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

SAR EVALUATION REPORT

(Class II Permissive Change: Added 10 MHz BW for LTE band 2 and 4)

For

Cellular/PCS/AWS CDMA and LTE Phone with Bluetooth and WLAN

MODEL: MS840, LGMS840 and LG-MS840
FCC ID: ZNFMS840

REPORT NUMBER: 12U14254-3
ISSUE DATE: February 15, 2012

Prepared for
LG ELECTRONICS MOBILECOMM U.S.A., INC.
10101 OLD GROVE ROAD
SAN DIEGO, CA 92131

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

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	February 15, 2012	Initial Issue	--

Table of Contents

1. Attestation of Test Results

Applicant:	LG ELECTRONICS MOBILECOMM U.S.A., INC.		
DUT description:	Cellular/PCS/AWS CDMA and LTE Band 2/4 Phone with Bluetooth and WLAN		
Model name:	MS840, LGMS840 and LG-MS840		
Device category:	Portable devices		
Exposure category:	General Population/Uncontrolled Exposure		
Date tested:	Feb 2-8, 2012		
FCC Rule Parts	Freq. Range [MHz]	Highest 1-g SAR	Limit (W/kg)
27 (LTE Band 2)	1850 - 1910	Head: 0.514 W/kg (Right Touch) Body & Hotspot: 0.475 W/kg (Front w/ 10 mm distance)	1.6
27 (LTE Band 4)	1710 - 1755	Head: 0.231 W/kg (Right Touch) Body & Hotspot: 0.412 W/kg (Rear w/ 10 mm distance)	
Applicable Standards			Test Results
FCC OET Bulletin 65 Supplement C 01-01, IEEE STD 1528:2003			Pass

Compliance Certification Services, Inc. (UL CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.

Approved & Released For UL CCS By:

Sunny Shih
Engineering Team Leader
Compliance Certification Services (UL CCS)

Tested By:

David Rodgers
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 Xmiter and Ant, v01r05
- 941225 D05 SAR for LTE Devices v01
- 941225 D06 Hot Spot SAR v01

KDB inquiry #: 933906

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		
ESA Series Network Analyzer	Agilent	E5071B	MY42100131	2	2	2012
Synthesized Signal Generator	HP	83732B	US34490599	7	14	2012
E-Field Probe	SPEAG	EX3DV4	3751	12	19	2012
Thermometer	ERTCO	639-1S	1718	7	19	2012
Data Acquisition Electronics	SPEAG	DAE4	1239	11	18	2012
System Validation Dipole	SPEAG	D1750V2	1050	4	19	2012
System Validation Dipole	SPEAG	D1900V2	5d140	4	18	2012
Power Meter	Giga-tronics	8651A	8651404	5	13	2012
Power Sensor	Giga-tronics	80701A	1834588	5	13	2012
Power Meter	HP	437B	3125U16345	5	13	2012
Power Sensor	HP	8481A	2702A60780	5	13	2012
Amplifier	MITEQ	4D00400600-50-30P	1620606	N/A		
Directional coupler	Werlatone	C8060-102	2141	N/A		

4.2. Measurement Uncertainty

Specific Absorption Rate (SAR) uncertainty calculation					
Measurement uncertainty for 300 MHz to 3 GHz averaged over 1 gram					
Component	error, %	Probe Distribution	Divisor	Sensitivity	U (Xi), %
Measurement System					
Probe Calibration (k=1)	6.00	Normal	1	1	6.00
Axial Isotropy	1.15	Rectangular	1.732	0.7071	0.47
Hemispherical Isotropy	2.30	Rectangular	1.732	0.7071	0.94
Boundary Effect	0.90	Rectangular	1.732	1	0.52
Probe Linearity	3.45	Rectangular	1.732	1	1.99
System Detection Limits	1.00	Rectangular	1.732	1	0.58
Readout Electronics	0.30	Normal	1	1	0.30
Response Time	0.80	Rectangular	1.732	1	0.46
Integration Time	2.60	Rectangular	1.732	1	1.50
RF Ambient Conditions - Noise	3.00	Rectangular	1.732	1	1.73
RF Ambient Conditions - Reflections	3.00	Rectangular	1.732	1	1.73
Probe Positioner Mechanical Tolerance	0.40	Rectangular	1.732	1	0.23
Probe Positioning with respect to Phantom	2.90	Rectangular	1.732	1	1.67
Extrapolation, Interpolation and Integration	1.00	Rectangular	1.732	1	0.58
Test Sample Related					
Test Sample Positioning	2.90	Normal	1	1	2.90
Device Holder Uncertainty	3.60	Normal	1	1	3.60
Output Power Variation - SAR Drift	5.00	Rectangular	1.732	1	2.89
Phantom and Tissue Parameters					
Phantom Uncertainty (shape and thickness)	4.00	Rectangular	1.732	1	2.31
Liquid Conductivity - deviation from target	5.00	Rectangular	1.732	0.64	1.85
Liquid Conductivity - measurement	-4.65	Normal	1	0.64	-2.98
Liquid Permittivity - deviation from target	5.00	Rectangular	1.732	0.6	1.73
Liquid Permittivity - measurement uncertainty	-4.97	Normal	1	0.6	-2.98
				Combined Standard Uncertainty Uc(y) =	10.61
				Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence = 21.22	%
				Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence = 1.67	dB

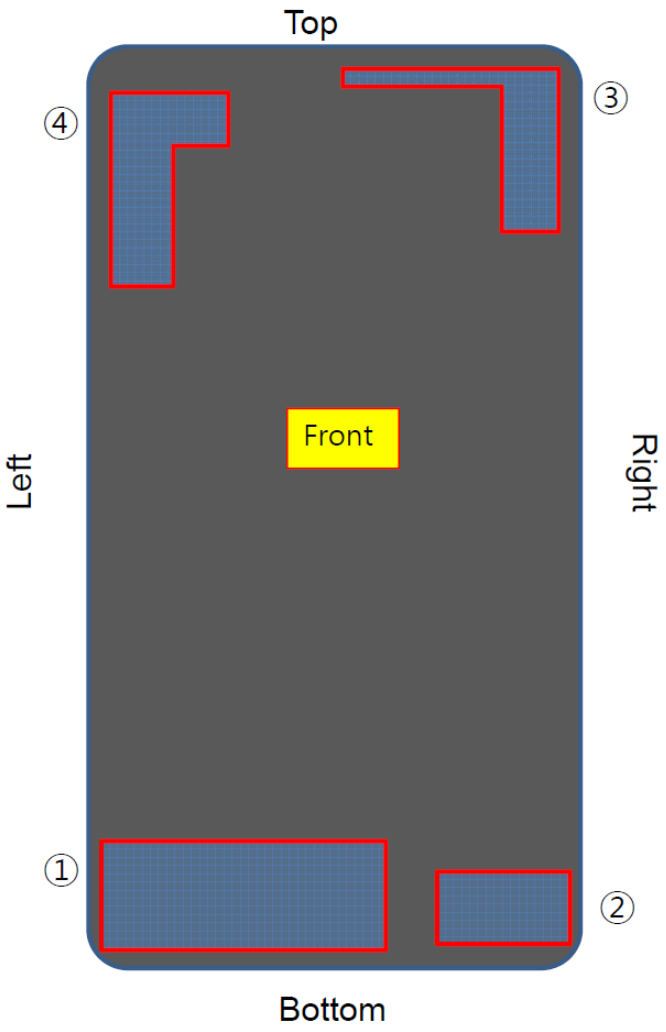
5. Device Under Test

Cellular/PCS/AWS CDMA and LTE Band 2/4 Phone with Bluetooth and WLAN MODEL: MS840, LGMS840 and LG-MS840	
Normal operation:	- Held to head, - Body (Rear and Front sides) with 10 mm separation distance. - Hotspot with 10 mm separation distance to all sides and edges.
Body Worn Accessory	Headset
Antenna-to-antenna and antenna-to-edges' separation distances:	Please refer to Section 5.2 & 5.3 Antenna Locations & Separation Distances" for details

5.1. Band and Air Interlaces

Tx Frequency Bands:	Cellular: 824 – 849 MHz AWS: 1714 – 1754 MHz PCS: 1850 – 1910 MHz 802.11b/g/n: 2412 – 2462MHz, HT20 Bluetooth: 2402-2480 MHz
Air Interfaces:	CDMA/EVDO: Cellular/AWS/PCS bands LTE: Band 2 and 4. 802.11b/g/n. Bluetooth
Uplink Modulations:	CDMA/EVDO: QPSK LTE: QPSK/16QAM 802.11b: DSS CCK 802.11g: OFDM 802.11n: OFDM Bluetooth: DQPSK, 8DPSK, GFSK

5.2. Antenna Description



① CDMA 1x BC0, BC1 and BC15 Rx/Tx

MODE	BAND	TX(MHz)	RX(MHz)
CDMA	BC0	824 ~ 849	869 ~ 894
	BC1	1850 ~ 1910	1930 ~ 1990
	BC15	1710 ~ 1755	2110 ~ 2155

② LTE Band 2 and 4 Rx/Tx
EVDO BC1 and BC15 Rx/Tx
* BC0 doesn't support EVDO capability

MODE	BAND	TX(MHz)	RX(MHz)
LTE	B2	1850 ~ 1910	1930 ~ 1990
	B4	1710 ~ 1755	2110 ~ 2155
EVDO	BC1	1850 ~ 1910	1930 ~ 1990
	BC15	1710 ~ 1755	2110 ~ 2155

③ GPS & BT/WIFI

MODE	TX(MHz)	RX(MHz)
GPS	x	1575.42
BT/WiFi(802.11b/g/n)	2412~2462	2412~2462

④ LTE Band 2 and 4 2nd RX, EVDO BC1 and BC15 Diversity

MODE	BAND	TX(MHz)	RX(MHz)
LTE	B2	2nd Rx	1930 ~ 1990
	B4	2nd Rx	2110 ~ 2155
EVDO	BC1	Diversity(Rx)	1930 ~ 1990
	BC15	Diversity(Rx)	2110 ~ 2155

5.3. Antenna Separation Distance

Antennas	Physical Separation Distance (mm)			
	ANT ①	ANT ②	ANT ③	ANT ④
ANT ①		12.6	84.5	72.3
ANT ②	12.6		80.7	88.7
ANT ③	84.5	80.7		21.0
ANT ④	72.3	88.7	21.0	

5.4. Head Exposure Condition

Head Operation					
Mode	TX (MHz)	ANT ①	ANT ②	ANT ③	ANT ④
CDMA Voice (1xRTT)	835	Yes	No	No	No
CDMA Voice (1xRTT)	1700	Yes	No	No	No
CDMA Voice (1xRTT)	1900	Yes	No	No	No
LTE Data	1900	No	Yes	No	No
LTE Data	1700	No	Yes	No	No
EVDO (VOIP)	1700	No	Yes	No	No
EVDO (VOIP)	1900	No	Yes	No	No
EVDO (VOIP)	1700	No	No	No	No
EVDO (VOIP)	1900	No	No	No	No
SVDO (Voice & Data)	1900	Yes	No	No	No
SVDO (Voice & Data)	1700	Yes	No	No	No
SVDO (Voice & Data)	1900	Yes	Yes	No	No
SVDO (Voice & Data)	1700	Yes	Yes	No	No
SVLTE (Voice & Data)	1900	Yes	Yes	No	No
SVLTE (Voice & Data)	1700	Yes	Yes	No	No
Wi-Fi (VOIP)	2400	No	No	Yes	No
BT	2400	No	No	No	No

5.5. Body-worn Exposure Condition

Body-worn Operation					
Separation Distance = 1 cm					
Mode	TX (MHz)	ANT ①	ANT ②	ANT ③	ANT ④
CDMA Voice (1xRTT)	835	Yes	No	No	No
CDMA Voice (1xRTT)	1700	Yes	No	No	No
CDMA Voice (1xRTT)	1900	Yes	No	No	No
LTE Data	1900	No	Yes	No	No
LTE Data	1700	No	Yes	No	No
EVDO Data	1700	No	Yes	No	No
EVDO Data	1900	No	Yes	No	No
EVDO Data	1700	No	No	No	No
EVDO Data	1900	No	No	No	No
SVDO (Voice & Data)	1900	Yes	Yes	No	No
SVDO (Voice & Data)	1700	Yes	Yes	No	No
SVLTE (Voice & Data)	1900	Yes	Yes	No	No
SVLTE (Voice & Data)	1700	Yes	Yes	No	No
Wi-Fi (Data)	2400	No	No	Yes	No
BT	2400	No	No	Yes	No

5.6. Personal Hotspot Exposure Condition

The device is capable of personal hotspot mode. The hotspot mode can be enabled by the users. SAR measurements in the Personal hot spot function are performed with 1 cm separation distance to all sides and edges to the body phantom.

Wireless Router / Hot Spot Operation					
Separation Distance = 1 cm					
Mode	TX (MHz)	ANT ①	ANT ②	ANT ③	ANT ④
LTE Data + Wi-Fi	1900/2400	No	Yes	Yes	No
LTE Data + Wi-Fi	1700/2400	No	Yes	Yes	No
EVDO Data + Wi-Fi	1700/2400	No	Yes	Yes	No
EVDO Data + Wi-Fi	1900/2400	No	Yes	Yes	No
SVDO (Voice & Data) + Wi-Fi	835/1900/2400	Yes	Yes	Yes	No
SVDO (Voice & Data) + Wi-Fi	835/1700/2400	Yes	Yes	Yes	No
SVDO (Voice & Data) + Wi-Fi	1900/1900/2400	Yes	Yes	Yes	No
SVDO (Voice & Data) + Wi-Fi	1900/1700/2400	Yes	Yes	Yes	No
SVDO (Voice & Data) + Wi-Fi	1700/1900/2400	Yes	Yes	Yes	No
SVDO (Voice & Data) + Wi-Fi	1700/1700/2400	Yes	Yes	Yes	No
SVLTE (Voice & Data)+ Wi-Fi	835/1900/2400	Yes	Yes	Yes	No
SVLTE (Voice & Data)+ Wi-Fi	835/1700/2400	Yes	Yes	Yes	No
SVLTE (Voice & Data)+ Wi-Fi	1900/1900/2400	Yes	Yes	Yes	No
SVLTE (Voice & Data)+ Wi-Fi	1900/1700/2400	Yes	Yes	Yes	No
SVLTE (Voice & Data)+ Wi-Fi	1700/1900/2400	Yes	Yes	Yes	No
SVLTE (Voice & Data)+ Wi-Fi	1700/1700/2400	Yes	Yes	Yes	No

5.7. KDB 941225 D05 "SAR for LTE Devices v01"

<table>
<tr><th>#</th><th>Description</th><th>Parameter</th></tr>
<tr><td>1</td><td>Identify the operating frequency range of each LTE transmission band used by the device</td><td>Band 2: 1850 to 1910 MHz
Band 4: 1710 to 1755 MHz</td></tr>
<tr><td>2</td><td>Identify the channel bandwidths used in each frequency band; 1.4, 3, 5, 10, 15, 20 MHz etc</td><td>Band 2: 10 MHz
Band 4: 10 MHz</td></tr>
<tr><td>3</td><td>Identify the high, middle and low (H, M, L) channel numbers and frequencies in each LTE frequency band</td><td>Band 2: 10MHz
• Low ch #: 18650, Freq. (MHz): 1855
• Mid. ch #: 18900, Freq. (MHz): 1880
• High ch #: 19150, Freq. (MHz): 1905
Band 4: 10 MHz
• Low ch #: 20000, Freq. (MHz): 1715
• Mid. ch #: 20175, Freq. (MHz): 1732.5
• High ch #: 20305, Freq. (MHz): 1750</td></tr>
<tr><td>4</td><td>Specify the UE category and uplink modulations used</td><td>The UE Category is 3
Uplink modulations: QPSK, 16QAM</td></tr>
<tr><td>5</td><td>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.</td><td>This model(MS840) 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.</td></tr>
<tr><td>6</td><td>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.</td><td>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</td></tr>
<tr><td>7</td><td>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.</td><td>As per 3GPP TS 36.101 v10.3.0 (2011-09), Release 10.4
<table>
<tr><th rowspan="2">Modulation</th><th>Channel bandwidth / Transmission bandwidth configuration (RB)</th><th>MPR (dB)</th></tr>
<tr><th>10 MHz</th><th></th></tr>
<tr><td>QPSK</td><td>> 12</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>≤ 12</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>> 12</td><td>≤ 2</td></tr>
</table>
MPR is permanently built-in by design.
A-MPR is supported by design, but is disabled for SAR testing.</td></tr>
<tr><td>8</td><td>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</td><td>Refer to section 10 RF output power table</td></tr>
</table>

<table>
<tr><td>9</td><td>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</td><td>* 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.</td></tr>
<tr><td>10</td><td>Include the maximum average conducted output power measured for the other wireless mode and frequency bands</td><td>See section 11 RF output power measurements in SAR report.</td></tr>
<tr><td>11</td><td>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.)</td><td>Please refer to the table in section 5.8</td></tr>
<tr><td>12</td><td>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</td><td>1. Power Reduction operation table for SVDO Mode
<table>
<tr><th>Mode</th><th>CDMA Current Voice Power for BC0, BC1 & BC15</th><th>CDMA EVDO Max. Power for BC1 & BC15</th></tr>
<tr><td rowspan="2">SVDO</td><td>P < 15.5 dBm</td><td>24.0 dBm (Limited)</td></tr>
<tr><td>P ≥ 15.5 dBm</td><td>19.0 dBm (Limited)</td></tr>
</table>
2. Power Reduction operation table for SVLTE Mode
<table>
<tr><th>Mode</th><th>CDMA Current Voice Power for BC0, BC1 & BC15</th><th>LTE Max. Power for B2 & B4</th></tr>
<tr><td rowspan="2">SVLTE</td><td>P < 18.5 dBm</td><td>22.8 dBm (Limited)</td></tr>
<tr><td>P ≥ 18.5 dBm</td><td>17.8 dBm (Limited)</td></tr>
</table>
Note:
CDMA BC0 = CDMA Cellular, CDMA BC1 = CDMA PCS,
CDMA BC15 = CDMA AWS</td></tr>
<tr><td>13</td><td>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</td><td>* Power reduction is implemented on EVDO in SVDO mode
* Power reduction is implemented on LTE in SVLTE mode</td></tr>
<tr><td>14</td><td>When appropriate, include a SAR test plan proposal with respect to the above</td><td>Not Applicable</td></tr>
<tr><td>15</td><td>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</td><td>Not applicable</td></tr>
</table>

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	X	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

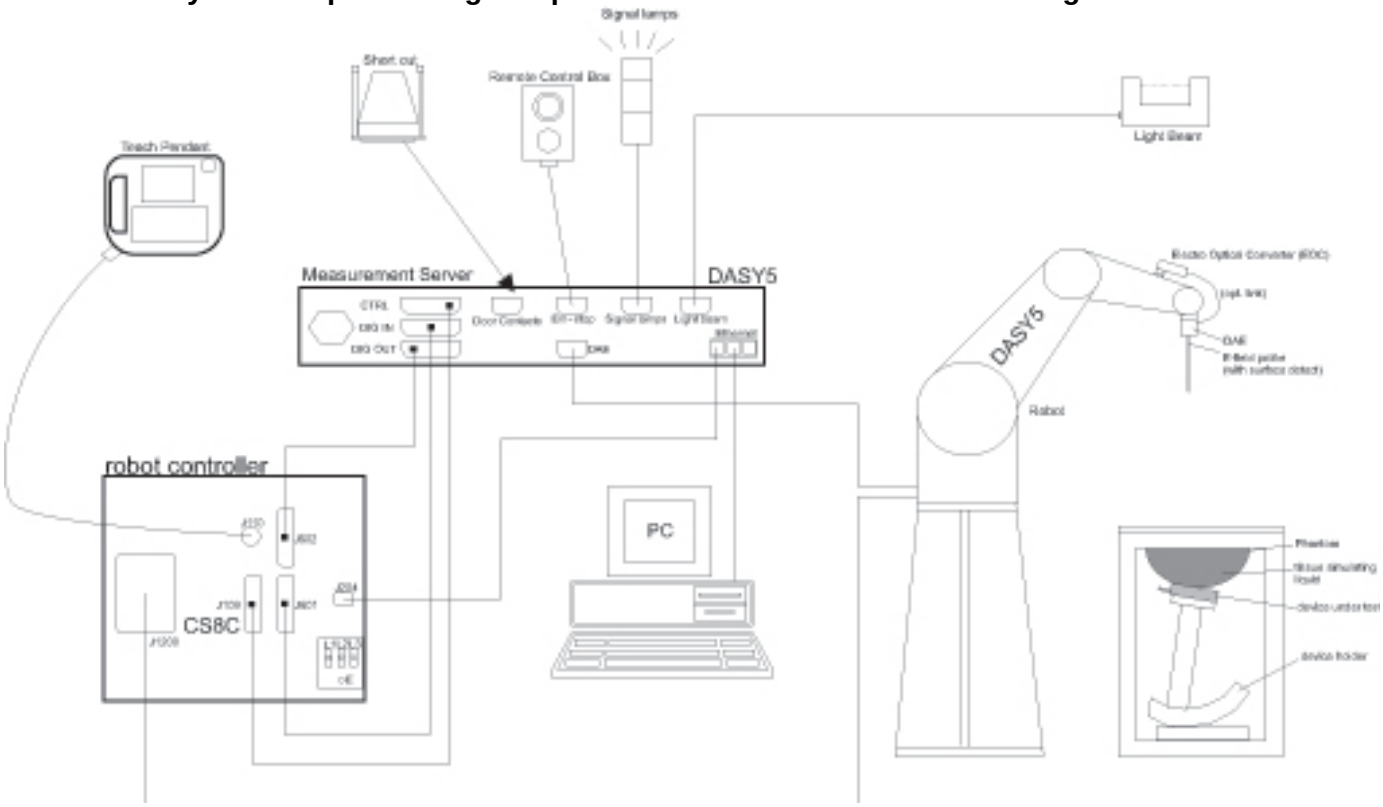
* BT and WLAN are not simultaneous transmission.
* CDMA EVDO and LTE are not simultaneous transmission.
* CDMA BC0 EVDO is not supported
* VOIP support (LTE, EVDO).
* SVLTE, SVDO is supported
* Power reduction is implemented on EVDO in SVDO mode
* Power reduction is implemented on LTE in SVLTE mode.

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	Standalone CDMA BC1 Voice
3	CDMA AWS Voice	O	O	X	X	X	Stand-alone CDMA AWS Voice
4	CDMA BC1 EVDO	O	O	X	X	X	Stand-alone CDMA EVDO BC1
5	CDMA AWS EVDO	O	O	X	X	X	Stand-alone CDMA EVDO AWS
6	LTE B2	O	O	X	X	X	Stand-alone LTE B2 data
7	LTE B4	O	O	X	X	X	Stand-alone LTE B4 data
8	Wi-Fi	O	O	X	X	X	Stand-alone Wi-Fi
9	BT	X	X	X	X	X	Below SAR Power Threshold
10	CDMA BC0 Voice + Wi-Fi data	O	O	X	X	X	
11	CDMA BC1 Voice + Wi-Fi data	O	O	X	X	X	
12	CDMA AWS Voice + Wi-Fi data	O	O	X	X	X	
13	CDMA BC1 EVDO+ Wi-Fi data	X	O	O	X	X	WI-FI Hotspot
14	CDMA AWS EVDO+ Wi-Fi data	X	O	O	X	X	WI-FI Hotspot
15	LTE B2 + Wi-Fi data	X	O	O	X	X	WI-FI Hotspot
16	LTE B4 + Wi-Fi data	X	O	O	X	X	WI-FI Hotspot
17	CDMA BC0 Voice + CDMA BC1 EVDO	O	O	X	O	X	SVDO
18	CDMA BC0 Voice + CDMA AWS EVDO	O	O	X	O	X	SVDO
19	CDMA BC0 Voice + LTE B2	O	O	X	X	O	SVLTE
20	CDMA BC0 Voice + LTE B4	O	O	X	X	O	SVLTE
21	CDMA BC1 Voice + CDMA BC1 EVDO	O	O	X	O	X	SVDO
22	CDMA BC1 Voice + CDMA AWS EVDO	O	O	X	O	X	SVDO
23	CDMA BC1 Voice + LTE B2	O	O	X	X	O	SVLTE
24	CDMA BC1 Voice + LTE B4	O	O	X	X	O	SVLTE
25	CDMA AWS Voice + CDMA BC1 EVDO	O	O	X	O	X	SVDO
26	CDMA AWS Voice + CDMA AWS EVDO	O	O	X	O	X	SVDO
27	CDMA AWS Voice + LTE B2	O	O	X	X	O	SVLTE
28	CDMA AWS Voice + LTE B4	O	O	X	X	O	SVLTE
29	CDMA BC0 Voice + CDMA BC1 EVDO + WLAN	O	O	O	O	X	WI-FI Hotspot
30	CDMA BC0 Voice + CDMA AWS EVDO + WLAN	O	O	O	O	X	WI-FI Hotspot
31	CDMA BC0 Voice + LTE B2 + WLAN	O	O	O	X	O	WI-FI Hotspot
32	CDMA BC0 Voice + LTE B4+ WLAN	O	O	O	X	O	WI-FI Hotspot
33	CDMA BC1 Voice + CDMA BC1 EVDO+ WLAN	O	O	O	O	X	WI-FI Hotspot
34	CDMA BC1 Voice + CDMA AWS EVDO+ WLAN	O	O	O	O	X	WI-FI Hotspot
35	CDMA BC1 Voice + LTE B2+ WLAN	O	O	O	X	O	WI-FI Hotspot
36	CDMA BC1 Voice + LTE B4+WLAN	O	O	O	X	O	WI-FI Hotspot
37	CDMA AWS Voice + CDMA BC1 EVDO+ WLAN	O	O	O	O	X	WI-FI Hotspot
38	CDMA AWS Voice + CDMA AWS EVDO+ WLAN	O	O	O	O	X	WI-FI Hotspot
39	CDMA AWS Voice + LTE B2 + WLAN	O	O	O	X	O	WI-FI Hotspot
40	CDMA AWS Voice + LTE B4 + WLAN	O	O	O	X	O	WI-FI Hotspot

6. Measurement System Description and Setup

The DASY5 system for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

7. Tissue Dielectric Property

IEEE Std 1528-2003 Table 2

Target Frequency (MHz)	Head	
	ε_r	σ (S/m)
300	45.3	0.87
450	43.5	0.87
835	41.5	0.90
900	41.5	0.97
1450	40.5	1.20
1800 – 2000	40.0	1.40
2450	39.2	1.80
2600	39.0	1.96
3000	38.5	2.40

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

Target Frequency (MHz)	Head		Body	
	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.8
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.9	55.2	0.97
900	41.5	0.97	55	1.05
915	41.5	0.98	55	1.06
1450	40.5	1.2	54	1.3
1610	40.3	1.29	53.8	1.4
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
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00

7.1. Composition of ingredients for the tissue material used in the SAR tests

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Salt: 99+% Pure Sodium Chloride Sugar: 98+% Pure Sucrose
Water: De-ionized, 16 MΩ+ resistivity HEC: Hydroxyethyl Cellulose
DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

MSL/HSL750 (Body and Head liquids for 700 – 800 MHz)

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

MSL/HSL1750 (Body and Head liquids for 1700 – 1800 MHz)

Item	Head Tissue Simulation Liquids HSL1750 Muscle (body) Tissue Simulation Liquids MSL1750
Type No	SL AAM 175
Manufacturer	SPEAG
-The item is composed of the following ingredients:	
H^2O	Water, 52 – 75%
C8H18O3	Diethylene glycol monobutyl ether (DGBE), 25-48%
NaCl	Sodium Chloride, <1.0%

7.2. Tissue dielectric parameters check results

Tissue dielectric parameters measured at the low, middle and high frequency of each operating frequency range of the test device.

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
2/2/2012	Head 1900	e'	38.2840	Relative Permittivity (ϵ_r):	38.28	40.00	-4.29	5
		e''	13.1962	Conductivity (σ):	1.39	1.40	-0.42	5
	Head 1850	e'	38.3818	Relative Permittivity (ϵ_r):	38.38	40.00	-4.05	5
		e''	13.0314	Conductivity (σ):	1.34	1.40	-4.25	5
	Head 1880	e'	38.3405	Relative Permittivity (ϵ_r):	38.34	40.00	-4.15	5
		e''	13.0855	Conductivity (σ):	1.37	1.40	-2.29	5
	Head 1910	e'	38.1851	Relative Permittivity (ϵ_r):	38.19	40.00	-4.54	5
		e''	13.2106	Conductivity (σ):	1.40	1.40	0.21	5
2/3/2012	Head 1900	e'	38.6099	Relative Permittivity (εr):	38.61	40.00	-3.48	5
		e''	13.4693	Conductivity (σ):	1.42	1.40	1.64	5
	Head 1850	e'	38.8782	Relative Permittivity (εr):	38.88	40.00	-2.80	5
		e''	13.3887	Conductivity (σ):	1.38	1.40	-1.63	5
	Head 1880	e'	38.7328	Relative Permittivity (εr):	38.73	40.00	-3.17	5
		e''	13.3770	Conductivity (σ):	1.40	1.40	-0.12	5
	Head 1910	e'	38.5011	Relative Permittivity (εr):	38.50	40.00	-3.75	5
		e''	13.4605	Conductivity (σ):	1.43	1.40	2.11	5
2/3/2012	Body 1900	e'	51.9184	Relative Permittivity (ϵ_r):	51.92	53.30	-2.59	5
		e''	14.4018	Conductivity (σ):	1.52	1.52	0.10	5
	Body 1850	e'	52.0553	Relative Permittivity (ϵ_r):	52.06	53.30	-2.34	5
		e''	14.2552	Conductivity (σ):	1.47	1.52	-3.53	5
	Body 1880	e'	51.9839	Relative Permittivity (ϵ_r):	51.98	53.30	-2.47	5
		e''	14.2777	Conductivity (σ):	1.49	1.52	-1.81	5
	Body 1910	e'	51.8457	Relative Permittivity (ϵ_r):	51.85	53.30	-2.73	5
		e''	14.4051	Conductivity (σ):	1.53	1.52	0.65	5
2/6/2012	Body 1900	e'	50.7816	Relative Permittivity (ϵ_r):	50.78	53.30	-4.72	5
		e''	14.4214	Conductivity (σ):	1.52	1.52	0.23	5
	Body 1850	e'	50.9789	Relative Permittivity (ϵ_r):	50.98	53.30	-4.35	5
		e''	14.2128	Conductivity (σ):	1.46	1.52	-3.82	5
	Body 1880	e'	50.7883	Relative Permittivity (ϵ_r):	50.79	53.30	-4.71	5
		e''	14.3492	Conductivity (σ):	1.50	1.52	-1.32	5
	Body 1910	e'	50.7503	Relative Permittivity (ϵ_r):	50.75	53.30	-4.78	5
		e''	14.4739	Conductivity (σ):	1.54	1.52	1.13	5
2/6/2012	Head 1750	e'	38.0943	Relative Permittivity (ϵ_r):	38.09	40.08	-4.97	5
		e''	13.5223	Conductivity (σ):	1.32	1.37	-3.88	5
	Head 1720	e'	38.1929	Relative Permittivity (ϵ_r):	38.19	40.13	-4.83	5
		e''	13.5412	Conductivity (σ):	1.30	1.35	-4.22	5
	Head 1735	e'	38.1153	Relative Permittivity (ϵ_r):	38.12	40.11	-4.97	5
		e''	13.5340	Conductivity (σ):	1.31	1.36	-4.03	5
2/7/2012	Body 1720	e'	51.3518	Relative Permittivity (ϵ_r):	51.35	53.52	-4.05	5
		e''	14.6334	Conductivity (σ):	1.40	1.47	-4.65	5
	Body 1735	e'	51.3341	Relative Permittivity (ϵ_r):	51.33	53.48	-4.01	5
		e''	14.6706	Conductivity (σ):	1.42	1.48	-4.17	5
	Body 1750	e'	51.3375	Relative Permittivity (ϵ_r):	51.34	53.44	-3.94	5
		e''	14.7879	Conductivity (σ):	1.44	1.49	-3.18	5

Tissue dielectric parameters check result (Continued)

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
2/8/2012	Body 1900	e'	50.9304	Relative Permittivity (ϵ_r):	50.93	53.30	-4.45	5
		e''	14.3552	Conductivity (σ):	1.52	1.52	-0.23	5
	Body 1850	e'	51.0235	Relative Permittivity (ϵ_r):	51.02	53.30	-4.27	5
		e''	14.1007	Conductivity (σ):	1.45	1.52	-4.57	5
	Body 1880	e'	50.9324	Relative Permittivity (ϵ_r):	50.93	53.30	-4.44	5
		e''	14.1888	Conductivity (σ):	1.48	1.52	-2.42	5
	Body 1910	e'	50.8854	Relative Permittivity (ϵ_r):	50.89	53.30	-4.53	5
		e''	14.4146	Conductivity (σ):	1.53	1.52	0.71	5

8. SAR Measurement Procedures

8.1. Normal SAR measurement procedure

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

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

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

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

Step 5: Z-Scan
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.

8.2. Volume scan procedures

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

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

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

Step 4: Volume Scan
Volume Scans are used to assess peak SAR and averaged SAR measurements in largely extended 3-dimensional volumes within any phantom. This measurement does not need any previous area scan. The grid can be anchored to a user specific point or to the current probe location.

Step 5: Power drift measurement
The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

9. System Performance Check

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

9.1. System performance check measurement conditions

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ±0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
  For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 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.

9.1. Reference SAR values for system performance check

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

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	SAR Measured (mW/g)		
				1g/10g	Head	Body
D1750V2	1050	4/19/11	1750	1g	36.8	36.4
				10g	19.6	19.4
D1900V2	5d140	4/18/11	1900	1g	41.6	41.2
				10g	21.5	21.6

9.2. System performance check results

Date Tested	System dipole		Measured (Normalized to 1 W)		Target	Delta (%)	Tolerance (%)
2/2/2012	Head	5d140	1g SAR	41.5	41.6	-0.24	±10
			10g SAR	21.5	21.5	0.00	
2/3/2012	Head	5d140	1g SAR	41.6	41.6	0.00	±10
			10g SAR	21.6	21.5	0.47	
2/3/2012	Body	5d140	1g SAR	42.7	41.2	3.64	±10
			10g SAR	22.4	21.6	3.70	
2/6/2012	Body	5d140	1g SAR	42.4	41.2	2.91	±10
			10g SAR	22.2	21.6	2.78	
2/6/2012	Head	1050	1g SAR	35.9	36.8	-2.45	±10
			10g SAR	19.0	19.6	-3.06	
2/7/2012	Body	1050	1g SAR	38.2	36.4	4.95	±10
			10g SAR	20.2	19.4	4.12	
2/8/2012	Body	5d140	1g SAR	43.0	41.2	4.37	±10
			10g SAR	22.7	21.6	5.09	

10. RF Output Power Measurement

10.1. LTE band 2

BW	Ch. #	Freq. (MHz)	Mode	UL RB Allocation	UL RB Start	Target MPR	Measured MPR	Max. Avg. Power (dBm)
10 MHz	18650	1855.0	QPSK	1	0	0	0	23.0
				1	49	0	0	23.0
				25	12	0	0	22.7
				50	0	0	0	22.7
			16QAM	1	0	0	0	23.0
				1	49	0	0	22.8
				25	12	0	0	22.9
				50	0	0	0	22.8
	18900	1880.0	QPSK	1	0	0	0	23.2
				1	49	0	0	23.0
				25	12	0	0	22.7
				50	0	0	0	22.9
			16QAM	1	0	0	0	23.0
				1	49	0	0	22.8
				25	12	0	0	23.1
				50	0	0	0	23.0
	19150	1905.0	QPSK	1	0	0	0	23.0
				1	49	0	0	23.0
				25	12	0	0	22.8
				50	0	0	0	22.9
			16QAM	1	0	0	0	22.7
				1	49	0	0	22.9
				25	12	0	0	23.0
				50	0	0	0	23.1

10.2. LTE Band 4

BW	Ch. #	Freq. (MHz)	Mode	UL RB Allocation	UL RB Start	Target MPR	Measured MPR	Max. Avg. Power (dBm)
10 MHz	20000	1715.0	QPSK	1	0	0	0	23.2
				1	49	0	0	23.2
				25	12	0	0	23.0
				50	0	0	0	23.2
			16QAM	1	0	0	0	22.9
				1	49	0	0	22.8
				25	12	0	0	23.2
				50	0	0	0	23.3
	20175	1732.5	QPSK	1	0	0	0	23.3
				1	49	0	0	23.2
				25	12	0	0	22.8
				50	0	0	0	22.9
			16QAM	1	0	0	0	22.9
				1	49	0	0	22.9
				25	12	0	0	23.0
				50	0	0	0	23.1
	20350	1750.0	QPSK	1	0	0	0	23.1
				1	49	0	0	23.1
				25	12	0	0	23.0
				50	0	0	0	22.9
			16QAM	1	0	0	0	22.8
				1	49	0	0	22.9
				25	12	0	0	23.0
				50	0	0	0	23.1

11. SAR Test Results

Test reduction is based on KDB 941225 D05 SAR for LTE Devices v01

11.1. LTE Band 2

(1) Head SAR

Test Position	Ch. BW	UL Ch #.	Freq. (MHz)	Mode	RB SIze	RB Offset	Avg Pwr (dBm)	MPR	SAR (mW/g)		Note
									1-g	10-g	
Left Touch	10 MHz	18650	1855.0	QPSK	1	0	23.0	0			
					1	49	23.0	0			
					25	12	22.7	0			
					50	0	22.7	0			
				16QAM	1	0	23.0	0			
					1	49	22.8	0			
					25	12	22.9	0			
					50	0	22.8	0			
		18900	1880.0	QPSK	1	0	23.2	0	0.253	0.171	
					1	49	23.0	0	0.219	0.142	
					25	12	22.7	0	0.216	0.144	
					50	0	22.9	0			
				16QAM	1	0	23.0	0	0.290	0.190	
					1	49	22.8	0	0.209	0.135	
					25	12	23.1	0	0.230	0.150	
					50	0	23.0	0			
		19150	1905.0	QPSK	1	0	23.0	0			
					1	49	23.0	0			
					25	12	22.8	0			
					50	0	22.9	0			
				16QAM	1	0	22.7	0			
					1	49	22.9	0			
					25	12	23.0	0			
					50	0	23.1	0			

Test Position	Ch. BW	UL Ch #.	Freq. (MHz)	Mode	RB SIze	RB Offset	Avg Pwr (dBm)	MPR	SAR (mW/g)		Note
									1-g	10-g	
Left Tilt	10 MHz	18650	1855.0	QPSK	1	0	23.0	0			
					1	49	23.0	0			
					25	12	22.7	0			
					50	0	22.7	0			
				16QAM	1	0	23.0	0			
					1	49	22.8	0			
					25	12	22.9	0			
					50	0	22.8	0			
		18900	1880.0	QPSK	1	0	23.2	0	0.189	0.110	
					1	49	23.0	0	0.113	0.067	
					25	12	22.7	0	0.150	0.087	
					50	0	22.9	0			
				16QAM	1	0	23.0	0	0.164	0.097	
					1	49	22.8	0	0.135	0.077	
					25	12	23.1	0	0.124	0.073	
					50	0	23.0	0			
		19150	1905.0	QPSK	1	0	23.0	0			
					1	49	23.0	0			
					25	12	22.8	0			
					50	0	22.9	0			
				16QAM	1	0	22.7	0			
					1	49	22.9	0			
					25	12	23.0	0			
					50	0	23.1	0			

Head SAR (continued)

Test Position	Ch. BW	UL Ch #.	Freq. (MHz)	Mode	RB SIze	RB Offset	Avg Pwr (dBm)	MPR	SAR (mW/g)		Note
									1-g	10-g	
Right touch	10 MHz	18650	1855.0	QPSK	1	0	23.0	0			
					1	49	23.0	0			
					25	12	22.7	0			
					50	0	22.7	0			
				16QAM	1	0	23.0	0			
					1	49	22.8	0			
					25	12	22.9	0			
					50	0	22.8	0			
		18900	1880.0	QPSK	1	0	23.2	0	0.514	0.315	
					1	49	23.0	0	0.390	0.238	
					25	12	22.7	0	0.407	0.249	
					50	0	22.9	0			
				16QAM	1	0	23.0	0	0.506	0.309	
					1	49	22.8	0	0.383	0.234	
					25	12	23.1	0	0.387	0.238	
					50	0	23.0	0			
		19150	1905.0	QPSK	1	0	23.0	0			
					1	49	23.0	0			
					25	12	22.8	0			
					50	0	22.9	0			
				16QAM	1	0	22.7	0			
					1	49	22.9	0			
					25	12	23.0	0			
					50	0	23.1	0			

Test Position	Ch. BW	UL Ch #.	Freq. (MHz)	Mode	RB SIze	RB Offset	Avg Pwr (dBm)	MPR	SAR (mW/g)		Note
									1-g	10-g	
Right Tilt	10 MHz	18650	1855.0	QPSK	1	0	23.0	0			
					1	49	23.0	0			
					25	12	22.7	0			
					50	0	22.7	0			
				16QAM	1	0	23.0	0			
					1	49	22.8	0			
					25	12	22.9	0			
					50	0	22.8	0			
		18900	1880.0	QPSK	1	0	23.2	0	0.168	0.108	
					1	49	23.0	0	0.125	0.081	
					25	12	22.7	0	0.127	0.082	
					50	0	22.9	0			
				16QAM	1	0	23.0	0	0.170	0.111	
					1	49	22.8	0	0.128	0.083	
					25	12	23.1	0	0.129	0.083	
					50	0	23.0	0			
		19150	1905.0	QPSK	1	0	23.0	0			
					1	49	23.0	0			
					25	12	22.8	0			
					50	0	22.9	0			
				16QAM	1	0	22.7	0			
					1	49	22.9	0			
					25	12	23.0	0			
					50	0	23.1	0			

(2) Hotspot SAR

Test Position	Ch. BW	UL Ch #.	Freq. (MHz)	Mode	RB SIze	RB Offset	Avg Pwr (dBm)	MPR	SAR (mW/g)		Note
									1-g	10-g	
Right edge W/10 mm Separation	10 MHz	18650	1855.0	QPSK	1	0	23.0	0			
					1	49	23.0	0			
					25	12	22.7	0			
					50	0	22.7	0			
				16QAM	1	0	23.0	0			
					1	49	22.8	0			
					25	12	22.9	0			
					50	0	22.8	0			
		18900	1880.0	QPSK	1	0	23.2	0	**0.339**	**0.196**	
					1	49	23.0	0	0.263	0.152	
					25	12	22.7	0	0.257	0.148	
					50	0	22.9	0			
				16QAM	1	0	23.0	0	0.335	0.193	
					1	49	22.8	0	0.255	0.147	
					25	12	23.1	0	0.266	0.154	
					50	0	23.0	0			
		19150	1905.0	QPSK	1	0	23.0	0			
					1	49	23.0	0			
					25	12	22.8	0			
					50	0	22.9	0			
				16QAM	1	0	22.7	0			
					1	49	22.9	0			
					25	12	23.0	0			
					50	0	23.1	0			

Test Position	Ch. BW	UL Ch #.	Freq. (MHz)	Mode	RB SIze	RB Offset	Avg Pwr (dBm)	MPR	SAR (mW/g)		Note
									1-g	10-g	
Bottom edge W/ 10mm Separation	10 MHz	18650	1855.0	QPSK	1	0	23.0	0			
					1	49	23.0	0			
					25	12	22.7	0			
					50	0	22.7	0			
				16QAM	1	0	23.0	0			
					1	49	22.8	0			
					25	12	22.9	0			
					50	0	22.8	0			
		18900	1880.0	QPSK	1	0	23.2	0	0.168	0.099	
					1	49	23.0	0	0.115	0.068	
					25	12	22.7	0	0.124	0.073	
					50	0	22.9	0			
				16QAM	1	0	23.0	0	**0.174**	**0.102**	
					1	49	22.8	0	0.120	0.070	
					25	12	23.1	0	0.129	0.079	
					50	0	23.0	0			
		19150	1905.0	QPSK	1	0	23.0	0			
					1	49	23.0	0			
					25	12	22.8	0			
					50	0	22.9	0			
				16QAM	1	0	22.7	0			
					1	49	22.9	0			
					25	12	23.0	0			
					50	0	23.1	0			

(3) Body & Hotspot SAR (continued)

Test Position	Ch. BW	UL Ch #.	Freq. (MHz)	Mode	RB SIze	RB Offset	Avg Pwr (dBm)	MPR	SAR (mW/g)		Note
									1-g	10-g	
Front W/ 10mm Separation	10 MHz	18650	1855.0	QPSK	1	0	23.0	0			
					1	49	23.0	0			
					25	12	22.7	0			
					50	0	22.7	0			
				16QAM	1	0	23.0	0			
					1	49	22.8	0			
					25	12	22.9	0			
					50	0	22.8	0			
		18900	1880.0	QPSK	1	0	23.2	0	0.475	0.293	
					1	0	23.0	0	0.455	0.284	1
					1	49	22.7	0	0.337	0.208	
					25	12	22.9	0	0.357	0.220	
					50	0	23.0	0			
				16QAM	1	0	22.8	0	0.450	0.279	
					1	49	23.1	0	0.326	0.200	
					25	12	23.0	0	0.301	0.188	
					50	0	23.0	0			
		19150	1905.0	QPSK	1	0	23.0	0			
					1	49	22.8	0			
					25	12	22.9	0			
					50	0	22.7	0			
				16QAM	1	0	22.9	0			
					1	49	23.0	0			
					25	12	23.1	0			
					50	0	23.1	0			

Test Position	Ch. BW	UL Ch #.	Freq. (MHz)	Mode	RB SIze	RB Offset	Avg Pwr (dBm)	MPR	SAR (mW/g)		Note
									1-g	10-g	
Rear W/ 10mm Separation	10 MHz	18650	1855.0	QPSK	1	0	23.0	0			
					1	49	23.0	0			
					25	12	22.7	0			
					50	0	22.7	0			
				16QAM	1	0	23.0	0			
					1	49	22.8	0			
					25	12	22.9	0			
					50	0	22.8	0			
		18900	1880.0	QPSK	1	0	23.2	0	0.417	0.254	
					1	49	23.0	0	0.299	0.179	
					25	12	22.7	0	0.315	0.190	
					50	0	22.9	0			
				16QAM	1	0	23.0	0	0.451	0.275	
					1	0	22.8	0	0.431	0.250	1
					1	49	23.1	0	0.358	0.212	
					25	12	23.0	0	0.331	0.199	
					50	0	23.0	0			
		19150	1905.0	QPSK	1	0	23.0	0			
					1	49	22.8	0			
					25	12	22.9	0			
					50	0	22.7	0			
				16QAM	1	0	22.9	0			
					1	49	23.0	0			
					25	12	23.1	0			
					50	0	23.1	0			

Note(s):

1. With headset attached.

11.2. LTE Band 4

(1) Head SAR

Test Position	Ch. BW	UL Ch #.	Freq. (MHz)	Mode	RB SIze	RB Offset	Avg Pwr (dBm)	MPR	SAR (mW/g) 1-g	SAR (mW/g) 10-g	Note
Left Touch	10 MHz	20000	1715.0	QPSK	1	0	23.2	0			
					1	49	23.2	0			
					25	12	23.0	0			
					50	0	23.2	0			
				16QAM	1	0	22.9	0			
					1	49	22.8	0			
					25	12	23.2	0			
					50	0	23.3	0			
		20175	1732.5	QPSK	1	0	23.3	0	0.137	0.090	
					1	49	23.2	0	0.135	0.088	
					25	12	22.8	0	0.131	0.086	
					50	0	22.9	0			
				16QAM	1	0	22.9	0	0.142	0.093	
					1	49	22.9	0	0.138	0.091	
					25	12	23.0	0	0.157	0.104	
					50	0	23.1	0			
		20350	1750.0	QPSK	1	0	23.1	0			
					1	49	23.1	0			
					25	12	23.0	0			
					50	0	22.9	0			
				16QAM	1	0	22.8	0			
					1	49	22.9	0			
					25	12	23.0	0			
					50	0	23.1	0			

Test Position	Ch. BW	UL Ch #.	Freq. (MHz)	Mode	RB SIze	RB Offset	Avg Pwr (dBm)	MPR	SAR (mW/g) 1-g	SAR (mW/g) 10-g	Note
Left Tilt	10 MHz	20000	1715.0	QPSK	1	0	23.2	0			
					1	49	23.2	0			
					25	12	23.0	0			
					50	0	23.2	0			
				16QAM	1	0	22.9	0			
					1	49	22.8	0			
					25	12	23.2	0			
					50	0	23.3	0			
		20175	1732.5	QPSK	1	0	23.3	0	0.107	0.065	
					1	49	23.2	0	0.103	0.063	
					25	12	22.8	0	0.103	0.063	
					50	0	22.9	0			
				16QAM	1	0	22.9	0	0.111	0.068	
					1	49	22.9	0	0.110	0.067	
					25	12	23.0	0	0.103	0.063	
					50	0	23.1	0			
		20350	1750.0	QPSK	1	0	23.1	0			
					1	49	23.1	0			
					25	12	23.0	0			
					50	0	22.9	0			
				16QAM	1	0	22.8	0			
					1	49	22.9	0			
					25	12	23.0	0			
					50	0	23.1	0			

Head SAR (continued)

Test Position	Ch. BW	UL Ch #.	Freq. (MHz)	Mode	RB SIze	RB Offset	Avg Pwr (dBm)	MPR	SAR (mW/g)		Note
									1-g	10-g	
Right Touch	10 MHz	20000	1715.0	QPSK	1	0	23.2	0			
					1	49	23.2	0			
					25	12	23.0	0			
					50	0	23.2	0			
				16QAM	1	0	22.9	0			
					1	49	22.8	0			
					25	12	23.2	0			
					50	0	23.3	0			
		20175	1732.5	QPSK	1	0	23.3	0	0.231	0.146	
					1	49	23.2	0	0.226	0.144	
					25	12	22.8	0	0.219	0.139	
					50	0	22.9	0			
				16QAM	1	0	22.9	0	0.219	0.140	
					1	49	22.9	0	0.215	0.137	
					25	12	23.0	0	0.226	0.143	
					50	0	23.1	0			
		20350	1750.0	QPSK	1	0	23.1	0			
					1	49	23.1	0			
					25	12	23.0	0			
					50	0	22.9	0			
				16QAM	1	0	22.8	0			
					1	49	22.9	0			
					25	12	23.0	0			
					50	0	23.1	0			

Test Position	Ch. BW	UL Ch #.	Freq. (MHz)	Mode	RB SIze	RB Offset	Avg Pwr (dBm)	MPR	SAR (mW/g)		Note
									1-g	10-g	
Right Tilt	10 MHz	20000	1715.0	QPSK	1	0	23.2	0			
					1	49	23.2	0			
					25	12	23.0	0			
					50	0	23.2	0			
				16QAM	1	0	22.9	0			
					1	49	22.8	0			
					25	12	23.2	0			
					50	0	23.3	0			
		20175	1732.5	QPSK	1	0	23.3	0	0.139	0.092	
					1	49	23.2	0	0.139	0.091	
					25	12	22.8	0	0.135	0.087	
					50	0	22.9	0			
				16QAM	1	0	22.9	0	0.126	0.083	
					1	49	22.9	0	0.127	0.084	
					25	12	23.0	0	0.131	0.086	
					50	0	23.1	0			
		20350	1750.0	QPSK	1	0	23.1	0			
					1	49	23.1	0			
					25	12	23.0	0			
					50	0	22.9	0			
				16QAM	1	0	22.8	0			
					1	49	22.9	0			
					25	12	23.0	0			
					50	0	23.1	0			

(2) Hotspot SAR

Test Position	Ch. BW	UL Ch #.	Freq. (MHz)	Mode	RB SIze	RB Offset	Avg Pwr (dBm)	MPR	SAR (mW/g)		Note
									1-g	10-g	
Right Edge W/ 10mm Separation	10 MHz	20000	1715.0	QPSK	1	0	23.2	0			
					1	49	23.2	0			
					25	12	23.0	0			
					50	0	23.2	0			
				16QAM	1	0	22.9	0			
					1	49	22.8	0			
					25	12	23.2	0			
					50	0	23.3	0			
		20175	1732.5	QPSK	1	0	23.3	0	0.170	0.099	
					1	49	23.2	0	0.172	0.100	
					25	12	22.8	0	0.161	0.094	
					50	0	22.9	0			
				16QAM	1	0	22.9	0	0.165	0.097	
					1	49	22.9	0	0.173	0.101	
					25	12	23.0	0	0.177	0.103	
					50	0	23.1	0			
		20350	1750.0	QPSK	1	0	23.1	0			
					1	49	23.1	0			
					25	12	23.0	0			
					50	0	22.9	0			
				16QAM	1	0	22.8	0			
					1	49	22.9	0			
					25	12	23.0	0			
					50	0	23.1	0			

Test Position	Ch. BW	UL Ch #.	Freq. (MHz)	Mode	RB SIze	RB Offset	Avg Pwr (dBm)	MPR	SAR (mW/g)		Note
									1-g	10-g	
Bottom Edge W/ 10mm Separation	10 MHz	20000	1715.0	QPSK	1	0	23.2	0			
					1	49	23.2	0			
					25	12	23.0	0			
					50	0	23.2	0			
				16QAM	1	0	22.9	0			
					1	49	22.8	0			
					25	12	23.2	0			
					50	0	23.3	0			
		20175	1732.5	QPSK	1	0	23.3	0	0.175	0.105	
					1	49	23.2	0	0.175	0.104	
					25	12	22.8	0	0.168	0.100	
					50	0	22.9	0			
				16QAM	1	0	22.9	0	0.188	0.113	
					1	49	22.9	0	0.187	0.112	
					25	12	23.0	0	0.167	0.100	
					50	0	23.1	0			
		20350	1750.0	QPSK	1	0	23.1	0			
					1	49	23.1	0			
					25	12	23.0	0			
					50	0	22.9	0			
				16QAM	1	0	22.8	0			
					1	49	22.9	0			
					25	12	23.0	0			
					50	0	23.1	0			

(3) Body & Hot-spot SAR

Test Position	Ch. BW	UL Ch #.	Freq. (MHz)	Mode	RB SIze	RB Offset	Avg Pwr (dBm)	MPR	SAR (mW/g) 1-g	SAR (mW/g) 10-g	Note
Front W/ 10mm Separation	10 MHz	20000	1715.0	QPSK	1	0	23.2	0			
					1	49	23.2	0			
					25	12	23.0	0			
					50	0	23.2	0			
				16QAM	1	0	22.9	0			
					1	49	22.8	0			
					25	12	23.2	0			
					50	0	23.3	0			
		20175	1732.5	QPSK	1	0	23.3	0	0.265	0.161	
					1	49	23.2	0	0.265	0.160	
					25	12	22.8	0	0.255	0.154	
					50	0	22.9	0			
				16QAM	1	0	22.9	0	0.275	0.167	
					1	0	22.9	0	0.256	0.157	1
					1	49	23.0	0	0.272	0.164	
					25	12	23.1	0	0.231	0.140	
					50	0	23.1	0			
		20350	1750.0	QPSK	1	0	23.1	0			
					1	49	23.0	0			
					25	12	22.9	0			
					50	0	22.8	0			
				16QAM	1	0	22.9	0			
					1	49	23.0	0			
					25	12	23.1	0			
					50	0	22.9	0			

Test Position	Ch. BW	UL Ch #.	Freq. (MHz)	Mode	RB SIze	RB Offset	Avg Pwr (dBm)	MPR	SAR (mW/g) 1-g	SAR (mW/g) 10-g	Note
Rear W/ 10mm Separation	10 MHz	20000	1715.0	QPSK	1	0	23.2	0			
					1	49	23.2	0			
					25	12	23.0	0			
					50	0	23.2	0			
				16QAM	1	0	22.9	0			
					1	49	22.8	0			
					25	12	23.2	0			
					50	0	23.3	0			
		20175	1732.5	QPSK	1	0	23.3	0	0.385	0.217	
					1	49	23.2	0	0.400	0.228	
					25	12	22.8	0	0.380	0.213	
					50	0	22.9	0			
				16QAM	1	0	22.9	0	0.401	0.226	
					1	49	22.9	0	0.412	0.233	
					1	49	23.0	0	0.358	0.200	1
					25	12	23.1	0	0.351	0.198	
					50	0	23.1	0			
		20350	1750.0	QPSK	1	0	23.1	0			
					1	49	23.0	0			
					25	12	22.9	0			
					50	0	22.8	0			
				16QAM	1	0	22.9	0			
					1	49	23.0	0			
					25	12	23.1	0			
					50	0	22.9	0			

Note(s):

1. With headset attached.

12. Summary of Highest 1-g SAR

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

Technology	Test configuration	Mode	Separation distance (mm)	Highest 1g SAR (W/kg)
LTE Band 2 (Part 27)	Head: Right touch	10 MHz, QPSK, RB# 1, RB# 0	--	0.514
	Body & Hotspot: Front	10 MHz, QPSK, RB# 1 RB# 0	10	0.475
LTE Band 4 (Part 27)	Head: Right Touch	10 MHz, QPSK, RB# 1 RB# 0	--	0.231
	Body & Hotspot: Rear	10 MHz, 16QAM, RB# 1 RB# 49	10	0.412

13. Worst-case SAR Plots

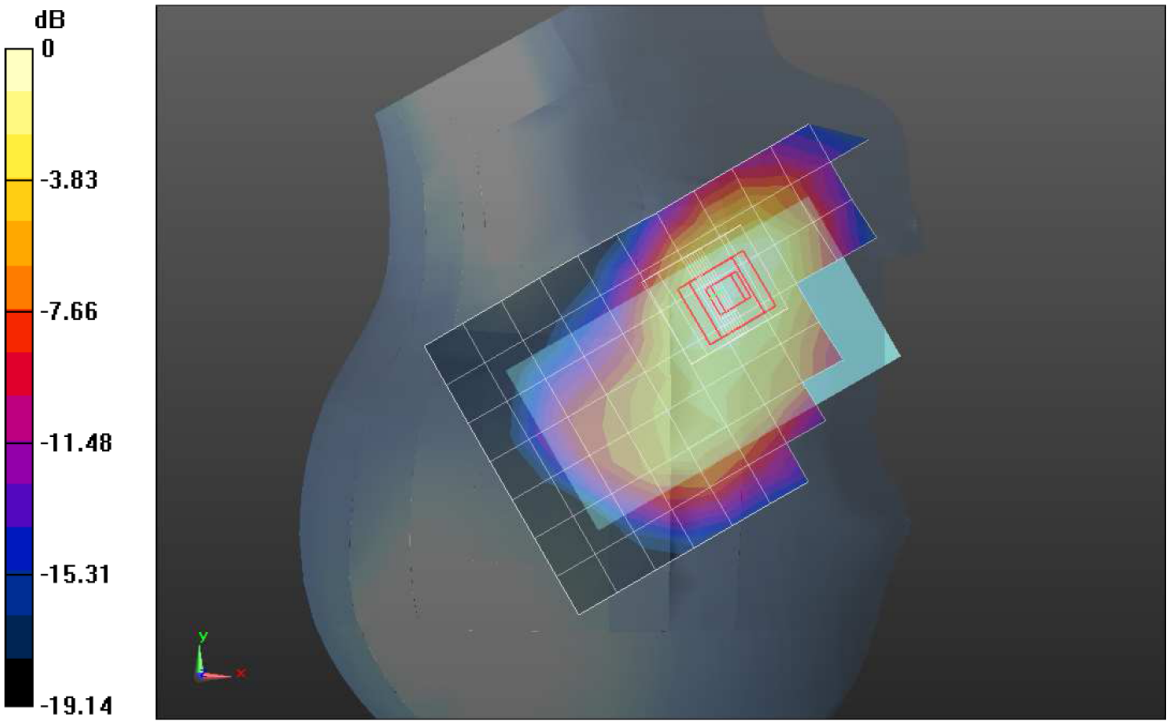
Test Laboratory: UL CCS SAR Lab C Date: 2/3/2012

LTE Band 2

Frequency: 1880 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used: f = 1880 MHz; σ = 1.399 mho/m; ε_r = 38.733; ρ = 1000 kg/m^3
DASY5 Configuration:
- Electronics: DAE4 Sn1239; Calibrated: 10/18/2011
- Probe: EX3DV4 - SN3751; ConvF(7.33, 7.33, 7.33); Calibrated: 12/19/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM; Type: QD000P40CD; Serial: 1632

RHS/Touch_10MHz QPSK_RB1/0_ch M/Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.572 mW/g

RHS/Touch_10MHz QPSK_RB1/0_ch M/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.452 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.7950
SAR(1 g) = 0.514 mW/g; SAR(10 g) = 0.315 mW/g
Maximum value of SAR (measured) = 0.644 mW/g



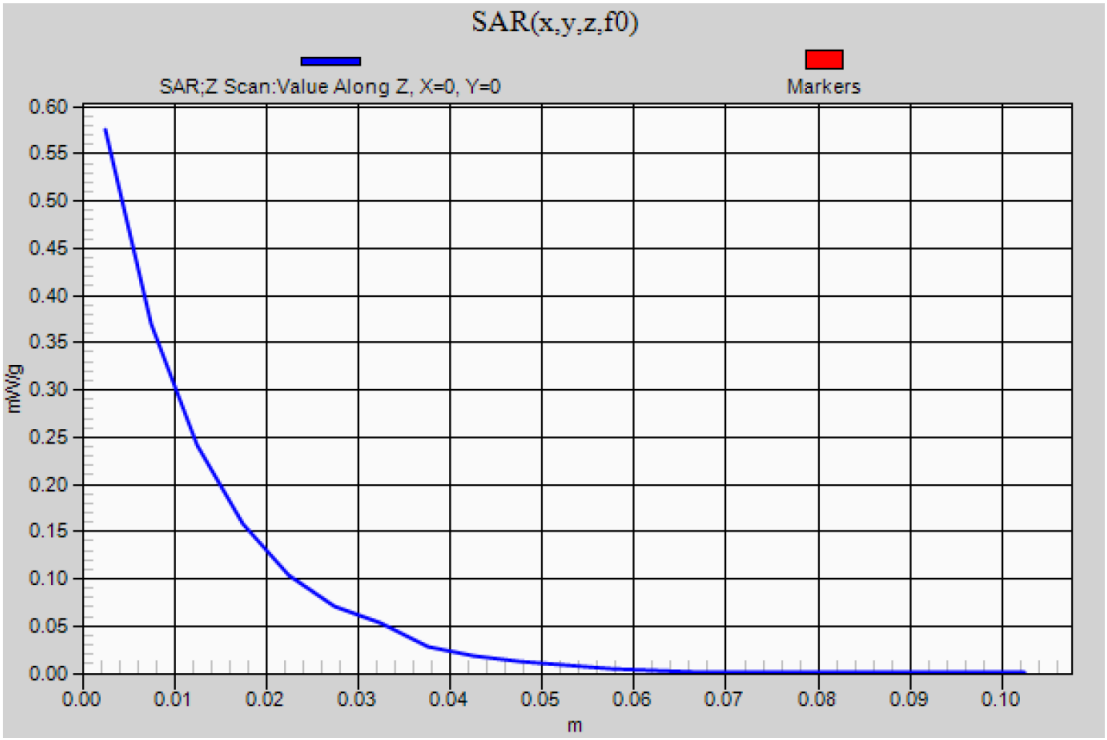
0 dB = 0.640mW/g = -3.88 dB mW/g

Test Laboratory: UL CCS SAR Lab C Date: 2/3/2012

LTE Band 2

Frequency: 1880 MHz; Duty Cycle: 1:1

RHS/Touch_10MHz QPSK_RB1/0_ch M/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.575 mW/g



Test Laboratory: UL CCS SAR Lab C Date: 2/4/2012

LTE Band 2

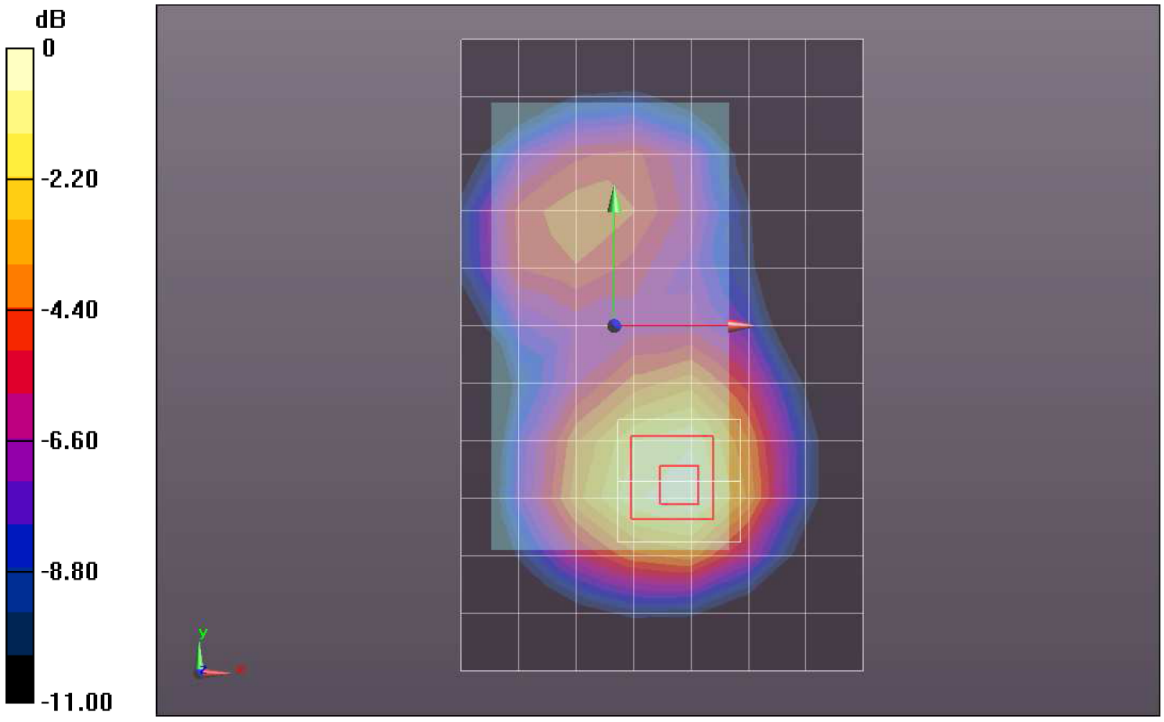
Frequency: 1880 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used: f = 1880 MHz; σ = 1.493 mho/m; ε_r = 51.984; ρ = 1000 kg/m^3
DASY5 Configuration:
- Electronics: DAE4 Sn1239; Calibrated: 10/18/2011
- Probe: EX3DV4 - SN3751; ConvF(6.83, 6.83, 6.83); Calibrated: 12/19/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (A); Type: QDOVA001BB; Serial: 1117

Hot Spot/Front Separation_10MHz QPSK_RB1/0_ch M/Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.567 mW/g

Hot Spot/Front Separation_10MHz QPSK_RB1/0_ch M/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.694 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.7300
SAR(1 g) = 0.475 mW/g; SAR(10 g) = 0.293 mW/g
Maximum value of SAR (measured) = 0.584 mW/g



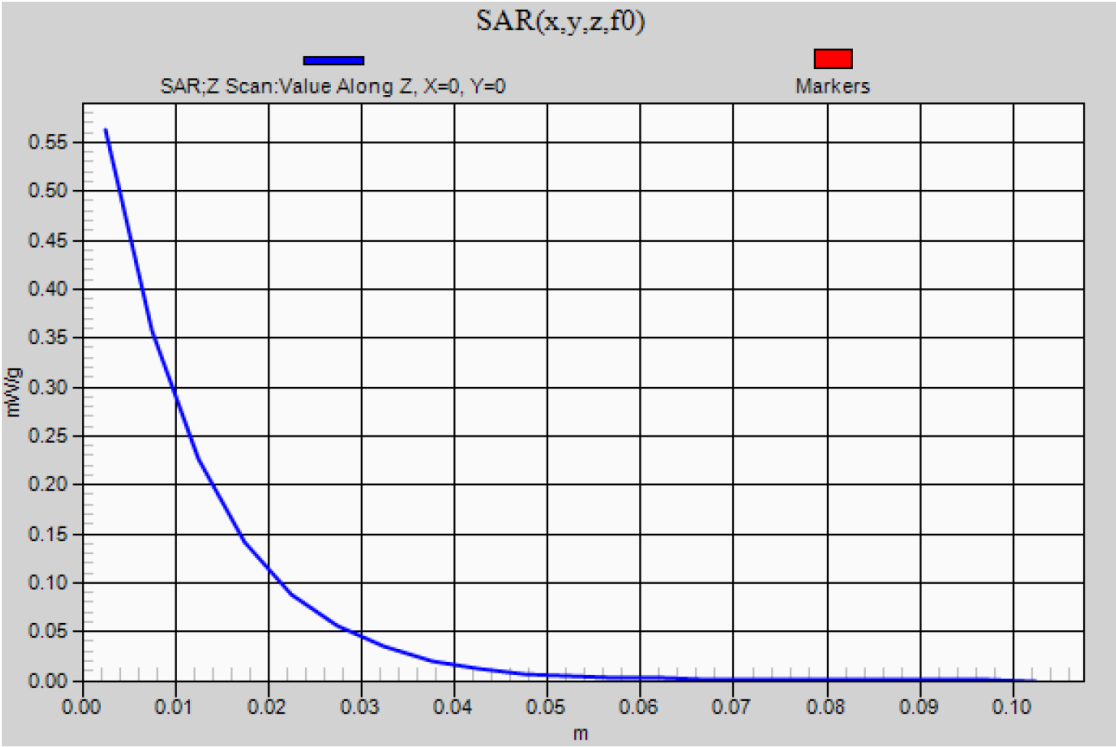
0 dB = 0.580mW/g = -4.73 dB mW/g

Test Laboratory: UL CCS SAR Lab C Date: 2/4/2012

LTE Band 2

Frequency: 1880 MHz; Duty Cycle: 1:1

Hot Spot/Front Separation_10MHz QPSK_RB1/0_ch M/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 0.563 mW/g



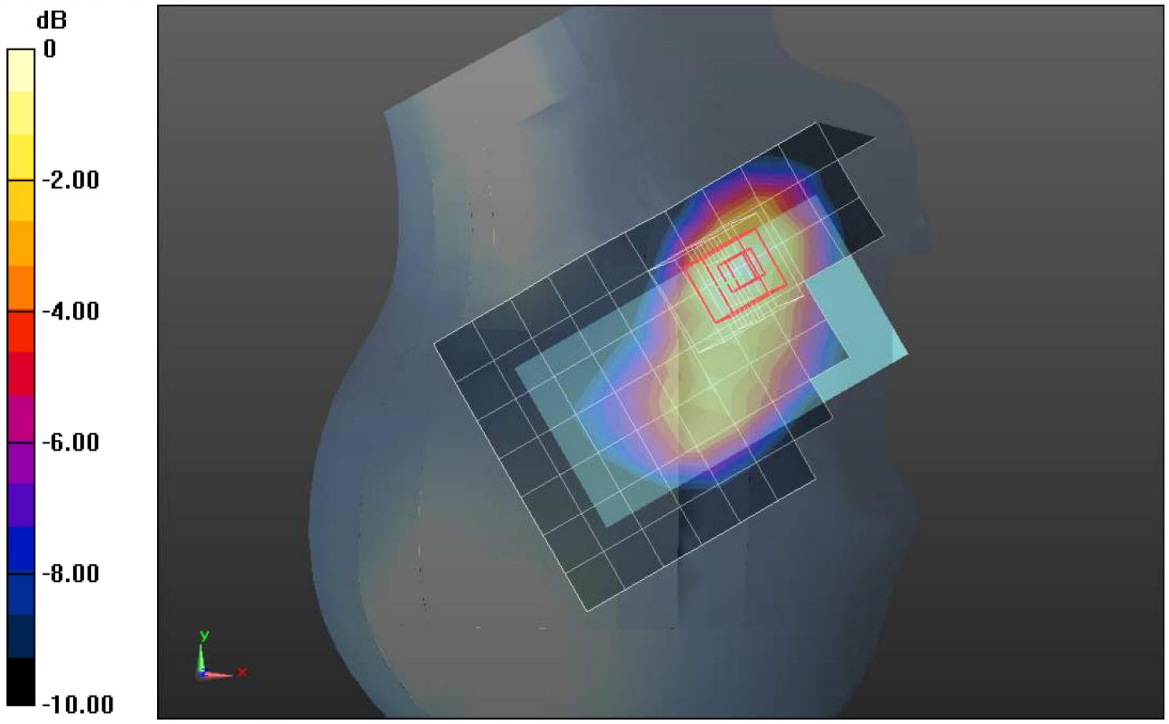
Test Laboratory: UL CCS SAR Lab C Date: 2/7/2012

LTE Band 4

Frequency: 1732.5 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): f = 1732.5 MHz; σ = 1.306 mho/m; ε_r = 38.12; ρ = 1000 kg/m^3
DASY5 Configuration:
- Electronics: DAE4 Sn1239; Calibrated: 10/18/2011
- Probe: EX3DV4 - SN3751; ConvF(7.56, 7.56, 7.56); Calibrated: 12/19/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: SAM; Type: QD000P40CD; Serial: 1632

RHS/Touch_10MHz QPSK_RB1/0_ch M/Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.276 mW/g

RHS/Touch_10MHz QPSK_RB1/0_ch M/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.629 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 0.3390
SAR(1 g) = 0.231 mW/g; SAR(10 g) = 0.146 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.280 mW/g



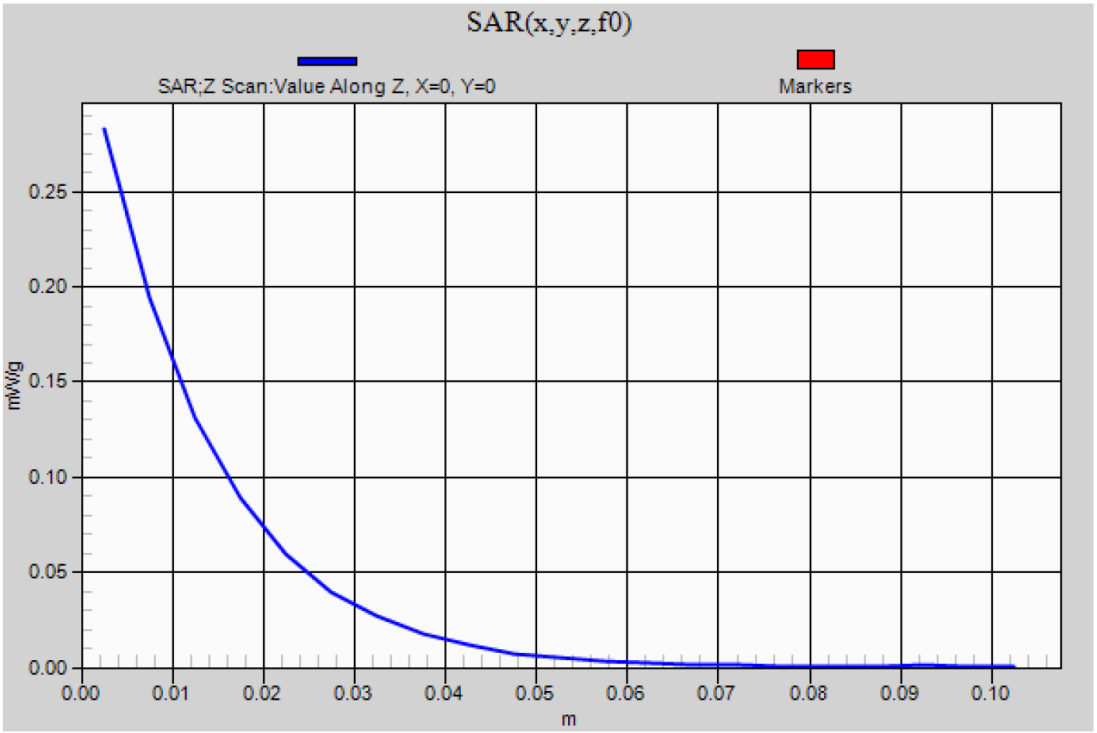
0 dB = 0.280mW/g = -11.06 dB mW/g

Test Laboratory: UL CCS SAR Lab C Date: 2/7/2012

LTE Band 4

Frequency: 1732.5 MHz; Duty Cycle: 1:1

RHS/Touch_10MHz QPSK_RB1/0_ch M/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.283 mW/g



Test Laboratory: UL CCS SAR Lab C Date: 2/7/2012

LTE Band 4

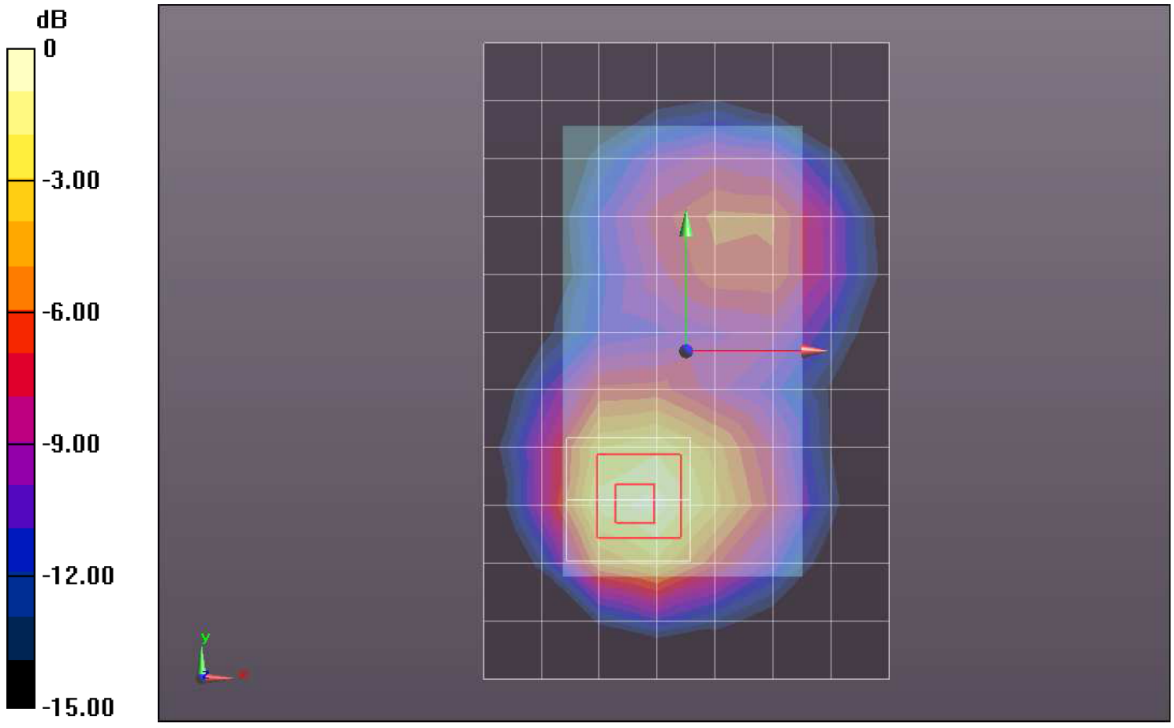
Frequency: 1732.5 MHz; Duty Cycle: 1:1; Room Ambient Temperature: 24.0°C; Liquid Temperature: 23.0°C
Medium parameters used (interpolated): f = 1732.5 MHz; σ = 1.415 mho/m; ε_r = 51.332; ρ = 1000 kg/m^3
DASY5 Configuration:
- Electronics: DAE4 Sn1239; Calibrated: 10/18/2011
- Probe: EX3DV4 - SN3751; ConvF(7.15, 7.15, 7.15); Calibrated: 12/19/2011
- Sensor-Surface: 2.5mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Phantom: ELI v5.0 (A); Type: QDOVA001BB; Serial: 1117

Hot Spot/Rear Separation_10MHz 16QAM_RB1/49_ch M/Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.476 mW/g

Hot Spot/Rear Separation_10MHz 16QAM_RB1/49_ch M/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.388 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 0.7050
SAR(1 g) = 0.412 mW/g; SAR(10 g) = 0.233 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.531 mW/g



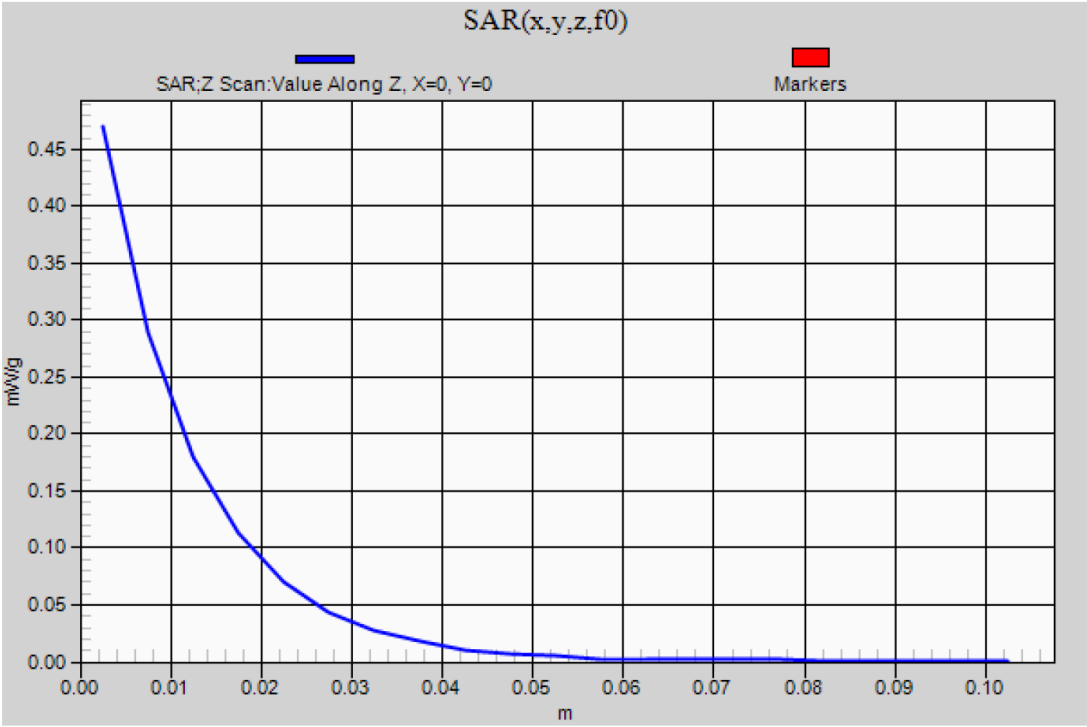
0 dB = 0.530mW/g = -5.51 dB mW/g

Test Laboratory: UL CCS SAR Lab C Date: 2/7/2012

LTE Band 4

Frequency: 1732.5 MHz; Duty Cycle: 1:1

Hot Spot/Rear Separation_10MHz 16QAM_RB1/49_ch M/Z Scan (1x1x21): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.470 mW/g



14. Simultaneous Transmission SAR Analysis

The maximum 1-g SAR of CDMA 1xRTT (voice) and WiFi is from Class II Permissive Change SAR report "HCTA1112FS01", as documented in 1/25/2012 CIIPC filing.

14.1. SV-LTE Band 2 Head Exposure Condition

Test Position	Voice			Data		Sum of the 1-g SAR (mW/g)
	CDMA850 1xRTT	CDMA1700 1xRTT	CDMA1900 1xRTT	LTE Band 2 (10 MHz BW)	WiFi	
Left touch	0.361			0.290	0.241	0.892
Left tilt	0.229			0.189	0.171	0.589
Right touch	0.299			0.514	0.074	0.887
Right tilt	0.188			0.170	0.068	0.426
Left touch		0.616		0.290	0.241	1.147
Left tilt		0.154		0.189	0.171	0.514
Right touch		0.335		0.514	0.074	0.923
Right tilt		0.148		0.170	0.068	0.386
Left touch			0.931	0.290	0.241	**1.462**
Left tilt			0.204	0.189	0.171	0.564
Right touch			0.444	0.514	0.074	1.032
Right tilt			0.239	0.170	0.068	0.477

Conclusions:

Simultaneous transmission SAR measurement (volume scan) is not required due to the sum of the 1-g SAR is < 1.6 W/kg.

14.2. SV-LTE Band 4 Head Exposure Condition

Test Position	Voice			Data		Sum of the 1-g SAR (mW/g)
	CDMA850 1xRTT	CDMA1700 1xRTT	CDMA1900 1xRTT	LTE Band 4 (10 MHz BW)	WiFi	
Left touch	0.361			0.157	0.241	0.759
Left tilt	0.229			0.111	0.171	0.511
Right touch	0.299			0.231	0.074	0.604
Right tilt	0.188			0.139	0.068	0.395
Left touch		0.616		0.157	0.241	1.014
Left tilt		0.154		0.111	0.171	0.436
Right touch		0.335		0.231	0.074	0.640
Right tilt		0.148		0.139	0.068	0.355
Left touch			0.931	0.157	0.241	**1.329**
Left tilt			0.204	0.111	0.171	0.486
Right touch			0.444	0.231	0.074	0.749
Right tilt			0.239	0.139	0.068	0.446

Conclusions:

Simultaneous transmission SAR measurement (volume scan) is not required due to the sum of the 1-g SAR is < 1.6 W/kg.

14.3. SV-LTE Band 2 Body & Hotspot exposure condition

Test Position	Voice			Data		Sum of the 1-g SAR (mW/g)
	CDMA850 1xRTT	CDMA1700 1xRTT	CDMA1900 1xRTT	LTE Band 2 (10 MHz BW)	WiFi	
Rear	0.842			0.451	0.361	1.654
Rear		0.430		0.451	0.361	1.242
Rear			0.792	0.451	0.361	1.604

SAR to Peak Location Separation Ratio (SPLSR)

Test Position	Worst-case combination			Sum of the 1-g SAR (mW/g)	Calculated distance (cm)	SPLSR
	CDMA850 1xRTT	LTE Band 2	WiFi			
Rear	0.842	0.451	0.361	1.654	n/a	n/a
	0.842	0.451		1.293	n/a	n/a
		0.451	0.361	0.812	n/a	n/a
	0.842		0.361	1.203	n/a	n/a
Test Position	Worst-case combination			Sum of the 1-g SAR (mW/g)	Calculated distance (cm)	SPLSR
	CDMA1900 1xRTT	LTE Band 2	WiFi			
Rear	0.792	0.451	0.361	1.604	n/a	n/a
	0.792	0.451		1.243	n/a	n/a
		0.451	0.361	0.812	n/a	n/a
	0.792		0.361	1.153	n/a	n/a

Conclusions:

SPLSR and Simultaneous transmission SAR measurement (volume scan) is not required due to the sum of the 1-g SAR for antenna pairs being <1.6 W/kg.

14.4. SV-LTE Band 4 Body & Hotspot exposure condition

Test Position	Voice			Data		Sum of the 1-g SAR (mW/g)
	CDMA850 1xRTT	CDMA1700 1xRTT	CDMA1900 1xRTT	LTE Band 4 (10 MHz BW)	WiFi	
Rear	0.842			0.412	0.361	1.615
Rear		0.430		0.412	0.361	1.203
Rear			0.792	0.412	0.361	1.565

SAR to Peak Location Separation Ratio (SPLSR)

Test Position	Worst-case combination			Sum of the 1-g SAR (mW/g)	Calculated distance (cm)	SPLSR
	CDMA850 1xRTT	LTE Band 4	WiFi			
Rear	0.842	0.412	0.361	1.615	n/a	n/a
	0.842	0.412		1.254	n/a	n/a
		0.412	0.361	0.773	n/a	n/a
	0.842		0.361	1.203	n/a	n/a

Conclusions:

SPLSR and Simultaneous transmission SAR measurement (volume scan) is not required due to the sum of the 1-g SAR for antenna pairs being <1.6 W/kg.

15. Appendixes

Refer to separated files for the following appendixes.

15.1. System check plots

15.2. SAR test plots for LTE Band 2

15.3. SAR test plots for LTE Band 4

15.4. Calibration certificate for E-Field Probe EX3DV4 SN 3751

15.5. Calibration certificate for D1750V2 SN 1050

15.6. Calibration certificate for D1900V2 SN 5d140