



**FCC OET BULLETIN 65 SUPPLEMENT C 01-01
IEEE STD 1528:2003**

SAR EVALUATION REPORT

For
Cellular/PCS GPRS/EDGE, AWS/PCS WCDMA Tablet with 802.11abgn, BT3.0
MODEL: SGH-T869
FCC ID: A3LSGHT869

REPORT NUMBER: 11I14017-6B
ISSUE DATE: November 4, 2011

Prepared for
Samsung Electronics Co., Ltd.
18600 Broadwick St.
Rancho Dominguez, CA 90220

Prepared by
COMPLIANCE CERTIFICATION SERVICES (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

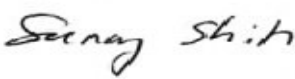
<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	October 11, 2011	Initial Issue	--
A	October 13, 2011	Updated report based on reviewer's comments - Sec. 5.3: Simultaneous Transmission Conditions - Updated Simultaneous Transmission table to include BT - Sec. 8: Liquid Parameters - Deleted "The differences with respect to the interpolated values were well within the desired $\pm 5\%$ for the whole 5 to 5.8 GHz range." - Sec. 12.2: Exposure conditions for WLAN - Updated from "Antenna-to-User distance" to "Antenna-to-edge/surface" - Sec. 13.5.1 & 13.5.2: 2.4 GHz & 5 GHz Bands - Updated to "...SAR is ≤ 0.8 W/kg and operating frequency band < 100 MHz per KDB 447498..) - Deleted note # 2 "SAR was too low (noise floor)" - Sec. 13.5.2: 5 GHz Bands - Updated to "...SAR is ≤ 0.4 W/kg and operating frequency band ≤ 200 MHz per KDB 447498 1) e) ii)...) - Added additional note # 2 blow 5.5 GHz SAR table. - Sec. 16.2: Body exposure condition (3G+WiFi 5GHz) - Removed "hotspot"	Sunny Shih
A1	October 27, 2011	Added Sec. 5.6 Summary table of power reduction dB levels per mode & band.	Sunny Shih
B	November 4, 2011	- Additional SAR with the EUT corner in contact with the phantom at a 45 degree angle (Top/Sec. Landscape). - Updated Sec. 12 Summary of test configurations, to include secondary landscape with 45° angle.	Sunny Shih

Table of Contents

1. Attestation of Test Results	6
2. Test Methodology	7
3. Facilities and Accreditation	7
4. Calibration and Uncertainty	8
4.1. <i>Measuring Instrument Calibration.....</i>	<i>8</i>
4.2. <i>Measurement Uncertainty.....</i>	<i>9</i>
5. Equipment Under Test	10
5.1. <i>Band and Air interlaces</i>	<i>10</i>
5.2. <i>Personal Hotspot Mode</i>	<i>10</i>
5.3. <i>Simultaneous Transmission Conditions.....</i>	<i>10</i>
5.4. <i>Power Sensor</i>	<i>10</i>
5.5. <i>Power Reduction Implementation.....</i>	<i>10</i>
5.6. <i>Summary Table of Power Reduction dB Levels per Mode & Band</i>	<i>11</i>
6. Top Edge and Back Sensor Coverage Area.....	14
6.1. <i>Back Sensor</i>	<i>14</i>
6.2. <i>Top Edge Sensor.....</i>	<i>15</i>
6.3. <i>Vertex Coverage / Top Left Corner.....</i>	<i>16</i>
7. System Specifications.....	17
8. Composition of Ingredients for Tissue Simulating Liquids.....	18
9. Liquid Parameters	19
9.1. <i>Liquid Check Results.....</i>	<i>20</i>
10. System Verification.....	22
10.1. <i>System Check Results.....</i>	<i>23</i>
11. SAR Measurement Procedure.....	25
12. RF Output Power Measurement.....	26
12.1. <i>GSM850 & GSM 1900</i>	<i>26</i>
12.2. <i>UMTS (WCDMA) Band II & IV</i>	<i>27</i>
12.3. <i>WiFi (802.11abgn)</i>	<i>31</i>
12.4. <i>Bluetooth.....</i>	<i>32</i>
13. Summary of Test Configurations.....	33
13.1. <i>Exposure conditions for WWAN.....</i>	<i>33</i>

13.2.	<i>Exposure conditions for WLAN</i>	34
14.	Standalone SAR Test Results	35
14.1.	<i>GSM850</i>	35
14.2.	<i>GSM1900</i>	36
14.3.	<i>UMTS (WCDMA) Band II</i>	37
14.4.	<i>UMTS (WCDMA) Band IV</i>	38
14.5.	<i>WiFi</i>	39
14.5.1.	2.4 GHz	39
14.5.2.	5 GHz Bands	40
15.	Summary of the Highest 1g SAR	42
16.	Worst-case SAR Plots	43
17.	Simultaneous Transmission SAR Analysis	60
17.1.	<i>Body-worn & -hotspot exposure condition (3G + WiFi 2.4 GHz)</i>	60
17.2.	<i>Body exposure condition (3G + WiFi 5 GHz)</i>	63
18.	Appendixes	74
18.1.	<i>Appendix A: System check plots</i>	74
18.2.	<i>Appendix B: SAR test plots for GSM850</i>	74
18.3.	<i>Appendix C: SAR test plots for GSM1900</i>	74
18.4.	<i>Appendix D: SAR test plots for UMTS band II</i>	74
18.5.	<i>Appendix E: SAR test plots for UMTS band IV</i>	74
18.6.	<i>Appendix F: SAR test plots for WiFi 2.4GHz</i>	74
18.7.	<i>Appendix G: SAR test plots for WiFi 5GHz</i>	74
18.8.	<i>Appendix H: Calibration certificate for E-Field Probe EX3DV4 SN 3772</i>	74
18.9.	<i>Appendix I: Calibration certificate for E-Field Probe EX3DV4 SN 3686</i>	74
18.10.	<i>Appendix J: Calibration Certificate for D835V2 - SN 4d117</i>	74
18.11.	<i>Appendix K: Calibration Certificate for D1750V2 - SN 1053</i>	74
18.12.	<i>Appendix L: Calibration Certificate for D1750V2 - SN 1050</i>	74
18.13.	<i>Appendix M: Calibration certificate for D1900V2 SN 5d140</i>	74
18.14.	<i>Appendix N: Calibration certificate for D2450V2 SN: 706 with extended cal. data</i>	74
18.15.	<i>Appendix O: Calibration Certificate for D5GHzV2 - SN 1003</i>	74
19.	Antenna Locations and Separation Distances	75
20.	Power Sensor Locations	76
21.	Set-up Photos	77
22.	External Photos	81

1. Attestation of Test Results

Applicant:	SAMSUNG ELECTRONICS CO., LTD.		
EUT description:	Cellular/PCS GPRS/EDGE, AWS/PCS WCDMA Tablet with 802.11abgn, BT3.0		
Model number:	SGH-T869		
Device category:	Portable		
Exposure category:	General Population/Uncontrolled Exposure		
Date tested:	9/21- 10/8 & 11/4, 2011		
FCC Rule Parts	Freq. Range [MHz]	Highest 1-g SAR (W/kg)	Limit (W/kg)
22H	824 - 849	0.871 W/kg (Top/Sec. Landscape w/ 5 mm distance) 0.805 W/kg (Rear/Base w/ 0 mm distance & Power back-off)	1.6
24E	1850 - 1910	1.10 W/kg (Top/Sec. Landscape w/ 5 mm distance) 1.14 W/kg (Rear/Base w/ 0 mm distance & Power back-off)	
27	1714 - 1754	1.04 W/kg (Top/Sec. Landscape w/ 5 mm distance) 1.11 W/kg (Rear/Base w/ 0 mm distance & Power back-off)	
15.247	2412 - 2462	0.746 W/kg (Rear/Base w/ 0 mm distance)	
15.407	5150 - 5250	0.729 W/kg (Rear/Base w/ 0 mm distance)	
	5250 - 5350	0.726 W/kg (Rear/Base w/ 0 mm distance)	
	5500 - 5700	0.648 W/kg (Rear/Base w/ 0 mm distance)	
15.247	5725 - 5850	0.592 W/kg (Rear/Base w/ 0 mm distance)	
Applicable Standards			Test Results
FCC OET Bulletin 65 Supplement C 01-01, IEEE STD 1528:2003			Pass
Compliance Certification Services, Inc. (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:	
			
Sunny Shih Engineering Team Leader Compliance Certification Services (UL CCS)		Chakrit Thammanavarat SAR Associate Engineer Compliance Certification Services (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 the following KDB Test Procedures.

- o 248227 D01 SAR meas for 802 11abg v01r02
- o 865664 SAR 3 to 6 GHz Rev SAR measurement procedures for transmitters operating in the 3 to 6 GHz range
- o 941225 D01 SAR test for 3G devices v02
- o 941225 D02 Guidance for 3GPP R6 and R7 HSPA v02v01
- o 941225 D03 SAR Test Reduction GSM GPRS EDGE v01
- o 941225 D06 Hot Spot SAR v01
- o 447498 D01 Mobile Portable RF Exposure v04

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 utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's 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		
Synthesized Signal Generator	HP	83732B	US34490599	7	14	2012
E-Field Probe	SPEAG	EX3DV4	3772	5	3	2012
E-Field Probe	SPEAG	EX3DV4	3686	1	24	2012
Thermometer	ERTCO	639-1S	1718	7	19	2012
Data Acquisition Electronics	SPEAG	DAE4	1239	11	17	2011
Data Acquisition Electronics	SPEAG	DAE4	1257	5	3	2012
System Validation Dipole	SPEAG	D835V2	4d117	4	15	2012
System Validation Dipole	SPEAG	D1750V2	1053	5	27	2012
System Validation Dipole	SPEAG	D1750V2	1050	4	19	2012
System Validation Dipole	SPEAG	D1900V2	5d140	4	18	2012
System Validation Dipole	SPEAG	*D2450V2	706	4	19	2012
System Validation Dipole	SPEAG	D5GHzV2	1003	8	23	2012
Power Meter	Giga-tronics	8651A	8651404	5	13	2012
Power Sensor	Giga-tronics	80701A	1834588	5	13	2012
Power Meter	HP	437B	3125U16345	5	13	2012
Power Sensor	HP	8481A	2702A60780	5	13	2012
Amplifier	MITEQ	4D00400600-50-30P	1620606	N/A		
Directional coupler	Werlatone	C8060-102	2141	N/A		

Notes:

*Per KDB 450824 D02 requirements for dipole calibration, UL CCS has adopted two years calibration intervals. On annual basis, each measurement dipole has been evaluated and is in compliance with the following criteria:

1. There is no physical damage on the dipole
2. System validation with specific dipole is within 10% of calibrated value.
3. Return-loss is within 20% of calibrated measurement. (See Appendix "N Calibration Certificate - Validation Dipole D2450V2 - SN 706" with extended cal. data)
4. Impedance is within 5Ω of calibrated measurement (See Appendix "N Calibration Certificate - Validation Dipole D2450V2 - SN 706" with extended cal. data)

4.2. Measurement Uncertainty

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

Component	error, %	Probe Distribution	Divisor	Sensitivity	U (X), %
Measurement System					
Probe Calibration (k=1)	5.50	Normal	1	1	5.50
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 (Body 1900)	3.40	Normal	1	0.64	2.18
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.6	1.73
Liquid Permittivity - measurement uncertainty (Body 1900)	-4.45	Normal	1	0.6	-2.67
Combined Standard Uncertainty Uc(y) =					10.05
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				20.10	%
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				1.59	dB

Measurement uncertainty for 3 to 6 GHz averaged over 1 gram

Component	error, %	Distribution	Divisor	Sensitivity	U (X), %
Measurement System					
Probe Calibration (k=1)	6.55	Normal	1	1	6.55
Axial Isotropy	1.15	Rectangular	1.732	0.7071	0.47
Hemispherical Isotropy	2.30	Rectangular	1.732	0.7071	0.94
Boundary Effect	0.90	Rectangular	1.732	1	0.52
Probe Linearity	3.45	Rectangular	1.732	1	1.99
System Detection Limits	1.00	Rectangular	1.732	1	0.58
Readout Electronics	1.00	Normal	1	1	1.00
Response Time	0.80	Rectangular	1.732	1	0.46
Integration Time	2.60	Rectangular	1.732	1	1.50
RF Ambient Conditions - Noise	3.00	Rectangular	1.732	1	1.73
RF Ambient Conditions - Reflections	3.00	Rectangular	1.732	1	1.73
Probe Positioner Mechanical Tolerance	0.40	Rectangular	1.732	1	0.23
Probe Positioning with respect to Phantom	2.90	Rectangular	1.732	1	1.67
Extrapolation, Interpolation and Integration	3.90	Rectangular	1.732	1	2.25
Test Sample Related					
Test Sample Positioning	1.10	Normal	1	1	1.10
Device Holder Uncertainty	3.60	Normal	1	1	3.60
Output Power Variation - SAR Drift	5.00	Rectangular	1.732	1	2.89
Phantom and Tissue Parameters					
Phantom Uncertainty (shape and thickness)	4.00	Rectangular	1.732	1	2.31
Liquid Conductivity - deviation from target	5.00	Rectangular	1.732	0.64	1.85
Liquid Conductivity - measurement (Body 5800)	2.36	Normal	1	0.64	1.51
Liquid Permittivity - deviation from target	10.00	Rectangular	1.732	0.6	3.46
Liquid Permittivity - measurement uncertainty (Body 5200)	5.30	Normal	1	0.6	3.18
Combined Standard Uncertainty Uc(y), %:					11.03
Expanded Uncertainty U, Coverage Factor = 1.96, > 95 % Confidence =				21.61	%
Expanded Uncertainty U, Coverage Factor = 1.96, > 95 % Confidence =				1.70	dB

5. Equipment Under Test

Cellular/PCS GPRS/EDGE, AWS/PCS WCDMA Tablet with 802.11abgn,BT3.0
Model: SGH-T869

Mode of operation:	Body and Wireless Router (Hotspot)
Antenna-to-antenna and antenna-to-edges' separation distances:	Please refer to Section 18 Antenna Locations & Separation Distances

5.1. Band and Air interlaces

Air Interfaces:	GSM, GPRS, EGPRS. WCDMA (Rel 99), HSDPA, HSPA, HSPA+. WiFi: 802.11abgn: 2.4GHz, 5GHz Bluetooth: 2.4 GHz
Uplink Modulations:	GSM Modes: GMSK, 8PSK UMTS Modes: BPSK, QPSK WiFi: 802.11abgn: 2.4GHz, 5GHz Bluetooth Ver 3.0
GPRS Multi-Slot Class:	10

5.2. Personal Hotspot Mode

The device is capable of personal hotspot mode. The hotspot mode can be enabled by the users. SAR measurements in the Personal hot spot function are performed with 10 m separation distance to all sides and edges to the body phantom.

5.3. Simultaneous Transmission Conditions

No	Simultaneous Transmission	Note
1	GPRS/EGPRS + BT	
2	WCDMA/HSPA + BT	
3	GPRS/EGPRS + WiFi 2.4 GHz + BT	2G Hotspot
4	WCDMA/HSPA + WiFi 2.4 GHz + BT	3G Hotspot
5	GPRS/EGPRS + WiFi 5 GHz + BT	Not support hotspot
6	WCDMA/HSPA + WiFi 5 GHz + BT	Not support hotspot
7	WiFi 2.4 GHz + BT	
8	WiFi 5 GHz + BT	

5.4. Power Sensor

With 2 Grip Sensor (functioned as proximity sensor) for power reduction

- On at the top edge
- One at the rear surface

Refer to Section 19 Power sensor locations

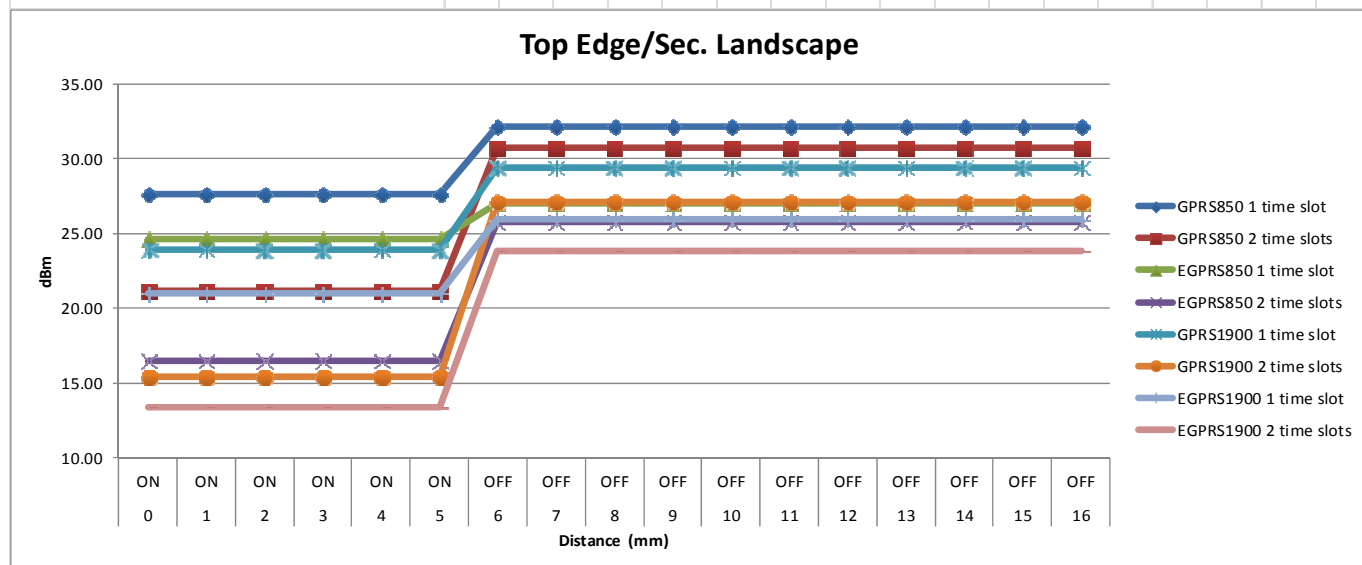
5.5. Power Reduction Implementation

- Top edge/Sec. landscape sensor: 5 mm separation distance
- Rear/Bottom Sensor: 10 mm separation distance

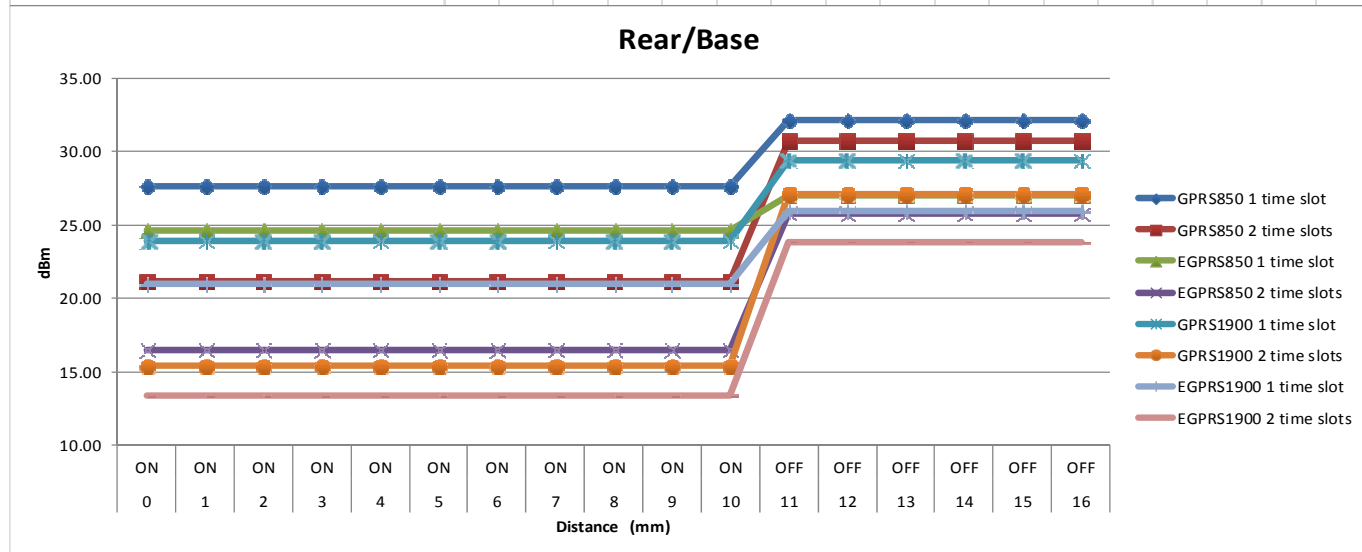
Wi-Fi does not have power reduction

5.6. Summary Table of Power Reduction dB Levels per Mode & Band

Top Edge/Sec. Landscape																		
Distance (mm):	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Proximity sensor with reduced power activation:	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
GPRS850 1 time slot	27.60	27.60	27.60	27.60	27.60	27.60	32.15	32.15	32.15	32.15	32.15	32.15	32.15	32.15	32.15	32.15	32.15	
GPRS850 2 time slots	21.20	21.20	21.20	21.20	21.20	21.20	30.75	30.75	30.75	30.75	30.75	30.75	30.75	30.75	30.75	30.75	30.75	
EGPRS850 1 time slot	24.60	24.60	24.60	24.60	24.60	24.60	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	
EGPRS850 2 time slots	16.50	16.50	16.50	16.50	16.50	16.50	25.73	25.73	25.73	25.73	25.73	25.73	25.73	25.73	25.73	25.73	25.73	
GPRS1900 1 time slot	23.90	23.90	23.90	23.90	23.90	23.90	29.42	29.42	29.42	29.42	29.42	29.42	29.42	29.42	29.42	29.42	29.42	
GPRS1900 2 time slots	15.40	15.40	15.40	15.40	15.40	15.40	27.05	27.05	27.05	27.05	27.05	27.05	27.05	27.05	27.05	27.05	27.05	
EGPRS1900 1 time slot	21.00	21.00	21.00	21.00	21.00	21.00	25.90	25.90	25.90	25.90	25.90	25.90	25.90	25.90	25.90	25.90	25.90	
EGPRS1900 2 time slots	13.40	13.40	13.40	13.40	13.40	13.40	23.80	23.80	23.80	23.80	23.80	23.80	23.80	23.80	23.80	23.80	23.80	



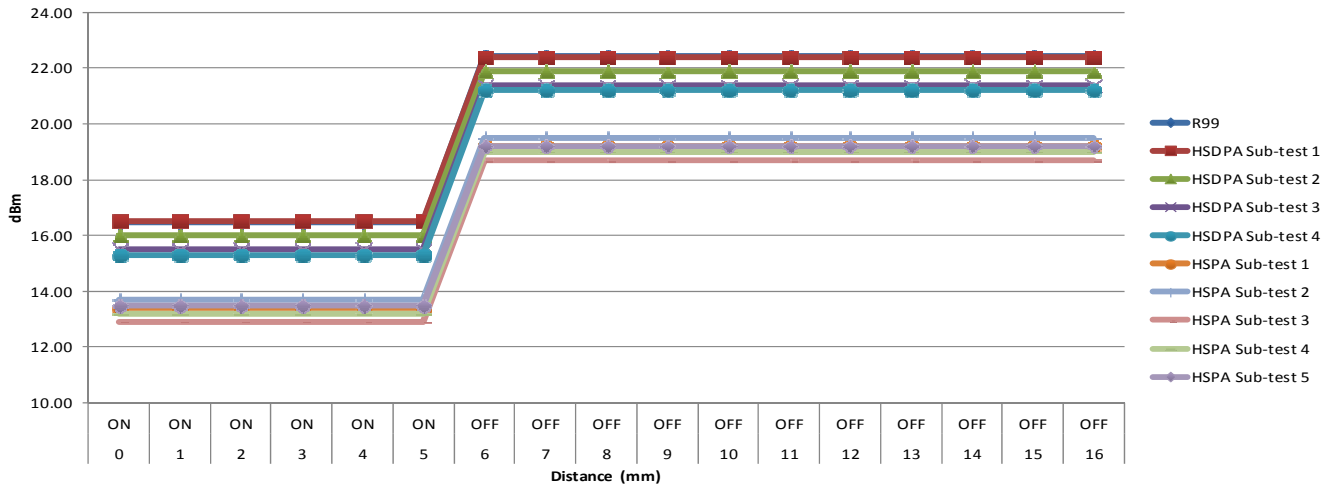
Rear/Base																		
Distance (mm):	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Proximity sensor with reduced power activation:	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	
GPRS850 1 time slot	27.60	27.60	27.60	27.60	27.60	27.60	27.60	27.60	27.60	27.60	27.60	32.15	32.15	32.15	32.15	32.15	32.15	
GPRS850 2 time slots	21.20	21.20	21.20	21.20	21.20	21.20	21.20	21.20	21.20	21.20	21.20	30.75	30.75	30.75	30.75	30.75	30.75	
EGPRS850 1 time slot	24.60	24.60	24.60	24.60	24.60	24.60	24.60	24.60	24.60	24.60	24.60	27.00	27.00	27.00	27.00	27.00	27.00	
EGPRS850 2 time slots	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	25.73	25.73	25.73	25.73	25.73	25.73	
GPRS1900 1 time slot	23.90	23.90	23.90	23.90	23.90	23.90	23.90	23.90	23.90	23.90	23.90	29.42	29.42	29.42	29.42	29.42	29.42	
GPRS1900 2 time slots	15.40	15.40	15.40	15.40	15.40	15.40	15.40	15.40	15.40	15.40	15.40	27.05	27.05	27.05	27.05	27.05	27.05	
EGPRS1900 1 time slot	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	25.90	25.90	25.90	25.90	25.90	25.90	
EGPRS1900 2 time slots	13.40	13.40	13.40	13.40	13.40	13.40	13.40	13.40	13.40	13.40	13.40	23.80	23.80	23.80	23.80	23.80	23.80	



Summary Table of Power Reduction dB Levels per Mode & Band (continued)

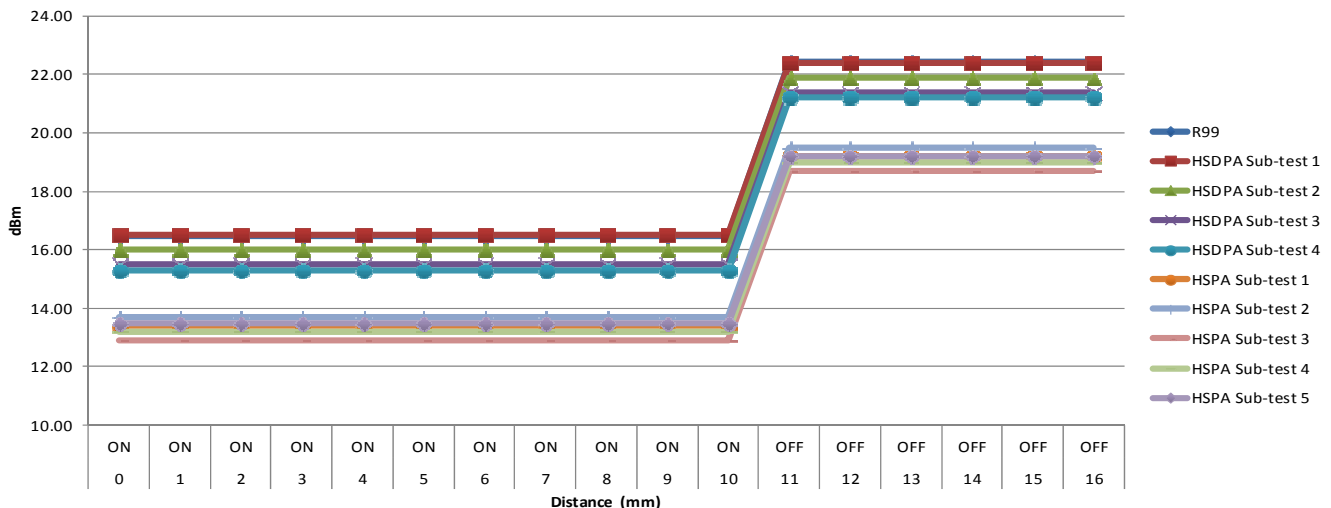
Top Edge/Sec. Landscape (UMTS Band IV)																	
Distance (mm):	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Proximity sensor with reduced power activation:	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
R99	16.47	16.47	16.47	16.47	16.47	16.47	22.45	22.45	22.45	22.45	22.45	22.45	22.45	22.45	22.45	22.45	22.45
HSDPA Sub-test 1	16.50	16.50	16.50	16.50	16.50	16.50	22.40	22.40	22.40	22.40	22.40	22.40	22.40	22.40	22.40	22.40	22.40
HSDPA Sub-test 2	16.00	16.00	16.00	16.00	16.00	16.00	21.90	21.90	21.90	21.90	21.90	21.90	21.90	21.90	21.90	21.90	21.90
HSDPA Sub-test 3	15.50	15.50	15.50	15.50	15.50	15.50	21.40	21.40	21.40	21.40	21.40	21.40	21.40	21.40	21.40	21.40	21.40
HSDPA Sub-test 4	15.30	15.30	15.30	15.30	15.30	15.30	21.20	21.20	21.20	21.20	21.20	21.20	21.20	21.20	21.20	21.20	21.20
HSPA Sub-test 1	13.40	13.40	13.40	13.40	13.40	13.40	19.20	19.20	19.20	19.20	19.20	19.20	19.20	19.20	19.20	19.20	19.20
HSPA Sub-test 2	13.70	13.70	13.70	13.70	13.70	13.70	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50
HSPA Sub-test 3	12.90	12.90	12.90	12.90	12.90	12.90	18.70	18.70	18.70	18.70	18.70	18.70	18.70	18.70	18.70	18.70	18.70
HSPA Sub-test 4	13.20	13.20	13.20	13.20	13.20	13.20	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00
HSPA Sub-test 5	13.50	13.50	13.50	13.50	13.50	13.50	19.20	19.20	19.20	19.20	19.20	19.20	19.20	19.20	19.20	19.20	19.20

Top Edge/Sec. Landscape (UMTS Band IV)



Rear/Base (UMTS Band IV)																	
Distance (mm):	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Proximity sensor with reduced power activation:	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
R99	16.47	16.47	16.47	16.47	16.47	16.47	16.47	16.47	16.47	16.47	16.47	22.45	22.45	22.45	22.45	22.45	22.45
HSDPA Sub-test 1	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	22.40	22.40	22.40	22.40	22.40	22.40
HSDPA Sub-test 2	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	21.90	21.90	21.90	21.90	21.90	21.90
HSDPA Sub-test 3	15.50	15.50	15.50	15.50	15.50	15.50	15.50	15.50	15.50	15.50	15.50	21.40	21.40	21.40	21.40	21.40	21.40
HSDPA Sub-test 4	15.30	15.30	15.30	15.30	15.30	15.30	15.30	15.30	15.30	15.30	15.30	21.20	21.20	21.20	21.20	21.20	21.20
HSPA Sub-test 1	13.40	13.40	13.40	13.40	13.40	13.40	13.40	13.40	13.40	13.40	13.40	19.20	19.20	19.20	19.20	19.20	19.20
HSPA Sub-test 2	13.70	13.70	13.70	13.70	13.70	13.70	13.70	13.70	13.70	13.70	13.70	19.50	19.50	19.50	19.50	19.50	19.50
HSPA Sub-test 3	12.90	12.90	12.90	12.90	12.90	12.90	12.90	12.90	12.90	12.90	12.90	18.70	18.70	18.70	18.70	18.70	18.70
HSPA Sub-test 4	13.20	13.20	13.20	13.20	13.20	13.20	13.20	13.20	13.20	13.20	13.20	19.00	19.00	19.00	19.00	19.00	19.00
HSPA Sub-test 5	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	19.20	19.20	19.20	19.20	19.20	19.20

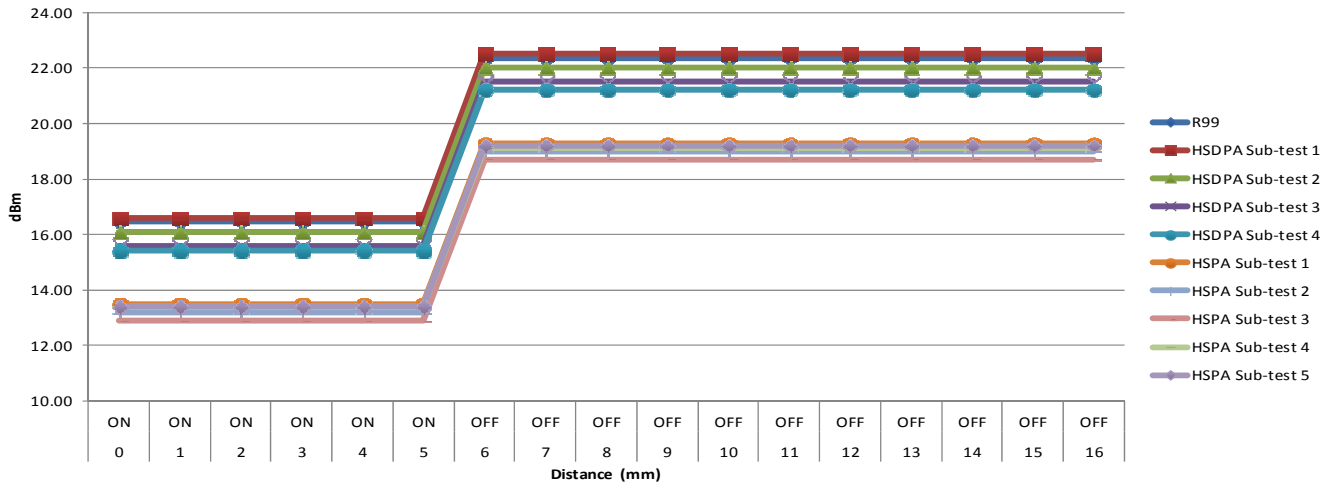
Rear/Base (UMTS Band IV)



Summary Table of Power Reduction dB Levels per Mode & Band (continued)

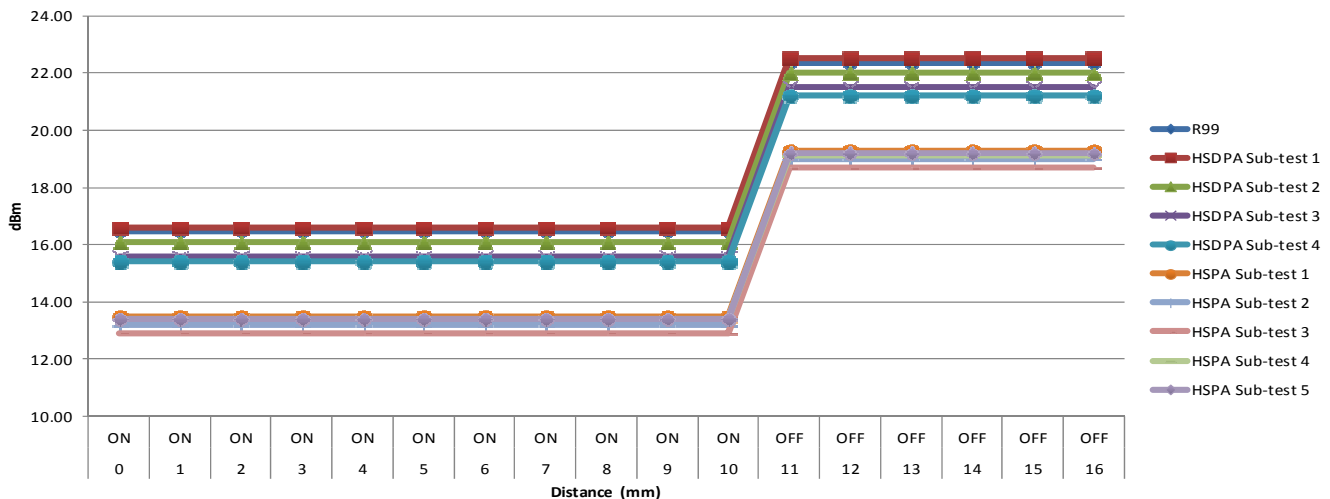
Top Edge/Sec. Landscape (UMTS Band II)																	
Distance (mm):	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Proximity sensor with reduced power activation:	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
R99	16.45	16.45	16.45	16.45	16.45	16.45	22.35	22.35	22.35	22.35	22.35	22.35	22.35	22.35	22.35	22.35	22.35
HSDPA Sub-test 1	16.60	16.60	16.60	16.60	16.60	16.60	22.50	22.50	22.50	22.50	22.50	22.50	22.50	22.50	22.50	22.50	22.50
HSDPA Sub-test 2	16.10	16.10	16.10	16.10	16.10	16.10	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00
HSDPA Sub-test 3	15.60	15.60	15.60	15.60	15.60	15.60	21.50	21.50	21.50	21.50	21.50	21.50	21.50	21.50	21.50	21.50	21.50
HSDPA Sub-test 4	15.40	15.40	15.40	15.40	15.40	15.40	21.20	21.20	21.20	21.20	21.20	21.20	21.20	21.20	21.20	21.20	21.20
HSPA Sub-test 1	13.50	13.50	13.50	13.50	13.50	13.50	19.30	19.30	19.30	19.30	19.30	19.30	19.30	19.30	19.30	19.30	19.30
HSPA Sub-test 2	13.20	13.20	13.20	13.20	13.20	13.20	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00
HSPA Sub-test 3	12.90	12.90	12.90	12.90	12.90	12.90	18.70	18.70	18.70	18.70	18.70	18.70	18.70	18.70	18.70	18.70	18.70
HSPA Sub-test 4	13.40	13.40	13.40	13.40	13.40	13.40	19.10	19.10	19.10	19.10	19.10	19.10	19.10	19.10	19.10	19.10	19.10
HSPA Sub-test 5	13.40	13.40	13.40	13.40	13.40	13.40	19.20	19.20	19.20	19.20	19.20	19.20	19.20	19.20	19.20	19.20	19.20

Top Edge/Sec. Landscape (UMTS Band II)



Rear/Base (UMTS Band II)																	
Distance (mm):	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Proximity sensor with reduced power activation:	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
R99	16.45	16.45	16.45	16.45	16.45	16.45	16.45	16.45	16.45	16.45	16.45	22.35	22.35	22.35	22.35	22.35	22.35
HSDPA Sub-test 1	16.60	16.60	16.60	16.60	16.60	16.60	16.60	16.60	16.60	16.60	16.60	22.50	22.50	22.50	22.50	22.50	22.50
HSDPA Sub-test 2	16.10	16.10	16.10	16.10	16.10	16.10	16.10	16.10	16.10	16.10	16.10	22.00	22.00	22.00	22.00	22.00	22.00
HSDPA Sub-test 3	15.60	15.60	15.60	15.60	15.60	15.60	15.60	15.60	15.60	15.60	15.60	21.50	21.50	21.50	21.50	21.50	21.50
HSDPA Sub-test 4	15.40	15.40	15.40	15.40	15.40	15.40	15.40	15.40	15.40	15.40	15.40	21.20	21.20	21.20	21.20	21.20	21.20
HSPA Sub-test 1	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	19.30	19.30	19.30	19.30	19.30	19.30
HSPA Sub-test 2	13.20	13.20	13.20	13.20	13.20	13.20	13.20	13.20	13.20	13.20	13.20	19.00	19.00	19.00	19.00	19.00	19.00
HSPA Sub-test 3	12.90	12.90	12.90	12.90	12.90	12.90	12.90	12.90	12.90	12.90	12.90	18.70	18.70	18.70	18.70	18.70	18.70
HSPA Sub-test 4	13.40	13.40	13.40	13.40	13.40	13.40	13.40	13.40	13.40	13.40	13.40	19.10	19.10	19.10	19.10	19.10	19.10
HSPA Sub-test 5	13.40	13.40	13.40	13.40	13.40	13.40	13.40	13.40	13.40	13.40	13.40	19.20	19.20	19.20	19.20	19.20	19.20

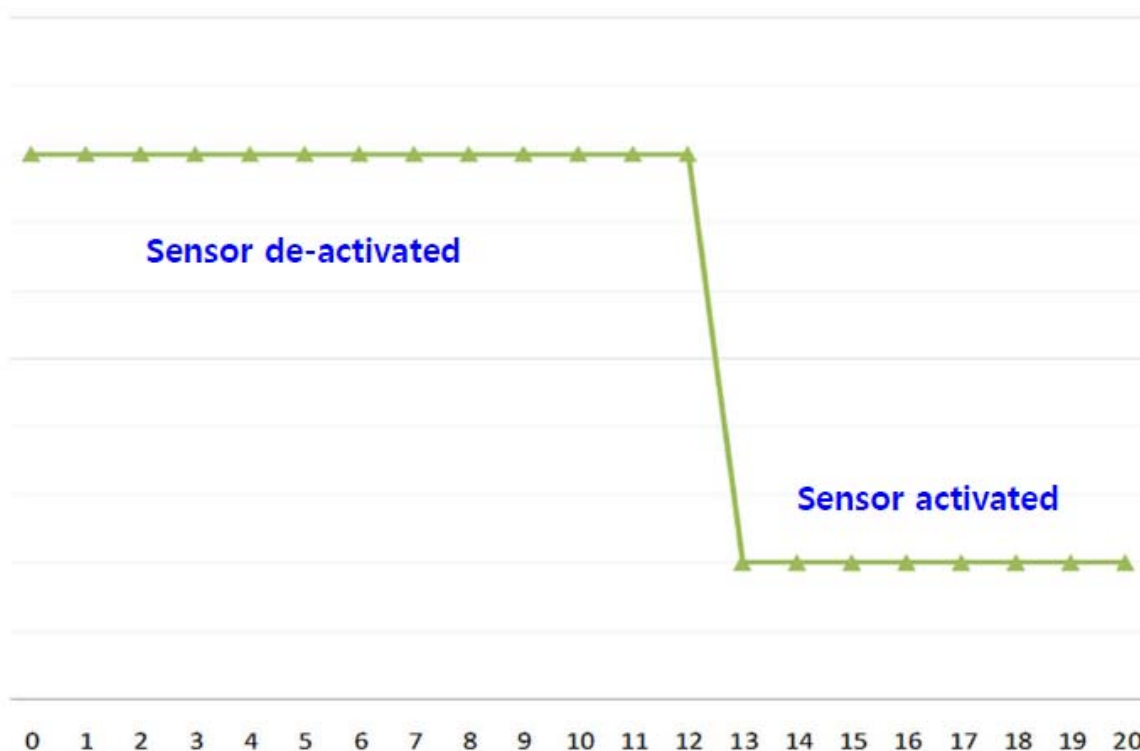
Rear/Base (UMTS Band II)



6. Top Edge and Back Sensor Coverage Area

6.1. Back Sensor

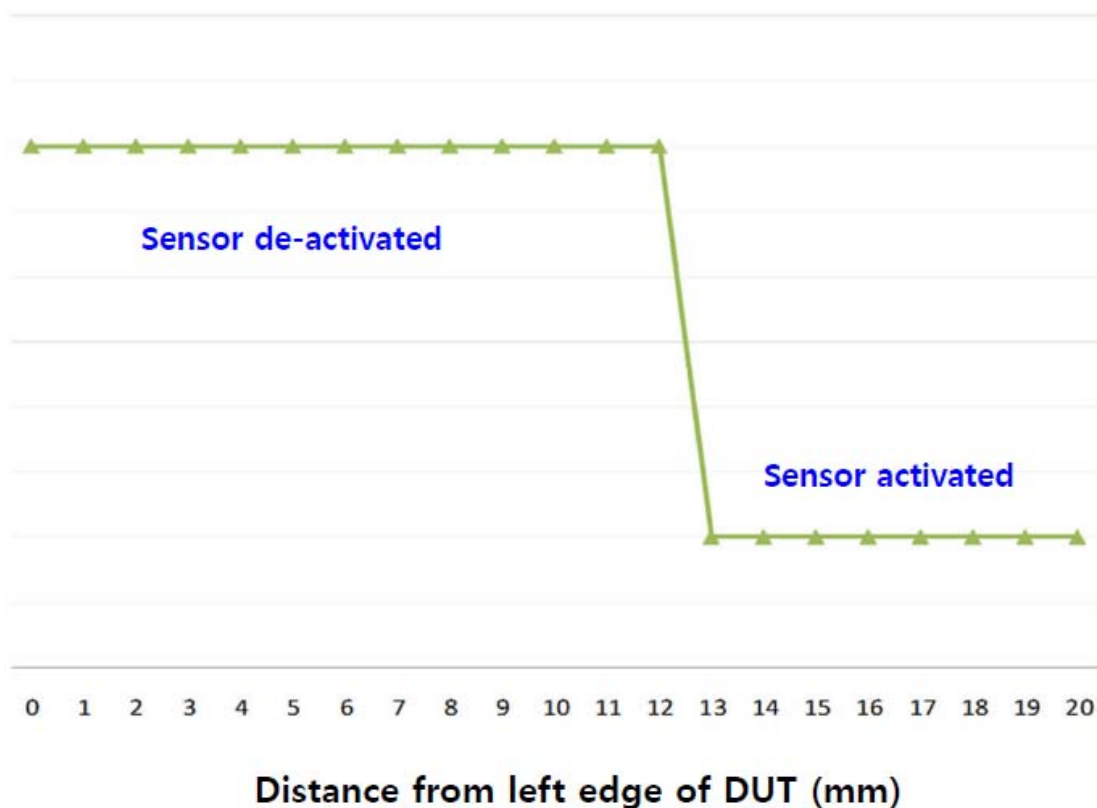
Sensor Triggering Distance away from Left Edge



Distance from left edge of DUT (mm)

6.2. Top Edge Sensor

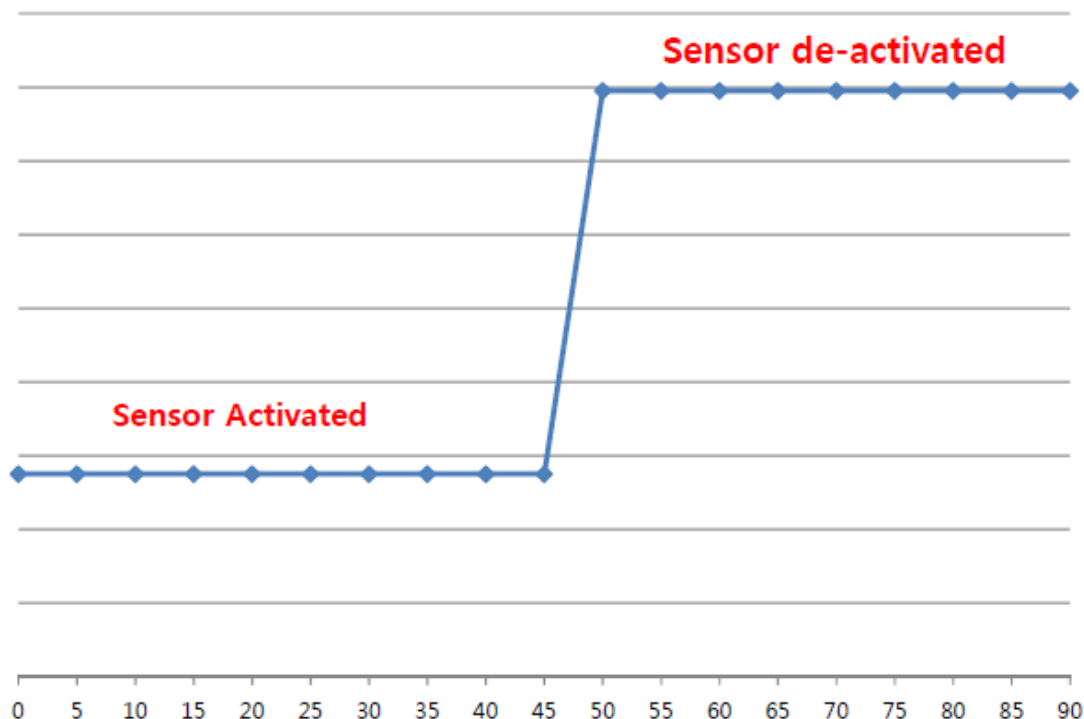
Sensor Triggering Distance away from Left Edge



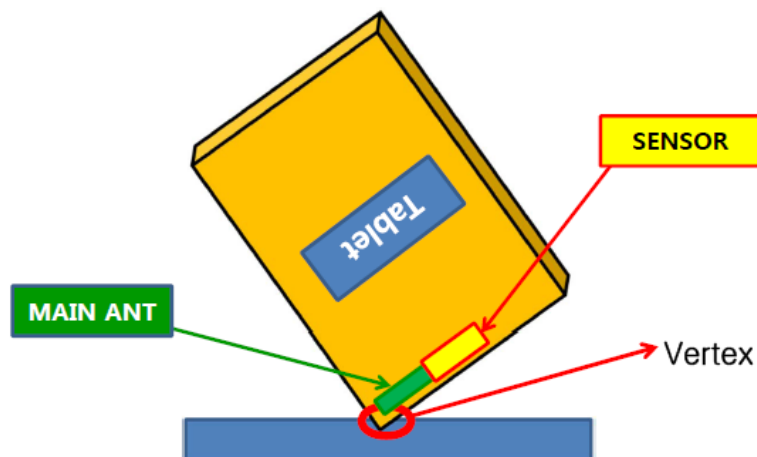
6.3. Vertex Coverage / Top Left Corner

At the top left corner, top edge and back sensor are not activated. Taken into the account if the device could be easily be used in such a way that the antenna could be in close proximity to the user without the proximity sensor triggering power reduction; for example, held by the left corner or with the left corner resting on the left knee or leg of the user. Based upon the trigger angle for power reduction as illustrated below, additional Vertex at 45 degree SAR evaluation with full power (no power reduction was performed)

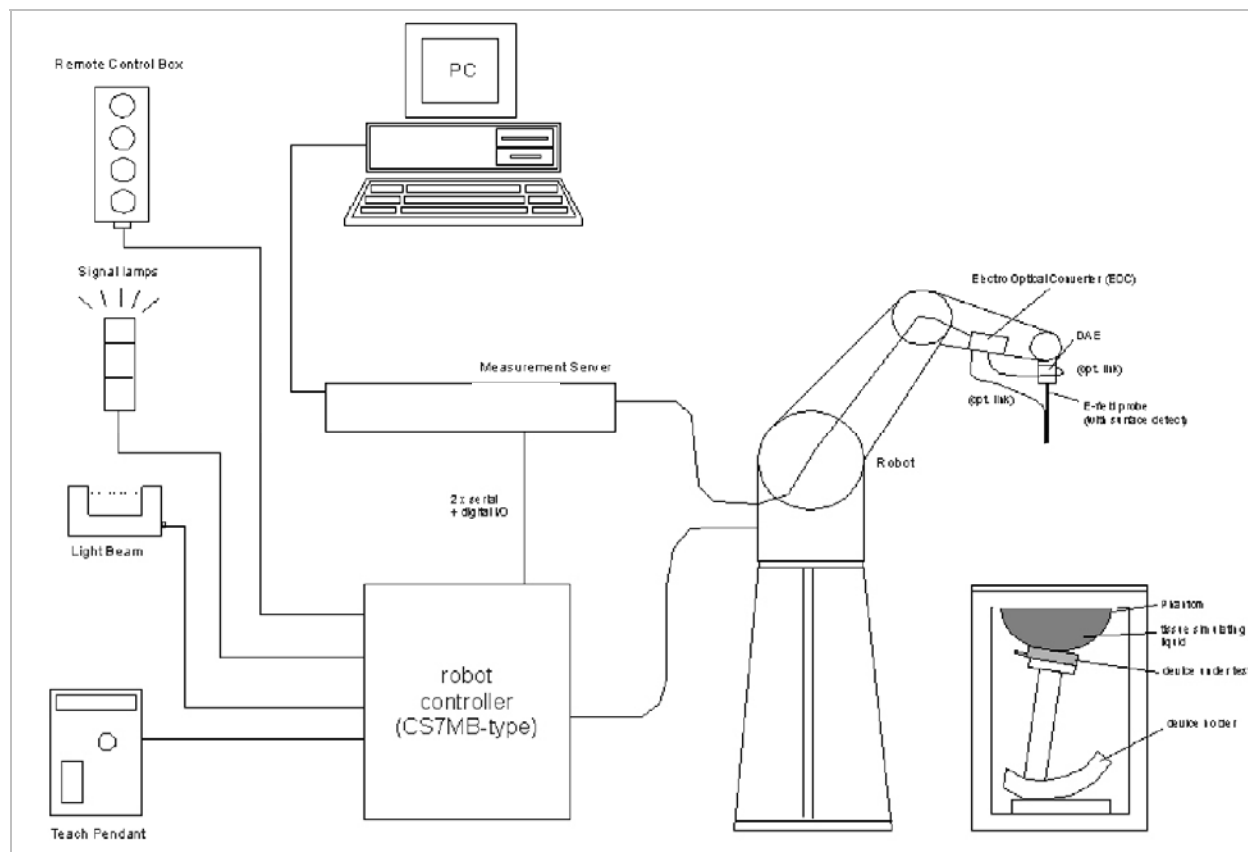
Triggering angle of sensor between phantom and the top side



Angle between phantom and the DUT top side



7. System Specifications



The DASY system 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. The probe is equipped with an optical surface detector system.
- 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 2000 or 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.

8. Composition of Ingredients for Tissue Simulating Liquids

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 HSL750
Type No	SL AAH 075
Manufacturer	SPEAG
The item is composed of the following ingredients:	
H ² O	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 HSL1750
Type No	SL AAM 175
Manufacturer	SPEAG
The item is composed of the following ingredients:	
H ² O	Water, 52 – 75%
C8H18O3	Diethylene glycol monobutyl ether (DGBE), 25-48%
NaCl	Sodium Chloride, <1.0%

9. Liquid Parameters

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine if the dielectric parameters are within the tolerances of the specified target values. For frequencies in 300 MHz to just under 2 GHz, the measured conductivity and relative permittivity should be within $\pm 5\%$ of the target values. For frequencies in the range of 2–3 GHz and above the measured conductivity should be within $\pm 5\%$ of the target values. The measured relative permittivity tolerance can be relaxed to no more than $\pm 10\%$.

Reference Values of Tissue Dielectric Parameters for Head & Body Phantom

The body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations and extrapolated according to the head parameters specified in IEEE Standard 1528.

Target Frequency (MHz)	Head		Body	
	ϵ_r	σ (S/m)	ϵ_r	σ (S/m)
150	52.3	0.76	61.9	0.8
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.9	55.2	0.97
900	41.5	0.97	55	1.05
915	41.5	0.98	55	1.06
1450	40.5	1.2	54	1.3
1610	40.3	1.29	53.8	1.4
1750	40.08	1.37	53.44	1.49
1800 – 2000	40	1.4	53.3	1.52
2450	39.2	1.8	52.7	1.95
3000	38.5	2.4	52	2.73
5800	35.3	5.27	48.2	6

(ϵ_r = relative permittivity, σ = conductivity and $\rho = 1000 \text{ kg/m}^3$)

Reference Values of Tissue Dielectric Parameters for Body Phantom (for 3000 MHz – 5800 MHz)

In the current guidelines and draft standards for compliance testing of mobile phones (i.e., IEEE P1528, OET 65 Supplement C), the dielectric parameters suggested for head and body tissue simulating liquid are given only at 3.0 GHz and 5.8 GHz. As an intermediate solution, dielectric parameters for the frequencies between 5 to 5.8 GHz were obtained using linear interpolation (see table below).

SPEAG has developed suitable head and body tissue simulating liquids consisting of the following ingredients: de-ionized water, salt and a special composition including mineral oil and an emulgators. Dielectric parameters of these liquids were measured using a HP 8570C Dielectric Probe Kit in conjunction with HP 8753ES Network Analyzer (30 kHz – 6G Hz).

f (MHz)	Body Tissue		Reference
	rel. permittivity	conductivity	
3000	52.0	2.73	Standard
5100	49.1	5.18	Interpolated
5200	49.0	5.30	Interpolated
5300	48.9	5.42	Interpolated
5400	48.7	5.53	Interpolated
5500	48.6	5.65	Interpolated
5600	48.5	5.77	Interpolated
5700	48.3	5.88	Interpolated
5800	48.2	6.00	Standard

(ϵ_r = relative permittivity, σ = conductivity and $\rho = 1000 \text{ kg/m}^3$)

9.1. Liquid Check Results

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
9/8/2011	Body 1900	e'	51.8378	Relative Permittivity (ε _r):	51.84	53.30	-2.74	5
		e''	14.7025	Conductivity (σ):	1.55	1.52	2.19	5
9/10/2011	Body 1900	e'	52.3001	Relative Permittivity (ε _r):	52.30	53.30	-1.88	5
		e''	14.3689	Conductivity (σ):	1.52	1.52	-0.13	5
9/10/2011	Body 1750	e'	52.7871	Relative Permittivity (ε _r):	52.79	53.30	-0.96	5
		e''	15.5614	Conductivity (σ):	1.51	1.52	-0.38	5
9/12/2011	Body 835	e'	54.9289	Relative Permittivity (ε _r):	54.93	55.20	-0.49	5
		e''	21.4455	Conductivity (σ):	1.00	0.97	2.65	5
9/14/2011	Body 835	e'	52.8429	Relative Permittivity (ε _r):	52.84	55.20	-4.27	5
		e''	20.9839	Conductivity (σ):	0.97	0.97	0.44	5
9/14/2011	Body 1900	e'	50.9289	Relative Permittivity (ε _r):	50.93	53.30	-4.45	5
		e''	14.2164	Conductivity (σ):	1.50	1.52	-1.19	5
9/16/2011	Body 835	e'	55.1760	Relative Permittivity (ε _r):	55.18	55.20	-0.04	5
		e''	21.3018	Conductivity (σ):	0.99	0.97	1.96	5
9/16/2011	Body 1900	e'	52.1367	Relative Permittivity (ε _r):	52.14	53.30	-2.18	5
		e''	14.2467	Conductivity (σ):	1.51	1.52	-0.98	5
9/19/2011	Body 1900	e'	51.3731	Relative Permittivity (ε _r):	51.37	53.30	-3.62	5
		e''	14.5160	Conductivity (σ):	1.53	1.52	0.89	5
9/20/2011	Body 1900	e'	52.2868	Relative Permittivity (ε _r):	52.29	53.30	-1.90	5
		e''	14.2998	Conductivity (σ):	1.51	1.52	-0.61	5
9/20/2011	Body 1750	e'	51.5770	Relative Permittivity (ε _r):	51.58	53.30	-3.23	5
		e''	15.2240	Conductivity (σ):	1.48	1.52	-2.54	5
9/29/2011	Body 5200	e'	51.6196	Relative Permittivity (ε _r):	51.62	49.02	5.30	10
		e''	18.1398	Conductivity (σ):	5.24	5.29	-0.94	5
9/29/2011	Body 5500	e'	51.0432	Relative Permittivity (ε _r):	51.04	48.61	5.00	10
		e''	18.6020	Conductivity (σ):	5.69	5.64	0.79	5
9/29/2011	Body 5800	e'	50.5804	Relative Permittivity (ε _r):	50.58	48.20	4.94	10
		e''	19.0435	Conductivity (σ):	6.14	6.00	2.36	5
10/5/2011	Body 1900	e'	52.6697	Relative Permittivity (ε _r):	52.67	53.30	-1.18	5
		e''	14.2214	Conductivity (σ):	1.50	1.52	-1.16	5
10/6/2011	Body 835	e'	56.2759	Relative Permittivity (ε _r):	56.28	55.20	1.95	5
		e''	21.5469	Conductivity (σ):	1.00	0.97	3.13	5
10/6/2011	Body 2450	e'	51.3061	Relative Permittivity (ε _r):	51.31	52.70	-2.64	5
		e''	14.5293	Conductivity (σ):	1.98	1.95	1.50	5

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
10/6/2011	Body 2450	e'	51.3061	Relative Permittivity (ε _r):	51.31	52.70	-2.64	5
		e''	14.5293	Conductivity (σ):	1.98	1.95	1.50	5
10/6/2011	Body 5200	e'	49.8673	Relative Permittivity (ε _r):	49.87	49.02	1.73	10
		e''	18.3857	Conductivity (σ):	5.32	5.29	0.40	5
10/6/2011	Body 5500	e'	49.3035	Relative Permittivity (ε _r):	49.30	48.61	1.42	10
		e''	18.6502	Conductivity (σ):	5.70	5.64	1.05	5
10/6/2011	Body 5800	e'	48.8037	Relative Permittivity (ε _r):	48.80	48.20	1.25	10
		e''	18.9492	Conductivity (σ):	6.11	6.00	1.85	5
10/7/2011	Body 5200	e'	49.0464	Relative Permittivity (ε _r):	49.05	49.02	0.05	10
		e''	18.4310	Conductivity (σ):	5.33	5.29	0.65	5
10/7/2011	Body 5500	e'	48.4904	Relative Permittivity (ε _r):	48.49	48.61	-0.25	10
		e''	18.7310	Conductivity (σ):	5.73	5.64	1.49	5
10/7/2011	Body 5800	e'	48.0086	Relative Permittivity (ε _r):	48.01	48.20	-0.40	10
		e''	19.0652	Conductivity (σ):	6.15	6.00	2.47	5
10/8/2011	Body 1750	e'	53.2438	Relative Permittivity (ε _r):	53.24	53.30	-0.11	5
		e''	15.1735	Conductivity (σ):	1.48	1.52	-2.86	5
10/11/2011	Body 835	e'	56.7794	Relative Permittivity (ε _r):	56.78	55.20	2.86	5
		e''	21.4187	Conductivity (σ):	0.99	0.97	2.52	5
10/11/2011	Body 1900	e'	52.5606	Relative Permittivity (ε _r):	52.56	53.30	-1.39	5
		e''	14.0387	Conductivity (σ):	1.48	1.52	-2.43	5
10/11/2011	Body 1750	e'	52.4594	Relative Permittivity (ε _r):	52.46	53.30	-1.58	5
		e''	15.1947	Conductivity (σ):	1.48	1.52	-2.73	5
11/4/2011	Body 835	e'	54.9449	Relative Permittivity (ε _r):	54.94	55.20	-0.46	5
		e''	21.2187	Conductivity (σ):	0.99	0.97	1.56	5
11/4/2011	Body 825	e'	55.0484	Relative Permittivity (ε _r):	55.05	55.26	-0.38	5
		e''	21.2583	Conductivity (σ):	0.98	0.97	0.65	5
11/4/2011	Body 850	e'	54.8005	Relative Permittivity (ε _r):	54.80	55.16	-0.65	5
		e''	21.1651	Conductivity (σ):	1.00	0.99	1.33	5
11/4/2011	Body 1850	e'	54.8294	Relative Permittivity (ε _r):	54.83	53.30	2.87	5
		e''	14.5817	Conductivity (σ):	1.50	1.52	-1.32	5
11/4/2011	Body 1880	e'	54.7415	Relative Permittivity (ε _r):	54.74	53.30	2.70	5
		e''	14.6977	Conductivity (σ):	1.54	1.52	1.08	5
11/4/2011	Body 1900	e'	54.6890	Relative Permittivity (ε _r):	54.69	53.30	2.61	5
		e''	14.7671	Conductivity (σ):	1.56	1.52	2.64	5
11/4/2011	Body 1910	e'	54.6587	Relative Permittivity (ε _r):	54.66	53.30	2.55	5
		e''	14.7983	Conductivity (σ):	1.57	1.52	3.40	5
11/4/2011	Body 1710	e'	53.2356	Relative Permittivity (ε _r):	53.24	53.54	-0.58	5
		e''	15.1284	Conductivity (σ):	1.44	1.46	-1.58	5
11/4/2011	Body 1730	e'	53.1560	Relative Permittivity (ε _r):	53.16	53.49	-0.63	5
		e''	15.1702	Conductivity (σ):	1.46	1.47	-0.99	5
11/4/2011	Body 1755	e'	53.0888	Relative Permittivity (ε _r):	53.09	53.43	-0.64	5
		e''	15.2400	Conductivity (σ):	1.49	1.49	-0.14	5

10. System Verification

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 $\pm 10\%$.

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 EX3DV4, SN: 3686 and E-Field Probe EX3DV4, SN: 3772 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 fine cube was chosen for 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.

Reference SAR Values for BODY-tissue from calibration certificate of SPEAG.

Cal. certificate #	Cal. date	System validation dipole	Freq. (MHz)	SAR Avg (mW/g)	
				Tissue:	Body
D835V2-4d117_Arp11	4/15/11	D835V2	835	1g SAR:	10.10
				10g SAR:	6.60
D1750V2-1053_May11	5/27/11	D1750V2	1750	1g SAR:	36.88
				10g SAR:	19.72
D1750V2-1050_Apr11	4/19/11	D1750V2	1750	1g SAR:	36.4
				10g SAR:	19.4
D1900V2-5d140_Apr11	4/18/11	D1900V2	1900	1g SAR:	41.2
				10g SAR:	21.6
D2450V2-706	4/19/10	D2450V2	2450	1g SAR:	52.4
				10g SAR:	24.5
D5GHzV2-1003	8/23/11	D5GHzV2	5200	1g SAR:	74.4
				10g SAR:	20.8
D5GHzV2-1003	8/23/11	D5GHzV2	5500	1g SAR:	80.0
				10g SAR:	22.3
D5GHzV2-1003	8/23/11	D5GHzV2	5800	1g SAR:	76.3
				10g SAR:	21.2

10.1. System Check Results

Date Tested	System validation dipole	Freq. (MHz)	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
09/08/11	D1900V2 Body	1900	1g SAR:	42.2	41.2	2.43	±10
			10g SAR:	21.9	21.6	1.39	
09/10/11	D1900V2 Body	1900	1g SAR:	41.6	41.2	0.97	±10
			10g SAR:	21.9	21.6	1.39	
09/10/11	D1750V2 Body	1750	1g SAR:	39.8	36.4	9.34	±10
			10g SAR:	21.1	19.4	8.76	
09/12/11	D835V2 Body	835	1g SAR:	10.10	10.1	0.00	±10
			10g SAR:	6.64	6.6	0.61	
09/14/11	D1900V2 Body	1900	1g SAR:	42.0	41.2	1.94	±10
			10g SAR:	22.0	21.6	1.85	
09/14/11	D835V2 Body	835	1g SAR:	10.10	10.1	0.00	±10
			10g SAR:	6.65	6.6	0.76	
09/16/11	D835V2 Body	835	1g SAR:	10.60	10.1	4.95	±10
			10g SAR:	6.98	6.6	5.76	
09/16/11	D1900V2 Body	1900	1g SAR:	42.4	41.2	2.91	±10
			10g SAR:	22.3	21.6	3.24	
09/19/11	D1900V2 Body	1900	1g SAR:	43.6	41.2	5.83	±10
			10g SAR:	22.8	21.6	5.56	
09/20/11	D1750V2 Body	1750	1g SAR:	38.2	36.4	4.95	±10
			10g SAR:	20.3	19.4	4.64	
09/20/11	D1900V2 Body	1900	1g SAR:	41.9	41.2	1.70	±10
			10g SAR:	22.1	21.6	2.31	

System Check Results (continued)

Date Tested	System validation dipole	Freq. (MHz)	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
09/29/11	D5GHzV2 Body	5200	1g SAR:	74.4	74.4	0.00	±10
			10g SAR:	21.4	20.8	2.88	
09/29/11	D5GHzV2 Body	5500	1g SAR:	76.0	80.0	-5.00	±10
			10g SAR:	21.6	22.3	-3.14	
09/29/11	D5GHzV2 Body	5800	1g SAR:	77.2	76.3	1.18	±10
			10g SAR:	22.2	21.2	4.72	
10/05/11	D1900V2 Body	1900	1g SAR:	42.3	41.2	2.67	±10
			10g SAR:	22.2	21.6	2.78	
10/06/11	D835V2 Body	835	1g SAR:	10.40	10.1	2.97	±10
			10g SAR:	6.85	6.6	3.79	
10/06/11	D2450V2-706 Body	2450	1g SAR:	54.0	52.4	3.05	±10
			10g SAR:	25.3	24.5	3.27	
10/06/11	D5GHzV2 Body	5200	1g SAR:	77.4	74.4	4.03	±10
			10g SAR:	22.3	20.8	7.21	
10/06/11	D5GHzV2 Body	5500	1g SAR:	78.1	80.0	-2.38	±10
			10g SAR:	22.4	22.3	0.45	
10/06/11	D5GHzV2 Body	5800	1g SAR:	79.6	76.3	4.33	±10
			10g SAR:	22.8	21.2	7.55	
10/07/11	D5GHzV2 Body	5200	1g SAR:	76.9	74.4	3.36	±10
			10g SAR:	22.1	20.8	6.25	
10/07/11	D5GHzV2 Body	5500	1g SAR:	75.6	80.0	-5.50	±10
			10g SAR:	21.7	22.3	-2.69	
10/07/11	D5GHzV2 Body	5800	1g SAR:	76.9	76.3	0.79	±10
			10g SAR:	22.0	21.2	3.77	
10/08/11	D1750V2 Body	1750	1g SAR:	38.2	36.88	3.58	±10
			10g SAR:	20.2	19.72	2.43	
10/09/11	D5GHzV2 Body	5500	1g SAR:	77.0	80.0	-3.75	±10
			10g SAR:	21.7	22.3	-2.69	
10/11/11	D835V2 Body	835	1g SAR:	9.78	10.1	-3.17	±10
			10g SAR:	6.42	6.6	-2.73	
10/11/11	D1900V2 Body	1900	1g SAR:	41.2	41.2	0.00	±10
			10g SAR:	21.8	21.6	0.93	
10/11/11	D1750V2 Body	1750	1g SAR:	37.5	36.88	1.68	±10
			10g SAR:	19.9	19.72	0.91	
11/04/11	D835V2 Body	835	1g SAR:	10.10	10.1	0.00	±10
			10g SAR:	6.62	6.6	0.30	
11/04/11	D1900V2 Body	1900	1g SAR:	42.7	41.2	3.64	±10
			10g SAR:	22.1	21.6	2.31	
11/04/11	D1750V2 Body	1750	1g SAR:	38.2	36.4	4.95	±10
			10g SAR:	20.3	19.4	4.64	

11. 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

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.

12. RF Output Power Measurement

12.1. GSM850 & GSM 1900

GPRS (GMSK, Coding Scheme: CS1) class 10

Band	Ch No.	f (MHz)	Avg Burst Pwr (dBm)			
			1 slot	Frame	2 slots	Frame
GSM850	128	824.2	32.15	23.1	30.75	24.7
	190	836.6	32.20	23.2	31.07	25.0
	251	848.8	32.16	23.1	30.78	24.8
GSM1900	512	1850.2	29.42	20.4	27.05	21.0
	661	1880	29.55	20.5	27.16	21.1
	810	1909.8	29.54	20.5	27.32	21.3

GPRS (GMSK, Coding Scheme: CS1) class 10 with power back-off

Band	Ch No.	f (MHz)	Avg Burst Pwr (dBm)			
			1 slot	Frame	2 slots	Frame
GSM850	128	824.2	27.70	18.7	21.20	15.2
	190	836.6	27.60	18.6	21.20	15.2
	251	848.8	27.70	18.7	21.20	15.2
GSM1900	512	1850.2	23.90	14.9	15.40	9.4
	661	1880	24.00	15.0	15.50	9.5
	810	1909.8	24.00	15.0	15.50	9.5

Note(s):

1. Based on the output power above, the following worst-case configurations were chosen for body SAR testing.
 - a. GPRS850, 1900 2 time slots
 - b. GPRS850, 1900 1 time slots (Power back off)

(E)GPRS (8PSK, Coding Scheme: MCS5)

Band	Ch No.	f (MHz)	Avg Burst Pwr (dBm)			
			1 slot	Frame	2 slots	Frame
GSM850	128	824.2	27.00	18.0	25.73	19.7
	190	836.6	27.02	18.0	25.75	19.7
	251	848.8	27.00	18.0	25.75	19.7
GSM1900	512	1850.2	25.90	16.9	23.90	17.9
	661	1880	26.00	17.0	23.80	17.8
	810	1909.8	26.00	17.0	23.80	17.8

(E)GPRS (8PSK, Coding Scheme: MCS5) with Power Back Off

Band	Ch No.	f (MHz)	Avg Burst Pwr (dBm)			
			1 slot	Frame	2 slots	Frame
GSM850	128	824.2	24.60	15.6	16.50	10.5
	190	836.6	24.70	15.7	16.50	10.5
	251	848.8	24.60	15.6	16.50	10.5
GSM1900	512	1850.2	21.00	12.0	13.50	7.5
	661	1880	21.00	12.0	13.40	7.4
	810	1909.8	21.10	12.1	13.50	7.5

Note(s):

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.

12.2. UMTS (WCDMA) Band II & IV

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 EUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7).

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

Release 99 (RMC, 12.2 kbps)

Band	Mode	UL Ch No.	Freq. (MHz)	Tx Conducted Pwr (dBm)	
				Avg Tx Pwr	with power back-off
UMTS (WCDMA) Band IV	Rel 99 (RMC, 12.2 kbps)	1312	1712.4	22.45	16.62
		1412	1732.6	22.57	16.65
		1513	1754.0	22.46	16.47
UMTS (WCDMA) Band II	Rel 99 (RMC, 12.2 kbps)	9262	1852.4	22.48	16.50
		9400	1880.0	22.40	16.50
		9538	1907.6	22.35	16.45

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			
	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			

HSDPA (Rel 6)

Band	Mode	UL Ch No.	Freq. (MHz)	MPR	Tx Conducted Pwr (dBm)	
					Avg Tx Pwr	with power back-off
UMTS (WCDMA) Band IV	Subtest 1	1312	1712.4	0	22.5	16.6
		1412	1732.6	0	22.4	16.6
		1513	1754.0	0	22.4	16.5
	Subtest 2	1312	1712.4	1	22.0	16.1
		1412	1732.6	1	21.9	16.1
		1513	1754.0	1	21.9	16.0
	Subtest 3	1312	1712.4	1.5	21.5	15.6
		1412	1732.6	1.5	21.4	15.5
		1513	1754.0	1.5	21.4	15.6
	Subtest 4	1312	1712.4	1.5	21.3	15.5
		1412	1732.6	1.5	21.2	15.3
		1513	1754.0	1.5	21.2	15.3
UMTS (WCDMA) Band II	Subtest 1	9262	1852.4	0	22.5	16.6
		9400	1880.0	0	22.5	16.6
		9538	1907.6	0	22.5	16.6
	Subtest 2	9262	1852.4	1	22.0	16.1
		9400	1880.0	1	22.0	16.1
		9538	1907.6	1	22.0	16.1
	Subtest 3	9262	1852.4	1.5	21.6	15.7
		9400	1880.0	1.5	21.5	15.6
		9538	1907.6	1.5	21.5	15.7
	Subtest 4	9262	1852.4	1.5	21.3	15.4
		9400	1880.0	1.5	21.2	15.4
		9538	1907.6	1.5	21.3	15.4

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

HSPA (HSDPA/HSUPA)

Band	Mode	UL Ch No.	Freq. (MHz)	MPR	Tx Conducted Pwr (dBm)	
					Avg Tx Pwr	with power back-off
UMTS (WCDMA) Band IV	Subtest 1	1312	1712.4	0	19.2	13.5
		1412	1732.6	0	19.2	13.4
		1513	1754.0	0	19.3	13.5
	Subtest 2	1312	1712.4	2	19.5	13.7
		1412	1732.6	2	19.8	14.0
		1513	1754.0	2	19.9	14.1
	Subtest 3	1312	1712.4	1	18.7	12.9
		1412	1732.6	1	19.3	13.5
		1513	1754.0	1	19.3	13.6
	Subtest 4	1312	1712.4	2	19.0	13.2
		1412	1732.6	2	19.1	13.3
		1513	1754.0	2	19.1	13.3
	Subtest 5	1312	1712.4	0	19.3	13.5
		1412	1732.6	0	19.2	13.5
		1513	1754.0	0	19.3	13.5
UMTS (WCDMA) Band II	Subtest 1	9262	1852.4	0	19.3	13.5
		9400	1880.0	0	19.3	13.5
		9538	1907.6	0	19.4	13.6
	Subtest 2	9262	1852.4	2	19.1	13.4
		9400	1880.0	2	19.0	13.2
		9538	1907.6	2	19.3	13.5
	Subtest 3	9262	1852.4	1	18.9	13.1
		9400	1880.0	1	18.7	12.9
		9538	1907.6	1	18.8	13.0
	Subtest 4	9262	1852.4	2	19.4	13.6
		9400	1880.0	2	19.2	13.4
		9538	1907.6	2	19.1	13.4
	Subtest 5	9262	1852.4	0	19.2	13.4
		9400	1880.0	0	19.2	13.4
		9538	1907.6	0	19.2	13.4

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.

12.3. WiFi (802.11abgn)

2.4GHz Band

Mode	Channel	Freq. (MHz)	Avg Power (dBm)
802.11b	1	2412	12.67
	6	2437	12.42
	11	2462	12.55
802.11g	1	2412	11.64
	6	2437	11.65
	11	2462	11.94
802.11n (HT20)	1	2412	11.91
	6	2437	11.52
	11	2462	12.25

5GHz Bands

Mode	Frequency (MHz)	Channel	Freq. (MHz)	Avg Power (dBm)
802.11a	5200	36	5180	7.85
		40	5200	8.01
		48	5240	7.48
802.11a	5300	52	5260	7.54
		56	5300	7.75
		60	5320	7.39
802.11a	5500	100	5500	8.09
		120	5600	8.68
		140	5700	8.65
802.11a	5800	149	5745	9.17
		157	5785	9.12
		165	5825	8.87
802.11n HT20	5200	36	5180	7.72
		40	5200	7.89
		48	5240	7.35
802.11n HT20	5300	52	5260	7.37
		56	5300	7.48
		60	5320	7.25
802.11n HT20	5500	100	5500	7.63
		120	5600	8.65
		140	5700	8.34
802.11n HT20	5800	149	5745	9.29
		157	5785	9.09
		165	5825	8.54
802.11n HT40	5200	38	5190	8.48
		46	5230	8.36
802.11n HT40	5300	54	5270	8.09
		62	5310	8.48
802.11n HT40	5500	102	5510	8.72
		134	5670	9.32
802.11n HT40	5800	151	5755	9.46
		159	5795	9.44

12.4. Bluetooth

Mode	Channel #	Freq. (MHz)	Conducted Avg Power	
			(dBm)	(mW)
GFSK	0	2402	8.29	6.7
	39	2441	8.25	6.7
	78	2480	8.82	7.6
8PSK	0	2402	5.46	3.5
	39	2441	5.94	3.9
	78	2480	6.67	4.6

Note(s):

1. Stand-alone SAR is not required due to output power is $\leq 60/f(\text{GHz})$ mW

13. Summary of Test Configurations

13.1. Exposure conditions for WWAN

Tablet (KDB 447498 D01 Mobile Portable RF Exposure v04)

Configuration	Antenna-to-User distance	SAR Required	note
Base	1.91 mm	Yes	
Primary landscape	> 180 mm	No	This is not the most conservative antenna-to-user distance at edge mode. According to KDB 447498 4) b) ii) (2), SAR is required only for the edge with the most conservative exposure conditions.
Secondary landscape	4.9 mm	Yes	
Secondary landscape (45°)	>4.9 mm	Yes	With full power
Primary portrait	>70 mm	No	This is not the most conservative antenna-to-user distance at edge mode. According to KDB 447498 4) b) ii) (2), SAR is required only for the edge with the most conservative exposure conditions
Secondary portrait	7.1 mm	Yes	

Body Hotspot (KDB 941225 D06 Hot Spot SAR v01)

Configuration	Antenna-to-edge/surface	SAR Required	note
Rear (Base)	1.91 mm	Yes	
Front	>10 mm	Yes	
Bottom (Primary Landscape)	> 180 mm	No	SAR is not required due to antenna located greater than 25 mm from the surface or edge
Top (Secondary Landscape)	4.9 mm	Yes	
Top (Secondary landscape (45°))	>4.9 mm	Yes	With full power
Right (Primary Portrait)	>70 mm	No	SAR is not required due to antenna located greater than 25 mm from the surface or edge
Left (Secondary Portrait)	7.1 mm	Yes	

13.2. Exposure conditions for WLAN

Tablet (KDB 447498 D01 Mobile Portable RF Exposure v04)

Configuration	Antenna-to-User distance	SAR Required	note
Base	<0.85 mm	Yes	
Primary landscape	> 54 mm	No	This is not the most conservative antenna-to-user distance at edge mode. According to KDB 447498 4) b) ii) (2), SAR is required only for the edge with the most conservative exposure conditions.
Secondary landscape	>121 mm	No	ditto
Primary portrait	>107 mm	No	ditto.
Secondary portrait	<6 mm	Yes	

Hotspot (KDB 941225 D06 Hot Spot SAR v01)

Configuration	Antenna-to-edge/surface	SAR Required	note
Rear (Base)	<0.85 mm	Yes	
Front	>10 mm	Yes	
Bottom (Primary Landscape)	> 54 mm	No	SAR is not required due to antenna located greater than 25 mm from the surface or edge
Top (Secondary Landscape)	>121 mm	No	ditto
Right (Primary Portrait)	>107 mm	No	ditto
Left (Secondary Portrait)	<6 mm	Yes	

14. Standalone SAR Test Results

14.1. GSM850

Full Power

Test position	Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	Distance (mm)	SAR (mW/g)		Note
						1-g	10-g	
Rear/Base	GPRS 2 Slot	128	824.2	30.75	10			1
		190	836.6	31.07	10	0.510	0.343	
		251	848.8	30.78	10			1
Top/Sec. Landscape	GPRS 2 Slot	128	824.2	30.75	5	0.737	0.494	
		190	836.6	31.07	5	0.810	0.539	
		251	848.8	30.78	5	0.871	0.580	
Top/Sec. Landscape (45°)	GPRS 2 Slot	128	824.2	30.75				1
		190	836.6	31.07				1
		251	848.8	30.78	0	0.457	0.204	
Left/Sec. Portrait	GPRS 2 Slot	128	824.2	30.75	0			1
		190	836.6	31.07	0	0.714	0.434	
		251	848.8	30.78	0			1
Front (Hotspot)	GPRS 2 Slot	128	824.2	30.75	10			1
		190	836.6	31.07	10	0.522	0.354	
		251	848.8	30.78	10			1

With Power Back Off

Test position	Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	Distance (mm)	SAR (mW/g)		Note
						1-g	10-g	
Rear/Base	GPRS 1 Slot	128	824.2	27.7	0	0.736	0.411	
		190	836.6	27.6	0	0.805	0.445	
		251	848.8	27.7	0	0.766	0.424	
Top/Sec. Landscape	GPRS 1 Slot	128	824.2	27.7	0			1
		190	836.6	27.6	0	0.340	0.215	
		251	848.8	27.7	0			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.

14.2. GSM1900

Full Power

Test position	Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	Distance (mm)	SAR (mW/g)		Note
						1-g	10-g	
Rear/Base	GPRS 2 Slot	512	1850.2	27.05	10			1
		661	1880.0	27.16	10	0.420	0.230	
		810	1909.8	27.32	10			1
Top/Sec. Landscape	GPRS 2 Slot	512	1850.2	27.05	5			1
		661	1880.0	27.16	5	0.694	0.346	
		810	1909.8	27.32	5			1
Top/Sec. Landscape (45°)	GPRS 2 Slot	512	1850.2	27.05				1
		661	1880.0	27.16	0	0.591	0.300	
		810	1909.8	27.32				1
Left/Sec. Portrait	GPRS 2 Slot	512	1850.2	27.05	0			1
		661	1880.0	27.16	0	0.308	0.160	
		810	1909.8	27.32	0			1
Front (Hotspot)	GPRS 2 Slot	512	1850.2	27.05	10			1
		661	1880.0	27.16	10	0.511	0.272	
		810	1909.8	27.32	10			1

With Power Back Off

Test position	Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	Distance (mm)	SAR (mW/g)		Note
						1-g	10-g	
Rear/Bottom	GPRS 1 Slot	512	1850.2	23.9	0			1
		661	1880.0	24.0	0	0.654	0.305	
		810	1909.8	24.0	0			1
Top/Sec. Landscape	GPRS 1 Slot	512	1850.2	23.9	0			1
		661	1880.0	24.0	0	0.569	0.246	
		810	1909.8	24.0	0			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.

14.3. UMTS (WCDMA) Band II

Full Power

Test position	Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	Distance (mm)	SAR (mW/g)		Note
						1-g	10-g	
Rear/Base	R99 (RMC, 12.2 kbps)	9262	1852.4	22.48	10			1
		9400	1880.0	22.40	10	0.495	0.273	
		9538	1907.6	22.35	10			1
Top/Sec. Landscape	R99 (RMC, 12.2 kbps)	9262	1852.4	22.48	5	1.1	0.538	
		9400	1880.0	22.40	5	0.867	0.425	
		9538	1907.6	22.35	5	1.03	0.510	
Top/Sec. Landscape (45°)	R99 (RMC, 12.2 kbps)	9262	1852.4	22.48	0	0.886	0.448	
		9400	1880.0	22.40	0	0.67	0.338	
		9538	1907.6	22.35	0	0.934	0.471	
Left/Sec. Portrait	R99 (RMC, 12.2 kbps)	9262	1852.4	22.48	0			1
		9400	1880.0	22.40	0	0.371	0.194	
		9538	1907.6	22.35	0			1
Front (Hotspot)	R99 (RMC, 12.2 kbps)	9262	1852.4	22.48	10			1
		9400	1880.0	22.40	10	0.580	0.318	
		9538	1907.6	22.35	10			1

With Power Back Off

Test position	Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	Distance (mm)	SAR (mW/g)		Note
						1-g	10-g	
Rear/Bottom	R99 (RMC, 12.2 kbps)	9262	1852.4	16.50	0	1.070	0.494	
		9400	1880.0	16.50	0	1.140	0.521	
		9538	1907.6	16.45	0	1.140	0.517	
Top/Sec. Landscape	R99 (RMC, 12.2 kbps)	9262	1852.4	16.50	0			1
		9400	1880.0	16.50	0	0.735	0.321	
		9538	1907.6	16.45	0			1

Note(s):

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

14.4. UMTS (WCDMA) Band IV

Full Power

Test position	Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	Distance (mm)	SAR (mW/g)		Note
						1-g	10-g	
Rear/Base	R99 (RMC, 12.2 kbps)	1312	1712.4	22.45	10			1
		1412	1732.6	22.57	10	0.613	0.342	
		1513	1754.0	22.46	10			1
Top/Sec. Landscape	R99 (RMC, 12.2 kbps)	1312	1712.4	22.45	5	0.87	0.428	
		1412	1732.6	22.57	5	1.04	0.513	
		1513	1754.0	22.46	5	0.972	0.474	
Top/Sec. Landscape (45°)	R99 (RMC, 12.2 kbps)	1312	1712.4	22.45	0	0.684	0.347	1
		1412	1732.6	22.57	0	0.802	0.408	
		1513	1754.0	22.46	0	0.762	0.386	1
Left/Sec. Portrait	R99 (RMC, 12.2 kbps)	1312	1712.4	22.45	0			1
		1412	1732.6	22.57	0	0.447	0.221	
		1513	1754.0	22.46	0			1
Front (Hotspot)	R99 (RMC, 12.2 kbps)	1312	1712.4	22.45	10			1
		1412	1732.6	22.57	10	0.691	0.365	
		1513	1754.0	22.46	10			1

With Power Back Off

Test position	Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	Distance (mm)	SAR (mW/g)		Note
						1-g	10-g	
Rear/Bottom	R99 (RMC, 12.2 kbps)	1312	1712.4	16.62	0	1.070	0.515	
		1412	1732.6	16.65	0	1.100	0.526	
		1513	1754.0	16.47	0	1.110	0.530	
Top/Sec. Landscape	R99 (RMC, 12.2 kbps)	1312	1712.4	16.62	0			1
		1412	1732.6	16.65	0	0.647	0.278	
		1513	1754.0	16.47	0			1

Note(s):

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

14.5. WiFi

14.5.1. 2.4 GHz

Rear/Base with 0 mm separation distance

Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
				1-g	10-g	
802.11b	1	2412	12.67	0.746	0.297	
	6	2437	12.42			1
	11	2462	12.55			1

Left/Sec. Portrait with 0 mm separation distance

Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
				1-g	10-g	
802.11b	1	2412	12.67	0.127	0.057	
	6	2437	12.42			1
	11	2462	12.55			1

Front with 10 mm separation distance (Hot Sport Mode)

Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
				1-g	10-g	
802.11b	1	2412	12.67	0.019	0.012	
	6	2437	12.42			1
	11	2462	12.55			1

Note(s):

- Testing was performed on the channel with the highest output power only due to SAR is ≤ 0.8 W/kg and operating frequency band < 100 MHz per KDB 447498 1) e) i).

14.5.2. 5 GHz Bands

5.2 GHz Band

Test Position	Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	Distance (mm)	SAR (mW/g)		Note
						1-g	10-g	
Rear/Base	802.11a	36	5180	7.85	0			1
		40	5200	8.01	0	0.505	0.132	
		48	5240	7.48	0			1
Left/Sec. Portrait	802.11a	36	5180	7.85	0			1
		40	5200	8.01	0	0.157	0.066	
		48	5240	7.48	0			1
Test Position	Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	Distance (mm)	SAR (mW/g)		Note
						1-g	10-g	
Rear/Base	802.11n HT40	38	5190	8.48	0	0.729	0.171	
		46	5230	8.36	0			1
Left/Sec. Portrait	802.11n HT40	38	5190	8.48	0	0.210	0.075	
		46	5230	8.36	0			1

5.3 GHz Band

Test Position	Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	Distance (mm)	SAR (mW/g)		Note
						1-g	10-g	
Rear/Base	802.11a	52	5260	7.54	0			1
		56	5300	7.75	0	0.479	0.134	
		64	5320	7.39	0			1
Left/Sec. Portrait	802.11a	52	5260	7.54	0			1
		56	5300	7.75	0	0.191	0.0770	
		62	5320	7.39	0			1
Test Position	Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	Distance (mm)	SAR (mW/g)		Note
						1-g	10-g	
Rear/Base	802.11n HT40	52	5270	8.09	0			1
		62	5310	8.48	0	0.726	0.178	
Left/Sec. Portrait	802.11n HT40	52	5270	8.09	0			1
		62	5310	8.48	0	0.226	0.039	

Note(s):

1. Testing was performed on the channel with the highest output power only due to SAR is ≤ 0.8 W/kg and operating frequency band < 100 MHz per KDB 447498 1) e) i).

5.5 GHz Band

Test Position	Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	Distance (mm)	SAR (mW/g)		Note
						1-g	10-g	
Rear/Base	802.11a	100	5500	8.09	0			1, 2
		120	5600	8.68	0	0.408	0.088	
		140	5700	8.65	0			1, 2
Left/Sec. Portrait	802.11a	100	5500	8.09	0			1
		120	5600	8.68	0	0.295	0.107	
		140	5700	8.65	0			1
Test Position	Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	Distance (mm)	SAR (mW/g)		Note
						1-g	10-g	
Rear/Base	802.11n HT40	102	5510	8.72	0	0.505	0.107	
		134	5670	9.32	0	0.648	0.175	
Left/Sec. Portrait	802.11n HT40	102	5510	8.72	0			1
		134	5670	9.32	0	0.336	0.109	

Note(s):

- Testing was performed on the channel with the highest output power only due to SAR is ≤ 0.4 W/kg and operating frequency band ≤ 200 MHz per KDB 447498 1) e) ii).
- Additional SAR is skipped since HT40 was highest power mode and has two measurements either ends of the band with SAR < 0.8 W/kg.

5.8 GHz Band

Test Position	Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	Distance (mm)	SAR (mW/g)		Note
						1-g	10-g	
Rear/Base	802.11a	149	5745	9.17	0	0.534	0.122	
		157	5785	9.12	0			1
		165	5825	8.87	0			1
Left/Sec. Portrait	802.11a	149	5745	9.17	0	0.347	0.119	
		157	5785	9.12	0			1
		165	5825	8.87	0			1
Test Position	Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	Distance (mm)	SAR (mW/g)		Note
						1-g	10-g	
Rear/Base	802.11n HT40	151	5755	9.46	0	0.592	0.164	
		159	5795	9.44	0			1
Left/Sec. Portrait	802.11n HT40	151	5755	9.46	0	0.288	0.094	
		159	5795	9.44	0			1

Note(s):

- Testing was performed on the channel with the highest output power only due to SAR is ≤ 0.8 W/kg and operating frequency band < 100 MHz per KDB 447498 1) e) i).

15. Summary of the Highest 1g SAR

Technology	Test configuration	Mode	Separation distance (mm)	Highest 1g SAR (W/kg)
GPRS850 (Part 22)	Top/Sec. Landscape	GPRS 2 time slots, CS1	5	0.871
GPRS850 (Part 22) (with power back off)	Rear/Base	GPRS 1 time slots, CS1	0	0.805
GPRS1900 (Part 24)	Top/Sec. Landscape	GPRS 2 time slots, CS1	5	0.694
GPRS1900 (Part 24) (with power back off)	Rear/Base	GPRS 1 time slots, CS1	0	0.654
UMTS (WCDMA) Band II (Part 24)	Top/Sec. Landscape	R99, RMC 12.2kbps	5	1.1
UMTS (WCDMA) Band II (Part 24) (with power back off)	Rear/Bottom	R99, RMC 12.2kbps	0	1.14
UMTS (WCDMA) Band IV (Part 27)	Top/Sec. Landscape	R99, RMC 12.2kbps	5	1.04
UMTS (WCDMA) Band IV (Part 27) (with power back off)	Rear/Base	R99, RMC 12.2kbps	0	1.11
WiFi 2.4 GHz (15.247)	Rear/Base	802.11b , 1 Mbps	0	0.746
WiFi 5.2 GHz (15.407)	Rear/Base	802.11n HT40, 54Mbps	0	0.729
WiFi 5.3 GHz (15.407)	Rear/Base	802.11n HT40, 54Mbps	0	0.726
WiFi 5.5 GHz (15.407)	Rear/Base	802.11n HT40, 54Mbps	0	0.648
WiFi 5.8 GHz (15.247)	Rear/Base	802.11n HT40, 54Mbps	0	0.592

16. Worst-case SAR Plots

GPRS 850 Plot

Date: 9/16/2011

Test Laboratory: UL CCS SAR Lab C

01_GSM850

Communication System: GPRS-FDD (GMSK, 2 slot); Frequency: 848.8 MHz; Duty Cycle: 1:4.00037
Medium parameters used (interpolated): $f = 848.8$ MHz; $\sigma = 1.003$ mho/m; $\epsilon_r = 55.044$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3772; ConvF(8.57, 8.57, 8.57); Calibrated: 5/3/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1257; Calibrated: 5/3/2011
- Phantom: ELI v4.0 (A); Type: QDOVA001BB; Serial: 1117
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Secondary Landscape _5 mm/GPRS 2 Slot_H-ch/Area Scan (71x121x1): Measurement grid:

dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 1.065 mW/g

Secondary Landscape _5 mm/GPRS 2 Slot_H-ch/Zoom Scan (5x5x7)/Cube 0: Measurement

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

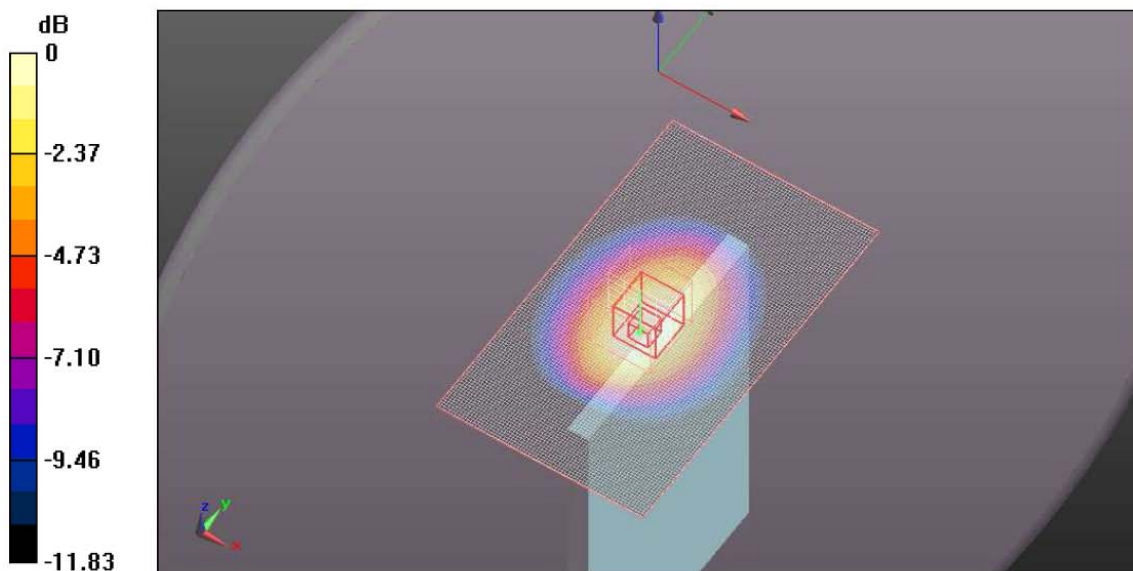
Reference Value = 31.619 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 1.277 W/kg

SAR(1 g) = 0.871 mW/g; SAR(10 g) = 0.580 mW/g

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

Maximum value of SAR (measured) = 1.042 mW/g



0 dB = 1.040mW/g

Z Plot

Date: 9/16/2011

Test Laboratory: UL CCS SAR Lab C

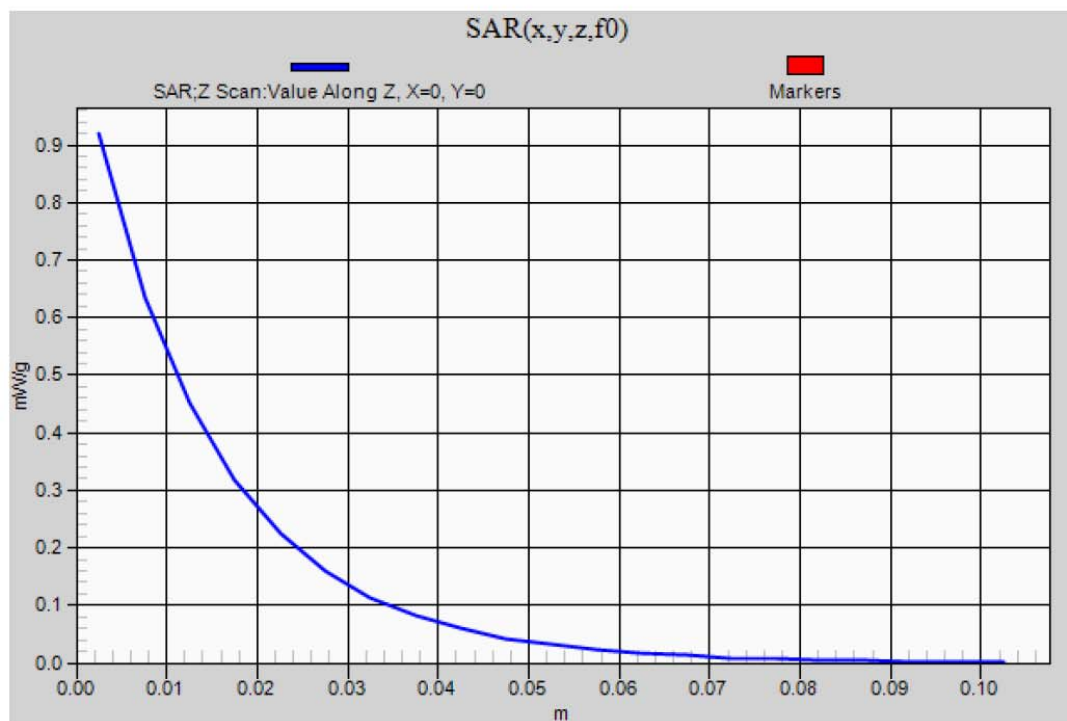
01_GSM850

Communication System: GPRS-FDD (GMSK, 2 slot); Frequency: 848.8 MHz; Duty Cycle: 1:4.00037

Secondary Landscape _5 mm/GPRS 2 Slot_H-ch/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

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

Maximum value of SAR (measured) = 0.919 mW/g



GPRS 1900 Plot

Date: 9/14/2011

Test Laboratory: UL CCS SAR Lab C

01_GSM1900

Communication System: GPRS-FDD (GMSK, 2 slot); Frequency: 1880 MHz; Duty Cycle: 1:4.00037
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.48$ mho/m; $\epsilon_r = 51.017$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3772; ConvF(6.76, 6.76, 6.76); Calibrated: 5/3/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1257; Calibrated: 5/3/2011
- Phantom: ELI v4.0 (A); Type: QDOVA001BB; Serial: 1117
- Measurement SW: DASY52, Version 52.6 (2);SEMCAD X Version 14.4.5 (3634)

Secondary Lanscape_5 mm/GPRS 2 Slot_M-ch/Area Scan (71x121x1): Measurement grid:

dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.929 mW/g

Secondary Lanscape_5 mm/GPRS 2 Slot_M-ch/Zoom Scan (5x5x7)/Cube 0: Measurement

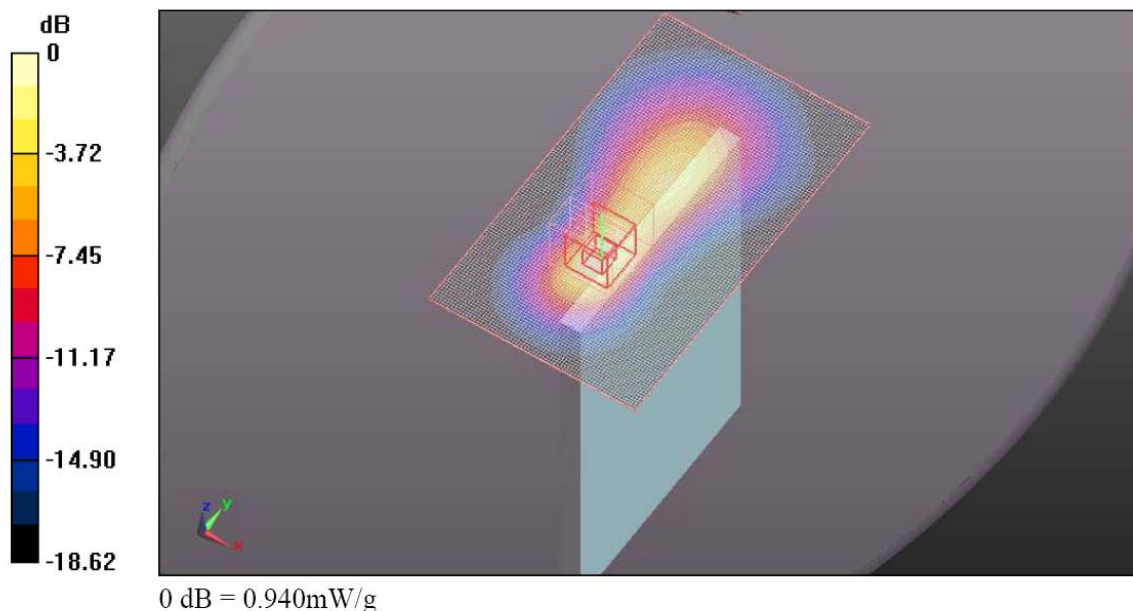
grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 24.291 V/m; Power Drift = -0.0075 dB

Peak SAR (extrapolated) = 1.238 W/kg

SAR(1 g) = 0.694 mW/g; SAR(10 g) = 0.346 mW/g

Maximum value of SAR (measured) = 0.937 mW/g



Z Plot

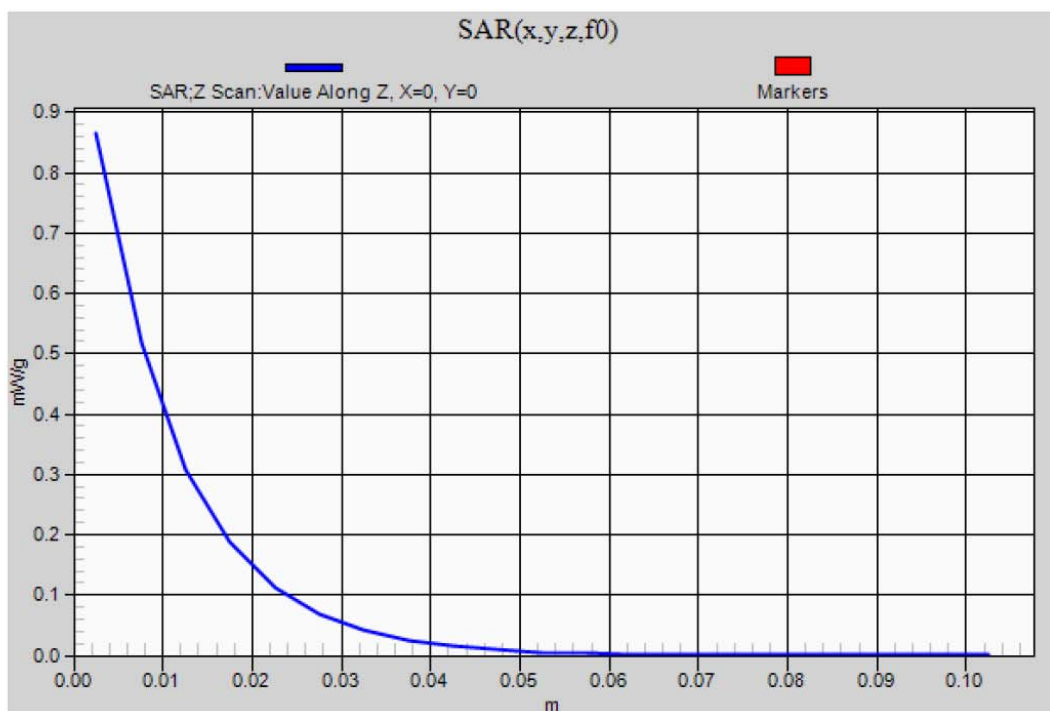
Date: 9/14/2011

Test Laboratory: UL CCS SAR Lab C

01_GSM1900

Communication System: GPRS-FDD (GMSK, 2 slot); Frequency: 1880 MHz; Duty Cycle: 1:4.00037

Secondary Landscape_5 mm/GPRS 2 Slot_M-ch/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.865 mW/g



UMTS (WCDMA) Band II Plot

Date: 9/20/2011

Test Laboratory: UL CCS SAR Lab C

02_WCDMA1900 Band II with power back off

Communication System: UMTS-FDD (WCDMA); Frequency: 1880 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.489$ mho/m; $\epsilon_r = 52.354$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

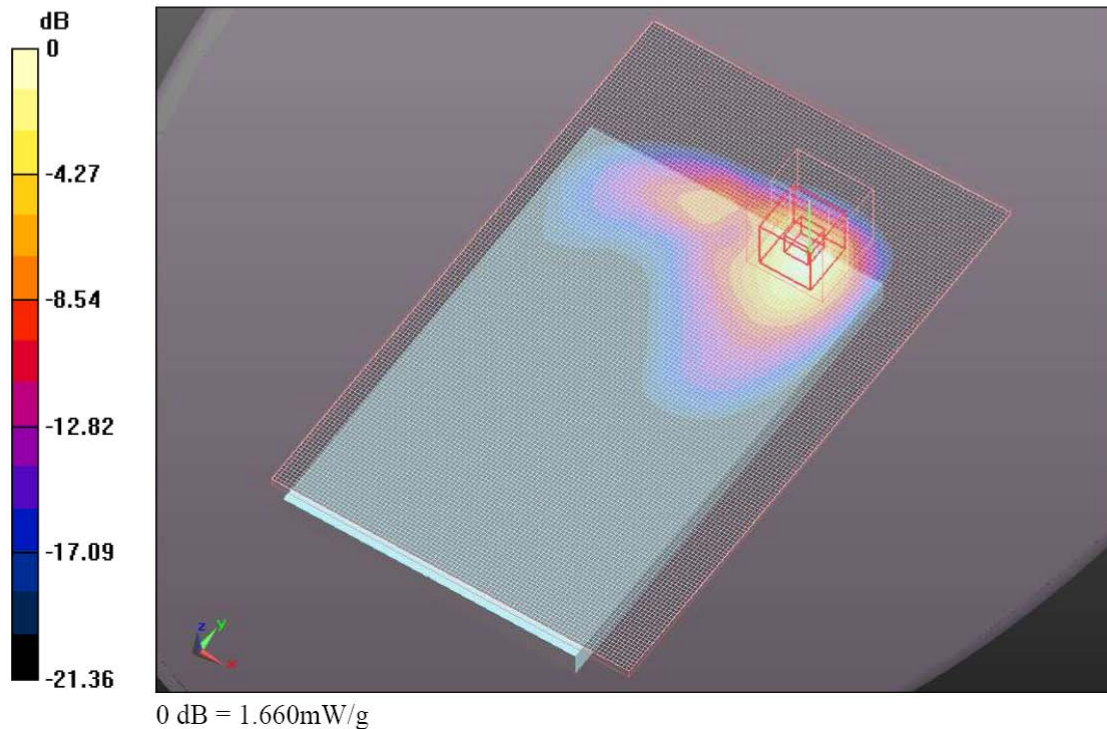
Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3772; ConvF(6.76, 6.76, 6.76); Calibrated: 5/3/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1257; Calibrated: 5/3/2011
- Phantom: ELI v4.0 (A); Type: QDOVA001BB; Serial: 1117
- Measurement SW: DASY52, Version 52.6 (2);SEMCAD X Version 14.4.5 (3634)

Bottom Face_0 mm/R99 RMC_M-ch/Area Scan (101x161x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.544 mW/g

Bottom Face_0 mm/R99 RMC_M-ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.534 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 2.367 W/kg
SAR(1 g) = 1.14 mW/g; SAR(10 g) = 0.521 mW/g
Maximum value of SAR (measured) = 1.655 mW/g



Z Plot

Date: 9/20/2011

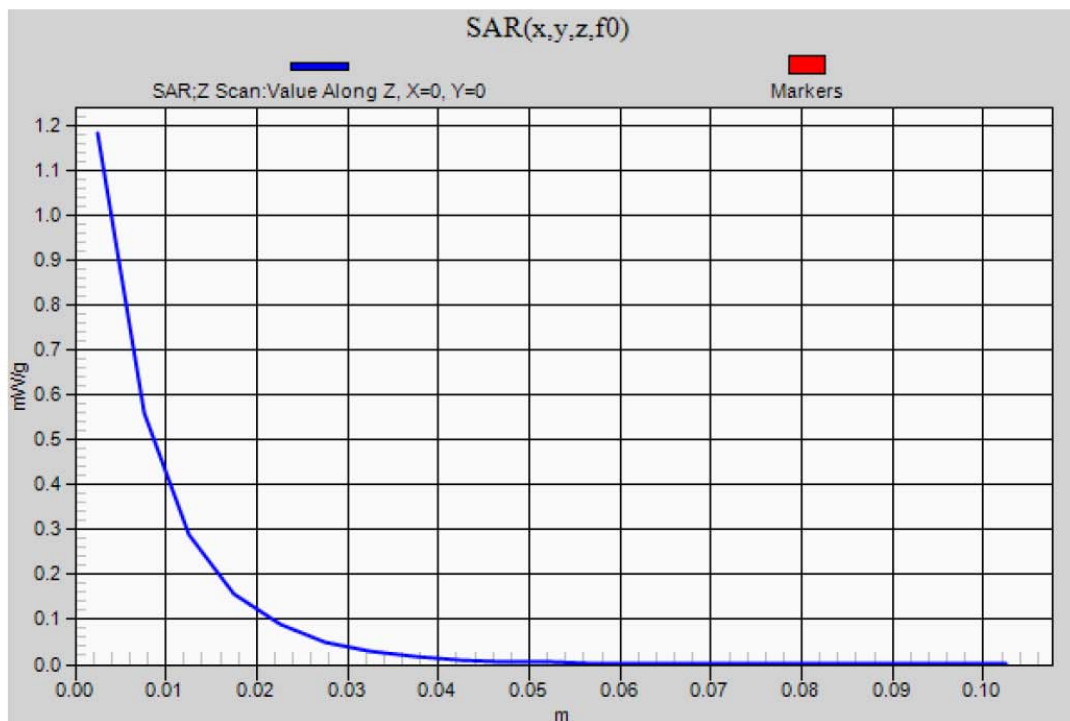
Test Laboratory: UL CCS SAR Lab C

02_WCDMA1900 Band II with power back off

Communication System: UMTS-FDD (WCDMA); Frequency: 1880 MHz; Duty Cycle: 1:1

Bottom Face_0 mm/R99 RMC_M-ch/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 1.184 mW/g



UMTS (WCDMA) Band IV Plot

Date: 9/20/2011

Test Laboratory: UL CCS SAR Lab C

01_WCDMA1700_Band IV

Communication System: UMTS-FDD (WCDMA); Frequency: 1754 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 1754$ MHz; $\sigma = 1.487$ mho/m; $\epsilon_r = 51.562$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3772; ConvF(7.15, 7.15, 7.15); Calibrated: 5/3/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1257; Calibrated: 5/3/2011
- Phantom: ELI v4.0 (A); Type: QDOVA001BB; Serial: 1117
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Bottom Face_0 mm/R99 RMC_H-ch/Area Scan (101x161x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 1.748 mW/g

Bottom Face_0 mm/R99 RMC_H-ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

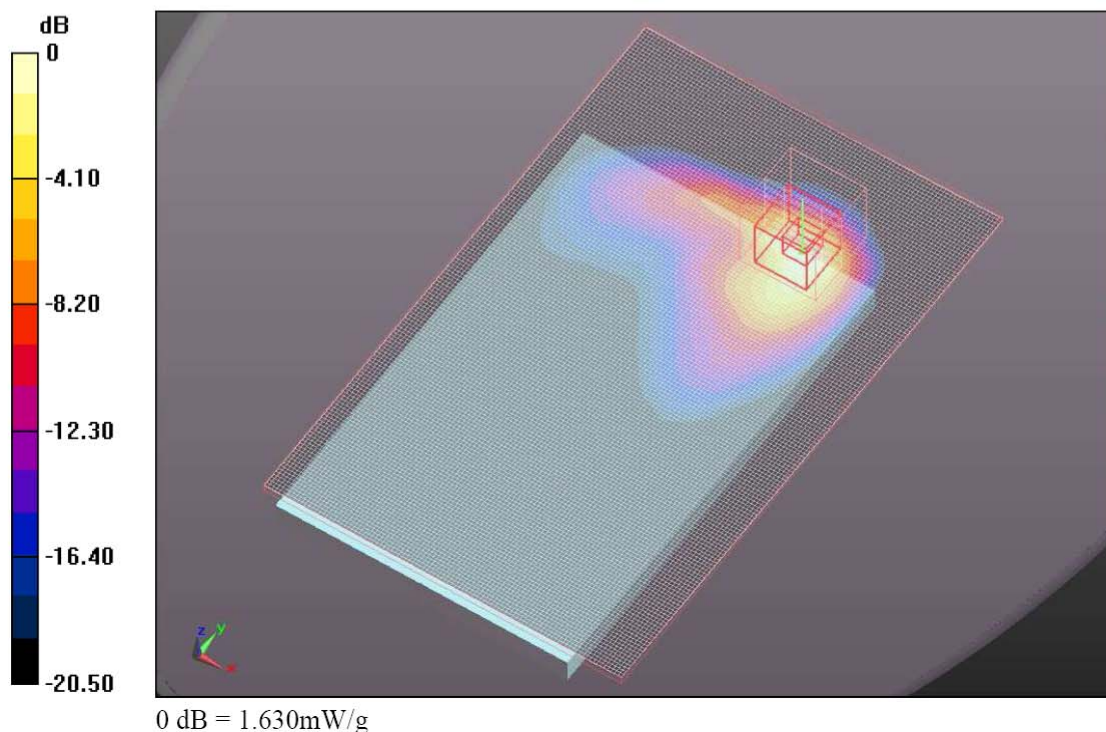
Reference Value = 28.094 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 2.305 W/kg

SAR(1 g) = 1.11 mW/g; SAR(10 g) = 0.530 mW/g

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

Maximum value of SAR (measured) = 1.628 mW/g



Z Plot

Date: 9/20/2011

Test Laboratory: UL CCS SAR Lab C

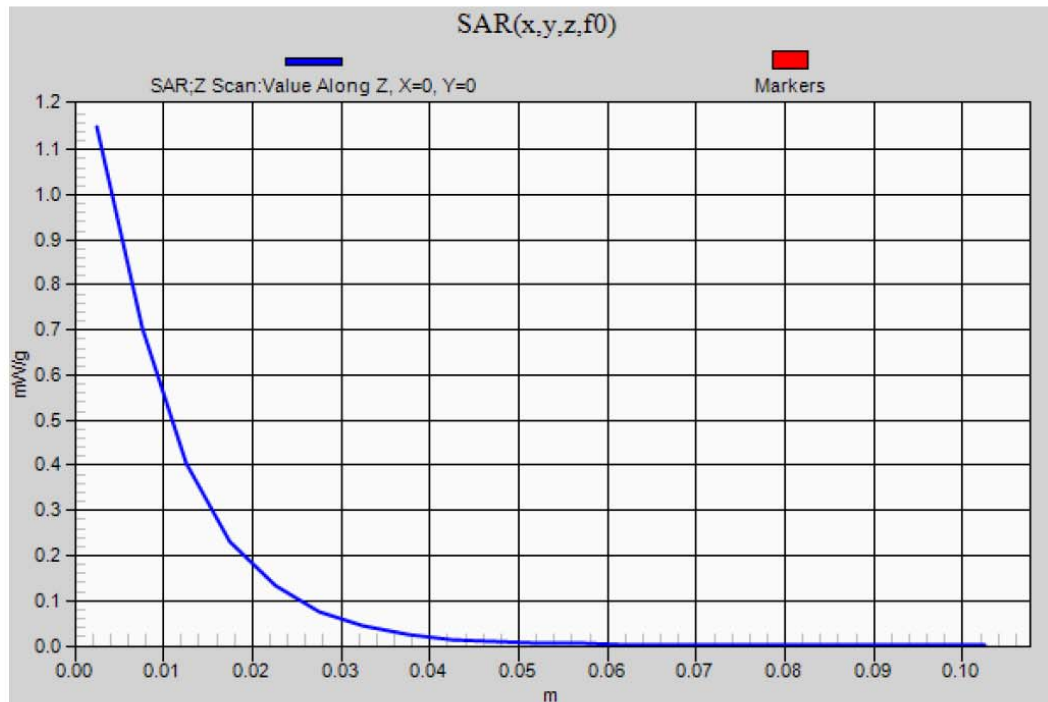
01_WCDMA1700_Band IV

Communication System: UMTS-FDD (WCDMA); Frequency: 1754 MHz; Duty Cycle: 1:1

Bottom Face_0 mm/R99 RMC_H-ch/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

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

Maximum value of SAR (measured) = 1.150 mW/g



WiFi 2.4GHz Plot

Date: 10/6/2011

Test Laboratory: UL CCS SAR Lab A

2.4 GHz Band

Communication System: IEEE 802.11b/g/n 2.4 GHz Band; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2412$ MHz; $\sigma = 1.929$ mho/m; $\epsilon_r = 51.435$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(6.86, 6.86, 6.86); Calibrated: 1/24/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 11/17/2010
- Phantom: ELI v4.0(B); Type: QDOVA001BB; Serial: 1099
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Bottom Face/802.11b_Ch 1/Area Scan (101x151x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.137 mW/g

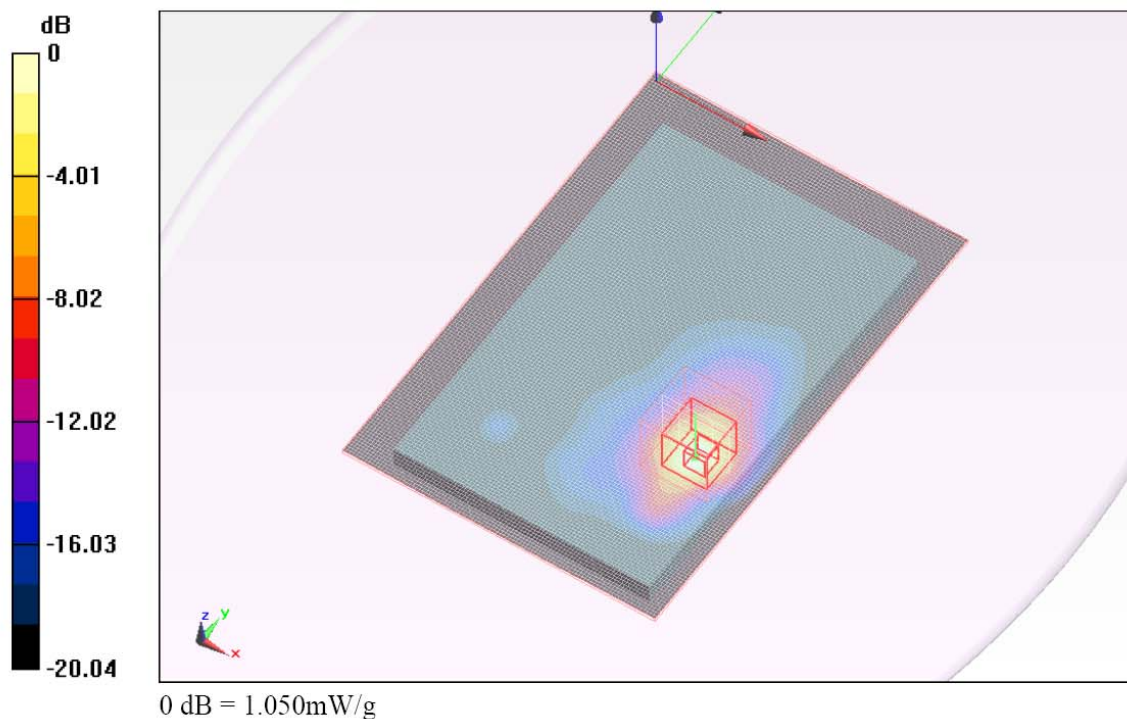
Bottom Face/802.11b_Ch 1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 24.808 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 2.110 W/kg

SAR(1 g) = 0.746 mW/g; SAR(10 g) = 0.297 mW/g

Maximum value of SAR (measured) = 1.053 mW/g



Z Plot

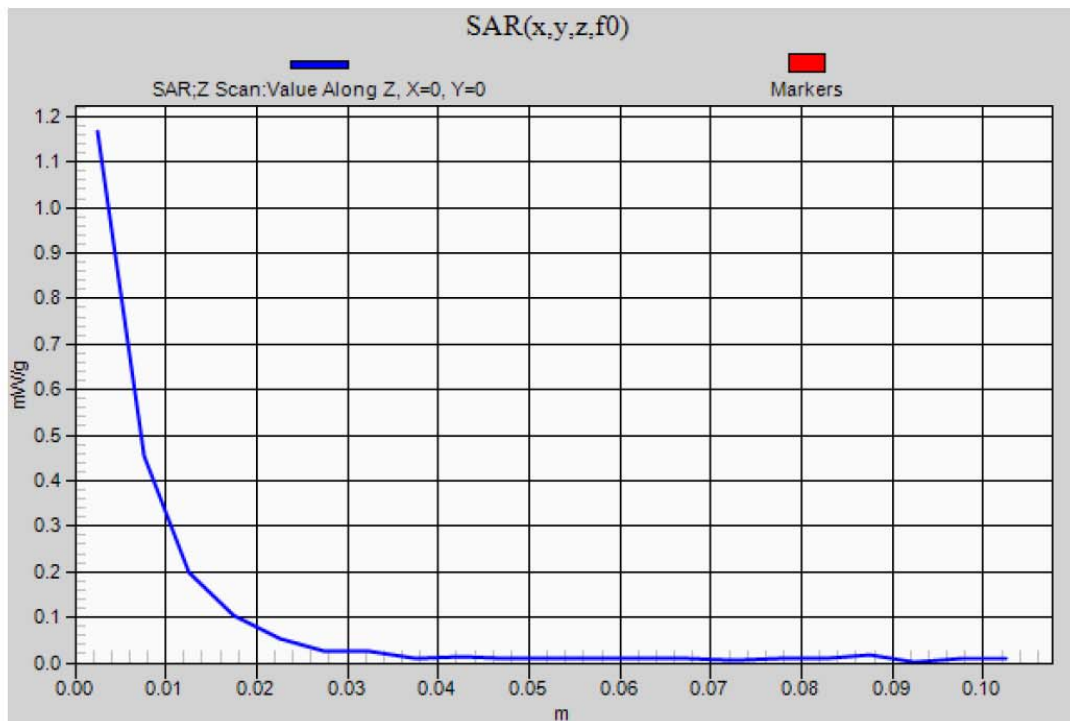
Date: 10/6/2011

Test Laboratory: UL CCS SAR Lab A

2.4 GHz Band

Communication System: IEEE 802.11b/g/n 2.4 GHz Band; Frequency: 2412 MHz; Duty Cycle: 1:1

Bottom Face/802.11b_Ch 1/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 1.167 mW/g



WiFi 5 GHz Plot

Date: 9/29/2011

Test Laboratory: UL CCS SAR Lab A

5GHz Bands

Communication System: WLAN 5GHz; Frequency: 5190 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5190$ MHz; $\sigma = 5.235$ mho/m; $\epsilon_r = 51.621$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

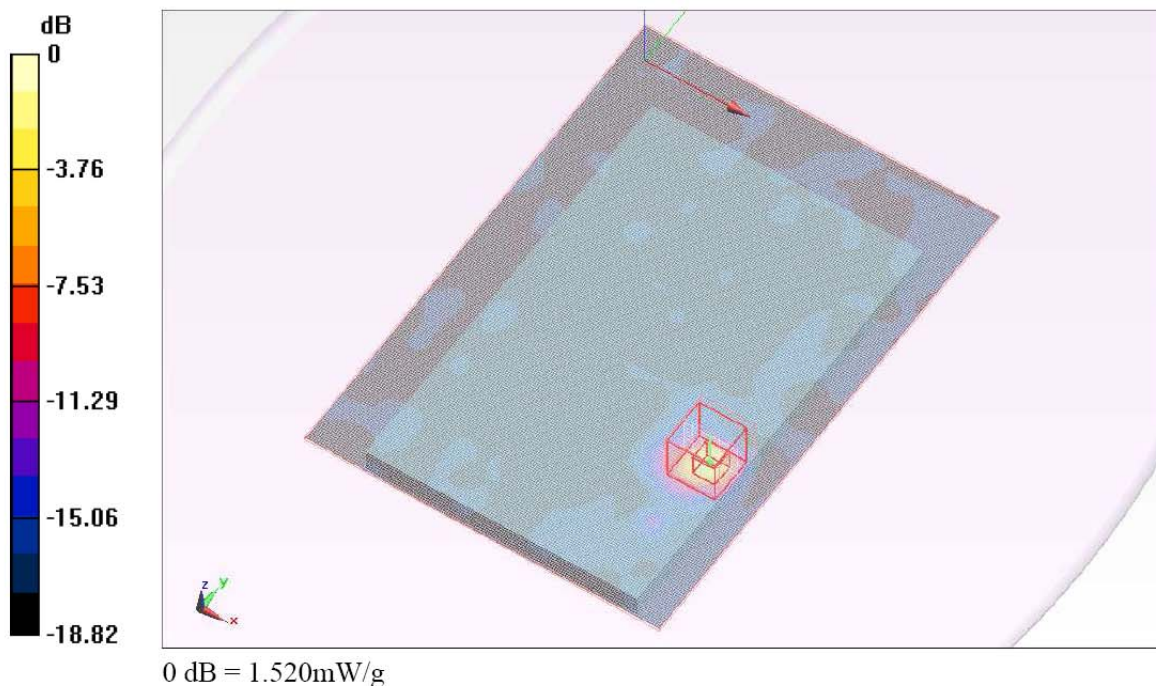
Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(3.98, 3.98, 3.98); Calibrated: 1/24/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 11/17/2010
- Phantom: ELI v4.0(B); Type: QDOVA001BB; Serial: 1099
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Bottom Face/5.2GHz_802.11n HT40/Ch 38/Area Scan (161x231x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.875 mW/g

Bottom Face /5.2GHz_802.11n HT40/Ch 38/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm
Reference Value = 11.818 V/m; Power Drift = -0.16 dB
Peak SAR (extrapolated) = 3.523 W/kg
SAR(1 g) = 0.729 mW/g; SAR(10 g) = 0.171 mW/g
Maximum value of SAR (measured) = 1.521 mW/g



Z Plot

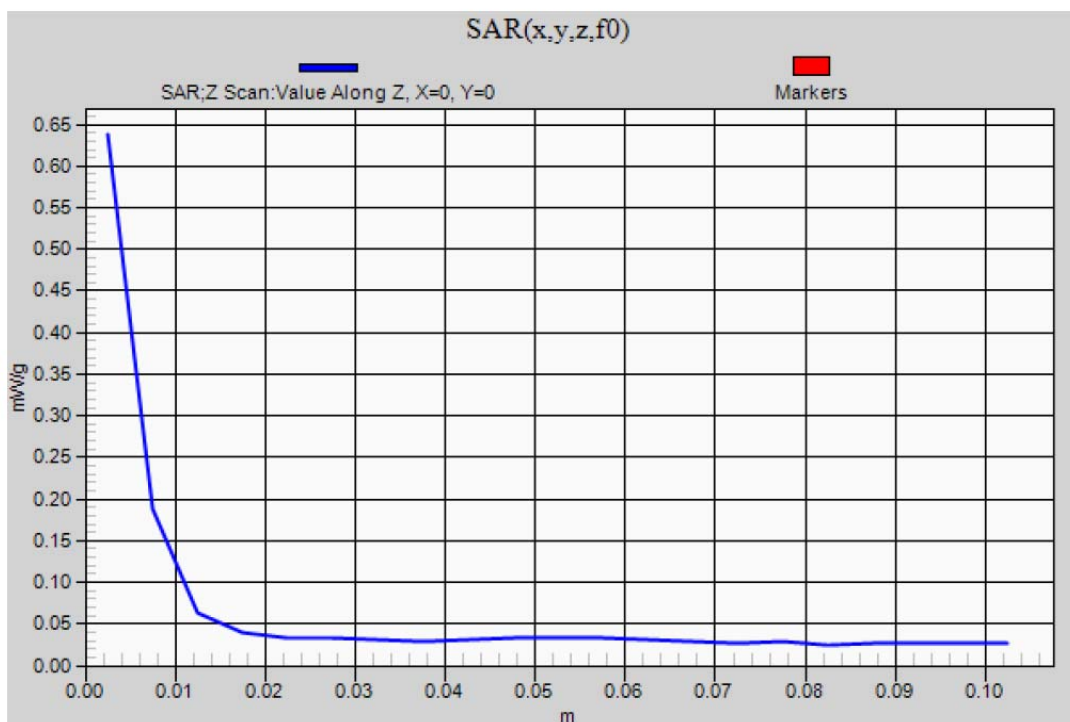
Date: 9/29/2011

Test Laboratory: UL CCS SAR Lab A

5GHz Bands

Communication System: WLAN 5GHz; Frequency: 5190 MHz; Duty Cycle: 1:1

Bottom Face /5.2GHz_802.11n HT40/Ch 38/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.638 mW/g



WiFi 5.3 GHz Plot

Date: 9/29/2011

Test Laboratory: UL CCS SAR Lab A

5GHz Bands

Communication System: WLAN 5GHz; Frequency: 5310 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5310$ MHz; $\sigma = 5.404$ mho/m; $\epsilon_r = 51.407$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(3.7, 3.7, 3.7); Calibrated: 1/24/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 11/17/2010
- Phantom: ELI v4.0(B); Type: QDOVA001BB; Serial: 1099
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Bottom Face/5.3GHz_802.11n HT40/Ch 62/Area Scan (161x231x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.849 mW/g

Bottom Face/5.3GHz_802.11n HT40/Ch 62/Zoom Scan (7x7x9)/Cube 0: Measurement grid:

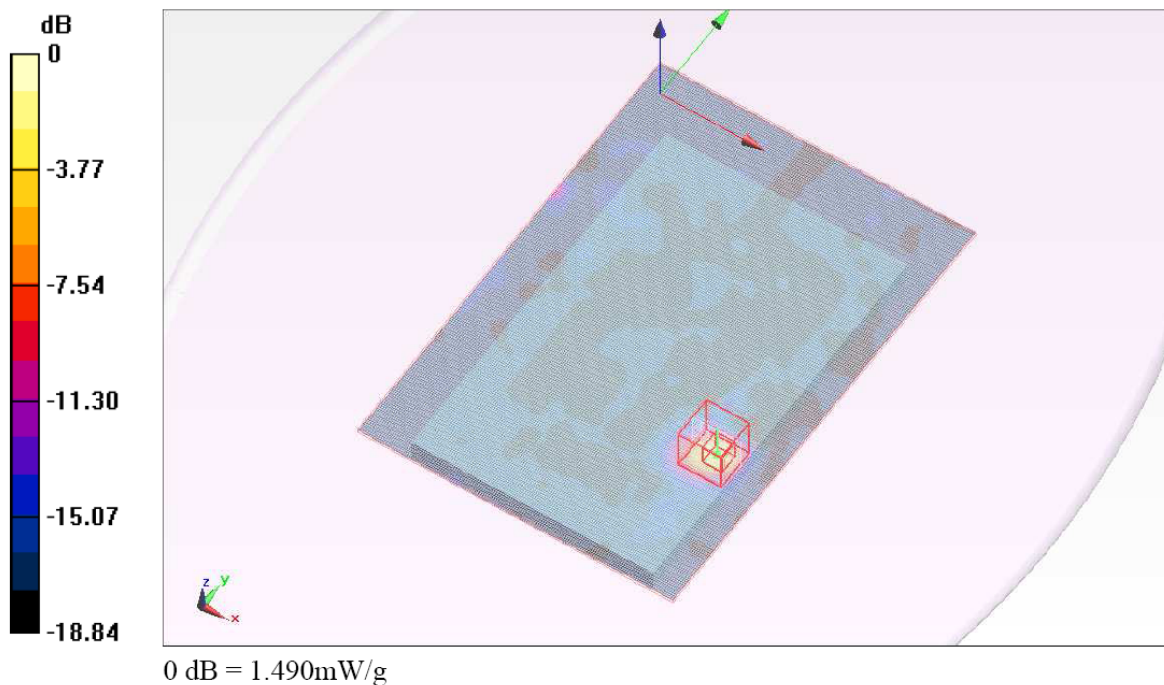
dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 11.930 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 3.593 W/kg

SAR(1 g) = 0.726 mW/g; SAR(10 g) = 0.178 mW/g

Maximum value of SAR (measured) = 1.490 mW/g



Z Plot

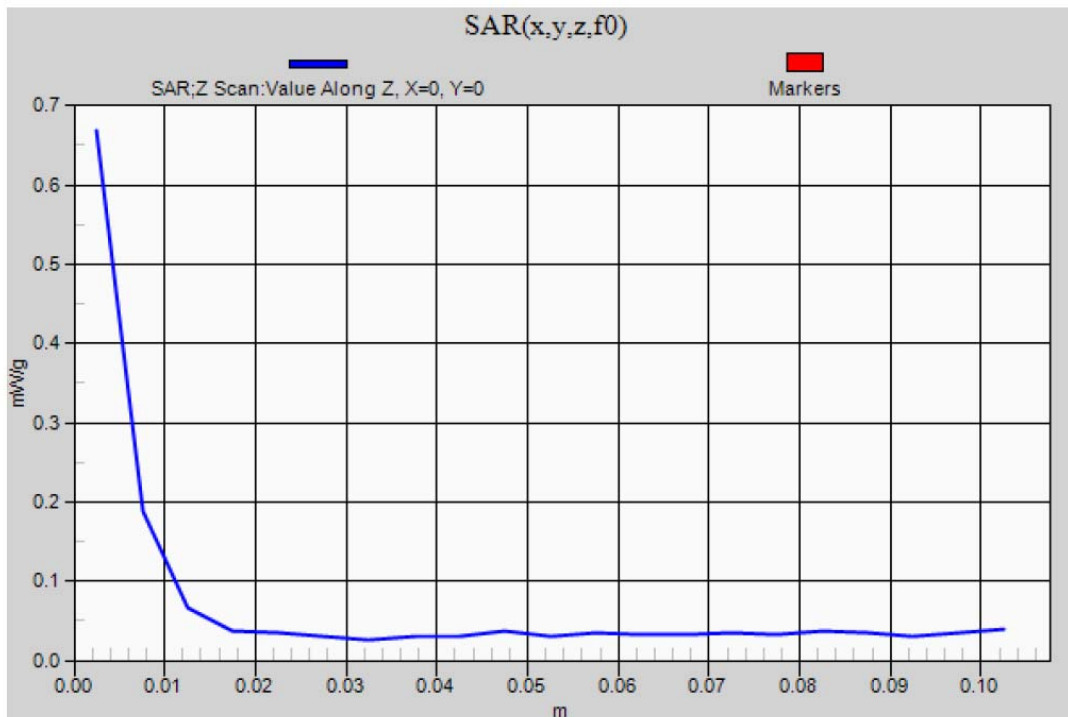
Date: 9/30/2011

Test Laboratory: UL CCS SAR Lab A

5GHz Bands

Communication System: WLAN 5GHz; Frequency: 5310 MHz; Duty Cycle: 1:1

Bottom Face/5.3GHz_802.11n HT40/Ch 62/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.668 mW/g



WiFi 5.5 GHz Plot

Date: 9/30/2011

Test Laboratory: UL CCS SAR Lab A

5GHz Bands

Communication System: WLAN 5GHz; Frequency: 5670 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5670$ MHz; $\sigma = 5.948$ mho/m; $\epsilon_r = 50.796$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(3.29, 3.29, 3.29); Calibrated: 1/24/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 11/17/2010
- Phantom: ELI v4.0(B); Type: QDOVA001BB; Serial: 1099
- Measurement SW: DASY52, Version 52.6 (2);SEMCAD X Version 14.4.5 (3634)

Bottom Face/5.5GHz_802.11n HT40/Ch 134/Area Scan (161x231x1): Measurement grid:

dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 1.039 mW/g

Bottom Face/5.5GHz_802.11n HT40/Ch 134/Zoom Scan (7x7x9)/Cube 0: Measurement grid:

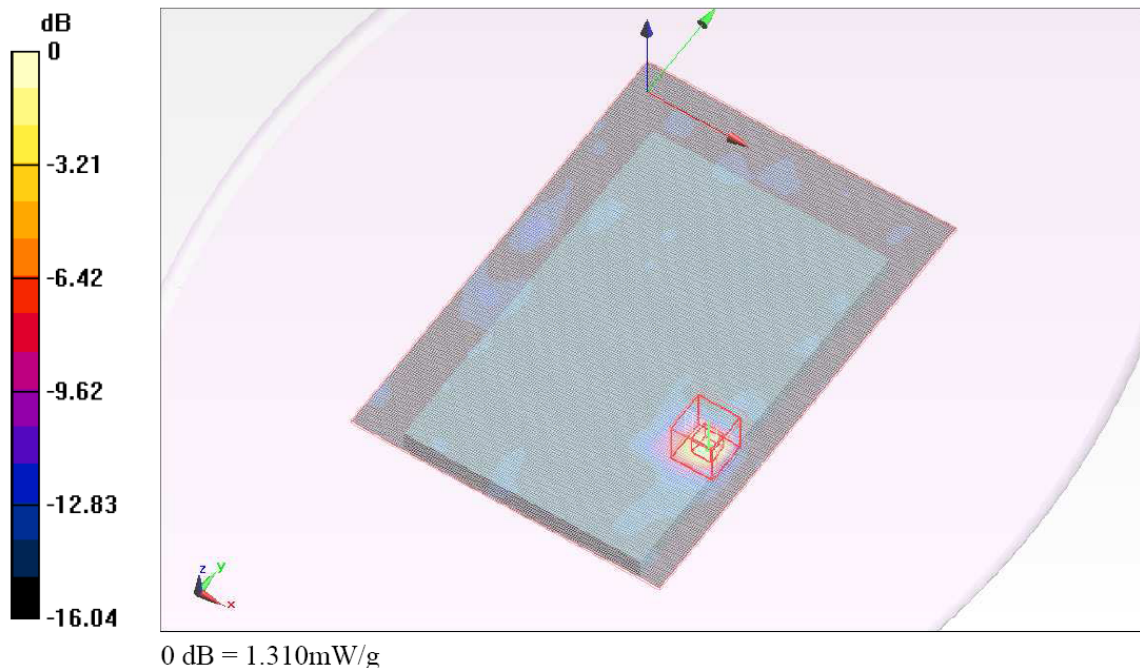
dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 10.556 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 3.159 W/kg

SAR(1 g) = 0.648 mW/g; SAR(10 g) = 0.175 mW/g

Maximum value of SAR (measured) = 1.313 mW/g



Z Plot

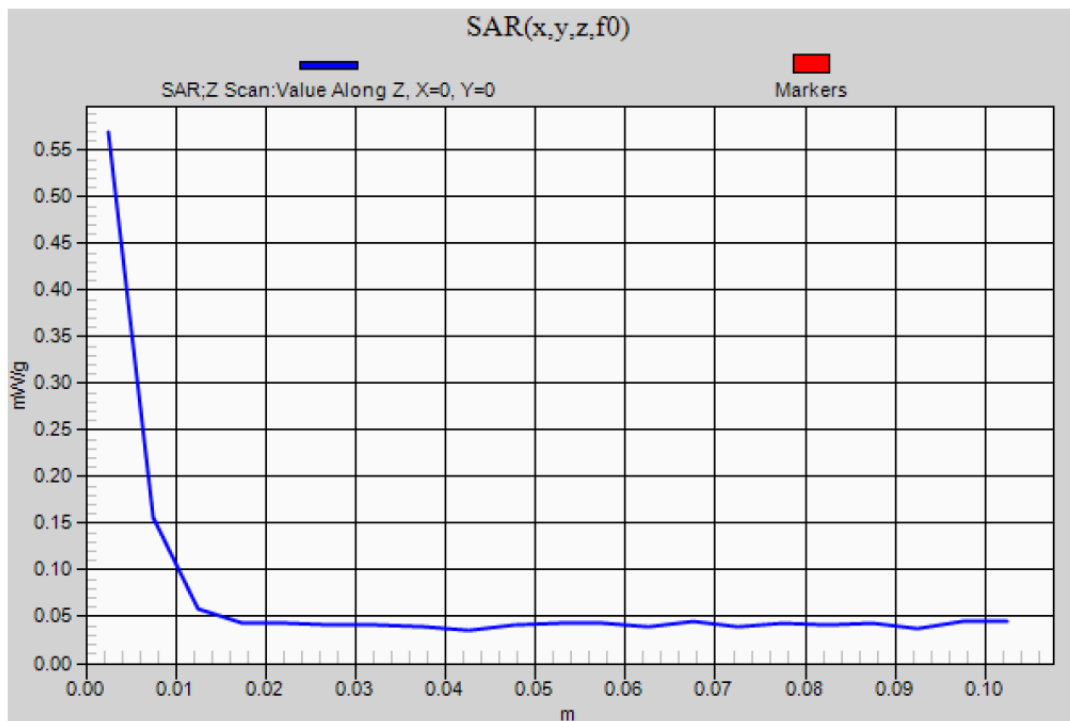
Date: 9/30/2011

Test Laboratory: UL CCS SAR Lab A

5GHz Bands

Communication System: WLAN 5GHz; Frequency: 5670 MHz; Duty Cycle: 1:1

Bottom Face/5.5GHz_802.11n HT40/Ch 134/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.570 mW/g



WiFi 5.8 GHz Plot

Date: 9/30/2011

Test Laboratory: UL CCS SAR Lab A

5GHz Bands

Communication System: WLAN 5GHz; Frequency: 5755 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5755$ MHz; $\sigma = 6.082$ mho/m; $\epsilon_r = 50.641$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

DASY5 Configuration:

- Area Scan setting - Find Secondary Maximum Within: 2.0 dB and with a peak SAR value greater than 0.0012W/kg
- Probe: EX3DV4 - SN3686; ConvF(3.7, 3.7, 3.7); Calibrated: 1/24/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 11/17/2010
- Phantom: ELI v4.0(B); Type: QDOVA001BB; Serial: 1099
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Bottom Face/5.8GHz_802.11n HT40/Ch 151/Area Scan (161x231x1): Measurement grid:

dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.788 mW/g

Bottom Face/5.8GHz_802.11n HT40/Ch 151/Zoom Scan (7x7x9)/Cube 0: Measurement grid:

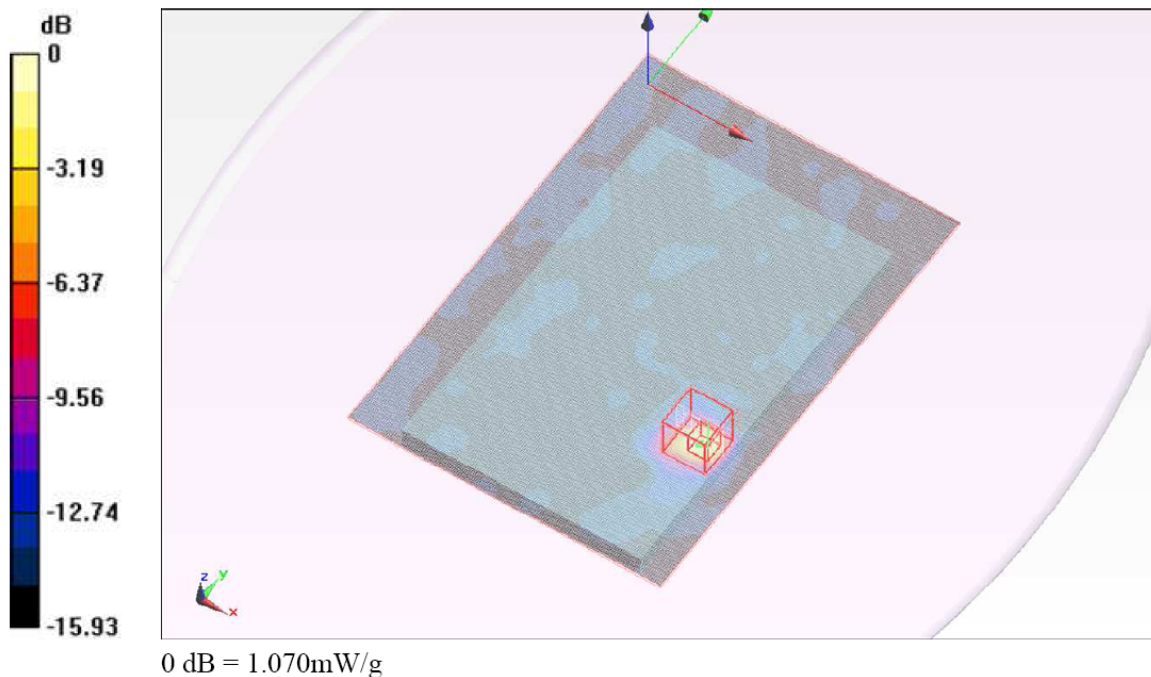
dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 11.855 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 3.206 W/kg

SAR(1 g) = 0.592 mW/g; SAR(10 g) = 0.164 mW/g

Maximum value of SAR (measured) = 1.069 mW/g



17. Simultaneous Transmission SAR Analysis

17.1. Body-worn & -hotspot exposure condition (3G + WiFi 2.4 GHz)

Test Position	(1) GSM850	(2) GSM1900	(3) UMTS (WCDMA) Band IV	(4) UMTS (WCDMA) Band II	(5) WiFi 2.4G	Sum of 1g SAR (mW/g)
Rear/Base	0.805				0.746	1.551
		0.654			0.746	1.400
			1.11		0.746	1.856
				1.140	0.746	1.886
Top/Sec. Landscape	0.871				0.000	0.871
		0.694			0.000	0.694
			1.04		0.000	1.040
				1.100	0.000	1.100
Left/Sec. Portrait	0.714				0.127	0.841
		0.308			0.127	0.435
			0.447		0.127	0.574
				0.371	0.127	0.498
Front	0.522				0.019	0.541
		0.511			0.019	0.530
			0.691		0.019	0.710
				0.580	0.019	0.599

SAR to Peak Location Separation Ratio (SPLSR)

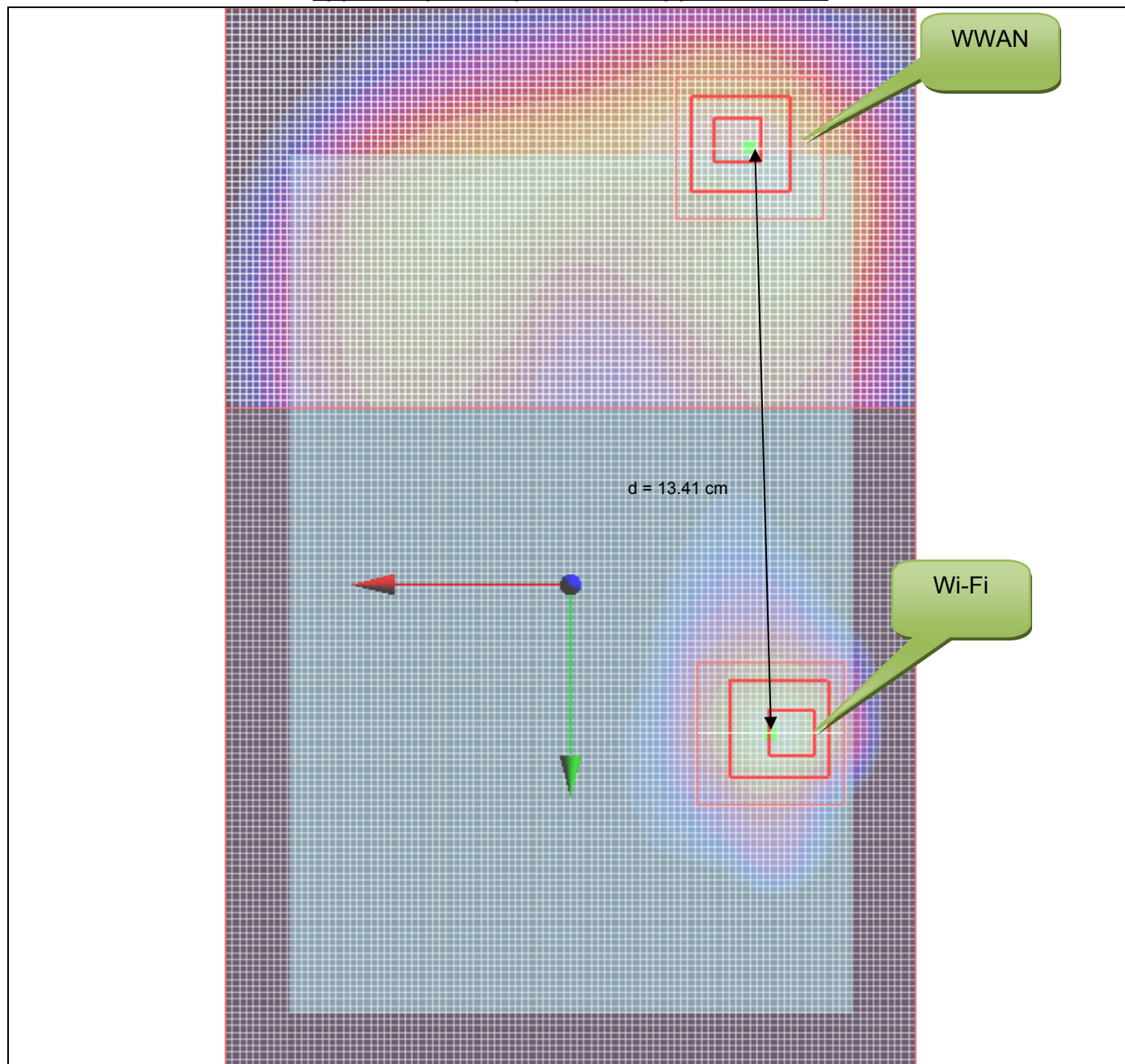
Test Position	Worst-case combination			Σ 1-g SAR (mW/g)	3D distance (cm)	SPLSR
	(3) UMTS (WCDMA) Band IV	(4) UMTS (WCDMA) Band II	(5) WiFi 2.4G			
Base	1.11		0.746	1.856	13.41	0.138
		1.14	0.746	1.886	13.39	0.141

Conclusions:

Simultaneous transmission SAR is not required because the SAR to peak location separation ratios is < 0.3.

SAR to Peak Location Separation Ratio (SPLSR)

"(3) UMTS (WCDMA) Band IV" to "(5) WiFi 2.4GHz"



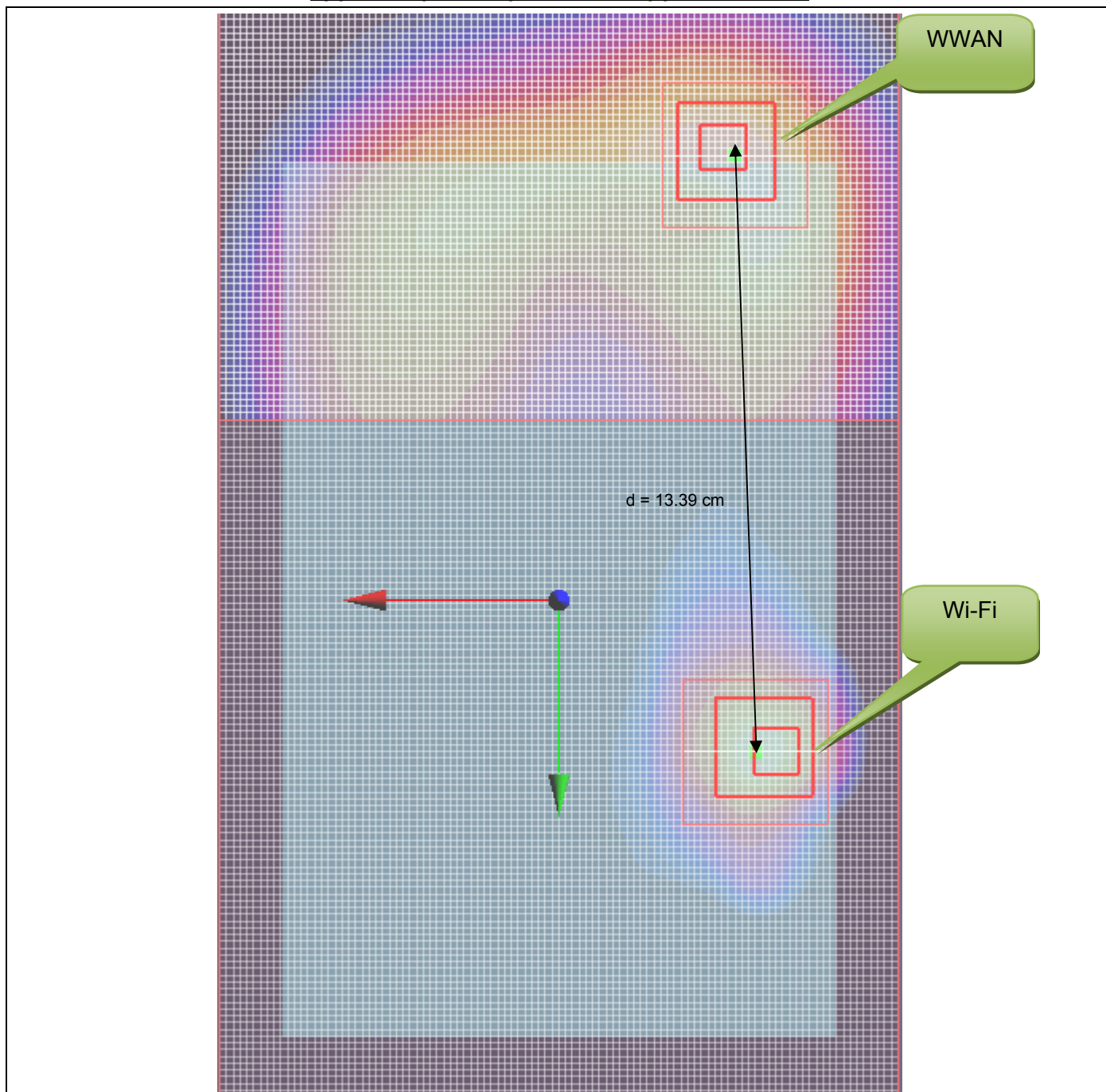
UMTS (WCDMA) Band IV
WiFi 2.4GHz
m cm

Value of SAR	X	Y	Z
mW/g	m	m	m
1.19	-0.0359	-0.1	-0.184
1.77	-0.0483	0.0335	-0.185

Separation distance (d) =	0.1341	13.41	
	SQRT((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)		

SAR to Peak Location Separation Ratio (SPLSR)

"(4) UMTS (WCDMA) Band II" to "(5) WiFi 2.4GHz"



UMTS (WCDMA) Band II
WiFi 2.4GHz
m
cm

Value of SAR mW/g	X m	Y m	Z m
1.52	-0.0374	-0.1	-0.184
1.77	-0.0483	0.0335	-0.185

Separation distance (d) =

0.1339

13.39

$$\text{SQRT}((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)$$

17.2. Body exposure condition (3G + WiFi 5 GHz)

Test Position	(1) GSM850	(2) GSM1900	(3) UMTS (WCDMA) Band IV	(4) UMTS (WCDMA) Band II	(5) WiFi 5.2GHz	(6) WiFi 5.3GHz	(7) WiFi 5.5GHz	(8) WiFi 5.8GHz	Sum of 1g SAR (mW/g)
Rear/Base	0.805				0.729				1.534
		0.654			0.729				1.383
			1.11		0.729				1.839
				1.140	0.729				1.869
	0.805					0.726			1.531
		0.654				0.726			1.380
			1.11			0.726			1.836
				1.140		0.726			1.866
	0.805						0.648		1.453
		0.654					0.648		1.302
			1.11				0.648		1.758
				1.140			0.648		1.788
	0.805							0.592	1.397
		0.654						0.592	1.246
			1.11					0.592	1.702
				1.140				0.592	1.732
Top/Sec. Landscape	0.871				0.000				0.871
		0.694			0.000				0.694
			1.04		0.000				1.040
				1.100	0.000				1.100
	0.871					0.000			0.871
		0.694				0.000			0.694
			1.04			0.000			1.040
				1.100		0.000			1.100
	0.871						0.000		0.871
		0.694					0.000		0.694
			1.04				0.000		1.040
				1.100			0.000		1.100
	0.871							0.000	0.871
		0.694						0.000	0.694
			1.04					0.000	1.040
				1.100				0.000	1.100

Body exposure condition (3G + WiFi 5 GHz)
(continued)

Test Position	(1) GSM850	(2) GSM1900	(3) UMTS (WCDMA) Band IV	(4) UMTS (WCDMA) Band II	(5) WiFi 5.2GHz	(6) WiFi 5.3GHz	(7) WiFi 5.5GHz	(8) WiFi 5.8GHz	Sum of 1g SAR (mW/g)
Left/ Sec. Portrait	0.714				0.210				0.924
		0.308			0.210				0.518
			0.447		0.210				0.657
				0.371	0.210				0.581
	0.714					0.226			0.940
		0.308				0.226			0.534
			0.447			0.226			0.673
				0.371		0.226			0.597
	0.714						0.336		1.050
		0.308					0.336		0.644
			0.447				0.336		0.783
				0.371			0.336		0.707
	0.714							0.347	1.061
		0.308						0.347	0.655
			0.447					0.347	0.794
Front				0.371				0.347	0.718
	0.522				0.000				0.522
		0.511			0.000				0.511
			0.691		0.000				0.691
				0.580	0.000				0.580
	0.522					0.000			0.522
		0.511				0.000			0.511
			0.691			0.000			0.691
				0.580		0.000			0.580
	0.522						0.000		0.522
		0.511					0.000		0.511
			0.691				0.000		0.691
				0.580			0.000		0.580
	0.522							0.000	0.522
		0.511						0.000	0.511
			0.691					0.000	0.691
				0.580				0.000	0.580

SAR to Peak Location Separation Ratio (SPLSR)

5.2GHz

Test Position	Worst-case combination			Σ 1-g SAR (mW/g)	3D distance (cm)	SPLSR
	(3) UMTS (WCDMA) Band IV	(4) UMTS (WCDMA) Band II	(5) WiFi 5.2GHz			
Rear/Base	1.11		0.729	1.839	13.09	0.140
		1.14	0.729	1.869	13.07	0.143

5.3GHz

Test Position	Worst-case combination			Σ 1-g SAR (mW/g)	3D distance (cm)	SPLSR
	(3) UMTS (WCDMA) Band IV	(4) UMTS (WCDMA) Band II	(6) WiFi 5.3GHz			
Rear/Base	1.11		0.726	1.836	12.92	0.142
		1.14	0.726	1.866	12.91	0.145

5.5GHz

Test Position	Worst-case combination			Σ 1-g SAR (mW/g)	3D distance (cm)	SPLSR
	(3) UMTS (WCDMA) Band IV	(4) UMTS (WCDMA) Band II	(7) WiFi 5.5GHz			
Rear/Base	1.11		0.648	1.758	12.74	0.138
		1.14	0.648	1.788	12.71	0.141

5.8GHz

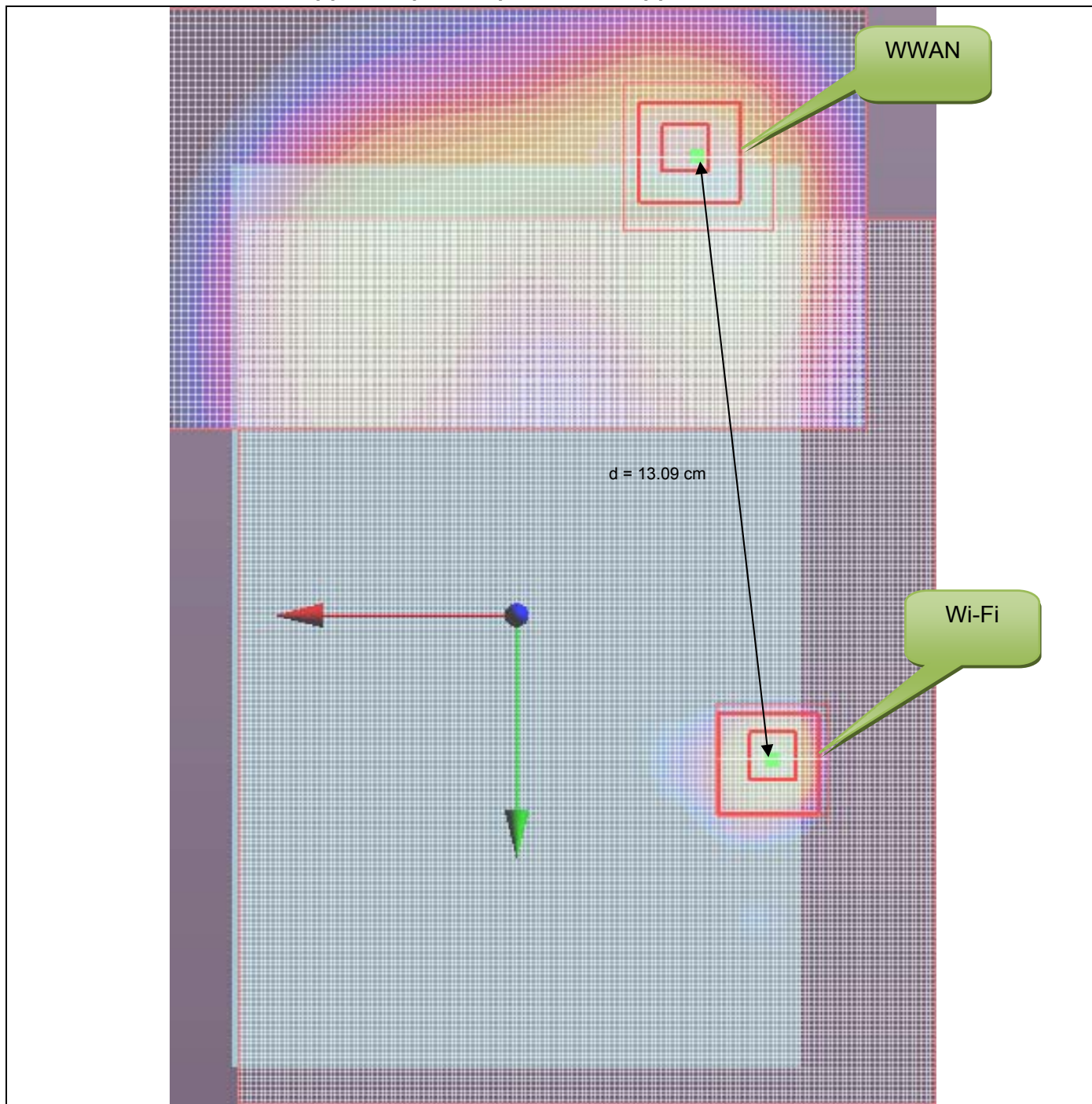
Test Position	Worst-case combination			Σ 1-g SAR (mW/g)	3D distance (cm)	SPLSR
	(3) UMTS (WCDMA) Band IV	(4) UMTS (WCDMA) Band II	(8) WiFi 5.8 GHz			
Rear/Base	1.11		0.592	1.702	12.87	0.132
		1.14	0.592	1.732	12.85	0.135

Conclusions:

Simultaneous transmission SAR is not required because the SAR to peak location separation ratios is < 0.3.

SAR to Peak Location Separation Ratio (SPLSR)

"(3) UMTS (WCDMA) Band IV" to "(5) WiFi 5.2GHz"



UMTS (WCDMA) Band IV
WiFi 5.2GHz
m
cm

Value of SAR mW/g	X m	Y m	Z m
1.19	-0.0359	-0.1	-0.184
2.36	-0.0558	0.0294	-0.184

Separation distance (d) =

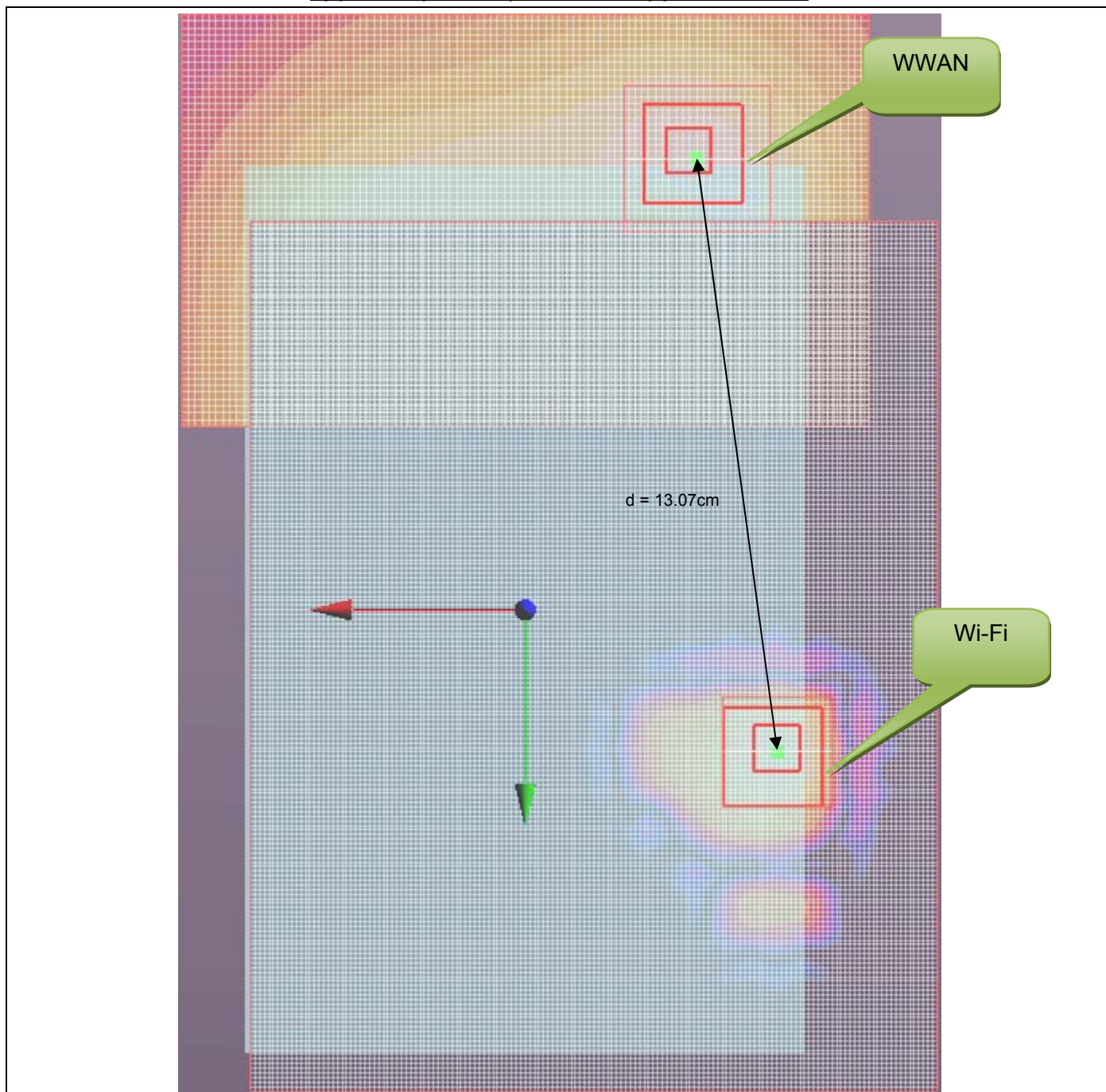
0.1309

13.09

$$\text{SQRT}((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)$$

SAR to Peak Location Separation Ratio (SPLSR)

"(4) UMTS (WCDMA) Band II" to "(5) WiFi 5.2GHz"



UMTS (WCDMA) Band II
WiFi 5.2GHz
m cm

Value of SAR	X	Y	Z
mW/g	m	m	m
1.52	-0.0374	-0.1	-0.184
2.36	-0.0558	0.0294	-0.184

Separation distance (d) =

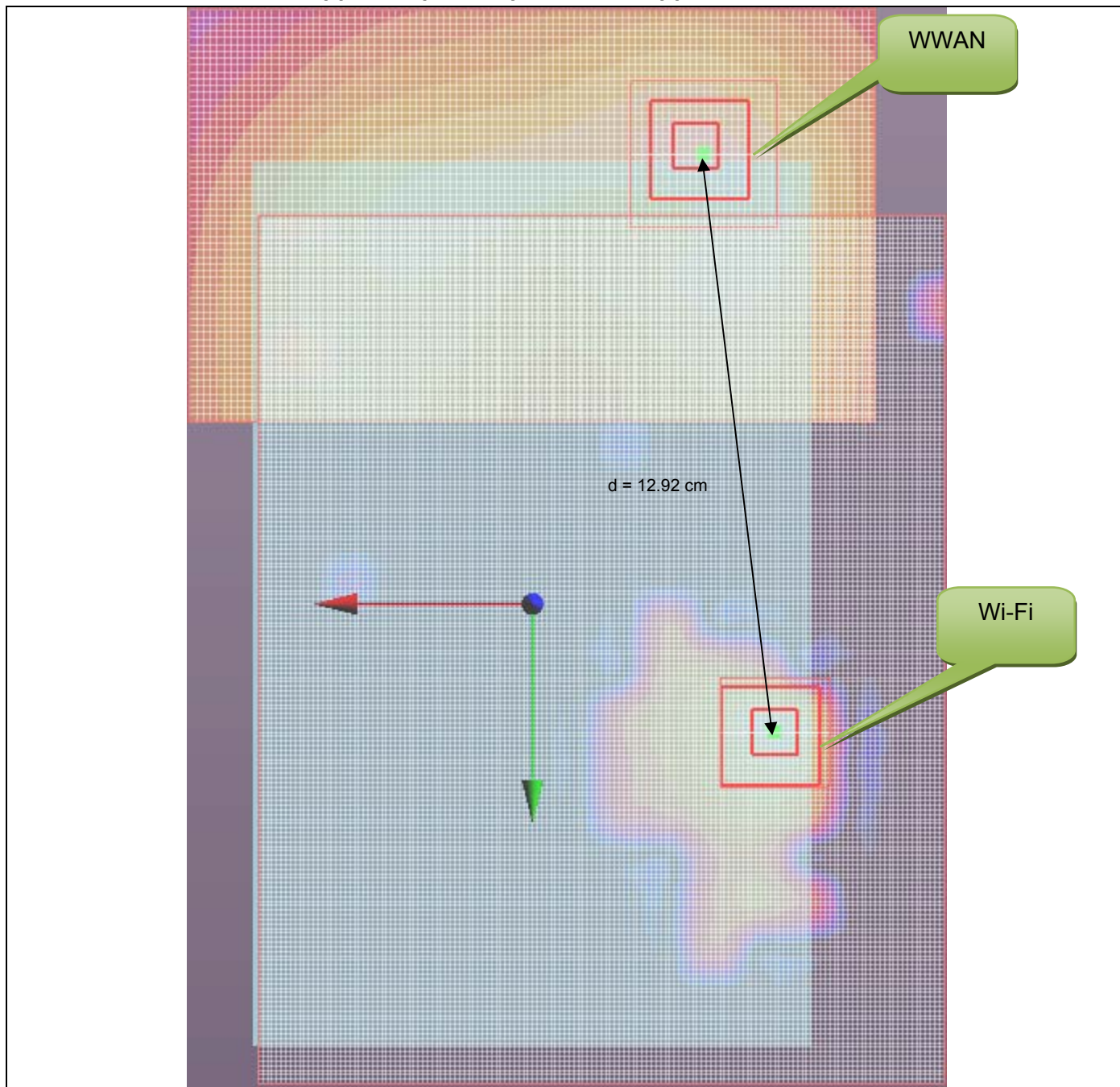
0.1307

13.07

$$\text{SQRT}((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)$$

SAR to Peak Location Separation Ratio (SPLSR)

"(3) UMTS (WCDMA) Band IV" to "(6) WiFi 5.3GHz"



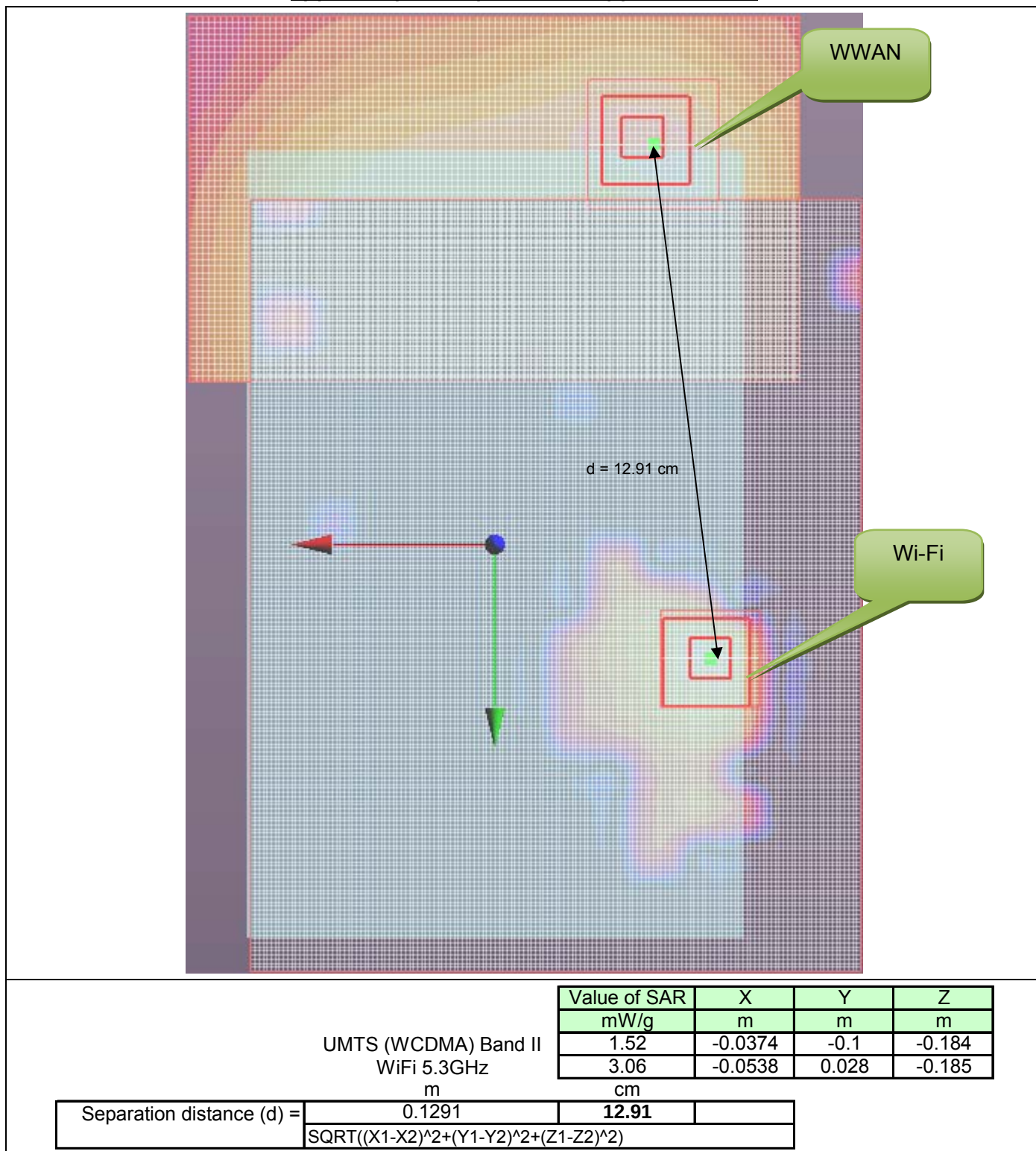
UMTS (WCDMA) Band IV
WiFi 5.3GHz
m

Value of SAR	X	Y	Z
mW/g	m	m	m
1.19	-0.0359	-0.1	-0.184
3.06	-0.0538	0.028	-0.185

Separation distance (d) =	0.1292	12.92	
	SQRT((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)		

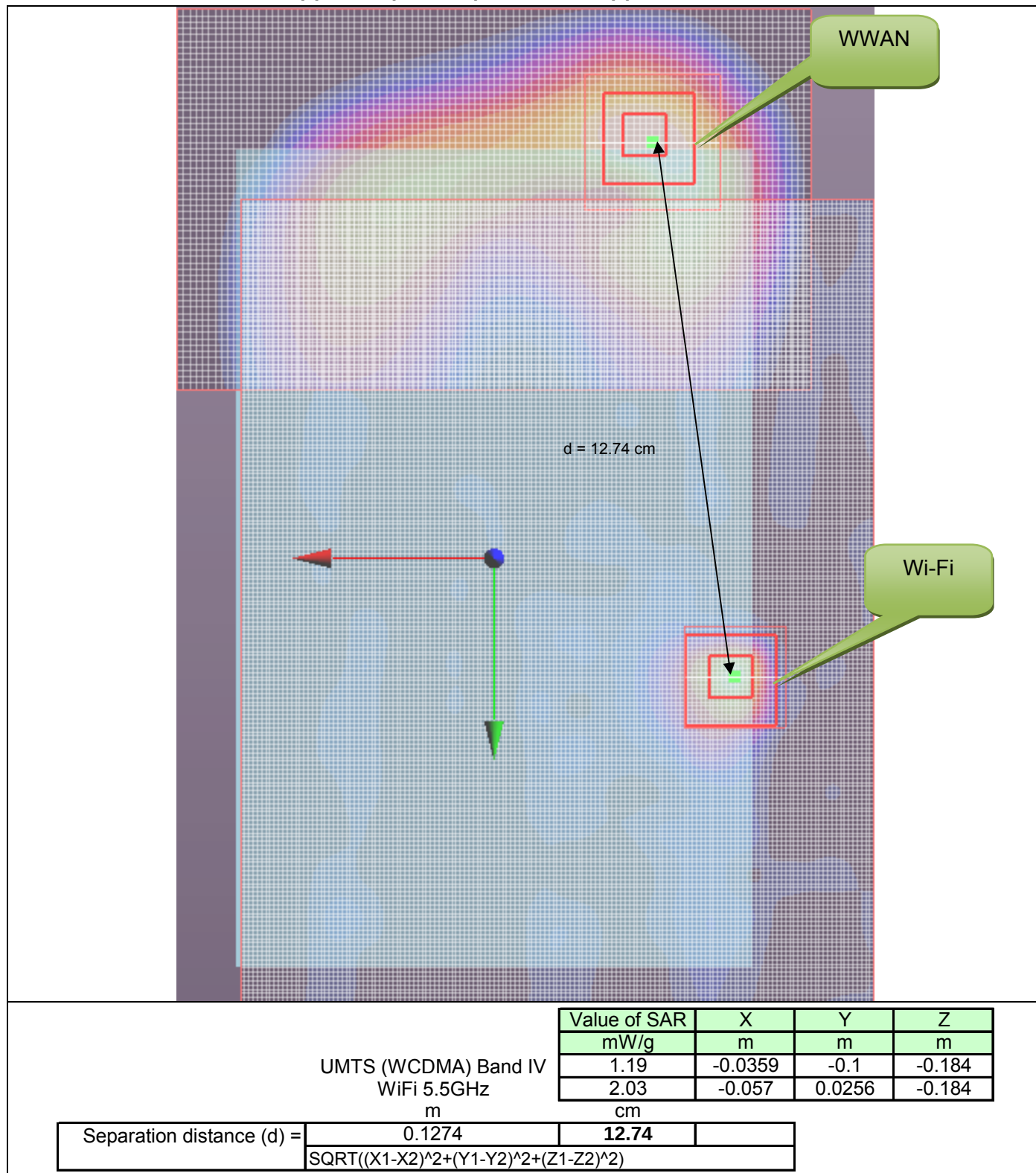
SAR to Peak Location Separation Ratio (SPLSR)

"(4) UMTS (WCDMA) Band II" to "(6) WiFi 5.3GHz"



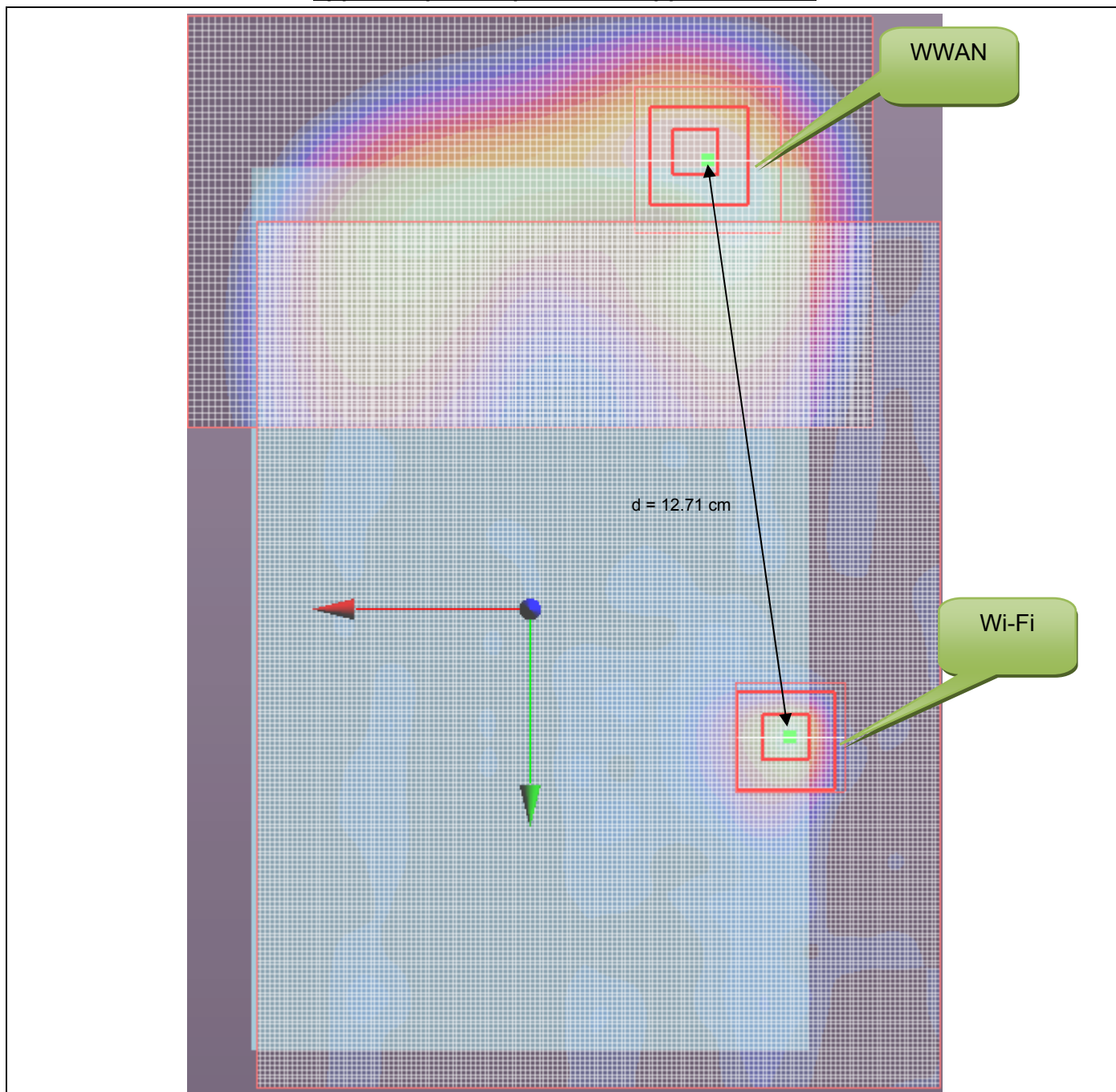
SAR to Peak Location Separation Ratio (SPLSR)

"(3) UMTS (WCDMA) Band IV" to "(7) WiFi 5.5GHz"



SAR to Peak Location Separation Ratio (SPLSR)

"(4) UMTS (WCDMA) Band II" to "(7) WiFi 5.5GHz"



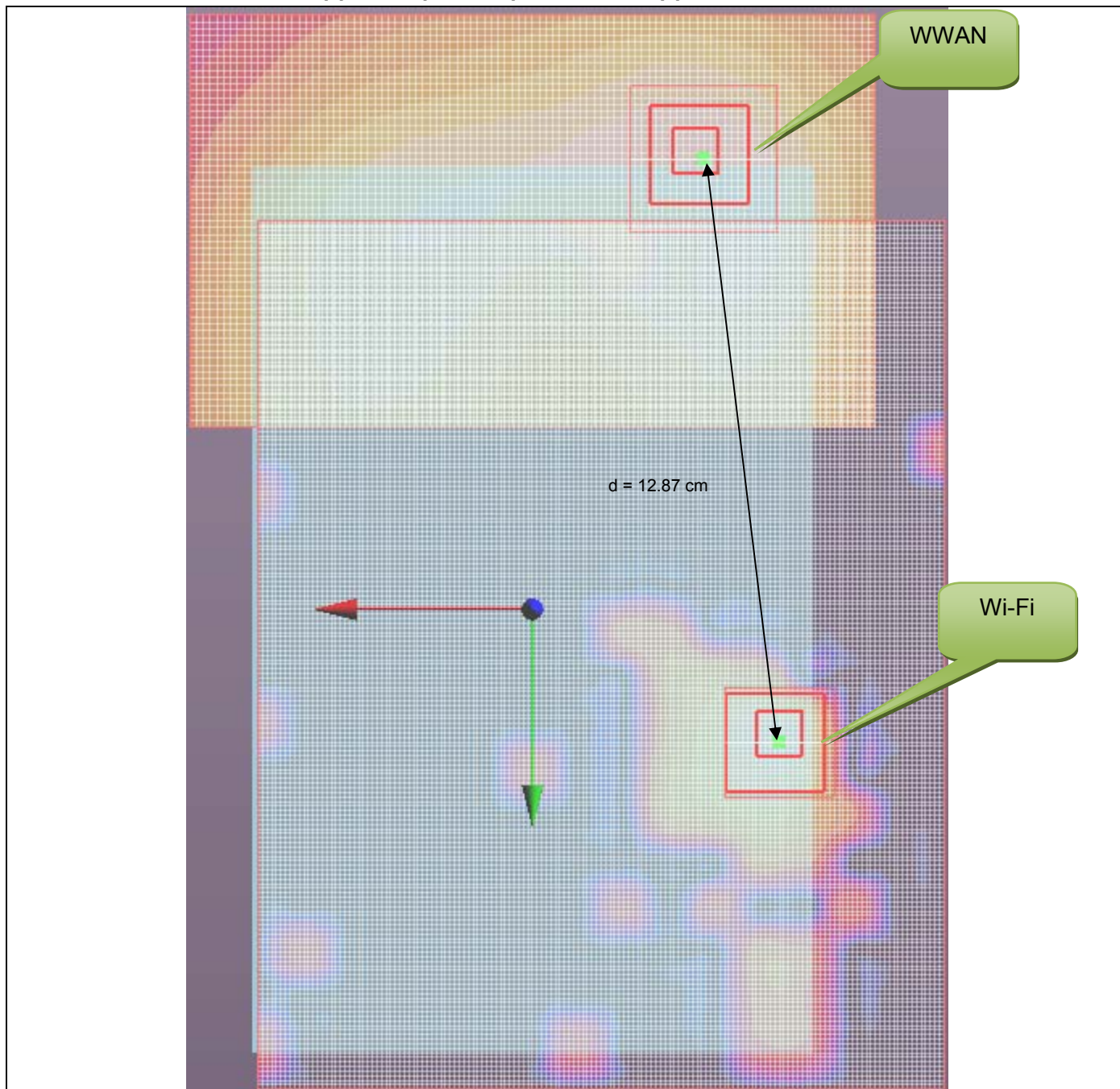
UMTS (WCDMA) Band II
WiFi 5.5GHz
m

Value of SAR	X	Y	Z
mW/g	m	m	m
1.52	-0.0374	-0.1	-0.184
2.03	-0.057	0.0256	-0.184

Separation distance (d) =	0.1271	12.71	
	SQRT((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)		

SAR to Peak Location Separation Ratio (SPLSR)

"(3) UMTS (WCDMA) Band IV" to "(8) WiFi 5.8GHz"



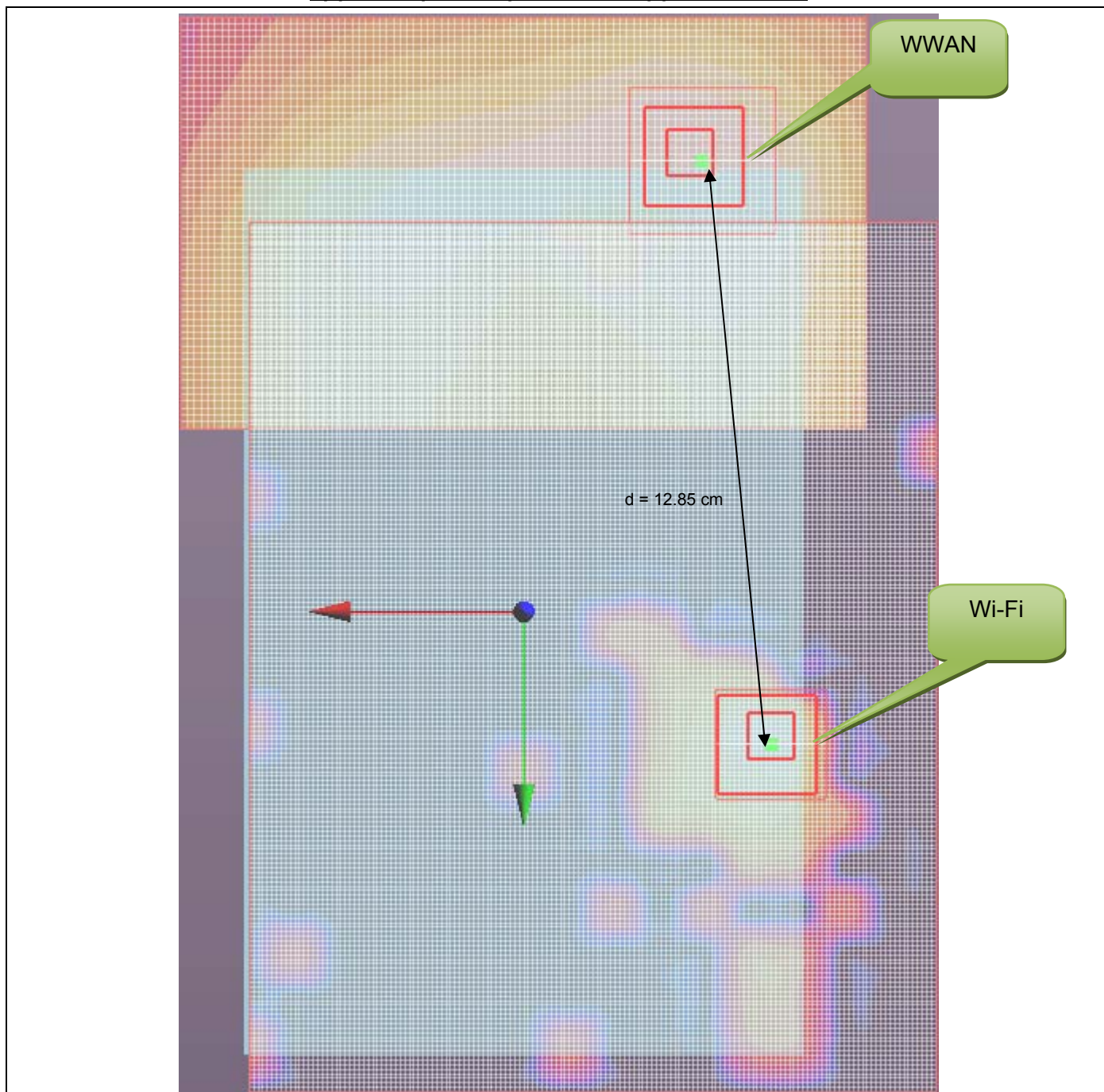
UMTS (WCDMA) Band IV
WiFi 5.8GHz
m

Value of SAR	X	Y	Z
mW/g	m	m	m
1.19	-0.0359	-0.1	-0.184
1.77	-0.054	0.0274	-0.184

Separation distance (d) =	0.1287	12.87	
$\text{SQRT}((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)$			

SAR to Peak Location Separation Ratio (SPLSR)

"(4) UMTS (WCDMA) Band II" to "(8) WiFi 5.8GHz"



UMTS (WCDMA) Band II
WiFi 5.8GHz
m cm

Value of SAR	X	Y	Z
mW/g	m	m	m
1.52	-0.0374	-0.1	-0.184
1.77	-0.054	0.0274	-0.184

Separation distance (d) =	0.1285	12.85	
	$\text{SQRT}((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)$		

18. Appendixes

Refer to separated files for the following appendixes.

- 18.1. Appendix A: System check plots**
- 18.2. Appendix B: SAR test plots for GSM850**
- 18.3. Appendix C: SAR test plots for GSM1900**
- 18.4. Appendix D: SAR test plots for UMTS band II**
- 18.5. Appendix E: SAR test plots for UMTS band IV**
- 18.6. Appendix F: SAR test plots for WiFi 2.4GHz**
- 18.7. Appendix G: SAR test plots for WiFi 5GHz**
- 18.8. Appendix H: Calibration certificate for E-Field Probe EX3DV4 SN 3772**
- 18.9. Appendix I: Calibration certificate for E-Field Probe EX3DV4 SN 3686**
- 18.10. Appendix J: Calibration Certificate for D835V2 - SN 4d117**
- 18.11. Appendix K: Calibration Certificate for D1750V2 - SN 1053**
- 18.12. Appendix L: Calibration Certificate for D1750V2 - SN 1050**
- 18.13. Appendix M: Calibration certificate for D1900V2 SN 5d140**
- 18.14. Appendix N: Calibration certificate for D2450V2 SN: 706 with extended cal. data**
- 18.15. Appendix O: Calibration Certificate for D5GHzV2 - SN 1003**