SAR EVALUATION REPORT
CLASS II 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-PM0943

Report Number: 16U23577-S1V1
Issue Date: 6/6/2016

Prepared for
SONY MOBILE COMMUNICATIONS INC.
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Date	Revisions	Revised By
V1	6/6/2016	Initial Issue	--

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1. Attestation of Test Results

Applicant Name	SONY MOBILE COMMUNICATIONS INC.			
FCC ID	PY7-PM0943			
Applicable Standards	FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013			
Exposure Category	SAR Limits (W/Kg)			
	Peak spatial-average(1g of tissue)		Extremities (hands, wrists, ankles, etc.) (10g of tissue)	
General population / Uncontrolled exposure	1.6		4	
RF Exposure Conditions	Equipment Class - Highest Reported SAR (W/kg)			
	PCE	DTS	NII	DSS
Head	0.433	0.286	0.257	N/A
Body-worn	0.360	0.017	0.021	
Hotspot/Wi-Fi Direct	0.540	0.052	N/A	
Simultaneous TX	1.010	1.010	0.981	
Date Tested	5/31/2016 to 6/2/2016			
Test Results	Pass			

Note: The proposed CllPC to add LTE band 26 is via software and does not affect previously reported values for other modes. The SAR measurement results from the original filing can be found in FCC SAR report 16J22997-S17V2. This report only contains the SAR values for the added LTE Band. The highest SAR Values for the new LTE Band does not surpass the previously reported highest SAR values in the original test report. Therefore, the highest SAR values remain unaffected by this change. 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:
	
Devin Chang Senior Engineer UL Verification Services Inc.	Henry Wong Laboratory Technician UL Verification Services Inc.

2. Test Specification, Methods and Procedures

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

- 447498 D01 General RF Exposure Guidance v06
- 447498 D03 Supplement C Cross-Reference v01
- 648474 D04 Handset SAR v01r03
- 690783 D01 SAR Listings on Grants v01r03
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
- 865664 D02 RF Exposure Reporting v01r02
- 941225 D05 SAR for LTE Devices v02r05
- 941225 D05A LTE Rel.10 KDB Inquiry Sheet v01r02
- 941225 D06 Hotspot Mode v02r01

3. Facilities and Accreditation

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

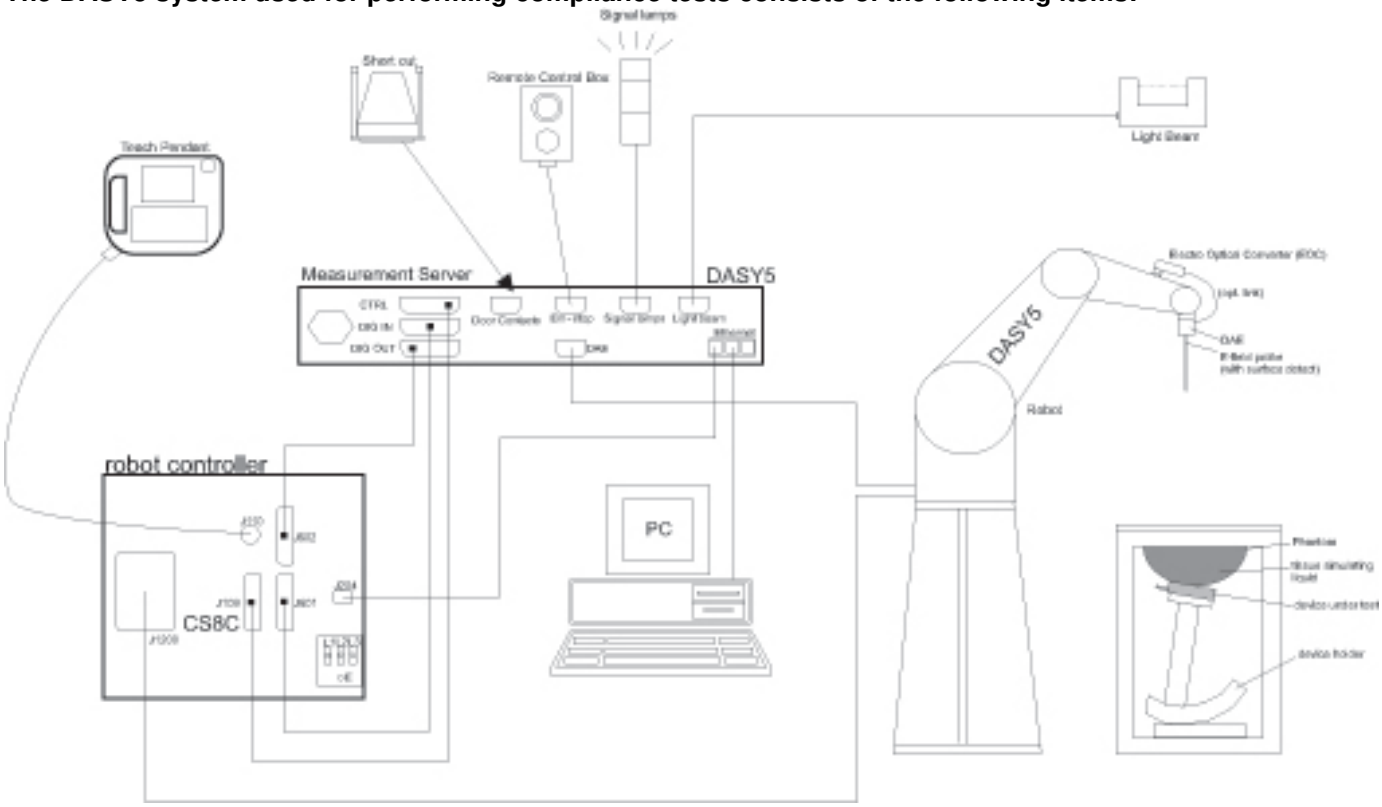
47173 Benicia Street	47266 Benicia Street
SAR Lab A	SAR Lab 1
SAR Lab B	SAR Lab 2
SAR Lab C	SAR Lab 3
SAR Lab D	SAR Lab 4
SAR Lab E	
SAR Lab F	
SAR Lab G	
SAR Lab H	

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

4. SAR Measurement System & Test Equipment

4.1. SAR Measurement System

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



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

4.2. SAR Scan Procedures

Step 1: Power Reference Measurement

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

Step 2: Area Scan

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

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

	≤ 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	MY40001647	7/28/2016
Dielectric Probe kit	SPEAG	DAK-3.5	1089	10/11/2016
Shorting block	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	Traceable Calibration Control Co.	4242	140493798	11/10/2016

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Synthesized Signal Generator	HP	8665B	3546A00784	6/27/2016
Power Meter	HP	437B	3125U09248	9/3/2016
Power Meter	HP	437B	3125U09516	9/17/2016
Power Sensor	Agilent	8481A	2349A36506	9/16/2016
Power Sensor	Agilent	8481A	3318A92374	9/16/2016
Amplifier	MITEQ	AMF-4D-00400600-50-30P	1622052	N/A
Directional coupler	Werlatone	C8060-102	2711	N/A
DC Power Supply	AMETEK	XT 15-4	131A02780	N/A
E-Field Probe (SAR Lab 3)	SPEAG	EX3DV4	3901	1/26/2017
Data Acquisition Electronics (SAR Lab 3)	SPEAG	DAE4	1360	3/16/2017
System Validation Dipole	SPEAG	D835V2	4d142	9/23/2016

Other

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

5. Measurement Uncertainty

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

6. Device Under Test (DUT) Information

6.1. DUT Description

Device Dimension	Overall (Length x Width): 143.5 mm x 70.3 mm Overall Diagonal: 155 mm Display Diagonal: 126 mm
Back Cover	☒ The rechargeable battery is not user accessible.
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) ☐ Mobile Hotspot (Wi-Fi 5 GHz)
Wi-Fi Direct	Wi-Fi Direct enabled devices transfer data directly between each other ☒ Wi-Fi Direct (Wi-Fi 2.4 GHz) ☐ Wi-Fi Direct (Wi-Fi 5 GHz)
Test sample information	**S/N** **IMEI** **Notes** CB512A0QXN 00440245-630692-1 SAR-LTE-Rad Anna
Hardware Version	A
Software Version	35.0.D.0.180

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ 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 V	UMTS Rel. 99 (Voice & Data) HSDPA (Rel. 5) HSUPA (Rel. 6) HSPA+ (Rel. 7)		100%
LTE	FDD Band 5 FDD Band 7 FDD Band 13 FDD Band 17 FDD Band 26 TDD Band 41	QPSK 16QAM ☐ Rel. 10 Does not support Carrier Aggregation (CA) ☐ Rel. 10 Carrier Aggregation (1 Uplink and 2 Downlinks) ☒ Rel. 11 Carrier Aggregation (2 Uplink and 2 Downlinks) (No Band Combinations are supported for Carrier Aggregation)		100% (FDD) 63.3% (TDD)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ 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 4.2 LE		77.5% (DH5)

6.3. Maximum Output Power from Tune-up Procedure

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

6.3.1. LTE Tethering OFF

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

LTE				Data			
				QPSK		16QAM	
Band	BW	CH	RB Config	Target [dBm]	Tolerance +-[dB]	Target [dBm]	Tolerance +-[dB]
LTEB26	1.4MHz	Low	1RB	23.5	-1.5~+1.0	22.5	-1.5~+1.0
		Mid	50% RB	23.5	-1.5~+1.0	22.5	-1.5~+1.0
		High	100% RB	22.5	-1.5~+1.0	21.5	-1.5~+1.0
	3MHz, 5MHz, 10MHz, 15MHz	Low	1RB	23.5	-1.5~+1.0	22.5	-1.5~+1.0
		Mid	50% RB	22.5	-1.5~+1.0	21.5	-1.5~+1.0
		High	100% RB	22.5	-1.5~+1.0	21.5	-1.5~+1.0

6.4. General LTE SAR Test and Reporting Considerations

<table>
<tr><th>Item</th><th colspan="7">Description</th></tr>
<tr><td rowspan="5">Frequency range, Channel Bandwidth, Numbers and Frequencies</td><td rowspan="2">Band 26</td><td colspan="6">Frequency range: 814 - 849 MHz</td></tr>
<tr><td colspan="6">Channel Bandwidth</td></tr>
<tr><td>20 MHz</td><td>15 MHz</td><td>10 MHz</td><td>5 MHz</td><td>3 MHz</td><td>1.4 MHz</td></tr>
<tr><td>Low</td><td></td><td></td><td>26740/ 819</td><td>26715/ 816.5</td><td>26705/ 815.5</td><td>26697/ 814.7</td></tr>
<tr><td>Mid</td><td></td><td>26865/ 831.5</td><td>26865/ 831.5</td><td>26865/ 831.5</td><td>26865/ 831.5</td><td>26865/ 831.5</td></tr>
<tr><td>High</td><td></td><td></td><td>26990/ 844</td><td>27015/ 846.5</td><td>27025/ 847.5</td><td>27033/ 848.3</td></tr>
<tr><td>LTE transmitter and antenna implementation</td><td colspan="7">LTE transmits from the Cellular Antenna.</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
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. Testing Rationale

Model FCC ID: PY7-PM0943 was previously tested for all wireless technologies and bands except LTE Band 26. The results for these tests are in FCC SAR report 16J22997-S17V2. LTE band 26 has subsequently been added to Model FCC ID: PY7-PM0943 through a software change. This report contains test results for LTE band 26 only. The Wi-Fi and BT results from FCC SAR report 16J22997-S17V2 have been used in this report for simultaneous transmission analysis.

7. RF Exposure Conditions (Test Configurations)

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

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

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.

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 %
3	5/31/2016	Head	835	835	40.97	41.50	-1.28	0.94	0.90	4.44
				805	41.01	41.68	-1.61	0.92	0.90	2.38
				905	39.87	41.50	-3.93	1.00	0.97	2.83
3	5/31/2016	Body	835	835	54.76	55.20	-0.80	1.00	0.97	2.87
				805	55.04	55.33	-0.53	0.97	0.97	0.00
				905	54.08	55.00	-1.67	1.07	1.05	1.19

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 %	
3	5/31/2016	Head	D835V2 SN:4d142	9/23/2016	0.880	8.80	9.27	-5.07	0.581	5.81	6.01	-3.33	
3	5/31/2016	Body	D835V2 SN:4d142	9/23/2016	1.010	10.10	9.41	7.33	0.668	6.68	6.18	8.09	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 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 26 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)		
						821.5 MHz	831.5 MHz	841.5 MHz
LTE Band 26	15	QPSK	1	0	0	24.00	**24.00**	23.90
			1	36	0	23.80	23.80	23.80
			1	74	0	24.00	24.00	23.80
			36	0	1	22.80	**22.90**	22.80
			36	18	1	22.80	22.80	22.90
			36	37	1	22.80	22.90	22.90
			75	0	1	22.80	**22.90**	22.90
		16QAM	1	0	1	23.20	23.10	23.00
			1	36	1	23.00	22.70	23.00
			1	74	1	23.10	23.10	23.20
			36	0	2	21.90	22.10	22.00
			36	18	2	21.80	21.90	21.90
			36	37	2	21.90	22.00	22.00
			75	0	2	21.90	22.00	21.90

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)		
						819 MHz	831.5 MHz	844 MHz
LTE Band 26	10	QPSK	1	0	0	23.70	23.90	23.50
			1	25	0	23.60	23.90	23.40
			1	49	0	23.60	23.90	23.40
			25	0	1	22.60	23.00	22.50
			25	12	1	22.70	23.00	22.40
			25	25	1	22.60	23.00	22.40
			50	0	1	22.60	23.00	22.50
		16QAM	1	0	1	22.80	22.80	22.80
			1	25	1	22.70	22.80	22.70
			1	49	1	22.50	22.80	22.60
			25	0	2	21.80	22.00	21.60
			25	12	2	21.90	22.00	21.50
			25	25	2	21.80	22.00	21.50
			50	0	2	21.70	22.00	21.50

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)		
						816.5 MHz	831.5 MHz	846.5 MHz
LTE Band 26	5	QPSK	1	0	0	23.80	24.10	23.30
			1	12	0	23.70	24.00	23.20
			1	24	0	23.70	24.00	23.20
			12	0	1	22.80	22.90	22.30
			12	6	1	22.70	22.90	22.30
			12	11	1	22.70	23.00	22.20
			25	0	1	22.70	23.00	22.30
		16QAM	1	0	1	22.80	23.20	22.80
			1	12	1	22.70	23.10	22.80
			1	24	1	22.80	23.10	22.80
			12	0	2	21.80	21.90	21.40
			12	6	2	21.80	22.00	21.50
			12	11	2	21.80	22.00	21.40
			25	0	2	21.70	22.00	21.40

Note(s):

15 MHz Bandwidth does not support at least three non-overlapping channels. 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 per KDB 941225 D05 SAR for LTE Devices.

LTE Band 26 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)		
						815.5 MHz	831.5 MHz	847.5 MHz
LTE Band 26	3	QPSK	1	0	0	23.70	24.00	23.10
			1	7	0	23.70	24.00	23.10
			1	14	0	23.60	24.00	23.10
			8	0	1	22.70	22.80	22.10
			8	4	1	22.70	22.90	22.10
			8	7	1	22.70	22.90	22.10
			15	0	1	22.70	23.00	22.20
		16QAM	1	0	1	22.80	22.70	22.50
			1	7	1	22.80	22.80	22.40
			1	14	1	22.80	22.80	22.50
			8	0	2	21.80	22.00	21.20
			8	4	2	21.80	22.00	21.20
			8	7	2	21.80	22.00	21.20
			15	0	2	21.70	22.00	21.20

Band	BW (MHz)	Mode	RB Allocation	RB offset	MPR	Max. Avg Pwr (dBm)		
						814.7 MHz	831.5 MHz	848.3 MHz
LTE Band 26	1.4	QPSK	1	0	0	23.60	23.90	23.10
			1	2	0	23.70	24.00	23.10
			1	5	0	23.60	24.00	23.10
			3	0	0	23.70	23.90	23.20
			3	1	0	23.70	23.90	23.20
			3	2	0	23.70	23.90	23.10
			6	0	1	22.60	22.90	22.10
		16QAM	1	0	1	22.70	22.90	22.50
			1	2	1	22.70	23.00	22.40
			1	5	1	22.60	22.90	22.40
			3	0	1	22.80	22.90	22.30
			3	1	1	22.80	23.00	22.40
			3	2	1	22.80	23.00	22.30
			6	0	2	21.80	22.00	21.00

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 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 26 (15MHz 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	26865	831.5	1	0	24.5	24.0	0.336	0.377	
						36	0	23.5	22.9	0.252	0.289	
			Left Tilt	26865	831.5	1	0	24.5	24.0	0.176	0.197	
						36	0	23.5	22.9	0.137	0.157	
			Right Touch	26865	831.5	1	0	24.5	24.0	0.386	**0.433**	1
						36	0	23.5	22.9	0.299	0.343	
			Right Tilt	26865	831.5	1	0	24.5	24.0	0.182	0.204	
						36	0	23.5	22.9	0.141	0.162	
Body-worn	QPSK	15	Rear	26865	831.5	1	0	24.5	24.0	0.295	0.331	
						36	0	23.5	22.9	0.234	0.269	
			Front	26865	831.5	1	0	24.5	24.0	0.321	**0.360**	2
						36	0	23.5	22.9	0.243	0.279	
Hotspot	QPSK	10	Rear	26865	831.5	1	0	24.5	24.0	0.481	**0.540**	3
						36	0	23.5	22.9	0.373	0.428	
			Front	26865	831.5	1	0	24.5	24.0	0.477	0.535	
						36	0	23.5	22.9	0.371	0.426	
			Edge 2	26865	831.5	1	0	24.5	24.0	0.383	0.430	
						36	0	23.5	22.9	0.313	0.359	
			Edge 3	26865	831.5	1	0	24.5	24.0	0.213	0.239	
						36	0	23.5	22.9	0.165	0.189	
			Edge 4	26865	831.5	1	0	24.5	24.0	0.251	0.282	
						36	0	23.5	22.9	0.186	0.214	

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 3 (1-g or 10-g respectively) 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 or 3 (1-g or 10-g respectively).

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)	First Repeated		Second Repeated		Third Repeated
						Measured SAR (W/kg)	Largest to Smallest SAR Ratio	Measured SAR (W/kg)	Largest to Smallest SAR Ratio	Measured SAR (W/kg)
850	LTE Band 26	Hotspot	Rear	No	0.481	N/A	N/A	N/A	N/A	N/A

12. Simultaneous Transmission SAR Analysis

Simultaneous Transmission Condition

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

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

RF Exposure conditions	Standalone SAR (W/kg)			∑ 1-g SAR (W/kg)
	WWAN ①	DTS Chain 0 ②	DTS Chain 1 ③	WWAN + DTS ① +② +③
Head	0.433	0.286	0.291	1.010
Body-worn	0.360	0.017	0.097	0.474
Hotspot	0.540	0.052	0.146	0.738

Note(s):

Please refer to SAR Report 16J22997-S17V2 for Standalone Wi-Fi (DTS) and Bluetooth data. Wi-Fi (DTS) and Bluetooth data is used for Simultaneous SAR evaluations.

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

RF Exposure conditions	Standalone SAR (W/kg)				∑ 1-g SAR (W/kg)	
	WWAN ①	U-NII Chain 0 ②	U-NII Chain 1 ③	BT ④	WWAN + U-NII ① +②+③	WWAN + U-NII + BT ① +② +③ +④
Head	0.433	0.257	0.254		0.944	
Body-worn	0.360	0.021	0.085	0.224	0.466	0.690

Note(s):

Please refer to SAR Report 16J22997-S17V2 for Standalone Wi-Fi (DTS) and Bluetooth data. Wi-Fi (DTS) and Bluetooth data is used for Simultaneous SAR evaluations.

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

RF Exposure conditions	Standalone SAR (W/kg)			∑ 1-g SAR (W/kg)
	WWAN ①	DTS Chain 0 ②	U-NII Chain 1 ③	WWAN + DTS + U-NII ① +② +③
Head	0.433	0.286	0.254	0.973
Body-worn	0.360	0.017	0.085	0.462
Hotspot	0.540	0.052		0.592

Note(s):

Please refer to SAR Report 16J22997-S17V2 for Standalone Wi-Fi (DTS) and Bluetooth data. Wi-Fi (DTS) and Bluetooth data is used for Simultaneous SAR evaluations.

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

RF Exposure conditions	Standalone SAR (W/kg)				∑ 1-g SAR (W/kg)	
	WWAN ①	DTS Chain 1 ②	U-NII Chain 0 ③	BT ④	WWAN + DTS + U-NII ① +② +③	WWAN + DTS + U-NII + BT ① +② +③ +④
Head	0.433	0.291	0.257		0.981	
Body-worn	0.360	0.097	0.021	0.224	0.478	0.702
Hotspot	0.540	0.146			0.686	

Note(s):

Please refer to SAR Report 16J22997-S17V2 for Standalone Wi-Fi (DTS) and Bluetooth data. Wi-Fi (DTS) and Bluetooth data is used for Simultaneous SAR evaluations.

Conclusion:

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

Appendixes

Refer to separated files for the following appendixes.

16U23577-S1V1 SAR_App A Setup Photos

16U23577-S1V1 SAR_App B System Check Plots

16U23577-S1V1 SAR_App C Highest Test Plots

16U23577-S1V1 SAR_App D Tissue Ingredients

16U23577-S1V1 SAR_App E Probe Cal. Certificates

16U23577-S1V1 SAR_App F Dipole Cal. Certificates

END OF REPORT