



SAR EVALUATION REPORT

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

For

GSM/CDMA/WCDMA/LTE Tablet + BT/BLE and DTS/UNII a/b/g/n/ac & ANT+

**FCC ID: A3LSMT819C
Model Name: SM-T819C**

**Report Number: 16K23301-S1V2
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Prepared for

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TL-637

Revision History

Rev.	Date	Revisions	Revised By
V1	5/4/2016	Initial Issue	Sunghoon Kim
V2	5/11/2016	Sec 6.2. : Revised "Not support Bandgap channels" Sec 6.3., Sec 9.5. : Removed Ch12 & Ch13 in 2.4GHz Wi-Fi. Sec 6.3., Sec 9.6. : Changed 802.11ac VHT40 Target power in 5GHz Wi-Fi.	Sunghoon Kim

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1. Attestation of Test Results

Applicant Name	SAMSUNG ELECTRONICS CO.,LTD.			
FCC ID	A3LSMT819C			
Model Name	SM-T819C			
Applicable Standards	FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013			
Exposure Category	SAR Limits (W/Kg) Peak spatial-average(1g of tissue)			
General population / Uncontrolled exposure	1.6			
RF Exposure Conditions	Equipment Class - Highest Reported SAR (W/kg)			
	Licensed	DTS	U-NII	DSS (BT)
Standalone	0.734	1.051	0.954	N/A
Simultaneous TX	1.536	1.534	1.536	
Date Tested	4/16/2016 to 4/30/2016			
Test Results	Pass			
UL Korea, Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Korea, Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report. Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by IAS, any agency of the Federal Government, or any agency of any government.				
Approved & Released By:		Prepared By:		
				
Justin Park Senior Engineer UL Korea, Ltd Suwon Laboratory		Sunghoon Kim Laboratory Engineer UL Korea, Ltd Suwon Laboratory		

2. Test Specification, Methods and Procedures

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

- 248227 D01 802.11 Wi-Fi SAR v02r02
- 447498 D01 General RF Exposure Guidance v06
- 616217 D04 SAR for laptop and tablets v01r02
- 690783 D01 SAR Listings on Grants v01r03
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
- 865664 D02 RF Exposure Reporting v01r02
- 941225 D01 3G SAR Procedures v03r01
- 941225 D05 SAR for LTE Devices v02r05
- 941225 D06 Hotspot Mode v02r01

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

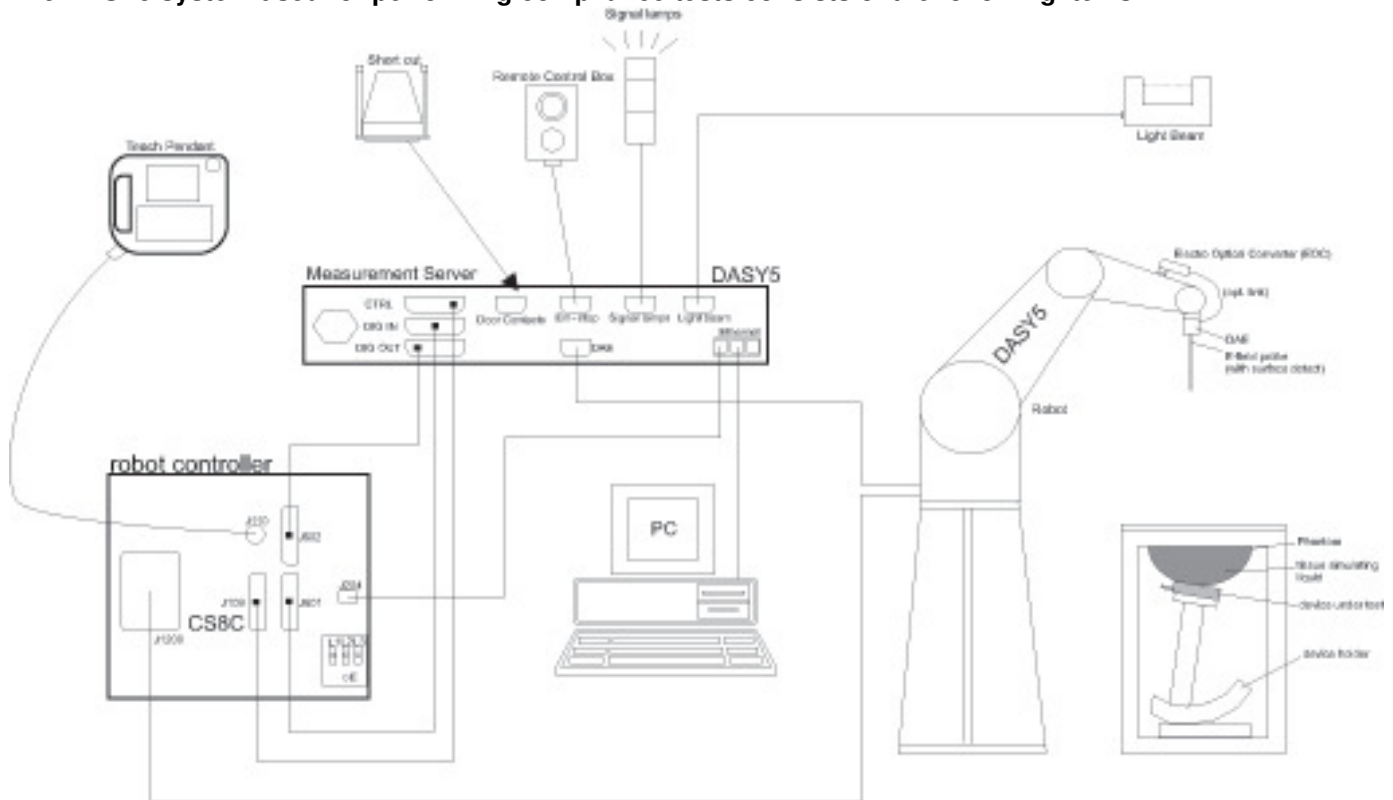
UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637.

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

Step 4: Power drift measurement

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

Step 5: Z-Scan (FCC only)

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

4.3. Test Equipment

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

Dielectric Property Measurements

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Network Analyzer	Agilent	E5071C	MY46522054	8-18-2016
Dielectric Assessment Kit	SPEAG	DAK-3.5	1196	8-4-2016
Shorting block	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	LKM	DTM3000	3424	8-19-2016
Thermometer	Lutron	MHB-382SD	AH.91478	8-12-2016

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
MXG Analog Signal Generator	Agilent	N5181A	MY50145882	8-18-2016
Power Sensor	Agilent	U2000A	MY54260010	8-18-2016
Power Sensor	Agilent	U2000A	MY54260007	8-18-2016
Power Amplifier	EXODUS	1410025-AMP2027-10003	10003	8-18-2016
Directional Coupler	Agilent	772D	MY52180193	8-18-2016
Directional Coupler	Agilent	778D	MY52180432	8-18-2016
Low Pass Filter	MICROLAB	LA-15N	03943	8-18-2016
Low Pass Filter	FILTRON	L14012FL	1410003S	8-18-2016
Low Pass Filter	MICROLAB	LA-60N	03942	8-18-2016
Attenuator	Agilent	8491B/003	MY39269292	8-18-2016
Attenuator	Agilent	8491B/010	MY39269315	8-18-2016
Attenuator	Agilent	8491B/020	MY39269298	8-18-2016
E-Field Probe (SAR1)	SPEAG	EX3DV4	7314	9-25-2016
E-Field Probe (SAR2)	SPEAG	EX3DV4	7376	9-2-2016
E-Field Probe (SAR3)	SPEAG	EX3DV4	7313	12-30-2016
Data Acquisition Electronics (SAR1)	SPEAG	DAE4	1447	9-23-2016
Data Acquisition Electronics (SAR2)	SPEAG	DAE4	1468	9-15-2016
Data Acquisition Electronics (SAR3)	SPEAG	DAE4	1494	11-11-2016
System Validation Dipole	SPEAG	D835V2	4d194	9-17-2016
System Validation Dipole	SPEAG	D1900V2	5d199	2-19-2017
System Validation Dipole	SPEAG	D2450V2	939	9-28-2016
System Validation Dipole	SPEAG	D2600V2	1097	11-18-2016
System Validation Dipole	SPEAG	D5GHzV2	1184	8-26-2016
Thermometer (SAR1)	Lutron	MHB-382SD	AH.91463	8-12-2016
Thermometer (SAR2)	Lutron	MHB-382SD	AH.50215	8-19-2016
Thermometer (SAR3)	Lutron	MHB-382SD	AH.50213	8-24-2016

Other

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Base Station Simulator	R & S	CMW500	150313	8-18-2016
Base Station Simulator	R & S	CMW500	150314	8-18-2016

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, Ch.149)		
Wi-Fi Direct	Wi-Fi Direct enabled devices transfer data directly between each other ☒ Wi-Fi Direct (Wi-Fi 2.4 GHz) ☒ Wi-Fi Direct (Wi-Fi 5 GHz, Ch. 36~48, Ch.149 ~165)		
Test sample information	No.	S/N	Notes
	1	R22H301M3TJ	Main Conduction
	2	R22H301M0BK	Main Conduction
	3	R22H301M62E	WiFi Conduction
	4	R22H3017RCM	SAR
	5	R22H3017QQT	SAR

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode		Duty Cycle used for SAR testing
CDMA2000	BC0	1xRTT (Voice & data) 1xEVDO Rel.0 1xEVDO Rev.A		100%
	Does this device SV-DO (1xRTT-1xEVDO)? ☐ Yes ☒ No			
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. 8) HSUPA (Rel. 6)		100%
LTE	TDD Band 41	QPSK 16QAM ☒ Rel. 10 Does not support Carrier Aggregation (CA)		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		76.85% (DH5)

6.3. Nominal and Maximum Output Power from Tune-up Procedure

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

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	
			Burst	Frame		Burst	Frame
GSM850	Voice/GPRS (1 slot)	33.0	33.5	24.5	25.5	26.0	17.0
	GPRS 2 slots	30.5	31.0	25.0	23.0	23.5	17.5
	GPRS 3 slots	28.5	29.0	24.7	21.5	22.0	17.7
	GPRS 4 slots	26.0	26.5	23.5	20.5	21.0	18.0
	EGPRS 1 slot	27.5	28.0	19.0	21.0	21.5	12.5
	EGPRS 2 slots	25.5	26.0	20.0	20.5	21.0	15.0
	EGPRS 3 slots	24.5	25.0	20.7	17.0	17.5	13.2
	EGPRS 4 slots	24.0	24.5	21.5	16.0	16.5	13.5
GSM1900	Voice/GPRS (1 slot)	29.5	30.0	21.0	20.5	21.0	12.0
	GPRS 2 slots	27.5	28.0	22.0	18.5	19.0	13.0
	GPRS 3 slots	24.5	25.0	20.7	16.5	17.0	12.7
	GPRS 4 slots	23.0	23.5	20.5	15.5	16.0	13.0
	EGPRS 1 slot	25.5	26.0	17.0	18.0	18.5	9.5
	EGPRS 2 slots	25.0	25.5	19.5	17.5	18.0	12.0
	EGPRS 3 slots	23.5	24.0	19.7	14.5	15.0	10.7
	EGPRS 4 slots	23.0	23.5	20.5	13.5	14.0	11.0

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
CDMA BC0	1xRTT	24.5	25.0	14.0	14.5
	1xEVDO Rel.0	24.5	25.0	14.0	14.5
	1xEVDO Rev.A	24.5	25.0	14.0	14.5
W-CDMA Band V	R99	23.5	24.0	15.0	15.5
	HSDPA	22.5	23.0	14.0	14.5
	HSUPA	22.7	23.2	14.0	14.5
W-CDMA Band II	R99	23.8	24.3	11.0	11.5
	HSDPA	22.8	23.3	10.3	10.8
	HSUPA	23.0	23.5	10.0	10.5
LTE Band 41	QPSK	23.8	24.3	14.5	15.0

Upper limit (dB): ~ 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
WiFi 2.4 GHz	802.11b	16.0	16.5	11.0	11.5
	802.11g	15.0	15.5	11.0	11.5
	802.11n HT20	14.0	14.5	11.0	11.5
WiFi 5 GHz	802.11a	12.0	12.5	7.0	7.5
	802.11n HT20	12.0	12.5	7.0	7.5
	802.11n HT40	10.0	10.5	7.0	7.5
	802.11ac VHT20	12.0	12.5	7.0	7.5
	802.11ac VHT40	10.0	10.5	7.0	7.5
	802.11ac VHT80	12.0	12.5	7.0	7.5
Bluetooth		8.0	8.5	N/A	
Bluetooth LE		0.5	1.0	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	40740/ 2605	40740/ 2605	40740/ 2605	40740/ 2605																																								
	High	41140/ 2645	41165/ 2647.5	41190/ 2650	41215/ 2652.5																																								
LTE transmitter and antenna implementation	LTE has 1 Main TX/RX antennas and 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, 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

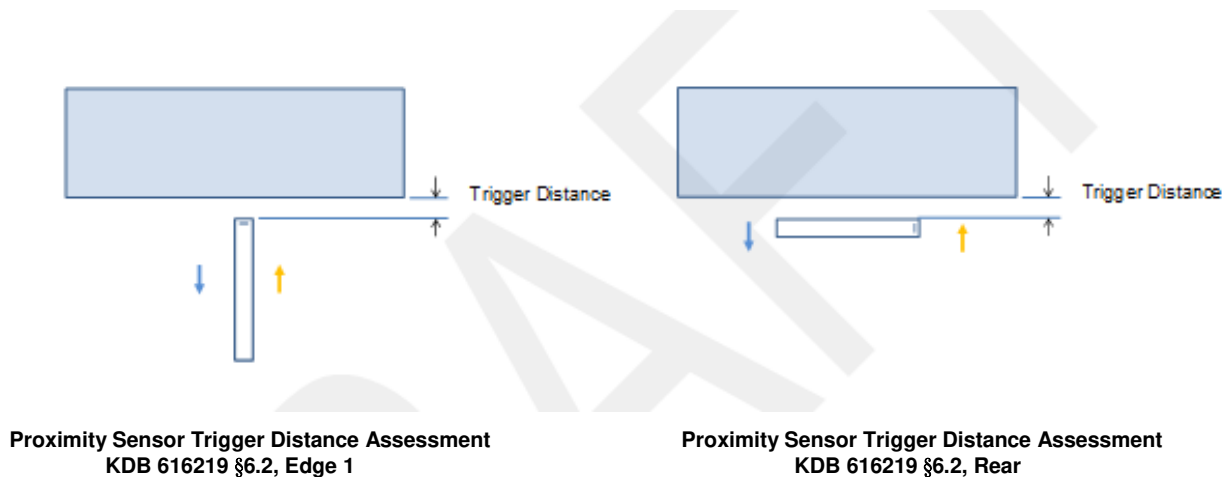
6.6.1. Proximity Sensor Triggering Distance (KDB 616217 §6.2)

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

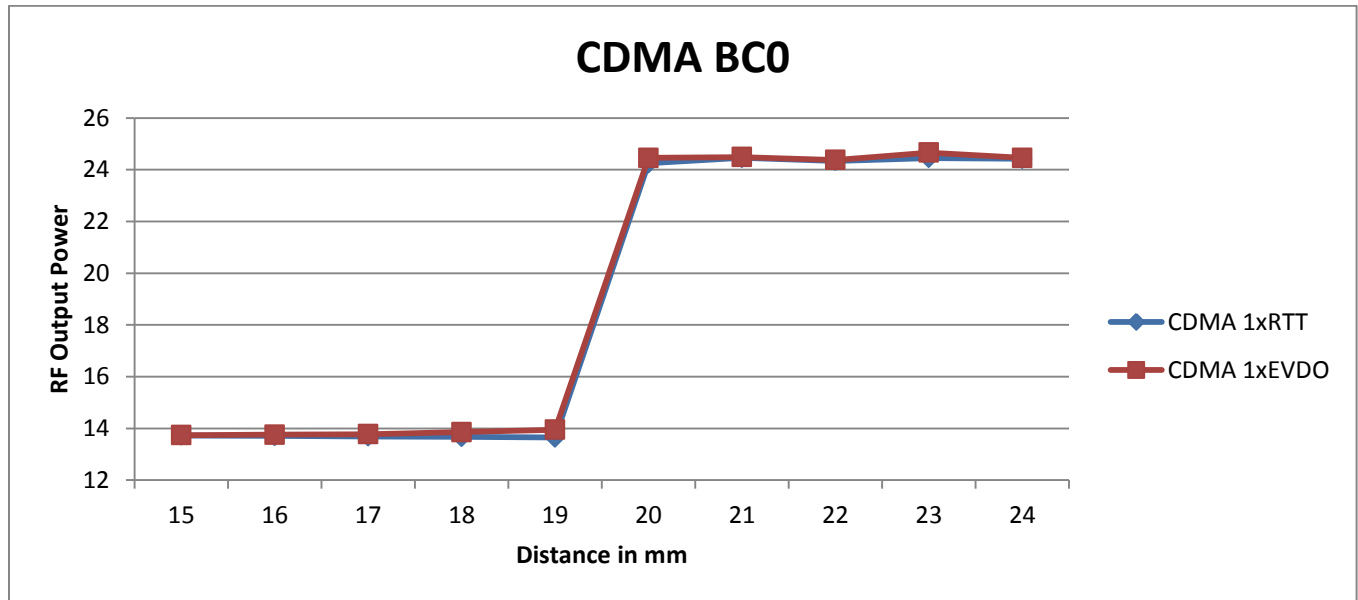
Summary of Trigger Distances

Tissue simulating liquid	Trigger distance - Rear		Trigger distance - Edge 1	
	Moving toward phantom	Moving from phantom	Moving toward phantom	Moving from phantom
850 muscle	19 mm	19 mm	21 mm	21 mm
1900 muscle	19 mm	19 mm	21 mm	21 mm
2450 muscle	6 mm	6 mm	N/A	N/A
2600 muscle	19 mm	19 mm	21 mm	21 mm
5000 muscle	6 mm	6 mm	N/A	N/A

Proximity Sensor Triggering Distance Measurement Results**CDMA BC0**

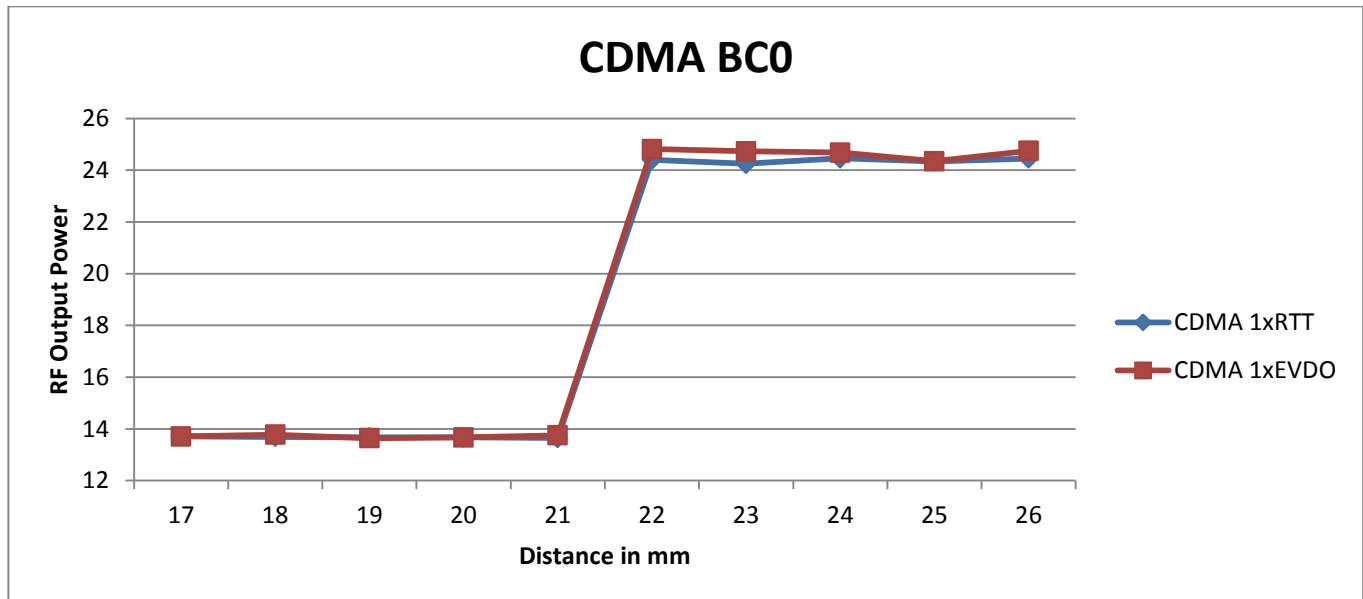
Rear, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm										
Distance (mm)	15	16	17	18	19	20	21	22	23	24
CDMA 1xRTT	13.7	13.7	13.7	13.7	13.7	24.3	24.5	24.3	24.5	24.4
CDMA 1xEVDO	13.7	13.8	13.8	13.9	14.0	24.5	24.5	24.4	24.7	24.5



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

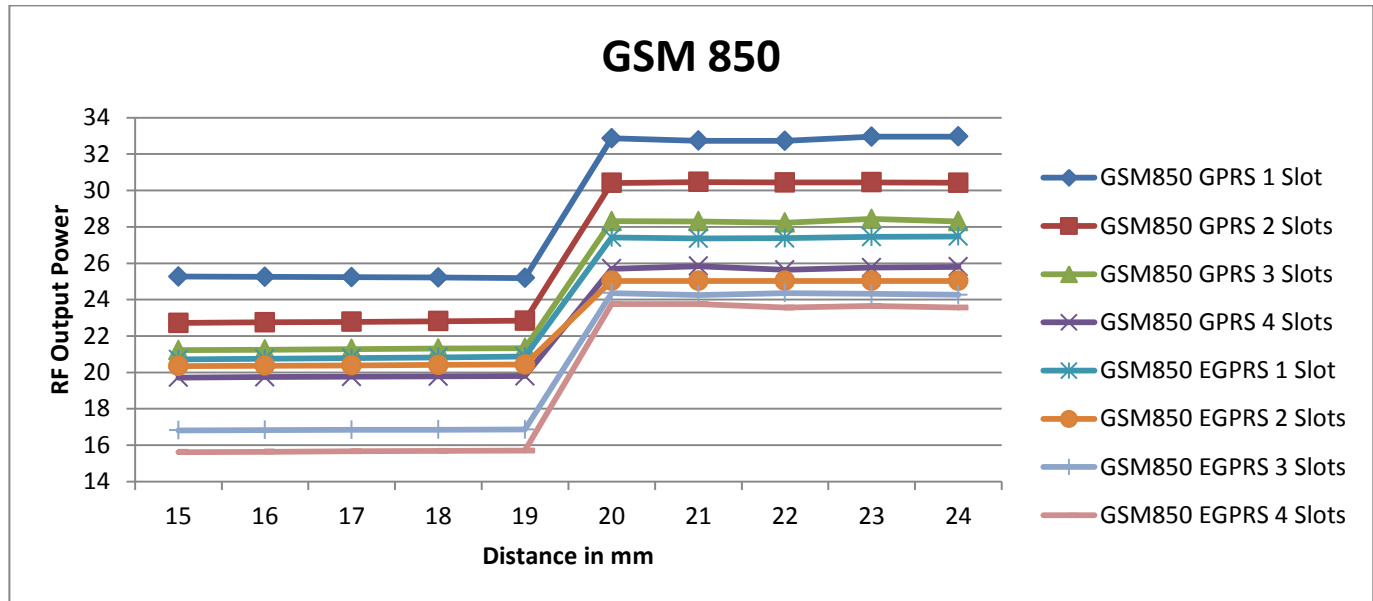
Distance to DUT vs. Output Power in dBm										
Distance (mm)	17	18	19	20	21	22	23	24	25	26
CDMA 1xRTT	13.7	13.7	13.7	13.7	13.7	24.4	24.3	24.5	24.3	24.5
CDMA 1xEVDO	13.7	13.8	13.6	13.7	13.8	24.8	24.7	24.7	24.4	24.8



GSM850

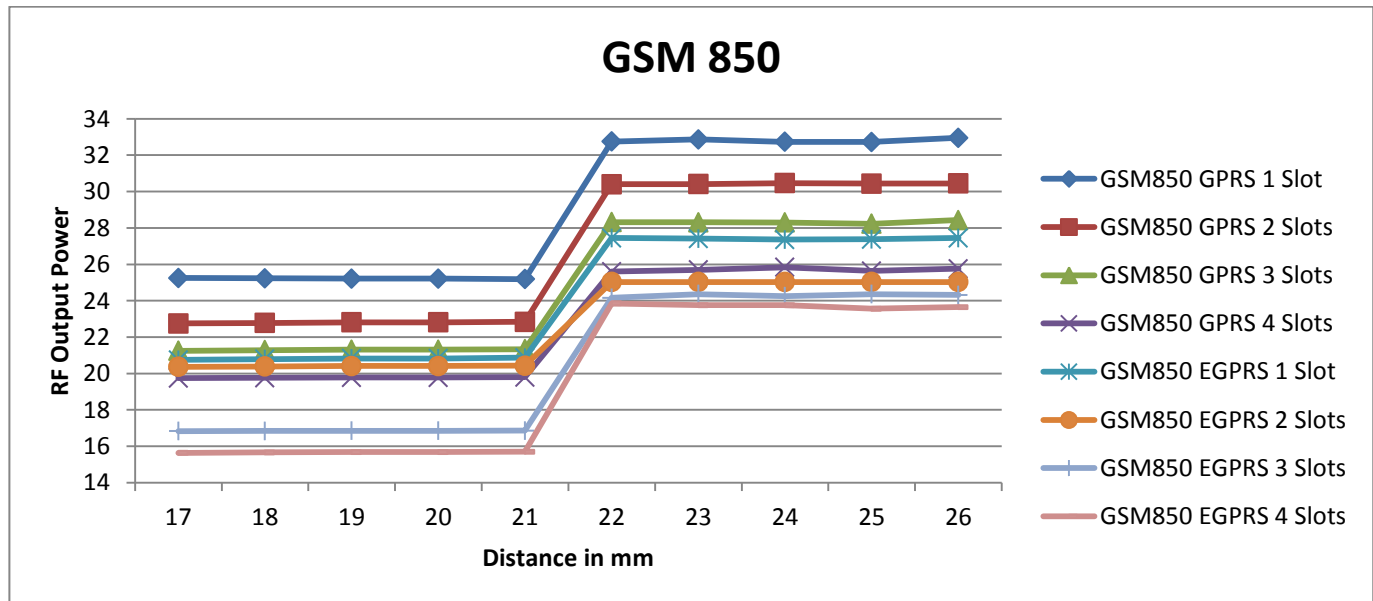
Rear, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm										
Distance (mm)	15	16	17	18	19	20	21	22	23	24
GSM850 GPRS 1 Slot	25.3	25.3	25.2	25.2	25.2	32.9	32.7	32.7	33.0	33.0
GSM850 GPRS 2 Slots	22.7	22.8	22.8	22.8	22.8	30.4	30.5	30.4	30.5	30.4
GSM850 GPRS 3 Slots	21.2	21.3	21.3	21.3	21.3	28.3	28.3	28.2	28.4	28.3
GSM850 GPRS 4 Slots	19.7	19.7	19.8	19.8	19.8	25.7	25.8	25.6	25.8	25.8
GSM850 EGPRS 1 Slot	20.7	20.8	20.8	20.8	20.9	27.4	27.4	27.4	27.5	27.5
GSM850 EGPRS 2 Slots	20.4	20.4	20.4	20.4	20.4	25.0	25.0	25.0	25.0	25.0
GSM850 EGPRS 3 Slots	16.8	16.8	16.8	16.9	16.9	24.4	24.3	24.4	24.3	24.3
GSM850 EGPRS 4 Slots	15.6	15.6	15.7	15.7	15.7	23.8	23.8	23.6	23.7	23.6



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

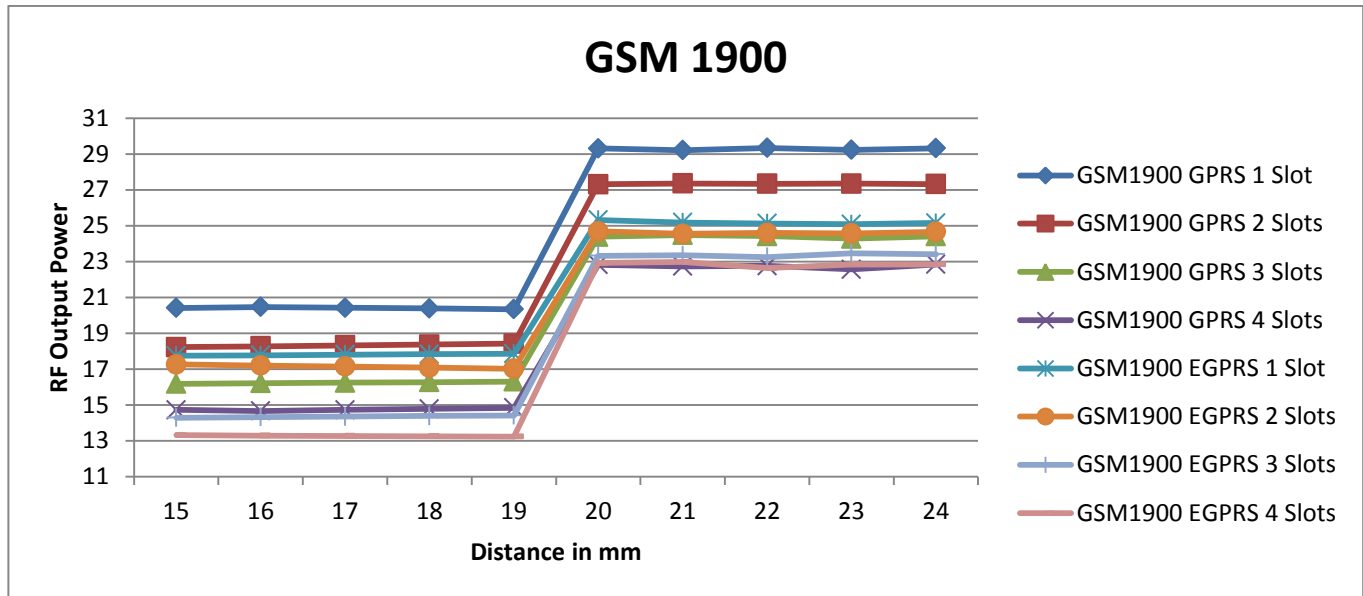
Distance to DUT vs. Output Power in dBm										
Distance (mm)	17	18	19	20	21	22	23	24	25	26
GSM850 GPRS 1 Slot	25.3	25.2	25.2	25.2	25.2	32.8	32.9	32.7	32.7	33.0
GSM850 GPRS 2 Slots	22.8	22.8	22.8	22.8	22.8	30.4	30.4	30.5	30.4	30.5
GSM850 GPRS 3 Slots	21.3	21.3	21.3	21.3	21.3	28.3	28.3	28.3	28.2	28.4
GSM850 GPRS 4 Slots	19.7	19.8	19.8	19.8	19.8	25.6	25.7	25.8	25.6	25.8
GSM850 EGPRS 1 Slot	20.8	20.8	20.8	20.8	20.9	27.5	27.4	27.4	27.4	27.5
GSM850 EGPRS 2 Slots	20.4	20.4	20.4	20.4	20.4	25.0	25.0	25.0	25.0	25.0
GSM850 EGPRS 3 Slots	16.8	16.8	16.9	16.9	16.9	24.2	24.4	24.3	24.4	24.3
GSM850 EGPRS 4 Slots	15.6	15.7	15.7	15.7	15.7	23.9	23.8	23.8	23.6	23.7



GSM1900

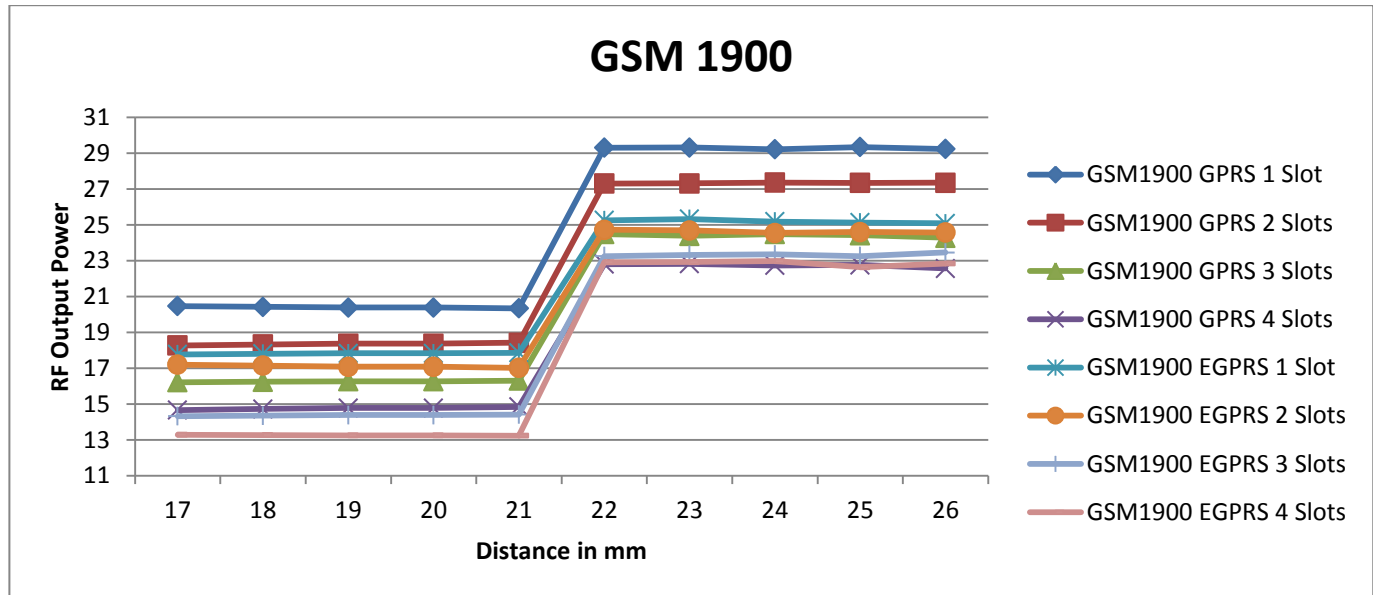
Rear, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm										
Distance (mm)	15	16	17	18	19	20	21	22	23	24
GSM1900 GPRS 1 Slot	20.4	20.5	20.4	20.4	20.3	29.3	29.2	29.3	29.2	29.3
GSM1900 GPRS 2 Slots	18.2	18.3	18.3	18.4	18.4	27.3	27.4	27.3	27.4	27.3
GSM1900 GPRS 3 Slots	16.2	16.2	16.2	16.3	16.3	24.4	24.5	24.4	24.3	24.4
GSM1900 GPRS 4 Slots	14.7	14.7	14.7	14.8	14.8	22.8	22.7	22.8	22.6	22.8
GSM1900 EGPRS 1 Slot	17.7	17.8	17.8	17.8	17.9	25.3	25.2	25.1	25.1	25.2
GSM1900 EGPRS 2 Slots	17.3	17.2	17.1	17.1	17.0	24.7	24.5	24.6	24.6	24.7
GSM1900 EGPRS 3 Slots	14.3	14.3	14.4	14.4	14.4	23.3	23.4	23.3	23.5	23.4
GSM1900 EGPRS 4 Slots	13.3	13.3	13.3	13.3	13.2	22.9	23.0	22.6	22.8	22.8



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

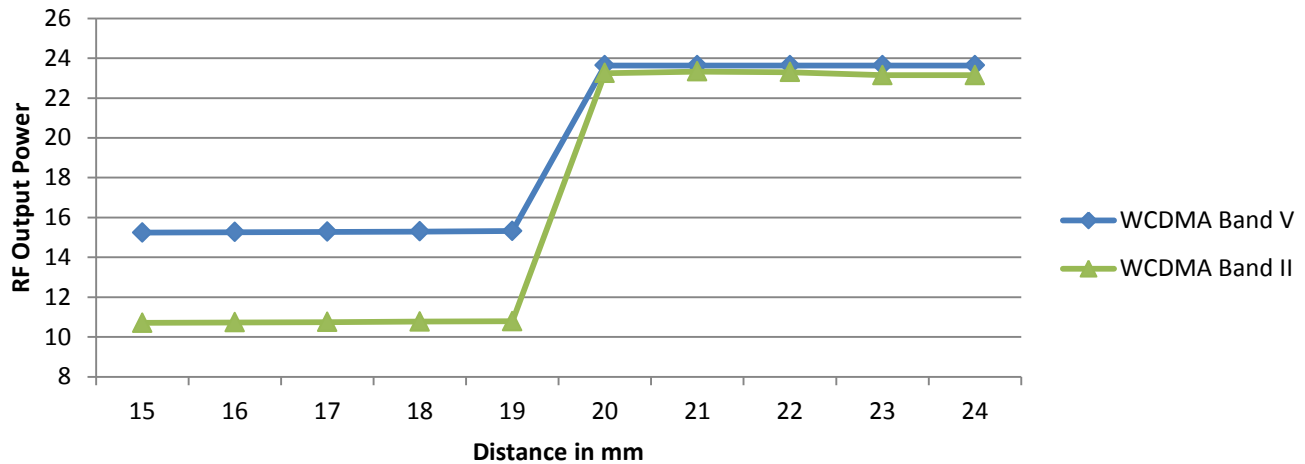
Distance to DUT vs. Output Power in dBm										
Distance (mm)	17	18	19	20	21	22	23	24	25	26
GSM1900 GPRS 1 Slot	20.5	20.4	20.4	20.4	20.3	29.3	29.3	29.2	29.3	29.2
GSM1900 GPRS 2 Slots	18.3	18.3	18.4	18.4	18.4	27.3	27.3	27.4	27.3	27.4
GSM1900 GPRS 3 Slots	16.2	16.2	16.3	16.3	16.3	24.5	24.4	24.5	24.4	24.3
GSM1900 GPRS 4 Slots	14.7	14.7	14.8	14.8	14.8	22.8	22.8	22.7	22.8	22.6
GSM1900 EGPRS 1 Slot	17.8	17.8	17.8	17.8	17.9	25.3	25.3	25.2	25.1	25.1
GSM1900 EGPRS 2 Slots	17.2	17.1	17.1	17.1	17.0	24.7	24.7	24.5	24.6	24.6
GSM1900 EGPRS 3 Slots	14.3	14.4	14.4	14.4	14.4	23.3	23.3	23.4	23.3	23.5
GSM1900 EGPRS 4 Slots	13.3	13.3	13.3	13.3	13.2	22.9	22.9	23.0	22.6	22.8



WCDMA Bands V & II

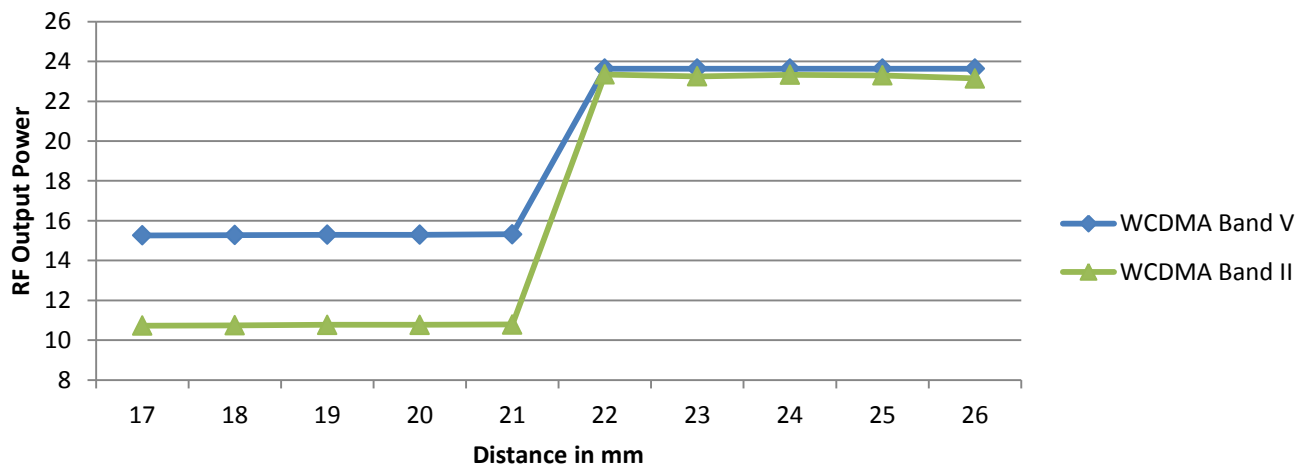
Rear, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm										
Distance (mm)	15	16	17	18	19	20	21	22	23	24
WCDMA Band V	15.2	15.3	15.3	15.3	15.3	23.6	23.6	23.6	23.6	23.6
WCDMA Band II	10.7	10.7	10.8	10.8	10.8	23.3	23.3	23.3	23.2	23.2

WCDMA Bands V / II

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

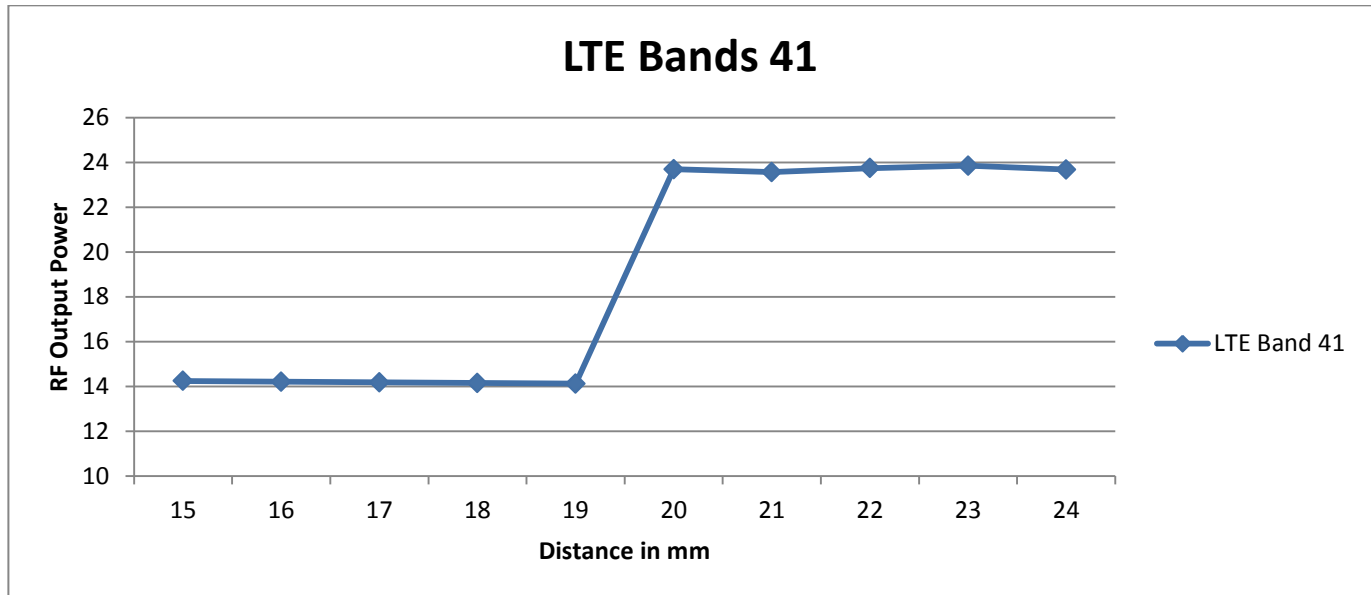
Distance to DUT vs. Output Power in dBm										
Distance (mm)	17	18	19	20	21	22	23	24	25	26
WCDMA Band V	15.3	15.3	15.3	15.3	15.3	23.6	23.6	23.6	23.6	23.6
WCDMA Band II	10.7	10.8	10.8	10.8	10.8	23.4	23.3	23.3	23.3	23.2

WCDMA Bands V / II

LTE Bands 41

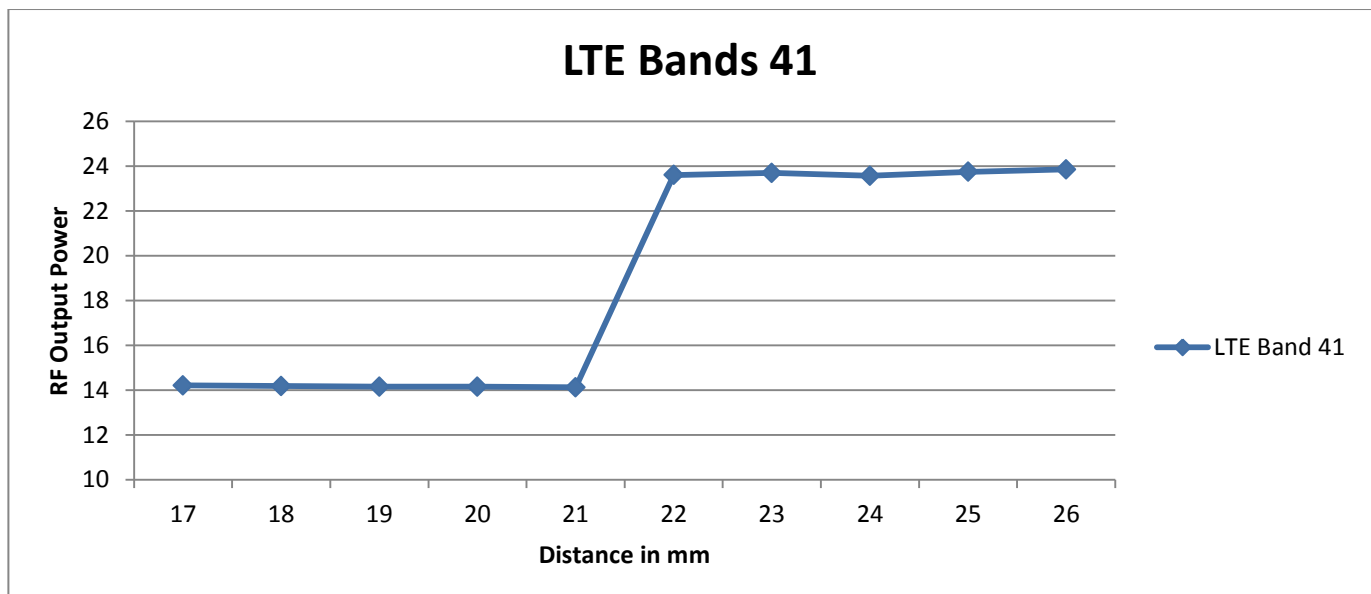
Rear, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm										
Distance (mm)	15	16	17	18	19	20	21	22	23	24
LTE Band 41	14.2	14.2	14.2	14.2	14.1	23.7	23.6	23.7	23.9	23.7



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

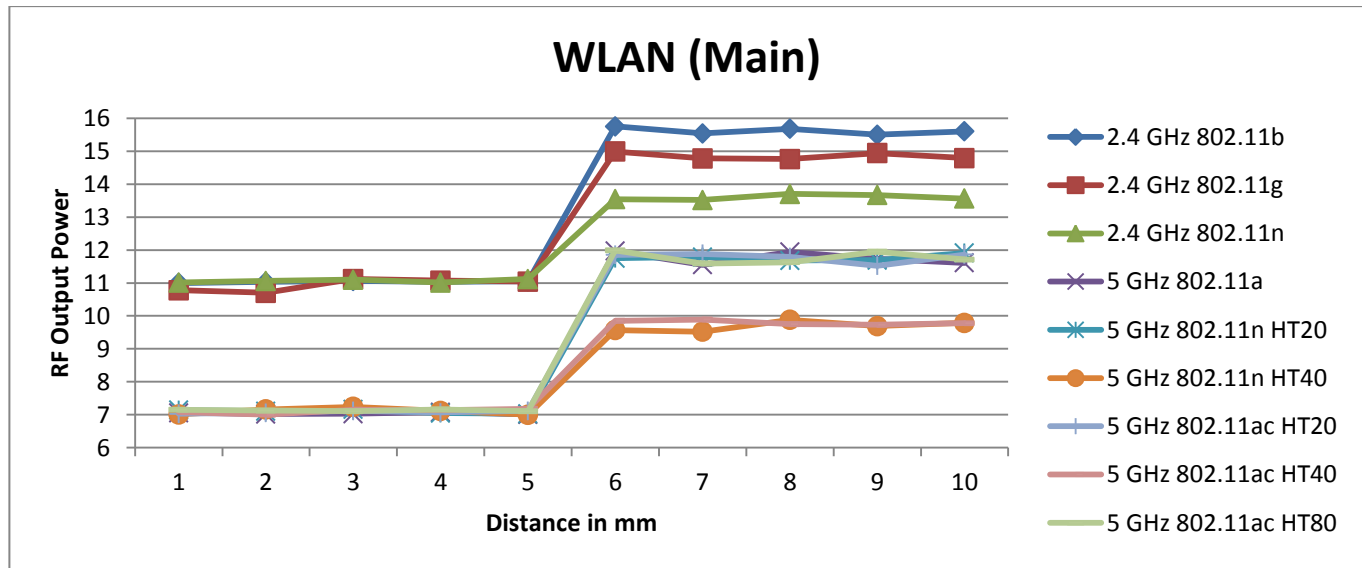
Distance to DUT vs. Output Power in dBm										
Distance (mm)	17	18	19	20	21	22	23	24	25	26
LTE Band 41	14.2	14.2	14.2	14.2	14.1	23.6	23.7	23.6	23.7	23.9



Wi-Fi 2.4GHz and 5GHz (Main)

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

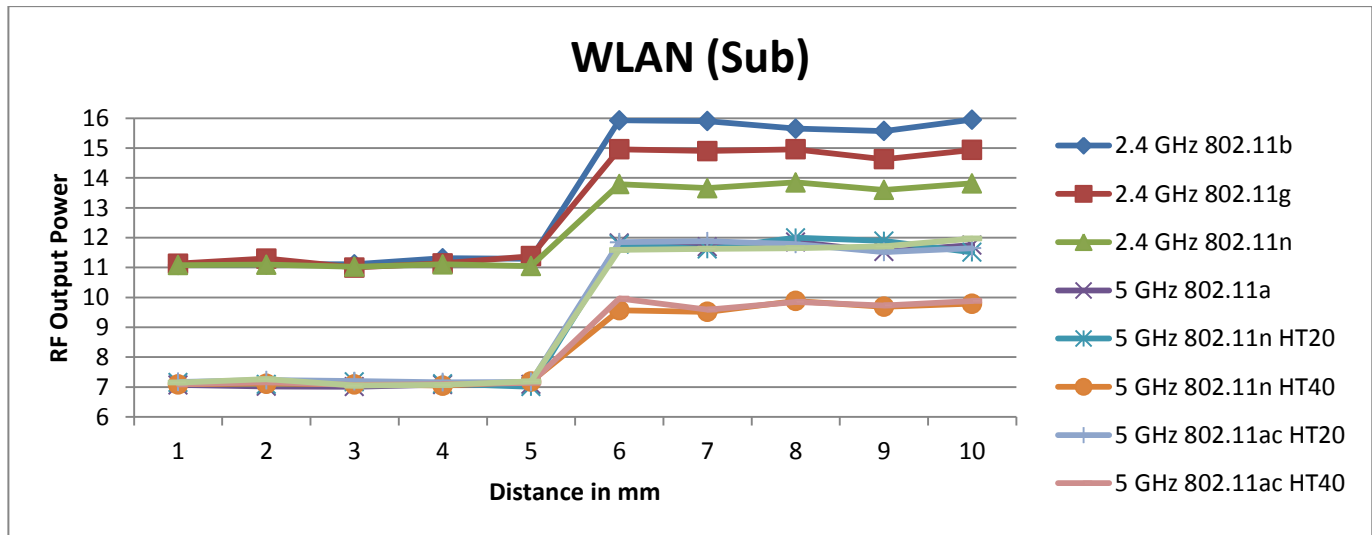
Distance to DUT vs. Output Power in dBm											
Antenna	Distance	1	3	4	5	6	7	8	9	10	11
Ant 1	2.4 GHz 802.11b	11.0	11.0	11.1	11.0	11.1	15.8	15.5	15.7	15.5	15.6
	2.4 GHz 802.11g	10.8	10.7	11.1	11.1	11.0	15.0	14.8	14.8	14.9	14.8
	2.4 GHz 802.11n	11.0	11.1	11.1	11.0	11.1	13.5	13.5	13.7	13.7	13.6
	5 GHz 802.11a	7.1	7.0	7.0	7.1	7.0	12.0	11.6	11.9	11.7	11.6
	5 GHz 802.11n HT20	7.1	7.1	7.2	7.1	7.0	11.8	11.8	11.7	11.7	11.9
	5 GHz 802.11n HT40	7.0	7.2	7.2	7.1	7.0	9.6	9.5	9.9	9.7	9.8
	5 GHz 802.11ac HT20	7.0	7.1	7.1	7.1	7.1	11.9	11.9	11.8	11.5	11.9
	5 GHz 802.11ac HT40	7.1	7.0	7.2	7.1	7.2	9.9	9.9	9.8	9.7	9.8
	5 GHz 802.11ac HT80	7.2	7.1	7.1	7.2	7.1	12.0	11.6	11.6	12.0	11.7



Wi-Fi 2.4GHz and 5GHz (Sub)

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

Distance to DUT vs. Output Power in dBm											
Antenna	Distance (mm)	1	3	4	5	6	7	8	9	10	11
Ant 1	2.4 GHz 802.11b	11.1	11.1	11.1	11.3	11.3	15.9	15.9	15.7	15.6	16.0
	2.4 GHz 802.11g	11.1	11.3	11.0	11.1	11.4	15.0	14.9	15.0	14.6	14.9
	2.4 GHz 802.11n	11.1	11.1	11.0	11.1	11.1	13.8	13.7	13.9	13.6	13.8
	5 GHz 802.11a	7.1	7.0	7.0	7.1	7.1	11.8	11.7	11.9	11.5	11.8
	5 GHz 802.11n HT20	7.2	7.1	7.2	7.1	7.0	11.8	11.6	12.0	11.9	11.5
	5 GHz 802.11n HT40	7.1	7.1	7.1	7.1	7.2	9.6	9.5	9.9	9.7	9.8
	5 GHz 802.11ac HT20	7.2	7.2	7.2	7.2	7.2	11.9	11.9	11.8	11.5	11.7
	5 GHz 802.11ac HT40	7.1	7.2	7.1	7.1	7.1	10.0	9.6	9.9	9.7	9.9
	5 GHz 802.11ac HT80	7.2	7.3	7.1	7.1	7.2	11.6	11.6	11.7	11.7	12.0



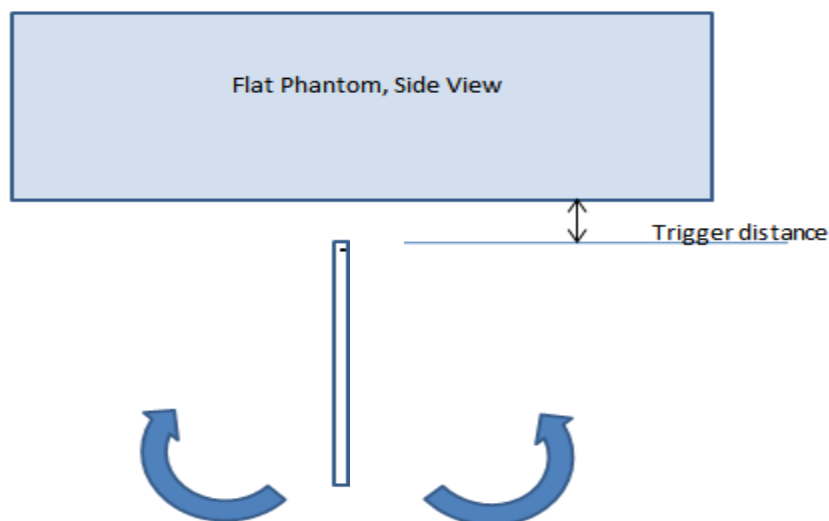
6.6.2. Proximity Sensor Coverage (KDB 616217 §6.3)

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	21 mm	21 mm	On	On	On	On	On	On	On	On	On	On	On
1900	21 mm	21 mm	On	On	On	On	On	On	On	On	On	On	On
2600	21 mm	21 mm	On	On	On	On	On	On	On	On	On	On	On

6.6.1. 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	19 mm	N/A	N/A	18 mm
	Edge 1	21 mm	N/A	21 mm	20 mm
WLAN	Rear	6 mm	N/A	N/A	5 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	31.00	315	0	0	43	233	43		58 -MEASURE-	58 -MEASURE-	6.7 -MEASURE-	> 50 mm	6.7 -MEASURE-	
Cellular	GPRS 2 Slots	1909.8	28.00	158	0	0	43	233	43		43.7 -MEASURE-	43.7 -MEASURE-	5.1 -MEASURE-	> 50 mm	5.1 -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	W-CDMA 2	1907.6	24.30	269	0	0	43	233	43		74.3 -MEASURE-	74.3 -MEASURE-	8.6 -MEASURE-	> 50 mm	8.6 -MEASURE-	
Cellular	CDMA BC0	848.31	25.00	316	0	0	43	233	43		58.2 -MEASURE-	58.2 -MEASURE-	6.8 -MEASURE-	> 50 mm	6.8 -MEASURE-	
Cellular	LTE Band 41	2655	24.30	269	0	0	43	233	43		87.7 -MEASURE-	87.7 -MEASURE-	10.2 -MEASURE-	> 50 mm	10.2 -MEASURE-	
Power Back-off, Proximity Sensor On																
Cellular	GPRS 2 Slots	848.8	23.50	56	0	0					10.3 -MEASURE-	10.3 -MEASURE-				
Cellular	GPRS 2 Slots	1909.8	19.00	20	0	0					5.5 -MEASURE-	5.5 -MEASURE-				
Cellular	W-CDMA 5	846.6	15.50	35	0	0					6.4 -MEASURE-	6.4 -MEASURE-				
Cellular	W-CDMA 2	1907.6	11.50	14	0	0					3.9 -MEASURE-	3.9 -MEASURE-				
Cellular	CDMA BC0	848.31	14.50	28	0	0					5.2 -MEASURE-	5.2 -MEASURE-				
Cellular	LTE Band 41	2655	15.00	32	0	0					10.4 -MEASURE-	10.4 -MEASURE-				

Note(s):

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	31.00	315	0	0	43	233	43		< 50 mm	< 50 mm	< 50 mm	1198.3 mW -EXEMPT-	< 50 mm	
Cellular	GPRS 2 Slots	1909.8	28.00	158	0	0	43	233	43		< 50 mm	< 50 mm	< 50 mm	1938.5 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	W-CDMA 2	1907.6	24.30	269	0	0	43	233	43		< 50 mm	< 50 mm	< 50 mm	1938.6 mW -EXEMPT-	< 50 mm	
Cellular	CDMA BC0	848.31	25.00	316	0	0	43	233	43		< 50 mm	< 50 mm	< 50 mm	1197.8 mW -EXEMPT-	< 50 mm	
Cellular	LTE Band 41	2655	24.30	269	0	0	43	233	43		< 50 mm	< 50 mm	< 50 mm	1922.1 mW -EXEMPT-	< 50 mm	
Power Back-off, Proximity Sensor On																
Cellular	GPRS 2 Slots	848.8	23.50	56	0	0					< 50 mm	< 50 mm				
Cellular	GPRS 2 Slots	1909.8	19.00	20	0	0					< 50 mm	< 50 mm				
Cellular	W-CDMA 5	846.6	15.50	35	0	0					< 50 mm	< 50 mm				
Cellular	W-CDMA 2	1907.6	11.50	14	0	0					< 50 mm	< 50 mm				
Cellular	CDMA BC0	848.31	14.50	28	0	0					< 50 mm	< 50 mm				
Cellular	LTE Band 41	2655	15.00	32	0	0					< 50 mm	< 50 mm				

Note(s):

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**Main Antenna < 50mm to adjacent edges**

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
Wi-Fi Main Antenna Max Power															
Wi-Fi 2.4 GHz	2462	16.50	45	0.9	180	5.1	28	160.3		14.1 -MEASURE-	> 50 mm	14.1 -MEASURE-	2.5 -EXEMPT-	> 50 mm	
Wi-Fi 5.3 GHz	5320	12.50	18	0.9	180	5.1	28	160.3		8.3 -MEASURE-	> 50 mm	8.3 -MEASURE-	1.5 -EXEMPT-	> 50 mm	
Wi-Fi 5.5 GHz	5700	12.50	18	0.9	180	5.1	28	160.3		8.6 -MEASURE-	> 50 mm	8.6 -MEASURE-	1.5 -EXEMPT-	> 50 mm	
Wi-Fi 5.8 GHz	5825	12.50	18	0.9	180	5.1	28	160.3		8.7 -MEASURE-	> 50 mm	8.7 -MEASURE-	1.6 -EXEMPT-	> 50 mm	
Bluetooth	2480	8.50	7	0.9	180	5.1	28	160.3		2.2 -EXEMPT-	> 50 mm	2.2 -EXEMPT-	0.4 -EXEMPT-	> 50 mm	
Wi-Fi Main Antenna Reduced Power															
Wi-Fi 2.4 GHz	2462	11.50	14	0.9						4.4 -MEASURE-					
Wi-Fi 5.3 GHz	5320	7.50	6	0.9						2.8 -EXEMPT-					
Wi-Fi 5.5 GHz	5700	7.50	6	0.9						2.9 -EXEMPT-					
Wi-Fi 5.8 GHz	5825	7.50	6	0.9						2.9 -EXEMPT-					

Sub Antenna < 50mm to adjacent edges

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	m W	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Wi-Fi Sub Antenna Max Power															
Wi-Fi 2.4 GHz	2462	16.50	45	0.8	221	65.8	4.29	81		14.1 -MEASURE-	> 50 mm	> 50 mm	14.1 -MEASURE-	> 50 mm	
Wi-Fi 5.3 GHz	5320	12.50	18	0.8	221	65.8	4.29	81		8.3 -MEASURE-	> 50 mm	> 50 mm	8.3 -MEASURE-	> 50 mm	
Wi-Fi 5.5 GHz	5700	12.50	18	0.8	221	65.8	4.29	81		8.6 -MEASURE-	> 50 mm	> 50 mm	8.6 -MEASURE-	> 50 mm	
Wi-Fi 5.8 GHz	5825	12.50	18	0.8	221	65.8	4.29	81		8.7 -MEASURE-	> 50 mm	> 50 mm	8.7 -MEASURE-	> 50 mm	
Wi-Fi Sub Antenna Reduced Power															
Wi-Fi 2.4 GHz	2462	11.50	14	0.8						4.4 -MEASURE-					
Wi-Fi 5.3 GHz	5320	7.50	6	0.8						2.8 -EXEMPT-					
Wi-Fi 5.5 GHz	5700	7.50	6	0.8						2.9 -EXEMPT-					
Wi-Fi 5.8 GHz	5825	7.50	6	0.8						2.9 -EXEMPT-					

Note(s):

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

Main Antennas > 50mm to adjacent edges

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	m W	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
Wi-Fi Main Antenna Max Power															
Wi-Fi 2.4 GHz	2462	16.50	45	0.9	180	5.1	28	160.3		< 50 mm	1395.6 mW -EXEMPT-	< 50 mm	< 50 mm	1198.6 mW -EXEMPT-	
Wi-Fi 5.3 GHz	5320	12.50	18	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	12.50	18	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	12.50	18	0.9	180	5.1	28	160.3		< 50 mm	1362.2 mW -EXEMPT-	< 50 mm	< 50 mm	1165.2 mW -EXEMPT-	
Bluetooth	2480	8.50	7	0.9	180	5.1	28	160.3		< 50 mm	1395.3 mW -EXEMPT-	< 50 mm	< 50 mm	1198.3 mW -EXEMPT-	
Wi-Fi Main Antenna Reduced Power															
Wi-Fi 2.4 GHz	2462	11.50	14	0.9						< 50 mm					
Wi-Fi 5.3 GHz	5320	7.50	6	0.9						< 50 mm					
Wi-Fi 5.5 GHz	5700	7.50	6	0.9						< 50 mm					
Wi-Fi 5.8 GHz	5825	7.50	6	0.9						< 50 mm					

Sub Antennas > 50mm to adjacent edges

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
Wi-Fi Sub Antenna Max Power															
Wi-Fi 2.4 GHz	2462	16.50	45	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 5.3 GHz	5320	12.50	18	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	12.50	18	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	12.50	18	0.8	221	65.8	4.29	81		< 50 mm	1772.2 mW -EXEMPT-	220.2 mW -EXEMPT-	< 50 mm	372.2 mW -EXEMPT-	
Wi-Fi Sub Antenna Reduced Power															
Wi-Fi 2.4 GHz	2462	11.50	14	0.8						< 50 mm					
Wi-Fi 5.3 GHz	5320	7.50	6	0.8						< 50 mm					
Wi-Fi 5.5 GHz	5700	7.50	6	0.8						< 50 mm					
Wi-Fi 5.8 GHz	5825	7.50	6	0.8						< 50 mm					

Note(s):

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
WCDMA Band II	Off	Yes	Yes	Yes	No	Yes
	On	Yes	Yes	No	No	No
WCDMA Band V	Off	Yes	Yes	Yes	No	Yes
	On	Yes	Yes	No	No	No
CDMA BC0(1xRTT & 1xEVDO)	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 (Main Antenna)	Off	Yes	No	Yes	No	No
	On	Yes	No	No	No	No
Wi-Fi 2.4 GHz (Sub Antenna)	Off	Yes	No	No	Yes	No
	On	Yes	No	No	No	No
Wi-Fi 5 GHz (Main Antenna)	Off	Yes	No	Yes	No	No
	On	Yes	No	No	No	No
Wi-Fi 5 GHz (Sub Antenna)	Off	Yes	No	No	Yes	No
	On	Yes	No	No	No	No
Bluetooth	Off	No	No	No	No	No

Note(s):

1. Yes = Testing is required. No = Testing is not required.
2. For Pwr Back-off modes in UNII bands, there is not required for SAR testing according to applied SAR test exclusion. But SAR of Pwr Back-off modes in UNII bands were evaluated with reduce power level at 0 mm since this scenario is more conservative.

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 ±(%)
4-21-2016	Body 2450	e'	50.6100	Relative Permittivity (ϵ_r):	50.61	52.70	-3.97	5
		e"	14.9900	Conductivity (σ):	2.04	1.95	4.72	5
	Body 2410	e'	50.6800	Relative Permittivity (ϵ_r):	50.68	52.76	-3.94	5
		e"	14.8900	Conductivity (σ):	2.00	1.91	4.61	5
	Body 2475	e'	50.5600	Relative Permittivity (ϵ_r):	50.56	52.67	-4.00	5
		e"	15.0700	Conductivity (σ):	2.07	1.99	4.47	5
4-21-2016	Body 2600	e'	50.1800	Relative Permittivity (ϵ_r):	50.18	52.51	-4.44	5
		e"	15.4600	Conductivity (σ):	2.24	2.16	3.43	5
	Body 2500	e'	50.4900	Relative Permittivity (ϵ_r):	50.49	52.64	-4.08	5
		e"	15.1500	Conductivity (σ):	2.11	2.02	4.24	5
	Body 2700	e'	49.8200	Relative Permittivity (ϵ_r):	49.82	52.38	-4.90	5
		e"	15.7200	Conductivity (σ):	2.36	2.30	2.55	5
4-25-2016	Body 2450	e'	53.1600	Relative Permittivity (ϵ_r):	53.16	52.70	0.87	5
		e"	15.0100	Conductivity (σ):	2.04	1.95	4.86	5
	Body 2410	e'	53.2400	Relative Permittivity (ϵ_r):	53.24	52.76	0.91	5
		e"	14.9100	Conductivity (σ):	2.00	1.91	4.75	5
	Body 2475	e'	53.1000	Relative Permittivity (ϵ_r):	53.10	52.67	0.82	5
		e"	15.0900	Conductivity (σ):	2.08	1.99	4.61	5

SAR 2 Room

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4-16-2016	Body 835	e'	52.7900	Relative Permittivity (ϵ_r):	52.79	55.20	-4.37	5
		e"	21.7800	Conductivity (σ):	1.01	0.97	4.25	5
	Body 820	e'	52.8600	Relative Permittivity (ϵ_r):	52.86	55.28	-4.37	5
		e"	21.8400	Conductivity (σ):	1.00	0.97	2.82	5
	Body 850	e'	52.6900	Relative Permittivity (ϵ_r):	52.69	55.16	-4.47	5
		e"	21.7600	Conductivity (σ):	1.03	0.99	4.18	5
4-24-2016	Body 835	e'	55.1900	Relative Permittivity (ϵ_r):	55.19	55.20	-0.02	5
		e"	21.5400	Conductivity (σ):	1.00	0.97	3.10	5
	Body 820	e'	55.3100	Relative Permittivity (ϵ_r):	55.31	55.28	0.06	5
		e"	21.6000	Conductivity (σ):	0.98	0.97	1.69	5
	Body 850	e'	55.0600	Relative Permittivity (ϵ_r):	55.06	55.16	-0.18	5
		e"	21.4800	Conductivity (σ):	1.02	0.99	2.84	5

SAR 3 Room

Date	Freq. (MHz)	Liquid Parameters			Measured	Target	Delta (%)	Limit ±(%)
4-18-2016	Body 1900	e'	51.0600	Relative Permittivity (ϵ_r):	51.06	53.30	-4.20	5
		e"	14.4200	Conductivity (σ):	1.52	1.52	0.22	5
	Body 1850	e'	51.2300	Relative Permittivity (ϵ_r):	51.23	53.30	-3.88	5
		e"	14.2100	Conductivity (σ):	1.46	1.52	-3.83	5
	Body 1910	e'	51.0200	Relative Permittivity (ϵ_r):	51.02	53.30	-4.28	5
		e"	14.4600	Conductivity (σ):	1.54	1.52	1.03	5
4-25-2016	Body 5180	e'	47.6300	Relative Permittivity (ϵ_r):	47.63	49.05	-2.89	10
		e"	18.6200	Conductivity (σ):	5.36	5.27	1.74	5
	Body 5200	e'	47.5800	Relative Permittivity (ϵ_r):	47.58	49.02	-2.94	10
		e"	18.6300	Conductivity (σ):	5.39	5.29	1.74	5
	Body 5600	e'	46.9300	Relative Permittivity (ϵ_r):	46.93	48.48	-3.19	10
		e"	19.0000	Conductivity (σ):	5.92	5.76	2.69	5
	Body 5800	e'	46.5900	Relative Permittivity (ϵ_r):	46.59	48.20	-3.34	10
		e"	19.1700	Conductivity (σ):	6.18	6.00	3.04	5
	Body 5825	e'	46.5600	Relative Permittivity (ϵ_r):	46.56	48.20	-3.40	10
		e"	19.2100	Conductivity (σ):	6.22	6.00	3.70	5
4-29-2016	Body 5180	e'	48.2400	Relative Permittivity (ϵ_r):	48.24	49.05	-1.64	10
		e"	18.1800	Conductivity (σ):	5.24	5.27	-0.67	5
	Body 5200	e'	48.2100	Relative Permittivity (ϵ_r):	48.21	49.02	-1.65	10
		e"	18.2100	Conductivity (σ):	5.27	5.29	-0.56	5
	Body 5600	e'	47.5700	Relative Permittivity (ϵ_r):	47.57	48.48	-1.87	10
		e"	18.6000	Conductivity (σ):	5.79	5.76	0.53	5
	Body 5800	e'	47.2500	Relative Permittivity (ϵ_r):	47.25	48.20	-1.97	10
		e"	18.7800	Conductivity (σ):	6.06	6.00	0.94	5
	Body 5825	e'	47.2200	Relative Permittivity (ϵ_r):	47.22	48.20	-2.03	10
		e"	18.8200	Conductivity (σ):	6.10	6.00	1.59	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 $\pm$ 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 $\geq$ 15.0 cm for SAR measurements $\leq$ 3 GHz and $\geq$ 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	4d194	9-17-2015	835	1g	9.38	9.49
				10g	6.09	6.18
D1900V2	5d199	2-19-2016	1900	1g	39.80	39.50
				10g	20.70	20.90
D2450V2	939	9-28-2015	2450	1g	51.6	50.7
				10g	23.9	23.7
D2600V2	1097	11-18-2015	2600	1g	58.5	55.8
				10g	26.1	25
D5GHzV2	1184	8-26-2015	5200	1g	79.6	76.1
				10g	22.7	21.2
D5GHzV2	1184	8-26-2015	5600	1g	82.8	80.5
				10g	23.6	22.3
D5GHzV2	1184	8-26-2015	5800	1g	80.3	78.7
				10g	22.8	21.7

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 $\pm 10\%$	Plot No.
	Type	Serial #		Zoom Scan to 100 mW	Normalize to 1 W			
4-21-2016	D2450V2	939	Body	1g	5.45	54.50	50.70	7.50
				10g	2.48	24.80	23.70	4.64
4-21-2016	D2600V2	1097	Body	1g	5.77	57.70	55.80	3.41
				10g	2.51	25.10	25.00	0.40
4-25-2016	D2450V2	939	Body	1g	5.46	54.60	50.70	7.69
				10g	2.48	24.80	23.70	4.64

SAR 2 Room

Date Tested	System Dipole		T.S. Liquid	Measured Results		Target (Ref. Value)	Delta $\pm 10\%$	Plot No.
	Type	Serial #		Zoom Scan to 100 mW	Normalize to 1 W			
4-16-2016	D835V2	4d194	Body	1g	1.02	10.20	9.49	7.48
				10g	0.67	6.72	6.18	8.74
4-24-2016	D835V2	4d194	Body	1g	1.02	10.20	9.49	7.48
				10g	0.67	6.68	6.18	8.09

SAR 3 Room

Date Tested	System Dipole		T.S. Liquid	Measured Results		Target (Ref. Value)	Delta $\pm 10\%$	Plot No.
	Type	Serial #		Zoom Scan to 100 mW	Normalize to 1 W			
4-18-2016	D1900V2	5d199	Body	1g	4.11	41.10	39.50	4.05
				10g	2.14	21.40	20.90	2.39
4-25-2016	D5GHzV2	1184	Body	1g	8.12	81.20	76.10	6.70
				10g	2.30	23.00	21.20	8.49
4-25-2016	D5GHzV2	1184	Body	1g	8.69	86.90	80.50	7.95
				10g	2.41	24.10	22.30	8.07
4-25-2016	D5GHzV2	1184	Body	1g	8.56	85.60	78.70	8.77
				10g	2.38	23.80	21.70	9.68
4-29-2016	D5GHzV2	1184	Body	1g	8.20	82.00	76.10	7.75
				10g	2.30	23.00	21.20	8.49
4-29-2016	D5GHzV2	1184	Body	1g	8.21	82.10	80.50	1.99
				10g	2.28	22.80	22.30	2.24
4-29-2016	D5GHzV2	1184	Body	1g	8.21	82.10	78.70	4.32
				10g	2.28	22.80	21.70	5.07

9. Conducted Output Power Measurements

9.1. CDMA

CDMA Measured Results

Band	Mode	UL Ch No.	Freq. (MHz)	Max. Pwr (dBm)	Reduce. Pwr (dBm)
BC0	1xRTT	RC1 SO55 (Loopback)	1013	824.70	24.2
			384	836.52	24.4
			777	848.31	24.2
		RC3 SO55 (Loopback)	1013	824.70	24.2
			384	836.52	24.4
			777	848.31	24.2
		RC3 SO32 (+F-SCH)	1013	824.70	24.2
			384	836.52	24.4
			777	848.31	24.2
	1xEV-DO Rel. 0	FTAP Rate : 307.2 kbps(2 slot, QPSK) RTAP Rate : 153.6 kbps	1013	824.70	24.2
			384	836.52	24.2
			777	848.31	24.1
	1xEV-DO Rev. A	FETAP : 307.2k, QPSK/ ACK RETAP : 4096	1013	824.70	24.3
			384	836.52	24.3
			777	848.31	24.2

9.2. GSM

Per KDB 941225 D01 3G SAR Procedures:

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

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	GPRS (Voice)	CS1	1	128	824.2	33.2	24.2	24.3	15.2
				190	836.6	33.0	24.0	24.3	15.3
				251	848.8	33.2	24.2	24.3	15.2
	GPRS (GMSK)	CS1	1	128	824.2	33.2	24.1	24.3	15.2
				190	836.6	33.0	24.0	24.3	15.3
				251	848.8	33.2	24.2	24.3	15.2
			2	128	824.2	30.6	24.6	23.3	17.2
				190	836.6	30.6	24.6	23.3	17.3
				251	848.8	30.8	24.8	23.1	17.1
			3	128	824.2	28.4	24.2	20.3	16.0
				190	836.6	28.4	24.1	20.7	16.4
				251	848.8	28.7	24.5	20.7	16.5
			4	128	824.2	26.2	23.2	19.8	16.8
				190	836.6	26.3	23.3	19.4	16.4
				251	848.8	26.2	23.1	19.6	16.6
	EGPRS (8PSK)	MCS5	1	128	824.2	26.5	17.4	20.3	11.3
				190	836.6	26.4	17.4	20.1	11.1
				251	848.8	26.3	17.3	20.2	11.2
			2	128	824.2	25.8	19.7	19.3	13.3
				190	836.6	25.7	19.7	19.2	13.2
				251	848.8	25.6	19.6	19.2	13.2
			3	128	824.2	24.6	20.4	16.1	11.9
				190	836.6	24.6	20.3	16.2	11.9
				251	848.8	24.5	20.2	16.2	12.0
			4	128	824.2	24.0	21.0	15.2	12.2
				190	836.6	24.0	20.9	15.1	12.1
				251	848.8	23.8	20.8	15.0	12.0

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 2 time slots for Reduced power, based on the output power measurements above
- SAR is not required for EGPRS (8PSK) mode because its output power is less than that of GPRS Mode

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	GPRS (Voice)	CS1	1	512	1850.2	29.6	20.6	19.6	10.6
				661	1880.0	29.3	20.3	19.5	10.4
				810	1909.8	29.0	20.0	19.7	10.6
	GPRS (GMSK)	CS1	1	512	1850.2	29.6	20.6	19.6	10.6
				661	1880.0	29.4	20.3	19.5	10.5
				810	1909.8	29.2	20.1	19.7	10.7
			2	512	1850.2	27.2	21.2	19.0	13.0
				661	1880.0	27.1	21.1	18.7	12.7
				810	1909.8	27.0	21.0	18.7	12.7
			3	512	1850.2	24.1	19.8	16.2	12.0
				661	1880.0	24.0	19.8	16.0	11.7
				810	1909.8	24.1	19.9	15.9	11.7
			4	512	1850.2	23.1	20.1	14.9	11.8
				661	1880.0	23.0	20.0	14.6	11.6
				810	1909.8	23.5	20.5	15.4	12.4
	EGPRS (8PSK)	MCS5	1	512	1850.2	25.4	16.4	17.2	8.2
				661	1880.0	25.2	16.2	17.1	8.1
				810	1909.8	25.2	16.2	17.2	8.2
			2	512	1850.2	24.4	18.3	16.5	10.5
				661	1880.0	24.2	18.2	16.4	10.4
				810	1909.8	24.2	18.2	16.6	10.6
			3	512	1850.2	23.8	19.6	13.5	9.2
				661	1880.0	23.7	19.4	13.5	9.2
				810	1909.8	23.8	19.5	13.6	9.3
			4	512	1850.2	23.2	20.2	12.6	9.6
				661	1880.0	23.1	20.1	12.4	9.4
				810	1909.8	23.2	20.2	12.6	9.6

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 2 time slots for Reduced power, based on the output power measurements above
- SAR is not required for EGPRS (8PSK) mode because its output power is less than that of GPRS Mode

9.3. 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 5 procedures in section 5.2 of 3GPP TS34.121. A summary of these settings are illustrated below:

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subtest	1	2	3	4
W-CDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set 1			
	Power Control Algorithm	Algorithm 2			
	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
	MPR (dB)	0	0	0.5	0.5
HSDPA Specific Settings	D_{ACK}	8			
	D_{NAK}	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback (Table 5.2B.4)	4ms			
	CQI Repetition Factor (Table 5.2B.4)	2			
	$A_{hs}=\beta_{hs}/\beta_c$	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-DPDCCH	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

W-CDMA Band II Measured Results

Band	Mode		UL Ch No.	Freq. (MHz)	MPR (dB)	Max. Pwr (dBm)	Reduced Pwr (dBm)
W-CDMA Band II	Rel 99	RMC, 12.2 kbps	9262	1852.4	N/A	23.3	11.5
			9400	1880.0	N/A	23.2	11.0
			9538	1907.6	N/A	23.1	10.7
	HSDPA	Subtest 1	9262	1852.4	0	22.3	10.5
			9400	1880.0	0	22.2	10.1
			9538	1907.6	0	22.2	9.8
		Subtest 2	9262	1852.4	0	21.8	10.1
			9400	1880.0	0	21.7	9.6
			9538	1907.6	0	21.7	9.4
		Subtest 3	9262	1852.4	0.5	21.8	10.0
			9400	1880.0	0.5	21.6	9.5
			9538	1907.6	0.5	21.6	9.3
		Subtest 4	9262	1852.4	0.5	21.8	10.0
			9400	1880.0	0.5	21.6	9.5
			9538	1907.6	0.5	21.6	9.3
	HSUPA	Subtest 1	9262	1852.4	0	22.3	10.2
			9400	1880.0	0	22.2	9.9
			9538	1907.6	0	22.0	9.8
		Subtest 2	9262	1852.4	2	20.3	8.5
			9400	1880.0	2	20.2	8.1
			9538	1907.6	2	20.1	7.8
		Subtest 3	9262	1852.4	1	21.3	9.5
			9400	1880.0	1	21.2	9.0
			9538	1907.6	1	21.2	8.8
		Subtest 4	9262	1852.4	2	20.3	8.5
			9400	1880.0	2	20.1	8.1
			9538	1907.6	2	20.1	7.9
		Subtest 5	9262	1852.4	0	22.3	10.5
			9400	1880.0	0	22.3	10.0
			9538	1907.6	0	22.2	9.7

W-CDMA Band V Measured Results

Band	Mode		UL Ch No.	Freq. (MHz)	MPR (dB)	Max. Pwr (dBm)	Reduced Pwr (dBm)
W-CDMA Band V	Rel 99	RMC, 12.2 kbps	4132	826.4	N/A	23.1	15.1
			4183	836.6	N/A	23.2	15.1
			4233	846.6	N/A	23.1	15.2
	HSDPA	Subtest 1	4132	826.4	0	22.1	14.1
			4183	836.6	0	22.1	14.1
			4233	846.6	0	22.1	14.2
		Subtest 2	4132	826.4	0	21.8	13.7
			4183	836.6	0	21.7	13.7
			4233	846.6	0	21.7	13.8
		Subtest 3	4132	826.4	0.5	21.6	13.6
			4183	836.6	0.5	21.6	13.6
			4233	846.6	0.5	21.5	13.7
		Subtest 4	4132	826.4	0.5	21.5	13.6
			4183	836.6	0.5	21.6	13.6
			4233	846.6	0.5	21.5	13.7
	HSUPA	Subtest 1	4132	826.4	0	22.2	14.1
			4183	836.6	0	22.2	14.1
			4233	846.6	0	21.7	14.1
		Subtest 2	4132	826.4	2	20.1	12.1
			4183	836.6	2	20.2	12.1
			4233	846.6	2	20.1	12.2
		Subtest 3	4132	826.4	1	21.1	13.1
			4183	836.6	1	21.2	13.1
			4233	846.6	1	21.1	13.2
		Subtest 4	4132	826.4	2	20.1	12.1
			4183	836.6	2	20.2	12.1
			4233	846.6	2	20.1	12.2
		Subtest 5	4132	826.4	0	22.2	14.0
			4183	836.6	0	22.2	14.0
			4233	846.6	0	22.1	14.1

9.4. 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 Signaling Value of "NS_01".

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

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

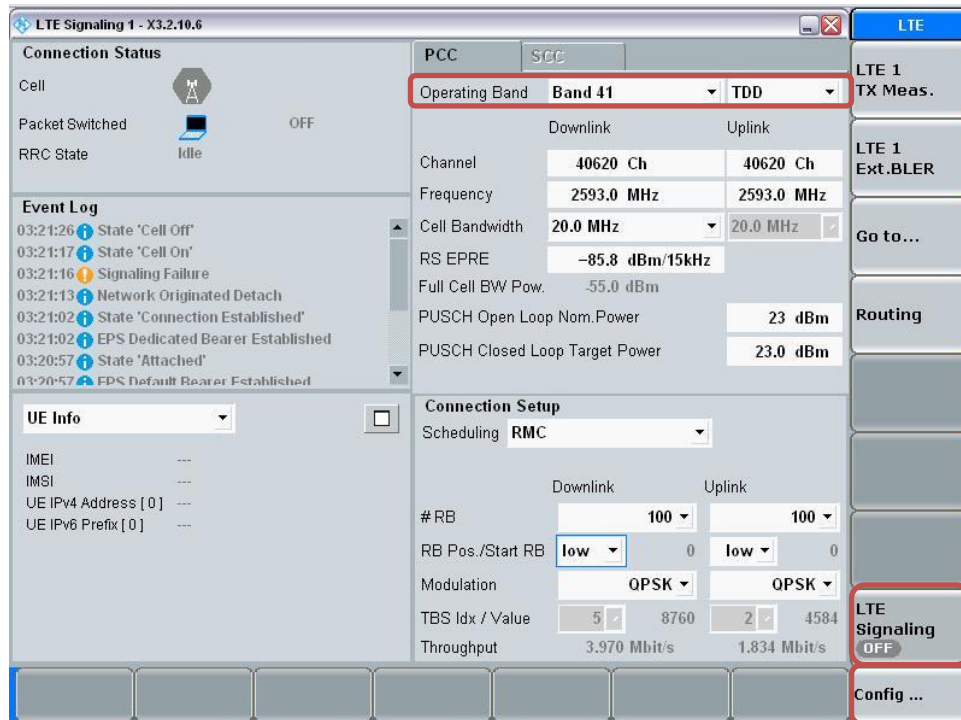
Note 1: Applies to the lower block of Band 23, i.e. a carrier placed in the 2000-2010 MHz region.

LTE Band 41 Measured Results

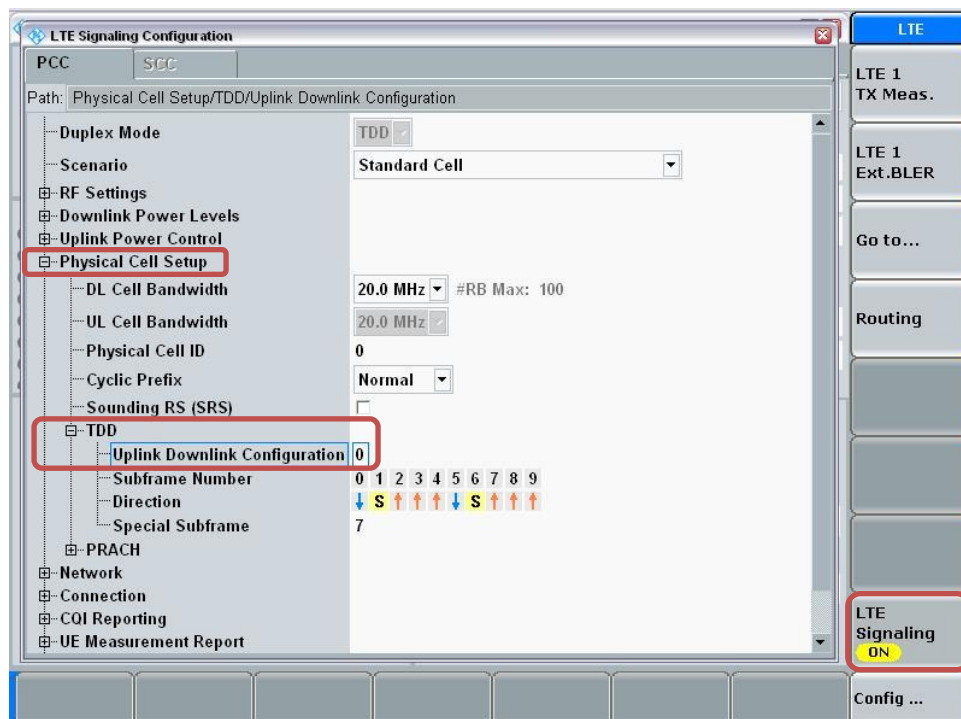
Procedure used to establish SAR test signal for LTE TDD Band 41

Set to CMW-500 with following parameters:

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

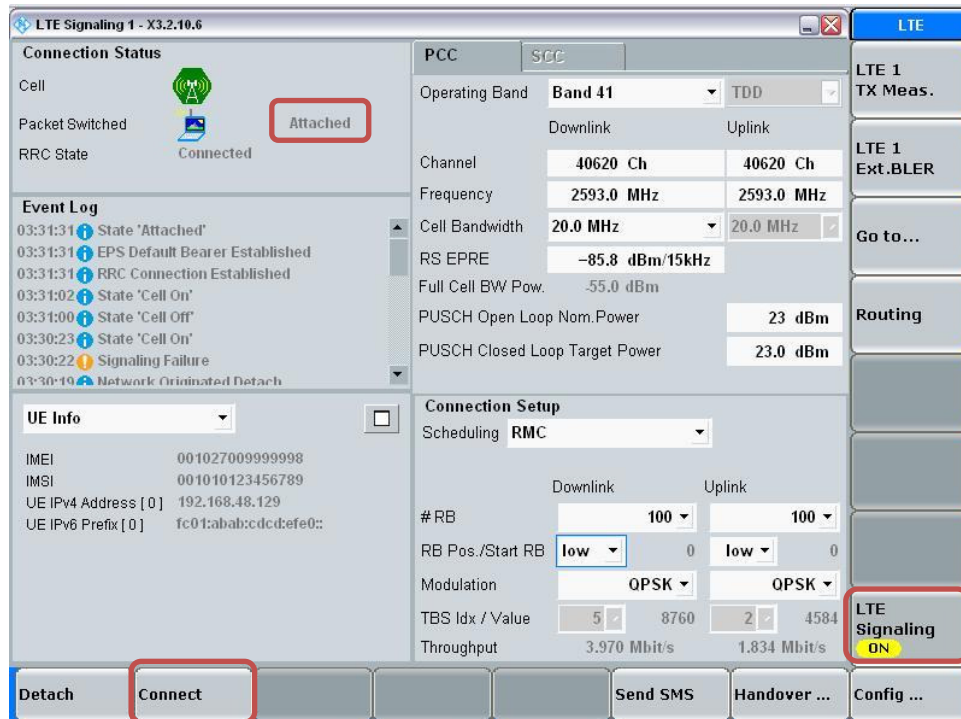


- Go to "Physical Cell Setup"
- Select "TDD" and Set "Uplink Downlink Configuration" to "0"
- Turn the cell on using "ON | OFF" key

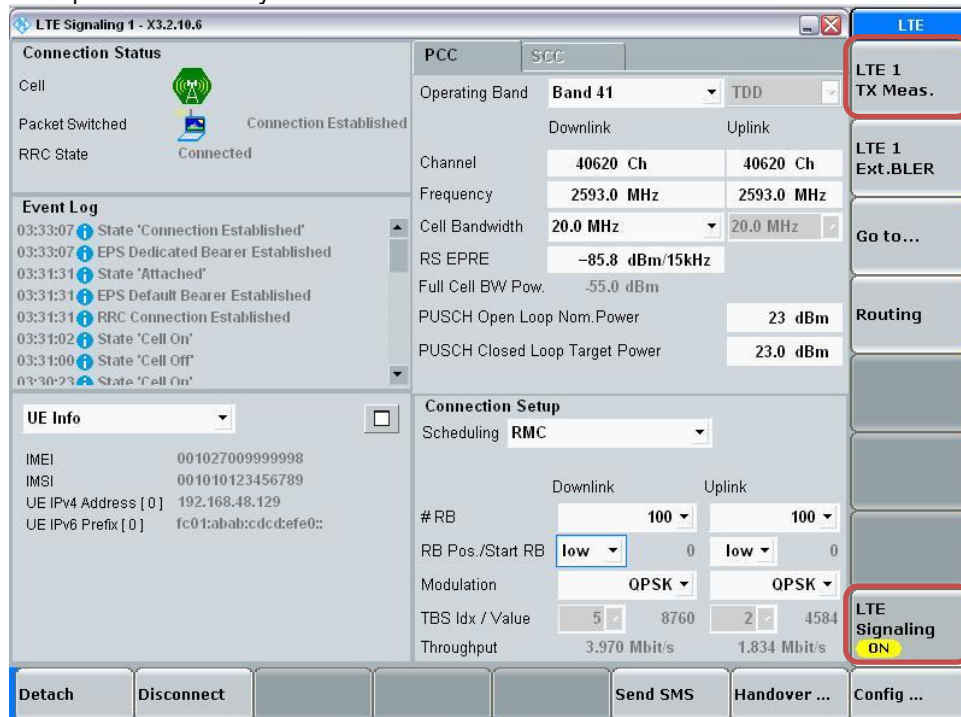


Connect to EUT

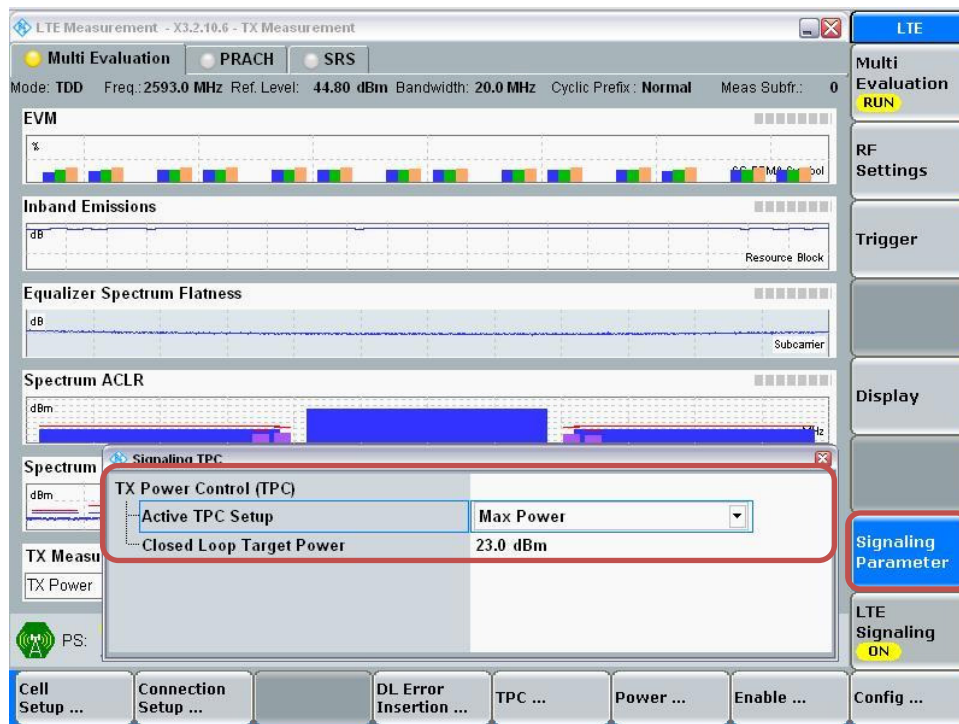
- Turn the cell on using “ON | OFF” key
- After EUT is Attached
- Select “Connect”

**Max Power Setting**

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

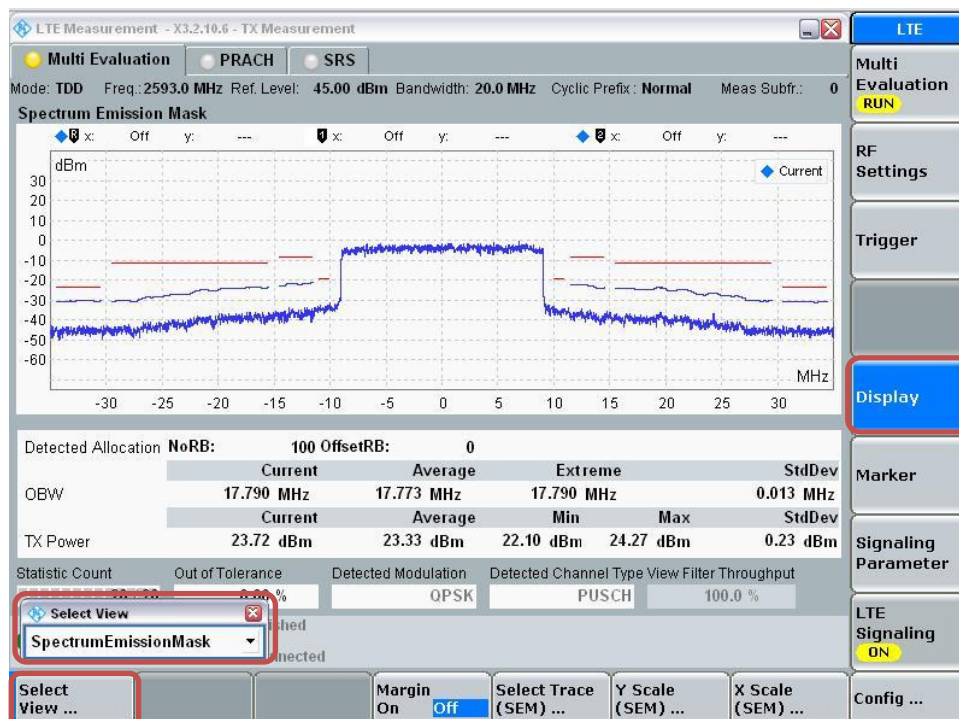


- Select “Signaling Parameter”
- Select “TX Power Control (TPC)” > Select “Active TPC Setup” to “Max Power” > Set “Closed Loop Target Power” to “23 dBm”



View TX Power

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



LTE Band 41 Measured Results

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Reduce. Avg Pwr (dBm)		
						2565 MHz	2605 MHz	2645 MHz		2565 MHz	2605 MHz	2645 MHz
LTE Band 41	20	QPSK	1	0	0	22.8	23.6	23.6	0	13.3	13.9	13.7
			1	49	0	23.4	24.1	23.8	0	13.9	14.6	14.9
			1	99	0	22.9	23.6	23.5	0	13.5	14.0	14.3
			50	0	1	21.9	21.9	21.9	0	14.3	14.1	13.9
			50	24	1	21.7	21.9	21.9	0	14.2	14.2	14.1
			50	50	1	21.7	21.8	21.8	0	14.0	14.0	13.9
			100	0	1	21.8	22.0	21.9	0	14.1	14.1	14.0
		16QAM	1	0	1	21.9	21.8	22.3	0	13.3	13.6	13.3
			1	49	1	22.3	22.7	22.5	0	13.9	14.5	14.4
			1	99	1	21.8	21.9	21.9	0	13.3	13.8	14.1
			50	0	2	20.9	20.9	20.8	0	14.1	14.0	14.0
			50	24	2	20.8	21.0	20.9	0	14.1	14.2	14.1
			50	50	2	20.8	20.9	20.9	0	13.9	14.0	14.0
			100	0	2	20.9	20.9	20.9	0	14.0	14.0	14.0
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Reduce. Avg Pwr (dBm)		
						2562.5 MHz	2605 MHz	2647.5 MHz		2562.5 MHz	2605 MHz	2647.5 MHz
LTE Band 41	15	QPSK	1	0	0	23.0	23.7	23.6	0	13.5	14.3	14.0
			1	37	0	23.2	24.0	23.8	0	13.7	14.5	14.7
			1	74	0	22.9	23.5	23.5	0	13.0	14.1	14.3
			36	0	1	21.8	22.0	22.0	0	14.5	14.1	14.1
			36	20	1	21.8	21.9	21.9	0	14.5	14.3	14.2
			36	39	1	21.6	21.9	21.8	0	14.4	14.1	14.1
			75	0	1	21.7	21.9	21.9	0	14.3	14.1	14.0
		16QAM	1	0	1	22.0	22.3	22.9	0	13.6	14.0	13.8
			1	37	1	22.1	22.5	23.2	0	13.8	14.3	14.3
			1	74	1	21.8	22.2	22.6	0	13.1	13.8	14.0
			36	0	2	20.9	21.0	20.8	0	14.4	14.1	14.0
			36	20	2	20.8	20.9	20.8	0	14.4	14.3	14.2
			36	39	2	20.7	20.8	20.7	0	14.3	14.1	14.0
			75	0	2	20.8	21.0	21.0	0	14.3	14.1	14.0
Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Reduce. Avg Pwr (dBm)		
						2560 MHz	2605 MHz	2650 MHz		2560 MHz	2605 MHz	2650 MHz
LTE Band 41	10	QPSK	1	0	0	23.2	23.7	23.7	0	13.7	14.2	14.1
			1	25	0	23.4	23.7	23.7	0	14.0	14.4	14.7
			1	49	0	23.0	23.7	23.7	0	13.2	14.0	14.3
			25	0	1	21.9	22.0	21.9	0	14.6	14.1	14.1
			25	12	1	21.8	22.0	21.9	0	14.7	14.2	14.2
			25	25	1	21.8	22.0	21.9	0	14.4	14.2	14.1
			50	0	1	21.8	21.9	21.9	0	14.5	14.1	14.1
		16QAM	1	0	1	22.0	22.3	23.0	0	13.7	13.9	13.9
			1	25	1	22.2	22.3	23.3	0	14.0	14.3	14.4
			1	49	1	21.8	21.8	22.8	0	13.2	14.0	13.9
			25	0	2	20.8	20.9	21.0	0	14.4	14.1	14.1
			25	12	2	20.8	20.9	21.0	0	14.5	14.3	14.1
			25	25	2	20.7	20.8	21.0	0	14.3	14.2	14.1
			50	0	2	20.8	20.8	20.9	0	14.3	14.2	14.1

LTE Band 41 Measured Results (continued)

Band	BW (MHz)	Mode	RB Allocation	RB offset	Target MPR	Max. Avg Pwr (dBm)			Target MPR	Reduce. Avg Pwr (dBm)		
						2557.5 MHz	2605 MHz	2652.5 Mhz		2557.5 MHz	2605 MHz	2652.5 Mhz
LTE Band 41	5	QPSK	1	0	0	23.2	23.7	23.2	0	13.5	14.0	14.0
			1	12	0	23.5	24.1	23.5	0	14.2	14.5	14.5
			1	24	0	23.2	23.6	23.2	0	13.4	13.9	13.9
			12	0	1	21.8	21.9	21.4	0	14.4	14.1	14.4
			12	7	1	21.9	21.9	21.5	0	14.6	14.3	14.5
			12	13	1	21.8	21.8	21.5	0	14.6	14.2	14.4
			25	0	1	21.7	21.8	21.4	0	14.4	14.1	14.4
		16QAM	1	0	1	22.2	22.4	22.2	0	13.5	13.8	13.8
			1	12	1	22.5	22.9	22.2	0	14.1	14.5	14.3
			1	24	1	22.3	22.4	22.1	0	13.4	13.7	13.7
			12	0	2	21.0	21.1	20.7	0	14.3	14.3	14.4
			12	7	2	20.9	21.2	20.7	0	14.5	14.4	14.5
			12	13	2	20.9	21.2	20.6	0	14.5	14.3	14.5
			25	0	2	20.9	21.0	20.7	0	14.4	14.2	14.4

9.5. Wi-Fi 2.4GHz (DTS Band)

Measured Results

Antenna	Mode	Data Rate	Ch #	Freq. (MHz)	Max Pwr.			Reduced Pwr.		
					Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)
SISO Main	802.11b	1 Mbps	1	2412	16.1	16.5	Yes	11.5	11.5	Yes
			6	2437	15.9			10.7		
			11	2462	15.8			11.5		
	802.11g	6 Mbps	1	2412	Not Required	15.5	No	Not Required	11.5	No
			6	2437						
			11	2462						
	802.11n	6.5 Mbps	1	2412	Not Required	14.5	No	Not Required	11.5	No
			6	2437						
			11	2462						
SISO Sub	802.11b	1 Mbps	1	2412	15.7	16.5	Yes	11.3	11.5	Yes
			6	2437	15.8			11.5		
			11	2462	16.3			11.1		
	802.11g	6 Mbps	1	2412	Not Required	15.5	No	Not Required	11.5	No
			6	2437						
			11	2462						
	802.11n	6.5 Mbps	1	2412	Not Required	14.5	No	Not Required	11.5	No
			6	2437						
			11	2462						

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.

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

Measured Results

Antenna	Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Max Pwr.			Reduce Pwr		
						Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)
SISO Main	5.3 (U-NII 2A)	802.11a	6 Mbps	52	5260	Not Required	12.5	No	Not Required	7.5	No
				56	5280						
				60	5300						
				64	5320						
		802.11n (HT20)	6.5 Mbps	52	5260		12.5	No		7.5	No
				56	5280						
				60	5300						
				64	5320						
		802.11n (HT40)	13.5 Mbps	54	5270		10.5	No		7.5	No
				62	5310						
		802.11ac (VHT20)	6.5 Mbps	52	5260		12.5	No		7.5	No
				56	5280						
				60	5300						
				64	5320						
		802.11ac (VHT40)	13.5 Mbps	54	5270		10.5	No		7.5	No
				62	5310						
		802.11ac (VHT80)	29.3 Mbps	58	5290	11.8	12.5	Yes	6.9	7.5	Yes
	5.5 (U-NII 2C) <5.65GHz	802.11a	6 Mbps	100	5500	Not Required	12.5	No	Not Required	7.5	No
				112	5560						
				116	5580						
				128	5640						
		802.11n (HT20)	6.5 Mbps	100	5500		12.5	No		7.5	No
				112	5560						
				116	5580						
				128	5640						
		802.11n (HT40)	13.5 Mbps	102	5510		10.5	No		7.5	No
				110	5550						
				118	5590						
				126	5630						
		802.11ac (VHT20)	6.5 Mbps	100	5500		12.5	No		7.5	No
				112	5560						
				116	5580						
				128	5640						
		802.11ac (VHT40)	13.5 Mbps	102	5510		10.5	No		7.5	No
				110	5550						
				118	5590						
				126	5630						
		802.11ac (VHT80)	29.3 Mbps	106	5530	12.1	12.5	Yes	7.1	7.5	Yes
				122	5610	11.6			6.7		
	5.5 (U-NII 2C) >5.65GHz + 5.8 (U-NII 3)	802.11a	6 Mbps	132	5660	Not Required	12.5	No	Not Required	7.5	No
				149	5745						
				165	5825						
		802.11n (HT20)	6.5 Mbps	132	5660		12.5	No		7.5	No
				149	5745						
				165	5825						
		802.11n (HT40)	13.5 Mbps	134	5670		10.5	No		7.5	No
				151	5755						
				159	5795						
		802.11ac (VHT20)	6.5 Mbps	132	5660		12.5	No		7.5	No
				149	5745						
				165	5825						
		802.11ac (VHT40)	13.5 Mbps	134	5670		10.5	No		7.5	No
				151	5755						
				159	5795						
		802.11ac	29.3 Mbps	155	5775	12.3	12.5	Yes	7.3	7.5	Yes

Antenna	Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Max Pwr.			Reduce Pwr			
						Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	
SISO Sub	5.3 (U-NII 2A)	802.11a	6 Mbps	52	5260	Not Required	12.5	No	Not Required	7.5	No	
				56	5280							
				60	5300							
				64	5320							
		802.11n (HT20)	6.5 Mbps	52	5260		12.5	No		7.5	No	
				56	5280							
				60	5300							
				64	5320							
		802.11n (HT40)	13.5 Mbps	54	5270		10.5	No		7.5	No	
				62	5310							
		802.11ac (VHT20)	6.5 Mbps	52	5260		12.5	No		7.5	No	
				56	5280							
				60	5300							
				64	5320							
		802.11ac (VHT40)	13.5 Mbps	54	5270		10.5	No		7.5	No	
				62	5310							
		802.11ac (VHT80)	29.3 Mbps	58	5290	12.2	12.5	Yes	7.2	7.5	Yes	
	5.5 (U-NII 2C) <5.65GHz	802.11a	6 Mbps	100	5500	Not Required	12.5	No	Not Required	7.5	No	
				112	5560							
				116	5580							
				128	5640							
		802.11n (HT20)	6.5 Mbps	100	5500		12.5	No		7.5	No	
				112	5560							
				116	5580							
				128	5640							
		802.11n (HT40)	13.5 Mbps	102	5510		10.5	No		7.5	No	
				110	5550							
				118	5590							
				126	5630							
		802.11ac (VHT20)	6.5 Mbps	100	5500		12.5	No		7.5	No	
				112	5560							
				116	5580							
				128	5640							
		802.11ac (VHT40)	13.5 Mbps	102	5510		10.5	No		7.5	No	
				110	5550							
				118	5590							
				126	5630							
		802.11ac (VHT80)	29.3 Mbps	106	5530	12.0	12.5	Yes	6.9	7.5	Yes	
				122	5610	12.0			6.9			
	5.5 (U-NII 2C) >5.65GHz + 5.8 (U-NII 3)	802.11a	6 Mbps	132	5660	Not Required	12.5	No	Not Required	7.5	No	
				149	5745							
				165	5825							
				132	5660		12.5	No		7.5	No	
		802.11n (HT20)	6.5 Mbps	149	5745							
				165	5825							
				134	5670		10.5	No		7.5	No	
		151	5755									
		159	5795									
		802.11ac (VHT20)	6.5 Mbps	132	5660		12.5	No		7.5	No	
				149	5745							
				165	5825							
				134	5670		10.5	No		7.5	No	
		802.11ac (VHT40)	13.5 Mbps	151	5755							
				159	5795							
				155	5775							
		802.11ac	29.3 Mbps	155	5775	12.0	12.5	Yes	7.1	7.5	Yes	

Note(s):

- Output power measurement is required for multiple configurations of the same channel bandwidth that have the same specified maximum output power according to APPENDIX C in KDB 248227.
- 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.

9.7. Bluetooth

Maximum tune-up tolerance limit is 8.5 dBm from the rated nominal maximum output power. This power level qualifies for exclusion of SAR testing.

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 v02r02:

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. CDMA BC0

RF Exposure Conditions	Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Standalone	1xRTT (RC3 SO32)	On	0	Rear	384	836.5	14.5	14.0	0.451	0.505	
				Edge 1	384	836.5	14.5	14.0	0.413	0.462	
	1xEVDO (Rel.0)	On	0	Rear	384	836.5	14.5	14.0	0.536	0.601	
				Edge 1	384	836.5	14.5	14.0	0.487	0.546	
Standalone	1xRTT (RC3 SO32)	Off	18	Rear	384	836.5	25.0	24.4	0.606	0.694	1
			20	Edge 1	384	836.5	25.0	24.4	0.475	0.544	
			0	Edge 2	384	836.5	25.0	24.4	0.342	0.392	
				Edge 4	384	836.5	25.0	24.4	0.076	0.087	
	1xEVDO (Rel.0)	Off	18	Rear	384	836.5	25.0	24.2	0.519	0.627	
			20	Edge 1	384	836.5	25.0	24.2	0.458	0.553	
			0	Edge 2	384	836.5	25.0	24.2	0.284	0.343	
				Edge 4	384	836.5	25.0	24.2	0.075	0.091	

10.2. GSM850

RF Exposure Conditions	Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Standalone	GPRS 2 Slots	On	0	Rear	190	836.6	23.5	23.3	0.675	0.702	2
				Edge 1	190	836.6	23.5	23.3	0.564	0.587	
Standalone	GPRS 2 Slots	OFF	18	Rear	190	836.6	31.0	30.6	0.437	0.479	
			20	Edge 1	190	836.6	31.0	30.6	0.446	0.489	
			0	Edge 2	190	836.6	31.0	30.6	0.411	0.451	
				Edge 4	190	836.6	31.0	30.6	0.111	0.122	

10.3. GSM1900

RF Exposure Conditions	Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Standalone	GPRS 2 Slots	ON	0	Rear	661	1880.0	19.0	18.7	0.426	0.458	3
				Edge 1	661	1880.0	19.0	18.7	0.230	0.247	
Standalone	GPRS 2 Slots	OFF	18	Rear	661	1880.0	28.0	27.1	0.135	0.165	
			20	Edge 1	661	1880.0	28.0	27.1	0.124	0.152	
			0	Edge 2	661	1880.0	28.0	27.1	0.013	0.016	
				Edge 4	661	1880.0	28.0	27.1	0.097	0.119	

10.4. W-CDMA Band II

RF Exposure Conditions	Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Standalone	Rel 99 RMC	ON	0	Rear	9400	1880.0	11.5	11.0	0.298	0.335	
				Edge 1	9400	1880.0	11.5	11.0	0.187	0.210	
Standalone	Rel 99 RMC	OFF	18	Rear	9400	1880.0	24.3	23.2	0.372	0.483	4
			20	Edge 1	9400	1880.0	24.3	23.2	0.366	0.475	
			0	Edge 2	9400	1880.0	24.3	23.2	0.031	0.040	
				Edge 4	9400	1880.0	24.3	23.2	0.334	0.434	

10.5. W-CDMA Band V

RF Exposure Conditions	Mode	Pwr Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.
							Tune-up limit	Meas.	Meas.	Scaled	
Standalone	Rel 99 RMC	ON	0	Rear	4183	836.6	15.5	15.1	0.536	0.582	5
				Edge 1	4183	836.6	15.5	15.1	0.448	0.491	
Standalone	Rel 99 RMC	OFF	18	Rear	4183	836.6	24.0	23.2	0.419	0.509	
			20	Edge 1	4183	836.6	24.0	23.2	0.445	0.541	
			0	Edge 2	4183	836.6	24.0	23.2	0.378	0.459	
				Edge 4	4183	836.6	24.0	23.2	0.109	0.132	

10.6. LTE Band 41 (20MHz Bandwidth)

RF Exposure Conditions	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	
Standalone	QPSK	On	0	Rear	40740	2605.0	1	49	15.0	14.6	0.672	0.734	6
							50	24	15.0	14.2	0.599	0.714	
				Edge 1	40740	2605.0	1	49	15.0	14.6	0.406	0.444	
							50	24	15.0	14.2	0.374	0.446	
Standalone	QPSK	OFF	18	Rear	40740	2605.0	1	49	24.3	24.1	0.248	0.260	
							50	24	23.3	21.9	0.147	0.201	
			20	Edge 1	40740	2605.0	1	49	24.3	24.1	0.112	0.117	
							50	24	23.3	21.9	0.068	0.093	
			0	Edge 2	40740	2605.0	1	49	24.3	24.1	0.060	0.062	
							50	24	23.3	21.9	0.038	0.052	
				Edge 4	40740	2605.0	1	49	24.3	24.1	0.392	0.411	
							50	24	23.3	21.9	0.240	0.328	

10.7. Wi-Fi (DTS Band)

Mode	Mode	Pwr. Back-off	Dist. (mm)	Antenna	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	
Standalone	802.11b 1 Mbps	On	0	SISO Main	Rear	11	2462.0	1.097	11.5	11.5	0.733	0.733	
				SISO Sub	Rear	6	2437.0	0.833	11.5	11.5	0.601	0.605	
		Off	5	SISO Main	Rear	1	2412.0	1.236	16.5	16.1	0.950	1.051	7
						6	2437.0	1.019	16.5	15.9	0.798	0.914	
			0	SISO Main	Edge 2	1	2412.0	0.479	16.5	16.1	0.393	0.435	
					Rear	11	2462.0	0.650	16.5	16.3	0.382	0.400	
			0	SISO Sub	Edge 3	11	2462.0	0.162	16.5	16.3	0.103	0.108	

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 this 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.

10.8. Wi-Fi (U-NII Band)

Mode	Frequency Band	Mode	Pwr. Back-off	Dist. (mm)	Antenna	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	
Standalone	5.3 GHz U-NII 2A	802.11ac (VHT80) 29.3 Mbps	On	0	SISO Main	Rear	58	5290.0	1.374	7.5	6.9	0.776	0.891	8
					SISO Sub	Rear	58	5290.0	0.728	7.5	7.2	0.771	0.836	
		802.11ac (VHT80) 29.3 Mbps	Off	0	SISO Main	Rear	58	5290.0	0.718	12.5	11.8	0.420	0.495	
					SISO Main	Edge 2	58	5290.0	0.606	12.5	11.8	0.329	0.387	
					SISO Sub	Rear	58	5290.0	0.705	12.5	12.2	0.577	0.613	
					SISO Sub	Edge 3	58	5290.0	0.419	12.5	12.2	0.190	0.202	
Standalone	5.5 GHz U-NII 2C	802.11ac (VHT80) 29.3 Mbps	On	0	SISO Main	Rear	106	5530.0	1.723	7.5	7.1	0.872	0.954	9
					SISO Main	Rear	122	5610.0	1.332	7.5	6.7	0.764	0.921	
					SISO Sub	Rear	106	5530.0	1.135	7.5	6.9	0.823	0.938	
					SISO Sub	Rear	122	5610.0	1.023	7.5	6.9	0.755	0.873	
		802.11ac (VHT80) 29.3 Mbps	Off	0	SISO Main	Rear	106	5530.0	1.177	12.5	12.1	0.525	0.580	
					SISO Main	Edge 2	106	5530.0	0.544	12.5	12.1	0.295	0.326	
					SISO Sub	Rear	106	5530.0	1.087	12.5	12.0	0.695	0.783	
					SISO Sub	Edge 3	106	5530.0	0.437	12.5	12.0	0.282	0.318	
Standalone	5.8 GHz U-NII 3	802.11ac (VHT80) 29.3 Mbps	On	0	SISO Main	Rear	155	5775.0	1.781	7.5	7.3	0.672	0.699	
					SISO Sub	Rear	155	5775.0	0.700	7.5	7.1	0.625	0.690	
		802.11ac (VHT80) 29.3 Mbps	Off	0	SISO Main	Rear	155	5775.0	1.651	12.5	12.3	0.746	0.779	
					SISO Main	Edge 2	155	5775.0	0.237	12.5	12.3	0.164	0.171	
					SISO Sub	Rear	155	5775.0	0.880	12.5	12.0	0.724	0.807	10
					SISO Sub	Edge 3	155	5775.0	0.401	12.5	12.0	0.202	0.225	

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 this 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.

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)	First Repeated	
						Measured SAR (W/kg)	Largest to Smallest SAR Ratio
850	CDMA BC0	Standalone	Rear	No	0.606	N/A	N/A
	GSM 850	Standalone	Rear	No	0.675	N/A	N/A
	WCDMA Band V	Standalone	Rear	No	0.536	N/A	N/A
1900	GSM 1900	Standalone	Rear	No	0.426	N/A	N/A
	WCDMA Band II	Standalone	Rear	No	0.372	N/A	N/A
2400	Wi-Fi 802.11b/g/n	Standalone	Rear	Yes	0.950	0.845	1.12
2600	LTE Band 41	Standalone	Rear	No	0.672	N/A	N/A
5300	Wi-Fi 802.11a/n/ac	Standalone	Rear	No	0.776	N/A	N/A
5500	Wi-Fi 802.11a/n/ac	Standalone	Rear	Yes	0.872	0.923	1.06
5800	Wi-Fi 802.11a/n/ac	Standalone	Rear	No	0.746	N/A	N/A

Note(s):

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

12. 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:

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

Simultaneous Transmission Condition

RF Exposure Condition	Item	Capable Transmit Configurations	
Standalone	1	CDMA	+ DTS
	2	CDMA	+ U-NII
	3	CDMA	+ BT
	4	GSM(GPRS/EDGE)	+ DTS
	5	GSM(GPRS/EDGE)	+ U-NII
	6	GSM(GPRS/EDGE)	+ BT
	7	W-CDMA	+ DTS
	8	W-CDMA	+ U-NII
	9	W-CDMA	+ BT
	10	LTE	+ DTS
	11	LTE	+ U-NII
	12	LTE	+ BT
Notes:			
1. DTS, U-NII supports Hotspot and Wi-Fi Direct.			
2. GPRS/EDGE, W-CDMA, CDMA and LTE support Hotspot.			
3. VoIP is supported in GPRS/EDGE, W-CDMA, CDMA and LTE.			
4. DTS Radio cannot transmit simultaneously with Bluetooth Radio.			
5. U-NII Radio cannot transmit simultaneously with 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	31.00	315	0	0	43	233	43		-MEASURE-	-MEASURE-	-MEASURE-	0.400	-MEASURE-	
Cellular	GPRS 2 Slots	1909.8	28.00	158	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	W-CDMA 2	1907.6	24.30	269	0	0	43	233	43		-MEASURE-	-MEASURE-	-MEASURE-	0.400	-MEASURE-	
Cellular	CDMA BC0	848.31	25.00	316	0	0	43	233	43		-MEASURE-	-MEASURE-	-MEASURE-	0.400	-MEASURE-	
Cellular	LTE Band 41	2655	24.30	269	0	0	43	233	43		-MEASURE-	-MEASURE-	-MEASURE-	0.400	-MEASURE-	
Power Back-off, Proximity Sensor On																
Cellular	GPRS 2 Slots	848.8	23.50	56	0	0					-MEASURE-	-MEASURE-				
Cellular	GPRS 2 Slots	1909.8	19.00	20	0	0					-MEASURE-	-MEASURE-				
Cellular	W-CDMA 5	846.6	15.50	35	0	0					-MEASURE-	-MEASURE-				
Cellular	W-CDMA 2	1907.6	11.50	14	0	0					-MEASURE-	-MEASURE-				
Cellular	CDMA BC0	848.31	14.50	28	0	0					-MEASURE-	-MEASURE-				
Cellular	LTE Band 41	2655	15.00	32	0	0					-MEASURE-	-MEASURE-				

Estimated SAR for WLAN**Main 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
Wi-Fi Main Antenna Max.															
Wi-Fi 2.4 GHz	2462	16.50	45	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.336	0.400	
Wi-Fi 5.3 GHz	5320	12.50	18	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.198	0.400	
Wi-Fi 5.5 GHz	5700	12.50	18	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.205	0.400	
Wi-Fi 5.8 GHz	5825	12.50	18	0.9	180	5.1	28	160.3		-MEASURE	0.400	-MEASURE	0.207	0.400	
Bluetooth	2480	8.50	7	0.9	180	5.1	28	160.3		0.294	0.400	0.294	0.052	0.400	
Wi-Fi Main Antenna Reduced.															
Wi-Fi 2.4 GHz	2462	11.50	14	0.9						-MEASURE					
Wi-Fi 5.3 GHz	5320	7.50	6	0.9						0.369					
Wi-Fi 5.5 GHz	5700	7.50	6	0.9						0.382					
Wi-Fi 5.8 GHz	5825	7.50	6	0.9						0.386					

Sub 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
Wi-Fi Main Antenna Max.															
Wi-Fi 2.4 GHz	2462	16.50	45	0.8	221	65.8	4.29	81		-MEASURE	0.400	0.400	-MEASURE	0.400	
Wi-Fi 5.3 GHz	5320	12.50	18	0.8	221	65.8	4.29	81		-MEASURE	0.400	0.400	-MEASURE	0.400	
Wi-Fi 5.5 GHz	5700	12.50	18	0.8	221	65.8	4.29	81		-MEASURE	0.400	0.400	-MEASURE	0.400	
Wi-Fi 5.8 GHz	5825	12.50	18	0.8	221	65.8	4.29	81		-MEASURE	0.400	0.400	-MEASURE	0.400	
Wi-Fi Main Antenna Reduced.															
Wi-Fi 2.4 GHz	2462	11.50	14	0.8						-MEASURE					
Wi-Fi 5.3 GHz	5320	7.50	6	0.8						0.369					
Wi-Fi 5.5 GHz	5700	7.50	6	0.8						0.382					
Wi-Fi 5.8 GHz	5825	7.50	6	0.8						0.386					

12.1. Sum of the SAR for CDMA BC0 & Wi-Fi & BT

Test Position	Standalone SAR (W/kg)			Σ 1-g SAR (W/kg)		
	WWAN ①	DTS Main ②	DTS Sub ③	WWAN + DTS Main ① + ②	WWAN + DTS Sub ① + ③	WWAN + DTS MIMO ① + ② + ③
Rear	0.694	1.051	0.605	1.745	1.299	2.350
Edge 1	0.553	0.400	0.400	0.953	0.953	1.353
Edge 2	0.392	0.435	0.400	0.827	0.792	1.227
Edge 3	0.400	0.400	0.108	0.800	0.508	0.908
Edge 4	0.091	0.400	0.400	0.491	0.491	0.891

Test Position	Standalone SAR (W/kg)				Σ 1-g SAR (W/kg)			
	WWAN ①	U-NII Main ②	U-NII Sub ③	BT ④	WWAN + U-NII Main ① + ②	WWAN + U-NII Sub ① + ③	WWAN + U-NII MIMO ① + ② + ③	WWAN + BT ① + ④
Rear	0.694	0.954	0.938	0.294	1.648	1.632	2.586	0.988
Edge 1	0.553	0.400	0.400	0.400	0.953	0.953	1.353	0.953
Edge 2	0.392	0.387	0.400	0.294	0.779	0.792	1.179	0.686
Edge 3	0.400	0.400	0.318	0.052	0.800	0.718	1.118	0.452
Edge 4	0.091	0.400	0.400	0.400	0.491	0.491	0.891	0.491

SAR to Peak Location Separation Ratio (SPLSR)

Test Position	Standalone SAR (W/kg)			Σ 1-g SAR (W/kg)		Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
	① WWAN	② DTS Main	③ DTS Sub	① + ② + ③					
Rear	0.694	1.051	0.605	① + ② + ③	2.350				1
	0.694	1.051		① + ②	1.745	211.4	0.01	No	
	0.694		0.605	① + ③	1.299	235.4	0.01	No	
		1.051	0.605	② + ③	1.656	69.5	0.03	No	
Test Position	Standalone SAR (W/kg)			Σ 1-g SAR (W/kg)		Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
	① WWAN	② U-NII Main	③ U-NII Sub	① + ② + ③					
Rear	0.694	0.954	0.938	① + ② + ③	2.586				2
	0.694	0.954		① + ②	1.648	213.8	0.01	No	
	0.694		0.938	① + ③	1.632	231.3	0.01	No	
		0.954	0.938	② + ③	1.892	70.0	0.04	No	

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

Test Position	Standalone SAR (W/kg)			Σ 1-g SAR (W/kg)		
	WWAN ①	DTS Main ②	DTS Sub ③	WWAN + DTS Main ① + ②	WWAN + DTS Sub ① + ③	WWAN + DTS MIMO ① + ② + ③
Rear	0.702	1.051	0.605	1.753	1.307	2.358
Edge 1	0.587	0.400	0.400	0.987	0.987	1.387
Edge 2	0.451	0.435	0.400	0.886	0.851	1.286
Edge 3	0.400	0.400	0.108	0.800	0.508	0.908
Edge 4	0.122	0.400	0.400	0.522	0.522	0.922

Test Position	Standalone SAR (W/kg)				Σ 1-g SAR (W/kg)			
	WWAN ①	U-NII Main ②	U-NII Sub ③	BT ④	WWAN + U-NII Main ① + ②	WWAN + U-NII Sub ① + ③	WWAN + U-NII MIMO ① + ② + ③	WWAN + BT ① + ④
Rear	0.702	0.954	0.938	0.294	1.656	1.640	2.594	0.996
Edge 1	0.587	0.400	0.400	0.400	0.987	0.987	1.387	0.987
Edge 2	0.451	0.387	0.400	0.294	0.838	0.851	1.238	0.745
Edge 3	0.400	0.400	0.318	0.052	0.800	0.718	1.118	0.452
Edge 4	0.122	0.400	0.400	0.400	0.522	0.522	0.922	0.522

SAR to Peak Location Separation Ratio (SPLSR)

Test Position	Standalone SAR (W/kg)			Σ 1-g SAR (W/kg)		Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
	① WWAN	② DTS Main	③ DTS Sub	① + ② + ③	① + ②				
Rear	0.702	1.051	0.605	① + ② + ③	2.358				3
	0.702	1.051		① + ②	1.753	205.4	0.01	No	
	0.702		0.605	① + ③	1.307	261.6	0.01	No	
		1.051	0.605	② + ③	1.656	69.5	0.03	No	
Test Position	Standalone SAR (W/kg)			Σ 1-g SAR (W/kg)		Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
	① WWAN	② U-NII Main	③ U-NII Sub	① + ② + ③	① + ②				
Rear	0.702	0.954	0.938	① + ② + ③	2.594				4
	0.702	0.954		① + ②	1.656	205.8	0.01	No	
	0.702		0.938	① + ③	1.640	258.1	0.01	No	
		0.954	0.938	② + ③	1.892	70.0	0.04	No	

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

Test Position	Standalone SAR (W/kg)			Σ 1-g SAR (W/kg)		
	WWAN ①	DTS Main ②	DTS Sub ③	WWAN + DTS Main ① + ②	WWAN + DTS Sub ① + ③	WWAN + DTS MIMO ① + ② + ③
Rear	0.458	1.051	0.605	1.509	1.063	2.114
Edge 1	0.247	0.400	0.400	0.647	0.647	1.047
Edge 2	0.016	0.435	0.400	0.451	0.416	0.851
Edge 3	0.400	0.400	0.108	0.800	0.508	0.908
Edge 4	0.119	0.400	0.400	0.519	0.519	0.919

Test Position	Standalone SAR (W/kg)				Σ 1-g SAR (W/kg)			
	WWAN ①	U-NII Main ②	U-NII Sub ③	BT ④	WWAN + U-NII Main ① + ②	WWAN + U-NII Sub ① + ③	WWAN + U-NII MIMO ① + ② + ③	WWAN + BT ① + ④
Rear	0.458	0.954	0.938	0.294	1.412	1.396	2.350	0.752
Edge 1	0.247	0.400	0.400	0.400	0.647	0.647	1.047	0.647
Edge 2	0.016	0.387	0.400	0.294	0.403	0.416	0.803	0.310
Edge 3	0.400	0.400	0.318	0.052	0.800	0.718	1.118	0.452
Edge 4	0.119	0.400	0.400	0.400	0.519	0.519	0.919	0.519

SAR to Peak Location Separation Ratio (SPLSR)

Test Position	Standalone SAR (W/kg)			Σ 1-g SAR (W/kg)		Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
	① WWAN	② DTS Main	③ DTS Sub	① + ② + ③	① + ②				
Rear	0.458	1.051	0.605	① + ② + ③	2.114				5
	0.458	1.051		① + ②	1.509	208.1	0.01	No	
	0.458		0.605	① + ③	1.063	223.8	0.00	No	
		1.051	0.605	② + ③	1.656	69.5	0.03	No	
Test Position	Standalone SAR (W/kg)			Σ 1-g SAR (W/kg)		Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
	① WWAN	② U-NII Main	③ U-NII Sub	① + ② + ③	① + ②				
Rear	0.458	0.954	0.938	① + ② + ③	2.350				6
	0.458	0.954		① + ②	1.412	210.8	0.01	No	
	0.458		0.938	① + ③	1.396	219.8	0.01	No	
		0.954	0.938	② + ③	1.892	70.0	0.04	No	

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

Test Position	Standalone SAR (W/kg)			Σ 1-g SAR (W/kg)		
	WWAN ①	DTS Main ②	DTS Sub ③	WWAN + DTS Main ① + ②	WWAN + DTS Sub ① + ③	WWAN + DTS MIMO ① + ② + ③
Rear	0.483	1.051	0.605	1.534	1.088	2.139
Edge 1	0.475	0.400	0.400	0.875	0.875	1.275
Edge 2	0.040	0.435	0.400	0.475	0.440	0.875
Edge 3	0.400	0.400	0.108	0.800	0.508	0.908
Edge 4	0.434	0.400	0.400	0.834	0.834	1.234

Test Position	Standalone SAR (W/kg)				Σ 1-g SAR (W/kg)			
	WWAN ①	U-NII Main ②	U-NII Sub ③	BT ④	WWAN + U-NII Main ① + ②	WWAN + U-NII Sub ① + ③	WWAN + U-NII MIMO ① + ② + ③	WWAN + BT ① + ④
Rear	0.483	0.954	0.938	0.294	1.437	1.421	2.375	0.777
Edge 1	0.475	0.400	0.400	0.400	0.875	0.875	1.275	0.875
Edge 2	0.040	0.387	0.400	0.294	0.427	0.440	0.827	0.334
Edge 3	0.400	0.400	0.318	0.052	0.800	0.718	1.118	0.452
Edge 4	0.434	0.400	0.400	0.400	0.834	0.834	1.234	0.834

SAR to Peak Location Separation Ratio (SPLSR)

Test Position	Standalone SAR (W/kg)			Σ 1-g SAR (W/kg)		Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
	① WWAN	② DTS Main	③ DTS Sub	① + ② + ③	① + ②				
Rear	0.483	1.051	0.605	① + ② + ③	2.139				7
	0.483	1.051		① + ②	1.534	212.6	0.01	No	
	0.483		0.605	① + ③	1.088	229.6	0.00	No	
		1.051	0.605	② + ③	1.656	69.5	0.03	No	
Test Position	Standalone SAR (W/kg)			Σ 1-g SAR (W/kg)		Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
	① WWAN	② U-NII Main	③ U-NII Sub	① + ② + ③	① + ②				
Rear	0.483	0.954	0.938	① + ② + ③	2.375				8
	0.483	0.954		① + ②	1.437	215.2	0.01	No	
	0.483		0.938	① + ③	1.421	225.6	0.01	No	
		0.954	0.938	② + ③	1.892	70.0	0.04	No	

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

Test Position	Standalone SAR (W/kg)			Σ 1-g SAR (W/kg)		
	WWAN ①	DTS Main ②	DTS Sub ③	WWAN + DTS Main ① + ②	WWAN + DTS Sub ① + ③	WWAN + DTS MIMO ① + ② + ③
Rear	0.582	1.051	0.605	1.633	1.187	2.238
Edge 1	0.541	0.400	0.400	0.941	0.941	1.341
Edge 2	0.459	0.435	0.400	0.894	0.859	1.294
Edge 3	0.400	0.400	0.108	0.800	0.508	0.908
Edge 4	0.132	0.400	0.400	0.532	0.532	0.932

Test Position	Standalone SAR (W/kg)				Σ 1-g SAR (W/kg)			
	WWAN ①	U-NII Main ②	U-NII Sub ③	BT ④	WWAN + U-NII Main ① + ②	WWAN + U-NII Sub ① + ③	WWAN + U-NII MIMO ① + ② + ③	WWAN + BT ① + ④
Rear	0.582	0.954	0.938	0.294	1.536	1.520	2.474	0.876
Edge 1	0.541	0.400	0.400	0.400	0.941	0.941	1.341	0.941
Edge 2	0.459	0.387	0.400	0.294	0.846	0.859	1.246	0.753
Edge 3	0.400	0.400	0.318	0.052	0.800	0.718	1.118	0.452
Edge 4	0.132	0.400	0.400	0.400	0.532	0.532	0.932	0.532

SAR to Peak Location Separation Ratio (SPLSR)

Test Position	Standalone SAR (W/kg)			Σ 1-g SAR (W/kg)		Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
	① WWAN	② DTS Main	③ DTS Sub	① + ② + ③	① + ②				
Rear	0.582	1.051	0.605	① + ② + ③	2.238				9
	0.582	1.051		① + ②	1.633	208.9	0.01	No	
	0.582		0.605	① + ③	1.187	233.4	0.01	No	
		1.051	0.605	② + ③	1.656	69.5	0.03	No	
Test Position	Standalone SAR (W/kg)			Σ 1-g SAR (W/kg)		Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
	① WWAN	② U-NII Main	③ U-NII Sub	① + ② + ③	① + ②				
Rear	0.582	0.954	0.938	① + ② + ③	2.474				10
	0.582	0.954		① + ②	1.536	211.3	0.01	No	
	0.582		0.938	① + ③	1.520	229.4	0.01	No	
		0.954	0.938	② + ③	1.892	70.0	0.04	No	

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

Test Position	Standalone SAR (W/kg)			Σ 1-g SAR (W/kg)		
	WWAN	DTS Main	DTS Sub	WWAN + DTS Main	WWAN + DTS Sub	WWAN + DTS MIMO
	①	②	③	① + ②	① + ③	① + ② + ③
Rear	0.734	1.051	0.605	1.785	1.339	2.390
Edge 1	0.446	0.400	0.400	0.846	0.846	1.246
Edge 2	0.062	0.435	0.400	0.497	0.462	0.897
Edge 3	0.400	0.400	0.108	0.800	0.508	0.908
Edge 4	0.411	0.400	0.400	0.811	0.811	1.211

Test Position	Standalone SAR (W/kg)				Σ 1-g SAR (W/kg)			
	WWAN	U-NII Main	U-NII Sub	BT	WWAN + U-NII Main	WWAN + U-NII Sub	WWAN + U-NII MIMO	WWAN + BT
	①	②	③	④	① + ②	① + ③	① + ② + ③	① + ④
Rear	0.734	0.954	0.938	0.294	1.688	1.672	2.626	1.028
Edge 1	0.446	0.400	0.400	0.400	0.846	0.846	1.246	0.846
Edge 2	0.062	0.387	0.400	0.294	0.449	0.462	0.849	0.356
Edge 3	0.400	0.400	0.318	0.052	0.800	0.718	1.118	0.452
Edge 4	0.411	0.400	0.400	0.400	0.811	0.811	1.211	0.811

SAR to Peak Location Separation Ratio (SPLSR)

Test Position	Standalone SAR (W/kg)			$\sum$ 1-g SAR (W/kg)		Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
	① WWAN	② DTS Main	③ DTS Sub						
Rear	0.734	1.051	0.605	① + ② + ③	2.390				11
	0.734	1.051		① + ②	1.785	210.4	0.01	No	
	0.734		0.605	① + ③	1.339	226.0	0.01	No	
		1.051	0.605	② + ③	1.656	69.5	0.03	No	
Test Position	Standalone SAR (W/kg)			$\sum$ 1-g SAR (W/kg)		Calculated distance (mm)	SPLSR (≤ 0.04)	Volume Scan (Yes/ No)	Figure
	① WWAN	② U-NII Main	③ U-NII Sub						
Rear	0.734	0.954	0.938	① + ② + ③	2.626				12
	0.734	0.954		① + ②	1.688	213.1	0.01	No	
	0.734		0.938	① + ③	1.672	222.0	0.01	No	
		0.954	0.938	② + ③	1.892	70.0	0.04	No	

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.

Figure (1)

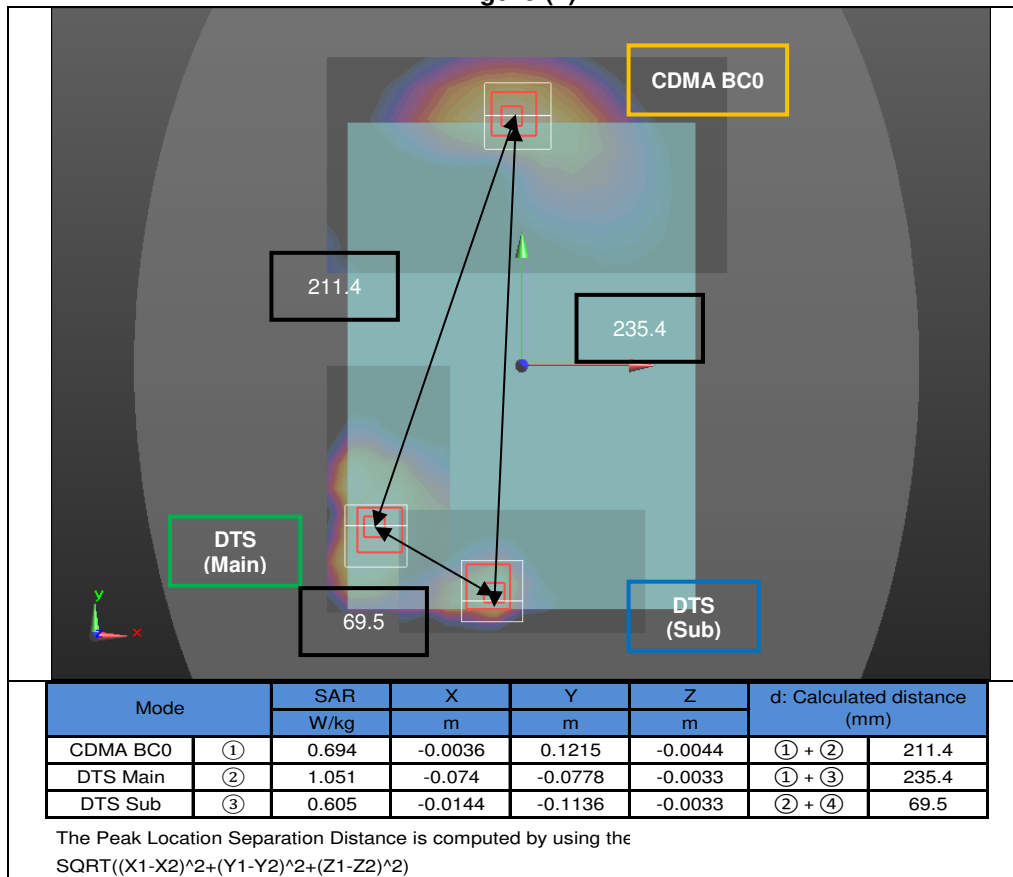


Figure (2)

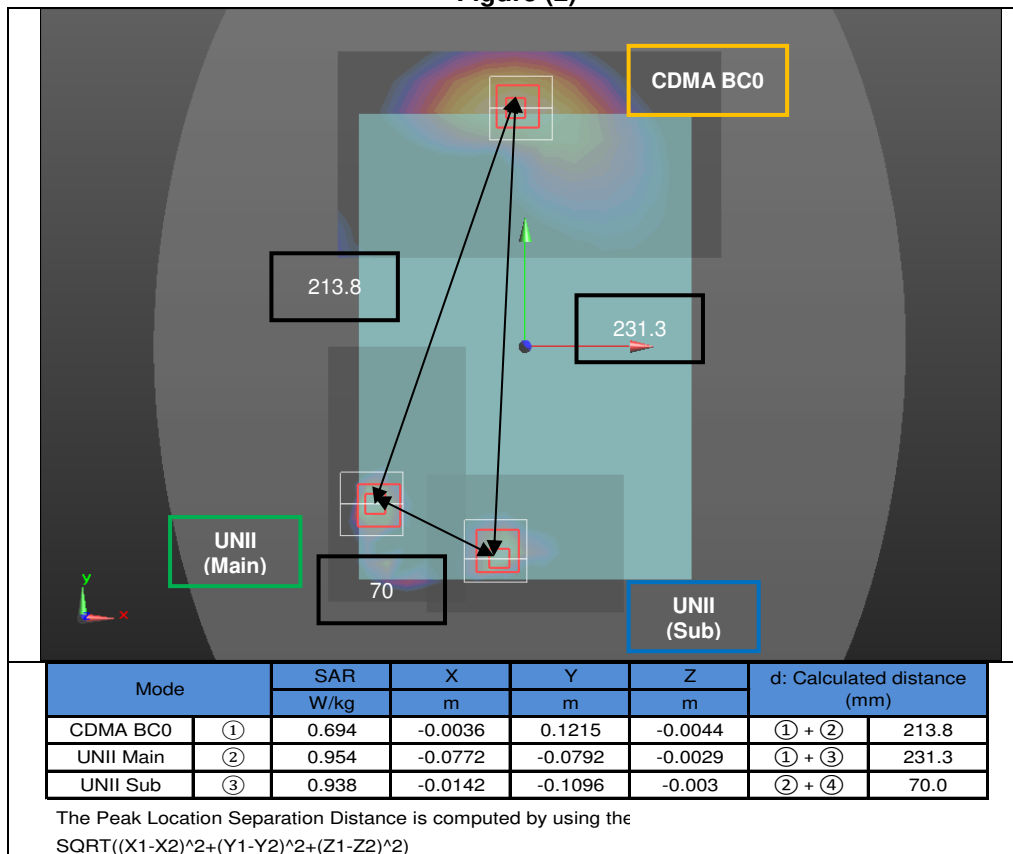


Figure (3)

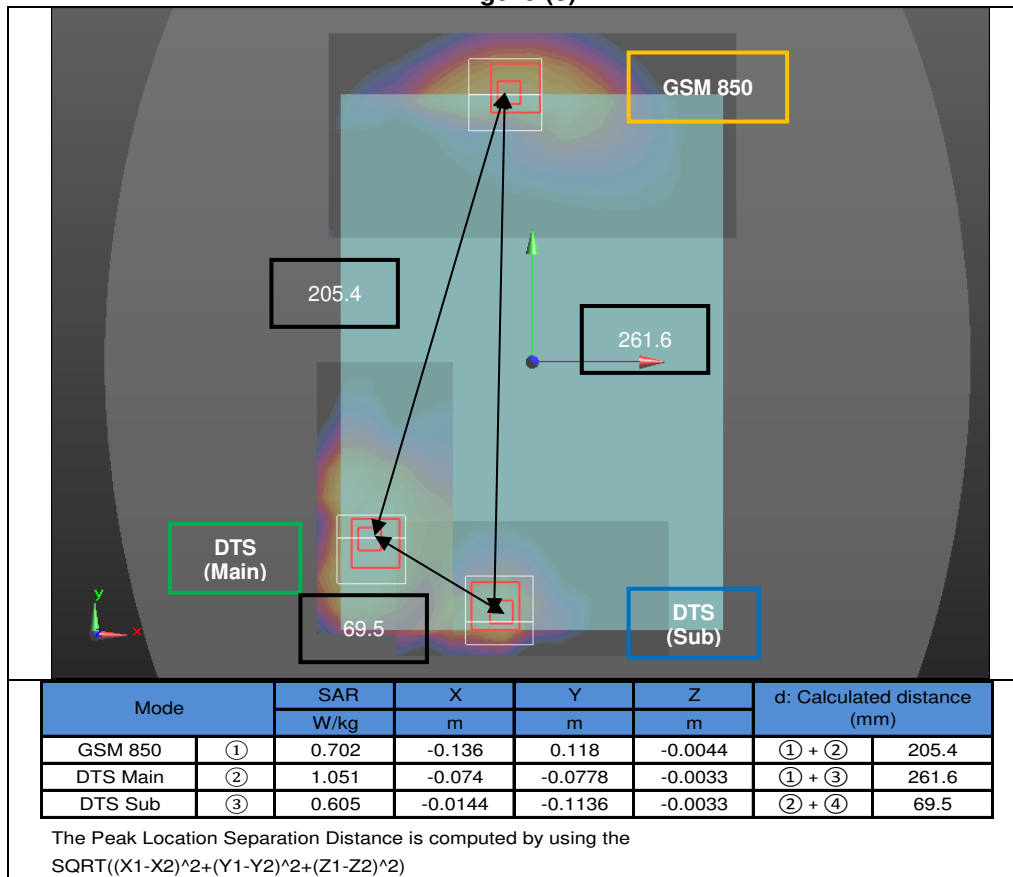


Figure (4)

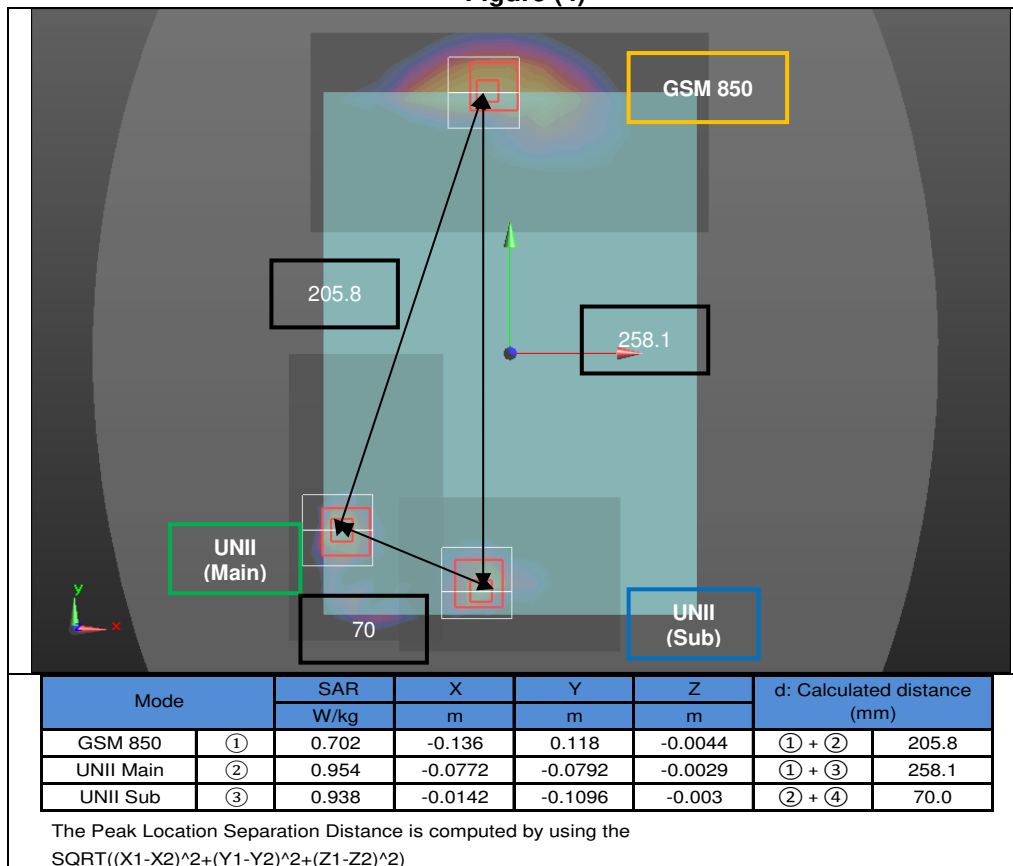


Figure (5)

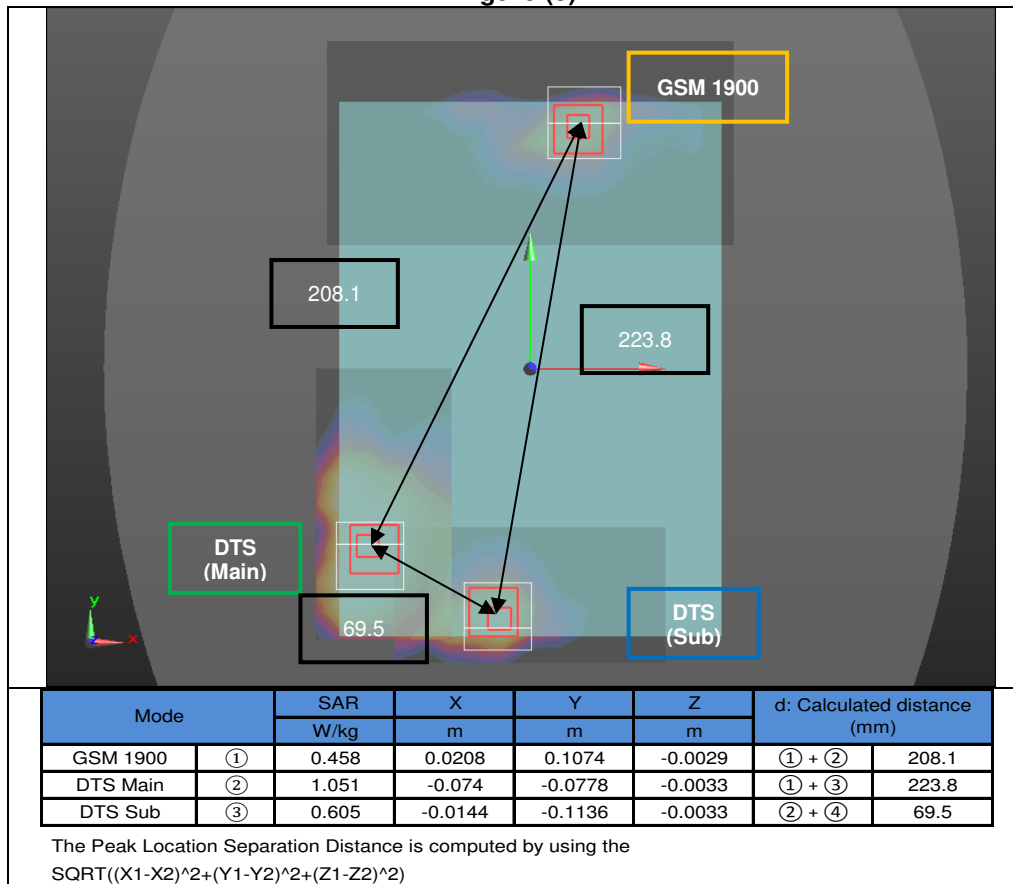


Figure (6)

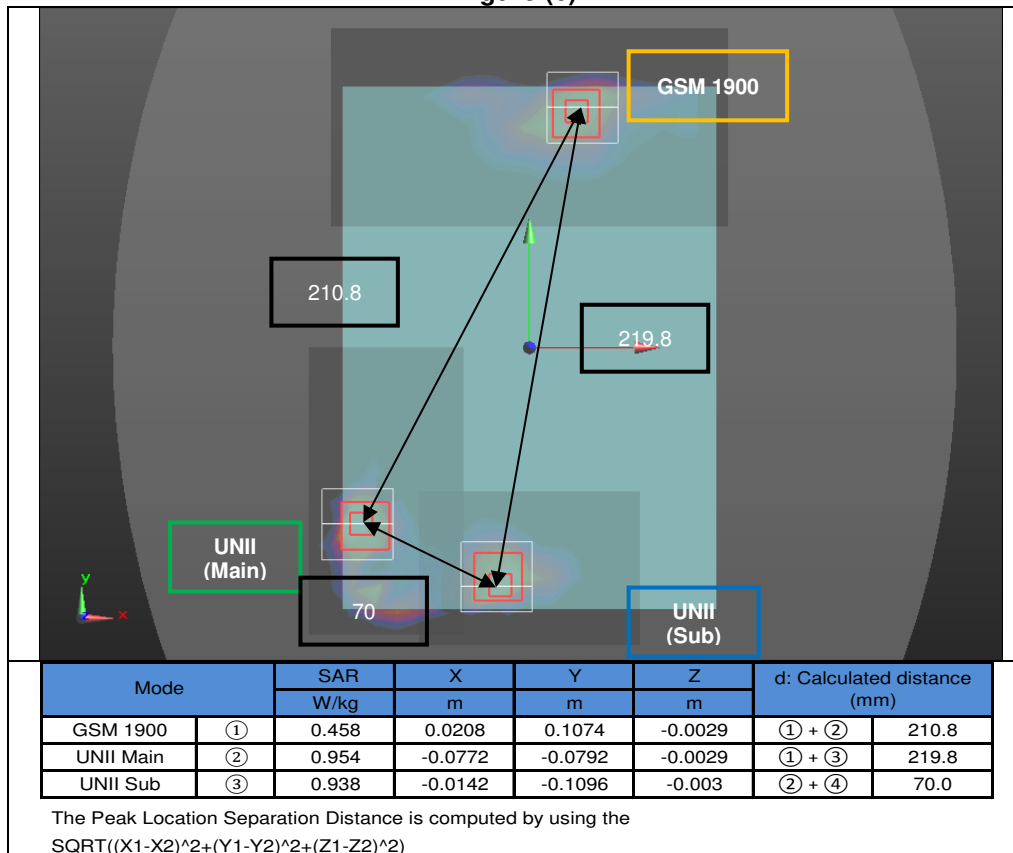


Figure (7)

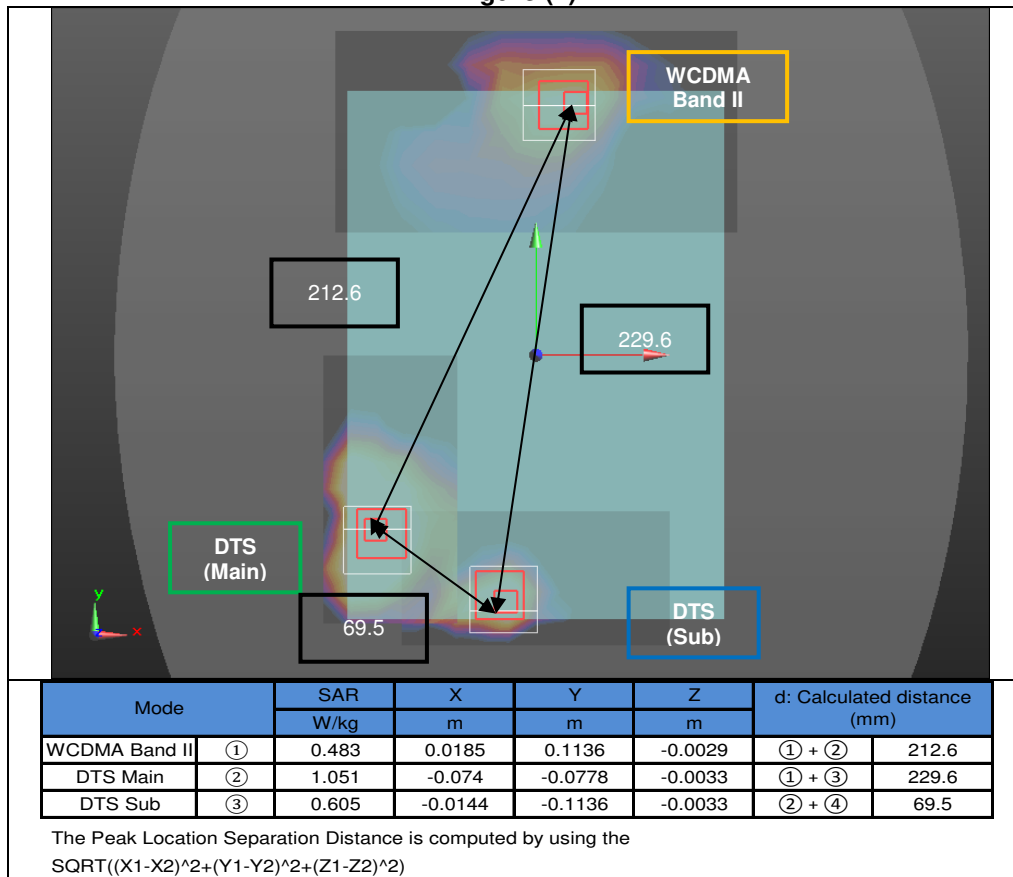


Figure (8)

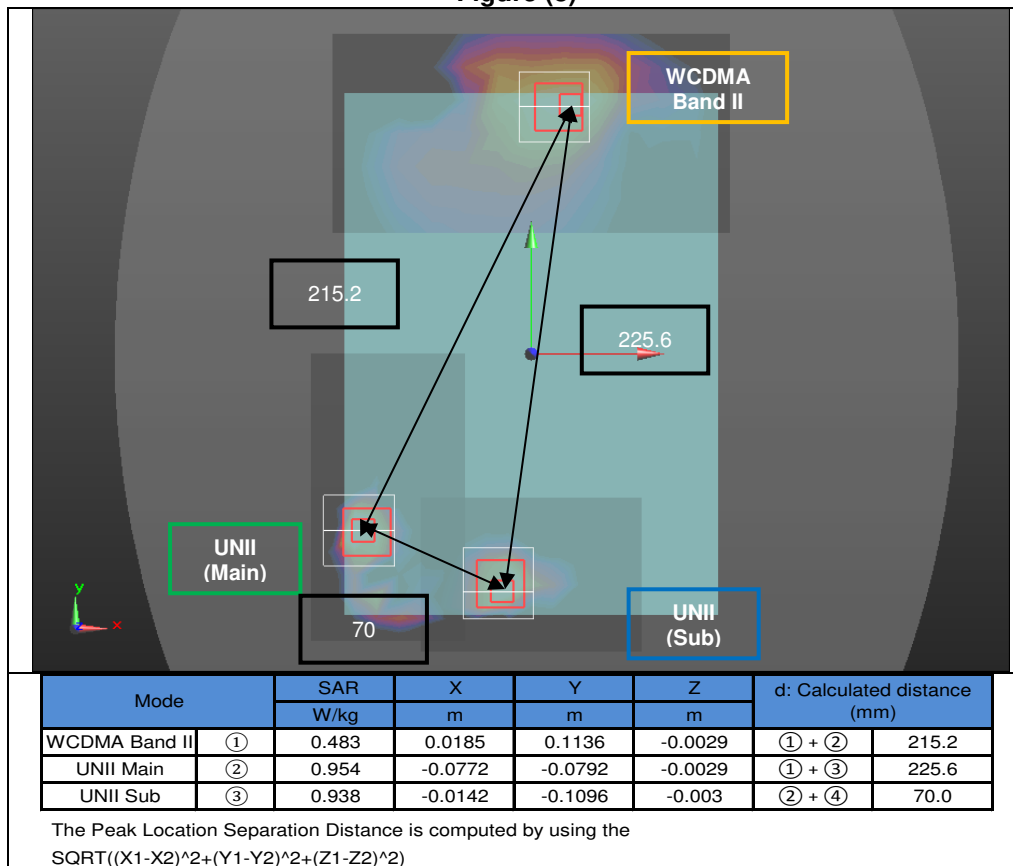


Figure (9)

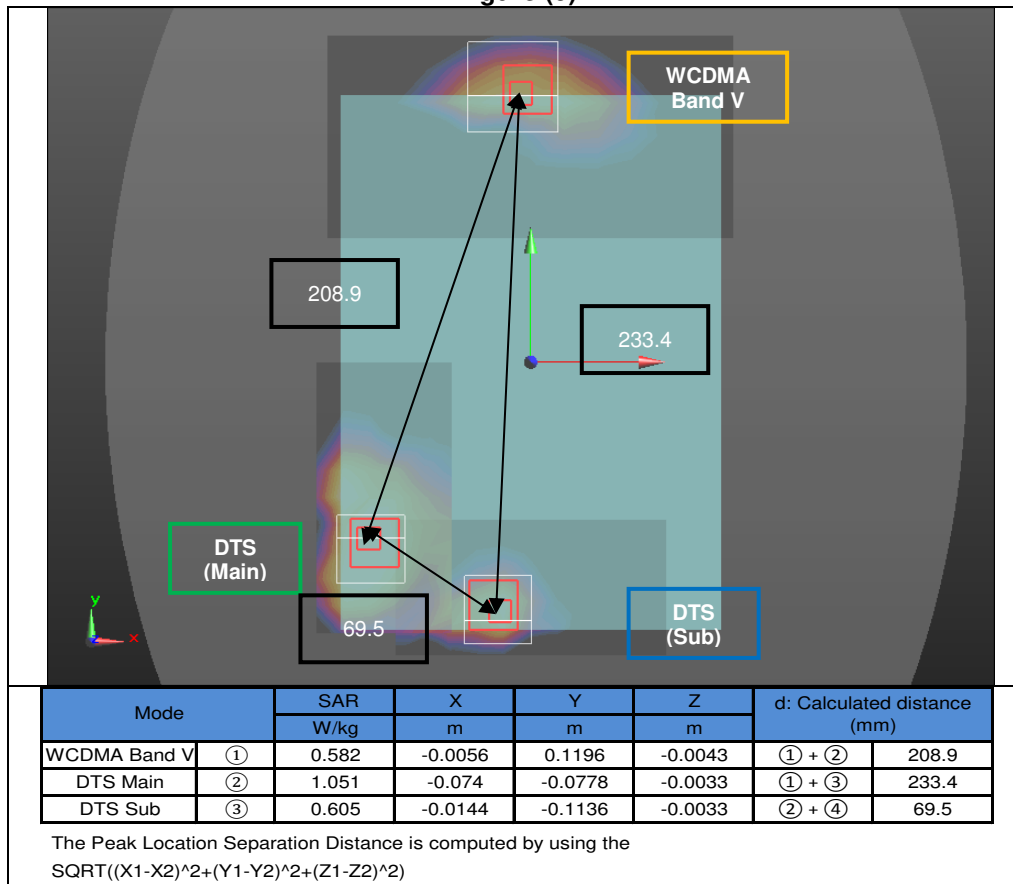


Figure (10)

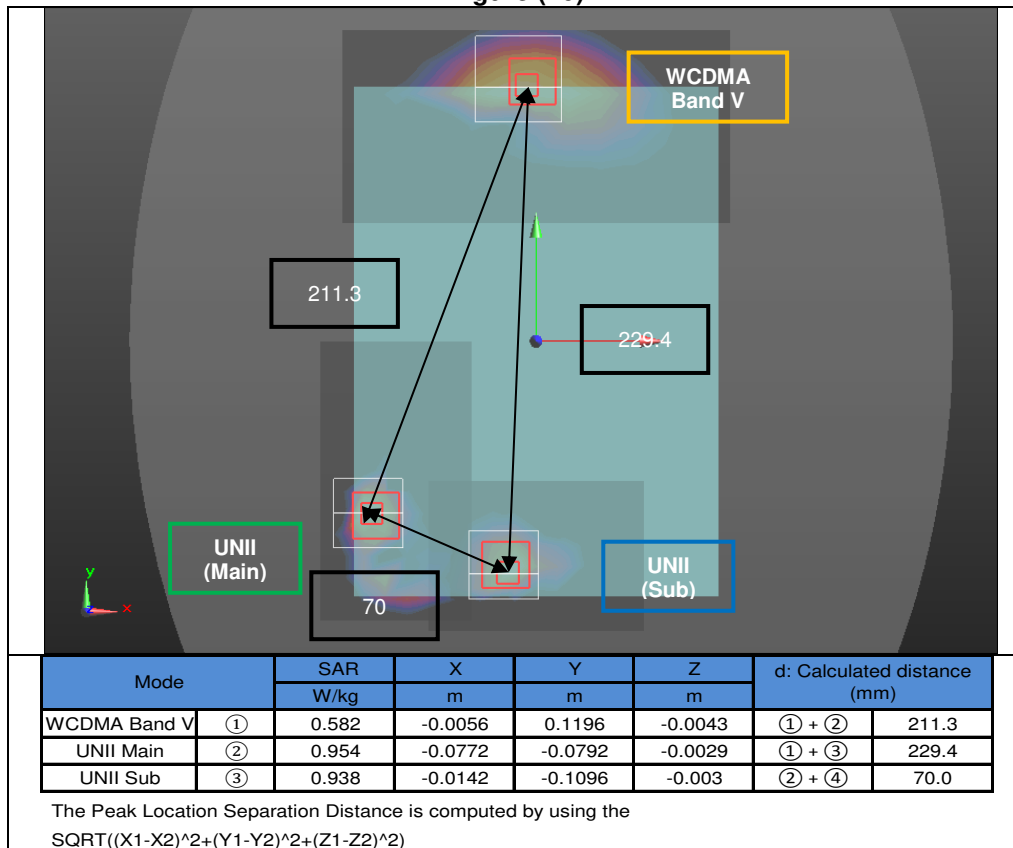


Figure (11)

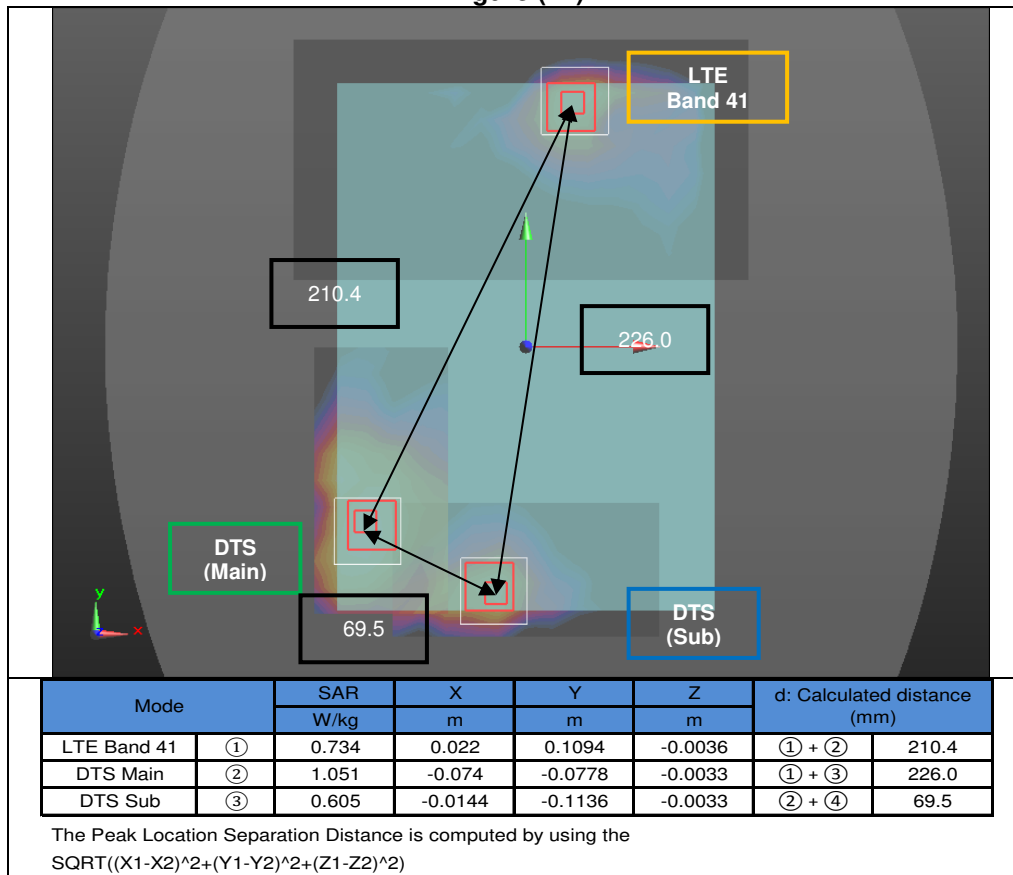
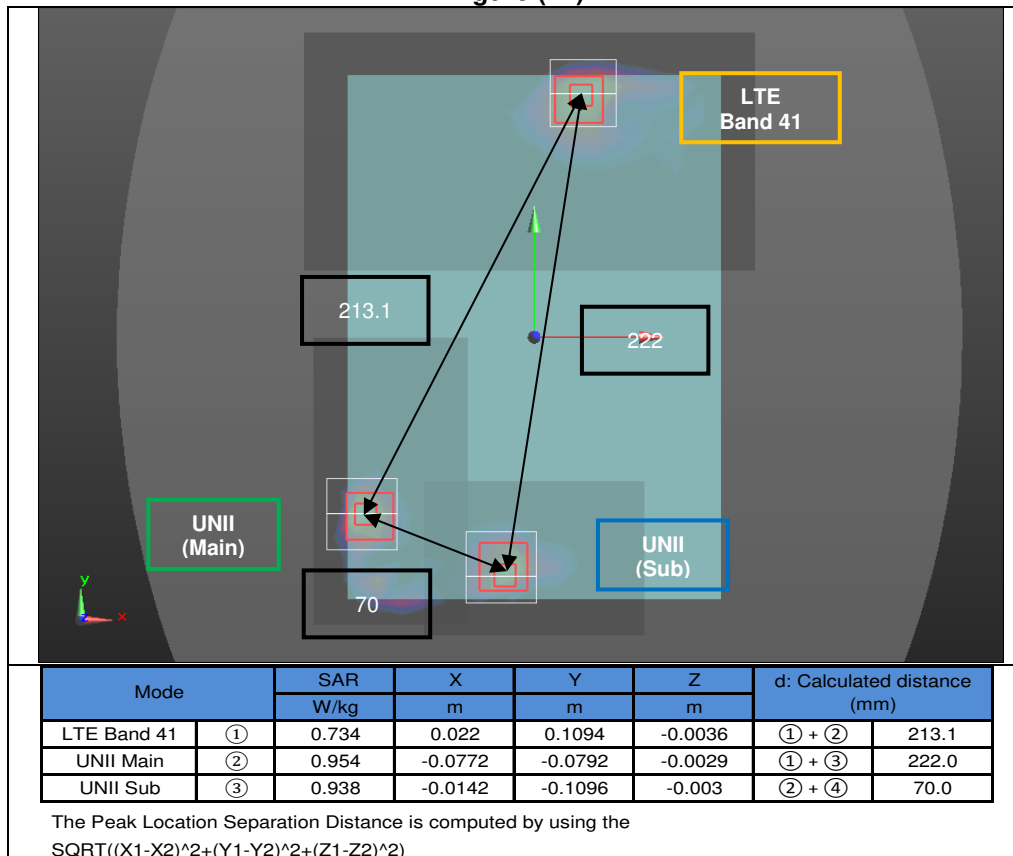


Figure (12)



Appendixes

Refer to separated files for the following appendixes.

16K23301-S1V2 FCC Report SAR_App A_Photos & Ant. Locations

16K23301-S1V2 FCC Report SAR_App B_Highest SAR Test Plots

16K23301-S1V2 FCC Report SAR_App C_System Check Plots

16K23301-S1V2 FCC Report SAR_App D_SAR Tissue Ingredients

16K23301-S1V2 FCC Report SAR_App E_Probe Cal. Certificates

16K23301-S1V2 FCC Report SAR_App F_Dipole Cal. Certificates

END OF REPORT