



**SAR EVALUATION REPORT**

**IEEE Std 1528-2013**

*For*

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

**FCC ID: A3LSMA305GT  
Model Name: SM-A305GT/DS**

**Report Number: 12678288-S1V3  
Issue Date: 3/4/2019**

*Prepared for*

**Samsung Electronics Co. Ltd  
129 Samsung-Ro, Yeongtong-Gu,  
Suwon-Si, Gyeonggi-Do, 16677, Korea**

*Prepared by*

**UL VERIFICATION SERVICES INC.  
47173 BENICIA STREET  
FREMONT, CA 94538, U.S.A.  
TEL: (510) 771-1000  
FAX: (510) 661-0888**



NVLAP LAB CODE 200065-0

**Revision History**



Rev.	Date	Revisions	Revised By
V1	2/15/2019	Initial Issue	--
V2	2/26/2019	Updated in accordance with TCB feedback	AJ Newcomer
V3	3/4/2019	Section 6.2: Removed Note 4	Coltyce Sanders

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# 1. Attestation of Test Results

Applicant Name	Samsung Electronics Co. Ltd				
FCC ID	A3LSMA305GT				
Model Name	SM-A305GT/DS				
Applicable Standards	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	0.283	0.199	0.378	0.047	
Body-worn	0.418	0.112	0.175	0.007	
Hotspot	0.726	0.276	0.206	0.015	
Product Specific 10g	N/A	N/A	1.180	N/A	
Simultaneous Tx	Head	0.476	0.476	0.331	0.321
	Body-worn	0.593	0.530	0.593	0.424
	Hotspot/ BT Tethering	1.002	1.002	0.932	0.741
Date Tested	1/31/2019 to 2/12/2019				
Test Results	Pass				
<p>UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.</p> <p>The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.</p> <p>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 the U.S. government.</p>					
Approved & Released By:		Prepared By:			
					
Devin Chang Senior Test Engineer UL Verification Services Inc.		Remi Rodberg Laboratory Technician UL Verification Services Inc.			

## 2. Test Specification, Methods and Procedures

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

- 248227 D01 802.11 Wi-Fi SAR 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

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

- [TCB workshop](#) October 2014; RF Exposure Procedures (Other LTE Considerations)
- [TCB workshop](#) April 2015; RF Exposure Procedures (Overlapping LTE Bands)
- [TCB workshop](#) October 2015; RF Exposure Procedures (KDB 941225 D05A)
- [TCB workshop](#) April 2016; RF Exposure Procedures (LTE Carrier Aggregation for DL)
- [TCB workshop](#) October 2016; RF Exposure Procedures (Bluetooth Duty Factor)
- [TCB workshop](#) October 2016; RF Exposure Procedures (DUT Holder Perturbations)
- [TCB workshop](#) May 2017; RF Exposure Procedures (Broadband Liquid Above 3 GHz)
- [TCB workshop](#) April 2018; RF Exposure Procedures (LTE DL CA SAR Test Exclusion)

## 3. Facilities and Accreditation

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

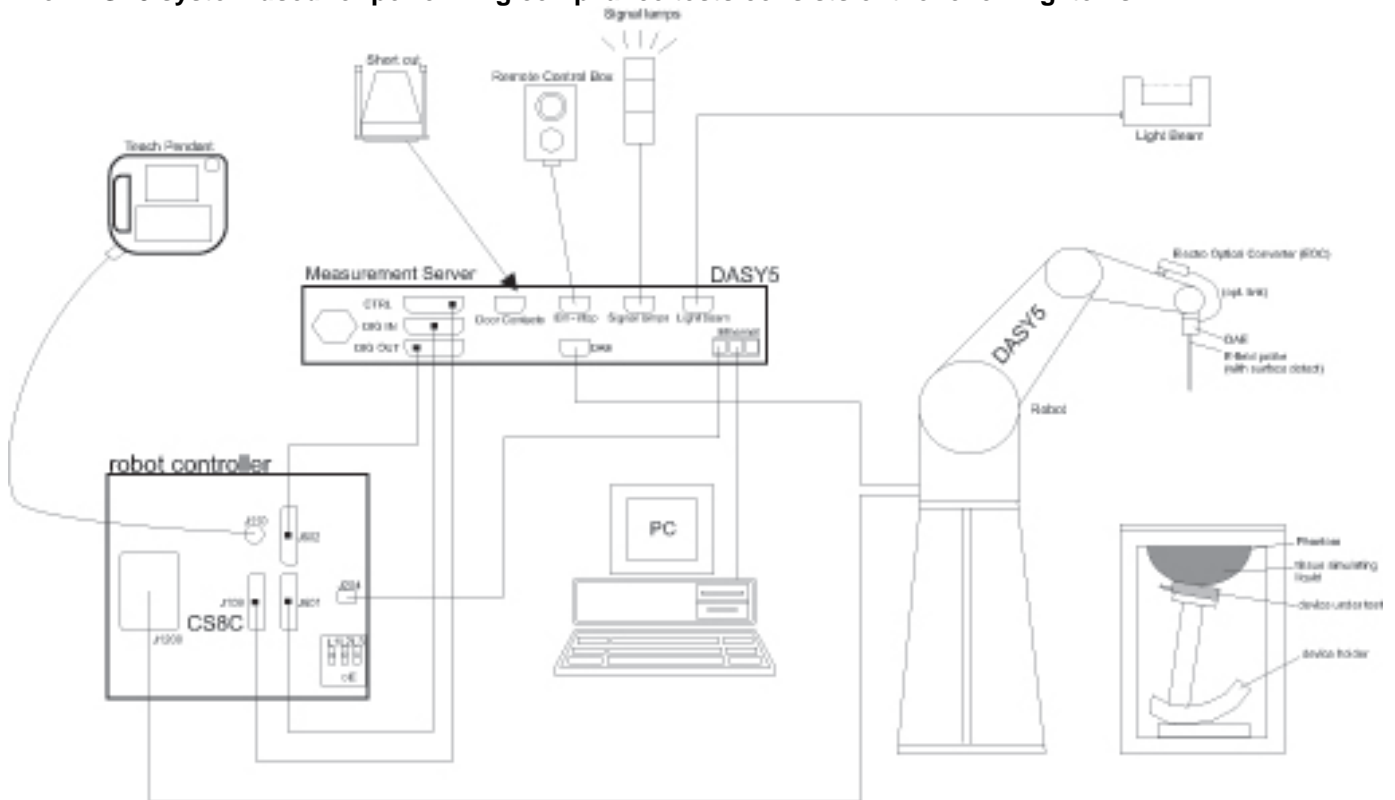
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	SAR Lab 5
SAR Lab F	SAR Lab 6
SAR Lab G	SAR Lab 7
SAR Lab H	SAR Lab 8

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

	$\leq 3$ GHz	$> 3$ GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	$5 \pm 1$ 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: $\Delta x_{Area}$ , $\Delta y_{Area}$	$\leq 2$ GHz: $\leq 15$ mm $2 - 3$ GHz: $\leq 12$ mm	$3 - 4$ GHz: $\leq 12$ mm $4 - 6$ GHz: $\leq 10$ 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

		$\leq 3$ GHz	$> 3$ GHz	
Maximum zoom scan spatial resolution: $\Delta x_{Zoom}, \Delta y_{Zoom}$		$\leq 2$ GHz: $\leq 8$ mm 2 – 3 GHz: $\leq 5$ mm*	3 – 4 GHz: $\leq 5$ mm* 4 – 6 GHz: $\leq 4$ mm*	
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$	$\leq 5$ mm	3 – 4 GHz: $\leq 4$ mm 4 – 5 GHz: $\leq 3$ mm 5 – 6 GHz: $\leq 2$ mm	
	graded grid	$\Delta z_{Zoom}(1)$ : between 1 <sup>st</sup> two points closest to phantom surface	$\leq 4$ mm	3 – 4 GHz: $\leq 3$ mm 4 – 5 GHz: $\leq 2.5$ mm 5 – 6 GHz: $\leq 2$ 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	$\geq 30$ mm	3 – 4 GHz: $\geq 28$ mm 4 – 5 GHz: $\geq 25$ mm 5 – 6 GHz: $\geq 22$ mm	
Note: $\delta$ 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 $\leq 1.4$ W/kg, $\leq 8$ mm, $\leq 7$ mm and $\leq 5$ 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.

### 4.3. Test Equipment

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

#### Dielectric Property Measurements

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Network Analyzer	R&S	ZNLE6	PRE0181650	7/16/2019
Dielectric Probe kit	SPEAG	DAK-3.5	1082	9/11/2019
Shorting block	SPEAG	DAK-3.5 Short	SM DAK 200 DA	9/11/2019
Thermometer	Traceable Calibration Control Co.	15-1078-179	170064398	3/14/2019

#### System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Signal Generator	Rhode & Schwarz	SMB100A	180969-yc	6/27/2019
Power Sensor	Rhode & Schwarz	NRP18A	100992-iu	6/19/2019
Signal Generator	Rhode & Schwarz	SMB100A	180969-yc	7/4/2019
Power Sensor	Rhode & Schwarz	NRP18A	100992-iu	6/19/2019
Synthesized Signal Generator	Agilent	N5181A	MY50140610	1/31/2020
Power Meter	Agilent	N1912A	MY50001018	1/30/2020
Power Sensor	Agilent	N1921A	MY53020038	4/23/2019
Power Sensor	Agilent	N10149	MY52260009	2/5/2020
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1795092	N/A
Directional Coupler	Werlatone	C8060-102	2149	N/A
DC Power Supply	Sorensen/Ametek	XT 15-4	1817A02680	N/A

#### Lab Equipment

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
E-Field Probe (SAR Lab B)	SPEAG	EX3DV4	3772	2/13/2019
E-Field Probe (SAR Lab E)	SPEAG	EX3DV4	3990	8/17/2019
E-Field Probe (SAR Lab F)	SPEAG	EX3DV4	3902	5/24/2019
E-Field Probe (SAR Lab G)	SPEAG	EX3DV4	7463	7/20/2019
E-Field Probe (SAR Lab H)	SPEAG	EX3DV4	7482	7/23/2019
Data Acquisition Electronics (SAR Lab B)	SPEAG	DAE4	1377	9/14/2019
Data Acquisition Electronics (SAR Lab E)	SPEAG	DAE4	1548	5/3/2019
Data Acquisition Electronics (SAR Lab F)	SPEAG	DAE4	1439	7/10/2019
Data Acquisition Electronics (SAR Lab G)*	SPEAG	DAE4	1359	2/9/2019
Data Acquisition Electronics (SAR Lab G)	SPEAG	DAE4	1257	9/14/2020
Data Acquisition Electronics (SAR Lab H)	SPEAG	DAE4	1239	7/11/2019
System Validation Dipole	SPEAG	D750V3	1024	5/16/2019
System Validation Dipole	SPEAG	D835V2	4d142	8/23/2019
System Validation Dipole	SPEAG	D1750V2	1050	4/10/2019
System Validation Dipole	SPEAG	D1900V2	5d140	4/11/2019
System Validation Dipole	SPEAG	D2450V2	706	5/18/2019
System Validation Dipole	SPEAG	D2600V2	1006	10/16/2019
System Validation Dipole	SPEAG	D5GHzV2	1003	3/13/2019

#### Notes:

\*Equipment not used past calibration due date

#### Other

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Power Meter	Agilent	N1912A	MY50001018	10/18/2019
Power Sensor	Agilent	N1921A	MY53020038	4/23/2019
Power Sensor	Agilent	N1921A	MY53260010	10/17/2019
Base Station Simulator	R & S	CMW500	135384	6/1/2019
Spectrum Analyzer	Agilent	N9030A	MY55410181	1/24/2020

## 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	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)	<p>Wi-Fi Hotspot mode permits the device to share its cellular data connection with other Wi-Fi-enabled devices.</p> <input checked="" type="checkbox"/> Mobile Hotspot (Wi-Fi 2.4 GHz) <input checked="" type="checkbox"/> Mobile Hotspot (Wi-Fi 5 GHz, Ch 149 only)																					
Wi-Fi Direct	<p>Wi-Fi Direct enabled devices transfer data directly between each other. Wi-Fi Direct is only available in hand use configuration</p> <input checked="" type="checkbox"/> Wi-Fi Direct (Wi-Fi 2.4 GHz) <input checked="" type="checkbox"/> Wi-Fi Direct (Wi-Fi 5.2 GHz/5.8 GHz)																					
Bluetooth Tethering	<p>BT Tethering mode permits the device to share its cellular data connection with other devices.</p> <input checked="" type="checkbox"/> BT Tethering (Bluetooth 2.4 GHz)																					
Test sample information	<table border="1"> <thead> <tr> <th>S/N</th> <th>IMEI</th> <th>Notes</th> </tr> </thead> <tbody> <tr> <td>R38M103M8YY</td> <td>354881/10/002687/6</td> <td>WWAN Conducted</td> </tr> <tr> <td>R38M103M34X</td> <td>354881/10/002495/2</td> <td>WLAN Conducted</td> </tr> <tr> <td>R38M103M35J</td> <td>354881/10/002496/2</td> <td>Radiated</td> </tr> <tr> <td>R38M103M9KN</td> <td>354881/10/002708/0</td> <td>Radiated</td> </tr> <tr> <td>R38M103M3JW</td> <td>354881/10/002509/2</td> <td>Radiated</td> </tr> <tr> <td>R38M103M3DA</td> <td>354881/10/002504/3</td> <td>Radiated</td> </tr> </tbody> </table>	S/N	IMEI	Notes	R38M103M8YY	354881/10/002687/6	WWAN Conducted	R38M103M34X	354881/10/002495/2	WLAN Conducted	R38M103M35J	354881/10/002496/2	Radiated	R38M103M9KN	354881/10/002708/0	Radiated	R38M103M3JW	354881/10/002509/2	Radiated	R38M103M3DA	354881/10/002504/3	Radiated
S/N	IMEI	Notes																				
R38M103M8YY	354881/10/002687/6	WWAN Conducted																				
R38M103M34X	354881/10/002495/2	WLAN Conducted																				
R38M103M35J	354881/10/002496/2	Radiated																				
R38M103M9KN	354881/10/002708/0	Radiated																				
R38M103M3JW	354881/10/002509/2	Radiated																				
R38M103M3DA	354881/10/002504/3	Radiated																				
Hardware Version	REV 1.0																					
Software Version	A305GT.001																					

## 6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EDGE (8PSK)	GSM Class : B Multi-Slot Class: Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
	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 (Cat. 24) HSUPA (Cat. 6) HSPA+ (Rel. 9, DL only)		100%
LTE	FDD Band 2 FDD Band 4 FDD Band 5 FDD Band 12 FDD Band 13 FDD Band 17 TDD Band 41 FDD Band 66	QPSK 16QAM 64QAM (Rx Only) Rel. 10 Carrier Aggregation support downlink only		100% (FDD) 63.3% (TDD) 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)		98.84% <sup>(802.11b)</sup> 1
	5 GHz	802.11a 802.11n (HT20) 802.11n (HT40) 802.11ac (VHT20) 802.11ac (VHT40) 802.11ac (VHT80) 802.11ac (VHT160)		94.72% <sup>(802.11a)</sup> 2 74.61% <sup>(802.11ac VHT80)</sup> 2
		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		74.93% <sup>(GFSK)</sup> 3

**Notes:**

1. Duty cycle for DTS is referenced from §9.5
2. Duty cycle for UNII is referenced from §9.6
3. Duty cycle for Bluetooth is referenced from §9.7

### 6.3. General LTE SAR Test and Reporting Considerations

Item	Description						
Frequency range, Channel Bandwidth, Numbers and Frequencies	Band 2	Frequency range: 1850 - 1910 MHz (BW = 60 MHz)					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low	<b>18700</b> <b>/1860</b>	18675/ 1857.5	18650/ 1855	18625/ 1852.5	18615/ 1851.5	18607/ 1850.7
	Mid	<b>18900/</b> <b>1880</b>	18900/ 1880	18900/ 1880	18900/ 1880	18900/ 1880	18900/ 1880
	High	<b>19100/</b> <b>1900</b>	19125/ 1902.5	19150/ 1905	19175/ 1907.5	19185/ 1908.5	19193/ 1909.3
	Band 4	Frequency range: 1710 - 1755 MHz (BW = 45 MHz)					
		Channel Bandwidth					
		20 MHz <sup>1</sup>	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	<b>20175/</b> <b>1732.5</b>	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5	20175/ 1732.5
	High	20300/ 1745	20325/ 1747.5	20350/ 1750	20375/ 1752.5	20385/ 1753.5	20393/ 1754.3
	Band 5	Frequency range: 824 - 849 MHz (BW = 25 MHz)					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz <sup>1</sup>	5 MHz	3 MHz	1.4 MHz
	Low			20450/ 829	20425/ 826.5	20415/ 825.5	20407/ 824.7
	Mid			<b>20525/</b> <b>836.5</b>	20525/ 836.5	20525/ 836.5	20525/ 836.5
	High			20600/ 844	20625/ 846.5	20635/ 847.5	20643/ 848.3
	Band 12	Frequency range: 699 – 716 MHz (BW = 17 MHz)					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz <sup>1</sup>	5 MHz	3 MHz	1.4 MHz
	Low			23060/ 704	23035/ 701.5	23025/ 700.5	23017/ 699.7
	Mid			<b>23095/</b> <b>707.5</b>	23095/ 707.5	23095/ 707.5	23095/ 707.5
	High			23130/ 711	23155/ 713.5	23165/ 714.5	23173/ 715.3
	Band 13	Frequency range: 777 - 787 MHz (BW = 10 MHz)					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz <sup>1</sup>	5 MHz <sup>1</sup>	3 MHz	1.4 MHz
Low				23205/ 779.5			
Mid			<b>23230/</b> <b>782</b>	23230/ 782			
High				23255/ 784.5			
Band 17	Frequency range: 704 - 716 MHz (BW = 12 MHz)						
	Channel Bandwidth						
	20 MHz	15 MHz	10 MHz <sup>1</sup>	5 MHz <sup>1</sup>	3 MHz	1.4 MHz	
Low			23780/ 709	23755/ 706.5			
Mid			<b>23790/</b> <b>710</b>	23790/ 710			
High			23800/ 711	23825/ 713.5			

**General LTE SAR Test and Reporting Considerations (Continued)**

Frequency range, Channel Bandwidth, Numbers and Frequencies	Band 41 <sup>2</sup>	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																																																																		
	Band 66	Frequency range: 1710 - 1780 MHz (BW = 70 MHz)																																																																		
		Channel Bandwidth																																																																		
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																																													
Low		132072/ 1720	132047/ 1717.5	132022/ 1715	131997/ 1712.5	131987/ 1711.5	131979/ 1710.7																																																													
Mid		132322/ 1745	132322/ 1745	132322/ 1745	132322/ 1745	132322/ 1745	132322/ 1745																																																													
High	132572/ 1770	132597/ 1772.5	132622/ 1775	132647/ 1777.5	132657/ 1778.5	132665/ 1779.3																																																														
LTE transmitter and antenna implementation	Refer to Appendix A.																																																																			
Maximum power reduction (MPR)	<p><b>Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3</b></p> <table border="1"> <thead> <tr> <th rowspan="2">Modulation</th> <th colspan="6">Channel bandwidth / Transmission bandwidth (N<sub>RB</sub>)</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>&gt; 5</td> <td>&gt; 4</td> <td>&gt; 8</td> <td>&gt; 12</td> <td>&gt; 16</td> <td>&gt; 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>&gt; 5</td> <td>&gt; 4</td> <td>&gt; 8</td> <td>&gt; 12</td> <td>&gt; 16</td> <td>&gt; 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>&gt; 5</td> <td>&gt; 4</td> <td>&gt; 8</td> <td>&gt; 12</td> <td>&gt; 16</td> <td>&gt; 18</td> <td>≤ 3</td> </tr> <tr> <td>256 QAM</td> <td colspan="6">≥ 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 <sub>RB</sub> )						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 <sub>RB</sub> )							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:**

- 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 band 41 test channels in accordance with October 2014 TCB workshop for all channels bandwidths.
- 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<sub>s</sub>) \* # 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.



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

**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 Antenna #2 Supports LTE Band 41 only.

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 (2.4/5.8 GHz Bands)	10 mm	Rear	< 25 mm	Yes		
			Front	< 25 mm	Yes		
			Edge 1 (Top)	< 25 mm	Yes		
			Edge 2 (Right)	< 25 mm	Yes		
			Edge 3 (Bottom)	> 25 mm	No	1	
	Product Specific 10g (5.3/5.6 GHz Bands)	0 mm	Edge 4 (Left)	> 25 mm	No	1	
			Rear	Refer to notes 2 & 3			
			Front				
			Edge 1 (Top)				
Edge 2 (Right)							
Edge 3 (Bottom)							
Edge 4 (Left)							

**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.
- 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.
- Wi-Fi Direct is only available in Hand use configuration.

## 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 ( $\epsilon_r$ ) and conductivity ( $\sigma$ ) 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  $\epsilon_r$  and  $\sigma$  may be relaxed to  $\pm 10\%$ . This is limited to frequencies  $\leq 3$  GHz.

#### Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

Target Frequency (MHz)	Head		Body	
	$\epsilon_r$	$\sigma$ (S/m)	$\epsilon_r$	$\sigma$ (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 ( $\epsilon_r$ )			Conductivity ( $\sigma$ )		
					Measured	Target	Delta (%)	Measured	Target	Delta (%)
B	2/4/2019	2450	Head	2450	40.10	39.20	2.30	1.83	1.80	1.67
				2400	40.19	39.30	2.27	1.79	1.75	2.19
				2480	40.10	39.16	2.39	1.85	1.83	0.85
B	2/4/2019	2450	Body	2450	52.65	52.70	-0.09	2.05	1.95	4.97
				2400	52.86	52.77	0.17	1.98	1.90	4.32
				2480	52.57	52.66	-0.18	2.09	1.99	4.66
E	2/4/2019	5250	Head	5250	35.03	35.93	-2.51	4.56	4.70	-2.98
				5150	35.22	36.05	-2.29	4.46	4.60	-3.15
				5350	34.84	35.82	-2.73	4.68	4.80	-2.53
E	2/4/2019	5600	Head	5600	34.44	35.53	-3.08	4.95	5.06	-2.26
				5500	34.61	35.65	-2.91	4.83	4.96	-2.68
				5725	34.17	35.39	-3.45	5.11	5.19	-1.58
E	2/4/2019	5750	Head	5750	34.14	35.36	-3.46	5.14	5.21	-1.34
				5700	34.26	35.42	-3.27	5.07	5.16	-1.73
				5850	33.98	35.30	-3.74	5.25	5.27	-0.38
E	2/4/2019	5250	Body	5250	48.03	48.95	-1.88	5.37	5.35	0.30
				5150	48.23	49.09	-1.75	5.23	5.24	-0.12
				5350	47.83	48.82	-2.02	5.52	5.47	0.89
E	2/4/2019	5600	Body	5600	47.39	48.48	-2.24	5.86	5.76	1.72
				5500	47.58	48.61	-2.13	5.71	5.64	1.09
				5725	47.11	48.31	-2.48	6.06	5.91	2.63
E	2/4/2019	5750	Body	5750	47.09	48.27	-2.45	6.10	5.94	2.80
				5700	47.19	48.34	-2.38	6.02	5.88	2.44
				5850	46.91	48.20	-2.68	6.25	6.00	4.12
F	1/31/2019	750	Head	750	43.04	41.96	2.57	0.90	0.89	0.39
				660	43.31	42.42	2.09	0.87	0.89	-2.23
				800	42.81	41.71	2.65	0.92	0.90	2.24
F	1/31/2019	750	Body	750	54.38	55.55	-2.10	0.95	0.96	-1.71
				660	55.15	55.89	-1.33	0.91	0.96	-4.54
				800	54.59	55.35	-1.38	0.97	0.97	0.18
F	1/31/2019	835	Head	835	42.81	41.50	3.16	0.93	0.90	3.00
				805	42.81	41.68	2.71	0.92	0.90	2.37
				850	42.74	41.50	2.99	0.93	0.92	1.76
F	1/31/2019	835	Body	835	54.57	55.20	-1.14	0.98	0.97	1.00
				805	54.59	55.33	-1.35	0.97	0.97	0.34
				850	54.48	55.16	-1.23	0.98	0.99	-0.33
F	2/4/2019	750	Head	750	42.63	41.96	1.59	0.90	0.89	1.09
				660	43.28	42.42	2.02	0.87	0.89	-1.97
				800	42.63	41.71	2.22	0.92	0.90	2.38
F	2/4/2019	750	Body	750	56.16	55.55	1.11	0.96	0.96	0.18
				660	56.37	55.89	0.85	0.93	0.96	-2.51
				800	55.91	55.35	1.00	0.98	0.97	1.55

SAR Lab	Date	Band (MHz)	Tissue Type	Frequency (MHz)	Relative Permittivity ( $\epsilon_r$ )			Conductivity ( $\sigma$ )		
					Measured	Target	Delta (%)	Measured	Target	Delta (%)
F	2/4/2019	835	Head	835	42.53	41.50	2.48	0.93	0.90	3.32
				805	42.60	41.68	2.21	0.92	0.90	2.54
				850	42.50	41.50	2.41	0.94	0.92	2.24
F	2/4/2019	835	Body	835	55.92	55.20	1.30	0.99	0.97	2.54
				805	55.92	55.33	1.06	0.98	0.97	1.75
				850	55.88	55.16	1.31	1.00	0.99	1.26
G	2/1/2019	1750	Head	1750	38.58	40.08	-3.75	1.34	1.37	-2.41
				1710	38.65	40.15	-3.73	1.32	1.35	-2.33
				1755	38.57	40.08	-3.76	1.34	1.37	-2.46
G	2/1/2019	1750	Body	1750	51.68	53.44	-3.30	1.48	1.49	-0.55
				1710	51.75	53.54	-3.35	1.45	1.46	-0.72
				1755	51.66	53.43	-3.31	1.48	1.49	-0.55
G	2/5/2019	5750	Body	5750	46.02	48.27	-4.67	5.94	5.94	0.05
				5700	46.12	48.34	-4.60	5.86	5.88	-0.28
				5850	45.85	48.20	-4.88	6.07	6.00	1.17
G	2/5/2019	5750	Head	5750	36.25	35.36	2.51	4.98	5.21	-4.54
				5700	36.35	35.42	2.63	4.91	5.16	-4.97
				5850	36.12	35.30	2.32	5.08	5.27	-3.68
G	2/12/2019	1750	Head	1750	39.32	40.08	-1.91	1.31	1.37	-4.45
				1710	39.51	40.15	-1.58	1.29	1.35	-4.56
				1755	39.31	40.08	-1.91	1.31	1.37	-4.50
H	1/31/2019	1900	Head	1900	40.22	40.00	0.55	1.42	1.40	1.64
				1850	40.38	40.00	0.95	1.39	1.40	-0.57
				1920	40.28	40.00	0.70	1.44	1.40	2.93
H	1/31/2019	1900	Body	1900	53.77	53.30	0.88	1.50	1.52	-1.58
				1850	53.90	53.30	1.13	1.46	1.52	-4.01
				1920	53.84	53.30	1.01	1.52	1.52	-0.26
H	2/4/2019	1900	Head	1900	39.26	40.00	-1.85	1.41	1.40	0.36
				1850	39.35	40.00	-1.63	1.37	1.40	-1.86
				1920	39.25	40.00	-1.88	1.42	1.40	1.43
H	2/4/2019	2600	Head	2600	38.25	39.01	-1.95	1.92	1.96	-2.40
				2495	38.39	39.14	-1.92	1.82	1.85	-1.55
				2690	38.05	38.90	-2.18	1.99	2.06	-3.42
H	2/4/2019	2600	Body	2600	52.43	52.51	-0.17	2.16	2.16	-0.18
				2495	52.48	52.64	-0.31	2.05	2.01	1.78
				2690	52.22	52.40	-0.34	2.25	2.29	-1.72
H	2/5/2019	2450	Head	2450	37.30	39.20	-4.85	1.72	1.80	-4.22
				2400	37.36	39.30	-4.93	1.69	1.75	-3.52
				2480	37.30	39.16	-4.76	1.74	1.83	-4.99
H	2/5/2019	2450	Body	2450	52.19	52.70	-0.97	1.97	1.95	1.08
				2400	52.25	52.77	-0.99	1.93	1.90	1.47
				2480	52.19	52.66	-0.90	1.99	1.99	0.09

## 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 $\pm 10\%$	
B	2/4/2019	Head	D2450V2 SN:706	5/18/2019	5.350	53.50	52.60	1.71	2.480	24.80	24.60	0.81	
B	2/4/2019	Body	D2450V2 SN:706	5/18/2019	5.39	53.90	50.60	<b>6.52</b>	2.460	24.60	23.70	3.80	1,2
E	2/4/2019	Head	D5GHzV2 SN:1003 (5.25 GHz)	3/13/2019	7.83	78.30	80.60	-2.85	2.250	22.50	23.20	-3.02	
E	2/4/2019	Head	D5GHzV2 SN:1003 (5.60 GHz)	3/13/2019	8.92	89.20	84.50	5.56	2.540	25.40	24.00	5.83	
E	2/4/2019	Head	D5GHzV2 SN:1003 (5.75 GHz)	3/13/2019	8.10	81.00	78.40	3.32	2.340	23.40	22.20	5.41	
E	2/4/2019	Body	D5GHzV2 SN:1003 (5.25 GHz)	3/13/2019	7.64	76.40	73.60	<b>3.80</b>	2.180	21.80	20.50	6.34	3,4
E	2/4/2019	Body	D5GHzV2 SN:1003 (5.60 GHz)	3/13/2019	8.44	84.40	77.70	<b>8.62</b>	2.380	23.80	21.70	9.68	5,6
E	2/4/2019	Body	D5GHzV2 SN:1003 (5.75 GHz)	3/13/2019	7.88	78.80	73.90	<b>6.63</b>	2.210	22.10	20.60	7.28	7,8
F	1/31/2019	Head	D835V2 SN:4d142	8/23/2019	0.96	9.58	9.48	1.05	0.625	6.25	6.10	2.46	
F	1/31/2019	Body	D835V2 SN:4d142	8/23/2019	0.94	9.36	9.68	-3.31	0.615	6.15	6.36	-3.30	
F	1/31/2019	Head	D750V3 SN:1024	5/16/2019	0.84	8.35	8.28	0.85	0.549	5.49	5.41	1.48	
F	1/31/2019	Body	D750V3 SN:1024	5/16/2019	0.83	8.31	9.03	<b>-7.97</b>	0.552	5.52	6.05	-8.76	9,10
F	2/4/2019	Head	D750V3 SN:1024	5/16/2019	0.87	8.68	8.28	4.83	0.574	5.74	5.41	6.10	
F	2/4/2019	Body	D750V3 SN:1024	5/16/2019	0.87	8.69	9.03	-3.77	0.581	5.81	6.05	-3.97	
F	2/4/2019	Head	D835V2 SN:4d142	8/23/2019	0.98	9.81	9.48	<b>3.48</b>	0.645	6.45	6.10	5.74	11,12
F	2/4/2019	Body	D835V2 SN:4d142	8/23/2019	0.96	9.60	9.68	-0.83	0.635	6.35	6.36	-0.16	
G	2/1/2019	Head	D1750V2 SN:1050	4/10/2019	3.36	33.60	36.50	-7.95	1.790	17.90	19.42	-7.83	
G	2/1/2019	Body	D1750V2 SN:1050	4/10/2019	3.66	36.60	37.18	-1.56	1.950	19.50	19.74	-1.22	
G	2/5/2019	Body	D5GHzV2 SN:1003 (5.75 GHz)	3/13/2019	7.22	72.20	73.90	-2.30	2.030	20.30	20.60	-1.46	
G	2/5/2019	Head	D5GHzV2 SN:1003 (5.75 GHz)	3/13/2019	7.64	76.40	78.40	<b>-2.55</b>	2.220	22.20	22.20	0.00	13,14
G	2/12/2019	Head	D1750V2 SN:1050	4/10/2019	3.33	33.30	36.50	<b>-8.77</b>	1.780	17.80	19.42	-8.34	15,16
H	1/31/2019	Head	D1900V2 SN:5d140	4/11/2019	4.21	42.10	38.93	<b>8.14</b>	2.170	21.70	20.14	7.75	17,18
H	1/31/2019	Body	D1900V2 SN:5d140	4/11/2019	4.11	41.10	41.00	0.24	2.140	21.40	21.05	1.66	
H	2/4/2019	Head	D1900V2 SN:5d140	4/11/2019	3.93	39.30	38.93	0.95	2.030	20.30	20.14	0.79	
H	2/4/2019	Head	D2600V2 SN:1006	10/16/2019	5.59	55.90	59.31	<b>-5.75</b>	2.500	25.00	26.43	-5.41	19,20
H	2/4/2019	Body	D2600V2 SN:1006	10/16/2019	5.62	56.20	58.52	-3.96	2.490	24.90	26.15	-4.78	
H	2/5/2019	Head	D2450V2 SN:706	5/18/2019	5.21	52.10	52.60	-0.95	2.410	24.10	24.60	-2.03	
H	2/5/2019	Body	D2450V2 SN:706	5/18/2019	5.35	53.50	50.60	<b>5.73</b>	2.480	24.80	23.70	4.64	21,22

## 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.

#### Maximum Output Power (Tune-up Limit) for GSM

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  $\leq 1.2$ W/kg.

#### GSM850 Measured Results

Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Maximum Average Power (dBm)			
					Measured		Tune-up Limit	
					Burst Pwr	Frame Pwr	Burst Pwr	Frame Pwr
GPRS/EDGE (GMSK)	CS1	1	128	824.2	32.61	23.58	34.00	24.97
			190	836.6	32.61	23.58		
			251	848.8	32.72	23.69		
		2	128	824.2	30.13	24.11	31.00	24.98
			190	836.6	29.92	23.90		
			251	848.8	30.05	24.03		
		3	128	824.2	28.55	24.29	30.00	25.74
			190	836.6	28.73	24.47		
			251	848.8	28.75	24.49		
		4	128	824.2	27.22	24.21	28.50	25.49
			190	836.6	27.32	24.31		
			251	848.8	27.26	24.25		
EDGE (8PSK)	MCS5	1	128	824.2	26.54	17.51	27.50	18.47
			190	836.6	26.48	17.45		
			251	848.8	26.34	17.31		
		2	128	824.2	24.71	18.69	25.50	19.48
			190	836.6	24.54	18.52		
			251	848.8	24.43	18.41		
		3	128	824.2	23.28	19.02	24.20	19.94
			190	836.6	23.22	18.96		
			251	848.8	23.13	18.87		
		4	128	824.2	21.85	18.84	22.50	19.49
			190	836.6	21.68	18.67		
			251	848.8	21.74	18.73		

#### Notes:

GPRS/EDGE (GMSK) mode with 3 time slots for Max power, based on the Tune-up Procedure.



**GSM1900 Measured Results**

Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Maximum Average Power (dBm)			
					Measured		Tune-up Limit	
					Burst Pwr	Frame Pwr	Burst Pwr	Frame Pwr
GPRS/EDGE (GMSK)	CS1	1	512	1850.2	29.84	20.81	31.00	21.97
			661	1880.0	29.88	20.85		
			810	1909.8	29.63	20.60		
		2	512	1850.2	26.56	20.54	28.00	21.98
			661	1880.0	26.62	20.60		
			810	1909.8	26.59	20.57		
		3	512	1850.2	25.20	20.94	26.60	<b>22.34</b>
			661	1880.0	25.11	20.85		
			810	1909.8	25.11	20.85		
		4	512	1850.2	23.47	20.46	25.00	21.99
			661	1880.0	23.55	20.54		
			810	1909.8	23.57	20.56		
EDGE (8PSK)	MCS5	1	512	1850.2	26.31	17.28	27.00	17.97
			661	1880.0	26.33	17.30		
			810	1909.8	26.25	17.22		
		2	512	1850.2	23.84	17.82	24.20	18.18
			661	1880.0	23.79	17.77		
			810	1909.8	23.79	17.77		
		3	512	1850.2	22.34	18.08	23.00	18.74
			661	1880.0	22.32	18.06		
			810	1909.8	22.32	18.06		
		4	512	1850.2	21.07	18.06	21.50	18.49
			661	1880.0	21.17	18.16		
			810	1909.8	21.19	18.18		

**Notes:**

GPRS/EDGE (GMSK) mode with 3 time slots for Max power, based on the Tune-up Procedure.

## 9.2. W-CDMA

### Per KDB 941225 D01 3G SAR Procedures for W-CDMA:

Maximum output power is verified on the high, middle and low channels and using the appropriate 12.2 kbps RMC with TPC (transmit power control) set to all "1's"

### 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. A summary of these settings is illustrated below:

Mode	Subtest	Rel99
WCDMA General Settings	Loopback Mode	Test Mode 2
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	$\beta_c/\beta_d$	8/15

### HSDPA Setup Procedures used to establish the test signals

The following 4 Sub-tests were completed according to procedures in table C.10.1.4 of 3GPP TS 34.121-1. A summary of these settings is illustrated below:

Table C.10.1.4:  $\beta$  values for transmitter characteristics tests with HS-DPCCH

Sub-test	$\beta_c$	$\beta_d$	$\beta_d$ (SF)	$\beta_c/\beta_d$	$\beta_{HS}$ (Note 1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (Note 4)	15/15 (Note 4)	64	12/15 (Note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1:  $\Delta_{ACK}$ ,  $\Delta_{NACK}$  and  $\Delta_{CQI} = 30/15$  with  $\beta_{HS} = 30/15 * \beta_c$ .

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA,  $\Delta_{ACK}$  and  $\Delta_{NACK} = 30/15$  with  $\beta_{HS} = 30/15 * \beta_c$ , and  $\Delta_{CQI} = 24/15$  with  $\beta_{HS} = 24/15 * \beta_c$ .

Note 3: CM = 1 for  $\beta_c/\beta_d = 12/15$ ,  $\beta_{HS}/\beta_c = 24/15$ . For all other combinations of DPDCCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the  $\beta_c/\beta_d$  ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to  $\beta_c = 11/15$  and  $\beta_d = 15/15$ .

### HSUPA Setup Procedures used to establish the test signals

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

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

Sub-test	$\beta_c$	$\beta_d$	$\beta_d$ (SF)	$\beta_c/\beta_d$	$\beta_{HS}$ (Note 1)	$\beta_{EC}$	$\beta_{d1}$ (Note 4) (Note 5)	$\beta_{d2}$ (SF)	$\beta_{d3}$ (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2) (Note 5)	AG Index (Note 5)	E-TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/25	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	$\beta_{d1}: 47/15$ $\beta_{d2}: 47/15$	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15	0	-	-	5/15	5/15	47/15	4	1	1.0	0.0	12	67

Note 1: For sub-test 1 to 4,  $\Delta_{ACK}$ ,  $\Delta_{NACK}$  and  $\Delta_{CQI} = 30/15$  with  $\beta_{HS} = 30/15 * \beta_c$ . For sub-test 5,  $\Delta_{ACK}$ ,  $\Delta_{NACK}$  and  $\Delta_{CQI} = 5/15$  with  $\beta_{HS} = 5/15 * \beta_c$ .

Note 2: CM = 1 for  $\beta_c/\beta_d = 12/15$ ,  $\beta_{HS}/\beta_c = 24/15$ . For all other combinations of DPDCCH, DPCCH, HS-DPCCH, E-DPCCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the  $\beta_c/\beta_d$  ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to  $\beta_c = 10/15$  and  $\beta_d = 15/15$ .

Note 4: In case of testing by UE using E-DPCCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.

Note 5:  $\beta_{d3}$  can not be set directly; it is set by Absolute Grant Value.

Note 6: For subtests 2, 3 and 4, UE may perform E-DPCCH power scaling at max power which could result in slightly smaller MPR values.

### HSPA+

DUT supports HSPA+ Release 9 DL only. Therefore, conducted power measurements is not required.

SAR measurement is not required for the HSDPA, HSUPA and HSPA+. When primary mode and the adjusted SAR is  $\leq 1.2$  W/kg and secondary mode is  $\leq 1/4$  dB higher than the primary mode

**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	25.04	N/A	25.50
		9400	1880.0	25.20		
		9538	1907.6	25.20		
HSDPA	Subtest 1	9262	1852.4	24.68	0	25.50
		9400	1880.0	24.54		
		9538	1907.6	24.42		
	Subtest 2	9262	1852.4	24.65	0	25.50
		9400	1880.0	24.56		
		9538	1907.6	24.44		
	Subtest 3	9262	1852.4	23.66	0.0	25.50
		9400	1880.0	23.55		
		9538	1907.6	23.38		
	Subtest 4	9262	1852.4	25.05	0.0	25.50
		9400	1880.0	25.20		
		9538	1907.6	25.28		
HSUPA	Subtest 1	9262	1852.4	23.00	2	23.00
		9400	1880.0	21.48		
		9538	1907.6	21.38		
	Subtest 2	9262	1852.4	21.09	3	22.00
		9400	1880.0	20.54		
		9538	1907.6	20.42		
	Subtest 3	9262	1852.4	23.00	2	23.00
		9400	1880.0	21.58		
		9538	1907.6	21.44		
	Subtest 4	9262	1852.4	21.65	3	22.00
		9400	1880.0	20.55		
		9538	1907.6	20.39		
	Subtest 5	9262	1852.4	24.99	0	25.00
		9400	1880.0	23.43		
		9538	1907.6	23.28		

**W-CDMA Band IV Measured Results**

Mode		UL Ch No.	Freq. (MHz)	Maximum Average Power (dBm)		
				Measured Power	MPR	Tune-up Limit
Release 99	Rel 99 (RMC, 12.2 kbps)	1312	1712.4	23.40	N/A	25.00
		1413	1732.6	23.10		
		1513	1752.6	23.10		
HSDPA	Subtest 1	1312	1712.4	22.90	0	23.50
		1413	1732.6	22.30		
		1513	1752.6	22.20		
	Subtest 2	1312	1712.4	22.20	0	23.50
		1413	1732.6	21.70		
		1513	1752.6	21.60		
	Subtest 3	1312	1712.4	21.30	0.5	23.00
		1413	1732.6	21.00		
		1513	1752.6	20.90		
	Subtest 4	1312	1712.4	21.30	0.5	23.00
		1413	1732.6	21.00		
		1513	1752.6	20.80		
HSUPA	Subtest 1	1312	1712.4	19.40	0	21.00
		1413	1732.6	18.90		
		1513	1752.6	18.90		
	Subtest 2	1312	1712.4	17.80	2	19.00
		1413	1732.6	17.30		
		1513	1752.6	18.00		
	Subtest 3	1312	1712.4	19.50	1	20.00
		1413	1732.6	19.00		
		1513	1752.6	18.90		
	Subtest 4	1312	1712.4	17.80	2	19.00
		1413	1732.6	17.30		
		1513	1752.6	18.00		
	Subtest 5	1312	1712.4	19.40	0	21.00
		1413	1732.6	18.90		
		1513	1752.6	18.90		

**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	24.74	N/A	25.50
		4183	836.6	24.52		
		4233	846.6	24.27		
HSDPA	Subtest 1	4132	826.4	23.37	0	24.00
		4183	836.6	23.15		
		4233	846.6	22.87		
	Subtest 2	4132	826.4	22.56	0	24.00
		4183	836.6	22.25		
		4233	846.6	22.02		
	Subtest 3	4132	826.4	21.36	0.5	23.50
		4183	836.6	21.41		
		4233	846.6	21.64		
	Subtest 4	4132	826.4	21.45	0.5	23.50
		4183	836.6	21.08		
		4233	846.6	21.12		
HSUPA	Subtest 1	4132	826.4	19.89	2	21.80
		4183	836.6	19.68		
		4233	846.6	19.33		
	Subtest 2	4132	826.4	18.91	3	20.80
		4183	836.6	18.66		
		4233	846.6	18.33		
	Subtest 3	4132	826.4	19.93	2	21.80
		4183	836.6	19.68		
		4233	846.6	19.35		
	Subtest 4	4132	826.4	18.87	3	20.80
		4183	836.6	18.55		
		4233	846.6	18.31		
	Subtest 5	4132	826.4	22.76	0	23.80
		4183	836.6	22.42		
		4233	846.6	22.02		

### 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 <sub>RB</sub> )						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 <sub>RB</sub> )	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

According to April 2015 TCB workshop, SAR test exclusion can be applied for testing overlapping LTE bands as follows:

- The maximum output power, including tolerance, for the smaller band must be ≤ the larger band to qualify for the SAR test exclusion.
- The channel bandwidth and other operating parameters for the smaller band must be fully supported by the larger band.
  - LTE Band 4 (1710-1755 MHz) is covered by LTE Band 66 (1710-1780 MHz)
  - LTE Band 17 (704-716 MHz) is covered by LTE Band 12 (699-716 MHz)

LTE QPSK configuration has the highest maximum average output power per 3GPP standard.

SAR measurement is not required for the 16QAM and 64QAM. When the highest maximum output power for 16QAM and 64QAM is ≤ ½ dB higher than the QPSK or when the reported SAR for the QPSK configuration is ≤ 1.45 W/kg.

Please refer to section 6.3. for LTE detail test channels.

**LTE Band 2 Measured Results**

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				18700	18900	19100	MPR	Tune-up Limit
				1860 MHz	1880 MHz	1900 MHz		
20 MHz	QPSK	1	0	24.13	24.23	24.27	0	24.7
		1	49	24.16	24.22	24.12	0	24.7
		1	99	24.18	24.15	24.01	0	24.7
		50	0	22.03	22.08	22.12	1	23.7
		50	24	22.03	22.06	22.04	1	23.7
		50	50	22.04	22.02	21.99	1	23.7
	16QAM	100	0	22.04	22.05	22.06	1	23.7
		1	0	23.20	23.14	23.19	1	23.7
		1	49	23.20	23.10	23.06	1	23.7
		1	99	23.21	23.04	22.96	1	23.7
		50	0	22.12	22.16	22.28	2	22.7
		50	24	22.14	22.14	22.22	2	22.7
		50	50	22.14	22.13	22.14	2	22.7
		100	0	22.19	22.18	22.26	2	22.7
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				18675	18900	19125	MPR	Tune-up Limit
				1857.5 MHz	1880 MHz	1902.5 MHz		
15 MHz	QPSK	1	0	24.30	24.26	24.33	0	24.7
		1	37	24.31	24.22	24.25	0	24.7
		1	74	24.33	24.18	24.20	0	24.7
		36	0	22.14	22.11	22.16	1	23.7
		36	20	22.16	22.09	22.11	1	23.7
		36	39	22.16	22.07	22.05	1	23.7
	16QAM	75	0	22.15	22.08	22.10	1	23.7
		1	0	23.12	23.39	23.35	1	23.7
		1	37	23.13	23.41	23.24	1	23.7
		1	74	23.13	23.35	23.17	1	23.7
		36	0	22.25	22.22	22.28	2	22.7
		36	20	22.25	22.22	22.23	2	22.7
		36	39	22.26	22.20	22.19	2	22.7
		75	0	22.29	22.19	22.26	2	22.7
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				18650	18900	19150	MPR	Tune-up Limit
				1855 MHz	1880 MHz	1905 MHz		
10 MHz	QPSK	1	0	24.36	24.24	24.30	0	24.7
		1	25	24.39	24.24	24.24	0	24.7
		1	49	24.40	24.22	24.25	0	24.7
		25	0	22.13	22.09	22.08	1	23.7
		25	12	22.13	22.06	22.06	1	23.7
		25	25	22.14	22.06	22.04	1	23.7
	16QAM	50	0	22.12	22.06	22.08	1	23.7
		1	0	23.35	23.27	23.25	1	23.7
		1	25	23.37	23.27	23.20	1	23.7
		1	49	23.38	23.24	23.20	1	23.7
		25	0	22.26	22.25	22.25	2	22.7
		25	12	22.27	22.24	22.22	2	22.7
		25	25	22.28	22.22	22.20	2	22.7
		50	0	22.29	22.15	22.23	2	22.7

**LTE Band 2 Measured Results (continued)**

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				18625	18900	19175	MPR	Tune-up Limit
				1852.5 MHz	1880 MHz	1907.5 MHz		
5 MHz	QPSK	1	0	24.20	24.19	24.22	0	24.7
		1	12	24.22	24.18	24.22	0	24.7
		1	24	24.22	24.18	24.24	0	24.7
		12	0	22.11	22.06	22.14	1	23.7
		12	7	22.11	22.06	22.12	1	23.7
		12	13	22.15	22.05	22.12	1	23.7
		25	0	22.12	22.06	22.13	1	23.7
	16QAM	1	0	23.11	23.31	23.12	1	23.7
		1	12	23.11	23.29	23.08	1	23.7
		1	24	23.15	23.29	23.11	1	23.7
		12	0	22.23	22.22	22.18	2	22.7
		12	7	22.24	22.16	22.16	2	22.7
		12	13	22.24	22.15	22.16	2	22.7
25	0	22.24	22.17	22.27	2	22.7		
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				18615	18900	19185	MPR	Tune-up Limit
				1851.5 MHz	1880 MHz	1908.5 MHz		
3 MHz	QPSK	1	0	24.33	24.17	24.24	0	24.7
		1	8	24.35	24.18	24.28	0	24.7
		1	14	24.37	24.17	24.31	0	24.7
		8	0	22.11	22.08	22.13	1	23.7
		8	4	22.11	22.08	22.14	1	23.7
		8	7	22.11	22.08	22.12	1	23.7
		15	0	22.09	22.05	22.12	1	23.7
	16QAM	1	0	23.13	23.29	23.24	1	23.7
		1	8	23.15	23.28	23.17	1	23.7
		1	14	23.20	23.25	23.18	1	23.7
		8	0	22.26	22.19	22.26	2	22.7
		8	4	22.25	22.18	22.28	2	22.7
		8	7	22.26	22.18	22.25	2	22.7
15	0	22.20	22.17	22.22	2	22.7		
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				18607	18900	19193	MPR	Tune-up Limit
				1850.7 MHz	1880 MHz	1909.3 MHz		
1.4 MHz	QPSK	1	0	24.19	24.18	24.24	0	24.7
		1	3	24.17	24.19	24.22	0	24.7
		1	5	24.22	24.18	24.25	0	24.7
		3	0	24.18	24.13	24.27	0	24.7
		3	1	24.18	24.14	24.25	0	24.7
		3	3	24.18	24.15	24.25	0	24.7
		6	0	22.07	22.05	22.16	1	23.7
	16QAM	1	0	23.23	23.22	23.23	1	23.7
		1	3	23.18	23.24	23.19	1	23.7
		1	5	23.24	23.25	23.26	1	23.7
		3	0	23.18	23.20	23.32	1	23.7
		3	1	23.20	23.20	23.30	1	23.7
		3	3	23.21	23.19	23.28	1	23.7
6	0	22.30	22.17	22.19	2	22.7		



**LTE Band 5 Measured Results**

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				20525			MPR	Tune-up Limit
				836.5 MHz				
10 MHz	QPSK	1	0	24.50			0	25
		1	25	24.50			0	25
		1	49	24.50			0	25
		25	0	23.05			1	24
		25	12	23.05			1	24
		25	25	23.06			1	24
		50	0	23.05			1	24
	16QAM	1	0	23.50			1	24
		1	25	23.50			1	24
		1	49	23.50			1	24
		25	0	22.50			2	23
		25	12	22.50			2	23
		25	25	22.50			2	23
		50	0	22.50			2	23
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				20425	20525	20625	MPR	Tune-up Limit
				826.5 MHz				
5 MHz	QPSK	1	0	23.72	23.78	23.55	0	25
		1	12	23.74	23.75	23.51	0	25
		1	24	23.68	23.76	23.47	0	25
		12	0	22.17	22.25	22.00	1	24
		12	7	22.16	22.25	22.00	1	24
		12	13	22.15	22.27	22.00	1	24
		25	0	22.18	22.25	22.02	1	24
	16QAM	1	0	22.67	22.76	22.51	1	24
		1	12	22.60	22.71	22.45	1	24
		1	24	22.60	22.73	22.44	1	24
		12	0	21.58	21.59	21.49	2	23
		12	7	21.61	21.66	21.42	2	23
		12	13	21.58	21.61	21.43	2	23
		25	0	21.71	21.70	21.42	2	23
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				20415	20525	20635	MPR	Tune-up Limit
				825.5 MHz				
3 MHz	QPSK	1	0	23.79	23.87	23.65	0	25
		1	8	23.78	23.84	23.62	0	25
		1	14	23.74	23.86	23.54	0	25
		8	0	22.17	22.26	22.02	1	24
		8	4	22.15	22.28	22.00	1	24
		8	7	22.16	22.28	22.00	1	24
		15	0	22.17	22.25	22.00	1	24
	16QAM	1	0	22.91	22.63	22.42	1	24
		1	8	22.98	22.49	22.32	1	24
		1	14	22.87	22.59	22.45	1	24
		8	0	21.72	21.72	21.46	2	23
		8	4	21.71	21.75	21.45	2	23
		8	7	21.70	21.75	21.42	2	23
		15	0	21.62	21.69	21.41	2	23

**Note(s):**  
 10 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 5 Measured Results (continued)**

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				20407	20525	20643	MPR	Tune-up Limit
				824.7 MHz	836.5 MHz	848.3 MHz		
1.4 MHz	QPSK	1	0	23.51	23.79	23.51	0	25
		1	3	23.44	23.76	23.44	0	25
		1	5	23.44	23.77	23.44	0	25
		3	0	23.54	23.74	23.54	0	25
		3	1	23.51	23.75	23.51	0	25
		3	3	23.52	23.74	23.52	0	25
		6	0	22.00	22.22	22.00	1	24
	16QAM	1	0	22.39	22.59	22.39	1	24
		1	3	22.44	22.60	22.44	1	24
		1	5	22.35	22.59	22.35	1	24
		3	0	22.38	22.63	22.38	1	24
		3	1	22.41	22.63	22.41	1	24
		3	3	22.35	22.62	22.35	1	24
		6	0	21.35	21.68	21.35	2	23

**LTE Band 12 Measured Results**

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				23095			MPR	Tune-up Limit
				707.5 MHz				
10 MHz	QPSK	1	0				0	24.8
		1	25				0	24.8
		1	49				0	24.8
		25	0				1	23.8
		25	12				1	23.8
		25	25				1	23.8
		50	0				1	23.8
	16QAM	1	0				1	23.8
		1	25				1	23.8
		1	49				1	23.8
		25	0				2	22.8
		25	12				2	22.8
		25	25				2	22.8
		50	0				2	22.8
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				23035	23095	23155	MPR	Tune-up Limit
				701.5 MHz				
5 MHz	QPSK	1	0	23.55	23.62	23.50	0	24.8
		1	12	23.49	23.63	23.91	0	24.8
		1	24	23.49	23.64	23.93	0	24.8
		12	0	22.19	22.31	22.49	1	23.8
		12	7	22.16	22.32	22.52	1	23.8
		12	13	22.12	22.27	22.52	1	23.8
		25	0	22.15	22.25	22.50	1	23.8
	16QAM	1	0	22.57	22.55	22.55	1	23.8
		1	12	22.50	22.57	22.56	1	23.8
		1	24	22.45	22.59	22.61	1	23.8
		12	0	21.11	21.30	21.38	2	22.8
		12	7	21.12	21.26	21.39	2	22.8
		12	13	21.10	21.27	21.39	2	22.8
		25	0	21.09	21.24	21.40	2	22.8
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				23025	23095	23165	MPR	Tune-up Limit
				700.5 MHz				
3 MHz	QPSK	1	0	23.64	23.67	23.92	0	24.8
		1	8	23.62	23.71	23.95	0	24.8
		1	14	23.55	23.68	23.96	0	24.8
		8	0	22.17	22.37	22.60	1	23.8
		8	4	22.17	22.36	22.63	1	23.8
		8	7	22.16	22.36	22.61	1	23.8
		15	0	22.16	22.32	22.56	1	23.8
	16QAM	1	0	22.71	22.87	22.69	1	23.8
		1	8	22.60	22.82	22.76	1	23.8
		1	14	22.62	22.85	22.78	1	23.8
		8	0	21.13	21.23	21.40	2	22.8
		8	4	21.13	21.23	21.42	2	22.8
		8	7	21.10	21.22	21.40	2	22.8
		15	0	21.12	21.28	21.45	2	22.8

**Note(s):**  
 10 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 12 Measured Results (continued)**

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				23017	23095	23173	MPR	Tune-up Limit
				699.7 MHz	707.5 MHz	715.3 MHz		
1.4 MHz	QPSK	1	0	23.55	23.64	23.90	0	24.8
		1	3	23.53	23.67	23.89	0	24.8
		1	5	23.51	23.66	23.94	0	24.8
		3	0	23.53	23.68	23.85	0	24.8
		3	1	23.56	23.66	23.85	0	24.8
		3	3	23.57	23.64	23.86	0	24.8
		6	0	22.19	22.31	22.53	1	23.8
	16QAM	1	0	22.35	22.59	22.74	1	23.8
		1	3	22.30	22.58	22.77	1	23.8
		1	5	22.35	22.62	22.72	1	23.8
		3	0	22.50	22.65	22.86	1	23.8
		3	1	22.50	22.61	22.91	1	23.8
		3	3	22.43	22.61	22.93	1	23.8
		6	0	21.18	21.19	21.38	2	22.8

**LTE Band 13 Measured Results**

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			
				23230	782 MHz	MPR	Tune-up Limit
10 MHz	QPSK	1	0	24.50		0	24.5
		1	25	24.50		0	24.5
		1	49	24.50		0	24.5
		25	0	22.03		1	23.5
		25	12	22.00		1	23.5
		25	25	21.97		1	23.5
		50	0	22.04		1	23.5
	16QAM	1	0	23.48		1	23.5
		1	25	23.35		1	23.5
		1	49	23.35		1	23.5
		25	0	22.50		2	22.5
		25	12	22.50		2	22.5
		25	25	22.48		2	22.5
		50	0	22.50		2	22.5
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			
				23230	782 MHz	MPR	Tune-up Limit
5 MHz	QPSK	1	0	24.50		0	24.5
		1	12	24.46		0	24.5
		1	24	24.43		0	24.5
		12	0	22.02		1	23.5
		12	7	22.00		1	23.5
		12	13	21.95		1	23.5
		25	0	21.98		1	23.5
	16QAM	1	0	23.50		1	23.5
		1	12	23.50		1	23.5
		1	24	23.49		1	23.5
		12	0	22.50		2	22.5
		12	7	22.47		2	22.5
		12	13	22.45		2	22.5
		25	0	22.42		2	22.5

**Note(s):**  
 10/5 MHz Bandwidths does not support at least three non-overlapping channels in certain channel bandwidths. When a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing per KDB 941225 D05 SAR for LTE Devices

**LTE Band 41 Measured Results**

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		
20 MHz	QPSK	1	0	23.37	23.63	23.31	23.19	23.36	0	25
		1	49	23.26	23.55	23.52	23.13	23.36	0	25
		1	99	23.28	23.41	23.53	23.05	23.37	0	25
		50	0	22.59	22.88	22.68	22.40	22.62	1	24
		50	24	22.57	22.83	22.72	22.36	22.61	1	24
		50	50	22.52	22.77	22.76	22.33	22.58	1	24
		100	0	22.56	22.81	22.74	22.37	22.62	1	24
	16QAM	1	0	22.70	22.90	22.52	22.60	22.89	1	24
		1	49	22.66	23.00	22.70	22.52	22.94	1	24
		1	99	22.36	22.75	22.64	22.46	22.91	1	24
		50	0	21.63	21.90	21.79	21.43	21.70	2	23
		50	24	21.59	21.84	21.81	21.37	21.65	2	23
		50	50	21.57	21.80	21.82	21.34	21.64	2	23
		100	0	21.61	21.83	21.78	21.41	21.64	2	23
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		
15 MHz	QPSK	1	0	23.36	23.55	23.35	23.12	23.29	0	25
		1	37	23.24	23.49	23.50	23.13	23.35	0	25
		1	74	23.27	23.41	23.47	23.09	23.21	0	25
		36	0	22.60	22.93	22.72	22.43	22.63	1	24
		36	20	22.58	22.88	22.77	22.39	22.62	1	24
		36	39	22.56	22.84	22.79	22.36	22.61	1	24
		75	0	22.56	22.89	22.77	22.40	22.62	1	24
	16QAM	1	0	22.27	23.06	22.72	22.29	22.80	1	24
		1	37	22.47	23.02	22.58	22.10	22.78	1	24
		1	74	22.42	22.91	22.51	22.13	22.83	1	24
		36	0	21.60	21.96	21.74	21.45	21.72	2	23
		36	20	21.59	21.94	21.78	21.41	21.72	2	23
		36	39	21.63	21.91	21.75	21.39	21.71	2	23
		75	0	21.60	21.92	21.80	21.40	21.64	2	23
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	23.27	23.49	23.45	23.17	23.28	0	25
		1	25	23.26	23.43	23.49	23.14	23.27	0	25
		1	49	23.25	23.41	23.54	23.11	23.28	0	25
		25	0	22.55	22.84	22.75	22.38	22.60	1	24
		25	12	22.54	22.81	22.77	22.36	22.59	1	24
		25	25	22.53	22.79	22.80	22.35	22.59	1	24
		50	0	22.50	22.79	22.75	22.35	22.57	1	24
	16QAM	1	0	22.26	23.05	22.59	22.34	22.86	1	24
		1	25	22.23	23.00	22.61	22.32	22.84	1	24
		1	49	22.22	22.98	22.65	22.29	22.84	1	24
		25	0	21.60	21.89	21.77	21.43	21.67	2	23
		25	12	21.59	21.85	21.80	21.41	21.65	2	23
		25	25	21.58	21.84	21.81	21.41	21.65	2	23
		50	0	21.59	21.83	21.80	21.41	21.64	2	23

**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		
5 MHz	QPSK	1	0	23.31	23.52	23.42	23.12	23.31	0	25
		1	12	23.30	23.50	23.43	23.09	23.30	0	25
		1	24	23.27	23.48	23.46	23.09	23.34	0	25
		12	0	22.57	22.83	22.75	22.36	22.58	1	24
		12	7	22.56	22.82	22.74	22.35	22.57	1	24
		12	13	22.55	22.81	22.75	22.33	22.57	1	24
		25	0	22.55	22.80	22.74	22.34	22.57	1	24
	16QAM	1	0	22.53	22.45	22.69	22.29	22.20	1	24
		1	12	22.50	22.44	22.70	22.29	22.20	1	24
		1	24	22.51	22.45	22.76	22.27	22.23	1	24
		12	0	21.52	21.74	21.80	21.30	21.55	2	23
		12	7	21.50	21.71	21.81	21.29	21.53	2	23
		12	13	21.51	21.70	21.81	21.28	21.52	2	23
		25	0	21.58	21.81	21.83	21.37	21.62	2	23

**LTE Band 66 Measured Results**

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				132072	132322	132572	MPR	Tune-up Limit
				1720 MHz	1745 MHz	1770 MHz		
20 MHz	QPSK	1	0	22.89	23.13	23.13	0	24
		1	49	22.80	23.06	23.14	0	24
		1	99	22.68	23.02	23.16	0	24
		50	0	21.00	21.16	21.21	1	23
		50	24	21.00	21.12	21.20	1	23
		50	50	21.00	21.10	21.20	1	23
		100	0	21.00	21.14	21.19	1	23
	16QAM	1	0	21.72	21.90	22.08	1	23
		1	49	21.63	21.85	22.07	1	23
		1	99	21.51	21.79	22.09	1	23
		50	0	20.93	21.15	21.18	2	22
		50	24	20.88	21.12	21.20	2	22
		50	50	20.81	21.11	21.19	2	22
		100	0	20.89	21.21	21.23	2	22
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				132047	132322	132597	MPR	Tune-up Limit
				1717.5 MHz	1745 MHz	1772.5 MHz		
15 MHz	QPSK	1	0	22.93	23.12	23.21	0	24
		1	37	22.85	23.05	23.21	0	24
		1	74	22.76	23.01	23.21	0	24
		36	0	21.00	21.15	21.21	1	23
		36	20	21.00	21.13	21.21	1	23
		36	39	21.00	21.12	21.22	1	23
		75	0	21.00	21.13	21.21	1	23
	16QAM	1	0	21.96	22.01	22.24	1	23
		1	37	21.89	21.96	22.21	1	23
		1	74	21.79	21.92	22.23	1	23
		36	0	20.97	21.19	21.18	2	22
		36	20	20.93	21.16	21.20	2	22
		36	39	20.87	21.14	21.20	2	22
		75	0	20.95	21.19	21.22	2	22
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				132022	132322	132622	MPR	Tune-up Limit
				1715 MHz	1745 MHz	1775 MHz		
10 MHz	QPSK	1	0	22.94	23.14	23.16	0	24
		1	25	22.88	23.09	23.16	0	24
		1	49	22.85	23.10	23.19	0	24
		25	0	21.00	21.13	21.21	1	23
		25	12	21.00	21.12	21.21	1	23
		25	25	21.00	21.09	21.22	1	23
		50	0	21.00	21.13	21.23	1	23
	16QAM	1	0	21.79	22.04	22.14	1	23
		1	25	21.72	21.99	22.14	1	23
		1	49	21.68	21.99	22.19	1	23
		25	0	20.94	21.17	21.23	2	22
		25	12	20.93	21.15	21.23	2	22
		25	25	20.90	21.15	21.24	2	22
		50	0	20.93	21.15	21.28	2	22



**LTE Band 66 Measured Results (continued)**

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				131997	132322	132647	MPR	Tune-up Limit
				1712.5 MHz	1745 MHz	1777.5 MHz		
5 MHz	QPSK	1	0	22.84	23.04	23.10	0	24
		1	12	22.77	23.01	23.08	0	24
		1	24	22.77	23.04	23.13	0	24
		12	0	21.00	21.08	21.20	1	23
		12	7	21.00	21.05	21.20	1	23
		12	13	21.00	21.08	21.21	1	23
		25	0	21.00	21.08	21.21	1	23
	16QAM	1	0	21.58	21.87	22.19	1	23
		1	12	21.52	21.83	22.17	1	23
		1	24	21.55	21.86	22.21	1	23
		12	0	20.89	21.14	21.21	2	22
		12	7	20.80	21.08	21.20	2	22
		12	13	20.81	21.07	21.21	2	22
		25	0	20.87	21.12	21.20	2	22
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				131987	132322	132657	MPR	Tune-up Limit
				1711.5 MHz	1745 MHz	1778.5 MHz		
3 MHz	QPSK	1	0	22.93	23.06	23.22	0	24
		1	8	22.92	23.04	23.20	0	24
		1	14	22.95	23.05	23.20	0	24
		8	0	21.00	21.09	21.21	1	23
		8	4	21.00	21.07	21.22	1	23
		8	7	21.00	21.09	21.22	1	23
		15	0	21.00	21.13	21.26	1	23
	16QAM	1	0	21.88	22.03	22.11	1	23
		1	8	21.85	22.00	22.06	1	23
		1	14	21.88	22.05	22.27	1	23
		8	0	20.87	21.11	21.17	2	22
		8	4	20.86	21.13	21.18	2	22
		8	7	20.84	21.13	21.16	2	22
		15	0	20.87	21.18	21.25	2	22
BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)				
				131979	132322	132665	MPR	Tune-up Limit
				1710.7 MHz	1745 MHz	1779.3 MHz		
1.4 MHz	QPSK	1	0	22.86	23.15	23.16	0	24
		1	3	22.83	23.11	23.22	0	24
		1	5	22.86	23.13	23.23	0	24
		3	0	22.86	23.09	23.17	0	24
		3	1	22.86	23.09	23.18	0	24
		3	3	22.86	23.09	23.19	0	24
		6	0	21.00	21.16	21.24	1	23
	16QAM	1	0	21.72	21.93	22.11	1	23
		1	3	21.65	21.90	22.13	1	23
		1	5	21.74	21.93	22.11	1	23
		3	0	21.72	22.00	22.00	1	22
		3	1	21.74	22.00	22.00	1	22
		3	3	21.71	22.00	22.00	1	22
		6	0	20.89	21.07	21.31	2	22

## 9.4. LTE Carrier Aggregation

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

For inter-band carrier aggregation with uplink assigned to one E-UTRA band (Table 5.6A-1), the requirements in subclause 6.2.3 apply.

For inter-band carrier aggregation with one component carrier per operating band and the uplink active in two E-UTRA bands, the requirements in subclause 6.2.3 apply for each uplink component carrier.

For intra-band contiguous carrier aggregation the allowed Maximum Power Reduction (MPR) for the maximum output power applicable to the DUT in table below. In case the modulation format is different on different component carriers then the MPR is determined by the rules applied to higher order of those modulations.

Modulation	CA bandwidth Class B and C / Smallest Component Carrier Transmission Bandwidth Configuration				MPR (dB)
	25 RB	50 RB	75 RB	100 RB	
QPSK	> 8 and ≤ 25	> 12 and ≤ 50	> 16 and ≤ 75	> 18 and ≤ 100	≤ 1
QPSK	> 25	> 50	> 75	> 100	≤ 2
16 QAM	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 8 and ≤ 25	> 12 and ≤ 50	> 16 and ≤ 75	> 18 and ≤ 100	≤ 2
16 QAM	> 25	> 50	> 75	> 100	≤ 3
64 QAM	≤ 8 and allocation wholly contained within a single CC	≤ 12 and allocation wholly contained within a single CC	≤ 16 and allocation wholly contained within a single CC	≤ 18 and allocation wholly contained within a single CC	≤ 2
64 QAM	> 8 or allocation extends across two CC's	> 12 or allocation extends across two CC's	> 16 or allocation extends across two CC's	> 18 or allocation extends across two CC's	≤ 3

For PUCCH and SRS transmissions, the allowed MPR is according to that specified for PUSCH WPKD modulation for the corresponding transmission bandwidth.

For intra-band contiguous carrier aggregation bandwidth class C with non-contiguous resource allocation, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2A-1 is specified as follows

$$MPR = \text{CEIL} \{ \min(M_A, M_{IM5}), 0.5 \}$$

Where  $M_A$  is defined as follows

$$M_A = \begin{cases} 8.2 & ; 0 \leq A < 0.025 \\ 9.2 - 40A & ; 0.025 \leq A < 0.05 \\ 8 - 16A & ; 0.05 \leq A < 0.25 \\ 4.83 - 3.33A & ; 0.25 \leq A \leq 0.4 \end{cases}$$

$$3.83 - 0.83A \quad ; 0.4 \leq A \leq 1$$

and  $M_{IM5}$  is defined as follows

$$M_{IM5} = \begin{array}{ll} 4.5 & ; \Delta_{IM5} < 1.5 * BW_{Channel\_CA} \\ 6.0 & ; 1.5 * BW_{Channel\_CA} \leq \Delta_{IM5} < BW_{Channel\_CA}/2 + \Delta f_{ooB} \\ M_A & ; \Delta_{IM5} \geq BW_{Channel\_CA}/2 + \Delta f_{ooB} \end{array}$$

Where

$$A = N_{RB\_alloc} / N_{RB\_agg}$$

$$\Delta_{IM5} = \max(|F_{C\_agg} - (3 * F_{agg\_alloc\_low} - 2 * F_{agg\_alloc\_high})|, |F_{C\_agg} - (3 * F_{agg\_alloc\_high} - 2 * F_{agg\_alloc\_low})|)$$

$CEIL\{M_A, 0.5\}$  means rounding upwards to closest 0.5dB, i.e.  $MPR \in [3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5]$

For intra-band carrier aggregation, the MPR is evaluated per slot and given by the maximum value taken over the transmission(s) on all component carriers within the slot; the maximum MPR over the two slots is then applied for the entire subframe.

For intra-band non-contiguous carrier aggregation with one uplink carrier on the PCC, the requirements in the subclause 6.2.3 apply. For intra-band non-contiguous aggregation with two uplink carriers the MPR is defined for those E-UTRA bands where maximum possible  $W_{GAP} \leq 42.2$  MHz as follows

$$MPR = CEIL\{M_A, 0.5\}$$

Where  $M_N$  is defined as follows

$$M_N = \begin{array}{ll} -0.125N + 18.25 & ; 2 \leq N \leq 50 \\ -0.0333 N + 13.67 & ; 50 < N \leq 200 \end{array}$$

Where  $N = N_{RB\_alloc}$  is the number of allocated resource blocks.

For the UE maximum output power modified by MPR, the power limits specified in subclause 6.2.5A apply.

**LTE Down-Link Carrier Aggregation**

The tables below show the supported frequency bands of the device for DL Inter-band and DL Intra-band combinations.

Power measurements were performed on the channel with the highest maximum output power from Tune-up Procedure.

When carrier aggregation is limited to downlink only, uplink maximum output power (single carrier) is measured for the supported combinations of downlink carrier aggregation listed in the table below. In applying the power measurement procedures of KDB 941225 D05A for DL CA to qualify for UL SAR test exclusion, power measurement is required only for the subset in each row with the largest combination of frequency bands and CCs (far right most configuration highlighted in the table below).

Index	2CC	Restriction	Completely Covered by Measurement Superset
<b>Intra-Band Contiguous</b>			
2CC # 1	CA_2C	N/A	No
2CC # 2	CA_41C	N/A	No
2CC # 3	CA_66C	N/A	No
<b>Intra-Band Non-Contiguous</b>			
2CC # 4	CA_2A-2A	N/A	No
2CC # 5	CA_4A-4A	N/A	No
2CC # 6	CA_41A-41A	N/A	No
2CC # 7	CA_66A-66A	N/A	No
<b>Inter-Band</b>			
2CC # 8	CA_2A-5A	N/A	No
2CC # 9	CA_2A-12A	N/A	No
2CC # 10	CA_2A-13A	N/A	No
2CC # 11	CA_2A-17A	N/A	No
2CC # 12	CA_4A-5A	N/A	No
2CC # 13	CA_4A-12A	N/A	No
2CC # 14	CA_4A-13A	N/A	No
2CC # 15	CA_4A-17A	N/A	No
2CC # 16	CA_5A-41A	N/A	No
2CC # 17	CA_12A-66A	N/A	No

In applying the power measurement procedures of KDB 941225 D05A for DL CA to qualify for UL SAR test exclusion, power measurement is required only for the CA configuration with the largest aggregated DL CA BW in each frequency band, independently for contiguous and non-contiguous CA; however, if the same frequency band is used for both contiguous and non-contiguous CA, power measurement was performed using the configuration with the largest aggregated BW and maximum output power among contiguous and non-contiguous CA.

**DL Intra-Band Contiguous Measured Results**

E-UTRA CA configuration (BCS)	3GPP Rel. #	CC1 (UL)					CC2 (DL)			Aggregated BW	MPR	CA Inactive (dBm)	CA Active (dBm)	Delta (dBm)
		Mode	BW (MHz)	Channel	Freq (MHz)	RB,Offset	BW (MHz)	Channel	Freq (MHz)					
CA_2C	12	QPSK	20	18801	1870.1	1,0	20	999	1969.9	40	0	23.70	23.60	-0.10
CA_41C	13	QPSK	20	40521	2583.1	1,0	20	40719	2602.9	40	0	23.40	23.40	0.00
CA_66C	14	QPSK	20	132323	1745.1	1,0	20	66985	2164.9	40	0	23.36	23.25	-0.11

**DL Intra-Band Non-Contiguous Measured Results**

E-UTRA CA configuration	3GPP Rel. #	CC1 (UL)					CC2 (DL)			Aggregated BW	MPR	CA Inactive (dBm)	CA Active (dBm)	Delta
		Mode	BW (MHz)	Channel	Freq (MHz)	RB,Offset	BW (MHz)	Channel	Freq (MHz)					
CA_2A-2A	12.4	QPSK	20	18700	1860	1,0	20	1100	1980	40	0	23.60	23.50	-0.10
CA_4A-4A	13	QPSK	20	20050	1720	1,0	20	2300	2145	40	0	23.07	22.93	-0.14
CA_41A-41A	12	QPSK	20	39750	2506	1,0	20	41490	2680	40	0	22.90	22.83	-0.07
CA_66A-66A	13	QPSK	20	132072	1720	1,0	20	67236	2190	40	0	23.25	23.10	-0.15

**DL Inter-Band Non-Contiguous Measured Results**

E-UTRA CA configuration	3GPP Rel. #	CC1 (UL)					CC2 (DL)			Aggregated BW	MPR	CA Inactive (dBm)	CA Active (dBm)	Delta
		Mode	BW (MHz)	Channel	Freq (MHz)	RB,Offset	BW (MHz)	Channel	Freq (MHz)					
CA_2A-5A	12	QPSK	20	18700	1860	1,0	10	2525	881.5	30	0	23.82	23.60	-0.22
CA_2A-12A	13	QPSK	20	18700	1860	1,0	10	5095	737.5	30	0	23.82	23.55	-0.27
CA_2A-13A	12	QPSK	20	18700	1860	1,0	10	5230	751	30	0	23.82	23.54	-0.28
CA_2A-17A	11	QPSK	10	19150	1905	1,0	10	5790	740	20	0	23.82	23.60	-0.22
CA_4A-5A	12	QPSK	20	20175	1732.5	1,0	10	2525	881.5	30	0	23.40	23.21	-0.19
CA_4A-12A	13	QPSK	20	20175	1732.5	1,0	10	5095	737.5	30	0	23.40	23.25	-0.15
CA_4A-13A	11	QPSK	20	20175	1732.5	1,0	10	5230	751	30	0	23.40	23.24	-0.16
CA_4A-17A	11	QPSK	10	20000	1715	1,0	10	5790	740	20	0	23.40	23.20	-0.20
CA_5A-41A	14	QPSK	10	20525	836.5	1,0	20	41490	2680	30	0	24.85	23.72	-1.13
CA_12A-66A	14	QPSK	10	23095	707.5	1,0	20	66886	2155	30	0	24.75	24.66	-0.09

### 9.5. Wi-Fi 2.4GHz (DTS Band)

Device is set to operate at its normal maximum output power during receiver off state. When the device is operating with a receiver on state, the maximum output power is reduced.

Refer to Operational Description for WLAN power back-off explanation.

#### Wi-Fi 2.4GHz Measured Results

The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures.

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  $\leq 1.2$  W/kg.

Band	Mode	Data Rate	Ch #	Freq. (MHz)	Maximum Average Power (dBm)					
					Reduced Average Power (dBm)			Maximum 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	11.50	12.00	Yes	18.30	19.00	Yes
			6	2437	11.80	12.00		18.40	19.00	
			11	2462	11.60	12.00		17.80	19.00	
			12	2467		8.00			8.00	
			13	2472		8.00			8.00	
OFDM 2.4 GHz	802.11g	6 Mbps	1	2412		12.00	No		17.00	No
			6	2437		12.00			17.00	
			11	2462		12.00			17.00	
			12	2467		8.00			8.00	
			13	2472		8.00			8.00	
	802.11n (HT20)	6.5 Mbps	1	2412		12.00	No		17.00	No
			6	2437		12.00			17.00	
			11	2462		12.00			17.00	
			12	2467		6.00			6.00	
			13	2472		6.00			6.00	

**Note(s):**

Additionally, SAR is not required for Channels 12 and 13 because the tune-up limit for these two channels are less than those for the default test channels.

#### Duty Factor Measured Results

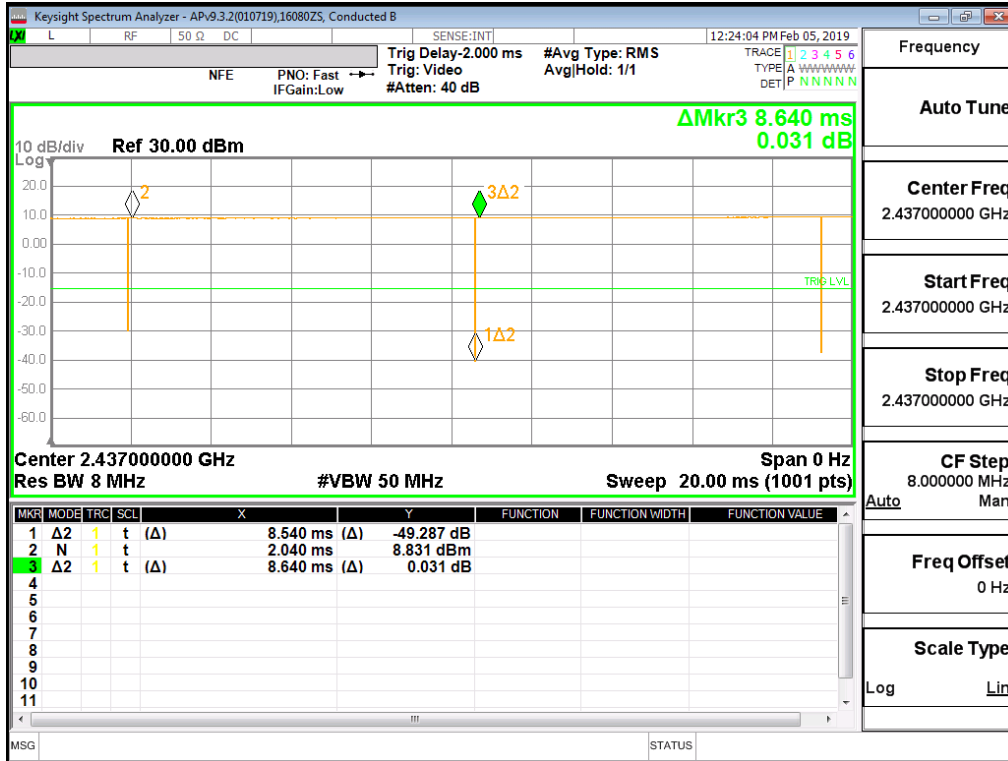
Mode	Type	T on (ms)	Period (ms)	Duty Cycle	Crest Factor (1/duty cycle)
DTS	802.11b	8.54	8.64	98.84%	1.01

**Note(s):**

Duty Cycle = (T on / period) \* 100%

# Duty Cycle plots

802.11b



### 9.6. Wi-Fi 5GHz (U-NII Bands)

Device is set to operate at its normal maximum output power during receiver off state. When the device is operating with a receiver on state, the maximum output power is reduced.

Refer to Operational Description for WLAN power back-off explanation.

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. The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures.

#### Wi-Fi 5 GHz Measured Results

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.

Band	Mode	Data Rate	Ch #	Freq. (MHz)	Reduced Average Power (dBm)			Maximum 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		12.00	No	16.00	17.00	No
			40	5200		12.00		16.00	17.00	
			44	5220		12.00		16.00	17.00	
			48	5240		12.00		16.00	17.00	
	802.11n (HT20)	6.5 Mbps	36	5180		12.00	No		16.00	No
			40	5200		12.00			16.00	
			44	5220		12.00			16.00	
			48	5240		12.00			16.00	
	802.11ac (VHT20)	6.5 Mbps	36	5180		12.00	No		16.00	No
			40	5200		12.00			16.00	
			44	5220		12.00			16.00	
			48	5240		12.00			16.00	
	802.11n (HT40)	13.5 Mbps	38	5190		12.00	No		15.00	No
			46	5230		12.00			15.00	
802.11ac (VHT40)	13.5 Mbps	38	5190		12.00	No		15.00	No	
		46	5230		12.00			15.00		
802.11ac (VHT80)	29.3 Mbps	42	5210	11.00	12.00	No		14.00	No	
Band	Mode	Data Rate	Ch #	Freq. (MHz)	Reduced Average Power (dBm)			Maximum 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		12.00	No	16.00	17.00	Yes
			56	5280		12.00		16.00	17.00	
			60	5300		12.00		16.00	17.00	
			64	5320		12.00		16.00	17.00	
	802.11n (HT20)	6.5 Mbps	52	5260		12.00	No		16.00	No
			56	5280		12.00			16.00	
			60	5300		12.00			16.00	
			64	5320		12.00			16.00	
	802.11ac (VHT20)	6.5 Mbps	52	5260		12.00	No		16.00	No
			56	5280		12.00			16.00	
			60	5300		12.00			16.00	
			64	5320		12.00			16.00	
	802.11n (HT40)	13.5 Mbps	54	5270		12.00	No		15.00	No
			62	5310		12.00			15.00	
802.11ac (VHT40)	13.5 Mbps	54	5270		12.00	No		15.00	No	
		62	5310		12.00			15.00		
802.11ac (VHT80)	29.3 Mbps	58	5290	11.00	12.00	Yes		14.00	No	



Band	Mode	Data Rate	Ch #	Freq. (MHz)	Reduced Average Power (dBm)			Maximum 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		12.00	No	16.00	17.00	Yes
			116	5580		12.00		16.00	17.00	
			124	5620		12.00		16.00	17.00	
			144	5720		12.00		15.90	17.00	
	802.11n (HT20)	6.5 Mbps	100	5500		12.00	No		16.00	No
			116	5580		12.00			16.00	
			124	5620		12.00			16.00	
			144	5720		12.00			16.00	
	802.11ac (VHT20)	6.5 Mbps	100	5500		12.00	No		16.00	No
			116	5580		12.00			16.00	
			124	5620		12.00			16.00	
			144	5720		12.00			16.00	
	802.11n (HT40)	13.5 Mbps	102	5510		12.00	No		13.00	No
			118	5590		12.00			15.00	
			126	5630		12.00			15.00	
			142	5710		12.00			15.00	
	802.11ac (VHT40)	13.5 Mbps	102	5510		12.00	No		13.00	No
			118	5590		12.00			15.00	
			126	5630		12.00			15.00	
			142	5710		12.00			15.00	
	802.11ac (VHT80)	29.3 Mbps	106	5530	11.00	12.00	Yes		14.00	No
122			5610	11.00	12.00			14.00		
138			5690	11.00	12.00			14.00		
Band	Mode	Data Rate	Ch #	Freq. (MHz)	Reduced Average Power (dBm)			Maximum 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		12.00	No	16.00	17.00	Yes
			157	5785		12.00		15.80	17.00	
			165	5825		12.00		15.90	17.00	
	802.11n (HT20)	6.5 Mbps	149	5745		12.00	No		16.00	No
			157	5785		12.00			16.00	
			165	5825		12.00			16.00	
	802.11ac (VHT20)	6.5 Mbps	149	5745		12.00	No		16.00	No
			157	5785		12.00			16.00	
			165	5825		12.00			16.00	
	802.11n (HT40)	13.5 Mbps	151	5755		12.00	No		15.00	No
			159	5795		12.00			15.00	
	802.11ac (VHT40)	13.5 Mbps	151	5755		12.00	No		15.00	No
			159	5795		12.00			15.00	
	802.11ac (VHT80)	29.3 Mbps	155	5775	10.70	12.00	Yes		14.00	No

**Duty Factor Measured Results**

Mode	Type	T on (ms)	Period (ms)	Duty Cycle	Crest Factor (1/duty cycle)
UNII	802.11a	1.435	1.515	94.72%	1.06
UNII	802.11VHT80	0.3333	0.4467	74.61%	1.34

**Note(s):**

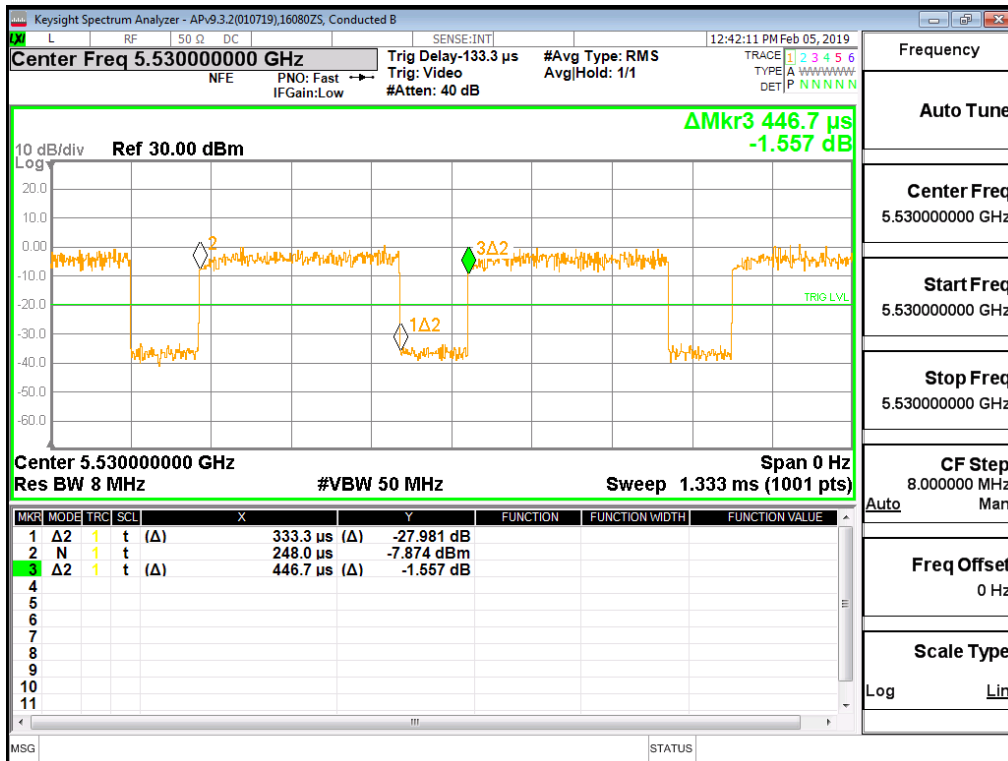
Duty Cycle = (T on / period) \* 100%

### Duty Cycle plots

802.11a



802.11ac 80



## 9.7. Bluetooth

### Bluetooth Measured Results

SAR measurement is not required for the QPSK, 8PSK, and BLE. When the secondary mode is  $\leq \frac{1}{4}$  dB higher than the primary mode.

Band	Mode	Ch #	Freq. (MHz)	Maximum Average Power (dBm)		
				Meas Pwr	Tune-up	SAR Test (Yes/No)
2.4	GFSK	0	2402	8.60	10.00	Yes
		39	2441	9.60	10.00	
		78	2480	8.20	10.00	
	EDR, $\pi/4$ DQPSK	0	2402	7.40	10.00	No
		39	2441	8.40	10.00	
		78	2480	7.20	10.00	
	EDR, 8-DPSK	0	2402	7.30	10.00	No
		39	2441	8.30	10.00	
		78	2480	7.10	10.00	
	LE, GFSK	0	2402	5.00	6.50	No
		19	2440	5.86	6.50	
		39	2480	5.10	6.50	

### Duty Factor Measured Results

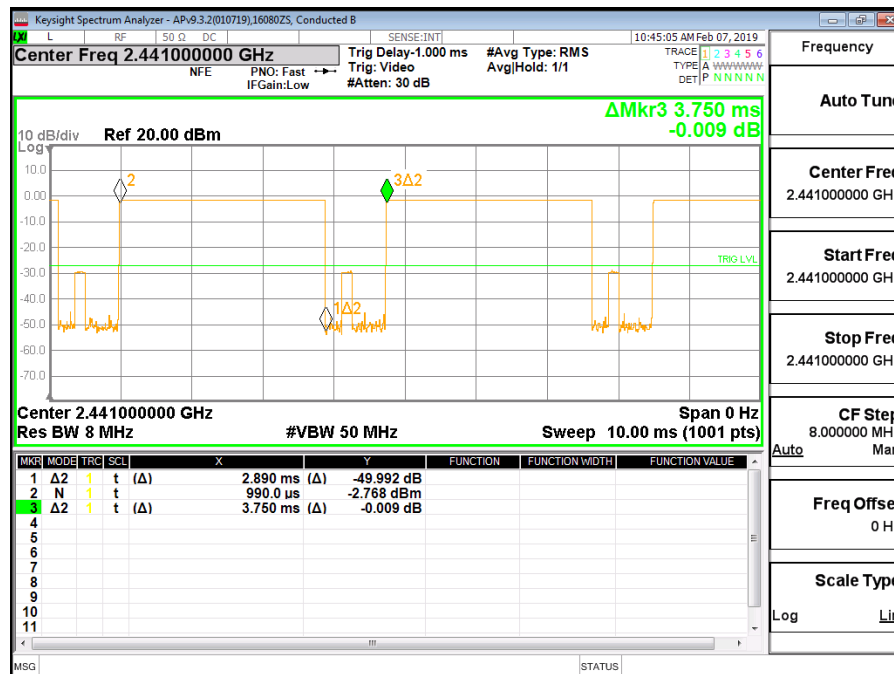
Mode	Type	T on (ms)	Period (ms)	Duty Cycle	Crest Factor (1/duty cycle)
GFSK	DH5	2.81	3.75	74.93%	1.33

#### Note(s):

Duty Cycle = (T on / period) \* 100%

### Duty Cycle plots

GFSK



## 10. Measured and Reported (Scaled) SAR Results

### SAR Test Reduction criteria are as follows:

- Reported SAR(W/kg) for WWAN and Bluetooth = Measured SAR \*Tune-up Scaling Factor
- Reported SAR(W/kg) for Wi-Fi = 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:

- $\leq 0.8$  W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is  $\leq 100$  MHz
- $\leq 0.6$  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
- $\leq 0.4$  W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is  $\geq 200$  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):

For smart phones, with a display diagonal dimension  $> 15.0$  cm or an overall diagonal dimension  $> 16.0$  cm.

When hotspot mode does not apply, 10-g Extremity SAR is required for all surfaces and edges with an antenna located at  $\leq 25$  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; however, when power reduction applies to hotspot mode the measured SAR must be scaled to the maximum output power, including tolerance, allowed for phablet modes to compare with the 1.2 W/kg SAR test reduction threshold.

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

### KDB 941225 D01 SAR test for 3G devices:

When the maximum output power and tune-up tolerance specified for production units in a secondary mode is  $\leq \frac{1}{4}$  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  $\leq 1.2$  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). Initial Test Position SAR Test Reduction Procedure is outlined in KDB 248227 D01 §5.1.1. To determine the initial test position, Area Scans were performed to determine the position with the Maximum Value of SAR (measured). The position that produced the highest Maximum Value of SAR is considered the worst case position; thus used as the initial test position.

**10.1. GSM850**

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up Limit	Meas.	Meas.	Scaled	
Head	GPRS 3 Slots	0	Left Touch	190	836.6	30.0	28.73	0.004	0.005	1
			Left Tilt	190	836.6	30.0	28.73	0.003	0.004	
			Right Touch	190	836.6	30.0	28.73	0.006	<b>0.008</b>	
			Right Tilt	190	836.6	30.0	28.73	0.002	0.003	
Body-worn	GPRS 3 Slots	15	Rear	190	836.6	30.0	28.73	0.008	<b>0.011</b>	2
			Front	190	836.6	30.0	28.73	0.003	0.004	
Hotspot	GPRS 3 Slots	10	Rear	190	836.6	30.0	28.73	0.012	<b>0.016</b>	3
			Front	190	836.6	30.0	28.73	0.004	0.005	
			Edge 2	190	836.6	30.0	28.73	0.005	0.006	
			Edge 3	190	836.6	30.0	28.73	0.003	0.005	
			Edge 4	190	836.6	30.0	28.73	0.002	0.002	

**10.2. GSM1900**

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up Limit	Meas.	Meas.	Scaled	
Head	GPRS 3 Slots	0	Left Touch	661	1880.0	26.6	25.11	0.132	<b>0.186</b>	4
			Left Tilt	661	1880.0	26.6	25.11	0.083	0.117	
			Right Touch	661	1880.0	26.6	25.11	0.100	0.141	
			Right Tilt	661	1880.0	26.6	25.11	0.067	0.094	
Body-worn	GPRS 3 Slots	15	Rear	661	1880.0	26.6	25.11	0.129	<b>0.182</b>	5
			Front	661	1880.0	26.6	25.11	0.105	0.148	
Hotspot	GPRS 3 Slots	10	Rear	661	1880.0	26.6	25.11	0.289	<b>0.407</b>	6
			Front	661	1880.0	26.6	25.11	0.165	0.233	
			Edge 2	661	1880.0	26.6	25.11	0.054	0.076	
			Edge 3	661	1880.0	26.6	25.11	0.164	0.231	
			Edge 4	661	1880.0	26.6	25.11	0.179	0.252	

**10.3. W-CDMA Band II**

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up Limit	Meas.	Meas.	Scaled	
Head	RMC Rel. 99 12.2 kbps	0	Left Touch	9400	1880.0	25.5	25.20	0.257	<b>0.275</b>	7
			Left Tilt	9400	1880.0	25.5	25.20	0.164	0.176	
			Right Touch	9400	1880.0	25.5	25.20	0.169	0.181	
			Right Tilt	9400	1880.0	25.5	25.20	0.114	0.122	
Body-w orn	RMC Rel. 99 12.2 kbps	15	Rear	9400	1880.0	25.5	25.20	0.216	<b>0.231</b>	8
			Front	9400	1880.0	25.5	25.20	0.181	0.194	
Hotspot	RMC Rel. 99 12.2 kbps	10	Rear	9400	1880.0	25.5	25.20	0.351	<b>0.376</b>	9
			Front	9400	1880.0	25.5	25.20	0.311	0.333	
			Edge 2	9400	1880.0	25.5	25.20	0.105	0.113	
			Edge 3	9400	1880.0	25.5	25.20	0.345	0.370	
			Edge 4	9400	1880.0	25.5	25.20	0.327	0.350	

**10.4. W-CDMA Band IV**

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up Limit	Meas.	Meas.	Scaled	
Head	RMC Rel. 99 12.2 kbps	0	Left Touch	1413	1732.6	25.0	23.10	0.163	<b>0.252</b>	10
			Left Tilt	1413	1732.6	25.0	23.10	0.113	0.175	
			Right Touch	1413	1732.6	25.0	23.10	0.105	0.163	
			Right Tilt	1413	1732.6	25.0	23.10	0.094	0.146	
Body-w orn	RMC Rel. 99 12.2 kbps	15	Rear	1413	1732.6	25.0	23.10	0.270	<b>0.418</b>	11
			Front	1413	1732.6	25.0	23.10	0.225	0.348	
Hotspot	RMC Rel. 99 12.2 kbps	10	Rear	1413	1732.6	25.0	23.10	0.469	<b>0.726</b>	12
			Front	1413	1732.6	25.0	23.10	0.327	0.506	
			Edge 2	1413	1732.6	25.0	23.10	0.252	0.390	
			Edge 3	1413	1732.6	25.0	23.10	0.287	0.445	
			Edge 4	1413	1732.6	25.0	23.10	0.256	0.396	

### 10.5. W-CDMA Band V

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up Limit	Meas.	Meas.	Scaled	
Head	RMC Rel. 99 12.2 kbps	0	Left Touch	4183	836.6	25.5	24.52	0.079	<b>0.099</b>	13
			Left Tilt	4183	836.6	25.5	24.52	0.052	0.065	
			Right Touch	4183	836.6	25.5	24.52	0.109	0.137	
			Right Tilt	4183	836.6	25.5	24.52	0.046	0.058	
Body-w orn	RMC Rel. 99 12.2 kbps	15	Rear	4183	836.6	25.5	24.52	0.224	<b>0.281</b>	14
			Front	4183	836.6	25.5	24.52	0.085	0.107	
Hotspot	RMC Rel. 99 12.2 kbps	10	Rear	4183	836.6	25.5	24.52	0.451	<b>0.565</b>	15
			Front	4183	836.6	25.5	24.52	0.094	0.118	
			Edge 2	4183	836.6	25.5	24.52	0.114	0.143	
			Edge 3	4183	836.6	25.5	24.52	0.155	0.194	
			Edge 4	4183	836.6	25.5	24.52	0.032	0.040	

### 10.6. LTE Band 2 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up Limit	Meas.	Meas.	Scaled	
Head	QPSK	0	Left Touch	18900	1880.0	1	0	24.7	24.23	0.249	<b>0.277</b>	16
						50	24	23.7	22.08	0.157	0.228	
			Left Tilt	18900	1880.0	1	0	24.7	24.23	0.178	0.198	
						50	24	23.7	22.08	0.113	0.164	
			Right Touch	18900	1880.0	1	0	24.7	24.23	0.178	0.198	
						50	24	23.7	22.08	0.110	0.160	
			Right Tilt	18900	1880.0	1	0	24.7	24.23	0.130	0.145	
						50	24	23.7	22.08	0.081	0.118	
Body-w orn	QPSK	15	Rear	18900	1880.0	1	0	24.7	24.23	0.252	<b>0.281</b>	17
						50	24	23.7	22.08	0.160	0.232	
			Front	18900	1880.0	1	0	24.7	24.23	0.194	0.216	
						50	24	23.7	22.08	0.119	0.173	
Hotspot	QPSK	10	Rear	18900	1880.0	1	0	24.7	24.23	0.617	<b>0.688</b>	18
						50	24	23.7	22.08	0.387	0.562	
			Front	18900	1880.0	1	0	24.7	24.23	0.331	0.369	
						50	24	23.7	22.08	0.205	0.298	
			Edge 2	18900	1880.0	1	0	24.7	24.23	0.130	0.145	
						50	24	23.7	22.08	0.082	0.119	
			Edge 3	18900	1880.0	1	0	24.7	24.23	0.369	0.411	
						50	24	23.7	22.08	0.230	0.334	
			Edge 4	18900	1880.0	1	0	24.7	24.23	0.387	0.431	
						50	24	23.7	22.08	0.238	0.346	



### 10.7. LTE Band 5 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up Limit	Meas.	Meas.	Scaled	
Head	QPSK	0	Left Touch	20525	836.5	1	0	25.0	24.50	0.102	0.114	
						25	25	24.0	23.06	0.059	0.073	
			Left Tilt (15°)	20525	836.5	1	0	25.0	24.50	0.057	0.064	
						25	25	24.0	23.06	0.033	0.041	
			Right Touch	20525	836.5	1	0	25.0	24.50	0.136	<b>0.153</b>	19
						25	25	24.0	23.06	0.084	0.104	
Right Tilt (15°)	20525	836.5	1	0	25.0	24.50	0.056	0.063				
			25	25	24.0	23.06	0.034	0.042				
Body-worn	QPSK	15	Rear	20525	836.5	1	0	25.0	24.50	0.213	<b>0.239</b>	20
						25	25	24.0	23.06	0.148	0.184	
			Front	20525	836.5	1	0	25.0	24.50	0.090	0.101	
						25	25	24.0	23.06	0.055	0.068	
Hotspot	QPSK	10	Rear	20525	836.5	1	0	25.0	24.50	0.488	<b>0.548</b>	21
						25	25	24.0	23.06	0.342	0.425	
			Front	20525	836.5	1	0	25.0	24.50	0.096	0.108	
						25	25	24.0	23.06	0.058	0.072	
			Edge 2	20525	836.5	1	0	25.0	24.50	0.141	0.158	
						25	25	24.0	23.06	0.086	0.107	
			Edge 3	20525	836.5	1	0	25.0	24.50	0.158	0.177	
						25	25	24.0	23.06	0.110	0.137	
			Edge 4	20525	836.5	1	0	25.0	24.50	0.043	0.048	
						25	25	24.0	23.06	0.025	0.031	

**10.8. LTE Band 12 (10MHz Bandwidth)**

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up Limit	Meas.	Meas.	Scaled	
Head	QPSK	0	Left Touch	23095	707.5	1	0	24.8	24.63	0.009	<b>0.010</b>	22
						25	0	23.8	23.35	0.006	0.006	
			Left Tilt	23095	707.5	1	0	24.8	24.63	0.004	0.004	
						25	0	23.8	23.35	0.003	0.004	
			Right Touch	23095	707.5	1	0	24.8	24.63	0.008	0.008	
						25	0	23.8	23.35	0.006	0.007	
Right Tilt	23095	707.5	1	0	24.8	24.63	0.005	0.005				
			25	0	23.8	23.35	0.003	0.003				
Body-worn	QPSK	15	Rear	23095	707.5	1	0	24.8	24.63	0.037	<b>0.038</b>	23
						25	0	23.8	23.35	0.027	0.030	
			Front	23095	707.5	1	0	24.8	24.63	0.016	0.017	
						25	0	23.8	23.35	0.012	0.013	
Hotspot	QPSK	10	Rear	23095	707.5	1	0	24.8	24.63	0.041	<b>0.043</b>	24
						25	0	23.8	23.35	0.030	0.033	
			Front	23095	707.5	1	0	24.8	24.63	0.012	0.012	
						25	0	23.8	23.35	0.009	0.010	
			Edge 2	23095	707.5	1	0	24.8	24.63	0.031	0.032	
						25	0	23.8	23.35	0.024	0.027	
			Edge 3	23095	707.5	1	0	24.8	24.63	0.004	0.004	
						25	0	23.8	23.35	0.003	0.003	
			Edge 4	23095	707.5	1	0	24.8	24.63	0.029	0.030	
						25	0	23.8	23.35	0.021	0.023	

**10.9. LTE Band 13 (10MHz Bandwidth)**

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up Limit	Meas.	Meas.	Scaled	
Head	QPSK	0	Left Touch	23230	782.0	1	0	24.5	24.50	0.047	0.047	
						25	0	23.5	22.03	0.027	0.038	
			Left Tilt	23230	782.0	1	0	24.5	24.50	0.027	0.027	
						25	0	23.5	22.03	0.016	0.022	
			Right Touch	23230	782.0	1	0	24.5	24.50	0.052	<b>0.052</b>	25
						25	0	23.5	22.03	0.031	0.043	
Right Tilt	23230	782.0	1	0	24.5	24.50	0.025	0.025				
			25	0	23.5	22.03	0.014	0.020				
Body-worn	QPSK	15	Rear	23230	782.0	1	0	24.5	24.50	0.140	<b>0.140</b>	26
						25	0	23.5	22.03	0.082	0.115	
			Front	23230	782.0	1	0	24.5	24.50	0.074	0.074	
						25	0	23.5	22.03	0.043	0.060	
Hotspot	QPSK	10	Rear	23230	782.0	1	0	24.5	24.50	0.169	<b>0.169</b>	27
						25	0	23.5	22.03	0.099	0.139	
			Front	23230	782.0	1	0	24.5	24.50	0.062	0.062	
						25	0	23.5	22.03	0.037	0.052	
			Edge 2	23230	782.0	1	0	24.5	24.50	0.073	0.073	
						25	0	23.5	22.03	0.043	0.060	
			Edge 3	23230	782.0	1	0	24.5	24.50	0.037	0.037	
						25	0	23.5	22.03	0.021	0.029	
			Edge 4	23230	782.0	1	0	24.5	24.50	0.039	0.039	
						25	0	23.5	22.03	0.022	0.031	

### 10.10. LTE Band 41 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up Limit	Meas.	Meas.	Scaled	
Head	QPSK	0	Left Touch	40620	2593.0	1	99	25.0	23.53	0.164	0.230	
						50	50	24.0	22.76	0.127	0.169	
			Left Tilt	40620	2593.0	1	99	25.0	23.53	0.140	0.196	
						50	50	24.0	22.76	0.107	0.142	
			Right Touch	40620	2593.0	1	99	25.0	23.53	0.202	<b>0.283</b>	28
						50	50	24.0	22.76	0.161	0.214	
Right Tilt	40620	2593.0	1	99	25.0	23.53	0.079	0.111				
			50	50	24.0	22.76	0.060	0.080				
Body-w orn	QPSK	15	Rear	40620	2593.0	1	99	25.0	23.53	0.187	<b>0.262</b>	29
						50	50	24.0	22.76	0.152	0.202	
			Front	40620	2593.0	1	99	25.0	23.53	0.152	0.213	
						50	50	24.0	22.76	0.123	0.164	
Hotspot	QPSK	10	Rear	40620	2593.0	1	99	25.0	23.53	0.406	<b>0.570</b>	30
						50	50	24.0	22.76	0.325	0.432	
			Front	40620	2593.0	1	99	25.0	23.53	0.309	0.433	
						50	50	24.0	22.76	0.252	0.335	
			Edge 2	40620	2593.0	1	99	25.0	23.53	0.277	0.389	
						50	50	24.0	22.76	0.225	0.299	
			Edge 3	40620	2593.0	1	99	25.0	23.53	0.160	0.224	
						50	50	24.0	22.76	0.130	0.173	
Edge 4	40620	2593.0	1	99	25.0	23.53	0.045	0.063				
			50	50	24.0	22.76	0.035	0.047				

**10.11. LTE Band 66 (20MHz Bandwidth)**

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up Limit	Meas.	Meas.	Scaled	
Head	QPSK	0	Left Touch	132322	1745.0	1	0	24.0	23.13	0.153	<b>0.187</b>	31
						50	0	23.0	21.16	0.098	0.150	
			Left Tilt	132322	1745.0	1	0	24.0	23.13	0.101	0.123	
						50	0	23.0	21.16	0.063	0.096	
			Right Touch	132322	1745.0	1	0	24.0	23.13	0.108	0.132	
						50	0	23.0	21.16	0.067	0.102	
Right Tilt	132322	1745.0	1	0	24.0	23.13	0.094	0.115				
			50	0	23.0	21.16	0.060	0.092				
Body-worn	QPSK	15	Rear	132322	1745.0	1	0	24.0	23.13	0.217	<b>0.265</b>	32
						50	0	23.0	21.16	0.140	0.214	
			Front	132322	1745.0	1	0	24.0	23.13	0.201	0.246	
						50	0	23.0	21.16	0.131	0.200	
Hotspot	QPSK	10	Rear	132322	1745.0	1	0	24.0	23.13	0.409	<b>0.500</b>	33
						50	0	23.0	21.16	0.266	0.406	
			Front	132322	1745.0	1	0	24.0	23.13	0.347	0.424	
						50	0	23.0	21.16	0.210	0.321	
			Edge 2	132322	1745.0	1	0	24.0	23.13	0.076	0.093	
						50	0	23.0	21.16	0.050	0.076	
			Edge 3	132322	1745.0	1	0	24.0	23.13	0.336	0.411	
						50	0	23.0	21.16	0.218	0.333	
Edge 4	132322	1745.0	1	0	24.0	23.13	0.252	0.308				
			50	0	23.0	21.16	0.166	0.254				

## 10.12. Wi-Fi (DTS Band)

When the 802.11b reported SAR of the highest measured maximum output power channel is  $\leq 0.8$  W/kg, no further SAR testing is required. If SAR is  $> 0.8$  W/kg and  $\leq 1.2$  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  $\leq 1.2$  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	6	2437	98.84%	0.285	12.0	11.80			
				Left Tilt	6	2437	98.84%	<b>0.338</b>	12.0	11.80	0.188	<b>0.199</b>	34
				Right Touch	6	2437	98.84%	0.113	12.0	11.80			
				Right Tilt	6	2437	98.84%	0.136	12.0	11.80			
Body-worn	802.11b 1 Mbps	OFF	15	Rear	6	2437	98.84%	<b>0.147</b>	19.0	18.40	0.096	<b>0.112</b>	35
				Front	6	2437	98.84%	0.097	19.0	18.40			
Hotspot	802.11b 1 Mbps	OFF	10	Rear	6	2437	98.84%	<b>0.407</b>	19.0	18.40	0.238	<b>0.276</b>	36
				Front	6	2437	98.84%	0.208	19.0	18.40			
				Edge 1	6	2437	98.84%	0.234	19.0	18.40			
				Edge 2	6	2437	98.84%	0.129	19.0	18.40			

### Note(s):

SAR testing is not required for OFDM mode(s) because the adjusted SAR is  $\leq 1.2$  W/kg.

## 10.13. 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

- $\leq 1.2$  W/kg, SAR is not required for UNII band 1
- $> 1.2$  W/kg, both bands should be tested independently for SAR.

### UNII-2A

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	74.61%	0.422	12.0	11.00			
				Left Tilt	58	5290	74.61%	<b>0.426</b>	12.0	11.00	0.224	<b>0.378</b>	37
				Right Touch	58	5290	74.61%	0.273	12.0	11.00			
				Right Tilt	58	5290	74.61%	0.338	12.0	11.00			
Body-worn	802.11a 6 Mbps	OFF	15	Rear	60	5300	94.72%	<b>0.274</b>	17.0	16.00	0.132	<b>0.175</b>	38
				Front	60	5300	94.72%	0.174	17.0	16.00			
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.
Product Specific 10g	802.11a 6 Mbps	OFF	0	Rear	60	5300	94.72%	4.490	17.0	16.00	0.515	0.684	39
				Front	60	5300	94.72%	1.840	17.0	16.00			
				Edge 1	60	5300	94.72%	<b>8.960</b>	17.0	16.00	0.888	<b>1.180</b>	40
				Edge 2	60	5300	94.72%	0.910	17.0	16.00			

#### Note(s):

Reported SAR for UNII-2A is  $< 1.2$  W/kg and 3.0 W/kg (Product Specific 10g), therefore SAR is not required for UNII-1.

### UNII-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	74.61%	0.186	12.0	11.00			
				Left Tilt	122	5610	74.61%	<b>0.215</b>	12.0	11.00	0.076	<b>0.128</b>	41
				Right Touch	122	5610	74.61%	0.121	12.0	11.00			
				Right Tilt	122	5610	74.61%	0.141	12.0	11.00			
Body-worn	802.11a 6 Mbps	OFF	15	Rear	124	5620	94.72%	<b>0.213</b>	17.0	16.00	0.126	<b>0.167</b>	42
				Front	124	5620	94.72%	0.107	17.0	16.00			
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.
Product Specific 10g	802.11a 6 Mbps	OFF	0	Rear	124	5620	94.72%	3.070	17.0	16.00			
				Front	124	5620	94.72%	1.000	17.0	16.00			
				Edge 1	124	5620	94.72%	<b>5.900</b>	17.0	16.00	0.608	<b>0.808</b>	43
				Edge 2	124	5620	94.72%	0.785	17.0	16.00			

**UNII-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	74.61%	<b>0.120</b>	12.0	10.70	0.030	<b>0.054</b>	44
				Left Tilt	155	5775	74.61%	0.104	12.0	10.70			
				Right Touch	155	5775	74.61%	0.044	12.0	10.70			
				Right Tilt	155	5775	74.61%	0.076	12.0	10.70			
Body-w orn	802.11a 6 Mbps	OFF	15	Rear	149	5745	94.72%	<b>0.139</b>	17.0	16.00	0.050	<b>0.066</b>	45
				Front	149	5745	94.72%	0.076	17.0	16.00			
Hotspot	802.11a 6 Mbps	OFF	10	Rear	149	5745	94.72%	0.203	17.0	16.00			
				Front	149	5745	94.72%	0.115	17.0	16.00			
				Edge 1	149	5745	94.72%	<b>0.381</b>	17.0	16.00	0.155	<b>0.206</b>	46
				Edge 2	149	5745	94.72%	0.151	17.0	16.00			

**10.14. Bluetooth**

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up Limit	Meas.	Meas.	Scaled	
Head	GFSK	0	Left Touch	39	2441	10.0	9.60	0.040	0.044	
			Left Tilt	39	2441	10.0	9.60	0.043	<b>0.047</b>	47
			Right Touch	39	2441	10.0	9.60	0.023	0.025	
			Right Tilt	39	2441	10.0	9.60	0.031	0.034	
Body-w orn	GFSK	15	Rear	39	2441	10.0	9.60	0.006	0.006	
			Front	39	2441	10.0	9.60	0.006	<b>0.007</b>	48
BT Tethering	GFSK	10	Rear	39	2441	10.0	9.60	0.014	<b>0.015</b>	49
			Front	39	2441	10.0	9.60	0.009	0.009	
			Edge 1	39	2441	10.0	9.60	0.009	0.009	
			Edge 2	39	2441	10.0	9.60	0.005	0.006	



## 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  $\geq 0.8$  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  $\geq 1.45$  or  $3.6$  W/kg ( $\sim 10\%$  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  $\geq 1.5$  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 12	Hotspot	Rear	No	0.041
	LTE Band 13	Hotspot	Rear	No	0.169
850	GSM 850	Hotspot	Rear	No	0.012
	WCDMA Band V	Hotspot	Rear	No	0.451
	LTE Band 5	Hotspot	Rear	No	0.488
1700	WCDMA Band IV	Hotspot	Rear	No	0.469
	LTE Band 66	Hotspot	Rear	No	0.409
1900	GSM 1900	Hotspot	Rear	No	0.289
	WCDMA Band II	Hotspot	Rear	No	0.351
	LTE Band 2	Hotspot	Rear	No	0.617
2400	Wi-Fi 802.11b/g/n	Hotspot	Rear	No	0.238
	BT	Head	Left Tilt	No	0.043
2600	LTE Band 41	Hotspot	Rear	No	0.406
5300	Wi-Fi 802.11a/n/ac	Head	Left Tilt	No	0.224
5500	Wi-Fi 802.11a/n/ac	Body	Rear	No	0.126
5800	Wi-Fi 802.11a/n/ac	Hotspot	Edge 1	No	0.155

### Note(s):

Repeated measurement is not required when the original highest measured SAR is  $< 0.8$  W/kg

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)
5300	Wi-Fi 802.11a/n/ac	Product Specific 10g	Edge 1	No	0.888
5600	Wi-Fi 802.11a/n/ac	Product Specific 10g	Edge 1	No	0.608

### Note(s):

Repeated measurement is not required when the original highest measured SAR is  $< 2$  W/kg

## 12. Simultaneous Transmission Conditions

RF Exposure Condition	Item	Capable Transmit Configurations	
Head Body-w orn Hotspot	1	GSM(Voice)	+ DTS
	2	GSM(Voice)	+ U-NII
	3	GSM(Voice)	+ BT
	4	GSM(GPRS/EDGE)	+ DTS
	5	GSM(GPRS/EDGE)	+ U-NII
	6	GSM(GPRS/EDGE)	+ BT
	7	W-CDMA	+ DTS
	8	W-CDMA	+ U-NII
	9	W-CDMA	+ BT
	10	LTE	+ DTS
	11	LTE	+ U-NII
	12	LTE	+ BT

Notes:

1. DTS & UNII (ch 149 only) supports Hotspot.
2. VoIP is supported in GPRS/EDGE, W-CDMA, and LTE.
3. DTS Radio cannot transmit simultaneously w ith Bluetooth Radio.
4. U-NII Radio cannot transmit simultaneously w ith Bluetooth Radio.

**Note(s):**

Product Specific 10g SAR does not require simultaneous transmission analysis.

### 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)				$\Sigma$ 1-g SAR (W/kg)		
		1	2	3	4	1+2	1+3	1+4
		WWAN	Wi-Fi 2.4G	Wi-Fi 5G ANT#	BT ANT#			
Head	Left Touch	0.277	0.199	0.054	0.044	0.476	0.331	0.321
	Left Tilt	0.198	0.199	0.378	0.047	0.397	0.576	0.245
	Right Touch	0.283	0.199	0.054	0.025	0.482	0.337	0.308
	Right Tilt	0.151	0.199	0.054	0.034	0.350	0.205	0.185
Body-worn	Rear	0.418	0.112	0.175	0.006	0.530	0.593	0.424
	Front	0.348	0.112	0.175	0.007	0.460	0.523	0.355
Hotspot	Rear	0.726	0.276	0.206	0.015	1.002	0.932	0.741
	Front	0.506	0.276	0.206	0.009	0.782	0.712	0.515
	Edge 1		0.276	0.206	0.009			
	Edge 2	0.390	0.276	0.206	0.006	0.666	0.596	0.396
	Edge 3	0.445						
	Edge 4	0.431						

## **Appendixes**

**Refer to separated files for the following appendixes.**

**Appendix A: SAR Setup Photos**

**Appendix B: SAR System Check Plots**

**Appendix C: SAR Highest Test Plots**

**Appendix D: SAR Tissue Ingredients**

**Appendix E: SAR Probe Certificates**

**Appendix F: SAR Dipole Certificates**

**END OF REPORT**