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 & NFC

FCC ID: PY7-54264J

Report Number: 12371499-S1V1
Issue Date: 8/6/2018

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	8/6/2018	Initial Issue	--

Table of Contents

1. Attestation of Test Results

Applicant Name	SONY MOBILE COMMUNICATIONS INC.			
FCC ID	PY7-54264J			
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)		Product specific (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	0.054	0.433	0.458	0.196
Body-worn	0.211	0.036	0.099	0.006
Hotspot/Wi-Fi Direct	0.791	0.141	N/A	0.062
Product specific 10g SAR	N/A	N/A	0.669	N/A
Simultaneous TX	0.773	0.636	0.773	0.773
Date Tested	7/6/2018 to 7/11/2018			
Test Results	Pass			

Note: The proposed Permissive Change requires SAR testing for LTE Bands 7 and 41 due to antenna gain differences from the original model. The SAR measurement results from the original filing can be found in FCC SAR report PY7-26828G. 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:
	
Dave Weaver Operations Leader UL Verification Services Inc.	AJ Newcomer Laboratory Engineer UL Verification Services Inc.

2. Test Specification, Methods and Procedures

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

- 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 April 2015; Page 33, RF Exposure Procedures Update (Overlapping LTE Bands)
- TCB workshop October 2014; Page 37, RF Exposure Procedures Update (Other LTE Considerations)
- TCB workshop October 2015; Page 6, RF Exposure Procedures (KDB 941225 D05A)
- TCB workshop April 2016; Page 13, RF Exposure Procedures (LTE Carrier Aggregation for DL)
- TCB workshop October 2016; Page 18, RF Exposure Procedures (DUT Holder Perturbations
- TCB workshop May 2017; Page 9, Broadband Liquid Above 3 GHz

3. Facilities and Accreditation

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

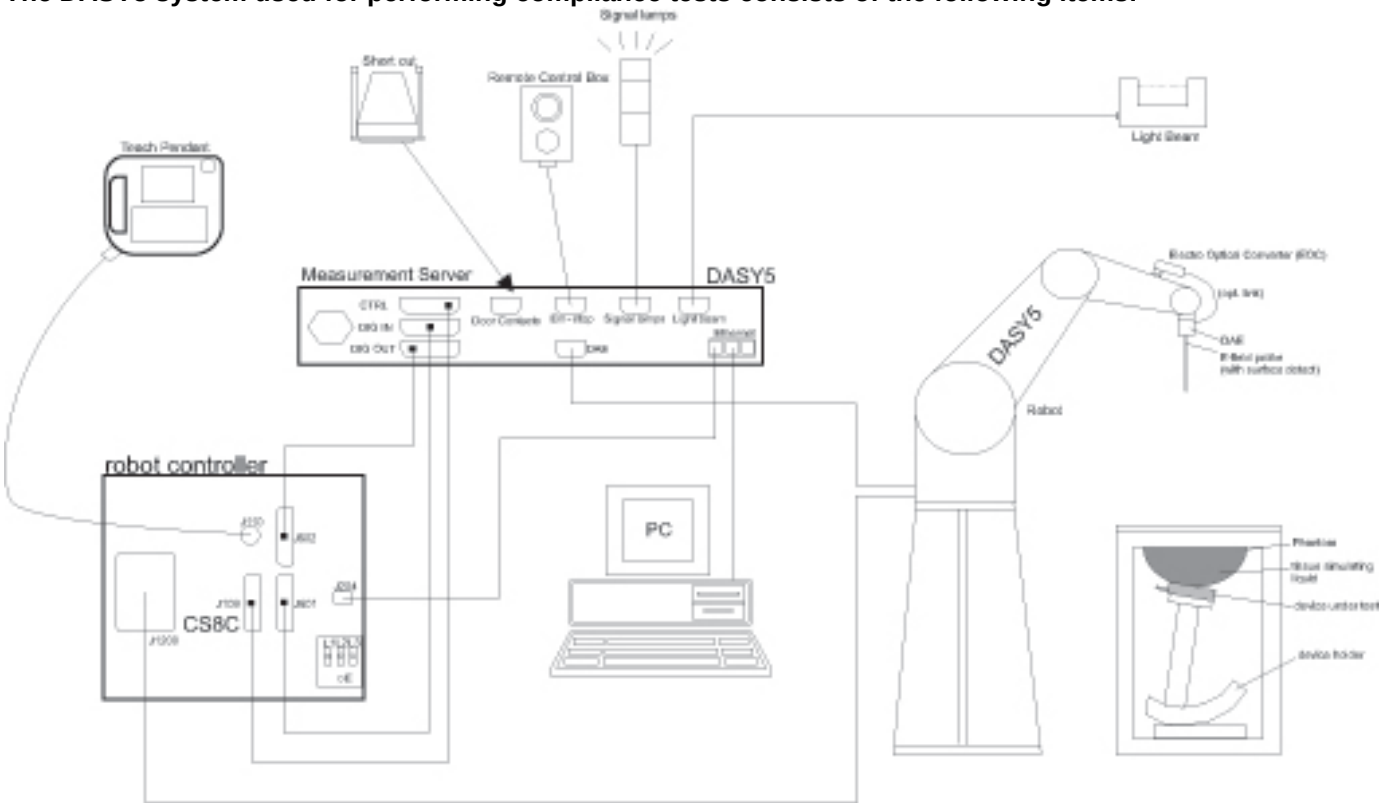
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	SAR Lab 5
SAR Lab F	SAR Lab 6
SAR Lab G	SAR Lab 7
SAR Lab H	SAR Lab 8

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0.

4. SAR Measurement System & Test Equipment

4.1. SAR Measurement System

The DASY5 system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

4.2. SAR Scan Procedures

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

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

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	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	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

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

* When zoom scan is required and the *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
S-Parameter Network Analyzer	Agilent	8753ES	MY40000980	5/14/2019
Dielectric Probe kit	SPEAG	DAK-3.5	1082	10/17/2018
Shorting Block	SPEAG	DAK-3.5 Short	SM DAK 200 BA	10/17/2018
Thermometer	Fisher Scientific	Traceable	140562250	11/7/2018

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Synthezised Signal Generator	Agilent	N5181A	MY50140630	5/25/2019
Power Meter	HP	437B	3125U12345	8/10/2018
Power Meter	HP	437B	3125U11347	8/15/2018
Power Sensor	HP	8481A	1926A27048	8/10/2018
Power Sensor	HP	8481A	3318A92374	8/15/2018
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1795092	N/A
Bi-directional coupler	Werlatone, Inc.	C8060-102	2141	N/A
DC Power Supply	BK Precision	1611	215-02292	N/A

Lab Equipment

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
E-Field Probe (SAR Lab 5)	SPEAG	EX3DV4	7498	5/4/2019
Data Acquisition Electronics (SAR Lab 5)	SPEAG	DAE4	1546	5/3/2019
System Validation Dipole	SPEAG	D2600V2	1036	3/16/2019
Thermometer (SAR Lab 5)	Fisher Sceintific	Traceable	181062300	2/26/2019

Other

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Base Station Simulator	R & S	R & S	164541-CI	2/19/2019

5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be ≤ 30%, for a confidence interval of k = 2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

6. Device Under Test (DUT) Information

6.1. DUT Description

Device Dimension	This is a Phablet Device (display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm) Refer to Appendix A		
Back Cover	The Back Cover is not removable		
Battery Options	The rechargeable battery is not user accessible.		
Accessory	Headset		
Wireless Router (Hotspot)	Wi-Fi Hotspot mode permits the device to share its cellular data connection with other Wi-Fi-enabled devices. ☒ 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**	**IMEI**	**Notes**
	BH94004FD5	004402458821570	FCC SAR LTE (HB) (conducted)
	BH94005ND5	004402458821370	FCC Cellular (conducted)_CA #1
	BH94001ZD5	004402458821570	FCC SAR LTE(HB)(Radiated) #1
Hardware Version	A		
Software Version	0.299		

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EDGE (8PSK)	Multi-Slot Class: Class 33 - 4 Up, 5 Down	GPRS: 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 FDD Band 29 (Rx Only) TDD Band 41 FDD Band 66	QPSK 16QAM 64AQM Rel. 12 Carrier Aggregation 4CC (1 Uplink and 4 Downlinks). Refer to §6.5.		100% (FDD) 63.3% (TDD) [3] Refer to §6.4
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20)		802.11b[1]: 99.19% 802.11g[1]: 98.16% 802.11n (HT20)[1]: 97.74%
	5 GHz	802.11a 802.11n (HT20) 802.11n (HT40) 802.11ac (VHT20) 802.11ac (VHT40) 802.11ac (VHT80)		802.11a[1]: 98.21% 802.11n (HT20)[1]: 98.05% 802.11n (HT40)[1]: 93.96% 802.11ac (VHT20)[1]: 98.05% 802.11ac (VHT40)[1]: 93.96% 802.11ac (VHT80)[1]: 88.48%
	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		GFSK[2]: 77.03% EDR, LE: N/A[4]

Notes:

1. Duty Cycles for Wi-Fi are referenced from the DTS report 12371351-E4 and U-NII report 12371351-E5.
2. Duty Cycle for Bluetooth GFSK mode is referenced from the BT report 12371351-E2.
3. This device supports uplink-downlink configuration 0-6. The configuration with the highest duty cycle was used (Subframe Number 0 at 63.3%).
4. Measured Duty Cycle is not required due to SAR test exemption.

6.3. General LTE SAR Test and Reporting Considerations

<table>
<tr><th>Item</th><th colspan="7">Description</th></tr>
<tr><td rowspan="11">Frequency range, Channel Bandwidth, Numbers and Frequencies</td><td rowspan="3">Band 7</td><td colspan="6">Frequency range: 2500 - 2570 MHz</td></tr>
<tr><td colspan="6">Channel Bandwidth</td></tr>
<tr><td>20 MHz</td><td>15 MHz</td><td>10 MHz</td><td>5 MHz</td><td>3 MHz</td><td>1.4 MHz</td></tr>
<tr><td>Low</td><td>20850
2510</td><td>20825
2507.5</td><td>20800
2505</td><td>20775
2502.5</td><td></td><td></td></tr>
<tr><td>Mid</td><td>21100
2535</td><td>21100
2535</td><td>21100
2535</td><td>21100
2535</td><td></td><td></td></tr>
<tr><td>High</td><td>21350
2560</td><td>21375
2562.5</td><td>21400
2565</td><td>21425
2567.5</td><td></td><td></td></tr>
<tr><td rowspan="3">Band 41[1]</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 1, 2 and 3
<table>
<tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (N_{RB})</th><th rowspan="2">MPR (dB)</th></tr>
<tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr>
<tr><td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 2</td></tr>
<tr><td>64 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 2</td></tr>
<tr><td>64 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 3</td></tr>
<tr><td>256 QAM</td><td colspan="6">≥ 1</td><td>≤ 5</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>

Notes:

1. LTE band 41 test channels in accordance with October 2014 TCB workshop for all channels bandwidths. This band was tested using Uplink-Downlink Configuration 0 at 63.3% duty cycle and Special Subframe 7.
2. LTE QPSK configuration has the highest maximum average output power per 3GPP standard.
3. SAR Testing for LTE was performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

6.4. LTE (TDD) Considerations

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

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

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

Special subframe configuration	Normal cyclic prefix in downlink			Extended cyclic prefix in downlink		
	DwPTS	UpPTS		DwPTS	UpPTS	
		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink
0	$6592 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$	$7680 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$
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: **Uplink-Downlink Configuration 0** at **63.3% duty cycle** and **Special Subframe 7**.

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	7B		√								√		
	7C			√				√					
			√					√	√				
		√						√	√	√			
	41C				√			√					
				√				√					
			√					√	√				
		√						√	√	√	√		
Intra-Band non-contiguous	7A-7A	√	√	√	√			√	√	√	√		

Note(s):

For supported channels, please refer to §6.3

7. RF Exposure Conditions (Test Configurations)

Refer to Appendix A for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

Wireless technologies	RF Exposure Conditions	DUT-to-User Separation	Test Position	Antenna-to-edge/surface	SAR Required	Note
WWAN (Main Ant. 1 & 2)	Head	0 mm	Left Touch	N/A	Yes	
			Left Tilt (15°)	N/A	Yes	
			Right Touch	N/A	Yes	
			Right Tilt (15°)	N/A	Yes	
	Body	15 mm	Rear	N/A	Yes	
			Front	N/A	Yes	
	Hotspot	10 mm	Rear	< 25 mm	Yes	
			Front	< 25 mm	Yes	
			Edge 1 (Top)	> 25 mm	No	1
			Edge 2 (Right)	< 25 mm	Yes	
			Edge 3 (Bottom)	< 25 mm	Yes	
			Edge 4 (Left)	< 25 mm	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. For Phablet devices: when Hotspot Mode is not supported, Product Specific 10-g SAR is required for all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge in direct contact with a flat phantom, to address interactive hand use exposure conditions.
3. For Phablet devices: when hotspot mode applies, Product Specific 10-g SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg.
4. The WWAN Sub Antenna (AS-Div) does not support FCC bands.

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.

The dielectric constant (εr) and conductivity (σ) of typical tissue-equivalent media recipes are expected to be within ± 5% of the required target values; but for SAR measurement systems that have implemented the SAR error compensation algorithms documented in IEEE Std 1528-2013, to automatically compensate the measured SAR results for deviations between the measured and required tissue dielectric parameters, the tolerance for 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 Lab	Date	Band (MHz)	Tissue Type	Frequency (MHz)	Relative Permittivity (εr)			Conductivity (σ)		
					Measured	Target	Delta (%)	Measured	Target	Delta (%)
5	7/9/2018	2600	Head	2600	39.43	39.01	1.07	1.92	1.96	-2.25
				2495	39.65	39.14	1.29	1.84	1.85	-0.74
				2690	39.31	38.90	1.06	1.98	2.06	-4.00
5	7/9/2018	2600	Body	2600	50.32	52.51	-4.17	2.16	2.16	-0.08
				2495	50.50	52.64	-4.07	2.06	2.01	2.07
				2690	50.15	52.40	-4.29	2.23	2.29	-2.59

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 Lab	Date	Tissue Type	Dipole Type _Serial #	Dipole Cal. Due Data	Measured Results for 1g SAR				Measured Results for 10g SAR				Plot No.
					Zoom Scan to 100 mW	Normalize to 1 W	Target (Ref. Value)	Delta ±10 %	Zoom Scan to 100 mW	Normalize to 1 W	Target (Ref. Value)	Delta ±10 %	
5	7/9/2018	Body	D2600V2 SN:1036	3/16/2019	5.560	55.60	56.13	-0.94	2.430	24.30	25.04	-2.96	
5	7/9/2018	Head	D2600V2 SN:1036	3/16/2019	5.570	55.70	54.54	**2.13**	2.500	25.00	24.56	1.79	1,2

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 1, 2 and 3

Modulation	Channel bandwidth / Transmission bandwidth (N_{RB})						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3
256 QAM	≥ 1						≤ 5

The allowed A-MPR values specified below in Table 6.2.4.-1 of 3GPP TS36.101 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signaling Value of “NS_01”.

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

Network Signalling value	Requirements (subclause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	N/A
NS_03	6.6.2.2.1	2, 4,10, 23, 25, 35, 36, 66, 70	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2, 6.6.3.3.19	41	5, 10, 15, 20	Table 6.2.4-4, Table 6.2.4-4a	
NS_05	6.6.3.3.1	1	10,15,20	≥ 50 (NOTE1)	≤ 1 (NOTE1)
			15, 20	Table 6.2.4-18 (NOTE2)	
		65 (NOTE 3)	10,15,20	≥ 50	≤ 1 (NOTE 1)
			15,20	Table 6.2.4-18 (NOTE 2)	
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	
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	
NS_11	6.6.2.2.1 6.6.3.3.13	23	1.4, 3, 5, 10, 15, 20	Table 6.2.4-5	
NS_12	6.6.3.3.5	26	1.4, 3, 5, 10, 15	Table 6.2.4-6	
NS_13	6.6.3.3.6	26	5	Table 6.2.4-7	
NS_14	6.6.3.3.7	26	10, 15	Table 6.2.4-8	
NS_15	6.6.3.3.8	26	1.4, 3, 5, 10, 15	Table 6.2.4-9 Table 6.2.4-10	
NS_16	6.6.3.3.9	27	3, 5, 10	Table 6.2.4-11, Table 6.2.4-12, Table 6.2.4-13	
NS_17	6.6.3.3.10	28	5, 10	Table 5.6-1	N/A
NS_18	6.6.3.3.11	28	5	≥ 2	≤ 1
			10, 15, 20	≥ 1	≤ 4
NS_19	6.6.3.3.12	44	10, 15, 20	Table 6.2.4-14	
NS_20	6.2.2 6.6.2.2.1 6.6.3.3.14	23	5, 10, 15, 20	Table 6.2.4-15	
NS_21	6.6.2.2.1 6.6.3.3.15	30	5, 10	Table 6.2.4-16	
NS_22	6.6.3.3.16	42, 43	5, 10, 15, 20	Table 6.2.4-17	
NS_23	6.6.3.3.17	42, 43	5, 10, 15, 20	N/A	
NS_24	6.6.3.3.20	65 (NOTE 4)	5, 10, 15, 20	Table 6.2.4-19	
NS_25	6.6.3.3.21	65 (NOTE 4)	5, 10, 15, 20	Table 6.2.4-20	
NS_26	6.6.3.3.22	68	10, 15	Table 6.2.4-21	
NS_27	6.6.2.2.5, 6.6.3.3.23	48	5, 10, 15, 20	Table 6.2.4-22	
NS_28	6.2.2A, 6.6.3.3.24	46 (NOTE 5)	20	Table 6.2.4-23	
NS_29	6.2.2A, 6.6.2.3.1a, 6.6.3.3.25	46 (NOTE 5)	20	Table 6.2.4-24	
NS_30	6.2.2A, 6.6.3.3.26	46 (NOTE 5)	20	Table 6.2.4-25	
NS_31	6.2.2A, 6.6.3.3.27	46 (NOTE 5)	20	Table 6.2.4-26	
NS_32	-	-	-	-	-

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

LTE Band 7 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				20850	21100	21350		
				2510 MHz	2535 MHz	2560 MHz		
20 MHz	QPSK	1	0	20.03	20.34	20.33	0	20.5
		1	49	20.14	20.29	20.15	0	20.5
		1	99	20.08	20.21	20.04	0	20.5
		50	0	20.18	20.42	20.27	0	20.5
		50	24	20.23	20.39	20.25	0	20.5
		50	50	20.15	20.30	20.16	0	20.5
		100	0	20.20	20.37	20.21	0	20.5
	16QAM	1	0	19.93	20.35	20.35	0	20.5
		1	49	20.05	20.26	20.18	0	20.5
		1	99	19.99	20.24	20.17	0	20.5
		50	0	19.72	20.05	19.87	0	20.5
		50	24	19.79	20.02	19.86	0	20.5
		50	50	19.71	19.95	19.76	0	20.5
		100	0	19.79	19.95	19.85	0	20.5
	64QAM	1	0	19.81	20.50	19.87	0	20.5
		1	49	19.92	20.50	20.07	0	20.5
		1	99	19.86	20.41	19.99	0	20.5
		50	0	19.80	20.04	19.98	0	20.5
		50	24	19.85	20.01	19.93	0	20.5
		50	50	19.78	19.97	19.86	0	20.5
		100	0	19.83	19.94	19.87	0	20.5

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				20825	21100	21375		
				2507.5 MHz	2535 MHz	2562.5 MHz		
15 MHz	QPSK	1	0	20.19	20.17	20.25	0	20.5
		1	37	20.29	20.15	20.14	0	20.5
		1	74	20.29	20.04	20.04	0	20.5
		36	0	20.32	20.26	20.21	0	20.5
		36	20	20.38	20.21	20.18	0	20.5
		36	39	20.33	20.15	20.11	0	20.5
		75	0	20.34	20.23	20.15	0	20.5
	16QAM	1	0	20.18	19.65	20.15	0	20.5
		1	37	20.09	19.60	20.06	0	20.5
		1	74	20.09	19.58	19.98	0	20.5
		36	0	19.87	19.85	19.87	0	20.5
		36	20	19.94	19.80	19.80	0	20.5
		36	39	19.85	19.73	19.75	0	20.5
		75	0	19.94	19.77	19.77	0	20.5
	64QAM	1	0	19.91	20.08	20.40	0	20.5
		1	37	19.93	20.06	20.25	0	20.5
		1	74	19.95	19.98	20.18	0	20.5
		36	0	20.00	19.92	19.81	0	20.5
		36	20	20.07	19.86	19.79	0	20.5
		36	39	20.01	19.81	19.74	0	20.5
		75	0	20.00	19.84	19.79	0	20.5

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				20800	21100	21400		
				2505 MHz	2535 MHz	2565 MHz		
10 MHz	QPSK	1	0	20.07	20.12	20.22	0	20.5
		1	25	20.10	20.16	20.14	0	20.5
		1	49	20.26	20.15	20.09	0	20.5
		25	0	20.19	20.26	20.20	0	20.5
		25	12	20.28	20.24	20.15	0	20.5
		25	25	20.35	20.19	20.11	0	20.5
		50	0	20.28	20.24	20.18	0	20.5
	16QAM	1	0	19.73	19.62	20.13	0	20.5
		1	25	19.70	19.64	20.05	0	20.5
		1	49	19.79	19.58	19.99	0	20.5
		25	0	19.85	19.84	19.79	0	20.5
		25	12	19.98	19.82	19.78	0	20.5
		25	25	20.01	19.79	19.72	0	20.5
		50	0	19.89	19.79	19.75	0	20.5
	64QAM	1	0	19.91	19.82	20.00	0	20.5
		1	25	19.90	19.89	19.95	0	20.5
		1	49	20.02	19.84	19.90	0	20.5
		25	0	19.87	19.92	19.80	0	20.5
		25	12	19.96	19.93	19.82	0	20.5
		25	25	20.01	19.87	19.79	0	20.5
		50	0	19.87	19.88	19.78	0	20.5

LTE Band 7 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)			MPR	Tune-up Limit
				20775	21100	21425		
				2502.5 MHz	2535 MHz	2567.5 MHz		
5 MHz	QPSK	1	0	20.14	20.07	20.14	0	20.5
		1	12	20.21	20.15	20.14	0	20.5
		1	24	20.18	20.12	20.13	0	20.5
		12	0	20.13	20.21	20.12	0	20.5
		12	7	20.15	20.20	20.15	0	20.5
		12	13	20.13	20.17	20.13	0	20.5
		25	0	20.15	20.18	20.14	0	20.5
	16QAM	1	0	19.83	20.16	19.83	0	20.5
		1	12	19.85	20.22	19.78	0	20.5
		1	24	19.81	20.16	19.73	0	20.5
		12	0	19.80	19.87	19.79	0	20.5
		12	7	19.81	19.91	19.75	0	20.5
		12	13	19.79	19.86	19.77	0	20.5
		25	0	19.76	19.81	19.68	0	20.5
	64QAM	1	0	19.58	19.92	19.93	0	20.5
		1	12	19.65	19.97	19.94	0	20.5
		1	24	19.63	19.94	19.88	0	20.5
		12	0	19.80	19.84	19.68	0	20.5
		12	7	19.79	19.86	19.68	0	20.5
		12	13	19.76	19.80	19.63	0	20.5
		25	0	19.71	19.75	19.69	0	20.5

LTE Band 41 Measured Results

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)					MPR	Tune-up Limit
				39750	40185	40620	41055	41490		
				2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz		
20 MHz	QPSK	1	0	24.42	24.41	24.50	24.50	24.50	0	24.5
		1	49	24.32	24.34	24.50	24.46	24.35	0	24.5
		1	99	24.38	24.35	24.46	24.48	24.22	0	24.5
		50	0	23.94	23.96	24.00	23.98	23.95	0.5	24
		50	24	23.98	23.94	24.00	24.00	23.88	0.5	24
		50	50	23.89	23.95	24.00	23.94	23.81	0.5	24
		100	0	23.96	23.99	24.00	24.00	23.89	0.5	24
	16QAM	1	0	23.59	23.44	23.52	23.72	23.58	0.5	24
		1	49	23.47	23.37	23.46	23.63	23.37	0.5	24
		1	99	23.53	23.40	23.39	23.63	23.26	0.5	24
		50	0	22.57	22.52	22.69	22.59	22.49	1.5	23
		50	24	22.62	22.50	22.64	22.64	22.42	1.5	23
		50	50	22.54	22.47	22.59	22.56	22.33	1.5	23
		100	0	22.56	22.56	22.63	22.55	22.44	1.5	23
	64QAM	1	0	22.55	22.38	23.00	22.63	22.47	1.5	23
		1	49	22.46	22.31	22.94	22.55	22.28	1.5	23
		1	99	22.49	22.37	22.87	22.55	22.16	1.5	23
		50	0	21.60	21.55	21.70	21.55	21.46	2.5	22
		50	24	21.65	21.55	21.63	21.59	21.44	2.5	22
		50	50	21.60	21.54	21.60	21.55	21.34	2.5	22
		100	0	21.64	21.57	21.63	21.62	21.41	2.5	22

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)					MPR	Tune-up Limit
				39750	40185	40620	41055	41490		
				2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz		
15 MHz	QPSK	1	0	24.41	24.47	24.49	24.49	24.48	0	24.5
		1	37	24.31	24.34	24.47	24.44	24.32	0	24.5
		1	74	24.37	24.37	24.41	24.46	24.24	0	24.5
		36	0	23.91	23.90	24.00	23.91	23.89	0.5	24
		36	20	23.97	23.87	24.00	24.00	23.83	0.5	24
		36	39	23.86	23.92	23.97	23.91	23.79	0.5	24
		75	0	23.93	23.99	24.00	23.95	23.85	0.5	24
	16QAM	1	0	23.43	23.58	23.59	23.50	23.60	0.5	24
		1	37	23.38	23.44	23.52	23.47	23.42	0.5	24
		1	74	23.43	23.50	23.47	23.53	23.35	0.5	24
		36	0	22.49	22.52	22.65	22.45	22.47	1.5	23
		36	20	22.56	22.49	22.61	22.57	22.44	1.5	23
		36	39	22.48	22.52	22.51	22.50	22.36	1.5	23
		75	0	22.54	22.56	22.60	22.57	22.42	1.5	23
	64QAM	1	0	22.05	22.37	22.85	22.12	22.38	1.5	23
		1	37	22.00	22.24	22.80	22.08	22.22	1.5	23
		1	74	22.04	22.29	22.73	22.09	22.15	1.5	23
		36	0	21.59	21.45	21.72	21.52	21.43	2.5	22
		36	20	21.64	21.42	21.69	21.62	21.39	2.5	22
		36	39	21.57	21.46	21.61	21.53	21.33	2.5	22
		75	0	21.56	21.57	21.61	21.52	21.42	2.5	22

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)					MPR	Tune-up Limit
				39750	40185	40620	41055	41490		
				2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz		
10 MHz	QPSK	1	0	24.37	24.42	24.45	24.50	24.43	0	24.5
		1	25	24.30	24.32	24.50	24.44	24.32	0	24.5
		1	49	24.37	24.26	24.43	24.42	24.29	0	24.5
		25	0	23.89	23.89	24.00	24.00	23.92	0.5	24
		25	12	23.95	23.87	24.00	24.00	23.89	0.5	24
		25	25	23.93	23.85	24.00	23.96	23.84	0.5	24
		50	0	23.95	23.86	24.00	23.96	23.84	0.5	24
	16QAM	1	0	23.44	23.58	23.54	23.55	23.63	0.5	24
		1	25	23.36	23.50	23.55	23.49	23.50	0.5	24
		1	49	23.42	23.48	23.54	23.43	23.50	0.5	24
		25	0	22.47	22.50	22.61	22.56	22.44	1.5	23
		25	12	22.56	22.50	22.61	22.56	22.45	1.5	23
		25	25	22.50	22.44	22.55	22.53	22.36	1.5	23
		50	0	22.59	22.48	22.57	22.56	22.46	1.5	23
	64QAM	1	0	22.05	22.49	22.81	22.17	22.56	1.5	23
		1	25	22.00	22.45	22.83	22.08	22.43	1.5	23
		1	49	22.07	22.43	22.78	22.05	22.40	1.5	23
		25	0	21.53	21.40	21.58	21.58	21.35	2.5	22
		25	12	21.63	21.40	21.56	21.57	21.31	2.5	22
		25	25	21.57	21.38	21.55	21.55	21.29	2.5	22
		50	0	21.61	21.45	21.56	21.56	21.38	2.5	22

LTE Band 41 Measured Results (continued)

BW (MHz)	Mode	RB Allocation	RB offset	Maximum Average Power (dBm)					MPR	Tune-up Limit
				39750	40185	40620	41055	41490		
				2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz		
5 MHz	QPSK	1	0	24.30	24.28	24.50	24.46	24.26	0	24.5
		1	12	24.28	24.25	24.50	24.43	24.24	0	24.5
		1	24	24.37	24.22	24.50	24.43	24.21	0	24.5
		12	0	23.85	23.83	24.00	23.96	23.87	0.5	24
		12	7	23.96	23.86	24.00	23.99	23.86	0.5	24
		12	13	23.94	23.83	24.00	23.96	23.85	0.5	24
		25	0	23.94	23.87	24.00	23.95	23.87	0.5	24
	16QAM	1	0	23.48	23.31	23.56	23.62	23.32	0.5	24
		1	12	23.46	23.30	23.57	23.60	23.29	0.5	24
		1	24	23.57	23.29	23.54	23.57	23.26	0.5	24
		12	0	22.51	22.44	22.58	22.62	22.43	1.5	23
		12	7	22.60	22.47	22.61	22.62	22.40	1.5	23
		12	13	22.54	22.42	22.54	22.56	22.40	1.5	23
		25	0	22.54	22.45	22.63	22.55	22.37	1.5	23
	64QAM	1	0	22.15	22.57	22.98	22.26	22.54	1.5	23
		1	12	22.12	22.54	22.96	22.24	22.51	1.5	23
		1	24	22.20	22.51	22.93	22.20	22.44	1.5	23
		12	0	21.46	21.38	21.66	21.54	21.31	2.5	22
		12	7	21.57	21.41	21.69	21.55	21.30	2.5	22
		12	13	21.55	21.36	21.69	21.50	21.27	2.5	22
		25	0	21.58	21.36	21.56	21.55	21.25	2.5	22

9.2. LTE Carrier Aggregation

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

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

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

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

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

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

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

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

Where M_A is defined as follows

$$M_A = \begin{cases} 8.2 & ;0 \le A < 0.025 \\ 9.2 - 40A & ;0.025 \le A < 0.05 \\ 8 - 16A & ;0.05 \le A < 0.25 \\ 4.83 - 3.33A & ;0.25 \le A \le 0.4 \\ 3.83 - 0.83A & ;0.4 \le A \le 1 \end{cases}$$

and M_{IM5} is defined as follows

$$M_{IM5} = \begin{cases} 4.5 & ; \Delta_{IM5} < 1.5 * BW_{Channel\_CA} \\ 6.0 & ; 1.5 * BW_{Channel\_CA} \le \Delta_{IM5} < BW_{Channel\_CA}/2 + \Delta f_{ooB} \\ M_A & ; \Delta_{IM5} \ge BW_{Channel\_CA}/2 + \Delta f_{ooB} \end{cases}$$

Where

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

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

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

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

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

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

Where M_N is defined as follows

$$M_N = \begin{cases} -0.125N + 18.25 & ; 2 \le N \le 50 \\ -0.0333\,N + 13.67 & ; 50 < N \le 200 \end{cases}$$

Where $N = N_{RB\_alloc}$ is the number of allocated resource blocks.
For the UE maximum output power modified by MPR, the power limits specified in subclause 6.2.5A apply.

LTE Carrier Aggregation Measured Results

The following power measurements were performed with a single carrier uplink. CA is only supported in the downlinks. The DUT supports downlink CA combinations up to one (1) Uplink and four (4) Downlinks. Below are the measured results for the modified LTE bands.

Type	LTE CA combinations			PCC (UL)					SCC (DL)			LTE Rel 8 Tx. Power [dBm]	LTE Rel 13 Tx. Power [dBm]	Delta
	PCC	+	SCC	Mode	BW (MHz)	Channel	Freq. (MHz)	RB/Offset	BW (MHz)	Channel	Freq. (MHz)			
Intra-Band Contiguous	7B			QPSK	15	21076	2532.6	1,0	5	3169	2661.9	19.76	19.82	0.3%
	7C			QPSK	20	21001	2525.1	1,0	20	3199	2664.9	19.88	19.92	0.2%
	41C			QPSK	20	39750	2506.0	1,0	20	39948	2525.8	24.33	24.34	0.0%
Intra-Band Non-Contiguous	7A	+	7A	QPSK	20	20850	2510.0	1,0	20	3350	2680.0	19.88	19.82	-0.3%

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:

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

KDB 447498 D01 General RF Exposure Guidance:

Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

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

KDB 648474 D04 Handset SAR:

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

KDB 648474 D04 Handset SAR (Phablet Only):

When hotspot mode does not apply, Product Specific 10-g SAR is required for all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge in direct contact with a flat phantom, to address interactive hand use exposure conditions. When hotspot mode applies, Product Specific 10-g SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg .

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	20.5	20.3	0.027	0.028	
						50	0	20.5	20.4	0.027	0.028	
			Left Tilt	21100	2535.0	1	0	20.5	20.3	0.012	0.012	
						50	0	20.5	20.4	0.012	0.012	
			Right Touch	21100	2535.0	1	0	20.5	20.3	0.031	**0.032**	1
						50	0	20.5	20.4	0.031	0.032	
			Right Tilt	21100	2535.0	1	0	20.5	20.3	0.005	0.005	
						50	0	20.5	20.4	0.004	0.004	
Body-worn	QPSK	15	Rear	21100	2535.0	1	0	20.5	20.3	0.100	0.104	
						50	0	20.5	20.4	0.113	0.115	
			Front	21100	2535.0	1	0	20.5	20.3	0.122	**0.127**	2
						50	0	20.5	20.4	0.123	0.125	
Hotspot	QPSK	10	Rear	21100	2535.0	1	0	20.5	20.3	0.182	0.189	
						50	0	20.5	20.4	0.181	0.184	
			Front	21100	2535.0	1	0	20.5	20.3	0.222	0.230	
						50	0	20.5	20.4	0.223	0.227	
			Edge 2	21100	2535.0	1	0	20.5	20.3	0.136	0.141	
						50	0	20.5	20.4	0.134	0.136	
			Edge 3	21100	2535.0	1	0	20.5	20.3	0.579	**0.601**	3
						50	0	20.5	20.4	0.569	0.580	
			Edge 4	21100	2535.0	1	0	20.5	20.3	0.028	0.029	
						50	0	20.5	20.4	0.028	0.029	

10.2. 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	24.5	24.5	0.050	0.050	
						50	0	24.0	24.0	0.049	0.049	
			Left Tilt	40620	2593.0	1	0	24.5	24.5	0.028	0.028	
						50	0	24.0	24.0	0.022	0.022	
			Right Touch	40620	2593.0	1	0	24.5	24.5	0.054	**0.054**	4
						50	0	24.0	24.0	0.045	0.045	
			Right Tilt	40620	2593.0	1	0	24.5	24.5	0.008	0.008	
						50	0	24.0	24.0	0.011	0.011	
Body-worn	QPSK	15	Rear	40620	2593.0	1	0	24.5	24.5	0.165	0.165	
						50	0	24.0	24.0	0.131	0.131	
			Front	40620	2593.0	1	0	24.5	24.5	0.211	**0.211**	5
						50	0	24.0	24.0	0.169	0.169	
Hotspot	QPSK	10	Rear	40620	2593.0	1	0	24.5	24.5	0.308	0.308	
						50	0	24.0	24.0	0.262	0.262	
			Front	40620	2593.0	1	0	24.5	24.5	0.409	0.409	
						50	0	24.0	24.0	0.332	0.332	
			Edge 2	40620	2593.0	1	0	24.5	24.5	0.282	0.282	
						50	0	24.0	24.0	0.232	0.232	
			Edge 3	40620	2593.0	1	0	24.5	24.5	0.791	**0.791**	6
						50	0	24.0	24.0	0.615	0.615	
			Edge 4	40620	2593.0	1	0	24.5	24.5	0.054	0.054	
						50	0	24.0	24.0	0.042	0.042	

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	Hotspot	Edge 3	No	0.579
2600	LTE Band 41	Hotspot	Edge 3	No	0.791

Note(s):

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

12. Simultaneous Transmission Conditions

Case	Cellular	WLAN Chain0 / BT	WLAN Chain1
1	GSM/GPRS/EDGE	BT/BLE	(None)
2	GSM/GPRS/EDGE	WLAN 2.4G	WLAN 2.4G
3	GSM/GPRS/EDGE	WLAN 5G	WLAN 5G
4	UMTS/HSPA	BT/BLE	(None)
5	UMTS/HSPA	WLAN 2.4G	WLAN 2.4G
6	UMTS/HSPA	WLAN 5G	WLAN 5G
7	LTE	BT/BLE	(None)
8	LTE	WLAN 2.4G	WLAN 2.4G
9	LTE	WLAN 5G	WLAN 5G
10	(None)	BT/BLE WLAN 5G	WLAN 5G
11	GSM/GPRS/EDGE	BT/BLE WLAN 5G	WLAN 5G
12	UMTS/HSPA	BT/BLE WLAN 5G	WLAN 5G
13	LTE	BT/BLE WLAN 5G	WLAN 5G
14	GSM/GPRS/EDGE	WLAN 2.4G	WLAN 5G
15	UMTS/HSPA	WLAN 2.4G	WLAN 5G
16	LTE	WLAN 2.4G	WLAN 5G

Note(s):

1. BT and WLAN 2.4G function can be used at the same time, but the antenna switch is shared for both RF paths.
2. Simultaneous cases other than Cases 1-16 (in above table) are not supported in this device.

12.1. Simultaneous transmission SAR test exclusion considerations

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

12.1.1. Sum of SAR

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

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

RF Exposure conditions	Test Position	Standalone SAR (W/kg)						∑ 1-g SAR (W/kg)						
		WWAN	DTS		U-NII		BT	WWAN + BT	WWAN + DTS	WWAN + DTS	WWAN + DTS + U-NII	WWAN + U-NII	WWAN+U-NII+BT	U-NII+BT
		①	Chain 0 ②	Chain 1 ③	Chain 0 ④	Chain 1 ⑤	Chain 0 ⑥	①+⑥	①+②	①+②+③	①+②+⑤	①+④+⑤	①+④+⑤+⑥	④+⑤+⑥
Head	Left Touch	0.050	0.301	0.046	0.415	0.065	0.055	0.105	0.351	0.397	0.416	0.530	0.585	0.535
	Left Tilt	0.028	0.301	0.046	0.415	0.065	0.063	0.091	0.329	0.375	0.394	0.508	0.571	0.543
	Right Touch	0.054	0.433	0.046	0.458	0.065	0.196	0.250	0.487	0.533	0.552	0.577	**0.773**	0.719
	Right Tilt	0.011	0.325	0.046	0.244	0.065	0.166	0.177	0.336	0.382	0.401	0.320	0.486	0.475
Body-worn	Rear	0.165	0.036	0.031	0.081	0.099	0.005	0.170	0.201	0.232	0.300	0.345	0.350	0.185
	Front	0.211	0.036	0.031	0.081	0.099	0.006	0.217	0.247	0.278	0.346	0.391	0.397	0.186
Hotspot	Rear	0.308	0.141	0.086			0.030	0.338	0.449	0.535				
	Front	0.409	0.141	0.086			0.019	0.428	0.550	**0.636**				
	Edge 1		0.141				0.008			0.141				
	Edge 2	0.282		0.086						0.368				
	Edge 3	0.791												
	Edge 4	0.054	0.141				0.062	0.116	0.195					

Appendixes

Refer to separated files for the following appendixes.

12371499-S1V1 Appendix A: SAR Setup Photos

12371499-S1V1 Appendix B: SAR System Check Plots

12371499-S1V1 Appendix C: Highest SAR Test Plots

12371499-S1V1 Appendix D: SAR Liquid Tissue Ingredients

12371499-S1V1 Appendix E: SAR Probe Calibration Certificates

12371499-S1V1 Appendix F: SAR Dipole Calibration Certificates

END OF REPORT