



SAR EVALUATION REPORT

**FCC 47 CFR § 2.1093
IEEE Std 1528-2013**

For
GSM/WCDMA/LTE Tablet + Bluetooth & DTS/UNII a/b/g/n/ac & ANT+

**FCC ID: A3LSMT815C
Model Name: SM-T815C**

**Report Number: 15K20541-S1B
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Revision History

Rev.	Date	Revisions	Revised By
--	5/22/2015	Initial Issue	Justin Park
A	5/24/2015	1. Revise footer	Justin Park
B	6/1/2015	1. Sec 6.1., 6.2.,6.3. : Update Table 2. Added Sec 6.5 3. Sec 6.6.1. : Updated Proximity Sensor Triggering Distance 4. Sec 12. : Updated Simultaneous Transmission SAR Analysis 5. Sec 10., 12.. : Added Wi-Fi MIMO Data	Justin Park

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1. Attestation of Test Results

Applicant Name	SAMSUNG ELECTRONICS CO.,LTD.			
FCC ID	A3LSMT815C			
Model Name	SM-T815C			
Applicable Standards	FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013			
SAR Limits (W/Kg)				
Exposure Category	Peak spatial-average(1g of tissue)			
General population / Uncontrolled exposure	1.6			
The Highest Reported SAR (W/kg)				
RF Exposure Conditions	Equipment Class			
	Licensed	DTS	U-NII	DSS (BT)
Standalone	0.736	0.738	0.992	0.108
Simultaneous TX	1.585	1.475	1.585	1.475
Date Tested	4/7/2015 to 5/28/2015			
Test Results	Pass			
Note: The GSM 850/1900,WCDMA Band II/V, Wi-Fi (DTS/U-NII) and Bluetooth SAR measurement results from the original filling can be found in SAR test report 15K20540-S1F, FCC ID A3LSMT815. The GSM 850/1900, WCDMA Band II/V and WLAN/BT antennas and surrounding circuitry is the same between these two units, and tune up power targets are identical for GSM 850/1900, WCDMA Band II/V and WLAN/BT operations. Therefore, SAR data for GSM 850/1900, WCDMA Band II/V and WLAN/BT from the original filling was used for this model. Spot checks for GSM 850/1900, WCDMA Band II/V and WLAN/BT were performed to ensure that the SAR measurements for both devices are the same.				
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:		
				
JiHo Choi Operations Manager UL Korea, Ltd Suwon Laboratory		Justin Park Engineer UL Korea, Ltd Suwon Laboratory		

2. Test Specification, Methods and Procedures

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

- 248227 D01 802.11 Wi-Fi SAR v02
- 447498 D01 General RF Exposure Guidance v05r02
- 616217 D04 SAR for laptop and tablets v01r01
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r03
- 865664 D02 RF Exposure Reporting v01r01
- 941225 D01 3G SAR Procedures v03
- 941225 D05 SAR for LTE Devices v02r03
- 941225 D06 Hotspot Mode v02

3. Facilities and Accreditation

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

Suwon
SAR 1 Room
SAR 2 Room
SAR 3 Room

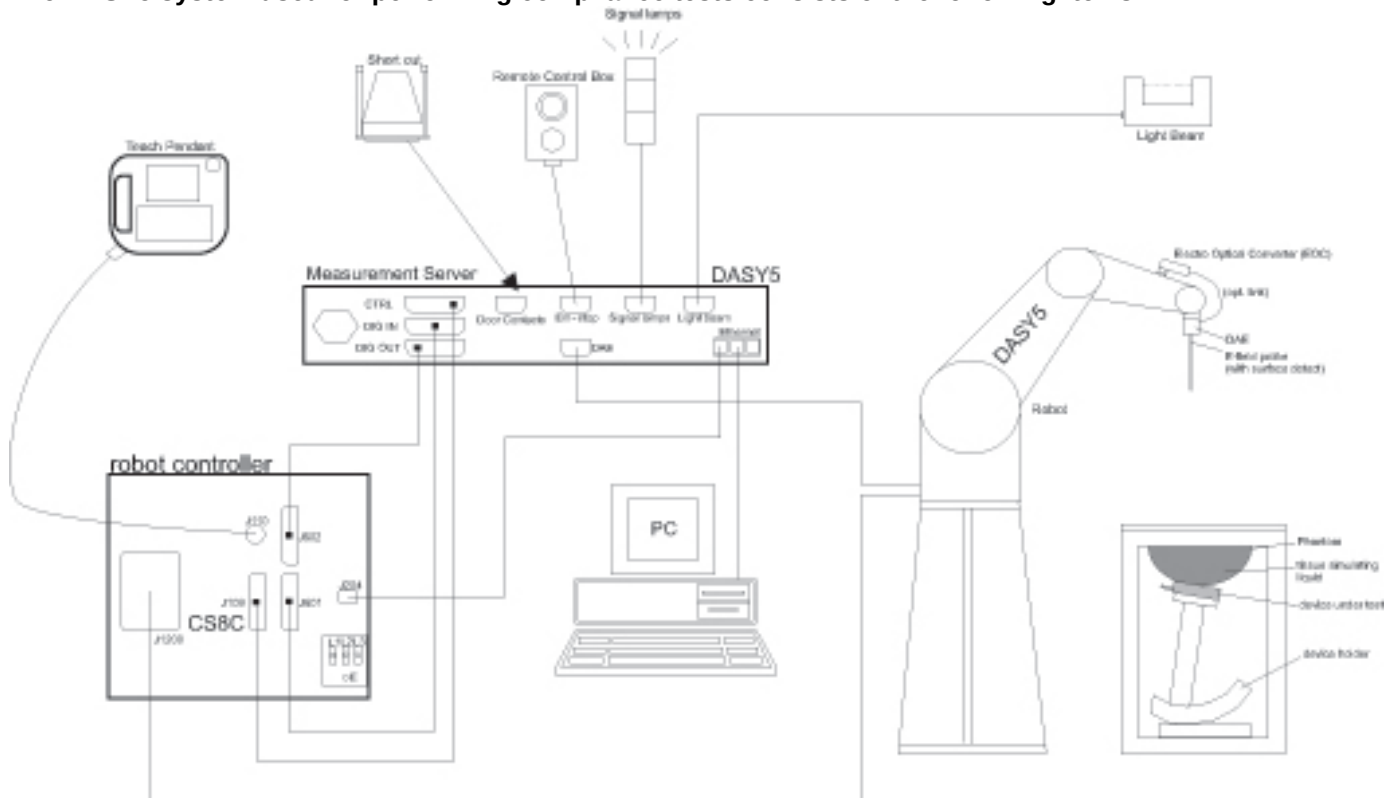
UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637.

The full scope of accreditation can be viewed at <http://www.iasonline.org/PDF/TL/TL-637.pdf>.

4. SAR Measurement System & Test Equipment

4.1. SAR Measurement System

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



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

4.2. SAR Scan Procedures

Step 1: Power Reference Measurement

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

Step 2: Area Scan

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

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

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
Maximum area scan spatial resolution: $\Delta x_{\text{Area}}, \Delta y_{\text{Area}}$	≤ 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 $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Step 3: Zoom Scan

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

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

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$			≤ 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: $\Delta z_{\text{Zoom}}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{\text{Zoom}}(1)$: between 1 st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{\text{Zoom}}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{\text{Zoom}}(n-1)$	
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 <i>reported</i> SAR from the area scan based <i>1-g SAR estimation</i> procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

Step 4: Power drift measurement

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

Step 5: Z-Scan (FCC only)

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

4.3. Test Equipment

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

Dielectric Property Measurements

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Network Analyzer	Agilent	E5071C	MY46522054	9-23-2015
Dielectronic Probe kit	SPEAG	DAK-3.5	1196	8-5-2015
Dielectronic Probe kit	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	LKM	DTM3000	3424	11-13-2015

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
MXG Analog Signal Generator	Agilent	N5181A	MY50145882	9-23-2015
Power Sensor	Agilent	U2000A	MY54260010	9-23-2015
Power Sensor	Agilent	U2000A	MY54260007	9-23-2015
Power Amplifier	EXODUS	1410025-AMP2027-10003	10003	11-7-2015
Directional Coupler	Agilent	772D	MY52180193	9-22-2015
Directional Coupler	Agilent	778D	MY52180432	9-22-2015
Low Pass Filter	MICROLAB	LA-15N	03943	11-4-2015
Low Pass Filter	FILTRON	L14012FL	1410003S	11-4-2015
Low Pass Filter	MICROLAB	LA-60N	03942	11-5-2015
Attenuator	Agilent	8491B/003	MY39269292	9-22-2015
Attenuator	Agilent	8491B/010	MY39269315	9-22-2015
Attenuator	Agilent	8491B/020	MY39269298	9-22-2015
E-Field Probe (SAR 1)	SPEAG	EX3DV4	7330	2-12-2016
E-Field Probe (SAR 2)	SPEAG	EX3DV4	7313	8-27-2015
E-Field Probe (SAR 3)	SPEAG	EX3DV4	7314	8-27-2015
E-Field Probe (SAR 3)	SPEAG	EX3DV4	7323	12-5-2015
Data Acquisition Electronics (SAR 1)	SPEAG	DAE4	1468	1-12-2016
Data Acquisition Electronics (SAR 2)	SPEAG	DAE4	1447	8-25-2015
Data Acquisition Electronics (SAR 3)	SPEAG	DAE4	1446	8-27-2015
System Validation Dipole	SPEAG	D835V2	4d174	8-13-2015
System Validation Dipole	SPEAG	D1900V2	5d190	8-12-2015
System Validation Dipole	SPEAG	D1900V2	5d199	2-6-2016
System Validation Dipole	SPEAG	D2450V2	939	8-11-2015
System Validation Dipole	SPEAG	D2600V2	1097	11-27-2015
System Validation Dipole	SPEAG	D5GHzV2	1184	8-22-2015
Thermometer (SAR 1)	Lutron	MHB-382SD	AH.53049	11-18-2015
Thermometer (SAR 2)	Lutron	MHB-382SD	AH.50215	11-18-2015
Thermometer (SAR 3)	Lutron	MHB-382SD	AH.50213	11-18-2015

Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Base Station Simulator	R & S	CMW500	150313	8-13-2015
Base Station Simulator	R & S	CMW500	150314	8-13-2015
Bluetooth Tester	TESCOM	TC-3000C	3000C000546	11-17-2015

5. Measurement Uncertainty

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

6. Device Under Test (DUT) Information

6.1. DUT Description

Device Dimension	Overall (Length x Width): 237.1 mm x 168.8 mm Overall Diagonal: 281.55 mm Display Diagonal: 246.3 mm
Back Cover	☒ The rechargeable battery is not user accessible.
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)
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)

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
GSM	850 1900	Voice (GMSK) GPRS (GMSK) EGPRS (8PSK)	GPRS Multi-Slot Class: ☐ Class 8 - 1 Up, 4 Down ☐ Class 10 - 2 Up, 4 Down ☐ Class 12 - 4 Up, 4 Down ☒ Class 33 - 4 Up, 5 Down	GSM Voice: 12.5% (E)GPRS: 1 Slot: 12.5% 2 Slots: 25% 3 Slots: 37.5% 4 Slots: 50%
			☒ Class B = GPRS connection interrupted during a GSM call, automatically resumed at end of call. Does this device support DTM (Dual Transfer Mode)? ☒ Yes ☐ No	
W-CDMA (UMTS)	Band II Band V	UMTS Rel. 99 (Voice & Data) HSDPA (Rel. 5) HSUPA (Rel. 6)		100%
LTE	TDD Band 41	QPSK 16QAM		63.3% (TDD)
		Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No		
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20)		100%
	5 GHz	802.11a 802.11n (HT20) 802.11n (HT40) 802.11ac (VHT20) 802.11ac (VHT40) 802.11ac (VHT80)		100%
	Does this device support bands 5.60 ~ 5.65 GHz? ☐ Yes ☒ No			
	Does this device support Band gap channel? ☐ Yes ☒ No			
Bluetooth	2.4 GHz	Version 4.1 LE		77.5% (DH5)

6.3. Nominal and Maximum Output Power

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

Upper limit (dB): -1.5 ~ 0.5		Max. RF Output Power (dBm)		Reduce RF Output Power (dBm)	
RF Air interface	Mode	Target	Max. tune-up tolerance limit	Target	Max. tune-up tolerance limit
GSM850	Voice	33.0	33.5	25.0	25.5
	GPRS 1 slot	33.0	33.5	25.0	25.5
	GPRS 2 slots	33.0	33.5	25.0	25.5
	GPRS 3 slots	29.0	29.5	25.0	25.5
	GPRS 4 slots	28.0	28.5	24.0	24.5
	EGPRS 1 slot	26.5	27.0	21.0	21.5
	EGPRS 2 slots	26.0	26.5	21.0	21.5
	EGPRS 3 slots	23.5	24.0	21.0	21.5
	EGPRS 4 slots	22.5	23.0	20.0	20.5
GSM1900	Voice	30.0	30.5	22.0	22.5
	GPRS 1 slot	30.0	30.5	22.0	22.5
	GPRS 2 slots	29.5	30.0	22.0	22.5
	GPRS 3 slots	26.5	27.0	22.0	22.5
	GPRS 4 slots	25.0	25.5	21.0	21.5
	EGPRS 1 slot	26.0	26.5	19.0	19.5
	EGPRS 2 slots	25.0	25.5	19.0	19.5
	EGPRS 3 slots	22.5	23.0	19.0	19.5
	EGPRS 4 slots	21.5	22.0	18.5	19.0
W-CDMA Band V	R99	23.5	24.0	15.5	16.0
	HSDPA	23.5	24.0	15.5	16.0
	HSUPA	23.5	24.0	15.5	16.0
W-CDMA Band II	R99	22.5	23.0	12.5	13.0
	HSDPA	22.5	23.0	12.5	13.0
	HSUPA	22.5	23.0	12.5	13.0
LTE Band 41	QPSK, 16QAM	23.0	23.5	17.0	17.5

Upper limit (dB): -1.5 ~ 0.5		Max. RF Output Power (dBm)		Reduce RF Output Power (dBm)		Reduce RF Output Power (dBm)	
RF Air interface	Mode	Main, Sub Ant		Main Ant		Sub Ant	
		Target	Max. tune-up tolerance limit	Target	Max. tune-up tolerance limit	Target	Max. tune-up tolerance limit
WiFi 2.4 GHz	802.11b	17.0	17.5	14.0	14.5	12.0	12.5
	802.11g	15.0	15.5	14.0	14.5	12.0	12.5
	802.11n HT20	14.0	14.5	14.0	14.5	12.0	12.5
WiFi 5 GHz	802.11a	14.0	14.5	8.0	8.5	9.0	9.5
	802.11n HT20	14.0	14.5	8.0	8.5	9.0	9.5
	802.11n HT40	14.0	14.5	8.0	8.5	9.0	9.5
	802.11ac VHT20	14.0	14.5	8.0	8.5	9.0	9.5
	802.11ac VHT40	14.0	14.5	8.0	8.5	9.0	9.5
	802.11ac VHT80	14.0	14.5	8.0	8.5	9.0	9.5
Bluetooth		9.5	10.0	N/A		N/A	
Bluetooth LE		6.5	7.0	N/A		N/A	

6.4. General LTE SAR Test and Reporting Considerations

Item	Description																																												
Frequency range, Channel Bandwidth, Numbers and Frequencies	Band 41	Frequency range: 2555 – 2655 MHz																																											
		Channel Bandwidth																																											
		20 MHz	15 MHz	10 MHz	5 MHz	3 MHz	1.4 MHz																																						
	Low	40340 /2565	40315/ 2562.5	40290/ 2560	40265/ 2557.5																																								
	Mid	40620/ 2593	40620/ 2593	40620/ 2593	40620/ 2593																																								
	High	41140/ 2645	41165/ 2647.5	41190/ 2650	41215/ 2652.5																																								
LTE transmitter and antenna implementation	LTE has one (1) TX/RX antennas and one (1) RX antennas Refer to Appendix A...																																												
Maximum power reduction (MPR)	Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3 <table border="1"> <thead> <tr> <th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (RB)</th><th rowspan="2">MPR (dB)</th></tr> <tr> <th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr> </thead> <tbody> <tr> <td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 1</td></tr> <tr> <td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr> <tr> <td>64 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 2</td></tr> </tbody> </table> MPR Built-in by design A-MPR (additional MPR) was disabled during SAR testing							Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1	16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1	64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)																																						
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz																																							
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1																																						
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1																																						
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2																																						
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.																																												

6.5. LTE (TDD) Considerations

According to KDB 941225 D05 SAR for LTE Devices v02r03, 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.

SAR was tested with the highest transmission duty factor (63.33%) using Uplink-downlink configuration 0 and Special subframe configuration 7.

LTE TDD Band 41 supports 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	$26336 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$	$7680 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$
5	$6592 \cdot T_s$			$20480 \cdot T_s$		
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 $\times (T_s) \times \#$ of S + $\#$ of U

Example for Calculated Duty Cycle for Uplink-Downlink Configuration 0:

Calculated Duty Cycle = $5120 \times [1/(15000 \times 2048)] \times 2 + 6 \text{ ms} = 63.33\%$

where

$T_s = 1/(15000 \times 2048)$ seconds

6.6. Power Reduction by Proximity Sensing

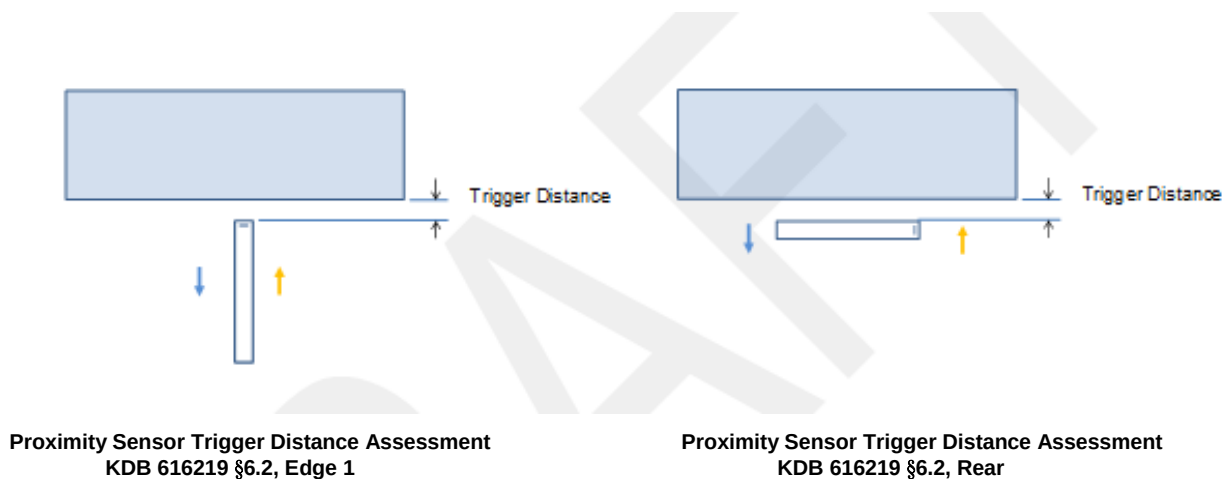
6.6.1. Proximity Sensor Triggering Distance (KDB 616217 §6.2)

Rear 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 measurement was then repeated for the surface of Edge 1.

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.



LEGEND

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

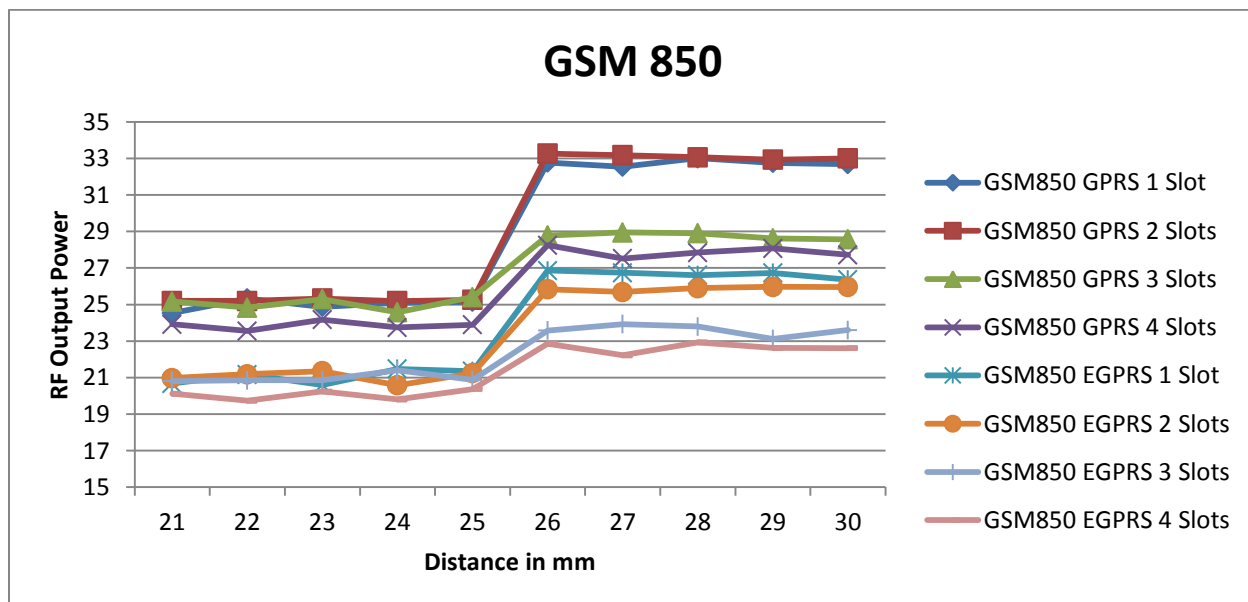
Summary of Trigger Distances

Tissue simulating liquid	Trigger distance - Edge 1		Trigger distance - Rear	
	Moving toward phantom	Moving from phantom	Moving toward phantom	Moving from phantom
850 muscle	25 mm	25 mm	25 mm	25 mm
1900 muscle	25 mm	25 mm	25 mm	25 mm
2600 muscle	25 mm	25 mm	25 mm	25 mm
2450 muscle	N/A	N/A	5mm	5mm
5000 muscle	N/A	N/A	5mm	5mm

Proximity Sensor Triggering Distance Measurement Results**GSM850**

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

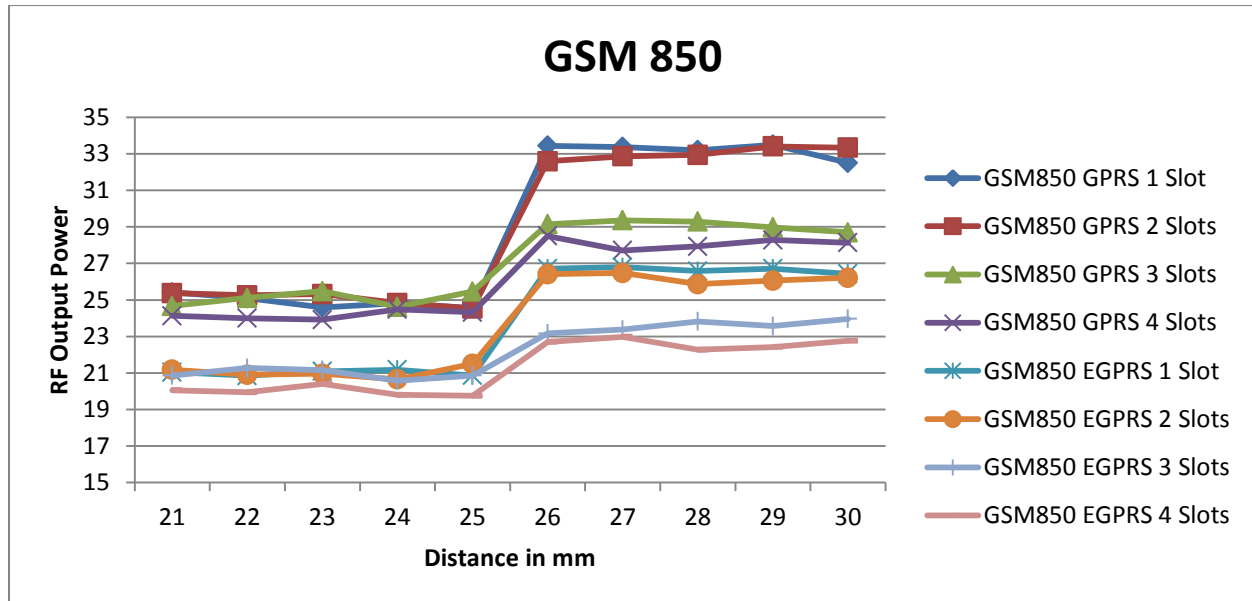
Distance to DUT vs. Output Power in dBm										
Distance (mm)	21	22	23	24	25	26	27	28	29	30
GSM850 GPRS 1 Slot	24.5	25.3	24.9	25.1	25.2	32.8	32.6	33.0	32.8	32.7
GSM850 GPRS 2 Slots	25.2	25.2	25.3	25.2	25.3	33.3	33.2	33.1	32.9	33.0
GSM850 GPRS 3 Slots	25.2	24.8	25.3	24.6	25.4	28.8	29.0	28.9	28.6	28.6
GSM850 GPRS 4 Slots	23.9	23.6	24.2	23.7	23.9	28.3	27.5	27.8	28.1	27.7
GSM850 EGPRS 1 Slot	20.7	21.2	20.6	21.5	21.4	26.9	26.7	26.6	26.7	26.4
GSM850 EGPRS 2 Slots	21.0	21.2	21.4	20.6	21.3	25.8	25.7	25.9	26.0	26.0
GSM850 EGPRS 3 Slots	20.8	20.9	20.9	21.4	20.9	23.6	23.9	23.8	23.1	23.6
GSM850 EGPRS 4 Slots	20.1	19.7	20.2	19.8	20.4	22.9	22.2	22.9	22.6	22.6



GSM850

Edge 1, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

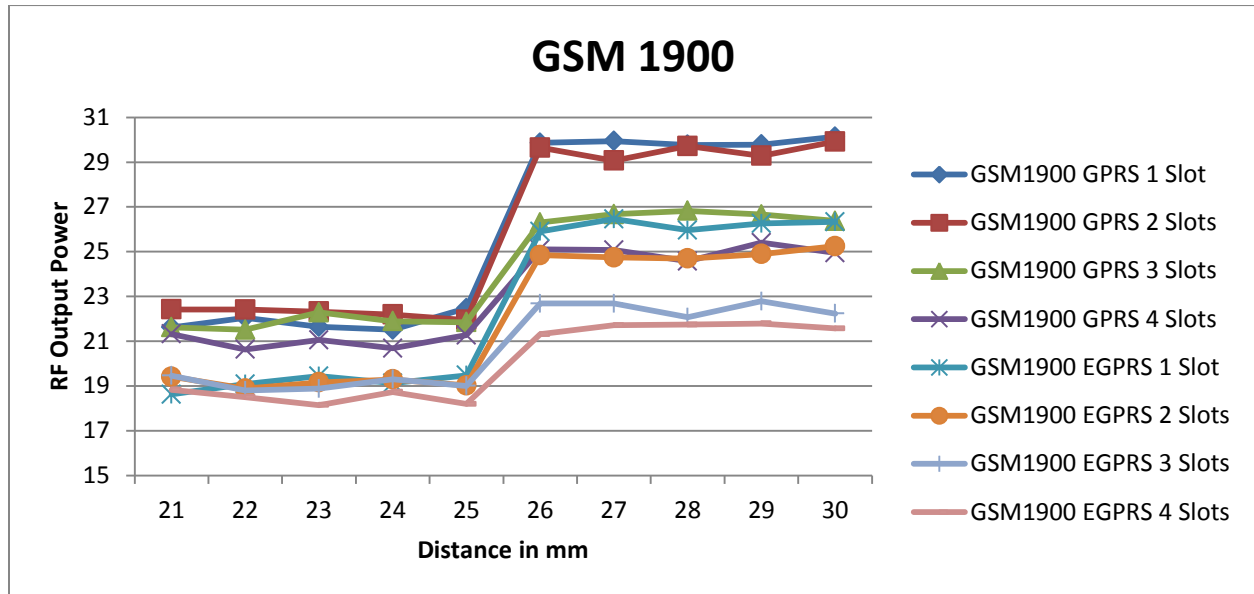
Distance to DUT vs. Output Power in dBm										
Distance (mm)	21	22	23	24	25	26	27	28	29	30
GSM850 GPRS 1 Slot	25.4	25.1	24.6	24.8	24.6	33.4	33.4	33.2	33.5	32.5
GSM850 GPRS 2 Slots	25.4	25.3	25.3	24.8	24.5	32.6	32.9	32.9	33.4	33.3
GSM850 GPRS 3 Slots	24.7	25.1	25.5	24.6	25.5	29.2	29.4	29.3	29.0	28.7
GSM850 GPRS 4 Slots	24.1	24.0	23.9	24.5	24.3	28.5	27.7	27.9	28.3	28.1
GSM850 EGPRS 1 Slot	21.1	20.9	21.1	21.2	20.9	26.7	26.8	26.6	26.7	26.4
GSM850 EGPRS 2 Slots	21.2	20.9	21.0	20.7	21.5	26.4	26.5	25.9	26.1	26.2
GSM850 EGPRS 3 Slots	20.9	21.3	21.2	20.6	20.9	23.2	23.4	23.8	23.6	24.0
GSM850 EGPRS 4 Slots	20.1	19.9	20.4	19.8	19.8	22.7	23.0	22.3	22.4	22.8



GSM1900

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

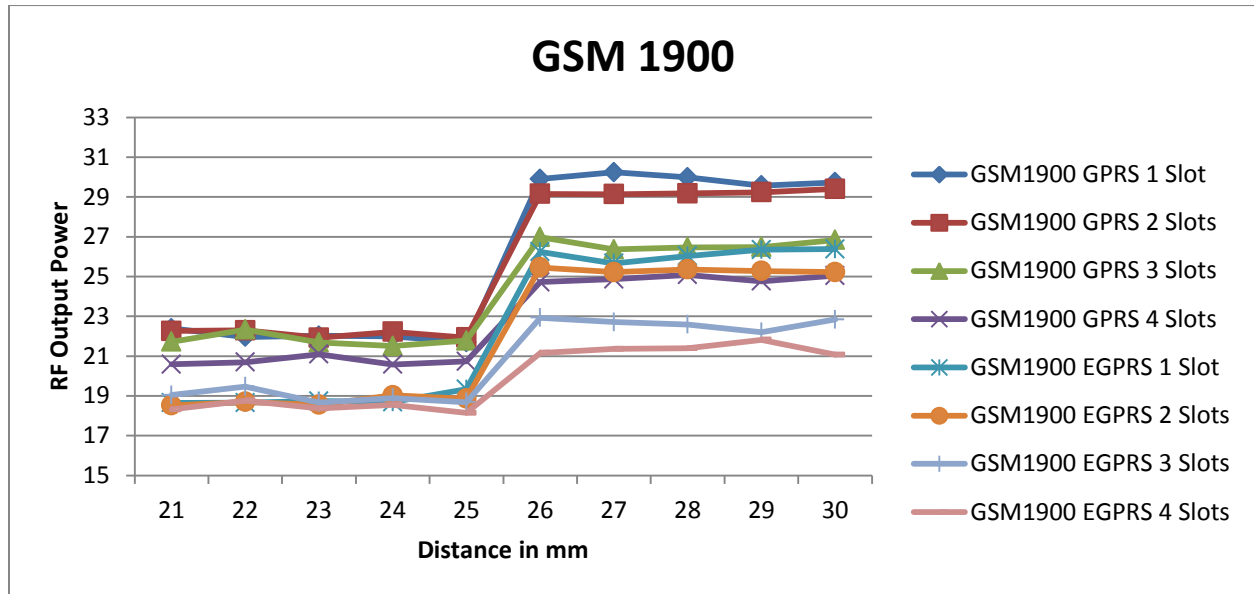
Distance to DUT vs. Output Power in dBm										
Distance (mm)	21	22	23	24	25	26	27	28	29	30
GSM1900 GPRS 1 Slot	21.6	22.1	21.6	21.5	22.5	29.9	29.9	29.8	29.8	30.1
GSM1900 GPRS 2 Slots	22.4	22.4	22.3	22.2	22.0	29.7	29.1	29.7	29.3	29.9
GSM1900 GPRS 3 Slots	21.6	21.5	22.3	21.9	21.9	26.3	26.7	26.8	26.7	26.4
GSM1900 GPRS 4 Slots	21.3	20.6	21.1	20.7	21.3	25.1	25.1	24.6	25.4	24.9
GSM1900 EGPRS 1 Slot	18.6	19.1	19.4	19.1	19.5	25.9	26.5	26.0	26.3	26.3
GSM1900 EGPRS 2 Slots	19.4	18.9	19.2	19.3	19.0	24.8	24.7	24.7	24.9	25.2
GSM1900 EGPRS 3 Slots	19.5	18.8	18.9	19.3	19.0	22.7	22.7	22.1	22.8	22.2
GSM1900 EGPRS 4 Slots	18.8	18.5	18.1	18.7	18.2	21.3	21.7	21.7	21.8	21.6



GSM1900

Edge 1, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

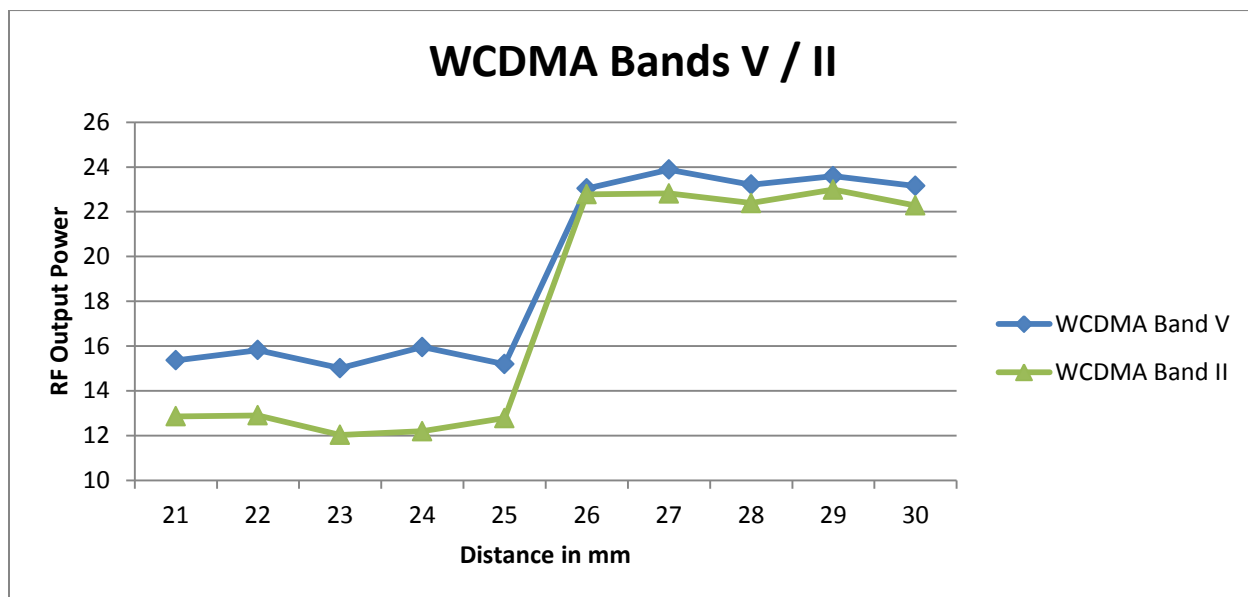
Distance to DUT vs. Output Power in dBm										
Distance (mm)	21	22	23	24	25	26	27	28	29	30
GSM1900 GPRS 1 Slot	22.4	22.0	22.0	22.0	21.7	29.9	30.2	30.0	29.6	29.7
GSM1900 GPRS 2 Slots	22.3	22.3	21.9	22.2	21.9	29.2	29.1	29.2	29.2	29.4
GSM1900 GPRS 3 Slots	21.7	22.3	21.7	21.5	21.8	27.0	26.4	26.5	26.5	26.8
GSM1900 GPRS 4 Slots	20.6	20.7	21.1	20.6	20.7	24.7	24.9	25.1	24.8	25.0
GSM1900 EGPRS 1 Slot	18.7	18.7	18.7	18.7	19.3	26.2	25.7	26.0	26.4	26.4
GSM1900 EGPRS 2 Slots	18.5	18.7	18.6	19.0	18.9	25.5	25.2	25.4	25.3	25.2
GSM1900 EGPRS 3 Slots	19.0	19.5	18.7	18.9	18.7	22.9	22.7	22.6	22.2	22.8
GSM1900 EGPRS 4 Slots	18.3	18.8	18.4	18.6	18.1	21.2	21.4	21.4	21.8	21.1



WCDMA Bands V & II

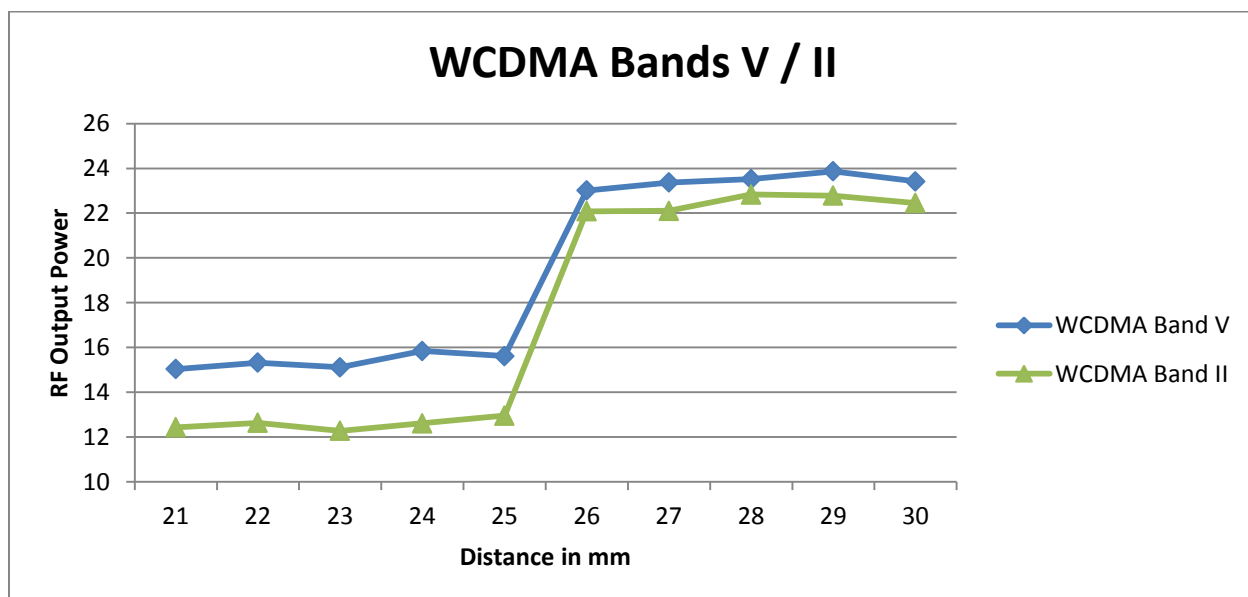
Rear, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm										
Distance (mm)	21	22	23	24	25	26	27	28	29	30
WCDMA Band V	15.4	15.8	15.0	16.0	15.2	23.0	23.9	23.2	23.6	23.2
WCDMA Band II	12.9	12.9	12.0	12.2	12.8	22.8	22.8	22.4	23.0	22.3

**WCDMA Bands V & II**

Edge 1, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

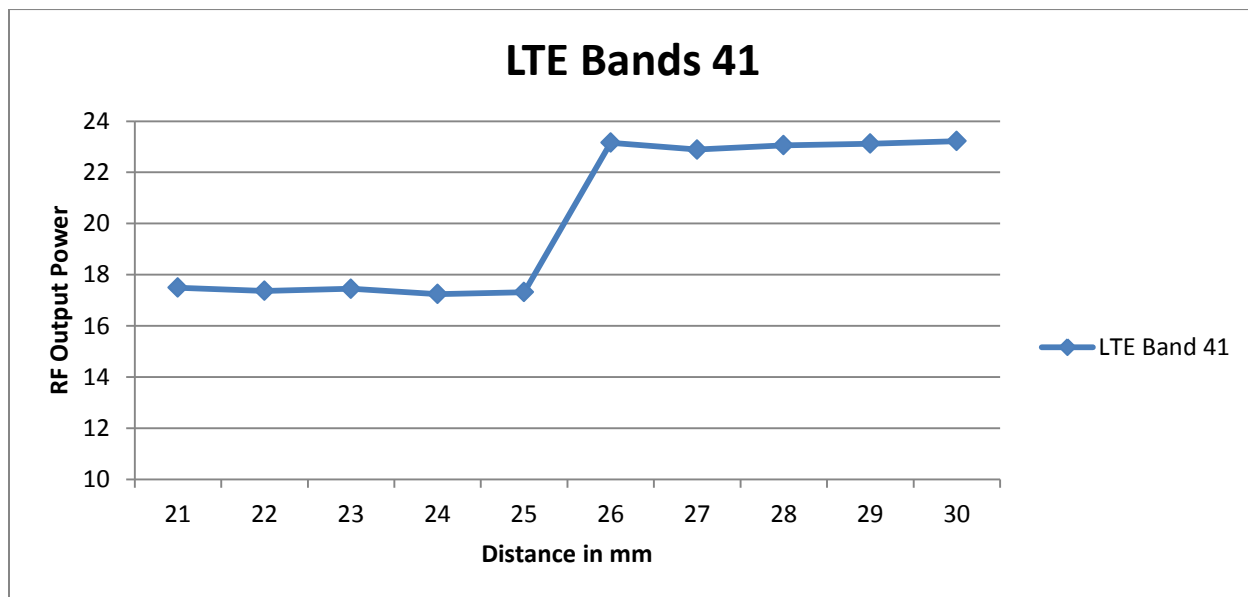
Distance to DUT vs. Output Power in dBm										
Distance (mm)	21	22	23	24	25	26	27	28	29	30
WCDMA Band V	15.0	15.3	15.1	15.8	15.6	23.0	23.4	23.5	23.9	23.4
WCDMA Band II	12.4	12.6	12.3	12.6	13.0	22.1	22.1	22.8	22.8	22.5



LTE Band 41

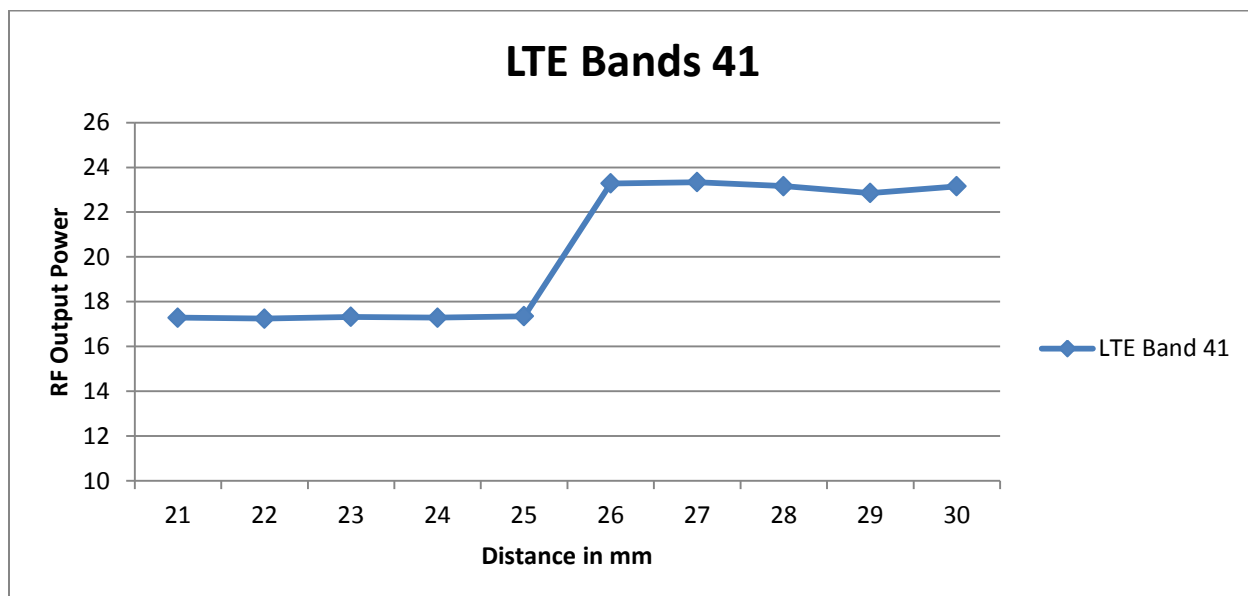
Rear, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm										
Distance (mm)	21	22	23	24	25	26	27	28	29	30
LTE Band 41	17.5	17.4	17.5	17.2	17.3	23.2	22.9	23.1	23.1	23.2

**LTE Band 41**

Edge 1, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

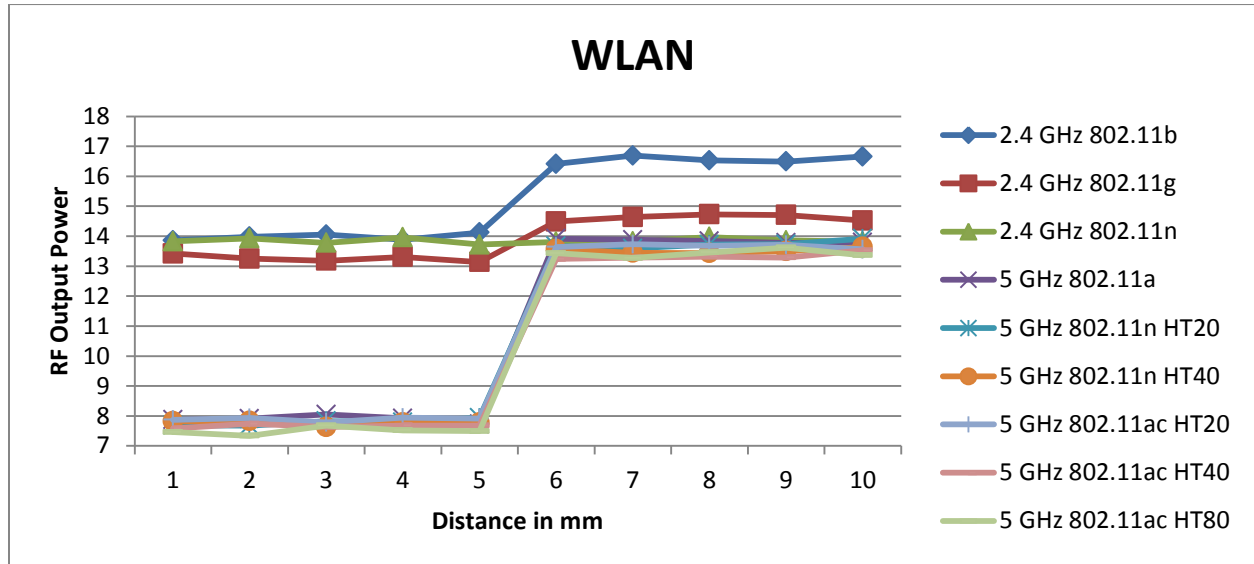
Distance to DUT vs. Output Power in dBm										
Distance (mm)	21	22	23	24	25	26	27	28	29	30
LTE Band 41	17.3	17.2	17.3	17.3	17.4	23.3	23.3	23.2	22.9	23.2



Wi-Fi 2.4GHz and 5GHz (Antenna 1)

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

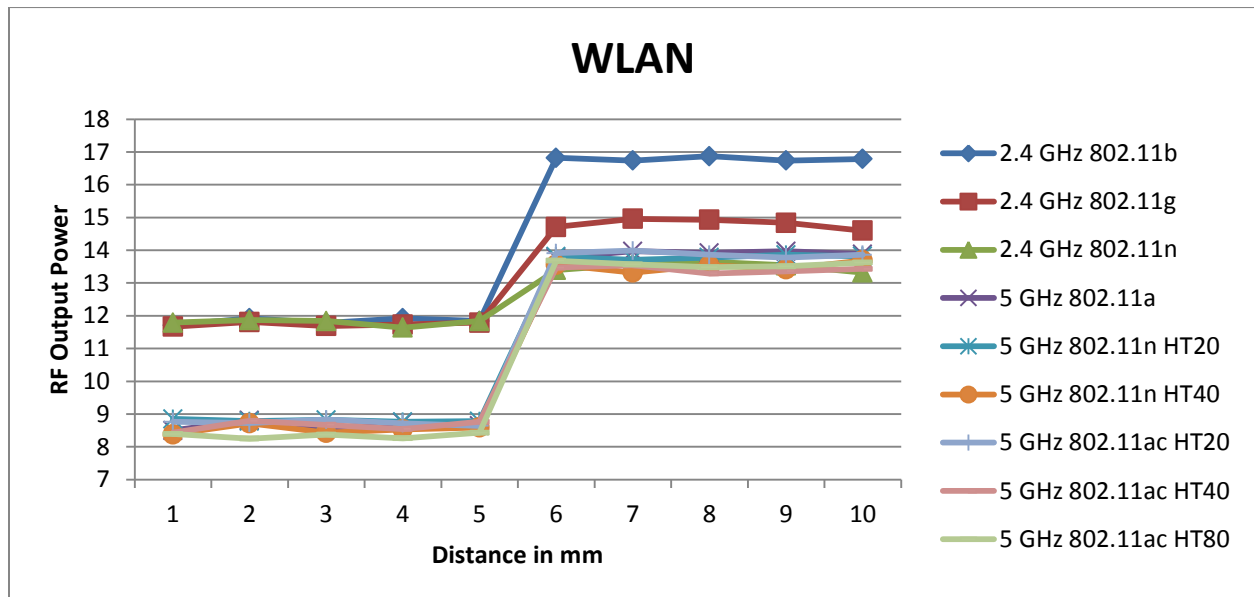
Distance to DUT vs. Output Power in dBm											
Antenna	Distance	1	2	3	4	5	6	7	8	9	10
Ant 1	2.4 GHz 802.11b	13.9	14.0	14.1	13.9	14.1	16.4	16.7	16.5	16.5	16.7
	2.4 GHz 802.11g	13.4	13.3	13.2	13.3	13.1	14.5	14.6	14.7	14.7	14.5
	2.4 GHz 802.11n	13.8	13.9	13.8	14.0	13.7	13.8	13.8	14.0	13.9	13.8
	5 GHz 802.11a	7.9	7.9	8.1	7.9	7.7	13.9	13.9	13.8	13.8	13.8
	5 GHz 802.11n HT20	7.7	7.7	7.8	7.8	7.9	13.7	13.6	13.7	13.7	13.9
	5 GHz 802.11n HT40	7.8	7.8	7.6	7.8	7.8	13.6	13.5	13.4	13.5	13.6
	5 GHz 802.11ac HT20	7.9	7.9	7.8	7.9	7.9	13.6	13.7	13.7	13.7	13.6
	5 GHz 802.11ac HT40	7.6	7.7	7.6	7.7	7.7	13.2	13.3	13.3	13.3	13.5
	5 GHz 802.11ac HT80	7.5	7.3	7.7	7.5	7.5	13.4	13.3	13.5	13.6	13.4



Wi-Fi 2.4GHz and 5GHz (Antenna 2)

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

Antenna	Distance (mm)	1	2	3	4	5	6	7	8	9	10
Ant 1	2.4 GHz 802.11b	11.7	11.9	11.8	11.9	11.8	16.8	16.7	16.9	16.7	16.8
	2.4 GHz 802.11g	11.7	11.8	11.7	11.7	11.8	14.7	15.0	14.9	14.8	14.6
	2.4 GHz 802.11n	11.8	11.9	11.8	11.6	11.8	13.4	13.6	13.7	13.5	13.3
	5 GHz 802.11a	8.5	8.8	8.6	8.7	8.6	13.8	14.0	13.9	14.0	13.9
	5 GHz 802.11n HT20	8.9	8.8	8.8	8.8	8.8	13.8	13.7	13.8	13.9	13.8
	5 GHz 802.11n HT40	8.4	8.7	8.4	8.5	8.6	13.6	13.3	13.5	13.4	13.7
	5 GHz 802.11ac HT20	8.8	8.7	8.8	8.7	8.6	13.9	14.0	13.9	13.8	13.9
	5 GHz 802.11ac HT40	8.4	8.8	8.7	8.5	8.8	13.5	13.5	13.3	13.4	13.4
	5 GHz 802.11ac HT80	8.4	8.3	8.4	8.3	8.4	13.7	13.6	13.5	13.5	13.6



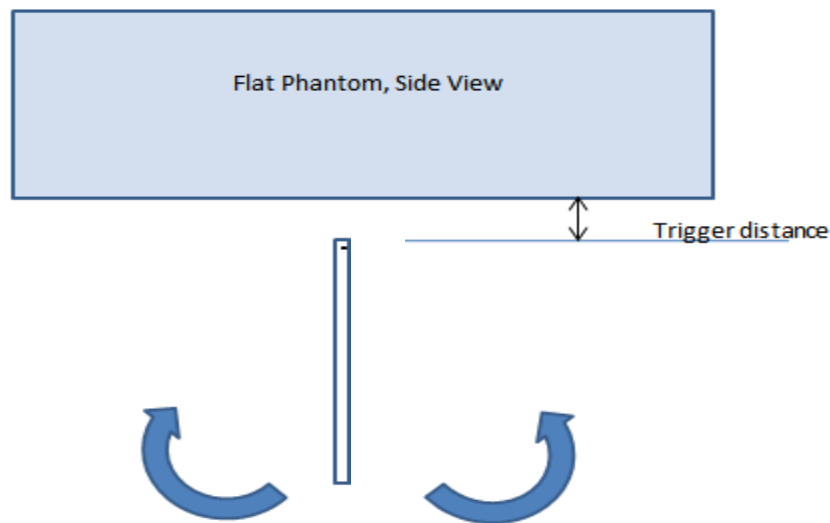
6.6.2. Proximity Sensor Coverage (KDB 616217 §6.3)

As there is no spatial offset between the antenna and the proximity sensor element, proximity sensor coverage did not need to be assessed.

6.6.3. Proximity Sensor Tilt Angle Assessment (KDB 616217 §6.4)

The DUT was positioned directly below the flat phantom at the minimum measured trigger distance with Edge 1 parallel to the base of the flat phantom for each band.

The EUT was rotated about Edge 1 for angles up to $\pm 45^\circ$. If the output power increased during the rotation the DUT was moved 1mm toward the phantom and the rotation repeated. This procedure was repeated until the power remained reduced for all angles up to $\pm 45^\circ$.



Proximity sensor tilt angle assessment (Edge 1) KDB 616217 §6.4

Summary of Tablet Tilt Angle Influence to Proximity Sensor Triggering

Band (MHz)	Minimum trigger distance measured according to KDB 616217 §6.2	Minimum distance at which power reduction was maintained over $\pm 45^\circ$	Power reduction status										
			-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°
850	25 mm	25 mm	On	On	On	On	On	On	On	On	On	On	On
1900	25 mm	25 mm	On	On	On	On	On	On	On	On	On	On	On
2600	25 mm	25 mm	On	On	On	On	On	On	On	On	On	On	On

6.6.4. Resulting test positions for SAR measurements

Wireless technologies	Position	§6.2 Triggering Distance	§6.3 Coverage	§6.4 Tilt Angle	Worst case distance for SAR
WWAN	Rear	25 mm	N/A	N/A	24 mm
	Edge 1	25 mm	N/A	25 mm	24 mm
WLAN	Rear	5 mm	N/A	N/A	4 mm

7. RF Exposure Conditions (Test Configurations)

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

7.1. Standalone SAR Test Exclusion Considerations

Since the *Dedicated Host Approach* is applied, the standalone SAR test exclusion procedure in KDB 447498 § 4.3.1 is applied in conjunction with KDB 616217 § 4.3 to determine the minimum test separation distance:

- When the separation distance from the antenna to an adjacent edge is ≤ 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.
- When the separation distance from the antenna to an adjacent edge is > 5 mm, the actual antenna-to-edge separation distance is applied to determine SAR test exclusion.

SAR Test Exclusion Calculations for WWAN

Antennas < 50mm to adjacent edges

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off																
Cellular	GPRS 2 Slots	848.8	33.50	560	0	0	43	233	43		103.2 -MEASURE-	103.2 -MEASURE-	12 -MEASURE-	> 50 mm	12 -MEASURE-	
Cellular	GPRS 2 Slots	1909.8	30.00	250	0	0	43	233	43		69.1 -MEASURE-	69.1 -MEASURE-	8 -MEASURE-	> 50 mm	8 -MEASURE-	
Cellular	W-CDMA 2	1907.6	23.00	200	0	0	43	233	43		55.2 -MEASURE-	55.2 -MEASURE-	6.4 -MEASURE-	> 50 mm	6.4 -MEASURE-	
Cellular	W-CDMA 5	846.6	24.00	251	0	0	43	233	43		46.2 -MEASURE-	46.2 -MEASURE-	5.4 -MEASURE-	> 50 mm	5.4 -MEASURE-	
Cellular	LTE Band 41	2680	23.50	224	0	0	43	233	43		73.3 -MEASURE-	73.3 -MEASURE-	8.5 -MEASURE-	> 50 mm	8.5 -MEASURE-	
Power Back-off, Proximity Sensor On																
Cellular	GPRS 4 Slots	848.8	24.50	141	0	0					26 -MEASURE-	26 -MEASURE-				
Cellular	GPRS 4 Slots	1909.8	21.50	71	0	0					19.6 -MEASURE-	19.6 -MEASURE-				
Cellular	W-CDMA 2	1907.6	13.00	20	0	0					5.5 -MEASURE-	5.5 -MEASURE-				
Cellular	W-CDMA 5	846.6	16.00	40	0	0					7.4 -MEASURE-	7.4 -MEASURE-				
Cellular	LTE Band 41	2680	17.50	56	0	0					18.3 -MEASURE-	18.3 -MEASURE-				

Note(s):

1. According to KDB 447498, if the calculated threshold value is >3 then SAR testing is required.

Antennas > 50mm to adjacent edges

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off																
Cellular	GPRS 2 Slots	848.8	33.50	560	0	0	43	233	43		< 50 mm	< 50 mm	< 50 mm	1198.3 mW -EXEMPT-	< 50 mm	
Cellular	GPRS 2 Slots	1909.8	30.00	250	0	0	43	233	43		< 50 mm	< 50 mm	< 50 mm	1938.5 mW -EXEMPT-	< 50 mm	
Cellular	W-CDMA 2	1907.6	23.00	200	0	0	43	233	43		< 50 mm	< 50 mm	< 50 mm	1938.6 mW -EXEMPT-	< 50 mm	
Cellular	W-CDMA 5	846.6	24.00	251	0	0	43	233	43		< 50 mm	< 50 mm	< 50 mm	1195.9 mW -EXEMPT-	< 50 mm	
Cellular	LTE Band 41	2680	23.50	224	0	0	43	233	43		< 50 mm	< 50 mm	< 50 mm	1921.6 mW -EXEMPT-	< 50 mm	
Power Back-off, Proximity Sensor On																
Cellular	GPRS 4 Slots	848.8	24.50	141	0	0					< 50 mm	< 50 mm				
Cellular	GPRS 4 Slots	1909.8	21.50	71	0	0					< 50 mm	< 50 mm				
Cellular	W-CDMA 2	1907.6	13.00	20	0	0					< 50 mm	< 50 mm				
Cellular	W-CDMA 5	846.6	16.00	40	0	0					< 50 mm	< 50 mm				
Cellular	LTE Band 41	2680	17.50	56	0	0					< 50 mm	< 50 mm				

Note(s):

1. According to KDB 447498, if the calculated Power threshold is less than the output power then SAR testing is required.

SAR Test Exclusion Calculations for WLAN

Antennas < 50mm to adjacent edges

SISO (Antenna 1)

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off															
Wi-Fi 2.4 GHz	2462	17.50	56	0.9	180	5.1	28	160.3		17.6 -MEASURE-	> 50 mm	17.6 -MEASURE-	3.1 -MEASURE-	> 50 mm	
Wi-Fi 5.2 GHz	5240	14.50	28	0.9	180	5.1	28	160.3		12.8 -MEASURE-	> 50 mm	12.8 -MEASURE-	2.3 -EXEMPT-	> 50 mm	
Wi-Fi 5.3 GHz	5320	14.50	28	0.9	180	5.1	28	160.3		12.9 -MEASURE-	> 50 mm	12.9 -MEASURE-	2.3 -EXEMPT-	> 50 mm	
Wi-Fi 5.5 GHz	5700	14.50	28	0.9	180	5.1	28	160.3		13.4 -MEASURE-	> 50 mm	13.4 -MEASURE-	2.4 -EXEMPT-	> 50 mm	
Wi-Fi 5.8 GHz	5825	14.50	28	0.9	180	5.1	28	160.3		13.5 -MEASURE-	> 50 mm	13.5 -MEASURE-	2.4 -EXEMPT-	> 50 mm	
Bluetooth	2480	10.00	10	0.9	180	5.1	28	160.3		3.1 -MEASURE-	> 50 mm	3.1 -MEASURE-	0.6 -EXEMPT-	> 50 mm	
Power Back-off, Proximity Sensor On															
Wi-Fi 2.4 GHz	2462	14.50	28	0.9						8.8 -MEASURE-					
Wi-Fi 5.2 GHz	5240	8.50	7	0.9						3.2 -MEASURE-					
Wi-Fi 5.3 GHz	5320	8.50	7	0.9						3.2 -MEASURE-					
Wi-Fi 5.5 GHz	5700	8.50	7	0.9						3.3 -MEASURE-					
Wi-Fi 5.8 GHz	5825	8.50	7	0.9						3.4 -MEASURE-					

SISO (Antenna 2)

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off															
Wi-Fi 2.4 GHz	2462	17.50	56	0.8	221	65.8	4.29	81		17.6 -MEASURE- 12.8	> 50 mm	> 50 mm	17.6 -MEASURE- 12.8	> 50 mm	
Wi-Fi 5.2 GHz	5240	14.50	28	0.8	221	65.8	4.29	81		12.8 -MEASURE- 12.9	> 50 mm	> 50 mm	12.8 -MEASURE- 12.9	> 50 mm	
Wi-Fi 5.3 GHz	5320	14.50	28	0.8	221	65.8	4.29	81		12.9 -MEASURE- 13.4	> 50 mm	> 50 mm	12.9 -MEASURE- 13.4	> 50 mm	
Wi-Fi 5.5 GHz	5700	14.50	28	0.8	221	65.8	4.29	81		13.4 -MEASURE- 13.5	> 50 mm	> 50 mm	13.4 -MEASURE- 13.5	> 50 mm	
Wi-Fi 5.8 GHz	5825	14.50	28	0.8	221	65.8	4.29	81		13.5 -MEASURE-	> 50 mm	> 50 mm	13.5 -MEASURE-	> 50 mm	
Power Back-off, Proximity Sensor On															
Wi-Fi 2.4 GHz	2462	12.50	18	0.8						5.6 -MEASURE- 4.1					
Wi-Fi 5.2 GHz	5240	9.50	9	0.8						4.1 -MEASURE- 4.2					
Wi-Fi 5.3 GHz	5320	9.50	9	0.8						4.2 -MEASURE- 4.3					
Wi-Fi 5.5 GHz	5700	9.50	9	0.8						4.3 -MEASURE- 4.3					
Wi-Fi 5.8 GHz	5825	9.50	9	0.8						4.3 -MEASURE-					

MIMO (Antenna 1)

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off															
Wi-Fi 2.4 GHz	2462	14.50	28	0.9	180	5.1	28	160.3		8.8 -MEASURE- 12.8	> 50 mm	8.8 -MEASURE- 12.8	1.6 -EXEMPT- 2.3	> 50 mm	
Wi-Fi 5.2 GHz	5240	14.50	28	0.9	180	5.1	28	160.3		12.8 -MEASURE- 12.9	> 50 mm	12.8 -MEASURE- 12.9	2.3 -EXEMPT- 2.3	> 50 mm	
Wi-Fi 5.3 GHz	5320	14.50	28	0.9	180	5.1	28	160.3		12.9 -MEASURE- 13.4	> 50 mm	12.9 -MEASURE- 13.4	2.3 -EXEMPT- 2.4	> 50 mm	
Wi-Fi 5.5 GHz	5700	14.50	28	0.9	180	5.1	28	160.3		13.4 -MEASURE- 13.5	> 50 mm	13.4 -MEASURE- 13.5	2.4 -EXEMPT- 2.4	> 50 mm	
Wi-Fi 5.8 GHz	5825	14.50	28	0.9	180	5.1	28	160.3		13.5 -MEASURE-	> 50 mm	13.5 -MEASURE-	2.4 -EXEMPT-	> 50 mm	
Power Back-off, Proximity Sensor On															
Wi-Fi 2.4 GHz	2462	14.50	28	0.9						8.8 -MEASURE-					
Wi-Fi 5.2 GHz	5240	8.50	7	0.9						3.2 -MEASURE-					
Wi-Fi 5.3 GHz	5320	8.50	7	0.9						3.2 -MEASURE-					
Wi-Fi 5.5 GHz	5700	8.50	7	0.9						3.3 -MEASURE-					
Wi-Fi 5.8 GHz	5825	8.50	7	0.9						3.4 -MEASURE-					

MIMO (Antenna 2)

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off															
Wi-Fi 2.4 GHz	2462	14.50	28	0.8	221	65.8	4.29	81		8.8 -MEASURE- 12.8	> 50 mm	> 50 mm	8.8 -MEASURE- 12.8	> 50 mm	
Wi-Fi 5.2 GHz	5240	14.50	28	0.8	221	65.8	4.29	81		-MEASURE- 12.9	> 50 mm	> 50 mm	-MEASURE- 12.9	> 50 mm	
Wi-Fi 5.3 GHz	5320	14.50	28	0.8	221	65.8	4.29	81		-MEASURE- 13.4	> 50 mm	> 50 mm	-MEASURE- 13.4	> 50 mm	
Wi-Fi 5.5 GHz	5700	14.50	28	0.8	221	65.8	4.29	81		-MEASURE- 13.5	> 50 mm	> 50 mm	-MEASURE- 13.5	> 50 mm	
Wi-Fi 5.8 GHz	5825	14.50	28	0.8	221	65.8	4.29	81		-MEASURE-	> 50 mm	> 50 mm	-MEASURE-	> 50 mm	
Power Back-off, Proximity Sensor On															
Wi-Fi 2.4 GHz	2462	12.50	18	0.8						5.6 -MEASURE- 4.1					
Wi-Fi 5.2 GHz	5240	9.50	9	0.8						-MEASURE- 4.2					
Wi-Fi 5.3 GHz	5320	9.50	9	0.8						-MEASURE- 4.3					
Wi-Fi 5.5 GHz	5700	9.50	9	0.8						-MEASURE- 4.3					
Wi-Fi 5.8 GHz	5825	9.50	9	0.8						-MEASURE-					

Note(s):

1. According to KDB 447498, if the calculated threshold value is >3 then SAR testing is required.

Antennas > 50mm to adjacent edges

SISO (Antenna 1)

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off															
Wi-Fi 2.4 GHz	2462	17.50	56	0.9	180	5.1	28	160.3		< 50 mm	1395.6 mW -EXEMPT-	< 50 mm	< 50 mm	1198.6 mW -EXEMPT-	
Wi-Fi 5.2 GHz	5240	14.50	28	0.9	180	5.1	28	160.3		< 50 mm	1365.5 mW -EXEMPT-	< 50 mm	< 50 mm	1168.5 mW -EXEMPT-	
Wi-Fi 5.3 GHz	5320	14.50	28	0.9	180	5.1	28	160.3		< 50 mm	1365 mW -EXEMPT-	< 50 mm	< 50 mm	1168 mW -EXEMPT-	
Wi-Fi 5.5 GHz	5700	14.50	28	0.9	180	5.1	28	160.3		< 50 mm	1362.8 mW -EXEMPT-	< 50 mm	< 50 mm	1165.8 mW -EXEMPT-	
Wi-Fi 5.8 GHz	5825	14.50	28	0.9	180	5.1	28	160.3		< 50 mm	1362.2 mW -EXEMPT-	< 50 mm	< 50 mm	1165.2 mW -EXEMPT-	
Bluetooth	2480	10.00	10	0.9	180	5.1	28	160.3		< 50 mm	1395.3 mW -EXEMPT-	< 50 mm	< 50 mm	1198.3 mW -EXEMPT-	
Power Back-off, Proximity Sensor On															
Wi-Fi 2.4 GHz	2462	14.50	28	0.9						< 50 mm					
Wi-Fi 5.2 GHz	5240	8.50	7	0.9						< 50 mm					
Wi-Fi 5.3 GHz	5320	8.50	7	0.9						< 50 mm					
Wi-Fi 5.5 GHz	5700	8.50	7	0.9						< 50 mm					
Wi-Fi 5.8 GHz	5825	8.50	7	0.9						< 50 mm					

SISO (Antenna 2)

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off															
Wi-Fi 2.4 GHz	2462	17.50	56	0.8	221	65.8	4.29	81		< 50 mm	1805.6 mW -EXEMPT-	253.6 mW -EXEMPT-	< 50 mm	405.6 mW -EXEMPT-	
Wi-Fi 5.2 GHz	5240	14.50	28	0.8	221	65.8	4.29	81		< 50 mm	1775.5 mW -EXEMPT-	223.5 mW -EXEMPT-	< 50 mm	375.5 mW -EXEMPT-	
Wi-Fi 5.3 GHz	5320	14.50	28	0.8	221	65.8	4.29	81		< 50 mm	1775 mW -EXEMPT-	223 mW -EXEMPT-	< 50 mm	375 mW -EXEMPT-	
Wi-Fi 5.5 GHz	5700	14.50	28	0.8	221	65.8	4.29	81		< 50 mm	1772.8 mW -EXEMPT-	220.8 mW -EXEMPT-	< 50 mm	372.8 mW -EXEMPT-	
Wi-Fi 5.8 GHz	5825	14.50	28	0.8	221	65.8	4.29	81		< 50 mm	1772.2 mW -EXEMPT-	220.2 mW -EXEMPT-	< 50 mm	372.2 mW -EXEMPT-	
Power Back-off, Proximity Sensor On															
Wi-Fi 2.4 GHz	2462	12.50	18	0.8						< 50 mm					
Wi-Fi 5.2 GHz	5240	9.50	9	0.8						< 50 mm					
Wi-Fi 5.3 GHz	5320	9.50	9	0.8						< 50 mm					
Wi-Fi 5.5 GHz	5700	9.50	9	0.8						< 50 mm					
Wi-Fi 5.8 GHz	5825	9.50	9	0.8						< 50 mm					

MIMO (Antenna 1)

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off															
Wi-Fi 2.4 GHz	2462	14.50	28	0.9	180	5.1	28	160.3		< 50 mm	1395.6 mW -EXEMPT-	< 50 mm	< 50 mm	1198.6 mW -EXEMPT-	
Wi-Fi 5.2 GHz	5240	14.50	28	0.9	180	5.1	28	160.3		< 50 mm	1365.5 mW -EXEMPT-	< 50 mm	< 50 mm	1168.5 mW -EXEMPT-	
Wi-Fi 5.3 GHz	5320	14.50	28	0.9	180	5.1	28	160.3		< 50 mm	1365 mW -EXEMPT-	< 50 mm	< 50 mm	1168 mW -EXEMPT-	
Wi-Fi 5.5 GHz	5700	14.50	28	0.9	180	5.1	28	160.3		< 50 mm	1362.8 mW -EXEMPT-	< 50 mm	< 50 mm	1165.8 mW -EXEMPT-	
Wi-Fi 5.8 GHz	5825	14.50	28	0.9	180	5.1	28	160.3		< 50 mm	1362.2 mW -EXEMPT-	< 50 mm	< 50 mm	1165.2 mW -EXEMPT-	
Power Back-off, Proximity Sensor On															
Wi-Fi 2.4 GHz	2462	14.50	28	0.9						< 50 mm					
Wi-Fi 5.2 GHz	5240	8.50	7	0.9						< 50 mm					
Wi-Fi 5.3 GHz	5320	8.50	7	0.9						< 50 mm					
Wi-Fi 5.5 GHz	5700	8.50	7	0.9						< 50 mm					
Wi-Fi 5.8 GHz	5825	8.50	7	0.9						< 50 mm					

MIMO (Antenna 2)

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off															
Wi-Fi 2.4 GHz	2462	14.50	28	0.8	221	65.8	4.29	81		< 50 mm	1805.6 mW -EXEMPT-	253.6 mW -EXEMPT-	< 50 mm	405.6 mW -EXEMPT-	
Wi-Fi 5.2 GHz	5240	14.50	28	0.8	221	65.8	4.29	81		< 50 mm	1775.5 mW -EXEMPT-	223.5 mW -EXEMPT-	< 50 mm	375.5 mW -EXEMPT-	
Wi-Fi 5.3 GHz	5320	14.50	28	0.8	221	65.8	4.29	81		< 50 mm	1775 mW -EXEMPT-	223 mW -EXEMPT-	< 50 mm	375 mW -EXEMPT-	
Wi-Fi 5.5 GHz	5700	14.50	28	0.8	221	65.8	4.29	81		< 50 mm	1772.8 mW -EXEMPT-	220.8 mW -EXEMPT-	< 50 mm	372.8 mW -EXEMPT-	
Wi-Fi 5.8 GHz	5825	14.50	28	0.8	221	65.8	4.29	81		< 50 mm	1772.2 mW -EXEMPT-	220.2 mW -EXEMPT-	< 50 mm	372.2 mW -EXEMPT-	
Power Back-off, Proximity Sensor On															
Wi-Fi 2.4 GHz	2462	12.50	18	0.8						< 50 mm					
Wi-Fi 5.2 GHz	5240	9.50	9	0.8						< 50 mm					
Wi-Fi 5.3 GHz	5320	9.50	9	0.8						< 50 mm					
Wi-Fi 5.5 GHz	5700	9.50	9	0.8						< 50 mm					
Wi-Fi 5.8 GHz	5825	9.50	9	0.8						< 50 mm					

Note(s):

1. According to KDB 447498, if the calculated Power threshold is less than the output power then SAR testing is required.

7.2. Required Test Configurations

The table below identifies the standalone test configurations required for this device according to the findings in Section 7.1:

Test Configurations	Pwr Back-off	Rear	Edge 1	Edge 2	Edge 3	Edge 4
			(Top Edge)	(Right Edge)	(Bottom Edge)	(Left Edge)
GSM850	OFF	Yes	Yes	Yes	No	Yes
	ON	Yes	Yes	No	No	No
GSM1900	OFF	Yes	Yes	Yes	No	Yes
	ON	Yes	Yes	No	No	No
W-CDMA Band 2	OFF	Yes	Yes	Yes	No	Yes
	ON	Yes	Yes	No	No	No
W-CDMA Band 5	OFF	Yes	Yes	Yes	No	Yes
	ON	Yes	Yes	No	No	No
LTE Band 41	OFF	Yes	Yes	Yes	No	Yes
	ON	Yes	Yes	No	No	No
Wi-Fi 2.4 GHz SISO (Antenna 1)	OFF	Yes	No	Yes	Yes	No
	ON	Yes	No	No	No	No
Wi-Fi 2.4 GHz SISO (Antenna 2)	OFF	Yes	No	No	Yes	No
	ON	Yes	No	No	No	No
Wi-Fi 2.4 GHz MIMO	OFF	Yes	No	Yes	Yes	No
	ON	Yes	No	No	No	No
Wi-Fi 5 GHz SISO (Antenna 1)	OFF	Yes	No	Yes	No	No
	ON	Yes	No	No	No	No
Wi-Fi 5 GHz SISO (Antenna 2)	OFF	Yes	No	No	Yes	No
	ON	Yes	No	No	No	No
Wi-Fi 5 GHz MIMO	OFF	Yes	No	Yes	Yes	No
	ON	Yes	No	No	No	No
Bluetooth	OFF	Yes	No	Yes	No	No

Note(s):

1. Yes = Testing is required.
2. No = Testing is not required.

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 $\pm 2^\circ\text{C}$ of the temperature when the tissue parameters are characterized.

The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

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

IEEE Std 1528-2013

Refer to Table 3 within the IEEE Std 1528-2013

Dielectric Property Measurements Results:**SAR 1 Room**

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
4-15-2015	Body 2450	e'	50.7500	Relative Permittivity (ϵ_r):	50.75	52.70	-3.70	5
		e''	14.5300	Conductivity (σ):	1.98	1.95	1.51	5
	Body 2410	e'	50.8900	Relative Permittivity (ϵ_r):	50.89	52.76	-3.54	5
		e''	14.3800	Conductivity (σ):	1.93	1.91	1.02	5
	Body 2475	e'	50.6600	Relative Permittivity (ϵ_r):	50.66	52.67	-3.81	5
		e''	14.6400	Conductivity (σ):	2.01	1.99	1.49	5
5-19-2015	Body 5180	e'	47.3500	Relative Permittivity (ϵ_r):	47.35	49.05	-3.46	5
		e''	18.2000	Conductivity (σ):	5.24	5.27	-0.56	5
	Body 5200	e'	47.3200	Relative Permittivity (ϵ_r):	47.32	49.02	-3.47	5
		e''	18.2300	Conductivity (σ):	5.27	5.29	-0.45	5
	Body 5600	e'	46.6800	Relative Permittivity (ϵ_r):	46.68	48.48	-3.71	5
		e''	18.6000	Conductivity (σ):	5.79	5.76	0.53	5
	Body 5800	e'	46.3600	Relative Permittivity (ϵ_r):	46.36	48.20	-3.82	5
		e''	18.8200	Conductivity (σ):	6.07	6.00	1.16	5
	Body 5825	e'	46.3100	Relative Permittivity (ϵ_r):	46.31	48.20	-3.92	5
		e''	18.8500	Conductivity (σ):	6.11	6.00	1.75	5
5-26-2015	Body 5180	e'	48.5100	Relative Permittivity (ϵ_r):	48.51	49.05	-1.09	5
		e''	18.7100	Conductivity (σ):	5.39	5.27	2.23	5
	Body 5200	e'	48.4600	Relative Permittivity (ϵ_r):	48.46	49.02	-1.14	5
		e''	18.7300	Conductivity (σ):	5.42	5.29	2.28	5
	Body 5600	e'	47.7800	Relative Permittivity (ϵ_r):	47.78	48.48	-1.44	5
		e''	19.1300	Conductivity (σ):	5.96	5.76	3.40	5
	Body 5800	e'	47.4500	Relative Permittivity (ϵ_r):	47.45	48.20	-1.56	5
		e''	19.3300	Conductivity (σ):	6.23	6.00	3.90	5
Body 5825	e'	47.4100	Relative Permittivity (ϵ_r):	47.41	48.20	-1.64	5	
	e''	19.3600	Conductivity (σ):	6.27	6.00	4.51	5	

SAR 2 Room

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4-12-2015	Body 835	e'	53.9000	Relative Permittivity (ε _r):	53.90	55.20	-2.36	5
		e"	21.7700	Conductivity (σ):	1.01	0.97	4.20	5
	Body 820	e'	54.0400	Relative Permittivity (ε _r):	54.04	55.28	-2.24	5
		e"	21.8500	Conductivity (σ):	1.00	0.97	2.87	5
	Body 850	e'	53.7600	Relative Permittivity (ε _r):	53.76	55.16	-2.53	5
		e"	21.7000	Conductivity (σ):	1.03	0.99	3.90	5
4-16-2015	Body 835	e'	54.2700	Relative Permittivity (ε _r):	54.27	55.20	-1.68	5
		e"	21.4400	Conductivity (σ):	1.00	0.97	2.62	5
	Body 820	e'	54.4300	Relative Permittivity (ε _r):	54.43	55.28	-1.53	5
		e"	21.5200	Conductivity (σ):	0.98	0.97	1.31	5
	Body 850	e'	54.1600	Relative Permittivity (ε _r):	54.16	55.16	-1.81	5
		e"	21.3600	Conductivity (σ):	1.01	0.99	2.27	5
5-21-2015	Body 5180	e'	46.9300	Relative Permittivity (ε _r):	46.93	49.05	-4.32	5
		e"	18.6400	Conductivity (σ):	5.37	5.27	1.85	5
	Body 5200	e'	46.8900	Relative Permittivity (ε _r):	46.89	49.02	-4.34	5
		e"	18.6700	Conductivity (σ):	5.40	5.29	1.95	5
	Body 5600	e'	46.2300	Relative Permittivity (ε _r):	46.23	48.48	-4.64	5
		e"	19.0100	Conductivity (σ):	5.92	5.76	2.75	5
	Body 5800	e'	45.9400	Relative Permittivity (ε _r):	45.94	48.20	-4.69	5
		e"	19.2200	Conductivity (σ):	6.20	6.00	3.31	5
	Body 5825	e'	45.8800	Relative Permittivity (ε _r):	45.88	48.20	-4.81	5
		e"	19.2500	Conductivity (σ):	6.23	6.00	3.91	5
5-26-2015	Body 5180	e'	47.1800	Relative Permittivity (ε _r):	47.18	49.05	-3.81	5
		e"	18.5900	Conductivity (σ):	5.35	5.27	1.57	5
	Body 5200	e'	47.1700	Relative Permittivity (ε _r):	47.17	49.02	-3.77	5
		e"	18.6100	Conductivity (σ):	5.38	5.29	1.63	5
	Body 5600	e'	46.4600	Relative Permittivity (ε _r):	46.46	48.48	-4.16	5
		e"	18.8700	Conductivity (σ):	5.88	5.76	1.99	5
	Body 5800	e'	46.2600	Relative Permittivity (ε _r):	46.26	48.20	-4.02	5
		e"	19.1200	Conductivity (σ):	6.17	6.00	2.77	5
	Body 5825	e'	46.1500	Relative Permittivity (ε _r):	46.15	48.20	-4.25	5
		e"	19.0900	Conductivity (σ):	6.18	6.00	3.05	5

SAR 3 Room

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4-8-2015	Body 1900	e'	55.3400	Relative Permittivity (ϵ_r):	55.34	53.30	3.83	5
		e"	14.9400	Conductivity (σ):	1.58	1.52	3.84	5
	Body 1850	e'	55.5100	Relative Permittivity (ϵ_r):	55.51	53.30	4.15	5
		e"	14.9200	Conductivity (σ):	1.53	1.52	0.97	5
	Body 1910	e'	55.3300	Relative Permittivity (ϵ_r):	55.33	53.30	3.81	5
		e"	14.9400	Conductivity (σ):	1.59	1.52	4.39	5
4-12-2015	Body 1900	e'	55.3300	Relative Permittivity (ϵ_r):	55.33	53.30	3.81	5
		e"	14.9600	Conductivity (σ):	1.58	1.52	3.98	5
	Body 1850	e'	55.4700	Relative Permittivity (ϵ_r):	55.47	53.30	4.07	5
		e"	14.9400	Conductivity (σ):	1.54	1.52	1.11	5
	Body 1910	e'	55.3100	Relative Permittivity (ϵ_r):	55.31	53.30	3.77	5
		e"	14.9700	Conductivity (σ):	1.59	1.52	4.59	5
4-16-2015	Body 1900	e'	55.3000	Relative Permittivity (ϵ_r):	55.30	53.30	3.75	5
		e"	14.9300	Conductivity (σ):	1.58	1.52	3.77	5
	Body 1850	e'	55.4700	Relative Permittivity (ϵ_r):	55.47	53.30	4.07	5
		e"	14.8900	Conductivity (σ):	1.53	1.52	0.77	5
	Body 1910	e'	55.2600	Relative Permittivity (ϵ_r):	55.26	53.30	3.68	5
		e"	14.9400	Conductivity (σ):	1.59	1.52	4.39	5
4-24-2015	Body 1900	e'	54.4200	Relative Permittivity (ϵ_r):	54.42	53.30	2.10	5
		e"	15.0000	Conductivity (σ):	1.58	1.52	4.26	5
	Body 1850	e'	54.5700	Relative Permittivity (ϵ_r):	54.57	53.30	2.38	5
		e"	14.9800	Conductivity (σ):	1.54	1.52	1.38	5
	Body 1910	e'	54.4000	Relative Permittivity (ϵ_r):	54.40	53.30	2.06	5
		e"	15.0200	Conductivity (σ):	1.60	1.52	4.94	5
4-30-2015	Body 2600	e'	50.2100	Relative Permittivity (ϵ_r):	50.21	52.51	-4.38	5
		e"	15.3000	Conductivity (σ):	2.21	2.16	2.36	5
	Body 2500	e'	50.5200	Relative Permittivity (ϵ_r):	50.52	52.64	-4.02	5
		e"	15.0500	Conductivity (σ):	2.09	2.02	3.55	5
	Body 2700	e'	49.8900	Relative Permittivity (ϵ_r):	49.89	52.38	-4.76	5
		e"	15.5400	Conductivity (σ):	2.33	2.30	1.38	5
5-6-2015	Body 2600	e'	50.8100	Relative Permittivity (ϵ_r):	50.81	52.51	-3.24	5
		e"	15.1500	Conductivity (σ):	2.19	2.16	1.36	5
	Body 2500	e'	51.1400	Relative Permittivity (ϵ_r):	51.14	52.64	-2.84	5
		e"	14.8900	Conductivity (σ):	2.07	2.02	2.45	5
	Body 2700	e'	50.5000	Relative Permittivity (ϵ_r):	50.50	52.38	-3.60	5
		e"	15.3500	Conductivity (σ):	2.30	2.30	0.14	5
5-26-2015	Body 2450	e'	52.0600	Relative Permittivity (ϵ_r):	52.06	52.70	-1.21	5
		e"	14.5600	Conductivity (σ):	1.98	1.95	1.72	5
	Body 2410	e'	52.2100	Relative Permittivity (ϵ_r):	52.21	52.76	-1.04	5
		e"	14.4300	Conductivity (σ):	1.93	1.91	1.37	5
	Body 2475	e'	51.9800	Relative Permittivity (ϵ_r):	51.98	52.67	-1.31	5
		e"	14.6700	Conductivity (σ):	2.02	1.99	1.70	5

8.2. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

System Performance Check Measurement Conditions:

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ± 0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- Distance between probe sensors and phantom surface was set to 3 mm.
For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was 100 mW.
- The results are normalized to 1 W input power.

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
D835V2	4d174	8-13-2014	835	1g	9.32	9.62
				10g	6.09	6.37
D1900V2	5d190	8-12-2014	1900	1g	40.2	40.4
				10g	21.0	21.3
D1900V2	5d199	2-6-2015	1900	1g	41	40.6
				10g	21.4	21.6
D2450V2	939	8-11-2014	2450	1g	52.1	51.4
				10g	24.2	24
D2600V2	1097	11-27-2014	2600	1g	56.5	57.3
				10g	25.4	25.5
D5GHzV2	1184	8-22-2014	5200	1g	79.5	77.1
				10g	22.7	21.5
			5600	1g	83.3	82.7
				10g	23.5	22.8
			5800	1g	79.2	76.9
				10g	22.4	21.3

System Check Results

The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within 10% of the manufacturer calibrated dipole SAR target.

SAR 1 Room

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Zoom Scan to 100 mW	Normalize to 1 W			
4-15-2015	D2450V2	939	Body	1g	5.28	52.80	51.40	2.72	1, 2
				10g	2.40	24.00	24.00	0.00	
5-19-2015	D5GHzV2 (5200)	1184	Body	1g	7.62	76.20	77.1	-1.17	
				10g	2.20	22.00	21.5	2.33	
5-19-2015	D5GhzV2 (5600)	1184	Body	1g	8.16	81.60	82.7	-1.33	3, 4
				10g	2.32	23.20	22.8	1.75	
5-19-2015	D5GhzV2 (5800)	1184	Body	1g	7.68	76.80	76.9	-0.13	
				10g	2.18	21.80	21.3	2.35	
5-26-2015	D5GHzV2 (5200)	1184	Body	1g	8.11	81.10	77.1	5.19	
				10g	2.34	23.40	21.5	8.84	
5-26-2015	D5GhzV2 (5600)	1184	Body	1g	8.72	87.20	82.7	5.44	
				10g	2.48	24.80	22.8	8.77	
5-26-2015	D5GhzV2 (5800)	1184	Body	1g	7.89	78.90	76.9	2.60	
				10g	2.25	22.50	21.3	5.63	

SAR 2 Room

Date Tested	System Dipole		T.S. Liquid		Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #			Zoom Scan to 100 mW	Normalize to 1 W			
4-12-2015	D835V2	4d174	Body	1g	1.00	9.95	9.62	3.43	
				10g	0.66	6.56	6.37	2.98	
4-16-2015	D835V2	4d174	Body	1g	1.00	9.96	9.62	3.53	5, 6
				10g	0.66	6.56	6.37	2.98	
5-21-2015	D5GHzV2 (5200)	1184	Body	1g	8.18	81.80	77.1	6.10	
				10g	2.30	23.00	21.5	6.98	
5-21-2015	D5GhzV2 (5600)	1184	Body	1g	8.88	88.80	82.7	7.38	
				10g	2.44	24.40	22.8	7.02	
5-21-2015	D5GhzV2 (5800)	1184	Body	1g	7.91	79.10	76.9	2.86	
				10g	2.18	21.80	21.3	2.35	
5-26-2015	D5GHzV2 (5200)	1184	Body	1g	8.18	81.80	77.1	6.10	
				10g	2.29	22.90	21.5	6.51	
5-26-2015	D5GhzV2 (5600)	1184	Body	1g	7.85	78.50	82.7	-5.08	
				10g	2.16	21.60	22.8	-5.26	
5-26-2015	D5GhzV2 (5800)	1184	Body	1g	7.92	79.20	76.9	2.99	
				10g	2.19	21.90	21.3	2.82	

SAR 3 Room

Date Tested	System Dipole		T.S. Liquid	Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.
	Type	Serial #		Zoom Scan to 100 mW	Normalize to 1 W			
4-8-2015	D1900V2	5d190	Body	1g	3.77	37.70	40.40	-6.68
				10g	1.96	19.60	21.30	-7.98
4-13-2015	D1900V2	5d190	Body	1g	3.99	39.90	40.40	-1.24
				10g	2.04	20.40	21.30	-4.23
4-16-2015	D1900V2	5d190	Body	1g	3.74	37.40	40.40	-7.43
				10g	1.95	19.50	21.30	-8.45
4-24-2015	D1900V2	5d199	Body	1g	4.20	42.00	40.60	3.45
				10g	2.16	21.60	21.60	0.00
4-30-2015	D2600V2	1097	Body	1g	6.07	60.70	57.3	5.93
				10g	2.69	26.90	25.50	5.49
5-6-2015	D2600V2	1097	Body	1g	5.67	56.70	57.3	-1.05
				10g	2.49	24.90	25.50	-2.35
5-26-2015	D2450V2	939	Body	1g	5.30	53.00	51.40	3.11
				10g	2.44	24.40	24.00	1.67

9. Conducted Output Power Measurements

9.1. GSM

GSM850 Measured Results

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Max. Pwr		Reduced Pwr	
						Burst (dBm)	Frame (dBm)	Burst (dBm)	Frame (dBm)
850	GSM (Voice)	CS1	1	128	824.2	33.1	24.1	25.0	16.0
				190	836.6	33.2	24.2	25.2	16.2
				251	848.8	33.3	24.2	25.5	16.4
	GPRS (GMSK)	CS1	1	128	824.2	33.1	24.1	25.0	16.0
				190	836.6	33.2	24.2	25.2	16.2
				251	848.8	33.3	24.3	25.5	16.5
			2	128	824.2	32.3	26.3	24.1	18.0
				190	836.6	32.6	26.6	24.1	18.0
				251	848.8	32.8	26.7	24.3	18.3
			3	128	824.2	28.8	24.5	24.9	20.6
				190	836.6	29.0	24.7	25.1	20.8
				251	848.8	29.2	24.9	25.3	21.1
			4	128	824.2	27.6	24.6	24.0	21.0
				190	836.6	27.8	24.8	24.0	21.0
				251	848.8	28.2	25.2	24.1	21.1
	EGPRS (8PSK)	MCS5	1	128	824.2	26.5	17.5	20.6	11.5
				190	836.6	26.7	17.7	20.6	11.5
				251	848.8	26.9	17.9	20.8	11.8
			2	128	824.2	25.4	19.4	19.5	13.5
				190	836.6	25.5	19.4	19.7	13.7
				251	848.8	26.0	20.0	19.7	13.7
			3	128	824.2	23.0	18.8	20.3	16.0
				190	836.6	23.5	19.2	20.5	16.3
				251	848.8	23.7	19.4	20.8	16.5
			4	128	824.2	22.2	19.2	19.4	16.4
				190	836.6	22.3	19.3	19.4	16.4
				251	848.8	22.6	19.5	19.7	16.6

Notes:

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

- Standalone: GMSK (GPRS) mode with 2 time slots for Max power and 4 time slots for Reduced power, based on the output power measurements above

GSM1900 Measured Results

Band	Mode	Coding Scheme	Time Slots	Ch No.	Freq. (MHz)	Max. Pwr		Reduced Pwr	
						Burst (dBm)	Frame (dBm)	Burst (dBm)	Frame (dBm)
1900	GSM (Voice)	CS1	1	512	1850.2	30.0	21.0	22.2	13.2
				661	1880.0	30.0	21.0	22.2	13.1
				810	1909.8	29.9	20.9	22.0	13.0
	GPRS (GMSK)	CS1	1	512	1850.2	30.0	21.0	22.2	13.2
				661	1880.0	30.0	21.0	22.2	13.1
				810	1909.8	29.9	20.9	22.0	13.0
			2	512	1850.2	29.1	23.1	21.1	15.1
				661	1880.0	29.4	23.4	21.1	15.0
				810	1909.8	29.2	23.2	20.9	14.8
			3	512	1850.2	26.1	21.8	22.2	18.0
				661	1880.0	26.3	22.1	22.2	17.9
				810	1909.8	26.4	22.1	22.0	17.7
			4	512	1850.2	25.0	22.0	21.1	18.1
				661	1880.0	25.1	22.1	21.1	18.0
				810	1909.8	25.2	22.2	20.9	17.9
	EGPRS (8PSK)	MCS5	1	512	1850.2	25.7	16.7	19.4	10.4
				661	1880.0	25.9	16.9	19.1	10.1
				810	1909.8	25.9	16.9	19.0	9.9
			2	512	1850.2	24.7	18.6	18.4	12.3
				661	1880.0	24.8	18.8	18.3	12.3
				810	1909.8	25.1	19.1	18.1	12.1
			3	512	1850.2	22.1	17.8	19.3	15.0
				661	1880.0	22.6	18.3	19.2	14.9
				810	1909.8	22.6	18.4	19.0	14.8
			4	512	1850.2	21.0	17.9	18.4	15.4
				661	1880.0	21.4	18.4	18.3	15.3
				810	1909.8	21.5	18.5	18.2	15.1

Notes:

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

- Standalone: GMSK (GPRS) mode with 2 time slots for Max power and 4 time slots for Reduced power, based on the output power measurements above

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
	β_c/β_d	8/15

HSDPA Setup Procedures used to establish the test signals

The following 4 Sub-tests were completed according to Release 7 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			
	β_c	2/15	11/15	15/15	15/15
	β_d	15/15	15/15	8/15	4/15
	Bd (SF)	64			
	β_c/β_d	2/15	11/15	15/8	15/4
	β_{hs}	4/15	24/15	30/15	30/15
HSDPA Specific Settings	MPR (dB)	0	0	0.5	0.5
	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			
	$A_{hs}=\beta_{hs}/\beta_c$	30/15			

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

The following 5 Sub-tests were completed according to Release 6 procedures in section 5.2 of 3GPP TS34.121. 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
	β_c	11/15	6/15	15/15	2/15	15/15
	β_d	15/15	15/15	9/15	15/15	0
	β_{ec}	209/225	12/15	30/15	2/15	5/15
	β_c/β_d	11/15	6/15	15/9	2/15	15/1
	β_{hs}	22/15	12/15	30/15	4/15	5/15
	β_{ed}	1309/225	94/75	47/15	56/75	47/15
HSDPA Specific Settings	CM (dB)	1	3	2	3	1
	MPR (dB)	0	2	1	2	0
	DACK	8				0
	DNAK	8				0
	DCQI	8				0
	Ack-Nack repetition factor	3				
	CQI Feedback (Table 5.2B.4)	4ms				
HSUPA Specific Settings	CQI Repetition Factor (Table 5.2B.4)	2				
	$A_{hs} = \beta_{hs}/\beta_c$	30/15				
	E-DPDCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	ETFCI (from 34.121 Table C.11.1.3)	75	67	92	71	81
	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

WCDMA Band V Measured Results

Band	Mode		UL Ch No.	Freq. (MHz)	MPR (dB)	Max. Pwr (dBm)	MPR (dB)	Reduced Pwr (dBm)
W-CDMA Band V	Rel 99	RMC, 12.2 kbps	4132	826.4	N/A	23.3	N/A	15.5
			4183	836.6	N/A	23.3	N/A	15.5
			4233	846.6	N/A	23.3	N/A	15.5
	HSDPA	Subtest 1	4132	826.4	0	23.5	0	15.7
			4183	836.6	0	23.5	0	15.6
			4233	846.6	0	23.5	0	15.6
		Subtest 2	4132	826.4	0	23.4	0	15.6
			4183	836.6	0	23.5	0	15.5
			4233	846.6	0	23.5	0	15.6
		Subtest 3	4132	826.4	0.5	22.9	0	15.6
			4183	836.6	0.5	22.9	0	15.5
			4233	846.6	0.5	22.9	0	15.6
		Subtest 4	4132	826.4	0.5	22.7	0	15.6
			4183	836.6	0.5	22.8	0	15.5
			4233	846.6	0.5	22.8	0	15.6
	HSUPA	Subtest 1	4132	826.4	0	22.7	0	14.7
			4183	836.6	0	22.7	0	14.6
			4233	846.6	0	22.7	0	14.8
		Subtest 2	4132	826.4	2	20.3	0	15.4
			4183	836.6	2	20.3	0	15.2
			4233	846.6	2	20.4	0	15.4
		Subtest 3	4132	826.4	1	21.2	0	15.5
			4183	836.6	1	21.2	0	14.0
			4233	846.6	1	21.3	0	15.5
		Subtest 4	4132	826.4	2	20.3	0	15.5
			4183	836.6	2	20.3	0	15.3
			4233	846.6	2	20.3	0	15.4
		Subtest 5	4132	826.4	0	23.5	0	15.6
			4183	836.6	0	23.4	0	15.5
			4233	846.6	0	23.5	0	15.6

W-CDMA Band II Measured Results

Band	Mode		UL Ch No.	Freq. (MHz)	MPR (dB)	Max. Pwr (dBm)	MPR (dB)	Reduced Pwr (dBm)
W-CDMA Band II	Rel 99	RMC, 12.2 kbps	9262	1852.4	N/A	22.5	N/A	12.4
			9400	1880.0	N/A	22.9	N/A	12.4
			9538	1907.6	N/A	22.8	N/A	12.6
	HSDPA	Subtest 1	9262	1852.4	0	22.6	0	12.7
			9400	1880.0	0	23.0	0	12.7
			9538	1907.6	0	22.8	0	12.6
		Subtest 2	9262	1852.4	0	22.6	0	12.8
			9400	1880.0	0	23.0	0	12.8
			9538	1907.6	0	22.8	0	12.6
		Subtest 3	9262	1852.4	0.5	22.1	0	12.8
			9400	1880.0	0.5	22.5	0	12.8
			9538	1907.6	0.5	22.3	0	12.7
		Subtest 4	9262	1852.4	0.5	21.7	0	12.7
			9400	1880.0	0.5	22.0	0	12.7
			9538	1907.6	0.5	21.8	0	12.6
	HSUPA	Subtest 1	9262	1852.4	0	21.8	0	12.7
			9400	1880.0	0	22.0	0	12.7
			9538	1907.6	0	21.8	0	12.5
		Subtest 2	9262	1852.4	2	19.5	0	12.8
			9400	1880.0	2	19.6	0	12.8
			9538	1907.6	2	19.4	0	12.6
		Subtest 3	9262	1852.4	1	21.7	0	12.8
			9400	1880.0	1	21.0	0	12.8
			9538	1907.6	1	20.9	0	12.6
		Subtest 4	9262	1852.4	2	19.3	0	12.8
			9400	1880.0	2	19.5	0	12.8
			9538	1907.6	2	19.3	0	12.5
		Subtest 5	9262	1852.4	0	22.7	0	12.8
			9400	1880.0	0	23.0	0	12.8
			9538	1907.6	0	22.7	0	12.6

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 3

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

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

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

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	NA
NS_03	6.6.2.2.1	2, 4, 10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10,15,20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	n/a
NS_07	6.6.2.2.3	13	10	Table 6.2.4-2	Table 6.2.4-2
	6.6.3.3.2				
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23 ¹	1.4, 3, 5, 10	Table 6.2.4-5	Table 6.2.4-5
..					
NS_32	-	-	-	-	-

Note 1: Applies to the lower block of Band 23, i.e. a carrier placed in the 2000-2010 MHz region.

LTE Band 41 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Pwr Back-off Avg Pwr (dBm)		
						2565 MHz	2593 MHz	2645 MHz		2565 MHz	2593 MHz	2645 MHz
LTE Band 41	20	QPSK	1	0	0	23.0	23.3	23.2	0	17.1	16.9	16.8
			1	49	0	23.4	23.2	23.2	0	16.9	16.8	16.7
			1	99	0	23.2	23.0	22.9	0	16.9	16.7	16.7
			50	0	1	22.2	22.0	21.7	0	16.9	16.8	16.7
			50	24	1	22.1	22.0	21.7	0	16.9	16.7	16.5
			50	50	1	22.0	22.0	21.6	0	16.8	16.7	16.5
			100	0	1	22.0	21.9	21.7	0	16.8	16.7	16.5
		16QAM	1	0	1	22.5	22.5	21.9	0	17.2	17.1	17.0
			1	49	1	22.2	22.4	21.8	0	16.8	17.2	17.0
			1	99	1	22.3	22.2	21.7	0	16.7	17.2	17.0
			50	0	2	21.0	21.0	20.7	0	16.9	16.7	16.6
			50	24	2	21.1	20.9	20.6	0	16.9	16.7	16.6
			50	50	2	21.0	20.9	20.6	0	16.7	16.6	16.5
			100	0	2	21.0	20.9	20.7	0	16.8	16.8	16.6
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Pwr Back-off Avg Pwr (dBm)		
						2562.5 MHz	2593 MHz	2647.5 MHz		2562.5 MHz	2593 MHz	2647.5 MHz
LTE Band 41	15	QPSK	1	0	0	23.3	23.1	23.2	0	16.8	16.9	17.0
			1	37	0	23.3	23.0	23.2	0	16.7	16.8	16.9
			1	74	0	23.2	23.0	23.1	0	16.8	16.7	16.9
			36	0	1	22.1	22.0	22.1	0	16.8	16.8	16.8
			36	20	1	22.1	22.0	22.0	0	16.7	16.7	16.8
			36	39	1	22.0	22.0	21.9	0	16.7	16.8	16.8
			75	0	1	22.0	21.9	21.9	0	16.7	16.7	16.9
		16QAM	1	0	1	22.0	21.8	22.5	0	16.7	16.3	17.2
			1	37	1	22.0	21.6	22.4	0	16.6	16.3	17.1
			1	74	1	21.8	21.9	22.5	0	16.5	16.2	17.0
			36	0	2	21.1	21.0	21.0	0	16.8	16.8	16.8
			36	20	2	21.0	21.0	20.9	0	16.8	16.7	16.8
			36	39	2	21.0	20.8	20.8	0	16.8	16.7	16.7
			75	0	2	20.9	20.9	20.9	0	16.7	16.7	16.9
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Pwr Back-off Avg Pwr (dBm)		
						2560 MHz	2593 MHz	2650 MHz		2560 MHz	2593 MHz	2650 MHz
LTE Band 41	10	QPSK	1	0	0	23.2	23.1	23.1	0	16.8	16.8	16.8
			1	25	0	23.1	23.1	23.0	0	16.7	16.8	16.7
			1	49	0	23.2	23.1	23.1	0	16.7	16.9	16.8
			25	0	1	22.0	21.9	21.8	0	16.7	16.7	16.8
			25	12	1	22.1	22.0	21.9	0	16.7	16.7	16.8
			25	25	1	22.0	21.9	21.8	0	16.7	16.7	16.7
			50	0	1	22.0	21.9	21.8	0	16.7	16.6	16.7
		16QAM	1	0	1	22.2	21.9	22.2	0	16.8	16.5	16.9
			1	25	1	22.1	21.8	22.1	0	16.8	16.4	16.8
			1	49	1	22.1	21.8	22.1	0	16.7	16.4	16.8
			25	0	2	21.0	20.9	20.8	0	16.7	16.6	16.8
			25	12	2	20.9	20.9	20.9	0	16.6	16.7	16.8
			25	25	2	20.9	20.8	20.7	0	16.7	16.7	16.7
			50	0	2	21.0	20.9	20.7	0	16.7	16.7	16.7

LTE Band 41 Measured Results continued

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Pwr Back-off Avg Pwr (dBm)		
						2557.5 MHz	2593 MHz	2652.5 MHz		2557.5 MHz	2593 MHz	2652.5 MHz
LTE Band 41	5	QPSK	1	0	0	22.8	23.1	23.0	0	16.5	16.8	16.7
			1	12	0	22.8	23.2	23.0	0	16.3	16.7	16.7
			1	24	0	22.8	23.0	23.0	0	16.4	16.8	16.7
			12	0	1	21.7	21.9	21.7	0	16.4	16.7	16.6
			12	7	1	21.7	21.9	21.8	0	16.4	16.7	16.6
			12	13	1	21.7	21.9	21.8	0	16.4	16.7	16.6
			25	0	1	21.6	21.9	21.8	0	16.4	16.7	16.6
		16QAM	1	0	1	21.4	22.4	21.7	0	16.1	16.6	16.7
			1	12	1	21.4	22.2	21.7	0	16.0	16.6	16.7
			1	24	1	21.4	22.3	21.7	0	16.0	16.9	16.4
			12	0	2	20.6	20.8	20.6	0	16.3	16.6	16.6
			12	7	2	20.5	20.9	20.7	0	16.3	16.7	16.6
			12	13	2	20.6	20.9	20.7	0	16.3	16.6	16.6
			25	0	2	20.7	20.9	20.6	0	16.4	16.7	16.6

9.4. Wi-Fi 2.4GHz (DTS Band)

SISO

Antenna	Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Max Pwr.		Reduced Pwr.		SAR Test (Yes/No)
						Avg Pwr (dBm)	Max Output Power (dBm)	Avg Pwr (dBm)	Max Output Power (dBm)	
SISO Chain 0	2.4	802.11b	1 Mbps	1	2412	16.9	17.5	13.6	14.5	Yes
				6	2437	17.0		13.8		
				11	2462	16.8		13.7		
		802.11g	6 Mbps	1	2412	Not Required	15.5	Not Required	14.5	No
				6	2437					
				11	2462					
		802.11n (HT20)	6.5 Mbps	1	2412	Not Required	14.5	Not Required	14.5	No
				6	2437					
				11	2462					
SISO Chain 1	2.4	802.11b	1 Mbps	1	2412	16.5	17.5	11.0	12.5	Yes
				6	2437	17.4		12.3		
				11	2462	17.3		12.1		
		802.11g	6 Mbps	1	2412	Not Required	15.5	Not Required	12.5	No
				6	2437					
				11	2462					
		802.11n (HT20)	6.5 Mbps	1	2412	Not Required	14.5	Not Required	12.5	No
				6	2437					
				11	2462					

MIMO

Antenna	Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Max Pwr.		Reduced Pwr.		SAR Test (Yes/No)
						Avg Pwr (dBm)	Max Output Power (dBm)	Avg Pwr (dBm)	Max Output Power (dBm)	
MIMO Chain 0	2.4	802.11n (HT20)	6.5 Mbps	1	2412	14.1	14.5	13.5	14.5	No
				6	2437	14.3		13.8		
				11	2462	14.3		13.8		
MIMO Chain 1	2.4	802.11n (HT20)	6.5 Mbps	1	2412	13.8	14.5	12.2	12.5	No
				6	2437	13.9		12.4		
				11	2462	14.0		12.4		

Note(s):

- Output Power and SAR is not required for 802.11g/n HT20 channels 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.

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

SISO Antenna 1

Antenna	Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Max Pwr.		Reduce Pwr		SAR Test (Yes/No)
						Avg Pwr (dBm)	Max Output Power (dBm)	Avg Pwr (dBm)	Max Output Power (dBm)	
SISO Ant 1	5.2 (U-NII 1)	802.11a	6 Mbps	36 ~ 48	5180 ~ 5240	Not Required	14.5	Not Required	8.5	No
		802.11n (HT20)	6.5 Mbps	36 ~ 48	5180 ~ 5240		14.5		8.5	No
		802.11n (HT40)	13.5 Mbps	38 ~ 46	5190 ~ 5230		14.5		8.5	No
		802.11ac (VHT20)	6.5 Mbps	36 ~ 48	5180 ~ 5240		14.5		8.5	No
		802.11ac (VHT40)	13.5 Mbps	38 ~ 46	5190 ~ 5230		14.5		8.5	No
		802.11ac (VHT80)	29.3 Mbps	42	5210	14.4	14.5	8.2	8.5	No
	5.3 (U-NII 2A)	802.11a	6 Mbps	52 ~ 64	5260 ~ 5320	Not Required	14.5	Not Required	8.5	No
		802.11n (HT20)	6.5 Mbps	52 ~ 64	5260 ~ 5320		14.5		8.5	No
		802.11n (HT40)	13.5 Mbps	54 ~ 62	5270 ~ 5310		14.5		8.5	No
		802.11ac (VHT20)	6.5 Mbps	52 ~ 64	5260 ~ 5320		14.5		8.5	No
		802.11ac (VHT40)	13.5 Mbps	54 ~ 62	5270 ~ 5310		14.5		8.5	No
		802.11ac (VHT80)	29.3 Mbps	58	5290	13.9	14.5	8.4	8.5	Yes
	5.5 (U-NII 2C)	802.11a	6 Mbps	100 ~ 140	5500 ~ 5700	Not Required	14.5	Not Required	8.5	No
		802.11n (HT20)	6.5 Mbps	100 ~ 140	5500 ~ 5700		14.5		8.5	No
		802.11n (HT40)	13.5 Mbps	102 ~ 134	5510 ~ 5670		14.5		8.5	No
		802.11ac (VHT20)	6.5 Mbps	100 ~ 140	5500 ~ 5700		14.5		8.5	No
		802.11ac (VHT40)	13.5 Mbps	102 ~ 134	5510 ~ 5670		14.5		8.5	No
		802.11ac (VHT80)	29.3 Mbps	106	5530	14.4	14.5	8.1	8.5	Yes
	5.8 (U-NII 3)	802.11a	6 Mbps	149 ~ 165	5745 ~ 5825	Not Required	14.5	Not Required	8.5	No
		802.11n (HT20)	6.5 Mbps	149 ~ 165	5745 ~ 5825		14.5		8.5	No
		802.11n (HT40)	13.5 Mbps	151 ~ 159	5755 ~ 5795		14.5		8.5	No
		802.11ac (VHT20)	6.5 Mbps	149 ~ 165	5745 ~ 5825		14.5		8.5	No
		802.11ac (VHT40)	13.5 Mbps	151 ~ 159	5755 ~ 5795		14.5		8.5	No
		802.11ac (VHT80)	29.3 Mbps	155	5775	14.3	14.5	8.4	8.5	Yes

SISO Antenna 2

Antenna	Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Max Pwr.		Reduce Pwr		SAR Test (Yes/No)
						Avg Pwr (dBm)	Max Output Power (dBm)	Avg Pwr (dBm)	Max Output Power (dBm)	
SISO Ant 2	5.2 (U-NII 1)	802.11a	6 Mbps	36 ~ 48	5180 ~ 5240	Not Required	14.5	Not Required	9.5	No
		802.11n (HT20)	6.5 Mbps	36 ~ 48	5180 ~ 5240		14.5		9.5	No
		802.11n (HT40)	13.5 Mbps	38 ~ 46	5190 ~ 5230		14.5		9.5	No
		802.11ac (VHT20)	6.5 Mbps	36 ~ 48	5180 ~ 5240		14.5		9.5	No
		802.11ac (VHT40)	13.5 Mbps	38 ~ 46	5190 ~ 5230		14.5		9.5	No
		802.11ac (VHT80)	29.3 Mbps	42	5210	14.3	14.5	9.2	9.5	No
	5.3 (U-NII 2A)	802.11a	6 Mbps	52 ~ 64	5260 ~ 5320	Not Required	14.5	Not Required	9.5	No
		802.11n (HT20)	6.5 Mbps	52 ~ 64	5260 ~ 5320		14.5		9.5	No
		802.11n (HT40)	13.5 Mbps	54 ~ 62	5270 ~ 5310		14.5		9.5	No
		802.11ac (VHT20)	6.5 Mbps	52 ~ 64	5260 ~ 5320		14.5		9.5	No
		802.11ac (VHT40)	13.5 Mbps	54 ~ 62	5270 ~ 5310		14.5		9.5	No
		802.11ac (VHT80)	29.3 Mbps	58	5290	14.0	14.5	9.2	9.5	Yes
	5.5 (U-NII 2C)	802.11a	6 Mbps	100 ~ 140	5500 ~ 5700	Not Required	14.5	Not Required	9.5	No
		802.11n (HT20)	6.5 Mbps	100 ~ 140	5500 ~ 5700		14.5		9.5	No
		802.11n (HT40)	13.5 Mbps	102 ~ 134	5510 ~ 5670		14.5		9.5	No
		802.11ac (VHT20)	6.5 Mbps	100 ~ 140	5500 ~ 5700		14.5		9.5	No
		802.11ac (VHT40)	13.5 Mbps	102 ~ 134	5510 ~ 5670		14.5		9.5	No
		802.11ac (VHT80)	29.3 Mbps	106	5530	14.0	14.5	9.5	9.5	Yes
	5.8 (U-NII 3)	802.11a	6 Mbps	149 ~ 165	5745 ~ 5825	Not Required	14.5	Not Required	9.5	No
		802.11n (HT20)	6.5 Mbps	149 ~ 165	5745 ~ 5825		14.5		9.5	No
		802.11n (HT40)	13.5 Mbps	151 ~ 159	5755 ~ 5795		14.5		9.5	No
		802.11ac (VHT20)	6.5 Mbps	149 ~ 165	5745 ~ 5825		14.5		9.5	No
		802.11ac (VHT40)	13.5 Mbps	151 ~ 159	5755 ~ 5795		14.5		9.5	No
		802.11ac (VHT80)	29.3 Mbps	155	5775	14.0	14.5	8.8	9.5	Yes

MIMO Antenna 1

Antenna	Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Max Pwr.		Reduce Pwr		SAR Test (Yes/No)
						Avg Pwr (dBm)	Max Output Power (dBm)	Avg Pwr (dBm)	Max Output Power (dBm)	
MIMO Ant 1	5.2 (U-NII 1)	802.11a	6 Mbps	36 ~ 48	5180 ~ 5240	Not Required	14.5	Not Required	8.5	No
		802.11n (HT20)	6.5 Mbps	36 ~ 48	5180 ~ 5240		14.5		8.5	No
		802.11n (HT40)	13.5 Mbps	38 ~ 46	5190 ~ 5230		14.5		8.5	No
		802.11ac (VHT20)	6.5 Mbps	36 ~ 48	5180 ~ 5240		14.5		8.5	No
		802.11ac (VHT40)	13.5 Mbps	38 ~ 46	5190 ~ 5230		14.5		8.5	No
		802.11ac (VHT80)	29.3 Mbps	42	5210	13.7	14.5	8.3	8.5	Yes
	5.3 (U-NII 2A)	802.11a	6 Mbps	52 ~ 64	5260 ~ 5320	Not Required	14.5	Not Required	8.5	No
		802.11n (HT20)	6.5 Mbps	52 ~ 64	5260 ~ 5320		14.5		8.5	No
		802.11n (HT40)	13.5 Mbps	54 ~ 62	5270 ~ 5310		14.5		8.5	No
		802.11ac (VHT20)	6.5 Mbps	52 ~ 64	5260 ~ 5320		14.5		8.5	No
		802.11ac (VHT40)	13.5 Mbps	54 ~ 62	5270 ~ 5310		14.5		8.5	No
		802.11ac (VHT80)	29.3 Mbps	58	5290	13.9	14.5	8.3	8.5	Yes
	5.5 (U-NII 2C)	802.11a	6 Mbps	100 ~ 140	5500 ~ 5700	Not Required	14.5	Not Required	8.5	No
		802.11n (HT20)	6.5 Mbps	100 ~ 140	5500 ~ 5700		14.5		8.5	No
		802.11n (HT40)	13.5 Mbps	102 ~ 134	5510 ~ 5670		14.5		8.5	No
		802.11ac (VHT20)	6.5 Mbps	100 ~ 140	5500 ~ 5700		14.5		8.5	No
		802.11ac (VHT40)	13.5 Mbps	102 ~ 134	5510 ~ 5670		14.5		8.5	No
		802.11ac (VHT80)	29.3 Mbps	106	5530	14.3	14.5	8.1	8.5	Yes
	5.8 (U-NII 3)	802.11a	6 Mbps	149 ~ 165	5745 ~ 5825	Not Required	14.5	Not Required	8.5	No
		802.11n (HT20)	6.5 Mbps	149 ~ 165	5745 ~ 5825		14.5		8.5	No
		802.11n (HT40)	13.5 Mbps	151 ~ 159	5755 ~ 5795		14.5		8.5	No
		802.11ac (VHT20)	6.5 Mbps	149 ~ 165	5745 ~ 5825		14.5		8.5	No
		802.11ac (VHT40)	13.5 Mbps	151 ~ 159	5755 ~ 5795		14.5		8.5	No
		802.11ac (VHT80)	29.3 Mbps	155	5775	14.1	14.5	8.3	8.5	Yes

MIMO Antenna 2

Antenna	Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Max Pwr.		Reduce Pwr		SAR Test (Yes/No)
						Avg Pwr (dBm)	Max Output Power (dBm)	Avg Pwr (dBm)	Max Output Power (dBm)	
MIMO Ant 2	5.2 (U-NII 1)	802.11a	6 Mbps	36 ~ 48	5180 ~ 5240	Not Required	14.5	Not Required	9.5	No
		802.11n (HT20)	6.5 Mbps	36 ~ 48	5180 ~ 5240		14.5		9.5	No
		802.11n (HT40)	13.5 Mbps	38 ~ 46	5190 ~ 5230		14.5		9.5	No
		802.11ac (VHT20)	6.5 Mbps	36 ~ 48	5180 ~ 5240		14.5		9.5	No
		802.11ac (VHT40)	13.5 Mbps	38 ~ 46	5190 ~ 5230		14.5		9.5	No
		802.11ac (VHT80)	29.3 Mbps	42	5210	14.2	14.5	9.0	9.5	Yes
	5.3 (U-NII 2A)	802.11a	6 Mbps	52 ~ 64	5260 ~ 5320	Not Required	14.5	Not Required	9.5	No
		802.11n (HT20)	6.5 Mbps	52 ~ 64	5260 ~ 5320		14.5		9.5	No
		802.11n (HT40)	13.5 Mbps	54 ~ 62	5270 ~ 5310		14.5		9.5	No
		802.11ac (VHT20)	6.5 Mbps	52 ~ 64	5260 ~ 5320		14.5		9.5	No
		802.11ac (VHT40)	13.5 Mbps	54 ~ 62	5270 ~ 5310		14.5		9.5	No
		802.11ac (VHT80)	29.3 Mbps	58	5290	14.2	14.5	9.1	9.5	Yes
	5.5 (U-NII 2C)	802.11a	6 Mbps	100 ~ 140	5500 ~ 5700	Not Required	14.5	Not Required	9.5	No
		802.11n (HT20)	6.5 Mbps	100 ~ 140	5500 ~ 5700		14.5		9.5	No
		802.11n (HT40)	13.5 Mbps	102 ~ 134	5510 ~ 5670		14.5		9.5	No
		802.11ac (VHT20)	6.5 Mbps	100 ~ 140	5500 ~ 5700		14.5		9.5	No
		802.11ac (VHT40)	13.5 Mbps	102 ~ 134	5510 ~ 5670		14.5		9.5	No
		802.11ac (VHT80)	29.3 Mbps	106	5530	14.0	14.5	9.3	9.5	Yes
	5.8 (U-NII 3)	802.11a	6 Mbps	149 ~ 165	5745 ~ 5825	Not Required	14.5	Not Required	9.5	No
		802.11n (HT20)	6.5 Mbps	149 ~ 165	5745 ~ 5825		14.5		9.5	No
		802.11n (HT40)	13.5 Mbps	151 ~ 159	5755 ~ 5795		14.5		9.5	No
		802.11ac (VHT20)	6.5 Mbps	149 ~ 165	5745 ~ 5825		14.5		9.5	No
		802.11ac (VHT40)	13.5 Mbps	151 ~ 159	5755 ~ 5795		14.5		9.5	No
		802.11ac (VHT80)	29.3 Mbps	155	5775	13.9	14.5	9.4	9.5	Yes

Note(s):

- Output Power and SAR measurement is not required for 802.11n HT20/HT40/HT80 channels when the specified tune-up tolerances for 802.11n HT20/HT40/HT80 are lower than 802.11a by more than ½ dB and the measured SAR is ≤ 1.2 W/Kg.
- 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.
- 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.

9.6. Bluetooth

Band (GHz)	Mode	Ch #	Freq. (MHz)	Avg Pwr (dBm)	Avg Pwr (mW)
2.4	V3.0 + BDR, GFSK	0	2402	9.1	8.11
		39	2441	9.9	9.82
		78	2480	9.0	8.00
	V3.0 + EDR, $\pi/4$ DQPSK	0	2402	5.4	3.50
		39	2441	5.8	3.82
		78	2480	4.6	2.89
	V3.0 + EDR, 8-DPSK	0	2402	5.2	3.29
		39	2441	5.7	3.75
		78	2480	4.6	2.86
	V4.0 LE, GFSK	0	2402	4.2	2.61
		19	2440	5.5	3.57
		39	2480	4.4	2.76

10. Measured and Reported (Scaled) SAR Results

SAR Test Reduction criteria are as follows:

KDB 447498 D01 General RF Exposure Guidance:

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

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

KDB 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 $\leq \frac{1}{4}$ 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.

KDB 248227 D01 SAR meas for 802.11 v02:

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

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

- ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.
- > 0.4 W/kg, SAR is repeated using the same wireless mode test configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the reported SAR is ≤ 0.8 W/kg or all required test positions are tested.
 - For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
 - When it is unclear, all equivalent conditions must be tested.

- For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required test channels are considered.
 - The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.
- When the specified maximum output power is the same for both UNII 1 and UNII 2A, begin SAR measurements in UNII 2A with the channel with the highest measured output power. If the reported SAR for UNII 2A is ≤ 1.2 W/kg, SAR is not required for UNII 1; otherwise treat the remaining bands separately and test them independently for SAR.
- When the specified maximum output power is different between UNII 1 and UNII 2A, begin SAR with the band that has the higher specified maximum output. If the highest reported SAR for the band with the highest specified power is ≤ 1.2 W/kg, testing for the band with the lower specified output power is not required; otherwise test the remaining bands independently for SAR.

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

10.1. GSM850

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	
GPRS 4 Slots	ON	0	Rear	190	836.6	24.5	24.0	0.650	0.729	1
			Edge 1	190	836.6	24.5	24.0	0.518	0.581	
			Edge 2	190	836.6	24.5	24.0	0.173	0.194	
			Edge 4	190	836.6	24.5	24.0	0.119	0.134	
GPRS 2 Slots	OFF	24	Rear	190	836.6	33.5	32.6	0.460	0.566	
		24	Edge 1	190	836.6	33.5	32.6	0.542	0.667	
		0	Edge 2	190	836.6	33.5	32.6	0.318	0.391	
		0	Edge 4	190	836.6	33.5	32.6	0.219	0.269	

Note(s):

All GSM 850 SAR data- used in this report were taken from SAR report 15K20540-S1F, submitted under FCC ID A3LSMT815. Both models share identical antennas and output power. Spot checks were performed on model SM-T815C to ensure SAR values were the same between both models.

10.2. GSM1900

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	
GPRS 4 Slots	ON	0	Rear	661	1880.0	21.5	21.1	0.492	0.539	
			Edge 1	661	1880.0	21.5	21.1	0.251	0.275	
GPRS 2 Slots	OFF	24	Rear	661	1880.0	30.0	29.4	0.280	0.321	
		24	Edge 1	661	1880.0	30.0	29.4	0.173	0.199	
		0	Edge 2	661	1880.0	30.0	29.4	0.048	0.055	
		0	Edge 4	661	1880.0	30.0	29.4	0.615	0.706	2

Note(s):

All GSM 1900 SAR data- used in this report were taken from SAR report 15K20540-S1F, submitted under FCC ID A3LSMT815. Both models share identical antennas and output power. Spot checks were performed on model SM-T815C to ensure SAR values were the same between both models.

10.3. W-CDMA Band V

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	
Rel 99 RMC	ON	0	Rear	4183	836.6	16.0	15.5	0.656	0.736	3
			Edge 1	4183	836.6	16.0	15.5	0.549	0.616	
Rel 99 RMC	OFF	24	Rear	4183	836.6	24.0	23.3	0.247	0.290	
		24	Edge 1	4183	836.6	24.0	23.3	0.395	0.464	
		0	Edge 2	4183	836.6	24.0	23.3	0.340	0.399	
		0	Edge 4	4183	836.6	24.0	23.3	0.183	0.215	

Note(s):

All W-CDMA Band V SAR data- used in this report were taken from SAR report 15K20540-S1F, submitted under FCC ID A3LSMT815. Both models share identical antennas and output power. Spot checks were performed on model SM-T815C to ensure SAR values were the same between both models.

10.4. W-CDMA Band II

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	
Rel 99 RMC	ON	0	Rear	9400	1880.0	13.0	12.4	0.539	0.619	4
			Edge 1	9400	1880.0	13.0	12.4	0.475	0.545	
Rel 99 RMC	OFF	24	Rear	9400	1880.0	23.0	22.9	0.128	0.131	
		24	Edge 1	9400	1880.0	23.0	22.9	0.110	0.113	
		0	Edge 2	9400	1880.0	23.0	22.9	0.039	0.040	
		0	Edge 4	9400	1880.0	23.0	22.9	0.501	0.513	

Note(s):

All W-CDMA Band II SAR data- used in this report were taken from SAR report 15K20540-S1F, submitted under FCC ID A3LSMT815. Both models share identical antennas and output power. Spot checks were performed on model SM-T815C to ensure SAR values were the same between both models.

10.5. LTE Band 41 (20MHz Bandwidth)

Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	RB Allocation	RB offset	Power (dBm)		1-g SAR (W/kg)		Plot No.
								Tune-up limit	Meas.	Meas.	Scaled	
QPSK	ON	0	Rear	40620	2593.0	1	0	17.5	16.9	0.633	0.728	5
						50	0	17.5	16.8	0.611	0.718	
			Edge 1	40620	2593.0	1	0	17.5	16.9	0.376	0.433	
						50	0	17.5	16.8	0.358	0.421	
QPSK	OFF	24	Rear	40620	2593.0	1	0	23.5	23.3	0.049	0.051	
						50	0	22.5	22.0	0.037	0.042	
		24	Edge 1	40620	2593.0	1	0	23.5	23.3	0.024	0.025	
						50	0	22.5	22.0	0.018	0.020	
		0	Edge 2	40620	2593.0	1	0	23.5	23.3	0.032	0.033	
						50	0	22.5	22.0	0.018	0.020	
		0	Edge 4	40620	2593.0	1	0	23.5	23.3	0.232	0.241	
						50	0	22.5	22.0	0.172	0.192	

10.6. Wi-Fi (DTS Band)

Band	Mode	Antenna	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.	Meas.	Scaled	
2.4GHz	802.11b	SISO Main	On	0	Rear	6	2437.0	1.030	14.5	13.8	0.628	0.738	6
			Off	4	Rear	6	2437.0	0.530	17.5	17.0	0.407	0.457	
				0	Edge 2	6	2437.0	0.056	17.5	17.0	0.041	0.046	
		SISO Sub	On	0	Rear	6	2437.0	0.511	12.5	12.3	0.603	0.631	
				4	Rear	6	2437.0	0.448	17.5	17.4	0.292	0.299	
			Off	0	Edge 3	6	2437.0	0.125	17.5	17.4			
	802.11n	MIMO Main	On	0	Rear	6	2437.0	0.665	14.5	13.8	0.479	0.563	
			Off	4	Rear	6	2437.0	0.299	14.5	14.3	0.270	0.283	
				0	Edge 2	6	2437.0	0.115	14.5	14.3			
		MIMO Sub	On	0	Rear	6	2437.0	0.665	12.5	12.4	0.704	0.720	
			Off	4	Rear	6	2437.0	0.299	14.5	13.9	0.251	0.288	
				0	Edge 3	6	2437.0	0.101	14.5	13.9			

Note(s):

- Highest reported SAR is ≤ 0.4 W/kg. Therefore, further SAR measurements within this exposure condition are not required.
- Highest reported SAR is > 0.4 W/kg. Due to the highest reported SAR for this test position, other test positions in Head exposure condition were evaluated until a SAR ≤ 0.8 W/kg was reported.
- Testing for a second channel was required because the reported SAR for this test position was > 0.8 W/kg.
- Additional testing required in order satisfying FCC simultaneous transmission limit criteria.
- All Wi-Fi (DTS Band) SAR data- used in this report were taken from SAR report 15K20540-S1F, submitted under FCC ID A3LSMT815. Both models share identical antennas and output power. Spot checks were performed on model SM-T815C to ensure SAR values were the same between both models

10.7. Wi-Fi (U-NII Band)

Frequency Band	Mode	Antenna	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.	Meas.	Scaled	
5.3 GHz U-NII 2A	802.11ac (VHT80) 29.3 Mbps	SISO Main	On	0	Rear	58	5290	1.034	8.5	8.4	0.604	0.618	7
			Off	4	Rear	58	5290	0.886	14.5	13.9	0.430	0.494	
				0	Edge 2	58	5290	0.462	14.5	13.9	0.214	0.246	
		SISO Sub	On	0	Rear	58	5290	2.115	9.5	9.2	0.803	0.860	
			Off	4	Rear	58	5290	1.397	14.5	14.0	0.550	0.617	
				0	Edge 3	58	5290	0.159	14.5	14.0	0.111	0.125	
5.3 GHz U-NII 2A	802.11ac (VHT80) 29.3 Mbps	MIMO Main	On	0	Rear	58	5290	0.844	8.5	8.3	0.546	0.572	
			Off	4	Rear	58	5290	1.142	14.5	13.9	0.174	0.200	
				0	Edge 2	58	5290	0.148	14.5	13.9			
				0	Edge 3	58	5290	0.159	14.5	13.9	0.042	0.048	
		MIMO Sub	On	0	Rear	58	5290	0.844	9.5	9.1	0.602	0.660	
			Off	4	Rear	58	5290	1.142	14.5	14.2	0.669	0.717	
				0	Edge 2	58	5290	0.148	14.5	14.2			
				0	Edge 3	58	5290	0.159	14.5	14.2	0.084	0.090	
				0	Edge 3	58	5290	0.159	14.5	14.2	0.084	0.090	
Frequency Band	Mode	Antenna	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.	Meas.	Scaled	
5.5 GHz U-NII 2C	802.11ac (VHT80) 29.3 Mbps	SISO Main	On	0	Rear	106	5530	0.696	8.5	8.1	0.530	0.581	8
			Off	4	Rear	106	5530	1.478	14.5	14.4	0.766	0.784	
				0	Edge 2	106	5530	0.501	14.5	14.4	0.284	0.291	
		SISO Sub	On	0	Rear	106	5530	2.599	9.5	9.5	0.985	0.985	
			Off	4	Rear	106	5530	1.831	14.5	14.0	0.845	0.948	
				0	Edge 3	106	5530	0.265	14.5	14.0	0.133	0.153	
5.5 GHz U-NII 2C	802.11ac (VHT80) 29.3 Mbps	MIMO Main	On	0	Rear	106	5530	0.873	8.5	8.1	0.591	0.648	
			Off	4	Rear	106	5530	1.150	14.5	14.3	0.152	0.159	
				0	Edge 2	106	5530	0.147	14.5	14.3			
				0	Edge 3	106	5530	0.214	14.5	14.3	0.037	0.039	
		MIMO Sub	On	0	Rear	106	5530	0.873	9.5	9.3	0.783	0.820	
			Off	4	Rear	106	5530	1.150	14.5	14.0	0.700	0.785	
				0	Edge 2	106	5530	0.147	14.5	14.0			
				0	Edge 3	106	5530	0.214	14.5	14.0	0.146	0.164	
				0	Edge 3	106	5530	0.214	14.5	14.0	0.146	0.164	
Frequency Band	Mode	Antenna	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.	Meas.	Scaled	
5.8 GHz U-NII 3	802.11ac (VHT80) 29.3 Mbps	SISO Main	On	0	Rear	155	5775	0.962	8.5	8.4	0.830	0.849	9
			Off	4	Rear	155	5775	0.447	14.5	14.3	0.393	0.412	
					Edge 2	155	5775	0.151	14.5	14.3	0.078	0.082	
		SISO Sub	On	0	Rear	155	5775	2.245	9.5	8.8	0.844	0.992	
			Off	4	Rear	155	5775	1.344	14.5	14.0	0.536	0.601	
					Edge 3	155	5775	0.228	14.5	14.0	0.161	0.181	
5.8 GHz U-NII 3	802.11ac (VHT80) 29.3 Mbps	MIMO Main	On	0	Rear	155	5775	2.020	8.5	8.3	0.680	0.712	
			Off	4	Rear	155	5775	0.866	14.5	14.1	0.326	0.357	
				0	Edge 2	155	5775	0.237	14.5	14.1			
				0	Edge 3	155	5775	0.365	14.5	14.1	0.066	0.072	
		MIMO Sub	On	0	Rear	155	5775	2.020	9.5	9.4	0.835	0.854	
			Off	4	Rear	155	5775	0.866	14.5	13.9	0.687	0.789	
				0	Edge 2	155	5775	0.237	14.5	13.9			
				0	Edge 3	155	5775	0.365	14.5	13.9	0.224	0.257	
				0	Edge 3	155	5775	0.365	14.5	13.9	0.224	0.257	

Note(s):

1. Highest reported SAR is ≤ 0.4 W/kg. Therefore, further SAR measurements within this exposure condition are not required.
2. Highest reported SAR is > 0.4 W/kg. Due to the highest reported SAR for this test position, other test positions in Head exposure condition were evaluated until a SAR ≤ 0.8 W/kg was reported.
3. Testing for a second channel was required because the reported SAR for this test position was > 0.8 W/kg.
4. Additional testing required in order satisfying FCC simultaneous transmission limit criteria.
5. All Wi-Fi (U-NII Band) SAR data- used in this report were taken from SAR report 15K20540-S1F, submitted under FCC ID A3LSMT815. Both models share identical antennas and output power. Spot checks were performed on model SM-T815C to ensure SAR values were the same between both models

10.8. Bluetooth

Measured SAR

Frequency Band	Mode	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
						Tune-up limit	Meas.	Meas.	Scaled	
2.4 GHz	GFSK	0	Rear	39	2441.0	10.0	9.9	0.106	0.108	10
			Edge 2	39	2441.0	10.0	9.9	0.022	0.022	

Note(s):

All Bluetooth SAR data- used in this report were taken from SAR report 15K20540-S1F, submitted under FCC ID A3LSMT815. Both models share identical antennas and output power. Spot checks were performed on model SM-T815C to ensure SAR values were the same between both models.

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 < 0.80 W/kg; steps 2) through 4) do not apply.
- 2) When the original highest measured SAR is ≥ 0.80 W/kg, 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 W/kg (~ 10% from the 1-g SAR limit).
- 4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20 .

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Repeated SAR (Yes/No)	Highest Measured SAR (W/kg)	Repeated Measured SAR (W/kg)	Largest to Smallest SAR Ratio
850	GSM 850	Standalone	Rear	No	0.65	N/A	N/A
	WCDMA Band V	Standalone	Rear	No	0.656	N/A	N/A
1900	GSM 1900	Standalone	Edge 4	No	0.615	N/A	N/A
	WCDMA Band II	Standalone	Rear	No	0.539	N/A	N/A
2400	Wi-Fi 802.11b/g/n	Standalone	Rear	No	0.628	N/A	N/A
	Bluetooth	Standalone	Rear	No	0.106	N/A	N/A
2600	LTE 41	Standalone	Rear	No	0.633	N/A	N/A
5300	Wi-Fi 802.11a/n/ac	Standalone	Rear	No	0.803	0.84	1.05
5500	Wi-Fi 802.11a/n/ac	Standalone	Rear	No	0.985	0.999	1.01
5800	Wi-Fi 802.11a/n/ac	Standalone	Rear	No	0.844	0.86	1.02

Note(s):

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

12. 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:

SAR₁ 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

SAR₂ 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				
Standalone	1	GSM(GPRS/EDGE)	+	DTS		
	2	GSM(GPRS/EDGE)	+	U-NII		
	3	GSM(GPRS/EDGE)	+	BT		
	4	GSM(GPRS/EDGE)	+	DTS	+	BT
	5	GSM(GPRS/EDGE)	+	U-NII	+	BT
	6	W-CDMA	+	DTS		
	7	W-CDMA	+	U-NII		
	8	W-CDMA	+	BT		
	9	W-CDMA	+	DTS	+	BT
	10	W-CDMA	+	U-NII	+	BT
	11	LTE	+	DTS		
	12	LTE	+	U-NII		
	13	LTE	+	BT		
	14	LTE	+	DTS	+	BT
	15	LTE	+	U-NII	+	BT
Notes:						
1. Only DTS supports Hotspot.						
2. GPRS/EDGE, W-CDMA and LTE support Hotspot.						
3. VoIP is supported in GPRS/EDGE, W-CDMA and LTE.						
4. DTS Radio can transmit simultaneously w ith Bluetooth Radio.						
5. U-NII Radio can transmit simultaneously w ith Bluetooth Radio.						

Estimated SAR for Simultaneous Transmission SAR Analysis

Considerations for SAR estimation

- When standalone SAR test exclusion applies, standalone SAR must also be estimated to determine simultaneous transmission SAR test exclusion.
- Dedicated Host Approach criteria for SAR test exclusion is likewise applied to SAR estimation, with certain distinctions between test exclusion and SAR estimation:
 - When the separation distance from the antenna to an adjacent edge is ≤ 5 mm, a distance of 5 mm is applied for SAR estimation; this is the same between test exclusion and SAR estimation calculations.
 - When the separation distance from the antenna to an adjacent edge is > 5 mm but ≤ 50 mm, the actual antenna-to-edge separation distance is applied for SAR estimation.
 - When the minimum test separation distance is > 50 mm, the estimated SAR value is 0.4 W/kg
- Please refer to Estimated SAR Tables to see which test positions are inherently compliant as they consist of only estimated SAR values for all applicable transmitters and consequently will always have sum of SAR values < 1.2 W/kg. Simultaneous transmission SAR analysis was therefore not performed for these test positions.

Estimated SAR for WWAN

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Estimated 1-g SAR Value (W/kg)					
			dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off																
Cellular	GPRS 2 Slots	848.8	33.50	560	0	0	43	233	43		-MEASURE-	-MEASURE-	-MEASURE-	0.400	-MEASURE-	
Cellular	GPRS 2 Slots	1909.8	30.00	250	0	0	43	233	43		-MEASURE-	-MEASURE-	-MEASURE-	0.400	-MEASURE-	
Cellular	W-CDMA 2	1907.6	23.00	200	0	0	43	233	43		-MEASURE-	-MEASURE-	-MEASURE-	0.400	-MEASURE-	
Cellular	W-CDMA 5	846.6	24.00	251	0	0	43	233	43		-MEASURE-	-MEASURE-	-MEASURE-	0.400	-MEASURE-	
Cellular	LTE Band 41	2680	23.50	224	0	0	43	233	43		-MEASURE-	-MEASURE-	-MEASURE-	0.400	-MEASURE-	
Power Back-off, Proximity Sensor On																
Cellular	GPRS 4 Slots	848.8	24.50	141	0	0	43	233	43		-MEASURE-	-MEASURE-	-MEASURE-	0.400	-MEASURE-	
Cellular	GPRS 4 Slots	1909.8	21.50	71	0	0	43	233	43		-MEASURE-	-MEASURE-	0.304	0.400	0.304	
Cellular	W-CDMA 2	1907.6	13.00	20	0	0	43	233	43		-MEASURE-	-MEASURE-	0.086	0.400	0.086	
Cellular	W-CDMA 5	846.6	16.00	40	0	0	43	233	43		-MEASURE-	-MEASURE-	0.114	0.400	0.114	
Cellular	LTE Band 41	2680	17.50	56	0	0	43	233	43		-MEASURE-	-MEASURE-	0.284	0.400	0.284	

Estimated SAR for WLAN

SISO (Antenna 1)

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Estimated 1-g SAR Value (W/kg)					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off															
Wi-Fi 2.4 GHz	2462	17.50	56	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	-MEASURE	0.400	
Wi-Fi 5.2 GHz	5240	14.50	28	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.305	0.400	
Wi-Fi 5.3 GHz	5320	14.50	28	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.308	0.400	
Wi-Fi 5.5 GHz	5700	14.50	28	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.318	0.400	
Wi-Fi 5.8 GHz	5825	14.50	28	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.322	0.400	
Bluetooth	2480	10.00	10	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.075	0.400	
Power Back-off, Proximity Sensor On															
Wi-Fi 2.4 GHz	2462	14.50	28	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.209	0.400	
Wi-Fi 5.2 GHz	5240	8.50	7	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.076	0.400	
Wi-Fi 5.3 GHz	5320	8.50	7	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.077	0.400	
Wi-Fi 5.5 GHz	5700	8.50	7	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.080	0.400	
Wi-Fi 5.8 GHz	5825	8.50	7	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.080	0.400	

SISO (Antenna 2)

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Estimated 1-g SAR Value (W/kg)					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off															
Wi-Fi 2.4 GHz	2462	17.50	56	0.8	221	65.8	4.29	81		-MEASURE	0.400	0.400	-MEASURE	0.400	
Wi-Fi 5.2 GHz	5240	14.50	28	0.8	221	65.8	4.29	81		-MEASURE	0.400	0.400	-MEASURE	0.400	
Wi-Fi 5.3 GHz	5320	14.50	28	0.8	221	65.8	4.29	81		-MEASURE	0.400	0.400	-MEASURE	0.400	
Wi-Fi 5.5 GHz	5700	14.50	28	0.8	221	65.8	4.29	81		-MEASURE	0.400	0.400	-MEASURE	0.400	
Wi-Fi 5.8 GHz	5825	14.50	28	0.8	221	65.8	4.29	81		-MEASURE	0.400	0.400	-MEASURE	0.400	
Power Back-off, Proximity Sensor On															
Wi-Fi 2.4 GHz	2462	12.50	18	0.8	221	65.8	4.29	81		-MEASURE	0.400	0.400	-MEASURE	0.400	
Wi-Fi 5.2 GHz	5240	9.50	9	0.8	221	65.8	4.29	81		-MEASURE	0.400	0.400	-MEASURE	0.400	
Wi-Fi 5.3 GHz	5320	9.50	9	0.8	221	65.8	4.29	81		-MEASURE	0.400	0.400	-MEASURE	0.400	
Wi-Fi 5.5 GHz	5700	9.50	9	0.8	221	65.8	4.29	81		-MEASURE	0.400	0.400	-MEASURE	0.400	
Wi-Fi 5.8 GHz	5825	9.50	9	0.8	221	65.8	4.29	81		-MEASURE	0.400	0.400	-MEASURE	0.400	

MIMO (Antenna 1)

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Estimated 1-g SAR Value (W/kg)					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off															
Wi-Fi 2.4 GHz	2462	14.50	28	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.209	0.400	
Wi-Fi 5.2 GHz	5240	14.50	28	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.305	0.400	
Wi-Fi 5.3 GHz	5320	14.50	28	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.308	0.400	
Wi-Fi 5.5 GHz	5700	14.50	28	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.318	0.400	
Wi-Fi 5.8 GHz	5825	14.50	28	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.322	0.400	
Bluetooth	2480	10.00	10	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.075	0.400	
Power Back-off, Proximity Sensor On															
Wi-Fi 2.4 GHz	2462	14.50	28	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.209	0.400	
Wi-Fi 5.2 GHz	5240	8.50	7	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.076	0.400	
Wi-Fi 5.3 GHz	5320	8.50	7	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.077	0.400	
Wi-Fi 5.5 GHz	5700	8.50	7	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.080	0.400	
Wi-Fi 5.8 GHz	5825	8.50	7	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.080	0.400	

MIMO (Antenna 2)

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Estimated 1-g SAR Value (W/kg)					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Full Power, Proximity Sensor Off															
Wi-Fi 2.4 GHz	2462	14.50	28	0.8	221	65.8	4.29	81		-MEASURE	0.400	0.400	-MEASURE	0.400	
Wi-Fi 5.2 GHz	5240	14.50	28	0.8	221	65.8	4.29	81		-MEASURE	0.400	0.400	-MEASURE	0.400	
Wi-Fi 5.3 GHz	5320	14.50	28	0.8	221	65.8	4.29	81		-MEASURE	0.400	0.400	-MEASURE	0.400	
Wi-Fi 5.5 GHz	5700	14.50	28	0.8	221	65.8	4.29	81		-MEASURE	0.400	0.400	-MEASURE	0.400	
Wi-Fi 5.8 GHz	5825	14.50	28	0.8	221	65.8	4.29	81		-MEASURE	0.400	0.400	-MEASURE	0.400	
Power Back-off, Proximity Sensor On															
Wi-Fi 2.4 GHz	2462	12.50	18	0.8	221	65.8	4.29	81		-MEASURE	0.400	0.400	-MEASURE	0.400	
Wi-Fi 5.2 GHz	5240	9.50	9	0.8	221	65.8	4.29	81		-MEASURE	0.400	0.400	-MEASURE	0.400	
Wi-Fi 5.3 GHz	5320	9.50	9	0.8	221	65.8	4.29	81		-MEASURE	0.400	0.400	-MEASURE	0.400	
Wi-Fi 5.5 GHz	5700	9.50	9	0.8	221	65.8	4.29	81		-MEASURE	0.400	0.400	-MEASURE	0.400	
Wi-Fi 5.8 GHz	5825	9.50	9	0.8	221	65.8	4.29	81		-MEASURE	0.400	0.400	-MEASURE	0.400	

12.1. Sum of the SAR for GSM850 & Wi-Fi & BT

Test Position	① WWAN	② DTS (Main Ant)	③ U-NII (Main Ant)	④ BT (Main Ant)	① + ② WWAN + DTS		① + ③ WWAN + U-NII		① + ④ WWAN + BT	
					Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Rear	0.729	0.738	0.849	0.108	1.467	No	1.578	No	0.837	No
Edge 2	0.391	0.046	0.291	0.022	0.437	No	0.682	No	0.413	No

RF Exposure conditions	① WWAN	② DTS (Sub Ant)	③ U-NII (Sub Ant)	④ BT (Main Ant)	① + ② WWAN + DTS		① + ③ WWAN + U-NII		① + ② + ④ WWAN + DTS + BT		① + ③ + ④ WWAN + U-NII + BT	
					Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Rear	0.729	0.631	0.985	0.108	1.360	No	1.714	Yes	1.468	No	1.822	Yes
Edge 2	0.391	0.400	0.400	0.022	0.791	No	0.791	No	0.813	No	0.813	No

RF Exposure conditions	① WWAN	② U-NII (Main + Sub Ant)	③ BT (Main Ant)	① + ② + ③ WWAN + U-NII (Main + Sub Ant) + BT	
				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Rear	0.729	0.854	0.108	1.691	Yes

SAR to Peak Location Separation Ratio (SPLSR)

Test Position	Worst-case combination				Σ 1-g SAR (mW/g)		Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
	① WWAN	② DTS (Sub Ant)	③ U-NII (Sub Ant)	④ BT (Main Ant)						
Rear	0.729		0.985	0.108	① + ③ + ④	1.822				1
	0.729		0.985		① + ③	1.714	230.2	0.010	No	
	0.729			0.108	① + ④	0.837	206.3	0.004	No	
			0.985	0.108	③ + ④	1.093	77.6	0.015	No	

Test Position	Worst-case combination			Σ 1-g SAR (mW/g)		Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
	① WWAN	② U-NII (Main + Sub Ant)	④ BT (Main Ant)						
Rear	0.729	0.854	0.108	① + ② + ④	1.691				2
	0.729	0.854		① + ②	1.583	227.5	0.009	No	
	0.729		0.108	① + ④	0.837	206.3	0.004	No	
		0.854	0.108	② + ④	0.962	74.2	0.013	No	

Note(s):

All GSM 850, Wi-Fi and Bluetooth SAR values (measured or estimated) used in this report were taken from SAR report 15K20540-S1F, submitted under FCC ID A3LSMT815

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

Test Position	① WWAN	② DTS (Main Ant)	③ U-NII (Main Ant)	④ BT (Main Ant)	① + ② WWAN + DTS		① + ③ WWAN + U-NII		① + ④ WWAN + BT	
					Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Rear	0.539	0.738	0.849	0.108	1.277	No	1.388	No	0.647	No
Edge 2	0.055	0.046	0.291	0.022	0.101	No	0.346	No	0.077	No

RF Exposure conditions	① WWAN	② DTS (Sub Ant)	③ U-NII (Sub Ant)	④ BT (Main Ant)	① + ② WWAN + DTS		① + ③ WWAN + U-NII		① + ② + ④ WWAN + DTS + BT		① + ③ + ④ WWAN + U-NII + BT	
					Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Rear	0.539	0.631	0.985	0.108	1.170	No	1.524	No	1.278	No	1.632	Yes
Edge 2	0.055	0.400	0.400	0.022	0.455	No	0.455	No	0.477	No	0.477	No

RF Exposure conditions	① WWAN	② U-NII (Main + Sub Ant)	③ BT (Main Ant)	① + ② + ③ WWAN + U-NII (Main + Sub Ant) + BT	
				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Rear	0.539	0.854	0.108	1.501	No

SAR to Peak Location Separation Ratio (SPLSR)

Test Position	Worst-case combination				Σ 1-g SAR (mW/g)		Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
	① WWAN	② DTS (Sub Ant)	③ U-NII (Sub Ant)	④ BT (Main Ant)						
Rear	0.539		0.985	0.108	① + ③ + ④	1.632				3
	0.539		0.985		① + ③	1.524	229.5	0.008	No	
	0.539			0.108	① + ④	0.647	212.1	0.002	No	
			0.985	0.108	③ + ④	1.093	77.6	0.015	No	

Note(s):

All GSM 1900, Wi-Fi and Bluetooth SAR values (measured or estimated) used in this report were taken from SAR report 15K20540-S1F, submitted under FCC ID A3LSMT815

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

Test Position	① WWAN	② DTS (Main Ant)	③ U-NII (Main Ant)	④ BT (Main Ant)	① + ② WWAN + DTS		① + ③ WWAN + U-NII		① + ④ WWAN + BT	
					Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Rear	0.736	0.738	0.849	0.108	1.474	No	1.585	No	0.844	No
Edge 2	0.399	0.046	0.291	0.022	0.445	No	0.690	No	0.421	No

RF Exposure conditions	① WWAN	② DTS (Sub Ant)	③ U-NII (Sub Ant)	④ BT (Main Ant)	① + ② WWAN + DTS		① + ③ WWAN + U-NII		① + ② + ④ WWAN + DTS + BT		① + ③ + ④ WWAN + U-NII + BT	
					Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Rear	0.736	0.631	0.985	0.108	1.367	No	1.721	Yes	1.475	No	1.829	Yes
Edge 2	0.399	0.400	0.400	0.022	0.799	No	0.799	No	0.821	No	0.821	No

RF Exposure conditions	① WWAN	② U-NII (Main + Sub Ant)	③ BT (Main Ant)	① + ② + ③ WWAN + U-NII (Main + Sub Ant) + BT	
				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Rear	0.736	0.854	0.108	1.698	Yes

SAR to Peak Location Separation Ratio (SPLSR)

Test Position	Worst-case combination				Σ 1-g SAR (mW/g)		Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
	① WWAN	② DTS (Sub Ant)	③ U-NII (Sub Ant)	④ BT (Main Ant)						
Rear	0.736		0.985	0.108	① + ③ + ④	1.829				4
	0.736		0.985		① + ③	1.721	231.9	0.010	No	
	0.736			0.108	① + ④	0.844	208.5	0.004	No	
			0.985	0.108	③ + ④	1.093	77.6	0.015	No	
Test Position	Worst-case combination			Σ 1-g SAR (mW/g)		Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure	
	① WWAN	② U-NII (Main + Sub Ant)	④ BT (Main Ant)							
Rear	0.736	0.854	0.108	① + ② + ④	1.698				5	
	0.736	0.854		① + ②	1.590	229.2	0.009	No		
	0.736		0.108	① + ④	0.844	208.5	0.004	No		
		0.854	0.108	② + ④	0.962	74.2	0.013	No		

Note(s):

All WCDMA Band V, Wi-Fi and Bluetooth SAR values (measured or estimated) used in this report were taken from SAR report 15K20540-S1F, submitted under FCC ID A3LSMT815

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

Test Position	① WWAN	② DTS (Main Ant)	③ U-NII (Main Ant)	④ BT (Main Ant)	① + ② WWAN + DTS		① + ③ WWAN + U-NII		① + ④ WWAN + BT	
					Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Rear	0.619	0.738	0.849	0.108	1.357	No	1.468	No	0.727	No
Edge 2	0.040	0.046	0.291	0.022	0.086	No	0.331	No	0.062	No

RF Exposure conditions	① WWAN	② DTS (Sub Ant)	③ U-NII (Sub Ant)	④ BT (Main Ant)	① + ② WWAN + DTS		① + ③ WWAN + U-NII		① + ② + ④ WWAN + DTS + BT		① + ③ + ④ WWAN + U-NII + BT	
					Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Rear	0.619	0.631	0.985	0.108	1.250	No	1.604	Yes	1.358	No	1.712	Yes
Edge 2	0.040	0.400	0.400	0.022	0.440	No	0.440	No	0.462	No	0.462	No

RF Exposure conditions	① WWAN	② U-NII (Main + Sub Ant)	③ BT (Main Ant)	① + ② + ③ WWAN + U-NII (Main + Sub Ant) + BT	
				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Rear	0.619	0.854	0.108	1.581	No

SAR to Peak Location Separation Ratio (SPLSR)

Test Position	Worst-case combination				Σ 1-g SAR (mW/g)		Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
	① WWAN	② DTS (Sub Ant)	③ U-NII (Sub Ant)	④ BT (Main Ant)						
Rear	0.619		0.985	0.108	① + ③ + ④	1.712				6
	0.619		0.985		① + ③	1.604	227.0	0.009	No	
	0.619			0.108	① + ④	0.727	213.0	0.003	No	
			0.985	0.108	③ + ④	1.093	77.6	0.015	No	

Note(s):

All WCDMA Band II, Wi-Fi and Bluetooth SAR values (measured or estimated) used in this report were taken from SAR report 15K20540-S1F, submitted under FCC ID A3LSMT815

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

Test Position	① WWAN	② DTS (Main Ant)	③ U-NII (Main Ant)	④ BT (Main Ant)	① + ② WWAN + DTS		① + ③ WWAN + U-NII		① + ④ WWAN + BT	
					Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Rear	0.728	0.738	0.849	0.108	1.466	No	1.577	No	0.836	No
Edge 2	0.033	0.046	0.291	0.022	0.079	No	0.324	No	0.055	No

RF Exposure conditions	① WWAN	② DTS (Sub Ant)	③ U-NII (Sub Ant)	④ BT (Main Ant)	① + ② WWAN + DTS		① + ③ WWAN + U-NII		① + ② + ④ WWAN + DTS + BT		① + ③ + ④ WWAN + U-NII + BT	
					Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)	Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Rear	0.728	0.631	0.985	0.108	1.359	No	1.713	Yes	1.467	No	1.821	Yes
Edge 2	0.033	0.400	0.400	0.022	0.433	No	0.433	No	0.455	No	0.455	No

RF Exposure conditions	① WWAN	② U-NII (Main + Sub Ant)	③ BT (Main Ant)	① + ② + ③ WWAN + U-NII (Main + Sub Ant) + BT	
				Σ 1-g SAR (mW/g)	SPLSR (Yes/ No)
Rear	0.728	0.854	0.108	1.690	Yes

SAR to Peak Location Separation Ratio (SPLSR)

Test Position	Worst-case combination				Σ 1-g SAR (mW/g)		Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
	① WWAN	② DTS (Sub Ant)	③ U-NII (Sub Ant)	④ BT (Main Ant)						
Rear	0.728		0.985	0.108	① + ③ + ④	1.821				7
	0.728		0.985		① + ③	1.713	230.2	0.010	No	
	0.728			0.108	① + ④	0.836	215.6	0.004	No	
			0.985	0.108	③ + ④	1.093	77.6	0.015	No	
Test Position	Worst-case combination			Σ 1-g SAR (mW/g)		Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure	
	① WWAN	② U-NII (Main + Sub Ant)	④ BT (Main Ant)							
Rear	0.728	0.854	0.108	① + ② + ④	1.690				8	
	0.728	0.854		① + ②	1.582	229.2	0.009	No		
	0.728		0.108	① + ④	0.836	208.5	0.004	No		
		0.854	0.108	② + ④	0.962	74.2	0.013	No		

Figure (1)

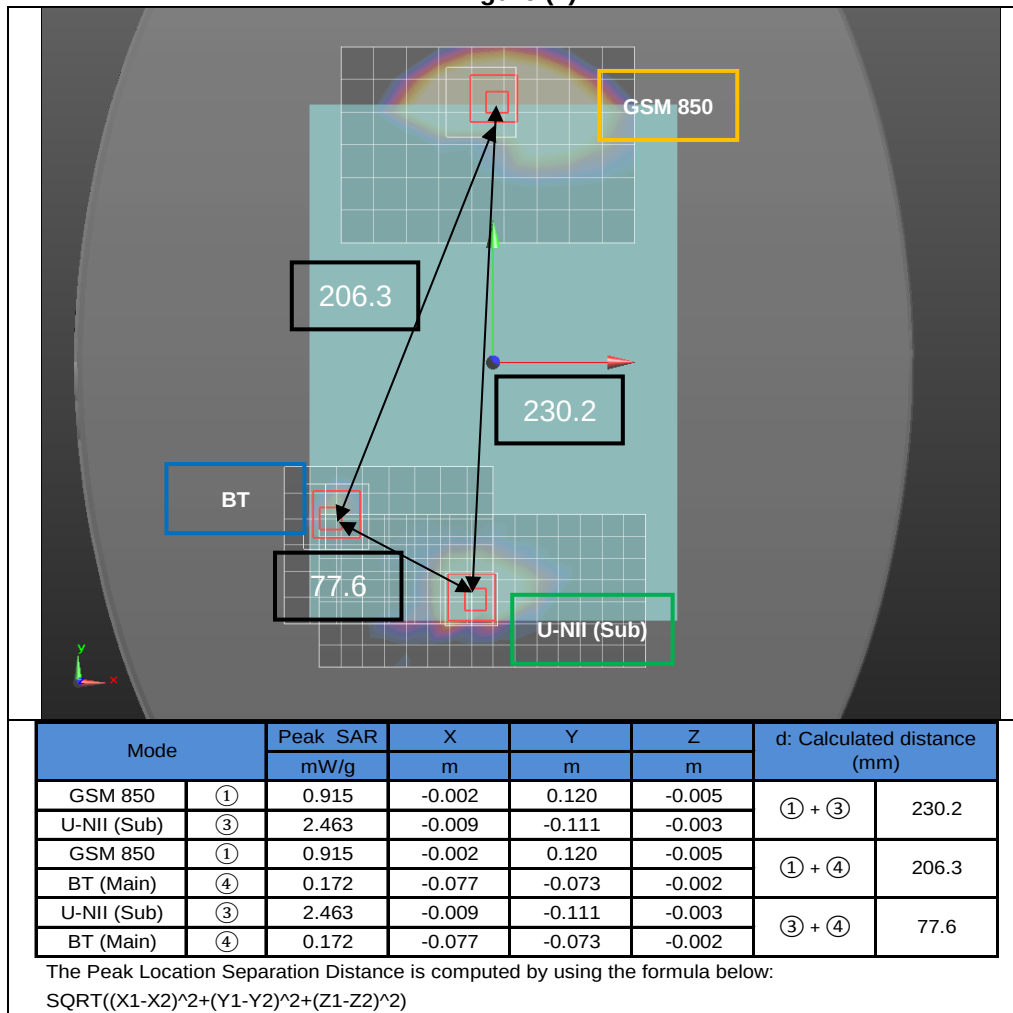


Figure (2)

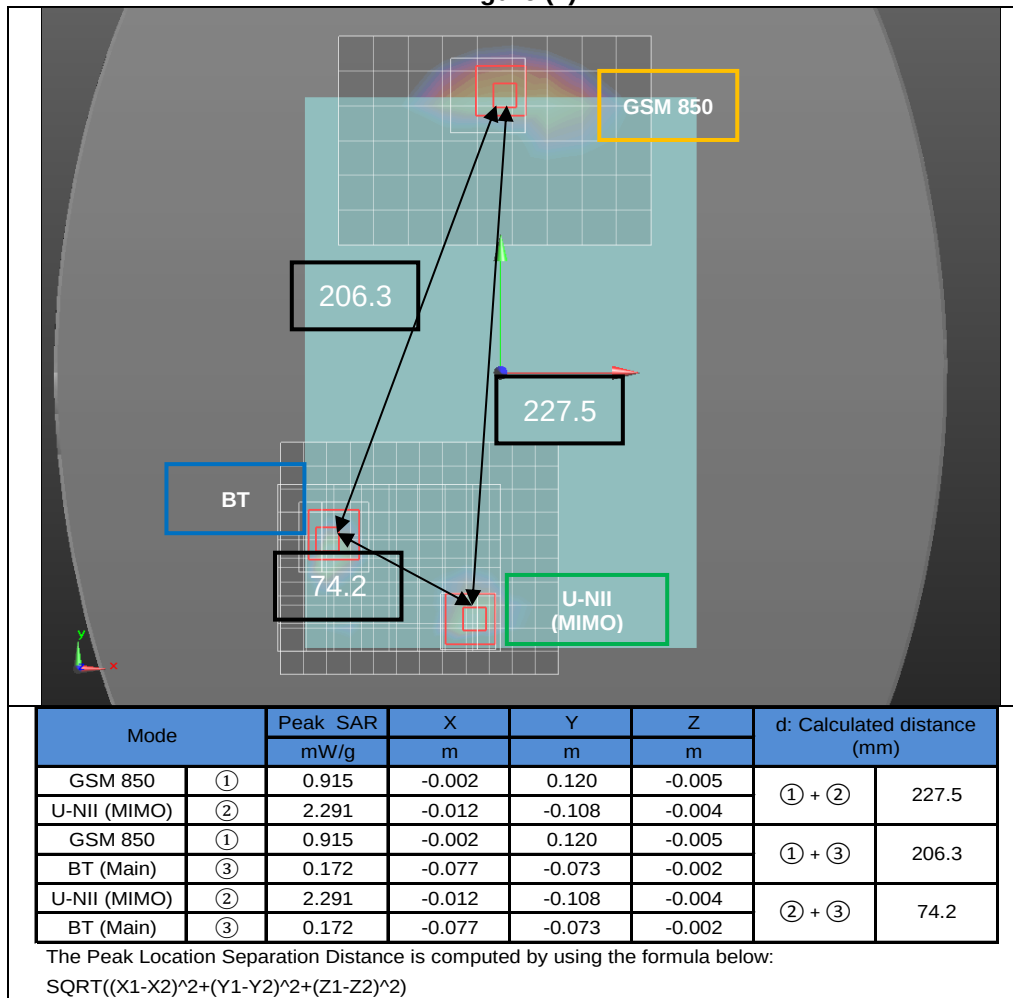


Figure (3)

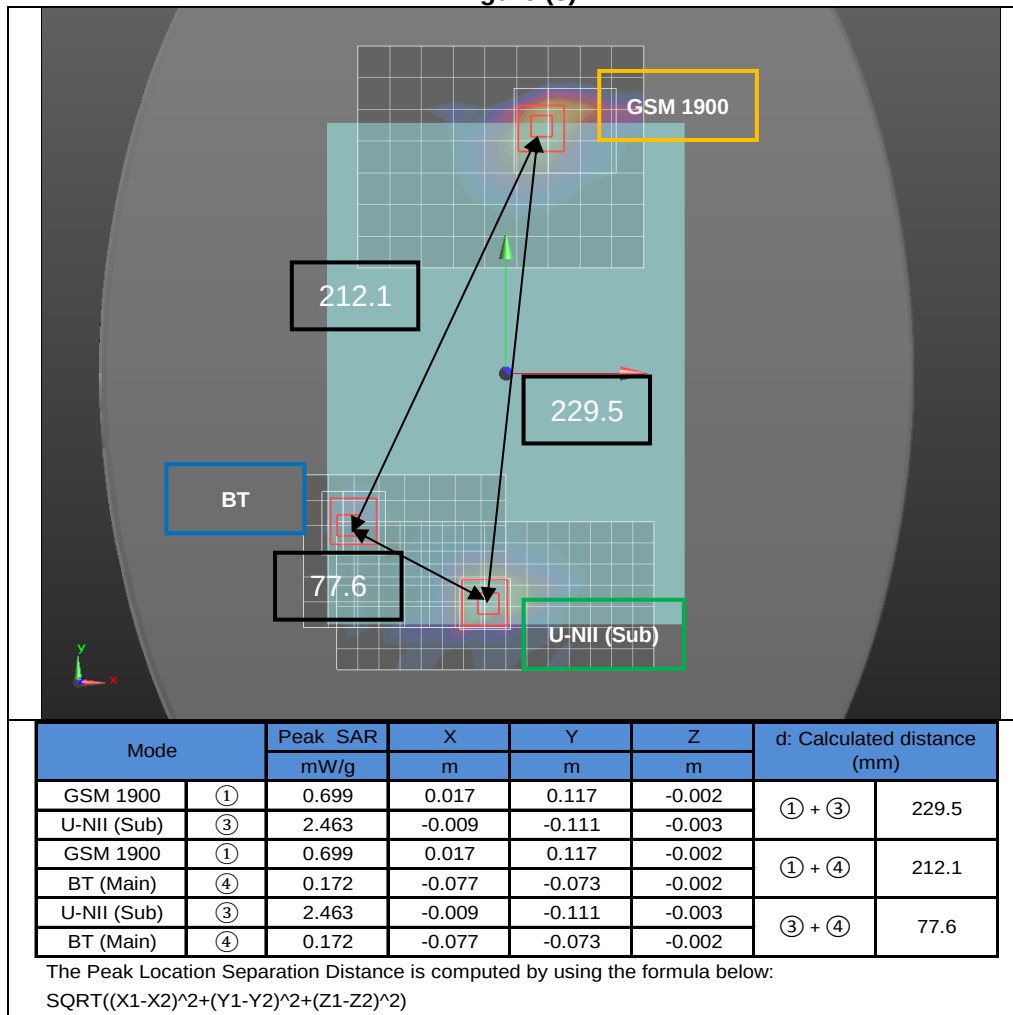


Figure (4)

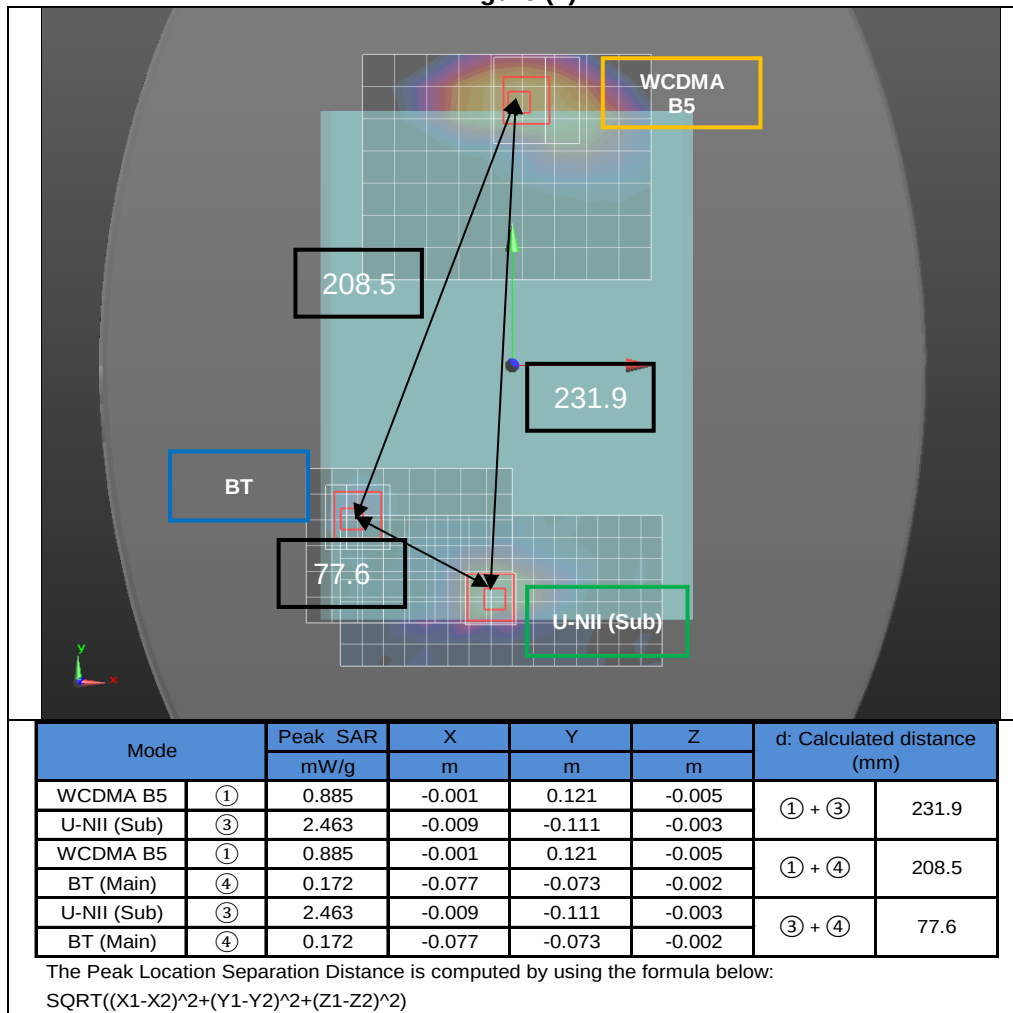


Figure (5)

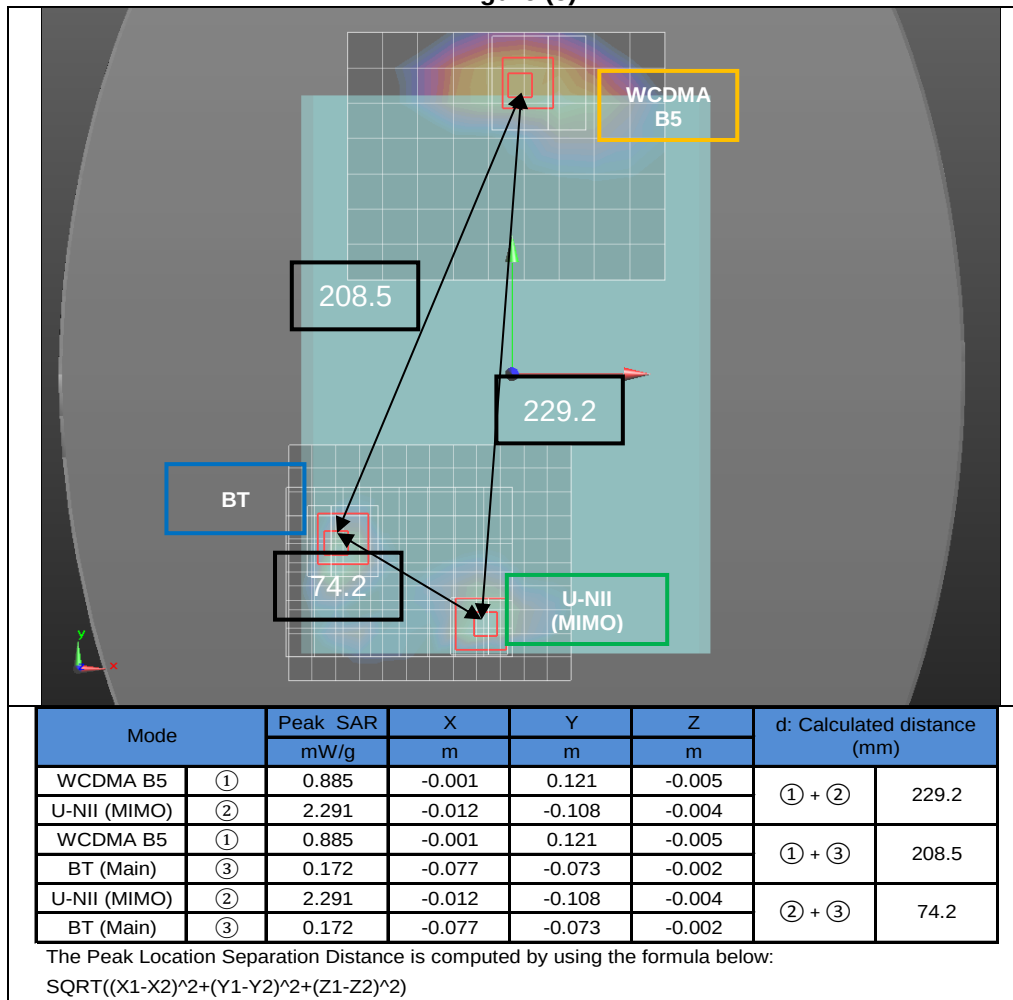


Figure (6)

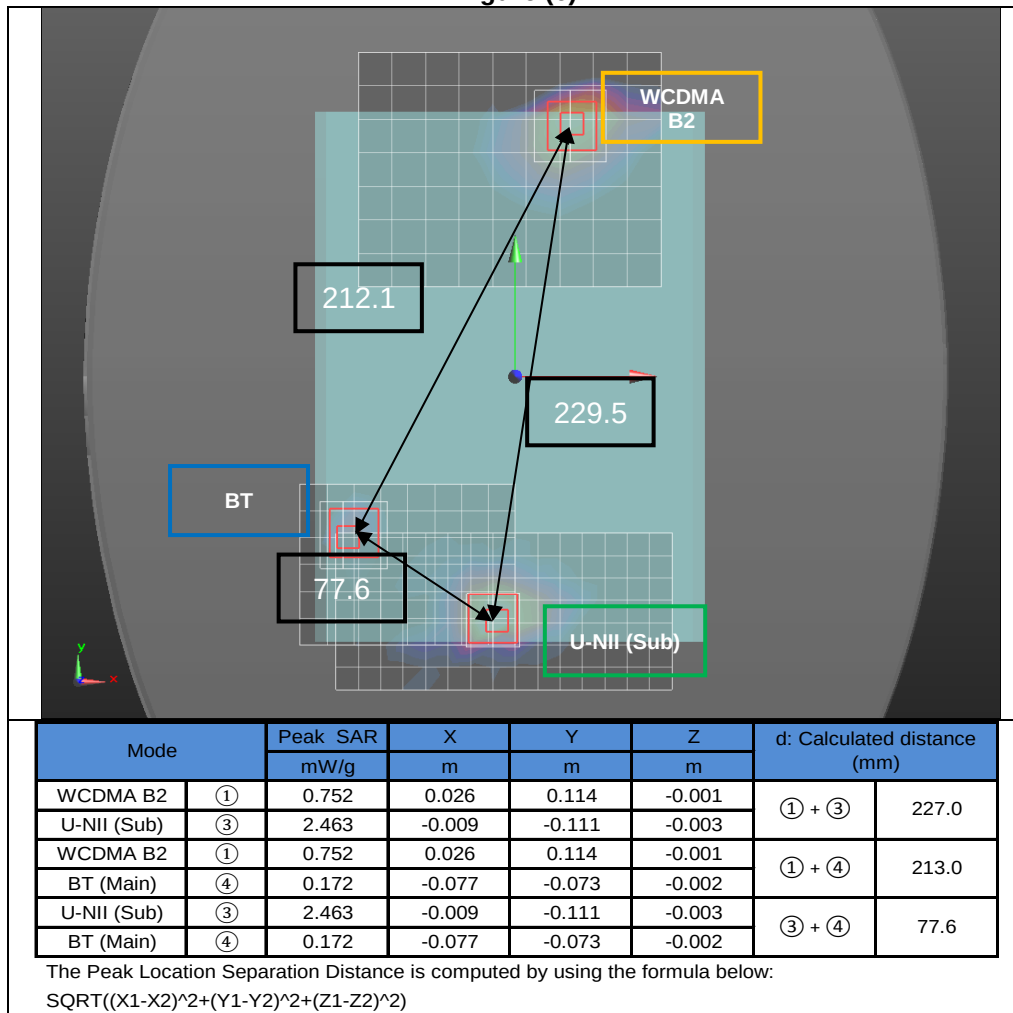


Figure (7)

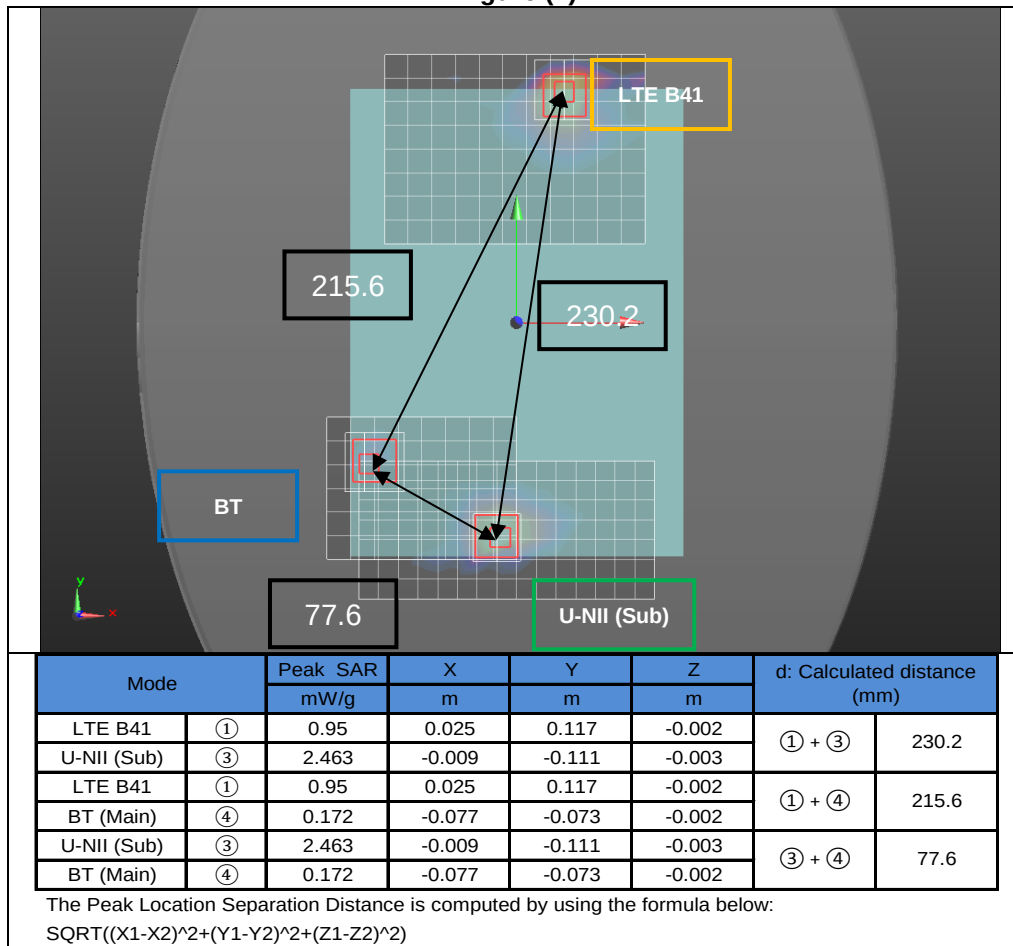
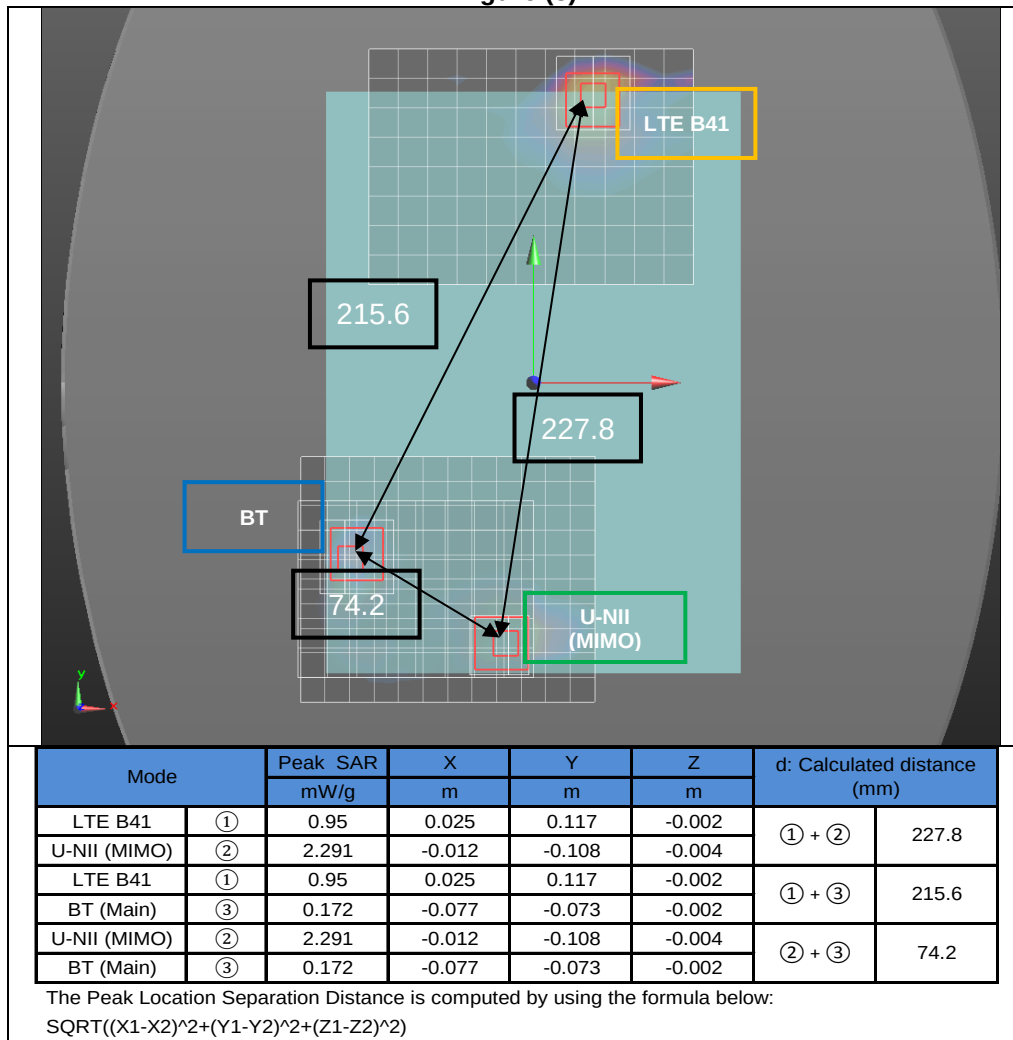


Figure (8)

**Conclusion:**

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

Appendixes

Refer to separated files for the following appendixes.

A_15K20541-S1 SAR Photos & Ant. Locations

B_15K20541-S1 SAR Highest Test Plots

C_15K20541-S1 SAR System Check Plots

D_15K20541-S1 SAR Tissue Ingredients

E_15K20541-S1 SAR Probe Cal. Certificates

F_15K20541-S1 SAR Dipole Cal. Certificates

END OF REPORT