



**SAR EVALUATION REPORT**

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

*For*

**GSM/WCDMA/LTE PHONE + BLUETOOTH, DTS b/g/n**

**FCC ID: ZNFH345**

**Model Name: LG-H345, H345, LGH345, LGMS345, MS345, LG-MS345**

**Report Number: 15I19960-S1**

**Issue Date: 4/1/2015**

*Prepared for*

**LG ELECTRONICS MOBILECOMM U.S.A., INC.**

**1000 Sylvan Avenue**

**Englewood Cliffs, New Jersey 07632**

*Prepared by*

**UL VERIFICATION SERVICES INC.**

**47173 BENICIA STREET**

**FREMONT, CA 94538, U.S.A.**

**TEL: (510) 771-1000**

**FAX: (510) 661-0888**



NVLAP LAB CODE 200065-0

**Revision History**



Rev.	Date	Revisions	Revised By
--	4/1/2015	Initial Issue	--

## Table of Contents

<b>1.</b>	<b>Attestation of Test Results .....</b>	<b>5</b>
<b>2.</b>	<b>Test Specification, Methods and Procedures.....</b>	<b>6</b>
<b>3.</b>	<b>Facilities and Accreditation.....</b>	<b>6</b>
<b>4.</b>	<b>SAR Measurement System &amp; Test Equipment .....</b>	<b>7</b>
4.1.	<i>SAR Measurement System.....</i>	<i>7</i>
4.2.	<i>SAR Scan Procedures.....</i>	<i>8</i>
4.3.	<i>Test Equipment.....</i>	<i>10</i>
<b>5.</b>	<b>Measurement Uncertainty.....</b>	<b>11</b>
<b>6.</b>	<b>Device Under Test (DUT) Information .....</b>	<b>12</b>
6.1.	<i>DUT Description .....</i>	<i>12</i>
6.2.	<i>Wireless Technologies.....</i>	<i>12</i>
6.3.	<i>Nominal and Maximum Output Power.....</i>	<i>13</i>
6.4.	<i>General LTE SAR Test and Reporting Considerations.....</i>	<i>14</i>
<b>7.</b>	<b>RF Exposure Conditions (Test Configurations).....</b>	<b>15</b>
<b>8.</b>	<b>Dielectric Property Measurements &amp; System Check .....</b>	<b>16</b>
8.1.	<i>Dielectric Property Measurements .....</i>	<i>16</i>
8.2.	<i>System Check.....</i>	<i>19</i>
<b>9.</b>	<b>Conducted Output Power Measurements.....</b>	<b>21</b>
9.1.	<i>GSM .....</i>	<i>21</i>
9.2.	<i>W-CDMA .....</i>	<i>23</i>
9.3.	<i>LTE.....</i>	<i>29</i>
9.4.	<i>Wi-Fi 2.4GHz.....</i>	<i>35</i>
9.5.	<i>Bluetooth .....</i>	<i>35</i>
<b>10.</b>	<b>Measured and Reported (Scaled) SAR Results.....</b>	<b>36</b>
10.1.	<i>GSM850.....</i>	<i>38</i>
10.2.	<i>GSM1900.....</i>	<i>38</i>
10.3.	<i>W-CDMA Band V .....</i>	<i>38</i>
10.4.	<i>W-CDMA Band IV .....</i>	<i>39</i>
10.5.	<i>W-CDMA Band II.....</i>	<i>39</i>
10.6.	<i>LTE Band 2 (20MHz Bandwidth) .....</i>	<i>40</i>
10.7.	<i>LTE Band 4 (20MHz Bandwidth) .....</i>	<i>41</i>
10.8.	<i>LTE Band 12 (10MHz Bandwidth) .....</i>	<i>42</i>
10.9.	<i>Wi-Fi (DTS Band).....</i>	<i>42</i>

10.10. Bluetooth.....	43
<b>11. SAR Measurement Variability.....</b>	<b>44</b>
<b>12. Simultaneous Transmission SAR Analysis.....</b>	<b>45</b>
12.1. Sum of the SAR for WWAN & Wi-Fi & BT.....	45
<b>Appendixes .....</b>	<b>46</b>
A_15119960v0 SAR Photos & Ant. Locations .....	46
B_15119960v0 SAR Highest Test Plots .....	46
C_15119960v0 SAR System Check Plots .....	46
D_15119960v0 SAR Tissue Ingredients.....	46
E_15119960v0 SAR Probe Cal. Certificates.....	46
F_15119960v0 SAR Dipole Cal. Certificates .....	46

# 1. Attestation of Test Results

Applicant Name	LG ELECTRONICS MOBILECOMM U.S.A., INC.			
FCC ID	ZNFH345			
Model Name	LG-H345, H345, LGH345, LGMS345, MS345, LG-MS345			
Applicable Standards	FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013			
<b>SAR Limits (W/Kg)</b>				
Exposure Category	Peak spatial-average(1g of tissue)			
General population / Uncontrolled exposure	1.6			
<b>The Highest Reported SAR (W/kg)</b>				
<b>RF Exposure Conditions</b>	<b>Equipment Class</b>			
	<b>Licensed</b>	<b>DTS</b>	<b>U-NII</b>	<b>DSS (BT)</b>
Head	1.047	0.172	N/A	N/A
Body-worn	1.277	0.056		
Hotspot/Wi-Fi Direct				
Simultaneous Tx	1.333	1.333		
Date Tested	2/2/2015 to 2/7/2015			
Test Results	Pass			
<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 1528-2013, the following FCC Published RF exposure [KDB](#) procedures:

- 248227 D01 SAR meas for 802.11 v02
- 447498 D01 General RF Exposure Guidance v05r02
- 648474 D04 Handset SAR v01r02
- 680106 D01 RF Exposure Wireless Charging Apps v02
- 690783 D01 SAR Listings on Grants v01r03
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r03
- 865664 D02 RF Exposure Reporting v01r01
- 941225 D01 3G SAR Procedures v03
- 941225 D05 SAR for LTE Devices v02r03
- 941225 D06 Hotspot Mode v02

## 3. Facilities and Accreditation

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

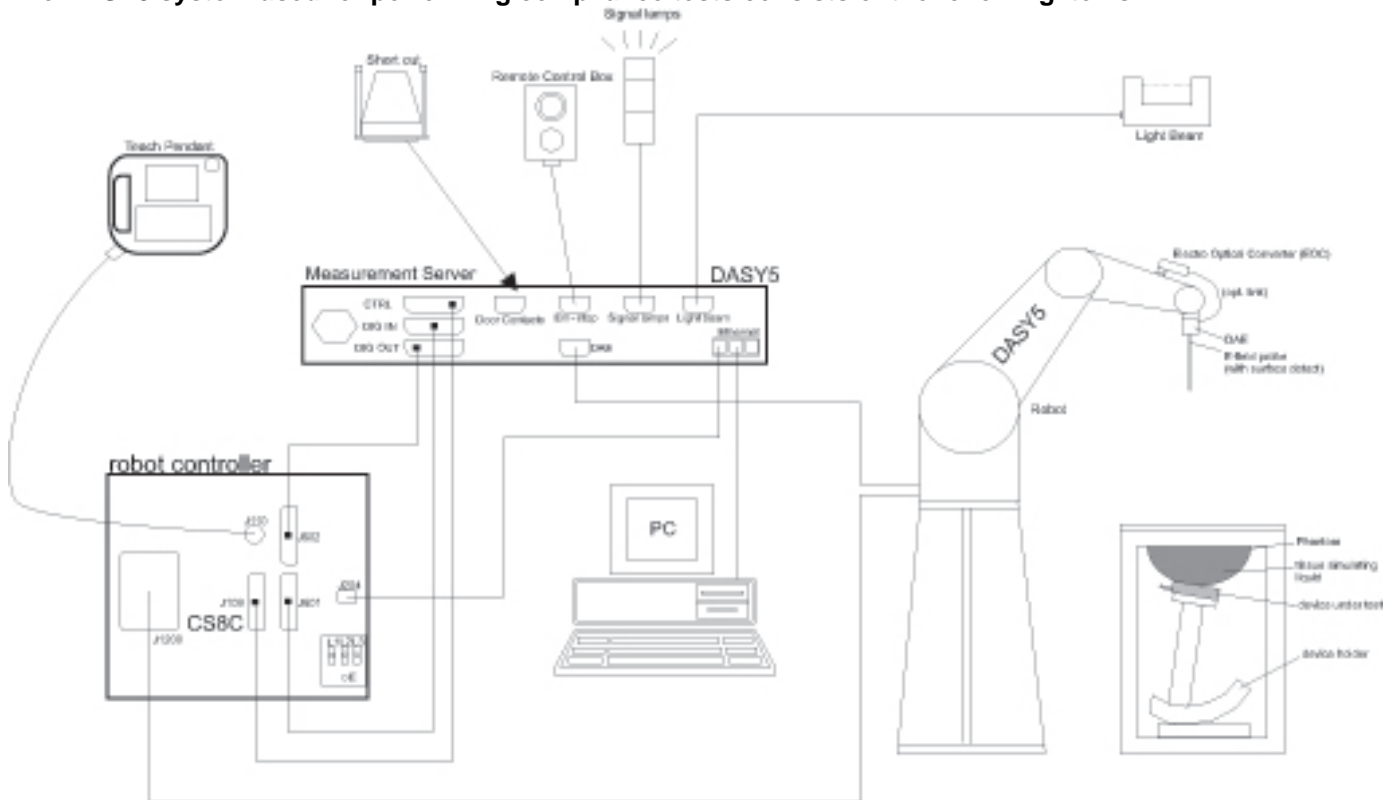
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	SAR Lab 5
SAR Lab F	
SAR Lab G	
SAR Lab H	

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0.

## 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. SAR Scan Procedures

### Step 1: Power Reference Measurement

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

### Step 2: Area Scan

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

Area Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

	$\leq 3$ GHz	$> 3$ GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	$5 \pm 1$ mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
Maximum area scan spatial resolution: $\Delta x_{Area}$ , $\Delta y_{Area}$	$\leq 2$ GHz: $\leq 15$ mm $2 - 3$ GHz: $\leq 12$ mm	$3 - 4$ GHz: $\leq 12$ mm $4 - 6$ GHz: $\leq 10$ mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	



**Step 3: Zoom Scan**

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

Zoom Scan Parameters extracted from KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

		$\leq 3$ GHz	$> 3$ GHz	
Maximum zoom scan spatial resolution: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$		$\leq 2$ GHz: $\leq 8$ mm 2 – 3 GHz: $\leq 5$ mm *	3 – 4 GHz: $\leq 5$ mm* 4 – 6 GHz: $\leq 4$ mm*	
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{\text{Zoom}}(n)$	$\leq 5$ mm	3 – 4 GHz: $\leq 4$ mm 4 – 5 GHz: $\leq 3$ mm 5 – 6 GHz: $\leq 2$ mm	
	graded grid	$\Delta z_{\text{Zoom}}(1)$ : between 1 <sup>st</sup> two points closest to phantom surface	$\leq 4$ mm	3 – 4 GHz: $\leq 3$ mm 4 – 5 GHz: $\leq 2.5$ mm 5 – 6 GHz: $\leq 2$ mm
		$\Delta z_{\text{Zoom}}(n>1)$ : between subsequent points	$\leq 1.5 \cdot \Delta z_{\text{Zoom}}(n-1)$	
Minimum zoom scan volume	x, y, z	$\geq 30$ mm	3 – 4 GHz: $\geq 28$ mm 4 – 5 GHz: $\geq 25$ mm 5 – 6 GHz: $\geq 22$ mm	
Note: $\delta$ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.				
* When zoom scan is required and the <i>reported</i> SAR from the area scan based <i>1-g SAR estimation</i> procedures of KDB 447498 is $\leq 1.4$ W/kg, $\leq 8$ mm, $\leq 7$ mm and $\leq 5$ mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

**Step 4: Power drift measurement**

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

**Step 5: Z-Scan (FCC only)**

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation the extrapolated distance should not be larger than the step size in Z-direction.

### 4.3. 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	E753ES	MY40000980	4/7/2015
Dielectronic Probe kit	SPEAG	DAK-3.5	1082	9/16/2015
Dielectronic Probe kit	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	Control Company	Traceable	122529163	10/8/2015

#### 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	3125U09516	10/6/2015
Power Meter	Agilent	N1911A	MY53060016	8/7/2015
Power Sensor	Agilent	E9323A	MY53070003	5/1/2015
Power Sensor	Agilent	8481A	3318A95392	10/6/2015
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	7/10/2015
Power Meter	HP	437B	3125U11347	8/27/2015
Power Meter	HP	437B	3125U16345	6/16/2015
Power Sensor	HP	8481A	2702A60780	6/16/2015
Power Sensor	HP	8481A	1926A16917	10/10/2015
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1808938	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 Lab 1)	SPEAG	EX3DV4	3902	5/19/2015
E-Field Probe (SAR Lab 3)	SPEAG	EX3DV4	3773	4/22/2015
E-Field Probe (SAR Lab 4)	SPEAG	EX3DV4	3929	5/9/2015
E-Field Probe (SAR Lab 5)	SPEAG	EX3DV4	3749	1/26/2016
Data Acquisition Electronics (SAR Lab 1)	SPEAG	DAE4	1352	11/7/2015
Data Acquisition Electronics (SAR Lab 3)	SPEAG	DAE4	1380	7/23/2015
Data Acquisition Electronics (SAR Lab 4)	SPEAG	DAE4	1377	8/27/2015
Data Acquisition Electronics (SAR Lab 5)	SPEAG	DAE4	1439	5/14/2015
System Validation Dipole	SPEAG	D750V3	1019	3/17/2015
System Validation Dipole	SPEAG	D835V2	4d142	9/9/2015
System Validation Dipole	SPEAG	D1750V2	1050	4/22/2015
System Validation Dipole	SPEAG	D1900V2	5d163	9/11/2015
System Validation Dipole	SPEAG	D2450V2	748	2/18/2015
Thermometer (SAR Lab 1)	EXTECH	445703	CCS-205	3/24/2015
Thermometer (SAR Lab 3)	EXTECH	445703	CCS-237	6/3/2015
Thermometer (SAR Lab 4)	EXTECH	445703	CCS-238	6/3/2015
Thermometer (SAR Lab 5)	EXTECH	445703	CCS-239	6/3/2015

#### Other

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Power Meter	Agilent	N1912A	MY53060016	8/7/2015
Power Sensor	Agilent	N1921A	MY52020038	3/10/2015
Base Station Simulator	R & S	CMW500	135393	7/3/2015

## 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 1528-2013 is not required in SAR reports submitted for equipment approval.

## 6. Device Under Test (DUT) Information

### 6.1. DUT Description

Device Dimension	Overall (Length x Width): 129.9 mm x 64.1 mm Overall Diagonal: 139 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 <input type="checkbox"/> The rechargeable battery is not user accessible.
Battery Options	<input checked="" type="checkbox"/> Standard – Lithium-ion battery, Rating 3.8Vdc, 6.9Wh <input type="checkbox"/> Extended (large capacity) <input type="checkbox"/> The rechargeable battery is not user accessible.
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
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: <input type="checkbox"/> Class 8 - One Up <input type="checkbox"/> Class 10 - Two Up <input checked="" type="checkbox"/> Class 12 - Four Up <input type="checkbox"/> Class 33 - Four Up
		Does this device support DTM (Dual Transfer Mode)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Rel. 5) HSUPA (Rel. 6) DC-HSDPA (Rel. 8) HSPA+ (Rel. 6)	100%
LTE (FDD)	Band 2 Band 4 Band 12	QPSK 16QAM	100%
		Does this device support SV-LTE (1xRTT-LTE)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20)	100%
Bluetooth	2.4 GHz	Version 4.0 LE	77.5% (DH5)

### 6.3. Nominal and Maximum Output Power

KDB 447498 sec.4.1.(3) at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit

Upper limit (dB): -1.5 ~ 0.5		RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
GSM850	Voice	32.7	<b>33.2</b>
	GPRS 1 slot	32.7	<b>33.2</b>
	GPRS 2 slots	31.2	<b>31.7</b>
	GPRS 3 slots	29.7	<b>30.2</b>
	GPRS 4 slots	28.2	<b>28.7</b>
	EGPRS 1 slot	27.2	<b>27.7</b>
	EGPRS 2 slots	26.2	<b>26.7</b>
	EGPRS 3 slots	24.2	<b>24.7</b>
	EGPRS 4 slots	23.2	<b>23.7</b>
GSM1900	Voice	30.2	<b>30.7</b>
	GPRS 1 slot	30.2	<b>30.7</b>
	GPRS 2 slots	28.2	<b>28.7</b>
	GPRS 3 slots	26.7	<b>27.2</b>
	GPRS 4 slots	25.2	<b>25.7</b>
	EGPRS 1 slot	26.2	<b>26.7</b>
	EGPRS 2 slots	25.2	<b>25.7</b>
	EGPRS 3 slots	23.2	<b>23.7</b>
	EGPRS 4 slots	22.2	<b>22.7</b>
W-CDMA Band V	R99	23.7	<b>24.2</b>
	HSDPA	23.7	<b>24.2</b>
	HSUPA	23.7	<b>24.2</b>
	DC-HSDPA	23.7	<b>24.2</b>
W-CDMA Band IV	R99	23.2	<b>23.7</b>
	HSDPA	23.2	<b>23.7</b>
	HSUPA	23.2	<b>23.7</b>
	DC-HSDPA	23.2	<b>23.7</b>
W-CDMA Band II	R99	23.2	<b>23.7</b>
	HSDPA	23.2	<b>23.7</b>
	HSUPA	23.2	<b>23.7</b>
	DC-HSDPA	23.2	<b>23.7</b>
LTE Band 2	QPSK	23.2	<b>23.7</b>
LTE Band 4	QPSK	23.2	<b>23.7</b>
LTE Band 12	QPSK	23.7	<b>24.2</b>
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	16.0	<b>17.0</b>
	802.11g	11.0	<b>12.0</b>
	802.11n HT20	10.0	<b>11.0</b>
Bluetooth		8.2	<b>9.2</b>
Bluetooth LE		0.0	<b>1.0</b>

### 6.4. 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 12	Frequency range: 699 – 716 MHz																																											
		Channel Bandwidth																																											
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																						
Low			23060/ 704	23035/ 701.5	23025/ 700.5	23017/ 699.7																																							
Mid			23095/ 707.5	23095/ 707.5	23095/ 707.5	23095/ 707.5																																							
High			23130/ 711	23155/ 713.5	23165/ 714.5	23173/ 715.3																																							
LTE transmitter and antenna implementation	LTE Bands 2/4 share one (1) Tx/Rx antenna, LTE Band 12 has one (1) Tx/Rx antenna, one (1) DRx antenna for LTE Bands 2/4, and one (1) Rx antenna for LTE Band 12 Refer to Appendix A.																																												
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	No																																												
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 “SAR Photos and Ant locations” Appendix for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

Wireless technologies	RF Exposure Conditions	DUT-to-User Separation	Test Position	Antenna-to-edge/surface	SAR Required	Note
WWAN (Antenna 4)	Head	0 mm	Left Touch	N/A	Yes	
			Left Tilt (15°)	N/A	Yes	
			Right Touch	N/A	Yes	
			Right Tilt (15°)	N/A	Yes	
	Body	10 mm	Rear	N/A	Yes	
			Front	N/A	Yes	
	Hotspot	10 mm	Rear	< 25 mm	Yes	
			Front	< 25 mm	Yes	
			Edge 1 (Top)	> 25 mm	No	1
			Edge 2 (Right)	< 25 mm	Yes	
			Edge 3 (Bottom)	< 25 mm	Yes	
			Edge 4 (Left)	> 25 mm	No	1
WWAN (Antenna 5)	Head	0 mm	Left Touch	N/A	Yes	
			Left Tilt (15°)	N/A	Yes	
			Right Touch	N/A	Yes	
			Right Tilt (15°)	N/A	Yes	
	Body	10 mm	Rear	N/A	Yes	
			Front	N/A	Yes	
	Hotspot	10 mm	Rear	< 25 mm	Yes	
			Front	< 25 mm	Yes	
			Edge 1 (Top)	> 25 mm	No	1
			Edge 2 (Right)	> 25 mm	No	1
			Edge 3 (Bottom)	< 25 mm	Yes	
			Edge 4 (Left)	< 25 mm	Yes	
WLAN (Antenna 1)	Head	0 mm	Left Touch	N/A	Yes	
			Left Tilt (15°)	N/A	Yes	
			Right Touch	N/A	Yes	
			Right Tilt (15°)	N/A	Yes	
	Body	10 mm	Rear	N/A	Yes	
			Front	N/A	Yes	
	Hotspot / Wi-Fi Direct	10 mm	Rear	< 25 mm	Yes	
			Front	< 25 mm	Yes	
			Edge 1 (Top)	< 25 mm	Yes	
			Edge 2 (Right)	> 25 mm	No	1
			Edge 3 (Bottom)	> 25 mm	No	1
			Edge 4 (Left)	< 25 mm	Yes	

**Notes:**

- SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR.

## 8. Dielectric Property Measurements & System Check

### 8.1. 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.

#### 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



**Dielectric Property Measurements Results:****SAR Lab 1**

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
2/2/2015	Head 2450	e'	38.5000	Relative Permittivity ( $\epsilon_r$ ):	38.50	39.20	-1.79	5
		e"	13.5100	Conductivity ( $\sigma$ ):	1.84	1.80	2.25	5
	Head 2410	e'	38.7200	Relative Permittivity ( $\epsilon_r$ ):	38.72	39.28	-1.42	5
		e"	13.4600	Conductivity ( $\sigma$ ):	1.80	1.76	2.46	5
	Head 2475	e'	38.4200	Relative Permittivity ( $\epsilon_r$ ):	38.42	39.17	-1.91	5
		e"	13.5500	Conductivity ( $\sigma$ ):	1.86	1.83	2.06	5
2/2/2015	Body 2450	e'	50.6100	Relative Permittivity ( $\epsilon_r$ ):	50.61	52.70	-3.97	5
		e"	14.9100	Conductivity ( $\sigma$ ):	2.03	1.95	4.16	5
	Body 2410	e'	50.8200	Relative Permittivity ( $\epsilon_r$ ):	50.82	52.76	-3.68	5
		e"	14.8400	Conductivity ( $\sigma$ ):	1.99	1.91	4.25	5
	Body 2475	e'	50.5400	Relative Permittivity ( $\epsilon_r$ ):	50.54	52.67	-4.04	5
		e"	15.0200	Conductivity ( $\sigma$ ):	2.07	1.99	4.12	5

**SAR Lab 3**

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
2/2/2015	Body 1750	e'	51.2100	Relative Permittivity ( $\epsilon_r$ ):	51.21	53.44	-4.17	5
		e"	15.3200	Conductivity ( $\sigma$ ):	1.49	1.49	0.31	5
	Body 1710	e'	51.2100	Relative Permittivity ( $\epsilon_r$ ):	51.21	53.54	-4.36	5
		e"	15.3300	Conductivity ( $\sigma$ ):	1.46	1.46	-0.27	5
	Body 1755	e'	51.1700	Relative Permittivity ( $\epsilon_r$ ):	51.17	53.43	-4.23	5
		e"	15.3700	Conductivity ( $\sigma$ ):	1.50	1.49	0.71	5
2/3/2015	Head 1750	e'	38.6000	Relative Permittivity ( $\epsilon_r$ ):	38.60	40.08	-3.70	5
		e"	13.7500	Conductivity ( $\sigma$ ):	1.34	1.37	-2.27	5
	Head 1710	e'	38.7600	Relative Permittivity ( $\epsilon_r$ ):	38.76	40.15	-3.45	5
		e"	13.6700	Conductivity ( $\sigma$ ):	1.30	1.35	-3.46	5
	Head 1755	e'	38.6100	Relative Permittivity ( $\epsilon_r$ ):	38.61	40.08	-3.66	5
		e"	13.7700	Conductivity ( $\sigma$ ):	1.34	1.37	-2.05	5
2/6/2015	Head 750	e'	40.1000	Relative Permittivity ( $\epsilon_r$ ):	40.10	41.96	-4.44	5
		e"	21.4300	Conductivity ( $\sigma$ ):	0.89	0.89	0.07	5
	Head 700	e'	40.7600	Relative Permittivity ( $\epsilon_r$ ):	40.76	42.22	-3.45	5
		e"	21.8400	Conductivity ( $\sigma$ ):	0.85	0.89	-4.40	5
	Head 725	e'	40.4600	Relative Permittivity ( $\epsilon_r$ ):	40.46	42.09	-3.87	5
		e"	21.6400	Conductivity ( $\sigma$ ):	0.87	0.89	-2.11	5
2/6/2015	Body 750	e'	55.7200	Relative Permittivity ( $\epsilon_r$ ):	55.72	55.55	0.31	5
		e"	23.1800	Conductivity ( $\sigma$ ):	0.97	0.96	0.37	5
	Body 700	e'	56.2900	Relative Permittivity ( $\epsilon_r$ ):	56.29	55.74	0.99	5
		e"	23.6900	Conductivity ( $\sigma$ ):	0.92	0.96	-3.87	5
	Body 725	e'	56.0800	Relative Permittivity ( $\epsilon_r$ ):	56.08	55.64	0.79	5
		e"	23.5100	Conductivity ( $\sigma$ ):	0.95	0.96	-1.40	5

**SAR Lab 4**

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
2/2/2015	Head 1900	e'	38.4900	Relative Permittivity ( $\epsilon_r$ ):	38.49	40.00	-3.78	5
		e"	13.6000	Conductivity ( $\sigma$ ):	1.44	1.40	2.63	5
	Head 1850	e'	38.7100	Relative Permittivity ( $\epsilon_r$ ):	38.71	40.00	-3.23	5
		e"	13.4300	Conductivity ( $\sigma$ ):	1.38	1.40	-1.32	5
	Head 1910	e'	38.4400	Relative Permittivity ( $\epsilon_r$ ):	38.44	40.00	-3.90	5
		e"	13.6100	Conductivity ( $\sigma$ ):	1.45	1.40	3.24	5
2/2/2015	Body 1900	e'	51.9000	Relative Permittivity ( $\epsilon_r$ ):	51.90	53.30	-2.63	5
		e"	14.5100	Conductivity ( $\sigma$ ):	1.53	1.52	0.85	5
	Body 1850	e'	52.0400	Relative Permittivity ( $\epsilon_r$ ):	52.04	53.30	-2.36	5
		e"	14.3900	Conductivity ( $\sigma$ ):	1.48	1.52	-2.62	5
	Body 1910	e'	51.8500	Relative Permittivity ( $\epsilon_r$ ):	51.85	53.30	-2.72	5
		e"	14.5700	Conductivity ( $\sigma$ ):	1.55	1.52	1.80	5
2/5/2015	Head 1900	e'	39.8000	Relative Permittivity ( $\epsilon_r$ ):	39.80	40.00	-0.50	5
		e"	13.2000	Conductivity ( $\sigma$ ):	1.39	1.40	-0.39	5
	Head 1850	e'	39.9600	Relative Permittivity ( $\epsilon_r$ ):	39.96	40.00	-0.10	5
		e"	13.0800	Conductivity ( $\sigma$ ):	1.35	1.40	-3.89	5
	Head 1910	e'	39.7200	Relative Permittivity ( $\epsilon_r$ ):	39.72	40.00	-0.70	5
		e"	13.2100	Conductivity ( $\sigma$ ):	1.40	1.40	0.21	5
2/5/2015	Body 1900	e'	52.1200	Relative Permittivity ( $\epsilon_r$ ):	52.12	53.30	-2.21	5
		e"	14.2000	Conductivity ( $\sigma$ ):	1.50	1.52	-1.30	5
	Body 1850	e'	52.2000	Relative Permittivity ( $\epsilon_r$ ):	52.20	53.30	-2.06	5
		e"	14.0700	Conductivity ( $\sigma$ ):	1.45	1.52	-4.78	5
	Body 1910	e'	52.0500	Relative Permittivity ( $\epsilon_r$ ):	52.05	53.30	-2.35	5
		e"	14.2100	Conductivity ( $\sigma$ ):	1.51	1.52	-0.72	5

**SAR Lab 5**

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
2/4/2015	Head 835	e'	42.1100	Relative Permittivity ( $\epsilon_r$ ):	42.11	41.50	1.47	5
		e"	19.8300	Conductivity ( $\sigma$ ):	0.92	0.90	2.30	5
	Head 820	e'	42.3600	Relative Permittivity ( $\epsilon_r$ ):	42.36	41.60	1.82	5
		e"	19.9000	Conductivity ( $\sigma$ ):	0.91	0.90	0.99	5
	Head 850	e'	41.9300	Relative Permittivity ( $\epsilon_r$ ):	41.93	41.50	1.04	5
		e"	19.8000	Conductivity ( $\sigma$ ):	0.94	0.92	2.27	5
2/4/2015	Body 835	e'	53.3900	Relative Permittivity ( $\epsilon_r$ ):	53.39	55.20	-3.28	5
		e"	21.1300	Conductivity ( $\sigma$ ):	0.98	0.97	1.14	5
	Body 820	e'	53.5700	Relative Permittivity ( $\epsilon_r$ ):	53.57	55.28	-3.09	5
		e"	21.2800	Conductivity ( $\sigma$ ):	0.97	0.97	0.18	5
	Body 850	e'	53.2000	Relative Permittivity ( $\epsilon_r$ ):	53.20	55.16	-3.55	5
		e"	21.0500	Conductivity ( $\sigma$ ):	0.99	0.99	0.78	5

## 8.2. 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 re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

### System Performance Check Measurement Conditions:

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ±0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.  
For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- Distance between probe sensors and phantom surface was set to 3 mm.  
For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was 100 mW.
- The results are normalized to 1 W input power.

### Reference 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	1019	3/17/2014	750	1g	8.21	8.64
				10g	5.38	5.69
D835V2	4d142	9/9/2014	835	1g	8.91	9.22
				10g	5.77	6.05
D1750V2	1050	4/22/2014	1750	1g	36.6	37.2
				10g	19.4	20.0
D1900V2	5d163	9/11/2014	1900	1g	40.8	40.6
				10g	21.2	21.4
D2450V2	748	2/18/2014	2450	1g	51.6	50.7
				10g	24.0	23.7

**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 $\pm 10\%$	Plot No.	
	Type	Serial #		Zoom Scan to 100 mW	Normalize to 1 W				
2/2/2015	D2450V2	748	Head	1g	5.35	53.5	51.6	3.68	
				10g	2.41	24.1	24	0.42	
2/2/2015	D2450V2	748	Body	1g	5.38	53.8	50.70	6.11	1,2
				10g	2.46	24.6	23.7	3.80	

**SAR Lab 3**

Date Tested	System Dipole		T.S. Liquid	Measured Results		Target (Ref. Value)	Delta $\pm 10\%$	Plot No.	
	Type	Serial #		Zoom Scan to 100 mW	Normalize to 1 W				
2/2/2015	D1750V2	1050	Body	1g	3.76	37.6	37.2	1.08	
				10g	2.01	20.1	20	0.50	
2/3/2015	D1750V2	1050	Head	1g	3.49	34.9	36.6	-4.64	3,4
				10g	1.84	18.4	19.4	-5.15	
2/6/2015	D750V3	1019	Head	1g	0.79	7.9	8.2	-3.78	5,6
				10g	0.52	5.2	5.4	-4.09	
2/6/2015	D750V3	1019	Body	1g	0.84	8.4	8.6	-2.43	
				10g	0.56	5.6	5.7	-1.41	

**SAR Lab 4**

Date Tested	System Dipole		T.S. Liquid	Measured Results		Target (Ref. Value)	Delta $\pm 10\%$	Plot No.	
	Type	Serial #		Zoom Scan to 100 mW	Normalize to 1 W				
2/2/2015	1900	5d163	Head	1g	4.01	40.1	40.80	-1.72	
				10g	2.07	20.7	21.20	-2.36	
2/2/2015	1900	5d163	Body	1g	3.85	38.5	40.60	-5.17	7,8
				10g	1.99	19.9	21.40	-7.01	
2/5/2015	1900	5d163	Head	1g	4.24	42.4	40.80	3.92	
				10g	2.20	22.0	21.20	3.77	
2/5/2015	1900	5d163	Body	1g	3.93	39.3	40.60	-3.20	
				10g	2.06	20.6	21.40	-3.74	

**SAR Lab 5**

Date Tested	System Dipole		T.S. Liquid	Measured Results		Target (Ref. Value)	Delta $\pm 10\%$	Plot No.	
	Type	Serial #		Zoom Scan to 100 mW	Normalize to 1 W				
2/4/2015	D835V2	4d142	Head	1g	0.93	9.3	8.91	4.71	9,10
				10g	0.61	6.1	5.77	6.41	
2/4/2015	D835V2	4d142	Body	1g	0.92	9.2	9.22	0.11	
				10g	0.61	6.1	6.05	0.83	

## 9. Conducted Output Power Measurements

### 9.1. GSM

#### GSM850 Measured Results

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Burst Pwr (dBm)	Frame Pwr (dBm)	
850	GSM (Voice)	CS1	1	128	824.2	33.0	23.9	
				190	836.6	33.0	24.0	
				251	848.8	32.7	23.6	
	GPRS (GMSK)	CS1	1	1	128	824.2	33.0	23.9
					190	836.6	33.0	24.0
					251	848.8	32.7	23.6
			2	1	128	824.2	31.0	25.0
					190	836.6	31.7	25.7
					251	848.8	31.5	25.5
			3	1	128	824.2	30.2	25.9
					190	836.6	30.2	25.9
					251	848.8	30.2	25.9
			4	1	128	824.2	28.7	25.7
					190	836.6	28.7	25.7
					251	848.8	28.6	25.5
	EGPRS (8PSK)	MCS5	1	1	128	824.2	27.7	18.7
					190	836.6	27.7	18.6
					251	848.8	27.4	18.4
			2	1	128	824.2	26.7	20.7
					190	836.6	26.7	20.6
					251	848.8	26.7	20.7
			3	1	128	824.2	24.7	20.4
					190	836.6	24.7	20.4
					251	848.8	24.5	20.2
4			1	128	824.2	23.7	20.6	
				190	836.6	23.6	20.6	
				251	848.8	23.3	20.3	

#### Notes:

The worst-case configuration and mode for SAR testing is determined to be as follows:

- Head & Body-worn Accessory: GMSK Voice Mode
- Hotspot mode: GMSK (GPRS) mode with 3 time slots, based on the output power measurements above
- SAR is not required for EGPRS (8PSK) mode because its output power is less than that of GPRS Mode

**GSM1900 Measured Results**

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Burst Pwr (dBm)	Frame Pwr (dBm)	
1900	GSM (Voice)	CS1	1	512	1850.2	30.5	21.5	
				661	1880.0	30.5	21.4	
				810	1909.8	30.3	21.2	
	GPRS (GMSK)	CS1	1	1	512	1850.2	30.5	21.5
					661	1880.0	30.5	21.4
					810	1909.8	30.3	21.2
			2	1	512	1850.2	28.5	22.5
					661	1880.0	28.7	22.7
					810	1909.8	28.6	22.6
			3	1	512	1850.2	27.1	22.8
					661	1880.0	27.0	22.8
					810	1909.8	26.8	22.6
			4	1	512	1850.2	25.4	22.3
					661	1880.0	25.5	22.5
					810	1909.8	25.4	22.3
	EGPRS (8PSK)	MCS5	1	1	512	1850.2	26.7	17.7
					661	1880.0	26.7	17.7
					810	1909.8	26.6	17.6
			2	1	512	1850.2	25.5	19.5
					661	1880.0	25.7	19.7
					810	1909.8	25.5	19.5
			3	1	512	1850.2	23.4	19.1
					661	1880.0	23.5	19.2
					810	1909.8	23.3	19.1
4			1	512	1850.2	22.2	19.2	
				661	1880.0	22.2	19.2	
				810	1909.8	22.2	19.1	

**Notes:**

The worst-case configuration and mode for SAR testing is determined to be as follows:

- Head & Body-worn Accessory: GMSK Voice Mode
- Hotspot mode: GMSK (GPRS) mode with 3 time slots, based on the output power measurements above
- SAR is not required for EGPRS (8PSK) mode because its output power is less than that of GPRS Mode

## 9.2. W-CDMA

### Release 99 Setup Procedures used to establish the test signals

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 specification. The DUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7).

Mode	Subtest	Rel99
WCDMA General Settings	Loopback Mode	Test Mode 2
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	$\beta_c/\beta_d$	8/15

### HSDPA Setup Procedures used to establish the test signals

The following 4 Sub-tests were completed according to Release 7 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
W-CDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set 1			
	Power Control Algorithm	Algorithm 2			
	$\beta_c$	2/15	11/15	15/15	15/15
	$\beta_d$	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	$\beta_c/\beta_d$	2/15	11/15	15/8	15/4
	$\beta_{hs}$	4/15	24/15	30/15	30/15
MPR (dB)	0	0	0.5	0.5	
HSDPA Specific Settings	$D_{ACK}$	8			
	$D_{NAK}$	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
$A_{hs}=\beta_{hs}/\beta_c$	30/15				

**HSPA (HSDPA & HSUPA) Setup Procedures used to establish the test signals**

The following 5 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

	Mode	HSPA				
	Subtest	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2 kbps RMC				
	HSDPA FRC	H-Set 1				
	HSUPA Test	HSPA				
	Power Control Algorithm	Algorithm 2				Algorithm 1
	$\beta_c$	11/15	6/15	15/15	2/15	15/15
	$\beta_d$	15/15	15/15	9/15	15/15	0
	$\beta_{ec}$	209/225	12/15	30/15	2/15	5/15
	$\beta_c/\beta_d$	11/15	6/15	15/9	2/15	15/1
	$\beta_{hs}$	22/15	12/15	30/15	4/15	5/15
	$\beta_{ed}$	1309/225	94/75	47/15	56/75	47/15
CM (dB)	1	3	2	3	1	
MPR (dB)	0	2	1	2	0	
HSDPA Specific Settings	DACK	8				0
	DNAK	8				0
	DCQI	8				0
	Ack-Nack repetition factor	3				
	CQI Feedback (Table 5.2B.4)	4ms				
	CQI Repetition Factor (Table 5.2B.4)	2				
	A <sub>hs</sub> = $\beta_{hs}/\beta_c$	30/15				
HSUPA Specific Settings	E-DPDCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	ETFCI (from 34.121 Table C.11.1.3)	75	67	92	71	81
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8	308.9
	Reference E-TFCIs	5	5	2	5	1
	Reference E-TFCI	11	11	11	11	67
	Reference E-TFCI PO	4	4	4	4	18
	Reference E-TFCI	67	67	92	67	67
	Reference E-TFCI PO	18	18	18	18	18
	Reference E-TFCI	71	71	71	71	71
	Reference E-TFCI PO	23	23	23	23	23
	Reference E-TFCI	75	75	75	75	75
	Reference E-TFCI PO	26	26	26	26	26
	Reference E-TFCI	81	81	81	81	81
Reference E-TFCI PO	27	27	27	27	27	
Maximum Channelization Codes	2xSF2				SF4	



**DC-HSDPA Setup Procedures used to establish the test signals**

The following tests were completed according to procedures in section 7.3.13 of 3GPP TS34.108 v9.5.0. A summary of these settings are illustrated below:

Downlink Physical Channels are set as per 3GPP TS34.121-1 v9.0.0 E.5.0

**Table E.5.0: Levels for HSDPA connection setup**

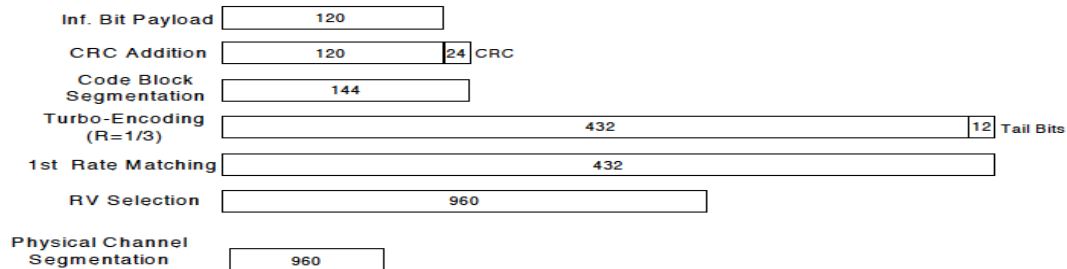
Parameter During Connection setup	Unit	Value
P-CPICH_Ec/Ior	dB	-10
P-CCPCH and SCH_Ec/Ior	dB	-12
PICH_Ec/Ior	dB	-15
HS-PDSCH	dB	off
HS-SCCH_1	dB	off
DPCH_Ec/Ior	dB	-5
OCNS_Ec/Ior	dB	-3.1

Call is set up as per 3GPP TS34.108 v9.5.0 sub clause 7.3.13

The configurations of the fixed reference channels for HSDPA RF tests are described in 3GPP TS 34.121, annex C for FDD and 3GPP TS 34.122.

**Table C.8.1.12: Fixed Reference Channel H-Set 12**

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	60
Inter-TTI Distance	TTI's	1
Number of HARQ Processes	Proces ses	6
Information Bit Payload ( $N_{INF}$ )	Bits	120
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	960
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codes	Codes	1
Modulation		QPSK
Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table.		
Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used.		



**Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)**

The following 4 Sub-tests for HSDPA were completed according to Release 8 procedures in section 5.2 of 3GPP TS34.121. A summary of subtest settings are illustrated below:

Mode	HSDPA	HSDPA	HSDPA	HSDPA
Subtest	1	2	3	4
WCDMA General Settings	Loopback Mode			
	Test Mode 1			
	Rel99 RMC			
	12.2kbps RMC			
	HSDPA FRC			
	H-Set 1			
	Power Control Algorithm			
	Algorithm2			
	$\beta_c$	2/15	11/15	15/15
$\beta_d$	15/15	15/15	8/15	4/15
$\beta_d$ (SF)	64			
$\beta_c/\beta_d$	2/15	11/15	15/8	15/4
$\beta_{hs}$	4/15	24/15	30/15	30/15
MPR (dB)	0	0	0.5	0.5
HSDPA Specific Settings	DACK			
	8			
	DNAK			
	8			
	DCQI			
	8			
	Ack-Nack Repetition factor			
3				
CQI Feedback				
4ms				
CQI Repetition Factor				
2				
$A_{hs} = \beta_{hs}/\beta_c$				
30/15				

**HSPA+**

Since 16QAM is not used for uplink, the uplink Category and release is same as HSUPA, i.e., CAT 6 Rel 6. Therefore, the RF conducted power is not measured.

**Measured Results**

Band	Mode		UL Ch No.	Freq. (MHz)	MPR (dB)	Avg Pwr (dBm)
W-CDMA Band II	Rel 99	RMC, 12.2 kbps	9262	1852.4	N/A	23.5
			9400	1880.0	N/A	23.3
			9538	1907.6	N/A	23.4
	HSDPA	Subtest 1	9262	1852.4	0	23.4
			9400	1880.0	0	23.3
			9538	1907.6	0	23.3
		Subtest 2	9262	1852.4	0	23.4
			9400	1880.0	0	23.3
			9538	1907.6	0	23.3
		Subtest 3	9262	1852.4	0.5	23.2
			9400	1880.0	0.5	23.2
			9538	1907.6	0.5	23.2
		Subtest 4	9262	1852.4	0.5	22.8
			9400	1880.0	0.5	23.2
			9538	1907.6	0.5	23.2
	HSUPA	Subtest 1	9262	1852.4	0	22.6
			9400	1880.0	0	23.1
			9538	1907.6	0	22.7
		Subtest 2	9262	1852.4	2	21.5
			9400	1880.0	2	21.7
			9538	1907.6	2	21.5
		Subtest 3	9262	1852.4	1	21.9
			9400	1880.0	1	22.0
			9538	1907.6	1	22.1
		Subtest 4	9262	1852.4	2	21.7
			9400	1880.0	2	21.7
			9538	1907.6	2	21.7
		Subtest 5	9262	1852.4	0	23.4
			9400	1880.0	0	23.2
			9538	1907.6	0	23.3
	DC-HSPA	Subtest 1	9262	1852.4	0	23.4
			9400	1880.0	0	23.3
			9538	1907.6	0	23.3
		Subtest 2	9262	1852.4	0	23.4
			9400	1880.0	0	23.3
			9538	1907.6	0	23.3
		Subtest 3	9262	1852.4	0.5	23.2
			9400	1880.0	0.5	23.2
			9538	1907.6	0.5	23.2
		Subtest 4	9262	1852.4	0.5	22.8
			9400	1880.0	0.5	23.2
			9538	1907.6	0.5	23.2

Band	Mode		UL Ch No.	Freq. (MHz)	MPR (dB)	Avg Pwr (dBm)	
W-CDMA Band IV	Rel 99	RMC, 12.2 kbps	1312	1712.4	N/A	23.5	
			1413	1732.6	N/A	23.4	
			1513	1752.6	N/A	23.6	
	HSDPA	Subtest 1	1312	1712.4	0	23.6	
			1413	1732.6	0	23.4	
			1513	1752.6	0	23.7	
		Subtest 2	1312	1712.4	0	23.4	
			1413	1732.6	0	23.4	
			1513	1752.6	0	23.7	
		Subtest 3	1312	1712.4	0.5	22.9	
			1413	1732.6	0.5	23.2	
			1513	1752.6	0.5	23.2	
		Subtest 4	1312	1712.4	0.5	23.2	
			1413	1732.6	0.5	23.2	
			1513	1752.6	0.5	23.2	
		HSUPA	Subtest 1	1312	1712.4	0	22.7
				1413	1732.6	0	23.2
				1513	1752.6	0	22.8
	Subtest 2		1312	1712.4	2	21.5	
			1413	1732.6	2	21.7	
			1513	1752.6	2	21.6	
	Subtest 3		1312	1712.4	1	22.1	
			1413	1732.6	1	22.2	
			1513	1752.6	1	22.6	
	Subtest 4		1312	1712.4	2	21.7	
			1413	1732.6	2	21.7	
			1513	1752.6	2	21.7	
	Subtest 5		1312	1712.4	0	23.5	
			1413	1732.6	0	23.5	
			1513	1752.6	0	23.6	
	DC-HSPA	Subtest 1	1312	1712.4	0	23.6	
			1413	1732.6	0	23.4	
			1513	1752.6	0	23.7	
		Subtest 2	1312	1712.4	0	23.4	
			1413	1732.6	0	23.4	
			1513	1752.6	0	23.7	
		Subtest 3	1312	1712.4	0.5	22.9	
			1413	1732.6	0.5	23.2	
			1513	1752.6	0.5	23.2	
		Subtest 4	1312	1712.4	0.5	23.2	
			1413	1732.6	0.5	23.2	
			1513	1752.6	0.5	23.2	

Band	Mode		UL Ch No.	Freq. (MHz)	MPR (dB)	Avg Pwr (dBm)	
W-CDMA Band V	Rel 99	RMC, 12.2 kbps	4132	826.4	N/A	24.1	
			4183	836.6	N/A	24.1	
			4233	846.6	N/A	24.2	
	HSDPA	Subtest 1	4132	826.4	0	24.0	
			4183	836.6	0	24.1	
			4233	846.6	0	24.1	
		Subtest 2	4132	826.4	0	24.0	
			4183	836.6	0	24.1	
			4233	846.6	0	24.1	
		Subtest 3	4132	826.4	0.5	23.7	
			4183	836.6	0.5	23.6	
			4233	846.6	0.5	23.6	
		Subtest 4	4132	826.4	0.5	23.7	
			4183	836.6	0.5	23.6	
			4233	846.6	0.5	23.6	
		HSUPA	Subtest 1	4132	826.4	0	24.0
				4183	836.6	0	24.0
				4233	846.6	0	23.3
	Subtest 2		4132	826.4	2	22.1	
			4183	836.6	2	22.2	
			4233	846.6	2	22.2	
	Subtest 3		4132	826.4	1	23.1	
			4183	836.6	1	23.0	
			4233	846.6	1	23.1	
	Subtest 4		4132	826.4	2	22.1	
			4183	836.6	2	22.2	
			4233	846.6	2	22.2	
	Subtest 5		4132	826.4	0	24.0	
			4183	836.6	0	24.0	
			4233	846.6	0	23.3	
	DC-HSPA	Subtest 1	4132	826.4	0	24.0	
			4183	836.6	0	24.1	
			4233	846.6	0	24.1	
		Subtest 2	4132	826.4	0	24.0	
			4183	836.6	0	24.1	
			4233	846.6	0	24.1	
		Subtest 3	4132	826.4	0.5	23.7	
			4183	836.6	0.5	23.6	
			4233	846.6	0.5	23.6	
		Subtest 4	4132	826.4	0.5	23.7	
			4183	836.6	0.5	23.6	
			4233	846.6	0.5	23.6	

### 9.3. LTE

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
			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
				> 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	23.6	23.3	23.7
			1	50	0	0	23.3	23.4	23.7
			1	99	0	0	23.1	23.4	23.7
			50	0	1	1	22.4	22.3	22.5
			50	25	1	1	22.3	22.2	22.4
			50	50	1	2	22.2	22.2	22.2
			100	0	1	2	22.2	22.2	22.2
		16QAM	1	0	1	1	22.4	22.1	21.9
			1	50	1	1	22.4	22.0	21.8
			1	99	1	2	22.2	21.9	21.8
			50	0	2	2	21.4	21.2	21.3
			50	25	2	2	21.3	21.2	21.3
			50	50	2	2	21.1	21.3	21.2
			100	0	2	2	21.3	21.2	21.3
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	23.2	23.4	23.3
			1	36	0	0	23.1	23.5	23.1
			1	74	0	0	23.0	23.4	23.2
			36	0	1	1	22.2	22.2	22.2
			36	18	1	1	22.2	22.2	22.2
			36	37	1	1	22.3	22.1	22.3
			75	0	1	1	22.2	22.2	22.2
		16QAM	1	0	1	1	22.5	22.2	22.6
			1	36	1	1	22.3	22.1	22.5
			1	74	1	1	22.3	22.0	22.6
			36	0	2	2	21.2	21.3	21.3
			36	18	2	2	21.1	21.3	21.1
			36	37	2	2	21.1	21.3	21.2
			75	0	2	2	21.2	21.2	21.3
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1855 MHz	1880 MHz	1905 MHz
LTE Band 2	10	QPSK	1	0	0	0	23.3	23.3	23.2
			1	25	0	0	23.3	23.1	23.2
			1	49	0	0	23.3	23.0	23.2
			25	0	1	1	22.3	22.2	22.1
			25	12	1	1	22.3	22.1	22.2
			25	25	1	1	22.2	22.2	22.3
			50	0	1	1	22.3	22.2	22.1
		16QAM	1	0	1	1	22.5	22.1	22.7
			1	25	1	1	22.6	22.7	22.4
			1	49	1	1	22.6	22.2	22.7
			25	0	2	2	21.2	21.1	21.2
			25	12	2	2	21.2	21.3	21.4
			25	25	2	2	21.2	21.2	21.5
			50	0	2	2	21.3	21.2	21.2

**LTE Band 2 Measured Results (continued)**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1852.5 MHz	1880 MHz	1907.5 MHz
LTE Band 2	5	QPSK	1	0	0	0	23.1	23.2	23.2
			1	12	0	0	23.3	22.9	23.5
			1	24	0	0	23.2	23.0	23.2
			12	0	1	1	22.1	22.1	22.3
			12	6	1	1	22.2	22.1	22.2
			12	11	1	1	22.2	22.2	22.3
			25	0	1	1	22.2	22.2	22.3
		16QAM	1	0	1	1	21.8	22.3	21.8
			1	12	1	1	21.7	22.3	22.2
			1	24	1	1	21.8	22.4	22.7
			12	0	2	2	21.1	21.2	21.3
			12	6	2	2	21.3	21.2	21.3
			12	11	2	2	21.3	21.3	21.5
			25	0	2	2	21.3	21.2	21.3
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1851.5 MHz	1880 MHz	1908.5 MHz
LTE Band 2	3	QPSK	1	0	0	0	23.1	23.4	23.3
			1	7	0	0	23.1	23.5	23.5
			1	14	0	0	23.2	23.3	23.3
			8	0	1	1	22.2	22.3	22.3
			8	4	1	1	22.2	22.3	22.3
			8	7	1	1	22.1	22.5	22.3
			15	0	1	1	22.1	22.4	22.4
		16QAM	1	0	1	1	22.0	22.6	22.5
			1	7	1	1	22.4	22.5	22.5
			1	14	1	1	22.0	22.0	22.0
			8	0	2	2	21.1	21.2	21.2
			8	4	2	2	21.4	21.4	21.4
			8	7	2	2	21.1	21.4	21.5
			15	0	2	2	21.2	21.4	21.6
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1850.7 MHz	1880 MHz	1909.3 MHz
LTE Band 2	1.4	QPSK	1	0	0	0	23.2	23.2	23.1
			1	2	0	0	23.3	23.3	23.2
			1	5	0	0	23.1	23.1	23.1
			3	0	0	0	23.2	23.2	23.2
			3	1	0	0	23.1	23.1	23.2
			3	2	0	0	23.1	23.1	23.3
			6	0	1	1	22.1	22.1	22.3
		16QAM	1	0	1	1	22.3	22.3	22.6
			1	2	1	1	22.5	22.4	22.5
			1	5	1	1	22.4	22.4	22.7
			3	0	1	1	22.0	22.0	22.0
			3	1	1	1	21.9	21.9	22.0
			3	2	1	1	22.0	22.0	22.2
			6	0	2	2	21.0	21.0	21.1

**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	23.5	23.7	23.7
			1	50	0	0	23.6	23.7	23.7
			1	99	0	0	23.2	23.6	23.6
			50	0	1	1	22.3	22.3	22.5
			50	25	1	1	22.3	22.2	22.6
			50	50	1	1	22.2	22.1	22.3
			100	0	1	1	22.3	22.2	22.3
		16QAM	1	0	1	1	22.5	22.4	22.0
			1	50	1	1	22.6	22.2	22.0
			1	99	1	1	22.6	22.7	21.7
			50	0	2	2	21.3	21.3	21.4
			50	25	2	2	21.3	21.3	21.3
			50	50	2	2	21.2	21.1	21.3
			100	0	2	2	21.3	21.2	21.2
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	23.4	23.4	23.1
			1	36	0	0	23.5	23.2	23.1
			1	74	0	0	23.1	23.3	23.0
			36	0	1	1	22.3	22.3	22.4
			36	18	1	1	22.2	22.2	22.4
			36	37	1	1	22.3	22.2	22.3
			75	0	1	1	22.3	22.2	22.3
		16QAM	1	0	1	1	22.5	22.5	22.6
			1	36	1	1	22.6	22.3	22.7
			1	74	1	1	22.7	22.3	22.6
			36	0	2	2	21.2	21.2	21.3
			36	18	2	2	21.1	21.1	21.2
			36	37	2	2	21.1	21.1	21.1
			75	0	2	2	21.3	21.3	21.2
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	23.4	23.2	23.5
			1	25	0	0	23.2	23.1	23.3
			1	49	0	0	23.3	23.4	23.2
			25	0	1	1	22.5	22.3	22.6
			25	12	1	1	22.3	22.3	22.5
			25	25	1	1	22.3	22.3	22.4
			50	0	1	1	22.4	22.4	22.5
		16QAM	1	0	1	1	22.5	22.5	22.3
			1	25	1	1	22.4	22.7	22.2
			1	49	1	1	22.6	22.7	22.5
			25	0	2	2	21.2	21.4	21.6
			25	12	2	2	21.3	21.3	21.5
			25	25	2	2	21.3	21.3	21.5
			50	0	2	2	21.3	21.4	21.4



**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	23.3	23.0	23.3
			1	12	0	0	23.4	23.0	23.5
			1	24	0	0	23.1	23.1	23.3
			12	0	1	1	22.3	22.1	22.4
			12	6	1	1	22.4	22.2	22.2
			12	11	1	1	22.3	22.2	22.4
			25	0	1	1	22.3	22.2	22.4
		16QAM	1	0	1	1	21.8	22.5	21.9
			1	12	1	1	21.9	22.5	21.8
			1	24	1	2	21.8	21.9	21.9
			12	0	2	2	21.2	21.1	21.2
			12	6	2	2	21.3	21.3	21.2
			12	11	2	2	21.3	21.1	21.2
			25	0	2	2	21.3	21.3	21.1
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1711.5 MHz	1732.5 MHz	1753.5 MHz
LTE Band 4	3	QPSK	1	0	0	0	23.3	23.1	23.2
			1	7	0	0	23.4	23.0	23.7
			1	14	0	0	23.3	23.2	23.2
			8	0	1	1	22.3	22.1	22.3
			8	4	1	1	22.3	22.2	22.4
			8	7	1	1	22.3	22.2	22.4
			15	0	1	1	22.3	22.2	22.4
		16QAM	1	0	1	1	22.5	22.3	22.6
			1	7	1	1	22.5	22.2	22.4
			1	14	1	1	22.1	22.3	22.0
			8	0	2	2	21.2	21.3	21.6
			8	4	2	2	21.1	20.7	21.4
			8	7	2	2	21.3	20.9	21.3
			15	0	2	2	21.4	21.1	21.3
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1710.7 MHz	1732.5 MHz	1754.3 MHz
LTE Band 4	1.4	QPSK	1	0	0	0	23.3	23.0	23.1
			1	2	0	0	23.5	23.1	23.4
			1	5	0	0	23.4	23.2	23.3
			3	0	0	0	23.5	23.1	23.3
			3	1	0	0	23.5	23.1	23.3
			3	2	0	0	23.3	23.1	23.3
			6	0	1	1	22.4	22.2	22.2
		16QAM	1	0	1	1	22.2	22.2	22.2
			1	2	1	1	22.4	22.3	22.3
			1	5	1	1	22.7	22.4	22.4
			3	0	1	1	22.0	22.2	22.0
			3	1	1	1	22.4	21.9	22.4
			3	2	1	1	22.4	22.2	22.4
			6	0	2	2	21.0	21.1	21.1

**LTE Band 12 Measured Results**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							704 MHz	707.5 MHz	711 MHz
LTE Band 12	10	QPSK	1	0	0	0	23.7	23.8	23.9
			1	25	0	0	23.7	23.9	23.9
			1	49	0	0	23.8	23.7	23.9
			25	0	1	1	22.8	22.8	23.0
			25	12	1	1	22.9	22.9	23.0
			25	25	1	1	22.9	22.9	22.9
			50	0	1	1	22.8	22.8	23.0
		16QAM	1	0	1	1	23.2	23.2	23.2
			1	25	1	1	23.0	23.2	23.0
			1	49	1	1	22.7	23.2	23.1
			25	0	2	2	21.7	21.9	22.0
			25	12	2	2	21.8	21.9	21.9
			25	25	2	2	21.8	21.9	22.0
			50	0	2	2	21.7	22.0	22.0
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							701.5 MHz	707.5 MHz	713.5 MHz
LTE Band 12	5	QPSK	1	0	0	0	23.8	24.2	23.9
			1	12	0	0	23.9	24.2	24.2
			1	24	0	0	23.6	23.9	23.8
			12	0	1	1	22.8	22.9	22.9
			12	6	1	1	22.7	22.9	23.0
			12	11	1	1	22.8	22.8	22.9
			25	0	1	1	22.8	22.9	22.9
		16QAM	1	0	1	1	22.4	23.2	23.2
			1	12	1	1	22.6	23.2	23.2
			1	24	1	1	22.4	23.2	23.2
			12	0	2	2	21.6	22.0	22.0
			12	6	2	2	21.8	22.0	22.0
			12	11	2	2	21.8	21.9	22.0
			25	0	2	2	21.9	21.8	22.0
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							700.5 MHz	707.5 MHz	714.5 MHz
LTE Band 12	3	QPSK	1	0	0	0	23.8	23.9	23.8
			1	7	0	0	24.0	23.8	24.2
			1	14	0	0	23.8	23.6	23.9
			8	0	1	1	22.8	22.8	22.8
			8	4	1	1	22.8	22.9	22.9
			8	7	1	1	22.9	22.8	22.9
			15	0	1	1	22.8	22.9	22.9
		16QAM	1	0	1	1	23.2	23.2	23.2
			1	7	1	1	23.2	23.2	23.2
			1	14	1	1	23.1	23.2	22.9
			8	0	2	2	21.9	21.7	21.5
			8	4	2	2	21.9	21.8	21.6
			8	7	2	2	21.9	21.7	21.8
			15	0	2	2	21.8	21.7	21.8

**LTE Band 12 Measured Results (continued)**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							699.7 MHz	707.5 MHz	715.3 MHz
LTE Band 12	1.4	QPSK	1	0	0	0	23.6	23.8	23.7
			1	2	0	0	23.9	23.9	23.9
			1	5	0	0	23.8	23.8	23.8
			3	0	0	0	23.8	23.7	23.9
			3	1	0	0	23.7	23.8	23.9
			3	2	0	0	23.8	23.9	23.9
			6	0	1	1	22.7	22.7	22.8
		16QAM	1	0	1	1	23.2	22.8	23.2
			1	2	1	1	22.4	23.2	23.2
			1	5	1	1	23.2	23.0	23.2
			3	0	1	1	23.0	22.4	23.2
			3	1	1	1	22.6	22.7	22.4
			3	2	1	1	22.5	23.2	22.6
			6	0	2	2	21.5	21.5	21.9

**9.4. Wi-Fi 2.4GHz**

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Note(s)
2.4	802.11b	1 Mbps	1	2412	16.3	17.0	Yes	
			6	2437	16.4			
			11	2462	16.4			
	802.11g	6 Mbps	1	2412	Not Required	12.0	No	1
			6	2437				
			11	2462				
	802.11n (HT20)	MCS0	1	2412	Not Required	11.0	No	1
			6	2437				
			11	2462				

**Note(s):**

- Output Power and SAR measurement is not required for 802.11g/n HT20 channels when the specified tune-up tolerances for 802.11g/n HT20 are lower than 802.11b by more than 1 dB and the measured SAR is ≤ 1.2 W/Kg.

**9.5. Bluetooth**

Maximum tune-up tolerance limit is 9.2 dBm from the rated nominal maximum output power. This power level qualifies for exclusion of SAR testing.

## 10. 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:

When the maximum output power and tune-up tolerance specified for production units in a secondary mode is  $\leq \frac{1}{4}$  dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is  $\leq 1.2$  W/kg, SAR measurement is not required for the secondary mode

### 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 meas for 802.11 v02:**

SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the initial test position(s) by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The initial test position(s) is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s). When the reported SAR for the initial test position is:

- $\leq 0.4$  W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.
- $> 0.4$  W/kg, SAR is repeated using the same wireless mode test configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the reported SAR is  $\leq 0.8$  W/kg or all required test positions are tested.
  - For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
  - When it is unclear, all equivalent conditions must be tested.
- For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is  $> 0.8$  W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is  $\leq 1.2$  W/kg or all required test channels are considered.
  - The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.
- When the specified maximum output power is the same for both UNII 1 and UNII 2A, begin SAR measurements in UNII 2A with the channel with the highest measured output power. If the reported SAR for UNII 2A is  $\leq 1.2$  W/kg, SAR is not required for UNII 1; otherwise treat the remaining bands separately and test them independently for SAR.
- When the specified maximum output power is different between UNII 1 and UNII 2A, begin SAR with the band that has the higher specified maximum output. If the highest reported SAR for the band with the highest specified power is  $\leq 1.2$  W/kg, testing for the band with the lower specified output power is not required; otherwise test the remaining bands independently for SAR.

To determine the initial test position, Area Scans were performed to determine the position with the *Maximum Value of SAR (measured)*. The position that produced the highest *Maximum Value of SAR* is considered the worst case position; thus used as the initial test position.

### 10.1. GSM850

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	
Head	Voice	0	Left Touch	190	836.6	33.2	33.0	0.519	0.545	1
			Left Tilt	190	836.6	33.2	33.0	0.325	0.341	
			Right Touch	190	836.6	33.2	33.0	0.636	<b>0.668</b>	
			Right Tilt	190	836.6	33.2	33.0	0.311	0.326	
Head VoIP	GPRS 3 Slots	0	Left Touch	190	836.6	30.2	30.2	0.725	0.725	
			Left Tilt	190	836.6	30.2	30.2	0.459	0.459	
			Right Touch	128	824.2	30.2	30.2	0.784	0.784	
				190	836.6	30.2	30.2	0.943	<b>0.943</b>	
			Right Tilt	251	848.8	30.2	30.2	0.811	0.819	
Body-worn	Voice	10	Rear	190	836.6	33.2	33.0	0.444	0.466	3
			Front	190	836.6	33.2	33.0	0.467	<b>0.490</b>	
Body-worn(VoIP) & Hotspot	GPRS 3 Slots	10	Rear	190	836.6	30.2	30.2	0.640	0.640	4
Front			190	836.6	30.2	30.2	0.683	<b>0.683</b>		
Hotspot			Edge 2	190	836.6	30.2	30.2	0.473	0.473	
			Edge 3	190	836.6	30.2	30.2	0.245	0.245	

### 10.2. GSM1900

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	
Head	Voice	0	Left Touch	661	1880.0	30.7	30.5	0.420	<b>0.444</b>	5
			Left Tilt	661	1880.0	30.7	30.5	0.095	0.101	
			Right Touch	661	1880.0	30.7	30.5	0.218	0.230	
			Right Tilt	661	1880.0	30.7	30.5	0.138	0.146	
Head VoIP	GPRS 3 Slots	0	Left Touch	661	1880.0	27.2	27.0	0.383	<b>0.399</b>	6
			Left Tilt	661	1880.0	27.2	27.0	0.098	0.102	
			Right Touch	661	1880.0	27.2	27.0	0.229	0.239	
			Right Tilt	661	1880.0	27.2	27.0	0.146	0.152	
Body-worn	Voice	10	Rear	661	1880.0	30.7	30.5	0.573	<b>0.606</b>	7
			Front	661	1880.0	30.7	30.5	0.364	0.385	
Body-worn(VoIP) & Hotspot	GPRS 3 Slots	10	Rear	661	1880.0	27.2	27.0	0.575	<b>0.599</b>	8
Front			661	1880.0	27.2	27.0	0.375	0.391		
Hotspot			Edge 3	661	1880.0	27.2	27.0	0.219	0.228	
			Edge 4	661	1880.0	27.2	27.0	0.200	0.208	

### 10.3. W-CDMA Band V

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	
Head	Rel 99 RMC	0	Left Touch	4183	836.6	24.2	24.1	0.575	0.588	9
			Left Tilt	4183	836.6	24.2	24.1	0.356	0.364	
			Right Touch	4183	836.6	24.2	24.1	0.710	<b>0.727</b>	
			Right Tilt	4183	836.6	24.2	24.1	0.341	0.349	
Body-worn & Hotspot	Rel 99 RMC	10	Rear	4183	836.6	24.2	24.1	0.663	<b>0.678</b>	10
			Front	4183	836.6	24.2	24.1	0.583	0.597	
Hotspot	Rel 99 RMC	10	Edge 2	4183	836.6	24.2	24.1	0.511	0.523	
			Edge 3	4183	836.6	24.2	24.1	0.185	0.189	

**10.4. W-CDMA Band IV**

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	
Head	Rel 99 RMC	0	Left Touch	1312	1712.4	23.7	23.6	0.768	0.786	11
				1413	1732.6	23.7	23.5	0.875	<b>0.916</b>	
				1513	1752.6	23.7	23.7	0.873	0.873	
			Left Tilt	1413	1732.6	23.7	23.5	0.237	0.248	
				Right Touch	1312	1712.4	23.7	23.6	0.883	
			1413		1732.6	23.7	23.5	0.864	0.905	
			1513		1752.6	23.7	23.7	0.806	0.806	
Right Tilt	1413	1732.6	23.7	23.5	0.205	0.215				
Body-worn & Hotspot	Rel 99 RMC	10	Rear	1312	1712.4	23.7	23.6	1.030	1.054	12
				1413	1732.6	23.7	23.5	1.100	1.152	
				1513	1752.6	23.7	23.7	1.210	1.210	
			Front	1312	1712.4	23.7	23.6	1.150	1.177	
				1413	1732.6	23.7	23.5	1.220	<b>1.277</b>	
				1513	1752.6	23.7	23.7	1.260	1.260	
Hotspot	Rel 99 RMC	10	Edge 3	1413	1732.6	23.7	23.5	0.724	0.758	
			Edge 4	1413	1732.6	23.7	23.5	0.556	0.582	

**10.5. W-CDMA Band II**

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	
Head	Rel 99 RMC	0	Left Touch	9262	1852.4	23.7	23.5	0.833	0.872	13
				9400	1880.0	23.7	23.3	0.872	0.956	
				9538	1907.6	23.7	23.4	0.900	<b>0.964</b>	
			Left Tilt	9400	1880.0	23.7	23.3	0.207	0.227	
			Right Touch	9400	1880.0	23.7	23.3	0.480	0.526	
			Right Tilt	9400	1880.0	23.7	23.3	0.282	0.309	
Body-worn & Hotspot	Rel 99 RMC	10	Rear	9262	1852.4	23.7	23.5	1.020	1.068	14
				9400	1880.0	23.7	23.3	0.949	1.041	
				9538	1907.6	23.7	23.4	0.980	1.050	
			Front	9262	1852.4	23.7	23.5	1.000	1.047	
				9400	1880.0	23.7	23.3	0.977	<b>1.071</b>	
				9538	1907.6	23.7	23.4	0.888	0.952	
Hotspot	Rel 99 RMC	10	Edge 3	9400	1880.0	23.7	23.3	0.380	0.417	
			Edge 4	9400	1880.0	23.7	23.3	0.456	0.500	

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

RF Exposure Conditions	Mode	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	0	Left Touch	18700	1860.0	1	0	23.7	23.6	0.823	0.842	15				
				18900	1880.0	1	0	23.7	23.3	0.955	<b>1.047</b>					
				50	0	22.7	22.3	0.628	0.689							
			19100	1900.0	1	0	23.7	23.7	0.817	0.817						
			Left Tilt	18900	1880.0	1	0	23.7	23.3	0.196	0.214					
				50	0	22.7	22.3	0.164	0.179							
			Right Touch	18900	1880.0	1	0	23.7	23.3	0.492	0.537					
				50	0	22.7	22.3	0.369	0.402							
			Right Tilt	18900	1880.0	1	0	23.7	23.3	0.266	0.290					
				50	0	22.7	22.3	0.230	0.251							
			Body-worn & Hotspot	QPSK	10	Rear	18700	1860.0	1	0	23.7		23.6	1.100	1.129	16
							50	0	22.7	22.4	0.890		0.962			
18900	1880.0	1					0	23.7	23.3	1.090	<b>1.189</b>					
50	0	22.7					22.3	0.849	0.925							
100	0	22.7					22.2	0.816	0.908							
19100	1900.0	1					0	23.7	23.7	1.120	1.120					
Front	50	0				22.7	22.5	0.839	0.888							
	18700	1860.0				1	0	23.7	23.6	0.913	0.937					
	18900	1880.0				1	0	23.7	23.3	0.922	1.006					
	50	0				22.7	22.3	0.692	0.754							
	19100	1900.0				1	0	23.7	23.7	0.952	0.952					
	50	0				22.7	22.3	0.530	0.578							
Hotspot	QPSK	10	Edge 3	18900	1880.0	1	0	23.7	23.3	0.530	0.578					
				50	0	22.7	22.3	0.379	0.413							
			Edge 4	18900	1880.0	1	0	23.7	23.3	0.496	0.541					
				50	0	22.7	22.3	0.366	0.399							



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

RF Exposure Conditions	Mode	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	0	Left Touch	20050	1720.0	1	49	23.7	23.6	0.745	0.762		
				20175	1732.5	1	49	23.7	23.7	0.963	0.963		
						50	0	22.7	22.3	0.643	0.705		
					20300	1745.0	1	49	23.7	23.7	0.854	0.854	
			Left Tilt	20175	1732.5	1	49	23.7	23.7	0.232	0.232		
						50	0	22.7	22.3	0.173	0.190		
			Right Touch	20050	1720.0	1	49	23.7	23.6	0.775	0.793		
				20175	1732.5	1	49	23.7	23.7	1.040	<b>1.040</b>	17	
						50	0	22.7	22.3	0.729	0.799		
					20300	1745.0	1	49	23.7	23.7	0.729	0.729	
			Right Tilt	20175	1732.5	1	49	23.7	23.7	0.223	0.223		
						50	0	22.7	22.3	0.195	0.214		
Body-worn & Hotspot	QPSK	10	Rear	20050	1720.0	1	49	23.7	23.6	0.945	0.967		
						50	0	22.7	22.3	0.761	0.834		
						100	0	22.7	22.3	0.766	0.840		
				20175	1732.5	1	49	23.7	23.7	1.180	<b>1.180</b>	18	
						50	0	22.7	22.3	0.800	0.877		
						20300	1745.0	1	49	23.7	23.7	1.160	1.160
			Front			50	25	22.7	22.6	0.847	0.867		
				20050	1720.0	1	49	23.7	23.6	1.120	1.146		
						50	0	22.7	22.3	0.822	0.901		
						100	0	22.7	22.3	0.812	0.890		
				20175	1732.5	1	49	23.7	23.7	1.140	1.140		
						50	0	22.7	22.3	0.854	0.936		
20300	1745.0	1	49			23.7	23.7	1.110	1.110				
		50	25	22.7	22.6	0.867	0.887						
Hotspot	QPSK	10	Edge 3	20175	1732.5	1	49	23.7	23.7	0.691	0.691		
						50	0	22.7	22.3	0.529	0.580		
			Edge 4	20175	1732.5	1	49	23.7	23.7	0.580	0.580		
						50	0	22.7	22.3	0.432	0.474		

### 10.8. LTE Band 12 (10MHz Bandwidth)

RF Exposure Conditions	Mode	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	0	Left Touch	23095	707.5	1	24	24.2	23.9	0.317	0.340		
						25	12	23.2	22.9	0.236	0.253		
			Left Tilt	23095	707.5	1	24	24.2	23.9	0.157	0.168		
						25	12	23.2	22.9	0.117	0.125		
			Right Touch	23095	707.5	1	24	24.2	23.9	0.424	<b>0.454</b>		19
						25	12	23.2	22.9	0.317	0.340		
			Right Tilt	23095	707.5	1	24	24.2	23.9	0.198	0.212		
						25	12	23.2	22.9	0.139	0.149		
Body-worn & Hotspot	QPSK	10	Rear	23060	704.0	1	49	24.2	23.8	0.764	0.838		
				23095	707.5	1	24	24.2	23.9	0.888	<b>0.952</b>	20	
						50	12	23.2	22.9	0.589	0.631		
			23130	711.0	25	24	24.2	23.9	0.754	0.808			
					23095	707.5	1	24	24.2	23.9	0.585	0.627	
							25	12	23.2	22.9	0.441	0.473	
Hotspot	QPSK	10	Edge 2	23095	707.5	1	24	24.2	23.9	0.148	0.159		
						25	12	23.2	22.9	0.102	0.109		
			Edge 3	23095	707.5	1	24	24.2	23.9	0.590	0.632		
						25	12	23.2	22.9	0.434	0.465		

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

Frequency Band	Mode	RF Exposure Conditions	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Notes	Plot No.
								Tune-up limit	Meas.	Meas.	Scaled		
2.4GHz	802.11b 1 Mbps	Head	0	Left Touch	6	2437.0	0.084						
				Left Tilt	6	2437.0	0.058						
				Right Touch	6	2437.0	0.193	17.0	16.4	0.150	<b>0.172</b>	1	21
				Right Tilt	6	2437.0	0.145						
		Body-worn & Hotspot & Wi-Fi Direct	10	Rear	6	2437.0	0.066	17.0	16.4	0.049	<b>0.056</b>	1	22
				Front	6	2437.0	0.035						
				Edge 1	6	2437.0	0.029						
				Edge 4	6	2437.0	0.050						

**Note(s):**

- Highest reported SAR is ≤ 0.4 W/kg. Therefore, further SAR measurements within this exposure condition are not required.

## 10.10. Bluetooth

### Standalone SAR Test Exclusion Considerations & Estimated SAR

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.

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.

### Body-worn Accessory Exposure Conditions

Max. tune-up tolerance limit		Min. test separation distance (mm)	Frequency (GHz)	SAR test exclusion Result*	Test Configuration	Estimated 1-g SAR (W/kg)
(dBm)	(mW)					
9.2	8	10	2.480	1.3	Rear/Front	0.175

### Conclusion:

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

## 11. SAR Measurement Variability

In accordance with published RF Exposure KDB 865664 D01 SAR measurement 100 MHz to 6 GHz. 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  $\geq 0.80$  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  $\geq 1.45$  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  $\geq 1.5$  W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)	Repeated Measured SAR (W/kg)	Largest to Smallest SAR Ratio
700	LTE Band 12	Body & Hotspot	Rear	Yes	0.888	0.846	1.05
850	GSM 850	Head	Right Touch	Yes	0.943	0.940	1.00
	WCDMA Band V	Head	Right Touch	No	0.710	N/A	N/A
1900	GSM 1900	Body (VoIP) & Hotspot	Rear	No	0.575	N/A	N/A
	WCDMA Band II	Body & Hotspot	Rear	No	1.080	1.020	1.06
	LTE Band 2	Body & Hotspot	Rear	Yes	1.120	1.070	1.05
1700	LTE Band 4	Body & Hotspot	Rear	No	1.180	1.100	1.07
	WCDMA Band IV	Body & Hotspot	Front	Yes	1.260	1.200	1.05
2400	Wi-Fi 802.11b/g/n	Head	Right Touch	No	0.150	N/A	N/A

### Note(s):

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.

## 12. Simultaneous Transmission SAR Analysis

### Simultaneous Transmission Condition

RF Exposure Condition	Item	Capable Transmit Configurations		
Head	1	GSM(Voice)	+	DTS
	2	GSM(GPRS/EDGE)	+	DTS
	3	W-CDMA	+	DTS
	4	LTE	+	DTS
Body-w orn	5	GSM(Voice)	+	DTS
	6	GSM(Voice)	+	BT
	7	GSM(GPRS/EDGE)	+	DTS
	8	GSM(GPRS/EDGE)	+	BT
	9	W-CDMA	+	DTS
	10	W-CDMA	+	BT
	11	LTE	+	DTS
	12	LTE	+	BT
Hotspot & Wi-Fi Direct	13	GSM(GPRS/EDGE)	+	DTS
	14	W-CDMA	+	DTS
	15	LTE	+	DTS

**Notes:**

1. Only DTS supports Hotspot.
2. GPRS/EDGE, W-CDMA, and LTE support Hotspot.
3. VoIP is supported in GPRS/EDGE, W-CDMA, and LTE.
4. DTS Radio cannot transmit simultaneously w ith Bluetooth Radio.

### 12.1. Sum of the SAR for WWAN & Wi-Fi & BT

RF Exposure conditions	① WWAN	② DTS	③ BT	① + ② WWAN +DTS		① + ③ WWAN +BT	
				∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)	∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Head	1047	0.172		1219	No		
Body-worn & Hotspot	1277	0.056	0.175	1.333	No	1452	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.

## **Appendixes**

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

**A\_15I19960v0 SAR Photos & Ant. Locations**

**B\_15I19960v0 SAR Highest Test Plots**

**C\_15I19960v0 SAR System Check Plots**

**D\_15I19960v0 SAR Tissue Ingredients**

**E\_15I19960v0 SAR Probe Cal. Certificates**

**F\_15I19960v0 SAR Dipole Cal. Certificates**

**END OF REPORT**