

Impedance Measurement Plot for Head TSL

23 Feb 2015 15:00:34

CH1 S11 1 U FS

1: 55.475 Ω -3.5762 Ω 8.4770 pF

5 250.000 000 MHz

*

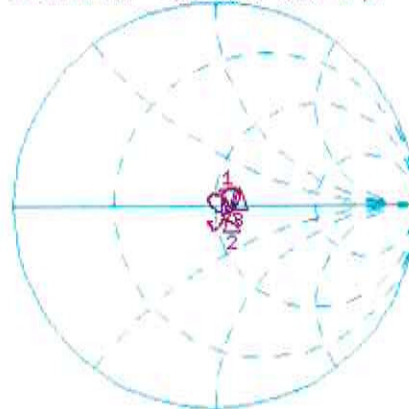
De1

Cor

Avg

16

H1 d



CH1 Markers

2: 57.719 Ω
-3.8516 Ω
5.60000 GHz
3: 61.148 Ω
3.6836 Ω
5.75000 GHz

CH2 S11 LOG

5 dB/REF -20 dB

1: -24.156 dB 5 250.000 000 MHz

Cor

Avg

16

H1 d



CH2 Markers

2: -21.934 dB
5.60000 GHz
3: -17.565 dB
5.75000 GHz

START 5 000.000 000 MHz

STOP 6 000.000 000 MHz

DASY5 Validation Report for Body TSL

Date: 24.02.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN:1016

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz
Medium parameters used: $f = 5250$ MHz; $\sigma = 5.51$ S/m; $\epsilon_r = 48.4$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5600$ MHz; $\sigma = 5.99$ S/m; $\epsilon_r = 47.7$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5750$ MHz; $\sigma = 6.22$ S/m; $\epsilon_r = 47.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.9, 4.9, 4.9); Calibrated: 30.12.2014, ConvF(4.35, 4.35, 4.35); 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=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 58.41 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 30.2 W/kg

SAR(1 g) = 7.61 W/kg; SAR(10 g) = 2.12 W/kg

Maximum value of SAR (measured) = 17.9 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 = 57.26 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 34.3 W/kg

SAR(1 g) = 7.78 W/kg; SAR(10 g) = 2.15 W/kg

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

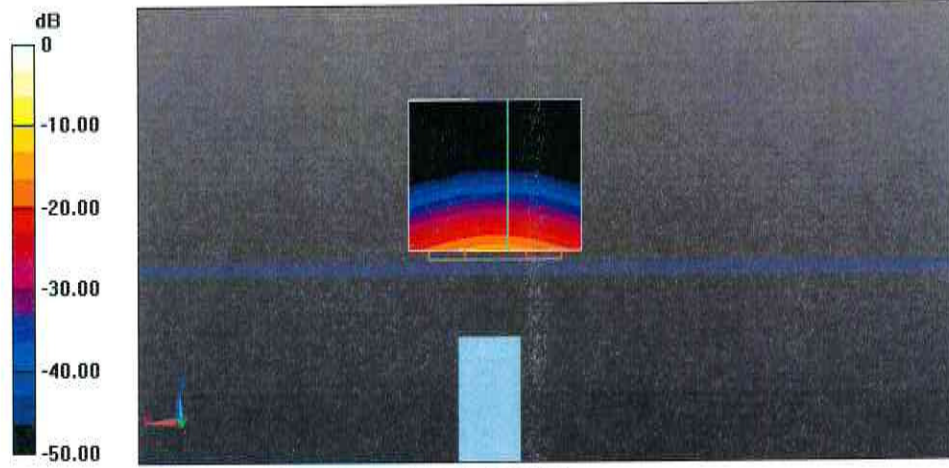
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 54.77 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 34.2 W/kg

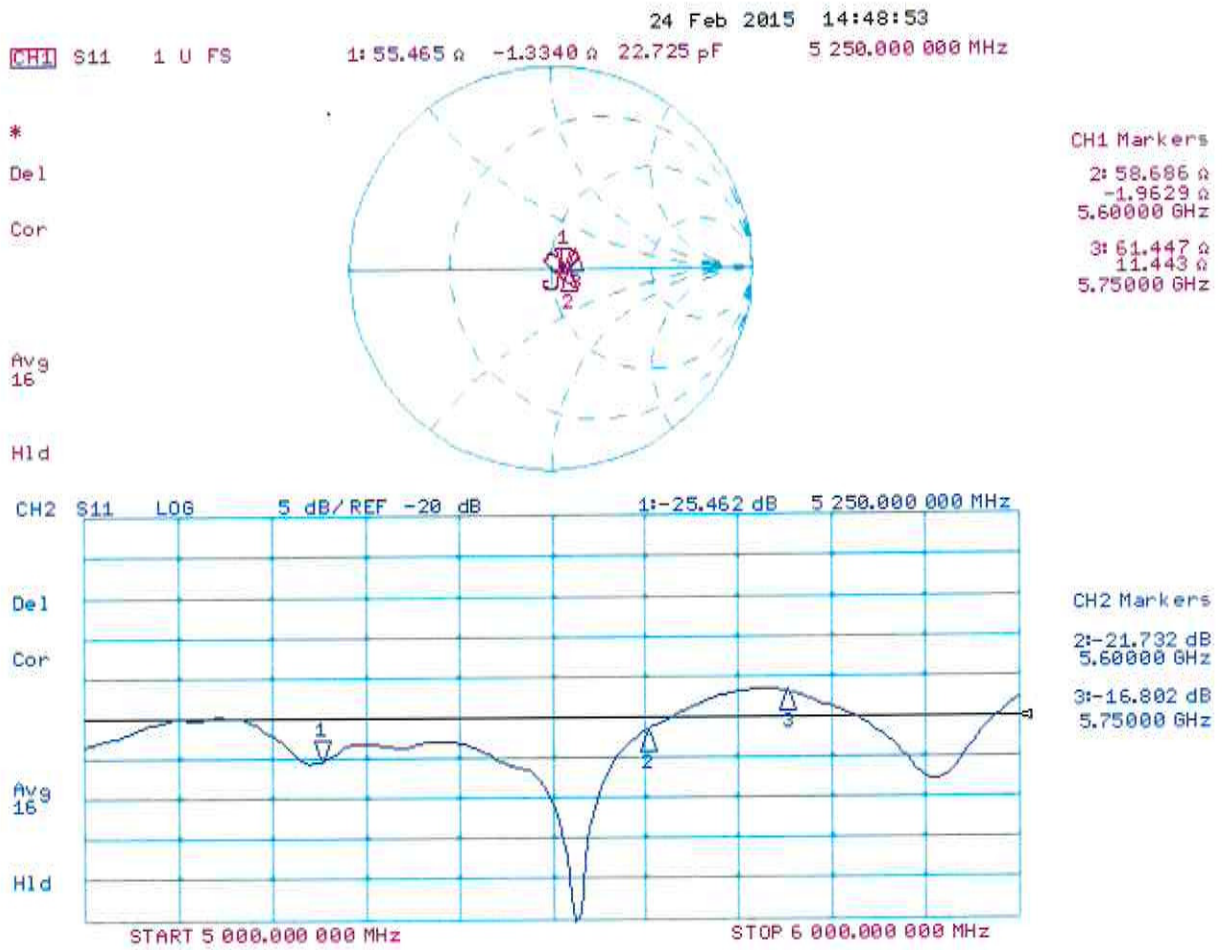
SAR(1 g) = 7.45 W/kg; SAR(10 g) = 2.06 W/kg

Maximum value of SAR (measured) = 18.5 W/kg



0 dB = 17.9 W/kg = 12.53 dBW/kg

Impedance Measurement Plot for Body TSL



12.6. Tissues-Equivalent Media Recipes

The body mixture consists of water, Polysorbate (Tween 20) and salt. Visual inspection is made to ensure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the tissue.

Ingredient (% by weight)	Frequency 750/835/850/900 MHz	
	Head	Body
De-Ionized Water	52.87	71.30
Polysorbate 20	46.10	28.00
Salt	1.03	0.70

Ingredient (% by weight)	Frequency 1700/1800/1900 MHz	
	Head	Body
De-Ionized Water	55.40	71.50
Polysorbate 20	44.22	28.00
Salt	0.38	0.50

Ingredient (% by weight)	Frequency 2300/2450/2600 MHz	
	Head	Body
De-Ionized Water	55.75 ⁽¹⁾	71.70
Polysorbate 20	45.25 ⁽¹⁾	28.00
Salt	0.00	0.30

Stimulating Liquid for 3700 MHz to 5800 MHz are supplied and manufactured by SPEAG

Ingredient (% by weight)	Frequency
	3700 - 5800 MHz Head / Body
De-Ionized Water	~78.00
Mineral Oil	~11.00
Emulsifiers	~9.00
Additives and Salt	~2.00

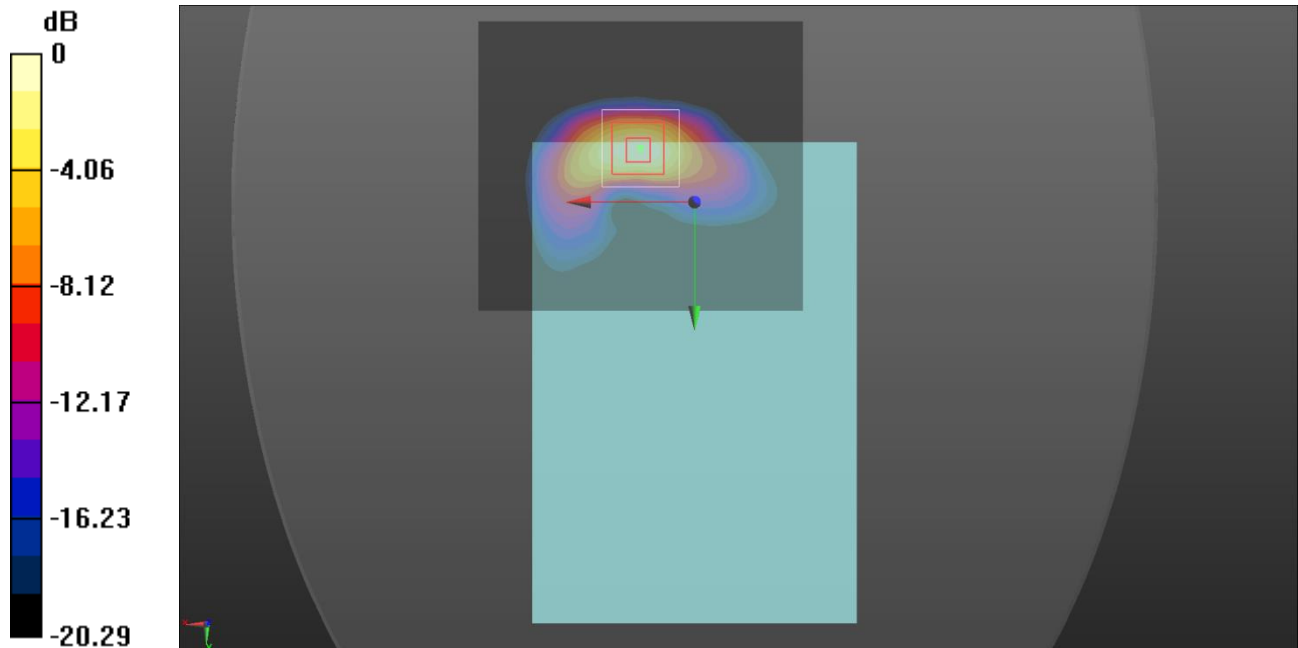
Note(s):

- As per the recipe provided by National Physical Laboratory, the 2450 MHz Head Fluid recipe is mixed to the total percentage of weight is by 101.0 %.

12.7. Baseline Plots

Back of EUT WCDMA Band 4 CH1513 UL VS Ltd

Date: 04/02/2015
 DUT Model: A1490



0 dB = 0.647 W/kg = -1.89 dBW/kg

Communication System: UID 0, UMTS FDD (0); Frequency: 1732.6 MHz; Duty Cycle: 1:1

Medium: 1800MHz MSL Medium parameters used (interpolated): $f = 1732.6$ MHz; $\sigma = 1.459$ S/m; $\epsilon_r = 52.277$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3994; ConvF(8.18, 8.18, 8.18); Calibrated: 07/05/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn450; Calibrated: 16/09/2014
- Phantom: ELI v5.0; Type: QDOVA002AA;
- ; SEMCAD X Version 14.6.10 (7164)

Configuration/Back - Middle 2/Area Scan (91x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.669 W/kg

Configuration/Back - Middle 2/Zoom Scan (5x5x7) 2 (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.504 V/m; Power Drift = 0.36 dB

Peak SAR (extrapolated) = 1.22 W/kg

SAR(1 g) = 0.581 W/kg; SAR(10 g) = 0.256 W/kg

Maximum value of SAR (measured) = 0.647 W/kg

Back of EUT WCDMA Band 4 CH1513 – Extract from Original Report

Test Laboratory: UL Verification Services Inc. SAR Lab E

Date: 8/22/2013

W-CDMA Band 4

Frequency: 1752.6 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): $f = 1752.6 \text{ MHz}$; $\sigma = 1.491 \text{ mho/m}$; $\epsilon_r = 51.654$; $\rho = 1000 \text{ kg/m}^3$

DASY5 Configuration:

- Area Scan Setting: Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1357; Calibrated: 2/5/2013
- Probe: EX3DV4 - SN3901; ConvF(8, 8, 8); Calibrated: 2/13/2013;
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 A; Type: QDOVA002AA; Serial: 1180

Rear_Second Stage Prox. On_0 mm/Rel. 99_ch 1513/Area Scan (9x9x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 1.44 W/kg

Rear_Second Stage Prox. On_0 mm/Rel. 99_ch 1513/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm

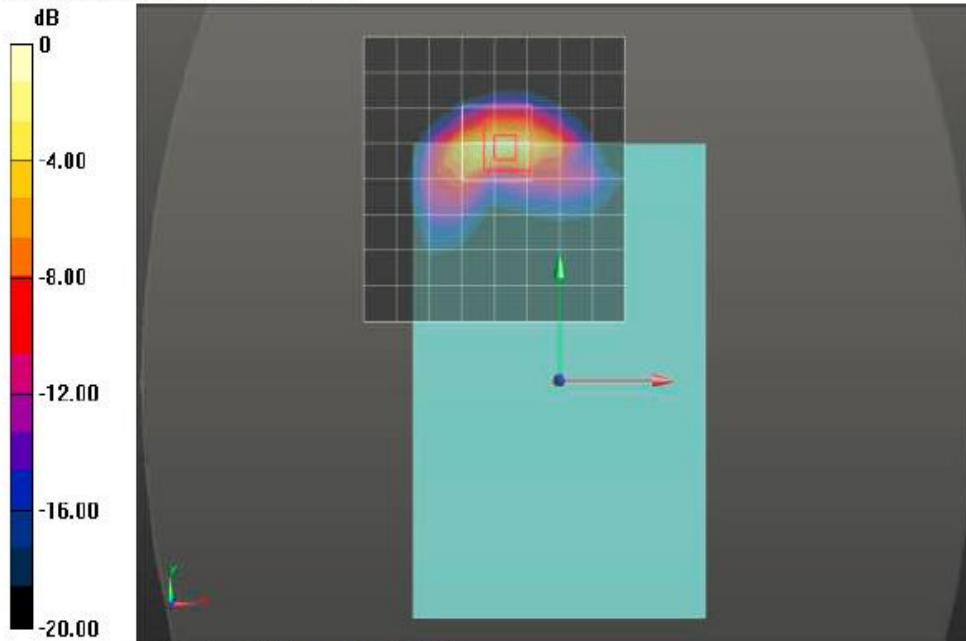
Reference Value = 32.298 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 2.406 mW/g

SAR(1 g) = 1.18 mW/g; SAR(10 g) = 0.526 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 1.53 W/kg

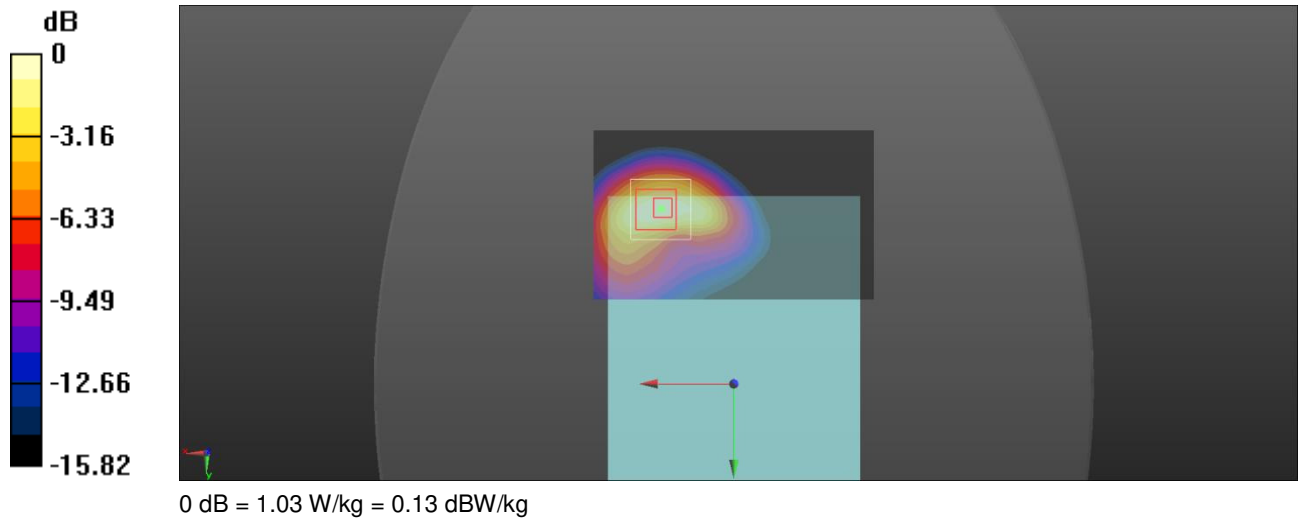


0 dB = 1.53 W/kg = 3.69 dB W/kg

Back of EUT CDMA BC10 CH476 UL VS Ltd

Date: 04/12/2014

DUT Model: A1490



Communication System: UID 0, CDMA2000 (0); Frequency: 817.9 MHz; Duty Cycle: 1:1
 Medium: 900 MHz MSL Medium parameters used (interpolated): $f = 817.9$ MHz; $\sigma = 0.993$ S/m; $\epsilon_r = 53.527$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3335; ConvF(6.21, 6.21, 6.21); Calibrated: 29/08/2014;

- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1438; Calibrated: 12/05/2014
- Phantom: ELI v5.0 (30deg probe tilt); Type: QDOVA002AA;
- ; SEMCAD X Version 14.6.10 (7164)

Configuration/Front - High/Area Scan (101x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.997 W/kg

Configuration/Front - High/Zoom Scan (5x5x7) 2 2 (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 21.523 V/m; Power Drift = 0.20 dB

Peak SAR (extrapolated) = 1.76 W/kg

SAR(1 g) = 0.881 W/kg; SAR(10 g) = 0.461 W/kg

Maximum value of SAR (measured) = 1.03 W/kg

Back of EUT CDMA BC10 CH476 – Extract from Original Report

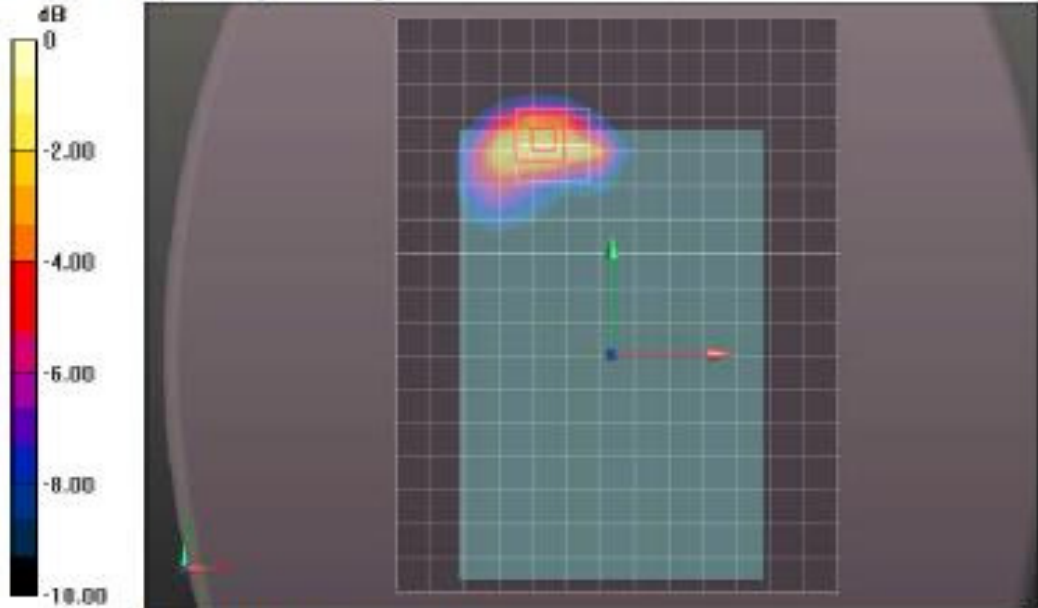
Test Laboratory: UL Verification Services Inc. SAR Lab B Date: 8/27/2013

CDMA BC10

Frequency: 817.9 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 23.0°C; Liquid Temperature: 22.0°C
 Medium parameters used (interpolated): $f = 817.9$ MHz; $\sigma = 1$ S/m; $\epsilon_r = 53.009$; $\rho = 1000$ kg/m³
 DASY5 Configuration:
 - Area Scan Setting: Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
 - Electronics: DAE3 Sn427; Calibrated: 1/9/2013
 - Probe: EX3DV4 - SN3751; ConvF(8.58, 8.58, 8.58); Calibrated: 11/15/2012;
 - Sensor-Surface: 2.5mm (Mechanical Surface Detection)
 - Phantom: ELI v5.0 (B); Type: QDOVA001BB; Serial: 1118

Rear_Second Stage Prox. On_0 mm/1xRTT_RC3 SO32_ch 476/Area Scan (14x18x1):
 Measurement grid: dx=15mm, dy=15mm
 Info: Interpolated medium parameters used for SAR evaluation.
 Maximum value of SAR (measured) = 1.30 W/kg

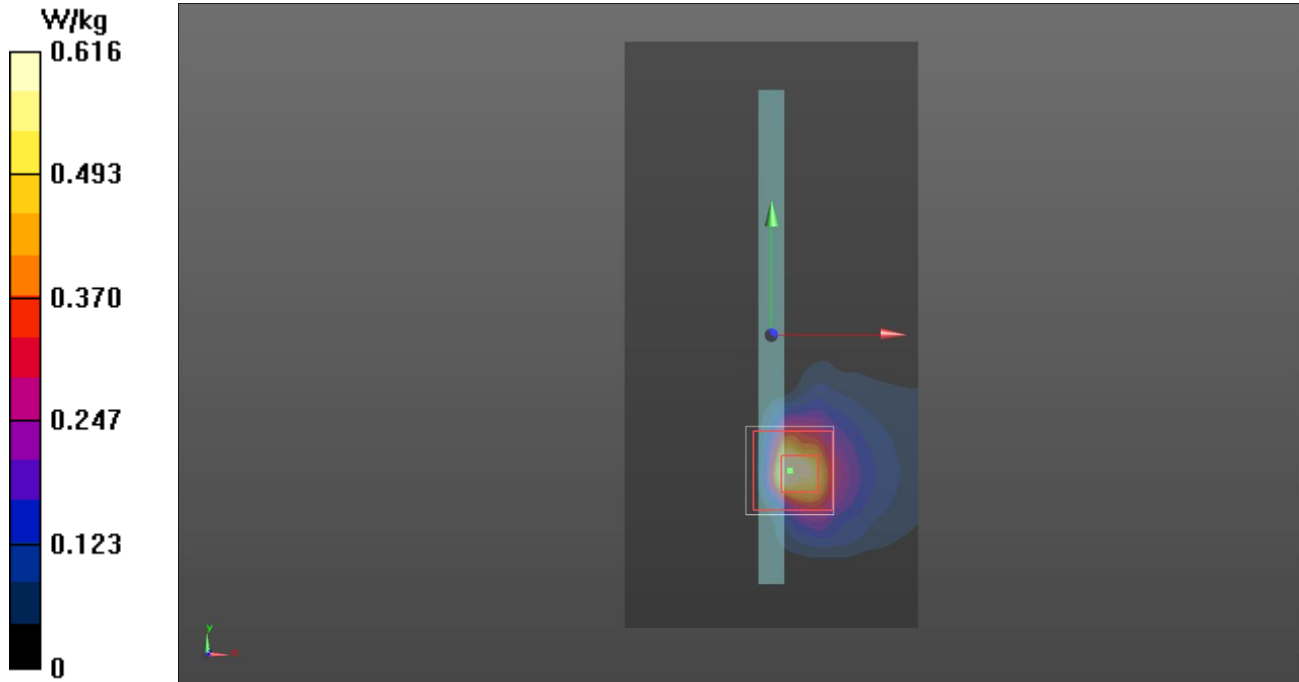
Rear_Second Stage Prox. On_0 mm/1xRTT_RC3 SO32_ch 476/Zoom Scan (5x5x7)/Cube
 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
 Reference Value = 40.916 V/m; Power Drift = 0.13 dB
 Peak SAR (extrapolated) = 2.41 W/kg
 SAR(1 g) = 1.17 W/kg; SAR(10 g) = 0.601 W/kg
 Info: Interpolated medium parameters used for SAR evaluation.
 Maximum value of SAR (measured) = 1.65 W/kg



0 dB = 1.65 W/kg = 2.17 dBW/kg

Bottom of EUT Wi-Fi 5.2GHz CH46 UL VS Ltd

Date: 31/03/2015
 DUT Model: A1490



Communication System: UID 0, WLAN 802.11 (0); Frequency: 5230 MHz; Duty Cycle: 1:1
 Medium: 5GHz MSL Medium parameters used (interpolated): $f = 5230$ MHz; $\sigma = 5.365$ S/m; $\epsilon_r = 47.852$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3814; ConvF(4.38, 4.38, 4.38); Calibrated: 18/09/2014;

- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1435; Calibrated: 15/04/2014
- Phantom: ELI v5.0 (30deg probe tilt); Type: QDOVA002AA;
- ; SEMCAD X Version 14.6.10 (7164)

Configuration/31-03-15 Ant 2 Cmd Bottom of EUT Facing Phantom 2 2 2/Area Scan (81x161x1): Interpolated grid:
 $dx=1.000$ mm, $dy=1.000$ mm

Maximum value of SAR (interpolated) = 0.727 W/kg

Configuration/31-03-15 Ant 2 Cmd Bottom of EUT Facing Phantom 2 2 2/Zoom Scan (7x7x12) (7x7x12)/Cube 0:

Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=2$ mm
 Reference Value = 7.334 V/m; Power Drift = -0.13 dB
 Peak SAR (extrapolated) = 1.70 W/kg
SAR(1 g) = 0.509 W/kg; SAR(10 g) = 0.147 W/kg
 Maximum value of SAR (measured) = 0.616 W/kg

Bottom of EUT Wi-Fi 5.2GHz CH46 – Extract from Original Report

Test Laboratory: Lab A Date: 8/23/2013

WiFi 5.2GHz (WiFi 2)

Frequency: 5230 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C

Medium parameters used: $f = 5230 \text{ MHz}$; $\sigma = 5.277 \text{ mho/m}$; $\epsilon_r = 47.769$; $\rho = 1000 \text{ kg/m}^3$

DASY5 Configuration:

- Area Scan Setting: Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1263; Calibrated: 1/14/2013
- Probe: EX3DV4 - SN3778; ConvF(4.14, 4.14, 4.14); Calibrated: 1/14/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Back ELI v5.0; Type: QDOVA002AA; Serial: 1134

Edge 3/802.11n_HT40_Ch 46/Area Scan (9x20x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 1.480 mW/g

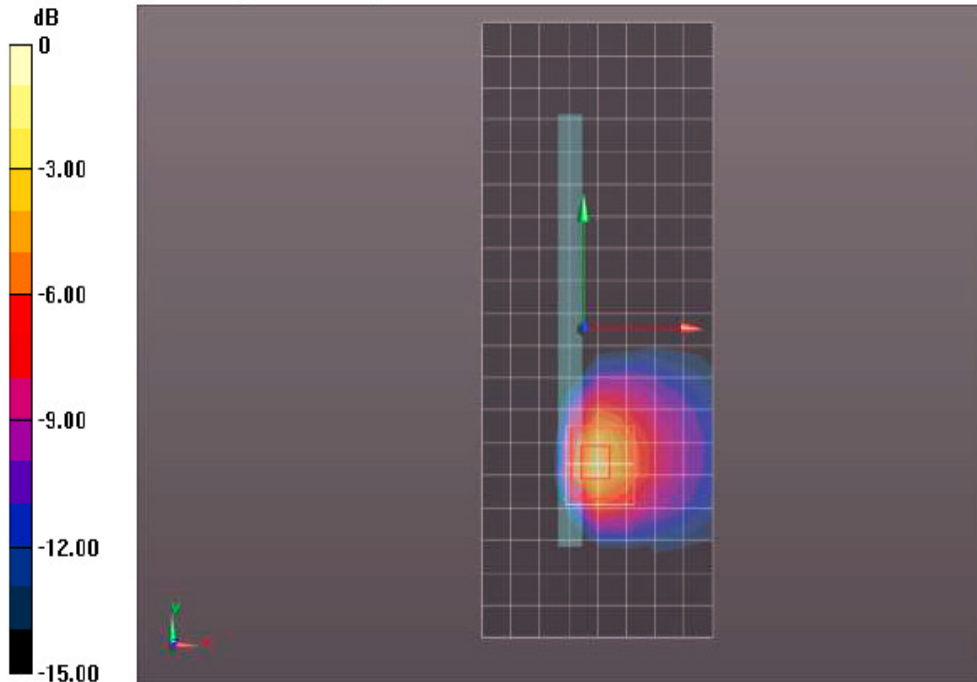
Edge 3/802.11n_HT40_Ch 46/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 16.263 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 3.6420

SAR(1 g) = 0.866 mW/g; SAR(10 g) = 0.268 mW/g

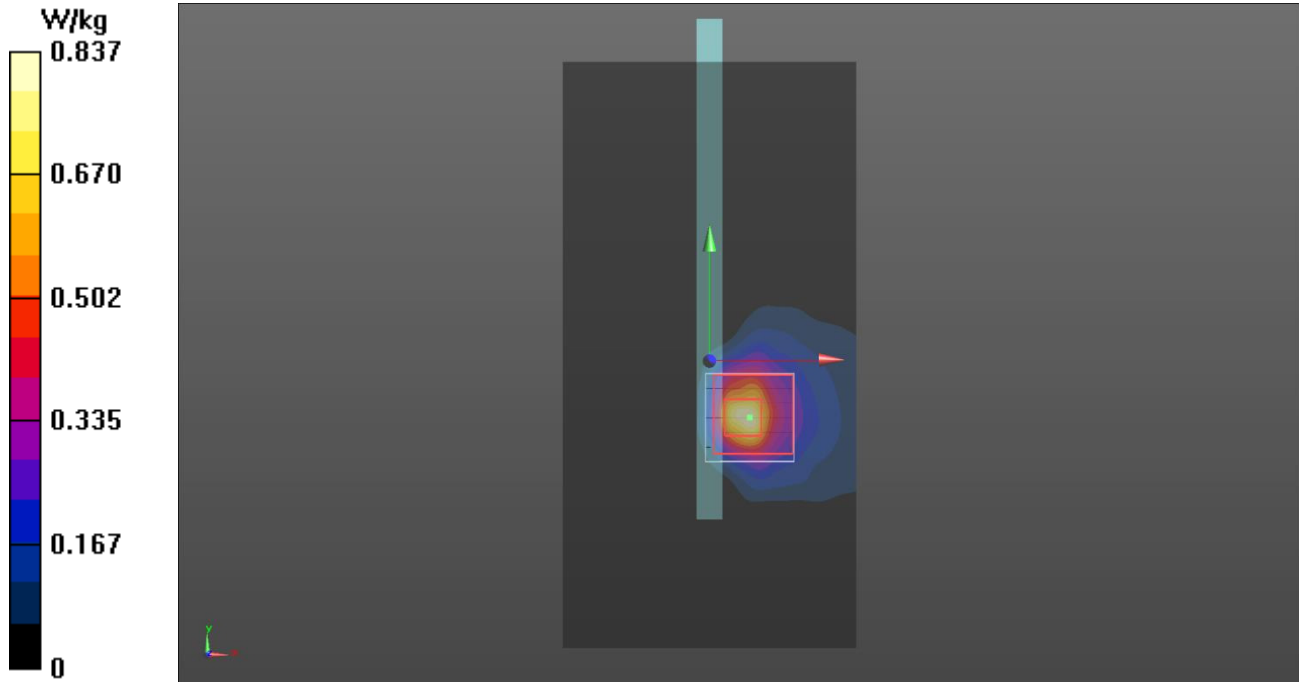
Maximum value of SAR (measured) = 1.742 mW/g



0 dB = 1.740mW/g = 4.81 dB mW/g

Bottom of EUT Wi-Fi 5.3GHz CH60 UL VS Ltd

Date: 01/04/2015
 DUT Model: A1490



Communication System: UID 0, WLAN 802.11 (0); Frequency: 5300 MHz; Duty Cycle: 1:1
 Medium: 5GHz MSL Medium parameters used: $f = 5300 \text{ MHz}$; $\sigma = 5.444 \text{ S/m}$; $\epsilon_r = 47.53$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3814; ConvF(4.18, 4.18, 4.18); Calibrated: 18/09/2014;

- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1435; Calibrated: 15/04/2014
- Phantom: ELI v5.0 (30deg probe tilt); Type: QDOVA002AA;
- ; SEMCAD X Version 14.6.10 (7164)

Configuration/31-03-15 Ant 2 Cmd Bottom of EUT Facing Phantom 2 2 2 2/Area Scan (81x161x1): Interpolated grid:
 $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$

Maximum value of SAR (interpolated) = 0.837 W/kg

Configuration/31-03-15 Ant 2 Cmd Bottom of EUT Facing Phantom 2 2 2 2/Zoom Scan (7x7x12) (7x7x12)/Cube 0:

Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$
 Reference Value = 12.007 V/m; Power Drift = 0.13 dB
 Peak SAR (extrapolated) = 2.05 W/kg
SAR(1 g) = 0.614 W/kg; SAR(10 g) = 0.196 W/kg
 Maximum value of SAR (measured) = 0.766 W/kg

Bottom of EUT Wi-Fi 5.3GHz CH60 – Extract from Original Report

Test Laboratory: Lab B

Date: 8/29/2013

WiFi 5.3GHz (WiFi 2)

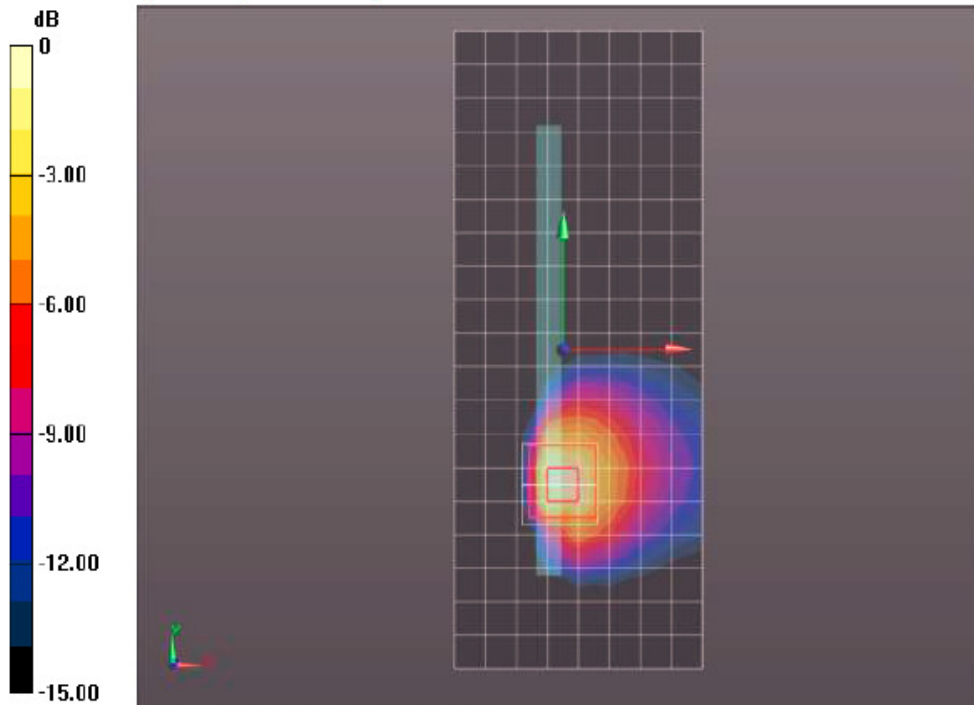
Frequency: 5300 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used: $f = 5300$ MHz; $\sigma = 5.365$ mho/m; $\epsilon_r = 47.803$; $\rho = 1000$ kg/m³

DASY5 Configuration:

- Area Scan Setting: Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1264; Calibrated: 1/14/2013
- Probe: EX3DV4 - SN3720; ConvF(3.98, 3.98, 3.98); Calibrated: 1/14/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Back ELI v5.0; Type: QDOVA002AA; Serial: 1137

Edge 3/802.11a_Ch 60/Area Scan (9x20x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 1.852 mW/g

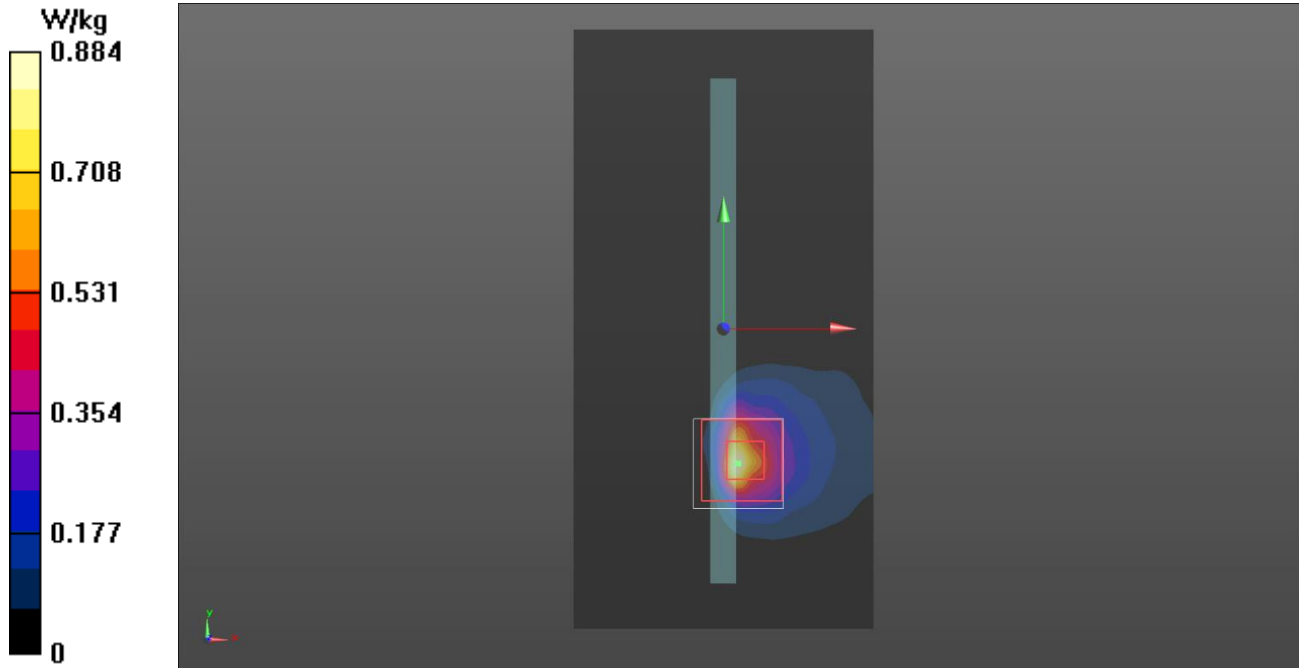
Edge 3/802.11a_Ch 60/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 19.201 V/m; Power Drift = 0.15 dB
Peak SAR (extrapolated) = 4.1040
SAR(1 g) = 0.970 mW/g; SAR(10 g) = 0.293 mW/g
Maximum value of SAR (measured) = 2.024 mW/g



0 dB = 2.020mW/g = 6.11 dB mW/g

Bottom of EUT Wi-Fi 5.8GHz CH157 UL VS Ltd

Date: 01/04/2015
 DUT Model: A1490



Communication System: UID 0, WLAN 802.11 (0); Frequency: 5785 MHz; Duty Cycle: 1:1
 Medium: 5GHz MSL Medium parameters used (interpolated): $f = 5785 \text{ MHz}$; $\sigma = 6.194 \text{ S/m}$; $\epsilon_r = 46.477$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3814; ConvF(4.06, 4.06, 4.06); Calibrated: 18/09/2014;

- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1435; Calibrated: 15/04/2014
- Phantom: ELI v5.0 (30deg probe tilt); Type: QDOVA002AA;
- ; SEMCAD X Version 14.6.10 (7164)

Configuration/31-03-15 Ant 2 Cmd Bottom of EUT Facing Phantom 2 2 2 2/Area Scan (81x161x1): Interpolated grid:
 $dx=1.000 \text{ mm}$, $dy=1.000 \text{ mm}$

Maximum value of SAR (interpolated) = 0.884 W/kg

Configuration/31-03-15 Ant 2 Cmd Bottom of EUT Facing Phantom 2 2 2 2/Zoom Scan (7x7x12) (7x7x12)/Cube 0:

Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$
 Reference Value = 8.198 V/m; Power Drift = -0.05 dB
 Peak SAR (extrapolated) = 1.85 W/kg
SAR(1 g) = 0.522 W/kg; SAR(10 g) = 0.166 W/kg
 Maximum value of SAR (measured) = 0.599 W/kg

Bottom of EUT Wi-Fi 5.8GHz CH157 – Extract from Original Report

Test Laboratory: Lab D

Date: 8/27/2013

WiFi 5.8GHz (WiFi 2)

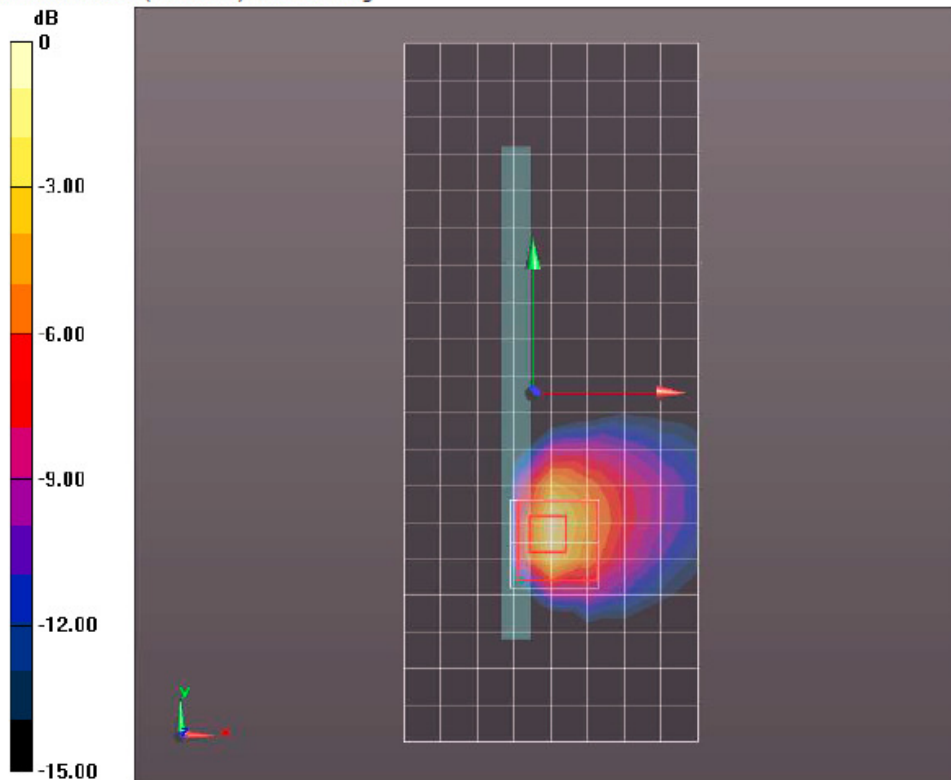
Frequency: 5785 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used: $f = 5785 \text{ MHz}$; $\sigma = 6.084 \text{ mho/m}$; $\epsilon_r = 46.637$; $\rho = 1000 \text{ kg/m}^3$

DASY5 Configuration:

- Area Scan Setting: Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1278; Calibrated: 1/30/2013
- Probe: EX3DV4 - SN3676; ConvF(3.92, 3.92, 3.92); Calibrated: 1/14/2013
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Phantom: Back ELI v5.0; Type: QDOVA002AA; Serial: 1135

Edge 3/802.11a_Ch 157/Area Scan (9x20x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 1.276 mW/g

Edge 3/802.11a_Ch 157/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 14.898 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 3.0610
SAR(1 g) = 0.703 mW/g; SAR(10 g) = 0.213 mW/g
Maximum value of SAR (measured) = 1.432 mW/g



0 dB = 1.430mW/g = 3.11 dB mW/g