



**SAR EVALUATION REPORT**

**FCC 47 CFR § 2.1093  
IEEE Std 1528-2013**

*For*  
**GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n/ac & NFC**

**FCC ID: PY7-PM0943**

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NVLAP LAB CODE 200065-0

**Revision History**

Rev.	Date	Revisions	Revised By
V1	4/15/2016	Initial Issue	--
V2	4/20/2016	Report revised to address Reviewer's comments: 1. Sec. 6.4.: Revised statement regarding LTE implementation	Ray Su

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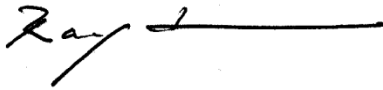
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# 1. Attestation of Test Results

Applicant Name	SONY MOBILE COMMUNICATIONS INC.			
FCC ID	PY7-PM0943			
Applicable Standards	FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013			
Exposure Category	SAR Limits (W/Kg)			
	Peak spatial-average(1g of tissue)		Extremities (hands, wrists, ankles, etc.) (10g of tissue)	
General population / Uncontrolled exposure	1.6		4	
RF Exposure Conditions	Equipment Class - Highest Reported SAR (W/kg)			
	PCE	DTS	NII	DSS
Head	0.666	0.286	0.257	N/A
Body-worn	0.572	0.017	0.021	
Hotspot/Wi-Fi Direct	0.701	0.052	N/A	
Simultaneous TX	1.243	1.243	1.214	
Date Tested	3/29/2016 to 4/4/2016			
Test Results	Pass			
<p>UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.</p> <p><b>Note:</b> The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.</p>				
Approved & Released By:		Prepared By:		
				
Devin Chang Senior Engineer UL Verification Services Inc.		Ray Su Laboratory Engineer UL Verification Services Inc.		

## 2. Test Specification, Methods and Procedures

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

- 248227 D01 802.11 Wi-Fi SAR v02r02
- 447498 D01 General RF Exposure Guidance v06
- 447498 D03 Supplement C Cross-Reference v01
- 648474 D04 Handset SAR v01r03
- 690783 D01 SAR Listings on Grants v01r03
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
- 865664 D02 RF Exposure Reporting v01r02
- 941225 D01 3G SAR Procedures v03r01
- 941225 D05 SAR for LTE Devices v02r05
- 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; Page 36, RF Exposure Procedures Update (Overlapping LTE Bands) and Page 37, Other LTE Considerations (LTE Band 41 Test Channels)

### 3. Facilities and Accreditation

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

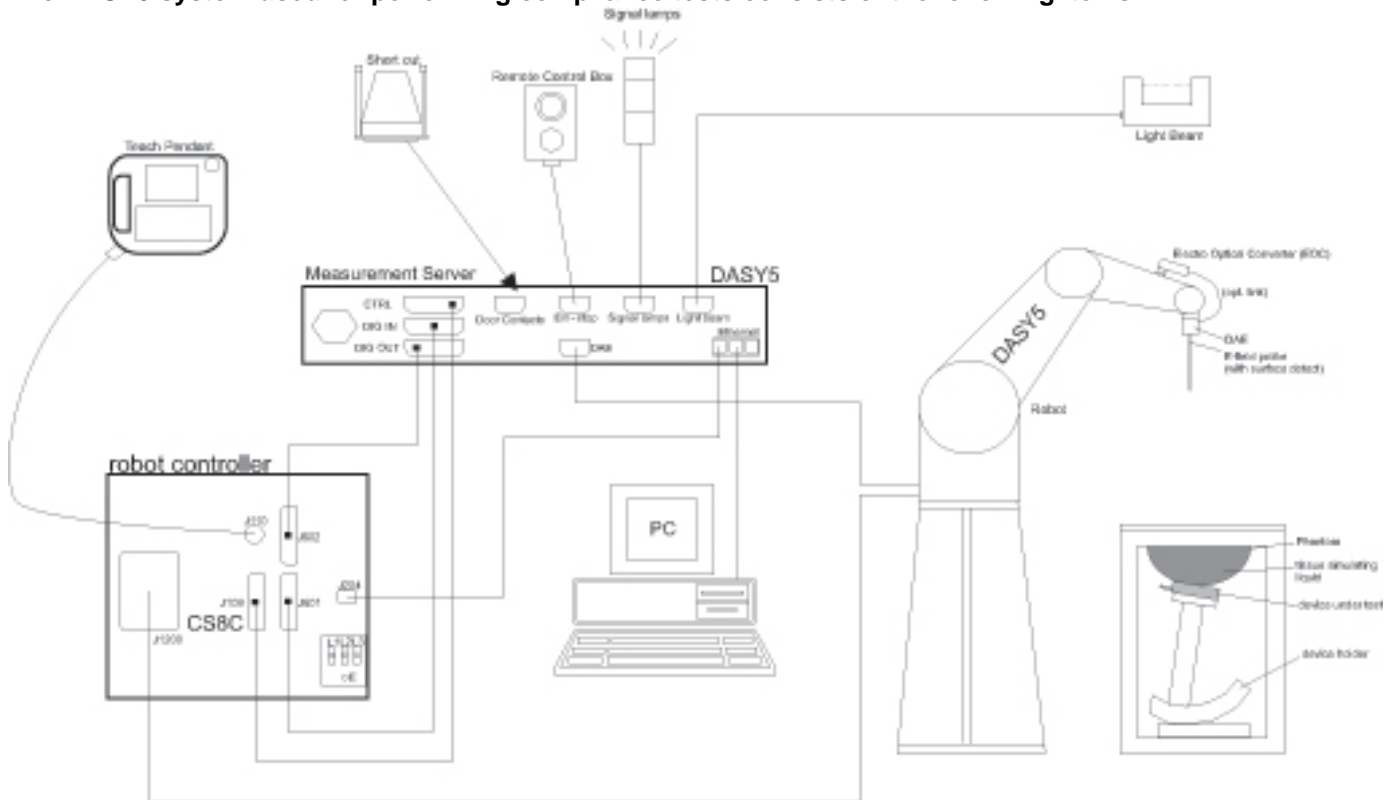
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	
SAR Lab F	
SAR Lab G	
SAR Lab H	

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

		≤ 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.

**Step 5: Z-Scan (FCC only)**

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

### 4.3. Test Equipment

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

#### Dielectric Property Measurements

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Network Analyzer	Agilent	8753ES	MY40000980	4/17/2016
Dielectric Probe kit	SPEAG	DAK-3.5	1082	9/15/2016
Shorting block	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	Traceable Calibration Control Co.	4242	140562250	8/24/2016

#### System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Synthesized Signal Generator	HP	8665B	3744A01084	5/8/2016
Power Meter	Keysight Technologies	N1912A	MY55196004	7/1/2017
Power Meter	Agilent	N1912A	MY50001018	10/19/2017
Power Sensor	Agilent	N1912A	MY52270022	12/17/2016
Power Sensor	Agilent	N1912A	MY52260009	12/18/2016
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1795093	N/A
Directional coupler	Werlatone	C8060-102	2149	N/A
DC Power Supply	AMETEK	XT 15-4	1319A02778	N/A
Synthesized Signal Generator	HP	8665B	3438A00633	9/4/2016
Power Meter	HP	437B	3125U16345	6/15/2016
Power Meter	HP	437B	3125U12345	7/31/2016
Power Sensor	HP	8481A	2702A76223	9/3/2016
Power Sensor	HP	8481A	1926A27048	8/3/2016
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1795092	N/A
Directional coupler	Werlatone	C8060-102	2141	N/A
DC Power Supply	BK PRECISION	1611	215-02292	N/A
E-Field Probe (SAR Lab D)	SPEAG	EX3DV4	3885	9/18/2016
E-Field Probe (SAR Lab E)	SPEAG	EX3DV4	3902	5/19/2016
E-Field Probe (SAR Lab F)	SPEAG	EX3DV4	3749	1/26/2017
E-Field Probe (SAR Lab G)	SPEAG	EX3DV4	3936	7/21/2016
E-Field Probe (SAR Lab H)	SPEAG	EX3DV4	3989	2/23/2017
Data Acquisition Electronics (SAR Lab D)	SPEAG	DAE4	1239	4/16/2016
Data Acquisition Electronics (SAR Lab D)	SPEAG	DAE4	1433	3/17/2017
Data Acquisition Electronics (SAR Lab E)	SPEAG	DAE4	1439	7/30/2016
Data Acquisition Electronics (SAR Lab F)	SPEAG	DAE4	1352	11/11/2016
Data Acquisition Electronics (SAR Lab G)	SPEAG	DAE4	1359	2/19/2017
Data Acquisition Electronics (SAR Lab H)	SPEAG	DAE4	1357	2/19/2017
System Validation Dipole	SPEAG	D750V3	1071	11/12/2016
System Validation Dipole	SPEAG	D835V2	4d142	9/23/2016
System Validation Dipole	SPEAG	D1900V2	5d140	4/14/2016
System Validation Dipole	SPEAG	D2450V2	748	2/22/2017
System Validation Dipole	SPEAG	D2600V2	1006	9/21/2016
System Validation Dipole	SPEAG	D5GHzV2	1168	11/13/2016

#### Other

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Power Meter	Agilent	N1912A	MY55196004	7/16/2016
Power Sensor	Agilent	N1921A	MY53260001	9/24/2016
Base Station Simulator	Agilent	8960	MY53211024	9/16/2016
Base Station Simulator	R & S	CMW500	134853	6/30/2016
Base Station Simulator	R & S	CMW500	137877	8/10/2016
Base Station Simulator	R & S	CMW500	125236	2/11/2017

## 5. Measurement Uncertainty

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

## 6. Device Under Test (DUT) Information

### 6.1. DUT Description

Device Dimension	Overall (Length x Width): 143.5 mm x 70.3 mm Overall Diagonal: 155 mm Display Diagonal: 126 mm		
Back Cover	<input checked="" type="checkbox"/> The rechargeable battery is not user accessible.		
Battery Options	<input checked="" type="checkbox"/> The rechargeable battery is not user accessible.		
Accessory	Headset		
Wireless Router (Hotspot)	Wi-Fi Hotspot mode permits the device to share its cellular data connection with other Wi-Fi-enabled devices. <input checked="" type="checkbox"/> Mobile Hotspot (Wi-Fi 2.4 GHz) <input type="checkbox"/> Mobile Hotspot (Wi-Fi 5 GHz)		
Wi-Fi Direct	Wi-Fi Direct enabled devices transfer data directly between each other <input checked="" type="checkbox"/> Wi-Fi Direct (Wi-Fi 2.4 GHz) <input type="checkbox"/> Wi-Fi Direct (Wi-Fi 5 GHz)		
Test sample information	<b>S/N</b>	<b>IMEI</b>	<b>Notes</b>
	CB5129YPEM	00-4402455882492	FCC_GSM/UMTS_cond
	CB5129YPJP	00-4402455882385	FCC_LTE_cond
	CB5129YPGW	00-4402455882500	FCC_WLAN_Adaptivity
	CB5129YPKC	00-4402455882583	SAR - GSM/UMTS Power
	CB5129YPPR	00-4402455882906	SAR - GSM/UMTS Power
	CB5129YPLW	00-4402455882476	SAR - LTE Power
	CB5129YPFB	00-4402455882484	SAR - LTE Power
	CB5129YPLZ	00-4402455882435	SAR-GSM_UMTS_tethering Backoff_Power
	CB5129Z1TY	00-4402456043375	SAR-LTE_tethering Backoff_rad
	CB5129Z1VR	00-4402456043524	SAR-GSM/UMTS_tethering Backoff_rad
	CB5129Z1WL	00-4402456043581	SAR -UMTS_Rad
	CB5129Z1WP	00-4402456043607	SAR -UMTS_Rad
	CB5129Z1Y1	00-4402456043466	SAR -LTE_MHB_Rad
	CB5129Z1VV	00-4402456043342	SAR -LTE_MHB_Rad
	CB5129Z1W4	00-4402456043292	SAR -LTE_LB_Rad
	CB5129Z21K	00-4402456043367	SAR -LTE_LB_Rad
	CB5129Z1WB	00-4402456043540	SAR -GSM_Rad
	CB5129Z1VB	00-4402456043565	SAR -GSM_Rad
	CB5129Z1UG	00-4402456043649	SAR - WLAN_5GHz_rad
	CB5129Z1Y5	00-4402456043680	SAR - WLAN_5GHz_rad
	CB5129Z1W8	00-4402456043698	SAR - WLAN_5GHz_rad
	CB5129Z1VA	00-4402456043490	SAR - WLAN_5GHz_rad
	CB5129Z1TW	00-4402456043631	SAR - WLAN_2.4GHz_rad
	CB5129Z201	00-4402456043532	SAR - WLAN_2.4GHz_rad
Hardware Version	A		
Software Version	35.0.D.0.180		

## 6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: <input type="checkbox"/> Class 8 - 1 Up, 4 Down <input type="checkbox"/> Class 10 - 2 Up, 4 Down <input type="checkbox"/> Class 12 - 4 Up, 4 Down <input checked="" type="checkbox"/> 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 checked="" type="checkbox"/> Yes <input type="checkbox"/> No			
W-CDMA (UMTS)	Band II Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Rel. 5) HSUPA (Rel. 6) HSPA+ (Rel. 7)		100%
LTE	FDD Band 5 FDD Band 7 FDD Band 13 FDD Band 17 TDD Band 41	QPSK 16QAM <input type="checkbox"/> Rel. 10 Does not support Carrier Aggregation (CA) <input type="checkbox"/> Rel. 10 Carrier Aggregation (1 Uplink and 2 Downlinks) <input checked="" type="checkbox"/> Rel. 11 Carrier Aggregation (2 Uplink and 2 Downlinks) (No Band Combinations are supported for Carrier Aggregation)		100% (FDD) 63.3% (TDD)
	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)		100%
	5 GHz	802.11a 802.11n (HT20) 802.11n (HT40) 802.11ac (VHT20) 802.11ac (VHT40) 802.11ac (VHT80)		100%
	Does this device support bands 5.60 ~ 5.65 GHz? <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 4.2 LE		77.5% (DH5)

### 6.3. Maximum Output Power from Tune-up Procedure

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

#### 6.3.1. GSM Tethering OFF

	GPRS									
	Tx 1 Slot		Tx 2 Slots		Tx 3 Slots		Tx 4 Slots			
	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]
GSM 850	30.5	-1.3~+1.1	29.5	-1.3~+1.1	27.5	-1.3~+1.1	26.5	-1.3~+1.1	26.5	-1.3~+1.1
GSM 1900	30.0	-1.3~+0.7	28.5	-1.3~+0.7	26.5	-1.3~+0.7	25.5	-1.3~+0.7	25.5	-1.3~+0.7
	EGPRS 8PSK Modulation (MCS5-9)									
	Tx 1 Slot		Tx 2 Slots		Tx 3 Slots		Tx 4 Slots			
	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]
GSM 850	27.0	-2.0~+1.1	25.5	-2.0~+1.1	23.5	-2.0~+1.1	22.5	-2.0~+1.1	22.5	-2.0~+1.1
GSM 1900	26.0	-2.0~+1.0	24.5	-2.0~+1.0	22.5	-2.0~+1.0	21.5	-2.0~+1.0	21.5	-2.0~+1.0
	CS Only					DTM				
	Tx 1 Slot		TX 2 Slots			TX 3 Slots				
	CS GMSK		CS GMSK		PS GMSK		CS GMSK		PS GMSK	
	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]
GSM 850	30.5	-1.3~+1.1	29.5	-1.3~+1.1	29.5	-1.3~+1.1	27.5	-1.3~+1.1	27.5	-1.3~+1.1
GSM 1900	30.0	-1.3~+0.7	28.5	-1.3~+0.7	28.5	-1.3~+0.7	26.5	-1.3~+0.7	26.5	-1.3~+0.7
	CS Only					DTM				
	Tx 1 Slot		TX 2 Slots			TX 3 Slots				
	CS GMSK		CS GMSK		PS 8PSK		CS GMSK		PS 8PSK	
	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]
GSM 850	30.5	-1.3~+1.1	29.5	-1.3~+1.1	25.5	-2.0~+1.1	27.5	-1.3~+1.1	23.5	-2.0~+1.1
GSM 1900	30.0	-1.3~+0.7	28.5	-1.3~+0.7	24.5	-2.0~+1.0	26.5	-1.3~+0.7	22.5	-2.0~+1.0

#### 6.3.2. GSM Tethering ON

	GPRS									
	Tx 1 Slot		Tx 2 Slots		Tx 3 Slots		Tx 4 Slots			
	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]
GSM 850	29.5	-1.3~+1.1	28.5	-1.3~+1.1	26.5	-1.3~+1.1	25.5	-1.3~+1.1	25.5	-1.3~+1.1
GSM 1900	26.0	-1.3~+0.7	24.5	-1.3~+0.7	22.5	-1.3~+0.7	21.5	-1.3~+0.7	21.5	-1.3~+0.7
	EGPRS 8PSK Modulation (MCS5-9)									
	Tx 1 Slot		Tx 2 Slots		Tx 3 Slots		Tx 4 Slots			
	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]
GSM 850	27.0	-2.0~+1.1	25.5	-2.0~+1.1	23.5	-2.0~+1.1	22.5	-2.0~+1.1	22.5	-2.0~+1.1
GSM 1900	23.7	-2.0~+1.0	22.2	-2.0~+1.0	20.2	-2.0~+1.0	19.2	-2.0~+1.0	19.2	-2.0~+1.0
	CS Only					DTM				
	Tx 1 Slot		TX 2 Slots			TX 3 Slots				
	CS GMSK		CS GMSK		PS GMSK		CS GMSK		PS GMSK	
	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]
GSM 850	29.5	-1.3~+1.1	28.5	-1.3~+1.1	28.5	-1.3~+1.1	26.5	-1.3~+1.1	26.5	-1.3~+1.1
GSM 1900	26.0	-1.3~+0.7	24.5	-1.3~+0.7	24.5	-1.3~+0.7	22.5	-1.3~+0.7	22.5	-1.3~+0.7
	CS Only					DTM				
	Tx 1 Slot		TX 2 Slots			TX 3 Slots				
	CS GMSK		CS GMSK		PS 8PSK		CS GMSK		PS 8PSK	
	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]
GSM 850	29.5	-1.3~+1.1	28.5	-1.3~+1.1	25.5	-2.0~+1.1	26.5	-1.3~+1.1	23.5	-2.0~+1.1
GSM 1900	26.0	-1.3~+0.7	24.5	-1.3~+0.7	22.2	-2.0~+1.0	22.5	-1.3~+0.7	20.2	-2.0~+1.0

**6.3.3. W-CDMA Tethering OFF**

		CS		HSDPSA			
				Subtest 1/2		Subtest 3/4	
		Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]
FDD 2	Low Mid High	23.5	-1.5~+0.5	22.5	-2~+1.0	22.0	-2~+1.0
FDD 5	Low Mid High	22.2	-1.5~+0.8	21.2	-2~+1.0	20.7	-2~+1.0
		HSUPA					
		Subtest 1/2		Subtest 2/4		Subtest 3	
		Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]
FDD 2	Low Mid High	22.0	-2~+1.0	20.5	-2~+1.0	21.5	-2~+1.0
FDD 5	Low Mid High	20.7	-2~+1.3	19.2	-2~+1.0	20.2	-2~+1.0

**6.3.4. W-CDMA Tethering ON**

		CS		HSDPSA			
				Subtest 1/2		Subtest 3/4	
		Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]
FDD 2	Low Mid High	18.5	-1.5~0.5	17.5	-2~+1.0	17.0	-2~+1.0
FDD 5	Low Mid High	21.2	-1.5~0.8	20.2	-2~+1.0	19.2	-2~+1.0
		HSUPA					
		Subtest 1/2		Subtest 2/4		Subtest 3	
		Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]	Target [dBm]	Tolerance +- [dB]
FDD 2	Low Mid High	17	-2~+1.0	15.5	-2~+1.0	16.5	-2~+1.0
FDD 5	Low Mid High	19.7	-2~+1.3	18.2	-2~+1.0	19.2	-2~+1.0



### 6.3.5. LTE Tethering OFF

LTE Tethering ON has the same Targets and Tolerances as LTE Tethering OFF

LTE				Data			
Band	BW	CH	RB Config	QPSK		16QAM	
				Target [dBm]	Tolerance +/-[dB]	Target [dBm]	Tolerance +/-[dB]
LTEB5	1.4MHz	Low Mid High	1RB	20.5	-1.5~+1.0	20.5	-1.5~+1.0
			50% RB	20.5	-1.5~+1.0	20.5	-1.5~+1.0
			100% RB	20.5	-1.5~+1.0	20.5	-1.5~+1.0
	3MHz 5MHz, 10MHz	Low Mid High	1RB	20.5	-1.5~+1.0	20.5	-1.5~+1.0
			50% RB	20.5	-1.5~+1.0	20.5	-1.5~+1.0
			100% RB	20.5	-1.5~+1.0	20.5	-1.5~+1.0
LTE B7	5MHz, 10MHz, 15MHz, 20MHz	Low Mid High	1RB	20.5	-1.5~+1.0	20.5	-1.5~+1.0
			50% RB	20.5	-1.5~+1.0	20.5	-1.5~+1.0
			100% RB	20.5	-1.5~+1.0	20.5	-1.5~+1.0
LTE B13	5MHz, 10MHz	Low Mid High	1RB	23.0	-1.5~+1.0	22.0	-1.5~+1.0
			50% RB	22.0	-1.5~+1.0	21.0	-1.5~+1.0
			100% RB	22.0	-1.5~+1.0	21.0	-1.5~+1.0
LTE B17	5MHz, 10MHz	Low Mid High	1RB	23.5	-1.5~+1.0	22.5	-1.5~+1.0
			50% RB	22.5	-1.5~+1.0	21.5	-1.5~+1.0
			100% RB	22.5	-1.5~+1.0	21.5	-1.5~+1.0
LTE B41	5MHz, 10MHz, 15MHz, 20MHz	Low Mid High	1RB	20.5	-1.5~+1.0	20.5	-1.5~+1.0
			50% RB	20.5	-1.5~+1.0	20.5	-1.5~+1.0
			100% RB	20.5	-1.5~+1.0	20.5	-1.5~+1.0

### 6.3.6. Wi-Fi 2.4GHz

Wi-Fi Chain 0				Wi-Fi Chain 1			
11b		Manufacturing Max Power {dBm}		11b		Manufacturing Max Power {dBm}	
Band 2400~2485	channel	1Mbps	11Mbps	Band 2400~2485	channel	1Mbps	11Mbps
	1,11	12.2	12.2		1,11	7.5	7.5
	12	12.2	12.2		12	7.5	7.5
	13	12.2	12.2		13	7.5	7.5
Other	12.2	12.2	Other	7.5	7.5		
11g		Manufacturing Max Power {dBm}		11g		Manufacturing Max Power {dBm}	
Band 2400~2485	channel	6Mbps	54Mbps	Band 2400~2485	channel	6Mbps	54Mbps
	1,11	12.6	12.6		1,11	8.4	8.4
	12	10.2	10.2		12	6.2	6.2
	13	3.7	3.7		13	-0.3	-0.3
Other	12.6	12.6	Other	8.4	8.4		
11n HT-20		Manufacturing Max Power {dBm}		11n HT-20		Manufacturing Max Power {dBm}	
Band 2400~2485	channel	MCS-0	MCS-7	Band 2400~2485	channel	MCS-0	MCS-7
	1,11	12.7	12.7		1,11	8.5	8.5
	12	8.5	8.5		12	4.5	4.5
	13	3.0	3.0		13	-1.0	-1.0
Other	12.7	12.7	Other	8.5	8.5		

### 6.3.7. Wi-Fi 5GHz

Wi-Fi Chain 0				Wi-Fi Chain 1			
11a		Manufacturing Max Power {dBm}		11a		Manufacturing Max Power {dBm}	
Band	channel	6Mbps	54Mbps	Band	channel	6Mbps	54Mbps
5150~5250MHz	All	9.4	9.4	5150~5250MHz	All	5.0	5.0
5250~5350MHz	All	9.6	9.6	5250~5350MHz	All	4.9	4.9
5470~5725MHz	All	10.2	10.2	5470~5725MHz	All	5.1	5.1
5725~5850MHz	All	10.1	10.1	5725~5850MHz	All	4.3	4.3
11n HT-20		Manufacturing Max Power {dBm}		11n HT-20		Manufacturing Max Power {dBm}	
Band	channel	MCS-0	MCS-7	Band	channel	MCS-0	MCS-7
5150~5250MHz	All	9.5	9.5	5150~5250MHz	All	5.0	5.0
5250~5350MHz	All	9.7	9.7	5250~5350MHz	All	4.9	4.9
5470~5725MHz	All	10.1	10.1	5470~5725MHz	All	5.1	5.1
5725~5850MHz	All	10.1	10.1	5725~5850MHz	All	4.3	4.3
11n HT-40		Manufacturing Max Power {dBm}		11n HT-40		Manufacturing Max Power {dBm}	
Band	channel	MCS-0	MCS-7	Band	channel	MCS-0	MCS-7
5150~5250MHz	All	10.1	10.1	5150~5250MHz	All	5.4	5.4
5250~5350MHz	All	10.4	10.4	5250~5350MHz	All	5.1	5.1
5470~5725MHz	All	10.7	10.7	5470~5725MHz	All	5.9	5.9
5725~5850MHz	All	10.6	10.6	5725~5850MHz	All	5.3	5.3
11ac VHT-20		Manufacturing Max Power {dBm}		11ac VHT-20		Manufacturing Max Power {dBm}	
Band	channel	MCS-0	MCS-8, 9	Band	channel	MCS-0	MCS-8, 9
5150~5250MHz	All	9.5	9.5	5150~5250MHz	All	5.0	5.0
5250~5350MHz	All	9.7	9.7	5250~5350MHz	All	4.9	4.9
5470~5725MHz	All	10.1	10.1	5470~5725MHz	All	5.1	5.1
5725~5850MHz	All	10.1	10.1	5725~5850MHz	All	4.3	4.3
11ac VHT-40		Manufacturing Max Power {dBm}		11ac VHT-40		Manufacturing Max Power {dBm}	
Band	channel	MCS-0	MCS-8, 9	Band	channel	MCS-0	MCS-8, 9
5150~5250MHz	All	10.1	10.1	5150~5250MHz	All	5.4	5.4
5250~5350MHz	All	10.4	10.4	5250~5350MHz	All	5.1	5.1
5470~5725MHz	All	10.7	10.7	5470~5725MHz	All	5.9	5.9
5725~5850MHz	All	10.6	10.6	5725~5850MHz	All	5.3	5.3
11ac VHT-80		Manufacturing Max Power {dBm}		11ac VHT-80		Manufacturing Max Power {dBm}	
Band	channel	MCS-0	MCS-8, 9	Band	channel	MCS-0	MCS-8, 9
5150~5250MHz	All	10.1	10.1	5150~5250MHz	All	5.1	5.1
5250~5350MHz	All	10.2	10.2	5250~5350MHz	All	4.8	4.8
5470~5725MHz	All	10.9	10.9	5470~5725MHz	All	5.8	5.8
5725~5850MHz	All	10.0	10.0	5725~5850MHz	All	4.8	4.8

**6.3.8. Bluetooth**

BT		Manufacturing Max Power [dBm]			
		BR	EDR	BLE	
2400~2485MHz	Low	Time Averaged	8.9	5.0	4.9
		Calculated to 100% Duty Cycle	10.0	6.1	5.6
	Mid	Time Averaged	10.9	6.8	7.0
		Calculated to 100% Duty Cycle	12.1	8.0	7.7
	High	Time Averaged	9.0	4.9	5.1
		Calculated to 100% Duty Cycle	10.2	6.0	5.8

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

Item	Description																																																																																																																																																																																																																																																																				
Frequency range, Channel Bandwidth, Numbers and Frequencies	<table border="1"> <tr> <td rowspan="3">Band 5</td> <td colspan="6">Frequency range: 824 – 849 MHz</td> </tr> <tr> <td colspan="6">Channel Bandwidth</td> </tr> <tr> <td>20 MHz</td> <td>15 MHz</td> <td>10 MHz</td> <td>5 MHz</td> <td>3 MHz</td> <td>1.4 MHz</td> </tr> <tr> <td>Low</td> <td></td> <td></td> <td>20450/ 829</td> <td>20425/ 826.5</td> <td>20415/ 825.5</td> <td>20407/ 824.7</td> </tr> <tr> <td>Mid</td> <td></td> <td></td> <td>20525/ 836.5</td> <td>20525/ 836.5</td> <td>20525/ 836.5</td> <td>20525/ 836.5</td> </tr> <tr> <td>High</td> <td></td> <td></td> <td>20600/ 844</td> <td>20625/ 846.5</td> <td>20635/ 847.5</td> <td>20643/ 848.3</td> </tr> <tr> <td rowspan="3">Band 7</td> <td colspan="6">Frequency range: 2500 - 2570 MHz</td> </tr> <tr> <td colspan="6">Channel Bandwidth</td> </tr> <tr> <td>20 MHz</td> <td>15 MHz</td> <td>10 MHz</td> <td>5 MHz</td> <td>3 MHz</td> <td>1.4 MHz</td> </tr> <tr> <td>Low</td> <td>20850 2510</td> <td>20825 2507.5</td> <td>20800 2505</td> <td>20775 2502.5</td> <td></td> <td></td> </tr> <tr> <td>Mid</td> <td>21100 2535</td> <td>21100 2535</td> <td>21100 2535</td> <td>21100 2535</td> <td></td> <td></td> </tr> <tr> <td>High</td> <td>21350 2560</td> <td>21375 2562.5</td> <td>21400 2565</td> <td>21425 2567.5</td> <td></td> <td></td> </tr> <tr> <td rowspan="3">Band 13</td> <td colspan="6">Frequency range: 777 - 787 MHz</td> </tr> <tr> <td colspan="6">Channel Bandwidth</td> </tr> <tr> <td>20 MHz</td> <td>15 MHz</td> <td>10 MHz</td> <td>5 MHz</td> <td>3 MHz</td> <td>1.4 MHz</td> </tr> <tr> <td>Low</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Mid</td> <td></td> <td></td> <td>23230/ 782</td> <td>23230/ 782</td> <td></td> <td></td> </tr> <tr> <td>High</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="3">Band 17</td> <td colspan="6">Frequency Range 704 – 716 MHz</td> </tr> <tr> <td colspan="6">Channel Bandwidth</td> </tr> <tr> <td>20 MHz</td> <td>15 MHz</td> <td>10 MHz</td> <td>5 MHz</td> <td>3 MHz</td> <td>1.4 MHz</td> </tr> <tr> <td>Low</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Mid</td> <td></td> <td></td> <td>23790/ 710</td> <td>23790/ 710</td> <td></td> <td></td> </tr> <tr> <td>High</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="7">Band 41</td> <td colspan="6">Frequency range: 2496 - 2690 MHz</td> </tr> <tr> <td colspan="6">Channel Bandwidth</td> </tr> <tr> <td>20 MHz</td> <td>15 MHz</td> <td>10 MHz</td> <td>5 MHz</td> <td>3 MHz</td> <td>1.4 MHz</td> </tr> <tr> <td>Low</td> <td colspan="5">39750 / 2506.0</td> <td></td> </tr> <tr> <td>Low-Mid</td> <td colspan="5">40185 / 2549.5</td> <td></td> </tr> <tr> <td>Mid</td> <td colspan="5">40620 / 2593.0</td> <td></td> </tr> <tr> <td>Mid-High</td> <td colspan="5">41055 / 2636.5</td> <td></td> </tr> <tr> <td>High</td> <td colspan="5">41490 / 2680.0</td> <td></td> </tr> <tr> <td>LTE transmitter and antenna implementation</td> <td>LTE transmits from the Cellular Antenna.</td> </tr> <tr> <td>Maximum power reduction (MPR)</td> <td> <p align="center"><b>Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3</b></p> <table border="1"> <thead> <tr> <th rowspan="2">Modulation</th> <th colspan="6">Channel bandwidth / Transmission bandwidth (RB)</th> <th rowspan="2">MPR (dB)</th> </tr> <tr> <th>1.4 MHz</th> <th>3.0 MHz</th> <th>5 MHz</th> <th>10 MHz</th> <th>15 MHz</th> <th>20 MHz</th> </tr> </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> </tbody> </table> <p>MPR Built-in by design A-MPR (additional MPR) was disabled during SAR testing</p> </td> </tr> <tr> <td>Power reduction</td> <td>No</td> </tr> <tr> <td>Spectrum plots for RB configurations</td> <td>A properly configured base station simulator was used for the SAR and power measurements; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.</td> </tr> </table>	Band 5	Frequency range: 824 – 849 MHz						Channel Bandwidth						20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz	Low			20450/ 829	20425/ 826.5	20415/ 825.5	20407/ 824.7	Mid			20525/ 836.5	20525/ 836.5	20525/ 836.5	20525/ 836.5	High			20600/ 844	20625/ 846.5	20635/ 847.5	20643/ 848.3	Band 7	Frequency range: 2500 - 2570 MHz						Channel Bandwidth						20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz	Low	20850 2510	20825 2507.5	20800 2505	20775 2502.5			Mid	21100 2535	21100 2535	21100 2535	21100 2535			High	21350 2560	21375 2562.5	21400 2565	21425 2567.5			Band 13	Frequency range: 777 - 787 MHz						Channel Bandwidth						20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz	Low							Mid			23230/ 782	23230/ 782			High							Band 17	Frequency Range 704 – 716 MHz						Channel Bandwidth						20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz	Low							Mid			23790/ 710	23790/ 710			High							Band 41	Frequency range: 2496 - 2690 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						LTE transmitter and antenna implementation	LTE transmits from the Cellular Antenna.	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### 6.5. 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.

SAR was tested with the highest transmission duty factor (63.33%) using Uplink-downlink configuration 0 and Special subframe configuration 7.

LTE TDD Band 41 supports 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	$6592 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$	$7680 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$
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	$6592 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$	$20480 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$
6	$19760 \cdot T_s$			$23040 \cdot T_s$		
7	$21952 \cdot T_s$			$12800 \cdot T_s$		
8	$24144 \cdot T_s$			-		
9	$13168 \cdot T_s$			-		

#### 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	63.33
1	5 ms	D	S	U	U	D	D	S	U	U	D	43.33
2	5 ms	D	S	U	D	D	D	S	U	D	D	23.33
3	10 ms	D	S	U	U	U	D	D	D	D	D	31.67
4	10 ms	D	S	U	U	D	D	D	D	D	D	21.67
5	10 ms	D	S	U	D	D	D	D	D	D	D	11.67
6	5 ms	D	S	U	U	U	D	S	U	U	D	53.33

Calculated Duty Cycle = Extended cyclic prefix in uplink x (T<sub>s</sub>) x # of S + # of U

Example for Calculated Duty Cycle for Uplink-Downlink Configuration 0:

Calculated Duty Cycle =  $5120 \times [1/(15000 \times 2048)] \times 2 + 6 \text{ ms} = 63.33\%$

where

$T_s = 1/(15000 \times 2048)$  seconds

### 7. RF Exposure Conditions (Test Configurations)

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

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

**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.

## 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.

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 Room	Date	Tissue Type	Band (MHz)	Frequency (MHz)	Relative Permittivity ( $\epsilon_r$ )			Conductivity ( $\sigma$ )		
					Measured	Target	Delta $\pm 5\%$	Measured	Target	Delta $\pm 5\%$
D	3/29/2016	Head	2600	2600	38.61	39.01	-1.03	2.03	1.96	3.56
				2495	39.00	39.14	-0.37	1.91	1.85	3.43
				2690	38.26	38.90	-1.64	2.14	2.06	3.86
D	3/29/2016	Body	2600	2600	51.87	52.51	-1.22	2.22	2.16	2.79
				2495	52.16	52.64	-0.92	2.09	2.01	3.81
				2690	51.57	52.40	-1.58	2.34	2.29	2.13
D	4/4/2016	Head	2600	2600	37.86	39.01	-2.95	2.04	1.96	3.97
				2495	38.12	39.14	-2.61	1.92	1.85	3.64
				2690	37.82	38.90	-2.77	2.15	2.06	4.54
D	4/4/2016	Body	2600	2600	51.14	52.51	-2.61	2.22	2.16	2.74
				2495	51.36	52.64	-2.44	2.10	2.01	4.21
				2690	50.92	52.40	-2.82	2.33	2.29	1.65
E	3/30/2016	Head	835	835	41.17	41.50	-0.80	0.91	0.90	1.01
				805	41.53	41.68	-0.36	0.88	0.90	-2.36
				905	40.29	41.50	-2.92	0.97	0.97	-0.03
E	3/30/2016	Body	835	835	54.33	55.20	-1.58	1.00	0.97	3.01
				805	54.62	55.33	-1.29	0.96	0.97	-0.40
				905	53.62	55.00	-2.51	1.07	1.05	1.66
F	3/30/2016	Body	1900	1900	50.76	53.30	-4.77	1.53	1.52	0.92
				1850	50.97	53.30	-4.37	1.48	1.52	-2.50
				1920	50.67	53.30	-4.93	1.56	1.52	2.37
F	3/30/2016	Head	1900	1900	39.44	40.00	-1.40	1.38	1.40	-1.57
				1850	39.53	40.00	-1.18	1.34	1.40	-4.21
				1920	39.33	40.00	-1.68	1.39	1.40	-0.50
F	4/4/2016	Head	2450	2450	38.76	39.20	-1.12	1.87	1.80	3.78
				2400	38.93	39.30	-0.93	1.81	1.75	3.39
				2480	38.65	39.16	-1.31	1.90	1.83	3.58
F	4/4/2016	Body	2450	2450	50.63	52.70	-3.93	2.00	1.95	2.77
				2400	50.82	52.77	-3.70	1.93	1.90	1.74
				2480	50.52	52.66	-4.07	2.04	1.99	2.40
G	3/28/2016	Head	5200	5200	36.85	35.99	2.39	4.53	4.65	-2.62
				5150	36.98	36.05	2.59	4.47	4.60	-2.74
				5350	36.69	35.82	2.43	4.69	4.80	-2.34
G	3/28/2016	Head	5600	5600	36.36	35.53	2.32	4.94	5.06	-2.32
				5500	36.47	35.65	2.31	4.84	4.96	-2.46
				5725	36.15	35.39	2.14	5.11	5.19	-1.58
G	3/31/2016	Head	5800	5800	34.44	35.30	-2.44	5.14	5.27	-2.49
				5700	34.62	35.42	-2.26	5.03	5.16	-2.63
				5850	34.32	35.30	-2.78	5.18	5.27	-1.78
G	3/31/2016	Body	5200	5200	48.29	49.02	-1.49	5.10	5.29	-3.68
				5150	48.38	49.09	-1.44	5.03	5.24	-3.88
				5350	48.15	48.82	-1.37	5.29	5.47	-3.28
G	3/31/2016	Body	5600	5600	47.92	48.48	-1.15	5.59	5.76	-3.00
				5500	48.01	48.61	-1.24	5.47	5.64	-3.14
				5725	47.79	48.31	-1.07	5.78	5.91	-2.21
G	3/31/2016	Body	5800	5800	47.60	48.20	-1.24	5.89	6.00	-1.82
				5700	47.84	48.34	-1.04	5.74	5.88	-2.31
				5850	47.54	48.20	-1.37	5.95	6.00	-0.88



**Dielectric Property Measurements Results continued:**

SAR Room	Date	Tissue Type	Band (MHz)	Frequency (MHz)	Relative Permittivity ( $\epsilon_r$ )			Conductivity ( $\sigma$ )		
					Measured	Target	Delta $\pm 5\%$	Measured	Target	Delta $\pm 5\%$
H	3/29/2016	Head	750	750	40.80	41.96	-2.77	0.90	0.89	0.36
				695	41.54	42.24	-1.67	0.85	0.89	-4.67
				790	40.23	41.76	-3.66	0.93	0.90	3.67
H	3/29/2015	Body	750	750	54.68	55.55	-1.56	0.97	0.96	0.25
				695	55.26	55.76	-0.89	0.91	0.96	-4.98
				790	54.21	55.39	-2.13	1.00	0.97	3.61

## 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 10% of the manufacturer calibrated dipole SAR target.

SAR Room	Date	Tissue Type	Dipole Type _Serial #	Dipole Cal. Due Data	Measured Results for 1g SAR				Measured Results for 10g SAR				Plot No.
					Zoom Scan to 100 mW	Normalize to 1 W	Target (Ref. Value)	Delta ±10 %	Zoom Scan to 100 mW	Normalize to 1 W	Target (Ref. Value)	Delta ±10 %	
D	3/29/2016	Head	D2600V2 SN:1006	9/21/2016	6.020	60.20	56.90	<b>5.80</b>	2.620	26.20	25.50	2.75	1,2
D	3/29/2016	Body	D2600V2 SN:1006	9/21/2016	5.820	58.20	55.30	5.24	2.530	25.30	24.80	2.02	
D	4/4/2016	Body	D2600V2 SN:1006	9/21/2016	5.740	57.40	55.30	3.80	2.500	25.00	24.80	0.81	
D	4/4/2016	Head	D2600V2 SN:1006	9/21/2016	5.870	58.70	56.90	3.16	2.560	25.60	25.50	0.39	
E	3/31/2016	Head	D835V2 SN:4d142	9/23/2016	0.998	9.98	9.27	7.66	0.658	6.58	6.01	9.48	
E	3/31/2016	Body	D835V2 SN:4d142	9/23/2016	1.020	10.20	9.41	8.40	0.677	6.77	6.18	9.55	3,4
F	3/30/2016	Body	D1900V2 SN:5d140	4/14/2016	4.030	40.30	39.90	1.00	2.120	21.20	21.30	-0.47	5,6
F	3/30/2016	Head	D1900V2 SN:5d140	4/14/2016	3.960	39.60	39.90	-0.75	2.070	20.70	20.80	-0.48	
F	4/4/2016	Head	D2450V2 SN:748	2/22/2017	5.450	54.50	50.90	<b>7.07</b>	2.470	24.70	23.70	4.22	7,8
F	4/4/2016	Body	D2450V2 SN:748	2/22/2017	5.270	52.70	49.80	5.82	2.420	24.20	23.20	4.31	
G	3/28/2016	Head	D5GHzV2 SN:1168 (5.2 GHz)	11/13/2016	8.090	80.90	78.40	3.19	2.340	23.40	22.50	4.00	
G	3/28/2016	Head	D5GHzV2 SN:1168 (5.6 GHz)	11/13/2016	7.910	79.10	87.60	-9.70	2.240	22.40	24.80	-9.68	9,10
G	3/31/2016	Head	D5GHzV2 SN:1168 (5.8 GHz)	11/13/2016	7.360	73.60	81.00	-9.14	2.090	20.90	23.00	-9.13	
G	3/31/2016	Body	D5GHzV2 SN:1168 (5.2 GHz)	11/13/2016	7.300	73.00	75.00	-2.67	2.050	20.50	21.00	-2.38	
G	3/31/2016	Body	D5GHzV2 SN:1168 (5.6 GHz)	11/13/2016	7.570	75.70	82.50	-8.24	2.110	21.10	23.00	-8.26	
G	3/31/2016	Body	D5GHzV2 SN:1168 (5.8 GHz)	11/13/2016	7.410	74.10	78.10	-5.12	2.060	20.60	21.60	-4.63	
H	3/29/2016	Head	D750V3 SN:1071	11/12/2016	0.847	8.47	8.21	<b>3.17</b>	0.552	5.52	5.38	2.60	11,12
H	3/29/2016	Body	D750V3 SN:1071	11/12/2016	0.879	8.79	8.74	0.57	0.584	5.84	5.81	0.52	

## 9. Conducted Output Power Measurements

### 9.1. GSM

Per KDB 941225 D01 3G SAR Procedures:

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

#### GSM850 Measured Results

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Max. Pwr		Reduced Pwr	
						Burst (dBm)	Frame (dBm)	Burst (dBm)	Frame (dBm)
850	GPRS (GMSK)	CS1	1	128	824.2	30.7	21.7	29.8	20.8
				190	836.6	30.6	21.6	29.8	20.8
				251	848.8	30.8	21.8	30.1	21.1
			2	128	824.2	29.6	23.6	28.8	22.8
				190	836.6	29.6	23.6	28.8	22.8
				251	848.8	29.7	23.7	29.1	23.1
			3	128	824.2	27.5	23.2	26.7	22.4
				190	836.6	27.5	23.2	26.7	22.4
				251	848.8	27.6	23.3	26.8	22.5
			4	128	824.2	<b>26.5</b>	<b>23.5</b>	<b>25.8</b>	<b>22.8</b>
				190	836.6	<b>26.5</b>	<b>23.5</b>	<b>25.8</b>	<b>22.8</b>
				251	848.8	<b>26.6</b>	<b>23.6</b>	<b>26.3</b>	<b>23.3</b>
	EGPRS (8PSK)	MCS5	1	128	824.2	26.7	17.7	27.4	18.4
				190	836.6	26.6	17.6	27.4	18.4
				251	848.8	26.8	17.8	27.6	18.6
			2	128	824.2	25.0	19.0	26.0	20.0
				190	836.6	24.9	18.9	26.0	20.0
				251	848.8	25.0	19.0	26.2	20.2
			3	128	824.2	23.1	18.8	24.0	19.7
				190	836.6	23.0	18.7	24.0	19.7
				251	848.8	23.1	18.8	24.2	19.9
			4	128	824.2	22.1	19.1	23.1	20.1
				190	836.6	22.0	19.0	23.1	20.1
				251	848.8	22.0	19.0	23.3	20.3

#### Notes:

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

- GMSK (GPRS) mode with 4 time slots for Max power and 4 time slots for Reduced power, based on the output power measurements above.
- SAR is not required for EGPRS (8PSK) mode because its output power is less than that of GPRS Mode

**GSM1900 Measured Results**

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Max. Pwr		Reduced Pwr	
						Burst (dBm)	Frame (dBm)	Burst (dBm)	Frame (dBm)
1900	GPRS (GMSK)	CS1	1	512	1850.2	30.4	21.4	24.5	15.5
				661	1880.0	30.3	21.3	24.5	15.5
				810	1909.8	30.3	21.3	24.7	15.7
			2	512	1850.2	28.9	22.9	23.1	17.1
				661	1880.0	28.8	22.8	23.1	17.1
				810	1909.8	28.9	22.9	23.2	17.2
			3	512	1850.2	27.0	22.7	21.2	16.9
				661	1880.0	26.8	22.5	21.0	16.7
				810	1909.8	27.0	22.7	21.1	16.8
			4	512	1850.2	<b>25.9</b>	<b>22.9</b>	<b>20.0</b>	<b>17.0</b>
				661	1880.0	<b>25.7</b>	<b>22.7</b>	<b>20.0</b>	<b>17.0</b>
				810	1909.8	<b>25.9</b>	<b>22.9</b>	<b>20.2</b>	<b>17.2</b>
	EGPRS (8PSK)	MCS5	1	512	1850.2	26.8	17.8	23.7	14.7
				661	1880.0	26.6	17.6	23.7	14.7
				810	1909.8	26.8	17.8	23.9	14.9
			2	512	1850.2	25.2	19.2	22.5	16.5
				661	1880.0	25.0	19.0	22.4	16.4
				810	1909.8	25.4	19.4	22.5	16.5
			3	512	1850.2	22.7	18.4	20.4	16.1
				661	1880.0	22.9	18.6	20.5	16.2
				810	1909.8	22.8	18.5	20.7	16.4
			4	512	1850.2	21.7	18.7	19.5	16.5
				661	1880.0	21.6	18.6	19.4	16.4
				810	1909.8	22.0	19.0	19.6	16.6

**Notes:**

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

- GMSK (GPRS) mode with 4 time slots for Max power and 4 time slots for Reduced power, based on the output power measurements above.
- SAR is not required for EGPRS (8PSK) mode because its output power is less than that of GPRS Mode

**GSM850 DTM Measured Results**

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Max. Pwr				Reduced Pwr			
						CS		PS		CS		PS	
						Burst (dBm)	Frame (dBm)	Burst (dBm)	Frame (dBm)	Burst (dBm)	Frame (dBm)	Burst (dBm)	Frame (dBm)
850	GSM(Voice) + GPRS(GMSK)	CS1	1	128	824.2	30.7	21.7			29.8	20.8		
				190	836.6	30.6	21.6			29.8	20.8		
				251	848.8	30.8	21.8			30.1	21.1		
			2	128	824.2	<b>29.5</b>	<b>23.5</b>	<b>29.6</b>	<b>23.6</b>	<b>28.3</b>	<b>22.3</b>	<b>28.4</b>	<b>22.4</b>
				190	836.6	<b>29.5</b>	<b>23.5</b>	<b>29.5</b>	<b>23.5</b>	<b>28.2</b>	<b>22.2</b>	<b>28.4</b>	<b>22.4</b>
				251	848.8	<b>29.6</b>	<b>23.6</b>	<b>29.7</b>	<b>23.7</b>	<b>28.5</b>	<b>22.5</b>	<b>28.6</b>	<b>22.6</b>
			3	128	824.2	27.4	23.1	27.4	23.1	26.2	21.9	26.2	21.9
				190	836.6	27.3	23.0	27.3	23.0	26.1	21.8	26.2	21.9
				251	848.8	27.5	23.2	27.5	23.2	26.3	22.0	26.4	22.1
	GSM(Voice) + EGPRS(8PSK)	MCS5	1	128	824.2	30.7	21.7			29.8	20.8		
				190	836.6	30.6	21.6			29.8	20.8		
				251	848.8	30.8	21.8			30.1	21.1		
			2	128	824.2	29.5	23.5	25.2	19.2	28.3	22.3	25.5	19.5
				190	836.6	29.4	23.4	25.1	19.1	28.3	22.3	25.5	19.5
				251	848.8	29.6	23.6	25.3	19.3	28.6	22.6	25.8	19.8
			3	128	824.2	27.5	23.2	23.3	19.0	26.3	22.0	23.5	19.2
				190	836.6	27.4	23.1	23.2	18.9	26.3	22.0	23.5	19.2
				251	848.8	27.6	23.3	23.4	19.1	26.5	22.2	23.7	19.4

**Notes:**

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

- GSM(Voice) + GMSK (GPRS) mode with 2 time slot for both Max and Reduced power, based on the output power measurements above.
- SAR is not required for GSM(Voice) + EGPRS (8PSK) mode because its output power is less than that of GSM(Voice) + GMSK (GPRS) mode.

**GSM1900 DTM Measured Results**

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Max. Pwr				Reduced Pwr			
						CS		PS		CS		PS	
						Burst (dBm)	Frame (dBm)	Burst (dBm)	Frame (dBm)	Burst (dBm)	Frame (dBm)	Burst (dBm)	Frame (dBm)
1900	GSM(Voice) + GPRS(GMSK)	CS1	1	512	1850.2	30.4	21.4			24.5	15.5		
				661	1880.0	30.3	21.3			24.5	15.5		
				810	1909.8	30.3	21.3			24.7	15.7		
			2	512	1850.2	<b>29.0</b>	<b>23.0</b>	<b>28.7</b>	<b>22.7</b>	<b>23.2</b>	<b>17.2</b>	<b>23.2</b>	<b>17.2</b>
				661	1880.0	<b>29.0</b>	<b>23.0</b>	<b>28.6</b>	<b>22.6</b>	<b>23.2</b>	<b>17.2</b>	<b>23.2</b>	<b>17.2</b>
				810	1909.8	<b>29.0</b>	<b>23.0</b>	<b>28.6</b>	<b>22.6</b>	<b>23.2</b>	<b>17.2</b>	<b>23.2</b>	<b>17.2</b>
			3	512	1850.2	26.9	22.6	26.9	22.6	21.2	16.9	21.2	16.9
				661	1880.0	27.0	22.7	26.8	22.5	21.2	16.9	21.2	16.9
				810	1909.8	27.0	22.7	26.8	22.5	21.2	16.9	21.2	16.9
	GSM(Voice) + EGPRS(8PSK)	MCS5	1	512	1850.2	30.4	21.4			24.7	15.7		
				661	1880.0	30.3	21.3			24.7	15.7		
				810	1909.8	30.3	21.3			24.7	15.7		
			2	512	1850.2	29.0	23.0	24.7	18.7	23.2	17.2	22.9	16.9
				661	1880.0	29.0	23.0	24.7	18.7	23.2	17.2	22.9	16.9
				810	1909.8	28.8	22.8	24.7	18.7	23.2	17.2	22.9	16.9
			3	512	1850.2	27.2	22.9	23.0	18.7	21.2	16.9	20.9	16.6
				661	1880.0	27.2	22.9	23.1	18.8	21.2	16.9	20.9	16.6
				810	1909.8	27.2	22.9	23.0	18.7	21.2	16.9	21.0	16.7

**Notes:**

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

- GSM(Voice) + GMSK (GPRS) mode with 2 time slots for Max and Reduced power, based on the output power measurements above.
- SAR is not required for GSM(Voice) + EGPRS (8PSK) mode because its output power is less than that of GSM(Voice) + GMSK (GPRS) mode.

## 9.2. W-CDMA

### Release 99 Setup Procedures used to establish the test signals

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

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

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

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

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
W-CDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set 1			
	Power Control Algorithm	Algorithm 2			
	$\beta_c$	2/15	11/15	15/15	15/15
	$\beta_d$	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	$\beta_c/\beta_d$	2/15	11/15	15/8	15/4
	$\beta_{hs}$	4/15	24/15	30/15	30/15
MPR (dB)	0	0	0.5	0.5	
HSDPA Specific Settings	$D_{ACK}$	8			
	$D_{NAK}$	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
$A_{hs}=\beta_{hs}/\beta_c$	30/15				

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

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

	Mode	HSPA				
	Subtest	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2 kbps RMC				
	HSDPA FRC	H-Set 1				
	HSUPA Test	HSPA				
	Power Control Algorithm	Algorithm 2				Algorithm 1
	$\beta_c$	11/15	6/15	15/15	2/15	15/15
	$\beta_d$	15/15	15/15	9/15	15/15	0
	$\beta_{ec}$	209/225	12/15	30/15	2/15	5/15
	$\beta_c/\beta_d$	11/15	6/15	15/9	2/15	15/1
	$\beta_{hs}$	22/15	12/15	30/15	4/15	5/15
	$\beta_{ed}$	1309/225	94/75	47/15	56/75	47/15
CM (dB)	1	3	2	3	1	
MPR (dB)	0	2	1	2	0	
HSDPA Specific Settings	DACK	8				0
	DNAK	8				0
	DCQI	8				0
	Ack-Nack repetition factor	3				
	CQI Feedback (Table 5.2B.4)	4ms				
	CQI Repetition Factor (Table 5.2B.4)	2				
A <sub>hs</sub> = $\beta_{hs}/\beta_c$	30/15					
HSUPA Specific Settings	E-DPDCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	ETFCI (from 34.121 Table C.11.1.3)	75	67	92	71	81
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8	308.9
	Reference E-TFCIs	5	5	2	5	1
	Reference E-TFCI	11	11	11	11	67
	Reference E-TFCI PO	4	4	4	4	18
	Reference E-TFCI	67	67	92	67	67
	Reference E-TFCI PO	18	18	18	18	18
	Reference E-TFCI	71	71	71	71	71
	Reference E-TFCI PO	23	23	23	23	23
	Reference E-TFCI	75	75	75	75	75
	Reference E-TFCI PO	26	26	26	26	26
	Reference E-TFCI	81	81	81	81	81
Reference E-TFCI PO	27	27	27	27	27	
Maximum Channelization Codes	2xSF2				SF4	

**HSPA+**

Since 16QAM is not used for uplink, the uplink Category and release is same as HSUPA, i.e., UL cat6 / DL cat10. Therefore, the RF conducted power is not measured.



**W-CDMA Band II Measured Results**

Band	Mode		UL Ch No.	Freq. (MHz)	MPR (dB)	Max. Pwr (dBm)	Reduced Pwr (dBm)	
W-CDMA Band II	Rel 99	RMC, 12.2 kbps	9262	1852.4	N/A	23.9	18.8	
			9400	1880.0	N/A	24.0	18.8	
			9538	1907.6	N/A	23.6	18.8	
	HSDPA	Subtest 1	9262	1852.4	0	22.4	17.4	
			9400	1880.0	0	22.4	17.4	
			9538	1907.6	0	22.5	17.4	
		Subtest 2	9262	1852.4	0	22.1	17.4	
			9400	1880.0	0	22.2	17.5	
			9538	1907.6	0	22.3	17.4	
		Subtest 3	9262	1852.4	0.5	22.0	17.3	
			9400	1880.0	0.5	21.8	17.4	
			9538	1907.6	0.5	22.1	17.3	
		Subtest 4	9262	1852.4	0.5	21.9	17.3	
			9400	1880.0	0.5	22.0	17.3	
			9538	1907.6	0.5	22.0	17.3	
		HSUPA	Subtest 1	9262	1852.4	0	22.5	17.5
				9400	1880.0	0	22.5	17.5
				9538	1907.6	0	22.6	17.5
	Subtest 2		9262	1852.4	2	21.2	15.6	
			9400	1880.0	2	21.1	15.7	
			9538	1907.6	2	21.3	15.8	
	Subtest 3		9262	1852.4	1	22.0	16.7	
			9400	1880.0	1	22.0	16.7	
			9538	1907.6	1	22.1	16.8	
	Subtest 4		9262	1852.4	2	21.1	15.6	
			9400	1880.0	2	21.1	15.7	
			9538	1907.6	2	21.2	15.8	
	Subtest 5		9262	1852.4	0	22.6	17.5	
			9400	1880.0	0	22.6	17.5	
			9538	1907.6	0	22.6	17.5	

**W-CDMA Band V Measured Results**

Band	Mode		UL Ch No.	Freq. (MHz)	MPR (dB)	Max. Pwr (dBm)	Reduced Pwr (dBm)	
W-CDMA Band V	Rel 99	RMC, 12.2 kbps	4132	826.4	N/A	22.7	21.8	
			4183	836.6	N/A	22.7	21.7	
			4233	846.6	N/A	22.7	21.7	
	HSDPA	Subtest 1	4132	826.4	0	21.5	20.6	
			4183	836.6	0	21.4	20.7	
			4233	846.6	0	21.6	20.6	
		Subtest 2	4132	826.4	0	21.2	20.6	
			4183	836.6	0	21.3	20.7	
			4233	846.6	0	21.4	20.6	
		Subtest 3	4132	826.4	0.5	21.2	20.1	
			4183	836.6	0.5	21.4	20.2	
			4233	846.6	0.5	21.4	20.2	
		Subtest 4	4132	826.4	0.5	21.3	20.1	
			4183	836.6	0.5	21.4	20.2	
			4233	846.6	0.5	21.4	20.2	
		HSUPA	Subtest 1	4132	826.4	0	21.0	20.8
				4183	836.6	0	21.1	20.7
				4233	846.6	0	21.0	20.7
	Subtest 2		4132	826.4	2	20.0	18.8	
			4183	836.6	2	20.0	18.8	
			4233	846.6	2	20.0	18.8	
	Subtest 3		4132	826.4	1	20.6	19.8	
			4183	836.6	1	20.6	19.8	
			4233	846.6	1	20.7	19.7	
	Subtest 4		4132	826.4	2	20.0	18.8	
			4183	836.6	2	20.0	18.8	
			4233	846.6	2	20.0	18.8	
	Subtest 5		4132	826.4	0	21.0	20.8	
			4183	836.6	0	21.0	20.7	
			4233	846.6	0	21.0	20.7	

### 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 3**

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

The allowed A-MPR values specified below in Table 6.2.4.-1 of 3GPP TS36.101 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signaling Value of "NS\_01".

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

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks ( $N_{RB}$ )	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	NA
NS_03	6.6.2.2.1	2, 4, 10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10,15,20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	n/a
NS_07	6.6.2.2.3	13	10	Table 6.2.4-2	Table 6.2.4-2
	6.6.3.3.2				
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23 <sup>1</sup>	1.4, 3, 5, 10	Table 6.2.4-5	Table 6.2.4-5
..					
NS_32	-	-	-	-	-

Note 1: Applies to the lower block of Band 23, i.e. a carrier placed in the 2000-2010 MHz region.

**LTE Band 5 Measured Results**

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Avg Pwr (dBm)		
						829 MHz	836.5 MHz	844 MHz
LTE Band 5	10	QPSK	1	0	0	20.80	20.90	20.60
			1	25	0	20.70	20.70	20.50
			1	49	0	20.80	20.70	20.60
			25	0	0	20.70	20.70	20.50
			25	12	0	20.80	20.70	20.50
			25	25	0	20.80	20.70	20.60
		16QAM	50	0	0	20.80	20.60	20.50
			1	0	0	21.10	20.80	20.60
			1	25	0	21.10	20.60	20.50
			1	49	0	21.10	20.60	20.60
			25	0	0	20.80	20.70	20.60
			25	12	0	20.90	20.80	20.70
			25	25	0	20.90	20.80	20.70
			50	0	0	20.80	20.70	20.50
Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Avg Pwr (dBm)		
						826.5 MHz	836.5 MHz	846.5 MHz
LTE Band 5	5	QPSK	1	0	0	20.70	20.60	20.60
			1	12	0	20.70	20.70	20.60
			1	24	0	20.70	20.70	20.60
			12	0	0	20.70	20.60	20.60
			12	7	0	20.80	20.60	20.70
			12	13	0	20.80	20.70	20.60
		16QAM	25	0	0	20.70	20.60	20.70
			1	0	0	20.80	21.10	21.10
			1	12	0	20.80	21.10	21.20
			1	24	0	20.80	21.20	21.10
			12	0	0	20.80	20.80	20.90
			12	7	0	20.90	20.80	20.90
			12	13	0	20.80	20.90	20.80
			25	0	0	20.80	20.80	20.80
Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Avg Pwr (dBm)		
						825.5 MHz	836.5 MHz	847.5 MHz
LTE Band 5	3	QPSK	1	0	0	20.60	20.60	20.70
			1	8	0	20.60	20.70	20.70
			1	14	0	20.70	20.80	20.70
			8	0	0	20.60	20.60	20.70
			8	4	0	20.60	20.70	20.70
			8	7	0	20.60	20.70	20.70
			15	0	0	20.60	20.60	20.70
		16QAM	1	0	0	20.60	21.00	20.60
			1	8	0	20.60	21.10	20.60
			1	14	0	20.70	21.10	20.60
			8	0	0	20.70	20.70	20.80
			8	4	0	20.70	20.80	20.80
			8	7	0	20.70	20.70	20.80
			15	0	0	20.60	20.70	20.80

**LTE Band 5 Measured Results (continued)**

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Avg Pwr (dBm)		
						824.7 MHz	836.5 MHz	848.3 MHz
LTE Band 5	1.4	QPSK	1	0	0	20.50	20.60	20.70
			1	3	0	20.60	20.70	20.60
			1	5	0	20.60	20.60	20.60
			3	0	0	20.60	20.60	20.60
			3	1	0	20.60	20.60	20.70
			3	3	0	20.60	20.70	20.60
		16QAM	6	0	0	20.60	20.60	20.60
			1	0	0	20.60	21.00	20.70
			1	3	0	20.60	21.10	20.80
			1	5	0	20.60	21.00	20.70
			3	0	0	20.80	20.80	20.70
			3	1	0	20.80	20.90	20.70
			3	3	0	20.80	20.90	20.70
			6	0	0	20.70	20.60	20.80

**LTE Band 7 Measured Results**

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)		
						2510 MHz	2535 MHz	2560 MHz
LTE Band 7	20	QPSK	1	0	0	19.9	20.0	19.8
			1	49	0	20.4	20.4	20.4
			1	99	0	20.0	20.1	20.0
			50	0	0	20.3	20.4	20.3
			50	24	0	20.4	20.5	20.4
			50	50	0	20.2	20.3	20.3
		16QAM	100	0	0	20.3	20.3	20.2
			1	0	0	20.0	20.4	20.4
			1	49	0	20.4	20.6	20.6
			1	99	0	20.0	20.6	20.6
			50	0	0	20.3	20.3	20.3
			50	24	0	20.4	20.5	20.4
			50	50	0	20.2	20.2	20.3
			100	0	0	20.3	20.3	20.2
Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)		
						2507.5 MHz	2535 MHz	2562.5 MHz
LTE Band 7	15	QPSK	1	0	0	20.2	20.1	20.0
			1	37	0	20.5	20.4	20.5
			1	74	0	19.9	20.0	19.9
			36	0	0	20.4	20.4	20.4
			36	20	0	20.5	20.5	20.4
			36	39	0	20.2	20.4	20.3
		16QAM	75	0	0	20.3	20.4	20.3
			1	0	0	20.5	20.1	20.5
			1	37	0	20.6	20.4	20.6
			1	74	0	20.3	20.0	20.4
			36	0	0	20.4	20.4	20.3
			36	20	0	20.5	20.4	20.3
			36	39	0	20.3	20.3	20.2
			75	0	0	20.4	20.4	20.3
Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)		
						2505 MHz	2535 MHz	2565 MHz
LTE Band 7	10	QPSK	1	0	0	20.1	20.1	19.8
			1	25	0	20.0	20.0	19.7
			1	49	0	20.5	20.5	20.2
			25	0	0	20.1	20.1	19.7
			25	12	0	20.0	20.1	19.8
			25	25	0	20.2	20.1	19.9
		16QAM	50	0	0	20.1	20.1	19.8
			1	0	0	20.5	20.2	19.8
			1	25	0	20.4	20.0	19.7
			1	49	0	20.6	20.5	20.2
			25	0	0	20.0	20.0	19.8
			25	12	0	19.9	20.1	19.8
			25	25	0	20.2	20.0	19.9
			50	0	0	20.1	20.0	19.8

**LTE Band 7 Measured Results (continued)**

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)		
						2502.5 MHz	2535 MHz	2567.5 MHz
LTE Band 7	5	QPSK	1	0	0	19.9	20.0	19.8
			1	12	0	20.0	20.1	19.8
			1	24	0	20.1	20.2	19.9
			12	0	0	20.0	20.0	19.7
			12	7	0	20.0	20.1	19.8
			12	13	0	20.0	20.0	19.8
			25	0	0	19.9	20.1	19.7
		16QAM	1	0	0	20.4	20.2	19.9
			1	12	0	20.5	20.3	19.9
			1	24	0	20.5	20.3	19.9
			12	0	0	20.1	20.1	19.7
			12	7	0	20.1	20.1	19.8
			12	13	0	20.2	20.1	19.8
			25	0	0	20.0	20.1	19.7

**LTE Band 13 Measured Results**

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)
						782 MHz
LTE Band 13	10	QPSK	1	0	0	23.2
			1	25	0	23.0
			1	49	0	23.4
			25	0	1	22.0
			25	12	1	22.1
			25	25	1	22.2
			50	0	1	22.0
		16QAM	1	0	1	22.0
			1	25	1	21.8
			1	49	1	22.0
			25	0	2	21.0
			25	12	2	21.1
			25	25	2	21.2
			50	0	2	21.0
Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)
						782 MHz
LTE Band 13	5	QPSK	1	0	0	22.9
			1	12	0	22.9
			1	24	0	23.0
			12	0	1	21.9
			12	6	1	22.0
			12	11	1	22.1
			25	0	1	22.0
		16QAM	1	0	1	22.1
			1	12	1	22.1
			1	24	1	22.2
			12	0	2	21.0
			12	6	2	21.1
			12	11	2	21.1
			25	0	2	21.0

**Note(s):**

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



**LTE Band 17 Measured Results**

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

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)
						710 MHz
LTE Band 17	10	QPSK	1	0	0	23.4
			1	25	0	23.2
			1	49	0	23.3
			25	0	1	22.3
			25	12	1	22.3
			25	25	1	22.2
			50	0	1	22.4
		16QAM	1	0	1	22.5
			1	25	1	22.3
			1	49	1	22.3
			25	0	2	21.4
			25	12	2	21.4
			25	25	2	21.3
			50	0	2	21.4
Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)
						710 MHz
LTE Band 17	5	QPSK	1	0	0	23.2
			1	12	0	23.3
			1	24	0	23.2
			12	0	1	22.2
			12	6	1	22.3
			12	11	1	22.3
			25	0	1	22.2
		16QAM	1	0	1	22.4
			1	12	1	22.6
			1	24	1	22.5
			12	0	2	21.3
			12	6	2	21.4
			12	11	2	21.4
			25	0	2	21.3

**Note(s):**

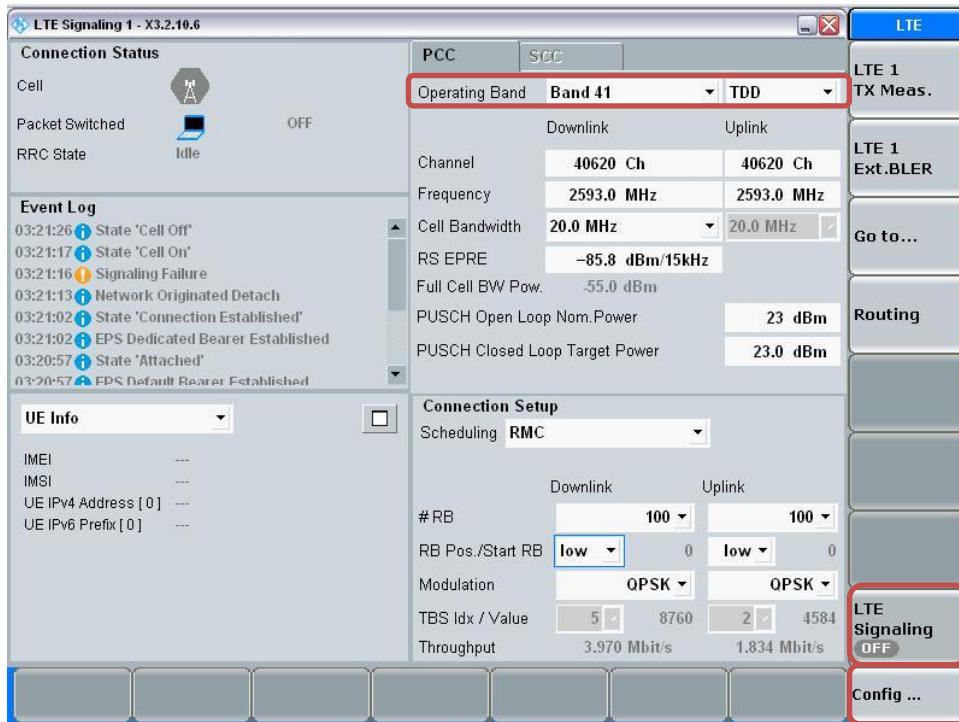
10/5 MHz Bandwidths does not support at least three non-overlapping channels in certain channel bandwidths. When a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing per KDB 941225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

**LTE Band 41 Measured Results**

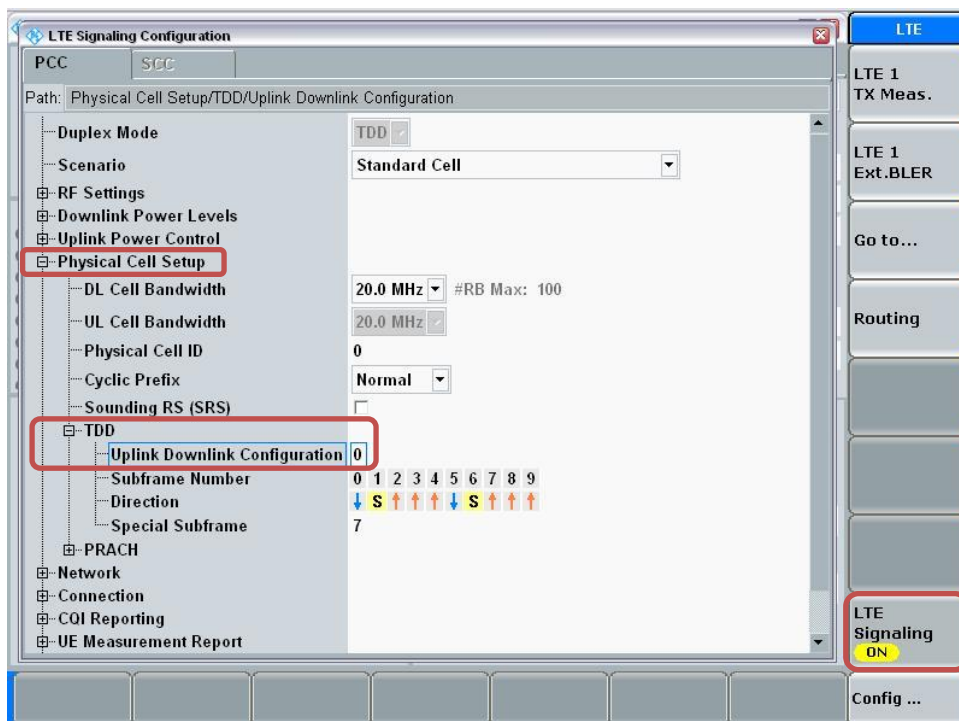
**Procedure used to establish SAR test signal for LTE TDD Band 41**

Set to CMW-500 with following parameters:

- Turn the LTE Signaling off using “ON | OFF” key
- Operating Band: Select Band 41 and TDD
- Go to “Config...”

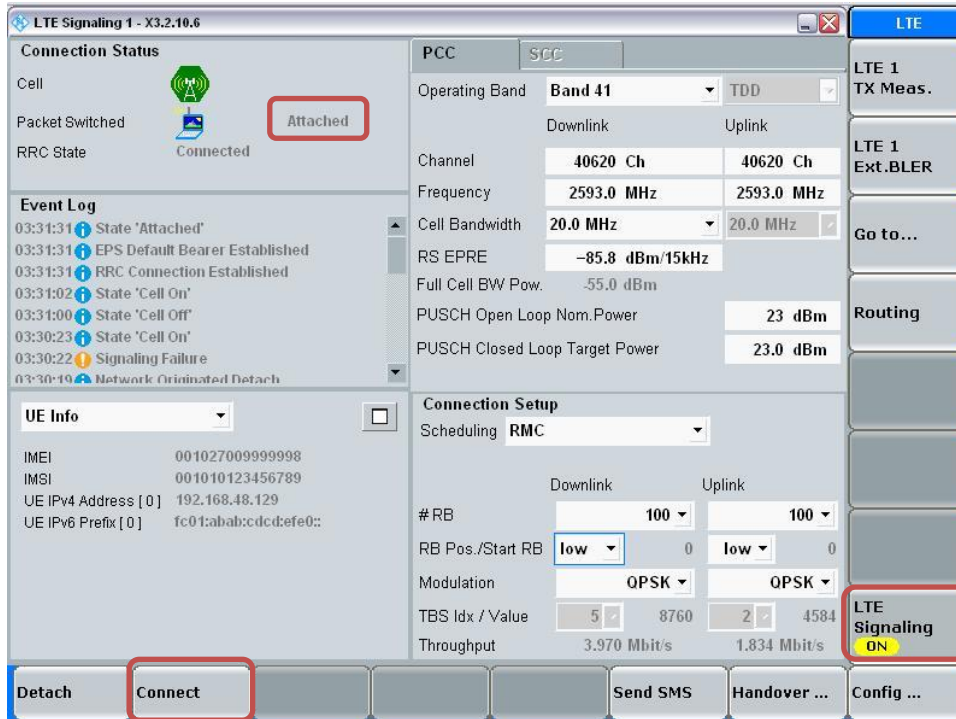


- Go to “Physical Cell Setup”
- Select “TDD” and Set “Uplink Downlink Configuration” to “0”
- Turn the cell on using “ON | OFF” key



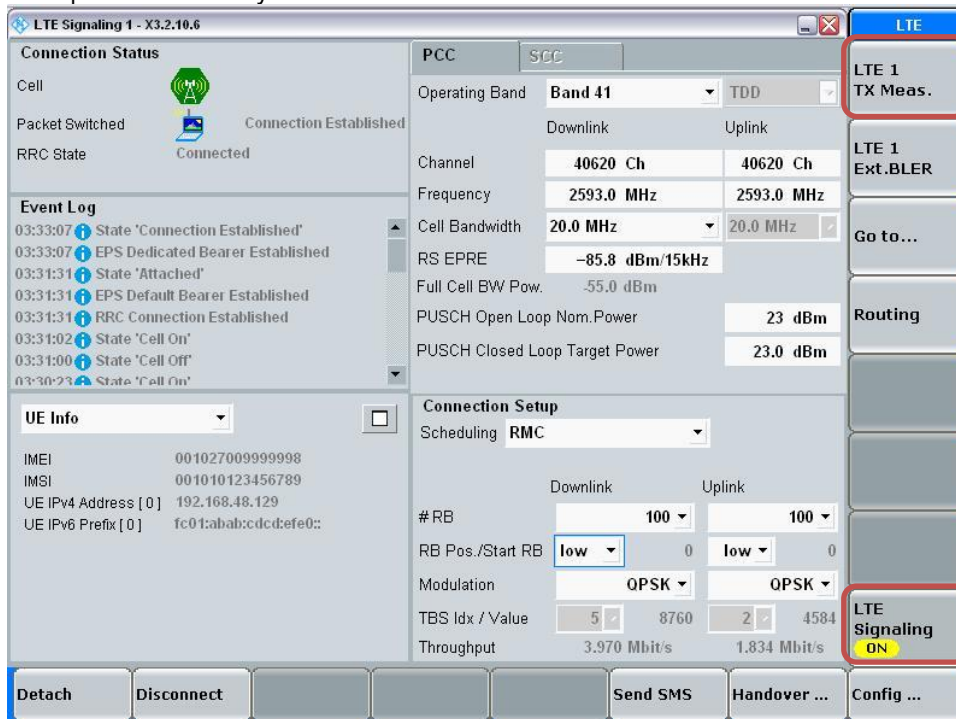
**Connect to EUT**

- Turn the cell on using “ON | OFF” key
- After EUT is Attached
- Select “Connect”

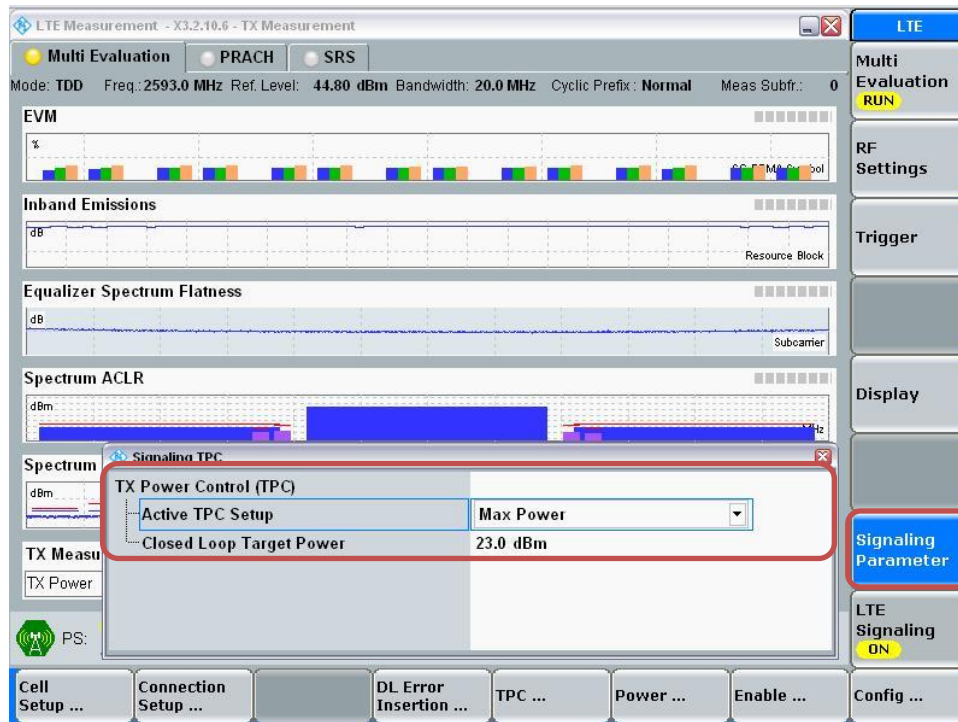


**Max Power Setting**

- Select “LTE 1 TX Meas.”
- Press “RESTART | STOP” Soft key

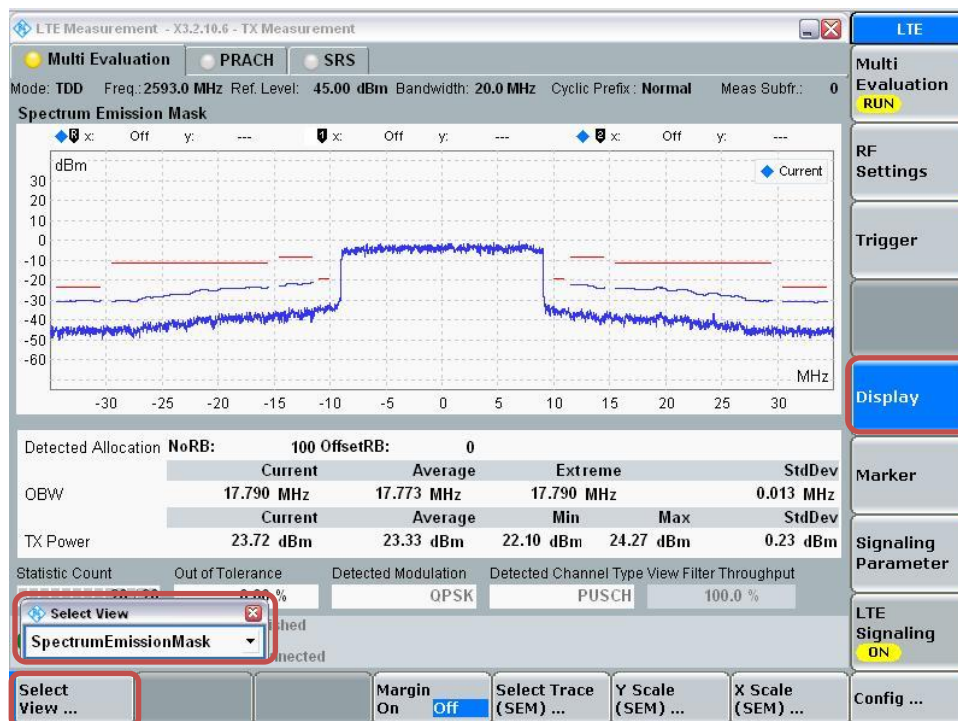


- Select “Signaling Parameter”
- Select “TX Power Control (TPC)” > Select “Active TPC Setup” to “Max Power” > Set “Closed Loop Target Power” to “23 dBm”



**View TX Power**

- Go to “Display”
- Select “Select View...”
- Select “Spectrum Emission Mask”



**LTE Band 41 Measured Results**

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)				
						2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz
LTE Band 41	20	QPSK	1	0	0	19.9	20.3	20.1	20.2	20.2
			1	50	0	20.4	20.4	20.5	20.3	20.5
			1	99	0	19.8	20.4	20.5	20.3	20.5
			50	0	0	20.2	20.5	20.4	20.4	20.5
			50	25	0	20.4	20.5	20.5	20.4	20.5
			50	50	0	20.1	20.5	20.5	20.3	20.5
			100	0	0	20.3	20.4	20.4	20.3	20.4
		16QAM	1	0	0	19.9	20.4	20.3	20.4	20.2
			1	50	0	20.3	20.4	20.3	20.3	20.3
			1	99	0	20.3	20.4	20.4	20.4	20.4
			50	0	0	20.4	20.4	20.4	20.4	20.4
			50	25	0	20.3	20.5	20.5	20.4	20.5
			50	50	0	20.3	20.5	20.4	20.4	20.5
			100	0	0	20.3	20.4	20.4	20.3	20.4
LTE Band 41	15	QPSK	1	0	0	20.4	20.4	20.4	20.3	20.0
			1	36	0	20.4	20.5	20.5	20.5	20.3
			1	74	0	20.4	20.5	20.2	20.4	20.1
			36	0	0	20.4	20.5	20.5	20.5	20.2
			36	18	0	20.4	20.5	20.5	20.5	20.2
			36	37	0	20.4	20.5	20.5	20.5	20.3
			75	0	0	20.5	20.5	20.5	20.5	20.0
		16QAM	1	0	0	20.4	20.5	20.5	20.5	20.0
			1	36	0	20.4	20.5	20.5	20.5	20.2
			1	74	0	20.4	20.4	20.5	20.4	20.0
			36	0	0	20.5	20.5	20.5	20.5	20.1
			36	18	0	20.5	20.5	20.5	20.5	20.2
			36	37	0	20.5	20.5	20.5	20.5	20.2
			75	0	0	20.5	20.5	20.5	20.5	20.2
LTE Band 41	10	QPSK	1	0	0	20.5	20.5	20.1	20.3	20.0
			1	25	0	20.5	20.5	20.1	20.3	20.1
			1	49	0	20.5	20.5	20.1	20.3	20.0
			25	0	0	20.5	20.5	20.1	20.3	20.1
			25	12	0	20.0	20.5	20.1	20.3	20.1
			25	25	0	20.5	20.5	20.1	20.3	20.1
			50	0	0	20.5	20.5	20.1	20.3	20.1
		16QAM	1	0	0	20.5	20.5	20.1	20.3	20.1
			1	25	0	20.5	20.5	20.1	20.3	20.1
			1	49	0	20.5	20.5	20.1	20.3	20.1
			25	0	0	20.5	20.5	20.1	20.3	20.1
			25	12	0	20.5	20.5	20.1	20.3	20.1
			25	25	0	20.5	20.5	20.1	20.3	20.1
			50	0	0	20.5	20.5	20.1	20.3	20.1

**LTE Band 41 Measured Results (continued)**

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)				
						2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz
LTE Band 41	5	QPSK	1	0	0	20.3	20.3	20.1	20.1	20.1
			1	12	0	20.3	20.3	20.1	20.1	20.1
			1	24	0	20.3	20.3	20.1	20.1	20.1
			12	0	0	20.3	20.3	20.1	20.1	20.1
			12	7	0	20.3	20.3	20.1	20.1	20.1
			12	13	0	20.3	20.3	20.1	20.1	20.1
		16QAM	25	0	0	20.3	20.3	20.1	20.1	20.1
			1	0	0	20.3	20.3	20.0	20.0	20.0
			1	12	0	20.3	20.3	20.0	20.0	20.0
			1	24	0	20.3	20.3	20.0	20.0	20.0
			12	0	0	20.3	20.3	20.1	20.1	20.1
			12	7	0	20.3	20.3	20.1	20.1	20.1
			12	13	0	20.3	20.3	20.1	20.1	20.1
			25	0	0	20.3	20.3	20.1	20.1	20.1

**LTE Rel. 11 Carrier Aggregation**

No Band Combinations are supported for Carrier Aggregation.

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

#### Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Chain 0			Chain 1		
					Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)
2.4	802.11b	1 Mbps	1	2412	11.4	12.2	Yes	6.7	7.5	No
			6	2437	11.4			7.2		
			11	2462	11.3			7.4		
	802.11g	6 Mbps	1	2412	Not Required	12.6	No	Not Required	8.4	No
			6	2437						
			11	2462						
	802.11n (HT20)	6.5 Mbps	1	2412	Not Required	12.7	No	Not Required	8.5	No
			6	2437						
			11	2462						

#### Note(s):

- Output Power and SAR is not required for 802.11g/n HT20 channels when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg.
- Chain 1 SAR is not required because it qualifies for SAR Test Exclusion.



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

#### Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Chain 0			Chain 1		
					Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)
5.2 (U-NII 1)	802.11a	6 Mbps	36	5180	Not Required	9.4	No	Not Required	5.0	No
			40	5200						
			44	5220						
			48	5240						
	802.11n (HT20)	6.5 Mbps	36	5180	Not Required	9.5	No	Not Required	5.0	No
			40	5200						
			44	5220						
			48	5240						
	802.11n (HT40)	13.5 Mbps	38	5190	Not Required	10.1	No	4.3	5.4	No
			46	5230				4.5		
	802.11ac (VHT20)	6.5 Mbps	36	5180	Not Required	9.5	No	Not Required	5.0	No
			40	5200						
			44	5220						
			48	5240						
	802.11ac (HT40)	13.5 Mbps	38	5190	Not Required	10.1	No	4.3	5.4	No
			46	5230				4.4		
	802.11ac (VHT80)	29.3 Mbps	42	5210	9.5	10.1	No	Not Required	5.1	No
	5.3 (U-NII 2A)	802.11a	6 Mbps	52	5260	Not Required	9.6	No	Not Required	4.9
56				5280						
60				5300						
64				5320						
802.11n (HT20)		6.5 Mbps	52	5260	Not Required	9.7	No	Not Required	4.9	No
			56	5280						
			60	5300						
			64	5320						
802.11n (HT40)		13.5 Mbps	54	5270	9.5	10.4	No	3.9	5.1	No
			62	5310	9.3			4.1		
802.11ac (VHT20)		6.5 Mbps	52	5260	Not Required	9.7	No	Not Required	4.9	No
			56	5280						
			60	5300						
			64	5320						
802.11ac (VHT40)		13.5 Mbps	54	5270	9.6	10.4	Yes	4.0	5.1	No
			62	5310	9.0			4.1		
802.11ac (VHT80)		29.3 Mbps	58	5290	Not Required	10.2	No	Not Required	4.8	No
5.5 (U-NII 2C)		802.11a	6 Mbps	100	5500	Not Required	10.2	No	Not Required	5.1
	116			5580						
	124			5620						
	144			5720						
	802.11n (HT20)	6.5 Mbps	100	5500	Not Required	10.1	No	Not Required	5.1	No
			116	5580						
			124	5620						
			144	5720						
	802.11n (HT40)	13.5 Mbps	102	5510	Not Required	10.7	No	4.9	5.9	No
			118	5590				5.2		
			142	5710				5.1		
	802.11ac (VHT20)	6.5 Mbps	100	5500	Not Required	10.1	No	Not Required	5.1	No
			116	5580						
			124	5620						
			144	5720						
	802.11ac (VHT40)	13.5 Mbps	102	5510	Not Required	10.7	No	5.1	5.9	No
			118	5590				5.0		
			142	5710				5.5		
802.11ac (VHT80)	29.3 Mbps	106	5530	10.1	10.9	Yes	Not Required	5.8	No	
		122	5610	10.9						
		138	5690	10.9						



**Wi-Fi 5GHz (U-NII Bands) continued**

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Chain 0			Chain 1		
					Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)
5.8 (U-NII 3)	802.11a	6 Mbps	149	5745	Not required	10.1	No	Not required	4.3	No
			157	5785						
			165	5825						
	802.11n (HT20)	6.5 Mbps	149	5745	Not required	10.1	No	Not required	4.3	No
			157	5785						
			165	5825						
	802.11n (HT40)	13.5 Mbps	151	5755	10.4	10.6	Yes	4.4	5.3	No
			159	5795	10.3			4.3		
	802.11ac (VHT20)	6.5 Mbps	149	5745	Not required	10.1	No	Not required	4.3	No
			157	5785						
			165	5825						
	802.11ac (VHT40)	13.5 Mbps	151	5755	10.4	10.6	No	4.5	5.3	No
159			5795	10.3	4.5					
802.11ac (VHT80)	29.3 Mbps	155	5775	Not required	10.0	No	Not required	4.8	No	

**Note(s):**

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

**9.6. Bluetooth**

Maximum tune-up tolerance limit is 12.10 dBm from the rated nominal maximum output power. This power level qualifies for exclusion of SAR testing.

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

SAR Test Reduction criteria are as follows:

### KDB 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 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). When the reported SAR for the initial test position is:

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

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

**10.1. GSM850**

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	GPRS 4 Slots	0	Left Touch	190	836.6	27.6	26.5	0.218	0.281	1
			Left Tilt	190	836.6	27.6	26.5	0.081	0.104	
			Right Touch	190	836.6	27.6	26.5	0.248	<b>0.319</b>	
			Right Tilt	190	836.6	27.6	26.5	0.071	0.091	
Body-worn(VoIP)	GPRS 4 Slots	15	Rear	190	836.6	27.6	26.5	0.235	0.303	2
Front			190	836.6	27.6	26.5	0.257	<b>0.331</b>		
Hotspot		10	Rear	190	836.6	26.6	25.8	0.339	0.408	3
			Front	190	836.6	26.6	25.8	0.350	<b>0.421</b>	
			Edge 2	190	836.6	26.6	25.8	0.163	0.196	
			Edge 3	190	836.6	26.6	25.8	0.164	0.197	
			Edge 4	190	836.6	26.6	25.8	0.071	0.085	

**DTM (Dual Transfer Mode)**

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	
Hotspot	DTM CS + 2 Slots	0	Left Touch	190	836.6	30.6	29.5	0.354	<b>0.456</b>	4

**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 4 Slots	0	Left Touch	661	1880.0	26.2	25.7	0.313	<b>0.351</b>	5
			Left Tilt	661	1880.0	26.2	25.7	0.091	0.103	
			Right Touch	661	1880.0	26.2	25.7	0.168	0.188	
			Right Tilt	661	1880.0	26.2	25.7	0.103	0.116	
Body-worn(VoIP)	GPRS 4 Slots	15	Rear	661	1880.0	26.2	25.7	0.198	0.222	6
Front			661	1880.0	26.2	25.7	0.332	<b>0.373</b>		
Hotspot		10	Rear	661	1880.0	20.2	20.0	0.158	0.165	7
			Front	661	1880.0	20.2	20.0	0.307	0.321	
			Edge 2	661	1880.0	20.2	20.0	0.012	0.013	
			Edge 3	661	1880.0	20.2	20.0	0.336	<b>0.352</b>	
			Edge 4	661	1880.0	20.2	20.0	0.117	0.123	

**DTM (Dual Transfer Mode)**

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	
Body-worn (VoIP)	DTM CS + 2 Slots	15	Rear	661	1880.0	29.2	29.0	0.258	0.270	8
Front			661	1880.0	29.2	29.0	0.463	<b>0.485</b>		
Hotspot		10	Rear	661	1880.0	23.2	22.9	0.186	0.199	9
			Front	661	1880.0	23.2	22.9	0.324	0.347	
			Edge 2	661	1880.0	23.2	22.9	0.017	0.018	
			Edge 3	661	1880.0	23.2	22.9	0.411	<b>0.440</b>	
			Edge 4	661	1880.0	23.2	22.9	0.153	0.164	

### 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	Rel 99 RMC	0	Left Touch	9400	1880.0	24.0	24.0	0.666	<b>0.666</b>	10
			Left Tilt	9400	1880.0	24.0	24.0	0.188	0.188	
			Right Touch	9400	1880.0	24.0	24.0	0.329	0.329	
			Right Tilt	9400	1880.0	24.0	24.0	0.170	0.170	
Body-worn	Rel 99 RMC	15	Rear	9400	1880.0	24.0	24.0	0.324	0.324	
			Front	9400	1880.0	24.0	24.0	0.572	<b>0.572</b>	11
Hotspot	Rel 99 RMC	10	Rear	9400	1880.0	19.0	18.8	0.232	0.243	
			Front	9400	1880.0	19.0	18.8	0.422	0.442	
			Edge 2	9400	1880.0	19.0	18.8	0.015	0.016	
			Edge 3	9400	1880.0	19.0	18.8	0.535	<b>0.560</b>	12
			Edge 4	9400	1880.0	19.0	18.8	0.178	0.186	

### 10.4. W-CDMA Band V

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Rel 99 RMC	0	Left Touch	4183	836.6	23.0	22.7	0.238	0.255	
			Left Tilt	4183	836.6	23.0	22.7	0.082	0.088	
			Right Touch	4183	836.6	23.0	22.7	0.289	<b>0.310</b>	13
			Right Tilt	4183	836.6	23.0	22.7	0.092	0.099	
Body-worn	Rel 99 RMC	15	Rear	4183	836.6	23.0	22.7	0.272	0.291	
			Front	4183	836.6	23.0	22.7	0.292	<b>0.313</b>	14
Hotspot	Rel 99 RMC	10	Rear	4183	836.6	22.0	21.7	0.391	<b>0.419</b>	15
			Front	4183	836.6	22.0	21.7	0.361	0.387	
			Edge 2	4183	836.6	22.0	21.7	0.164	0.176	
			Edge 3	4183	836.6	22.0	21.7	0.162	0.174	
			Edge 4	4183	836.6	22.0	21.7	0.089	0.095	

### 10.5. 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	21.5	20.9	0.172	0.197	
						25	0	21.5	20.7	0.163	0.196	
			Left Tilt	20525	836.5	1	0	21.5	20.9	0.083	0.095	
						25	0	21.5	20.7	0.080	0.096	
			Right Touch	20525	836.5	1	0	21.5	20.9	0.194	<b>0.223</b>	16
						25	0	21.5	20.7	0.183	0.220	
			Right Tilt	20525	836.5	1	0	21.5	20.9	0.081	0.093	
						25	0	21.5	20.7	0.078	0.094	
Body-worn	QPSK	15	Rear	20525	836.5	1	0	21.5	20.9	0.196	0.225	
						25	0	21.5	20.7	0.188	0.226	
			Front	20525	836.5	1	0	21.5	20.9	0.198	0.227	
						25	0	21.5	20.7	0.190	<b>0.228</b>	17
Hotspot	QPSK	10	Rear	20525	836.5	1	0	21.5	20.9	0.322	<b>0.370</b>	18
						25	0	21.5	20.7	0.270	0.325	
			Front	20525	836.5	1	0	21.5	20.9	0.310	0.356	
						25	0	21.5	20.7	0.298	0.358	
			Edge 2	20525	836.5	1	0	21.5	20.9	0.173	0.199	
						25	0	21.5	20.7	0.168	0.202	
			Edge 3	20525	836.5	1	0	21.5	20.9	0.132	0.152	
						25	0	21.5	20.7	0.126	0.151	
			Edge 4	20525	836.5	1	0	21.5	20.9	0.084	0.096	
						25	0	21.5	20.7	0.081	0.097	

### 10.6. LTE Band 7 (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	21100	2535.0	1	49	21.5	20.4	0.142	0.183	
						50	24	21.5	20.5	0.145	0.183	
			Left Tilt	21100	2535.0	1	49	21.5	20.4	0.118	0.152	
						50	24	21.5	20.5	0.118	0.149	
			Right Touch	21100	2535.0	1	49	21.5	20.4	0.310	0.399	
						50	24	21.5	20.5	0.318	<b>0.400</b>	19
			Right Tilt	21100	2535.0	1	49	21.5	20.4	0.060	0.077	
						50	24	21.5	20.5	0.065	0.081	
Body-worn	QPSK	15	Rear	21100	2535.0	1	49	21.5	20.4	0.141	<b>0.182</b>	20
						50	24	21.5	20.5	0.144	0.181	
			Front	21100	2535.0	1	49	21.5	20.4	0.102	0.131	
						50	24	21.5	20.5	0.105	0.132	
Hotspot	QPSK	10	Rear	21100	2535.0	1	49	21.5	20.4	0.237	0.305	
						50	24	21.5	20.5	0.244	0.307	
			Front	21100	2535.0	1	49	21.5	20.4	0.208	0.268	
						50	24	21.5	20.5	0.226	0.285	
			Edge 2	21100	2535.0	1	49	21.5	20.4	0.260	0.335	
						50	24	21.5	20.5	0.266	<b>0.335</b>	21
			Edge 3	21100	2535.0	1	49	21.5	20.4	0.093	0.120	
						50	24	21.5	20.5	0.104	0.131	
			Edge 4	21100	2535.0	1	49	21.5	20.4	0.014	0.018	
						50	24	21.5	20.5	0.014	0.018	

### 10.7. 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	49	24.0	23.4	0.161	0.185	
						25	24	23.0	22.2	0.125	0.150	
			Left Tilt	23230	782.0	1	49	24.0	23.4	0.101	0.116	
						25	24	23.0	22.2	0.082	0.098	
			Right Touch	23230	782.0	1	49	24.0	23.4	0.164	<b>0.188</b>	22
						25	24	23.0	22.2	0.128	0.154	
			Right Tilt	23230	782.0	1	49	24.0	23.4	0.076	0.087	
						25	24	23.0	22.2	0.059	0.071	
Body-worn	QPSK	15	Rear	23230	782.0	1	49	24.0	23.4	0.210	0.241	
						25	24	23.0	22.2	0.162	0.195	
			Front	23230	782.0	1	49	24.0	23.4	0.231	<b>0.265</b>	23
						25	24	23.0	22.2	0.178	0.214	
Hotspot	QPSK	10	Rear	23230	782.0	1	49	24.0	23.4	0.273	0.313	
						25	24	23.0	22.2	0.214	0.257	
			Front	23230	782.0	1	49	24.0	23.4	0.311	<b>0.357</b>	24
						25	24	23.0	22.2	0.239	0.287	
			Edge 2	23230	782.0	1	49	24.0	23.4	0.237	0.272	
						25	24	23.0	22.2	0.184	0.221	
			Edge 3	23230	782.0	1	49	24.0	23.4	0.101	0.116	
						25	24	23.0	22.2	0.077	0.092	
			Edge 4	23230	782.0	1	49	24.0	23.4	0.128	0.147	
						25	24	23.0	22.2	0.102	0.123	

### 10.8. LTE Band 17 (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	23790	710.0	1	0	24.5	23.4	0.284	<b>0.366</b>	25			
						25	0	23.5	22.3	0.221	0.291				
						Left Tilt	23790	710.0	1	0	24.5		23.4	0.159	0.205
									25	0	23.5		22.3	0.124	0.163
						Right Touch	23790	710.0	1	0	24.5		23.4	0.283	0.365
									25	0	23.5		22.3	0.220	0.290
			Right Tilt	23790	710.0	1	0	24.5	23.4	0.149	0.192				
						25	0	23.5	22.3	0.115	0.152				
			Body-worn	QPSK	15	Rear	23790	710.0	1	0	24.5	23.4	0.385	0.496	
									25	0	23.5	22.3	0.302	0.398	
									Front	23790	710.0	1	0	24.5	
						25	0	23.5				22.3	0.339	0.447	
Hotspot	QPSK	10				Rear	23790	710.0				1	0	24.5	23.4
									25	0	23.5	22.3	0.383	0.505	
			Front	23790	710.0	1	0	24.5	23.4	0.544	<b>0.701</b>	27			
						25	0	23.5	22.3	0.421	0.555				
			Edge 2	23790	710.0	1	0	24.5	23.4	0.359	0.462				
						25	0	23.5	22.3	0.285	0.376				
Edge 3	23790	710.0	1	0	24.5	23.4	0.128	0.165							
			25	0	23.5	22.3	0.100	0.132							
Edge 4	23790	710.0	1	0	24.5	23.4	0.427	0.550							
			25	0	23.5	22.3	0.337	0.444							

### 10.9. 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	49	21.5	20.5	0.145	0.183					
						50	24	21.5	20.5	0.149	0.188					
						Left Tilt	40620	2593.0	1	49	21.5		20.5	0.120	0.151	
									50	24	21.5		20.5	0.128	0.161	
						Right Touch	40620	2593.0	1	49	21.5		20.5	0.166	0.209	28
									50	24	21.5		20.5	0.169	<b>0.213</b>	
			Right Tilt	40620	2593.0	1	49	21.5	20.5	0.058	0.073					
						50	24	21.5	20.5	0.042	0.053					
			Body-worn	QPSK	15	Rear	40620	2593.0	1	49	21.5	20.5	0.303	<b>0.381</b>	29	
									50	24	21.5	20.5	0.250	0.315		
									Front	40620	2593.0	1	49	21.5		20.5
						50	24	21.5				20.5	0.202	0.254		
Hotspot	QPSK	10				Rear	40620	2593.0				1	49	21.5	20.5	0.286
									50	24	21.5	20.5	0.292	<b>0.368</b>		
			Front	40620	2593.0	1	49	21.5	20.5	0.264	0.332					
						50	24	21.5	20.5	0.273	0.344					
			Edge 2	40620	2593.0	1	49	21.5	20.5	0.209	0.263					
						50	24	21.5	20.5	0.219	0.276					
Edge 3	40620	2593.0	1	49	21.5	20.5	0.075	0.094								
			50	24	21.5	20.5	0.076	0.096								
Edge 4	40620	2593.0	1	49	21.5	20.5	0.011	0.014								
			50	24	21.5	20.5	0.011	0.014								

### 10.10. Wi-Fi (DTS Band)

Frequency Band	Mode & Ant.	RF Exposure Conditions	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
2.4GHz	SISO Chain 0 802.11b 1 Mbps	Head	0	Left Touch	6	2437.0	0.273	12.2	11.4	0.238	<b>0.286</b>	31
				Left Tilt	6	2437.0	0.055	12.2	11.4			
				Right Touch	6	2437.0	0.104	12.2	11.4			
				Right Tilt	6	2437.0	0.037	12.2	11.4			
		Body-worn	15	Rear	6	2437.0	0.001	12.2	11.4			
				Front	6	2437.0	0.021	12.2	11.4	0.014	<b>0.017</b>	32
		Hotspot & Wi-Fi Direct	10	Rear	6	2437.0	0.020	12.2	11.4			
				Front	6	2437.0	0.048	12.2	11.4			
				Edge 2	6	2437.0	0.058	12.2	11.4	0.043	<b>0.052</b>	33

#### Chain 1 SAR Test Exclusion

Max. tune-up tolerance limit		Min. test separation distance (mm)	Frequency (GHz)	SAR test exclusion Result*	RF Exposure Conditions	Estimated 1-g SAR (W/kg)
(dBm)	(mW)					
8.5	7	5	2.437	2.2	Head	<b>0.291</b>
Max. tune-up tolerance limit		Min. test separation distance (mm)	Frequency (GHz)	SAR test exclusion Result*	RF Exposure Conditions	Estimated 1-g SAR (W/kg)
(dBm)	(mW)					
8.5	7	15	2.437	0.7	Body-worn	<b>0.097</b>
Max. tune-up tolerance limit		Min. test separation distance (mm)	Frequency (GHz)	SAR test exclusion Result*	RF Exposure Conditions	Estimated 1-g SAR (W/kg)
(dBm)	(mW)					
8.5	7	10	2.437	1.1	Hotspot	<b>0.146</b>

#### Conclusion:

\*: The computed value is  $\leq 3.0$ ; therefore, Wi-Fi 2.4GHz qualifies for Standalone SAR test exclusion.



### 10.11. Wi-Fi (U-NII Band)

Frequency Band	Mode & Ant.	RF Exposure Conditions	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
5.3 GHz U-NII 2A	Chain 0 802.11ac VHT40	Head	0	Left Touch	54	5270	0.292	10.4	9.6	0.100	<b>0.120</b>	34
				Left Tilt	54	5270	0.021	10.4	9.6			
				Right Touch	54	5270	0.040	10.4	9.6			
				Right Tilt	54	5270	0.017	10.4	9.6			
		Body-worn	15	Rear	54	5270	0.013	10.4	9.6			
				Front	54	5270	0.019	10.4	9.6	0.0056	<b>0.0067</b>	35
Frequency Band	Mode & Ant.	RF Exposure Conditions	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
5.5 GHz U-NII 2C	Chain 0 802.11ac VHT80	Head	0	Left Touch	122	5610	0.451	10.9	10.9	0.257	<b>0.257</b>	36
				Left Tilt	122	5610	0.067	10.9	10.9			
				Right Touch	122	5610	0.124	10.9	10.9			
				Right Tilt	122	5610	0.042	10.9	10.9			
		Body-worn	15	Rear	122	5610	0.031	10.9	10.9			
				Front	122	5610	0.047	10.9	10.9	0.011	<b>0.011</b>	37
Frequency Band	Mode & Ant.	RF Exposure Conditions	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
5.8 GHz U-NII 3	Chain 0 802.11n HT40	Head	0	Left Touch	151	5755	0.308	10.6	10.4	0.208	<b>0.218</b>	38
				Left Tilt	151	5755	0.033	10.6	10.4			
				Right Touch	151	5755	0.107	10.6	10.4			
				Right Tilt	151	5755	0.032	10.6	10.4			
		Body-worn	15	Rear	151	5755	0.020	10.6	10.4			
				Front	151	5755	0.045	10.6	10.4	0.020	<b>0.021</b>	39

#### Chain 1 SAR Test Exclusion

Max. tune-up tolerance limit		Min. test separation distance (mm)	Frequency (GHz)	SAR test exclusion Result*	RF Exposure Conditions	Estimated 1-g SAR (W/kg)
(dBm)	(mW)					
5.9	4	5	5.670	1.9	Head	0.254
Max. tune-up tolerance limit		Min. test separation distance (mm)	Frequency (GHz)	SAR test exclusion Result*	RF Exposure Conditions	Estimated 1-g SAR (W/kg)
(dBm)	(mW)					
5.9	4	15	5.670	0.6	Body-worn	0.085

#### Conclusion:

\*: The computed value is  $\leq 3.0$ ; therefore, Wi-Fi 5GHz qualifies for Standalone SAR test exclusion.

## 10.12. Bluetooth

### Standalone SAR Test Exclusion Considerations & Estimated SAR

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

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

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

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

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

- $(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f_{(\text{GHz})}/x}] \text{ W/kg}$  for test separation distances ≤ 50 mm;  
where  $x = 7.5$  for 1-g SAR, and  $x = 18.75$  for 10-g SAR.
- 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is > 50 mm.

#### Body-worn

Max. tune-up tolerance limit		Min. test separation distance (mm)	Frequency (GHz)	SAR test exclusion Result*	RF Exposure Conditions	Estimated 1-g SAR (W/kg)
(dBm)	(mW)					
12.1	16	15	2.480	1.7	Body-worn	0.224

#### Conclusion:

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

## 11. SAR Measurement Variability

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

- 1) Repeated measurement is not required when the original highest measured SAR is  $< 0.8$  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  $3$  (1-g or 10-g respectively) 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  $> 1.20$  or  $3$  (1-g or 10-g respectively).

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)	First Repeated		Second Repeated		Third Repeated
						Measured SAR (W/kg)	Largest to Smallest SAR Ratio	Measured SAR (W/kg)	Largest to Smallest SAR Ratio	Measured SAR (W/kg)
700	LTE Band 13	Hotspot	Front	No	0.311	N/A	N/A	N/A	N/A	N/A
	LTE Band 17	Hotspot	Front	No	0.544	N/A	N/A	N/A	N/A	N/A
850	GSM 850	Hotspot	Front	No	0.354	N/A	N/A	N/A	N/A	N/A
	WCDMA Band V	Hotspot	Rear	No	0.391	N/A	N/A	N/A	N/A	N/A
	LTE Band 5	Body	Front	No	0.322	N/A	N/A	N/A	N/A	N/A
1900	GSM 1900	Body	Front	No	0.463	N/A	N/A	N/A	N/A	N/A
	WCDMA Band II	Head	Left Touch	No	0.666	N/A	N/A	N/A	N/A	N/A
2400	Wi-Fi 802.11b/g/n	Head	Left Touch	No	0.238	N/A	N/A	N/A	N/A	N/A
2600	LTE Band 7	Head	Right Touch	No	0.318	N/A	N/A	N/A	N/A	N/A
	LTE Band 41	Body	Rear	No	0.303	N/A	N/A	N/A	N/A	N/A
5300	Wi-Fi 802.11a/n/ac	Head	Left Touch	No	0.100	N/A	N/A	N/A	N/A	N/A
5500	Wi-Fi 802.11a/n/ac	Head	Left Touch	No	0.257	N/A	N/A	N/A	N/A	N/A
5800	Wi-Fi 802.11a/n/ac	Head	Left Touch	No	0.208	N/A	N/A	N/A	N/A	N/A

### Note(s):

Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is not  $> 1.20$  or  $3$  (1-g or 10-g respectively).

## 12. Simultaneous Transmission SAR Analysis

### Simultaneous Transmission Condition

Case	Cellular	WLAN/BT Main	WLAN/BT Sub	Note
1	GSM/GPRS/EDGE	BT/BLE	(None)	
2	GSM/GPRS/EDGE	WLAN 2.4G	WLAN 2.4G	
3	GSM/GPRS/EDGE	WLAN 5G	WLAN 5G	
4	UMTS/HSPA	BT/BLE	(None)	
5	UMTS/HSPA	WLAN 2.4G	WLAN 2.4G	
6	UMTS/HSPA	WLAN 5G	WLAN 5G	
7	LTE	BT/BLE	(None)	
8	LTE	WLAN 2.4G	WLAN 2.4G	
9	LTE	WLAN 5G	WLAN 5G	
10	(None)	BT WLAN 5G	WLAN 5G	
11	GSM/GPRS/EDGE	BT WLAN 5G	WLAN 5G	
12	UMTS/HSPA	BT WLAN 5G	WLAN 5G	
13	LTE	BT WLAN 5G	WLAN 5G	
14	GSM/GPRS/EDGE	WLAN 2.4G	WLAN 5G	
15	GSM/GPRS/EDGE	WLAN 5G	WLAN 2.4G	
16	GSM/GPRS/EDGE	BT WLAN 5G	WLAN 2.4G	
17	UMTS/HSPA	WLAN 2.4G	WLAN 5G	
18	UMTS/HSPA	WLAN 5G	WLAN 2.4G	
19	UMTS/HSPA	BT WLAN 5G	WLAN 2.4G	
20	LTE	WLAN 2.4G	WLAN 5G	
21	LTE	WLAN 5G	WLAN 2.4G	
22	LTE	BT WLAN 5G	WLAN 2.4G	

### 12.1. Sum of the SAR for WWAN & Wi-Fi DTS

RF Exposure conditions	Standalone SAR (W/kg)			$\Sigma$ 1-g SAR (W/kg)
	WWAN ①	DTS Chain 0 ②	DTS Chain 1 ③	WWAN + DTS ① + ② + ③
Head	0.666	0.286	0.291	1.243
Body-worn	0.572	0.017	0.097	0.686
Hotspot	0.701	0.052	0.146	0.899

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

RF Exposure conditions	Standalone SAR (W/kg)				$\Sigma$ 1-g SAR (W/kg)	
	WWAN ①	U-NII Chain 0 ②	U-NII Chain 1 ③	BT ④	WWAN + U-NII ① + ② + ③	WWAN + U-NII + BT ① + ② + ③ + ④
Head	0.666	0.257	0.254		1.177	
Body-worn	0.572	0.021	0.085	0.224	0.678	0.902

### 12.3. Sum of the SAR for WWAN & Wi-Fi DTS Chain 0 & Wi-Fi U-NII Chain 1

RF Exposure conditions	Standalone SAR (W/kg)			$\Sigma$ 1-g SAR (W/kg)
	WWAN ①	DTS Chain 0 ②	U-NII Chain 1 ③	WWAN + DTS + U-NII ① + ② + ③
Head	0.666	0.286	0.254	1.206
Body-worn	0.572	0.017	0.085	0.674
Hotspot	0.701	0.052		0.753

### 12.4. Sum of the SAR for WWAN & Wi-Fi DTS Chain 1 & Wi-Fi U-NII Chain 0 & BT

RF Exposure conditions	Standalone SAR (W/kg)				$\Sigma$ 1-g SAR (W/kg)	
	WWAN ①	DTS Chain 1 ②	U-NII Chain 0 ③	BT ④	WWAN + DTS + U-NII ① + ② + ③	WWAN + DTS + U-NII + BT ① + ② + ③ + ④
Head	0.666	0.291	0.257		1.214	
Body-worn	0.572	0.097	0.021	0.224	0.690	0.914
Hotspot	0.701	0.146			0.847	

#### Conclusion:

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

## **Appendixes**

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

**16J22997-S17V1 SAR\_App A Photos & Ant. Locations**

**16J22997-S17V1 SAR\_App B System Check Plots**

**16J22997-S17V1 SAR\_App C Highest Test Plots**

**16J22997-S17V1 SAR\_App D Tissue Ingredients**

**16J22997-S17V1 SAR\_App E Probe Cal. Certificates**

**16J22997-S17V1 SAR\_App F Dipole Cal. Certificates**

**END OF REPORT**