



## **SAR EVALUATION REPORT**

**(CLASS II PERMISSIVE CHANGE)**

**FCC 47 CFR § 2.1093  
IEEE Std 1528-2013**

*For*

**CDMA/LTE Phone + Bluetooth & DTS b/g/n + NFC**

**Model: LG-VS810PP, VS810PP, LGVS810PP  
FCC ID: ZNFVS810PP**

**Report Number: 14U18510-S1  
Issue Date: 9/30/14**

*Prepared for*

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NVLAP LAB CODE 200065-0

## REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
--	9/30/14	Initial Issue	--

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### 1. Attestation of Test Results

Applicant Name	LG ELECTRONICS MOBILECOMM U.S.A., INC.		
Application Purpose	<input type="checkbox"/> Original Grant <input checked="" type="checkbox"/> Class II Permissive Change		
FCC ID	ZNFVS810PP		
DUT Description	CDMA/LTE Phone + Bluetooth & DTS/UNII b/g/n + NFC		
Exposure Category	General Population/Uncontrolled Exposure (1g SAR limit: 1.6 W/kg)		
The Highest Reported SAR	RF Exposure Conditions	Equipment Class	
		Licensed	DTS
	Head	0.789 W/kg	0.444 W/kg
	Body-worn Accessory	1.110 W/kg	0.170 W/kg
	Wireless Router (Hotspot)		
	Wi-Fi Direct	N/A	
Simultaneous Transmission	Head: 1.203 W/kg		
		Body: 1.513 W/kg	N/A
Applicable Standards	FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013		
Test Results	Pass		
Date tested	09/22/2014 – 09/25/2014		
<p>UL Verification Services Inc. 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 Verification Services Inc. 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.</p> <p><b>Note:</b> 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 Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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.</p>			
Approved & Released By:	Prepared By:		
			
Dave Weaver Program Manager UL Verification Services Inc.	Coltyce Sanders Laboratory Engineer UL Verification Services Inc.		

## 2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE STD 1528-2003 & 2013, the following FCC Published RF exposure KDB procedures, and TCB workshop updates:

- 447498 D01 General RF Exposure Guidance v05r02
- 648474 D04 Handset SAR v01r02
- 941225 D01 SAR test for 3G devices v02
- 941225 D02 HSPA and 1x Advanced v02r02
- 941225 D05 SAR for LTE Devices v02r03
- 941225 D05A LTE Rel.10 KDB Inquiry Sheet v01
- 941225 D06 Hotspot Mode SAR v01r01
- 248227 D01 SAR Meas for 802 11abg v01r02
- 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03
- 865664 D02 SAR Reporting v01r01
- 690783 D01 SAR Listings on Grants v01r03

## 3. Facilities and Accreditation

The test sites and measurement facilities used to collect data are located at

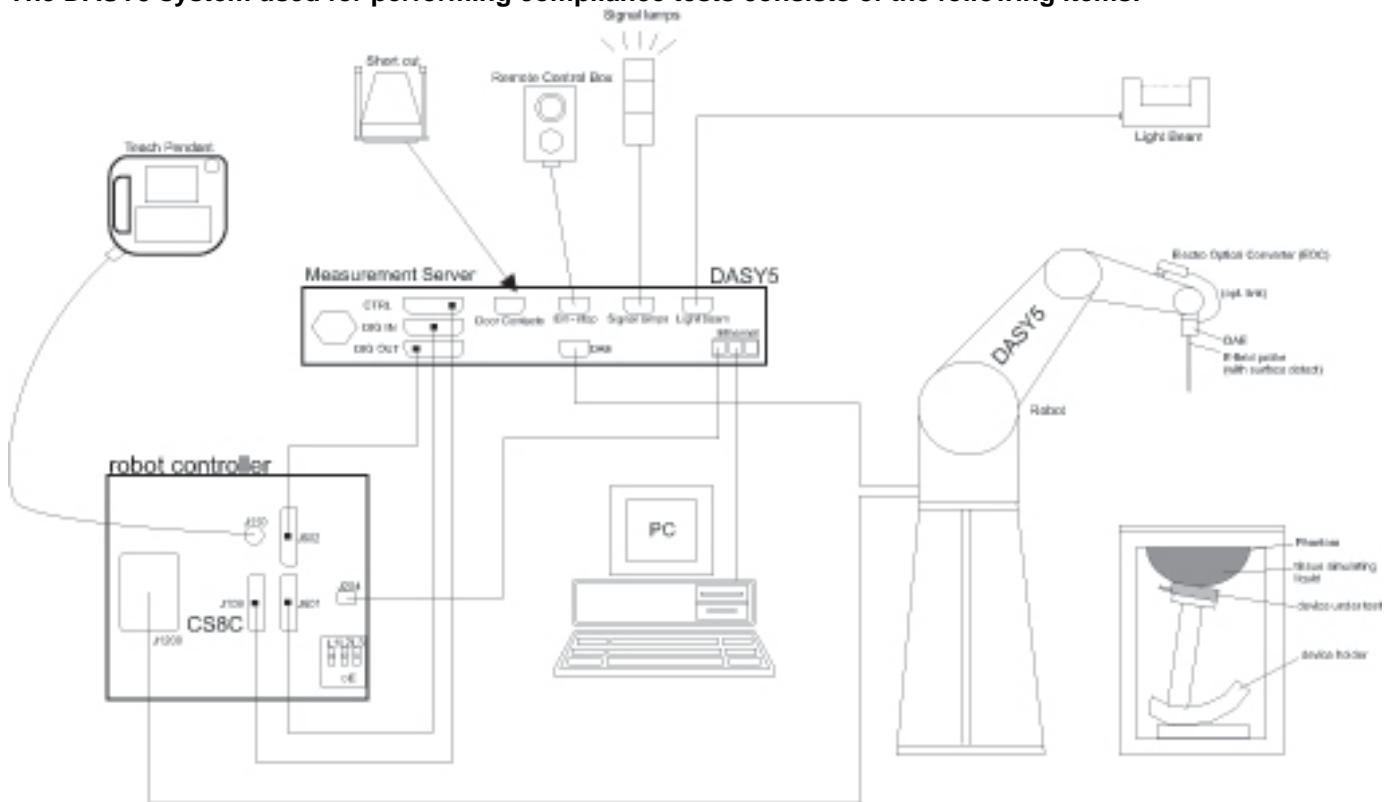
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	SAR Lab 5
SAR Lab F	
SAR Lab G	
SAR Lab H	

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2000650.htm>

## 4. SAR Measurement System & Test Equipment

### 4.1. SAR Measurement System

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



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

## 4.2. Test Equipment

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

### Dielectric Property Measurements

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Network Analyzer	Agilent	E5071B	MY42100131	2/24/2015
Dielectric Probe kit	SPEAG	DAK-3.5	1087	11/13/2014
Dielectric Probe kit	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	EXTECH	445703	CCS-200	3/24/2015

### System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
HP Signal Generator	HP	8665B	3546A00784	6/23/2015
Power Meter	HP	437B	3125U16345	6/16/2015
Power Meter	HP	437B	3125U09516	9/30/2014
Power Sensor	Agilent	8481A	2702A60780	6/16/2015
Power Sensor	Agilent	8481A	3318A95392	9/30/2014
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1622052	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2711	N/A
DC Power Supply	Sorensen Ametek	XT20-3	1318A00530	N/A
Synthesized Signal Generator	Agilent	8665B	3438A00633	8/29/2015
Power Meter	HP	438A	2822A05684	10/10/2104
Power Sensor	Agilent	8481A	2349A36506	9/30/2014
Power Sensor	Agilent	8481A	2237A31744	10/2/2014
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1808939	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2710	N/A
DC Power Supply	HP	6296A	2841A-05955	N/A
E-Field Probe (SAR 1)	SPEAG	EX3DV4	3902	5/19/2015
E-Field Probe (SAR 4)	SPEAG	EX3DV3	3929	5/9/2015
E-Field Probe (SAR 5)	SPEAG	EX3DV4	3991	5/16/2015
Data Acquisition Electronics (SAR 1)	SPEAG	DAE3	427	1/21/2015
Data Acquisition Electronics (SAR 4)	SPEAG	DAE4	1377	8/27/2015
Data Acquisition Electronics (SAR 5)	SPEAG	DAE4	1439	5/14/2015
System Validation Dipole	SPEAG	D750V3	1071	11/15/2014
System Validation Dipole	SPEAG	D835V2	4d117	5/16/2015
System Validation Dipole	SPEAG	D1750V2	1050	4/22/2015
System Validation Dipole	SPEAG	D1900V2	5d043	11/12/2014
System Validation Dipole	SPEAG	D2450V2	706	5/20/2015
Thermometer (SAR Lab 1)	EXTECH	445703	CCS-205	3/24/2015
Thermometer (SAR Lab 4)	EXTECH	445703	CCS-238	6/3/2015
Thermometer (SAR Lab 5)	EXTECH	445703	CCS-239	6/3/2015

### Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Power Meter	Agilent	N1912A	MY53040015	7/10/2015
Power Sensor	Agilent	N1921A	MY52020011	5/6/2015
Base Station Simulator	R & S	CMW500	137873-wG	7/14/2015
Base Station Simulator	R & S	CMW500	132910-cp	4/25/2015
Base Station Simulator	R & S	CMW500	135393-vQ	7/3/2015
Base Station Simulator	R & S	CMW500	104245-jz	3/26/2015



## 5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2003 & 2013 is not required in SAR reports submitted for equipment approval.

## 6. Device Under Test (DUT) Information

### 6.1. DUT Description

Model: LG-VS810PP, VS810PP, LGVS810PP	
Device Dimension	Overall (Length x Width): 127.5 mm x 67.9 mm Overall Diagonal: 136 mm Display Diagonal: 115 mm
Battery Back Cover	<input checked="" type="checkbox"/> Normal Battery Cover <input type="checkbox"/> Normal Battery Cover with NFC <input type="checkbox"/> Wireless Charger Battery Cover <input type="checkbox"/> Wireless Charger Battery Cover with NFC.
Battery Options	<input checked="" type="checkbox"/> Standard – Lithium-ion battery, Rating 3.8Vdc, 8.0Wh <input type="checkbox"/> Extended (large capacity)
Accessory	Headset
Wireless Router (Hotspot)	Wi-Fi Hotspot mode permits the device to share its cellular data connection with other Wi-Fi-enabled devices. <input checked="" type="checkbox"/> Mobile Hotspot (Wi-Fi 2.4 GHz) <input type="checkbox"/> Mobile Hotspot (Wi-Fi 5 GHz)
Wi-Fi Direct	Wi-Fi Direct enabled devices transfer data directly between each other <input checked="" type="checkbox"/> Wi-Fi Direct (Wi-Fi 2.4 GHz) <input type="checkbox"/> Wi-Fi Direct (Wi-Fi 5 GHz)

### 6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle used for SAR testing
CDMA2000	BC0 and BC1	1xRTT (Voice & Data) 1xEV-DO Rel. 0 1xEV-DO Rev. A	1xRTT: 100% 1xEV-DO Rel. 0: 100% 1xEV-DO Rev. A: 100%
	Does this device support SV-DO (1xRTT-1xEVDO)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
LTE (FDD)	Band 4 / 13	QPSK, 16QAM	100%
	Does this device support SV-LTE (1xRTT-LTE)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20)	100%
Bluetooth	2.4 GHz	Version 4.0 LE + EDR	32.25% (DH1), 66.68% (DH3), 77.52% (DH5)

### 6.3. Nominal and Maximum Output Power

Upper limit (dB): 0.5 ~ -1.5		RF Output Power (MAX) (dBm)		RF Output Power with Power Reduction (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit	Target	Max. tune-up tolerance limit
CDMA BC0	1xRTT	24.2	24.7	18.1	18.6
	1xEVDO Rel. 0	24.2	24.7		
	1xEVDO Rev. A	24.2	24.7		
CDMA BC1	1xRTT	24.2	24.7	17.7	18.2
	1xEVDO Rel. 0	24.2	24.7		
	1xEVDO Rev. A	24.2	24.7		
LTE Band 4	QPSK	22.7	23.2	18.7	19.2
LTE Band 13	QPSK	23.8	24.3	19.8	20.3

Upper limit (dB): 1.0		RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
WiFi 2.4 GHz	802.11b	14.5	15.5
	802.11g	11.5	12.5
	802.11n HT20	10.5	11.5

Upper limit (dB): 0.5		RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
	Bluetooth	9.0	9.5
	Bluetooth LE	0.0	0.5

### 6.4. Simultaneous Transmission Condition

RF Exposure Condition	Capable Transmit Configurations
Head	<ol style="list-style-type: none"> <li>CDMA 1xRTT BC0 / BC1 + Wi-Fi 2.4 GHz</li> <li>CDMA 1xEVDO BC0 / BC1 + Wi-Fi 2.4 GHz (VoIP)</li> <li>LTE Band 4 / 13 + Wi-Fi 2.4 GHz</li> <li>CDMA 1x RTT BC0 / BC1 + LTE B4 / B13 + Wi-Fi 2.4 GHz (SV-LTE + Wi-Fi)</li> </ol>
Body-worn Accessory	<ol style="list-style-type: none"> <li>CDMA 1xRTT BC0 / BC1 + Wi-Fi 2.4 GHz</li> <li>CDMA 1xRTT BC0 / BC1 + BT</li> <li>CDMA 1xEVDO BC0 / BC1 + Wi-Fi 2.4 (VoIP)</li> <li>CDMA 1xEVDO BC0 / BC1 + BT (VoIP)</li> <li>LTE Band 4 / 13 + Wi-Fi 2.4 GHz</li> <li>LTE Band 4 / 13 + BT</li> <li>CDMA 1xRTT BC0 / BC1 + LTE B4 / B13 + Wi-Fi 2.4 GHz (SV-LTE + Wi-Fi)</li> <li>CDMA 1xRTT BC0 / BC1 + LTE B4 / B13 + BT (SV-LTE + BT)</li> </ol>
Wireless Router (Hotspot)	<ol style="list-style-type: none"> <li>CDMA 1xEVDO BC0 / BC1 + Wi-Fi 2.4 GHz</li> <li>LTE Band 4 / 13 + Wi-Fi 2.4 GHz</li> <li>CDMA 1xRTT BC0 / BC1 + LTE B4 / B13 + Wi-Fi 2.4 GHz (SV-LTE + Wi-Fi)</li> </ol>
Wi-Fi Direct	<ol style="list-style-type: none"> <li>CDMA 1xEVDO BC0 / BC1 + Wi-Fi 2.4 GHz (GO / GC)</li> <li>LTE Band 4 / 13 + Wi-Fi 2.4 GHz (GO / GC)</li> <li>CDMA 1xRTT BC0 / BC1 + LTE B4 / B13 + Wi-Fi 2.4 GHz (SV-LTE + Wi-Fi) (GO / GC)</li> </ol>
Notes:	<ol style="list-style-type: none"> <li>CDMA 1xEVDO and LTE support Hotspot.</li> <li>VoIP is supported in CDMA and LTE (e.g. 3rd party VoIP)</li> <li>Wi-Fi 2.4 GHz supports Hotspot and Wi-Fi Direct (GO/GC).</li> <li>Wi-Fi and Bluetooth cannot transmit simultaneously</li> </ol>

### 6.5. General LTE SAR Test and Reporting Considerations

Item	Description																																						
Frequency range, Channel Bandwidth, Numbers and Frequencies	Band 4	Frequency range: 1710 - 1755 MHz																																					
		Channel Bandwidth																																					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																
	Low	20050/ 1720	20025/ 1717.5	20000/ 1715	19975/ 1712.5																																		
	Mid	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5																																		
	High	20300/ 1745	20325/ 1747.5	20350/ 1750	20375/ 1752.5																																		
	Band 13	Frequency range: 777 - 787 MHz																																					
		Channel Bandwidth																																					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																
	Low																																						
Mid			23230/ 782																																				
High																																							
LTE Transmitter and Antenna Implementation	LTE has one (1) TX/RX antenna and two (2) RX antenna Refer to Appendix 14.1. Photos and Antenna Locations.																																						
Maximum Power Reduction (MPR)	<p><b>Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3</b></p> <table border="1"> <thead> <tr> <th rowspan="2">Modulation</th> <th colspan="6">Channel bandwidth / Transmission bandwidth (RB)</th> <th rowspan="2">MPR (dB)</th> </tr> <tr> <th>1.4 MHz</th> <th>3.0 MHz</th> <th>5 MHz</th> <th>10 MHz</th> <th>15 MHz</th> <th>20 MHz</th> </tr> </thead> <tbody> <tr> <td>QPSK</td> <td>&gt; 5</td> <td>&gt; 4</td> <td>&gt; 8</td> <td>&gt; 12</td> <td>&gt; 16</td> <td>&gt; 18</td> <td>≤ 1</td> </tr> <tr> <td>16 QAM</td> <td>≤ 5</td> <td>≤ 4</td> <td>≤ 8</td> <td>≤ 12</td> <td>≤ 16</td> <td>≤ 18</td> <td>≤ 1</td> </tr> <tr> <td>16 QAM</td> <td>&gt; 5</td> <td>&gt; 4</td> <td>&gt; 8</td> <td>&gt; 12</td> <td>&gt; 16</td> <td>&gt; 18</td> <td>≤ 2</td> </tr> </tbody> </table> <p>MPR Built-in by design A-MPR (additional MPR) was disabled during SAR testing</p>	Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1	16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1	16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)																																
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz																																	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1																																
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1																																
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2																																
Power Reduction	<table border="1"> <thead> <tr> <th>Mode</th> <th>CDMA Current Voice Power for BC0 &amp; BC1</th> <th>LTE B13 &amp; B4 Max Power</th> </tr> </thead> <tbody> <tr> <td rowspan="2">SVLTE</td> <td>P ≤ 18.1 dBm (BC0) P ≤ 17.7 dBm (BC1)</td> <td>B13: 23.8 dBm (Limited) B4: 22.7 dBm (Limited)</td> </tr> <tr> <td>P &gt; 18.1 dBm (BC0) P &gt; 17.7 dBm (BC1)</td> <td>B13: 19.8 dBm (Limited) B4: 18.7 dBm (Limited)</td> </tr> </tbody> </table>	Mode	CDMA Current Voice Power for BC0 & BC1	LTE B13 & B4 Max Power	SVLTE	P ≤ 18.1 dBm (BC0) P ≤ 17.7 dBm (BC1)	B13: 23.8 dBm (Limited) B4: 22.7 dBm (Limited)	P > 18.1 dBm (BC0) P > 17.7 dBm (BC1)	B13: 19.8 dBm (Limited) B4: 18.7 dBm (Limited)																														
Mode	CDMA Current Voice Power for BC0 & BC1	LTE B13 & B4 Max Power																																					
SVLTE	P ≤ 18.1 dBm (BC0) P ≤ 17.7 dBm (BC1)	B13: 23.8 dBm (Limited) B4: 22.7 dBm (Limited)																																					
	P > 18.1 dBm (BC0) P > 17.7 dBm (BC1)	B13: 19.8 dBm (Limited) B4: 18.7 dBm (Limited)																																					
Spectrum Plots for RB Configurations	A properly configured base station simulator was used for the SAR and power measurements; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.																																						

## 7. RF Exposure Conditions (Test Configurations)

Refer to Appendix 14.1.Photos and Antenna Locations for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

### 7.1. Head

#### For WWAN, LTE and Wi-Fi

Test Configurations	SAR Required	Note
Left Touch	Yes	
Left Tilt (15°)	Yes	
Right Touch	Yes	
Right Tilt (15°)	Yes	

### 7.2. Body-worn Accessory

#### For WWAN and LTE

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

#### For Wi-Fi

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

### 7.3. Wireless Router (Hotspot)

#### For WWAN

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	
Edge 1 (Top)	111.5 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR
Edge 2 (Right)	1 mm	Yes	
Edge 3 (Bottom)	1 mm	Yes	
Edge 4 (Left)	42.4 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR

#### For LTE

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	
Edge 1 (Top)	106 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR
Edge 2 (Right)	40.4 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR
Edge 3 (Bottom)	1 mm	Yes	
Edge 4 (Left)	1 mm	Yes	

**For Wi-Fi**

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	
Edge 1 (Top)	10 mm	Yes	
Edge 2 (Right)	53 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR
Edge 3 (Bottom)	105.7 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR
Edge 4 (Left)	2.9 mm	Yes	

## 8. Conducted Output Power Measurements

### 8.1. CDMA BC0 and BC1

#### 1xRTT Measured Results

Band	Mode	Ch	Freq. (MHz)	Avg Pwr (dBm)	Avg Reduced Pwr (dBm)
BC 0	RC1 SO55 (Loopback)	1013	824.70	24.4	18.3
		384	836.52	24.4	18.0
		777	848.31	24.4	18.4
	RC3 SO55 (Loopback)	1013	824.70	24.3	18.3
		384	836.52	24.4	18.0
		777	848.31	24.4	18.4
	RC3 SO32 (+F-SCH)	1013	824.70	24.4	18.3
		384	836.52	24.4	18.0
		777	848.31	24.4	18.4
BC 1	RC1 SO55 (Loopback)	25	1851.25	24.6	17.7
		600	1880.00	24.6	17.8
		1175	1908.75	24.6	17.9
	RC3 SO55 (Loopback)	25	1851.25	24.6	17.7
		600	1880.00	24.6	17.8
		1175	1908.75	24.6	18.1
	RC3 SO32 (+F-SCH)	25	1851.25	24.6	17.7
		600	1880.00	24.6	17.8
		1175	1908.75	24.6	18.1

#### 1xEV-DO Rel. 0 Measured Results

Band	FTAP Rate	RTAP Rate	Channel	Freq. (MHz)	Avg Pwr (dBm)
BC 0	307.2 kbps (2 slot, QPSK)	153.6 kbps	1013	824.70	24.4
			384	836.52	24.5
			777	848.31	24.5
BC1	307.2 kbps (2 slot, QPSK)	153.6 kbps	25	1851.25	24.6
			600	1880.00	24.6
			1175	1908.75	24.6

#### 1xEV-DO Rev. A Measured Results

Band	FETAP Traffic Format	RETAP Data Payload Size	Channel	Freq. (MHz)	Avg Pwr (dBm)
BC 0	307.2k, QPSK/ ACK channel is transmitted at all the slots	4096	1013	824.70	24.4
			384	836.52	24.5
			777	848.31	24.5
BC1	307.2k, QPSK/ ACK channel is transmitted at all the slots	4096	25	1851.25	24.6
			600	1880.00	24.6
			1175	1908.75	24.6

## 8.2. LTE Bands 4 and 13

The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS36.101 specification.

UE Power Class: 3 (23 +/- 2dBm). The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101.

**Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3**

Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

The allowed A-MPR values specified below in Table 6.2.4.-1 of 3GPP TS36.101 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signaling Value of "NS\_01".

**Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR)**

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks ( $N_{RB}$ )	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	NA
NS_03	6.6.2.2.1	2, 4, 10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10, 15, 20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	n/a
NS_07	6.6.2.2.3	13	10	Table 6.2.4-2	Table 6.2.4-2
	6.6.3.3.2				
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23 <sup>1</sup>	1.4, 3, 5, 10	Table 6.2.4-5	Table 6.2.4-5
..					
NS_32	-	-	-	-	-

Note 1: Applies to the lower block of Band 23, i.e. a carrier placed in the 2000-2010 MHz region.



**LTE Band 4 Measured Results**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1720 MHz	1732.5 MHz	1745 MHz
LTE Band 4	20	QPSK	1	0	0	0	22.9	22.9	22.9
			1	49	0	0	23.0	23.0	23.0
			1	99	0	0	22.9	23.1	23.0
			50	0	1	1	22.0	22.0	22.0
			50	24	1	1	22.0	22.0	22.1
			50	50	1	1	22.0	22.1	22.1
			100	0	1	1	21.9	22.0	22.1
		16QAM	1	0	1	1	22.1	22.0	22.1
			1	49	1	1	22.1	22.2	22.1
			1	99	1	1	22.0	22.2	22.1
			50	0	2	2	21.0	21.0	21.1
			50	24	2	2	21.0	21.1	21.1
			50	50	2	2	21.0	21.2	21.1
			100	0	2	2	21.0	21.1	21.1
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Reduced Pwr (dBm)		
							1720 MHz	1732.5 MHz	1745 MHz
LTE Band 4	20	QPSK	1	0	0	0	18.9	18.9	19.0
			1	49	0	0	18.9	19.0	19.1
			1	99	0	0	18.8	19.1	19.1
			50	0	1	1	18.0	17.9	18.1
			50	24	1	1	17.9	18.1	18.1
			50	50	1	1	18.0	18.2	18.1
			100	0	1	1	18.0	18.1	18.1
		16QAM	1	0	1	1	18.0	18.0	18.1
			1	49	1	1	18.1	18.1	18.2
			1	99	1	1	18.0	18.2	18.2
			50	0	2	2	17.1	17.0	16.9
			50	24	2	2	17.0	17.1	16.9
			50	50	2	2	17.0	17.0	17.0
			100	0	2	2	17.0	17.0	17.0

**LTE Band 4 Measured Results (continued)**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1717.5 MHz	1732.5 MHz	1747.5 MHz
LTE Band 4	15	QPSK	1	0	0	0	22.8	22.9	23.1
			1	37	0	0	22.7	22.9	23.0
			1	74	0	0	22.9	22.9	23.0
			36	0	1	1	21.9	21.9	22.1
			36	20	1	1	21.9	21.9	22.0
			36	39	1	1	22.0	22.0	22.0
			75	0	1	1	21.9	21.9	22.0
		16QAM	1	0	1	1	21.7	21.7	22.2
			1	37	1	1	21.7	21.7	22.2
			1	74	1	1	21.8	21.8	22.2
			36	0	2	2	20.9	20.9	21.1
			36	20	2	2	20.8	20.8	21.0
			36	39	2	2	20.9	20.9	21.1
			75	0	2	2	20.9	20.9	21.1
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Reduced Pwr (dBm)		
							1717.5 MHz	1732.5 MHz	1747.5 MHz
LTE Band 4	15	QPSK	1	0	0	0	18.8	18.9	19.0
			1	37	0	0	18.8	19.0	18.8
			1	74	0	0	18.8	19.0	18.9
			36	0	1	1	18.0	17.9	18.1
			36	20	1	1	18.0	18.1	18.1
			36	39	1	1	18.0	18.1	18.2
			75	0	1	1	18.0	18.1	18.1
		16QAM	1	0	1	1	17.7	18.3	17.9
			1	37	1	1	17.8	18.4	17.8
			1	74	1	1	17.7	18.5	17.8
			36	0	2	2	16.9	16.8	17.0
			36	20	2	2	16.9	17.0	17.0
			36	39	2	2	17.0	17.0	17.0
			75	0	2	2	17.0	17.0	17.0

**LTE Band 4 Measured Results (continued)**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1715 MHz	1732.5 MHz	1750 MHz
LTE Band 4	10	QPSK	1	0	0	0	22.7	22.9	22.8
			1	25	0	0	22.7	22.9	22.9
			1	49	0	0	22.8	22.7	22.9
			25	0	1	1	21.9	21.8	22.0
			25	12	1	1	21.9	22.0	22.0
			25	25	1	1	21.9	22.1	21.9
			50	0	1	1	21.9	22.0	22.0
		16QAM	1	0	1	1	21.7	21.7	21.7
			1	25	1	1	21.6	21.8	21.8
			1	49	1	1	21.7	21.7	21.7
			25	0	2	2	20.9	20.9	21.0
			25	12	2	2	20.9	21.0	21.1
			25	25	2	2	20.8	21.1	21.0
			50	0	2	2	20.9	21.1	21.1
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Reduced Pwr (dBm)		
LTE Band 4	10	QPSK	1	0	0	0	18.7	18.8	18.8
			1	25	0	0	18.7	18.9	19.0
			1	49	0	0	18.7	18.9	18.9
			25	0	1	1	17.9	17.9	18.1
			25	12	1	1	18.0	18.1	18.1
			25	25	1	1	18.0	18.1	18.1
			50	0	1	1	18.0	18.1	18.2
		16QAM	1	0	1	1	17.7	18.1	17.7
			1	25	1	1	17.7	18.2	17.9
			1	49	1	1	17.7	18.1	17.8
			25	0	2	2	16.8	16.9	17.1
			25	12	2	2	16.9	17.0	17.2
			25	25	2	2	16.9	17.1	17.1
			50	0	2	2	16.9	17.1	17.1

**LTE Band 4 Measured Results (continued)**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1712.5 MHz	1732.5 MHz	1752.5 MHz
LTE Band 4	5	QPSK	1	0	0	0	22.8	22.8	22.9
			1	12	0	0	22.7	22.9	22.8
			1	24	0	0	22.7	22.9	22.9
			12	0	1	1	21.9	21.9	21.9
			12	7	1	1	21.8	22.0	21.9
			12	13	1	1	21.9	22.1	21.8
			25	0	1	1	21.8	22.1	21.9
		16QAM	1	0	1	1	21.6	21.7	21.8
			1	12	1	1	21.6	21.7	21.7
			1	24	1	1	21.6	21.8	21.8
			12	0	2	2	20.9	21.0	21.0
			12	7	2	2	20.9	21.0	20.9
			12	13	2	2	20.9	21.1	20.9
			25	0	2	2	21.0	21.2	21.0
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Reduced Pwr (dBm)		
							1712.5 MHz	1732.5 MHz	1752.5 MHz
LTE Band 4	5	QPSK	1	0	0	0	18.7	19.0	19.0
			1	12	0	0	18.7	19.0	18.9
			1	24	0	0	18.8	19.1	18.9
			12	0	1	1	17.9	18.0	18.1
			12	7	1	1	17.9	18.1	18.1
			12	13	1	1	17.9	18.2	18.1
			25	0	1	1	18.0	18.2	18.1
		16QAM	1	0	1	1	17.6	18.0	17.9
			1	12	1	1	17.5	18.0	17.8
			1	24	1	1	17.7	18.1	17.8
			12	0	2	2	16.8	17.0	17.0
			12	7	2	2	16.8	17.0	17.0
			12	13	2	2	16.9	17.1	17.1
			25	0	2	2	17.0	17.1	17.1

**LTE Band 13 Measured Results**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)
							782 MHz
LTE Band 13	10	QPSK	1	0	0	0	24.1
			1	25	0	0	24.0
			1	49	0	0	24.0
			25	0	1	1	23.0
			25	12	1	1	22.9
			25	25	1	1	22.9
			50	0	1	1	22.9
		16QAM	1	0	1	1	22.9
			1	25	1	1	22.9
			1	49	1	1	22.9
			25	0	2	2	22.0
			25	12	2	2	22.0
			25	25	2	2	21.9
			50	0	2	2	21.9
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Reduced Pwr (dBm)
							782 MHz
LTE Band 13	10	QPSK	1	0	0	0	19.9
			1	25	0	0	19.8
			1	49	0	0	19.8
			25	0	1	1	19.0
			25	12	1	1	18.9
			25	25	1	1	18.9
			50	0	1	1	18.9
		16QAM	1	0	1	1	18.8
			1	25	1	1	18.8
			1	49	1	1	18.8
			25	0	2	2	18.0
			25	12	2	2	17.9
			25	25	2	2	17.9
			50	0	2	2	17.9

**Note(s):**

10/5 MHz Bandwidths does not support at least three non-overlapping channels in certain channel bandwidths. When a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing per KDB 941225 D05 SAR for LTE Devices

### 8.3. SVLTE

#### 8.3.1. CDMA BC0 + LTE Band 4

Agilent 8960		R&S CMW 500				
CDMA BC0 (1xRTT)		LTE Band 4 (20MHz)				
P > 18.6 dBm		Limit = 19.2 dBm				
Ch. #	Avg Pwr (dBm)	Ch. #	Mod	UL RB Setting		Avg Pwr (dBm)
1013		20175	QPSK	1	0	18.9
				1	49	19.0
				1	99	19.1
				50	0	17.9
				50	24	18.1
				50	50	18.2
			16QAM	100	0	18.1
				1	0	18.0
				1	49	18.1
				1	99	18.2
				50	0	17.0
				50	24	17.1
				50	50	17.0
				100	0	17.0
				384		20175
1	49	19.0				
1	99	19.1				
50	0	17.9				
50	24	18.1				
50	50	18.2				
16QAM	100	0	18.1			
	1	0	18.0			
	1	49	18.1			
	1	99	18.2			
	50	0	17.0			
	50	24	17.1			
	50	50	17.0			
	100	0	17.0			
	777		20175			
1				49	19.0	
1				99	19.1	
50				0	17.9	
50				24	18.1	
50				50	18.2	
16QAM				100	0	18.1
				1	0	18.0
				1	49	18.1
				1	99	18.2
				50	0	17.0
				50	24	17.1
				50	50	17.0
				100	0	17.0

Agilent 8960		R&S CMW 500				
CDMA BC0 (1xRTT)		LTE Band 4 (20MHz)				
P ≤ 18.6 dBm		Limit = 23.2 dBm				
Ch. #	Avg Pwr (dBm)	Ch. #	Mod	UL RB Setting		Avg Pwr (dBm)
1013		20175	QPSK	1	0	22.9
				1	49	23.0
				1	99	23.1
				50	0	22.0
				50	24	22.0
				50	50	22.1
			16QAM	100	0	22.0
				1	0	22.0
				1	49	22.2
				1	99	22.2
				50	0	21.0
				50	24	21.1
				50	50	21.2
				100	0	21.1
				384		20175
1	49	23.0				
1	99	23.1				
50	0	22.0				
50	24	22.0				
50	50	22.1				
16QAM	100	0	22.0			
	1	0	22.0			
	1	49	22.2			
	1	99	22.2			
	50	0	21.0			
	50	24	21.1			
	50	50	21.2			
	100	0	21.1			
	777		20175			
1				49	23.0	
1				99	23.1	
50				0	22.0	
50				24	22.0	
50				50	22.1	
16QAM				100	0	22.0
				1	0	22.0
				1	49	22.2
				1	99	22.2
				50	0	21.0
				50	24	21.1
				50	50	21.2
				100	0	21.1

**8.3.2. CDMA BC1 + LTE Band 4**

Agilent 8960		R&S CMW 500				
CDMA BC1 (1xRTT)		LTE Band 4 (20MHz)				
P > 18.2 dBm		Limit = 19.2 dBm				
Ch. #	Avg Pwr (dBm)	Ch. #	Mod	UL RB Setting		Avg Pwr (dBm)
25		20175	QPSK	1	0	18.9
				1	49	19.0
				1	99	19.1
				50	0	17.9
				50	24	18.1
				50	50	18.2
			16QAM	100	0	18.1
				1	0	18.0
				1	49	18.1
				1	99	18.2
				50	0	17.0
				50	24	17.1
				50	50	17.0
				100	0	17.0
				600		20175
1	49	19.0				
1	99	19.1				
50	0	17.9				
50	24	18.1				
50	50	18.2				
16QAM	100	0	18.1			
	1	0	18.0			
	1	49	18.1			
	1	99	18.2			
	50	0	17.0			
	50	24	17.1			
	50	50	17.0			
	100	0	17.0			
	1175		20175			
1				49	19.0	
1				99	19.1	
50				0	17.9	
50				24	18.1	
50				50	18.2	
16QAM				100	0	18.1
				1	0	18.0
				1	49	18.1
				1	99	18.2
				50	0	17.0
				50	24	17.1
				50	50	17.0
				100	0	17.0

Agilent 8960		R&S CMW 500				
CDMA BC1 (1xRTT)		LTE Band 4 (20MHz)				
P ≤ 18.2 dBm		Limit = 23.2 dBm				
Ch. #	Avg Pwr (dBm)	Ch. #	Mod	UL RB Setting		Avg Pwr (dBm)
25		20175	QPSK	1	0	22.9
				1	49	23.0
				1	99	23.1
				50	0	22.0
				50	24	22.0
				50	50	22.1
			16QAM	100	0	22.0
				1	0	22.0
				1	49	22.2
				1	99	22.2
				50	0	21.0
				50	24	21.1
				50	50	21.2
				100	0	21.1
				600		20175
1	49	23.0				
1	99	23.1				
50	0	22.0				
50	24	22.0				
50	50	22.1				
16QAM	100	0	22.0			
	1	0	22.0			
	1	49	22.2			
	1	99	22.2			
	50	0	21.0			
	50	24	21.1			
	50	50	21.2			
	100	0	21.1			
	1175		20175			
1				49	23.0	
1				99	23.1	
50				0	22.0	
50				24	22.0	
50				50	22.1	
16QAM				100	0	22.0
				1	0	22.0
				1	49	22.2
				1	99	22.2
				50	0	21.0
				50	24	21.1
				50	50	21.2
				100	0	21.1

**8.3.3. CDMA BC0 + LTE Band 13**

Agilent 8960		R&S CMW 500				
CDMA BC0 (1xRTT)		LTE Band 13 (10 MHz)				
P > 18.6 dBm		Limit = 20.3 dBm				
Ch. #	Avg Pwr (dBm)	Ch. #	Mod	UL RB Setting		Avg Pwr (dBm)
1013		23230	QPSK	1	0	19.9
				1	25	19.8
				1	49	19.8
				25	0	19.0
				25	12	18.9
				25	25	18.9
			16QAM	50	0	18.9
				1	0	18.8
				1	25	18.8
				1	49	18.8
				25	0	18.0
				25	12	17.9
				25	25	17.9
				50	0	17.9
				384		23230
1	25	19.8				
1	49	19.8				
25	0	19.0				
25	12	18.9				
25	25	18.9				
16QAM	50	0	18.9			
	1	0	18.8			
	1	25	18.8			
	1	49	18.8			
	25	0	18.0			
	25	12	17.9			
	25	25	17.9			
	50	0	17.9			
	777		23230			
1				25	19.8	
1				49	19.8	
25				0	19.0	
25				12	18.9	
25				25	18.9	
16QAM				50	0	18.9
				1	0	18.8
				1	25	18.8
				1	49	18.8
				25	0	18.0
				25	12	17.9
				25	25	17.9
				50	0	17.9

Agilent 8960		R&S CMW 500				
CDMA BC0 (1xRTT)		LTE Band 13 (10MHz)				
P ≤ 18.6 dBm		Limit = 24.3 dBm				
Ch. #	Avg Pwr (dBm)	Ch. #	Mod	UL RB Setting		Avg Pwr (dBm)
1013		23230	QPSK	1	0	24.07
				1	25	23.99
				1	49	23.99
				25	0	22.98
				25	12	22.93
				25	25	22.89
			16QAM	50	0	22.94
				1	0	22.95
				1	25	22.88
				1	49	22.92
				25	0	21.99
				25	12	21.98
				25	25	21.90
				50	0	21.93
				384		23230
1	25	24.0				
1	49	24.0				
25	0	23.0				
25	12	22.9				
25	25	22.9				
16QAM	50	0	22.9			
	1	0	22.9			
	1	25	22.9			
	1	49	22.9			
	25	0	22.0			
	25	12	22.0			
	25	25	21.9			
	50	0	21.9			
	777		23230			
1				25	24.0	
1				49	24.0	
25				0	23.0	
25				12	22.9	
25				25	22.9	
16QAM				50	0	22.9
				1	0	22.9
				1	25	22.9
				1	49	22.9
				25	0	22.0
				25	12	22.0
				25	25	21.9
				50	0	21.9



**8.3.4. CDMA BC1 + LTE Band 13**

Agilent 8960		R&S CMW 500				
CDMA BC1 (1xRTT)		LTE Band 13 (10 MHz)				
P > 18.2 dBm		Limit = 20.3 dBm				
Ch. #	Avg Pwr (dBm)	Ch. #	Mod	UL RB Setting		Avg Pwr (dBm)
25		23230	QPSK	1	0	19.9
				1	25	19.8
				1	49	19.8
				25	0	19.0
				25	12	18.9
				25	25	18.9
				50	0	18.9
			16QAM	1	0	18.8
				1	25	18.8
				1	49	18.8
				25	0	18.0
				25	12	17.9
				25	25	17.9
				50	0	17.9
600		23230	QPSK	1	0	19.9
				1	25	19.8
				1	49	19.8
				25	0	19.0
				25	12	18.9
				25	25	18.9
				50	0	18.9
			16QAM	1	0	18.8
				1	25	18.8
				1	49	18.8
				25	0	18.0
				25	12	17.9
				25	25	17.9
				50	0	17.9
1175		23230	QPSK	1	0	19.9
				1	25	19.8
				1	49	19.8
				25	0	19.0
				25	12	18.9
				25	25	18.9
				50	0	18.9
			16QAM	1	0	18.8
				1	25	18.8
				1	49	18.8
				25	0	18.0
				25	12	17.9
				25	25	17.9
				50	0	17.9

Agilent 8960		R&S CMW 500				
CDMA BC1 (1xRTT)		LTE Band 13 (10MHz)				
P ≤ 18.2 dBm		Limit = 24.3 dBm				
Ch. #	Avg Pwr (dBm)	Ch. #	Mod	UL RB Setting		Avg Pwr (dBm)
25		23230	QPSK	1	0	24.1
				1	25	24.0
				1	49	24.0
				25	0	23.0
				25	12	22.9
				25	25	22.9
				50	0	22.9
			16QAM	1	0	22.9
				1	25	22.9
				1	49	22.9
				25	0	22.0
				25	12	22.0
				25	25	21.9
				50	0	21.9
600		23230	QPSK	1	0	24.1
				1	25	24.0
				1	49	24.0
				25	0	23.0
				25	12	22.9
				25	25	22.9
				50	0	22.9
			16QAM	1	0	22.9
				1	25	22.9
				1	49	22.9
				25	0	22.0
				25	12	22.0
				25	25	21.9
				50	0	21.9
1175		23230	QPSK	1	0	24.1
				1	25	24.0
				1	49	24.0
				25	0	23.0
				25	12	22.9
				25	25	22.9
				50	0	22.9
			16QAM	1	0	22.9
				1	25	22.9
				1	49	22.9
				25	0	22.0
				25	12	22.0
				25	25	21.9
				50	0	21.9

## 8.4. Wi-Fi (2.4 GHz Band)

Required Test Channels per KDB 248227 D01

### Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)	SAR Test (Yes/No)
2.4 (DTS)	802.11b	1 Mbps	1	2412	14.4	Yes
			6	2437	14.5	
			11	2462	14.4	
	802.11g	6 Mbps	1	2412	11.0	No
			6	2437	11.0	
			11	2462	11.0	
	802.11n (HT20)	MCS0	1	2412	9.9	No
			6	2437	10.0	
			11	2462	10.1	

### Note(s):

- Per KDB 248227 D01, 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.

### Power measurements to determine worst-case data rates

Mode	Ch #	Freq. (MHz)	Data Rate	Avg Pwr (dBm)	SAR test (Yes/No)
802.11b	6	2437	1 Mbps	14.5	Yes
			2 Mbps	14.3	No
			5.5 Mbps	14.1	No
			11 Mbps	14.0	No

## 8.5. Bluetooth

Maximum tune-up tolerance limit is 9.5 dBm. This power level qualifies for exclusion of SAR testing. Refer to Standalone SAR Test Exclusion Considerations Section.

## 9. Dielectric Property Measurements

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within  $\pm 2^\circ\text{C}$  of the temperature when the tissue parameters are characterized.

The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

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

### 9.1. Tissue Dielectric Parameters

#### FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

Target Frequency (MHz)	Head		Body	
	$\epsilon_r$	$\sigma$ (S/m)	$\epsilon_r$	$\sigma$ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00

#### IEEE Std 1528-2013

Refer to Table 3 within the IEEE Std 1528-2013

## 9.2. Dielectric Property Measurements Results

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within  $\pm 2^\circ\text{C}$  of the temperature when the tissue parameters are characterized.

The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

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

### SAR Lab 1

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit $\pm$ (%)	
9/22/2014	Head 835	e'	41.1500	Relative Permittivity ( $\epsilon_r$ ):	41.15	41.50	-0.84	5
		e"	19.9600	Conductivity ( $\sigma$ ):	0.93	0.90	2.97	5
	Head 820	e'	41.3400	Relative Permittivity ( $\epsilon_r$ ):	41.34	41.60	-0.63	5
		e"	20.0100	Conductivity ( $\sigma$ ):	0.91	0.90	1.55	5
	Head 850	e'	40.9600	Relative Permittivity ( $\epsilon_r$ ):	40.96	41.50	-1.30	5
		e"	19.9100	Conductivity ( $\sigma$ ):	0.94	0.92	2.84	5
9/22/2014	Body 835	e'	53.8700	Relative Permittivity ( $\epsilon_r$ ):	53.87	55.20	-2.41	5
		e"	21.8800	Conductivity ( $\sigma$ ):	1.02	0.97	4.73	5
	Body 820	e'	54.0100	Relative Permittivity ( $\epsilon_r$ ):	54.01	55.28	-2.29	5
		e"	21.9600	Conductivity ( $\sigma$ ):	1.00	0.97	3.39	5
	Body 850	e'	53.7100	Relative Permittivity ( $\epsilon_r$ ):	53.71	55.16	-2.62	5
		e"	21.8100	Conductivity ( $\sigma$ ):	1.03	0.99	4.42	5
9/24/2014	Body 2450	e'	52.3100	Relative Permittivity ( $\epsilon_r$ ):	52.31	52.70	-0.74	5
		e"	14.7400	Conductivity ( $\sigma$ ):	2.01	1.95	2.97	5
	Body 2410	e'	52.4800	Relative Permittivity ( $\epsilon_r$ ):	52.48	52.76	-0.53	5
		e"	14.5900	Conductivity ( $\sigma$ ):	1.96	1.91	2.50	5
	Body 2475	e'	52.2400	Relative Permittivity ( $\epsilon_r$ ):	52.24	52.67	-0.81	5
		e"	14.8500	Conductivity ( $\sigma$ ):	2.04	1.99	2.95	5
9/24/2014	Head 2450	e'	37.6200	Relative Permittivity ( $\epsilon_r$ ):	37.62	39.20	-4.03	5
		e"	13.8100	Conductivity ( $\sigma$ ):	1.88	1.80	4.52	5
	Head 2410	e'	37.7800	Relative Permittivity ( $\epsilon_r$ ):	37.78	39.28	-3.82	5
		e"	13.7100	Conductivity ( $\sigma$ ):	1.84	1.76	4.36	5
	Head 2475	e'	37.5200	Relative Permittivity ( $\epsilon_r$ ):	37.52	39.17	-4.21	5
		e"	13.8800	Conductivity ( $\sigma$ ):	1.91	1.83	4.55	5

### SAR Lab 4

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit $\pm$ (%)	
9/23/2014	Head 1750	e'	38.4700	Relative Permittivity ( $\epsilon_r$ ):	38.47	40.08	-4.03	5
		e"	14.0300	Conductivity ( $\sigma$ ):	1.37	1.37	-0.28	5
	Head 1710	e'	38.6400	Relative Permittivity ( $\epsilon_r$ ):	38.64	40.15	-3.75	5
		e"	13.9400	Conductivity ( $\sigma$ ):	1.33	1.35	-1.56	5
	Head 1755	e'	38.4500	Relative Permittivity ( $\epsilon_r$ ):	38.45	40.08	-4.06	5
		e"	14.0400	Conductivity ( $\sigma$ ):	1.37	1.37	-0.13	5
9/23/2014	Body 1750	e'	51.6300	Relative Permittivity ( $\epsilon_r$ ):	51.63	53.44	-3.39	5
		e"	15.3600	Conductivity ( $\sigma$ ):	1.49	1.49	0.57	5
	Body 1710	e'	51.7800	Relative Permittivity ( $\epsilon_r$ ):	51.78	53.54	-3.29	5
		e"	15.2500	Conductivity ( $\sigma$ ):	1.45	1.46	-0.79	5
	Body 1755	e'	51.6200	Relative Permittivity ( $\epsilon_r$ ):	51.62	53.43	-3.38	5
		e"	15.3700	Conductivity ( $\sigma$ ):	1.50	1.49	0.71	5

**SAR Lab 5**

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
9/22/2014	Head 1900	e'	38.9300	Relative Permittivity ( $\epsilon_r$ ):	38.93	40.00	-2.68	5
		e"	13.1100	Conductivity ( $\sigma$ ):	1.39	1.40	-1.07	5
	Head 1850	e'	39.1600	Relative Permittivity ( $\epsilon_r$ ):	39.16	40.00	-2.10	5
		e"	13.0300	Conductivity ( $\sigma$ ):	1.34	1.40	-4.26	5
	Head 1910	e'	38.8900	Relative Permittivity ( $\epsilon_r$ ):	38.89	40.00	-2.78	5
		e"	13.1300	Conductivity ( $\sigma$ ):	1.39	1.40	-0.40	5
9/23/2014	Body 1900	e'	51.4900	Relative Permittivity ( $\epsilon_r$ ):	51.49	53.30	-3.40	5
		e"	14.5500	Conductivity ( $\sigma$ ):	1.54	1.52	1.13	5
	Body 1850	e'	51.6700	Relative Permittivity ( $\epsilon_r$ ):	51.67	53.30	-3.06	5
		e"	14.4100	Conductivity ( $\sigma$ ):	1.48	1.52	-2.48	5
	Body 1910	e'	51.4500	Relative Permittivity ( $\epsilon_r$ ):	51.45	53.30	-3.47	5
		e"	14.5700	Conductivity ( $\sigma$ ):	1.55	1.52	1.80	5
9/24/2014	Body 750	e'	53.2700	Relative Permittivity ( $\epsilon_r$ ):	53.27	55.55	-4.10	5
		e"	23.4300	Conductivity ( $\sigma$ ):	0.98	0.96	1.45	5
	Body 700	e'	53.8900	Relative Permittivity ( $\epsilon_r$ ):	53.89	55.74	-3.32	5
		e"	23.9200	Conductivity ( $\sigma$ ):	0.93	0.96	-2.94	5
	Body 790	e'	52.8900	Relative Permittivity ( $\epsilon_r$ ):	52.89	55.39	-4.52	5
		e"	23.0600	Conductivity ( $\sigma$ ):	1.01	0.97	4.84	5
9/24/2014	Head 785	e'	40.0200	Relative Permittivity ( $\epsilon_r$ ):	40.02	41.78	-4.22	5
		e"	21.5300	Conductivity ( $\sigma$ ):	0.94	0.90	4.91	5
	Head 750	e'	40.5200	Relative Permittivity ( $\epsilon_r$ ):	40.52	41.96	-3.44	5
		e"	21.7900	Conductivity ( $\sigma$ ):	0.91	0.89	1.75	5
	Head 770	e'	40.2200	Relative Permittivity ( $\epsilon_r$ ):	40.22	41.86	-3.92	5
		e"	21.6300	Conductivity ( $\sigma$ ):	0.93	0.89	3.52	5

## 10. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are remeasured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

### 10.1. Reference Target SAR Values

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

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (W/kg)		
				1g/10g	Head	Body
D750V3	1071	11/15/2013	750	1g	8.46	8.64
				10g	5.51	5.72
D835V2	4d117	5/16/2014	835	1g	9.23	9.61
				10g	5.98	6.31
D1750V2	1050	4/22/2014	1750	1g	36.6	37.20
				10g	19.4	20.0
D1900V2	5d043	11/12/2013	1900	1g	40.1	39.0
				10g	21.1	20.8
D2450V2	706	5/20/2014	2450	1g	53.0	50.2
				10g	24.5	23.4

## 10.2. System Check Results

The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within 10% of the manufacturer calibrated dipole SAR target.

### SAR Lab 1

Date Tested	System Dipole		T.S. Liquid	Measured Results			Target (Ref. Value)	Delta $\pm 10\%$	Est./Zoom Ratio	Plot No.	
	Type	Serial #		Area Scan	Zoom Scan	Normalize to 1 W					
9/22/2014	D835V2	4d117	Head	1g	0.90	0.88	8.8	9.23	-4.66	2.00	1,2
				10g	0.61	0.58	5.8	5.98	-3.34		
9/22/2014	D835V2	4d117	Body	1g	0.95	0.93	9.3	9.61	-3.23	2.31	
				10g	0.64	0.62	6.2	6.31	-2.38		
9/24/2014	D2450V2	706	Head	1g	5.41	5.31	53.1	53.00	0.19	1.85	
				10g	2.34	2.39	23.9	24.50	-2.45		
9/24/2014	D2450V2	706	Body	1g	5.02	5.07	50.7	50.20	1.00	-1.00	3,4
				10g	2.19	2.34	23.4	23.40	0.00		

### SAR Lab 4

Date Tested	System Dipole		T.S. Liquid	Measured Results			Target (Ref. Value)	Delta $\pm 10\%$	Est./Zoom Ratio	Plot No.	
	Type	Serial #		Area Scan	Zoom Scan	Normalize to 1 W					
9/23/2014	D1750V2	1050	Head	1g	3.63	3.57	35.7	36.60	-2.46	1.65	5,6
				10g	1.95	1.90	19.0	19.40	-2.06		
9/23/2014	D1750V2	1050	Body	1g	3.82	3.75	37.5	37.20	0.81	1.83	
				10g	1.98	2.00	20.0	20.00	0.00		

### SAR Lab 5

Date Tested	System Dipole		T.S. Liquid	Measured Results			Target (Ref. Value)	Delta $\pm 10\%$	Est./Zoom Ratio	Plot No.	
	Type	Serial #		Area Scan	Zoom Scan	Normalize to 1 W					
9/22/2014	D1900V2	5d043	Head	1g	3.86	3.89	38.9	40.1	-2.99	-0.78	7,8
				10g	2.02	2.02	20.2	21.1	-4.27		
9/23/2014	D1900V2	5d043	Body	1g	3.99	4.00	40.0	39.0	2.56	-0.25	
				10g	2.00	2.10	21.0	20.8	0.96		
9/24/2014	D750V3	1071	Body	1g	0.855	0.831	8.3	8.64	-3.82	2.81	
				10g	0.579	0.555	5.6	5.72	-2.97		
9/24/2014	D750V3	1071	Head	1g	0.784	0.769	7.7	8.46	-9.10	1.91	9,10
				10g	0.534	0.501	5.0	5.51	-9.07		

## 11. Measured and Reported (Scaled) SAR Results

**SAR Test Reduction criteria are as follows:**

**KDB 447498 D01 General RF Exposure Guidance:**

Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

- $\leq 0.8$  W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is  $\leq 100$  MHz
- $\leq 0.6$  W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
- $\leq 0.4$  W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is  $\geq 200$  MHz

**KDB 648474 D04 Handset SAR:**

With headset attached, when the reported SAR for body-worn accessory, measured without a headset connected to the handset, is  $> 1.2$  W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

**KDB 941225 D01 SAR test for 3G devices:**

For handsets with Ev-Do capabilities, when the maximum average output power for each channel in Rev. 0 is less than a quarter dB higher than that measured in RC3 (1xRTT), body SAR for Ev-Do is not required... SAR for Rev. A is not required when the maximum average output power of each channel is less than that measured in Rev. 0 or less than a quarter dB higher than that measured in RC3.

**KDB 941225 D05 SAR for LTE Devices:**

SAR test reduction is applied using the following criteria:

- Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB, and 50% RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel.
- When the reported SAR is  $> 0.8$  W/kg, testing for other Channels is performed at the highest output power level for 1RB, and 50% RB configuration for that channel.
- Testing for 100% RB configuration is performed at the highest output power level for 100% RB configuration across the Low, Mid and High Channel when the highest reported SAR for 1 RB and 50% RB are  $> 0.8$  W/kg. Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation  $< 1.45$  W/kg.
- Testing for 16-QAM modulation is not required because the reported SAR for QPSK is  $< 1.45$  W/Kg and its output power is not more than 0.5 dB higher than that of QPSK.
- Testing for the other channel bandwidths is not required because the reported SAR for the highest channel bandwidth is  $< 1.45$  W/Kg and its output power is not more than 0.5 dB higher than that of the highest channel bandwidth.

**KDB 248227 D01 SAR Measurements Procedures for 802.11 a/b/g Transmitters v01r02 (pg.6):**

Each channel should be tested at the lowest data rate in each a-b/g mode or 4.9 GHz channel BW configuration.

When the extrapolated maximum peak SAR for the maximum output channel is  $\leq 1.6$  W/kg and the 1-g averaged SAR is  $\leq 0.8$  W/kg, testing of other channels in the "default test channels" or "required test channels" configuration is optional.



### 11.1. CDMA BC0

RF Exposure Conditions	Mode	Power Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.				
							Tune-up limit	Meas.	Meas.	Scaled					
Head	1xRTT (RC3 SO55)	OFF	0	Left Touch	384	836.5	24.7	24.4	0.318	0.341	1				
				Left Tilt	384	836.5	24.7	24.4	0.205	0.220					
				Right Touch	384	836.5	24.7	24.4	0.420	<b>0.450</b>					
				Right Tilt	384	836.5	24.7	24.4	0.225	0.241					
		ON	0	Left Touch	384	836.5	18.6	18.0	0.080	0.092					
				Left Tilt	384	836.5	18.6	18.0	0.049	0.056					
				Right Touch	384	836.5	18.6	18.0	0.108	0.124					
				Right Tilt	384	836.5	18.6	18.0	0.054	0.062					
	1xEVDO (Rel. 0)	OFF	0	Left Touch	384	836.5	24.7	24.5	0.155	0.162					
				Left Tilt	384	836.5	24.7	24.5	0.115	0.120					
				Right Touch	384	836.5	24.7	24.5	0.277	0.290					
				Right Tilt	384	836.5	24.7	24.5	0.148	0.155					
Body-worn & Hotspot	1xRTT (RC3 SO32)	OFF	10	Rear	384	836.5	24.7	24.4	0.586	<b>0.628</b>	2				
				Front	384	836.5	24.7	24.4	0.437	0.468					
		ON	10	Rear	384	836.5	18.6	18.0	0.137	0.157					
				Front	384	836.5	18.6	18.0	0.110	0.126					
				Hotspot	1xRTT (RC3 SO32)	OFF	10	Edge 2	384	836.5	24.7	24.4	0.425	0.455	
								Edge 3	384	836.5	24.7	24.4	0.207	0.222	
Edge 4	384	836.5	24.7					24.4	0.158	0.169					
ON	10	Edge 2	384	836.5		18.6	18.0	0.108	0.124						
		Edge 3	384	836.5		18.6	18.0	0.059	0.068						
		Edge 4	384	836.5		18.6	18.0	0.041	0.047						

### 11.2. CDMA BC1

RF Exposure Conditions	Mode	Power Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Head	1xRTT (RC3 SO55)	OFF	0	Left Touch	600	1880.0	24.7	24.6	0.311	0.318	
				Left Tilt	600	1880.0	24.7	24.6	0.212	0.217	
				Right Touch	600	1880.0	24.7	24.6	0.514	0.526	
				Right Tilt	600	1880.0	24.7	24.6	0.273	0.279	
		ON	0	Left Touch	600	1880.0	18.2	17.8	0.076	0.083	
				Left Tilt	600	1880.0	18.2	17.8	0.054	0.059	
				Right Touch	600	1880.0	18.2	17.8	0.134	0.147	
				Right Tilt	600	1880.0	18.2	17.8	0.070	0.077	
	1xEVDO (Rel. 0)	OFF	0	Left Touch	600	1880.0	24.7	24.6	0.325	0.333	
				Left Tilt	600	1880.0	24.7	24.6	0.230	0.235	
				Right Touch	600	1880.0	24.7	24.6	0.552	<b>0.565</b>	3
				Right Tilt	600	1880.0	24.7	24.6	0.271	0.277	
Body-worn & Hotspot	1xRTT (RC3 SO32)	OFF	10	Rear	600	1880.0	24.7	24.6	0.715	<b>0.732</b>	4
				Front	600	1880.0	24.7	24.6	0.487	0.498	
		ON	10	Rear	600	1880.0	18.2	17.8	0.215	0.236	
				Front	600	1880.0	18.2	17.8	0.143	0.157	
Hotspot	1xRTT (RC3 SO32)	OFF	10	Edge 2	600	1880.0	24.7	24.6	0.293	0.300	
				Edge 3	600	1880.0	24.7	24.6	0.244	0.250	
				Edge 4	600	1880.0	24.7	24.6	0.140	0.143	
				Edge 2	600	1880.0	18.2	17.8	0.076	0.083	
		ON	10	Edge 3	600	1880.0	18.2	17.8	0.065	0.071	
				Edge 4	600	1880.0	18.2	17.8	0.032	0.035	

### 11.3. LTE Band 4 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Power Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.		
									Tune-up limit	Meas.	Meas.	Scaled			
Head	QPSK	OFF	0	Left Touch	20175	1732.5	1	99	23.2	23.1	0.771	<b>0.789</b>	5		
							50	50	22.2	22.1	0.622	0.636			
				Left Tilt	20175	1732.5	1	99	23.2	23.1	0.330	0.338			
							50	50	22.2	22.1	0.265	0.271			
		Right Touch	20175	1732.5	1	99	23.2	23.1	0.511	0.523					
					50	50	22.2	22.1	0.433	0.443					
		Right Tilt	20175	1732.5	1	99	23.2	23.1	0.300	0.307					
					50	50	22.2	22.1	0.247	0.253					
	ON	0	Left Touch	20175	1732.5	1	99	19.2	19.1	0.324	0.332				
						50	50	18.2	18.2	0.255	0.255				
			Left Tilt	20175	1732.5	1	99	19.2	19.1	0.142	0.145				
						50	50	18.2	18.2	0.114	0.114				
			Right Touch	20175	1732.5	1	99	19.2	19.1	0.228	0.233				
						50	50	18.2	18.2	0.187	0.187				
			Right Tilt	20175	1732.5	1	99	19.2	19.1	0.113	0.116				
						50	50	18.2	18.2	0.095	0.095				
Body-worn & Hotspot	QPSK	OFF	10	Rear	20050	1720.0	1	49	23.2	23.0	1.020	1.068			
							50	50	22.2	22.0	0.821	0.860			
					20175	1732.5	1	99	23.2	23.1	1.080	1.105			
				50			50	22.2	22.1	0.876	0.896				
				20300	1745.0	1	99	23.2	23.0	1.060	<b>1.110</b>	6			
						50	24	22.2	22.1	0.856	0.876				
		100	0			22.2	22.2	0.831	0.831						
		Front	20050	1720.0	1	49	23.2	23.0	0.941	0.985					
					50	50	22.2	22.0	0.768	0.804					
			20175	1732.5	1	99	23.2	23.1	0.985	1.008					
					50	50	22.2	22.1	0.824	0.843					
			20300	1745.0	1	99	23.2	23.0	1.050	1.099					
	50				24	22.2	22.1	0.755	0.773						
	100	0	22.2	22.2	0.771	0.771									
	ON	10	Rear	20175	1732.5	1	99	19.2	19.1	0.445	0.455				
						50	50	18.2	18.2	0.364	0.364				
Front			20175	1732.5	1	99	19.2	19.1	0.424	0.434					
					50	50	18.2	18.2	0.350	0.350					
Hotspot			QPSK	OFF	10	Edge 2	20175	1732.5	1	99	23.2	23.1	0.140	0.143	
									50	50	22.2	22.1	0.110	0.113	
	Edge 3	20175				1732.5	1	99	23.2	23.1	0.528	0.540			
							50	50	22.2	22.1	0.429	0.439			
	Edge 4	20175	1732.5	1	99	23.2	23.1	0.500	0.512						
				50	50	22.2	22.1	0.411	0.421						
	ON	10	Edge 2	20175	1732.5	1	99	19.2	19.1	0.058	0.059				
						50	50	18.2	18.2	0.045	0.045				
Edge 3			20175	1732.5	1	99	19.2	19.1	0.205	0.210					
					50	50	18.2	18.2	0.161	0.161					
Edge 4	20175	1732.5	1	99	19.2	19.1	0.202	0.207							
			50	50	18.2	18.2	0.174	0.174							

### 11.4. LTE Band 13 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Power Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.	Meas.	Scaled	
Head	QPSK	OFF	0	Left Touch	23230	782.0	1	0	24.3	24.1	0.527	<b>0.552</b>	7
							25	0	23.3	23.0	0.411	0.440	
				Left Tilt	23230	782.0	1	0	24.3	24.1	0.327	0.342	
							25	0	23.3	23.0	0.247	0.265	
				Right Touch	23230	782.0	1	0	24.3	24.1	0.377	0.395	
							25	0	23.3	23.0	0.287	0.308	
		Right Tilt	23230	782.0	1	0	24.3	24.1	0.244	0.255			
					25	0	23.3	23.0	0.190	0.204			
		ON	0	Left Touch	23230	782.0	1	0	20.3	19.9	0.196	0.215	
							25	0	19.3	19.0	0.151	0.162	
				Left Tilt	23230	782.0	1	0	20.3	19.9	0.099	0.109	
							25	0	19.3	19.0	0.076	0.081	
Right Touch	23230			782.0	1	0	20.3	19.9	0.140	0.154			
					25	0	19.3	19.0	0.106	0.114			
Right Tilt	23230	782.0	1	0	20.3	19.9	0.084	0.092					
			25	0	19.3	19.0	0.064	0.069					
Body-worn & Hotspot	QPSK	OFF	10	Rear	23230	782.0	1	0	24.3	24.1	0.521	<b>0.546</b>	8
							25	0	23.3	23.0	0.395	0.423	
				Front	23230	782.0	1	0	24.3	24.1	0.442	0.463	
		25	0				23.3	23.0	0.370	0.396			
		ON	10	Rear	23230	782.0	1	0	20.3	19.9	0.188	0.206	
							25	0	19.3	19.0	0.141	0.151	
Front	23230			782.0	1	0	20.3	19.9	0.180	0.197			
		25	0		19.3	19.0	0.136	0.146					
Hotspot	QPSK	OFF	10	Edge 2	23230	782.0	1	0	24.3	24.1	0.216	0.226	
							25	0	23.3	23.0	0.169	0.181	
				Edge 3	23230	782.0	1	0	24.3	24.1	0.487	0.510	
							25	0	23.3	23.0	0.344	0.369	
				Edge 4	23230	782.0	1	0	24.3	24.1	0.593	<b>0.621</b>	9
							25	0	23.3	23.0	0.437	0.468	
		ON	10	Edge 2	23230	782.0	1	0	20.3	19.9	0.084	0.092	
							25	0	19.3	19.0	0.063	0.068	
				Edge 3	23230	782.0	1	0	20.3	19.9	0.197	0.216	
							25	0	19.3	19.0	0.143	0.153	
				Edge 4	23230	782.0	1	0	20.3	19.9	0.226	0.248	
							25	0	19.3	19.0	0.168	0.180	

### 11.5. Wi-Fi (DTS Band)

Frequency Band	RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
2.4 GHz	Head	802.11b 1 Mbps	0	Left Touch	6	2437.0	15.5	14.5	0.141	0.178	
				Left Tilt	6	2437.0	15.5	14.5	0.115	0.145	
				Right Touch	6	2437.0	15.5	14.5	0.353	<b>0.444</b>	
				Right Tilt	6	2437.0	15.5	14.5	0.182	0.229	
	Body-worn, Hotspot, & Wi-Fi Direct	802.11b 1 Mbps	10	Rear	6	2437.0	15.5	14.5	0.135	<b>0.170</b>	11
				Front	6	2437.0	15.5	14.5	0.074	0.093	
	Hotspot & Wi-Fi Direct	802.11b 1 Mbps	10	Edge 1	6	2437.0	15.5	14.5	0.093	0.117	
				Edge 4	6	2437.0	15.5	14.5	0.052	0.065	

## 11.6. Bluetooth

### 11.6.1. Standalone SAR Test Exclusion Considerations

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq 50$  mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ , for 1-g SAR and  $\leq 7.5$  for 10-g extremity SAR, where

- $f_{(\text{GHz})}$  is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is  $\leq 50$  mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm is applied to determine SAR test exclusion.

#### Body-worn Accessory Exposure Conditions

Max. tune-up tolerance limit		Min. test separation distance (mm)	Frequency (GHz)	Result
(dBm)	(mW)			
9.5	9	10	2.480	1.4

#### Conclusion:

The computed value is  $< 3$ ; therefore, Bluetooth qualifies for Standalone SAR test exclusion.

### 11.6.2. Estimated SAR

When the standalone SAR test exclusion is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

- $(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f_{(\text{GHz})}/x}] \text{ W/kg}$  for test separation distances  $\leq 50$  mm; where  $x = 7.5$  for 1-g SAR, and  $x = 18.75$  for 10-g SAR.
- 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is  $> 50$  mm.

#### Estimated SAR Result for Body-worn Accessory Conditions:

Test Configuration	Max. tune-up tolerance limit (mW)	Min. test separation distance (mm)	Frequency (GHz)	Estimated 1-g SAR (W/kg)
Rear/Front	9	10	2.480	0.189

## 12. SAR Measurement Variability

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz v01. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

- 1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
- 2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
- 3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
- 4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

### 12.1. The Highest Measured SAR Configuration in Each Frequency Band

Frequency Band (MHz)	Air Interface	Head (W/kg)	Body-worn Accessory (W/kg)	Wireless Router (Hotspot) and Wi-Fi Direct (W/kg)	Repeated SAR (Yes/No)
750	LTE Band 13			0.593	No
850	CDMA BC0		0.586		No
1900	CDMA BC1		0.715		No
1750	LTE Band 4		<b>1.08</b>		<b>Yes</b>
2400	Wi-Fi 802.11b/g/n	0.353			No

### 12.2. Repeated Measurement Results

Head

N/A

#### Body-worn Accessory and Wireless Router (Hotspot)

Frequency band	Test Position	Mode	Ch #.	Freq. (MHz)	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio	Note
					Original	Repeated		
LTE Band 4	Rear	QPSK RB1/99	20175	1732.5	<b>1.080</b>	1.070	1.01	1

#### Note(s):

1. Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is not > 1.20.

### 13. Simultaneous Transmission SAR Analysis

#### 13.1. Sum of the SAR for CDMA BC0 & Wi-Fi & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario			$\Sigma$ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① CDMA BC0	② Wi-Fi(DTS)	③ Bluetooth		
Head	Left Touch	① + ②	0.341	0.178		0.519	No
	Left Tilt	① + ②	0.220	0.145		0.365	No
	Right Touch	① + ②	0.450	0.444		0.894	No
	Right Tilt	① + ②	0.241	0.229		0.470	No
Body-w orn Accessory, Hotspot, & W-Fi Direct	Rear	① + ②	0.628	0.170		0.798	No
		① + ③	0.628		0.189	0.817	No
	Front	① + ②	0.468	0.093		0.561	No
		① + ③	0.468		0.189	0.657	No
Hotspot & Wi-Fi Direct	Edge 1	① + ②		0.117		0.117	No
	Edge 2	① + ②	0.455			0.455	No
	Edge 3	① + ②	0.222			0.222	No
	Edge 4	① + ②	0.169	0.065		0.234	No

#### 13.2. Sum of the SAR for CDMA BC1 & Wi-Fi & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario			$\Sigma$ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① CDMA BC1	② Wi-Fi(DTS)	③ Bluetooth		
Head	Left Touch	① + ②	0.333	0.178		0.511	No
	Left Tilt	① + ②	0.235	0.145		0.380	No
	Right Touch	① + ②	0.565	0.444		1.009	No
	Right Tilt	① + ②	0.279	0.229		0.508	No
Body-w orn Accessory, Hotspot, & W-Fi Direct	Rear	① + ②	0.732	0.170		0.902	No
		① + ③	0.732		0.189	0.921	No
	Front	① + ②	0.498	0.093		0.591	No
		① + ③	0.498		0.189	0.687	No
Hotspot & Wi-Fi Direct	Edge 1	① + ②		0.117		0.117	No
	Edge 2	① + ②	0.300			0.300	No
	Edge 3	① + ②	0.250			0.250	No
	Edge 4	① + ②	0.143	0.065		0.208	No

**13.3. Sum of the SAR for LTE Band 4 & Wi-Fi & BT**

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario			Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① LTE Band 4	② Wi-Fi(DTS)	③ Bluetooth		
Head	Left Touch	① + ②	0.789	0.178		0.967	No
	Left Tilt	① + ②	0.338	0.145		0.483	No
	Right Touch	① + ②	0.523	0.444		0.967	No
	Right Tilt	① + ②	0.307	0.229		0.536	No
Body-w orn Accessory, Hotspot, & W-Fi Direct	Rear	① + ②	1.110	0.170		1.280	No
		① + ③	1.110		0.189	1.299	No
	Front	① + ②	1.099	0.093		1.192	No
		① + ③	1.099		0.189	1.288	No
Hotspot & Wi-Fi Direct	Edge 1	① + ②		0.117			
	Edge 2	① + ②	0.143			0.143	No
	Edge 3	① + ②	0.540			0.540	No
	Edge 4	① + ②	0.512	0.065		0.577	No

**13.4. Sum of the SAR for LTE Band 13 & Wi-Fi & BT**

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario			Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① LTE Band 13	② Wi-Fi(DTS)	③ Bluetooth		
Head	Left Touch	① + ②	0.552	0.178		0.730	No
	Left Tilt	① + ②	0.342	0.145		0.487	No
	Right Touch	① + ②	0.395	0.444		0.839	No
	Right Tilt	① + ②	0.255	0.229		0.484	No
Body-w orn Accessory, Hotspot, & W-Fi Direct	Rear	① + ②	0.546	0.170		0.716	No
		① + ③	0.546		0.189	0.735	No
	Front	① + ②	0.463	0.093		0.556	No
		① + ③	0.463		0.189	0.652	No
Hotspot & Wi-Fi Direct	Edge 1	① + ②		0.117		0.117	No
	Edge 2	① + ②	0.226			0.226	No
	Edge 3	① + ②	0.510			0.510	No
	Edge 4	① + ②	0.621	0.065		0.686	No

### 13.5. Sum of the SAR for SV-LTE

#### 13.5.1. CDMA (Maximum Power), LTE (Power Reduction), Wi-Fi 2.4GHz Band, & BT

RF Exposure Conditions	Test Position	Voice (Maximum Power)		Data (Reduced Power)		Data		Σ 1-g SAR (W/kg)	SPLSR (Yes/ No)
		CDMA BC0	CDMA BC1	LTE Band 4	LTE Band 13	WiFi DTS Band	Bluetooth		
Head	Left Touch	0.341		0.332		0.178		0.850	No
		0.341			0.215	0.178		0.733	No
			0.318	0.332		0.178		0.828	No
			0.318		0.215	0.178		0.711	No
	Left Tilt	0.220		0.145		0.145		0.509	No
		0.220			0.109	0.145		0.473	No
			0.217	0.145		0.145		0.507	No
			0.217		0.109	0.145		0.471	No
	Right Touch	0.450		0.233		0.444		1.127	No
		0.450			0.154	0.444		1.048	No
			0.526	0.233		0.444		<b>1.203</b>	No
			0.526		0.154	0.444		1.124	No
	Right Tilt	0.241		0.116		0.229		0.586	No
		0.241			0.092	0.229		0.562	No
			0.279	0.116		0.229		0.624	No
			0.279		0.092	0.229		0.600	No
Body-worn, Hotspot, & Wi-Fi Direct	Rear	0.628		0.455		0.170		1.253	No
		0.628		0.455			0.189	1.272	No
		0.628			0.206	0.170		1.004	No
		0.628			0.206		0.189	1.023	No
			0.732	0.455		0.170		1.357	No
			0.732	0.455			0.189	1.376	No
			0.732		0.206	0.170		1.108	No
			0.732		0.206		0.189	1.127	No
	Front	0.468		0.434		0.093		0.995	No
		0.468		0.434			0.189	1.091	No
		0.468			0.197	0.093		0.758	No
		0.468			0.197		0.189	0.854	No
			0.498	0.434		0.093		1.026	No
			0.498	0.434			0.189	1.121	No
			0.498		0.197	0.093		0.789	No
			0.498		0.197		0.189	0.884	No
Hotspot & Wi-Fi Direct	Edge 1					0.117		0.117	No
	Edge 2	0.455		0.059				0.514	No
		0.455			0.092			0.547	No
			0.300	0.059				0.359	No
			0.300		0.092			0.392	No
	Edge 3	0.222		0.210				0.432	No
		0.222			0.216			0.438	No
			0.250	0.210				0.460	No
			0.250		0.216			0.466	No
	Edge 4	0.169		0.207		0.065		0.442	No
		0.169			0.248	0.065		0.483	No
			0.143	0.207		0.065		0.416	No
		0.143		0.248	0.065		0.457	No	



**13.5.2. CDMA (Power Reduction), LTE (Max Power), Wi-Fi 2.4GHz Band, & BT**

RF Exposure Conditions	Test Position	Voice (Reduced Power)		Data (Maximum Power)		Data		Σ 1-g SAR (W/kg)	SPLSR (Yes/ No)
		CDMA BC0	CDMA BC1	LTE Band 4	LTE Band 13	WiFi DTS Band	Bluetooth		
Head	Left Touch	0.092		0.782		0.178		1.051	No
		0.092			0.556	0.178		0.825	No
			0.083	0.782		0.178		1.043	No
			0.083		0.556	0.178		0.817	No
	Left Tilt	0.056		0.335		0.145		0.535	No
		0.056			0.345	0.145		0.545	No
			0.059	0.335		0.145		0.539	No
	Right Touch	0.124		0.518		0.444		1.087	No
		0.124			0.398	0.444		0.966	No
			0.147	0.518		0.444		1.109	No
	Right Tilt	0.062		0.304		0.229		0.596	No
		0.062			0.257	0.229		0.549	No
		0.077	0.304		0.229		0.610	No	
		0.077		0.257	0.229		0.563	No	
Body-worn, Hotspot, & Wi-Fi Direct	Rear	0.157		1.107		0.170		1.435	No
		0.157		1.107			0.189	1.454	No
		0.157			0.549	0.170		0.877	No
		0.157			0.549		0.189	0.896	No
			0.236	1.107		0.170		1.513	No
			0.236	1.107			0.189	1.532	No
			0.236		0.549	0.170		0.955	No
	Front		0.236		0.549		0.189	0.974	No
		0.126		1.097		0.093		1.316	No
		0.126		1.097			0.189	1.412	No
		0.126			0.466	0.093		0.685	No
		0.126			0.466		0.189	0.781	No
			0.157	1.097		0.093		1.347	No
			0.157	1.097			0.189	1.443	No
Hotspot & Wi-Fi Direct	Edge 1					0.117		0.117	No
	Edge 2	0.124		0.142				0.266	No
		0.124			0.228			0.352	No
	Edge 3		0.083	0.142				0.225	No
			0.083		0.228			0.311	No
		0.067		0.535				0.603	No
		0.067			0.513			0.581	No
	Edge 4		0.071	0.535				0.607	No
			0.071		0.513			0.585	No
		0.047		0.507		0.065		0.619	No
		0.047			0.625	0.065		0.738	No
			0.035	0.507		0.065		0.608	No
		0.035		0.625	0.065		0.726	No	

**Conclusion:**

Simultaneous transmission SAR measurement (Volume Scan) is not required because either the sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

## **14. Appendixes**

**Refer to separated files for the following appendixes.**

- 14.1. Photos and Antenna Locations**
- 14.2. System Performance Check Plots**
- 14.3. Highest SAR Test Plots**
- 14.4. Calibration Certificate for E-Field Probe EX3DV4 - SN 3902**
- 14.5. Calibration Certificate for E-Field Probe EX3DV4 - SN 3929**
- 14.6. Calibration Certificate for E-Field Probe EX3DV3 - SN 3991**
- 14.7. Calibration Certificate for D750V3 - SN 1071**
- 14.8. Calibration Certificate for D835V2 - SN 4d117**
- 14.9. Calibration Certificate for D1750V2 - SN 1050**
- 14.10. Calibration Certificate for D1900V2- SN 5d043**
- 14.11. Calibration Certificate for D2450V2 - SN 706**

**END OF REPORT**