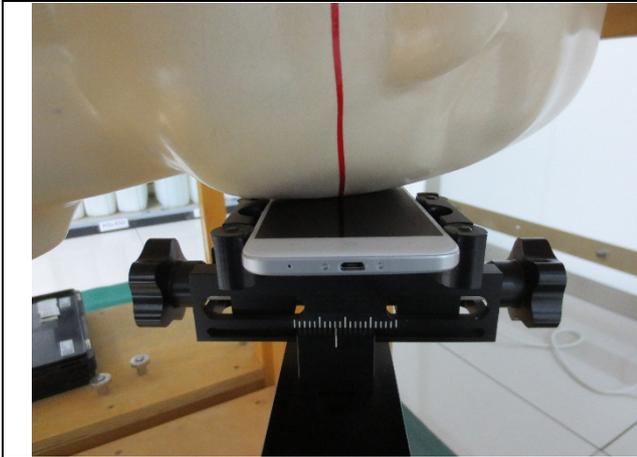
Impedance Measurement Plot for Body TSL



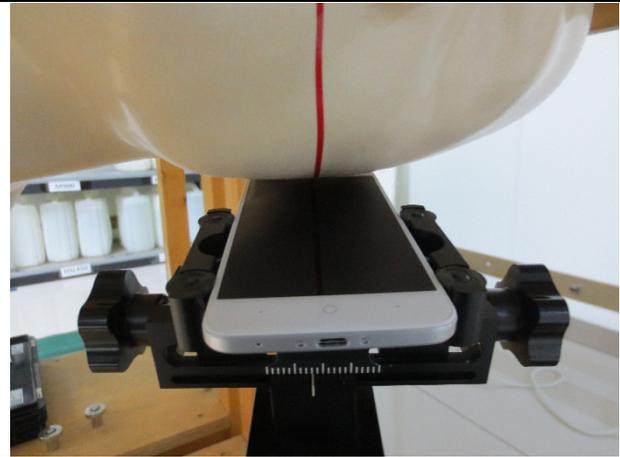
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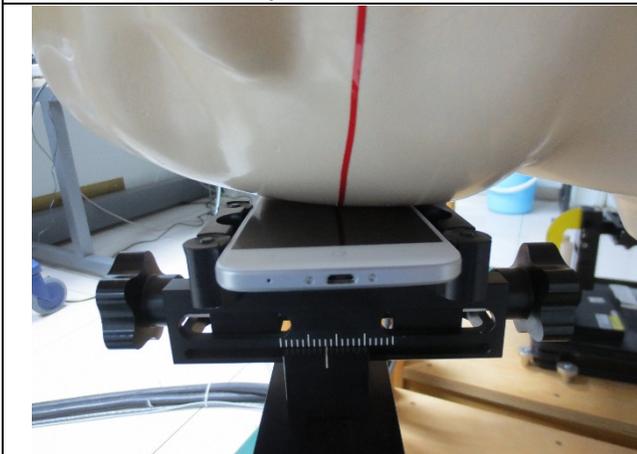
## ANNEX C - PHOTOGRAPH



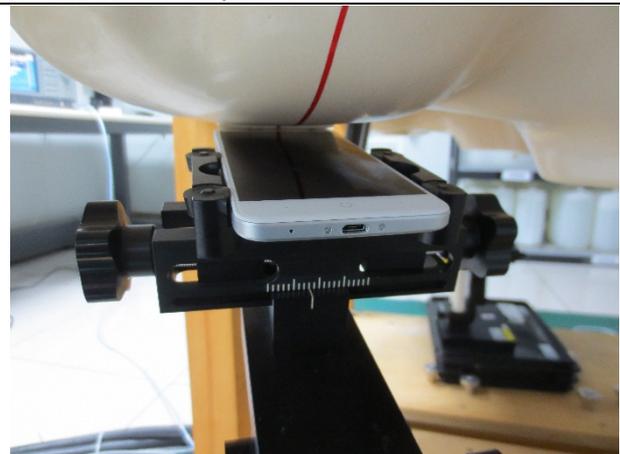
Cheek position, left side



Tilt position, left side



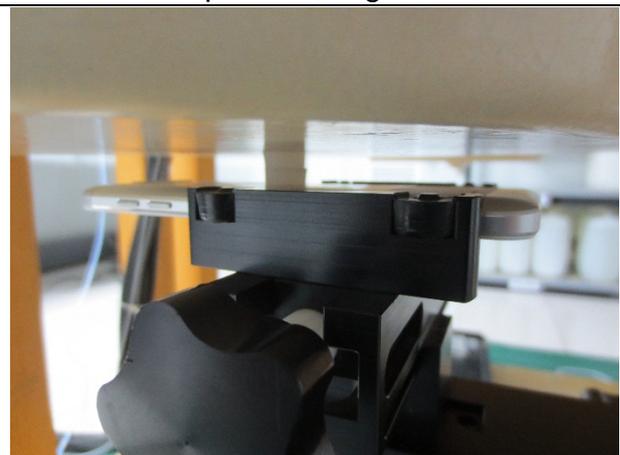
Cheek position, Right side



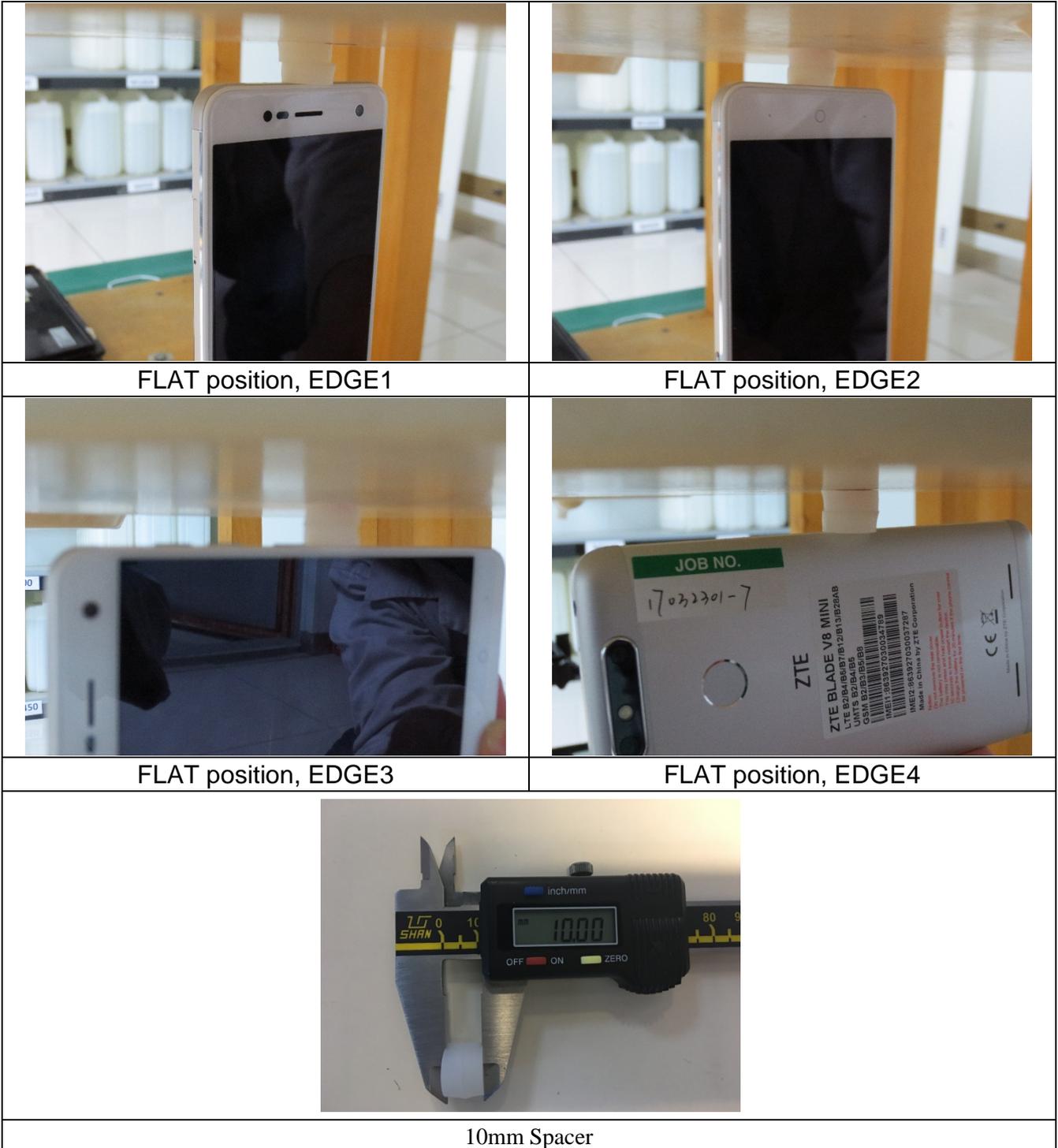
Tilt position, Right side



FLAT position, Towards phantom



FLAT position, Towards ground



---End of Test Report---