



**SAR EVALUATION REPORT**

**PERMISSIVE CHANGE**

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

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

**FCC ID: PY7-68552B**

**Report Number: 11785248-S1V1  
Issue Date: 7/10/2017**

*Prepared for*  
**SONY MOBILE COMMUNICATIONS INC.  
4-12-3 HIGASHI-SHINAGAWA  
SHINAGAWA-KU, TOKYO, 140-0002, JAPAN**

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



**NVLAP LAB CODE 200065-0**

**Revision History**

Rev.	Date	Revisions	Revised By
V1	7/10/2017	Initial Issue	--

**Table of Contents**

**1. Attestation of Test Results ..... 5**

**2. Test Specification, Methods and Procedures..... 6**

**3. Facilities and Accreditation ..... 6**

**4. SAR Measurement System & Test Equipment ..... 7**

    4.1. SAR Measurement System..... 7

    4.2. SAR Scan Procedures..... 8

    4.3. Test Equipment..... 10

**5. Measurement Uncertainty..... 10**

**6. Device Under Test (DUT) Information ..... 11**

    6.1. DUT Description ..... 11

    6.2. Wireless Technologies..... 12

    6.3. Maximum Output Power from Tune-up Procedure ..... 12

    6.4. General LTE SAR Test and Reporting Considerations..... 13

    6.5. LTE Carrier Aggregation ..... 14

    6.6. LTE (TDD) Considerations..... 15

**7. RF Exposure Conditions (Test Configurations)..... 16**

**8. Dielectric Property Measurements & System Check ..... 17**

    8.1. Dielectric Property Measurements ..... 17

    8.2. System Check..... 18

**9. Conducted Output Power Measurements..... 19**

    9.1. LTE..... 19

    9.2. LTE Carrier Aggregation ..... 24

**10. Measured and Reported (Scaled) SAR Results..... 25**

    10.1. LTE Band 7 (20MHz Bandwidth) ..... 26

    10.2. LTE Band 38 (20MHz Bandwidth) ..... 26

    10.3. LTE Band 41 (20MHz Bandwidth) ..... 26

**11. SAR Measurement Variability..... 27**

**12. Simultaneous Transmission SAR Analysis..... 28**

    12.1. Sum of the SAR for WWAN & Wi-Fi & BT..... 28

**Appendixes ..... 29**

    11785248-S1V1 SAR\_App A Setup Photos & Ant. Locations..... 29

    11785248-S1V1 SAR\_App B System Check Plots..... 29

---

11785248-S1V1 SAR_App C Highest Test Plots.....	29
11785248-S1V1 SAR_App D Tissue Ingredients.....	29
11785248-S1V1 SAR_App E Probe Cal. Certificates .....	29
11785248-S1V1 SAR_App F Dipole Cal. Certificate.....	29



# 1. Attestation of Test Results

Applicant Name	SONY MOBILE COMMUNICATIONS INC.			
FCC ID	PY7-68552B			
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	0.112	0.917	0.661	N/A
Body-worn	0.150	0.061	0.041	N/A
Hotspot/Wi-Fi Direct	0.320	0.134	N/A	N/A
Extremity	N/A	N/A	0.399	N/A
Simultaneous TX 1-g	1.203	1.203	1.203	0.635
Simultaneous TX 10-g	N/A	N/A	0.828	0.828
Date Tested	6/17/2017 to 6/20/2017			
Test Results	Pass			

**Note:** The proposed Permissive Change requires SAR testing for LTE Bands 7, 38 and 41 due to antenna pattern matching differences from the original model. The SAR measurement results from the original filing can be found in FCC SAR report PY7-81775I. This report only contains the SAR values for the modified LTE Bands. Please refer to the original filing for the highest SAR values. The Wi-Fi and BT results from the original filing have been used in this report for simultaneous transmission analysis. The Wi-Fi and BT results from the original filing are listed above.

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government (NIST Handbook 150, Annex A). This report is written to support regulatory compliance of the applicable standards stated above.

Approved & Released By: 	Prepared By: 
David Weaver Program Manager UL Verification Services Inc.	Coltyce Sanders 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:

- 447498 D01 General RF Exposure Guidance v06
- 447498 D03 Supplement C Cross-Reference v01
- 648474 D04 Handset SAR v01r03
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
- 865664 D02 RF Exposure Reporting v01r02
- 941225 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 37, RF Exposure Procedures Update (Other LTE Considerations)
- [TCB workshop](#) October, 2015; Page 6, RF Exposure Procedures (KDB 941225 D05A)
- [TCB workshop](#) April, 2016; Page 13, RF Exposure Procedures (LTE Carrier Aggregation)

## 3. Facilities and Accreditation

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

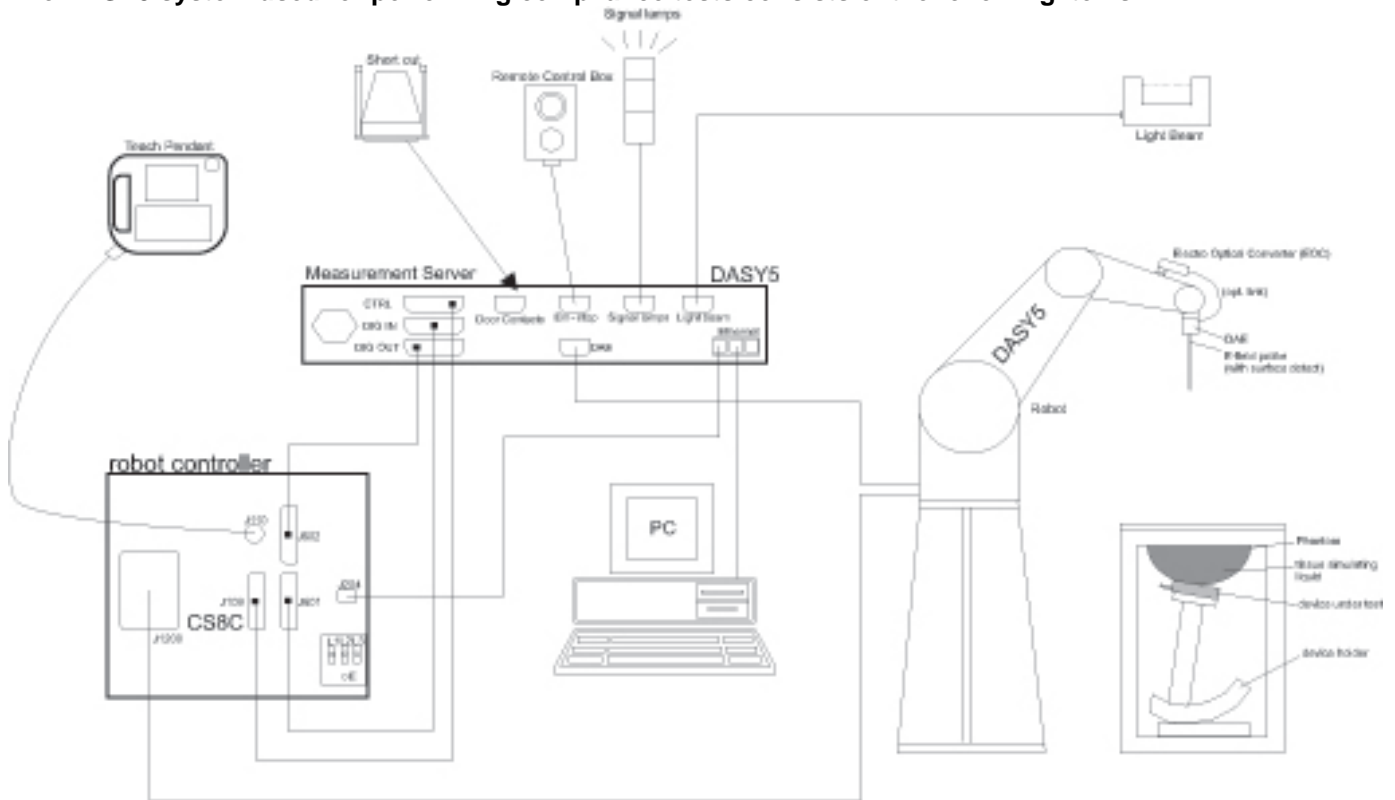
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 4
SAR Lab D	
SAR Lab E	
SAR Lab F	
SAR Lab G	
SAR Lab H	

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

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

**Step 4: Power drift measurement**

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

**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
S-Parameter Network Analyzer	Agilent	8753ES	MY40000980	5/10/2018
Dielectric Probe kit	SPEAG	DAK-3.5	2097	8/28/2018
Dielectric Probe kit	SPEAG	DAK-3.5	2052	2/16/2018
Shorting block	SPEAG	DAK-3.5 Short	SM DAK 200 BA	11/8/2017
Thermometer	Control Company	Traceable 4242	122529162	11/11/2017

#### System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Synthesized Signal Generator	Agilent	N5181A	MY50140610	5/31/2018
Power Meter	HP	437B	3125U11364	8/30/2017
Power Meter	HP	437B	3125U09248	9/14/2017
Power Sensor	Agilent	8481A	3318A95392	9/29/2017
Power Sensor	Agilent	8481A	2349A36506	9/29/2017
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1795093	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2710	N/A
DC Power Supply	HP	6296A	2841A-05955	N/A

#### Lab Equipment

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
E-Field Probe (SAR Lab 2)	SPEAG	EX3DV4	3686	8/25/2017
E-Field Probe (SAR Lab 3)	SPEAG	EX3DV4	3871	8/25/2017
Data Acquisition Electronics (SAR Lab 2)	SPEAG	DAE4	1433	3/8/2018
Data Acquisition Electronics (SAR Lab 3)	SPEAG	DAE4	1343	8/15/2017
System Validation Dipole	SPEAG	D2600V2	1036	3/10/2018
Thermometer (SAR Lab 2)	Traceable	15557603	160643193	7/25/2017
Thermometer (SAR Lab 3)	Traceable	15557603	160643167	7/25/2017

#### Other

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Base Station Simulator	R & S	CMW500	125236	3/6/2018
Base Station Simulator	R & S	CMW500	137873	7/8/2017
Base Station Simulator	R & S	CMW500	135393	5/15/2018

## 5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg, the 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): 147.9 mm x 73.4 mm Overall Diagonal: 163.1 mm Display Diagonal: 130.85 mm												
Back Cover	<input checked="" type="checkbox"/> The Back Cover is not removable.												
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	<table border="1"> <thead> <tr> <th>S/N</th> <th>Technology</th> <th>Notes</th> </tr> </thead> <tbody> <tr> <td>QV7000AK0Q</td> <td>LTE</td> <td>Radiated</td> </tr> <tr> <td>QV70009Y0Q</td> <td>LTE</td> <td>Radiated</td> </tr> <tr> <td>QV70005X0Q</td> <td>LTE</td> <td>Conducted</td> </tr> </tbody> </table>	S/N	Technology	Notes	QV7000AK0Q	LTE	Radiated	QV70009Y0Q	LTE	Radiated	QV70005X0Q	LTE	Conducted
S/N	Technology	Notes											
QV7000AK0Q	LTE	Radiated											
QV70009Y0Q	LTE	Radiated											
QV70005X0Q	LTE	Conducted											
Hardware Version	A												
Software Version	0.184												

### 6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing	
GSM	850 1900	Voice (GMSK)	GPRS Multi-Slot Class:	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%	
		GPRS (GMSK)	<input type="checkbox"/> Class 8 - 1 Up, 4 Down		
		EGPRS (8PSK)	<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		
Does this device support DTM (Dual Transfer Mode)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No					
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Rel. 5) HSUPA (Rel. 6) DC-HSDPA (Rel. 8) HSPA+ (Rel. 7)		100%	
LTE	FDD Band 2 FDD Band 4 FDD Band 5 FDD Band 7 FDD Band 12 FDD Band 13 FDD Band 17 FDD Band 25 FDD Band 26 FDD Band 29 (Rx Only) TDD Band 38 TDD Band 41 FDD Band 66	QPSK 16QAM <input checked="" type="checkbox"/> Rel. 11 Carrier Aggregation 4CC (1 Uplink and 4 Downlinks). (Carrier Aggregation is only supported for downlink and not for uplink.)		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 5.0 LE		N/A	

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

RF Air interface	Mode	Max. RF Output Power (dBm)
LTE Band 7	QPSK	22.5
	16QAM	22.5
	64QAM	22.5
LTE Band 38	QPSK	24.0
	16QAM	24.0
	64QAM	23.0
LTE Band 41	QPSK	24.0
	16QAM	24.0
	64QAM	23.0

### 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 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 rowspan="2">Low</td> <td>20850</td> <td>20825</td> <td>20800</td> <td>20775</td> <td></td> <td></td> </tr> <tr> <td>2510</td> <td>2507.5</td> <td>2505</td> <td>2502.5</td> <td></td> <td></td> </tr> <tr> <td rowspan="2">Mid</td> <td>21100</td> <td>21100</td> <td>21100</td> <td>21100</td> <td></td> <td></td> </tr> <tr> <td>2535</td> <td>2535</td> <td>2535</td> <td>2535</td> <td></td> <td></td> </tr> <tr> <td rowspan="2">High</td> <td>21350</td> <td>21375</td> <td>21400</td> <td>21425</td> <td></td> <td></td> </tr> <tr> <td>2560</td> <td>2562.5</td> <td>2565</td> <td>2567.5</td> <td></td> <td></td> </tr> <tr> <td rowspan="3">Band 38</td> <td colspan="6">Frequency Range: 2570 – 2620 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 rowspan="2">Low</td> <td>37850/ 2580</td> <td>37825/ 2577.5</td> <td>37800/ 2575</td> <td>37775/ 2572.5</td> <td></td> <td></td> </tr> <tr> <td>38000/ 2595</td> <td>38000/ 2595</td> <td>38000/ 2595</td> <td>38000/ 2595</td> <td></td> <td></td> </tr> <tr> <td rowspan="2">High</td> <td>38150/ 2610</td> <td>38175/ 2612.5</td> <td>38200/ 2615</td> <td>38225/ 2617.5</td> <td></td> <td></td> </tr> <tr> <td colspan="6">Frequency range: 2496 - 2690 MHz</td> </tr> <tr> <td rowspan="3">Band 41</td> <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> </table>	Band 7	Frequency range: 2500 - 2570 MHz						Channel Bandwidth						20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz	Low	20850	20825	20800	20775			2510	2507.5	2505	2502.5			Mid	21100	21100	21100	21100			2535	2535	2535	2535			High	21350	21375	21400	21425			2560	2562.5	2565	2567.5			Band 38	Frequency Range: 2570 – 2620 MHz						Channel Bandwidth						20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz	Low	37850/ 2580	37825/ 2577.5	37800/ 2575	37775/ 2572.5			38000/ 2595	38000/ 2595	38000/ 2595	38000/ 2595			High	38150/ 2610	38175/ 2612.5	38200/ 2615	38225/ 2617.5			Frequency range: 2496 - 2690 MHz						Band 41	Channel Bandwidth						20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz	Low	39750 / 2506.0						Low-Mid	40185 / 2549.5						Mid	40620 / 2593.0						Mid-High	41055 / 2636.5						High	41490 / 2680.0					
	Band 7		Frequency range: 2500 - 2570 MHz																																																																																																																																																					
			Channel Bandwidth																																																																																																																																																					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																																																																																																																																	
	Low	20850	20825	20800	20775																																																																																																																																																			
		2510	2507.5	2505	2502.5																																																																																																																																																			
	Mid	21100	21100	21100	21100																																																																																																																																																			
		2535	2535	2535	2535																																																																																																																																																			
	High	21350	21375	21400	21425																																																																																																																																																			
		2560	2562.5	2565	2567.5																																																																																																																																																			
	Band 38	Frequency Range: 2570 – 2620 MHz																																																																																																																																																						
		Channel Bandwidth																																																																																																																																																						
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																																																																																																																																	
	Low	37850/ 2580	37825/ 2577.5	37800/ 2575	37775/ 2572.5																																																																																																																																																			
		38000/ 2595	38000/ 2595	38000/ 2595	38000/ 2595																																																																																																																																																			
	High	38150/ 2610	38175/ 2612.5	38200/ 2615	38225/ 2617.5																																																																																																																																																			
Frequency range: 2496 - 2690 MHz																																																																																																																																																								
Band 41	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	Refer to Appendix A.																																																																																																																																																							
Maximum power reduction (MPR)	<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                      The manufacturer MPR values are always within the 3GPP maximum MPR allowance but may not follow the default MPR values.                      A-MPR (additional MPR) was disabled during SAR testing</p>	Modulation	Channel bandwidth / Transmission bandwidth (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																																																																																																																	
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																																																																																																																																																	
Power reduction	No																																																																																																																																																							
Spectrum plots for RB configurations	A properly configured base station simulator was used for the SAR and power measurements; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.																																																																																																																																																							

### 6.5. LTE Carrier Aggregation

Combination	CA configuration	Bandwidth (MHz)											
		PCC						SCC1					
		20	15	10	5	3	1.4	20	15	10	5	3	1.4
Intra-Band Contiguous	7C			√				√					
			√					√	√				
		√						√	√	√			
	38C		√						√				
						√			√				
				√					√	√			
41C								√					
			√					√	√				
	√							√	√	√	√		
Intra-Band Non- Contiguous	7A-7A				√				√				
				√					√	√			
		√							√				
Inter-Band Non- Contiguous	7A-12A	√	√	√	√					√	√		

**Note(s):**

This report contains CA combinations for the modified LTE bands. For all supported CA combinations and power measurements, please refer to FCC SAR Report PY7-81775I. For supported channels, please refer to §6.4

## 6.6. LTE (TDD) Considerations

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

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

Table 4.2-1: Configuration of Special Subframe (lengths of DwPTS/GP/UpPTS).

Special subframe configuration	Normal cyclic prefix in downlink			Extended cyclic prefix in downlink		
	DwPTS	UpPTS		DwPTS	UpPTS	
		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink
0	$6592 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$	$7680 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$
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  $\times (T_s) \times \#$  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

#### Note(s):

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

## 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
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-worn	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
			Edge 2 (Right)	< 25 mm	Yes
	Extremity	0 mm	Edge 3 (Bottom)	< 25 mm	Yes
			Edge 4 (Left)	< 25 mm	Yes
			Rear	< 25 mm	Yes
			Front	< 25 mm	Yes
			Edge 1 (Top)	> 25 mm	No
			Edge 2 (Right)	< 25 mm	Yes
			Edge 3 (Bottom)	< 25 mm	Yes
			Edge 4 (Left)	< 25 mm	Yes

### Notes:

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



## 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 $\pm 5\%$
2	6/17/2017	2600	Head	2600	37.68	39.01	-3.41	2.05	1.96	4.37
				2495	38.14	39.14	-2.56	1.93	1.85	4.18
				2690	37.44	38.90	-3.75	2.15	2.06	4.54
3	6/19/2017	2600	Body	2600	50.70	52.51	-3.45	2.11	2.16	-2.58
				2495	50.84	52.64	-3.43	1.99	2.01	-1.06
				2690	50.23	52.40	-4.14	2.19	2.29	-4.25

## 8.2. System Check

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

### System Performance Check Measurement Conditions:

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

### 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 %	
2	6/17/2017	Head	D2600V2 SN:1036	3/10/2018	6.040	60.40	57.50	<b>5.04</b>	2.650	26.50	25.60	3.52	1,2
3	6/19/2017	Body	D2600V2 SN:1036	3/10/2018	5.300	53.00	54.60	<b>-2.93</b>	2.330	23.30	24.50	-4.90	3,4

## 9. Conducted Output Power Measurements

### 9.1. LTE

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

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

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

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

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

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

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks ( $N_{RB}$ )	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	NA
NS_03	6.6.2.2.1	2, 4, 10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10,15,20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	n/a
NS_07	6.6.2.2.3	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 7 Measured Results**

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Meas. Avg Pwr (dBm)		
						2510 MHz	2535 MHz	2560 MHz
LTE Band 7	20	QPSK	1	0	0	21.9	22.1	22.2
			1	49	0	21.7	21.9	21.9
			1	99	0	21.7	21.8	21.9
			50	0	0	21.9	22.0	22.1
			50	24	0	21.8	22.0	22.0
			50	50	0	21.7	21.8	21.9
			100	0	0	21.8	21.9	22.0
		16QAM	1	0	0	21.8	22.0	22.2
			1	49	0	21.6	21.8	21.9
			1	99	0	21.6	21.7	21.9
			50	0	0	21.4	21.5	21.6
			50	24	0	21.3	21.5	21.5
			50	50	0	21.2	21.4	21.4
			100	0	0	21.3	21.4	21.5
		64QAM	1	0	0	21.4	21.5	21.5
			1	49	0	21.1	21.3	21.2
			1	99	0	21.2	21.3	21.2
			50	0	0.5	20.6	20.7	20.7
			50	24	0.5	20.6	20.7	20.5
			50	50	0.5	20.4	20.7	20.5
			100	0	0.5	20.5	20.7	20.6
Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Meas. Avg Pwr (dBm)		
						2507.5 MHz	2535 MHz	2562.5 MHz
LTE Band 7	15	QPSK	1	0	0	21.9	22.1	22.1
			1	37	0	21.8	22.0	22.0
			1	74	0	21.7	21.9	22.0
			36	0	0	21.9	22.0	22.2
			36	20	0	21.9	22.0	22.1
			36	39	0	21.8	22.0	22.0
			75	0	0	21.8	22.0	22.0
		16QAM	1	0	0	21.9	21.9	21.6
			1	37	0	21.6	21.8	21.4
			1	74	0	21.5	21.6	21.4
			36	0	0	21.4	21.6	21.7
			36	20	0	21.4	21.6	21.6
			36	39	0	21.3	21.5	21.4
			75	0	0	21.4	21.5	21.6
		64QAM	1	0	0	21.1	21.2	21.3
			1	37	0	21.0	21.0	21.2
			1	74	0	20.9	21.0	21.1
			36	0	0.5	20.3	20.4	20.6
			36	20	0.5	20.2	20.5	20.4
			36	39	0.5	20.2	20.4	20.4
			75	0	0.5	20.3	20.5	20.6

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

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Meas. Avg Pwr (dBm)		
						2505 MHz	2535 MHz	2565 MHz
LTE Band 7	10	QPSK	1	0	0	21.8	22.1	22.0
			1	25	0	21.8	22.0	22.0
			1	49	0	21.7	22.0	22.0
			25	0	0	21.9	22.0	22.1
			25	12	0	21.9	22.0	22.1
			25	25	0	21.8	21.9	22.1
			50	0	0	21.9	22.0	22.0
		16QAM	1	0	0	21.4	21.9	21.5
			1	25	0	21.4	21.8	21.4
			1	49	0	21.3	21.7	21.5
			25	0	0	21.5	21.5	21.7
			25	12	0	21.5	21.5	21.5
			25	25	0	21.5	21.5	21.6
			50	0	0	21.4	21.5	21.5
		64QAM	1	0	0	21.2	21.3	21.1
			1	25	0	21.2	21.2	21.0
			1	49	0	21.2	21.3	21.1
			25	0	0.5	20.4	20.6	20.7
			25	12	0.5	20.4	20.7	20.6
			25	25	0.5	20.4	20.6	20.5
			50	0	0.5	20.4	20.6	20.4
Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Meas. Avg Pwr (dBm)		
						2502.5 MHz	2535 MHz	2567.5 MHz
LTE Band 7	5	QPSK	1	0	0	22.0	21.9	22.1
			1	12	0	22.0	22.0	22.1
			1	24	0	22.0	21.9	22.1
			12	0	0	22.0	22.0	22.1
			12	7	0	22.0	22.0	22.1
			12	13	0	22.0	21.9	22.1
			25	0	0	22.0	22.0	22.1
		16QAM	1	0	0	21.6	21.9	21.7
			1	12	0	21.6	22.0	21.7
			1	24	0	21.6	21.9	21.7
			12	0	0	21.6	21.7	21.7
			12	7	0	21.6	21.7	21.7
			12	13	0	21.5	21.6	21.7
			25	0	0	21.4	21.6	21.6
		64QAM	1	0	0	21.2	21.3	21.4
			1	12	0	21.2	21.3	21.4
			1	24	0	21.1	21.2	21.4
			12	0	0.5	20.5	20.7	20.7
			12	7	0.5	20.5	20.7	20.6
			12	13	0.5	20.5	20.6	20.7
			25	0	0.5	20.4	20.7	20.6

**LTE Band 38 Measured Results**

SAR for LTE Band 38 (Frequency range: 2570-2620 MHz) is covered by LTE Band 41 (Frequency range: 2496-2690 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**LTE Band 41 Measured Results**

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Meas. Avg Pwr (dBm)						
						2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz		
LTE Band 41	20	QPSK	1	0	0	23.5	23.6	23.8	23.7	23.8		
			1	49	0	23.4	23.5	23.6	23.5	23.5		
			1	99	0	23.4	23.3	23.5	23.3	23.5		
			50	0	0	23.5	23.6	23.7	23.7	23.4		
			50	24	0	23.6	23.5	23.7	23.5	23.4		
			50	50	0	23.4	23.4	23.6	23.4	23.5		
		16QAM	100	0	0	23.6	23.4	23.7	23.5	23.2		
			1	0	0	23.0	23.2	23.2	23.2	23.4		
			1	49	0	22.8	23.0	23.0	23.0	23.1		
			1	99	0	22.8	22.9	22.8	22.8	23.1		
			50	0	1	22.0	22.1	22.2	22.2	22.2		
			50	24	1	22.0	22.0	22.2	22.0	22.1		
		64QAM	50	50	1	21.9	21.9	22.1	21.9	22.1		
			100	0	1	22.0	21.9	22.2	22.1	22.1		
			1	0	1	21.5	21.7	21.6	21.6	21.4		
			1	49	1	21.5	21.4	21.3	21.5	21.3		
			1	99	1	21.4	21.4	21.2	21.4	21.1		
			50	0	2	20.5	20.5	20.5	20.4	20.3		
		LTE Band 41	15	QPSK	50	24	2	20.4	20.6	20.3	20.4	20.3
					50	50	2	20.4	20.6	20.3	20.4	20.2
					100	0	2	20.4	20.6	20.3	20.4	20.2
1	0				0	23.1	23.6	23.6	23.8	23.6		
1	37				0	23.1	23.4	23.4	23.7	23.4		
1	74				0	23.2	23.3	23.3	23.6	23.4		
36	0				0	23.2	23.6	23.4	23.7	23.4		
16QAM	36			20	0	23.2	23.6	23.5	23.7	23.5		
	36			39	0	23.2	23.5	23.4	23.6	23.5		
	75			0	0	23.2	23.5	23.4	23.5	23.2		
	1			0	0	22.7	23.3	23.0	23.3	23.2		
	1			37	0	22.6	23.1	22.9	23.1	23.0		
	1			74	0	22.6	23.0	22.8	23.0	23.0		
	36			0	1	21.7	22.2	21.9	22.3	22.1		
64QAM	36			20	1	21.6	22.1	22.0	22.3	22.1		
	36	39	1	21.7	22.0	21.9	22.2	22.1				
	75	0	1	21.7	22.1	22.0	22.2	22.0				
	1	0	1	21.6	21.8	21.5	21.5	21.5				
	1	37	1	21.6	21.6	21.4	21.2	21.4				
	1	74	1	21.4	21.6	21.2	21.2	21.0				
	36	0	2	20.5	20.6	20.4	20.2	20.3				
64QAM	36	20	2	20.5	20.6	20.3	20.4	20.2				
	36	39	2	20.5	20.5	20.3	20.4	20.1				
	75	0	2	20.4	20.3	20.3	20.4	20.1				

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

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Meas. Avg Pwr (dBm)						
						2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz		
LTE Band 41	10	QPSK	1	0	0	23.3	23.4	23.3	23.6	23.7		
			1	25	0	23.2	23.3	23.3	23.5	23.6		
			1	49	0	23.3	23.2	23.2	23.4	23.6		
			25	0	0	23.3	23.4	23.4	23.4	23.6		
			25	12	0	23.3	23.4	23.4	23.5	23.5		
			25	25	0	23.3	23.3	23.4	23.3	23.5		
		16QAM	1	0	0	22.8	22.8	23.0	23.1	23.3		
			1	25	0	22.7	22.7	22.9	23.0	23.1		
			1	49	0	22.7	22.7	22.8	22.9	23.2		
			25	0	1	21.8	21.9	22.0	22.1	22.1		
			25	12	1	21.7	21.8	21.9	22.0	22.1		
			25	25	1	21.8	21.8	21.8	22.0	22.0		
		64QAM	1	0	1	21.3	21.9	21.4	21.4	21.1		
			1	25	1	21.3	21.8	21.3	21.3	21.0		
			1	49	1	21.2	21.6	21.3	21.3	21.0		
			25	0	2	20.5	20.5	20.3	20.3	20.3		
			25	12	2	20.5	20.6	20.3	20.2	20.2		
			25	25	2	20.4	20.5	20.3	20.2	20.2		
		LTE Band 41	5	QPSK	1	0	0	23.3	23.6	23.4	23.6	23.5
					1	12	0	23.2	23.5	23.3	23.5	23.5
					1	24	0	23.3	23.5	23.3	23.5	23.5
12	0				0	23.2	23.6	23.3	23.5	23.5		
12	7				0	23.2	23.6	23.4	23.6	23.5		
12	13				0	23.3	23.5	23.3	23.5	23.5		
16QAM	25			0	0	23.2	23.6	23.3	23.4	23.4		
	1			0	0	22.7	23.0	22.8	23.1	23.1		
	1			12	0	22.6	22.9	22.7	23.1	23.1		
	1			24	0	22.7	22.9	22.7	23.1	23.1		
	12			0	1	21.7	22.1	21.8	22.2	22.1		
	12			7	1	21.7	22.1	21.8	22.1	22.1		
64QAM	12			13	1	21.7	22.0	21.8	22.1	22.1		
	25			0	1	21.7	22.0	21.9	22.1	22.0		
	1			0	1	21.5	21.7	21.4	21.4	21.2		
	1			12	1	21.5	21.7	21.5	21.4	21.1		
	1			24	1	21.5	21.6	21.4	21.3	21.2		
	12			0	2	20.5	20.6	20.3	20.3	20.2		
	12			7	2	20.5	20.6	20.3	20.3	20.2		
	12			13	2	20.5	20.6	20.3	20.3	20.2		
	25			0	2	20.5	20.6	20.3	20.3	20.2		

## 9.2. LTE Carrier Aggregation

Type	LTE CA combinations		PCC (UL)					SCC (DL)			LTE Rel 8 Tx. Power [dBm]	LTE Rel 11 Tx. Power [dBm]	Delta	
	PCC	+	SCC	Mode	BW (MHz)	Channel	Freq. (MHz)	RB/Offset	BW (MHz)	Channel				Freq. (MHz)
Intra-BandContiguous	7C			QPSK	20	21001	2525.1	1,0	20	3199	2664.9	22.08	22.00	-0.4%
	38C			QPSK	20	37901	2585.1	1,0	20	38099	2604.9	23.88	23.89	0.0%
	41C			QPSK	20	39750	2506.0	1,0	20	39948	2525.8	23.60	23.56	-0.2%
Intra-Band Non-Contiguous	7A	+	7A	QPSK	20	20850	2510.0	1,0	20	3350	2680.0	22.14	22.08	-0.3%
Inter-Band Non-Contiguous	7A	+	12A	QPSK	20	21100	2535.0	1,0	10	5095	737.5	22.36	22.34	-0.1%

**Note:**

- This report contains CA combinations for the modified LTE bands. For all supported CA combinations and power measurements, please refer to FCC SAR Report PY7-817751.
- Per KDB 941225 D05A LTE Rel. 10 KDB Inquiry Sheet: SAR is excluded for Carrier Aggregation when measured power does not exceed LTE Release 8 by more than a 1/4 dBm.



## 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 648474 D04 Handset SAR (Phablet):

When Hotspot Mode is not supported, 10-g Extremity SAR is required for all surfaces and edges with an antenna located at  $\leq 25$  mm from that surface or edge in direct contact with a flat phantom, to address interactive hand use exposure conditions.

When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR  $> 1.2$  W/kg.

### 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.

**10.1. 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	0	22.5	22.1	0.095	<b>0.104</b>	1
						50	0	22.5	22.0	0.068	0.076	
			Left Tilt	21100	2535.0	1	0	22.5	22.1	0.019	0.021	
						50	0	22.5	22.0	0.022	0.025	
			Right Touch	21100	2535.0	1	0	22.5	22.1	0.086	0.094	
						50	0	22.5	22.0	0.079	0.089	
			Right Tilt	21100	2535.0	1	0	22.5	22.1	0.035	0.038	
						50	0	22.5	22.0	0.037	0.042	
Body-worn	QPSK	15	Rear	21100	2535.0	1	0	22.5	22.1	0.122	0.134	
						50	0	22.5	22.0	0.114	0.128	
			Front	21100	2535.0	1	0	22.5	22.1	0.137	<b>0.150</b>	2
						50	0	22.5	22.0	0.129	0.145	
Hotspot	QPSK	10	Rear	21100	2535.0	1	0	22.5	22.1	0.163	0.179	
						50	0	22.5	22.0	0.175	0.196	
			Front	21100	2535.0	1	0	22.5	22.1	0.292	<b>0.320</b>	3
						50	0	22.5	22.0	0.225	0.252	
			Edge 2	21100	2535.0	1	0	22.5	22.1	0.025	0.027	
						50	0	22.5	22.0	0.025	0.028	
			Edge 3	21100	2535.0	1	0	22.5	22.1	0.248	0.272	
						50	0	22.5	22.0	0.230	0.258	
			Edge 4	21100	2535.0	1	0	22.5	22.1	0.037	0.041	
						50	0	22.5	22.0	0.043	0.048	

**10.2. LTE Band 38 (20MHz Bandwidth)**

SAR for LTE Band 38 (Frequency range: 2570-2620 MHz) is covered by LTE Band 41 (Frequency range: 2496-2690 MHz) due to overlapping frequency range, same maximum tune-up limit and same channel bandwidth.

**10.3. 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	0	24.0	23.8	0.062	0.065	
						50	0	24.0	23.7	0.048	0.051	
			Left Tilt	40620	2593.0	1	0	24.0	23.8	0.019	0.020	
						50	0	24.0	23.7	0.019	0.020	
			Right Touch	40620	2593.0	1	0	24.0	23.8	0.107	<b>0.112</b>	4
						50	0	24.0	23.7	0.086	0.092	
			Right Tilt	40620	2593.0	1	0	24.0	23.8	0.043	0.045	
						50	0	24.0	23.7	0.032	0.034	
Body-worn	QPSK	15	Rear	40620	2593.0	1	0	24.0	23.8	0.093	<b>0.097</b>	5
						50	0	24.0	23.7	0.076	0.081	
			Front	40620	2593.0	1	0	24.0	23.8	0.086	0.090	
						50	0	24.0	23.7	0.072	0.077	
Hotspot	QPSK	10	Rear	40620	2593.0	1	0	24.0	23.8	0.169	0.176	
						50	0	24.0	23.7	0.137	0.147	
			Front	40620	2593.0	1	0	24.0	23.8	0.174	0.181	
						50	0	24.0	23.7	0.141	0.151	
			Edge 2	40620	2593.0	1	0	24.0	23.8	0.069	0.072	
						50	0	24.0	23.7	0.050	0.054	
			Edge 3	40620	2593.0	1	0	24.0	23.8	0.205	<b>0.214</b>	6
						50	0	24.0	23.7	0.172	0.184	
			Edge 4	40620	2593.0	1	0	24.0	23.8	0.050	0.052	
						50	0	24.0	23.7	0.035	0.038	

## 11. SAR Measurement Variability

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

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

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)
2500	LTE Band 7	Hotspot	Front	No	0.292
2600	LTE Band 41	Hotspot	Edge 3	No	0.205

**Note(s):**

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

## 12. Simultaneous Transmission SAR Analysis

### Simultaneous Transmission Condition

Case	Cellular	WLAN Chain 0 / BT	WLAN Chain 1
1	GSM/GPRS/Edge	BT/BLE	(None)
2	GSM/GPRS/Edge	WLAN 2.4G	(None)
3	GSM/GPRS/Edge	WLAN 2.4G	WLAN 2.4G
4	GSM/GPRS/Edge	WLAN 2.4G	WLAN 5G
5	GSM/GPRS/Edge	WLAN 5G	WLAN 5G
6	GSM/GPRS/Edge	BT WLAN 5G	WLAN 5G
7	UMTS/HSPA	BT/BLE	(None)
8	UMTS/HSPA	WLAN 2.4G	(None)
9	UMTS/HSPA	WLAN 2.4G	WLAN 2.4G
10	UMTS/HSPA	WLAN 2.4G	WLAN 5G
11	UMTS/HSPA	WLAN 5G	WLAN 5G
12	UMTS/HSPA	BT WLAN 5G	WLAN 5G
13	LTE	BT/BLE	(None)
14	LTE	WLAN 2.4G	(None)
15	LTE	WLAN 2.4G	WLAN 2.4G
16	LTE	WLAN 2.4G	WLAN 5G
17	LTE	WLAN 5G	WLAN 5G
18	LTE	BT WLAN 5G	WLAN 5G
19	(None)	BT WLAN 5G	WLAN 5G

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

RF Exposure conditions	Test Position	Standalone SAR (W/kg)						Σ 1-g SAR (W/kg)							
		WWAN		DTS		U-NII		BT	WWAN + BT	WWAN + DTS	WWAN + DTS	WWAN + U-NII	WWAN+DTS+U-NII	WWAN+U-NII+BT	U-NII+BT
		①	Chain 0 ②	Chain 1 ③	Chain 0 ④	Chain 1 ⑤	⑥	① + ⑥	① + ②	① + ② + ③	① + ④ + ⑤	① + ② + ⑤	① + ④ + ⑤ + ⑥	④ + ⑤ + ⑥	
Head	Left Touch	0.104	0.181	0.266	0.326	0.174			0.285	0.551	0.604	0.459		0.500	
	Left Tilt	0.025	0.181	0.108	0.326	0.174			0.206	0.314	0.525	0.380		0.500	
	Right Touch	0.112	0.917	0.029	0.661	0.174			1.029	1.058	0.947	1.203		0.835	
	Right Tilt	0.045	0.418	0.027	0.436	0.174			0.463	0.490	0.655	0.637		0.610	
Body-worn	Rear	0.134	0.061	0.009	0.041	0.023	0.210	0.344	0.195	0.204	0.198	0.218	0.408	0.274	
	Front	0.150	0.061	0.009	0.041	0.023	0.210	0.360	0.211	0.220	0.214	0.234	0.424	0.274	
Hotspot	Rear	0.196	0.134	0.024			0.315	0.511	0.330	0.354					
	Front	0.320	0.134	0.024			0.315	0.635	0.454	0.478					
	Edge 1		0.134	0.024			0.315	0.315	0.134	0.158					
	Edge 2	0.072		0.024					0.072	0.096					
	Edge 3	0.272						0.272	0.272	0.272					
	Edge 4	0.052	0.134				0.315	0.367	0.186	0.186					

#### Conclusion:

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

## **Appendixes**

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

**11785248-S1V1 SAR\_App A Setup Photos & Ant. Locations**

**11785248-S1V1 SAR\_App B System Check Plots**

**11785248-S1V1 SAR\_App C Highest Test Plots**

**11785248-S1V1 SAR\_App D Tissue Ingredients**

**11785248-S1V1 SAR\_App E Probe Cal. Certificates**

**11785248-S1V1 SAR\_App F Dipole Cal. Certificate**

**END OF REPORT**