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

SAR EVALUATION REPORT

(Class II Permissive Change)

For
GSM & W-CDMA Phone + BT

Model: LG440G
FCC ID: ZNFLG440G

Report Number: 12U14489-3A
Issue Date: 9/10/2012

LG440G
Prepared for
LG ELECTRONICS MOBILECOMM U.S.A., INC.
1000 SYLVAN AVE.
ENGLEWOOD CLIFFS, NJ 07632

Prepared by
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	7/25/2012	Initial Issue	--
A	9/10/2012	Updated Measuring instrument calibration list: 1. Added additional Signal Generator of HP, 8660B 2. Added additional Thermometer of ERTCO, 639-1S, SN 8350	Sunny Shih

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1. Attestation of Test Results

Applicant	LG ELECTRONICS MOBILECOMM U.S.A., INC.		
DUT description	GSM & W-CDMA Phone +BT		
Model	LG440G		
Test device is	An identical prototype		
Device category	Portable		
Exposure category	General Population/Uncontrolled Exposure		
Date tested	6/25/2012 – 7/23/2012		
FCC Rule Parts	Freq. Range	Highest 1-g SAR	Limit
22	824-849 MHz	Head: 0.673 W/kg (Left Touch) Body: 0.581 W/kg (Rear w/ 15mm distance)	1.6 W/kg
24	1850-1910 MHz	Head: 0.765 W/kg (Left Touch) Body: 0.229 W/kg (Rear w/ 15 mm distance)	
Applicable Standards			Test Results
FCC OET Bulletin 65 Supplement C 01-01, IEEE Std 1528-2003 and 1528a-2005			Pass

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.

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.

Approved & Released For UL CCS By:

Sunny Shih
Engineering Leader
UL CCS

Tested By:

Elijah Garcia
SAR 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 & 1528a-2005 and the following KDB Procedures:

- 648474 D01 SAR Handsets Multi Xmiter and Ant, v01r05
- 941225 D01 SAR test for 3G devices v02
- 941225 D03 SAR Test Reduction GSM GPRS EDGE v01

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	MY48360228	11	28	2012
ESA Series Network Analyzer	Agilent	E5071B	MY42100131	2	11	2013
Synthesized Signal Generator	HP	83732B	US34490599	7	14	2012
Synthesized Signal Generator	HP	8665B	3438A00633	2	22	2013
E-Field Probe	SPEAG	EX3DV4	3772	2	16	2013
E-Field Probe	SPEAG	EX3DV4	3686	2	16	2013
Thermometer	ERTCO	639-1S	1718	7	19	2012
Thermometer	ERTCO	639-1S	8350*	7	30	2013
Data Acquisition Electronics	SPEAG	DAE4	1258	3	8	2013
Data Acquisition Electronics	SPEAG	DAE4	1259	2	13	2013
System Validation Dipole	SPEAG	D835V2	4d002	3	6	2013
System Validation Dipole	SPEAG	D1900V2	5d043	11	10	2012
Power Meter	HP	437B	3125U16345	5	22	2013
Power Sensor	HP	8481A	2702A60780	5	22	2013
Amplifier	MITEQ	4D00400600-50-30P	1620606	N/A		
Directional coupler	Werlatone	C8060-102	2141	N/A		

Note(s):

*: UL CCS has adopted two year calibration intervals for Thermometer, ERTCO, type 639-1S, SN: 3686.

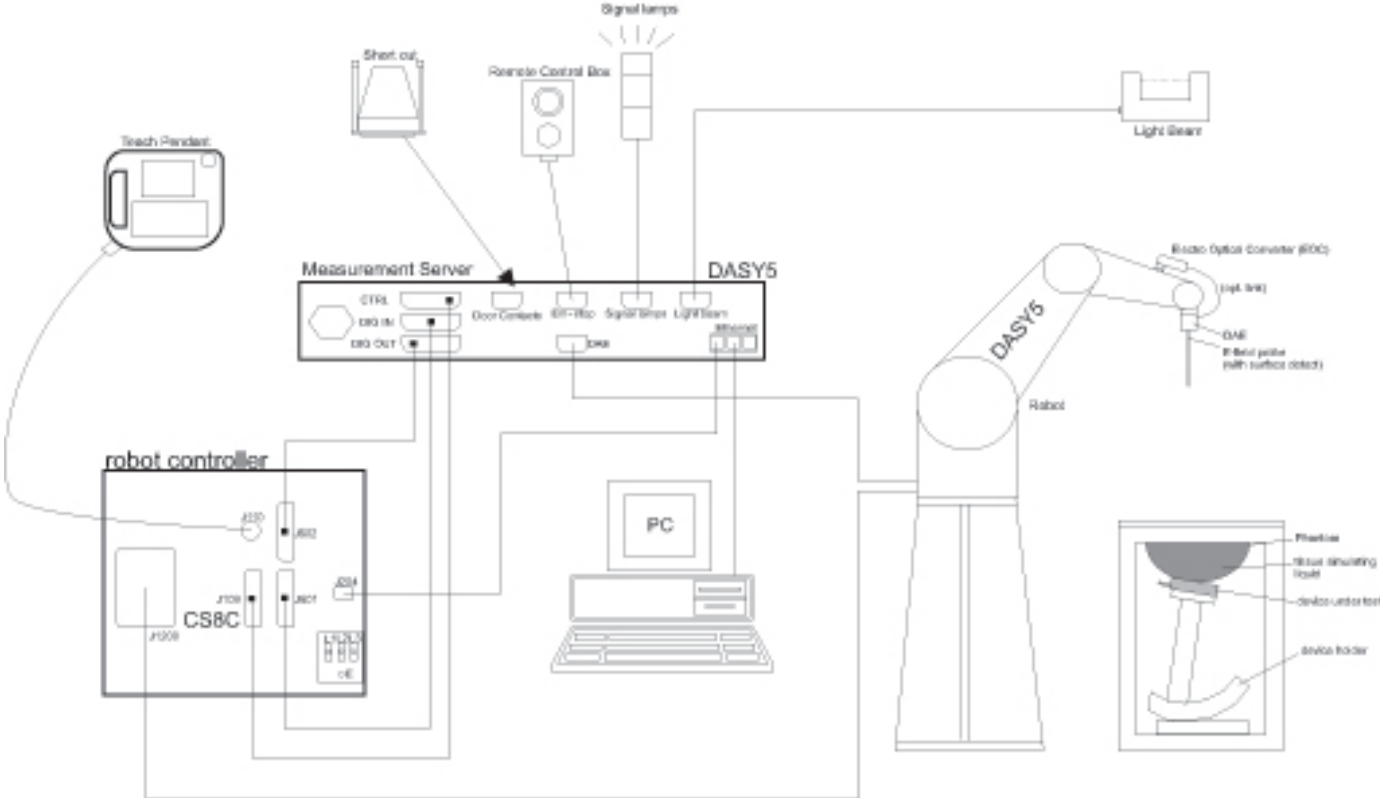
4.2. Measurement Uncertainty

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

Component	Error, %	Distribution	Divisor	Sensitivity	U (Xi), %
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	**-4.51**	Normal	1	0.64	-2.89
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.6	1.73
Liquid Permittivity - measurement uncertainty	**-4.54**	Normal	1	0.6	-2.72
				Combined Standard Uncertainty Uc(y) =	10.52
				Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =	21.04 %
				Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =	1.66 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 with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- 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 Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- 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.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.

The phantom, the device holder and other accessories a

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 ≥ 7x7x9 (above 4.5 GHz) or 5x5x7 (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 ≥ 7x7x9 (above 4.5 GHz) or 5x5x7 (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 & W-CDMA Phone + BT Model: LG440G	
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 (Rx only) - W-CDMA Rel 99, HSDPA (Rel 5, CAT 8), HSUPA (Not supported) - Bluetooth Ver 2.1 with EDR
Tx Frequency Ranges	- GSM850: 824 - 849 MHz - GSM1900: 1850 - 1910 MHz - W-CDMA Band V: 824 - 849 MHz - W-CDMA Band II: 1850 - 1910 MHz - Bluetooth: 2402 - 2480 MHz

7.2. Simultaneous Transmission

No.	Conditions
1	GSM850 Voice + BT
2	GSM1900 Voice + BT
3	GSM850 GPRS + BT
4	GSM1900 GPRS + BT
5	W-CDMA Band V+ BT
6	W-CDMA Band II+ BT

Notes:

1. EGPRS is Rx only

7.3. Hotspot (Wireless router) Exposure Condition

The device is not capable of personal hotspot mode.

8. Summary of Test Configurations

Refer to Section 17 “Antenna Location and Separation Distances” for the specific details of the antenna-to-antenna distances and Section 18 “Setup Photos” for the details of the test positions.

8.1. Head Test Configuration

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

8.2. Body-worn Accessory Test Configuration

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

9. RF Output Power Measurement

9.1. GSM850

Target Power: 32.5 dBm
Tune-up Tolerance: -1.5 dB / +0.7 dB

GMSK (Voice) Mode

Band	Ch No.	Freq. (MHz)	Avg burst Pwr (dBm)
850	128	824.2	33.0
	190	836.6	33.0
	251	848.8	33.0

Target Power:
GPRS 1 slot 32.5 dBm
GPRS 2 slot 30.0 dBm
Tune-up Tolerance: -1.5 dB / +0.7 dB

GMSK (GPRS) Mode - Coding Scheme: CS1

Band	Ch No.	Freq. (MHz)	Avg burst Pwr (dBm)			
			1 slot	Frame Avg Pwr	2 slots	Frame Avg Pwr
850	128	824.2	33.0	24.0	30.4	**24.4**
	190	836.6	33.0	23.9	30.4	**24.4**
	251	848.8	33.0	24.0	30.4	**24.4**

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

8PSK (EGPRS) Mode - Coding Scheme: MCS5
This mode is Rx only

9.2. GSM1900

Target Power: 29.5 dBm
Tune-up Tolerance: -1.5 dB / +0.7 dB

GMSK (Voice) Mode

Band	Ch No.	Freq. (MHz)	Avg burst Pwr (dBm)
1900	512	1850.2	30.1
	661	1880.0	30.0
	810	1909.8	30.1

Target Power:
GPRS 1 slot 29.5 dBm
GPRS 2 slot 27.5 dBm
Tune-up Tolerance: -1.5 dB / +0.7 dB

GMSK (GPRS) Mode - Coding Scheme: CS1

Band	Ch No.	Freq. (MHz)	Avg burst Pwr (dBm)			
			1 slot	Frame Avg Pwr	2 slots	Frame Avg Pwr
1900	512	1850.2	30.1	21.1	28.0	**22.0**
	661	1880.0	30.0	21.0	27.9	**21.9**
	810	1909.8	30.1	21.1	27.8	**21.7**

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

8PSK (EGPRS) Mode - Coding Scheme: MCS5
N/A: This mode is Rx only

9.3. W-CDMA (UMTS) Band V

Target Power: 23.0 dBm
Tune-up Tolerance: -1.5 dB / +0.7 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
	βc/βd	8/15

Output power table

Band	Ch No.	Freq. (MHz)	Avg Pwr (dBm)
850 (Band V)	4132	826.4	23.7
	4183	836.6	23.4
	4233	846.6	23.6

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			
	βc	2/15	12/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	βc/βd	2/15	12/15	15/8	15/4
	βhs	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			
	Ahs =βhs/βc	30/15			

Output power table

Band	Subtest	Ch No.	Freq. (MHz)	Avg Pwr (dBm)
850 (Band V)	1	4132	826.4	23.7
		4183	836.6	23.4
		4233	846.6	23.7
	2	4132	826.4	23.8
		4183	836.6	23.3
		4233	846.6	23.8
	3	4132	826.4	23.6
		4183	836.6	23.2
		4233	846.6	23.5
	4	4132	826.4	23.6
		4183	836.6	23.3
		4233	846.6	23.5

9.4. W-CDMA (UMTS) Band II

Target Power: 22.5 dBm
Tune-up Tolerance: -1.5 dB / +0.7 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
	βc/βd	8/15

Output power table

Band	Ch No.	Freq. (MHz)	Avg Pwr (dBm)
1900 (Band II)	9262	1852.4	22.8
	9400	1880.0	23.1
	9538	1907.6	23.1

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			
	βc	2/15	12/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	βc/βd	2/15	12/15	15/8	15/4
	βhs	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			
	Ahs =βhs/βc	30/15			

Output power table

Band	Subtest	Ch No.	Freq. (MHz)	Avg Pwr (dBm)
1900 (Band II)	1	9262	1852.4	22.8
		9400	1880.0	23.2
		9538	1907.6	23.0
	2	9262	1852.4	22.8
		9400	1880.0	23.2
		9538	1907.6	23.0
	3	9262	1852.4	22.6
		9400	1880.0	22.9
		9538	1907.6	22.6
	4	9262	1852.4	22.6
		9400	1880.0	22.9
		9538	1907.6	22.8

9.5. Bluetooth

Mode	Channel #	Freq. (MHz)	Conducted Avg Power	
			(dBm)	(mW)
GFSK	0	2402	7.62	5.78
	39	2441	8.00	6.31
	78	2480	8.15	6.53
QPSK	0	2402	6.15	4.12
	39	2441	6.56	4.53
	78	2480	6.69	4.67
8PSK	0	2402	6.10	4.07
	39	2441	6.45	4.42
	78	2480	6.64	4.61

Note(s):

According to KDB 648474, Table 2, Unlicensed transmitters
When there is simultaneous transmission, Stand-alone SAR not required due to

☒ Output ≤ 2 · P_{Ref} (13.8dBm / 24 mW) and antenna is ≥ 5.0 cm from other antennas
☒ Output ≤ P_{Ref} (10.79dBm / 12 mW)

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

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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

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 ±(%)
6/25/2012	Head 835	e'	41.7860	Relative Permittivity (ϵ_r):	41.79	41.50	0.69	5
		e''	18.6857	Conductivity (σ):	0.87	0.90	-3.61	5
	Head 825	e'	41.5256	Relative Permittivity (ϵ_r):	41.53	41.58	-0.12	5
		e''	18.7114	Conductivity (σ):	0.86	0.90	-4.51	5
	Head 850	e'	41.1784	Relative Permittivity (ϵ_r):	41.18	41.50	-0.77	5
		e''	18.6617	Conductivity (σ):	0.88	0.92	-3.61	5
6/25/2012	Head 1900	e'	39.9724	Relative Permittivity (ϵ_r):	39.97	40.00	-0.07	5
		e''	13.2934	Conductivity (σ):	1.40	1.40	0.31	5
	Head 1850	e'	40.1782	Relative Permittivity (ϵ_r):	40.18	40.00	0.45	5
		e''	13.1451	Conductivity (σ):	1.35	1.40	-3.42	5
	Head 1880	e'	40.0453	Relative Permittivity (ϵ_r):	40.05	40.00	0.11	5
		e''	13.2339	Conductivity (σ):	1.38	1.40	-1.19	5
	Head 1910	e'	39.9354	Relative Permittivity (ϵ_r):	39.94	40.00	-0.16	5
		e''	13.3156	Conductivity (σ):	1.41	1.40	1.01	5
6/26/2012	Body 835	e'	52.8077	Relative Permittivity (ϵ_r):	52.81	55.20	-4.33	5
		e''	20.7114	Conductivity (σ):	0.96	0.97	-0.87	5
	Body 820	e'	52.9635	Relative Permittivity (ϵ_r):	52.96	55.28	-4.19	5
		e''	20.7675	Conductivity (σ):	0.95	0.97	-2.23	5
	Body 850	e'	52.6512	Relative Permittivity (ϵ_r):	52.65	55.16	-4.54	5
		e''	20.6619	Conductivity (σ):	0.98	0.99	-1.07	5
6/26/2012	Body 1900	e'	50.9221	Relative Permittivity (ϵ_r):	50.92	53.30	-4.46	5
		e''	14.2189	Conductivity (σ):	1.50	1.52	-1.17	5
	Body 1850	e'	51.0994	Relative Permittivity (ϵ_r):	51.10	53.30	-4.13	5
		e''	14.0461	Conductivity (σ):	1.44	1.52	-4.94	5
	Body 1880	e'	50.9875	Relative Permittivity (ϵ_r):	50.99	53.30	-4.34	5
		e''	14.1506	Conductivity (σ):	1.48	1.52	-2.68	5
	Body 1910	e'	50.8908	Relative Permittivity (ϵ_r):	50.89	53.30	-4.52	5
		e''	14.2503	Conductivity (σ):	1.51	1.52	-0.43	5
7/23/2012	Head 1900	e'	39.0071	Relative Permittivity (ϵ_r):	39.01	40.00	-2.48	5
		e''	13.3518	Conductivity (σ):	1.41	1.40	0.75	5
	Head 1850	e'	39.2346	Relative Permittivity (ϵ_r):	39.23	40.00	-1.91	5
		e''	13.2460	Conductivity (σ):	1.36	1.40	-2.67	5
	Head 1880	e'	39.0981	Relative Permittivity (ϵ_r):	39.10	40.00	-2.25	5
		e''	13.3481	Conductivity (σ):	1.40	1.40	-0.33	5
	Head 1910	e'	38.9677	Relative Permittivity (ϵ_r):	38.97	40.00	-2.58	5
		e''	13.5554	Conductivity (σ):	1.44	1.40	2.83	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 ±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)	Target SAR Ref. Values (mW/g)		
				1g/10g	Head	Body
D835V2	4d002	3/6/12	835	1g	9.24	9.64
				10g	6.04	6.32
D1900V2	5d043	11/10/11	1900	1g	40.8	42.0
				10g	21.16	21.96

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.						
6/25/2012	D835V2	4d002	Head	1g	9.85	9.24	6.60	±10
				10g	6.45	6.04	6.79	
6/25/2012	D1900V2	5d043	Head	1g	37.40	40.80	-8.33	±10
				10g	19.40	21.16	-8.32	
6/26/2012	D835V2	4d002	Body	1g	9.81	9.64	1.76	±10
				10g	6.45	6.32	2.06	
6/26/2012	D1900V2	5d043	Body	1g	42.40	42.00	0.95	±10
				10g	22.70	21.96	3.37	
7/23/2012	D1900V2	5d043	Head	1g	43.10	40.80	5.64	±10
				10g	22.30	21.16	5.39	

12. SAR Test Results

12.1. GSM850

12.1.1. Head SAR

Test Position	Mode	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
					1-g	10-g	
Left Touch	GMSK (Voice)	128	824.20	33.0			1
		190	836.60	33.0	**0.584**	**0.381**	
		251	848.80	33.0			1
Left Tilt (15°)	GMSK (Voice)	128	824.20	33.0			1
		190	836.60	33.0	0.197	0.153	
		251	848.80	33.0			1
Right Touch	GMSK (Voice)	128	824.20	33.0			1
		190	836.60	33.0	0.442	0.294	
		251	848.80	33.0			1
Right Tilt (15°)	GMSK (Voice)	128	824.20	33.0			1
		190	836.60	33.0	0.201	0.152	
		251	848.80	33.0			1

12.1.2. Body SAR

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
						1-g	10-g	
Rear	GPRS 2 slots	15	128	824.20	30.4			1
			190	836.60	30.4	**0.581**	**0.407**	
			251	848.80	30.4			1
Rear	GMSK (Voice)	15	190	836.60	33.0	0.515	0.361	2
Front	GPRS 2 slots	15	128	824.20	30.4			1
			190	836.60	30.4	0.137	0.100	
			251	848.80	30.4			1

Note(s):
1. 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.
2. With headset attached.

12.2. GSM1900

12.2.1. Head SAR

Test Position	Mode	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
					1-g	10-g	
Left Touch	GMSK (Voice)	512	1850.2	30.1			1
		661	1880.0	30.0	**0.765**	**0.442**	
		810	1909.8	30.1			1
Left Tilt (15°)	GMSK (Voice)	512	1850.2	30.1			1
		661	1880.0	30.0	0.042	0.026	
		810	1909.8	30.1			1
Right Touch	GMSK (Voice)	512	1850.2	30.1			1
		661	1880.0	30.0	0.235	0.150	
		810	1909.8	30.1			1
Right Tilt (15°)	GMSK (Voice)	512	1850.2	30.1			1
		661	1880.0	30.0	0.035	0.022	
		810	1909.8	30.1			1

12.2.2. Body SAR

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
Rear	GPRS 2 slots	15	512	1850.2	28.0			1
			661	1880.0	27.9	**0.124**	**0.079**	
			810	1909.8	27.8			1
Rear	GMSK (Voice)	15	661	1880.0	30.0	0.085	0.049	2
Front	GPRS 2 slots	15	512	1850.2	28.0			1
			661	1880.0	27.9	0.067	0.042	
			810	1909.8	27.8			1

Note(s):

1. 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.
2. With headset attached.

12.3. WCDMA (UMTS) Band V

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 SAR

Test Position	Mode	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
					1-g	10-g	
Left Touch	Rel 99 RMC 12.2kbps	4132	826.4	23.7			1
		4183	836.6	23.4	**0.673**	**0.452**	
		4233	846.6	23.6			1
Left Tilt (15°)	Rel 99 RMC 12.2kbps	4132	826.4	23.7			1
		4183	836.6	23.4	0.278	0.212	
		4233	846.6	23.6			1
Right Touch	Rel 99 RMC 12.2kbps	4132	826.4	23.7			1
		4183	836.6	23.4	0.594	0.394	
		4233	846.6	23.6			1
Right Tilt (15°)	Rel 99 RMC 12.2kbps	4132	826.4	23.7			1
		4183	836.6	23.4	0.291	0.221	
		4233	846.6	23.6			1

12.3.2. Body SAR

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
						1-g	10-g	
Rear	Rel 99 RMC 12.2kbps	15	4132	826.4	23.7			1
			4183	836.6	23.4	0.365	0.259	
			4183	836.6	23.4	**0.370**	**0.261**	2
			4233	846.6	23.6			1
Front	Rel 99 RMC 12.2kbps	15	4132	826.4	23.7			1
			4183	836.6	23.4	0.122	0.088	
			4233	846.6	23.6			1

Note(s):

1. 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.
2. With headset attached.

12.4. WCDMA (UMTS) Band II

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

12.4.1. Head SAR

Test Position	Mode	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
					1-g	10-g	
Left Touch	Rel 99 RMC 12.2kbps	9262	1852.4	22.8			1
		9400	1880.0	23.1	**0.611**	**0.374**	
		9538	1907.6	23.1			1
Left Tilt (15°)	Rel 99 RMC 12.2kbps	9262	1852.4	22.8			1
		9400	1880.0	23.1	0.075	0.047	
		9538	1907.6	23.1			1
Right Touch	Rel 99 RMC 12.2kbps	9262	1852.4	22.8			1
		9400	1880.0	23.1	0.501	0.318	
		9538	1907.6	23.1			1
Right Tilt (15°)	Rel 99 RMC 12.2kbps	9262	1852.4	22.8			1
		9400	1880.0	23.1	0.063	0.040	
		9538	1907.6	23.1			1

12.4.2. Body SAR

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
						1-g	10-g	
Rear	Rel 99 RMC 12.2kbps	15	9262	1852.4	22.8			1
			9400	1880.0	23.1	**0.229**	**0.147**	
			9400	1880.0	23.1	0.195	0.125	2
			9538	1907.6	23.1			1
Front	Rel 99 RMC 12.2kbps	15	9262	1852.4	22.8			1
			9400	1880.0	23.1	0.142	0.090	
			9538	1907.6	23.1			1

Note(s):

1. 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.
2. 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 (W/kg)
GSM850	Head	Left Touch	GMSK (Voice)	0.584
	Body	Rear	GPRS 2 slots	**0.581**
GSM1900	Head	Left Touch	GMSK (Voice)	**0.765**
	Body	Rear	GPRS 2 slots	0.124
W-CDMA Band V	Head	Left Touch	Rel99 (RMC, 12.2 kbps)	**0.673**
	Body	Rear w/ headset attached	Rel99 (RMC, 12.2 kbps)	0.370
W-CDMA Band II	Head	Left Touch	Rel99 (RMC, 12.2 kbps)	0.611
	Body	Rear	Rel99 (RMC, 12.2 kbps)	**0.229**

13.1. Scaled SAR Values to the Maximum tune-up Tolerances

The following measured results were scaled to the maximum tune-up tolerance, according to the output power of the channel tested for the highest measured results in each frequency band.

Test Configuration		Mode	Ch #.	Freq. (MHz)	Power (dBm)		SAR (W/kg)	
					Max. tune-up limit	Measured	Measured	Scaled
Head	Left Touch	GSM850	190	836.6	33.2	33.0	0.584	0.612
Body	Rear	GSM850(GPRS)	190	836.6	30.7	30.4	0.581	0.623
Head	Left Touch	GSM1900	661	1880.0	30.2	30.0	0.765	0.801
Body	Rear	GSM1900 (GPRS)	661	1880.0	28.2	27.9	0.124	0.133
Head	Left Touch	W-CDMA BAND V	4183	836.6	23.7	23.4	0.673	0.721
Body	Rear w/ headset	W-CDMA BAND V	4183	836.6	23.7	23.4	0.370	0.396
Head	Left Touch	W-CDMA BAND II	9400	1880.0	23.2	23.1	0.611	0.625
Body	Rear	W-CDMA BAND II	9400	1880.0	23.2	23.1	0.229	0.234

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

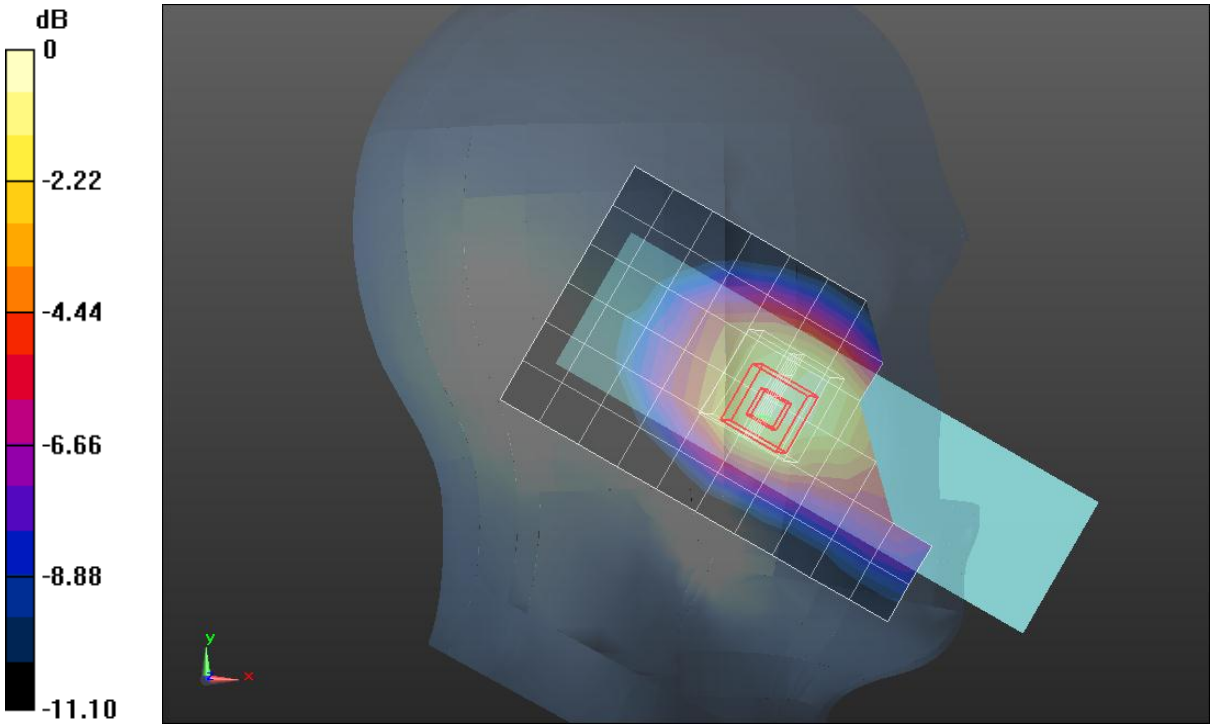
Test Laboratory: UL CCS SAR Lab A
Date: 6/25/2012

GSM850

Frequency: 836.6 MHz; Duty Cycle: 1:8; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.87 mho/m; ε_r = 41.355; ρ = 1000 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 Sn1258; Calibrated: 3/8/2012
- Probe: EX3DV4 - SN3772; ConvF(8.67, 8.67, 8.67); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM v5.0 (B); Type: QD000P40CD; Serial: 1628

Left Touch_GSM ch 190/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.604 mW/g

Left Touch_GSM ch 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 26.740 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 0.8800
SAR(1 g) = 0.584 mW/g; SAR(10 g) = 0.381 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.721 mW/g



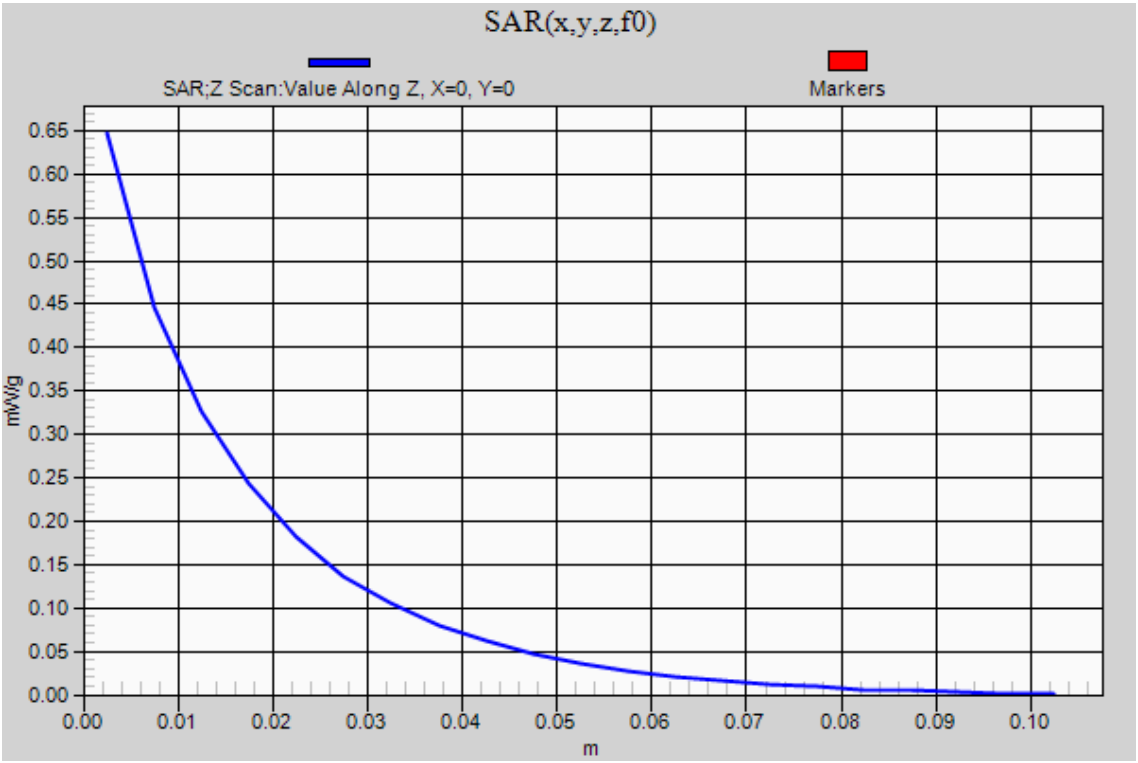
0 dB = 0.720mW/g = -2.85 dB mW/g

Test Laboratory: UL CCS SAR Lab A
Date: 6/25/2012

GSM850

Frequency: 836.6 MHz; Duty Cycle: 1:8

Left Touch_GSM 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) = 0.647 mW/g



Test Laboratory: UL CCS SAR Lab A Date: 6/26/2012

GSM850

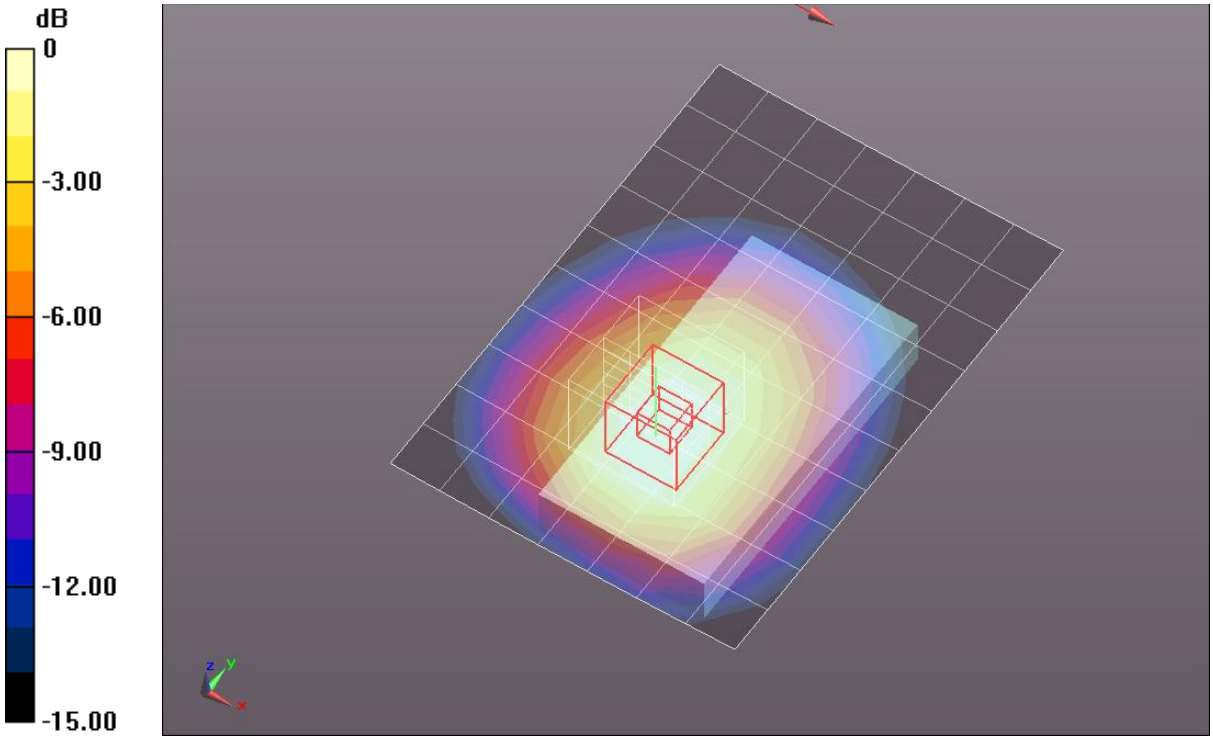
Frequency: 836.6 MHz; Duty Cycle: 1:4.00037; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.964 mho/m; ε_r = 52.789; ρ = 1000 kg/m^3
DASY5 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1258; Calibrated: 3/8/2012
- Probe: EX3DV4 - SN3772; ConvF(8.89, 8.89, 8.89); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (A); Type: QDOVA001BB; Serial: 1120

Rear/GPRS 2 Slots/Ch 190/Area Scan (8x11x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.647 mW/g

Rear/GPRS 2 Slots/Ch 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 26.080 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.7700
SAR(1 g) = 0.581 mW/g; SAR(10 g) = 0.407 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.669 mW/g



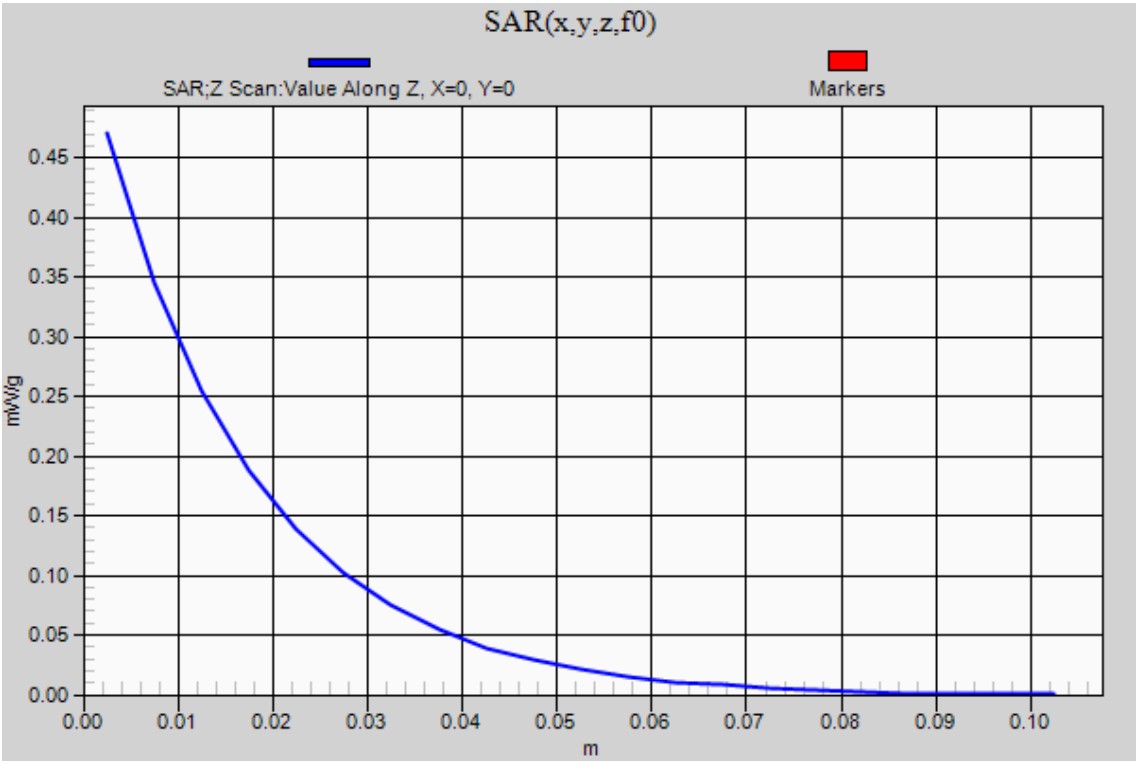
0 dB = 0.670mW/g = -3.48 dB mW/g

Test Laboratory: UL CCS SAR Lab A
Date: 6/26/2012

GSM850

Frequency: 836.6 MHz; Duty Cycle: 1:4

Rear/GPRS 2 Slots/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) = 0.470 mW/g



Test Laboratory: UL CCS SAR Lab B Date: 7/23/2012

GSM1900

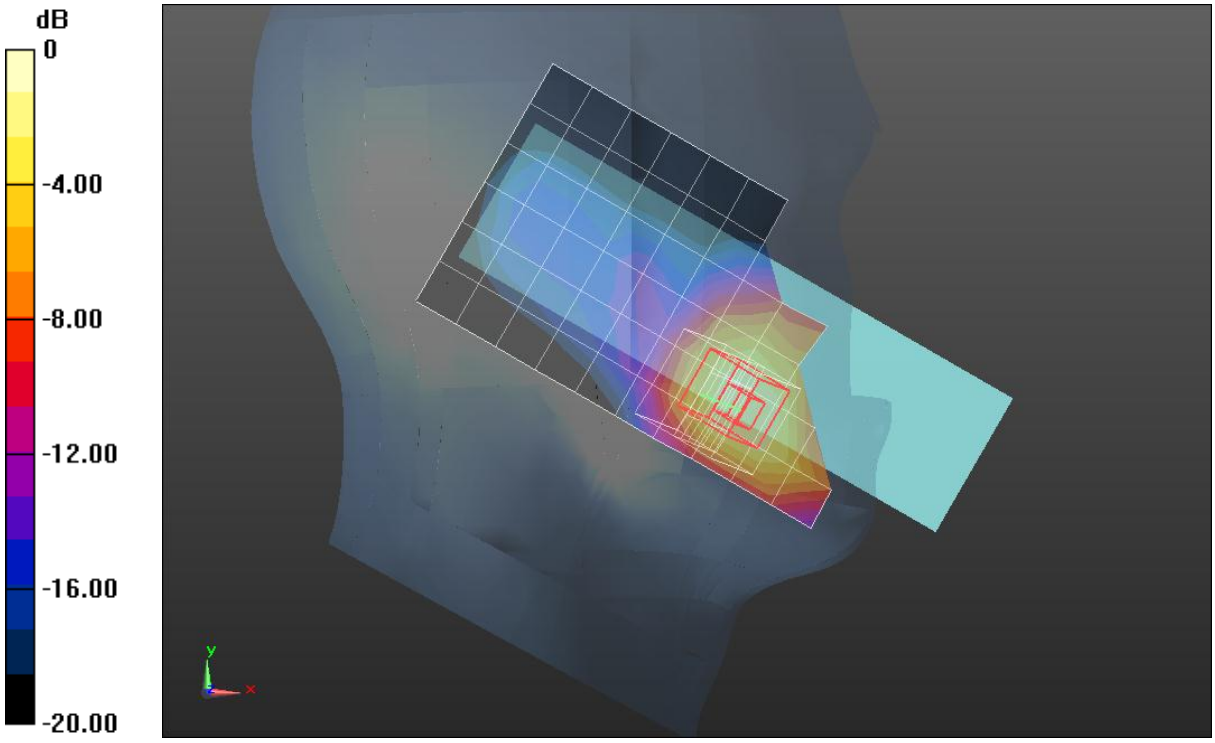
Frequency: 1880 MHz; Duty Cycle: 1:8.00018; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used: f = 1880 MHz; σ = 1.396 mho/m; ε_r = 39.098; ρ = 1000 kg/m^3
DASY5 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater 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

Left Touch_GSM ch 661/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.748 mW/g

Left Touch_GSM ch 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 23.567 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.2450
SAR(1 g) = 0.765 mW/g; SAR(10 g) = 0.442 mW/g
Maximum value of SAR (measured) = 0.986 mW/g



0 dB = 0.990mW/g = -0.09 dB mW/g

Test Laboratory: UL CCS SAR Lab B Date: 7/23/2012

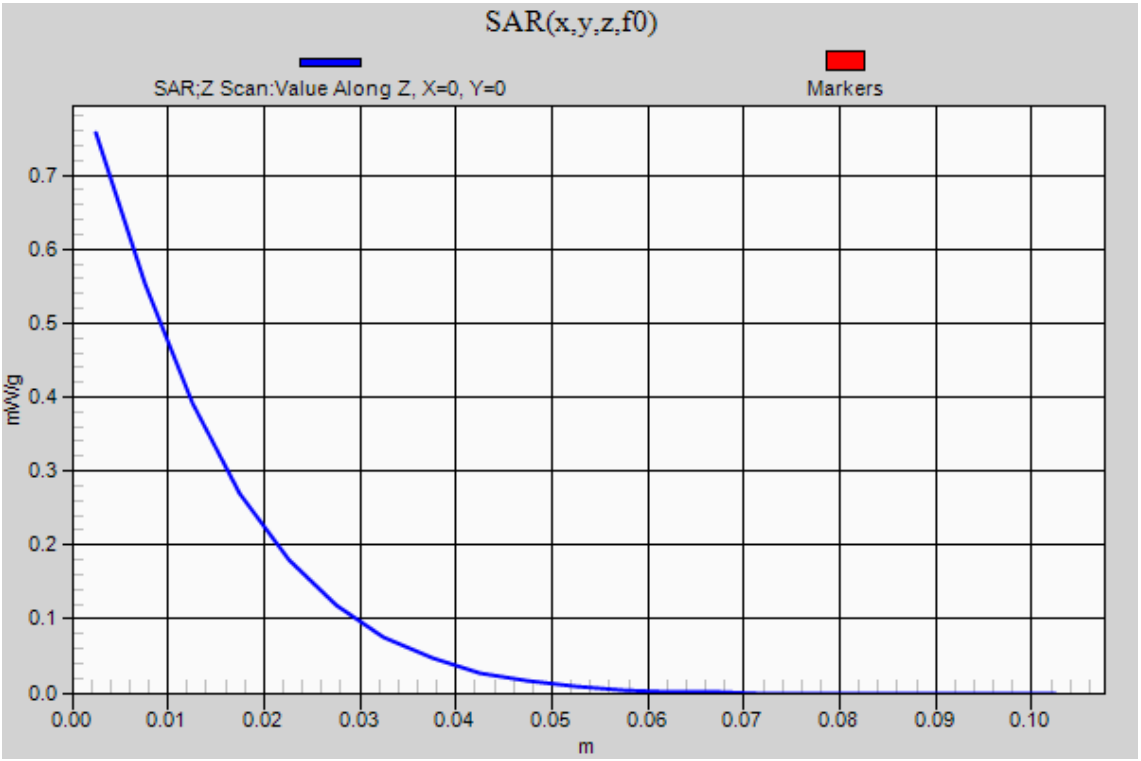
GSM1900

Frequency: 1880 MHz; Duty Cycle: 1:8.00018

Left Touch_GSM ch 661/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.748 mW/g

Left Touch_GSM ch 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.567 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.2450
SAR(1 g) = 0.765 mW/g; SAR(10 g) = 0.442 mW/g
Maximum value of SAR (measured) = 0.986 mW/g

Left Touch_GSM ch 661/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.757 mW/g



Test Laboratory: UL CCS SAR Lab A Date: 6/26/2012

GSM1900

Frequency: 1880 MHz; Duty Cycle: 1:4; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used: f = 1880 MHz; σ = 1.48 mho/m; ε_r = 50.987; ρ = 1000 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 Sn1258; Calibrated: 3/8/2012
- Probe: EX3DV4 - SN3772; ConvF(7.23, 7.23, 7.23); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (B); Type: QDOVA001BB; Serial: 1099

Rear/GPRS 2 Slots/Ch 661/Area Scan (8x11x1): Measurement grid: dx=15mm, dy=15mm

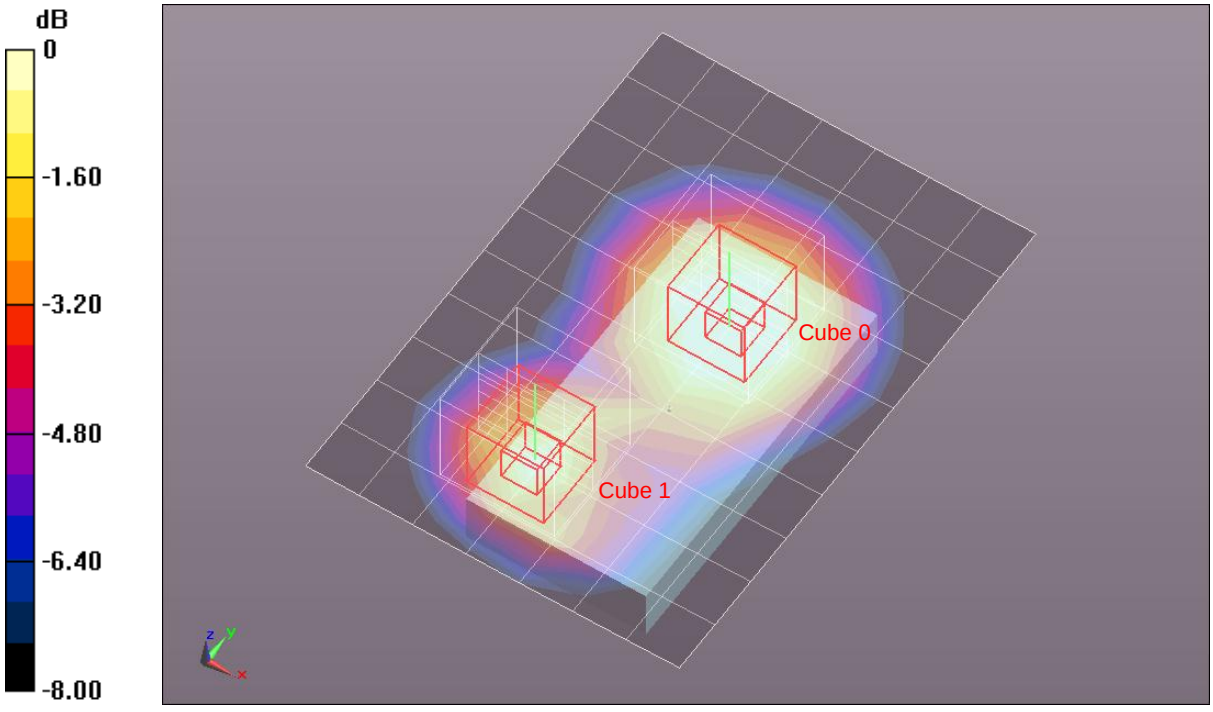
Maximum value of SAR (measured) = 0.153 mW/g

Rear/GPRS 2 Slots/Ch 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 10.263 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 0.1830
SAR(1 g) = 0.124 mW/g; SAR(10 g) = 0.079 mW/g
Maximum value of SAR (measured) = 0.150 mW/g

Rear/GPRS 2 Slots/Ch 661/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 10.263 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 0.1560
SAR(1 g) = 0.095 mW/g; SAR(10 g) = 0.055 mW/g
Maximum value of SAR (measured) = 0.121 mW/g



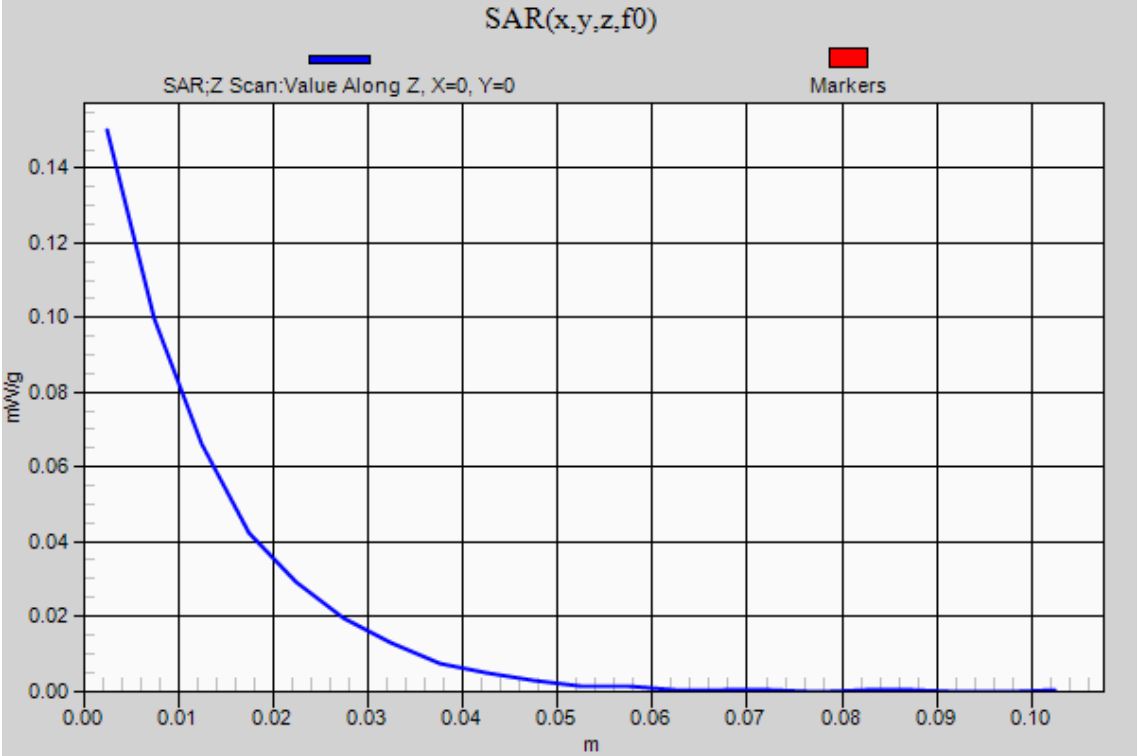
0 dB = 0.120mW/g = -18.42 dB mW/g

Test Laboratory: UL CCS SAR Lab A
Date: 6/26/2012

GSM1900

Frequency: 1880 MHz; Duty Cycle: 1:4

Rear/GPRS 2 Slots/Ch 661/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.150 mW/g



Test Laboratory: UL CCS SAR Lab A
Date: 6/25/2012

W-CDMA Band V

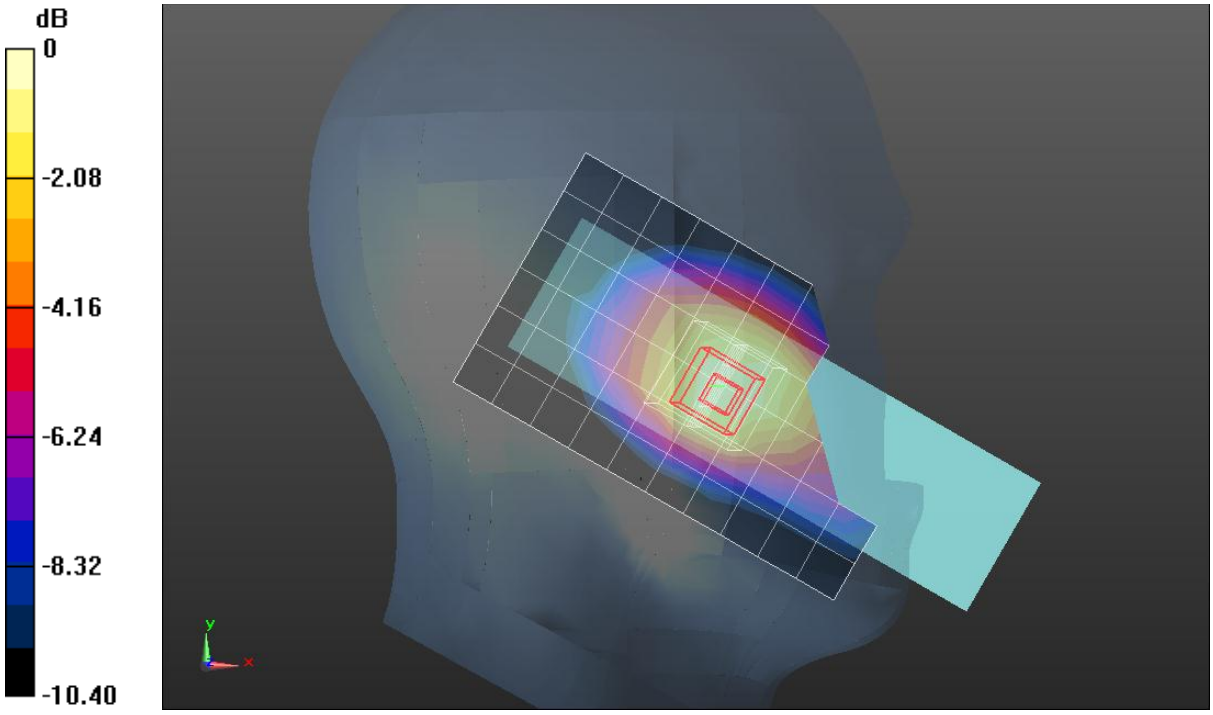
Frequency: 836.6 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.87 mho/m; ε_r = 41.355; ρ = 1000 kg/m^3
DASY5 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1258; Calibrated: 3/8/2012
- Probe: EX3DV4 - SN3772; ConvF(8.67, 8.67, 8.67); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM v5.0 (B); Type: QD000P40CD; Serial: 1628

Left Touch_R99_ch 4183/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.702 mW/g

Left Touch_R99_ch 4183/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 28.066 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 0.9770
SAR(1 g) = 0.673 mW/g; SAR(10 g) = 0.452 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.812 mW/g



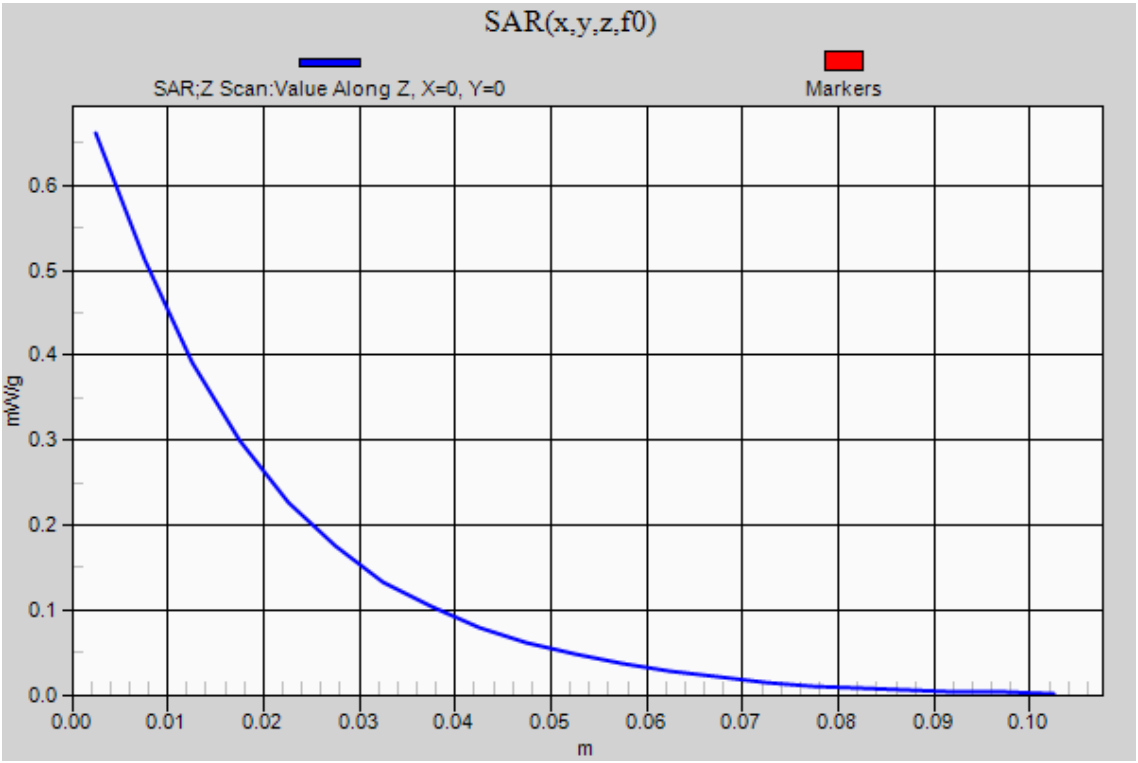
0 dB = 0.810mW/g = -1.83 dB mW/g

Test Laboratory: UL CCS SAR Lab A
Date: 6/25/2012

W-CDMA Band V

Frequency: 836.6 MHz; Duty Cycle: 1:1

Left Touch_R99_ch 4183/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.661 mW/g



Test Laboratory: UL CCS SAR Lab A Date: 6/26/2012

W-CDMA Band V

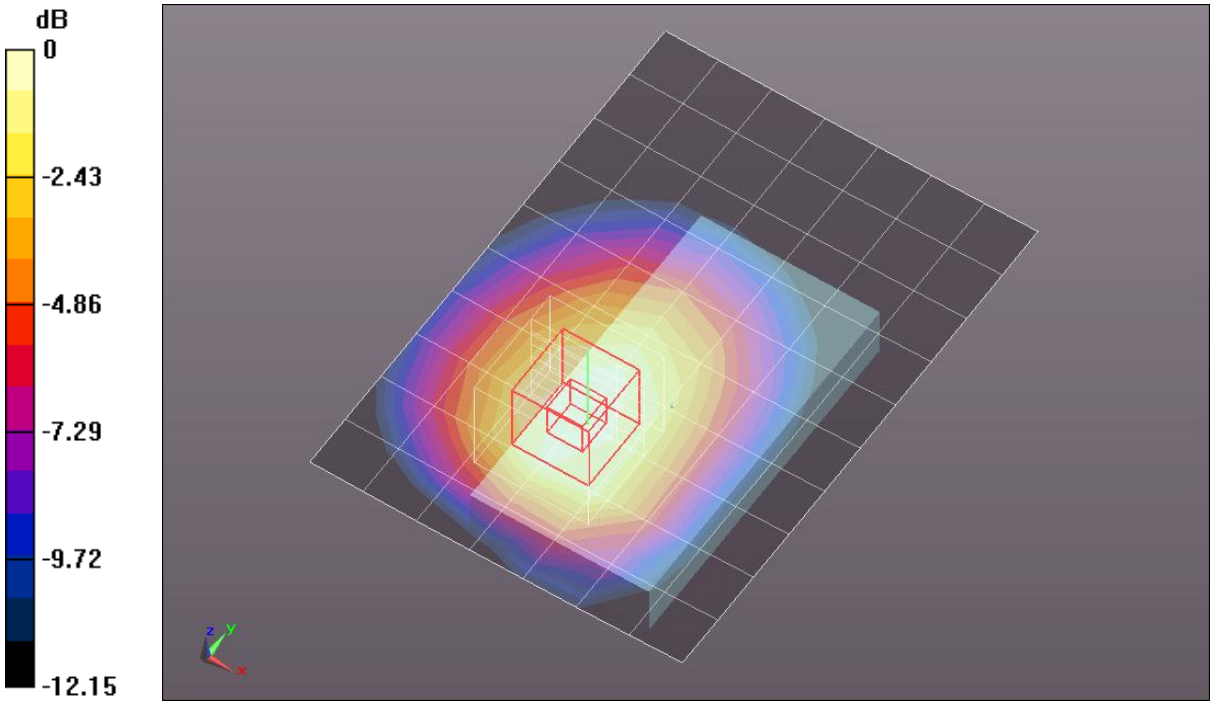
Frequency: 836.6 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.964 mho/m; ε_r = 52.789; ρ = 1000 kg/m^3
DASY5 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1258; Calibrated: 3/8/2012
- Probe: EX3DV4 - SN3772; ConvF(8.89, 8.89, 8.89); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (A); Type: QDOVA001BB; Serial: 1120

Rear/with Headset/Rel 99_RMC_12.2kbps/Ch 4183/Area Scan (8x11x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.426 mW/g

Rear/with Headset/Rel 99_RMC_12.2kbps/Ch 4183/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.260 V/m; Power Drift = 0.0022 dB
Peak SAR (extrapolated) = 0.5000
SAR(1 g) = 0.370 mW/g; SAR(10 g) = 0.261 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.421 mW/g



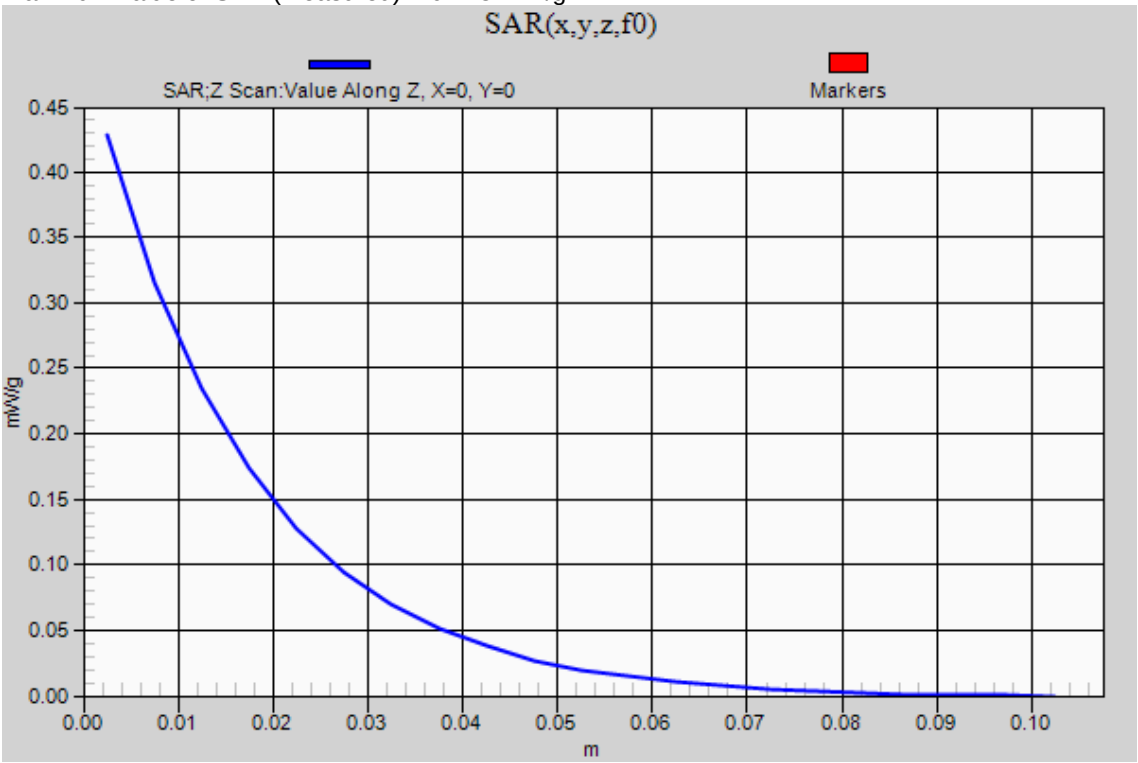
0 dB = 0.420mW/g = -7.54 dB mW/g

Test Laboratory: UL CCS SAR Lab A
Date: 6/26/2012

W-CDMA Band V

Frequency: 836.6 MHz; Duty Cycle: 1:1

Rear/with Headset/Rel 99_RMC_12.2kbps/Ch 4183/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.428 mW/g



Test Laboratory: UL CCS SAR Lab A
Date: 6/26/2012

W-CDMA Band II

Frequency: 1880 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used: f = 1880 MHz; σ = 1.384 mho/m; ε_r = 40.045; ρ = 1000 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 Sn1258; Calibrated: 3/8/2012
- Probe: EX3DV4 - SN3772; ConvF(7.59, 7.59, 7.59); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM v5.0 (A); Type: QD000P40CC; Serial: 1602

Left Touch_R99_ch 9400 2/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

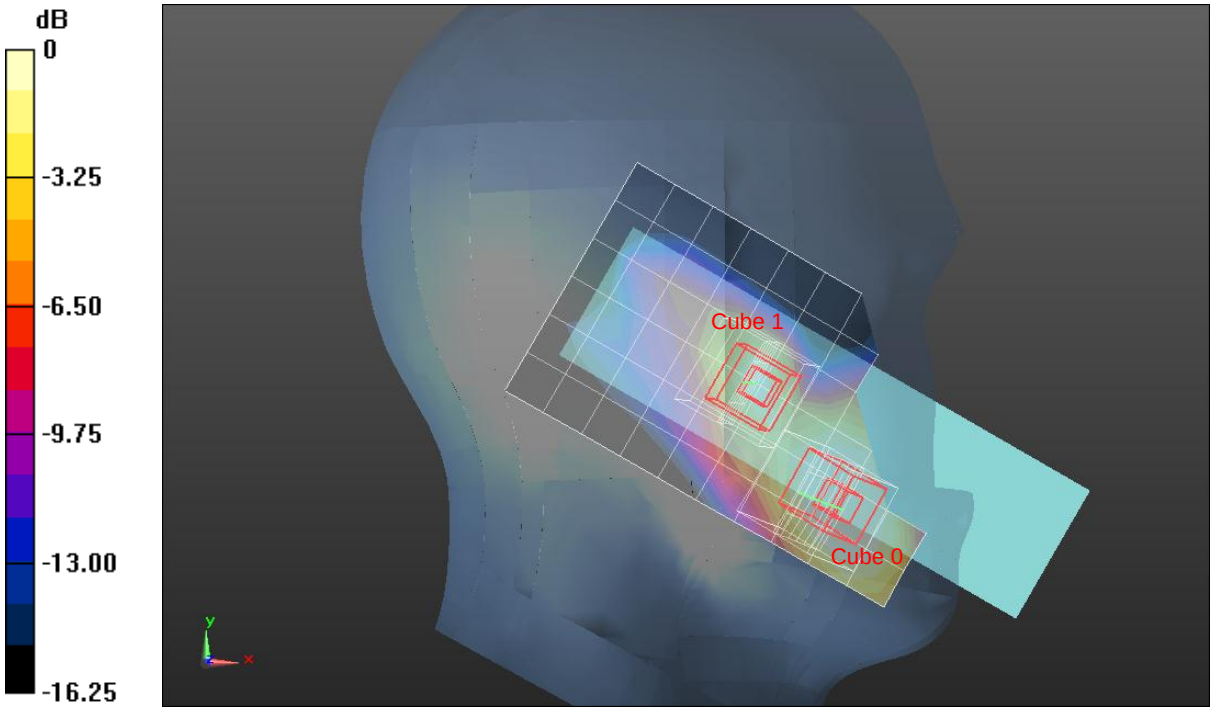
Maximum value of SAR (measured) = 0.691 mW/g

Left Touch_R99_ch 9400 2/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 22.493 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.9390
SAR(1 g) = 0.611 mW/g; SAR(10 g) = 0.374 mW/g
Maximum value of SAR (measured) = 0.751 mW/g

Left Touch_R99_ch 9400 2/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 22.493 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.6580
SAR(1 g) = 0.373 mW/g; SAR(10 g) = 0.188 mW/g
Maximum value of SAR (measured) = 0.494 mW/g



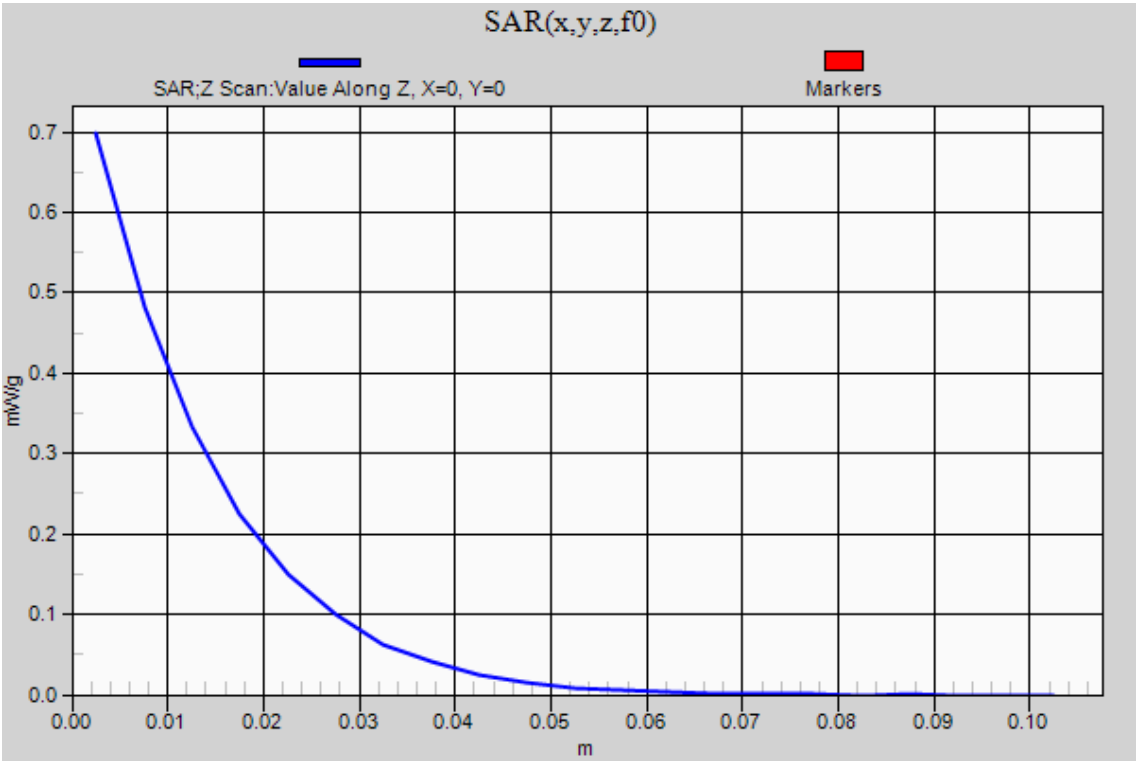
0 dB = 0.490mW/g = -6.20 dB mW/g

Test Laboratory: UL CCS SAR Lab A
Date: 6/26/2012

W-CDMA Band II

Frequency: 1880 MHz; Duty Cycle: 1:1

Left Touch_R99_ch 9400 2/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.698 mW/g



Test Laboratory: UL CCS SAR Lab A
Date: 6/26/2012

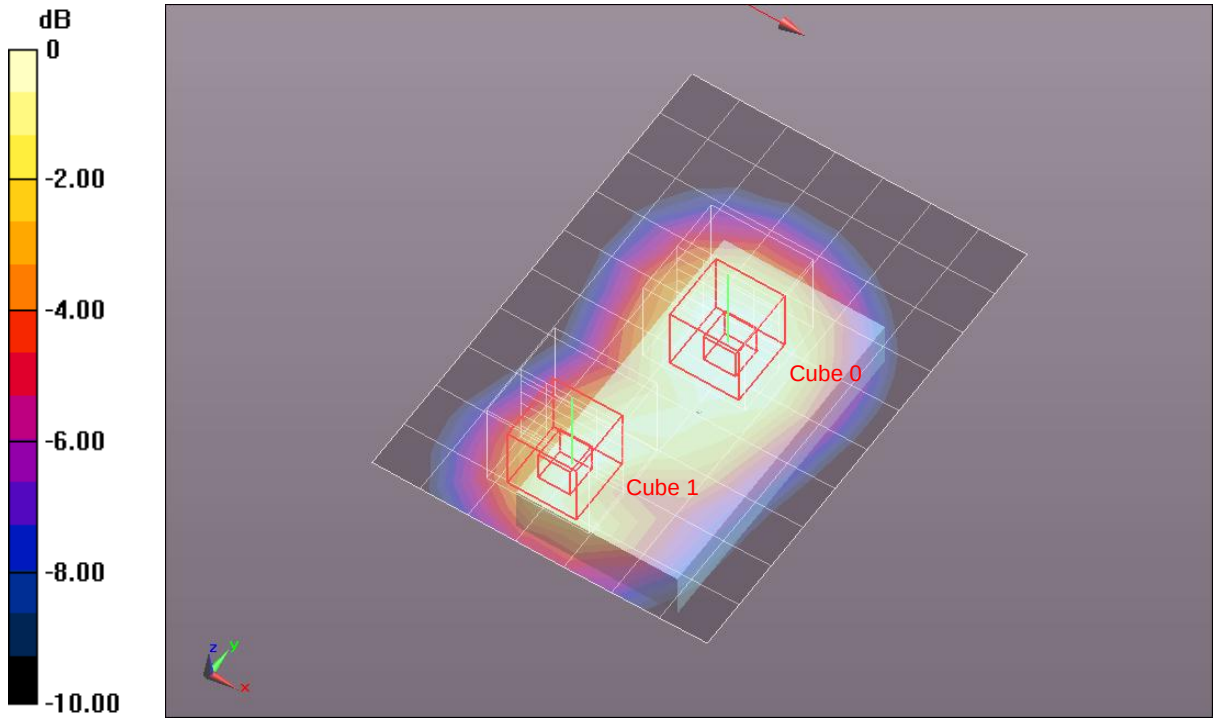
W-CDMA Band II

Frequency: 1880 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used: f = 1880 MHz; σ = 1.48 mho/m; ε_r = 50.987; ρ = 1000 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 Sn1258; Calibrated: 3/8/2012
- Probe: EX3DV4 - SN3772; ConvF(7.23, 7.23, 7.23); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (B); Type: QDOVA001BB; Serial: 1099

Rear/Rel. 99_RMC_12.2kbps/Ch 9400/Area Scan (8x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.261 mW/g

Rear/Rel. 99_RMC_12.2kbps/Ch 9400/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.494 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.3370
SAR(1 g) = 0.229 mW/g; SAR(10 g) = 0.147 mW/g
Maximum value of SAR (measured) = 0.274 mW/g

Rear/Rel. 99_RMC_12.2kbps/Ch 9400/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.494 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.3150
SAR(1 g) = 0.192 mW/g; SAR(10 g) = 0.111 mW/g
Maximum value of SAR (measured) = 0.242 mW/g



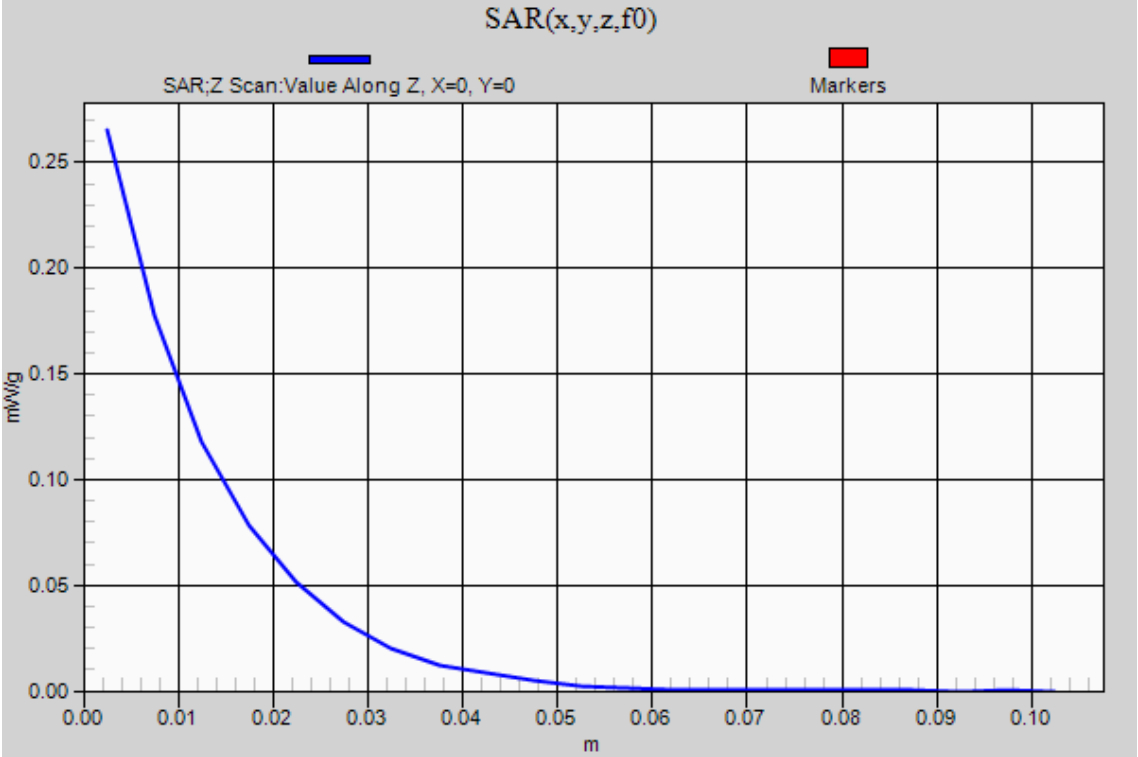
0 dB = 0.240mW/g = -12.40 dB mW/g

Test Laboratory: UL CCS SAR Lab A
Date: 6/26/2012

W-CDMA Band II

Frequency: 1880 MHz; Duty Cycle: 1:1

Rear/Rel. 99_RMC_12.2kbps/Ch 9400/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.265 mW/g



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14. Simultaneous Transmission SAR Analysis

The Bluetooth's output power is ≤ 2·P_{Ref} (13.8 dBm / 24 mW), which stand-alone SAR evaluation is not required. Therefore, simultaneous transmission SAR evaluation is not required.

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 W-CDMA Band V

15.5. SAR Test Plots for W-CDMA Band II

15.6. Calibration Certificate for E-Field Probe EX3DV4 - SN 3772

15.7. Calibration Certificate for E-Field Probe EX3DV4 - SN 3686

15.8. Calibration Certificate for D835V2 - SN 4d002

15.9. Calibration Certificate for D1900V2 - SN 5d043