



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

SAR EVALUATION REPORT

For
Portable Handset

**Model: GT-B7810L
FCC ID: A3LGTB7810L**

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Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	7/25/2012	Initial Issue	--
A	9/6/2012	Amended target powers for GSM and W-CDMA to agree with revised tune-up procedure. Revised scaled results in line with tune-up procedure.	Dave Weaver

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1. Attestation of Test Results

Applicant	SAMSUNG ELECTRONICS CO., LTD.		
DUT description	Portable Handset		
Model	GT-B7810L		
Test device is	An identical prototype		
Device category	Portable		
Exposure category	General Population/Uncontrolled Exposure		
Date tested	7/11/2012-7/17/2012		
FCC Rule Parts	Freq. Range	Highest 1-g SAR	Limit
22	824-849 MHz	Head: 0.322W/kg (Right Touch) (W-CDMA RMC, 12.2 kbps) Body & Hotspot: 0.656W/kg (Rear w/ 10mm distance) (W-CDMA RMC, 12.2 kbps)	1.6 W/kg
24	1850-1910 MHz	Head: 1.08W/kg (Right Touch) (W-CDMA RMC, 12.2 kbps) Body & Hotspot: 0.559W/kg (Rear w/ 10 mm distance) (W-CDMA RMC, 12.2 kbps)	
15.247	2412-2462 MHz	Head: 0.153W/kg (Right Touch) Body & Hotspot: 0.228W/kg (Rear w/ 10 mm distance)	
Applicable Standards			Test Results
FCC OET Bulletin 65 Supplement C 01-01, IEEE Std 1528-2003, 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:		Tested By:	
			
Dave Weaver Staff Engineer UL CCS		Elijah Garcia Laboratory Technician I 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 KDB Procedures:

- 648474 D01 SAR Handsets Multi Xmitter 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	3749	1	27	2013
E-Field Probe	SPEAG	EX3DV4	3772	2	16	2013
Thermometer	ERTCO	639-1S	1718	7	30	2012
Data Acquisition Electronics	SPEAG	DAE4	1258	3	8	2013
Data Acquisition Electronics	SPEAG	DAE3	427	1	17	2013
System Validation Dipole	SPEAG	D835V2	4d117	4	10	2013
System Validation Dipole	SPEAG	D1900V2	5d140	4	12	2013
System Validation Dipole	SPEAG	D2450V2	748	2	7	2013
Amplifier	MITEQ	4D00400600-50-30P	1620606	N/A		
Directional coupler	Werlatone	C8060-102	2141	N/A		

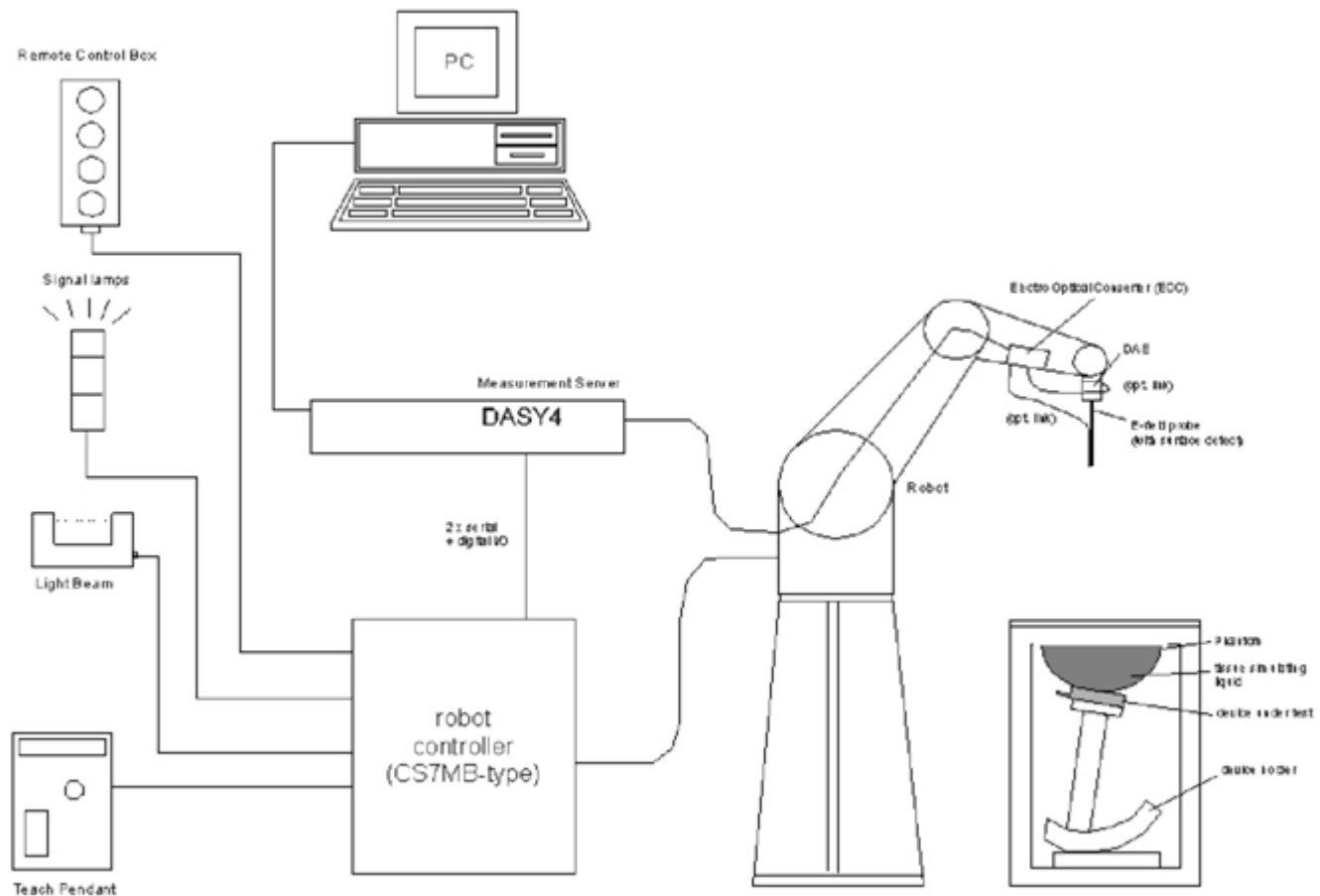
4.2. Measurement Uncertainty

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

Component	Error, %	Distribution	Divisor	Sensitivity	U (X), %
Measurement System					
Probe Calibration (k=1)	6.00	Normal	1	1	6.00
Axial Isotropy	1.15	Rectangular	1.732	0.7071	0.47
Hemispherical Isotropy	2.30	Rectangular	1.732	0.7071	0.94
Boundary Effect	0.90	Rectangular	1.732	1	0.52
Probe Linearity	3.45	Rectangular	1.732	1	1.99
System Detection Limits	1.00	Rectangular	1.732	1	0.58
Readout Electronics	0.30	Normal	1	1	0.30
Response Time	0.80	Rectangular	1.732	1	0.46
Integration Time	2.60	Rectangular	1.732	1	1.50
RF Ambient Conditions - Noise	3.00	Rectangular	1.732	1	1.73
RF Ambient Conditions - Reflections	3.00	Rectangular	1.732	1	1.73
Probe Positioner Mechanical Tolerance	0.40	Rectangular	1.732	1	0.23
Probe Positioning with respect to Phantom	2.90	Rectangular	1.732	1	1.67
Extrapolation, Interpolation and Integration	1.00	Rectangular	1.732	1	0.58
Test Sample Related					
Test Sample Positioning	2.90	Normal	1	1	2.90
Device Holder Uncertainty	3.60	Normal	1	1	3.60
Output Power Variation - SAR Drift	5.00	Rectangular	1.732	1	2.89
Phantom and Tissue Parameters					
Phantom Uncertainty (shape and thickness)	4.00	Rectangular	1.732	1	2.31
Liquid Conductivity - deviation from target	5.00	Rectangular	1.732	0.64	1.85
Liquid Conductivity - measurement uncertainty	-4.68	Normal	1	0.64	-3.00
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.6	1.73
Liquid Permittivity - measurement uncertainty	3.39	Normal	1	0.6	2.03
Combined Standard Uncertainty $U_c(y)$ =					10.39
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				20.78 %	
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				1.64 dB	

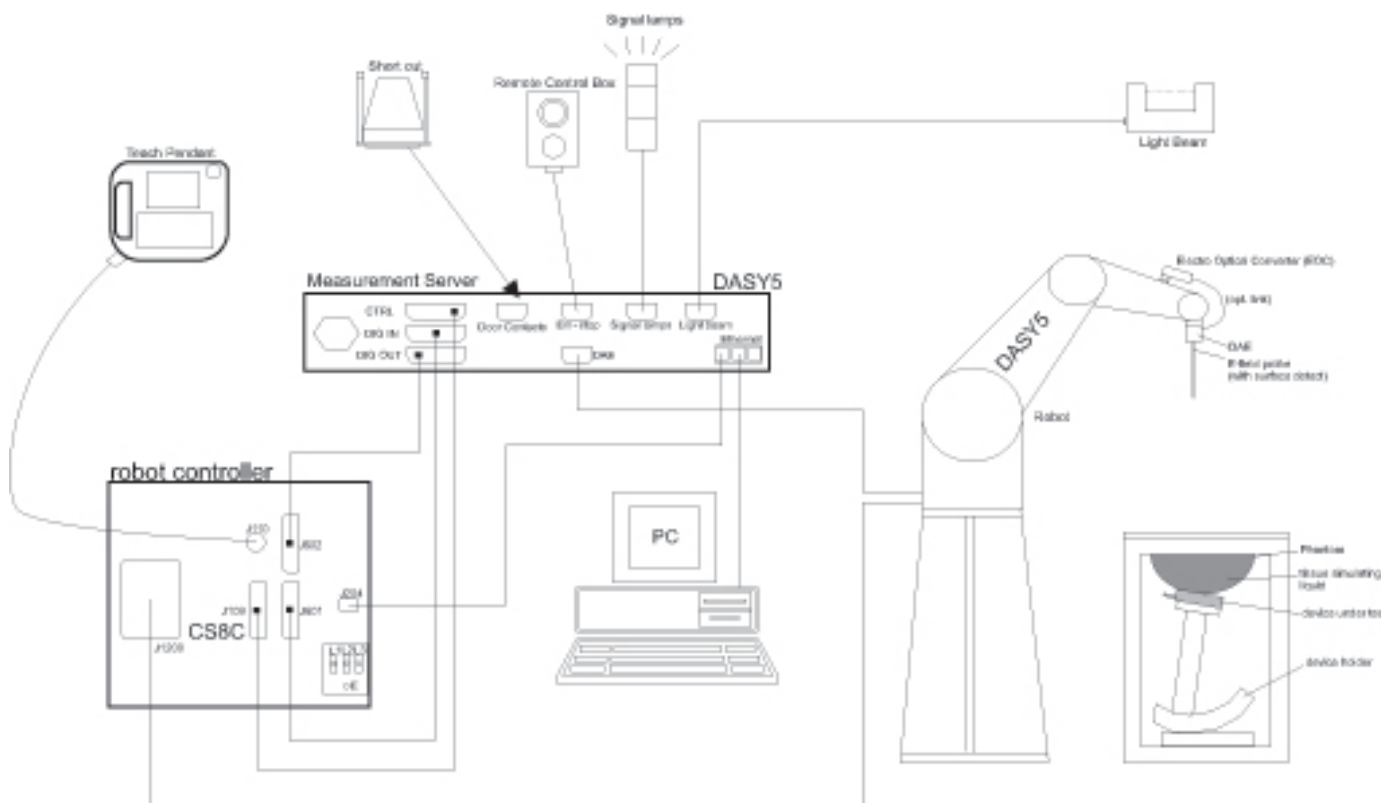
5. Measurement System Description and Setup

The DASY4 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.

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

Step 4: Power drift measurement

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

Step 5: Z-Scan (FCC only)

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

6.2. Volume Scan Procedures

Step 1: Power Reference Measurement

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

Step 2: Area Scan

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

Step 3: Zoom Scan

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

Step 4: Volume Scan

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

Step 5: Power drift measurement

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

7. Device Under Test

Portable Handset Base Model: GT-B7810L	
Normal operation	- Held to head, - Body (Rear and Front sides) with 10 mm separation distance. - Hotspot (wireless router) with 10 mm separation distance to all sides and edges.
Accessory	1. Headset 2. Battery Cover - o Standard Battery Cove

7.1. Band and Air Interfaces

Tx Frequency Bands	- GSM850: 824 - 849 MHz - GSM1900: 1850 - 1910 MHz - W-CDMA (UMTS) Band V: 824 - 849 MHz - W-CDMA (UMTS) Band II: 1850 - 1910 MHz - 802.11b/g: 2412 - 2462 MHz - Bluetooth: 2402 - 2480 MHz
GPRS Multi-Slot Class:	12
GPRS Class:	B
DTM Class:	Not supported

7.2. Hotspot (Wireless router) Exposure Condition

The device is capable of personal hotspot mode through W-CDMA but not GSM. The hotspot mode can be enabled by the user.

7.3. Simultaneous Transmission

No.	Conditions
1	GSM850 Voice + BT
2	GSM1900 Voice + BT
3	GSM850 GPRS + BT
4	GSM1900 GPRS + BT
5	W-CDMA (UMTS) Band V+ BT
6	W-CDMA (UMTS) Band II+ BT
7	GSM850 Voice + WiFi
8	GSM1900 Voice + WiFi
9	GSM850 GPRS + WiFi
10	GSM1900 GPRS + WiFi
11	W-CDMA (UMTS) Band V+ WiFi
12	W-CDMA (UMTS) Band II+ WiFi

Notes:

1. WiFi and BT cannot transmit simultaneously because of shared antenna

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 Test Configurations for WWAN and WiFi

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 Configurations

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

8.3. Personal Router/Hotspot Test Configurations

For GSM850/1900

No Personal Router/Hotspot testing is required for GSM850/1900 as it does not support Hotspot mode.

For W-CDMA Band V and Band II

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	< 25 mm	Yes	
Front	< 25 mm	Yes	
Edge 1	95 mm	No	SAR is not required because the distance from the antenna to this edge is > 2.5 cm as per KDB 941225 D06 Hot Spot SAR v01
Edge 2	2 mm	Yes	
Edge 3	1.95 mm	Yes	
	4.45 mm	Yes	
Edge 4	1.5 mm	Yes	

For WiFi

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	< 25 mm	Yes	
Front	< 25 mm	Yes	
Edge 1	3 mm	Yes	
Edge 2	46.5 mm	No	
Edge 3	94.7 mm	No	SAR is not required because the distance from the antenna to this edge is > 2.5 cm as per KDB 941225 D06 Hot Spot SAR v01
Edge 4	5.5 mm	Yes	

9. RF Output Power Measurement

9.1. Target Power with Tune-up Tolerance

Mode	Target Power (dBm)			
	GSM850	GSM1900	W-CDMA Band V	W-CDMA Band II
Voice	33.0	30.5	23.0	23.0
GPRS 1 Slot	31.9	29.6	-	-
GPRS 2 Slot	29.4	27.3	-	-
GPRS 3 Slot	27.5	25.3	-	-
GPRS 4 Slot	26.5	24.4	-	-
SUBTEST 1, 2	-	-	23.0	23.0
SUBTEST 3, 4	-	-	23.0	23.0

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

9.2. GSM850

GMSK (Voice) Mode

Target Power: 33.0 dBm

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

Band	Ch No.	Freq. (MHz)	Avg burst Pwr (dBm)
850	128	824.2	33.1
	190	836.6	33.2
	251	848.8	33.2

GMSK (GPRS) Mode - Coding Scheme: CS1

Target Power: 31.9 dBm for 1 slot

29.4 dBm for 2 slots

27.5 dBm for 3 slots

26.5 dBm for 4 slots

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

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	31.9	22.8	29.4	23.4	27.5	23.2	26.5	23.5
	190	836.6	32.2	23.1	29.8	23.7	27.8	23.5	26.8	23.8
	251	848.8	32.0	23.0	29.6	23.6	27.7	23.4	26.7	23.7

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

This mode is Rx only

9.3. GSM1900

GMSK (Voice) Mode

Target Power: 30.5 dBm

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

Ch No.	Freq. (MHz)	Avg burst Pwr (dBm)
512	1850.2	29.2
661	1880	29.4
810	1909.8	29.3

GMSK (GPRS) Mode - Coding Scheme: CS1

Target Power: 29.6 dBm for 1 slot

27.3 dBm for 2 slots

25.3 dBm for 3 slots

24.4 dBm for 4 slots

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

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	29.49	20.46	27.52	21.50	25.59	21.33	24.68	21.67
	661	1880	29.70	20.67	27.36	21.34	25.40	21.14	24.40	21.39
	810	1909.8	29.16	20.13	27.33	21.31	25.36	21.10	24.43	21.42

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 4 time slots, based on the output power measurements above

8PSK (EGPRS) Mode - Coding Scheme: MCS5

N/A: This mode is Rx only

9.4. W-CDMA (UMTS) Band V

Release 99 (RMC, 12.2kbps)

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

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

Target Power: 23.0 dBm

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

Band	Ch No.	Freq. (MHz)	Measured Avg. Power (dBm)
850 (Band V)	4132	826.4	23.4
	4183	836.6	23.5
	4233	846.6	23.4

HSDPA

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

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

Target Power: 23.0 dBm for Subset 1
23.0 dBm for Subset 2
23.0 dBm for Subset 3
23.0 dBm for Subset 4

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

Band	Subtest	Ch No.	Freq. (MHz)	Target MPR	Meas. MPR	Measured Avg. Power (dBm)
850 (Band V)	1	4132	826.4	0	0	23.0
		4183	836.6	0	0	23.1
		4233	846.6	0	0	22.9
	2	4132	826.4	0	0	22.9
		4183	836.6	0	0	23.0
		4233	846.6	0	0	23.0
	3	4132	826.4	0	0	22.9
		4183	836.6	0	0	22.7
		4233	846.6	0	0	23.0
	4	4132	826.4	0	0	22.8
		4183	836.6	0	0	22.7
		4233	846.6	0	0	23.0

9.5. W-CDMA (UMTS) Band II

Release 99 (RMC, 12.2kbps)

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

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

Target Power: 23.0 dBm

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

Band	Ch No.	Freq. (MHz)	Measured Avg. Power (dBm)
1900 (Band II)	9262	1852.4	23.3
	9400	1880.0	23.5
	9538	1907.6	23.3

HSDPA

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

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

Target Power: 23.0 dBm for Subset 1
23.0 dBm for Subset 2
23.0 dBm for Subset 3
23.0 dBm for Subset 4

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

Band	Subtest	Ch No.	Freq. (MHz)	Target MPR	Meas. MPR	Measured Avg. Power (dBm)
1900 (Band II)	1	9262	1852.4	0	0	22.2
		9400	1880.0	0	0	22.7
		9538	1907.6	0	0	22.1
	2	9262	1852.4	0	0	22.4
		9400	1880.0	0	0	22.5
		9538	1907.6	0	0	22.1
	3	9262	1852.4	0	0	22.1
		9400	1880.0	0	0	22.5
		9538	1907.6	0	0	22.0
	4	9262	1852.4	0	0	22.1
		9400	1880.0	0	0	22.6
		9538	1907.6	0	0	22.1

9.6. Wi-Fi (802.11bg)

Required Test Channels per KDB 248227 D01

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

Notes:
 √ = "default test channels"
 ▽ = possible 802.11g channels with maximum average output $\frac{1}{4}$ dB $\geq$ the "default test channels"
 # = when output power is reduced for channel 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.

Target Power: 15 dBm (802.11b Mode), 13 dBm (802.11g Mode) 11 dBm (802.11n Mode)
 Tune-up Tolerance: -1.5 dBm / +0.5 dBm

Output power table

Band (GHz)	Mode	Data Rate (Mbps)	Ch #	Freq. (MHz)	Measured Avg Pwr(dBm)
2.4	802.11b	1	1	2412	15.0
			6	2437	15.1
			11	2462	15.2
	802.11g	6	1	2412	12.1
			6	2437	12.2
			11	2462	12.0
	802.11n	MCS0	1	2412	9.3
			6	2437	9.0
			11	2462	9.1

Output power for the different modulations and data rate configurations

Band (GHz)	Mode	Ch #	Freq. (MHz)	Data rate (Mbps)	Measured Avg Pwr(dBm)
2.4	802.11b	6	2462	1	15.2
				2	15.1
				5.5	15.0
				11	14.9
	802.11g	6	2462	6	12.2
				9	12.1
				12	12.0
				18	11.8
				24	11.6
				36	11.2
				48	11.0
				54	10.9

Note(s):

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

9.7. Bluetooth

Mode	Channel #	Freq. (MHz)	Measured Avg Pwr(dBm)
GFSK	0	2402	10.09
	39	2441	10.45
	78	2480	9.86
QPSK	0	2402	9.41
	39	2441	9.90
	78	2480	9.33
8-PSK	0	2402	9.70
	39	2441	10.20
	78	2480	9.66

Note(s):

According to KDB 648474, Table 2, Unlicensed transmitters

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

- ☒ Output $\leq 2 \cdot P_{\text{Ref}}$ (13.8dBm / 24 mW) and antenna is ≥ 5.0 cm from other antennas
- ☐ Output $\leq P_{\text{Ref}}$ (10.79dBm / 12 mW) and antenna is ≥ 2.5 cm from other antennas
- ☐ Output $\leq P_{\text{Ref}}$ (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/HSL750 (Body and Head liquids for 700 – 800 MHz)

Item	Head Tissue Simulation Liquids HSL750 Muscle (body) Tissue Simulation Liquids MSL750
Type No	SL AAH 075
Manufacturer	SPEAG
The item is composed of the following ingredients:	
H ₂ O	Water, 35 – 58%
Sucrose	Sugar, white, refined, 40-60%
NaCl	Sodium Chloride, 0-6%
Hydroxyethyl-cellulose	Medium Viscosity (CAS# 9004-62-0), <0.3%
Preventol-D7	Preservative: aqueous preparation, (CAS# 55965-84-9), containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyl-3(2H)-isothiazolone, 0.1-0.7%

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.

Tissue Dielectric Parameter Check Results

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit $\pm$ (%)
07/11/2012	Body 1900	e'	51.5121	Relative Permittivity (ϵ_r):	51.51	53.30	-3.35	5
		e''	14.3729	Conductivity (σ):	1.52	1.52	-0.10	5
	Body 1850	e'	51.6390	Relative Permittivity (ϵ_r):	51.64	53.30	-3.12	5
		e''	14.2282	Conductivity (σ):	1.46	1.52	-3.71	5
	Body 1880	e'	51.5936	Relative Permittivity (ϵ_r):	51.59	53.30	-3.20	5
		e''	14.3821	Conductivity (σ):	1.50	1.52	-1.09	5
	Body 1910	e'	51.5355	Relative Permittivity (ϵ_r):	51.54	53.30	-3.31	5
		e''	14.3182	Conductivity (σ):	1.52	1.52	0.04	5
07/12/2012	Head 1900	e'	41.1917	Relative Permittivity (ϵ_r):	41.19	40.00	2.98	5
		e''	12.9451	Conductivity (σ):	1.37	1.40	-2.31	5
	Head 1850	e'	41.3573	Relative Permittivity (ϵ_r):	41.36	40.00	3.39	5
		e''	12.9725	Conductivity (σ):	1.33	1.40	-4.68	5
	Head 1880	e'	41.2494	Relative Permittivity (ϵ_r):	41.25	40.00	3.12	5
		e''	12.9764	Conductivity (σ):	1.36	1.40	-3.11	5
	Head 1915	e'	40.9973	Relative Permittivity (ϵ_r):	41.00	40.00	2.49	5
		e''	13.0359	Conductivity (σ):	1.39	1.40	-0.85	5
07/13/2012	Head 1900	e'	39.4761	Relative Permittivity (ϵ_r):	39.48	40.00	-1.31	5
		e''	13.5158	Conductivity (σ):	1.43	1.40	1.99	5
	Head 1850	e'	39.6782	Relative Permittivity (ϵ_r):	39.68	40.00	-0.80	5
		e''	13.3592	Conductivity (σ):	1.37	1.40	-1.84	5
	Head 1880	e'	39.5542	Relative Permittivity (ϵ_r):	39.55	40.00	-1.11	5
		e''	13.4465	Conductivity (σ):	1.41	1.40	0.40	5
	Head 1915	e'	39.4194	Relative Permittivity (ϵ_r):	39.42	40.00	-1.45	5
		e''	13.5643	Conductivity (σ):	1.44	1.40	3.17	5
07/13/2012	Head 835	e'	41.9574	Relative Permittivity (ϵ_r):	41.96	41.50	1.10	5
		e''	19.0776	Conductivity (σ):	0.89	0.90	-1.58	5
	Head 825	e'	42.1191	Relative Permittivity (ϵ_r):	42.12	41.58	1.30	5
		e''	19.1523	Conductivity (σ):	0.88	0.90	-2.26	5
	Head 850	e'	41.7976	Relative Permittivity (ϵ_r):	41.80	41.50	0.72	5
		e''	19.0345	Conductivity (σ):	0.90	0.92	-1.68	5
07/14/2012	Body 835	e'	53.8994	Relative Permittivity (ϵ_r):	53.90	55.20	-2.36	5
		e''	21.1328	Conductivity (σ):	0.98	0.97	1.15	5
	Body 820	e'	54.0604	Relative Permittivity (ϵ_r):	54.06	55.28	-2.20	5
		e''	21.2845	Conductivity (σ):	0.97	0.97	0.21	5
	Body 850	e'	53.7747	Relative Permittivity (ϵ_r):	53.77	55.16	-2.51	5
		e''	21.2057	Conductivity (σ):	1.00	0.99	1.53	5

Tissue Dielectric Parameter Check Results (continued)

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit $\pm$ (%)
7/14/2012	Body 1900	e'	53.8167	Relative Permittivity (ϵ_r):	53.82	53.30	0.97	5
		e''	14.3057	Conductivity (σ):	1.51	1.52	-0.57	5
	Body 1850	e'	53.9539	Relative Permittivity (ϵ_r):	53.95	53.30	1.23	5
		e''	14.1114	Conductivity (σ):	1.45	1.52	-4.50	5
	Body 1880	e'	53.8899	Relative Permittivity (ϵ_r):	53.89	53.30	1.11	5
		e''	14.2571	Conductivity (σ):	1.49	1.52	-1.95	5
	Body 1910	e'	53.7670	Relative Permittivity (ϵ_r):	53.77	53.30	0.88	5
		e''	14.4244	Conductivity (σ):	1.53	1.52	0.78	5
7/16/2012	Head 2450	e'	39.7159	Relative Permittivity (ϵ_r):	39.72	39.20	1.32	5
		e''	13.3574	Conductivity (σ):	1.82	1.80	1.09	5
	Head 2410	e'	39.7397	Relative Permittivity (ϵ_r):	39.74	39.28	1.17	5
		e''	13.2900	Conductivity (σ):	1.78	1.76	1.16	5
	Head 2435	e'	39.6378	Relative Permittivity (ϵ_r):	39.64	39.24	1.03	5
		e''	13.3484	Conductivity (σ):	1.81	1.78	1.40	5
	Head 2475	e'	39.5302	Relative Permittivity (ϵ_r):	39.53	39.17	0.92	5
		e''	13.5336	Conductivity (σ):	1.86	1.83	1.94	5
7/16/2012	Body 2450	e'	50.9803	Relative Permittivity (ϵ_r):	50.98	52.70	-3.26	5
		e''	14.7668	Conductivity (σ):	2.01	1.95	3.16	5
	Body 2410	e'	51.2067	Relative Permittivity (ϵ_r):	51.21	52.76	-2.94	5
		e''	14.5696	Conductivity (σ):	1.95	1.91	2.35	5
	Body 2435	e'	51.1157	Relative Permittivity (ϵ_r):	51.12	52.73	-3.05	5
		e''	14.6819	Conductivity (σ):	1.99	1.93	2.94	5
	Body 2475	e'	51.0010	Relative Permittivity (ϵ_r):	51.00	52.67	-3.17	5
		e''	14.9991	Conductivity (σ):	2.06	1.99	3.98	5

System Performance Check

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

10.3. 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.

10.4. 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	4d117	4/10/12	835	1g	9.40	9.84
				10g	6.16	6.48
D1900V2	5d140	4/12/12	1900	1g	39.08	40.0
				10g	20.56	21.28
D2450V2	748	2/7/12	2450	1g	53.6	50.8
				10g	24.8	23.6

10.5. 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.						
7/11/2012	D1900V2	5d140	Body	1g	42.3	40.00	5.75	±10
				10g	22.0	21.28	3.38	
7/12/2012	D1900V2	5d140	Head	1g	37.4	39.08	-4.30	±10
				10g	19.6	20.56	-4.67	
7/13/2012	D1900V2	5d140	Head	1g	40.10	39.08	2.61	±10
				10g	20.90	20.56	1.65	
7/13/2012	D835V2	4d117	Head	1g	9.5	9.40	1.28	±10
				10g	6.3	6.16	1.46	
7/14/2012	D835V2	4d117	Body	1g	9.4	9.84	-4.67	±10
				10g	6.2	6.48	-4.63	
7/14/2012	D1900V2	5d140	Body	1g	41.9	40.00	4.75	±10
				10g	22.1	21.28	3.85	
7/16/2012	D2450V2	748	Head	1g	55.1	53.60	2.80	±10
				10g	24.9	24.80	0.40	
7/17/2012	D2450V2	748	Body	1g	54.2	50.80	6.69	±10
				10g	25.2	23.60	6.78	

11. SAR Test Results

11.1. GSM850

11.1.1. Head Test Configuration

Test Position	Mode	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
					1-g	10-g	
Left Touch	GMSK (Voice)	128	824.20	33.1			
		190	836.60	33.2	0.297	0.208	1
		251	848.80	33.2			
Left Tilt (15°)	GMSK (Voice)	128	824.20	33.1			
		190	836.60	33.2	0.134	0.104	1
		251	848.80	33.2			
Right Touch	GMSK (Voice)	128	824.20	33.1			
		190	836.60	33.2	0.312	0.214	1
		251	848.80	33.2			
Right Tilt (15°)	GMSK (Voice)	128	824.20	33.1			
		190	836.60	33.2	0.143	0.110	1
		251	848.80	33.2			

11.1.2. Body-worn Accessory Test Configuration

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	29.4			1
			190	836.60	29.8	0.406	0.291	
			251	848.80	29.6			1
	GMSK (Voice)	10	190	836.60	29.8	0.235	0.166	2
Front	GPRS 2 slots	10	128	824.20	29.4			1
			190	836.60	29.8	0.230	0.167	
			251	848.80	29.6			1

Note(s):

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

11.2. Personal Router/Hotspot Test Configurations

For GSM850/1900

No Personal Router/Hotspot testing is required for GSM850/1900 as it does not support Hotspot mode.

11.3. GSM1900

11.3.1. Head Test Configuration

Test Position	Mode	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
					1-g	10-g	
Left Touch	GMSK (Voice)	512	1850.2	29.2			
		661	1880.0	29.4	0.326	0.215	1
		810	1909.8	29.3			
Left Tilt (15°)	GMSK (Voice)	512	1850.2	29.2			
		661	1880.0	29.4	0.178	0.106	1
		810	1909.8	29.3			
Right Touch	GMSK (Voice)	512	1850.2	29.2			
		661	1880.0	29.4	0.516	0.307	1
		810	1909.8	29.3			
Right Tilt (15°)	GMSK (Voice)	512	1850.2	29.2			
		661	1880.0	29.4	0.184	0.104	1
		810	1909.8	29.3			

11.3.2. Body-worn Accessory Test Configuration

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
						1-g	10-g	
Rear	GPRS 4 slots	10	512	1850.2	24.68			1
			661	1880.0	24.40	0.413	0.241	
			810	1909.8	24.43			1
	GMSK (Voice)	10	661	1880.0	24.40	0.303	0.183	2
Front	GPRS 4 slots	10	512	1850.2	24.68			1
			661	1880.0	24.40	0.318	0.190	
			810	1909.8	24.43			1

Note(s):

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

11.3.3. Personal Router/Hotspot Test Configurations

For GSM850/1900

No Personal Router/Hotspot testing is required for GSM850/1900 as it does not support Hotspot mode

11.4. 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

11.4.1. Head Test Configuration

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	23.4			
		4183	836.6	23.5	0.312	0.219	1
		4233	846.6	23.4			
Left Tilt (15°)	Rel 99 RMC 12.2kbps	4132	826.4	23.4			
		4183	836.6	23.5	0.136	0.106	1
		4233	846.6	23.4			
Right Touch	Rel 99 RMC 12.2kbps	4132	826.4	23.4			
		4183	836.6	23.5	0.322	0.220	1
		4233	846.6	23.4			
Right Tilt (15°)	Rel 99 RMC 12.2kbps	4132	826.4	23.4			
		4183	836.6	23.5	0.141	0.107	1
		4233	846.6	23.4			

11.4.2. Body-worn Accessory Test Configuration

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	23.4			1
			4183	836.6	23.5	0.656	0.455	
			4183	836.6	23.5	0.488	0.331	2
			4233	846.6	23.4			1
Front	Rel 99 RMC 12.2kbps	10	4132	826.4	23.4			1
			4183	836.6	23.5	0.327	0.232	
			4233	846.6	23.4			1

Note(s):

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

11.4.3. Personal Router/Hotspot Test Configurations

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	23.4			1
			4183	836.6	23.5	0.656	0.455	
			4233	846.6	23.4			1
Front	Rel 99 RMC 12.2kbps	10	4132	826.4	23.4			1
			4183	836.6	23.5	0.327	0.232	
			4233	846.6	23.4			1
Edge 1	Rel 99 RMC 12.2kbps	10	4132	826.4	23.4			2
			4183	836.6	23.5			2
			4233	846.6	23.4			2
Edge 2	Rel 99 RMC 12.2kbps	10	4132	826.4	23.4			1
			4183	836.6	23.5	0.261	0.180	
			4233	846.6	23.4			1
Edge 3	Rel 99 RMC 12.2kbps	10	4132	826.4	23.4			1
			4183	836.6	23.5	0.035	0.022	
			4233	846.6	23.4			1
Edge 4	Rel 99 RMC 12.2kbps	10	4132	826.4	23.4			1
			4183	836.6	23.5	0.293	0.208	
			4233	846.6	23.4			1

Note(s):

- SAR test was performed in the middle channel only as the measured level was < 50% of the SAR limit as stated in FCC "Public Notice DA 02-1438" by the SCC-34/SC-2. Testing in the low and high channel is optional.
- SAR is not required because the distance from the tested antenna to this edge is greater than 2.5 cm.

11.5. 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

11.5.1. Head Test Configuration

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	23.3			
		9400	1880.0	23.5	0.583	0.386	1
		9538	1907.6	23.3			
Left Tilt (15°)	Rel 99 RMC 12.2kbps	9262	1852.4	23.3			
		9400	1880.0	23.5	0.310	0.181	1
		9538	1907.6	23.3			
Right Touch	Rel 99 RMC 12.2kbps	9262	1852.4	23.3	0.899	0.532	
		9400	1880.0	23.5	0.849	0.498	
		9538	1907.6	23.3	1.080	0.632	
Right Tilt (15°)	Rel 99 RMC 12.2kbps	9262	1852.4	23.3			
		9400	1880.0	23.5	0.291	0.165	1
		9538	1907.6	23.3			

11.5.2. Body-worn Accessory Test Configuration

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	23.3			1
			9400	1880.0	23.5	0.559	0.328	
			9400	1880.0	23.5	0.531	0.321	2
			9538	1907.6	23.3			1
Front	Rel 99 RMC 12.2kbps	10	9262	1852.4	23.3			1
			9400	1880.0	23.5	0.423	0.254	
			9538	1907.6	23.3			1

Note(s):

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

11.5.3. Personal Router/Hotspot Test Configurations

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	23.3			1
			9400	1880.0	23.5	0.559	0.328	
			9538	1907.6	23.3			1
Front	Rel 99 RMC 12.2kbps	10	9262	1852.4	23.3			1
			9400	1880.0	23.5	0.423	0.254	
			9538	1907.6	23.3			1
Edge 1	Rel 99 RMC 12.2kbps	10	9262	1852.4	23.3			2
			9400	1880.0	23.5			2
			9538	1907.6	23.3			2
Edge 2	Rel 99 RMC 12.2kbps	10	9262	1852.4	23.3			1
			9400	1880.0	23.5	0.171	0.105	
			9538	1907.6	23.3			1
Edge 3	Rel 99 RMC 12.2kbps	10	9262	1852.4	23.3			1
			9400	1880.0	23.5	0.148	0.088	
			9538	1907.6	23.3			1
Edge 4	Rel 99 RMC 12.2kbps	10	9262	1852.4	23.3			1
			9400	1880.0	23.5	0.090	0.056	
			9538	1907.6	23.3			1

Note(s):

- SAR test was performed in the middle channel only as the measured level was < 50% of the SAR limit as stated in FCC "Public Notice DA 02-1438" by the SCC-34/SC-2. Testing in the low and high channel is optional.
- SAR is not required because the distance from the tested antenna to this edge is greater than 2.5 cm.

11.6. Wi-Fi (2.4 GHz Band)

11.6.1. Head Test Configuration

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			1
		11	2462	15.2	0.093	0.047	
Left Tilt (15°)	802.11b	1	2412	15.0			1
		6	2437	15.1			1
		11	2462	15.2	0.081	0.038	
Right Touch	802.11b	1	2412	15.0			1
		6	2437	15.1			1
		11	2462	15.2	0.153	0.075	
Right Tilt (15°)	802.11b	1	2412	15.0			1
		6	2437	15.1			1
		11	2462	15.2	0.093	0.047	

11.6.2. Body-worn Accessory Test Configuration

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			1
			11	2462	15.2	0.228	0.108	
			11	2462	15.2	0.215	0.101	2
Front	802.11b	10	1	2412	15.0			1
			6	2437	15.1			1
			11	2462	15.2	0.028	0.016	

Note(s):

- For frequency bands with an operating range of < 100 MHz, when the SAR measured for the highest output power channel within is ≤ 0.8 W/kg, SAR for the remaining channels is not required. Per KDB 447498 1) e) i)
- With headset attached.

11.6.3. Personal Router/Hotspot Test Configurations

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			1
			11	2462	15.2	0.228	0.108	
Front	802.11b	10	1	2412	15.0			1
			6	2437	15.1			1
			11	2462	15.2	0.028	0.016	
Edge 1	802.11b	10	1	2412	15.0			1
			6	2437	15.1			1
			11	2462	15.2	0.085	0.042	
Edge 2	802.11b	10	1	2412	15.0			
			6	2437	15.1			
			11	2462	15.2	0.026	0.012	
Edge 3	802.11b	10	1	2412	15.0			2
			6	2437	15.1			2
			11	2462	15.2			2
Edge 4	802.11b	10	1	2412	15.0			1
			6	2437	15.1			1
			11	2462	15.2	0.017	0.008	

Note(s):

- For frequency bands with an operating range of < 100 MHz, when the SAR measured for the highest output power channel within is ≤ 0.8 W/kg, SAR for the remaining channels is not required. Per KDB 447498 1) e) i)
- SAR is not required because the distance from the tested antenna to this edge is greater than 2.5 cm.

12. 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	Right Touch	GMSK (Voice)	0.312
	Body & Hotspot	Rear	GMSK (GPRS 2 slots)	0.406
GSM1900	Head	Right Touch	GMSK (Voice)	0.516
	Body & Hotspot	Rear	GMSK (GPRS 4 slots)	0.413
WCDMA Band V	Head	Right Touch	Rel.99 (RMC, 12.2 kbps)	0.322
	Body & Hotspot	Rear	Rel.99 (RMC, 12.2 kbps)	0.656
WCDMA Band II	Head	Right Touch	Rel.99 (RMC, 12.2 kbps)	1.08
	Body & Hotspot	Rear	Rel.99 (RMC, 12.2 kbps)	0.559
WiFi 2.4 GHz	Head	Right Touch	802.11b 1Mbps	0.153
	Body & Hotspot	Rear	802.11b 1Mbps	0.228

12.1. 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	Right Touch	GSM Voice	190	836.60	33.5	33.2	0.312	0.334
Body	Rear	GPRS 2 Slots	190	836.60	29.9	29.8	0.406	0.415
Head	Right Touch	GSM Voice	661	1880.00	31.0	29.4	0.516	0.746
Body	Rear	GPRS 4 Slots	661	1880.00	24.9	24.4	0.413	0.463
Head	Right Touch	RMC 12.2 kbps	4183	836.60	23.5	23.5	0.322	0.322
Body&Hotspot	Rear	RMC 12.2 kbps	4183	836.60	23.5	23.5	0.656	0.656
Head	Right Touch	RMC 12.2 kbps	9400	1880.00	23.5	23.5	1.080	1.080
Body&Hotspot	Rear	RMC 12.2 kbps	9400	1880.00	23.5	23.5	0.559	0.559
Head	Right Touch	802.11b	11	2412.00	15.5	15.2	0.153	0.164
Body&Hotspot	Rear	802.11b	11	2412.00	15.5	15.2	0.228	0.244

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

Test Laboratory: UL CCS SAR Lab D

Date/Time: 7/13/2012 3:23:57 PM

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; $\sigma = 0.886$ mho/m; $\epsilon_r = 41.9$; $\rho = 1000$ kg/m³;
DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE3 Sn427; Calibrated: 1/17/2012
- Probe: EX3DV4 - SN3749; ConvF(8.68, 8.68, 8.68); Calibrated: 1/27/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM A (Twin); Type: SAM A; Serial: 1050

Right Touch/GMSK (Voice)/Ch190/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.351 mW/g

Right Touch/GMSK (Voice)/Ch190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

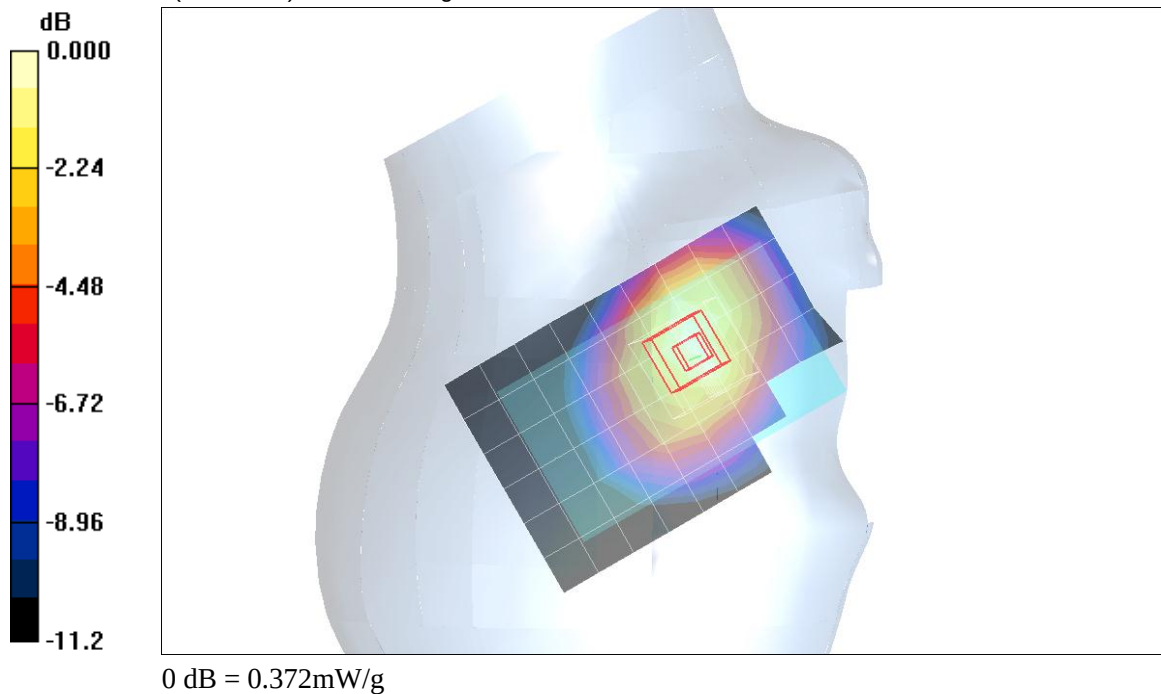
Reference Value = 20.2 V/m; Power Drift = -0.028 dB

Peak SAR (extrapolated) = 0.429 W/kg

SAR(1 g) = 0.312 mW/g; SAR(10 g) = 0.214 mW/g

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

Maximum value of SAR (measured) = 0.372 mW/g



GSM850

Frequency: 836.6 MHz; Duty Cycle: 1:8

Right Touch/GMSK (Voice)/Ch190/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.351 mW/g

Right Touch/GMSK (Voice)/Ch190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 20.2 V/m; Power Drift = -0.028 dB

Peak SAR (extrapolated) = 0.429 W/kg

SAR(1 g) = 0.312 mW/g; SAR(10 g) = 0.214 mW/g

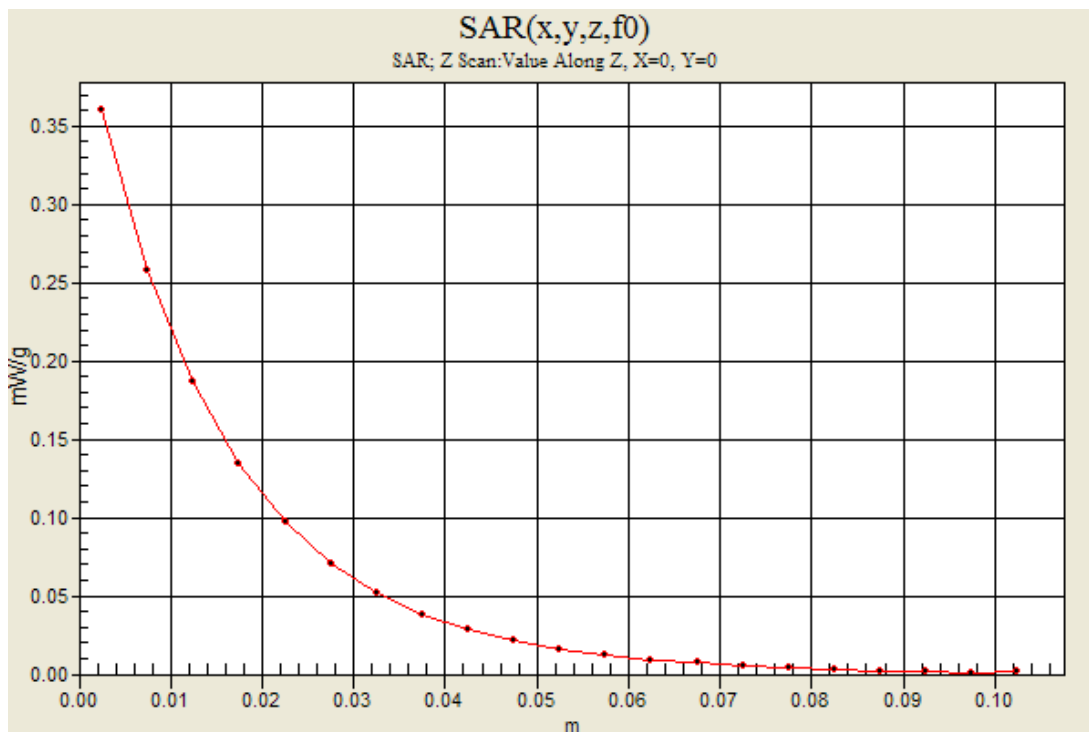
[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.372 mW/g

Right Touch/GMSK (Voice)/Ch190/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

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

Maximum value of SAR (measured) = 0.360 mW/g



GSM850

Frequency: 836.6 MHz; Duty Cycle: 1:4; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.984$ mho/m; $\epsilon_r = 53.8$; $\rho = 1000$ kg/m³;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE3 Sn427; Calibrated: 1/17/2012
- Probe: EX3DV4 - SN3749; ConvF(8.84, 8.84, 8.84); Calibrated: 1/27/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM B (Twin); Type: SAM B; Serial: TP-105

Rear/GPRS 2 slots/Ch190/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.461 mW/g

Rear/GPRS 2 slots/Ch190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

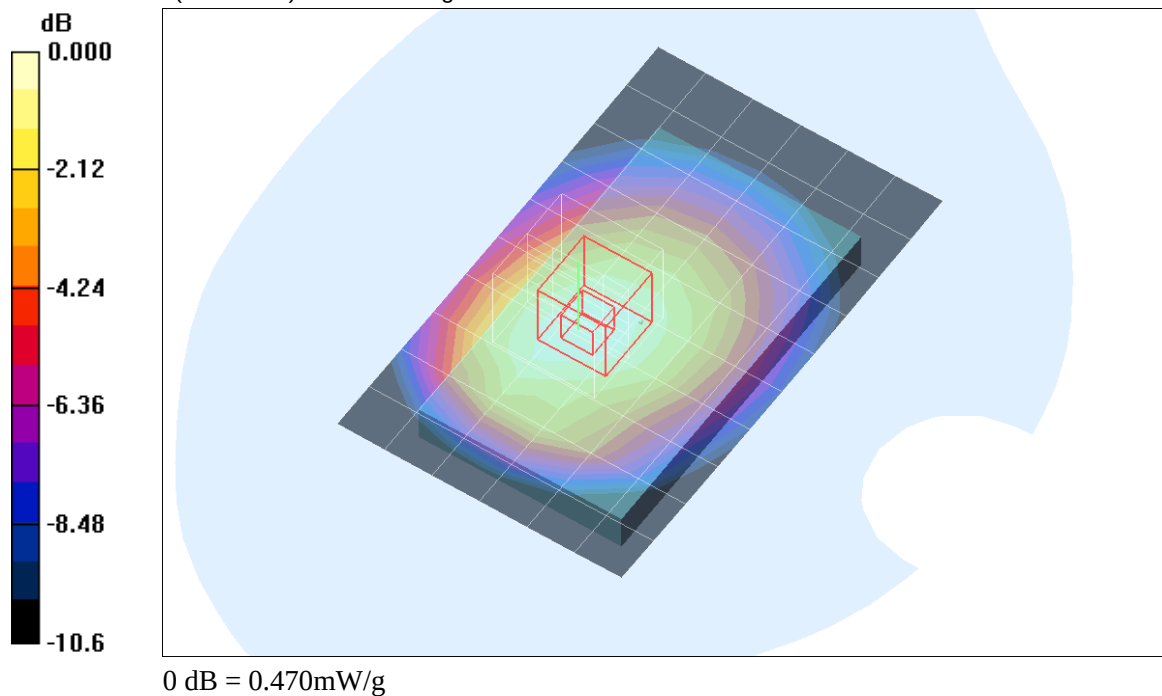
Reference Value = 22.0 V/m; Power Drift = -0.062 dB

Peak SAR (extrapolated) = 0.542 W/kg

SAR(1 g) = 0.406 mW/g; SAR(10 g) = 0.291 mW/g

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

Maximum value of SAR (measured) = 0.470 mW/g



GSM850

Frequency: 836.6 MHz; Duty Cycle: 1:4

Front/GPRS 2 slots/Ch190/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.263 mW/g

Front/GPRS 2 slots/Ch190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 16.7 V/m; Power Drift = -0.006 dB

Peak SAR (extrapolated) = 0.305 W/kg

SAR(1 g) = 0.230 mW/g; SAR(10 g) = 0.167 mW/g

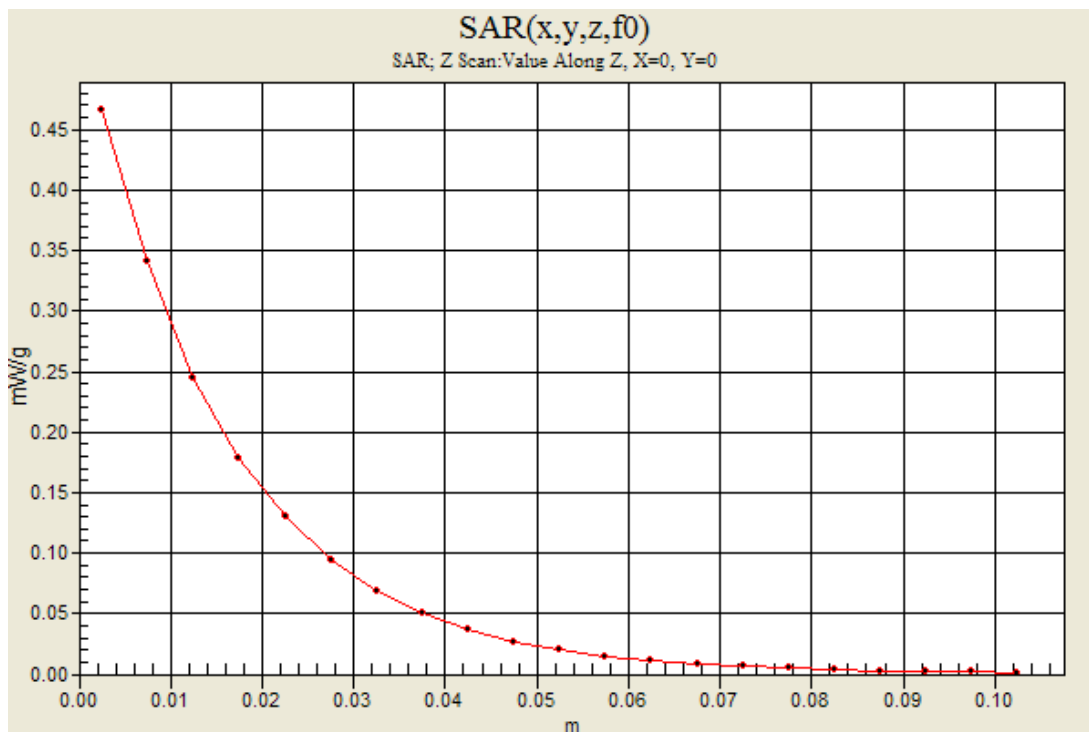
[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.265 mW/g

Rear/GPRS 2 slots/Ch190/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

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

Maximum value of SAR (measured) = 0.466 mW/g



GSM1900

Frequency: 1880 MHz; Duty Cycle: 1:8; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.41$ mho/m; $\epsilon_r = 39.6$; $\rho = 1000$ kg/m³;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE3 Sn427; Calibrated: 1/17/2012
- Probe: EX3DV4 - SN3749; ConvF(7.67, 7.67, 7.67); Calibrated: 1/27/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM B (Twin); Type: SAM B; Serial: TP-105

Right Touch/GMSK (Voice)/Ch661/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.575 mW/g

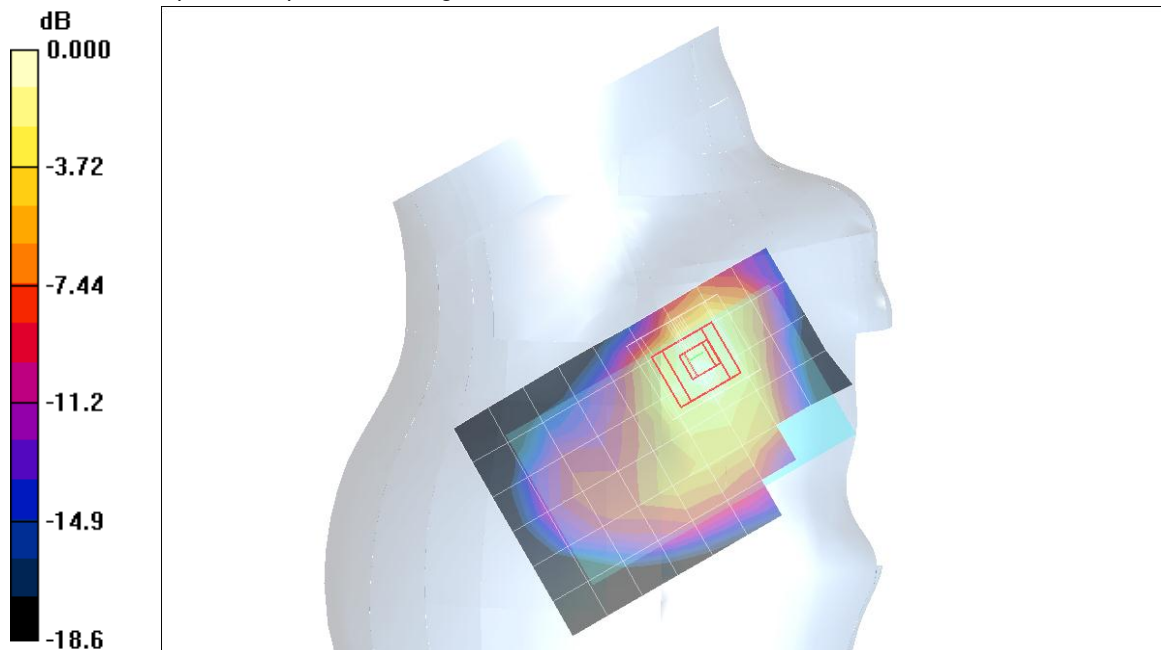
Right Touch/GMSK (Voice)/Ch661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 20.3 V/m; Power Drift = 0.049 dB

Peak SAR (extrapolated) = 0.791 W/kg

SAR(1 g) = 0.516 mW/g; SAR(10 g) = 0.307 mW/g

Maximum value of SAR (measured) = 0.635 mW/g



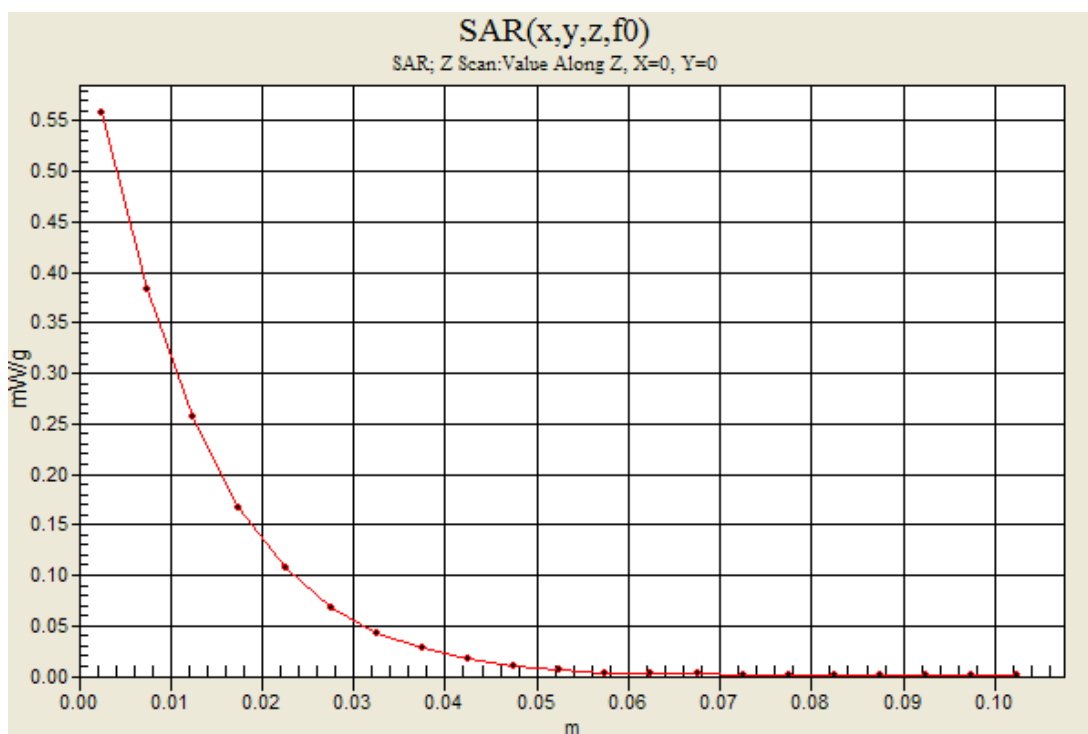
GSM1900

Frequency: 1880 MHz; Duty Cycle: 1:8

Right Touch/GMSK (Voice)/Ch661/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.575 mW/g

Right Touch/GMSK (Voice)/Ch661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.3 V/m; Power Drift = 0.049 dB
Peak SAR (extrapolated) = 0.791 W/kg
SAR(1 g) = 0.516 mW/g; SAR(10 g) = 0.307 mW/g
Maximum value of SAR (measured) = 0.635 mW/g

Right Touch/GMSK (Voice)/Ch661/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.558 mW/g



GSM1900

Frequency: 1880 MHz; Duty Cycle: 1:2; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.49$ mho/m; $\epsilon_r = 53.9$; $\rho = 1000$ kg/m³;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE3 Sn427; Calibrated: 1/17/2012
- Probe: EX3DV4 - SN3749; ConvF(6.97, 6.97, 6.97); Calibrated: 1/27/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM B (Twin); Type: SAM B; Serial: TP-105

Rear/GPRS 4 slots/Ch661/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.530 mW/g

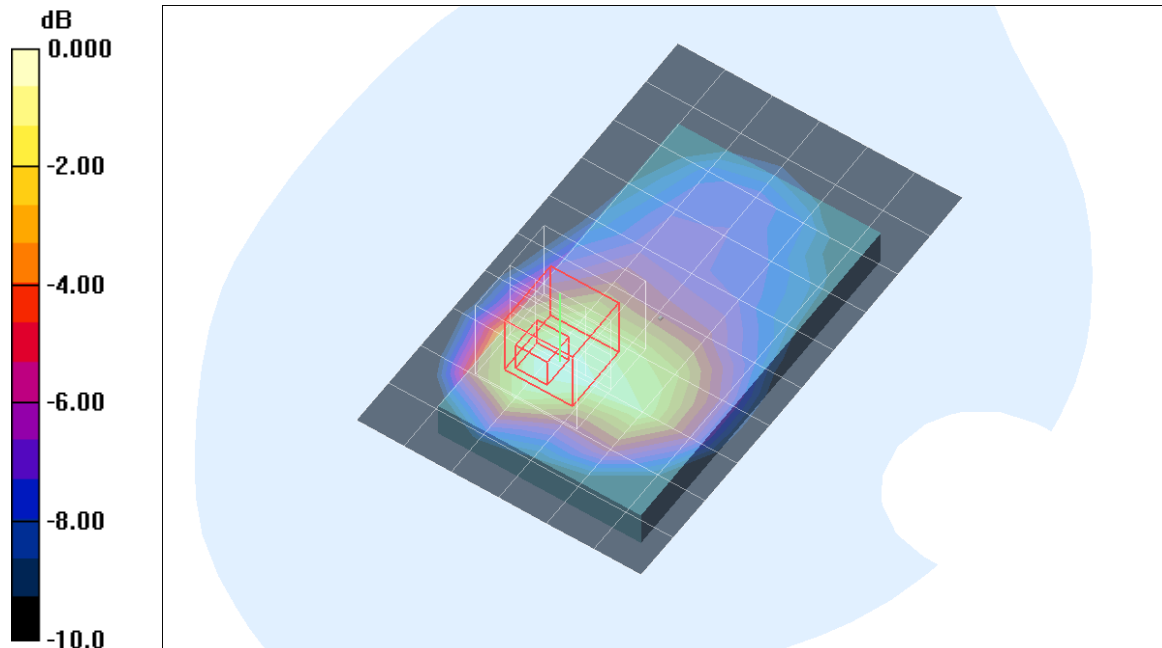
Rear/GPRS 4 slots/Ch661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 19.1 V/m; Power Drift = 0.010 dB

Peak SAR (extrapolated) = 0.702 W/kg

SAR(1 g) = 0.413 mW/g; SAR(10 g) = 0.241 mW/g

Maximum value of SAR (measured) = 0.514 mW/g



0 dB = 0.514mW/g

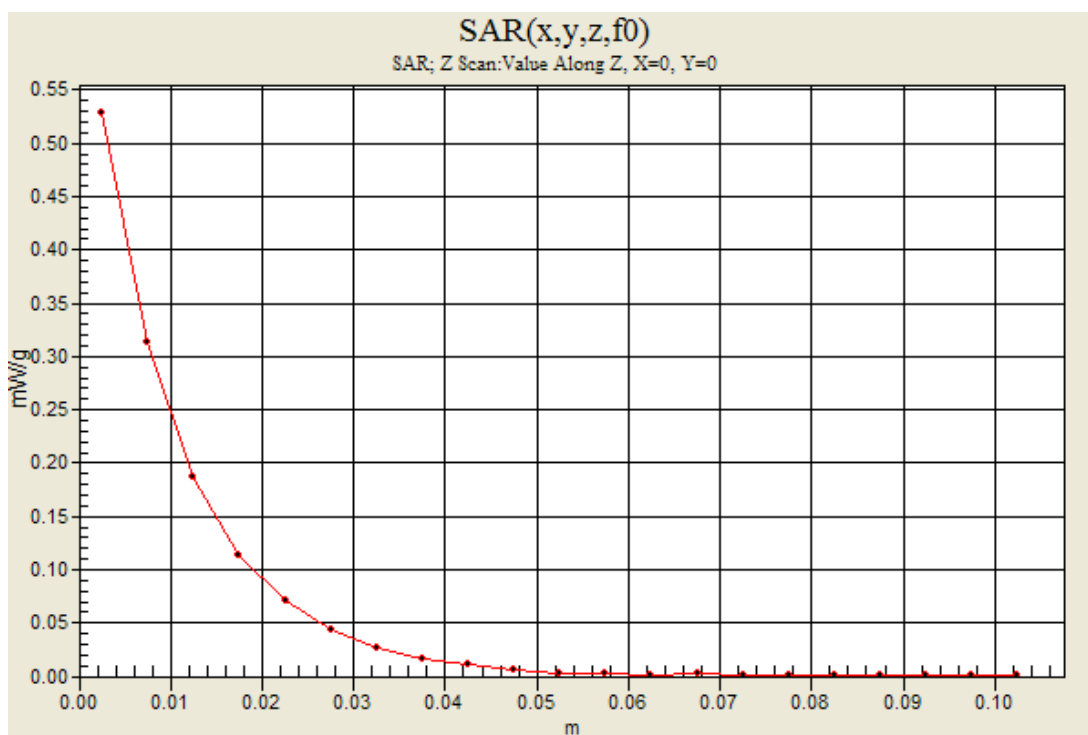
GSM1900

Frequency: 1880 MHz; Duty Cycle: 1:2

Rear/GPRS 4 slots/Ch661/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.530 mW/g

Rear/GPRS 4 slots/Ch661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.1 V/m; Power Drift = 0.010 dB
Peak SAR (extrapolated) = 0.702 W/kg
SAR(1 g) = 0.413 mW/g; SAR(10 g) = 0.241 mW/g
Maximum value of SAR (measured) = 0.514 mW/g

Rear/GPRS 4 slots/Ch661/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.529 mW/g



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; $\sigma = 0.886$ mho/m; $\epsilon_r = 41.9$; $\rho = 1000$ kg/m³;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE3 Sn427; Calibrated: 1/17/2012
- Probe: EX3DV4 - SN3749; ConvF(8.68, 8.68, 8.68); Calibrated: 1/27/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM A (Twin); Type: SAM A; Serial: 1050

Right Touch/Rel.99/Ch4183/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.365 mW/g

Right Touch/Rel.99/Ch4183/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

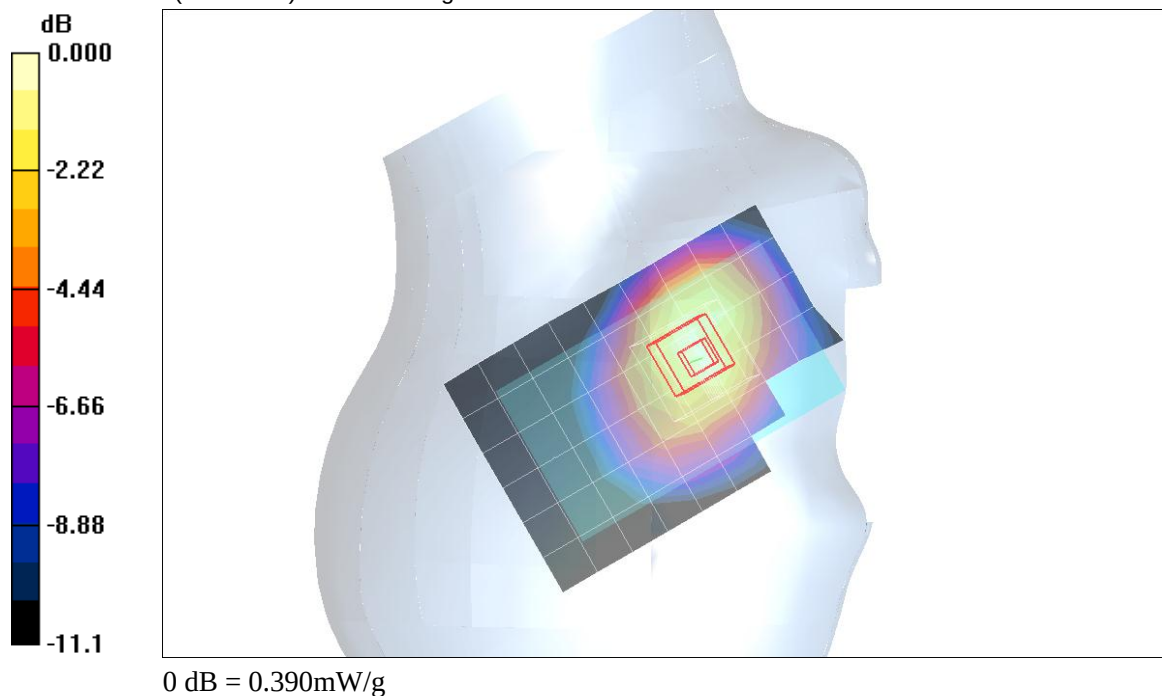
Reference Value = 20.1 V/m; Power Drift = 0.150 dB

Peak SAR (extrapolated) = 0.447 W/kg

SAR(1 g) = 0.322 mW/g; SAR(10 g) = 0.220 mW/g

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

Maximum value of SAR (measured) = 0.390 mW/g



W-CDMA Band V

Frequency: 836.6 MHz; Duty Cycle: 1:1

Right Touch/Rel.99/Ch4183/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.365 mW/g

Right Touch/Rel.99/Ch4183/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 20.1 V/m; Power Drift = 0.150 dB

Peak SAR (extrapolated) = 0.447 W/kg

SAR(1 g) = 0.322 mW/g; SAR(10 g) = 0.220 mW/g

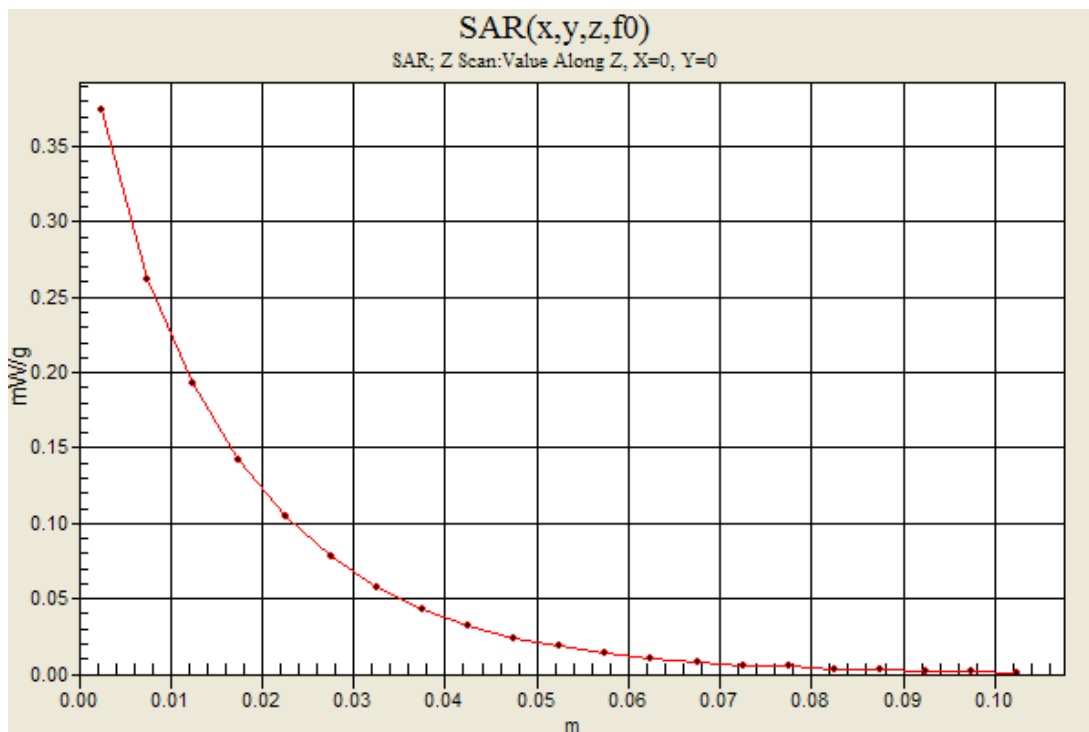
[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.390 mW/g

Right Touch/Rel.99/Ch4183/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

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

Maximum value of SAR (measured) = 0.374 mW/g



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; $\sigma = 0.984$ mho/m; $\epsilon_r = 53.8$; $\rho = 1000$ kg/m³;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE3 Sn427; Calibrated: 1/17/2012
- Probe: EX3DV4 - SN3749; ConvF(8.84, 8.84, 8.84); Calibrated: 1/27/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM B (Twin); Type: SAM B; Serial: TP-105

Rear/Rel.99/Ch4183/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.747 mW/g

Rear/Rel.99/Ch4183/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

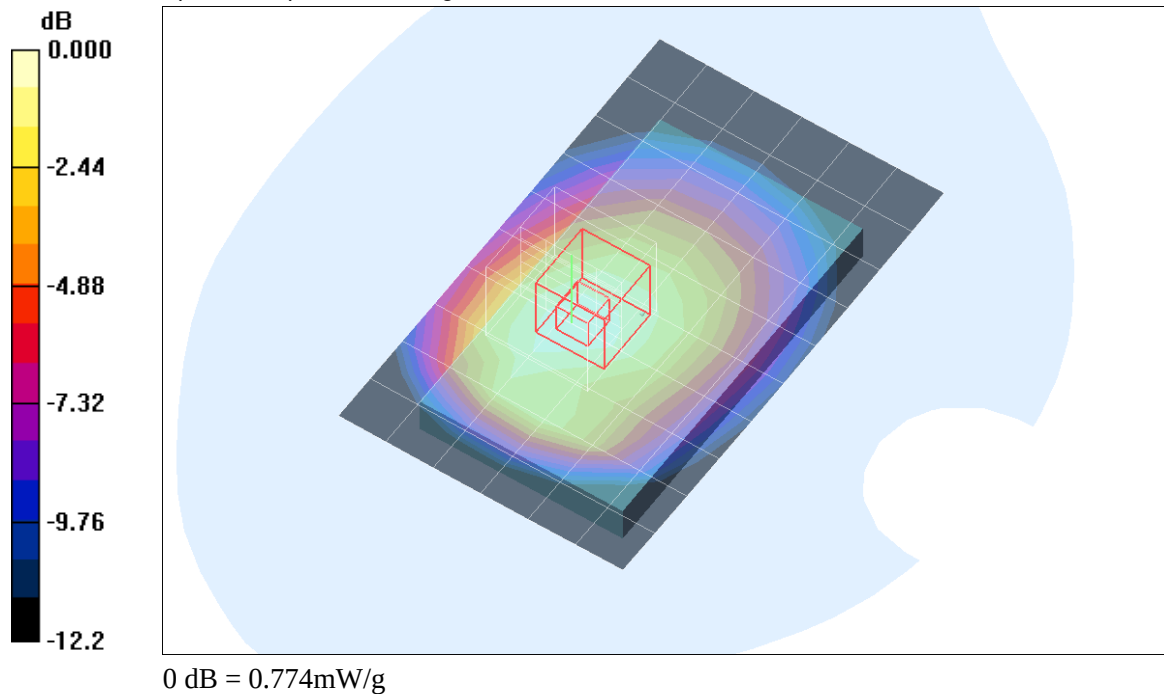
Reference Value = 27.9 V/m; Power Drift = 0.042 dB

Peak SAR (extrapolated) = 0.911 W/kg

SAR(1 g) = 0.656 mW/g; SAR(10 g) = 0.455 mW/g

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

Maximum value of SAR (measured) = 0.774 mW/g



W-CDMA Band V

Frequency: 836.6 MHz; Duty Cycle: 1:1

Rear/Rel.99/Ch4183 w/headset/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.569 mW/g

Rear/Rel.99/Ch4183 w/headset/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 24.5 V/m; Power Drift = -0.080 dB

Peak SAR (extrapolated) = 0.709 W/kg

SAR(1 g) = 0.488 mW/g; SAR(10 g) = 0.331 mW/g

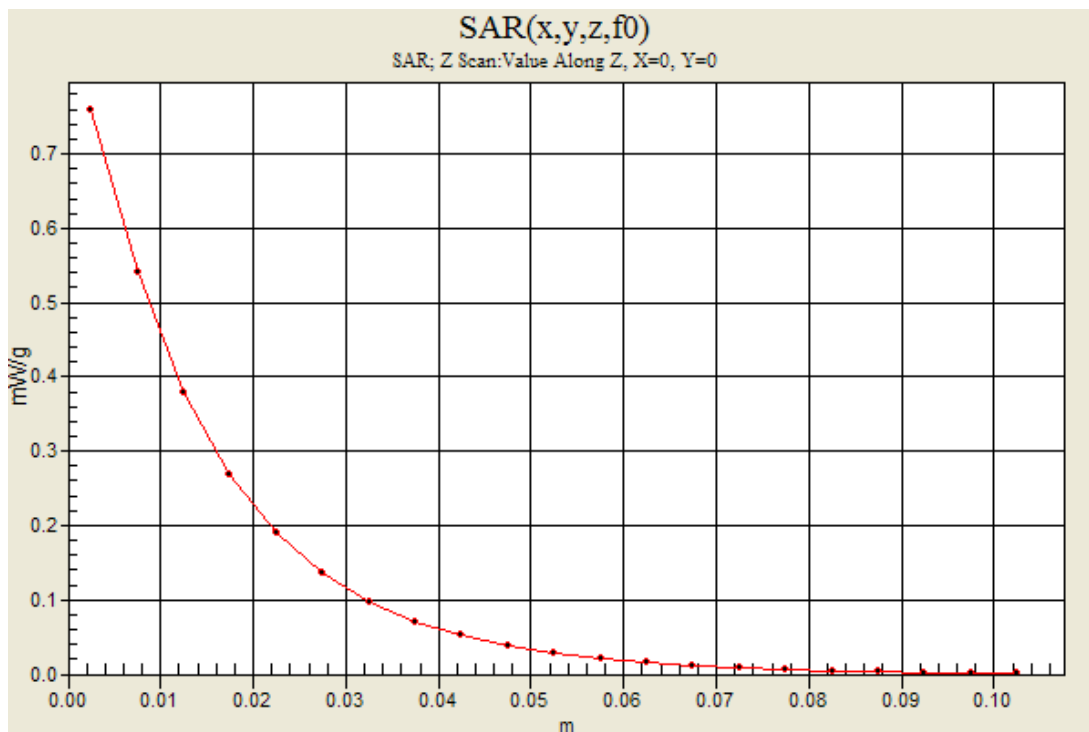
[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.586 mW/g

Rear/Rel.99/Ch4183/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

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

Maximum value of SAR (measured) = 0.759 mW/g



W-CDMA Band II

Frequency: 1907.6 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): $f = 1907.6$ MHz; $\sigma = 1.38$ mho/m; $\epsilon_r = 41.1$; $\rho = 1000$ kg/m³;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE3 Sn427; Calibrated: 1/17/2012
- Probe: EX3DV4 - SN3749; ConvF(7.67, 7.67, 7.67); Calibrated: 1/27/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM B (Twin); Type: SAM B; Serial: TP-105

Right Touch/Rel.99/Ch9538/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 1.27 mW/g

Right Touch/Rel.99/Ch9538/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

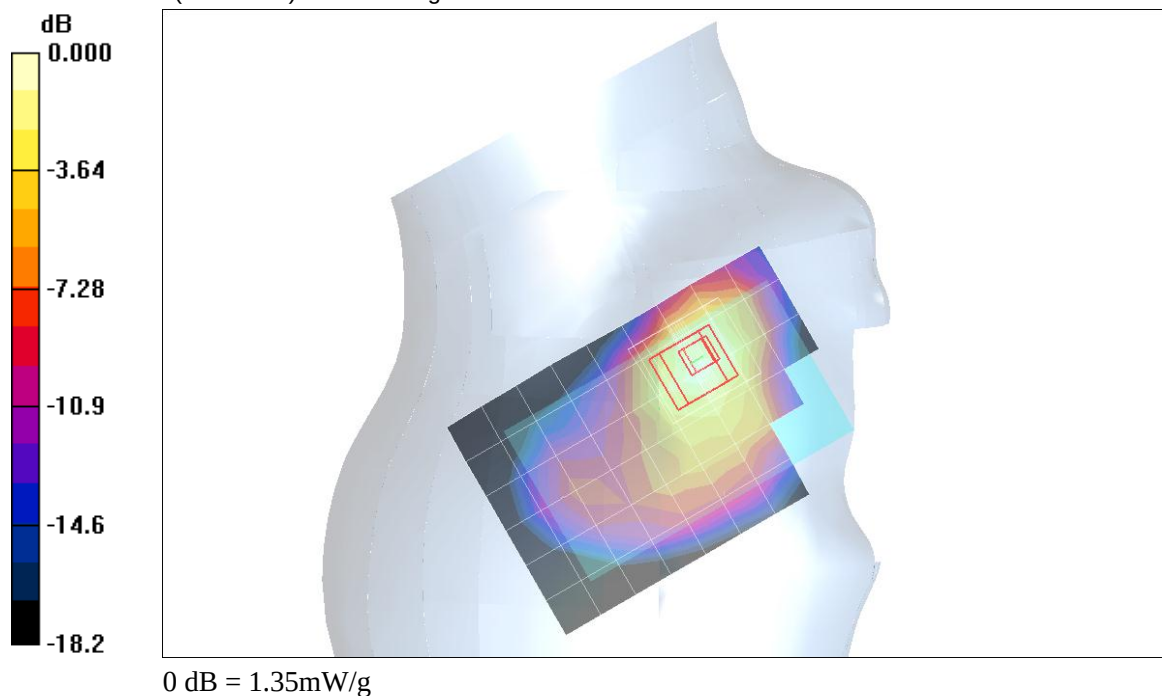
Reference Value = 30.3 V/m; Power Drift = 0.050 dB

Peak SAR (extrapolated) = 1.69 W/kg

SAR(1 g) = 1.08 mW/g; SAR(10 g) = 0.632 mW/g

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

Maximum value of SAR (measured) = 1.35 mW/g



W-CDMA Band II

Frequency: 1907.6 MHz; Duty Cycle: 1:1

Right Touch/Rel.99/Ch9538/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 1.27 mW/g

Right Touch/Rel.99/Ch9538/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 30.3 V/m; Power Drift = 0.050 dB

Peak SAR (extrapolated) = 1.69 W/kg

SAR(1 g) = 1.08 mW/g; SAR(10 g) = 0.632 mW/g

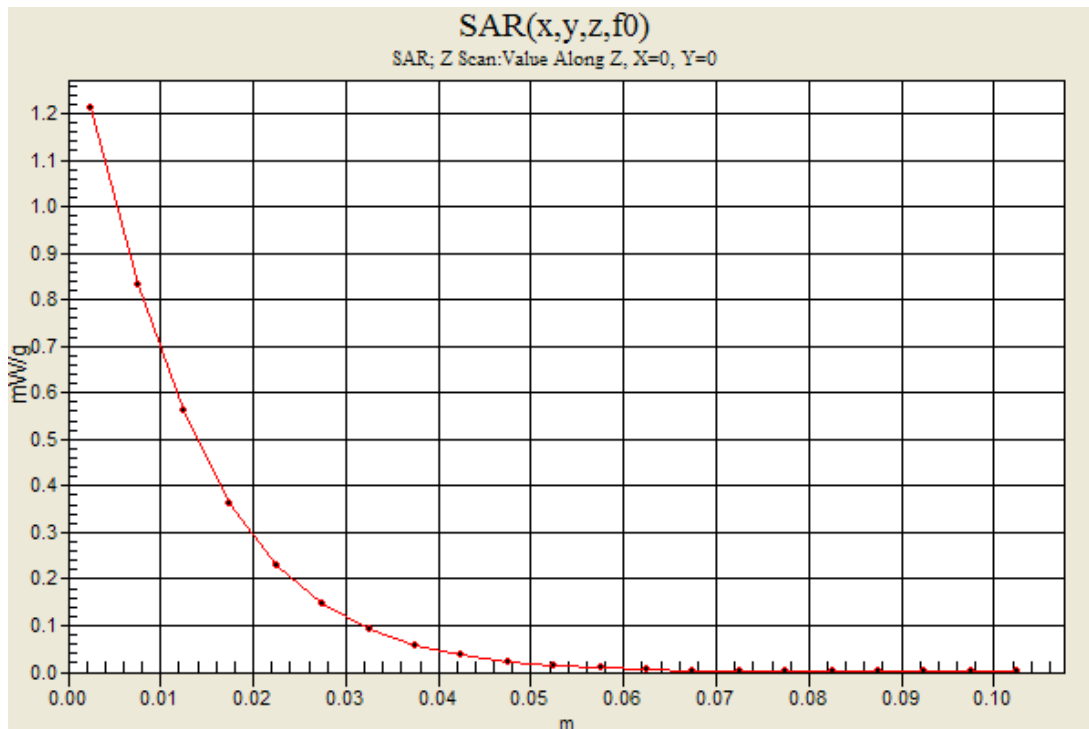
[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 1.35 mW/g

Right Touch/Rel.99/Ch9538/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

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

Maximum value of SAR (measured) = 1.21 mW/g



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; $\sigma = 1.49$ mho/m; $\epsilon_r = 53.9$; $\rho = 1000$ kg/m³;

DASY4 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE3 Sn427; Calibrated: 1/17/2012
- Probe: EX3DV4 - SN3749; ConvF(6.97, 6.97, 6.97); Calibrated: 1/27/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM B (Twin); Type: SAM B; Serial: TP-105

Rear/Rel.99/Ch9400/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.715 mW/g

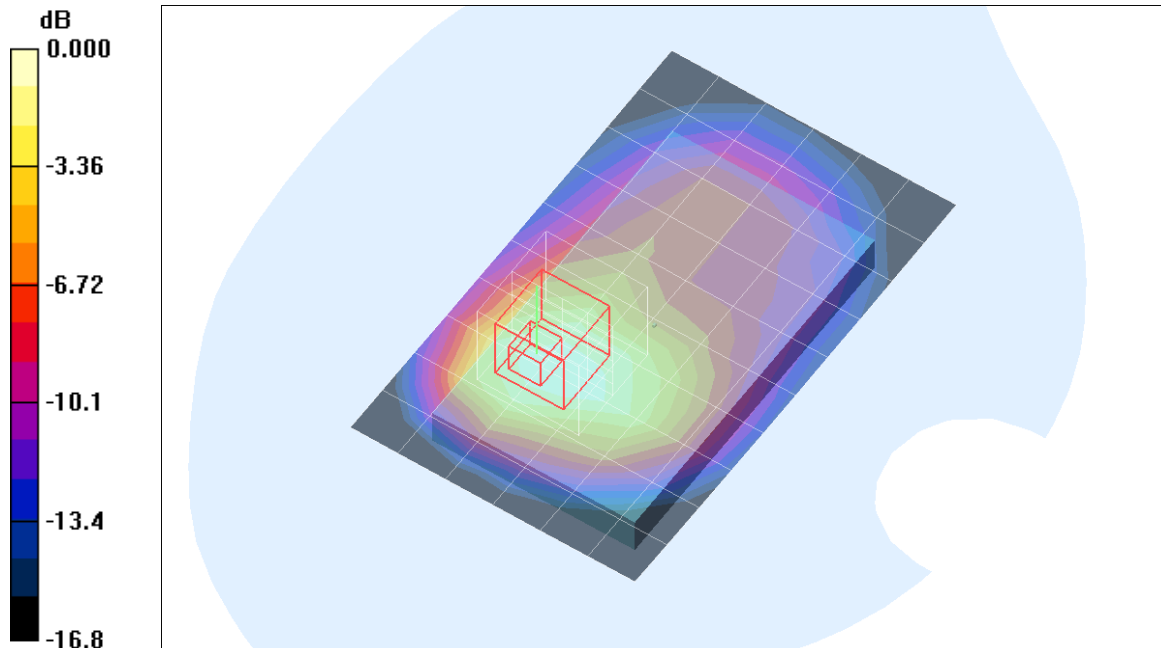
Rear/Rel.99/Ch9400/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 21.9 V/m; Power Drift = 0.140 dB

Peak SAR (extrapolated) = 0.959 W/kg

SAR(1 g) = 0.559 mW/g; SAR(10 g) = 0.328 mW/g

Maximum value of SAR (measured) = 0.704 mW/g



0 dB = 0.704mW/g

Test Laboratory: UL CCS SAR Lab D

Date/Time: 7/14/2012 7:31:24 PM

W-CDMA Band II

Frequency: 1880 MHz; Duty Cycle: 1:1

Rear/Rel.99/Ch9400/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.715 mW/g

Rear/Rel.99/Ch9400/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 21.9 V/m; Power Drift = 0.140 dB

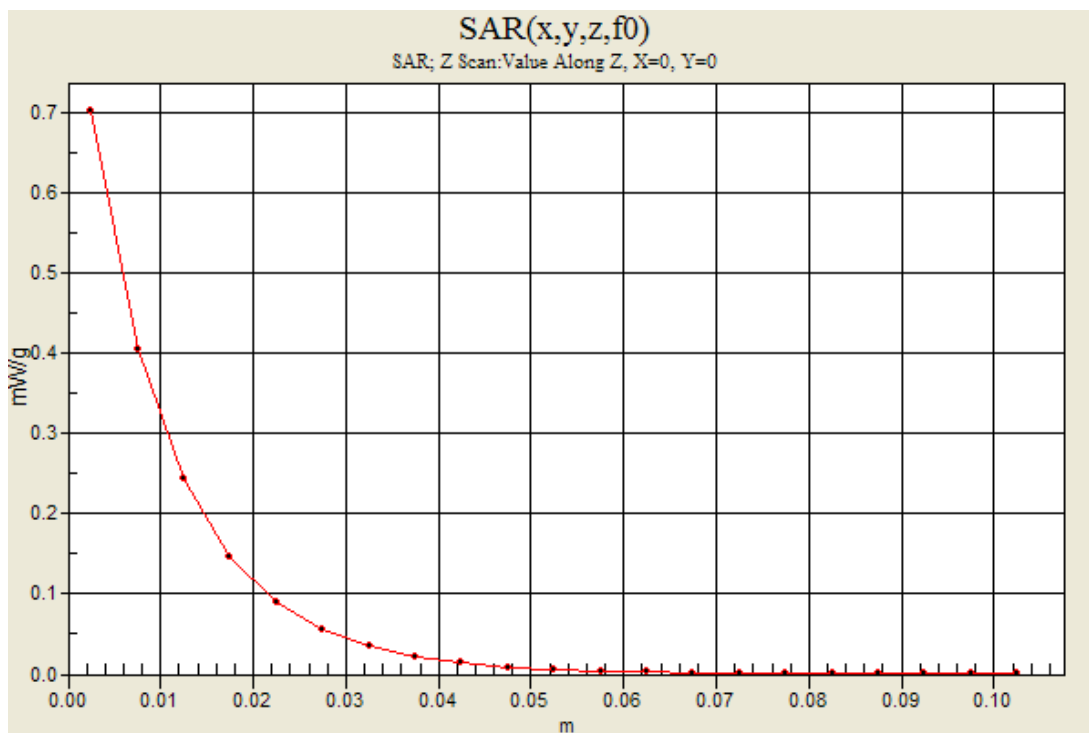
Peak SAR (extrapolated) = 0.959 W/kg

SAR(1 g) = 0.559 mW/g; SAR(10 g) = 0.328 mW/g

Maximum value of SAR (measured) = 0.704 mW/g

Rear/Rel.99/Ch9400/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 0.702 mW/g



WiFi 2.4GHz

Frequency: 2462 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): $f = 2462$ MHz; $\sigma = 1.829$ mho/m; $\epsilon_r = 39.574$; $\rho = 1000$ kg/m³

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1258; Calibrated: 3/8/2012
- Probe: EX3DV4 - SN3772; ConvF(6.64, 6.64, 6.64); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM v5.0 (A); Type: QD000P40CC; Serial: 1602

Head/Right Touch_802.11b_ch 11/Area Scan (7x10x1):

Measurement grid: dx=15mm, dy=15mm
[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.191 mW/g

Head/Right Touch_802.11b_ch 11/Zoom Scan (5x5x7)/Cube 0:

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

Reference Value = 10.412 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.2810

SAR(1 g) = 0.153 mW/g; SAR(10 g) = 0.075 mW/g

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

Maximum value of SAR (measured) = 0.208 mW/g

Head/Right Touch_802.11b_ch 11/Zoom Scan (5x5x7)/Cube 1:

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

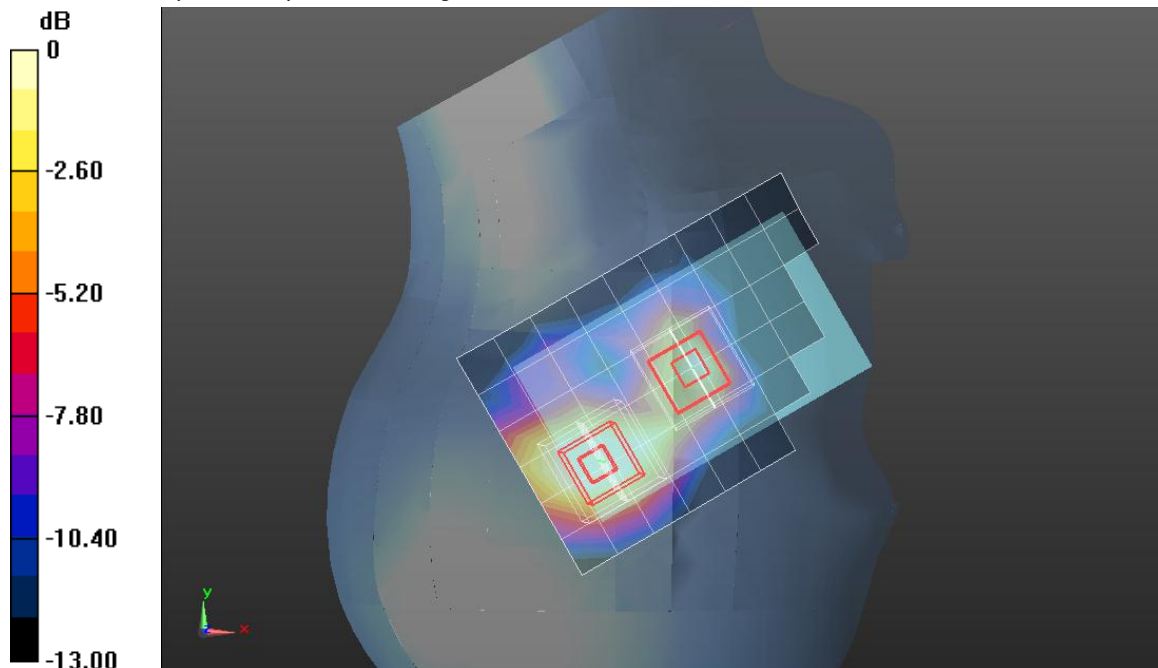
Reference Value = 10.412 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.1830

SAR(1 g) = 0.097 mW/g; SAR(10 g) = 0.046 mW/g

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

Maximum value of SAR (measured) = 0.128 mW/g



0 dB = 0.130mW/g = -17.72 dB mW/g

Test Laboratory: UL CCS SAR Lab A

Date: 7/16/2012

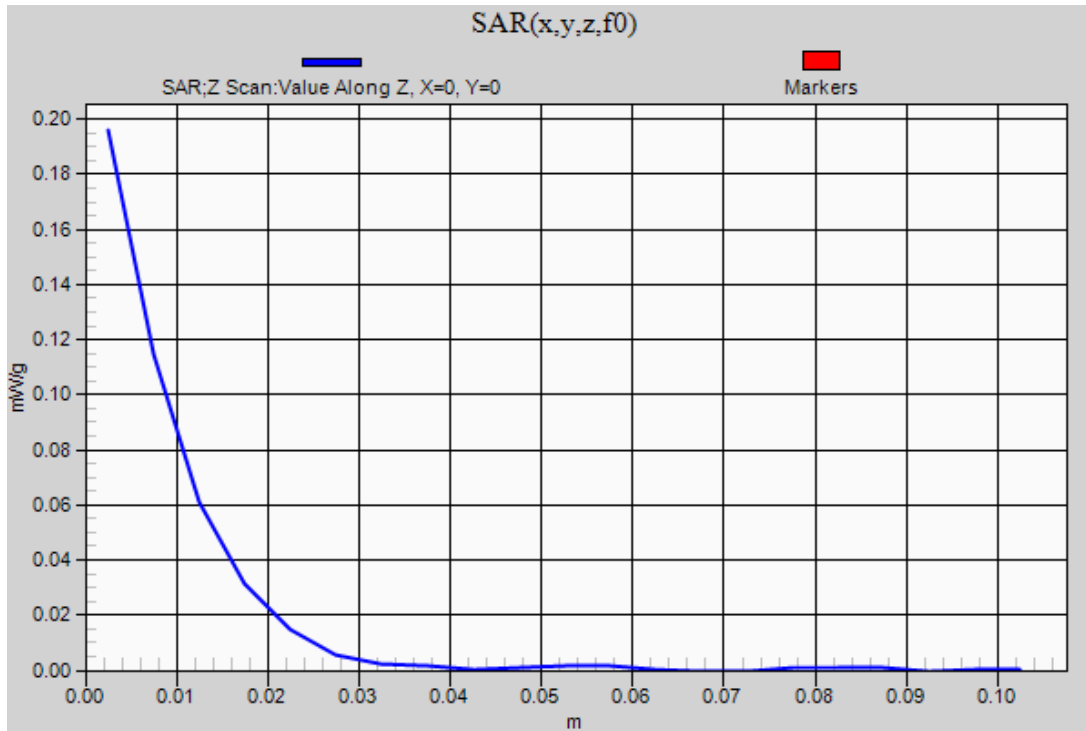
WiFi 2.4GHz

Frequency: 2462 MHz; Duty Cycle: 1:1

Head/Right Touch_802.11b_ch 11/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

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

Maximum value of SAR (measured) = 0.196 mW/g



WiFi 2.4GHz

Frequency: 2462 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C

Medium parameters used (interpolated): $f = 2462$ MHz; $\sigma = 2.036$ mho/m; $\epsilon_r = 51.001$; $\rho = 1000$ kg/m³

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Electronics: DAE4 Sn1258; Calibrated: 3/8/2012
- Probe: EX3DV4 - SN3772; ConvF(6.65, 6.65, 6.65); Calibrated: 2/16/2012
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (B); Type: QDOVA001BB; Serial: 1099

Body/Rear_802.11b_ch 11/Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 0.212 mW/g

Body/Rear_802.11b_ch 11/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

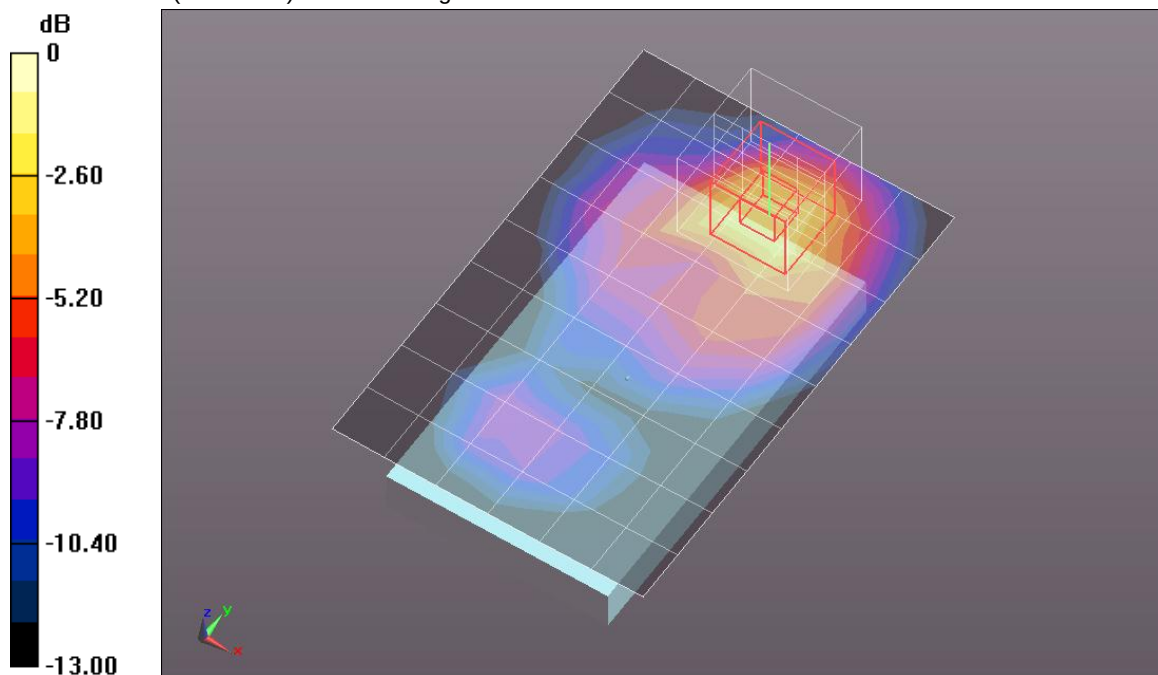
Reference Value = 10.188 V/m; Power Drift = 0.20 dB

Peak SAR (extrapolated) = 0.4600

SAR(1 g) = 0.228 mW/g; SAR(10 g) = 0.108 mW/g

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

Maximum value of SAR (measured) = 0.317 mW/g



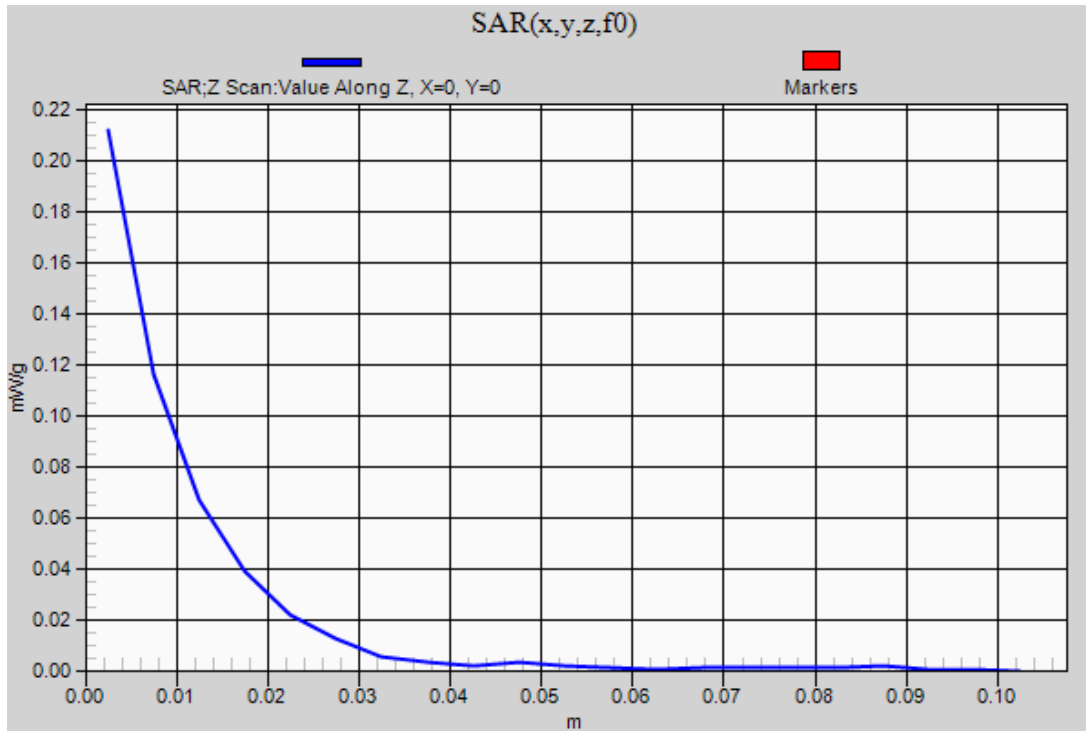
WiFi 2.4GHz

Frequency: 2462 MHz; Duty Cycle: 1:1

Body/Rear_802.11b_ch 11/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

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

Maximum value of SAR (measured) = 0.212 mW/g



13. Simultaneous Transmission SAR Analysis

As its max average power is 12.3 mW [$<60/f(\text{GHz})$ mW], standalone SAR is not required for Bluetooth. Therefore, Bluetooth need not be considered in the simultaneous transmission SAR evaluation of other transmitters.

13.1. Head Test Configuration

13.1.1. Sum of the SAR for GSM, W-CDMA, & WiFi

Sum of the SAR with Measured Values

Test Position	Voice				Data WiFi 2.4 GHz	Σ 1-g SAR (mW/g)
	GSM 850	GSM 1900	W-CDMA Band V	W-CDMA Band II		
Left Touch	0.297				0.093	0.390
		0.326			0.093	0.419
			0.312		0.093	0.405
				0.583	0.093	0.676
Left Tilt	0.134				0.081	0.215
		0.178			0.081	0.259
			0.136		0.081	0.217
				0.31	0.081	0.391
Right Touch	0.312				0.153	0.465
		0.516			0.153	0.669
			0.322		0.153	0.475
				1.08	0.153	1.233
Right Tilt	0.143				0.093	0.236
		0.184			0.093	0.277
			0.141		0.093	0.234
				0.291	0.093	0.384

Sum of the SAR with Scaled Values for the Worst-case Configuration

Test Position	Voice				Data WiFi 2.4 GHz	Σ 1-g SAR (mW/g)
	GSM 850	GSM 1900	W-CDMA Band V	W-CDMA Band II		
Right Touch	0.334				0.153	0.487
		0.746			0.153	0.899
			0.322		0.153	0.475
				1.08	0.153	1.233

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.

13.2. Body-worn Accessory Test Configuration

13.2.1. Sum of the SAR for GSM, W-CDMA, & WiFi

Sum of the SAR with Measured Values

Test Position	Voice				Data	Σ 1-g SAR (mW/g)
	GSM 850	GSM 1900	W-CDMA Band V	W-CDMA Band II	WiFi 2.4 GHz	
Rear	0.406				0.228	0.634
		0.413			0.228	0.641
			0.656		0.228	0.884
				0.559	0.228	0.787
Front	0.23				0.028	0.258
		0.413			0.028	0.441
			0.656		0.028	0.684
				0.559	0.028	0.587

Sum of the SAR with Scaled Values for the Worst-case Configuration

Test Position	Voice				Data	Σ 1-g SAR (mW/g)
	GSM 850	GSM 1900	W-CDMA Band V	W-CDMA Band II	WiFi 2.4 GHz	
Rear	0.415				0.244	0.659
		0.463			0.244	0.707
			0.656		0.244	0.900
				0.559	0.244	0.803

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.

13.3. Personal Router/Hotspot Test Configurations

13.3.1. Sum of the SAR for GSM, W-CDMA, & WiFi

Sum of the SAR with Measured Values

Test Position	Voice				Data WiFi 2.4 GHz	Σ 1-g SAR (mW/g)
	GSM 850	GSM 1900	W-CDMA Band V	W-CDMA Band II		
Rear	0.406				0.228	0.634
		0.413			0.228	0.641
			0.656		0.228	0.884
				0.559	0.228	0.787
Front	0.23				0.028	0.258
		0.318			0.028	0.346
			0.327		0.028	0.355
				0.423	0.028	0.451
Edge 1	0				0.085	0.085
		0			0.085	0.085
			0		0.085	0.085
				0	0.085	0.085
Edge 2	0				0.026	0.026
		0			0.026	0.026
			0.261		0.026	0.287
				0.171	0.026	0.197
Edge 3	0				0	
		0			0	
			0.035		0	0.035
				0.148	0	0.148
Edge 4	0				0.017	0.017
		0			0.017	0.017
			0.293		0.017	0.310
				0.09	0.017	0.107

Sum of the SAR with Scaled Values for the Worst-case Configuration

Test Position	Voice				Data WiFi 2.4 GHz	Σ 1-g SAR (mW/g)
	GSM 850	GSM 1900	W-CDMA Band V	W-CDMA Band II		
Rear	0.415				0.244	0.659
		0.463			0.244	0.707
			0.659		0.244	0.903
				0.559	0.244	0.803

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.

14. Appendixes

Refer to separated files for the following appendixes.

- 14.1. System Performance Check Plots**
- 14.2. SAR Test Plots for GSM850**
- 14.3. SAR Test Plots for GSM1900**
- 14.4. SAR Test Plots for WCDMA (UMTS) Band V**
- 14.5. SAR Test Plots for WCDMA (UMTS) Band II**
- 14.6. SAR Test Plots for WiFi 2.4 GHz Band**
- 14.7. Calibration Certificate for E-Field Probe EX3DV4 - SN 3749**
- 14.8. Calibration Certificate for E-Field Probe EX3DV4 - SN 3772**
- 14.9. Calibration Certificate for D835V2 - SN 4d117**
- 14.10. Calibration Certificate for D2450V2 - SN 748**
- 14.11. Calibration Certificate for D1900V2 - SN 5d140**