

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.6 ± 6 %	5.42 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.50 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	74.6 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.10 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.9 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.36 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.5 ± 6 %	5.49 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

SAR result with Body TSL at 5250 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.54 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	75.0 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.11 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.0 W/kg ± 19.5 % (k=2)

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Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.4 ± 6 %	5.55 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.54 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	75.0 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.11 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.0 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.1 ± 6 %	5.82 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.06 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	80.2 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.24 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	22.2 W/kg ± 19.5 % (k=2)



Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.9 ± 6 %	5.95 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.91 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	78.7 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.20 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.8 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5750 MHz The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.3	5.94 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.7 ± 6 %	6.17 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

SAR result with Body TSL at 5750 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.53 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	74.9 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.09 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.7 W/kg ± 19.5 % (k=2)



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	46.6 ± 6 %	6.23 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.72 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	76.8 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.2 W/kg ± 19.5 % (k=2)

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Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	51.8 Ω - 6.3 jΩ
Return Loss	- 23.8 dB

Antenna Parameters with Head TSL at 5250 MHz

Impedance, transformed to feed point	50.9 Ω - 2.3 jΩ
Return Loss	- 32.1 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	50.3 Ω - 0.4 jΩ
Return Loss	- 45.2 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	50.9 Ω - 1.6 jΩ
Return Loss	- 34.8 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	55.1 Ω + 0.0 jΩ
Return Loss	- 26.3 dB

Antenna Parameters with Head TSL at 5750 MHz

Impedance, transformed to feed point	$53.3 \Omega + 2.6 j\Omega$
Return Loss	- 27.8 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	$52.3~\Omega + 0.8~\mathrm{j}\Omega$
Return Loss	- 32.5 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	51.2 Ω - 4.9 jΩ
Return Loss	- 26.0 dB

Antenna Parameters with Body TSL at 5250 MHz

Impedance, transformed to feed point	51.0 Ω - 1.0 jΩ
Return Loss	- 37.0 dB



Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	50.8 Ω + 0.3 jΩ
Return Loss	- 41.8 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	50.1 Ω - 0.4 JΩ
Return Loss	- 47.7 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	56.3 Ω + 1.1 jΩ
Return Loss	- 24.4 dB

Antenna Parameters with Body TSL at 5750 MHz

Impedance, transformed to feed point	54.1 Ω + 3.4 j Ω
Return Loss	- 25.7 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	$52.5~\Omega + 1.6~\mathrm{j}\Omega$
Return Loss	- 30.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.208 ns

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

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 24, 2010

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DASY5 Validation Report for Head TSL

Date: 18.03.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1103

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5250 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz, Frequency: 5800 MHz Medium parameters used: f=5200 MHz; $\sigma=4.53$ S/m; $\epsilon_r=34.7$; $\rho=1000$ kg/m³ , Medium parameters used: f=5250 MHz; $\sigma=4.58$ S/m; $\epsilon_r=34.6$; $\rho=1000$ kg/m³ , Medium parameters used: f=5300 MHz; $\sigma=4.63$ S/m; $\epsilon_r=34.6$; $\rho=1000$ kg/m³ , Medium parameters used: f=5500 MHz; $\sigma=4.82$ S/m; $\epsilon_r=34.3$; $\rho=1000$ kg/m³ , Medium parameters used: f=5500 MHz; $\sigma=4.82$ S/m; $\epsilon_r=34.3$; $\rho=1000$ kg/m³ , Medium parameters used: f=5600 MHz; $\sigma=4.93$ S/m; $\epsilon_r=34.1$; $\rho=1000$ kg/m³ , Medium parameters used: f=5750 MHz; $\sigma=5.08$ S/m; $\epsilon_r=33.9$; $\rho=1000$ kg/m³ , Medium parameters used: f=5800 MHz; $\sigma=5.13$ S/m; $\epsilon_r=33.9$; $\rho=1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 SN3503; ConvF(5.51, 5.51, 5.51); Calibrated: 30.12.2014, ConvF(5.45, 5.45, 5.45); Calibrated: 30.12.2014, ConvF(5.21, 5.21, 5.21); Calibrated: 30.12.2014, ConvF(5.12, 5.12, 5.12); Calibrated: 30.12.2014, ConvF(4.92, 4.92, 4.92); Calibrated: 30.12.2014, ConvF(4.91, 4.91, 4.91); Calibrated: 30.12.2014, ConvF(4.9, 4.9, 4.9); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan,

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

Reference Value = 65.47 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 29.0 W/kg

SAR(1 g) = 7.94 W/kg; SAR(10 g) = 2.28 W/kgMaximum value of SAR (measured) = 18.2 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan,

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

Reference Value = 65.57 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 29.8 W/kg

SAR(1 g) = 8.12 W/kg; SAR(10 g) = 2.34 W/kgMaximum value of SAR (measured) = 18.7 W/kg

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Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan,

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

Reference Value = 66.11 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 31.3 W/kg

SAR(1 g) = 8.31 W/kg; SAR(10 g) = 2.4 W/kg

Maximum value of SAR (measured) = 19.1 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan,

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

Reference Value = 64.96 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 33.2 W/kg

SAR(1 g) = 8.37 W/kg; SAR(10 g) = 2.39 W/kg

Maximum value of SAR (measured) = 19.5 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan,

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

Reference Value = 64.75 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 32.8 W/kg

SAR(1 g) = 8.3 W/kg; SAR(10 g) = 2.37 W/kg

Maximum value of SAR (measured) = 19.6 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan,

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

Reference Value = 63.07 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 32.5 W/kg

SAR(1 g) = 8 W/kg; SAR(10 g) = 2.29 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan,

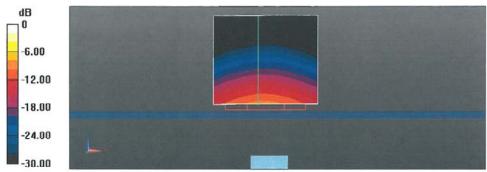
dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 61.91 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 32.6 W/kg

SAR(1 g) = 7.91 W/kg; SAR(10 g) = 2.26 W/kg

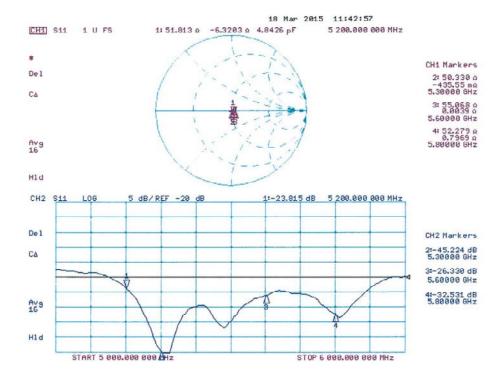
Maximum value of SAR (measured) = 19.0 W/kg



0 dB = 18.2 W/kg = 12.60 dBW/kg

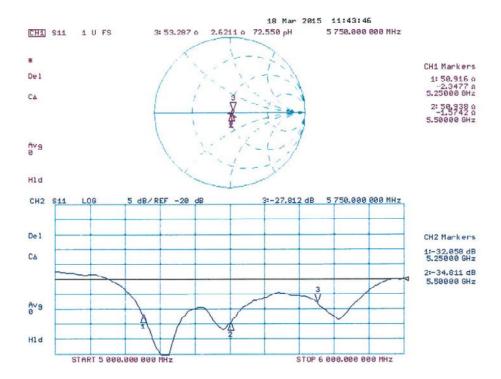


Impedance Measurement Plot for Head TSL (5200, 5300, 5600, 5800)





Impedance Measurement Plot for Head TSL (5250, 5500, 5750)





DASY5 Validation Report for Body TSL

Date: 23.03.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1103

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5250 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz, Frequency: 5800 MHz Medium parameters used: f = 5200 MHz; $\sigma = 5.42$ S/m; $\epsilon_r = 47.6$; $\rho = 1000$ kg/m³, Medium parameters used: f = 5250 MHz; $\sigma = 5.49$ S/m; $\epsilon_r = 47.5$; $\rho = 1000$ kg/m³, Medium parameters used: f = 5300 MHz; $\sigma = 5.55$ S/m; $\epsilon_r = 47.4$; $\rho = 1000$ kg/m³, Medium parameters used: f = 5500 MHz; $\sigma = 5.82$ S/m; $\epsilon_r = 47.1$; $\rho = 1000$ kg/m³, Medium parameters used: f = 5600 MHz; $\sigma = 5.95$ S/m; $\epsilon_r = 46.9$; $\rho = 1000$ kg/m³, Medium parameters used: f = 5750 MHz; $\sigma = 6.17$ S/m; $\sigma = 6.17$

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 SN3503; ConvF(4.95, 4.95, 4.95); Calibrated: 30.12.2014, ConvF(4.9, 4.9, 4.9);
 Calibrated: 30.12.2014, ConvF(4.78, 4.78, 4.78); Calibrated: 30.12.2014, ConvF(4.45, 4.45, 4.45);
 Calibrated: 30.12.2014, ConvF(4.35, 4.35, 4.35); Calibrated: 30.12.2014, ConvF(4.32, 4.32, 4.32);
 Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 58.85 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 29.7 W/kg

SAR(1 g) = 7.5 W/kg; SAR(10 g) = 2.1 W/kg

Maximum value of SAR (measured) = 17.7 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 58.90 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 29.9 W/kg

SAR(1 g) = 7.54 W/kg; SAR(10 g) = 2.11 W/kg

Maximum value of SAR (measured) = 17.8 W/kg

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Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan,

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

Reference Value = 58.44 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 30.6 W/kg

SAR(1 g) = 7.54 W/kg; SAR(10 g) = 2.11 W/kgMaximum value of SAR (measured) = 18.0 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan,

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

Reference Value = 58.84 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 34.5 W/kg

SAR(1 g) = 8.06 W/kg; SAR(10 g) = 2.24 W/kgMaximum value of SAR (measured) = 19.5 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan,

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

Reference Value = 57.65 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 34.9 W/kg

SAR(1 g) = 7.91 W/kg; SAR(10 g) = 2.2 W/kg

Maximum value of SAR (measured) = 19.4 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan,

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

Reference Value = 55.90 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 34.7 W/kg

SAR(1 g) = 7.53 W/kg; SAR(10 g) = 2.09 W/kgMaximum value of SAR (measured) = 18.8 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan,

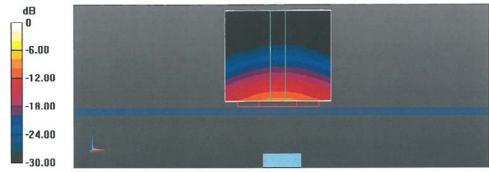
dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 56.16 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 35.9 W/kg

SAR(1 g) = 7.72 W/kg; SAR(10 g) = 2.14 W/kg

Maximum value of SAR (measured) = 19.3 W/kg

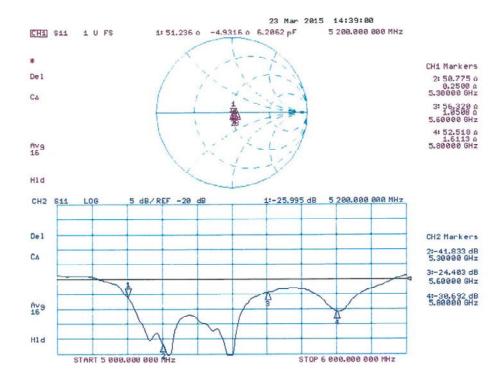


0 dB = 17.7 W/kg = 12.48 dBW/kg

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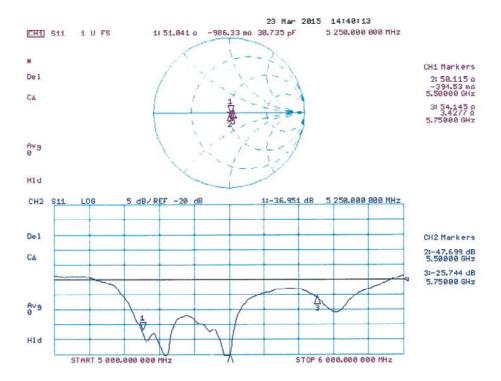


Impedance Measurement Plot for Body TSL (5200, 5300, 5600, 5800)





Impedance Measurement Plot for Body TSL (5250, 5500, 5750)



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Attachment 3. - SAR SYSTEM VALIDATION



SAR System Validation

Per FCC KDB 865664 D02v01r02, SAR system validation status should be documented to confirm measurement accuracy. The SAR systems (including SAR probes, system components and software versions) used for this device were validated against its performance specifications prior to the SAR measurements. Reference dipoles were used with the required tissue- equivalent media for system validation, according to the procedures outlined in FCC KDB 865664 D01v01r04 and IEEE 1528-2013. Since SAR probe calibrations are frequency dependent, each probe calibration point was validated at a frequency within the valid frequency range of the probe calibration point, using the system that normally operates with the probe for routine SAR measurements and according to the required tissue-equivalent media.

A tabulated summary of the system validation status including the validation date(s), measurement frequencies, SAR probes and tissue dielectric parameters has been included.

PERM. COND. **CW Validation** MOD. Validation Probe CAL. SAR Freq. Probe Probe Date Sensi-Probe Probe MOD. [MHz] SN Point System Type **PAR** (Er) (σ) Factor tivity Linearity Isortopy Type D 2450 2015-10-12 3933 EX3DV4 2450 52.763 1.974 **PASS PASS PASS** OFDM N/A **PASS** Body 5200 2015-10-13 3933 EX3DV4 48.895 5.256 PASS **PASS PASS** OFDM N/A **PASS** Body 2015-10-14 EX3DV4 **PASS PASS** OFDM D 5300 3933 5300 Body 48 745 5 397 **PASS** N/A **PASS** D 5500 2015-10-15 3933 EX3DV4 5500 Body 48.544 5.586 **PASS PASS PASS** OFDM N/A **PASS** 2015-10-16 D 5600 3933 FX3DV4 5600 Body 48 331 5.714 PASS **PASS** PASS OFDM N/A **PASS** D 5800 2015-10-19 3933 EX3DV4 5800 Body 48.133 5.996 PASS **PASS PASS** OFDM N/A **PASS**

Table Attachment 3.1 SAR System Validation Summary

NOTE: While the probes have been calibrated for both a CW and modulated signals, all measurements were performed using communication systems calibrated for CW signals only. Modulations in the table above represent test configurations for which the measurement system has been validated per FCC KDB Publication 865664 D01v01r04 for scenarios when CW probe calibrations are used with other signal types.SAR systems were validated for modulated signals with a periodic duty cycle, such as GMSK, or with a high peak to average ratio (>5 dB), such as OFDM according to KDB 865664.