



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

SAR EVALUATION REPORT

For
Cellular/PCS CDMA and LTE Phone with Bluetooth & WLAN

**MODEL: VS840, LG-VS840, LGVS840
FCC ID: ZNFVS840**

**REPORT NUMBER: 11U14141-9A
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Prepared for
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NVLAP LAB CODE 200065-0

Revision History

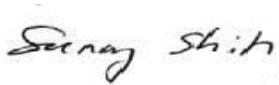
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--	December 9, 2011	Initial Issue	--
A	December 20, 2011	Updated report based on reviewer's comments 1. Sec. 1: Updated the highest SAR value for Simultaneous transmission condition 2. Sec. 5: Updated Accessory information 3. Sec. 5.7: Updated Table Information 4. Sec. 5.8: Added all Simultaneous possible conditions Table 5. Sec. 10.2: Added Target MPR	Bobby Bayani

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1. Attestation of Test Results

Applicant:	LG ELECTRONICS MOBILECOMM U.S.A., INC.		
EUT description:	Cellular/PCS CDMA and LTE Phone with Bluetooth & WLAN		
Model numbers:	VS840, LG-VS840, LGVS840		
Device category:	Portable devices		
Exposure category:	General Population/Uncontrolled Exposure		
Date tested:	November 14 - November 21, 2011		
FCC Rule Parts	Freq. Range [MHz]	Highest 1-g SAR (W/kg)	Limit (W/kg)
22	824-849	Head: 0.87 W/kg (Right Touch) Body: 0.89 W/kg (Rear w/ 10mm distance) Hotspot: 0.90 W/kg (Rear w/ 10mm distance)	1.6
24	1850-1910	Head: 1.14 W/kg (Right Touch) Body: 1.17 W/kg (Rear w/ 10 mm distance) Hotspot: 0.59 W/kg (Rear w/ 10 mm distance)	
27 (LTE Band 13)	777-787	Head: 0.35 W/kg (Right Touch) Body: 0.56 W/kg (Rear w/ 10 mm distance) Hotspot: 0.56 W/kg (Rear w/ 10 mm distance)	
15.247	2412-2462	Head: 0.11 W/kg (Right Touch) Body: 0.17 W/kg (Rear w/ 10 mm distance) Hotspot: 0.17 W/kg (Rear w/ 10 mm distance)	
Simultaneous transmission condition:		1.54 W/kg (The highest SAR across exposure conditions)	
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)		Bobby Bayani SAR 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 Edition 01-01, IEEE STD 1528:2003 and the following KDB Procedures.

- 648474 D01 SAR Handsets Multi Xmitter and Ant, v01r05
- 648474 D03 Handset Wireless Battery Chargers v01
- 248227 D01 SAR meas for 802 11abg v01r02
- 941225 D01 SAR test for 3G devices v02
- 941225 D05 SAR for LTE Devices v01
- 941225 D06 Hot Spot SAR v01

3. Facilities and Accreditation

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

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

4. Calibration and Uncertainty

4.1. Measuring Instrument Calibration

The measuring equipment 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		
Base Station Simulator	Agilent	8960	GB46160222	6	17	2012
Base Station Simulator	R & S	CMU 200	106291	6	24	2012
Base Station Simulator	Anritsu	MT8820C	6200985430	6	17	2012
ESA Series Network Analyzer	Agilent	E5071B	MY42100131	2	2	2012
Synthesized Signal Generator	HP	83732B	US34490599	7	14	2012
E-Field Probe	SPEAG	EX3DV4	3772	5	3	2012
E-Field Probe	SPEAG	EX3DV4	3773	5	3	2012
Thermometer	ERTCO	639-1S	1718	7	19	2012
Data Acquisition Electronics	SPEAG	DAE4	1258	5	2	2012
Data Acquisition Electronics	SPEAG	DAE4	1239	10	18	2012
System Validation Dipole	SPEAG	D835V2	4d117	4	15	2012
System Validation Dipole	SPEAG	D1900V2	5d140	4	18	2012
System Validation Dipole	SPEAG	*D2450V2	706	4	19	2012
System Validation Dipole	SPEAG	D750V3	1019	12	16	2011
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 O_Calibration Certificate for D2450V2 SN 706 incl. extended cal. data)
4. Impedance is within 5Ω of calibrated measurement (See Appendix O_Calibration Certificate for D2450V2 SN 706 incl. 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)	-4.92	Normal	1	0.64	-3.15
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.6	1.73
Liquid Permittivity - measurement uncertainty (Body 1900)	-4.44	Normal	1	0.6	-2.66
Combined Standard Uncertainty $U_c(y)$ =					10.30
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				20.60	%
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =				1.63	dB

5. Equipment Under Test

Cellular/PCS CDMA and LTE Phone with Bluetooth & WLAN

MODEL: VS840, LG-VS840, LGVS840

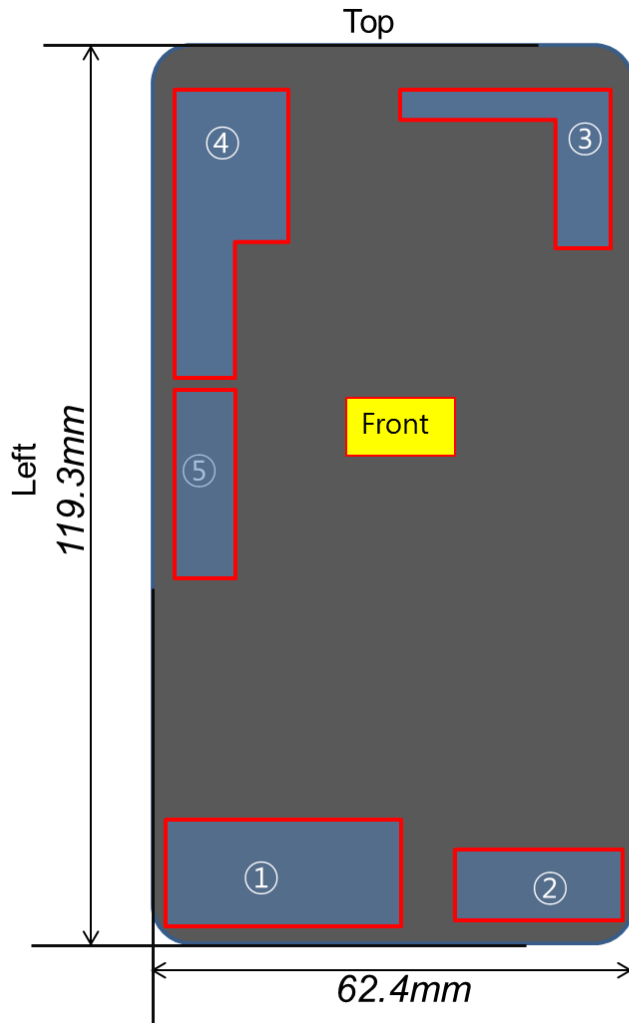
Normal operation:	- Held to head, - Body (Rear and Front sides) with 10 mm separation distance. - Hotspot (wireless router) with 10 mm separation distance to all sides and edges.
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Accessory:	1. Headset 2. Battery Cover - o Normal Battery Cover - o Wireless Charging Battery Cover
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5.1. Band and Air Interlaces

Tx Frequency Bands:	- CDMA BC 0: 824 - 849 MHz - CDMA BC 1: 1850 - 1910 MHz - LTE Band 13: 777 - 787 MHz - 802.11b/g/n: 2412 - 2462 MHz, HT20 - Bluetooth: 2402 - 2480 MHz
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5.2. Antenna Description



MODE	BAND	TX(MHz)	RX(MHz)
CDMA	BC0	824 ~ 849	869 ~ 894
	BC1	1850 ~ 1910	1930 ~ 1990

② LTE Band 13 Rx/Tx

MODE	BAND	TX(MHz)	RX(MHz)
LTE	B13	777 ~ 787	746 ~ 756

MODE	BAND	TX(MHz)	RX(MHz)
GPS	x	1575.42	
LTE	B13	2 nd Rx	

MODE	TX(MHz)	RX(MHz)
EVDO BC0	824 ~ 849	869~894
EVDO BC1	1850 ~ 1910	1930 ~ 1990

MODE	TX(MHz)	RX(MHz)
BT & WiFi (802.11b/g/n)	BT : 2402 (1ch) ~ 2480 (79ch)	BT : 2402 (1ch) ~ 2480 (79ch)
	Wifi : 2412(1ch) ~ 2462(11ch)	Wifi : 2412(1ch) ~ 2462(11ch)

5.3. Antenna Separation Distance

Antennas	Physical Separation Distance (mm)				
	ANT ①	ANT ②	ANT ③	ANT ④	ANT ⑤
ANT ①		14.3	73.8	51.3	29.6
ANT ②	14.3		68.7	75.4	44.3
ANT ③	73.8	68.7		21.0	46.3
ANT ④	51.3	75.4	21.0		0.7
ANT ⑤	29.6	44.3	46.3	0.7	

5.4. Head Exposure Condition

Mode	Band	Tx (MHz)	ANT ①	ANT ②	ANT ③	ANT ④	ANT ⑤
CDMA Voice (1xRTT/1xAdvanced)	BC0	835	Yes	No	No	No	No
CDMA Voice (1xRTT/1xAdvanced)	BC1	1900	Yes	No	No	No	No
EVDO (VOIP)	BC0	835	No	No	No	Yes	No
EVDO (VOIP)	BC1	1900	No	No	Yes	No	No
LTE Data	13	1900	No	No	Yes	No	No
SV-DO (Voice & Data)	BC0	835	Yes	No	No	Yes	No
SV-DO (Voice & Data)	BC1	1900	Yes	No	Yes	No	No
SV-LTE (Voice & Data)	BC0 & 13	835/1900	Yes	No	Yes	No	No
SV-LTE (Voice & Data)	BC1 & 13	1900/1900	Yes	No	Yes	No	No
Wi-Fi (VOIP)	2400	2400	No	No	No	No	Yes
BT	2400	2400	No	No	No	No	Yes

5.5. Body Exposure Condition

Separation Distance = 10 mm							
Mode	Band	Tx (MHz)	ANT ①	ANT ②	ANT ③	ANT ④	ANT ⑤
CDMA Voice (1xRTT/1xAdvanced)	BC0	835	Yes	No	No	No	No
CDMA Voice (1xRTT/1xAdvanced)	BC1	1900	Yes	No	No	No	No
EVDO (VOIP)	BC0	835	No	No	No	Yes	No
EVDO (VOIP)	BC1	1900	No	No	Yes	No	No
LTE Data	13	1900	No	No	Yes	No	No
SV-DO (Voice & Data)	BC0	835	Yes	No	No	Yes	No
SV-DO (Voice & Data)	BC1	1900	Yes	No	Yes	No	No
SV-LTE (Voice & Data)	BC0 & 13	835/1900	Yes	No	Yes	No	No
SV-LTE (Voice & Data)	BC1 & 13	1900/1900	Yes	No	Yes	No	No
Wi-Fi (VOIP)	2400	2400	No	No	No	No	Yes
BT	2400	2400	No	No	No	No	Yes

5.6. Hotspot (Wireless router) Exposure Condition

Separation Distance = 10 mm							
Mode	Band	Tx (MHz)	ANT ①	ANT ②	ANT ③	ANT ④	ANT ⑤
EVDO + WiFi	BC0	835/2400	No	No	No	Yes	Yes
EVDO + WiFi	BC1	1900/2400	No	No	No	Yes	Yes
LTE Data + WiFi	13	780/2400	No	Yes	No	No	Yes
SV-DO (Voice & Data) + WiFi	BC0/BC0	835/835/2400	Yes	No	No	Yes	Yes
SV-DO (Voice & Data) + WiFi	BC0/BC1	835/1900/2400	Yes	No	No	Yes	Yes
SV-DO (Voice & Data) + WiFi	BC1/BC0	1900/835/2400	Yes	No	No	Yes	Yes
SV-DO (Voice & Data) + WiFi	BC1/BC1	1900/1900/2400	Yes	No	No	Yes	Yes
SV-LTE (Voice & Data) + WiFi	BC0 & 13	835/780/2400	Yes	Yes	No	No	Yes
SV-LTE (Voice & Data) + WiFi	BC1 & 13	1900/780/2400	Yes	Yes	No	No	Yes

5.7. KDB 941225 D05 SAR for LTE Devices v01

#	Description	Information																							
1	Identify the operating frequency range of each LTE transmission band used by the device	Band 13: 777 - 787 MHz																							
2	Identify the channel bandwidths used in each frequency band; 1.4, 3, 5, 10, 15, 20 MHz etc	Band 13: 10 MHz																							
3	Identify the high, middle and low (H, M, L) channel numbers and frequencies in each LTE frequency band	LTE Band13 - Bandwidth: 10MHz Ch No.: 23230 Frequency: 782MHz																							
4	Specify the UE category and uplink modulations used	The UE Category is 3 Uplink modulations: QPSK, 16QAM																							
5	Descriptions of the LTE transmitter and antenna implementation & identify whether it is a standalone transmitter operating independently of other wireless transmitters in the device or sharing hardware components and/or antenna(s) with other transmitters etc.	This model(VS840) has the same HW and one Tx antenna for CDMA US PCS EVDO/LTE. For details, please refer to the antenna distance document and block diagram.																							
6	Identify the LTE voice/data requirements in each operating mode and exposure condition with respect to head and body test configurations, antenna locations, handset flip-cover or slide positions, antenna diversity conditions, etc.	Exposure conditions 1) Body SAR is required because LTE hotspot is supported. 2) Hotspot SAR: Front/Back/Right Edge/Left Edge/Bottom Edge C /Top Edge is required																							
7	Identify if Maximum Power Reduction (MPR) is optional or mandatory, i.e. built-in by design: a) only mandatory MPR may be considered during SAR testing, when the maximum output power is permanently limited by the MPR implemented within the UE; and only for the applicable RB (resource block) configurations specified in LTE standards b) A-MPR (additional MPR) must be disabled.	As per 3GPP TS 36.101 v10.3.0 (2011-09), Release 10.4 <table border="1"><thead><tr><th rowspan="2">Modulation</th><th colspan="3">Channel bandwidth / Transmission bandwidth configuration (RB)</th><th rowspan="2">MPR (dB)</th></tr><tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5.0 MHz</th></tr></thead><tbody><tr><td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>≤ 1</td></tr><tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 1</td></tr><tr><td>16 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>≤ 1</td></tr></tbody></table> MPR is permanently built-in by design. A-MPR is supported by design, but is disabled for SAR testing.	Modulation	Channel bandwidth / Transmission bandwidth configuration (RB)			MPR (dB)	1.4 MHz	3.0 MHz	5.0 MHz	QPSK	> 5	> 4	> 8	≤ 1	16 QAM	≤ 5	≤ 4	≤ 8	≤ 1	16 QAM	> 5	> 4	> 8	≤ 1
Modulation	Channel bandwidth / Transmission bandwidth configuration (RB)			MPR (dB)																					
	1.4 MHz	3.0 MHz	5.0 MHz																						
QPSK	> 5	> 4	> 8	≤ 1																					
16 QAM	≤ 5	≤ 4	≤ 8	≤ 1																					
16 QAM	> 5	> 4	> 8	≤ 1																					
8	Include the maximum average conducted output power measured on the required test channels for each channel bandwidth and UL modulation used in each frequency band: a) with 1 RB allocated at the upper edge of a channel b) with 1 RB allocated at the lower edge of a channel c) using 50% RB allocation centered within a channel d) using 100% RB allocation	Refer to section 10.2 RF output power table																							

KDB 941225 D05 SAR for LTE Devices v01 (Continued)

#	Description	Information																
9	Identify all other U.S. wireless operating modes (3G, Wi-Fi, WiMax, Bluetooth etc), device/exposure configurations (head and body, antenna and handset flip-cover or slide positions, antenna diversity conditions etc.) and frequency bands used for these modes	* Supported band & Exposure conditions 1) Bluetooth 2.4GHZ - Exposure conditions: BT SAR is not required due to the lower power & antenna separation distance. 2) WiFi 2.4GHz - Exposure conditions: Head/Body SAR required * WiFi hotspot is supported.																
10	Include the maximum average conducted output power measured for the other wireless mode and frequency bands	See section 10 RF output power measurements																
11	Identify the simultaneous transmission conditions for the voice and data configurations supported by all wireless modes, device configurations and frequency bands, for the head and body exposure conditions and device operating configurations (handset flip or cover positions, antenna diversity conditions etc.)	Refer to the table in section 5.8																
12	When power reduction is applied to certain wireless modes to satisfy SAR compliance for simultaneous transmission conditions, other equipment certification or operating requirements, include the maximum average conducted output power measured in each power reduction mode applicable to the simultaneous voice/data transmission configurations for such wireless configurations and frequency bands; and also include details of the power reduction implementation and measurement setup	1. Power Reduction operation table for SV-DO Mode <table border="1"> <thead> <tr> <th>Mode</th><th>CDMA Current Voice Power for BC0, BC1</th><th>CDMA EVDO Max. Power for BC0 & BC1</th></tr> </thead> <tbody> <tr> <td rowspan="2">SV-DO</td><td>P < 15.5 dBm</td><td>23.7 dBm (Limited)</td></tr> <tr> <td>P ≥ 15.5 dBm</td><td>18.7 dBm (Limited)</td></tr> </tbody> </table> 2. Power Reduction operation table for SV-LTE Mode <table border="1"> <thead> <tr> <th>Mode</th><th>CDMA Current Voice Power for BC0, BC1</th><th>LTE Max. Power for B13</th></tr> </thead> <tbody> <tr> <td rowspan="2">SV-LTE</td><td>P < 18.5 dBm</td><td>22.5 dBm (Limited)</td></tr> <tr> <td>P ≥ 18.5 dBm</td><td>18.5 dBm (Limited)</td></tr> </tbody> </table>	Mode	CDMA Current Voice Power for BC0, BC1	CDMA EVDO Max. Power for BC0 & BC1	SV-DO	P < 15.5 dBm	23.7 dBm (Limited)	P ≥ 15.5 dBm	18.7 dBm (Limited)	Mode	CDMA Current Voice Power for BC0, BC1	LTE Max. Power for B13	SV-LTE	P < 18.5 dBm	22.5 dBm (Limited)	P ≥ 18.5 dBm	18.5 dBm (Limited)
Mode	CDMA Current Voice Power for BC0, BC1	CDMA EVDO Max. Power for BC0 & BC1																
SV-DO	P < 15.5 dBm	23.7 dBm (Limited)																
	P ≥ 15.5 dBm	18.7 dBm (Limited)																
Mode	CDMA Current Voice Power for BC0, BC1	LTE Max. Power for B13																
SV-LTE	P < 18.5 dBm	22.5 dBm (Limited)																
	P ≥ 18.5 dBm	18.5 dBm (Limited)																
13	Include descriptions of the test equipment, test software, built-in test firmware etc. required to support testing the device when power reduction is applied to one or more transmitters/antennas for simultaneous voice/data transmission	Not Applicable																
14	When appropriate, include a SAR test plan proposal with respect to the above	Not Applicable																
15	If applicable, include preliminary SAR test data and/or supporting information in laboratory testing inquiries to address specific issues and concerns or for requesting further test reduction considerations appropriate for the device; for example, simultaneous transmission configurations	Not applicable																

5.8. Simultaneous Transmission Conditions

Summary of Simultaneous

No.	Capable TX Configuration	Head SAR	Body SAR	Hotspot SAR	Power Reduction (CDMA EVDO)	Power Reduction (LTE)	Note
1	CDMA Voice	O	O	X	X	X	Stand-alone CDMA Voice
2	CDMA EVDO	O	O	X	X	X	Stand-alone CDMA EVDO
3	LTE	O	O	X	X	O	Stand-alone LTE
4	Wi-Fi	O	O	X	X	X	Stand-alone Wi-Fi
5	BT	X	X	X	X	X	
6	CDMA Voice + CDMA EVDO	O	O	X	O	X	SVDO
7	CDMA Voice + LTE	O	O	X	X	O	SVLTE
8	CDMA Voice + CDMA EVDO + WLAN	O	O	O	O	X	Wi-Fi Hotspot
9	CDMA Voice + LTE + WLAN	O	O	O	X	O	Wi-Fi Hotspot
* BT and WLAN are not simultaneous transmission. * CDMA EVDO and LTE are not simultaneous transmission. * VOIP support (LTE, EVDO). * SVLTE, SVDO is supported * Power reduction is implemented on EVDO in SVDO mode * Power reduction is implemented on LTE in SVLTE mode.							

All Simultaneous Case

No.	Capable TX Configuration	Head SAR	Body SAR	Hotspot SAR	Power Reduction (CDMA EVDO)	Power Reduction (LTE)	Note
1	CDMA BC0 Voice	O	O	X	X	X	Stand alone CDMA BC0 Voice
2	CDMA BC1 Voice	O	O	X	X	X	Stand alone CDMA BC1 Voice
4	CDMA BC0 EVDO	O	O	X	X	X	Stand alone CDMA EVDO BC0
5	CDMA BC1 EVDO	O	O	X	X	X	Stand alone CDMA EVDO BC1
7	LTE B13	O	O	X	X	X	Stand alone LTE B13 data
9	WiFi	O	O	X	X	X	Stand alone WiFi
10	BT	X	X	X	X	X	N/A
11	CDMA BC0 Voice + WiFi data	O	O	X	X	X	
12	CDMA BC1 Voice + WiFi data	O	O	X	X	X	
14	CDMA BC0 EVDO + WiFi data	X	O	O	X	X	WiFi Hotspot
15	CDMA BC1 EVDO+ WiFi data	X	O	O	X	X	WiFi Hotspot
17	LTE B13 + WiFi data	X	O	O	X	X	WiFi Hotspot
19	CDMA BC0 Voice + CDMA BC0 EVDO	O	O	X	O	X	SVDO
20	CDMA BC0 Voice + CDMA BC1 EVDO	O	O	X	O	X	SVDO
22	CDMA BC0 Voice + LTE B13	O	O	X	X	O	SVLTE
24	CDMA BC1 Voice + CDMA BC0 EVDO	O	O	X	O	X	SVDO
25	CDMA BC1 Voice + CDMA BC1 EVDO	O	O	X	O	X	SVDO
27	CDMA BC1 Voice + LTE B13	O	O	X	X	O	SVLTE
34	CDMA BC0 Voice + CDMA BC0 EVDO + WLAN	O	O	O	O	X	WiFi Hotspot + SVDO
35	CDMA BC0 Voice + CDMA BC1 EVDO + WLAN	O	O	O	O	X	WiFi Hotspot + SVDO
37	CDMA BC0 Voice + LTE B13 + WLAN	O	O	O	X	O	WiFi Hotspot + SVLTE
39	CDMA BC1 Voice + CDMA BC0 EVDO+ WLAN	O	O	O	O	X	WiFi Hotspot + SVDO
40	CDMA BC1 Voice + CDMA BC1 EVDO+ WLAN	O	O	O	O	X	WiFi Hotspot + SVDO
42	CDMA BC1 Voice + LTE B13+ WLAN	O	O	O	X	O	WiFi Hotspot + SVLTE
* BT and WLAN are not simultaneous transmission. * CDMA EVDO and LTE are not simultaneous transmission. * VOIP support (LTE, EVDO). * Hotspot support (LTE ,EVDO) * SVLTE, SVDO is supported							

6. 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%
Sucrose	Sugar, white, refined, 40-60%
NaCl	Sodium Chloride, 0-6%
Hydroxyethyl-cellulose	Medium Viscosity (CAS# 9004-62-0), <0.3%
Preventol-D7	Preservative: aqueous preparation, (CAS# 55965-84-9), containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyl-3(2H)-isothiazolone, 0.1-0.7%

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%
C ₈ H ₁₈ O ₃	Diethylene glycol monobutyl ether (DGBE), 25-48%
NaCl	Sodium Chloride, <1.0%

7. 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
750	41.96	0.89	55.6	0.96
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

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

7.1. Liquid Check Results

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
11/14/2011	Body 1900	e'	51.1875	Relative Permittivity (ϵ_r):	51.19	53.30	-3.96	5
		e"	14.1983	Conductivity (σ):	1.50	1.52	-1.32	5
	Body 1850	e'	51.3015	Relative Permittivity (ϵ_r):	51.30	53.30	-3.75	5
		e"	14.0492	Conductivity (σ):	1.45	1.52	-4.92	5
	Body 1880	e'	51.2206	Relative Permittivity (ϵ_r):	51.22	53.30	-3.90	5
		e"	14.1446	Conductivity (σ):	1.48	1.52	-2.72	5
	Body 1910	e'	51.1700	Relative Permittivity (ϵ_r):	51.17	53.30	-4.00	5
		e"	14.2283	Conductivity (σ):	1.51	1.52	-0.59	5
11/14/2011	Body 2450	e'	51.5614	Relative Permittivity (ϵ_r):	51.56	52.70	-2.16	5
		e"	14.3398	Conductivity (σ):	1.95	1.95	0.18	5
	Body 2410	e'	51.7535	Relative Permittivity (ϵ_r):	51.75	52.76	-1.91	5
		e"	14.1977	Conductivity (σ):	1.90	1.91	-0.26	5
	Body 2435	e'	51.6268	Relative Permittivity (ϵ_r):	51.63	52.73	-2.09	5
		e"	14.2735	Conductivity (σ):	1.93	1.93	0.07	5
	Body 2475	e'	51.4942	Relative Permittivity (ϵ_r):	51.49	52.67	-2.23	5
		e"	14.4534	Conductivity (σ):	1.99	1.99	0.20	5
11/14/2011	Head 2450	e'	39.2740	Relative Permittivity (ϵ_r):	39.27	39.20	0.19	5
		e"	13.5872	Conductivity (σ):	1.85	1.80	2.83	5
	Head 2410	e'	39.4207	Relative Permittivity (ϵ_r):	39.42	39.28	0.36	5
		e"	13.4599	Conductivity (σ):	1.80	1.76	2.46	5
	Head 2435	e'	39.3306	Relative Permittivity (ϵ_r):	39.33	39.24	0.24	5
		e"	13.5381	Conductivity (σ):	1.83	1.78	2.84	5
	Head 2475	e'	39.1877	Relative Permittivity (ϵ_r):	39.19	39.17	0.05	5
		e"	13.6705	Conductivity (σ):	1.88	1.83	2.97	5
11/03/2011	Body 750	e'	53.7421	Relative Permittivity (ϵ_r):	53.74	55.55	-3.25	5
		e"	22.3905	Conductivity (σ):	0.93	0.96	-3.05	5
	Body 775	e'	53.4960	Relative Permittivity (ϵ_r):	53.50	55.45	-3.52	5
		e"	22.1936	Conductivity (σ):	0.96	0.97	-0.89	5
	Body 790	e'	53.3532	Relative Permittivity (ϵ_r):	53.35	55.39	-3.68	5
		e"	22.1087	Conductivity (σ):	0.97	0.97	0.52	5
11/15/2011	Head 1900	e'	39.4784	Relative Permittivity (ϵ_r):	39.48	40.00	-1.30	5
		e"	13.2060	Conductivity (σ):	1.40	1.40	-0.35	5
	Head 1850	e'	39.6785	Relative Permittivity (ϵ_r):	39.68	40.00	-0.80	5
		e"	13.0679	Conductivity (σ):	1.34	1.40	-3.98	5
	Head 1880	e'	39.5496	Relative Permittivity (ϵ_r):	39.55	40.00	-1.13	5
		e"	13.1505	Conductivity (σ):	1.37	1.40	-1.81	5
	Head 1910	e'	39.4448	Relative Permittivity (ϵ_r):	39.44	40.00	-1.39	5
		e"	13.2269	Conductivity (σ):	1.40	1.40	0.34	5

Liquid Check Results (Continued)

Date	Freq. (MHz)		Liquid Parameters	Measured	Target	Delta (%)	Limit ±(%)
11/16/2011	Body 835	e'	53.3592 Relative Permittivity (ϵ_r):	53.36	55.20	-3.33	5
		e''	20.8419 Conductivity (σ):	0.97	0.97	-0.24	5
	Body 820	e'	53.4767 Relative Permittivity (ϵ_r):	53.48	55.28	-3.26	5
		e''	20.9141 Conductivity (σ):	0.95	0.97	-1.54	5
	Body 850	e'	53.2393 Relative Permittivity (ϵ_r):	53.24	55.16	-3.48	5
		e''	20.7704 Conductivity (σ):	0.98	0.99	-0.56	5
11/16/2011	Body 750	e'	55.5819 Relative Permittivity (ϵ_r):	55.58	55.55	0.06	5
		e''	22.8263 Conductivity (σ):	0.95	0.96	-1.16	5
	Body 775	e'	55.3495 Relative Permittivity (ϵ_r):	55.35	55.45	-0.18	5
		e''	22.6089 Conductivity (σ):	0.97	0.97	0.96	5
	Body 790	e'	55.2267 Relative Permittivity (ϵ_r):	55.23	55.39	-0.30	5
		e''	22.5050 Conductivity (σ):	0.99	0.97	2.32	5
11/16/2011	Head 750	e'	42.5711 Relative Permittivity (ϵ_r):	42.57	41.96	1.45	5
		e''	21.4817 Conductivity (σ):	0.90	0.89	0.31	5
	Head 775	e'	42.2415 Relative Permittivity (ϵ_r):	42.24	41.83	0.98	5
		e''	21.2932 Conductivity (σ):	0.92	0.90	2.52	5
	Head 790	e'	42.0711 Relative Permittivity (ϵ_r):	42.07	41.76	0.75	5
		e''	21.2053 Conductivity (σ):	0.93	0.90	3.94	5
11/17/2011	Head 835	e'	41.3776 Relative Permittivity (ϵ_r):	41.38	41.50	-0.29	5
		e''	18.8377 Conductivity (σ):	0.87	0.90	-2.82	5
	Head 820	e'	41.5474 Relative Permittivity (ϵ_r):	41.55	41.60	-0.13	5
		e''	18.8834 Conductivity (σ):	0.86	0.90	-4.17	5
	Head 830	e'	41.4318 Relative Permittivity (ϵ_r):	41.43	41.55	-0.29	5
		e''	18.8544 Conductivity (σ):	0.87	0.90	-3.23	5
	Head 850	e'	41.2122 Relative Permittivity (ϵ_r):	41.21	41.50	-0.69	5
		e''	18.7962 Conductivity (σ):	0.89	0.92	-2.91	5
11/17/2011	Head 750	e'	42.9501 Relative Permittivity (ϵ_r):	42.95	41.96	2.36	5
		e''	21.7842 Conductivity (σ):	0.91	0.89	1.72	5
	Head 775	e'	42.6238 Relative Permittivity (ϵ_r):	42.62	41.83	1.89	5
		e''	21.5910 Conductivity (σ):	0.93	0.90	3.96	5
	Head 790	e'	42.4443 Relative Permittivity (ϵ_r):	42.44	41.76	1.65	5
		e''	21.3954 Conductivity (σ):	0.94	0.90	4.87	5
11/18/2011	Body 1900	e'	51.0085 Relative Permittivity (ϵ_r):	51.01	53.30	-4.30	5
		e''	14.2539 Conductivity (σ):	1.51	1.52	-0.93	5
	Body 1850	e'	51.1807 Relative Permittivity (ϵ_r):	51.18	53.30	-3.98	5
		e''	14.0839 Conductivity (σ):	1.45	1.52	-4.69	5
	Body 1880	e'	51.0768 Relative Permittivity (ϵ_r):	51.08	53.30	-4.17	5
		e''	14.1873 Conductivity (σ):	1.48	1.52	-2.43	5
	Body 1910	e'	50.9759 Relative Permittivity (ϵ_r):	50.98	53.30	-4.36	5
		e''	14.2891 Conductivity (σ):	1.52	1.52	-0.16	5

Liquid Check Results (Continued)

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
11/18/2011	Body 750	e'	54.9041	Relative Permittivity (ϵ_r):	54.90	55.55	-1.16	5
		e''	22.7176	Conductivity (σ):	0.95	0.96	-1.63	5
	Body 775	e'	54.6367	Relative Permittivity (ϵ_r):	54.64	55.45	-1.47	5
		e''	22.5057	Conductivity (σ):	0.97	0.97	0.50	5
	Body 790	e'	54.5085	Relative Permittivity (ϵ_r):	54.51	55.39	-1.60	5
		e''	22.3994	Conductivity (σ):	0.98	0.97	1.84	5
11/18/2011	Head 1900	e'	38.2781	Relative Permittivity (ϵ_r):	38.28	40.00	-4.30	5
		e''	13.1944	Conductivity (σ):	1.39	1.40	-0.43	5
	Head 1850	e'	38.4954	Relative Permittivity (ϵ_r):	38.50	40.00	-3.76	5
		e''	13.0473	Conductivity (σ):	1.34	1.40	-4.13	5
	Head 1880	e'	38.3650	Relative Permittivity (ϵ_r):	38.37	40.00	-4.09	5
		e''	13.1346	Conductivity (σ):	1.37	1.40	-1.93	5
	Head 1910	e'	38.2348	Relative Permittivity (ϵ_r):	38.23	40.00	-4.41	5
		e''	13.2232	Conductivity (σ):	1.40	1.40	0.31	5
11/18/2011	Head 2450	e'	37.8881	Relative Permittivity (ϵ_r):	37.89	39.20	-3.35	5
		e''	13.4454	Conductivity (σ):	1.83	1.80	1.76	5
	Head 2410	e'	38.0173	Relative Permittivity (ϵ_r):	38.02	39.28	-3.21	5
		e''	13.3285	Conductivity (σ):	1.79	1.76	1.46	5
	Head 2435	e'	37.9412	Relative Permittivity (ϵ_r):	37.94	39.24	-3.30	5
		e''	13.4024	Conductivity (σ):	1.81	1.78	1.81	5
Head 2475	e'	37.7859	Relative Permittivity (ϵ_r):	37.79	39.17	-3.53	5	
	e''	13.5222	Conductivity (σ):	1.86	1.83	1.85	5	
11/20/2011	Body 1900	e'	50.9761	Relative Permittivity (ϵ_r):	50.98	53.30	-4.36	5
		e''	14.2504	Conductivity (σ):	1.51	1.52	-0.95	5
	Body 1850	e'	51.1988	Relative Permittivity (ϵ_r):	51.20	53.30	-3.94	5
		e''	14.0977	Conductivity (σ):	1.45	1.52	-4.59	5
	Body 1880	e'	51.0748	Relative Permittivity (ϵ_r):	51.07	53.30	-4.17	5
		e''	14.1865	Conductivity (σ):	1.48	1.52	-2.44	5
Body 1910	e'	50.9361	Relative Permittivity (ϵ_r):	50.94	53.30	-4.44	5	
	e''	14.2886	Conductivity (σ):	1.52	1.52	-0.17	5	
11/21/2011	Body 835	e'	54.2464	Relative Permittivity (ϵ_r):	54.25	55.20	-1.73	5
		e''	21.0276	Conductivity (σ):	0.98	0.97	0.65	5
	Body 820	e'	54.3746	Relative Permittivity (ϵ_r):	54.37	55.28	-1.63	5
		e''	21.0847	Conductivity (σ):	0.96	0.97	-0.73	5
	Body 850	e'	54.2464	Relative Permittivity (ϵ_r):	54.25	55.16	-1.65	5
		e''	21.0276	Conductivity (σ):	0.99	0.99	0.68	5

Liquid Check Results (Continued)

Date	Freq. (MHz)		Liquid Parameters	Measured	Target	Delta (%)	Limit ±(%)
11/22/2011	Head 750	e'	43.2308	Relative Permittivity (ϵ_r):	43.23	41.96	3.02
		e''	20.9724	Conductivity (σ):	0.87	0.89	-2.07
	Head 775	e'	42.9246	Relative Permittivity (ϵ_r):	42.92	41.83	2.61
		e''	20.7914	Conductivity (σ):	0.90	0.90	0.11
	Head 790	e'	42.7473	Relative Permittivity (ϵ_r):	42.75	41.76	2.37
		e''	20.6993	Conductivity (σ):	0.91	0.90	1.46
11/28/2011	Head 835	e'	42.3086	Relative Permittivity (ϵ_r):	42.31	41.50	1.95
		e''	19.0589	Conductivity (σ):	0.88	0.90	-1.68
	Head 825	e'	42.4334	Relative Permittivity (ϵ_r):	42.43	41.58	2.06
		e''	19.0837	Conductivity (σ):	0.88	0.90	-2.61
	Head 850	e'	42.1217	Relative Permittivity (ϵ_r):	42.12	41.50	1.50
		e''	19.0145	Conductivity (σ):	0.90	0.92	-1.78

8. 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 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 HEAD & BODY-tissue from calibration certificate of SPEAG.

System validation dipole	Cal. certificate #	Cal. date	SAR Avg (mW/g)		
			Tissue:	Head	Body
D750V3	D750V3-1019	12/16/10	1g SAR:	8.16	8.64
			10g SAR:	5.32	5.72
D835V2	D835V2-4d117	4/15/11	1g SAR:	9.64	10.10
			10g SAR:	6.28	6.60
D1900V2	D1900V2-5d140	4/18/11	1g SAR:	41.60	41.20
			10g SAR:	21.50	21.60
D2450V2	D2450V2-706	4/19/10	1g SAR:	51.6	52.4
			10g SAR:	24.4	24.5

8.1. System Check Results

System validation dipole	Date Tested	Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
D1900V2 Body	11/14/11	1g SAR:	39.50	41.2	-4.13	±10
		10g SAR:	20.60	21.6	-4.63	
D2450V2 Body	11/14/11	1g SAR:	53.90	51.6	4.46	±10
		10g SAR:	24.60	24.4	0.82	
D2450V2 Head	11/14/11	1g SAR:	53.00	51.6	2.71	±10
		10g SAR:	24.10	24.4	-1.23	
D750V3 Body	11/15/11	1g SAR:	8.84	8.64	2.31	±10
		10g SAR:	5.88	5.72	2.80	
D1900V2 Head	11/15/11	1g SAR:	39.50	41.6	-5.05	±10
		10g SAR:	20.50	21.5	-4.65	
D835V2 Body	11/16/11	1g SAR:	10.20	10.1	0.99	±10
		10g SAR:	6.72	6.6	1.82	
D750V3 Body	11/16/11	1g SAR:	8.90	8.64	3.01	±10
		10g SAR:	5.91	5.72	3.32	
D750V3 Head	11/16/11	1g SAR:	8.57	8.16	5.02	±10
		10g SAR:	5.59	5.32	5.08	
D835V2 Head	11/17/11	1g SAR:	9.73	9.64	0.93	±10
		10g SAR:	6.39	6.28	1.75	
D750V3 Head	11/17/11	1g SAR:	8.64	8.16	5.88	±10
		10g SAR:	5.63	5.32	5.83	
D1900V2 Body	11/18/11	1g SAR:	42.40	41.6	1.92	±10
		10g SAR:	22.20	21.5	3.26	
D750V3 Body	11/18/11	1g SAR:	8.95	8.64	3.59	±10
		10g SAR:	5.95	5.72	4.02	
D1900V2 Head	11/18/11	1g SAR:	40.30	41.6	-3.13	±10
		10g SAR:	20.90	21.5	-2.79	
D2450V2 Body	11/18/11	1g SAR:	52.50	51.6	1.74	±10
		10g SAR:	23.70	24.4	-2.87	
D1900V2 Body	11/20/11	1g SAR:	40.80	41.6	-1.92	±10
		10g SAR:	21.50	21.5	0.00	
D835V2 Body	11/21/11	1g SAR:	9.91	10.1	-1.88	±10
		10g SAR:	6.51	6.6	-1.36	
D750V3 Head	11/22/11	1g SAR:	8.56	8.16	4.90	±10
		10g SAR:	5.59	5.32	5.08	
D835V2 Head	11/28/11	1g SAR:	10.10	9.64	4.77	±10
		10g SAR:	6.63	6.28	5.57	

9. SAR Measurement Procedures

9.1. Normal SAR Measurement Procedures

Step 1: Power Reference Measurement

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

Step 2: Area Scan

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

Step 3: Zoom Scan

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

Step 4: 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.

9.2. Volume Scan Procedures

Step 1: Power Reference Measurement

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

Step 2: Area Scan

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

Step 3: Zoom Scan

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

Step 4: Volume Scan

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

Step 5: Power drift measurement

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

10. RF Output Power Measurement

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

10.1. CDMA2000

1xRTT

RF Output Power for BC0

Radio Configuration (RC)	Service Option (SO)	Conducted Output Power (dBm)		
		Ch. 1013/824.7 MHz	Ch. 384/836.52 MHz	Ch. 777/848.31 MHz
		Average	Average	Average
RC1	55 (Loopback)	24.30	24.33	24.31
RC3	55 (Loopback)	24.26	24.38	24.37
	32 (+ F-SCH)	24.25	24.30	24.10

RF Output Power for BC1

Radio Configuration (RC)	Service Option (SO)	Conducted Output Power (dBm)		
		Ch. 25/1851.25 MHz	Ch. 600/1880 MHz	Ch.1175/1908.75 MHz
		Average	Average	Average
RC1	55 (Loopback)	24.36	24.27	24.30
RC3	55 (Loopback)	24.37	24.40	24.26
	32 (+ F-SCH)	24.26	24.35	24.17

1xEv-Do Rel. 0

RF Output Power for BC0

FTAP Rate	RTAP Rate	Channel	f (MHz)	Conducted power (dBm)	
				Average	Peak
307.2 kbps (2 slot, QPSK)	153.6 kbps	1013	824.70	24.39	
		384	836.52	24.37	
		777	848.31	24.13	

RF Output Power for BC1

FTAP Rate	RTAP Rate	Channel	f (MHz)	Conducted power (dBm)	
				Average	Peak
307.2 kbps (2 slot, QPSK)	153.6 kbps	25	1851.25	24.37	
		600	1880.00	24.44	
		1175	1908.75	24.21	

1xEv-Do Rev. A

RF Output Power for BC0

FETAP Traffic Format	RETAP Data Payload Size	Channel	f (MHz)	Conducted power (dBm)	
				Average	Peak
307.2k, QPSK/ ACK channel is transmitted at all	4096	1013	824.70	24.31	
		384	836.52	24.40	
		777	848.31	24.12	

RF Output Power for BC1

FETAP Traffic Format	RETAP Data Payload Size	Channel	f (MHz)	Conducted power (dBm)	
				Average	Peak
307.2k, QPSK/ ACK channel is transmitted at all	4096	25	1851.25	24.24	
		600	1880.00	24.32	
		1175	1908.75	24.33	

10.2. LTE Band 13

BW	Ch	Freq. (MHz)	Mode	UL RB Allocation	UL RB Start	Target MPR	Measure MPR	Max. Avg. Power (dBm)
10MHz	23230	782.0	QPSK	1	0	0	0	22.70
				1	49	0	0	22.73
				25	12	1	1	21.50
				50	0	1	1	21.50
			16QAM	1	0	1	1	21.70
				1	49	1	1	21.72
				25	12	2	2	20.45
				50	0	2	2	20.50

10.3. Wi-Fi

802.11b

Channel #	Freq. (MHz)	Conducted Avg Power	
		(dBm)	(mW)
1	2412	15.0	31.6
6	2437	15.0	31.6
11	2462	15.0	31.6

802.11g

1	2412	11.9	15.6
6	2437	12.1	16.0
11	2462	12.0	15.7

802.11n HT20

1	2412	12.6	18.2
6	2437	12.6	18.3
11	2462	12.5	17.9

Note(s):

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

10.4. Bluetooth

Mode	Channel #	Freq. (MHz)	Conducted Avg Power	
			(dBm)	(mW)
GFSK	0	2402	9.4	8.7
	39	2441	9.4	8.7
	78	2480	9.3	8.5
8PSK	0	2402	7.3	5.4
	39	2441	7.3	5.4
	78	2480	7.3	5.4

Note(s):

According to KDB 648474, Table 2, Unlicensed transmitters

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

- ☒ Output $\leq 2 \cdot P_{\text{Ref}}$ (24 mW) and antenna is ≥ 5.0 cm from other antennas
- ☒ Output $\leq P_{\text{Ref}}$ (12 mW) and antenna is ≥ 2.5 cm from other antennas
- ☒ Output $\leq P_{\text{Ref}}$ (12 mW) and antenna is < 2.5 cm from other antennas

10.5. Power Reduction for SV-DO

SV-DO: CDMA 1xRTT (BC0) to 1xEVDO (BC0 & BC1)

CDMA BC0 850 1xRTT		BC0 850 1xEVDO			BC1 1900 1xEVDO		
		Output Power [dBm]			Output Power [dBm]		
Ch. #	Output Power [dBm]	Low_1013	Middle_384	High_777	Low_25	Middle_600	High_1175
Low_1013	11	23.9	23.8	23.8	24.0	23.9	23.9
	15	23.8	23.7	23.7	24.0	23.9	23.8
	16	18.5	18.4	18.5	18.6	18.5	18.8
	24	18.5	18.4	18.5	18.6	18.5	18.6
Middle_384	11	23.9	23.8	23.9	24.0	23.9	23.9
	15	23.8	23.7	23.8	24.0	23.9	23.8
	16	18.5	18.5	18.5	18.6	18.5	18.8
	24	18.4	18.4	18.5	18.6	18.4	18.7
High_777	11	23.9	23.8	23.8	24.0	23.9	23.8
	15	23.9	23.7	23.7	24.0	23.9	23.8
	16	18.5	18.5	18.5	18.6	18.6	18.8
	24	18.4	18.5	18.5	18.5	18.4	18.6

SV-DO: CDMA 1xRTT (BC1) to 1xEVDO (BC0 & BC1)

CDMA BC1 1900 1xRTT		BC0 850 1xEVDO			BC1 1900 1xEVDO		
		Output Power [dBm]			Output Power [dBm]		
Ch. #	Output Power [dBm]	Low_1013	Middle_384	High_777	Low_25	Middle_600	High_1175
Low_25	11	23.9	24.0	24.0	24.0	24.0	23.8
	15	23.9	23.9	23.9	24.0	24.0	23.8
	16	18.5	18.5	18.5	18.6	18.6	18.8
	24	18.4	18.4	18.5	18.5	18.5	18.7
Middle_600	11	23.9	23.8	23.9	24.0	24.0	23.8
	15	23.8	23.7	23.8	24.0	24.0	23.8
	16	18.5	18.5	18.5	18.6	18.6	18.7
	24	18.5	18.4	18.5	18.6	18.5	18.6
High_1175	11	23.9	23.8	23.9	24.0	23.9	23.8
	15	23.8	23.7	23.8	23.9	23.9	23.8
	16	18.5	18.5	18.5	18.6	18.6	18.7
	24	18.4	18.4	18.5	18.5	18.5	18.6

10.6. Power Reduction for SV-LTE Band 13

SV-LTE: CDMA 1xRTT (BC0) to SV-LTE Band 13 (QPSK, 16QAM)

CDMA BC0 850 1xRTT		QPSK				16QAM			
		Output Power [dBm]				Output Power [dBm]			
Ch. #	Output Power [dBm]	1RB, 0 offset	1RB 49 offset	25RB 12 offset	50RB	1RB, 0 offset	1RB 49 offset	25RB 12 offset	50RB
Low_1013	11	22.7	22.6	21.7	21.6	21.7	21.7	20.6	20.6
	18	22.7	22.6	21.6	21.5	21.6	21.6	20.5	20.6
	19	18.4	18.3	18.4	18.4	18.6	18.5	18.3	18.4
	24	18.4	18.3	18.4	18.3	18.6	18.5	18.3	18.4
Middle_384	11	22.7	22.6	21.6	21.5	21.7	21.6	20.6	20.5
	18	22.6	22.5	21.6	21.5	21.6	21.6	20.5	20.6
	19	18.4	18.3	18.5	18.3	18.5	18.5	18.3	18.4
	24	18.3	18.3	18.4	18.3	18.6	18.5	18.2	18.3
High_777	11	22.6	22.5	21.6	21.5	21.6	21.6	20.5	20.6
	18	22.6	22.5	21.6	21.5	21.6	21.6	20.6	20.5
	19	18.4	18.3	18.4	18.3	18.5	18.5	18.3	18.4
	24	18.3	18.3	18.4	18.3	18.5	18.5	18.2	18.4

SV-LTE: CDMA 1xRTT (BC1) to SV-LTE Band 13 (QPSK, 16QAM)

CDMA BC1 1900 1xRTT		QPSK				16QAM			
		Output Power [dBm]				Output Power [dBm]			
Ch. #	Output Power [dBm]	1RB, 0 offset	1RB 49 offset	25RB 12 offset	50RB	1RB, 0 offset	1RB 49 offset	25RB 12 offset	50RB
Low_25	11	22.6	22.5	21.6	21.5	21.7	21.6	20.5	20.6
	18	22.6	22.5	21.6	21.5	21.7	21.6	20.5	20.5
	19	18.3	18.3	18.4	18.3	18.5	18.4	18.3	18.3
	24	18.3	18.2	18.4	18.3	18.5	18.4	18.2	18.3
Middle_600	11	22.6	22.5	21.5	21.5	21.7	21.6	20.5	20.5
	18	22.5	22.5	21.6	21.5	21.7	21.6	20.5	20.5
	19	18.3	18.2	18.4	18.3	18.5	18.5	18.3	18.3
	24	18.3	18.2	18.4	18.2	18.5	18.5	18.2	18.3
High_1175	11	22.6	22.5	21.6	21.5	21.6	21.6	20.5	20.5
	18	22.5	22.5	21.6	21.5	21.6	21.6	20.5	20.5
	19	18.3	18.3	18.4	18.2	18.6	18.5	18.2	18.3
	24	18.3	18.2	18.4	18.2	18.5	18.5	18.2	18.3

11. Standalone SAR Test Results

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

11.1. CDMA BC0

Head SAR

Test Position	Mode	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
					1-g	10-g	
Left Touch	1xRTT (RC3,SO55)	1013	824.70	24.26			1
		384	836.52	24.38	0.513	0.377	
		777	848.31	24.37			1
		384	836.52	24.38	0.590	0.435	3
Left Tilt (15°)	1xRTT (RC3,SO55)	1013	824.70	24.26			1
		384	836.52	24.38	0.270	0.209	
		777	848.31	24.37			1
Right Touch	1xRTT (RC3,SO55)	1013	824.70	24.26			1
		384	836.52	24.38	0.456	0.345	
		777	848.31	24.37			1
Right Tilt (15°)	1xRTT (RC3,SO55)	1013	824.70	24.26			1
		384	836.52	24.38	0.274	0.210	
		777	848.31	24.37			1

Head SAR (VOIP mode operation)

Test Position	Mode	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
					1-g	10-g	
Left Touch	1xEVDO (Rel. 0)	1013	824.70	24.39			1
		384	836.52	24.37	0.546	0.370	
		777	848.31	24.13			1
Left Tilt (15°)	1xEVDO (Rel. 0)	1013	824.70	24.39			1
		384	836.52	24.37	0.304	0.209	
		777	848.31	24.13			1
Right Touch	1xEVDO (Rel. 0)	1013	824.70	24.39	0.818	0.514	
		384	836.52	24.37	0.779	0.488	
		777	848.31	24.13	0.792	0.494	
		1013	824.70	24.39	0.869	0.541	2
Right Tilt (15°)	1xEVDO (Rel. 0)	1013	824.70	24.39			1
		384	836.52	24.37	0.432	0.291	
		777	848.31	24.13			1

Note(s):

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

Body-worn SAR with 10 mm separation distance

Test Position	Mode	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
					1-g	10-g	
Rear	1xRTT (RC3, SO32)	1013	824.70	24.25	0.849	0.597	
		384	836.52	24.30	0.837	0.588	
		777	848.31	24.10	0.892	0.627	
		777	848.31	24.10	0.744	0.503	2
		777	848.31	24.10	0.784	0.557	3
Front	1xRTT (RC3, SO32)	1013	824.70	24.25			1
		384	836.52	24.30	0.442	0.330	
		777	848.31	24.10			1

Body-hotspot SAR with 10 mm separation distance

Test Position	Mode	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
					1-g	10-g	
Rear	1xEVDO (Rel. 0)	1013	824.70	24.39	0.827	0.522	
		384	836.52	24.37	0.895	0.565	
		777	848.31	24.13	0.882	0.550	
		384	836.52	24.37	0.715	0.447	2
		384	836.52	24.37	0.748	0.480	3
Front	1xEVDO (Rel. 0)	1013	824.70	24.39			1
		384	836.52	24.37	0.297	0.208	
		777	848.31	24.13			1
Left	1xEVDO (Rel. 0)	1013	824.70	24.39			1
		384	836.52	24.37	0.417	0.280	
		777	848.31	24.13			1
Right	1xEVDO (Rel. 0)	1013	824.70	24.39			4
		384	836.52	24.37			4
		777	848.31	24.13			4
Bottom	1xEVDO (Rel. 0)	1013	824.70	24.39			4
		384	836.52	24.37			4
		777	848.31	24.13			4
Top	1xEVDO (Rel. 0)	1013	824.70	24.39			1
		384	836.52	24.37	0.059	0.041	
		777	848.31	24.13			1

Note(s):

1. SAR test was performed in the middle channel only as the measured level was < 50% of the SAR limit as stated in FCC "Public Notice DA 02-1438" by the SCC-34/SC-2. Testing in the low and high channel is optional.
2. With headset attached.
3. With wireless charging battery cover.
4. SAR is not required due to antenna-to-edge's distance is greater than 2.5 cm.

11.2. CDMA BC1

Head SAR

Test Position	Mode	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
					1-g	10-g	
Left Touch	1xRTT (RC3,SO55)	25	1851.25	24.37	0.964	0.597	
		600	1880.00	24.40	0.785	0.543	
		1175	1908.75	24.26	0.885	0.566	
Left Tilt (15°)	1xRTT (RC3,SO55)	25	1851.25	24.37			1
		600	1880.00	24.40	0.364	0.224	
		1175	1908.75	24.26			1
Right Touch	1xRTT (RC3,SO55)	25	1851.25	24.37	0.872	0.538	
		600	1880.00	24.40	1.050	0.640	
		1175	1908.75	24.26	0.912	0.553	
		600	1880.00	24.40	1.140	0.692	3
Right Tilt (15°)	1xRTT (RC3,SO55)	25	1851.25	24.37			1
		600	1880.00	24.40	0.309	0.181	
		1175	1908.75	24.26			1

Head SAR (VOIP mode operation)

Test Position	Mode	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
					1-g	10-g	
Left Touch	1xEVDO (Rel. 0)	25	1851.25	24.37			1
		600	1880.00	24.44	0.512	0.322	
		1175	1908.75	24.21			1
Left Tilt (15°)	1xEVDO (Rel. 0)	25	1851.25	24.37			1
		600	1880.00	24.44	0.554	0.323	
		1175	1908.75	24.21			1
Right Touch	1xEVDO (Rel. 0)	25	1851.25	24.37			1
		600	1880.00	24.44	0.688	0.386	
		1175	1908.75	24.21			1
		600	1880.00	24.44	0.722	0.405	2
Right Tilt (15°)	1xEVDO (Rel. 0)	25	1851.25	24.37			1
		600	1880.00	24.44	0.504	0.297	
		1175	1908.75	24.21			1

Note(s):

1. SAR test was performed in the middle channel only as the measured level was < 50% of the SAR limit as stated in FCC "Public Notice DA 02-1438" by the SCC-34/SC-2. Testing in the low and high channel is optional.
2. With headset attached.
3. With wireless charging battery cover.
4. SAR is not required due to antenna-to-edge's distance is greater than 2.5 cm.

Body-worn SAR with 10 mm separation distance

Test Position	Mode	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
					1-g	10-g	
Rear	1xRTT (RC3, SO32)	25	1851.25	24.26	1.170	0.686	
		600	1880.0	24.35	1.150	0.669	
		1175	1908.75	24.17	1.070	0.634	
		25	1851.25	24.26	1.160	0.675	2
		25	1851.25	24.26	1.120	0.663	3
Front	1xRTT (RC3, SO32)	25	1851.25	24.26	0.958	0.596	
		600	1880.0	24.35	1.010	0.627	
		1175	1908.75	24.17	0.963	0.595	

Body-hotspot SAR with 10 mm separation distance

Test Position	Mode	Ch #.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
					1-g	10-g	
Rear	1xEVDO (Rel. 0)	25	1851.25	24.37			1
		600	1880.0	24.44	0.592	0.366	
		1175	1908.75	24.21			1
		600	1880.0	24.44	0.431	0.263	2
		600	1880.0	24.44	0.393	0.235	3
Front	1xEVDO (Rel. 0)	25	1851.25	24.37			1
		600	1880.0	24.44	0.374	0.236	
		1175	1908.75	24.21			1
Left	1xEVDO (Rel. 0)	25	1851.25	24.37			1
		600	1880.0	24.44	0.357	0.187	
		1175	1908.75	24.21			1
Right	1xEVDO (Rel. 0)	25	1851.25	24.37			4
		600	1880.0	24.44			4
		1175	1908.75	24.21			4
Bottom	1xEVDO (Rel. 0)	25	1851.25	24.37			4
		600	1880.0	24.44			4
		1175	1908.75	24.21			4
Top	1xEVDO (Rel. 0)	25	1851.25	24.37			1
		600	1880.0	24.44	0.178	0.107	
		1175	1908.75	24.21			1

Note(s):

1. SAR test was performed in the middle channel only as the measured level was < 50% (0.8 mW/g) of the SAR limit as stated in FCC "Public Notice DA 02-1438" by the SCC-34/SC-2. Testing in the low and high channel is optional.
2. With headset attached.
3. With wireless charging battery cover.
4. SAR is not required due to antenna-to-edge's distance is greater than 2.5 cm.

11.3. LTE Band 13

Head SAR

Test Position	Mode	UL Ch #.	Freq. (MHz)	RB Size	RB Offset	MPR	Avg Pwr (dBm)	SAR (mW/g)		Note
								1-g	10-g	
Left Touch	QPSK	23230	782.0	1	0	0	22.70	0.310	0.223	
				1	49	0	22.73	0.316	0.236	
				25	12	1	21.50	0.183	0.138	
				50	0	1	21.50			1
	16QAM	23230	782.0	1	0	1	21.70	0.245	0.185	
				1	49	1	21.72	0.260	0.196	
				25	12	2	20.45	0.130	0.098	
				50	0	2	20.50			1
Left Tilt (15°)	QPSK	23230	782.0	1	0	0	22.70	0.173	0.131	
				1	49	0	22.73	0.154	0.116	
				25	12	1	21.50	0.092	0.070	
				50	0	1	21.50			1
	16QAM	23230	782.0	1	0	1	21.70	0.140	0.105	
				1	49	1	21.72	0.129	0.097	
				25	12	2	20.45	0.075	0.057	
				50	0	2	20.50			1
Right Touch	QPSK	23230	782.0	1	0	0	22.70	0.347	0.253	
				1	0	0	22.70	0.332	0.242	3
				1	49	0	22.73	0.344	0.249	
				25	12	1	21.50	0.254	0.183	
	16QAM	23230	782.0	50	0	1	21.50	0.268	0.195	
				1	0	1	21.70	0.274	0.199	
				1	49	1	21.72	0.284	0.203	
				25	12	2	20.45	0.211	0.154	
Right Tilt (15°)	QPSK	23230	782.0	50	0	2	20.50	0.216	0.155	
				1	0	0	22.70	0.199	0.151	
				1	49	0	22.73	0.189	0.142	
				25	12	1	21.50	0.136	0.102	
	16QAM	23230	782.0	50	0	1	21.50			1
				1	0	1	21.70	0.183	0.139	
				1	49	1	21.72	0.159	0.120	
				25	12	2	20.45	0.097	0.073	
				50	0	2	20.50			1

Note(s):

1. The test reduction for LTE SAR are based on KDB 941225 D05 SAR for LTE Devices v01
2. With headset attached.
3. With wireless charging battery cover.

Body-worn & Body-hotspot SAR with 10 mm separation distance

Test Position	Mode	UL Ch #.	Freq. (MHz)	RB Slze	RB Offset	MPR	Avg Pwr (dBm)	SAR (mW/g)		Note
								1-g	10-g	
Rear	QPSK	23230	782.0	1	0	0	22.70	0.461	0.321	
				1	49	0	22.73	0.560	0.372	
				1	49	0	22.70	0.459	0.290	2
				1	49	0	22.70	0.511	0.329	3
				25	12	1	21.50	0.353	0.229	
				50	0	1	21.50	0.353	0.232	
	16QAM	23230	782.0	1	0	1	21.70	0.372	0.259	
				1	49	1	21.72	0.452	0.301	
				25	12	2	20.45	0.260	0.169	
				50	0	2	20.50	0.285	0.186	
Front	QPSK	23230	782.0	1	0	0	22.70	0.340	0.250	
				1	49	0	22.73	0.357	0.236	
				25	12	1	21.50	0.244	0.169	
				50	0	1	21.50			1
	16QAM	23230	782.0	1	0	1	21.70	0.292	0.206	
				1	49	1	21.72	0.311	0.181	
				25	12	2	20.45	0.307	0.192	
				50	0	2	20.50			1
Left	QPSK	23230	782.0	1	0	0	22.70			4
				1	49	0	22.73			4
				25	12	1	21.50			4
				50	0	1	21.50			4
	16QAM	23230	782.0	1	0	1	21.70			4
				1	49	1	21.72			4
				25	12	2	20.45			4
				50	0	2	20.50			4
Right	QPSK	23230	782.0	1	0	0	22.70	0.404	0.283	
				1	49	0	22.73	0.355	0.249	
				25	12	1	21.50	0.272	0.186	
				50	0	1	21.50			1
	16QAM	23230	782.0	1	0	1	21.70	0.358	0.251	
				1	49	1	21.72	0.319	0.223	
				25	12	2	20.45	0.228	0.160	
				50	0	2	20.50			1
Bottom	QPSK	23230	782.0	1	0	0	22.70	0.225	0.138	
				1	49	0	22.73	0.174	0.105	
				25	12	1	21.50	0.170	0.106	
				50	0	1	21.50			1
	16QAM	23230	782.0	1	0	1	21.70	0.194	0.119	
				1	49	1	21.72	0.147	0.088	
				25	12	2	20.45	0.146	0.090	
				50	0	2	20.50			1
Top	QPSK	23230	782.0	1	0	0	22.70			4
				1	49	0	22.73			4
				25	12	1	21.50			4
				50	0	1	21.50			4
	16QAM	23230	782.0	1	0	1	21.70			4
				1	49	1	21.72			4
				25	12	2	20.45			4
				50	0	2	20.50			4

Note(s):

1. The test reduction for LTE SAR is based on KDB 941225 D05 SAR for LTE Devices v01.
2. With headset attached.
3. With wireless charging battery cover.
4. SAR is not required due to antenna-to-edge's distance is greater than 2.5 cm.

11.4. Wi-Fi

Head SAR

Test position	Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
					1-g	10-g	
Left Touch	802.11b	1	2412	15.0			1
		6	2437	15.0	0.016	0.00562	
		11	2462	15.0			1
Left Tilt (15°)	802.11b	1	2412	15.0			1
		6	2437	15.0	0.017	0.00853	
		11	2462	15.0			1
Right Touch	802.11b	1	2412	15.0			1
		6	2437	15.0	0.111	0.053	
		11	2462	15.0			1
		6	2437	15.0	0.096	0.046	3
Right Tilt (15°)	802.11b	1	2412	15.0			1
		6	2437	15.0	0.043	0.020	
		11	2462	15.0			1

Body-worn & Body-hotspot SAR with 10 mm separation distance

Test position	Mode	Ch No.	Freq. (MHz)	Avg Pwr (dBm)	SAR (mW/g)		Note
					1-g	10-g	
Rear	802.11b	1	2412	15.0			1
		6	2437	15.0	0.171	0.083	
		11	2462	15.0			1
		6	2437	15.0	0.096	0.039	2
		6	2437	15.0	0.109	0.054	3
Front	802.11b	1	2412	15.0			1
		6	2437	15.0	0.160	0.054	
		11	2462	15.0			1
Left	802.11b	1	2412	15.0			1
		6	2437	15.0	0.110	0.052	
		11	2462	15.0			1
Right	802.11b	1	2412	15.0			4
		6	2437	15.0			4
		11	2462	15.0			4
Bottom	802.11b	1	2412	15.0			4
		6	2437	15.0			4
		11	2462	15.0			4
Top	802.11b	1	2412	15.0			4
		6	2437	15.0			4
		11	2462	15.0			4

Note(s):

1. Testing was performed on the channel with the highest output power only as the SAR was ≤ 0.8 W/kg with the operating frequency band having a range of < 100 MHz. Per KDB 447498 1) e) i)
2. With headset attached.
3. With wireless charging battery cover.
4. SAR is not required due to antenna-to-edge's distance is greater than 2.5 cm.

12. Summary of Highest 1-g SAR

The test configuration for each body exposure condition (head, body and Hotspot) is dependent on the applicable voice or data modes, and antenna selected.

FCC rule part	Technology/Band	Test configuration	Mode	Separation distance (mm)	Highest 1g SAR (W/kg)
22	CDMA BC0 (835)	Head: Left Touch	1xRTT (RC3, SO55)	--	0.590
		Head: Left Touch	1xEVDO (Rel. 0)	--	0.869
		Body: Rear	1xRTT (RC3, SO32)	10	0.892
		Hotspot: Rear	1xEVDO (Rel. 0)	10	0.895
24	CDMA BC1 (1900)	Head: Right Touch	1xRTT (RC3, SO55)	--	1.140
		Head: Right Touch	1xEVDO (Rel. 0)	--	0.722
		Body: Rear	1xRTT (RC3, SO32)	10	1.17
		Hotspot: Rear	1xEVDO (Rel. 0)	10	0.592
27	LTE Band 13	Head: Right Touch	10 MHz (QPSK) RB# 1 RB# 0	--	0.347
		Body & Hotspot: Rear	10 MHz (QPSK) RB# 1 RB# 49	10	0.560
15.247	Wi-Fi 2.4 GHz	Head: Right touch	802.11b, 1 kbps	--	0.111
		Body & Hotspot: Rear	802.11b, 1 kbps	10	0.171

13. Worst-case SAR Plots

Date: 11/17/2011

Test Laboratory: UL CCS SAR Lab C

CDMA2000 Cell 1xRTT (RC3 SO55)

Communication System: CDMA2000; Frequency: 836.52 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 836.52$ MHz; $\sigma = 0.876$ mho/m; $\epsilon_r = 41.36$; $\rho = 1000$ kg/m³
Phantom section: Left 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(8.52, 8.52, 8.52); 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 Sn1239; Calibrated: 10/18/2011
- Phantom: SAM with CRP v5.0; Type: QD000P40CD; Serial: TP1632
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

LHS/Touch_M ch w/ wireless battery cover/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.676 mW/g

LHS/Touch_M ch w/ wireless battery cover/Zoom Scan (5x5x7)/Cube 0: Measurement grid:

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

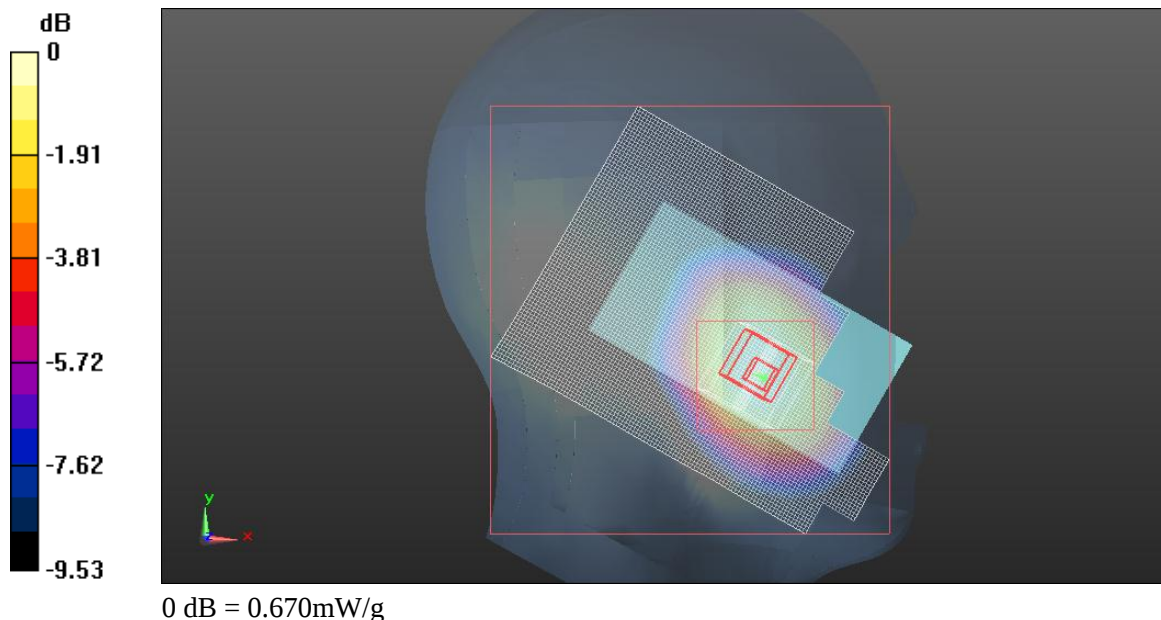
Reference Value = 27.650 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 0.776 W/kg

SAR(1 g) = 0.590 mW/g; SAR(10 g) = 0.435 mW/g

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

Maximum value of SAR (measured) = 0.673 mW/g



Date: 11/17/2011

Test Laboratory: UL CCS SAR Lab C

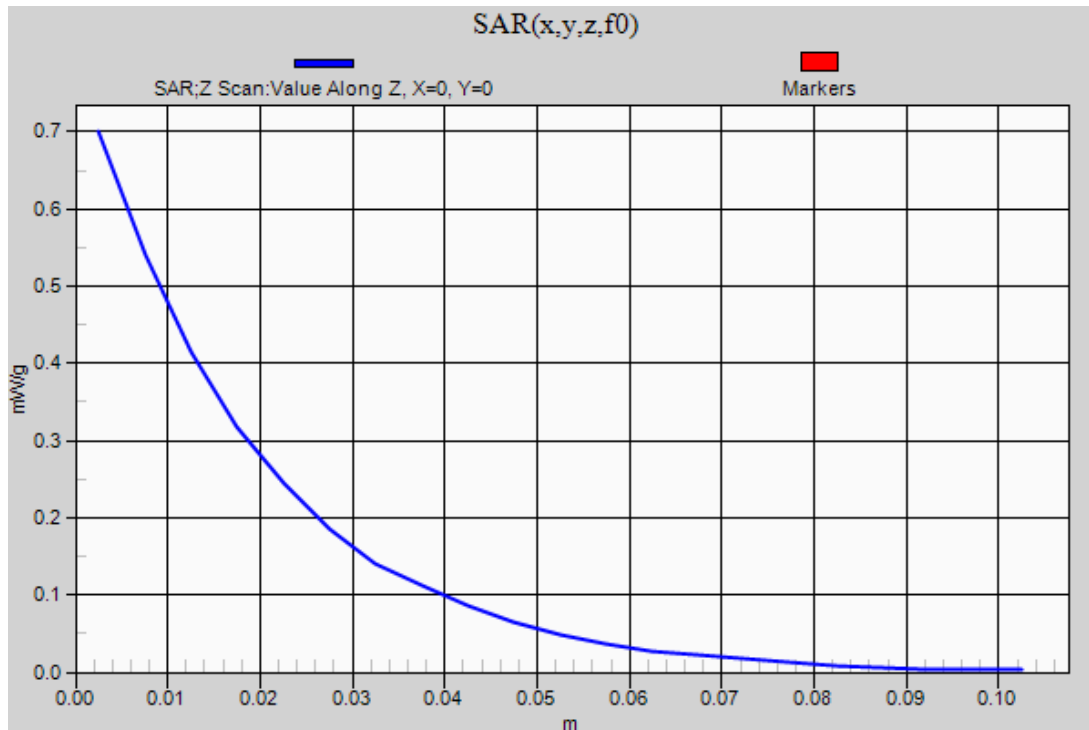
CDMA2000 Cell 1xRTT (RC3 SO55)

Communication System: CDMA2000; Frequency: 836.52 MHz; Duty Cycle: 1:1

LHS/Touch_M ch w/ wireless battery cover/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

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

Maximum value of SAR (measured) = 0.700 mW/g



Date: 11/28/2011

Test Laboratory: UL CCS SAR Lab B

CDMA2000 Cell 1xEVDO (Rel. 0) Volume scan

Communication System: CDMA2000; Frequency: 824.7 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 825$ MHz; $\sigma = 0.876$ mho/m; $\epsilon_r = 42.433$; $\rho = 1000$ kg/m³
Phantom section: Right Section

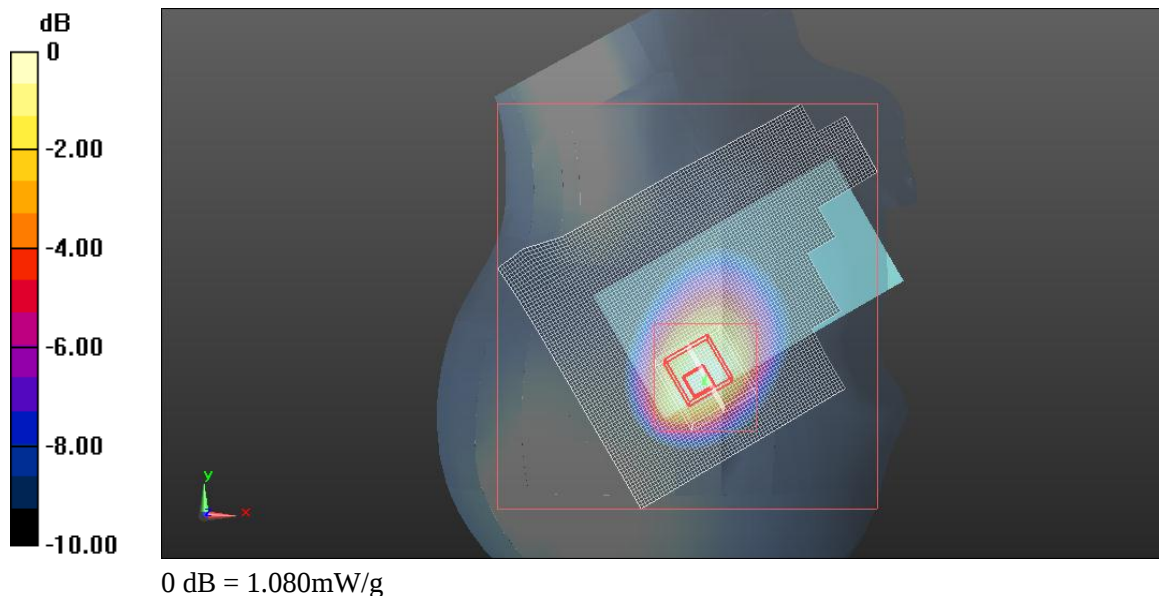
Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

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 - SN3773; ConvF(8.64, 8.64, 8.64); 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 Sn1258; Calibrated: 5/2/2011
- Phantom: SAM with CRP v5.0; Type: QD000P40CD; Serial: TP1632
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

RHS/Touch_L ch w/ wireless battery cover/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.116 mW/g

RHS/Touch_L ch w/ wireless battery cover/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 34.178 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 1.387 W/kg
SAR(1 g) = 0.869 mW/g; SAR(10 g) = 0.541 mW/g
Maximum value of SAR (measured) = 1.083 mW/g



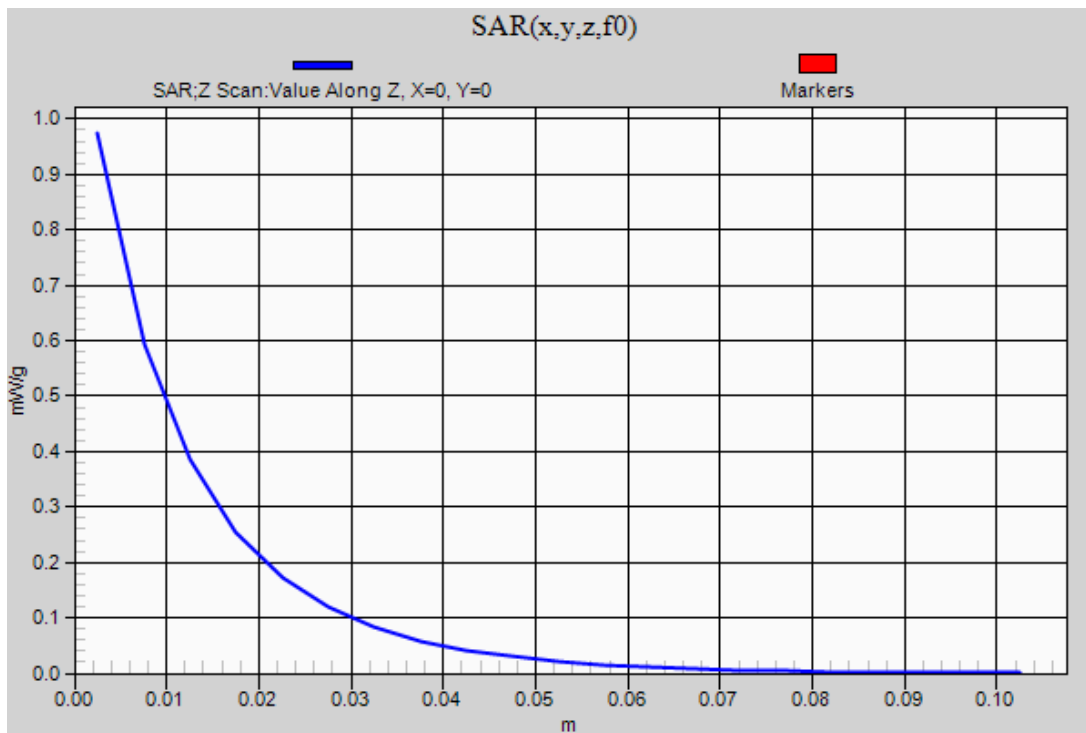
Date: 11/28/2011

Test Laboratory: UL CCS SAR Lab B

CDMA2000 Cell 1xEVDO (Rel. 0) Volume scan

Communication System: CDMA2000; Frequency: 824.7 MHz; Duty Cycle: 1:1

RHS/Touch_L ch w/ wireless battery cover/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.974 mW/g



Date: 11/16/2011

Test Laboratory: UL CCS SAR Lab C

CDMA2000 Cell 1xRTT (RC3 SO32)

Communication System: CDMA2000; Frequency: 848.31 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 848.31$ MHz; $\sigma = 0.981$ mho/m; $\epsilon_r = 53.253$; $\rho = 1000$ 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)
- Electronics: DAE4 Sn1239; Calibrated: 10/18/2011
- Phantom: ELI v4.0 (B); Type: QDOVA001BB; Serial: 1121
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Rear/H ch/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 1.072 mW/g

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

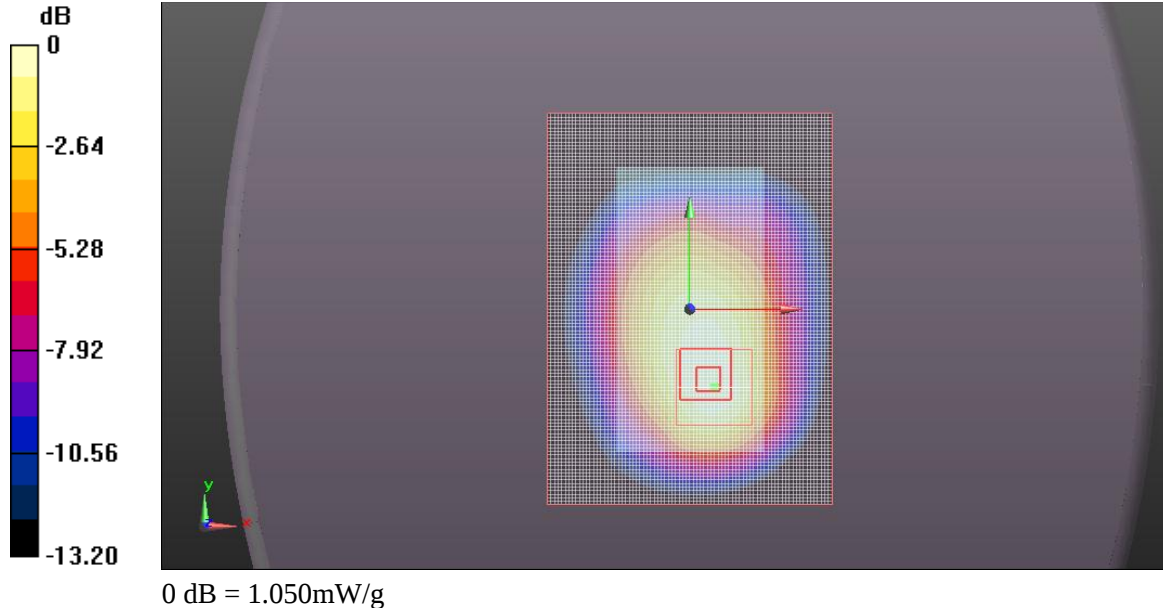
Reference Value = 32.265 V/m; Power Drift = 0.0039 dB

Peak SAR (extrapolated) = 1.304 W/kg

SAR(1 g) = 0.892 mW/g; SAR(10 g) = 0.627 mW/g

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

Maximum value of SAR (measured) = 1.050 mW/g



Date: 11/16/2011

Test Laboratory: UL CCS SAR Lab C

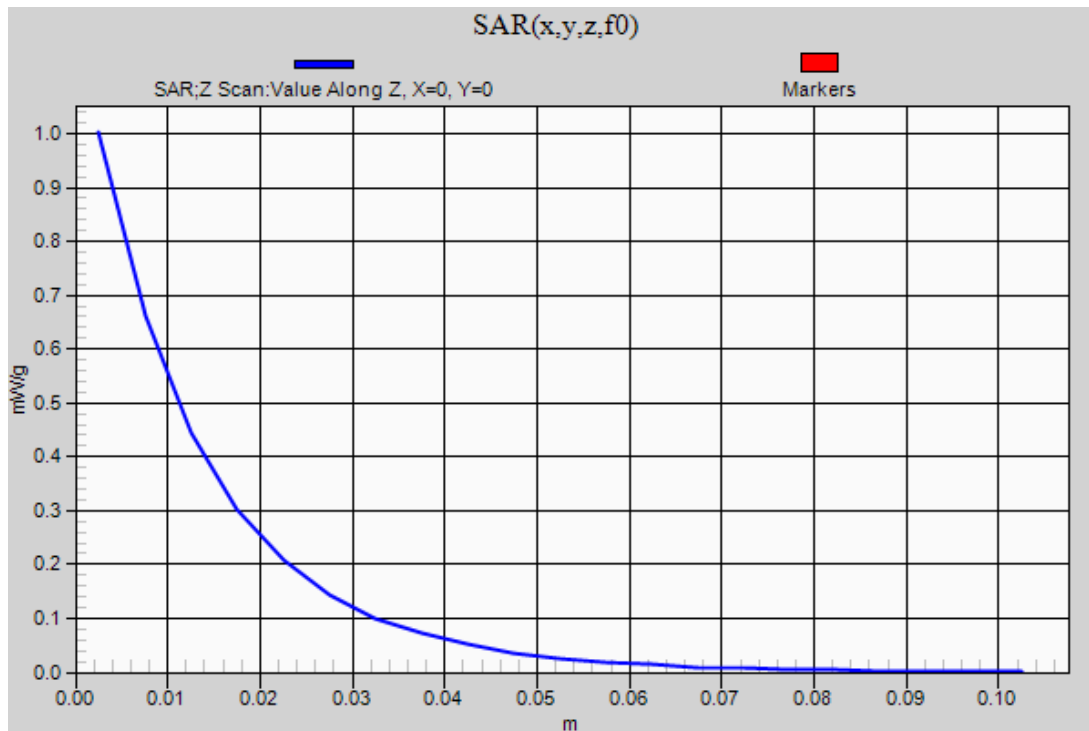
CDMA2000 Cell 1xRTT (RC3 SO32)

Communication System: CDMA2000; Frequency: 848.31 MHz; Duty Cycle: 1:1

Rear/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) = 1.002 mW/g



Date: 11/16/2011

Test Laboratory: UL CCS SAR Lab C

CDMA2000 Cell 1xEVDO (Rel. 0)

Communication System: CDMA2000; Frequency: 836.52 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 836.52$ MHz; $\sigma = 0.97$ mho/m; $\epsilon_r = 53.347$; $\rho = 1000$ 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)
- Electronics: DAE4 Sn1239; Calibrated: 10/18/2011
- Phantom: ELI v4.0 (B); Type: QDOVA001BB; Serial: 1121
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Rear/M ch/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 1.036 mW/g

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

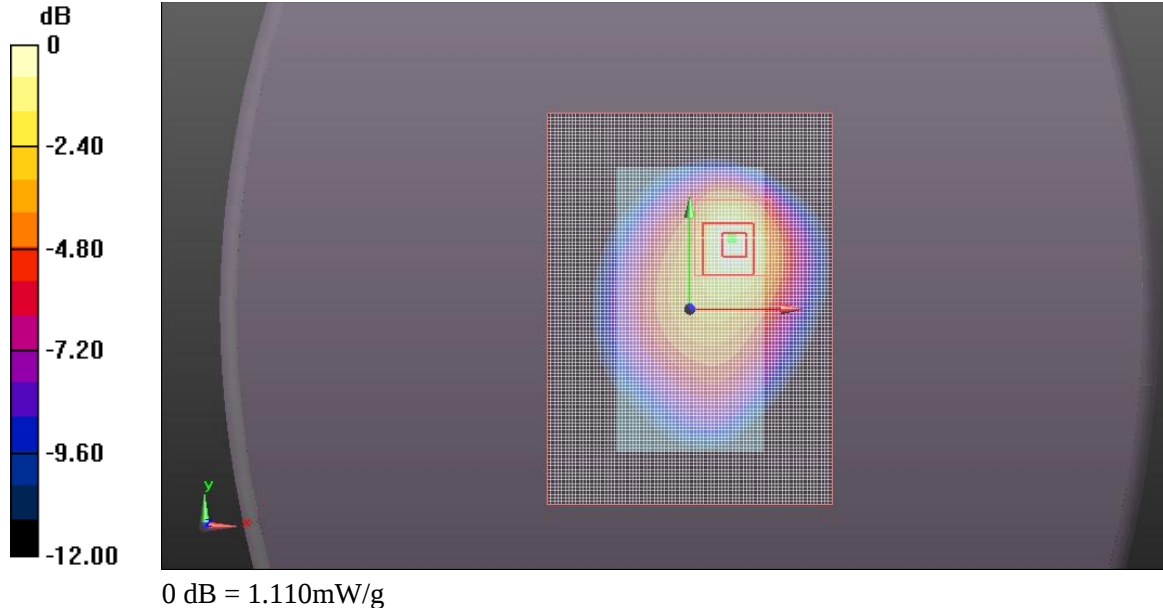
Reference Value = 32.510 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 1.374 W/kg

SAR(1 g) = 0.895 mW/g; SAR(10 g) = 0.565 mW/g

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

Maximum value of SAR (measured) = 1.108 mW/g



Date: 11/16/2011

Test Laboratory: UL CCS SAR Lab C

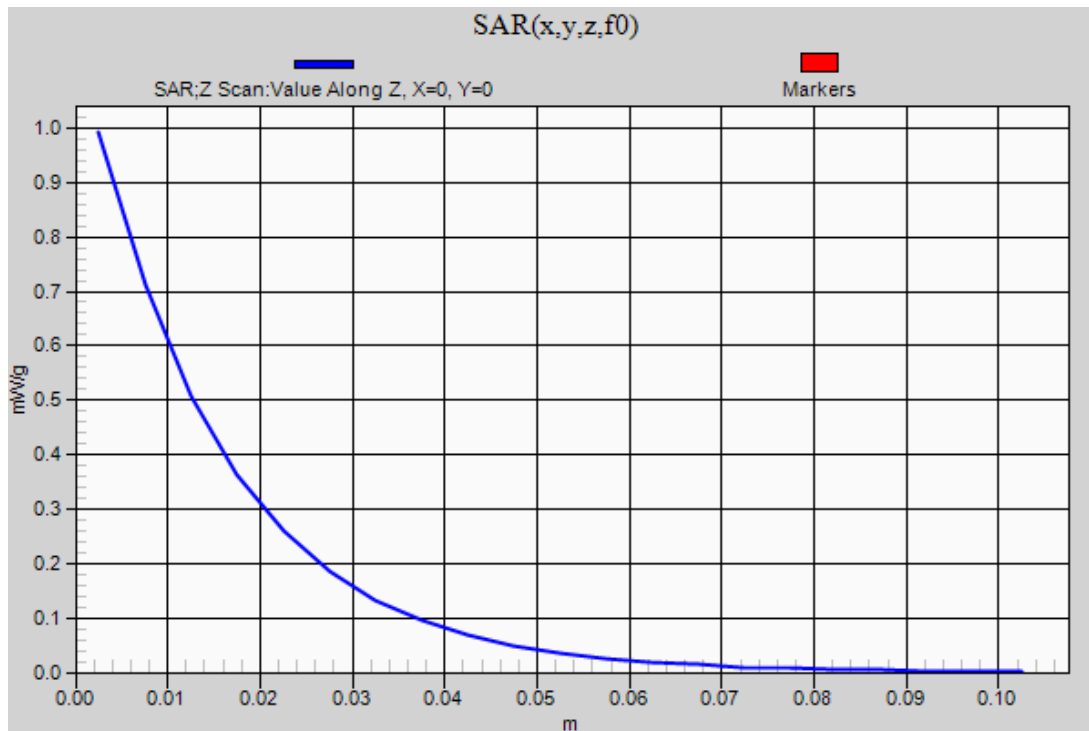
CDMA2000 Cell 1xEVDO (Rel. 0)

Communication System: CDMA2000; Frequency: 836.52 MHz; Duty Cycle: 1:1

Rear/M 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) = 0.992 mW/g



Date: 11/15/2011

Test Laboratory: UL CCS SAR Lab C

CDMA2000 PCS 1xRTT (RC3 SO55)

Communication System: CDMA2000; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.375$ mho/m; $\epsilon_r = 39.55$; $\rho = 1000$ kg/m³
Phantom section: Right 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(7.17, 7.17, 7.17); 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 Sn1239; Calibrated: 10/18/2011
- Phantom: SAM with CRP v5.0; Type: QD000P40CD; Serial: TP1632
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

RHS/Touch_M ch w/ wireless charging battery cover/Area Scan (81x111x1): Measurement

grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.382 mW/g

RHS/Touch_M ch w/ wireless charging battery cover/Zoom Scan (5x5x7)/Cube 0:

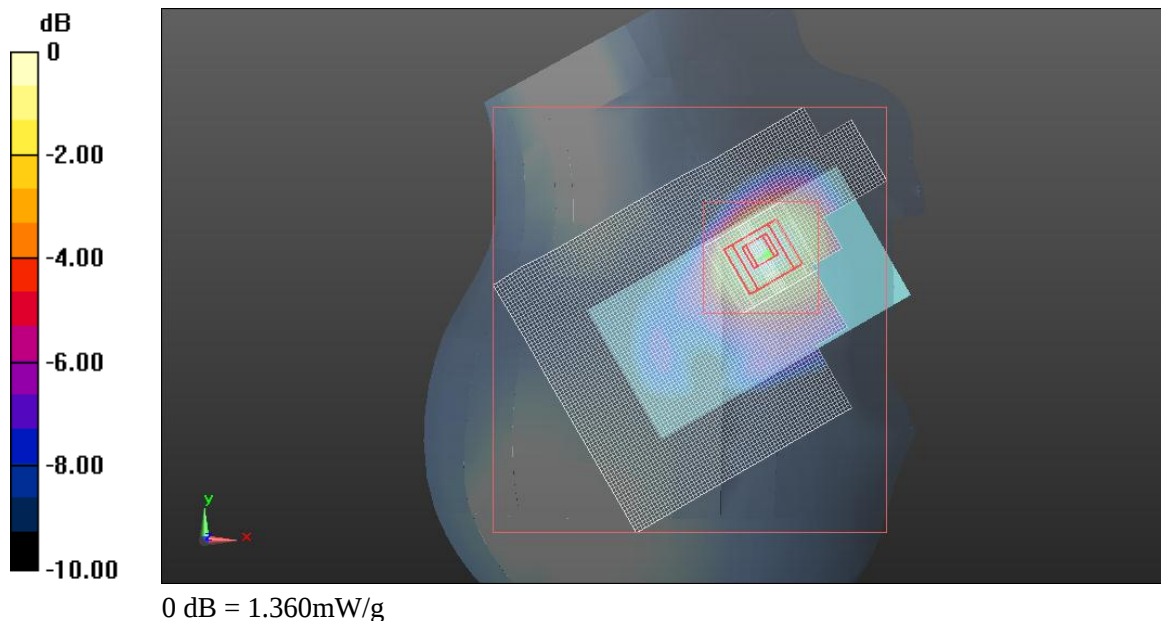
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 32.067 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 1.772 W/kg

SAR(1 g) = 1.14 mW/g; SAR(10 g) = 0.692 mW/g

Maximum value of SAR (measured) = 1.356 mW/g



Date: 11/15/2011

Test Laboratory: UL CCS SAR Lab C

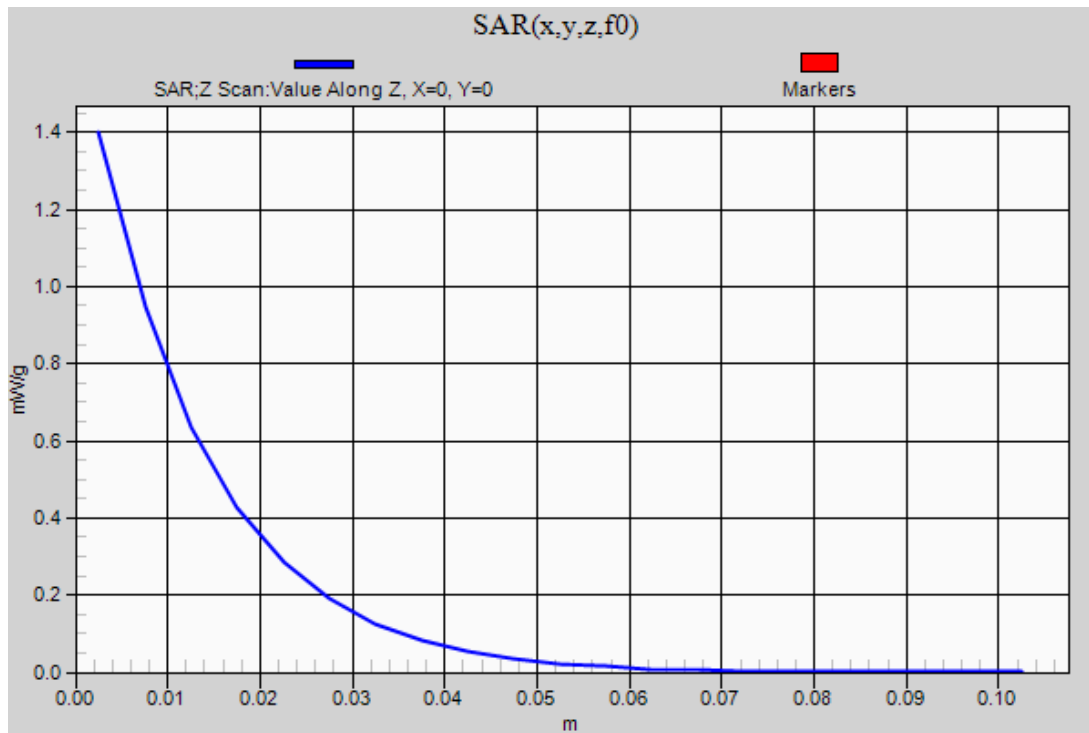
CDMA2000 PCS 1xRTT (RC3 SO55)

Communication System: CDMA2000; Frequency: 1880 MHz; Duty Cycle: 1:1

RHS/Touch_M ch w/ wireless charging battery cover/Z Scan (1x1x21): Measurement grid:

dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 1.400 mW/g



Date: 11/15/2011

Test Laboratory: UL CCS SAR Lab C

CDMA2000 PCS 1xEVDO (RCell. 0)

Communication System: CDMA2000; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.375$ mho/m; $\epsilon_r = 39.55$; $\rho = 1000$ kg/m³
Phantom section: Right 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(7.17, 7.17, 7.17); 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 Sn1239; Calibrated: 10/18/2011
- Phantom: SAM with CRP v5.0; Type: QD000P40CD; Serial: TP1632
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

RHS/Touch_M ch w/ wireless charging battery cover/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.024 mW/g

RHS/Touch_M ch w/ wireless charging battery cover/Zoom Scan (5x5x7)/Cube 0:

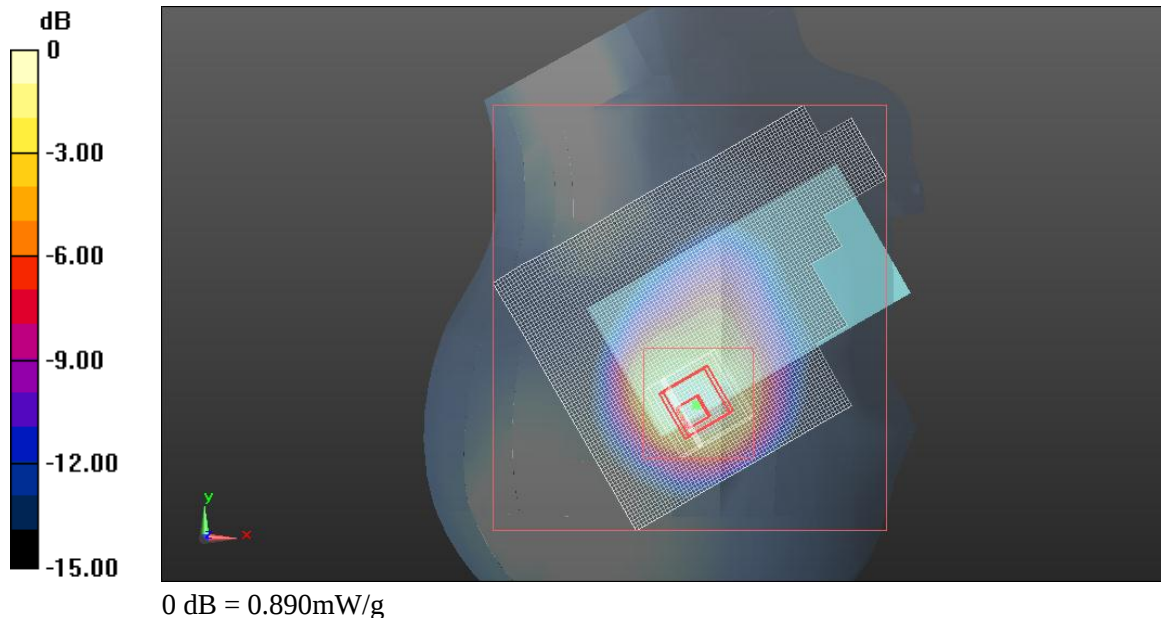
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 26.440 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 1.283 W/kg

SAR(1 g) = 0.722 mW/g; SAR(10 g) = 0.405 mW/g

Maximum value of SAR (measured) = 0.890 mW/g



Date: 11/15/2011

Test Laboratory: UL CCS SAR Lab C

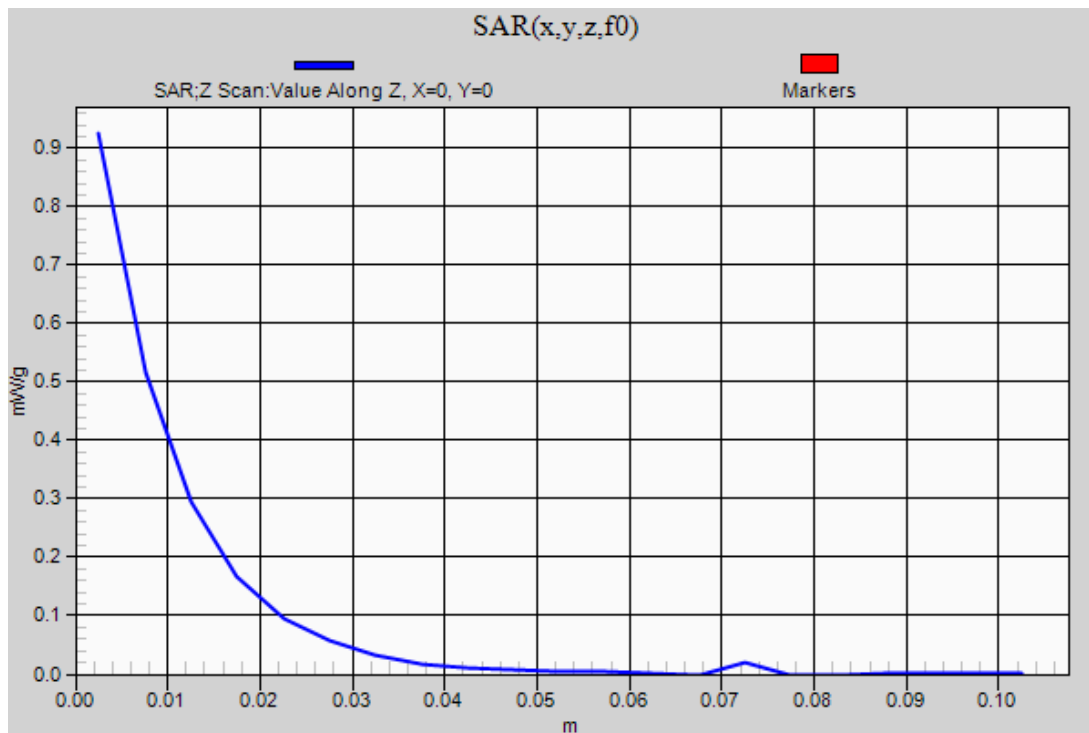
CDMA2000 PCS 1xEVDO (RCell. 0)

Communication System: CDMA2000; Frequency: 1880 MHz; Duty Cycle: 1:1

RHS/Touch_M ch w/ wireless charging battery cover/Z Scan (1x1x21): Measurement grid:

dx=20mm, dy=20mm, dz=5mm

Maximum value of SAR (measured) = 0.925 mW/g



Date: 11/14/2011

Test Laboratory: UL CCS SAR Lab C

CDMA2000 PCS 1xRTT (RC3 SO32)

Communication System: CDMA2000; Frequency: 1851.25 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 1851.25$ MHz; $\sigma = 1.447$ mho/m; $\epsilon_r = 51.297$; $\rho = 1000$ 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 (Locations From Previous Scan Used)), Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1239; Calibrated: 10/18/2011
- Phantom: ELI v4.0 (A); Type: QDOVA001BB; Serial: 1117
- Measurement SW: DASY52, Version 52.6 (2);SEMCAD X Version 14.4.5 (3634)

Rear/L ch/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 1.435 mW/g

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

Reference Value = 32.093 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 1.961 W/kg

SAR(1 g) = 1.17 mW/g; SAR(10 g) = 0.686 mW/g

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

Maximum value of SAR (measured) = 1.460 mW/g



Date: 11/14/2011

Test Laboratory: UL CCS SAR Lab C

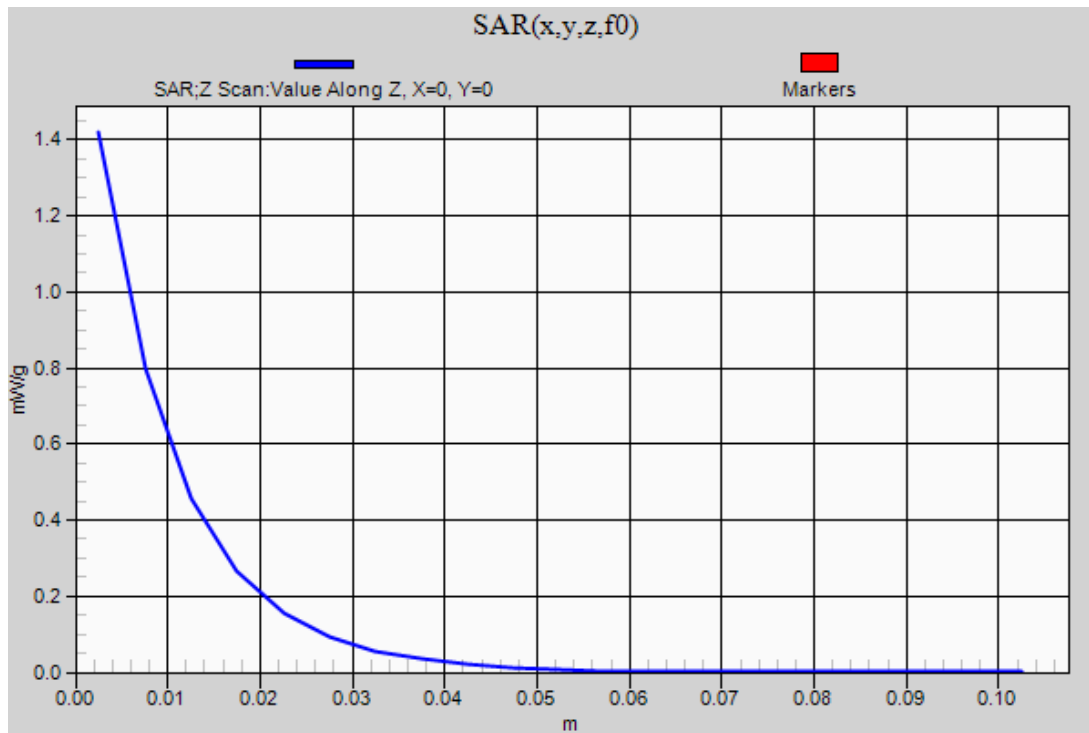
CDMA2000 PCS 1xRTT (RC3 SO32)

Communication System: CDMA2000; Frequency: 1851.25 MHz; Duty Cycle: 1:1

Rear/L 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) = 1.419 mW/g



Date: 11/14/2011

Test Laboratory: UL CCS SAR Lab C

CDMA2000 PCS 1xEVDO (Rel. 0)

Communication System: CDMA2000; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.479$ mho/m; $\epsilon_r = 51.221$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

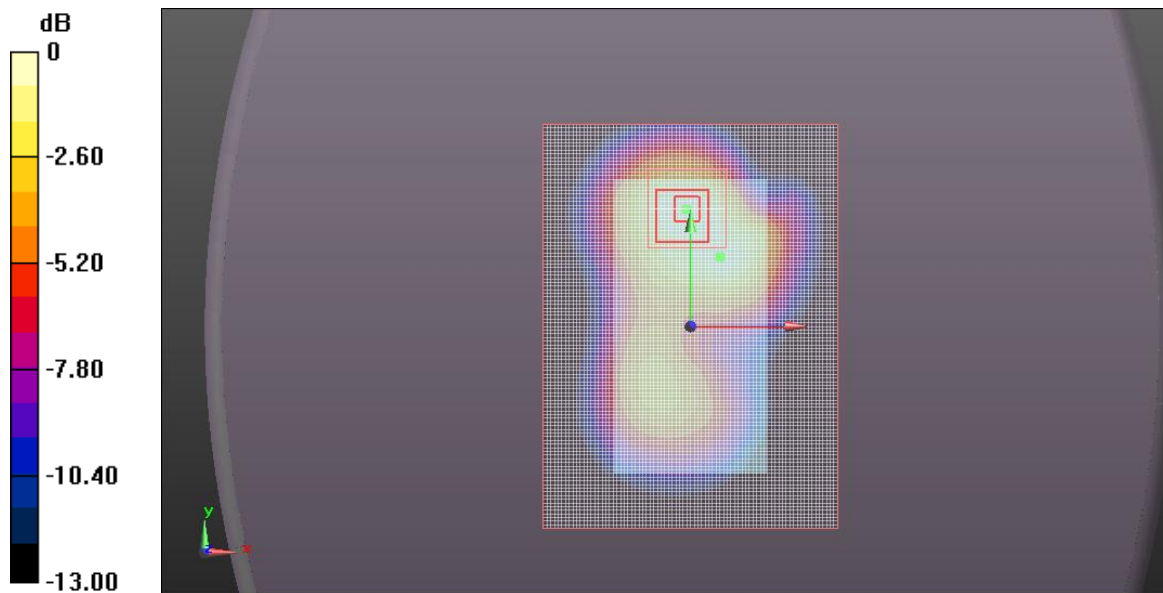
Room Ambient Temperature: 24.0 deg. C; Liquid Temperature: 23.0 deg. C

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 Sn1239; Calibrated: 10/18/2011
- Phantom: ELI v4.0 (A); Type: QDOVA001BB; Serial: 1117
- Measurement SW: DASY52, Version 52.6 (2);SEMCAD X Version 14.4.5 (3634)

Rear/M ch/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.766 mW/g

Rear/M ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.003 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.958 W/kg
SAR(1 g) = 0.592 mW/g; SAR(10 g) = 0.366 mW/g
Maximum value of SAR (measured) = 0.730 mW/g



0 dB = 0.730mW/g

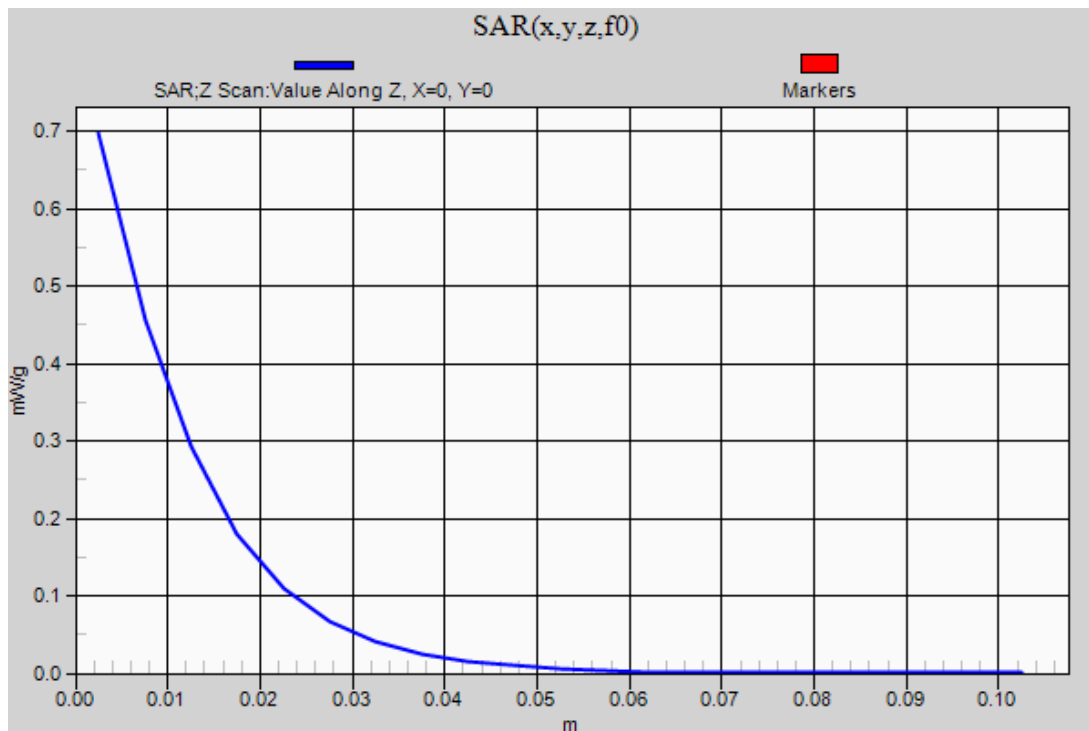
Date: 11/14/2011

Test Laboratory: UL CCS SAR Lab C

CDMA2000 PCS 1xEVDO (Rel. 0)

Communication System: CDMA2000; Frequency: 1880 MHz; Duty Cycle: 1:1

Rear/M ch/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.697 mW/g



Date: 11/22/2011

Test Laboratory: UL CCS SAR Lab B

LTE_Band 13 (BW=10MHz)

Communication System: LTE; Frequency: 782 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 782 \text{ MHz}$; $\sigma = 0.902 \text{ mho/m}$; $\epsilon_r = 42.842$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Right 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 - SN3773; ConvF(8.96, 8.96, 8.96); 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 Sn1258; Calibrated: 5/2/2011
- Phantom: SAM with CRP v5.0; Type: QD000P40CD; Serial: TP1632
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

RHS/Touch_M ch_QPSK_RB 1/0/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.427 mW/g

RHS/Touch_M ch_QPSK_RB 1/0/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

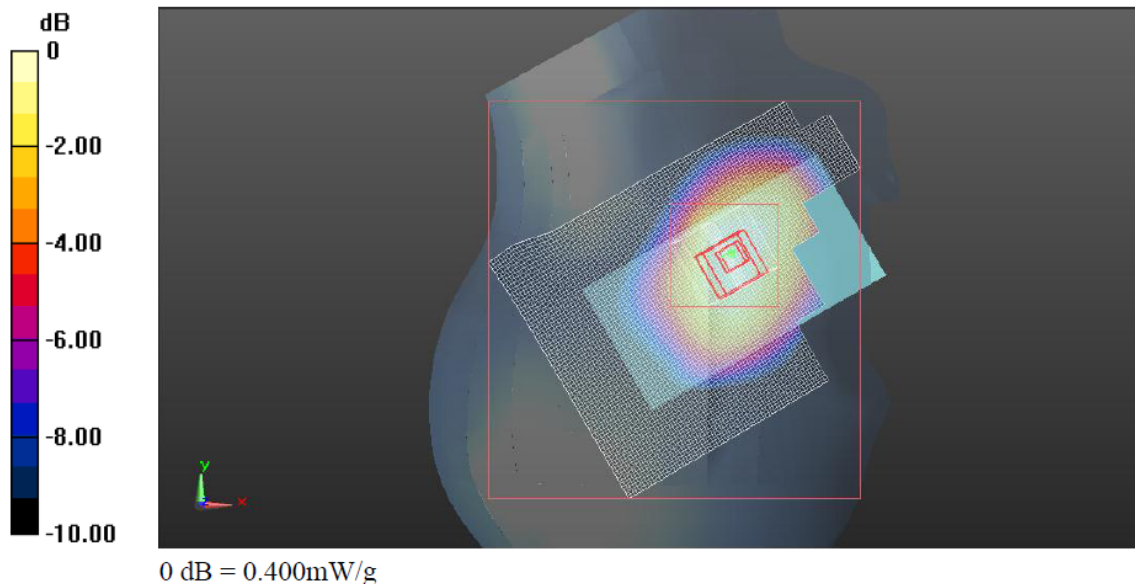
Reference Value = 20.858 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 0.475 W/kg

SAR(1 g) = 0.347 mW/g; SAR(10 g) = 0.253 mW/g

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

Maximum value of SAR (measured) = 0.398 mW/g



Date: 11/22/2011

Test Laboratory: UL CCS SAR Lab B

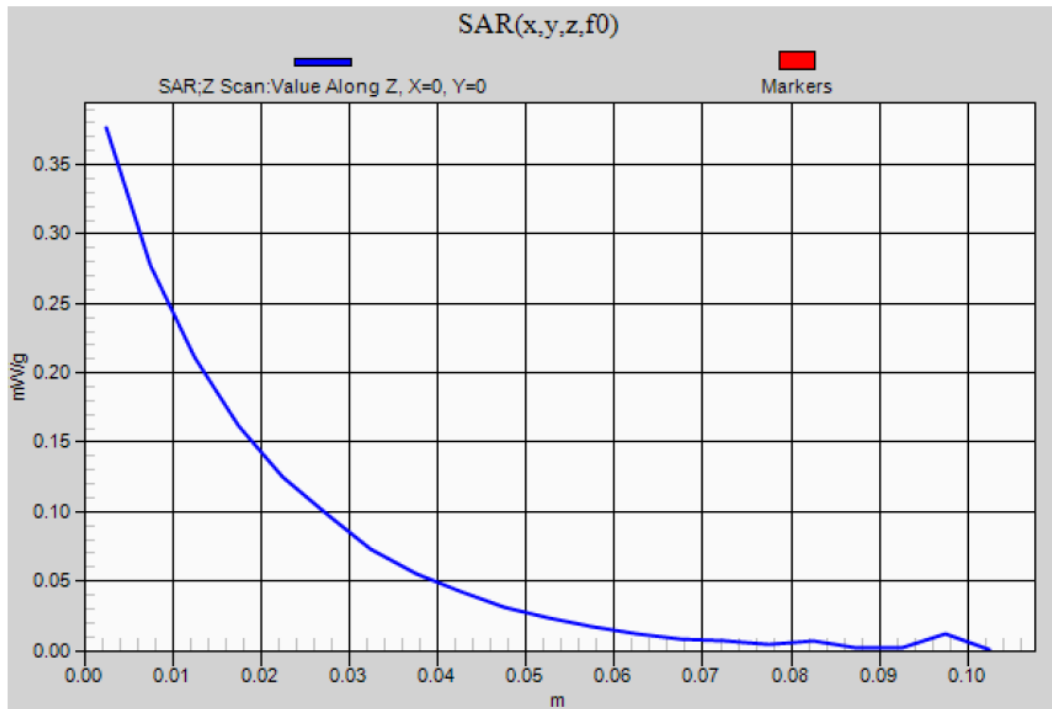
LTE_Band 13 (BW=10MHz)

Communication System: LTE; Frequency: 782 MHz;Duty Cycle: 1:1

RHS/Touch_M ch_QPSK_RB 1/0/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

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

Maximum value of SAR (measured) = 0.376 mW/g



Date: 11/15/2011

Test Laboratory: UL CCS SAR Lab B

LTE_Band 13 (BW=10MHz)

Communication System: LTE; Frequency: 782 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 782 \text{ MHz}$; $\sigma = 0.964 \text{ mho/m}$; $\epsilon_r = 53.433$; $\rho = 1000 \text{ kg/m}^3$

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 - SN3773; ConvF(8.74, 8.74, 8.74); Calibrated: 5/3/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1258; Calibrated: 5/2/2011
- Phantom: ELI v5.0 (B); Type: QDOVA001BB; Serial: 1118
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Rear/M ch_QPSK_RB 1/49/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.723 mW/g

Rear/M ch_QPSK_RB 1/49/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

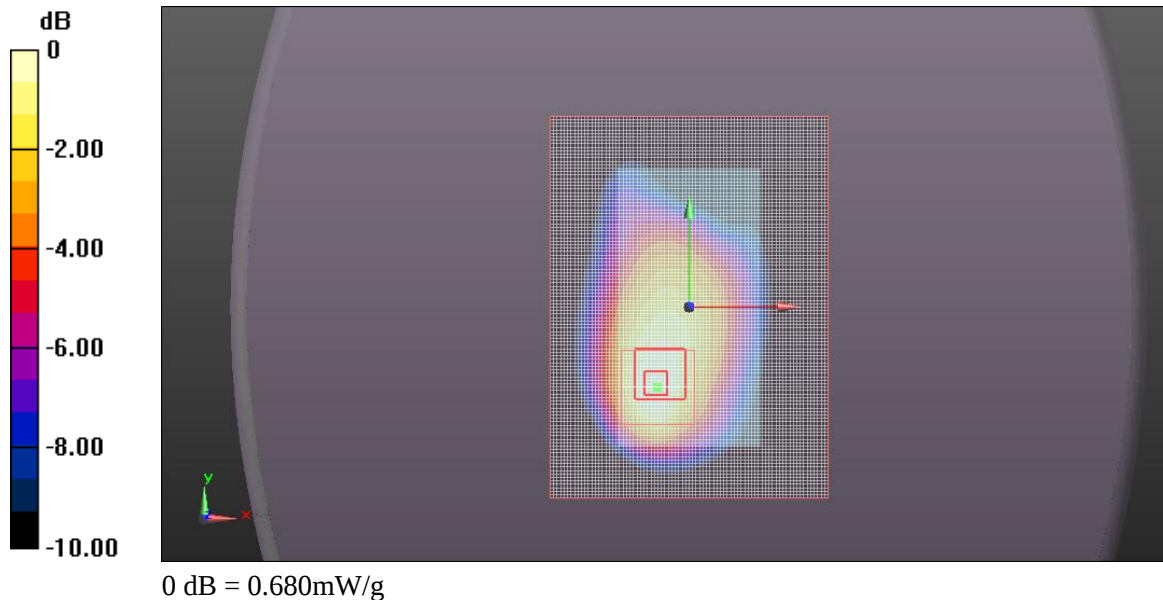
Reference Value = 26.950 V/m; Power Drift = -0.0097 dB

Peak SAR (extrapolated) = 0.877 W/kg

SAR(1 g) = 0.560 mW/g; SAR(10 g) = 0.372 mW/g

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

Maximum value of SAR (measured) = 0.683 mW/g



Date: 11/15/2011

Test Laboratory: UL CCS SAR Lab B

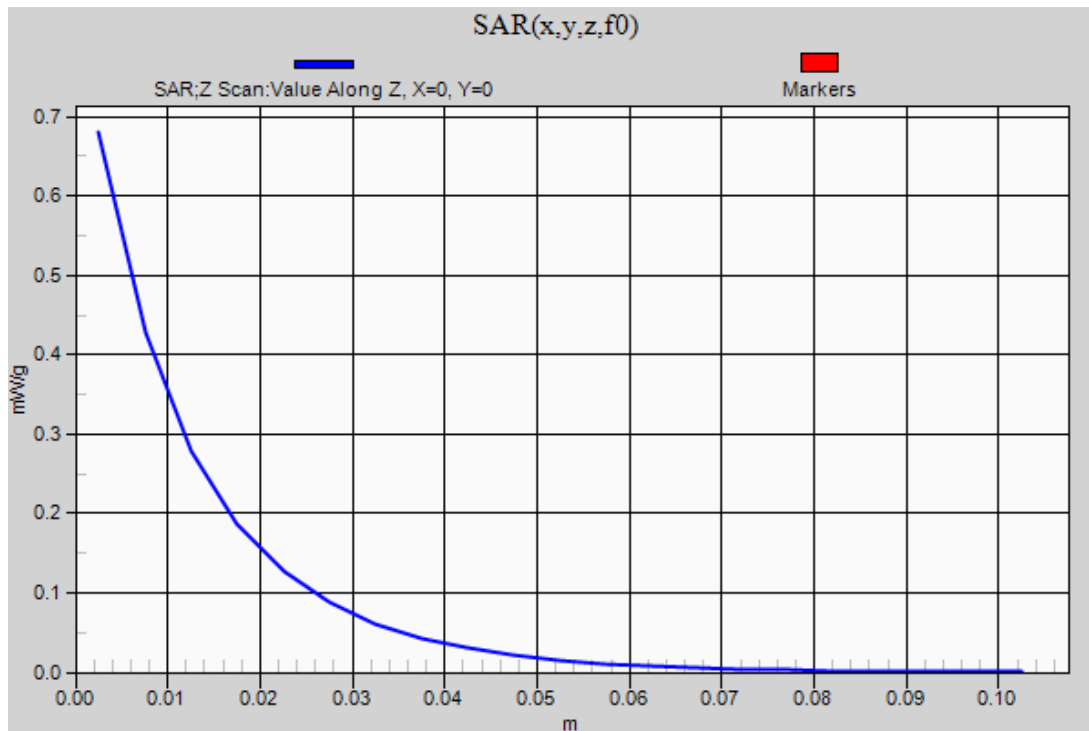
LTE_Band 13 (BW=10MHz)

Communication System: LTE; Frequency: 782 MHz; Duty Cycle: 1:1

Rear/M ch_QPSK_RB 1/49/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm

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

Maximum value of SAR (measured) = 0.680 mW/g



Date: 11/19/2011

Test Laboratory: UL CCS SAR Lab C

WiFi 802.11b 1Mbps RHS Volume Scan

Communication System: IEEE 802.11 b/g/n; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.818$ mho/m; $\epsilon_r = 37.935$; $\rho = 1000$ kg/m³
Phantom section: Right 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 - SN3773; ConvF(6.56, 6.56, 6.56); 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 Sn1258; Calibrated: 5/2/2011
- Phantom: SAM with CRP v5.0; Type: QD000P40CD; Serial: TP1632
- Measurement SW: DASY52, Version 52.6 (2);SEMCAD X Version 14.4.5 (3634)

RHS/Touch_M ch/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.162 mW/g

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

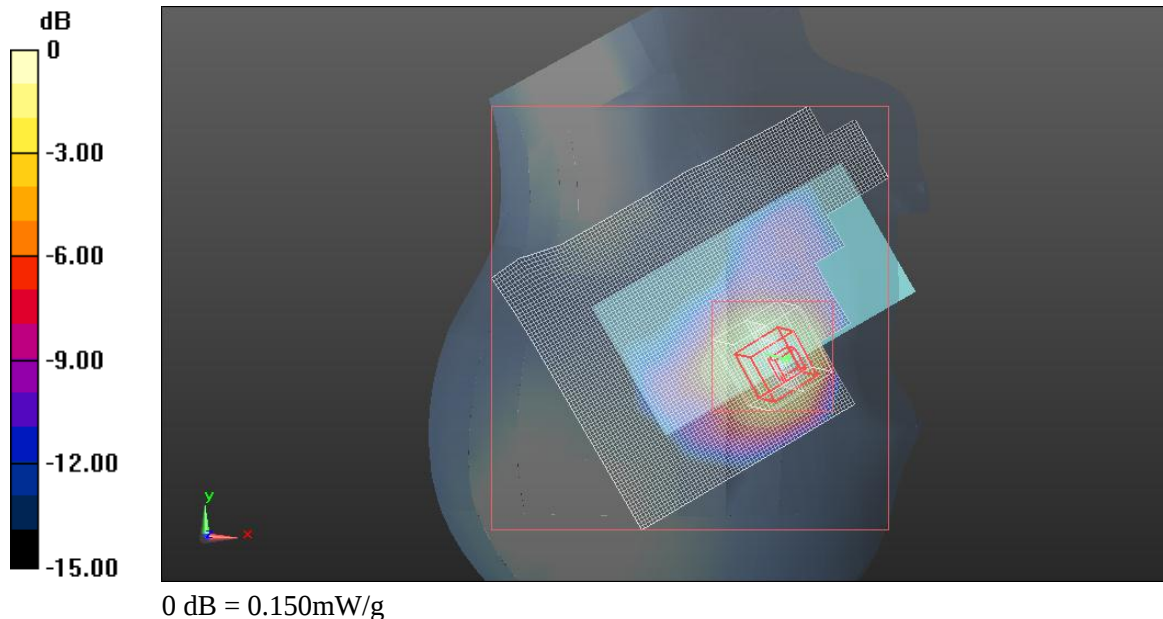
Reference Value = 9.421 V/m; Power Drift = -0.13 dB

Peak SAR (extrapolated) = 0.250 W/kg

SAR(1 g) = 0.111 mW/g; SAR(10 g) = 0.053 mW/g

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

Maximum value of SAR (measured) = 0.154 mW/g



Date: 11/19/2011

Test Laboratory: UL CCS SAR Lab C

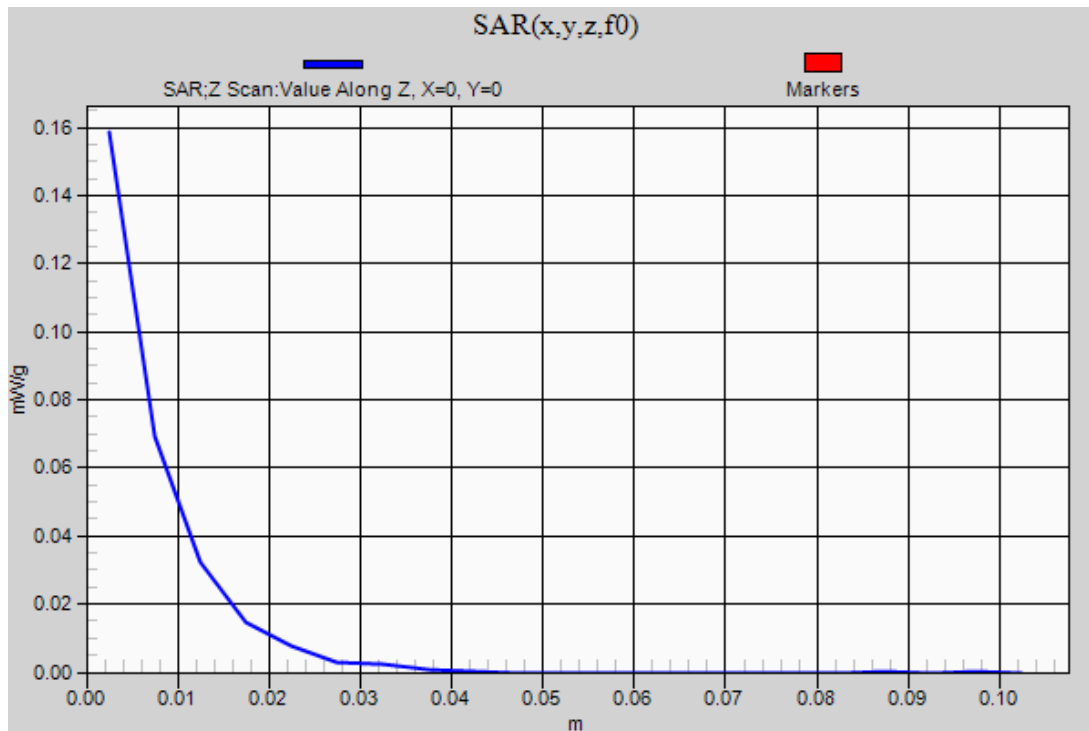
WiFi 802.11b 1Mbps RHS Volume Scan

Communication System: IEEE 802.11 b/g/n; Frequency: 2437 MHz; Duty Cycle: 1:1

RHS/Touch_M 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) = 0.159 mW/g



Date: 11/14/2011

Test Laboratory: UL CCS SAR Lab B

WiFi 802.11b 1Mbps

Communication System: IEEE 802.11b/g/n 2.4 GHz Band; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.936$ mho/m; $\epsilon_r = 51.617$; $\rho = 1000$ 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 - SN3773; ConvF(6.87, 6.87, 6.87); Calibrated: 5/3/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1258; Calibrated: 5/2/2011
- Phantom: ELI v5.0 (B); Type: QDOVA001BB; Serial: 1118
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Rear/M ch/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (interpolated) = 0.230 mW/g

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

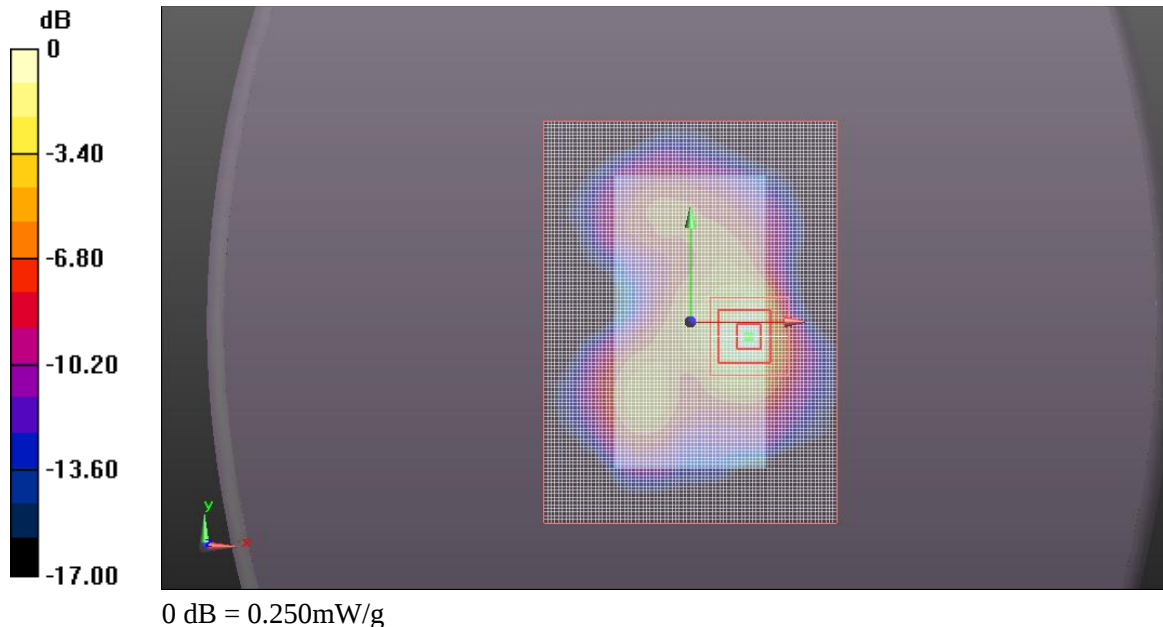
Reference Value = 9.816 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 0.362 W/kg

SAR(1 g) = 0.171 mW/g; SAR(10 g) = 0.083 mW/g

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

Maximum value of SAR (measured) = 0.245 mW/g



Date: 11/14/2011

Test Laboratory: UL CCS SAR Lab B

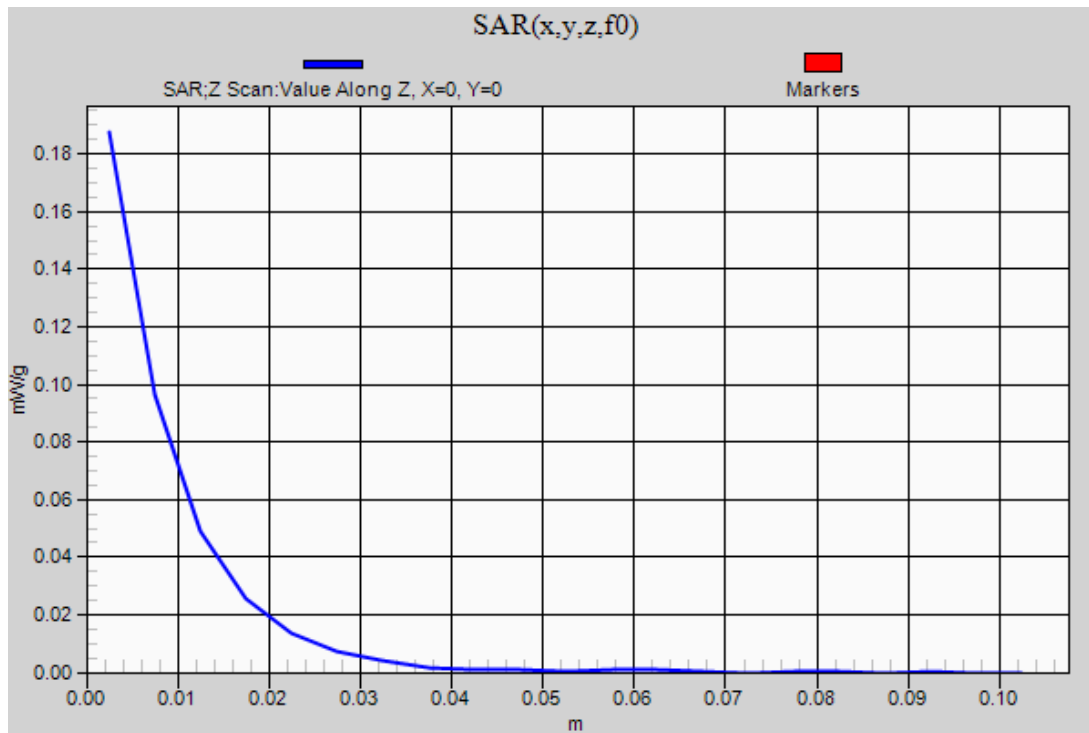
WiFi 802.11b 1Mbps

Communication System: IEEE 802.11b/g/n 2.4 GHz Band; Frequency: 2437 MHz; Duty Cycle: 1:1

Rear/M 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) = 0.187 mW/g



14. Simultaneous Transmission SAR Analysis (KDB 648474)

14.1. SV-DO Head Exposure Condition

Test Position	Voice		Data			Σ 1g SAR (mW/g)
	(1) CDMA850 1xRTT	(2) CDMA1900 1xRTT	(3) CDMA850 1xEVDO	(4) CDMA1900 1xEVDO	(5) WiFi	
Left touch	0.590		0.546		0.016	1.152
Left tilt	0.270		0.304		0.022	0.596
Right touch	0.456		0.869		0.111	1.436
Right tilt	0.274		0.432		0.126	0.832
Left touch	0.590			0.512	0.016	1.118
Left tilt	0.270			0.554	0.022	0.846
Right touch	0.456			0.722	0.111	1.289
Right tilt	0.274			0.504	0.126	0.904
Left touch		0.964	0.546		0.016	1.526
Left tilt		0.364	0.304		0.022	0.690
Right touch		1.140	0.869		0.111	2.120
Right tilt		0.309	0.432		0.126	0.867
Left touch		0.964		0.512	0.016	1.492
Left tilt		0.364		0.554	0.022	0.940
Right touch		1.140		0.722	0.111	1.973
Right tilt		0.309		0.504	0.126	0.939

SAR to Peak Location Separation Ratio (SPLSR)

Test Position	Worst-case combination			Σ 1-g SAR (mW/g)	3D distance (cm)	SPLSR
	(2) CDMA1900 1xRTT	(3) CDMA850 1xEVDO	(5) WiFi			
Right touch	1.140	0.869	0.111	2.120	*	
	1.140	0.869		2.009	6.37	0.315
	1.140		0.111	1.251	n/a	n/a
Test Position	Worst-case combination			Σ 1-g SAR (mW/g)	3D distance (cm)	SPLSR
	(2) CDMA1900 1xRTT	(4) CDMA1900 1xEVDO	(5) WiFi			
Right touch	1.140	0.722	0.111	1.973	*	
	1.140	0.722		1.862	7.73	0.241
	1.140		0.111	1.251	n/a	n/a

Conclusions:

Volume scan SAR is required because the sum of the 1-g SAR is > 1.6 W/kg and SPLSR is > 0.3.

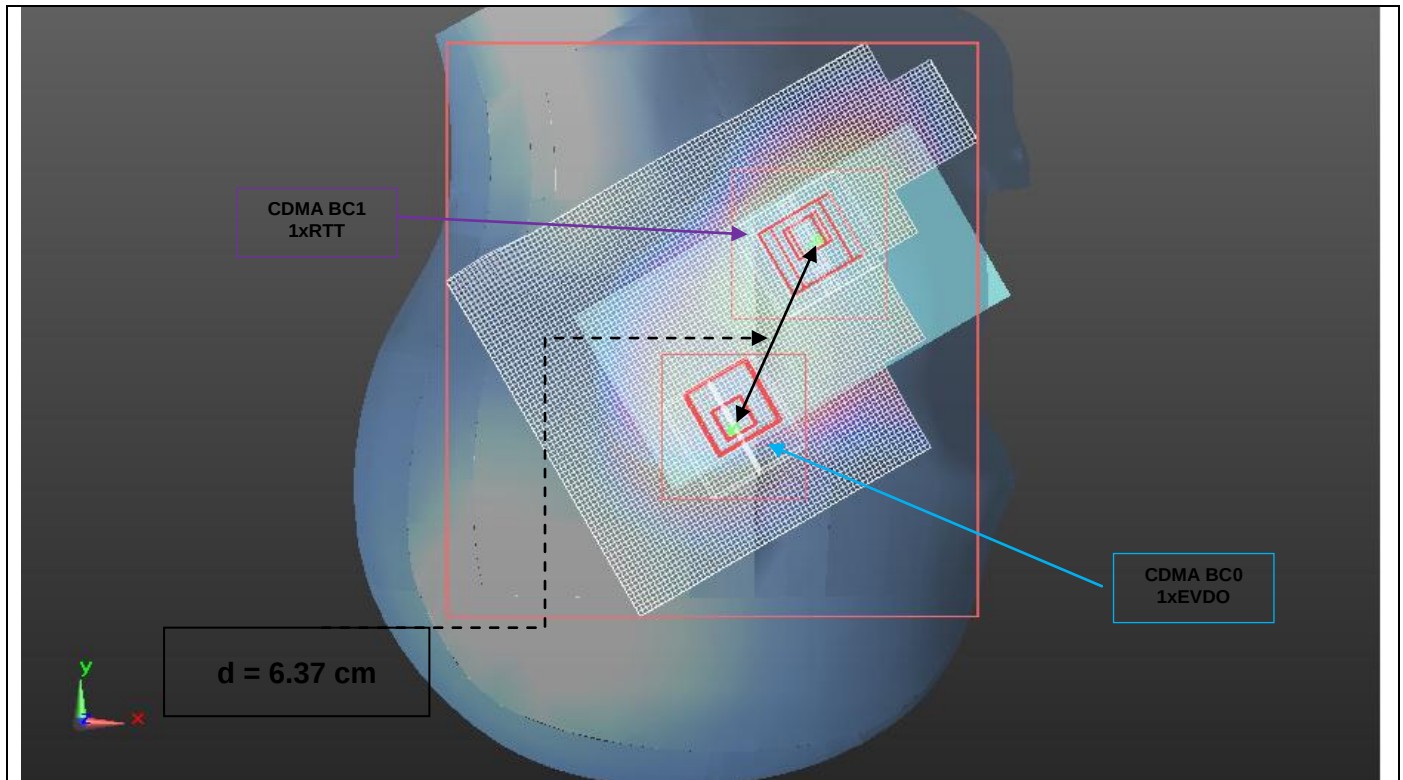
Note:

*: With 3 simultaneously transmitting antennas, it is not possible to calculate the 3D distance.

SAR to Peak Location Separation Ratio (SPLSR)

Right Touch

"(2) CDMA1900 BC1 1xRTT" to "(3) CDMA850 BC0 1xEVDO"



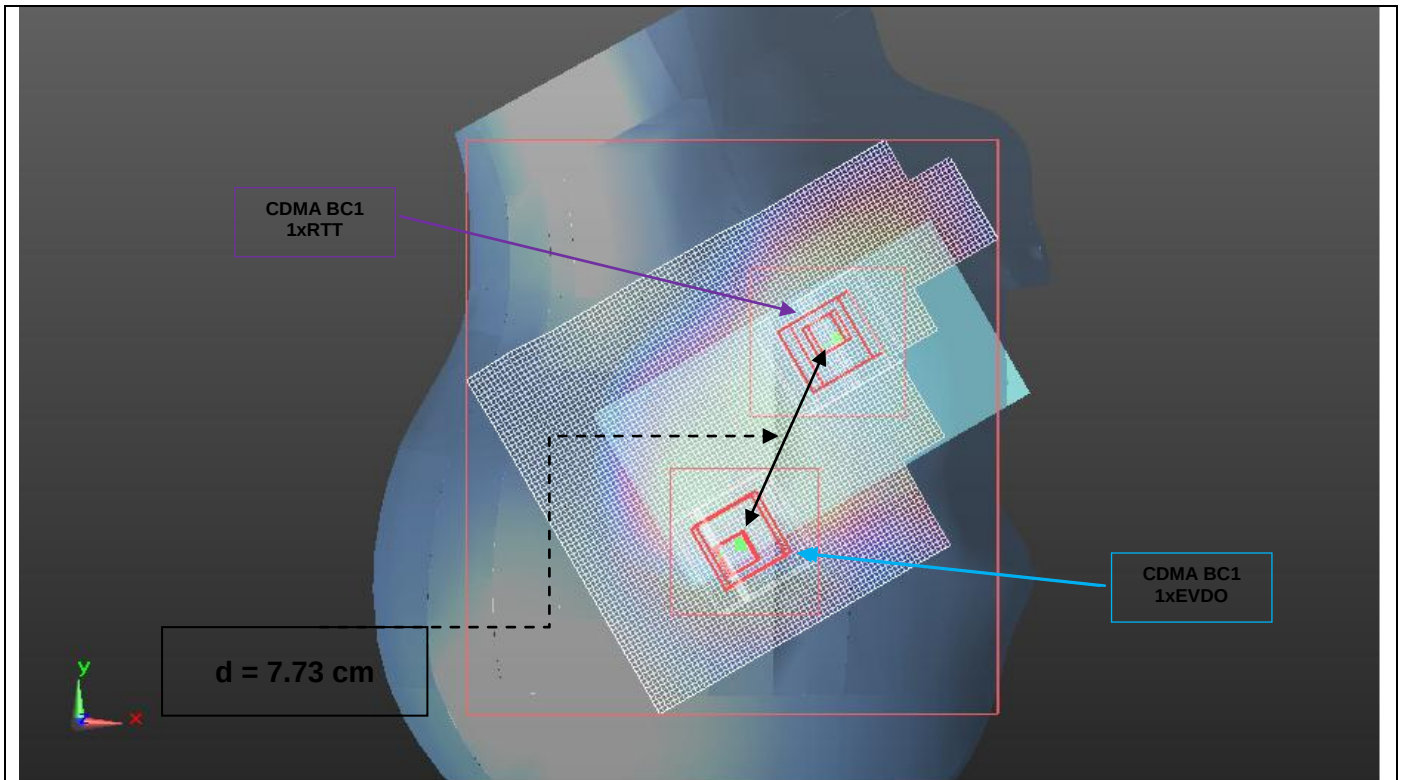
CDMA BC1 1xRTT:
CDMA BC0 1xEVDO:
m cm

Value of SAR	X	Y	Z
mW/g	m	m	m
1.36	0.0698	-0.262	-0.172
1.1	0.0435	-0.32	-0.173

Separation distance (d) =	0.0637	6.37	
	SQRT((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)		

Right Touch

"(2) CDMA1900 BC1 1xRTT" to "(4) CDMA1900 BC1 1xEVDO"



CDMA BC1 1xRTT:
CDMA BC1 1xEVDO:
m
cm

Value of SAR	X	Y	Z
mW/g	m	m	m
1.36	0.0698	-0.262	-0.172
0.89	0.033	-0.33	-0.172

Separation distance (d) =	0.0773	7.73	
	$\text{SQRT}((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)$		

14.1.1. SV-DO Head Volume Scans & Combined Results

Test position	Combination	Test Results (mW/g)			
		Zoom Scan	Volume scan	Combined Results	
Right touch	(2) CDMA BC1 1xRTT	1.14	1.19	1.22	1.22
	(3) CDMA BC0 1xEvDO	0.869	0.886		
	(5) WiFi 2.4GHz	0.111	0.113		
Right touch	(2) CDMA BC1 1xRTT	1.14	1.19	1.23	1.23
	(4) CDMA BC1 1xEvDO	0.722	0.696		
	(5) WiFi 2.4GHz	0.111	0.113		

Note(s):

1. See Appendix F_SAR test plots for SV-DO volume scans.
2. See Appendix G_SAR test plots for SV-DO Multi band results

14.2. SV-DO Body and Hotspot exposure condition

Test Position	Voice		Data			Σ 1g SAR (mW/g)
	(1) CDMA850 1xRTT	(2) CDMA1900 1xRTT	(3) CDMA850 1xEVDO	(4) CDMA1900 1xEVDO	(5) WiFi	
Rear	0.892		0.895		0.171	1.958
	0.892			0.592	0.171	1.655
Front	0.442		0.297		0.16	0.899
	0.442			0.374	0.16	0.976
Rear		1.17	0.895		0.171	2.236
		1.17		0.592	0.171	1.933
Front		1.01	0.297		0.16	1.467
		1.01		0.374	0.16	1.544

SAR to Peak Location Separation Ratio (SPLSR)

Test Position	Worst-case combination			Σ 1-g SAR (mW/g)	3D distance (cm)	SPLSR
	(1) CDMA850 1xRTT	(3) CDMA850 1xEVDO	(5) WiFi			
Rear	0.892	0.895	0.171	1.958		
	0.892	0.895		1.787	6.34	0.282
	0.892		0.171	1.063	n/a	n/a
Test Position	Worst-case combination			Σ 1-g SAR (mW/g)	3D distance (cm)	SPLSR
	(1) CDMA850 1xRTT	(4) CDMA1900 1xEVDO	(5) WiFi			
Rear	0.892	0.592	0.171	1.655		
	0.892	0.592		1.484	n/a	n/a
	0.892		0.171	1.063	n/a	n/a
Test Position	Worst-case combination			Σ 1-g SAR (mW/g)	3D distance (cm)	SPLSR
	(2) CDMA1900 1xRTT	(3) CDMA850 1xEVDO	(5) WiFi			
Rear	1.17	0.895	0.171	2.236		
	1.17	0.895		2.065	6.78	0.305
	1.17		0.171	1.341	n/a	n/a
Test Position	Worst-case combination			Σ 1-g SAR (mW/g)	3D distance (cm)	SPLSR
	(2) CDMA1900 1xRTT	(4) CDMA1900 1xEVDO	(5) WiFi			
Rear	1.17	0.592	0.171	1.933		
	1.17	0.592		1.762	8.66	0.203
	1.17		0.171	1.341	n/a	n/a

Conclusions:

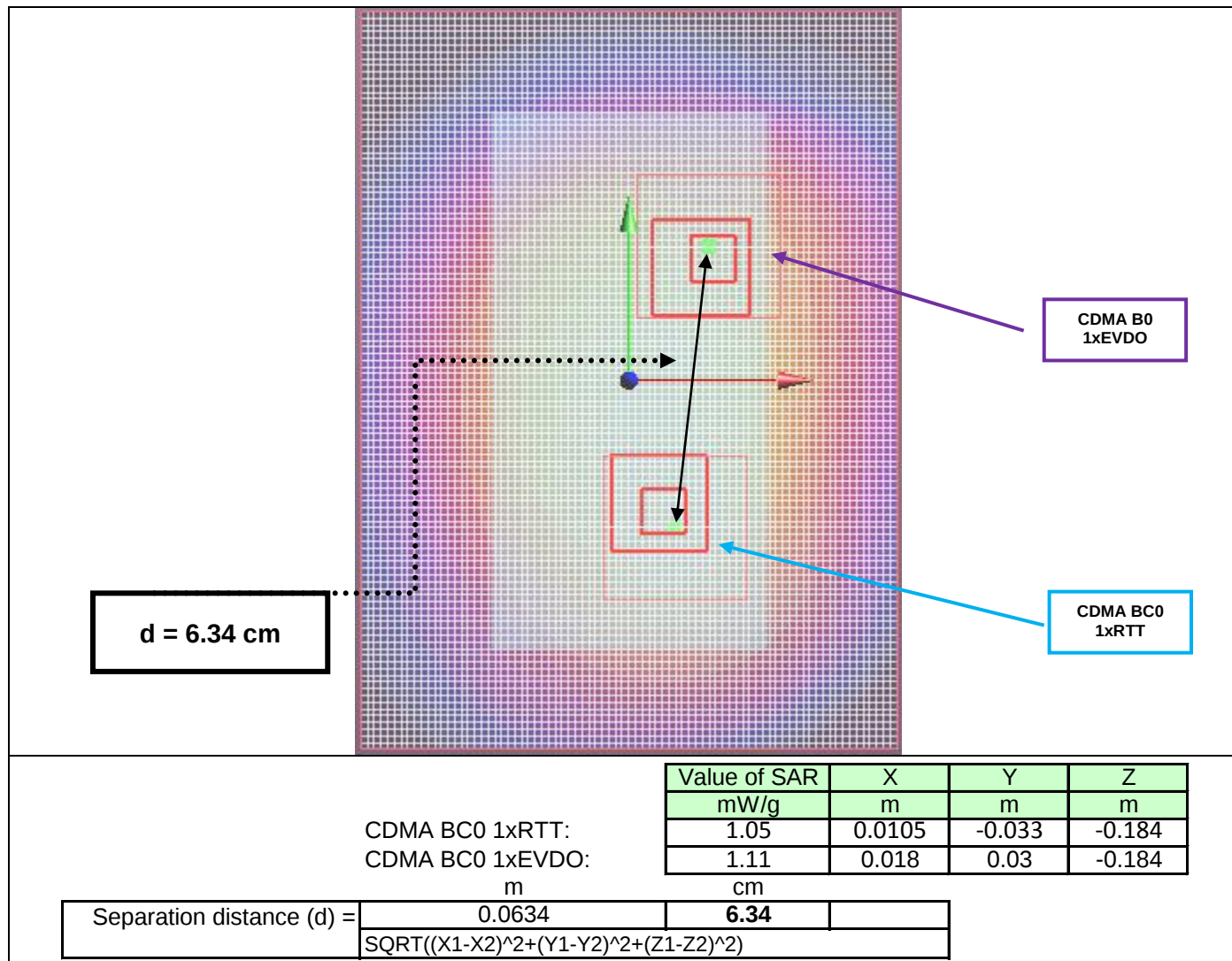
Volume scan SAR is required because the sum of the 1-g SAR is > 1.6 W/kg and SPLSR is > 0.3.

Note:

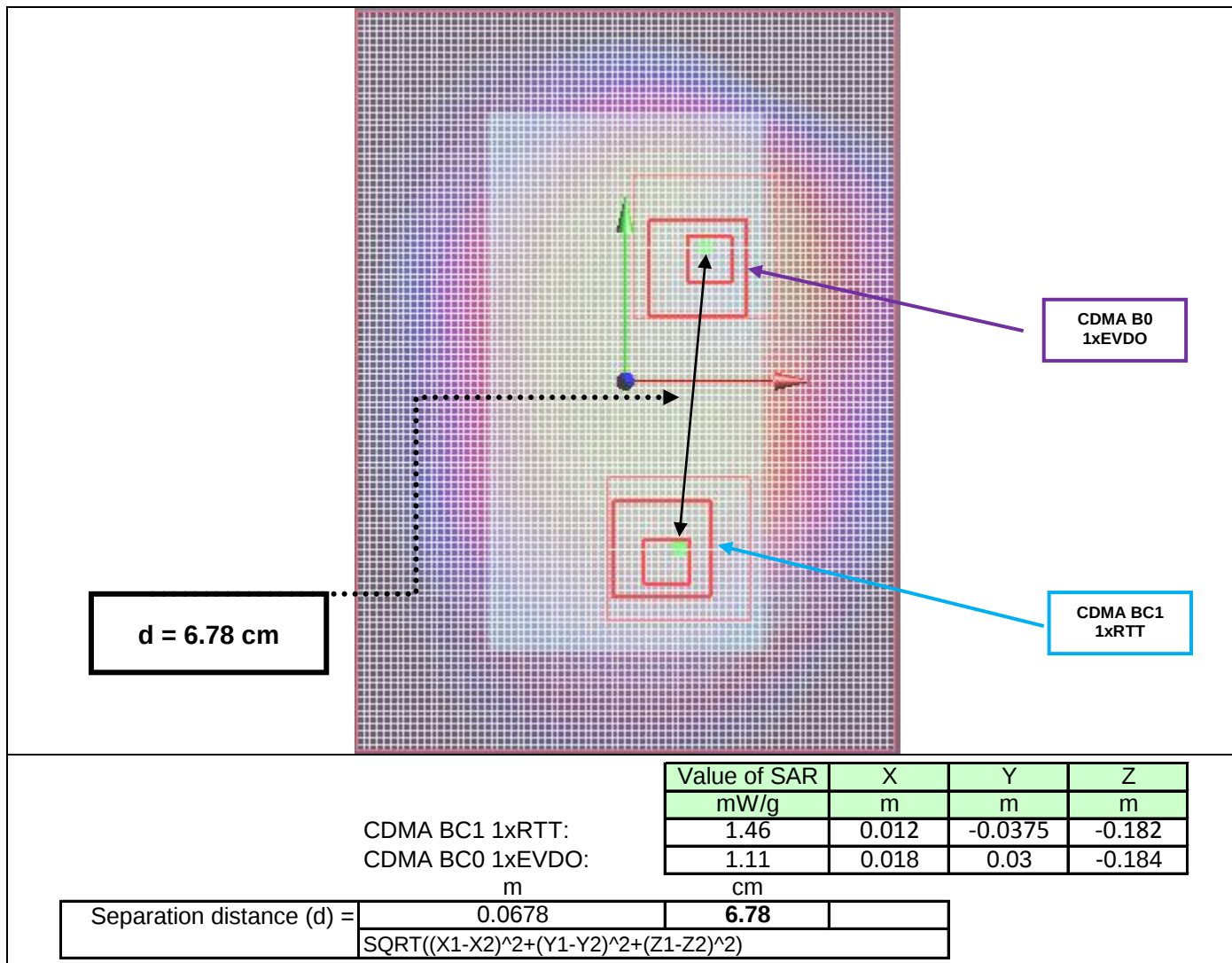
With 3 simultaneously transmitting antennas, it is not possible to calculate the 3D distance.

SAR to Peak Location Separation Ratio (SPLSR)

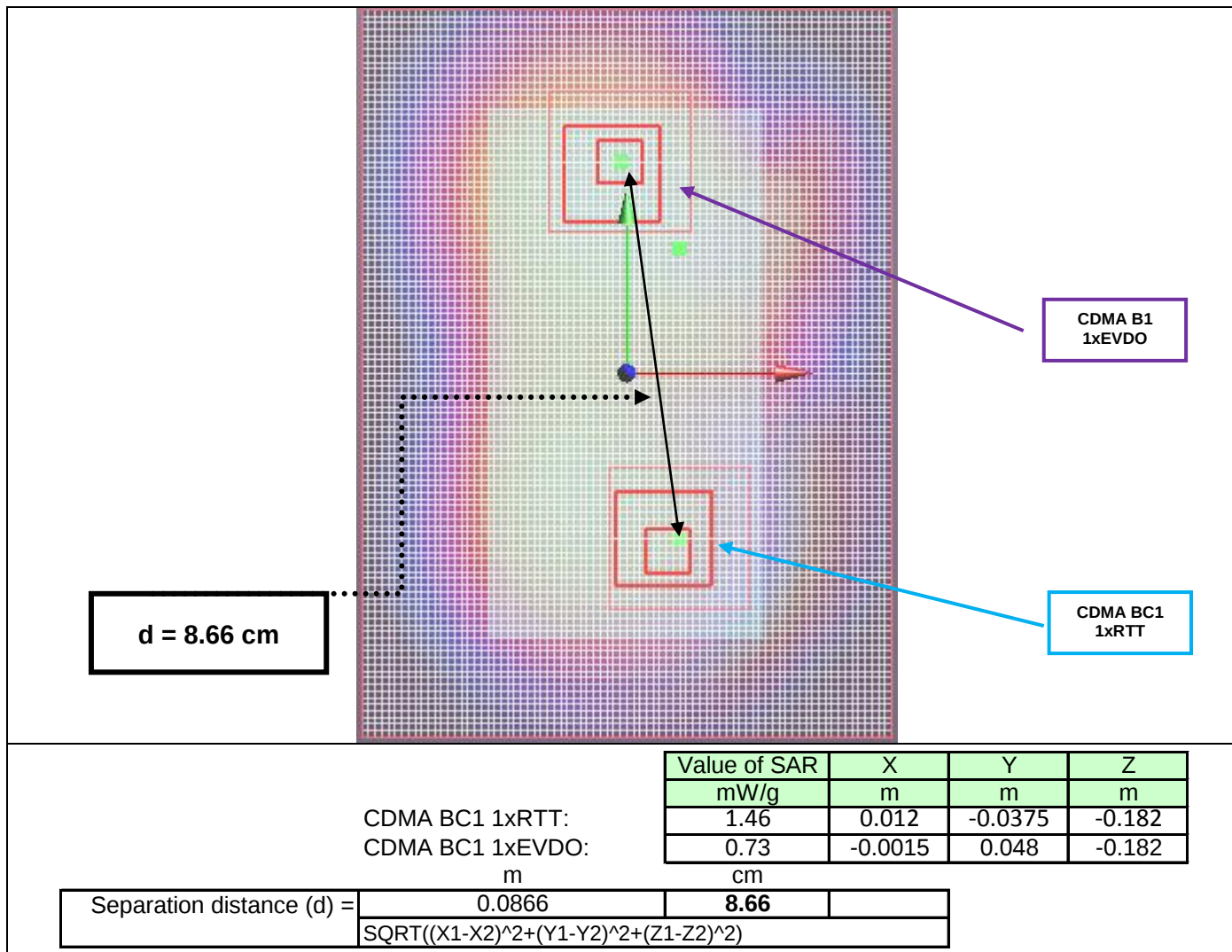
"(1) CDMA850 BC0 1xRTT" to "(3) CDMA850 BC0 1xEVDO"



"(2) CDMA1900 BC1 1xRTT" to "(3) CDMA850 BC0 1xEVDO"



"(2) CDMA BC1 1xRTT" to "(4) CDMA BC1 1xEVDO"



14.2.1. SV-DO Body Volume Scans & Combined Results

Test position	Combination	Test Results (mW/g)			
		Zoom Scan	Volume scan	Combined Results	
Rear	(1) CDMA BC0 1xRTT	0.892	0.895	1.31	1.39
	(3) CDMA BC0 1xEvDO	0.895	0.977		
	(5) WiFi 2.4GHz	0.171	0.177		
Rear	(1) CDMA BC0 1xRTT	0.892	0.895	1.13	1.17
	(4) CDMA BC1 1xEvDO	0.592	0.574		
	(5) WiFi 2.4GHz	0.171	0.177		
Rear	(2) CDMA BC1 1xRTT	1.17	1.16	1.4	1.43
	(3) CDMA BC0 1xEvDO	0.895	0.977		
	(5) WiFi 2.4GHz	0.171	0.177		
Rear	(2) CDMA BC1 1xRTT	1.17	1.16	1.34	1.37
	(4) CDMA BC1 1xEvDO	0.592	0.574		
	(5) WiFi 2.4GHz	0.171	0.177		

Note(s):

1. See Appendix F_SAR test plots for SV-DO volume scans.
2. See Appendix G_SAR test plots for SV-DO Multi band results

14.3. SV-LTE Band 13 Head Exposure Condition

Test Position	Voice		Data		Σ 1g SAR (mW/g)
	(1) CDMA BC0 1xRTT	(2) CDMA BC1 1xRTT	(3) LTE Band 13	(4) WiFi	
Left touch	0.59		0.316	0.016	0.922
Left tilt	0.27		0.173	0.022	0.465
Right touch	0.456		0.347	0.111	0.914
Right tilt	0.274		0.199	0.126	0.599
Left touch		0.964	0.316	0.016	1.296
Left tilt		0.364	0.173	0.022	0.559
Right touch		1.14	0.347	0.111	1.598
Right tilt		0.309	0.199	0.126	0.634

SAR to Peak Location Separation Ratio (SPLSR)

Test Position	Worst-case combination			Σ 1-g SAR (mW/g)	3D distance (cm)	SPLSR
	(2) CDMA BC1 1xRTT	(3) LTE Band 13	(4) WiFi			
Right Touch	1.140	0.347	0.111	1.598		
	1.140	0.347		1.487	n/a	n/a
	1.140		0.111	1.251	n/a	n/a

Conclusions:

Volume scan SAR is not required because the sum of the 1-g SAR is < 1.6 W/kg

Note(s):

With 3 simultaneously transmitting antennas, it is not possible to calculate the 3D distance.

14.4. SV-LTE Band 13 Body & Hotspot exposure condition

Test Position	Voice		Data		Σ 1g SAR (mW/g)
	(1) CDMA BC0 1xRTT	(2) CDMA BC1 1xRTT	(3) LTE Band 13	(4) WiFi	
Rear	0.892		0.56	0.171	1.623
Front	0.442		0.357	0.16	0.959
Rear		1.17	0.56	0.171	1.901
Front		1.01	0.357	0.16	1.527

SAR to Peak Location Separation Ratio (SPLSR)

Test Position	Worst-case combination			Σ 1-g SAR (mW/g)	3D distance (cm)	SPLSR
	(1) CDMA BC0 1xRTT	(3) LTE Band 13	(4) WiFi			
Rear	0.892	0.560	0.171	1.623		
	0.892	0.560		1.452	n/a	n/a
	0.892		0.171	1.063	n/a	n/a
Test Position	Worst-case combination			Σ 1-g SAR (mW/g)	3D distance (cm)	SPLSR
	(2) CDMA BC1 1xRTT	(3) LTE Band 25	(4) WiFi			
Rear	1.170	0.560	0.171	1.901		
	1.170	0.560		1.730	2.58	0.671
	1.170		0.171	1.341	n/a	n/a

Conclusions:

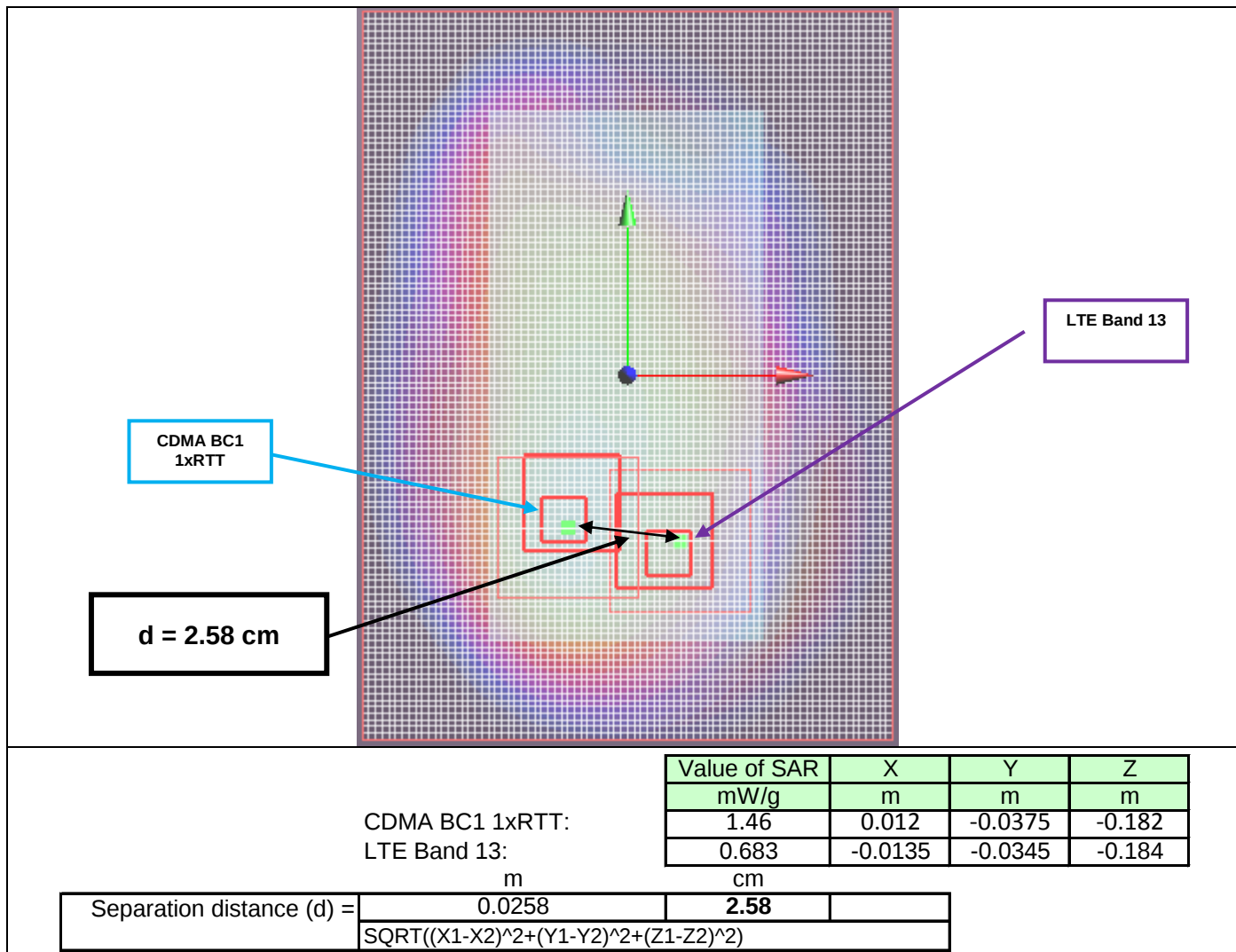
Volume scan SAR is required because the sum of the 1-g SAR is > 1.6 W/kg and SPLSR is > 0.3

Note:

With 3 simultaneously transmitting antennas, it is not possible to calculate the 3D distance.

SAR to Peak Location Separation Ratio (SPLSR)

"(2) CDMA1900 BC1 1xRTT" to "(3) LTE Band 13"



14.4.1. SV-LTE Band 13 Body Volume Scans & Combined Results

Test position	Multi-band	Test Results (mW/g)			
		Zoom Scan	Volume scan	Combined Results	
Rear	(1) CDMA BC0 1xRTT	0.892	0.895	1.27	1.32
	(3) LTE Band 13	0.560	0.545		
	(4) WiFi 2.4GHz	0.171	0.177		
Rear	(2) CDMA BC1 1xRTT	1.17	1.16	1.36	1.39
	(3) LTE Band 13	0.560	0.545		
	(4) WiFi 2.4GHz	0.171	0.177		

Note(s):

1. See Appendix H_SAR test plots for SV-LTE volume scans.
2. See Appendix I_SAR test plots for SV-LTE Multi band results

15. Appendixes

Refer to separated files for the following appendixes.

- 15.1. Appendix A: System check plots**
- 15.2. Appendix B: SAR Test plots for CDMA2000 BC0**
- 15.3. Appendix C: SAR test plots for CDMA2000 BC1**
- 15.4. Appendix D: SAR test plots for LTE Band 13**
- 15.5. Appendix E: SAR test plots for WiFi**
- 15.6. Appendix F: SAR test plots for SV-DO Volume scans**
- 15.7. Appendix G: SAR test plots for SV-DO Multi band results**
- 15.8. Appendix H: SAR test plots for SV-LTE volume scans**
- 15.9. Appendix I: SAR test plots for SV-LTE Multi band results**
- 15.10. Appendix J: Calibration certificate for E-Field Probe EX3DV4 SN 3772**
- 15.11. Appendix K: Calibration certificate for E-Field Probe EX3DV4 SN 3773**
- 15.12. Appendix L: Calibration Certificate for D750V3 - SN 1019**
- 15.13. Appendix M: Calibration certificate for D835V2 - SN 4d117**
- 15.14. Appendix N: Calibration certificate for D1900V2 SN 5d140**
- 15.15. Appendix O: Calibration certificate for D2450V2 SN: 706 w/ extended cal. data**