

### Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

|                                                | Temperature     | Permittivity | Conductivity     |
|------------------------------------------------|-----------------|--------------|------------------|
| <b>Nominal Body TSL parameters</b>             | 22.0 °C         | 49.0         | 5.30 mho/m       |
| <b>Measured Body TSL parameters</b>            | (22.0 ± 0.2) °C | 48.4 ± 6 %   | 5.35 mho/m ± 6 % |
| <b>Body TSL temperature change during test</b> | <1.0 °C         | ----         | ----             |

### SAR result with Body TSL at 5200 MHz

|                                                               |                    |                                  |
|---------------------------------------------------------------|--------------------|----------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b>   | Condition          |                                  |
| SAR measured                                                  | 100 mW input power | 7.15 mW / g                      |
| SAR for nominal Body TSL parameters                           | normalized to 1W   | <b>71.3 mW /g ± 24.4 % (k=2)</b> |
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b> | Condition          |                                  |
| SAR measured                                                  | 100 mW input power | 2.05 mW / g                      |
| SAR for nominal Body TSL parameters                           | normalized to 1W   | <b>20.5 mW /g ± 24.2 % (k=2)</b> |

### Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

|                                                | Temperature     | Permittivity | Conductivity     |
|------------------------------------------------|-----------------|--------------|------------------|
| <b>Nominal Body TSL parameters</b>             | 22.0 °C         | 48.9         | 5.42 mho/m       |
| <b>Measured Body TSL parameters</b>            | (22.0 ± 0.2) °C | 48.1 ± 6 %   | 5.47 mho/m ± 6 % |
| <b>Body TSL temperature change during test</b> | <1.0 °C         | ----         | ----             |

### SAR result with Body TSL at 5300 MHz

|                                                               |                    |                                  |
|---------------------------------------------------------------|--------------------|----------------------------------|
| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b>   | Condition          |                                  |
| SAR measured                                                  | 100 mW input power | 7.39 mW / g                      |
| SAR for nominal Body TSL parameters                           | normalized to 1W   | <b>73.7 mW /g ± 24.4 % (k=2)</b> |
| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b> | Condition          |                                  |
| SAR measured                                                  | 100 mW input power | 2.12 mW / g                      |
| SAR for nominal Body TSL parameters                           | normalized to 1W   | <b>21.1 mW /g ± 24.2 % (k=2)</b> |



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### Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

|                                         | Temperature     | Permittivity | Conductivity     |
|-----------------------------------------|-----------------|--------------|------------------|
| Nominal Body TSL parameters             | 22.0 °C         | 48.2         | 6.00 mho/m       |
| Measured Body TSL parameters            | (22.0 ± 0.2) °C | 47.1 ± 6 %   | 6.17 mho/m ± 6 % |
| Body TSL temperature change during test | <1.0 °C         | ----         | ----             |

### SAR result with Body TSL at 5800 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   | <b>74.3 mW /g ± 24.4 % (k=2)</b> |
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | Condition          |                                  |
| SAR measured                                            | 100 mW input power | 2.11 mW / g                      |
| SAR for nominal Body TSL parameters                     | normalized to 1W   | <b>21.0 mW /g ± 24.2 % (k=2)</b> |

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

### Antenna Parameters with Head TSL at 5200 MHz

|                                      |                |
|--------------------------------------|----------------|
| Impedance, transformed to feed point | 53.6Ω - 6.87jΩ |
| Return Loss                          | - 22.5dB       |

### Antenna Parameters with Head TSL at 5300 MHz

|                                      |                |
|--------------------------------------|----------------|
| Impedance, transformed to feed point | 50.7Ω + 1.28jΩ |
| Return Loss                          | - 36.7dB       |

### Antenna Parameters with Head TSL at 5800 MHz

|                                      |               |
|--------------------------------------|---------------|
| Impedance, transformed to feed point | 55.0Ω +6.61jΩ |
| Return Loss                          | - 22.1dB      |

### Antenna Parameters with Body TSL at 5200 MHz

|                                      |                |
|--------------------------------------|----------------|
| Impedance, transformed to feed point | 53.1Ω - 5.01jΩ |
| Return Loss                          | - 24.9dB       |

### Antenna Parameters with Body TSL at 5300 MHz

|                                      |                |
|--------------------------------------|----------------|
| Impedance, transformed to feed point | 48.9Ω + 3.26jΩ |
| Return Loss                          | - 29.2dB       |

### Antenna Parameters with Body TSL at 5800 MHz

|                                      |                 |
|--------------------------------------|-----------------|
| Impedance, transformed to feed point | 55.57Ω + 8.75jΩ |
| Return Loss                          | - 20.1dB        |



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## General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.051 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: 08.29.2018

Test Laboratory: CCTL, Beijing, China

**DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1218**

Communication System: CW; Frequency: 5200 MHz, Frequency: 5300 MHz,  
Frequency: 5800 MHz,

Medium parameters used:  $f = 5200$  MHz;  $\sigma = 4.796$  S/m;  $\epsilon_r = 36.02$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 5300$  MHz;  $\sigma = 4.902$  S/m;  $\epsilon_r = 35.79$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 5800$  MHz;  $\sigma = 5.424$  S/m;  $\epsilon_r = 34.79$ ;  $\rho = 1000$  kg/m<sup>3</sup>,

Phantom section: Center Section

### DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(5.82, 5.82, 5.82) @ 5200 MHz; Calibrated: 9/12/2017, ConvF(5.53, 5.53, 5.53) @ 5300 MHz; Calibrated: 9/12/2017, ConvF(5.11, 5.11, 5.11) @ 5800 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 /Pin=100mW, d=10mm, f=5200 MHz/Zoom Scan,

**dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 57.36 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 31.5 W/kg

**SAR(1 g) = 7.61 W/kg; SAR(10 g) = 2.2 W/kg**

Maximum value of SAR (measured) = 17.6 W/kg

### Dipole Calibration /Pin=100mW, d=10mm, f=5300 MHz/Zoom Scan,

**dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 59.56 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 33.9 W/kg

**SAR(1 g) = 7.86 W/kg; SAR(10 g) = 2.28 W/kg**

Maximum value of SAR (measured) = 19.0 W/kg

### Dipole Calibration /Pin=100mW, d=10mm, f=5800 MHz/Zoom Scan,

**dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 57.44 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 36.9 W/kg

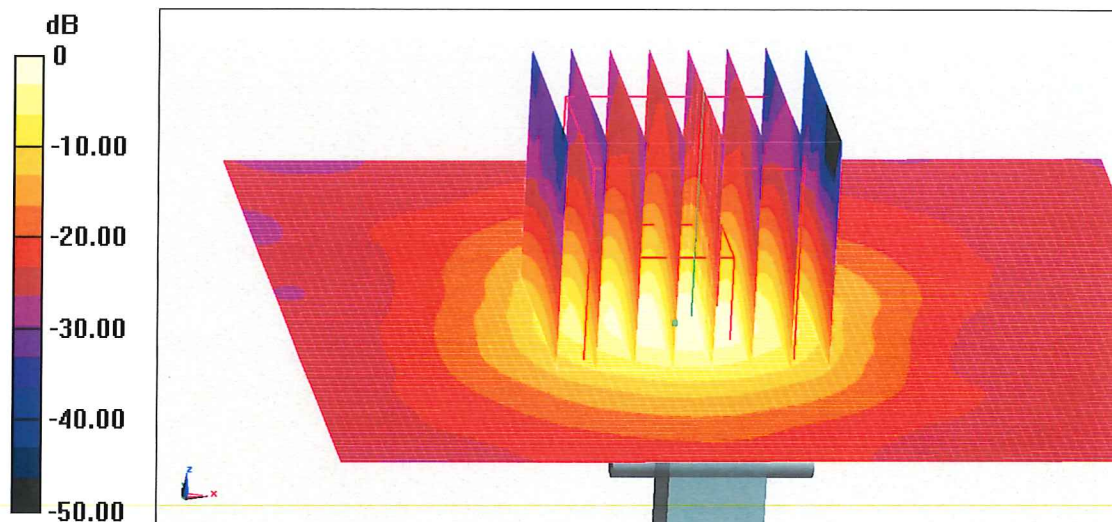
**SAR(1 g) = 7.76 W/kg; SAR(10 g) = 2.23 W/kg**

Maximum value of SAR (measured) = 19.2 W/kg



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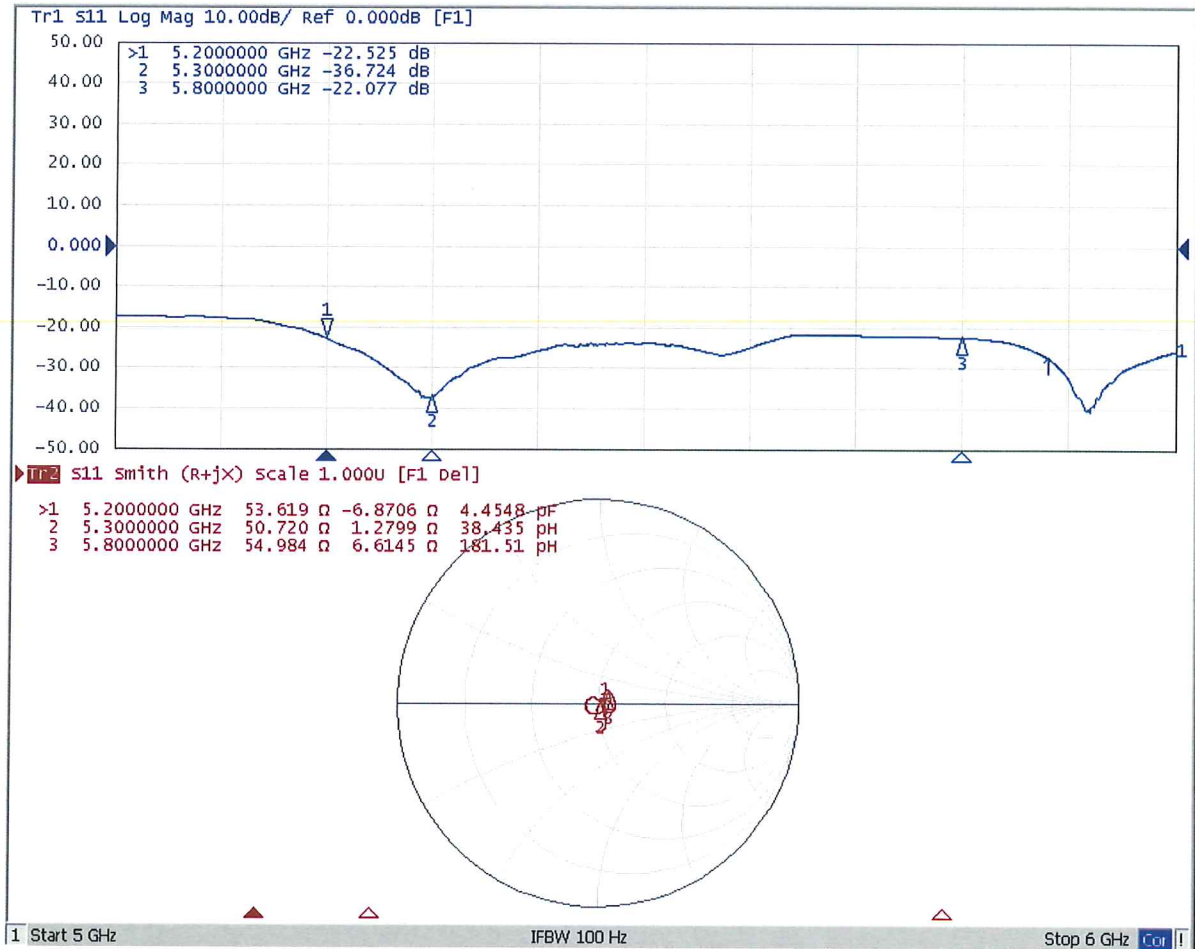




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## Impedance Measurement Plot for Head TSL





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## **DASY5 Validation Report for Body TSL**

Date: 08.27.2018

Test Laboratory: CTTL, Beijing, China

**DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1218**

Communication System: CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5800 MHz,

Medium parameters used:  $f = 5200$  MHz;  $\sigma = 5.351$  S/m;  $\epsilon_r = 48.41$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 5300$  MHz;  $\sigma = 5.466$  S/m;  $\epsilon_r = 48.14$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 5800$  MHz;  $\sigma = 6.174$  S/m;  $\epsilon_r = 47.05$ ;  $\rho = 1000$  kg/m<sup>3</sup>,

Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(5.39, 5.39, 5.39) @ 5200 MHz; Calibrated: 9/12/2017, ConvF(5.19, 5.19, 5.19) @ 5300 MHz; Calibrated: 9/12/2017, ConvF(4.67, 4.67, 4.67) @ 5800 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 /Pin=100mW, d=10mm, f=5200 MHz/Zoom Scan,**

**dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 51.03 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 29.4 W/kg

**SAR(1 g) = 7.15 W/kg; SAR(10 g) = 2.05 W/kg**

Maximum value of SAR (measured) = 16.7 W/kg

**Dipole Calibration /Pin=100mW, d=10mm, f=5300 MHz/Zoom Scan,**

**dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 47.69 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 31.6 W/kg

**SAR(1 g) = 7.39 W/kg; SAR(10 g) = 2.12 W/kg**

Maximum value of SAR (measured) = 17.5 W/kg

**Dipole Calibration /Pin=100mW, d=10mm, f=5800 MHz/Zoom Scan,**

**dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 47.44 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 36.4 W/kg

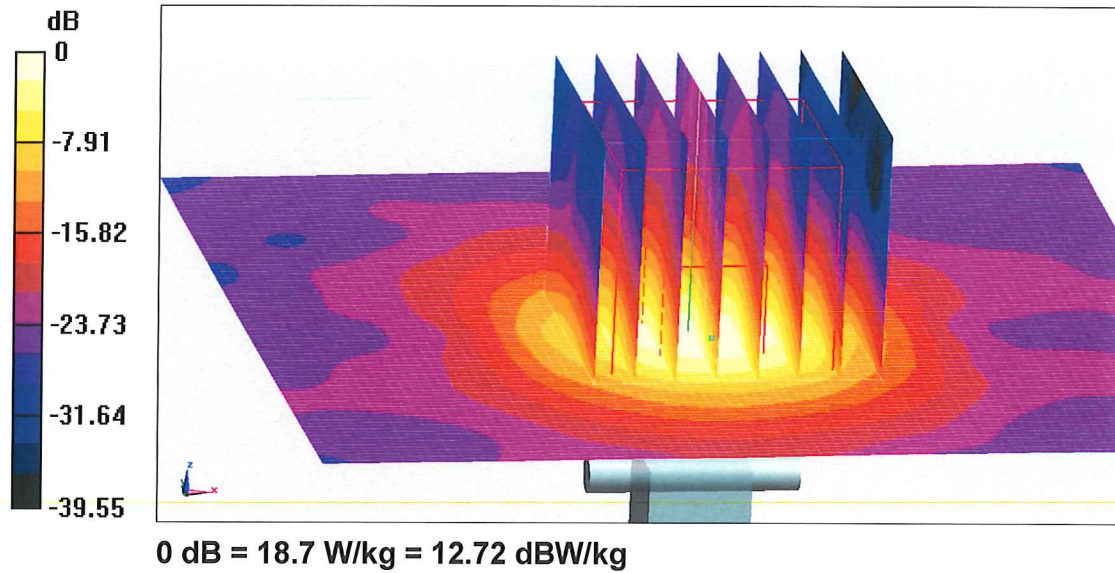
**SAR(1 g) = 7.46 W/kg; SAR(10 g) = 2.11 W/kg**

Maximum value of SAR (measured) = 18.7 W/kg



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## Impedance Measurement Plot for Body TSL

