



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

SAR EVALUATION REPORT

For

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

**Model: LG-D725, D725, LGD725
FCC ID: ZNFD725**

**Report Number: 14U17493-S7A
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Prepared for

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Table of Contents

1. Attestation of Test Results..... 6

2. Test Methodology 7

3. Facilities and Accreditation 7

4. Calibration and Uncertainty 8

 4.1. *Measuring Instrument Calibration 8*

 4.2. *Measurement Uncertainty..... 9*

5. Measurement System Description and Setup..... 10

6. SAR Measurement Procedure..... 11

 6.1. *Normal SAR Measurement Procedure..... 11*

 6.2. *Volume Scan Procedures 13*

7. Device Under Test..... 14

 7.1. *General Information 14*

 7.2. *Wireless Technologies..... 15*

 7.3. *RF Output Power Tolerance 16*

 7.4. *Simultaneous Transmission Condition 17*

 7.5. *General LTE SAR Test and Reporting Considerations..... 18*

8. RF Exposure Conditions 20

 8.1. *Head Exposure Conditions 20*

 8.2. *Body-worn Accessory Exposure Conditions..... 20*

 8.3. *Hotspot Exposure Conditions and Wi-Fi Direct 20*

9. RF Output Power Measurement..... 22

 9.1. *GSM 22*

 9.2. *W-CDMA 23*

 9.3. *LTE Band..... 27*

 9.3.1. *LTE Rel. 10 Carrier Aggregation..... 34*

 9.4. *Wi-Fi (2.4 GHz Band)..... 37*

 9.5. *Wi-Fi (5 GHz Bands)..... 38*

 9.6. *Bluetooth 41*

10. Tissue Dielectric Properties 42

 10.1. *Composition of Ingredients for the Tissue Material Used in the SAR Tests 43*

 10.2. *Tissue Dielectric Parameter Check Results..... 44*

11. System Performance Check 47

11.1.	System Performance Check Measurement Conditions.....	47
11.2.	Reference SAR Values for System Performance Check.....	48
11.3.	System Performance Check Results	49
12.	SAR Test Results	51
12.1.	GSM850.....	52
12.2.	GSM1900.....	52
12.3.	W-CDMA Band V	53
12.4.	W-CDMA Band II.....	53
12.5.	LTE Band 2 (10MHz Bandwidth)	54
12.6.	LTE Band 4 (10MHz Bandwidth)	54
12.7.	LTE Band 5 (10MHz Bandwidth)	55
12.8.	LTE Band 7 (20MHz Bandwidth)	55
12.9.	LTE Band 17 (10MHz Bandwidth)	56
12.10.	Wi-Fi (DTS Band).....	56
12.11.	Wi-Fi (UNII Band).....	57
12.12.	Bluetooth.....	58
12.12.1.	Standalone SAR Test Exclusion Considerations	58
12.12.2.	Estimated SAR.....	58
13.	SAR Measurement Variability.....	59
13.1.	The Highest Measured SAR Configuration in Each Frequency Band	59
13.2.	Repeated Measurement Results	60
14.	Simultaneous Transmission SAR Analysis.....	61
14.1.	Sum of the SAR for GSM850 & Wi-Fi & BT	62
14.2.	Sum of the SAR for GSM1900 & Wi-Fi & BT	62
14.3.	Sum of the SAR for WCDMA Band V & Wi-Fi & BT.....	63
14.4.	Sum of the SAR for WCDMA Band II & Wi-Fi & BT	63
14.5.	Sum of the SAR for LTE Band 2 & Wi-Fi & BT	64
14.6.	Sum of the SAR for LTE Band 4 & Wi-Fi & BT	64
14.7.	Sum of the SAR for LTE Band 5 & Wi-Fi & BT	65
14.8.	Sum of the SAR for LTE Band 7 & Wi-Fi & BT	65
14.9.	Sum of the SAR for LTE Band 17 & Wi-Fi & BT	66
15.	Appendixes.....	67
15.1.	Photos and Antenna Locations.....	67
15.2.	System Performance Check Plots.....	67
15.3.	Highest SAR Test Plots.....	67

15.4.	Calibration Certificate for E-Field Probe EX3DV4 - SN 3929	67
15.5.	Calibration Certificate for E-Field Probe EX3DV3 - SN 3531	67
15.6.	Calibration Certificate for E-Field Probe EX3DV4 - SN 3902	67
15.7.	Calibration Certificate for E-Field Probe EX3DV4 - SN 3936	67
15.8.	Calibration Certificate for D750V3 - SN 1024	67
15.9.	Calibration Certificate for D835V2 - SN 4d002	67
15.10.	Calibration Certificate for D1750V2 - SN 1053	67
15.11.	Calibration Certificate for D1900V2- SN 5d163	67
15.12.	Calibration Certificate for D2450V2 - SN 706	67
15.13.	Calibration Certificate for D5GHzV2 - SN 1138	67

1. Attestation of Test Results

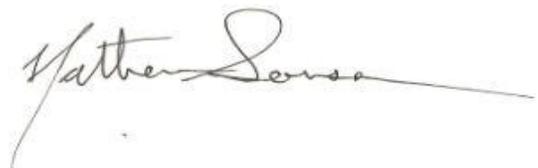
Applicant	LG ELECTRONICS MOBILECOMM U.S.A., INC.			
DUT description	GSM/WCDMA/LTE Phone + Bluetooth, DTS/UNII a/b/g/n and NFC			
Model	LG-D725, D725, LGD725			
Test device is	An identical prototype			
Device category	Portable			
Exposure category	General Population/Uncontrolled Exposure			
Date tested	4/3/2014 – 4/23/2014			
The highest reported SAR values	RF exposure condition	Licensed	DTS	UNII
	Head	1.074 W/kg	0.145 W/kg	0.105 W/kg
	Body-worn Accessory	1.070 W/kg	0.075 W/kg	0.093 W/kg
	Wireless Router (Hotspot)	1.070 W/kg	0.092 W/kg	N/A
	Simultaneous Transmission	1.174 W/kg		1.115 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.

Approved & Released By:

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 UL Verification Services Inc.

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 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 D05A LTE Rel.10 KDB Inquiry Sheet v01
- 941225 D06 Hotspot Mode SAR v01r01
- 248227 D01 SAR Meas for 802 11abg v01r02
- 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03
- 865664 D02 SAR Reporting v01r01
- 690783 D01 SAR Listings on Grants v01r03

3. Facilities and Accreditation

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

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 the recognized national standards.

Tissue Dielectric Properties

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
PNA Network Analyzer	Agilent	E8363C	MY49030443	12/3/2014
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
Synthesized Signal Generator	Agilent	8665B	3438A0063	6/13/2014
Power Meter	HP	438A	2822A05684	10/10/2014
Power Sensor	Agilent	8481A	2237A31744	10/2/2014
Power Sensor	Agilent	8481A	2349A36506	9/30/2014
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1795093	N/A
Directional coupler	Werlatone	C8060-102	2711	N/A
DC Power Supply	AMETEK	XHR60-18	1308A01935	N/A
Synthesized Signal Generator	HP	8665B	3744A01084	5/7/2014
Power Meter	HP	437B	3125U11364	8/26/2014
Power Meter	HP	437B	3125U12345	7/29/2014
Power Sensor	HP	8481A	1926A27048	7/29/2014
Power Sensor	HP	8481A	2702A76223	9/17/2014
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1622052	N/A
Directional coupler	Werlatone	C8060-102	2149	N/A
DC Power Supply	BK Precision	1611	215-02292	N/A
E-Field Probe	SPEAG	EX3DV4	3929	6/24/2014
E-Field Probe	SPEAG	EX3DV3	3531	11/21/2014
E-Field Probe	SPEAG	EX3DV4	3902	7/12/2014
E-Field Probe	SPEAG	EX3DV4	3936	7/22/2014
Data Acquisition Electronics	SPEAG	DAE3	427	1/21/2015
Data Acquisition Electronics	SPEAG	DAE4	1359	2/17/2015
Data Acquisition Electronics	SPEAG	DAE4	1377	7/15/2014
Data Acquisition Electronics	SPEAG	DAE4	1380	7/15/2014
System Validation Dipole	SPEAG	D750V3	1024	5/28/2014
System Validation Dipole	SPEAG	D835V2	4d002	11/15/2014
System Validation Dipole	SPEAG	D1750V2	1053	8/27/2014
System Validation Dipole	SPEAG	D1900V2	5d163	9/17/2014
System Validation Dipole	SPEAG	D2450V2	706	5/29/2014
System Validation Dipole	SPEAG	D5GHzV2	1138	11/19/2014

Others

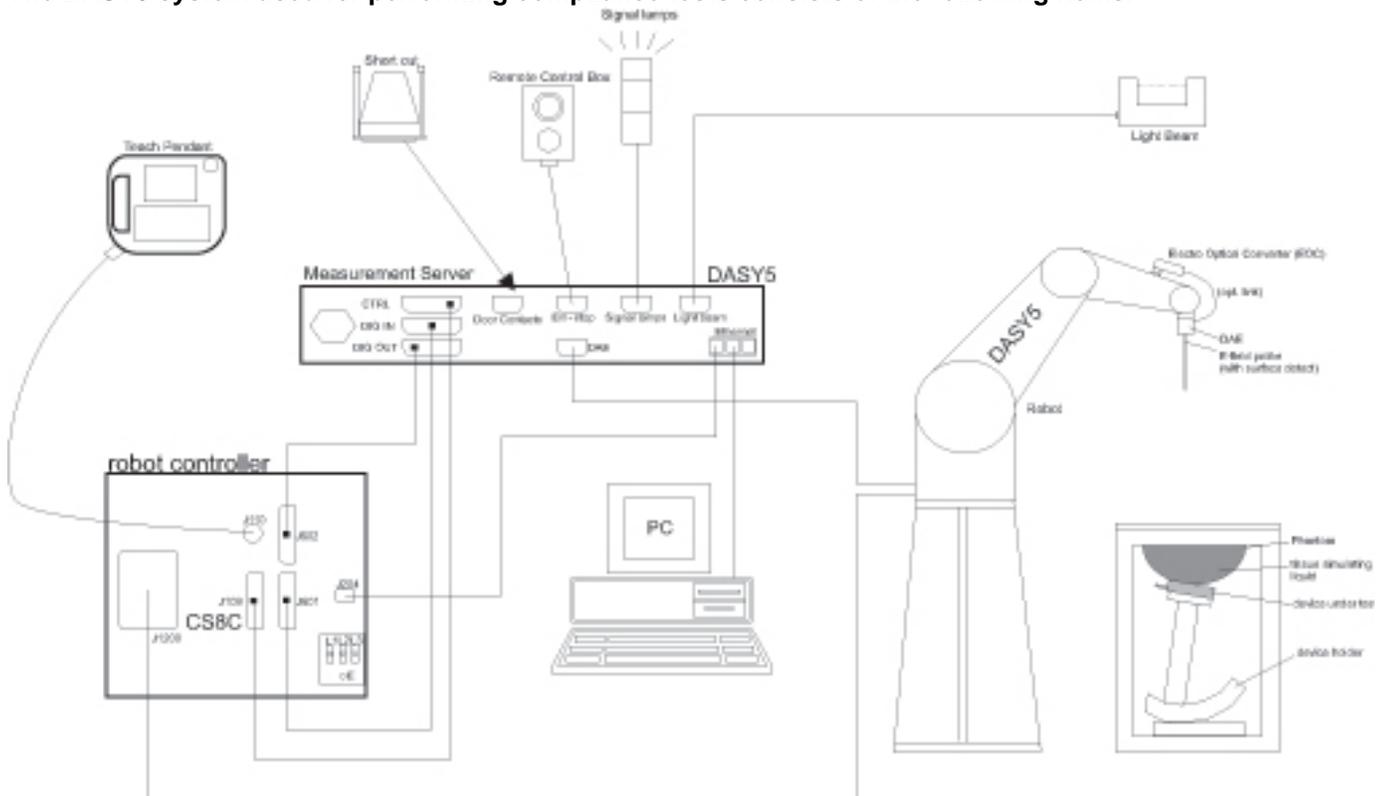
Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Base Station Simulator	R & S	CMW500	103764-dn	8/16/2014
Base Station Simulator	R & S	CMW500	103766-ly	8/19/2014
Base Station Simulator	R & S	CMW500	107513-be	7/26/2014
Power Meter	Agilent	N1912A	MY50001018	8/23/2014
Power Sensor	Agilent	N1921A	MY52020011	5/13/2014
Power Sensor	Agilent	N1921A	MY52200012	9/25/2014

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	$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
Maximum area scan spatial resolution: Δx_{Area} , Δy_{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 \leq the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Step 3: Zoom Scan

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

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

		≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: $\Delta x_{Zoom}, \Delta y_{Zoom}$		≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm *	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$	≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1 st two points closest to phantom surface	≤ 4 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	≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm
Note: δ 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 ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 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 checked="" type="checkbox"/> Mobile Hotspot (Wi-Fi 5.8 GHz only)
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 only)
Device dimension	Overall (Length x Width): 136.4 mm x 69.8mm Overall Diagonal: 147.4mm Display Diagonal: 127.0mm
Back Cover	<input checked="" type="checkbox"/> Normal Battery Cover <input type="checkbox"/> Wireless Charger Battery Cover <input 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, 9.7Wh <input type="checkbox"/> Extended (large capacity)

7.2. Wireless Technologies

Wireless Technology and Frequency Bands	GSM: 850 / 1900 W-CDMA Band: V / II LTE Band 2 / 4 / 5 / 17 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) W-CDMA - <input checked="" type="checkbox"/> UMTS Rel. 99 (Voice & Data) - <input checked="" type="checkbox"/> HSDPA - <input checked="" type="checkbox"/> HSUPA - <input checked="" type="checkbox"/> HSPA+ LTE - <input checked="" type="checkbox"/> QPSK - <input checked="" type="checkbox"/> 16QAM - <input checked="" type="checkbox"/> Rel. 10 Carrier Aggregation (1 Uplink and 2 Downlinks) Wi-Fi 2.4GHz (802.11b/g/n) - <input checked="" type="checkbox"/> 802.11b - <input checked="" type="checkbox"/> 802.11g - <input checked="" type="checkbox"/> 802.11n (HT20) Wi-Fi 5GHz - <input checked="" type="checkbox"/> 802.11a - <input checked="" type="checkbox"/> 802.11n (HT20) - <input checked="" type="checkbox"/> 802.11n (HT40) Bluetooth Ver. 4.0 (LE)
Duty Cycle	GSM Voice: 12.5%; GPRS 1 Slot: 12.5%; 2 Slots: 25%, 3 Slots: 37.5%, 4 Slots: 50%, W-CDMA: 100% LTE: 100% Wi-Fi 802.11a/b/g/n: 100% Bluetooth: 32.25% (DH1), 66.68% (DH3), 77.52% (DH5)
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
DTM (Dual Transfer Mode)	<input type="checkbox"/> Supported
VoIP (GPRS)	<input checked="" type="checkbox"/> Supported
SV-LTE & SV-DO	<input 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	25.2	25.7
GSM1900	Voice	30.2	30.7
	GPRS 1 slot	30.2	30.7
	GPRS 2 slots	28.2	28.7
	EGPRS 1 slot	26.2	26.7
	EGPRS 2 slots	24.2	24.7
W-CDMA Band V	R99	24.2	24.7
	HSDPA	24.2	24.7
	HSUPA	24.2	24.7
W-CDMA Band II	R99	23.7	24.2
	HSDPA	23.7	24.2
	HSUPA	23.7	24.2
LTE Band 2	QPSK	24.2	24.7
LTE Band 4	QPSK	24.2	24.7
LTE Band 5	QPSK	24.2	24.7
LTE Band 7	QPSK	23.7	24.2
LTE Band 17	QPSK	24.2	24.7

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	15.0	16.0
	802.11g	12.5	13.5
	802.11n HT20	10.0	11.0
WiFi 5 GHz	802.11a	10.0	11.0
	802.11n HT20	10.0	11.0
	802.11n HT40	10.0	11.0
Bluetooth		9.0	10.0
Bluetooth LE		4.0	5.0

7.4. Simultaneous Transmission Condition

Item	Capable Transmit Configurations	RF Exposure Condition			Notes
		Head	Body-worn Accessory	Wireless Router (Hotspot) & Wi-Fi Direct	
1	GSM 850/1900 Voice + Wi-Fi 2.4/5GHz	✓	✓	✓	
2	GSM 850/1900 (GPRS/EDGE) + Wi-Fi 2.4/5GHz (VoIP)	✓	✓	✓	
3	WCDMA Band V/II + Wi-Fi 2.4/5GHz	✓	✓	✓	
4	LTE B2/B5/B7/B17 + Wi-Fi 2.4/5GHz	✓	✓	✓	
5	GSM 850/1900 Voice + BT		✓		
6	GSM 850/1900 (GPRS/EDGE) + BT(VoIP)		✓		
7	WCDMA Band V/II + BT		✓		
8	LTE B2/B5/B7/B17 + BT		✓		

Notes:

1. Wi-Fi 2.4/5.8GHz support Hotspot and Wi-Fi Direct.
2. GPRS/EDGE, WCDMA, and LTE support Hotspot.
3. GPRS/EDGE, WCDMA, and LTE support VoIP.
4. Wi-Fi 2.4 GHz Radio cannot transmit simultaneously with Bluetooth Radio.
5. Wi-Fi 5 GHz Radio can transmit simultaneously with Bluetooth Radio.

7.5. General LTE SAR Test and Reporting Considerations

Item	Description						
Frequency range, Channel Bandwidth, Numbers and Frequencies	Band 2	Frequency range: 1850 - 1910 MHz					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low			18650/ 1855	18625/ 1852.5		
	Mid			18900/ 1880	18900/ 1880		
	High			19150/ 1905	19175/ 1907.5		
	Band 4	Frequency range: 1710 - 1755 MHz					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low			20000/ 1715	19975/ 1712.5		
	Mid			20175/ 1732.5	20175/ 1732.5		
	High			20350/ 1750	20375/ 1752.5		
	Band 5	Frequency range: 824 - 849 MHz					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low			20450/ 829	20425/ 826.5		
	Mid			20525/ 836.5	20525/ 836.5		
	High			20600/ 844	20625/ 846.5		
	Band 17	Frequency range: 704 - 716 MHz					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
Low				23755/ 706.5			
Mid			23790/ 710	23790/ 710			
High				23825/ 713.5			
Carrier Aggregation Combinations	Band 2 Primary	Channel Bandwidth		Band 17 Secondary	Channel Bandwidth		
		10 MHz	5 MHz		10 MHz	5 MHz	
	Low	18650/ 1855	18625/ 1852.5	Secondary Cell is Downlink only			
	Mid	18900/ 1880	18900/ 1880				
	High	19150/ 1905	19175/ 1907.5				
	Band 4 Primary	Channel Bandwidth		Band 17 Secondary	Channel Bandwidth		
		10 MHz	5 MHz		10 MHz	5 MHz	
	Low	20000/ 1715	19975/ 1712.5	Secondary Cell is Downlink only			
	Mid	20175/ 1732.5	20175/ 1732.5				
	High	20350/ 1750	20375/ 1752.5				
	Band 17 Primary	Channel Bandwidth		Band 2 Secondary	Channel Bandwidth		
		10 MHz	5 MHz		10 MHz	5 MHz	
Low	23780/ 709	23755/ 706.5	Secondary Cell is Downlink only				
Mid	23790/ 710	23790/ 710					
High	23800/ 711	23825/ 713.5					

General LTE SAR Test and Reporting Considerations (continued)

LTE transmitter and antenna implementation	LTE has two (2) TX antennas and one (1) DRX MIMO antenna TX/RX Antenna 4: LTE Band 17, 7, and 5 TX/RX Antenna 5: LTE Bands 2 and 4 Refer to Appendix 15.1. Photos and Antenna Locations.																																						
Maximum power reduction (MPR)	<p style="text-align: center;">Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <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>> 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>≤ 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>> 5</td> <td>> 4</td> <td>> 8</td> <td>> 12</td> <td>> 16</td> <td>> 18</td> <td>≤ 2</td> </tr> </tbody> </table> <p>MPR Built-in by design A-MPR (additional MPR) was disabled during SAR testing</p>	Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1	16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1	16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)																																
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz																																	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1																																
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1																																
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2																																
Power reduction	No																																						
Spectrum plots for RB configurations	A properly configured base station simulator was used for the SAR and power measurements; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.																																						

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, LTE and Wi-Fi

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 WWAN and LTE

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

For Wi-Fi

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

8.3. Hotspot Exposure Conditions and Wi-Fi Direct

For WWAN and LTE Band 5/7/17 Main Antenna 1 (④)

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	
Edge 1 (Top)	122.95 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR
Edge 2 (Right)	1 mm	Yes	
Edge 3 (Bottom)	1 mm	Yes	
Edge 4 (Left)	19.4 mm	Yes	

For WWAN and LTE Band 2/4 Main Antenna 2 (⑤)

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	
Edge 1 (Top)	124.95 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)	54.4 mm	No	SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR
Edge 3 (Bottom)	1 mm	Yes	
Edge 4 (Left)	1 mm	Yes	

For Wi-Fi (①)

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Rear	<25 mm	Yes	
Front	<25 mm	Yes	
Edge 1 (Top)	1 mm	Yes	
Edge 2 (Right)	61.4 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 3 (Bottom)	115.95 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)	1 mm	Yes	

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	33.2	24.2	
				190	836.6	33.1	24.1	
				251	848.8	33.0	24.0	
	GPRS (GMSK)	CS1	1	1	128	824.2	33.2	24.2
					190	836.6	33.2	24.2
					251	848.8	33.0	24.0
			2	1	128	824.2	31.5	25.5
					190	836.6	31.6	25.6
					251	848.8	31.5	25.5
	EGPRS (8PSK)	MCS5	1	1	128	824.2	27.7	18.7
					190	836.6	27.6	18.6
					251	848.8	27.6	18.6
2			1	128	824.2	25.4	19.4	
				190	836.6	25.4	19.4	
				251	848.8	25.6	19.6	

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	30.6	21.6	
				661	1880.0	30.6	21.6	
				810	1909.8	30.4	21.4	
	GPRS (GMSK)	CS1	1	1	512	1850.2	30.6	21.6
					661	1880.0	30.6	21.6
					810	1909.8	30.4	21.4
			2	1	512	1850.2	28.6	22.6
					661	1880.0	28.5	22.5
					810	1909.8	28.5	22.5
	EGPRS (8PSK)	MCS5	1	1	512	1850.2	26.3	17.3
					661	1880.0	26.3	17.3
					810	1909.8	26.4	17.4
			2	1	512	1850.2	24.5	18.5
					661	1880.0	24.5	18.5
					810	1909.8	24.6	18.6

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. 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
	β_c/β_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	24.6
		4183	836.6	24.5
		4233	846.6	24.6
W-CDMA Band II	Rel 99 (RMC, 12.2 kbps)	9262	1852.4	23.7
		9400	1880.0	23.7
		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			
	β_c	2/15	12/15	15/15	15/15
	β_d	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	β_c/β_d	2/15	12/15	15/8	15/4
	β_{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= β_{hs}/β_c	30/15				

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	24.6
		4183	836.6	24.5
		4233	846.6	24.7
	Subtest 2	4132	826.4	24.7
		4183	836.6	24.6
		4233	846.6	24.6
	Subtest 3	4132	826.4	24.2
		4183	836.6	24.2
		4233	846.6	24.2
	Subtest 4	4132	826.4	24.2
		4183	836.6	24.1
		4233	846.6	24.2
W-CDMA Band II	Subtest 1	9262	1852.4	23.5
		9400	1880.0	23.8
		9538	1907.6	23.7
	Subtest 2	9262	1852.4	23.8
		9400	1880.0	23.8
		9538	1907.6	23.8
	Subtest 3	9262	1852.4	23.3
		9400	1880.0	23.2
		9538	1907.6	23.2
	Subtest 4	9262	1852.4	23.3
		9400	1880.0	23.2
		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
	β_c	11/15	6/15	15/15	2/15	15/15
	β_d	15/15	15/15	9/15	15/15	0
	β_{ec}	209/225	12/15	30/15	2/15	5/15
	β_c/β_d	11/15	11/15	15/9	2/15	15/0
	β_{hs}	22/15	12/15	30/15	4/15	5/15
	β_{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 _{hs} = β_{hs}/β_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	24.3
		4183	836.6	23.8
		4233	846.6	23.5
	Subtest 2	4132	826.4	23.1
		4183	836.6	22.9
		4233	846.6	22.5
	Subtest 3	4132	826.4	23.2
		4183	836.6	23.1
		4233	846.6	23.5
	Subtest 4	4132	826.4	23.2
		4183	836.6	23.1
		4233	846.6	23.0
	Subtest 5	4132	826.4	23.6
		4183	836.6	23.5
		4233	846.6	24.4
W-CDMA Band II	Subtest 1	9262	1852.4	22.6
		9400	1880.0	23.1
		9538	1907.6	22.9
	Subtest 2	9262	1852.4	21.6
		9400	1880.0	22.0
		9538	1907.6	22.1
	Subtest 3	9262	1852.4	22.2
		9400	1880.0	22.6
		9538	1907.6	22.3
	Subtest 4	9262	1852.4	22.5
		9400	1880.0	21.9
		9538	1907.6	22.1
	Subtest 5	9262	1852.4	22.6
		9400	1880.0	23.4
		9538	1907.6	23.6

9.3. 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 ¹	1.4, 3, 5, 10	Table 6.2.4-5	Table 6.2.4-5
..					
NS_32	-	-	-	-	-

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

LTE Band 2 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1855 MHz	1880 MHz	1905 MHz
LTE Band 2	10	QPSK	1	0	0	0	24.5	24.6	24.6
			1	25	0	0	24.6	24.6	24.5
			1	49	0	0	24.5	24.6	24.5
			25	0	1	1	23.6	23.6	23.6
			25	12	1	1	23.6	23.7	23.5
			25	25	1	1	23.6	23.7	23.6
			50	0	1	1	23.6	23.7	23.6
		16QAM	1	0	1	1	23.4	23.5	23.5
			1	25	1	1	23.4	23.4	23.4
			1	49	1	1	23.4	23.5	23.4
			25	0	2	2	22.6	22.7	22.7
			25	12	2	2	22.6	22.7	22.6
			25	25	2	2	22.6	22.7	22.6
			50	0	2	2	22.6	22.7	22.6
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1852.5 MHz	1880 MHz	1907.5 MHz
LTE Band 2	5	QPSK	1	0	0	0	24.6	24.7	24.6
			1	12	0	0	24.5	24.6	24.5
			1	24	0	0	24.6	24.6	24.6
			12	0	1	1	23.6	23.7	23.6
			12	7	1	1	23.6	23.7	23.6
			12	13	1	1	23.6	23.7	23.6
			25	0	1	1	23.6	23.7	23.6
		16QAM	1	0	1	1	23.3	23.5	23.4
			1	12	1	1	23.4	23.4	23.3
			1	24	1	1	23.4	23.5	23.4
			12	0	2	2	22.6	22.7	22.6
			12	7	2	2	22.7	22.7	22.6
			12	13	2	2	22.7	22.7	22.7
			25	0	2	2	22.7	22.7	22.7

LTE Band 4 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1715 MHz	1732.5 MHz	1750 MHz
LTE Band 4	10	QPSK	1	0	0	0	24.6	24.6	24.6
			1	25	0	0	24.5	24.5	24.7
			1	49	0	0	24.5	24.6	24.7
			25	0	1	1	23.5	23.6	23.6
			25	12	1	1	23.5	23.5	23.6
			25	25	1	1	23.6	23.5	23.6
			50	0	1	1	23.6	23.6	23.6
		16QAM	1	0	1	1	23.4	23.4	23.4
			1	25	1	1	23.3	23.3	23.4
			1	49	1	1	23.3	23.4	23.4
			25	0	2	2	22.6	22.7	22.7
			25	12	2	2	22.5	22.5	22.7
			25	25	2	2	22.6	22.6	22.6
			50	0	2	2	22.6	22.6	22.6
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1715 MHz	1732.5 MHz	1752.5 MHz
LTE Band 4	5	QPSK	1	0	0	0	24.5	24.5	24.7
			1	12	0	0	24.5	24.5	24.7
			1	24	0	0	24.6	24.6	24.7
			12	0	1	1	23.6	23.5	23.6
			12	7	1	1	23.5	23.5	23.6
			12	13	1	1	23.5	23.5	23.6
			25	0	1	1	23.5	23.5	23.5
		16QAM	1	0	1	1	23.3	23.3	23.4
			1	12	1	1	23.3	23.2	23.4
			1	24	1	1	23.4	23.3	23.4
			12	0	2	2	22.6	22.5	22.7
			12	7	2	2	22.6	22.6	22.7
			12	13	2	2	22.6	22.6	22.6
			25	0	2	2	22.7	22.6	22.7

LTE Band 5 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							829 MHz	836.5 MHz	844 MHz
LTE Band 5	10	QPSK	1	0	0	0	24.6	24.5	24.6
			1	25	0	0	24.6	24.6	24.6
			1	49	0	0	24.5	24.6	24.7
			25	0	1	1	23.6	23.5	23.6
			25	12	1	1	23.6	23.6	23.6
			25	25	1	1	23.6	23.6	23.6
			50	0	1	1	23.6	23.6	23.6
		16QAM	1	0	1	1	23.5	23.4	23.4
			1	25	1	1	23.4	23.4	23.4
			1	49	1	1	23.4	23.4	23.5
			25	0	2	2	22.7	22.6	22.6
			25	12	2	2	22.6	22.6	22.5
			25	25	2	2	22.6	22.5	22.6
			50	0	2	2	22.7	22.6	22.6
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							826.5 MHz	836.5 MHz	846.5 MHz
LTE Band 5	5	QPSK	1	0	0	0	24.5	24.5	24.6
			1	12	0	0	24.6	24.6	24.6
			1	24	0	0	24.6	24.6	24.7
			12	0	1	1	23.5	23.6	23.6
			12	7	1	1	23.6	23.6	23.6
			12	13	1	1	23.6	23.5	23.6
			25	0	1	1	23.6	23.6	23.6
		16QAM	1	0	1	1	23.2	23.3	23.3
			1	12	1	1	23.4	23.3	23.3
			1	24	1	1	23.4	23.4	23.4
			12	0	2	2	22.5	22.6	22.6
			12	7	2	2	22.6	22.6	22.6
			12	13	2	2	22.6	22.6	22.6
			25	0	2	2	22.7	22.7	22.7

LTE Band 7 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							2510 MHz	2535 MHz	2560 MHz
LTE Band 7	20	QPSK	1	0	0	0	23.7	24.1	24.0
			1	49	0	0	23.7	24.0	24.0
			1	99	0	0	23.9	24.1	23.7
			50	0	1	1	22.7	23.0	23.0
			50	24	1	1	22.7	23.0	22.9
			50	50	1	1	22.7	22.9	22.8
			100	0	1	1	22.7	22.9	22.9
		16QAM	1	0	1	1	22.8	23.1	23.1
			1	49	1	1	22.8	23.0	23.0
			1	99	1	1	23.0	23.0	22.8
			50	0	2	2	21.8	22.1	22.0
			50	24	2	2	21.7	22.0	22.0
			50	50	2	2	21.8	22.1	21.9
			100	0	2	2	21.8	22.0	22.0
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							2507.5 MHz	2535 MHz	2562.5 MHz
LTE Band 7	15	QPSK	1	0	0	0	23.8	24.1	24.1
			1	37	0	0	23.6	24.0	24.0
			1	74	0	0	23.9	24.1	23.8
			36	0	1	1	22.7	23.0	23.0
			36	20	1	1	22.7	23.0	23.0
			36	39	1	1	22.8	23.0	22.9
			75	0	1	1	22.7	23.0	23.0
		16QAM	1	0	1	1	22.6	22.8	22.8
			1	37	1	1	22.5	22.8	22.8
			1	74	1	1	22.6	22.9	22.6
			36	0	2	2	21.8	22.1	22.0
			36	20	2	2	21.7	22.0	22.0
			36	39	2	2	21.7	22.0	21.9
			75	0	2	2	21.7	22.0	22.0
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							2505 MHz	2535 MHz	2565 MHz
LTE Band 7	10	QPSK	1	0	0	0	23.8	24.2	24.0
			1	25	0	0	23.7	24.1	23.9
			1	49	0	0	23.7	24.2	23.7
			25	0	1	0	22.7	23.1	22.9
			25	12	1	0	22.7	23.0	22.9
			25	25	1	0	22.7	23.0	22.8
			50	0	1	0	22.7	23.0	22.9
		16QAM	1	0	1	0	22.7	22.9	22.8
			1	25	1	0	22.6	22.8	22.7
			1	49	1	0	22.5	22.9	22.5
			25	0	2	0	21.8	22.2	22.0
			25	12	2	0	21.8	22.0	21.9
			25	25	2	0	21.7	22.1	21.8
			50	0	2	0	21.8	22.1	21.9

LTE Band 7 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							2502.5 MHz	2535 MHz	2567.5 MHz
LTE Band 7	5	QPSK	1	0	0	0	23.8	24.2	24.0
			1	12	0	0	23.7	24.1	23.9
			1	24	0	0	23.8	24.2	23.8
			12	0	1	1	22.8	23.0	22.9
			12	6	1	1	22.8	23.0	22.9
			12	13	1	1	22.8	23.0	22.9
			25	0	1	1	22.7	23.0	22.9
		16QAM	1	0	1	1	22.6	22.8	22.7
			1	12	1	1	22.4	22.7	22.6
			1	24	1	1	22.6	22.8	22.6
			12	0	2	2	21.8	22.0	21.9
			12	6	2	2	21.8	22.1	22.0
			12	13	2	2	21.8	22.1	21.9
			25	0	2	2	21.8	22.2	21.9

LTE Band 17 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)
							710 MHz
LTE Band 17	10	QPSK	1	0	0	0	24.7
			1	25	0	0	24.7
			1	49	0	0	24.4
			25	0	1	1	23.6
			25	12	1	1	23.6
			25	25	1	1	23.6
			50	0	1	1	23.6
		16QAM	1	0	1	1	23.5
			1	25	1	1	23.5
			1	49	1	1	23.4
			25	0	2	2	22.6
			25	12	2	2	22.6
			25	25	2	2	22.6
			50	0	2	2	22.6
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)
							710 MHz
LTE Band 17	5	QPSK	1	0	0	0	24.7
			1	12	0	0	24.7
			1	24	0	0	24.7
			12	0	1	1	23.6
			12	7	1	1	23.6
			12	13	1	1	23.7
			25	0	1	1	23.6
		16QAM	1	0	1	1	23.4
			1	12	1	1	23.4
			1	24	1	1	23.4
			12	0	2	2	22.6
			12	7	2	2	22.6
			12	13	2	2	22.7
			25	0	2	2	22.7

Note(s):

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

9.3.1. LTE Rel. 10 Carrier Aggregation

The following power measurements were performed with a single carrier uplink; CA for this particular project only supports one (1) uplink and two (2) downlinks. B17+B4 CA mode is disabled due to the harmonic leakage issue

CA: LTE Band 2 (PCC) + LTE Band 17 (SCC)

BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)					
						LTE Band 2 (Primary Cell)			LTE Band 17 (Secondary Cell)		
						1855 MHz	1880 MHz	1905 MHz	709 MHz	710 MHz	711 MHz
10	QPSK	1	0	0	0	24.1	24.2	24.2	Downlink Only		
		1	25	0	0	24.2	24.2	24.2			
		1	49	0	0	24.2	24.2	24.2			
		25	0	1	1	23.1	23.4	23.4			
		25	12	1	1	23.2	23.4	23.5			
		25	25	1	1	23.2	23.4	23.6			
		50	0	1	1	23.2	23.4	23.6			
	16QAM	1	0	1	1	23.3	23.5	23.4			
		1	25	1	1	23.3	23.5	23.5			
		1	49	1	1	23.3	23.5	23.6			
		25	0	2	2	22.1	22.3	22.4			
		25	12	2	2	22.1	22.4	22.5			
		25	25	2	2	22.2	22.4	22.7			
		50	0	2	2	22.2	22.4	22.5			
BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)					
						LTE Band 2 (Primary Cell)			LTE Band 17 (Secondary Cell)		
						1852.5 MHz	1880 MHz	1907.5 MHz	706.5 MHz	710 MHz	713.5 MHz
5	QPSK	1	0	0	0	24.1	24.2	24.2	Downlink Only		
		1	12	0	0	24.1	24.2	24.2			
		1	24	0	0	24.2	24.2	24.2			
		12	0	1	1	23.2	23.3	23.6			
		12	6	1	1	23.3	23.3	23.6			
		12	11	1	1	23.2	23.3	23.6			
		25	0	1	1	23.1	23.4	23.7			
	16QAM	1	0	1	1	23.0	23.4	23.5			
		1	12	1	1	23.0	23.3	23.6			
		1	24	1	1	23.0	23.4	23.6			
		12	0	2	2	22.2	22.4	22.6			
		12	6	2	2	22.1	22.4	22.7			
		12	11	2	2	22.2	22.4	22.6			
		25	0	2	2	22.1	22.4	22.7			

CA: LTE Band 4 (PCC) + LTE Band 17 (SCC)

BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)					
						LTE Band 4 (Primary Cell)			LTE Band 17 (Secondary Cell)		
						1715 MHz	1735.5 MHz	1750 MHz	709 MHz	710 MHz	711 MHz
10	QPSK	1	0	0	0	24.2	24.2	24.2	Downlink Only		
		1	25	0	0	24.2	24.2	24.2			
		1	49	0	0	24.2	24.2	24.2			
		25	0	1	1	23.4	23.3	23.3			
		25	12	1	1	23.4	23.3	23.4			
		25	25	1	1	23.3	23.3	23.2			
		50	0	1	1	23.3	23.3	23.3			
	16QAM	1	0	1	1	23.5	23.4	23.3			
		1	25	1	1	23.5	23.4	23.4			
		1	49	1	1	23.4	23.4	23.4			
		25	0	2	2	22.4	22.3	22.4			
		25	12	2	2	22.4	22.3	22.4			
		25	25	2	2	22.3	22.3	22.4			
		50	0	2	2	22.3	22.4	22.3			
BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)					
						LTE Band 4 (Primary Cell)			LTE Band 17 (Secondary Cell)		
						1712.5 MHz	1732.5 MHz	1752.5 MHz	706.5 MHz	710 MHz	713.5 MHz
5	QPSK	1	0	0	0	24.2	24.2	24.2	Downlink Only		
		1	12	0	0	24.2	24.2	24.2			
		1	24	0	0	24.2	24.2	24.2			
		12	0	1	1	23.5	23.3	23.3			
		12	6	1	1	23.4	23.3	23.4			
		12	11	1	1	23.4	23.3	23.3			
		25	0	1	1	23.4	23.3	23.3			
	16QAM	1	0	1	1	23.4	23.2	23.3			
		1	12	1	1	23.3	23.2	23.3			
		1	24	1	1	23.3	23.2	23.4			
		12	0	2	2	22.5	22.4	22.3			
		12	6	2	2	22.5	22.4	22.4			
		12	11	2	2	22.4	22.4	22.4			
		25	0	2	2	22.4	22.4	22.4			

CA: LTE Band 17 (PCC) + LTE Band 2 (SCC)

BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)					
						LTE Band 17 (Primary Cell)			LTE Band 2 (Secondary Cell)		
						709 MHz	710 MHz	711 MHz	1855 MHz	1880 MHz	1905 MHz
10	QPSK	1	0	0	0	24.6	24.5	24.5	Downlink Only		
		1	25	0	0	24.6	24.6	24.6			
		1	49	0	0	24.6	24.6	24.6			
		25	0	1	1	23.5	23.6	23.6			
		25	12	1	1	23.6	23.6	23.6			
		25	25	1	1	23.6	23.5	23.6			
		50	0	1	1	23.5	23.6	23.6			
	16QAM	1	0	1	1	23.7	23.6	23.5			
		1	25	1	1	23.7	23.7	23.6			
		1	49	1	1	23.7	23.8	23.6			
		25	0	2	2	22.5	22.5	22.5			
		25	12	2	2	22.5	22.5	22.6			
		25	25	2	2	22.6	22.5	22.5			
		50	0	2	2	22.4	22.5	22.5			
BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)					
						LTE Band 17 (Primary Cell)			LTE Band 2 (Secondary Cell)		
						706.5 MHz	710 MHz	713.5 MHz	1852.5 MHz	1880 MHz	1907.5 MHz
5	QPSK	1	0	0	0	24.6	24.5	24.6	Downlink Only		
		1	12	0	0	24.4	24.6	24.6			
		1	24	0	0	24.5	24.5	24.6			
		12	0	1	1	23.5	23.6	23.5			
		12	6	1	1	23.5	23.6	23.5			
		12	11	1	1	23.5	23.6	23.6			
		25	0	1	1	23.5	23.6	23.6			
	16QAM	1	0	1	1	23.6	23.4	23.5			
		1	12	1	1	23.4	23.5	23.4			
		1	24	1	1	23.5	23.5	23.6			
		12	0	2	2	22.5	22.6	22.5			
		12	6	2	2	22.4	22.6	22.5			
		12	11	2	2	22.4	22.6	22.6			
		25	0	2	2	22.5	22.5	22.5			

9.4. 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 [#]	√	∇
		2.437	6	√	∇
		2.462	11 [#]	√	∇

Notes:

√ = "default test channels"

∇ = possible 802.11g channels with maximum average output ¼ dB ≥ 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	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)	SAR Test (Yes/No)
2.4 (DTS)	802.11b	1 Mbps	1	2412	14.6	Yes
			6	2437	15.5	
			11	2462	15.5	
	802.11g	6 Mbps	1	2412	11.9	No
			6	2437	12.8	
			11	2462	12.7	
	802.11n (HT20)	MCS0	1	2412	9.6	No
			6	2437	10.5	
			11	2462	10.3	

Note(s):

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

Power measurements to determine worst-case data rates

Mode	Ch #	Freq. (MHz)	Data Rate	Avg Pwr (dBm)	SAR test (Yes/No)
802.11b	6	2437	1 Mbps	15.5	Yes
			2 Mbps	15.4	No
			5.5 Mbps	15.4	No
			11 Mbps	15.4	No

9.5. 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		*
			5.220	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		*	
	5.660		132		*	
	5.680		136	√		
	5.700		140		*	
	DTS (15.247)	5.8 GHz	5.745	149	√	
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	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)	SAR Test (Yes/No)
5.2 (UNII)	802.11a	6 Mbps	36	5180	9.3	Yes
			40	5200	9.3	
			44	5220	9.2	
			48	5240	9.3	
	802.11n (HT20)	MCS0	36	5180	9.2	No
			40	5200	9.0	
			44	5220	9.1	
			48	5240	9.2	
802.11n (HT40)	MCS0	38	5190	9.4	No	
		46	5230	9.4		
5.3 (UNII)	802.11a	6 Mbps	52	5260	9.5	Yes
			56	5280	9.4	
			60	5300	9.4	
			64	5320	9.5	
	802.11n (HT20)	MCS0	52	5260	9.3	Yes
			56	5280	9.3	
			60	5300	9.3	
			64	5320	9.3	
802.11n (HT40)	MCS0	54	5270	9.5	No	
		62	5310	9.6		
5.5 (UNII)	802.11a	6 Mbps	100	5500	9.2	Yes
			104	5520	9.2	
			108	5540	9.3	
			112	5560	9.2	
			116	5580	9.3	
			120	5600	Not Supported	
			124	5620	Not Supported	
			128	5640	Not Supported	
			132	5660	9.4	
			136	5680	9.3	
			140	5700	9.4	
	802.11n (HT20)	MCS0	100	5500	9.0	Yes
			104	5520	9.1	
			108	5540	9.1	
			112	5560	9.1	
			116	5580	9.2	
			120	5600	Not Supported	
			124	5620	Not Supported	
			128	5640	Not Supported	
			132	5660	9.2	
802.11n (HT40)	MCS0	102	5510	9.4	No	
		110	5550	9.4		
		134	5670	9.5		

Wi-Fi (5 GHz Bands) 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	9.1	Yes
			153	5765	9.1	
			157	5785	9.0	
			161	5805	9.0	
			165	5825	9.1	
	802.11n (HT20)	MCS0	149	5745	9.0	No
			153	5765	9.0	
			157	5785	9.0	
			161	5805	9.0	
	802.11n (HT40)	MCS0	151	5755	9.3	No
159			5795	9.2		

Note(s):

Per KDB 248227, SAR is not required for 802.11n HT20/HT40 and 802.11ac VHT40/VHT80 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	9.3	Yes
				9 Mbps	9.1	No
				12 Mbps	9.1	No
				18 Mbps	9.0	No
				24 Mbps	9.1	No
				36 Mbps	9.0	No
				48 Mbps	8.9	No
				54 Mbps	9.0	No
5.3 GHz (UNII)	802.11a	52	5260	6 Mbps	9.5	Yes
				9 Mbps	9.4	No
				12 Mbps	9.4	No
				18 Mbps	9.4	No
				24 Mbps	9.4	No
				36 Mbps	9.4	No
				48 Mbps	9.4	No
				54 Mbps	9.4	No
5.5 GHz (UNII)	802.11a	132	5660	6 Mbps	9.4	Yes
				9 Mbps	9.4	No
				12 Mbps	9.4	No
				18 Mbps	9.4	No
				24 Mbps	9.4	No
				36 Mbps	9.3	No
				48 Mbps	9.3	No
				54 Mbps	9.3	No
5.8 GHz (DTS)	802.11a	149	5745	6 Mbps	9.1	Yes
				9 Mbps	9.1	No
				12 Mbps	9.1	No
				18 Mbps	9.1	No
				24 Mbps	9.0	No
				36 Mbps	9.1	No
				48 Mbps	9.0	No
				54 Mbps	9.0	No

9.6. Bluetooth

Maximum tune-up tolerance limit is 10 dBm from the rated nominal maximum output power. This power level qualifies for exclusion of SAR testing.

10. Tissue Dielectric Properties

IEEE Standard 1528-2013

Target Frequency (MHz)	Head	
	ϵ_r	σ (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	
	ϵ_r	σ (S/m)	ϵ_r	σ (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

10.2. 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 1

	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
4/3/2014	Head 835	e'	41.7300	Relative Permittivity (ϵ_r):	41.73	41.50	0.55	5
		e"	19.8400	Conductivity (σ):	0.92	0.90	2.35	5
	Head 820	e'	41.9200	Relative Permittivity (ϵ_r):	41.92	41.60	0.76	5
		e"	19.8800	Conductivity (σ):	0.91	0.90	0.89	5
	Head 850	e'	41.5500	Relative Permittivity (ϵ_r):	41.55	41.50	0.12	5
		e"	19.8000	Conductivity (σ):	0.94	0.92	2.27	5
4/3/2014	Body 835	e'	53.5200	Relative Permittivity (ϵ_r):	53.52	55.20	-3.04	5
		e"	21.8900	Conductivity (σ):	1.02	0.97	4.78	5
	Body 820	e'	53.6800	Relative Permittivity (ϵ_r):	53.68	55.28	-2.89	5
		e"	21.9400	Conductivity (σ):	1.00	0.97	3.29	5
	Body 850	e'	53.3500	Relative Permittivity (ϵ_r):	53.35	55.16	-3.28	5
		e"	21.8200	Conductivity (σ):	1.03	0.99	4.47	5

SAR Lab 2

	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
4/7/2014	Head 1750	e'	39.3600	Relative Permittivity (ϵ_r):	39.36	40.08	-1.81	5
		e"	13.8600	Conductivity (σ):	1.35	1.37	-1.48	5
	Head 1710	e'	39.5100	Relative Permittivity (ϵ_r):	39.51	40.15	-1.58	5
		e"	13.7800	Conductivity (σ):	1.31	1.35	-2.69	5
	Head 1755	e'	39.3300	Relative Permittivity (ϵ_r):	39.33	40.08	-1.86	5
		e"	13.8700	Conductivity (σ):	1.35	1.37	-1.33	5
4/7/2014	Body 1750	e'	51.3300	Relative Permittivity (ϵ_r):	51.33	53.44	-3.95	5
		e"	15.1200	Conductivity (σ):	1.47	1.49	-1.00	5
	Body 1710	e'	51.4500	Relative Permittivity (ϵ_r):	51.45	53.54	-3.91	5
		e"	15.0200	Conductivity (σ):	1.43	1.46	-2.29	5
	Body 1755	e'	51.3100	Relative Permittivity (ϵ_r):	51.31	53.43	-3.96	5
		e"	15.1300	Conductivity (σ):	1.48	1.49	-0.86	5

SAR Lab 3

	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
4/4/2014	Head 2450	e'	37.5500	Relative Permittivity (ϵ_r):	37.55	39.20	-4.21	5
		e"	12.7500	Conductivity (σ):	1.74	1.80	-3.51	5
	Head 2410	e'	37.7300	Relative Permittivity (ϵ_r):	37.73	39.28	-3.94	5
		e"	12.6300	Conductivity (σ):	1.69	1.76	-3.86	5
	Head 2475	e'	37.4300	Relative Permittivity (ϵ_r):	37.43	39.17	-4.44	5
		e"	12.8200	Conductivity (σ):	1.76	1.83	-3.44	5
4/4/2014	Body 2450	e'	52.0800	Relative Permittivity (ϵ_r):	52.08	52.70	-1.18	5
		e"	14.2800	Conductivity (σ):	1.95	1.95	-0.24	5
	Body 2410	e'	52.2700	Relative Permittivity (ϵ_r):	52.27	52.76	-0.93	5
		e"	14.1100	Conductivity (σ):	1.89	1.91	-0.87	5
	Body 2475	e'	51.9600	Relative Permittivity (ϵ_r):	51.96	52.67	-1.35	5
		e"	14.3800	Conductivity (σ):	1.98	1.99	-0.31	5

SAR Lab 4

Freq. (MHz)		Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4/3/2014	Head 1900	e'	38.8500	Relative Permittivity (ϵ_r):	38.85	40.00	-2.88	5
		e"	13.5700	Conductivity (σ):	1.43	1.40	2.40	5
	Head 1850	e'	39.0900	Relative Permittivity (ϵ_r):	39.09	40.00	-2.27	5
		e"	13.4500	Conductivity (σ):	1.38	1.40	-1.18	5
	Head 1910	e'	38.8100	Relative Permittivity (ϵ_r):	38.81	40.00	-2.97	5
		e"	13.6000	Conductivity (σ):	1.44	1.40	3.17	5
4/3/2014	Body 1900	e'	51.7900	Relative Permittivity (ϵ_r):	51.79	53.30	-2.83	5
		e"	14.7800	Conductivity (σ):	1.56	1.52	2.73	5
	Body 1850	e'	51.9900	Relative Permittivity (ϵ_r):	51.99	53.30	-2.46	5
		e"	14.6500	Conductivity (σ):	1.51	1.52	-0.86	5
	Body 1910	e'	51.7500	Relative Permittivity (ϵ_r):	51.75	53.30	-2.91	5
		e"	14.8100	Conductivity (σ):	1.57	1.52	3.48	5
4/7/2014	Head 1900	e'	39.9000	Relative Permittivity (ϵ_r):	39.90	40.00	-0.25	5
		e"	13.4100	Conductivity (σ):	1.42	1.40	1.19	5
	Head 1850	e'	40.1300	Relative Permittivity (ϵ_r):	40.13	40.00	0.33	5
		e"	13.2900	Conductivity (σ):	1.37	1.40	-2.35	5
	Head 1910	e'	39.8600	Relative Permittivity (ϵ_r):	39.86	40.00	-0.35	5
		e"	13.4300	Conductivity (σ):	1.43	1.40	1.88	5
4/7/2014	Body 1900	e'	51.2300	Relative Permittivity (ϵ_r):	51.23	53.30	-3.88	5
		e"	14.5600	Conductivity (σ):	1.54	1.52	1.20	5
	Body 1850	e'	51.4200	Relative Permittivity (ϵ_r):	51.42	53.30	-3.53	5
		e"	14.4300	Conductivity (σ):	1.48	1.52	-2.35	5
	Body 1910	e'	51.2000	Relative Permittivity (ϵ_r):	51.20	53.30	-3.94	5
		e"	14.5900	Conductivity (σ):	1.55	1.52	1.94	5
4/8/2014	Head 835	e'	40.9600	Relative Permittivity (ϵ_r):	40.96	41.50	-1.30	5
		e"	19.4700	Conductivity (σ):	0.90	0.90	0.44	5
	Head 820	e'	41.1500	Relative Permittivity (ϵ_r):	41.15	41.60	-1.09	5
		e"	19.5100	Conductivity (σ):	0.89	0.90	-0.99	5
	Head 850	e'	40.7600	Relative Permittivity (ϵ_r):	40.76	41.50	-1.78	5
		e"	19.4200	Conductivity (σ):	0.92	0.92	0.31	5
4/8/2014	Body 835	e'	55.4300	Relative Permittivity (ϵ_r):	55.43	55.20	0.42	5
		e"	21.9200	Conductivity (σ):	1.02	0.97	4.92	5
	Body 820	e'	55.5800	Relative Permittivity (ϵ_r):	55.58	55.28	0.55	5
		e"	22.0100	Conductivity (σ):	1.00	0.97	3.62	5
	Body 850	e'	55.2700	Relative Permittivity (ϵ_r):	55.27	55.16	0.20	5
		e"	21.8400	Conductivity (σ):	1.03	0.99	4.57	5
4/9/2014	Head 750	e'	40.3500	Relative Permittivity (ϵ_r):	40.35	41.96	-3.84	5
		e"	21.5400	Conductivity (σ):	0.90	0.89	0.58	5
	Head 700	e'	41.0100	Relative Permittivity (ϵ_r):	41.01	42.22	-2.86	5
		e"	21.9200	Conductivity (σ):	0.85	0.89	-4.05	5
	Head 790	e'	39.8200	Relative Permittivity (ϵ_r):	39.82	41.76	-4.64	5
		e"	21.2700	Conductivity (σ):	0.93	0.90	4.26	5
4/9/2014	Body 750	e'	53.1600	Relative Permittivity (ϵ_r):	53.16	55.55	-4.30	5
		e"	23.3300	Conductivity (σ):	0.97	0.96	1.02	5
	Body 700	e'	53.6400	Relative Permittivity (ϵ_r):	53.64	55.74	-3.76	5
		e"	23.7400	Conductivity (σ):	0.92	0.96	-3.67	5
	Body 790	e'	52.9000	Relative Permittivity (ϵ_r):	52.90	55.39	-4.50	5
		e"	23.0200	Conductivity (σ):	1.01	0.97	4.66	5

SAR Lab 4 (continued)

	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)		
4/10/2014	Head 2450	e'	38.7900	Relative Permittivity (ϵ_r):	38.79	39.20	-1.05	5	
		e"	13.3800	Conductivity (σ):	1.82	1.80	1.26	5	
	Head 2410	e'	38.9500	Relative Permittivity (ϵ_r):	38.95	39.28	-0.84	5	
		e"	13.2700	Conductivity (σ):	1.78	1.76	1.01	5	
	Head 2475	e'	38.7000	Relative Permittivity (ϵ_r):	38.70	39.17	-1.20	5	
		e"	13.4600	Conductivity (σ):	1.85	1.83	1.39	5	
4/10/2014	Body 2450	e'	50.9700	Relative Permittivity (ϵ_r):	50.97	52.70	-3.28	5	
		e"	14.6400	Conductivity (σ):	1.99	1.95	2.28	5	
	Body 2410	e'	51.1200	Relative Permittivity (ϵ_r):	51.12	52.76	-3.11	5	
		e"	14.4800	Conductivity (σ):	1.94	1.91	1.72	5	
	Body 2475	e'	50.8900	Relative Permittivity (ϵ_r):	50.89	52.67	-3.38	5	
		e"	14.7500	Conductivity (σ):	2.03	1.99	2.25	5	
4/14/2014	Body 5180	e'	48.4500	Relative Permittivity (ϵ_r):	48.45	49.05	-1.22	5	
		e"	18.3800	Conductivity (σ):	5.29	5.27	0.43	5	
	Body 5200	e'	48.4100	Relative Permittivity (ϵ_r):	48.41	49.02	-1.24	5	
		e"	18.3900	Conductivity (σ):	5.32	5.29	0.43	5	
	Body 5600	e'	47.7300	Relative Permittivity (ϵ_r):	47.73	48.48	-1.54	5	
		e"	18.7800	Conductivity (σ):	5.85	5.76	1.50	5	
	Body 5800	e'	47.4100	Relative Permittivity (ϵ_r):	47.41	48.20	-1.64	5	
		e"	18.9800	Conductivity (σ):	6.12	6.00	2.02	5	
	Body 5825	e'	47.3700	Relative Permittivity (ϵ_r):	47.37	48.20	-1.72	5	
		e"	19.0100	Conductivity (σ):	6.16	6.00	2.62	5	
	4/18/2014	Head 5180	e'	35.8200	Relative Permittivity (ϵ_r):	35.82	36.01	-0.54	5
			e"	15.3300	Conductivity (σ):	4.42	4.63	-4.65	5
Head 5200		e'	35.7900	Relative Permittivity (ϵ_r):	35.79	35.99	-0.56	5	
		e"	15.3300	Conductivity (σ):	4.43	4.65	-4.70	5	
Head 5600		e'	35.2000	Relative Permittivity (ϵ_r):	35.20	35.53	-0.94	5	
		e"	15.5700	Conductivity (σ):	4.85	5.06	-4.19	5	
Head 5800		e'	34.9700	Relative Permittivity (ϵ_r):	34.97	35.30	-0.93	5	
		e"	15.6200	Conductivity (σ):	5.04	5.27	-4.41	5	
Head 5825		e'	34.9400	Relative Permittivity (ϵ_r):	34.94	35.30	-1.02	5	
		e"	15.6600	Conductivity (σ):	5.07	5.27	-3.76	5	
4/22/2014	Head 5180	e'	37.7100	Relative Permittivity (ϵ_r):	37.71	36.01	4.71	5	
		e"	15.3900	Conductivity (σ):	4.43	4.63	-4.27	5	
	Head 5200	e'	37.6800	Relative Permittivity (ϵ_r):	37.68	35.99	4.70	5	
		e"	15.4000	Conductivity (σ):	4.45	4.65	-4.26	5	
	Head 5600	e'	37.1100	Relative Permittivity (ϵ_r):	37.11	35.53	4.44	5	
		e"	15.6000	Conductivity (σ):	4.86	5.06	-4.01	5	
	Head 5800	e'	36.8400	Relative Permittivity (ϵ_r):	36.84	35.30	4.36	5	
		e"	15.7200	Conductivity (σ):	5.07	5.27	-3.80	5	
	Head 5825	e'	36.8200	Relative Permittivity (ϵ_r):	36.82	35.30	4.31	5	
		e"	15.7300	Conductivity (σ):	5.09	5.27	-3.33	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 ± 0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm ± 0.5 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm ± 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
D750V3	1024	5/28/2013	750	1g	8.52	8.71
				10g	5.58	5.71
D835V2	4d002	11/15/2013	835	1g	9.49	9.43
				10g	6.18	6.21
D1750V2	1053	8/27/2013	1750	1g	36.7	37.7
				10g	19.5	20.3
D1900V2	5d163	9/17/2013	1900	1g	40.9	40.1
				10g	21.2	21.2
D2450V2	706	5/29/2013	2450	1g	53.7	49.9
				10g	25.0	23.3
D5GHzV2	1138	11/19/2013	5200	1g	78.5	72.9
				10g	22.5	20.4
			5600	1g	82.7	78.3
				10g	23.5	21.7
			5800	1g	78.3	72.8
				10g	22.4	20.1

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 1

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					
4/3/2014	D835V2	4d002	Head	1g	1.05	1.01	10.1	9.49	6.43	3.81	1, 2
				10g	0.70	0.66	6.56	6.18	6.15		
4/3/2014	D835V2	4d002	Body	1g	1.01	0.99	9.94	9.43	5.41	1.58	
				10g	0.68	0.65	6.53	6.21	5.15		

SAR Lab 2

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					
4/7/2014	D1750V2	1053	Head	1g	3.47	3.40	34.00	36.70	-7.36	2.02	3, 4
				10g	1.85	1.81	18.10	19.50	-7.18		
4/7/2014	D1750V2	1053	Body	1g	3.61	3.55	35.50	37.70	-5.84	1.66	
				10g	1.89	1.90	19.00	20.30	-6.40		

SAR Lab 3

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					
4/4/2014	D2450V2	706	Head	1g	5.13	5.12	51.20	53.70	-4.66	0.19	
				10g	2.24	2.32	23.20	25.00	-7.20		
4/4/2014	D2450V2	706	Body	1g	5.27	5.27	52.70	49.90	5.61	0.00	5, 6
				10g	2.28	2.43	24.30	23.30	4.29		

SAR Lab 4

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					
4/3/2014	D1900V2	5d163	Head	1g	4.00	3.87	38.70	40.9	-5.38	3.25	7, 8
				10g	2.05	2.00	20.00	21.2	-5.66		
4/3/2014	D1900V2	5d163	Body	1g	3.83	3.87	38.70	40.1	-3.49	-1.04	
				10g	1.94	2.03	20.30	21.2	-4.25		
4/7/2014	D1900V2	5d163	Head	1g	3.99	3.90	39.00	40.9	-4.65	2.26	
				10g	2.05	2.02	20.20	21.2	-4.72		
4/7/2014	D1900V2	5d163	Body	1g	3.84	3.83	38.30	40.1	-4.49	0.26	
				10g	1.92	2.01	20.10	21.2	-5.19		
4/8/2014	D835V2	4d002	Head	1g	1.01	0.982	9.82	9.49	3.48	2.77	9, 10
				10g	0.680	0.644	6.44	6.18	4.21		
4/8/2014	D835V2	4d002	Body	1g	0.987	0.969	9.69	9.43	2.76	1.82	
				10g	0.662	0.639	6.39	6.21	2.90		
4/9/2014	D750V3	1024	Head	1g	0.840	0.811	8.11	8.52	-4.81	3.45	11, 12
				10	0.570	0.528	5.28	5.58	-5.38		
4/9/2014	D750V3	1024	Body	1g	0.919	0.894	8.94	8.71	2.64	2.72	
				10g	0.622	0.595	5.95	5.71	4.20		

SAR Lab 4 (continued)

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					
4/10/2014	D2450V2	706	Head	1g	5.56	5.34	53.4	53.7	-0.56	3.96	
				10g	2.43	2.43	24.3	25.0	-2.80		
4/10/2014	D2450V2	706	Body	1g	5.15	5.17	51.7	49.9	3.61	-0.39	13, 14
				10g	2.24	2.41	24.1	23.3	3.43		
4/14/2014	5.2GHz	1138	Body	1g	6.93	7.10	71.0	72.9	-2.61	-2.45	
				10g	1.90	2.01	20.1	20.4	-1.47		
	5.6GHz	1138	Body	1g	7.61	8.35	83.5	78.3	6.64	-9.72	15, 16
				10g	2.06	2.32	23.2	21.7	6.91		
	5.8GHz	1138	Body	1g	6.98	7.57	75.7	72.8	3.98	-8.45	
				10g	1.91	2.12	21.2	20.1	5.47		
4/18/2014	5.2GHz	1138	Head	1g	7.41	7.54	75.4	78.5	-3.95	-1.75	17, 18
				10g	2.12	2.19	21.9	22.5	-2.67		
	5.6GHz	1138	Head	1g	7.60	8.26	82.6	82.7	-0.12	-8.68	
				10g	2.12	2.35	23.5	23.5	0.00		
	5.8GHz	1138	Head	1g	6.77	7.41	74.1	78.3	-5.36	-9.45	
				10g	1.89	2.11	21.1	22.4	-5.80		
4/22/2014	5.2GHz	1138	Head	1g	7.54	8.06	80.6	78.5	2.68	-6.90	
				10g	2.12	2.32	23.2	22.5	3.11		
	5.6GHz	1138	Head	1g	7.78	8.38	83.8	82.7	1.33	-7.71	
				10g	2.13	2.38	23.8	23.5	1.28		
	5.8GHz	1138	Head	1g	6.70	7.29	72.9	78.3	-6.90	-8.81	19, 20
				10g	1.85	2.07	20.7	22.4	-7.59		

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:

- ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
- ≤ 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
- ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

KDB 648474 D04 Handset SAR:

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

KDB 941225 D01 SAR test for 3G devices:

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.

12.1. GSM850

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Voice	0	Left Touch	190	836.6	33.2	33.1	0.211	0.216	1
			Left Tilt	190	836.6	33.2	33.1	0.180	0.184	
			Right Touch	190	836.6	33.2	33.1	0.256	0.262	
			Rightt Tilt	190	836.6	33.2	33.1	0.198	0.203	
Head VoIP	GPRS 2 Slots	0	Left Touch	190	836.6	31.7	31.6	0.219	0.224	2
			Left Tilt	190	836.6	31.7	31.6	0.199	0.204	
			Right Touch	190	836.6	31.7	31.6	0.286	0.293	
			Rightt Tilt	190	836.6	31.7	31.6	0.237	0.243	
Body-worn	Voice	10	Rear	190	836.6	33.2	33.1	0.301	0.308	3
			Front	190	836.6	33.2	33.1	0.253	0.259	
Body-worn(VoIP) & Hotspot	GPRS 2 Slots	10	Rear	190	836.6	31.7	31.6	0.356	0.364	4
			Front	190	836.6	31.7	31.6	0.290	0.297	
			Edge 2	190	836.6	31.7	31.6	0.257	0.263	
			Edge 3	190	836.6	31.7	31.6	0.133	0.136	
			Edge 4	190	836.6	31.7	31.6	0.175	0.179	

12.2. GSM1900

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Voice	0	Left Touch	661	1880.0	30.7	30.6	0.361	0.369	5
			Left Tilt	661	1880.0	30.7	30.6	0.114	0.117	
			Right Touch	661	1880.0	30.7	30.6	0.233	0.238	
			Rightt Tilt	661	1880.0	30.7	30.6	0.114	0.117	
Head VoIP	GPRS 2 Slots	0	Left Touch	661	1880.0	28.7	28.5	0.432	0.452	6
			Left Tilt	661	1880.0	28.7	28.5	0.132	0.138	
			Right Touch	661	1880.0	28.7	28.5	0.202	0.212	
			Rightt Tilt	661	1880.0	28.7	28.5	0.143	0.150	
Body-worn	Voice	10	Rear	661	1880.0	30.7	30.6	0.461	0.472	7
			Front	661	1880.0	30.7	30.6	0.452	0.463	
Body-worn(VoIP) & Hotspot	GPRS 2 Slots	10	Rear	661	1880.0	28.7	28.5	0.523	0.548	8
			Front	661	1880.0	28.7	28.5	0.549	0.575	
			Edge 3	661	1880.0	28.7	28.5	0.247	0.259	
			Edge 4	661	1880.0	28.7	28.5	0.372	0.390	

12.3. W-CDMA Band V

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Rel 99 RMC	0	Left Touch	4183	836.6	24.7	24.5	0.262	0.274	9
			Left Tilt	4183	836.6	24.7	24.5	0.227	0.238	
			Right Touch	4183	836.6	24.7	24.5	0.332	0.348	
			Rightt Tilt	4183	836.6	24.7	24.5	0.270	0.283	
Body-worn & Hotspot	Rel 99 RMC	10	Rear	4183	836.6	24.7	24.5	0.405	0.424	10
			Front	4183	836.6	24.7	24.5	0.318	0.333	
Hotspot	Rel 99 RMC	10	Edge 2	4183	836.6	24.7	24.5	0.423	0.443	11
			Edge 3	4183	836.6	24.7	24.5	0.160	0.168	
			Edge 4	4183	836.6	24.7	24.5	0.340	0.356	

12.4. W-CDMA Band II

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Rel 99 RMC	0	Left Touch	9262	1852.4	24.2	23.7	0.674	0.756	12
				9400	1880.0	24.2	23.7	0.810	0.909	
				9538	1907.6	24.2	23.6	0.910	1.045	
			Left Tilt	9400	1880.0	24.2	23.7	0.235	0.264	
			Right Touch	9400	1880.0	24.2	23.7	0.388	0.435	
			Rightt Tilt	9400	1880.0	24.2	23.7	0.242	0.272	
Body-worn & Hotspot	Rel 99 RMC	10	Rear	9262	1852.4	24.2	23.7	0.903	1.013	13
				9400	1880.0	24.2	23.7	0.902	1.012	
				9538	1907.6	24.2	23.6	0.834	0.958	
			Front	9262	1852.4	24.2	23.7	0.954	1.070	
				9400	1880.0	24.2	23.7	0.950	1.066	
				9538	1907.6	24.2	23.6	0.887	1.018	
Hotspot	Rel 99 RMC	10	Edge 3	9400	1880.0	24.2	23.7	0.443	0.497	
			Edge 4	9400	1880.0	24.2	23.7	0.676	0.758	

12.5. LTE Band 2 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.				
								Tune-up limit	Meas.	Meas.	Scaled					
Head	QPSK	0	Left Touch	18650	1855.0	1	25	24.7	24.6	0.734	0.751	14				
				18900	1880.0	1	49	24.7	24.6	0.937	0.959					
				19150	1905.0	1	0	24.7	24.6	1.050	1.074					
			Left Tilt	18900	1880.0	1	49	24.7	24.6	0.294	0.301					
				25	25	23.7	23.7	0.230	0.230							
			Right Touch	18900	1880.0	1	49	24.7	24.6	0.459	0.470					
				25	25	23.7	23.7	0.379	0.379							
			Rightt Tilt	18900	1880.0	1	49	24.7	24.6	0.313	0.320					
				25	25	23.7	23.7	0.260	0.260							
			Body-worn & Hotspot	QPSK	10	Rear	18900	1880.0	1	49	24.7		24.6	0.770	0.788	15
							25	25	23.7	23.7	0.626		0.626			
						Front	18650	1855.0	1	25	24.7		24.6	0.845	0.865	
18900	1880.0	1					49	24.7	24.6	0.816	0.835					
25	25	23.7				23.7	0.649	0.649								
19150	1905.0	1				0	24.7	24.6	0.774	0.792						
Hotspot	QPSK	10	Edge 3	18900	1880.0	1	49	24.7	24.6	0.503	0.515	16				
				25	25	23.7	23.7	0.413	0.413							
			Edge 4	18650	1855.0	1	25	24.7	24.6	0.725	0.742					
				18900	1880.0	1	49	24.7	24.6	0.851	0.871					
			25	25	23.7	23.7	0.664	0.664								
			19150	1905.0	1	0	24.7	24.6	0.864	0.884						

12.6. LTE Band 4 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.				
								Tune-up limit	Meas.	Meas.	Scaled					
Head	QPSK	0	Left Touch	20175	1732.5	1	0	24.7	24.6	0.476	0.487	17				
				25	0	23.7	23.6	0.369	0.378							
			Left Tilt	20175	1732.5	1	0	24.7	24.6	0.145	0.148					
				25	0	23.7	23.6	0.107	0.109							
			Right Touch	20175	1732.5	1	0	24.7	24.6	0.354	0.362					
				25	0	23.7	23.6	0.274	0.280							
			Rightt Tilt	20175	1732.5	1	0	24.7	24.6	0.121	0.124					
				25	0	23.7	23.6	0.092	0.094							
			Body-worn & Hotspot	QPSK	10	Rear	20175	1732.5	1	0	24.7		24.6	0.714	0.731	18
							25	0	23.7	23.6	0.572		0.585			
Front	20175	1732.5				1	0	24.7	24.6	0.703	0.719					
	25	0				23.7	23.6	0.556	0.569							
Hotspot	QPSK	10	Edge 3	20175	1732.5	1	0	24.7	24.6	0.454	0.465	19				
				25	0	23.7	23.6	0.361	0.369							
			Edge 4	20175	1732.5	1	0	24.7	24.6	0.504	0.516					
				25	0	23.7	23.6	0.413	0.423							

12.7. LTE Band 5 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
Head	QPSK	0	Left Touch	20525	836.6	1	49	24.7	24.6	0.226	0.231	19
						25	12	23.7	23.6	0.201	0.206	
			Left Tilt	20525	836.6	1	49	24.7	24.6	0.193	0.197	
						25	12	23.7	23.6	0.159	0.163	
			Right Touch	20525	836.6	1	49	24.7	24.6	0.256	0.262	
						25	12	23.7	23.6	0.221	0.226	
			Rightt Tilt	20525	836.6	1	49	24.7	24.6	0.201	0.206	
						25	12	23.7	23.6	0.171	0.175	
Body-worn & Hotspot	QPSK	10	Rear	20525	836.6	1	49	24.7	24.6	0.364	0.372	
						25	12	23.7	23.6	0.313	0.320	
			Front	20525	836.6	1	49	24.7	24.6	0.369	0.378	
						25	12	23.7	23.6	0.265	0.271	
Hotspot	QPSK	10	Edge 2	20525	836.6	1	49	24.7	24.6	0.398	0.407	
						25	12	23.7	23.6	0.319	0.326	
			Edge 3	20525	836.6	1	49	24.7	24.6	0.136	0.139	
						25	12	23.7	23.6	0.110	0.113	
			Edge 4	20525	836.6	1	49	24.7	24.6	0.299	0.306	
						25	12	23.7	23.6	0.236	0.241	

12.8. LTE Band 7 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
Head	QPSK	0	Left Touch	21100	2535.0	1	0	24.2	24.1	0.101	0.103	
						50	0	23.2	23.0	0.083	0.087	
			Left Tilt	21100	2535.0	1	0	24.2	24.1	0.060	0.061	
						50	0	23.2	23.0	0.045	0.047	
			Right Touch	21100	2535.0	1	0	24.2	24.1	0.218	0.223	
						50	0	23.2	23.0	0.175	0.183	
			Rightt Tilt	21100	2535.0	1	0	24.2	24.1	0.070	0.072	
						50	0	23.2	23.0	0.051	0.053	
Body-worn & Hotspot	QPSK	10	Rear	21100	2535.0	1	0	24.2	24.1	0.489	0.500	
						50	0	23.2	23.0	0.398	0.417	
			Front	21100	2535.0	1	0	24.2	24.1	0.402	0.411	
						50	0	23.2	23.0	0.393	0.412	
Hotspot	QPSK	10	Edge 2	21100	2535.0	1	0	24.2	24.1	0.160	0.164	
						50	0	23.2	23.0	0.123	0.129	
			Edge 3	21100	2535.0	1	0	24.2	24.1	0.267	0.273	
						50	0	23.2	23.0	0.221	0.231	
			Edge 4	21100	2535.0	1	0	24.2	24.1	0.097	0.099	
						50	0	23.2	23.0	0.078	0.082	

12.9. LTE Band 17 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.	
								Tune-up limit	Meas.	Meas.	Scaled		
Head	QPSK	0	Left Touch	23790	710.0	1	0	24.7	24.7	0.275	0.275	24	
						25	12	23.7	23.6	0.203	0.208		
			Left Tilt	23790	710.0	1	0	24.7	24.7	0.176	0.176		
						25	12	23.7	23.6	0.139	0.142		
			Right Touch	23790	710.0	1	0	24.7	24.7	0.290	0.290		
						25	12	23.7	23.6	0.215	0.220		
			Righttt Tilt	23790	710.0	1	0	24.7	24.7	0.189	0.189		
						25	12	23.7	23.6	0.135	0.138		
Body-worn & Hotspot	QPSK	10	Rear	23790	710.0	1	0	24.7	24.7	0.535	0.535	25	
						25	12	23.7	23.6	0.409	0.419		
			Front	23790	710.0	1	0	24.7	24.7	0.288	0.288		
						25	12	23.7	23.6	0.222	0.227		
Hotspot	QPSK	10	Edge 2	23790	710.0	1	0	24.7	24.7	0.336	0.336		
						25	12	23.7	23.6	0.274	0.280		
			Edge 3	23790	710.0	1	0	24.7	24.7	0.082	0.082		
						25	12	23.7	23.6	0.056	0.058		
			Edge 4	23790	710.0	1	0	24.7	24.7	0.269	0.269		
						25	12	23.7	23.6	0.216	0.221		

12.10. Wi-Fi (DTS 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	802.11b 1 Mbps	0	Left Touch	6	2437.0	16.0	15.5	0.089	0.100	26
			Left Tilt	6	2437.0	16.0	15.5	0.106	0.119	
			Right Touch	6	2437.0	16.0	15.5	0.129	0.145	
			Righttt Tilt	6	2437.0	16.0	15.5	0.102	0.114	
Body-worn & Hotspot	802.11b 1 Mbps	10	Rear	6	2437.0	16.0	15.5	0.067	0.075	27
			Front	6	2437.0	16.0	15.5	0.037	0.042	
Hotspot	802.11b 1 Mbps	10	Edge 1	6	2437.0	16.0	15.5	0.082	0.092	28
			Edge 4	6	2437.0	16.0	15.5	0.034	0.039	

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	802.11a 6 Mbps	0	Left Touch	157	5785.0	11.0	9.0	0.002	0.003	29
			Left Tilt	157	5785.0	11.0	9.0	0.000	0.000	
			Right Touch	157	5785.0	11.0	9.0	0.021	0.033	
			Righttt Tilt	157	5785.0	11.0	9.0	0.000	0.000	
Body-worn & Hotspot	802.11a 6 Mbps	10	Rear	157	5785.0	11.0	9.0	0.021	0.033	30
			Front	157	5785.0	11.0	9.0	0.003	0.004	
Hotspot	802.11a 6 Mbps	10	Edge 1	157	5785.0	11.0	9.0	0.036	0.057	
		10	Edge 4	157	5785.0	11.0	9.0	0.057	0.090	

12.11. Wi-Fi (UNII 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	802.11a 6 Mbps	0	Left Touch	36	5180.0	11.0	9.3	0.023	0.034	
				52	5260.0	11.0	9.5	0.029	0.041	
				140	5700.0	11.0	9.4	0.027	0.039	
			Left Tilt	36	5180.0	11.0	9.3	0.023	0.034	
				52	5260.0	11.0	9.5	0.022	0.031	
				140	5700.0	11.0	9.4	0.025	0.036	
			Right Touch	36	5180.0	11.0	9.3	0.071	0.105	32
				52	5260.0	11.0	9.5	0.072	0.102	
				140	5700.0	11.0	9.4	0.050	0.072	33
			Right Tilt	36	5180.0	11.0	9.3	0.062	0.091	34
				52	5260.0	11.0	9.5	0.057	0.080	35
				140	5700.0	11.0	9.4	0.041	0.060	
Body-worn Accessory	802.11a 6 Mbps	10	Rear	36	5180.0	11.0	9.3	0.063	0.093	36
				52	5260.0	11.0	9.5	0.064	0.091	37
				140	5700.0	11.0	9.4	0.035	0.050	38
			Front	36	5180.0	11.0	9.3	0.010	0.015	
				52	5260.0	11.0	9.5	0.003	0.004	
				140	5700.0	11.0	9.4	0.009	0.014	

12.12. Bluetooth

12.12.1. 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 ≤ 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 ≤ 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 ≤ 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)			
10.0	10	10	2.480	1.6

Conclusion:

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

12.12.2. 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:

- $(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f_{(\text{GHz})}/x}]$ W/kg for test separation distances ≤ 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	10	10	2.480	0.210

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 Accessory (W/kg)	Hotspot/Wi-Fi Direct (W/kg)	Repeated SAR (Yes/No)
750	LTE Band 17		0.535		No
850	GSM 850				No
	WCDMA Band V		0.423		No
	LTE Band 5				No
1750	LTE Band 4		0.714		No
1900	GSM 1900				No
	WCDMA Band II		0.954		Yes
	LTE Band 2	1.050			Yes
2400	Wi-Fi 802.11b/g/n		0.082		No
2500	LTE Band 7		0.489		No
5200	Wi-Fi 802.11a/n/ac	0.071			No
5300	Wi-Fi 802.11a/n/ac	0.072			No
5500	Wi-Fi 802.11a/n/ac	0.050			No
5800	Wi-Fi 802.11a/n/ac		0.057		No

13.2. Repeated Measurement Results

Head Exposure Condition

Frequency band	Test Position	Mode	Ch #.	Freq. (MHz)	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio	Note
					Original	Repeated		
LTE Band 2	Left Touch	QPSK	19150	1905.0	1.050	1.010	1.04	1

Body-worn Accessory and Hotspot Mode Exposure Conditions

Frequency band	Test Position	Mode	Ch #.	Freq. (MHz)	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio	Note
					Original	Repeated		
W-CDMA Band II	Front	Rel. 99 RMC 12.2 kbps	9262	1852.4	0.954	0.908	1.05	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:

SAR₁ 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

SAR₂ 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 GSM850 & Wi-Fi & 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)	0.224	0.100			0.324	No
		WWAN + Wi-Fi(UNII)	0.224		0.041		0.265	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.204	0.119			0.323	No
		WWAN + Wi-Fi(UNII)	0.204		0.036		0.240	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.293	0.145			0.438	No
		WWAN + Wi-Fi(UNII)	0.293		0.105		0.398	No
Right Tilt	WWAN + Wi-Fi(DTS)	0.243	0.114			0.357	No	
	WWAN + Wi-Fi(UNII)	0.243		0.091		0.334	No	
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.364	0.075			0.439	No
		WWAN + Wi-Fi(UNII)	0.364		0.093		0.457	No
		WWAN + BT	0.364			0.210	0.574	No
	Front	WWAN + Wi-Fi(DTS)	0.297	0.042			0.339	No
		WWAN + Wi-Fi(UNII)	0.297		0.015		0.312	No
		WWAN + BT	0.297			0.210	0.507	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.092			0.092	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.263				0.263	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.136				0.136	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.179	0.090			0.269	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.

14.2. Sum of the SAR for GSM1900 & Wi-Fi & 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)	0.452	0.100			0.552	No
		WWAN + Wi-Fi(UNII)	0.452		0.041		0.493	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.138	0.119			0.257	No
		WWAN + Wi-Fi(UNII)	0.138		0.036		0.174	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.238	0.145			0.383	No
		WWAN + Wi-Fi(UNII)	0.238		0.105		0.343	No
Right Tilt	WWAN + Wi-Fi(DTS)	0.150	0.114			0.264	No	
	WWAN + Wi-Fi(UNII)	0.150		0.091		0.241	No	
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.548	0.075			0.623	No
		WWAN + Wi-Fi(UNII)	0.548		0.093		0.641	No
		WWAN + BT	0.548			0.210	0.758	No
	Front	WWAN + Wi-Fi(DTS)	0.575	0.042			0.617	No
		WWAN + Wi-Fi(UNII)	0.575		0.015		0.590	No
		WWAN + BT	0.575			0.210	0.785	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.092			0.092	No
	Edge 2	WWAN + Wi-Fi(DTS)					0.000	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.259				0.259	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.390	0.090			0.480	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 WCDMA Band V & Wi-Fi & 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)	0.274	0.100			0.374	No
		WWAN + Wi-Fi(UNII)	0.274		0.041		0.315	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.238	0.119			0.357	No
		WWAN + Wi-Fi(UNII)	0.238		0.036		0.274	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.348	0.145			0.493	No
		WWAN + Wi-Fi(UNII)	0.348		0.105		0.453	No
Right Tilt	WWAN + Wi-Fi(DTS)	0.283	0.114			0.397	No	
	WWAN + Wi-Fi(UNII)	0.283		0.091		0.374	No	
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.424	0.075			0.499	No
		WWAN + Wi-Fi(UNII)	0.424		0.093		0.517	No
		WWAN + BT	0.424			0.210	0.634	No
	Front	WWAN + Wi-Fi(DTS)	0.333	0.042			0.375	No
		WWAN + Wi-Fi(UNII)	0.333		0.015		0.348	No
		WWAN + BT	0.333			0.210	0.543	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.092			0.092	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.443				0.443	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.168				0.168	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.356	0.090			0.446	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.

14.4. Sum of the SAR for WCDMA Band II & Wi-Fi & 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)	1.045	0.100			1.145	No
		WWAN + Wi-Fi(UNII)	1.045		0.041		1.086	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.264	0.119			0.383	No
		WWAN + Wi-Fi(UNII)	0.264		0.036		0.300	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.435	0.145			0.580	No
		WWAN + Wi-Fi(UNII)	0.435		0.105		0.540	No
Right Tilt	WWAN + Wi-Fi(DTS)	0.272	0.114			0.386	No	
	WWAN + Wi-Fi(UNII)	0.272		0.091		0.363	No	
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	1.013	0.075			1.088	No
		WWAN + Wi-Fi(UNII)	1.013		0.093		1.106	No
		WWAN + BT	1.013			0.210	1.223	No
	Front	WWAN + Wi-Fi(DTS)	1.070	0.042			1.112	No
		WWAN + Wi-Fi(UNII)	1.070		0.015		1.085	No
		WWAN + BT	1.070			0.210	1.280	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.092			0.092	No
	Edge 2	WWAN + Wi-Fi(DTS)					0.000	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.497				0.497	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.758	0.090			0.848	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 LTE Band 2 & Wi-Fi & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			LTE Band 2	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	1.074	0.100			1.174	No
		WWAN + Wi-Fi(UNII)	1.074		0.041		1.115	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.301	0.119			0.420	No
		WWAN + Wi-Fi(UNII)	0.301		0.036		0.337	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.470	0.145			0.615	No
		WWAN + Wi-Fi(UNII)	0.470		0.105		0.575	No
Right Tilt	WWAN + Wi-Fi(DTS)	0.320	0.114			0.434	No	
	WWAN + Wi-Fi(UNII)	0.320		0.091		0.411	No	
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.788	0.075			0.863	No
		WWAN + Wi-Fi(UNII)	0.788		0.093		0.881	No
		WWAN + BT	0.788			0.210	0.998	No
	Front	WWAN + Wi-Fi(DTS)	0.865	0.042			0.907	No
		WWAN + Wi-Fi(UNII)	0.865		0.015		0.880	No
		WWAN + BT	0.865			0.210	1.075	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.092			0.092	No
	Edge 2	WWAN + Wi-Fi(DTS)					0.000	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.515				0.515	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.884	0.090			0.974	No

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

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			LTE Band 4	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.487	0.100			0.587	No
		WWAN + Wi-Fi(UNII)	0.487		0.041		0.528	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.148	0.119			0.267	No
		WWAN + Wi-Fi(UNII)	0.148		0.036		0.184	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.362	0.145			0.507	No
		WWAN + Wi-Fi(UNII)	0.362		0.105		0.467	No
Right Tilt	WWAN + Wi-Fi(DTS)	0.124	0.114			0.238	No	
	WWAN + Wi-Fi(UNII)	0.124		0.091		0.215	No	
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.731	0.075			0.806	No
		WWAN + Wi-Fi(UNII)	0.731		0.093		0.824	No
		WWAN + BT	0.731			0.210	0.941	No
	Front	WWAN + Wi-Fi(DTS)	0.719	0.042			0.761	No
		WWAN + Wi-Fi(UNII)	0.719		0.015		0.734	No
		WWAN + BT	0.719			0.210	0.929	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.092			0.092	No
	Edge 2	WWAN + Wi-Fi(DTS)					0.000	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.465				0.465	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.423	0.090			0.513	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 LTE Band 5 & Wi-Fi & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			LTE Band 5	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.231	0.100			0.331	No
		WWAN + Wi-Fi(UNII)	0.231		0.041		0.272	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.197	0.119			0.316	No
		WWAN + Wi-Fi(UNII)	0.197		0.036		0.233	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.262	0.145			0.407	No
		WWAN + Wi-Fi(UNII)	0.262		0.105		0.367	No
Right Tilt	WWAN + Wi-Fi(DTS)	0.206	0.114			0.320	No	
	WWAN + Wi-Fi(UNII)	0.206		0.091		0.297	No	
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.372	0.075			0.447	No
		WWAN + Wi-Fi(UNII)	0.372		0.093		0.465	No
		WWAN + BT	0.372			0.210	0.582	No
	Front	WWAN + Wi-Fi(DTS)	0.378	0.042			0.420	No
		WWAN + Wi-Fi(UNII)	0.378		0.015		0.393	No
		WWAN + BT	0.378			0.210	0.588	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.092			0.092	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.407				0.407	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.139				0.139	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.306	0.090			0.396	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.

14.8. Sum of the SAR for LTE Band 7 & Wi-Fi & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			LTE Band 7	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.103	0.100			0.203	No
		WWAN + Wi-Fi(UNII)	0.103		0.041		0.144	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.061	0.119			0.180	No
		WWAN + Wi-Fi(UNII)	0.061		0.036		0.097	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.223	0.145			0.368	No
		WWAN + Wi-Fi(UNII)	0.223		0.105		0.328	No
Right Tilt	WWAN + Wi-Fi(DTS)	0.072	0.114			0.186	No	
	WWAN + Wi-Fi(UNII)	0.072		0.091		0.163	No	
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.500	0.075			0.575	No
		WWAN + Wi-Fi(UNII)	0.500		0.093		0.593	No
		WWAN + BT	0.500			0.210	0.710	No
	Front	WWAN + Wi-Fi(DTS)	0.412	0.042			0.454	No
		WWAN + Wi-Fi(UNII)	0.412		0.015		0.427	No
		WWAN + BT	0.412			0.210	0.622	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.092			0.092	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.164				0.164	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.273				0.273	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.099	0.090			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.

14.9. Sum of the SAR for LTE Band 17 & Wi-Fi & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			LTE Band 17	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.275	0.100			0.375	No
		WWAN + Wi-Fi(UNII)	0.275		0.041		0.316	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.176	0.119			0.295	No
		WWAN + Wi-Fi(UNII)	0.176		0.036		0.212	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.290	0.145			0.435	No
		WWAN + Wi-Fi(UNII)	0.290		0.105		0.395	No
Right Tilt	WWAN + Wi-Fi(DTS)	0.189	0.114			0.303	No	
	WWAN + Wi-Fi(UNII)	0.189		0.091		0.280	No	
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.535	0.075			0.610	No
		WWAN + Wi-Fi(UNII)	0.535		0.093		0.628	No
		WWAN + BT	0.535			0.210	0.745	No
	Front	WWAN + Wi-Fi(DTS)	0.288	0.042			0.330	No
		WWAN + Wi-Fi(UNII)	0.288		0.015		0.303	No
		WWAN + BT	0.288			0.210	0.498	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.092			0.092	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.336				0.336	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.082				0.082	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.269	0.090			0.359	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 3929**
- 15.5. Calibration Certificate for E-Field Probe EX3DV3 - SN 3531**
- 15.6. Calibration Certificate for E-Field Probe EX3DV4 - SN 3902**
- 15.7. Calibration Certificate for E-Field Probe EX3DV4 - SN 3936**
- 15.8. Calibration Certificate for D750V3 - SN 1024**
- 15.9. Calibration Certificate for D835V2 - SN 4d002**
- 15.10. Calibration Certificate for D1750V2 - SN 1053**
- 15.11. Calibration Certificate for D1900V2- SN 5d163**
- 15.12. Calibration Certificate for D2450V2 - SN 706**
- 15.13. Calibration Certificate for D5GHzV2 - SN 1138**

END OF REPORT