FCC 47 CFR § 2.1093
IEEE Std 1528-2013

SAR EVALUATION REPORT

FOR

GSM/WCDMA/LTE Phone + BT/BLE, DTS b/g/n and NFC

MODEL NUMBER : SM-J600L, SM-J600N

FCC ID: A3LSMJ600KOR

REPORT NUMBER: 4788452485-S1V1

ISSUE DATE: 5/11/2018

Prepared for
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ACCREDITED
Testing Laboratory

TL-637

Revision History

Rev.	Date	Revisions	Revised By
V1	5/11/2018	Initial Issue	Sunghoon Kim

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1. Attestation of Test Results

Applicant Name		SAMSUNG ELECTRONICS CO.,LTD.		
FCC ID		A3LSMJ600KOR		
Model Number		SM-J600L and SM-J600N		
Applicable Standards		FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013		
SAR Limits (W/Kg)				
Exposure Category		Peak spatial-average(1g of tissue)		
General population / Uncontrolled exposure		1.6		
The Highest Reported SAR (W/kg)				
RF Exposure Conditions		**Equipment Class**		
		Licensed	**DTS**	**DSS(BT)**
Head		0.47	0.49	0.30
Body-worn		0.42	0.21	
Hotspot		1.30	0.44	
Simultaneous TX	Head	0.96		0.77
	Body-worn	0.63		
	Hotspot	1.07		
Date Tested		4/18/2018 to 4/30/2018		
Test Results		Pass		

UL Korea, Ltd. 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 Korea, Ltd. 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 Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. 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 IAS, any agency of the Federal Government, or any agency of any government.

Approved & Released By:	Prepared By:
	
Justin Park Lead Test Engineer UL Korea, Ltd. Suwon Laboratory	Sunghoon Kim Associate Test Engineer UL Korea, Ltd. Suwon Laboratory

2. Test Specification, Methods and Procedures

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

- 248227 D01 802.11 Wi-Fi SAR v02r02
- 447498 D01 General RF Exposure Guidance v06
- 648474 D04 Handset SAR v01r03
- 690783 D01 SAR Listings on Grants v01r03
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
- 865664 D02 RF Exposure Reporting v01r02
- 941225 D01 3G SAR Procedures v03r01
- 941225 D05 SAR for LTE Devices v02r05
- 941225 D06 Hotspot Mode v02r01

In addition to the above, the following information was used:

- TCB workshop October, 2014; Page 37, RF Exposure Procedures Update (Other LTE Considerations)
- TCB workshop October, 2016; Page 7, RF Exposure Procedures (Bluetooth Duty Factor)

3. Facilities and Accreditation

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

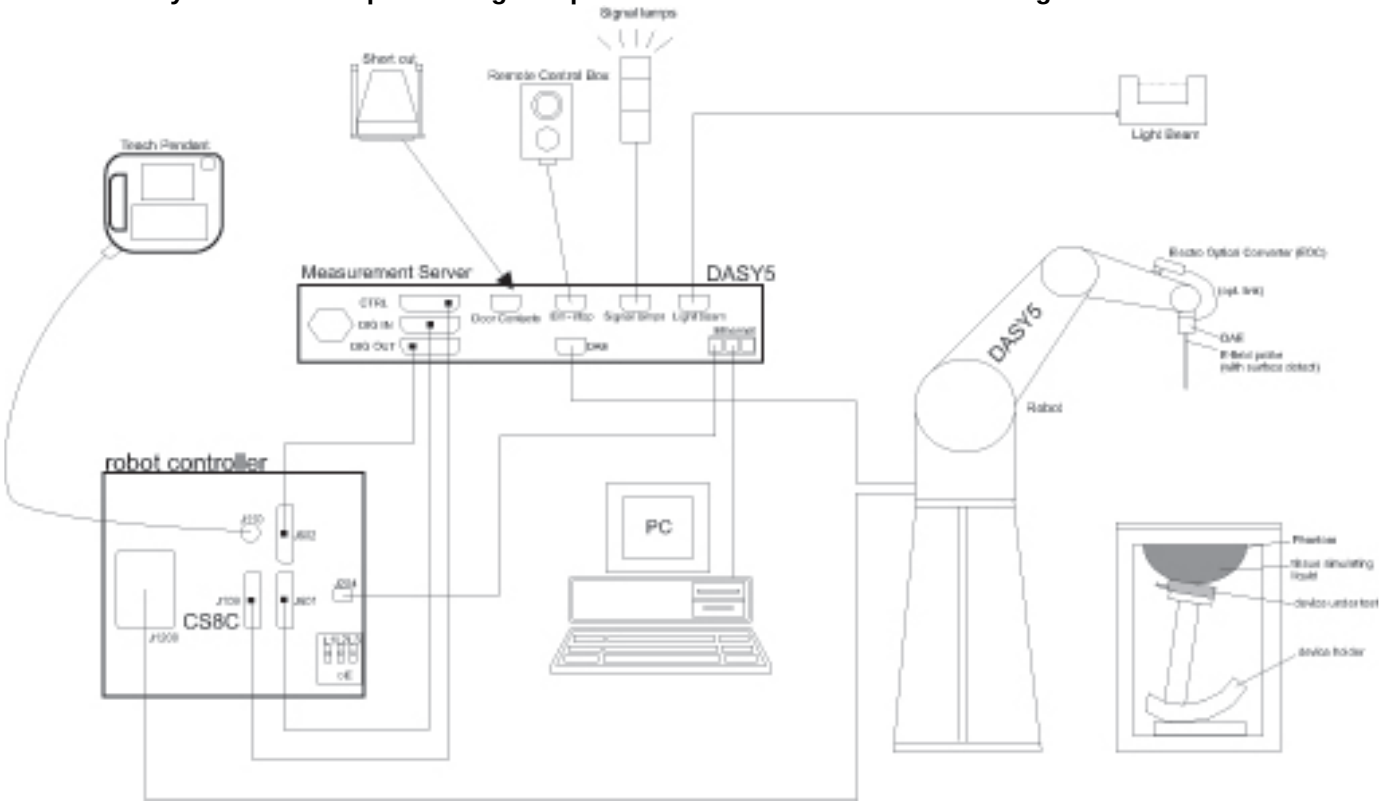
Suwon
SAR 1 Room
SAR 2 Room
SAR 3 Room

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637.
The full scope of accreditation can be viewed at http://www.iasonline.org/PDF/TL/TL-637.pdf.

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	E5071C	MY46522054	8-8-2018
Dielectric Assessment Kit	SPEAG	DAK-3.5	1196	8-2-2018
Shorting block	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	LKM	DTM3000	3424	8-11-2018
Thermometer	Lutron	MHB-382SD	AH.91478	8-10-2018

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
MXG Analog Signal Generator	Agilent	N5181A	MY50145882	8-7-2018
Power Sensor	Agilent	U2000A	MY54260010	8-8-2018
Power Sensor	Agilent	U2000A	MY54260007	8-8-2018
Power Amplifier	EXODUS	1410025-AMP2027-10003	10003	8-8-2018
Directional Coupler	Agilent	772D	MY52180193	8-7-2018
Directional Coupler	Agilent	778D	MY52180432	8-7-2018
Low Pass Filter	MICROLAB	LA-15N	03943	8-7-2018
Low Pass Filter	FILTRON	L14012FL	1410003S	8-7-2018
Attenuator	Agilent	8491B/003	MY39269292	8-7-2018
Attenuator	Agilent	8491B/010	MY39269315	8-7-2018
Attenuator	Agilent	8491B/020	MY39269298	8-7-2018
E-Field Probe (SAR1)	SPEAG	EX3DV4	7376	8-22-2018
E-Field Probe (SAR2)	SPEAG	EX3DV4	7330	1-22-2019
E-Field Probe (SAR3)	SPEAG	EX3DV4	7314	9-28-2018
Data Acquisition Electronics (SAR1)	SPEAG	DAE4	1468	8-22-2018
Data Acquisition Electronics (SAR2)	SPEAG	DAE4	1447	3-15-2019
Data Acquisition Electronics (SAR3)	SPEAG	DAE4	1494	7-20-2018
System Validation Dipole	SPEAG	D750V3	1122	2-19-2019
System Validation Dipole	SPEAG	D835V2	4d194	7-19-2018
System Validation Dipole	SPEAG	D1900V2	5d190	9-20-2018
System Validation Dipole	SPEAG	D2450V2	939	9-19-2018
System Validation Dipole	SPEAG	D2600V2	1097	1-17-2019
Thermometer (SAR1)	Lutron	MHB-382SD	AH.91463	8-10-2018
Thermometer (SAR2)	Lutron	MHB-382SD	AH.50215	2-9-2019
Thermometer (SAR3)	Lutron	MHB-382SD	AH.50213	8-16-2018

Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Base Station Simulator	R & S	CMW500	150313	12-08-2018
Base Station Simulator	R & S	CMW500	150314	12-05-2018
Bluetooth Tester	TESCOM	TC-3000C	3000C000546	8-7-2018

5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The 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	Overall (Length x Width): 149.3 mm x 70.7 mm Overall Diagonal: 155.5 mm Display Diagonal: 142.8 mm
Back Cover	☒ The Back Cover is not removable.
Battery Options	☒ The rechargeable battery is not user accessible
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	**No.** / **S/N** / **Notes** 1 / 5200874F4E6015E7 / Wi-Fi/BT conduction 2 / RD50337M / Main conduction 3 / R39K30VMWSK / SAR 4 / R39K30VN42F / SAR

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	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 (Release.5) HSUPA (Release.6) HSPA+ (Release.7)		100%
LTE	FDD Band 5 FDD Band 17 TDD Band 41	QPSK 16QAM ☒ Rel. 10 Does not support Carrier Aggregation (CA)		100%(FDD) 63.3%(TDD) [1]
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20)		99.5% (802.11b) 96.9% (802.11g) 96.7% (802.11n HT20)
Bluetooth	2.4 GHz	Version 4.2 LE		77.0% (DH5)

Notes:

1. The Bluetooth protocol is considered source-based averaging. Bluetooth GFSK (DH5) was verified to have the highest duty cycle of 77.0% and was considered and used for SAR Testing.
2. Duty cycle for Wi-Fi is referenced from the DTS report.

6.3. Nominal and Maximum Output Power

KDB 447498 sec.4.1. 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.

RF Air interface	Mode	Time Slots	Max. RF Output Power (dBm)	
			Tune-up Limit	Frame Pwr
GSM1900	Voice	1	**30.5**	**21.5**
	GPRS	1	**30.5**	**21.5**
	GPRS	2	**28.0**	**22.0**
	GPRS	3	**26.5**	**22.2**
	GPRS	4	**25.0**	**22.0**
	EGPRS	1	**27.5**	**18.5**
	EGPRS	2	**25.5**	**19.5**
	EGPRS	3	**24.3**	**20.0**
	EGPRS	4	**23.1**	**20.1**

RF Air interface	Mode	Max. RF Output Power (dBm)
W-CDMA Band II	R99	**24.5**
	HSDPA	**22.0**
	HSUPA	**23.5**
W-CDMA Band V	R99	**25.0**
	HSDPA	**23.0**
	HSUPA	**23.0**

RF Air interface	Mode	Max. RF Output Power (dBm)
LTE Band 5	QPSK	**25.0**
LTE Band 17	QPSK	**25.0**
LTE Band 41	QPSK	**24.0**

Notes:

1. LTE QPSK configuration has the highest maximum average output power per 3GPP standard.

RF Air interface	Mode	Max. RF Output Power (dBm)	Reduced RF Output Power (dBm)
WiFi 2.4 GHz (Ch. 1~Ch. 10)	802.11b	**18.0**	**13.0**
	802.11g	**17.0**	**13.0**
	802.11n HT20	**17.0**	**13.0**
WiFi 2.4 GHz (Ch. 11)	802.11b	**18.0**	**13.0**
	802.11g	**15.5**	**13.0**
	802.11n HT20	**15.0**	**13.0**
WiFi 2.4 GHz (Ch. 12)	802.11b	**8.5**	
	802.11g	**8.5**	
	802.11n HT20	**8.5**	
WiFi 2.4 GHz (Ch. 13)	802.11b	**3.0**	
	802.11g	**3.0**	
	802.11n HT20	**3.0**	
Bluetooth		**11.0**	
Bluetooth LE		**9.5**	

Note(s):

This device uses an independent fixed level power reduction mechanism for WLAN operations during voice or VoIP held to ear scenarios. Per FCC Guidance, the held-to-ear exposure conditions were evaluated at reduced power according to the head SAR positions described in IEEE 1528-2013. Detailed descriptions of the power reduction mechanism are included in the operational description.

6.4. General LTE SAR Test and Reporting Considerations

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Frequency range, Channel Bandwidth, Numbers and Frequencies</td><td>
<table>
<tr><td rowspan="3">Band 5</td><td colspan="6">Frequency range: 824 - 849 MHz</td></tr>
<tr><td colspan="6">Channel Bandwidth</td></tr>
<tr><td>20 MHz</td><td>15 MHz</td><td>10 MHz</td><td>5 MHz</td><td>3 MHz</td><td>1.4 MHz</td></tr>
<tr><td>Low</td><td></td><td></td><td>20450/ 829</td><td>20425/ 826.5</td><td>20415/ 825.5</td><td>20407/ 824.7</td></tr>
<tr><td>Mid</td><td></td><td></td><td>20525/ 836.5</td><td>20525/ 836.5</td><td>20525/ 836.5</td><td>20525/ 836.5</td></tr>
<tr><td>High</td><td></td><td></td><td>20600/ 844</td><td>20625/ 846.5</td><td>20635/ 847.5</td><td>20643/ 848.3</td></tr>
<tr><td rowspan="3">Band 17</td><td colspan="6">Frequency range: 704 - 716 MHz</td></tr>
<tr><td colspan="6">Channel Bandwidth</td></tr>
<tr><td>20 MHz</td><td>15 MHz</td><td>10 MHz</td><td>5 MHz</td><td>3 MHz</td><td>1.4 MHz</td></tr>
<tr><td>Low</td><td></td><td></td><td>23780/ 709</td><td>23755/ 706.5</td><td></td><td></td></tr>
<tr><td>Mid</td><td></td><td></td><td>23790/ 710</td><td>23790/ 710</td><td></td><td></td></tr>
<tr><td>High</td><td></td><td></td><td>23800/ 711</td><td>23825/ 713.5</td><td></td><td></td></tr>
<tr><td rowspan="3">Band 41</td><td colspan="6">Frequency range: 2496 - 2690 MHz</td></tr>
<tr><td colspan="6">Channel Bandwidth</td></tr>
<tr><td>20 MHz</td><td>15 MHz</td><td>10 MHz</td><td>5 MHz</td><td>3 MHz</td><td>1.4 MHz</td></tr>
<tr><td>Low</td><td colspan="4">39750 / 2506.0</td><td></td><td></td></tr>
<tr><td>Low-Mid</td><td colspan="4">40185 / 2549.5</td><td></td><td></td></tr>
<tr><td>Mid</td><td colspan="4">40620 / 2593.0</td><td></td><td></td></tr>
<tr><td>Mid-High</td><td colspan="4">41055 / 2636.5</td><td></td><td></td></tr>
<tr><td>High</td><td colspan="4">41490 / 2680.0</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>LTE transmitter and antenna implementation</td><td>Refer to Appendix A.</td></tr>
<tr><td>Maximum power reduction (MPR)</td><td>
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>No</td></tr>
<tr><td>Spectrum plots for RB configurations</td><td>A properly configured base station simulator was used for the SAR and power measurements; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.</td></tr>
</table>

Notes:

1. SAR Testing for LTE was performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

6.5. LTE (TDD) Considerations

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

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

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

Special subframe configuration	Normal cyclic prefix in downlink			Extended cyclic prefix in downlink		
	DwPTS	UpPTS		DwPTS	UpPTS	
		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink
0	$6592 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$	$7680 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$
1	$19760 \cdot T_s$			$20480 \cdot T_s$		
2	$21952 \cdot T_s$			$23040 \cdot T_s$		
3	$24144 \cdot T_s$			$25600 \cdot T_s$		
4	$26336 \cdot T_s$			$7680 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$
5	$6592 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$	$20480 \cdot T_s$		
6	$19760 \cdot T_s$			$23040 \cdot T_s$		
7	$21952 \cdot T_s$			$12800 \cdot T_s$		
8	$24144 \cdot T_s$			-	-	-
9	$13168 \cdot T_s$			-	-	-

Calculated Duty Cycle

Uplink-Downlink Configuration	Downlink-to-Uplink Switch-point Periodicity	Subframe Number										Calculated Duty Cycle (%)
		0	1	2	3	4	5	6	7	8	9	
0	5 ms	D	S	U	U	U	D	S	U	U	U	63.33
1	5 ms	D	S	U	U	D	D	S	U	U	D	43.33
2	5 ms	D	S	U	D	D	D	S	U	D	D	23.33
3	10 ms	D	S	U	U	U	D	D	D	D	D	31.67
4	10 ms	D	S	U	U	D	D	D	D	D	D	21.67
5	10 ms	D	S	U	D	D	D	D	D	D	D	11.67
6	5 ms	D	S	U	U	U	D	S	U	U	D	53.33

Calculated Duty Cycle = Extended cyclic prefix in uplink x (T_s) x # of S + # of U

Example for Calculated Duty Cycle for Uplink-Downlink Configuration 0:
Calculated Duty Cycle = 5120 x [1/(15000 x 2048)] x 2 + 6 ms = 63.33%
where
T_s = 1/(15000 x 2048) seconds

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

6.6. Power Reduction by Proximity Sensing

6.6.1. Proximity Sensor Triggering Distance (KDB 616217 §6.2)

Front of the DUT was placed directly below the flat phantom. The DUT was moved toward the phantom in accordance with the steps outlined in KDB 616217 §6.2 to determine the trigger distance for enabling power reduction. The DUT was moved away from the phantom to determine the trigger distance for resuming full power.

The DUT featured a visual indicator on its display that showed the status of the proximity sensor (Triggered or not triggered). This was used to determine the status of the sensor during the proximity sensor assessment as monitoring the output power directly was not practical without affecting the measurement.

It was confirmed separately that the output power was altered according to the proximity sensor status indication. This was achieved by observing the proximity sensor status at the same time as monitoring the conducted power. Section 9 contains both the full and reduced conducted power measurements.

Proximity Sensor Trigger Distance Assessment
KDB 616217 §6.2, Front

LEGEND

Direction of DUT travel for determination of power reduction triggering point

Direction of DUT travel for determination of full power resumption triggering point

Summary of Trigger Distances

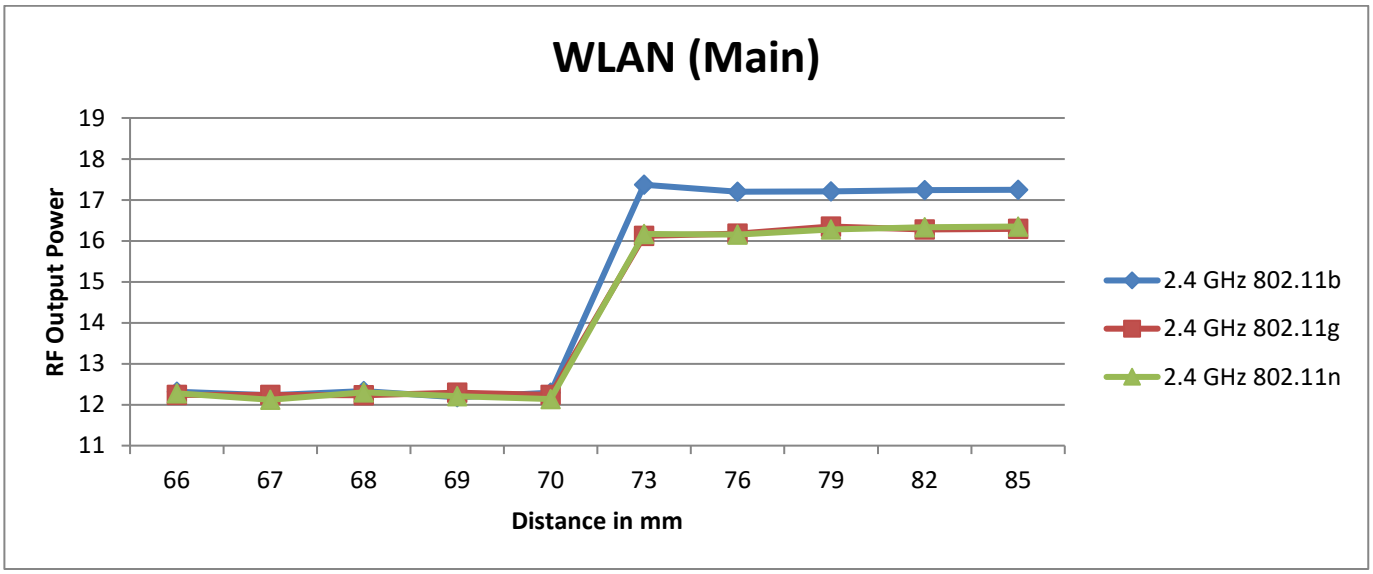
Tissue simulating liquid	Trigger distance - Front	
	Moving toward phantom	Moving from phantom
2450 Head	70 mm	79 mm

Proximity Sensor Triggering Distance Measurement Results

WLAN 2.4 GHz

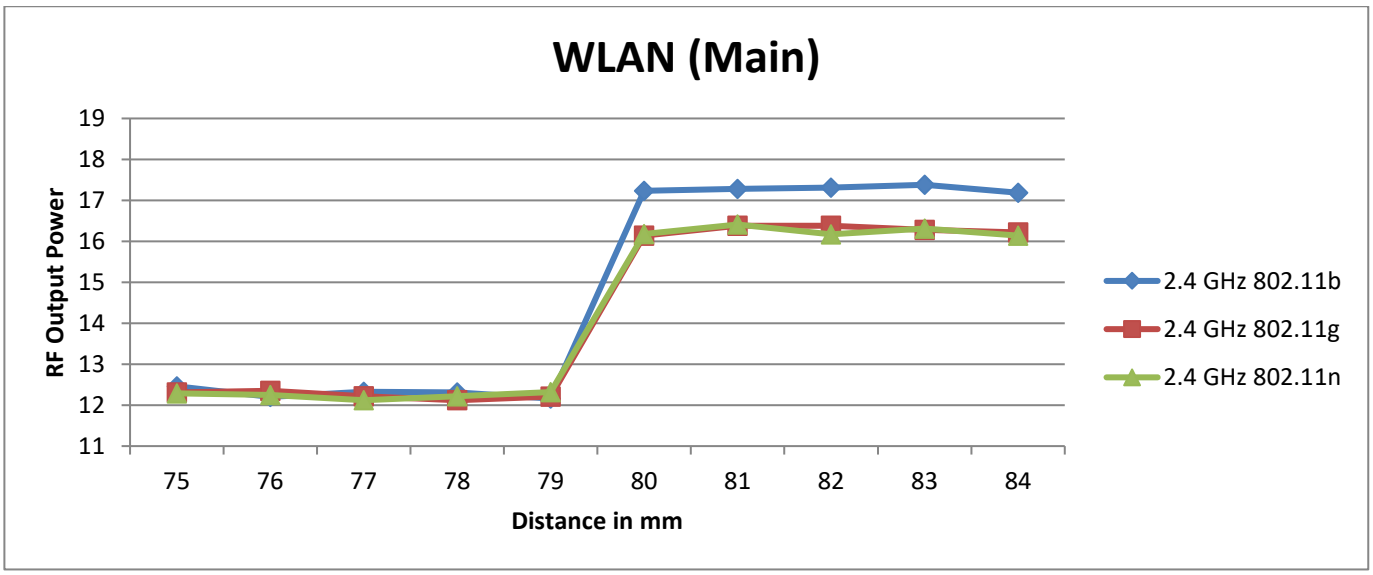
Front, DUT Moving Toward (Trigger) from the Phantom

Distance to DUT vs. Output Power in dBm										
Distance	66	67	68	69	70	73	76	79	82	85
2.4 GHz 802.11b	12.3	12.2	12.3	12.2	12.3	17.4	17.2	17.2	17.2	17.3
2.4 GHz 802.11g	12.2	12.2	12.2	12.3	12.2	16.1	16.2	16.4	16.3	16.3
2.4 GHz 802.11n	12.3	12.1	12.3	12.2	12.1	16.2	16.2	16.3	16.3	16.4



Front, DUT Moving Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm										
Distance	75	76	77	78	79	80	81	82	83	84
2.4 GHz 802.11b	12.5	12.2	12.3	12.3	12.2	17.2	17.3	17.3	17.4	17.2
2.4 GHz 802.11g	12.3	12.4	12.2	12.1	12.2	16.1	16.4	16.4	16.3	16.2
2.4 GHz 802.11n	12.3	12.3	12.1	12.2	12.3	16.2	16.4	16.2	16.3	16.1



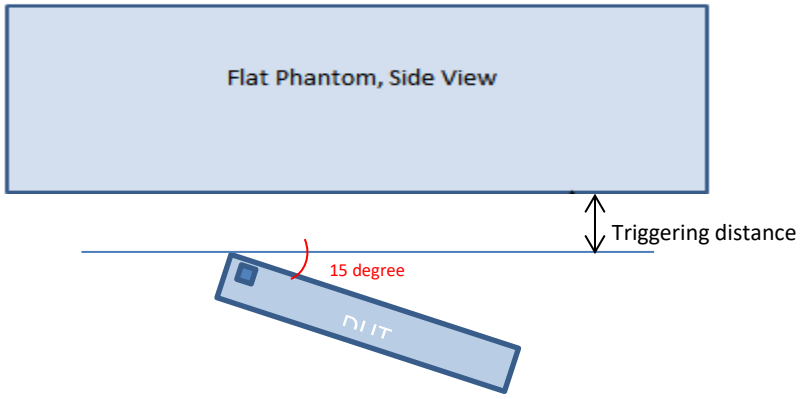
6.6.2. Proximity Sensor Coverage (KDB 616217 §6.3)

This device uses a proximity senor that is triggering in any conditions the user may use the device in proximity of the sensor in the device. Therefore, no further sensor coverage assessments were required according to KDB 616217 §6.3.

6.6.3. Tilt angle of the front side

Proximity sensor is triggering at 70mm on front side according to KDB 616217 Sec 6.2.

For tilt angle (15 degree) of the front side, Power is reduced at 70mm according to operate Proximity sensor. So All head exposure tests are evaluated using reduced power.



Summary of Tilt Angle of the front side to Proximity Sensor Triggering

Band (MHz)	Minimum trigger distance measured according to KDB 616217 §6.2	Minimum distance at which power reduction was maintained at +15°	Power reduction status	
			0°	15°
2450	70 mm	70 mm	On	On

6.6.4. Resulting test positions for SAR measurements

Wireless technologies	DUT Position	Sec.6.6.1 Triggering Distance	Sec.6.6.2 Coverage	Sec.6.6.3 Tilt Angle at 15 degree	Worst case distance for SAR
WLAN	Front	70 mm	N/A	70 mm	69 mm

Notes:

1. Worst case distance for SAR is not considered for body exposure condition. Because Power reduction is applied only voice or VoIP held to ear scenarios.
2. This proximity sensor is only operating in Head exposure condition. So tilt (15 degree) position of Head exposure was additional verified.

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	Head	0 mm	Left Touch	N/A	Yes	
			Left Tilt (15°)	N/A	Yes	
			Right Touch	N/A	Yes	
			Right Tilt (15°)	N/A	Yes	
	Body	15 mm	Rear	N/A	Yes	
			Front	N/A	Yes	
	Hotspot	10 mm	Rear	< 25 mm	Yes	
			Front	< 25 mm	Yes	
			Edge 1 (Top)	> 25 mm	No	1
			Edge 2 (Right)	< 25 mm	Yes	
			Edge 3 (Bottom)	< 25 mm	Yes	
			Edge 4 (Left)	< 25 mm	Yes	
WLAN	Head	0 mm	Left Touch	N/A	Yes	
			Left Tilt (15°)	N/A	Yes	
			Right Touch	N/A	Yes	
			Right Tilt (15°)	N/A	Yes	
	Body	15 mm	Rear	N/A	Yes	
			Front	N/A	Yes	
	Hotspot / Wi-Fi Direct	10 mm	Rear	< 25 mm	Yes	
			Front	< 25 mm	Yes	
			Edge 1 (Top)	< 25 mm	Yes	
			Edge 2 (Right)	> 25 mm	No	1
			Edge 3 (Bottom)	> 25 mm	No	1
			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 Hotspot 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.

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 1 Room

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4-18-2018	Body 2450	e'	51.8500	Relative Permittivity (ϵ_r):	51.85	52.70	-1.61	5
		e''	14.9400	Conductivity (σ):	2.04	1.95	4.37	5
	Body 2410	e'	51.9300	Relative Permittivity (ϵ_r):	51.93	52.76	-1.57	5
		e''	14.8400	Conductivity (σ):	1.99	1.91	4.25	5
	Body 2480	e'	51.7600	Relative Permittivity (ϵ_r):	51.76	52.66	-1.71	5
		e''	15.0300	Conductivity (σ):	2.07	1.99	4.04	5
4-18-2018	Body 2600	e'	51.4100	Relative Permittivity (ϵ_r):	51.41	52.51	-2.10	5
		e''	15.3400	Conductivity (σ):	2.22	2.16	2.63	5
	Body 2500	e'	51.7100	Relative Permittivity (ϵ_r):	51.71	52.64	-1.76	5
		e''	15.0800	Conductivity (σ):	2.10	2.02	3.76	5
	Body 2700	e'	51.1100	Relative Permittivity (ϵ_r):	51.11	52.38	-2.43	5
		e''	15.6000	Conductivity (σ):	2.34	2.30	1.77	5
4-20-2018	Body 750	e'	53.6200	Relative Permittivity (ϵ_r):	53.62	55.55	-3.47	5
		e''	23.0400	Conductivity (σ):	0.96	0.96	-0.23	5
	Body 700	e'	54.1700	Relative Permittivity (ϵ_r):	54.17	55.74	-2.81	5
		e''	23.4200	Conductivity (σ):	0.91	0.96	-4.97	5
	Body 790	e'	53.1700	Relative Permittivity (ϵ_r):	53.17	55.39	-4.01	5
		e''	22.7700	Conductivity (σ):	1.00	0.97	3.52	5
4-27-2018	Body 2450	e'	52.4700	Relative Permittivity (ϵ_r):	52.47	52.70	-0.44	5
		e''	14.3900	Conductivity (σ):	1.96	1.95	0.53	5
	Body 2400	e'	52.5700	Relative Permittivity (ϵ_r):	52.57	52.77	-0.38	5
		e''	14.3100	Conductivity (σ):	1.91	1.90	0.61	5
	Body 2480	e'	52.3900	Relative Permittivity (ϵ_r):	52.39	52.66	-0.52	5
		e''	14.4700	Conductivity (σ):	2.00	1.99	0.16	5
4-30-2018	Body 2450	e'	52.4400	Relative Permittivity (ϵ_r):	52.44	52.70	-0.49	5
		e''	14.7400	Conductivity (σ):	2.01	1.95	2.97	5
	Body 2400	e'	52.5100	Relative Permittivity (ϵ_r):	52.51	52.77	-0.50	5
		e''	14.6500	Conductivity (σ):	1.96	1.90	3.00	5
	Body 2480	e'	52.3900	Relative Permittivity (ϵ_r):	52.39	52.66	-0.52	5
		e''	14.8100	Conductivity (σ):	2.04	1.99	2.51	5

SAR 2 Room

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4-18-2018	Head 835	e'	40.3200	Relative Permittivity (ϵ_r):	40.32	41.50	-2.84	5
		e''	19.5200	Conductivity (σ):	0.91	0.90	0.70	5
	Head 820	e'	40.4900	Relative Permittivity (ϵ_r):	40.49	41.60	-2.67	5
		e''	19.5800	Conductivity (σ):	0.89	0.90	-0.64	5
	Head 850	e'	40.1500	Relative Permittivity (ϵ_r):	40.15	41.50	-3.25	5
		e''	19.4800	Conductivity (σ):	0.92	0.92	0.62	5
4-19-2018	Body 1900	e'	51.8900	Relative Permittivity (ϵ_r):	51.89	53.30	-2.65	5
		e''	14.9100	Conductivity (σ):	1.58	1.52	3.63	5
	Body 1850	e'	51.9900	Relative Permittivity (ϵ_r):	51.99	53.30	-2.46	5
		e''	14.8600	Conductivity (σ):	1.53	1.52	0.56	5
	Body 1910	e'	51.8600	Relative Permittivity (ϵ_r):	51.86	53.30	-2.70	5
		e''	14.9300	Conductivity (σ):	1.59	1.52	4.32	5
4-19-2018	Head 2600	e'	37.4800	Relative Permittivity (ϵ_r):	37.48	39.01	-3.92	5
		e''	14.0400	Conductivity (σ):	2.03	1.96	3.44	5
	Head 2500	e'	37.8100	Relative Permittivity (ϵ_r):	37.81	39.14	-3.39	5
		e''	13.8100	Conductivity (σ):	1.92	1.85	3.54	5
	Head 2700	e'	37.0900	Relative Permittivity (ϵ_r):	37.09	38.88	-4.62	5
		e''	14.2800	Conductivity (σ):	2.14	2.07	3.55	5
4-27-2018	Head 2450	e'	38.4100	Relative Permittivity (ϵ_r):	38.41	39.20	-2.02	5
		e''	13.5300	Conductivity (σ):	1.84	1.80	2.40	5
	Head 2400	e'	38.5900	Relative Permittivity (ϵ_r):	38.59	39.30	-1.80	5
		e''	13.4200	Conductivity (σ):	1.79	1.75	2.24	5
	Head 2480	e'	38.3100	Relative Permittivity (ϵ_r):	38.31	39.16	-2.18	5
		e''	13.6000	Conductivity (σ):	1.88	1.83	2.34	5
4-30-2018	Head 2450	e'	38.2400	Relative Permittivity (ϵ_r):	38.24	39.20	-2.45	5
		e''	13.7600	Conductivity (σ):	1.87	1.80	4.14	5
	Head 2400	e'	38.3700	Relative Permittivity (ϵ_r):	38.37	39.30	-2.36	5
		e''	13.6400	Conductivity (σ):	1.82	1.75	3.91	5
	Head 2480	e'	38.1600	Relative Permittivity (ϵ_r):	38.16	39.16	-2.56	5
		e''	13.8200	Conductivity (σ):	1.91	1.83	4.00	5

SAR 3 Room

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4-18-2018	Head 1900	e'	38.6100	Relative Permittivity (ϵ_r):	38.61	40.00	-3.48	5
		e''	13.8000	Conductivity (σ):	1.46	1.40	4.14	5
	Head 1850	e'	38.8000	Relative Permittivity (ϵ_r):	38.80	40.00	-3.00	5
		e''	13.6900	Conductivity (σ):	1.41	1.40	0.59	5
	Head 1910	e'	38.5600	Relative Permittivity (ϵ_r):	38.56	40.00	-3.60	5
		e''	13.8100	Conductivity (σ):	1.47	1.40	4.76	5
4-18-2018	Head 750	e'	41.8600	Relative Permittivity (ϵ_r):	41.86	41.96	-0.24	5
		e''	21.5000	Conductivity (σ):	0.90	0.89	0.39	5
	Head 700	e'	42.5500	Relative Permittivity (ϵ_r):	42.55	42.22	0.79	5
		e''	21.8300	Conductivity (σ):	0.85	0.89	-4.45	5
	Head 790	e'	41.3100	Relative Permittivity (ϵ_r):	41.31	41.76	-1.07	5
		e''	21.2300	Conductivity (σ):	0.93	0.90	4.06	5
4-20-2018	Body 835	e'	54.0400	Relative Permittivity (ϵ_r):	54.04	55.20	-2.10	5
		e''	21.7800	Conductivity (σ):	1.01	0.97	4.25	5
	Body 820	e'	54.2000	Relative Permittivity (ϵ_r):	54.20	55.28	-1.95	5
		e''	21.8500	Conductivity (σ):	1.00	0.97	2.87	5
	Body 850	e'	53.9000	Relative Permittivity (ϵ_r):	53.90	55.16	-2.28	5
		e''	21.7100	Conductivity (σ):	1.03	0.99	3.94	5

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 2.5 mm.
  For 5 GHz band - Distance between probe sensors and phantom surface was set to 1.4 mm
- The dipole input power (forward power) was 100 mW.
- The results are normalized to 1 W input power.

Reference Target SAR Values

The reference SAR values can be obtained from the calibration certificate of system validation dipoles.

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (W/kg)		
				1g/10g	Head	Body
D750V3	1122	2-19-2018	750	1g	8.22	8.63
				10g	5.35	5.72
D835V2	4d194	7-19-2017	835	1g	9.33	9.30
				10g	6.03	6.09
D1900V2	5d190	9-20-2017	1900	1g	38.30	40.00
				10g	20.10	21.10
D2450V2	939	9-19-2017	2450	1g	52.30	50.70
				10g	24.60	23.90
D2600V2	1097	2018-01-17	2600	1g	56.40	54.40
				10g	25.30	24.20

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 1 Room

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Zoom Scan to 100 mW	Normalize to 1 W			
4-18-2018	D2450V2	939	Body	1g	5.27	52.70	50.70	3.94	1, 2
				10g	2.41	24.10	23.90	0.84	
4-18-2018	D2600V2	1097	Body	1g	5.62	56.20	54.40	3.31	
				10g	2.45	24.50	24.20	1.24	
4-20-2018	D750V3	1122	Body	1g	0.86	8.57	8.63	-0.70	
				10g	0.57	5.72	5.72	0.00	
4-27-2018	D2450V2	939	Body	1g	4.99	49.90	50.70	-1.58	
				10g	2.29	22.90	23.90	-4.18	
4-30-2018	D2450V2	939	Body	1g	5.02	50.20	50.70	-0.99	
				10g	2.30	23.00	23.90	-3.77	

SAR 2 Room

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Zoom Scan to 100 mW	Normalize to 1 W			
4-18-2018	D835V2	4d194	Head	1g	0.99	9.88	9.33	5.89	3, 4
				10g	0.65	6.49	6.03	7.63	
4-19-2018	D1900V2	5d190	Body	1g	4.29	42.90	40.00	7.25	5, 6
				10g	2.19	21.90	21.10	3.79	
4-19-2018	D2600V2	1097	Head	1g	5.95	59.50	56.40	5.50	7, 8
				10g	2.61	26.10	25.30	3.16	
4-27-2018	D2450V2	939	Head	1g	5.53	55.30	52.30	5.74	9, 10
				10g	2.51	25.10	24.60	2.03	
4-30-2018	D2450V2	939	Head	1g	5.42	54.20	52.30	3.63	
				10g	2.47	24.70	24.60	0.41	

SAR 3 Room

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Zoom Scan to 100 mW	Normalize to 1 W			
4-18-2018	D1900V2	5d190	Head	1g	3.61	36.10	38.30	-5.74	
				10g	1.88	18.80	20.10	-6.47	
4-18-2018	D750V3	1122	Head	1g	0.79	7.93	8.22	-3.53	11, 12
				10g	0.53	5.25	5.35	-1.87	
4-20-2018	D835V2	4d194	Body	1g	0.98	9.79	9.30	5.27	
				10g	0.64	6.43	6.09	5.58	

9. Conducted Output Power Measurements

9.1. GSM

Per KDB 941225 D01 3G SAR Procedures:

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

GSM1900 Measured Results

					Full Power		
Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Burst Pwr (dBm)	Frame Pwr (dBm)	Max. Frame Pwr (dBm)
GSM (Voice)	CS1	1	512	1850.2	29.3	20.3	21.5
			661	1880.0	29.2	20.2	
			810	1909.8	28.9	19.9	
GPRS (GMSK)	CS1	1	512	1850.2	29.1	20.1	21.5
			661	1880.0	29.0	20.0	
			810	1909.8	28.7	19.6	
		2	512	1850.2	27.3	21.3	22.0
			661	1880.0	27.2	21.2	
			810	1909.8	26.9	20.9	
		3	512	1850.2	26.0	21.7	**22.2**
			661	1880.0	25.6	21.3	
			810	1909.8	25.3	21.0	
		4	512	1850.2	24.5	21.5	22.0
			661	1880.0	24.4	21.4	
			810	1909.8	24.1	21.1	
EGPRS (8PSK)	MCS5	1	512	1850.2	25.9	16.9	18.5
			661	1880.0	25.8	16.8	
			810	1909.8	25.3	16.3	
		2	512	1850.2	24.0	18.0	19.5
			661	1880.0	24.0	18.0	
			810	1909.8	23.6	17.6	
		3	512	1850.2	22.8	18.5	20.0
			661	1880.0	22.5	18.3	
			810	1909.8	22.3	18.0	
		4	512	1850.2	21.0	18.0	20.1
			661	1880.0	21.0	18.0	
			810	1909.8	20.8	17.8	

Notes:

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

- GMSK (GPRS) mode with 3 time slots for Max power and 3 time slots based on the Tune-up Procedure. Refer to §6.3.
- SAR is not required for EGPRS (8PSK) mode because the maximum output power and tune-up limit is ≤ 1/4dB higher than GMSK GPRS or the adjusted SAR of the highest reported SAR of GMSK GPRS is ≤ 1.2W/kg.

9.2. W-CDMA

Release 99 Setup Procedures used to establish the test signals

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

Mode	Subtest	Rel99
WCDMA General Settings	Loopback Mode	Test Mode 2
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	βc/βd	8/15

HSDPA Setup Procedures used to establish the test signals

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

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

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

The following 5 Sub-tests were completed according to Release 6 procedures in table C,11.1.3 of 3GPP TS 34.121-1 v13.
A summary of these settings are illustrated below:

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

HSPA+

Since 16QAM is not used for uplink, the uplink Category and release is same as HSUPA, i.e., Rel. 7 Therefore, the RF conducted power is not measured.

W-CDMA Band II Measured Results

Band	Mode		UL Ch No.	Freq. (MHz)	MPR (dB)	Max. Meas. Avg Pwr (dBm)
W-CDMA Band V	Rel 99	RMC, 12.2 kbps	9262	1852.4	N/A	22.9
			9400	1880.0	N/A	22.5
			9538	1907.6	N/A	22.7
	HSDPA	Subtest 1	9262	1852.4	0	21.3
			9400	1880.0		21.2
			9538	1907.6		21.6
		Subtest 2	9262	1852.4	0	21.2
			9400	1880.0		21.2
			9538	1907.6		21.5
		Subtest 3	9262	1852.4	0.5	20.9
			9400	1880.0		20.9
			9538	1907.6		21.2
		Subtest 4	9262	1852.4	0.5	21.0
			9400	1880.0		20.9
			9538	1907.6		21.2
	HSUPA	Subtest 1	9262	1852.4	2	19.5
			9400	1880.0		19.4
			9538	1907.6		20.1
		Subtest 2	9262	1852.4	4	18.1
			9400	1880.0		17.9
			9538	1907.6		18.3
		Subtest 3	9262	1852.4	1	21.0
			9400	1880.0		20.9
			9538	1907.6		21.1
		Subtest 4	9262	1852.4	4	17.8
			9400	1880.0		17.7
			9538	1907.6		17.9
		Subtest 5	9262	1852.4	0	22.3
			9400	1880.0		22.3
			9538	1907.6		22.5

W-CDMA Band V Measured Results

Band	Mode		UL Ch No.	Freq. (MHz)	MPR (dB)	Max. Meas. Avg Pwr (dBm)
W-CDMA Band V	Rel 99	RMC, 12.2 kbps	4132	826.4	N/A	24.1
			4183	836.6	N/A	24.1
			4233	846.6	N/A	24.1
	HSDPA	Subtest 1	4132	826.4	0	21.6
			4183	836.6		21.6
			4233	846.6		21.6
		Subtest 2	4132	826.4	0	21.6
			4183	836.6		21.5
			4233	846.6		21.5
		Subtest 3	4132	826.4	0.5	21.1
			4183	836.6		21.0
			4233	846.6		21.1
		Subtest 4	4132	826.4	0.5	21.1
			4183	836.6		21.0
			4233	846.6		21.0
	HSUPA	Subtest 1	4132	826.4	0	22.0
			4183	836.6		22.0
			4233	846.6		22.0
		Subtest 2	4132	826.4	2	20.2
			4183	836.6		20.2
			4233	846.6		20.1
		Subtest 3	4132	826.4	1	21.1
			4183	836.6		21.0
			4233	846.6		21.1
		Subtest 4	4132	826.4	2	20.2
			4183	836.6		20.1
			4233	846.6		20.1
		Subtest 5	4132	826.4	0	23.0
			4183	836.6		23.0
			4233	846.6		23.0

9.3. LTE

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

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

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 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 5 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Max. Meas. Avg Pwr (dBm)			
					MPR	829 MHz	836.5 MHz	844 MHz
LTE Band 5	10	QPSK	1	0	0		24.0	
			1	25	0		24.0	
			1	49	0		23.9	
			25	0	1		22.8	
			25	12	1		22.8	
			25	25	1		22.8	
			50	0	1		22.8	
		16QAM	1	0	1		22.9	
			1	25	1		22.8	
			1	49	1		22.8	
			25	0	2		21.6	
			25	12	2		21.6	
			25	25	2		21.6	
			50	0	2		21.6	

Band	BW (MHz)	Mode	RB Allocation	RB offset	Max. Meas. Avg Pwr (dBm)			
					MPR	826.5 MHz	836.5 MHz	846.5 MHz
LTE Band 5	5	QPSK	1	0	0	23.8	23.8	23.9
			1	12	0	23.8	23.8	23.9
			1	24	0	23.8	23.8	23.8
			12	0	1	22.9	22.8	23.0
			12	7	1	22.8	22.8	23.0
			12	13	1	22.8	22.8	22.9
			25	0	1	22.8	22.8	23.0
		16QAM	1	0	1	22.6	22.7	23.0
			1	12	1	22.6	22.7	23.0
			1	24	1	22.6	22.7	23.1
			12	0	2	21.5	21.6	21.7
			12	7	2	21.6	21.6	21.7
			12	13	2	21.6	21.6	21.7
			25	0	2	21.7	21.6	21.7

Band	BW (MHz)	Mode	RB Allocation	RB offset	Max. Meas. Avg Pwr (dBm)			
					MPR	825.5 MHz	836.5 MHz	847.5 MHz
LTE Band 5	3	QPSK	1	0	0	23.9	24.0	24.0
			1	8	0	23.8	24.0	24.0
			1	14	0	23.8	24.0	24.1
			8	0	1	22.8	22.8	23.0
			8	4	1	22.8	22.8	22.9
			8	7	1	22.8	22.8	23.0
			15	0	1	22.8	22.8	23.0
		16QAM	1	0	1	22.9	23.1	23.4
			1	8	1	22.8	23.1	23.3
			1	14	1	22.8	22.8	23.5
			8	0	2	21.7	21.6	21.7
			8	4	2	21.7	21.6	21.7
			8	7	2	21.7	21.6	21.7
			15	0	2	21.6	21.5	21.7

LTE Band 5 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Max. Meas. Avg Pwr (dBm)			
					MPR	824.7 MHz	836.5 MHz	848.3 MHz
LTE Band 5	1.4 MHz	QPSK	1	0	0	23.8	23.9	24.0
			1	3	0	23.8	23.8	23.9
			1	5	0	23.8	23.9	24.0
			3	0	0	23.9	23.9	24.0
			3	1	0	23.9	23.9	24.0
			3	3	0	24.0	23.9	24.0
			6	0	1	22.8	22.8	22.9
		16QAM	1	0	1	23.1	23.0	22.8
			1	3	1	23.2	22.9	22.9
			1	5	1	23.1	23.0	23.0
			3	0	1	22.9	22.8	23.1
			3	1	1	22.9	22.8	23.1
			3	3	1	22.9	22.9	23.1
			6	0	2	21.5	21.6	21.8

Note(s):

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

LTE Band 17 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Max. Meas. Avg Pwr (dBm)	
					MPR	710 MHz
LTE Band 17	10	QPSK	1	0	0	23.9
			1	25	0	23.9
			1	49	0	23.9
			25	0	1	22.7
			25	12	1	22.7
			25	25	1	22.7
			50	0	1	22.7
		16QAM	1	0	1	22.7
			1	25	1	22.7
			1	49	1	22.7
			25	0	2	21.7
			25	12	2	21.7
			25	25	2	21.7
			50	0	2	21.7
Band	BW (MHz)	Mode	RB Allocation	RB offset	Max. Meas. Avg Pwr (dBm)	
					MPR	710 MHz
LTE Band 17	5	QPSK	1	0	0	23.8
			1	12	0	23.8
			1	24	0	23.8
			12	0	1	22.7
			12	7	1	22.7
			12	13	1	22.8
			25	0	1	22.7
		16QAM	1	0	1	22.8
			1	12	1	22.9
			1	24	1	22.9
			12	0	2	21.7
			12	7	2	21.7
			12	13	2	21.7
			25	0	2	21.7

Note(s):

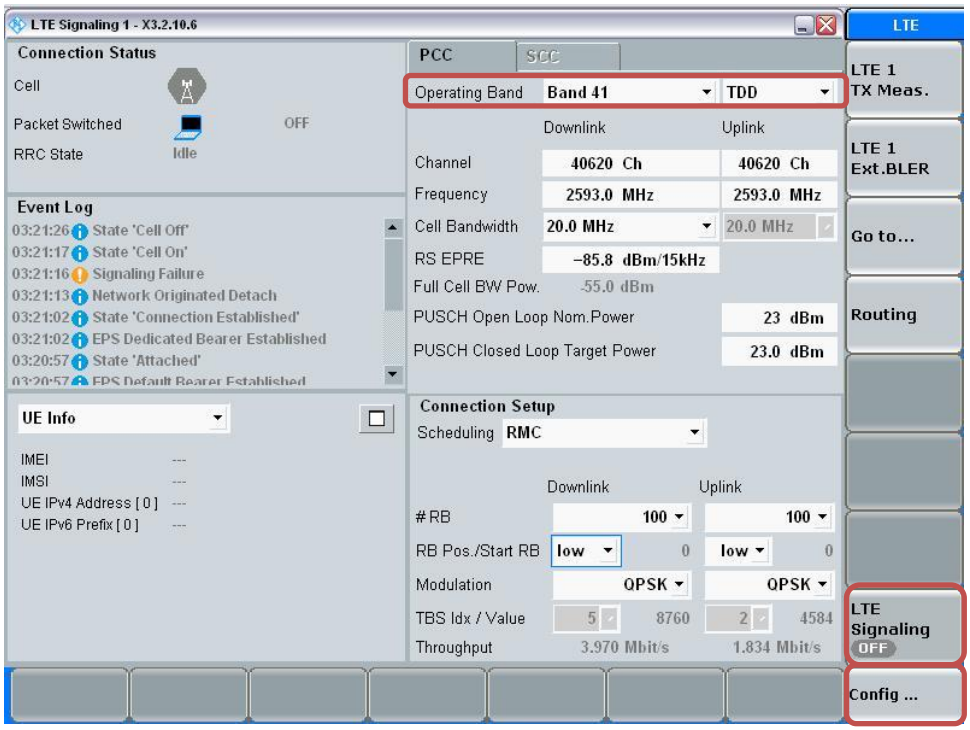
10/5 MHz Bandwidths does not support at least three non-overlapping channels in certain channel bandwidths. When a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing per KDB 941225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

LTE Band TDD Measured Results

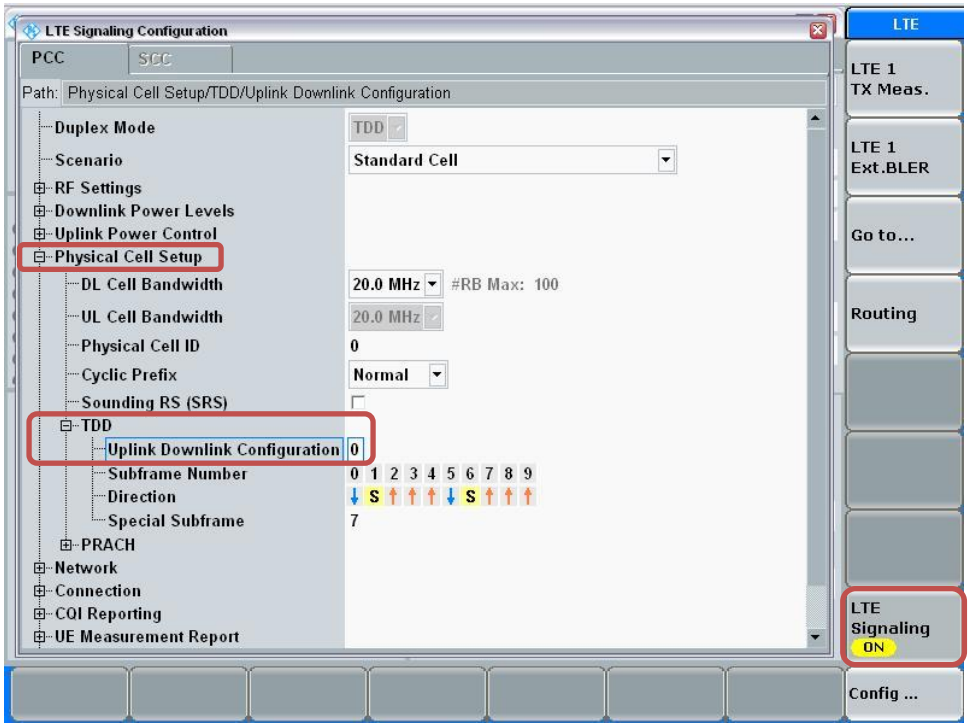
Procedure used to establish SAR test signal for LTE TDD Band

Set to CMW-500 with following parameters:

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

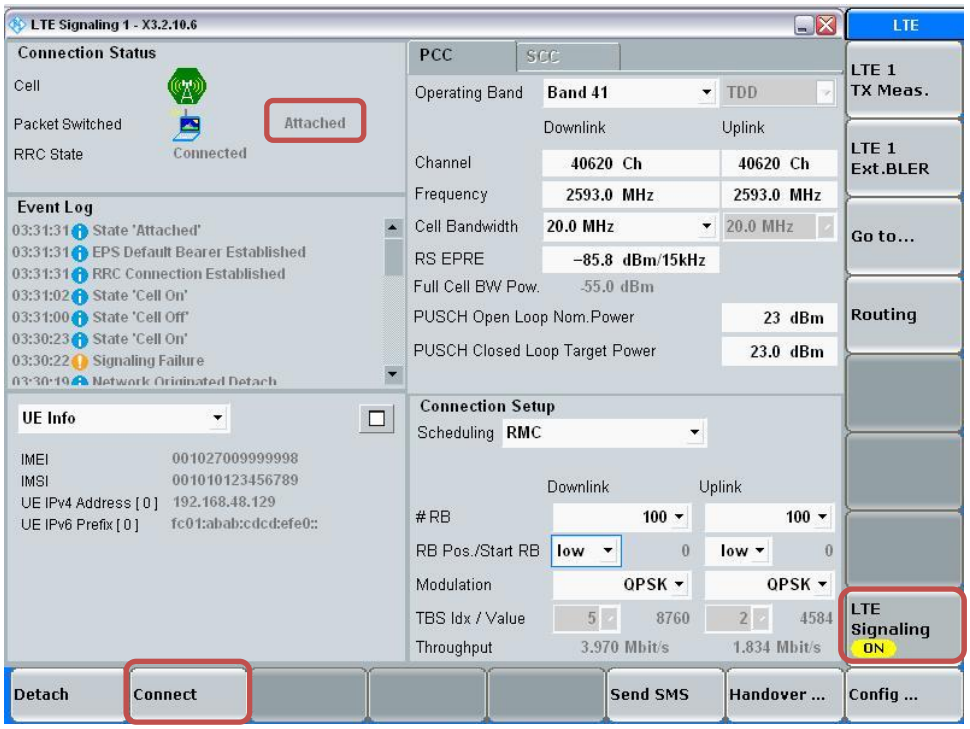


- Go to “Physical Cell Setup”
- Select “TDD” and Set “Uplink Downlink Configuration” to “0”
- Turn the cell on using “ON | OFF” key



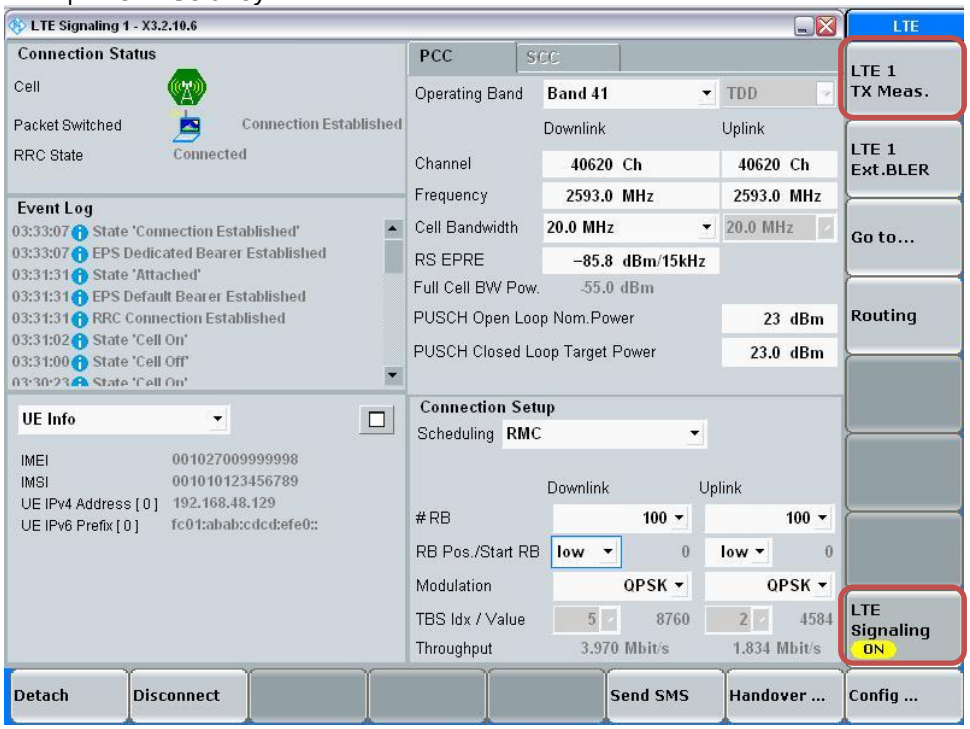
Connect to EUT

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

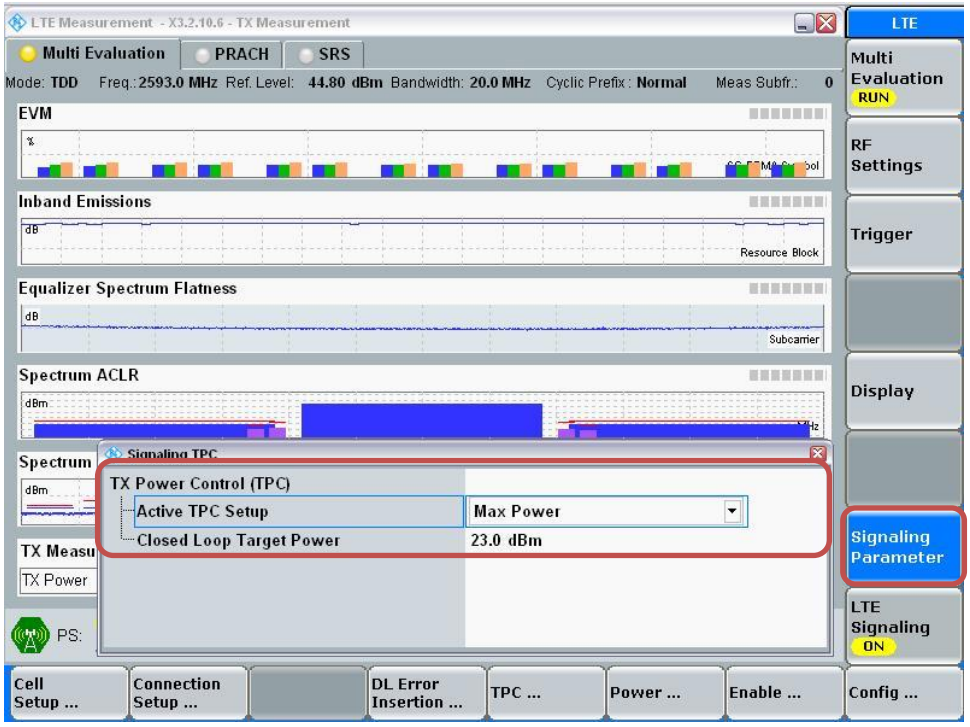


Max Power Setting

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

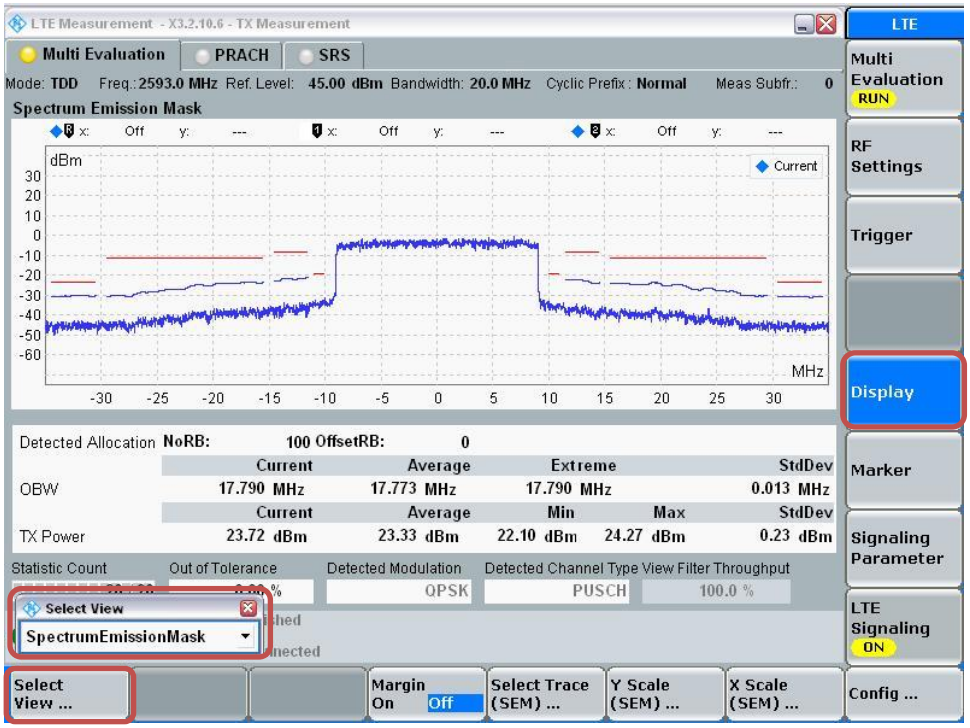


- Select “Signaling Parameter”
- Select “TX Power Control (TPC)” > Select “Active TPC Setup” to “Max Power” > Set “Closed Loop Target Power” to “23 dBm”



View TX Power

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



LTE Band 41 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Meas. Avg Pwr (dBm)				
						2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz
LTE Band 41	20	QPSK	1	0	0	23.1	23.3	23.0	23.0	22.9
			1	49	0	23.2	23.4	22.9	23.1	22.9
			1	99	0	23.1	23.3	22.9	23.0	22.9
			50	0	1	22.1	22.4	21.8	21.9	21.9
			50	24	1	22.1	22.3	21.9	21.9	21.9
			50	50	1	22.1	22.3	21.8	21.9	21.9
			100	0	1	22.1	22.3	21.8	21.9	21.9
		16QAM	1	0	1	21.6	22.5	21.8	21.8	22.0
			1	49	1	21.8	22.6	21.7	21.9	21.6
			1	99	1	22.0	22.4	21.7	21.6	21.9
			50	0	2	21.1	21.3	20.8	20.9	20.8
			50	24	2	21.1	21.3	20.8	20.9	20.8
			50	50	2	21.1	21.3	20.8	20.9	20.8
			100	0	2	21.1	21.3	20.8	20.9	20.8

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Meas. Avg Pwr (dBm)				
						2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz
LTE Band 41	15	QPSK	1	0	0	23.2	23.5	23.0	23.0	23.0
			1	37	0	23.1	23.4	22.9	23.0	23.0
			1	74	0	23.2	23.4	22.9	23.0	23.0
			36	0	1	22.1	22.4	21.9	21.9	21.9
			36	20	1	22.1	22.3	21.9	21.9	21.9
			36	39	1	22.1	22.3	21.9	21.9	21.9
			75	0	1	22.1	22.4	21.9	21.9	21.9
		16QAM	1	0	1	21.8	22.7	21.6	21.9	21.9
			1	37	1	21.7	22.5	21.7	21.6	21.7
			1	74	1	22.0	22.2	21.8	21.9	22.0
			36	0	2	21.0	21.4	20.9	20.9	20.9
			36	20	2	21.1	21.3	20.9	20.9	20.9
			36	39	2	21.1	21.3	20.8	21.0	20.9
			75	0	2	21.1	21.3	20.8	20.9	20.9

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Meas. Avg Pwr (dBm)				
						2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz
LTE Band 41	10	QPSK	1	0	0	23.2	23.0	22.9	23.0	23.0
			1	25	0	23.2	23.0	22.9	23.0	23.0
			1	49	0	23.2	23.0	22.9	23.0	23.0
			25	0	1	22.1	21.9	21.9	21.9	21.9
			25	12	1	22.1	21.9	21.9	21.9	21.9
			25	25	1	22.1	21.9	21.9	21.9	21.9
			50	0	1	22.1	21.9	21.9	21.9	21.9
		16QAM	1	0	1	22.0	22.2	21.6	21.8	22.1
			1	25	1	22.0	22.2	21.5	21.8	22.2
			1	49	1	22.0	22.1	21.5	21.9	22.2
			25	0	2	21.0	20.9	20.9	20.9	20.9
			25	12	2	21.0	20.9	20.9	20.8	20.9
			25	25	2	21.0	20.9	20.8	20.9	20.9
			50	0	2	21.0	20.9	20.8	20.9	20.8

LTE Band 41 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Meas. Avg Pwr (dBm)				
						2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz
LTE Band 41	5	QPSK	1	0	0	23.1	23.0	23.0	22.9	22.9
			1	12	0	23.1	23.0	23.0	22.9	22.9
			1	24	0	23.1	23.0	23.0	22.9	23.0
			12	0	1	22.1	21.9	21.9	21.9	21.9
			12	7	1	22.1	21.9	21.8	21.9	21.9
			12	13	1	22.1	21.9	21.9	21.9	21.9
			25	0	1	22.1	21.9	21.9	21.9	21.9
		16QAM	1	0	1	21.7	21.7	21.9	21.6	21.5
			1	12	1	21.7	21.6	21.9	21.7	21.5
			1	24	1	21.8	21.6	21.9	21.6	21.5
			12	0	2	21.1	20.8	20.8	20.9	20.7
			12	7	2	21.1	20.8	20.8	20.9	20.7
			12	13	2	21.1	20.8	20.8	20.9	20.7
			25	0	2	21.0	20.9	20.9	20.9	20.9

9.4. Wi-Fi 2.4 GHz (DTS Band)

Measured Results (Max power)

Mode	Data Rate	Ch #	Freq. (MHz)	Meas. Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)
802.11b	1 Mbps	1	2412	17.2	18.0	Yes
		6	2437	17.2		
		11	2462	17.3		
		12	2467	8.0	8.5	No
		13	2472	2.7	3.0	
802.11g	6 Mbps	1	2412	Not Require	17.0	No
		6	2437			
		11	2462		15.5	
		12	2467		8.5	
		13	2472		3.0	
802.11n (HT20)	6.5 Mbps	1	2412	Not Require	17.0	No
		6	2437			
		11	2462		15.0	
		12	2467		8.5	
		13	2472		3.0	

Measured Results (Reduced power)

Mode	Data Rate	Ch #	Freq. (MHz)	Meas. Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)
802.11b	1 Mbps	1	2412	12.5	13.0	Yes
		6	2437	12.5		
		11	2462	12.3		
		12	2467	8.0	8.5	No
		13	2472	2.7	3.0	
802.11g	6 Mbps	1	2412	12.6	13.0	No
		6	2437	12.6		
		11	2462	12.5		
		12	2467	8.2	8.5	
		13	2472	2.9	3.0	
802.11n (HT20)	6.5 Mbps	1	2412	12.4	13.0	No
		6	2437	12.5		
		11	2462	12.4		
		12	2467	8.0	8.5	
		13	2472	2.7	3.0	

Note(s):

1. SAR is not required for 802.11g/n modes when the adjusted SAR for 802.11b is < 1.2 W/kg.
2. For “Not required”, SAR Test reduction was applied from KDB 248227 guidance, Sec. 2.1, b), 1) when the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band. Additional output power measurements were not deemed necessary.
3. Additionally, SAR is not required for Channels 12 and 13 because the tune-up limit and the measured output power for these two channels are no greater than those for the default test channels. Refer to §6.3.

9.5. Bluetooth

Average Power Measured Results

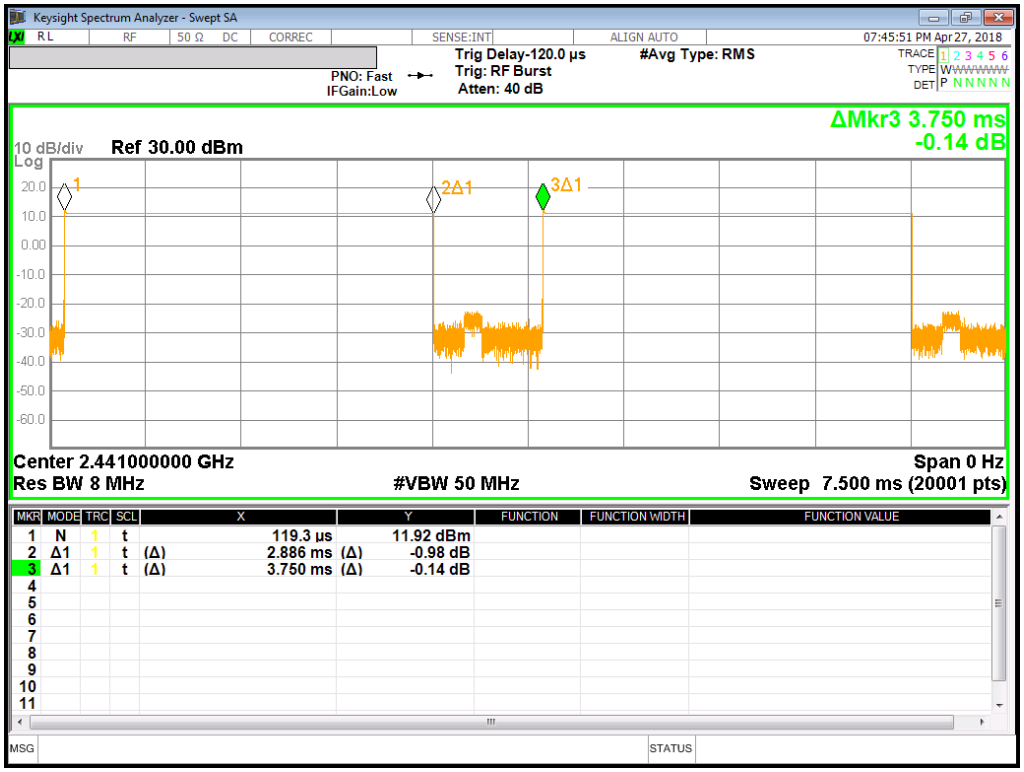
Band (GHz)	Mode	Ch #	Freq. (MHz)	Meas. Avg Pwr (dBm)
2.4	GFSK	0	2402	9.1
		39	2441	10.8
		78	2480	8.6
	EDR, π/4 DQPSK	0	2402	4.7
		39	2441	6.6
		78	2480	5.3
	EDR, 8-DPSK	0	2402	4.7
		39	2441	6.6
		78	2480	5.3
	LE, GFSK	0	2402	6.9
		19	2440	9.5
		39	2480	7.6

Duty Factor Measured Results

Mode	Type	T on (ms)	Period (ms)	Duty Cycle	Crest Factor (1/duty cycle)
GFSK	DH5	2.886	3.750	77.0%	1.30

Duty Cycle plots

GFSK



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

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 D01 SAR test for 3G devices:

When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.

KDB 941225 D05 SAR for LTE Devices:

SAR test reduction is applied using the following criteria:

- Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB, and 50% RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel.
- When the reported SAR is > 0.8 W/kg, testing for other Channels is performed at the highest output power level for 1RB, and 50% RB configuration for that channel.
- Testing for 100% RB configuration is performed at the highest output power level for 100% RB configuration across the Low, Mid and High Channel when the highest reported SAR for 1 RB and 50% RB are > 0.8 W/kg. Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation < 1.45 W/kg.
- Testing for 16-QAM modulation is not required because the reported SAR for QPSK is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of QPSK.
- Testing for the other channel bandwidths is not required because the reported SAR for the highest channel bandwidth is < 1.45 W/Kg and its output power is not more than 0.5 dB higher than that of the highest channel bandwidth.
- For LTE bands that do not support at least three non-overlapping channels in certain channel bandwidths, test the available non-overlapping channels instead. When a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing; therefore, the requirement for H, M and L channels may not fully apply.

KDB 248227 D01 SAR meas for 802.11:

SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the *initial test position(s)* by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The *initial test position(s)* is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s). When the *reported* SAR for the *initial test position* is:

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

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

10.1. GSM1900

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	GPRS 3 Slot	0	Left Touch	512	1850.2	26.5	26.0	0.336	0.381	1
			Left Tilt	512	1850.2	26.5	26.0	0.137	0.155	
			Right Touch	512	1850.2	26.5	26.0	0.175	0.199	
			Right Tilt	512	1850.2	26.5	26.0	0.145	0.165	
Body-worn	GPRS 3 Slot	15	Rear	512	1850.2	26.5	26.0	0.222	0.252	2
			Front	512	1850.2	26.5	26.0	0.147	0.167	
Hotspot	GPRS 3 Slot	10	Rear	512	1850.2	26.5	26.0	0.547	0.621	
			Front	512	1850.2	26.5	26.0	0.215	0.244	
			Edge 2	512	1850.2	26.5	26.0	0.041	0.047	
			Edge 3	512	1850.2	26.5	26.0	0.604	0.685	3
			Edge 4	512	1850.2	26.5	26.0	0.285	0.323	

10.2. W-CDMA Band II

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Rel 99 RMC	0	Left Touch	9400	1880.0	24.5	22.5	0.301	0.473	4
			Left Tilt	9400	1880.0	24.5	22.5	0.115	0.181	
			Right Touch	9400	1880.0	24.5	22.5	0.145	0.228	
			Rightt Tilt	9400	1880.0	24.5	22.5	0.117	0.184	
Bod-worn	Rel 99 RMC	15	Rear	9400	1880.0	24.5	22.5	0.264	0.415	5
			Front	9400	1880.0	24.5	22.5	0.166	0.261	
Hotspot	Rel 99 RMC	10	Rear	9262	1852.4	24.5	22.9	0.902	1.304	6
				9400	1880.0	24.5	22.5	0.648	1.018	
				9538	1907.6	24.5	22.7	0.568	0.866	
			Front	9400	1880.0	24.5	22.5	0.365	0.573	
			Edge 2	9400	1880.0	24.5	22.5	0.033	0.051	
			Edge 3	9262	1852.4	24.5	22.9	0.757	1.094	
				9400	1880.0	24.5	22.5	0.578	0.908	
				9538	1907.6	24.5	22.7	0.505	0.770	
			Edge 4	9400	1880.0	24.5	22.5	0.265	0.416	

Note(s):

Adjusted SAR is not over 1.2 W/kg for HSDPA, HSUPA. So additional tests are not required.

10.3. W-CDMA Band V

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
Head	Rel 99 RMC	0	Left Touch	4183	836.6	25.0	24.1	0.198	0.246	
			Left Tilt	4183	836.6	25.0	24.1	0.129	0.161	
			Right Touch	4183	836.6	25.0	24.1	0.217	0.270	7
			Rightt Tilt	4183	836.6	25.0	24.1	0.141	0.175	
Body-worn	Rel 99 RMC	15	Rear	4183	836.6	25.0	24.1	0.300	0.373	8
			Front	4183	836.6	25.0	24.1	0.196	0.244	
Hotspot	Rel 99 RMC	10	Rear	4183	836.6	25.0	24.1	0.379	0.472	9
			Front	4183	836.6	25.0	24.1	0.288	0.358	
			Edge 2	4183	836.6	25.0	24.1	0.158	0.197	
			Edge 3	4183	836.6	25.0	24.1	0.103	0.128	
			Edge 4	4183	836.6	25.0	24.1	0.178	0.222	

10.4. LTE Band 5 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
Head	QPSK	0	Left Touch	20525	836.5	1	0	25.0	24.0	0.209	0.260	
						25	0	24.0	22.8	0.157	0.205	
			Left Tilt	20525	836.5	1	0	25.0	24.0	0.097	0.121	
						25	0	24.0	22.8	0.070	0.091	
			Right Touch	20525	836.5	1	0	25.0	24.0	0.223	0.278	10
						25	0	24.0	22.8	0.171	0.223	
			Right Tilt	20525	836.5	1	0	25.0	24.0	0.110	0.137	
						25	0	24.0	22.8	0.081	0.105	
Body-worn	QPSK	15	Rear	20525	836.5	1	0	25.0	24.0	0.222	0.277	11
						25	0	24.0	22.8	0.164	0.214	
			Front	20525	836.5	1	0	25.0	24.0	0.192	0.239	
						25	0	24.0	22.8	0.144	0.188	
Hotspot	QPSK	10	Rear	20525	836.5	1	0	25.0	24.0	0.410	0.511	12
						25	0	24.0	22.8	0.329	0.430	
			Front	20525	836.5	1	0	25.0	24.0	0.262	0.326	
						25	0	24.0	22.8	0.209	0.273	
			Edge 2	20525	836.5	1	0	25.0	24.0	0.169	0.211	
						25	0	24.0	22.8	0.127	0.166	
			Edge 3	20525	836.5	1	0	25.0	24.0	0.094	0.117	
						25	0	24.0	22.8	0.075	0.098	
			Edge 4	20525	836.5	1	0	25.0	24.0	0.144	0.179	
						25	0	24.0	22.8	0.113	0.148	

10.5. LTE Band 17 (10MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
Head	QPSK	0	Left Touch	23790	710.0	1	0	25.0	23.9	0.071	0.090	13
						25	25	24.0	22.7	0.064	0.085	
			Left Tilt	23790	710.0	1	0	25.0	23.9	0.044	0.056	
						25	25	24.0	22.7	0.041	0.054	
			Right Touch	23790	710.0	1	0	25.0	23.9	0.069	0.087	
						25	25	24.0	22.7	0.061	0.082	
			Right Tilt	23790	710.0	1	0	25.0	23.9	0.044	0.056	
						25	25	24.0	22.7	0.038	0.051	
Body-worn	QPSK	15	Rear	23790	710.0	1	0	25.0	23.9	0.157	0.200	14
						25	25	24.0	22.7	0.137	0.184	
			Front	23790	710.0	1	0	25.0	23.9	0.107	0.136	
						25	25	24.0	22.7	0.099	0.132	
Hotspot	QPSK	10	Rear	23790	710.0	1	0	25.0	23.9	0.191	0.243	15
						25	25	24.0	22.7	0.162	0.217	
			Front	23790	710.0	1	0	25.0	23.9	0.119	0.152	
						25	25	24.0	22.7	0.105	0.141	
			Edge 2	23790	710.0	1	0	25.0	23.9	0.080	0.101	
						25	25	24.0	22.7	0.077	0.103	
			Edge 3	23790	710.0	1	0	25.0	23.9	0.017	0.022	
						25	25	24.0	22.7	0.017	0.022	
			Edge 4	23790	710.0	1	0	25.0	23.9	0.130	0.166	
						25	25	24.0	22.7	0.122	0.164	

10.6. LTE Band 41 (20MHz Bandwidth)

RF Exposure Conditions	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offest	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
Head	QPSK	0	Left Touch	40185	2549.5	1	49	24.0	23.4	0.198	0.229	
						50	0	23.0	22.4	0.158	0.182	
			Left Tilt	40185	2549.5	1	49	24.0	23.4	0.158	0.183	
						50	0	23.0	22.4	0.124	0.143	
			Right Touch	40185	2549.5	1	49	24.0	23.4	0.300	0.348	16
						50	0	23.0	22.4	0.235	0.271	
			Right Tilt	40185	2549.5	1	49	24.0	23.4	0.082	0.095	
						50	0	23.0	22.4	0.065	0.074	
Body-worn	QPSK	15	Rear	40185	2549.5	1	49	24.0	23.4	0.158	0.183	
						50	0	23.0	22.4	0.124	0.143	
			Front	40185	2549.5	1	49	24.0	23.4	0.199	0.231	17
						50	0	23.0	22.4	0.156	0.180	
Hotspot	QPSK	10	Rear	40185	2549.5	1	49	24.0	23.4	0.340	0.394	18
						50	0	23.0	22.4	0.267	0.308	
			Front	40185	2549.5	1	49	24.0	23.4	0.305	0.353	
						50	0	23.0	22.4	0.239	0.276	
			Edge 2	40185	2549.5	1	49	24.0	23.4	0.226	0.262	
						50	0	23.0	22.4	0.183	0.211	
			Edge 3	40185	2549.5	1	49	24.0	23.4	0.241	0.279	
						50	0	23.0	22.4	0.194	0.224	
			Edge 4	40185	2549.5	1	49	24.0	23.4	0.050	0.058	
						50	0	23.0	22.4	0.040	0.046	

10.7. Wi-Fi (DTS Band)

Frequency Band	Mode	RF Exposure Conditions	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		Duty Cycle (%)	1-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.		Meas.	Scaled	
2.4GHz	802.11b 1 Mbps	Head	On	0	Left Touch	6	2437.0	0.513	13.0	12.5	99.5%			
					Left Tilt	6	2437.0	0.474	13.0	12.5	99.5%			
					Right Touch	6	2437.0	0.606	13.0	12.5	99.5%	0.428	0.487	19
					Rightt Tilt	6	2437.0	0.563	13.0	12.5	99.5%	0.413	0.470	
		Body-worn	Off	15	Rear	11	2462.0	0.212	18.0	17.3	99.5%	0.176	0.210	20
					Front	11	2462.0	0.205	18.0	17.3	99.5%			
		Hotspot & Wi-Fi Direct	Off	10	Rear	11	2462.0	0.434	18.0	17.3	99.5%	0.372	0.444	21
					Front	11	2462.0	0.377	18.0	17.3	99.5%			
					Edge 1	11	2462.0	0.378	18.0	17.3	99.5%	0.353	0.422	
					Edge 4	11	2462.0	0.073	18.0	17.3	99.5%			

Note(s):

1. When the 802.11b reported SAR of the highest measured maximum output power channel is ≤ 0.8 W/kg, no further SAR testing is required. If SAR is > 0.8 W/kg and ≤ 1.2 W/kg, SAR is required for the next highest measured output power channel. Finally, if SAR is > 1.2 W/kg, SAR is required for the third channel.
2. SAR testing is not required for OFDM mode(s) when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

10.8. Bluetooth

Frequency Band	Mode	RF Exposure Conditions	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Duty Cycle (%)	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
2.4GHz	GFSK	Head	0	Left Touch	39	2441.0	77.0%	11.0	10.8	0.181	0.247	
				Left Tilt	39	2441.0	77.0%	11.0	10.8	0.168	0.229	
				Right Touch	39	2441.0	77.0%	11.0	10.8	0.217	0.296	22
				Rightt Tilt	39	2441.0	77.0%	11.0	10.8	0.217	0.296	23

Standalone SAR Test Exclusion Considerations & Estimated SAR

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

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)]·[√f(GHz)] ≤ 3.0, for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

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

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

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

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

RF Air interface	RF Exposure Conditions	Frequency (GHz)	Max. tune-up tolerance Power		Min. test separation distance (mm)	SAR test exclusion Result*	Estimated 1-g SAR (W/kg)
			(dBm)	(mW)			
Bluetooth	Body-worn	2.480	11.0	13	15	1.4	0.182
	Hotspot	2.480	11.0	13	10	2.0	0.273

Conclusion:

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

11. SAR Measurement Variability

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

1) Repeated measurement is not required when the original highest measured SAR is <0.8 or 2 W/kg (1-g or 10-g respectively); steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 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.

Peak spatial-average (1g of tissue)

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)	Repeated Measured SAR (W/kg)	Largest to Smallest SAR Ratio
700	LTE Band 17	Hotspot	Rear	No	0.191	N/A	N/A
850	WCDMA Band V	Hotspot	Rear	No	0.379	N/A	N/A
	LTE Band 5	Hotspot	Rear	No	0.410	N/A	N/A
1900	GSM 1900	Hotspot	Edge 3	No	0.604	N/A	N/A
	WCDMA Band II	Hotspot	Rear	Yes	0.902	0.897	1.01
2400	Wi-Fi 802.11b/g/n	Head	Right Touch	No	0.428	N/A	N/A
	Bluetooth	Head	Right Touch	No	0.217	N/A	N/A
2600	LTE Band 41	Hotspot	Rear	No	0.340	N/A	N/A

Note(s):

Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is not > 1.20.

12. DUT Holder Perturbations

In accordance with published DUT Holder Perturbations in Oct.2016 TCB workshop,

When Highest reported SAR is over 1.2 W/kg, Holder perturbation verification is required for each antenna, using the highest configuration among all applicable frequency bands.

Both Head test and Body test (Edge 1-4 sides) are evaluated with DUT holder. Both Front and Rear sides are evaluated without DUT holder. (Details of test setup are refer to Appendix A.)

So we are only consider about Head test and Body test (Edge 1-4 sides).

Main Antenna

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	DUTHolder Perturbation(Yes/No)	Highest Reported SAR (W/kg)	SAR test without holder	Deviation (%)
						Measured SAR (W/kg)	
700	LTE Band 17	Hotspot	Rear	No	0.243	N/A	N/A
850	WCDMA Band V	Hotspot	Rear	No	0.472	N/A	N/A
	LTE Band 5	Hotspot	Rear	No	0.511	N/A	N/A
1900	GSM 1900	Hotspot	Edge 3	No	0.685	N/A	N/A
	WCDMA Band II	Hotspot	Rear	No	1.304	N/A	N/A
2600	LTE Band 41	Hotspot	Rear	No	0.394	N/A	N/A

WLAN Antenna

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	DUTHolder Perturbation(Yes/No)	Highest Reported SAR (W/kg)	SAR test without holder	Deviation (%)
						Measured SAR (W/kg)	
2400	Wi-Fi 802.11b/g/n	Head	Right Touch	No	0.487	N/A	N/A
	Bluetooth	Head	Right Touch	No	0.296	N/A	N/A

Note(s):

Both deviation should be within measurement uncertainty (22%).

13. Simultaneous Transmission SAR Analysis

KDB 447498 D01 General RF Exposure Guidance introduces a new formula for calculating the SAR to Peak Location Ratio (SPLSR) between pairs of simultaneously transmitting antennas:

$$SPLSR = (SAR_1 + SAR_2)^{1.5} / Ri$$

Where:

SAR_1 is the highest measured or estimated SAR for the first of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition

SAR_2 is the highest measured or estimated SAR for the second of a pair of simultaneous transmitting antennas, in the same test operating mode and exposure condition as the first

Ri is the separation distance between the pair of simultaneous transmitting antennas. When the SAR is measured, for both antennas in the pair, it is determined by the actual x, y and z coordinates in the 1-g SAR for each SAR peak location, based on the extrapolated and interpolated result in the zoom scan measurement, using the formula of $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$

In order for a pair of simultaneous transmitting antennas with the sum of 1-g SAR > 1.6 W/kg to qualify for exemption from Simultaneous Transmission SAR measurements, it has to satisfy the condition of:

$$(SAR_1 + SAR_2)^{1.5} / Ri < 0.04$$

Simultaneous Transmission Condition

RF Exposure Condition	Item	Capable Transmit Configurations		
Head	1	GSM(Voice/GPRS)	+	DTS
	2	GSM(Voice/GPRS)	+	BT
	3	W-CDMA	+	DTS
	4	W-CDMA	+	BT
	5	LTE	+	DTS
	6	LTE	+	BT
Body-worn	7	GSM(Voice/GPRS)	+	DTS
	8	GSM(Voice/GPRS)	+	BT
	9	W-CDMA	+	DTS
	10	W-CDMA	+	BT
	11	LTE	+	DTS
	12	LTE	+	BT
Hotspot	13	GSM(GPRS)	+	DTS
	14	GSM(GPRS)	+	BT
	15	WCDMA	+	DTS
	16	WCDMA	+	BT
	17	LTE	+	DTS
	18	LTE	+	BT

Notes:
1. DTS supports Wi-Fi Direct, Hotspot and VoIP.
2. GPRS, W-CDMA, LTE supports Hotspot and VoIP.
3. DTS Radio cannot transmit simultaneously with Bluetooth Radio.
4. BT tethering is consider about each RF exposure conditions

13.1. Sum of the SAR for GSM1900 & Wi-Fi & BT

RF Exposure conditions	Test Position	① WWAN	② DTS	③ BT	① + ② WWAN + DTS		① + ③ WWAN + BT	
					∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)	∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Head	All positions	0.381	0.487	0.296	0.868	No	0.677	No
Body-worn	All positions	0.252	0.210	0.182	0.462	No	0.434	No
Hotspot	Rear	0.621	0.444	0.273	1.065	No	0.894	No
	Front	0.244	0.444	0.273	0.688	No	0.517	No
	Edge 1		0.422	0.273	0.422	No	0.273	No
	Edge 2	0.047			0.047	No	0.047	No
	Edge 3	0.685			0.685	No	0.685	No
	Edge 4	0.323	0.444	0.273	0.767	No	0.596	No

13.2. Sum of the SAR for WCDMA Band II & Wi-Fi & BT

RF Exposure conditions	Test Position	① WWAN	② DTS	③ BT	① + ② WWAN + DTS		① + ③ WWAN + BT	
					∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)	∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Head	All positions	0.473	0.487	0.296	0.960	No	0.769	No
Body-worn	All positions	0.415	0.210	0.182	0.625	No	0.597	No
Hotspot	Rear	1.304	0.444	0.273	1.748	Yes	1.577	No
	Front	0.573	0.444	0.273	1.017	No	0.846	No
	Edge 1		0.422	0.273	0.422	No	0.273	No
	Edge 2	0.051			0.051	No	0.051	No
	Edge 3	1.094			1.094	No	1.094	No
	Edge 4	0.416	0.444	0.273	0.860	No	0.689	No

SAR to Peak Location Separation Ratio (SPLSR)

Test Position	Standalone SAR (W/kg)		∑ 1-g SAR (W/kg)		Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
	① WWAN	② DTS						
Rear	1.304	0.444	① + ②	1.748	139.8	0.02	No	1

13.3. Sum of the SAR for WCDMA Band V & Wi-Fi & BT

RF Exposure conditions	Test Position	① WWAN	② DTS	③ BT	① + ② WWAN + DTS		① + ③ WWAN + BT	
					∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)	∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Head	All positions	0.270	0.487	0.296	0.757	No	0.566	No
Body-worn	All positions	0.373	0.210	0.182	0.583	No	0.555	No
Hotspot	Rear	0.472	0.444	0.273	0.916	No	0.745	No
	Front	0.358	0.444	0.273	0.802	No	0.631	No
	Edge 1		0.422	0.273	0.422	No	0.273	No
	Edge 2	0.197			0.197	No	0.197	No
	Edge 3	0.128			0.128	No	0.128	No
	Edge 4	0.222	0.444	0.273	0.666	No	0.495	No

13.4. Sum of the SAR for LTE Band 5 & Wi-Fi & BT

RF Exposure conditions	Test Position	① WWAN	② DTS	③ BT	① + ② WWAN + DTS		① + ③ WWAN + BT	
					∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)	∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Head	All positions	0.278	0.487	0.296	0.765	No	0.574	No
Body-worn	All positions	0.277	0.210	0.182	0.487	No	0.459	No
Hotspot	Rear	0.511	0.444	0.273	0.955	No	0.784	No
	Front	0.326	0.444	0.273	0.770	No	0.599	No
	Edge 1		0.422	0.273	0.422	No	0.273	No
	Edge 2	0.211			0.211	No	0.211	No
	Edge 3	0.117			0.117	No	0.117	No
	Edge 4	0.179	0.444	0.273	0.623	No	0.452	No

13.5. Sum of the SAR for LTE Band 17 & Wi-Fi & BT

RF Exposure conditions	Test Position	① WWAN	② DTS	③ BT	① + ② WWAN + DTS		① + ③ WWAN + BT	
					∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)	∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Head	All positions	0.090	0.487	0.296	0.577	No	0.386	No
Body-worn	All positions	0.200	0.210	0.182	0.410	No	0.382	No
Hotspot	Rear	0.243	0.444	0.273	0.687	No	0.516	No
	Front	0.152	0.444	0.273	0.596	No	0.425	No
	Edge 1		0.422	0.273	0.422	No	0.273	No
	Edge 2	0.103			0.103	No	0.103	No
	Edge 3	0.022			0.022	No	0.022	No
	Edge 4	0.166	0.444	0.273	0.610	No	0.439	No

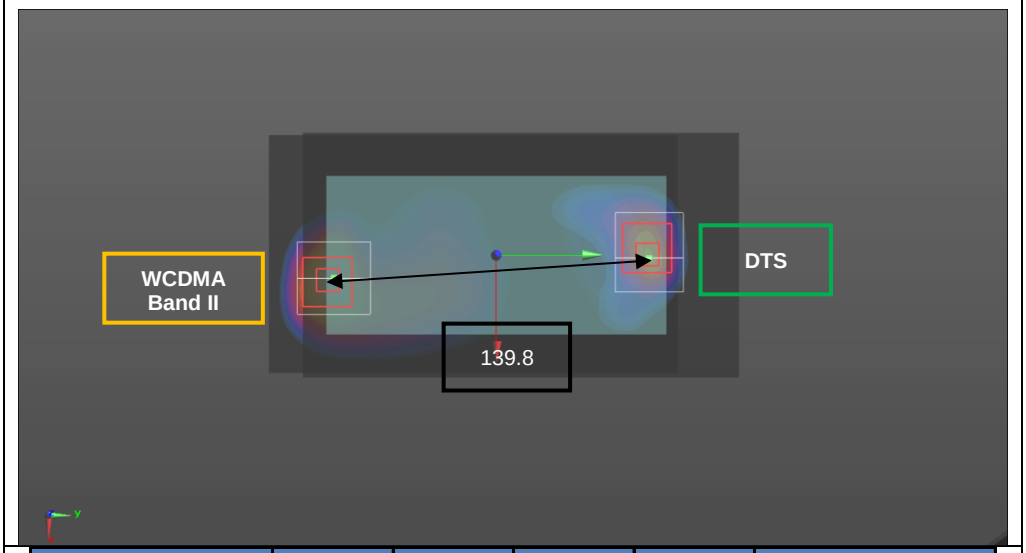
13.6. Sum of the SAR for LTE Band 41 & Wi-Fi & BT

RF Exposure conditions	Test Position	① WWAN	② DTS	③ BT	① + ② WWAN + DTS		① + ③ WWAN + BT	
					∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)	∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Head	All positions	0.348	0.487	0.296	0.835	No	0.644	No
Body-worn	All positions	0.231	0.210	0.182	0.441	No	0.413	No
Hotspot	Rear	0.394	0.444	0.273	0.838	No	0.667	No
	Front	0.353	0.444	0.273	0.797	No	0.626	No
	Edge 1		0.422	0.273	0.422	No	0.273	No
	Edge 2	0.262			0.262	No	0.262	No
	Edge 3	0.279			0.279	No	0.279	No
	Edge 4	0.058	0.444	0.273	0.502	No	0.331	No

Conclusion:

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

Figure (1)



Mode		SAR W/kg	X m	Y m	Z m	d: Calculated distance (mm)	
WCDMA Band II	①	1.304	0.0116	-0.0731	-0.0041	① + ②	139.8
DTS	②	0.444	0.0032	0.0664	-0.0018		

The Peak Location Separation Distance is computed by using the f

SQRT((X1-X2)^2+(Y1-Y2)^2+(Z1-Z2)^2)

Appendixes

Refer to separated files for the following appendixes.

4788452485-S1V1 FCC Report SAR_App A_Photos & Ant. Locations

4788452485-S1V1 FCC Report SAR_App B_Highest SAR Test Plots

4788452485-S1V1 FCC Report SAR_App C_System Check Plots

4788452485-S1V1 FCC Report SAR_App D_SAR Tissue Ingredients

4788452485-S1V1 FCC Report SAR_App E_Probe Cal. Certificates

4788452485-S1V1 FCC Report SAR_App F_Dipole Cal. Certificates

END OF REPORT