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

SAR EVALUATION REPORT

For

BT3.0, 802.11 b/g/n 1X1 HT20, GSM/850/1900MHz, WCDMA/850MHz/1900MHz BAR PHONE

Model: GT-S6010L
FCC ID: A3LGTS6010L

Report Number: 12I14598-4D
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Prepared for

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Revision History

Rev.	Issue Date	Revisions	Revised By
--	9/11/2012		--
A	9/20/2012	Section 1 – Corrected SAR value from 0.772 to 0.792 and added hotspot text to FCC Part 22 results. Corrected report number from 12I14598-1 to 12I14598-4A	Dave Weaver
B	9/20/2012	Section 7.1 – Corrected Bluetooth version Section 9.6 – Corrected Simultaneous transmission exemption criteria.	Dave Weaver
C	9/20/2012	Sections 9.3 and 9.4 – Corrected HSUPA power measurements	Dave Weaver
D	9/27/2012	Removed GPRS head SAR results as voice over data is not supported in this mode	Dave Weaver

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1. Attestation of Test Results

Applicant	SAMSUNG ELECTRONICS CO., LTD.		
DUT description	BT3.0, 802.11 B/G/N 1X1 HT20, GSM/850/1900MHz, WCDMA/850MHz/1900MHz BAR PHONE		
Model	GT-S6010L		
Test device is	An identical prototype		
Device category	Portable		
Exposure category	General Population/Uncontrolled Exposure		
Date tested	8/30/2012 – 9/09/2012		
FCC Rule Parts	Freq. Range	Highest 1-g SAR	Limit
22	824-849 MHz	Head: 0.406 W/kg (LeftTouch) (GSM850) Body and Hotspot: 0.792 W/kg (Rear with 10mm distance) (W-CDMA Band V)	1.6 W/kg
24	1850-1910 MHz	Head: 0.898 W/kg (Left Touch) (W-CDMA Band II) Body & Hotspot: 1.02 W/kg (Rear with 10mm distance) (W-CDMA Band II)	
15.247	2412-2462 MHz	Head: 0.014 W/kg (Left Tilt) Body & Hotspot: 0.018 W/kg (Rear with headset & 10mm distance)	
Simultaneous Transmission Condition:		1.038 W/kg (The highest SAR across exposure conditions)	
Applicable Standards			Test Results
FCC OET Bulletin 65 Supplement C 01-01, IEEE Std 1528-2003 and IEEE Std 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:

Dave Weaver
WiSE Program Manager
UL CCS

Tested By:

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 and the following published KDB Procedures:

- 648474 D01 SAR Handsets Multi Xmiter and Ant, v01r05
- 248227 D01 SAR meas for 802 11abg v01r02
- 941225 D01 SAR test for 3G devices v02
- 941225 D03 SAR Test Reduction GSM GPRS EDGE v01
- 941225 D06 Hot Spot SAR 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	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
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		

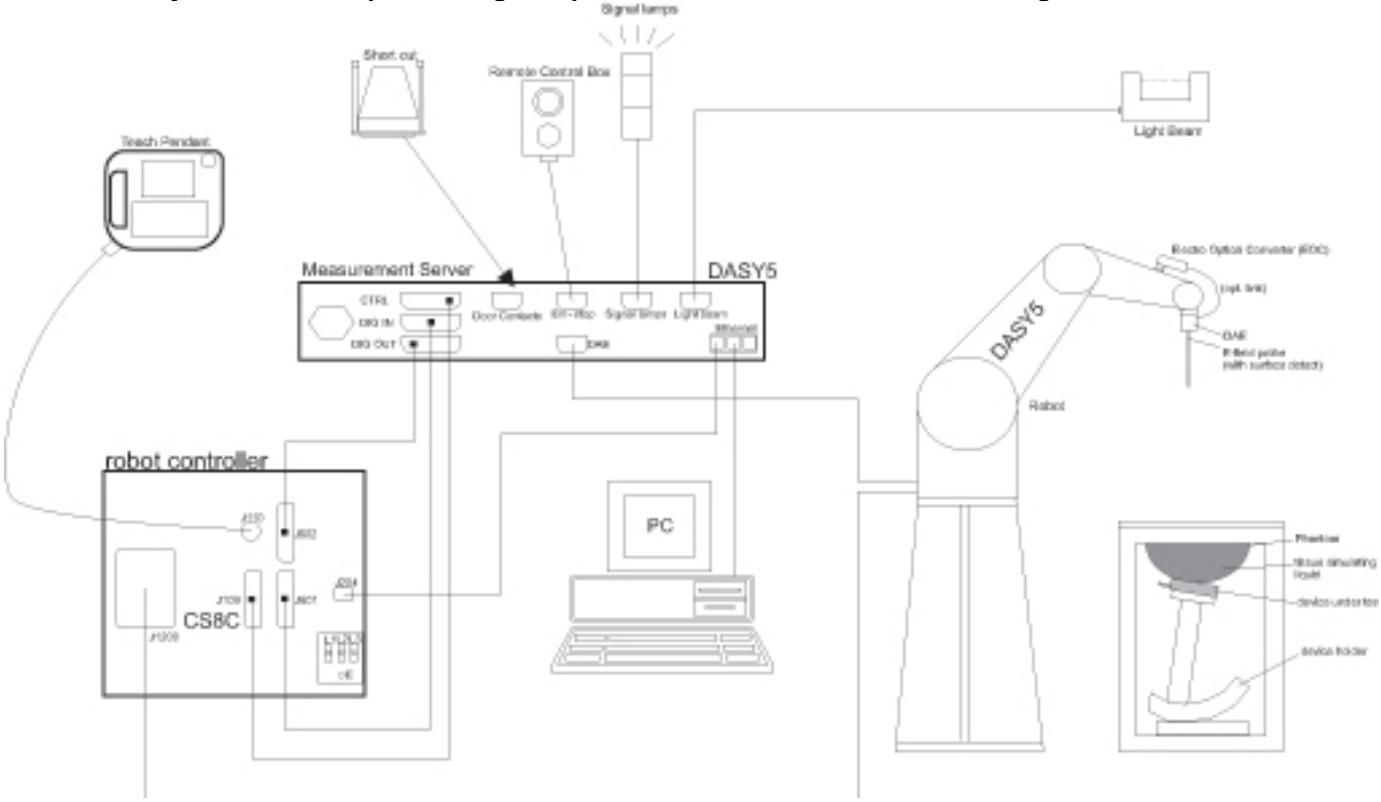
4.2. Measurement Uncertainty

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

Component	Error, %	Distribution	Divisor	Sensitivity	U (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 uncertainty	**-4.87**	Normal	1	0.64	-3.12
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.6	1.73
Liquid Permittivity - measurement uncertainty	**-3.74**	Normal	1	0.6	-2.24
Combined Standard Uncertainty Uc(y) =					10.47
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				20.94	%
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				1.65	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 according to the targeted measurement.

6. SAR Measurement Procedure

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 $\geq$ 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

BT3.0, 802.11 B/G/N 1X1 HT20, GSM/850/1900MHz, WCDMA/850MHz/1900MHz BAR PHONE Model: GT-S6010L	
Normal operation	- Held to head, - Body-worn Accessory (Rear and Front sides) with 10 mm separation distance. - Hotspot mode with 10 mm separation distance to all sides and edges.
Accessory	1. Headset

7.1. Band and Air Interfaces

Tx Frequency Bands	- GSM850: 824 - 849 MHz - GSM1900: 1850 - 1910 MHz - W-CDMA Band V: 824 - 849 MHz - W-CDMA Band II: 1850 - 1910 MHz - 802.11 b/g/n: 2412 - 2462 MHz, b / g / HT20 - Bluetooth: 2402 - 2480 MHz (Ver. 3.0 +EDR)

7.2. Hotspot (Wireless router) Exposure Condition

The device is capable of personal hotspot mode. The hotspot mode can be enabled by the user.

7.3. Simultaneous Transmission Condition

No.	Conditions	Head	Body	Hotspot
1	GSM850 GPRS + WiFi	☒	☒	☒
2	GSM1900 GPRS + WiFi	☒	☒	☒
3	W-CDMA (UMTS) Band V+ WiFi	☒	☒	☒
4	W-CDMA (UMTS) Band II+ WiFi	☒	☒	☒
5	GSM850 GPRS + BT	☒	☒	☐
6	GSM1900 GPRS + BT	☒	☒	☐
7	W-CDMA (UMTS) Band V+ BT	☒	☒	☐
8	W-CDMA (UMTS) Band II+ BT	☒	☒	☐
9	WiFi Bands+ BT	☐	☐	☐

8. Summary of Test Configurations

Refer to Section 17 “Antenna Location and Separation Distances” for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

8.1. Head Exposure Conditions for WWAN (Ant.) and Wi-Fi/BT (Ant.)

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

8.2. Body-worn Accessory Exposure Conditions for WWAN (Ant.) and Wi-Fi/BT (Ant.)

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	< 25 mm	Yes	
Front	< 25 mm	Yes	

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

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	< 25 mm	Yes	
Front	< 25 mm	Yes	
Edge 1	> 25 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	< 25 mm	Yes	
Edge 3	< 25 mm	Yes	
Edge 4	< 25 mm	Yes	

8.4. Hotspot Mode Exposure Conditions for Wi-Fi/BT (Ant.)

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	< 25 mm	Yes	
Front	< 25 mm	Yes	
Edge 1*	< 25 mm	Yes	
Edge 2*	< 25 mm	Yes	
Edge 3*	> 25 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*	> 25 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.

Notes:

- Edge 1= Top Edge
- Edge 2= Right Edge
- Edge 3= Bottom Edge
- Edge 4= Left Edge

9. RF Output Power Measurement

9.1. GSM850

Target Power: 32.5 dBm
Tune-up Tolerance: -1.5 dB / +0.5 dB

GSM (GMSK) Voice Mode

Band	Ch No.	Freq. (MHz)	Avg burst Pwr (dBm)
850	128	824.2	32.3
	190	836.6	32.4
	251	848.8	32.2

Target Power:
GPRS 1 slot 32.5 dBm
GPRS 2 slot 30.0 dBm
GPRS 3 slot 28.0 dBm
GPRS 4 slot 27.0 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	32.4	23.3	29.5	**23.5**	27.6	23.4	26.5	23.5
	190	836.6	32.4	23.3	29.5	**23.5**	27.7	23.4	26.5	23.5
	251	848.8	32.3	23.2	29.4	**23.4**	27.5	23.3	26.4	23.4

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
Edge is Rx mode only

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
- SAR is not required for EGPRS (8PSK) Mode because its output power is less than that of GPRS Mode

9.2. GSM1900

Target Power: 29.5 dBm
Tune-up Tolerance: -1.5 dB / +0.5 dB

GSM (GMSK) Voice Mode

Band	Ch No.	Freq. (MHz)	Avg burst Pwr (dBm)
1900	512	1850.2	29.5
	661	1880.0	29.4
	810	1909.8	29.3

Target Power:
GPRS 1 slot 29.5 dBm
GPRS 2 slot 27.0 dBm
GPRS 3 slot 25.0 dBm
GPRS 4 slot 24.0 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	29.5	20.4	26.6	**20.6**	24.7	20.5	23.6	20.5
	661	1880.0	29.4	20.4	26.5	**20.5**	24.7	20.4	23.5	20.5
	810	1909.8	29.3	20.3	26.4	**20.4**	24.6	20.3	23.4	20.4

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
Edge is Rx mode only

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
- SAR is not required for EGPRS (8PSK) Mode because its output power is less than that of GPRS Mode

9.3. W-CDMA (UMTS) Band V

Target Power: 22.5 dBm
Tune-up Tolerance: -1.5 dB / +0.5 dB

Release 99

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

Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA (UMTS) Band V	Rel 99 (RMC, 12.2 kbps)	4132	826.4	22.8
		4182	836.4	22.9
		4233	846.6	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
W-CDMA 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			

Results

Band	Mode	UL Ch No.	Freq. (MHz)	Target MPR	Avg Pwr (dBm)
W-CDMA (UMTS) Band V	Subtest 1	4132	826.4	0	22.7
		4182	836.4	0	22.6
		4233	846.6	0	22.7
	Subtest 2	4132	826.4	0	22.7
		4182	836.4	0	22.7
		4233	846.6	0	22.7
	Subtest 3	4132	826.4	0.5	22.7
		4182	836.4	0.5	22.6
		4233	846.6	0.5	22.7
	Subtest 4	4132	826.4	0.5	22.7
		4182	836.4	0.5	22.7
		4233	846.6	0.5	22.7

Note(s):

KDB 941225 D01 – Body SAR is not required for HSDPA when the maximum average output of each RF channel with HSDPA active is less than ¼ dB higher than that measured without HSDPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is < 75% of the SAR limit.

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				
	βc	11/15	6/15	15/15	2/15	15/15
	βd	15/15	15/15	9/15	15/15	15/15
	βec	209/225	12/15	30/15	2/15	24/15
	βc/βd	11/15	6/15	15/9	2/15	15/15
	βhs	22/15	12/15	30/15	4/15	30/15
	βed	1309/225	94/75	47/15 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				
	Ahs = βhs/βc	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)
WCDMA (UMTS) Band V	Subtest 1	4132	826.4	0	22.7
		4182	836.4	0	22.6
		4233	846.6	0	22.7
	Subtest 2	4132	826.4	2	20.6
		4182	836.4	2	20.7
		4233	846.6	2	20.7
	Subtest 3	4132	826.4	1	22.1
		4182	836.4	1	22.0
		4233	846.6	1	22.0
	Subtest 4	4132	826.4	2	21.5
		4182	836.4	2	21.3
		4233	846.6	2	21.5
	Subtest 5	4132	826.4	0	22.7
		4182	836.4	0	22.6
		4233	846.6	0	22.6

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.

HSPA+

Since 16QAM is not used for uplink, the uplink Category and release is same as HSUPA, i.e., CAT 6 Rel 6. Therefore, the RF conducted power is not measured.

9.4. W-CDMA (UMTS) Band II

Target Power: 22.5 dBm
Tune-up Tolerance: -1.5 dB / +0.5 dB

Release 99

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

Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA (UMTS) Band II	Rel 99 (RMC, 12.2 kbps)	9262	1852.4	22.2
		9400	1880.0	22.2
		9538	1907.6	22.1

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
W-CDMA 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			

Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA (UMTS) Band II	Subtest 1	9262	1852.4	22.2
		9400	1880.0	22.2
		9538	1907.6	22.1
	Subtest 2	9262	1852.4	22.1
		9400	1880.0	22.1
		9538	1907.6	22.1
	Subtest 3	9262	1852.4	22.1
		9400	1880.0	22.0
		9538	1907.6	22.0
	Subtest 4	9262	1852.4	21.9
		9400	1880.0	22.0
		9538	1907.6	22.0

Note(s):

KDB 941225 D01 – Body SAR is not required for HSDPA when the maximum average output of each RF channel with HSDPA active is less than ¼ dB higher than that measured without HSDPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is < 75% of the SAR limit.

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				
	βc	11/15	6/15	15/15	2/15	15/15
	βd	15/15	15/15	9/15	15/15	15/15
	βec	209/225	12/15	30/15	2/15	24/15
	βc/βd	11/15	6/15	15/9	2/15	15/15
	βhs	22/15	12/15	30/15	4/15	30/15
	βed	1309/225	94/75	47/15 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				
	Ahs = βhs/βc	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)
WCDMA (UMTS) Band II	Subtest 1	9262	1852.4	0	22.1
		9400	1880.0	0	22.1
		9538	1907.6	0	22.0
	Subtest 2	9262	1852.4	2	19.9
		9400	1880.0	2	19.9
		9538	1907.6	2	20.0
	Subtest 3	9262	1852.4	1	21.4
		9400	1880.0	1	21.4
		9538	1907.6	1	21.4
	Subtest 4	9262	1852.4	2	20.9
		9400	1880.0	2	20.8
		9538	1907.6	2	20.8
	Subtest 5	9262	1852.4	0	22.0
		9400	1880.0	0	22.0
		9538	1907.6	0	22.0

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.

HSPA+

Since 16QAM is not used for uplink, the uplink Category and release is same as HSUPA, i.e., CAT 6 Rel 6. Therefore, the RF conducted power is not measured.

9.5. Wi-Fi (2.4 GHz band)

Power settings:
b mode = 22dBm, g mode = 20dBm, n mode = 19dBm

Target Power: 15dBm (b mode), 13dBm (g mode), 12dBm (n mode)

Band (GHz)	Mode	Ch #	Freq. (MHz)	Measured Avg Pwr(dBm)
2.4	802.11b	1	2412	15.0
		6	2437	15.1
		11	2462	14.9
	802.11g	1	2412	12.9
		6	2437	12.7
		11	2462	12.6
	802.11n (HT20)	1	2412	11.7
		6	2437	11.6
		11	2462	11.5

Note(s):

1. SAR is not required for 802.11g/HT20 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a/b channels. As per KDB 248227

9.6. Bluetooth

Mode	Channel #	Freq. (MHz)	Conducted Avg Power	
			(dBm)	(mW)
V3 + EDR, GFSK	0	2402	12.4	17.38
	39	2441	12.1	16.22
	78	2480	11.6	14.45
V3 + EDR, 8PSK	0	2402	10.0	10.00
	39	2441	9.4	8.71
	78	2480	8.7	7.41

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) and antenna is ≥ 2.5 cm from other antennas
☐ Output ≤ 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^2O	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 ±(%)
08/30/2012	Body 835	e'	53.8725	Relative Permittivity (ϵ_r):	53.87	55.20	-2.40	5
		e''	21.3116	Conductivity (σ):	0.99	0.97	2.01	5
	Body 815	e'	53.9920	Relative Permittivity (ϵ_r):	53.99	55.30	-2.36	5
		e''	21.4455	Conductivity (σ):	0.97	0.97	0.39	5
	Body 820	e'	54.0826	Relative Permittivity (ϵ_r):	54.08	55.28	-2.16	5
		e''	21.5027	Conductivity (σ):	0.98	0.97	1.23	5
	Body 850	e'	53.7126	Relative Permittivity (ϵ_r):	53.71	55.16	-2.62	5
		e''	21.3798	Conductivity (σ):	1.01	0.99	2.36	5
08/31/2012	Body 2450	e'	50.7717	Relative Permittivity (ϵ_r):	50.77	52.70	-3.66	5
		e''	14.6913	Conductivity (σ):	2.00	1.95	2.63	5
	Body 2410	e'	50.9166	Relative Permittivity (ϵ_r):	50.92	52.76	-3.49	5
		e''	14.5306	Conductivity (σ):	1.95	1.91	2.08	5
	Body 2435	e'	50.8202	Relative Permittivity (ϵ_r):	50.82	52.73	-3.62	5
		e''	14.6279	Conductivity (σ):	1.98	1.93	2.56	5
	Body 2475	e'	50.6974	Relative Permittivity (ϵ_r):	50.70	52.67	-3.74	5
		e''	14.8017	Conductivity (σ):	2.04	1.99	2.61	5
09/04/2012	Head 1900	e'	39.7274	Relative Permittivity (ϵ_r):	39.73	40.00	-0.68	5
		e''	13.2833	Conductivity (σ):	1.40	1.40	0.24	5
	Head 1850	e'	39.9654	Relative Permittivity (ϵ_r):	39.97	40.00	-0.09	5
		e''	13.1599	Conductivity (σ):	1.35	1.40	-3.31	5
	Head 1880	e'	39.8302	Relative Permittivity (ϵ_r):	39.83	40.00	-0.42	5
		e''	13.2346	Conductivity (σ):	1.38	1.40	-1.18	5
	Head 1910	e'	39.6814	Relative Permittivity (ϵ_r):	39.68	40.00	-0.80	5
		e''	13.3187	Conductivity (σ):	1.41	1.40	1.03	5
09/05/2012	Body 835	e'	56.6498	Relative Permittivity (ϵ_r):	56.65	55.20	2.63	5
		e''	21.7124	Conductivity (σ):	1.01	0.97	3.93	5
	Body 815	e'	56.8127	Relative Permittivity (ϵ_r):	56.81	55.30	2.74	5
		e''	21.7954	Conductivity (σ):	0.99	0.97	2.03	5
	Body 820	e'	56.7746	Relative Permittivity (ϵ_r):	56.77	55.28	2.71	5
		e''	21.7747	Conductivity (σ):	0.99	0.97	2.51	5
	Body 850	e'	56.5454	Relative Permittivity (ϵ_r):	56.55	55.16	2.52	5
		e''	21.6431	Conductivity (σ):	1.02	0.99	3.62	5

10.3. Tissue Dielectric Parameter Check Results – continued

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 ±(%)
09/05/2012	Head 1900	e'	39.8111	Relative Permittivity (ϵ_r):	39.81	40.00	-0.47	5
		e''	13.1715	Conductivity (σ):	1.39	1.40	-0.61	5
	Head 1850	e'	40.0115	Relative Permittivity (ϵ_r):	40.01	40.00	0.03	5
		e''	13.0222	Conductivity (σ):	1.34	1.40	-4.32	5
	Head 1880	e'	39.8887	Relative Permittivity (ϵ_r):	39.89	40.00	-0.28	5
		e''	13.1190	Conductivity (σ):	1.37	1.40	-2.04	5
	Head 1910	e'	39.7723	Relative Permittivity (ϵ_r):	39.77	40.00	-0.57	5
		e''	13.2035	Conductivity (σ):	1.40	1.40	0.16	5
09/06/2012	Head 835	e'	42.1548	Relative Permittivity (ϵ_r):	42.15	41.50	1.58	5
		e''	19.3553	Conductivity (σ):	0.90	0.90	-0.15	5
	Head 815	e'	42.3570	Relative Permittivity (ϵ_r):	42.36	41.63	1.75	5
		e''	19.4167	Conductivity (σ):	0.88	0.90	-2.02	5
	Head 820	e'	42.3101	Relative Permittivity (ϵ_r):	42.31	41.60	1.70	5
		e''	19.3993	Conductivity (σ):	0.88	0.90	-1.55	5
	Head 850	e'	41.9847	Relative Permittivity (ϵ_r):	41.98	41.50	1.17	5
		e''	19.3113	Conductivity (σ):	0.91	0.92	-0.25	5
09/07/2012	Body 1900	e'	52.2605	Relative Permittivity (ϵ_r):	52.26	53.30	-1.95	5
		e''	14.4568	Conductivity (σ):	1.53	1.52	0.48	5
	Body 1850	e'	52.4874	Relative Permittivity (ϵ_r):	52.49	53.30	-1.52	5
		e''	14.2952	Conductivity (σ):	1.47	1.52	-3.26	5
	Body 1880	e'	52.3583	Relative Permittivity (ϵ_r):	52.36	53.30	-1.77	5
		e''	14.3936	Conductivity (σ):	1.50	1.52	-1.01	5
	Body 1910	e'	52.2202	Relative Permittivity (ϵ_r):	52.22	53.30	-2.03	5
		e''	14.4941	Conductivity (σ):	1.54	1.52	1.27	5
09/09/2012	Head 835	e'	41.9311	Relative Permittivity (ϵ_r):	41.93	41.50	1.04	5
		e''	19.2697	Conductivity (σ):	0.89	0.90	-0.59	5
	Head 815	e'	42.1776	Relative Permittivity (ϵ_r):	42.18	41.63	1.32	5
		e''	19.3190	Conductivity (σ):	0.88	0.90	-2.52	5
	Head 820	e'	42.1175	Relative Permittivity (ϵ_r):	42.12	41.60	1.24	5
		e''	19.3122	Conductivity (σ):	0.88	0.90	-2.00	5
	Head 850	e'	41.7577	Relative Permittivity (ϵ_r):	41.76	41.50	0.62	5
		e''	19.2185	Conductivity (σ):	0.91	0.92	-0.73	5

10.4. Tissue Dielectric Parameter Check Results – continued

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
09/09/2012	Body 1900	e'	51.4796	Relative Permittivity (ϵ_r):	51.48	53.30	-3.42	5
		e''	14.2199	Conductivity (σ):	1.50	1.52	-1.17	5
	Body 1850	e'	51.6598	Relative Permittivity (ϵ_r):	51.66	53.30	-3.08	5
		e''	14.0574	Conductivity (σ):	1.45	1.52	-4.87	5
	Body 1880	e'	51.5559	Relative Permittivity (ϵ_r):	51.56	53.30	-3.27	5
		e''	14.1529	Conductivity (σ):	1.48	1.52	-2.67	5
	Body 1910	e'	51.4427	Relative Permittivity (ϵ_r):	51.44	53.30	-3.48	5
		e''	14.1490	Conductivity (σ):	1.50	1.52	-1.14	5
09/09/2012	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

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)	SAR Measured (mW/g)		
				1g/10g	Head	Body
D835V2	4d002	3/6/12	835	1g	9.24	9.64
				10g	6.04	6.32
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

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.						
8/30/2012	D835V2	4d002	Body	1g	9.9	9.64	3.11	±10
				10g	6.5	6.32	3.01	
8/31/2012	D2450V2	706	Body	1g	49.8	49.60	0.40	±10
				10g	23.2	23.40	-0.85	
9/4/2012	D1900V2	5d140	Head	1g	39.5	39.10	1.02	±10
				10g	20.5	20.60	-0.49	
9/5/2012	D835V2	4d002	Body	1g	9.7	9.64	0.21	±10
				10g	6.4	6.32	0.63	
9/5/2012	D1900V2	5d140	Head	1g	37.8	39.10	-3.32	±10
				10g	19.8	20.60	-3.88	
9/6/2012	D835V2	4d002	Head	1g	9.3	9.24	0.76	±10
				10g	6.1	6.04	1.32	
9/7/2012	D1900V2	5d140	Body	1g	40.7	40.00	1.75	±10
				10g	21.3	21.30	0.00	
9/9/2012	D835V2	4d002	Head	1g	8.9	9.24	-3.79	±10
				10g	5.8	6.04	-3.31	
9/9/2012	D1900V2	5d140	Body	1g	39.8	40.00	-0.50	±10
				10g	20.8	21.30	-2.35	
9/9/2012	D2450V2	706	Head	1g	50.2	51.20	-1.95	±10
				10g	22.9	23.90	-4.18	

12. SAR Test Results

12.1. GSM850

12.1.1. Head Exposure Conditions

Test Position	Mode	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
					1-g	10-g	
Left Touch	GMSK (Voice)	128	824.20	32.3			1
		190	836.60	32.4	**0.406**	**0.265**	
		251	848.80	32.2			1
Left Tilt (15°)	GMSK (Voice)	128	824.20	32.3			1
		190	836.60	32.4	0.199	0.153	
		251	848.80	32.2			1
Right Touch	GMSK (Voice)	128	824.20	32.3			1
		190	836.60	32.4	0.338	0.253	
		251	848.80	32.2			1
Right Tilt (15°)	GMSK (Voice)	128	824.20	32.3			1
		190	836.60	32.4	0.191	0.147	
		251	848.80	32.2			1

12.1.2. Body-worn Accessory Exposure Conditions

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
						1-g	10-g	
Rear	GMSK (Voice)	10	128	824.20	32.3			1
			190	836.60	32.4	**0.766**	**0.538**	
			190	836.60	32.4	0.512	0.354	2
			251	848.80	32.2			1
Front	GMSK (Voice)	10	128	824.20	32.3			1
			190	836.60	32.4	0.352	0.256	
			251	848.80	32.2			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.
2. With headset attached.

12.1.3. Hotspot Mode Exposure Conditions

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
						1-g	10-g	
Rear	GPRS 2 slots	10	128	824.20	29.5			1
			190	836.60	29.5	**0.772**	**0.540**	
			251	848.80	29.4			1
Front	GPRS 2 slots	10	128	824.20	29.5			1
			190	836.60	29.5	0.363	0.264	
			251	848.80	29.4			1
Edge 2	GPRS 2 slots	10	128	824.20	29.5			1
			190	836.60	29.5	0.130	0.091	
			251	848.80	29.4			1
Edge 3	GPRS 2 slots	10	128	824.20	29.5			1
			190	836.60	29.5	0.070	0.044	
			251	848.80	29.4			1
Edge 4	GPRS 2 slots	10	128	824.20	29.5			1
			190	836.60	29.5	0.271	0.189	
			251	848.80	29.4			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. GSM1900

12.2.1. Head Exposure Conditions

Test Position	Mode	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
					1-g	10-g	
Left Touch	GMSK (Voice)	512	1850.2	29.5			1
		661	1880.0	29.4	**0.559**	**0.299**	
		810	1909.8	29.3			1
Left Tilt (15°)	GMSK (Voice)	512	1850.2	29.5			1
		661	1880.0	29.4	0.149	0.088	
		810	1909.8	29.3			1
Right Touch	GMSK (Voice)	512	1850.2	29.5			1
		661	1880.0	29.4	0.448	0.267	
		810	1909.8	29.3			1
Right Tilt (15°)	GMSK (Voice)	512	1850.2	29.5			1
		661	1880.0	29.4	0.168	0.099	
		810	1909.8	29.3			1

12.2.2. Body-worn Accessory Exposure Conditions

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
Rear	GMSK (Voice)	10	512	1850.2	29.5			1
			661	1880.0	29.4	0.561	0.310	
			810	1909.8	29.3			1
			661	1880.0	29.4	0.550	0.308	2
Front	GMSK (Voice)	10	512	1850.2	29.5			1
			661	1880.0	29.4	0.331	0.197	
			810	1909.8	29.3			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.
2. With headset attached.

12.2.3. Hotspot Mode Exposure Conditions

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
						1-g	10-g	
Rear	GPRS 2 slots	10	512	1850.2	26.6			1
			661	1880.0	26.5	0.354	0.212	
			810	1909.8	26.4			1
Front	GPRS 2 slots	10	512	1850.2	26.6			1
			661	1880.0	26.5	0.569	0.317	
			810	1909.8	26.4			1
Edge 2	GPRS 2 slots	10	512	1850.2	26.6			1
			661	1880.0	26.5	0.087	0.054	
			810	1909.8	26.4			1
Edge 3	GPRS 2 slots	10	512	1850.2	26.6			1
			661	1880.0	26.5	0.353	0.197	
			810	1909.8	26.4			1
Edge 4	GPRS 2 slots	10	512	1850.2	26.6			1
			661	1880.0	26.5	0.117	0.071	
			810	1909.8	26.4			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.

12.3. 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 Exposure Conditions

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	22.8			1
		4182	836.4	22.9	**0.509**	**0.372**	
		4233	846.6	22.9			1
Left Tilt (15°)	Rel 99 RMC 12.2kbps	4132	826.4	22.8			1
		4182	836.4	22.9	0.233	0.178	
		4233	846.6	22.9			1
Right Touch	Rel 99 RMC 12.2kbps	4132	826.4	22.8			1
		4182	836.4	22.9	0.407	0.305	
		4233	846.6	22.9			1
Right Tilt (15°)	Rel 99 RMC 12.2kbps	4132	826.4	22.8			1
		4182	836.4	22.9	0.213	0.162	
		4233	846.6	22.9			1

12.3.2. Body-worn Accessory & Hotspot Mode Exposure Conditions

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	10	4132	826.4	22.8			1
			4182	836.4	22.9	**0.792**	**0.555**	
			4182	836.4	22.9	0.676	0.478	2
			4233	846.6	22.9			1
Front	Rel 99 RMC 12.2kbps	10	4132	826.4	22.8			1
			4182	836.4	22.9	0.400	0.292	
			4233	846.6	22.9			1
Edge 2	Rel 99 RMC 12.2kbps	10	4132	826.4	22.8			1
			4182	836.4	22.9	0.150	0.105	
			4233	846.6	22.9			1
Edge 3	Rel 99 RMC 12.2kbps	10	4132	826.4	22.8			1
			4182	836.4	22.9	0.074	0.047	
			4233	846.6	22.9			1
Edge 4	Rel 99 RMC 12.2kbps	10	4132	826.4	22.8			1
			4182	836.4	22.9	0.292	0.204	
			4233	846.6	22.9			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.
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 Exposure Conditions

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	22.2	0.832	0.444	
		9400	1880.0	22.2	**0.898**	**0.476**	
		9538	1907.6	22.1	0.843	0.445	
Left Tilt (15°)	Rel 99 RMC 12.2kbps	9262	1852.4	22.2			1
		9400	1880.0	22.2	0.242	0.144	
		9538	1907.6	22.1			1
Right Touch	Rel 99 RMC 12.2kbps	9262	1852.4	22.2			1
		9400	1880.0	22.2	0.662	0.339	
		9538	1907.6	22.1			1
Right Tilt (15°)	Rel 99 RMC 12.2kbps	9262	1852.4	22.2			1
		9400	1880.0	22.2	0.272	0.162	
		9538	1907.6	22.1			1

12.4.2. Body-worn Accessory & Hotspot Mode Exposure Conditions

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	10	9262	1852.4	22.2	0.955	0.524	
			9400	1880.0	22.2	1.020	0.546	
			9538	1907.6	22.1	0.980	0.52	
			9400	1880.0	22.2	1.020	0.556	2
Front	Rel 99 RMC 12.2kbps	10	9262	1852.4	22.2			1
			9400	1880.0	22.2	0.569	0.336	
			9538	1907.6	22.1			1
Edge 2	Rel 99 RMC 12.2kbps	10	9262	1852.4	22.2			1
			9400	1880.0	22.2	0.125	0.077	
			9538	1907.6	22.1			1
Edge 3	Rel 99 RMC 12.2kbps	10	9262	1852.4	22.2			1
			9400	1880.0	22.2	0.535	0.303	
			9538	1907.6	22.1			1
Edge 4	Rel 99 RMC 12.2kbps	10	9262	1852.4	22.2			1
			9400	1880.0	22.2	0.169	0.099	
			9538	1907.6	22.1			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.
2. With headset attached.

12.5. Wi-Fi

12.5.1. Head Exposure Conditions

Test Position	Mode	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
					1-g	10-g	
Left Touch	802.11b	1	2412	15.0			1
		6	2437	15.1	0.0096	0.007	
		11	2462	14.9			1
Left Tilt (15°)	802.11b	1	2412	15.0			1
		6	2437	15.1	**0.014**	**0.002**	
		11	2462	14.9			1
Right Touch	802.11b	1	2412	15.0			1
		6	2437	15.1	0.012	0.008	
		11	2462	14.9			1
Right Tilt (15°)	802.11b	1	2412	15.0			1
		6	2437	15.1	0.0063	0.003	
		11	2462	14.9			1

12.5.2. Body-worn Accessory & Hotspot Mode Exposure Conditions

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
						1-g	10-g	
Rear	802.11b	10	1	2412	15.0			1
			6	2437	15.1	0.016	0.007	
			11	2462	14.9			1
			6	2437	15.1	**0.018**	**0.005**	2
Front	802.11b	10	1	2412	15.0			1
			6	2437	15.1	0.011	0.008	
			11	2462	14.9			1

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

12.5.1. Body Hotspot Exposure Conditions

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
						1-g	10-g	
Rear	802.11b	10	1	2412	15.0			
			6	2437	15.1	0.018	0.007	
			11	2462	14.9			
Front	802.11b	10	1	2412	15.0			
			6	2437	15.1	0.011	0.008	
			11	2462	14.9			
Edge 1	802.11b	10	1	2412	15.0			
			6	2437	15.1	0.0078	0.004	
			11	2462	14.9			
Edge 2	802.11b	10	1	2412	15.0			
			6	2437	15.1	0.0097	0.007	
			11	2462	14.9			

Note(s):

1. 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)

13. Summary of Highest SAR Values

Results of 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)	0.406
	Body	Rear	GMSK (Voice)	0.766
	Hotspot	Rear	GPRS 2 slots	0.772
GSM1900	Head	Left Touch	GMSK (Voice)	0.559
	Body	Rear	GMSK (Voice)	0.561
	Hotspot	Rear	GPRS 2 slots	0.569
W-CDMA Band V	Head	Left Touch	Rel 99 RMC 12.2kbps	0.509
	Body & Hotspot	Rear	Rel 99 RMC 12.2kbps	0.792
W-CDMA Band II	Head	Left Touch	Rel 99 RMC 12.2kbps	0.898
	Body & Hotspot	Rear	Rel 99 RMC 12.2kbps	1.02
WiFi 2.4 GHz	Head	Left Touch	802.11b 1Mbps	0.014
	Body & Hotspot	Rear	802.11b 1Mbps w/ headset	0.018

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
Body	Rear	GSM850 (GPRS 2 slot)	190	836.6	30.5	29.5	0.772	0.972
Body	Front	GSM1900 (GPRS 2 slot)	661	1880.0	27.5	26.5	0.569	0.716
Body&Hotspot	Rear	W-CDMA BAND V	4182	836.4	23.0	22.9	0.792	0.810
Body&Hotspot	Rear	W-CDMA BAND II	9400	1880.0	23.0	22.1	1.020	1.255
Body&Hotspot	Rear	802.11b	6	2437.0	15.0	15.1	0.018	0.018

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

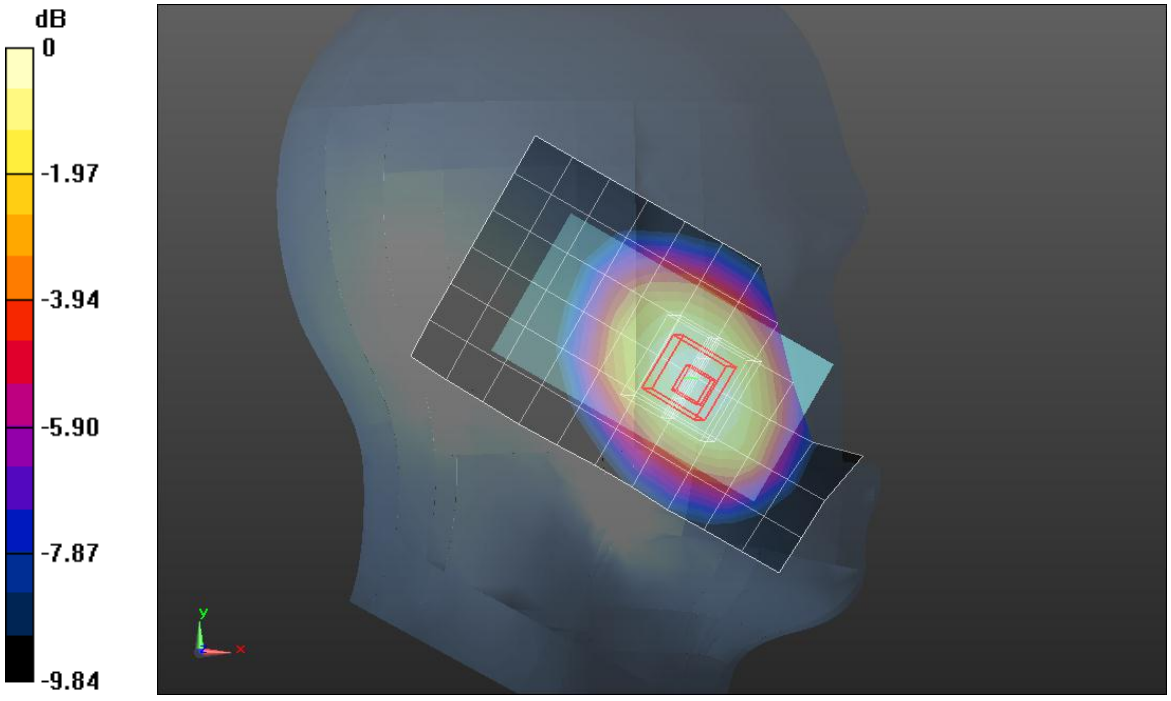
Test Laboratory: UL CCS SAR Lab B Date: 9/6/2012

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; σ = 0.901 mho/m; ε_r = 42.136; 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(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) = 0.458 mW/g

Head/Left Touch/GMSK Voice/Ch 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.847 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.5170
SAR(1 g) = 0.406 mW/g; SAR(10 g) = 0.300 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.454 mW/g

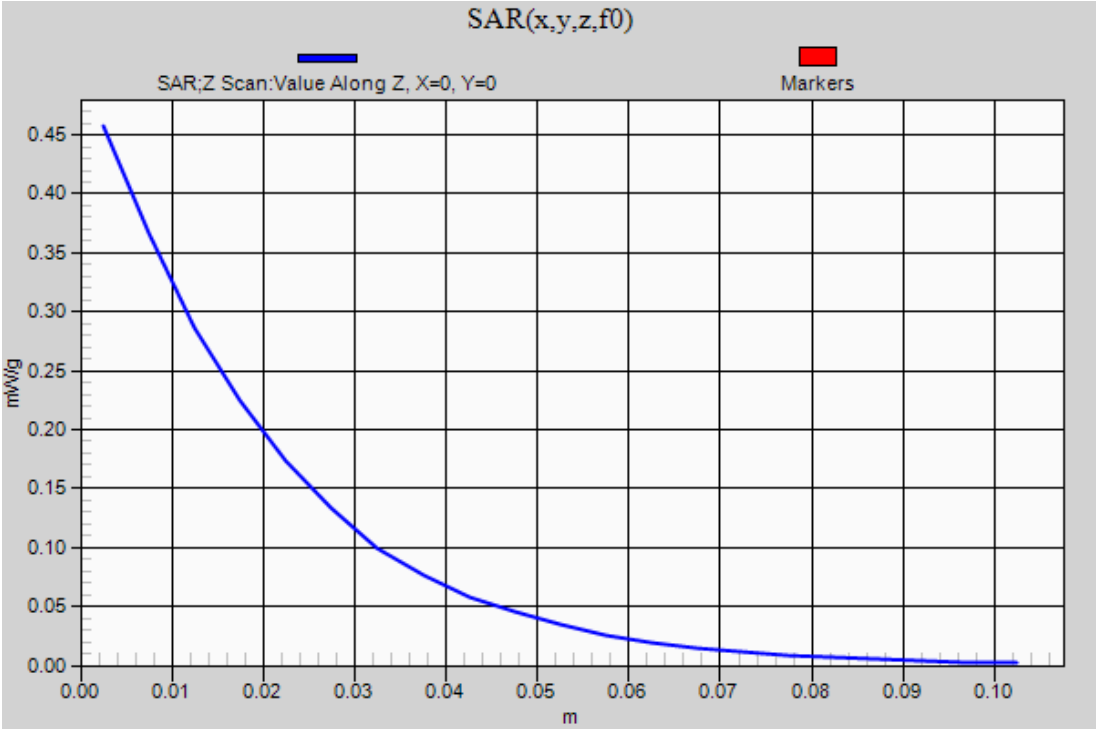


0 dB = 0.450mW/g = -6.94 dB mW/g

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) = 0.457 mW/g

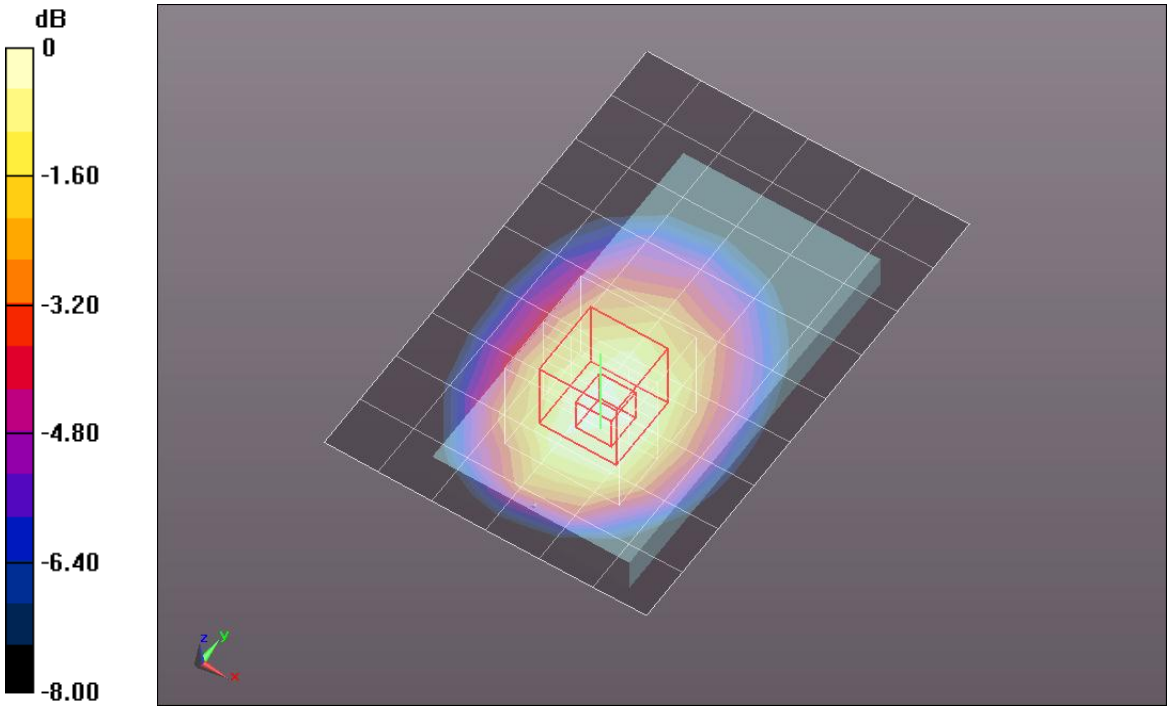


GSM850

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; σ = 0.992 mho/m; ε_r = 53.836; 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(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 (7x10x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.868 mW/g

Body/Rear/GMSK Voice/10mm/Ch 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 29.985 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.0630
SAR(1 g) = 0.766 mW/g; SAR(10 g) = 0.538 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.898 mW/g

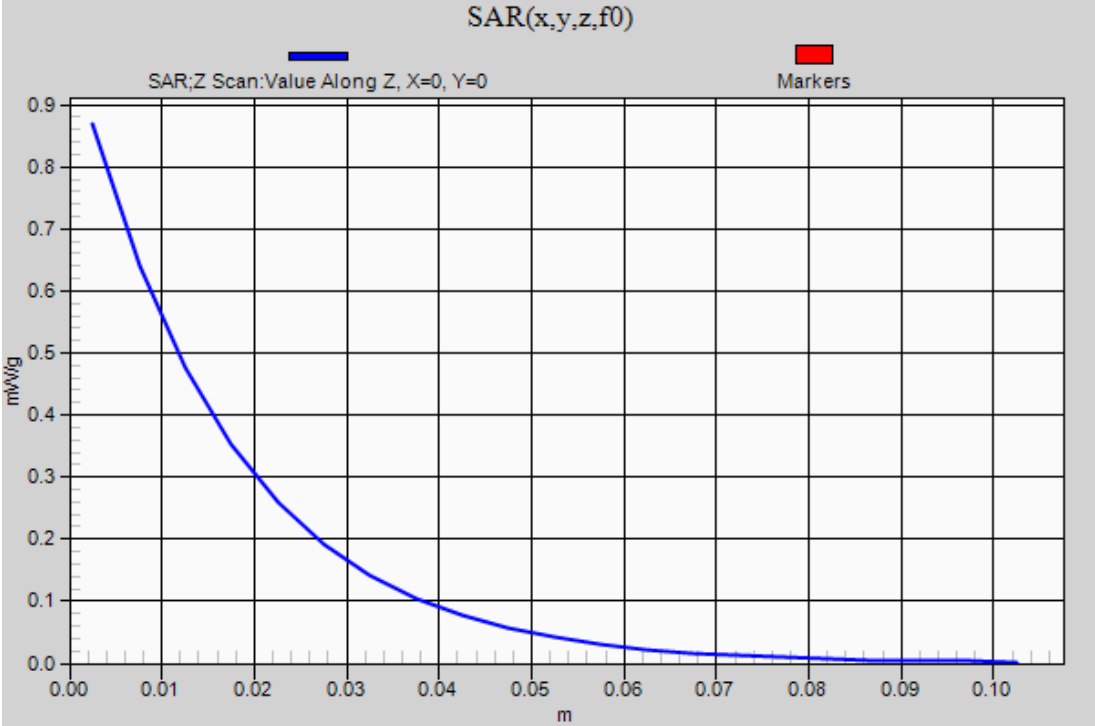


0 dB = 0.900mW/g = -0.92 dB mW/g

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) = 0.869 mW/g

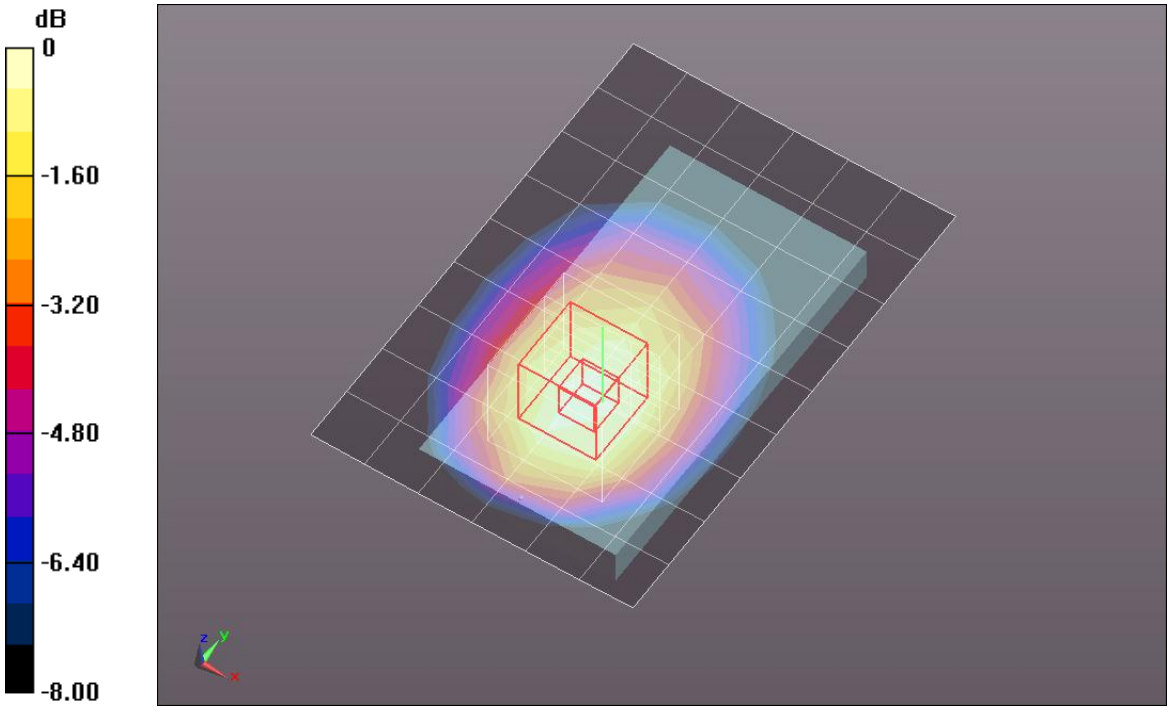


GSM850

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 = 0.992 mho/m; ε_r = 53.836; 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(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/GPRS 2 Slot/10mm/Ch 190/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.888 mW/g

Body/Rear/GPRS 2 Slot/10mm/Ch 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 30.288 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.0710
SAR(1 g) = 0.772 mW/g; SAR(10 g) = 0.540 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.897 mW/g

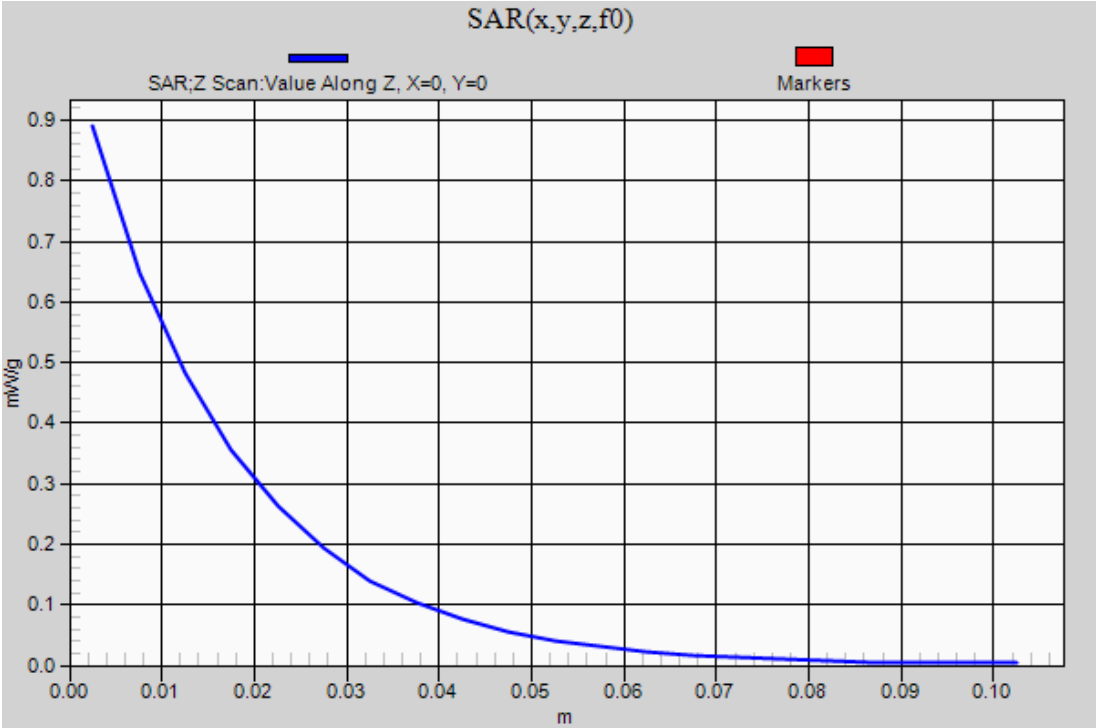


0 dB = 0.900mW/g = -0.92 dB mW/g

GSM850

Frequency: 836.6 MHz; Duty Cycle: 1:4.00037

Body/Rear/GPRS 2 Slot/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) = 0.890 mW/g

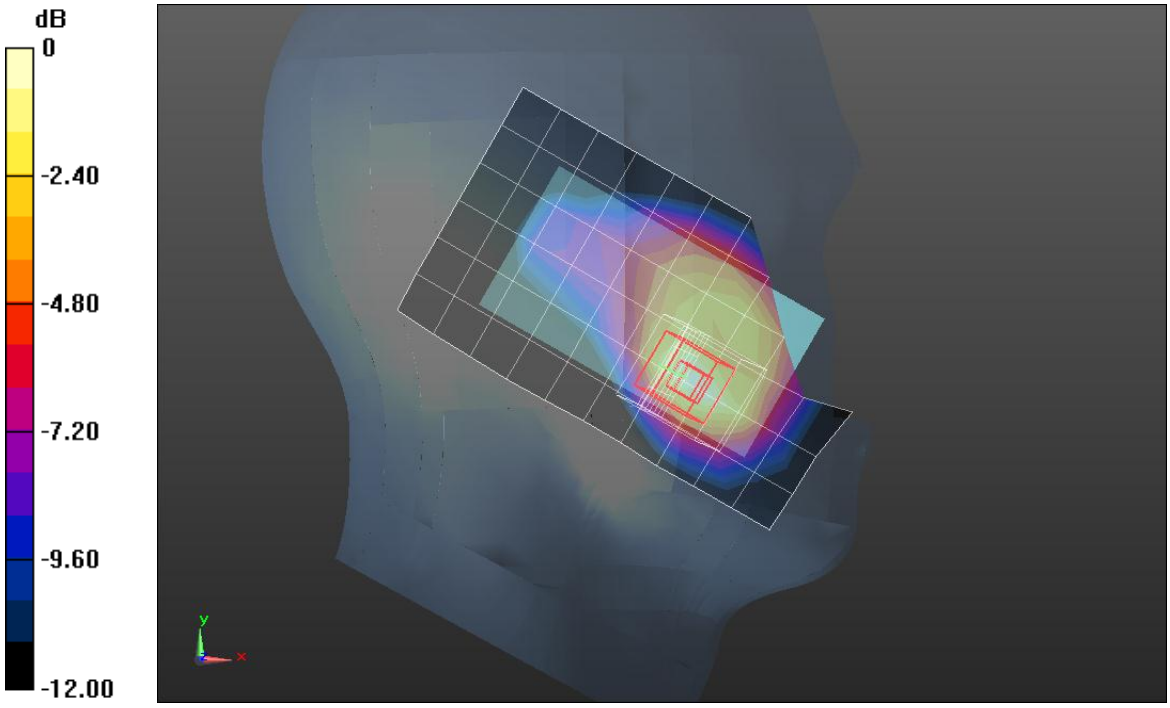


GSM1900

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 = 1.384 mho/m; ε_r = 39.83; 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

Head/Left Touch/GMSK Voice/Ch 661/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.717 mW/g

Head/Left Touch/GMSK Voice/Ch 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.197 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.9600
SAR(1 g) = 0.559 mW/g; SAR(10 g) = 0.299 mW/g
Maximum value of SAR (measured) = 0.706 mW/g

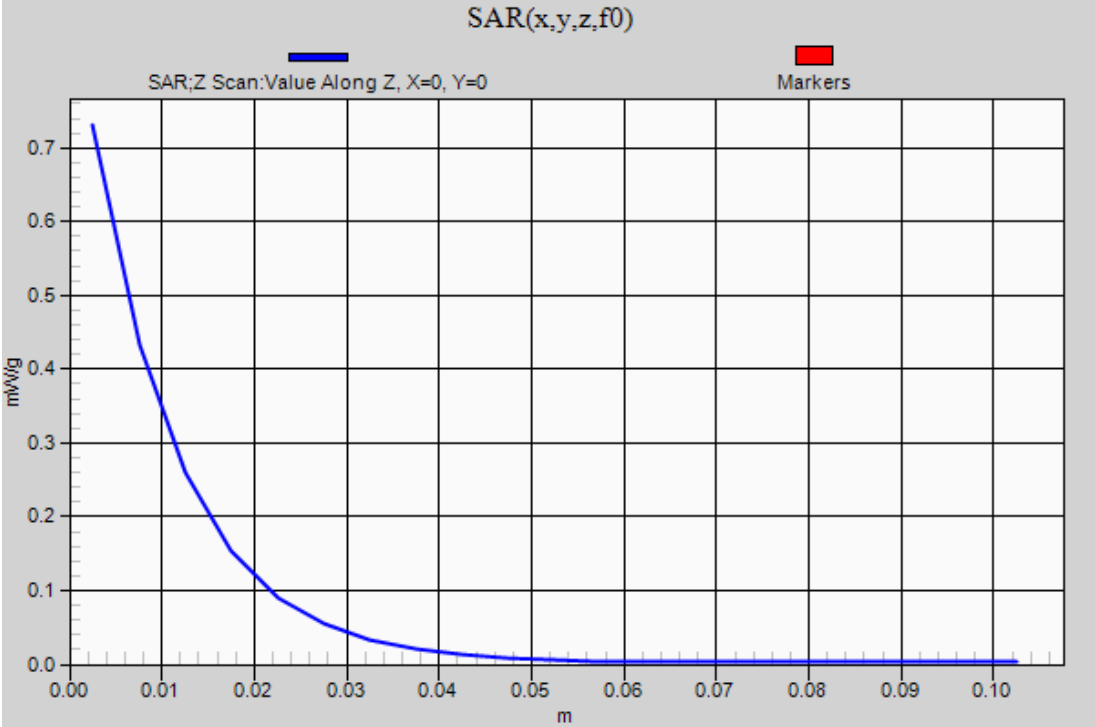


0 dB = 0.710mW/g = -2.97 dB mW/g

GSM1900

Frequency: 1880 MHz; Duty Cycle: 1:8.00018

Head/Left Touch/GMSK Voice/Ch 661/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.731 mW/g

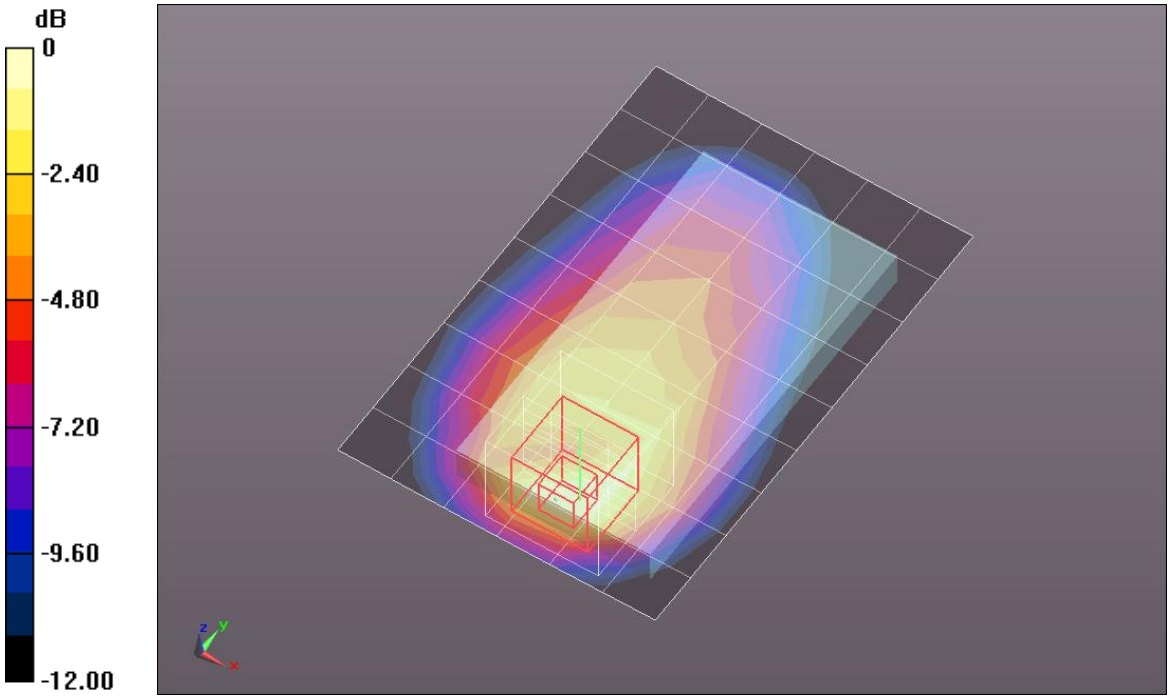


GSM1900

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 = 1.505 mho/m; ε_r = 52.358; 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(7.04, 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 (7x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.606 mW/g

Body/Rear/GMSK Voice/10mm/Ch 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.193 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.9220
SAR(1 g) = 0.561 mW/g; SAR(10 g) = 0.310 mW/g
Maximum value of SAR (measured) = 0.733 mW/g

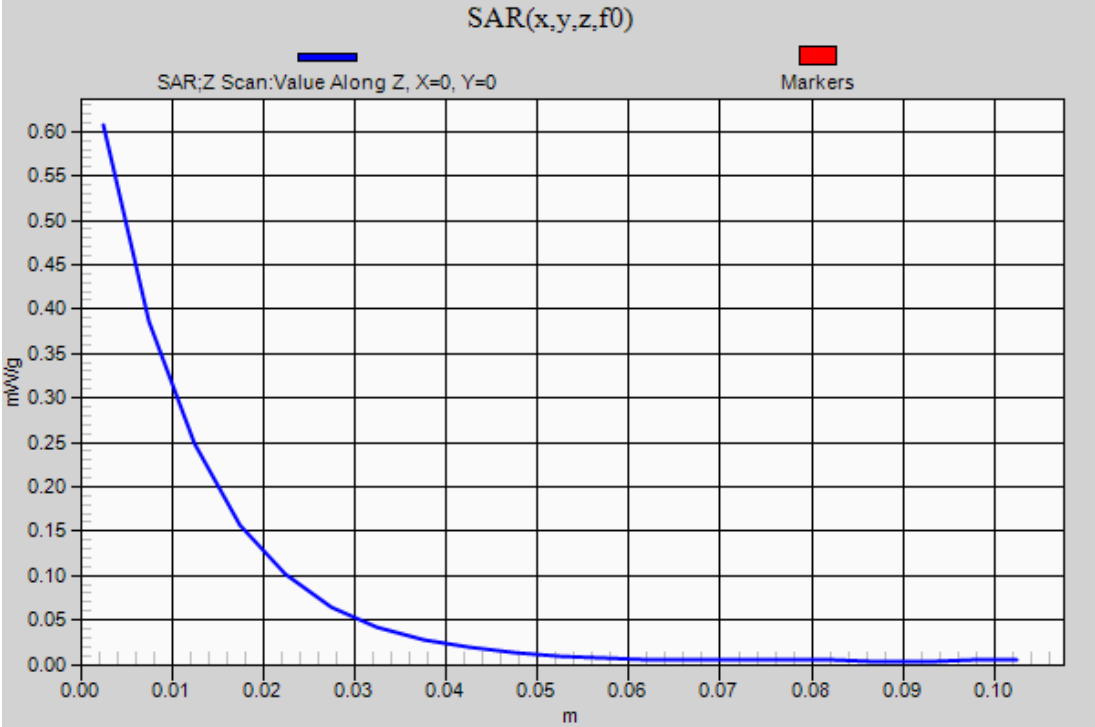


0 dB = 0.730mW/g = -2.73 dB mW/g

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) = 0.607 mW/g

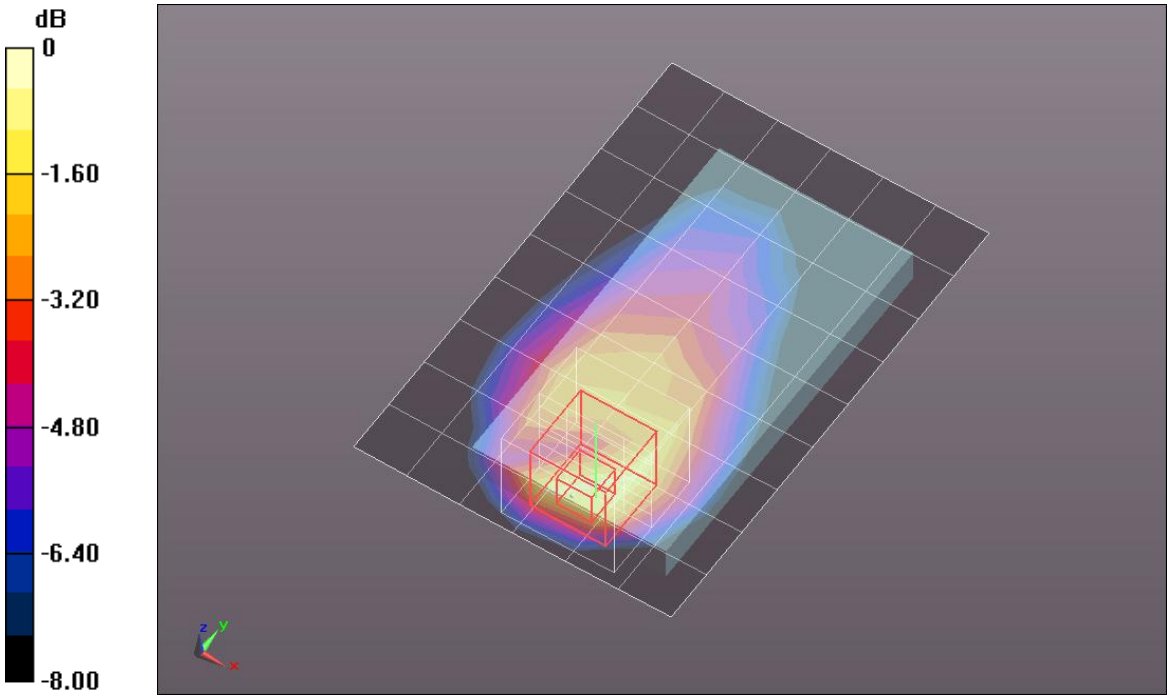


GSM1900

Frequency: 1880 MHz; Duty Cycle: 1:4.00037; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used: f = 1880 MHz; σ = 1.505 mho/m; ε_r = 52.358; 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(7.04, 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/GPRS 2 slot/10mm/Ch 661/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.598 mW/g

Body/Rear/GPRS 2 slot/10mm/Ch 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.119 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 0.9320
SAR(1 g) = 0.569 mW/g; SAR(10 g) = 0.317 mW/g
Maximum value of SAR (measured) = 0.735 mW/g

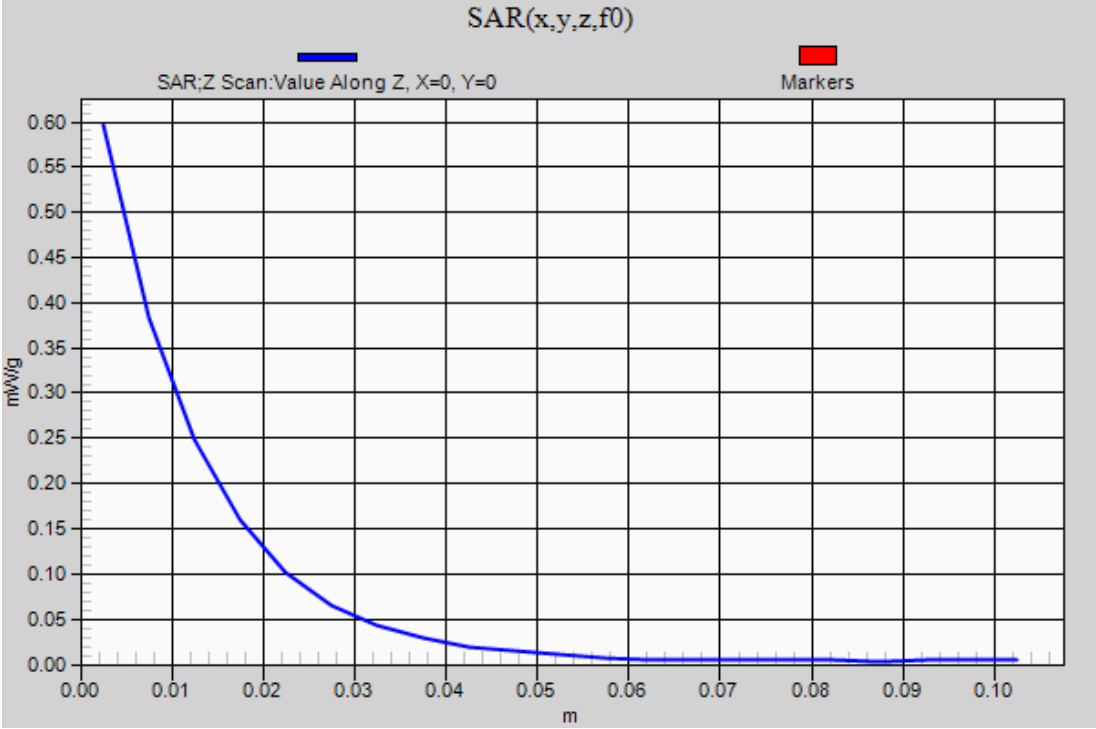


0 dB = 0.740mW/g = -2.62 dB mW/g

GSM1900

Frequency: 1880 MHz; Duty Cycle: 1:4.00037

Body/Rear/GPRS 2 slot/10mm/Ch 661/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.596 mW/g

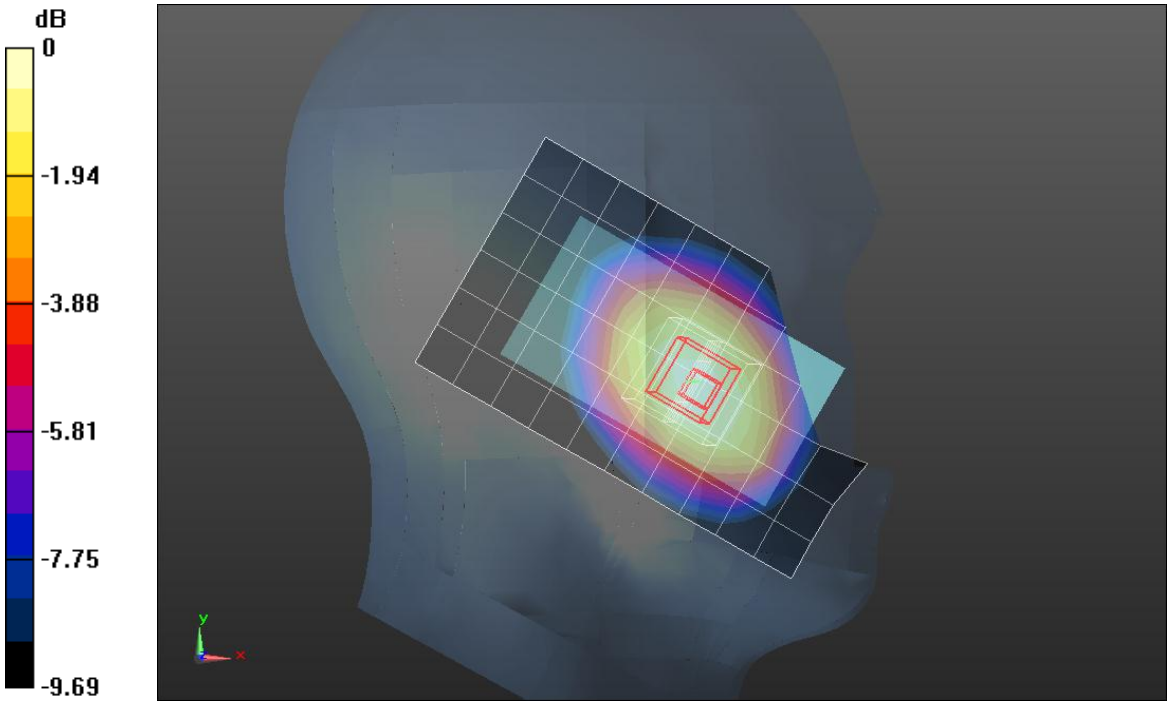


WCDMA Band V

Frequency: 836.4 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): f = 836.4 MHz; σ = 0.896 mho/m; ε_r = 41.915; 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(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/Rel. 99/Ch 4182/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.561 mW/g

Head/Left Touch/Rel. 99/Ch 4182/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.609 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.6600
SAR(1 g) = 0.509 mW/g; SAR(10 g) = 0.372 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.576 mW/g

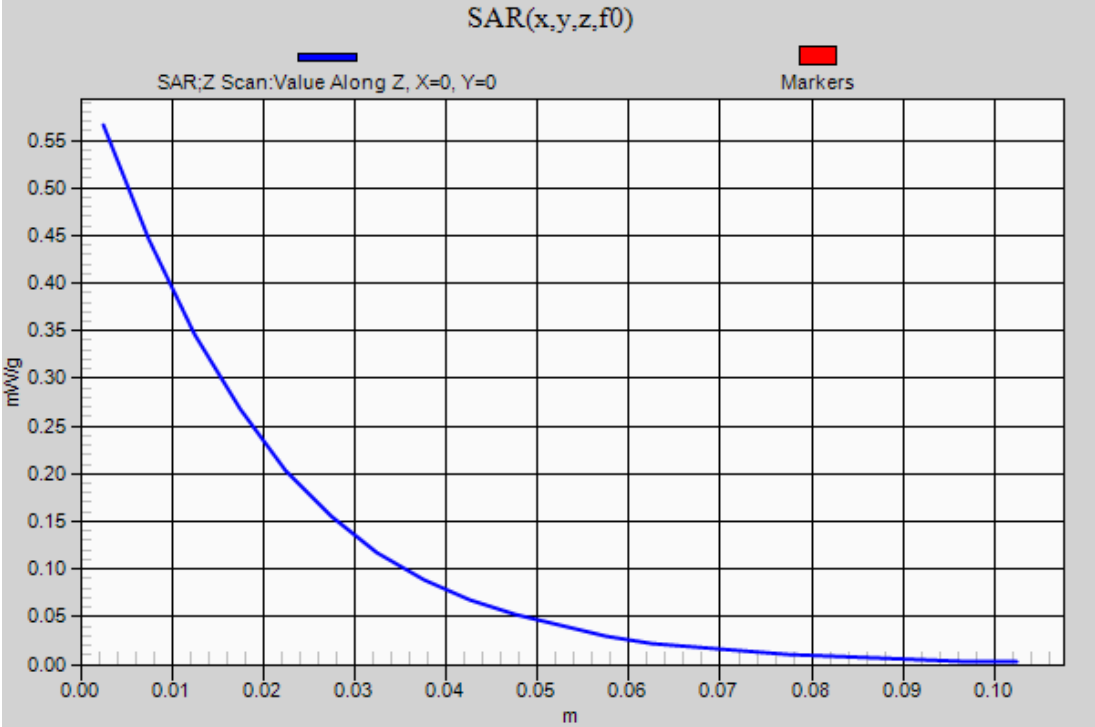


0 dB = 0.580mW/g = -4.73 dB mW/g

WCDMA Band V

Frequency: 836.4 MHz; Duty Cycle: 1:1

Head/Left Touch/Rel. 99/Ch 4182/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.566 mW/g

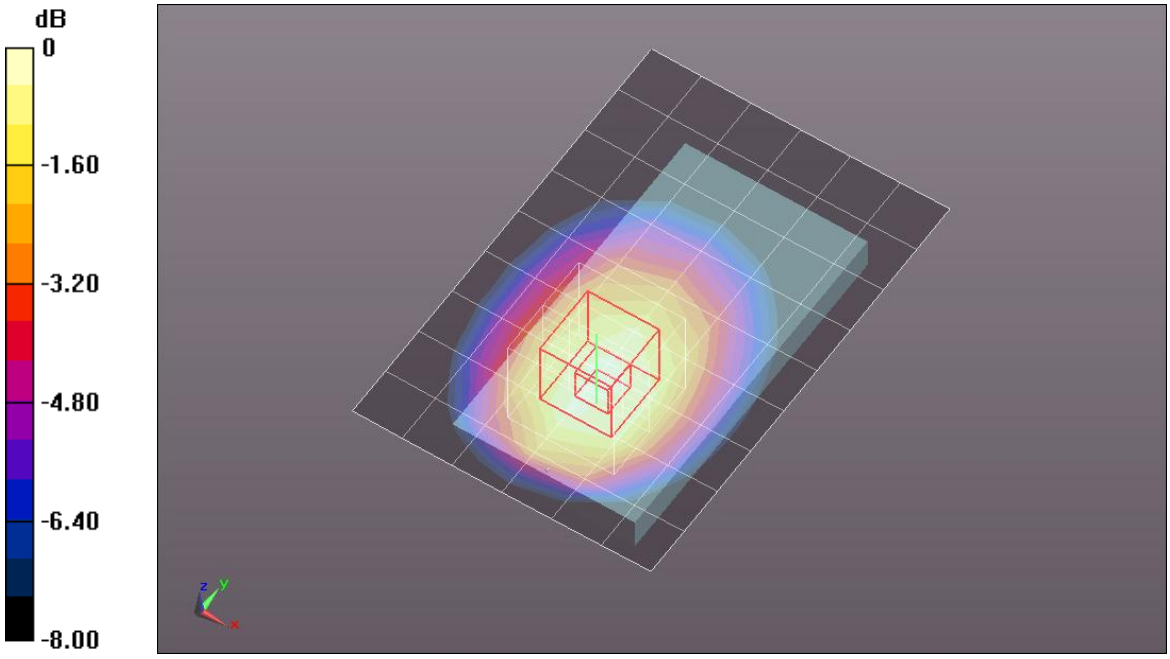


WCDMA Band V

Frequency: 836.4 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): f = 836.4 MHz; σ = 1.01 mho/m; ε_r = 56.637; 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(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/Rel. 99/10mm/Ch 4182/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.892 mW/g

Body/Rear/Rel. 99/10mm/Ch 4182/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 30.613 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 1.1000
SAR(1 g) = 0.792 mW/g; SAR(10 g) = 0.555 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.924 mW/g

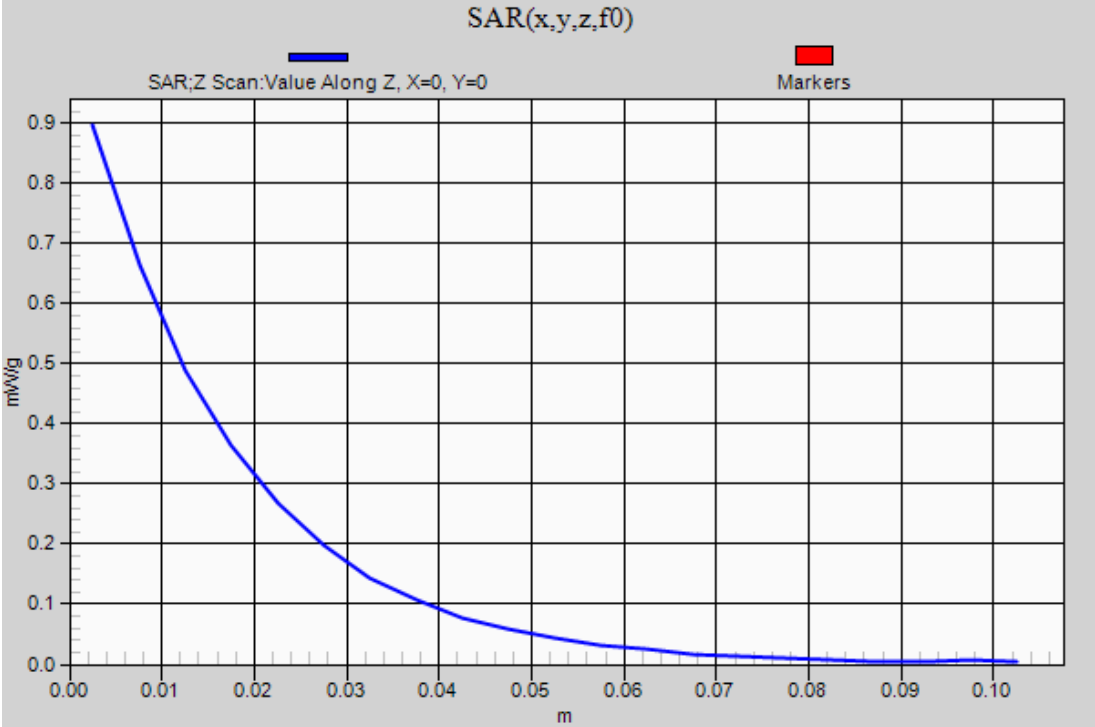


0 dB = 0.920mW/g = -0.72 dB mW/g

WCDMA Band V

Frequency: 836.4 MHz; Duty Cycle: 1:1

Body/Rear/Rel. 99/10mm/Ch 4182/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.897 mW/g

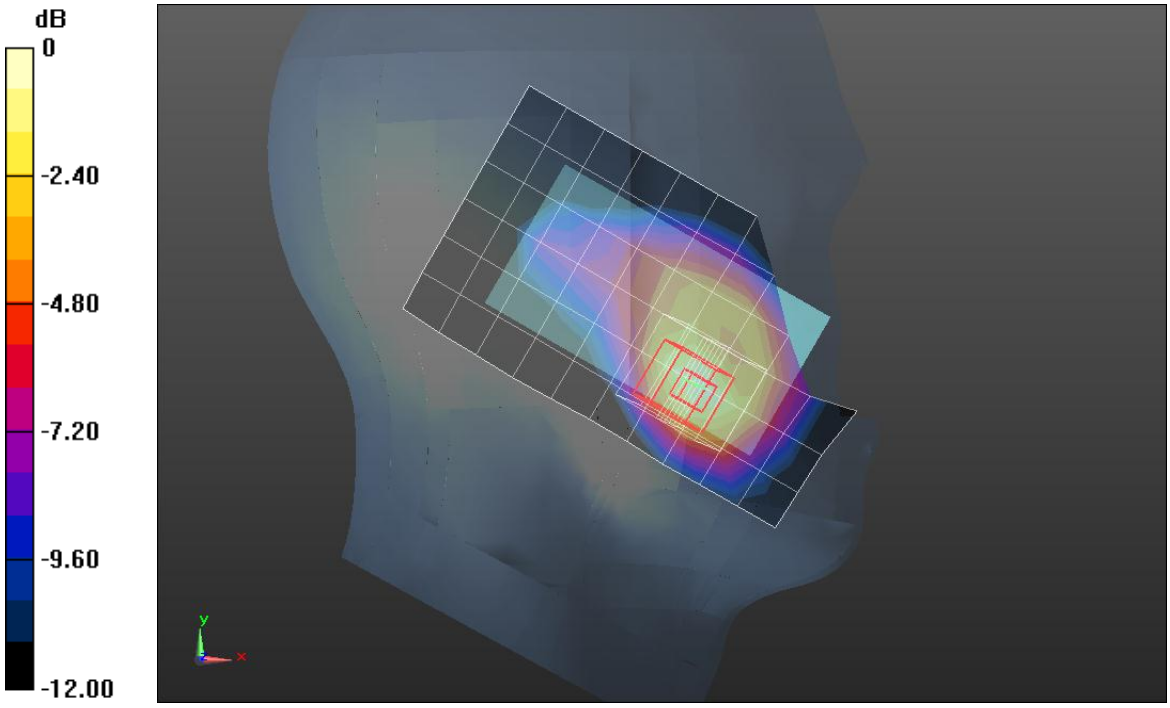


WCDMA Band II

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 = 1.371 mho/m; ε_r = 39.889; 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

Head/Left Touch/Rel. 99/Ch 9400/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.045 mW/g

Head/Left Touch/Rel. 99/Ch 9400/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.624 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 1.5350
SAR(1 g) = 0.898 mW/g; SAR(10 g) = 0.476 mW/g
Maximum value of SAR (measured) = 1.102 mW/g

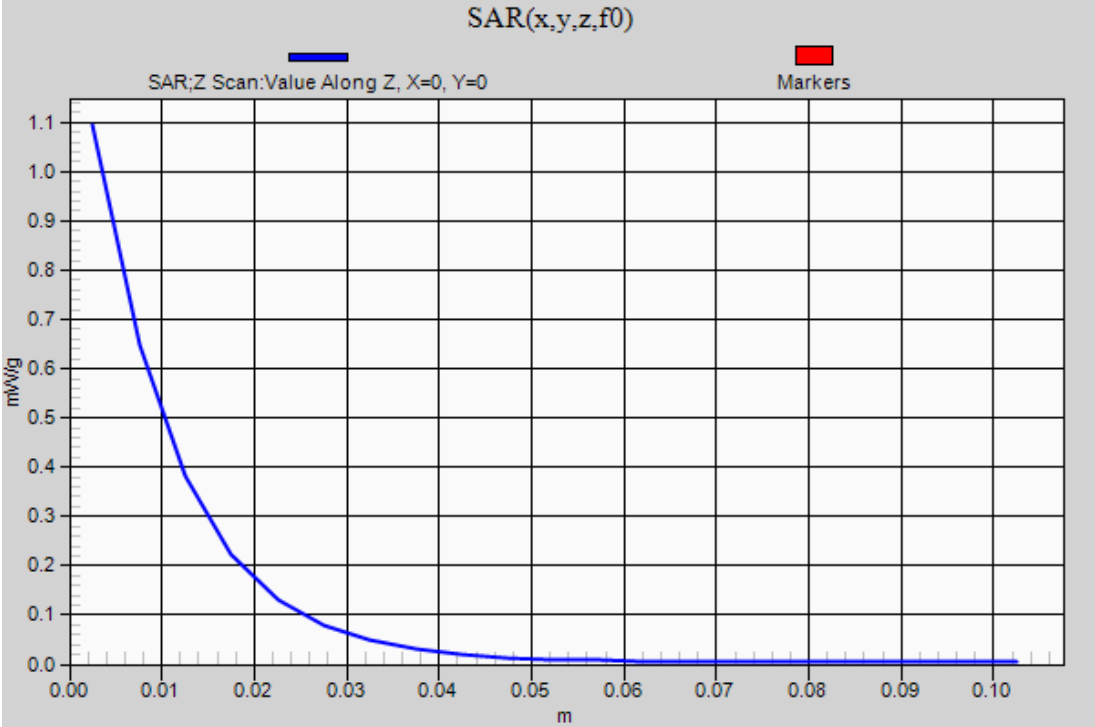


0 dB = 1.100mW/g = 0.83 dB mW/g

WCDMA Band II

Frequency: 1880 MHz; Duty Cycle: 1:1

Head/Left Touch/Rel. 99/Ch 9400/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 1.094 mW/g

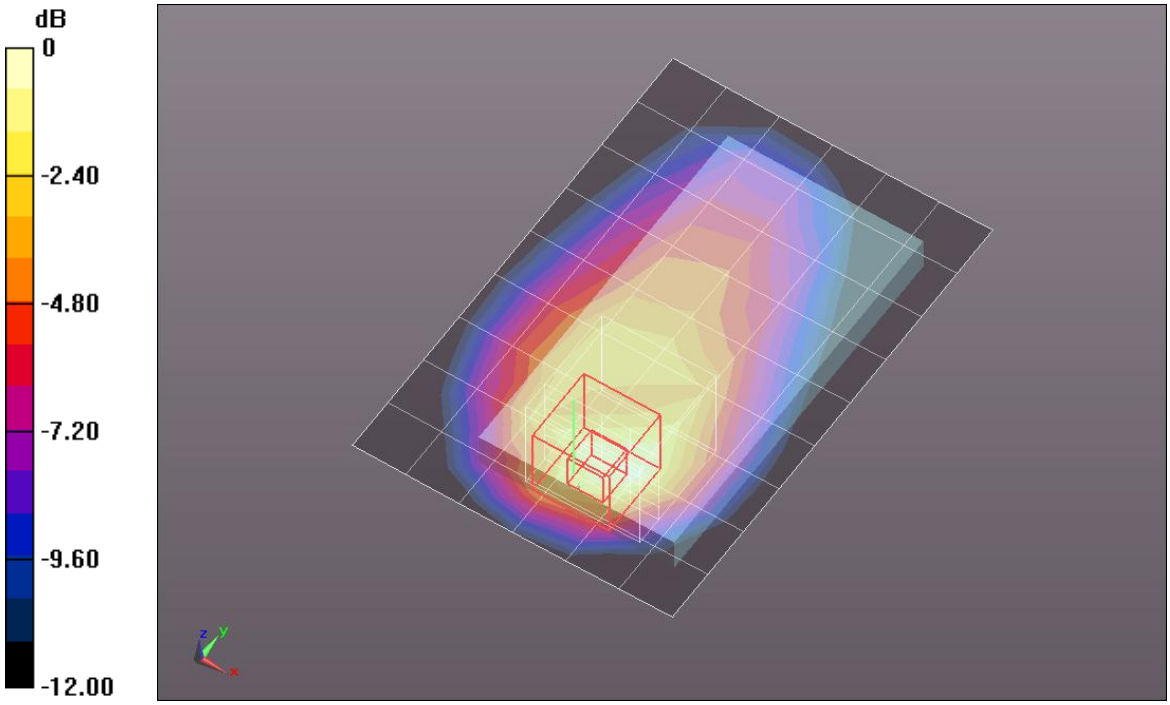


WCDMA Band II

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 = 51.556; 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(7.04, 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/Rel. 99/10mm/Ch 9400/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.141 mW/g

Body/Rear/Rel. 99/10mm/Ch 9400/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.009 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 1.7080
SAR(1 g) = 1.02 mW/g; SAR(10 g) = 0.546 mW/g
Maximum value of SAR (measured) = 1.255 mW/g

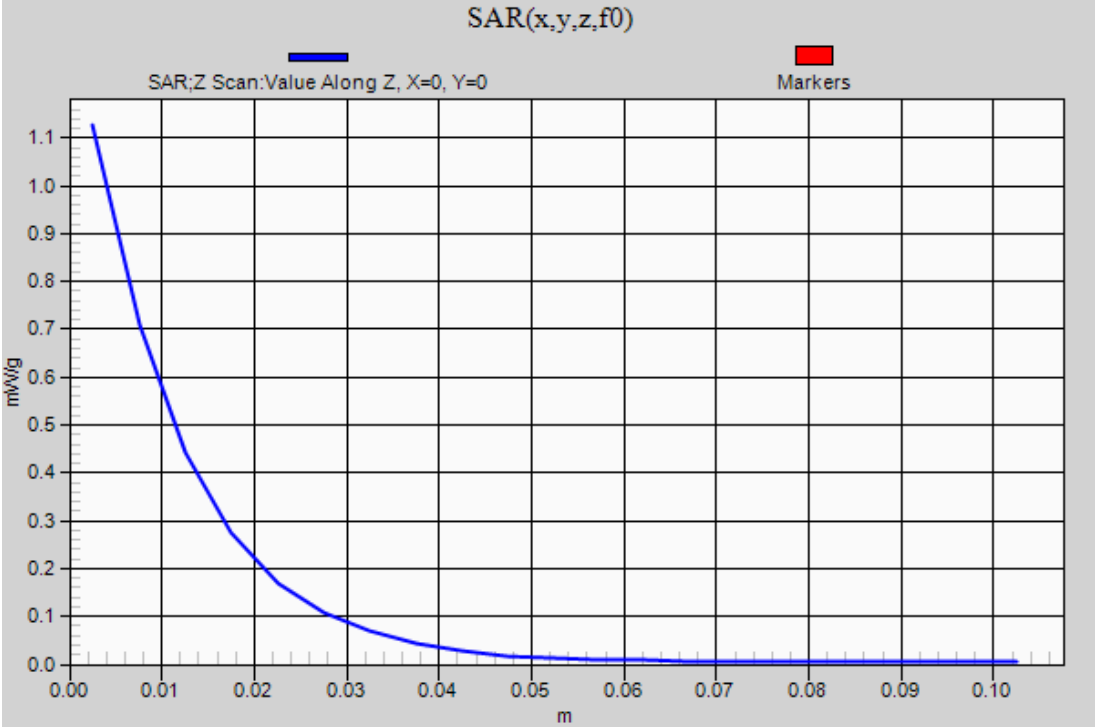


0 dB = 1.260mW/g = 2.01 dB mW/g

WCDMA Band II

Frequency: 1880 MHz; Duty Cycle: 1:1

Body/Rear/Rel. 99/10mm/Ch 9400/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 1.127 mW/g



WiFi 2.4GHz

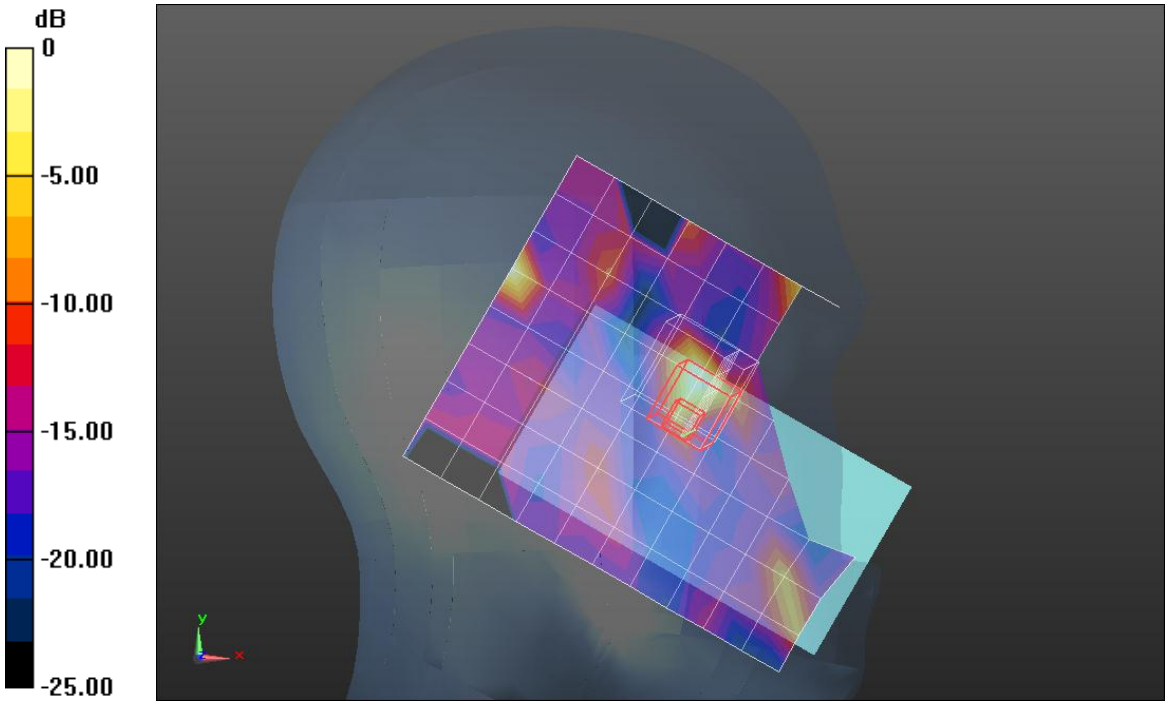
Frequency: 2437 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.943 mho/m; ε_r = 41.01; ρ = 1000 kg/m^3
DASY5 Configuration:
- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1259; Calibrated: 2/13/2012
- Probe: EX3DV4 - SN3686; ConvF(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 Tilt/802.11b/Ch 6/Area Scan (9x11x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.541 mW/g

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

Reference Value = 1.515 V/m; Power Drift = -5.84 dB
Peak SAR (extrapolated) = 0.3010
SAR(1 g) = 0.014 mW/g; SAR(10 g) = 0.00249 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.301 mW/g

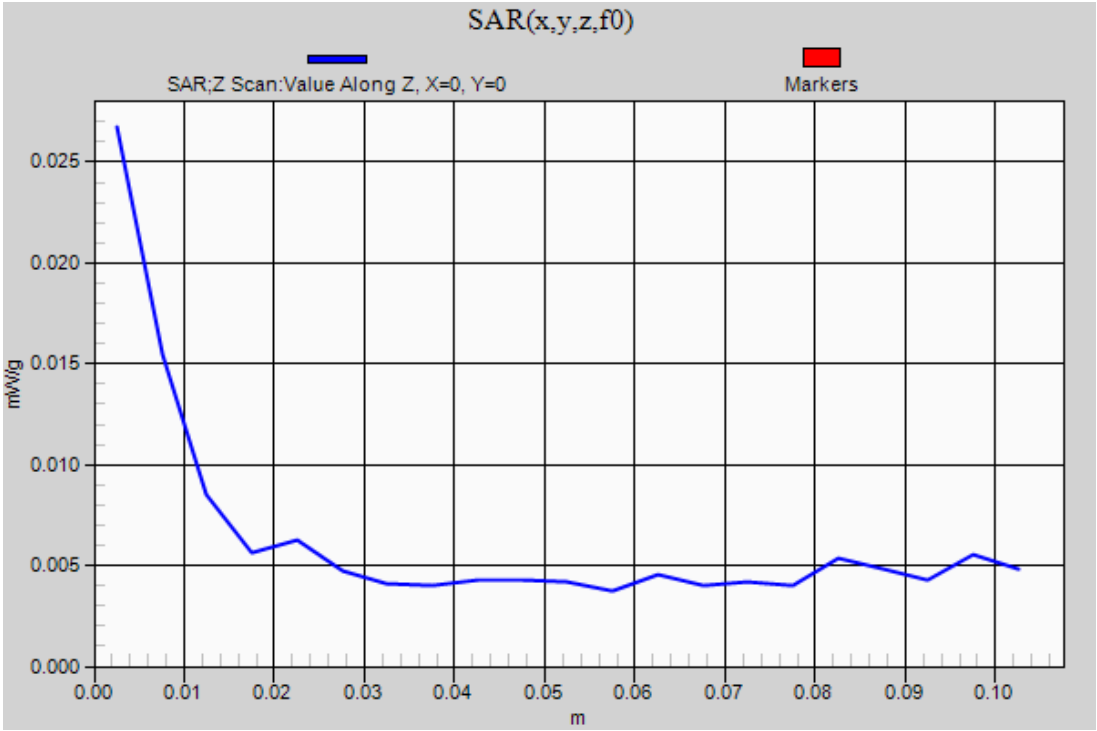


0 dB = 0.300mW/g = -10.46 dB mW/g

WiFi 2.4GHz

Frequency: 2437 MHz; Duty Cycle: 1:1

Head/Left Tilt/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) = 0.018 mW/g

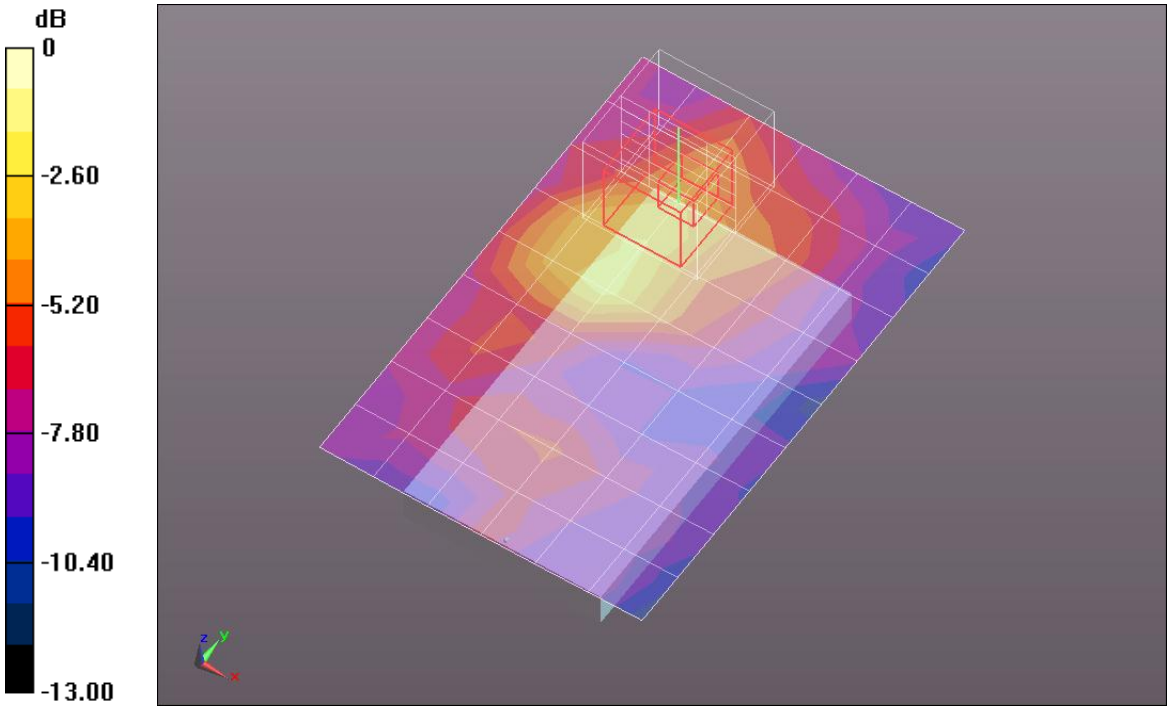


WiFi 2.4GHz

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; σ = 1.984 mho/m; ε_r = 50.814; 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(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 with headset/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.025 mW/g

Body/Rear/802.11b/10mm/Ch 6 with headset/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.488 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 0.0900
SAR(1 g) = 0.018 mW/g; SAR(10 g) = 0.00472 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.038 mW/g

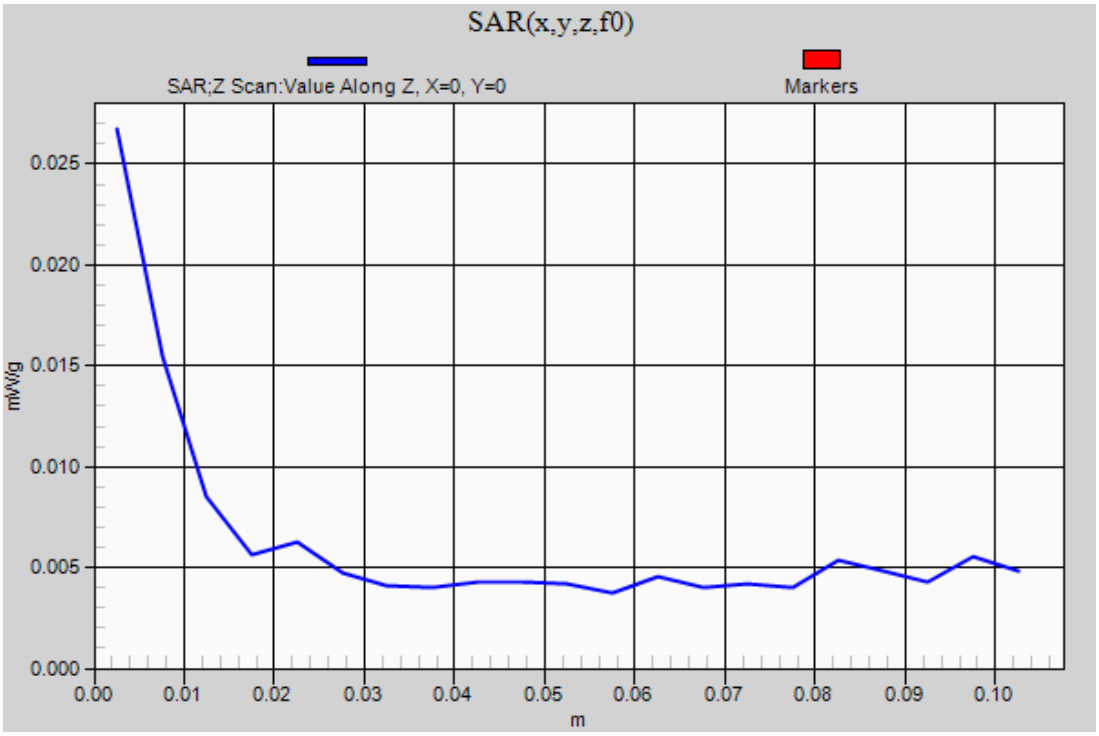


0 dB = 0.040mW/g = -27.96 dB mW/g

WiFi 2.4GHz

Frequency: 2437 MHz; Duty Cycle: 1:1

Body/Rear/802.11b/10mm/Ch 6 with headset/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.027 mW/g



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.

14.1. Head Exposure Conditions

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

Sum of the SAR with Measured Values

Test Position	Voice				Data	∑ 1-g SAR (mW/g)
	GSM 850	GSM 1900	WCDMA Band V	WCDMA Band II	WiFi 2.4 GHz	
Left Touch	0.406				0.010	0.416
		0.559			0.010	0.569
			0.509		0.010	0.519
				0.898	0.010	0.908
Left Tilt	0.199				0.014	0.213
		0.149			0.014	0.163
			0.233		0.014	0.247
				0.242	0.014	0.256
Right Touch	0.338				0.012	0.350
		0.448			0.012	0.460
			0.407		0.012	0.419
				0.662	0.012	0.674
Right Tilt	0.191				0.006	0.197
		0.168			0.006	0.174
			0.213		0.006	0.219
				0.272	0.006	0.278

SAR to Peak Location Separation Ratio (SPLSR)
As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

Conclusion:

- Simultaneous transmission SAR measurement (Volume Scan) is not required because the sum of the 1-g SAR is < 1.6 W/kg under all conditions.

14.1.2. Body Exposure Conditions

14.2. Sum of the SAR for GSM & Wi-Fi in the 2.4 GHz Band

Sum of the SAR with Measured Values

Test Position	Voice				Data	∑ 1-g SAR (mW/g)
	GSM850	GSM1900	WCDMA Band V	WCDMA Band II	WiFi 2.4 GHz	
Rear	0.766				0.018	0.784
		0.561			0.018	0.579
			0.792		0.018	0.810
				1.020	0.018	1.038
Front	0.352				0.011	0.363
		0.331			0.011	0.342
			0.400		0.011	0.411
				0.569	0.011	0.580

SAR to Peak Location Separation Ratio (SPLSR)
As the Sum of the SAR is not greater than 1.6 W/kg, SPLSR assessment is not required.

Conclusion:

- Simultaneous transmission SAR measurement (Volume Scan) is not required because the sum of the 1-g SAR is < 1.6 W/kg under all conditions.

14.2.1. Hotspot Mode Exposure Conditions

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

Sum of the SAR with Measured Values

Test Position	Data					∑ 1-g SAR (mW/g)
	GSM850	GSM1900	WCDMA Band V	WCDMA Band II	WiFi 2.4 GHz	
Rear	0.772				0.018	0.790
		0.354			0.018	0.372
			0.792		0.018	0.810
				1.020	0.018	1.038
Front	0.363				0.011	0.374
		0.569			0.011	0.580
			0.4		0.011	0.411
				0.569	0.011	0.580
Edge 1	0				0.008	0.008
		0			0.008	0.008
			0		0.008	0.008
				0	0.008	0.008
Edge 2	0.13				0.010	0.140
		0.087			0.010	0.097
			0.15		0.010	0.160
				0.125	0.010	0.135
Edge 3	0.07				0	0.070
		0.353			0	0.353
			0.074		0	0.074
				0.535	0	0.535
Edge 4	0.271				0	0.271
		0.117			0	0.117
			0.292		0	0.292
				0.169	0	0.169

SAR to Peak Location Separation Ratio (SPLSR)
As the Sum of the SAR is not greater than 1.6 W/kg, SPLSR assessment is not required.

Conclusion:

- Simultaneous transmission SAR measurement (Volume Scan) is not required because the sum of the 1-g SAR is < 1.6 W/kg under all conditions.

14.4. Scaling of Simultaneous Transmission SAR measurements

The scaling of combined SAR measurements to compensate for the difference between the measured output power and the maximum value indicated in the tune-up procedure was considered unnecessary. The maximum difference between any of the power measurements and the corresponding maximum possible power allowed by the tune-up procedure, for any of the transmitters, is 1.1 dB. Only combined SAR measurements above 1.24 W/kg could exceed 1.6 W/kg as a result of scaling to accommodate this 1.1 dB difference. The worst case combined SAR measurement is 1.038 W/kg

15. Appendix to FCC SAR report

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 (UMTS) Band V

15.5. SAR Test Plots for W-CDMA (UMTS) Band II

15.6. SAR Test Plots for Wi-Fi 2.4 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 D1900V2 - SN 5d140

15.10. Calibration Certificate for D2450V2 - SN 706