

## 12\_WLAN5GHz\_802.11n-HT20 MCS0\_Left Tilted\_Ch36

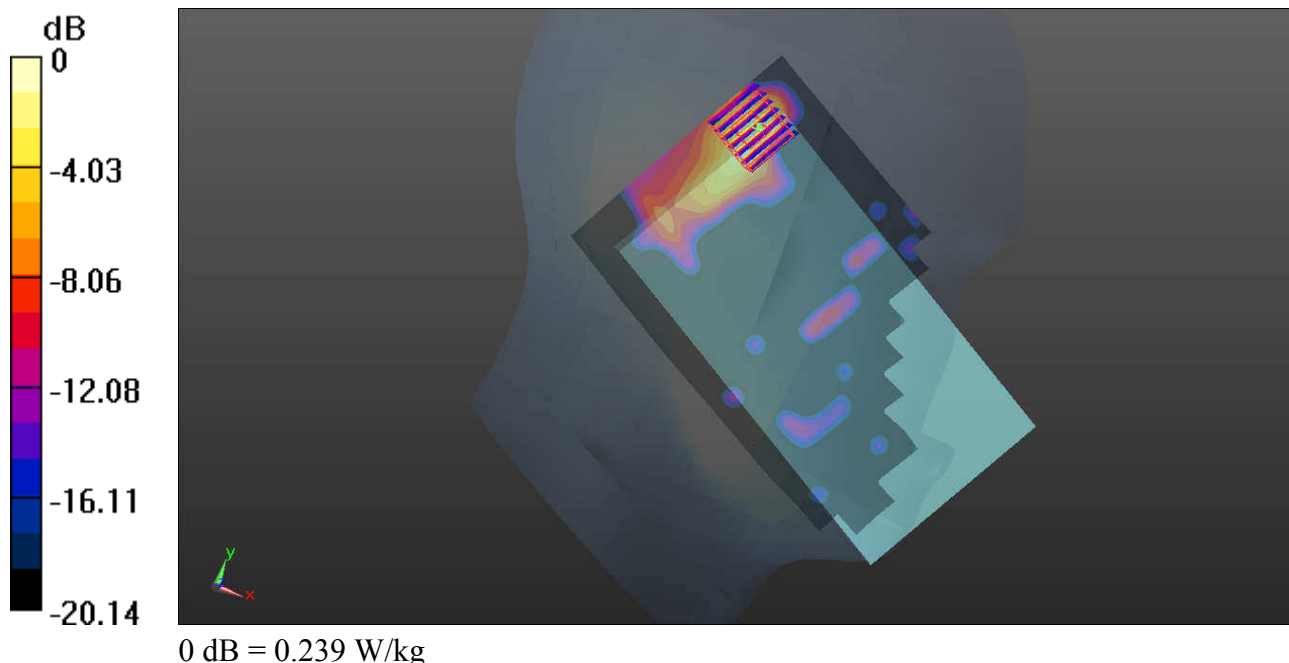
Communication System: UID 0, WIFI (0); Frequency: 5180 MHz; Duty Cycle: 1:1.155  
Medium: HSL\_5250\_160621 Medium parameters used:  $f = 5180$  MHz;  $\sigma = 4.684$  S/m;  $\epsilon_r = 37.155$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Ambient Temperature : 23.6 °C; Liquid Temperature : 22.8 °C

### DASY5 Configuration:

- Probe: EX3DV4 - SN3819; ConvF(4.99, 4.99, 4.99); Calibrated: 2015.11.27;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2015.11.23
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch36/Area Scan (111x191x1):** Interpolated grid: dx=10mm, dy=10mm  
Maximum value of SAR (interpolated) = 0.239 W/kg

**Ch36/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm  
Reference Value = 0.8310 V/m; Power Drift = -0.09 dB  
Peak SAR (extrapolated) = 0.403 W/kg  
**SAR(1 g) = 0.103 W/kg; SAR(10 g) = 0.036 W/kg**  
Maximum value of SAR (measured) = 0.236 W/kg



### 13\_WLAN5GHz\_802.11n-HT20 MCS0\_Left Cheek\_Ch157

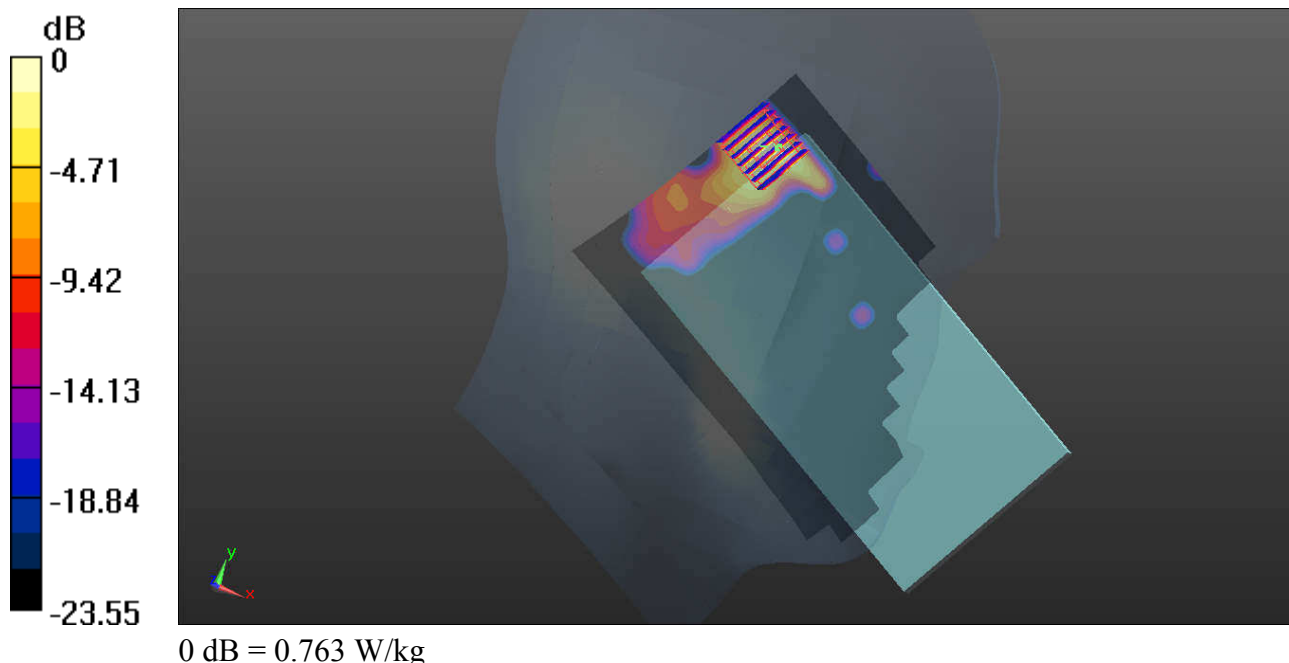
Communication System: UID 0, WIFI (0); Frequency: 5785 MHz; Duty Cycle: 1:1.155  
Medium: HSL\_5750\_160621 Medium parameters used:  $f = 5785$  MHz;  $\sigma = 5.419$  S/m;  $\epsilon_r = 35.836$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Ambient Temperature : 23.6 °C; Liquid Temperature : 22.9 °C

#### DASY5 Configuration:

- Probe: EX3DV4 - SN3819; ConvF(4.4, 4.4, 4.4); Calibrated: 2015.11.27;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2015.11.23
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch157/Area Scan (111x191x1):** Interpolated grid: dx=10mm, dy=10mm  
Maximum value of SAR (interpolated) = 0.763 W/kg

**Ch157/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm  
Reference Value = 1.371 V/m; Power Drift = -0.08 dB  
Peak SAR (extrapolated) = 1.57 W/kg  
**SAR(1 g) = 0.319 W/kg; SAR(10 g) = 0.098 W/kg**  
Maximum value of SAR (measured) = 0.828 W/kg



### 14\_GSM850\_GPRS(2 Tx slots)\_Back\_10mm\_Ch251

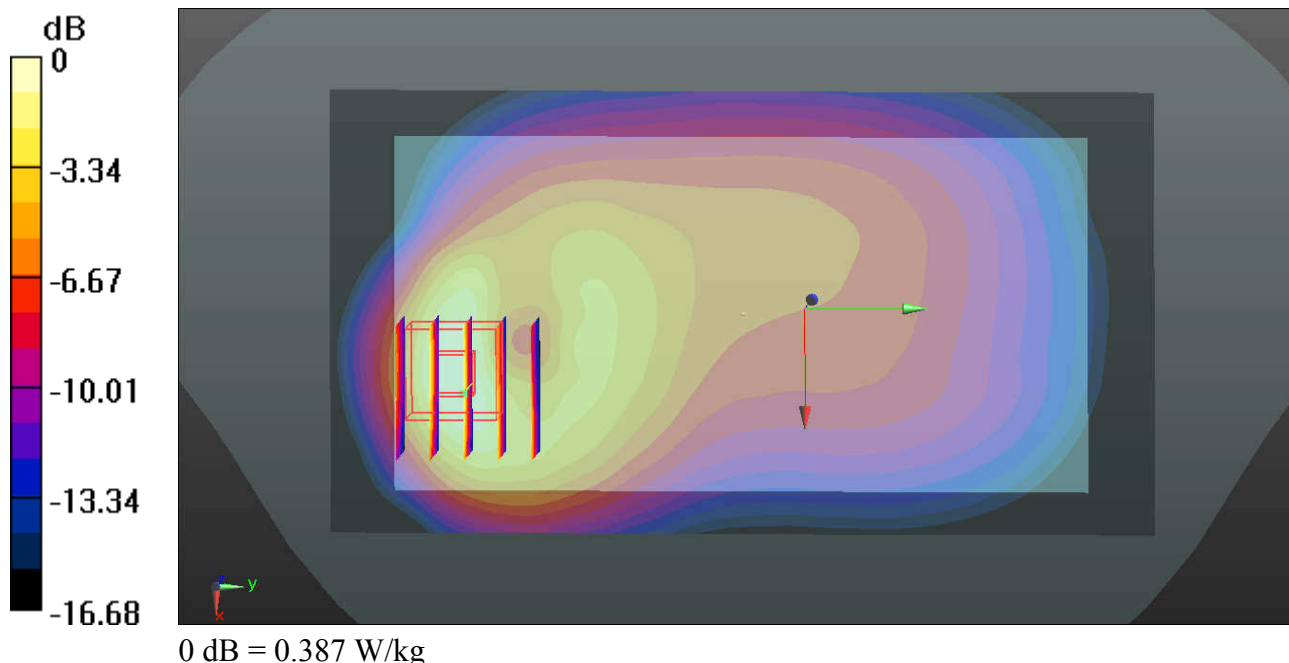
Communication System: UID 0, GPRS/EDGE10 (0); Frequency: 848.8 MHz; Duty Cycle: 1:4.15  
 Medium: MSL\_835\_160609 Medium parameters used:  $f = 848.8 \text{ MHz}$ ;  $\sigma = 1.026 \text{ S/m}$ ;  $\epsilon_r = 56.11$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Ambient Temperature : 23.4 °C; Liquid Temperature : 22.8 °C

**DASY5 Configuration:**

- Probe: EX3DV4 - SN3911; ConvF(9.8, 9.8, 9.8); Calibrated: 2015.10.01;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch251/Area Scan (71x131x1):** Interpolated grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.387 W/kg

**Ch251/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
 Reference Value = 0.7160 V/m; Power Drift = 0.12 dB  
 Peak SAR (extrapolated) = 0.489 W/kg  
**SAR(1 g) = 0.274 W/kg; SAR(10 g) = 0.146 W/kg**  
 Maximum value of SAR (measured) = 0.375 W/kg



### 15\_GSM1900\_GPRS(2 Tx slots)\_Back\_10mm\_Ch810

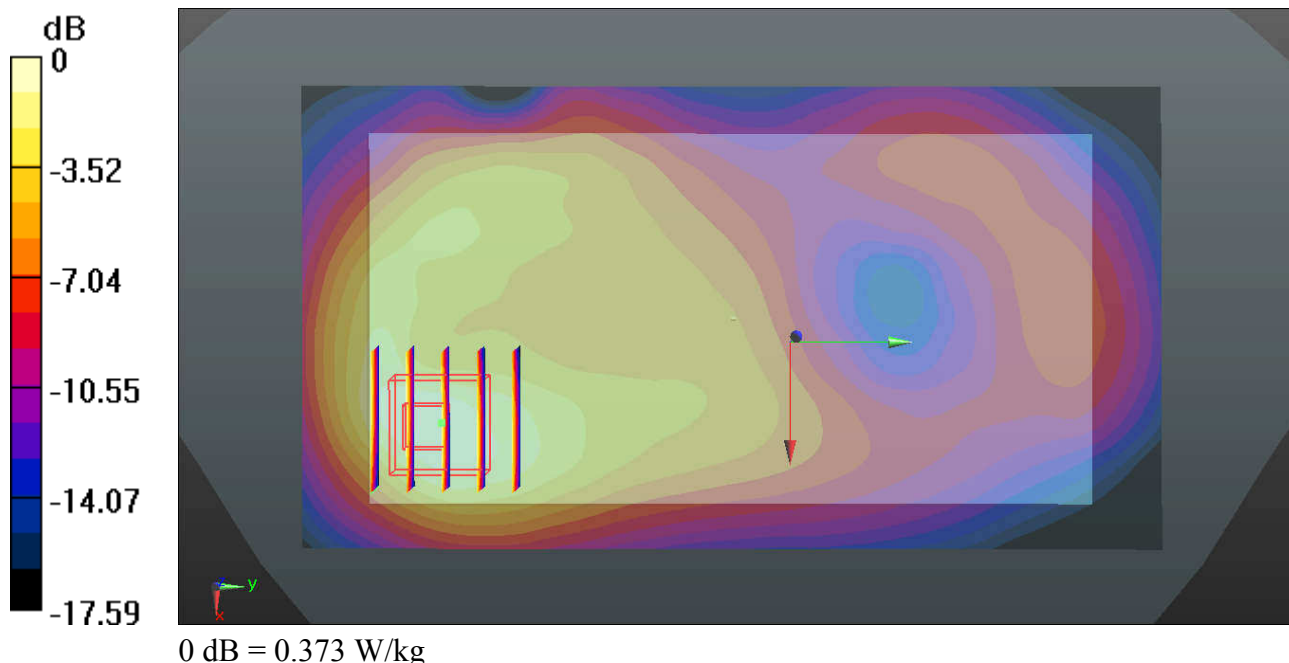
Communication System: UID 0, GPRS/EDGE10 (0); Frequency: 1909.8 MHz; Duty Cycle: 1:4.15  
Medium: MSL\_1900\_160617 Medium parameters used:  $f = 1909.8$  MHz;  $\sigma = 1.557$  S/m;  $\epsilon_r = 53.783$ ;  
 $\rho = 1000$  kg/m<sup>3</sup>  
Ambient Temperature : 23.5 °C; Liquid Temperature : 22.5 °C

#### DASY5 Configuration:

- Probe: EX3DV4 - SN3819; ConvF(7.39, 7.39, 7.39); Calibrated: 2015.11.27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2015.11.23
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch810/Area Scan (71x131x1):** Interpolated grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.373 W/kg

**Ch810/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 1.932 V/m; Power Drift = 0.08 dB  
Peak SAR (extrapolated) = 0.518 W/kg  
**SAR(1 g) = 0.292 W/kg; SAR(10 g) = 0.160 W/kg**  
Maximum value of SAR (measured) = 0.397 W/kg



## 16\_WCDMA V\_RMC 12.2Kbps\_Back\_10mm\_Ch4182

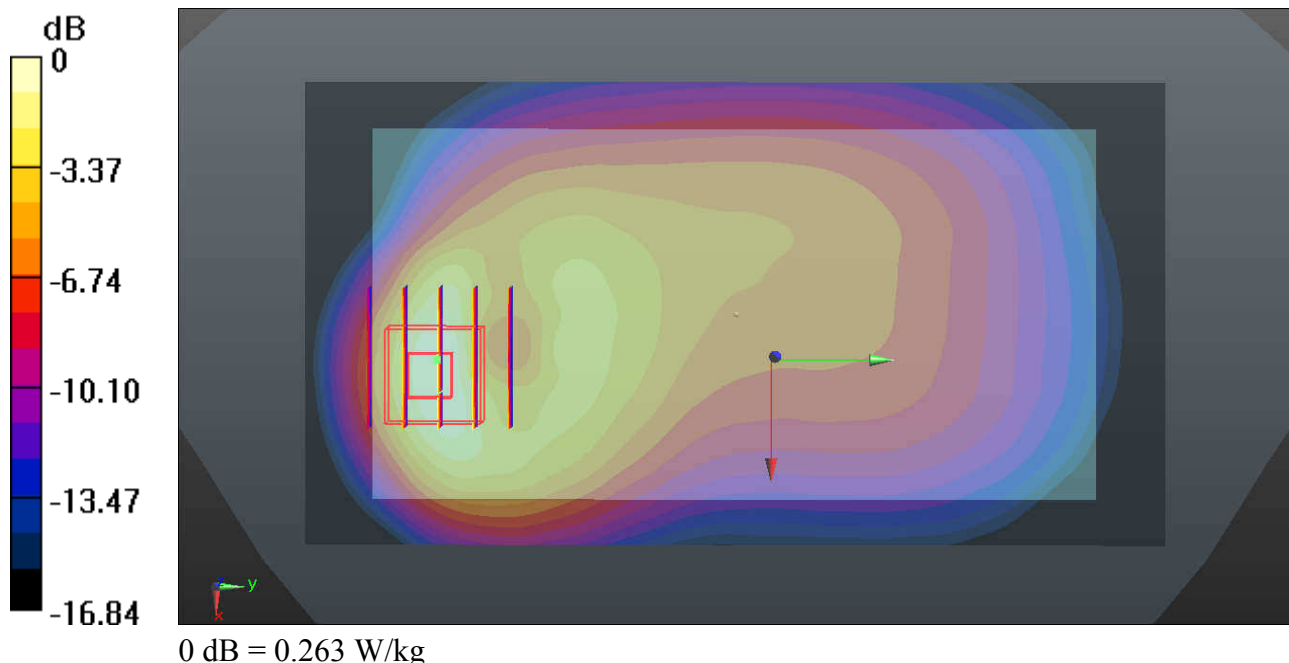
Communication System: UID 0, UMTS (0); Frequency: 836.4 MHz; Duty Cycle: 1:1  
 Medium: MSL\_835\_160609 Medium parameters used:  $f = 836.4$  MHz;  $\sigma = 1.013$  S/m;  $\epsilon_r = 56.228$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Ambient Temperature : 23.4 °C; Liquid Temperature : 22.8 °C

### DASY5 Configuration:

- Probe: EX3DV4 - SN3911; ConvF(9.8, 9.8, 9.8); Calibrated: 2015.10.01;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch4182/Area Scan (71x131x1):** Interpolated grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.263 W/kg

**Ch4182/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
 Reference Value = 0 V/m; Power Drift = 0.09 dB  
 Peak SAR (extrapolated) = 0.324 W/kg  
**SAR(1 g) = 0.182 W/kg; SAR(10 g) = 0.098 W/kg**  
 Maximum value of SAR (measured) = 0.258 W/kg



### 17\_WCDMA IV\_RMC 12.2Kbps\_Back\_10mm\_Ch1513

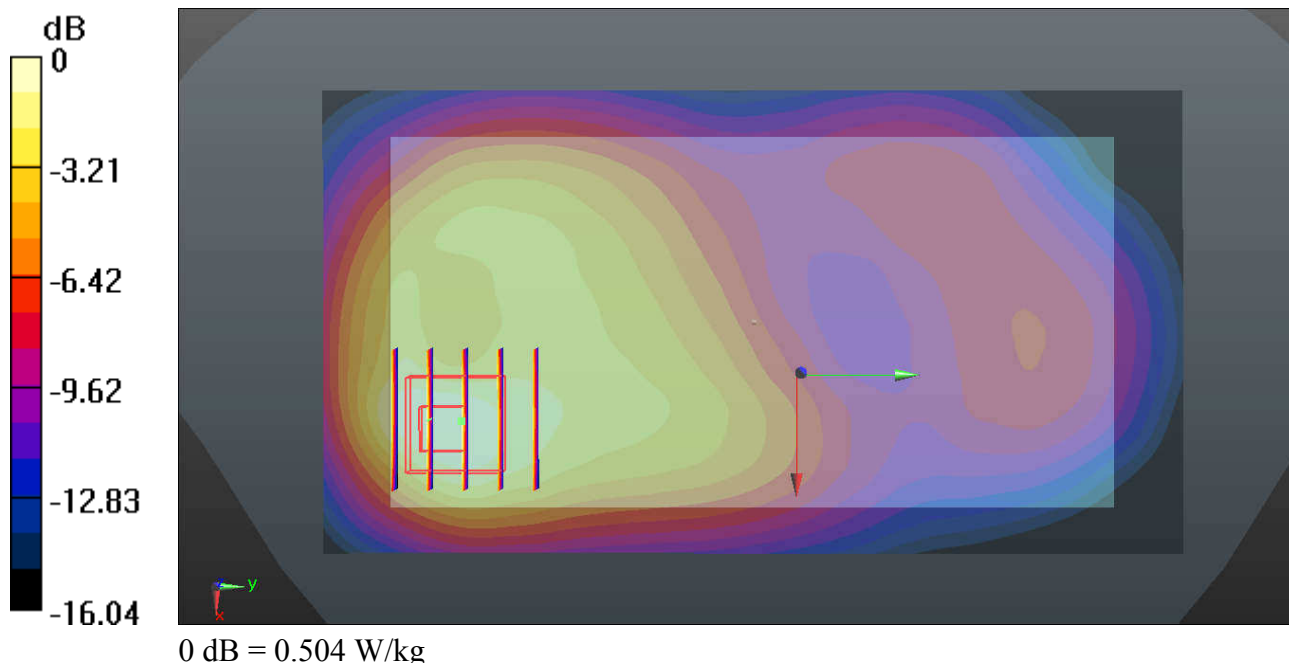
Communication System: UID 0, UMTS (0); Frequency: 1752.6 MHz; Duty Cycle: 1:1  
Medium: MSL\_1800\_160617 Medium parameters used:  $f = 1752.6$  MHz;  $\sigma = 1.517$  S/m;  $\epsilon_r = 53.568$ ;  
 $\rho = 1000$  kg/m<sup>3</sup>  
Ambient Temperature : 23.6 °C; Liquid Temperature : 22.5 °C

#### DASY5 Configuration:

- Probe: EX3DV4 - SN3819; ConvF(7.71, 7.71, 7.71); Calibrated: 2015.11.27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2015.11.23
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch1513/Area Scan (71x131x1):** Interpolated grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.504 W/kg

**Ch1513/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 2.681 V/m; Power Drift = 0.08 dB  
Peak SAR (extrapolated) = 0.661 W/kg  
**SAR(1 g) = 0.380 W/kg; SAR(10 g) = 0.215 W/kg**  
Maximum value of SAR (measured) = 0.517 W/kg



### 18\_WCDMA II\_RMC 12.2Kbps\_Back\_10mm\_Ch9538

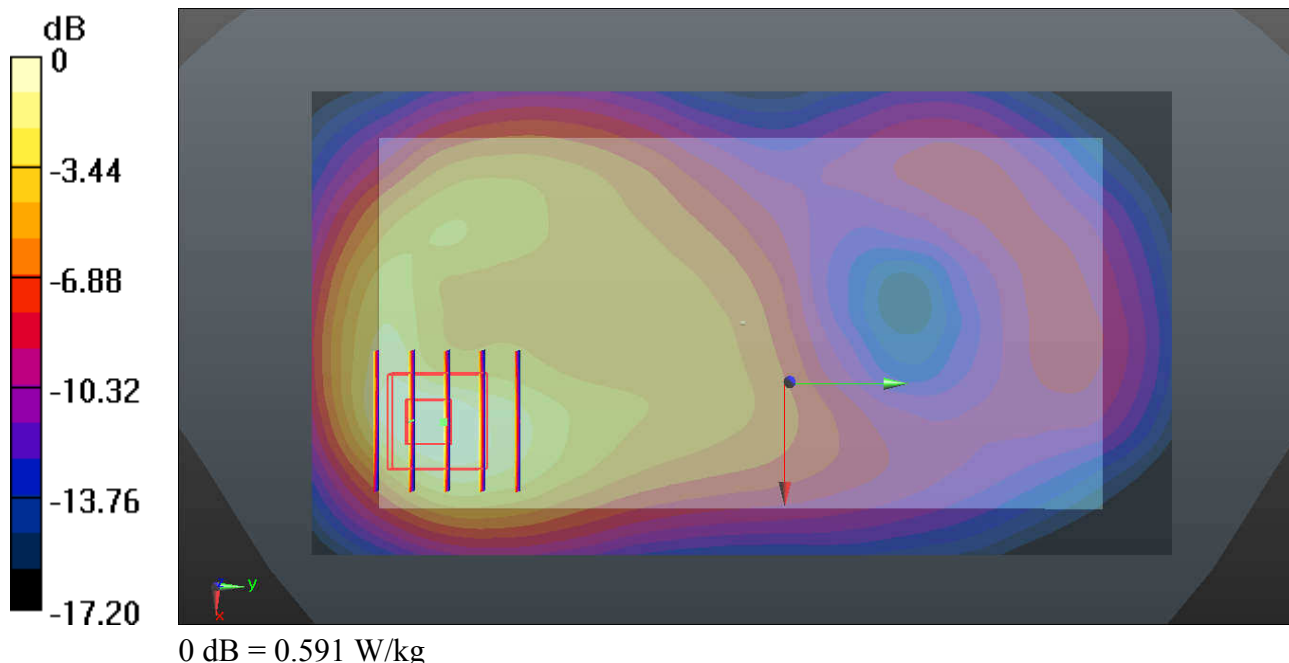
Communication System: UID 0, UMTS (0); Frequency: 1907.6 MHz; Duty Cycle: 1:1  
 Medium: MSL\_1900\_160617 Medium parameters used:  $f = 1907.6$  MHz;  $\sigma = 1.555$  S/m;  $\epsilon_r = 53.787$ ;  
 $\rho = 1000$  kg/m<sup>3</sup>  
 Ambient Temperature : 23.5 °C; Liquid Temperature : 22.5 °C

**DASY5 Configuration:**

- Probe: EX3DV4 - SN3819; ConvF(7.39, 7.39, 7.39); Calibrated: 2015.11.27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2015.11.23
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch9538/Area Scan (71x131x1):** Interpolated grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.591 W/kg

**Ch9538/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
 Reference Value = 2.607 V/m; Power Drift = -0.12 dB  
 Peak SAR (extrapolated) = 0.799 W/kg  
**SAR(1 g) = 0.439 W/kg; SAR(10 g) = 0.239 W/kg**  
 Maximum value of SAR (measured) = 0.606 W/kg



### 19\_LTE Band 12\_10M\_QPSK\_25RB\_0Offset\_Back\_10mm\_Ch23095

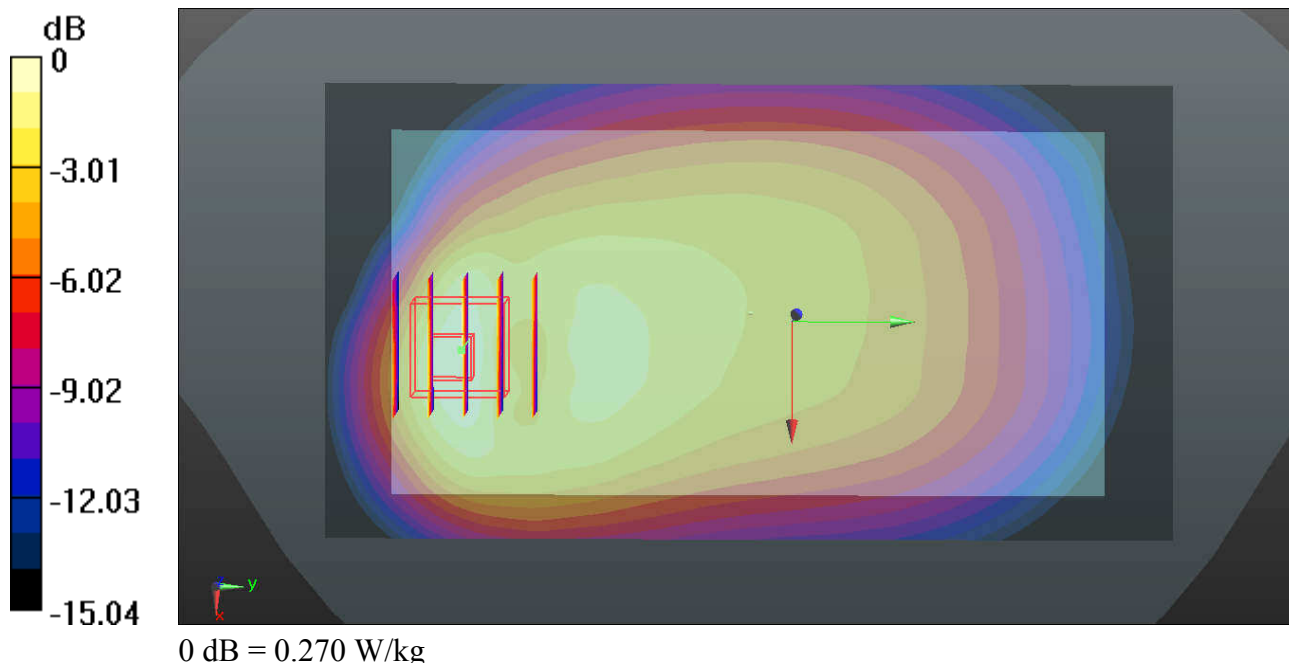
Communication System: UID 0, LTE (0); Frequency: 707.5 MHz; Duty Cycle: 1:1  
Medium: MSL\_750\_160609 Medium parameters used:  $f = 707.5$  MHz;  $\sigma = 0.931$  S/m;  $\epsilon_r = 54.883$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Ambient Temperature : 23.4 °C; Liquid Temperature : 22.7 °C

#### DASY5 Configuration:

- Probe: EX3DV4 - SN3911; ConvF(10.08, 10.08, 10.08); Calibrated: 2015.10.01;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch23095/Area Scan (71x131x1):** Interpolated grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.270 W/kg

**Ch23095/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 0.8470 V/m; Power Drift = 0.01 dB  
Peak SAR (extrapolated) = 0.323 W/kg  
**SAR(1 g) = 0.187 W/kg; SAR(10 g) = 0.107 W/kg**  
Maximum value of SAR (measured) = 0.252 W/kg



## 20\_LTE Band 5\_10M\_QPSK\_25RB\_0Offset\_Back\_10mm\_Ch20525

Communication System: UID 0, LTE (0); Frequency: 836.5 MHz; Duty Cycle: 1:1

Medium: MSL\_835\_160617 Medium parameters used:  $f = 836.5$  MHz;  $\sigma = 0.976$  S/m;  $\epsilon_r = 54.189$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.2 °C; Liquid Temperature : 22.9 °C

### DASY5 Configuration:

- Probe: EX3DV4 - SN3819; ConvF(9.47, 9.47, 9.47); Calibrated: 2015.11.27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2015.11.23
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch20525/Area Scan (71x131x1):** Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.381 W/kg

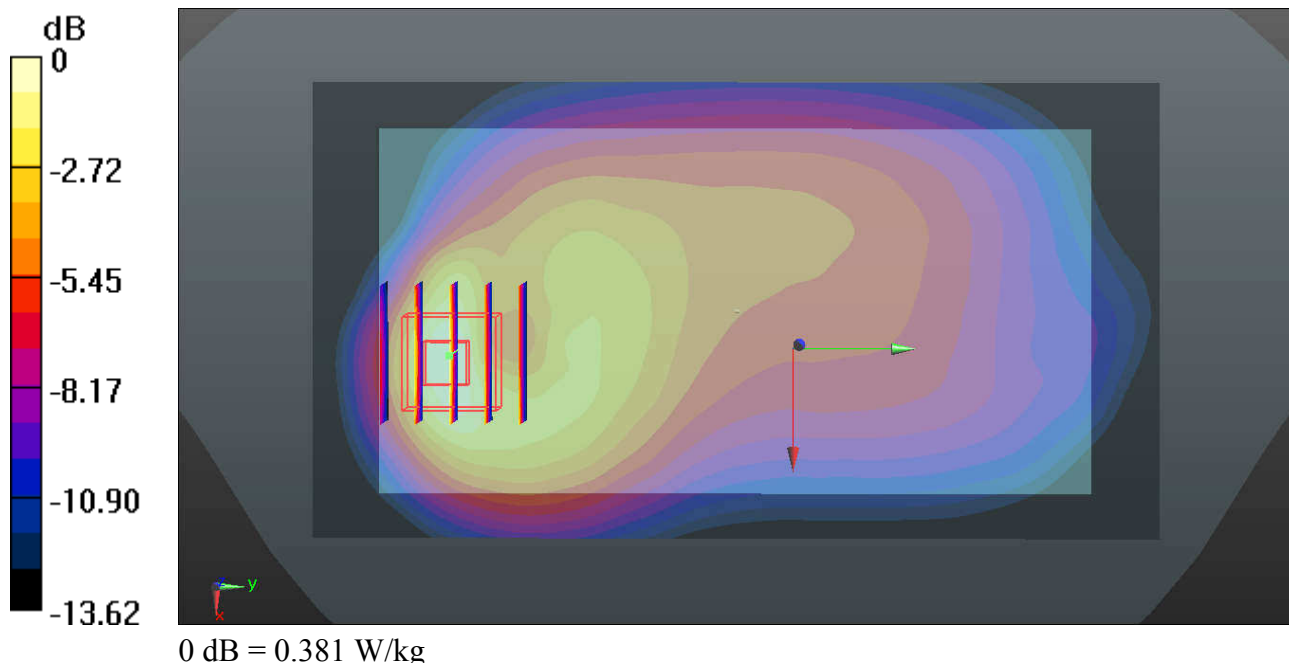
**Ch20525/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 1.796 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.452 W/kg

**SAR(1 g) = 0.265 W/kg; SAR(10 g) = 0.149 W/kg**

Maximum value of SAR (measured) = 0.372 W/kg



### 21\_LTE Band 4\_20M\_QPSK\_1RB\_49Offset\_Back\_10mm\_Ch20175

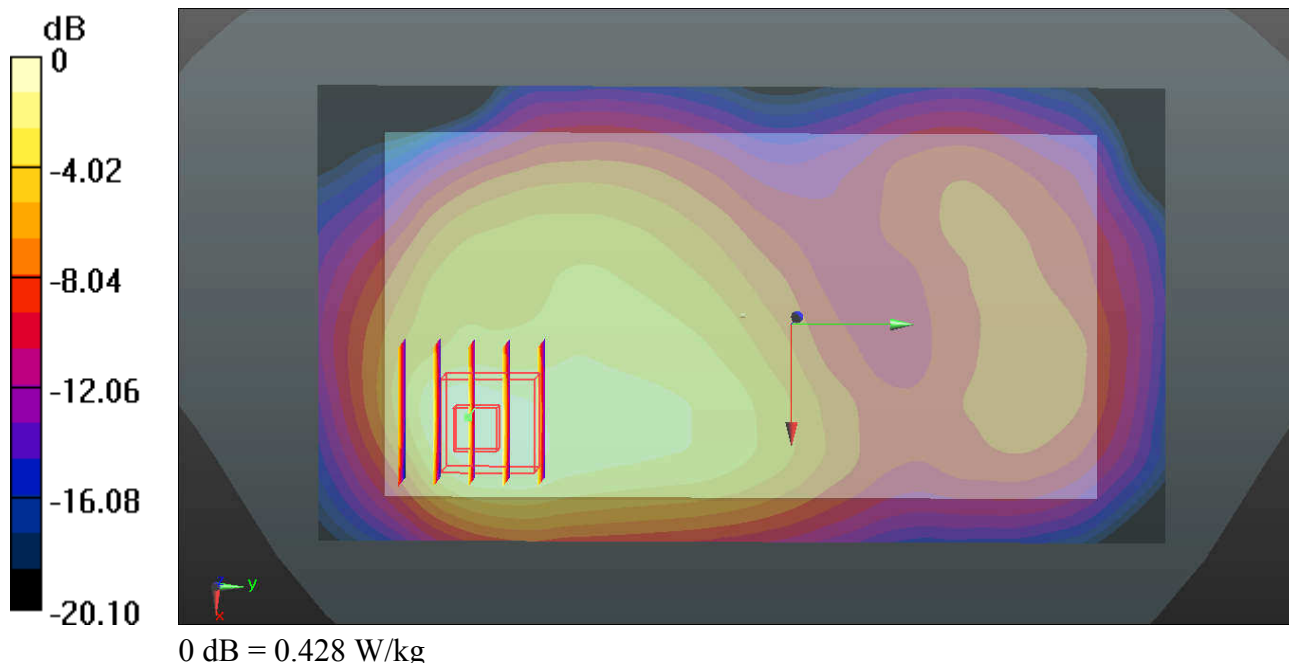
Communication System: UID 0, LTE (0); Frequency: 1732.5 MHz; Duty Cycle: 1:1  
Medium: MSL\_1800\_160613 Medium parameters used:  $f = 1732.5$  MHz;  $\sigma = 1.507$  S/m;  $\epsilon_r = 52.655$ ;  
 $\rho = 1000$  kg/m<sup>3</sup>  
Ambient Temperature : 23.3 °C; Liquid Temperature : 22.8 °C

#### DASY5 Configuration:

- Probe: EX3DV4 - SN3911; ConvF(8.01, 8.01, 8.01); Calibrated: 2015.10.01;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch20175/Area Scan (71x131x1):** Interpolated grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.428 W/kg

**Ch20175/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 0.8990 V/m; Power Drift = 0.10 dB  
Peak SAR (extrapolated) = 0.571 W/kg  
**SAR(1 g) = 0.332 W/kg; SAR(10 g) = 0.189 W/kg**  
Maximum value of SAR (measured) = 0.443 W/kg



## 22\_LTE Band 2\_20M\_QPSK\_50RB\_24Offset\_Back\_10mm\_Ch18900

Communication System: UID 0, LTE (0); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: MSL\_1900\_160613 Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.513$  S/m;  $\epsilon_r = 53.825$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.3 °C; Liquid Temperature : 22.7 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3911; ConvF(7.75, 7.75, 7.75); Calibrated: 2015.10.01;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch18900/Area Scan (71x131x1):** Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.581 W/kg

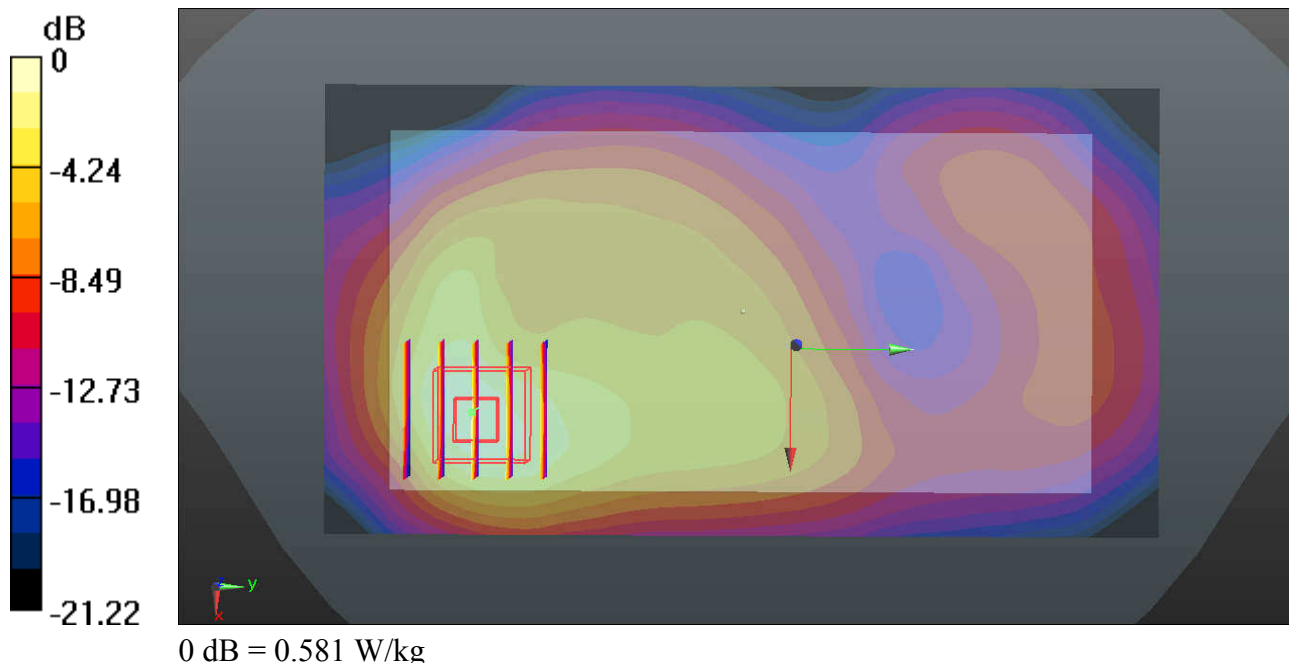
**Ch18900/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.9940 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.719 W/kg

**SAR(1 g) = 0.398 W/kg; SAR(10 g) = 0.215 W/kg**

Maximum value of SAR (measured) = 0.558 W/kg



### 23\_LTE Band 7\_20M\_QPSK\_1RB\_0Offset\_Bottom Side\_10mm\_Ch21350

Communication System: UID 0, LTE (0); Frequency: 2560 MHz; Duty Cycle: 1:1

Medium: MSL\_2600\_160612 Medium parameters used:  $f = 2560$  MHz;  $\sigma = 2.129$  S/m;  $\epsilon_r = 51.064$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.2 °C; Liquid Temperature : 22.6 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3911; ConvF(7.14, 7.14, 7.14); Calibrated: 2015.10.01;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch21350/Area Scan (41x91x1):** Interpolated grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 0.160 W/kg

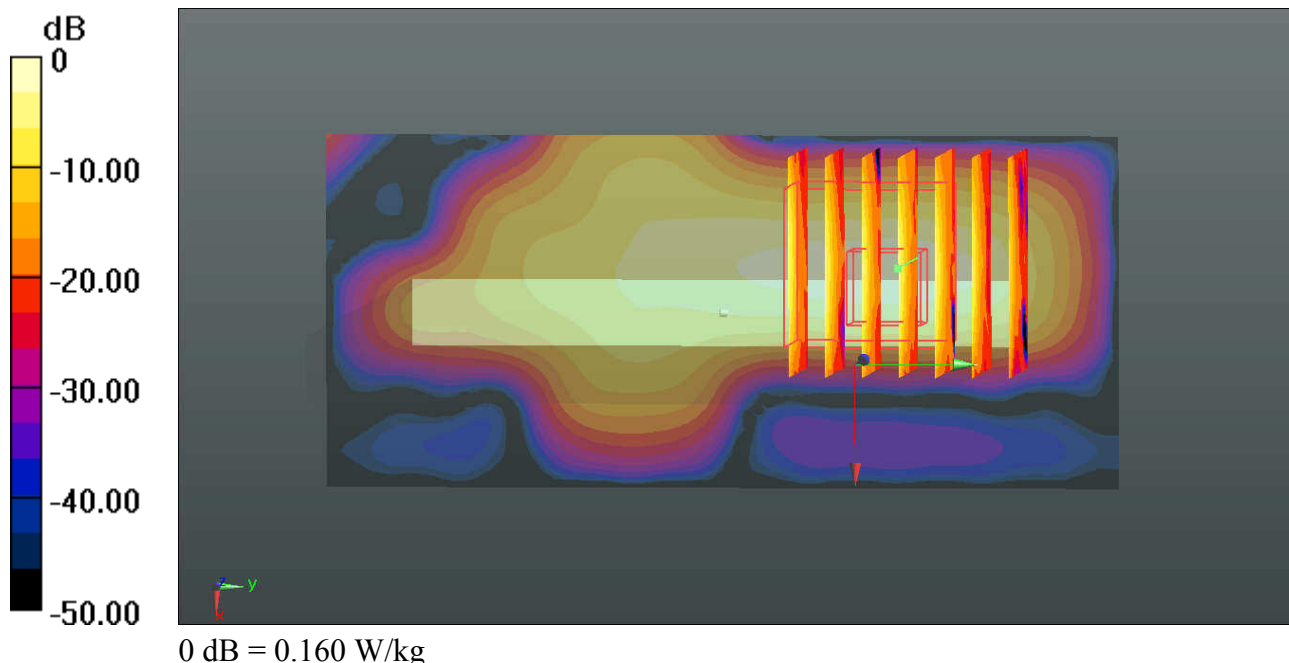
**Ch21350/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.9940 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 0.124 W/kg

**SAR(1 g) = 0.044 W/kg; SAR(10 g) = 0.018 W/kg**

Maximum value of SAR (measured) = 0.0673 W/kg



## 24\_WLAN2.4GHz\_802.11b 1Mbps\_Back\_10mm\_Ch6

Communication System: UID 0, WIFI (0); Frequency: 2437 MHz; Duty Cycle: 1:1.022  
 Medium: MSL\_2450\_160619 Medium parameters used:  $f = 2437$  MHz;  $\sigma = 1.949$  S/m;  $\epsilon_r = 54.149$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Ambient Temperature : 23.7 °C; Liquid Temperature : 22.5 °C

### DASY5 Configuration:

- Probe: EX3DV4 - SN3819; ConvF(7.08, 7.08, 7.08); Calibrated: 2015.11.27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2015.11.23
- Phantom: SAM 3; Type: QD000P40CC; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch6/Area Scan (91x161x1):** Interpolated grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 0.112 W/kg

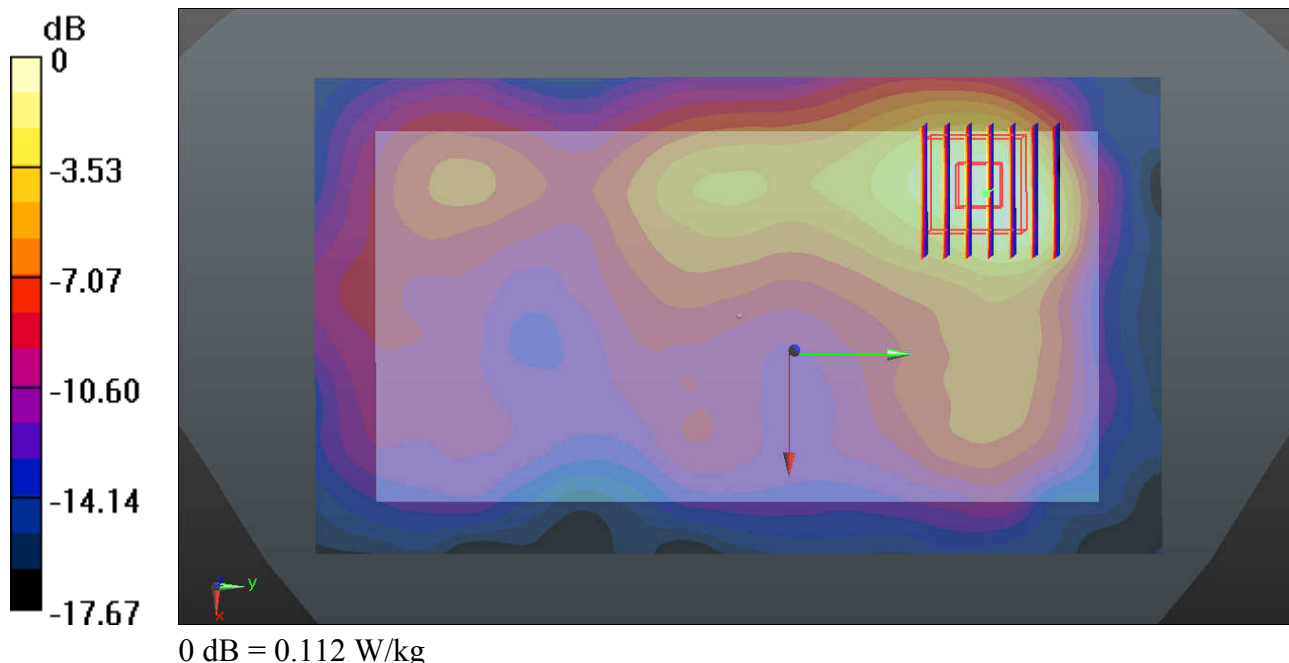
**Ch6/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 1.029 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.153 W/kg

**SAR(1 g) = 0.075 W/kg; SAR(10 g) = 0.038 W/kg**

Maximum value of SAR (measured) = 0.111 W/kg



## 25\_WLAN5GHz\_802.11n-HT20 MCS0\_Back\_10mm\_Ch36

Communication System: UID 0, WIFI (0); Frequency: 5180 MHz; Duty Cycle: 1:1.155

Medium: MSL\_5250\_160621 Medium parameters used:  $f = 5180$  MHz;  $\sigma = 5.183$  S/m;  $\epsilon_r = 51.08$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.8 °C; Liquid Temperature : 22.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3819; ConvF(4.2, 4.2, 4.2); Calibrated: 2015.11.27;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2015.11.23
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch36/Area Scan (111x191x1):** Interpolated grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.306 W/kg

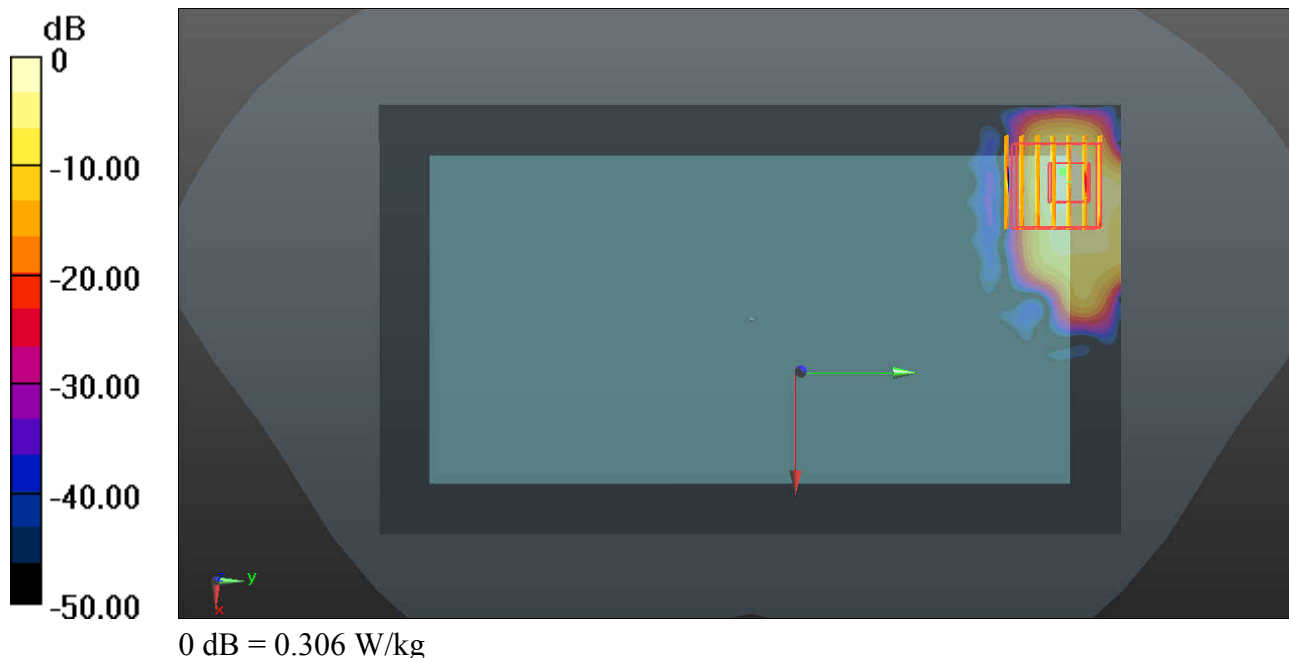
**Ch36/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 1.106 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 0.335 W/kg

**SAR(1 g) = 0.060 W/kg; SAR(10 g) = 0.017 W/kg**

Maximum value of SAR (measured) = 0.164 W/kg



## 26\_WLAN5GHz\_802.11n-HT20 MCS0\_Back\_10mm\_Ch157

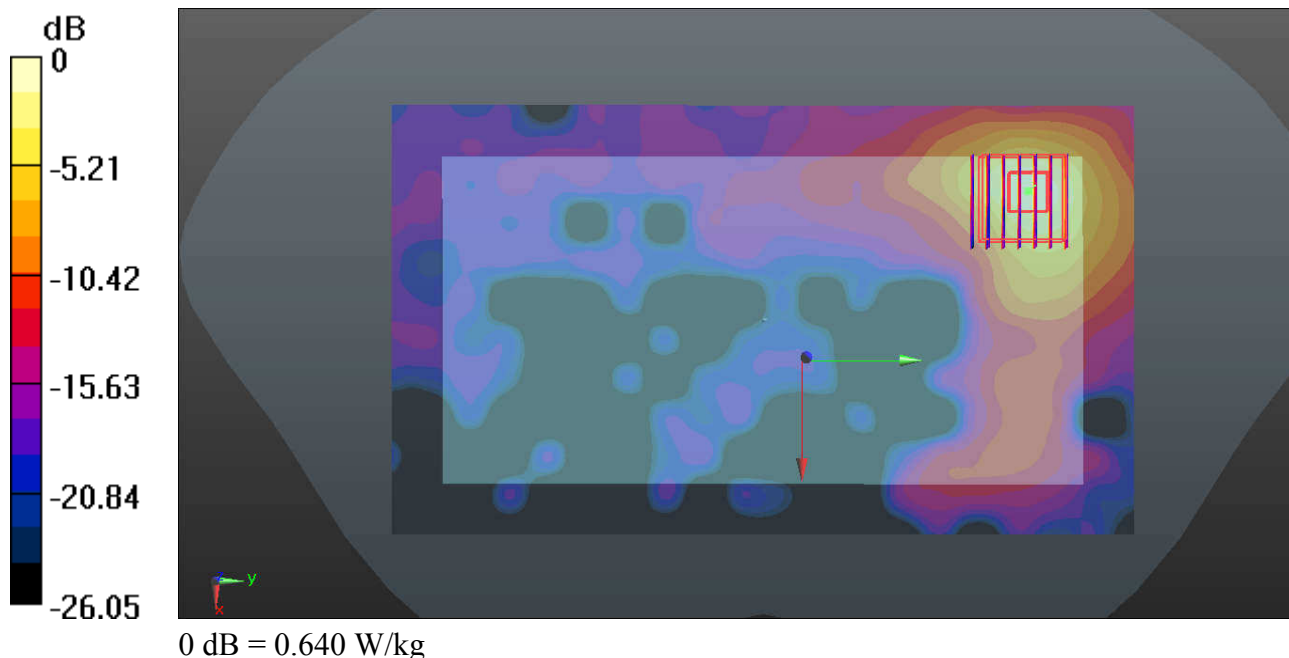
Communication System: UID 0, WIFI (0); Frequency: 5785 MHz; Duty Cycle: 1:1.155  
Medium: MSL\_5750\_160621 Medium parameters used:  $f = 5785$  MHz;  $\sigma = 6.191$  S/m;  $\epsilon_r = 49.901$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Ambient Temperature : 23.8 °C; Liquid Temperature : 22.6 °C

### DASY5 Configuration:

- Probe: EX3DV4 - SN3819; ConvF(3.73, 3.73, 3.73); Calibrated: 2015.11.27;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2015.11.23
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch157/Area Scan (111x191x1):** Interpolated grid: dx=10mm, dy=10mm  
Maximum value of SAR (interpolated) = 0.640 W/kg

**Ch157/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm  
Reference Value = 1.010 V/m; Power Drift = 0.13 dB  
Peak SAR (extrapolated) = 1.07 W/kg  
**SAR(1 g) = 0.278 W/kg; SAR(10 g) = 0.089 W/kg**  
Maximum value of SAR (measured) = 0.649 W/kg



### 27\_GSM850\_GPRS(2 Tx slots)\_Back\_15mm\_Ch251

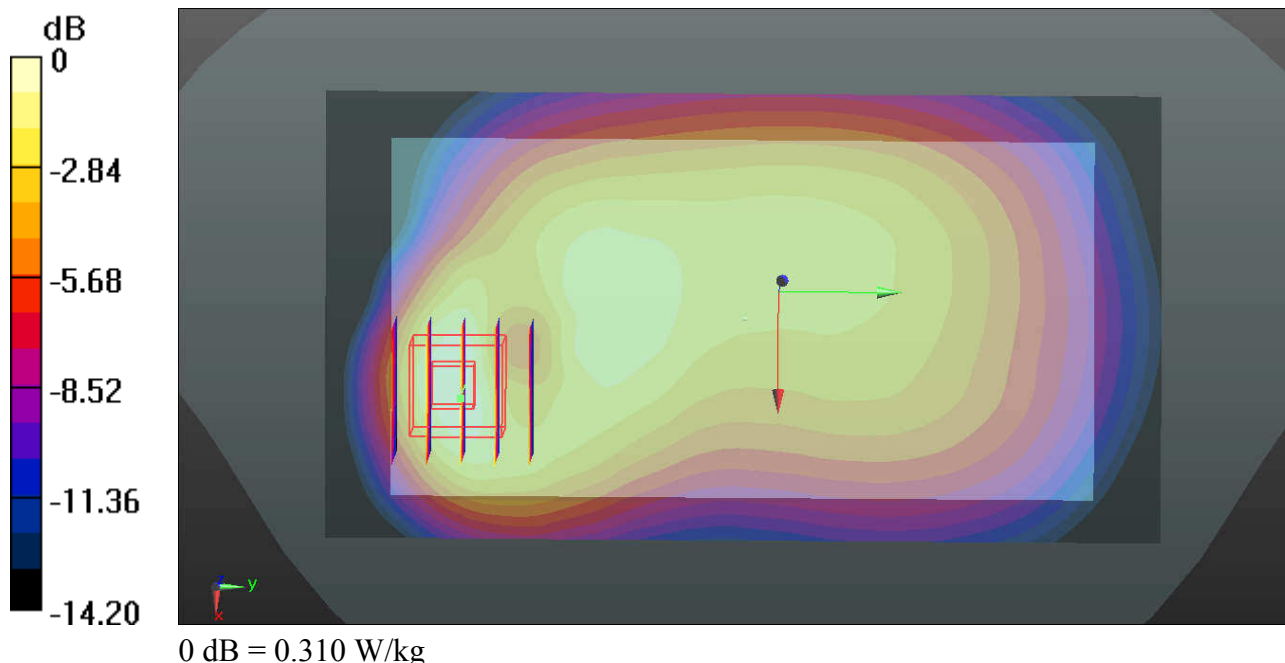
Communication System: UID 0, GPRS/EDGE10 (0); Frequency: 848.8 MHz; Duty Cycle: 1:4.15  
 Medium: MSL\_835\_160609 Medium parameters used:  $f = 848.8$  MHz;  $\sigma = 1.026$  S/m;  $\epsilon_r = 56.11$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Ambient Temperature : 23.4 °C; Liquid Temperature : 22.8 °C

**DASY5 Configuration:**

- Probe: EX3DV4 - SN3911; ConvF(9.8, 9.8, 9.8); Calibrated: 2015.10.01;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch251/Area Scan (71x131x1):** Interpolated grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.310 W/kg

**Ch251/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
 Reference Value = 1.160 V/m; Power Drift = -0.07 dB  
 Peak SAR (extrapolated) = 0.372 W/kg  
**SAR(1 g) = 0.230 W/kg; SAR(10 g) = 0.132 W/kg**  
 Maximum value of SAR (measured) = 0.305 W/kg



### 28\_GSM1900\_GPRS(2 Tx slots)\_Back\_15mm\_Ch810

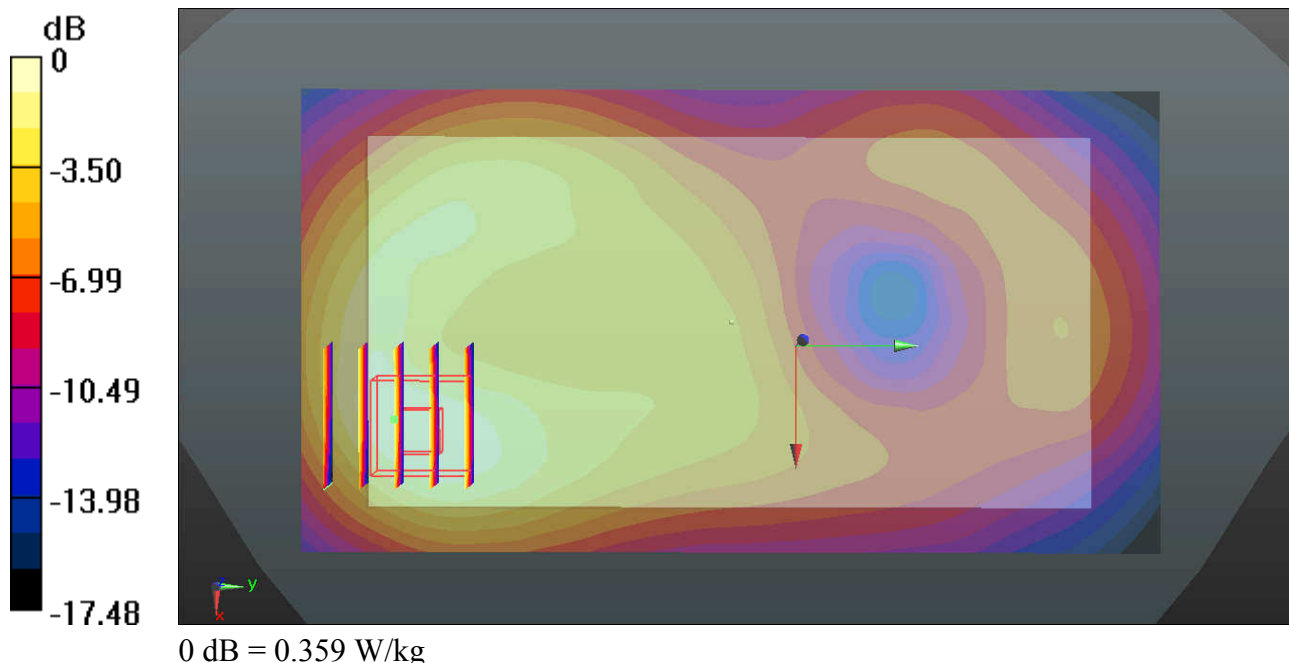
Communication System: UID 0, GPRS/EDGE10 (0); Frequency: 1909.8 MHz; Duty Cycle: 1:4.15  
Medium: MSL\_1900\_160617 Medium parameters used:  $f = 1909.8$  MHz;  $\sigma = 1.557$  S/m;  $\epsilon_r = 53.783$ ;  
 $\rho = 1000$  kg/m<sup>3</sup>  
Ambient Temperature : 23.5 °C; Liquid Temperature : 22.5 °C

#### DASY5 Configuration:

- Probe: EX3DV4 - SN3819; ConvF(7.39, 7.39, 7.39); Calibrated: 2015.11.27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2015.11.23
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch810/Area Scan (71x131x1):** Interpolated grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.359 W/kg

**Ch810/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 2.913 V/m; Power Drift = 0.09 dB  
Peak SAR (extrapolated) = 0.462 W/kg  
**SAR(1 g) = 0.274 W/kg; SAR(10 g) = 0.159 W/kg**  
Maximum value of SAR (measured) = 0.360 W/kg



## 29\_WCDMA V\_RMC 12.2Kbps\_Back\_15mm\_Ch4182

Communication System: UID 0, UMTS (0); Frequency: 836.4 MHz; Duty Cycle: 1:1  
 Medium: MSL\_835\_160609 Medium parameters used:  $f = 836.4$  MHz;  $\sigma = 1.013$  S/m;  $\epsilon_r = 56.228$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Ambient Temperature : 23.4 °C; Liquid Temperature : 22.8 °C

### DASY5 Configuration:

- Probe: EX3DV4 - SN3911; ConvF(9.8, 9.8, 9.8); Calibrated: 2015.10.01;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch4182/Area Scan (71x131x1):** Interpolated grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.350 W/kg

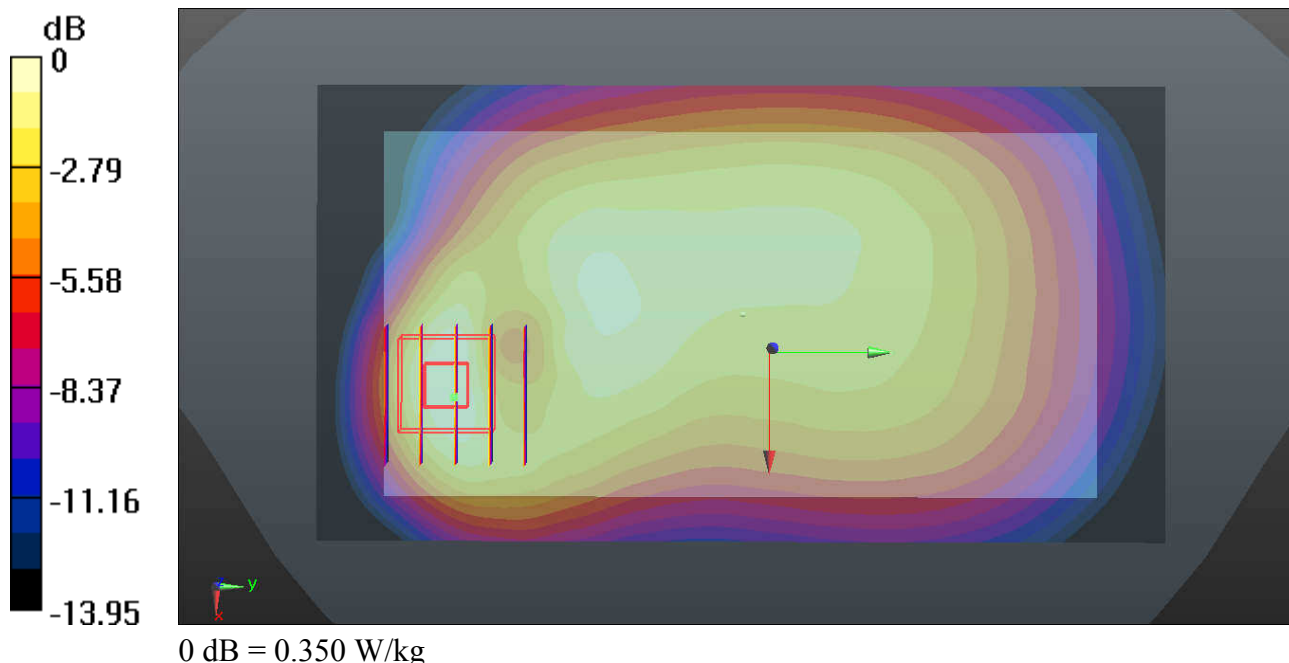
**Ch4182/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 1.211 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 0.426 W/kg

**SAR(1 g) = 0.262 W/kg; SAR(10 g) = 0.151 W/kg**

Maximum value of SAR (measured) = 0.347 W/kg



### 30\_WCDMA IV\_RMC 12.2Kbps\_Back\_15mm\_Ch1513

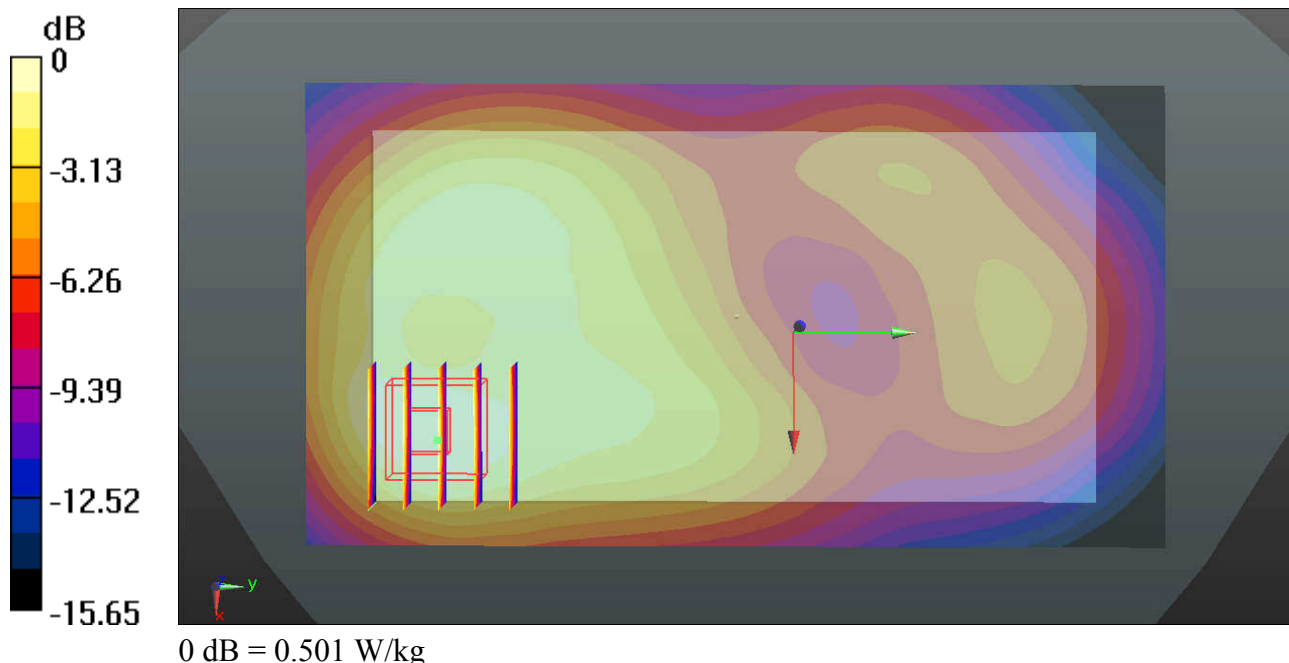
Communication System: UID 0, UMTS (0); Frequency: 1752.6 MHz; Duty Cycle: 1:1  
 Medium: MSL\_1800\_160617 Medium parameters used:  $f = 1752.6$  MHz;  $\sigma = 1.517$  S/m;  $\epsilon_r = 53.568$ ;  
 $\rho = 1000$  kg/m<sup>3</sup>  
 Ambient Temperature : 23.6 °C; Liquid Temperature : 22.5 °C

**DASY5 Configuration:**

- Probe: EX3DV4 - SN3819; ConvF(7.71, 7.71, 7.71); Calibrated: 2015.11.27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2015.11.23
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch1513/Area Scan (71x131x1):** Interpolated grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.501 W/kg

**Ch1513/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
 Reference Value = 4.148 V/m; Power Drift = 0.12 dB  
 Peak SAR (extrapolated) = 0.647 W/kg  
**SAR(1 g) = 0.397 W/kg; SAR(10 g) = 0.238 W/kg**  
 Maximum value of SAR (measured) = 0.520 W/kg



### 31\_WCDMA II\_RMC 12.2Kbps\_Back\_15mm\_Ch9538

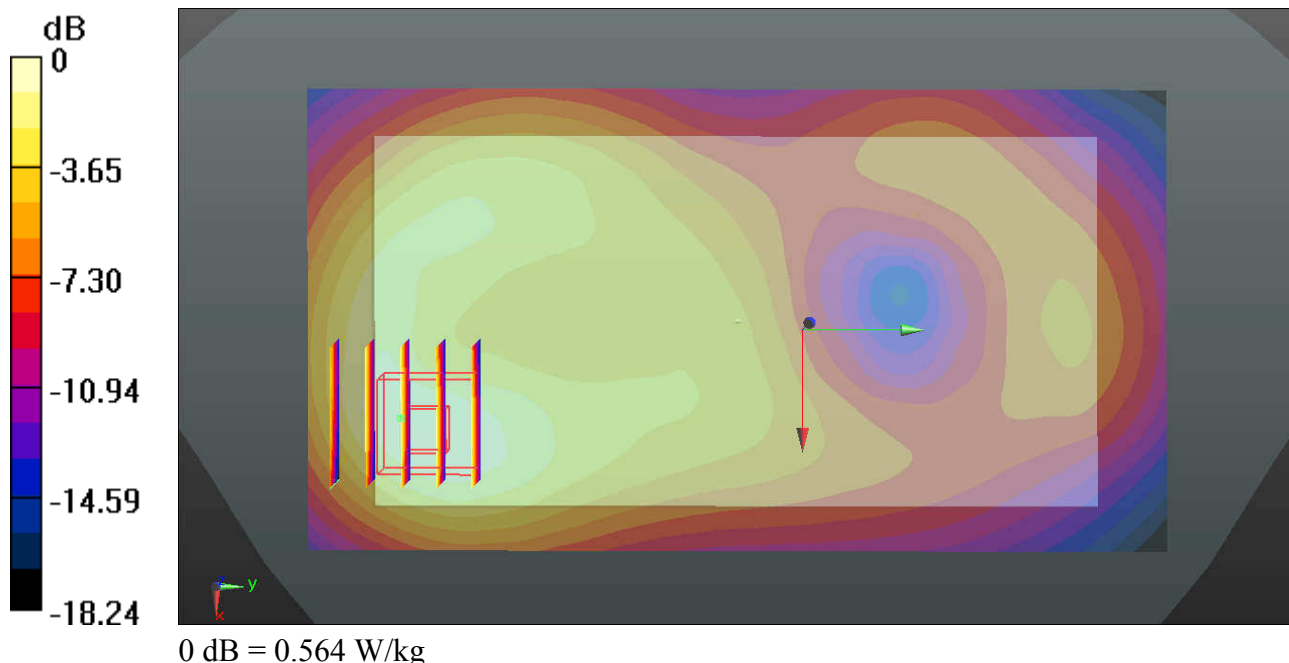
Communication System: UID 0, UMTS (0); Frequency: 1907.6 MHz; Duty Cycle: 1:1  
Medium: MSL\_1900\_160617 Medium parameters used:  $f = 1907.6$  MHz;  $\sigma = 1.555$  S/m;  $\epsilon_r = 53.787$ ;  
 $\rho = 1000$  kg/m<sup>3</sup>  
Ambient Temperature : 23.5 °C; Liquid Temperature : 22.5 °C

#### DASY5 Configuration:

- Probe: EX3DV4 - SN3819; ConvF(7.39, 7.39, 7.39); Calibrated: 2015.11.27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2015.11.23
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch9538/Area Scan (71x131x1):** Interpolated grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.564 W/kg

**Ch9538/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 3.640 V/m; Power Drift = 0.17 dB  
Peak SAR (extrapolated) = 0.722 W/kg  
**SAR(1 g) = 0.430 W/kg; SAR(10 g) = 0.249 W/kg**  
Maximum value of SAR (measured) = 0.563 W/kg



### 32\_LTE Band 12\_10M\_QPSK\_1RB\_25Offset\_Back\_15mm\_Ch23095

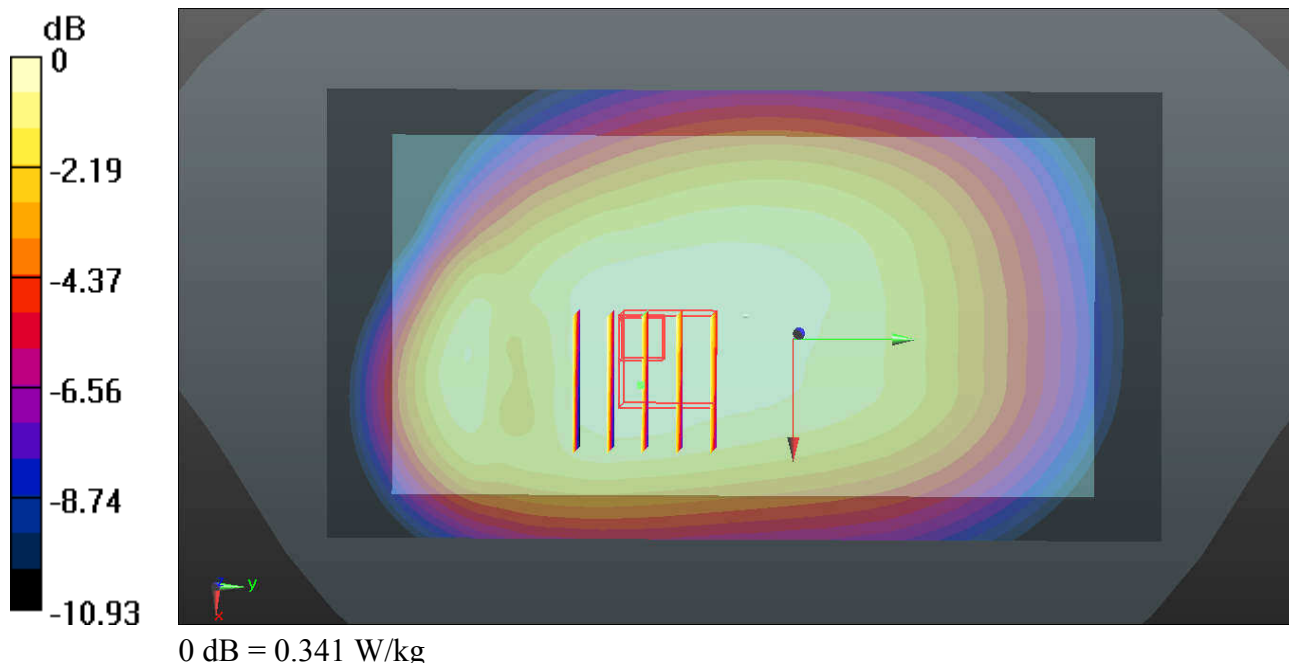
Communication System: UID 0, LTE (0); Frequency: 707.5 MHz; Duty Cycle: 1:1  
Medium: MSL\_750\_160609 Medium parameters used:  $f = 707.5$  MHz;  $\sigma = 0.931$  S/m;  $\epsilon_r = 54.883$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Ambient Temperature : 23.4 °C; Liquid Temperature : 22.7 °C

#### DASY5 Configuration:

- Probe: EX3DV4 - SN3911; ConvF(10.08, 10.08, 10.08); Calibrated: 2015.10.01;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch23095/Area Scan (71x131x1):** Interpolated grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.341 W/kg

**Ch23095/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 1.464 V/m; Power Drift = 0.04 dB  
Peak SAR (extrapolated) = 0.370 W/kg  
**SAR(1 g) = 0.293 W/kg; SAR(10 g) = 0.226 W/kg**  
Maximum value of SAR (measured) = 0.332 W/kg



### 33\_LTE Band 5\_10M\_QPSK\_1RB\_25Offset\_Back\_15mm\_Ch20525

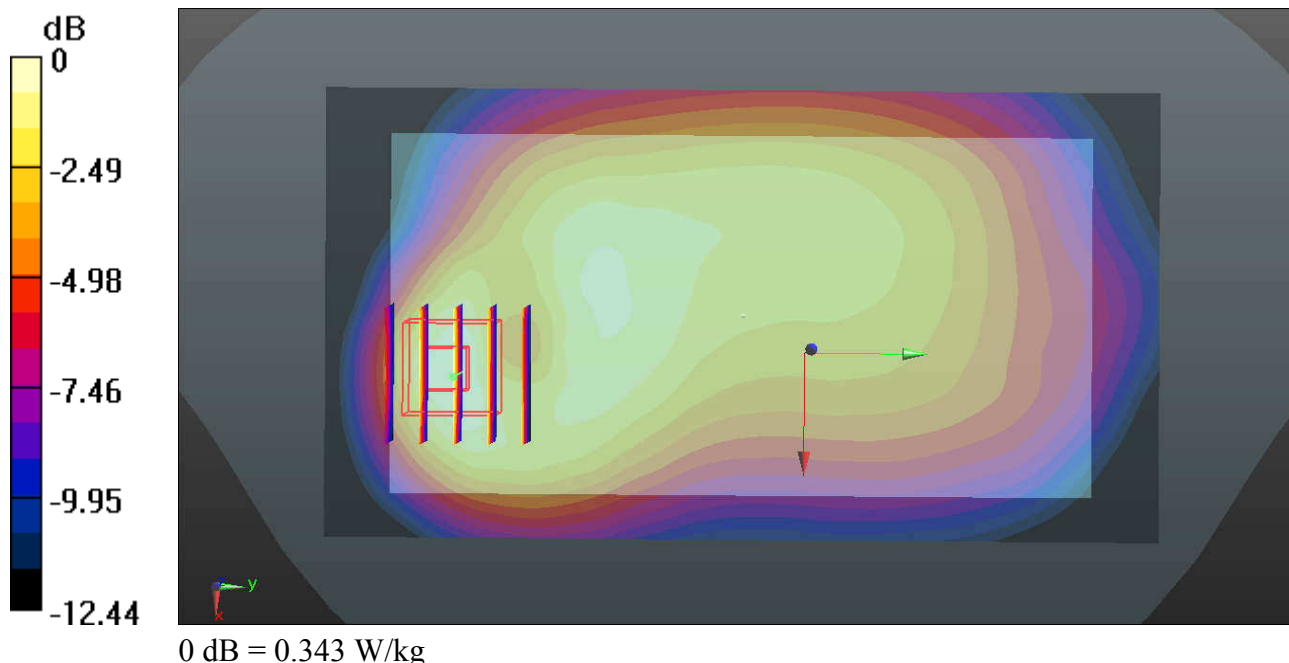
Communication System: UID 0, LTE (0); Frequency: 836.5 MHz; Duty Cycle: 1:1  
Medium: MSL\_835\_160617 Medium parameters used:  $f = 836.5$  MHz;  $\sigma = 0.976$  S/m;  $\epsilon_r = 54.189$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Ambient Temperature : 23.2 °C; Liquid Temperature : 22.9 °C

#### DASY5 Configuration:

- Probe: EX3DV4 - SN3819; ConvF(9.47, 9.47, 9.47); Calibrated: 2015.11.27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2015.11.23
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch20525/Area Scan (71x131x1):** Interpolated grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.343 W/kg

**Ch20525/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 2.419 V/m; Power Drift = 0.05 dB  
Peak SAR (extrapolated) = 0.424 W/kg  
**SAR(1 g) = 0.269 W/kg; SAR(10 g) = 0.161 W/kg**  
Maximum value of SAR (measured) = 0.355 W/kg



### 34\_LTE Band 4\_20M\_QPSK\_1RB\_49Offset\_Back\_15mm\_Ch20175

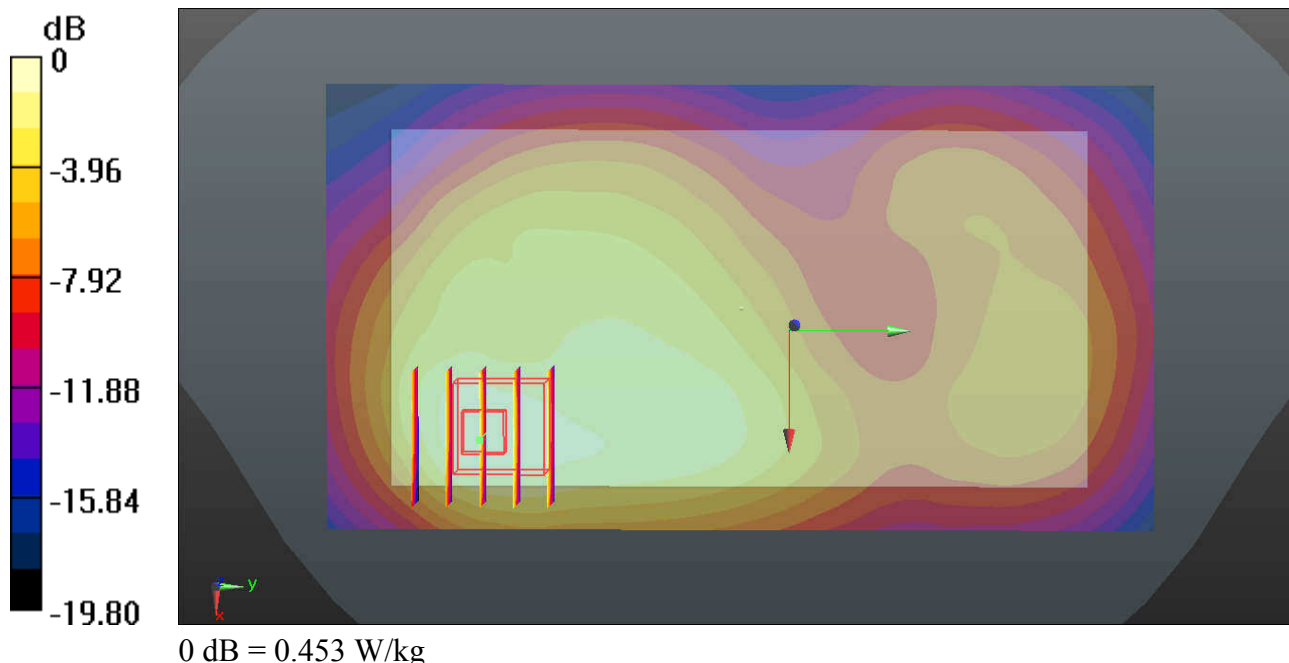
Communication System: UID 0, LTE (0); Frequency: 1732.5 MHz; Duty Cycle: 1:1  
 Medium: MSL\_1800\_160613 Medium parameters used:  $f = 1732.5$  MHz;  $\sigma = 1.507$  S/m;  $\epsilon_r = 52.655$ ;  
 $\rho = 1000$  kg/m<sup>3</sup>  
 Ambient Temperature : 23.3 °C; Liquid Temperature : 22.8 °C

**DASY5 Configuration:**

- Probe: EX3DV4 - SN3911; ConvF(8.01, 8.01, 8.01); Calibrated: 2015.10.01;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch20175/Area Scan (71x131x1):** Interpolated grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.453 W/kg

**Ch20175/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
 Reference Value = 1.832 V/m; Power Drift = 0.08 dB  
 Peak SAR (extrapolated) = 0.522 W/kg  
**SAR(1 g) = 0.318 W/kg; SAR(10 g) = 0.189 W/kg**  
 Maximum value of SAR (measured) = 0.427 W/kg



### 35\_LTE Band 2\_20M\_QPSK\_1RB\_49Offset\_Back\_15mm\_Ch18900

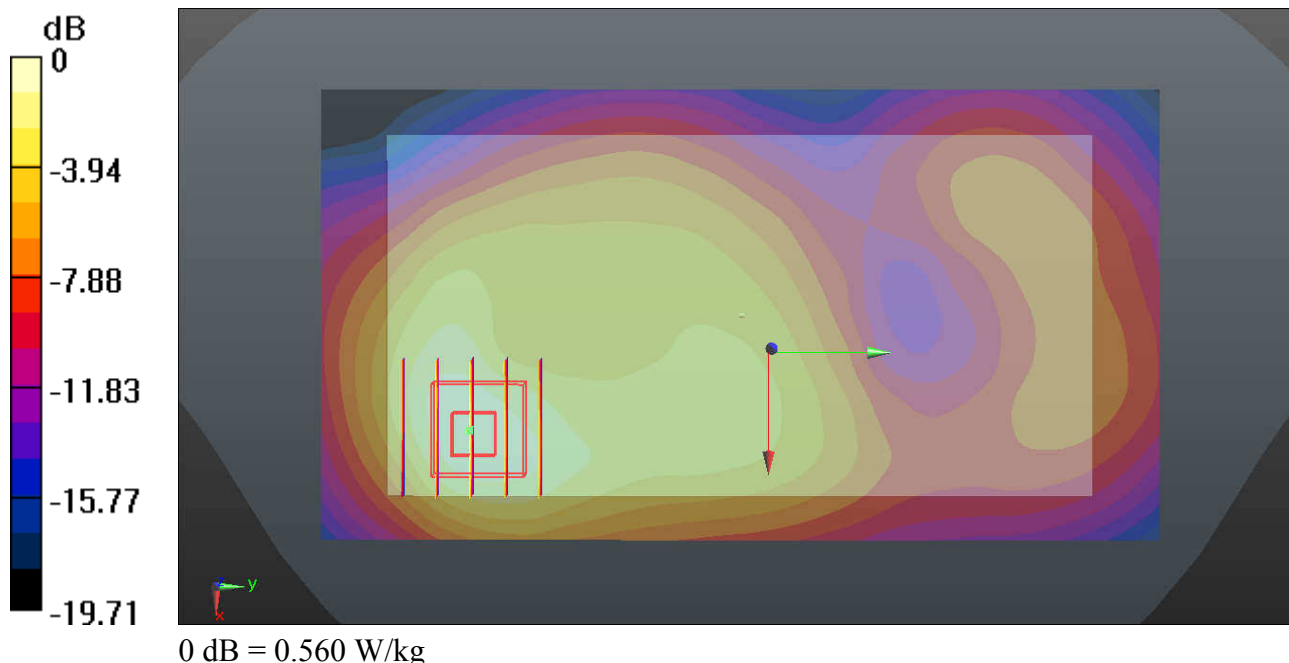
Communication System: UID 0, LTE (0); Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium: MSL\_1900\_160613 Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.513$  S/m;  $\epsilon_r = 53.825$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Ambient Temperature : 23.3 °C; Liquid Temperature : 22.7 °C

#### DASY5 Configuration:

- Probe: EX3DV4 - SN3911; ConvF(7.75, 7.75, 7.75); Calibrated: 2015.10.01;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch18900/Area Scan (71x131x1):** Interpolated grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.560 W/kg

**Ch18900/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 1.218 V/m; Power Drift = 0.07 dB  
Peak SAR (extrapolated) = 0.753 W/kg  
**SAR(1 g) = 0.441 W/kg; SAR(10 g) = 0.252 W/kg**  
Maximum value of SAR (measured) = 0.605 W/kg



### 36\_LTE Band 7\_20M\_QPSK\_1RB\_0Offset\_Back\_15mm\_Ch21350

Communication System: UID 0, LTE (0); Frequency: 2560 MHz; Duty Cycle: 1:1

Medium: MSL\_2600\_160612 Medium parameters used:  $f = 2560$  MHz;  $\sigma = 2.129$  S/m;  $\epsilon_r = 51.064$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.2 °C; Liquid Temperature : 22.6 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3911; ConvF(7.14, 7.14, 7.14); Calibrated: 2015.10.01;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch21350/Area Scan (91x161x1):** Interpolated grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 0.114 W/kg

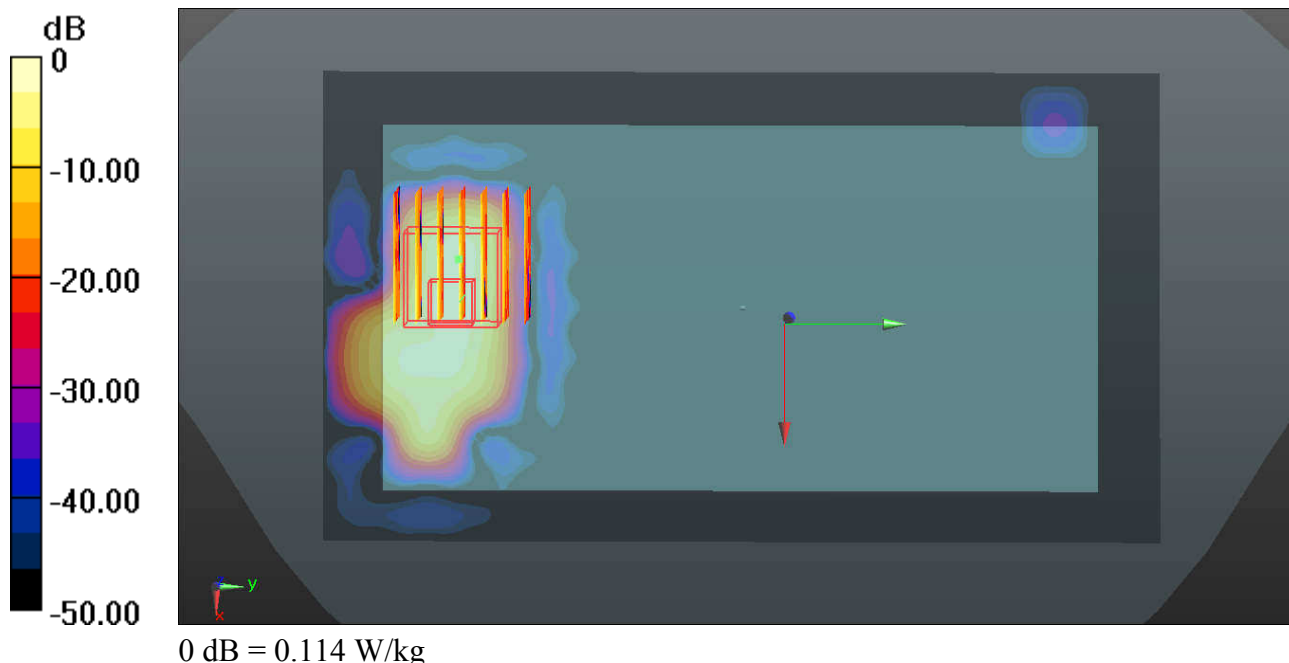
**Ch21350/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.7290 V/m; Power Drift = 0.1 dB

Peak SAR (extrapolated) = 0.0650 W/kg

**SAR(1 g) = 0.033 W/kg; SAR(10 g) = 0.011 W/kg**

Maximum value of SAR (measured) = 0.0505 W/kg



### 37\_WLAN2.4GHz\_802.11b 1Mbps\_Back\_15mm\_Ch6

Communication System: UID 0, WIFI (0); Frequency: 2437 MHz; Duty Cycle: 1:1.022  
 Medium: MSL\_2450\_160619 Medium parameters used:  $f = 2437$  MHz;  $\sigma = 1.949$  S/m;  $\epsilon_r = 54.149$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Ambient Temperature : 23.7 °C; Liquid Temperature : 22.5 °C

**DASY5 Configuration:**

- Probe: EX3DV4 - SN3819; ConvF(7.08, 7.08, 7.08); Calibrated: 2015.11.27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2015.11.23
- Phantom: SAM 3; Type: QD000P40CC; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch6/Area Scan (91x161x1):** Interpolated grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 0.0504 W/kg

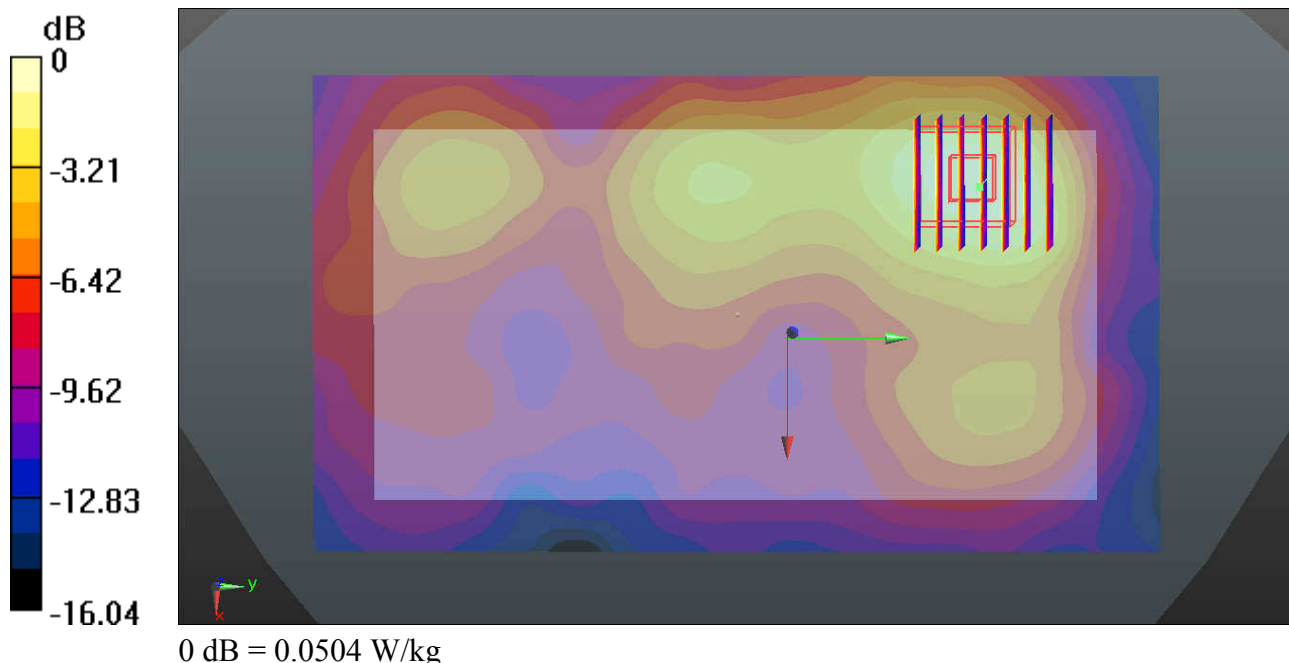
**Ch6/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 1.399 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 0.0660 W/kg

**SAR(1 g) = 0.034 W/kg; SAR(10 g) = 0.019 W/kg**

Maximum value of SAR (measured) = 0.0487 W/kg



### 38\_WLAN5GHz\_802.11n-HT20 MCS0\_Back\_15mm\_Ch36

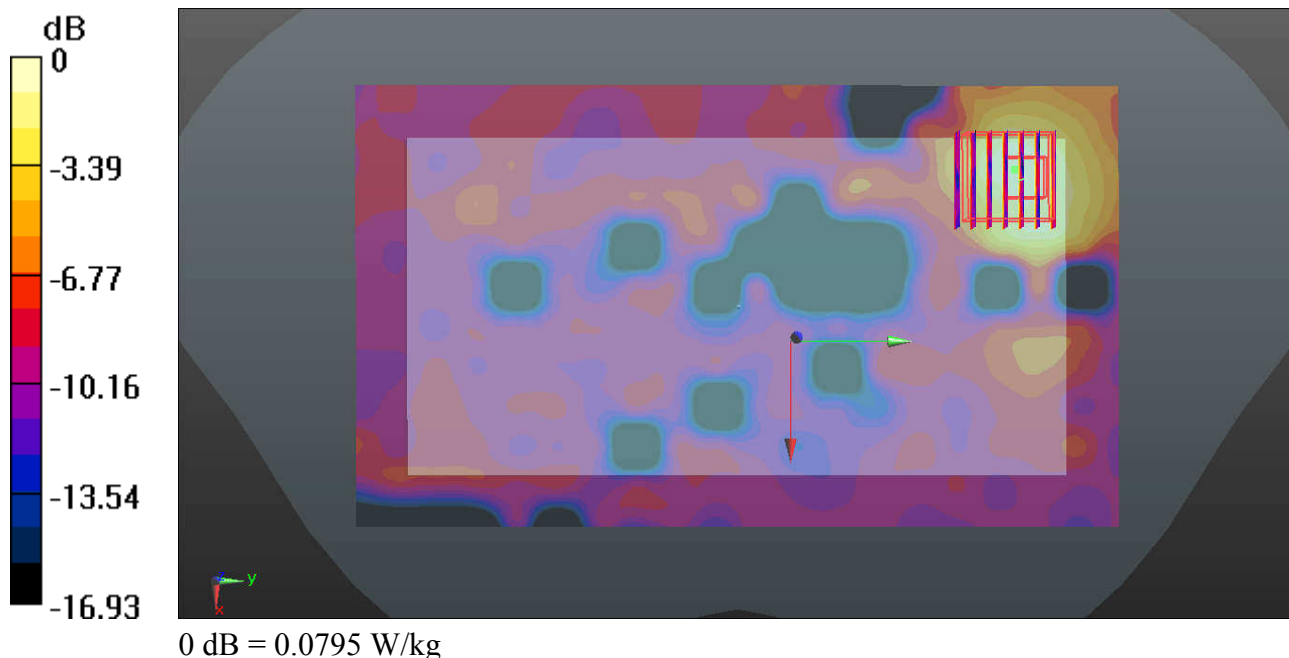
Communication System: UID 0, WIFI (0); Frequency: 5180 MHz; Duty Cycle: 1:1.155  
Medium: MSL\_5250\_160621 Medium parameters used:  $f = 5180$  MHz;  $\sigma = 5.183$  S/m;  $\epsilon_r = 51.08$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Ambient Temperature : 23.8 °C; Liquid Temperature : 22.5 °C

#### DASY5 Configuration:

- Probe: EX3DV4 - SN3819; ConvF(4.2, 4.2, 4.2); Calibrated: 2015.11.27;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2015.11.23
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch36/Area Scan (111x191x1):** Interpolated grid: dx=10mm, dy=10mm  
Maximum value of SAR (interpolated) = 0.0795 W/kg

**Ch36/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm  
Reference Value = 1.438 V/m; Power Drift = -0.01 dB  
Peak SAR (extrapolated) = 0.113 W/kg  
**SAR(1 g) = 0.039 W/kg; SAR(10 g) = 0.017 W/kg**  
Maximum value of SAR (measured) = 0.0774 W/kg



### 39\_WLAN5GHz\_802.11n-HT20 MCS0\_Back\_15mm\_Ch157

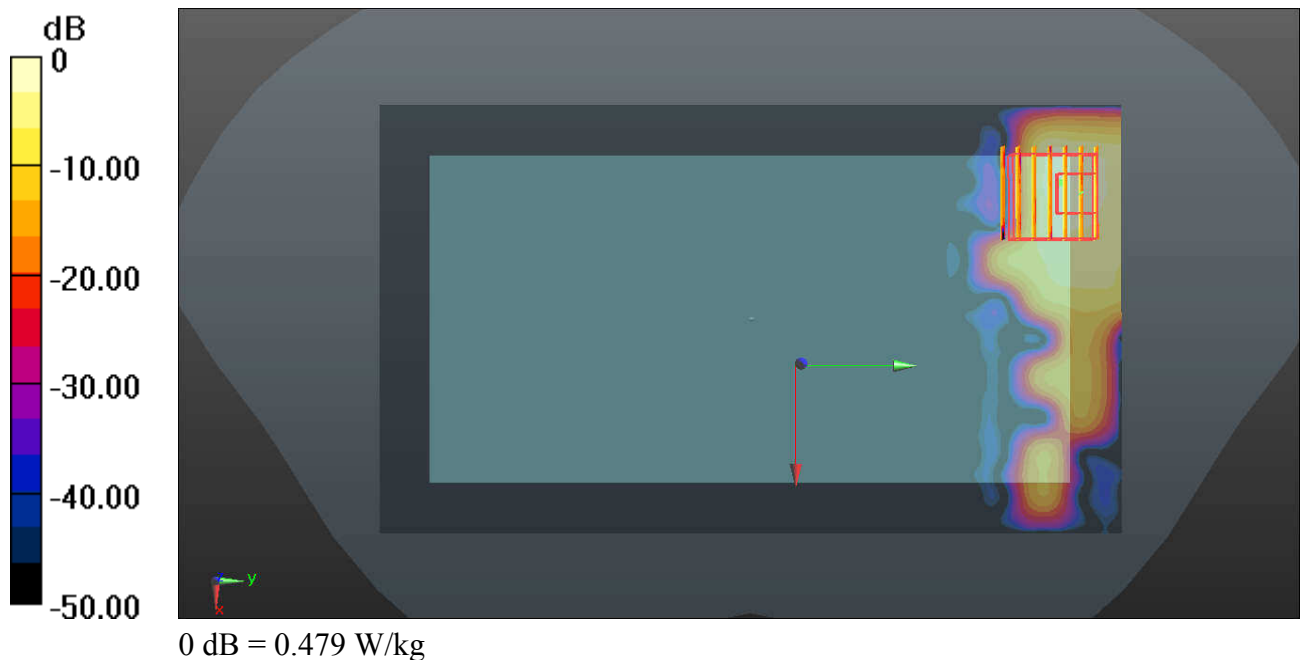
Communication System: UID 0, WIFI (0); Frequency: 5785 MHz; Duty Cycle: 1:1.155  
 Medium: MSL\_5750\_160621 Medium parameters used:  $f = 5785 \text{ MHz}$ ;  $\sigma = 6.191 \text{ S/m}$ ;  $\epsilon_r = 49.901$ ;  $\rho = 1000 \text{ kg/m}^3$   
 Ambient Temperature : 23.8 °C; Liquid Temperature : 22.6 °C

**DASY5 Configuration:**

- Probe: EX3DV4 - SN3819; ConvF(3.73, 3.73, 3.73); Calibrated: 2015.11.27;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2015.11.23
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch157/Area Scan (111x191x1):** Interpolated grid: dx=10mm, dy=10mm  
 Maximum value of SAR (interpolated) = 0.479 W/kg

**Ch157/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm  
 Reference Value = 1.369 V/m; Power Drift = -0.03 dB  
 Peak SAR (extrapolated) = 0.446 W/kg  
**SAR(1 g) = 0.136 W/kg; SAR(10 g) = 0.047 W/kg**  
 Maximum value of SAR (measured) = 0.295 W/kg



### 40\_WLAN5GHz\_802.11n-HT20 MCS0\_Back\_0mm\_Ch52

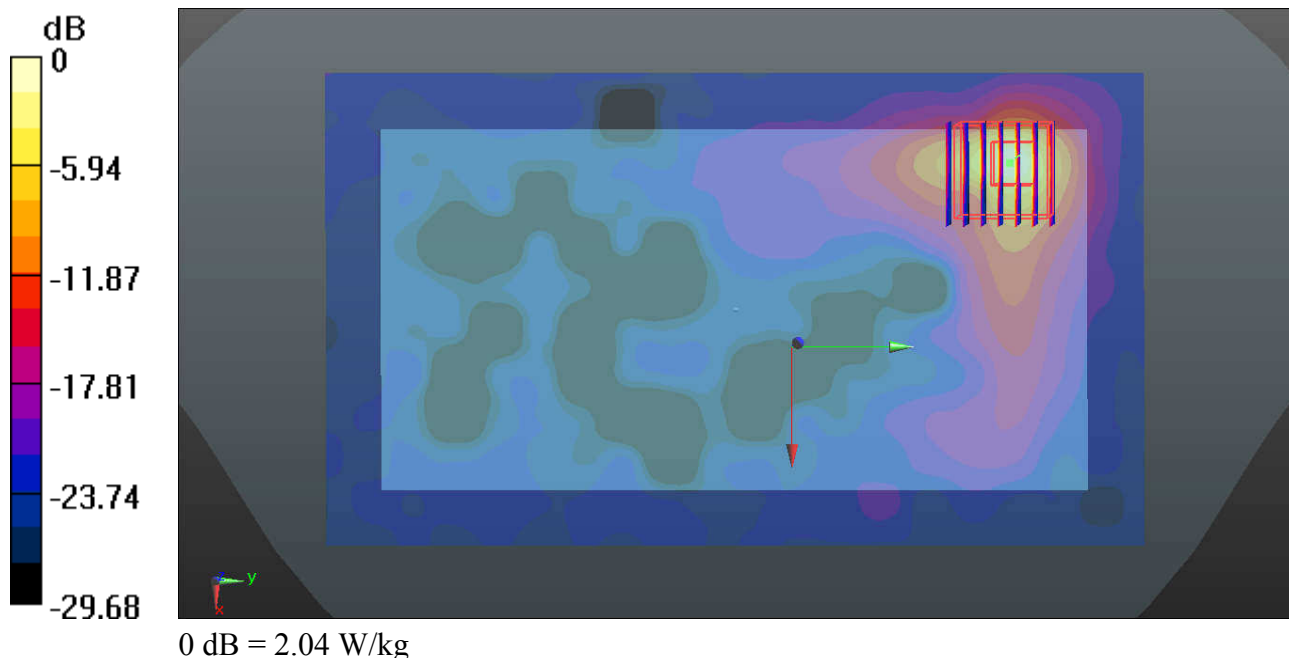
Communication System: UID 0, WIFI (0); Frequency: 5260 MHz; Duty Cycle: 1:1.155  
Medium: MSL\_5250\_160621 Medium parameters used:  $f = 5260$  MHz;  $\sigma = 5.316$  S/m;  $\epsilon_r = 50.994$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Ambient Temperature : 23.8 °C; Liquid Temperature : 22.5 °C

#### DASY5 Configuration:

- Probe: EX3DV4 - SN3819; ConvF(4.2, 4.2, 4.2); Calibrated: 2015.11.27;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2015.11.23
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch52/Area Scan (111x191x1):** Interpolated grid: dx=10mm, dy=10mm  
Maximum value of SAR (interpolated) = 2.12 W/kg

**Ch52/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm  
Reference Value = 1.612 V/m; Power Drift = -0.12 dB  
Peak SAR (extrapolated) = 3.41 W/kg  
**SAR(1 g) = 0.745 W/kg; SAR(10 g) = 0.168 W/kg**  
Maximum value of SAR (measured) = 2.04 W/kg





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**Appendix C. DASYS Calibration Certificate**

The DASYS calibration certificates are shown as follows.



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 **Sporton-SZ (Auden)**

Certificate No: **D750V3-1099\_Nov15**

## CALIBRATION CERTIFICATE

Object **D750V3 - SN: 1099**

Calibration procedure(s) **QA CAL-05.v9  
Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **November 24, 2015**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	07-Oct-15 (No. 217-02222)	Oct-16
Power sensor HP 8481A	US37292783	07-Oct-15 (No. 217-02222)	Oct-16
Power sensor HP 8481A	MY41092317	07-Oct-15 (No. 217-02223)	Oct-16
Reference 20 dB Attenuator	SN: 5058 (20k)	01-Apr-15 (No. 217-02131)	Mar-16
Type-N mismatch combination	SN: 5047.2 / 06327	01-Apr-15 (No. 217-02134)	Mar-16
Reference Probe EX3DV4	SN: 7349	30-Dec-14 (No. EX3-7349_Dec14)	Dec-15
DAE4	SN: 601	17-Aug-15 (No. DAE4-601_Aug15)	Aug-16
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100972	15-Jun-15 (in house check Jun-15)	In house check: Jun-18
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

Calibrated by: **Name** Claudio Leubler **Function** Laboratory Technician

**Signature**

Approved by: **Name** Katja Pokovic **Function** Technical Manager

Issued: November 24, 2015

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Multilateral Agreement for the recognition of calibration certificates

#### Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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

- 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 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### Additional Documentation:

- DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

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

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

## Measurement Conditions

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

<b>DASY Version</b>	DASY5	V52.8.8
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Modular Flat Phantom	
<b>Distance Dipole Center - TSL</b>	15 mm	with Spacer
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	750 MHz ± 1 MHz	

## Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	41.9	0.89 mho/m
<b>Measured Head TSL parameters</b>	(22.0 ± 0.2) °C	42.8 ± 6 %	0.90 mho/m ± 6 %
<b>Head TSL temperature change during test</b>	< 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	2.05 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	<b>8.17 W/kg ± 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	<b>5.38 W/kg ± 16.5 % (k=2)</b>

## Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Body TSL parameters</b>	22.0 °C	55.5	0.96 mho/m
<b>Measured Body TSL parameters</b>	(22.0 ± 0.2) °C	55.9 ± 6 %	0.97 mho/m ± 6 %
<b>Body TSL temperature change during test</b>	< 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	2.22 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	<b>8.82 W/kg ± 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.47 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	<b>5.85 W/kg ± 16.5 % (k=2)</b>

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

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.3 $\Omega$ - 0.8 j $\Omega$
Return Loss	- 27.5 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.0 $\Omega$ - 2.9 j $\Omega$
Return Loss	- 30.8 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.035 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	July 05, 2013

## DASY5 Validation Report for Head TSL

Date: 24.11.2015

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1099**

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used:  $f = 750$  MHz;  $\sigma = 0.9$  S/m;  $\epsilon_r = 42.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.1, 10.1, 10.1); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 17.08.2015
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

### Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

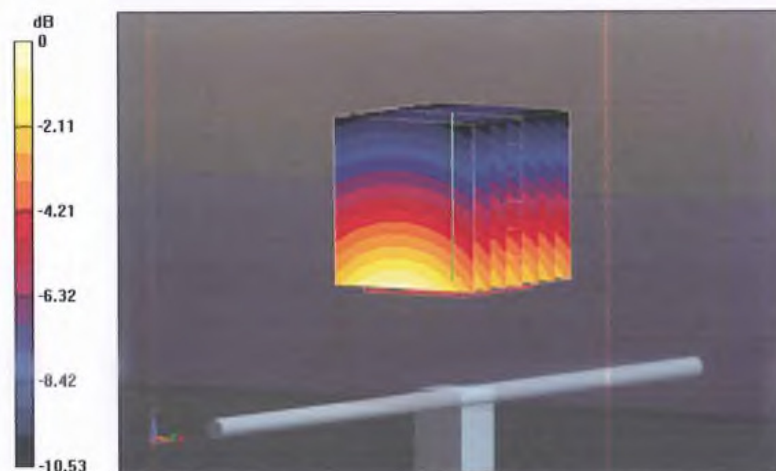
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.98 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 3.06 W/kg

**SAR(1 g) = 2.05 W/kg; SAR(10 g) = 1.35 W/kg**

Maximum value of SAR (measured) = 2.70 W/kg

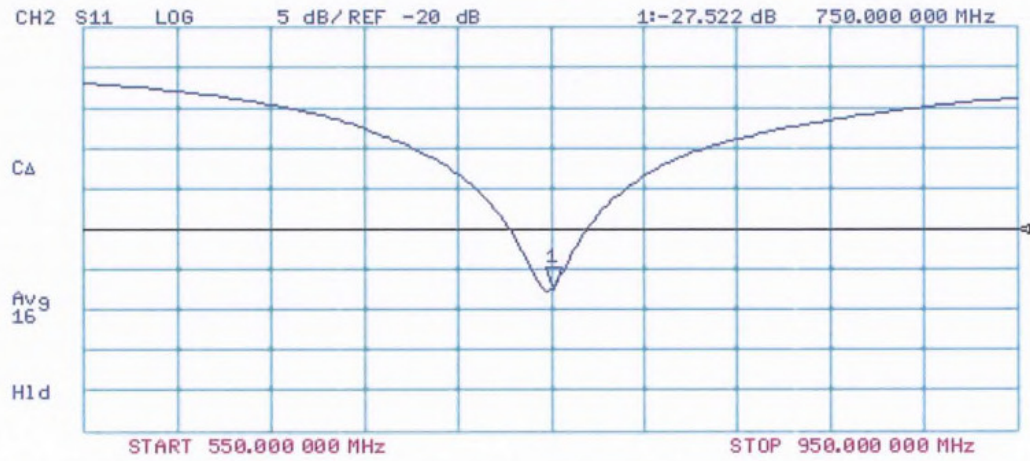
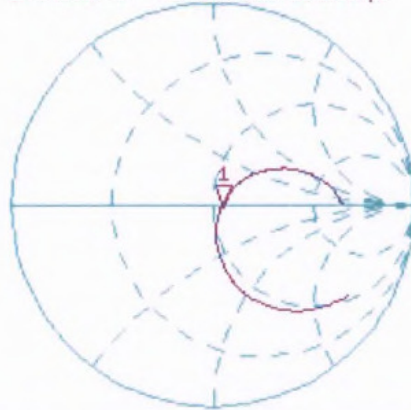


0 dB = 2.70 W/kg = 4.31 dBW/kg

# Impedance Measurement Plot for Head TSL

24 Nov 2015 15:41:33  
[CH1] S11 1 U FS 1: 54.307  $\Omega$  -845.70 m $\Omega$  250.92 pF 750.000 000 MHz

\*  
De1  
CA  
Avg  
16  
H1d



## DASY5 Validation Report for Body TSL

Date: 24.11.2015

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1099**

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used:  $f = 750$  MHz;  $\sigma = 0.97$  S/m;  $\epsilon_r = 55.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.61, 9.61, 9.61); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 17.08.2015
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

### Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

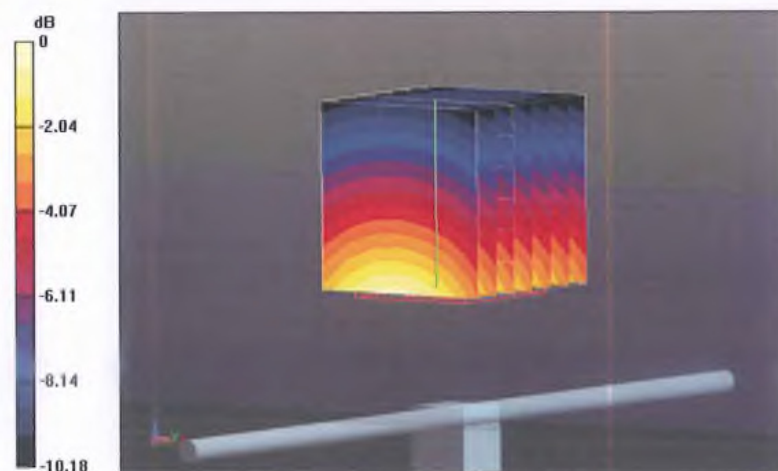
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.87 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 3.27 W/kg

**SAR(1 g) = 2.22 W/kg; SAR(10 g) = 1.47 W/kg**

Maximum value of SAR (measured) = 2.91 W/kg

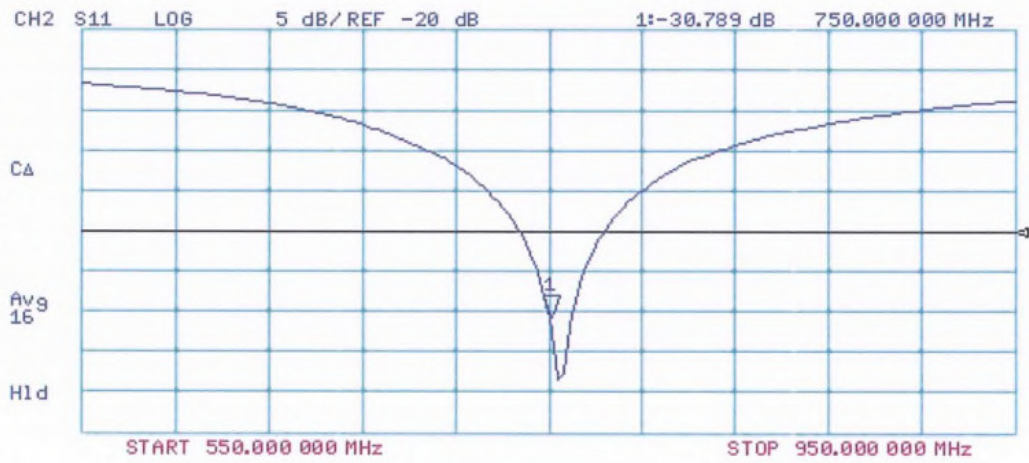
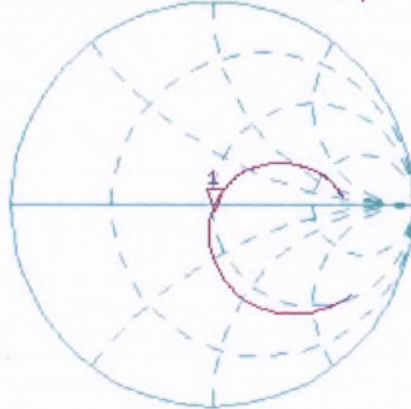


0 dB = 2.91 W/kg = 4.64 dBW/kg

# Impedance Measurement Plot for Body TSL

24 Nov 2015 11:40:03  
CH1 S11 1 U FS 1: 49.996  $\Omega$  -2.8848  $\Omega$  73.561 pF 750.000 000 MHz

\*  
De1  
CA  
Avg  
16  
H1d





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Accreditation No.: **SCS 0108**

Client **Sporton-SZ (Auden)**

Certificate No: **D835V2-4d162\_Nov15**

## CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d162**

Calibration procedure(s) **QA CAL-05.v9  
Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **November 24, 2015**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	07-Oct-15 (No. 217-02222)	Oct-16
Power sensor HP 8481A	US37292783	07-Oct-15 (No. 217-02222)	Oct-16
Power sensor HP 8481A	MY41092317	07-Oct-15 (No. 217-02223)	Oct-16
Reference 20 dB Attenuator	SN: 5058 (20k)	01-Apr-15 (No. 217-02131)	Mar-16
Type-N mismatch combination	SN: 5047.2 / 06327	01-Apr-15 (No. 217-02134)	Mar-16
Reference Probe EX3DV4	SN: 7349	30-Dec-14 (No. EX3-7349_Dec14)	Dec-15
DAE4	SN: 601	17-Aug-15 (No. DAE4-601_Aug15)	Aug-16
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100972	15-Jun-15 (in house check Jun-15)	In house check: Jun-18
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

Calibrated by: **Claudio Leubler**      Name: Claudio Leubler      Function: Laboratory Technician

Signature

Approved by: **Katja Pokovic**      Name: Katja Pokovic      Function: Technical Manager

Issued: November 24, 2015

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Accreditation No.: SCS 0108

#### Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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

- 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 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### Additional Documentation:

- DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

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

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

## Measurement Conditions

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

<b>DASY Version</b>	DASY5	V52.8.8
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Modular Flat Phantom	
<b>Distance Dipole Center - TSL</b>	15 mm	with Spacer
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	835 MHz $\pm$ 1 MHz	

## Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	41.5	0.90 mho/m
<b>Measured Head TSL parameters</b>	(22.0 $\pm$ 0.2) °C	42.6 $\pm$ 6 %	0.92 mho/m $\pm$ 6 %
<b>Head TSL temperature change during test</b>	< 0.5 °C	----	----

## SAR result with Head TSL

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR measured	250 mW input power	2.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	<b>9.14 W/kg <math>\pm</math> 17.0 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR measured	250 mW input power	1.50 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	<b>5.94 W/kg <math>\pm</math> 16.5 % (k=2)</b>

## Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Body TSL parameters</b>	22.0 °C	55.2	0.97 mho/m
<b>Measured Body TSL parameters</b>	(22.0 $\pm$ 0.2) °C	55.6 $\pm$ 6 %	0.99 mho/m $\pm$ 6 %
<b>Body TSL temperature change during test</b>	< 0.5 °C	----	----

## SAR result with Body TSL

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b>	Condition	
SAR measured	250 mW input power	2.41 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	<b>9.51 W/kg <math>\pm</math> 17.0 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b>	condition	
SAR measured	250 mW input power	1.58 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	<b>6.25 W/kg <math>\pm</math> 16.5 % (k=2)</b>

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

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.7 $\Omega$ - 5.5 j $\Omega$
Return Loss	- 24.9 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.5 $\Omega$ - 7.4 j $\Omega$
Return Loss	- 21.9 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.440 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 28, 2012

## DASY5 Validation Report for Head TSL

Date: 24.11.2015

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d162**

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.92$  S/m;  $\epsilon_r = 42.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.77, 9.77, 9.77); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 17.08.2015
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

### Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

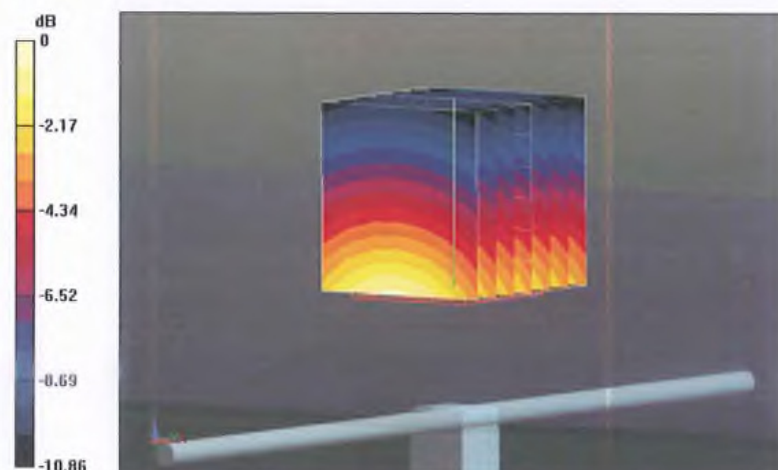
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 60.52 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 3.43 W/kg

**SAR(1 g) = 2.31 W/kg; SAR(10 g) = 1.5 W/kg**

Maximum value of SAR (measured) = 3.03 W/kg

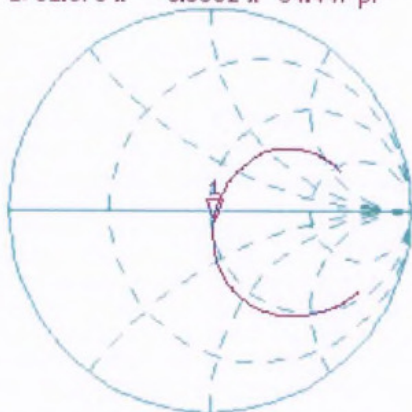


0 dB = 3.03 W/kg = 4.81 dBW/kg

# Impedance Measurement Plot for Head TSL

24 Nov 2015 15:49:16  
[CH1] S11 1 U FS 1: 51.678  $\Omega$  -5.5332  $\Omega$  34.447 pF 835.000 000 MHz

\*  
Del  
CA



Avg  
16

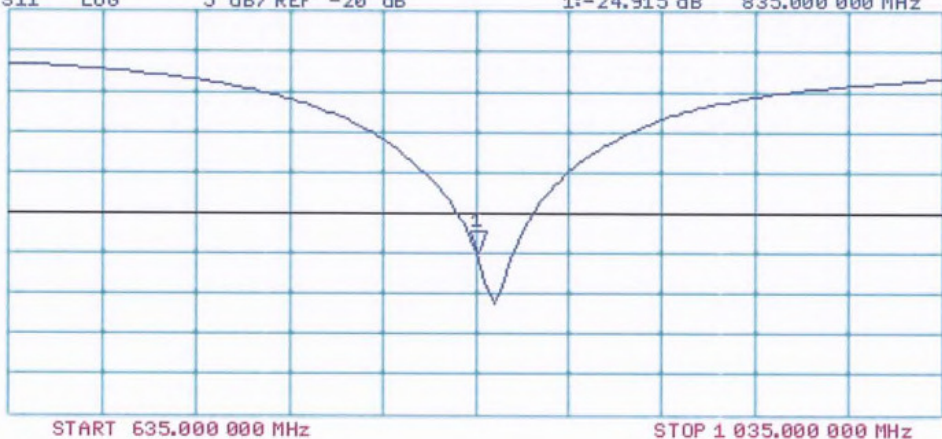
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-24.915 dB 835.000 000 MHz

CA

Avg  
16

H1d



## DASY5 Validation Report for Body TSL

Date: 24.11.2015

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d162**

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.99$  S/m;  $\epsilon_r = 55.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.72, 9.72, 9.72); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 17.08.2015
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

### Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

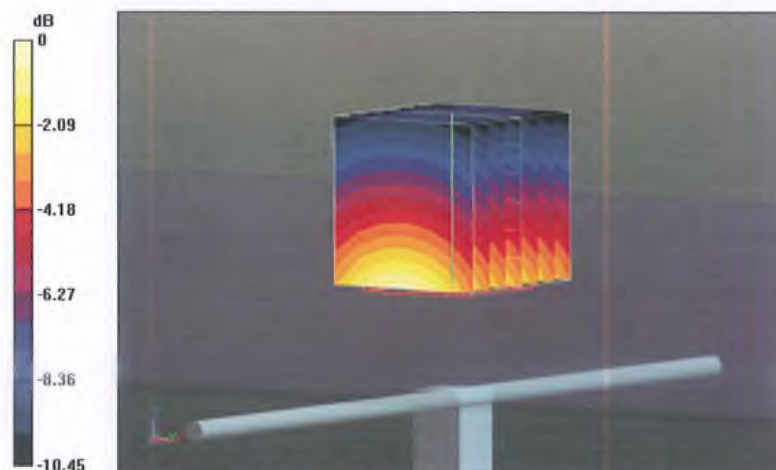
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 59.66 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 3.56 W/kg

**SAR(1 g) = 2.41 W/kg; SAR(10 g) = 1.58 W/kg**

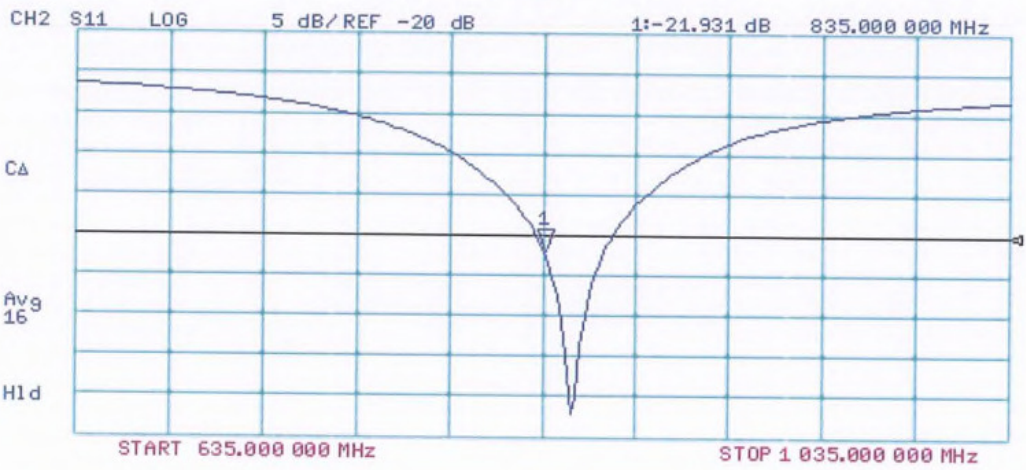
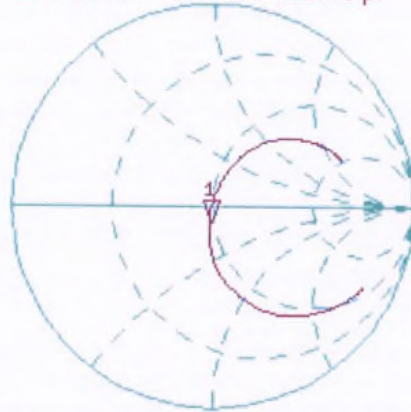
Maximum value of SAR (measured) = 3.17 W/kg



# Impedance Measurement Plot for Body TSL

24 Nov 2015 11:46:46  
[CH1] S11 1 U FS 1: 47.455  $\Omega$  -7.3965  $\Omega$  25.770 pF 835.000 000 MHz

\*  
De1  
CA  
Avg  
16  
H1d





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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **Auden**

Certificate No: **D1750V2-1023\_Jun15**

## CALIBRATION CERTIFICATE

Object **D1750V2 - SN:1023**

Calibration procedure(s) **QA CAL-05.v9**  
**Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **June 23, 2015**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	US37292783	07-Oct-14 (No. 217-02020)	Oct-15
Power sensor HP 8481A	MY41092317	07-Oct-14 (No. 217-02021)	Oct-15
Reference 20 dB Attenuator	SN: 5058 (20k)	01-Apr-15 (No. 217-02131)	Mar-16
Type-N mismatch combination	SN: 5047.2 / 06327	01-Apr-15 (No. 217-02134)	Mar-16
Reference Probe ES3DV3	SN: 3205	30-Dec-14 (No. ES3-3205_Dec14)	Dec-15
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

Calibrated by: **Name** Michael Weber **Function** Laboratory Technician

Signature

Approved by: **Name** Katja Pokovic **Function** Technical Manager

Issued: June 23, 2015

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

### Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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

- 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 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

### Additional Documentation:

- DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

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

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

## Measurement Conditions

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

DASY Version	DASY5	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	1750 MHz $\pm$ 1 MHz	

## Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.0 $\pm$ 6 %	1.37 mho/m $\pm$ 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	9.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	<b>37.2 W/kg <math>\pm</math> 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.00 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	<b>19.9 W/kg <math>\pm</math> 16.5 % (k=2)</b>

## Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	51.3 $\pm$ 6 %	1.49 mho/m $\pm$ 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	9.48 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	<b>37.6 W/kg <math>\pm</math> 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.12 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	<b>20.4 W/kg <math>\pm</math> 16.5 % (k=2)</b>

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

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	$50.8 \Omega + 0.6 j\Omega$
Return Loss	- 40.3 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	$46.9 \Omega + 0.6 j\Omega$
Return Loss	- 29.7 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.218 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	August 20, 2009

## DASY5 Validation Report for Head TSL

Date: 23.06.2015

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1023**

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used:  $f = 1750$  MHz;  $\sigma = 1.37$  S/m;  $\epsilon_r = 39$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.2, 5.2, 5.2); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**

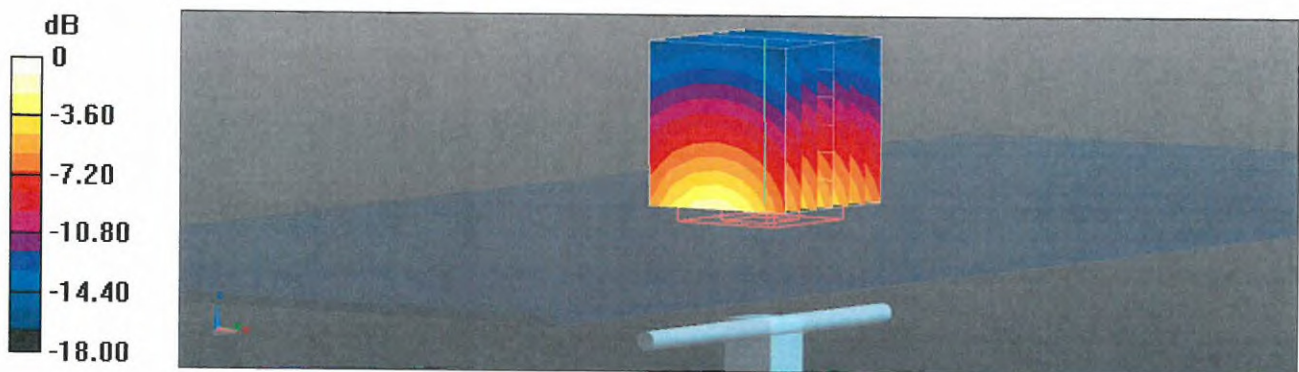
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.92 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 16.8 W/kg

**SAR(1 g) = 9.37 W/kg; SAR(10 g) = 5 W/kg**

Maximum value of SAR (measured) = 11.9 W/kg

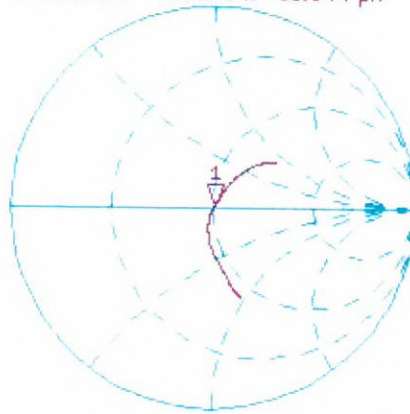


0 dB = 11.9 W/kg = 10.76 dBW/kg

# Impedance Measurement Plot for Head TSL

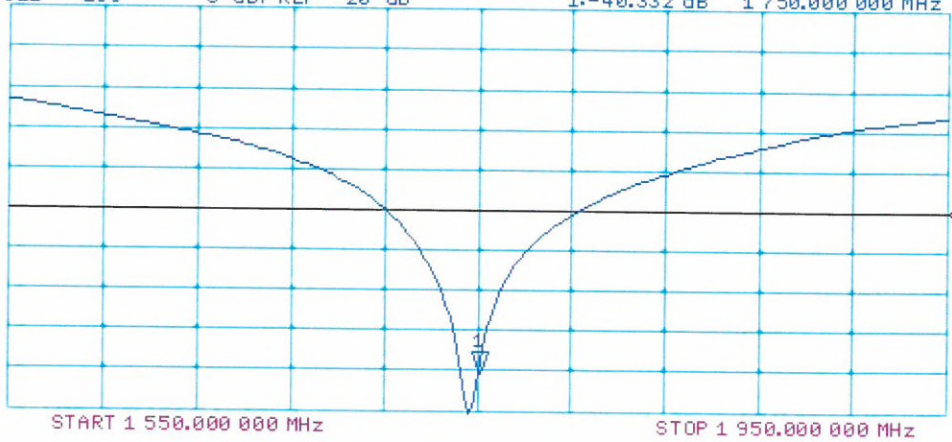
23 Jun 2015 10:43:23  
[CH1] S11 1 U FS 1: 50.766  $\Omega$  0.5898  $\Omega$  53.644 pF 1 750.000 000 MHz

\*  
De1  
Ca  
Avg  
16  
H1d



CH2 S11 LOG 5 dB/REF -20 dB 1:-40.332 dB 1 750.000 000 MHz

De1  
Ca  
Avg  
16  
H1d



## DASY5 Validation Report for Body TSL

Date: 23.06.2015

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1023**

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used:  $f = 1750$  MHz;  $\sigma = 1.49$  S/m;  $\epsilon_r = 51.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.88, 4.88, 4.88); Calibrated: 30.12.2014;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

### Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

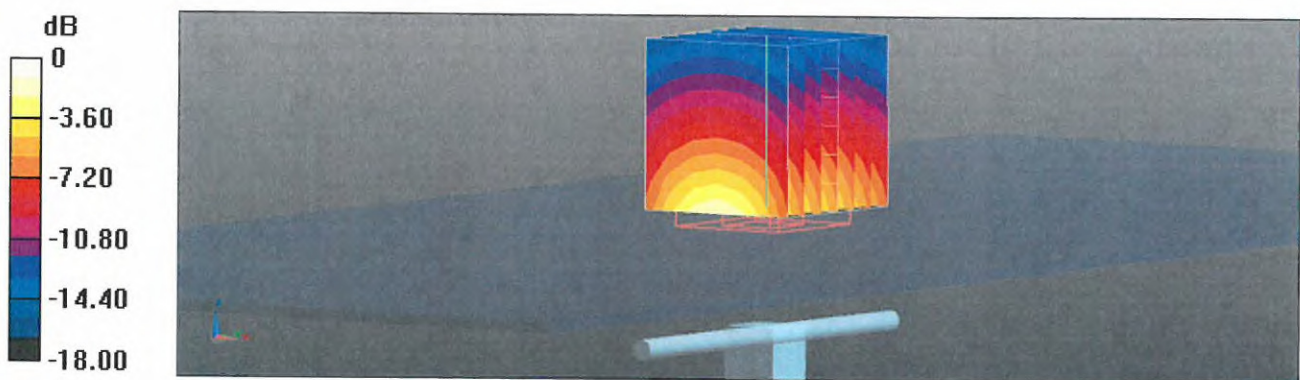
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.37 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 16.2 W/kg

**SAR(1 g) = 9.48 W/kg; SAR(10 g) = 5.12 W/kg**

Maximum value of SAR (measured) = 11.9 W/kg



# Impedance Measurement Plot for Body TSL

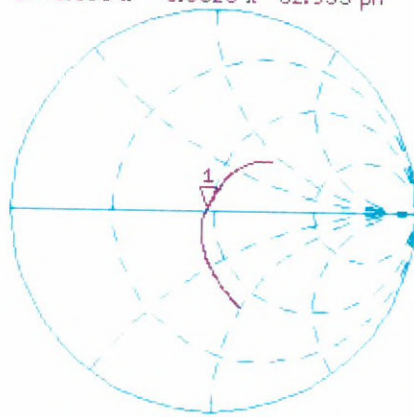
23 Jun 2015 10:43:00  
[CH1] S11 1 U FS 1: 46.895  $\Omega$  0.5820  $\Omega$  52.933 pF 1 750.000 000 MHz

\*  
De1

CΔ

Avg  
16

H1d



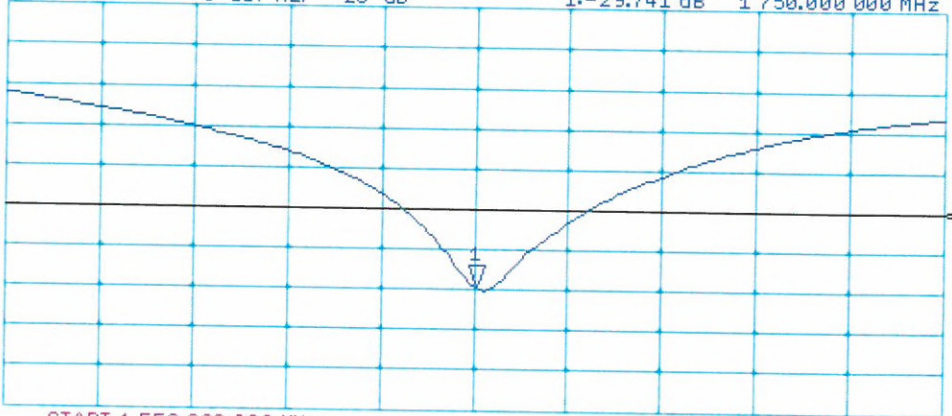
CH2 S11 LOG 5 dB/REF -20 dB 1:-29.741 dB 1 750.000 000 MHz

De1

CΔ

Avg  
16

H1d



START 1 550.000 000 MHz STOP 1 950.000 000 MHz



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Accreditation No.: **SCS 0108**

Client **Sporton-SZ (Auden)**

Certificate No: **D1900V2-5d182\_Nov15**

## CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d182**

Calibration procedure(s) **QA CAL-05.v9  
Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **November 23, 2015**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	07-Oct-15 (No. 217-02222)	Oct-16
Power sensor HP 8481A	US37292783	07-Oct-15 (No. 217-02222)	Oct-16
Power sensor HP 8481A	MY41092317	07-Oct-15 (No. 217-02223)	Oct-16
Reference 20 dB Attenuator	SN: 5058 (20k)	01-Apr-15 (No. 217-02131)	Mar-16
Type-N mismatch combination	SN: 5047.2 / 06327	01-Apr-15 (No. 217-02134)	Mar-16
Reference Probe EX3DV4	SN: 7349	30-Dec-14 (No. EX3-7349_Dec14)	Dec-15
DAE4	SN: 601	17-Aug-15 (No. DAE4-601_Aug15)	Aug-16
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100972	15-Jun-15 (in house check Jun-15)	In house check: Jun-18
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

Calibrated by:	Name Michael Weber	Function Laboratory Technician	Signature 
Approved by:	Katja Pokovic	Technical Manager	

Issued: November 26, 2015

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Multilateral Agreement for the recognition of calibration certificates

#### Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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

- 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 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### Additional Documentation:

- DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

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

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

## Measurement Conditions

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

DASY Version	DASY5	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	1900 MHz $\pm$ 1 MHz	

## Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.4 $\pm$ 6 %	1.39 mho/m $\pm$ 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	9.88 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	<b>39.6 W/kg <math>\pm</math> 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.17 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	<b>20.7 W/kg <math>\pm</math> 16.5 % (k=2)</b>

## Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	52.2 $\pm$ 6 %	1.52 mho/m $\pm$ 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	10.2 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	<b>40.6 W/kg <math>\pm</math> 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.38 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	<b>21.5 W/kg <math>\pm</math> 16.5 % (k=2)</b>

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

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.9 $\Omega$ + 6.4 j $\Omega$
Return Loss	- 22.8 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.0 $\Omega$ + 6.2 j $\Omega$
Return Loss	- 23.9 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.201 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	August 23, 2013

## DASY5 Validation Report for Head TSL

Date: 23.11.2015

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d182**

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.39$  S/m;  $\epsilon_r = 39.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.14, 8.14, 8.14); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 17.08.2015
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

### Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

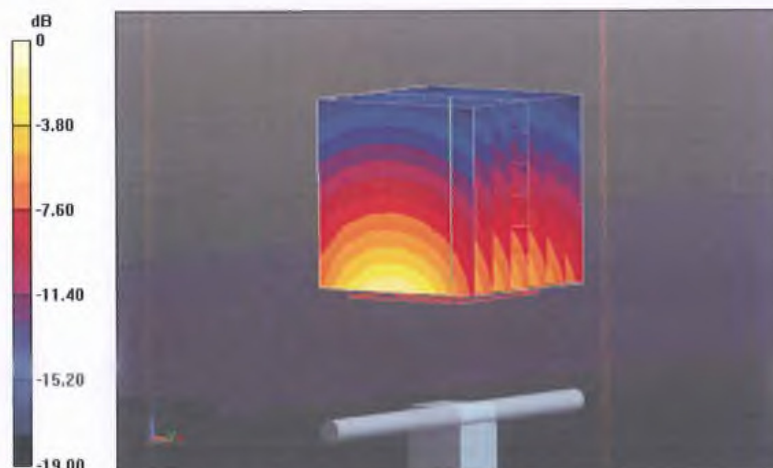
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 108.3 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 18.6 W/kg

**SAR(1 g) = 9.88 W/kg; SAR(10 g) = 5.17 W/kg**

Maximum value of SAR (measured) = 15.3 W/kg

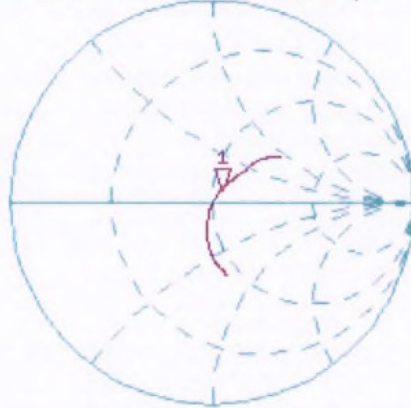


0 dB = 15.3 W/kg = 11.85 dBW/kg

# Impedance Measurement Plot for Head TSL

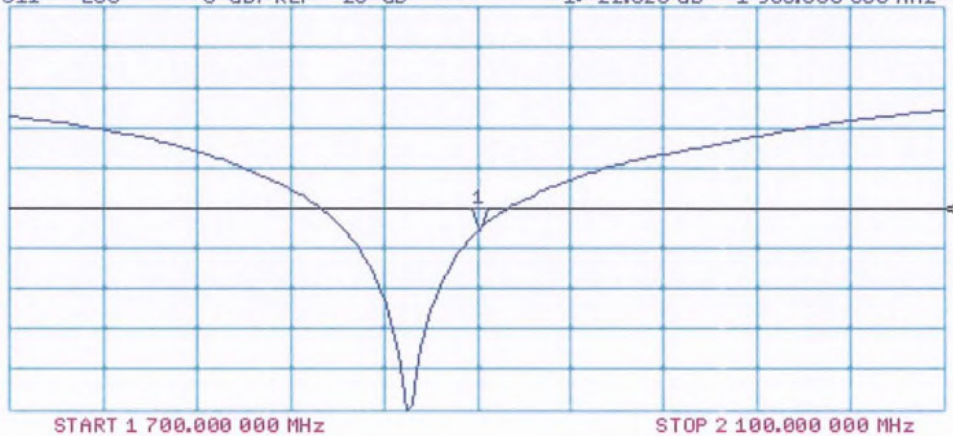
23 Nov 2015 16:03:57  
[CH1] S11 1 U FS 1: 53.895  $\Omega$  6.4336  $\Omega$  538.91  $\mu\text{H}$  1 900.000 000 MHz

\*  
De1  
Ca  
Avg  
16  
H1d



CH2 S11 LOG 5 dB/REF -20 dB 1:-22.820 dB 1 900.000 000 MHz

De1  
Ca  
Avg  
16  
H1d



## DASY5 Validation Report for Body TSL

Date: 23.11.2015

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d182**

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.52$  S/m;  $\epsilon_r = 52.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.9, 7.9, 7.9); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 17.08.2015
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

### Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

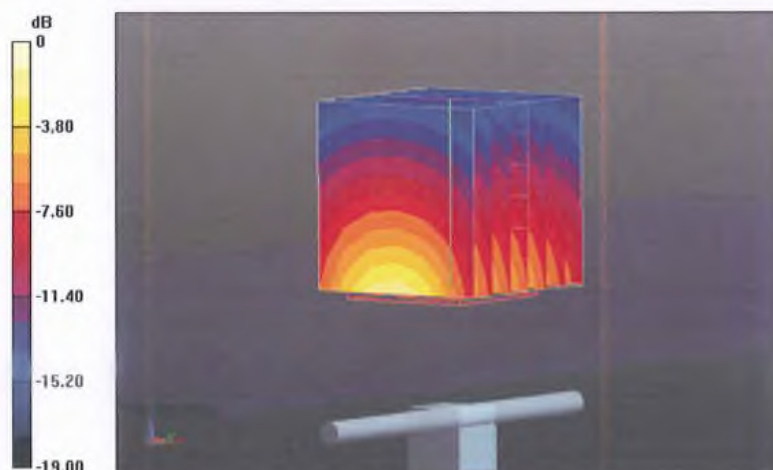
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 105.3 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 18.4 W/kg

**SAR(1 g) = 10.2 W/kg; SAR(10 g) = 5.38 W/kg**

Maximum value of SAR (measured) = 15.5 W/kg



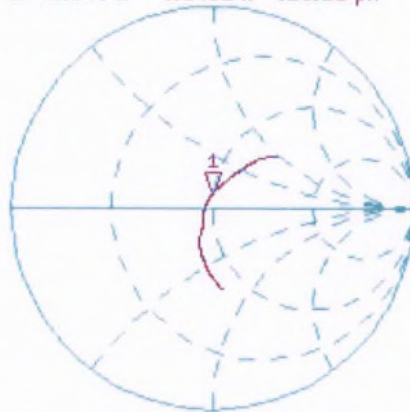
0 dB = 15.5 W/kg = 11.90 dBW/kg

# Impedance Measurement Plot for Body TSL

23 Nov 2015 16:03:34

CH1 S11 1 U FS 1: 49.049  $\Omega$  6.2461  $\Omega$  523.21 pF 1 900.000 000 MHz

\*  
De l  
CA

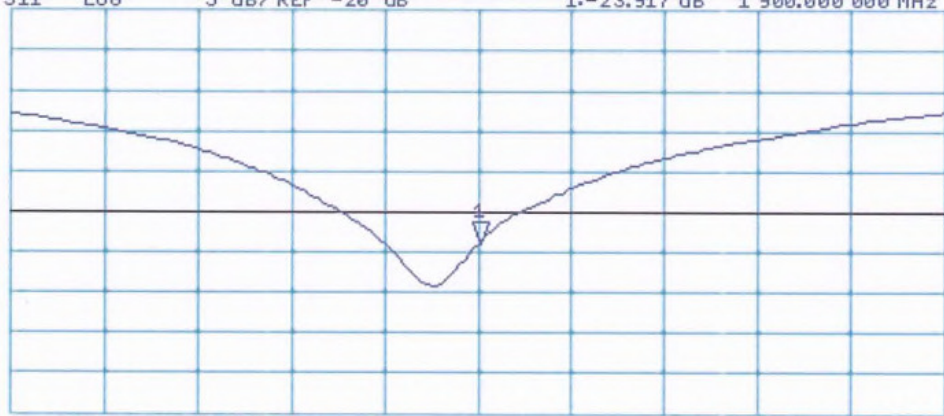


Avg  
16  
H1 d

CH2 S11 LOG 5 dB/ REF -20 dB 1: -23.917 dB 1 900.000 000 MHz

De l  
CA

Avg  
16  
H1 d



START 1 700.000 000 MHz

STOP 2 100.000 000 MHz



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **Sporton-SZ (Auden)**

Certificate No: **D2450V2-924\_Feb16**

## CALIBRATION CERTIFICATE

Object: **D2450V2 - SN: 924**

Calibration procedure(s): **QA CAL-05.v9  
Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **February 24, 2016**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	07-Oct-15 (No. 217-02222)	Oct-16
Power sensor HP 8481A	US37292783	07-Oct-15 (No. 217-02222)	Oct-16
Power sensor HP 8481A	MY41092317	07-Oct-15 (No. 217-02223)	Oct-16
Reference 20 dB Attenuator	SN: 5058 (20k)	01-Apr-15 (No. 217-02131)	Mar-16
Type-N mismatch combination	SN: 5047.2 / 06327	01-Apr-15 (No. 217-02134)	Mar-16
Reference Probe EX3DV4	SN: 7349	31-Dec-15 (No. EX3-7349_Dec15)	Dec-16
DAE4	SN: 601	30-Dec-15 (No. DAE4-601_Dec15)	Dec-16
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100972	15-Jun-15 (in house check Jun-15)	In house check: Jun-18
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

Calibrated by:	Name <b>Jeton Kastrati</b>	Function <b>Laboratory Technician</b>	Signature 
Approved by:	Name <b>Katja Pokovic</b>	Function <b>Technical Manager</b>	Signature 

Issued: February 24, 2016

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