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

SAR EVALUATION REPORT

For
Convertible Tablet Computer

Model: TP00042A
FCC ID: GKR-TP00042AHB

Report Number: 12U14543-2A
Issue Date: 12/13/2012

Prepared for
Compal Electronics Inc.
581 Juikuang Road,
Neihu, Taipai 114, Taiwan.

Prepared by
UL CCS
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	11/1/2012	Initial Issue	--
A	12/14/2012	Section 8.1 – corrected output power measurements Section 14 – Included 5GHz simultaneous transmission analysis. General – expanded the surface and edge descriptions.	Dave Weaver

Table of Contents

1. Attestation of Test Results

Applicant	Compal Electronics Inc.		
DUT description	Convertible Tablet Computer with GSM/WCDMA Ericsson model: H5321		
Model	TP00042A		
Test device is	An identical prototype		
Device category	Portable Portable - 47 CFR §2.1093		
Exposure category	General Population/Uncontrolled Exposure		
Date tested	7/18/2012 – 7/31/2012		
FCC Rule Parts	Freq. Range	Highest 1-g SAR	Limit
22	824-849 MHz	Body: 0.758 W/kg (Edge 1 with 0 mm distance)	1.6 W/kg
24	1850-1910 MHz	Body: 0.221 W/kg (Edge 1 with 0 mm Separation)	
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:

Dave Weaver
Staff Engineer
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 01-01 IEEE Std 1528-2003 and IEEE Std 1528a-2005 and the following KDB Procedures:

The tests documented in this report were performed in accordance with FCC OET Bulletin 65 Supplement C Edition 01-01, IEEE STD 1528-2003 and the following KDB Procedures:

- 447498 D01 Mobile Portable RF Exposure v04
- 616217 D03 SAR Supp Note and Netbook Laptop v01
- 941225 D01 SAR test for 3G devices v02
- 941225 D02 Guidance for 3GPP R6 and R7 HSPA v02v01
- 941225 D03 SAR Test Reduction GSM GPRS EDGE v01

3. Facilities and Accreditation

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

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

4. Calibration and Uncertainty

4.1. Measuring Instrument Calibration

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

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due date		
				MM	DD	Year
Dielectronic Probe kit	HP	85070C	N/A	N/A		
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
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		

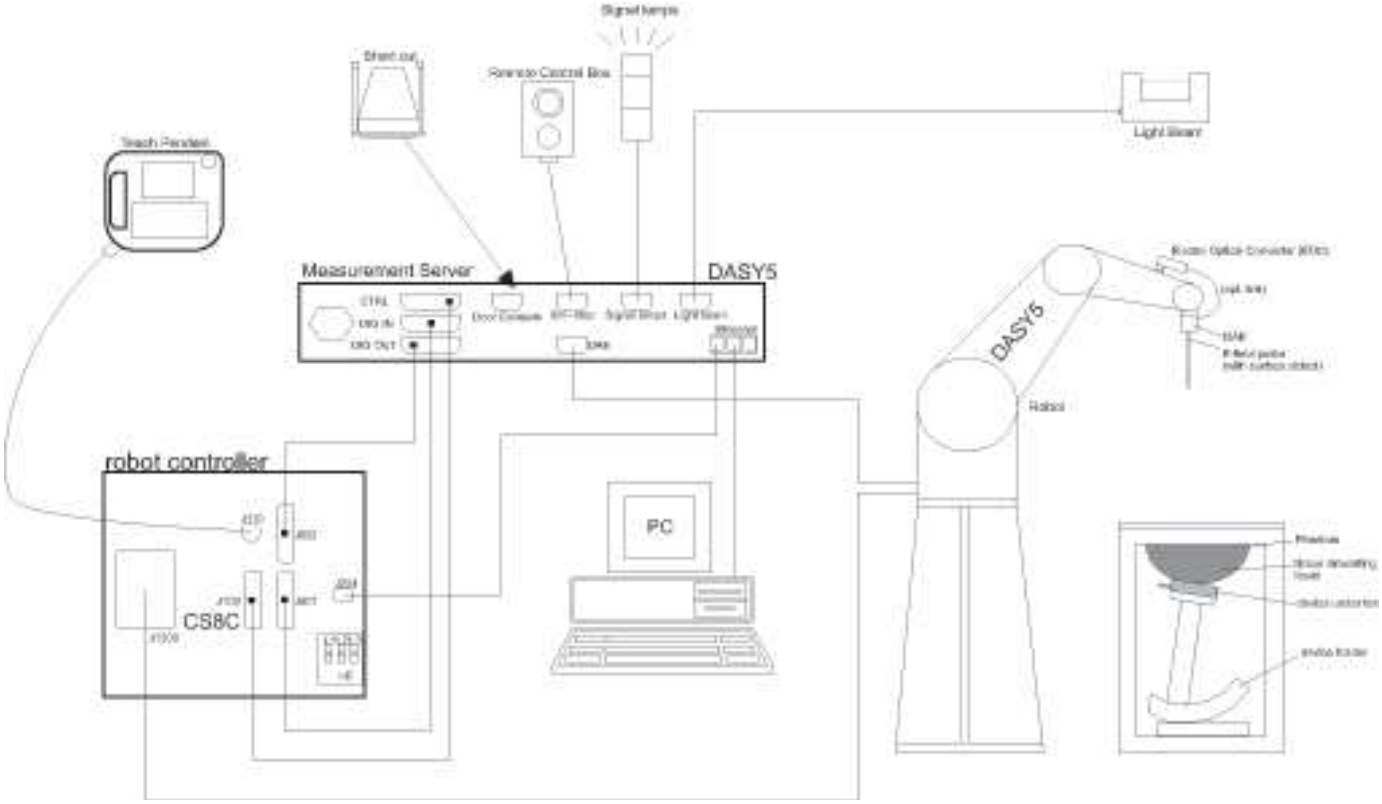
4.2. Measurement Uncertainty

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	**-4.64**	Normal	1	0.64	-2.97
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.6	1.73
Liquid Permittivity - measurement uncertainty	**-4.60**	Normal	1	0.6	-2.76
				Combined Standard Uncertainty Uc(y) =	10.55
				Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence = 21.10 %	
				Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence = 1.66 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 (Stäubli RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows XP.
- DASY software.
- Remote controls with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing validating the proper functioning of the system.

6. SAR Measurement Procedures

6.1. Normal SAR Measurement Procedure

Step 1: Power Reference Measurement
The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

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

Step 3: Zoom Scan
Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures ≥ 7x7x9 (above 4.5 GHz) or 5x5x7 (below 3 GHz) points within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

Step 4: Power drift measurement
The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

Step 5: Z-Scan (FCC only)
The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation the extrapolated distance should not be larger than the step size in Z-direction.

6.2. Volume Scan Procedures

Step 1: Power Reference Measurement

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

Step 2: Area Scan

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

Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures ≥ 7x7x9 (above 4.5 GHz) or 5x5x7 (below 3 GHz) points within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

Step 4: Volume Scan

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

Step 5: Power drift measurement

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

7. Device Under Test

Lenovo Tablet PC with GSM/W-CDMA Models: TP00042A	
Normal operation	Body (Rear/bottom and each edge): Multiple display orientations supporting both portrait and landscape configurations
Device Dimension (mm)	314x235x23(LxWxH)
Antenna Tested	Manufacturer: Wistron NeWeb Corporation Part number: WWAN Main: 81.EG915.G32 WWAN Aux: 81.EG915.G33

7.1. Band and Air Interfaces

Air Interfaces	- GSM, GPRS and EGPRS Class 10 - W-CDMA (UMTS) Rel 99, HSDPA (Rel 6, CAT 14), HSUPA (Rel 6, CAT 6)
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 - 802.11ab/g/n: 2412 - 2462 MHz, b / g / HT20 / HT40 5150 - 5250 MHz, a / HT20 / HT40 5250 - 5350 MHz, a / HT20 / HT40 5500 - 5700 MHz, a / HT20 / HT40 5725 - 5850 MHz, a / HT20 / HT40 - Bluetooth: 2402 - 2480 MHz WWAN and BT SAR was assessed by Bureau Veritas (Test report number SA120508C13A)

7.2. Simultaneous Transmission

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 + BT	☐	☒	☐

Note(s):

As the tablet has been assessed in accordance with KDB 447498, which has more conservative measurement distances than KDB 941225, further assessment in accordance with KDB 941225 is judged unnecessary. This is also in accordance with FCC training provided in October 2011 (TCBC Workshop) which indicates that hotspot mode KDB procedures are not intended for larger tablets.

7.3. Hotspot (Wireless router) Exposure Condition

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

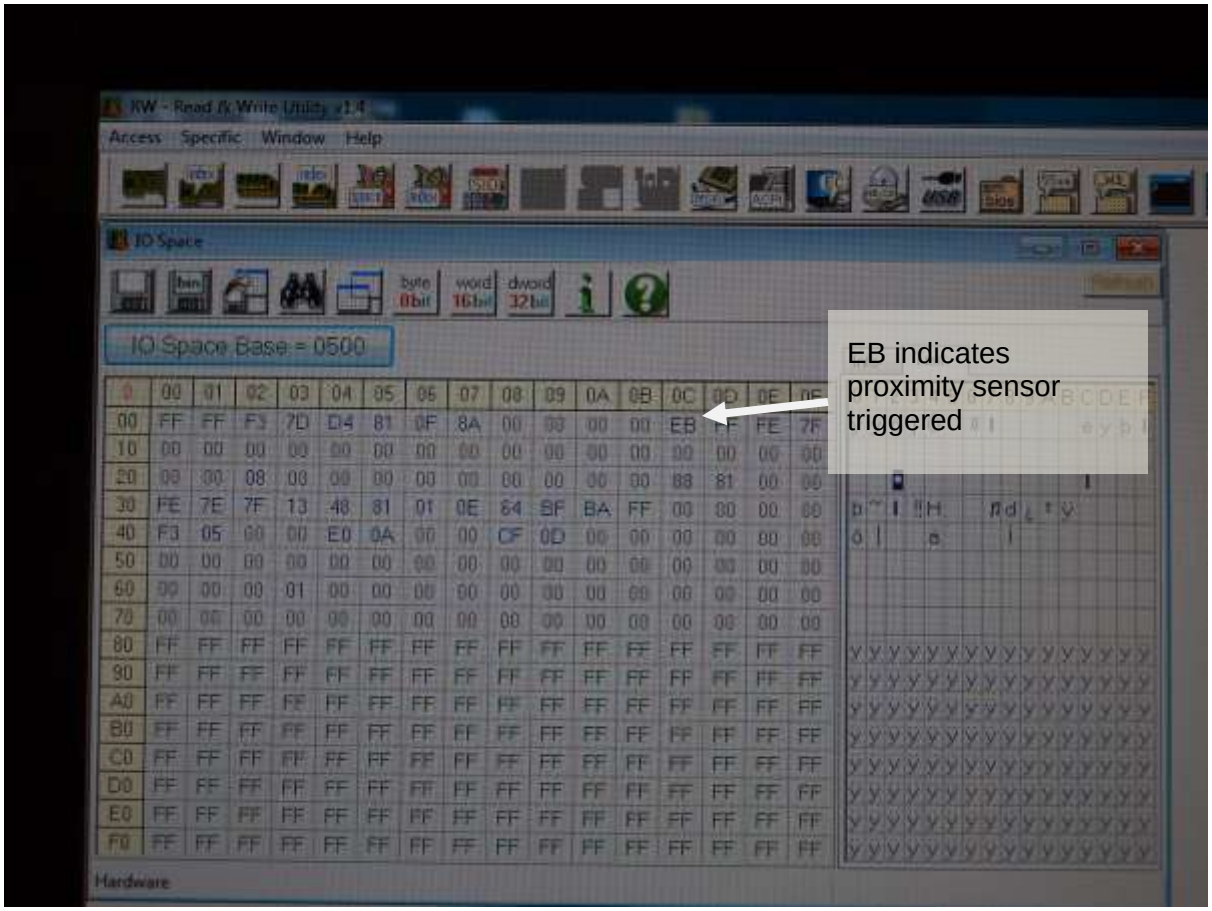
7.4. Power Reduction Implementation

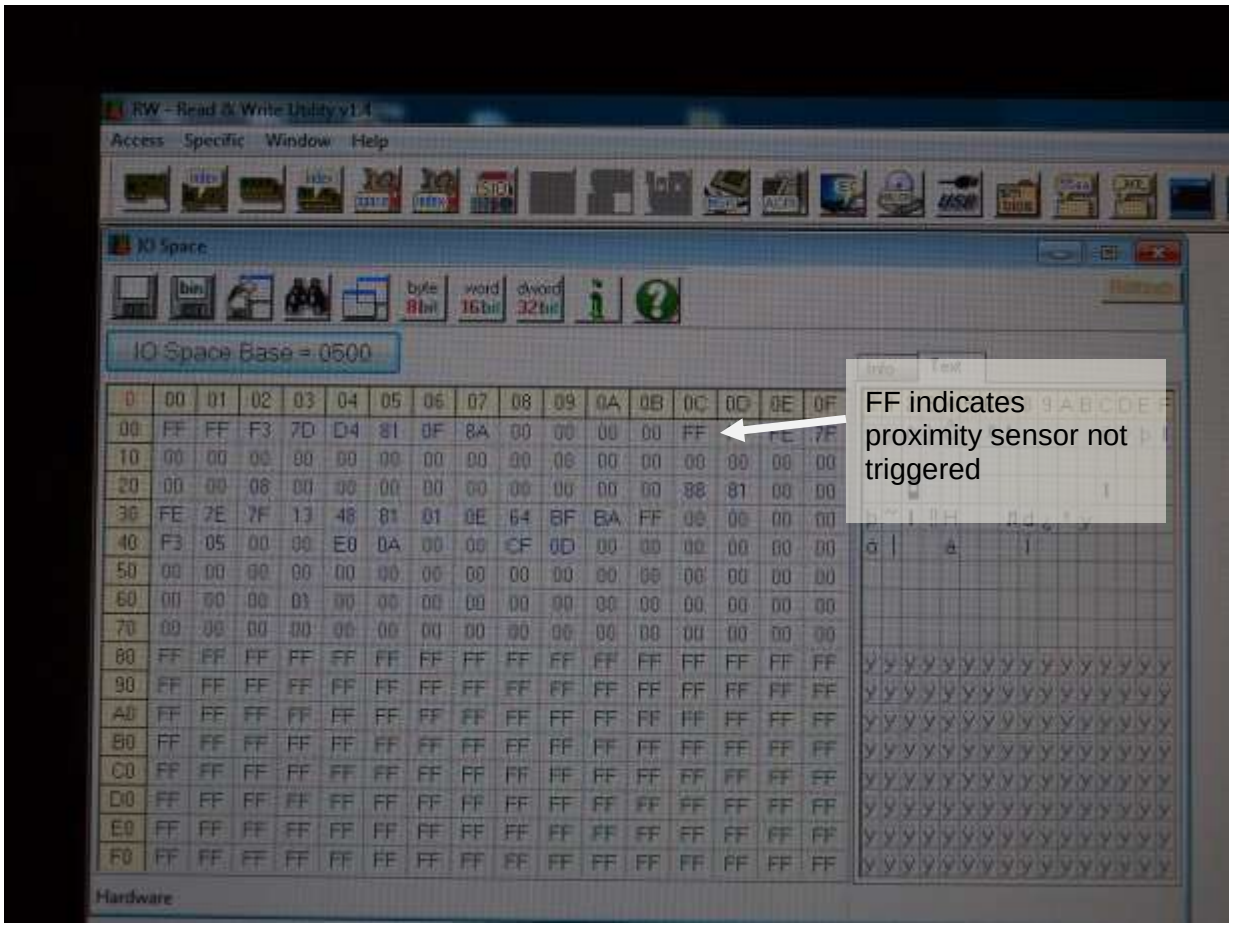
When the proximity sensor is enabled, the system will reduce the WWAN module TX power 5dB for GSM850, 4 dB for GSM1900 and UMTS bands II and V. The proximity sensor covers the Rear/Bottom and Top-edge (Edge 1) of the DUT and the measured trigger distances are:

- 10 mm from Bottom (Rear) of the DUT
- 10 mm from Top-edge (Edge 1) of the DUT

7.5. Proximity Sensor Trigger Distance Measurement

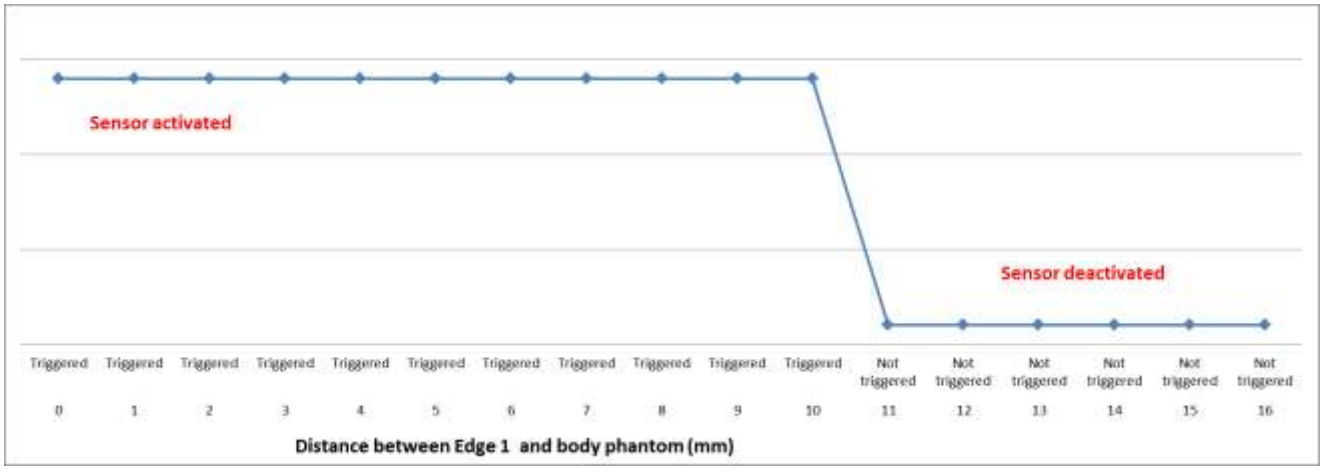
The proximity sensor triggering distances were measured by placing edge 1 or the base of the DUT below the flat phantom and moving the DUT toward the phantom. The status of the triggering sensor was monitored during the translation of the DUT using a software tool provided by the client.





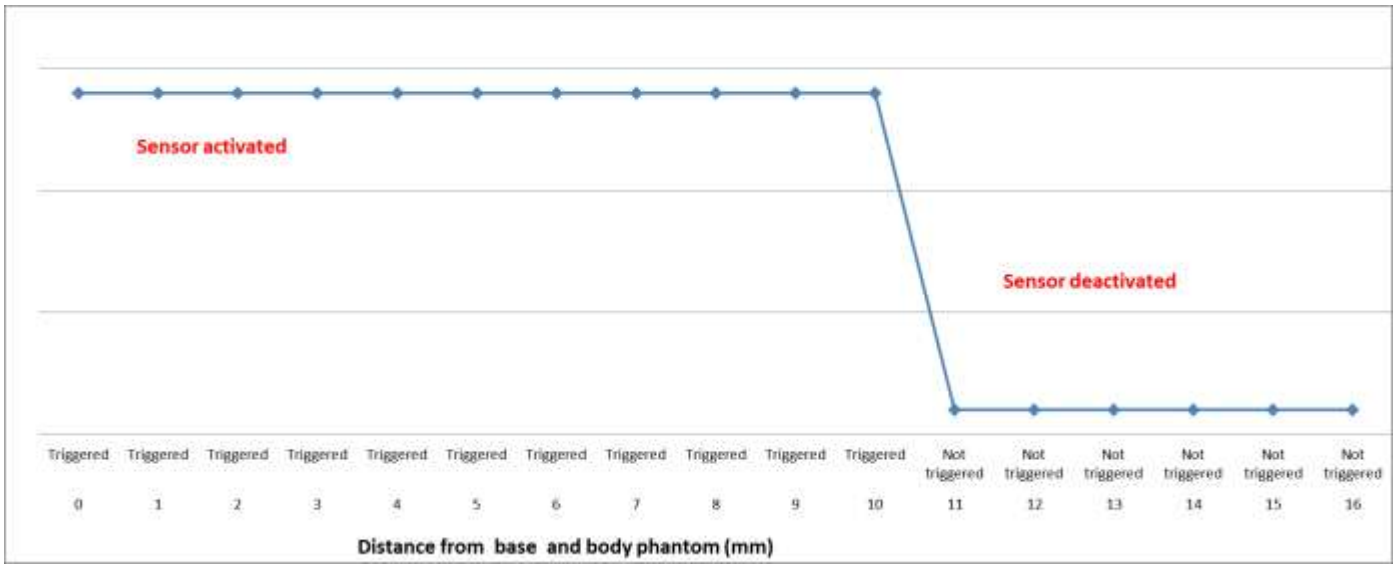
7.5.1. Edge 1 (Secondary landscape) Trigger distance

Distance (mm):	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Proximity sensor status	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF



7.5.2. Rear Trigger distance

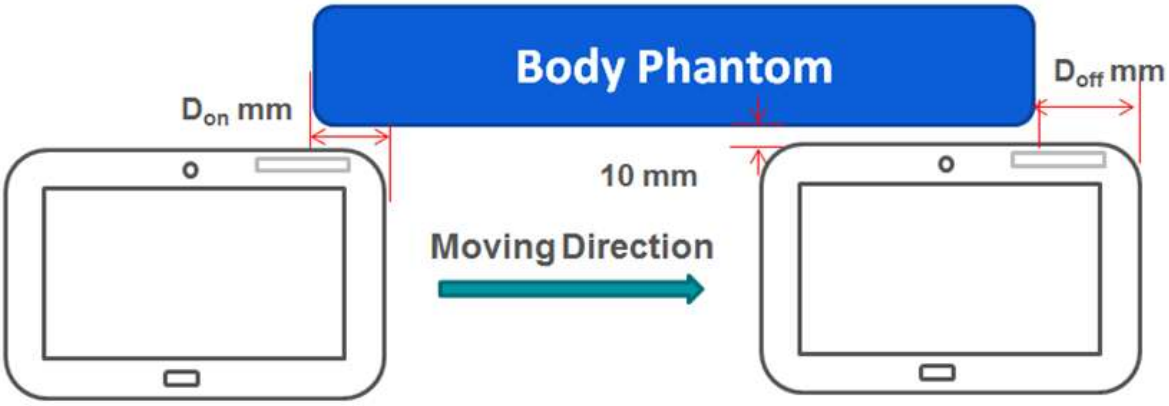
Distance (mm):	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Proximity sensor status	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF



7.6. Sensor Coverage Area

7.6.1. Edge Coverage

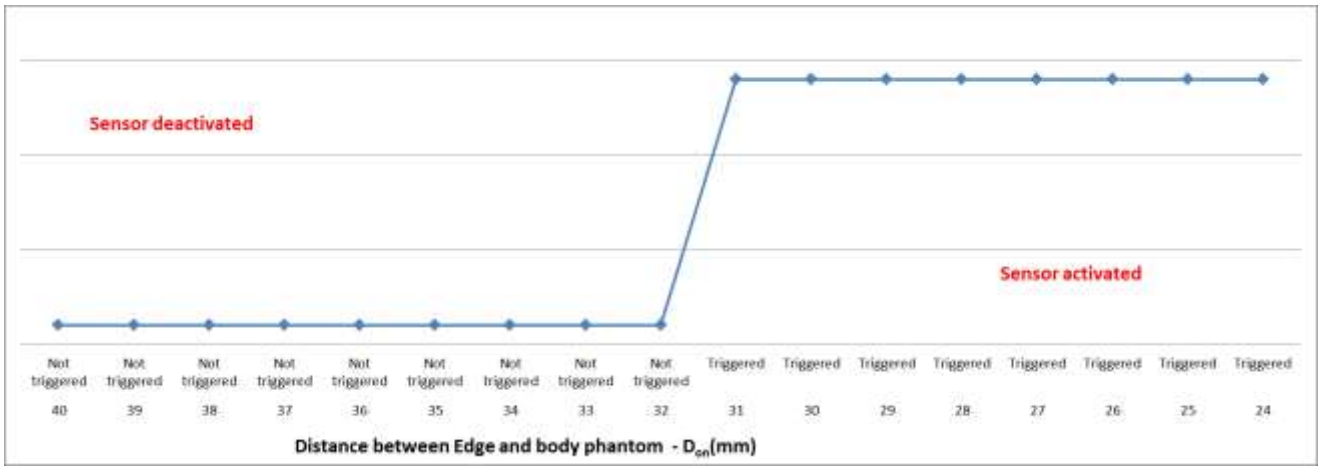
The edge coverage was measured with the DUT placed below the phantom and translated in the direction shown. The distances D_{on} (proximity sensor activates) and D_{off} (proximity sensor deactivates) were measured



D_{on} = 31mm, D_{off} = 130mm

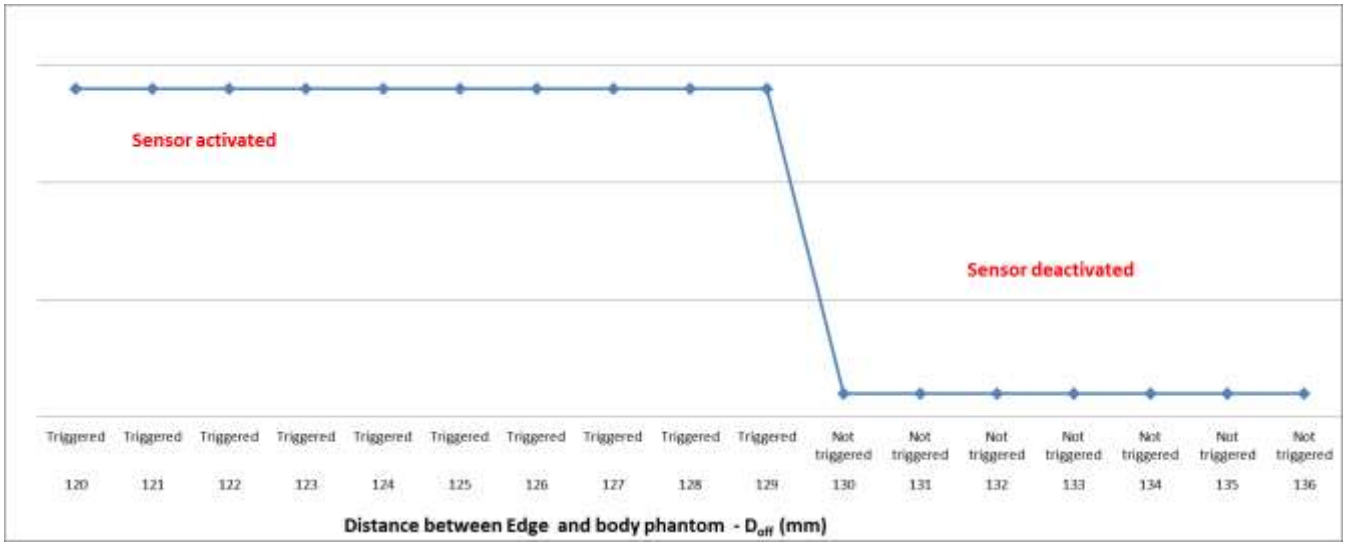
7.6.2. Edge D_{on} Measurement

Distance (mm):	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24
Proximity sensor status	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON



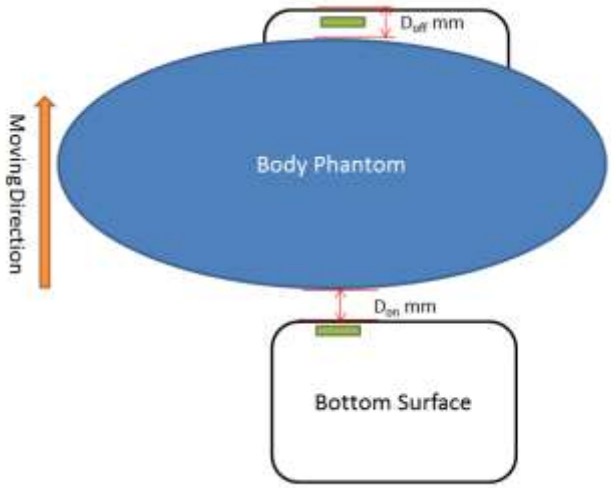
7.6.3. Edge D_{off} Measurement

Distance (mm):	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136
Proximity sensor status	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF



7.6.4. Rear Coverage

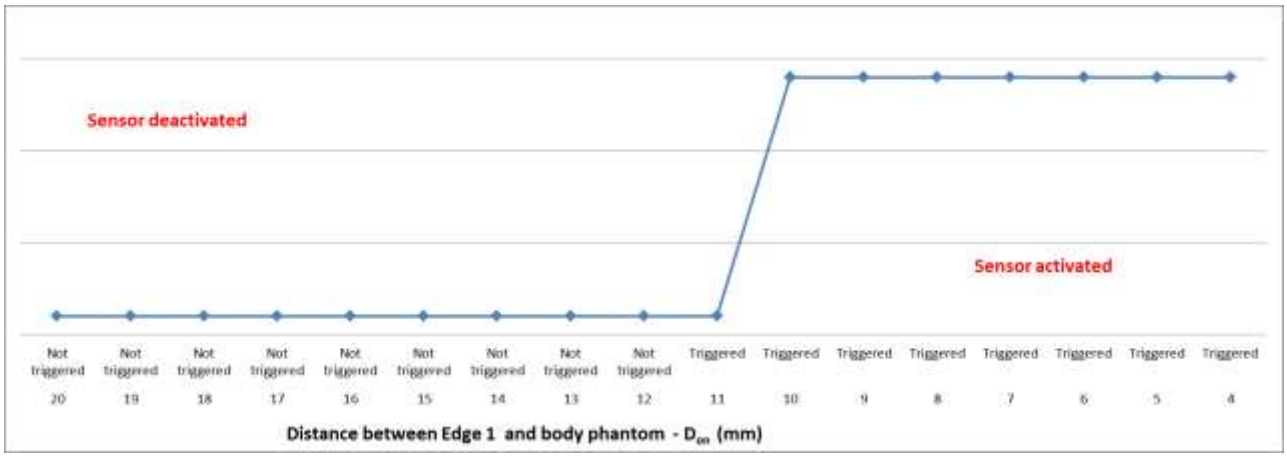
The base coverage was measured with the DUT placed below the phantom and translated in the direction shown. The distances D_{on} (proximity sensor activates) and D_{off} (proximity sensor deactivates) were measured



D_{on} = 10mm, D_{off} = 15mm

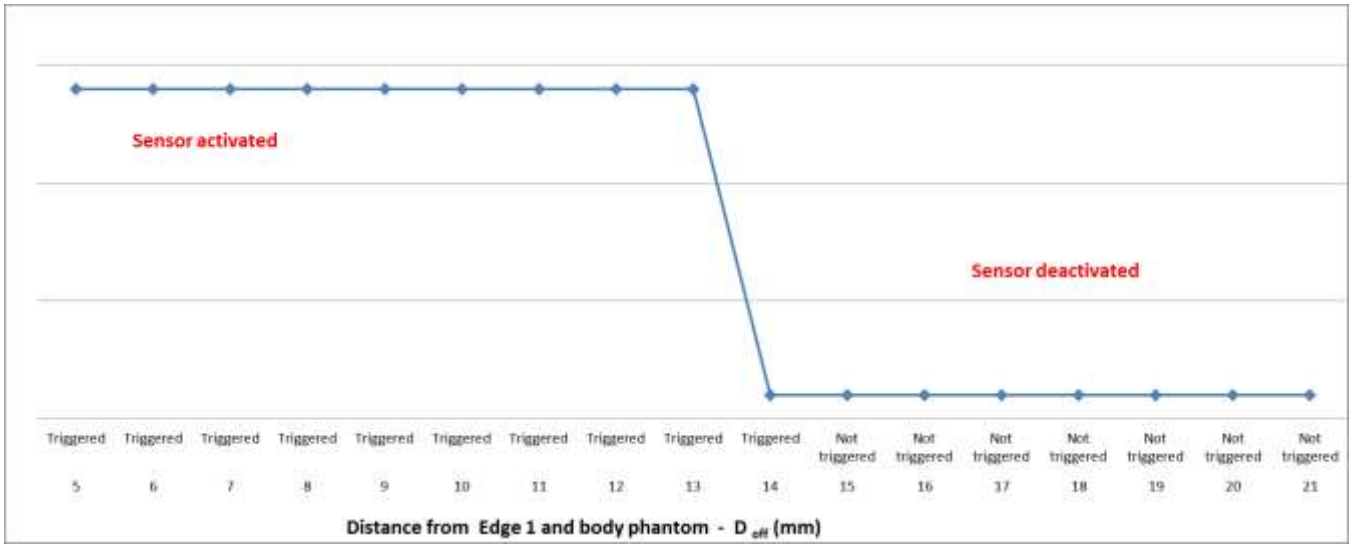
7.6.5. Rear D_{on} Measurement

Distance (mm):	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4
Proximity sensor status	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON



7.6.6. Rear D_{off} Measurement

Distance (mm):	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Proximity sensor status	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF



8. RF Output Power Measurement/Verification

Maximum output power is verified on the Low, Middle and High channels according to procedures in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E for 1xRTT, section 3.1.2.3.4 of 3GPP2 C.S0033-0/TIA-866 for Rel. 0 and section 4.3.4 of 3GPP2 C.S0033-A for Rev. A

8.1. GSM850/1900

Target levels

GSM850 (GMSK):

Target Power: 32 dBm (without Power Back-off)
27 dBm (with Power Back-off)
Tune-up Tolerance: -1dB / +1dB

GSM850 (8PSK):

Target Power: 27 dBm (without Power Back-off
22 dBm (with Power Back-off)
Tune-up Tolerance: -1.0dB / +0.5dB

GSM1900 (GMSK):

Target Power: 29 dBm (without Power Back-off
26 dBm (with Power Back-off)
Tune-up Tolerance: -1.0dB / +1.0dB

GSM1900 (8PSK):

Target Power: 26 dBm (without Power Back-off
21 dBm (with Power Back-off)
Tune-up Tolerance: -1.0dB / +0.5dB

GPRS (GMSK) - Coding Scheme: CS1

Band	Ch No.	f (MHz)	Avg burst Pwr (dBm)			
			1 slot	Frame Avg Pwr	2 slots	Frame Avg Pwr
850	128	824.2	32.6	23.6	32.6	26.5
	190	836.6	32.5	23.5	32.4	26.4
	251	848.8	32.3	23.3	32.3	26.2
1900	512	1850.2	29.5	20.5	29.5	23.5
	661	1880.0	29.3	20.3	29.2	23.2
	810	1909.8	29.1	20.0	29.0	22.9

EGPRS (8PSK) - Coding Scheme: MCS5

Band	Ch No.	f (MHz)	Avg burst Pwr (dBm)			
			1 slot	Frame Avg Pwr	2 slots	Frame Avg Pwr
850	128	824.2	27.4	18.4	27.2	21.2
	190	836.6	27.5	18.4	27.3	21.3
	251	848.8	27.4	18.4	27.3	21.3
1900	512	1850.2	25.8	16.7	26.0	20.0
	661	1880.0	25.6	16.6	25.7	19.6
	810	1909.8	25.3	16.2	25.3	19.3

GPRS (GMSK) - Coding Scheme: CS1 With Power Back Off

Band	Ch No.	f (MHz)	Avg burst Pwr (dBm)			
			1 slot	Frame Avg Pwr	2 slots	Frame Avg Pwr
850	128	824.2	28.0	19.0	28.0	22.0
	190	836.6	28.0	19.0	28.0	22.0
	251	848.8	27.9	18.9	28.0	22.0
1900	512	1850.2	25.9	16.9	25.9	19.9
	661	1880.0	25.7	16.7	25.7	19.6
	810	1909.8	25.5	16.4	25.5	19.4

EGPRS (8PSK) - Coding Scheme: MCS5 With Power Back Off

Band	Ch No.	f (MHz)	Avg burst Pwr (dBm)			
			1 slot	Frame Avg Pwr	2 slots	Frame Avg Pwr
850	128	824.2	22.3	13.2	22.3	16.2
	190	836.6	22.3	13.3	22.3	16.3
	251	848.8	22.3	13.2	22.2	16.2
1900	512	1850.2	21.5	12.5	21.5	15.5
	661	1880.0	21.5	12.5	21.5	15.5
	810	1909.8	21.4	12.4	21.4	15.4

Notes:

According to KDB 941225 D03 SAR Test Reduction GSM/GPRS/EDGE vo1, noted in the following sections indicated below may be considered to determine SAR test reduction requirements for devices operating in GSM/GPRS/EDGE modes to demonstrate RF exposure compliance.

1. Since the source-based time-averaged output power for EGPRS mode is lower than that in the GPRS mode, therefore Body SAR test reduction is applicable for this device.
2. Based on output power above and time slots, the following worst-case configurations were chosen for Body SAR testing.
   a. GPRS850 2 time slots
   b. GPRS1900 2 time slots
   c. GPRS850 2 time slots (Power back off)
   d. GPRS1900 2 time slots (Power back off)

8.2. WCDMA (UMTS) Band V & II

W-CDMA (UMTS) Band V:

Target Power: 23 dBm (without Power Back-off
18 dBm (with Power Back-off)
Tune-up Tolerance: -1.0dB / +0.5dB

W-CDMA (UMTS) Band II:

Target Power: 22 dBm (without Power Back-off
18 dBm (with Power Back-off)
Tune-up Tolerance: -1.0dB / +0.5dB

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/o Pwr back-off	W/ Pwr back-off
WCDMA (UMTS) Band V	Rel 99 (RMC, 12.2 kbps)	4132	826.4	23.0	18.0
		4183	846.6	23.0	18.1
		4233	846.6	22.9	17.9
WCDMA (UMTS) Band II	Rel 99 (RMC, 12.2 kbps)	9262	1852.4	22.5	18.5
		9400	1880.0	22.5	18.5
		9538	1907.6	22.4	18.4

HSDPA

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

Results

Band	Mode	UL Ch No.	Freq. (MHz)	Target MPR	Avg Pwr (dBm)	
					W/o Pwr back-off	W/ Pwr back-off
WCDMA (UMTS) Band V	Subtest 1	4132	826.4	0	22.9	18.9
		4183	836.6	0	23.0	18.9
		4233	846.6	0	22.8	18.9
	Subtest 2	4132	826.4	1	21.8	17.9
		4183	836.6	1	21.9	17.9
		4233	846.6	1	21.8	17.9
	Subtest 3	4132	826.4	1.5	20.8	17.4
		4183	836.6	1.5	20.9	17.5
		4233	846.6	1.5	20.7	17.4
	Subtest 4	4132	826.4	1.5	20.9	17.5
		4183	836.6	1.5	20.9	17.5
		4233	846.6	1.5	20.9	17.5
WCDMA (UMTS) Band II	Subtest 1	9262	1852.4	0	21.8	18.7
		9400	1880.0	0	21.8	18.8
		9538	1907.6	0	21.7	18.6
	Subtest 2	9262	1852.4	1	20.8	17.8
		9400	1880.0	1	20.7	17.8
		9538	1907.6	1	20.6	17.7
	Subtest 3	9262	1852.4	1.5	19.7	17.4
		9400	1880.0	1.5	19.7	17.3
		9538	1907.6	1.5	19.6	17.2
	Subtest 4	9262	1852.4	1.5	19.7	17.4
		9400	1880.0	1.5	19.7	17.3
		9538	1907.6	1.5	19.6	17.2

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)	
					W/o Pwr back-off	W/ Pwr back-off
WCDMA (UMTS) Band V	Subtest 1	4132	826.4	0	22.7	18.9
		4183	836.6	0	22.7	19.0
		4233	846.6	0	22.7	18.9
	Subtest 2	4132	826.4	2	20.8	16.9
		4183	836.6	2	20.9	17.0
		4233	846.6	2	20.8	16.9
	Subtest 3	4132	826.4	1	20.9	18.0
		4183	836.6	1	20.9	18.0
		4233	846.6	1	20.8	17.9
	Subtest 4	4132	826.4	2	18.9	17.0
		4183	836.6	2	19.0	17.0
		4233	846.6	2	18.9	16.9
	Subtest 5	4132	826.4	0	22.9	19.0
		4183	836.6	0	22.9	19.0
		4233	846.6	0	22.8	18.9
WCDMA (UMTS) Band II	Subtest 1	9262	1852.4	0	21.5	18.7
		9400	1880.0	0	21.6	18.8
		9538	1907.6	0	21.5	18.7
	Subtest 2	9262	1852.4	2	19.8	16.8
		9400	1880.0	2	19.8	16.8
		9538	1907.6	2	19.7	16.7
	Subtest 3	9262	1852.4	1	19.7	17.7
		9400	1880.0	1	19.8	17.8
		9538	1907.6	1	19.6	17.7
	Subtest 4	9262	1852.4	2	17.8	16.8
		9400	1880.0	2	17.8	16.9
		9538	1907.6	2	17.7	16.7
	Subtest 5	9262	1852.4	0	21.8	18.8
		9400	1880.0	0	21.7	18.9
		9538	1907.6	0	21.8	18.8

Note(s):

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

9. Summary of Test Configurations

The following test configurations are based on KDB 447498 4) b) Tablet Mode

9.1. Body Exposure Conditions for WWAN

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	16.95 mm	Yes	SAR evaluated with the base/bottom of the tablet in direct contact with a flat phantom as per KDB 447498 4) b) i)
Edge 1 (secondary landscape)	4.2 mm	Yes	This is the most conservative antenna-to-user angle at Top-Edge at which proximity sensor is triggered on.
Edge 2 (secondary portrait)	49.12 mm	No	This is not the most conservative antenna-to-user distance at edge mode as per KDB 447498 4) b) ii) (2)
Edge 3 (primary landscape)	219.3 mm	No	This is not the most conservative antenna-to-user distance at edge mode as per KDB 447498 4) b) ii) (2)
Edge 4 (primary portrait)	193.88 mm	No	This is not the most conservative antenna-to-user distance at edge mode as per KDB 447498 4) b) ii) (2)
Rear (10 mm Separation)	26.95 mm	Yes	This is the most conservative antenna-to-user distance at Rear at which proximity sensor is triggered off.
Edge 1 (primary landscape) (10 mm Separation)	14.2 mm	Yes	This is the most conservative antenna-to-user distance at Top-Edge at which proximity sensor is triggered off.

10. Tissue Dielectric Properties

IEEE Std 1528-2003, IEEE Std 1528a-2005 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

FCC OET Bulletin 65 Supplement C 01-01 & IC RSS-102

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

EN 62209-1 and IEC 62209-2 Table 1

Target Frequency (MHz)	Head	
	ε_r	σ (S/m)
30	55.0	0.75
150	52.3	0.76
300	45.3	0.87
450	43.5	0.87
835	41.5	0.90
900	41.5	0.97
915	41.5	0.98
1450	40.5	1.20
1610	40.3	1.29
1800 – 2000	40.0	1.40
2450	39.2	1.80
2600	39.0	1.96
3000	38.5	2.40
3500	37.9	2.91
4000	37.4	3.43
4500	36.8	3.94
5000	36.2	4.45
5200	36.0	4.66
5400	35.8	4.86
5600	35.5	5.07
5800	35.3	5.27
6000	35.1	5.48

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^2O	Water, 35 – 58%
Sucrese	Sugar, white, refined, 40-60%
NaCl	Sodium Chloride, 0-6%
Hydroxyethel-cellulsoe	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-methyyl-3(2H)-isothiazolone, 0.1-0.7%

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%

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 ±(%)
7/19/2012	Body 1900		51.7547	Relative Permittivity (ϵ_r):	51.75	53.30	-2.90	5
		e''	14.2125	Conductivity (σ):	1.50	1.52	-1.22	5
	Body 1850	e'	51.8887	Relative Permittivity (ϵ_r):	51.89	53.30	-2.65	5
		e''	14.0910	Conductivity (σ):	1.45	1.52	-4.64	5
	Body 1880	e'	51.8192	Relative Permittivity (ϵ_r):	51.82	53.30	-2.78	5
		e''	14.1840	Conductivity (σ):	1.48	1.52	-2.45	5
	Body 1910	e'	51.7078	Relative Permittivity (ϵ_r):	51.71	53.30	-2.99	5
			14.2587	Conductivity (σ):	1.51	1.52	-0.37	5
7/24/2012	Body 1900		51.3583	Relative Permittivity (ϵ_r):	51.36	53.30	-3.64	5
		e''	14.7038	Conductivity (σ):	1.55	1.52	2.20	5
	Body 1850	e'	51.4457	Relative Permittivity (ϵ_r):	51.45	53.30	-3.48	5
		e''	14.5240	Conductivity (σ):	1.49	1.52	-1.71	5
	Body 1880	e'	51.4773	Relative Permittivity (ϵ_r):	51.48	53.30	-3.42	5
		e''	14.5872	Conductivity (σ):	1.52	1.52	0.32	5
	Body 1910	e'	51.2196	Relative Permittivity (ϵ_r):	51.22	53.30	-3.90	5
			14.6928	Conductivity (σ):	1.56	1.52	2.66	5
7/25/2012	Body 1900		51.7060	Relative Permittivity (ϵ_r):	51.71	53.30	-2.99	5
		e''	14.4676	Conductivity (σ):	1.53	1.52	0.56	5
	Body 1850	e'	52.0004	Relative Permittivity (ϵ_r):	52.00	53.30	-2.44	5
		e''	14.2375	Conductivity (σ):	1.46	1.52	-3.65	5
	Body 1880	e'	51.8325	Relative Permittivity (ϵ_r):	51.83	53.30	-2.75	5
		e''	14.3719	Conductivity (σ):	1.50	1.52	-1.16	5
	Body 1910	e'	51.6241	Relative Permittivity (ϵ_r):	51.62	53.30	-3.14	5
			14.3637	Conductivity (σ):	1.53	1.52	0.36	5
7/26/2012	Body 1900		51.5321	Relative Permittivity (ϵ_r):	51.53	53.30	-3.32	5
		e''	14.7304	Conductivity (σ):	1.56	1.52	2.38	5
	Body 1850	e'	51.7538	Relative Permittivity (ϵ_r):	51.75	53.30	-2.90	5
		e''	14.6874	Conductivity (σ):	1.51	1.52	-0.60	5
	Body 1880	e'	51.6464	Relative Permittivity (ϵ_r):	51.65	53.30	-3.10	5
		e''	14.6887	Conductivity (σ):	1.54	1.52	1.02	5
	Body 1910	e'	51.4878	Relative Permittivity (ϵ_r):	51.49	53.30	-3.40	5
			14.8539	Conductivity (σ):	1.58	1.52	3.78	5

Tissue Dielectric Parameter Check Results - continued

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
07/27/2012	Body 835	e'	52.9865	Relative Permittivity (ϵ_r):	52.99	55.20	-4.01	5
		e''	20.9228	Conductivity (σ):	0.97	0.97	0.15	5
	Body 820	e'	53.0335	Relative Permittivity (ϵ_r):	53.03	55.28	-4.06	5
		e''	21.0454	Conductivity (σ):	0.96	0.97	-0.92	5
	Body 850	e'	52.7571	Relative Permittivity (ϵ_r):	52.76	55.16	-4.35	5
		e''	20.9065	Conductivity (σ):	0.99	0.99	0.10	5
07/30/2012	Body 835	e'	52.6664	Relative Permittivity (ϵ_r):	52.67	55.20	-4.59	5
		e''	20.9059	Conductivity (σ):	0.97	0.97	0.07	5
	Body 820	e'	52.7912	Relative Permittivity (ϵ_r):	52.79	55.28	-4.50	5
		e''	20.9889	Conductivity (σ):	0.96	0.97	-1.19	5
	Body 850	e'	52.6173	Relative Permittivity (ϵ_r):	52.62	55.16	-4.60	5
		e''	20.9484	Conductivity (σ):	0.99	0.99	0.30	5
07/31/2012	Body 835	e'	54.7671	Relative Permittivity (ϵ_r):	54.77	55.20	-0.78	5
		e''	21.2379	Conductivity (σ):	0.99	0.97	1.65	5
	Body 820	e'	55.1689	Relative Permittivity (ϵ_r):	55.17	55.28	-0.20	5
		e''	21.3492	Conductivity (σ):	0.97	0.97	0.51	5
	Body 850	e'	54.7727	Relative Permittivity (ϵ_r):	54.77	55.16	-0.70	5
		e''	21.2680	Conductivity (σ):	1.01	0.99	1.83	5

11. System Performance Check

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

11.1. System Performance Check Measurement Conditions

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

11.2. Reference SAR Values for System Performance Check

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

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	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

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.						
7/19/2012	D1900V2	5d140	Body	1g	41.6	40.0	4.00	±10
				10g	21.7	21.3	1.88	
7/24/2012	D1900V2	5d140	Body	1g	39.6	40.0	-1.00	±10
				10g	20.5	21.3	-3.76	
7/25/2012	D1900V2	5d140	Body	1g	39.8	40.0	-0.50	±10
				10g	20.7	21.3	-2.82	
7/26/2012	D1900V2	5d140	Body	1g	39.5	40.0	-1.25	±10
				10g	20.4	21.3	-4.23	
7/27/2012	D835V2	4d002	Body	1g	9.68	9.64	0.41	±10
				10g	6.30	6.37	-1.10	
7/30/2012	D835V2	4d002	Body	1g	9.71	9.64	0.73	±10
				10g	6.38	6.37	0.16	
7/31/2012	D835V2	4d002	Body	1g	9.39	9.64	-2.59	±10
				10g	6.17	6.37	-3.14	

12. SAR Test Results

All SAR tests were used with the normal battery cover (without the wireless charging hardware). The test was repeated with wireless charging battery cover for the highest SAR measured from normal battery cover, as per KDB 648474 D03 Handset Wireless Battery Chargers v01.

12.1. GSM850

Body SAR with Power Back Off (Proximity Sensor On) @ 5 dB

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
						1-g	10-g	
Rear	GPRS 2 slots	0	128	824.20	28.1			
			190	836.60	28.1	0.235	0.146	1
			251	848.80	28.1			
Edge 1 (secondary landscape)	GPRS 2 slots	0	128	824.20	28.1			
			190	836.60	28.1	**0.758**	**0.437**	1
			251	848.80	28.1			

Body SAR with Full Power (Proximity Sensor Off)

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	32.6			
			190	836.60	32.4	0.224	0.150	1
			251	848.80	32.3			
Edge 1 (secondary landscape)	GPRS 2 slots	10	128	824.20	32.6			
			190	836.60	32.4	0.517	0.335	1
			251	848.80	32.3			

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

12.2. GSM1900

Body SAR with Power Back Off (Proximity Sensor On) @ 4 dB

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
						1-g	10-g	
Rear	GPRS 2 slots	0	512	1850.2	25.9			
			661	1880.0	25.7	0.134	0.067	1
			810	1909.8	25.5			
Edge 1 (secondary landscape)	GPRS 2 slots	0	512	1850.2	25.9			
			661	1880.0	25.7	0.221	0.111	1
			810	1909.8	25.5			

Body SAR with Full Power (Proximity Sensor Off)

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	29.5			
			661	1880.0	29.2	0.080	0.046	1
			810	1909.8	29.0			
Edge 1 (secondary landscape)	GPRS 2 slots	10	512	1850.2	29.5			
			661	1880.0	29.2	0.154	0.093	1
			810	1909.8	29.0			

Note(s):

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

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

Body SAR with Power Back off (Proximity Sensor On) @ 4 dB

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	0	4132	826.4	18.0			
			4183	836.6	18.1	0.153	0.094	1
			4233	846.6	17.9			
Edge 1 (secondary landscape)	Rel 99 RMC 12.2kbps	0	4132	826.4	18.0			
			4183	836.6	18.1	**0.431**	**0.247**	1
			4233	846.6	17.9			

Body SAR with Full Power (Proximity Sensor Off)

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	23.0			
			4183	836.6	23.0	0.099	0.066	1
			4233	846.6	22.9			
Edge 1 (secondary landscape)	Rel 99 RMC 12.2kbps	10	4132	826.4	23.0			
			4183	836.6	23.0	0.280	0.183	1
			4233	846.6	22.9			

Note(s):

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

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

Body SAR with Power Back off (Proximity Sensor On) @ 4 dB

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	0	9262	1852.4	18.5			
			9400	1880.0	18.5	0.130	0.064	1
			9538	1907.6	18.4			
Edge 1 (secondary landscape)	Rel 99 RMC 12.2kbps	0	9262	1852.4	18.5			
			9400	1880.0	18.5	**0.202**	**0.104**	1
			9538	1907.6	18.4			

Body SAR with Full Power (Proximity Sensor Off)

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	22.7			
			9400	1880.0	22.7	0.060	0.036	1
			9538	1907.6	22.6			
Edge 1 (secondary landscape)	Rel 99 RMC 12.2kbps	10	9262	1852.4	22.7			
			9400	1880.0	22.7	0.125	0.077	1
			9538	1907.6	22.6			

Note(s):

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

13. Summary of Highest SAR Values

Results for highest Body SAR values for each frequency band and mode

Technology/Band	Test configuration	Mode	1g-SAR (W/kg)	10g-SAR (W/kg)
GSM850	Edge 1 (secondary landscape) with (0 mm Separation)	GPRS 2 slots	0.758	0.437
GSM1900	Edge 1 (secondary landscape) with (0 mm Separation))	GPRS 2 slots	0.221	0.135
W-CDMA (UMTS) Band V	Edge 1 (secondary landscape) with (0 mm Separation)	Rel 99 RMC 12.2kbps	0.431	0.247
W-CDMA (UMTS) Band II	Edge 1 (secondary landscape) with (0 mm Separation)	Rel 99 RMC 12.2kbps	0.202	0.104

13.1. Scaling of Standalone SAR measurements

The scaling of the standalone 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, was 1.7 dB. Only SAR measurements above 1.08 W/kg could exceed 1.6 W/kg as a result of scaling to accommodate this 1.7dB difference. The worst case standalone SAR measurement is 0.437 W/kg

14. Simultaneous Transmission SAR Analysis

14.1. Bluetooth

As the Bluetooth output power is ≤ 2·P_{Ref} (4.8 dBm / 3 mW) (FCC ID QDS-BRCM1058) stand-alone SAR evaluation is not required. Therefore, simultaneous transmission SAR evaluation is not required

14.2. WLAN SAR Test Results

The EUT supports WLAN and WWAN simultaneous transmission. The WLAN SAR results are from Bureau Veritas Test report number SA120508C13A.

14.3. Simultaneous Transmission Analysis Criteria

Simultaneous transmission SAR analysis was assessed in accordance with KDB 616217 D03 R Supp Note and Netbook Laptop, section 4).

The WLAN Main and WWAN SAR simultaneous transmission was assessed using Section 4)b).

The WLAN Aux and WWAN SAR simultaneous transmission was assessed using Section 4)a).

14.4. Body Exposure Conditions

14.4.1. Simultaneous Transmission analysis for GSM, W-CDMA, & Wi-Fi Main Antenna (10mm separation)

Test Position	Data						∑ 1-g SAR (mW/g)	Minimum antenna separation distance (cm)[1]	EUT antenna separation (cm)
	GSM850	GSM1900	WCDMA Band V	WCDMA Band II	WiFi 2.4 GHz	Wi-Fi 5GHz			
Rear	0.224				0.137		0.361	0.536	15
		0.08			0.137		0.217	0.250	
			0.099		0.137		0.236	0.283	
				0.06	0.137		0.197	0.216	
Edge 1 (secondary landscape)	0.517				0.591		1.108	2.881	
		0.154			0.591		0.745	1.589	
			0.28		0.591		0.871	2.008	
				0.125	0.591		0.716	1.497	
Rear	0.224					0.267	0.491	0.850	
		0.08				0.267	0.347	0.505	
			0.099			0.267	0.366	0.547	
				0.06		0.267	0.327	0.462	
Edge 1 (secondary landscape)	0.517					0.928	1.445	4.291	
		0.154				0.928	1.082	2.781	
			0.28			0.928	1.208	3.280	
				0.125		0.928	1.053	2.670	

Note(s):

1. Minimum antenna distance is calculated using $5*[(SAR_1+SAR_2)/16]^{1.5}$ From KDB 616217 D03 R Supp Note and Netbook Laptop section 4)b) i)

14.4.2. Simultaneous Transmission analysis for GSM, W-CDMA, & Wi-Fi Main Antenna (0mm separation)

Test Position	Data						∑ 1-g SAR (mW/g)	Minimum antenna distance (cm)[1]	EUT antenna separation (cm)
	GSM850	GSM1900	WCDMA Band V	WCDMA Band II	WiFi 2.4 GHz	WiFi 5 GHz			
Rear	0.235				0.137		0.372	0.561	15
		0.134			0.137		0.271	0.349	
			0.153		0.137		0.290	0.386	
				0.13	0.137		0.267	0.341	
Edge 1 (secondary landscape)	0.758				0.591		1.349	3.871	
		0.221			0.591		0.812	1.808	
			0.431		0.591		1.022	2.553	
				0.202	0.591		0.793	1.745	
Rear	0.235					0.267	0.502	0.879	
		0.134				0.267	0.401	0.627	
			0.153			0.267	0.420	0.672	
				0.13		0.267	0.397	0.618	
Edge 1 (secondary landscape)	0.758					0.928	1.686	5.408	
		0.221				0.928	1.149	3.043	
			0.431			0.928	1.359	3.914	
				0.202		0.928	1.130	2.968	

Note(s):

1. Minimum antenna distance is calculated using $5*[(SAR_1+SAR_2)/1.6]^{1.5}$ From KDB 616217 D03 R Supp Note and Netbook Laptop section 4)b) i)

14.4.3. Sum of the SAR for GSM, W-CDMA, & Wi-Fi Aux Antenna (10mm separation)

Test Position	Data						∑ 1-g SAR (mW/g)	(∑ 1-g SAR)/1.6[1]	Limit
	GSM850	GSM1900	WCDMA Band V	WCDMA Band II	WiFi 2.4 GHz	Wi-Fi 5GHz			
Rear	0.224				0.000		0.224	0.140	<1
		0.080			0.000		0.080	0.050	
			0.099		0.000		0.099	0.062	
				0.060	0.000		0.060	0.038	
Edge 1 (secondary landscape)	0.517				0.089		0.606	0.379	
		0.154			0.089		0.243	0.152	
			0.280		0.089		0.369	0.231	
				0.125	0.089		0.214	0.134	
Rear	0.224					0.131	0.355	0.222	
		0.080				0.131	0.211	0.132	
			0.099			0.131	0.230	0.144	
				0.060		0.131	0.191	0.119	
Edge 1 (secondary landscape)	0.517					0.318	0.835	0.522	
		0.154				0.318	0.472	0.295	
			0.280			0.318	0.598	0.374	
				0.125		0.318	0.443	0.277	

Note(s):

1. (∑ 1-g SAR)/1.6 comes from KDB 616217 D03 R Supp Note and Netbook Laptop section 4)a)

14.4.4. Sum of the SAR for GSM, W-CDMA, & Wi-Fi Aux Antenna (0mm separation)

Test Position	Data						∑ 1-g SAR (mW/g)	(∑ 1-g SAR)/1.6[1]	Limit
	GSM850	GSM1900	WCDMA Band V	WCDMA Band II	WiFi 2.4 GHz	WiFi 5 GHz			
Rear	0.235				0.000		0.235	0.147	<1
		0.134			0.000		0.134	0.084	
			0.153		0.000		0.153	0.096	
				0.13	0.000		0.130	0.081	
Edge 1 (secondary landscape)	0.758				0.089		0.847	0.529	
		0.221			0.089		0.310	0.194	
			0.431		0.089		0.520	0.325	
				0.202	0.089		0.291	0.182	
Rear	0.235					0.131	0.366	0.229	
		0.134				0.131	0.265	0.166	
			0.153			0.131	0.284	0.178	
				0.13		0.131	0.261	0.163	
Edge 1 (secondary landscape)	0.758					0.318	1.076	0.673	
		0.221				0.318	0.539	0.337	
			0.431			0.318	0.749	0.468	
				0.202		0.318	0.520	0.325	

Note(s):

1. (∑ 1-g SAR)/1.6 comes from KDB 616217 D03 R Supp Note and Netbook Laptop section 4)a)

14.5. Scaling of Simultaneous Transmission SAR Analysis Wi-Fi Main Antenna

14.5.1. Wi-Fi main antenna

The scaling of the simultaneous transmission SAR measurements to compensate for the difference between the measured output power and the maximum value indicated in the tune-up procedure was only considered necessary for calculated antenna distances greater than 10.1cm. 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, was 1.7 dB. Only calculated antenna distances greater than 10.1cm could exceed the actual antenna separation distance of 15cm as a result of scaling by 1.7dB. The maximum calculated antenna separation distance was 5.408cm.

14.5.2. Wi-Fi Aux antenna

The scaling of the simultaneous transmission SAR measurements to compensate for the difference between the measured output power and the maximum value indicated in the tune-up procedure was only considered necessary for those values that exceeded 1.08 W/kg. 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, was 1.9dB. Only combined SAR measurements above 1.08 W/kg could exceed 1.6 W/kg as a result of scaling by 1.7dB.

15. SAR Plots (from Summary of Highest Measured SAR Values)

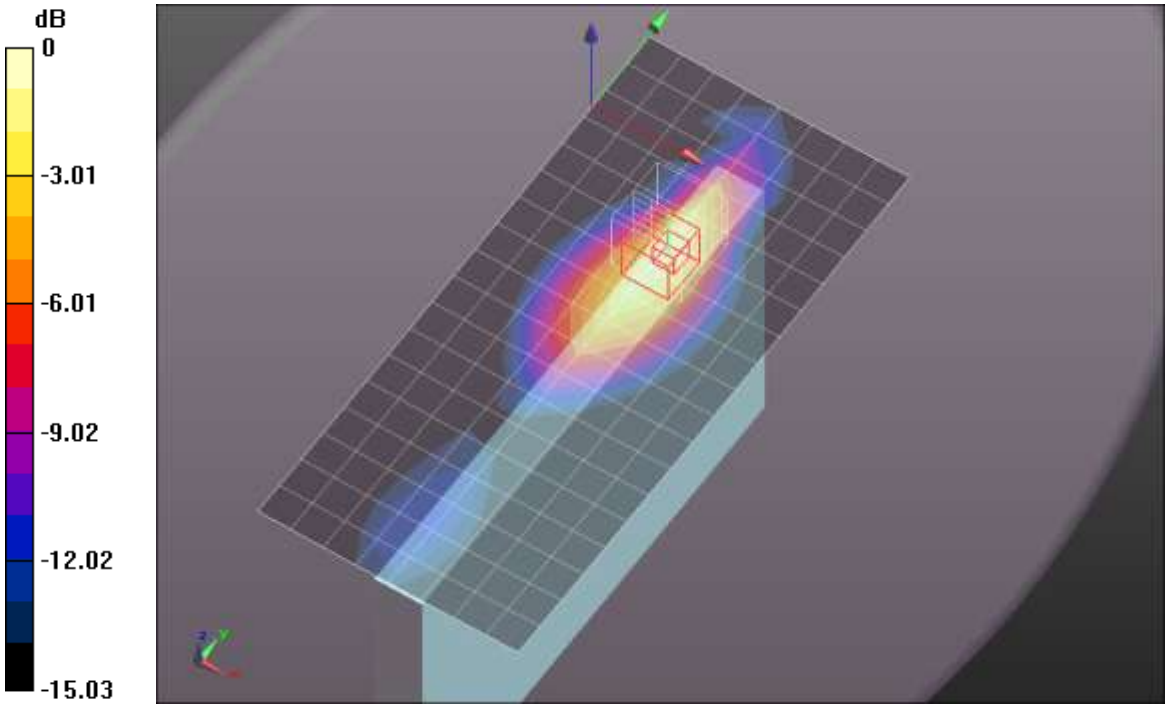
Test Laboratory: UL CCS SAR Lab B Date: 7/30/2012

GSM850

Frequency: 836.6 MHz; Duty Cycle: 1:4.00037; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.976 mho/m; ε_r = 52.631; 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/Edge 1/GPRS 2 Slots/0mm/Ch190/Area Scan (9x19x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.866 mW/g

Body/Edge 1/GPRS 2 Slots/0mm/Ch190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 30.133 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 1.4060
SAR(1 g) = 0.758 mW/g; SAR(10 g) = 0.437 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.028 mW/g



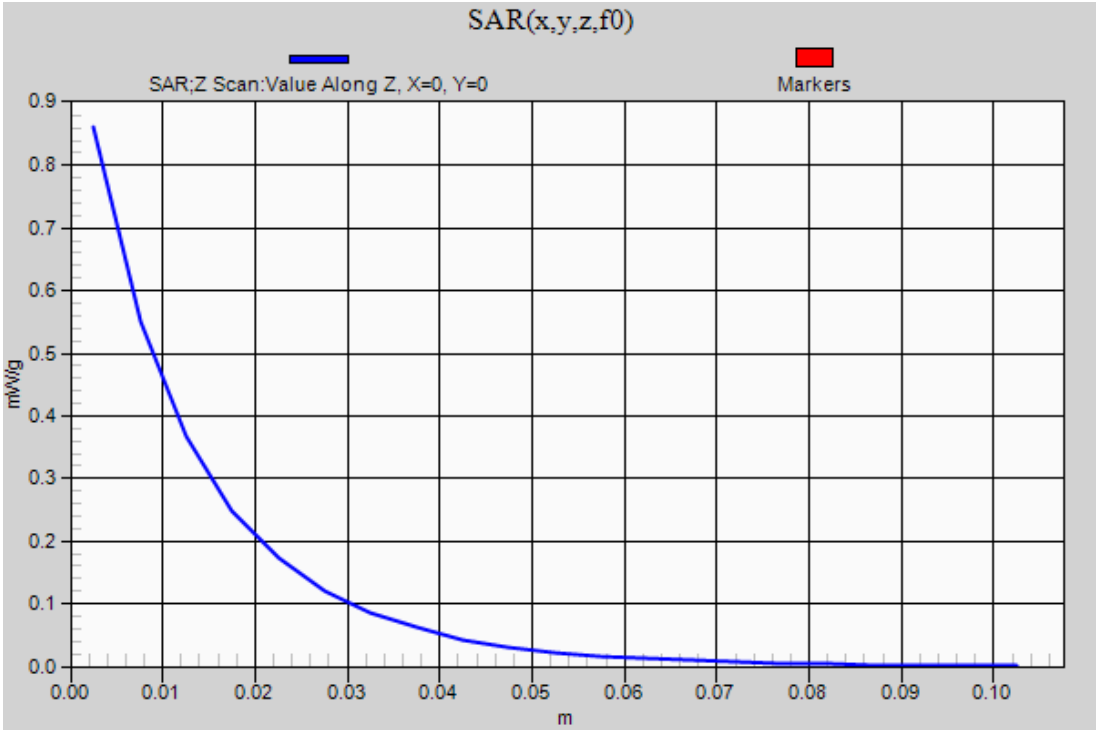
0 dB = 1.030mW/g = 0.26 dB mW/g

Test Laboratory: UL CCS SAR Lab B Date: 7/30/2012

GSM850

Frequency: 836.6 MHz; Duty Cycle: 1:4.00037

Body/Edge 1/GPRS 2 Slots/0mm/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) = 0.861 mW/g



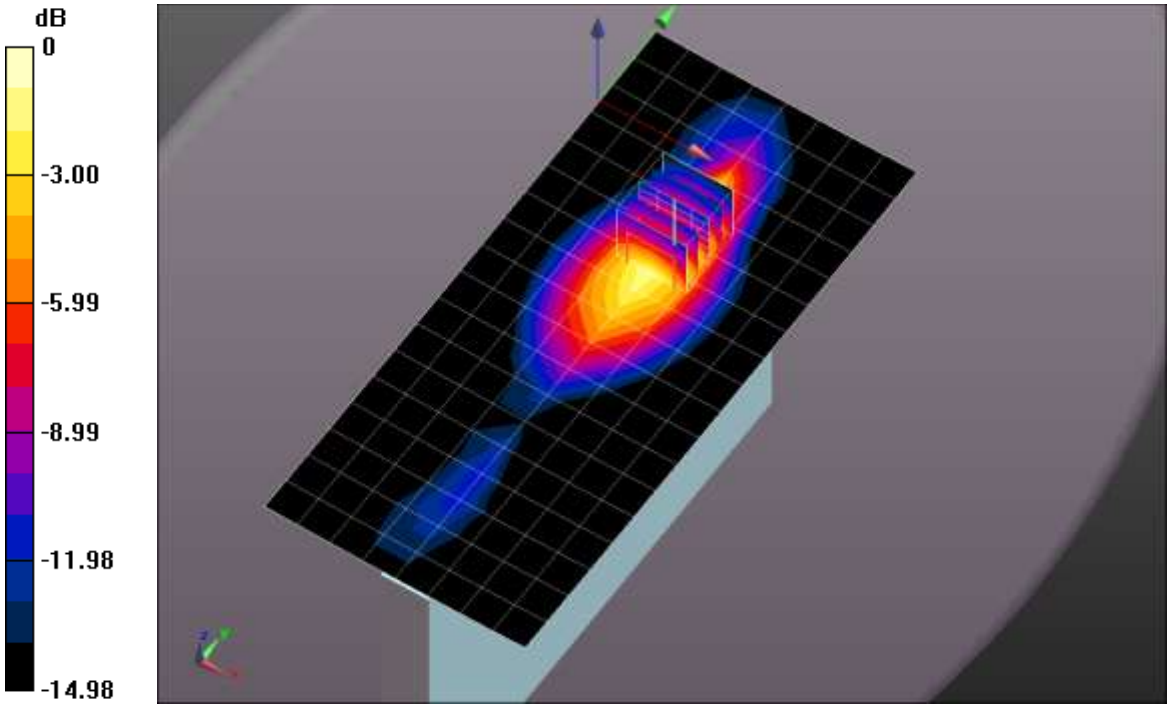
Test Laboratory: UL CCS SAR Lab B Date: 7/31/2012

WCDMA

Frequency: 836.6 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.989 mho/m; ε_r = 54.802; 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/Edge 1/Rel.99/0mm/Ch4183/Area Scan (9x19x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.556 mW/g

Body/Edge 1/Rel.99/0mm/Ch4183/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.147 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 0.8040
SAR(1 g) = 0.431 mW/g; SAR(10 g) = 0.247 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.594 mW/g



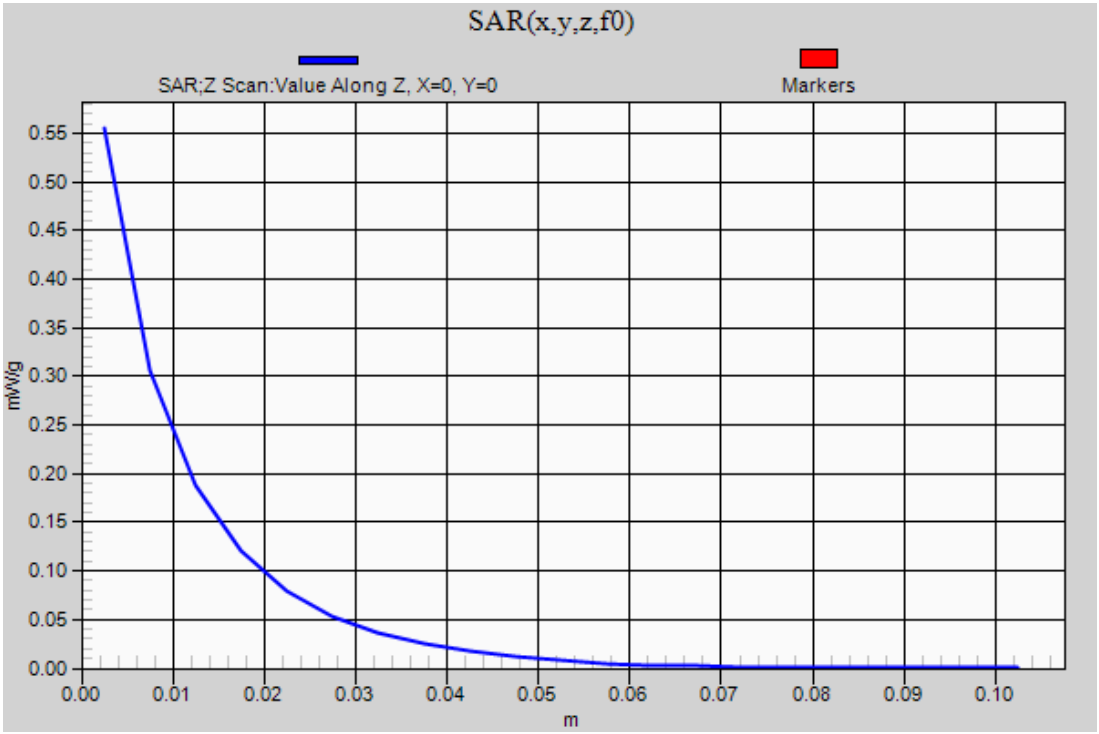
0 dB = 0.590mW/g = -4.58 dB mW/g

Test Laboratory: UL CCS SAR Lab B Date: 7/31/2012

WCDMA

Frequency: 836.6 MHz; Duty Cycle: 1:1

Body/Edge 1/Rel.99/0mm/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) = 0.555 mW/g



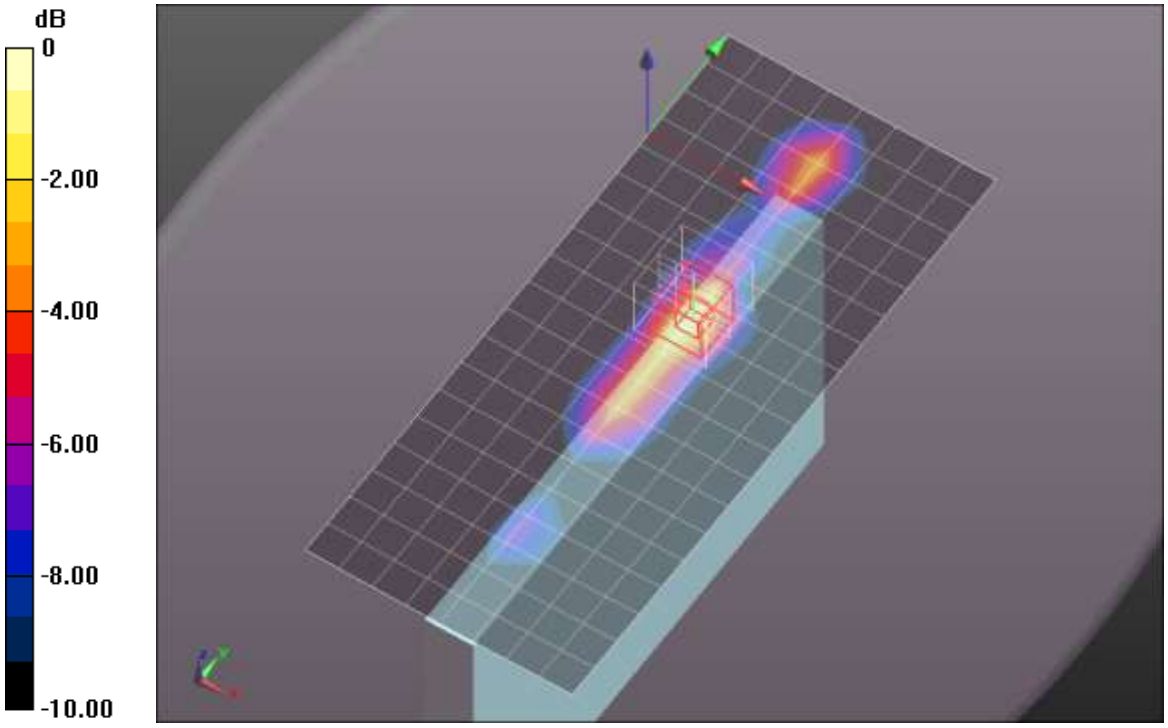
Test Laboratory: UL CCS SAR Lab B Date: 7/26/2012

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 = 1.536 mho/m; ε_r = 51.646; 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/Edge 1/Rel.99/0mm/Ch9400/Area Scan (9x20x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.256 mW/g

Body/Edge 1/Rel.99/0mm/Ch9400/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.115 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.3640
SAR(1 g) = 0.202 mW/g; SAR(10 g) = 0.104 mW/g
Maximum value of SAR (measured) = 0.279 mW/g



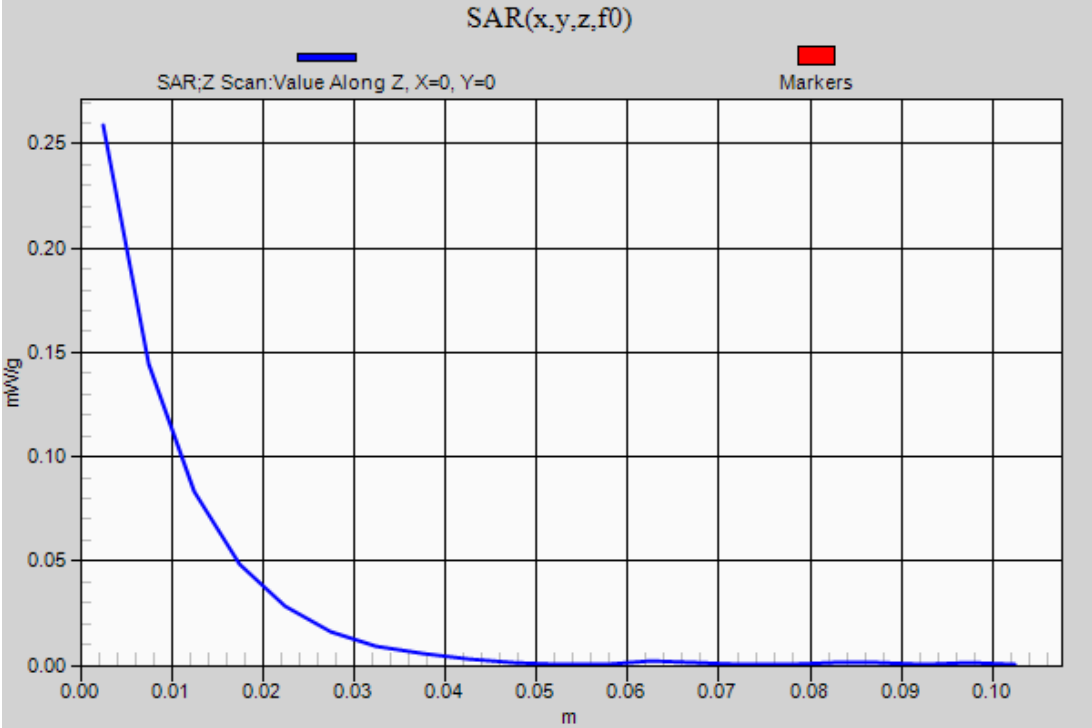
0 dB = 0.280mW/g = -11.06 dB mW/g

Test Laboratory: UL CCS SAR Lab B Date: 7/26/2012

WCDMA Band II

Frequency: 1880 MHz; Duty Cycle: 1:1

Body/Edge 1/Rel.99/0mm/Ch9400/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.259 mW/g



16. Appendixes

Refer to separated files for the following appendixes.

16.1. System Performance Check Plots

16.2. SAR Test Plots for GSM850

16.3. SAR Test Plots for GSM1900

16.4. SAR Test Plots for WCDMA (UMTS) Band V

16.5. SAR Test Plots for WCDMA (UMTS) Band II

16.6. Calibration Certificate for E-Field Probe EX3DV4 - SN 3749

16.7. Calibration Certificate for D835V2 - SN 4d002

16.8. Calibration Certificate for D1900V2 - SN 5d140