



**FCC 47 CFR Parts 1 & 2  
Published RF Exposure KDB Procedures  
IEEE Std 1528-2013**

**SAR EVALUATION REPORT**

*For*  
**GSM/CDMA/WCDMA/LTE Phone + Bluetooth, DTS/UNII a/b/g/n/ac and NFC**

**Model: LG-LS990, LS990, LGLS990  
FCC ID: ZNFLS990**

**Report Number: 14U17501-S7  
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**NVLAP LAB CODE 200065-0**

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# 1. Attestation of Test Results

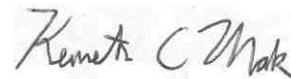
Applicant	LG ELECTRONICS MOBILECOMM U.S.A., INC.			
DUT description	GSM/CDMA/WCDMA/LTE Phone + Bluetooth, DTS/UNII a/b/g/n/ac and NFC			
Model	LG-LS990, LS990, LGLS990			
Test device is	An identical prototype			
Device category	Portable			
Exposure category	General Population/Uncontrolled Exposure			
Date tested	4/8/2014 – 5/14/2014			
The highest reported SAR values	RF exposure condition	Licensed	DTS	UNII
	Head	0.561 W/kg	0.703 W/kg	0.620 W/kg
	Body-worn Accessory	1.115 W/kg	0.286 W/kg	0.307 W/kg
	Wireless Router (Hotspot)	1.115 W/kg	0.251 W/kg	N/A
	Wi-Fi Direct	N/A	0.286 W/kg	N/A
	Simultaneous Transmission	1.395 W/kg	1.395 W/kg	1.309 W/kg
Applicable Standards	FCC 47 CFR Parts 1 & 2 Published RF Exposure KDB Procedures, and TCB workshop updates IEEE Std 1528-2013			
Test Results	Pass			

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.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL 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.

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## 2. Test Methodology

The tests documented in this report were performed in accordance with FCC 47 CFR Parts 1 & 2, IEEE STD 1528-2013, the following FCC Published RF exposure KDB procedures, and TCB workshop updates:

- 447498 D01 General RF Exposure Guidance v05r02
- 648474 D03 Wireless Chargers Battery Cover v01r02
- 648474 D04 Handset SAR v01r02
- 941225 D01 SAR test for 3G devices v02
- 941225 D02 HSPA and 1x Advanced v02r02
- 941225 D03 SAR Test Reduction GSM GPRS EDGE v01
- 941225 D04 SAR for GSM E GPRS Dual Xfer Mode v01
- 941225 D05 SAR for LTE Devices v02r03
- 941225 D06 Hotspot Mode SAR v01r01
- 248227 D01 SAR Meas for 802 11abg v01r02
- 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03
- 865664 D02 SAR Reporting v01r01
- 690783 D01 SAR Listings on Grants v01r03

## 3. Facilities and Accreditation

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

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 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. Calibration and Uncertainty

### 4.1. Measuring Instrument Calibration

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.

#### Tissue Dielectric Properties

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Network Analyzer	Agilent	8753ES	MY40001647	7/11/2014
Dielectronic Probe kit	SPEAG	DAK-3.5	1082	9/10/2014
Dielectronic Probe kit	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	Control Company	4242	122529162	9/19/2014

#### System Performance Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Power Meter	HP	438A	2822A05684	10/10/2014
Power Sensor	HP	8481A	2237A31744	10/2/2014
Synthesized Signal Generator	HP	8665B	3438A00633	6/13/2014
Power Sensor	HP	8481A	2349A36506	9/30/2014
Directional coupler	Werlatone	C8060-102	2710	N/A
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1808939	N/A
DC Power Supply	AMETEK	XT15-4	1319A02778	N/A
E-Field Probe	SPEAG	EX3DV4	3885	9/18/2014
E-Field Probe	SPEAG	EX3DV4	3751	11/21/2014
E-Field Probe	SPEAG	EX3DV4	3749	1/29/2015
E-Field Probe	SPEAG	EX3DV4	3686	3/18/2015
E-Field Probe	SPEAG	EX3DV4	3990	4/15/2015
Data Acquisition Electronics	SPEAG	DAE3	500	5/28/2014
Data Acquisition Electronics	SPEAG	DAE4	1343	7/24/2014
Data Acquisition Electronics	SPEAG	DAE4	1352	9/11/2014
Data Acquisition Electronics	SPEAG	DAE4	1258	3/18/2015
Data Acquisition Electronics	SPEAG	DAE4	1434	4/14/2015
System Validation Dipole	SPEAG	D835V2	4d117	5/28/2014
System Validation Dipole	SPEAG	D1900V2	5d043	11/12/2014
System Validation Dipole	SPEAG	D2450V2	748	2/18/2015
System Validation Dipole	SPEAG	D2600V2	1036	3/12/2015
System Validation Dipole	SPEAG	D5GHzV2	1168	12/12/2014
System Validation Dipole	SPEAG	D5GHzV2	1003	2/26/2015

#### Others

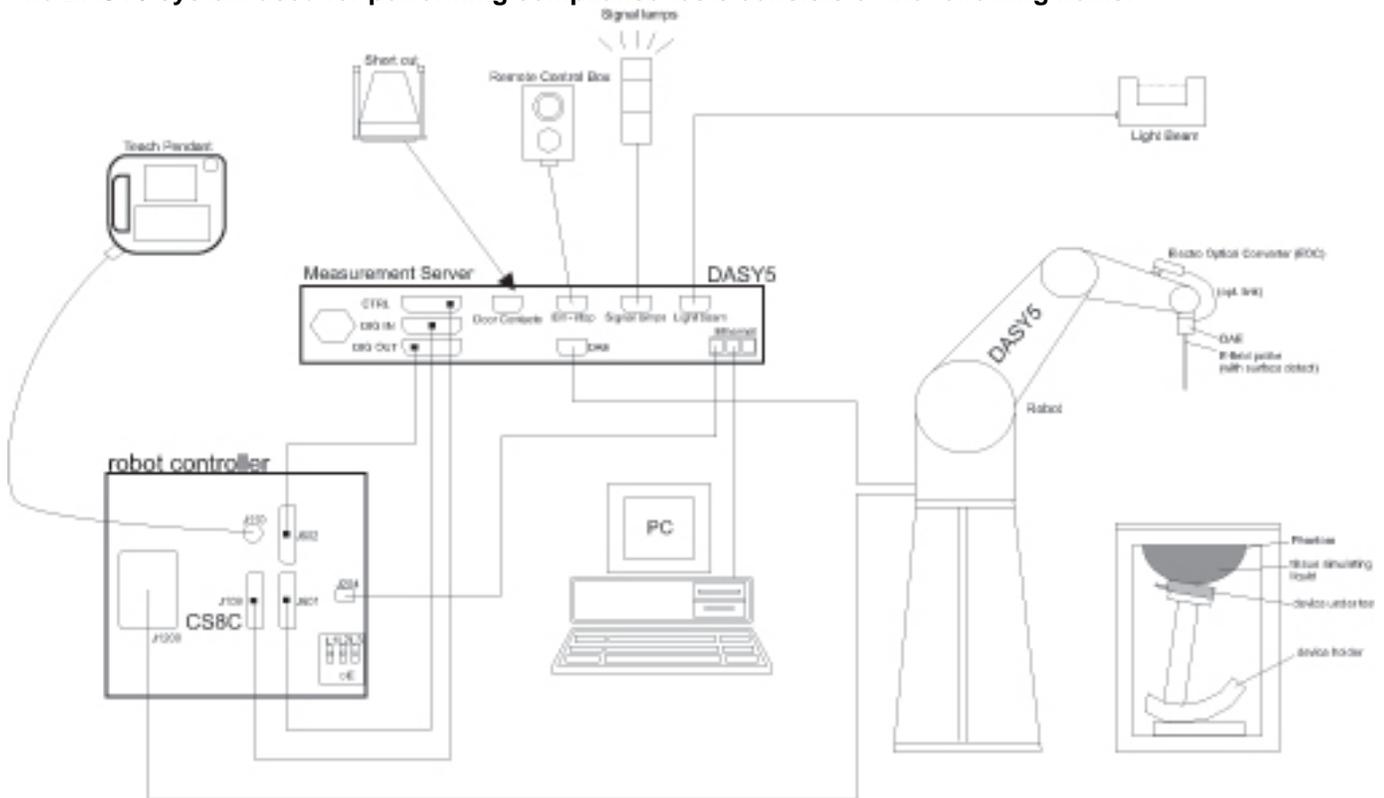
Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Power Sensor	Agilent	N1921A	MY52260009	12/12/2014
Power Meter	Agilent	N1912A	MY50001018	8/23/2014
Base Station Simulator	R & S	CMU200	118715	5/20/2014
Base Station Simulator	R & S	CMW500	103764-dn	8/16/2014
Base Station Simulator	R & S	CMW500	103766-ly	8/19/2014
Base Station Simulator	R & S	CMW500	107513-be	7/26/2014

### 4.2. 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.

## 5. Measurement System Description and Setup

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.

## 6. SAR Measurement Procedure

### 6.1. Normal SAR Measurement Procedure

#### Step 1: Power Reference Measurement

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

#### Step 2: Area Scan

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

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

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 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° ± 1°	20° ± 1°
Maximum area scan spatial resolution: $\Delta x_{Area}$ , $\Delta y_{Area}$	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 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 ≤ 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: $\Delta x_{Zoom}, \Delta y_{Zoom}$		$\leq 2$ 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: $\Delta z_{Zoom}(n)$	$\leq 5$ mm	3 – 4 GHz: $\leq 4$ mm 4 – 5 GHz: $\leq 3$ mm 5 – 6 GHz: $\leq 2$ mm	
	graded grid	$\Delta z_{Zoom}(1)$ : 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
		$\Delta z_{Zoom}(n>1)$ : between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
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.

## 6.2. Volume Scan Procedures

### Step 1: Repeat Step 1-4 in Section 6.1

#### Step 2: Volume Scan

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

#### Step 3: 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.

## 7. Device Under Test

### 7.1. General Information

Operating Configuration(s)	Held to head, Body-worn (Voice call)
Mobile 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 5.8 GHz)
Device dimension	Overall (Length x Width): 146.3 mm x 74.6 mm Overall Diagonal: 157.5 mm Display Diagonal: 140.0 mm
Back Cover	<input type="checkbox"/> Normal Battery Cover <input checked="" type="checkbox"/> Wireless Charger Battery Cover <input checked="" type="checkbox"/> Normal Battery Cover with NFC
Accessory	<input checked="" type="checkbox"/> Headset
Battery Options	<input checked="" type="checkbox"/> Standard – Lithium-ion battery, Rating 3.8Vdc, 3000mAh <input type="checkbox"/> Extended (large capacity)

## 7.2. Wireless Technologies

Wireless Technology and Frequency Bands	GSM: 850 / 1900 CDMA BC 0 / 1 / 10 W-CDMA Band: V / II LTE (FDD) Band: 25 / 26 LTE (TDD) Band: 41 Wi-Fi : 2.4 / 5 GHz Bluetooth: 2.4 GHz.
Mode	GSM - <input checked="" type="checkbox"/> Voice (GMSK) - <input checked="" type="checkbox"/> GPRS (GMSK) - <input checked="" type="checkbox"/> EGPRS (8PSK) CDMA2000 - <input checked="" type="checkbox"/> 1xRTT (Voice & Data) - <input checked="" type="checkbox"/> 1xEVDO Rel. 0 - <input checked="" type="checkbox"/> 1xEVDO Rev. A - <input checked="" type="checkbox"/> 1xAdvanced W-CDMA - <input checked="" type="checkbox"/> UMTS Rel. 99 (Voice & Data) - <input checked="" type="checkbox"/> HSDPA (Rel. 5) - <input checked="" type="checkbox"/> HSUPA (Rel. 6) - <input checked="" type="checkbox"/> HSPA+ (Rel. 7) LTE - <input checked="" type="checkbox"/> QPSK - <input checked="" type="checkbox"/> 16QAM Wi-Fi 2.4GHz (802.11b/g/n/ac) - <input checked="" type="checkbox"/> 802.11b - <input checked="" type="checkbox"/> 802.11g - <input checked="" type="checkbox"/> 802.11n (HT20) - <input checked="" type="checkbox"/> 802.11ac (HT20) Wi-Fi 5GHz (802.11a/n/ac) - <input checked="" type="checkbox"/> 802.11a - <input checked="" type="checkbox"/> 802.11n (HT20) - <input checked="" type="checkbox"/> 802.11n (HT40) - <input checked="" type="checkbox"/> 802.11ac (HT20) - <input checked="" type="checkbox"/> 802.11ac (HT40) - <input checked="" type="checkbox"/> 802.11ac (HT80) Bluetooth - <input checked="" type="checkbox"/> Version 4.0 LE
Duty Cycle (Used for SAR testing)	GSM Voice: 12.5%; GPRS 1 Slot: 12.5%; 2 Slots: 25% CDMA: 100% W-CDMA: 100% LTE (FDD): 100% LTE (TDD): 63.33% Wi-Fi 802.11a/b/g/n/ac: 100%
GPRS Multi-Slot Class	<input type="checkbox"/> Class 8 - One Up <input checked="" type="checkbox"/> Class 10 - Two Up <input type="checkbox"/> Class 12 - Four Up <input type="checkbox"/> Class 33 - Four Up
VoIP	<input checked="" type="checkbox"/> Supported

### 7.3. RF Output Power Tolerance

Upper limit (dB): 0.5 ~ -1.5		RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
GSM850	Voice	32.7	33.2
	GPRS 1 slot	32.7	33.2
	GPRS 2 slots	31.2	31.7
	EGPRS 1 slot	27.2	27.7
	EGPRS 2 slots	27.2	27.7
GSM1900	Voice	29.7	30.2
	GPRS 1 slot	29.7	30.2
	GPRS 2 slots	28.2	28.7
	EGPRS 1 slot	25.7	26.2
	EGPRS 2 slots	25.7	26.2
CDMA BC0	1xRTT	25.0	25.5
	1xEVDO Rel. 0	25.0	25.5
	1xEVDO Rev. A	25.0	25.5
	1xAdvanced	25.0	25.5
CDMA BC1	1xRTT	24.4	24.9
	1xEVDO Rel. 0	24.4	24.9
	1xEVDO Rev. A	24.4	24.9
	1xAdvanced	24.4	24.9
CDMA BC10	1xRTT	24.7	25.2
	1xEVDO Rel. 0	24.7	25.2
	1xEVDO Rev. A	24.7	25.2
	1xAdvanced	24.7	25.2
W-CDMA Band V	R99	23.2	23.7
	HSDPA	23.2	23.7
	HSUPA	23.2	23.7
W-CDMA Band II	R99	23.2	23.7
	HSDPA	23.2	23.7
	HSUPA	23.2	23.7
LTE Band 25	QPSK	23.2	23.7
LTE Band 26	QPSK	23.2	23.7
LTE Band 41	QPSK	23.7	24.2

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	17.0
	802.11g	13.0	14.0
	802.11n HT20	12.0	13.0
	802.11ac HT20	10.0	11.0
WiFi 5 GHz	802.11a	12.0	13.0
	802.11n HT20	11.0	12.0
	802.11n HT40	10.0	11.0
	802.11ac HT20	10.0	11.0
	802.11ac HT40	10.0	11.0
	802.11ac HT80	10.0	11.0

Upper limit (dB): 1.5		RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
Bluetooth		7.5	9.0

Upper limit (dB): 2.0		RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
Bluetooth LE		0.0	2.0

### 7.4. Simultaneous Transmission Condition

RF Exposure Condition	Capable Transmit Configurations				
Head	<ol style="list-style-type: none"> <li>GSM 850 / 1900 Voice + Wi-Fi 2.4 / 5GHz</li> <li>GSM 850 / 1900 (GPRS / EDGE) + Wi-Fi 2.4 / 5 GHz (VoIP)</li> <li>CDMA 1xRTT BC0 / BC1 / BC10+ Wi-Fi 2.4 / 5 GHz</li> <li>CDMA 1xEVDO BC0 / BC1 / BC10 + Wi-Fi 2.4 / 5 GHz (VoIP)</li> <li>WCDMA Band V / II + Wi-Fi 2.4 / 5 GHz</li> <li>LTE Band 25 / 26 / 41 + Wi-Fi 2.4 / 5 GHz</li> </ol>				
Body-worn Accessory	<ol style="list-style-type: none"> <li>GSM 850/1900 Voice + Wi-Fi 2.4 / 5 GHz</li> <li>GSM 850/1900 Voice + BT</li> <li>GSM 850/1900 (GPRS/EDGE) + Wi-Fi 2.4 / 5 GHz (VoIP)</li> <li>GSM 850/1900 (GPRS/EDGE) + BT(VoIP)</li> <li>CDMA 1xRTT BC0 / BC1 / BC10 + Wi-Fi 2.4 / 5 GHz</li> <li>CDMA 1xRTT BC0 / BC1 / BC10 + BT</li> <li>CDMA 1xEVDO BC0 / BC1 / BC10 + Wi-Fi 2.4 / 5 GHz (VoIP)</li> <li>CDMA 1xEVDO BC0 / BC1 / BC10 + BT (VoIP)</li> <li>WCDMA Band V/II + Wi-Fi 2.4 / 5 GHz</li> <li>WCDMA Band V/II + BT</li> <li>LTE Band 25 / 26 / 41 + Wi-Fi 2.4 / 5 GHz</li> <li>LTE Band 25 / 26 / 41 + BT</li> </ol>				
Wireless Router (Hotspot)	<ol style="list-style-type: none"> <li>GSM 850 / 1900 (GPRS / EDGE) + Wi-Fi 2.4 GHz</li> <li>CDMA 1xEVDO BC0 / BC1 / BC10 + Wi-Fi 2.4 GHz</li> <li>WCDMA Band V / II + Wi-Fi 2.4 GHz</li> <li>LTE Band 25 / 26 / 41 + Wi-Fi 2.4 GHz</li> </ol>				
Wi-Fi Direct	<ol style="list-style-type: none"> <li>GSM 850 / 1900 (GPRS / EDGE) + Wi-Fi 2.4 / 5.8 GHz (GO / GC)</li> <li>CDMA 1xEVDO BC0 / BC1 / BC10 + Wi-Fi 2.4 / 5.8 GHz (GO / GC)</li> <li>WCDMA Band V / II + Wi-Fi 2.4 / 5.8 GHz (GO / GC)</li> <li>LTE Band 25 / 26 / 41 + Wi-Fi 2.4 / 5.8 GHz (GO / GC)</li> </ol>				
<b>Notes:</b> <ol style="list-style-type: none"> <li>GPRS/EDGE, CDMA, W-CDMA, and LTE support VoIP and Hotspot.</li> <li>Wi-Fi 2.4 GHz supports Hotspot and Wi-Fi Direct</li> <li>Wi-Fi 5 GHz does not support Hotspot, but does support Wi-Fi Direct:           <table border="0" style="width: 100%; margin-left: 20px;"> <tr> <td style="width: 50%;">UNII I (5.2 GHz): Wi-Fi Direct GC is only supported (SAR Exclusion)</td> <td style="width: 50%;">UNII III (5.5 GHz): Wi-Fi Direct is not supported</td> </tr> <tr> <td>UNII II (5.3 GHz): Wi-Fi Direct is not supported</td> <td>UNII IV (5.8 GHz): Wi-Fi Direct GC and GO is supported</td> </tr> </table> </li> <li>Wi-Fi and Bluetooth cannot transmit simultaneously because they share the same chip.</li> </ol>		UNII I (5.2 GHz): Wi-Fi Direct GC is only supported (SAR Exclusion)	UNII III (5.5 GHz): Wi-Fi Direct is not supported	UNII II (5.3 GHz): Wi-Fi Direct is not supported	UNII IV (5.8 GHz): Wi-Fi Direct GC and GO is supported
UNII I (5.2 GHz): Wi-Fi Direct GC is only supported (SAR Exclusion)	UNII III (5.5 GHz): Wi-Fi Direct is not supported				
UNII II (5.3 GHz): Wi-Fi Direct is not supported	UNII IV (5.8 GHz): Wi-Fi Direct GC and GO is supported				

## 7.5. General LTE SAR Test and Reporting Considerations

Item	Description																																						
Frequency range, Channel Bandwidth, Numbers and Frequencies	<b>Band 25</b>																																						
	Tx: 1850 to 1915 MHz   Rx: 1930 to 1995 MHz																																						
	<b>Band 26</b>																																						
	Tx: 814 to 849 MHz   Rx: 859 to 894 MHz																																						
	<b>Band 41</b>																																						
	Tx: 2496 to 2690 MHz   Rx: 2496 to 2690 MHz																																						
	<b>Band 25</b>	<b>Channel Bandwidth</b>																																					
		20 MHz   15 MHz   10 MHz   5 MHz   3 MHz   1.4 MHz																																					
	Low	26090   26065   26055																																					
	Mid	26365   26365   26365																																					
	High	26640   26665   26675																																					
	<b>Band 26</b>	<b>Channel Bandwidth</b>																																					
		20 MHz   15 MHz   10 MHz   5 MHz   3 MHz   1.4 MHz																																					
	Low	26740   26715   26705   26697																																					
	Mid	26865   26865   26865   26865																																					
	High	26990   27015   27025   27033																																					
	<b>Band 41</b>	<b>Channel Bandwidth</b>																																					
		20 MHz   15 MHz   10 MHz   5 MHz   3 MHz   1.4 MHz																																					
	Low	39750   39725   39700																																					
	Low-Mid	40185   40173   40160																																					
Mid	40620   40620   40620																																						
Mid-High	41055   41068   41080																																						
High	41490   41515   41540																																						
LTE transmitter and antenna implementation	LTE has two TX/RX antennas and two Rx only antennas. Refer to Appendix "Antenna Locations and Separation Distances" for antenna locations																																						
Maximum power reduction (MPR)	<p><b>Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3</b></p> <table border="1"> <thead> <tr> <th rowspan="2">Modulation</th> <th colspan="6">Channel bandwidth / Transmission bandwidth (RB)</th> <th rowspan="2">MPR (dB)</th> </tr> <tr> <th>1.4 MHz</th> <th>3.0 MHz</th> <th>5 MHz</th> <th>10 MHz</th> <th>15 MHz</th> <th>20 MHz</th> </tr> </thead> <tbody> <tr> <td>QPSK</td> <td>&gt; 5</td> <td>&gt; 4</td> <td>&gt; 8</td> <td>&gt; 12</td> <td>&gt; 16</td> <td>&gt; 18</td> <td>≤ 1</td> </tr> <tr> <td>16 QAM</td> <td>≤ 5</td> <td>≤ 4</td> <td>≤ 8</td> <td>≤ 12</td> <td>≤ 16</td> <td>≤ 18</td> <td>≤ 1</td> </tr> <tr> <td>16 QAM</td> <td>&gt; 5</td> <td>&gt; 4</td> <td>&gt; 8</td> <td>&gt; 12</td> <td>&gt; 16</td> <td>&gt; 18</td> <td>≤ 2</td> </tr> </tbody> </table> <p>MPR Built-in by design                      A-MPR (additional MPR) was disabled during SAR testing</p>	Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1	16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1	16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)																																
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz																																	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1																																
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1																																
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2																																
Power reduction	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No																																						
Spectrum plots for RB configurations	A properly configured basestation 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.																																						

### 7.5.1. TDD LTE Considerations

According to KDB 941225 D05 SAR for LTE Devices, for Time-Division Duplex (TDD) systems, SAR must be tested using a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by the defined 3GPP LTE TDD configurations.

SAR was tested with the highest transmission duty factor (63.33%) using Uplink-downlink configuration 0 and Special subframe configuration 7.

LTE TDD Band 41 supports 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations and Table 4.2-1 for Special subframe configurations.

Table 4.2-1: Configuration of special subframe (lengths of DwPTS/GP/UpPTS).

Special subframe configuration	Normal cyclic prefix in downlink				Extended cyclic prefix in downlink		
	DwPTS	UpPTS		DwPTS	UpPTS		
		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink	
0	$6592 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$	$7680 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$	
1	$19760 \cdot T_s$			$20480 \cdot T_s$			
2	$21952 \cdot T_s$			$23040 \cdot T_s$			
3	$24144 \cdot T_s$			$25600 \cdot T_s$			
4	$26336 \cdot T_s$			$7680 \cdot T_s$			
5	$6592 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$	$20480 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$	
6	$19760 \cdot T_s$			$23040 \cdot T_s$			
7	$21952 \cdot T_s$			$12800 \cdot T_s$			
8	$24144 \cdot T_s$			-			
9	$13168 \cdot T_s$			-			

Table 4.2-2: Uplink-downlink configurations.

Uplink-downlink configuration	Downlink-to-Uplink Switch-point periodicity	Subframe number									
		0	1	2	3	4	5	6	7	8	9
0	5 ms	D	S	U	U	U	D	S	U	U	U
1	5 ms	D	S	U	U	D	D	S	U	U	D
2	5 ms	D	S	U	D	D	D	S	U	D	D
3	10 ms	D	S	U	U	U	D	D	D	D	D
4	10 ms	D	S	U	U	D	D	D	D	D	D
5	10 ms	D	S	U	D	D	D	D	D	D	D
6	5 ms	D	S	U	U	U	D	S	U	U	D

#### Calculated Duty Cycle

Uplink-Downlink Configuration	Downlink-to-Uplink Switch-point Periodicity	Subframe Number										Calculated Duty Cycle (%)
		0	1	2	3	4	5	6	7	8	9	
0	5 ms	D	S	U	U	U	D	S	U	U	U	63.33
1	5 ms	D	S	U	U	D	D	S	U	U	D	43.33
2	5 ms	D	S	U	D	D	D	S	U	D	D	23.33
3	10 ms	D	S	U	U	U	D	D	D	D	D	31.67
4	10 ms	D	S	U	U	D	D	D	D	D	D	21.67
5	10 ms	D	S	U	D	D	D	D	D	D	D	11.67
6	5 ms	D	S	U	U	U	D	S	U	U	D	53.33

Calculated Duty Cycle = Extended cyclic prefix in uplink x ( $T_s$ ) x # of S + # of U

Example for Calculated Duty Cycle for Uplink-Downlink Configuration 0:  
 Calculated Duty Cycle =  $5120 \times [1/(15000 \times 2048)] \times 2 + 6 \text{ ms} = 63.33\%$   
 where  
 $T_s = 1/(15000 \times 2048)$  seconds

## 8. RF Exposure Conditions

Refer to Appendix “Antenna Locations and Separation Distances” for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

### 8.1. Head Exposure Conditions

#### For WWAN, WLAN and Bluetooth

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

### 8.2. Body-worn Accessory Exposure Conditions

#### For GSM, CDMA, W-CDMA, LTE Band 25/26 (①)

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

#### For LTE Band 41(②)

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

#### For Wi-Fi/Bluetooth (③)

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

### 8.3. Hotspot Exposure Conditions

#### For GSM, CDMA, W-CDMA, LTE Band 25/26 (①)

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	
Edge 1 (Top)	134.8 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
Edge 2 (Right)	1.5 mm	Yes	
Edge 3 (Bottom)	1.5 mm	Yes	
Edge 4 (Left)	23.1 mm	Yes	

#### For LTE Band 41(②)

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	
Edge 1 (Top)	108.8 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
Edge 2 (Right)	53.1 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR
Edge 3 (Bottom)	1.5 mm	Yes	
Edge 4 (Left)	1.5 mm	Yes	

#### For Wi-Fi/Bluetooth (③)

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	
Edge 1 (Top)	1.5 mm	Yes	
Edge 2 (Right)	20.5 mm	Yes	
Edge 3 (Bottom)	111.8 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 648474 D04 Handset SAR
Edge 4 (Left)	37.5 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 648474 D04 Handset SAR

### 8.4. Wi-Fi Direct Exposure Conditions

#### For Wi-Fi (③)

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	
Edge 1 (Top)	1.5 mm	Yes	
Edge 2 (Right)	20.5 mm	Yes	
Edge 3 (Bottom)	111.8 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 648474 D04 Handset SAR
Edge 4 (Left)	37.5 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 648474 D04 Handset SAR

## 9. RF Output Power Measurement

### 9.1. GSM

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Burst Pwr (dBm)	Frame Pwr (dBm)	
850	GSM (Voice)	CS1	1	128	824.2	32.9	23.9	
				190	836.6	33.0	24.0	
				251	848.8	33.1	24.1	
	GPRS (GMSK)	CS1	1	1	128	824.2	32.9	23.9
					190	836.6	33.0	24.0
					251	848.8	33.1	24.1
			2	1	128	824.2	31.2	25.2
					190	836.6	31.2	25.2
					251	848.8	31.7	25.7
	EGPRS (8PSK)	MCS5	1	1	128	824.2	27.5	18.5
					190	836.6	27.5	18.5
					251	848.8	27.7	18.7
2			1	128	824.2	27.2	21.2	
				190	836.6	27.2	21.2	
				251	848.8	27.4	21.4	

#### 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 2 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

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Burst Pwr (dBm)	Frame Pwr (dBm)	
1900	GSM (Voice)	CS1	1	512	1850.2	30.2	21.2	
				661	1880.0	30.2	21.2	
				810	1909.8	30.0	21.0	
	GPRS (GMSK)	CS1	1	1	512	1850.2	30.1	21.1
					661	1880.0	30.2	21.2
					810	1909.8	30.0	21.0
			2	1	512	1850.2	28.7	22.7
					661	1880.0	28.6	22.6
					810	1909.8	28.5	22.5
	EGPRS (8PSK)	MCS5	1	1	512	1850.2	26.2	17.2
					661	1880.0	26.1	17.1
					810	1909.8	26.1	17.1
			2	1	512	1850.2	25.9	19.9
					661	1880.0	25.9	19.9
					810	1909.8	26.0	20.0

#### 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 2 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. CDMA

### 1xRTT Measured Results

Band	Mode	Ch	Freq. (MHz)	Avg Pwr (dBm)
BC 0	RC1 SO55 (Loopback)	1013	824.70	25.4
		384	836.52	24.5
		777	848.31	24.4
	RC3 SO55 (Loopback)	1013	824.70	25.4
		384	836.52	25.5
		777	848.31	25.5
	RC3 SO32 (+F-SCH)	1013	824.70	25.4
		384	836.52	25.5
		777	848.31	25.4
BC 1	RC1 SO55 (Loopback)	25	1851.25	24.9
		600	1880.00	24.9
		1175	1908.75	24.9
	RC3 SO55 (Loopback)	25	1851.25	24.8
		600	1880.00	24.8
		1175	1908.75	24.9
	RC3 SO32 (+F-SCH)	25	1851.25	24.8
		600	1880.00	24.8
		1175	1908.75	24.9
BC10	RC1, SO55 (Loopback)	476	817.90	25.2
		580	820.50	25.2
		684	823.10	25.2
	RC3, SO55 (Loopback)	476	817.90	25.2
		580	820.50	25.2
		684	823.10	25.2
	RC3, SO32 (+F-SCH)	476	817.90	25.2
		580	820.50	25.2
		684	823.10	25.2

### 1x Advanced Measured Results

Band	Mode	Ch	Freq. (MHz)	Avg Pwr (dBm)
BC 0	Fwd11/Rvs8 SO75 (Loopback)	1013	824.70	25.5
		384	836.52	25.5
		777	848.31	25.5
BC 1	Fwd11/Rvs8 SO75 (Loopback)	25	1851.25	24.9
		600	1880.00	24.9
		1175	1908.75	24.9
BC 10	Fwd11/Rvs8 SO75 (Loopback)	476	817.9	25.2
		580	820.5	25.2
		684	823.1	25.2

**1xEv-Do Rel. 0 Measured Results**

Band	FTAP Rate	RTAP Rate	Channel	Freq. (MHz)	Avg Pwr (dBm)
BC 0	307.2 kbps (2 slot, QPSK)	153.6 kbps	1013	824.70	25.4
			384	836.52	25.5
			777	848.31	25.5
BC1	307.2 kbps (2 slot, QPSK)	153.6 kbps	25	1851.25	24.8
			600	1880.00	24.8
			1175	1908.75	24.8
BC10	307.2 kbps (2 slot, QPSK)	153.6 kbps	476	817.90	25.2
			580	820.50	25.2
			684	823.10	25.2

**1xEv-Do Rev. A Measured Results**

Band	FETAP Traffic Format	RETAP Data Payload Size	Channel	Freq. (MHz)	Avg Pwr (dBm)
BC 0	307.2k, QPSK/ ACK channel is transmitted at all the slots	4096	1013	824.70	25.4
			384	836.52	25.4
			777	848.31	25.4
BC1	307.2k, QPSK/ ACK channel is transmitted at all the slots	4096	25	1851.25	24.8
			600	1880.00	24.8
			1175	1908.75	24.7
BC10	307.2k, QPSK/ ACK channel is transmitted at all the slots	4096	476	817.90	25.1
			580	820.50	25.1
			684	823.10	25.1

### 9.3. W-CDMA

#### Release 99

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 1
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	$\beta_c/\beta_d$	8/15

#### Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band V	Rel 99 (RMC, 12.2 kbps)	4132	826.4	23.7
		4183	836.6	23.6
		4233	846.6	23.7
W-CDMA Band II	Rel 99 (RMC, 12.2 kbps)	9262	1852.4	23.7
		9400	1880.0	23.6
		9538	1907.6	23.6

#### HSDPA

The following 4 Sub-tests were completed according to Release 5 / 6 procedures in section 5.2 of 3GPP TS34.121-1. 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-Set1			
	Power Control Algorithm	Algorithm 2			
	$\beta_c$	2/15	12/15	15/15	15/15
	$\beta_d$	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	$\beta_c/\beta_d$	2/15	12/15	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			
Ahs= $\beta_{hs}/\beta_c$	30/15				

**Measured Results**

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	23.6
		4183	836.6	23.6
		4233	846.6	23.7
	Subtest 2	4132	826.4	23.6
		4183	836.6	23.7
		4233	846.6	23.7
	Subtest 3	4132	826.4	23.1
		4183	836.6	23.2
		4233	846.6	23.2
	Subtest 4	4132	826.4	23.1
		4183	836.6	23.2
		4233	846.6	23.2
W-CDMA Band II	Subtest 1	9262	1852.4	23.7
		9400	1880.0	23.6
		9538	1907.6	23.6
	Subtest 2	9262	1852.4	23.7
		9400	1880.0	23.7
		9538	1907.6	23.7
	Subtest 3	9262	1852.4	23.2
		9400	1880.0	23.1
		9538	1907.6	23.2
	Subtest 4	9262	1852.4	23.1
		9400	1880.0	23.1
		9538	1907.6	23.2

Maximum output power levels that are possible for all subtests reported.

**HSPA (HSDPA & HSUPA)**

The following 5 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	HSPA				
	Subtest	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2kbps 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	11/15	15/9	2/15	15/0
	$\beta_{hs}$	22/15	12/15	30/15	4/15	5/15
	$\beta_{ed}$	1309/225	94/75	47/15 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 Channelisation Codes	2xSF2				SF4	

**Measured Results**

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	23.4
		4183	836.6	23.0
		4233	846.6	23.1
	Subtest 2	4132	826.4	21.7
		4183	836.6	22.0
		4233	846.6	22.1
	Subtest 3	4132	826.4	22.6
		4183	836.6	22.3
		4233	846.6	21.5
	Subtest 4	4132	826.4	22.1
		4183	836.6	22.3
		4233	846.6	22.4
	Subtest 5	4132	826.4	23.1
		4183	836.6	22.8
		4233	846.6	23.2
W-CDMA Band II	Subtest 1	9262	1852.4	23.2
		9400	1880.0	23.3
		9538	1907.6	23.5
	Subtest 2	9262	1852.4	22.2
		9400	1880.0	22.2
		9538	1907.6	22.3
	Subtest 3	9262	1852.4	22.3
		9400	1880.0	21.6
		9538	1907.6	22.6
	Subtest 4	9262	1852.4	22.4
		9400	1880.0	22.6
		9538	1907.6	22.3
	Subtest 5	9262	1852.4	23.3
		9400	1880.0	23.4
		9538	1907.6	23.6

### 9.4. LTE Band

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 25 Measured Results**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1855 MHz	1882.5 MHz	1910 MHz
LTE Band 25	10	QPSK	1	0	0	0	23.6	23.6	23.4
			1	25	0	0	23.7	23.5	23.4
			1	49	0	0	23.6	23.5	23.5
			25	0	1	1	22.6	22.6	22.4
			25	12	1	1	22.6	22.6	22.4
			25	25	1	1	22.6	22.6	22.4
			50	0	1	1	22.7	22.6	22.5
		16QAM	1	0	1	1	22.3	22.7	22.2
			1	25	1	1	22.4	22.7	22.2
			1	49	1	1	22.4	22.7	22.3
			25	0	2	2	21.6	21.5	21.6
			25	12	2	2	21.5	21.6	21.5
			25	25	2	2	21.5	21.6	21.5
			50	0	2	2	21.6	21.6	21.5
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1852.5 MHz	1882.5 MHz	1912.5 MHz
LTE Band 25	5	QPSK	1	0	0	0	23.4	23.6	23.4
			1	12	0	0	23.5	23.6	23.4
			1	24	0	0	23.5	23.6	23.5
			12	0	1	1	22.5	22.6	22.5
			12	7	1	1	22.6	22.5	22.5
			12	13	1	1	22.6	22.5	22.5
			25	0	1	1	22.6	22.6	22.5
		16QAM	1	0	1	1	22.2	22.5	22.3
			1	12	1	1	22.3	22.5	22.2
			1	24	1	1	22.4	22.6	22.4
			12	0	2	2	21.5	21.6	21.6
			12	7	2	2	21.6	21.6	21.6
			12	13	2	2	21.6	21.6	21.6
			25	0	2	2	21.6	21.5	21.6
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1851.5 MHz	1882.5 MHz	1913.5 MHz
LTE Band 25	3	QPSK	1	0	0	0	23.4	23.7	23.7
			1	8	0	0	23.5	23.6	23.7
			1	14	0	0	23.6	23.7	23.7
			8	0	1	1	22.5	22.6	22.6
			8	4	1	1	22.5	22.6	22.5
			8	7	1	1	22.6	22.7	22.6
			15	0	1	1	22.6	22.7	22.7
		16QAM	1	0	1	1	22.2	22.4	22.3
			1	8	1	1	22.2	22.3	22.3
			1	14	1	1	22.3	22.3	22.4
			8	0	2	2	21.5	21.5	21.6
			8	4	2	2	21.5	21.5	21.6
			8	7	2	2	21.6	21.5	21.6
			15	0	2	2	21.4	21.5	21.6

**LTE Band 26 Measured Results**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							819 MHz	831.5 MHz	844 MHz
LTE Band 26	10	QPSK	1	0	0	0	23.5	23.6	23.6
			1	25	0	0	23.5	23.6	23.5
			1	49	0	0	23.5	23.6	23.6
			25	0	1	1	22.7	22.6	22.6
			25	12	1	1	22.6	22.6	22.6
			25	25	1	1	22.6	22.6	22.5
			50	0	1	1	22.7	22.7	22.6
		16QAM	1	0	1	1	22.2	22.3	22.3
			1	25	1	1	22.3	22.3	22.2
			1	49	1	1	22.2	22.3	22.2
			25	0	2	2	21.7	21.5	21.6
			25	12	2	2	21.7	21.6	21.6
			25	25	2	2	21.7	21.5	21.5
			50	0	2	2	21.7	21.6	21.6
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
LTE Band 26	5	QPSK	1	0	0	0	23.5	23.5	23.5
			1	12	0	0	23.4	23.5	23.5
			1	24	0	0	23.6	23.5	23.5
			12	0	1	1	22.5	22.5	22.6
			12	7	1	1	22.6	22.6	22.5
			12	13	1	1	22.6	22.6	22.5
			25	0	1	1	22.6	22.6	22.5
		16QAM	1	0	1	1	22.4	22.2	22.4
			1	12	1	1	22.3	22.2	22.4
			1	24	1	1	22.5	22.2	22.4
			12	0	2	2	21.5	21.6	21.6
			12	7	2	2	21.6	21.5	21.5
			12	13	2	2	21.6	21.6	21.5
			25	0	2	2	21.5	21.6	21.5
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
LTE Band 26	3	QPSK	1	0	0	0	23.5	23.6	23.5
			1	8	0	0	23.5	23.5	23.5
			1	14	0	0	23.6	23.5	23.6
			8	0	1	1	22.6	22.5	22.5
			8	4	1	1	22.5	22.5	22.5
			8	7	1	1	22.6	22.6	22.5
			15	0	1	1	22.6	22.6	22.5
		16QAM	1	0	1	1	22.6	22.3	22.7
			1	8	1	1	22.6	22.2	22.6
			1	14	1	1	22.6	22.2	22.6
			8	0	2	2	21.6	21.5	21.5
			8	4	2	2	21.6	21.5	21.5
			8	7	2	2	21.6	21.5	21.5
			15	0	2	2	21.5	21.5	21.6

**LTE Band 26 Measured Results (continued)**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							814.7 MHz	831.5 MHz	848.3 MHz
LTE Band 26	1.4	QPSK	1	0	0	0	23.5	23.6	23.5
			1	2	0	0	23.5	23.5	23.5
			1	5	0	0	23.5	23.6	23.5
			3	0	0	0	23.5	23.5	23.6
			3	2	0	0	23.5	23.5	23.5
			3	3	0	0	23.4	23.6	23.5
			6	0	1	1	22.6	22.6	22.5
		16QAM	1	0	1	1	22.5	22.6	22.6
			1	2	1	1	22.5	22.5	22.6
			1	5	1	1	22.5	22.5	22.6
			3	0	1	1	22.4	22.4	22.4
			3	2	1	1	22.4	22.4	22.3
			3	3	1	1	22.4	22.4	22.3
			6	0	2	2	21.6	21.6	21.3

**LTE Band 41 Measured Results**

**Procedure used to establish SAR test signal for LTE TDD Band 41**

Set to CMW-500 with following parameters:

- Turn the LTE Signaling off using “ON | OFF” key
- Operating Band: Select Band 41 and TDD
- Go to “Config...”

**LTE Signaling 1 - X3.2.10.6**

**Connection Status**

Cell: **OFF**

Packet Switched: **OFF**

RRC State: **Idle**

**Event Log**

- 03:21:26 State 'Cell Off'
- 03:21:17 State 'Cell On'
- 03:21:16 Signaling Failure
- 03:21:13 Network Originated Detach
- 03:21:02 State 'Connection Established'
- 03:21:02 EPS Dedicated Bearer Established
- 03:20:57 State 'Attached'
- 03:20:57 EPS Default Bearer Established

**UE Info**

IMEI: ---

IMSI: ---

UE IPv4 Address [0]: ---

UE IPv6 Prefix [0]: ---

**Connection Setup**

Scheduling: **RMC**

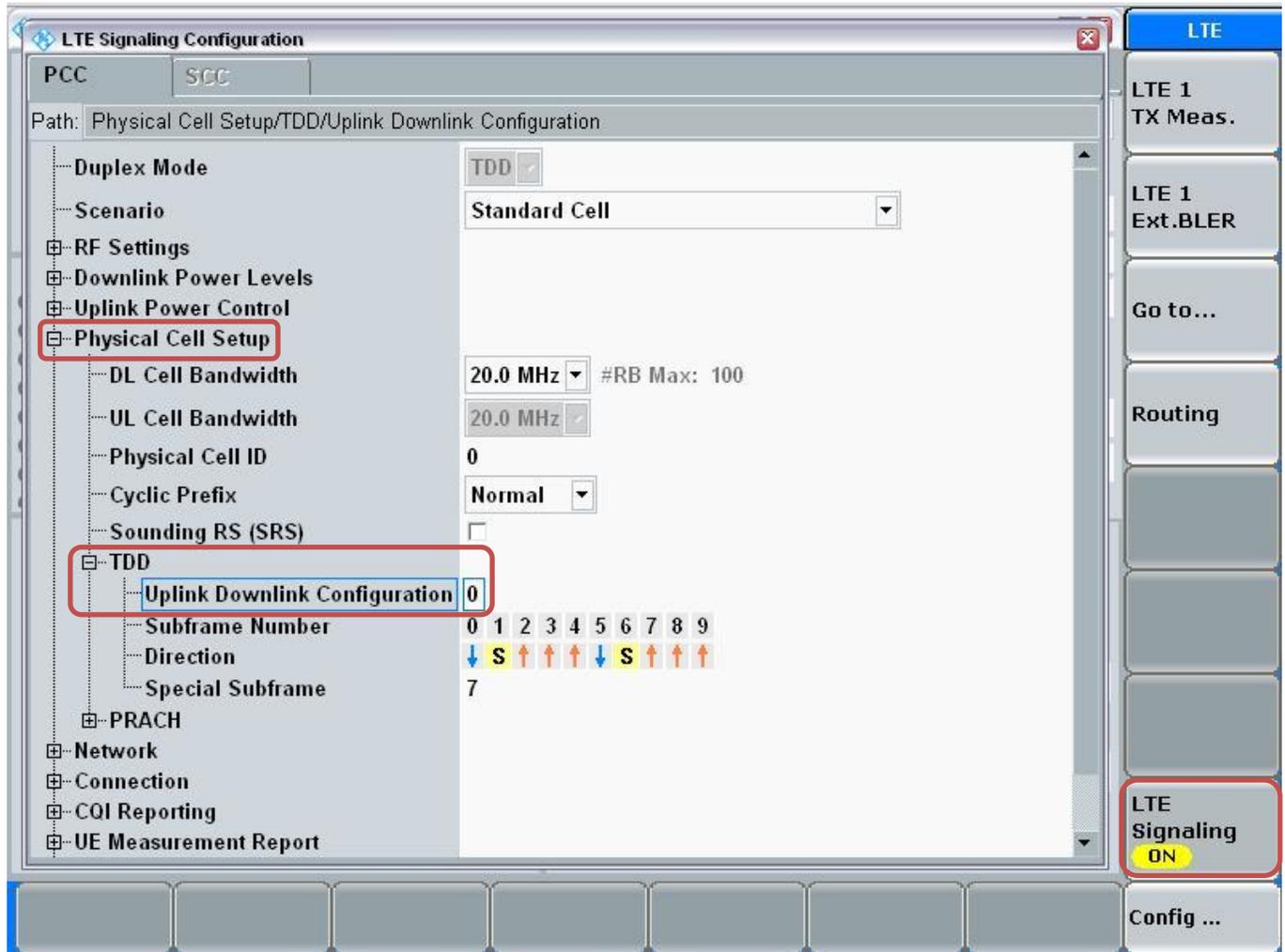
	Downlink	Uplink
Channel	40620 Ch	40620 Ch
Frequency	2593.0 MHz	2593.0 MHz
Cell Bandwidth	20.0 MHz	20.0 MHz
RS EPRE	-85.8 dBm/15kHz	
Full Cell BW Pow.	-55.0 dBm	
PUSCH Open Loop Nom.Power	23 dBm	
PUSCH Closed Loop Target Power	23.0 dBm	
# RB	100	100
RB Pos./Start RB	low 0	low 0
Modulation	QPSK	QPSK
TBS Idx / Value	5 8760	2 4584
Throughput	3.970 Mbit/s	1.834 Mbit/s

**LTE Signaling OFF**

**Config ...**

Go to "Physical Cell Setup"

- Select "TDD" and Set "Uplink Downlink Configuration" to "0"
- Turn the cell on using "ON | OFF" key



**Connect to EUT**

- Turn the cell on using “ON | OFF” key
- After EUT is Attached
- Select “Connect”

The screenshot displays the 'LTE Signaling 1 - X3.2.10.6' interface. On the left, the 'Connection Status' section shows the cell is 'Attached' and 'Connected'. Below this is an 'Event Log' with several entries, including 'State Attached' and 'EPS Default Bearer Established'. The 'UE Info' section lists IMEI, IMSI, and IP addresses. The main area is divided into 'PCC' and 'SCC' tabs, showing parameters like 'Operating Band', 'Channel', 'Frequency', and 'Power'. The 'Connection Setup' section at the bottom shows 'Scheduling RMC' and various modulation and throughput settings. On the right side, there is a vertical toolbar with buttons for 'LTE 1 TX Meas.', 'LTE 1 Ext.BLER', 'Go to...', 'Routing', and 'LTE Signaling ON' (which is highlighted with a red box). At the bottom, there are buttons for 'Detach', 'Connect' (highlighted with a red box), 'Send SMS', 'Handover ...', and 'Config ...'.

**Max Power Setting**

- Select "LTE 1 TX Meas."
- Press "RESTART | STOP" Soft key

The screenshot displays the 'LTE Signaling 1 - X3.2.10.6' interface. On the left, the 'Connection Status' section shows 'Cell' with a signal strength icon, 'Packet Switched' with a laptop icon, and 'RRC State' as 'Connected'. Below this is an 'Event Log' with several entries including 'State 'Connection Established'', 'EPS Dedicated Bearer Established', 'State 'Attached'', 'EPS Default Bearer Established', 'RRC Connection Established', 'State 'Cell On'', 'State 'Cell Off'', and 'State 'Cell On''. The 'UE Info' section lists IMEI (001027009999998), IMSI (001010123456789), UE IPv4 Address [0] (192.168.48.129), and UE IPv6 Prefix [0] (fc01:abab:cdcd:efe0::). The main area is divided into 'PCC' and 'SCC' tabs. The 'PCC' tab shows 'Operating Band' as 'Band 41', 'Channel' as '40620 Ch', 'Frequency' as '2593.0 MHz', 'Cell Bandwidth' as '20.0 MHz', and 'RS EPRE' as '-85.8 dBm/15kHz'. The 'SCC' tab shows 'Downlink' and 'Uplink' parameters: '# RB' (100), 'RB Pos./Start RB' (low), 'Modulation' (QPSK), 'TBS Idx / Value' (5/8760 and 2/4584), and 'Throughput' (3.970 Mbit/s and 1.834 Mbit/s). On the right side, there is a vertical menu with buttons: 'LTE', 'LTE 1 TX Meas.' (highlighted with a red box), 'LTE 1 Ext.BLER', 'Go to...', 'Routing', and 'LTE Signaling ON' (highlighted with a red box). At the bottom, there are buttons for 'Detach', 'Disconnect', 'Send SMS', 'Handover ...', and 'Config ...'.

Select "Signaling Parameter"

- Select "TX Power Control (TPC)" > Select "Active TPC Setup" to "Max Power" > Set "Closed Loop Target Power" to "23 dBm"

The screenshot displays the 'LTE Measurement - X3.2.10.6 - TX Measurement' software interface. The main window shows various measurement plots: EVM, Inband Emissions, Equalizer Spectrum Flatness, and Spectrum ACLR. A 'Signaling TPC' dialog box is open, showing the 'Active TPC Setup' dropdown set to 'Max Power' and the 'Closed Loop Target Power' set to '23.0 dBm'. The 'Signaling Parameter' button on the right sidebar is highlighted with a red box. The bottom of the interface features a toolbar with buttons for 'Cell Setup ...', 'Connection Setup ...', 'DL Error Insertion ...', 'TPC ...', 'Power ...', 'Enable ...', and 'Config ...'. The right sidebar contains buttons for 'LTE', 'Multi Evaluation RUN', 'RF Settings', 'Trigger', 'Display', 'Signaling Parameter', 'LTE Signaling ON', and 'Config ...'.

**View TX Power**

- Go to "Display"
- Select "Select View..."
- Select "Spectrum Emission Mask"

LTE Measurement - X3.2.10.6 - TX Measurement

Mode: TDD Freq.: 2593.0 MHz Ref. Level: 45.00 dBm Bandwidth: 20.0 MHz Cyclic Prefix: Normal Meas Subfr.: 0

**Spectrum Emission Mask**

dBm vs MHz graph showing Current power levels. The power is approximately -45 dBm outside the channel and rises to about -10 dBm within the channel.

Detected Allocation	NoRB:	100	OffsetRB:	0		
	Current		Average	Extreme	StdDev	
OBW	17.790 MHz		17.773 MHz	17.790 MHz	0.013 MHz	
	Current		Average	Min	Max	StdDev
TX Power	23.72 dBm		23.33 dBm	22.10 dBm	24.27 dBm	0.23 dBm

Statistic Count: 20/20 Out of Tolerance: 0.00% Detected Modulation: QPSK Detected Channel Type: PUSCH View Filter Throughput: 100.0%

Select View dropdown menu: SpectrumEmissionMask

Buttons: Select View ..., Margin On Off, Select Trace (SEM) ..., Y Scale (SEM) ..., X Scale (SEM) ..., Config ...

Right sidebar buttons: LTE, Multi Evaluation RUN, RF Settings, Trigger, Display (highlighted), Marker, Signaling Parameter, LTE Signaling ON, Config ...

**LTE Band 41 Measured Results (continued)**

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)				
							2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz
LTE Band 41	20	QPSK	1	0	0	0	24.0	23.9	24.2	24.1	24.2
			1	49	0	0	23.9	24.0	24.0	24.2	24.1
			1	99	0	0	23.9	24.1	24.0	24.2	24.0
			50	0	1	1	23.0	23.0	23.1	23.1	23.0
			50	24	1	1	23.1	23.0	23.1	23.2	22.8
			50	50	1	1	23.0	23.0	23.0	23.1	23.0
		16QAM	100	0	1	1	23.0	23.0	23.1	23.2	22.9
			1	0	1	1	22.8	22.6	22.5	22.4	22.7
			1	49	1	1	22.7	22.7	22.4	22.5	22.8
			1	99	1	1	22.7	22.8	22.4	22.5	22.7
			50	0	2	2	22.0	21.9	22.1	22.0	22.0
			50	24	2	2	22.0	21.9	22.0	22.2	21.9
			50	50	2	2	21.9	21.8	22.0	22.1	22.0
			100	0	2	2	22.0	21.9	22.0	22.0	21.9

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)				
							2503.5 MHz	2548.3 MHz	2593 MHz	2637.75 MHz	2682.5 MHz
LTE Band 41	15	QPSK	1	0	0	0	24.0	24.0	24.1	24.1	23.9
			1	37	0	0	24.0	24.0	24.0	24.0	23.8
			1	74	0	0	23.9	24.0	24.1	24.1	23.8
			36	0	1	1	23.0	23.0	23.2	23.1	22.9
			36	20	1	1	23.0	23.0	23.0	23.2	22.9
			36	39	1	1	23.1	23.0	23.0	23.1	23.0
		16QAM	75	0	1	1	23.0	23.0	23.1	23.1	22.9
			1	0	1	1	23.1	22.7	23.0	23.0	22.8
			1	37	1	1	23.0	22.7	22.8	23.0	22.8
			1	74	1	1	23.1	22.7	22.8	23.0	22.7
			36	0	2	2	21.8	21.9	22.1	22.0	21.8
			36	20	2	2	21.8	21.8	22.0	22.0	21.8
			36	39	2	2	21.8	21.9	22.0	22.0	21.9
			75	0	2	2	21.9	21.9	22.0	22.1	21.9

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)				
							2501 MHz	2547 MHz	2593 MHz	2639 MHz	2685 MHz
LTE Band 41	10	QPSK	1	0	0	0	24.0	23.9	24.2	24.1	23.9
			1	25	0	0	23.9	23.9	24.1	24.2	23.8
			1	49	0	0	23.9	23.9	24.0	24.2	23.7
			25	0	1	1	23.0	23.0	23.2	23.2	22.9
			25	12	1	1	23.0	23.0	23.0	23.2	23.0
			25	25	1	1	23.0	23.0	23.1	23.1	23.0
			50	0	1	1	23.1	23.0	23.0	23.1	23.0
		16QAM	1	0	1	1	23.1	23.0	22.8	22.8	22.3
			1	25	1	1	23.0	23.0	22.8	22.9	22.3
			1	49	1	1	23.0	23.0	22.8	22.8	22.4
			25	0	2	2	21.9	21.9	22.0	22.0	21.9
			25	12	2	2	22.0	21.8	21.8	22.0	22.0
			25	25	2	2	21.9	21.9	21.8	22.0	21.9
			50	0	2	2	21.9	21.8	21.9	22.1	22.1

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

Required Test Channels per KDB 248227 D01

Mode	Band	GHz	Channel	"Default Test Channels"	
				802.11b	802.11g
802.11b/g	2.4 GHz	2.412	1 <sup>#</sup>	√	∇
		2.437	6	√	∇
		2.462	11 <sup>#</sup>	√	∇

**Notes:**

√ = "default test channels"

∇ = possible 802.11g channels with maximum average output ¼ dB ≥ the "default test channels"

<sup>#</sup> = when output power is reduced for channel 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.

#### Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)	SAR Test (Yes/No)
2.4 (DTS)	802.11b	1 Mbps	1	2412	17.0	Yes
			6	2437	16.9	
			11	2462	17.0	
	802.11g	6 Mbps	1	2412	13.0	No
			6	2437	12.9	
			11	2462	13.0	
	802.11n (HT20)	MCS0	1	2412	12.7	No
			6	2437	12.8	
			11	2462	12.9	
	802.11ac (HT20)	MCS0	1	2412	10.8	Yes
			6	2437	10.9	
			11	2462	10.9	

**Note(s):**

Per KDB 248227 D01, SAR is not required for 802.11g/n (HT20) channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels.

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

Mode	Ch #	Freq. (MHz)	Data Rate	Avg Pwr (dBm)	SAR test (Yes/No)
802.11b	6	2437	1 Mbps	16.9	Yes
			2 Mbps	16.8	No
			5.5 Mbps	16.8	No
			11 Mbps	16.8	No

### 9.6. Wi-Fi (5 GHz Bands)

#### Required Test Channels per KDB 248227 D01

Mode		Band	GHz	Channel	"Default Test Channels"	
					802.11a	
802.11a	UNII (15.407)	5.2 GHz	5.180	36	√	
			5.200	40		*
			2.220	44		*
			5.240	48	√	
		5.3 GHz	5.260	52	√	
			5.280	56		*
			5.300	60		*
			5.320	64	√	
		5.5 GHz	5.500	100		
			5.520	104	√	
			5.540	108		*
			5.560	112		*
	5.580		116	√		
	5.600		120		*	
	5.620		124	√		
	5.640		128		*	
	5.8 GHz	5.660	132		*	
		5.680	136	√		
		5.700	140		*	
		5.745	149	√		
DTS (15.247)	5.8 GHz	5.765	153		*	
		5.785	157	√		
		5.805	161		*	
		5.825	165	√		

√ = "default test channels"

\* = possible 802.11a channels with maximum average output > the "default test channels"

# = when output power is reduced for channel 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested.

**Measured Results**

Band (GHz)	Mode	Mode	Ch #	Freq. (MHz)	Avg Pwr (dBm)	SAR Test (Yes/No)
5.2 (UNII)	802.11a	6 Mbps	36	5180	12.5	Yes
			40	5200	12.5	
			44	5220	12.4	
			48	5240	12.5	
	802.11n (HT20)	MCS0	36	5180	11.5	No
			40	5200	11.5	
			44	5220	11.5	
			48	5240	11.6	
	802.11n (HT40)	MCS0	38	5190	10.8	No
			46	5230	10.8	
	802.11ac (20MHz)	MCS0	36	5180	10.5	Yes
			40	5200	10.6	
			44	5220	10.5	
			48	5240	10.5	
802.11ac (40MHz)	MCS0	38	5190	10.8	No	
		46	5230	10.6		
802.11ac (80MHz)	MCS0	42	5210	10.6	No	
5.3 (UNII)	802.11a	6 Mbps	52	5260	12.6	Yes
			56	5280	12.6	
			60	5300	12.6	
			64	5320	12.7	
	802.11n (HT20)	MCS0	52	5260	11.5	No
			56	5280	11.5	
			60	5300	11.6	
			64	5320	11.6	
	802.11n (HT40)	MCS0	54	5270	10.7	No
			62	5310	10.7	
	802.11ac (20MHz)	MCS0	52	5260	10.8	Yes
			56	5280	10.8	
			60	5300	10.8	
			64	5320	10.8	
802.11ac (40MHz)	MCS0	54	5270	10.7	No	
		62	5310	10.8		
802.11ac (80MHz)	MCS0	58	5290	10.7	No	

**Note(s):**

Per KDB 248227, SAR is not required for 802.11n (HT20/HT40) and 802.11ac (HT40/HT80) channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a channels.

**Measured Results (continued)**

Band (GHz)	Mode	Mode	Ch #	Freq. (MHz)	Avg Pwr (dBm)	SAR Test (Yes/No)
5.5 (UNII)	802.11a	6 Mbps	100	5500	12.4	Yes
			104	5520	12.3	
			108	5540	12.3	
			112	5560	12.4	
			116	5580	12.4	
			120	5600	Not Supported	
			124	5620	Not Supported	
			128	5640	Not Supported	
			132	5660	12.4	
			136	5680	12.3	
	140	5700	12.3			
	802.11n (HT20)	MCS0	100	5500	11.2	No
			104	5520	11.2	
			108	5540	11.2	
			112	5560	11.3	
			116	5580	11.3	
			120	5600	Not Supported	
			124	5620	Not Supported	
			128	5640	Not Supported	
			132	5660	11.3	
			136	5680	11.2	
	140	5700	11.2			
	802.11n (HT40)	MCS0	102	5510	10.5	No
			110	5550	10.5	
			134	5670	10.5	
	802.11ac (20MHz)	MCS0	100	5500	10.3	Yes
			104	5520	10.3	
			108	5540	10.3	
			112	5560	10.3	
			116	5580	10.3	
			132	5660	10.3	
			136	5680	10.3	
			140	5700	10.2	
	144	5720	10.2			
	802.11ac (40MHz)	MCS0	102	5510	10.6	No
			110	5550	10.6	
142			5710	10.5		
802.11ac (80MHz)	MCS0	106	5530	11.0	No	
		138	5690	11.0		

**Note(s):**

Per KDB 248227, SAR is not required for 802.11n (HT20/HT40) and 802.11ac (HT40/HT80) channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a channels.

**Measured Results (continued)**

Band (GHz)	Mode	Mode	Ch #	Freq. (MHz)	Avg Pwr (dBm)	SAR Test (Yes/No)
5.8 (DTS)	802.11a	6 Mbps	149	5745	12.3	Yes
			153	5765	12.3	
			157	5785	12.2	
			161	5805	12.2	
			165	5825	12.1	
	802.11n (HT20)	MCS0	149	5745	11.1	No
			153	5765	11.1	
			157	5785	11.0	
			161	5805	11.0	
			165	5825	11.0	
	802.11n (HT40)	MCS0	151	5755	10.3	No
			159	5795	10.3	
	802.11ac (20MHz)	MCS0	149	5745	11.0	Yes
			153	5765	11.0	
			157	5785	11.0	
			161	5805	11.0	
			165	5825	10.9	
802.11ac (40MHz)	MCS0	151	5755	10.3	No	
		159	5795	10.2		
802.11ac (80MHz)	MCS0	155	5775	11.0	No	

**Note(s):**

Per KDB 248227, SAR is not required for 802.11n (HT20/HT40) and 802.11ac (HT40/HT80) channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11a channels.

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

Band	Mode	Ch #	Freq. (MHz)	Data Rate	Avg Pwr (dBm)	SAR test (Yes/No)
5.2 GHz (UNII)	802.11a	36	5180	6 Mbps	12.5	Yes
				9 Mbps	12.4	No
				12 Mbps	12.4	No
				18 Mbps	12.4	No
				24 Mbps	12.4	No
				36 Mbps	12.4	No
				48 Mbps	12.4	No
54 Mbps	12.4	No				
5.3 GHz (UNII)	802.11a	64	5320	6 Mbps	12.6	Yes
				9 Mbps	12.5	No
				12 Mbps	12.5	No
				18 Mbps	12.5	No
				24 Mbps	12.5	No
				36 Mbps	12.5	No
				48 Mbps	12.5	No
54 Mbps	12.5	No				
5.5 GHz (UNII)	802.11a	116	5580	6 Mbps	12.4	Yes
				9 Mbps	12.3	No
				12 Mbps	12.3	No
				18 Mbps	12.3	No
				24 Mbps	12.3	No
				36 Mbps	12.3	No
				48 Mbps	12.3	No
54 Mbps	12.3	No				
5.8 GHz (DTS)	802.11a	149	5745	6 Mbps	12.3	Yes
				9 Mbps	12.2	No
				12 Mbps	12.2	No
				18 Mbps	12.2	No
				24 Mbps	12.2	No
				36 Mbps	12.2	No
				48 Mbps	12.2	No
54 Mbps	12.2	No				

## 9.7. Bluetooth

Maximum tune-up tolerance limit is 9.0 dBm from the rated nominal maximum output power. This power level qualifies for exclusion of SAR testing.

## 10. Tissue Dielectric Properties

### IEEE Std 1528-2013

Target Frequency (MHz)	Head	
	$\epsilon_r$	$\sigma$ (S/m)
300	45.3	0.87
450	43.5	0.87
750	41.9	0.89
835	41.5	0.90
900	41.5	0.97
1450	40.5	1.20
1500	40.4	1.23
1640	40.2	1.31
1750	40.1	1.37
1800	40.0	1.40
1900	40.0	1.40
2000	40.0	1.40
2100	39.8	1.49
2300	39.5	1.67
2450	39.2	1.80
2600	39.0	1.96
3000	38.5	2.40
3500	37.9	2.91
4000	37.4	3.43
4500	36.8	3.94
5000	36.2	4.45
5200	36.0	4.66
5400	35.8	4.86
5600	35.5	5.07
5800	35.3	5.27
6000	35.1	5.48

NOTE—For convenience, permittivity and conductivity values at some frequencies that are not part of the original data from Drossos et al. [B60] or the extension to 5800 MHz are provided (i.e., the values shown in italics). These values were linearly interpolated between the values in this table that are immediately above and below these values, except the values at 6000 MHz that were linearly extrapolated from the values at 3000 MHz and 5800 MHz.

### 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

## 10.1. Composition of Ingredients for the Tissue Material Used in the SAR Tests

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

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

Salt: 99+% Pure Sodium Chloride

Sugar: 98+% Pure Sucrose

Water: De-ionized, 16 MΩ+ resistivity

HEC: Hydroxyethyl Cellulose

DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]

Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

### Simulating Liquids for 5 GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	78
Mineral oil	11
Emulsifiers	9
Additives and Salt	2

## 10.2. Tissue Dielectric Parameter Check 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.

### SAR Lab B

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
4/9/2014	Body 835	e'	53.6700	Relative Permittivity ( $\epsilon_r$ ):	53.67	55.20	-2.77	5
		e"	21.6800	Conductivity ( $\sigma$ ):	1.01	0.97	3.77	5
	Body 820	e'	53.8300	Relative Permittivity ( $\epsilon_r$ ):	53.83	55.28	-2.62	5
		e"	21.6800	Conductivity ( $\sigma$ ):	0.99	0.97	2.07	5
	Body 850	e'	53.4900	Relative Permittivity ( $\epsilon_r$ ):	53.49	55.16	-3.02	5
		e"	21.6200	Conductivity ( $\sigma$ ):	1.02	0.99	3.51	5
4/15/2014	Head 835	e'	41.4000	Relative Permittivity ( $\epsilon_r$ ):	41.40	41.50	-0.24	5
		e"	19.5100	Conductivity ( $\sigma$ ):	0.91	0.90	0.65	5
	Head 820	e'	41.6000	Relative Permittivity ( $\epsilon_r$ ):	41.60	41.60	-0.01	5
		e"	19.5500	Conductivity ( $\sigma$ ):	0.89	0.90	-0.79	5
	Head 850	e'	41.2100	Relative Permittivity ( $\epsilon_r$ ):	41.21	41.50	-0.70	5
		e"	19.4900	Conductivity ( $\sigma$ ):	0.92	0.92	0.67	5
4/15/2014	Body 835	e'	52.9800	Relative Permittivity ( $\epsilon_r$ ):	52.98	55.20	-4.02	5
		e"	21.4900	Conductivity ( $\sigma$ ):	1.00	0.97	2.86	5
	Body 820	e'	53.1700	Relative Permittivity ( $\epsilon_r$ ):	53.17	55.28	-3.81	5
		e"	21.5600	Conductivity ( $\sigma$ ):	0.98	0.97	1.50	5
	Body 850	e'	52.8600	Relative Permittivity ( $\epsilon_r$ ):	52.86	55.16	-4.16	5
		e"	21.4200	Conductivity ( $\sigma$ ):	1.01	0.99	2.56	5
5/5/2014	Body 5180	e'	47.4800	Relative Permittivity ( $\epsilon_r$ ):	47.48	49.05	-3.19	5
		e"	18.4000	Conductivity ( $\sigma$ ):	5.30	5.27	0.54	5
	Body 5200	e'	47.9000	Relative Permittivity ( $\epsilon_r$ ):	47.90	49.02	-2.28	5
		e"	18.4300	Conductivity ( $\sigma$ ):	5.33	5.29	0.64	5
	Body 5600	e'	47.2600	Relative Permittivity ( $\epsilon_r$ ):	47.26	48.48	-2.51	5
		e"	18.7700	Conductivity ( $\sigma$ ):	5.84	5.76	1.45	5
	Body 5800	e'	46.9600	Relative Permittivity ( $\epsilon_r$ ):	46.96	48.20	-2.57	5
		e"	18.9900	Conductivity ( $\sigma$ ):	6.12	6.00	2.07	5
	Body 5825	e'	46.8900	Relative Permittivity ( $\epsilon_r$ ):	46.89	48.20	-2.72	5
		e"	19.0400	Conductivity ( $\sigma$ ):	6.17	6.00	2.78	5
5/5/2014	Head 5180	e'	37.1500	Relative Permittivity ( $\epsilon_r$ ):	37.15	36.01	3.16	5
		e"	15.6700	Conductivity ( $\sigma$ ):	4.51	4.63	-2.53	5
	Head 5200	e'	37.1200	Relative Permittivity ( $\epsilon_r$ ):	37.12	35.99	3.14	5
		e"	15.7200	Conductivity ( $\sigma$ ):	4.55	4.65	-2.27	5
	Head 5600	e'	36.5800	Relative Permittivity ( $\epsilon_r$ ):	36.58	35.53	2.94	5
		e"	15.9300	Conductivity ( $\sigma$ ):	4.96	5.06	-1.98	5
	Head 5800	e'	36.3100	Relative Permittivity ( $\epsilon_r$ ):	36.31	35.30	2.86	5
		e"	16.0500	Conductivity ( $\sigma$ ):	5.18	5.27	-1.78	5
	Head 5825	e'	36.2600	Relative Permittivity ( $\epsilon_r$ ):	36.26	35.30	2.72	5
		e"	16.0800	Conductivity ( $\sigma$ ):	5.21	5.27	-1.17	5

**SAR Lab B (continued)**

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
5/12/2014	Body 5180	e'	50.7800	Relative Permittivity ( $\epsilon_r$ ):	50.78	49.05	3.53	5
		e"	18.2600	Conductivity ( $\sigma$ ):	5.26	5.27	-0.23	5
	Body 5200	e'	50.9400	Relative Permittivity ( $\epsilon_r$ ):	50.94	49.02	3.92	5
		e"	18.4500	Conductivity ( $\sigma$ ):	5.33	5.29	0.75	5
	Body 5600	e'	50.4600	Relative Permittivity ( $\epsilon_r$ ):	50.46	48.48	4.09	5
		e"	18.8400	Conductivity ( $\sigma$ ):	5.87	5.76	1.83	5
	Body 5800	e'	49.9000	Relative Permittivity ( $\epsilon_r$ ):	49.90	48.20	3.53	5
		e"	18.8300	Conductivity ( $\sigma$ ):	6.07	6.00	1.21	5
	Body 5825	e'	49.9800	Relative Permittivity ( $\epsilon_r$ ):	49.98	48.20	3.69	5
		e"	19.0500	Conductivity ( $\sigma$ ):	6.17	6.00	2.83	5

**SAR Lab C**

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
4/8/2014	Body 1900	e'	51.8000	Relative Permittivity ( $\epsilon_r$ ):	51.80	53.30	-2.81	5
		e"	14.1100	Conductivity ( $\sigma$ ):	1.49	1.52	-1.93	5
	Body 1850	e'	51.8600	Relative Permittivity ( $\epsilon_r$ ):	51.86	53.30	-2.70	5
		e"	14.0700	Conductivity ( $\sigma$ ):	1.45	1.52	-4.78	5
	Body 1910	e'	51.7600	Relative Permittivity ( $\epsilon_r$ ):	51.76	53.30	-2.89	5
		e"	14.1200	Conductivity ( $\sigma$ ):	1.50	1.52	-1.34	5
4/15/2014	Head 1900	e'	40.0800	Relative Permittivity ( $\epsilon_r$ ):	40.08	40.00	0.20	5
		e"	13.8500	Conductivity ( $\sigma$ ):	1.46	1.40	4.51	5
	Head 1850	e'	40.3300	Relative Permittivity ( $\epsilon_r$ ):	40.33	40.00	0.82	5
		e"	13.4900	Conductivity ( $\sigma$ ):	1.39	1.40	-0.88	5
	Head 1910	e'	40.1300	Relative Permittivity ( $\epsilon_r$ ):	40.13	40.00	0.33	5
		e"	13.8300	Conductivity ( $\sigma$ ):	1.47	1.40	4.91	5
4/19/2014	Body 1900	e'	51.2500	Relative Permittivity ( $\epsilon_r$ ):	51.25	53.30	-3.85	5
		e"	14.2500	Conductivity ( $\sigma$ ):	1.51	1.52	-0.96	5
	Body 1850	e'	51.4200	Relative Permittivity ( $\epsilon_r$ ):	51.42	53.30	-3.53	5
		e"	14.1200	Conductivity ( $\sigma$ ):	1.45	1.52	-4.44	5
	Body 1910	e'	51.2300	Relative Permittivity ( $\epsilon_r$ ):	51.23	53.30	-3.88	5
		e"	14.3100	Conductivity ( $\sigma$ ):	1.52	1.52	-0.02	5
4/21/2014	Head 1900	e'	40.5400	Relative Permittivity ( $\epsilon_r$ ):	40.54	40.00	1.35	5
		e"	13.3900	Conductivity ( $\sigma$ ):	1.41	1.40	1.04	5
	Head 1850	e'	40.7300	Relative Permittivity ( $\epsilon_r$ ):	40.73	40.00	1.82	5
		e"	13.2900	Conductivity ( $\sigma$ ):	1.37	1.40	-2.35	5
	Head 1910	e'	40.4900	Relative Permittivity ( $\epsilon_r$ ):	40.49	40.00	1.23	5
		e"	13.4000	Conductivity ( $\sigma$ ):	1.42	1.40	1.65	5
4/26/2014	Body 1900	e'	51.2200	Relative Permittivity ( $\epsilon_r$ ):	51.22	53.30	-3.90	5
		e"	14.1500	Conductivity ( $\sigma$ ):	1.49	1.52	-1.65	5
	Body 1850	e'	51.4000	Relative Permittivity ( $\epsilon_r$ ):	51.40	53.30	-3.56	5
		e"	14.0400	Conductivity ( $\sigma$ ):	1.44	1.52	-4.98	5
	Body 1910	e'	51.1700	Relative Permittivity ( $\epsilon_r$ ):	51.17	53.30	-4.00	5
		e"	14.2000	Conductivity ( $\sigma$ ):	1.51	1.52	-0.79	5
4/26/2014	Head 1900	e'	39.2800	Relative Permittivity ( $\epsilon_r$ ):	39.28	40.00	-1.80	5
		e"	13.5100	Conductivity ( $\sigma$ ):	1.43	1.40	1.95	5
	Head 1850	e'	39.5000	Relative Permittivity ( $\epsilon_r$ ):	39.50	40.00	-1.25	5
		e"	13.4000	Conductivity ( $\sigma$ ):	1.38	1.40	-1.54	5
	Head 1910	e'	39.2400	Relative Permittivity ( $\epsilon_r$ ):	39.24	40.00	-1.90	5
		e"	13.5400	Conductivity ( $\sigma$ ):	1.44	1.40	2.71	5

**SAR Lab D**

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
4/11/2014	Head 2450	e'	38.1400	Relative Permittivity ( $\epsilon_r$ ):	38.14	39.20	-2.70	5
		e"	13.3700	Conductivity ( $\sigma$ ):	1.82	1.80	1.19	5
	Head 2410	e'	38.2800	Relative Permittivity ( $\epsilon_r$ ):	38.28	39.28	-2.54	5
		e"	13.2800	Conductivity ( $\sigma$ ):	1.78	1.76	1.09	5
	Head 2475	e'	38.0500	Relative Permittivity ( $\epsilon_r$ ):	38.05	39.17	-2.86	5
		e"	13.4300	Conductivity ( $\sigma$ ):	1.85	1.83	1.16	5
4/11/2014	Body 2450	e'	51.5500	Relative Permittivity ( $\epsilon_r$ ):	51.55	52.70	-2.18	5
		e"	14.8500	Conductivity ( $\sigma$ ):	2.02	1.95	3.74	5
	Body 2410	e'	51.6700	Relative Permittivity ( $\epsilon_r$ ):	51.67	52.76	-2.06	5
		e"	14.7400	Conductivity ( $\sigma$ ):	1.98	1.91	3.55	5
	Body 2475	e'	51.4700	Relative Permittivity ( $\epsilon_r$ ):	51.47	52.67	-2.28	5
		e"	14.9000	Conductivity ( $\sigma$ ):	2.05	1.99	3.29	5
4/11/2014	Body 2600	e'	51.1100	Relative Permittivity ( $\epsilon_r$ ):	51.11	52.51	-2.67	5
		e"	15.2200	Conductivity ( $\sigma$ ):	2.20	2.16	1.83	5
	Body 2500	e'	51.4200	Relative Permittivity ( $\epsilon_r$ ):	51.42	52.64	-2.31	5
		e"	14.9800	Conductivity ( $\sigma$ ):	2.08	2.02	3.07	5
	Body 2700	e'	50.7900	Relative Permittivity ( $\epsilon_r$ ):	50.79	52.38	-3.04	5
		e"	15.4200	Conductivity ( $\sigma$ ):	2.31	2.30	0.59	5
4/14/2014	Head 2600	e'	39.5700	Relative Permittivity ( $\epsilon_r$ ):	39.57	39.01	1.43	5
		e"	14.0700	Conductivity ( $\sigma$ ):	2.03	1.96	3.66	5
	Head 2500	e'	39.9000	Relative Permittivity ( $\epsilon_r$ ):	39.90	39.14	1.95	5
		e"	13.8000	Conductivity ( $\sigma$ ):	1.92	1.85	3.47	5
	Head 2700	e'	39.2000	Relative Permittivity ( $\epsilon_r$ ):	39.20	38.88	0.81	5
		e"	14.3300	Conductivity ( $\sigma$ ):	2.15	2.07	3.92	5
4/22/2014	Head 2450	e'	37.4300	Relative Permittivity ( $\epsilon_r$ ):	37.43	39.20	-4.52	5
		e"	13.7400	Conductivity ( $\sigma$ ):	1.87	1.80	3.99	5
	Head 2410	e'	37.6100	Relative Permittivity ( $\epsilon_r$ ):	37.61	39.28	-4.25	5
		e"	13.6400	Conductivity ( $\sigma$ ):	1.83	1.76	3.83	5
	Head 2475	e'	37.3000	Relative Permittivity ( $\epsilon_r$ ):	37.30	39.17	-4.77	5
		e"	13.8000	Conductivity ( $\sigma$ ):	1.90	1.83	3.95	5
4/22/2014	Body 2450	e'	50.5900	Relative Permittivity ( $\epsilon_r$ ):	50.59	52.70	-4.00	5
		e"	14.8100	Conductivity ( $\sigma$ ):	2.02	1.95	3.46	5
	Body 2410	e'	50.7600	Relative Permittivity ( $\epsilon_r$ ):	50.76	52.76	-3.79	5
		e"	14.7000	Conductivity ( $\sigma$ ):	1.97	1.91	3.27	5
	Body 2475	e'	50.4900	Relative Permittivity ( $\epsilon_r$ ):	50.49	52.67	-4.14	5
		e"	14.8700	Conductivity ( $\sigma$ ):	2.05	1.99	3.08	5
4/25/2014	Head 2600	e'	38.2800	Relative Permittivity ( $\epsilon_r$ ):	38.28	39.01	-1.87	5
		e"	13.9500	Conductivity ( $\sigma$ ):	2.02	1.96	2.78	5
	Head 2500	e'	38.6800	Relative Permittivity ( $\epsilon_r$ ):	38.68	39.14	-1.17	5
		e"	13.6700	Conductivity ( $\sigma$ ):	1.90	1.85	2.49	5
	Head 2700	e'	37.8300	Relative Permittivity ( $\epsilon_r$ ):	37.83	38.88	-2.71	5
		e"	14.2400	Conductivity ( $\sigma$ ):	2.14	2.07	3.26	5
4/25/2014	Body 2600	e'	51.3800	Relative Permittivity ( $\epsilon_r$ ):	51.38	52.51	-2.15	5
		e"	15.0800	Conductivity ( $\sigma$ ):	2.18	2.16	0.89	5
	Body 2500	e'	51.7100	Relative Permittivity ( $\epsilon_r$ ):	51.71	52.64	-1.76	5
		e"	14.8000	Conductivity ( $\sigma$ ):	2.06	2.02	1.83	5
	Body 2700	e'	51.0000	Relative Permittivity ( $\epsilon_r$ ):	51.00	52.38	-2.64	5
		e"	15.3600	Conductivity ( $\sigma$ ):	2.31	2.30	0.20	5

**SAR Lab F**

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)		
4/16/2014	Body 5180	e'	48.3800	Relative Permittivity ( $\epsilon_r$ ):	48.38	49.05	-1.36	5	
		e"	18.2100	Conductivity ( $\sigma$ ):	5.24	5.27	-0.50	5	
	Body 5200	e'	48.3500	Relative Permittivity ( $\epsilon_r$ ):	48.35	49.02	-1.37	5	
		e"	18.2100	Conductivity ( $\sigma$ ):	5.27	5.29	-0.56	5	
	Body 5600	e'	47.8100	Relative Permittivity ( $\epsilon_r$ ):	47.81	48.48	-1.38	5	
		e"	18.7400	Conductivity ( $\sigma$ ):	5.84	5.76	1.29	5	
	Body 5800	e'	47.3600	Relative Permittivity ( $\epsilon_r$ ):	47.36	48.20	-1.74	5	
		e"	18.8300	Conductivity ( $\sigma$ ):	6.07	6.00	1.21	5	
	Body 5825	e'	47.3100	Relative Permittivity ( $\epsilon_r$ ):	47.31	48.20	-1.85	5	
		e"	18.8900	Conductivity ( $\sigma$ ):	6.12	6.00	1.97	5	
	4/21/2014	Head 5180	e'	36.8900	Relative Permittivity ( $\epsilon_r$ ):	36.89	36.01	2.44	5
			e"	15.4400	Conductivity ( $\sigma$ ):	4.45	4.63	-3.96	5
Head 5200		e'	36.8700	Relative Permittivity ( $\epsilon_r$ ):	36.87	35.99	2.44	5	
		e"	15.4800	Conductivity ( $\sigma$ ):	4.48	4.65	-3.77	5	
Head 5600		e'	36.3200	Relative Permittivity ( $\epsilon_r$ ):	36.32	35.53	2.21	5	
		e"	15.6700	Conductivity ( $\sigma$ ):	4.88	5.06	-3.58	5	
Head 5800		e'	36.0800	Relative Permittivity ( $\epsilon_r$ ):	36.08	35.30	2.21	5	
		e"	15.7800	Conductivity ( $\sigma$ ):	5.09	5.27	-3.43	5	
Head 5825		e'	36.0300	Relative Permittivity ( $\epsilon_r$ ):	36.03	35.30	2.07	5	
		e"	15.8200	Conductivity ( $\sigma$ ):	5.12	5.27	-2.77	5	

**SAR Lab G**

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
5/14/2014	Head 5180	e'	37.3800	Relative Permittivity ( $\epsilon_r$ ):	37.38	36.01	3.80	5
		e"	15.8500	Conductivity ( $\sigma$ ):	4.57	4.63	-1.41	5
	Head 5200	e'	37.3300	Relative Permittivity ( $\epsilon_r$ ):	37.33	35.99	3.72	5
		e"	15.7300	Conductivity ( $\sigma$ ):	4.55	4.65	-2.21	5
	Head 5600	e'	36.6400	Relative Permittivity ( $\epsilon_r$ ):	36.64	35.53	3.11	5
		e"	15.8200	Conductivity ( $\sigma$ ):	4.93	5.06	-2.65	5
	Head 5800	e'	36.4800	Relative Permittivity ( $\epsilon_r$ ):	36.48	35.30	3.34	5
		e"	16.2300	Conductivity ( $\sigma$ ):	5.23	5.27	-0.68	5
	Head 5825	e'	36.5000	Relative Permittivity ( $\epsilon_r$ ):	36.50	35.30	3.40	5
		e"	16.1400	Conductivity ( $\sigma$ ):	5.23	5.27	-0.81	5

## 11. System Performance 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.

### 11.1. System Performance Check Measurement Conditions

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness:  $2.0 \pm 0.2$  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  $\geq 15.0$  cm  $\pm 0.5$  cm for SAR measurements  $\leq 3$  GHz and  $\geq 10.0$  cm  $\pm 0.5$  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.

## 11.2. Reference SAR Values for System Performance Check

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

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (mW/g)		
				1g/10g	Head	Body
D835V2	4d117	5/28/2013	835	1g	9.54	9.40
				10g	6.21	6.16
D1900V2	5d043	11/12/2013	1900	1g	40.1	39.0
				10g	21.1	20.8
D2450V2	748	2/18/2014	2450	1g	51.6	50.7
				10g	24.0	23.7
D2600V2	1036	3/12/2014	2600	1g	57.4	56.4
				10g	25.7	25.0
D5GHzV2	1168	12/12/2013	5200	1g	79.3	75.2
				10g	22.7	21.0
			5600	1g	85.3	80.6
				10g	24.3	22.3
			5800	1g	81.0	75.7
				10g	22.9	20.9
D5GHzV2	1003	2/26/2014	5200	1g	77.7	73.5
				10g	22.2	20.5
			5600	1g	81.8	79.6
				10g	23.2	22.1
			5800	1g	78.3	73.8
				10g	22.1	20.4

### 11.3. System Performance 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 B

Date Tested	System Dipole		T.S. Liquid	Measured Results			Target (Ref. Value)	Delta ±10 %	Est./Zoom Ratio	Plot No.	
	Type	Serial #		Area Scan	Zoom Scan	Normalize to 1 W					
4/9/2014	D835V2	4d117	Body	1g	0.986	0.981	9.81	9.40	4.36	0.51	1,2
				10g	0.663	0.649	6.49	6.16	5.36		
4/15/2014	D835V2	4d117	Head	1g	0.938	0.930	9.30	9.54	-2.52	0.85	
				10g	0.635	0.611	6.11	6.21	-1.61		
4/15/2014	D835V2	4d117	Body	1g	0.970	0.958	9.58	9.40	1.91	1.24	
				10g	0.653	0.633	6.33	6.16	2.76		
5/5/2014	D5200V2	1003	Body	1g	6.65	7.46	74.6	73.50	1.50	-12.18	
				10g	1.83	2.07	20.7	20.50	0.98		
	1g			7.71	7.86	78.6	79.6	-1.26	-1.95		
	10g			2.10	2.21	22.1	22.1	0.00			
	1g			6.36	6.88	68.8	73.8	-6.78	-8.18		
	10g			1.76	1.94	19.4	20.4	-4.90			
5/5/2014	D5200V2	1003	Head	1g	6.91	7.37	73.7	77.7	-5.15	-6.66	
				10g	1.96	2.14	21.4	22.2	-3.60		
	1g			7.74	8.43	84.3	81.8	3.06	-8.91		
	10g			2.15	2.40	24.0	23.2	3.45			
	1g			6.79	7.29	72.9	78.3	-6.90	-7.36		
	10g			1.86	2.08	20.8	22.1	-5.88			
5/12/2014	D5800V2	1003	Body	1g	5.07	6.97	69.70	73.8	-5.56	-37.48	
				10g	1.38	1.97	19.70	20.4	-3.43		

#### SAR Lab C

Date Tested	System Dipole		T.S. Liquid	Measured Results			Target (Ref. Value)	Delta ±10 %	Est./Zoom Ratio	Plot No.	
	Type	Serial #		Area Scan	Zoom Scan	Normalize to 1 W					
4/8/2014	D1900V2	5d043	Body	1g	4.26	4.25	42.5	39.0	8.97	0.23	5,6
				10g	2.14	2.23	22.3	20.8	7.21		
4/15/2014	D1900V2	5d043	Head	1g	4.25	4.15	41.5	40.1	3.49	2.35	
				10g	2.16	2.19	21.9	21.1	3.79		
4/19/2014	D1900V2	5d043	Body	1g	3.72	3.68	36.8	39.0	-5.64	1.08	
				10g	1.87	1.93	19.3	20.8	-7.21		
4/21/2014	D1900V2	5d043	Head	1g	3.87	3.79	37.9	40.1	-5.49	2.07	
				10g	2.00	1.98	19.8	21.1	-6.16		
4/26/2014	D1900V2	5d043	Body	1g	4.28	4.22	42.2	39.0	8.21	1.40	
				10g	2.16	2.18	21.8	20.8	4.81		
4/26/2014	D1900V2	5d043	Head	1g	4.04	3.96	39.6	40.1	-1.25	1.98	
				10g	2.09	2.05	20.5	21.1	-2.84		

**SAR Lab D**

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					
4/11/2014	D2450V2	748	Head	1g	5.47	5.39	53.9	51.6	4.46	1.46	
				10g	2.39	2.46	24.6	24.0	2.50		
4/11/2014	D2450V2	748	Body	1g	5.46	5.50	55.0	50.7	8.48	-0.73	7,8
				10g	2.35	2.55	25.5	23.7	7.59		
4/11/2014	D2600V2	1036	Body	1g	6.00	5.83	58.3	56.4	3.37	2.83	
				10g	2.60	2.58	25.8	25.0	3.20		
4/14/2014	D2600V2	1036	Head	1g	5.98	5.79	57.9	57.4	0.87	3.18	
				10g	2.65	2.53	25.3	25.7	-1.56		
4/22/2014	D2450V2	748	Head	1g	5.29	5.21	52.1	51.6	0.97	1.51	
				10g	2.30	2.35	23.5	24.0	-2.08		
4/22/2014	D2450V2	748	Body	1g	5.31	5.34	53.4	50.7	5.33	-0.56	
				10g	2.27	2.45	24.5	23.7	3.38		
4/25/2014	D2600V2	1036	Head	1g	6.34	6.16	61.6	57.4	7.32	2.84	9,10
				10g	2.84	2.70	27.0	25.7	5.06		
4/25/2014	D2600V2	1036	Body	1g	6.09	5.96	59.6	56.4	5.67	2.13	
				10g	2.64	2.63	26.3	25.0	5.20		

**SAR Lab F**

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					
4/16/2014	D5200V2	1168	Body	1g	6.50	6.89	68.9	75.2	-8.38	-6.00	11,12
				10g	1.77	1.94	19.4	21.0	-7.62		
	D5600V2			1g	7.26	7.74	77.4	80.6	-3.97	-6.61	
				10g	1.97	2.16	21.6	22.3	-3.14		
	D5800V2			1g	7.10	7.87	78.7	75.7	3.96	-10.85	
10g	1.93	2.21	22.1	20.9	5.74						
4/21/2014	D5200V2	1168	Head	1g	6.88	7.30	73.0	79.3	-7.94	-6.10	
				10g	1.91	2.09	20.9	22.7	-7.93		
	D5600V2			1g	7.59	8.16	81.6	85.3	-4.34	-7.51	
				10g	2.07	2.31	23.1	24.3	-4.94		
	D5800V2			1g	7.87	8.59	85.9	81.0	6.05	-9.15	
10g	2.13	2.43	24.3	22.9	6.11						

**SAR Lab G**

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					
5/14/2014	D5800V2	1168	Head	1g	7.27	7.84	78.4	81.0	-3.21	-7.84	13,14
				10g	1.98	2.22	22.2	22.9	-3.06		

## 12. SAR Test 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 D03 Wireless Chargers Battery Cover:**

Initially, the handset must be tested according to all applicable SAR test procedures using the normal battery cover (without the wireless charging hardware). The highest SAR measured for each wireless technology (1xRTT, EVDO, WCDMA, GSM, Wi-Fi etc.), frequency band, operating mode (different modes/configurations within each wireless technology) and exposure condition (head, body-worn accessory, hotspot mode etc.) must be repeated using the wireless charging battery cover (Left, right, touch and tilt positions are grouped as a single exposure condition.). In addition, for test cases where the measured SAR for a handset with normal battery cover is greater than 1.2 W/kg, these tests should be repeated with the wireless charging battery cover.

### **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:**

Body SAR is also measured for HSPA when the maximum average output of each RF channel with HSPA active is at least  $\frac{1}{4}$  dB higher than that measured without HSPA using 12.2 kbps RMC or the maximum SAR for 12.2 kbps RMC is above 75% of the SAR limit. Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 with power control algorithm 2.

### **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.

### **April 2013 TCB Workshop Updates:**

Apply usual 802.11 test exclusion considerations, but include 802.11ac SAR for highest 802.11a configuration in each frequency band and each exposure condition.

### 12.1. GSM850

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
						Tune-up limit	Meas.	Meas.	Scaled		
Head	Voice	0	Left Touch	190	836.6	33.2	33.0	0.224	0.235		
			Left Tilt	190	836.6	33.2	33.0	0.164	0.172		
			Right Touch	190	836.6	33.2	33.0	0.268	0.281	1	
			Right Touch	190	836.6	33.2	33.0	0.264	0.276		1
			Right Tilt	190	836.6	33.2	33.0	0.168	0.176		
Head VoIP	GPRS 2 Slots	0	Left Touch	190	836.6	31.7	31.2	0.290	0.325		
			Left Tilt	190	836.6	31.7	31.2	0.235	0.264		
			Right Touch	190	836.6	31.7	31.2	0.368	0.413	2	
			Right Touch	190	836.6	31.7	31.2	0.338	0.379		1
			Right Tilt	190	836.6	31.7	31.2	0.234	0.263		
Body-worn	Voice	10	Rear	190	836.6	33.2	33.0	0.380	0.398	3	
			Rear	190	836.6	33.2	33.0	0.325	0.340		1
			Front	190	836.6	33.2	33.0	0.326	0.341		
Body-worn(VoIP) & Hotspot	GPRS 2 Slots	10	Rear	190	836.6	31.7	31.2	0.539	0.605	4	
			Rear	190	836.6	31.7	31.2	0.462	0.518		1
			Front	190	836.6	31.7	31.2	0.461	0.517		
			Edge 2	190	836.6	31.7	31.2	0.533	0.598		
			Edge 3	190	836.6	31.7	31.2	0.449	0.504		
			Edge 4	190	836.6	31.7	31.2	0.274	0.307		

### 12.2. GSM1900

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
						Tune-up limit	Meas.	Meas.	Scaled		
Head	Voice	0	Left Touch	661	1880.0	30.2	30.2	0.099	0.099		
			Left Tilt	661	1880.0	30.2	30.2	0.065	0.065		
			Right Touch	661	1880.0	30.2	30.2	0.104	0.104	5	
			Right Touch	661	1880.0	30.2	30.2	0.096	0.096		1
			Right Tilt	661	1880.0	30.2	30.2	0.054	0.054		
Head VoIP	GPRS 2 Slots	0	Left Touch	661	1880.0	28.7	28.6	0.144	0.147		
			Left Tilt	661	1880.0	28.7	28.6	0.095	0.097		
			Right Touch	661	1880.0	28.7	28.6	0.147	0.150	6	
			Right Touch	661	1880.0	28.7	28.6	0.086	0.088		1
			Right Tilt	661	1880.0	28.7	28.6	0.078	0.080		
Body-worn	Voice	10	Rear	661	1880.0	30.2	30.2	0.407	0.407		
			Rear	661	1880.0	30.2	30.2	0.431	0.431	7	1
			Front	661	1880.0	30.2	30.2	0.233	0.233		
Body-worn(VoIP) & Hotspot	GPRS 2 Slots	10	Rear	661	1880.0	28.7	28.6	0.549	0.562		
			Front	661	1880.0	28.7	28.6	0.330	0.338		
			Edge 2	661	1880.0	28.7	28.6	0.096	0.098		
			Edge 3	661	1880.0	28.7	28.6	0.552	0.565		
			Edge 3	661	1880.0	28.7	28.6	0.623	0.638	8	1
			Edge 4	661	1880.0	28.7	28.6	0.102	0.104		

**Note:**

- Per 648474 D03 Wireless Chargers Battery Cover, SAR test was repeated using wireless charging battery cover from the highest SAR measured for each mode.

### 12.3. CDMA BC0

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
						Tune-up limit	Meas.	Meas.	Scaled		
Head	1xRTT (RC3 SO55)	0	Left Touch	384	836.5	25.5	25.5	0.435	0.435		
			Left Tilt	384	836.5	25.5	25.5	0.329	0.329		
			Right Touch	384	836.5	25.5	25.5	0.561	0.561	9	
			Right Touch	384	836.5	25.5	25.5	0.484	0.484		1
			Right Tilt	384	836.5	25.5	25.5	0.322	0.322		
	1xEVDO (Rel. 0)		Left Touch	384	836.5	25.5	25.5	0.403	0.403		
			Left Tilt	384	836.5	25.5	25.5	0.289	0.289		
			Right Touch	384	836.5	25.5	25.5	0.536	0.536		
			Right Touch	384	836.5	25.5	25.5	0.508	0.508		1
			Right Tilt	384	836.5	25.5	25.5	0.310	0.310		
Body-worn & Hotspot	1xRTT (RC3 SO32)	10	Rear	384	836.5	25.5	25.5	0.675	0.675	10	
			Rear	384	836.5	25.5	25.5	0.635	0.635		1
			Front	384	836.5	25.5	25.5	0.629	0.629		
	1xEVDO (Rel. 0)		Rear	384	836.5	25.5	25.5	0.625	0.625		
			Rear	384	836.5	25.5	25.5	0.633	0.633		1
			Front	384	836.5	25.5	25.5	0.576	0.576		
Hotspot	1xRTT (RC3 SO32)	10	Edge 2	384	836.5	25.5	25.5	0.539	0.539		
			Edge 3	384	836.5	25.5	25.5	0.642	0.642	11	
			Edge 4	384	836.5	25.5	25.5	0.225	0.225		
	1xEVDO (Rel. 0)		Edge 2	384	836.5	25.5	25.5	0.519	0.519		
			Edge 3	384	836.5	25.5	25.5	0.624	0.624		
			Edge 4	384	836.5	25.5	25.5	0.217	0.217		

**Note:**

- Per 648474 D03 Wireless Chargers Battery Cover, SAR test was repeated using wireless charging battery cover from the highest SAR measured for each mode.

### 12.4. CDMA BC1

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note	
						Tune-up limit	Meas.	Meas.	Scaled			
Head	1xRTT (RC3 SO55)	0	Left Touch	600	1880.0	24.9	24.8	0.277	0.283			
			Left Tilt	600	1880.0	24.9	24.8	0.154	0.158			
			Right Touch	600	1880.0	24.9	24.8	0.279	0.285			
			Right Touch	600	1880.0	24.9	24.8	0.212	0.217		1	
			Right Tilt	600	1880.0	24.9	24.8	0.127	0.130			
	1xEVDO (Rel. 0)		Left Touch	600	1880.0	24.9	24.8	0.264	0.270			
			Left Touch	600	1880.0	24.9	24.8	0.285	0.292		12	1
			Left Tilt	600	1880.0	24.9	24.8	0.178	0.182			
			Right Touch	600	1880.0	24.9	24.8	0.257	0.263			
	Right Tilt	600	1880.0	24.9	24.8	0.124	0.127					
Body-worn & Hotspot	1xRTT (RC3 SO32)	10	Rear	25	1851.3	24.9	24.8	0.674	0.690			
				600	1880.0	24.9	24.8	0.832	0.851			
				1175	1908.8	24.9	24.9	0.935	0.935		1	
				1175	1908.8	24.9	24.9	0.999	0.999			
	Front		600	1880.0	24.9	24.8	0.592	0.606				
	1xEVDO (Rel. 0)		Rear	25	1851.3	24.9	24.8	0.879	0.899			
				600	1880.0	24.9	24.8	1.020	1.044			
				1175	1908.8	24.9	24.8	1.090	1.115		13	
				1175	1908.8	24.9	24.8	0.988	1.011		1	
				Front	600	1880.0	24.9	24.8	0.655	0.670		
Hotspot	1xRTT (RC3 SO32)	10	Edge 2	600	1880.0	24.9	24.8	0.206	0.211			
				25	1851.3	24.9	24.8	0.749	0.766			
			Edge 3	600	1880.0	24.9	24.8	0.933	0.955			
				1175	1908.8	24.9	24.9	0.988	0.988			
	1175		1908.8	24.9	24.9	1.110	1.110		14	1		
	Edge 4		600	1880.0	24.9	24.8	0.168	0.172				
	1xEVDO (Rel. 0)		Edge 2	600	1880.0	24.9	24.8	0.164	0.168			
				25	1851.3	24.9	24.8	0.790	0.808			
				Edge 3	600	1880.0	24.9	24.8	0.926	0.948		
					1175	1908.8	24.9	24.8	0.999	1.022		
Edge 4		600		1880.0	24.9	24.8	0.140	0.143				

**Note:**

- Per 648474 D03 Wireless Chargers Battery Cover, SAR test was repeated using wireless charging battery cover from the highest SAR measured for each mode.

### 12.5. CDMA BC10

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
						Tune-up limit	Meas.	Meas.	Scaled		
Head	1xRTT (RC3 SO55)	0	Left Touch	580	820.5	25.2	25.2	0.326	0.326		
		0	Left Tilt	580	820.5	25.2	25.2	0.294	0.294		
		0	Right Touch	580	820.5	25.2	25.2	0.441	0.441	15	
		0	Right Touch	580	820.5	25.2	25.2	0.379	0.379		1
		0	Right Tilt	580	820.5	25.2	25.2	0.301	0.301		
	1xEVDO (Rel. 0)	0	Left Touch	580	820.5	25.2	25.2	0.328	0.328		
		0	Left Tilt	580	820.5	25.2	25.2	0.248	0.248		
		0	Right Touch	580	820.5	25.2	25.2	0.363	0.363		
		0	Right Touch	580	820.5	25.2	25.2	0.375	0.375		1
		0	Right Tilt	580	820.5	25.2	25.2	0.246	0.246		
Body-worn & Hotspot	1xRTT (RC3 SO32)	10	Rear	580	820.5	25.2	25.2	0.581	0.581	16	
		10	Rear	580	820.5	25.2	25.2	0.572	0.572		1
		10	Front	580	820.5	25.2	25.2	0.441	0.441		
	1xEVDO (Rel. 0)	10	Rear	580	820.5	25.2	25.2	0.505	0.505		
		10	Rear	580	820.5	25.2	25.2	0.531	0.531		1
		10	Front	580	820.5	25.2	25.2	0.444	0.444		
Hotspot	1xRTT (RC3 SO32)	10	Edge 2	580	820.5	25.2	25.2	0.506	0.506	17	
		10	Edge 3	580	820.5	25.2	25.2	0.440	0.440		
		10	Edge 4	580	820.5	25.2	25.2	0.226	0.226		
	1xEVDO (Rel. 0)	10	Edge 2	580	820.5	25.2	25.2	0.458	0.458		
		10	Edge 3	580	820.5	25.2	25.2	0.411	0.411		
		10	Edge 4	580	820.5	25.2	25.2	0.215	0.215		

### 12.6. W-CDMA Band V

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
						Tune-up limit	Meas.	Meas.	Scaled		
Head	Rel 99 RMC	0	Left Touch	4183	836.6	23.7	23.6	0.286	0.293		
			Left Tilt	4183	836.6	23.7	23.6	0.204	0.209		
			Right Touch	4183	836.6	23.7	23.6	0.374	0.383	18	
			Right Touch	4183	836.6	23.7	23.6	0.325	0.333		1
			Right Tilt	4183	836.6	23.7	23.6	0.209	0.214		
Body-worn & Hotspot	Rel 99 RMC	10	Rear	4183	836.6	23.7	23.6	0.404	0.413		
			Front	4183	836.6	23.7	23.6	0.411	0.421	19	
			Front	4183	836.6	23.7	23.6	0.314	0.321		1
Hotspot	Rel 99 RMC	10	Edge 2	4183	836.6	23.7	23.6	0.405	0.414		
			Edge 3	4183	836.6	23.7	23.6	0.391	0.400		
			Edge 4	4183	836.6	23.7	23.6	0.185	0.189		

**Note:**

- Per 648474 D03 Wireless Chargers Battery Cover, SAR test was repeated using wireless charging battery cover from the highest SAR measured for each mode.

### 12.7. W-CDMA Band II

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
						Tune-up limit	Meas.	Meas.	Scaled		
Head	Rel 99 RMC	0	Left Touch	9400	1880.0	23.7	23.6	0.194	0.199		
			Left Tilt	9400	1880.0	23.7	23.6	0.119	0.122		
			Right Touch	9400	1880.0	23.7	23.6	0.213	0.218	20	
			Right Touch	9400	1880.0	23.7	23.6	0.160	0.164		1
			Right Tilt	9400	1880.0	23.7	23.6	0.100	0.102		
Body-worn & Hotspot	Rel 99 RMC	10	Rear	9262	1852.4	23.7	23.7	0.709	0.709		
				9400	1880.0	23.7	23.6	0.811	0.830		
				9538	1907.6	23.7	23.6	0.921	0.942	21	
				9538	1907.6	23.7	23.6	0.811	0.830		1
			Front	9400	1880.0	23.7	23.6	0.451	0.462		
Hotspot	Rel 99 RMC	10	Edge 2	9400	1880.0	23.7	23.6	0.128	0.131		
			Edge 3	9400	1880.0	23.7	23.6	0.713	0.730		
			Edge 4	9400	1880.0	23.7	23.6	0.131	0.134		

### 12.8. LTE Band 25 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	UL Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
								Tune-up limit	Meas.	Meas.	Scaled		
Head	QPSK	0	Left Touch	26365	1882.5	1	0	23.7	23.6	0.177	0.181		
						25	0	22.7	22.6	0.141	0.144		
			Left Tilt	26365	1882.5	1	0	23.7	23.6	0.109	0.112		
						25	0	22.7	22.6	0.087	0.089		
			Right Touch	26365	1882.5	1	0	23.7	23.6	0.186	0.190	22	
						1	0	23.7	23.6	0.143	0.146		1
			Right Tilt	26365	1882.5	25	0	22.7	22.6	0.146	0.149		
						1	0	23.7	23.6	0.097	0.099		
25	0	22.7	22.6	0.077	0.078								
Body-worn & Hotspot	QPSK	10	Rear	26365	1882.5	1	0	23.7	23.6	0.684	0.700		
						1	0	23.7	23.6	0.553	0.566		1
			Front	26365	1882.5	25	0	22.7	22.6	0.535	0.547		
						1	0	23.7	23.6	0.453	0.464		
25	0	22.7	22.6	0.358	0.366								
Hotspot	QPSK	10	Edge 2	26365	1882.5	1	0	23.7	23.6	0.171	0.175		
						25	0	22.7	22.6	0.133	0.136		
			Edge 3	26365	1882.5	1	0	23.7	23.6	0.724	0.741	23	
						1	0	23.7	23.6	0.681	0.697		1
			Edge 4	26365	1882.5	25	0	22.7	22.6	0.556	0.569		
						1	0	23.7	23.6	0.142	0.145		
25	0	22.7	22.6	0.111	0.114								

**Note:**

- Per 648474 D03 Wireless Chargers Battery Cover, SAR test was repeated using wireless charging battery cover from the highest SAR measured for each mode.

### 12.9. LTE Band 26 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	UL Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note		
								Tune-up limit	Meas.	Meas.	Scaled				
Head	QPSK	0	Left Touch	26865	831.5	1	0	23.7	23.6	0.225	0.230				
						25	0	22.7	22.6	0.189	0.193				
			Left Tilt	26865	831.5	1	0	23.7	23.6	0.170	0.174				
						25	0	22.7	22.6	0.141	0.144				
			Right Touch	26865	831.5	1	0	23.7	23.6	0.311	0.318	24			
						1	0	23.7	23.6	0.296	0.303		1		
		Right Tilt	26865	831.5	25	0	22.7	22.6	0.257	0.263					
					1	0	23.7	23.6	0.185	0.189					
								25	0	22.7	22.6	0.150	0.153		
		Body-worn & Hotspot	QPSK	10	Rear	26865	831.5	1	0	23.7	23.6	0.396	0.405		
								1	0	23.7	23.6	0.423	0.433	25	1
25	0							22.7	22.6	0.324	0.332				
Front	26865				831.5	1	0	23.7	23.6	0.333	0.341				
						1	0	23.7	23.6	0.333	0.341				
						25	0	22.7	22.6	0.276	0.282				
Hotspot	QPSK	10	Edge 2	26865	831.5	1	0	23.7	23.6	0.391	0.400				
						25	0	22.7	22.6	0.314	0.321				
			Edge 3	26865	831.5	1	0	23.7	23.6	0.321	0.328				
						25	0	22.7	22.6	0.267	0.273				
			Edge 4	26865	831.5	1	0	23.7	23.6	0.202	0.207				
						25	0	22.7	22.6	0.165	0.169				

**Note:**

- Per 648474 D03 Wireless Chargers Battery Cover, SAR test was repeated using wireless charging battery cover from the highest SAR measured for each mode.

### 12.10. LTE Band 41 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	UL Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
								Tune-up limit	Meas.	Meas.	Scaled		
Head	QPSK	0	Left Touch	40620	2593.0	1	0	24.2	24.2	0.045	0.045		
						50	0	23.2	23.1	0.063	0.064		
			Left Tilt	40620	2593.0	1	0	24.2	24.2	0.032	0.032		
						50	0	23.2	23.1	0.024	0.025		
			Right Touch	40620	2593.0	1	0	24.2	24.2	0.086	0.086		
						1	0	24.2	24.2	0.054	0.054		1
50	0	23.2	23.1	0.090	0.092	26							
Right Tilt	40620	2593.0	1	0	24.2	24.2	0.039	0.039					
			50	0	23.2	23.1	0.032	0.033					
Body-worn & Hotspot	QPSK	10	Rear	40620	2593.0	1	0	24.2	24.2	0.286	0.286		
						1	0	24.2	24.2	0.229	0.229		1
						50	0	23.2	23.1	0.226	0.231		
			Front	40620	2593.0	1	0	24.2	24.2	0.126	0.126		
50	0	23.2				23.1	0.100	0.102					
Hotspot	QPSK	10	Edge 3	40620	2593.0	1	0	24.2	24.2	0.401	0.401	27	
						1	0	24.2	24.2	0.177	0.177		1
						50	0	23.2	23.1	0.316	0.323		
			Edge 4	40620	2593.0	1	0	24.2	24.2	0.221	0.221		
50	0	23.2				23.1	0.178	0.182					

**Note:**

- Per 648474 D03 Wireless Chargers Battery Cover, SAR test was repeated using wireless charging battery cover from the highest SAR measured for each mode.

## 12.11. Wi-Fi (DTS Band)

### 12.11.1. 2.4 GHz Band

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
						Tune-up limit	Meas.	Meas.	Scaled		
Head	802.11b 1 Mbps	0	Left Touch	6	2437	17.0	16.9	0.348	0.356		
		0	Left Tilt	6	2437	17.0	16.9	0.360	0.368	28	
		0	Left Tilt	6	2437	17.0	16.9	0.286	0.293		1
		0	Right Touch	6	2437	17.0	16.9	0.227	0.232		
		0	Right Tilt	6	2437	17.0	16.9	0.225	0.230		
Body-worn & Hotspot	802.11b 1 Mbps	10	Rear	6	2437	17.0	16.9	0.245	0.251	29	
		10	Rear	6	2437	17.0	16.9	0.213	0.218		1
		10	Front	6	2437	17.0	16.9	0.086	0.088		
Hotspot	802.11b 1 Mbps	10	Edge 1	6	2437	17.0	16.9	0.128	0.131		
		10	Edge 2	6	2437	17.0	16.9	0.042	0.043		

### 12.11.2. 5.8 GHz Band

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
						Tune-up limit	Meas.	Meas.	Scaled		
Head	802.11a 6 Mbps	0	Left Touch	149	5745	13.0	12.3	0.450	0.529		
		0	Left Tilt	149	5745	13.0	12.3	0.514	0.604		
		0		153	5765	13.0	12.3	0.518	0.609		
		0		161	5805	13.0	12.2	0.585	0.703	30	
		0	Right Tilt	161	5805	13.0	12.2	0.365	0.439		1
		0		Right Touch	149	5745	13.0	12.3	0.354	0.416	
		0	Right Tilt	149	5745	13.0	12.3	0.342	0.402		
Body-worn & Wi-Fi Direct	802.11a 6 Mbps	10	Rear	149	5745	13.0	12.3	0.238	0.280		
		10	Rear	149	5745	13.0	12.3	0.243	0.286	31	1
		10	Front	149	5745	13.0	12.3	0.049	0.057		
Wi-Fi Direct	802.11a 6 Mbps	10	Edge 1	149	5745	13.0	12.3	0.191	0.224		
		10	Edge 2	149	5745	13.0	12.3	0.053	0.062		

**Note:**

- Per 648474 D03 Wireless Chargers Battery Cover, SAR test was repeated using wireless charging battery cover from the highest SAR measured for each mode.

### 12.12. Wi-Fi (UNII Band)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
						Tune-up limit	Meas.	Meas.	Scaled		
Head	802.11a 6 Mbps	0	Left Touch	36	5180.0	13.0	12.5	0.142	0.159		
				64	5320.0	13.0	12.7	0.256	0.274		
				100	5500.0	13.0	12.4	0.325	0.373		
				116	5580.0	13.0	12.4	0.362	0.416		
				132	5660.0	13.0	12.4	0.476	0.547	32	
				132	5660.0	13.0	12.4	0.322	0.370		1
			Left Tilt	36	5180.0	13.0	12.5	0.197	0.221		
				64	5320.0	13.0	12.7	0.378	0.405		
				116	5580.0	13.0	12.4	0.251	0.288		
			Right Touch	36	5180.0	13.0	12.5	0.213	0.239	33	
				36	5180.0	13.0	12.5	0.188	0.211		1
				64	5320.0	13.0	12.7	0.293	0.314		
				116	5580.0	13.0	12.4	0.278	0.319		
			Right Tilt	36	5180.0	13.0	12.5	0.190	0.213		
				64	5320.0	13.0	12.7	0.579	0.620	34	
				64	5320.0	13.0	12.7	0.394	0.422		1
100	5500.0	13.0		12.4	0.394	0.452					
116	5580.0	13.0		12.4	0.371	0.426					
Body-worn	802.11a 6 Mbps	10	Rear	36	5180.0	13.0	12.5	0.130	0.146		
				36	5180.0	13.0	12.5	0.159	0.178	35	1
				64	5320.0	13.0	12.7	0.154	0.165		
				64	5320.0	13.0	12.7	0.202	0.216	36	1
				116	5580.0	13.0	12.4	0.169	0.194		
			Front	116	5580.0	13.0	12.4	0.267	0.307	37	1
				36	5180.0	13.0	12.5	0.037	0.042		
				64	5320.0	13.0	12.7	0.074	0.079		
				64	5320.0	13.0	12.7	0.074	0.079		
				116	5580.0	13.0	12.4	0.036	0.041		

**Note:**

- Per 648474 D03 Wireless Chargers Battery Cover, SAR test was repeated using wireless charging battery cover from the highest SAR measured for each mode.

### 12.13. Additional Testing in 802.11ac Mode for Highest 802.11a/b mode

#### Test exclusion considerations for 802.11ac mode:

Apply usual 802.11 test exclusion considerations, but include 802.11ac SAR for highest 802.11a/b configuration in each frequency band and each exposure condition according to April 2013 TCB Workshop Updates.

Additional testing in 802.11ac mode was performed in HT20 mode so that the same channels from the 802.11a mode could be tested.

#### 12.13.1. 2.4 GHz Band

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	802.11ac (HT20) MCS0	0	Left Tilt	6	2437	11.0	10.9	0.076	0.078	
Hotspot		10	Rear	6	2437	11.0	10.9	0.046	0.047	

#### 12.13.2. 2.4 GHz Band With Wireless Battery Charging Cover

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	802.11ac (HT20) MCS0	0	Left Tilt	6	2437	11.0	10.9	0.059	0.060	
Hotspot		10	Rear	6	2437	11.0	10.9	0.029	0.030	

#### 12.13.3. 5 GHz Band

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	802.11ac (HT20) MCS0	0	Right Touch	36	5180.0	11.0	10.5	0.135	0.151	
		0	Right Tilt	64	5320.0	11.0	10.8	0.357	0.374	
		0	Right Tilt	132	5660.0	11.0	10.3	0.202	0.237	
		0	Left Tilt	161	5805.0	11.0	11.0	0.403	0.403	
Body-worn & Wi-Fi Direct		10	Rear	36	5180.0	11.0	10.5	0.054	0.061	
		10	Rear	64	5320.0	11.0	10.8	0.085	0.089	
		10	Rear	116	5580.0	11.0	10.3	0.106	0.125	
		10	Rear	149	5745.0	11.0	11.0	0.177	0.177	

#### 12.13.4. 5 GHz Band With Wireless Battery Charging Cover

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	802.11ac (HT20) MCS0	0	Right Touch	36	5180.0	11.0	10.5	0.129	0.145	
		0	Right Tilt	64	5320.0	11.0	10.8	0.260	0.272	
		0	Right Tilt	132	5660.0	11.0	10.3	0.213	0.250	
		0	Left Tilt	161	5805.0	11.0	11.0	0.331	0.331	
Body-worn & Wi-Fi Direct		10	Rear	36	5180.0	11.0	10.5	0.137	0.154	
		10	Rear	64	5320.0	11.0	10.8	0.173	0.181	
		10	Rear	116	5580.0	11.0	10.3	0.201	0.236	
		10	Rear	149	5745.0	11.0	11.0	0.204	0.204	

**Note:**

- Per 648474 D03 Wireless Chargers Battery Cover, SAR test was repeated using wireless charging battery cover from the highest SAR measured for each mode.

## 12.14. Bluetooth

### 12.14.1. Standalone SAR Test Exclusion Considerations

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

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

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

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

#### Body-worn Accessory Exposure Conditions

Max. tune-up tolerance limit		Min. test separation distance (mm)	Frequency (GHz)	Result
(dBm)	(mW)			
9.0	8	10	2.480	1.3

#### Conclusion:

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

### 12.14.2. Estimated SAR

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

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

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

Test Configuration	Max. tune-up tolerance limit (mW)	Min. test separation distance (mm)	Frequency (GHz)	Estimated 1-g SAR (W/kg)
Rear/Front	8	10	2.480	0.168

### 13. SAR Measurement Variability

In accordance with published RF Exposure KDB procedure 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 ≥ 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.

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

Frequency Band (MHz)	Air Interface	Head (W/kg)	Body-worn & Hotspot (W/kg)	Hotspot/Wi-Fi Direct (W/kg)
850	GSM 850	N/A	N/A	N/A
	CDMA BC0	N/A	N/A	N/A
	CDMA BC10	N/A	N/A	N/A
	W-CDMA Band V	N/A	N/A	N/A
	LTE Band 26	N/A	N/A	N/A
1900	GSM 1900	N/A	N/A	N/A
	CDMA BC1	N/A	1.110 W/kg	N/A
	W-CDMA Band II	N/A	0.921 W/kg	N/A
	LTE Band 25	N/A	N/A	N/A
2400	Wi-Fi 802.11b/g/n	N/A	N/A	N/A
2600	LTE Band 41	N/A	N/A	N/A
5200	802.11a/n	N/A	N/A	N/A
5300		N/A	N/A	N/A
5500		N/A	N/A	N/A
5800		N/A	N/A	N/A

### 13.2. Repeated Measurement Results

#### Head Exposure Condition

Not Applicable.

#### Body-worn Accessory and Hotspot Mode Exposure Conditions

Not Applicable.

#### Hotspot Mode/Wi-Fi Direct Exposure Condition

RF Exposure Conditions	Dist. (mm)	Mode	Test Position	Ch #.	Freq. (MHz)	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio	Note
						Original	Repeated		
Body	10	1xRTT (RC3 SO32)	Edge 3 (wireless charging battery cover)	1175	1908.75	1.110	1.040	1.07	1

#### Note(s):

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

## 14. Simultaneous Transmission SAR Analysis

KDB 447498 D01 General RF Exposure Guidance, 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 reported 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 reported 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:

$$[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$$

A new threshold of 0.04 is also introduced in the KDB 447498. Thus, in order for a pair of simultaneously 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:

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

### 14.1. Sum of the SAR for GSM 850 & Wi-Fi 2.4 GHz Band & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario			Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			GSM 850	Wi-Fi (DTS)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.325	0.356		0.681	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.264	0.368		0.632	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.413	0.232		0.645	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.263	0.230		0.493	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.605	0.251		0.856	No
		WWAN + BT	0.605		0.168	0.773	No
	Front	WWAN + Wi-Fi(DTS)	0.517	0.088		0.605	No
		WWAN + BT	0.517		0.168	0.685	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.131		0.131	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.598	0.043		0.641	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.504			0.504	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.307			0.307	No

### 14.2. Sum of the SAR for GSM 850 & Wi-Fi 5 GHz Bands & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			GSM 850	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.325	0.529			0.854	No
		WWAN + Wi-Fi(UNII)	0.325		0.547		0.872	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.264	0.703			0.967	No
		WWAN + Wi-Fi(UNII)	0.264		0.405		0.669	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.413	0.416			0.829	No
		WWAN + Wi-Fi(UNII)	0.413		0.319		0.732	No
Right Tilt	WWAN + Wi-Fi(DTS)	0.263	0.402			0.665	No	
	WWAN + Wi-Fi(UNII)	0.263		0.620		0.883	No	
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.605	0.280			0.885	No
		WWAN + Wi-Fi(UNII)	0.605		0.194		0.799	No
		WWAN + BT	0.605			0.168	0.773	No
	Front	WWAN + Wi-Fi(DTS)	0.517	0.057			0.574	No
		WWAN + Wi-Fi(UNII)	0.517		0.079		0.596	No
		WWAN + BT	0.517			0.168	0.685	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.224			0.224	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.598	0.062			0.660	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.504				0.504	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.307				0.307	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.

### 14.3. Sum of the SAR for GSM 1900 & Wi-Fi 2.4 GHz Band & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario			Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			GSM 1900	Wi-Fi (DTS)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.147	0.356		0.503	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.097	0.368		0.465	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.150	0.232		0.382	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.080	0.230		0.310	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.562	0.251		0.813	No
		WWAN + BT	0.562		0.168	0.730	No
	Front	WWAN + Wi-Fi(DTS)	0.338	0.088		0.426	No
		WWAN + BT	0.338		0.168	0.506	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.131		0.131	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.098	0.043		0.141	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.638			0.638	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.104			0.104	No

### 14.4. Sum of the SAR for GSM 1900 & Wi-Fi 5 GHz Bands & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			GSM 1900	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.147	0.529			0.676	No
		WWAN + Wi-Fi(UNII)	0.147		0.547		0.694	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.097	0.703			0.800	No
		WWAN + Wi-Fi(UNII)	0.097		0.405		0.502	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.150	0.416			0.566	No
		WWAN + Wi-Fi(UNII)	0.150		0.319		0.469	No
Right Tilt	WWAN + Wi-Fi(DTS)	0.080	0.402			0.482	No	
	WWAN + Wi-Fi(UNII)	0.080		0.620		0.700	No	
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.562	0.280			0.842	No
		WWAN + Wi-Fi(UNII)	0.562		0.194		0.756	No
		WWAN + BT	0.562			0.168	0.730	No
	Front	WWAN + Wi-Fi(DTS)	0.338	0.057			0.395	No
		WWAN + Wi-Fi(UNII)	0.338		0.079		0.417	No
		WWAN + BT	0.338			0.168	0.506	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.224			0.224	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.098	0.062			0.160	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.638				0.638	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.104				0.104	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.

**14.5. Sum of the SAR for CDMA BC0 & Wi-Fi 2.4 GHz Band & BT**

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario			Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			CDMA BC0	Wi-Fi (DTS)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.435	0.356		0.791	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.329	0.368		0.697	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.561	0.232		0.793	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.322	0.230		0.552	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.675	0.251		0.926	No
		WWAN + BT	0.675		0.168	0.843	No
	Front	WWAN + Wi-Fi(DTS)	0.629	0.088		0.717	No
		WWAN + BT	0.629		0.168	0.797	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.131		0.131	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.539	0.043		0.582	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.642			0.642	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.225			0.225	No

**14.6. Sum of the SAR for CDMA BC0 & Wi-Fi 5 GHz Bands & BT**

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			CDMA BC0	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.435	0.529			0.964	No
		WWAN + Wi-Fi(UNII)	0.435		0.547		0.982	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.329	0.703			1.032	No
		WWAN + Wi-Fi(UNII)	0.329		0.405		0.734	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.561	0.416			0.977	No
		WWAN + Wi-Fi(UNII)	0.561		0.319		0.880	No
Right Tilt	WWAN + Wi-Fi(DTS)	0.322	0.402			0.724	No	
	WWAN + Wi-Fi(UNII)	0.322		0.620		0.942	No	
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.675	0.280			0.955	No
		WWAN + Wi-Fi(UNII)	0.675		0.194		0.869	No
		WWAN + BT	0.675			0.168	0.843	No
	Front	WWAN + Wi-Fi(DTS)	0.629	0.057			0.686	No
		WWAN + Wi-Fi(UNII)	0.629		0.079		0.708	No
		WWAN + BT	0.629			0.168	0.797	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.224			0.224	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.539	0.062			0.601	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.642				0.642	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.225				0.225	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.

**14.7. Sum of the SAR for CDMA BC1 & Wi-Fi 2.4 GHz & BT**

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario			Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			CDMA BC1	Wi-Fi (DTS)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.292	0.356		0.648	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.182	0.368		0.550	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.285	0.232		0.517	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.130	0.230		0.360	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	1.115	0.251		1.366	No
		WWAN + BT	1.115		0.168	1.283	No
	Front	WWAN + Wi-Fi(DTS)	0.670	0.088		0.758	No
		WWAN + BT	0.670		0.168	0.838	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.131		0.131	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.211	0.043		0.254	No
	Edge 3	WWAN + Wi-Fi(DTS)	1.110			1.110	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.172			0.172	No

**14.8. Sum of the SAR for CDMA BC1 & Wi-Fi 5 GHz Bands & BT**

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			CDMA BC1	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.292	0.529			0.821	No
		WWAN + Wi-Fi(UNII)	0.292		0.547		0.839	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.182	0.703			0.885	No
		WWAN + Wi-Fi(UNII)	0.182		0.405		0.587	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.285	0.416			0.701	No
		WWAN + Wi-Fi(UNII)	0.285		0.319		0.604	No
Right Tilt	WWAN + Wi-Fi(DTS)	0.130	0.402			0.532	No	
	WWAN + Wi-Fi(UNII)	0.130		0.620		0.750	No	
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	1.115	0.280			1.395	No
		WWAN + Wi-Fi(UNII)	1.115		0.194		1.309	No
		WWAN + BT	1.115			0.168	1.283	No
	Front	WWAN + Wi-Fi(DTS)	0.670	0.057			0.727	No
		WWAN + Wi-Fi(UNII)	0.670		0.079		0.749	No
		WWAN + BT	0.670			0.168	0.838	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.224			0.224	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.211	0.062			0.273	No
	Edge 3	WWAN + Wi-Fi(DTS)	1.110				1.110	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.172				0.172	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.

**14.9. Sum of the SAR for CDMA BC10 & Wi-Fi 2.4 GHz & BT**

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario			Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			CDMA BC10	Wi-Fi (DTS)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.328	0.356		0.684	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.294	0.368		0.662	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.441	0.232		0.673	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.301	0.230		0.531	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.581	0.251		0.832	No
		WWAN + BT	0.581		0.168	0.749	No
	Front	WWAN + Wi-Fi(DTS)	0.444	0.088		0.532	No
		WWAN + BT	0.444		0.168	0.612	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.131		0.131	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.506	0.043		0.549	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.440			0.440	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.226			0.226	No

**14.10. Sum of the SAR for CDMA BC10 & Wi-Fi 5 GHz Bands & BT**

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			CDMA BC10	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.328	0.529			0.857	No
		WWAN + Wi-Fi(UNII)	0.328		0.547		0.875	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.294	0.703			0.997	No
		WWAN + Wi-Fi(UNII)	0.294		0.405		0.699	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.441	0.416			0.857	No
		WWAN + Wi-Fi(UNII)	0.441		0.319		0.760	No
Right Tilt	WWAN + Wi-Fi(DTS)	0.301	0.402			0.703	No	
	WWAN + Wi-Fi(UNII)	0.301		0.620		0.921	No	
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.581	0.280			0.861	No
		WWAN + Wi-Fi(UNII)	0.581		0.194		0.775	No
		WWAN + BT	0.581			0.168	0.749	No
	Front	WWAN + Wi-Fi(DTS)	0.444	0.057			0.501	No
		WWAN + Wi-Fi(UNII)	0.444		0.079		0.523	No
		WWAN + BT	0.444			0.168	0.612	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.224			0.224	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.506	0.062			0.568	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.440				0.440	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.226				0.226	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.

**14.11. Sum of the SAR for W-CDMA Band V & Wi-Fi 2.4 GHz & BT**

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario			Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			W-CDMA Band V	Wi-Fi (DTS)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.293	0.356		0.649	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.209	0.368		0.577	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.383	0.232		0.615	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.214	0.230		0.444	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.413	0.251		0.664	No
		WWAN + BT	0.413		0.168	0.581	No
	Front	WWAN + Wi-Fi(DTS)	0.421	0.088		0.509	No
		WWAN + BT	0.421		0.168	0.589	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.131		0.131	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.414	0.043		0.457	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.400			0.400	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.189			0.189	No

**14.12. Sum of the SAR for W-CDMA Band V & Wi-Fi 5 GHz Bands & BT**

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			W-CDMA Band V	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.293	0.529			0.822	No
		WWAN + Wi-Fi(UNII)	0.293		0.547		0.840	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.209	0.703			0.912	No
		WWAN + Wi-Fi(UNII)	0.209		0.405		0.614	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.383	0.416			0.799	No
		WWAN + Wi-Fi(UNII)	0.383		0.319		0.702	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.214	0.402			0.616	No
		WWAN + Wi-Fi(UNII)	0.214		0.620		0.834	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.413	0.280			0.693	No
		WWAN + Wi-Fi(UNII)	0.413		0.194		0.607	No
		WWAN + BT	0.413			0.168	0.581	No
	Front	WWAN + Wi-Fi(DTS)	0.421	0.057			0.478	No
		WWAN + Wi-Fi(UNII)	0.421		0.079		0.500	No
		WWAN + BT	0.421			0.168	0.589	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.224			0.224	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.414	0.062			0.476	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.400				0.400	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.189				0.189	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.

**14.13. Sum of the SAR for W-CDMA Band II & Wi-Fi 2.4 GHz & BT**

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario			Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			W-CDMA Band II	Wi-Fi (DTS)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.199	0.356		0.555	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.122	0.368		0.490	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.218	0.232		0.450	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.102	0.230		0.332	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.942	0.251		1.193	No
		WWAN + BT	0.942		0.168	1.110	No
	Front	WWAN + Wi-Fi(DTS)	0.462	0.088		0.550	No
		WWAN + BT	0.462		0.168	0.630	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.131		0.131	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.131	0.043		0.174	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.730			0.730	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.134			0.134	No

**14.14. Sum of the SAR for W-CDMA Band II & Wi-Fi 5 GHz Bands & BT**

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			W-CDMA Band II	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.199	0.529			0.728	No
		WWAN + Wi-Fi(UNII)	0.199		0.547		0.746	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.122	0.703			0.825	No
		WWAN + Wi-Fi(UNII)	0.122		0.405		0.527	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.218	0.416			0.634	No
		WWAN + Wi-Fi(UNII)	0.218		0.319		0.537	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.102	0.402			0.504	No
		WWAN + Wi-Fi(UNII)	0.102		0.620		0.722	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.942	0.280			1.222	No
		WWAN + Wi-Fi(UNII)	0.942		0.194		1.136	No
		WWAN + BT	0.942			0.168	1.110	No
	Front	WWAN + Wi-Fi(DTS)	0.462	0.057			0.519	No
		WWAN + Wi-Fi(UNII)	0.462		0.079		0.541	No
		WWAN + BT	0.462			0.168	0.630	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.224			0.224	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.131	0.062			0.193	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.730				0.730	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.134				0.134	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.

**14.15. Sum of the SAR for LTE Band 25 & Wi-Fi 2.4 GHz & BT**

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario			Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			LTE Band 25	Wi-Fi (DTS)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.181	0.356		0.537	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.112	0.368		0.480	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.190	0.232		0.422	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.099	0.230		0.329	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.700	0.251		0.951	No
		WWAN + BT	0.700		0.168	0.868	No
	Front	WWAN + Wi-Fi(DTS)	0.464	0.088		0.552	No
		WWAN + BT	0.464		0.168	0.632	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.131		0.131	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.175	0.043		0.218	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.741			0.741	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.145			0.145	No

**14.16. Sum of the SAR for LTE Band 25 & Wi-Fi 5 GHz Bands & BT**

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			LTE Band 25	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.181	0.529			0.710	No
		WWAN + Wi-Fi(UNII)	0.181		0.547		0.728	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.112	0.703			0.815	No
		WWAN + Wi-Fi(UNII)	0.112		0.405		0.517	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.190	0.416			0.606	No
		WWAN + Wi-Fi(UNII)	0.190		0.319		0.509	No
Right Tilt	WWAN + Wi-Fi(DTS)	0.099	0.402			0.501	No	
	WWAN + Wi-Fi(UNII)	0.099		0.620		0.719	No	
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.700	0.280			0.980	No
		WWAN + Wi-Fi(UNII)	0.700		0.194		0.894	No
		WWAN + BT	0.700			0.168	0.868	No
	Front	WWAN + Wi-Fi(DTS)	0.464	0.057			0.521	No
		WWAN + Wi-Fi(UNII)	0.464		0.079		0.543	No
		WWAN + BT	0.464			0.168	0.632	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.224			0.224	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.175	0.062			0.237	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.741				0.741	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.145				0.145	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.

**14.17. Sum of the SAR for LTE Band 26 & Wi-Fi 2.4 GHz & BT**

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario			Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			LTE Band 26	Wi-Fi (DTS)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.230	0.356		0.586	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.174	0.368		0.542	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.318	0.232		0.550	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.189	0.230		0.419	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.433	0.251		0.684	No
		WWAN + BT	0.433		0.168	0.601	No
	Front	WWAN + Wi-Fi(DTS)	0.341	0.088		0.429	No
		WWAN + BT	0.341		0.168	0.509	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.131		0.131	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.400	0.043		0.443	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.328			0.328	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.207			0.207	No

**14.18. Sum of the SAR for LTE Band 26 & Wi-Fi 5 GHz Bands & BT**

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			LTE Band 26	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.230	0.529			0.759	No
		WWAN + Wi-Fi(UNII)	0.230		0.547		0.777	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.174	0.703			0.877	No
		WWAN + Wi-Fi(UNII)	0.174		0.405		0.579	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.318	0.416			0.734	No
		WWAN + Wi-Fi(UNII)	0.318		0.319		0.637	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.189	0.402			0.591	No
		WWAN + Wi-Fi(UNII)	0.189		0.620		0.809	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.433	0.280			0.713	No
		WWAN + Wi-Fi(UNII)	0.433		0.194		0.627	No
		WWAN + BT	0.433			0.168	0.601	No
	Front	WWAN + Wi-Fi(DTS)	0.341	0.057			0.398	No
		WWAN + Wi-Fi(UNII)	0.341		0.079		0.420	No
		WWAN + BT	0.341			0.168	0.509	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.224			0.224	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.400	0.062			0.462	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.328				0.328	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.207				0.207	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.

**14.19. Sum of the SAR for LTE Band 41 & Wi-Fi 2.4 GHz & BT**

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario			Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			LTE Band 41	Wi-Fi (DTS)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.064	0.356		0.420	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.032	0.368		0.400	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.099	0.232		0.331	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.039	0.230		0.269	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.286	0.251		0.537	No
		WWAN + BT	0.286		0.168	0.454	No
	Front	WWAN + Wi-Fi(DTS)	0.126	0.088		0.214	No
		WWAN + BT	0.126		0.168	0.294	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.131		0.131	No
	Edge 2	WWAN + Wi-Fi(DTS)		0.043		0.043	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.401			0.401	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.221			0.221	No

**14.20. Sum of the SAR for LTE Band 41 & Wi-Fi 5 GHz Bands & BT**

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			LTE Band 41	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.064	0.529			0.593	No
		WWAN + Wi-Fi(UNII)	0.064		0.547		0.611	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.032	0.703			0.735	No
		WWAN + Wi-Fi(UNII)	0.032		0.405		0.437	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.099	0.416			0.515	No
		WWAN + Wi-Fi(UNII)	0.099		0.319		0.418	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.039	0.402			0.441	No
		WWAN + Wi-Fi(UNII)	0.039		0.620		0.659	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.286	0.280			0.566	No
		WWAN + Wi-Fi(UNII)	0.286		0.194		0.480	No
		WWAN + BT	0.286			0.168	0.454	No
	Front	WWAN + Wi-Fi(DTS)	0.126	0.057			0.183	No
		WWAN + Wi-Fi(UNII)	0.126		0.079		0.205	No
		WWAN + BT	0.126			0.168	0.294	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.224			0.224	No
	Edge 2	WWAN + Wi-Fi(DTS)		0.062			0.062	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.401				0.401	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.221				0.221	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.

## **15. Appendixes**

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

- 15.1. Photos and Antenna Locations**
- 15.2. System Performance Check Plots**
- 15.3. Highest SAR Test Plots**
- 15.4. Calibration Certificate for E-Field Probe EX3DV4 - SN 3885**
- 15.5. Calibration Certificate for E-Field Probe EX3DV4 - SN 3751**
- 15.6. Calibration Certificate for E-Field Probe EX3DV4 - SN 3749**
- 15.7. Calibration Certificate for E-Field Probe EX3DV4 - SN 3686**
- 15.8. Calibration Certificate for E-Field Probe EX3DV4 - SN 3990**
- 15.9. Calibration Certificate for D835V2 - SN 4d117**
- 15.10. Calibration Certificate for D1900V2- SN 5d043**
- 15.11. Calibration Certificate for D2450V2 - SN 748**
- 15.12. Calibration Certificate for D2600V2 - SN 1036**
- 15.13. Calibration Certificate for D5GHzV2 - SN 1168**
- 15.14. Calibration Certificate for D5GHzV2 – SN 1003**

**END OF REPORT**