FCC 47 CFR § 2.1093
IEEE Std 1528-2013

SAR EVALUATION REPORT

FOR

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

MODEL NUMBER: SM-A605K

FCC ID: A3LSMA605K

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Testing Laboratory

TL-637

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1. Attestation of Test Results

Applicant Name		SAMSUNG ELECTRONICS CO.,LTD.		
FCC ID		A3LSMA605K		
Model Number		SM-A605K		
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)	Phablet (10g of tissue)	
General population / Uncontrolled exposure		1.6	4.0	
The Highest Reported SAR (W/kg)				
RF Exposure Conditions		**Equipment Class**		
		Licensed	**DTS**	**U-NII**	**DSS(BT)**
Head		0.27	0.28	0.68	0.22
Body-worn		0.90	0.14	0.28	< 0.10
Hotspot		1.01	0.25	0.46	< 0.10
Phablet-10g		2.97	N/A	1.19	N/A
Simultaneous TX	Head	0.95	0.55	0.95	0.49
	Body-worn	1.19	1.05	1.19	0.94
	Hotspot	1.47	1.26	1.47	1.08
	Phablet-10g	3.46	N/A	3.46	N/A
Date Tested		5/8/2018 to 5/21/2018		
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

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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
- 941225 D07 UMPC Mini Tablet v01r02

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.

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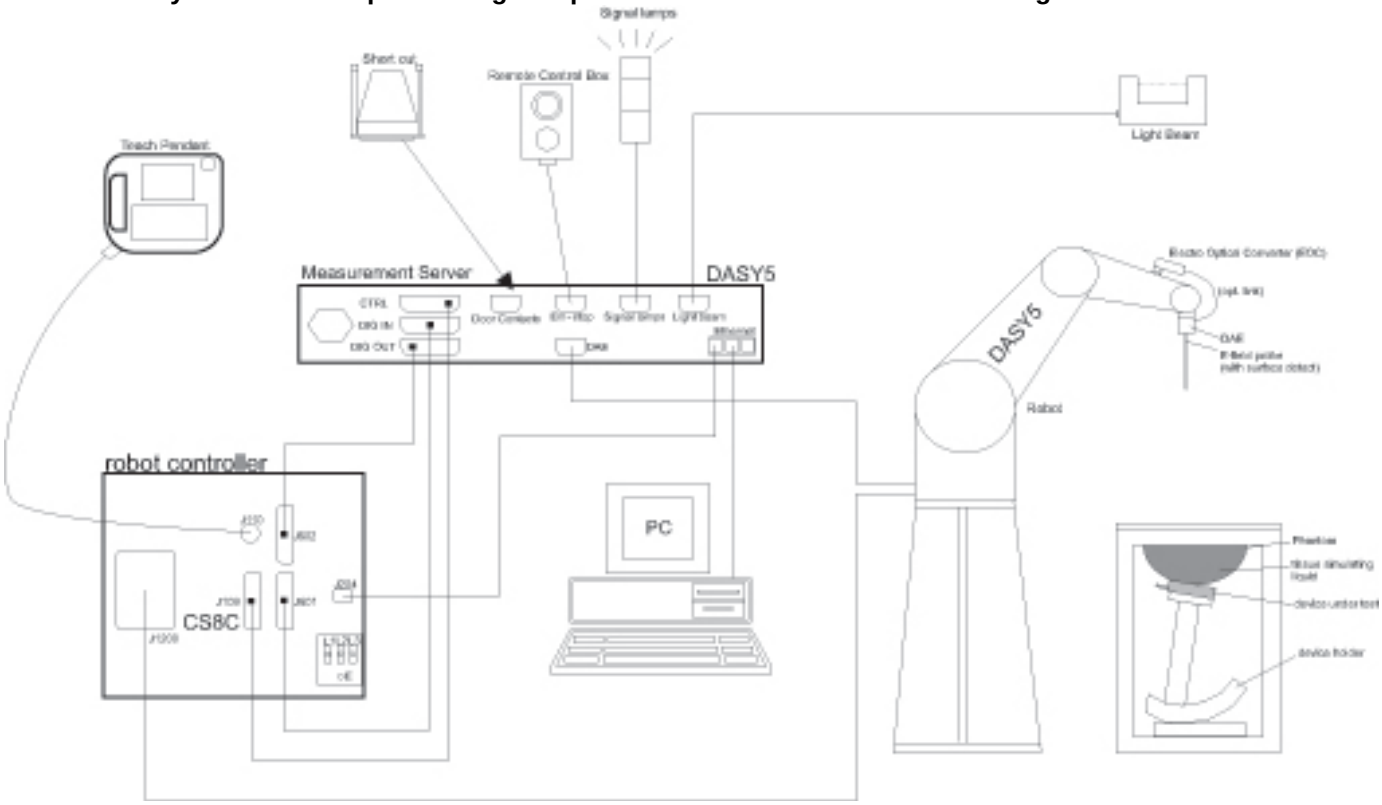
4. SAR Measurement System & Test Equipment

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.

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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.	

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Step 3: Zoom Scan

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

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

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

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

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

Step 4: Power drift measurement

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

Step 5: Z-Scan (FCC only)

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

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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
Low Pass Filter	MICROLAB	LA-60N	03942	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	11-22-2018
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
System Validation Dipole	SPEAG	D5GHzV2	1209	2-15-2019
System Validation Dipole	SPEAG	D5GHzV2	1184	8-23-2018
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

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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): 160.2 mm x 75.7 mm Overall Diagonal: 169.0 mm Display Diagonal: 154.0 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) ☒ Mobile Hotspot (Wi-Fi 5 GHz_Ch.149 – Ch.165)		
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_Ch.36 – Ch.48, Ch 149 – Ch165)		
Test Sample Information	**No.**	**S/N**	**Notes**
	1	R39K30GTV6B	Wi-Fi/BT conduction
	2	R39K30GTZMV	Main conduction
	3	R39K30GTW1N	SAR
	4	R39K30GV34D	SAR

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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.9) HSUPA (Release.9) HSPA+ (Release.9)		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)
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20)		99.7% (802.11b) 98.2% (802.11g) 98.1% (802.11n 20MHz BW)
	5 GHz	802.11a 802.11n (HT20) 802.11n (HT40)		98.2% (802.11a) 98.1% (802.11n 20MHz BW) 96.0% (802.11n 40MHz BW)
	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		76.9% (DH5)

Notes:

1. This device supports uplink-downlink configuration 0-6. The configuration with the highest duty cycle was used (Subframe Number 0 at 63.3%).
2. The Bluetooth protocol is considered source-based averaging. Bluetooth GFSK (DH5) was verified to have the highest duty cycle of 76.9% and was considered and used for SAR Testing.
3. Duty cycle for Wi-Fi is referenced from the DTS report.

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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)		Reduced. RF Output Power (dBm)	
			Tune-up Limit	Frame Pwr	Tune-up Limit	Frame Pwr
GSM1900	Voice/GPRS	1	**30.5**	**21.5**	**28.5**	**19.5**
	GPRS	2	**27.5**	**21.5**	**25.5**	**19.5**
	GPRS	3	**25.5**	**21.2**	**23.7**	**19.4**
	GPRS	4	**24.5**	**21.5**	**22.5**	**19.5**
	EGPRS	1	**25.5**	**16.5**	**23.5**	**14.5**
	EGPRS	2	**23.5**	**17.5**	**21.5**	**15.5**
	EGPRS	3	**21.5**	**17.2**	**20.0**	**15.7**
	EGPRS	4	**20.5**	**17.5**	**18.5**	**15.5**

RF Air interface	Mode	Max. RF Output Power (dBm)	Reduced. RF Output Power (dBm)
W-CDMA Band II	R99	**22.5**	**19.5**
	HSDPA	**22.0**	**19.0**
	HSUPA	**22.0**	**19.0**
W-CDMA Band V	R99	**24.5**	**22.5**
	HSDPA	**24.0**	**22.0**
	HSUPA	**24.0**	**22.0**

RF Air interface	Mode	Max. RF Output Power (dBm)	Reduced. RF Output Power (dBm)
LTE Band 5	QPSK	**25.0**	**23.0**
LTE Band 17	QPSK	**23.5**	
LTE Band 41	QPSK	**23.0**	

Notes:

1. The device utilizes power reduction under some portable hotspot conditions for SAR compliance. There is power reduction for GSM1900, WCDMA Band II, V, LTE Band 5. The reduced powers were confirmed via conducted power measurements the RF port. Detailed description of the hotspot power reduction mechanism is included in the operational description.
2. LTE QPSK configuration has the highest maximum average output power per 3GPP standard.

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RF Air interface	Mode	Max. RF Output Power (dBm)	Reduced. RF Output Power (dBm)
WiFi 2.4 GHz (Ch.1)	802.11b	**19.0**	**13.0**
	802.11g	**14.0**	**13.0**
	802.11n HT20	**14.0**	**13.0**
WiFi 2.4 GHz (Ch.2 - Ch.10)	802.11b	**19.0**	**13.0**
	802.11g	**18.0**	**13.0**
	802.11n HT20	**18.0**	**13.0**
WiFi 2.4 GHz (Ch.11)	802.11b	**19.0**	**13.0**
	802.11g	**16.0**	**13.0**
	802.11n HT20	**15.0**	**13.0**
WiFi 2.4 GHz (Ch.12)	802.11b	**18.0**	**13.0**
	802.11g	**13.0**	
	802.11n HT20	**13.0**	
WiFi 2.4 GHz (Ch.13)	802.11b	**15.0**	**13.0**
	802.11g	**9.0**	
	802.11n HT20	**9.0**	
WiFi 5 GHz	802.11a	**16.0**	**10.0**
	802.11n HT20	**16.0**	**10.0**
	802.11n HT40	**16.0**	**10.0**
Bluetooth		**13.0**	
Bluetooth LE		**3.0**	

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.

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6.4. General LTE SAR Test and Reporting Considerations

Item	Description						
Frequency range, Channel Bandwidth, Numbers and Frequencies	Band 5	Frequency range: 824 – 849 MHz					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low			20450/ 829	20425/ 826.5	20415/ 825.5	20407/ 824.7
	Mid			20525/ 836.5	20525/ 836.5	20525/ 836.5	20525/ 836.5
	High			20600/ 844	20625/ 846.5	20635/ 847.5	20643/ 848.3
	Band 17	Frequency range: 704 - 716 MHz					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low			23780/ 709	23755/ 706.5		
	Mid			23790/ 710	23790/ 710		
	High			23800/ 711	23825/ 713.5		
	Band 41	Frequency range: 2496 - 2690 MHz					
		Channel Bandwidth					
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz
	Low	39750 / 2506.0					
	Low-Mid	40185 / 2549.5					
	Mid	40620 / 2593.0					
	Mid-High	41055 / 2636.5					
	High	41490 / 2680.0					
LTE transmitter and antenna implementation	Refer to Appendix A.						
Maximum power reduction (MPR)	**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

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

Power reduction	Yes
Spectrum plots for RB configurations	A properly configured base station simulator was used for the SAR and power measurements; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.

Notes:

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

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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

<u>Example for Calculated Duty Cycle for Uplink-Downlink Configuration 0:</u>
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.

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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	70 mm
5000 Head	70 mm	70 mm

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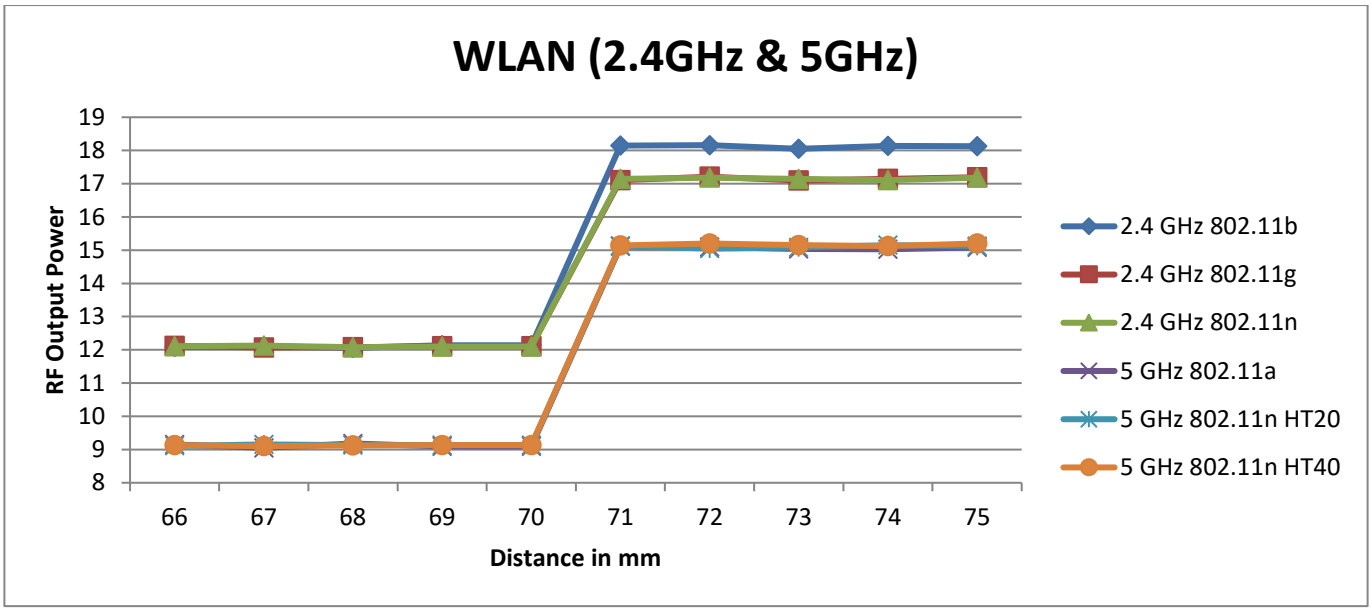
Proximity Sensor Triggering Distance Measurement Results

WLAN 2.4 GHz & 5GHz

Front, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm										
Distance	66	67	68	69	70	71	72	73	74	75
2.4 GHz 802.11b	12.1	12.1	12.1	12.1	12.1	18.2	18.2	18.1	18.1	18.1
2.4 GHz 802.11g	12.1	12.1	12.1	12.1	12.1	17.1	17.2	17.1	17.2	17.2
2.4 GHz 802.11n	12.1	12.1	12.1	12.1	12.1	17.2	17.2	17.2	17.1	17.2
5 GHz 802.11a	9.2	9.1	9.2	9.1	9.1	15.1	15.1	15.0	15.0	15.1
5 GHz 802.11n HT20	9.1	9.2	9.1	9.1	9.1	15.1	15.1	15.1	15.2	15.1
5 GHz 802.11n HT40	9.1	9.1	9.1	9.1	9.1	15.1	15.2	15.2	15.1	15.2



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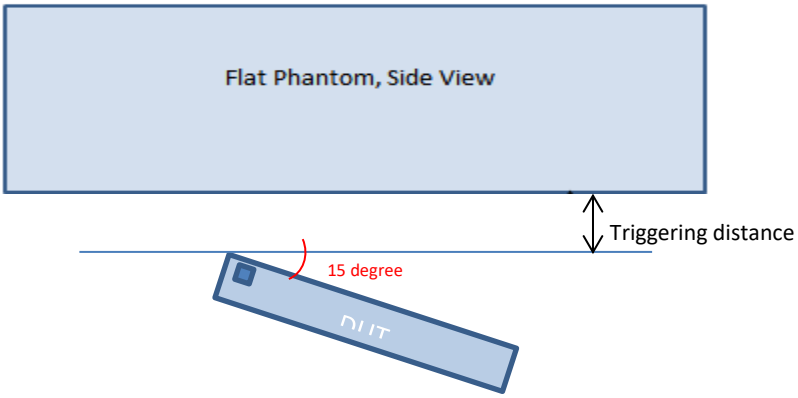
6.6.2. Proximity Sensor Coverage (KDB 616217 §6.3)

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
5000	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.

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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	
	Phablet-10g	0 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	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	
	Phablet-10g	0 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 Hot Spot SAR.
2. When Hotspot Mode is not supported, 10-g Phablet SAR is required for all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge in direct contact with a flat phantom, to address interactive hand use exposure conditions.
3. When hotspot mode applies, 10-g Phablet SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg. When hotspot mode does not apply, 10-g Phablet SAR is required for all surfaces and Edges within 25mm of the antenna.

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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

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Dielectric Property Measurements Results:

SAR 1 Room

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
5-8-2018	Body 835	e'	52.9200	Relative Permittivity (ε_r):	52.92	55.20	-4.13	5
		e''	21.7300	Conductivity (σ):	1.01	0.97	4.01	5
	Body 820	e'	53.1000	Relative Permittivity (ε_r):	53.10	55.28	-3.94	5
		e''	21.8200	Conductivity (σ):	0.99	0.97	2.73	5
	Body 850	e'	52.7800	Relative Permittivity (ε_r):	52.78	55.16	-4.31	5
		e''	21.6600	Conductivity (σ):	1.02	0.99	3.70	5
5-9-2018	Body 750	e'	55.1400	Relative Permittivity (ε_r):	55.14	55.55	-0.73	5
		e''	23.0900	Conductivity (σ):	0.96	0.96	-0.02	5
	Body 700	e'	55.6500	Relative Permittivity (ε_r):	55.65	55.74	-0.16	5
		e''	23.4900	Conductivity (σ):	0.91	0.96	-4.69	5
	Body 790	e'	54.7200	Relative Permittivity (ε_r):	54.72	55.39	-1.21	5
		e''	22.7800	Conductivity (σ):	1.00	0.97	3.57	5
5-16-2018	Head 2450	e'	38.3800	Relative Permittivity (ε_r):	38.38	39.20	-2.09	5
		e''	13.6200	Conductivity (σ):	1.86	1.80	3.08	5
	Head 2400	e'	38.5600	Relative Permittivity (ε_r):	38.56	39.30	-1.87	5
		e''	13.4900	Conductivity (σ):	1.80	1.75	2.77	5
	Head 2480	e'	38.2600	Relative Permittivity (ε_r):	38.26	39.16	-2.30	5
		e''	13.7200	Conductivity (σ):	1.89	1.83	3.25	5
5-17-2018	Head 5180	e'	36.0900	Relative Permittivity (ε_r):	36.09	36.01	0.21	5
		e''	15.5200	Conductivity (σ):	4.47	4.63	-3.46	5
	Head 5300	e'	36.0500	Relative Permittivity (ε_r):	36.05	35.88	0.48	5
		e''	15.5200	Conductivity (σ):	4.57	4.75	-3.78	5
	Head 5600	e'	35.3200	Relative Permittivity (ε_r):	35.32	35.53	-0.60	5
		e''	15.6800	Conductivity (σ):	4.88	5.06	-3.51	5
	Head 5800	e'	35.0100	Relative Permittivity (ε_r):	35.01	35.30	-0.82	5
		e''	15.7800	Conductivity (σ):	5.09	5.27	-3.43	5
	Head 5825	e'	34.9600	Relative Permittivity (ε_r):	34.96	35.30	-0.96	5
		e''	15.7800	Conductivity (σ):	5.11	5.27	-3.02	5
5-21-2018	Body 5180	e'	49.2900	Relative Permittivity (ε_r):	49.29	49.05	0.50	5
		e''	18.2500	Conductivity (σ):	5.26	5.27	-0.28	5
	Body 5300	e'	49.1000	Relative Permittivity (ε_r):	49.10	48.88	0.44	5
		e''	18.3700	Conductivity (σ):	5.41	5.41	0.04	5
	Body 5600	e'	48.6100	Relative Permittivity (ε_r):	48.61	48.48	0.27	5
		e''	18.6600	Conductivity (σ):	5.81	5.76	0.86	5
	Body 5800	e'	48.3100	Relative Permittivity (ε_r):	48.31	48.20	0.23	5
		e''	18.8800	Conductivity (σ):	6.09	6.00	1.48	5
	Body 5825	e'	48.2600	Relative Permittivity (ε_r):	48.26	48.20	0.12	5
		e''	18.9000	Conductivity (σ):	6.12	6.00	2.02	5

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SAR 2 Room

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
5-8-2018	Body 2600	e'	51.7100	Relative Permittivity (ε_r):	51.71	52.51	-1.53	5
		e''	15.2900	Conductivity (σ):	2.21	2.16	2.30	5
	Body 2500	e'	52.1900	Relative Permittivity (ε_r):	52.19	52.64	-0.85	5
		e''	15.0600	Conductivity (σ):	2.09	2.02	3.62	5
	Body 2700	e'	51.2200	Relative Permittivity (ε_r):	51.22	52.38	-2.22	5
		e''	15.4700	Conductivity (σ):	2.32	2.30	0.92	5
5-9-2018	Body 1900	e'	54.6900	Relative Permittivity (ε_r):	54.69	53.30	2.61	5
		e''	14.9900	Conductivity (σ):	1.58	1.52	4.19	5
	Body 1850	e'	54.8300	Relative Permittivity (ε_r):	54.83	53.30	2.87	5
		e''	14.9700	Conductivity (σ):	1.54	1.52	1.31	5
	Body 1910	e'	54.6600	Relative Permittivity (ε_r):	54.66	53.30	2.55	5
		e''	15.0000	Conductivity (σ):	1.59	1.52	4.80	5
5-12-2018	Head 2600	e'	37.6100	Relative Permittivity (ε_r):	37.61	39.01	-3.59	5
		e''	13.9700	Conductivity (σ):	2.02	1.96	2.93	5
	Head 2500	e'	37.9500	Relative Permittivity (ε_r):	37.95	39.14	-3.03	5
		e''	13.7600	Conductivity (σ):	1.91	1.85	3.17	5
	Head 2700	e'	37.2600	Relative Permittivity (ε_r):	37.26	38.88	-4.18	5
		e''	14.1800	Conductivity (σ):	2.13	2.07	2.83	5
5-13-2018	Head 835	e'	40.9200	Relative Permittivity (ε_r):	40.92	41.50	-1.40	5
		e''	19.6500	Conductivity (σ):	0.91	0.90	1.37	5
	Head 820	e'	41.0900	Relative Permittivity (ε_r):	41.09	41.60	-1.23	5
		e''	19.6800	Conductivity (σ):	0.90	0.90	-0.13	5
	Head 850	e'	40.7500	Relative Permittivity (ε_r):	40.75	41.50	-1.81	5
		e''	19.6200	Conductivity (σ):	0.93	0.92	1.34	5

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SAR 3 Room

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
5-10-2018	Head 750	e'	41.5000	Relative Permittivity (ε_r):	41.50	41.96	-1.10	5
		e''	21.4300	Conductivity (σ):	0.89	0.89	0.07	5
	Head 700	e'	42.1900	Relative Permittivity (ε_r):	42.19	42.22	-0.07	5
		e''	21.7900	Conductivity (σ):	0.85	0.89	-4.62	5
	Head 790	e'	40.9700	Relative Permittivity (ε_r):	40.97	41.76	-1.88	5
		e''	21.1600	Conductivity (σ):	0.93	0.90	3.72	5
5-11-2018	Body 1900	e'	53.4300	Relative Permittivity (ε_r):	53.43	53.30	0.24	5
		e''	14.9900	Conductivity (σ):	1.58	1.52	4.19	5
	Body 1850	e'	53.5600	Relative Permittivity (ε_r):	53.56	53.30	0.49	5
		e''	14.9500	Conductivity (σ):	1.54	1.52	1.17	5
	Body 1910	e'	53.4200	Relative Permittivity (ε_r):	53.42	53.30	0.23	5
		e''	15.0000	Conductivity (σ):	1.59	1.52	4.80	5
5-13-2018	Head 1900	e'	38.5200	Relative Permittivity (ε_r):	38.52	40.00	-3.70	5
		e''	13.5900	Conductivity (σ):	1.44	1.40	2.55	5
	Head 1850	e'	38.7100	Relative Permittivity (ε_r):	38.71	40.00	-3.23	5
		e''	13.5000	Conductivity (σ):	1.39	1.40	-0.81	5
	Head 1910	e'	38.4800	Relative Permittivity (ε_r):	38.48	40.00	-3.80	5
		e''	13.6100	Conductivity (σ):	1.45	1.40	3.24	5
5-16-2018	Body 2450	e'	52.8200	Relative Permittivity (ε_r):	52.82	52.70	0.23	5
		e''	14.5100	Conductivity (σ):	1.98	1.95	1.37	5
	Body 2400	e'	52.9100	Relative Permittivity (ε_r):	52.91	52.77	0.26	5
		e''	14.3900	Conductivity (σ):	1.92	1.90	1.17	5
	Body 2480	e'	52.7600	Relative Permittivity (ε_r):	52.76	52.66	0.19	5
		e''	14.5800	Conductivity (σ):	2.01	1.99	0.92	5
5-17-2018	Body 5250	e'	49.8200	Relative Permittivity (ε_r):	49.82	48.95	1.77	5
		e''	18.4600	Conductivity (σ):	5.39	5.35	0.67	5
	Body 5260	e'	49.7800	Relative Permittivity (ε_r):	49.78	48.94	1.72	5
		e''	18.4500	Conductivity (σ):	5.40	5.36	0.59	5
	Body 5600	e'	49.2300	Relative Permittivity (ε_r):	49.23	48.48	1.55	5
		e''	18.7500	Conductivity (σ):	5.84	5.76	1.34	5
	Body 5750	e'	48.9400	Relative Permittivity (ε_r):	48.94	48.27	1.38	5
		e''	18.9500	Conductivity (σ):	6.06	5.94	2.07	5
	Body 5825	e'	48.9200	Relative Permittivity (ε_r):	48.92	48.20	1.49	5
		e''	18.9800	Conductivity (σ):	6.15	6.00	2.46	5
5-21-2018	Body 2450	e'	52.7200	Relative Permittivity (ε_r):	52.72	52.70	0.04	5
		e''	14.6600	Conductivity (σ):	2.00	1.95	2.42	5
	Body 2400	e'	52.8600	Relative Permittivity (ε_r):	52.86	52.77	0.17	5
		e''	14.5100	Conductivity (σ):	1.94	1.90	2.02	5
	Body 2480	e'	52.6200	Relative Permittivity (ε_r):	52.62	52.66	-0.08	5
		e''	14.7200	Conductivity (σ):	2.03	1.99	1.89	5

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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.

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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	1-17-2018	2600	1g	56.40	54.40
				10g	25.30	24.20
D5GHzV2	1184	8-23-2017	5300	1g	81.30	76.40
				10g	23.20	21.30
D5GHzV2	1184	8-23-2017	5500	1g	80.60	77.10
				10g	22.90	21.30
D5GHzV2	1184	8-23-2017	5600	1g	82.30	79.20
				10g	23.40	22.20
D5GHzV2	1184	8-23-2017	5800	1g	78.10	76.40
				10g	22.20	21.20
D5GHzV2	1209	2-15-2018	5250	1g	80.80	75.70
				10g	23.10	21.00
D5GHzV2	1209	2-15-2018	5600	1g	83.40	79.00
				10g	23.80	21.90
D5GHzV2	1209	2-15-2018	5750	1g	80.70	75.60
				10g	22.90	20.80

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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			
5-8-2018	D835V2	4d194	Body	1g	1.00	9.99	9.30	7.42	1, 2
				10g	0.66	6.57	6.09	7.88	
5-9-2018	D750V3	1122	Body	1g	0.88	8.77	8.63	1.62	
				10g	0.59	5.85	5.72	2.27	
5-16-2018	D2450V2	939	Head	1g	5.50	55.00	52.30	5.16	
				10g	2.50	25.00	24.60	1.63	
5-17-2018	D5GHzV2 (5300)	1184	Head	1g	7.81	78.10	81.30	-3.94	
				10g	2.19	21.90	23.20	-5.60	
5-17-2018	D5GHzV2 (5500)	1184	Head	1g	7.88	78.80	80.60	-2.23	
				10g	2.22	22.20	22.90	-3.06	
5-17-2018	D5GHzV2 (5600)	1184	Head	1g	7.97	79.70	82.30	-3.16	
				10g	2.24	22.40	23.40	-4.27	
5-17-2018	D5GHzV2 (5800)	1184	Head	1g	7.68	76.80	78.10	-1.66	
				10g	2.16	21.60	22.20	-2.70	
5-21-2018	D5GHzV2 (5500)	1184	Body	1g	8.30	83.00	77.10	7.65	3, 4
				10g	2.31	23.10	21.30	8.45	
5-21-2018	D5GHzV2 (5600)	1184	Body	1g	8.19	81.90	79.20	3.41	
				10g	2.29	22.90	22.20	3.15	

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			
5-8-2018	D2600V2	1097	Body	1g	5.33	53.30	54.4	-2.02	
				10g	2.35	23.50	24.20	-2.89	
5-9-2018	D1900V2	5d190	Body	1g	4.04	40.40	40.00	1.00	
				10g	2.05	20.50	21.10	-2.84	
5-12-2018	D2600V2	1097	Head	1g	5.92	59.20	56.40	4.96	5, 6
				10g	2.58	25.80	25.30	1.98	
5-13-2018	D835V2	4d194	Head	1g	0.96	9.61	9.33	3.00	
				10g	0.63	6.33	6.03	4.98	

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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			
5-10-2018	D750V3	1122	Head	1g	0.81	8.08	8.22	-1.70	7, 8
				10g	0.54	5.35	5.35	0.00	
5-11-2018	D1900V2	5d190	Body	1g	3.92	39.20	40.00	-2.00	
				10g	2.00	20.00	21.10	-5.21	
5-13-2018	D1900V2	5d190	Head	1g	4.11	41.10	38.30	7.31	9, 10
				10g	2.09	20.90	20.10	3.98	
5-16-2018	D2450V2	939	Body	1g	4.93	49.30	50.7	-2.76	
				10g	2.27	22.70	23.9	-5.02	
5-17-2018	D5GHzV2 (5250)	1209	Body	1g	7.47	74.70	75.7	-1.32	
				10g	2.08	20.80	21	-0.95	
5-17-2018	D5GHzV2 (5600)	1209	Body	1g	8.07	80.70	79	2.15	
				10g	2.21	22.10	21.9	0.91	
5-17-2018	D5GHzV2 (5750)	1209	Body	1g	7.34	73.40	75.6	-2.91	11, 12
				10g	2.02	20.20	20.8	-2.88	
5-21-2018	D2450V2	939	Body	1g	5.47	54.70	50.7	7.89	13, 14
				10g	2.49	24.90	23.9	4.18	

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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			Reduced Power	
Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Burst Pwr (dBm)	Frame Pwr (dBm)	Max. Frame Pwr (dBm)	Burst Pwr (dBm)	Frame Pwr (dBm)	Max. Frame Pwr (dBm)
GSM (Voice)	CS1	1	512	1850.2	29.4	20.4	21.5	27.4	18.3	19.5
			661	1880.0	29.5	20.5		27.5	18.5	
			810	1909.8	29.4	20.4		27.4	18.4	
GPRS (GMSK)	CS1	1	512	1850.2	29.4	20.3	21.5	27.4	18.3	19.5
			661	1880.0	29.4	20.4		27.4	18.4	
			810	1909.8	29.3	20.3		27.3	18.3	
		2	512	1850.2	26.2	20.2	21.5	24.8	18.8	19.5
			661	1880.0	26.3	20.3		24.8	18.7	
			810	1909.8	26.0	20.0		24.7	18.7	
		3	512	1850.2	24.2	19.9	21.2	22.8	18.6	19.4
			661	1880.0	24.3	20.0		22.8	18.5	
			810	1909.8	24.2	19.9		22.6	18.4	
		4	512	1850.2	23.3	20.3	**21.5**	21.3	18.3	**19.5**
			661	1880.0	23.3	20.3		21.4	18.4	
			810	1909.8	23.2	20.2		21.2	18.2	
EGPRS (8PSK)	MCS5	1	512	1850.2	24.8	15.7	16.5	22.8	13.8	14.5
			661	1880.0	24.8	15.8		22.9	13.8	
			810	1909.8	24.6	15.5		22.6	13.6	
		2	512	1850.2	22.6	16.5	17.5	20.7	14.6	15.5
			661	1880.0	22.6	16.6		20.7	14.7	
			810	1909.8	22.4	16.4		20.5	14.5	
		3	512	1850.2	20.8	16.6	17.2	18.9	14.7	15.7
			661	1880.0	20.9	16.7		19.0	14.8	
			810	1909.8	20.7	16.5		18.8	14.5	
		4	512	1850.2	19.1	16.1	17.5	17.2	14.2	15.5
			661	1880.0	19.2	16.2		17.3	14.3	
			810	1909.8	19.0	16.0		17.1	14.1	

Notes:

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

- GMSK (GPRS) mode with 4 time slots for Max power and 4 time slots for reduced power, 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.

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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			

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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.

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W-CDMA Band II Measured Results

Band	Mode		UL Ch No.	Freq. (MHz)	MPR (dB)	Max. RF output power (dBm)	Reduced. RF output power (dBm)
						Meas. Avg Pwr	Meas. Avg Pwr
W-CDMA Band II	Rel 99	RMC, 12.2 kbps	9262	1852.4	N/A	22.0	19.1
			9400	1880.0		22.1	19.3
			9538	1907.6		21.8	19.0
	HSDPA	Subtest 1	9262	1852.4	0	21.0	18.1
			9400	1880.0		21.1	18.3
			9538	1907.6		20.8	17.9
		Subtest 2	9262	1852.4	0	20.9	18.1
			9400	1880.0		21.1	18.2
			9538	1907.6		20.7	17.9
		Subtest 3	9262	1852.4	0.5	20.4	17.6
			9400	1880.0		20.5	17.7
			9538	1907.6		20.2	17.4
		Subtest 4	9262	1852.4	0.5	20.4	17.6
			9400	1880.0		20.5	17.7
			9538	1907.6		20.2	17.4
	HSUPA	Subtest 1	9262	1852.4	0	20.9	18.1
			9400	1880.0		21.1	18.2
			9538	1907.6		20.8	17.9
		Subtest 2	9262	1852.4	2	18.9	16.1
			9400	1880.0		19.0	16.2
			9538	1907.6		18.7	15.9
		Subtest 3	9262	1852.4	1	20.0	17.1
			9400	1880.0		20.1	17.3
			9538	1907.6		19.7	17.0
		Subtest 4	9262	1852.4	2	19.0	16.1
			9400	1880.0		19.1	16.2
			9538	1907.6		18.8	15.9
		Subtest 5	9262	1852.4	0	20.9	18.1
			9400	1880.0		21.0	18.2
			9538	1907.6		20.8	17.9

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W-CDMA Band V Measured Results

Band	Mode		UL Ch No.	Freq. (MHz)	MPR (dB)	Max. RF output power (dBm)	Reduced. RF output power (dBm)
						Meas. Avg Pwr	Meas. Avg Pwr
W-CDMA Band V	Rel 99	RMC, 12.2 kbps	4132	826.4	N/A	23.8	21.8
			4183	836.6		24.0	22.0
			4233	846.6		24.0	22.0
	HSDPA	Subtest 1	4132	826.4	0	22.8	20.8
			4183	836.6		23.0	21.0
			4233	846.6		23.0	21.0
		Subtest 2	4132	826.4	0	22.8	20.8
			4183	836.6		23.0	21.0
			4233	846.6		23.0	21.0
		Subtest 3	4132	826.4	0.5	22.3	20.3
			4183	836.6		22.5	20.5
			4233	846.6		22.5	20.5
		Subtest 4	4132	826.4	0.5	22.3	20.3
			4183	836.6		22.5	20.5
			4233	846.6		22.5	20.5
	HSUPA	Subtest 1	4132	826.4	0	22.8	20.8
			4183	836.6		23.1	21.1
			4233	846.6		23.0	21.0
		Subtest 2	4132	826.4	2	20.9	18.9
			4183	836.6		21.1	19.1
			4233	846.6		21.0	19.0
		Subtest 3	4132	826.4	1	21.9	19.8
			4183	836.6		22.1	20.1
			4233	846.6		22.0	20.0
		Subtest 4	4132	826.4	2	20.9	18.9
			4183	836.6		21.1	19.1
			4233	846.6		21.1	19.1
		Subtest 5	4132	826.4	0	22.8	20.8
			4183	836.6		23.1	21.1
			4233	846.6		23.0	21.0

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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					

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LTE Band 5 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Meas. Avg Pwr (dBm)			Target MPR	Reduced. Meas. Avg Pwr (dBm)		
						829 MHz	836.5 MHz	844 MHz		829 MHz	836.5 MHz	844 MHz
LTE Band 5	10	QPSK	1	0	0		24.3		0		22.4	
			1	25	0		24.2		0		22.3	
			1	49	0		24.5		0		22.7	
			25	0	1		23.2		0		22.3	
			25	12	1		23.3		0		22.4	
			25	25	1		23.3		0		22.4	
			50	0	1		23.4		0		22.4	
		16QAM	1	0	1		23.3		0		22.8	
			1	25	1		23.2		0		22.7	
			1	49	1		23.4		0		22.9	
			25	0	2		22.3		0		22.3	
			25	12	2		22.3		0		22.4	
			25	25	2		22.4		0		22.4	
			50	0	2		22.3		0		22.4	

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Meas. Avg Pwr (dBm)			Target MPR	Reduced. Meas. Avg Pwr (dBm)		
						826.5 MHz	836.5 MHz	846.5 MHz		826.5 MHz	836.5 MHz	846.5 MHz
LTE Band 5	5	QPSK	1	0	0	24.2	24.3	24.3	0	22.3	22.4	22.5
			1	12	0	24.1	24.3	24.3	0	22.2	22.4	22.4
			1	24	0	24.2	24.2	24.3	0	22.2	22.4	22.4
			12	0	1	23.2	23.3	23.3	0	22.3	22.4	22.3
			12	7	1	23.3	23.3	23.3	0	22.3	22.4	22.4
			12	13	1	23.3	23.2	23.2	0	22.4	22.3	22.3
			25	0	1	23.3	23.3	23.3	0	22.4	22.4	22.4
		16QAM	1	0	1	23.8	23.4	23.4	0	22.9	22.4	22.5
			1	12	1	23.8	23.4	23.3	0	22.8	22.5	22.4
			1	24	1	23.8	23.4	23.4	0	22.8	22.5	22.5
			12	0	2	22.4	22.4	22.4	0	22.4	22.4	22.4
			12	7	2	22.4	22.4	22.4	0	22.5	22.5	22.5
			12	13	2	22.5	22.3	22.3	0	22.5	22.4	22.4
			25	0	2	22.4	22.3	22.4	0	22.4	22.4	22.4

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Meas. Avg Pwr (dBm)			Target MPR	Reduced. Meas. Avg Pwr (dBm)		
						825.5 MHz	836.5 MHz	847.5 MHz		825.5 MHz	836.5 MHz	847.5 MHz
LTE Band 5	3	QPSK	1	0	0	24.2	24.1	24.1	0	22.3	22.3	22.3
			1	8	0	24.2	24.2	24.2	0	22.3	22.3	22.3
			1	14	0	24.2	24.1	24.1	0	22.3	22.2	22.3
			8	0	1	23.3	23.2	23.2	0	22.4	22.3	22.3
			8	4	1	23.2	23.3	23.3	0	22.3	22.3	22.4
			8	7	1	23.2	23.3	23.3	0	22.3	22.3	22.4
			15	0	1	23.2	23.3	23.3	0	22.3	22.3	22.4
		16QAM	1	0	1	23.8	23.1	23.2	0	22.4	22.7	22.3
			1	8	1	23.6	23.2	23.2	0	22.5	22.8	22.5
			1	14	1	23.7	23.1	23.1	0	22.4	22.7	22.2
			8	0	2	22.4	22.3	22.3	0	22.4	22.4	22.4
			8	4	2	22.3	22.5	22.4	0	22.4	22.4	22.5
			8	7	2	22.3	22.4	22.4	0	22.4	22.4	22.5
			15	0	2	22.3	22.3	22.3	0	22.3	22.4	22.4

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LTE Band 5 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Meas. Avg Pwr (dBm)			Target MPR	Reduced. Meas. Avg Pwr (dBm)		
						824.7 MHz	836.5 MHz	848.3 MHz		824.7 MHz	836.5 MHz	848.3 MHz
LTE Band 5	1.4	QPSK	1	0	0	24.3	24.1	24.2	0	22.3	22.3	22.3
			1	3	0	24.3	24.3	24.2	0	22.4	22.3	22.3
			1	5	0	24.2	24.1	24.2	0	22.2	22.3	22.3
			3	0	0	24.1	24.1	24.2	0	22.2	22.2	22.2
			3	1	0	24.2	24.2	24.2	0	22.3	22.2	22.2
			3	3	0	24.2	24.2	24.2	0	22.3	22.3	22.3
			6	0	1	23.3	23.3	23.2	0	22.3	22.3	22.3
		16QAM	1	0	1	23.3	23.2	23.6	0	22.7	22.3	22.3
			1	3	1	23.4	23.3	23.7	0	22.9	22.4	22.5
			1	5	1	23.3	23.3	23.7	0	22.7	22.4	22.3
			3	0	1	23.3	23.4	23.4	0	22.4	22.3	22.3
			3	1	1	23.3	23.4	23.5	0	22.5	22.3	22.3
			3	3	1	23.3	23.4	23.3	0	22.5	22.3	22.4
			6	0	2	22.5	22.4	22.2	0	22.2	22.5	22.4

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

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LTE Band 17 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Meas. Avg Pwr (dBm)		
						709 MHz	710 MHz	711 MHz
LTE Band 17	10	QPSK	1	0	0		23.0	
			1	25	0		22.8	
			1	49	0		23.0	
			25	0	1		21.8	
			25	12	1		21.8	
			25	25	1		21.8	
			50	0	1		21.9	
		16QAM	1	0	1		22.0	
			1	25	1		21.7	
			1	49	1		22.1	
			25	0	2		20.8	
			25	12	2		20.9	
			25	25	2		20.8	
			50	0	2		20.9	

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Meas. Avg Pwr (dBm)		
						706.5 MHz	710 MHz	713.5 MHz
LTE Band 17	5	QPSK	1	0	0		22.8	
			1	12	0		22.7	
			1	24	0		22.7	
			12	0	1		21.8	
			12	7	1		21.8	
			12	13	1		21.8	
			25	0	1		21.8	
		16QAM	1	0	1		22.3	
			1	12	1		22.3	
			1	24	1		22.3	
			12	0	2		20.9	
			12	7	2		20.9	
			12	13	2		21.0	
			25	0	2		20.9	

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

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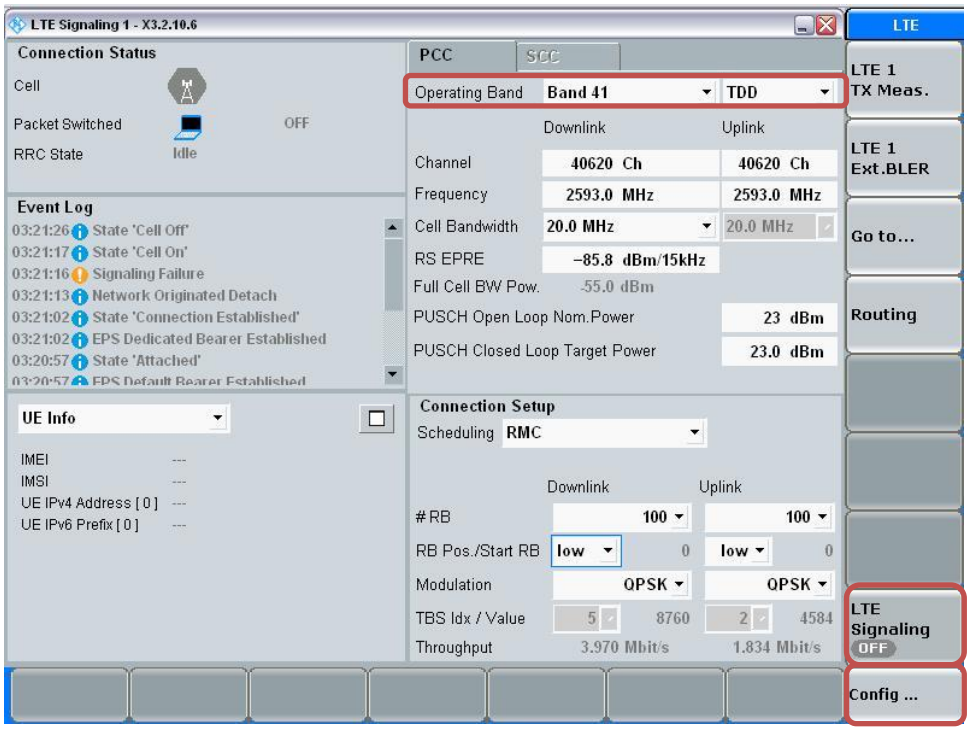
LTE Band TDD Measured Results

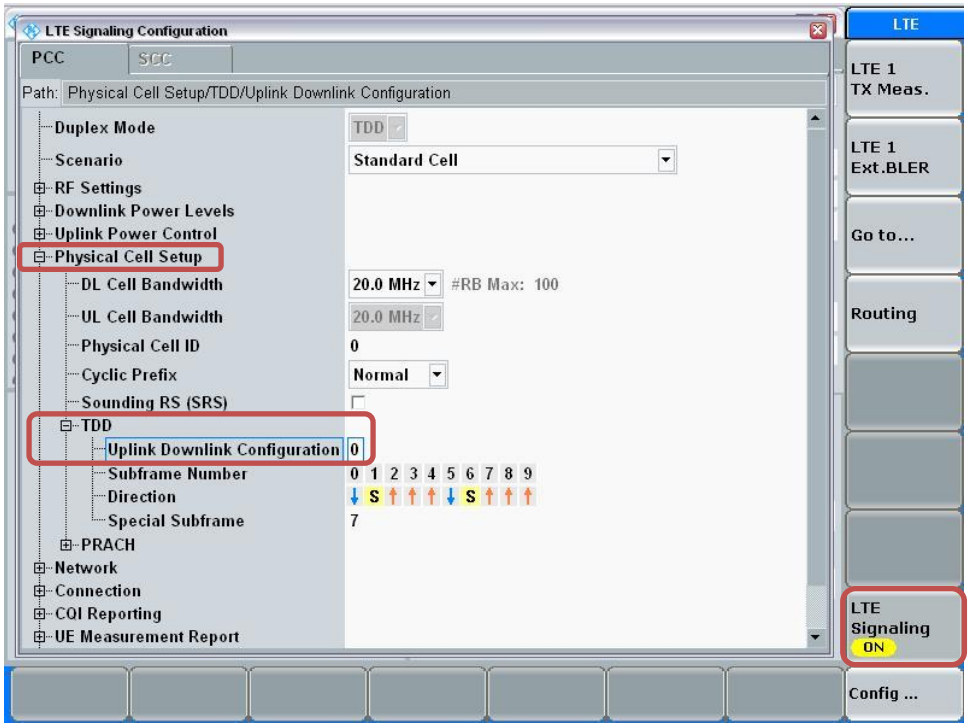
Procedure used to establish SAR test signal for LTE TDD Band

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



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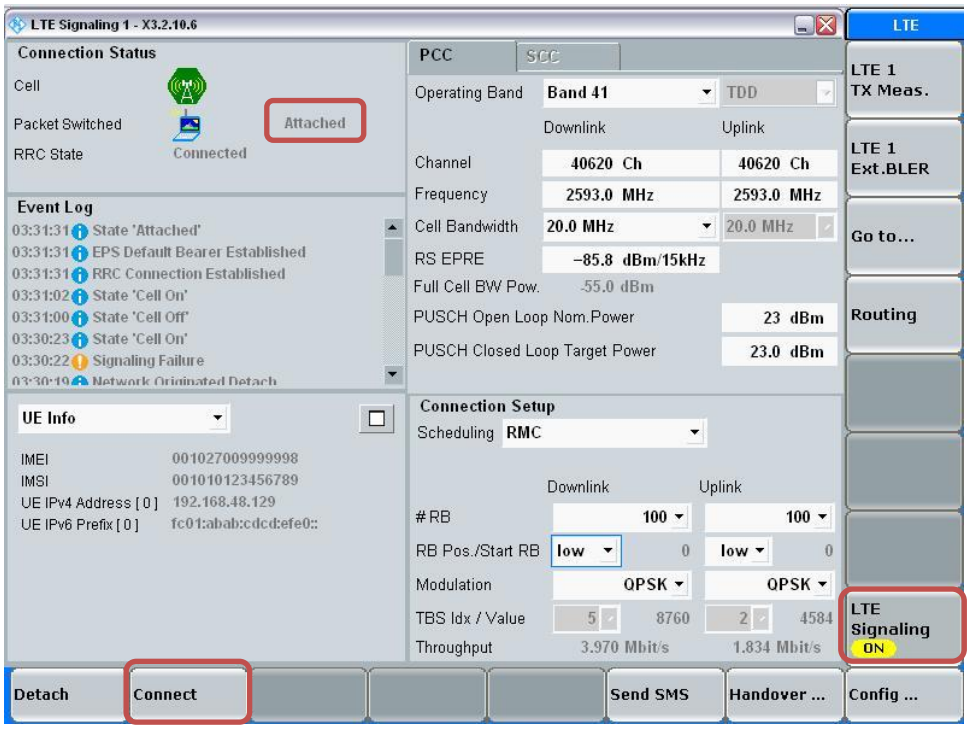
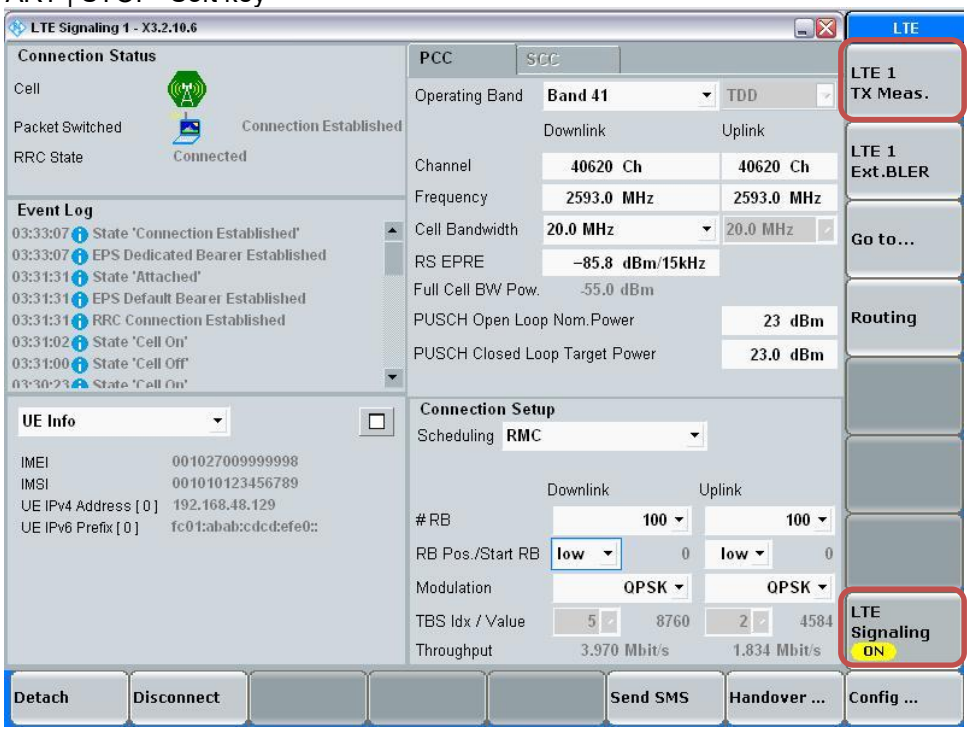
Connect to EUT

- 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



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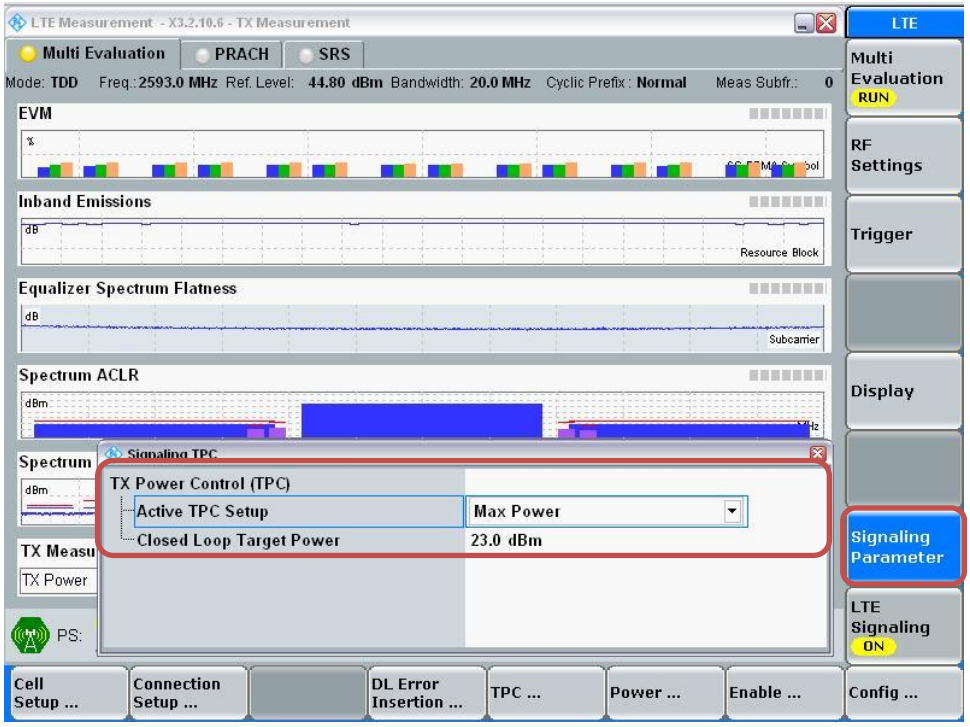
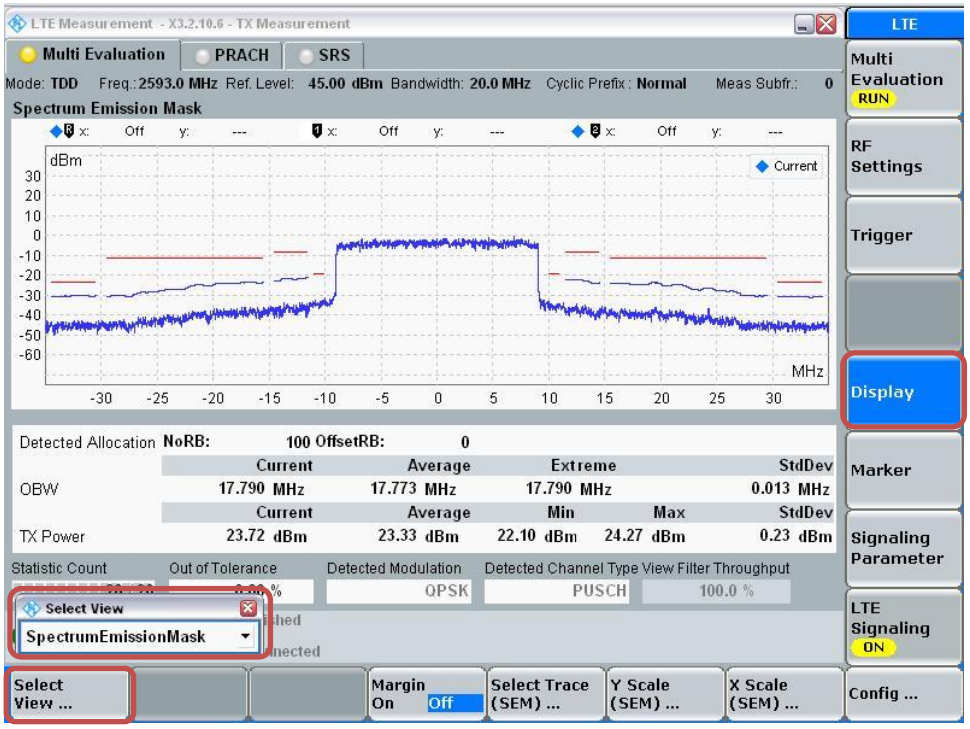
- Select “Signaling Parameter”
- Select “TX Power Control (TPC)” > Select “Active TPC Setup” to “Max Power” > Set “Closed Loop Target Power” to “23 dBm”



View TX Power

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



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LTE Band 41 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Max. Meas. Avg Pwr (dBm)					
					MPR	2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz
LTE Band 41	20	QPSK	1	0	0	22.5	22.4	22.4	22.5	22.4
			1	49	0	22.7	22.6	22.7	22.6	22.5
			1	99	0	22.6	22.5	22.6	22.6	22.6
			50	0	1	21.7	21.6	21.7	21.6	21.6
			50	24	1	21.6	21.6	21.6	21.5	21.6
			50	50	1	21.7	21.6	21.6	21.6	21.7
			100	0	1	21.6	21.6	21.7	21.6	21.6
		16QAM	1	0	1	21.2	21.4	21.3	21.3	21.3
			1	49	1	21.5	21.6	21.4	21.4	21.5
			1	99	1	21.4	21.6	21.5	21.4	21.6
			50	0	2	20.6	20.7	20.6	20.6	20.5
			50	24	2	20.5	20.5	20.6	20.5	20.6
			50	50	2	20.6	20.6	20.6	20.6	20.7
			100	0	2	20.6	20.6	20.6	20.4	20.6
Band	BW (MHz)	Mode	RB Allocation	RB offset	Max. Meas. Avg Pwr (dBm)					
					MPR	2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz
LTE Band 41	15	QPSK	1	0	0	22.8	22.8	22.7	22.9	22.8
			1	37	0	22.6	21.8	22.2	22.7	22.5
			1	74	0	22.7	22.8	22.9	22.7	22.9
			36	0	1	21.6	21.6	21.6	21.7	21.7
			36	20	1	21.6	21.6	21.6	21.6	21.6
			36	39	1	21.6	21.6	21.6	21.5	21.8
			75	0	1	21.6	21.6	21.6	21.6	21.7
		16QAM	1	0	1	21.7	21.8	21.8	21.7	21.8
			1	37	1	21.6	21.7	21.1	21.4	21.7
			1	74	1	21.6	21.8	21.7	21.7	21.8
			36	0	2	20.6	20.6	20.5	20.6	20.7
			36	20	2	20.6	20.6	20.5	20.5	20.5
			36	39	2	20.6	20.7	20.6	20.5	20.7
			75	0	2	20.6	20.6	20.6	20.6	20.6
Band	BW (MHz)	Mode	RB Allocation	RB offset	Max. Meas. Avg Pwr (dBm)					
					MPR	2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz
LTE Band 41	10	QPSK	1	0	0	22.9	22.7	22.8	22.8	22.8
			1	25	0	22.6	22.4	22.7	22.6	22.5
			1	49	0	22.8	22.6	22.9	22.8	23.0
			25	0	1	21.6	21.5	21.5	21.6	21.7
			25	12	1	21.6	21.6	21.6	21.6	21.6
			25	25	1	21.6	21.6	21.6	21.6	21.6
			50	0	1	21.7	21.5	21.6	21.6	21.6
		16QAM	1	0	1	21.8	21.9	21.7	21.5	22.0
			1	25	1	21.6	21.8	21.5	21.6	21.9
			1	49	1	21.6	22.0	21.7	21.6	22.0
			25	0	2	20.6	20.5	20.4	20.5	20.6
			25	12	2	20.6	20.6	20.5	20.6	20.6
			25	25	2	20.7	20.6	20.6	20.6	20.6
			50	0	2	20.6	20.7	20.6	20.5	20.7

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LTE Band 41 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Max. Meas. Avg Pwr (dBm)					
					MPR	2506 MHz	2549.5 MHz	2593 MHz	2636.5 MHz	2680 MHz
LTE Band 41	5	QPSK	1	0	0	22.5	22.6	22.7	22.5	22.7
			1	12	0	22.5	22.5	22.7	22.4	22.4
			1	24	0	22.5	22.6	22.6	22.4	22.6
			12	0	1	21.5	21.7	21.6	21.5	21.7
			12	7	1	21.5	21.5	21.5	21.6	21.6
			12	13	1	21.6	21.5	21.6	21.5	21.6
			25	0	1	21.6	21.6	21.6	21.6	21.7
		16QAM	1	0	1	21.5	21.5	21.7	21.5	21.6
			1	12	1	21.5	21.5	21.5	21.5	21.6
			1	24	1	21.5	21.5	21.6	21.4	21.5
			12	0	2	20.7	20.5	20.6	20.5	20.6
			12	7	2	20.6	20.5	20.6	20.6	20.6
			12	13	2	20.6	20.5	20.5	20.5	20.5
			25	0	2	20.6	20.6	20.5	20.6	20.7

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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	18.5	19.0	Yes
		6	2437	18.5		
		11	2462	18.4		
		12	2467	17.5	18.0	No
		13	2472	14.4	15.0	
802.11g	6 Mbps	1	2412	Not Require	14.0	No
		6	2437		18.0	
		10	2457			
		11	2462		16.0	
		12	2467		13.0	
		13	2472		9.0	
802.11n (HT20)	6.5 Mbps	1	2412	Not Require	14.0	No
		6	2437		18.0	
		10	2457			
		11	2462		15.0	
		12	2467		13.0	
		13	2472		9.0	

Measured Results (Reduced power)

Mode	Data Rate	Ch #	Freq. (MHz)	Meas. Avg Pwr (dBm)	Reduced Output Power (dBm)	SAR Test (Yes/No)
802.11b	1 Mbps	1	2412	12.2	13.0	Yes
		6	2437	12.0		
		11	2462	12.5		
		12	2467	12.4		
		13	2472	12.5		
802.11g	6 Mbps	1	2412	12.4	13.0	No
		6	2437	12.0		
		11	2462	12.6		
		12	2467	12.4		
		13	2472	8.8	9.0	
802.11n (HT20)	6.5 Mbps	1	2412	12.3	13.0	No
		6	2437	12.1		
		11	2462	12.6		
		12	2467	12.3		
		13	2472	8.1	9.0	

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.

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9.5 Wi-Fi 5GHz (U-NII Bands)

Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Max Pwr.			Reduce Pwr		
					Meas. Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Meas. Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)
5.3 (U-NII 2A)	802.11a	6 Mbps	52	5260	Not Required	16.0	Yes	Not Required	10.0	No
			56	5280						
			60	5300						
			64	5320						
	802.11n (HT20)	6.5 Mbps	52	5260		16.0	No		10.0	No
			56	5280						
			60	5300						
			64	5320						
	802.11n (HT40)	13.5 Mbps	54	5270	15.1	16.0	No	8.9	10.0	Yes
			62	5310	15.9			9.2		
5.5 (U-NII 2C)	802.11a	6 Mbps	100	5500	Not Required	16.0	Yes	Not Required	10.0	No
			116	5580						
			132	5660						
			140	5700						
	802.11n (HT20)	6.5 Mbps	100	5500		16.0	No		10.0	No
			116	5580						
			132	5660						
			140	5700						
	802.11n (HT40)	13.5 Mbps	102	5510	15.7	16.0	No	8.9	10.0	Yes
			110	5550	15.9			8.9		
			134	5670	15.7			8.8		
5.8 (U-NII 3)	802.11a	6 Mbps	149	5745	Not Required	16.0	Yes	Not Required	10.0	No
			157	5785						
			165	5825						
	802.11n (HT20)	6.5 Mbps	149	5745		16.0	No		10.0	No
			157	5785						
			165	5825						
	802.11n (HT40)	13.5 Mbps	151	5755	15.2	16.0	No	8.9	10.0	Yes
			159	5795	15.5			9.5		

Note(s):

1. 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.
2. When the same transmission mode configurations have the same maximum output power on the same channel for the 802.11 a/g/n/ac modes, the channel in the lower order/sequence 802.11 mode (i.e. a, g, n then ac) is selected.
3. When the specified maximum output power is the same for both UNII band I and UNII band 2A, begin SAR measurement in UNII band 2A; and if the highest *reported* SAR for UNII band 2A is
   - ≤ 1.2 W/kg, SAR is not required for UNII band I
   - > 1.2 W/kg, both bands should be tested independently for SAR.

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9.6 Bluetooth

Average Power Measured Results

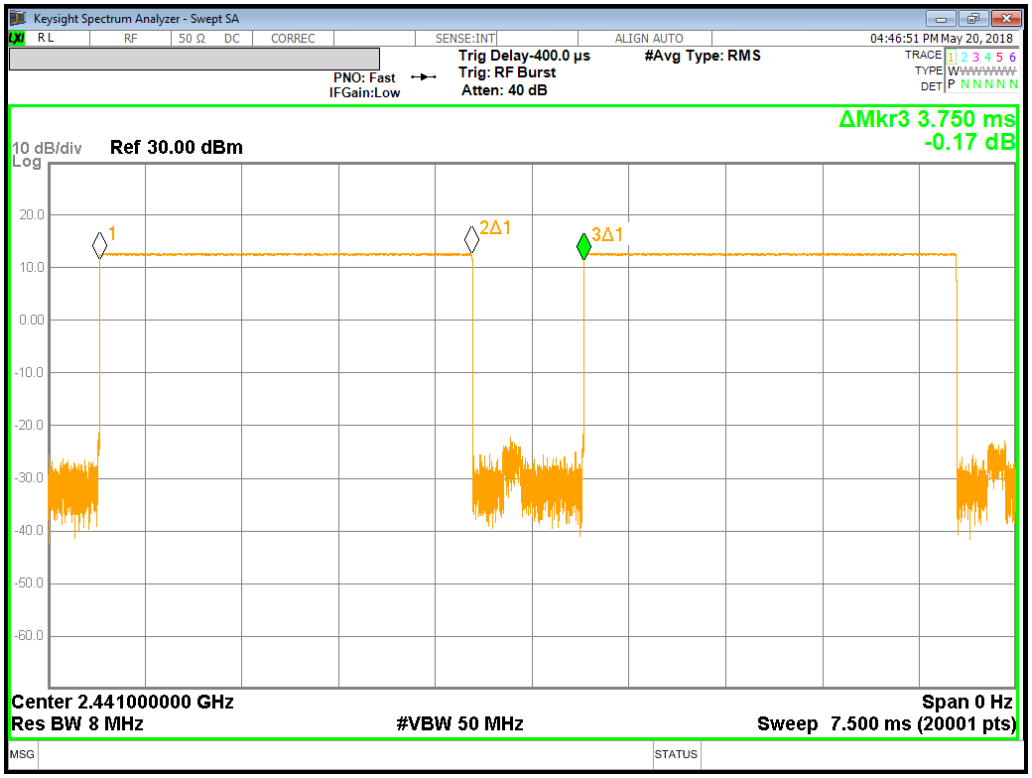
Band (GHz)	Mode	Ch #	Freq. (MHz)	Meas. Avg Pwr (dBm)
2.4	GFSK	0	2402	11.9
		39	2441	12.4
		78	2480	11.3
	EDR, π/4 DQPSK	0	2402	9.7
		39	2441	10.3
		78	2480	9.2
	EDR, 8-DPSK	0	2402	9.8
		39	2441	10.3
		78	2480	9.2
	LE, GFSK	0	2402	2.4
		19	2440	2.7
		39	2480	1.9

Duty Factor Measured Results

Mode	Type	T on (ms)	Period (ms)	Duty Cycle	Crest Factor (1/duty cycle)
GFSK	DH5	2.884	3.750	76.9%	1.30

Duty Cycle plots

GFSK



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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 648474 D04 Handset SAR (Phablet Only):

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

Additional 1-g SAR testing at 5 mm is not required when hotspot mode 10-g extremity SAR is not required for the surfaces and edges; since all 1-g reported SAR < 1.2 W/kg.

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.

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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*.

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10.1 GSM 1900

RF Exposure Conditions	Mode	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Head	GPRS 4 Slot	Off	0	Left Touch	661	1880.0	24.5	23.3	0.051	0.067	1
				Left Tilt	661	1880.0	24.5	23.3	0.029	0.038	
				Right Touch	661	1880.0	24.5	23.3	0.014	0.019	
				Right Tilt	661	1880.0	24.5	23.3	0.019	0.025	
Body-worn	GPRS 4 Slot	Off	15	Rear	661	1880.0	24.5	23.3	0.342	0.452	2
				Front	661	1880.0	24.5	23.3	0.162	0.214	
Hotspot	GPRS 4 Slot	On	10	Rear	661	1880.0	22.5	21.4	0.444	0.576	3
				Front	661	1880.0	22.5	21.4	0.206	0.267	
				Edge 2	661	1880.0	22.5	21.4	0.050	0.065	
				Edge 3	661	1880.0	22.5	21.4	0.434	0.563	
				Edge 4	661	1880.0	22.5	21.4	0.044	0.057	

10.2 W-CDMA Band II

RF Exposure Conditions	Mode	PWR Back-off	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	Off	0	Left Touch	9400	1880.0	22.5	22.1	0.176	0.193	4
				Left Tilt	9400	1880.0	22.5	22.1	0.108	0.118	
				Right Touch	9400	1880.0	22.5	22.1	0.062	0.068	
				Rightt Tilt	9400	1880.0	22.5	22.1	0.036	0.039	
Bod-worn	Rel 99 RMC	Off	15	Rear	9262	1852.4	22.5	22.0	0.712	0.808	
					9400	1880.0	22.5	22.1	0.826	0.904	5
					9538	1907.6	22.5	21.8	0.648	0.754	
				Front	9400	1880.0	22.5	22.1	0.378	0.414	
Hotspot	Rel 99 RMC	On	10	Rear	9262	1852.4	19.5	19.1	0.813	0.885	
					9400	1880.0	19.5	19.3	0.946	0.993	
					9538	1907.6	19.5	19.0	0.732	0.829	
				Front	9400	1880.0	19.5	19.3	0.430	0.451	
				Edge 2	9400	1880.0	19.5	19.3	0.090	0.094	
				Edge 3	9262	1852.4	19.5	19.1	0.827	0.901	
					9400	1880.0	19.5	19.3	0.963	1.011	6
					9538	1907.6	19.5	19.0	0.723	0.819	
				Edge 4	9400	1880.0	19.5	19.3	0.077	0.081	
RF Exposure Conditions	Mode	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		10-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Phablet-10g	Rel 99 RMC	Off	0	Rear	9262	1852.4	22.5	22.0	2.070	2.349	
					9400	1880.0	22.5	22.1	2.110	2.308	
					9538	1907.6	22.5	21.8	2.420	2.817	
				Front	9262	1852.4	22.5	22.0	1.900	2.157	
					9400	1880.0	22.5	22.1	2.080	2.275	
					9538	1907.6	22.5	21.8	1.870	2.177	
				Edge 2	9400	1880.0	22.5	22.1	0.306	0.335	
				Edge 3	9262	1852.4	22.5	22.0	2.040	2.315	
					9400	1880.0	22.5	22.1	2.090	2.286	
					9538	1907.6	22.5	21.8	2.550	2.969	7
				Edge 4	9400	1880.0	22.5	22.1	0.315	0.345	

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10.3 W-CDMA Band V

RF Exposure Conditions	Mode	PWR Back-off	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	Off	0	Left Touch	4183	836.6	24.5	24.0	0.159	0.178	
				Left Tilt	4183	836.6	24.5	24.0	0.107	0.120	
				Right Touch	4183	836.6	24.5	24.0	0.224	0.250	8
				Rightt Tilt	4183	836.6	24.5	24.0	0.112	0.125	
Body-worn	Rel 99 RMC	Off	15	Rear	4183	836.6	24.5	24.0	0.437	0.488	9
				Front	4183	836.6	24.5	24.0	0.264	0.295	
Hotspot	Rel 99 RMC	On	10	Rear	4183	836.6	22.5	22.0	0.592	0.663	10
				Front	4183	836.6	22.5	22.0	0.324	0.363	
				Edge 2	4183	836.6	22.5	22.0	0.208	0.233	
				Edge 3	4183	836.6	22.5	22.0	0.206	0.231	
				Edge 4	4183	836.6	22.5	22.0	0.048	0.054	

10.4 LTE Band 5 (10MHz Bandwidth)

RF Exposure Conditions	Mode	PWR Back-off	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	Off	0	Left Touch	20525	836.5	1	49	25.0	24.5	0.159	0.180	
							25	25	24.0	23.3	0.113	0.131	
				Left Tilt	20525	836.5	1	49	25.0	24.5	0.104	0.118	
							25	25	24.0	23.3	0.077	0.089	
				Right Touch	20525	836.5	1	49	25.0	24.5	0.238	0.270	11
							25	25	24.0	23.3	0.167	0.194	
				Right Tilt	20525	836.5	1	49	25.0	24.5	0.108	0.122	
							25	25	24.0	23.3	0.079	0.092	
Body-worn	QPSK	Off	15	Rear	20525	836.5	1	49	25.0	24.5	0.452	0.512	12
							25	25	24.0	23.3	0.343	0.399	
				Front	20525	836.5	1	49	25.0	24.5	0.279	0.316	
							25	25	24.0	23.3	0.204	0.237	
Hotspot	QPSK	On	10	Rear	20525	836.5	1	49	23.0	22.7	0.699	0.752	13
							25	25	23.0	22.4	0.648	0.745	
				Front	20525	836.5	1	49	23.0	22.7	0.350	0.377	
							25	25	23.0	22.4	0.324	0.373	
				Edge 2	20525	836.5	1	49	23.0	22.7	0.201	0.216	
							25	25	23.0	22.4	0.188	0.216	
				Edge 3	20525	836.5	1	49	23.0	22.7	0.273	0.294	
							25	25	23.0	22.4	0.249	0.286	
				Edge 4	20525	836.5	1	49	23.0	22.7	0.045	0.049	
							25	25	23.0	22.4	0.043	0.049	

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10.5 LTE Band 17 (10MHz Bandwidth)

RF Exposure Conditions	Mode	PWR Back-off	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	N/A	0	Left Touch	23790	710.0	1	0	23.5	23.0	0.072	0.081	
							25	12	22.5	21.8	0.058	0.068	
				Left Tilt	23790	710.0	1	0	23.5	23.0	0.039	0.043	
							25	12	22.5	21.8	0.030	0.035	
				Right Touch	23790	710.0	1	0	23.5	23.0	0.082	0.091	14
							25	12	22.5	21.8	0.062	0.073	
				Right Tilt	23790	710.0	1	0	23.5	23.0	0.044	0.049	
							25	12	22.5	21.8	0.033	0.038	
Body-worn	QPSK		15	Rear	23790	710.0	1	0	23.5	23.0	0.214	0.238	15
							25	12	22.5	21.8	0.165	0.192	
				Front	23790	710.0	1	0	23.5	23.0	0.139	0.155	
							25	12	22.5	21.8	0.108	0.126	
Hotspot	QPSK		10	Rear	23790	710.0	1	0	23.5	23.0	0.336	0.374	16
							25	12	22.5	21.8	0.266	0.310	
				Front	23790	710.0	1	0	23.5	23.0	0.160	0.178	
							25	12	22.5	21.8	0.125	0.146	
				Edge 2	23790	710.0	1	0	23.5	23.0	0.143	0.159	
							25	12	22.5	21.8	0.113	0.132	
				Edge 3	23790	710.0	1	0	23.5	23.0	0.078	0.086	
							25	12	22.5	21.8	0.059	0.069	
				Edge 4	23790	710.0	1	0	23.5	23.0	0.124	0.138	
							25	12	22.5	21.8	0.099	0.116	

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10.6 LTE Band 41 (20MHz Bandwidth)

RF Exposure Conditions	Mode	PWR Back-off	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	N/A	0	Left Touch	40620	2593.0	1	49	23.0	22.7	0.135	0.146	
							50	0	22.0	21.7	0.104	0.111	
				Left Tilt	40620	2593.0	1	49	23.0	22.7	0.101	0.109	
							50	0	22.0	21.7	0.079	0.085	
				Right Touch	40620	2593.0	1	49	23.0	22.7	0.079	0.085	
							50	0	22.0	21.7	0.061	0.065	
				Right Tilt	40620	2593.0	1	49	23.0	22.7	0.162	0.175	17
							50	0	22.0	21.7	0.130	0.139	
Body-worn	QPSK		15	Rear	40620	2593.0	1	49	23.0	22.7	0.298	0.322	18
							50	0	22.0	21.7	0.237	0.254	
				Front	40620	2593.0	1	49	23.0	22.7	0.139	0.150	
							50	0	22.0	21.7	0.115	0.123	
Hotspot	QPSK		10	Rear	39750	2506.0	1	49	23.0	22.7	0.559	0.605	
					40185	2549.5	1	49	23.0	22.6	0.587	0.650	
					40620	2593.0	1	49	23.0	22.7	0.635	0.687	
							50	0	22.0	21.7	0.485	0.520	
					41055	2636.5	1	49	23.0	22.6	0.576	0.636	
					41490	2680.0	1	49	23.0	22.5	0.515	0.580	
				Front	40620	2593.0	1	49	23.0	22.7	0.270	0.292	
							50	0	22.0	21.7	0.211	0.226	
				Edge 2	40620	2593.0	1	49	23.0	22.7	0.102	0.110	
							50	0	22.0	21.7	0.076	0.082	
				Edge 3	39750	2506.0	1	49	23.0	22.7	0.615	0.666	
					40185	2549.5	1	49	23.0	22.6	0.627	0.695	
					40620	2593.0	1	49	23.0	22.7	0.679	0.734	19
							50	0	22.0	21.7	0.549	0.588	
					41055	2636.5	1	49	23.0	22.6	0.593	0.655	
					41490	2680.0	1	49	23.0	22.5	0.491	0.553	
				Edge 4	40620	2593.0	1	49	23.0	22.7	0.152	0.164	
							50	0	22.0	21.7	0.126	0.135	

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)	Duty Cycle (%)	Power (dBm)		1-g SAR (W/kg)		Plot No.
										Tune-up limit	Meas.	Meas.	Scaled	
2.4GHz	802.11b 1 Mbps	Head	On	0	Left Touch	11	2462.0	0.137	99.7	13.0	12.5			
					Left Tilt	11	2462.0	0.146	99.7	13.0	12.5			
					Right Touch	11	2462.0	0.279	99.7	13.0	12.5			
					Rightt Tilt	11	2462.0	0.335	99.7	13.0	12.5	0.247	0.278	20
		Body-worn	Off	15	Rear	1	2412.0	0.158	99.7	19.0	18.5	0.125	0.142	21
					Front	1	2412.0	0.048	99.7	19.0	18.5			
		Hotspot	Off	10	Rear	1	2412.0	0.292	99.7	19.0	18.5	0.223	0.253	22
					Front	1	2412.0	0.096	99.7	19.0	18.5			
					Edge 1	1	2412.0	0.178	99.7	19.0	18.5			
					Edge 4	1	2412.0	0.047	99.7	19.0	18.5			

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.

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10.8 Wi-Fi (U-NII Bands)

Frequency Band	Mode	RF Exposure Conditions	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle (%)	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
										Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled	
5.3 GHz U-NII 2A	802.11n HT 40 13.5 Mbps	Head	On	0	Left Touch	62	5310.0	0.463	96.0	10.0	9.2					
					Left Tilt	62	5310.0	0.441	96.0	10.0	9.2					
					Right Touch	62	5310.0	0.737	96.0	10.0	9.2	0.357	0.445			
					Right Tilt	62	5310.0	0.761	96.0	10.0	9.2	0.372	0.464			23
		Body-worn	Off	15	Rear	62	5310.0	0.123	96.0	10.0	15.9					
					Front	62	5310.0	0.401	96.0	16.0	15.9	0.170	0.181			24
		Phablet-10g	Off	0	Rear	62	5310.0	6.551	96.0	16.0	15.9			0.432	0.460	
					Front	62	5310.0	5.980	96.0	16.0	15.9			0.856	0.912	
					Edge 1	62	5310.0	7.565	96.0	16.0	15.9			0.874	0.931	25
					Edge 4	62	5310.0	0.955	96.0	16.0	15.9					

Frequency Band	Mode	RF Exposure Conditions	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle (%)	Power (dBm)		1-g SAR (W/kg)		10-g SAR (W/kg)		Plot No.
										Tune-up limit	Meas.	Meas.	Scaled	Meas.	Scaled	
5.5 GHz U-NII 2C	802.11n HT 40 13.5 Mbps	Head	On	0	Left Touch	110	5550.0	0.646	96.0	10.0	8.9					
					Left Tilt	110	5550.0	0.628	96.0	10.0	8.9					
					Right Touch	110	5550.0	1.009	96.0	10.0	8.9	0.511	0.679			26
					Right Tilt	110	5550.0	0.892	96.0	10.0	8.9	0.487	0.647			
		Body-worn	Off	15	Rear	110	5550.0	0.145	96.0	16.0	15.9					
					Front	110	5550.0	0.561	96.0	16.0	15.9	0.252	0.269			27
		Phablet-10g	Off	0	Rear	110	5550.0	6.449	96.0	16.0	15.9			0.466	0.498	
					Front	110	5550.0	7.716	96.0	16.0	15.9			1.110	1.185	28
					Edge 1	110	5550.0	6.853	96.0	16.0	15.9			0.755	0.806	
					Edge 4	110	5550.0	0.537	96.0	16.0	15.9					

Frequency Band	Mode	RF Exposure Conditions	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle (%)	Power (dBm)		1-g SAR (W/kg)		Plot No.
										Tune-up limit	Meas.	Meas.	Scaled	
5.8 GHz U-NII 3	802.11n HT 40 13.5 Mbps	Head	On	0	Left Touch	159	5795.0	0.743	96.0	10.0	9.5			
					Left Tilt	159	5795.0	0.710	96.0	10.0	9.5			
					Right Touch	159	5795.0	0.993	96.0	10.0	9.5	0.500	0.584	29
					Right Tilt	159	5795.0	0.870	96.0	10.0	9.5	0.458	0.535	
		Body-worn	Off	15	Rear	159	5795.0	0.129	96.0	16.0	15.5			
					Front	159	5795.0	0.507	96.0	16.0	15.5	0.242	0.281	30
		Hotspot	Off	10	Rear	159	5795.0	0.152	96.0	16.0	15.5			
					Front	159	5795.0	0.840	96.0	16.0	15.5	0.399	0.463	31
					Edge 1	159	5795.0	0.428	96.0	16.0	15.5	0.189	0.219	
					Edge 4	159	5795.0	0.058	96.0	16.0	15.5			

10.9 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	76.9	13.0	12.4	0.067	0.099	
				Left Tilt	39	2441.0	76.9	13.0	12.4	0.078	0.116	
				Right Touch	39	2441.0	76.9	13.0	12.4	0.128	0.190	
				Rightt Tilt	39	2441.0	76.9	13.0	12.4	0.151	0.224	32
		Body-worn	15	Rear	39	2441.0	76.9	13.0	12.4	0.025	0.037	33
				Front	39	2441.0	76.9	13.0	12.4	0.010	0.015	
		Hotspot	10	Rear	39	2441.0	76.9	13.0	12.4	0.046	0.068	34
				Front	39	2441.0	76.9	13.0	12.4	0.020	0.030	
				Edge 1	39	2441.0	76.9	13.0	12.4	0.040	0.059	
				Edge 4	39	2441.0	76.9	13.0	12.4	0.013	0.020	

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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
750	LTE Band 17	Hotspot	Rear	No	0.336	N/A	N/A
835	WCDMA Band V	Hotspot	Rear	No	0.592	N/A	N/A
	LTE Band 5	Hotspot	Rear	No	0.699	N/A	N/A
1900	GSM 1900	Hotspot	Rear	No	0.444	N/A	N/A
	WCDMA Band II	Hotspot	Edge 3	Yes	0.963	0.953	1.01
2400	Wi-Fi 802.11b/g/n	Head	Right Tilt	No	0.247	N/A	N/A
	Bluetooth	Head	Right Tilt	No	0.151	N/A	N/A
2600	LTE Band 41	Hotspot	Edge 3	No	0.679	N/A	N/A
5300	Wi-Fi 802.11a/n	Head	Right Tilt	No	0.372	N/A	N/A
5500	Wi-Fi 802.11a/n	Head	Right Touch	No	0.511	N/A	N/A
5800	Wi-Fi 802.11a/n	Head	Right Touch	No	0.500	N/A	N/A

Peak spatial-average (10g 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
1900	WCDMA Band II	Phablet-10g	Edge 3	Yes	2.550	2.510	1.02
5300	Wi-Fi 802.11a/n	Phablet-10g	Edge 1	No	0.874	N/A	N/A
5500	Wi-Fi 802.11a/n	Phablet-10g	Front	No	1.110	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.

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12. 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	GSM(Voice/GPRS)	+	U-NII
	4	W-CDMA	+	DTS
	5	W-CDMA	+	BT
	6	W-CDMA	+	U-NII
	7	LTE	+	DTS
	8	LTE	+	BT
	9	LTE	+	U-NII
Body-worn	10	GSM(Voice/GPRS)	+	DTS
	11	GSM(Voice/GPRS)	+	BT
	12	GSM(Voice/GPRS)	+	U-NII
	13	W-CDMA	+	DTS
	14	W-CDMA	+	BT
	15	W-CDMA	+	U-NII
	16	LTE	+	DTS
	17	LTE	+	BT
	18	LTE	+	U-NII
Hotspot	19	GSM(GPRS)	+	DTS
	20	GSM(GPRS)	+	BT
	21	GSM(GPRS)	+	U-NII
	22	WCDMA	+	DTS
	23	WCDMA	+	BT
	24	WCDMA	+	U-NII
	25	LTE	+	DTS
	26	LTE	+	BT
	27	LTE	+	U-NII
Phablet-10g	28	WCDMA	+	U-NII

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

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

RF Exposure conditions	Test Position	① WWAN	② DTS	③ U-NII	④ BT	① + ② WWAN + DTS		① + ③ WWAN + U-NII		① + ④ WWAN + BT	
						∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)	∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)	∑ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Head	All position	0.270	0.278	0.679	0.224	0.548	No	0.949	No	0.494	No
Body-worn	All position	0.904	0.142	0.281	0.037	1.046	No	1.185	No	0.941	No
Hotspot	All position	1.011	0.253	0.463	0.068	1.264	No	1.474	No	1.079	No

RF Exposure conditions	Test Position	① WWAN	② U-NII	① + ② WWAN + U-NII	
				∑ 10-g SAR (mW/g)	SPLSR (Yes/ No)
Phablet-10g	Rear	2.817	0.498	3.315	No
	Front	2.275	1.185	3.460	No
	Edge 1		0.931	0.931	No
	Edge 2	0.335		0.335	No
	Edge 3	2.969		2.969	No
	Edge 4	0.345	1.185	1.530	No

Conclusion:

Simultaneous transmission SAR measurement (Volume Scan) is not required because the sum of the 1-g SAR is < 1.6 W/kg (10-g SAR is < 4.0 W/kg).

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Appendixes

Refer to separated files for the following appendixes.

4788480738-S1V1 FCC Report SAR_App A_Photos & Ant. Locations

4788480738-S1V1 FCC Report SAR_App B_Highest SAR Test Plots

4788480738-S1V1 FCC Report SAR_App C_System Check Plots

4788480738-S1V1 FCC Report SAR_App D_SAR Tissue Ingredients

4788480738-S1V1 FCC Report SAR_App E_Probe Cal. Certificates

4788480738-S1V1 FCC Report SAR_App F_Dipole Cal. Certificates

END OF REPORT

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