SAR EVALUATION REPORT

FCC 47 CFR § 2.1093
IEEE Std 1528-2013

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

FCC ID: ZNFUS991
Model Name: LG-US991, US991, LGUS991

Report Number: 15I20405-S1A
Issue Date: 4/28/2015

Prepared for
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Date	Revisions	Revised By
--	4/21/2015	Initial Issue	--
A	4/28/2015	Report revised based on Reviewer's comments: 1. Sec. 10.: Updated note	Kenneth Mak

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1. Attestation of Test Results

Applicant Name	LG ELECTRONICS MOBILECOMM U.S.A., INC.		
FCC ID	ZNUS991		
Model Name	LG-US991, US991, LGUS991		
Applicable Standards	FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013		
SAR Limits (W/Kg)			
Exposure Category	Peak spatial-average(1g of tissue)		
General population / Uncontrolled exposure	1.6		
The Highest Reported SAR (W/kg)			
RF Exposure Conditions	**Equipment Class**		
	Licensed	**DTS**	**U-NII**
Head	1.156	0.431	0.749
Body-worn	0.890	0.305	0.382
Hotspot/Wi-Fi Direct	0.910	0.305	0.339
Simultaneous TX	1.535	1.535	1.520
Date Tested	3/31/2015 to 4/16/2015		
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:
	
Bobby Bayani Senior Engineer UL Verification Services Inc.	Anthony Cerezo Laboratory Technician UL Verification Services Inc.

2. Test Specification, Methods and Procedures

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

- 248227 D01 802.11 Wi-Fi SAR v02
- 447498 D01 General RF Exposure Guidance v05r02
- 648474 D04 Handset SAR v01r02
- 690783 D01 SAR Listings on Grants v01r03
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r03
- 865664 D02 RF Exposure Reporting v01r01
- 941225 D01 3G SAR Procedures v03
- 941225 D05 SAR for LTE Devices v02r03
- 941225 D05A LTE Rel.10 KDB Inquiry Sheet v01r01
- 941225 D06 Hotspot Mode v02

3. Facilities and Accreditation

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

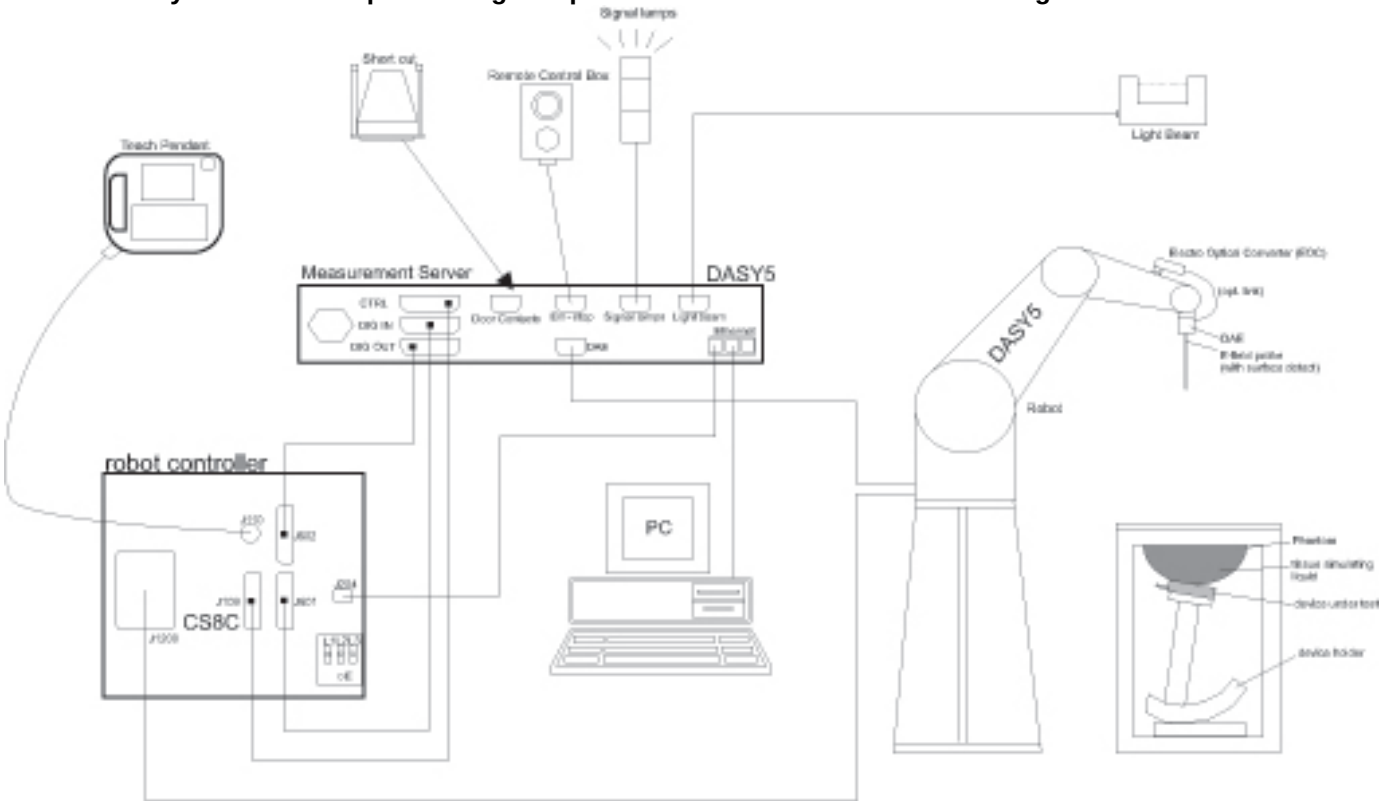
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	SAR Lab 5
SAR Lab F	
SAR Lab G	
SAR Lab H	

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/2000650.htm

4. SAR Measurement System & Test Equipment

4.1. SAR Measurement System

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



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

4.2. SAR Scan Procedures

Step 1: Power Reference Measurement

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

Step 2: Area Scan

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

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

	≤ 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.	

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	≤ 1.5·$\Delta z_{Zoom}(n-1)$	
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.

4.3. Test Equipment

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

Dielectric Property Measurements

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Network Analyzer	Agilent	E753ES	MY40000980	4/7/2015
Dielectronic Probe kit	SPEAG	DAK-3.5	1082	9/16/2015
Dielectronic Probe kit	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	Control Company	Traceable	122529163	10/8/2015
Network Analyzer	Agilent	8753ES	MY40001647	7/17/2015
Dielectronic Probe kit	SPEAG	DAK-3.5	1087	11/11/2015
Dielectronic Probe kit	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	Traceable Calibration Control Co.	4242	122529162	10/8/2015

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Synthesized Signal Generator	HP	8665B	3744A01084	5/20/2015
Power Meter	Agilent	N1912A	MY50001018	9/3/2015
Power Sensor	Agilent	E9323A	MY53070005	5/1/2015
Power Sensor	Agilent	E9323A	MY53070009	5/28/2015
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1795093	N/A
Directional coupler	Werlatone	C8060-102	2149	N/A
DC Power Supply	AMETEK	XT 15-4	1319A02778	N/A
Synthesized Signal Generator	HP	8665B	3744A01155	3/18/2016
Power Meter	HP	437B	3125U11364	8/27/2015
Power Meter	HP	437B	3125U12345	8/15/2015
Power Sensor	HP	8481A	1926A27048	8/15/2015
Power Sensor	HP	8481A	2702A76223	9/17/2015
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1795092	N/A
Directional coupler	Werlatone	C8060-102	2141	N/A
DC Power Supply	BK PRECISION	1611	215-02292	N/A
E-Field Probe (SAR Lab A)	SPEAG	EX3DV4	3901	1/27/2016
E-Field Probe (SAR Lab B)	SPEAG	EX3DV4	3751	11/14/2015
E-Field Probe (SAR Lab E)	SPEAG	EX3DV4	3772	2/23/2016
E-Field Probe (SAR Lab F)	SPEAG	EX3DV4	3936	7/24/2015
E-Field Probe (SAR Lab G)	SPEAG	EX3DV4	3686	2/23/2016
E-Field Probe (SAR Lab H)	SPEAG	EX3DV4	3871	8/26/2015
Data Acquisition Electronics (SAR Lab A)	SPEAG	DAE4	1357	2/20/2016
Data Acquisition Electronics (SAR Lab B)	SPEAG	DAE3	500	5/15/2015
Data Acquisition Electronics (SAR Lab E)	SPEAG	DAE4	1257	9/29/2015
Data Acquisition Electronics (SAR Lab F)	SPEAG	DAE4	1239	4/15/2015
Data Acquisition Electronics (SAR Lab F)	SPEAG	DAE4	1359	2/18/2016
Data Acquisition Electronics (SAR Lab G)	SPEAG	DAE4	1433	3/12/2016
Data Acquisition Electronics (SAR Lab H)	SPEAG	DAE4	1258	5/15/2015
System Validation Dipole	SPEAG	D750V3	1071	11/13/2015
System Validation Dipole	SPEAG	D835V2	4d002	11/13/2015
System Validation Dipole	SPEAG	D1750V2	1050	4/22/2015
System Validation Dipole	SPEAG	D1750V2	1053	8/18/2015
System Validation Dipole	SPEAG	D1750V2	1077	9/11/2015
System Validation Dipole	SPEAG	D1900V2	5d043	11/7/2015
System Validation Dipole	SPEAG	D1900V2	5d140	4/23/2015
System Validation Dipole	SPEAG	D2450V2	706	5/20/2015
System Validation Dipole	SPEAG	D5GHzV2	1138	9/18/2015
System Validation Dipole	SPEAG	D5GHzV2	1168	12/4/2015

Other

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Power Meter	Agilent	N1912A	MY53040015	2/27/2016
Power Sensor	Agilent	N1921A	MY52270022	12/12/2015
Base Station Simulator	R & S	CMW500	124593-ss	7/31/2015
Base Station Simulator	R & S	CMW500	104245-jz	1/14/2016
Base Station Simulator	R & S	CMW500	134853-ud	7/17/2015

5. Measurement Uncertainty

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

6. Device Under Test (DUT) Information

6.1. DUT Description

Device Dimension	Overall (Length x Width): 148.9 mm x 76.2 mm Overall Diagonal: 161 mm Display Diagonal: 139 mm
Back Cover	☒ Normal Battery Cover ☒ Smart Cover
Battery Options	☒ Standard – Lithium-ion battery, Rating 3.85Vdc, 11.6Wh
Accessory	Headset
Wireless Router (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 GHz) (UNII-3 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 GHz) (UNII-3 Only)

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☒ Class 10 - 2 Up, 4 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25%
	☒ Class A = both simultaneously. ☐ Class B = GPRS connection interrupted during a GSM call, automatically resumed at end of call. ☐ Class C = manual GSM / GPRS mode switching. Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
CDMA (CDMA2000)	BC0 BC1	1xRTT (Voice & Data) 1xEV-DO Rel. 0 1xEV-DO Rev. A		100%
	Does this device support SV-DO (1xRTT-1xEVDO)? ☐ Yes ☒ No			
W-CDMA (UMTS)	Band II Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Rel. 5) HSUPA (Rel. 6) HSPA+ (Rel. 7)		100%
LTE	FDD Band 2 FDD Band 4 FDD Band 5 FDD Band 12 FDD Band 13 FDD Band 17 FDD Band 25	QPSK 16QAM ☒ Rel. 10 Carrier Aggregation (2 Downlinks only)		100% (FDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20) 802.11ac (VHT20)		100%
	5 GHz	802.11a 802.11n (HT20) 802.11n (HT40) 802.11ac (VHT20) 802.11ac (VHT40) 802.11ac (VHT80)		100%
	Does this device support bands 5.60 ~ 5.65 GHz? ☐ Yes ☒ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 4.0 LE		N/A

6.3. Nominal and Maximum Output Power

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

Upper limit (dB): -1.5 ~ 0.5		Max. RF Output Power (dBm)		
RF Air interface	Mode	Target	Max. tune-up tolerance limit	
			Burst	Frame
GSM850	Voice (1 slot)	32.7	**33.2**	**24.2**
	GPRS 1 slot	32.7	**33.2**	**24.2**
	GPRS 2 slots	31.2	**31.7**	**25.7**
	EGPRS 1 slot	27.2	**27.7**	**18.7**
	EGPRS 2 slots	27.2	**27.7**	**21.7**
GSM1900	Voice (1 slot)	28.9	**29.4**	**20.4**
	GPRS 1 slot	28.9	**29.4**	**20.4**
	GPRS 2 slots	27.9	**28.4**	**22.4**
	EGPRS 1 slot	26.2	**26.7**	**17.7**
	EGPRS 2 slots	26.2	**26.7**	**20.7**

Upper limit (dB): -1.5 ~ 0.5		Max. RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
W-CDMA Band V	R99	23.2	**23.7**
	HSDPA	23.2	**23.7**
	HSUPA	23.2	**23.7**
	HSPA+	23.2	**23.7**
W-CDMA Band II	R99	23.2	**23.7**
	HSDPA	23.2	**23.7**
	HSUPA	23.2	**23.7**
	HSPA+	23.2	**23.7**
CDMA BC0	1xRTT	24.2	**24.7**
	1xEVDO Rel. 0	24.2	**24.7**
	1xEVDO Rev. A	24.2	**24.7**
CDMA BC1	1xRTT	24.2	**24.7**
	1xEVDO Rel. 0	24.2	**24.7**
	1xEVDO Rev. A	24.2	**24.7**
LTE Band 2	QPSK	23.7	**24.2**
LTE Band 4	QPSK	24.0	**24.5**
LTE Band 5	QPSK	23.9	**24.4**
LTE Band 12	QPSK	24.2	**24.7**
LTE Band 13	QPSK	23.9	**24.4**
LTE Band 17	QPSK	24.2	**24.7**
LTE Band 25	QPSK	23.7	**24.2**

Upper limit (dB): -1.5 ~ 1.0		Max. RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
WiFi 2.4 GHz	802.11b	16.0	**17.0**
	802.11g	15.0	**16.0**
	802.11n HT20	14.0	**15.0**
	802.11ac VHT20	12.0	**13.0**
WiFi 5 GHz	802.11a	13.0	**14.0**
	802.11n HT20	13.0	**14.0**
	802.11n HT40	11.0	**12.0**
	802.11ac VHT20	13.0	**14.0**
	802.11ac VHT40	11.0	**12.0**
	802.11ac VHT80	11.0	**12.0**

Upper limit (dB): -1.5 ~ 1.5		Max. RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
Bluetooth		8.5	**10.0**
Bluetooth LE		5.0	**6.5**

6.4. General LTE SAR Test and Reporting Considerations

Item	Description						
Frequency range, Channel Bandwidth, Numbers and Frequencies	Band 2	Frequency range: 1850 - 1910 MHz					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low	18700 /1860	18675/ 1857.5	18650/ 1855	18625/ 1852.5	18615/ 1851.5	18607/ 1850.7
	Mid	18900/ 1880	18900/ 1880	18900/ 1880	18900/ 1880	18900/ 1880	18900/ 1880
	High	19100/ 1900	19125/ 1902.5	19150/ 1905	19175/ 1907.5	19185/ 1908.5	19193/ 1909.3
	Band 4	Frequency range: 1710 - 1755 MHz					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low	20050/ 1720	20025/ 1717.5	20000/ 1715	19975/ 1712.5	19965/ 1711.5	19957/ 1710.7
	Mid	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5
	High	20300/ 1745	20325/ 1747.5	20350/ 1750	20375/ 1752.5	20385/ 1753.5	20393/ 1754.3
	Band 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	20415/ 825.5	20407/ 824.7
	Mid			20525/ 836.5	20525/ 836.5	20525/ 836.5	20525/ 836.5
	High			20600/ 844	20625/ 846.5	20635/ 847.5	20643/ 848.3
	Band 12	Frequency range: 699 – 716 MHz					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low			23060/ 704	23035/ 701.5	23025/ 700.5	23017/ 699.7
	Mid			23095/ 707.5	23095/ 707.5	23095/ 707.5	23095/ 707.5
	High			23130/ 711	23155/ 713.5	23165/ 714.5	23173/ 715.3
	Band 13	Frequency range: 777 - 787 MHz					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low						
	Mid			23230/ 782	23230/ 782		
	High						

General LTE SAR Test and Reporting Considerations (Continued)

Frequency range, Channel Bandwidth, Numbers and Frequencies

Band 17	Frequency range: 704 - 716 MHz					
	Channel Bandwidth					
	20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
Low			23780/ 709	23755/ 706.5		
Mid			23790/ 710	23790/ 710		
High			23800/ 711	23825/ 713.5		

Band 25	Frequency range: 1850 - 1915 MHz					
	Channel Bandwidth					
	20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
Low	26140/ 1860	26115/ 1857.5	26090/ 1855	26065/ 1852.5	26055/ 1851.5	26047/ 1850.7
Mid	26365/ 1882.5	26365/ 1882.5	26365/ 1882.5	26365/ 1882.5	26365/ 1882.5	26365/ 1882.5
High	26590/ 1905	26615/ 1907.5	26640/ 1910	26665/ 1912.5	26675/ 1913.5	26683/ 1914.3

LTE transmitter and antenna implementation

LTE has 2 TX/RX antennas and 2 RX antennas

Refer to Appendix A.

Maximum power reduction (MPR)

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

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.

7. RF Exposure Conditions (Test Configurations)

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

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

Notes:

1. SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR.
2. The Body-worn minimum separation distance is 15 mm. To cover both body-worn and hotspot RF exposure conditions testing was performed at a separation distance of 10 mm.

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

Dielectric Property Measurements Results:

SAR Lab A

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4/3/2015	Body 835	e'	53.0300	Relative Permittivity (ϵ_r):	53.03	55.20	-3.93	5
		e''	21.3400	Conductivity (σ):	0.99	0.97	2.14	5
	Body 820	e'	53.1600	Relative Permittivity (ϵ_r):	53.16	55.28	-3.83	5
		e''	21.4100	Conductivity (σ):	0.98	0.97	0.80	5
	Body 850	e'	52.8500	Relative Permittivity (ϵ_r):	52.85	55.16	-4.18	5
		e''	21.3000	Conductivity (σ):	1.01	0.99	1.98	5

SAR Lab B

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4/7/2015	Head 2450	e'	38.7700	Relative Permittivity (ϵ_r):	38.77	39.20	-1.10	5
		e''	13.2200	Conductivity (σ):	1.80	1.80	0.05	5
	Head 2410	e'	38.8800	Relative Permittivity (ϵ_r):	38.88	39.28	-1.02	5
		e''	13.1500	Conductivity (σ):	1.76	1.76	0.10	5
	Head 2475	e'	38.6700	Relative Permittivity (ϵ_r):	38.67	39.17	-1.27	5
		e''	13.2100	Conductivity (σ):	1.82	1.83	-0.50	5
4/7/2015	Body 2450	e'	51.1200	Relative Permittivity (ϵ_r):	51.12	52.70	-3.00	5
		e''	14.8300	Conductivity (σ):	2.02	1.95	3.60	5
	Body 2410	e'	51.2300	Relative Permittivity (ϵ_r):	51.23	52.76	-2.90	5
		e''	14.7800	Conductivity (σ):	1.98	1.91	3.83	5
	Body 2475	e'	51.0600	Relative Permittivity (ϵ_r):	51.06	52.67	-3.05	5
		e''	14.8200	Conductivity (σ):	2.04	1.99	2.74	5

SAR Lab E

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4/13/2015	Head 5180	e'	37.0400	Relative Permittivity (ϵ_r):	37.04	36.01	2.85	5
		e''	15.5800	Conductivity (σ):	4.49	4.63	-3.09	5
	Head 5200	e'	36.8200	Relative Permittivity (ϵ_r):	36.82	35.99	2.31	5
		e''	15.9100	Conductivity (σ):	4.60	4.65	-1.09	5
	Head 5600	e'	37.1000	Relative Permittivity (ϵ_r):	37.10	35.53	4.41	5
		e''	16.6700	Conductivity (σ):	5.19	5.06	2.58	5
	Head 5800	e'	35.9400	Relative Permittivity (ϵ_r):	35.94	35.30	1.81	5
		e''	16.1600	Conductivity (σ):	5.21	5.27	-1.11	5
	Head 5825	e'	36.2500	Relative Permittivity (ϵ_r):	36.25	35.30	2.69	5
		e''	16.7400	Conductivity (σ):	5.42	5.27	2.88	5
4/13/2015	Body 5180	e'	47.3800	Relative Permittivity (ϵ_r):	47.38	49.05	-3.40	5
		e''	17.5800	Conductivity (σ):	5.06	5.27	-3.94	5
	Body 5200	e'	47.3200	Relative Permittivity (ϵ_r):	47.32	49.02	-3.47	5
		e''	18.3000	Conductivity (σ):	5.29	5.29	-0.07	5
	Body 5600	e'	48.2200	Relative Permittivity (ϵ_r):	48.22	48.48	-0.53	5
		e''	19.0400	Conductivity (σ):	5.93	5.76	2.91	5
	Body 5800	e'	46.3500	Relative Permittivity (ϵ_r):	46.35	48.20	-3.84	5
		e''	18.6200	Conductivity (σ):	6.00	6.00	0.08	5
	Body 5825	e'	47.1600	Relative Permittivity (ϵ_r):	47.16	48.20	-2.16	5
		e''	19.3700	Conductivity (σ):	6.27	6.00	4.56	5
4/16/2015	Head 835	e'	40.9500	Relative Permittivity (ϵ_r):	40.95	41.50	-1.33	5
		e''	19.0600	Conductivity (σ):	0.88	0.90	-1.67	5
	Head 820	e'	41.1800	Relative Permittivity (ϵ_r):	41.18	41.60	-1.02	5
		e''	19.1200	Conductivity (σ):	0.87	0.90	-2.97	5
	Head 850	e'	40.8200	Relative Permittivity (ϵ_r):	40.82	41.50	-1.64	5
		e''	19.0200	Conductivity (σ):	0.90	0.92	-1.76	5

SAR Lab F

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
3/31/2015	Body 1750	e'	52.8900	Relative Permittivity (ϵ_r):	52.89	53.44	-1.03	5
		e''	14.9700	Conductivity (σ):	1.46	1.49	-1.98	5
	Body 1710	e'	52.9800	Relative Permittivity (ϵ_r):	52.98	53.54	-1.05	5
		e''	14.9400	Conductivity (σ):	1.42	1.46	-2.81	5
	Body 1755	e'	52.7900	Relative Permittivity (ϵ_r):	52.79	53.43	-1.19	5
		e''	14.9600	Conductivity (σ):	1.46	1.49	-1.97	5
3/31/2015	Body 1900	e'	51.4000	Relative Permittivity (ϵ_r):	51.40	53.30	-3.56	5
		e''	14.4700	Conductivity (σ):	1.53	1.52	0.57	5
	Body 1850	e'	51.6200	Relative Permittivity (ϵ_r):	51.62	53.30	-3.15	5
		e''	14.3700	Conductivity (σ):	1.48	1.52	-2.75	5
	Body 1910	e'	51.4100	Relative Permittivity (ϵ_r):	51.41	53.30	-3.55	5
		e''	14.5600	Conductivity (σ):	1.55	1.52	1.73	5
4/2/2015	Head 1750	e'	39.2200	Relative Permittivity (ϵ_r):	39.22	40.08	-2.16	5
		e''	13.6800	Conductivity (σ):	1.33	1.37	-2.76	5
	Head 1710	e'	39.3500	Relative Permittivity (ϵ_r):	39.35	40.15	-1.98	5
		e''	13.5800	Conductivity (σ):	1.29	1.35	-4.10	5
	Head 1755	e'	39.2300	Relative Permittivity (ϵ_r):	39.23	40.08	-2.11	5
		e''	13.6500	Conductivity (σ):	1.33	1.37	-2.90	5
4/2/2015	Head 1900	e'	40.5500	Relative Permittivity (ϵ_r):	40.55	40.00	1.37	5
		e''	13.4400	Conductivity (σ):	1.42	1.40	1.42	5
	Head 1850	e'	40.8200	Relative Permittivity (ϵ_r):	40.82	40.00	2.05	5
		e''	13.5900	Conductivity (σ):	1.40	1.40	-0.15	5
	Head 1910	e'	40.3700	Relative Permittivity (ϵ_r):	40.37	40.00	0.92	5
		e''	13.4600	Conductivity (σ):	1.43	1.40	2.11	5
4/6/2015	Head 1750	e'	39.4700	Relative Permittivity (ϵ_r):	39.47	40.08	-1.53	5
		e''	13.6200	Conductivity (σ):	1.33	1.37	-3.19	5
	Head 1710	e'	39.6800	Relative Permittivity (ϵ_r):	39.68	40.15	-1.16	5
		e''	13.5800	Conductivity (σ):	1.29	1.35	-4.10	5
	Head 1755	e'	39.4700	Relative Permittivity (ϵ_r):	39.47	40.08	-1.51	5
		e''	13.6400	Conductivity (σ):	1.33	1.37	-2.97	5
4/6/2015	Body 1750	e'	52.1400	Relative Permittivity (ϵ_r):	52.14	53.44	-2.43	5
		e''	15.4900	Conductivity (σ):	1.51	1.49	1.42	5
	Body 1710	e'	52.2900	Relative Permittivity (ϵ_r):	52.29	53.54	-2.34	5
		e''	15.4900	Conductivity (σ):	1.47	1.46	0.77	5
	Body 1755	e'	52.2400	Relative Permittivity (ϵ_r):	52.24	53.43	-2.22	5
		e''	15.5400	Conductivity (σ):	1.52	1.49	1.83	5
4/6/2015	Head 1900	e'	39.6100	Relative Permittivity (ϵ_r):	39.61	40.00	-0.98	5
		e''	13.7300	Conductivity (σ):	1.45	1.40	3.61	5
	Head 1850	e'	39.7600	Relative Permittivity (ϵ_r):	39.76	40.00	-0.60	5
		e''	13.6900	Conductivity (σ):	1.41	1.40	0.59	5
	Head 1910	e'	39.5800	Relative Permittivity (ϵ_r):	39.58	40.00	-1.05	5
		e''	13.7600	Conductivity (σ):	1.46	1.40	4.38	5
4/6/2015	Body 1900	e'	51.4000	Relative Permittivity (ϵ_r):	51.40	53.30	-3.56	5
		e''	14.4800	Conductivity (σ):	1.53	1.52	0.64	5
	Body 1850	e'	51.4900	Relative Permittivity (ϵ_r):	51.49	53.30	-3.40	5
		e''	14.5200	Conductivity (σ):	1.49	1.52	-1.74	5
	Body 1910	e'	51.4100	Relative Permittivity (ϵ_r):	51.41	53.30	-3.55	5
		e''	14.4800	Conductivity (σ):	1.54	1.52	1.17	5

SAR Lab F (continued)

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4/13/2015	Head 1900	e'	40.6500	Relative Permittivity (ϵ_r):	40.65	40.00	1.63	5
		e''	13.6800	Conductivity (σ):	1.45	1.40	3.23	5
	Head 1850	e'	40.8000	Relative Permittivity (ϵ_r):	40.80	40.00	2.00	5
		e''	13.6000	Conductivity (σ):	1.40	1.40	-0.07	5
	Head 1910	e'	40.6300	Relative Permittivity (ϵ_r):	40.63	40.00	1.58	5
		e''	13.6900	Conductivity (σ):	1.45	1.40	3.85	5
4/13/2015	Body 1900	e'	50.8500	Relative Permittivity (ϵ_r):	50.85	53.30	-4.60	5
		e''	15.0000	Conductivity (σ):	1.58	1.52	4.26	5
	Body 1850	e'	50.9600	Relative Permittivity (ϵ_r):	50.96	53.30	-4.39	5
		e''	14.9800	Conductivity (σ):	1.54	1.52	1.38	5
	Body 1910	e'	50.8300	Relative Permittivity (ϵ_r):	50.83	53.30	-4.63	5
		e''	15.0000	Conductivity (σ):	1.59	1.52	4.80	5
4/13/2015	Body 5180	e'	47.6100	Relative Permittivity (ϵ_r):	47.61	49.05	-2.93	5
		e''	18.6700	Conductivity (σ):	5.38	5.27	2.01	5
	Body 5200	e'	47.5900	Relative Permittivity (ϵ_r):	47.59	49.02	-2.92	5
		e''	18.7500	Conductivity (σ):	5.42	5.29	2.39	5
	Body 5600	e'	46.9200	Relative Permittivity (ϵ_r):	46.92	48.48	-3.21	5
		e''	19.0500	Conductivity (σ):	5.93	5.76	2.96	5
	Body 5800	e'	46.6300	Relative Permittivity (ϵ_r):	46.63	48.20	-3.26	5
		e''	19.3300	Conductivity (σ):	6.23	6.00	3.90	5
	Body 5825	e'	46.6000	Relative Permittivity (ϵ_r):	46.60	48.20	-3.32	5
		e''	19.3000	Conductivity (σ):	6.25	6.00	4.18	5

SAR Lab G

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4/8/2015	Head 750	e'	40.2500	Relative Permittivity (ϵ_r):	40.25	41.96	-4.08	5
		e''	21.6300	Conductivity (σ):	0.90	0.89	1.00	5
	Head 700	e'	40.9800	Relative Permittivity (ϵ_r):	40.98	42.22	-2.93	5
		e''	21.9900	Conductivity (σ):	0.86	0.89	-3.75	5
	Head 790	e'	39.7100	Relative Permittivity (ϵ_r):	39.71	41.76	-4.90	5
		e''	21.3500	Conductivity (σ):	0.94	0.90	4.65	5
4/8/2015	Body 750	e'	54.6500	Relative Permittivity (ϵ_r):	54.65	55.55	-1.61	5
		e''	23.3300	Conductivity (σ):	0.97	0.96	1.02	5
	Body 700	e'	55.0900	Relative Permittivity (ϵ_r):	55.09	55.74	-1.16	5
		e''	23.6600	Conductivity (σ):	0.92	0.96	-4.00	5
	Body 790	e'	54.2500	Relative Permittivity (ϵ_r):	54.25	55.39	-2.06	5
		e''	23.0500	Conductivity (σ):	1.01	0.97	4.80	5
4/13/2015	Head 5180	e'	35.8400	Relative Permittivity (ϵ_r):	35.84	36.01	-0.48	5
		e''	15.6900	Conductivity (σ):	4.52	4.63	-2.41	5
	Head 5200	e'	35.8300	Relative Permittivity (ϵ_r):	35.83	35.99	-0.45	5
		e''	15.8600	Conductivity (σ):	4.59	4.65	-1.40	5
	Head 5600	e'	35.3700	Relative Permittivity (ϵ_r):	35.37	35.53	-0.46	5
		e''	16.0700	Conductivity (σ):	5.00	5.06	-1.11	5
	Head 5800	e'	35.0200	Relative Permittivity (ϵ_r):	35.02	35.30	-0.79	5
		e''	16.3700	Conductivity (σ):	5.28	5.27	0.18	5
	Head 5825	e'	35.1200	Relative Permittivity (ϵ_r):	35.12	35.30	-0.51	5
		e''	16.3000	Conductivity (σ):	5.28	5.27	0.18	5

SAR Lab H

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4/2/2015	Head 835	e'	42.8100	Relative Permittivity (ϵ_r):	42.81	41.50	3.16	5
		e''	19.8000	Conductivity (σ):	0.92	0.90	2.14	5
	Head 820	e'	43.0300	Relative Permittivity (ϵ_r):	43.03	41.60	3.43	5
		e''	19.8400	Conductivity (σ):	0.90	0.90	0.68	5
	Head 850	e'	42.6500	Relative Permittivity (ϵ_r):	42.65	41.50	2.77	5
		e''	19.8500	Conductivity (σ):	0.94	0.92	2.53	5
4/2/2015	Body 1900	e'	52.5900	Relative Permittivity (ϵ_r):	52.59	53.30	-1.33	5
		e''	14.5600	Conductivity (σ):	1.54	1.52	1.20	5
	Body 1850	e'	52.7400	Relative Permittivity (ϵ_r):	52.74	53.30	-1.05	5
		e''	14.5000	Conductivity (σ):	1.49	1.52	-1.87	5
	Body 1910	e'	52.5300	Relative Permittivity (ϵ_r):	52.53	53.30	-1.44	5
		e''	14.6500	Conductivity (σ):	1.56	1.52	2.36	5
4/6/2015	Head 835	e'	41.7700	Relative Permittivity (ϵ_r):	41.77	41.50	0.65	5
		e''	19.7800	Conductivity (σ):	0.92	0.90	2.04	5
	Head 820	e'	41.9400	Relative Permittivity (ϵ_r):	41.94	41.60	0.81	5
		e''	19.7900	Conductivity (σ):	0.90	0.90	0.43	5
	Head 850	e'	41.6300	Relative Permittivity (ϵ_r):	41.63	41.50	0.31	5
		e''	19.7700	Conductivity (σ):	0.93	0.92	2.12	5
4/6/2015	Body 835	e'	55.8200	Relative Permittivity (ϵ_r):	55.82	55.20	1.12	5
		e''	21.8500	Conductivity (σ):	1.01	0.97	4.58	5
	Body 820	e'	56.0000	Relative Permittivity (ϵ_r):	56.00	55.28	1.31	5
		e''	22.0000	Conductivity (σ):	1.00	0.97	3.57	5
	Body 850	e'	55.7200	Relative Permittivity (ϵ_r):	55.72	55.16	1.02	5
		e''	21.7800	Conductivity (σ):	1.03	0.99	4.28	5

8.2. System Check

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

System Performance Check Measurement Conditions:

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

Reference Target SAR Values

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

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (W/kg)		
				1g/10g	Head	Body
D750V3	1071	11/13/2014	750	1g	8.22	8.52
				10g	5.39	5.64
D835V2	4d002	11/13/2014	835	1g	9.23	9.33
				10g	5.99	6.12
D1750V2	1050	4/22/2014	1750	1g	36.6	37.2
				10g	19.4	20.0
D1750V2	1053	8/18/2014	1750	1g	36.9	38.0
				10g	19.6	20.4
D1750V2	1077	9/11/2014	1750	1g	36.5	36.9
				10g	19.4	19.8
D1900V2	5d043	11/7/2014	1900	1g	40.6	40.0
				10g	21.1	21.3
D1900V2	5d140	4/23/2014	1900	1g	40.1	40.2
				10g	21.0	21.3
D2450V2	706	5/20/2014	2450	1g	53.0	50.2
				10g	24.5	23.4
D5GHzV2	1138	9/18/2014	5200	1g	81.4	75.4
				10g	23.3	21.0
			5600	1g	85.1	81.9
				10g	24.2	22.6
			5800	1g	80.6	75.2
				10g	23.0	20.8
D5GHzV2	1168	12/4/2014	5200	1g	79.3	76.0
				10g	22.5	21.1
			5600	1g	81.7	82.0
				10g	23.2	22.7
			5800	1g	78.0	76.2
				10g	22.1	21.0

System Check Results

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

SAR Lab A

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Zoom Scan to 100 mW	Normalize to 1 W			
4/3/2015	D835V2	4d002	Body	1g	0.977	9.77	9.33	4.72	1, 2
				10g	0.642	6.42	6.12	4.90	

SAR Lab B

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Zoom Scan to 100 mW	Normalize to 1 W			
4/7/2015	2450	706	Head	1g	5.12	51.2	53.0	-3.40	
				10g	2.31	23.1	24.5	-5.71	
4/7/2015	2450	706	Body	1g	5.23	52.3	50.2	4.18	3, 4
				10g	2.30	23.0	23.4	-1.71	

SAR Lab E

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Zoom Scan to 100 mW	Normalize to 1 W			
4/13/2015	D5GHzV2 (5.6GHz)	1138	Head	1g	8.40	84.0	85.1	-1.29	
				10g	2.38	23.8	24.2	-1.65	
	D5GHzV2 (5.8GHz)			1g	7.93	79.3	80.6	-1.61	
				10g	2.25	22.5	23.0	-2.17	
4/13/2015	D5GHzV2 (5.6GHz)	1138	Body	1g	8.76	87.6	81.9	6.96	5, 6
				10g	2.45	24.5	22.6	8.41	
	D5GHzV2 (5.8GHz)			1g	7.84	78.4	75.2	4.26	
				10g	2.21	22.1	20.8	6.25	
4/16/2015	D835V2	4d002	Head	1g	0.960	9.60	9.23	4.01	7, 8
				10g	0.633	6.33	5.99	5.68	

SAR Lab F

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Zoom Scan to 100 mW	Normalize to 1 W			
4/1/2015	D1750V2	1050	Head	1g	3.56	35.6	36.6	-2.73	
				10g	1.88	18.8	19.4	-3.09	
4/1/2015	D1750V2	1050	Body	1g	3.60	36.0	37.2	-3.23	
				10g	1.91	19.1	20.0	-4.50	
4/1/2015	D1900V2	5d043	Head	1g	4.16	41.6	40.6	2.46	
				10g	2.12	21.2	21.1	0.47	
4/1/2015	D1900V2	5d043	Body	1g	4.13	41.3	40.0	3.25	
				10g	2.13	21.3	21.3	0.00	
4/6/2015	D1750V2	1050	Head	1g	3.57	35.7	36.6	-2.46	
				10g	1.89	18.9	19.4	-2.58	
4/6/2015	D1750V2	1050	Body	1g	3.89	38.9	37.2	4.57	9, 10
				10g	2.06	20.6	20.0	3.00	
4/6/2015	D1900V2	5d043	Head	1g	4.22	42.2	40.6	3.94	
				10g	2.15	21.5	21.1	1.90	
4/6/2015	D1900V2	5d043	Body	1g	4.04	40.4	40.0	1.00	
				10g	2.07	20.7	21.3	-2.82	
4/9/2015	D1900V2	5d140	Head	1g	4.25	42.5	40.1	5.99	11, 12
				10g	2.17	21.7	21.0	3.33	
4/9/2015	D1900V2	5d140	Body	1g	3.87	38.7	40.2	-3.73	
				10g	1.98	19.8	21.3	-7.04	
4/9/2015	D1750V2	1077	Head	1g	3.71	37.1	36.5	1.64	13, 14
				10g	1.96	19.6	19.4	1.03	
4/9/2015	D1750V2	1077	Body	1g	3.75	37.5	36.9	1.63	
				10g	1.98	19.8	19.8	0.00	
4/13/2015	D1900V2	5d043	Head	1g	3.81	38.1	40.6	-6.16	15, 16
				10g	1.95	19.5	21.1	-7.58	
4/13/2015	D1900V2	5d043	Body	1g	3.85	38.5	40.0	-3.75	
				10g	1.98	19.8	21.3	-7.04	
4/13/2015	D5GHzV2 (5.2GHz)	1168	Body	1g	8.07	80.7	76.0	6.18	17, 18
				10g	2.28	22.8	21.1	8.06	
	D5GHzV2 (5.6GHz)			1g	8.53	85.3	82.0	4.02	
				10g	2.39	23.9	22.7	5.29	
	D5GHzV2 (5.8GHz)			1g	7.59	75.9	76.2	-0.39	
				10g	2.13	21.3	21.0	1.43	
4/13/2015	D1750V2	1053	Head	1g	3.60	36.0	36.9	-2.44	19, 20
				10g	1.90	19.0	19.6	-3.06	
4/13/2015	D1750V2	1053	Body	1g	3.82	38.2	38.0	0.53	
				10g	2.01	20.1	20.4	-1.47	

SAR Lab G

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Zoom Scan to 100 mW	Normalize to 1 W			
4/8/2015	D750V3	1071	Head	1g	0.781	7.81	8.22	-4.99	
				10g	0.512	5.12	5.39	-5.01	
4/8/2015	D750V3	1071	Body	1g	0.901	9.01	8.52	5.75	21, 22
				10g	0.600	6.00	5.64	6.38	
4/13/2015	D5GHzv2 (5.2GHz)	1138	Head	1g	8.13	81.3	81.4	-0.12	
				10g	2.32	23.2	23.3	-0.43	
	D5GHzv2 (5.6GHz)			1g	8.73	87.3	85.1	2.59	23, 24
				10g	2.44	24.4	24.2	0.83	
	D5GHzv2 (5.8GHz)			1g	8.16	81.6	80.6	1.24	
				10g	2.29	22.9	23.0	-0.43	

SAR Lab H

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Zoom Scan to 100 mW	Normalize to 1 W			
4/2/2015	D835V2	4d002	Head	1g	0.935	9.35	9.23	1.30	
				10g	0.612	6.12	5.99	2.17	
4/2/2015	D1900V2	5d043	Body	1g	4.06	40.6	40.0	1.50	25, 26
				10g	2.12	21.2	21.3	-0.47	
4/6/2015	D835V2	4d002	Head	1g	0.943	9.43	9.23	2.17	
				10g	0.617	6.17	5.99	3.01	
4/6/2015	D835V2	4d002	Body	1g	0.978	9.78	9.33	4.82	27, 28
				10g	0.648	6.48	6.12	5.88	

9. Conducted Output Power Measurements

9.1. GSM

Per KDB 941225 D01 3G SAR Procedures:

SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested.

GSM850 Measured Results

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Max. Pwr		
						Burst (dBm)	Frame (dBm)	Maximum Frame Pwr
850	GSM (Voice)	CS1	1	128	824.2	33.2	24.2	24.2
				190	836.6	33.2	24.2	
				251	848.8	33.2	24.2	
	GPRS (GMSK)	CS1	1	128	824.2	33.2	24.2	24.2
				190	836.6	33.2	24.2	
				251	848.8	33.2	24.2	
			2	128	824.2	31.7	25.7	25.7
				190	836.6	31.7	25.7	
				251	848.8	31.5	25.5	
	EGPRS (8PSK)	MCS5	1	128	824.2	27.7	18.7	18.7
				190	836.6	27.7	18.7	
				251	848.8	27.7	18.7	
			2	128	824.2	27.7	21.7	21.7
				190	836.6	27.7	21.7	
				251	848.8	27.7	21.7	

Notes:

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

- Head & Body-worn: GMSK Voice Mode
- Hotspot mode: GMSK (GPRS) mode with 2 time slots for Max power, based on the output power measurements above.
- SAR is not required for EGPRS (8PSK) mode because its output power is less than that of GPRS Mode

GSM1900 Measured Results

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Max. Pwr		
						Burst (dBm)	Frame (dBm)	Maximum Frame Pwr
1900	GSM (Voice)	CS1	1	512	1850.2	29.4	20.4	20.4
				661	1880.0	29.4	20.4	
				810	1909.8	29.4	20.4	
	GPRS (GMSK)	CS1	1	512	1850.2	29.4	20.4	20.4
				661	1880.0	29.4	20.4	
				810	1909.8	29.4	20.4	
			2	512	1850.2	28.4	22.4	22.4
				661	1880.0	28.4	22.4	
				810	1909.8	28.4	22.4	
	EGPRS (8PSK)	MCS5	1	512	1850.2	26.7	17.7	17.7
				661	1880.0	26.7	17.7	
				810	1909.8	26.7	17.7	
			2	512	1850.2	26.7	20.7	20.7
				661	1880.0	26.7	20.7	
				810	1909.8	26.7	20.7	

Notes:

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

- Head & Body-worn: GMSK Voice Mode
- Hotspot mode: GMSK (GPRS) mode with 2 time slots for Max power, based on the output power measurements above.
- SAR is not required for EGPRS (8PSK) mode because its output power is less than that of GPRS Mode

9.2. W-CDMA

Release 99 Setup Procedures used to establish the test signals

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

Mode	Subtest	Rel99
WCDMA General Settings	Loopback Mode	Test Mode 2
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	βc/βd	8/15

HSDPA Setup Procedures used to establish the test signals

The following 4 Sub-tests were completed according to Release 5 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
W-CDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set 1			
	Power Control Algorithm	Algorithm 2			
	βc	2/15	11/15	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			

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

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

	Mode	HSPA				
	Subtest	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2 kbps RMC				
	HSDPA FRC	H-Set 1				
	HSUPA Test	HSPA				
	Power Control Algorithm	Algorithm 2				Algorithm 1
	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	6/15	15/9	2/15	15/1
	βhs	22/15	12/15	30/15	4/15	5/15
	βed	1309/225	94/75	47/15	56/75	47/15
	CM (dB)	1	3	2	3	1
	MPR (dB)	0	2	1	2	0
HSDPA Specific Settings	DACK	8				0
	DNAK	8				0
	DCQI	8				0
	Ack-Nack repetition factor	3				
	CQI Feedback (Table 5.2B.4)	4ms				
	CQI Repetition Factor (Table 5.2B.4)	2				
	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

HSPA+

Since 16QAM is not used for uplink, the uplink Category and release is same as HSUPA, i.e., Rel. 7 Therefore, the RF conducted power is not measured.

W-CDMA Band II Measured Results

Band	Mode		UL Ch No.	Freq. (MHz)	MPR (dB)	Max. Pwr (dBm)
W-CDMA Band II	Rel 99	RMC, 12.2 kbps	9262	1852.4	N/A	23.5
			9400	1880.0	N/A	23.5
			9538	1907.6	N/A	23.5
	HSDPA	Subtest 1	9262	1852.4	0	23.4
			9400	1880.0	0	23.4
			9538	1907.6	0	23.4
		Subtest 2	9262	1852.4	0	23.3
			9400	1880.0	0	23.3
			9538	1907.6	0	23.2
		Subtest 3	9262	1852.4	0.5	21.7
			9400	1880.0	0.5	21.8
			9538	1907.6	0.5	21.7
		Subtest 4	9262	1852.4	0.5	21.5
			9400	1880.0	0.5	21.6
			9538	1907.6	0.5	21.5
	HSUPA	Subtest 1	9262	1852.4	0	22.4
			9400	1880.0	0	22.4
			9538	1907.6	0	21.8
		Subtest 2	9262	1852.4	2	20.8
			9400	1880.0	2	21.1
			9538	1907.6	2	20.8
		Subtest 3	9262	1852.4	1	22.1
			9400	1880.0	1	22.2
			9538	1907.6	1	22.1
		Subtest 4	9262	1852.4	2	22.2
			9400	1880.0	2	21.3
			9538	1907.6	2	22.2
		Subtest 5	9262	1852.4	0	23.4
			9400	1880.0	0	23.4
			9538	1907.6	0	23.3

W-CDMA Band V Measured Results

Band	Mode		UL Ch No.	Freq. (MHz)	MPR (dB)	Max. Pwr (dBm)
W-CDMA Band V	Rel 99	RMC, 12.2 kbps	4132	826.4	N/A	23.6
			4183	836.6	N/A	23.6
			4233	846.6	N/A	23.4
	HSDPA	Subtest 1	4132	826.4	0	23.6
			4183	836.6	0	23.5
			4233	846.6	0	23.3
		Subtest 2	4132	826.4	0	22.0
			4183	836.6	0	22.1
			4233	846.6	0	22.1
		Subtest 3	4132	826.4	0.5	21.9
			4183	836.6	0.5	22.0
			4233	846.6	0.5	22.0
		Subtest 4	4132	826.4	0.5	22.2
			4183	836.6	0.5	22.1
			4233	846.6	0.5	21.9
	HSUPA	Subtest 1	4132	826.4	0	22.2
			4183	836.6	0	22.1
			4233	846.6	0	22.3
		Subtest 2	4132	826.4	2	21.7
			4183	836.6	2	21.5
			4233	846.6	2	21.1
		Subtest 3	4132	826.4	1	22.0
			4183	836.6	1	22.4
			4233	846.6	1	21.4
		Subtest 4	4132	826.4	2	21.4
			4183	836.6	2	22.2
			4233	846.6	2	22.2
		Subtest 5	4132	826.4	0	23.5
			4183	836.6	0	23.5
			4233	846.6	0	23.4

9.3. CDMA

CDMA BC0 Measured Results

Band	Mode		Ch No.	Freq. (MHz)	Max. Pwr (dBm)
BC 0	1xRTT	RC1 SO55 (Loopback)	1013	824.70	24.6
			384	836.52	24.6
			777	848.31	24.6
		RC3 SO55 (Loopback)	1013	824.70	24.5
			384	836.52	24.5
			777	848.31	24.5
		RC3 SO32 (+F-SCH)	1013	824.70	24.6
			384	836.52	24.6
			777	848.31	24.6
	1xEVDO Rel. 0	FTAP Rate: 307.2 kbps(2 slot, QPSK) RTAP Rate: 153.6 kbps	1013	824.70	24.4
			384	836.52	24.5
			777	848.31	24.5
	1xEVDO Rev. A	FETAP: 307.2k, QPSK/ ACK RETAP: 4096	1013	824.70	24.1
			384	836.52	24.2
			777	848.31	24.1

CDMA BC1 Measured Results

Band	Mode		Ch No.	Freq. (MHz)	Max. Pwr (dBm)
BC 1	1xRTT	RC1 SO55 (Loopback)	25	1851.25	24.4
			600	1880.00	24.4
			1175	1908.75	24.4
		RC3 SO55 (Loopback)	25	1851.25	24.4
			600	1880.00	24.4
			1175	1908.75	24.4
		RC3 SO32 (+F-SCH)	25	1851.25	24.4
			600	1880.00	24.4
			1175	1908.75	24.4
	1xEVDO Rel. 0	FTAP Rate: 307.2 kbps(2 slot, QPSK) RTAP Rate: 153.6 kbps	25	1851.25	24.2
			600	1880.00	24.3
			1175	1908.75	24.4
	1xEVDO Rev. A	FETAP: 307.2k, QPSK/ ACK RETAP: 4096	25	1851.25	24.0
			600	1880.00	24.0
			1175	1908.75	24.1

9.4. 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 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.					

LTE Band 2 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1860 MHz	1880 MHz	1900 MHz
LTE Band 2	20	QPSK	1	0	0	24.1	24.0	24.2
			1	50	0	24.0	23.8	24.0
			1	99	0	23.8	23.9	23.8
			50	0	1	22.4	22.4	22.6
			50	25	1	22.4	22.4	22.6
			50	50	1	22.4	22.4	22.6
			100	0	1	22.4	22.5	22.6
		16QAM	1	0	1	23.0	23.0	22.9
			1	50	1	22.9	22.8	22.7
			1	99	1	22.7	22.7	22.8
			50	0	2	21.6	21.6	21.6
			50	25	2	21.5	21.5	21.6
			50	50	2	21.5	21.5	21.6
			100	0	2	21.5	21.6	21.7

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1857.5 MHz	1880 MHz	1902.5 MHz
LTE Band 2	15	QPSK	1	0	0	23.7	23.8	24.0
			1	36	0	23.4	23.5	23.7
			1	74	0	23.6	23.6	23.9
			36	0	1	22.4	22.4	22.5
			36	18	1	22.5	22.4	22.5
			36	37	1	22.3	22.4	22.5
			75	0	1	22.5	22.5	22.6
		16QAM	1	0	1	22.7	22.6	23.0
			1	36	1	22.6	22.2	22.4
			1	74	1	22.6	22.4	23.1
			36	0	2	21.5	21.5	21.6
			36	18	2	21.6	21.5	21.6
			36	37	2	21.5	21.4	21.6
			75	0	2	21.6	21.5	21.7

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1855 MHz	1880 MHz	1905 MHz
LTE Band 2	10	QPSK	1	0	0	23.9	23.8	24.0
			1	25	0	23.7	23.8	24.2
			1	49	0	23.8	23.8	23.9
			25	0	1	22.8	22.8	23.0
			25	12	1	22.7	22.7	22.9
			25	25	1	22.8	22.7	22.9
			50	0	1	22.8	22.7	22.9
		16QAM	1	0	1	22.9	22.9	23.1
			1	25	1	23.2	23.2	23.1
			1	49	1	22.7	22.8	22.9
			25	0	2	22.0	22.0	22.1
			25	12	2	21.8	21.9	22.1
			25	25	2	21.9	21.9	22.0
			50	0	2	21.9	21.8	22.0

LTE Band 2 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1852.5 MHz	1880 MHz	1907.5 MHz
LTE Band 2	5	QPSK	1	0	0	23.9	23.9	24.0
			1	12	0	23.9	24.1	23.8
			1	24	0	24.0	23.9	24.0
			12	0	1	22.7	22.6	22.7
			12	6	1	22.7	22.6	22.7
			12	11	1	22.7	22.6	22.8
			25	0	1	22.7	22.6	22.7
		16QAM	1	0	1	22.8	22.7	22.9
			1	12	1	22.9	22.5	23.0
			1	24	1	22.9	21.6	22.9
			12	0	2	21.8	21.7	21.9
			12	6	2	21.9	21.7	21.8
			12	11	2	21.8	21.7	21.8
			25	0	2	21.8	21.7	21.8
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1851.5 MHz	1880 MHz	1908.5 MHz
LTE Band 2	3	QPSK	1	0	0	23.7	23.7	23.9
			1	7	0	24.2	24.2	24.1
			1	14	0	23.8	23.7	23.9
			8	0	1	22.7	22.6	22.8
			8	4	1	22.7	22.6	22.8
			8	7	1	22.8	22.6	22.8
			15	0	1	22.8	22.6	22.8
		16QAM	1	0	1	22.5	22.5	23.1
			1	7	1	22.5	22.5	22.9
			1	14	1	22.6	22.4	22.9
			8	0	2	21.9	21.8	21.7
			8	4	2	21.9	21.7	21.8
			8	7	2	22.0	21.8	21.8
			15	0	2	21.9	21.7	21.9
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1850.7 MHz	1880 MHz	1909.3 MHz
LTE Band 2	1.4	QPSK	1	0	0	23.8	23.7	23.9
			1	2	0	23.9	23.9	23.9
			1	5	0	23.7	23.5	23.8
			3	0	0	23.6	23.6	23.7
			3	1	0	23.7	23.6	23.7
			3	2	0	23.7	23.6	23.8
			6	0	1	22.7	22.5	22.7
		16QAM	1	0	1	22.5	22.5	23.1
			1	2	1	22.4	22.4	23.0
			1	5	1	22.6	22.4	22.9
			3	0	1	22.9	22.9	22.7
			3	1	1	23.0	22.8	22.8
			3	2	1	22.9	22.7	22.8
			6	0	2	21.8	21.6	21.8

LTE Band 4 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1720 MHz	1732.5 MHz	1745 MHz
LTE Band 4	20	QPSK	1	0	0	24.4	24.4	24.4
			1	50	0	24.2	24.3	24.0
			1	99	0	24.1	24.1	23.9
			50	0	1	23.1	23.1	23.1
			50	25	1	23.1	23.1	23.0
			50	50	1	23.1	23.1	23.0
			100	0	1	23.1	23.1	23.1
		16QAM	1	0	1	23.5	23.5	23.3
			1	50	1	23.5	23.5	23.2
			1	99	1	23.5	23.5	22.9
			50	0	2	22.2	22.2	22.0
			50	25	2	22.2	22.1	22.0
			50	50	2	22.1	22.1	22.0
			100	0	2	22.1	22.1	22.1
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1717.5 MHz	1732.5 MHz	1747.5 MHz
LTE Band 4	15	QPSK	1	0	0	24.2	24.3	24.3
			1	36	0	24.2	24.2	24.3
			1	74	0	24.1	24.1	24.2
			36	0	1	23.3	23.3	23.3
			36	18	1	23.3	23.3	23.3
			36	37	1	23.3	23.3	23.3
			75	0	1	23.4	23.3	23.2
		16QAM	1	0	1	23.3	23.3	23.5
			1	36	1	23.5	23.2	23.5
			1	74	1	23.4	23.0	23.5
			36	0	2	22.3	22.3	22.2
			36	18	2	22.3	22.3	22.2
			36	37	2	22.3	22.3	22.3
			75	0	2	22.4	22.3	22.3
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1715 MHz	1732.5 MHz	1750 MHz
LTE Band 4	10	QPSK	1	0	0	24.1	24.2	24.3
			1	25	0	24.1	24.1	24.2
			1	49	0	24.0	24.0	24.2
			25	0	1	23.3	23.2	23.2
			25	12	1	23.3	23.2	23.2
			25	25	1	23.2	23.3	23.3
			50	0	1	23.3	23.3	23.3
		16QAM	1	0	1	23.3	23.3	23.5
			1	25	1	23.4	23.2	23.5
			1	49	1	23.3	23.1	23.4
			25	0	2	22.3	22.3	22.3
			25	12	2	22.3	22.3	22.3
			25	25	2	22.3	22.3	22.3
			50	0	2	22.3	22.3	22.3

LTE Band 4 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1712.5 MHz	1732.5 MHz	1752.5 MHz
LTE Band 4	5	QPSK	1	0	0	24.0	24.0	24.2
			1	12	0	24.1	24.0	24.2
			1	24	0	24.0	24.0	24.2
			12	0	1	23.3	23.2	23.2
			12	6	1	23.2	23.2	23.2
			12	11	1	23.2	23.2	23.2
			25	0	1	23.3	23.3	23.3
		16QAM	1	0	1	23.3	23.3	23.3
			1	12	1	23.3	23.2	23.3
			1	24	1	22.2	23.1	23.3
			12	0	2	22.3	22.3	22.3
			12	6	2	22.2	22.2	22.2
			12	11	2	22.2	22.2	22.2
			25	0	2	22.2	22.2	22.2
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1711.5 MHz	1732.5 MHz	1753.5 MHz
LTE Band 4	3	QPSK	1	0	0	23.9	24.0	24.1
			1	7	0	24.0	23.9	24.0
			1	14	0	23.9	23.8	24.0
			8	0	1	23.0	23.1	22.9
			8	4	1	23.0	23.0	23.0
			8	7	1	23.0	23.0	23.0
			15	0	1	23.1	23.0	23.0
		16QAM	1	0	1	23.1	23.1	23.1
			1	7	1	23.1	23.1	23.2
			1	14	1	23.1	23.0	23.0
			8	0	2	22.1	22.1	22.2
			8	4	2	22.2	22.1	22.1
			8	7	2	22.1	22.1	22.1
			15	0	2	22.1	22.1	22.2
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1710.7 MHz	1732.5 MHz	1754.3 MHz
LTE Band 4	1.4	QPSK	1	0	0	24.0	24.0	24.2
			1	2	0	24.0	24.1	24.2
			1	5	0	24.0	24.0	24.2
			3	0	0	24.1	24.1	24.1
			3	1	0	24.1	24.1	24.2
			3	2	0	24.1	24.1	24.1
			6	0	1	23.1	23.1	23.1
		16QAM	1	0	1	23.3	23.3	23.3
			1	2	1	23.3	23.2	23.3
			1	5	1	23.2	23.1	23.3
			3	0	1	23.2	23.2	23.2
			3	1	1	23.2	23.2	23.2
			3	2	1	23.2	23.2	23.2
			6	0	2	22.2	22.2	22.2

LTE Band 5 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						829 MHz	836.5 MHz	844 MHz
LTE Band 5	10	QPSK	1	0	0	24.4	24.4	24.4
			1	25	0	24.4	24.4	24.4
			1	49	0	24.4	24.4	24.4
			25	0	1	23.4	23.4	23.4
			25	12	1	23.4	23.4	23.4
			25	25	1	23.4	23.4	23.4
			50	0	1	23.4	23.4	23.4
		16QAM	1	0	1	23.4	23.4	23.4
			1	25	1	23.3	23.4	23.3
			1	49	1	23.3	23.3	23.3
			25	0	2	22.3	22.2	22.3
			25	12	2	22.3	22.2	22.2
			25	25	2	22.2	22.1	22.2
			50	0	2	22.2	22.2	22.2
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						826.5 MHz	836.5 MHz	846.5 MHz
LTE Band 5	5	QPSK	1	0	0	24.3	24.4	24.2
			1	12	0	24.0	24.4	24.3
			1	24	0	24.2	24.3	24.2
			12	0	1	23.1	23.2	23.2
			12	6	1	23.2	23.2	23.1
			12	11	1	23.1	23.2	23.1
			25	0	1	23.2	23.1	23.2
		16QAM	1	0	1	23.2	23.1	23.4
			1	12	1	23.3	23.1	23.4
			1	24	1	23.1	23.1	23.4
			12	0	2	22.1	22.1	22.1
			12	6	2	22.1	22.1	22.1
			12	11	2	22.1	22.1	22.1
			25	0	2	22.3	22.2	22.1
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						825.5 MHz	836.5 MHz	847.5 MHz
LTE Band 5	3	QPSK	1	0	0	24.3	24.3	24.2
			1	7	0	24.2	24.4	24.3
			1	14	0	24.2	24.3	24.2
			8	0	1	23.1	23.2	23.2
			8	4	1	23.2	23.2	23.1
			8	7	1	23.1	23.2	23.1
			15	0	1	23.2	23.1	23.2
		16QAM	1	0	1	23.2	23.1	23.4
			1	7	1	23.3	23.2	23.4
			1	14	1	23.1	23.1	23.3
			8	0	2	22.1	22.1	22.2
			8	4	2	22.1	22.1	22.1
			8	7	2	22.1	22.1	22.1
			15	0	2	22.2	22.2	22.1

LTE Band 5 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						824.7 MHz	836.5 MHz	848.3 MHz
LTE Band 5	1.4	QPSK	1	0	0	24.3	24.3	24.3
			1	2	0	24.2	24.3	24.2
			1	5	0	24.2	24.3	24.2
			3	0	0	24.1	24.2	24.2
			3	1	0	24.2	24.2	24.1
			3	2	0	24.1	24.1	24.1
			6	0	1	23.2	23.1	23.2
		16QAM	1	0	1	23.2	23.1	23.4
			1	2	1	23.3	23.1	23.4
			1	5	1	23.1	23.1	23.3
			3	0	1	23.1	23.2	23.2
			3	1	1	23.2	23.2	23.1
			3	2	1	23.1	23.1	23.2
			6	0	2	22.2	22.2	22.2

LTE Band 12 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						704 MHz	707.5 MHz	711 MHz
LTE Band 12	10	QPSK	1	0	0	24.7	24.6	24.7
			1	25	0	24.6	24.5	24.6
			1	49	0	24.6	24.5	24.5
			25	0	1	23.4	23.5	23.4
			25	12	1	23.4	23.4	23.4
			25	25	1	23.4	23.4	23.4
			50	0	1	23.4	23.4	23.4
		16QAM	1	0	1	23.4	23.7	23.7
			1	25	1	23.3	23.7	23.7
			1	49	1	23.3	23.7	23.7
			25	0	2	22.4	22.4	22.4
			25	12	2	22.3	22.4	22.3
			25	25	2	22.3	22.3	22.3
			50	0	2	22.3	22.3	22.3

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						701.5 MHz	707.5 MHz	713.5 MHz
LTE Band 12	5	QPSK	1	0	0	24.6	24.6	24.6
			1	12	0	24.6	24.5	24.5
			1	24	0	24.6	24.5	24.5
			12	0	1	23.4	23.4	23.4
			12	7	1	23.3	23.4	23.4
			12	13	1	23.3	23.4	23.4
			25	0	1	23.3	23.4	23.4
		16QAM	1	0	1	23.4	23.7	23.7
			1	12	1	23.3	23.7	23.7
			1	24	1	23.3	23.7	23.6
			12	0	2	22.3	22.3	22.3
			12	7	2	22.3	22.4	22.3
			12	13	2	22.3	22.3	22.3
			25	0	2	22.3	22.3	22.3

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						700.5 MHz	707.5 MHz	714.5 MHz
LTE Band 12	3	QPSK	1	0	0	24.6	24.6	24.6
			1	8	0	24.6	24.5	24.6
			1	14	0	24.5	24.5	24.6
			8	0	1	23.4	23.5	23.5
			8	4	1	23.4	23.5	23.5
			8	7	1	23.4	23.4	23.5
			15	0	1	23.4	23.4	23.5
		16QAM	1	0	1	23.4	23.4	23.7
			1	8	1	23.4	23.4	23.7
			1	14	1	23.4	23.4	23.6
			8	0	2	22.4	22.5	22.5
			8	4	2	22.4	22.5	22.5
			8	7	2	22.4	22.5	22.4
			15	0	2	22.4	22.4	22.5

LTE Band 12 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						699.7 MHz	707.5 MHz	715.3 MHz
LTE Band 12	1.4	QPSK	1	0	0	24.6	24.5	24.5
			1	3	0	24.5	24.6	24.5
			1	5	0	24.5	24.5	24.5
			3	0	0	24.5	24.5	24.5
			3	1	0	24.5	24.5	24.4
			3	3	0	24.5	24.4	24.4
			6	0	1	23.5	23.4	23.5
		16QAM	1	0	1	23.5	23.4	23.5
			1	3	1	23.4	23.4	23.4
			1	5	1	23.5	23.4	23.4
			3	0	1	23.3	23.2	23.4
			3	1	1	23.3	23.2	23.3
			3	3	1	23.2	23.2	23.3
			6	0	2	22.3	22.3	22.4

LTE Band 13 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)
						782 MHz
LTE Band 13	10	QPSK	1	0	0	24.2
			1	25	0	24.2
			1	49	0	24.1
			25	0	1	23.2
			25	12	1	23.2
			25	25	1	23.1
			50	0	1	23.1
		16QAM	1	0	1	23.4
			1	25	1	23.3
			1	49	1	23.3
			25	0	2	22.1
			25	12	2	22.0
			25	25	2	22.0
			50	0	2	22.1
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)
						782 MHz
LTE Band 13	5	QPSK	1	0	0	24.2
			1	12	0	24.2
			1	24	0	24.1
			12	0	1	23.1
			12	6	1	23.1
			12	11	1	23.1
			25	0	1	23.1
		16QAM	1	0	1	23.1
			1	12	1	23.1
			1	24	1	23.1
			12	0	2	22.1
			12	6	2	22.1
			12	11	2	22.1
			25	0	2	22.3

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

LTE Band 17 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)
						710 MHz
LTE Band 17	10	QPSK	1	0	0	24.6
			1	25	0	24.5
			1	49	0	24.4
			25	0	1	23.4
			25	12	1	23.4
			25	25	1	23.3
			50	0	1	23.4
		16QAM	1	0	1	23.7
			1	25	1	23.7
			1	49	1	23.7
			25	0	2	22.3
			25	12	2	22.3
			25	25	2	22.2
			50	0	2	22.2
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)
						710 MHz
LTE Band 17	5	QPSK	1	0	0	24.4
			1	12	0	24.4
			1	24	0	24.3
			12	0	1	23.3
			12	6	1	23.3
			12	11	1	23.3
			25	0	1	23.4
		16QAM	1	0	1	23.5
			1	12	1	23.5
			1	24	1	23.4
			12	0	2	22.3
			12	6	2	22.3
			12	11	2	22.3
			25	0	2	22.5

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

LTE Band 25 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1860 MHz	1882.5 MHz	1905 MHz
LTE Band 25	20	QPSK	1	0	0	24.2	24.2	24.2
			1	50	0	24.2	24.1	24.2
			1	99	0	24.1	24.0	24.2
			50	0	1	22.9	22.9	22.5
			50	25	1	22.9	22.8	22.4
			50	50	1	22.9	22.8	22.5
			100	0	1	22.9	22.8	22.6
		16QAM	1	0	1	23.2	23.2	22.7
			1	50	1	23.1	23.1	22.5
			1	99	1	23.0	23.0	22.4
			50	0	2	22.0	22.0	21.6
			50	25	2	22.0	22.0	21.6
			50	50	2	22.0	21.9	21.6
			100	0	2	21.9	21.9	21.7

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1857.5 MHz	1882.5 MHz	1907.5 MHz
LTE Band 25	15	QPSK	1	0	0	24.2	24.2	24.1
			1	36	0	24.2	24.1	24.1
			1	74	0	24.2	24.0	24.0
			36	0	1	22.9	22.9	22.6
			36	18	1	22.9	22.9	22.6
			36	37	1	22.9	22.9	22.6
			75	0	1	22.9	22.9	22.6
		16QAM	1	0	1	23.1	23.0	23.1
			1	36	1	23.0	23.0	23.0
			1	74	1	22.9	23.0	23.0
			36	0	2	22.0	21.9	21.7
			36	18	2	22.0	21.9	21.7
			36	37	2	22.0	22.0	21.7
			75	0	2	21.9	22.0	21.7

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1855 MHz	1882.5 MHz	1910 MHz
LTE Band 25	10	QPSK	1	0	0	24.2	24.1	24.1
			1	25	0	24.1	24.1	24.0
			1	49	0	24.1	24.0	24.0
			25	0	1	22.9	22.9	22.7
			25	12	1	22.9	22.9	22.7
			25	25	1	22.9	22.9	22.7
			50	0	1	22.9	22.9	22.7
		16QAM	1	0	1	23.1	23.0	23.1
			1	25	1	23.0	23.0	23.0
			1	49	1	23.0	23.0	23.0
			25	0	2	22.0	22.0	21.8
			25	12	2	22.0	22.0	21.8
			25	25	2	22.0	22.0	21.8
			50	0	2	22.0	22.0	21.8

LTE Band 25 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1852.5 MHz	1882.5 MHz	1912.5 MHz
LTE Band 25	5	QPSK	1	0	0	24.1	24.1	24.1
			1	12	0	24.1	24.1	24.0
			1	24	0	24.1	24.1	24.0
			12	0	1	22.9	22.8	22.7
			12	6	1	23.0	22.9	22.6
			12	11	1	22.9	23.0	22.6
			25	0	1	22.9	22.9	22.7
		16QAM	1	0	1	23.1	23.0	23.1
			1	12	1	23.1	23.0	23.0
			1	24	1	23.0	22.9	23.0
			12	0	2	22.0	21.9	21.8
			12	6	2	22.0	22.0	21.8
			12	11	2	22.0	22.0	21.8
			25	0	2	22.0	22.0	21.8

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1851.5 MHz	1882.5 MHz	1913.5 MHz
LTE Band 25	3	QPSK	1	0	0	24.1	24.1	24.0
			1	7	0	24.1	24.1	24.0
			1	14	0	24.0	24.0	24.0
			8	0	1	22.9	22.8	22.6
			8	4	1	23.0	22.9	22.6
			8	7	1	22.9	22.9	22.6
			15	0	1	22.9	22.9	22.7
		16QAM	1	0	1	23.1	23.0	23.0
			1	7	1	23.2	23.0	23.0
			1	14	1	23.0	23.0	23.0
			8	0	2	22.0	22.0	21.8
			8	4	2	22.0	22.0	21.7
			8	7	2	22.0	22.0	21.7
			15	0	2	22.0	22.0	21.7

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)		
						1850.7 MHz	1882.5 MHz	1914.3 MHz
LTE Band 25	1.4	QPSK	1	0	0	24.2	24.1	24.1
			1	2	0	24.1	24.1	24.1
			1	5	0	24.0	24.0	24.1
			3	0	0	24.0	24.0	23.8
			3	1	0	24.0	24.0	23.7
			3	2	0	23.9	23.9	23.7
			6	0	1	22.9	22.9	22.7
		16QAM	1	0	1	23.1	23.0	23.0
			1	2	1	23.2	23.0	23.0
			1	5	1	23.0	23.0	23.0
			3	0	1	23.0	23.0	22.8
			3	1	1	23.0	23.0	22.8
			3	2	1	23.0	23.0	22.8
			6	0	2	22.0	22.0	21.8

9.5. LTE Rel. 10 Carrier Aggregation

Carrier Aggregation is implemented for downlink only. Only Uplink output power was measured. Uplink output power is independent with downlink Carrier Aggregation active or inactive.

Refer to standalone output power.

9.6. 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	17.0	Yes	
			6	2437	16.0			
			11	2462	15.8			
	802.11g	6 Mbps	1	2412	Not Required	16.0	No	1
			6	2437				
			11	2462				
	802.11n (HT20)	6.5 Mbps	1	2412		15.0	No	1
			6	2437				
			11	2462				
	802.11ac (HT20)	6.5 Mbps	1	2412		13.0	No	1
			6	2437				
			11	2462				

Note(s):

1. Output Power and SAR is not required for 802.11g/n/ac 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.

9.7. Wi-Fi 5GHz (U-NII Bands)

Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Note(s)
5.2 (U-NII 1)	802.11a	6 Mbps	36	5180	13.2	14	No	3
			40	5200	13.2			
			44	5220	13.1			
			48	5240	13.1			
	802.11n (HT20)	6.5 Mbps	36	5180	13.1	14	No	3
			40	5200	13.1			
			44	5220	13.0			
			48	5240	13.0			
	802.11n (HT40)	13.5 Mbps	38	5190	Not Required	12	No	1
			46	5230				
	802.11ac (VHT20)	6.5 Mbps	36	5180	Not Required	14	No	1
			40	5200				
			44	5220				
			48	5240				
	802.11ac (VHT40)	13.5 Mbps	38	5190	Not Required	12	No	1
			46	5230				
	802.11ac (VHT80)	29.3 Mbps	42	5210	Not Required	12	No	1
5.3 (U-NII 2A)	802.11a	6 Mbps	52	5260	13.2	14	Yes	
			56	5280	13.2			
			60	5300	13.2			
			64	5320	13.1			
	802.11n (HT20)	6.5 Mbps	52	5260	13.0	14	No	2
			56	5280	13.0			
			60	5300	13.0			
			64	5320	13.0			
	802.11n (HT40)	13.5 Mbps	54	5270	Not Required	12	No	1
			62	5310				
	802.11ac (VHT20)	6.5 Mbps	52	5260	Not Required	14	No	1, 2
			56	5280				
			60	5300				
			64	5320				
	802.11ac (VHT40)	13.5 Mbps	54	5270	Not Required	12	No	1
			62	5310				
	802.11ac (VHT80)	29.3 Mbps	58	5290	Not Required	12	No	1

Note(s):

1. Output Power and SAR measurement is not required for 802.11n/ac HT20/HT40/VHT80 channels when the specified tune-up tolerances for 802.11n/ac HT20/HT40/VHT80 are lower than 802.11a by more than ½ dB and the measured SAR is ≤ 1.2 W/Kg.
2. When the same transmission mode configurations have the same maximum output power on the same channel for the 802.11 a/g/n/ac modes, the channel in the lower order/sequence 802.11 mode (i.e. a, g, n then ac) is selected.
3. When the specified maximum output power is the same for both UNII band I and UNII band 2A, begin SAR measurement in UNII band 2A; and if the highest *reported* SAR for UNII band 2A is
   - ≤ 1.2 W/kg, SAR is not required for UNII band I
   - > 1.2 W/kg, both bands should be tested independently for SAR.

Measured Results (continued)

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Note(s)
5.5 (U-NII 2C)	802.11a	6 Mbps	100	5500	13.5	14	Yes	
			112	5560	13.5			
			116	5580	13.5			
	802.11n (HT20)	6.5 Mbps	100	5500	13.5	14	No	2
			112	5560	13.5			
			116	5580	13.5			
	802.11n (HT40)	13.5 Mbps	102	5510	Not Required	12	No	1
			110	5550				
	802.11ac (VHT20)	6.5 Mbps	100	5500	Not Required	14	No	1, 2
			112	5560				
			116	5580				
	802.11ac (VHT40)	13.5 Mbps	102	5510	Not Required	12	No	1
			110	5550				
			118	5590				
	802.11ac (VHT80)	29.3 Mbps	106	5530	Not Required	12	No	1
5.8 (U-NII 3)	802.11a	6 Mbps	132	5660	13.6	14	Yes	
			149	5745	13.6			
			161	5808	13.6			
			165	5825	13.6			
	802.11n (HT20)	6.5 Mbps	132	5660	13.4	14	No	2
			149	5745	13.5			
			161	5808	13.5			
			165	5825	13.5			
	802.11n (HT40)	13.5 Mbps	134	5670	Not Required	12	No	1
			142	5710				
			151	5755				
			159	5795				
	802.11ac (VHT20)	6.5 Mbps	132	5660	Not Required	14	No	1, 2
			149	5745				
			161	5808				
			165	5825				
	802.11ac (VHT40)	13.5 Mbps	134	5670	Not Required	12	No	1
			142	5710				
			151	5755				
			159	5795				
	802.11ac (VHT80)	29.3 Mbps	138	5790	Not Required	12	No	1
			155	5775				

Note(s):

1. Output Power and SAR measurement is not required for 802.11n/ac HT20/HT40/VHT80 channels when the specified tune-up tolerances for 802.11n/ac HT20/HT40/VHT80 are lower than 802.11a by more than ½ dB and the measured SAR is ≤ 1.2 W/Kg.
2. When the same transmission mode configurations have the same maximum output power on the same channel for the 802.11 a/g/n/ac modes, the channel in the lower order/sequence 802.11 mode (i.e. a, g, n then ac) is selected.

9.8. Bluetooth

Maximum tune-up tolerance limit is 10.00 dBm from the rated nominal maximum output power. This power level qualifies for exclusion of SAR testing.

10. Measured and Reported (Scaled) SAR Results

SAR Test Reduction criteria are as follows:

KDB 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.

Additional 1-g SAR testing at 5 mm is not required. For hotspot mode, 10-g extremity SAR is not required for the surfaces and edges since all 1-g reported SAR < 1.2 W/kg.

KDB 941225 D01 SAR test for 3G devices:
When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode

KDB 941225 D05 SAR for LTE Devices:
SAR test reduction is applied using the following criteria:

- Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB, and 50% RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel.
- When the reported SAR is > 0.8 W/kg, testing for other Channels is performed at the highest output power level for 1RB, and 50% RB configuration for that channel.
- Testing for 100% RB configuration is performed at the highest output power level for 100% RB configuration across the Low, Mid and High Channel when the highest reported SAR for 1 RB and 50% RB are > 0.8 W/kg. Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation < 1.45 W/kg.
- Testing for 16-QAM modulation is not required because the reported SAR for QPSK is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of QPSK.
- Testing for the other channel bandwidths is not required because the reported SAR for the highest channel bandwidth is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of the highest channel bandwidth.

KDB 248227 D01 SAR meas for 802.11 v02:
SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

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

- ≤ 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*.

10.1. GSM850

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Voice	0	Left Touch	190	836.6	33.2	33.2	0.351	0.351	
			Left Tilt	190	836.6	33.2	33.2	0.226	0.226	
			Right Touch	190	836.6	33.2	33.2	0.457	0.457	
			Right Tilt	190	836.6	33.2	33.2	0.246	0.246	
Head VoIP	GPRS 2 Slots	0	Left Touch	190	836.6	31.7	31.7	0.560	0.560	
			Left Tilt	190	836.6	31.7	31.7	0.408	0.408	
			Right Touch	190	836.6	31.7	31.7	0.686	0.686	1
			Right Tilt	190	836.6	31.7	31.7	0.429	0.429	
Body-worn	Voice	10	Rear	190	836.6	33.2	33.2	0.539	0.539	
			Front	190	836.6	33.2	33.2	0.567	0.567	
Body-worn(VoIP) & Hotspot	GPRS 2 Slots	10	Rear	190	836.6	31.7	31.7	0.765	0.765	
			Front	190	836.6	31.7	31.7	0.786	0.786	2
Hotspot			Edge 2	190	836.6	31.7	31.7	0.681	0.681	
			Edge 3	190	836.6	31.7	31.7	0.507	0.507	
			Edge 4	190	836.6	31.7	31.7	0.327	0.327	

Additional Tests with Smart Cover

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head VoIP	GPRS 2 Slots	0	Right Touch	190	836.6	31.7	31.7	0.647	0.647	
Body-worn(VoIP) & Hotspot	GPRS 2 Slots	10	Rear	190	836.6	31.7	31.7	0.627	0.627	
Hotspot			Edge 2	190	836.6	31.7	31.7	0.611	0.611	

10.2. GSM1900

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Voice	0	Left Touch	661	1880.0	29.4	29.4	0.346	0.346	
			Left Tilt	661	1880.0	29.4	29.4	0.128	0.128	
			Right Touch	661	1880.0	29.4	29.4	0.157	0.157	
			Right Tilt	661	1880.0	29.4	29.4	0.124	0.124	
Head VoIP	GPRS 2 Slots	0	Left Touch	661	1880.0	28.4	28.4	0.532	0.532	
			Left Tilt	661	1880.0	28.4	28.4	0.190	0.190	
			Right Touch	661	1880.0	28.4	28.4	0.240	0.240	
			Right Tilt	661	1880.0	28.4	28.4	0.189	0.189	
Body-worn	Voice	10	Rear	661	1880.0	29.4	29.4	0.190	0.190	
			Front	661	1880.0	29.4	29.4	0.248	0.248	
Body-worn(VoIP) & Hotspot	GPRS 2 Slots	10	Rear	661	1880.0	28.4	28.4	0.296	0.296	
			Front	661	1880.0	28.4	28.4	0.400	0.400	3
Hotspot			Edge 3	661	1880.0	28.4	28.4	0.268	0.268	
			Edge 4	661	1880.0	28.4	28.4	0.491	0.491	4

Additional Tests with Smart Cover

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head VoIP	GPRS 2 Slots	0	Left Touch	661	1880.0	28.4	28.4	0.588	0.588	5
Body-worn(VoIP) & Hotspot	GPRS 2 Slots	10	Front	661	1880.0	28.4	28.4	0.234	0.234	
Hotspot			Edge 4	661	1880.0	28.4	28.4	0.398	0.398	

10.3. W-CDMA Band V

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Rel 99 RMC	0	Left Touch	4183	836.6	23.7	23.6	0.352	0.360	
			Left Tilt	4183	836.6	23.7	23.6	0.252	0.258	
			Right Touch	4183	836.6	23.7	23.6	0.439	0.449	6
			Right Tilt	4183	836.6	23.7	23.6	0.269	0.275	
Body-worn & Hotspot	Rel 99 RMC	10	Rear	4183	836.6	23.7	23.6	0.441	0.451	
			Front	4183	836.6	23.7	23.6	0.602	0.616	7
Hotspot	Rel 99 RMC	10	Edge 2	4183	836.6	23.7	23.6	0.346	0.354	
			Edge 3	4183	836.6	23.7	23.6	0.403	0.412	
			Edge 4	4183	836.6	23.7	23.6	0.175	0.179	

Additional Tests with Smart Cover

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Rel 99 RMC	0	Right Touch	4183	836.6	23.7	23.6	0.340	0.348	
Body-worn & Hotspot	Rel 99 RMC	10	Front	4183	836.6	23.7	23.6	0.348	0.356	
Hotspot	Rel 99 RMC	10	Edge 3	4183	836.6	23.7	23.6	0.347	0.355	

10.4. 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	23.7	23.5	0.731	0.765	8
			Left Tilt	9400	1880.0	23.7	23.5	0.259	0.271	
			Right Touch	9400	1880.0	23.7	23.5	0.341	0.357	
			Right Tilt	9400	1880.0	23.7	23.5	0.277	0.290	
Body-worn & Hotspot	Rel 99 RMC	10	Rear	9400	1880.0	23.7	23.5	0.468	0.490	
			Front	9400	1880.0	23.7	23.5	0.498	0.521	9
Hotspot	Rel 99 RMC	10	Edge 3	9400	1880.0	23.7	23.5	0.379	0.397	
			Edge 4	9400	1880.0	23.7	23.5	0.615	0.644	10

Additional Tests with Smart Cover

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Rel 99 RMC	0	Left Touch	9400	1880.0	23.7	23.5	0.716	0.750	
Body-worn & Hotspot	Rel 99 RMC	10	Front	9400	1880.0	23.7	23.5	0.497	0.520	
Hotspot	Rel 99 RMC	10	Edge 4	9400	1880.0	23.7	23.5	0.549	0.575	

10.5. 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	24.7	24.5	0.478	0.501	
			Left Tilt	384	836.5	24.7	24.5	0.338	0.354	
			Right Touch	384	836.5	24.7	24.5	0.622	0.651	11
			Right Tilt	384	836.5	24.7	24.5	0.351	0.368	
	1xEVDO (Rel. 0)	0	Left Touch	384	836.5	24.7	24.5	0.468	0.490	
			Left Tilt	384	836.5	24.7	24.5	0.340	0.356	
			Right Touch	384	836.5	24.7	24.5	0.601	0.629	
			Right Tilt	384	836.5	24.7	24.5	0.363	0.380	
Body-worn & Hotspot	1xRTT (RC3 SO32)	10	Rear	384	836.5	24.7	24.6	0.590	0.604	
			Front	384	836.5	24.7	24.6	0.700	0.716	12
Hotspot	1xRTT (RC3 SO32)	10	Edge 2	384	836.5	24.7	24.6	0.496	0.508	
			Edge 3	384	836.5	24.7	24.6	0.470	0.481	
			Edge 4	384	836.5	24.7	24.6	0.245	0.251	

Additional Tests with Smart Cover

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	1xRTT (RC3 SO55)	0	Right Touch	384	836.5	24.7	24.5	0.558	0.584	
Body-worn & Hotspot	1xRTT (RC3 SO32)	10	Front	384	836.5	24.7	24.6	0.575	0.588	
Hotspot	1xRTT (RC3 SO32)	10	Edge 2	384	836.5	24.7	24.6	0.473	0.484	

10.6. 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	25	1851.3	24.7	24.4	0.977	1.047	
				600	1880.0	24.7	24.4	0.942	1.009	
				1175	1908.8	24.7	24.4	0.883	0.946	
			Left Tilt	600	1880.0	24.7	24.4	0.304	0.326	
			Right Touch	600	1880.0	24.7	24.4	0.463	0.496	
			Right Tilt	600	1880.0	24.7	24.4	0.319	0.342	
	1xEVDO (Rel. 0)	0	Left Touch	25	1851.3	24.7	24.2	1.030	1.156	13
				600	1880.0	24.7	24.3	0.991	1.087	
				1175	1908.8	24.7	24.4	0.941	1.008	
			Left Tilt	600	1880.0	24.7	24.3	0.330	0.362	
			Right Touch	600	1880.0	24.7	24.3	0.442	0.485	
			Right Tilt	600	1880.0	24.7	24.3	0.311	0.341	
Body-worn & Hotspot	1xRTT (RC3 SO32)	10	Rear	25	1851.3	24.7	24.4	0.831	0.890	14
				600	1880.0	24.7	24.4	0.786	0.842	
				1175	1908.8	24.7	24.4	0.694	0.744	
			Front	25	1851.3	24.7	24.4	0.814	0.872	
				600	1880.0	24.7	24.4	0.750	0.804	
				1175	1908.8	24.7	24.4	0.622	0.666	
Hotspot	1xRTT (RC3 SO32)	10	Edge 3	600	1880.0	24.7	24.4	0.451	0.483	
			Edge 4	25	1851.3	24.7	24.4	0.838	0.898	
				600	1880.0	24.7	24.4	0.849	0.910	15
				1175	1908.8	24.7	24.4	0.747	0.800	

Additional Tests with Smart Cover

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	1xEVDO (Rel. 0)	0	Left Touch	25	1851.3	24.7	24.2	0.917	1.029	
Body-worn & Hotspot	1xRTT (RC3 SO32)	10	Rear	25	1851.3	24.7	24.4	0.577	0.618	
Hotspot	1xRTT (RC3 SO32)	10	Edge 4	600	1880.0	24.7	24.4	0.620	0.664	

10.7. LTE Band 2 (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	18700	1860.0	1	0	24.2	24.1	0.894	0.915	
				18900	1880.0	1	0	24.2	24.0	0.846	0.886	
						50	0	23.2	22.4	0.597	0.718	
				19100	1900.0	1	0	24.2	24.2	0.828	0.828	
			Left Tilt	18900	1880.0	1	0	24.2	24.0	0.302	0.316	
						50	0	23.2	22.4	0.208	0.250	
			Right Touch	18900	1880.0	1	0	24.2	24.0	0.423	0.443	
						50	0	23.2	22.4	0.288	0.346	
			Right Tilt	18900	1880.0	1	0	24.2	24.0	0.317	0.332	
						50	0	23.2	22.4	0.212	0.255	
Body-worn & Hotspot	QPSK	10	Rear	18900	1880.0	1	0	24.2	24.0	0.633	0.663	
						50	0	23.2	22.4	0.446	0.536	
			Front	18700	1860.0	1	0	24.2	24.1	0.823	0.842	16
				18900	1880.0	1	0	24.2	24.0	0.763	0.799	
						50	0	23.2	22.4	0.534	0.642	
				19100	1900.0	1	0	24.2	24.2	0.720	0.720	
Hotspot	QPSK	10	Edge 3	18900	1880.0	1	0	24.2	24.0	0.465	0.487	
						50	0	23.2	22.4	0.328	0.394	
			Edge 4	18900	1880.0	1	0	24.2	24.0	0.741	0.776	
						50	0	23.2	22.4	0.517	0.622	

Additional Tests with Smart Cover

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	18700	1860.0	1	0	24.2	24.1	1.020	1.044	17
Body-worn & Hotspot	QPSK	10	Front	18700	1860.0	1	0	24.2	24.1	0.441	0.451	
Hotspot	QPSK	10	Edge 4	18900	1880.0	1	0	24.2	24.0	0.620	0.649	

10.8. LTE Band 4 (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	20050	1720.0	1	0	24.5	24.4	0.653	0.668	
				20175	1732.5	1	0	24.5	24.4	0.814	0.833	
						50	0	23.5	23.1	0.586	0.643	
				20300	1745.0	1	0	24.5	24.4	0.808	0.827	
			Left Tilt	20175	1732.5	1	0	24.5	24.4	0.364	0.372	
						50	0	23.5	23.1	0.259	0.284	
			Right Touch	20175	1732.5	1	0	24.5	24.4	0.372	0.381	
						50	0	23.5	23.1	0.265	0.291	
			Right Tilt	20175	1732.5	1	0	24.5	24.4	0.388	0.397	
						50	0	23.5	23.1	0.385	0.422	
Body-worn & Hotspot	QPSK	10	Rear	20175	1732.5	1	0	24.5	24.4	0.670	0.686	
						50	0	23.5	23.1	0.494	0.542	
			Front	20175	1732.5	1	0	24.5	24.4	0.715	0.732	18
						50	0	23.5	23.1	0.551	0.604	
Hotspot	QPSK	10	Edge 3	20175	1732.5	1	0	24.5	24.4	0.398	0.407	
						50	0	23.5	23.1	0.302	0.331	
			Edge 4	20175	1732.5	1	0	24.5	24.4	0.627	0.642	
						50	0	23.5	23.1	0.462	0.507	

Additional Tests with Smart Cover

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	1745.0	1	0	24.5	24.4	0.948	0.970	19
Body-worn & Hotspot	QPSK	10	Front	20175	1745.0	1	0	24.5	24.4	0.646	0.661	
Hotspot	QPSK	10	Edge 4	20175	1745.0	1	0	24.5	24.4	0.573	0.586	

10.9. 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	836.5	1	0	24.4	24.4	0.368	0.368	
						25	0	23.4	23.4	0.368	0.368	
			Left Tilt	20525	836.5	1	0	24.4	24.4	0.323	0.323	
						25	0	23.4	23.4	0.259	0.259	
			Right Touch	20525	836.5	1	0	24.4	24.4	0.529	0.529	20
						25	0	23.4	23.4	0.425	0.425	
			Right Tilt	20525	836.5	1	0	24.4	24.4	0.350	0.350	
						25	0	23.4	23.4	0.278	0.278	
Body-worn & Hotspot	QPSK	10	Rear	20525	836.5	1	0	24.4	24.4	0.555	0.555	
						25	0	23.4	23.4	0.438	0.438	
			Front	20525	836.5	1	0	24.4	24.4	0.748	0.748	21
						25	0	23.4	23.4	0.483	0.483	
Hotspot	QPSK	10	Edge 2	20525	836.5	1	0	24.4	24.4	0.487	0.487	
						25	0	23.4	23.4	0.388	0.388	
			Edge 3	20525	836.5	1	0	24.4	24.4	0.436	0.436	
						25	0	23.4	23.4	0.357	0.357	
			Edge 4	20525	836.5	1	0	24.4	24.4	0.216	0.216	
						25	0	23.4	23.4	0.176	0.176	

Additional Tests with Smart Cover

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	Right Touch	20525	836.6	1	0	24.4	24.4	0.387	0.387	
Body-worn & Hotspot	QPSK	10	Front	20525	836.6	1	0	24.4	24.4	0.374	0.374	
Hotspot	QPSK	10	Edge 2	20525	836.6	1	0	24.4	24.4	0.356	0.356	

10.10. LTE Band 12 (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	23095	707.5	1	0	24.7	24.6	0.170	0.174	
						25	0	23.7	23.5	0.135	0.141	
			Left Tilt	23095	707.5	1	0	24.7	24.6	0.106	0.108	
						25	0	23.7	23.5	0.084	0.088	
			Right Touch	23095	707.5	1	0	24.7	24.6	0.218	0.223	22
						25	0	23.7	23.5	0.174	0.182	
			Right Tilt	23095	707.5	1	0	24.7	24.6	0.103	0.105	
						25	0	23.7	23.5	0.081	0.085	
Body-worn & Hotspot	QPSK	10	Rear	23095	707.5	1	0	24.7	24.6	0.279	0.285	
						25	0	23.7	23.5	0.222	0.232	
			Front	23095	707.5	1	0	24.7	24.6	0.413	0.423	23
						25	0	23.7	23.5	0.329	0.345	
Hotspot	QPSK	10	Edge 2	23095	707.5	1	0	24.7	24.6	0.321	0.328	
						25	0	23.7	23.5	0.244	0.255	
			Edge 3	23095	707.5	1	0	24.7	24.6	0.169	0.173	
						25	0	23.7	23.5	0.131	0.137	
			Edge 4	23095	707.5	1	0	24.7	24.6	0.174	0.178	
						25	0	23.7	23.5	0.135	0.141	

Additional Tests with Smart Cover

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	Right Touch	23095	707.5	1	0	24.7	24.6	0.167	0.171	
Body-worn & Hotspot	QPSK	10	Front	23095	707.5	1	0	24.7	24.6	0.221	0.226	
Hotspot	QPSK	10	Edge 2	23095	707.5	1	0	24.7	24.6	0.272	0.278	

10.11. LTE Band 13 (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	23230	782.0	1	0	24.4	24.2	0.252	0.264	
						25	0	23.4	23.2	0.164	0.172	
			Left Tilt	23230	782.0	1	0	24.4	24.2	0.169	0.177	
						25	0	23.4	23.2	0.121	0.127	
			Right Touch	23230	782.0	1	0	24.4	24.2	0.338	0.354	24
						25	0	23.4	23.2	0.234	0.245	
			Right Tilt	23230	782.0	1	0	24.4	24.2	0.123	0.129	
						25	0	23.4	23.2	0.123	0.129	
Body-worn & Hotspot	QPSK	10	Rear	23230	782.0	1	0	24.4	24.2	0.390	0.408	
						25	0	23.4	23.2	0.278	0.291	
			Front	23230	782.0	1	0	24.4	24.2	0.527	0.552	25
						25	0	23.4	23.2	0.420	0.440	
Hotspot	QPSK	10	Edge 2	23230	782.0	1	0	24.4	24.2	0.312	0.327	
						25	0	23.4	23.2	0.224	0.235	
			Edge 3	23230	782.0	1	0	24.4	24.2	0.288	0.302	
						25	0	23.4	23.2	0.226	0.237	
			Edge 4	23230	782.0	1	0	24.4	24.2	0.149	0.156	
						25	0	23.4	23.2	0.109	0.114	

Additional Tests with Smart Cover

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	Right Touch	23230	782.0	1	0	24.4	24.2	0.297	0.311	
Body-worn & Hotspot	QPSK	10	Front	23230	782.0	1	0	24.4	24.2	0.373	0.391	
Hotspot	QPSK	10	Edge 2	23230	782.0	1	0	24.4	24.2	0.251	0.263	

10.12. LTE Band 17 (10MHz Bandwidth)

SAR for LTE Band 17 is covered by LTE Band 12 (refer to section 10.10.) due to similar frequency range, same maximum tune-up limit and same channel bandwidth.

10.13. LTE Band 25 (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	26140	1860.0	1	0	24.2	24.2	1.100	1.100	26
				26365	1882.5	1	0	24.2	24.2	1.050	1.050	
						50	0	23.2	22.9	0.619	0.663	
				26590	1905.0	1	0	24.2	24.2	0.659	0.659	
			Left Tilt	26365	1882.5	1	0	24.2	24.2	0.354	0.354	
						50	0	23.2	22.9	0.220	0.236	
			Right Touch	26365	1882.5	1	0	24.2	24.2	0.517	0.517	
						50	0	23.2	22.9	0.306	0.328	
			Right Tilt	26365	1882.5	1	0	24.2	24.2	0.379	0.379	
						50	0	23.2	22.9	0.223	0.239	
Body-worn & Hotspot	QPSK	10	Rear	26365	1882.5	1	0	24.2	24.2	0.722	0.722	
						50	0	23.2	22.9	0.514	0.551	
			Front	26365	1882.5	1	0	24.2	24.2	0.769	0.769	27
						50	0	23.2	22.9	0.510	0.546	
Hotspot	QPSK	10	Edge 3	26365	1882.5	1	0	24.2	24.2	0.485	0.485	
						50	0	23.2	22.9	0.330	0.354	
			Edge 4	26365	1882.5	1	0	24.2	24.2	0.746	0.746	
						50	0	23.2	22.9	0.551	0.590	

Additional Tests with Smart Cover

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	26140	1860.0	1	0	24.2	24.2	1.090	1.090	
Body-worn & Hotspot	QPSK	10	Front	26365	1882.5	1	0	24.2	24.2	0.504	0.504	
Hotspot	QPSK	10	Edge 4	26365	1882.5	1	0	24.2	24.2	0.705	0.705	

10.14. Wi-Fi (DTS Band)

Frequency Band	Mode	RF Exposure Conditions	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Notes	Plot No.
								Tune-up limit	Meas.	Meas.	Scaled		
2.4GHz	802.11b 1 Mbps	Head	0	Left Touch	6	2437.0	0.409	17.0	16.0	0.301	0.379		
				Left Tilt	6	2437.0	0.419	17.0	16.0	0.325	0.409	2	
				Right Touch	6	2437.0	0.287	17.0	16.0				
				Right Tilt	6	2437.0	0.316	17.0	16.0				
		Body-worn & Hotspot & Wi-Fi Direct	10	Rear	6	2437.0	0.209	17.0	16.0	0.149	0.188	1	
				Front	6	2437.0	0.091	17.0	16.0				
				Edge 1	6	2437.0	0.126	17.0	16.0				
				Edge 2	6	2437.0	0.040	17.0	16.0				

Additional Tests with Smart Cover

Frequency Band	Mode	RF Exposure Conditions	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Notes	Plot No.
								Tune-up limit	Meas.	Meas.	Scaled		
2.4GHz	802.11b 1 Mbps	Head	0	Left Tilt	6	2437.0	0.306	17.0	16.0	0.342	0.431		28
		Body-worn & Hotspot & Wi-Fi Direct	10	Rear	6	2437.0	0.352	17.0	16.0	0.242	0.305		29

Note(s):

1. Highest *reported* SAR is ≤ 0.4 W/kg. Therefore, further SAR measurements within this exposure condition are not required.
2. Highest *reported* SAR is > 0.4 W/kg. Due to the highest *reported* SAR for this test position, other test positions in Head exposure condition were evaluated until a SAR ≤ 0.8 W/kg was *reported*.
3. Testing for a second channel was required because the *reported* SAR for this test position was >0.8 W/kg.
4. Additional testing required in order satisfying FCC simultaneous transmission limit criteria.

10.15. Wi-Fi (U-NII Band)

Frequency Band	Mode	RF Exposure Conditions	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Notes	Plot No.
								Tune-up limit	Meas.	Meas.	Scaled		
5.3 GHz U-NII 2A	802.11a 6 Mbps	Head	0	Left Touch	60	5300.0	0.955	14.0	13.2				
				Left Tilt	60	5300.0	1.155	14.0	13.2	0.567	0.682		
				Right Touch	60	5300.0	0.984	14.0	13.2				
				Right Tilt	60	5300.0	1.160	14.0	13.2	0.623	0.749	2	30
		Body-worn	10	Rear	60	5300.0	0.616	14.0	13.2	0.318	0.382	1	31
				Front	60	5300.0	0.284	14.0	13.2				
Frequency Band	Mode	RF Exposure Conditions	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Notes	Plot No.
								Tune-up limit	Meas.	Meas.	Scaled		
5.5 GHz U-NII 2C	802.11a 6 Mbps	Head	0	Left Touch	116	5580.0	0.592	14.0	13.5				
				Left Tilt	116	5580.0	0.820	14.0	13.5	0.440	0.494		
				Right Touch	116	5580.0	0.677	14.0	13.5				
				Right Tilt	116	5580.0	0.839	14.0	13.5	0.452	0.507	2	32
		Body-worn	10	Rear	116	5580.0	0.306	14.0	13.5	0.176	0.197	1	
				Front	116	5580.0	0.221	14.0	13.5				
Frequency Band	Mode	RF Exposure Conditions	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Notes	Plot No.
								Tune-up limit	Meas.	Meas.	Scaled		
5.8 GHz U-NII 3	802.11a 6 Mbps	Head	0	Left Touch	149	5745.0	0.666	14.0	13.6	0.332	0.364		
				Left Tilt	149	5745.0	0.708	14.0	13.6	0.376	0.412	2	33
				Right Touch	149	5745.0	0.564	14.0	13.6				
				Right Tilt	149	5745.0	0.571	14.0	13.6				
		Body-worn & Hotspot & Wi-Fi Direct	10	Rear	149	5745.0	0.318	14.0	13.6				
				Front	149	5745.0	0.193	14.0	13.6				
				Edge 1	149	5745.0	0.559	14.0	13.6	0.309	0.339	1	34
				Edge 2	149	5745.0	0.026	14.0	13.6				

Additional Tests with Smart Cover

Frequency Band	Mode	RF Exposure Conditions	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Notes	Plot No.
								Tune-up limit	Meas.	Meas.	Scaled		
5.3 GHz U-NII 2A	802.11a 6 Mbps	Head	0	Right Tilt	60	5300.0	1.060	14.0	13.2	0.589	0.708		
		Body-worn	10	Rear	60	5300.0	0.520	14.0	13.2	0.284	0.341		
Frequency Band	Mode	RF Exposure Conditions	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Notes	Plot No.
								Tune-up limit	Meas.	Meas.	Scaled		
5.5 GHz U-NII 2C	802.11a 6 Mbps	Head	0	Right Tilt	116	5580.0	0.735	14.0	13.5	0.400	0.449		
		Body-worn	10	Rear	116	5580.0	0.342	14.0	13.5	0.193	0.217		35
Frequency Band	Mode	RF Exposure Conditions	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Notes	Plot No.
								Tune-up limit	Meas.	Meas.	Scaled		
5.8 GHz U-NII 3	802.11a 6 Mbps	Head	0	Left Tilt	149	5745.0	0.547	14.0	13.6	0.315	0.345		
		Body-worn & Hotspot & Wi-Fi Direct	10	Edge 1	149	5745.0	0.525	14.0	13.6	0.294	0.322		

Note(s):

1. Highest *reported* SAR is ≤ 0.4 W/kg. Therefore, further SAR measurements within this exposure condition are not required.
2. Highest *reported* SAR is > 0.4 W/kg. Due to the highest *reported* SAR for this test position, other test positions in Head exposure condition were evaluated until a SAR ≤ 0.8 W/kg was *reported*.
3. Testing for a second channel was required because the *reported* SAR for this test position was >0.8 W/kg.
4. Additional testing required in order satisfying FCC simultaneous transmission limit criteria.

10.16. 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)					
10.0	10	10	2.480	1.6	Rear/Front	0.210

Conclusion:

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

11. SAR Measurement Variability

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

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 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.

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)	Repeated Measured SAR (W/kg)	Largest to Smallest SAR Ratio
700	LTE Band 12	Body	Front	No	0.413	N/A	N/A
	LTE Band 13	Body	Front	No	0.527	N/A	N/A
850	GSM 850	Body	Front	No	0.786	N/A	N/A
	CDMA BC0	Body	Front	No	0.700	N/A	N/A
	WCDMA Band V	Body	Front	No	0.602	N/A	N/A
	LTE Band 5	Body	Front	No	0.748	N/A	N/A
1900	GSM 1900	Head	Left Touch	No	0.588	N/A	N/A
	CDMA BC1	Head	Left Touch	No	1.03	N/A	N/A
	WCDMA Band II	Head	Left Touch	No	0.731	N/A	N/A
	LTE Band 2	Head	Left Touch	No	1.02	N/A	N/A
	LTE Band 25	Head	Left Touch	Yes	1.10	1.05	1.05
1700	LTE Band 4	Head	Left Touch	Yes	0.948	0.905	1.05
2400	Wi-Fi 802.11b/g/n	Head	Left Tilt	No	0.342	N/A	N/A
5300	Wi-Fi 802.11a/n/ac	Head	Right Tilt	No	0.623	N/A	N/A
5500	Wi-Fi 802.11a/n/ac	Head	Right Tilt	No	0.452	N/A	N/A
5800	Wi-Fi 802.11a/n/ac	Head	Left Touch	No	0.332	N/A	N/A

Note(s):

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

12. Simultaneous Transmission SAR Analysis

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

In order for a pair of simultaneous 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:

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

Simultaneous Transmission Condition

RF Exposure Condition	Item	Capable Transmit Configurations		
Head	1	GSM(Voice)	+	DTS
	2	GSM(Voice)	+	U-NII
	3	GSM(GPRS/EDGE)	+	DTS
	4	GSM(GPRS/EDGE)	+	U-NII
	5	W-CDMA	+	DTS
	6	W-CDMA	+	U-NII
	7	CDMA	+	DTS
	8	CDMA	+	U-NII
	9	LTE	+	DTS
	10	LTE	+	U-NII
Body-worn	11	GSM(Voice)	+	DTS
	12	GSM(Voice)	+	U-NII
	13	GSM(Voice)	+	BT
	15	GSM(GPRS/EDGE)	+	DTS
	16	GSM(GPRS/EDGE)	+	U-NII
	17	GSM(GPRS/EDGE)	+	BT
	19	W-CDMA	+	DTS
	20	W-CDMA	+	U-NII
	21	W-CDMA	+	BT
	23	CDMA	+	DTS
	24	CDMA	+	U-NII
	25	CDMA	+	BT
	27	LTE	+	DTS
	28	LTE	+	U-NII
	29	LTE	+	BT
Hotspot & Wi-Fi Direct	31	GSM(GPRS/EDGE)	+	DTS
	32	GSM(GPRS/EDGE)	+	U-NII 3
	33	W-CDMA	+	DTS
	34	W-CDMA	+	U-NII 3
	35	CDMA	+	DTS
	36	CDMA	+	U-NII 3
	37	LTE	+	DTS
	38	LTE	+	U-NII 3

Notes:

1. DTS and U-NII 3 support Hotspot and Wi-Fi Direct.
2. GPRS/EDGE, W-CDMA, CDMA and LTE support Hotspot.
3. VoIP is supported in GPRS/EDGE, W-CDMA, CDMA and LTE.
4. DTS Radio cannot transmit simultaneously with Bluetooth Radio.
5. U-NII Radio cannot transmit simultaneously with Bluetooth Radio.

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

RF Exposure conditions	Test Position	① WWAN	② DTS	③ U-NII	④ BT	①+② WWAN +DTS		①+③ WWAN + U-NII		①+④ WWAN +BT	
						∑1-g SAR (mW/g)	SPLSR (Yes/ No)	∑1-g SAR (mW/g)	SPLSR (Yes/ No)	∑1-g SAR (mW/g)	SPLSR (Yes/ No)
Head	Left Touch	0.560	0.379	0.364		0.939	No	0.924	No		
	Left Tilt	0.408	0.431	0.682		0.839	No	1090	No		
	Right Touch	0.686	0.431	0.749		1.117	No	1435	No		
	Right Tilt	0.429	0.431	0.749		0.860	No	1178	No		
Body-worn & Hotspot	Rear	0.765	0.305	0.382	0.210	1070	No	1147	No	0.975	No
	Front	0.786	0.305	0.382	0.210	1091	No	1168	No	0.996	No
Hotspot	Edge 2	0.681	0.305	0.382		0.986	No	1063	No		

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because either the sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

12.2. Sum of the SAR for GSM1900 & Wi-Fi & BT

RF Exposure conditions	Test Position	① WWAN	② DTS	③ U-NII	④ BT	①+② WWAN +DTS		①+③ WWAN + U-NII		①+④ WWAN +BT	
						∑1-g SAR (mW/g)	SPLSR (Yes/ No)	∑1-g SAR (mW/g)	SPLSR (Yes/ No)	∑1-g SAR (mW/g)	SPLSR (Yes/ No)
Head	Left Touch	0.588	0.379	0.364		0.967	No	0.952	No		
	Left Tilt	0.190	0.431	0.682		0.621	No	0.872	No		
	Right Touch	0.240	0.431	0.749		0.671	No	0.989	No		
	Right Tilt	0.189	0.431	0.749		0.620	No	0.938	No		
Body-worn & Hotspot	Rear	0.296	0.305	0.382	0.210	0.601	No	0.678	No	0.506	No
	Front	0.400	0.305	0.382	0.210	0.705	No	0.782	No	0.610	No

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because either the sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

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

RF Exposure conditions	Test Position	① WWAN	② DTS	③ U-NII	④ BT	①+② WWAN +DTS		①+③ WWAN + U-NII		①+④ WWAN +BT	
						∑1-g SAR (mW/g)	SPLSR (Yes/ No)	∑1-g SAR (mW/g)	SPLSR (Yes/ No)	∑1-g SAR (mW/g)	SPLSR (Yes/ No)
Head	Left Touch	0.360	0.379	0.364		0.739	No	0.724	No		
	Left Tilt	0.258	0.431	0.682		0.689	No	0.940	No		
	Right Touch	0.449	0.431	0.749		0.880	No	1.198	No		
	Right Tilt	0.275	0.431	0.749		0.706	No	1.024	No		
Body-worn & Hotspot	Rear	0.451	0.305	0.382	0.210	0.756	No	0.833	No	0.661	No
	Front	0.616	0.305	0.382	0.210	0.921	No	0.998	No	0.826	No
Hotspot	Edge 2	0.354	0.305	0.382		0.659	No	0.736	No		

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because either the sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

12.4. Sum of the SAR for WCDMA Band II & Wi-Fi & BT

RF Exposure conditions	Test Position	① WWAN	② DTS	③ U-NII	④ BT	①+② WWAN +DTS		①+③ WWAN + U-NII		①+④ WWAN +BT	
						∑1-g SAR (mW/g)	SPLSR (Yes/ No)	∑1-g SAR (mW/g)	SPLSR (Yes/ No)	∑1-g SAR (mW/g)	SPLSR (Yes/ No)
Head	Left Touch	0.765	0.379	0.364		1.144	No	1.129	No		
	Left Tilt	0.271	0.431	0.682		0.702	No	0.953	No		
	Right Touch	0.357	0.431	0.749		0.788	No	1.106	No		
	Right Tilt	0.290	0.431	0.749		0.721	No	1.039	No		
Body-worn & Hotspot	Rear	0.490	0.305	0.382	0.210	0.795	No	0.872	No	0.700	No
	Front	0.521	0.305	0.382	0.210	0.826	No	0.903	No	0.731	No

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because either the sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

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

RF Exposure conditions	Test Position	① WWAN	② DTS	③ U-NII	④ BT	①+② WWAN +DTS		①+③ WWAN + U-NII		①+④ WWAN +BT	
						∑1-g SAR (mW/g)	SPLSR (Yes/ No)	∑1-g SAR (mW/g)	SPLSR (Yes/ No)	∑1-g SAR (mW/g)	SPLSR (Yes/ No)
Head	Left Touch	0.501	0.379	0.364		0.880	No	0.865	No		
	Left Tilt	0.356	0.431	0.682		0.787	No	1038	No		
	Right Touch	0.651	0.431	0.749		1082	No	1400	No		
	Right Tilt	0.380	0.431	0.749		0.811	No	1129	No		
Body-worn & Hotspot	Rear	0.604	0.305	0.382	0.210	0.909	No	0.986	No	0.814	No
	Front	0.716	0.305	0.382	0.210	1021	No	1098	No	0.926	No
Hotspot	Edge 2	0.508	0.305	0.382		0.813	No	0.890	No		

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because either the sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

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

RF Exposure conditions	Test Position	① WWAN	② DTS	③ U-NII	④ BT	①+② WWAN +DTS		①+③ WWAN + U-NII		①+④ WWAN +BT	
						∑1-g SAR (mW/g)	SPLSR (Yes/ No)	∑1-g SAR (mW/g)	SPLSR (Yes/ No)	∑1-g SAR (mW/g)	SPLSR (Yes/ No)
Head	Left Touch	1156	0.379	0.364		1535	No	1520	No		
	Left Tilt	0.362	0.431	0.682		0.793	No	1044	No		
	Right Touch	0.496	0.431	0.749		0.927	No	1245	No		
	Right Tilt	0.342	0.431	0.749		0.773	No	1091	No		
Body-worn & Hotspot	Rear	0.890	0.305	0.382	0.210	1195	No	1272	No	1100	No
	Front	0.872	0.305	0.382	0.210	1177	No	1254	No	1082	No

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because either the sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

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

RF Exposure conditions	Test Position	① WWAN	② DTS	③ U-NII	④ BT	①+② WWAN +DTS		①+③ WWAN + U-NII		①+④ WWAN +BT	
						∑1-g SAR (mW/g)	SPLSR (Yes/ No)	∑1-g SAR (mW/g)	SPLSR (Yes/ No)	∑1-g SAR (mW/g)	SPLSR (Yes/ No)
Head	Left Touch	1044	0.379	0.364		1423	No	1408	No		
	Left Tilt	0.316	0.431	0.682		0.747	No	0.998	No		
	Right Touch	0.443	0.431	0.749		0.874	No	1.192	No		
	Right Tilt	0.332	0.431	0.749		0.763	No	1081	No		
Body-worn & Hotspot	Rear	0.663	0.305	0.382	0.210	0.968	No	1045	No	0.873	No
	Front	0.842	0.305	0.382	0.210	1.147	No	1224	No	1052	No

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because either the sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

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

RF Exposure conditions	Test Position	① WWAN	② DTS	③ U-NII	④ BT	①+② WWAN +DTS		①+③ WWAN + U-NII		①+④ WWAN +BT	
						∑1-g SAR (mW/g)	SPLSR (Yes/ No)	∑1-g SAR (mW/g)	SPLSR (Yes/ No)	∑1-g SAR (mW/g)	SPLSR (Yes/ No)
Head	Left Touch	0.970	0.379	0.364		1349	No	1334	No		
	Left Tilt	0.372	0.431	0.682		0.803	No	1054	No		
	Right Touch	0.381	0.431	0.749		0.812	No	1130	No		
	Right Tilt	0.422	0.431	0.749		0.853	No	1171	No		
Body-worn & Hotspot	Rear	0.686	0.305	0.382	0.210	0.991	No	1068	No	0.896	No
	Front	0.732	0.305	0.382	0.210	1037	No	1114	No	0.942	No

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because either the sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

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

RF Exposure conditions	Test Position	① WWAN	② DTS	③ U-NII	④ BT	①+② WWAN +DTS		①+③ WWAN + U-NII		①+④ WWAN +BT	
						∑1-g SAR (mW/g)	SPLSR (Yes/ No)	∑1-g SAR (mW/g)	SPLSR (Yes/ No)	∑1-g SAR (mW/g)	SPLSR (Yes/ No)
Head	Left Touch	0.368	0.379	0.364		0.747	No	0.732	No		
	Left Tilt	0.323	0.431	0.682		0.754	No	1005	No		
	Right Touch	0.529	0.431	0.749		0.960	No	1278	No		
	Right Tilt	0.350	0.431	0.749		0.781	No	1099	No		
Body-worn & Hotspot	Rear	0.555	0.305	0.382	0.210	0.860	No	0.937	No	0.765	No
	Front	0.748	0.305	0.382	0.210	1053	No	1130	No	0.958	No
Hotspot	Edge 2	0.487	0.305	0.382		0.792	No	0.869	No		

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because either the sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

12.10. Sum of the SAR for LTE Band 12 & Wi-Fi & BT

RF Exposure conditions	Test Position	① WWAN	② DTS	③ U-NII	④ BT	①+② WWAN +DTS		①+③ WWAN + U-NII		①+④ WWAN +BT	
						∑1-g SAR (mW/g)	SPLSR (Yes/ No)	∑1-g SAR (mW/g)	SPLSR (Yes/ No)	∑1-g SAR (mW/g)	SPLSR (Yes/ No)
Head	Left Touch	0.174	0.379	0.364		0.553	No	0.538	No		
	Left Tilt	0.108	0.431	0.682		0.539	No	0.790	No		
	Right Touch	0.223	0.431	0.749		0.654	No	0.972	No		
	Right Tilt	0.105	0.431	0.749		0.536	No	0.854	No		
Body-worn & Hotspot	Rear	0.285	0.305	0.382	0.210	0.590	No	0.667	No	0.495	No
	Front	0.423	0.305	0.382	0.210	0.728	No	0.805	No	0.633	No
Hotspot	Edge 2	0.328	0.305	0.382		0.633	No	0.710	No		

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because either the sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

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

RF Exposure conditions	Test Position	① WWAN	② DTS	③ U-NII	④ BT	①+② WWAN +DTS		①+③ WWAN + U-NII		①+④ WWAN +BT	
						∑1-g SAR (mW/g)	SPLSR (Yes/ No)	∑1-g SAR (mW/g)	SPLSR (Yes/ No)	∑1-g SAR (mW/g)	SPLSR (Yes/ No)
Head	Left Touch	0.264	0.379	0.364		0.643	No	0.628	No		
	Left Tilt	0.177	0.431	0.682		0.608	No	0.859	No		
	Right Touch	0.354	0.431	0.749		0.785	No	1.103	No		
	Right Tilt	0.129	0.431	0.749		0.560	No	0.878	No		
Body-worn & Hotspot	Rear	0.408	0.305	0.382	0.210	0.713	No	0.790	No	0.618	No
	Front	0.552	0.305	0.382	0.210	0.857	No	0.934	No	0.762	No
Hotspot	Edge 2	0.327	0.305	0.382		0.632	No	0.709	No		

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because either the sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

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

Covered by LTE Band 12 (refer to Section 12.10.) due to similar frequency range, same maximum tune-up limit and same channel bandwidth.

12.13. Sum of the SAR for LTE Band 25 & Wi-Fi & BT

RF Exposure conditions	Test Position	① WWAN	② DTS	③ U-NII	④ BT	①+② WWAN +DTS		①+③ WWAN + U-NII		①+④ WWAN +BT	
						∑1-g SAR (mW/g)	SPLSR (Yes/ No)	∑1-g SAR (mW/g)	SPLSR (Yes/ No)	∑1-g SAR (mW/g)	SPLSR (Yes/ No)
Head	Left Touch	1.100	0.379	0.364		1.479	No	1.464	No		
	Left Tilt	0.354	0.431	0.682		0.785	No	1.036	No		
	Right Touch	0.517	0.431	0.749		0.948	No	1.266	No		
	Right Tilt	0.379	0.431	0.749		0.810	No	1.128	No		
Body-worn & Hotspot	Rear	0.722	0.305	0.382	0.210	1.027	No	1.104	No	0.932	No
	Front	0.769	0.305	0.382	0.210	1.074	No	1.151	No	0.979	No

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because either the sum of the 1-g SAR is < 1.6 W/kg or the SPLSR is < 0.04 for all circumstances that require SPLSR calculation.

Appendixes

Refer to separated files for the following appendixes.

A_15I20405v0 SAR Photos & Ant. Locations

B_15I20405v0 SAR System Check Plots

C_15I20405v0 SAR Highest Test Plots

D_15I20405v0 SAR Tissue Ingredients

E_15I20405v0 SAR Probe Cal. Certificates

F_15I20405v0 SAR Dipole Cal. Certificates

END OF REPORT