



SAR EVALUATION REPORT

IEEE Std 1528-2013

For

GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n/ac, ANT+ and NFC

**FCC ID: A3LSMA750N
Model Name: SM-A750N**

**Report Number: 12440940-S1V3
Issue Date: 9/12/2018**

Prepared for

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Date	Revisions	Revised By
V1	9/7/2018	Initial Issue	--
V2	9/11/2018	Added Section 6.5	Coltyce Sanders
V3	9/12/2018	Section 10.13: Removed Product Specific 10g Bluetooth Exclusion	AJ Newcomer

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1. Attestation of Test Results

Applicant Name		Samsung Electronics Co., Ltd.			
FCC ID		A3LSMA750N			
Model Name		SM-A750N			
Applicable Standards		FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013			
Exposure Category		SAR Limits (W/Kg)			
		Peak spatial-average (1g of tissue)		Extremities (hands, wrists, ankles, etc.) (10g of tissue)	
General population / Uncontrolled exposure		1.6		4	
RF Exposure Conditions		Equipment Class - Highest Reported SAR (W/kg)			
		PCE	DTS	NII	DSS
Head		0.599	0.655	0.585	0.008
Body-worn		0.378	0.403	0.399	N/A
Hotspot/Wi-Fi Direct/BT Tethering		0.771	0.790	1.051	N/A
Product Specific 10g SAR		N/A	N/A	0.968	N/A
Simultaneous TX	Head	1.153	1.153	1.069	0.607
	Body-worn	0.781	0.781	0.777	0.518
	Hotspot/ Wi-Fi Direct/ BT Tethering	1.561	1.561	1.390	0.981
Date Tested		8/27/2018 to 8/31/2018			
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: 
Dave Weaver Operations Leader UL Verification Services Inc.	Lance Fleischer 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 802.11 Wi-Fi SAR v02r02
- 447498 D01 General RF Exposure Guidance v06
- 447498 D03 Supplement C Cross-Reference v01
- 648474 D04 Handset SAR v01r03
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
- 865664 D02 RF Exposure Reporting v01r02
- 941225 D01 3G SAR Procedures v03r01
- 941225 D05 SAR for LTE Devices v02r05
- 941225 D05A LTE Rel.10 KDB Inquiry Sheet v01r02
- 941225 D06 Hotspot Mode v02r01
- 941225 D07 UMPC Mini Tablet v01r02

In addition to the above, the following information was used:

- [TCB workshop](#) April 2015; Page 33, RF Exposure Procedures Update (Overlapping LTE Bands)
- [TCB workshop](#) October 2014; Page 37, RF Exposure Procedures Update (Other LTE Considerations)
- [TCB workshop](#) October 2015; Page 6, RF Exposure Procedures (KDB 941225 D05A)
- [TCB workshop](#) April 2016; Page 13, RF Exposure Procedures (LTE Carrier Aggregation for DL)
- [TCB workshop](#) October 2016; Page 4 and 5, RF Exposure Procedures (LTE Carrier Aggregation for UL)
- [TCB workshop](#) October 2016; Page 7, RF Exposure Procedures (Bluetooth Duty Factor)

3. Facilities and Accreditation

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

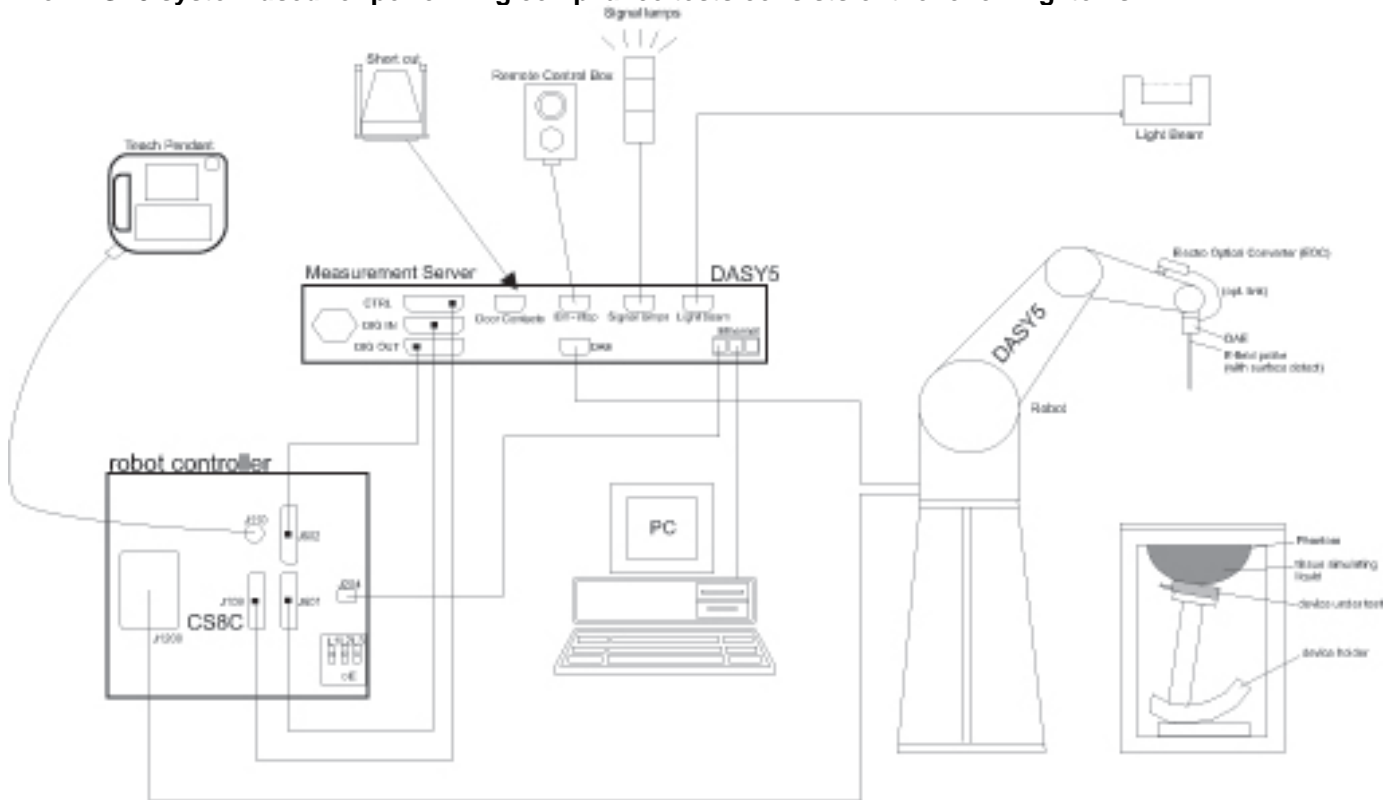
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	SAR Lab 5
SAR Lab F	SAR Lab 6
SAR Lab G	SAR Lab 7
SAR Lab H	SAR Lab 8

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	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
Maximum area scan spatial resolution: Δx_{Area} , Δy_{Area}	≤ 2 GHz: ≤ 15 mm $2 - 3$ GHz: ≤ 12 mm	$3 - 4$ GHz: ≤ 12 mm $4 - 6$ GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be \leq the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Step 3: Zoom Scan

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

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

		≤ 3 GHz	> 3 GHz	
Maximum zoom scan spatial resolution: $\Delta x_{Zoom}, \Delta y_{Zoom}$		≤ 2 GHz: ≤ 8 mm $2 - 3$ GHz: ≤ 5 mm*	$3 - 4$ GHz: ≤ 5 mm* $4 - 6$ GHz: ≤ 4 mm*	
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$	≤ 5 mm	$3 - 4$ GHz: ≤ 4 mm $4 - 5$ GHz: ≤ 3 mm $5 - 6$ GHz: ≤ 2 mm	
	graded grid	$\Delta z_{Zoom}(1)$: between 1 st two points closest to phantom surface	≤ 4 mm	$3 - 4$ GHz: ≤ 3 mm $4 - 5$ GHz: ≤ 2.5 mm $5 - 6$ GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z	≥ 30 mm	$3 - 4$ GHz: ≥ 28 mm $4 - 5$ GHz: ≥ 25 mm $5 - 6$ GHz: ≥ 22 mm	
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details. * When zoom scan is required and the <i>reported</i> SAR from the <i>area scan based 1-g SAR estimation</i> procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

Step 5: Z-Scan (FCC only)

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation the extrapolated distance should not be larger than the step size in Z-direction.

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
Vector Network Analyzer	R&S	ZNLE6	101274-MN	7/16/2019
Dielectric Probe kit	SPEAG	DAK-3.5	1082	10/17/2018
Shorting Block	SPEAG	DAK-3.5 Short	SM DAK 200 BA	10/17/2018
Thermometer	Fisher Scientific	Traceable	140562250	11/7/2018

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Signal Generator	Agilent	N5181A	MY50140610	6/7/2019
Power Meter	Keysight	N1912A	MY55196007	7/23/2019
Power Sensor	Agilent	N1921A	MY53020038	4/23/2019
Power Sensor	Agilent	N1921A	MY5226009	1/8/2019
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1795093	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2149	N/A
DC Power Supply	HP	6296A	2841A-05955	N/A

Lab Equipment

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
E-Field Probe (SAR Lab 5)	SPEAG	EX3DV4	7498	5/4/2019
E-Field Probe (SAR Lab 6)	SPEAG	EX3DV4	3885	10/24/2018
Data Acquisition Electronics (SAR Lab 5)	SPEAG	DAE4	1546	5/3/2019
Data Acquisition Electronics (SAR Lab 6)	SPEAG	DAE4	1545	4/13/2019
System Validation Dipole	SPEAG	D750V3	1071	11/21/2018
System Validation Dipole	SPEAG	D835V2	4d117	5/16/2019
System Validation Dipole	SPEAG	D1750V2	1077	10/5/2018
System Validation Dipole	SPEAG	D1900V2	5d163	10/5/2018
System Validation Dipole	SPEAG	D2450V2	899	3/16/2019
System Validation Dipole	SPEAG	D2600V2	1036	3/16/2019
System Validation Dipole	SPEAG	D5GHzV2	1003	3/13/2019
Thermometer (SAR Lab 5/6)	Fisher Scientific	Traceable	181062300	2/26/2019

Other

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Power Meter	Keysight	N1912A	MY55196015	3/1/2019
Power Sensor	Agilent	N1921A	MY53260010	10/17/2018
Base Station Simulator	R & S	R & S	137874-NU	5/29/2019
Base Station Simulator	R & S	R & S	104245-JZ	6/21/2019
Base Station Simulator	R & S	R & S	137873-WG	6/1/2019
Base Station Simulator	R & S	R & S	137875-DZ	2/21/2019
PXA Spectrum Analyzer	Keysight	N9030A	MY53311010	2/3/2019

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 and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be $\leq 30\%$, for a confidence interval of $k = 2$. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

Therefore, the measurement uncertainty is not required.

6. Device Under Test (DUT) Information

6.1. DUT Description

Device Dimension	This is a Phablet Device (display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm) Refer to Appendix A		
Back Cover	The Back Cover is not removable		
Battery Options	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. <input checked="" type="checkbox"/> Mobile Hotspot (Wi-Fi 2.4 GHz) <input checked="" type="checkbox"/> Mobile Hotspot (Wi-Fi 5.8 GHz Channel 149 only)		
Wi-Fi Direct	Wi-Fi Direct enabled devices transfer data directly between each other <input checked="" type="checkbox"/> Wi-Fi Direct (Wi-Fi 2.4 GHz) <input checked="" type="checkbox"/> Wi-Fi Direct (Wi-Fi 5.2 GHz) <input checked="" type="checkbox"/> Wi-Fi Direct (Wi-Fi 5.8 GHz)		
Bluetooth Tethering	BT Tethering mode permits the device to share its cellular data connection with other devices. <input checked="" type="checkbox"/> BT Tethering (Bluetooth 2.4 GHz)		
Test sample information	S/N	IMEI	Notes
	R39K70AH01	351755100054299	CONDUCTED
	R39K70AGZN	351755100054174	CONDUCTED
	R39K70AGZJ	351755100054133	RADIATED
	R39K70DSR0	351904100053253	RADIATED
	R39K70DSRL	351904100053451	RADIATED
Hardware Version	Rev 1.1		
Software Version	A750N.001		

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	1900	Voice (GMSK) GPRS (GMSK) EDGE (8PSK)	Multi-Slot Class: Class 33 - 4 Up, 5 Down	GPRS: 2Slots: 25%
	Does this device support DTM (Dual Transfer Mode)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Rel. 9) HSUPA (Rel. 9) HSPA+ (Rel. 9) ³		100%
LTE	FDD Band 4 FDD Band 5 FDD Band 17 FDD Band 26 TDD Band 41	QPSK 16QAM Rel. 10 Carrier Aggregation support downlink only ²		100% (FDD) 63.3% (TDD) ¹ Refer to §6.4
	Does this device support SV-LTE (1xRTT-LTE)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20)		99.64% ⁴ (802.11b)
	5 GHz	802.11a 802.11n (HT20) 802.11n (HT40) 802.11ac (VHT20) 802.11ac (VHT40) 802.11ac (VHT80)		98.28% ⁵ (802.11a) 93.29% ⁵ (802.11n/ac 80MHz BW)
	Does this device support bands 5.60 ~ 5.65 GHz? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			
	Does this device support Band gap channel(s)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			
Bluetooth	2.4 GHz	Version 5.0 LE		76.8% ⁶ (GFSK)

Notes:

1. This device supports uplink-downlink configuration 0-6. The configuration with the highest duty cycle was used (Subframe Number 0 at 63.3%).
2. Carrier Aggregation is not available for FCC bands.
3. Uplink 16QAM is not supported for HSPA+. Only downlink is supported.
4. Refer to §9.4 for Duty Cycle Measurement
5. Refer to §9.5 for Duty Cycle Measurement
6. Refer to §9.6 for Duty Cycle Measurement

6.3. General LTE SAR Test and Reporting Considerations

Item	Description						
Frequency range, Channel Bandwidth, Numbers and Frequencies	Band 4	Frequency range: 1710 - 1755 MHz (BW = 45 MHz)					
		Channel Bandwidth					
		20 MHz ²	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 ³	Frequency range: 824 - 849 MHz (BW = 25 MHz)					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz ²	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 17	Frequency range: 704 - 716 MHz (BW = 12 MHz)					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz ²	5 MHz ²	3 MHz	1.4 MHz
	Low			23780/ 709	23755/ 706.5		
	Mid			23790/ 710	23790/ 710		
	High			23800/ 711	23825/ 713.5		
	Band 26	Frequency range: 814 - 849 MHz (BW = 35 MHz)					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low		26765/ 821.5	26740/ 819	26715/ 816.5	26705/ 815.5	26697/ 814.7
	Mid		26865/ 831.5	26865/ 831.5	26865/ 831.5	26865/ 831.5	26865/ 831.5
	High		26965/ 841.5	26990/ 844	27015/ 846.5	27025/ 847.5	27033/ 848.3
	Band 41 ¹	Frequency range: 2496 - 2690 MHz (BW = 194 MHz)					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
Low	39750 / 2506.0						
Low-Mid	40185 / 2549.5						
Mid	40620 / 2593.0						
Mid-High	41055 / 2636.5						
High	41490 / 2680.0						

General LTE SAR Test and Reporting Considerations continued

Item	Description																																																														
LTE transmitter and antenna implementation	Refer to Appendix A.																																																														
Maximum power reduction (MPR)	<p align="center">Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3</p> <table border="1"> <thead> <tr> <th rowspan="2">Modulation</th> <th colspan="6">Channel bandwidth / Transmission bandwidth (N_{RB})</th> <th rowspan="2">MPR (dB)</th> </tr> <tr> <th>1.4 MHz</th> <th>3.0 MHz</th> <th>5 MHz</th> <th>10 MHz</th> <th>15 MHz</th> <th>20 MHz</th> </tr> </thead> <tbody> <tr> <td>QPSK</td> <td>> 5</td> <td>> 4</td> <td>> 8</td> <td>> 12</td> <td>> 16</td> <td>> 18</td> <td>≤ 1</td> </tr> <tr> <td>16 QAM</td> <td>≤ 5</td> <td>≤ 4</td> <td>≤ 8</td> <td>≤ 12</td> <td>≤ 16</td> <td>≤ 18</td> <td>≤ 1</td> </tr> <tr> <td>16 QAM</td> <td>> 5</td> <td>> 4</td> <td>> 8</td> <td>> 12</td> <td>> 16</td> <td>> 18</td> <td>≤ 2</td> </tr> <tr> <td>64 QAM</td> <td>≤ 5</td> <td>≤ 4</td> <td>≤ 8</td> <td>≤ 12</td> <td>≤ 16</td> <td>≤ 18</td> <td>≤ 2</td> </tr> <tr> <td>64 QAM</td> <td>> 5</td> <td>> 4</td> <td>> 8</td> <td>> 12</td> <td>> 16</td> <td>> 18</td> <td>≤ 3</td> </tr> <tr> <td>256 QAM</td> <td colspan="6" style="text-align: center;">≥ 1</td> <td>≤ 5</td> </tr> </tbody> </table> <p>MPR Built-in by design The manufacturer MPR values are always within the 3GPP maximum MPR allowance but may not follow the default MPR values. A-MPR (additional MPR) was disabled during SAR testing</p>	Modulation	Channel bandwidth / Transmission bandwidth (N _{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	64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2	64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3	256 QAM	≥ 1						≤ 5
Modulation	Channel bandwidth / Transmission bandwidth (N _{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																																																								
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2																																																								
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3																																																								
256 QAM	≥ 1						≤ 5																																																								
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.																																																														

Notes:

- LTE band 41 test channels in accordance with October 2014 TCB workshop for all channels bandwidths. This band was tested using Uplink-Downlink configuration 0 at 63.3% duty cycle and special subframe 7.
- Maximum bandwidth 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 QPSK configuration has the highest maximum average output power per 3GPP standard.
 - LTE Band 5 (Frequency range: 824-849 MHz) is covered by LTE Band 26 (Frequency range: 814-849 MHz) due to similar frequency range, same maximum tune-up limit and same channel bandwidth.
- SAR Testing for LTE was performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

6.4. LTE (TDD) Considerations

According to KDB 941225 D05 SAR for LTE Devices, for Time-Division Duplex (TDD) systems, SAR must be tested using a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by the defined 3GPP LTE TDD configurations.

LTE TDD Bands support 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations and Table 4.2-1 for Special subframe configurations.

Table 4.2-1: Configuration of special subframe (lengths of DwPTS/GP/UpPTS)

Special subframe configuration	Normal cyclic prefix in downlink			Extended cyclic prefix in downlink		
	DwPTS	UpPTS		DwPTS	UpPTS	
		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink
0	$6592 \cdot T_s$	$(1+X) \cdot 2192 \cdot T_s$	$(1+X) \cdot 2560 \cdot T_s$	$7680 \cdot T_s$	$(1+X) \cdot 2192 \cdot T_s$	$(1+X) \cdot 2560 \cdot T_s$
1	$19760 \cdot T_s$			$20480 \cdot T_s$		
2	$21952 \cdot T_s$			$23040 \cdot T_s$		
3	$24144 \cdot T_s$			$25600 \cdot T_s$		
4	$26336 \cdot T_s$			$7680 \cdot T_s$		
5	$6592 \cdot T_s$	$(2+X) \cdot 2192 \cdot T_s$	$(2+X) \cdot 2560 \cdot T_s$	$20480 \cdot T_s$	$(2+X) \cdot 2192 \cdot T_s$	$(2+X) \cdot 2560 \cdot T_s$
6	$19760 \cdot T_s$			$23040 \cdot T_s$		
7	$21952 \cdot T_s$			$12800 \cdot T_s$		
8	$24144 \cdot T_s$			-		
9	$13168 \cdot T_s$			-		
10	$13168 \cdot T_s$	$13152 \cdot T_s$	$12800 \cdot T_s$	-	-	-

Table 4.2-2: Uplink-downlink configurations & Calculated Duty Cycle

Uplink-Downlink Configuration	Downlink-to-Uplink Switch-point Periodicity	Subframe Number										Calculated Duty Cycle (%)
		0	1	2	3	4	5	6	7	8	9	
0	5 ms	D	S	U	U	U	D	S	U	U	U	63.3%
1	5 ms	D	S	U	U	D	D	S	U	U	D	43.3%
2	5 ms	D	S	U	D	D	D	S	U	D	D	23.3%
3	10 ms	D	S	U	U	U	D	D	D	D	D	31.7%
4	10 ms	D	S	U	U	D	D	D	D	D	D	21.7%
5	10 ms	D	S	U	D	D	D	D	D	D	D	11.7%
6	5 ms	D	S	U	U	U	D	S	U	U	D	53.3%

Calculated Duty Cycle = Extended cyclic prefix in uplink * (T_s) * # of S + # of U / period

Note(s):

This device supports uplink-downlink configurations 0-6. The configuration with highest duty cycle was used for SAR Testing: configuration 0 at 63.3 % duty cycle and Special Subframe 7.

6.5. WLAN Proximity Sensor Test Rationale

When a user makes or receives a voice or VOIP call, the audio of the call is sent through the earpiece at the top of the device so that the device can be used next to the ear. The IR Sensor located at the top of the device is used to detect when the device is in proximity of the user's head in order to optimize the user's device experience, for example, to dim or turn off the screen to save battery life. For this model, an auxiliary function of the IR sensor is for the purpose of RF Safety (i.e. reducing output power for Head SAR compliance).

A reduced power level of the device is called when the IR sensor is activated while in a held-to-ear voice/VOIP call and the active audio receiver. Therefore, when the IR proximity sensor is active in a held-to-ear user scenario, the output power level is reduced.

7. RF Exposure Conditions (Test Configurations)

Refer to Appendix A 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 (Main 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	
			Front	N/A	Yes	
	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	
	Product Specific 10g	0 mm	Rear	< 25 mm	Yes	2
			Front	< 25 mm	Yes	2
			Edge 1 (Top)	> 25 mm	No	1
			Edge 2 (Right)	> 25 mm	No	1
Edge 3 (Bottom)			< 25 mm	Yes	2	
Edge 4 (Left)			< 25 mm	Yes	2	
WWAN (Main 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	
			Front	N/A	Yes	
	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	No	1
	Product Specific 10g	0 mm	Rear	< 25 mm	Yes	2
			Front	< 25 mm	Yes	2
			Edge 1 (Top)	> 25 mm	No	1
			Edge 2 (Right)	< 25 mm	Yes	2
Edge 3 (Bottom)			< 25 mm	Yes	2	
Edge 4 (Left)			> 25 mm	No	1	

Notes:

- SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR.
- For Phablet devices: when hotspot mode applies, Product Specific 10-g SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg.
- WWAN Main Ant. 2 supports LTE Band 41 only.
- Cellular Sub Antenna is Rx only.

RF Exposure Conditions (Test Configurations) (continued):

Wireless technologies	RF Exposure Conditions	DUT-to-User Separation	Test Position	Antenna-to-edge/surface	SAR Required	Note
WLAN & BT	Head	0 mm	Left Touch	N/A	Yes	
			Left Tilt (15°)	N/A	Yes	
			Right Touch	N/A	Yes	
			Right Tilt (15°)	N/A	Yes	
	Body	15 mm	Rear	N/A	Yes	
			Front	N/A	Yes	
	Hotspot / Wi-Fi Direct (2.4/5.2/5.8 GHz Bands)	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
	Product Specific 10g (2.4 GHz)	0 mm	Edge 4 (Left)	< 25 mm	Yes	
			Rear	< 25 mm	Yes	3
			Front	< 25 mm	Yes	3
			Edge 1 (Top)	< 25 mm	Yes	3
			Edge 2 (Right)	> 25 mm	No	1
	Product Specific 10g (5 GHz Bands)	0 mm	Edge 3 (Bottom)	> 25 mm	No	1
			Edge 4 (Left)	< 25 mm	Yes	3
			Rear	< 25 mm	Yes	2
			Front	< 25 mm	Yes	2
Edge 1 (Top)			< 25 mm	Yes	2	
Edge 2 (Right)			> 25 mm	No	1	
			Edge 3 (Bottom)	> 25 mm	No	1
			Edge 4 (Left)	< 25 mm	Yes	2

Notes:

- SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR.
- For Phablet devices: when Hotspot Mode is not supported, Product Specific 10-g SAR is required for all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge in direct contact with a flat phantom, to address interactive hand use exposure conditions.
- For Phablet devices: when hotspot mode applies, Product Specific 10-g SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg.

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 $\pm 2^\circ\text{C}$ 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.

The dielectric constant (ϵ_r) and conductivity (σ) of typical tissue-equivalent media recipes are expected to be within $\pm 5\%$ of the required target values; but for SAR measurement systems that have implemented the SAR error compensation algorithms documented in IEEE Std 1528-2013, to automatically compensate the measured SAR results for deviations between the measured and required tissue dielectric parameters, the tolerance for ϵ_r and σ may be relaxed to $\pm 10\%$. This is limited to frequencies ≤ 3 GHz.

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	Date	Band (MHz)	Tissue Type	Frequency (MHz)	Relative Permittivity (ϵ_r)			Conductivity (σ)		
					Measured	Target	Delta	Measured	Target	Delta
5	8/27/2018	2450	Head	2450	38.38	39.20	-2.09	1.82	1.80	1.33
				2400	38.46	39.30	-2.13	1.79	1.75	2.02
				2480	38.30	39.16	-2.20	1.85	1.83	0.85
5	8/28/2018	2450	Body	2450	54.96	52.70	4.29	2.07	1.95	6.26
				2400	55.08	52.77	4.37	2.02	1.90	6.48
				2480	54.94	52.66	4.33	2.10	1.99	5.36
5	8/28/2018	2600	Head	2600	38.04	39.01	-2.49	1.99	1.96	1.37
				2495	38.19	39.14	-2.44	1.89	1.85	2.35
				2690	37.84	38.90	-2.72	2.06	2.06	0.17
5	8/28/2018	2600	Body	2600	52.23	52.51	-0.53	2.23	2.16	2.97
				2495	52.36	52.64	-0.54	2.11	2.01	4.76
				2690	52.06	52.40	-0.64	2.32	2.29	1.43
6	8/27/2018	5250	Head	5250	36.12	35.93	0.52	4.50	4.70	-4.24
				5150	36.29	36.05	0.67	4.40	4.60	-4.43
				5350	35.93	35.82	0.31	4.62	4.80	-3.92
6	8/27/2018	5600	Head	5600	35.51	35.53	-0.07	4.88	5.06	-3.60
				5500	35.69	35.65	0.12	4.77	4.96	-3.89
				5725	35.28	35.39	-0.31	5.03	5.19	-3.09
6	8/27/2018	5750	Head	5750	35.23	35.36	-0.38	5.06	5.21	-3.04
				5700	35.34	35.42	-0.23	5.00	5.16	-3.23
				5850	35.09	35.30	-0.59	5.17	5.27	-1.99
6	8/27/2018	5250	Body	5250	47.75	48.95	-2.46	5.41	5.35	1.03
				5150	47.96	49.09	-2.30	5.27	5.24	0.60
				5350	47.54	48.82	-2.61	5.55	5.47	1.47
6	8/27/2018	5600	Body	5600	47.06	48.48	-2.92	5.89	5.76	2.19
				5500	47.26	48.61	-2.78	5.74	5.64	1.75
				5725	46.79	48.31	-3.14	6.07	5.91	2.76
6	8/27/2018	5750	Body	5750	46.73	48.27	-3.20	6.11	5.94	2.98
				5700	46.86	48.34	-3.07	6.04	5.88	2.73
				5850	46.56	48.20	-3.40	6.26	6.00	4.28
6	8/28/2018	1900	Head	1900	39.25	40.00	-1.88	1.48	1.40	5.71
				1850	39.33	40.00	-1.68	1.45	1.40	3.50
				1920	39.24	40.00	-1.90	1.50	1.40	6.86
6	8/28/2018	1900	Body	1900	55.48	53.30	4.09	1.56	1.52	2.43
				1850	55.54	53.30	4.20	1.52	1.52	0.07
				1920	55.48	53.30	4.09	1.58	1.52	3.62
6	8/28/2018	1750	Head	1750	39.52	40.08	-1.41	1.39	1.37	1.46
				1710	39.56	40.15	-1.46	1.37	1.35	1.45
				1755	39.51	40.08	-1.41	1.39	1.37	1.40

Dielectric Property Measurements Results Continued:

SAR Lab	Date	Band (MHz)	Tissue Type	Frequency (MHz)	Relative Permittivity (ϵ_r)			Conductivity (σ)		
					Measured	Target	Delta	Measured	Target	Delta
6	8/28/2018	1750	Body	1750	52.86	53.44	-1.09	1.48	1.49	-0.28
				1710	52.89	53.54	-1.22	1.46	1.46	-0.38
				1755	52.85	53.43	-1.08	1.49	1.49	-0.28
6	8/29/2018	1900	Head	1900	38.17	40.00	-4.58	1.48	1.40	5.93
				1850	38.42	40.00	-3.95	1.45	1.40	3.50
				1920	38.27	40.00	-4.32	1.50	1.40	7.36
6	8/29/2018	835	Head	835	43.21	41.50	4.12	0.94	0.90	4.94
				805	43.03	41.68	3.24	0.93	0.90	4.14
				905	42.95	41.50	3.49	0.97	0.97	0.21
6	8/29/2018	835	Body	835	53.81	55.20	-2.52	1.01	0.97	4.23
				805	53.55	55.33	-3.23	1.00	0.97	3.38
				905	53.58	55.00	-2.58	1.04	1.05	-0.81
6	8/29/2018	750	Head	750	41.02	41.96	-2.24	0.92	0.89	2.77
				695	42.03	42.24	-0.51	0.90	0.89	0.79
				790	41.39	41.76	-0.88	0.93	0.90	4.02
6	8/29/2018	750	Body	750	52.83	55.55	-4.89	0.98	0.96	1.64
				695	53.89	55.76	-3.35	0.96	0.96	-0.27
				790	53.28	55.39	-3.81	0.99	0.97	2.91

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 \pm 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 \geq 15.0 cm for SAR measurements \leq 3 GHz and \geq 10.0 cm for measurements $>$ 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- Distance between probe sensors and phantom surface was set to 3 mm.
For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was 100 mW.
- The results are normalized to 1 W input power.

System Check Results

The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within $\pm 10\%$ of the manufacturer calibrated dipole SAR target. Refer to Appendix B for the SAR System Check Plots.

SAR Lab	Date	Tissue Type	Dipole Type Serial #	Dipole Cal. Due Data	Measured Results for 1g SAR				Measured Results for 10g SAR				Plot No.
					Zoom Scan to 100 mW	Normalize to 1 W	Target (Ref. Value)	Delta $\pm 10\%$	Zoom Scan to 100 mW	Normalize to 1 W	Target (Ref. Value)	Delta $\pm 10\%$	
5	8/27/2018	Head	D2450V2 SN:899	3/16/2019	5.190	51.90	51.75	0.29	2.410	24.10	24.20	-0.41	
5	8/28/2018	Body	D2450V2 SN:899	3/16/2019	5.350	53.50	50.55	5.84	2.480	24.80	23.20	6.90	1,2
5	8/28/2018	Head	D2600V2 SN:1036	3/16/2019	5.540	55.40	54.54	1.58	2.480	24.80	24.56	0.98	
5	8/28/2018	Body	D2600V2 SN:1036	3/16/2019	5.240	52.40	56.13	-6.65	2.330	23.30	25.04	-6.95	3,4
6	8/27/2018	Head	D5GHzV2 SN:1003 (5.25 GHz)	3/13/2019	8.700	87.00	80.60	7.94	2.530	25.30	23.20	9.05	5,6
6	8/27/2018	Head	D5GHzV2 SN:1003 (5.60 GHz)	3/13/2019	9.060	90.60	84.50	7.22	2.610	26.10	24.00	8.75	
6	8/27/2018	Head	D5GHzV2 SN:1003 (5.75 GHz)	3/13/2019	8.390	83.90	78.40	7.02	2.420	24.20	22.20	9.01	
6	8/27/2018	Body	D5GHzV2 SN:1003 (5.25 GHz)	3/13/2019	7.680	76.80	73.60	4.35	2.150	21.50	20.50	4.88	
6	8/27/2018	Body	D5GHzV2 SN:1003 (5.60 GHz)	3/13/2019	8.440	84.40	77.70	8.62	2.350	23.50	21.70	8.29	7,8
6	8/27/2018	Body	D5GHzV2 SN:1003 (5.75 GHz)	3/13/2019	7.940	79.40	73.90	7.44	2.210	22.10	20.60	7.28	9,10
6	8/28/2018	Head	D1750V2 SN:1077	10/5/2018	3.800	38.00	36.26	4.80	2.010	20.10	19.34	3.93	11,12
6	8/28/2018	Body	D1750V2 SN:1077	10/5/2018	3.620	36.20	37.34	-3.05	1.910	19.10	19.98	-4.40	
6	8/28/2018	Body	D1900V2 SN:5d163	10/5/2018	4.030	40.30	42.99	-6.26	2.080	20.80	21.97	-5.33	13,14
6	8/28/2018	Head	D1900V2 SN:5d163	10/5/2018	4.010	40.10	38.77	3.43	2.070	20.70	20.10	2.99	
6	8/29/2018	Head	D835V2 SN:4d117	5/16/2019	0.950	9.50	9.87	-3.75	0.613	6.13	6.40	-4.22	
6	8/29/2018	Body	D835V2 SN:4d117	5/16/2019	0.948	9.48	10.31	-8.05	0.616	6.16	6.84	-9.94	15,16
6	8/29/2018	Head	D750V3 SN:1071	11/21/2018	0.861	8.61	8.59	0.23	0.558	5.58	5.73	-2.62	
6	8/29/2018	Body	D750V3 SN:1071	11/21/2018	0.923	9.23	8.52	8.33	0.607	6.07	5.69	6.68	17,18

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.

When different maximum output power applies to GSM voice or GPRS/EDGE time slots, GSM voice and GPRS/EDGE time slots should be tested separately to determine compliance by summing the corresponding reported SAR.

The GMSK EDGE configurations are grouped with GPRS and considered with respect to time-averaged maximum output power to determine compliance

Per October 2013 TCB Workshop:

When the maximum frame-averaged powers levels are within 0.25 dB of each other, test the configuration with the most number of time slots.

GSM1900 Measured Results

Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Maximum Average Power (dBm)			
					Measured		Tune-up Limit	
					Burst Pw r	Frame Pw r	Burst Pw r	Frame Pw r
GPRS/EDGE (GMSK)	CS1	1	512	1850.2	29.64	20.61	30.50	21.47
			661	1880.0	29.72	20.69		
			810	1909.8	29.68	20.65		
		2	512	1850.2	27.06	21.04	28.50	22.48
			661	1880.0	27.17	21.15		
			810	1909.8	27.13	21.11		
		3	512	1850.2	25.47	21.21	26.50	22.24
			661	1880.0	25.85	21.59		
			810	1909.8	25.59	21.33		
		4	512	1850.2	24.14	21.13	25.00	21.99
			661	1880.0	24.31	21.30		
			810	1909.8	24.03	21.02		
EDGE (8PSK)	MCS5	1	512	1850.2	25.20	16.17	26.00	16.97
			661	1880.0	25.33	16.30		
			810	1909.8	25.10	16.07		
		2	512	1850.2	22.67	16.65	24.00	17.98
			661	1880.0	22.75	16.73		
			810	1909.8	22.55	16.53		
		3	512	1850.2	21.11	16.85	23.50	19.24
			661	1880.0	21.18	16.92		
			810	1909.8	21.17	16.91		
		4	512	1850.2	19.50	16.49	22.00	18.99
			661	1880.0	19.59	16.58		
			810	1909.8	19.50	16.49		

Notes:

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

- GPRS/EDGE (GMSK) mode with 2 time slots for Max power and 2 time slots for reduced power, based on the Tune-up Procedure.
- SAR is not required for EDGE (8PSK) mode because the maximum output power and tune-up limit is $\leq 1/4$ dB higher than GPRS/EDGE (GMSK) or the adjusted SAR of the highest reported SAR of GPRS/EDGE (GMSK) is ≤ 1.2 W/kg.

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
	β_c/β_d	8/15

HSDPA Setup Procedures used to establish the test signals

The following 4 Sub-tests were completed according to Release 9 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

Table C.10.2.4: β values for transmitter characteristics tests with HS-DPCCH

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
	β_c	2/15	11/15	15/15	15/15
	β_d	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	β_c/β_d	2/15	11/15	15/8	15/4
	β_{hs}	4/15	24/15	30/15	30/15
MPR (dB)	0	0	0.5	0.5	
HSDPA Specific Settings	D_{ACK}	8			
	D_{NAK}	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
Ahs= β_{hs}/β_c	30/15				

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

The following 5 Sub-tests were completed according to Release 9 procedures in table C,11.1.3 of 3GPP TS 34.121-1
A summary of these settings are illustrated below:

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH

	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
	β_c	11/15	6/15	15/15	2/15	15/15
	β_d	15/15	15/15	9/15	15/15	0
	β_{ec}	209/225	12/15	30/15	2/15	5/15
	β_c/β_d	11/15	6/15	15/9	2/15	-
	β_{hs}	22/15	12/15	30/15	4/15	5/15
	β_{ed}	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				
	A _{hs} = β_{hs}/β_c	30/15				
HSUPA Specific Settings	E-DPDCCH	6	8	8	5	0
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	12
	ETFCI (from 34.121 Table C.11.1.3)	75	67	92	71	67
	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 Channelization Codes	2xSF2				SF4	

HSPA+ Release 9

Since 16QAM is not used for uplink, RF conducted power measurements are not required for HSPA+

W-CDMA Band II Measured Results

Mode		UL Ch No.	Freq. (MHz)	Maximum Average Power (dBm)		
				Measured Pwr	MPR	Tune-up Limit
Release 99	Rel 99 (RMC, 12.2 kbps)	9262	1852.4	23.32	N/A	24.50
		9400	1880.0	23.44		
		9538	1907.6	23.40		
HSDPA	Subtest 1	9262	1852.4	23.46	0	23.60
		9400	1880.0	23.55		
		9538	1907.6	23.51		
	Subtest 2	9262	1852.4	22.60	0	23.60
		9400	1880.0	22.60		
		9538	1907.6	22.47		
	Subtest 3	9262	1852.4	21.56	0.5	23.10
		9400	1880.0	21.67		
		9538	1907.6	21.77		
	Subtest 4	9262	1852.4	21.51	0.5	23.10
		9400	1880.0	21.57		
		9538	1907.6	21.62		
HSUPA	Subtest 1	9262	1852.4	21.46	0	23.00
		9400	1880.0	21.50		
		9538	1907.6	21.50		
	Subtest 2	9262	1852.4	19.64	2	21.00
		9400	1880.0	19.73		
		9538	1907.6	19.71		
	Subtest 3	9262	1852.4	20.68	1	22.00
		9400	1880.0	20.66		
		9538	1907.6	20.67		
	Subtest 4	9262	1852.4	19.67	2	21.00
		9400	1880.0	19.74		
		9538	1907.6	19.72		
	Subtest 5	9262	1852.4	21.51	0	23.00
		9400	1880.0	21.50		
		9538	1907.6	21.50		

W-CDMA Band IV Measured Results

Mode		UL Ch No.	Freq. (MHz)	Maximum Average Power (dBm)		
				Measured Pwr	MPR	Tune-up Limit
Release 99	Rel 99 (RMC, 12.2 kbps)	1312	1712.4	23.34	N/A	24.50
		1413	1732.6	22.72		
		1513	1752.6	23.00		
HSDPA	Subtest 1	1312	1712.4	22.82	0	23.00
		1413	1732.6	22.31		
		1513	1752.6	22.50		
	Subtest 2	1312	1712.4	22.27	0	23.00
		1413	1732.6	21.87		
		1513	1752.6	22.07		
	Subtest 3	1312	1712.4	21.84	0.5	22.50
		1413	1732.6	21.37		
		1513	1752.6	21.52		
	Subtest 4	1312	1712.4	21.78	0.5	22.50
		1413	1732.6	21.38		
		1513	1752.6	21.63		
HSUPA	Subtest 1	1312	1712.4	19.87	0	21.50
		1413	1732.6	19.38		
		1513	1752.6	19.60		
	Subtest 2	1312	1712.4	17.84	2	19.50
		1413	1732.6	17.35		
		1513	1752.6	17.55		
	Subtest 3	1312	1712.4	20.50	1	20.50
		1413	1732.6	20.40		
		1513	1752.6	20.50		
	Subtest 4	1312	1712.4	17.87	2	19.50
		1413	1732.6	17.33		
		1513	1752.6	17.55		
	Subtest 5	1312	1712.4	19.88	0	21.50
		1413	1732.6	19.38		
		1513	1752.6	19.61		

W-CDMA Band V Measured Results

Mode		UL Ch No.	Freq. (MHz)	Maximum Average Power (dBm)		
				Measured Pwr	MPR	Tune-up Limit
Release 99	Rel 99 (RMC, 12.2 kbps)	4132	826.4	24.12	N/A	25.00
		4183	836.6	24.09		
		4233	846.6	24.10		
HSDPA	Subtest 1	4132	826.4	23.10	0	23.50
		4183	836.6	23.08		
		4233	846.6	23.09		
	Subtest 2	4132	826.4	22.50	0	23.50
		4183	836.6	22.60		
		4233	846.6	22.53		
	Subtest 3	4132	826.4	21.90	0.5	23.00
		4183	836.6	21.80		
		4233	846.6	21.87		
	Subtest 4	4132	826.4	21.87	0.5	23.00
		4183	836.6	21.78		
		4233	846.6	21.90		
HSUPA	Subtest 1	4132	826.4	20.04	0	22.20
		4183	836.6	20.03		
		4233	846.6	20.07		
	Subtest 2	4132	826.4	18.01	2	20.20
		4183	836.6	18.00		
		4233	846.6	18.00		
	Subtest 3	4132	826.4	21.13	1	21.20
		4183	836.6	21.01		
		4233	846.6	21.08		
	Subtest 4	4132	826.4	17.97	2	20.20
		4183	836.6	18.01		
		4233	846.6	18.00		
	Subtest 5	4132	826.4	20.03	0	22.20
		4183	836.6	20.05		
		4233	846.6	20.06		

9.3. 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 1, 2 and 3

Modulation	Channel bandwidth / Transmission bandwidth (N _{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
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3
256 QAM	≥ 1						≤ 5

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 (subclause)	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	N/A
NS_03	6.6.2.2.1	2, 4, 10, 23, 25, 35, 36, 66, 70	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
NS_04	6.6.2.2.2, 6.6.3.3.19	41	5, 10, 15, 20	Table 6.2.4-4, Table 6.2.4-4a	
				NS_05	6.6.3.3.1
15, 20	Table 6.2.4-18 (NOTE2)				
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	N/A
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
				NS_09	6.6.3.3.4
> 55	≤ 2				
NS_10		20	15, 20	Table 6.2.4-3	
NS_11	6.6.2.2.1, 6.6.3.3.13	23	1.4, 3, 5, 10, 15, 20	Table 6.2.4-5	
				NS_12	6.6.3.3.5
NS_13	6.6.3.3.6	26	5		
NS_14	6.6.3.3.7	26	10, 15	Table 6.2.4-8	
NS_15	6.6.3.3.8	26	1.4, 3, 5, 10, 15	Table 6.2.4-9	
				Table 6.2.4-10	
NS_16	6.6.3.3.9	27	3, 5, 10	Table 6.2.4-11, Table 6.2.4-12, Table 6.2.4-13	
NS_17	6.6.3.3.10	28	5, 10	Table 5.6-1	N/A
NS_18	6.6.3.3.11	28	5	≥ 2	≤ 1
			10, 15, 20	≥ 1	≤ 4
NS_19	6.6.3.3.12	44	10, 15, 20	Table 6.2.4-14	
NS_20	6.2.2, 6.6.2.2.1, 6.6.3.3.14	23	5, 10, 15, 20	Table 6.2.4-15	
				NS_21	6.6.2.2.1, 6.6.3.3.15
NS_22	6.6.3.3.16	42, 43	5, 10, 15, 20		
NS_23	6.6.3.3.17	42, 43	5, 10, 15, 20	N/A	
NS_24	6.6.3.3.20	65 (NOTE 4)	5, 10, 15, 20	Table 6.2.4-19	
NS_25	6.6.3.3.21	65 (NOTE 4)	5, 10, 15, 20	Table 6.2.4-20	
NS_26	6.6.3.3.22	68	10, 15	Table 6.2.4-21	
NS_27	6.6.2.2.5, 6.6.3.3.23	48	5, 10, 15, 20	Table 6.2.4-22	
				NS_28	6.2.2A, 6.6.3.3.24
NS_29	6.2.2A, 6.6.2.3.1a, 6.6.3.3.25	46 (NOTE 5)	20		
				NS_30	6.2.2A, 6.6.3.3.26
NS_31	6.2.2A, 6.6.3.3.27	46 (NOTE 5)	20		
				NS_32	-

NOTE 1: Applicable when the lower edge of the assigned E-UTRA UL channel bandwidth frequency is larger than or equal to the upper edge of PHS band (1915.7 MHz) + 4 MHz + the channel BW assigned, where channel BW is as defined in subclause 5.6. A-MPR for

LTE Band 4 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				20050	20175	20300	MPR	Tune-up Limit
				1720 MHz	1732.5 MHz	1745 MHz		
20 MHz	QPSK	1	0		22.14		0	24
		1	49		22.09		0	24
		1	99		22.04		0	24
		50	0		20.99		1	23
		50	24		20.95		1	23
		50	50		20.92		1	23
		100	0		20.97		1	23
	16QAM	1	0		20.82		1	23
		1	49		20.76		1	23
		1	99		20.70		1	23
		50	0		20.05		2	22
		50	24		20.00		2	22
		50	50		19.98		2	22
		100	0		20.04		2	22
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				20025	20175	20325	MPR	Tune-up Limit
				1717.5 MHz	1732.5 MHz	1747.5 MHz		
15 MHz	QPSK	1	0	22.10	21.64	21.90	0	24
		1	37	22.04	21.57	21.84	0	24
		1	74	21.99	21.50	21.78	0	24
		36	0	20.96	20.50	20.74	1	23
		36	20	20.94	20.50	20.70	1	23
		36	39	20.92	20.50	20.69	1	23
		75	0	20.93	20.50	20.72	1	23
	16QAM	1	0	21.03	20.50	20.72	1	23
		1	37	20.98	20.50	20.66	1	23
		1	74	20.93	20.50	20.59	1	23
		36	0	20.02	19.55	19.77	2	22
		36	20	19.99	19.52	19.75	2	22
		36	39	19.98	19.53	19.72	2	22
		75	0	19.96	19.53	19.75	2	22

Note(s):

20 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 4 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				20000	20175	20350	MPR	Tune-up Limit
				1715 MHz	1732.5 MHz	1750 MHz		
10 MHz	QPSK	1	0	22.57	22.17	22.47	0	24
		1	25	22.54	22.15	22.44	0	24
		1	49	22.50	22.11	22.40	0	24
		25	0	21.44	20.94	21.27	1	23
		25	12	21.44	20.90	21.25	1	23
		25	25	21.41	20.90	21.23	1	23
	16QAM	50	0	21.43	20.91	21.23	1	23
		1	0	21.63	20.84	21.13	1	23
		1	25	21.60	20.84	21.10	1	23
		1	49	21.58	20.79	21.07	1	23
		25	0	20.46	20.00	20.31	2	22
		25	12	20.44	19.98	20.30	2	22
		25	25	20.42	19.96	20.28	2	22
	50	0	20.36	20.00	20.22	2	22	
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				19975	20175	20375	MPR	Tune-up Limit
				1712.5 MHz	1732.5 MHz	1752.5 MHz		
5 MHz	QPSK	1	0	22.05	21.52	21.91	0	24
		1	12	22.05	21.50	21.91	0	24
		1	24	22.01	21.50	21.87	0	24
		12	0	20.92	20.50	20.73	1	23
		12	7	20.92	20.50	20.73	1	23
		12	13	20.91	20.50	20.71	1	23
	16QAM	25	0	20.91	20.50	20.71	1	23
		1	0	20.72	20.50	20.76	1	23
		1	12	20.79	20.50	20.75	1	23
		1	24	20.74	20.50	20.72	1	23
		12	0	20.01	19.50	19.81	2	22
		12	7	19.96	19.50	19.79	2	22
		12	13	19.97	19.50	19.79	2	22
	25	0	20.00	19.51	19.79	2	22	

LTE Band 4 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				19965	20175	20385	MPR	Tune-up Limit
				1711.5 MHz	1732.5 MHz	1753.5 MHz		
3 MHz	QPSK	1	0	22.07	21.50	21.96	0	24
		1	8	22.09	21.50	21.92	0	24
		1	14	22.03	21.50	21.81	0	24
		8	0	20.93	20.50	20.70	1	23
		8	4	20.93	20.50	20.69	1	23
		8	7	20.94	20.50	20.69	1	23
		15	0	20.91	20.50	20.67	1	23
	16QAM	1	0	20.91	20.50	20.78	1	23
		1	8	21.14	20.50	20.56	1	23
		1	14	21.04	20.50	20.54	1	23
		8	0	20.08	19.50	19.73	2	22
		8	4	20.07	19.50	19.72	2	22
		8	7	20.07	19.50	19.74	2	22
		15	0	19.99	19.50	19.69	2	22
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				19957	20175	20393	MPR	Tune-up Limit
				1710.7 MHz	1732.5 MHz	1754.3 MHz		
1.4 MHz	QPSK	1	0	22.16	21.55	21.94	0	24
		1	3	22.16	21.53	21.95	0	24
		1	5	22.15	21.55	21.92	0	24
		3	0	22.09	21.51	21.83	0	24
		3	1	22.10	21.52	21.83	0	24
		3	3	22.08	21.51	21.81	0	24
		6	0	20.99	20.50	20.78	1	23
	16QAM	1	0	20.98	20.50	20.59	1	23
		1	3	20.96	20.50	20.58	1	23
		1	5	20.98	20.50	20.62	1	23
		3	0	21.03	20.50	20.84	1	23
		3	1	21.01	20.50	20.85	1	23
		3	3	21.01	20.50	20.84	1	23
		6	0	19.97	19.61	19.78	2	22

LTE Band 5 Measured Results

LTE Band 5 (Frequency range: 824-849 MHz) is covered by LTE Band 26 (Frequency range: 814-849 MHz) due to similar frequency range, same maximum tune-up limit and same channel bandwidth.

LTE Band 17 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			
				23790		MPR	Tune-up Limit
				710 MHz			
10 MHz	QPSK	1	0	23.71		0	25
		1	25	23.71		0	25
		1	49	23.65		0	25
		25	0	22.73		1	24
		25	12	22.74		1	24
		25	25	22.72		1	24
		50	0	22.73		1	24
	16QAM	1	0	22.55		1	24
		1	25	22.53		1	24
		1	49	22.48		1	24
		25	0	21.68		2	23
		25	12	21.69		2	23
		25	25	21.69		2	23
		50	0	21.71		2	23
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			
				23790		MPR	Tune-up Limit
				710 MHz			
5 MHz	QPSK	1	0	23.32		0	25
		1	12	23.32		0	25
		1	24	23.28		0	25
		12	0	22.26		1	24
		12	7	22.24		1	24
		12	13	22.24		1	24
		25	0	22.23		1	24
	16QAM	1	0	21.99		1	24
		1	12	21.99		1	24
		1	24	21.96		1	24
		12	0	21.12		2	23
		12	7	21.09		2	23
		12	13	21.08		2	23
		25	0	21.10		2	23

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 26 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				26765	26865	26965	MPR	Tune-up Limit
				821.5 MHz	831.5 MHz	841.5 MHz		
15 MHz	QPSK	1	0		23.48		0	25
		1	37		23.46		0	25
		1	74		23.37		0	25
		36	0		22.47		1	24
		36	20		22.45		1	24
		36	39		22.43		1	24
		75	0		22.44		1	24
	16QAM	1	0		22.24		1	24
		1	37		22.20		1	24
		1	74		22.12		1	24
		36	0		21.44		2	23
		36	20		21.42		2	23
		36	39		21.40		2	23
		75	0		21.46		2	23
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				26740	26865	26990	MPR	Tune-up Limit
				819 MHz	831.5 MHz	844 MHz		
10 MHz	QPSK	1	0	23.98	23.99	23.93	0	25
		1	25	23.94	24.00	23.82	0	25
		1	49	23.92	23.95	23.73	0	25
		25	0	22.91	22.96	22.83	1	24
		25	12	22.89	22.95	22.80	1	24
		25	25	22.86	22.95	22.77	1	24
		50	0	22.89	22.93	22.80	1	24
	16QAM	1	0	22.75	22.86	22.93	1	24
		1	25	22.69	22.85	22.83	1	24
		1	49	22.66	22.79	22.76	1	24
		25	0	21.92	21.99	21.90	2	23
		25	12	21.88	21.98	21.85	2	23
		25	25	21.86	21.97	21.78	2	23
		50	0	21.88	21.93	21.77	2	23

Note(s):

15 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 26 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				26715	26865	27015	MPR	Tune-up Limit
				816.5 MHz	831.5 MHz	846.5 MHz		
5 MHz	QPSK	1	0	23.44	23.48	23.40	0	25
		1	12	23.41	23.50	23.36	0	25
		1	24	23.38	23.46	23.34	0	25
		12	0	22.44	22.48	22.37	1	24
		12	7	22.41	22.47	22.35	1	24
		12	13	22.39	22.47	22.33	1	24
		25	0	22.41	22.47	22.33	1	24
	16QAM	1	0	22.28	22.16	22.10	1	24
		1	12	22.27	22.15	22.08	1	24
		1	24	22.22	22.16	22.07	1	24
		12	0	21.42	21.47	21.42	2	23
		12	7	21.38	21.44	21.39	2	23
		12	13	21.35	21.46	21.35	2	23
25	0	21.36	21.50	21.32	2	23		
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				26705	26865	27025	MPR	Tune-up Limit
				815.5 MHz	831.5 MHz	847.5 MHz		
3 MHz	QPSK	1	0	23.43	23.53	23.35	0	25
		1	8	23.43	23.54	23.27	0	25
		1	14	23.40	23.44	23.19	0	25
		8	0	22.44	22.47	22.35	1	24
		8	4	22.40	22.45	22.33	1	24
		8	7	22.39	22.46	22.32	1	24
		15	0	22.37	22.39	22.29	1	24
	16QAM	1	0	22.17	22.29	22.03	1	24
		1	8	22.20	22.31	22.18	1	24
		1	14	22.23	22.26	22.17	1	24
		8	0	21.38	21.50	21.30	2	23
		8	4	21.40	21.48	21.30	2	23
		8	7	21.40	21.47	21.31	2	23
15	0	21.43	21.31	21.36	2	23		

LTE Band 26 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				26697	26865	27033	MPR	Tune-up Limit
				814.7 MHz	831.5 MHz	848.3 MHz		
1.4 MHz	QPSK	1	0	23.40	23.45	23.36	0	25
		1	3	23.39	23.43	23.39	0	25
		1	5	23.39	23.46	23.37	0	25
		3	0	23.37	23.43	23.27	0	25
		3	1	23.34	23.42	23.27	0	25
		3	3	23.37	23.43	23.27	0	25
	16QAM	6	0	22.40	22.46	22.30	1	24
		1	0	22.19	22.36	22.31	1	24
		1	3	22.14	22.34	22.27	1	24
		1	5	22.12	22.35	22.29	1	24
		3	0	22.34	22.31	22.16	1	24
		3	1	22.31	22.34	22.17	1	24
		3	3	22.29	22.34	22.17	1	24
6	0	21.34	21.57	21.38	2	23		

LTE Band 41 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)					MPR	Tune-up Limit
				39750	40185	40620	41055	41490		
				2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz		
20 MHz	QPSK	1	0	23.26	23.09	23.60	22.95	22.40	0	24.5
		1	49	23.23	23.23	23.69	22.93	22.53	0	24.5
		1	99	23.29	23.19	23.77	23.06	22.54	0	24.5
		50	0	22.32	22.23	22.74	21.93	21.53	1	23.5
		50	24	22.35	22.25	22.79	21.94	21.58	1	23.5
		50	50	22.36	22.30	22.82	21.96	21.60	1	23.5
		100	0	22.36	22.26	22.76	21.93	21.55	1	23.5
	16QAM	1	0	22.35	21.60	22.26	21.94	21.15	1	23.5
		1	49	22.16	22.01	22.46	21.77	21.00	1	23.5
		1	99	22.23	22.11	22.54	21.76	21.30	1	23.5
		50	0	21.31	21.18	21.73	20.93	20.42	2	22.5
		50	24	21.33	21.20	21.78	20.97	20.45	2	22.5
		50	50	21.36	21.27	21.82	20.97	20.47	2	22.5
		100	0	21.33	21.21	21.74	20.92	20.42	2	22.5
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)					MPR	Tune-up Limit
				39750	40185	40620	41055	41490		
				2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz		
15 MHz	QPSK	1	0	22.68	22.70	23.16	22.36	22.00	0	24.5
		1	37	22.84	22.73	23.16	22.37	22.00	0	24.5
		1	74	22.81	22.65	23.24	22.47	22.00	0	24.5
		36	0	21.83	21.73	22.17	21.44	21.00	1	23.5
		36	20	21.85	21.76	22.20	21.44	21.00	1	23.5
		36	39	21.84	21.77	22.24	21.47	21.00	1	23.5
		75	0	21.85	21.78	22.22	21.44	21.00	1	23.5
	16QAM	1	0	21.72	21.43	21.99	21.21	21.00	1	23.5
		1	37	21.76	21.45	21.82	21.45	21.00	1	23.5
		1	74	21.78	21.79	22.04	21.93	21.00	1	23.5
		36	0	20.79	20.69	21.15	20.37	20.00	2	22.5
		36	20	20.79	20.72	21.15	20.46	20.00	2	22.5
		36	39	20.83	20.75	21.26	20.46	20.00	2	22.5
		75	0	20.83	20.74	21.19	20.37	20.00	2	22.5

LTE Band 41 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)						
				39750	40185	40620	41055	41490	MPR	Tune-up Limit
				2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz		
10 MHz	QPSK	1	0	23.19	23.09	23.64	22.82	22.38	0	24.5
		1	25	23.22	23.12	23.69	22.85	22.40	0	24.5
		1	49	23.25	23.17	23.74	22.87	22.46	0	24.5
		25	0	22.30	22.23	22.69	21.89	21.48	1	23.5
		25	12	22.32	22.25	22.74	21.90	21.51	1	23.5
		25	25	22.35	22.27	22.78	21.92	21.53	1	23.5
	16QAM	50	0	22.33	22.24	22.75	21.89	21.51	1	23.5
		1	0	22.34	21.80	22.36	21.85	21.06	1	23.5
		1	25	22.35	21.83	22.41	21.87	21.08	1	23.5
		1	49	22.39	21.87	22.46	21.93	21.11	1	23.5
		25	0	21.32	21.16	21.69	20.90	20.35	2	22.5
		25	12	21.34	21.20	21.70	20.90	20.38	2	22.5
5 MHz	QPSK	25	25	21.34	21.22	21.72	20.91	20.40	2	22.5
		50	0	21.32	21.23	21.72	20.90	20.44	2	22.5
		1	0	22.71	22.75	23.13	22.31	22.00	0	24.5
		1	12	22.75	22.75	23.15	22.31	22.00	0	24.5
		1	24	22.77	22.76	23.20	22.36	22.00	0	24.5
		12	0	21.87	21.72	22.21	21.39	21.00	1	23.5
	16QAM	12	7	21.87	21.74	22.21	21.41	21.00	1	23.5
		12	13	21.89	21.73	22.23	21.40	21.00	1	23.5
		25	0	21.88	21.73	22.24	21.40	21.00	1	23.5
		1	0	21.58	21.47	21.98	21.00	21.00	1	23.5
		1	12	21.58	21.49	21.94	21.00	21.00	1	23.5
		1	24	21.64	21.52	22.00	21.00	21.00	1	23.5
16QAM	12	0	20.76	20.63	21.23	20.28	20.00	2	22.5	
	12	7	20.77	20.66	21.24	20.29	20.00	2	22.5	
	12	13	20.78	20.67	21.24	20.31	20.00	2	22.5	
	25	0	20.84	20.71	21.19	20.34	20.00	2	22.5	

9.4. Wi-Fi 2.4GHz (DTS Band)

Wi-Fi 2.4GHz Measured Results

Band	Mode	Data Rate	Ch #	Freq. (MHz)	Max Average Power (dBm)			Reduced Average Power (dBm)		
					Meas Pwr	Tune-up	SAR Test (Yes/No)	Meas Pwr	Tune-up	SAR Test (Yes/No)
DSSS 2.4 GHz	802.11b	1 Mbps	1	2412	14.00	15.00	Yes	12.80	13.00	Yes
			2	2417	18.60	19.00		12.30	13.00	
			6	2437	18.60	19.00		12.30	13.00	
			10	2457	18.50	19.00		12.30	13.00	
			11	2462	16.00	16.00		12.50	13.00	
OFDM 2.4 GHz	802.11g	6 Mbps	1	2412	15.90	17.00	No	12.90	13.00	No
			6	2437	16.20	17.00		12.40	13.00	
			11	2462	16.40	17.00		12.70	13.00	
	802.11n (HT20)	6.5 Mbps	1	2412	15.40	16.00	No	12.30	13.00	No
			6	2437	15.50	16.00		12.70	13.00	
			11	2462	14.80	15.00		12.10	13.00	

Note(s):

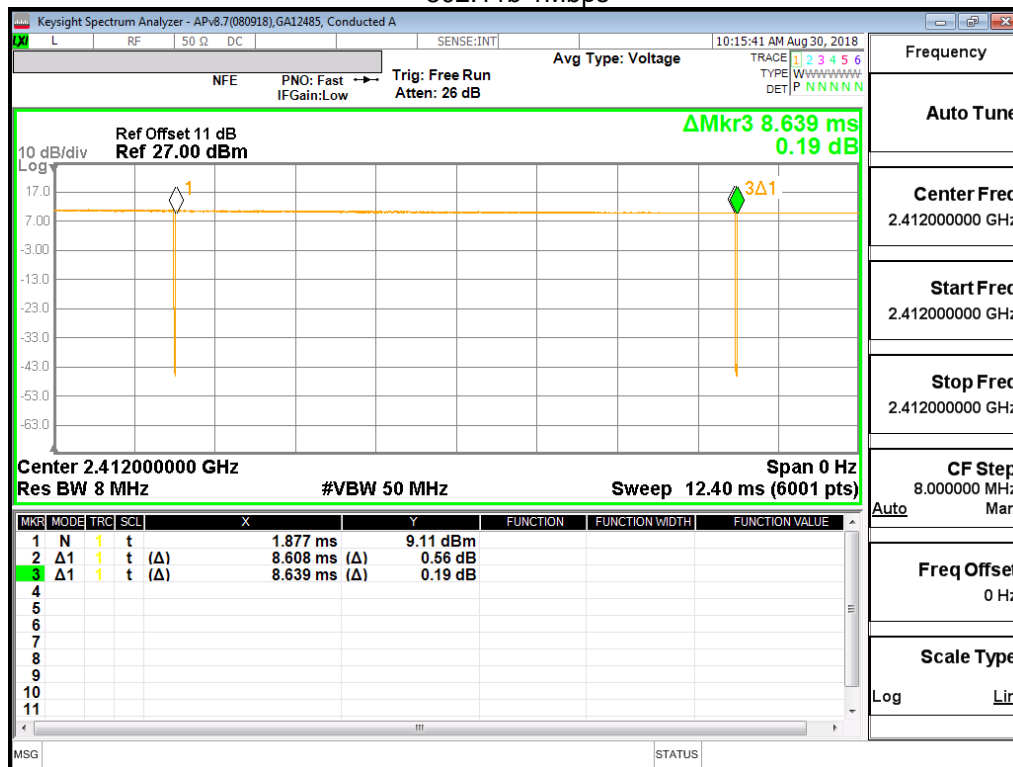
- SAR testing is not required for OFDM modes when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.
- For "Not required", SAR Test reduction was applied in accordance with KDB 248227 §2.1, b), 1).
- Channels 2, 6 and 10 for Maximum average power, were chosen for SAR evaluation due to these channels having highest Tune-up power.

Duty Factor Measured Results

Mode	Type	T on (ms)	Period (ms)	Duty Cycle	Crest Factor (1/duty cycle)
802.11b	1 Mbps	8.608	8.639	99.64%	1.00

Duty Cycle plot

802.11b 1Mbps



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

Wi-Fi 5 GHz Measured Results

Band	Mode	Data Rate	Ch #	Freq. (MHz)	Maximum Average Power (dBm)			Reduced Average Power (dBm)		
					Meas Pwr	Tune-up	SAR Test (Yes/No)	Meas Pwr	Tune-up	SAR Test (Yes/No)
UNII-1 5.2 GHz	802.11a	6 Mbps	36	5180	16.1	16.5	Yes	Not Required	11.0	No
			40	5200	16.0	16.5			11.0	
			44	5220	16.0	16.5			11.0	
			48	5240	16.2	16.5			11.0	
	802.11n (HT20)	6.5 Mbps	36	5180	Not Required	16.5	No	Not Required	11.0	No
			40	5200		16.5			11.0	
			44	5220		16.5			11.0	
			48	5240		16.5			11.0	
	802.11ac (VHT20)	6.5 Mbps	36	5180	Not Required	16.5	No	Not Required	11.0	No
			40	5200		16.5			11.0	
			44	5220		16.5			11.0	
			48	5240		16.5			11.0	
	802.11n (HT40)	13.5 Mbps	38	5190	Not Required	15.0	No	Not Required	11.0	No
			46	5230		15.0			11.0	
	802.11ac (VHT40)	13.5 Mbps	38	5190	Not Required	15.0	No	Not Required	11.0	No
			46	5230		15.0			11.0	
802.11ac (VHT80)	29.3 Mbps	42	5210	Not Required	11.0	No	10.8	11.0	Yes	
Band	Mode	Data Rate	Ch #	Freq. (MHz)	Maximum Average Power (dBm)			Reduced Average Power (dBm)		
					Meas Pwr	Tune-up	SAR Test (Yes/No)	Meas Pwr	Tune-up	SAR Test (Yes/No)
UNII-2A 5.3 GHz	802.11a	6 Mbps	52	5260	15.9	16.5	Yes	Not Required	11.0	No
			56	5280	16.2	16.5			11.0	
			60	5300	15.7	16.5			11.0	
			64	5320	16.4	16.5			11.0	
	802.11n (HT20)	6.5 Mbps	52	5260	Not Required	16.5	No	Not Required	11.0	No
			56	5280		16.5			11.0	
			60	5300		16.5			11.0	
			64	5320		16.5			11.0	
	802.11ac (VHT20)	6.5 Mbps	52	5260	Not Required	16.5	No	Not Required	11.0	No
			56	5280		16.5			11.0	
			60	5300		16.5			11.0	
			64	5320		16.5			11.0	
	802.11n (HT40)	13.5 Mbps	54	5270	Not Required	15.0	No	Not Required	11.0	No
			62	5310		15.0			11.0	
	802.11ac (VHT40)	13.5 Mbps	54	5270	Not Required	15.0	No	Not Required	11.0	No
			62	5310		15.0			11.0	
802.11ac (VHT80)	29.3 Mbps	58	5290	Not Required	14.0	No	10.8	11.0	Yes	

Note(s):

- For "Not required", SAR Test reduction was applied in accordance with KDB 248227 §2.1, b), 1). When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band. Additional output power measurements were not deemed necessary.
- 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.
- When the specified maximum output power is the same for both U-NII band 1 and U-NII band 2A, begin SAR measurement in U-NII band 2A; and if the highest reported SAR for U-NII band 2A is
 - ≤ 1.2 W/kg, SAR is not required for U-NII band 1
 - > 1.2 W/kg, both bands should be tested independently for SAR.
- Wi-Fi Direct is supported in U-NII Band 1. Therefore, Wi-Fi Direct was tested separately for SAR for U-NII Band 1.

Wi-Fi 5 GHz Measured Results (continued)

Band	Mode	Data Rate	Ch #	Freq. (MHz)	Maximum Average Power (dBm)			Reduced Average Power (dBm)		
					Meas Pwr	Tune-up	SAR Test (Yes/No)	Meas Pwr	Tune-up	SAR Test (Yes/No)
UNII-2C 5.5 GHz	802.11a	6 Mbps	100	5500	16.0	16.5	Yes	Not Required	11.0	No
			116	5580	15.6	16.5			11.0	
			124	5620	15.6	16.5			11.0	
			140	5700	15.6	16.5			11.0	
			144	5720	15.5	16.5			11.0	
	802.11n (HT20)	6.5 Mbps	100	5500	Not Required	16.5	No	Not Required	11.0	No
			116	5580		16.5			11.0	
			124	5620		16.5			11.0	
			140	5700		16.5			11.0	
			144	5720		16.5			11.0	
	802.11ac (VHT20)	6.5 Mbps	100	5500	Not Required	16.5	No	Not Required	11.0	No
			116	5580		16.5			11.0	
			124	5620		16.5			11.0	
			140	5700		16.5			11.0	
			144	5720		16.5			11.0	
	802.11n (HT40)	13.5 Mbps	102	5510	Not Required	15.0	No	Not Required	11.0	No
			118	5590		15.0			11.0	
			126	5630		15.0			11.0	
			134	5670		15.0			11.0	
			142	5710		15.0			11.0	
	802.11ac (VHT40)	13.5 Mbps	102	5510	Not Required	15.0	No	Not Required	11.0	No
			118	5590		15.0			11.0	
			126	5630		15.0			11.0	
			134	5670		15.0			11.0	
142			5710	15.0		11.0				
802.11ac (VHT80)	29.3 Mbps	106	5530	Not Required	14.0	No	10.4	11.0	Yes	
		122	5610		14.0		10.5			
		138	5690		14.0		10.4			

Band	Mode	Data Rate	Ch #	Freq. (MHz)	Maximum Average Power (dBm)			Reduced Average Power (dBm)		
					Meas Pwr	Tune-up	SAR Test (Yes/No)	Meas Pwr	Tune-up	SAR Test (Yes/No)
UNII-3 5.8 GHz	802.11a	6 Mbps	149	5745	14.9	16.5	Yes	Not Required	11.0	No
			157	5785	15.0	16.5			11.0	
			165	5825	15.1	16.5			11.0	
	802.11n (HT20)	6.5 Mbps	149	5745	Not Required	16.5	No	Not Required	11.0	No
			157	5785		16.5			11.0	
			165	5825		16.5			11.0	
	802.11ac (VHT20)	6.5 Mbps	149	5745	Not Required	16.5	No	Not Required	11.0	No
			157	5785		16.5			11.0	
			165	5825		16.5			11.0	
	802.11n (HT40)	13.5 Mbps	151	5755	Not Required	15.0	No	Not Required	11.0	No
			159	5795		15.0			11.0	
	802.11ac (VHT40)	13.5 Mbps	151	5755	Not Required	15.0	No	Not Required	11.0	No
			159	5795		15.0			11.0	
	802.11ac (VHT80)	29.3 Mbps	155	5775	Not Required	14.0	No	10.5	11.0	Yes

Note(s):

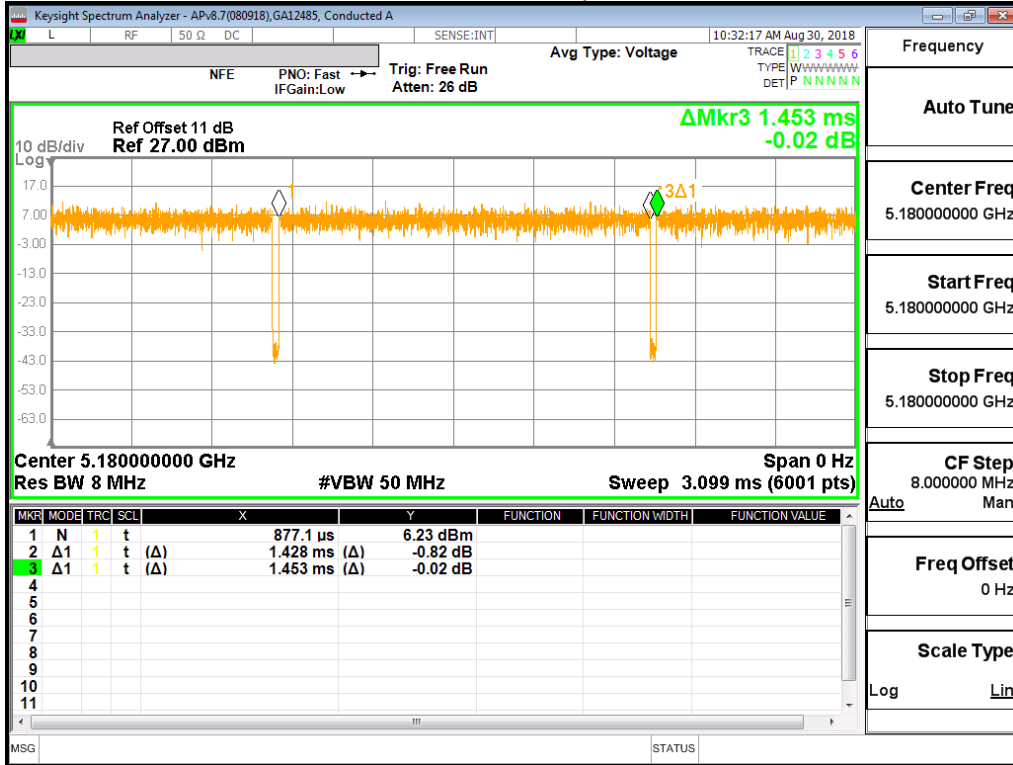
- For "Not required", SAR Test reduction was applied in accordance with KDB 248227 §2.1, b), 1). When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band. Additional output power measurements were not deemed necessary.
- 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.

Duty Factor Measured Results

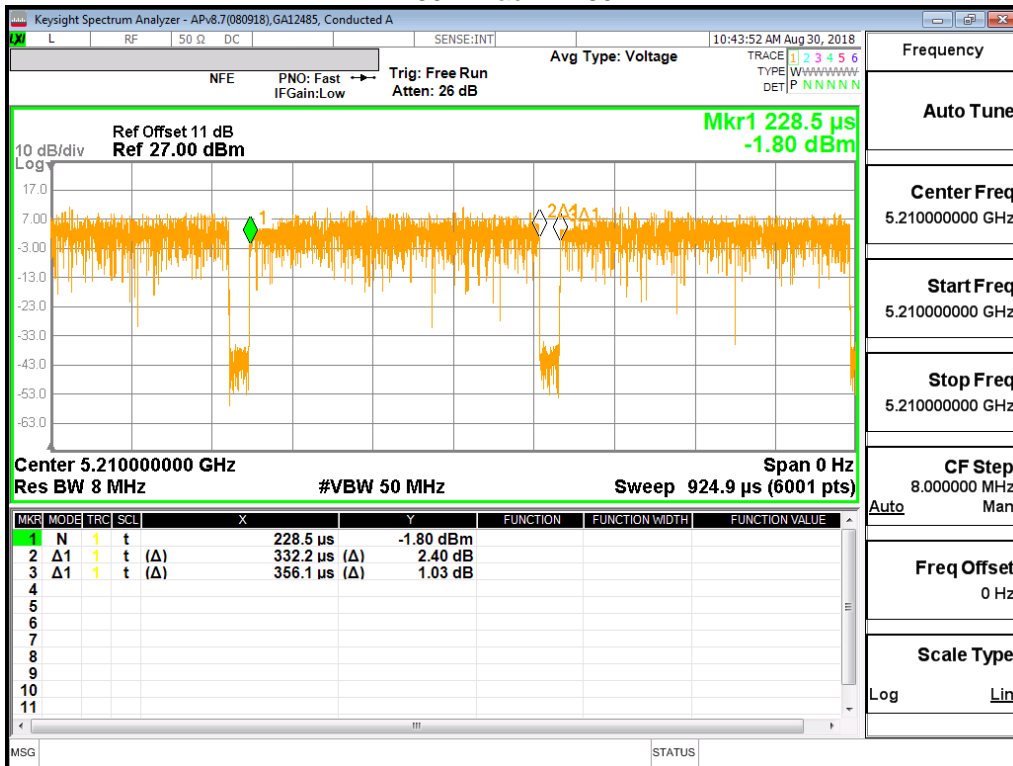
Mode	Type	T on (ms)	Period (ms)	Duty Cycle	Crest Factor (1/duty cycle)
802.11a	6 Mbps	1.428	1.453	98.28%	1.02
802.11ac	VHT80	0.3322	0.3561	93.29%	1.07

Duty Cycle plots

802.11a 6 Mbps



802.11ac VHT80



9.6. Bluetooth

Bluetooth Measured Results

Band	Mode	Ch #	Freq. (MHz)	Maximum Average Power (dBm)		
				Meas Pwr	Tune-up	SAR Test (Yes/No)
2.4	GFSK	0	2402	8.1	10.00	Yes
		39	2441	8.3	10.00	
		78	2480	7.6	10.00	
	EDR, $\pi/4$ DQPSK	0	2402	7.4	10.00	No
		39	2441	7.8	10.00	
		78	2480	7.1	10.00	
	EDR, 8-DPSK	0	2402	6.7	10.00	No
		39	2441	7.2	10.00	
		78	2480	6.5	10.00	
	LE, GFSK	0	2402	4.2	5.00	No
		19	2440	4.9	5.00	
		39	2480	4.4	5.00	

Note(s):

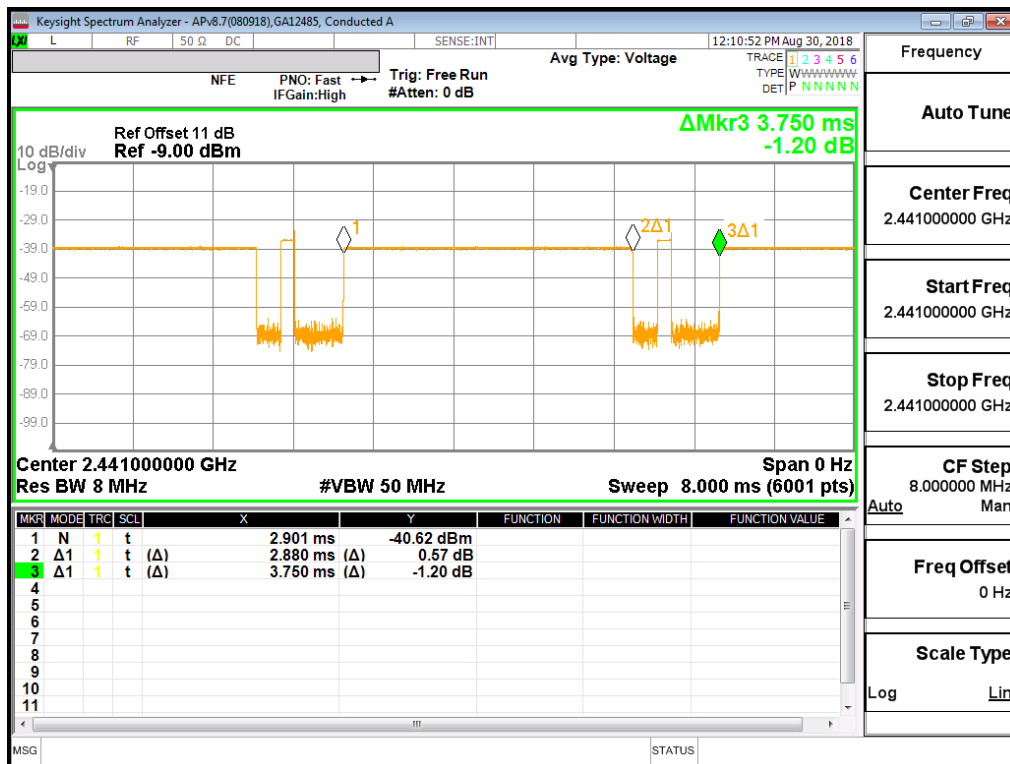
Body-worn and BT Tethering Mode qualify for SAR Test Exclusion. Refer to §10.12.

Duty Factor Measured Results

Mode	Type	T on (ms)	Period (ms)	Duty Cycle	Crest Factor (1/duty cycle)
GFSK	DH5	2.88	3.75	76.80%	1.30

Duty Cycle plots

GFSK



10. Measured and Reported (Scaled) SAR Results

SAR Test Reduction criteria are as follows:

- Reported SAR(W/kg) for WWAN = Measured SAR *Tune-up Scaling Factor
- Reported SAR(W/kg) for Wi-Fi and Bluetooth = Measured SAR * Tune-up scaling factor * Duty Cycle scaling factor
- Duty Cycle scaling factor = 1 / Duty cycle (%)

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 648474 D04 Handset SAR (Phablet Only):

When hotspot mode does not apply, 10-g Extremity SAR is required for all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge in direct contact with a flat phantom, to address interactive hand use exposure conditions. When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 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 $\leq \frac{1}{4}$ 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.
- For LTE bands that do not support at least three non-overlapping channels in certain channel bandwidths, test the available non-overlapping channels instead. When a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing; therefore, the requirement for H, M and L channels may not fully apply.

KDB 248227 D01 SAR meas for 802.11:

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. GSM1900

RF Exposure Conditions	Mode	Power Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Head	GPRS 2 Slots	OFF	0	Left Touch	661	1880.0	28.5	27.2	0.254	0.345	1
				Left Tilt	661	1880.0	28.5	27.2	0.113	0.153	
				Right Touch	661	1880.0	28.5	27.2	0.150	0.204	
				Right Tilt	661	1880.0	28.5	27.2	0.108	0.147	
Body-worn	GPRS 2 Slots	OFF	15	Rear	661	1880.0	28.5	27.2	0.146	0.198	
				Front	661	1880.0	28.5	27.2	0.155	0.211	2
Hotspot	GPRS 2 Slots	OFF	10	Rear	661	1880.0	28.5	27.2	0.338	0.459	3
				Front	661	1880.0	28.5	27.2	0.287	0.390	
				Edge 3	661	1880.0	28.5	27.2	0.168	0.228	
				Edge 4	661	1880.0	28.5	27.2	0.230	0.312	

10.2. W-CDMA Band II

RF Exposure Conditions	Mode	Power Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Head	Rel. 99 RMC 12.2 kbps	OFF	0	Left Touch	9400	1880.0	24.5	23.4	0.469	0.599	4
				Left Tilt	9400	1880.0	24.5	23.4	0.191	0.244	
				Right Touch	9400	1880.0	24.5	23.4	0.262	0.334	
				Right Tilt	9400	1880.0	24.5	23.4	0.158	0.202	
Body-worn	Rel. 99 RMC 12.2 kbps	OFF	15	Rear	9400	1880.0	24.5	23.4	0.259	0.331	5
				Front	9400	1880.0	24.5	23.4	0.233	0.297	
Hotspot	Rel. 99 RMC 12.2 kbps	OFF	10	Rear	9400	1880.0	24.5	23.4	0.604	0.771	6
				Front	9400	1880.0	24.5	23.4	0.516	0.659	
				Edge 3	9400	1880.0	24.5	23.4	0.323	0.412	
				Edge 4	9400	1880.0	24.5	23.4	0.255	0.325	

10.3. W-CDMA Band IV

RF Exposure Conditions	Mode	Power Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Head	Rel. 99 RMC 12.2 kbps	OFF	0	Left Touch	1413	1732.6	24.5	22.7	0.326	0.491	7
				Left Tilt	1413	1732.6	24.5	22.7	0.185	0.279	
				Right Touch	1413	1732.6	24.5	22.7	0.180	0.271	
				Right Tilt	1413	1732.6	24.5	22.7	0.133	0.200	
Body-worn	Rel. 99 RMC 12.2 kbps	OFF	15	Rear	1413	1732.6	24.5	22.7	0.251	0.378	8
				Front	1413	1732.6	24.5	22.7	0.234	0.353	
Hotspot	Rel. 99 RMC 12.2 kbps	OFF	10	Rear	1413	1732.6	24.5	22.7	0.434	0.654	9
				Front	1413	1732.6	24.5	22.7	0.355	0.535	
				Edge 3	1413	1732.6	24.5	22.7	0.248	0.374	
				Edge 4	1413	1732.6	24.5	22.7	0.335	0.505	

10.4. W-CDMA Band V

RF Exposure Conditions	Mode	Power Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Head	Rel. 99 RMC 12.2 kbps	OFF	0	Left Touch	4183	836.6	25.0	24.1	0.073	0.090	10
				Left Tilt	4183	836.6	25.0	24.1	0.045	0.055	
				Right Touch	4183	836.6	25.0	24.1	0.112	0.138	
				Right Tilt	4183	836.6	25.0	24.1	0.081	0.100	
Body-worn	Rel. 99 RMC 12.2 kbps	OFF	15	Rear	4183	836.6	25.0	24.1	0.197	0.243	11
				Front	4183	836.6	25.0	24.1	0.174	0.215	
Hotspot	Rel. 99 RMC 12.2 kbps	OFF	10	Rear	4183	836.6	25.0	24.1	0.375	0.462	12
				Front	4183	836.6	25.0	24.1	0.185	0.228	
				Edge 3	4183	836.6	25.0	24.1	0.139	0.171	
				Edge 4	4183	836.6	25.0	24.1	0.062	0.076	

10.5. LTE Band 4 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Power Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.	Meas.	Scaled	
Head	QPSK	OFF	0	Left Touch	20175	1732.5	1	0	24.0	22.1	0.217	0.333	13
							50	0	23.0	21.0	0.183	0.291	
				Left Tilt	20175	1732.5	1	0	24.0	22.1	0.120	0.184	
							50	0	23.0	21.0	0.101	0.161	
				Right Touch	20175	1732.5	1	0	24.0	22.1	0.104	0.159	
							50	0	23.0	21.0	0.086	0.137	
Right Tilt	20175	1732.5	1	0	24.0	22.1	0.083	0.127					
			50	0	23.0	21.0	0.066	0.105					
Body-worn	QPSK	OFF	15	Rear	20175	1732.5	1	0	24.0	22.1	0.154	0.236	
							50	0	23.0	21.0	0.125	0.199	
				Front	20175	1732.5	1	0	24.0	22.1	0.242	0.371	14
							50	0	23.0	21.0	0.189	0.300	
Hotspot	QPSK	OFF	10	Rear	20175	1732.5	1	0	24.0	22.1	0.302	0.463	
							50	0	23.0	21.0	0.247	0.393	
				Front	20175	1732.5	1	0	24.0	22.1	0.388	0.595	15
							50	0	23.0	21.0	0.185	0.294	
				Edge 3	20175	1732.5	1	0	24.0	22.1	0.228	0.350	
							50	0	23.0	21.0	0.170	0.270	
Edge 4	20175	1732.5	1	0	24.0	22.1	0.283	0.434					
			50	0	23.0	21.0	0.210	0.334					

10.6. LTE Band 5 (10MHz Bandwidth)

LTE Band 5 (Frequency range: 824-849 MHz) is covered by LTE Band 26 (Frequency range: 814-849 MHz) due to similar frequency range, same maximum tune-up limit and same channel bandwidth.

10.7. LTE Band 17 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Power Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.	Meas.	Scaled	
Head	QPSK	OFF	0	Left Touch	23790	710.0	1	0	25.0	23.7	0.087	0.117	
							25	12	24.0	22.7	0.063	0.084	
				Left Tilt	23790	710.0	1	0	25.0	23.7	0.055	0.074	
							25	12	24.0	22.7	0.042	0.056	
				Right Touch	23790	710.0	1	0	25.0	23.7	0.122	0.164	16
							25	12	24.0	22.7	0.091	0.122	
Right Tilt	23790	710.0	1	0	25.0	23.7	0.059	0.079					
			25	12	24.0	22.7	0.046	0.062					
Body-worn	QPSK	OFF	15	Rear	23790	710.0	1	0	25.0	23.7	0.250	0.336	17
							25	12	24.0	22.7	0.187	0.250	
				Front	23790	710.0	1	0	25.0	23.7	0.177	0.238	
							25	12	24.0	22.7	0.132	0.177	
Hotspot	QPSK	OFF	10	Rear	23790	710.0	1	0	25.0	23.7	0.294	0.395	18
							25	12	24.0	22.7	0.234	0.313	
				Front	23790	710.0	1	0	25.0	23.7	0.162	0.218	
							25	12	24.0	22.7	0.123	0.165	
				Edge 3	23790	710.0	1	0	25.0	23.7	0.102	0.137	
							25	12	24.0	22.7	0.075	0.100	
				Edge 4	23790	710.0	1	0	25.0	23.7	0.164	0.221	
							25	12	24.0	22.7	0.112	0.150	

10.8. LTE Band 26 (15MHz Bandwidth)

RF Exposure Conditions	Mode	Power Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.	Meas.	Scaled	
Head	QPSK	OFF	0	Left Touch	26865	831.5	1	0	25.0	23.5	0.075	0.106	
							36	0	24.0	22.5	0.054	0.077	
				Left Tilt	26865	831.5	1	0	25.0	23.5	0.045	0.064	
							36	0	24.0	22.5	0.031	0.044	
				Right Touch	26865	831.5	1	0	25.0	23.5	0.109	0.155	19
							36	0	24.0	22.5	0.079	0.112	
Right Tilt	26865	831.5	1	0	25.0	23.5	0.048	0.068					
			36	0	24.0	22.5	0.033	0.047					
Body-worn	QPSK	OFF	15	Rear	26865	831.5	1	0	25.0	23.5	0.165	0.234	20
							36	0	24.0	22.5	0.093	0.132	
				Front	26865	831.5	1	0	25.0	23.5	0.089	0.126	
							36	0	24.0	22.5	0.066	0.094	
Hotspot	QPSK	OFF	10	Rear	26865	831.5	1	0	25.0	23.5	0.386	0.548	21
							36	0	24.0	22.5	0.306	0.436	
				Front	26865	831.5	1	0	25.0	23.5	0.139	0.197	
							36	0	24.0	22.5	0.126	0.179	
				Edge 3	26865	831.5	1	0	25.0	23.5	0.186	0.264	
							36	0	24.0	22.5	0.141	0.201	
				Edge 4	26865	831.5	1	0	25.0	23.5	0.038	0.054	
							36	0	24.0	22.5	0.026	0.037	

10.9. LTE Band 41 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Power Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.	Meas.	Scaled	
Head	QPSK	OFF	0	Left Touch	40620	2593.0	1	99	24.5	23.8	0.135	0.160	
							50	50	23.5	22.8	0.106	0.124	
				Left Tilt	40620	2593.0	1	99	24.5	23.8	0.118	0.140	
							50	50	23.5	22.8	0.084	0.098	
				Right Touch	40620	2593.0	1	99	24.5	23.8	0.183	0.216	22
							50	50	23.5	22.8	0.146	0.171	
Right Tilt	40620	2593.0	1	99	24.5	23.8	0.039	0.046					
			50	50	23.5	22.8	0.020	0.023					
Body-worn	QPSK	OFF	15	Rear	40620	2593.0	1	99	24.5	23.8	0.217	0.257	
							50	50	23.5	22.8	0.167	0.195	
				Front	40620	2593.0	1	99	24.5	23.8	0.223	0.264	23
							50	50	23.5	22.8	0.176	0.206	
Hotspot	QPSK	OFF	10	Rear	40620	2593.0	1	99	24.5	23.8	0.411	0.486	
							50	50	23.5	22.8	0.275	0.322	
				Front	40620	2593.0	1	99	24.5	23.8	0.490	0.580	24
							50	50	23.5	22.8	0.391	0.457	
				Edge 2	40620	2593.0	1	99	24.5	23.8	0.265	0.314	
							50	50	23.5	22.8	0.212	0.248	
Edge 3	40620	2593.0	1	99	24.5	23.8	0.073	0.086					
			50	50	23.5	22.8	0.059	0.069					

10.10. Wi-Fi (DTS Band)

When the 802.11b reported SAR of the highest measured maximum output power channel is ≤ 0.8 W/kg, no further SAR testing is required. If SAR is > 0.8 W/kg and ≤ 1.2 W/kg, SAR is required for the next highest measured output power channel. Finally, if SAR is > 1.2 W/kg, SAR is required for the third channel.

SAR testing is not required for OFDM mode(s) 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.

RF Exposure Conditions	Mode	Power Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Duty Cycle	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.	Meas.	Scaled	
Head	802.11b 1 Mbps	ON	0	Left Touch	1	2412.0	99.64%	0.605	13.0	12.8			
				Left Tilt	1	2412.0	99.64%	0.618	13.0	12.8			
				Right Touch	1	2412.0	99.64%	0.903	13.0	12.8	0.527	0.554	
				Right Tilt	1	2412.0	99.64%	0.973	13.0	12.8	0.623	0.655	25
Body-worn	802.11b 1 Mbps	OFF	15	Rear	6	2437.0	99.64%	0.494	19.0	18.6	0.366	0.403	26
				Front	6	2437.0	99.64%	0.396	19.0	18.6	0.253	0.278	
Hotspot & Wi-Fi Direct	802.11b 1 Mbps	OFF	10	Rear	6	2437.0	99.64%	1.040	19.0	18.6	0.718	0.790	27
				Front	6	2437.0	99.64%	0.796	19.0	18.6	0.516	0.568	
				Edge 1	6	2437.0	99.64%	0.637	19.0	18.6			
				Edge 4	6	2437.0	99.64%	0.151	19.0	18.6			

Adjusted SAR for OFDM Modes:

Power Back-off	802.11b Max. Power		802.11g Max. Power		802.11n HT20 Max. Power		Highest Reported SAR for 802.11b (W/kg)	Adjusted SAR for 802.11g (W/kg)	Adjusted SAR for 802.11n HT20 (W/kg)
	dBm	mW	dBm	mW	dBm	mW			
ON	13.0	20	13.0	20	13.0	20	0.655	0.655	0.655
OFF	19.0	79	17.0	50	17.0	50	0.403	0.254	0.254

Note(s):

Adjusted SAR for OFDM modes is < 1.2 W/kg, therefore SAR testing is not required for OFDM modes.

10.11. Wi-Fi (U-NII Band)

UNII-1 &2A

When the specified maximum output power is the same for both UNII band 1 and UNII band 2A, begin SAR measurement in UNII band 2A; and if the highest reported SAR for UNII band 2A is

- ≤ 1.2 or 3 W/kg (1g and 10g respectively), SAR is not required for UNII band 1
- > 1.2 or 3 W/kg (1g and 10g respectively), both bands should be tested independently for SAR.

RF Exposure Conditions	Mode	Power Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Duty Cycle	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.	Meas.	Scaled	
Wi-Fi Direct	802.11a 6 Mbps	OFF	10	Rear	48	5240.0	98.28%	0.907	16.5	16.2	0.395	0.431	
				Front	48	5240.0	98.35%	0.614	16.5	16.2			
				Edge 1	48	5240.0	98.35%	1.212	16.5	16.2	0.516	0.562	28
				Edge 4	48	5240.0	98.35%	0.092	16.5	16.2			

Note(s):

Wi-Fi Direct is supported in U-NII Band 1, therefore it was evaluated separately.

RF Exposure Conditions	Mode	Power Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Duty Cycle	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.	Meas.	Scaled	
Head	802.11ac VHT80	ON	0	Left Touch	58	5290.0	93.29%	0.652	11.0	10.8			
				Left Tilt	58	5290.0	93.29%	0.887	11.0	10.8			
				Right Touch	58	5290.0	93.29%	0.927	11.0	10.8	0.301	0.338	
				Right Tilt	58	5290.0	93.29%	1.150	11.0	10.8	0.521	0.585	29
Body-worn	802.11a 6 Mbps	OFF	15	Rear	64	5320.0	98.28%	0.536	16.5	16.4	0.246	0.256	30
				Front	64	5320.0	98.28%	0.481	16.5	16.4			

RF Exposure Conditions	Mode	Power Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Duty Cycle	Area Scan Max. SAR (W/kg)	Power (dBm)		10-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.	Meas.	Scaled	
Product Specific 10g	802.11a 6 Mbps	OFF	0	Rear	64	5320.0	98.28%	7.680	16.5	16.4	0.862	0.898	31
				Front	64	5320.0	98.28%	6.340	16.5	16.4			
				Edge 1	64	5320.0	98.28%	7.320	16.5	16.4			
				Edge 4	64	5320.0	98.28%	0.306	16.5	16.4			

Note(s):

1. For Head and Body-worn RF Exposure Conditions, The Highest Reported 1-g SAR for U-NII 2A mode is < 1.2 W/kg, therefore SAR testing is not required for U-NII 1 mode.
2. For Product Specific 10g RF Exposure Condition, The Highest Reported 10-g SAR for U-NII 2A mode is < 3.0 W/kg, therefore SAR testing is not required for U-NII 1 mode.

U-NII 2C

RF Exposure Conditions	Mode	Power Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Duty Cycle	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.	Meas.	Scaled	
Head	802.11ac VHT80	ON	0	Left Touch	122	5610.0	93.29%	0.542	11.0	10.5			
				Left Tilt	122	5610.0	93.29%	0.637	11.0	10.5	0.391	0.470	32
				Right Touch	122	5610.0	93.29%	0.621	11.0	10.5			
				Right Tilt	122	5610.0	93.29%	0.858	11.0	10.5	0.349	0.420	
Body-worn	802.11a 6 Mbps	OFF	15	Rear	100	5500.0	98.28%	0.688	16.5	16.0	0.299	0.341	33
				Front	100	5500.0	98.28%	0.489	16.5	16.0			

RF Exposure Conditions	Mode	Power Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Duty Cycle	Area Scan Max. SAR (W/kg)	Power (dBm)		10-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.	Meas.	Scaled	
Product Specific 10g	802.11a 6 Mbps	OFF	0	Rear	100	5500.0	98.28%	9.950	16.5	16.0	0.848	0.968	34
				Front	100	5500.0	98.28%	7.210	16.5	16.0			
				Edge 1	100	5500.0	98.28%	6.950	16.5	16.0			
				Edge 4	100	5500.0	98.28%	0.294	16.5	16.0			

U-NII 3

RF Exposure Conditions	Mode	Power Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Duty Cycle	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.	Meas.	Scaled	
Head	802.11ac VHT80	ON	0	Left Touch	155	5775	93.29%	0.800	11.0	10.5			
				Left Tilt	155	5775	93.29%	0.828	11.0	10.5			
				Right Touch	155	5775	93.29%	1.160	11.0	10.5	0.433	0.521	
				Right Tilt	155	5775	93.29%	1.230	11.0	10.5	0.486	0.585	35
Body-worn	802.11a 6 Mbps	OFF	15	Rear	165	5825	98.28%	0.643	16.5	15.1	0.284	0.399	36
				Front	165	5825	98.28%	0.503	16.5	15.1			
Hotspot & Wi-Fi Direct	802.11a 6 Mbps	OFF	10	Rear	165	5825	98.28%	0.920	16.5	15.1	0.441	0.619	
				Front	165	5825	98.28%	0.770	16.5	15.1			
				Edge 1	149	5745	98.28%	1.530	16.5	14.9	0.703	1.034	
					157	5785	98.28%	1.500	16.5	15.0	0.731	1.051	37
				Edge 4	165	5825	98.28%	1.560	16.5	15.1	0.677	0.951	

10.12. Bluetooth

RF Exposure Conditions	Mode	Power Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Duty Cycle	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
Head	GFSK DH5	OFF	0	Left Touch	39	2441	76.80%	10.0	8.3	<0.001	<0.001	
				Left Tilt	39	2441	76.80%	10.0	8.3	0.004	0.008	38
				Right Touch	39	2441	76.80%	10.0	8.3	<0.001	<0.001	
				Right Tilt	39	2441	76.80%	10.0	8.3	<0.001	<0.001	

Note(s):

Body-worn and BT Tethering Mode qualify for SAR Test Exclusion. Refer to §10.13.

10.13. 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:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$, for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- $f_{(\text{GHz})}$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

When the standalone SAR test exclusion is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:

- $(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f_{(\text{GHz})}/x}] \text{ W/kg}$ 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 and BT Tethering:

RF Air interface	RF Exposure Conditions	Frequency (GHz)	Max. tune-up tolerance Power		Min. test separation distance (mm)	SAR test exclusion Result*	Estimated 1-g SAR (W/kg)
			(dBm)	(mW)			
Bluetooth	Body-worn	2.480	10.0	10	15	1.0	0.140
Bluetooth	Tethering	2.480	10.0	10	10	1.6	0.210

Conclusion:

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

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)
700	LTE Band 17	Hotspot	Rear	No	0.294
850	WCDMA Band V	Hotspot	Rear	No	0.375
	LTE Band 26	Hotspot	Rear	No	0.386
1700	WCDMA Band IV	Hotspot	Rear	No	0.434
	LTE Band 4	Hotspot	Front	No	0.388
1900	GSM 1900	Hotspot	Rear	No	0.338
	WCDMA Band II	Hotspot	Rear	No	0.604
2400	Wi-Fi 802.11b/g/n	Hotspot	Rear	No	0.718
	BT	Head	Left Tilt	No	0.004
2600	LTE Band 41	Hotspot	Front	No	0.490
5200	Wi-Fi 802.11a/n/ac	WiFi Direct	Edge 1	No	0.516
5300	Wi-Fi 802.11a/n/ac	Head	Right Tilt	No	0.521
5500	Wi-Fi 802.11a/n/ac	Head	Left Tilt	No	0.391
5800	Wi-Fi 802.11a/n/ac	WiFi Direct	Edge 1	No	0.731

Note(s):

Repeated Measurement is not required since measured SAR is < 0.8 W/kg.

Product Specific 10g SAR:

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)
5300	Wi-Fi 802.11a	Product Specific 10g	Rear	No	0.862
5500	Wi-Fi 802.11a	Product Specific 10g	Rear	No	0.848

Note(s):

Repeated Measurement is not required since measured SAR is < 2.0 W/kg.

12. Simultaneous Transmission Conditions

Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Notes
1	GSM voice + 2.4 GHz Wl-Fi	Yes	Yes	N/A	
2	GSM voice + 5 GHz Wl-Fi	Yes	Yes	N/A	
3	GSM voice + 2.4 GHz Bluetooth	Yes^	Yes	N/A	^Bluetooth Tethering is considered
4	UMTS + 2.4 GHz Wl-Fi	Yes	Yes	Yes	
5	UMTS + 5 GHz Wl-Fi	Yes	Yes	Yes	
6	UMTS + 2.4 GHz Bluetooth	Yes^	Yes	Yes^	^Bluetooth Tethering is considered
7	LTE + 2.4 GHz Wl-Fi	Yes	Yes	Yes	
8	LTE + 5 GHz Wl-Fi	Yes	Yes	Yes	
9	LTE + 2.4 GHz Bluetooth	Yes^	Yes	Yes^	^Bluetooth Tethering is considered
10	GPRS/EDGE + 2.4 GHz Wl-Fi	N/A	N/A	Yes	
11	GPRS/EDGE + 5 GHz Wl-Fi	N/A	N/A	Yes	
12	GPRS/EDGE + 2.4 GHz Bluetooth	N/A	N/A	Yes^	

12.1. Simultaneous transmission SAR test exclusion considerations

KDB 447498 D01 General RF Exposure Guidance provides two procedures for determining simultaneous transmission SAR test exclusion: Sum of SAR and SAR to Peak Location Ratio (SPLSR)

12.1.1. Sum of SAR

To qualify for simultaneous transmission SAR test exclusion based upon Sum of SAR the sum of the reported standalone SARs for all simultaneously transmitting antennas shall be below the applicable standalone SAR limit. If the sum of the SARs is above the applicable limit then simultaneous transmission SAR test exclusion may still apply if the requirements of the SAR to Peak Location Ratio (SPLSR) evaluation are met.

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

RF Exposure conditions	Test Position	Standalone SAR (W/kg)				Σ 1-g SAR (W/kg)		
		WWAN ①	DTS ②	U-NII ③	BT ④	WWAN + DTS ① + ②	WWAN + U-NII ① + ③	WWAN + BT ① + ④
Head	Left Touch	0.599	0.554	0.470	0.008	1.153	1.069	0.607
	Left Tilt	0.279	0.554	0.470	0.008	0.833	0.749	0.287
	Right Touch	0.334	0.554	0.521	0.008	0.888	0.855	0.342
	Right Tilt	0.202	0.655	0.585	0.008	0.857	0.787	0.210
Body-worn	Rear	0.378	0.403	0.399	0.140	0.781	0.777	0.518
	Front	0.371	0.278	0.399	0.140	0.649	0.770	0.511
Hotspot, Wi-Fi Direct & BT Tethering	Rear	0.771	0.790	0.619	0.210	1.561	1.390	0.981
	Front	0.659	0.568	0.619	0.210	1.227	1.278	0.869
	Edge 1		0.568	1.051	0.210			0.210
	Edge 2	0.314						
	Edge 3	0.412						
	Edge 4	0.505	0.568	0.619	0.210	1.073	1.124	0.715

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the sum of the 1-g SAR is < 1.6 W/kg.

Appendixes

Refer to separated files for the following appendixes.

12440940-S1V1 Appendix A: SAR Setup Photos

12440940-S1V1 Appendix B: SAR System Check Plots

12440940-S1V1 Appendix C: Highest SAR Test Plots

12440940-S1V1 Appendix D: SAR Liquid Tissue Ingredients

12440940-S1V1 Appendix E: SAR Probe Calibration Certificates

12440940-S1V1 Appendix F: SAR Dipole Calibration Certificates

END OF REPORT