SAR EVALUATION REPORT
CLASS II PERMISSIVE CHANGE

FCC 47 CFR § 2.1093
IEEE Std 1528-2013

For
CDMA/LTE PHONE WITH BT & DTS WLAN b/g/n

FCC ID: ZNFL62VL
Model Name: LGL62VL, L62VL, LG-L62VL

Report Number: 16I22653-S1V2
Issue Date: 2/8/2016

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Date	Revisions	Revised By
V1	2/1/2016	Initial Issue	--
V2	2/8/2016	Section 2: Updated KDB 941225 D05 to latest Revision Section 7: Removed Note 1.	Coltyce Sanders

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Table of Contents

1. Attestation of Test Results 5

2. Test Specification, Methods and Procedures 6

3. Facilities and Accreditation 6

4. SAR Measurement System & Test Equipment 7

4.1. SAR Measurement System 7

4.2. SAR Scan Procedures 8

4.3. Test Equipment 10

5. Measurement Uncertainty 11

6. Device Under Test (DUT) Information 12

6.1. DUT Description 12

6.2. Wireless Technologies 12

6.3. Maximum Output Power from Tune-up Procedure 13

6.4. General LTE SAR Test and Reporting Considerations 14

7. RF Exposure Conditions (Test Configurations) 15

8. Dielectric Property Measurements & System Check 16

8.1. Dielectric Property Measurements 16

8.2. System Check 19

9. Conducted Output Power Measurements 20

9.1. CDMA 20

9.2. LTE 22

9.3. Wi-Fi 2.4GHz (DTS Band) 28

9.4. Bluetooth 28

10. Measured and Reported (Scaled) SAR Results 29

10.1. CDMA BC0 31

10.2. CDMA BC1 31

10.3. LTE Band 2 (20MHz Bandwidth) 31

10.4. LTE Band 4 (20MHz Bandwidth) 32

10.5. LTE Band 13 (10MHz Bandwidth) 32

10.6. Wi-Fi (DTS Band) 32

10.7. Bluetooth 33

11. SAR Measurement Variability 34

12. Simultaneous Transmission SAR Analysis 35

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12.1. Sum of SAR for CDMA BC0 & Wi-Fi & BT 35
12.2. Sum of SAR for CDMA BC1 & Wi-Fi & BT 35
12.3. Sum of SAR for LTE Band 2 & Wi-Fi & BT 35
12.4. Sum of SAR for LTE Band 4 & Wi-Fi & BT 36
12.5. Sum of SAR for LTE Band 13 & Wi-Fi & BT 36

Appendixes 37

16I22653-S1V1 SAR_App A Photos & Ant. Locations 37
16I22653-S1V1 SAR_App B System Check Plots 37
16I22653-S1V1 SAR_App C Highest Test Plots 37
16I22653-S1V1 SAR_App D Tissue Ingredients 37
16I22653-S1V1 SAR_App E Probe Cal. Certificates 37
16I22653-S1V1 SAR_App F Dipole Cal. Certificates 37

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1. Attestation of Test Results

Applicant Name	LG ELECTRONICS MOBILECOMM U.S.A., INC.			
FCC ID	ZNFL62VL			
Model Name	LGL62VL, L62VL, LG-L62VL			
Applicable Standards	FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013			
Exposure Category	SAR Limits (W/Kg)			
	Peak spatial-average(1g of tissue)			
General population / Uncontrolled exposure	1.6			
RF Exposure Conditions	Equipment Class - Highest Reported SAR (W/kg)			
	Licensed	DTS	U-NII	DSS (BT)
Head	0.738	0.714	N/A	N/A
Body-worn	0.553	0.099		
Wi-Fi Direct	N/A	0.195		
Simultaneous Tx	1.371			
Date Tested	1/12/2016 to 1/21/2016			
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:	Prepared By:
Devin Chang Senior Engineer UL Verification Services Inc.	Krischelle Aurelio Laboratory Technician UL Verification Services Inc.

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2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE STD 1528-2013, the following FCC Published RF exposure KDB procedures:

- 248227 D01 802.11 Wi-Fi SAR v02r02
- 447498 D01 General RF Exposure Guidance v06
- 447498 D03 Supplement C Cross-Reference v01
- 648474 D04 Handset SAR v01r03
- 690783 D01 SAR Listings on Grants v01r03
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
- 865664 D02 RF Exposure Reporting v01r02
- 941225 D01 3G SAR Procedures v03r01
- 941225 D05 SAR for LTE Devices v02r05

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 F	
SAR Lab G	
SAR Lab H	

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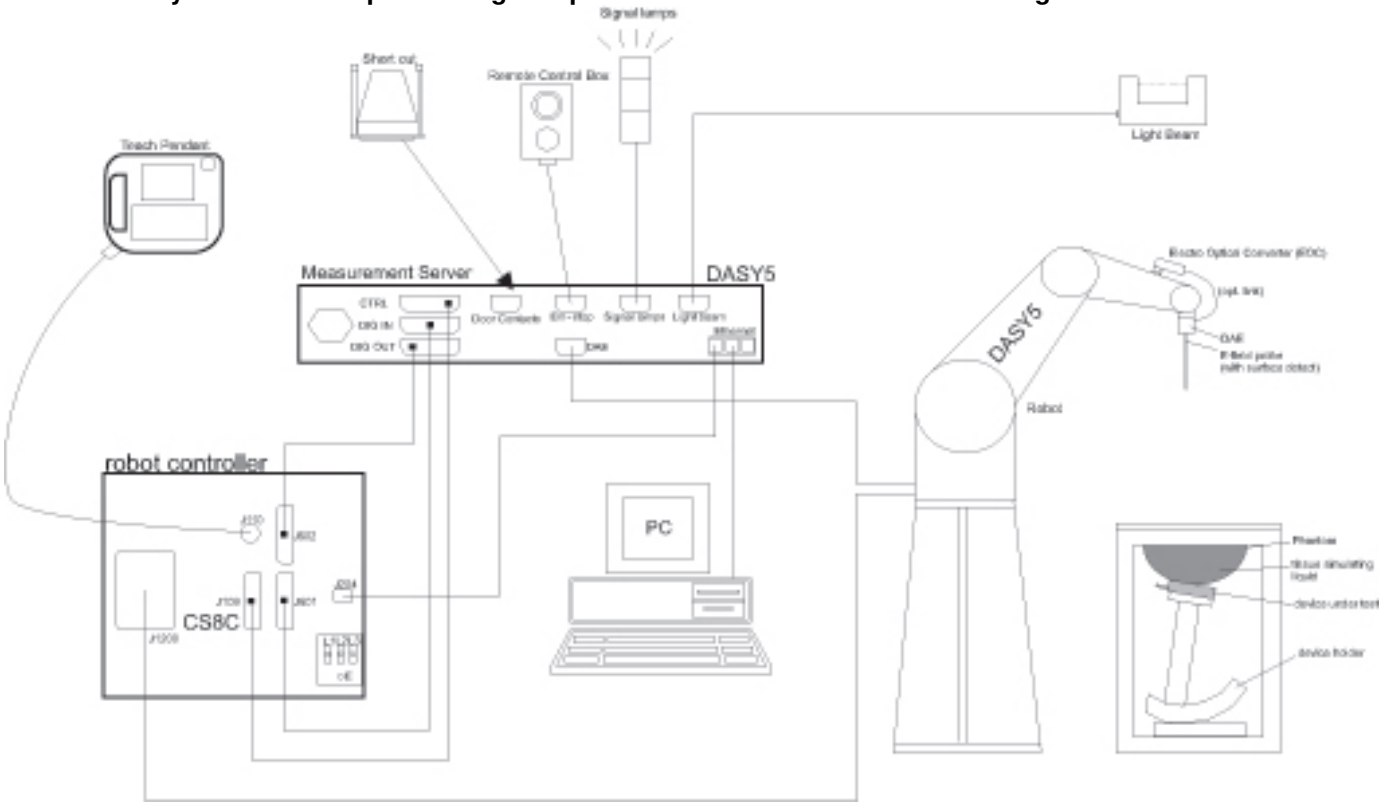
4. SAR Measurement System & Test Equipment

4.1. SAR Measurement System

The DASY5 system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

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4.2. SAR Scan Procedures

Step 1: Power Reference Measurement

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

Step 2: Area Scan

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

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

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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

KDE 2 GH

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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4.3. Test Equipment

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

Dielectric Property Measurements

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Network Analyzer	Agilent	8753ES	MY40001647	7/28/2016
Dielectric Probe kit	SPEAG	DAK-3.5	1103	2/17/2016
Shorting block	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	Traceable Calibration Control Co.	4242	140493798	8/4/2016

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
HP Signal Generator	HP	8665B	3744A01084	5/8/2016
Power Meter	Agilent	N1912A	MY50001018	10/19/2017
Power Sensor	Agilent	E9323A	MY5307005	4/29/2016
Power Sensor	Agilent	E9323A	MY5307007	3/2/2016
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1795093	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2149	N/A
DC Power Supply	Sorensen Ametek	XT15-4	1319A02778	N/A
Synthesized Signal Generator	Agilent	8665B	3546A00784	6/27/2016
Power Meter	HP	437B	3125U09248	9/3/2016
Power Meter	HP	437B	3125U09516	9/17/2016
Power Sensor	Agilent	8481A	2349A36506	9/16/2016
Power Sensor	Agilent	8481A	3318A92374	9/16/2016
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1622052	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2711	N/A
DC Power Supply	Sorensen Ametek	XT 15-4	1319A02780	N/A
E-Field Probe (SAR Lab 1)	SPEAG	EX3DV4	7356	4/22/2016
E-Field Probe (SAR Lab 2)	SPEAG	EX3DV4	3990	3/18/2016
E-Field Probe (SAR Lab 3)	SPEAG	EX3DV4	3773	4/22/2016
E-Field Probe (SAR Lab 3)	SPEAG	EX3DV4	3749	1/26/2016
E-Field Probe (SAR Lab 4)	SPEAG	EX3DV4	3989	3/17/2016
Data Acquisition Electronics (SAR Lab 1)	SPEAG	DAE3	500	5/22/2016
Data Acquisition Electronics (SAR Lab 2)	SPEAG	DAE4	1257	9/16/2016
Data Acquisition Electronics (SAR Lab 3)	SPEAG	DAE4	1434	4/16/2016
Data Acquisition Electronics (SAR Lab 4)	SPEAG	DAE4	1258	5/14/2016
System Validation Dipole	SPEAG	D750V3	1019	3/11/2016
System Validation Dipole	SPEAG	D835V2	4d142	9/23/2016
System Validation Dipole	SPEAG	D1750V2	1050	4/15/2016
System Validation Dipole	SPEAG	D1900V2	5d163	9/21/2016
System Validation Dipole	SPEAG	D2450V2	899	3/13/2016
Thermometer (SAR Lab 1)	EXTECH	445703	CCS-205	3/20/2016
Thermometer (SAR Lab 2)	EXTECH	445703	CCS-200	3/19/2016
Thermometer (SAR Lab 3)	EXTECH	445703	CCS-237	6/5/2016
Thermometer (SAR Lab 4)	EXTECH	445703	CCS-238	6/5/2016

Other

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Power Meter	Agilent	N1912A	MY55196004	7/1/2016
Power Sensor	Agilent	N1921A	MY53260001	9/24/2016
Base Station Simulator	R & S	CMW500	132910	10/22/2016
Base Station Simulator	R & S	CMW500	135390	4/6/2016

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5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

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6. Device Under Test (DUT) Information

6.1. DUT Description

Device Dimension	Overall (Length x Width): 146.61 mm x 74.86 mm Overall Diagonal: 156 mm Display Diagonal: 135 mm
Back Cover	☒ Normal Battery Cover ☐ Normal Battery Cover with NFC
Battery Options	☒ Standard – Lithium-ion battery, Rating 3.8Vdc, 8.8Wh ☐ Extended (large capacity)
Accessory	Headset
Wireless Router (Hotspot)	Not supported
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 GHz)
Test sample information	**S/N** / **IMEI** / **Notes** 601KPZK000749 / 35492-07—000749-1 / Conducted unit 601KPJP000740 / 354792-07-0000740-0 / Radiated unit 601KPRW000742 / 354792-07-000742-6 / Radiated unit 601KPBF000741 / 354792-07-000741-8 / Radiated unit

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle used for SAR testing
CDMA (CDMA2000)	BC0 BC1	1xRTT (Voice & Data) 1xEV-DO Rel. 0 1xEV-DO Rev. A 1xAdvanced	100%
	Does this device support SV-DO (1xRTT-1xEVDO)? ☐ Yes ☒ No		
LTE	FDD Band 2 FDD Band 4 FDD Band 13	QPSK 16QAM ☒ Rel. 10 Does not support Carrier Aggregation (CA)	100% (FDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No		
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20)	100%
Bluetooth	2.4 GHz	Version 4.1 LE	77.5% (DH5)

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6.3. Maximum Output Power from Tune-up Procedure

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

RF Interface	Mode	Max. RF Output Power (dBm)
CDMA BC0	1xRTT	**24.4**
	1xAdvanced	**24.4**
	1xEVDO Rel. 0	**24.4**
	1xEVDO Rel. A	**24.4**
CDMA BC1	1xRTT	**24.7**
	1xAdvanced	**24.7**
	1xEVDO Rel. 0	**24.7**
	1xEVDO Rel. A	**24.7**
LTE Band 2	QPSK	**24.2**
	16-QAM	**23.2**
LTE Band 4	QPSK	**24.4**
	16-QAM	**23.4**
LTE Band 13	QPSK	**24.2**
	16-QAM	**23.2**
WiFi 2.4 GHz	802.11b	**16.0**
	802.11g	**13.0**
	802.11n HT20	**12.0**
Bluetooth		**8.5**
Bluetooth LE		**0.0**

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6.4. General LTE SAR Test and Reporting Considerations

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td rowspan="15">Frequency range, Channel Bandwidth, Numbers and Frequencies</td><td>
<table>
<tr><td rowspan="3">Band 2</td><td colspan="6">Frequency range: 1850 - 1910 MHz</td></tr>
<tr><td colspan="6">Channel Bandwidth</td></tr>
<tr><td>20 MHz</td><td>15 MHz</td><td>10 MHz</td><td>5 MHz</td><td>3 MHz</td><td>1.4 MHz</td></tr>
<tr><td>Low</td><td>18700 /1860</td><td>18675/ 1857.5</td><td>18650/ 1855</td><td>18625/ 1852.5</td><td>18615/ 1851.5</td><td>18607/ 1850.7</td></tr>
<tr><td>Mid</td><td>18900/ 1880</td><td>18900/ 1880</td><td>18900/ 1880</td><td>18900/ 1880</td><td>18900/ 1880</td><td>18900/ 1880</td></tr>
<tr><td>High</td><td>19100/ 1900</td><td>19125/ 1902.5</td><td>19150/ 1905</td><td>19175/ 1907.5</td><td>19185/ 1908.5</td><td>19193/ 1909.3</td></tr>
<tr><td rowspan="3">Band 4</td><td colspan="6">Frequency range: 1710 - 1755 MHz</td></tr>
<tr><td colspan="6">Channel Bandwidth</td></tr>
<tr><td>20 MHz</td><td>15 MHz</td><td>10 MHz</td><td>5 MHz</td><td>3 MHz</td><td>1.4 MHz</td></tr>
<tr><td>Low</td><td></td><td>20025/ 1717.5</td><td>20000/ 1715</td><td>19975/ 1712.5</td><td>19965/ 1711.5</td><td>19957/ 1710.7</td></tr>
<tr><td>Mid</td><td>20175/ 1732.5</td><td>20175/ 1732.5</td><td>20175/ 1732.5</td><td>20175/ 1732.5</td><td>20175/ 1732.5</td><td>20175/ 1732.5</td></tr>
<tr><td>High</td><td></td><td>20325/ 1747.5</td><td>20350/ 1750</td><td>20375/ 1752.5</td><td>20385/ 1753.5</td><td>20393/ 1754.3</td></tr>
<tr><td rowspan="3">Band 13</td><td colspan="6">Frequency range: 777 - 787 MHz</td></tr>
<tr><td colspan="6">Channel Bandwidth</td></tr>
<tr><td>20 MHz</td><td>15 MHz</td><td>10 MHz</td><td>5 MHz</td><td>3 MHz</td><td>1.4 MHz</td></tr>
<tr><td>Low</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Mid</td><td></td><td></td><td>23230/ 782</td><td>23230/ 782</td><td></td><td></td></tr>
<tr><td>High</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>LTE transmitter and antenna implementation</td><td>LTE Bands 2 and 4 have one (1) Tx/Rx antenna and one (1) Rx antenna
LTE Band 13 has one (1) Tx/Rx antenna and one (1) Rx antenna
Refer to Appendix A.</td></tr>
<tr><td>Maximum power reduction (MPR)</td><td>
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
</td></tr>
<tr><td>Power reduction</td><td>No</td></tr>
<tr><td>Spectrum plots for RB configurations</td><td>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.</td></tr>
</table>

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7. RF Exposure Conditions (Test Configurations)

Refer to “SAR Photos and Ant locations” Appendix for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

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

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8. Dielectric Property Measurements & System Check

8.1. Dielectric Property Measurements

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 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.

Tissue Dielectric Parameters

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

IEEE Std 1528-2013

Refer to Table 3 within the IEEE Std 1528-2013

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Dielectric Property Measurements Results:

SAR Lab 1

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
1/11/2016	Head 835	e'	41.9500	Relative Permittivity (ε_r):	41.95	41.50	1.08	5
		e"	19.8900	Conductivity (σ):	0.92	0.90	2.61	5
	Head 820	e'	42.1300	Relative Permittivity (ε_r):	42.13	41.60	1.27	5
		e"	19.8500	Conductivity (σ):	0.91	0.90	0.73	5
	Head 850	e'	41.7800	Relative Permittivity (ε_r):	41.78	41.50	0.67	5
		e"	19.8600	Conductivity (σ):	0.94	0.92	2.58	5
1/11/2016	Body 835	e'	54.0200	Relative Permittivity (ε_r):	54.02	55.20	-2.14	5
		e"	21.8800	Conductivity (σ):	1.02	0.97	4.73	5
	Body 820	e'	54.2100	Relative Permittivity (ε_r):	54.21	55.28	-1.93	5
		e"	21.9200	Conductivity (σ):	1.00	0.97	3.20	5
	Body 850	e'	53.9100	Relative Permittivity (ε_r):	53.91	55.16	-2.26	5
		e"	21.8300	Conductivity (σ):	1.03	0.99	4.52	5

SAR Lab 2

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
1/14/2016	Head 1750	e'	40.9700	Relative Permittivity (ε_r):	40.97	40.08	2.21	5
		e"	13.9800	Conductivity (σ):	1.36	1.37	-0.63	5
	Head 1710	e'	41.1300	Relative Permittivity (ε_r):	41.13	40.15	2.45	5
		e"	13.8600	Conductivity (σ):	1.32	1.35	-2.12	5
	Head 1755	e'	40.8900	Relative Permittivity (ε_r):	40.89	40.08	2.03	5
		e"	13.9700	Conductivity (σ):	1.36	1.37	-0.62	5
1/14/2016	Body 1750	e'	51.6500	Relative Permittivity (ε_r):	51.65	53.44	-3.35	5
		e"	15.1800	Conductivity (σ):	1.48	1.49	-0.61	5
	Body 1710	e'	51.7500	Relative Permittivity (ε_r):	51.75	53.54	-3.35	5
		e"	15.1100	Conductivity (σ):	1.44	1.46	-1.70	5
	Body 1755	e'	51.6200	Relative Permittivity (ε_r):	51.62	53.43	-3.38	5
		e"	15.1900	Conductivity (σ):	1.48	1.49	-0.47	5

SAR Lab 3

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
1/13/2016	Head 1900	e'	38.6700	Relative Permittivity (ε_r):	38.67	40.00	-3.33	5
		e"	13.4000	Conductivity (σ):	1.42	1.40	1.12	5
	Head 1850	e'	38.9300	Relative Permittivity (ε_r):	38.93	40.00	-2.68	5
		e"	13.2800	Conductivity (σ):	1.37	1.40	-2.42	5
	Head 1910	e'	38.6600	Relative Permittivity (ε_r):	38.66	40.00	-3.35	5
		e"	13.4700	Conductivity (σ):	1.43	1.40	2.18	5
1/13/2016	Body 1900	e'	51.1900	Relative Permittivity (ε_r):	51.19	53.30	-3.96	5
		e"	14.4400	Conductivity (σ):	1.53	1.52	0.36	5
	Body 1850	e'	51.4500	Relative Permittivity (ε_r):	51.45	53.30	-3.47	5
		e"	14.3300	Conductivity (σ):	1.47	1.52	-3.02	5
	Body 1910	e'	51.2400	Relative Permittivity (ε_r):	51.24	53.30	-3.86	5
		e"	14.5400	Conductivity (σ):	1.54	1.52	1.59	5
1/19/2016	Body 1900	e'	52.3700	Relative Permittivity (ε_r):	52.37	53.30	-1.74	5
		e"	14.5600	Conductivity (σ):	1.54	1.52	1.20	5
	Body 1850	e'	52.6100	Relative Permittivity (ε_r):	52.61	53.30	-1.29	5
		e"	14.4900	Conductivity (σ):	1.49	1.52	-1.94	5
	Body 1910	e'	52.2800	Relative Permittivity (ε_r):	52.28	53.30	-1.91	5
		e"	14.5800	Conductivity (σ):	1.55	1.52	1.87	5
1/19/2016	Head 1900	e'	39.0500	Relative Permittivity (ε_r):	39.05	40.00	-2.38	5
		e"	13.3900	Conductivity (σ):	1.41	1.40	1.04	5
	Head 1850	e'	39.3100	Relative Permittivity (ε_r):	39.31	40.00	-1.72	5
		e"	13.3300	Conductivity (σ):	1.37	1.40	-2.06	5
	Head 1910	e'	39.0400	Relative Permittivity (ε_r):	39.04	40.00	-2.40	5
		e"	13.4400	Conductivity (σ):	1.43	1.40	1.95	5

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SAR Lab 4

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
1/12/2016	Head 2450	e'	37.3100	Relative Permittivity (ε_r):	37.31	39.20	-4.82	5
		e"	13.8300	Conductivity (σ):	1.88	1.80	4.67	5
	Head 2410	e'	37.5400	Relative Permittivity (ε_r):	37.54	39.28	-4.43	5
		e"	13.7500	Conductivity (σ):	1.84	1.76	4.66	5
	Head 2480	e'	37.2400	Relative Permittivity (ε_r):	37.24	39.16	-4.91	5
		e"	13.9400	Conductivity (σ):	1.92	1.83	4.90	5
1/12/2016	Body 2450	e'	50.5600	Relative Permittivity (ε_r):	50.56	52.70	-4.06	5
		e"	14.6300	Conductivity (σ):	1.99	1.95	2.21	5
	Body 2410	e'	50.7200	Relative Permittivity (ε_r):	50.72	52.76	-3.87	5
		e"	14.5800	Conductivity (σ):	1.95	1.91	2.43	5
	Body 2480	e'	50.5100	Relative Permittivity (ε_r):	50.51	52.66	-4.09	5
		e"	14.7100	Conductivity (σ):	2.03	1.99	1.82	5
1/14/2016	Head 750	e'	39.4300	Relative Permittivity (ε_r):	39.43	41.96	-6.03	10
		e"	21.4800	Conductivity (σ):	0.90	0.89	0.30	10
	Head 700	e'	40.1600	Relative Permittivity (ε_r):	40.16	42.22	-4.87	10
		e"	21.8900	Conductivity (σ):	0.85	0.89	-4.19	10
	Head 790	e'	38.9600	Relative Permittivity (ε_r):	38.96	41.76	-6.70	10
		e"	21.2000	Conductivity (σ):	0.93	0.90	3.92	10
1/14/2016	Body 750	e'	53.2100	Relative Permittivity (ε_r):	53.21	55.55	-4.21	5
		e"	23.5700	Conductivity (σ):	0.98	0.96	2.06	5
	Body 700	e'	53.7400	Relative Permittivity (ε_r):	53.74	55.74	-3.59	5
		e"	23.9600	Conductivity (σ):	0.93	0.96	-2.78	5
	Body 790	e'	52.8000	Relative Permittivity (ε_r):	52.80	55.39	-4.68	5
		e"	23.0800	Conductivity (σ):	1.01	0.97	4.93	5

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8.2. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

System Performance Check Measurement Conditions:

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

System Check Results

The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within 10% of the manufacturer calibrated dipole SAR target.

SAR Room	Date	Tissue Type	Dipole Type Serial #	Dipole Cal. Due Data	Measured Results for 1g SAR				Measured Results for 10g SAR				Plot No.
					Zoom Scan to 100 mW	Normalize to 1 W	Target (Ref. Value)	Delta ±10 %	Zoom Scan to 100 mW	Normalize to 1 W	Target (Ref. Value)	Delta ±10 %	
1	1/11/2016	Head	D835V2 SN:4d142	9/23/2016	0.90	8.98	9.27	-3.13	0.59	5.86	6.01	-2.50	1,2
1	1/11/2016	Body	D835V2 SN:4d142	9/23/2016	0.92	9.18	9.41	-2.44	0.60	6.03	6.18	-2.43	
2	1/14/2016	Head	D1750V2 SN:1050	4/15/2016	3.57	35.70	36.40	-1.92	1.89	18.90	19.30	-2.07	3,4
2	1/14/2016	Body	D1750V2 SN:1050	4/15/2016	3.74	37.40	37.00	1.08	2.01	20.10	19.90	1.01	
3	1/13/2016	Head	D1900V2 SN:5d163	9/21/2016	4.25	42.50	40.10	5.99	2.19	21.90	21.00	4.29	
3	1/13/2016	Body	D1900V2 SN:5d163	9/21/2016	4.25	42.50	39.90	6.52	2.23	22.30	21.00	6.19	5,6
3	1/19/2016	Head	D1900V2 SN:5d163	9/21/2016	3.84	38.40	40.10	-4.24	2.02	20.20	21.00	-3.81	7,8
3	1/19/2016	Body	D1900V2 SN:5d163	9/21/2016	4.13	41.30	39.90	3.51	2.12	21.20	21.00	0.95	
4	1/12/2016	Head	D2450V2 SN:899	3/13/2016	5.36	53.60	51.60	3.88	2.43	24.30	23.90	1.67	
4	1/12/2016	Body	D2450V2 SN:899	3/13/2016	5.36	53.60	48.80	9.84	2.45	24.50	22.70	7.93	9,10
4	1/14/2016	Head	D750V3 SN:1019	3/11/2016	0.82	8.19	8.44	-2.96	0.54	5.38	5.50	-2.18	
4	1/14/2016	Body	D750V3 SN:1019	3/11/2016	0.90	9.03	8.53	5.86	0.60	6.00	5.68	5.63	11,12

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9. Conducted Output Power Measurements

9.1. CDMA

1x Advanced Setup Procedures used to establish the test signals

Call box setup procedure

- Protocol Rev > 6 (IS-2000-0)
- System ID: 331; NID: 65535, Reg. Ch. #.:
- Radio Config (RC) > Fwd11,Rvs8
- Service Option (SO) Setup > SO75 (Loopback)
- Traffic Data Rate > Full
- Rvs Power Ctrl > All Up bits (Maximum TxPout)
- Reverse Power Control Mode: 00-200 to 400 bps
- Smart blanking was disabled.

CDMA BC0 Measured Results

Band	Mode		Ch No.	Freq. (MHz)	Max. Pwr (dBm)
BC 0	1xRTT	RC1 SO55 (Loopback)	1013	824.70	24.0
			384	836.52	24.1
			777	848.31	24.2
		RC3 SO55 (Loopback)	1013	824.70	24.0
			384	836.52	24.1
			777	848.31	24.2
		RC3 SO32 (+F-SCH)	1013	824.70	24.0
			384	836.52	24.1
			777	848.31	24.2
	1xAdvanced	Fwd11/Rvs8 SO75 (Loopback)	1013	824.70	24.0
			384	836.52	24.1
			777	848.31	24.1
	1xEVDO Rel. 0	FTAP Rate: 307.2 kbps(2 slot, QPSK) RTAP Rate: 153.6 kbps	1013	824.70	24.0
			384	836.52	24.1
			777	848.31	24.2
	1xEVDO Rev. A	FETAP: 307.2k, QPSK/ ACK RETAP: 4096	1013	824.70	24.0
			384	836.52	24.1
			777	848.31	24.2

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CDMA BC1 Measured Results

Band	Mode		Ch No.	Freq. (MHz)	Max. Pwr (dBm)
BC 1	1xRTT	RC1 SO55 (Loopback)	25	1851.25	24.7
			600	1880.00	24.5
			1175	1908.75	24.4
		RC3 SO55 (Loopback)	25	1851.25	24.7
			600	1880.00	24.6
			1175	1908.75	24.4
		RC3 SO32 (+F-SCH)	25	1851.25	24.7
			600	1880.00	24.7
			1175	1908.75	24.5
	1xAdvanced	Fwd11/Rvs8 SO75 (Loopback)	25	1851.25	24.7
			600	1880.00	24.6
			1175	1908.75	24.6
	1xEVDO Rel. 0	FTAP Rate: 307.2 kbps(2 slot, QPSK) RTAP Rate: 153.6 kbps	25	1851.25	24.7
			600	1880.00	24.6
			1175	1908.75	24.5
	1xEVDO Rev. A	FETAP: 307.2k, QPSK/ ACK RETAP: 4096	25	1851.25	24.7
			600	1880.00	24.6
			1175	1908.75	24.5

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9.2. LTE

The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS36.101 specification.

UE Power Class: 3 (23 +/- 2dBm). The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101.

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

Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

The allowed A-MPR values specified below in Table 6.2.4.-1 of 3GPP TS36.101 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signaling Value of “NS_01”.

Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR)

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	NA
NS_03	6.6.2.2.1	2, 4,10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10,15,20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	n/a
NS_07	6.6.2.2.3 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	MPR	Max. Avg Pwr (dBm)		
						1860 MHz	1880 MHz	1900 MHz
LTE Band 2	20	QPSK	1	0	0	24.2	24.2	24.2
			1	50	0	24.2	24.2	24.2
			1	99	0	23.9	24.0	23.8
			50	0	1	23.1	23.2	23.1
			50	25	1	23.1	23.2	23.0
			50	50	1	23.1	23.1	23.0
			100	0	1	23.2	23.2	23.0
		16QAM	1	0	1	23.2	23.2	23.2
			1	50	1	23.2	23.1	23.2
			1	99	1	23.2	23.0	22.9
			50	0	2	22.1	22.1	22.0
			50	25	2	22.1	22.1	21.9
			50	50	2	22.1	22.0	22.0
			100	0	2	22.2	22.2	22.0

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)		
						1857.5 MHz	1880 MHz	1902.5 MHz
LTE Band 2	15	QPSK	1	0	0	24.2	24.2	24.1
			1	36	0	24.2	24.1	23.9
			1	74	0	24.0	24.1	23.9
			36	0	1	23.1	23.1	22.9
			36	18	1	23.1	23.1	23.0
			36	37	1	23.1	23.0	23.0
			75	0	1	23.1	23.0	22.9
		16QAM	1	0	1	23.2	23.0	23.2
			1	36	1	23.2	23.2	23.2
			1	74	1	23.2	23.2	23.2
			36	0	2	22.1	22.0	21.9
			36	18	2	22.1	22.1	22.0
			36	37	2	22.0	22.0	22.1
			75	0	2	22.1	22.0	21.9

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)		
						1855 MHz	1880 MHz	1905 MHz
LTE Band 2	10	QPSK	1	0	0	23.9	23.9	23.8
			1	25	0	23.8	23.8	23.9
			1	49	0	23.9	23.9	23.7
			25	0	1	23.0	23.0	22.9
			25	12	1	23.0	23.0	23.0
			25	25	1	23.0	23.1	23.0
			50	0	1	23.1	23.1	22.9
		16QAM	1	0	1	23.0	23.2	23.2
			1	25	1	23.2	23.2	23.2
			1	49	1	23.2	23.2	23.2
			25	0	2	22.2	22.1	22.0
			25	12	2	22.1	22.0	22.1
			25	25	2	22.1	22.1	22.0
			50	0	2	22.1	21.9	22.0

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LTE Band 2 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)		
						1852.5 MHz	1880 MHz	1907.5 MHz
LTE Band 2	5	QPSK	1	0	0	23.9	23.8	23.6
			1	12	0	23.8	23.9	23.8
			1	24	0	23.7	23.8	23.7
			12	0	1	23.0	23.0	23.0
			12	6	1	22.9	23.1	23.0
			12	13	1	22.9	23.1	23.0
			25	0	1	23.0	23.0	23.0
		16QAM	1	0	1	23.1	22.8	23.0
			1	12	1	23.1	22.7	23.0
			1	24	1	23.2	22.8	23.0
			12	0	2	21.9	21.8	22.1
			12	6	2	21.8	21.9	22.1
			12	13	2	22.0	22.0	22.1
			25	0	2	22.0	22.1	22.1

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)		
						1851.5 MHz	1880 MHz	1908.5 MHz
LTE Band 2	3	QPSK	1	0	0	23.8	23.9	23.5
			1	7	0	23.7	24.0	23.9
			1	14	0	23.7	23.7	23.8
			8	0	1	23.0	22.9	23.0
			8	4	1	22.9	23.0	22.9
			8	7	1	22.9	23.0	23.0
			15	0	1	22.9	23.0	23.0
		16QAM	1	0	1	23.2	23.1	23.2
			1	7	1	23.2	23.2	23.2
			1	14	1	23.1	23.2	23.2
			8	0	2	22.1	22.1	22.0
			8	4	2	22.1	22.1	21.9
			8	7	2	22.1	22.2	21.9
			15	0	2	21.9	21.9	22.0

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)		
						1850.7 MHz	1880 MHz	1909.3 MHz
LTE Band 2	1.4	QPSK	1	0	0	23.8	23.8	23.7
			1	2	0	23.7	23.9	23.7
			1	5	0	23.7	24.0	23.7
			3	0	0	23.9	23.8	23.7
			3	2	0	23.8	23.9	23.8
			3	3	0	23.9	23.9	23.9
			6	0	1	22.9	23.1	23.0
		16QAM	1	0	1	23.2	23.2	23.1
			1	2	1	23.2	23.2	23.1
			1	5	1	23.2	23.2	23.1
			3	0	1	23.2	22.8	23.2
			3	2	1	23.0	22.9	23.2
			3	3	1	22.9	23.1	23.2
			6	0	2	21.9	21.7	22.0

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LTE Band 4 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)		
							1732.5 MHz	
LTE Band 4	20	QPSK	1	0	0		24.2	
			1	50	0		24.3	
			1	99	0		24.2	
			50	0	1		23.0	
			50	25	1		23.0	
			50	50	1		23.0	
			100	0	1		23.0	
		16QAM	1	0	1		23.4	
			1	50	1		23.3	
			1	99	1		23.2	
			50	0	2		22.1	
			50	25	2		22.0	
			50	50	2		21.7	
			100	0	2		21.9	

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)		
						1717.5 MHz	1732.5 MHz	1747.5 MHz
LTE Band 4	15	QPSK	1	0	0	23.8	23.8	23.8
			1	36	0	23.6	23.7	23.4
			1	74	0	23.7	23.7	23.5
			36	0	1	23.0	23.0	23.1
			36	18	1	23.0	23.0	22.9
			36	37	1	22.8	22.8	23.0
			75	0	1	22.8	22.9	23.0
		16QAM	1	0	1	23.4	23.4	23.4
			1	36	1	23.3	23.4	23.4
			1	74	1	23.3	23.4	23.4
			36	0	2	22.1	22.1	21.9
			36	18	2	22.1	22.1	21.8
			36	37	2	21.9	21.9	21.8
			75	0	2	21.9	21.9	21.9

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)		
						1715 MHz	1732.5 MHz	1750 MHz
LTE Band 4	10	QPSK	1	0	0	23.9	23.5	23.6
			1	25	0	23.7	23.6	23.5
			1	49	0	23.7	23.4	23.7
			25	0	1	22.9	22.9	22.9
			25	12	1	22.9	22.9	22.9
			25	25	1	23.0	22.8	23.0
			50	0	1	23.0	22.9	23.0
		16QAM	1	0	1	23.1	23.1	23.1
			1	25	1	23.2	23.1	23.4
			1	49	1	23.4	23.0	23.4
			25	0	2	22.0	22.1	22.0
			25	12	2	22.1	22.0	21.8
			25	25	2	21.9	21.9	21.8
			50	0	2	22.1	21.8	21.8

Note(s):

20 MHz Bandwidth does not support at least three non-overlapping channels. 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; therefore, the requirement for H, M and L channels may not fully apply per KDB 941225 D05 SAR for LTE Devices.

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LTE Band 4 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)		
						1712.5 MHz	1732.5 MHz	1752.5 MHz
LTE Band 4	5	QPSK	1	0	0	23.6	23.7	23.5
			1	12	0	23.9	23.8	23.6
			1	24	0	23.4	23.5	23.7
			12	0	1	22.9	22.9	23.0
			12	6	1	22.9	22.9	23.0
			12	13	1	22.9	22.9	23.1
			25	0	1	22.9	22.9	23.0
		16QAM	1	0	1	23.0	22.8	23.4
			1	12	1	23.1	22.4	22.9
			1	24	1	23.2	22.6	22.8
			12	0	2	22.0	21.8	21.9
			12	6	2	21.8	21.8	21.9
			12	13	2	21.9	21.9	22.2
			25	0	2	22.0	22.0	22.2

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)		
						1711.5 MHz	1732.5 MHz	1753.5 MHz
LTE Band 4	3	QPSK	1	0	0	23.8	23.5	23.7
			1	7	0	23.7	23.4	23.7
			1	14	0	23.8	23.4	23.7
			8	0	1	22.9	22.8	23.0
			8	4	1	22.8	22.9	23.1
			8	7	1	23.0	23.0	23.0
			15	0	1	22.9	22.8	23.1
		16QAM	1	0	1	23.4	23.0	23.4
			1	7	1	23.4	23.1	23.3
			1	14	1	23.4	22.9	23.4
			8	0	2	21.9	21.9	22.1
			8	4	2	21.9	22.0	22.2
			8	7	2	21.9	21.9	21.8
			15	0	2	21.9	21.8	22.1

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)		
						1710.7 MHz	1732.5 MHz	1754.3 MHz
LTE Band 4	1.4	QPSK	1	0	0	23.4	23.5	23.4
			1	2	0	23.4	23.5	23.7
			1	5	0	23.4	23.3	23.6
			3	0	0	23.5	23.4	23.7
			3	2	0	23.5	23.5	23.8
			3	3	0	23.5	23.5	23.7
			6	0	1	22.7	22.8	23.0
		16QAM	1	0	1	22.8	23.3	23.1
			1	2	1	23.0	23.4	23.3
			1	5	1	22.9	23.4	23.2
			3	0	1	22.6	23.1	23.1
			3	2	1	22.5	22.6	23.4
			3	3	1	22.5	22.6	23.3
			6	0	2	21.8	21.6	22.1

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LTE Band 13 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm) 782 MHz
LTE Band 13	10	QPSK	1	0	0	23.8
			1	25	0	24.0
			1	49	0	24.0
			25	0	1	22.9
			25	12	1	22.9
			25	25	1	22.9
			50	0	1	22.9
		16QAM	1	0	1	22.7
			1	25	1	23.2
			1	49	1	23.1
			25	0	2	22.0
			25	12	2	21.9
			25	25	2	22.0
			50	0	2	22.0
Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm) 782 MHz
LTE Band 13	5	QPSK	1	0	0	23.8
			1	12	0	24.2
			1	24	0	24.0
			12	0	1	22.9
			12	6	1	22.9
			12	11	1	22.9
			25	0	1	22.8
		16QAM	1	0	1	22.7
			1	12	1	22.5
			1	24	1	22.6
			12	0	2	21.7
			12	6	2	21.9
			12	11	2	21.9
			25	0	2	22.1

Note(s):

10/5 MHz Bandwidths does not support at least three non-overlapping channels. 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; therefore, the requirement for H, M and L channels may not fully apply per KDB 941225 D05 SAR for LTE Devices.

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9.3. Wi-Fi 2.4GHz (DTS Band)

Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Note(s)
2.4	802.11b	1 Mbps	1	2412	**15.7**	16.0	Yes	
			6	2437	15.6			
			11	2462	15.4			
	802.11g	6 Mbps	1	2412	Not Required	13.0	No	1
			6	2437				
			11	2462				
	802.11n (HT20)	6.5 Mbps	1	2412		12.0	No	1
			6	2437				
			11	2462				

Note(s):

1. Output Power and SAR is not required for 802.11g/n HT20 channels when the highest *reported* SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

9.4. Bluetooth

Maximum tune-up tolerance limit is 8.50 dBm. This power level qualifies for exclusion of SAR testing.

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10. Measured and Reported (Scaled) SAR Results

SAR Test Reduction criteria are as follows:

KDB 447498 D01 General RF Exposure Guidance:
Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

- ≤ 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 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.
- For LTE bands that do not support at least three non-overlapping channels in certain channel bandwidths, test the available non-overlapping channels instead. 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; therefore, the requirement for H, M and L channels may not fully apply.

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KDB 248227 D01 SAR meas for 802.11 v02r02:

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

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

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

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

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10.1. CDMA BC0

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	1xRTT (RC3 SO55)	0	Left Touch	384	836.5	24.4	24.1	0.454	0.486	
			Left Tilt	384	836.5	24.4	24.1	0.304	0.326	
			Right Touch	384	836.5	24.4	24.1	0.515	0.552	
			Right Tilt	384	836.5	24.4	24.1	0.334	0.358	
	1xEVDO (Rel. 0)	0	Left Touch	384	836.5	24.4	24.1	0.433	0.464	
			Left Tilt	384	836.5	24.4	24.1	0.311	0.333	
			Right Touch	384	836.5	24.4	24.1	0.542	0.581	1
			Right Tilt	384	836.5	24.4	24.1	0.340	0.364	
Body-worn	1xRTT (RC3 SO32)	15	Rear	384	836.5	24.4	24.1	0.516	**0.553**	2
			Front	384	836.5	24.4	24.1	0.429	0.460	

10.2. CDMA BC1

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	1xRTT (RC3 SO55)	0	Left Touch	600	1880.0	24.7	24.6	0.721	**0.738**	3
			Left Tilt	600	1880.0	24.7	24.6	0.527	0.539	
			Right Touch	600	1880.0	24.7	24.6	0.605	0.619	
			Right Tilt	600	1880.0	24.7	24.6	0.340	0.348	
	1xEVDO (Rel. 0)	0	Left Touch	600	1880.0	24.7	24.6	0.685	0.701	
			Left Tilt	600	1880.0	24.7	24.6	0.477	0.488	
			Right Touch	600	1880.0	24.7	24.6	0.642	0.657	
			Right Tilt	600	1880.0	24.7	24.6	0.323	0.331	
Body-worn	1xRTT (RC3 SO32)	15	Rear	600	1880.0	24.7	24.7	0.442	0.442	4
			Front	600	1880.0	24.7	24.7	0.416	0.416	

10.3. LTE Band 2 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
Head	QPSK	0	Left Touch	18900	1880.0	1	0	24.2	24.2	0.468	0.468	5
						50	0	23.2	23.2	0.363	0.363	
			Left Tilt	18900	1880.0	1	0	24.2	24.2	0.384	0.384	
						50	0	23.2	23.2	0.296	0.296	
			Right Touch	18900	1880.0	1	0	24.2	24.2	0.402	0.402	
						50	0	23.2	23.2	0.306	0.306	
			Right Tilt	18900	1880.0	1	0	24.2	24.2	0.288	0.288	
						50	0	23.2	23.2	0.212	0.212	
Body-worn	QPSK	15	Rear	18900	1880.0	1	0	24.2	24.2	0.403	0.403	
						50	0	23.2	23.2	0.328	0.328	
			Front	18900	1880.0	1	0	24.2	24.2	0.421	0.421	6
						50	0	23.2	23.2	0.314	0.314	

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10.4. LTE Band 4 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
Head	QPSK	0	Left Touch	20175	1732.5	1	0	24.4	24.2	0.424	0.444	7
						50	0	23.4	23.0	0.349	0.383	
			Left Tilt	20175	1732.5	1	0	24.4	24.2	0.320	0.335	
						50	0	23.4	23.0	0.233	0.255	
			Right Touch	20175	1732.5	1	0	24.4	24.2	0.411	0.430	
						50	0	23.4	23.0	0.325	0.356	
			Right Tilt	20175	1732.5	1	0	24.4	24.2	0.243	0.254	
						50	0	23.4	23.0	0.177	0.194	
Body-worn	QPSK	15	Rear	20175	1732.5	1	0	24.4	24.2	0.479	0.502	8
						50	0	23.4	23.0	0.398	0.436	
			Front	20175	1732.5	1	0	24.4	24.2	0.415	0.435	
						50	0	23.4	23.0	0.343	0.376	

10.5. LTE Band 13 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
Head	QPSK	0	Left Touch	23230	782.0	1	25	24.2	24.0	0.303	0.317	9
						25	0	23.2	22.9	0.205	0.220	
			Left Tilt	23230	782.0	1	25	24.2	24.0	0.195	0.204	
						25	0	23.2	22.9	0.137	0.147	
			Right Touch	23230	782.0	1	25	24.2	24.0	0.286	0.299	
						25	0	23.2	22.9	0.223	0.239	
			Right Tilt	23230	782.0	1	25	24.2	24.0	0.192	0.201	
						25	0	23.2	22.9	0.142	0.152	
Body-worn	QPSK	15	Rear	23230	782.0	1	25	24.2	24.0	0.436	0.457	10
						25	0	23.2	22.9	0.325	0.348	
			Front	23230	782.0	1	25	24.2	24.0	0.343	0.359	
						25	0	23.2	22.9	0.258	0.276	

10.6. Wi-Fi (DTS Band)

Frequency Band	Mode	RF Exposure Conditions	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
2.4GHz	802.11b 1 Mbps	Head	0	Left Touch	1	2412.0	0 996	16.0	15.7	0.559	0.599	
				Left Tilt	1	2412.0	1 060	16.0	15.7	0.666	**0.714**	11
				Right Touch	1	2412.0	0 582	16.0	15.7			
				Right Tilt	1	2412.0	0.624	16.0	15.7			
		Body-worn	15	Rear	1	2412.0	0.112	16.0	15.7	0.092	**0.099**	12
				Front	1	2412.0	0.0820	16.0	15.7			
		Wi-Fi Direct	10	Rear	1	2412.0	0 255	16.0	15.7	0.182	**0.195**	13
				Front	1	2412.0	0.1550	16.0	15.7			
				Edge 1	1	2412.0	0 229	16.0	15.7			
				Edge 2	1	2412.0	0.0440	16.0	15.7			

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10.7. Bluetooth

Standalone SAR Test Exclusion Considerations & Estimated SAR

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 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.

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.

Body-worn Accessory Exposure Conditions

Max. tune-up tolerance limit		Min. test separation distance (mm)	Frequency (GHz)	SAR test exclusion Result*	Test Configuration	Estimated 1-g SAR (W/kg)
(dBm)	(mW)					
8.5	7	15	2.480	0.7	Rear/Front	0.098

Conclusion:

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

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11. SAR Measurement Variability

In accordance with published RF Exposure KDB 865664 D01 SAR measurement 100 MHz to 6 GHz. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

1) Repeated measurement is not required when the original highest measured SAR is <0.8 or 2 W/kg (1-g or 10-g respectively); steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 0.8 or 2 W/kg (1-g or 10-g respectively), 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 3 (1-g or 10-g respectively) or when the original or repeated measurement is ≥ 1.45 or 3.6 W/kg (~ 10% from the 1-g or 10-g respective SAR limit).
4) Perform a third repeated measurement only if the original, first, or second repeated measurement is ≥ 1.5 or 3.75 W/kg (1-g or 10-g respectively) and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20 or 3 (1-g or 10-g respectively).

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)
750	LTE Band 13	Body	Rear	No	0.436
850	CDMA BC0	Head	Right Touch	No	0.542
1900	CDMA BC1	Head	Left Touch	No	0.721
	LTE Band 2	Head	Right Touch	No	0.468
1700	LTE Band 4	Body	Rear	No	0.479
2400	Wi-Fi 802.11b/g/n	Head	Left Tilt	No	0.666

Note(s):

Repeated Measurement is not required since the measured SAR is not > 0.8 W/kg for all frequency bands.

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12. Simultaneous Transmission SAR Analysis

Simultaneous Transmission Condition

RF Exposure Condition	Item	Capable Transmit Configurations		
Head	1	CDMA	+	DTS
	2	LTE	+	DTS
Body-worn	3	CDMA	+	DTS
	4	CDMA	+	BT
	5	LTE	+	DTS
	6	LTE	+	BT
Wi-Fi Direct	7	CDMA	+	DTS
	8	LTE	+	DTS

Notes:

1. Hotspot Mode is not supported for this device.
2. DTS supports Wi-Fi Direct.
3. VoIP is supported in CDMA and LTE.
4. DTS Radio cannot transmit simultaneously with Bluetooth Radio.

12.1. Sum of SAR for CDMA BC0 & Wi-Fi & BT

RF Exposure conditions	Test Position	Standalone SAR (W/kg)			∑ 1-g SAR (W/kg)	
		WWAN ①	DTS ②	BT ③	WWAN + DTS ①+②	WWAN + BT ①+③
Head	Left Touch	0.486	0.599		1.085	
	Left Tilt	0.333	0.714		1.047	
	Right Touch	0.581	0.714		1.295	
	Right Tilt	0.364	0.714		1.078	
Body-worn	Rear	0.553	0.099	0.098	0.652	0.651
	Front	0.460	0.099	0.098	0.559	0.558
Wi-Fi Direct	Rear	0.553	0.195		0.748	

12.2. Sum of SAR for CDMA BC1 & Wi-Fi & BT

RF Exposure conditions	Test Position	Standalone SAR (W/kg)			∑ 1-g SAR (W/kg)	
		WWAN ①	DTS ②	BT ③	WWAN + DTS ①+②	WWAN + BT ①+③
Head	Left Touch	0.738	0.599		1.337	
	Left Tilt	0.539	0.714		1.253	
	Right Touch	0.657	0.714		**1.371**	
	Right Tilt	0.348	0.714		1.062	
Body-worn	Rear	0.442	0.099	0.098	0.541	0.540
	Front	0.416	0.099	0.098	0.515	0.514
Wi-Fi Direct	Rear	0.442	0.195		0.637	

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

RF Exposure conditions	Test Position	Standalone SAR (W/kg)			∑ 1-g SAR (W/kg)	
		WWAN ①	DTS ②	BT ③	WWAN + DTS ①+②	WWAN + BT ①+③
Head	Left Touch	0.468	0.599		1.067	
	Left Tilt	0.384	0.714		1.098	
	Right Touch	0.402	0.714		1.116	
	Right Tilt	0.288	0.714		1.002	
Body-worn	Rear	0.403	0.099	0.098	0.502	0.501
	Front	0.421	0.099	0.098	0.520	0.519
Wi-Fi Direct	Rear	0.403	0.195		0.598	

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

RF Exposure conditions	Test Position	Standalone SAR (W/kg)			∑ 1-g SAR (W/kg)	
		WWAN ①	DTS ②	BT ③	WWAN + DTS ① + ②	WWAN + BT ① + ③
Head	Left Touch	0.444	0.599		1.043	
	Left Tilt	0.335	0.714		1.049	
	Right Touch	0.430	0.714		1.144	
	Right Tilt	0.254	0.714		0.968	
Body-worn	Rear	0.502	0.099	0.098	0.601	0.600
	Front	0.435	0.099	0.098	0.534	0.533
Wi-Fi Direct	Rear	0.502	0.195		0.697	

12.5. Sum of SAR for LTE Band 13 & Wi-Fi & BT

RF Exposure conditions	Test Position	Standalone SAR (W/kg)			∑ 1-g SAR (W/kg)	
		WWAN ①	DTS ②	BT ③	WWAN + DTS ① + ②	WWAN + BT ① + ③
Head	Left Touch	0.317	0.599		0.916	
	Left Tilt	0.204	0.714		0.918	
	Right Touch	0.299	0.714		1.013	
	Right Tilt	0.201	0.714		0.915	
Body-worn	Rear	0.457	0.099	0.098	0.556	0.555
	Front	0.359	0.099	0.098	0.458	0.457
Wi-Fi Direct	Rear	0.457	0.195		0.652	

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Appendixes

Refer to separated files for the following appendixes.

16I22653-S1V1 SAR_App A Photos & Ant. Locations

16I22653-S1V1 SAR_App B System Check Plots

16I22653-S1V1 SAR_App C Highest Test Plots

16I22653-S1V1 SAR_App D Tissue Ingredients

16I22653-S1V1 SAR_App E Probe Cal. Certificates

16I22653-S1V1 SAR_App F Dipole Cal. Certificates

END OF REPORT

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