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: PY7-66475M

Report Number: 11626381M-S1V2
Issue Date: 5/18/2017

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

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Date	Revisions	Revised By
V1	5/2/2017	Initial Issue	--
V2	5/18/2017	Section 1: Fixed notes for modified LTE bands. Updated Highest Reported SAR values. Section 8.2: Added plot numbers Section 12: Updated WLAN results	Coltyce Sanders

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1. Attestation of Test Results

Applicant Name	SONY MOBILE COMMUNICATIONS INC.			
FCC ID	PY7-66475M			
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	0.514	0.777	0.437	N/A
Body-worn	0.261	0.051	0.046	
Hotspot/Wi-Fi Direct	0.490	0.144	N/A	
Extremity	N/A		0.266	
Simultaneous TX (1g)	1.187	1.187	1.176	0.539
Simultaneous TX (10g)	N/A		0.749	
Date Tested	4/10/2017 to 4/12/2017			
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 PY7-08618T. This report only contains the SAR values for the modified LTE Bands. Please refer to the original filling for the highest SAR values. The Wi-Fi and BT results from the original filling have been used in this report for simultaneous transmission analysis. The Wi-Fi and BT results from the original filling 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

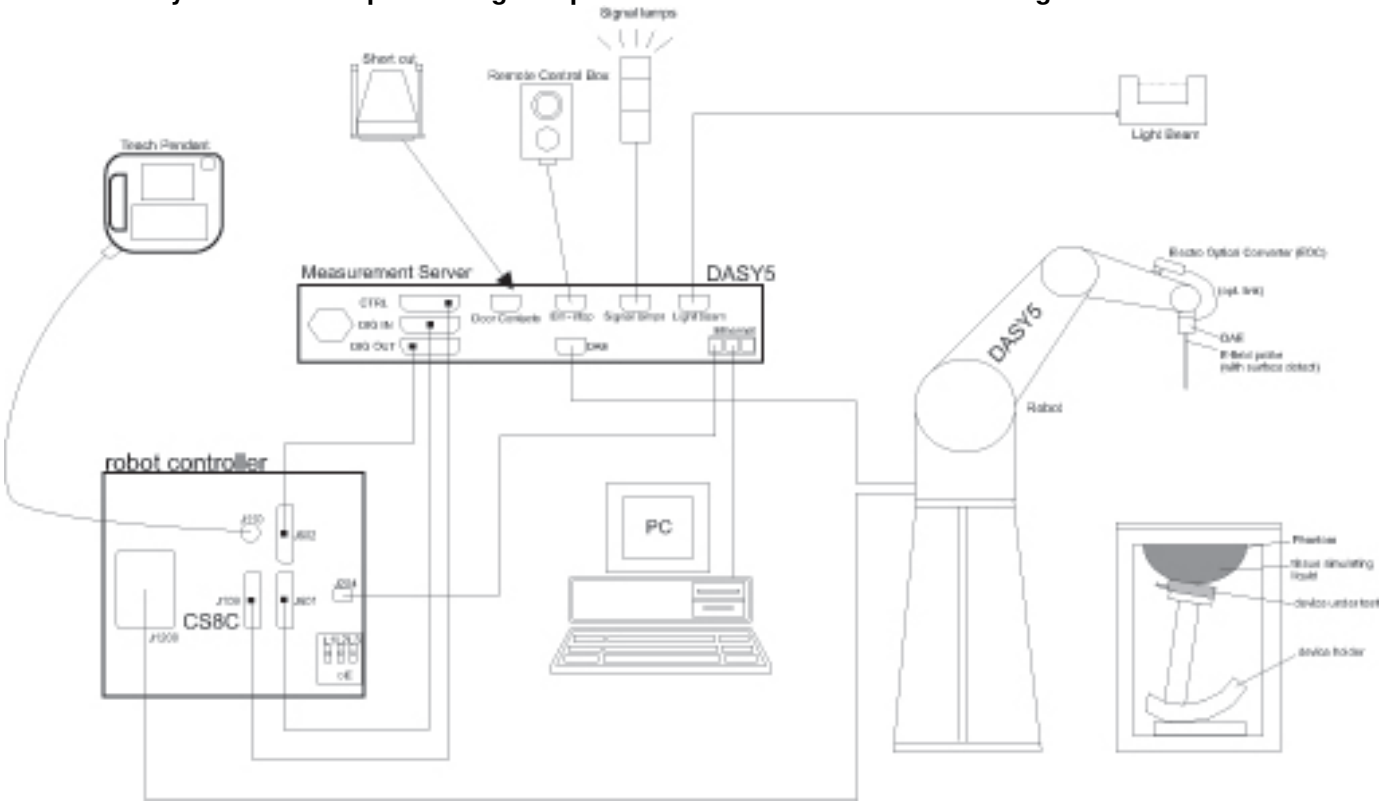
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 4
SAR Lab D	
SAR Lab E	
SAR Lab F	
SAR Lab G	
SAR Lab H	

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

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Step 3: Zoom Scan

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

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

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	≤ 1.5·$\Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

Step 4: Power drift measurement

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

Step 5: Z-Scan (FCC only)

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

4.3. Test Equipment

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

Dielectric Property Measurements

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Network Analyzer	Agilent	8753ES	MY40000980	4/27/2017
Dielectric Probe kit	SPEAG	DAK-3.5	1087	11/8/2017
Shorting block	SPEAG	DAK-3.5 Short	SM DAK 200 BA	11/8/2017
Thermometer	Traceable Calibration Control Co.	4242	140493798	8/9/2017

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Synthesized Signal Generator	Agilent	N5181A	MY50140610	5/9/2017
Power Meter	Keysight	N1912A	MY55196008	5/3/2017
Power Sensor	Agilent	E9323A	US40411556	11/11/2017
Power Sensor	Agilent	E9323A	MY53070009	6/13/2017
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1795093	N/A
Directional coupler	Werlatone	C8060-102	2149	N/A
DC Power Supply	BK PRECISION	1161	215-02292	N/A

Lab Equipment

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
E-Field Probe (SAR Lab D)	SPEAG	EX3DV4	3936	7/26/2017
Data Acquisition Electronics (SAR Lab D)	SPEAG	DAE4	1359	2/10/2018
System Validation Dipole	SPEAG	D2600V2	1006	9/13/2017

Other

Name of Equipment	Manufacturer	Type/Model	T Number	Serial No.	Cal. Due Date
Power Sensor	Agilent	N1921A	T 309	MY52270022	12/17/2017
Power Meter	Agilent	N1912A	T1263	MY55196004	7/8/2017
Base Station Simulator	R & S	CMW500	T970	137875-DZ	71/2017

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 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 x Thickness): 155.8 mm x 77.44 mm Overall Diagonal: 173 mm Display Diagonal: 139 mm
Back Cover	☒ The Back Cover is not removable.
Battery Options	☒ The rechargeable battery is not user accessible.
Accessory	Headset
Wireless Router (Hotspot)	Wi-Fi Hotspot mode permits the device to share its cellular data connection with other Wi-Fi-enabled devices. ☒ Mobile Hotspot (Wi-Fi 2.4 GHz)
Wi-Fi Direct	Wi-Fi Direct enabled devices transfer data directly between each other ☒ Wi-Fi Direct (Wi-Fi 2.4 GHz)
Test sample information	**S/N** / **Technology** / **Notes** CB512DRH20 / LTE (Main2-HB) #1 / Radiated CB512DRH35 / LTE (Main2-HB) #2 / Radiated CB512DJPC6 / LTE HB Power / Conducted
Hardware Version	A
Software Version	1.11

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: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ 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)? ☒ Yes ☐ No			
W-CDMA (UMTS)	Band II Band IV Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Rel. 5) HSUPA (Rel. 6) HSPA+ (Rel. 7) DC-HSDPA (Rel. 8)		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 26 TDD Band 38 TDD Band 41	QPSK 16QAM 64QAM ☒ Rel. 11 Carrier Aggregation (1 Uplink and 3 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)? ☐ Yes ☒ 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? ☒ Yes ☐ No			
	Does this device support Band gap channel(s)? ☒ Yes ☐ No			
Bluetooth	2.4 GHz	Version 5.0 LE		N/A

6.3. Maximum Output Power from Tune-up Procedure

RF Air Interface	LTE			Mode					
				QPSK		16QAM		64QAM	
Band	BW	CH	RB Config	Target [dBm]	Tolerance +-[dB]	Target [dBm]	Tolerance +-[dB]	Target [dBm]	Tolerance +-[dB]
LTE B7	5MHz, 10MHz 15MHz, 20MHz	Low	1RB	20.5	-1.5~+1.0	19.5	-1.5~+1.0	18.5	-1.5~+1.0
		Mid	50% RB	19.5	-1.5~+1.0	18.5	-1.5~+1.0	17.5	-1.5~+1.0
		High	100% RB	19.5	-1.5~+1.0	18.5	-1.5~+1.0	17.5	-1.5~+1.0
LTE B38	5MHz, 10MHz, 15MHz, 20MHz	Low	1RB	21.5	-1.5~+1.0	20.5	-1.5~+1.0	19.5	-1.5~+1.0
		Mid	50% RB	20.5	-1.5~+1.0	19.5	-1.5~+1.0	18.5	-1.5~+1.0
		High	100% RB	20.5	-1.5~+1.0	19.5	-1.5~+1.0	18.5	-1.5~+1.0
LTE B41	5MHz, 10MHz, 15MHz, 20MHz	Low	1RB	21.5	-1.5~+1.0	20.5	-1.5~+1.0	19.5	-1.5~+1.0
		Mid	50% RB	20.5	-1.5~+1.0	19.5	-1.5~+1.0	18.5	-1.5~+1.0
		High	100% RB	20.5	-1.5~+1.0	19.5	-1.5~+1.0	18.5	-1.5~+1.0

6.4. General LTE SAR Test and Reporting Considerations

<table>
<tr><td>Item</td><td colspan="7">Description</td></tr>
<tr><td rowspan="15">Frequency range, Channel Bandwidth, Numbers and Frequencies</td><td rowspan="2">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="2">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>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>Mid</td><td>38000/
2595</td><td>38000/
2595</td><td>38000/
2595</td><td>38000/
2595</td><td></td><td></td></tr>
<tr><td>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 rowspan="2">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="4">39750 / 2506.0</td><td></td><td></td></tr>
<tr><td>Low-Mid</td><td colspan="4">40185 / 2549.5</td><td></td><td></td></tr>
<tr><td>Mid</td><td colspan="4">40620 / 2593.0</td><td></td><td></td></tr>
<tr><td>Mid-High</td><td colspan="4">41055 / 2636.5</td><td></td><td></td></tr>
<tr><td>High</td><td colspan="4">41490 / 2680.0</td><td></td><td></td></tr>
<tr><td>LTE transmitter and antenna implementation</td><td colspan="7">Refer to Appendix A.</td></tr>
<tr><td>Maximum power reduction (MPR)</td><td colspan="7">Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3
<table><tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (RB)</th><th rowspan="2">MPR (dB)</th></tr><tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr><tr><td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 1</td></tr><tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr><tr><td>16 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 2</td></tr></table>
MPR Built-in by design
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</td></tr>
<tr><td>Power reduction</td><td colspan="7">No</td></tr>
<tr><td>Spectrum plots for RB configurations</td><td colspan="7">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>

6.5. LTE Carrier Aggregation

Combination	CA configuration	Bandwidth (MHz)											
		Carrier 1						Carrier 2					
		20	15	10	5	3	1.4	20	15	10	5	3	1.4
Intra-Band contiguous	12B				√					√	√		
	7C			√				√					
			√					√	√				
		√						√	√	√			
	41C				√			√					
				√				√					
			√					√	√				
		√						√	√	√	√		
Intra-Band non-contiguous	2A-2A	√	√	√	√			√	√	√	√		
	4A-4A	√	√	√	√			√	√	√	√		
	7A-7A				√				√				
				√					√	√			
			√					√	√				
		√						√					
Inter-Band non-contiguous	2A-4A	√	√	√	√	√	√	√	√	√	√		
	2A-5A	√	√	√	√					√	√		
	2A-7A	√	√	√	√			√	√	√	√		
	2A-12A	√	√	√	√					√	√	√	
	2A-13A	√	√	√	√					√			
	2A-17A			√	√					√	√		
	4A-5A	√	√	√	√					√	√		
	4A-7A			√	√			√	√	√	√		
	4A-12A	√	√	√	√	√	√			√	√	√	
	4A-13A	√	√	√	√					√			
	4A-17A			√	√					√	√		
	7A-12A	√	√	√	√					√	√		

Note(s):

For supported channels, please refer to §6.4

Combination	CA configuration	Bandwidth (MHz)																	
		Carrier 1						Carrier 2						Carrier 3					
		20	15	10	5	3	1.4	20	15	10	5	3	1.4	20	15	10	5	3	1.4
Inter-Band non-contiguous	2A-4A-4A	√	√	√	√			√	√	√	√			√	√	√	√		
	2A-2A-13A	√	√	√	√			√	√	√	√						√		
	4A-4A-5A	√	√	√	√			√	√	√	√					√	√		
	4A-12B	√	√	√	√						√					√	√		
	4A-4A-12A	√	√	√	√			√	√	√	√					√	√		
	4A-4A-13A	√	√	√	√			√	√	√	√					√			
	2A-4A-5A	√	√	√	√			√	√	√	√					√	√		
	2A-4A-12A	√	√	√	√			√	√	√	√					√	√		
	2A-4A-13A	√	√	√	√			√	√	√	√					√			

Note(s):

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	$26336 \cdot T_s$			$7680 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$
5	$6592 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$	$20480 \cdot T_s$		
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_s) x # of S + # of U

Example for Calculated Duty Cycle for Uplink-Downlink Configuration 0:
Calculated Duty Cycle = 5120 x [1/(15000 x 2048)] x 2 + 6 ms = 63.33%
where
T_s = 1/(15000 x 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	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-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	1
			Edge 2 (Right)	<	25 mm	Yes	
			Edge 3 (Bottom)	<	25 mm	Yes	
			Edge 4 (Left)	<	25 mm	Yes	
	Extremity	0 mm	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:

1. SAR is not required because the distance from the antenna to the edge is > 25 mm as per KDB 941225 D06 Hot Spot SAR.
2. 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.
3. 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 ± 2°C of the temperature when the tissue parameters are characterized.
The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.
Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.
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 εr and σ may be relaxed to ± 10%. This is limited to frequencies ≤ 3 GHz.

Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

Target Frequency (MHz)	Head		Body	
	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00

IEEE Std 1528-2013

Refer to Table 3 within the IEEE Std 1528-2013

Dielectric Property Measurements Results:

SAR Room	Date	Tissue Type	Band (MHz)	Frequency (MHz)	Relative Permittivity (εr)			Conductivity (σ)		
					Measured	Target	Delta ±5 %	Measured	Target	Delta ±5 %
D	4/10/2017	2600	Body	2600	50.34	52.51	-4.13	2.23	2.16	3.06
				2495	50.62	52.64	-3.84	2.10	2.01	4.06
				2690	50.10	52.40	-4.38	2.34	2.29	2.48
D	4/10/2017	2600	Head	2600	38.01	39.01	-2.57	2.00	1.96	1.83
				2495	38.38	39.14	-1.95	1.88	1.85	1.80
				2690	37.68	38.90	-3.13	2.10	2.06	2.07

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 %	
D	4/10/2017	Body	D2600V2 SN:1006	9/13/2017	5.740	57.40	54.20	5.90	2.500	25.00	24.30	2.88	1,2
D	4/10/2017	Head	D2600V2 SN:1006	9/13/2017	5.730	57.30	55.50	3.24	2.500	25.00	25.00	0.00	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 6.6.3.3.2	13	10	Table 6.2.4-2	Table 6.2.4-2
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23[1]	1.4, 3, 5, 10	Table 6.2.4-5	Table 6.2.4-5
..					
NS_32	-	-	-	-	-
Note 1: Applies to the lower block of Band 23, i.e. a carrier placed in the 2000-2010 MHz region.					

LTE Band 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	21.0	21.2	21.0
			1	49	0	20.7	20.8	20.9
			1	99	0	20.5	20.6	21.1
			50	0	1	19.9	20.0	20.1
			50	24	1	19.8	19.9	20.1
			50	50	1	19.6	19.7	20.1
			100	0	1	19.7	19.8	20.1
		16QAM	1	0	1	20.4	20.5	20.4
			1	49	1	20.2	20.1	20.4
			1	99	1	20.0	19.8	20.5
			50	0	2	18.9	19.0	19.0
			50	24	2	18.8	18.9	19.1
			50	50	2	18.6	18.7	19.1
			100	0	2	18.8	18.8	19.1
		64QAM	1	0	2	19.0	19.3	19.1
			1	49	2	18.8	18.9	19.1
			1	99	2	18.7	18.7	19.2
			50	0	3	17.9	17.9	17.9
			50	24	3	17.8	17.8	18.0
			50	50	3	17.7	17.7	18.0
			100	0	3	17.8	17.8	18.0
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	21.0	21.0	21.1
			1	37	0	20.8	20.7	21.0
			1	74	0	20.7	20.5	21.2
			36	0	1	20.0	19.9	20.1
			36	20	1	20.0	19.8	20.1
			36	39	1	19.9	19.7	20.1
			75	0	1	19.9	19.8	20.1
		16QAM	1	0	1	19.9	20.4	20.4
			1	37	1	19.7	20.0	20.4
			1	74	1	19.6	19.9	20.5
			36	0	2	19.0	19.0	19.0
			36	20	2	19.0	18.8	19.1
			36	39	2	18.9	18.7	19.1
			75	0	2	18.9	18.8	19.1
		64QAM	1	0	2	19.2	19.2	19.2
			1	37	2	19.1	18.8	19.2
			1	74	2	19.0	18.8	19.4
			36	0	3	17.9	17.9	17.9
			36	20	3	17.9	17.8	18.0
			36	39	3	17.9	17.6	18.1
			75	0	3	17.9	17.8	18.0

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	20.8	20.9	21.0
			1	25	0	20.7	20.8	21.0
			1	49	0	20.7	20.6	21.1
			25	0	1	19.9	19.9	20.1
			25	12	1	19.9	19.9	20.2
			25	25	1	19.8	19.8	20.2
			50	0	1	19.9	19.8	20.2
		16QAM	1	0	1	19.8	20.3	20.1
			1	25	1	19.7	20.1	20.1
			1	49	1	19.6	20.0	20.2
			25	0	2	18.9	18.9	19.2
			25	12	2	18.9	18.9	19.3
			25	25	2	18.9	18.8	19.2
			50	0	2	18.9	18.8	19.2
		64QAM	1	0	2	19.0	18.9	19.0
			1	25	2	19.0	18.7	19.1
			1	49	2	19.0	18.6	19.1
			25	0	3	17.8	17.8	17.9
			25	12	3	17.8	17.8	17.9
			25	25	3	17.8	17.7	18.0
			50	0	3	17.8	17.7	17.9
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	21.1	20.8	21.0
			1	12	0	21.1	20.7	21.1
			1	24	0	21.1	20.6	21.1
			12	0	1	20.1	19.9	20.2
			12	7	1	20.1	19.8	20.2
			12	13	1	20.1	19.8	20.2
			25	0	1	20.1	19.8	20.2
		16QAM	1	0	1	20.5	19.9	20.3
			1	12	1	20.5	19.8	20.4
			1	24	1	20.5	19.8	20.4
			12	0	2	19.3	18.9	19.3
			12	7	2	19.3	18.9	19.3
			12	13	2	19.3	18.8	19.3
			25	0	2	19.2	18.8	19.2
		64QAM	1	0	2	19.2	19.0	19.1
			1	12	2	19.2	18.9	19.2
			1	24	2	19.2	18.8	19.2
			12	0	3	18.0	17.8	18.0
			12	7	3	18.1	17.8	18.0
			12	13	3	18.0	17.7	18.0
			25	0	3	18.0	17.7	18.0

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	21.8	21.9	21.8	21.7	21.6
			1	49	0	21.6	21.7	21.5	21.5	21.3
			1	99	0	21.5	21.6	21.4	21.4	21.2
			50	0	1	20.7	20.7	20.6	20.6	20.4
			50	24	1	20.6	20.7	20.5	20.6	20.4
			50	50	1	20.6	20.6	20.5	20.5	20.3
			100	0	1	20.6	20.7	20.5	20.6	20.4
		16QAM	1	0	1	20.6	20.6	20.4	20.4	20.5
			1	49	1	20.3	20.4	20.1	20.2	20.2
			1	99	1	20.2	20.3	20.0	20.1	20.1
			50	0	2	19.7	19.7	19.6	19.6	19.5
			50	24	2	19.6	19.6	19.5	19.6	19.4
			50	50	2	19.5	19.6	19.5	19.5	19.3
			100	0	2	19.6	19.7	19.6	19.6	19.4
		64QAM	1	0	2	19.6	19.8	19.9	19.7	19.1
			1	49	2	19.5	19.4	19.7	19.8	19.0
			1	99	2	19.4	19.3	19.5	19.6	19.0
			50	0	3	18.7	18.8	18.6	18.4	18.1
			50	24	3	18.6	18.6	18.5	18.5	18.0
			50	50	3	18.6	18.6	18.4	18.4	17.9
			100	0	3	18.7	18.6	18.4	18.5	18.0

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	15	QPSK	1	0	0	22.5	22.5	22.5	22.4	22.3
			1	37	0	22.2	22.4	22.2	22.3	22.1
			1	74	0	22.2	22.3	22.2	22.2	22.0
			36	0	1	21.5	21.5	21.3	21.3	21.1
			36	20	1	21.4	21.4	21.3	21.3	21.1
			36	39	1	21.4	21.4	21.2	21.3	21.0
			75	0	1	21.4	21.4	21.3	21.3	21.0
		16QAM	1	0	1	21.4	21.3	21.2	21.2	21.0
			1	37	1	21.1	21.1	21.0	21.0	20.8
			1	74	1	21.1	21.0	20.9	21.0	20.7
			36	0	2	20.5	20.4	20.3	20.3	20.1
			36	20	2	20.4	20.4	20.3	20.3	20.1
			36	39	2	20.3	20.3	20.2	20.2	20.0
			75	0	2	20.4	20.4	20.3	20.3	20.1
		64QAM	1	0	2	19.5	20.4	19.7	19.4	19.8
			1	37	2	19.5	20.3	19.5	19.3	19.7
			1	74	2	19.4	20.2	19.4	19.2	19.5
			36	0	3	18.6	18.7	18.6	18.6	18.1
			36	20	3	18.6	18.7	18.6	18.5	18.1
			36	39	3	18.6	18.7	18.5	18.4	18.0
			75	0	3	18.6	18.7	18.5	18.5	18.0

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	22.4	22.5	22.4	22.1	22.1
			1	25	0	22.3	22.4	22.3	22.1	22.0
			1	49	0	22.2	22.4	22.2	22.0	21.9
			25	0	1	21.4	21.5	21.3	21.1	21.1
			25	12	1	21.4	21.5	21.3	21.1	21.1
			25	25	1	21.4	21.4	21.3	21.1	21.0
			50	0	1	21.4	21.4	21.3	21.1	21.1
		16QAM	1	0	1	21.2	21.3	21.1	21.1	20.9
			1	25	1	21.1	21.2	21.0	21.0	20.8
			1	49	1	21.0	21.1	20.9	21.0	20.7
			25	0	2	20.4	20.5	20.3	20.2	20.1
			25	12	2	20.4	20.4	20.3	20.1	20.1
			25	25	2	20.3	20.4	20.2	20.1	20.0
			50	0	2	20.4	20.4	20.3	20.1	20.1
		64QAM	1	0	2	20.3	19.7	19.5	20.1	19.1
			1	25	2	20.1	19.5	19.3	20.0	19.0
			1	49	2	20.0	19.5	19.3	20.0	18.8
			25	0	3	18.6	18.7	18.5	18.5	18.0
			25	12	3	18.7	18.6	18.5	18.5	18.0
			25	25	3	18.5	18.6	18.4	18.4	18.0
			50	0	3	18.7	18.7	18.5	18.5	18.1
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	5	QPSK	1	0	0	22.4	22.4	22.3	22.1	22.1
			1	12	0	22.4	22.4	22.3	22.0	22.1
			1	24	0	22.3	22.4	22.2	22.0	22.0
			12	0	1	21.4	21.5	21.3	21.1	21.1
			12	7	1	21.4	21.4	21.3	21.1	21.1
			12	13	1	21.3	21.4	21.3	21.1	21.0
			25	0	1	21.4	21.4	21.2	21.1	21.1
		16QAM	1	0	1	21.2	21.3	21.1	20.8	20.9
			1	12	1	21.1	21.3	21.0	20.8	20.8
			1	24	1	21.1	21.3	21.0	20.8	20.8
			12	0	2	20.4	20.5	20.2	20.1	20.0
			12	7	2	20.4	20.5	20.3	20.2	20.1
			12	13	2	20.3	20.4	20.2	20.1	20.0
			25	0	2	20.4	20.4	20.3	20.1	20.1
		64QAM	1	0	2	19.8	19.9	20.1	19.7	19.3
			1	12	2	19.7	19.9	20.0	19.6	19.2
			1	24	2	19.8	19.8	20.0	19.7	19.1
			12	0	3	18.6	18.7	18.5	18.6	18.1
			12	7	3	18.7	18.7	18.5	18.6	18.1
			12	13	3	18.7	18.7	18.6	18.6	18.1
			25	0	3	18.7	18.7	18.6	18.6	18.1

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	BW (MHz)	Freq. (MHz)	Channel	RB/Offset	BW (MHz)	Freq. (MHz)	Channel			
Intra Band Contiguous	7C			20	2535.0	21100	1,0	20	2675.0	3300	21.2	21.2	0.0%
	41C			20	2506.0	39750	1,0	20	2525.8	39948	21.8	22.0	0.9%
Intra Band Non-Contiguous	7A	+	7A	20	2535.0	21100	1,0	20	2680.0	3350	21.2	21.1	-0.5%
Inter Band Non-Contiguous	7A	+	12A	20	2535.0	21100	1,0	10	737.5	5095	21.2	21.1	-0.5%

Note:

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:

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

KDB 648474 D04 Handset SAR:

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

KDB 648474 D04 Handset SAR (Phablet):

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.

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	21.5	21.2	0.177	0.190	
						50	0	20.5	20.0	0.131	0.147	
			Left Tilt	21100	2535.0	1	0	21.5	21.2	0.198	0.212	
						50	0	20.5	20.0	0.146	0.164	
			Right Touch	21100	2535.0	1	0	21.5	21.2	0.480	0.514	1
						50	0	20.5	20.0	0.272	0.305	
			Right Tilt	21100	2535.0	1	0	21.5	21.2	0.092	0.099	
						50	0	20.5	20.0	0.070	0.079	
Body-worn	QPSK	15	Rear	21100	2535.0	1	0	21.5	21.2	0.244	0.261	2
						50	0	20.5	20.0	0.191	0.214	
			Front	21100	2535.0	1	0	21.5	21.2	0.234	0.251	
						50	0	20.5	20.0	0.180	0.202	
Hotspot	QPSK	10	Rear	21100	2535.0	1	0	21.5	21.2	0.457	0.490	3
						50	0	20.5	20.0	0.355	0.398	
			Front	21100	2535.0	1	0	21.5	21.2	0.453	0.485	
						50	0	20.5	20.0	0.350	0.393	
			Edge 2	21100	2535.0	1	0	21.5	21.2	0.300	0.321	
						50	0	20.5	20.0	0.229	0.257	
			Edge 3	21100	2535.0	1	0	21.5	21.2	0.152	0.163	
						50	0	20.5	20.0	0.116	0.130	
			Edge 4	21100	2535.0	1	0	21.5	21.2	0.012	0.013	
						50	0	20.5	20.0	0.009	0.011	

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	22.5	21.8	0.113	0.133	
						50	0	21.5	20.6	0.086	0.106	
			Left Tilt	40620	2593.0	1	0	22.5	21.8	0.133	0.156	
						50	0	21.5	20.6	0.102	0.125	
			Right Touch	40620	2593.0	1	0	22.5	21.8	0.269	0.316	4
						50	0	21.5	20.6	0.206	0.253	
			Right Tilt	40620	2593.0	1	0	22.5	21.8	0.073	0.086	
						50	0	21.5	20.6	0.056	0.069	
Body-worn	QPSK	15	Rear	40620	2593.0	1	0	22.5	21.8	0.205	0.241	5
						50	0	21.5	20.6	0.153	0.188	
			Front	40620	2593.0	1	0	22.5	21.8	0.181	0.213	
						50	0	21.5	20.6	0.136	0.167	
Hotspot	QPSK	10	Rear	40620	2593.0	1	0	22.5	21.8	0.358	0.421	6
						50	0	21.5	20.6	0.294	0.362	
			Front	40620	2593.0	1	0	22.5	21.8	0.336	0.395	
						50	0	21.5	20.6	0.253	0.311	
			Edge 2	40620	2593.0	1	0	22.5	21.8	0.238	0.280	
						50	0	21.5	20.6	0.186	0.229	
			Edge 3	40620	2593.0	1	0	22.5	21.8	0.095	0.112	
						50	0	21.5	20.6	0.070	0.086	
			Edge 4	40620	2593.0	1	0	22.5	21.8	0.005	0.006	
						50	0	21.5	20.6	0.003	0.003	

11. SAR Measurement Variability

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

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

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)
2500	LTE Band 7	Head	Right Touch	No	0.480
2600	LTE Band 41	Hotspot	Rear	No	0.358

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 LTE Band 7 & Wi-Fi & BT

RF Exposure conditions	Test Position	Standalone SAR (W/kg)						∑ 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	0.190	0.185	0.777	0.437	0.225			0.375	1.152	0.852	0.600		0.662
	Left Tilt	0.212	0.099	0.402	0.437	0.225			0.311	0.713	0.874	0.536		0.662
	Right Touch	0.514	0.452	0.221	0.437	0.225			0.966	1.187	1.176	1.191		0.662
	Right Tilt	0.099	0.132	0.137	0.191	0.225			0.231	0.368	0.515	0.456		0.416
Body-worn	Rear	0.261	0.011	0.051	0.022	0.046	0.210	0.471	0.272	0.323	0.329	0.318	0.539	0.278
	Front	0.251	0.011	0.051	0.022	0.046	0.210	0.461	0.262	0.313	0.319	0.308	0.529	0.278
Hotspot	Rear	0.490	0.031	0.144					0.521	0.665	0.490	0.521		
	Front	0.485	0.031	0.144					0.516	0.660	0.485	0.516		
	Edge 1		0.031	0.144						0.175		0.031		
	Edge 2	0.321	0.031	0.144					0.352	0.496	0.321	0.352		
	Edge 3	0.163							0.163	0.163	0.163	0.163		
	Edge 4	0.013	0.031	0.144					0.044	0.188	0.013	0.044		

12.2. Sum of the SAR for LTE Band 38 & Wi-Fi & BT

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.

12.3. Sum of the SAR for LTE Band 41 & Wi-Fi & BT

RF Exposure conditions	Test Position	Standalone SAR (W/kg)						∑ 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	0.133	0.185	0.777	0.437	0.225			0.318	1.095	0.795	0.543		0.662
	Left Tilt	0.156	0.099	0.402	0.437	0.225			0.255	0.657	0.818	0.480		0.662
	Right Touch	0.316	0.452	0.221	0.437	0.225			0.768	0.989	0.978	0.993		0.662
	Right Tilt	0.086	0.132	0.137	0.191	0.225			0.218	0.355	0.502	0.443		0.416
Body-worn	Rear	0.241	0.011	0.051	0.022	0.046	0.210	0.451	0.252	0.303	0.309	0.298	0.519	0.278
	Front	0.213	0.011	0.051	0.022	0.046	0.210	0.423	0.224	0.275	0.281	0.270	0.491	0.278
Hotspot	Rear	0.421	0.031	0.144					0.452	0.596	0.421	0.452		
	Front	0.395	0.031	0.144					0.426	0.570	0.395	0.426		
	Edge 1		0.031	0.144						0.175		0.031		
	Edge 2	0.280	0.031	0.144					0.311	0.455	0.280	0.311		
	Edge 3	0.112							0.112	0.112	0.112	0.112		
	Edge 4	0.006	0.031	0.144					0.037	0.181	0.006	0.037		

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.

11626381M-S1V1 SAR_App A Setup Photos & Ant. Locations

11626381M-S1V1 SAR_App B System Check Plots

11626381M-S1V1 SAR_App C Highest Test Plots

11626381M-S1V1 SAR_App D Tissue Ingredients

11626381M-S1V1 SAR_App E Probe Cal. Certificate

11626381M-S1V1 SAR_App F Dipole Cal. Certificate

END OF REPORT