

**27\_WCDMA IV\_RMC 12.2Kbps\_Front\_10mm\_Ch1312**

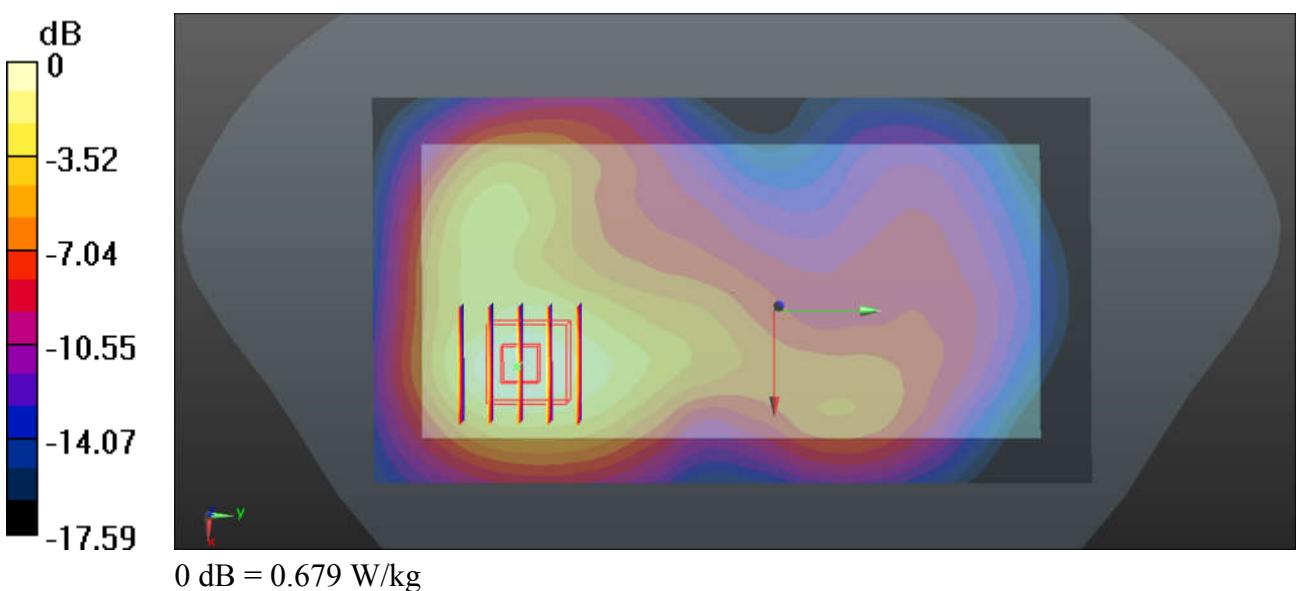
Communication System: UID 0, UMTS (0); Frequency: 1712.4 MHz; Duty Cycle: 1:1  
Medium: HSL\_1750\_190615 Medium parameters used:  $f = 1712.4$  MHz;  $\sigma = 1.363$  S/m;  $\epsilon_r = 40.271$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Ambient Temperature : 23.4 °C; Liquid Temperature : 22.7 °C

## DASY5 Configuration:

- Probe: ES3DV3 - SN3191; ConvF(5.51, 5.51, 5.51); Calibrated: 2019.01.29;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1437; Calibrated: 2018.10.15
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch1312/Area Scan (71x131x1):** Interpolated grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.679 W/kg

**Ch1312/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 15.26 V/m; Power Drift = -0.06 dB  
Peak SAR (extrapolated) = 0.910 W/kg  
**SAR(1 g) = 0.579 W/kg; SAR(10 g) = 0.342 W/kg**  
Maximum value of SAR (measured) = 0.693 W/kg



**28\_WCDMA II\_RMC 12.2Kbps\_Front\_10mm\_Ch9538**

Communication System: UID 0, UMTS (0); Frequency: 1907.6 MHz; Duty Cycle: 1:1  
Medium: HSL\_1900\_190615 Medium parameters used:  $f = 1908 \text{ MHz}$ ;  $\sigma = 1.451 \text{ S/m}$ ;  $\epsilon_r = 39.996$ ;  $\rho = 1000 \text{ kg/m}^3$   
Ambient Temperature : 23.5 °C; Liquid Temperature : 22.9 °C

## DASY5 Configuration:

- Probe: ES3DV3 - SN3191; ConvF(5.28, 5.28, 5.28); Calibrated: 2019.01.29;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1437; Calibrated: 2018.10.15
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

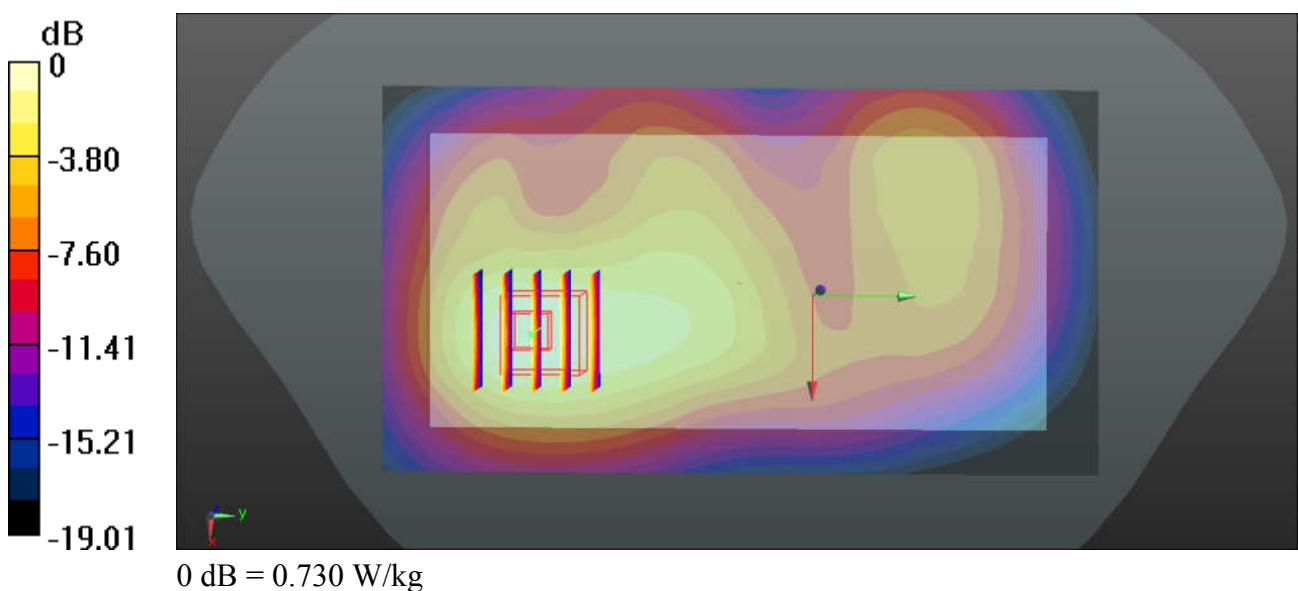
**Ch9538/Area Scan (71x131x1):** Interpolated grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.730 W/kg

**Ch9538/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 13.93 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 0.992 W/kg

**SAR(1 g) = 0.599 W/kg; SAR(10 g) = 0.346 W/kg**

Maximum value of SAR (measured) = 0.729 W/kg



**29\_LTE Band 12\_10M\_QPSK\_1RB\_25Offset\_Back\_10mm\_Ch23095**

Communication System: UID 0, LTE (0); Frequency: 707.5 MHz; Duty Cycle: 1:1  
Medium: HSL\_750\_190617 Medium parameters used:  $f = 707.5$  MHz;  $\sigma = 0.86$  S/m;  $\epsilon_r = 41.73$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.4 °C; Liquid Temperature : 22.4 °C

## DASY5 Configuration:

- Probe: ES3DV3 - SN3191; ConvF(6.59, 6.59, 6.59); Calibrated: 2019.01.29;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1437; Calibrated: 2018.10.15
- 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) = 0.442 W/kg

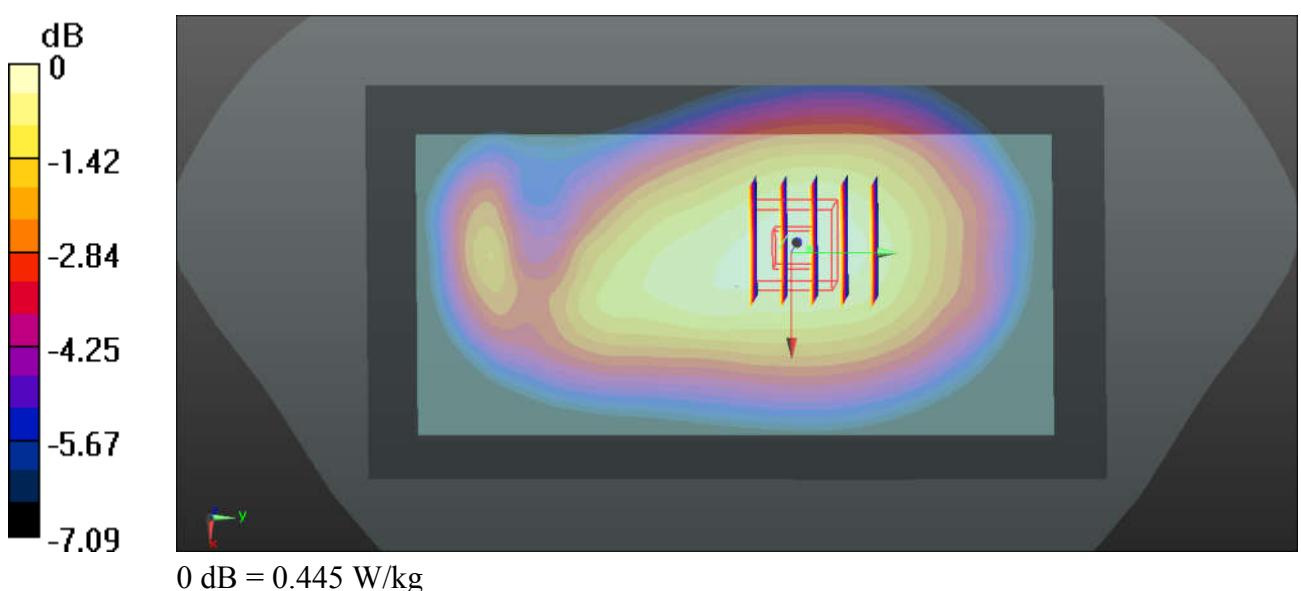
**Ch23095/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 22.41 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.493 W/kg

**SAR(1 g) = 0.407 W/kg; SAR(10 g) = 0.312 W/kg**

Maximum value of SAR (measured) = 0.445 W/kg



**30\_LTE Band 13\_10M\_QPSK\_1RB\_25Offset\_Back\_10mm\_Ch23230**

Communication System: UID 0, LTE (0); Frequency: 782 MHz; Duty Cycle: 1:1  
Medium: HSL\_750\_190617 Medium parameters used:  $f = 782 \text{ MHz}$ ;  $\sigma = 0.902 \text{ S/m}$ ;  $\epsilon_r = 40.073$ ;  $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 23.4 °C; Liquid Temperature : 22.4 °C

DASY5 Configuration:

- Probe: ES3DV3 - SN3191; ConvF(6.59, 6.59, 6.59); Calibrated: 2019.01.29;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1437; Calibrated: 2018.10.15
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

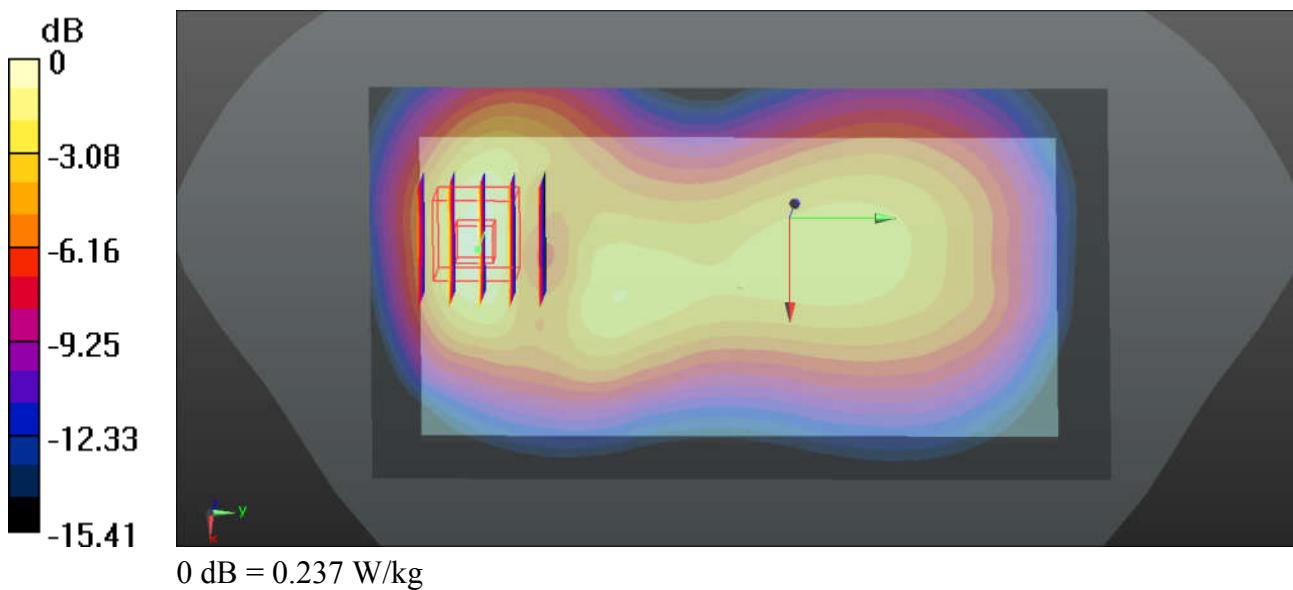
**Ch23230/Area Scan (71x131x1):** Interpolated grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.229 W/kg

**Ch23230/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 2.326 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 0.334 W/kg

**SAR(1 g) = 0.186 W/kg; SAR(10 g) = 0.103 W/kg**

Maximum value of SAR (measured) = 0.237 W/kg



**31\_LTE Band 5\_10M\_QPSK\_1RB\_25Offset\_Back\_10mm\_Ch20525**

Communication System: UID 0, LTE (0); Frequency: 836.5 MHz; Duty Cycle: 1:1  
Medium: HSL\_835\_190616 Medium parameters used:  $f = 836.5$  MHz;  $\sigma = 0.915$  S/m;  $\epsilon_r = 41.816$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.4 °C; Liquid Temperature : 22.6 °C

DASY5 Configuration:

- Probe: ES3DV3 - SN3191; ConvF(6.38, 6.38, 6.38); Calibrated: 2019.01.29;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1437; Calibrated: 2018.10.15
- 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) = 0.379 W/kg

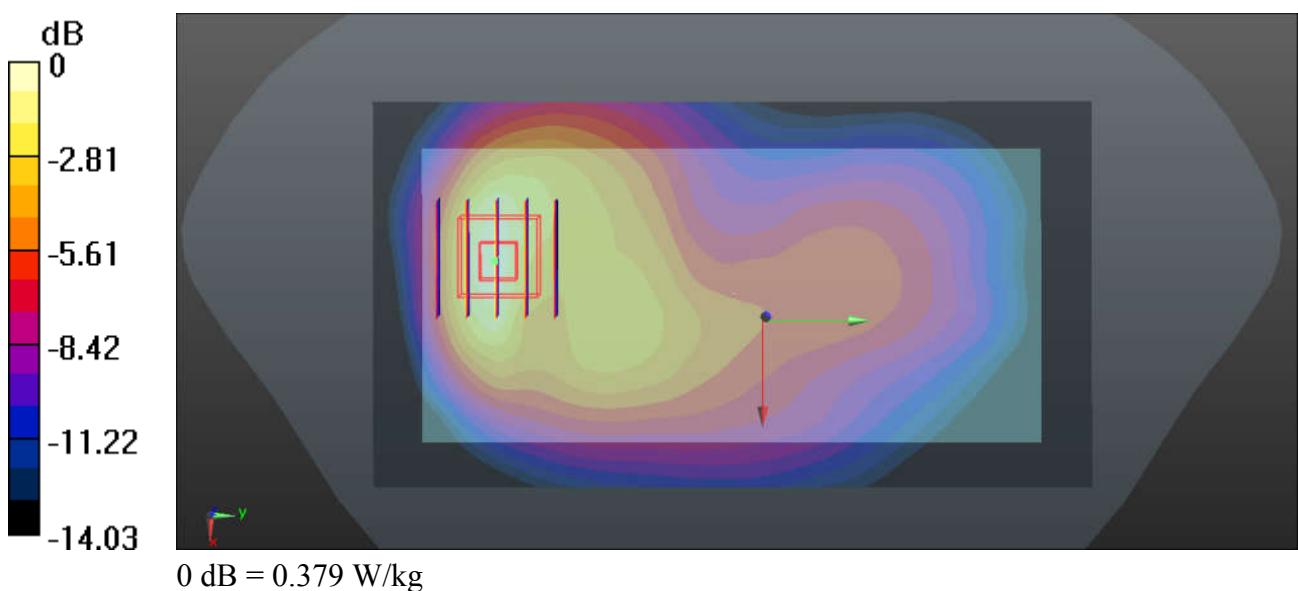
**Ch20525/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 1.580 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.556 W/kg

**SAR(1 g) = 0.322 W/kg; SAR(10 g) = 0.179 W/kg**

Maximum value of SAR (measured) = 0.410 W/kg



**32\_LTE Band 4\_20M\_QPSK\_1RB\_0Offset\_Front\_10mm\_Ch20175**

Communication System: UID 0, LTE (0); Frequency: 1732.5 MHz; Duty Cycle: 1:1  
Medium: HSL\_1750\_190615 Medium parameters used:  $f = 1732.5$  MHz;  $\sigma = 1.386$  S/m;  $\epsilon_r = 40.178$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Ambient Temperature : 23.4 °C; Liquid Temperature : 22.7 °C

## DASY5 Configuration:

- Probe: ES3DV3 - SN3191; ConvF(5.51, 5.51, 5.51); Calibrated: 2019.01.29;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1437; Calibrated: 2018.10.15
- 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) = 0.478 W/kg

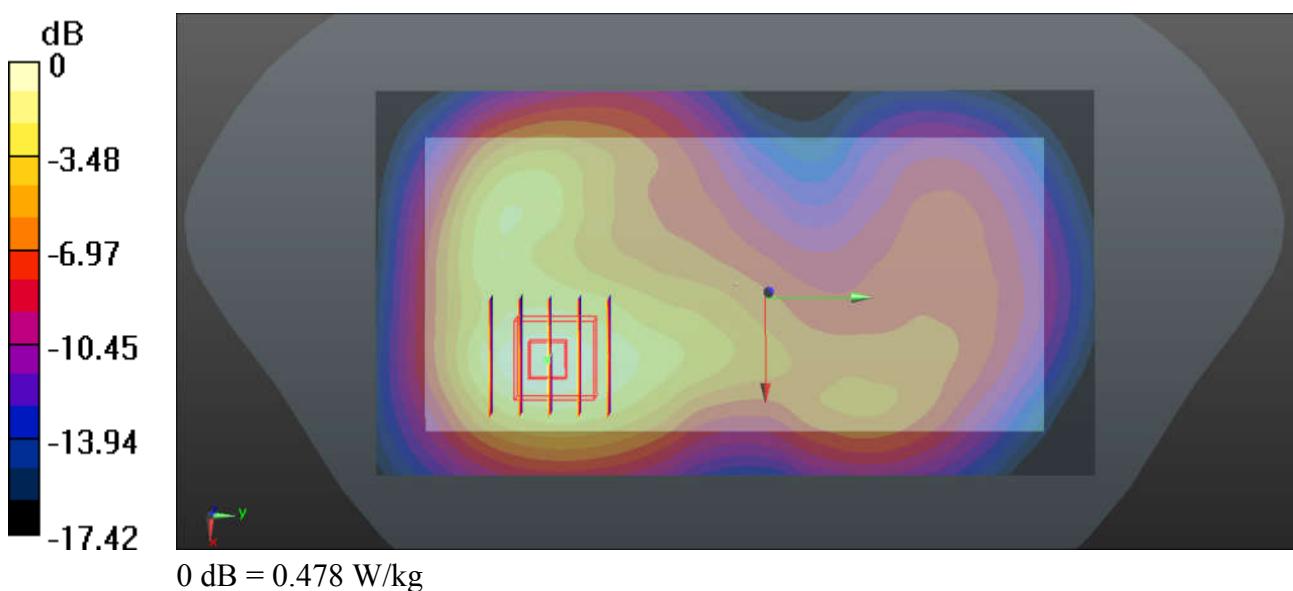
**Ch20175/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.798 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 0.612 W/kg

**SAR(1 g) = 0.388 W/kg; SAR(10 g) = 0.229 W/kg**

Maximum value of SAR (measured) = 0.467 W/kg



**33\_LTE Band 2\_20M\_QPSK\_1RB\_49Offset\_Front\_10mm\_Ch19100**

Communication System: UID 0, LTE (0); Frequency: 1900 MHz; Duty Cycle: 1:1  
Medium: HSL\_1900\_190615 Medium parameters used:  $f = 1900 \text{ MHz}$ ;  $\sigma = 1.443 \text{ S/m}$ ;  $\epsilon_r = 40.03$ ;  $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 23.5 °C; Liquid Temperature : 22.9 °C

## DASY5 Configuration:

- Probe: ES3DV3 - SN3191; ConvF(5.28, 5.28, 5.28); Calibrated: 2019.01.29;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1437; Calibrated: 2018.10.15
- Phantom: SAM2; Type: QD000P40CD; Serial: TP:1671
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

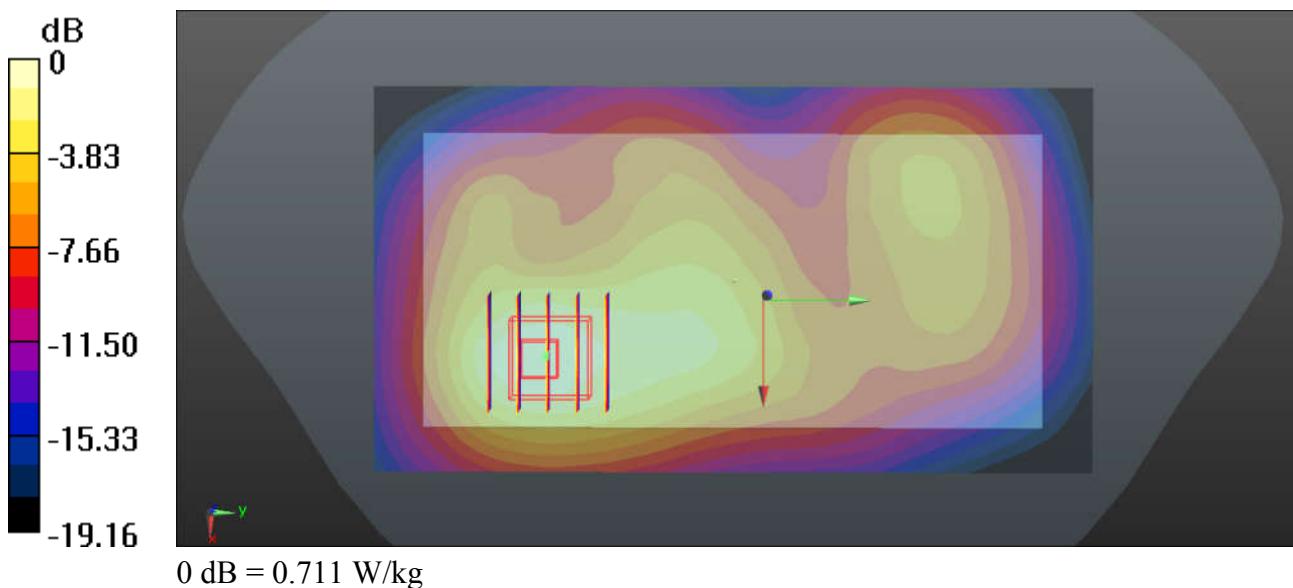
**Ch19100/Area Scan (71x131x1):** Interpolated grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.711 W/kg

**Ch19100/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 11.75 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 0.978 W/kg

**SAR(1 g) = 0.589 W/kg; SAR(10 g) = 0.338 W/kg**

Maximum value of SAR (measured) = 0.713 W/kg



## 34\_WLAN2.4GHz\_802.11b 1Mbps\_Front\_10mm\_Ch11

Communication System: UID 0, WIFI (0); Frequency: 2462 MHz; Duty Cycle: 1:1.025  
Medium: HSL\_2450\_190628 Medium parameters used:  $f = 2462$  MHz;  $\sigma = 1.841$  S/m;  $\epsilon_r = 37.976$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.6 °C; Liquid Temperature : 22.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3819; ConvF(7.21, 7.21, 7.21); Calibrated: 2019.03.01;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn715; Calibrated: 2019.01.23
- Phantom: SAM (Front) with CRP v5.0; Type: QD000P40CD; Serial: TP:1795
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch11/Area Scan (91x161x1):** Interpolated grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 0.138 W/kg

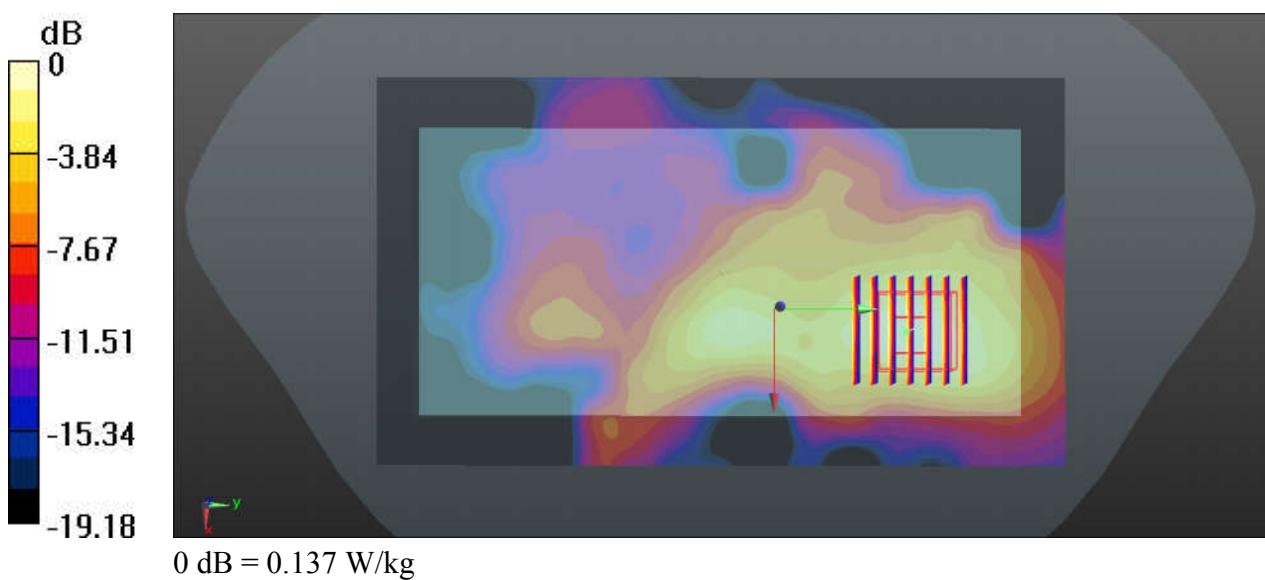
**Ch11/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 4.934 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 0.181 W/kg

**SAR(1 g) = 0.097 W/kg; SAR(10 g) = 0.052 W/kg**

Maximum value of SAR (measured) = 0.137 W/kg



## 35\_WLAN5GHz\_802.11a 6Mbps\_Back\_10mm\_Ch60

Communication System: UID 0, WIFI (0); Frequency: 5300 MHz; Duty Cycle: 1:1.143  
Medium: HSL\_5250\_190628 Medium parameters used:  $f = 5300$  MHz;  $\sigma = 4.776$  S/m;  $\epsilon_r = 36.353$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.7 °C; Liquid Temperature : 22.4 °C

### DASY5 Configuration:

- Probe: EX3DV4 - SN3819; ConvF(5.07, 5.07, 5.07); Calibrated: 2019.03.01;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn715; Calibrated: 2019.01.23
- Phantom: SAM (Front) with CRP v5.0; Type: QD000P40CD; Serial: TP:1795
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch60/Area Scan (101x191x1):** Interpolated grid: dx=10mm, dy=10mm  
Maximum value of SAR (interpolated) = 0.432 W/kg

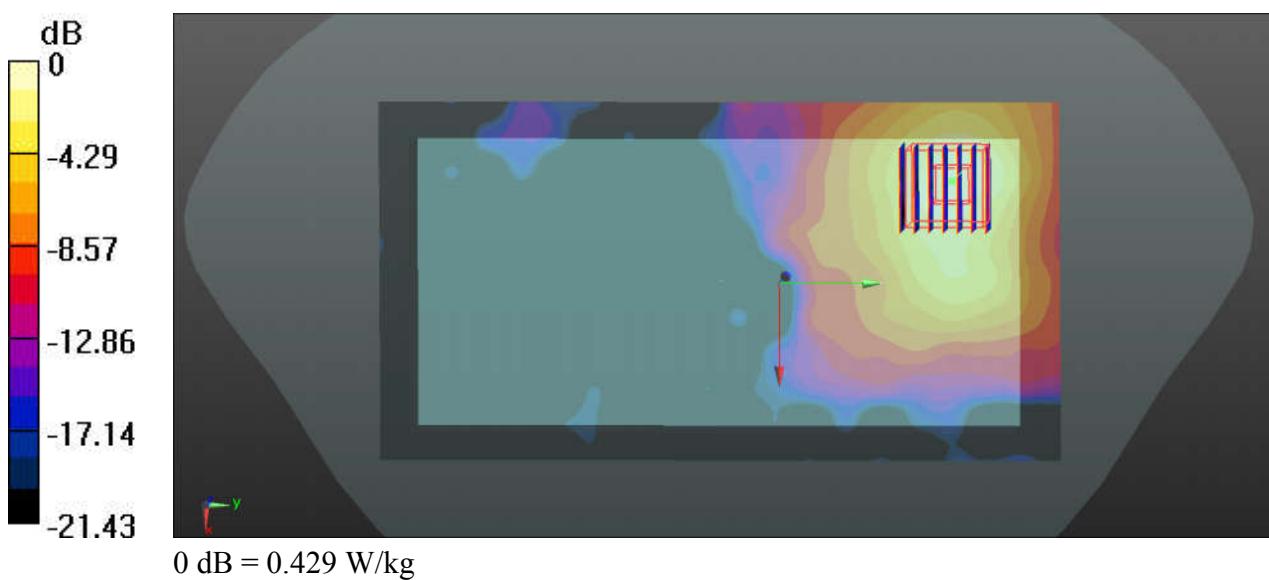
**Ch60/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 0.8360 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 0.739 W/kg

**SAR(1 g) = 0.196 W/kg; SAR(10 g) = 0.079 W/kg**

Maximum value of SAR (measured) = 0.429 W/kg



## 36\_WLAN5GHz\_802.11a 6Mbps\_Back\_10mm\_Ch116

Communication System: UID 0, WIFI (0); Frequency: 5580 MHz; Duty Cycle: 1:1.143  
Medium: HSL\_5600\_190627 Medium parameters used:  $f = 5580$  MHz;  $\sigma = 5.008$  S/m;  $\epsilon_r = 36.542$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.5 °C; Liquid Temperature : 22.6 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3819; ConvF(4.7, 4.7, 4.7); Calibrated: 2019.03.01;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn715; Calibrated: 2019.01.23
- Phantom: SAM (Front) with CRP v5.0; Type: QD000P40CD; Serial: TP:1795
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch116/Area Scan (101x191x1):** Interpolated grid: dx=10mm, dy=10mm  
Maximum value of SAR (interpolated) = 0.642 W/kg

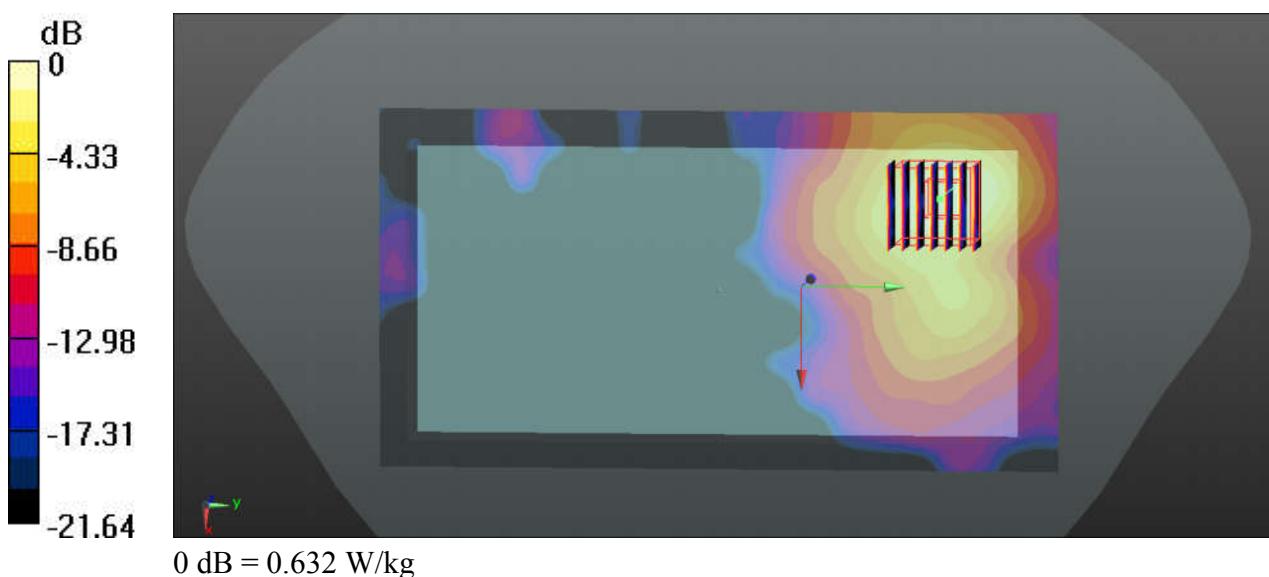
**Ch116/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 0.4390 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 1.10 W/kg

**SAR(1 g) = 0.281 W/kg; SAR(10 g) = 0.107 W/kg**

Maximum value of SAR (measured) = 0.632 W/kg



## 37\_WLAN5GHz\_802.11a 6Mbps\_Back\_10mm\_Ch149

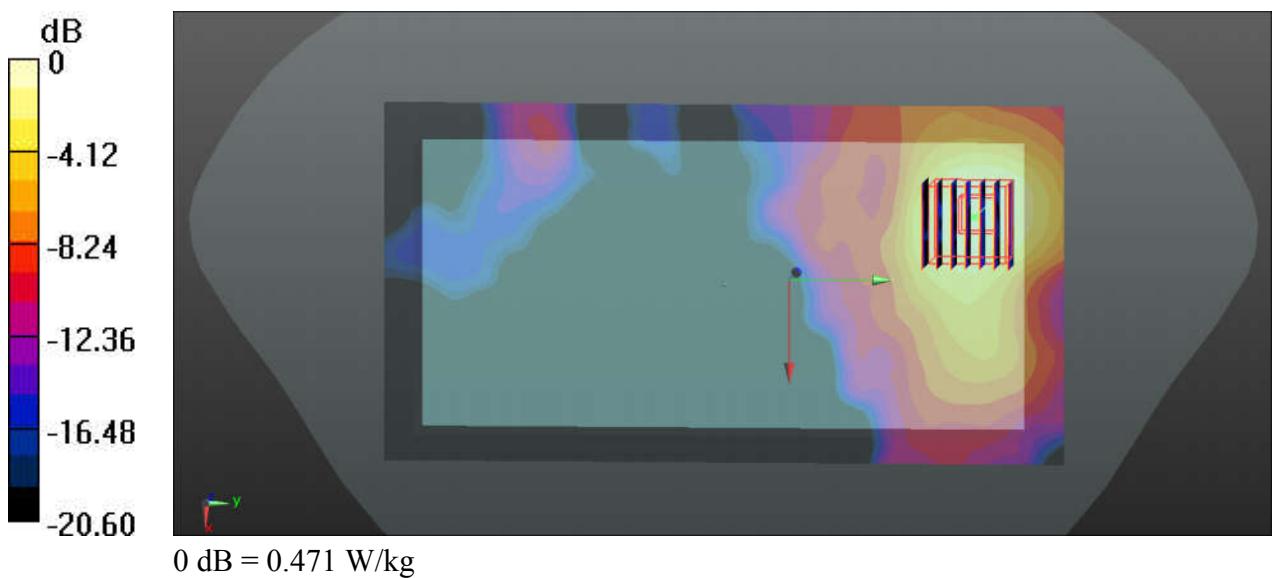
Communication System: UID 0, WIFI (0); Frequency: 5745 MHz; Duty Cycle: 1:1.143  
Medium: HSL\_5750\_190626 Medium parameters used:  $f = 5745 \text{ MHz}$ ;  $\sigma = 5.308 \text{ S/m}$ ;  $\epsilon_r = 35.56$ ;  $\rho = 1000 \text{ kg/m}^3$   
Ambient Temperature : 23.4 °C; Liquid Temperature : 22.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3819; ConvF(4.77, 4.77, 4.77); Calibrated: 2019.03.01;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn715; Calibrated: 2019.01.23
- Phantom: SAM (Front) with CRP v5.0; Type: QD000P40CD; Serial: TP:1795
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch149/Area Scan (101x191x1):** Interpolated grid: dx=10mm, dy=10mm  
Maximum value of SAR (interpolated) = 0.482 W/kg

**Ch149/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm  
Reference Value = 0 V/m; Power Drift = 0.03 dB  
Peak SAR (extrapolated) = 0.830 W/kg  
**SAR(1 g) = 0.209 W/kg; SAR(10 g) = 0.083 W/kg**  
Maximum value of SAR (measured) = 0.471 W/kg



## 38\_Bluetooth\_DH5\_1Mbps\_Front\_10mm\_Ch0

Communication System: UID 0, Bluetooth (0); Frequency: 2402 MHz; Duty Cycle: 1:1.302  
Medium: HSL\_2450\_190628 Medium parameters used:  $f = 2402$  MHz;  $\sigma = 1.767$  S/m;  $\epsilon_r = 38.098$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.6 °C; Liquid Temperature : 22.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3819; ConvF(7.21, 7.21, 7.21); Calibrated: 2019.03.01;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn715; Calibrated: 2019.01.23
- Phantom: SAM (Front) with CRP v5.0; Type: QD000P40CD; Serial: TP:1795
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch0/Area Scan (91x161x1):** Interpolated grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 0.0157 W/kg

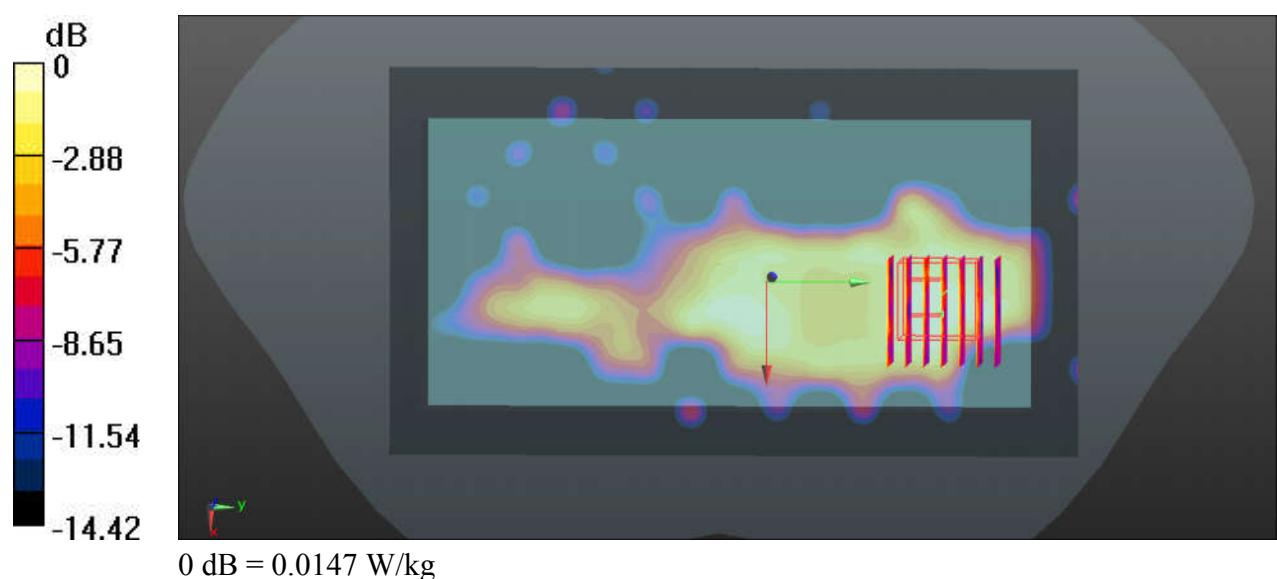
**Ch0/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.6970 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.0430 W/kg

**SAR(1 g) = 0.00976 W/kg; SAR(10 g) = 0.00517 W/kg**

Maximum value of SAR (measured) = 0.0147 W/kg



**39\_WLAN5GHz\_802.11a 6Mbps\_Right Side\_0mm\_Ch60**

Communication System: UID 0, WIFI (0); Frequency: 5300 MHz; Duty Cycle: 1:1.143  
Medium: HSL\_5250\_190628 Medium parameters used:  $f = 5300$  MHz;  $\sigma = 4.776$  S/m;  $\epsilon_r = 36.353$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.7 °C; Liquid Temperature : 22.4 °C

## DASY5 Configuration:

- Probe: EX3DV4 - SN3819; ConvF(5.07, 5.07, 5.07); Calibrated: 2019.03.01;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn715; Calibrated: 2019.01.23
- Phantom: SAM (Front) with CRP v5.0; Type: QD000P40CD; Serial: TP:1795
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Ch60/Area Scan (61x191x1):** Interpolated grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 5.55 W/kg

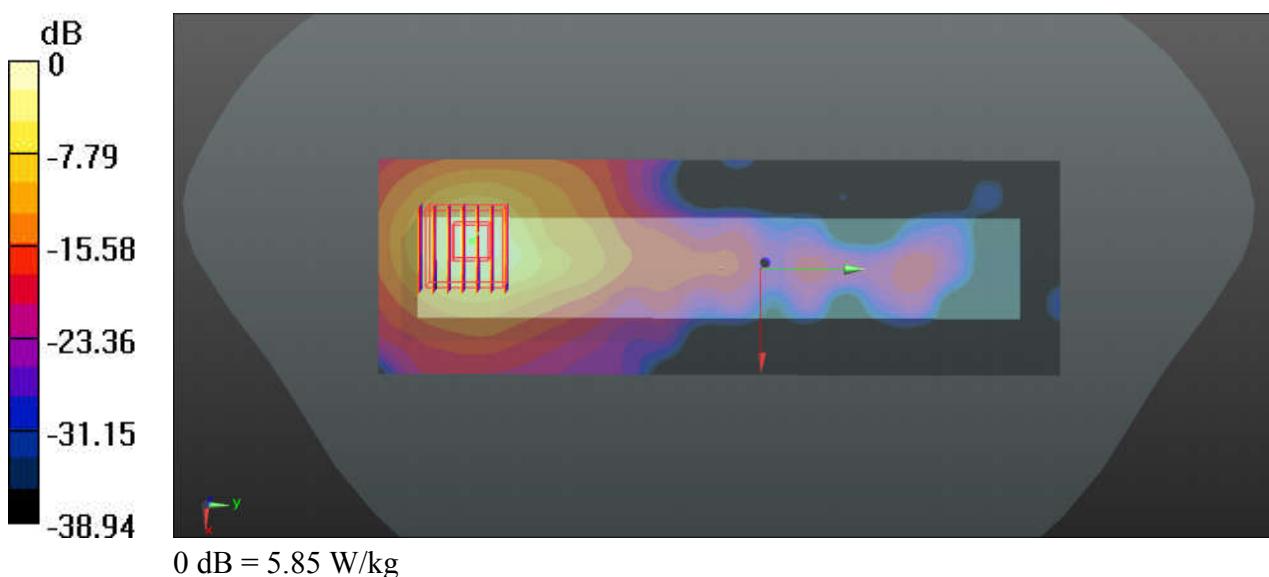
**Ch60/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 4.971 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 9.88 W/kg

**SAR(1 g) = 2.38 W/kg; SAR(10 g) = 0.679 W/kg**

Maximum value of SAR (measured) = 5.85 W/kg



**40\_WLAN5GHz\_802.11a 6Mbps\_Right Side\_0mm\_Ch116**

Communication System: UID 0, WIFI (0); Frequency: 5580 MHz; Duty Cycle: 1:1.143  
Medium: HSL\_5600\_190627 Medium parameters used:  $f = 5580$  MHz;  $\sigma = 5.008$  S/m;  $\epsilon_r = 36.542$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.5 °C; Liquid Temperature : 22.6 °C

## DASY5 Configuration:

- Probe: EX3DV4 - SN3819; ConvF(4.7, 4.7, 4.7); Calibrated: 2019.03.01;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn715; Calibrated: 2019.01.23
- Phantom: SAM (Front) with CRP v5.0; Type: QD000P40CD; Serial: TP:1795
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

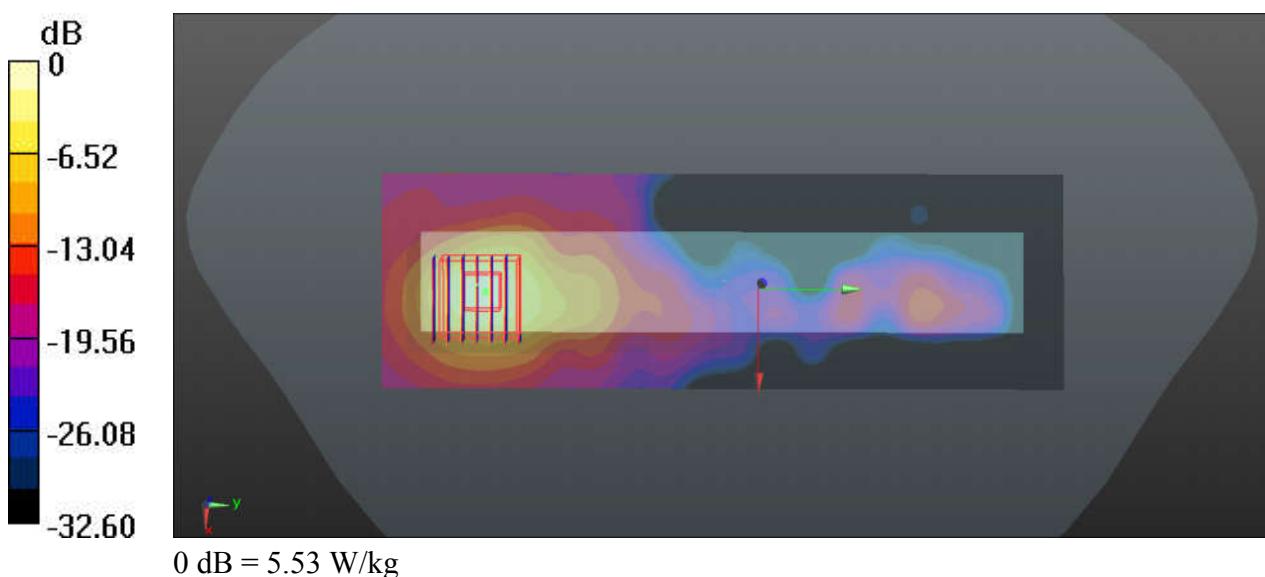
**Ch116/Area Scan (61x191x1):** Interpolated grid: dx=10mm, dy=10mm  
Maximum value of SAR (interpolated) = 5.22 W/kg

**Ch116/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm  
Reference Value = 1.711 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 9.84 W/kg

**SAR(1 g) = 2.13 W/kg; SAR(10 g) = 0.603 W/kg**

Maximum value of SAR (measured) = 5.53 W/kg





## Appendix C. DASY Calibration Certificate

The DASY calibration certificates are shown as follows.



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

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China  
 Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504  
 E-mail: ctll@chinattl.com http://www.chinattl.cn



中国认可  
 国际互认  
 校准  
 CALIBRATION  
 CNAS L0570

Client

Sporton

Certificate No: Z18-60532

## CALIBRATION CERTIFICATE

Object D750V3 - SN: 1099

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

Calibration date: December 6, 2018

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

All calibrations have been conducted in the closed laboratory facility: environment temperature( $22\pm3$ )°C and humidity<70%.

### Calibration Equipment used (M&TE critical for calibration)

| Primary Standards       | ID #       | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
|-------------------------|------------|--|-----------------------|
| Power Meter NRVD        | 102196     | 07-Mar-18 (CTTL, No.J18X01510)           | Mar-19                |
| Power sensor NRV-Z5     | 100596     | 07-Mar-18 (CTTL, No.J18X01510)           | Mar-19                |
| Reference Probe EX3DV4  | SN 7514    | 27-Aug-18(SPEAG, No.EX3-7514_Aug18)      | Aug-19                |
| DAE4                    | SN 1555    | 20-Aug-18(SPEAG, No.DAE4-1555_Aug18)     | Aug-19                |
| Secondary Standards     | ID #       | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
| Signal Generator E4438C | MY49071430 | 23-Jan-18 (CTTL, No.J18X00560)           | Jan-19                |
| NetworkAnalyzer E5071C  | MY46110673 | 24-Jan-18 (CTTL, No.J18X00561)           | Jan-19                |

| Calibrated by: | Name        | Function           | Signature |
|----------------|-------------|--------------------|-----------|
|                | Zhao Jing   | SAR Test Engineer  |           |
| Reviewed by:   | Lin Hao     | SAR Test Engineer  |           |
| Approved by:   | Qi Dianyuan | SAR Project Leader |           |

Issued: December 9, 2018

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### Glossary:

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

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

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

### Additional Documentation:

- e) DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

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

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



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## Measurement Conditions

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

|                                     |                          |              |
|-------------------------------------|--------------------------|--------------|
| <b>DASY Version</b>                 | DASY52                   | 52.10.2.1495 |
| <b>Extrapolation</b>                | Advanced Extrapolation   |              |
| <b>Phantom</b>                      | Triple Flat Phantom 5.1C |              |
| <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 | 43.1 ± 6 %   | 0.87 mho/m ± 6 % |
| <b>Head TSL temperature change during test</b> | <1.0 °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 | 2.07 mW / g               |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | 8.52 mW /g ± 18.8 % (k=2) |
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b> | Condition          |                           |
| SAR measured  | 250 mW input power | 1.38 mW / g               |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | 5.64 mW /g ± 18.7 % (k=2) |

## 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 | 54.0 ± 6 %   | 0.95 mho/m ± 6 % |
| <b>Body TSL temperature change during test</b> | <1.0 °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 | 2.15 mW / g               |
| SAR for nominal Body TSL parameters                           | normalized to 1W   | 8.61 mW /g ± 18.8 % (k=2) |
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b> | Condition          |                           |
| SAR measured  | 250 mW input power | 1.44 mW / g               |
| SAR for nominal Body TSL parameters                           | normalized to 1W   | 5.77 mW /g ± 18.7 % (k=2) |



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## Appendix (Additional assessments outside the scope of CNAS L0570)

### Antenna Parameters with Head TSL

|                                      |               |
|--------------------------------------|---------------|
| Impedance, transformed to feed point | 54.2Ω- 1.12jΩ |
| Return Loss                          | - 27.7dB      |

### Antenna Parameters with Body TSL

|                                      |               |
|--------------------------------------|---------------|
| Impedance, transformed to feed point | 49.8Ω- 3.37jΩ |
| Return Loss                          | - 29.4dB      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 0.900 ns |
|----------------------------------|----------|

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

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

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

### Additional EUT Data

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



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## DASY5 Validation Report for Head TSL

Date: 12.05.2018

Test Laboratory: CTTL, Beijing, China

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

Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 750 \text{ MHz}$ ;  $\sigma = 0.865 \text{ S/m}$ ;  $\epsilon_r = 43.13$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7514; ConvF(9.47, 9.47, 9.47) @ 750 MHz; Calibrated: 8/27/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/20/2018
- Phantom: MFP\_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

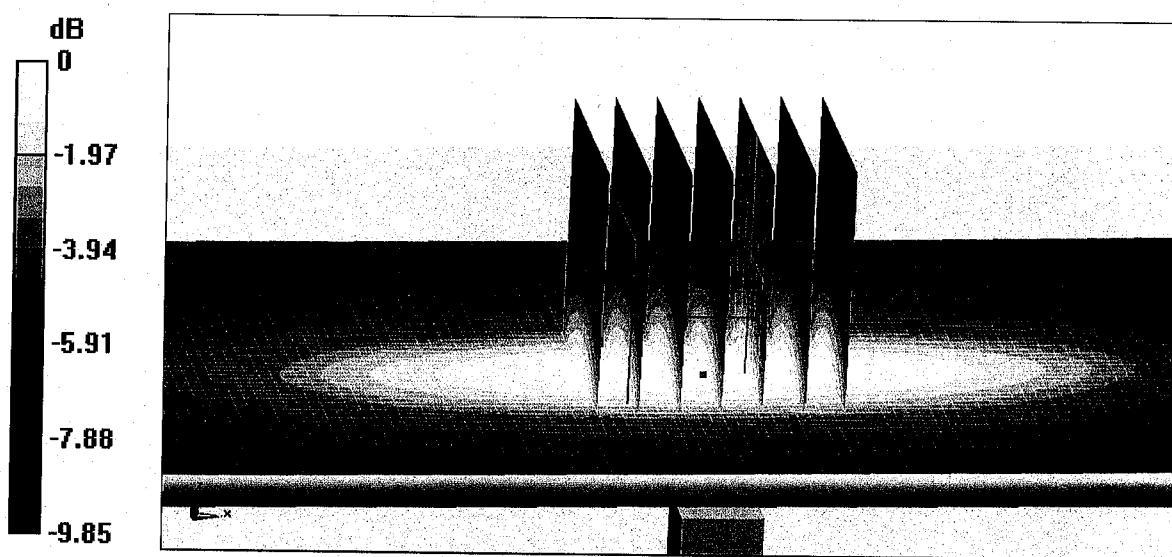
**Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 53.37 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 3.12 W/kg

**SAR(1 g) = 2.07 W/kg; SAR(10 g) = 1.38 W/kg**

Maximum value of SAR (measured) = 2.75 W/kg

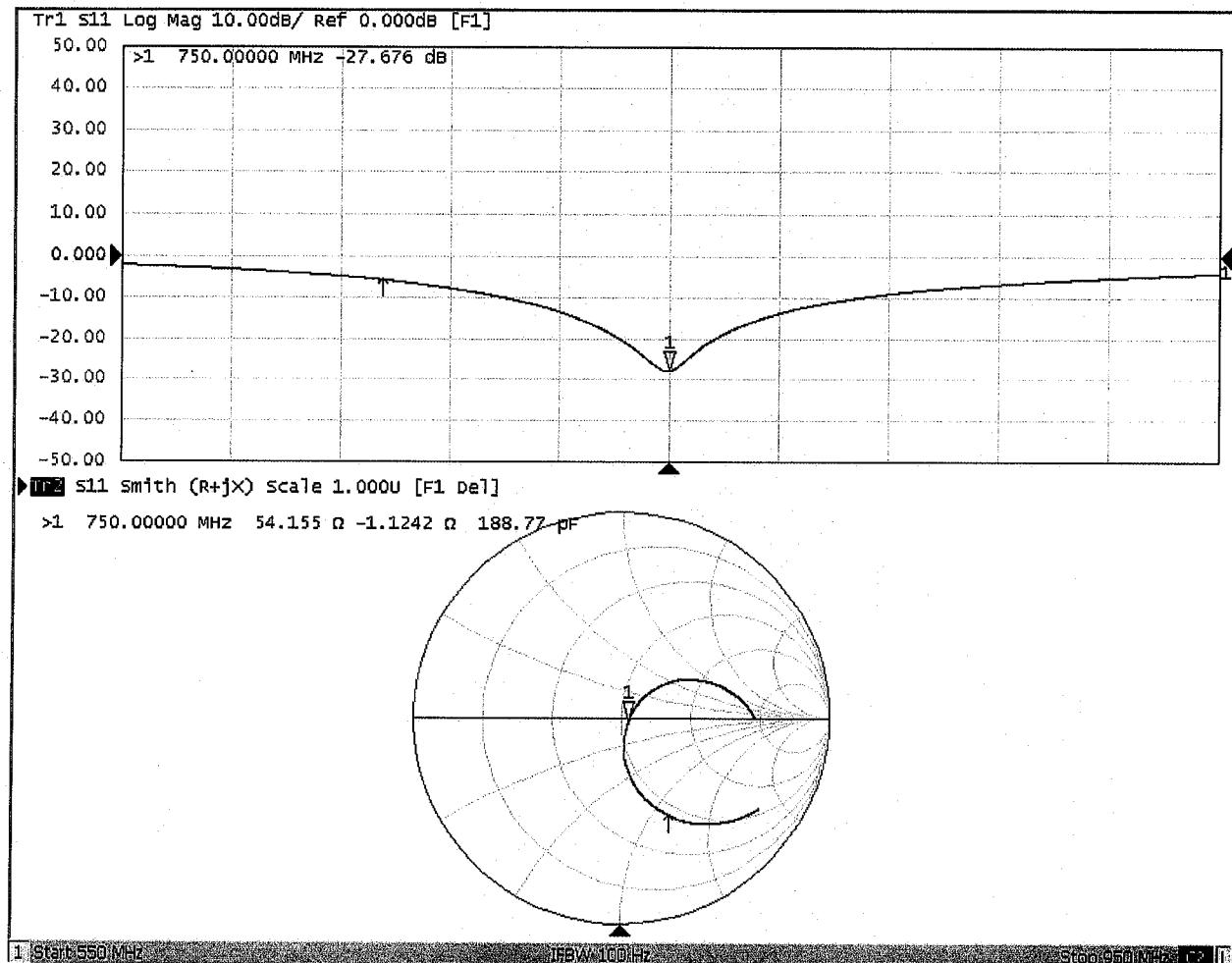




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### Impedance Measurement Plot for Head TSL





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## DASY5 Validation Report for Body TSL

Date: 12.05.2018

Test Laboratory: CTTL, Beijing, China

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

Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 750 \text{ MHz}$ ;  $\sigma = 0.951 \text{ S/m}$ ;  $\epsilon_r = 54.02$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7514; ConvF(9.68, 9.68, 9.68) @ 750 MHz; Calibrated: 8/27/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/20/2018
- Phantom: MFP\_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

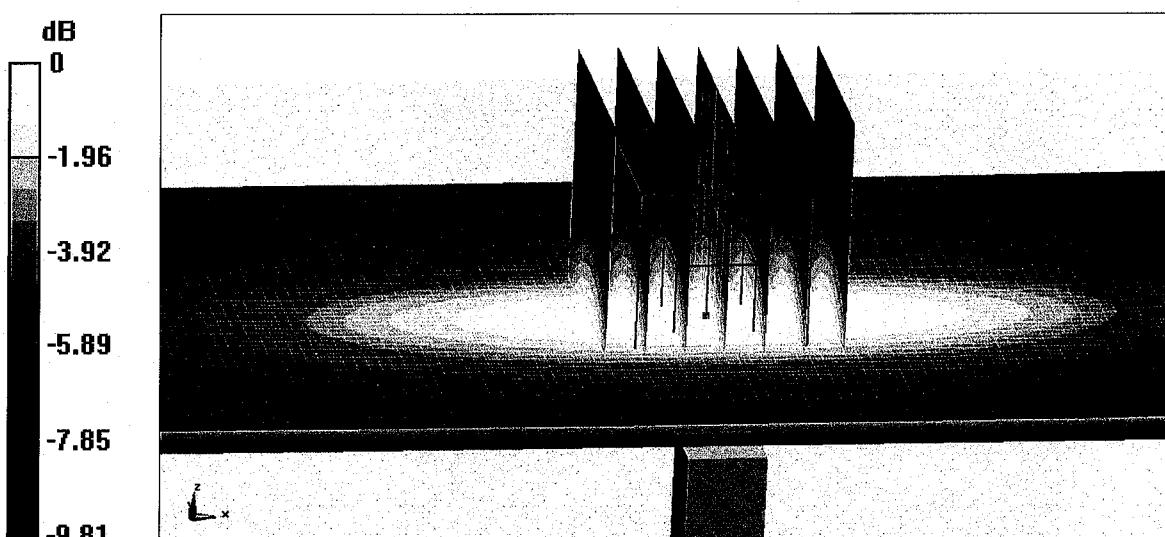
**Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 51.51 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 3.29 W/kg

**SAR(1 g) = 2.15 W/kg; SAR(10 g) = 1.44 W/kg**

Maximum value of SAR (measured) = 2.88 W/kg



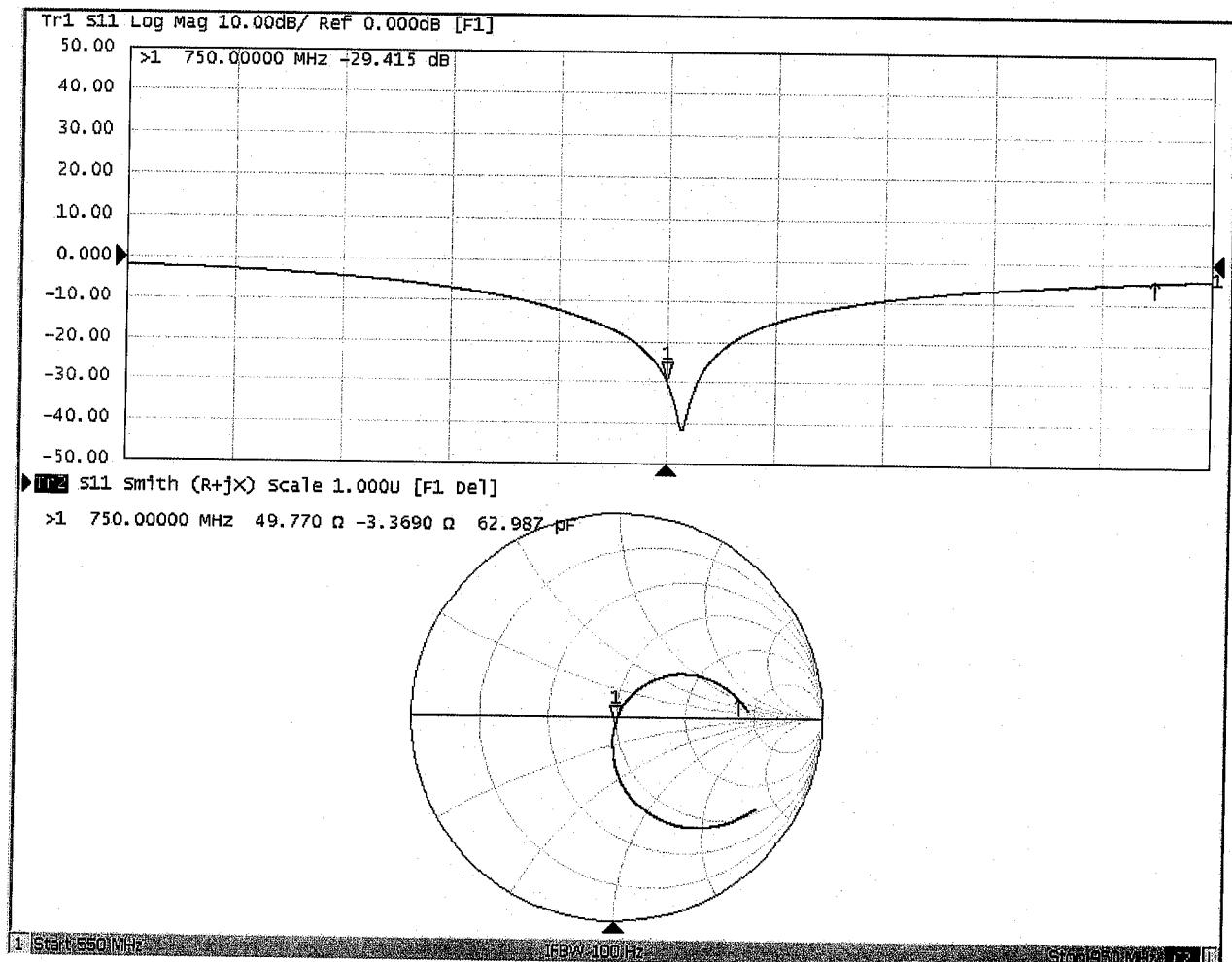
**0 dB = 2.88 W/kg = 4.59 dBW/kg**



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### Impedance Measurement Plot for Body TSL





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 CNAS L0570

Client

Sportun

Certificate No: Z18-60533

## CALIBRATION CERTIFICATE

Object D835V2 - SN: 4d162

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

Calibration date: December 5, 2018

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

All calibrations have been conducted in the closed laboratory facility: environment temperature( $22\pm3$ )°C and humidity<70%.

### Calibration Equipment used (M&TE critical for calibration)

| Primary Standards       | ID #       | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
|-------------------------|------------|--|-----------------------|
| Power Meter NRVD        | 102196     | 07-Mar-18 (CTTL, No.J18X01510)           | Mar-19                |
| Power sensor NRV-Z5     | 100596     | 07-Mar-18 (CTTL, No.J18X01510)           | Mar-19                |
| Reference Probe EX3DV4  | SN 7514    | 27-Aug-18(SPEAG, No.EX3-7514_Aug18)      | Aug-19                |
| DAE4                    | SN 1555    | 20-Aug-18(SPEAG, No.DAE4-1555_Aug18)     | Aug-19                |
| Secondary Standards     | ID #       | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
| Signal Generator E4438C | MY49071430 | 23-Jan-18 (CTTL, No.J18X00560)           | Jan-19                |
| NetworkAnalyzer E5071C  | MY46110673 | 24-Jan-18 (CTTL, No.J18X00561)           | Jan-19                |

| Calibrated by: | Name        | Function           | Signature |
|----------------|-------------|--------------------|-----------|
|                | Zhao Jing   | SAR Test Engineer  |           |
| Reviewed by:   | Lin Hao     | SAR Test Engineer  |           |
| Approved by:   | Qi Dianyuan | SAR Project Leader |           |

Issued: December 8, 2018

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### Glossary:

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

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

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

### Additional Documentation:

- e) DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

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

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



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## Measurement Conditions

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

|                              |                          |              |
|------------------------------|--------------------------|--------------|
| DASY Version                 | DASY52                   | 52.10.2.1495 |
| Extrapolation                | Advanced Extrapolation   |              |
| Phantom                      | Triple Flat Phantom 5.1C |              |
| Distance Dipole Center - TSL | 15 mm                    | with Spacer  |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm        |              |
| Frequency                    | 835 MHz ± 1 MHz          |              |

## Head TSL parameters

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 41.5         | 0.90 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 42.7 ± 6 %   | 0.88 mho/m ± 6 % |
| Head TSL temperature change during test | <1.0 °C         | ----         | ----             |

## SAR result with Head TSL

|   |                    |                           |
|---|--------------------|---------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL   | Condition          |                           |
| SAR measured  | 250 mW input power | 2.35 mW / g               |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 9.61 mW /g ± 18.8 % (k=2) |
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | Condition          |                           |
| SAR measured  | 250 mW input power | 1.56 mW / g               |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 6.35 mW /g ± 18.7 % (k=2) |

## Body TSL parameters

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 55.2         | 0.97 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 53.7 ± 6 %   | 0.99 mho/m ± 6 % |
| Body TSL temperature change during test | <1.0 °C         | ----         | ----             |

## SAR result with Body TSL

|   |                    |                           |
|---|--------------------|---------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL   | Condition          |                           |
| SAR measured  | 250 mW input power | 2.47 mW / g               |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 9.70 mW /g ± 18.8 % (k=2) |
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | Condition          |                           |
| SAR measured  | 250 mW input power | 1.64 mW / g               |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 6.47 mW /g ± 18.7 % (k=2) |



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## Appendix (Additional assessments outside the scope of CNAS L0570)

### Antenna Parameters with Head TSL

|                                      |               |
|--------------------------------------|---------------|
| Impedance, transformed to feed point | 52.6Ω- 2.56jΩ |
| Return Loss                          | - 28.9dB      |

### Antenna Parameters with Body TSL

|                                      |               |
|--------------------------------------|---------------|
| Impedance, transformed to feed point | 47.2Ω- 6.92jΩ |
| Return Loss                          | - 22.3dB      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.306 ns |
|----------------------------------|----------|

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

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

### Additional EUT Data

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



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Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504  
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## DASY5 Validation Report for Head TSL

Date: 12.04.2018

Test Laboratory: CTTL, Beijing, China

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

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.881 \text{ S/m}$ ;  $\epsilon_r = 42.71$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7514; ConvF(9.09, 9.09, 9.09) @ 835 MHz; Calibrated: 8/27/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/20/2018
- Phantom: MFP\_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

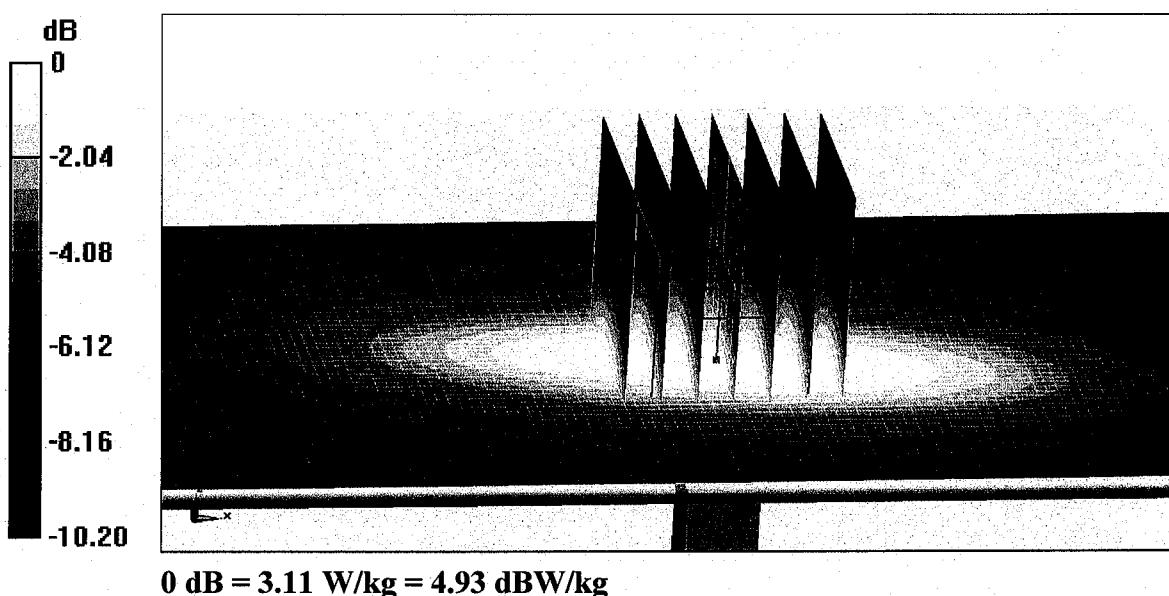
**Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 57.75 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 3.50 W/kg

**SAR(1 g) = 2.35 W/kg; SAR(10 g) = 1.56 W/kg**

Maximum value of SAR (measured) = 3.11 W/kg

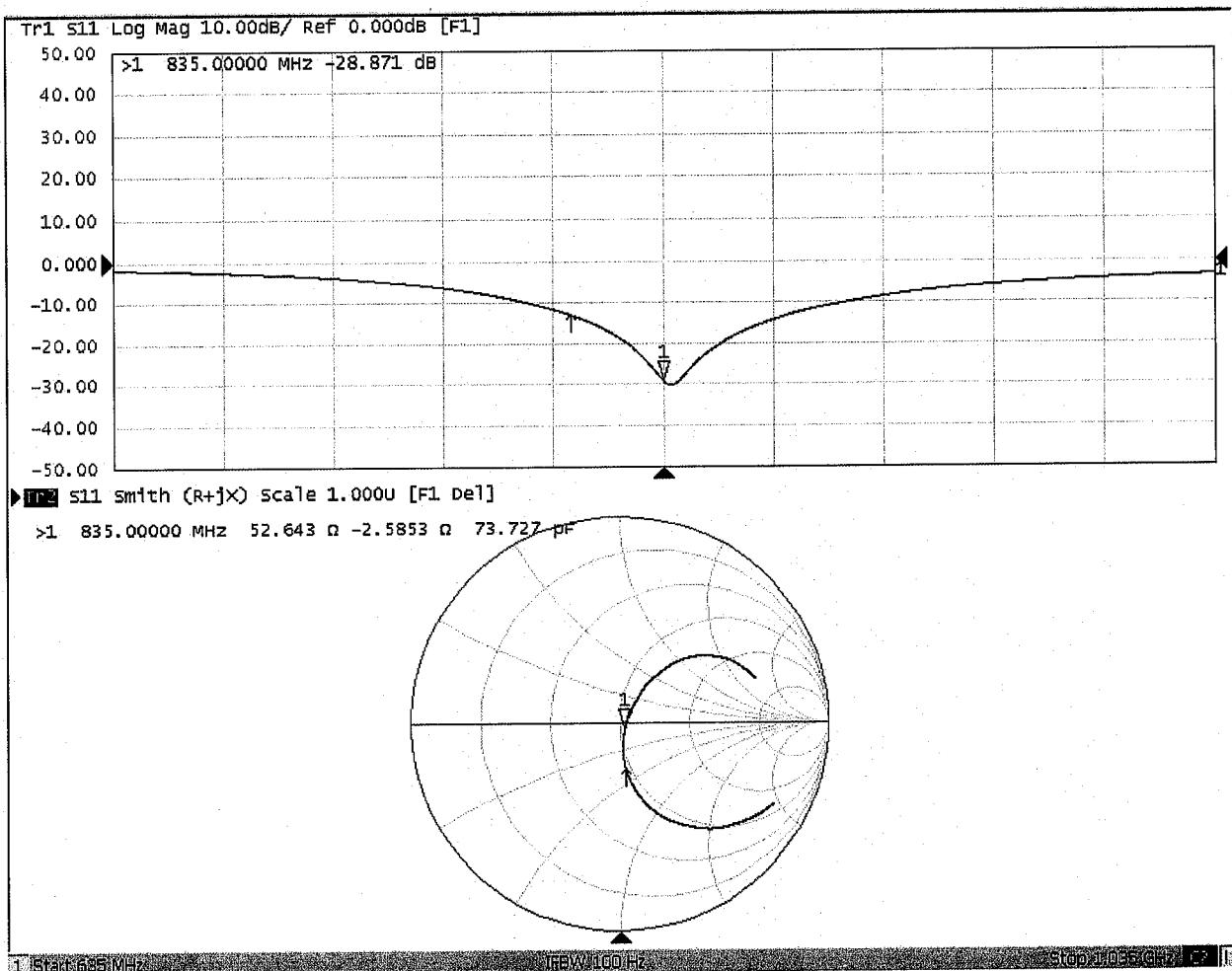




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## Impedance Measurement Plot for Head TSL





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## DASY5 Validation Report for Body TSL

Date: 12.04.2018

Test Laboratory: CTTL, Beijing, China

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

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.986 \text{ S/m}$ ;  $\epsilon_r = 53.72$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7514; ConvF(9.47, 9.47, 9.47) @ 835 MHz; Calibrated: 8/27/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/20/2018
- Phantom: MFP\_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

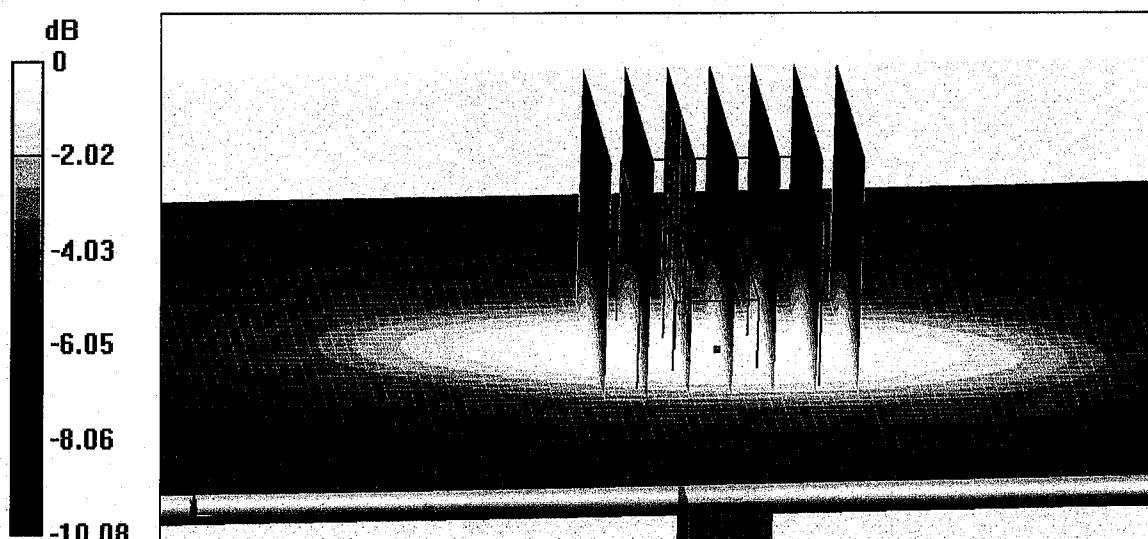
**Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 55.24 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 3.72 W/kg

**SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.64 W/kg**

Maximum value of SAR (measured) = 3.29 W/kg

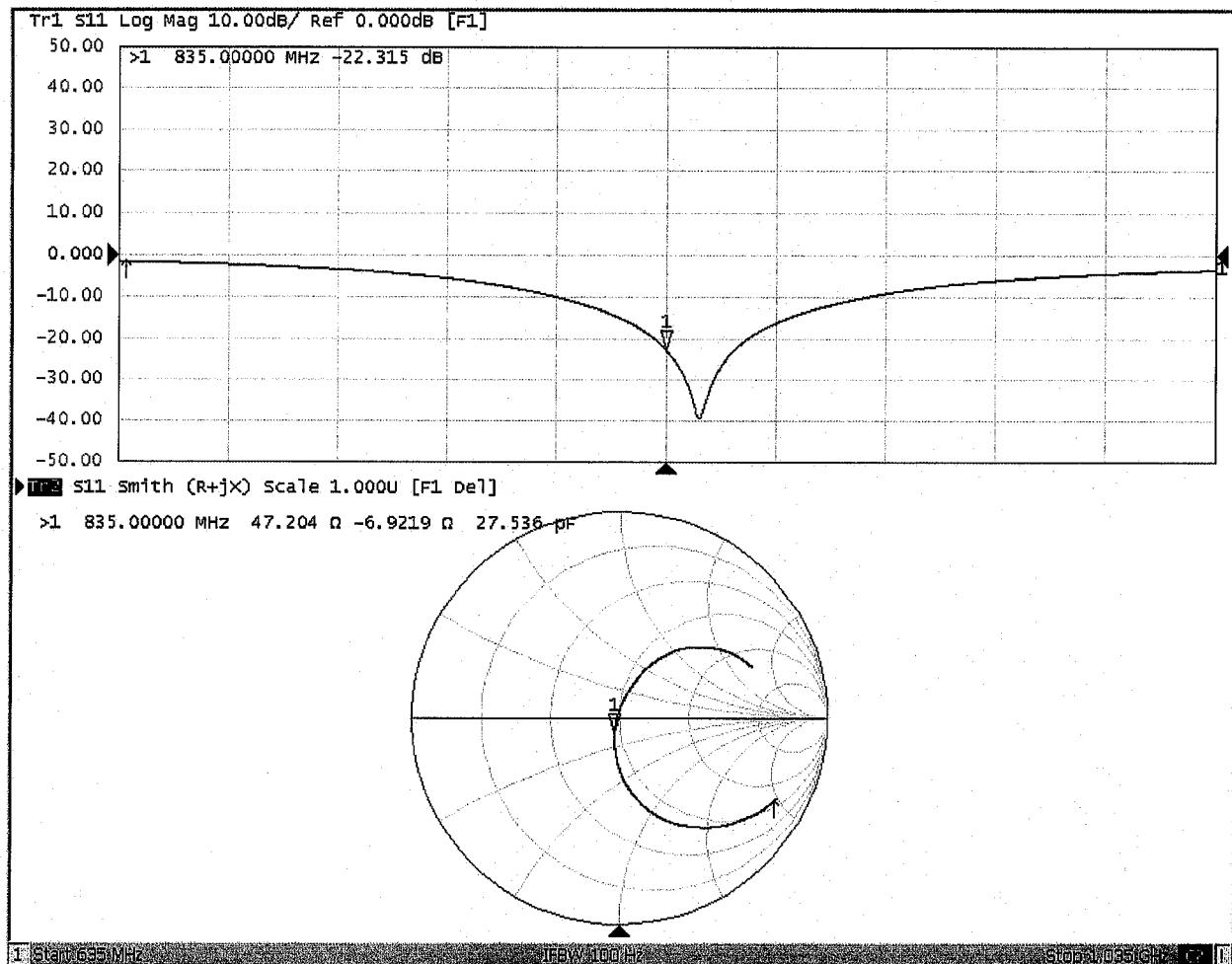




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### Impedance Measurement Plot for Body TSL





Client Sporton

Certificate No: Z18-60258

## CALIBRATION CERTIFICATE

Object D1750V2 - SN: 1137

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

Calibration date: July 30, 2018

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

All calibrations have been conducted in the closed laboratory facility: environment temperature( $22\pm3$ )°C and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards       | ID #       | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
|-------------------------|------------|--|-----------------------|
| Power Meter NRVD        | 102083     | 01-Nov-17 (CTTL, No.J17X08756)           | Oct-18                |
| Power sensor NRV-Z5     | 100542     | 01-Nov-17 (CTTL, No.J17X08756)           | Oct-18                |
| Reference Probe EX3DV4  | SN 7464    | 12-Sep-17(SPEAG, No.EX3-7464_Sep17)      | Sep-18                |
| DAE4                    | SN 1524    | 13-Sep-17(SPEAG, No.DAE4-1524_Sep17)     | Sep-18                |
| Secondary Standards     | ID #       | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
| Signal Generator E4438C | MY49071430 | 23-Jan-18 (CTTL, No.J18X00560)           | Jan-19                |
| Network Analyzer E5071C | MY46110673 | 24-Jan-18 (CTTL, No.J18X00561)           | Jan-19                |

|                | Name        | Function           | Signature |
|----------------|-------------|--------------------|-----------|
| Calibrated by: | Zhao Jing   | SAR Test Engineer  |           |
| Reviewed by:   | Lin Hao     | SAR Test Engineer  |           |
| Approved by:   | Qi Dianyuan | SAR Project Leader |           |

Issued: August 3, 2018

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### Glossary:

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

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

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

### Additional Documentation:

- e) DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

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

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



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## Measurement Conditions

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

|                              |                          |              |
|------------------------------|--------------------------|--------------|
| DASY Version                 | DASY52                   | 52.10.1.1476 |
| Extrapolation                | Advanced Extrapolation   |              |
| Phantom                      | Triple Flat Phantom 5.1C |              |
| Distance Dipole Center - TSL | 10 mm                    | with Spacer  |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm        |              |
| Frequency                    | 1750 MHz ± 1 MHz         |              |

## Head TSL parameters

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 40.1         | 1.37 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 41.2 ± 6 %   | 1.33 mho/m ± 6 % |
| Head TSL temperature change during test | <1.0 °C         | ---          | ---              |

## SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL   | Condition          |                            |
|---|--------------------|----------------------------|
| SAR measured  | 250 mW input power | 8.91 mW / g                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 36.5 mW / g ± 18.8 % (k=2) |
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | Condition          |                            |
| SAR measured  | 250 mW input power | 4.81 mW / g                |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 19.5 mW / g ± 18.7 % (k=2) |

## Body TSL parameters

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 53.4         | 1.49 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 53.8 ± 6 %   | 1.48 mho/m ± 6 % |
| Body TSL temperature change during test | <1.0 °C         | ---          | ---              |

## SAR result with Body TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL   | Condition          |                            |
|---|--------------------|----------------------------|
| SAR measured  | 250 mW input power | 9.17 mW / g                |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 37.0 mW / g ± 18.8 % (k=2) |
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | Condition          |                            |
| SAR measured  | 250 mW input power | 5.05 mW / g                |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 20.3 mW / g ± 18.7 % (k=2) |



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## Appendix (Additional assessments outside the scope of CNAS L0570)

### Antenna Parameters with Head TSL

|                                      |               |
|--------------------------------------|---------------|
| Impedance, transformed to feed point | 50.3- 0.87 jΩ |
| Return Loss                          | - 40.7 dB     |

### Antenna Parameters with Body TSL

|                                      |                |
|--------------------------------------|----------------|
| Impedance, transformed to feed point | 44.8Ω- 2.59 jΩ |
| Return Loss                          | - 24.3 dB      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.087 ns |
|----------------------------------|----------|

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

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

### Additional EUT Data

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



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Date: 07.30.2018

## DASY5 Validation Report for Head TSL

Test Laboratory: CTTL, Beijing, China

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1137**

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 1750 \text{ MHz}$ ;  $\sigma = 1.332 \text{ S/m}$ ;  $\epsilon_r = 41.17$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(8.7, 8.7, 8.7) @ 1750 MHz; Calibrated: 9/12/2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1524; Calibrated: 9/13/2017
- Phantom: MFP\_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

**System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:**

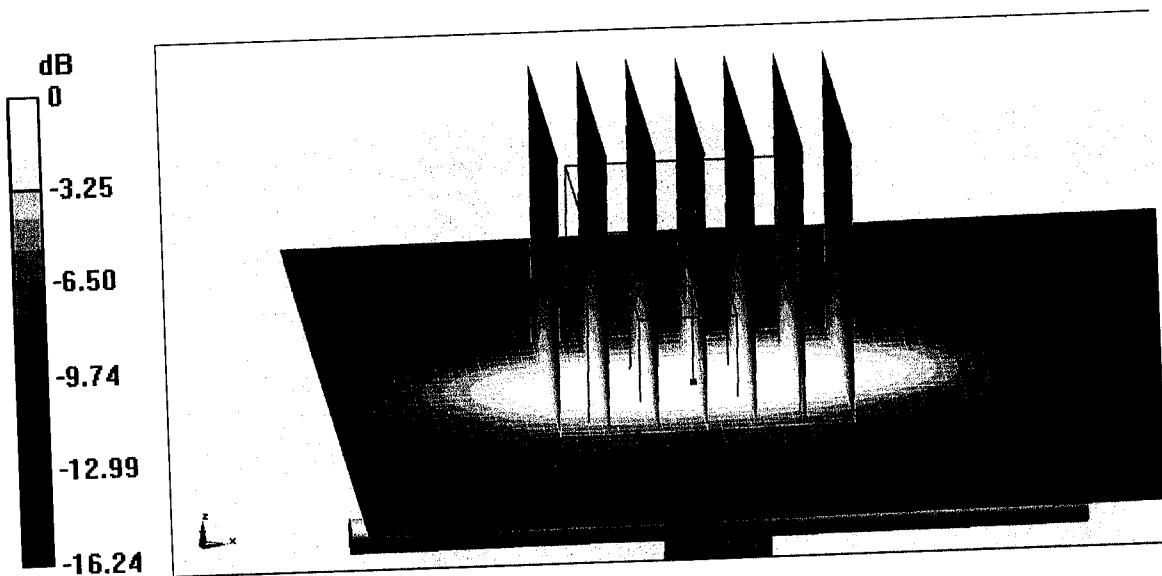
$dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 96.50 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 16.1 W/kg

**SAR(1 g) = 8.91 W/kg; SAR(10 g) = 4.81 W/kg**

Maximum value of SAR (measured) = 13.5 W/kg



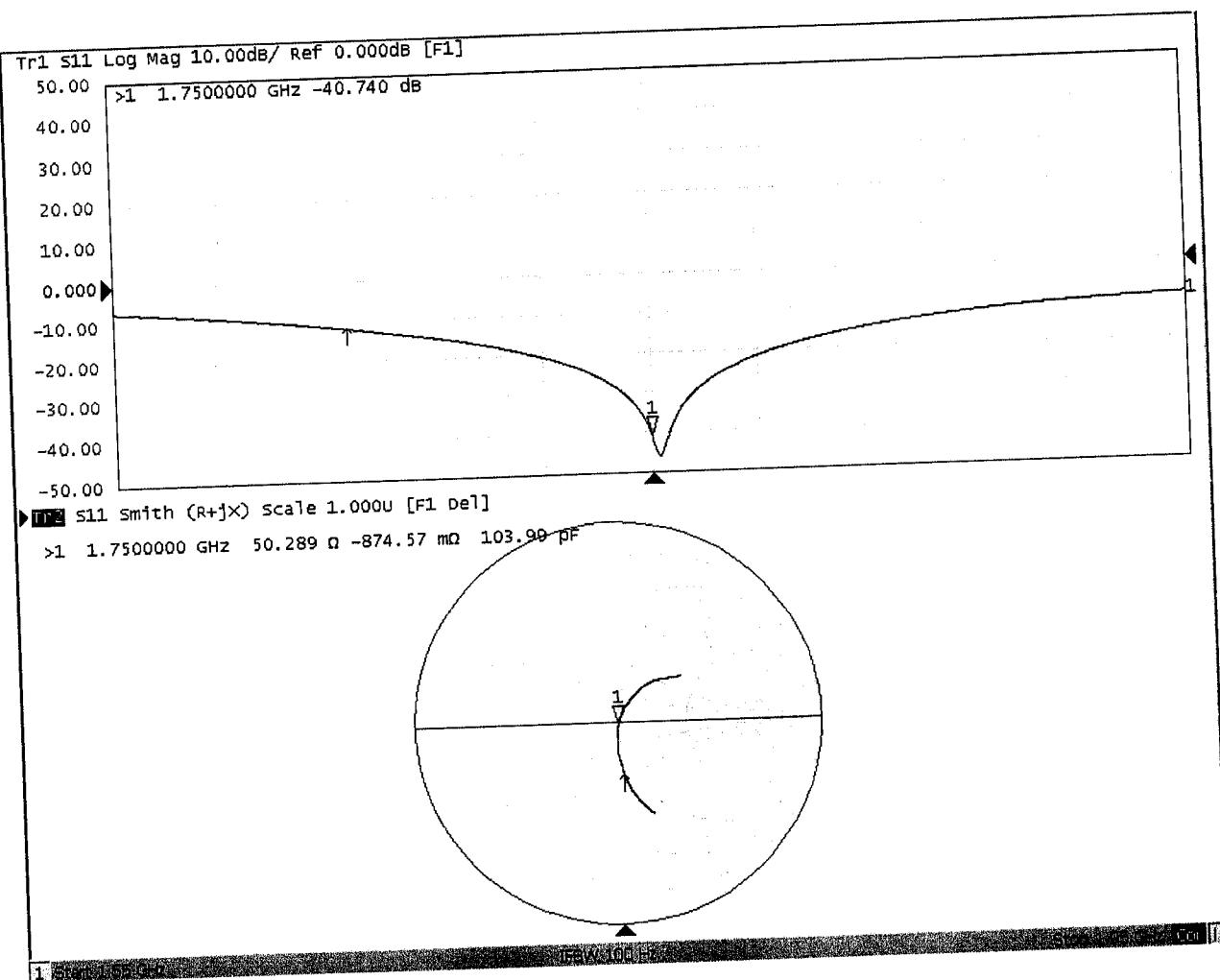
$$0 \text{ dB} = 13.5 \text{ W/kg} = 11.30 \text{ dBW/kg}$$



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### Impedance Measurement Plot for Head TSL





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Date: 07.30.2018

## DASY5 Validation Report for Body TSL

Test Laboratory: CTTL, Beijing, China

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1137**

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 1750 \text{ MHz}$ ;  $\sigma = 1.477 \text{ S/m}$ ;  $\epsilon_r = 53.84$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(8.6, 8.6, 8.6) @ 1750 MHz; Calibrated: 9/12/2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1524; Calibrated: 9/13/2017
- Phantom: MFP\_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

**System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:**

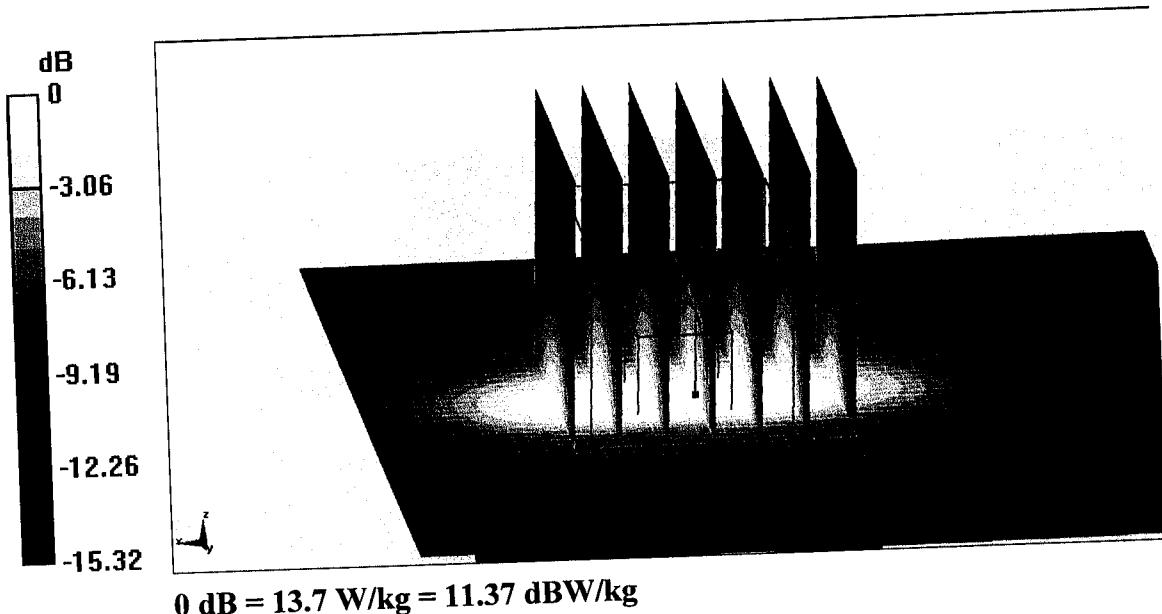
$dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 77.55 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 16.0 W/kg

**SAR(1 g) = 9.17 W/kg; SAR(10 g) = 5.05 W/kg**

Maximum value of SAR (measured) = 13.7 W/kg

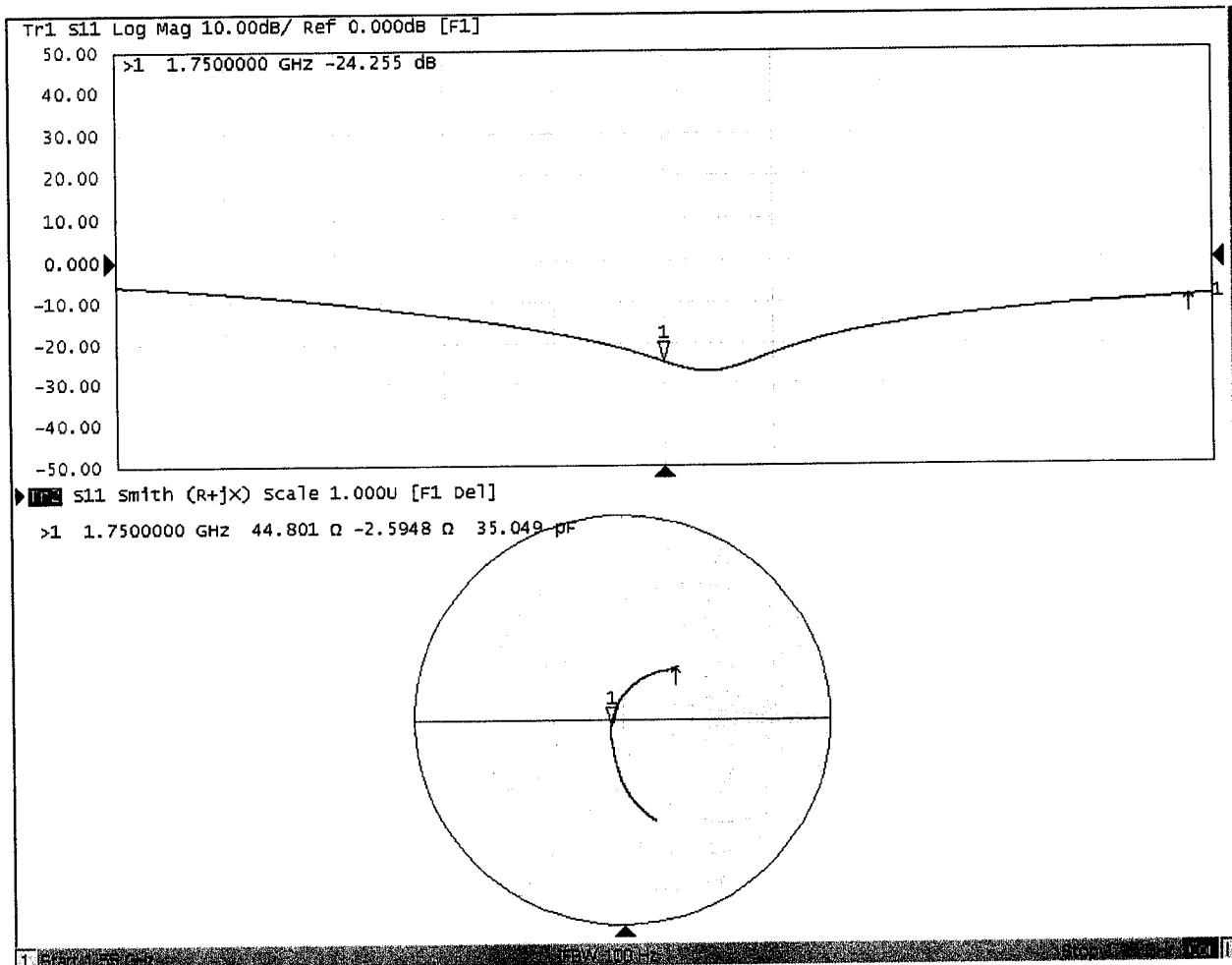




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### Impedance Measurement Plot for Body TSL





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 国际互认  
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 CALIBRATION  
 CNAS L0570

Client

Sporton

Certificate No: Z18-60536

## CALIBRATION CERTIFICATE

Object

D1900V2 - SN: 5d182

Calibration Procedure(s)

FF-Z11-003-01

Calibration Procedures for dipole validation kits

Calibration date:

December 7, 2018

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

All calibrations have been conducted in the closed laboratory facility: environment temperature( $22\pm3$ )°C and humidity<70%.

Calibration Equipment used (M&amp;TE critical for calibration)

| Primary Standards       | ID #       | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
|-------------------------|------------|--|-----------------------|
| Power Meter NRVD        | 102196     | 07-Mar-18 (CTTL, No.J18X01510)           | Mar-19                |
| Power sensor NRV-Z5     | 100596     | 07-Mar-18 (CTTL, No.J18X01510)           | Mar-19                |
| Reference Probe EX3DV4  | SN 7514    | 27-Aug-18(SPEAG, No.EX3-7514_Aug18)      | Aug-19                |
| DAE4                    | SN 1555    | 20-Aug-18(SPEAG, No.DAE4-1555_Aug18)     | Aug-19                |
| Secondary Standards     | ID #       | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
| Signal Generator E4438C | MY49071430 | 23-Jan-18 (CTTL, No.J18X00560)           | Jan-19                |
| Network Analyzer E5071C | MY46110673 | 24-Jan-18 (CTTL, No.J18X00561)           | Jan-19                |

|                | Name        | Function           |
|----------------|-------------|--------------------|
| Calibrated by: | Zhao Jing   | SAR Test Engineer  |
| Reviewed by:   | Lin Hao     | SAR Test Engineer  |
| Approved by:   | Qi Dianyuan | SAR Project Leader |

Signature

Issued: December 10, 2018

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#### lossary:

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

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

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

#### Additional Documentation:

- e) DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

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

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



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### Measurement Conditions

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

|                              |                          |              |
|------------------------------|--------------------------|--------------|
| DASY Version                 | DASY52                   | 52.10.2.1495 |
| Extrapolation                | Advanced Extrapolation   |              |
| Phantom                      | Triple Flat Phantom 5.1C |              |
| Distance Dipole Center - TSL | 10 mm                    | with Spacer  |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm        |              |
| Frequency                    | 1900 MHz ± 1 MHz         |              |

### Head TSL parameters

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 40.0         | 1.40 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 39.6 ± 6 %   | 1.44 mho/m ± 6 % |
| Head TSL temperature change during test | <1.0 °C         | ----         | ----             |

### SAR result with Head TSL

|   |                    |                           |
|---|--------------------|---------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL   | Condition          |                           |
| SAR measured  | 250 mW input power | 10.1 mW / g               |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 39.6 mW /g ± 18.8 % (k=2) |
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | Condition          |                           |
| SAR measured  | 250 mW input power | 5.25 mW / g               |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 20.7 mW /g ± 18.7 % (k=2) |

### Body TSL parameters

The following parameters and calculations were applied.

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

### SAR result with Body TSL

|   |                    |                           |
|---|--------------------|---------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL   | Condition          |                           |
| SAR measured  | 250 mW input power | 10.2 mW / g               |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 39.9 mW /g ± 18.8 % (k=2) |
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | Condition          |                           |
| SAR measured  | 250 mW input power | 5.31 mW / g               |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 20.9 mW /g ± 18.7 % (k=2) |



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## Appendix (Additional assessments outside the scope of CNAS L0570)

### Antenna Parameters with Head TSL

|                                      |               |
|--------------------------------------|---------------|
| Impedance, transformed to feed point | 52.1Ω+ 5.35jΩ |
| Return Loss                          | - 25.0dB      |

### Antenna Parameters with Body TSL

|                                      |               |
|--------------------------------------|---------------|
| Impedance, transformed to feed point | 48.9Ω+ 6.19jΩ |
| Return Loss                          | - 24.0dB      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.067 ns |
|----------------------------------|----------|

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

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

### Additional EUT Data

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



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Date: 12.06.2018

## DASY5 Validation Report for Head TSL

Test Laboratory: CTTL, Beijing, China

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

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 1900 \text{ MHz}$ ;  $\sigma = 1.441 \text{ S/m}$ ;  $\epsilon_r = 39.59$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7514; ConvF(7.73, 7.73, 7.73) @ 1900 MHz; Calibrated: 8/27/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/20/2018
- Phantom: MFP\_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

### System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

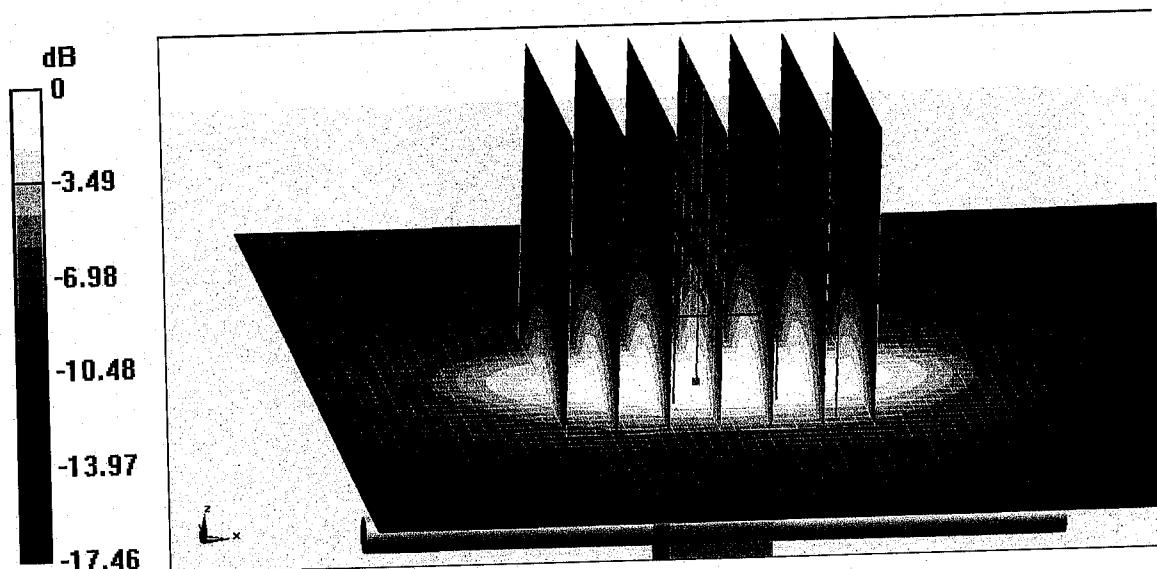
$dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 95.91 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 19.3 W/kg

**SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.25 W/kg**

Maximum value of SAR (measured) = 15.8 W/kg



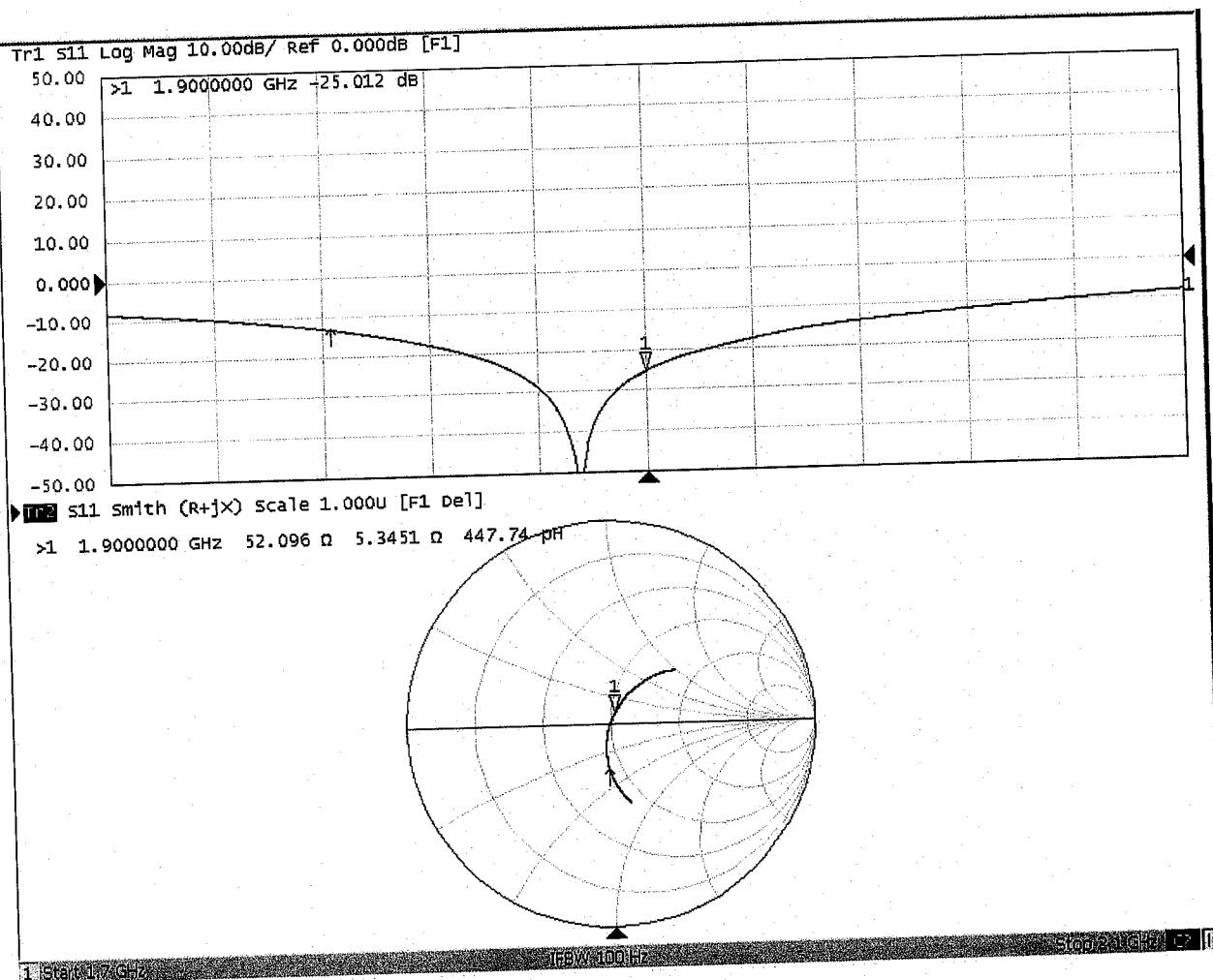
$$0 \text{ dB} = 15.8 \text{ W/kg} = 11.99 \text{ dBW/kg}$$



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## Impedance Measurement Plot for Head TSL





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## DASY5 Validation Report for Body TSL

Date: 12.05.2018

Test Laboratory: CTTL, Beijing, China

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

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 1900 \text{ MHz}$ ;  $\sigma = 1.564 \text{ S/m}$ ;  $\epsilon_r = 51.82$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7514; ConvF(7.53, 7.53, 7.53) @ 1900 MHz; Calibrated: 8/27/2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1555; Calibrated: 8/20/2018
- Phantom: MFP\_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

### System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

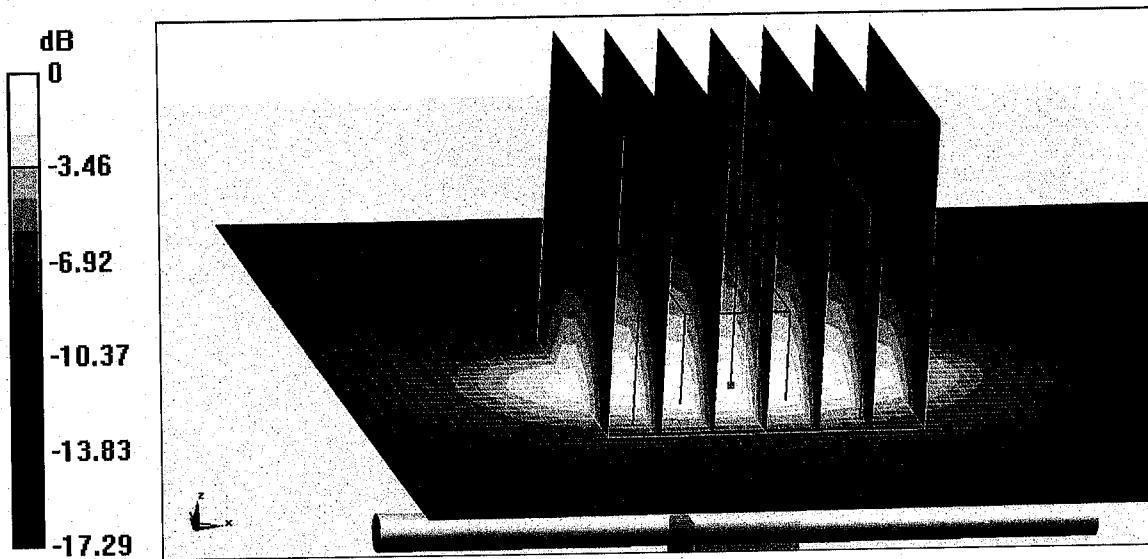
$dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 84.07 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 18.9 W/kg

**SAR(1 g) = 10.2 W/kg; SAR(10 g) = 5.31 W/kg**

Maximum value of SAR (measured) = 15.7 W/kg

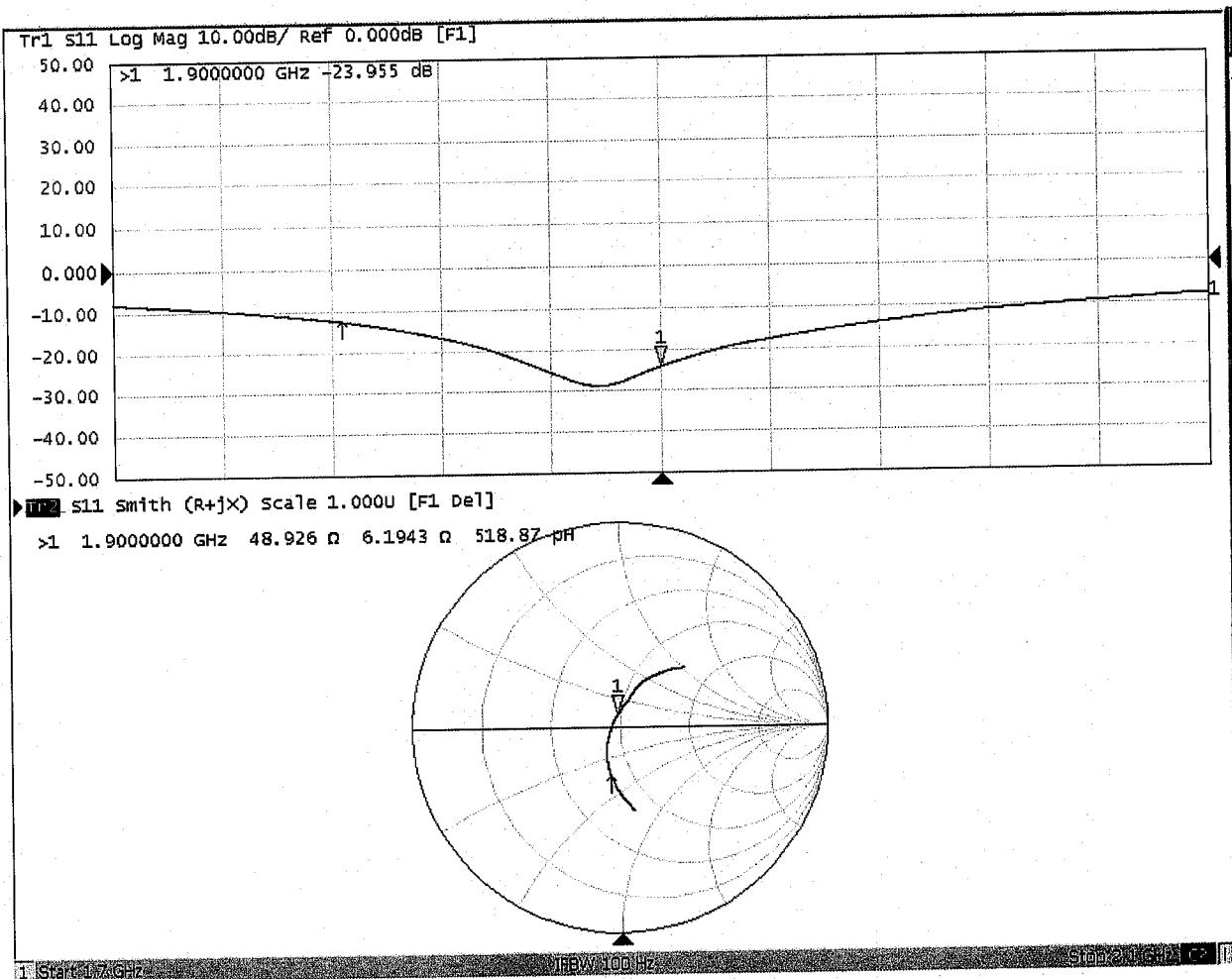




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### Impedance Measurement Plot for Body TSL





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 CNAS L0570

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Sporton

Certificate No: Z18-60326

## CALIBRATION CERTIFICATE

Object D2450V2 - SN: 736

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

Calibration date: August 31, 2018

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

All calibrations have been conducted in the closed laboratory facility: environment temperature( $22\pm3$ )°C and humidity<70%.

### Calibration Equipment used (M&TE critical for calibration)

| Primary Standards       | ID #       | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
|-------------------------|------------|--|-----------------------|
| Power Meter NRVD        | 102083     | 01-Nov-17 (CTTL, No.J17X08756)           | Oct-18                |
| Power sensor NRV-Z5     | 100542     | 01-Nov-17 (CTTL, No.J17X08756)           | Oct-18                |
| Reference Probe EX3DV4  | SN 7464    | 12-Sep-17(SPEAG, No.EX3-7464_Sep17)      | Sep-18                |
| DAE4                    | SN 1524    | 13-Sep-17(SPEAG, No.DAE4-1524_Sep17)     | Sep-18                |
| Secondary Standards     | ID #       | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
| Signal Generator E4438C | MY49071430 | 23-Jan-18 (CTTL, No.J18X00560)           | Jan-19                |
| Network Analyzer E5071C | MY46110673 | 24-Jan-18 (CTTL, No.J18X00561)           | Jan-19                |

|                | Name        | Function           | Signature |
|----------------|-------------|--------------------|-----------|
| Calibrated by: | Zhao Jing   | SAR Test Engineer  |           |
| Reviewed by:   | Lin Hao     | SAR Test Engineer  |           |
| Approved by:   | Qi Dianyuan | SAR Project Leader |           |

Issued: September 3, 2018

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#### Glossary:

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

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

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

#### Additional Documentation:

- e) DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

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

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



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## Measurement Conditions

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

|                                     |                          |              |
|-------------------------------------|--------------------------|--------------|
| <b>DASY Version</b>                 | DASY52                   | 52.10.1.1476 |
| <b>Extrapolation</b>                | Advanced Extrapolation   |              |
| <b>Phantom</b>                      | Triple Flat Phantom 5.1C |              |
| <b>Distance Dipole Center - TSL</b> | 10 mm                    | with Spacer  |
| <b>Zoom Scan Resolution</b>         | dx, dy, dz = 5 mm        |              |
| <b>Frequency</b>                    | 2450 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         | 39.2         | 1.80 mho/m       |
| <b>Measured Head TSL parameters</b>            | (22.0 ± 0.2) °C | 38.8 ± 6 %   | 1.80 mho/m ± 6 % |
| <b>Head TSL temperature change during test</b> | <1.0 °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 | 13.2 mW / g               |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | 52.7 mW /g ± 18.8 % (k=2) |
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b> | Condition          |                           |
| SAR measured  | 250 mW input power | 6.17 mW / g               |
| SAR for nominal Head TSL parameters                           | normalized to 1W   | 24.6 mW /g ± 18.7 % (k=2) |

## Body TSL parameters

The following parameters and calculations were applied.

|  | Temperature     | Permittivity | Conductivity     |
|--|-----------------|--------------|------------------|
| <b>Nominal Body TSL parameters</b>             | 22.0 °C         | 52.7         | 1.95 mho/m       |
| <b>Measured Body TSL parameters</b>            | (22.0 ± 0.2) °C | 52.3 ± 6 %   | 1.98 mho/m ± 6 % |
| <b>Body TSL temperature change during test</b> | <1.0 °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 | 13.0 mW / g               |
| SAR for nominal Body TSL parameters                           | normalized to 1W   | 51.5 mW /g ± 18.8 % (k=2) |
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b> | Condition          |                           |
| SAR measured  | 250 mW input power | 6.14 mW / g               |
| SAR for nominal Body TSL parameters                           | normalized to 1W   | 24.4 mW /g ± 18.7 % (k=2) |



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## Appendix (Additional assessments outside the scope of CNAS L0570)

### Antenna Parameters with Head TSL

|                                      |               |
|--------------------------------------|---------------|
| Impedance, transformed to feed point | 53.9Ω+ 2.56jΩ |
| Return Loss                          | - 26.9dB      |

### Antenna Parameters with Body TSL

|                                      |               |
|--------------------------------------|---------------|
| Impedance, transformed to feed point | 50.0Ω+ 4.22jΩ |
| Return Loss                          | - 27.5dB      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.022 ns |
|----------------------------------|----------|

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

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

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

### Additional EUT Data

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



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## DASY5 Validation Report for Head TSL

Date: 08.31.2018

Test Laboratory: CTTL, Beijing, China

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 736**

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2450 \text{ MHz}$ ;  $\sigma = 1.802 \text{ S/m}$ ;  $\epsilon_r = 38.84$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(7.89, 7.89, 7.89) @ 2450 MHz; Calibrated: 9/12/2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1524; Calibrated: 9/13/2017
- Phantom: MFP\_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

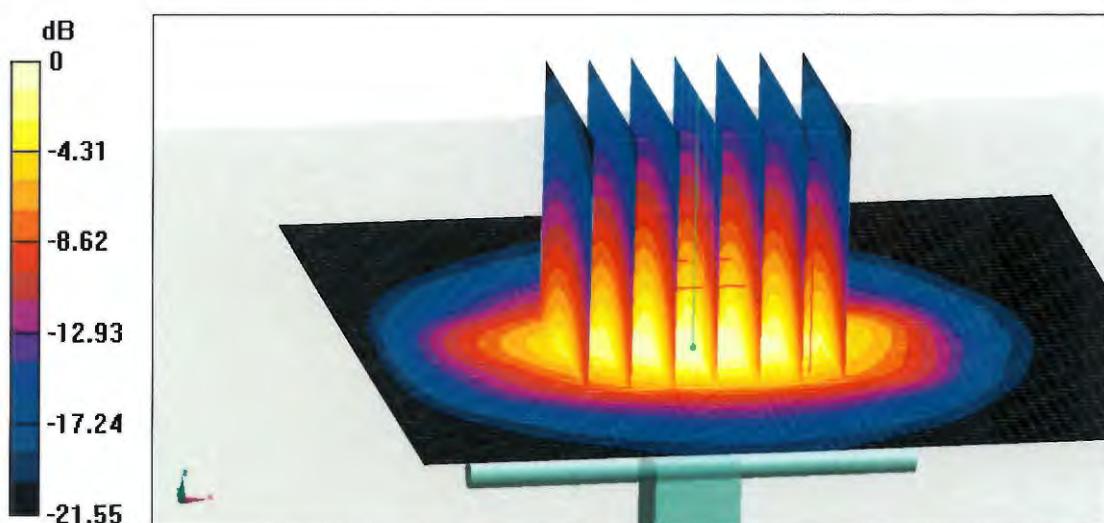
**Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm**

Reference Value = 100.2 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 27.6 W/kg

**SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.17 W/kg**

Maximum value of SAR (measured) = 22.2 W/kg



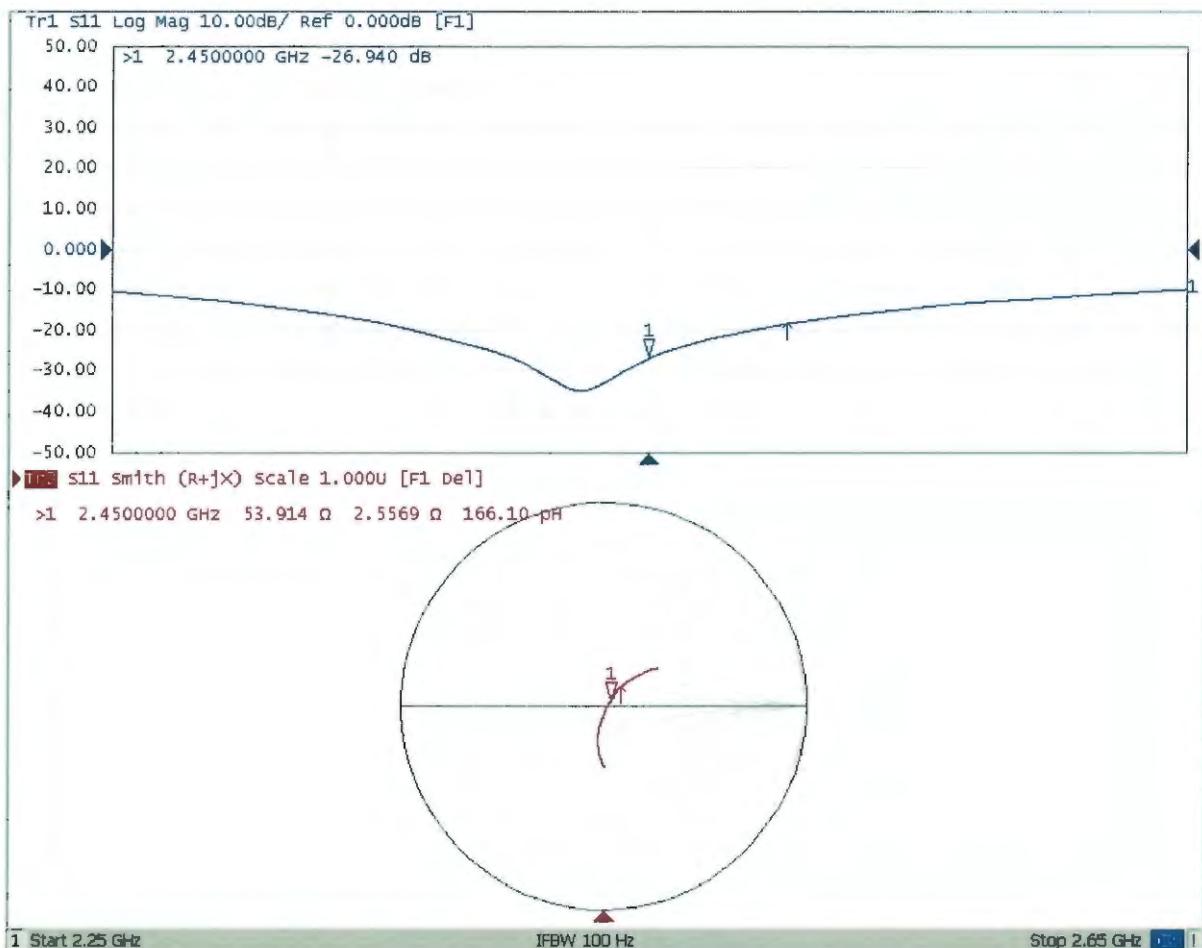
**0 dB = 22.2 W/kg = 13.46 dBW/kg**



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### Impedance Measurement Plot for Head TSL





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## DASY5 Validation Report for Body TSL

Date: 08.30.2018

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 736

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.982$  S/m;  $\epsilon_r = 52.34$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Center Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(8.09, 8.09, 8.09) @ 2450 MHz; Calibrated: 9/12/2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1524; Calibrated: 9/13/2017
- Phantom: MFP\_V5.1C ; Type: QD 000 P51CA; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (1); SEMCAD X Version 14.6.11 (7439)

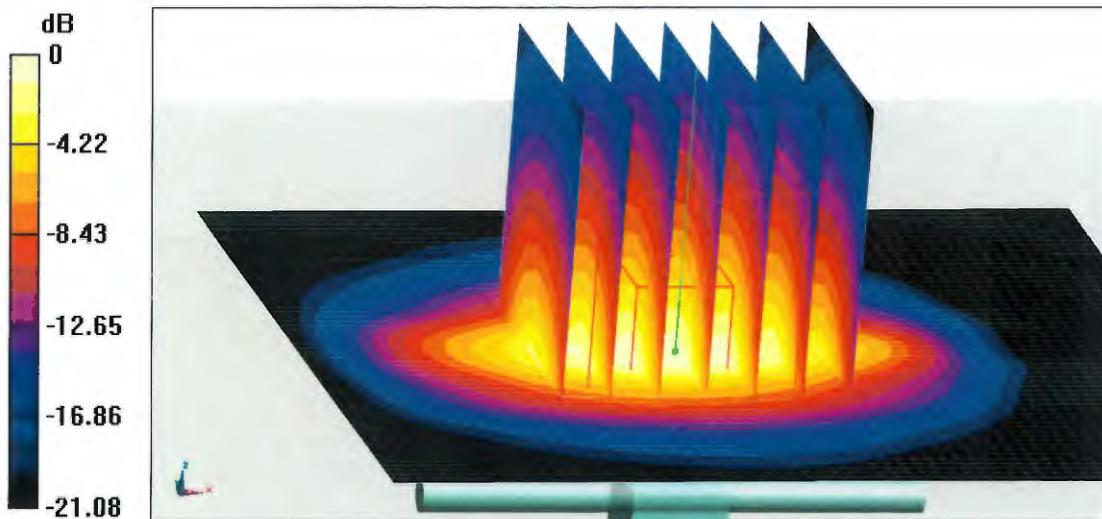
**Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 98.71 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 26.0 W/kg

SAR(1 g) = 13 W/kg; SAR(10 g) = 6.14 W/kg

Maximum value of SAR (measured) = 21.3 W/kg

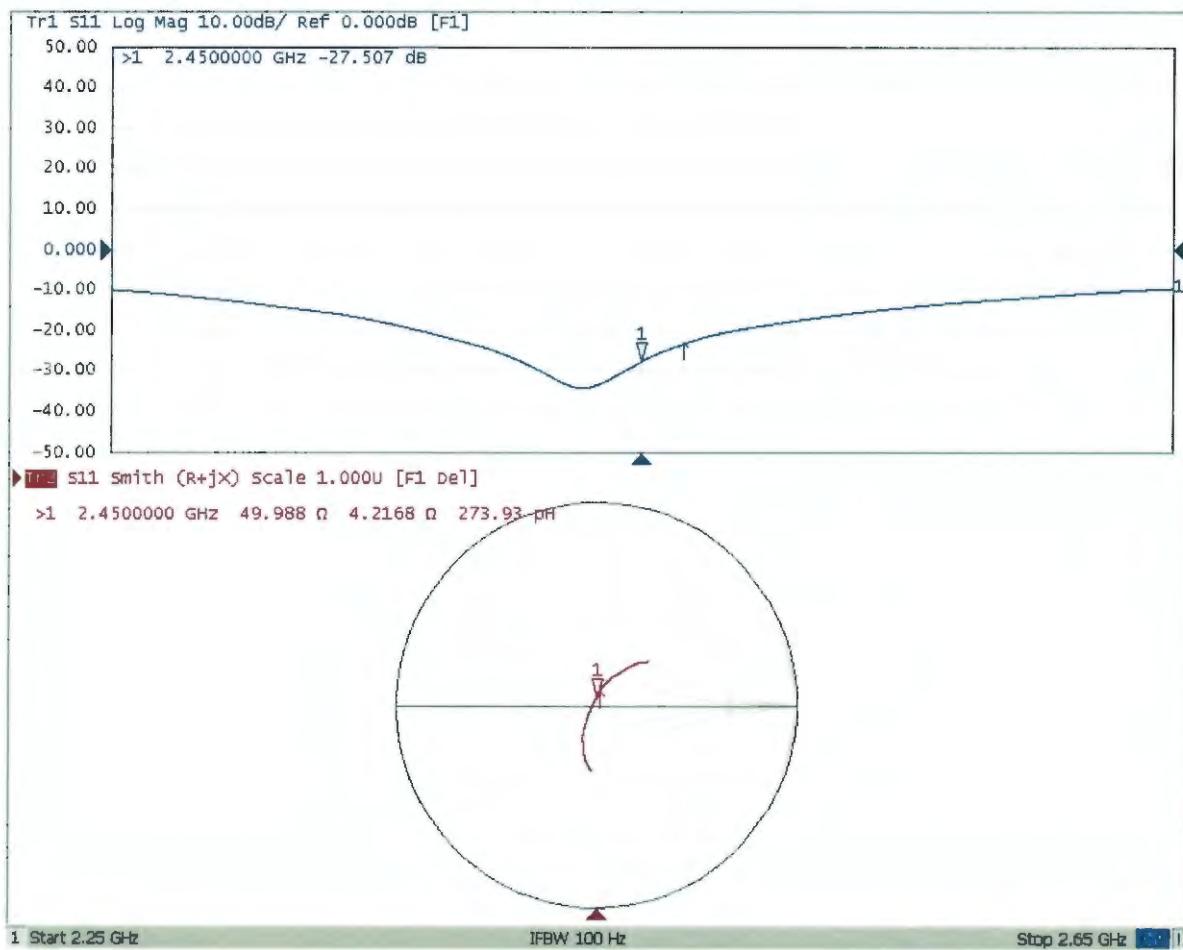




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### Impedance Measurement Plot for Body TSL





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 CNAS L0570

Client

Sportun

Certificate No: Z18-60259

## CALIBRATION CERTIFICATE

Object D5GHzV2 - SN: 1167

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

Calibration date: August 03, 2018

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

All calibrations have been conducted in the closed laboratory facility: environment temperature( $22\pm3$ )°C and humidity<70%.

### Calibration Equipment used (M&TE critical for calibration)

| Primary Standards       | ID #       | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
|-------------------------|------------|--|-----------------------|
| Power Meter NRP2        | 102083     | 01-Nov-17 (CTTL, No.J17X08756)           | Oct-18                |
| Power sensor NRP-Z91    | 100542     | 01-Nov-17 (CTTL, No.J17X08756)           | Oct-18                |
| ReferenceProbe EX3DV4   | SN 7464    | 12-Sep-17(SPEAG, No.EX3-7464_Sep17)      | Sep-18                |
| DAE4                    | SN 1524    | 13-Sep-17(SPEAG, No.DAE4-1524_Sep17)     | Sep-18                |
| Secondary Standards     | ID #       | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
| Signal Generator E4438C | MY49071430 | 23-Jan-18 (CTTL, No.J18X00560)           | Jan-19                |
| NetworkAnalyzerE5071C   | MY46110673 | 24-Jan-18 (CTTL, No.J18X00561)           | Jan-19                |

|                | Name        | Function           | Signature |
|----------------|-------------|--------------------|-----------|
| Calibrated by: | Zhao Jing   | SAR Test Engineer  |           |
| Reviewed by:   | Lin Hao     | SAR Test Engineer  |           |
| Approved by:   | Qi Dianyuan | SAR Project Leader |           |

Issued: August 6, 2018

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### Glossary:

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

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

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

### Additional Documentation:

- e) DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

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

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



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## Measurement Conditions

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

|                              |  |                                  |
|------------------------------|--|----------------------------------|
| DASY Version                 | DASY52   | 52.10.1.1476                     |
| Extrapolation                | Advanced Extrapolation                                   |                                  |
| Phantom                      | Triple Flat Phantom 5.1C                                 |                                  |
| Distance Dipole Center - TSL | 10 mm  | with Spacer                      |
| Zoom Scan Resolution         | dx, dy = 4 mm, dz = 1.4 mm                               | Graded Ratio = 1.4 (Z direction) |
| Frequency                    | 5250 MHz ± 1 MHz<br>5600 MHz ± 1 MHz<br>5750 MHz ± 1 MHz |                                  |

## Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 35.9         | 4.71 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 35.9 ± 6 %   | 4.82 mho/m ± 6 % |
| Head TSL temperature change during test | <1.0 °C         | ----         | ----             |

## SAR result with Head TSL at 5250 MHz

|   |                    |                           |
|---|--------------------|---------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL   | Condition          |                           |
| SAR measured  | 100 mW input power | 7.69 mW / g               |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 77.0 mW /g ± 24.4 % (k=2) |
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | Condition          |                           |
| SAR measured  | 100 mW input power | 2.20 mW / g               |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 22.0 mW /g ± 24.2 % (k=2) |



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### Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 35.5         | 5.07 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 35.1 ± 6 %   | 5.18 mho/m ± 6 % |
| Head TSL temperature change during test | <1.0 °C         | ----         | ----             |

### SAR result with Head TSL at 5600 MHz

|   |                    |                           |
|---|--------------------|---------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL   | Condition          |                           |
| SAR measured  | 100 mW input power | 8.09 mW / g               |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 80.8 mW /g ± 24.4 % (k=2) |
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | Condition          |                           |
| SAR measured  | 100 mW input power | 2.32 mW / g               |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 23.2 mW /g ± 24.2 % (k=2) |

### Head TSL parameters at 5750 MHz

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 35.4         | 5.22 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 34.9 ± 6 %   | 5.37 mho/m ± 6 % |
| Head TSL temperature change during test | <1.0 °C         | ----         | ----             |

### SAR result with Head TSL at 5750 MHz

|   |                    |                           |
|---|--------------------|---------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL   | Condition          |                           |
| SAR measured  | 100 mW input power | 7.70 mW / g               |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 76.9 mW /g ± 24.4 % (k=2) |
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | Condition          |                           |
| SAR measured  | 100 mW input power | 2.17 mW / g               |
| SAR for nominal Head TSL parameters                     | normalized to 1W   | 21.6 mW /g ± 24.2 % (k=2) |



Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China  
Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504  
E-mail: [ctl@chinattl.com](mailto:ctl@chinattl.com) http://www.chinattl.cn

### Body TSL parameters at 5250 MHz

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| <b>Nominal Body TSL parameters</b>      | 22.0 °C         | 48.9         | 5.36 mho/m       |
| <b>Measured Body TSL parameters</b>     | (22.0 ± 0.2) °C | 48.4 ± 6 %   | 5.32 mho/m ± 6 % |
| Body TSL temperature change during test | <1.0 °C         | ----         | ----             |

### SAR result with Body TSL at 5250 MHz

|   |                    |                           |
|---|--------------------|---------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL   | Condition          |                           |
| SAR measured  | 100 mW input power | 7.46 mW / g               |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 74.4 mW /g ± 24.4 % (k=2) |
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | Condition          |                           |
| SAR measured  | 100 mW input power | 2.10 mW / g               |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 20.9 mW /g ± 24.2 % (k=2) |

### Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| <b>Nominal Body TSL parameters</b>      | 22.0 °C         | 48.5         | 5.77 mho/m       |
| <b>Measured Body TSL parameters</b>     | (22.0 ± 0.2) °C | 47.7 ± 6 %   | 5.79 mho/m ± 6 % |
| Body TSL temperature change during test | <1.0 °C         | ----         | ----             |

### SAR result with Body TSL at 5600 MHz

|   |                    |                           |
|---|--------------------|---------------------------|
| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL   | Condition          |                           |
| SAR measured  | 100 mW input power | 7.73 mW / g               |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 77.1 mW /g ± 24.4 % (k=2) |
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | Condition          |                           |
| SAR measured  | 100 mW input power | 2.16 mW / g               |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | 21.5 mW /g ± 24.2 % (k=2) |