SAR EVALUATION REPORT

FCC 47 CFR § 2.1093
IEEE Std 1528-2013

For
CDMA/LTE Phone + Bluetooth and DTS b/g/n

FCC ID: ZNFUS550
Model Name: LG-US550, US550, LGUS550

Report Number: 14I19592-S1A
Issue Date: 1/27/2015

Prepared for
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Date	Revisions	Revised By
--	1/5/2015	Initial Issue	--
A	1/27/2015	Section 1: Updated Highest Reported SAR for Licensed Section 10.2.1: Updated Tune-up Limit for CDMA BC1 Section 12.1: Updated Sum of the SAR Table Appendix B: Updated Highest SAR Test Plots	Coltyce Sanders

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1. Attestation of Test Results

Applicant Name	LG ELECTRONICS MOBILECOMM U.S.A., INC.			
FCC ID	ZNFUS550			
Model Name	LG-US550, US550, LGUS550			
Applicable Standards	FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Standard 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**	**DSS (BT)**
Head	1.122	0.276	N/A	N/A
Body-worn	1.281	0.062		
Hotspot/Wi-Fi Direct				
Simultaneous TX	1.398			
Date Tested	12/8/2014 to 1/5/2015			
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:
	
Devin Chang Senior Engineer UL Verification Services Inc.	Nathan Sousa Laboratory Engineer 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 SAR meas for 802.11 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 D06 Hotspot Mode v02

3. Facilities and Accreditation

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

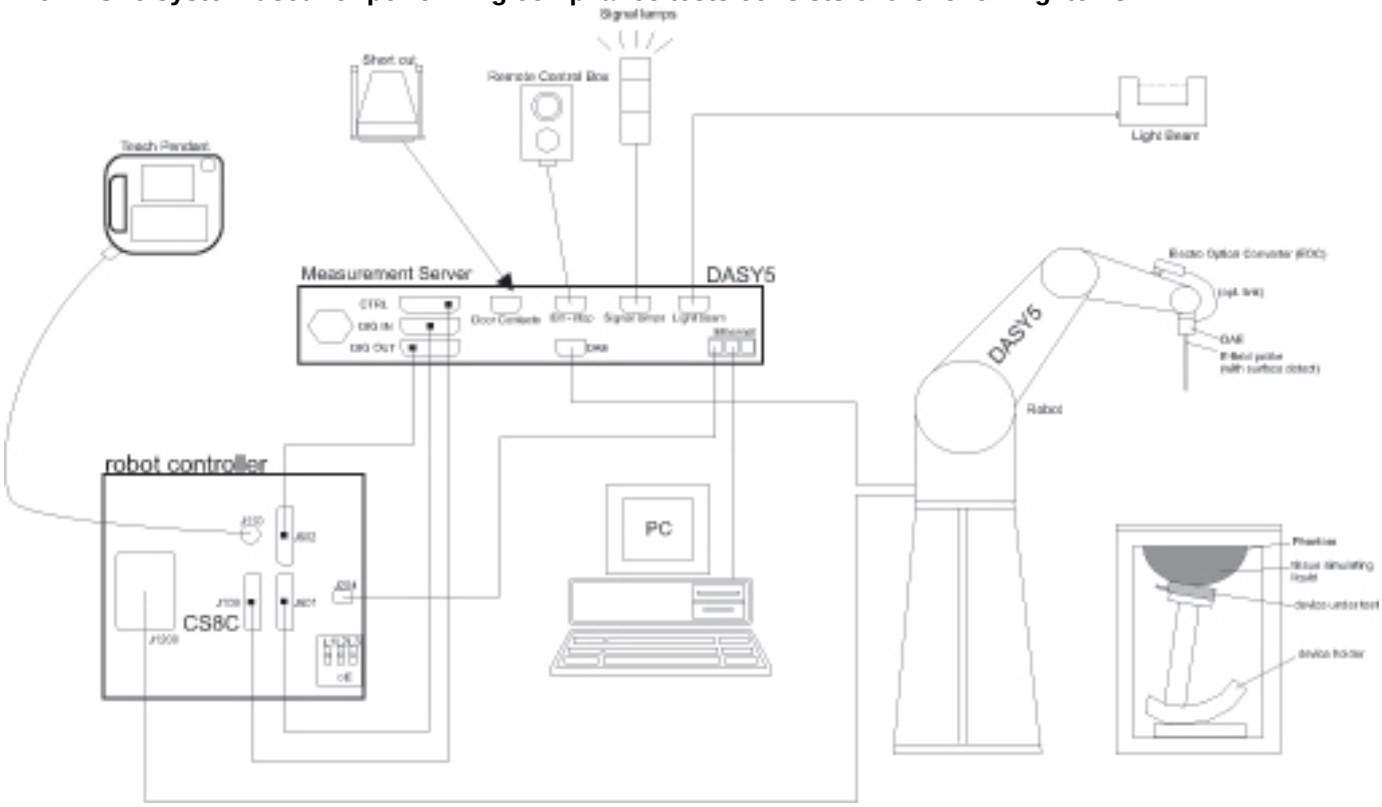
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	SAR Lab 5
SAR Lab F	
SAR Lab G	
SAR Lab H	

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0.

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	4242	122529163	10/8/2015
Thermometer	EXTECH	445703	CCS-200	3/24/2015

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
HP Signal Generator	HP	8665B	3546A00784	6/23/2015
Power Meter	HP	437B	3125U09516	10/6/2015
Power Meter	Agilent	N1911A	MY53060016	8/7/2015
Power Sensor	Agilent	E9323A	MY53070003	5/1/2015
Power Sensor	Agilent	8481A	3318A95392	10/6/2015
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1622052	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2711	N/A
DC Power Supply	Sorensen Ametek	XT20-3	1318A00530	N/A
Synthesized Signal Generator	Agilent	8665B	3438A00633	7/10/2015
Power Meter	HP	437B	3125U11347	8/27/2015
Power Meter	HP	437B	3125U16345	6/16/2015
Power Sensor	HP	8481A	2702A60780	6/16/2015
Power Sensor	HP	8481A	1926A16917	10/10/2015
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1808938	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2710	N/A
DC Power Supply	HP	6296A	2841A-05955	N/A
E-Field Probe (SAR 1)	SPEAG	EX3DV4	3902	5/19/2015
E-Field Probe (SAR 2)	SPEAG	EX3DV3	3871	8/26/2015
E-Field Probe (SAR 3)	SPEAG	EX3DV4	3773	4/22/2015
E-Field Probe (SAR 4)	SPEAG	EX3DV4	3929	5/9/2015
Data Acquisition Electronics (SAR 1)	SPEAG	DAE3	427	1/21/2015
Data Acquisition Electronics (SAR 2)	SPEAG	DAE4	1359	2/17/2015
Data Acquisition Electronics (SAR 3)	SPEAG	DAE4	1380	7/23/2015
Data Acquisition Electronics (SAR 4)	SPEAG	DAE4	1377	8/27/2015
System Validation Dipole	SPEAG	D750V3	1019	3/17/2015
System Validation Dipole	SPEAG	D835V2	4d142	9/9/2015
System Validation Dipole	SPEAG	D1750V2	1050	4/22/2015
System Validation Dipole	SPEAG	D1900V2	5d163	9/11/2015
System Validation Dipole	SPEAG	D2450V2	748	2/18/2015
Thermometer (SAR Lab 1)	EXTECH	445703	CCS-205	3/24/2015
Thermometer (SAR Lab 2)	EXTECH	445703	CCS-203	3/28/2015
Thermometer (SAR Lab 3)	EXTECH	445703	CCS-237	6/3/2015
Thermometer (SAR Lab 4)	EXTECH	445703	CCS-238	6/3/2015

Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Power Meter	Agilent	N1912A	MY53040015	7/10/2015
Power Sensor	Agilent	N1921A	MY52020011	5/6/2015
Base Station Simulator	R & S	CMW500	135393	7/3/2015
Base Station Simulator	Agilent	E5515E	GB47050526	10/7/2015

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

Model: LG-US550, US550, LGUS550	
Device Dimension	Overall (Length x Width): 133.25 mm x 66.12 mm Overall Diagonal: 143 mm Display Diagonal: 120 mm
Battery Back Cover	☒ Normal Battery Cover ☐ Normal Battery Cover with NFC ☐ Wireless Charger Battery Cover ☐ Wireless Charger Battery Cover with NFC ☐ The rechargeable battery is not user accessible.
Battery Options	☒ Standard – Lithium-ion battery, Rating 3.8Vdc, 8.0Wh ☐ Extended (large capacity) ☐ The rechargeable battery is not user accessible.
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)
Wi-Fi Direct	Wi-Fi Direct enabled devices transfer data directly between each other ☐ Wi-Fi Direct (Wi-Fi 2.4 GHz)

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle used for SAR testing
CDMA2000	BC0 BC1	1xRTT (Voice & Data) 1xEV-DO Rel. 0 1xEV-DO Rev. A	100%
	Does this device SV-DO (1xRTT-1xEVDO)? ☐Yes ☒ No		
LTE (FDD)	Band 2 Band 4 Band 5 Band 12 Band 17 Band 25	QPSK 16QAM	100%
	Does this device SV-LTE (1xRTT-LTE)? ☐Yes ☒ No		
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20)	100%
Bluetooth	2.4 GHz	Version 4.0 LE	77.5% (DH5)

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 no more than 2 dBs lower than the maximum tune-up tolerance limit

Upper limit (dB): -1.5 ~ 0.5		RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
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	23.2	**23.7**
LTE Band 4	QPSK	23.2	**23.7**
LTE Band 5	QPSK	23.2	**23.7**
LTE Band 12	QPSK	23.2	**23.7**
LTE Band 17	QPSK	23.2	**23.7**
LTE Band 25	QPSK	23.2	**23.7**

Upper limit (dB): -1.0 ~ 1.0		RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit
WiFi 2.4 GHz	802.11b	14.5	**15.5**
	802.11g	11.0	**12.0**
	802.11n HT20	10.0	**11.0**
Bluetooth		8.5	**9.5**
Bluetooth LE		0.0	**1.0**

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		
	Mid	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5		
	High	20300/ 1745	20325/ 1747.5	20350/ 1750	20375/ 1752.5		
	Band 5	Frequency range: 824 - 849 MHz					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low			20450/ 829	20425/ 826.5	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: 824 - 849 MHz					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low			23060/ 704	23035/ 701.5		
	Mid			23095/ 707.5	23095/ 707.5		
	High			23130/ 711	23155/ 713.5		
	Band 17	Frequency range: 704 - 716 MHz					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low				23755/ 706.5		
	Mid			23790/ 710	23790/ 710		
	High				23825/ 713.5		
	Band 25	Frequency range: 1850 - 1915 MHz					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low				26065/ 1852.5		
	Mid				26365/ 1882.5		
	High				26665/ 1912.5		
LTE transmitter and antenna implementation	LTE has two (2) TX/RX antennas and two (2) RX antennas. Refer to Appendix A.						

General LTE SAR Test and Reporting Considerations (Continued)

<table>
<tr><td>Maximum power reduction (MPR)</td><td>
Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3
<table>
<tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (RB)</th><th rowspan="2">MPR (dB)</th></tr>
<tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr>
<tr><td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 2</td></tr>
</table>
MPR Built-in by design
A-MPR (additional MPR) was disabled during SAR testing
</td></tr>
<tr><td>Power reduction</td><td>No</td></tr>
<tr><td>Spectrum plots for RB configurations</td><td>A properly configured base station simulator was used for the SAR and power measurements; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.</td></tr>
</table>

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 (Antenna 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	10 mm	Rear	N/A	Yes	2
			Front	N/A	Yes	2
	Hotspot	10 mm	Rear	N/A	Yes	
			Front	N/A	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	No	1
WWAN (Antenna 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	10 mm	Rear	N/A	Yes	2
			Front	N/A	Yes	2
	Hotspot	10 mm	Rear	N/A	Yes	
			Front	N/A	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 (Antenna 5)	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	10 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	Yes	
			Edge 2 (Right)	> 25 mm	No	1
			Edge 3 (Bottom)	> 25 mm	No	1
			Edge 4 (Left)	< 25 mm	Yes	

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 Standard 1528-2013

Refer to Table 3 within the IEEE Standard 1528-2013

Dielectric Property Measurements Results:

SAR Lab 1

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
12/11/2014	Head 2450	e'	39.3700	Relative Permittivity (ϵ_r):	39.37	39.20	0.43	5
		e''	13.0000	Conductivity (σ):	1.77	1.80	-1.61	5
	Head 2410	e'	39.5600	Relative Permittivity (ϵ_r):	39.56	39.28	0.72	5
		e''	12.9000	Conductivity (σ):	1.73	1.76	-1.81	5
	Head 2475	e'	39.3100	Relative Permittivity (ϵ_r):	39.31	39.17	0.36	5
		e''	13.0700	Conductivity (σ):	1.80	1.83	-1.55	5
12/11/2014	Body 2450	e'	50.7600	Relative Permittivity (ϵ_r):	50.76	52.70	-3.68	5
		e''	14.2800	Conductivity (σ):	1.95	1.95	-0.24	5
	Body 2410	e'	50.9300	Relative Permittivity (ϵ_r):	50.93	52.76	-3.47	5
		e''	14.1800	Conductivity (σ):	1.90	1.91	-0.38	5
	Body 2475	e'	50.6700	Relative Permittivity (ϵ_r):	50.67	52.67	-3.79	5
		e''	14.4400	Conductivity (σ):	1.99	1.99	0.10	5
12/15/2014	Head 750	e'	41.4900	Relative Permittivity (ϵ_r):	41.49	41.96	-1.12	5
		e''	22.2500	Conductivity (σ):	0.93	0.89	3.90	5
	Head 700	e'	42.0900	Relative Permittivity (ϵ_r):	42.09	42.22	-0.30	5
		e''	22.6900	Conductivity (σ):	0.88	0.89	-0.68	5
	Head 725	e'	41.7700	Relative Permittivity (ϵ_r):	41.77	42.09	-0.76	5
		e''	22.5200	Conductivity (σ):	0.91	0.89	1.87	5
12/15/2014	Body 750	e'	53.2900	Relative Permittivity (ϵ_r):	53.29	55.55	-4.06	5
		e''	23.2600	Conductivity (σ):	0.97	0.96	0.72	5
	Body 700	e'	53.8300	Relative Permittivity (ϵ_r):	53.83	55.74	-3.42	5
		e''	23.7300	Conductivity (σ):	0.92	0.96	-3.71	5
	Body 725	e'	53.4800	Relative Permittivity (ϵ_r):	53.48	55.64	-3.89	5
		e''	23.4400	Conductivity (σ):	0.94	0.96	-1.69	5

SAR Lab 2

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
12/13/2014	Head 1750	e'	38.4900	Relative Permittivity (ϵ_r):	38.49	40.08	-3.98	5
		e''	13.7800	Conductivity (σ):	1.34	1.37	-2.05	5
	Head 1710	e'	38.6900	Relative Permittivity (ϵ_r):	38.69	40.15	-3.63	5
		e''	13.7000	Conductivity (σ):	1.30	1.35	-3.25	5
	Head 1755	e'	38.4500	Relative Permittivity (ϵ_r):	38.45	40.08	-4.06	5
		e''	13.8000	Conductivity (σ):	1.35	1.37	-1.83	5
12/13/2014	Body 1750	e'	51.1800	Relative Permittivity (ϵ_r):	51.18	53.44	-4.23	5
		e''	15.1200	Conductivity (σ):	1.47	1.49	-1.00	5
	Body 1710	e'	51.3700	Relative Permittivity (ϵ_r):	51.37	53.54	-4.06	5
		e''	15.0100	Conductivity (σ):	1.43	1.46	-2.35	5
	Body 1755	e'	51.1700	Relative Permittivity (ϵ_r):	51.17	53.43	-4.23	5
		e''	15.1100	Conductivity (σ):	1.47	1.49	-0.99	5
1/5/2015	Head 1750	e'	39.1400	Relative Permittivity (ϵ_r):	39.14	40.08	-2.36	5
		e''	14.2600	Conductivity (σ):	1.39	1.37	1.36	5
	Head 1710	e'	39.2900	Relative Permittivity (ϵ_r):	39.29	40.15	-2.13	5
		e''	14.1900	Conductivity (σ):	1.35	1.35	0.21	5
	Head 1755	e'	39.0900	Relative Permittivity (ϵ_r):	39.09	40.08	-2.46	5
		e''	14.2300	Conductivity (σ):	1.39	1.37	1.23	5
1/5/2015	Body 1750	e'	51.0100	Relative Permittivity (ϵ_r):	51.01	53.44	-4.55	5
		e''	15.5000	Conductivity (σ):	1.51	1.49	1.49	5
	Body 1710	e'	51.1200	Relative Permittivity (ϵ_r):	51.12	53.54	-4.53	5
		e''	15.4200	Conductivity (σ):	1.47	1.46	0.32	5
	Body 1755	e'	51.0100	Relative Permittivity (ϵ_r):	51.01	53.43	-4.53	5
		e''	15.4900	Conductivity (σ):	1.51	1.49	1.50	5

SAR Lab 3

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
12/11/2014	Head 835	e'	40.5100	Relative Permittivity (ϵ_r):	40.51	41.50	-2.39	5
		e''	19.6300	Conductivity (σ):	0.91	0.90	1.27	5
	Head 820	e'	40.7700	Relative Permittivity (ϵ_r):	40.77	41.60	-2.00	5
		e''	19.6400	Conductivity (σ):	0.90	0.90	-0.33	5
	Head 850	e'	40.3700	Relative Permittivity (ϵ_r):	40.37	41.50	-2.72	5
		e''	19.5900	Conductivity (σ):	0.93	0.92	1.19	5
12/11/2014	Body 835	e'	52.9000	Relative Permittivity (ϵ_r):	52.90	55.20	-4.17	5
		e''	21.8100	Conductivity (σ):	1.01	0.97	4.39	5
	Body 820	e'	53.1700	Relative Permittivity (ϵ_r):	53.17	55.28	-3.81	5
		e''	21.9500	Conductivity (σ):	1.00	0.97	3.34	5
	Body 850	e'	52.7700	Relative Permittivity (ϵ_r):	52.77	55.16	-4.33	5
		e''	21.8800	Conductivity (σ):	1.03	0.99	4.76	5

SAR Lab 4

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
12/11/2014	Head 1900	e'	40.3200	Relative Permittivity (ϵ_r):	40.32	40.00	0.80	5
		e''	13.0800	Conductivity (σ):	1.38	1.40	-1.30	5
	Head 1850	e'	40.4700	Relative Permittivity (ϵ_r):	40.47	40.00	1.18	5
		e''	12.9700	Conductivity (σ):	1.33	1.40	-4.70	5
	Head 1910	e'	40.2800	Relative Permittivity (ϵ_r):	40.28	40.00	0.70	5
		e''	13.0800	Conductivity (σ):	1.39	1.40	-0.78	5
12/11/2014	Body 1900	e'	52.0400	Relative Permittivity (ϵ_r):	52.04	53.30	-2.36	5
		e''	14.4100	Conductivity (σ):	1.52	1.52	0.16	5
	Body 1850	e'	52.2200	Relative Permittivity (ϵ_r):	52.22	53.30	-2.03	5
		e''	14.2300	Conductivity (σ):	1.46	1.52	-3.70	5
	Body 1910	e'	52.0400	Relative Permittivity (ϵ_r):	52.04	53.30	-2.36	5
		e''	14.3600	Conductivity (σ):	1.53	1.52	0.33	5
12/15/2014	Head 1900	e'	38.7600	Relative Permittivity (ϵ_r):	38.76	40.00	-3.10	5
		e''	13.2400	Conductivity (σ):	1.40	1.40	-0.09	5
	Head 1850	e'	39.0400	Relative Permittivity (ϵ_r):	39.04	40.00	-2.40	5
		e''	13.1200	Conductivity (σ):	1.35	1.40	-3.60	5
	Head 1910	e'	38.7500	Relative Permittivity (ϵ_r):	38.75	40.00	-3.13	5
		e''	13.2600	Conductivity (σ):	1.41	1.40	0.59	5
12/15/2014	Body 1900	e'	51.7300	Relative Permittivity (ϵ_r):	51.73	53.30	-2.95	5
		e''	14.3600	Conductivity (σ):	1.52	1.52	-0.19	5
	Body 1850	e'	52.0100	Relative Permittivity (ϵ_r):	52.01	53.30	-2.42	5
		e''	14.2200	Conductivity (σ):	1.46	1.52	-3.77	5
	Body 1910	e'	51.7500	Relative Permittivity (ϵ_r):	51.75	53.30	-2.91	5
		e''	14.3400	Conductivity (σ):	1.52	1.52	0.19	5
12/16/2014	Head 835	e'	42.1300	Relative Permittivity (ϵ_r):	42.13	41.50	1.52	5
		e''	19.6100	Conductivity (σ):	0.91	0.90	1.16	5
	Head 820	e'	42.2500	Relative Permittivity (ϵ_r):	42.25	41.60	1.56	5
		e''	19.7700	Conductivity (σ):	0.90	0.90	0.33	5
	Head 850	e'	41.9300	Relative Permittivity (ϵ_r):	41.93	41.50	1.04	5
		e''	19.6300	Conductivity (σ):	0.93	0.92	1.40	5
12/16/2014	Body 835	e'	53.3500	Relative Permittivity (ϵ_r):	53.35	55.20	-3.35	5
		e''	21.6000	Conductivity (σ):	1.00	0.97	3.39	5
	Body 820	e'	53.4200	Relative Permittivity (ϵ_r):	53.42	55.28	-3.36	5
		e''	21.7800	Conductivity (σ):	0.99	0.97	2.54	5
	Body 850	e'	53.2000	Relative Permittivity (ϵ_r):	53.20	55.16	-3.55	5
		e''	21.5200	Conductivity (σ):	1.02	0.99	3.03	5

SAR Lab 4 continued

Date	Freq. (MHz)	Liquid Parameters				Target	Delta (%)	Limit ±(%)
12/18/2014	Head 1900	e'	39.5900	Relative Permittivity (ϵ_r):	39.59	40.00	-1.02	5
		e''	13.1100	Conductivity (σ):	1.39	1.40	-1.07	5
	Head 1850	e'	39.8100	Relative Permittivity (ϵ_r):	39.81	40.00	-0.47	5
		e''	13.0100	Conductivity (σ):	1.34	1.40	-4.41	5
	Head 1910	e'	39.5500	Relative Permittivity (ϵ_r):	39.55	40.00	-1.13	5
		e''	13.1900	Conductivity (σ):	1.40	1.40	0.06	5
12/18/2014	Body 1900	e'	51.8500	Relative Permittivity (ϵ_r):	51.85	53.30	-2.72	5
		e''	14.3700	Conductivity (σ):	1.52	1.52	-0.12	5
	Body 1850	e'	52.0700	Relative Permittivity (ϵ_r):	52.07	53.30	-2.31	5
		e''	14.2500	Conductivity (σ):	1.47	1.52	-3.56	5
	Body 1910	e'	51.8400	Relative Permittivity (ϵ_r):	51.84	53.30	-2.74	5
		e''	14.4300	Conductivity (σ):	1.53	1.52	0.82	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	1019	3/17/2014	750	1g	8.21	8.64
				10g	5.38	5.69
D835V2	4d142	9/9/2014	835	1g	8.91	9.22
				10g	5.77	6.05
D1750V2	1050	4/22/2014	1750	1g	36.6	37.2
				10g	19.4	20.0
D1900V2	5d163	9/11/2014	1900	1g	40.8	40.6
				10g	21.2	21.4
D2450V2	748	2/18/2014	2450	1g	51.6	50.7
				10g	24.0	23.7

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 1

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			
12/11/2014	D2450V2	748	Head	1g	5.23	52.30	51.60	1.36	
				10g	2.35	23.50	24.00	-2.08	
12/11/2014	D2450V2	748	Body	1g	5.29	52.90	50.70	**4.34**	1, 2
				10g	2.43	24.30	23.70	2.53	
12/15/2014	D750V3	1019	Head	1g	0.767	7.67	8.21	**-6.58**	3, 4
				10g	0.501	5.01	5.38	-6.88	
12/15/2014	D750V3	1019	Body	1g	0.870	8.70	8.64	0.69	
				10g	0.581	5.81	5.69	2.11	

SAR Lab 2

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			
12/13/2014	D1750V2	1050	Head	1g	3.44	34.40	36.60	**-6.01**	5, 6
				10g	1.83	18.30	19.40	-5.67	
12/13/2014	D1750V2	1050	Body	1g	3.70	37.00	37.20	-0.54	
				10g	1.98	19.80	20.00	-1.00	
1/5/2015	D1750V2	1050	Head	1g	3.64	36.4	36.60	-0.55	
				10g	1.91	19.1	19.40	-1.55	
1/5/2015	D1750V2	1050	Body	1g	3.67	36.7	37.20	-1.34	
				10g	1.96	19.6	20.00	-2.00	

SAR Lab 3

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			
12/11/2014	D835V2	4d142	Head	1g	0.906	9.06	8.91	**1.68**	7, 8
				10g	0.593	5.93	5.77	2.77	
12/11/2014	D835V2	4d142	Body	1g	0.933	9.33	9.22	1.19	
				10g	0.614	6.14	6.05	1.49	

SAR Lab 4

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			
12/11/2014	D1900V2	5d163	Head	1g	3.99	39.9	40.8	-2.21	
				10g	2.06	20.6	21.2	-2.83	
12/11/2014	D1900V2	5d163	Body	1g	3.90	39.0	40.6	-3.94	
				10g	2.02	20.2	21.4	-5.61	
12/15/2014	D1900V2	5d163	Head	1g	4.04	40.4	40.8	-0.98	
				10g	2.09	20.9	21.2	-1.42	
12/15/2014	D1900V2	5d163	Body	1g	3.86	38.6	40.6	**-4.93**	9, 10
				10g	2.01	20.1	21.4	-6.07	
12/16/2014	D835V2	4d142	Head	1g	0.927	9.27	8.91	**4.04**	11, 12
				10g	0.608	6.08	5.77	5.37	
12/16/2014	D835V2	4d142	Body	1g	0.940	9.40	9.22	1.95	
				10g	0.615	6.15	6.05	1.65	
12/18/2014	D1900V2	5d163	Head	1g	4.05	40.50	40.8	-0.74	
				10g	2.10	21.00	21.2	-0.94	
12/18/2014	D1900V2	5d163	Body	1g	3.90	39.00	40.60	-3.94	
				10g	2.02	20.20	21.40	-5.61	

9. Conducted Output Power Measurements

9.1. CDMA

Measured Results

Band	Mode		Ch No.	Freq. (MHz)	Avg Pwr (dBm)
BC 0	1xRTT	RC1 SO55 (Loopback)	1013	824.70	24.6
			384	836.52	24.5
			777	848.31	24.5
		RC3 SO55 (Loopback)	1013	824.70	24.6
			384	836.52	24.4
			777	848.31	24.5
		RC3 SO32 (+F-SCH)	1013	824.70	24.5
			384	836.52	24.4
			777	848.31	24.5
	1xEVDO Rel. 0	FTAP Rate: 307.2 kbps(2 slot, QPSK) RTAP Rate: 153.6 kbps	1013	824.70	24.0
			384	836.52	23.9
			777	848.31	24.0
	1xEVDO Rev. A	FETAP: 307.2k, QPSK/ ACK RETAP: 4096	1013	824.70	24.0
			384	836.52	23.8
			777	848.31	23.9
Band	Mode		Ch No.	Freq. (MHz)	Avg Pwr (dBm)
BC 1	1xRTT	RC1 SO55 (Loopback)	25	1851.25	24.7
			600	1880.00	24.7
			1175	1908.75	24.7
		RC3 SO55 (Loopback)	25	1851.25	24.7
			600	1880.00	24.7
			1175	1908.75	24.7
		RC3 SO32 (+F-SCH)	25	1851.25	24.7
			600	1880.00	24.7
			1175	1908.75	24.7
	1xEVDO Rel. 0	FTAP Rate: 307.2 kbps(2 slot, QPSK) RTAP Rate: 153.6 kbps	25	1851.25	24.0
			600	1880.00	24.2
			1175	1908.75	24.2
	1xEVDO Rev. A	FETAP: 307.2k, QPSK/ ACK RETAP: 4096	25	1851.25	24.0
			600	1880.00	24.2
			1175	1908.75	24.2

9.2. LTE

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

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

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

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

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

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

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	NA
NS_03	6.6.2.2.1	2, 4,10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10,15,20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	n/a
NS_07	6.6.2.2.3 6.6.3.3.2	13	10	Table 6.2.4-2	Table 6.2.4-2
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23[1]	1.4, 3, 5, 10	Table 6.2.4-5	Table 6.2.4-5
..					
NS_32	-	-	-	-	-
Note 1: Applies to the lower block of Band 23, i.e. a carrier placed in the 2000-2010 MHz region.					

LTE Band 2 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1860 MHz	1880 MHz	1900 MHz
LTE Band 2	20	QPSK	1	0	0	0	23.5	23.3	23.3
			1	50	0	0	23.3	23.0	23.3
			1	99	0	0	23.3	23.2	23.3
			50	0	1	1	22.3	22.4	22.1
			50	25	1	1	22.2	22.3	22.1
			50	50	1	1	22.2	22.3	22.1
			100	0	1	1	22.3	22.4	22.1
		16QAM	1	0	1	1	21.9	22.0	22.2
			1	50	1	1	22.0	21.9	21.9
			1	99	1	1	21.8	22.0	21.9
			50	0	2	2	21.2	21.2	21.2
			50	25	2	2	21.1	21.4	21.2
			50	50	2	2	21.2	21.3	21.2
			100	0	2	2	21.3	21.2	21.2
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1857.5 MHz	1880 MHz	1902.5 MHz
LTE Band 2	15	QPSK	1	0	0	0	23.3	23.3	23.2
			1	36	0	0	23.3	23.4	23.3
			1	74	0	0	23.3	23.2	23.2
			36	0	1	1	22.2	22.2	22.2
			36	18	1	1	22.2	22.3	22.1
			36	37	1	1	22.1	22.4	22.2
			75	0	1	1	22.2	22.3	22.2
		16QAM	1	0	1	1	22.2	22.2	22.1
			1	36	1	1	22.0	22.3	22.1
			1	74	1	1	22.2	22.3	22.1
			36	0	2	2	21.2	21.5	21.2
			36	18	2	2	21.2	21.2	21.2
			36	37	2	2	21.2	21.2	21.2
			75	0	2	2	21.2	21.4	21.2
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1855 MHz	1880 MHz	1905 MHz
LTE Band 2	10	QPSK	1	0	0	0	23.3	23.2	23.3
			1	25	0	0	23.2	23.3	23.4
			1	49	0	0	23.2	23.3	23.2
			25	0	1	1	22.3	22.4	22.2
			25	12	1	1	22.2	22.4	22.2
			25	25	1	1	22.2	22.4	22.2
			50	0	1	1	22.2	22.4	22.2
		16QAM	1	0	1	1	22.2	22.1	22.3
			1	25	1	1	22.2	22.7	22.2
			1	49	1	1	22.4	22.4	22.3
			25	0	2	2	21.3	21.4	21.2
			25	12	2	2	21.4	21.4	21.2
			25	25	2	2	21.3	21.3	21.2
			50	0	2	2	21.2	21.2	21.2

LTE Band 2 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1852.5 MHz	1880 MHz	1907.5 MHz
LTE Band 2	5	QPSK	1	0	0	1	23.2	23.1	23.1
			1	12	0	0	23.2	23.7	23.2
			1	24	0	1	23.1	22.9	23.0
			12	0	1	1	22.2	22.3	22.1
			12	6	1	1	22.2	22.3	22.1
			12	11	1	1	22.3	22.3	22.2
			25	0	1	1	22.2	22.4	22.2
		16QAM	1	0	1	1	21.7	22.5	22.6
			1	12	1	1	21.7	22.1	22.3
			1	24	1	1	21.7	22.6	21.8
			12	0	2	2	21.1	21.4	21.4
			12	6	2	2	21.2	21.4	21.0
			12	11	2	2	21.2	21.4	21.3
			25	0	2	2	21.4	21.4	21.4
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1851.5 MHz	1880 MHz	1908.5 MHz
LTE Band 2	3	QPSK	1	0	0	0	23.1	23.2	23.1
			1	7	0	0	23.6	23.4	23.2
			1	14	0	0	23.2	23.2	23.2
			8	0	1	1	22.2	22.3	22.2
			8	4	1	1	22.3	22.4	22.1
			8	7	1	1	22.3	22.4	22.2
			15	0	1	1	22.3	22.3	22.2
		16QAM	1	0	1	1	22.1	22.1	22.7
			1	7	1	1	22.2	22.4	22.5
			1	14	1	1	22.2	22.5	22.3
			8	0	2	2	21.1	21.5	21.5
			8	4	2	2	21.4	21.3	21.2
			8	7	2	2	21.2	21.1	21.2
			15	0	2	2	21.1	21.7	21.2
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1850.7 MHz	1880 MHz	1909.3 MHz
LTE Band 2	1.4	QPSK	1	0	0	0	23.0	23.1	23.0
			1	2	0	0	23.1	23.3	23.3
			1	5	0	0	23.1	23.0	23.0
			3	0	0	0	23.1	23.3	23.3
			3	1	0	0	23.1	23.3	23.2
			3	2	0	0	23.1	23.2	23.3
			6	0	1	1	22.1	22.3	22.2
		16QAM	1	0	1	1	22.6	22.6	22.4
			1	2	1	1	22.7	22.7	22.7
			1	5	1	1	22.4	22.1	22.3
			3	0	1	1	22.0	21.7	21.7
			3	1	1	1	22.2	21.7	21.7
			3	2	1	2	21.7	21.7	21.7
			6	0	2	2	21.3	21.7	21.3

LTE Band 4 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1720 MHz	1732.5 MHz	1745 MHz
LTE Band 4	20	QPSK	1	0	0	0	23.4	23.7	23.4
			1	49	0	0	23.7	23.7	23.4
			1	99	0	0	23.2	23.4	23.4
			50	0	1	1	22.5	22.6	22.4
			50	24	1	1	22.4	22.4	22.3
			50	50	1	1	22.3	22.3	22.3
			100	0	1	1	22.3	22.4	22.3
		16QAM	1	0	1	1	22.0	21.7	22.4
			1	49	1	1	22.0	21.6	22.4
			1	99	1	1	21.7	21.5	22.4
			50	0	2	2	21.2	21.4	21.4
			50	24	2	2	21.2	21.3	21.3
			50	50	2	2	21.2	21.2	21.3
			100	0	2	2	21.3	21.3	21.2
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1717.5 MHz	1732.5 MHz	1747.5 MHz
LTE Band 4	15	QPSK	1	0	0	0	22.9	23.0	23.2
			1	37	0	0	22.7	22.8	23.0
			1	74	0	0	22.6	22.8	23.1
			36	0	1	1	22.4	22.3	22.4
			36	20	1	1	22.3	22.2	22.3
			36	39	1	1	22.2	22.1	22.3
			75	0	1	1	22.2	22.1	22.2
		16QAM	1	0	1	1	22.5	22.4	22.0
			1	37	1	1	22.4	21.8	21.9
			1	74	1	1	21.9	21.9	21.7
			36	0	2	2	21.2	21.4	21.4
			36	20	2	2	21.1	21.3	21.2
			36	39	2	2	21.1	21.2	21.3
			75	0	2	2	21.1	21.2	21.2
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1715 MHz	1732.5 MHz	1750 MHz
LTE Band 4	10	QPSK	1	0	0	0	23.2	23.3	23.2
			1	25	0	1	23.1	23.1	23.1
			1	49	0	1	23.0	23.0	23.2
			25	0	1	1	22.2	22.2	22.5
			25	12	1	1	22.2	22.1	22.5
			25	25	1	1	22.2	22.1	22.5
			50	0	1	2	22.2	22.2	22.2
		16QAM	1	0	1	1	22.5	22.6	22.7
			1	25	1	1	22.4	22.0	22.0
			1	49	1	1	22.0	22.2	22.4
			25	0	2	3	21.1	21.1	21.2
			25	12	2	2	21.0	21.2	21.3
			25	25	2	2	21.2	21.1	21.2
			50	0	2	3	21.1	21.1	21.2

LTE Band 4 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1712.5 MHz	1732.5 MHz	1752.5 MHz
LTE Band 4	5	QPSK	1	0	0	0	23.2	23.5	23.0
			1	12	0	0	23.2	23.4	23.0
			1	24	0	0	23.0	23.2	23.0
			12	0	1	1	22.1	22.2	22.2
			12	6	1	1	22.2	22.2	22.1
			12	11	1	1	22.2	22.1	22.2
			25	0	1	1	22.2	22.2	22.2
		16QAM	1	0	1	1	22.4	22.5	22.1
			1	12	1	1	22.5	21.7	21.8
			1	24	1	1	22.4	22.3	22.1
			12	0	2	2	21.2	21.2	21.0
			12	6	2	2	21.2	21.2	21.2
			12	11	2	2	21.1	21.4	21.2
			25	0	2	2	21.2	21.1	21.3

LTE Band 5 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							829 MHz	836.5 MHz	844 MHz
LTE Band 5	10	QPSK	1	0	0	0	23.0	23.4	23.0
			1	25	0	0	23.0	23.6	23.0
			1	49	0	0	22.9	23.4	23.2
			25	0	1	2	22.0	21.9	21.9
			25	12	1	2	22.0	21.9	21.9
			25	25	1	2	22.0	21.9	21.9
			50	0	1	2	22.0	22.0	21.8
		16QAM	1	0	1	1	22.1	22.2	22.3
			1	25	1	1	22.4	22.5	22.0
			1	49	1	1	22.0	22.2	21.8
			25	0	2	2	21.0	21.2	20.8
			25	12	2	2	21.0	21.0	21.2
			25	25	2	2	21.0	21.2	21.2
			50	0	2	3	21.0	21.0	21.0
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							826.5 MHz	836.5 MHz	846.5 MHz
LTE Band 5	5	QPSK	1	0	0	0	22.9	23.2	22.9
			1	12	0	0	23.0	23.4	23.2
			1	24	0	0	22.8	23.2	22.8
			12	0	1	1	22.0	22.0	22.0
			12	6	1	1	22.0	22.1	22.0
			12	11	1	1	22.0	22.0	22.1
			25	0	1	1	21.9	22.0	21.9
		16QAM	1	0	1	1	22.2	21.8	22.1
			1	12	1	1	22.7	22.2	22.2
			1	24	1	1	22.4	22.2	22.0
			12	0	2	2	21.1	20.8	21.0
			12	6	2	2	20.9	21.0	20.9
			12	11	2	2	21.1	21.0	21.0
			25	0	2	2	21.1	21.1	21.1
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							825.5 MHz	836.5 MHz	847.5 MHz
LTE Band 5	3	QPSK	1	0	0	0	22.8	23.5	23.1
			1	7	0	0	22.9	23.5	23.3
			1	14	0	0	22.7	23.5	22.8
			8	0	1	1	22.0	22.0	22.0
			8	4	1	1	21.9	21.9	22.0
			8	7	1	2	21.9	21.9	21.9
			15	0	1	1	21.9	22.0	22.0
		16QAM	1	0	1	1	22.3	22.4	22.1
			1	7	1	1	22.1	22.7	22.2
			1	14	1	1	22.1	22.7	22.1
			8	0	2	2	21.2	21.1	21.2
			8	4	2	2	21.1	21.3	20.9
			8	7	2	2	21.1	21.3	21.0
			15	0	2	3	21.0	21.0	20.9

LTE Band 5 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							824.7 MHz	836.5 MHz	848.3 MHz
LTE Band 5	1.4	QPSK	1	0	0	0	23.2	23.3	23.2
			1	2	0	0	23.3	23.5	23.3
			1	5	0	0	23.3	23.3	23.2
			3	0	0	0	23.0	23.1	23.0
			3	1	0	0	23.1	23.0	23.1
			3	2	0	0	23.0	23.0	23.0
			6	0	1	2	21.9	22.0	21.9
		16QAM	1	0	1	1	22.6	22.4	22.6
			1	2	1	1	22.7	22.5	22.6
			1	5	1	1	22.6	22.4	22.5
			3	0	1	2	21.8	21.8	22.0
			3	1	1	2	21.8	21.7	21.9
			3	2	1	2	21.8	21.8	21.9
			6	0	2	3	20.7	20.7	20.7

LTE Band 12 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							704 MHz	707.5 MHz	711 MHz
LTE Band 12	10	QPSK	1	0	0	0	23.0	23.4	23.0
			1	25	0	0	22.9	23.6	22.9
			1	49	0	0	22.9	23.3	23.0
			25	0	1	1	22.1	22.1	22.3
			25	12	1	1	22.1	22.1	22.2
			25	25	1	1	22.1	22.1	22.2
			50	0	1	1	22.1	22.0	22.3
		16QAM	1	0	1	1	22.3	21.9	22.5
			1	25	1	1	22.5	22.4	22.5
			1	49	1	1	22.3	22.2	22.6
			25	0	2	2	21.0	21.1	21.1
			25	12	2	3	20.9	20.9	21.0
			25	25	2	2	21.2	21.0	21.0
			50	0	2	2	21.1	21.0	21.1
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							701.5 MHz	707.5 MHz	713.5 MHz
LTE Band 12	5	QPSK	1	0	0	0	22.8	23.3	22.7
			1	12	0	0	23.4	23.3	23.0
			1	24	0	0	23.0	23.0	22.9
			12	0	1	1	22.1	22.2	22.1
			12	6	1	1	22.0	22.1	22.2
			12	11	1	1	22.0	22.0	22.3
			25	0	1	1	22.0	22.0	22.1
		16QAM	1	0	1	1	22.4	22.2	22.7
			1	12	1	1	22.1	22.4	22.6
			1	24	1	1	22.2	22.4	22.5
			12	0	2	2	21.0	21.1	21.2
			12	6	2	2	20.9	21.0	21.1
			12	11	2	2	20.9	21.3	21.3
			25	0	2	2	21.1	21.3	21.3

LTE Band 17 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)
							710 MHz
LTE Band 17	10	QPSK	1	0	0	0	23.6
			1	25	0	0	23.5
			1	49	0	0	23.6
			25	0	1	1	22.2
			25	12	1	2	22.0
			25	25	1	2	22.1
			50	0	1	2	22.1
		16QAM	1	0	1	1	22.4
			1	25	1	2	22.0
			1	49	1	2	22.0
			25	0	2	2	21.4
			25	12	2	2	21.1
			25	25	2	2	21.2
			50	0	2	2	21.2
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)
							710 MHz
LTE Band 17	5	QPSK	1	0	0	0	23.3
			1	12	0	0	23.4
			1	24	0	0	23.3
			12	0	1	1	22.2
			12	6	1	1	22.1
			12	11	1	1	22.2
			25	0	1	1	22.1
		16QAM	1	0	1	1	22.6
			1	12	1	1	22.3
			1	24	1	1	22.1
			12	0	2	2	21.2
			12	6	2	2	21.1
			12	11	2	2	21.0
			25	0	2	2	21.1

Note(s):

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

LTE Band 25 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Meas. MPR	Avg Pwr (dBm)		
							1852.5 MHz	1882.5 MHz	1912.5 MHz
LTE Band 25	5	QPSK	1	0	0	0	23.2	23.3	22.8
			1	12	0	0	23.4	23.4	23.7
			1	24	0	0	23.2	23.2	23.1
			12	0	1	1	22.1	22.2	22.1
			12	6	1	1	22.0	22.2	22.0
			12	11	1	1	22.1	22.1	22.1
			25	0	1	1	22.2	22.2	22.1
		16QAM	1	0	1	1	21.8	22.6	21.9
			1	12	1	1	22.0	22.0	22.3
			1	24	1	1	22.0	21.8	22.3
			12	0	2	2	21.2	21.1	21.3
			12	6	2	2	21.1	21.3	21.0
			12	11	2	2	21.0	21.2	21.0
			25	0	2	2	21.1	21.1	21.2

9.3. Wi-Fi DTS (2.4 GHz) Band

Required Test Channels per KDB 248227 D01

Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Max Output Power (dBm)	Avg Pwr (dBm)	SAR Test (Yes/No)
2.4	802.11b	1 Mbps	1	2412	15.5	14.1	Yes
			6	**2437**		**14.4**	
			11	2462		14.4	
	802.11g	6 Mbps	1	2412	12.0	Not Required	No
			6	2437			
			11	2462			
	802.11n (HT20)	MCS0	1	2412	11.0		No
			6	2437			
			11	2462			

Note(s):

Per KDB 248227 D01 v02:

1. Output Power and SAR measurement is not required for 802.11g/n HT20 channels when the specified tune-up tolerances for 802.11g/n HT20 are lower than 802.11b by more than 1 dB and the measured SAR is ≤ 1.2 W/Kg.
2. A second channel is tested because the *reported* SAR is > 0.8 W/kg. A third channel is tested because the *reported* SAR is > 1.2 W/kg.

9.4. Bluetooth

Maximum tune-up tolerance limit is 9.50 dBm from the rated nominal maximum output power. This power level qualifies for exclusion of SAR testing.

Refer to Standalone SAR Test Exclusion Considerations Section.

10. Measured and Reported (Scaled) SAR Results

SAR Test Reduction criteria are as follows:

KDB 447498 D01 General RF Exposure Guidance:

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

- ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
- ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
- ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

KDB 648474 D04 Handset SAR:

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

KDB 941225 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.

April 2013 TCB Workshop Updates:

- LTE Band 17 is contained within Band 12. When both bands apply, band 12 SAR also covers Band 17.

KDB 248227 D01 SAR Measurements Procedures for 802.11 a/b/g Transmitters v02 (pg.6):

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. 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	24.2	0.080	0.090	
			Left Tilt	384	836.5	24.7	24.2	0.049	0.055	
			Right Touch	384	836.5	24.7	24.2	0.089	0.100	
			Right Tilt	384	836.5	24.7	24.2	0.054	0.061	
	1xEVDO (Rel. 0)	0	Left Touch	384	836.5	24.7	23.9	0.071	0.085	
			Left Tilt	384	836.5	24.7	23.9	0.039	0.047	
			Right Touch	384	836.5	24.7	23.9	0.084	**0.101**	1
			Right Tilt	384	836.5	24.7	23.9	0.052	0.063	
Body-worn & Hotspot	1xRTT (RC3 SO32)	10	Rear	384	836.5	24.7	24.3	0.192	**0.211**	2
			Front	384	836.5	24.7	24.3	0.104	0.114	
Hotspot	1xRTT (RC3 SO32)	10	Edge 2	384	836.5	24.7	24.3	0.077	0.084	
			Edge 3	384	836.5	24.7	24.3	0.069	0.076	
			Edge 4	384	836.5	24.7	24.3	0.066	0.072	

10.2. CDMA BC1

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
						Tune-up limit	Meas.	Meas.	Scaled		
Head	1xRTT (RC3 SO55)	0	Left Touch	25	1851.3	24.7	24.7	0.816	0.816		
				600	1880.0	24.7	24.7	0.936	0.936		
				1175	1908.8	24.7	24.7	0.992	0.992		
			Left Tilt	600	1880.0	24.7	24.7	0.375	0.375		
			Right Touch	600	1880.0	24.7	24.7	0.621	0.621		
			Right Tilt	600	1880.0	24.7	24.7	0.377	0.377		
	1xEVDO (Rel. 0)	0	Left Touch	25	1851.3	24.7	24.0	0.807	0.948		
				600	1880.0	24.7	24.2	0.951	1.067		
				1175	1908.8	24.7	24.2	1.000	**1.122**	3	
			Left Tilt	600	1880.0	24.7	24.2	0.354	0.397		
			Right Touch	600	1880.0	24.7	24.2	0.686	0.770		
			Right Tilt	600	1880.0	24.7	24.2	0.383	0.430		
Body-worn & Hotspot	1xRTT (RC3 SO32)	10	Rear	25	1851.3	24.7	24.7	1.200	1.200		
				600	1880.0	24.7	24.7	1.240	1.240		
				1175	1908.8	24.7	24.7	1.280	**1.280**	4	1
			Front	25	1851.3	24.7	24.7	1.010	1.010		
				600	1880.0	24.7	24.7	1.010	1.010		
				1175	1908.8	24.7	24.7	1.020	1.020		
Hotspot	1xRTT (RC3 SO32)	10	Edge 3	600	1880.0	24.7	24.7	0.587	0.587		
			Edge 4	1175	1908.8	24.7	24.7	0.709	0.709		

Note(s):

Per KDB 941225 D01:

1. If SAR for the primary mode is > 1.2 W/kg, SAR is adjusted accordingly to determine exclusion for the secondary modes:

   Highest Reported SAR * ((Max Tune-up for Primary in mW) / (Max Tune-up for Secondary in mW))

   If the adjusted SAR is > 1.2 W/kg, SAR is required for the secondary mode for the position whose SAR is > 1.2 W/kg.

10.2.1. Additional Tests for CDMA BC1

RF Exposure Conditions	Dist. (mm)	Mode	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Body	10	1xRTT (RC1 SO55)	Rear	25	1851.25	24.7	24.7	1.050	1.050	
				600	1880.00	24.7	24.7	1.040	1.040	
				1175	1908.75	24.7	24.7	1.070	1.070	
Body & Hotspot	10	1xEVDO (Rel. 0)	Rear	25	1851.25	24.7	24.0	1.090	**1.281**	5
				600	1880.00	24.7	24.2	1.070	1.201	
				1175	1908.75	24.7	24.2	1.070	1.201	
Body & Hotspot	10	1xEVDO (Rel. A)	Rear	25	1851.25	24.7	24.0	1.090	**1.281**	6
				600	1880.00	24.7	24.2	1.080	1.212	
				1175	1908.75	24.7	24.2	1.080	1.212	

Note(s):

- Since the DUT supports 1xEV-DO, the same SAR adjustment is required to determine exclusion for 1xEV-DO.

10.3. 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	18900	1880.0	1	0	23.7	23.3	0.615	**0.674**	7
						50	0	22.7	22.4	0.462	0.495	
			Left Tilt	18900	1880.0	1	0	23.7	23.3	0.250	0.274	
						50	0	22.7	22.4	0.206	0.221	
			Right Touch	18900	1880.0	1	0	23.7	23.3	0.507	0.556	
						50	0	22.7	22.4	0.381	0.408	
			Right Tilt	18900	1880.0	1	0	23.7	23.3	0.260	0.285	
						50	0	22.7	22.4	0.192	0.206	
Body-worn & Hotspot	QPSK	10	Rear	18900	1880.0	1	0	23.7	23.3	0.681	**0.747**	8
						50	0	22.7	22.4	0.536	0.574	
			Front	18900	1880.0	1	0	23.7	23.3	0.627	0.687	
						50	0	22.7	22.4	0.493	0.528	
Hotspot	QPSK	10	Edge 3	18900	1880.0	1	0	23.7	23.3	0.359	0.394	
						50	0	22.7	22.4	0.290	0.311	
			Edge 4	18900	1880.0	1	0	23.7	23.3	0.506	0.555	
						50	0	22.7	22.4	0.399	0.428	

10.4. 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	20175	1732.5	1	0	23.7	23.7	0.359	**0.359**	9
						50	0	22.7	22.6	0.286	0.293	
			Left Tilt	20175	1732.5	1	0	23.7	23.7	0.164	0.164	
						50	0	22.7	22.6	0.130	0.133	
			Right Touch	20175	1732.5	1	0	23.7	23.7	0.256	0.256	
						50	0	22.7	22.6	0.198	0.203	
			Right Tilt	20175	1732.5	1	0	23.7	23.7	0.143	0.143	
						50	0	22.7	22.6	0.107	0.109	
Body-worn & Hotspot	QPSK	10	Rear	20175	1732.5	1	0	23.7	23.7	0.765	**0.765**	10
						50	0	22.7	22.6	0.546	0.559	
			Front	20175	1732.5	1	0	23.7	23.7	0.479	0.479	
						50	0	22.7	22.6	0.373	0.382	
Hotspot	QPSK	10	Edge 3	20175	1732.5	1	0	23.7	23.7	0.367	0.367	
						50	0	22.7	22.6	0.276	0.282	
			Edge 4	20175	1732.5	1	0	23.7	23.7	0.287	0.287	
						50	0	22.7	22.6	0.232	0.237	

10.5. 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	24	23.7	23.6	0.335	0.343	
						25	0	22.7	21.9	0.262	0.315	
			Left Tilt	20525	836.5	1	24	23.7	23.6	0.218	0.223	
						25	0	22.7	21.9	0.166	0.200	
			Right Touch	20525	836.5	1	24	23.7	23.6	0.444	**0.454**	11
						25	0	22.7	21.9	0.329	0.396	
			Right Tilt	20525	836.5	1	24	23.7	23.6	0.258	0.264	
						25	0	22.7	21.9	0.179	0.215	
Body-worn & Hotspot	QPSK	10	Rear	20525	836.5	1	24	23.7	23.6	0.601	**0.615**	12
						25	0	22.7	21.9	0.438	0.527	
			Front	20525	836.5	1	24	23.7	23.6	0.462	0.473	
						25	0	22.7	21.9	0.336	0.404	
Hotspot	QPSK	10	Edge 2	20525	836.5	1	24	23.7	23.6	0.329	0.337	
						25	0	22.7	21.9	0.257	0.309	
			Edge 3	20525	836.5	1	24	23.7	23.6	0.183	0.187	
						25	0	22.7	21.9	0.126	0.151	
			Edge 4	20525	836.5	1	24	23.7	23.6	0.278	0.284	
						25	0	22.7	21.9	0.194	0.233	

10.6. 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	24	23.7	23.6	0.179	0.183	
						25	0	22.7	22.1	0.128	0.147	
			Left Tilt	23095	707.5	1	24	23.7	23.6	0.105	0.107	
						25	0	22.7	22.1	0.079	0.091	
			Right Touch	23095	707.5	1	24	23.7	23.6	0.227	**0.232**	13
						25	0	22.7	22.1	0.149	0.171	
			Right Tilt	23095	707.5	1	24	23.7	23.6	0.106	0.108	
						25	0	22.7	22.1	0.075	0.086	
Body-worn & Hotspot	QPSK	10	Rear	23095	707.5	1	24	23.7	23.6	0.373	**0.382**	14
						25	0	22.7	22.1	0.310	0.356	
			Front	23095	707.5	1	24	23.7	23.6	0.264	0.270	
						25	0	22.7	22.1	0.195	0.224	
Hotspot	QPSK	10	Edge 2	23095	707.5	1	24	23.7	23.6	0.333	0.341	
						25	0	22.7	22.1	0.244	0.280	
			Edge 3	23095	707.5	1	24	23.7	23.6	0.072	0.074	
						25	0	22.7	22.1	0.054	0.062	
			Edge 4	23095	707.5	1	24	23.7	23.6	0.158	0.162	
						25	0	22.7	22.1	0.125	0.144	

10.7. LTE Band 17 (10MHz Bandwidth)

Covered by LTE Band 12 (refer to section 10.6.), due to similar frequency range, same maximum tune-up limit and same channel bandwidth.

10.8. LTE Band 25 (5MHz 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	26665	1912.5	1	12	23.7	23.7	0.778	**0.778**	15
						12	0	22.7	22.1	0.576	0.661	
			Left Tilt	26665	1912.5	1	12	23.7	23.7	0.331	0.331	
						12	0	22.7	22.1	0.251	0.288	
			Right Touch	26665	1912.5	1	12	23.7	23.7	0.553	0.553	
						12	0	22.7	22.1	0.413	0.474	
			Right Tilt	26665	1912.5	1	12	23.7	23.7	0.299	0.299	
						12	0	22.7	22.1	0.234	0.269	
Body-worn & Hotspot	QPSK	10	Rear	26665	1912.5	1	12	23.7	23.7	0.736	0.736	
						12	0	22.7	22.1	0.597	0.685	
			Front	26665	1912.5	1	12	23.7	23.7	0.789	**0.789**	16
						12	0	22.7	22.1	0.591	0.679	
Hotspot	QPSK	10	Edge 2	26665	1912.5	1	12	23.7	23.7	0.171	0.171	
						12	0	22.7	22.1	0.123	0.141	
			Edge 3	26665	1912.5	1	12	23.7	23.7	0.402	0.402	
						12	0	22.7	22.1	0.337	0.387	
			Edge 4	26665	1912.5	1	12	23.7	23.7	0.570	0.570	
						12	0	22.7	22.1	0.404	0.464	

10.9. Wi-Fi (DTS Band)

Frequency Band	Mode	RF Exposure Conditions	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Notes
								Tune-up limit	Meas.	Meas.	Scaled		
2.4GHz	802.11b 1 Mbps	Head	0	Left Touch	6	2437.0	0.159						
				Left Tilt	6	2437.0	0.161						
				Right Touch	6	2437.0	0.266	15.5	14.4	0.214	**0.276**	17	1
				Right Tilt	6	2437.0	0.219						
		Body-worn & Hotspot & Wi-Fi Direct	10	Rear	6	2437.0	0.068	15.5	14.4	0.048	**0.062**	18	1
				Front	6	2437.0	0.049						
				Edge 1	6	2437.0	0.060						
				Edge 4	6	2437.0	0.041						

Note(s):

1. Highest *reported* SAR is ≤ 0.4 W/kg. Therefore, further SAR measurements within this exposure condition are not required.

10.10. 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)					
9.5	9	10	2.480	1.4	Rear/Front	0.187

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-worn & Hotspot	Rear	No	0.373	N/A	N/A
850	CDMA BC0	Body-worn & Hotspot	Rear	No	0.192	N/A	N/A
	LTE Band 5	Body-worn & Hotspot	Rear	No	0.601	N/A	N/A
1700	LTE Band 4	Body-worn & Hotspot	Rear	No	0.765	N/A	N/A
1900	CDMA BC1	Body-worn & Hotspot	Rear	Yes	1.280	1.100	1.16
	LTE Band 2	Body-worn & Hotspot	Rear	No	0.681	N/A	N/A
	LTE Band 25	Body-worn & Hotspot	Front	No	0.789	N/A	N/A
2400	Wi-Fi 802.11b/g/n	Head	Right Touch	No	0.214	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

Simultaneous Transmission Condition

RF Exposure Condition	Item	Capable Transmit Configurations		
Head	1	CDMA	+	Wi-Fi 2.4 GHz
	2	LTE	+	Wi-Fi 2.4 GHz
Body-worn	3	CDMA	+	Wi-Fi 2.4 GHz
	4	CDMA	+	BT
	5	LTE	+	Wi-Fi 2.4 GHz
	6	LTE	+	BT
Hotspot & Wi-Fi Direct	7	CDMA	+	Wi-Fi 2.4 GHz
	8	LTE	+	Wi-Fi 2.4 GHz

Notes:
1. Wi-Fi only 2.4GHz supports Hotspot.
2. CDMA and LTE support Hotspot.
3. VoIP is supported in CDMA and LTE.
4. Wi-Fi 2.4 GHz Radio cannot transmit simultaneously with Bluetooth Radio.

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

RF Exposure conditions	Simultaneous Transmission Scenario			∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
	WWAN	Wi-Fi(DTS)	Bluetooth		
Head	1.122	0.276		**1.398**	No
Body-worn Accessory & Hotspot	1.281	0.062		1.343	No
			0.187	1.468	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. 14I19592v0 SAR Photos & Ant. Locations

B. 14I19592v1 SAR Highest SAR Test Plots

C. 14I19592v0 SAR System Check Plots

D. 14I19592v0 SAR Tissue Ingredients

E. 14I19592v0 SAR Probe Cal. Certificates

F. 14I19592v0 SAR Dipole Cal. Certificates

END OF REPORT