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: 14U18112-S7A
Issue Date: 09/12/2014

Prepared for
LG ELECTRONICS MOBILECOMM U.S.A., INC.
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	7/11/2014	Initial Issue	--
A	9/12/2014	1. Sec. 1: Corrected highest simultaneous transmission SAR. 2. Sec. 1: Corrected signature.	Devin Chang

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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	06/27/2014 – 07/02/2014 and 07/09/2014 – 7/10/2014			
The highest reported SAR values	RF exposure condition	Licensed	DTS	UNII
	Head	0.734 W/kg	0.229 W/kg	0.221 W/kg
	Body-worn Accessory	0.981 W/kg	0.209 W/kg	0.270 W/kg
	Wireless Router (Hotspot)	0.981 W/kg	0.209 W/kg	N/A
	Simultaneous Transmission	1.251 W/kg	1.190 W/kg	1.251 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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Prepared By:

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WiSE Laboratory Technician
UL Verification Services Inc.

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2. Test Methodology

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

- 447498 D01 General RF Exposure Guidance v05r02
- 648474 D04 Handset SAR v01r02
- 648474 D03 Wireless Chargers Battery Cover
- 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	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	SAR Lab 5
SAR Lab F	
SAR Lab G	
SAR Lab H	

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

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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
ENA Network Analyzer	Agilent	E5071B	MY42100131	2/24/2015
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
ESG Vecto Signal Generator	Agilent	E4438C	MY47271507	6/17/2015
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	1808939	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2710	N/A
DC Power Supply	Sorensen Ametek	XT15-4	1319A02778	N/A
ESG Vecto Signal Generator	Agilent	E4438C	MY47271045	6/18/2015
Power Meter	HP	438A	3513U04320	10/2/2014
Power Sensor	Agilent	8481A	2702A66876	9/30/2014
Power Sensor	Agilent	8481A	3318A95392	9/30/2014
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1622052	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2711	N/A
DC Power Supply	HP	6296A	2841A-05955	N/A
E-Field Probe	SPEAG	EX3DV4	3929	5/9/2015
E-Field Probe	SPEAG	EX3DV4	3991	5/16/2015
Data Acquisition Electronics	SPEAG	DAE4	1352	9/11/2014
Data Acquisition Electronics	SPEAG	DAE4	1439	5/14/2015
System Validation Dipole	SPEAG	D750V3	1071	11/15/2014
System Validation Dipole	SPEAG	D835V2	4d002	11/15/2014
System Validation Dipole	SPEAG	D1750V2	1077	9/12/2014
System Validation Dipole	SPEAG	D1900V2	5d043	11/12/2014
System Validation Dipole	SPEAG	D2450V2	899	9/10/2014
System Validation Dipole	SPEAG	D2600V2	1006	9/11/2014
System Validation Dipole	SPEAG	D5GHzV2	1138	11/19/2014

Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Power Meter	Agilent	N1911A	MY53060016	8/3/2014
Power Sensor	Agilent	N1921A	MY52020011	5/6/2015
Base Station Simulator	R&S	CMW 500	132909-bd	6/6/2015
Base Station Simulator	R&S	CMW 500	135393-VQ	7/3/2015
Base Station Simulator	R&S	CMU 200	106291	10/18/2014

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.

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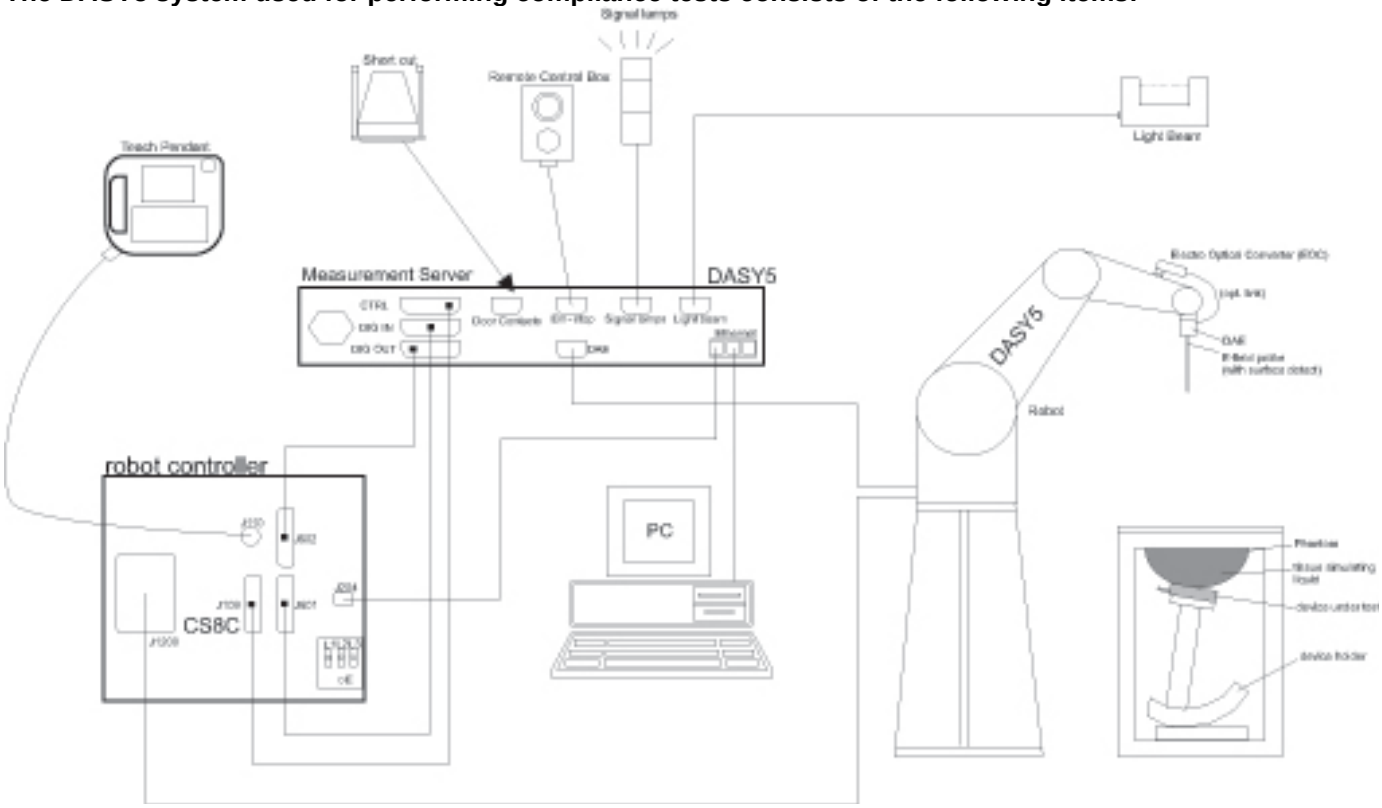
5. Measurement System Description and Setup

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.

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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	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: 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 ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

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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: Δx_{Zoom}, Δy_{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 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 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 *reported* SAR from the area scan based *1-g SAR estimation* 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.

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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.

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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. ☒ Mobile Hotspot (Wi-Fi 2.4 GHz) ☒ Mobile Hotspot (Wi-Fi 5.8 GHz only)
Wi-Fi Direct	Wi-Fi Direct enabled devices transfer data directly between each other ☒ Wi-Fi Direct (Wi-Fi 2.4 GHz) ☒ 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	☐ Normal Battery Cover ☒ Normal Battery Cover with NFC ☐ Wireless Charger Battery Cover with NFC (with Front Cover) ☐ Wireless Charger Battery Cover with NFC (without Front Cover)
Accessory	☒ Headset
Battery Options	☒ Standard – Lithium-ion battery, Rating 3.8Vdc, 9.7Wh ☐ Extended (large capacity)

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7.2. Wireless Technologies

Wireless Technology and Frequency Bands	GSM: 850 / 1900 W-CDMA Band: V / II LTE Band 2 / 4 / 5 / 7 / 17 Wi-Fi : 2.4 / 5 GHz Bluetooth: 2.4 GHz.
Mode	GSM - ☒ Voice (GMSK) - ☒ GPRS (GMSK) - ☒ EGPRS (8PSK) W-CDMA - ☒ UMTS Rel. 99 (Voice & Data) - ☒ HSDPA - ☒ HSUPA - ☒ HSPA+ LTE - ☒ QPSK - ☒ 16QAM - ☒ Rel. 10 Carrier Aggregation (1 Uplink and 2 Downlinks) Wi-Fi 2.4GHz (802.11b/g/n) - ☒ 802.11b - ☒ 802.11g - ☒ 802.11n (HT20) Wi-Fi 5GHz - ☒ 802.11a - ☒ 802.11n (HT20) - ☒ 802.11n (HT40) Bluetooth Ver. 4.0 (LE)
Duty Cycle	GSM Voice: 12.5%; GPRS 1 Slot: 12.5%; 2 Slots: 25% 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	☐ Class 8 - One Up ☒ Class 10 - Two Up ☐ Class 12 - Four Up ☐ Class 33 - Four Up
DTM (Dual Transfer Mode)	☐ Supported
VoIP (GPRS)	☒ Supported
SV-LTE & SV-DO	☐ Supported

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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 Pow er (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**

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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/B4/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/B4/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.

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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 7	Frequency range: 2500 - 2570 MHz					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low	20850 2510	20825 2507.5	20800 2505	20775 2502.5		
	Mid	21100 2535	21100 2535	21100 2535	21100 2535		
	High	21350 2560	21375 2562.5	21400 2565	21425 2567.5		
	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		

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General LTE SAR Test and Reporting Considerations (continued)

<table>
<tr><td rowspan="15">Carrier Aggregation Combinations</td><td rowspan="2">Band 2
Primary</td><td colspan="2">Channel Bandwidth</td><td rowspan="2">Band 17
Secondary</td><td colspan="2">Channel Bandwidth</td></tr>
<tr><td>10 MHz</td><td>5 MHz</td><td>10 MHz</td><td>5 MHz</td></tr>
<tr><td>Low</td><td>18650/
1855</td><td>18625/
1852.5</td><td colspan="3" rowspan="3">Secondary Cell is Downlink only</td></tr>
<tr><td>Mid</td><td>18900/
1880</td><td>18900/
1880</td></tr>
<tr><td>High</td><td>19150/
1905</td><td>19175/
1907.5</td></tr>
<tr><td rowspan="2">Band 4
Primary</td><td colspan="2">Channel Bandwidth</td><td rowspan="2">Band 17
Secondary</td><td colspan="2">Channel Bandwidth</td></tr>
<tr><td>10 MHz</td><td>5 MHz</td><td>10 MHz</td><td>5 MHz</td></tr>
<tr><td>Low</td><td>20000/
1715</td><td>19975/
1712.5</td><td colspan="3" rowspan="3">Secondary Cell is Downlink only</td></tr>
<tr><td>Mid</td><td>20175/
1732.5</td><td>20175/
1732.5</td></tr>
<tr><td>High</td><td>20350/
1750</td><td>20375/
1752.5</td></tr>
<tr><td rowspan="2">Band 17
Primary</td><td colspan="2">Channel Bandwidth</td><td rowspan="2">Band 2
Secondary</td><td colspan="2">Channel Bandwidth</td></tr>
<tr><td>10 MHz</td><td>5 MHz</td><td>10 MHz</td><td>5 MHz</td></tr>
<tr><td>Low</td><td>23780/
709</td><td>23755/
706.5</td><td colspan="3" rowspan="3">Secondary Cell is Downlink only</td></tr>
<tr><td>Mid</td><td>23790/
710</td><td>23790/
710</td></tr>
<tr><td>High</td><td>23800/
711</td><td>23825/
713.5</td></tr>
</table>

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

<table>
<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>
<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>
</table>

MPR Built-in by design

A-MPR (additional MPR) was disabled during SAR testing

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.

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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	

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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	

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9. RF Output Power Measurement

9.1. GSM

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Burst Pwr (dBm)	Frame Pwr (dBm)
850	GSM (Voice)	CS1	1	128	824.2	32.9	23.9
				190	836.6	32.8	23.8
				251	848.8	33.1	24.1
	GPRS (GMSK)	CS1	1	128	824.2	32.9	23.9
				190	836.6	32.8	23.8
				251	848.8	33.1	24.1
			2	**128**	**824.2**	**31.1**	**25.1**
				190	**836.6**	**31.0**	**25.0**
				251	**848.8**	**30.8**	**24.8**
	EGPRS (8PSK)	MCS5	1	128	824.2	26.7	17.7
				190	836.6	26.4	17.4
				251	848.8	26.4	17.4
			2	128	824.2	24.4	18.4
				190	836.6	24.3	18.3
				251	848.8	24.2	18.2

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	30.7	21.7
				661	1880.0	30.7	21.7
				810	1909.8	30.7	21.7
	GPRS (GMSK)	CS1	1	512	1850.2	30.7	21.7
				661	1880.0	30.7	21.7
				810	1909.8	30.7	21.7
			2	**512**	**1850.2**	**28.0**	**22.0**
				661	**1880.0**	**28.1**	**22.1**
				810	**1909.8**	**28.1**	**22.1**
	EGPRS (8PSK)	MCS5	1	512	1850.2	26.2	17.2
				661	1880.0	26.1	17.1
				810	1909.8	26.1	17.1
			2	512	1850.2	23.7	17.7
				661	1880.0	23.7	17.7
				810	1909.8	23.7	17.7

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

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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
	βc/βd	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	24.7
		4183	836.6	24.7
		4233	846.6	24.7
W-CDMA Band II	Rel 99 (RMC, 12.2 kbps)	9262	1852.4	24.2
		9400	1880.0	24.2
		9538	1907.6	24.2

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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			
	βc	2/15	12/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	βc/βd	2/15	12/15	15/8	15/4
	βhs	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=βhs/βc	30/15			

Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	24.7
		4183	836.6	24.6
		4233	846.6	24.6
	Subtest 2	4132	826.4	24.7
		4183	836.6	24.6
		4233	846.6	24.7
	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	24.2
		4233	846.6	24.2
W-CDMA Band II	Subtest 1	9262	1852.4	24.2
		9400	1880.0	24.2
		9538	1907.6	24.2
	Subtest 2	9262	1852.4	24.2
		9400	1880.0	24.2
		9538	1907.6	24.2
	Subtest 3	9262	1852.4	23.7
		9400	1880.0	23.7
		9538	1907.6	23.7
	Subtest 4	9262	1852.4	23.7
		9400	1880.0	23.7
		9538	1907.6	23.7

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

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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
	βc	11/15	6/15	15/15	2/15	15/15
	βd	15/15	15/15	9/15	15/15	0
	βec	209/225	12/15	30/15	2/15	5/15
	βc/βd	11/15	11/15	15/9	2/15	15/0
	βhs	22/15	12/15	30/15	4/15	5/15
	βed	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				
	Ahs = βhs/βc	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

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Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Avg Pwr (dBm)
W-CDMA Band V	Subtest 1	4132	826.4	24.0
		4183	836.6	24.3
		4233	846.6	24.3
	Subtest 2	4132	826.4	22.7
		4183	836.6	22.7
		4233	846.6	22.7
	Subtest 3	4132	826.4	23.4
		4183	836.6	23.2
		4233	846.6	23.5
	Subtest 4	4132	826.4	22.7
		4183	836.6	22.7
		4233	846.6	22.7
	Subtest 5	4132	826.4	24.6
		4183	836.6	24.6
		4233	846.6	24.6
W-CDMA Band II	Subtest 1	9262	1852.4	24.1
		9400	1880.0	23.8
		9538	1907.6	24.1
	Subtest 2	9262	1852.4	22.2
		9400	1880.0	22.2
		9538	1907.6	22.2
	Subtest 3	9262	1852.4	23.2
		9400	1880.0	23.2
		9538	1907.6	23.2
	Subtest 4	9262	1852.4	22.2
		9400	1880.0	22.2
		9538	1907.6	22.2
	Subtest 5	9262	1852.4	24.2
		9400	1880.0	24.2
		9538	1907.6	24.2

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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 6.6.3.3.2	13	10	Table 6.2.4-2	Table 6.2.4-2
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.					

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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	24.58	24.70	24.67
			1	25	0	0	24.48	24.70	24.68
			1	49	0	0	24.62	24.70	24.59
			25	0	1	1	23.70	23.70	23.70
			25	12	1	1	23.70	23.70	23.69
			25	25	1	1	23.70	23.70	23.69
			50	0	1	1	23.70	23.70	23.70
		16QAM	1	0	1	1	23.55	23.70	23.65
			1	25	1	1	23.44	23.70	23.59
			1	49	1	1	23.58	23.70	23.50
			25	0	2	2	22.70	22.70	22.70
			25	12	2	2	22.70	22.70	22.70
			25	25	2	2	22.70	22.70	22.70
			50	0	2	2	22.70	22.70	22.70

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	24.58	24.70	24.63
			1	12	0	0	24.60	24.70	24.58
			1	24	0	0	24.55	24.70	24.56
			12	0	1	1	23.70	23.70	23.70
			12	7	1	1	23.70	23.70	23.70
			12	13	1	1	23.70	23.70	23.70
			25	0	1	1	23.70	23.70	23.70
		16QAM	1	0	1	1	23.70	23.70	23.70
			1	12	1	1	23.70	23.70	23.70
			1	24	1	1	23.70	23.70	23.70
			12	0	2	2	22.70	22.70	22.70
			12	7	2	2	22.70	22.70	22.70
			12	13	2	2	22.70	22.70	22.70
			25	0	2	2	22.70	22.70	22.70

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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	24.40	24.53	24.45
			1	25	0	0	24.30	24.54	24.46
			1	49	0	0	24.23	24.55	24.50
			25	0	1	1	23.50	23.56	23.59
			25	12	1	1	23.52	23.60	23.60
			25	25	1	1	23.40	23.56	23.62
			50	0	1	1	23.61	23.68	23.68
		16QAM	1	0	1	1	23.36	23.70	23.37
			1	25	1	1	23.24	23.70	23.38
			1	49	1	1	23.17	23.70	23.41
			25	0	2	2	22.47	22.65	22.63
			25	12	2	2	22.48	22.68	22.64
			25	25	2	2	22.43	22.61	22.67
			50	0	2	2	22.59	22.70	22.70

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	24.42	24.67	24.52
			1	12	0	0	24.31	24.68	24.54
			1	24	0	0	24.33	24.62	24.62
			12	0	1	1	23.54	23.60	23.61
			12	7	1	1	23.44	23.58	23.59
			12	13	1	1	23.45	23.63	23.63
			25	0	1	1	23.45	23.57	23.63
		16QAM	1	0	1	1	23.36	23.56	23.39
			1	12	1	1	23.21	23.58	23.41
			1	24	1	1	23.28	23.51	23.47
			12	0	2	2	22.66	22.66	22.70
			12	7	2	2	22.54	22.70	22.70
			12	13	2	2	22.54	22.70	22.70
			25	0	2	2	22.60	22.64	22.70

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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	24.66	24.60	24.61
			1	25	0	0	24.47	24.45	24.58
			1	49	0	0	24.47	24.59	24.62
			25	0	1	1	23.60	23.58	23.70
			25	12	1	1	23.53	23.59	23.70
			25	25	1	1	23.59	23.60	23.70
			50	0	1	1	23.64	23.57	23.70
		16QAM	1	0	1	1	23.59	23.44	23.54
			1	25	1	1	23.38	23.31	23.52
			1	49	1	1	23.36	23.46	23.55
			25	0	2	2	22.59	22.64	22.70
			25	12	2	2	22.61	22.65	22.70
			25	25	2	2	22.60	22.67	22.70
			50	0	2	2	22.62	22.58	22.69
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	24.65	24.60	24.62
			1	12	0	0	24.50	24.58	24.62
			1	24	0	0	24.50	24.70	24.69
			12	0	1	1	23.58	23.53	23.70
			12	7	1	1	23.56	23.55	23.70
			12	13	1	1	23.53	23.49	23.65
			25	0	1	1	23.63	23.56	23.70
		16QAM	1	0	1	1	23.47	23.52	23.47
			1	12	1	1	23.33	23.48	23.44
			1	24	1	1	23.36	23.59	23.48
			12	0	2	2	22.65	22.57	22.70
			12	7	2	2	22.62	22.59	22.70
			12	13	2	2	22.64	22.59	22.70
			25	0	2	2	22.70	22.51	22.70

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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	23.5	23.8	23.7
			1	49	0	0	23.4	23.7	23.6
			1	99	0	0	23.6	23.7	23.4
			50	0	1	1	22.6	22.8	22.7
			50	24	1	1	22.6	22.8	22.7
			50	50	1	1	22.6	22.8	22.7
			100	0	1	1	22.6	22.8	22.7
		16QAM	1	0	1	1	22.7	23.0	22.9
			1	49	1	1	22.7	23.0	22.8
			1	99	1	1	22.8	22.9	22.7
			50	0	2	2	21.7	22.0	21.9
			50	24	2	2	21.7	21.9	21.8
			50	50	2	2	21.7	21.9	21.8
			100	0	2	2	21.7	21.9	21.8

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

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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

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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	24.54
			1	25	0	0	24.56
			1	49	0	0	24.53
			25	0	1	1	23.62
			25	12	1	1	23.66
			25	25	1	1	23.70
			50	0	1	1	23.70
		16QAM	1	0	1	1	23.55
			1	25	1	1	23.54
			1	49	1	1	23.45
			25	0	2	2	22.65
			25	12	2	2	22.70
			25	25	2	2	22.64
			50	0	2	2	22.70
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	24.70
			1	12	0	0	24.62
			1	24	0	0	24.69
			12	0	1	1	23.70
			12	7	1	1	23.65
			12	13	1	1	23.67
			25	0	1	1	23.66
		16QAM	1	0	1	1	23.66
			1	12	1	1	23.61
			1	24	1	1	23.65
			12	0	2	2	22.70
			12	7	2	2	22.68
			12	13	2	2	22.68
			25	0	2	2	22.67

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

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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.

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			

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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			

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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			

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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

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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		*
			2.220	44		*
			5.240	48	√	
		5.3 GHz	5.260	52	√	
			5.280	56		*
			5.300	60		*
			5.320	64	√	
		5.5 GHz	5.500	100		
			5.520	104	√	
			5.540	108		*
			5.560	112		*
			5.580	116	√	
			5.600	120		*
			5.620	124	√	
			5.640	128		*
			5.660	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.

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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	
			136	5680	9.3	
			140	5700	9.3	
	802.11n (HT40)	MCS0	102	5510	9.4	No
			110	5550	9.4	
			134	5670	9.5	

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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	
			165	5825	9.1	
	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 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

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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.

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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

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

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

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

Salt: 99+% Pure Sodium Chloride
Sugar: 98+% Pure Sucrose
Water: De-ionized, 16 MΩ+ resistivity
HEC: Hydroxyethyl Cellulose
DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

MSL/HSL750 (Body and Head liquids for 700 – 800 MHz)

Item	Head Tissue Simulation Liquids HSL750 Muscle (body) Tissue Simulation Liquids MSL750
Type No	SL AAH 075
Manufacturer	SPEAG
The item is composed of the following ingredients:	
H^2O	Water, 35 – 58%
Sucrese	Sugar, white, refined, 40-60%
NaCl	Sodium Chloride, 0-6%
Hydroxyethel-cellulsoe	Medium Viscosity (CAS# 9004-62-0), <0.3%
Preventol-D7	Preservative: aqueous preparation, (CAS# 55965-84-9), containing 5-chloro-2-methyl-3(2H)-isothiazolone and 2-methyyl-3(2H)-isothiazolone, 0.1-0.7%

MSL/HSL1750 (Body and Head liquids for 1700 – 1800 MHz)

Item	Head Tissue Simulation Liquids HSL1750 Muscle (body) Tissue Simulation Liquids MSL1750
Type No	SL AAM 175
Manufacturer	SPEAG
-The item is composed of the following ingredients:	
H^2O	Water, 52 – 75%
C8H18O3	Diethylene glycol monobutyl ether (DGBE), 25-48%
NaCl	Sodium Chloride, <1.0%

Simulating Liquids for 5 GHz, Manufactured by SPEAG

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

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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 4

	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
6/27/2014	Head 1900	e'	39.8700	Relative Permittivity (ε_r):	39.87	40.00	-0.33	5
		e''	13.1700	Conductivity (σ):	1.39	1.40	-0.62	5
	Head 1850	e'	40.0800	Relative Permittivity (ε_r):	40.08	40.00	0.20	5
		e''	13.0400	Conductivity (σ):	1.34	1.40	-4.19	5
	Head 1910	e'	39.8200	Relative Permittivity (ε_r):	39.82	40.00	-0.45	5
		e''	13.1900	Conductivity (σ):	1.40	1.40	0.06	5
6/27/2014	Body 1900	e'	52.7300	Relative Permittivity (ε_r):	52.73	53.30	-1.07	5
		e''	14.2800	Conductivity (σ):	1.51	1.52	-0.75	5
	Body 1850	e'	52.9100	Relative Permittivity (ε_r):	52.91	53.30	-0.73	5
		e''	14.1900	Conductivity (σ):	1.46	1.52	-3.97	5
	Body 1910	e'	52.6900	Relative Permittivity (ε_r):	52.69	53.30	-1.14	5
		e''	14.2900	Conductivity (σ):	1.52	1.52	-0.16	5
6/27/2014	Head 835	e'	39.9400	Relative Permittivity (ε_r):	39.94	41.50	-3.76	5
		e''	18.9100	Conductivity (σ):	0.88	0.90	-2.45	5
	Head 820	e'	40.1500	Relative Permittivity (ε_r):	40.15	41.60	-3.49	5
		e''	18.9500	Conductivity (σ):	0.86	0.90	-3.83	5
	Head 850	e'	39.7400	Relative Permittivity (ε_r):	39.74	41.50	-4.24	5
		e''	18.8500	Conductivity (σ):	0.89	0.92	-2.63	5
6/27/2014	Body 835	e'	53.7600	Relative Permittivity (ε_r):	53.76	55.20	-2.61	5
		e''	21.7100	Conductivity (σ):	1.01	0.97	3.91	5
	Body 820	e'	53.9200	Relative Permittivity (ε_r):	53.92	55.28	-2.45	5
		e''	21.7700	Conductivity (σ):	0.99	0.97	2.49	5
	Body 850	e'	53.6100	Relative Permittivity (ε_r):	53.61	55.16	-2.80	5
		e''	21.6300	Conductivity (σ):	1.02	0.99	3.56	5
6/30/2014	Head 1900	e'	38.3300	Relative Permittivity (ε_r):	38.33	40.00	-4.18	5
		e''	13.2800	Conductivity (σ):	1.40	1.40	0.21	5
	Head 1850	e'	38.5200	Relative Permittivity (ε_r):	38.52	40.00	-3.70	5
		e''	13.1700	Conductivity (σ):	1.35	1.40	-3.23	5
	Head 1910	e'	38.2900	Relative Permittivity (ε_r):	38.29	40.00	-4.28	5
		e''	13.2900	Conductivity (σ):	1.41	1.40	0.82	5
7/1/2014	Body 1900	e'	52.0700	Relative Permittivity (ε_r):	52.07	53.30	-2.31	5
		e''	14.7000	Conductivity (σ):	1.55	1.52	2.17	5
	Body 1850	e'	52.2500	Relative Permittivity (ε_r):	52.25	53.30	-1.97	5
		e''	14.6500	Conductivity (σ):	1.51	1.52	-0.86	5
	Body 1910	e'	52.0500	Relative Permittivity (ε_r):	52.05	53.30	-2.35	5
		e''	14.7000	Conductivity (σ):	1.56	1.52	2.71	5

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SAR Lab 4 continued

	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
7/7/2014	Body 2600	e'	51.8700	Relative Permittivity (ε_r):	51.87	52.51	-1.22	5
		e''	14.3800	Conductivity (σ):	2.08	2.16	-3.79	5
	Body 2500	e'	52.1500	Relative Permittivity (ε_r):	52.15	52.64	-0.93	5
		e''	14.1400	Conductivity (σ):	1.97	2.02	-2.71	5
	Body 2700	e'	51.5600	Relative Permittivity (ε_r):	51.56	52.38	-1.57	5
		e''	14.6700	Conductivity (σ):	2.20	2.30	-4.30	5
7/8/2014	Head 2600	e'	38.4300	Relative Permittivity (ε_r):	38.43	39.01	-1.49	5
		e''	13.9200	Conductivity (σ):	2.01	1.96	2.56	5
	Head 2500	e'	38.8400	Relative Permittivity (ε_r):	38.84	39.14	-0.76	5
		e''	13.7000	Conductivity (σ):	1.90	1.85	2.72	5
	Head 2700	e'	38.0400	Relative Permittivity (ε_r):	38.04	38.88	-2.17	5
		e''	14.1100	Conductivity (σ):	2.12	2.07	2.32	5
7/10/2014	Body 1750	e'	51.9200	Relative Permittivity (ε_r):	51.92	53.44	-2.85	5
		e''	15.8400	Conductivity (σ):	1.54	1.49	3.71	5
	Body 1710	e'	52.0500	Relative Permittivity (ε_r):	52.05	53.54	-2.79	5
		e''	15.7000	Conductivity (σ):	1.49	1.46	2.14	5
	Body 1755	e'	51.9100	Relative Permittivity (ε_r):	51.91	53.43	-2.84	5
		e''	15.8400	Conductivity (σ):	1.55	1.49	3.79	5

SAR Lab 5

	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
6/28/2014	Head 2450	e'	38.6800	Relative Permittivity (ε_r):	38.68	39.20	-1.33	5
		e''	13.7500	Conductivity (σ):	1.87	1.80	4.06	5
	Head 2410	e'	38.8400	Relative Permittivity (ε_r):	38.84	39.28	-1.12	5
		e''	13.6400	Conductivity (σ):	1.83	1.76	3.83	5
	Head 2475	e'	38.5800	Relative Permittivity (ε_r):	38.58	39.17	-1.50	5
		e''	13.8200	Conductivity (σ):	1.90	1.83	4.10	5
6/28/2014	Body 2450	e'	51.8700	Relative Permittivity (ε_r):	51.87	52.70	-1.57	5
		e''	14.3600	Conductivity (σ):	1.96	1.95	0.32	5
	Body 2410	e'	52.0200	Relative Permittivity (ε_r):	52.02	52.76	-1.40	5
		e''	14.2100	Conductivity (σ):	1.90	1.91	-0.17	5
	Body 2475	e'	51.7900	Relative Permittivity (ε_r):	51.79	52.67	-1.67	5
		e''	14.4500	Conductivity (σ):	1.99	1.99	0.17	5
7/1/2014	Head 5180	e'	35.5200	Relative Permittivity (ε_r):	35.52	36.01	-1.37	5
		e''	15.4100	Conductivity (σ):	4.44	4.63	-4.15	5
	Head 5200	e'	35.4700	Relative Permittivity (ε_r):	35.47	35.99	-1.45	5
		e''	15.4000	Conductivity (σ):	4.45	4.65	-4.26	5
	Head 5600	e'	34.9200	Relative Permittivity (ε_r):	34.92	35.53	-1.73	5
		e''	15.5500	Conductivity (σ):	4.84	5.06	-4.31	5
	Head 5800	e'	34.6700	Relative Permittivity (ε_r):	34.67	35.30	-1.78	5
		e''	15.6900	Conductivity (σ):	5.06	5.27	-3.98	5
	Head 5825	e'	34.6300	Relative Permittivity (ε_r):	34.63	35.30	-1.90	5
		e''	15.6800	Conductivity (σ):	5.08	5.27	-3.63	5
7/1/2014	Body 5180	e'	47.1600	Relative Permittivity (ε_r):	47.16	49.05	-3.85	5
		e''	18.9000	Conductivity (σ):	5.44	5.27	3.27	5
	Body 5200	e'	47.1100	Relative Permittivity (ε_r):	47.11	49.02	-3.90	5
		e''	18.9100	Conductivity (σ):	5.47	5.29	3.26	5
	Body 5600	e'	46.4200	Relative Permittivity (ε_r):	46.42	48.48	-4.24	5
		e''	19.2300	Conductivity (σ):	5.99	5.76	3.94	5
	Body 5800	e'	46.1000	Relative Permittivity (ε_r):	46.10	48.20	-4.36	5
		e''	19.4400	Conductivity (σ):	6.27	6.00	4.49	5
	Body 5825	e'	46.0400	Relative Permittivity (ε_r):	46.04	48.20	-4.48	5
		e''	19.4500	Conductivity (σ):	6.30	6.00	4.99	5

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SAR Lab 5 continued

	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
7/2/2014	Head 750	e'	41.7000	Relative Permittivity (ε_r):	41.70	41.96	-0.62	5
		e''	21.6400	Conductivity (σ):	0.90	0.89	1.05	5
	Head 700	e'	42.2900	Relative Permittivity (ε_r):	42.29	42.22	0.17	5
		e''	22.0300	Conductivity (σ):	0.86	0.89	-3.57	5
	Head 725	e'	41.9800	Relative Permittivity (ε_r):	41.98	42.09	-0.26	5
		e''	21.8200	Conductivity (σ):	0.88	0.89	-1.29	5
7/2/2014	Body 750	e'	54.4400	Relative Permittivity (ε_r):	54.44	55.55	-1.99	5
		e''	23.4100	Conductivity (σ):	0.98	0.96	1.37	5
	Body 700	e'	54.9400	Relative Permittivity (ε_r):	54.94	55.74	-1.43	5
		e''	23.8700	Conductivity (σ):	0.93	0.96	-3.14	5
	Body 725	e'	54.6700	Relative Permittivity (ε_r):	54.67	55.64	-1.75	5
		e''	23.6200	Conductivity (σ):	0.95	0.96	-0.93	5
7/2/2014	Body 1750	e'	52.6800	Relative Permittivity (ε_r):	52.68	53.44	-1.42	5
		e''	15.6800	Conductivity (σ):	1.53	1.49	2.66	5
	Body 1710	e'	52.7600	Relative Permittivity (ε_r):	52.76	53.54	-1.46	5
		e''	15.5900	Conductivity (σ):	1.48	1.46	1.42	5
	Body 1755	e'	52.6700	Relative Permittivity (ε_r):	52.67	53.43	-1.42	5
		e''	15.6900	Conductivity (σ):	1.53	1.49	2.81	5
7/2/2014	Head 1750	e'	38.7900	Relative Permittivity (ε_r):	38.79	40.08	-3.23	5
		e''	13.9000	Conductivity (σ):	1.35	1.37	-1.20	5
	Head 1710	e'	38.9200	Relative Permittivity (ε_r):	38.92	40.15	-3.05	5
		e''	13.8100	Conductivity (σ):	1.31	1.35	-2.48	5
	Head 1755	e'	38.7800	Relative Permittivity (ε_r):	38.78	40.08	-3.24	5
		e''	13.9200	Conductivity (σ):	1.36	1.37	-0.98	5

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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.

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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	1071	11/15/2013	750	1g	8.46	8.64
				10g	5.51	5.72
D835V2	4d002	11/15/2013	835	1g	9.49	9.43
				10g	6.18	6.21
D1750V2	1077	9/12/2013	1750	1g	37.6	37.7
				10g	20.0	20.3
D1900V2	5d043	11/12/2013	1900	1g	40.1	39.0
				10g	21.1	20.8
D2450V2	899	9/10/2013	2450	1g	51.3	49.7
				10g	23.9	23.3
D2600V2	1006	9/11/2013	2600	1g	56.5	55.7
				10g	25.2	24.8
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

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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 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				
6/27/2014	D1900V2	5d043	Head	1g	4.16	4.11	41.1	40.10	2.49	1.20	
				10g	2.140	2.190	21.9	21.10	3.79		
6/27/2014	D1900V2	5d043	Body	1g	3.89	3.89	38.9	39.00	-0.26	0.00	
				10g	1.940	2.060	20.6	20.80	-0.96		
6/27/2014	D835V2	4d002	Head	1g	0.96	0.94	9.4	9.50	-1.58	2.81	
				10g	0.674	0.62	6.2	6.20	-0.81		
6/27/2014	D835V2	4d002	Body	1g	1.03	1.02	10.2	9.43	8.17	0.97	1,2
				10g	0.690	0.670	6.7	6.21	7.89		
7/1/2014	D1900V2	5d043	Head	1g	4.26	4.16	41.6	40.10	3.74	2.35	
				10g	2.210	2.170	21.7	21.10	2.84		
7/1/2014	D1900V2	5d043	Body	1g	4.07	4.08	40.8	39.00	4.62	-0.25	3,4
				10g	2.030	2.170	21.7	20.80	4.33		
7/8/2014	D2600V2	1006	Body	1g	5.90	5.67	56.7	55.70	1.80	3.90	
				10g	2.550	2.500	25.0	24.80	0.81		
7/8/2014	D2600V2	1006	Head	1g	6.35	6.09	60.9	56.50	7.79	4.09	5,6
				10g	2.820	2.700	27.0	25.20	7.14		
7/10/2014	D1750V2	1050	Body	1g	3.73	3.65	36.5	37.20	-1.88	2.14	7,8
				10g	1.940	1.940	19.4	20	-3.00		

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SAR Lab 5

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				
6/28/2014	D2450V2	899	Body	1g	4.960	5.07	50.7	49.70	2.01	-2.22	
				10g	2.180	2.390	23.9	23.30	2.58		
6/28/2014	D2450V2	899	Head	1g	5.10	5.05	50.5	51.30	-1.56	0.98	9,10
				10g	2.230	2.300	23.0	23.90	-3.77		
7/1/2014	D5GHzV2 (5.2GHz)	1138	Head	1g	7.43	7.86	78.6	78.5	0.13	-5.79	
				10g	2.160	2.310	23.1	22.5	2.67		
7/1/2014	D5GHzV2 (5.6GHz)	1138	Head	1g	7.98	8.58	85.8	82.7	3.75	-7.52	
				10g	2.210	2.450	24.5	23.5	4.26		
7/1/2014	D5GHzV2 (5.8GHz)	1138	Head	1g	6.90	7.40	74.0	78.3	-5.49	-7.25	
				10g	1.960	2.160	21.6	22.4	-3.57		
7/1/2014	D5GHzV2 (5.2GHz)	1138	Body	1g	6.45	6.59	65.9	72.9	-9.60	-2.17	11,12
				10g	1.860	1.970	19.7	20.4	-3.43		
7/1/2014	D5GHzV2 (5.6GHz)	1138	Body	1g	7.96	8.12	81.2	78.3	3.70	-2.01	
				10g	2.200	2.300	23.0	21.7	5.99		
7/1/2014	D5GHzV2 (5.8GHz)	1138	Body	1g	6.99	7.22	72.2	72.8	-0.82	-3.29	
				10g	1.920	2.070	20.7	20.1	2.99		
7/2/2014	D750V3	1071	Head	1g	0.813	0.802	8.02	8.460	-5.20	1.35	13,14
				10g	0.552	0.523	5.23	5.510	-5.08		
7/2/2014	D750V3	1071	Body	1g	0.877	0.867	8.67	8.640	0.35	1.14	
				10g	0.595	0.581	5.81	5.720	1.57		
7/2/2014	D1750V2	1077	Body	1g	3.95	3.89	38.90	37.70	3.18	1.52	
				10g	2.05	2.08	20.80	20.30	2.46		
7/2/2014	D1750V2	1077	Head	1g	3.51	3.43	34.30	37.60	-8.78	2.28	15,16
				10g	1.88	1.82	18.20	20.00	-9.00		

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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 ¼ 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 248227 D01 SAR Measurements Procedures for 802.11 a/b/g Transmitters v01r02 (pg.6):
When the extrapolated maximum peak SAR for the maximum output channel is ≤ 1.6 W/kg and the 1-g averaged SAR is ≤ 0.8 W/kg, testing of other channels in the “default test channels” or “required test channels” configuration is optional.

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.

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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	32.8	0.271	0.297	
			Left Tilt	190	836.6	33.2	32.8	0.205	0.225	
			Right Touch	190	836.6	33.2	32.8	0.351	**0.385**	1
			Rightt Tilt	190	836.6	33.2	32.8	0.213	0.234	
Head VoIP	GPRS 2 Slots	0	Left Touch	190	836.6	31.7	31.0	0.295	0.347	
			Left Tilt	190	836.6	31.7	31.0	0.223	0.262	
			Right Touch	190	836.6	31.7	31.0	0.370	**0.435**	2
			Rightt Tilt	190	836.6	31.7	31.0	0.229	0.269	
Body-worn	Voice	10	Rear	190	836.6	33.2	32.8	0.429	**0.470**	3
			Front	190	836.6	33.2	32.8	0.376	0.412	
Body-worn(VoIP) & Hotspot	GPRS 2 Slots	10	Rear	190	836.6	31.7	31.0	0.526	**0.618**	4
			Front	190	836.6	31.7	31.0	0.487	0.572	
			Edge 2	190	836.6	31.7	31.0	0.525	0.617	
			Edge 3	190	836.6	31.7	31.0	0.155	0.182	
			Edge 4	190	836.6	31.7	31.0	0.390	0.458	

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	30.7	0.277	**0.277**	5
			Left Tilt	661	1880.0	30.7	30.7	0.113	0.113	
			Right Touch	661	1880.0	30.7	30.7	0.216	0.216	
			Rightt Tilt	661	1880.0	30.7	30.7	0.111	0.111	
Head VoIP	GPRS 2 Slots	0	Left Touch	661	1880.0	28.7	28.1	0.326	**0.374**	6
			Left Tilt	661	1880.0	28.7	28.1	0.143	0.164	
			Right Touch	661	1880.0	28.7	28.1	0.253	0.290	
			Rightt Tilt	661	1880.0	28.7	28.1	0.124	0.142	
Body-worn	Voice	10	Rear	661	1880.0	30.7	30.7	0.265	0.265	
			Front	661	1880.0	30.7	30.7	0.275	**0.275**	7
Body-worn(VoIP) & Hotspot	GPRS 2 Slots	10	Rear	661	1880.0	28.7	28.1	0.319	0.366	
			Front	661	1880.0	28.7	28.1	0.329	0.378	
			Edge 3	661	1880.0	28.7	28.1	0.199	0.228	
			Edge 4	661	1880.0	28.7	28.1	0.342	**0.393**	8

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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 12.2 kbps	0	Left Touch	4183	836.6	24.7	24.7	0.610	0.610	
			Left Tilt	4183	836.6	24.7	24.7	0.439	0.439	
			Right Touch	4183	836.6	24.7	24.7	0.734	**0.734**	9
			Rightt Tilt	4183	836.6	24.7	24.7	0.464	0.464	
Body-worn & Hotspot	Rel 99 RMC 12.2 kbps	10	Rear	4183	836.6	24.7	24.7	0.595	**0.595**	10
			Front	4183	836.6	24.7	24.7	0.482	0.482	
Hotspot	Rel 99 RMC 12.2 kbps	10	Edge 2	4183	836.6	24.7	24.7	0.444	0.444	
			Edge 3	4183	836.6	24.7	24.7	0.162	0.162	
			Edge 4	4183	836.6	24.7	24.7	0.322	0.322	

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	9400	1880.0	24.2	24.2	0.476	**0.476**	11
			Left Tilt	9400	1880.0	24.2	24.2	0.163	0.163	
			Right Touch	9400	1880.0	24.2	24.2	0.291	0.291	
			Rightt Tilt	9400	1880.0	24.2	24.2	0.164	0.164	
Body-worn & Hotspot	Rel 99 RMC	10	Rear	9400	1880.0	24.2	24.2	0.349	0.349	
			Front	9400	1880.0	24.2	24.2	0.414	**0.414**	12
Hotspot	Rel 99 RMC	10	Edge 3	9400	1880.0	24.2	24.2	0.162	0.162	
			Edge 4	9400	1880.0	24.2	24.2	0.380	0.380	

12.5. LTE Band 2 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
Head	QPSK	0	Left Touch	18900	1880.0	1	49	24.7	24.7	0.709	**0.709**	13
						25	25	23.7	23.7	0.569	0.569	
			Left Tilt	18900	1880.0	1	49	24.7	24.7	0.356	0.356	
						25	25	23.7	23.7	0.277	0.277	
			Right Touch	18900	1880.0	1	49	24.7	24.7	0.492	0.492	
						25	25	23.7	23.7	0.384	0.384	
			Rightt Tilt	18900	1880.0	1	49	24.7	24.7	0.307	0.307	
						25	25	23.7	23.7	0.244	0.244	
Body-worn & Hotspot	QPSK	10	Rear	18900	1880.0	1	49	24.7	24.7	0.791	**0.791**	14
						25	25	23.7	23.7	0.641	0.641	
			Front	18900	1880.0	1	49	24.7	24.7	0.778	**0.778**	
						25	25	23.7	23.7	0.627	0.627	
Hotspot	QPSK	10	Edge 3	18900	1880.0	1	49	24.7	24.7	0.424	0.424	
						25	25	23.7	23.7	0.357	0.357	
			Edge 4	18900	1880.0	1	49	24.7	24.7	0.701	0.701	
						25	25	23.7	23.7	0.558	0.558	

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12.6. LTE Band 4 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	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	24.5	0.481	**0.504**	15
						25	0	23.7	23.6	0.372	0.381	
			Left Tilt	20175	1732.5	1	0	24.7	24.5	0.186	0.195	
						25	0	23.7	23.6	0.143	0.146	
			Right Touch	20175	1732.5	1	0	24.7	24.5	0.395	0.414	
						25	0	23.7	23.6	0.304	0.311	
			Rightt Tilt	20175	1732.5	1	0	24.7	24.5	0.203	0.213	
						25	0	23.7	23.6	0.156	0.160	
Body-worn & Hotspot	QPSK	10	Rear	20000	1715.0	1	0	24.7	24.4	0.761	0.815	
				20175	1732.5	1	0	24.7	24.5	0.857	0.897	
						25	0	23.7	23.6	0.682	0.698	
				20350	1750.0	1	25	24.7	24.5	0.911	0.954	
			Front	20000	1715.0	1	0	24.7	24.4	0.701	0.751	
				20175	1732.5	1	0	24.7	24.5	0.822	0.861	
						25	0	23.7	23.6	0.615	0.629	
				20350	1750.0	1	25	24.7	24.5	0.859	0.899	
Hotspot	QPSK	10	Edge 3	20175	1732.5	1	0	24.7	24.5	0.508	0.532	
						25	0	23.7	23.6	0.392	0.401	
			Edge 4	20175	1732.5	1	0	24.7	24.5	0.517	0.541	
						25	0	23.7	23.6	0.401	0.410	

Additional Test for Repeated

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
Body-worn & Hotspot	QPSK	10	Rear	20350	1750.0	1	25	24.7	24.5	0.937	**0.981**	16

12.7. LTE Band 5 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	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	0.355	0.363	
						25	12	23.7	23.6	0.257	0.263	
			Left Tilt	20525	836.6	1	49	24.7	24.6	0.246	0.252	
						25	12	23.7	23.6	0.183	0.187	
			Right Touch	20525	836.6	1	49	24.7	24.6	0.446	**0.456**	17
						25	12	23.7	23.6	0.327	0.335	
			Rightt Tilt	20525	836.6	1	49	24.7	24.6	0.273	0.279	
						25	12	23.7	23.6	0.206	0.211	
Body-worn & Hotspot	QPSK	10	Rear	20525	836.6	1	49	24.7	24.6	0.546	**0.559**	18
						25	12	23.7	23.6	0.423	0.433	
			Front	20525	836.6	1	49	24.7	24.6	0.449	0.459	
						25	12	23.7	23.6	0.343	0.351	
Hotspot	QPSK	10	Edge 2	20525	836.6	1	49	24.7	24.6	0.466	0.477	
						25	12	23.7	23.6	0.354	0.362	
			Edge 3	20525	836.6	1	49	24.7	24.6	0.180	0.184	
						25	12	23.7	23.6	0.128	0.131	
			Edge 4	20525	836.6	1	49	24.7	24.6	0.277	0.283	
						25	12	23.7	23.6	0.230	0.235	

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12.8. LTE Band 7 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	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	23.8	0.120	0.132	
						50	0	23.2	22.8	0.101	0.111	
			Left Tilt	21100	2535.0	1	0	24.2	23.8	0.075	0.082	
						50	0	23.2	22.8	0.062	0.068	
			Right Touch	21100	2535.0	1	0	24.2	23.8	0.334	**0.366**	19
						50	0	23.2	22.8	0.310	0.340	
			Rightt Tilt	21100	2535.0	1	0	24.2	23.8	0.117	0.128	
						50	0	23.2	22.8	0.094	0.104	
Body-worn & Hotspot	QPSK	10	Rear	21100	2535.0	1	0	24.2	23.8	0.420	0.461	
						50	0	23.2	22.8	0.346	0.379	
			Front	21100	2535.0	1	0	24.2	23.8	0.568	**0.623**	20
						50	0	23.2	22.8	0.470	0.515	
Hotspot	QPSK	10	Edge 2	21100	2535.0	1	0	24.2	23.8	0.186	0.204	
						50	0	23.2	22.8	0.160	0.175	
			Edge 3	21100	2535.0	1	0	24.2	23.8	0.289	0.317	
						50	0	23.2	22.8	0.237	0.260	
			Edge 4	21100	2535.0	1	0	24.2	23.8	0.094	0.103	
						50	0	23.2	22.8	0.077	0.084	

12.9. LTE Band 17 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	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	24.5	0.185	0.194	
						25	12	23.7	23.7	0.146	0.146	
			Left Tilt	23790	710.0	1	0	24.7	24.5	0.129	0.135	
						25	12	23.7	23.7	0.105	0.105	
			Right Touch	23790	710.0	1	0	24.7	24.5	0.206	**0.216**	21
						25	12	23.7	23.7	0.163	0.163	
			Rightt Tilt	23790	710.0	1	0	24.7	24.5	0.147	0.154	
						25	12	23.7	23.7	0.114	0.114	
Body-worn & Hotspot	QPSK	10	Rear	23790	710.0	1	0	24.7	24.5	0.436	**0.457**	22
						25	12	23.7	23.7	0.338	0.338	
			Front	23790	710.0	1	0	24.7	24.5	0.254	0.266	
						25	12	23.7	23.7	0.199	0.199	
Hotspot	QPSK	10	Edge 2	23790	710.0	1	0	24.7	24.5	0.299	0.313	
						25	12	23.7	23.7	0.238	0.238	
			Edge 3	23790	710.0	1	0	24.7	24.5	0.069	0.072	
						25	12	23.7	23.7	0.056	0.056	
			Edge 4	23790	710.0	1	0	24.7	24.5	0.227	0.238	
						25	12	23.7	23.7	0.183	0.183	

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	0.107	0.120	
		0	Left Tilt	6	2437.0	16.0	15.5	0.127	0.142	
		0	Right Touch	6	2437.0	16.0	15.5	0.204	**0.229**	23
		0	Rightt Tilt	6	2437.0	16.0	15.5	0.159	0.178	
Body-worn & Hotspot	802.11b 1 Mbps	10	Rear	6	2437.0	16.0	15.5	0.038	**0.043**	
			Front	6	2437.0	16.0	15.5	0.047	**0.053**	24
Hotspot	802.11b 1 Mbps	10	Edge 1	6	2437.0	16.0	15.5	0.043	0.048	
			Edge 4	6	2437.0	16.0	15.5	0.036	0.040	

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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	0.046	0.073	
		0	Left Tilt	157	5785.0	11.0	9.0	0.040	0.063	
		0	Right Touch	157	5785.0	11.0	9.0	0.115	**0.182**	25
		0	Rightt Tilt	157	5785.0	11.0	9.0	0.095	0.151	
Body-worn & Hotspot	802.11a 6 Mbps	10	Rear	157	5785.0	11.0	9.0	0.132	**0.209**	26
			Front	157	5785.0	11.0	9.0	0.024	0.038	
Hotspot	802.11a 6 Mbps	10	Edge 1	157	5785.0	11.0	9.0	0.040	0.063	
		10	Edge 4	157	5785.0	11.0	9.0	0.125	0.198	

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	0.022	0.033	
				52	5260.0	11.0	9.5	0.046	0.065	
				140	5700.0	11.0	9.4	0.062	0.090	
			Left Tilt	36	5180.0	11.0	9.3	0.025	0.037	
				52	5260.0	11.0	9.5	0.035	0.049	
				140	5700.0	11.0	9.4	0.050	0.072	
			Right Touch	36	5180.0	11.0	9.3	0.116	0.172	
				52	5260.0	11.0	9.5	0.155	0.219	
				140	5700.0	11.0	9.4	0.153	**0.221**	27
			Right Tilt	36	5180.0	11.0	9.3	0.085	0.126	
				52	5260.0	11.0	9.5	0.118	0.167	
				140	5700.0	11.0	9.4	0.122	0.176	
Body-worn Accessory	802.11a 6 Mbps	10	Rear	36	5180.0	11.0	9.3	0.115	0.170	
				52	5260.0	11.0	9.5	0.166	0.234	
				140	5700.0	11.0	9.4	0.187	**0.270**	28
			Front	36	5180.0	11.0	9.3	0.024	0.035	
				52	5260.0	11.0	9.5	0.033	0.047	
				140	5700.0	11.0	9.4	0.029	0.042	

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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:

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)]·[√f(GHz)] ≤ 3.0, for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- $f_{(GHz)}$ 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:

- *(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)]·[√$f_{(GHz)}$/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

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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		0.436		No
850	GSM 850		0.526		No
	WCDMA Band V	0.734			No
	LTE Band 5		0.546		No
1750	LTE Band 4		0.937		Yes
1900	GSM 1900			0.342	No
	WCDMA Band II	0.476			No
	LTE Band 2		0.791		No
2400	Wi-Fi 802.11b/g/n	0.204			No
2500	LTE Band 7		0.568		No
5200	Wi-Fi 802.11a/n/ac	0.116			No
5300	Wi-Fi 802.11a/n/ac		0.166		No
5500	Wi-Fi 802.11a/n/ac		0.187		No
5800	Wi-Fi 802.11a/n/ac		0.132		No

13.2. Repeated Measurement Results

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		
LTE Band 4	Rear	QPSK	20350	1750.0	0.911	0.937	1.03	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.

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14. Simultaneous Transmission SAR Analysis

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

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

Where:

SAR_1 is the highest reported or estimated SAR for the first of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition

SAR_2 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:

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

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14.1. Sum of the SAR for GSM850 & Wi-Fi & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			GSM 850	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.347	0.120			0.467	No
		WWAN + Wi-Fi(UNII)	0.347		0.090		0.437	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.262	0.142			0.404	No
		WWAN + Wi-Fi(UNII)	0.262		0.072		0.334	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.435	0.229			0.664	No
		WWAN + Wi-Fi(UNII)	0.435		0.221		0.656	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.269	0.178			0.447	No
		WWAN + Wi-Fi(UNII)	0.269		0.176		0.445	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.618	0.209			0.827	No
		WWAN + Wi-Fi(UNII)	0.618		0.270		0.888	No
		WWAN + BT	0.618			0.210	0.828	No
	Front	WWAN + Wi-Fi(DTS)	0.572	0.053			0.625	No
		WWAN + Wi-Fi(UNII)	0.572		0.047		0.619	No
		WWAN + BT	0.572			0.210	0.782	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.063			0.063	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.617				0.617	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.182				0.182	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.458	0.198			0.656	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				∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			GSM 1900	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.374	0.120			0.494	No
		WWAN + Wi-Fi(UNII)	0.374		0.090		0.464	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.164	0.142			0.306	No
		WWAN + Wi-Fi(UNII)	0.164		0.072		0.236	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.290	0.229			0.519	No
		WWAN + Wi-Fi(UNII)	0.290		0.221		0.511	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.142	0.178			0.320	No
		WWAN + Wi-Fi(UNII)	0.142		0.176		0.318	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.366	0.209			0.575	No
		WWAN + Wi-Fi(UNII)	0.366		0.270		0.636	No
		WWAN + BT	0.366			0.210	0.576	No
	Front	WWAN + Wi-Fi(DTS)	0.378	0.053			0.431	No
		WWAN + Wi-Fi(UNII)	0.378		0.047		0.425	No
		WWAN + BT	0.378			0.210	0.588	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.063			0.063	No
	Edge 2	WWAN + Wi-Fi(DTS)					0.000	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.228				0.228	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.393	0.198			0.591	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.

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14.3. Sum of the SAR for WCDMA Band V & Wi-Fi & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 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)	0.610	0.120			0.730	No
		WWAN + Wi-Fi(UNII)	0.610		0.090		0.700	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.439	0.142			0.581	No
		WWAN + Wi-Fi(UNII)	0.439		0.072		0.511	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.734	0.229			0.963	No
		WWAN + Wi-Fi(UNII)	0.734		0.221		0.955	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.464	0.178			0.642	No
		WWAN + Wi-Fi(UNII)	0.464		0.176		0.640	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.595	0.209			0.804	No
		WWAN + Wi-Fi(UNII)	0.595		0.270		0.865	No
		WWAN + BT	0.595			0.210	0.805	No
	Front	WWAN + Wi-Fi(DTS)	0.482	0.053			0.535	No
		WWAN + Wi-Fi(UNII)	0.482		0.047		0.529	No
		WWAN + BT	0.482			0.210	0.692	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.063			0.063	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.444				0.444	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.162				0.162	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.322	0.198			0.520	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				∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
			W-CDMA Band II	Wi-Fi (DTS)	Wi-Fi (UNII)	Bluetooth		
Head	Left Touch	WWAN + Wi-Fi(DTS)	0.476	0.120			0.596	No
		WWAN + Wi-Fi(UNII)	0.476		0.090		0.566	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.163	0.142			0.305	No
		WWAN + Wi-Fi(UNII)	0.163		0.072		0.235	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.291	0.229			0.520	No
		WWAN + Wi-Fi(UNII)	0.291		0.221		0.512	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.164	0.178			0.342	No
		WWAN + Wi-Fi(UNII)	0.164		0.176		0.340	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.349	0.209			0.558	No
		WWAN + Wi-Fi(UNII)	0.349		0.270		0.619	No
		WWAN + BT	0.349			0.210	0.559	No
	Front	WWAN + Wi-Fi(DTS)	0.414	0.053			0.467	No
		WWAN + Wi-Fi(UNII)	0.414		0.047		0.461	No
		WWAN + BT	0.414			0.210	0.624	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.063			0.063	No
	Edge 2	WWAN + Wi-Fi(DTS)					0.000	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.162				0.162	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.380	0.198			0.578	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.

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

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 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)	0.709	0.120			**0.829**	No
		WWAN + Wi-Fi(UNII)	0.709		0.090		**0.799**	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.356	0.142			0.498	No
		WWAN + Wi-Fi(UNII)	0.356		0.072		0.428	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.492	0.229			0.721	No
		WWAN + Wi-Fi(UNII)	0.492		0.221		0.713	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.307	0.178			0.485	No
		WWAN + Wi-Fi(UNII)	0.307		0.176		0.483	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.791	0.209			1.000	No
		WWAN + Wi-Fi(UNII)	0.791		0.270		1.061	No
		WWAN + BT	0.791			0.210	1.001	No
	Front	WWAN + Wi-Fi(DTS)	0.778	0.053			0.831	No
		WWAN + Wi-Fi(UNII)	0.778		0.047		0.825	No
		WWAN + BT	0.778			0.210	0.988	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.063			0.063	No
	Edge 2	WWAN + Wi-Fi(DTS)					0.000	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.424				0.424	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.701	0.198			0.899	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.

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

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 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)	0.504	0.120			0.624	No
		WWAN + Wi-Fi(UNII)	0.504		0.090		0.594	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.195	0.142			0.337	No
		WWAN + Wi-Fi(UNII)	0.195		0.072		0.267	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.414	0.229			0.643	No
		WWAN + Wi-Fi(UNII)	0.414		0.221		0.635	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.213	0.178			0.391	No
		WWAN + Wi-Fi(UNII)	0.213		0.176		0.389	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.981	0.209			**1.190**	No
		WWAN + Wi-Fi(UNII)	0.981		0.270		**1.251**	No
		WWAN + BT	0.981			0.210	1.191	No
	Front	WWAN + Wi-Fi(DTS)	0.899	0.053			0.952	No
		WWAN + Wi-Fi(UNII)	0.899		0.047		0.946	No
		WWAN + BT	0.899			0.210	1.109	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.063			0.063	No
	Edge 2	WWAN + Wi-Fi(DTS)					0.000	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.532				0.532	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.541	0.198			0.739	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.

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14.7. Sum of the SAR for LTE Band 5 & Wi-Fi & BT

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 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)	0.363	0.120			0.483	No
		WWAN + Wi-Fi(UNII)	0.363		0.090		0.453	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.252	0.142			0.394	No
		WWAN + Wi-Fi(UNII)	0.252		0.072		0.324	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.456	0.229			0.685	No
		WWAN + Wi-Fi(UNII)	0.456		0.221		0.677	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.279	0.178			0.457	No
		WWAN + Wi-Fi(UNII)	0.279		0.176		0.455	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.559	0.209			0.768	No
		WWAN + Wi-Fi(UNII)	0.559		0.270		0.829	No
		WWAN + BT	0.559			0.210	0.769	No
	Front	WWAN + Wi-Fi(DTS)	0.459	0.053			0.512	No
		WWAN + Wi-Fi(UNII)	0.459		0.047		0.506	No
		WWAN + BT	0.459			0.210	0.669	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.063			0.063	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.477				0.477	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.184				0.184	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.283	0.198			0.481	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				∑ 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)	0.132	0.120			0.252	No
		WWAN + Wi-Fi(UNII)	0.132		0.090		0.222	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.082	0.142			0.224	No
		WWAN + Wi-Fi(UNII)	0.082		0.072		0.154	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.366	0.229			0.595	No
		WWAN + Wi-Fi(UNII)	0.366		0.221		0.587	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.128	0.178			0.306	No
		WWAN + Wi-Fi(UNII)	0.128		0.176		0.304	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.461	0.209			0.670	No
		WWAN + Wi-Fi(UNII)	0.461		0.270		0.731	No
		WWAN + BT	0.461			0.210	0.671	No
	Front	WWAN + Wi-Fi(DTS)	0.623	0.053			0.676	No
		WWAN + Wi-Fi(UNII)	0.623		0.047		0.670	No
		WWAN + BT	0.623			0.210	0.833	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.063			0.063	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.204				0.204	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.317				0.317	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.103	0.198			0.301	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.

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

RF Exposure conditions	Test Position		Simultaneous Transmission Scenario				∑ 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)	0.194	0.120			0.314	No
		WWAN + Wi-Fi(UNII)	0.194		0.090		0.284	No
	Left Tilt	WWAN + Wi-Fi(DTS)	0.135	0.142			0.277	No
		WWAN + Wi-Fi(UNII)	0.135		0.072		0.207	No
	Right Touch	WWAN + Wi-Fi(DTS)	0.216	0.229			0.445	No
		WWAN + Wi-Fi(UNII)	0.216		0.221		0.437	No
	Right Tilt	WWAN + Wi-Fi(DTS)	0.154	0.178			0.332	No
		WWAN + Wi-Fi(UNII)	0.154		0.176		0.330	No
Body-worn Accessory & Hotspot	Rear	WWAN + Wi-Fi(DTS)	0.457	0.209			0.666	No
		WWAN + Wi-Fi(UNII)	0.457		0.270		0.727	No
		WWAN + BT	0.457			0.210	0.667	No
	Front	WWAN + Wi-Fi(DTS)	0.266	0.053			0.319	No
		WWAN + Wi-Fi(UNII)	0.266		0.047		0.313	No
		WWAN + BT	0.266			0.210	0.476	No
Hotspot	Edge 1	WWAN + Wi-Fi(DTS)		0.063			0.063	No
	Edge 2	WWAN + Wi-Fi(DTS)	0.313				0.313	No
	Edge 3	WWAN + Wi-Fi(DTS)	0.072				0.072	No
	Edge 4	WWAN + Wi-Fi(DTS)	0.238	0.198			0.436	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.

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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 3991

15.6. Calibration Certificate for D750V3 - SN 1071

15.7. Calibration Certificate for D835V2 - SN 4d002

15.8. Calibration Certificate for D1750V2 - SN 1077

15.9. Calibration Certificate for D1900V2- SN 5d043

15.10. Calibration Certificate for D2450V2 - SN 899

15.11. Calibration Certificate for D2600V2 - SN 1006

15.12. Calibration Certificate for D5GHzV2 - SN 1138

END OF REPORT

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