



**FCC OET BULLETIN 65 SUPPLEMENT C 01-01
IEEE Std 1528-2003, IEEE Std 1528a-2005**

SAR EVALUATION REPORT

For

GSM/WCDMA BAND PHONE WITH BT, WLAN, AND NFC

**Models: LG-P880g, LGP880g, P880g, LG-P880G, LGP880G, and P880G
FCC ID: ZNFP880G**

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--	9/10/2012	Initial Issue	--
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Table of Contents

1. Attestation of Test Results..... 6

2. Test Methodology 7

3. Facilities and Accreditation 7

4. Calibration and Uncertainty 8

 4.1. *Measuring Instrument Calibration 8*

 4.2. *Measurement Uncertainty..... 9*

5. Measurement System Description and Setup..... 10

6. SAR Measurement Procedures..... 11

 6.1. *Normal SAR Measurement Procedure..... 11*

 6.2. *Volume Scan Procedures 12*

7. Device Under Test..... 13

 7.1. *Air Interfaces and Frequency Ranges..... 13*

 7.2. *Simultaneous Transmission..... 13*

8. Summary of Test Configurations..... 14

 8.1. *Head Exposure Condition for WWAN (Ant. ③) and WiFi (Ant. ①)..... 14*

 8.2. *Body Exposure Condition for WWAN (Ant. ③) and WiFi (Ant. ①) 14*

 8.3. *Hotspot Mode Exposure Conditions for WWAN (Ant. ③) 14*

 8.4. *Hotspot Mode Exposure Conditions for WiFi (Ant. ①)..... 14*

9. RF Output Power Measurement..... 15

 9.1. *GSM850 15*

 9.2. *GSM1900 16*

 9.3. *W-CDMA (UMTS) Band IV..... 17*

 9.4. *Wi-Fi (802.11bgn)..... 21*

 9.5. *WiFi (5 GHz Bands)..... 22*

 9.6. *Bluetooth 24*

10. Tissue Dielectric Properties 25

 10.1. *Composition of Ingredients for the Tissue Material Used in the SAR Tests 26*

 10.2. *Tissue Dielectric Parameter Check Results..... 27*

 10.3. *Tissue Dielectric Parameter Check Results – continued..... 28*

 10.4. *Tissue Dielectric Parameter Check Results – continued..... 29*



 10.5. *Tissue Dielectric Parameter Check Results – continued..... 30*

 10.6. *Tissue Dielectric Parameter Check Results – continued..... 31*

11. System Performance Check	32
11.1. System Performance Check Measurement Conditions.....	32
11.2. Reference SAR Values for System Performance Check.....	33
11.3. System Performance Check Results	34
12. SAR Test Results	35
12.1. GSM850.....	35
12.1.1. Head Exposure Conditions.....	35
12.1.2. Body-worn Accessory Exposure Conditions	36
12.1.1. Hotspot Mode Exposure Conditions	37
12.2. GSM1900.....	38
12.2.1. Head Exposure Conditions.....	38
12.2.2. Body-worn Accessory Exposure Conditions	39
12.2.1. Hotspot Mode Exposure Conditions	40
12.3. WCDMA (UMTS) Band IV	41
12.3.1. Head Exposure Conditions.....	41
12.3.1. Body-worn Accessory Exposure Conditions	41
12.3.1. Hotspot Mode Exposure Conditions	42
12.4. Wi-Fi (2.4 GHz Band)	43
12.4.1. Head Exposure Conditions.....	43
12.4.1. Body & Hotspot SAR.....	43
12.5. Wi-Fi (5 GHz Band)	44
12.5.1. Head SAR.....	44
12.5.2. Body-Worn SAR.....	45
13. Summary of Highest SAR Values.....	46
13.1. SAR Plots (from Summary of Highest SAR Values)	47
14. Simultaneous Transmission SAR Analysis.....	79
14.1. Head Exposure Conditions.....	79
14.1.1. Sum of the SAR for WWAN & Wi-Fi in the 2.4 GHz Band.....	79
14.1.2. Sum of the SAR for WWAN & Wi-Fi in the 5GHz Band	80
14.1.3. SAR to Peak Location Separation Ratio (SPLSR)	80
14.2. Body Exposure Conditions	81
14.2.1. Sum of the SAR for WWAN & Wi-Fi in the 2.4 GHz Band.....	81
14.2.2. Sum of the SAR for WWAN & Wi-Fi in the 5 GHz Band)	81
14.2.3. SAR to Peak Location Separation Ratio (SPLSR)	81
14.3. Hotspot Mode Exposure Conditions	82

14.3.1.	Sum of the SAR for GSM, W-CDMA & Wi-Fi in the 2.4 GHz Band	82
14.3.2.	SAR to Peak Location Separation Ratio (SPLSR)	82
14.3.3.	Sum of the 1g SAR for Body Hotspot Condition (WWAN and WLAN 5 GHz)	83
15.	Appendixes	84
15.1.	<i>System Performance Check Plots</i>	<i>84</i>
15.2.	<i>SAR Test Plots for GSM850</i>	<i>84</i>
15.3.	<i>SAR Test Plots for GSM1900</i>	<i>84</i>
15.4.	<i>SAR Test Plots for WCDMA (UMTS) Band IV</i>	<i>84</i>
15.5.	<i>SAR Test Plots for WiFi 2.4 GHz Band</i>	<i>84</i>
15.6.	<i>SAR Test Plots for WiFi 5 GHz Band</i>	<i>84</i>
15.7.	<i>Calibration Certificate for E-Field Probe EX3DV4 - SN 3686</i>	<i>84</i>
15.8.	<i>Calibration Certificate for D835V2 - SN 4d002</i>	<i>84</i>
15.9.	<i>Calibration Certificate for D1750V2 - SN 1050</i>	<i>84</i>
15.10.	<i>Calibration Certificate for D1900V2 - SN 5d140</i>	<i>84</i>
15.11.	<i>Calibration Certificate for D2450V2 - SN 706</i>	<i>84</i>
15.12.	<i>Calibration Certificate for D5GHzV2 - SN 1075</i>	<i>84</i>
15.13.	<i>Calibration Certificate for D5GHzV2 - SN 1003</i>	<i>84</i>
16.	External Photos	85
17.	Antenna Locations & Separation Distances	86
18.	Setup Photos	87

1. Attestation of Test Results

Applicant	LG ELECTRONICS MOBILECOMM U.S.A., INC.		
DUT description	GSM/WCDMA BAND PHONE WITH BT, WLAN, AND NFC		
Model	LG-P880g, LGP880g, P880g, LG-P880G, LGP880G and P880G IMEI: 004402342171117		
Test device is	An identical prototype		
Device category	Portable		
Exposure category	General Population/Uncontrolled Exposure		
Date tested	8/3/2012 - 8/26/2012		
FCC Rule Parts	Freq. Range	Highest 1-g SAR	Limit
22	824-849 MHz	Head: 0.296 mW/g (Left Touch) Body: 0.767 mW/g (Rear w/ 10mm distance)	1.6 W/kg
27	1712-1753 MHz	Head: 0.571 mW/g (Left Touch) Body: 0.977 mW/g (Rear w/ 10 mm distance)	
24	1850-1910 MHz	Head: 0.438 mW/g (Left Touch) Body: 0.779 mW/g (Rear w/ 10 mm distance)	
15.247	2412-2462	Head: 0.255 mW/g (Left Touch) Body: 0.047 mW/g (Rear)	
	5725-5850	Head: 0.434 mW/g (Left Touch) Body: 0.239 mW/g (Rear)	
15.407	5150-5250	Head: 0.249 mW/g (Left Touch) Body: 0.066 mW/g (Rear)	
	5250-5350	Head: 0.346 mW/g (Left Touch) Body: 0.085 mW/g (Front)	
	5500-5700	Head: 0.335 mW/g (Left Touch) Body: 0.130 mW/g (Rear)	
Applicable Standards			Test Results
FCC OET Bulletin 65 Supplement C 01-01, IEEE Std 1528-2003, IEEE Std 1528a-2005			Pass
<p>UL CCS tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.</p> <p>Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.</p> <p>Approved & Released For UL CCS By:  Tested By: </p>			
Dave Weaver Staff Engineer UL CCS		Elijah Garcia WiSE Lab Engineer UL CCS	

2. Test Methodology

The tests documented in this report were performed in accordance with FCC OET Bulletin 65 Supplement C Edition 01-01, IEEE STD 1528-2003, IEEE STD 1528a-2005, IC RSS-102 Issue 4, March 2010, IEC 62209-1:2006 & IEC 62209-2:2010 and the following KDB Procedures:

- 941225 D06 Hotspot SAR v01
- 248227 D01 SAR meas for 802 11abg v01r02
- 941225 D01 SAR test for 3G devices v02
- 858664 D01 SAR Measurement 3-6 GHz

3. Facilities and Accreditation

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

4. Calibration and Uncertainty

4.1. Measuring Instrument Calibration

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due date		
				MM	DD	Year
Dielectronic Probe kit	HP	85070C	N/A	N/A		
Base Station Simulator	Agilent	8960	GB46160222	6	20	2013
ESA Series Network Analyzer	Agilent	E5071B	MY42100131	2	11	2013
Synthesized Signal Generator	HP	8665B	3744A01084	5	3	2013
E-Field Probe	SPEAG	EX3DV4	3686	2	16	2013
Thermometer	ERTCO	639-1S	8350	7	30	2013
Data Acquisition Electronics	SPEAG	DAE4	1259	2	13	2013
System Validation Dipole	SPEAG	D835V2	4d002	3	6	2013
System Validation Dipole	SPEAG	D1900V2	5d140	4	12	2013
System Validation Dipole	SPEAG	D2450V2	706	4	11	2013
System Validation Dipole	SPEAG	D5GhzV2	1033	8	23	2012
System Validation Dipole	SPEAG	D5GhzV2	1075	2	14	2013
System Validation Dipole	SPEAG	D1750V2	1050	4	19	2013
Power Meter	HP	438A	2822A05684	10	7	2013
Power Sensor	HP	8481A	2702A66876	8	1	2013
Amplifier	MITEQ	4D00400600-50-30P	1620606	N/A		
Directional coupler	Werlatone	C8060-102	2141	N/A		

4.2. Measurement Uncertainty

Measurement uncertainty for 300 MHz to 3 GHz averaged over 1 gram

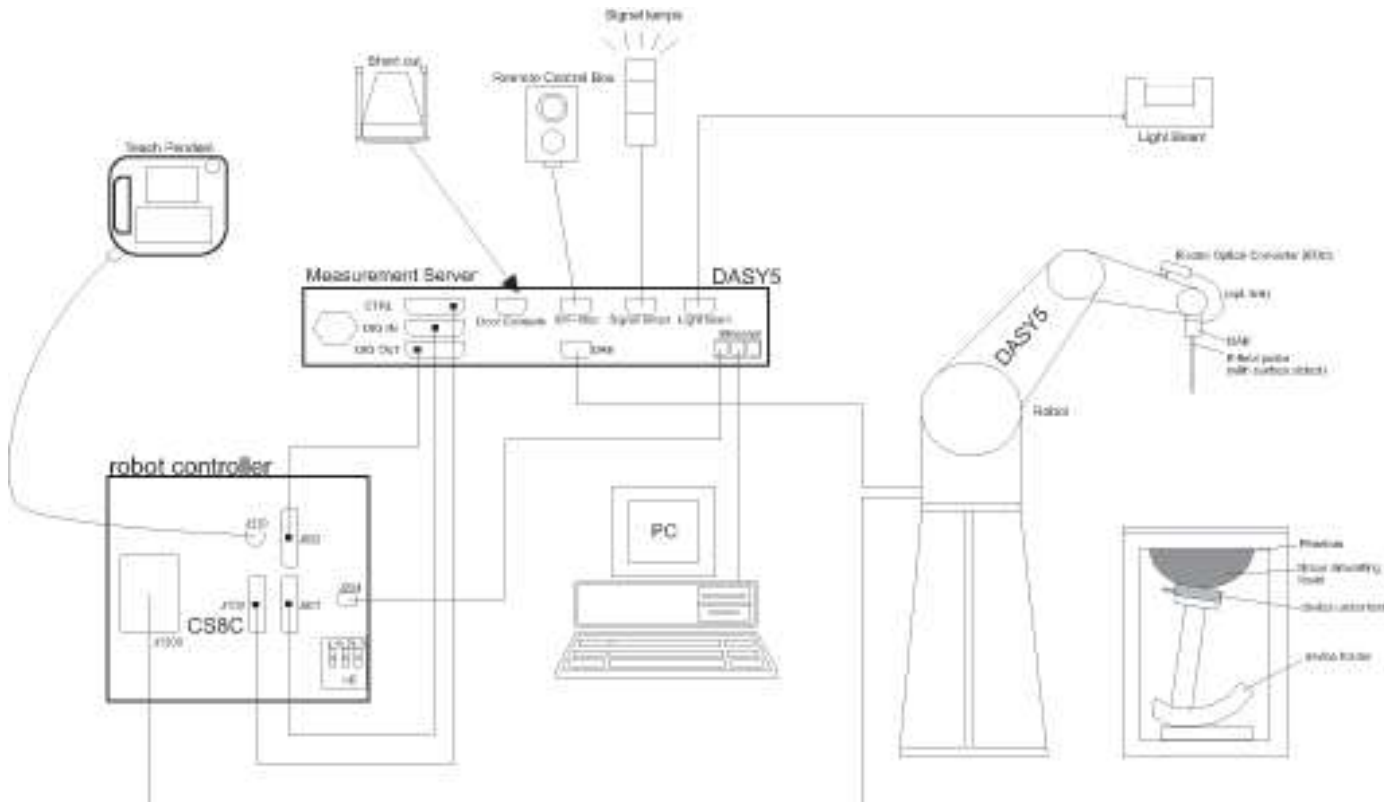
Component	Error, %	Distribution	Divisor	Sensitivity	U (X), %
Measurement System					
Probe Calibration (k=1)	6.00	Normal	1	1	6.00
Axial Isotropy	1.15	Rectangular	1.732	0.7071	0.47
Hemispherical Isotropy	2.30	Rectangular	1.732	0.7071	0.94
Boundary Effect	0.90	Rectangular	1.732	1	0.52
Probe Linearity	3.45	Rectangular	1.732	1	1.99
System Detection Limits	1.00	Rectangular	1.732	1	0.58
Readout Electronics	0.30	Normal	1	1	0.30
Response Time	0.80	Rectangular	1.732	1	0.46
Integration Time	2.60	Rectangular	1.732	1	1.50
RF Ambient Conditions - Noise	3.00	Rectangular	1.732	1	1.73
RF Ambient Conditions - Reflections	3.00	Rectangular	1.732	1	1.73
Probe Positioner Mechanical Tolerance	0.40	Rectangular	1.732	1	0.23
Probe Positioning with respect to Phantom	2.90	Rectangular	1.732	1	1.67
Extrapolation, Interpolation and Integration	1.00	Rectangular	1.732	1	0.58
Test Sample Related					
Test Sample Positioning	2.90	Normal	1	1	2.90
Device Holder Uncertainty	3.60	Normal	1	1	3.60
Output Power Variation - SAR Drift	5.00	Rectangular	1.732	1	2.89
Phantom and Tissue Parameters					
Phantom Uncertainty (shape and thickness)	4.00	Rectangular	1.732	1	2.31
Liquid Conductivity - deviation from target	5.00	Rectangular	1.732	0.64	1.85
Liquid Conductivity - measurement uncertainty	-4.67	Normal	1	0.64	-2.99
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.6	1.73
Liquid Permittivity - measurement uncertainty	-4.47	Normal	1	0.6	-2.68
Combined Standard Uncertainty Uc(y) =					10.54
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =					21.07 %
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =					1.66 dB

Measurement uncertainty for 3 to 6 GHz averaged over 1 gram

Component	Error, %	Distribution	Divisor	Sensitivity	U (X), %
Measurement System					
Probe Calibration (k=1)	6.55	Normal	1	1	6.55
Axial Isotropy	1.15	Rectangular	1.732	0.7071	0.47
Hemispherical Isotropy	2.30	Rectangular	1.732	0.7071	0.94
Boundary Effect	0.90	Rectangular	1.732	1	0.52
Probe Linearity	3.45	Rectangular	1.732	1	1.99
System Detection Limits	1.00	Rectangular	1.732	1	0.58
Readout Electronics	1.00	Normal	1	1	1.00
Response Time	0.80	Rectangular	1.732	1	0.46
Integration Time	2.60	Rectangular	1.732	1	1.50
RF Ambient Conditions - Noise	3.00	Rectangular	1.732	1	1.73
RF Ambient Conditions - Reflections	3.00	Rectangular	1.732	1	1.73
Probe Positioner Mechanical Tolerance	0.40	Rectangular	1.732	1	0.23
Probe Positioning with respect to Phantom	2.90	Rectangular	1.732	1	1.67
Extrapolation, Interpolation and Integration	3.90	Rectangular	1.732	1	2.25
Test Sample Related					
Test Sample Positioning	1.10	Normal	1	1	1.10
Device Holder Uncertainty	3.60	Normal	1	1	3.60
Output Power Variation - SAR Drift	5.00	Rectangular	1.732	1	2.89
Phantom and Tissue Parameters					
Phantom Uncertainty (shape and thickness)	4.00	Rectangular	1.732	1	2.31
Liquid Conductivity - deviation from target	5.00	Rectangular	1.732	0.64	1.85
Liquid Conductivity - measurement uncertainty	4.22	Normal	1	0.64	2.70
Liquid Permittivity - deviation from target	10.00	Rectangular	1.732	0.6	3.46
Liquid Permittivity - measurement uncertainty	-3.74	Normal	1	0.6	-2.24
Combined Standard Uncertainty Uc(y), %:					11.02
Expanded Uncertainty U, Coverage Factor = 1.96, > 95 % Confidence =					21.61 %
Expanded Uncertainty U, Coverage Factor = 1.96, > 95 % Confidence =					1.70 dB

5. Measurement System Description and Setup

The DASY5 system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot (Stäubli RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows XP.
- DASY software.
- Remote controls with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing validating the proper functioning of the system.

6. SAR Measurement Procedures

6.1. Normal SAR Measurement Procedure

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures $\geq 7 \times 7 \times 9$ (above 4.5 GHz) or $5 \times 5 \times 7$ (below 3 GHz) points within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

Step 5: Z-Scan (FCC only)

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation the extrapolated distance should not be larger than the step size in Z-direction.

6.2. Volume Scan Procedures

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures $\geq 7 \times 7 \times 9$ (above 4.5 GHz) or $5 \times 5 \times 7$ (below 3 GHz) points within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

Step 4: Volume Scan

Volume Scans are used to assess peak SAR and averaged SAR measurements in largely extended 3-dimensional volumes within any phantom. This measurement does not need any previous area scan. The grid can be anchored to a user specific point or to the current probe location.

Step 5: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

7. Device Under Test

GSM/WCDMA BAND PHONE WITH BT, WLAN, AND NFC Model: LG-P880g, LGP880g, P880g, LG-P880G, LGP880G, and P880G	
Normal operation	- Held to head, - Body (Rear and Front sides) with 15 mm separation distance.
Accessory	1. Headset 2. Battery Cover o Normal Battery Cover

7.1. Air Interfaces and Frequency Ranges

Air Interfaces	- GSM, GPRS and EGPRS - UMTS (WCDMA) Rel 99, HSDPA (Rel 6, CAT 5), HSUPA - 802.11a/b/g/n - Bluetooth Ver 4.0
Tx Frequency Ranges	- GSM850: 824 - 849 MHz - GSM1900: 1850 - 1910 MHz - W-CDMA (UMTS) Band IV: 1712 - 1753 MHz - 802.11a/n: 5180 - 5825 MHz - 802.11b/g/n: 2412 - 2462 MHz - Bluetooth: 2402 - 2480 MHz
Voice over data operation	- The DUT supports voice over data operation (VoIP) therefore head SAR measurements for GPRS and WiFi are required.

7.2. Simultaneous Transmission

No	Capable TX Configuration	Head SAR	Body SAR	Hotspot SAR
1	GSM850 Voice + WiFi	O	O	X
2	GSM1900 Voice + WiFi	O	O	X
3	GSM850 GPRS + WiFi	O	O	O
4	GSM1900 GPRS + WiFi	O	O	O
5	WCDMA Band IV + WiFi	O	O	O
6	GSM850 Voice + BT	O	O	X
7	GSM1900 Voice + BT	O	O	X
8	GSM850 GPRS + BT	O	O	X
9	GSM1900 GPRS + BT	O	O	X
10	WCDMA Band IV + BT	O	O	X

Notes:

1. WiFi and BT cannot transmit simultaneously

8. Summary of Test Configurations

8.1. Head Exposure Condition for WWAN (Ant.③) and WiFi (Ant.①)

Test Configurations	SAR Required	Note
Left Touch	Yes	
Left Tilt (15°)	Yes	
Right Touch	Yes	
Right Tilt (15°)	Yes	

8.2. Body Exposure Condition for WWAN (Ant.③) and WiFi (Ant.①)

Test Configurations	Separation distance	SAR Required	Note
Rear	15 mm	Yes	
Front	15 mm	Yes	

8.3. Hotspot Mode Exposure Conditions for WWAN (Ant.③)

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	< 25 mm	Yes	
Front	< 25 mm	Yes	
Edge 1	118.8 mm	No	SAR is not required because the distance from the WWAN antenna to this edge is > 2.5 cm as per KDB 941225 D06 Hot Spot SAR v01
Edge 2	6.2 mm	Yes	
Edge 3	1.6 mm	Yes	
Edge 4	3.3 mm	Yes	

8.4. Hotspot Mode Exposure Conditions for WiFi (Ant.①)

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	< 25 mm	Yes	
Front	< 25 mm	Yes	
Edge 1*	7.6 mm	Yes	
Edge 2*	1.8 mm	Yes	
Edge 3*	120 mm	No	SAR is not required because the distance from the Wi-Fi/BT antenna to this edge is > 2.5 cm as per KDB 941225 D06 Hot Spot SAR v01
Edge 4*	58.6 mm	No	SAR is not required because the distance from the Wi-Fi/BT antenna to this edge is > 2.5 cm as per KDB 941225 D06 Hot Spot SAR v01

*: SAR testing under Hotspot Mode test positions is not required as Wi-Fi in the 5 GHz Bands does not support hotspot mode operation,

9. RF Output Power Measurement

9.1. GSM850

Target Power: 33.2 dBm

Tune-up Tolerance: -1.5 dB / +0.5 dB

GMSK (Voice) Mode

Band	Ch No.	Freq. (MHz)	Avg burst Pwr (dBm)
850	128	824.2	33.6
	190	836.6	33.6
	251	848.8	33.6

Target Power:

GPRS 1 slot 33.2 dBm

GPRS 2 slot 30.2 dBm

GPRS 3 slot 28.7 dBm

GPRS 4 slot 27.2 dBm

Tune-up Tolerance: -1.5 dB / +0.5 dB

GMSK (GPRS) Mode - Coding Scheme: CS1

Band	Ch No.	Freq. (MHz)	Avg burst Pwr (dBm)				Avg burst Pwr (dBm)			
			1 slot	Frame Avg Pwr	2 slots	Frame Avg Pwr	3 slots	Frame Avg Pwr	4 slots	Frame Avg Pwr
850	128	824.2	33.6	24.6	30.6	24.6	29.1	24.9	27.6	24.6
	190	836.6	33.6	24.6	30.6	24.6	29.1	24.9	27.6	24.6
	251	848.8	33.6	24.5	30.6	24.6	29.2	24.9	27.6	24.6

Notes:

The worst-case configuration and mode for SAR testing is determined to be as follows:

- Head: GMSK Voice Mode
- Body: GMSK (GPRS) mode with 2 time slots, based on the output power measurements above

Target Power:

EGPRS 1 slot 26.2 dBm

EGPRS 2 slot 26.2 dBm

EGPRS 3 slot 25.7 dBm

EGPRS 4 slot 25.2 dBm

Tune-up Tolerance: -1.5 dB / +0.7 dB

8PSK (EGPRS) Mode - Coding Scheme: MCS5

Band	Ch No.	Freq. (MHz)	Avg burst Pwr (dBm)				Avg burst Pwr (dBm)			
			1 slot	Frame Avg Pwr	2 slots	Frame Avg Pwr	3 slots	Frame Avg Pwr	4 slots	Frame Avg Pwr
850	128	824.2	26.5	17.5	26.6	20.5	26.2	21.9	25.6	22.6
	190	836.6	26.6	17.5	26.6	20.6	26.1	21.8	25.6	22.6
	251	848.8	26.6	17.6	26.6	20.6	26.1	21.9	25.7	22.7

9.2. GSM1900

Target Power: 30.2 dBm
 Tune-up Tolerance: -1.5 dB / +0.5 dB

GMSK (Voice) Mode

Band	Ch No.	Freq. (MHz)	Avg burst Pwr (dBm)
1900	512	1850.2	30.6
	661	1880.0	30.5
	810	1909.8	30.5

Target Power:
 GPRS 1 slot 30.2 dBm
 GPRS 2 slot 27.2 dBm
 GPRS 3 slot 25.7 dBm
 GPRS 4 slot 24.7 dBm
 Tune-up Tolerance: -1.5 dB / +0.5 dB

GMSK (GPRS) Mode - Coding Scheme: CS1

Band	Ch No.	Freq. (MHz)	Avg burst Pwr (dBm)				Avg burst Pwr (dBm)			
			1 slot	Frame Avg Pwr	2 slots	Frame Avg Pwr	3 slots	Frame Avg Pwr	4 slots	Frame Avg Pwr
1900	512	1850.2	30.6	21.5	27.6	21.6	26.1	21.9	25.2	22.2
	661	1880.0	30.5	21.5	27.6	21.6	26.1	21.8	25.1	22.1
	810	1909.8	30.5	21.4	27.6	21.5	26.1	21.8	25.1	22.1

Notes:

The worst-case configuration and mode for SAR testing is determined to be as follows:

- Head: GMSK Voice Mode
- Body: GMSK (GPRS) mode with 2 time slots, based on the output power measurements above

Target Power:
 EGPRS 1 slot 25.2 dBm
 EGPRS 2 slot 25.2 dBm
 EGPRS 3 slot 24.7 dBm
 EGPRS 4 slot 24.2 dBm
 Tune-up Tolerance: -1.5 dB / +0.5 dB

8PSK (EGPRS) Mode - Coding Scheme: MCS5

Band	Ch No.	Freq. (MHz)	Avg burst Pwr (dBm)				Avg burst Pwr (dBm)			
			1 slot	Frame Avg Pwr	2 slots	Frame Avg Pwr	3 slots	Frame Avg Pwr	4 slots	Frame Avg Pwr
1900	512	1850.2	25.5	16.5	25.6	19.6	25.1	20.8	24.6	21.6
	661	1880.0	25.5	16.5	25.6	19.5	25.1	20.9	24.6	21.6
	810	1909.8	25.5	16.5	25.6	19.6	25.1	20.9	24.6	21.6

9.3.W-CDMA (UMTS) Band IV

Target Power: 22.8 dBm

Tune-up Tolerance: -1.5 dB / +0.5 dB

Release 99 (RMC, 12.2kbps)

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 specification. The DUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7).

Mode	Subtest	Rel99
WCDMA General Settings	Loopback Mode	Test Mode 1
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	β_c/β_d	8/15

Output power table

Band	Ch No.	Freq. (MHz)	Avg Pwr (dBm)
1700 (Band IV)	1312	1712.4	23.0
	1412	1732.4	22.8
	1862	1752.5	22.9

HSDPA

The following 4 Sub-tests were completed according to Release 5 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

Mode	HSDPA	HSDPA	HSDPA	HSDPA
Subtest	1	2	3	4
WCDMA General Settings	Loopback Mode			
	Test Mode 1			
	Rel99 RMC			
	12.2kbps RMC			
	HSDPA FRC			
	H-Set1			
	Power Control Algorithm			
	Algorithm 2			
	β_c	2/15	12/15	15/15
β_d	15/15	15/15	8/15	4/15
Bd (SF)				
64				
β_c/β_d	2/15	12/15	15/8	15/4
β_{hs}	4/15	24/15	30/15	30/15
CM (dB)	0	1	1.5	1.5
HSDPA Specific Settings	D_{ACK}			
	8			
	D_{NAK}			
	8			
	DCQI			
	8			
	Ack-Nack repetition factor			
3				
CQI Feedback (Table 5.2B.4)				
4ms				
CQI Repetition Factor (Table 5.2B.4)				
2				
$A_{hs} = \beta_{hs}/\beta_c$				
30/15				

Output power table

Band	Subtest	Ch No.	Freq. (MHz)	Avg Pwr (dBm)
1700 (Band IV)	1	1312	1712.4	23.0
		1412	1732.4	22.9
		1862	1752.5	22.9
	2	1312	1712.4	23.0
		1412	1732.4	23.0
		1862	1752.5	23.0
	3	1312	1712.4	22.7
		1412	1732.4	22.5
		1862	1752.5	22.5
	4	1312	1712.4	22.4
		1412	1732.4	22.2
		1862	1752.5	22.2

HSPA (HSDPA & HSUPA)

The following 5 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

Mode	HSPA	HSPA	HSPA	HSPA	HSPA	
Subtest	1	2	3	4	5	
WCDMA General Settings	Loopback Mode					
	Test Mode 1					
	Rel99 RMC					
	12.2kbps RMC					
	HSDPA FRC					
	H-Set1					
	HSUPA Test					
	HSUPA Loopback					
	Power Control Algorithm					
	Algorithm2					
	β_c	11/15	6/15	15/15	2/15	15/15
β_d	15/15	15/15	9/15	15/15	15/15	
β_{ec}	209/225	12/15	30/15	2/15	24/15	
β_c/β_d	11/15	6/15	15/9	2/15	15/15	
β_{hs}	22/15	12/15	30/15	4/15	30/15	
β_{ed}	1309/225	94/75	47/15	56/75	134/15	
CM (dB)	1.0	3.0	2.0	3.0	1.0	
MPR (dB)	0	2	1	2	0	
HSDPA Specific Settings	DACK					
	8					
	DNAK					
	8					
	DCQI					
	8					
	Ack-Nack repetition factor					
3						
CQI Feedback (Table 5.2B.4)						
4ms						
CQI Repetition Factor (Table 5.2B.4)						
2						
A _{hs} = β_{hs}/β_c						
30/15						
HSUPA Specific Settings	D E-DPCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	ETFCI (from 34.121 Table C.11.1.3)	75	67	92	71	81
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8	308.9
	Reference E_TFCIs	E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27		E-TFCI 11 E-TFCI PO 4 E-TFCI 92 E-TFCI PO 18		E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27

Results

Band	Mode	UL Ch No.	Freq. (MHz)	Target MPR	Avg Pwr (dBm)
1700 (Band IV)	Subtest 1	1312	1712.4	0	22.6
		1412	1732.4	0	22.4
		1862	1752.5	0	22.4
	Subtest 2	1312	1712.4	2	21.1
		1412	1732.4	2	20.9
		1862	1752.5	2	20.9
	Subtest 3	1312	1712.4	1	22.0
		1412	1732.4	1	21.9
		1862	1752.5	1	21.8
	Subtest 4	1312	1712.4	2	21.3
		1412	1732.4	2	21.1
		1862	1752.5	2	21.1
	Subtest 5	1312	1712.4	0	22.7
		1412	1732.4	0	22.6
		1862	1752.5	0	22.5

Note(s):

- KDB 941225 D01 – Body SAR is not required for handsets with HSPA capabilities when the maximum average output of each RF channel with HSUPA/HSDPA active is less than ¼ dB higher than that measured without HSUPA/HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2kbps RMC is ≤ 75% of the SAR limit.

9.4.Wi-Fi (802.11bgn)

Required Test Channels per KDB 248227 D01

Mode	Band	GHz	Channel	"Default Test Channels"	
				802.11b	802.11g
802.11b/g	2.4 GHz	2.412	1 [#]	√	∇
		2.437	6	√	∇
		2.462	11 [#]	√	∇

Notes:

√ = "default test channels"

∇ = possible 802.11g channels with maximum average output ¼ dB ≥ the "default test channels"

[#] = when output power is reduced for channel 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.

Band (MHz)	Mode	Ch #	Freq. (MHz)	Target Pwr (dBm)	Avg Pwr (dBm)
2.4	802.11b	1	2412	13.1	12.9
		6	2437	13.1	13.1
		11	2462	13.1	13.1
	802.11g	1	2412	12.7	12.6
		6	2437	12.7	12.6
		11	2462	12.7	12.7
	802.11n (HT20)	1	2412	11.6	11.6
		6	2437	11.6	11.6
		11	2462	11.6	11.6

9.5.WiFi (5 GHz Bands)

Mode		Band	GHz	Channel	"Default Test Channels"	
					802.11a	
802.11a	UNII (15.407)	5.2 GHz	5.180	36	√	
			5.200	40		*
			5.220	44		*
			5.240	48	√	
		5.3 GHz	5.260	52	√	
			5.280	56		*
			5.300	60		*
			5.320	64	√	
		5.5 GHz	5.500	100		
			5.520	104	√	
			5.540	108		*
			5.560	112		*
			5.580	116	√	
			5.600	120		*
			5.620	124	√	
			5.640	128		*
		5.8 GHz	5.660	132		*
			5.680	136	√	
	5.700		140		*	
	5.745		149	√		
DTS (15.247)	5.8 GHz	5.765	153		*	
		5.785	157	√		
		5.805	161		*	
		5.825	165	√		

√ = "default test channels"

* = possible 802.11a channels with maximum average output > the "default test channels"

WiFi (5 GHz Bands) (Continued)

Band (MHz)	Mode	Ch #	Freq. (MHz)	Target Pwr (dBm)	Avg Pwr (dBm)	Note
5.2	802.11a	36	5180	9.1	9.1	
		40	5200	9.1	9.1	
		44	5220	9.1	9.1	
		48	5240	9.1	9.1	
	802.11n (HT20)	36	5180	8.5	8.5	
		40	5200	8.5	8.5	
48		5240	8.5	8.5		
5.3	802.11a	52	5260	9.1	9.1	
		56	5280	9.1	9.1	
		60	5300	9.1	9.1	
		64	5320	9.1	9.1	
	802.11n (HT20)	52	5260	8.5	8.5	
		56	5280	8.5	8.5	
		60	5300	8.5	8.5	
		64	5320	8.5	8.5	
5.5	802.11a	100	5500	9.1	9.1	
		104	5520	9.1	9.1	
		108	5540	9.1	9.1	
		112	5560	9.1	9.1	
		116	5580	9.1	9.1	
		120	5600	not supported	not supported	
		124	5620			
		128	5640			
		132	5660	9.1	9.1	
		136	5680	9.1	9.1	
	140	5700	9.1	9.1		
	802.11n (HT20)	100	5500	8.6	8.5	
		110	5550	8.6	8.5	
		134	5670	8.6	8.6	
5.8	802.11a	149	5745	12.8	12.7	
		153	5765	12.8	12.6	
		157	5785	12.8	12.7	
		161	5805	12.8	12.8	
		165	5825	12.8	12.8	
	802.11n (HT20)	149	5745	11.4	11.2	
		157	5785	11.4	11.2	
		165	5825	11.4	11.3	

Note(s):

9.6. Bluetooth

Version 4.0, Power class: 1 (100 mW/20 dBm)

Mode	Channel #	Freq. (MHz)	Conducted Avg Power	
			(dBm)	(mW)
V2.1 + EDR, GFSK	0	2402	8.7	7.41
	39	2441	9.0	7.94
	78	2480	8.3	6.76
V2.1 + EDR, 8PSK	0	2402	6.6	4.57
	39	2441	6.9	4.90
	78	2480	6.2	4.17
V4.0 LE, GFSK	0	2402	5.5	3.55
	39	2441	6.3	4.27
	78	2480	5.1	3.24

Note(s):

According to KDB 648474, Table 2, Unlicensed transmitters

When there is simultaneous transmission, Stand-alone SAR not required due to

- Output $\leq 2 \cdot P_{Ref}$ (13.8dBm / 24 mW) and antenna is ≥ 5.0 cm from other antennas
- Output $\leq P_{Ref}$ (10.79dBm / 12 mW) and antenna is ≥ 2.5 cm from other antennas
- Output $\leq P_{Ref}$ (10.79dBm / 12 mW) and antenna is < 2.5 cm from other antennas

10. Tissue Dielectric Properties

IEEE Std 1528-2003 Table 2

Target Frequency (MHz)	Head	
	ϵ_r	σ (S/m)
300	45.3	0.87
450	43.5	0.87
835	41.5	0.90
900	41.5	0.97
1450	40.5	1.20
1800 – 2000	40.0	1.40
2450	39.2	1.80
2600	39.0	1.96
3000	38.5	2.40

FCC OET Bulletin 65 Supplement C 01-01

Target Frequency (MHz)	Head		Body	
	ϵ_r	σ (S/m)	ϵ_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00

10.1. Composition of Ingredients for the Tissue Material Used in the SAR Tests

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Salt: 99+% Pure Sodium Chloride Sugar: 98+% Pure Sucrose
 Water: De-ionized, 16 MΩ+ resistivity HEC: Hydroxyethyl Cellulose
 DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
 Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

MSL/HSL1750 (Body and Head liquids for 1700 – 1800 MHz)

Item	Head Tissue Simulation Liquids HSL1750 Muscle (body) Tissue Simulation Liquids MSL1750
Type No	SL AAM 175
Manufacturer	SPEAG
-The item is composed of the following ingredients:	
H ² O	Water, 52 – 75%
C8H18O3	Diethylene glycol monobutyl ether (DGBE), 25-48%
NaCl	Sodium Chloride, <1.0%

Simulating Liquids for 5 GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	78
Mineral oil	11
Emulsifiers	9
Additives and Salt	2

10.2. Tissue Dielectric Parameter Check Results

Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit \pm (%)	
08/03/2012	Head 835	e'	42.7324	Relative Permittivity (ϵ_r):	42.73	41.50	2.97	5
		e"	19.4325	Conductivity (σ):	0.90	0.90	0.25	5
	Head 815	e'	43.0232	Relative Permittivity (ϵ_r):	43.02	41.63	3.35	5
		e"	19.4355	Conductivity (σ):	0.88	0.90	-1.93	5
	Head 820	e'	42.7533	Relative Permittivity (ϵ_r):	42.75	41.60	2.77	5
		e"	19.4021	Conductivity (σ):	0.88	0.90	-1.54	5
Head 850	e'	42.5870	Relative Permittivity (ϵ_r):	42.59	41.50	2.62	5	
	e"	19.2814	Conductivity (σ):	0.91	0.92	-0.41	5	
08/06/2012	Body 835	e'	54.2930	Relative Permittivity (ϵ_r):	54.29	55.20	-1.64	5
		e"	21.3533	Conductivity (σ):	0.99	0.97	2.21	5
	Body 815	e'	54.4960	Relative Permittivity (ϵ_r):	54.50	55.30	-1.45	5
		e"	21.4471	Conductivity (σ):	0.97	0.97	0.40	5
	Body 820	e'	54.4480	Relative Permittivity (ϵ_r):	54.45	55.28	-1.50	5
		e"	21.4245	Conductivity (σ):	0.98	0.97	0.87	5
Body 850	e'	54.1517	Relative Permittivity (ϵ_r):	54.15	55.16	-1.82	5	
	e"	21.2848	Conductivity (σ):	1.01	0.99	1.91	5	
08/08/2012	Body 1900	e'	50.9760	Relative Permittivity (ϵ_r):	50.98	53.30	-4.36	5
		e"	14.1972	Conductivity (σ):	1.50	1.52	-1.32	5
	Body 1850	e'	51.1869	Relative Permittivity (ϵ_r):	51.19	53.30	-3.96	5
		e"	14.0870	Conductivity (σ):	1.45	1.52	-4.67	5
	Body 1880	e'	51.0919	Relative Permittivity (ϵ_r):	51.09	53.30	-4.14	5
		e"	14.1541	Conductivity (σ):	1.48	1.52	-2.66	5
Body 1910	e'	50.9192	Relative Permittivity (ϵ_r):	50.92	53.30	-4.47	5	
	e"	14.2289	Conductivity (σ):	1.51	1.52	-0.58	5	
08/09/2012	Body 835	e'	55.7551	Relative Permittivity (ϵ_r):	55.76	55.20	1.01	5
		e"	21.8457	Conductivity (σ):	1.01	0.97	4.56	5
	Body 815	e'	55.9227	Relative Permittivity (ϵ_r):	55.92	55.30	1.13	5
		e"	21.9372	Conductivity (σ):	0.99	0.97	2.69	5
	Body 820	e'	55.8754	Relative Permittivity (ϵ_r):	55.88	55.28	1.08	5
		e"	21.9151	Conductivity (σ):	1.00	0.97	3.17	5
Body 850	e'	55.6243	Relative Permittivity (ϵ_r):	55.62	55.16	0.85	5	
	e"	21.7731	Conductivity (σ):	1.03	0.99	4.25	5	

10.3. Tissue Dielectric Parameter Check Results – continued

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
08/10/2012	Head 1900	e'	38.5088	Relative Permittivity (ϵ_r):	38.51	40.00	-3.73	5
		e"	13.2450	Conductivity (σ):	1.40	1.40	-0.05	5
	Head 1850	e'	38.6576	Relative Permittivity (ϵ_r):	38.66	40.00	-3.36	5
		e"	13.0720	Conductivity (σ):	1.34	1.40	-3.95	5
	Head 1880	e'	38.4561	Relative Permittivity (ϵ_r):	38.46	40.00	-3.86	5
		e"	13.2035	Conductivity (σ):	1.38	1.40	-1.41	5
Head 1910	e'	38.4129	Relative Permittivity (ϵ_r):	38.41	40.00	-3.97	5	
	e"	13.2744	Conductivity (σ):	1.41	1.40	0.70	5	
08/12/2012	Head 1750	e'	38.4554	Relative Permittivity (ϵ_r):	38.46	40.08	-4.06	5
		e"	13.5730	Conductivity (σ):	1.32	1.37	-3.52	5
	Head 1720	e'	38.5790	Relative Permittivity (ϵ_r):	38.58	40.13	-3.87	5
		e"	13.5082	Conductivity (σ):	1.29	1.35	-4.45	5
	Head 1735	e'	38.5149	Relative Permittivity (ϵ_r):	38.51	40.11	-3.97	5
		e"	13.5395	Conductivity (σ):	1.31	1.36	-3.99	5
08/12/2012	Body 1720	e'	55.0642	Relative Permittivity (ϵ_r):	55.06	53.52	2.89	5
		e"	15.0154	Conductivity (σ):	1.44	1.47	-2.16	5
	Body 1735	e'	55.0173	Relative Permittivity (ϵ_r):	55.02	53.48	2.88	5
		e"	15.0467	Conductivity (σ):	1.45	1.48	-1.72	5
	Body 1750	e'	54.9776	Relative Permittivity (ϵ_r):	54.98	53.44	2.88	5
		e"	15.0800	Conductivity (σ):	1.47	1.49	-1.26	5
08/14/2012	Head 2450	e'	38.7030	Relative Permittivity (ϵ_r):	38.70	39.20	-1.27	5
		e"	13.5571	Conductivity (σ):	1.85	1.80	2.60	5
	Head 2410	e'	38.9298	Relative Permittivity (ϵ_r):	38.93	39.28	-0.89	5
		e"	13.3156	Conductivity (σ):	1.78	1.76	1.36	5
	Head 2435	e'	38.8002	Relative Permittivity (ϵ_r):	38.80	39.24	-1.11	5
		e"	13.4262	Conductivity (σ):	1.82	1.78	1.99	5
	Head 2475	e'	38.7260	Relative Permittivity (ϵ_r):	38.73	39.17	-1.13	5
		e"	13.5277	Conductivity (σ):	1.86	1.83	1.90	5

10.4. Tissue Dielectric Parameter Check Results – continued

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
08/15/2012	Body 2450	e'	52.5989	Relative Permittivity (ϵ_r):	52.60	52.70	-0.19	5
		e"	14.0756	Conductivity (σ):	1.92	1.95	-1.67	5
	Body 2410	e'	52.7508	Relative Permittivity (ϵ_r):	52.75	52.76	-0.02	5
		e"	13.8503	Conductivity (σ):	1.86	1.91	-2.70	5
	Body 2435	e'	52.6672	Relative Permittivity (ϵ_r):	52.67	52.73	-0.11	5
		e"	14.0502	Conductivity (σ):	1.90	1.93	-1.49	5
Body 2475	e'	52.5331	Relative Permittivity (ϵ_r):	52.53	52.67	-0.26	5	
	e"	14.2257	Conductivity (σ):	1.96	1.99	-1.38	5	
08/16/2012	Body 5180	e'	49.2839	Relative Permittivity (ϵ_r):	49.28	49.05	0.48	10
		e"	18.6913	Conductivity (σ):	5.38	5.27	2.13	5
	Body 5200	e'	49.2187	Relative Permittivity (ϵ_r):	49.22	49.02	0.41	10
		e"	18.6436	Conductivity (σ):	5.39	5.29	1.81	5
	Body 5500	e'	48.7253	Relative Permittivity (ϵ_r):	48.73	48.61	0.23	10
		e"	18.9824	Conductivity (σ):	5.81	5.64	2.85	5
Body 5800	e'	48.1800	Relative Permittivity (ϵ_r):	48.18	48.20	-0.04	10	
	e"	19.1824	Conductivity (σ):	6.19	6.00	3.10	5	
Body 5825	e'	48.1298	Relative Permittivity (ϵ_r):	48.13	48.20	-0.15	10	
	e"	19.1786	Conductivity (σ):	6.21	6.00	3.53	5	
08/20/2012	Body 5180	e'	47.7515	Relative Permittivity (ϵ_r):	47.75	49.05	-2.64	10
		e"	18.1913	Conductivity (σ):	5.24	5.27	-0.60	5
	Body 5200	e'	47.8549	Relative Permittivity (ϵ_r):	47.85	49.02	-2.38	10
		e"	18.4420	Conductivity (σ):	5.33	5.29	0.71	5
	Body 5500	e'	47.2314	Relative Permittivity (ϵ_r):	47.23	48.61	-2.84	10
		e"	18.6035	Conductivity (σ):	5.69	5.64	0.79	5
Body 5800	e'	46.7722	Relative Permittivity (ϵ_r):	46.77	48.20	-2.96	10	
	e"	18.9938	Conductivity (σ):	6.13	6.00	2.09	5	
Body 5825	e'	46.7596	Relative Permittivity (ϵ_r):	46.76	48.20	-2.99	10	
	e"	19.0485	Conductivity (σ):	6.17	6.00	2.83	5	

10.5. Tissue Dielectric Parameter Check Results – continued

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)		
08/21/2012	Body 5180	e'	48.0011	Relative Permittivity (ϵ_r):	48.00	49.05	-2.13	10	
		e"	18.5554	Conductivity (σ):	5.34	5.27	1.39	5	
	Body 5200	e'	47.9532	Relative Permittivity (ϵ_r):	47.95	49.02	-2.18	10	
		e"	18.5757	Conductivity (σ):	5.37	5.29	1.44	5	
	Body 5500	e'	47.3522	Relative Permittivity (ϵ_r):	47.35	48.61	-2.59	10	
		e"	18.9382	Conductivity (σ):	5.79	5.64	2.61	5	
	Body 5800	e'	46.8191	Relative Permittivity (ϵ_r):	46.82	48.20	-2.86	10	
		e"	19.2873	Conductivity (σ):	6.22	6.00	3.67	5	
	Body 5825	e'	46.7567	Relative Permittivity (ϵ_r):	46.76	48.20	-2.99	10	
		e"	19.3062	Conductivity (σ):	6.25	6.00	4.22	5	
	08/22/2012	Body 5180	e'	47.6255	Relative Permittivity (ϵ_r):	47.63	49.05	-2.90	10
			e"	18.4518	Conductivity (σ):	5.31	5.27	0.82	5
Body 5200		e'	47.5877	Relative Permittivity (ϵ_r):	47.59	49.02	-2.92	10	
		e"	18.4766	Conductivity (σ):	5.34	5.29	0.90	5	
Body 5500		e'	46.9844	Relative Permittivity (ϵ_r):	46.98	48.61	-3.35	10	
		e"	18.8451	Conductivity (σ):	5.76	5.64	2.10	5	
Body 5800		e'	46.4440	Relative Permittivity (ϵ_r):	46.44	48.20	-3.64	10	
		e"	19.2057	Conductivity (σ):	6.19	6.00	3.23	5	
Body 5825		e'	46.3954	Relative Permittivity (ϵ_r):	46.40	48.20	-3.74	10	
		e"	19.2236	Conductivity (σ):	6.23	6.00	3.77	5	
08/23/2012		Head 5180	e'	36.6940	Relative Permittivity (ϵ_r):	36.69	36.01	1.89	10
			e"	16.3672	Conductivity (σ):	4.71	4.63	1.81	5
	Head 5200	e'	36.6725	Relative Permittivity (ϵ_r):	36.67	35.99	1.90	10	
		e"	16.3890	Conductivity (σ):	4.74	4.65	1.89	5	
	Head 5500	e'	36.1385	Relative Permittivity (ϵ_r):	36.14	35.65	1.38	10	
		e"	16.5955	Conductivity (σ):	5.08	4.96	2.37	5	
	Head 5800	e'	35.6450	Relative Permittivity (ϵ_r):	35.65	35.30	0.98	10	
		e"	16.7967	Conductivity (σ):	5.42	5.27	2.79	5	
	08/24/2012	Head 5180	e'	36.1602	Relative Permittivity (ϵ_r):	36.16	36.01	0.41	10
			e"	16.3321	Conductivity (σ):	4.70	4.63	1.59	5
		Head 5200	e'	36.1383	Relative Permittivity (ϵ_r):	36.14	35.99	0.41	10
			e"	16.3509	Conductivity (σ):	4.73	4.65	1.65	5
Head 5500		e'	35.5942	Relative Permittivity (ϵ_r):	35.59	35.65	-0.15	10	
		e"	16.5583	Conductivity (σ):	5.06	4.96	2.14	5	
Head 5800		e'	35.0923	Relative Permittivity (ϵ_r):	35.09	35.30	-0.59	10	
		e"	16.7704	Conductivity (σ):	5.41	5.27	2.63	5	

10.6. Tissue Dielectric Parameter Check Results – continued

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
08/25/2012	Head 5180	e'	36.2376	Relative Permittivity (ϵ_r):	36.24	36.01	0.62	10
		e"	16.3467	Conductivity (σ):	4.71	4.63	1.68	5
	Head 5200	e'	36.2016	Relative Permittivity (ϵ_r):	36.20	35.99	0.59	10
		e"	16.3645	Conductivity (σ):	4.73	4.65	1.73	5
	Head 5500	e'	35.6783	Relative Permittivity (ϵ_r):	35.68	35.65	0.09	10
		e"	16.6279	Conductivity (σ):	5.09	4.96	2.56	5
Head 5800	e'	35.1879	Relative Permittivity (ϵ_r):	35.19	35.30	-0.32	10	
	e"	16.7497	Conductivity (σ):	5.40	5.27	2.50	5	
08/26/2012	Head 835	e'	43.0291	Relative Permittivity (ϵ_r):	43.03	41.50	3.68	5
		e"	19.5400	Conductivity (σ):	0.91	0.90	0.80	5
	Head 815	e'	43.3119	Relative Permittivity (ϵ_r):	43.31	41.63	4.04	5
		e"	19.5985	Conductivity (σ):	0.89	0.90	-1.11	5
	Head 820	e'	43.2414	Relative Permittivity (ϵ_r):	43.24	41.60	3.94	5
		e"	19.5828	Conductivity (σ):	0.89	0.90	-0.62	5
Head 850	e'	42.8286	Relative Permittivity (ϵ_r):	42.83	41.50	3.20	5	
	e"	19.4944	Conductivity (σ):	0.92	0.92	0.69	5	
08/26/2012	Head 1900	e'	40.0870	Relative Permittivity (ϵ_r):	40.09	40.00	0.22	5
		e"	13.1612	Conductivity (σ):	1.39	1.40	-0.68	5
	Head 1850	e'	40.2950	Relative Permittivity (ϵ_r):	40.30	40.00	0.74	5
		e"	13.0077	Conductivity (σ):	1.34	1.40	-4.43	5
	Head 1880	e'	40.1644	Relative Permittivity (ϵ_r):	40.16	40.00	0.41	5
		e"	13.1031	Conductivity (σ):	1.37	1.40	-2.16	5
Head 1910	e'	40.0573	Relative Permittivity (ϵ_r):	40.06	40.00	0.14	5	
	e"	13.1920	Conductivity (σ):	1.40	1.40	0.07	5	

11. System Performance Check

The system performance check is performed prior to any usage of the system in order to verify SAR system measurement accuracy. The system performance check verifies that the system operates within its specifications of $\pm 10\%$.

11.1. System Performance Check Measurement Conditions

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ± 0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- Distance between probe sensors and phantom surface was set to 3 mm.
For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was 100 mW.
- The results are normalized to 1 W input power.

11.2. Reference SAR Values for System Performance Check

The reference SAR values can be obtained from the calibration certificate of system validation dipoles

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	SAR Measured (mW/g)		
				1g/10g	Head	Body
D835V2	4d002	3/6/12	835	1g	9.24	9.64
				10g	6.04	6.32
D1750V2	1050	4/19/12	1750	1g	35.9	36.9
				10g	19.1	19.9
D1900V2	5d140	4/12/12	1900	1g	39.1	40.0
				10g	20.6	21.3
D2450V2	706	4/11/12	2450	1g	51.2	49.6
				10g	23.9	23.4
D5GHzV2	1003	8/23/11	5200	1g	76.3	74.4
				10g	21.7	20.8
			5500	1g	80.7	79.9
				10g	23.0	22.3
			5800	1g	76.0	76.2
				10g	21.6	21.2
D5GHzV2	1075	2/14/2012	5200	1g	79.4	72.7
				10g	22.8	20.5
			5500	1g	85.7	77.7
				10g	24.3	21.7
			5800	1g	78.9	72.5
				10g	22.5	20.2

11.3. System Performance Check Results

Date Tested	System Dipole		T.S. Liquid	SAR Measured (Normalized to 1 W)		Target (Ref. Value)	Delta (%)	Tolerance (%)
	Type	Serial No.		1g	10g			
8/3/2012	D835V2	4d002	Head	1g	9.27	9.24	0.32	±10
				10g	6.07			
8/6/2012	D835V2	4d002	Body	1g	9.71	9.64	0.73	±10
				10g	6.38			
8/8/2012	D1900V2	5d043	Body	1g	41.20	40	3.00	±10
				10g	21.70			
8/9/2012	D835V2	4d002	Body	1g	9.58	9.64	-0.62	±10
				10g	6.33			
8/10/2012	D1900V2	5d043	Head	1g	37.10	39.1	-5.12	±10
				10g	19.50			
8/12/2012	D1750V2	1050	Head	1g	35.50	35.9	-1.11	±10
				10g	18.90			
8/12/2012	D1750V2	1050	Body	1g	37.70	36.9	2.17	±10
				10g	20.30			
8/14/2012	D2450V2	706	Head	1g	51.00	51.2	-0.39	±10
				10g	23.60			
8/15/2012	D2450V2	706	Body	1g	52.00	49.6	4.84	±10
				10g	24.40			
8/16/2012	D5GHzV2 (5.2 GHz)	1003	Body	1g	76.20	74.4	2.42	±10
				10g	21.70			
8/20/2012	D5GHzV2 (5.2 GHz)	1003	Body	1g	75.00	74.4	0.81	±10
				10g	21.20			
8/21/2012	D5GHzV2 (5.5 GHz)	1003	Body	1g	80.30	79.9	0.50	±10
				10g	22.70			
8/22/2012	D5GHzV2 (5.8 GHz)	1003	Body	1g	70.50	76.2	-7.48	±10
				10g	20.00			
8/23/2012	D5GHzV2 (5.2 GHz)	1075	Head	1g	76.90	79.4	-3.15	±10
				10g	22.20			
8/24/2012	D5GHzV2 (5.5 GHz)	1075	Head	1g	79.80	80.7	-1.12	±10
				10g	23.10			
8/25/2012	D5GHzV2 (5.8 GHz)	1075	Head	1g	77.20	78.9	-2.15	±10
				10g	22.00			
8/26/2012	D835V2	4d002	Head	1g	9.34	9.24	1.08	±10
				10g	6.13			
8/26/2012	D1900V2	5d140	Head	1g	39.00	39.1	-0.26	±10
				10g	20.30			

12. SAR Test Results

12.1. GSM850

12.1.1. Head Exposure Conditions

Test Position	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Note
				Tune-up limit	Measured	Measured	Scaled	
Left Touch	Voice	128	824.20	33.7	33.6			1
		190	836.60	33.7	33.6	0.296	0.303	
		251	848.80	33.7	33.6			1
Left Tilt (15°)	Voice	128	824.20	33.7	33.6			1
		190	836.60	33.7	33.6	0.195	0.200	
		251	848.80	33.7	33.6			1
Right Touch	Voice	128	824.20	33.7	33.6			1
		190	836.60	33.7	33.6	0.295	0.302	
		251	848.80	33.7	33.6			1
Right Tilt (15°)	Voice	128	824.20	33.7	33.6			1
		190	836.60	33.7	33.6	0.196	0.201	
		251	848.80	33.7	33.6			1

VoIP function is supported for this device

Test Position	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Note
				Tune-up limit	Measured	Measured	Scaled	
Left Touch	GPRS 3 slots	128	824.20	29.2	29.1			1
		190	836.60	29.2	29.1	0.294	0.301	
		251	848.80	29.2	29.2			1
Left Tilt (15°)	GPRS 3 slots	128	824.20	29.2	29.1			1
		190	836.60	29.2	29.1	0.190	0.194	
		251	848.80	29.2	29.2			1
Right Touch	GPRS 3 slots	128	824.20	29.2	29.1			1
		190	836.60	29.2	29.1	0.290	0.297	
		251	848.80	29.2	29.2			1
Right Tilt (15°)	GPRS 3 slots	128	824.20	29.2	29.1			1
		190	836.60	29.2	29.1	0.203	0.208	
		251	848.80	29.2	29.2			1

Note(s):

1. According to FCC "Public Notice DA 02-1438" by the SCC-34/SC-2, when the SAR measured for the middle channel is < 50% of the SAR limit, testing for the low and high channel is optional.

12.1.2. Body-worn Accessory Exposure Conditions

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Note
					Tune-up limit	Measured	Measured	Scaled	
Rear	Voice	10	128	824.20	33.7	33.6			1
			190	836.60	33.7	33.6	0.767	0.785	
			190	836.60	33.7	33.6	0.552	0.565	2
			251	848.80	33.7	33.6			1
Front	Voice	10	128	824.20	33.7	33.6			1
			190	836.60	33.7	33.6	0.371	0.380	
			251	848.80	33.7	33.6			1

Note(s):

- SAR test was performed in the middle channel only as the measured level was < 50% of the SAR limit as stated in FCC "Public Notice DA 02-1438" by the SCC-34/SC-2. Testing in the low and high channel is optional.
- With headset attached.

12.1.1. Hotspot Mode Exposure Conditions

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Note
					Tune-up limit	Measured	Measured	Scaled	
Rear	GPRS 3 slots	10	128	824.20	29.2	29.1			1
			190	836.60	29.2	29.1	0.709	0.726	
			251	848.80	29.2	29.2			1
Front	GPRS 3 slots	10	128	824.20	29.2	29.1			1
			190	836.60	29.2	29.1	0.355	0.363	
			251	848.80	29.2	29.2			1
Edge 2	GPRS 3 slots	10	128	824.20	29.2	29.1			1
			190	836.60	29.2	29.1	0.285	0.292	
			251	848.80	29.2	29.2			1
Edge 3	GPRS 3 slots	10	128	824.20	29.2	29.1			1
			190	836.60	29.2	29.1	0.071	0.073	
			251	848.80	29.2	29.2			1
Edge 4	GPRS 3 slots	10	128	824.20	29.2	29.1			1
			190	836.60	29.2	29.1	0.316	0.323	
			251	848.80	29.2	29.2			1

Note(s):

- SAR test was performed in the middle channel only as the measured level was < 50% of the SAR limit as stated in FCC "Public Notice DA 02-1438" by the SCC-34/SC-2. Testing in the low and high channel is optional.
- With headset attached.

12.2. GSM1900

12.2.1. Head Exposure Conditions

Test Position	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Note
				Tune-up limit	Measured	Measured	Scaled	
Left Touch	Voice	512	1850.2	30.7	30.6			1
		661	1880.0	30.7	30.5	0.385	0.403	
		810	1909.8	30.7	30.5			1
Left Tilt (15°)	Voice	512	1850.2	30.7	30.6			1
		661	1880.0	30.7	30.5	0.176	0.184	
		810	1909.8	30.7	30.5			1
Right Touch	Voice	512	1850.2	30.7	30.6			1
		661	1880.0	30.7	30.5	0.287	0.301	
		810	1909.8	30.7	30.5			1
Right Tilt (15°)	Voice	512	1850.2	30.7	30.6			1
		661	1880.0	30.7	30.5	0.158	0.165	
		810	1909.8	30.7	30.5			1

VoIP function is supported for this device

Test Position	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Note
				Tune-up limit	Measured	Measured	Scaled	
Left Touch	GPRS 4 slots	512	1850.2	25.2	25.2			1
		661	1880.0	25.2	25.1	0.438	0.448	
		810	1909.8	25.2	25.1			1
Left Tilt (15°)	GPRS 4 slots	512	1850.2	25.2	25.2			1
		661	1880.0	25.2	25.1	0.193	0.197	
		810	1909.8	25.2	25.1			1
Right Touch	GPRS 4 slots	512	1850.2	25.2	25.2			1
		661	1880.0	25.2	25.1	0.295	0.302	
		810	1909.8	25.2	25.1			1
Right Tilt (15°)	GPRS 4 slots	512	1850.2	25.2	25.2			1
		661	1880.0	25.2	25.1	0.173	0.177	
		810	1909.8	25.2	25.1			1

Note(s):

1. According to FCC "Public Notice DA 02-1438" by the SCC-34/SC-2, when the SAR measured for the middle channel is < 50% of the SAR limit, testing for the low and high channel is optional.

12.2.2. Body-worn Accessory Exposure Conditions

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Note
					Tune-up limit	Measured	Measured	Scaled	
Rear	Voice	10	512	1850.2	30.7	30.6			1
			661	1880.0	30.7	30.5	0.779	0.816	
			661	1880.0	30.7	30.5	0.688	0.720	2
			810	1909.8	30.7	30.5			1
Front	Voice	10	512	1850.2	30.7	30.6			1
			661	1880.0	30.7	30.5	0.533	0.558	
			810	1909.8	30.7	30.5			1

Note(s):

- SAR test was performed in the middle channel only as the measured level was < 50% of the SAR limit as stated in FCC "Public Notice DA 02-1438" by the SCC-34/SC-2. Testing in the low and high channel is optional.
- With headset attached.

12.2.1. Hotspot Mode Exposure Conditions

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Note
					Tune-up limit	Measured	Measured	Scaled	
Rear	GPRS 4 slots	10	512	1850.2	25.2	25.2			1
			661	1880.0	25.2	25.1	0.745	0.762	
			810	1909.8	25.2	25.1			1
Front	GPRS 4 slots	10	512	1850.2	25.2	25.2			1
			661	1880.0	25.2	25.1	0.517	0.529	
			810	1909.8	25.2	25.1			1
Edge 2	GPRS 4 slots	10	512	1850.2	25.2	25.2			1
			661	1880.0	25.2	25.1	0.110	0.113	
			810	1909.8	25.2	25.1			1
Edge 3	GPRS 4 slots	10	512	1850.2	25.2	25.2			1
			661	1880.0	25.2	25.1	0.226	0.231	
			810	1909.8	25.2	25.1			1
Edge 4	GPRS 4 slots	10	512	1850.2	25.2	25.2			
			661	1880.0	25.2	25.1	0.229	0.234	
			810	1909.8	25.2	25.1			

Note(s):

- SAR test was performed in the middle channel only as the measured level was < 50% of the SAR limit as stated in FCC "Public Notice DA 02-1438" by the SCC-34/SC-2. Testing in the low and high channel is optional.

12.3. WCDMA (UMTS) Band IV

Test mode reduction considerations

Body SAR is not required for handsets with HSPA capabilities when the maximum average output of each RF channel with HSUPA/HSDPA active is less than ¼ dB higher than that measured without HSUPA/HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2kbps RMC is ≤ 75% of the SAR limit as per KDB 941225 D01

12.3.1. Head Exposure Conditions

Test Position	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Note
				Tune-up limit	Measured	Measured	Scaled	
Left Touch	Rel 99 RMC 12.2kbps	1312	1712.40	23.3	23.0			1
		1412	1732.40	23.3	22.8	0.571	0.641	
		1862	1752.50	23.3	22.9			1
Left Tilt (15°)	Rel 99 RMC 12.2kbps	1312	1712.40	23.3	23.0			1
		1412	1732.40	23.3	22.8	0.282	0.316	
		1862	1752.50	23.3	22.9			1
Right Touch	Rel 99 RMC 12.2kbps	1312	1712.40	23.3	23.0			1
		1412	1732.40	23.3	22.8	0.355	0.398	
		1862	1752.50	23.3	22.9			1
Right Tilt (15°)	Rel 99 RMC 12.2kbps	1312	1712.40	23.3	23.0			1
		1412	1732.40	23.3	22.8	0.244	0.274	
		1862	1752.50	23.3	22.9			1

12.3.1. Body-worn Accessory Exposure Conditions

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Note
					Tune-up limit	Measured	Measured	Scaled	
Rear	Rel 99 RMC 12.2kbps	10	1312	1712.4	23.3	23.0	0.891	0.955	1
			1412	1732.4	23.3	22.8	0.977	1.096	
			1412	1732.4	23.3	22.8	0.903	1.013	2
			1862	1752.5	23.3	22.9	0.970	1.064	1
Front	Rel 99 RMC 12.2kbps	10	1312	1712.4	23.3	23.0			1
			1412	1732.4	23.3	22.8	0.642	0.720	
			1862	1752.5	23.3	22.9			1

Note(s):

- SAR test was performed in the middle channel only as the measured level was < 50% of the SAR limit as stated in FCC "Public Notice DA 02-1438" by the SCC-34/SC-2. Testing in the low and high channel is optional.
- With headset attached.

12.3.1. Hotspot Mode Exposure Conditions

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Note
					Tune-up limit	Measured	Measured	Scaled	
Rear	Rel 99 RMC 12.2kbps	10	1312	1712.40	23.3	23.0	0.891	0.955	
			1412	1732.40	23.3	22.8	0.977	1.096	
			1862	1752.50	23.3	22.9	0.970	1.064	
Front	Rel 99 RMC 12.2kbps	10	1312	1712.40	23.3	23.0			1
			1412	1732.40	23.3	22.8	0.642	0.720	
			1862	1752.50	23.3	22.9			1
Edge 2	Rel 99 RMC 12.2kbps	10	1312	1712.40	23.3	23.0			1
			1412	1732.40	23.3	22.8	0.293	0.329	
			1862	1752.50	23.3	22.9			1
Edge 3	Rel 99 RMC 12.2kbps	10	1312	1712.40	23.3	23.0			1
			1412	1732.40	23.3	22.8	0.406	0.456	
			1862	1752.50	23.3	22.9			1
Edge 4	Rel 99 RMC 12.2kbps	10	1312	1712.40	23.3	23.0			
			1412	1732.40	23.3	22.8	0.107	0.120	
			1862	1752.50	23.3	22.9			

Note(s):

- SAR test was performed in the middle channel only as the measured level was < 50% of the SAR limit as stated in FCC "Public Notice DA 02-1438" by the SCC-34/SC-2. Testing in the low and high channel is optional.

12.4. Wi-Fi (2.4 GHz Band)

12.4.1. Head Exposure Conditions

Test Position	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Note
				Tune-up limit	Measured	Measured	Scaled	
Left Touch	802.11b	1	2412	13.1	12.9			1
		6	2437	13.1	13.1			1
		11	2462	13.1	13.1	0.255	0.255	
Left Tilt (15°)	802.11b	1	2412	13.1	12.9			1
		6	2437	13.1	13.1			1
		11	2462	13.1	13.1	0.139	0.139	
Right Touch	802.11b	1	2412	13.1	12.9			1
		6	2437	13.1	13.1			1
		11	2462	13.1	13.1	0.139	0.139	
Right Tilt (15°)	802.11b	1	2412	13.1	12.9			1
		6	2437	13.1	13.1			1
		11	2462	13.1	13.1	0.089	0.089	1

12.4.1. Body & Hotspot SAR

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Note
					Tune-up limit	Measured	Measured	Scaled	
Rear	802.11b	10	1	2412	13.1	12.9			1
			6	2437	13.1	13.1			
			11	2462	13.1	13.1	0.047	0.047	
Front	802.11b	10	1	2412	13.1	12.9			1
			6	2437	13.1	13.1			1
			11	2462	13.1	13.1	0.046	0.046	
Edge 1	802.11b	10	1	2412	13.1	12.9			1
			6	2437	13.1	13.1			1
			11	2462	13.1	13.1	0.018	0.018	
Edge 2	802.11b	10	1	2412	13.1	12.9			1
			6	2437	13.1	13.1			1
			11	2462	13.1	13.1	0.043	0.043	

Note(s):

- Testing was performed on the channel with the highest output power only as the SAR was ≤ 0.8 W/kg with the operating frequency band having a range of < 100 MHz. Per KDB 447498 1) e) i)

12.5. Wi-Fi (5 GHz Band)

12.5.1. Head SAR

Band (GHz)	Test Position	Mode	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Note
					Tune-up limit	Measured	Measured	Scaled	
5.2	Left Touch	802.11a	36	5180	9.1	9.1	0.196	0.196	
			48	5240	9.1	9.1	0.249	0.249	
	Left Tilt (15°)	802.11a	36	5180	9.1	9.1	0.128	0.128	
			48	5240	9.1	9.1	0.136	0.136	
	Right Touch	802.11a	36	5180	9.1	9.1	0.103	0.103	
			48	5240	9.1	9.1	0.126	0.126	
Right Tilt (15°)	802.11a	36	5180	9.1	9.1	0.084	0.084		
		48	5240	9.1	9.1	0.102	0.102		
5.3	Left Touch	802.11a	52	5260	9.1	9.1	0.318	0.318	
			64	5320	9.1	9.1	0.346	0.346	
	Left Tilt (15°)	802.11a	52	5260	9.1	9.1	0.181	0.181	
			64	5320	9.1	9.1	0.219	0.219	
	Right Touch	802.11a	52	5260	9.1	9.1	0.115	0.115	
			64	5320	9.1	9.1	0.017	0.017	
Right Tilt (15°)	802.11a	52	5260	9.1	9.1	0.031	0.031		
		64	5320	9.1	9.1	0.130	0.130		
5.5	Left Touch	802.11a	104	5520	9.1	9.1	0.278	0.278	
			116	5580	9.1	9.1	0.275	0.275	
			132	5660	9.1	9.1	0.335	0.335	
			136	5680	9.1	9.1	0.238	0.238	
	Left Tilt (15°)	802.11a	104	5520	9.1	9.1	0.236	0.236	
			116	5580	9.1	9.1	0.216	0.216	
			132	5660	9.1	9.1	0.205	0.205	
			136	5680	9.1	9.1	0.193	0.193	
	Right Touch	802.11a	104	5520	9.1	9.1	0.180	0.180	
			116	5580	9.1	9.1	0.179	0.179	
			132	5660	9.1	9.1	0.170	0.170	
			136	5680	9.1	9.1	0.177	0.177	
Right Tilt (15°)	802.11a	104	5520	9.1	9.1	0.130	0.130		
		116	5580	9.1	9.1	0.008	0.008		
		132	5660	9.1	9.1	0.144	0.144		
		136	5680	9.1	9.1	0.089	0.089		
5.8	Left Touch	802.11a	149	5745	12.8	12.7	0.419	0.429	
			157	5785	12.8	12.7	0.434	0.444	
			165	5825	12.8	12.8	0.375	0.375	
	Left Tilt (15°)	802.11a	149	5745	12.8	12.7	0.347	0.355	
			157	5785	12.8	12.7	0.323	0.331	
			165	5825	12.8	12.8	0.370	0.370	
	Right Touch	802.11a	149	5745	12.8	12.7	0.117	0.120	
			157	5785	12.8	12.7	0.253	0.259	
			165	5825	12.8	12.8	0.250	0.250	
Right Tilt (15°)	802.11a	149	5745	12.8	12.7	0.221	0.226		
		157	5785	12.8	12.7	0.211	0.216		
		165	5825	12.8	12.8	0.012	0.012		

12.5.2. Body-Worn SAR

Band (GHz)	Test Position	Dist. (mm)	Mode	Ch #.	Freq. (MHz)	Power (dBm)		SAR (W/kg)		Note
						Tune-up limit	Measured	Measured	Scaled	
5.2	Rear	10	802.11a	36	5180	9.1	9.1	0.066	0.066	
				48	5240	9.1	9.1	0.050	0.050	
	Front	10	802.11a	36	5180	9.1	9.1	0.066	0.066	
				36	5180	9.1	9.1	0.050	0.050	1
				48	5240	9.1	9.1	0.002	0.002	
5.3	Rear	10	802.11a	52	5260	9.1	9.1	0.051	0.051	
				64	5320	9.1	9.1	0.080	0.080	
	Front	10	802.11a	52	5260	9.1	9.1	0.052	0.052	
				64	5320	9.1	9.1	0.085	0.085	
				64	5320	9.1	9.1	0.070	0.070	1
5.5	Rear	10	802.11a	104	5520	9.1	9.1	0.130	0.130	
				104	5520	9.1	9.1	0.102	0.102	1
				116	5580	9.1	9.1	0.090	0.090	
				132	5660	9.1	9.1	0.110	0.110	
	Front	10	802.11a	104	5520	9.1	9.1	0.077	0.077	
				116	5580	9.1	9.1	0.072	0.072	
				132	5660	9.1	9.1	0.082	0.082	
				136	5680	9.1	9.1	0.063	0.063	
5.8	Rear	10	802.11a	149	5745	12.8	12.7	0.239	0.245	
				149	5745	12.8	12.7	0.161	0.165	1
				157	5785	12.8	12.7	0.151	0.155	
				165	5825	12.8	12.8	0.147	0.147	
	Front	10	802.11a	149	5745	12.8	12.7	0.090	0.092	
				157	5785	12.8	12.7	0.102	0.104	
				165	5825	12.8	12.8	0.087	0.087	

Note(s):

1. With headset attached.

13. Summary of Highest SAR Values

Results for highest SAR values for each frequency band and mode

Technology/Band	Test configuration		Mode	Highest 1g SAR (mW/g)	Measured power	Target power	Scaled SAR
GSM850	Head	Left Touch	GMSK	0.296	33.6	33.7	0.303
	Body	Rear	GPRS 3 Slot	0.767	29.1	29.2	0.785
GSM1900	Head	Right Touch	GPRS 4 slot	0.438	25.1	25.2	0.448
	Body	Rear	GPRS 4 slot	0.779	25.1	25.2	0.816
WCDMA (UMTS) band IV	Head	Left Touch	Rel 99 RMC 12.2kbps	0.571	22.8	23.7	0.641
	Body	Rear	Rel 99 RMC 12.2kbps	0.977	22.8	23.7	1.096
WiFi 2.4 GHz	Head	Left Touch	802.11b 1Mbps	0.255	13.1	13.1	0.255
	Body	Rear	802.11b 1Mbps	0.047	13.1	13.1	0.047
WiFi 5.2 GHz	Head	Left Touch	802.11a 6Mbps	0.249	9.1	9.1	0.249
	Body	Rear	802.11a 6Mbps	0.066	9.1	9.1	0.066
WiFi 5.3 GHz	Head	Left Touch	802.11a 6Mbps	0.346	9.1	9.1	0.346
	Body	Front	802.11a 6Mbps	0.085	9.1	9.1	0.085
WiFi 5.5 GHz	Head	Left Touch	802.11a 6Mbps	0.335	9.1	9.1	0.335
	Body	Rear	802.11a 6Mbps	0.130	9.1	9.1	0.130
WiFi 5.8 GHz	Head	Left Touch	802.11a 6Mbps	0.434	12.7	12.8	0.444
	Body	Rear	802.11a 6Mbps	0.239	12.7	12.8	0.245

13.1. SAR Plots (from Summary of Highest SAR Values)

Test Laboratory: UL CCS SAR Lab B Date: 8/3/2012

GSM850

Frequency: 836.6 MHz; Duty Cycle: 1:8.00018; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.903$ mho/m; $\epsilon_r = 42.75$; $\rho = 1000$ 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 Sn1259; Calibrated: 2/13/2012
- Probe: EX3DV4 - SN3686; ConvF(8.61, 8.61, 8.61); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM; Type: QD000P40CD; Serial: 1629

Head/Left Touch/GMSK Voice/Ch 190/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.310 mW/g

Head/Left Touch/GMSK Voice/Ch 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm,

dy=8mm, dz=5mm

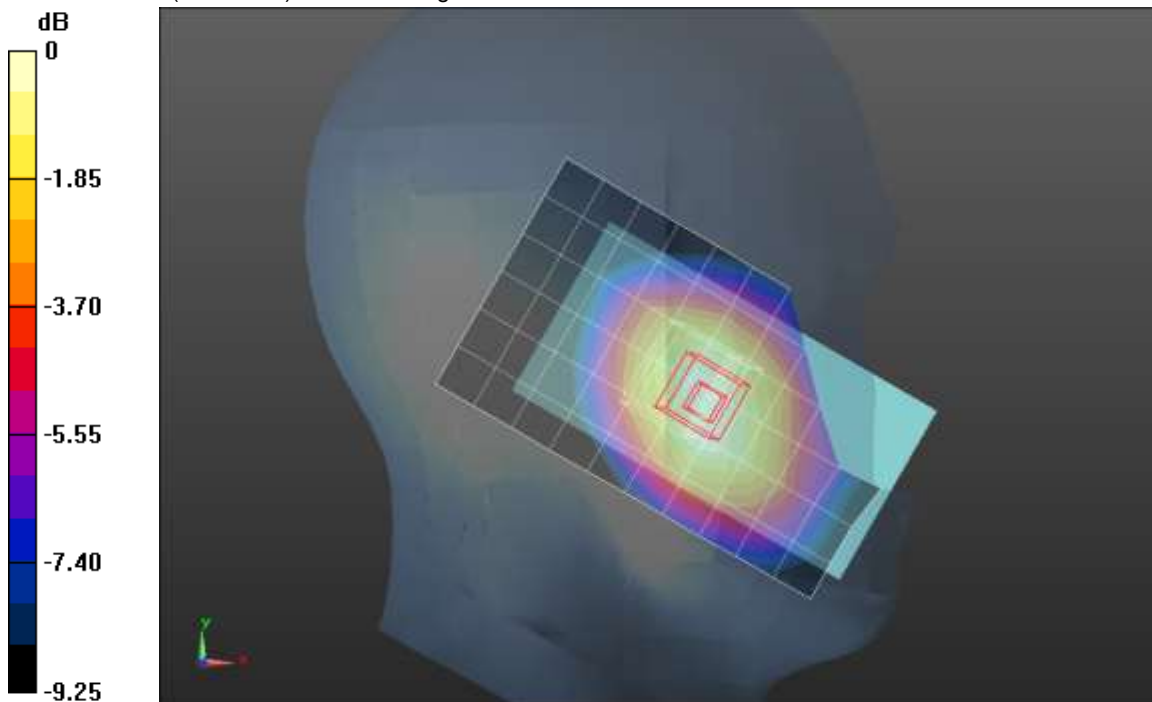
Reference Value = 18.696 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.3640

SAR(1 g) = 0.296 mW/g; SAR(10 g) = 0.224 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.328 mW/g



0 dB = 0.330mW/g = -9.63 dB mW/g

Test Laboratory: UL CCS SAR Lab B Date: 8/3/2012

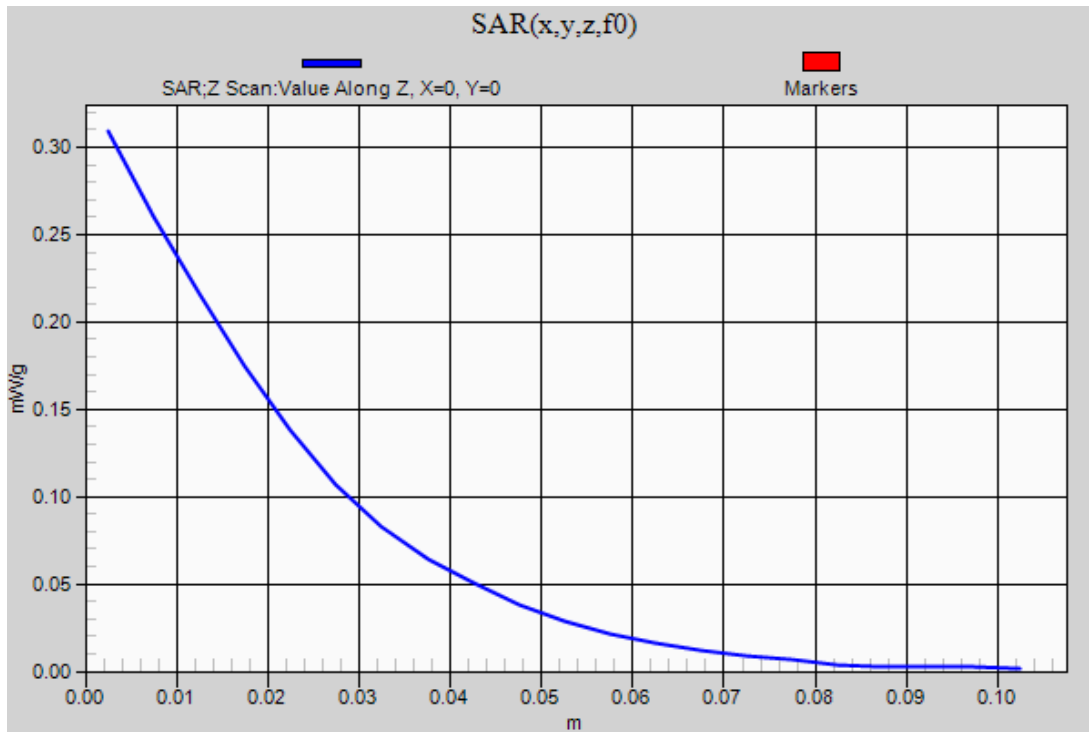
GSM850

Frequency: 836.6 MHz; Duty Cycle: 1:8.00018

Head/Left Touch/GMSK Voice/Ch 190/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.309 mW/g



Test Laboratory: UL CCS SAR Lab B Date: 8/6/2012

GSM850

Frequency: 836.6 MHz; Duty Cycle: 1:8.00018; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.993$ mho/m; $\epsilon_r = 54.278$; $\rho = 1000$ 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 Sn1239; Calibrated: 6/6/2012
- Probe: EX3DV4 - SN3686; ConvF(8.73, 8.73, 8.73); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (B); Type: QDOVA001BB; Serial: 1118

Body/Rear/GMSK Voice/10mm/Ch 190/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.870 mW/g

Body/Rear/GMSK Voice/10mm/Ch 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

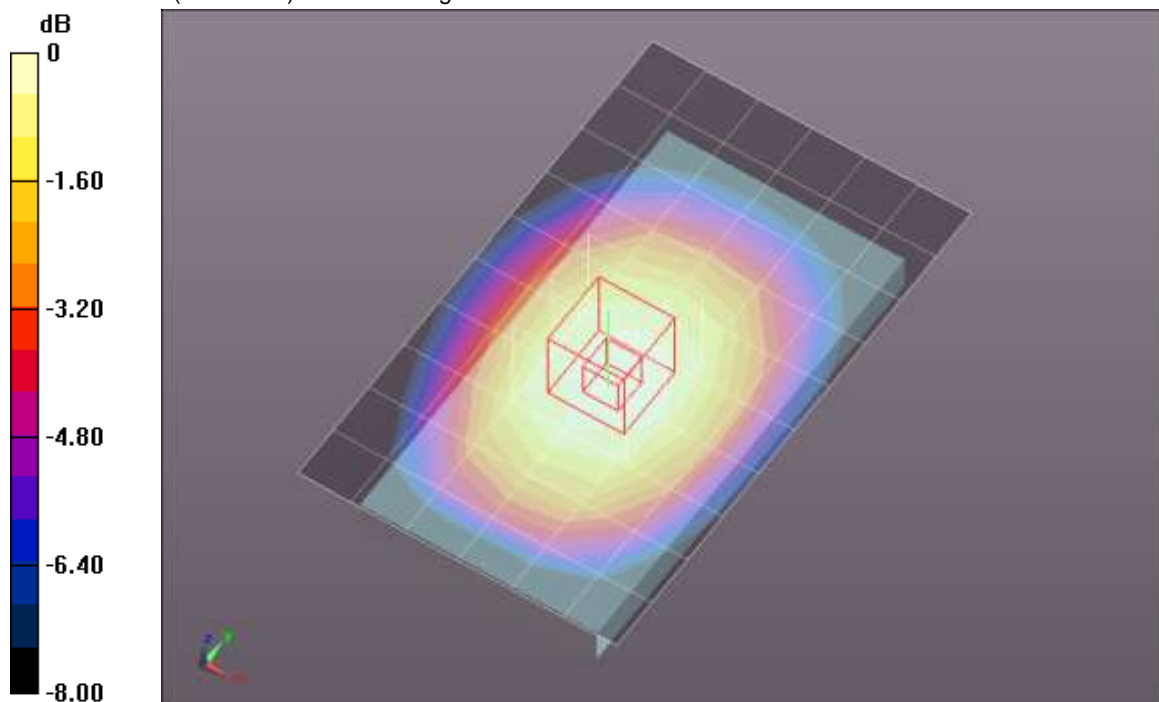
Reference Value = 29.893 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 0.9860

SAR(1 g) = 0.767 mW/g; SAR(10 g) = 0.574 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.868 mW/g



0 dB = 0.870mW/g = -1.21 dB mW/g

Test Laboratory: UL CCS SAR Lab B Date: 8/6/2012

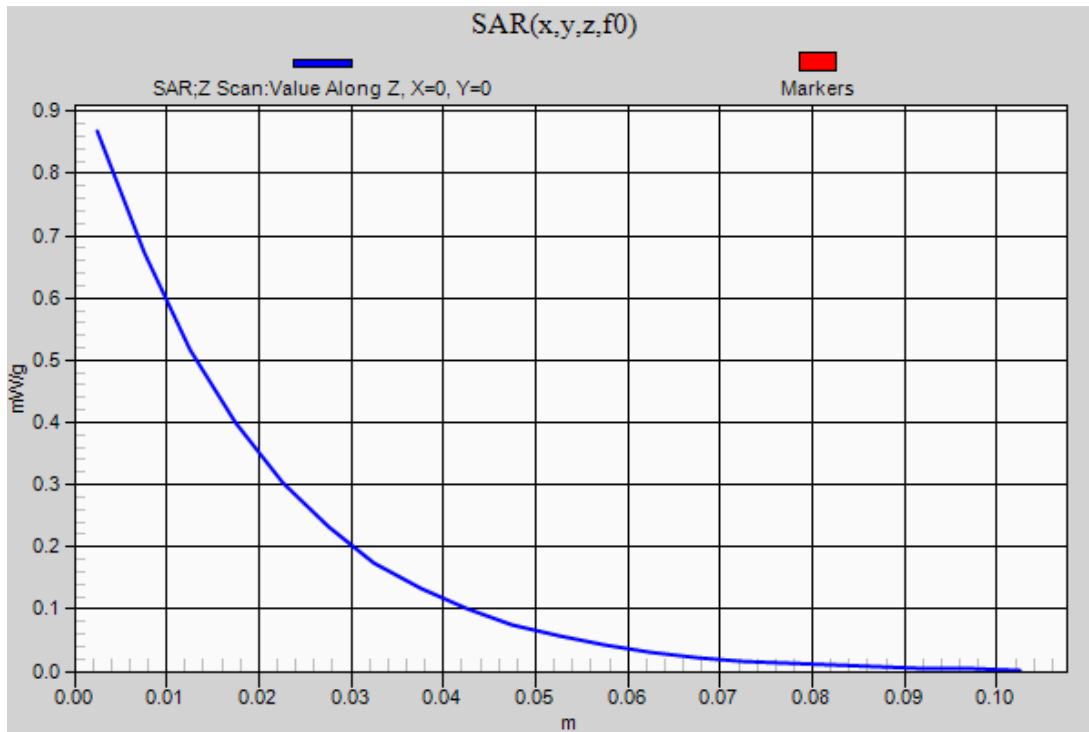
GSM850

Frequency: 836.6 MHz; Duty Cycle: 1:8.00018

Body/Rear/GMSK Voice/10mm/Ch 190/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.868 mW/g



Test Laboratory: UL CCS SAR Lab B Date: 8/26/2012

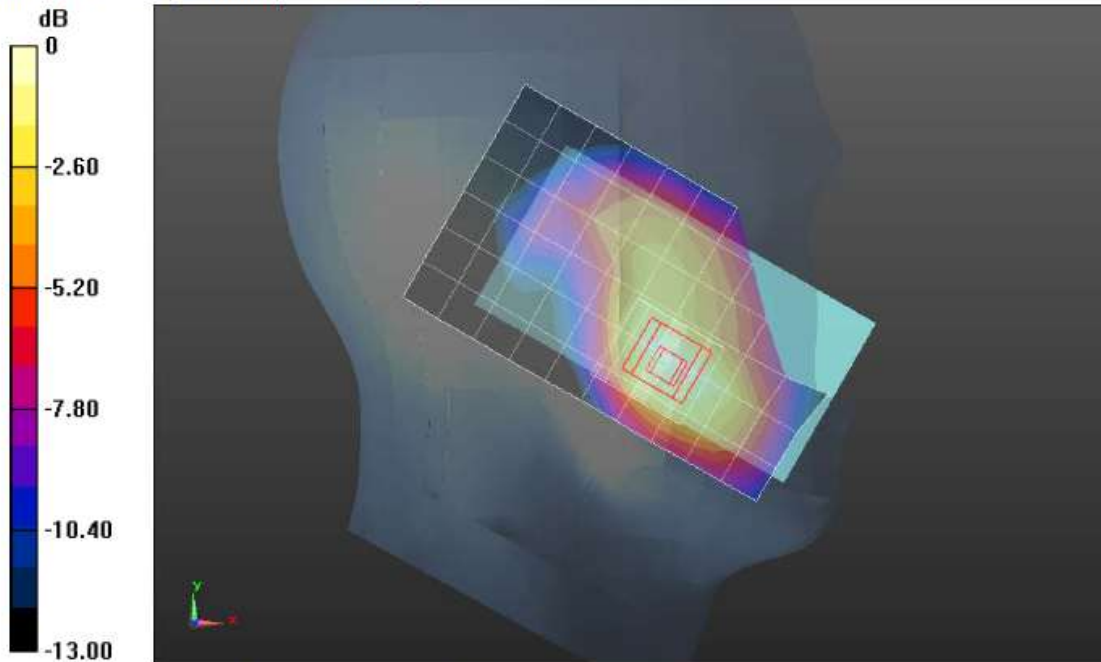
GSM1900

Frequency: 1880 MHz; Duty Cycle: 1:1.99986; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.37 \text{ mho/m}$; $\epsilon_r = 40.164$; $\rho = 1000 \text{ kg/m}^3$
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 Sn1259; Calibrated: 2/13/2012
- Probe: EX3DV4 - SN3686; ConvF(7.51, 7.51, 7.51); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM; Type: QD000P40CD; Serial: 1629

Head/Left Touch/GPRS 4 slot/Ch 661/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.499 mW/g

Head/Left Touch/GPRS 4 slot/Ch 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.127 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 0.6860
SAR(1 g) = 0.438 mW/g; SAR(10 g) = 0.271 mW/g
Maximum value of SAR (measured) = 0.543 mW/g



0 dB = 0.540mW/g = -5.35 dB mW/g

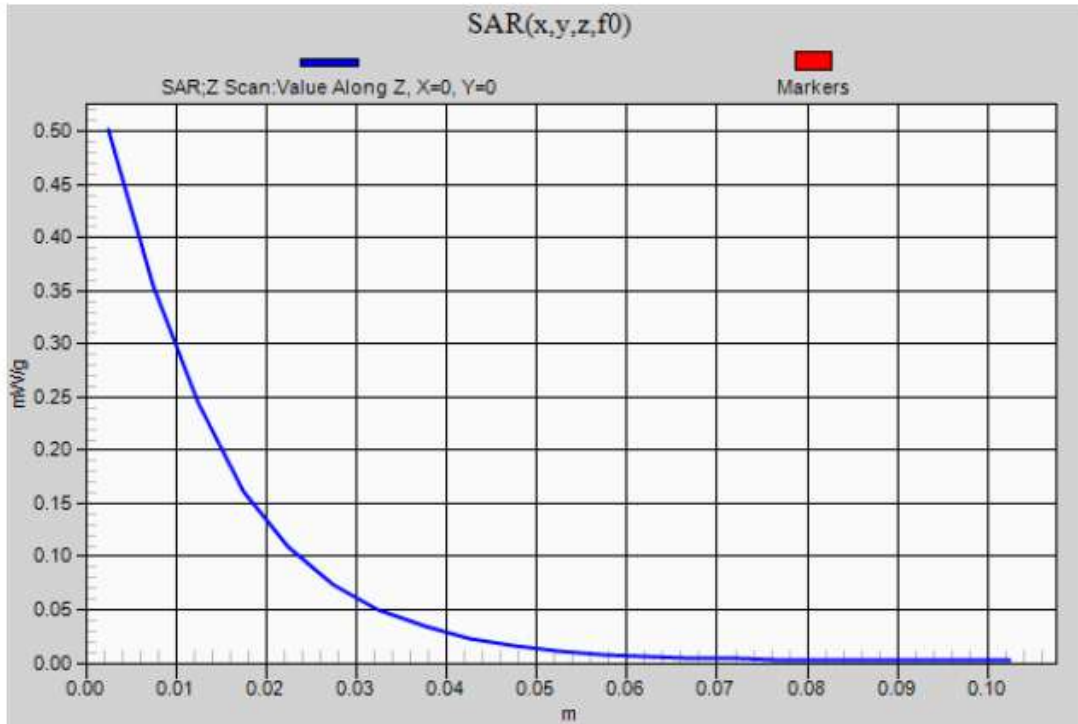
Test Laboratory: UL CCS SAR Lab B Date: 8/26/2012

GSM1900

Frequency: 1880 MHz; Duty Cycle: 1:1.99986

Head/Left Touch/GPRS 4 slot/Ch 661/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 0.502 mW/g



Test Laboratory: UL CCS SAR Lab B Date: 8/8/2012

GSM1900

Frequency: 1880 MHz; Duty Cycle: 1:8.00018; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.48$ mho/m; $\epsilon_r = 51.092$; $\rho = 1000$ 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 Sn1259; Calibrated: 2/13/2012
- Probe: EX3DV4 - SN3686; ConvF(7.04, 7.04, 7.04); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (A); Type: QDOVA001BB; Serial: 1120

Body/Rear/GMSK Voice/10mm/Ch 661/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.898 mW/g

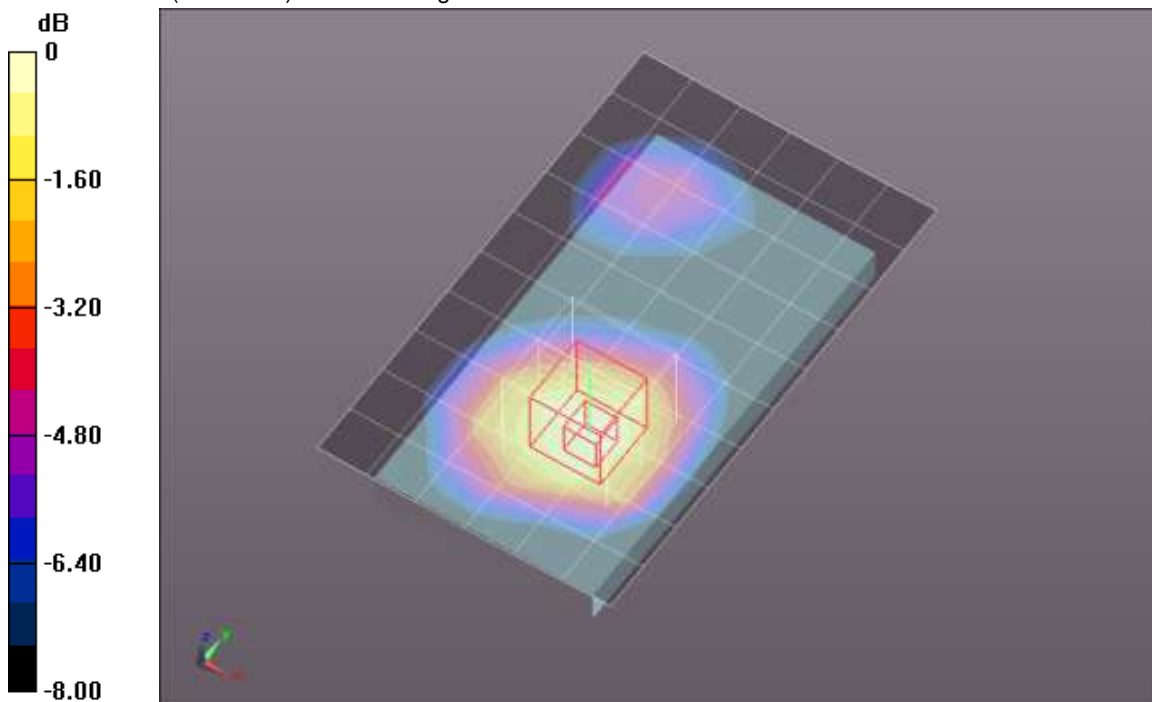
Body/Rear/GMSK Voice/10mm/Ch 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 24.859 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 1.1740

SAR(1 g) = 0.779 mW/g; SAR(10 g) = 0.496 mW/g

Maximum value of SAR (measured) = 0.944 mW/g



0 dB = 0.940mW/g = -0.54 dB mW/g

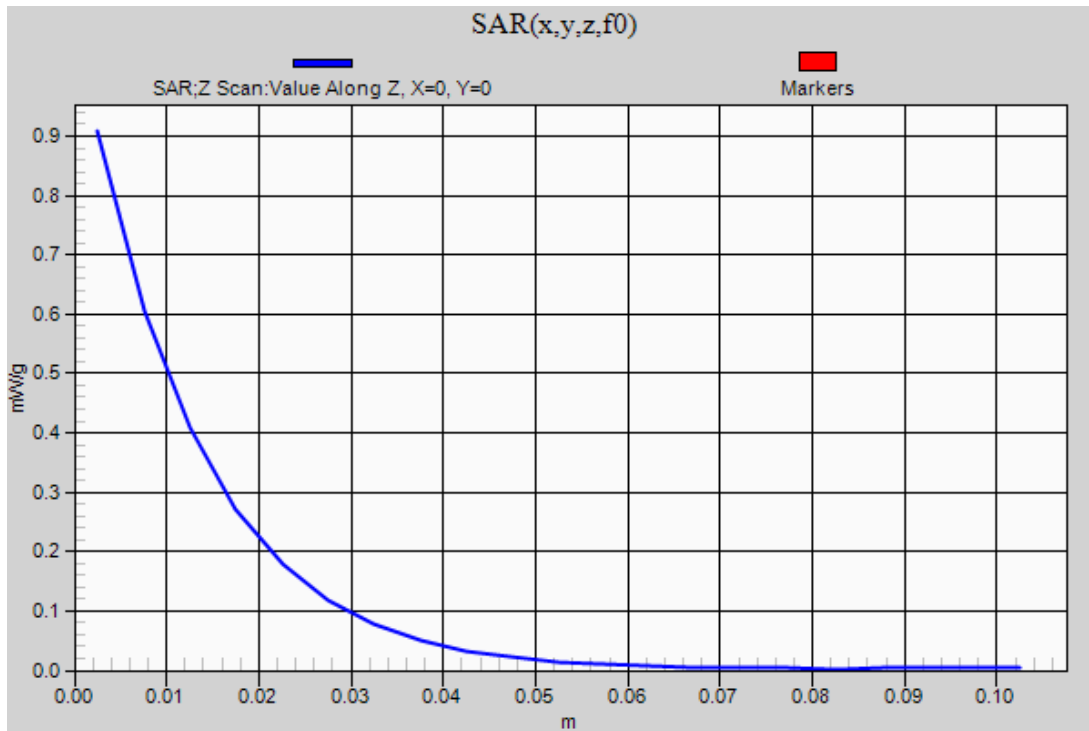
Test Laboratory: UL CCS SAR Lab B Date: 8/8/2012

GSM1900

Frequency: 1880 MHz; Duty Cycle: 1:8.00018

Body/Rear/GMSK Voice/10mm/Ch 661/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 0.908 mW/g



Test Laboratory: UL CCS SAR Lab B Date: 8/12/2012

WCDMA Band IV

Frequency: 1732.4 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): $f = 1732.4$ MHz; $\sigma = 1.304$ mho/m; $\epsilon_r = 38.525$; $\rho = 1000$ 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 Sn1259; Calibrated: 2/13/2012
- Probe: EX3DV4 - SN3686; ConvF(7.65, 7.65, 7.65); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM; Type: QD000P40CD; Serial: 1629

Head/Left Touch/Rel.99/Ch 1412/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.625 mW/g

Head/Left Touch/Rel.99/Ch 1412/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

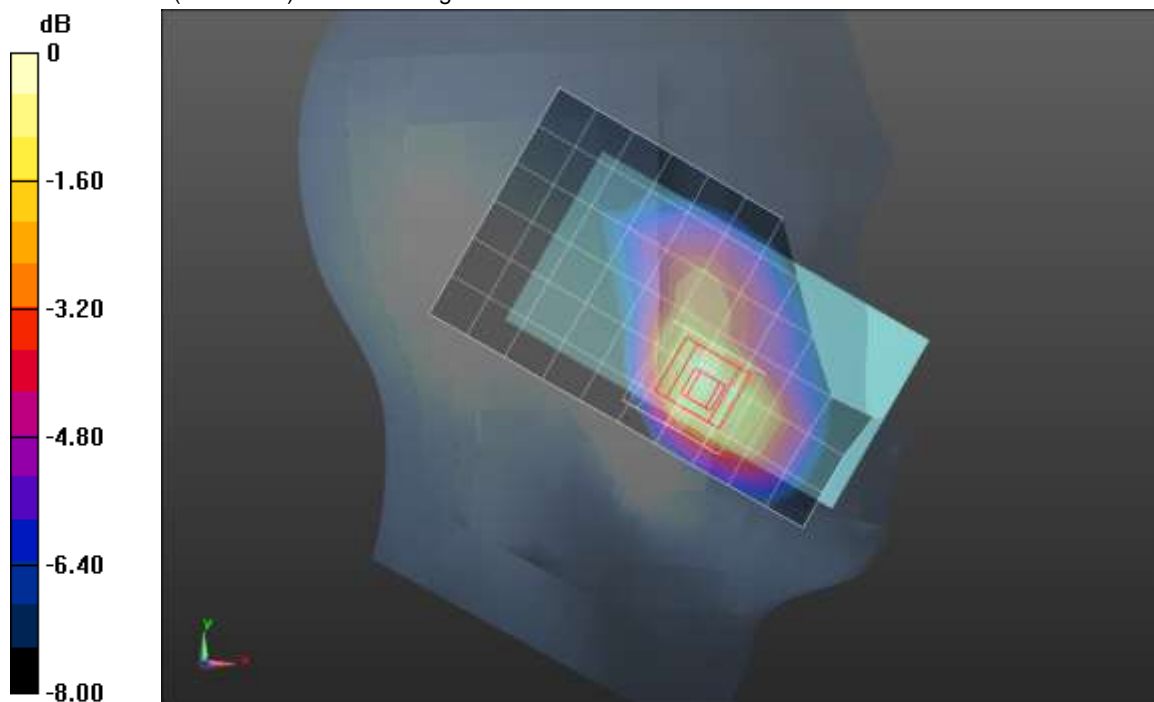
Reference Value = 22.070 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.8830

SAR(1 g) = 0.571 mW/g; SAR(10 g) = 0.357 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.709 mW/g



0 dB = 0.710mW/g = -2.97 dB mW/g

Test Laboratory: UL CCS SAR Lab B Date: 8/12/2012

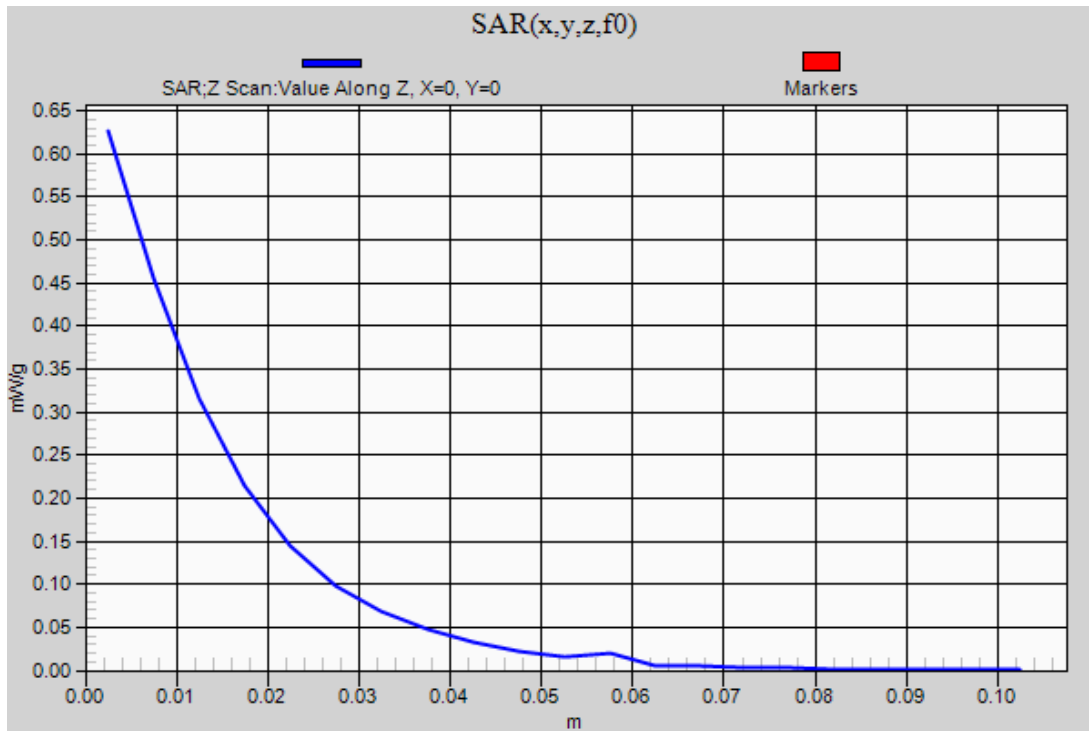
WCDMA Band IV

Frequency: 1732.4 MHz; Duty Cycle: 1:1

Head/Left Touch/Rel.99/Ch 1412/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.626 mW/g



Test Laboratory: UL CCS SAR Lab B Date: 8/12/2012

WCDMA Band IV

Frequency: 1732.4 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): $f = 1732.4$ MHz; $\sigma = 1.449$ mho/m; $\epsilon_r = 55.024$; $\rho = 1000$ 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 Sn1259; Calibrated: 2/13/2012
- Probe: EX3DV4 - SN3686; ConvF(7.44, 7.44, 7.44); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (A); Type: QDOVA001BB; Serial: 1120

Body/Rear/Rel.99/10mm/Ch 1412/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 1.128 mW/g

Body/Rear/Rel.99/10mm/Ch 1412/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

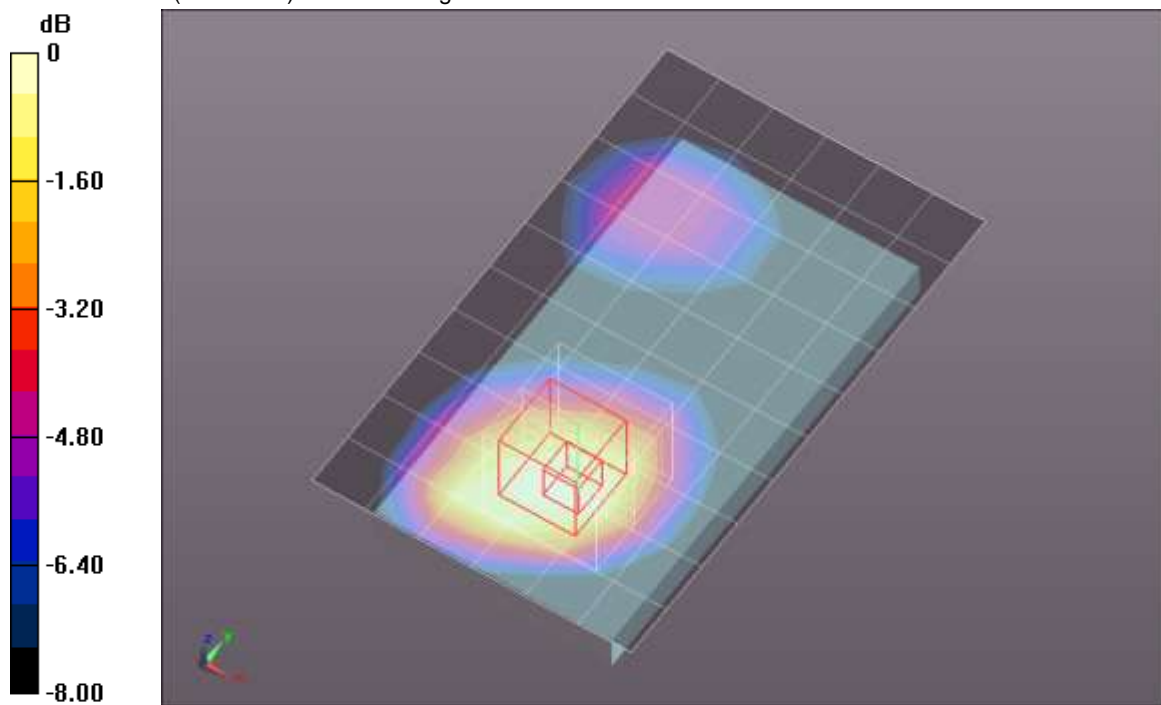
Reference Value = 28.510 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 1.4280

SAR(1 g) = 0.977 mW/g; SAR(10 g) = 0.632 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 1.177 mW/g



0 dB = 1.180mW/g = 1.44 dB mW/g

Test Laboratory: UL CCS SAR Lab B Date: 8/12/2012

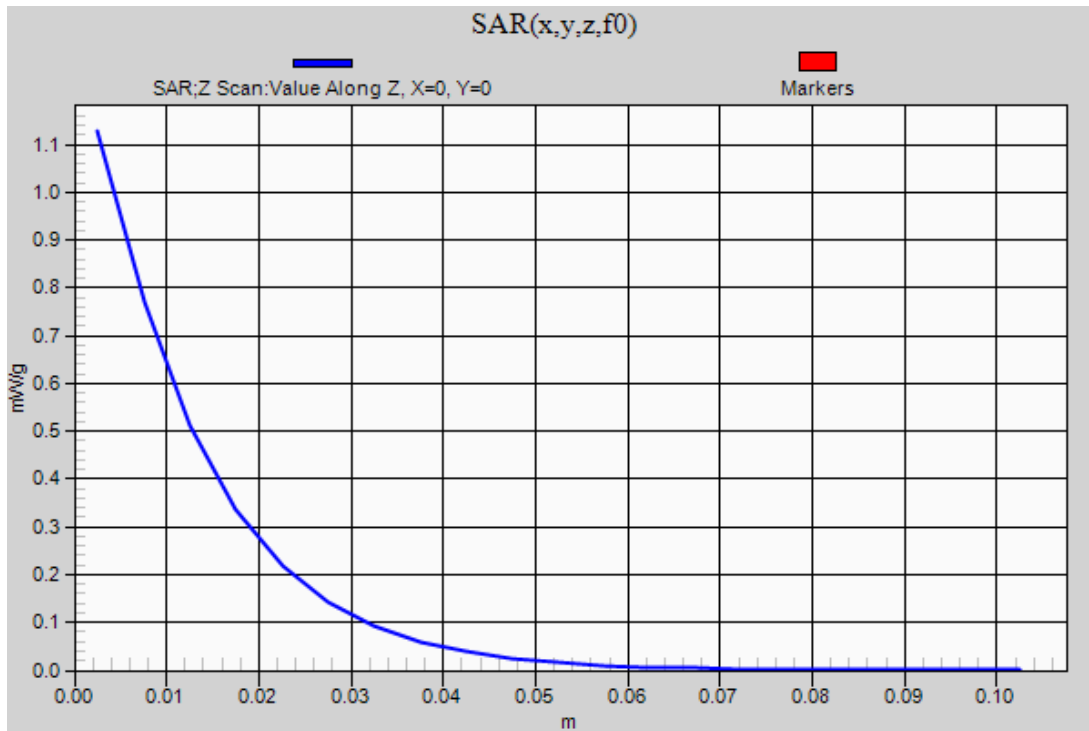
WCDMA Band IV

Frequency: 1732.4 MHz; Duty Cycle: 1:1

Body/Rear/Rel.99/10mm/Ch 1412/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 1.128 mW/g



Test Laboratory: UL CCS SAR Lab B Date: 8/14/2012

WiFi 2.4GHz

Frequency: 2437 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.817$ mho/m; $\epsilon_r = 38.776$; $\rho = 1000$ 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 Sn1259; Calibrated: 2/13/2012
- Probe: EX3DV4 - SN3686; ConvF(6.72, 6.72, 6.72); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM; Type: QD000P40CD; Serial: 1629

Head/Left Touch/802.11b/Ch 6/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.243 mW/g

Head/Left Touch/802.11b/Ch 6/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

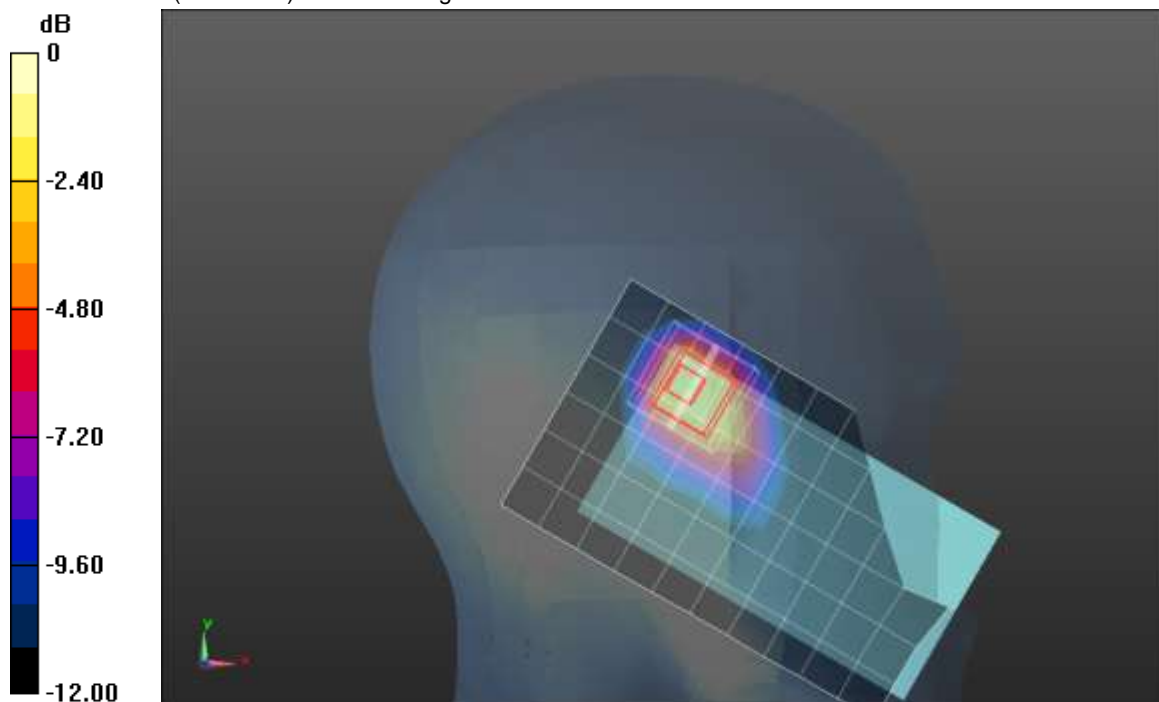
Reference Value = 11.440 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 0.5160

SAR(1 g) = 0.255 mW/g; SAR(10 g) = 0.120 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.346 mW/g



0 dB = 0.350mW/g = -9.12 dB mW/g

Test Laboratory: UL CCS SAR Lab B Date: 8/14/2012

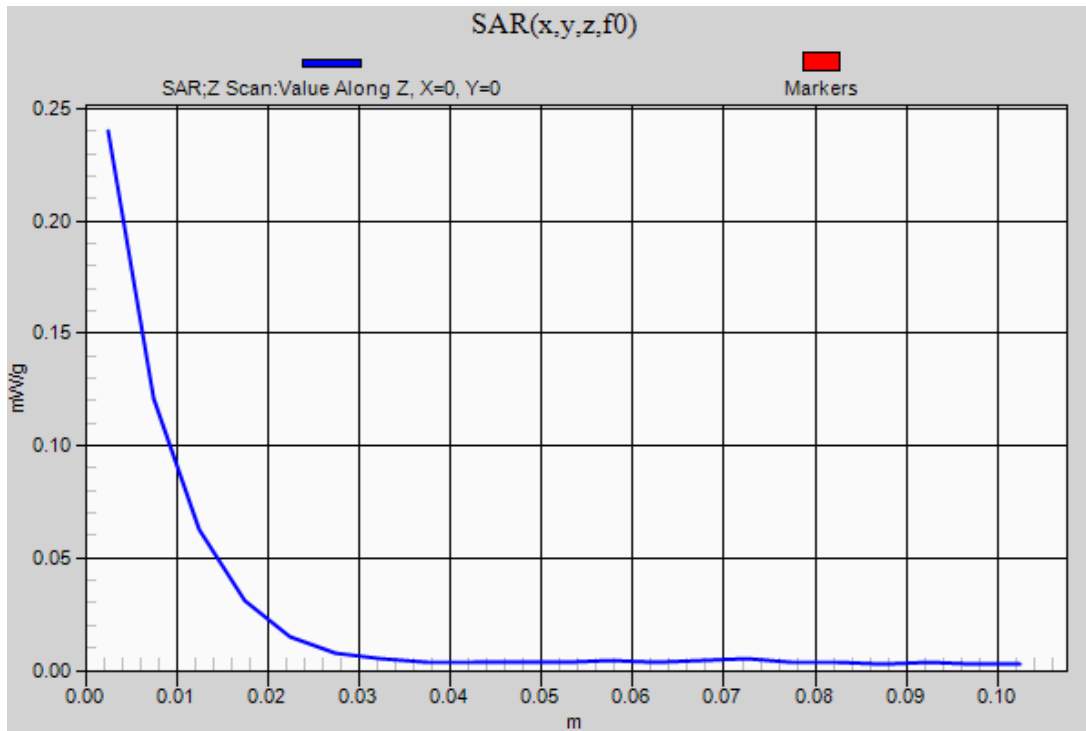
WiFi 2.4GHz

Frequency: 2437 MHz; Duty Cycle: 1:1

Head/Left Touch/802.11b/Ch 6/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.240 mW/g



Test Laboratory: UL CCS SAR Lab B Date: 8/15/2012

WiFi 2.4GHz

Frequency: 2437 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.902$ mho/m; $\epsilon_r = 52.642$; $\rho = 1000$ 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 Sn1259; Calibrated: 2/13/2012
- Probe: EX3DV4 - SN3686; ConvF(6.7, 6.7, 6.7); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (A); Type: QDOVA001BB; Serial: 1120

Body/Rear/802.11b/10mm/Ch 6/Area Scan (7x11x1):

Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.063 mW/g

Body/Rear/802.11b/10mm/Ch 6/Zoom Scan (5x5x7)/Cube 0:

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

dz=5mm

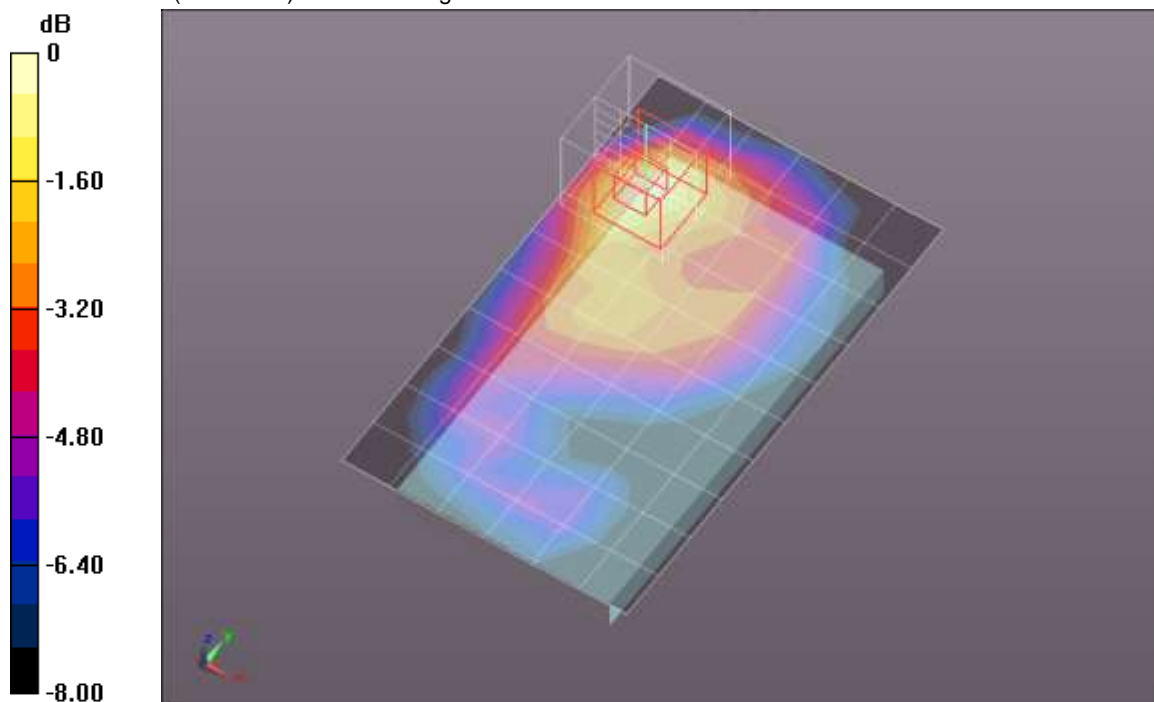
Reference Value = 5.731 V/m; Power Drift = 0.0075 dB

Peak SAR (extrapolated) = 0.0830

SAR(1 g) = 0.047 mW/g; SAR(10 g) = 0.022 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.062 mW/g



0 dB = 0.060mW/g = -24.44 dB mW/g

Test Laboratory: UL CCS SAR Lab B Date: 8/15/2012

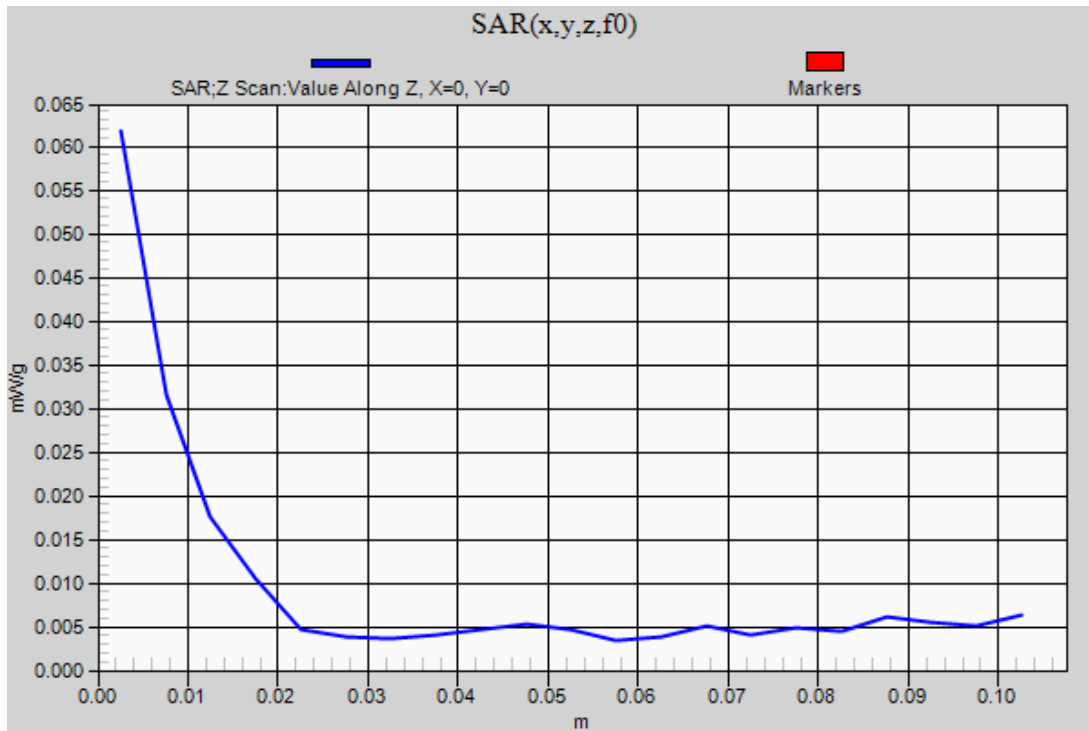
WiFi 2.4GHz

Frequency: 2437 MHz; Duty Cycle: 1:1

Body/Rear/802.11b/10mm/Ch 6/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Info: [Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.062 mW/g



Test Laboratory: UL CCS SAR Lab B Date: 8/23/2012

WiFi 5GHz

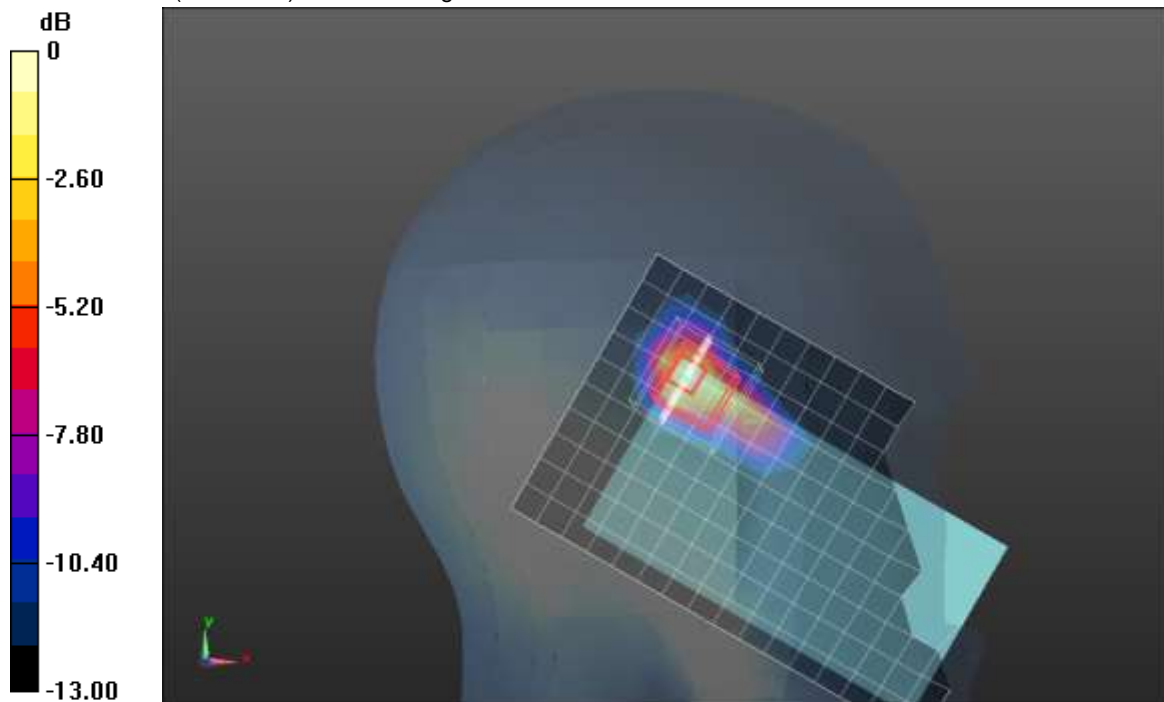
Frequency: 5240 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C
Medium parameters used: $f = 5240$ MHz; $\sigma = 4.776$ mho/m; $\epsilon_r = 36.591$; $\rho = 1000$ kg/m³

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 Sn1259; Calibrated: 2/13/2012
- Probe: EX3DV4 - SN3686; ConvF(4.61, 4.61, 4.61); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM; Type: QD000P40CD; Serial: 1629

Head/Left Touch/802.11a/Ch 48/Area Scan (11x17x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.451 mW/g

Head/Left Touch/802.11a/Ch 48/Zoom Scan (9x9x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 10.059 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 1.7180
SAR(1 g) = 0.249 mW/g; SAR(10 g) = 0.070 mW/g
Maximum value of SAR (measured) = 0.433 mW/g



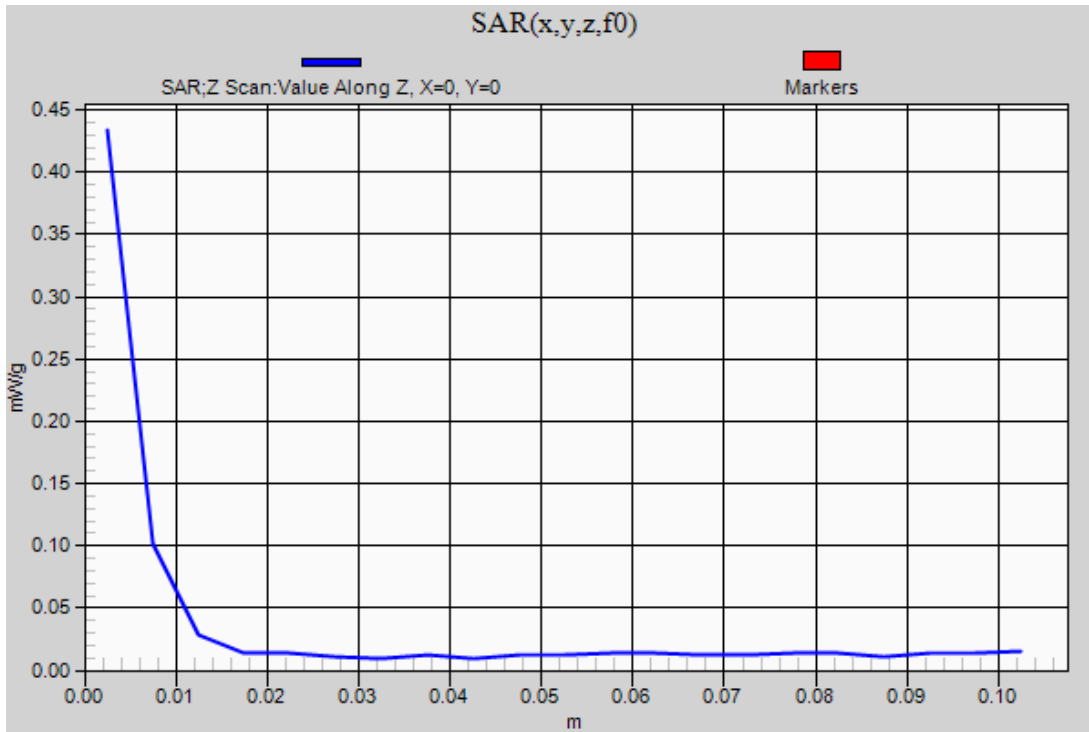
0 dB = 0.430mW/g = -7.33 dB mW/g

Test Laboratory: UL CCS SAR Lab B Date: 8/23/2012

WiFi 5GHz

Frequency: 5240 MHz; Duty Cycle: 1:1

Head/Left Touch/802.11a/Ch 48/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.434 mW/g



Test Laboratory: UL CCS SAR Lab B Date: 8/16/2012

WiFi 5GHz

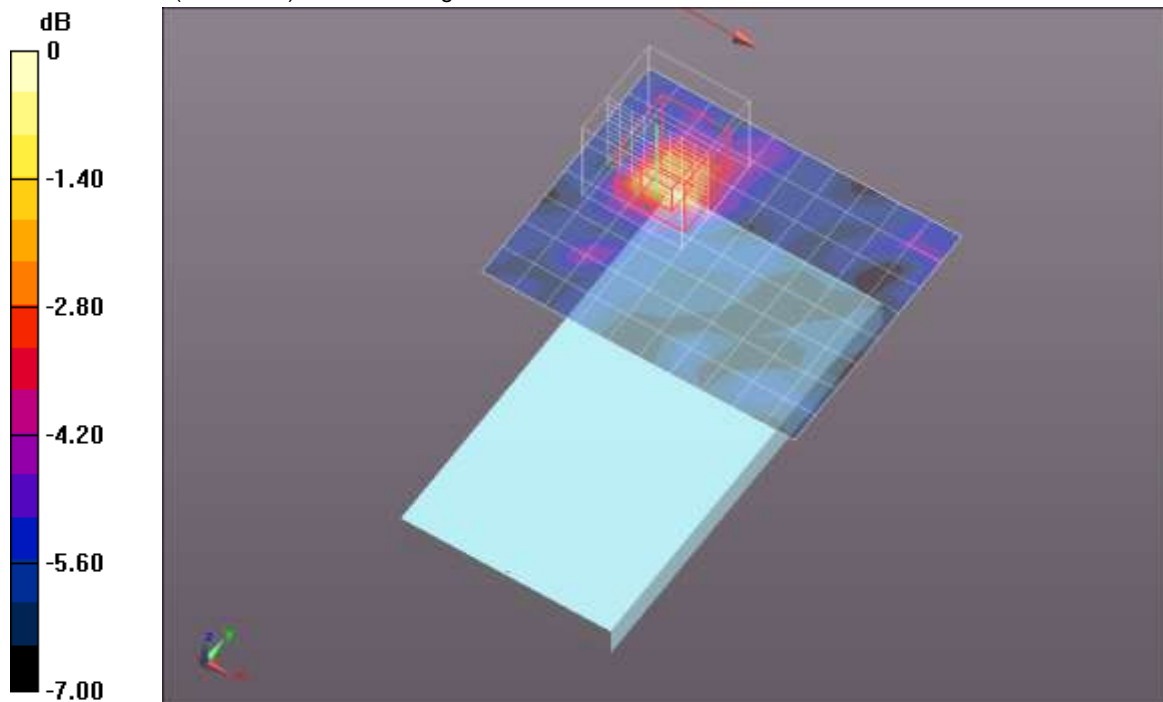
Frequency: 5180 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used: $f = 5180$ MHz; $\sigma = 5.386$ mho/m; $\epsilon_r = 49.284$; $\rho = 1000$ kg/m³

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 Sn1259; Calibrated: 2/13/2012
- Probe: EX3DV4 - SN3686; ConvF(4.04, 4.04, 4.04); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (B); Type: QDOVA001BB; Serial: 1118

Body/Rear/802.11a/10mm/Ch 36/Area Scan 4 (11x9x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.086 mW/g

Body/Rear/802.11a/10mm/Ch 36/Zoom Scan (9x9x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 4.204 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.2010
SAR(1 g) = 0.066 mW/g; SAR(10 g) = 0.035 mW/g
Maximum value of SAR (measured) = 0.102 mW/g



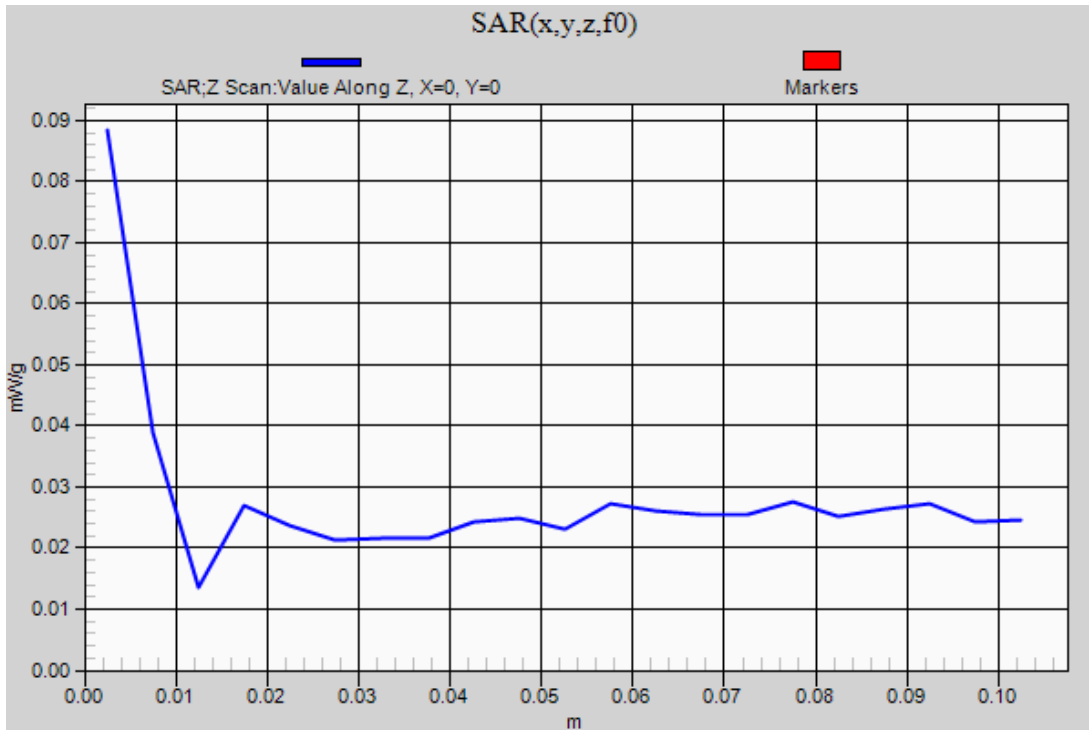
0 dB = 0.100mW/g = -20.00 dB mW/g

Test Laboratory: UL CCS SAR Lab B Date: 8/16/2012

WiFi 5GHz

Frequency: 5180 MHz; Duty Cycle: 1:1

Body/Rear/802.11a/10mm/Ch 36/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.088 mW/g



Test Laboratory: UL CCS SAR Lab B Date: 8/23/2012

WiFi 5GHz

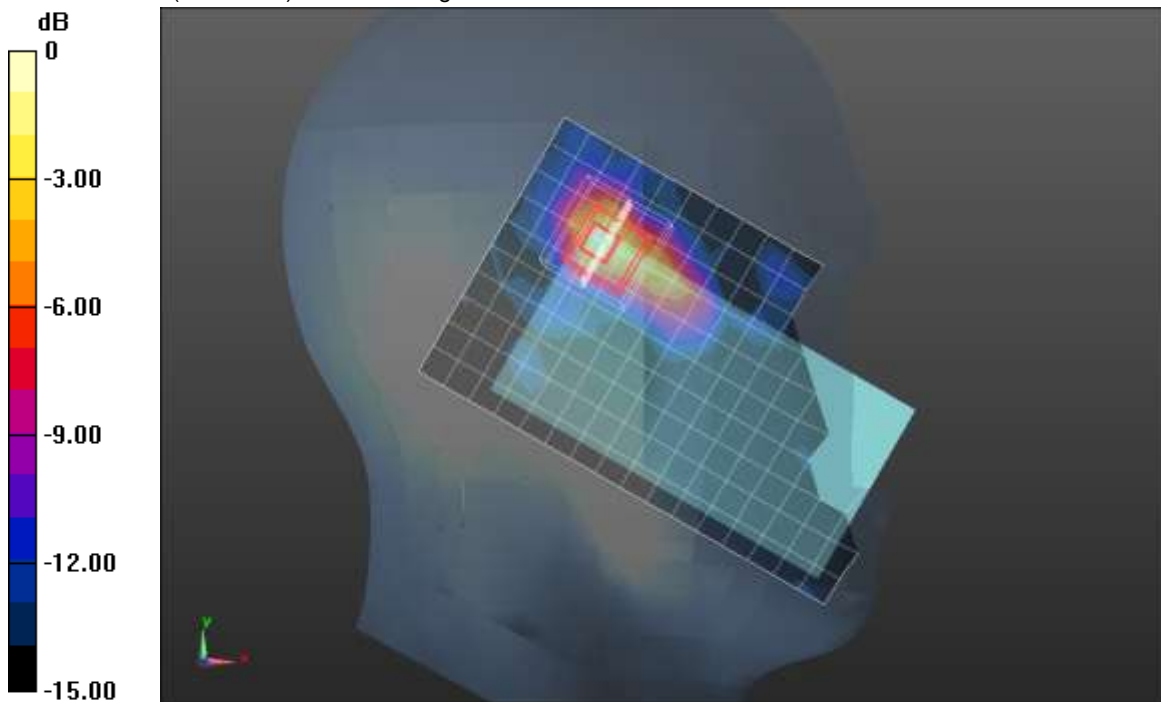
Frequency: 5320 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C
Medium parameters used: $f = 5320$ MHz; $\sigma = 4.872$ mho/m; $\epsilon_r = 36.468$; $\rho = 1000$ kg/m³

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 Sn1259; Calibrated: 2/13/2012
- Probe: EX3DV4 - SN3686; ConvF(4.39, 4.39, 4.39); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM; Type: QD000P40CD; Serial: 1629

Head/Left Touch/802.11a/Ch 64/Area Scan (11x17x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.569 mW/g

Head/Left Touch/802.11a/Ch 64/Zoom Scan (9x9x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 11.741 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.3820
SAR(1 g) = 0.346 mW/g; SAR(10 g) = 0.109 mW/g
Maximum value of SAR (measured) = 0.568 mW/g



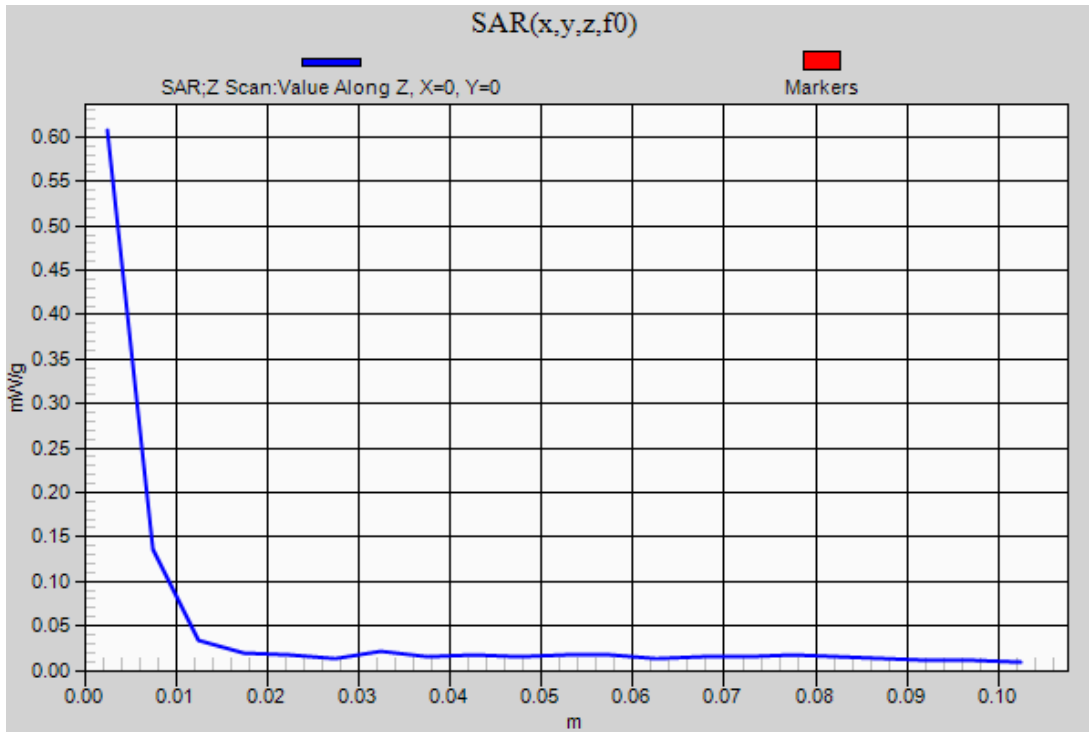
0 dB = 0.570mW/g = -4.88 dB mW/g

Test Laboratory: UL CCS SAR Lab B Date: 8/23/2012

WiFi 5GHz

Frequency: 5320 MHz; Duty Cycle: 1:1

Head/Left Touch/802.11a/Ch 64/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.608 mW/g



Test Laboratory: UL CCS SAR Lab B Date: 8/21/2012

WiFi 5GHz

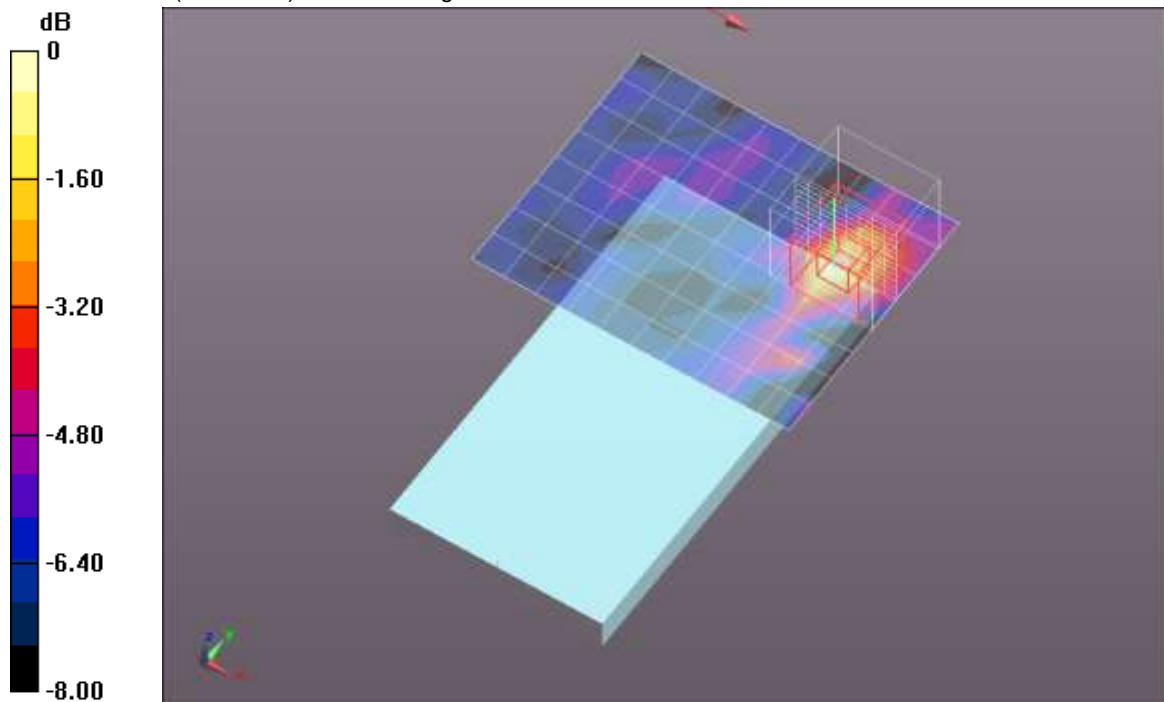
Frequency: 5320 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C
Medium parameters used: $f = 5320$ MHz; $\sigma = 5.542$ mho/m; $\epsilon_r = 47.736$; $\rho = 1000$ kg/m³

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 Sn1259; Calibrated: 2/13/2012
- Probe: EX3DV4 - SN3686; ConvF(3.8, 3.8, 3.8); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (B); Type: QDOVA001BB; Serial: 1118

Body/Front/802.11a/10mm/Ch 64/Area Scan (11x9x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.095 mW/g

Body/Front/802.11a/10mm/Ch 64/Zoom Scan (9x9x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 4.316 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 0.7840
SAR(1 g) = 0.085 mW/g; SAR(10 g) = 0.021 mW/g
Maximum value of SAR (measured) = 0.092 mW/g



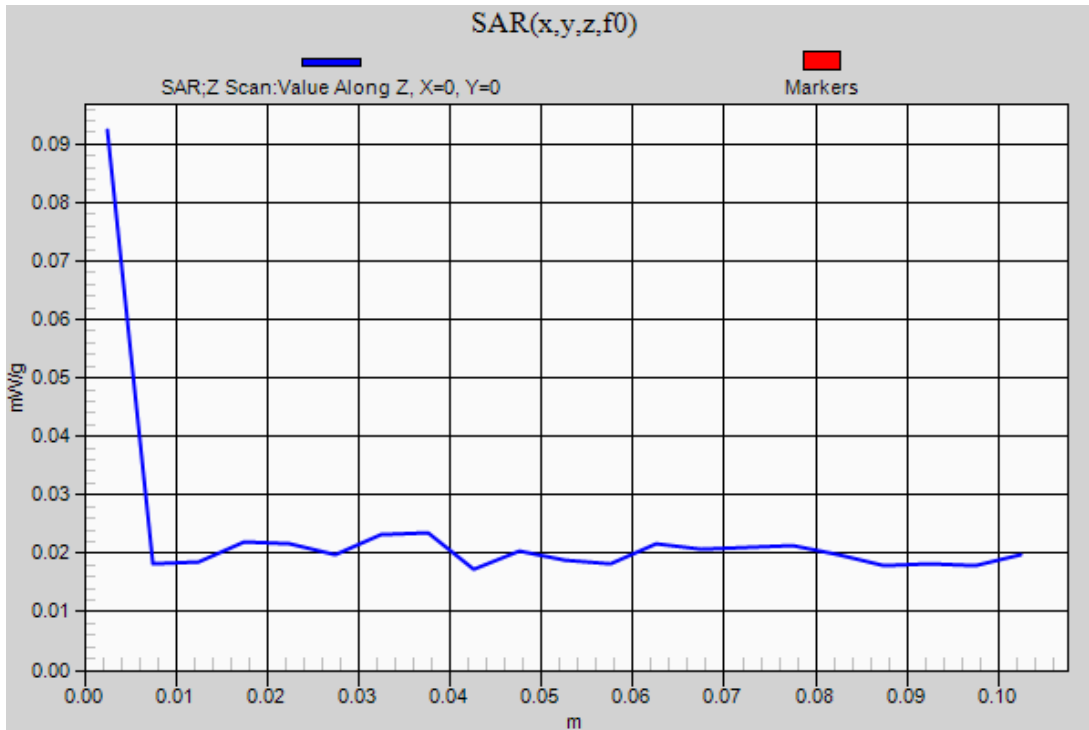
0 dB = 0.090mW/g = -20.92 dB mW/g

Test Laboratory: UL CCS SAR Lab B Date: 8/21/2012

WiFi 5GHz

Frequency: 5320 MHz; Duty Cycle: 1:1

Body/Front/802.11a/10mm/Ch 64/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.092 mW/g



Test Laboratory: UL CCS SAR Lab B Date: 8/24/2012

WiFi 5GHz

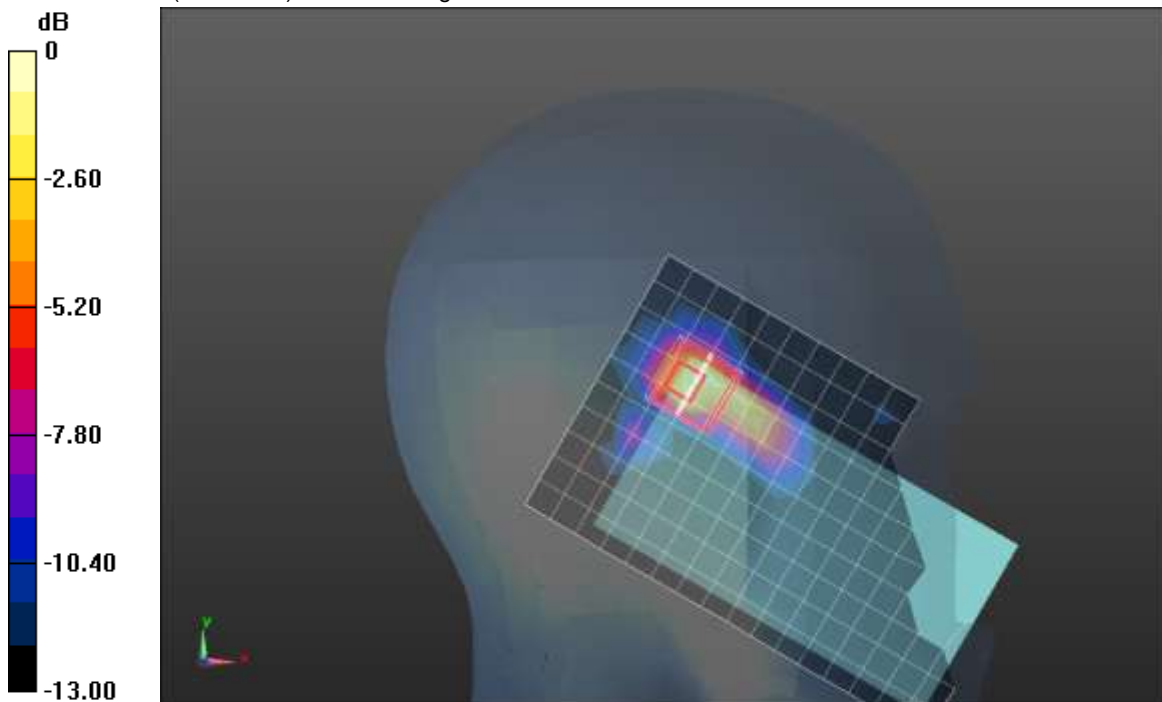
Frequency: 5660 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C
Medium parameters used: $f = 5660$ MHz; $\sigma = 5.242$ mho/m; $\epsilon_r = 35.328$; $\rho = 1000$ kg/m³

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 Sn1259; Calibrated: 2/13/2012
- Probe: EX3DV4 - SN3686; ConvF(4.15, 4.15, 4.15); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM; Type: QD000P40CD; Serial: 1629

Head/Left Touch/802.11a/Ch 132/Area Scan (11x17x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.423 mW/g

Head/Left Touch/802.11a/Ch 132/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 9.243 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 3.5550
SAR(1 g) = 0.335 mW/g; SAR(10 g) = 0.076 mW/g
Maximum value of SAR (measured) = 0.510 mW/g



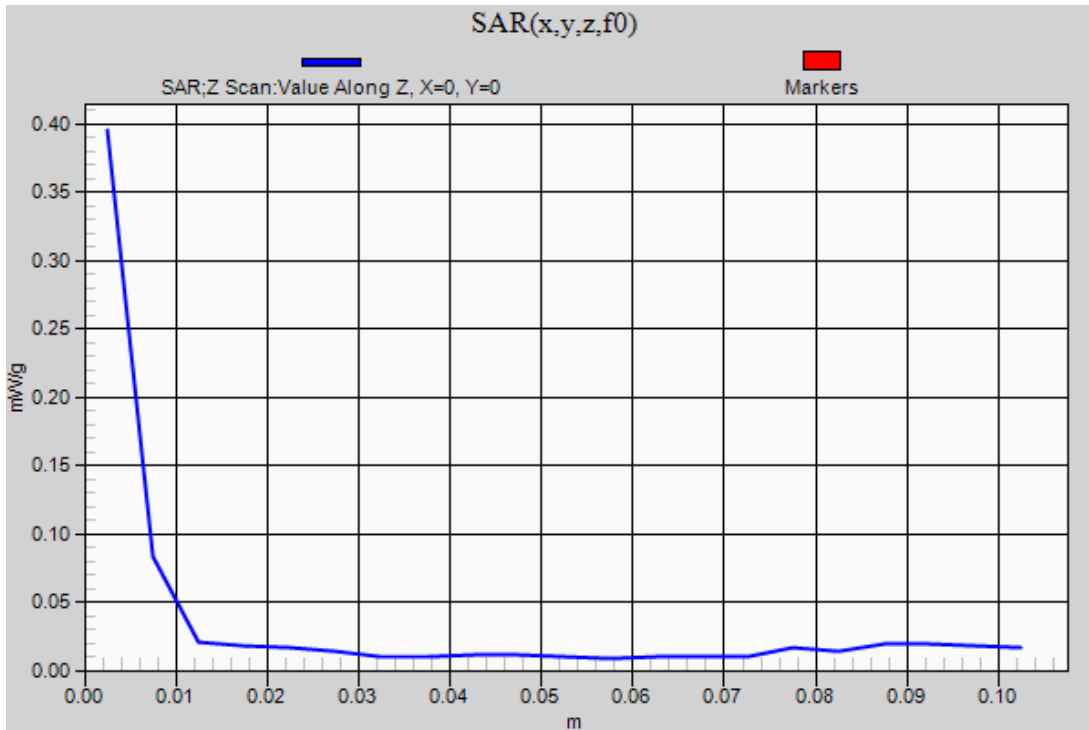
0 dB = 0.510mW/g = -5.85 dB mW/g

Test Laboratory: UL CCS SAR Lab B Date: 8/24/2012

WiFi 5GHz

Frequency: 5660 MHz; Duty Cycle: 1:1

Head/Left Touch/802.11a/Ch 132/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.395 mW/g



Test Laboratory: UL CCS SAR Lab B Date: 8/21/2012

WiFi 5GHz

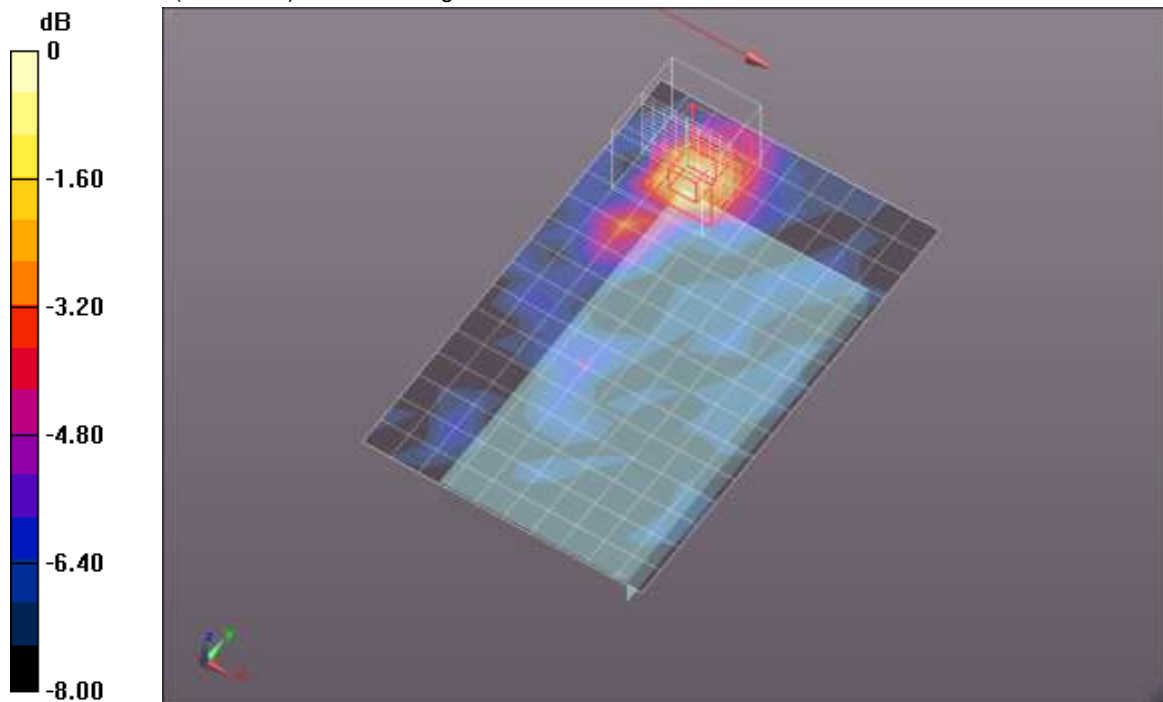
Frequency: 5520 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C
Medium parameters used: $f = 5520$ MHz; $\sigma = 5.824$ mho/m; $\epsilon_r = 47.315$; $\rho = 1000$ kg/m³

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 Sn1259; Calibrated: 2/13/2012
- Probe: EX3DV4 - SN3686; ConvF(3.62, 3.62, 3.62); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (B); Type: QDOVA001BB; Serial: 1118

Body/Rear/802.11a/10mm/Ch 104/Area Scan (11x17x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.118 mW/g

Body/Rear/802.11a/10mm/Ch 104/Zoom Scan (9x9x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 2.246 V/m; Power Drift = -0.14 dB
Peak SAR (extrapolated) = 1.2400
SAR(1 g) = 0.130 mW/g; SAR(10 g) = 0.038 mW/g
Maximum value of SAR (measured) = 0.143 mW/g



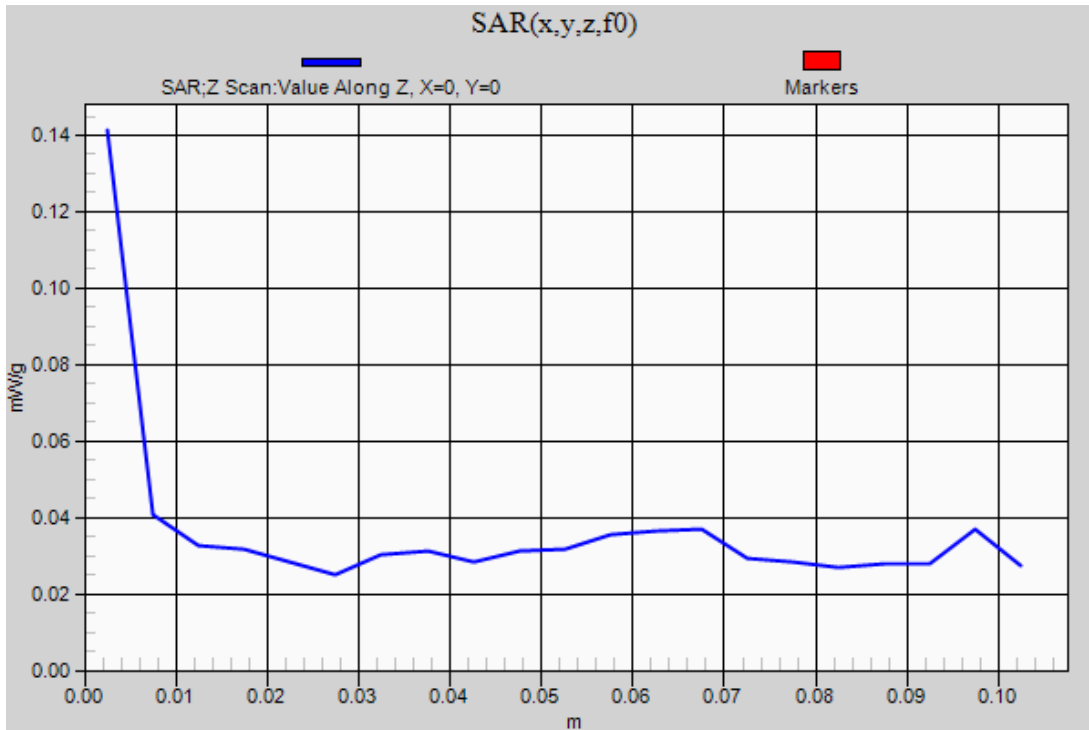
0 dB = 0.140mW/g = -17.08 dB mW/g

Test Laboratory: UL CCS SAR Lab B Date: 8/21/2012

WiFi 5GHz

Frequency: 5520 MHz; Duty Cycle: 1:1

Body/Rear/802.11a/10mm/Ch 104/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.186 mW/g



Test Laboratory: UL CCS SAR Lab B Date: 8/25/2012

WiFi 5GHz

Frequency: 5785 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C
Medium parameters used: $f = 5785$ MHz; $\sigma = 5.378$ mho/m; $\epsilon_r = 35.263$; $\rho = 1000$ 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 Sn1259; Calibrated: 2/13/2012
- Probe: EX3DV4 - SN3686; ConvF(4.14, 4.14, 4.14); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM; Type: QD000P40CD; Serial: 1629

Head/Left Touch/802.11a/Ch 157/Area Scan (11x17x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.475 mW/g

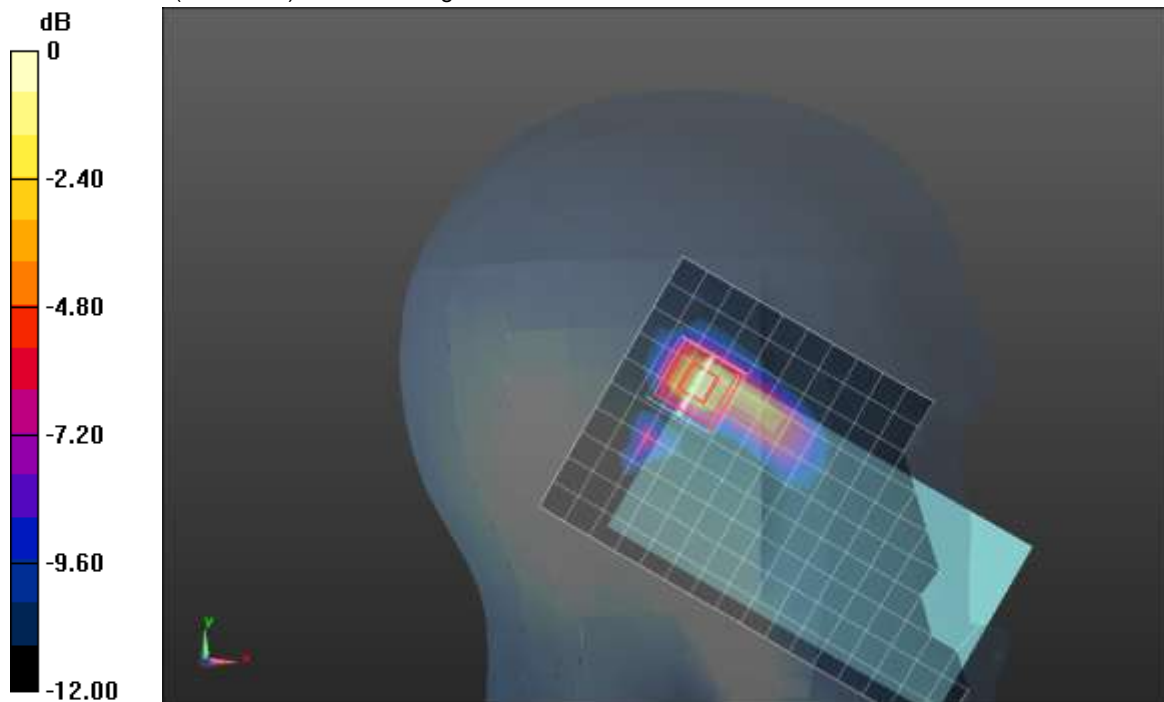
Head/Left Touch/802.11a/Ch 157/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 10.091 V/m; Power Drift = -0.0074 dB

Peak SAR (extrapolated) = 1.7940

SAR(1 g) = 0.434 mW/g; SAR(10 g) = 0.133 mW/g

Maximum value of SAR (measured) = 0.764 mW/g

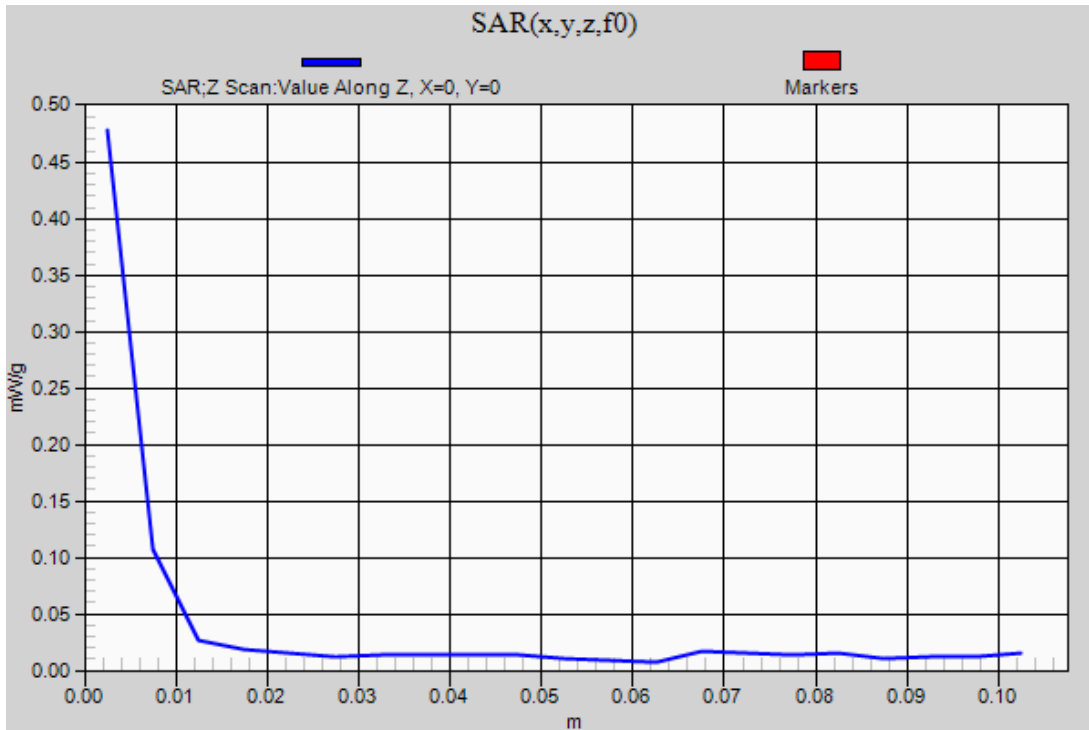


Test Laboratory: UL CCS SAR Lab B Date: 8/25/2012

WiFi 5GHz

Frequency: 5785 MHz; Duty Cycle: 1:1

Head/Left Touch/802.11a/Ch 157/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.478 mW/g



Test Laboratory: UL CCS SAR Lab B Date: 8/22/2012

WiFi 5GHz

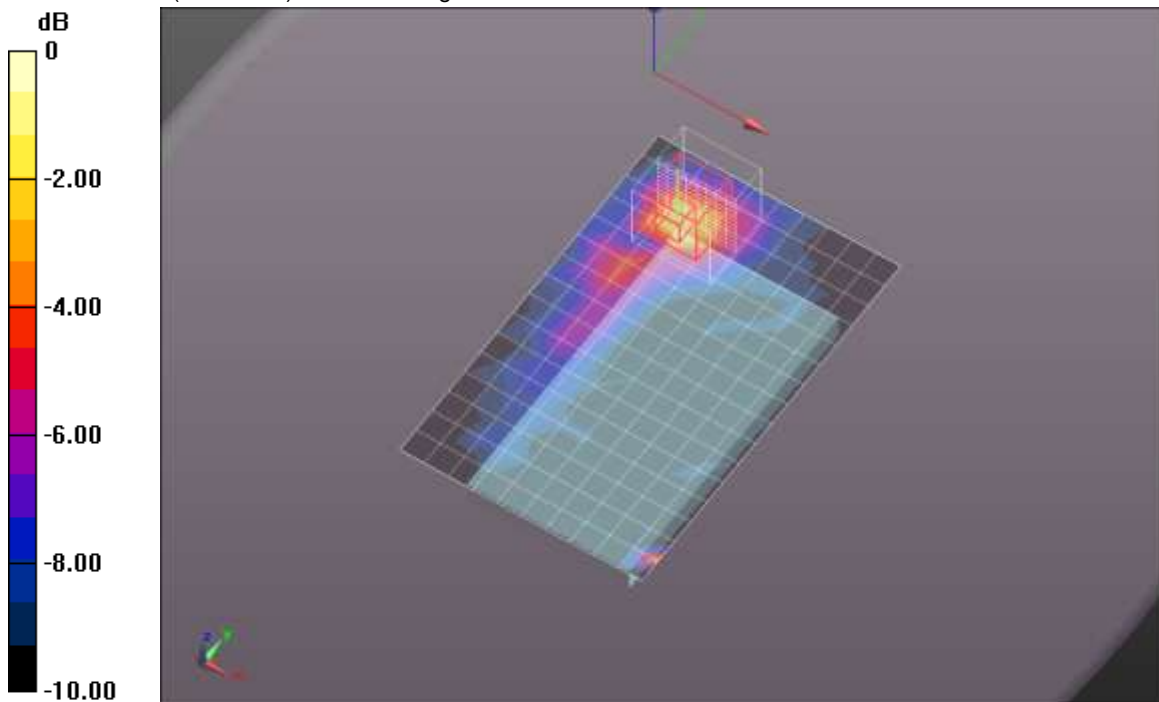
Frequency: 5745 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 25.0°C; Liquid Temperature: 24.0°C
Medium parameters used: $f = 5745$ MHz; $\sigma = 6.122$ mho/m; $\epsilon_r = 46.556$; $\rho = 1000$ kg/m³

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 Sn1259; Calibrated: 2/13/2012
- Probe: EX3DV4 - SN3686; ConvF(3.57, 3.57, 3.57); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (B); Type: QDOVA001BB; Serial: 1118

Body/Rear/802.11a/10mm/Ch 149/Area Scan (11x17x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.240 mW/g

Body/Rear/802.11a/10mm/Ch 149/Zoom Scan (9x9x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 6.689 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 2.5700
SAR(1 g) = 0.239 mW/g; SAR(10 g) = 0.082 mW/g
Maximum value of SAR (measured) = 0.310 mW/g



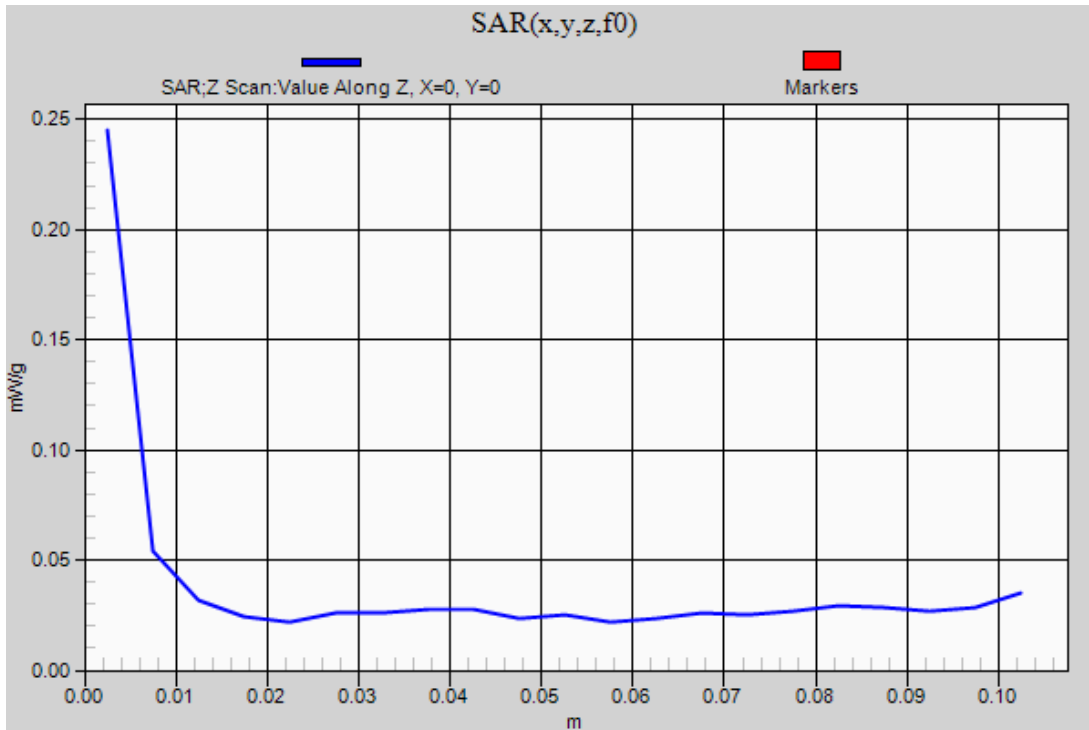
0 dB = 0.310mW/g = -10.17 dB mW/g

Test Laboratory: UL CCS SAR Lab B Date: 8/22/2012

WiFi 5GHz

Frequency: 5745 MHz; Duty Cycle: 1:1

Body/Rear/802.11a/10mm/Ch 149/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.245 mW/g



14. Simultaneous Transmission SAR Analysis

14.1. Head Exposure Conditions

14.1.1. Sum of the SAR for WWAN & Wi-Fi in the 2.4 GHz Band

Sum of the 1-g measured SAR for WWAN and WiFi 2.4GHz Band

The Bluetooth output power is < 25 mW [60/f_(GHz)], which stand-alone SAR evaluation is not required. Therefore, simultaneous transmission SAR evaluation is not required.

Test Position	GSM850	GSM1900	UMTS (WCDMA) Band IV	WiFi 2.4GHz	Σ 1g SAR (mW/g)
Left Touch	0.296			0.255	0.551
		0.438		0.255	0.693
			0.571	0.255	0.826
Left Tilt	0.195			0.139	0.334
		0.193		0.139	0.332
			0.282	0.139	0.421
Right Touch	0.295			0.139	0.434
		0.295		0.139	0.434
			0.355	0.139	0.494
Right Tilt	0.196			0.089	0.285
		0.173		0.089	0.262
			0.244	0.089	0.333

Sum of the 1-g Scaled SAR for WWAN and WiFi 2.4GHz Band

Test Position	GSM850	GSM1900	UMTS (WCDMA) Band IV	WiFi 2.4GHz	Σ 1g SAR (mW/g)
Left Touch	0.303			0.255	0.558
		0.448		0.255	0.703
			0.641	0.255	0.896
Left Tilt	0.200			0.139	0.339
		0.197		0.139	0.336
			0.316	0.139	0.455
Right Touch	0.302			0.139	0.441
		0.302		0.139	0.441
			0.398	0.139	0.537
Right Tilt	0.201			0.089	0.290
		0.177		0.089	0.266
			0.274	0.089	0.363

14.1.2. Sum of the SAR for WWAN & Wi-Fi in the 5GHz Band

Sum of the 1-g measured SAR for WWAN and WiFi 5GHz Band

Test Position	GSM850	GSM1900	UMTS (WCDMA) Band IV	WiFi 5GHz	Σ 1g SAR (mW/g)
Left Touch	0.296			0.444	0.740
		0.438		0.444	0.882
			0.571	0.444	1.015
Left Tilt	0.195			0.370	0.565
		0.193		0.370	0.563
			0.282	0.370	0.652
Right Touch	0.295			0.259	0.554
		0.295		0.259	0.554
			0.355	0.259	0.614
Right Tilt	0.196			0.226	0.422
		0.173		0.226	0.399
			0.244	0.226	0.470

Sum of the 1-g Scaled SAR for WWAN and WiFi 5GHz Band

Test Position	GSM850	GSM1900	UMTS (WCDMA) Band IV	WiFi 5GHz	Σ 1g SAR (mW/g)
Left Touch	0.303			0.444	0.747
		0.448		0.444	0.892
			0.641	0.444	1.085
Left Tilt	0.200			0.370	0.570
		0.197		0.370	0.567
			0.316	0.370	0.686
Right Touch	0.302			0.259	0.561
		0.302		0.259	0.561
			0.398	0.259	0.657
Right Tilt	0.201			0.226	0.427
		0.177		0.226	0.403
			0.274	0.226	0.500

14.1.3. SAR to Peak Location Separation Ratio (SPLSR)

N/A: Sum of the SAR is not greater than 1.6 mW/g, therefore SPLSR does not need to be calculated

14.2. Body Exposure Conditions

14.2.1. Sum of the SAR for WWAN & Wi-Fi in the 2.4 GHz Band

Sum of the 1-g Measured SAR for WWAN and WiFi 2.4GHz Band

Test Position	GSM850	GSM1900	UMTS (WCDMA) Band IV	WiFi 2.4GHz	Σ 1g SAR (mW/g)
Rear	0.767			0.047	0.814
		0.779		0.047	0.826
			0.977	0.047	1.024
Front	0.371			0.046	0.417
		0.533		0.046	0.579
			0.642	0.046	0.688

Sum of the 1-g Scaled SAR for WWAN and WiFi 2.4GHz Band

Test Position	GSM850	GSM1900	UMTS (WCDMA) Band IV	WiFi 2.4GHz	Σ 1g SAR (mW/g)
Rear	0.785			0.047	0.832
		0.816		0.047	0.863
			1.096	0.047	1.143
Front	0.380			0.046	0.426
		0.558		0.046	0.604
			0.720	0.046	0.766

14.2.2. Sum of the SAR for WWAN & Wi-Fi in the 5 GHz Band)

Sum of the 1-g Measured SAR for WWAN and WiFi 5GHz Band

Test Position	GSM850	GSM1900	UMTS (WCDMA) Band IV	WiFi 5GHz	Σ 1g SAR (mW/g)
Rear	0.767			0.239	1.006
		0.779		0.239	1.018
			0.977	0.239	1.216
Front	0.371			0.102	0.473
		0.533		0.102	0.635
			0.642	0.102	0.744

Sum of the 1-g Scaled SAR for WWAN and WiFi 5GHz Band

Test Position	GSM850	GSM1900	UMTS (WCDMA) Band IV	WiFi 5GHz	Σ 1g SAR (mW/g)
Rear	0.785			0.245	1.030
		0.816		0.245	1.061
			1.096	0.245	1.341
Front	0.380			0.104	0.484
		0.558		0.104	0.662
			0.720	0.104	0.824

14.2.3. SAR to Peak Location Separation Ratio (SPLSR)

N/A: Sum of the SAR is not greater than 1.6 W/kg, therefore SPLSR does not need to be calculated.

14.3. Hotspot Mode Exposure Conditions

14.3.1. Sum of the SAR for GSM, W-CDMA & Wi-Fi in the 2.4 GHz Band

Sum of the 1-g Measured SAR for WWAN and WiFi 2.4GHz Band

Test Position	GSM850	GSM1900	UMTS (WCDMA) Band IV	WiFi 2.4GHz	Σ 1g SAR (mW/g)
Rear	0.709			0.047	0.756
		0.745		0.047	0.792
			0.977	0.047	1.024
Front	0.355			0.046	0.401
		0.517		0.046	0.563
			0.642	0.046	0.688
Edge 1				0.018	0.018
				0.018	0.018
				0.018	0.018
Edge 2	0.285			0.043	0.328
		0.110		0.043	0.153
			0.293	0.043	0.336
Edge 3	0.071			0	0.071
		0.226		0	0.226
			0.406	0	0.406
Edge 4	0.316			0	0.316
		0.229		0	0.229
			0.107	0	0.107

Sum of the 1-g Scaled SAR for WWAN and WiFi 2.4GHz Band

Test Position	GSM850	GSM1900	UMTS (WCDMA) Band IV	WiFi 2.4GHz	Σ 1g SAR (mW/g)
Rear	0.726			0.047	0.773
		0.762		0.047	0.809
			1.096	0.047	1.143
Front	0.363			0.046	0.409
		0.529		0.046	0.575
			0.720	0.046	0.766
Edge 1				0.018	0.018
				0.018	0.018
				0.018	0.018
Edge 2	0.292			0.043	0.335
		0.113		0.043	0.156
			0.329	0.043	0.372
Edge 3	0.073			0	0.073
		0.231		0	0.231
			0.456	0	0.456
Edge 4	0.323			0	0.323
		0.234		0	0.234
			0.120	0	0.120

14.3.2. SAR to Peak Location Separation Ratio (SPLSR)

N/A: Sum of the SAR is not greater than 1.6 mW/g, therefore SPLSR does not need to be calculated

14.3.3. Sum of the 1g SAR for Body Hotspot Condition (WWAN and WLAN 5 GHz)

The DUT does not support hotspot mode for the 5 GHz WLAN bands

15. Appendixes

Refer to separated files for the following appendixes.

- 15.1. System Performance Check Plots
- 15.2. SAR Test Plots for GSM850
- 15.3. SAR Test Plots for GSM1900
- 15.4. SAR Test Plots for WCDMA (UMTS) Band IV
- 15.5. SAR Test Plots for WiFi 2.4 GHz Band
- 15.6. SAR Test Plots for WiFi 5 GHz Band
- 15.7. Calibration Certificate for E-Field Probe EX3DV4 - SN 3686
- 15.8. Calibration Certificate for D835V2 - SN 4d002
- 15.9. Calibration Certificate for D1750V2 - SN 1050
- 15.10. Calibration Certificate for D1900V2 - SN 5d140
- 15.11. Calibration Certificate for D2450V2 - SN 706
- 15.12. Calibration Certificate for D5GHzV2 - SN 1075
- 15.13. Calibration Certificate for D5GHzV2 - SN 1003