



## **SAR EVALUATION REPORT**

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

**(Class II Permissive Change)  
Added 20/15 MHz Bandwidth to LTE Bands 2/4/25  
Reference FCC Report 13U14853-1A for Original Data**

*For*  
**LTE Phone Bluetooth and WLAN**

**Model: US780, LG-US780, LGUS780 AS780, LG-AS780 and LGAS780  
FCC ID: ZNFUS780**

**Report Number: 14U18391-S1  
Issue Date: 8/7/2014**

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NVLAP LAB CODE 200065-0

## REVISION HISTORY


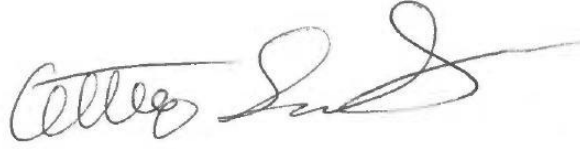
Rev.	Issue Date	Revisions	Revised By
--	8/7/2014	Initial Issue	--

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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	US780, LG-US780, LGUS780 AS780, LG-AS780 and LGAS780			
DUT Description	LTE Phone Bluetooth and WLAN			
Exposure Category	General Population/Uncontrolled Exposure (1g SAR limit: 1.6 W/kg)			
The highest reported SAR	RF Exposure Conditions	Equipment Class		
		Licensed	DTS	UNII
	Head	0.244 W/kg	0.258 W/kg	0.196 W/kg
	Body-worn Accessory	0.315 W/kg	0.271 W/kg	0.225 W/kg
	Wireless Router (Hotspot)			N/A
	Wi-Fi Direct	N/A		0.225 W/kg
Simultaneous Transmission	Head: 0.445 W/kg Body: 0.586 W/kg		Head: 0.440 W/kg Body: 0.540 W/kg	
Applicable Standards	FCC 47 CFR § 2.1093 KDB publication IEEE Std 1528-2013			
Test Results	Pass			
Date tested	2/7/2013 – 2/22/2013; 7/29/2014 – 8/1/2014			
<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:		
				
Devin Chang Senior Engineer 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 D05 SAR for LTE Devices v02r03
- 941225 D06 Hotspot Mode SAR v01r01
- 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

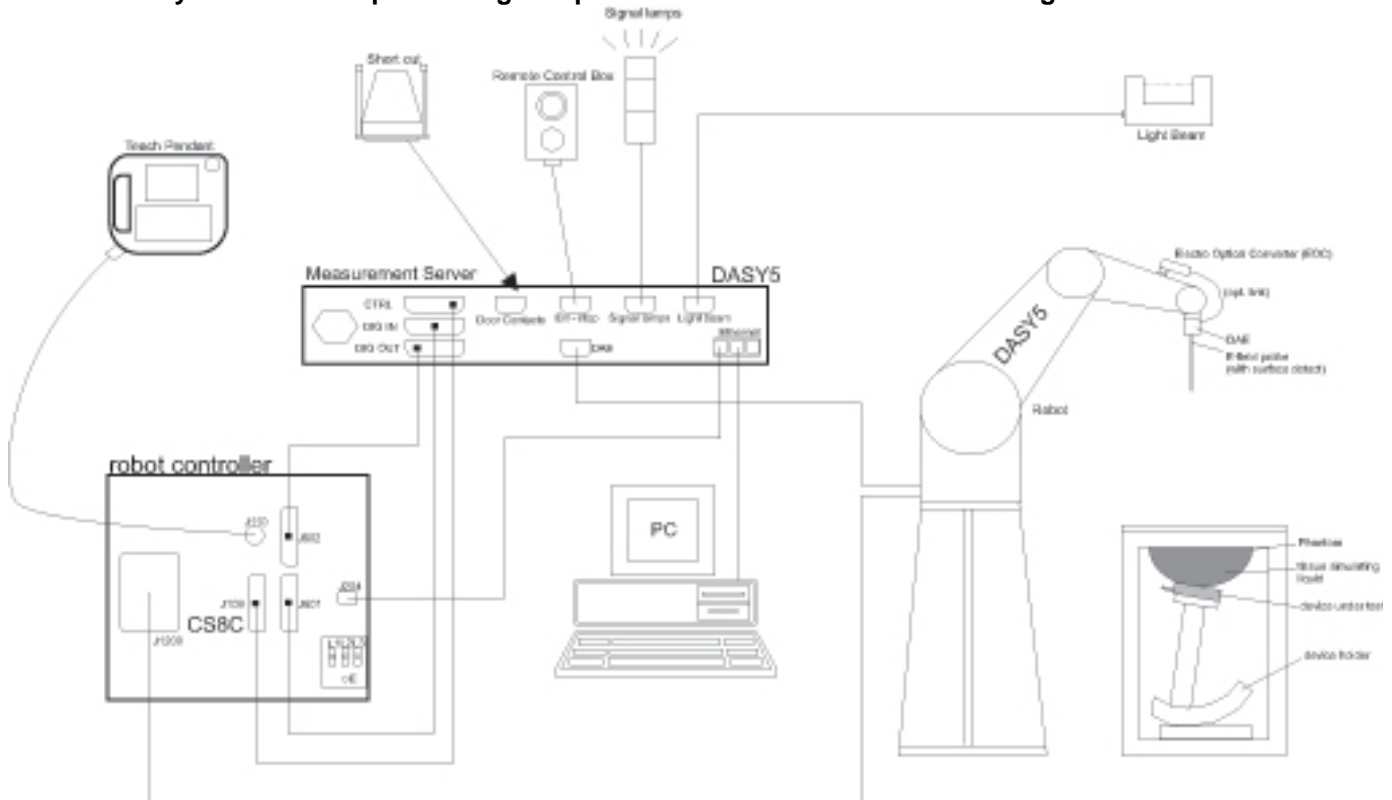
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	SAR Lab 5
SAR Lab F	
SAR Lab G	
SAR Lab H	

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

## 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	ENA Series/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	Control Company	4242	122529163	9/19/2014
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	2237A31744	10/2/2014
Power Sensor	Agilent	8481A	2349A36506	9/30/2014
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1808939	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2710	N/A
DC Power Supply	Sorensen Ametek	XT15-4	1319A02778	N/A
HP Signal Generator	HP	8665B	3438A00633	7/10/2015
Power Meter	HP	438A	3513U04320	10/2/2014
Power Sensor	Agilent	8481A	2702A66876	9/30/2014
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	HP	6296A	2841A-05955	N/A
E-Field Probe (SAR 4)	SPEAG	EX3DV4	3929	5/9/2015
Data Acquisition Electronics (SAR 4)	SPEAG	DAE4	1352	9/11/2014
System Validation Dipole	SPEAG	D1750V2	1050	4/22/2015
System Validation Dipole	SPEAG	D1900V2	5d043	11/12/2015
Thermometer (SAR Lab 4)	EXTECH	445703	CCS-238	6/3/2015

### Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Base Station Simulator	R & S	CMW500	125236-es	5/29/2015



## 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: US780, LG-US780, LGUS780 AS780, LG-AS780 and LGAS780	
Device Dimension	Overall (Length x Width): 131.6 mm x 68.4 mm Overall Diagonal: 143 mm Display Diagonal: 120 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, 9.7Wh <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 checked="" 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
LTE (FDD)	Band 2 / 4 / 5 / 12 / 25	QPSK, 16QAM	100%
Does this device SV-LTE (1xRTT-LTE)? <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No			

### 6.3. Nominal and Maximum Output Power

Upper limit (dB): 0.5 ~ -1.5		RF Output Power (dBm)		RF Output Power (Power Reduction) (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit	Target	Max. tune-up tolerance limit
LTE Band 2	QPSK	23.2	<b>23.7</b>	19.2	<b>19.7</b>
LTE Band 4	QPSK	23.2	<b>23.7</b>	19.2	<b>19.7</b>
LTE Band 25	QPSK	23.2	<b>23.7</b>	19.2	<b>19.7</b>

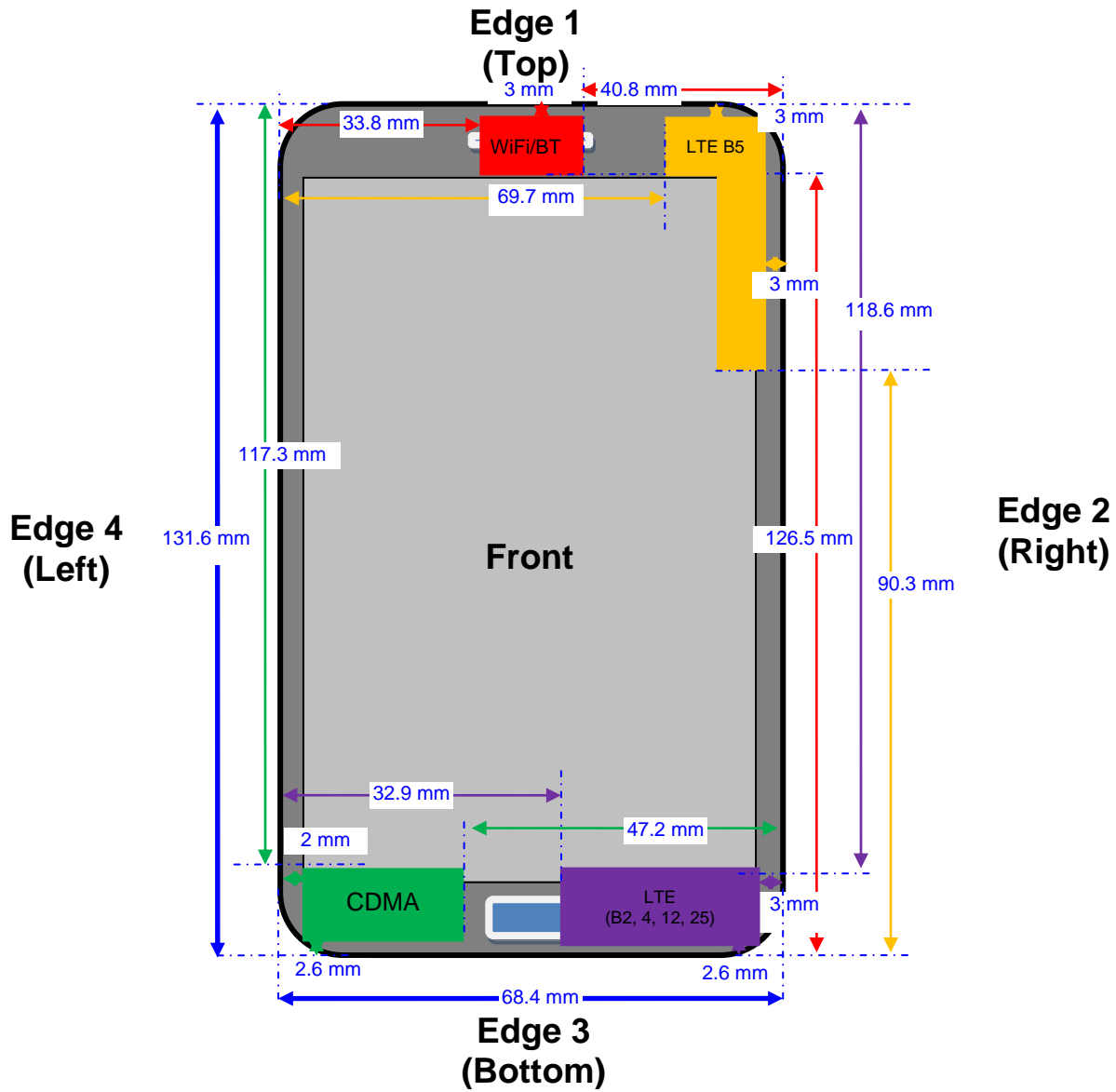
## 6.4. Simultaneous Transmission Condition

RF Exposure Condition	Capable Transmit Configurations
Head	<ol style="list-style-type: none"> <li>1. LTE B2, 4, 25 Data + 2.4GHz Wi-Fi</li> <li>2. LTE B2, 4, 25 Data + 5GHz Wi-Fi</li> </ol>
Body-worn Accessory	<ol style="list-style-type: none"> <li>1. LTE B2, 4, 25 Data + 2.4GHz Wi-Fi</li> <li>2. LTE B2, 4, 25 Data + 5GHz Wi-Fi</li> <li>3. LTE B2, 4, 25 Data + 2.4GHz Bluetooth</li> </ol>
Wireless Router (Hotspot)	<ol style="list-style-type: none"> <li>1. LTE B2, 4, 25 Data + 2.4GHz Wi-Fi</li> </ol>
<p>Notes:</p> <ol style="list-style-type: none"> <li>1. Simultaneous transmission between BT and Wi-Fi is not supported.</li> <li>2. SVLTE is supported only. (SVDO is not supported.)</li> <li>3. VoIP is supported.</li> <li>4. Maximum output power will be used for SAR compliance. If necessary, power reduction will be used for SAR compliance.</li> </ol>	

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

Item	Description																																												
Frequency range, Channel Bandwidth, Numbers and Frequencies	Band 2	Frequency range: 1850 - 1910 MHz																																											
		Channel Bandwidth																																											
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																						
	Low	18700 /1860	18675/ 1857.5	18650/ 1855	18625/ 1852.5	18615/ 1851.5	18607/ 1850.7																																						
	Mid	18900/ 1880	18900/ 1880	18900/ 1880	18900/ 1880	18900/ 1880	18900/ 1880																																						
	High	19100/ 1900	19125/ 1902.5	19150/ 1905	19175/ 1907.5	19185/ 1908.5	19193/ 1909.3																																						
	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	19965/ 1711.5	19957/ 1710.7																																						
	Mid	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5																																						
	High	20300/ 1745	20325/ 1747.5	20350/ 1750	20375/ 1752.5	20385/ 1753.5	20393/ 1754.3																																						
	Band 25	Frequency range: 1850 - 1915 MHz																																											
		Channel Bandwidth																																											
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																						
	Low	26140/ 1860	26115/ 1857.5	26090/ 1855	26065/ 1852.5	26055/ 1851.5	26047/ 1850.7																																						
	Mid	26365/ 1882.5	26365/ 1882.5	26365/ 1882.5	26365/ 1882.5	26365/ 1882.5	26365/ 1882.5																																						
High	26590/ 1905	26615/ 1907.5	26640/ 1910	26665/ 1912.5	26675/ 1913.5	26683/ 1914.3																																							
LTE transmitter and antenna implementation	LTE has one (1) TX/RX antennas and one (1) RX antennas Refer to Appendix 13.1. Photos and Antenna Locations.																																												
Maximum power reduction (MPR)	<p align="center"><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	CDMA Current Voice Power for BC0, BC1 & BC15			LTE Max. Power																																									
	P ≤ 18.5 dBm			23.7dBm																																									
	P > 18.5 dBm			19.7 dBm																																									
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.																																												

### 6.6. Antenna Dimensions and Separation Distances



## 7. RF Exposure Conditions (Test Configurations)

Refer to Appendix 13.1.Photos and Antenna Locations for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

### 7.1. Head

#### For 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 LTE Bands 2 / 4 / 25

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	1 mm	Yes	
Front	7 mm	Yes	

#### For Wi-Fi

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	1 mm	Yes	
Front	8 mm	Yes	

### 7.3. Wireless Router (Hotspot)

#### For LTE 2 / 4 / 25

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	1 mm	Yes	
Front	7 mm	Yes	
Edge 1 (Top)	118.6 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 v01
Edge 2 (Right)	3 mm	Yes	
Edge 3 (Bottom)	2.6 mm	Yes	
Edge 4 (Left)	32.9 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 v01

#### For Wi-Fi

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	1 mm	Yes	
Front	8 mm	Yes	
Edge 1 (Top)	3 mm	Yes	
Edge 2 (Right)	40.8 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 v01
Edge 3 (Bottom)	126.5 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 v01
Edge 4 (Left)	33.8 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 v01

## 8. Conducted Output Power Measurements

The proprietary logic is used to determine when head/body power table is used.

### 8.1. LTE Band 2, 4, and 25

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 Signalling 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
			20	>10	≤ 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 2 Measured Results**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1860 MHz	1880 MHz	1900 MHz
LTE Band 2	20	QPSK	1	0	0	0	23.5	23.4	23.5
			1	49	0	0	23.6	23.5	23.5
			1	99	0	0	23.4	23.5	23.6
			50	0	1	1	22.5	22.4	22.4
			50	24	1	1	22.5	22.4	22.4
			50	50	1	1	22.3	22.6	22.5
			100	0	1	1	22.4	22.4	22.4
		16QAM	1	0	1	1	22.4	22.5	22.6
			1	49	1	1	22.5	22.5	22.6
			1	99	1	1	22.3	22.6	22.7
			50	0	2	2	21.2	21.0	21.1
			50	24	2	2	21.2	21.2	21.1
			50	50	2	2	21.0	21.3	21.2
			100	0	2	2	21.2	21.1	21.1
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1857.5 MHz	1880 MHz	1902.5 MHz
LTE Band 2	15	QPSK	1	0	0	0	23.4	23.2	23.3
			1	37	0	0	23.3	23.3	23.4
			1	74	0	0	23.2	23.4	23.4
			36	0	1	1	22.4	22.3	22.4
			36	20	1	1	22.4	22.4	22.4
			36	39	1	1	22.4	22.4	22.4
			75	0	1	1	22.3	22.4	22.4
		16QAM	1	0	1	1	22.4	22.3	22.2
			1	37	1	1	22.5	22.4	22.3
			1	74	1	1	22.4	22.6	22.4
			36	0	2	3	21.1	21.0	21.0
			36	20	2	3	21.1	21.2	21.1
			36	39	2	3	21.0	21.2	21.1
			75	0	2	3	21.1	21.1	21.1



**LTE Band 2 Power Reduction Measured Results**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1860 MHz	1880 MHz	1900 MHz
LTE Band 2	20	QPSK	1	0	MPR is disabled when Power Reduction is enabled		19.7	19.7	19.6
			1	49			19.6	19.7	19.7
			1	99			19.6	19.6	19.3
			50	0			19.7	19.7	19.6
			50	25			19.5	19.7	19.6
			50	49			19.5	19.6	19.6
		16QAM	100	0			19.7	19.7	19.5
			1	0			19.7	19.7	19.7
			1	49			19.7	19.7	19.7
			1	99			19.7	19.7	19.4
			50	0			19.6	19.6	19.5
			50	25			19.5	19.7	19.6
			50	49			19.5	19.6	19.6
			100	0			19.7	19.6	19.5
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
LTE Band 2	15	QPSK	1	0	MPR is disabled when Power Reduction is enabled		1857.5 MHz	1880 MHz	1902.5 MHz
			1	37			19.6	19.6	19.6
			1	74			19.5	19.5	19.2
			36	0			19.7	19.5	19.5
			36	18			19.6	19.6	19.5
			36	35			19.5	19.5	19.4
		16QAM	75	0			19.5	19.5	19.4
			1	0			19.3	19.6	19.5
			1	37			19.2	19.6	19.6
			1	74			19.1	19.6	19.3
			36	0			19.7	19.6	19.4
			36	18			19.6	19.7	19.4
			36	35			19.5	19.6	19.4
			75	0			19.4	19.6	19.4

**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	23.4	23.4	23.6
			1	49	0	0	23.3	23.3	23.5
			1	99	0	0	23.3	23.4	23.5
			50	0	1	1	22.2	22.3	22.3
			50	24	1	1	22.2	22.2	22.3
			50	50	1	1	22.1	22.2	22.2
			100	0	1	1	22.2	22.3	22.3
		16QAM	1	0	1	1	22.4	22.4	22.5
			1	49	1	1	22.2	22.3	22.4
			1	99	1	1	22.3	22.5	22.3
			50	0	2	3	20.9	21.0	21.0
			50	24	2	2	20.9	21.0	21.1
			50	50	2	3	20.9	20.9	20.9
			100	0	2	3	20.9	21.0	21.0
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
LTE Band 4	15	QPSK	1	0	0	0	23.3	23.2	23.5
			1	37	0	0	23.3	23.2	23.5
			1	74	0	0	23.2	23.2	23.3
			36	0	1	1	22.2	22.2	22.4
			36	20	1	1	22.3	22.2	22.2
			36	39	1	2	22.1	22.2	22.2
			75	0	1	1	22.2	22.2	22.2
		16QAM	1	0	1	1	21.8	21.8	22.5
			1	37	1	1	21.8	21.7	22.5
			1	74	1	1	21.7	21.7	22.4
			36	0	2	3	20.9	20.9	21.0
			36	20	2	3	21.0	20.9	20.9
			36	39	2	3	20.9	20.9	20.9
			75	0	2	3	20.9	20.9	20.9
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	1717.5 MHz	1732.5 MHz	1747.5 MHz

**LTE Band 4 Power Reduction 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	MPR is disabled when Power Reduction is enabled		20.4	20.2	19.9
			1	49			20.4	19.9	19.9
			1	99			20.4	19.9	19.9
			50	0			20.4	19.9	19.9
			50	25			20.4	19.9	19.9
			50	49			20.4	19.9	19.9
			100	0			20.4	19.9	19.9
		16QAM	1	0			20.4	19.9	19.9
			1	49			20.4	19.9	19.9
			1	99			20.4	19.9	19.9
			50	0			20.4	19.9	19.9
			50	25			20.4	19.9	19.9
			50	49			20.4	19.9	19.9
			100	0			20.4	19.9	19.9
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
LTE Band 4	15	QPSK	1	0	MPR is disabled when Power Reduction is enabled		1717.5 MHz	1732.5 MHz	1747.5 MHz
			1	37			19.6	20.0	20.2
			1	74			19.6	20.0	20.2
			36	0			19.6	20.0	20.2
			36	18			19.6	20.0	20.2
			36	35			19.6	20.0	20.2
			75	0			19.6	20.0	20.2
		16QAM	1	0			19.6	20.0	20.2
			1	37			19.6	19.9	20.1
			1	74			19.6	19.9	20.1
			36	0			19.6	19.9	20.1
			36	18			19.6	19.9	20.1
			36	35			19.6	19.9	20.1
			75	0			19.6	19.9	20.1

**LTE Band 25 Measured Results**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1860 MHz	1882.5 MHz	1905 MHz
LTE Band 25	20	QPSK	1	0	0	0	23.5	23.5	23.4
			1	49	0	0	23.5	23.6	23.5
			1	99	0	0	23.4	23.5	23.4
			50	0	1	0	22.6	22.5	22.4
			50	24	1	0	22.4	22.4	22.3
			50	50	1	0	22.3	22.3	22.3
			100	0	1	0	22.5	22.4	22.4
		16QAM	1	0	1	0	22.6	22.5	22.5
			1	49	1	0	22.5	22.5	22.5
			1	99	1	0	22.4	22.5	22.4
			50	0	2	0	21.3	21.2	21.1
			50	24	2	0	21.1	21.1	21.0
			50	50	2	0	21.0	21.1	21.5
			100	0	2	0	21.3	21.2	21.1
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
LTE Band 25	15	QPSK	1	0	0	0	23.7	23.5	23.6
			1	37	0	0	23.5	23.5	23.5
			1	74	0	0	23.4	23.5	23.5
			36	0	1	0	22.6	22.4	22.4
			36	20	1	0	22.4	22.4	22.3
			36	39	1	0	22.3	22.4	22.4
			75	0	1	0	22.4	22.3	22.4
		16QAM	1	0	1	0	22.3	22.5	22.6
			1	37	1	0	22.0	22.6	22.5
			1	74	1	0	22.0	22.6	22.4
			36	0	2	0	21.3	21.2	21.2
			36	20	2	0	21.2	21.2	21.2
			36	39	2	0	21.1	21.2	21.1
			75	0	2	0	21.1	21.6	21.1

**LTE Band 25 Power Reduction Measured Results**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)			
							1860 MHz	1882.5 MHz	1905 MHz	
LTE Band 25	20	QPSK	1	0	MPR is disabled when Power Reduction is enabled		19.4	19.5	19.4	
			1	49			19.4	19.4	19.5	
			1	99			19.3	19.3	19.4	
			50	0			19.5	19.4	19.4	
			50	25			19.3	19.4	19.4	
			50	49			19.2	19.3	19.4	
		16QAM	100	0			19.4	19.4	19.4	
			1	0			19.4	19.6	19.4	
			1	49			19.4	19.5	19.5	
			1	99			19.4	19.4	19.4	
			50	0			19.4	19.4	19.4	
			50	25			19.3	19.4	19.3	
			50	49			19.1	19.3	19.3	
			100	0			19.4	19.4	19.4	
LTE Band 25	15	QPSK	1	0	MPR is disabled when Power Reduction is enabled		19.3	19.5	19.5	
			1	37			19.3	19.4	19.4	
			1	74			19.1	19.3	19.4	
			36	0			19.4	19.4	19.4	
			36	18			19.4	19.5	19.3	
			36	35			19.3	19.3	19.2	
			75	0			19.4	19.4	19.3	
			16QAM	1			0	18.8	19.6	19.6
		1		37			18.8	19.5	19.4	
		1		74			18.6	19.4	19.4	
		36		0			19.4	19.5	19.4	
		36		18			19.3	19.5	19.2	
		36		35			19.3	19.4	19.2	
		75		0			19.3	19.4	19.2	
		1857.5 MHz		1882.5 MHz			1907.5 MHz	19.3	19.4	19.2
								19.3	19.4	19.2

## 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 Standard 1528-2013

Refer to Table 3

## 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 ± 2°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.

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Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
7/30/2014	Body 1750	e'	51.5000	Relative Permittivity ( $\epsilon_r$ ):	51.50	53.44	-3.63	5
		e"	14.8500	Conductivity ( $\sigma$ ):	1.44	1.49	-2.77	5
	Body 1710	e'	51.2400	Relative Permittivity ( $\epsilon_r$ ):	51.24	53.54	-4.30	5
		e"	14.7200	Conductivity ( $\sigma$ ):	1.40	1.46	-4.24	5
	Body 1755	e'	51.0900	Relative Permittivity ( $\epsilon_r$ ):	51.09	53.43	-4.38	5
		e"	14.8800	Conductivity ( $\sigma$ ):	1.45	1.49	-2.50	5
7/30/2014	Head 1750	e'	39.6100	Relative Permittivity ( $\epsilon_r$ ):	39.61	40.08	-1.18	5
		e"	13.8000	Conductivity ( $\sigma$ ):	1.34	1.37	-1.91	5
	Head 1710	e'	39.8000	Relative Permittivity ( $\epsilon_r$ ):	39.80	40.15	-0.86	5
		e"	13.7300	Conductivity ( $\sigma$ ):	1.31	1.35	-3.04	5
	Head 1755	e'	39.5800	Relative Permittivity ( $\epsilon_r$ ):	39.58	40.08	-1.24	5
		e"	13.8100	Conductivity ( $\sigma$ ):	1.35	1.37	-1.76	5
7/29/2014	Body 1900	e'	51.6000	Relative Permittivity ( $\epsilon_r$ ):	51.60	53.30	-3.19	5
		e"	14.5600	Conductivity ( $\sigma$ ):	1.54	1.52	1.20	5
	Body 1850	e'	51.7600	Relative Permittivity ( $\epsilon_r$ ):	51.76	53.30	-2.89	5
		e"	14.4700	Conductivity ( $\sigma$ ):	1.49	1.52	-2.07	5
	Body 1910	e'	51.5600	Relative Permittivity ( $\epsilon_r$ ):	51.56	53.30	-3.26	5
		e"	14.5600	Conductivity ( $\sigma$ ):	1.55	1.52	1.73	5
7/29/2014	Head 1900	e'	38.6000	Relative Permittivity ( $\epsilon_r$ ):	38.60	40.00	-3.50	5
		e"	13.4000	Conductivity ( $\sigma$ ):	1.42	1.40	1.12	5
	Head 1850	e'	38.7900	Relative Permittivity ( $\epsilon_r$ ):	38.79	40.00	-3.03	5
		e"	13.3100	Conductivity ( $\sigma$ ):	1.37	1.40	-2.20	5
	Head 1910	e'	38.5600	Relative Permittivity ( $\epsilon_r$ ):	38.56	40.00	-3.60	5
		e"	13.4100	Conductivity ( $\sigma$ ):	1.42	1.40	1.73	5
8/1/2014	Head 1900	e'	39.0500	Relative Permittivity ( $\epsilon_r$ ):	39.05	40.00	-2.38	5
		e"	13.1600	Conductivity ( $\sigma$ ):	1.39	1.40	-0.69	5
	Head 1850	e'	39.2600	Relative Permittivity ( $\epsilon_r$ ):	39.26	40.00	-1.85	5
		e"	13.0300	Conductivity ( $\sigma$ ):	1.34	1.40	-4.26	5
	Head 1910	e'	39.0100	Relative Permittivity ( $\epsilon_r$ ):	39.01	40.00	-2.48	5
		e"	13.1900	Conductivity ( $\sigma$ ):	1.40	1.40	0.06	5
8/1/2014	Body 1900	e'	50.8300	Relative Permittivity ( $\epsilon_r$ ):	50.83	53.30	-4.63	5
		e"	14.2300	Conductivity ( $\sigma$ ):	1.50	1.52	-1.10	5
	Body 1850	e'	51.0000	Relative Permittivity ( $\epsilon_r$ ):	51.00	53.30	-4.32	5
		e"	14.0800	Conductivity ( $\sigma$ ):	1.45	1.52	-4.71	5
	Body 1910	e'	50.8000	Relative Permittivity ( $\epsilon_r$ ):	50.80	53.30	-4.69	5
		e"	14.2700	Conductivity ( $\sigma$ ):	1.52	1.52	-0.30	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
D1750V2	1050	4/22/2014	1750	1g	36.6	37.2
				10g	19.4	20.0
D1900V2	5d043	9/17/2013	1900	1g	40.9	40.1
				10g	21.2	21.2

### 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.

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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					
7/30/2014	D1750V2	1050	Body	1g	3.86	3.81	38.1	37.20	2.42	1.30	1,2
				10g	2.010	2.03	20.3	20.00	1.50		
7/30/2014	D1750V2	1050	Head	1g	3.74	3.62	36.2	36.6	-1.09	3.21	
				10g	2.010	1.930	19.3	19.4	-0.52		
7/29/2014	D1900V2	5d043	Head	1g	4.53	4.41	44.1	40.9	7.82	2.65	
				10g	2.350	2.300	23.0	21.2	8.49		
7/29/2014	D1900V2	5d043	Body	1g	4.40	4.35	43.5	40.10	8.48	1.14	3,4
				10g	2.210	2.270	22.7	21.2	7.08		
8/1/2014	D1900V2	5d043	Head	1g	4.21	4.09	40.9	40.9	0.00	2.85	
				10g	2.180	2.140	21.4	21.2	0.94		
8/1/2014	D1900V2	5d043	Body	1g	3.94	3.88	38.8	40.10	-3.24	1.52	
				10g	2.000	2.030	20.3	21.2	-4.25		



## 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 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.

### 11.1. LTE Band 2 (20MHz Bandwidth)

Covered by LTE Band 25 (refer to section 11.8.), due to similar frequency range, same maximum tune-up limit and same channel bandwidth.

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

RF Exposure Conditions	Mode	Dist. (mm)	Pwr Backoff	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	0	OFF	Left Touch	20175	1732.5	1	99	23.7	23.4	0.068	0.073	1
							50	0	22.7	22.3	0.080	0.088	
				Left Tilt	20175	1732.5	1	99	23.7	23.4	0.052	0.056	
							50	0	22.7	22.3	0.055	0.060	
				Right Touch	20175	1732.5	1	99	23.7	23.4	0.149	0.160	
							50	0	22.7	22.3	0.154	0.169	
				Right Tilt	20175	1732.5	1	99	23.7	23.4	0.048	0.051	
							50	0	22.7	22.3	0.060	0.066	
		ON	Left Touch	20175	1732.5	1	0	19.7	19.7	0.064	0.064		
						50	25	19.7	19.7	0.053	0.053		
			Left Tilt	20175	1732.5	1	0	19.7	19.7	0.030	0.030		
						50	25	19.7	19.7	0.025	0.025		
			Right Touch	20175	1732.5	1	0	19.7	19.7	0.063	0.063		
						50	25	19.7	19.7	0.052	0.052		
			Right Tilt	20175	1732.5	1	0	19.7	19.7	0.029	0.029		
						50	25	19.7	19.7	0.025	0.025		
Body-worn & Hotspot	QPSK	10	OFF	Rear	20175	1732.5	1	99	23.7	23.4	0.214	0.229	2
							50	0	22.7	22.3	0.193	0.212	
				Front	20175	1732.5	1	99	23.7	23.4	0.163	0.175	
							50	0	22.7	22.3	0.176	0.193	
			ON	Rear	20175	1732.5	1	0	19.7	19.7	0.129	0.129	
							50	25	19.7	19.7	0.116	0.116	
				Front	20175	1732.5	1	0	19.7	19.7	0.114	0.114	
							50	25	19.7	19.7	0.104	0.104	
Hotspot	QPSK	10	OFF	Edge 2	20175	1732.5	1	99	23.7	23.4	0.113	0.121	
							50	0	22.7	22.3	0.103	0.113	
				Edge 3	20175	1732.5	1	99	23.7	23.4	0.121	0.130	
							50	0	22.7	22.3	0.130	0.143	
			ON	Edge 2	20175	1732.5	1	0	19.7	19.7	0.046	0.046	
							50	25	19.7	19.7	0.040	0.040	
				Edge 3	20175	1732.5	1	0	19.7	19.7	0.087	0.087	
							50	25	19.7	19.7	0.078	0.078	

### 11.3. LTE Band 25 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Pwr Backoff	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	0	OFF	Left Touch	26365	1882.5	1	49	23.7	23.6	0.134	0.137		
							50	0	22.7	22.5	0.114	0.119		
				Left Tilt	26365	1882.5	1	49	23.7	23.6	0.094	0.096		
							50	0	22.7	22.5	0.083	0.087		
				Right Touch	26365	1882.5	1	49	23.7	23.6	0.238	0.244		3
							50	0	22.7	22.5	0.194	0.203		
			Right Tilt	26365	1882.5	1	49	23.7	23.6	0.086	0.088			
						50	0	22.7	22.5	0.074	0.078			
			ON	Left Touch	26365	1882.5	1	0	19.7	19.5	0.045	0.047		
							50	0	19.7	19.4	0.041	0.044		
				Left Tilt	26365	1882.5	1	0	19.7	19.5	0.041	0.043		
							50	0	19.7	19.4	0.040	0.043		
Right Touch	26365	1882.5		1	0	19.7	19.5	0.087	0.091					
				50	0	19.7	19.4	0.078	0.084					
Right Tilt	26365	1882.5	1	0	19.7	19.5	0.033	0.035						
			50	0	19.7	19.4	0.038	0.041						
Body-worn & Hotspot	QPSK	10	OFF	Rear	26365	1882.5	1	49	23.7	23.6	0.308	0.315	4	
							50	0	22.7	22.5	0.257	0.269		
				Front	26365	1882.5	1	49	23.7	23.6	0.216	0.221		
							50	0	22.7	22.5	0.181	0.190		
			ON	Rear	26365	1882.5	1	0	19.7	19.5	0.131	0.137		
							50	0	19.7	19.4	0.125	0.134		
				Front	26365	1882.5	1	0	19.7	19.5	0.097	0.102		
							50	0	19.7	19.4	0.087	0.093		
Hotspot	QPSK	10	OFF	Edge 2	26365	1882.5	1	49	23.7	23.6	0.158	0.162		
							50	0	22.7	22.5	0.136	0.142		
				Edge 3	26365	1882.5	1	49	23.7	23.6	0.247	0.253		
							50	0	22.7	22.5	0.189	0.198		
			ON	Edge 2	26365	1882.5	1	0	19.7	19.5	0.072	0.075		
							50	0	19.7	19.4	0.072	0.077		
				Edge 3	26365	1882.5	1	0	19.7	19.5	0.080	0.084		
							50	0	19.7	19.4	0.075	0.080		

## 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) (W/kg)	Repeated SAR (Yes/No)
1750	LTE Band 4		0.214		No
1900	LTE Band 2				
	LTE Band 25		0.308		No

### 12.2. Repeated Measurement Results

**Head**

N/A

**Body-worn Accessory & Wireless Router (Hotspot)**

N/A

**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

KDB 447498 D01 General RF Exposure Guidance v05, introduces a new formula for calculating the SAR to Peak Location Ratio (SPLSR) between pairs of simultaneously transmitting antennas:

$$SPLSR = (SAR_1 + SAR_2)^{1.5} / Ri$$

Where:

**SAR<sub>1</sub>** is the highest measured or estimated SAR for the first of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition

**SAR<sub>2</sub>** is the highest measured or estimated SAR for the second of a pair of simultaneous transmitting antennas, in the same test operating mode and exposure condition as the first

**Ri** is the separation distance between the pair of simultaneous transmitting antennas. When the SAR is measured, for both antennas in the pair, it is determined by the actual x, y and z coordinates in the 1-g SAR for each SAR peak location, based on the extrapolated and interpolated result in the zoom scan measurement, using the formula of  $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$

A new threshold of 0.04 is also introduced in the draft KDB. Thus, in order for a pair of simultaneous transmitting antennas with the sum of 1-g SAR > 1.6 W/kg to qualify for exemption from Simultaneous Transmission SAR measurements, it has to satisfy the condition of:

$$(SAR_1 + SAR_2)^{1.5} / Ri < 0.04$$

The following Wi-Fi measurements were taken from the Original FCC report 13U14853-1A.

### 13.1. Sum of the SAR for LTE Band 2 & Wi-Fi & BT

Covered by LTE Band 25 (refer to Section 13.3.) due to similar frequency range, same maximum tune-up limit and same channel bandwidth.

### 13.2. 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 Wi-Fi(UNII)	④ Bluetooth		
Head	Left Touch	① + ②	0.088	0.258			0.346	No
		① + ③	0.088		0.169		0.257	No
	Left Tilt	① + ②	0.060	0.254			0.314	No
		① + ③	0.060		0.174		0.234	No
	Right Touch	① + ②	0.169	0.201			0.370	No
		① + ③	0.169		0.196		0.365	No
Right Tilt	① + ②	0.066	0.209			0.275	No	
	① + ③	0.066		0.153		0.219	No	
Body-worn Accessory & Hotspot	Rear	① + ②	0.229	0.271			0.500	No
		① + ③	0.229		0.225		0.454	No
		① + ④	0.229			0.229	0.458	No
	Front	① + ②	0.193	0.075			0.268	No
		① + ③	0.193		0.042		0.235	No
		① + ④	0.193			0.229	0.422	No
Hotspot	Edge 1	① + ②		0.157			0.157	No
	Edge 2	① + ②	0.121				0.121	No
	Edge 3	① + ②	0.143				0.143	No
	Edge 4	① + ②					0.000	No

#### SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

### 13.3. Sum of the SAR for LTE Band 25 & Wi-Fi & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			① LTE Band 25	② Wi-Fi(DTS)	③ Wi-Fi(UNII)	④ Bluetooth		
Head	Left Touch	① + ②	0.137	0.258			0.395	No
		① + ③	0.137		0.169		0.306	No
	Left Tilt	① + ②	0.096	0.254			0.350	No
		① + ③	0.096		0.174		0.270	No
	Right Touch	① + ②	0.244	0.201			0.445	No
		① + ③	0.244		0.196		0.440	No
Right Tilt	① + ②	0.088	0.209			0.297	No	
	① + ③	0.088		0.153		0.241	No	
Body-worn Accessory & Hotspot	Rear	① + ②	0.315	0.271			0.586	No
		① + ③	0.315		0.225		0.540	No
		① + ④	0.315			0.229	0.544	No
	Front	① + ②	0.221	0.075			0.296	No
		① + ③	0.221		0.042		0.263	No
		① + ④	0.221			0.229	0.450	No
Hotspot	Edge 1	① + ②		0.157			0.157	No
	Edge 2	① + ②	0.162				0.162	No
	Edge 3	① + ②	0.253				0.253	No
	Edge 4	① + ②					0.000	No

#### SAR to Peak Location Separation Ratio (SPLSR)

As the Sum of the SAR is not greater than 1.6 W/kg SPLSR assessment is not required.

## 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 3929
- 14.5. Calibration Certificate for D1750V2 - SN 1050
- 14.6. Calibration Certificate for D1900V2 - SN 5d043

END OF REPORT