



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

**SAR EVALUATION REPORT**

**FOR**

**DTS/UNII a/b/g/n/ac Tablet + BT/BLE,**

**MODEL NUMBER: SM-T730**

**FCC ID: A3LSMT730**

**REPORT NUMBER: 4789867697-S1V2**

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**TL-637**

**Revision History**

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V1	4/27/2021	Initial Issue	-
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# 1. Attestation of Test Results

Applicant Name	SAMSUNG ELECTRONICS CO.,LTD.		
FCC ID	A3LSMT730		
Model Name	SM-T730		
Applicable Standards	FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013		
<b>SAR Limits (W/Kg)</b>			
Exposure Category	Peak spatial-average(1g of tissue)		
General population / Uncontrolled exposure	1.6		
<b>The Highest Reported SAR (W/kg)</b>			
<b>RF Exposure Conditions</b>	<b>Equipment Class</b>		
	<b>DTS</b>	<b>U-III</b>	<b>DSS(BT)</b>
Standalone	0.26	1.20	0.32
Simultaneous TX	0.80	1.50	1.50
Date Tested	4/5/2021 to 4/27/2021		
Test Results	Pass		
<p>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.</p> <p><b>Note:</b> 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.</p>			
Approved & Released By:	Prepared By:		
			
Justin Park Operations Leader UL Korea, Ltd. Suwon Laboratory	JeongYeon Won Senior Laboratory Technician UL Korea, Ltd. Suwon Laboratory		

**1.1. The Highest Reported SAR for RF exposure conditions for each bands**

Equipment Class	Band	The Highest Reported SAR (W/kg)
		1g of tissue
		Standalone Exposure condition
DTS	2.4GHz WLAN	0.262
UNII	5GHz WLAN	1.200
DSS	Bluetooth	0.316

## 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

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

- [TCB workshop](#) October, 2016; Page 7, RF Exposure Procedures (Bluetooth Duty Factor)
- [TCB workshop](#) April, 2019 Page 19, RF Exposure Procedures (Tissue Simulating Liquids (TSL))

### Additional Guidance: KDB inquiry

- Additional SAR test of corner side – KDB guidance to identify that SAR test when sensor and antenna is located near corner side.

## 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
SAR 4 Room

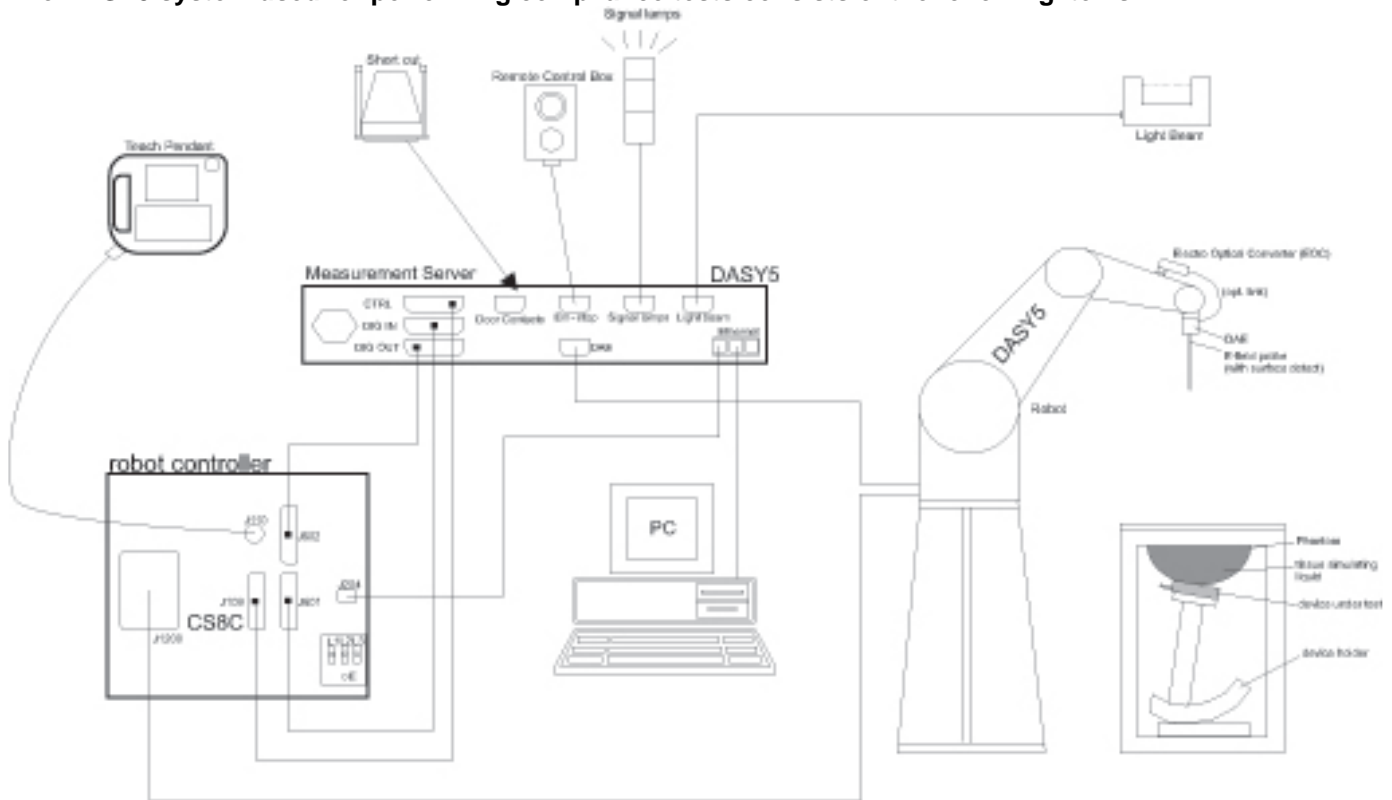
UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637.

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

	$\leq 3$ GHz	$> 3$ GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	$5 \pm 1$ 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: $\Delta x_{Area}$ , $\Delta y_{Area}$	$\leq 2$ GHz: $\leq 15$ mm $2 - 3$ GHz: $\leq 12$ mm	$3 - 4$ GHz: $\leq 12$ mm $4 - 6$ GHz: $\leq 10$ 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

		$\leq 3$ GHz	$> 3$ GHz	
Maximum zoom scan spatial resolution: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$		$\leq 2$ GHz: $\leq 8$ mm 2 – 3 GHz: $\leq 5$ mm *	3 – 4 GHz: $\leq 5$ mm* 4 – 6 GHz: $\leq 4$ mm*	
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{\text{Zoom}}(n)$	$\leq 5$ mm	3 – 4 GHz: $\leq 4$ mm 4 – 5 GHz: $\leq 3$ mm 5 – 6 GHz: $\leq 2$ mm	
	graded grid	$\Delta z_{\text{Zoom}}(1)$ : between 1 <sup>st</sup> two points closest to phantom surface	$\leq 4$ mm	3 – 4 GHz: $\leq 3$ mm 4 – 5 GHz: $\leq 2.5$ mm 5 – 6 GHz: $\leq 2$ 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	$\geq 30$ mm	3 – 4 GHz: $\geq 28$ mm 4 – 5 GHz: $\geq 25$ mm 5 – 6 GHz: $\geq 22$ mm	
Note: $\delta$ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.				
* When zoom scan is required and the <i>reported</i> SAR from the area scan based <i>1-g SAR estimation</i> procedures of KDB 447498 is $\leq 1.4$ W/kg, $\leq 8$ mm, $\leq 7$ mm and $\leq 5$ 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	8-4-2021
Dielectric Assessment Kit	SPEAG	DAK-3.5	1196	7-17-2021
Shorting block	SPEAG	DAK-3.5 Short	SM DAK 200 BA	N/A
Thermometer	LKM	DTM3000	3424	8-11-2021

#### System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
MXG Analog Signal Generator	Agilent	N5181A	MY50145882	8-4-2021
Power Sensor	Agilent	U2000A	MY60180020	9-9-2021
Power Sensor	Agilent	U2000A	MY54260007	8-7-2021
Power Amplifier	EXODUS	1410025-AMP2027-10003	10003	8-4-2021
Directional Coupler	Agilent	772D	MY52180193	8-4-2021
Directional Coupler	Agilent	778D	MY52180432	8-4-2021
Low Pass Filter	MICROLAB	LA-15N	3943	8-4-2021
Low Pass Filter	FILTRON	L14012FL	1410003S	8-4-2021
Low Pass Filter	MICROLAB	LA-60N	3942	8-4-2021
Attenuator	Agilent	8491B/003	MY39271969	12-3-2021
Attenuator	Agilent	8491B/010	MY39271981	9-9-2021
Attenuator	Agilent	8491B/020	MY39271973	9-9-2021
E-Field Probe (SAR1)	SPEAG	EX3DV4	7376	7-31-2021
E-Field Probe (SAR2)	SPEAG	EX3DV4	7313	1-26-2022
E-Field Probe (SAR3)	SPEAG	EX3DV4	3871	8-28-2021
E-Field Probe (SAR4)	SPEAG	EX3DV4	7314	5-29-2021
Data Acquisition Electronics (SAR1)	SPEAG	DAE4	1468	8-25-2021
Data Acquisition Electronics (SAR2)	SPEAG	DAE4	1343	8-25-2021
Data Acquisition Electronics (SAR3)	SPEAG	DAE4	1494	7-23-2021
Data Acquisition Electronics (SAR4)	SPEAG	DAE4	912	11-24-2021
System Validation Dipole	SPEAG	D2450V2	939	7-25-2021
System Validation Dipole	SPEAG	D5GHzV2	1209	2-27-2022
Thermometer (SAR1)	Lutron	MHB-382SD	AH.91463	8-11-2021
Thermometer (SAR2)	Lutron	MHB-382SD	AH.50215	8-11-2021
Thermometer (SAR3)	Lutron	MHB-382SD	AH.50213	8-11-2021
Thermometer (SAR4)	Lutron	MHB-382SD	AH.45903	8-11-2021

#### Others

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Wireless Connectivity Tester	R & S	CMW270	100982	8-3-2021

#### Note(s):

Refer to Appendix F that mentioned about justification for Extended SAR Dipole Calibrations D2450(SN : 939), D5GHz(SN : 1209))

## 5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be  $\leq 30\%$ , for a confidence interval of  $k = 2$ . If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

### 5.1 DECISION RULE

Decision rule for statement(s) of conformity is based on Procedure 1, Clause 4.4.2 in IEC Guide 115:2007.

## 6. Device Under Test (DUT) Information

### 6.1. DUT Description

Device Dimension	Refer to Appendix A.		
Back Cover	<input checked="" type="checkbox"/> The Back Cover is not removable.		
Battery Options	<input checked="" type="checkbox"/> The rechargeable battery is not user accessible.		
Accessory	Keyboard		
Wi-Fi Direct	Wi-Fi Direct enabled devices transfer data directly between each other <input checked="" type="checkbox"/> Wi-Fi Direct (Wi-Fi 2.4 GHz) <input checked="" type="checkbox"/> Wi-Fi Direct (Wi-Fi 5 GHz : Ch.36 – Ch.48, Ch.149 – Ch.165))		
Test Sample Information	<b>No.</b>	<b>S/N</b>	<b>Notes</b>
	1	R32R3004A9H	WI-FI & BT Conducted
	2	R32R3004WAR	SAR
	3	R32R300625L	SAR
	4	R32R30062ZE	SAR
	5	R32R30062NB	SAR

## 6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle used for SAR testing
Wi-Fi	2.4 GHz	802.11b 802.11g 802.11n (HT20)	98.8% (802.11b) 98.7% (802.11g) 98.6% (802.11n 20MHz BW)
	5 GHz	802.11a 802.11n (HT20) 802.11n (HT40) 802.11ac (VHT20) 802.11ac (VHT40) 802.11ac (VHT80)	98.7% (802.11a SISO & MIMO) 98.6% (802.11n,ac 20MHz BW) 98.6% (802.11n,ac 40MHz BW) 98.6% (802.11ac 80MHz BW SISO) 97.3% (802.11ac 80MHz BW MIMO)
		Does this device support bands 5.60 ~ 5.65 GHz? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
		Does this device support Band gap channel(s)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Bluetooth	2.4 GHz	Version 5.0 LE	77.1% (DH5)

### Notes:

1. The Bluetooth protocol is considered source-based averaging. Bluetooth GFSK (DH5) was verified to have the highest duty cycle of 77.1% and was considered and used for SAR Testing.
2. Duty cycle for Wi-Fi is referenced from the DTS and UNII report.

### 6.3. Nominal and Maximum Output Power

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

#### WLAN SISO mode

RF Air interface	Mode	Max. RF Output Power (dBm)	Reduced. RF Output Power (dBm) -Proximity sensor back-off-
		Wi-Fi Ant.1	Wi-Fi Ant.1
WiFi 2.4 GHz (Ch.1)	802.11b	19.0	12.0
	802.11g	16.0	12.0
	802.11n HT20	16.0	12.0
WiFi 2.4 GHz (Ch.2~10)	802.11b	19.0	12.0
	802.11g	19.0	12.0
	802.11n HT20	18.0	12.0
WiFi 2.4 GHz (Ch11)	802.11b	19.0	12.0
	802.11g	16.0	12.0
	802.11n HT20	16.0	12.0
WiFi 2.4 GHz (Ch.12)	802.11b	5.0	5.0
	802.11g	5.0	5.0
	802.11n HT20	5.0	5.0
WiFi 2.4 GHz (Ch.13)	802.11b	2.0	2.0
	802.11g	2.0	2.0
	802.11n HT20	2.0	2.0
WiFi 5 GHz (UNII-1)	802.11a	17.0	9.5
	802.11n HT20	17.0	9.5
	802.11n HT40	14.0	9.5
	802.11ac VHT20	17.0	9.5
	802.11ac VHT80	13.0	9.5
WiFi 5 GHz (UNII-2A)	802.11a	17.0	9.5
	802.11n HT20	17.0	9.5
	802.11n HT40	14.0	9.5
	802.11ac VHT20	17.0	9.5
	802.11ac VHT80	13.0	9.5
WiFi 5 GHz (UNII-2C)	802.11a	17.0	9.5
	802.11n HT20	17.0	9.5
	802.11n HT40	14.0	9.5
	802.11ac VHT20	17.0	9.5
	802.11ac VHT80	13.0	9.5
WiFi 5 GHz (UNII-3)	802.11a	17.0	9.5
	802.11n HT20	17.0	9.5
	802.11n HT40	14.0	9.5
	802.11ac VHT20	17.0	9.5
	802.11ac VHT80	13.0	9.5
Bluetooth		18.0	10.0
Bluetooth-EDR		16.0	10.0
Bluetooth-LE_1Mbps		8.0	8.0
Bluetooth-LE_2Mbps		8.0	8.0

#### Notes:

1. WLAN bands has support to power reduction during triggering proximity sensor. So the Proximity sensor were verified according to KDB 616217 D04. Please refer to section 6.4.

**WLAN MIMO mode**

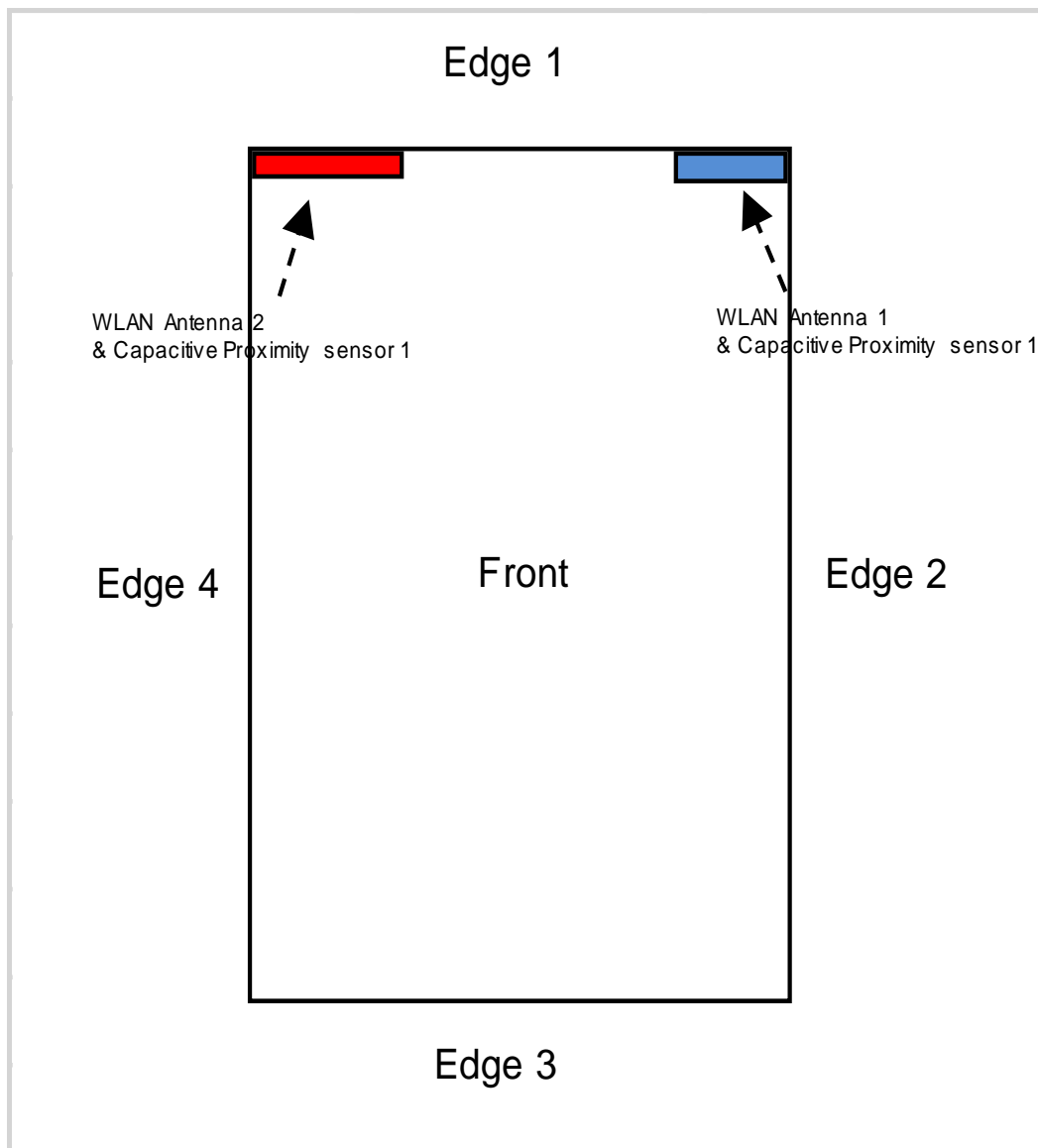
RF Air interface	Mode	Max RF Output power (dBm)			Reduced RF Output power (dBm) -Proximity sensor back-off-		
		Wi-Fi Ant.1	Wi-Fi Ant.2	Wi-Fi MIMO (Ant 1 + Ant 2)	Wi-Fi Ant.1	Wi-Fi Ant.2	Wi-Fi MIMO (Ant 1 + Ant 2)
WiFi 2.4 GHz (Ch.1)	802.11g	16.0	16.0	19.0	12.0	12.0	15.0
	802.11n HT20	16.0	16.0	19.0	12.0	12.0	15.0
WiFi 2.4 GHz (Ch.2~10)	802.11g	19.0	19.0	22.0	12.0	12.0	15.0
	802.11n HT20	18.0	18.0	21.0	12.0	12.0	15.0
WiFi 2.4 GHz (Ch.11)	802.11g	16.0	16.0	19.0	12.0	12.0	15.0
	802.11n HT20	16.0	16.0	19.0	12.0	12.0	15.0
WiFi 2.4 GHz (Ch.12)	802.11g	5.0	5.0	8.0	5.0	5.0	8.0
	802.11n HT20	5.0	5.0	8.0	5.0	5.0	8.0
WiFi 2.4 GHz (Ch.13)	802.11g	2.0	2.0	5.0	2.0	2.0	5.0
	802.11n HT20	2.0	2.0	5.0	2.0	2.0	5.0
WiFi 5 GHz (UNII-1)	802.11a	17.0	17.0	20.0	9.5	9.5	12.5
	802.11n HT20	17.0	17.0	20.0	9.5	9.5	12.5
	802.11n HT40	14.0	14.0	17.0	9.5	9.5	12.5
	802.11ac VHT20	17.0	17.0	20.0	9.5	9.5	12.5
	802.11ac VHT40	14.0	14.0	17.0	9.5	9.5	12.5
	802.11ac VHT80	13.0	13.0	16.0	9.5	9.5	12.5
WiFi 5 GHz (UNII-2A)	802.11a	17.0	17.0	20.0	9.5	9.5	12.5
	802.11n HT20	17.0	17.0	20.0	9.5	9.5	12.5
	802.11n HT40	14.0	14.0	17.0	9.5	9.5	12.5
	802.11ac VHT20	17.0	17.0	20.0	9.5	9.5	12.5
	802.11ac VHT40	14.0	14.0	17.0	9.5	9.5	12.5
	802.11ac VHT80	13.0	13.0	16.0	9.5	9.5	12.5
WiFi 5 GHz (UNII-2C)	802.11a	17.0	17.0	20.0	9.5	9.5	12.5
	802.11n HT20	17.0	17.0	20.0	9.5	9.5	12.5
	802.11n HT40	14.0	14.0	17.0	9.5	9.5	12.5
	802.11ac VHT20	17.0	17.0	20.0	9.5	9.5	12.5
	802.11ac VHT40	14.0	14.0	17.0	9.5	9.5	12.5
	802.11ac VHT80	13.0	13.0	16.0	9.5	9.5	12.5
WiFi 5 GHz (UNII-3)	802.11a	17.0	17.0	20.0	9.5	9.5	12.5
	802.11n HT20	17.0	17.0	20.0	9.5	9.5	12.5
	802.11n HT40	14.0	14.0	17.0	9.5	9.5	12.5
	802.11ac VHT20	17.0	17.0	20.0	9.5	9.5	12.5
	802.11ac VHT40	14.0	14.0	17.0	9.5	9.5	12.5
	802.11ac VHT80	13.0	13.0	16.0	9.5	9.5	12.5

**Notes:**

1. WLAN bands has support to power reduction during triggering proximity sensor. So the Proximity sensor were verified according to KDB 616217 D04. Please refer to section 6.4.

## 6.4 Proximity sensor feature

The DUT has three proximity sensors to reduce the output power. The position of the sensors and antenna are as shown in the graphic.



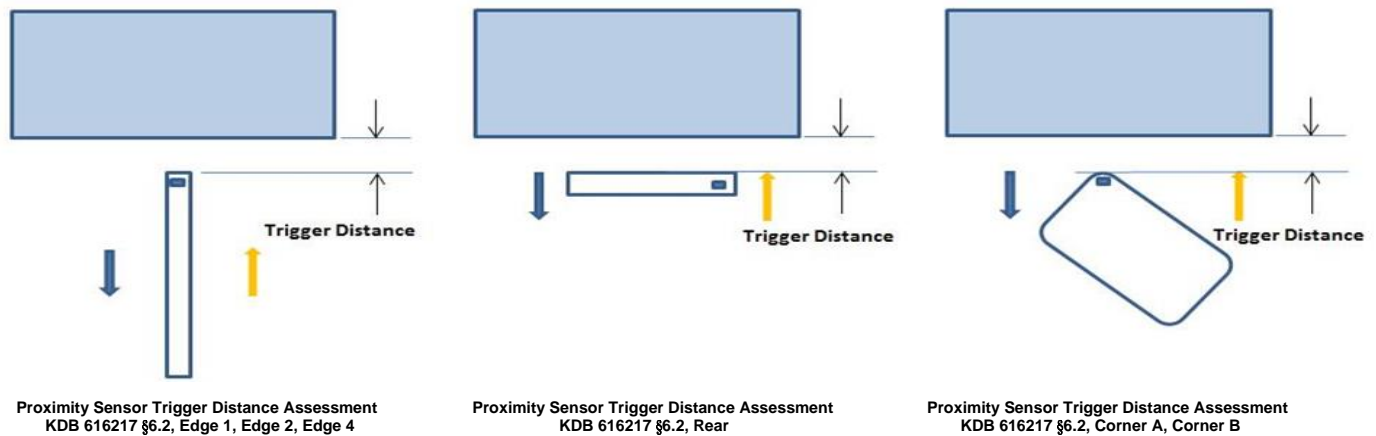


### 6.4.1 Proximity Sensor Triggering Distance (KDB 616217 §6.2)

Rear, Edge 1, Edge 2, Edge 4, Corner A (Side of between Edge 1 and Edge 2), Corner B (Side of between Edge 1 and Edge 4) of the DUT was placed directly below the flat phantom. The DUT was moved toward the phantom in accordance with the steps outlined in KDB 616217 §6.2 to determine the trigger distance for enabling power reduction. The DUT was moved away from the phantom to determine the trigger distance for resuming full power.

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

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



**LEGEND**

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

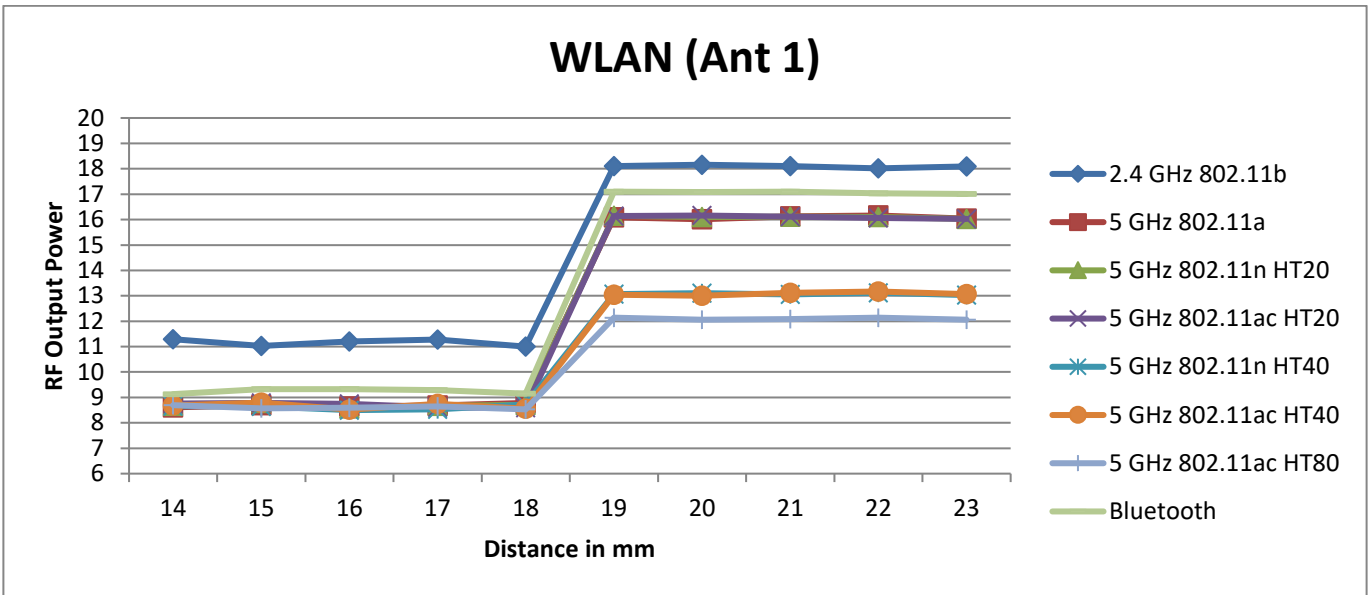
### Summary of Trigger Distances

Antenna	Tissue simulating liquid	Trigger distance - Rear		Trigger distance - Edge 1		Trigger distance - Edge 2		Trigger distance - Edge 4		Trigger distance - Corner A		Trigger distance - Corner B	
		Moving toward phantom	Moving from phantom	Moving toward phantom	Moving from phantom	Moving toward phantom	Moving from phantom	Moving toward phantom	Moving from phantom	Moving toward phantom	Moving from phantom	Moving toward phantom	Moving from phantom
WLAN Ant.	2450 Head Ant 1	18 mm	18 mm	21 mm	21 mm	10 mm	10 mm	N/A	N/A	16 mm	16 mm	N/A	N/A
	2450 Head Ant 2	17 mm	17 mm	20 mm	20 mm	N/A	N/A	7 mm	7 mm	N/A	N/A	14 mm	14 mm
	5000 Head Ant 1	18 mm	18 mm	21 mm	21 mm	10 mm	10 mm	N/A	N/A	16 mm	16 mm	N/A	N/A
	5000 Head Ant 2	17 mm	17 mm	20 mm	20 mm	N/A	N/A	7 mm	7 mm	N/A	N/A	14 mm	14 mm

**Proximity Sensor Triggering Distance Measurement Results**  
**WLAN 2.4GHz and 5GHz**

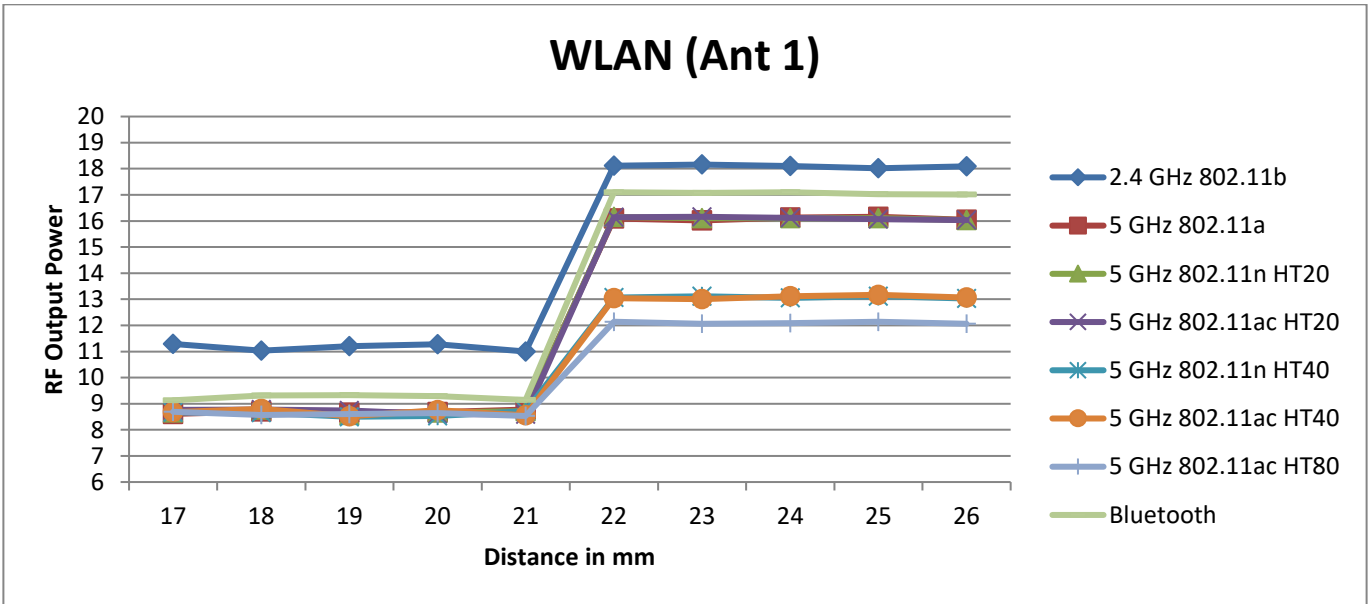
Rear, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm											
Antenna	Distance	14	15	16	17	18	19	20	21	22	23
Ant 1	2.4 GHz 802.11b	11.3	11.0	11.2	11.3	11.0	18.1	18.2	18.1	18.0	18.1
	5 GHz 802.11a	8.6	8.7	8.7	8.7	8.8	16.1	16.0	16.1	16.2	16.0
	5 GHz 802.11n HT20	8.7	8.8	8.6	8.7	8.7	16.2	16.1	16.1	16.1	16.0
	5 GHz 802.11ac HT20	8.8	8.8	8.7	8.6	8.6	16.1	16.2	16.1	16.1	16.0
	5 GHz 802.11n HT40	8.7	8.7	8.5	8.5	8.7	13.1	13.1	13.1	13.1	13.0
	5 GHz 802.11ac HT40	8.7	8.8	8.5	8.8	8.6	13.0	13.0	13.1	13.2	13.1
	5 GHz 802.11ac HT80	8.7	8.6	8.6	8.6	8.5	12.1	12.1	12.1	12.1	12.1
Bluetooth	9.1	9.3	9.3	9.3	9.2	17.1	17.1	17.1	17.0	17.0	



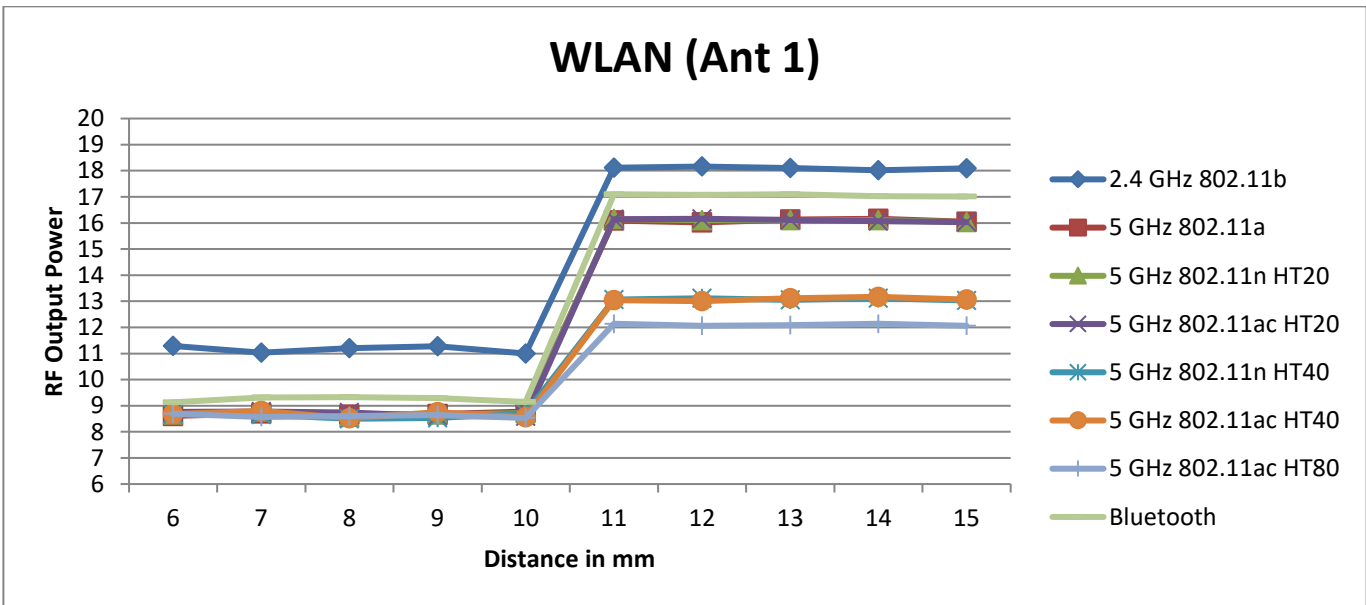
Edge 1, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm											
Antenna	Distance	17	18	19	20	21	22	23	24	25	26
Ant 1	2.4 GHz 802.11b	11.0	11.3	11.0	11.1	11.1	18.1	18.1	18.0	18.0	18.1
	5 GHz 802.11a	8.8	8.6	8.8	8.8	8.6	16.0	16.0	16.1	16.1	16.0
	5 GHz 802.11n HT20	8.8	8.6	8.8	8.5	8.6	16.1	16.0	16.0	16.0	16.1
	5 GHz 802.11ac HT20	8.7	8.8	8.8	8.8	8.6	16.2	16.1	16.1	16.1	16.0
	5 GHz 802.11n HT40	8.6	8.6	8.6	8.6	8.6	13.1	13.1	13.1	13.1	13.0
	5 GHz 802.11ac HT40	8.5	8.5	8.6	8.6	8.6	13.1	13.0	13.1	13.0	13.2
	5 GHz 802.11ac HT80	8.8	8.8	8.7	8.7	8.7	12.1	12.0	12.0	12.0	12.0
	Bluetooth	9.1	9.0	9.2	9.2	9.1	17.0	17.0	17.1	17.2	17.1



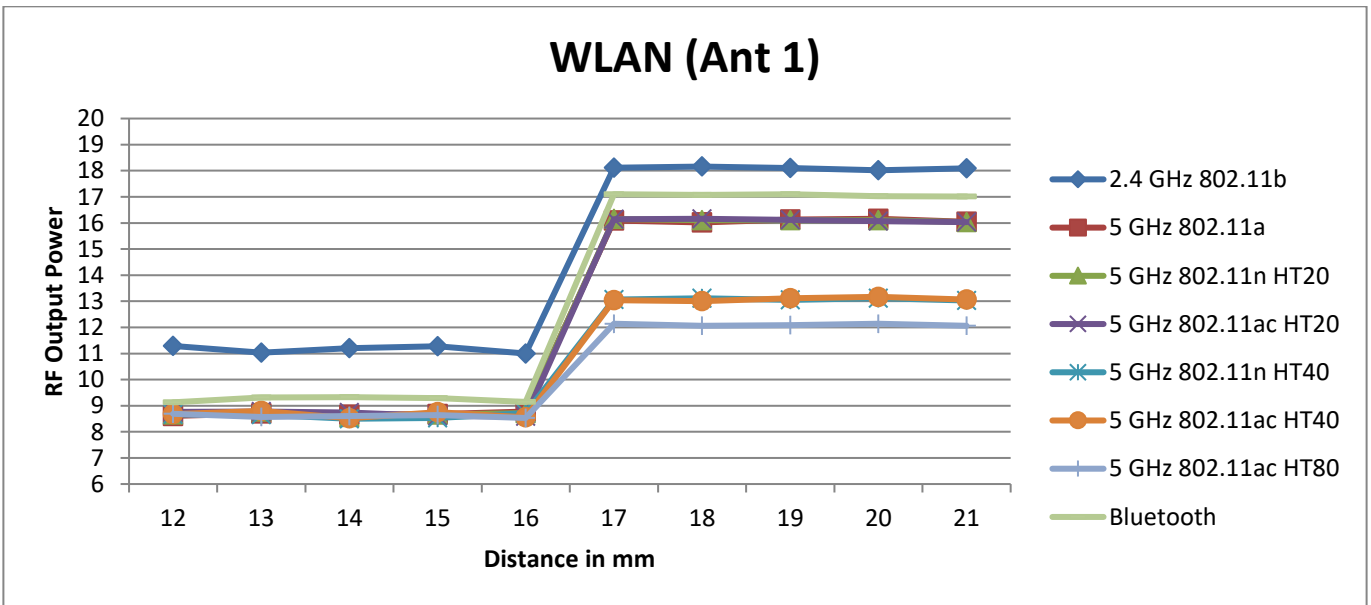
Edge 2, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm											
Antenna	Distance	6	7	8	9	10	11	12	13	14	15
Ant 1	2.4 GHz 802.11b	11.2	11.1	11.1	11.3	11.1	18.1	18.1	18.0	18.1	18.1
	5 GHz 802.11a	8.5	8.7	8.6	8.8	8.8	16.1	16.2	16.1	16.0	16.1
	5 GHz 802.11n HT20	8.8	8.7	8.5	8.6	8.7	16.2	16.0	16.1	16.1	16.0
	5 GHz 802.11n HT40	8.6	8.8	8.7	8.6	8.6	13.1	13.0	13.1	13.0	13.1
	5 GHz 802.11ac HT20	8.8	8.8	8.6	8.7	8.6	16.1	16.2	16.0	16.1	16.1
	5 GHz 802.11ac HT40	8.6	8.7	8.7	8.5	8.6	13.2	13.2	13.1	13.0	13.2
	5 GHz 802.11ac HT80	8.7	8.6	8.7	8.5	8.8	12.0	12.1	12.1	12.1	12.1
	Bluetooth	9.2	9.3	9.0	9.1	9.3	17.1	17.1	17.2	17.1	17.1



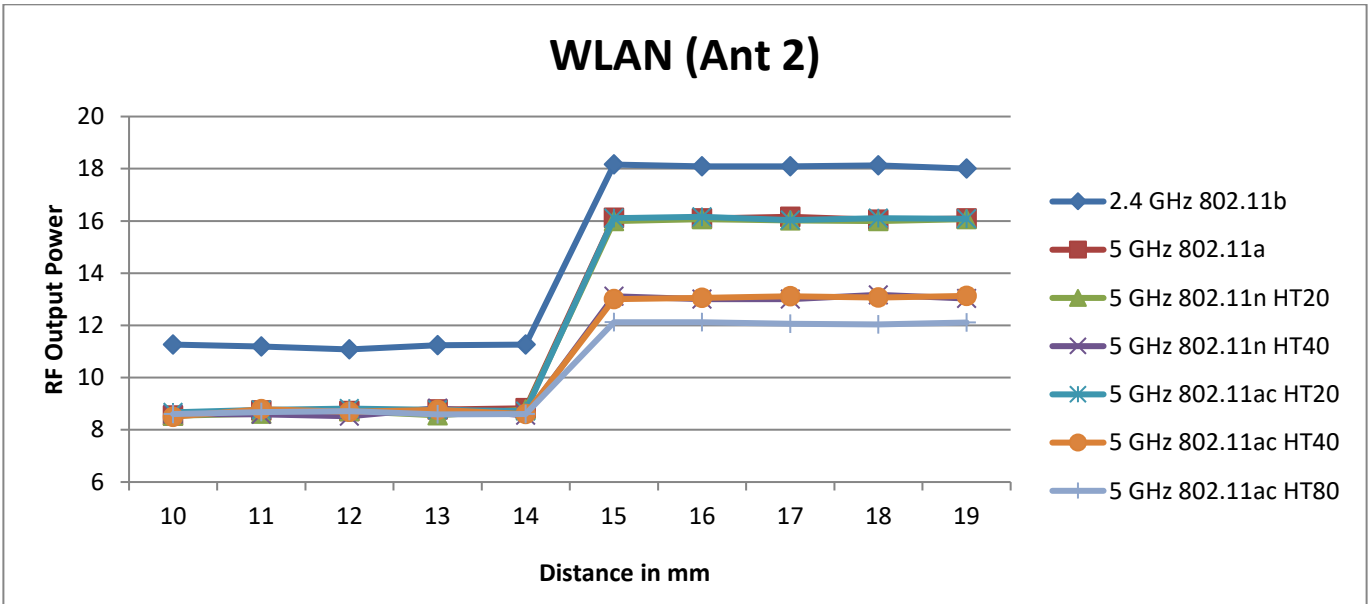
Corner A, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm											
Antenna	Distance	12	13	14	15	16	17	18	19	20	21
Ant 1	2.4 GHz 802.11b	11.2	11.2	11.0	11.0	11.3	18.0	18.0	18.1	18.1	18.1
	5 GHz 802.11a	8.8	8.7	8.8	8.6	8.5	16.1	16.0	16.1	16.1	16.1
	5 GHz 802.11n HT20	8.7	8.8	8.8	8.6	8.7	16.0	16.0	16.0	16.1	16.0
	5 GHz 802.11n HT40	8.6	8.6	8.5	8.8	8.6	13.1	13.1	13.1	13.1	13.0
	5 GHz 802.11ac HT20	8.8	8.6	8.6	8.6	8.6	16.0	16.1	16.2	16.2	16.1
	5 GHz 802.11ac HT40	8.7	8.8	8.7	8.5	8.8	13.0	13.1	13.1	13.1	13.1
	5 GHz 802.11ac HT80	8.8	8.6	8.7	8.8	8.6	12.1	12.1	12.1	12.1	12.2
	Bluetooth	9.3	9.2	9.3	9.2	9.1	17.1	17.0	17.1	17.1	17.1



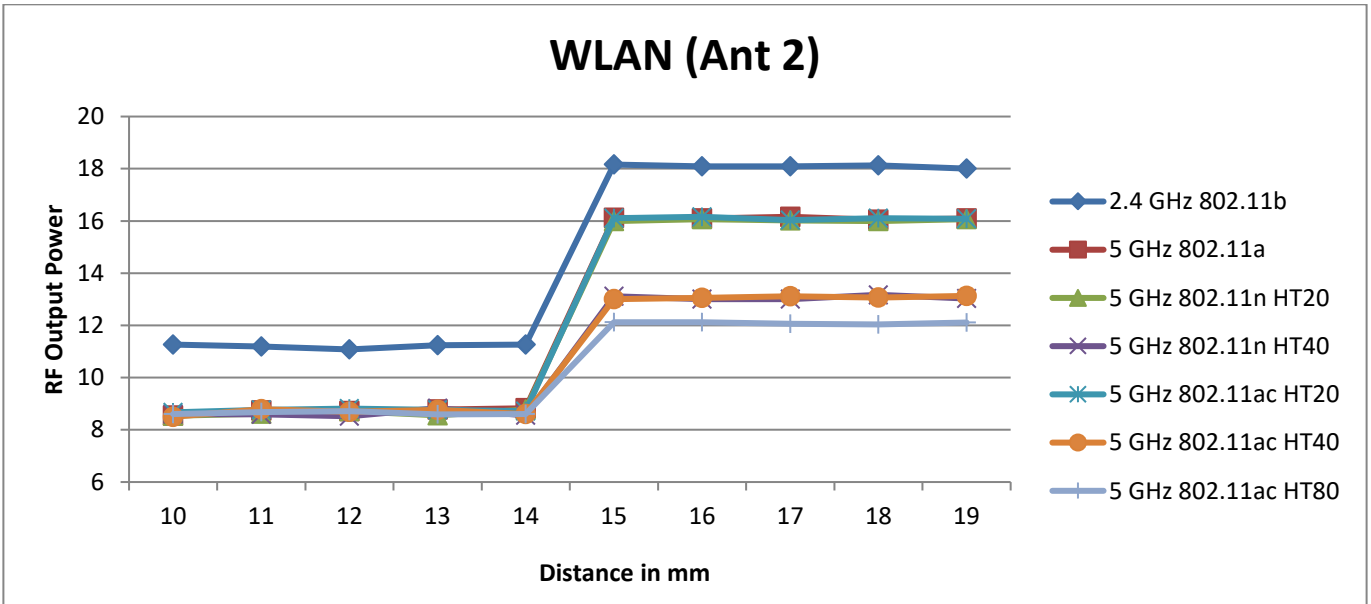
Rear, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm											
Antenna	Distance	13	14	15	16	17	18	19	20	21	22
Ant 2	2.4 GHz 802.11b	11.3	11.2	11.1	11.0	11.0	18.0	18.0	18.1	18.1	18.1
	5 GHz 802.11a	8.7	8.5	8.7	8.6	8.6	16.1	16.1	16.2	16.0	16.1
	5 GHz 802.11n HT20	8.8	8.7	8.6	8.6	8.6	16.1	16.1	16.1	16.1	16.1
	5 GHz 802.11n HT40	8.5	8.6	8.8	8.8	8.8	13.2	13.1	13.2	13.1	13.1
	5 GHz 802.11ac HT20	8.5	8.6	8.7	8.6	8.8	16.1	16.1	16.1	16.2	16.1
	5 GHz 802.11ac HT40	8.6	8.6	8.7	8.6	8.5	13.1	13.0	13.1	13.1	13.1
	5 GHz 802.11ac HT80	8.7	8.5	8.8	8.5	8.5	12.1	12.1	12.1	12.1	12.1



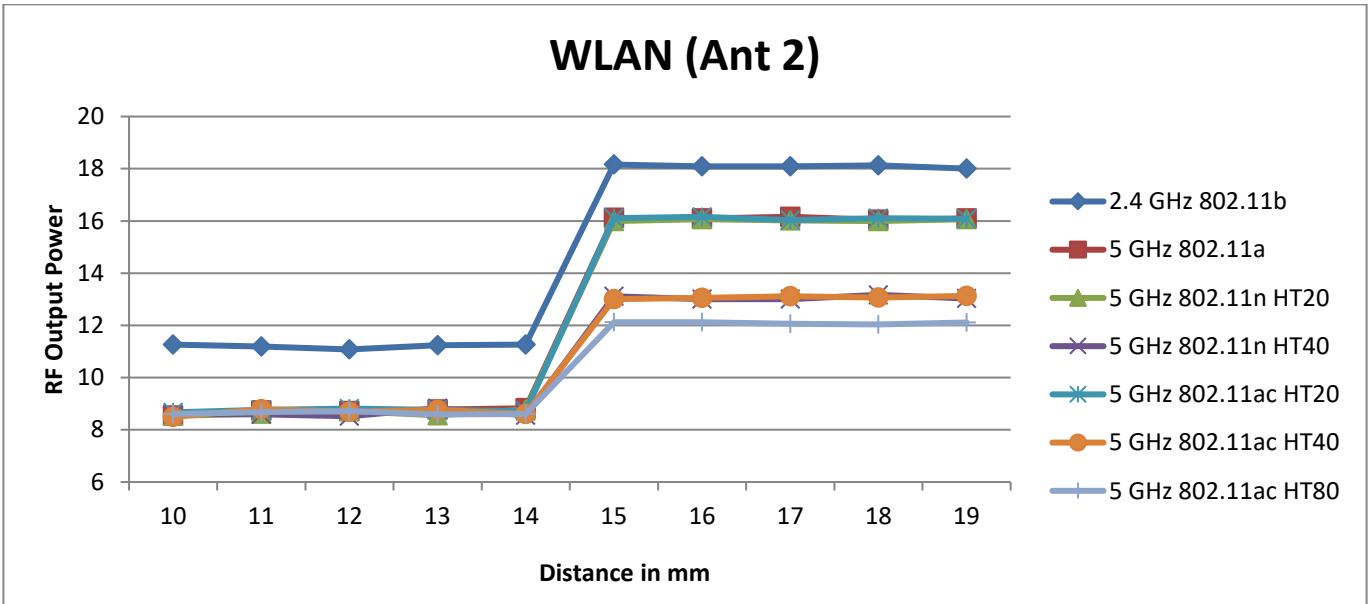
Edge 1, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

Distance to DUT vs. Output Power in dBm											
Antenna	Distance	16	17	18	19	20	21	22	23	24	25
Ant 2	2.4 GHz 802.11b	11.2	11.2	11.1	11.3	11.2	18.1	18.0	18.1	18.1	18.0
	5 GHz 802.11a	8.6	8.5	8.7	8.8	8.7	16.1	16.0	16.0	16.1	16.0
	5 GHz 802.11n HT20	8.7	8.6	8.7	8.6	8.8	16.1	16.1	16.0	16.1	16.1
	5 GHz 802.11n HT40	8.5	8.6	8.8	8.8	8.5	13.2	13.1	13.1	13.0	13.0
	5 GHz 802.11ac HT20	8.8	8.5	8.6	8.6	8.8	16.1	16.1	16.1	16.1	16.1
	5 GHz 802.11ac HT40	8.5	8.8	8.6	8.7	8.6	13.1	13.1	13.1	13.1	13.0
	5 GHz 802.11ac HT80	8.7	8.8	8.6	8.7	8.7	12.1	12.1	12.0	12.1	12.1



Edge 4, DUT Moving Toward (Trigger) and Away (Release) from the Phantom

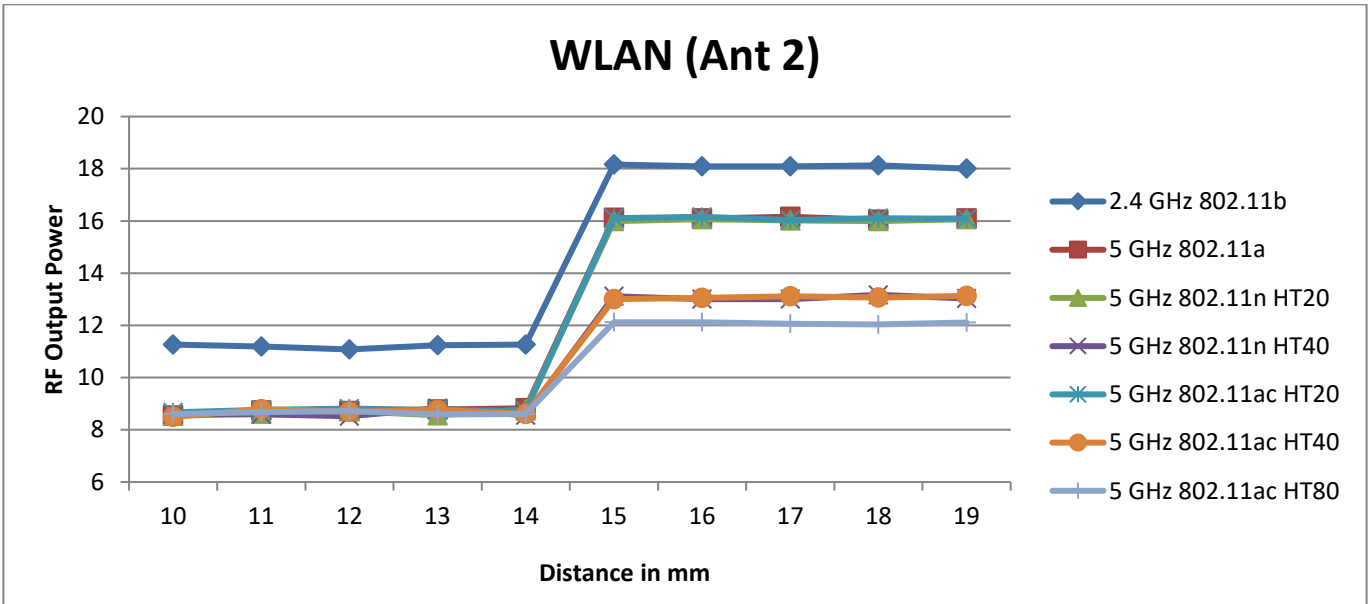
Distance to DUT vs. Output Power in dBm											
Antenna	Distance	3	4	5	6	7	8	9	10	11	12
Ant 2	2.4 GHz 802.11b	11.1	11.2	11.3	11.2	11.2	18.1	18.0	18.0	18.1	18.2
	5 GHz 802.11a	8.6	8.8	8.6	8.5	8.5	16.0	16.0	16.1	16.0	16.1
	5 GHz 802.11n HT20	8.8	8.7	8.8	8.8	8.5	16.1	16.0	16.0	16.1	16.2
	5 GHz 802.11n HT40	8.8	8.6	8.8	8.5	8.7	13.2	13.0	13.1	13.1	13.1
	5 GHz 802.11ac HT20	8.5	8.7	8.6	8.7	8.8	16.1	16.0	16.1	16.1	16.1
	5 GHz 802.11ac HT40	8.7	8.6	8.5	8.6	8.7	13.1	13.0	13.1	13.0	13.1
	5 GHz 802.11ac HT80	8.8	8.7	8.7	8.8	8.6	12.1	12.1	12.1	12.1	12.1





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

Distance to DUT vs. Output Power in dBm											
Antenna	Distance	10	11	12	13	14	15	16	17	18	19
Ant 2	2.4 GHz 802.11b	11.3	11.2	11.1	11.2	11.3	18.2	18.1	18.1	18.1	18.0
	5 GHz 802.11a	8.5	8.7	8.7	8.8	8.8	16.1	16.1	16.2	16.0	16.1
	5 GHz 802.11n HT20	8.5	8.6	8.7	8.6	8.8	16.0	16.1	16.0	16.0	16.1
	5 GHz 802.11n HT40	8.6	8.6	8.5	8.8	8.6	13.1	13.0	13.0	13.2	13.0
	5 GHz 802.11ac HT20	8.7	8.8	8.8	8.8	8.7	16.1	16.2	16.0	16.1	16.1
	5 GHz 802.11ac HT40	8.5	8.8	8.7	8.8	8.6	13.0	13.1	13.1	13.1	13.1
	5 GHz 802.11ac HT80	8.6	8.7	8.7	8.6	8.6	12.1	12.1	12.1	12.1	12.1



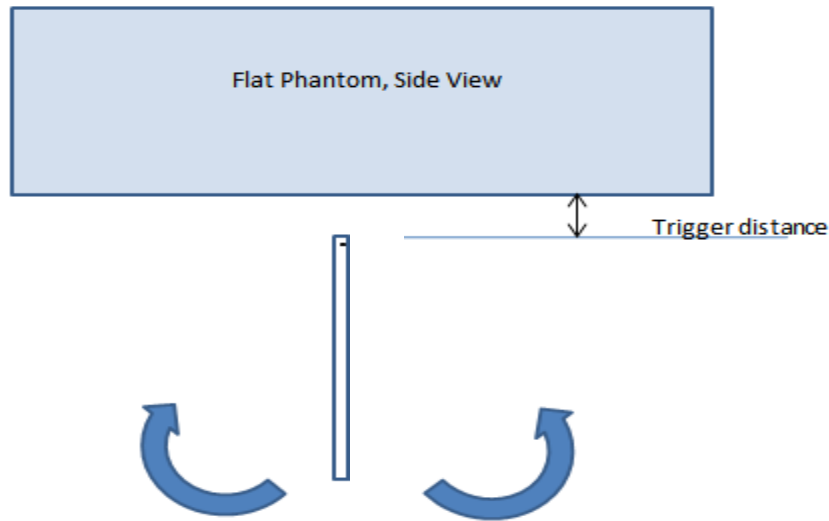
### 6.4.2 Proximity Sensor Coverage (KDB 616217 §6.3)

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

### 6.4.3 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, Edge 2, Edge 4 parallel to the base of the flat phantom for each band.

The EUT was rotated about Edge 1, Edge 2, Edge 4 for angles up to +/- 45°. 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 +/- 45°.



Proximity sensor tilt angle assessment (Edge 1, Edge 2, Edge 4) KDB 616217 §6.4

#### Summary of Tablet Tilt Angle Influence to Proximity Sensor Triggering (Edge 1)

Band (MHz)	Minimum trigger distance measured according to KDB 616217 §6.2	Minimum distance at which power reduction was maintained over +/-45°	Power reduction status										
			-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°
2450 Ant 1	21 mm	21 mm	On	On	On	On	On	On	On	On	On	On	On
2450 Ant 2	20 mm	20 mm	On	On	On	On	On	On	On	On	On	On	On
5000 Ant 1	21 mm	21 mm	On	On	On	On	On	On	On	On	On	On	On
5000 Ant 2	20 mm	20 mm	On	On	On	On	On	On	On	On	On	On	On

#### Summary of Tablet Tilt Angle Influence to Proximity Sensor Triggering (Edge 2)

Band (MHz)	Minimum trigger distance measured according to KDB 616217 §6.2	Minimum distance at which power reduction was maintained over +/-45°	Power reduction status										
			-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°
2450 Ant 1	10 mm	10 mm	On	On	On	On	On	On	On	On	On	On	On
5000 Ant 1	10 mm	10 mm	On	On	On	On	On	On	On	On	On	On	On

**Summary of Tablet Tilt Angle Influence to Proximity Sensor Triggering (Edge 4)**

Band (MHz)	Minimum trigger distance measured according to KDB 616217 §6.2	Minimum distance at which power reduction was maintained over +/-45°	Power reduction status										
			-45°	-40°	-30°	-20°	-10°	0°	10°	20°	30°	40°	45°
2450 Ant 2	7 mm	7 mm	On	On	On	On	On	On	On	On	On	On	On
5000 Ant 2	7 mm	7 mm	On	On	On	On	On	On	On	On	On	On	On

**6.4.4 Resulting test positions for SAR measurements**

Wireless technologies	Position	§6.6.1 Triggering Distance	§6.6.2 Coverage	§6.6.3 Tilt Angle	Worst case distance for SAR
WLAN Ant 1	Rear	18 mm	N/A	N/A	17 mm
	Edge 1	21 mm	N/A	21 mm	20 mm
	Edge 2	10 mm	N/A	10 mm	9 mm
	Corner A	16 mm	N/A	N/A	15 mm
WLAN Ant 2	Rear	17 mm	N/A	N/A	16 mm
	Edge 1	20 mm	N/A	13 mm	19 mm
	Edge 4	7 mm	N/A	7 mm	6 mm
	Corner B	14 mm	N/A	N/A	13 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  $\leq 5$  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 WLAN

Antennas < 50mm to adjacent edges

SISO Max															
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
<b>Wi-Fi Antenna 1</b>															
Wi-Fi 2.4 GHz	2462	19.00	79	0	0	0	272.1	138		24.8	24.8	24.8	> 50 mm	> 50 mm	
Wi-Fi 5.3 GHz	5320	17.00	50	0	0	0	272.1	138		23.1	23.1	23.1	> 50 mm	> 50 mm	
Wi-Fi 5.5 GHz	5700	17.00	50	0	0	0	272.1	138		23.9	23.9	23.9	> 50 mm	> 50 mm	
Wi-Fi 5.8 GHz	5825	17.00	50	0	0	0	272.1	138		24.1	24.1	24.1	> 50 mm	> 50 mm	
Bluetooth	2480	18.00	63	0	0	0	272.1	138		19.8	19.8	19.8	> 50 mm	> 50 mm	
<b>Wi-Fi Antenna 2</b>															
Wi-Fi 2.4 GHz	2462	18.00	63	0	0	138	272.1	0		19.8	19.8	> 50 mm	> 50 mm	19.8	
Wi-Fi 5.3 GHz	5320	17.00	50	0	0	138	272.1	0		23.1	23.1	> 50 mm	> 50 mm	23.1	
Wi-Fi 5.5 GHz	5700	17.00	50	0	0	138	272.1	0		23.9	23.9	> 50 mm	> 50 mm	23.9	
Wi-Fi 5.8 GHz	5825	17.00	50	0	0	138	272.1	0		24.1	24.1	> 50 mm	> 50 mm	24.1	

SISO Reduce															
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
<b>Wi-Fi Antenna 1</b>															
Wi-Fi 2.4 GHz	2462	12.00	16	0	0	0				5	5	5			
Wi-Fi 5.3 GHz	5320	9.50	9	0	0	0				4.2	4.2	4.2			
Wi-Fi 5.5 GHz	5700	9.50	9	0	0	0				4.3	4.3	4.3			
Wi-Fi 5.8 GHz	5825	9.50	9	0	0	0				4.3	4.3	4.3			
Bluetooth	2480	10.00	10	0	0	0				3.1	3.1	3.1			
<b>Wi-Fi Antenna 2</b>															
Wi-Fi 2.4 GHz	2462	12.00	16	0	0			0		5	5			5	
Wi-Fi 5.3 GHz	5320	9.50	9	0	0			0		4.2	4.2			4.2	
Wi-Fi 5.5 GHz	5700	9.50	9	0	0			0		4.3	4.3			4.3	
Wi-Fi 5.8 GHz	5825	9.50	9	0	0			0		4.3	4.3			4.3	

MIMO Max															
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
<b>Wi-Fi Antenna 1</b>															
Wi-Fi 5.3 GHz	5320	17.00	50	0	0	0	272.1	138		23.1	23.1	23.1	> 50 mm	> 50 mm	
Wi-Fi 5.5 GHz	5700	17.00	50	0	0	0	272.1	138		23.9	23.9	23.9	> 50 mm	> 50 mm	
Wi-Fi 5.8 GHz	5825	17.00	50	0	0	0	272.1	138		24.1	24.1	24.1	> 50 mm	> 50 mm	
<b>Wi-Fi Antenna 2</b>															
Wi-Fi 5.3 GHz	5320	17.00	50	0	0	138	272.1	0		23.1	23.1	> 50 mm	> 50 mm	23.1	
Wi-Fi 5.5 GHz	5700	17.00	50	0	0	138	272.1	0		23.9	23.9	> 50 mm	> 50 mm	23.9	
Wi-Fi 5.8 GHz	5825	17.00	50	0	0	138	272.1	0		24.1	24.1	> 50 mm	> 50 mm	24.1	

MIMO Reduce															
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
<b>Wi-Fi Antenna 1</b>															
Wi-Fi 5.3 GHz	5320	9.50	9	0	0	0		138		4.2	4.2	4.2		> 50 mm	
Wi-Fi 5.5 GHz	5700	9.50	9	0	0	0		138		4.3	4.3	4.3		> 50 mm	
Wi-Fi 5.8 GHz	5825	9.50	9	0	0	0		138		4.3	4.3	4.3		> 50 mm	
<b>Wi-Fi Antenna 2</b>															
Wi-Fi 5.3 GHz	5320	9.50	9	0	0	138		0		4.2	4.2	> 50 mm		4.2	
Wi-Fi 5.5 GHz	5700	9.50	9	0	0	138		0		4.3	4.3	> 50 mm		4.3	
Wi-Fi 5.8 GHz	5825	9.50	9	0	0	138		0		4.3	4.3	> 50 mm		4.3	

**Note(s):**

1. According to KDB 447498, if the calculated threshold value is >3 then SAR testing is required.
2. MIMO UNII SAR test were additionally evaluated for determining simultaneous transmission SAR test exclusion.

Antennas > 50mm to adjacent edges

SISO Max															
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
<b>Wi-Fi Antenna 1</b>															
Wi-Fi 2.4 GHz	2462	19.00	79	0	0	0	272.1	138		< 50 mm	< 50 mm	< 50 mm	2316.6 mW -EXEMPT-	975.6 mW -EXEMPT-	
Wi-Fi 5.3 GHz	5320	17.00	50	0	0	0	272.1	138		< 50 mm	< 50 mm	< 50 mm	2286 mW -EXEMPT-	945 mW -EXEMPT-	
Wi-Fi 5.5 GHz	5700	17.00	50	0	0	0	272.1	138		< 50 mm	< 50 mm	< 50 mm	2283.8 mW -EXEMPT-	942.8 mW -EXEMPT-	
Wi-Fi 5.8 GHz	5825	17.00	50	0	0	0	272.1	138		< 50 mm	< 50 mm	< 50 mm	2283.2 mW -EXEMPT-	942.2 mW -EXEMPT-	
Bluetooth	2480	18.00	63	0	0	0	272.1	138		< 50 mm	< 50 mm	< 50 mm	2316.3 mW -EXEMPT-	975.3 mW -EXEMPT-	
<b>Wi-Fi Antenna 2</b>															
Wi-Fi 2.4 GHz	2462	18.00	63	0	0	138	282.1	0		< 50 mm	< 50 mm	975.6 mW -EXEMPT-	2416.6 mW -EXEMPT-	< 50 mm	
Wi-Fi 5.3 GHz	5320	17.00	50	0	0	138	282.1	0		< 50 mm	< 50 mm	945 mW -EXEMPT-	2386 mW -EXEMPT-	< 50 mm	
Wi-Fi 5.5 GHz	5700	17.00	50	0	0	138	282.1	0		< 50 mm	< 50 mm	942.8 mW -EXEMPT-	2383.8 mW -EXEMPT-	< 50 mm	
Wi-Fi 5.8 GHz	5825	17.00	50	0	0	138	282.1	0		< 50 mm	< 50 mm	942.2 mW -EXEMPT-	2383.2 mW -EXEMPT-	< 50 mm	

SISO Reduce															
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
<b>Wi-Fi Antenna 1</b>															
Wi-Fi 2.4 GHz	2462	12.00	16	0	0	0				< 50 mm	< 50 mm	< 50 mm			
Wi-Fi 5.3 GHz	5320	9.50	9	0	0	0				< 50 mm	< 50 mm	< 50 mm			
Wi-Fi 5.5 GHz	5700	9.50	9	0	0	0				< 50 mm	< 50 mm	< 50 mm			
Wi-Fi 5.8 GHz	5825	9.50	9	0	0	0				< 50 mm	< 50 mm	< 50 mm			
Bluetooth	2480	10.00	10	0	0	0				< 50 mm	< 50 mm	< 50 mm			
<b>Wi-Fi Antenna 2</b>															
Wi-Fi 2.4 GHz	2462	12.00	16	0	0			0		< 50 mm	< 50 mm			< 50 mm	
Wi-Fi 5.3 GHz	5320	9.50	9	0	0			0		< 50 mm	< 50 mm			< 50 mm	
Wi-Fi 5.5 GHz	5700	9.50	9	0	0			0		< 50 mm	< 50 mm			< 50 mm	
Wi-Fi 5.8 GHz	5825	9.50	9	0	0			0		< 50 mm	< 50 mm			< 50 mm	

MIMO Max															
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
<b>Wi-Fi Antenna 1</b>															
Wi-Fi 5.3 GHz	5320	17.00	50	0	0	0	272.1	138		< 50 mm	< 50 mm	< 50 mm	2286 mW -EXEMPT-	945 mW -EXEMPT-	
Wi-Fi 5.5 GHz	5700	17.00	50	0	0	0	272.1	138		< 50 mm	< 50 mm	< 50 mm	2283.8 mW -EXEMPT-	942.8 mW -EXEMPT-	
Wi-Fi 5.8 GHz	5825	17.00	50	0	0	0	272.1	138		< 50 mm	< 50 mm	< 50 mm	2283.2 mW -EXEMPT-	942.2 mW -EXEMPT-	
<b>Wi-Fi Antenna 2</b>															
Wi-Fi 5.3 GHz	5320	17.00	50	0	0	138	272.1	0		< 50 mm	< 50 mm	945 mW -EXEMPT-	2286 mW -EXEMPT-	< 50 mm	
Wi-Fi 5.5 GHz	5700	17.00	50	0	0	138	272.1	0		< 50 mm	< 50 mm	942.8 mW -EXEMPT-	2283.8 mW -EXEMPT-	< 50 mm	
Wi-Fi 5.8 GHz	5825	17.00	50	0	0	138	272.1	0		< 50 mm	< 50 mm	942.2 mW -EXEMPT-	2283.2 mW -EXEMPT-	< 50 mm	

MIMO Reduce															
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
<b>Wi-Fi Antenna 1</b>															
Wi-Fi 5.3 GHz	5320	9.50	9	0	0	0		138		< 50 mm	< 50 mm	< 50 mm		945 mW -EXEMPT-	
Wi-Fi 5.5 GHz	5700	9.50	9	0	0	0		138		< 50 mm	< 50 mm	< 50 mm		942.8 mW -EXEMPT-	
Wi-Fi 5.8 GHz	5825	9.50	9	0	0	0		138		< 50 mm	< 50 mm	< 50 mm		942.2 mW -EXEMPT-	
<b>Wi-Fi Antenna 2</b>															
Wi-Fi 5.3 GHz	5320	9.50	9	0	0	138		0		< 50 mm	< 50 mm	945 mW -EXEMPT-		< 50 mm	
Wi-Fi 5.5 GHz	5700	9.50	9	0	0	138		0		< 50 mm	< 50 mm	942.8 mW -EXEMPT-		< 50 mm	
Wi-Fi 5.8 GHz	5825	9.50	9	0	0	138		0		< 50 mm	< 50 mm	942.2 mW -EXEMPT-		< 50 mm	

**Note(s):**

1. According to KDB 447498, if the calculated Power threshold is less than the output power then SAR testing is required.
2. MIMO UNII SAR test were additionally evaluated for determining simultaneous transmission SAR test exclusion.

## 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	Corner A	Corner B
			(Top Edge)	(Right Edge )	(Bottom Edge)	(Left Edge)	Note 2	Note 3
Wi-Fi 2.4 GHz (Ant 1)	OFF	Yes	Yes	Yes	No	No	Yes	No
	ON	Yes	Yes	Yes	No	No	Yes	No
Wi-Fi 5 GHz (Ant 1)	OFF	Yes	Yes	Yes	No	No	Yes	No
	ON	Yes	Yes	Yes	No	No	Yes	No
Wi-Fi 2.4 GHz (Ant 2)	OFF	Yes	Yes	No	No	Yes	No	Yes
	ON	Yes	Yes	No	No	Yes	No	Yes
Wi-Fi 5 GHz (Ant 2)	OFF	Yes	Yes	No	No	Yes	No	Yes
	ON	Yes	Yes	No	No	Yes	No	Yes
Wi-Fi 5 GHz (MIMO)	OFF	Yes	Yes	Yes	No	Yes	Yes	Yes
	ON	Yes	Yes	Yes	No	Yes	Yes	Yes
Bluetooth	OFF	Yes	Yes	Yes	No	No	Yes	No
	On	Yes	Yes	Yes	No	No	Yes	No

**Note(s):**

1. Yes = Testing is required. No = Testing is not required.
2. Corner A side is located between Edge 1 and Edge 2.
3. Corner B side is located between Edge 1 and Edge 4.
4. For Corner A and Corner B, Additional Corner side tests are evaluated for bands that support reduced power due to proximity sensor operation.
5. MIMO UNII SAR test were additionally evaluated for determining simultaneous transmission SAR test exclusion.
6. The laptop configuration with the accessory keyboard connected was not evaluated as this was considered to be covered by the edge 4 tests (edge 4 is the bottom surface in laptop mode).

## 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	
	$\epsilon_r$	$\sigma$ (S/m)
150	52.3	0.76
300	45.3	0.87
450	43.5	0.87
835	41.5	0.90
900	41.5	0.97
915	41.5	0.98
1450	40.5	1.20
1610	40.3	1.29
1800 – 2000	40.0	1.40
2450	39.2	1.80
3000	38.5	2.40
5000	36.2	4.45
5100	36.1	4.55
5200	36.0	4.66
5300	35.9	4.76
5400	35.8	4.86
5500	35.6	4.96
5600	35.5	5.07
5700	35.4	5.17
5800	35.3	5.27

SAR test were performed in All RF exposure conditions using Head tissue according to TCB workshop note of April. 2019.

#### 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 ±(%)	
4-7-2021	Head 5250	e'	35.9000	Relative Permittivity ( $\epsilon_r$ ):	35.90	35.93	-0.09	5
		e"	16.0700	Conductivity ( $\sigma$ ):	4.69	4.70	-0.23	5
	Head 5260	e'	35.9300	Relative Permittivity ( $\epsilon_r$ ):	35.93	35.92	0.02	5
		e"	16.1200	Conductivity ( $\sigma$ ):	4.71	4.71	0.05	5
	Head 5600	e'	35.8600	Relative Permittivity ( $\epsilon_r$ ):	35.86	35.53	0.92	5
		e"	15.6900	Conductivity ( $\sigma$ ):	4.89	5.06	-3.45	5
	Head 5750	e'	35.3900	Relative Permittivity ( $\epsilon_r$ ):	35.39	35.36	0.08	5
		e"	15.7100	Conductivity ( $\sigma$ ):	5.02	5.21	-3.66	5
	Head 5825	e'	35.3500	Relative Permittivity ( $\epsilon_r$ ):	35.35	35.30	0.14	5
		e"	15.9200	Conductivity ( $\sigma$ ):	5.16	5.27	-2.16	5

**SAR 2 Room**

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)		
4-12-2021	Head 5250	e'	35.7400	Relative Permittivity ( $\epsilon_r$ ):	35.74	35.93	-0.54	5	
		e"	15.5000	Conductivity ( $\sigma$ ):	4.52	4.70	-3.77	5	
	Head 5260	e'	35.7300	Relative Permittivity ( $\epsilon_r$ ):	35.73	35.92	-0.53	5	
		e"	15.5100	Conductivity ( $\sigma$ ):	4.54	4.71	-3.74	5	
	Head 5600	e'	35.2200	Relative Permittivity ( $\epsilon_r$ ):	35.22	35.53	-0.88	5	
		e"	15.7200	Conductivity ( $\sigma$ ):	4.89	5.06	-3.27	5	
	Head 5750	e'	35.0900	Relative Permittivity ( $\epsilon_r$ ):	35.09	35.36	-0.77	5	
		e"	15.7500	Conductivity ( $\sigma$ ):	5.04	5.21	-3.42	5	
	Head 5825	e'	35.0000	Relative Permittivity ( $\epsilon_r$ ):	35.00	35.30	-0.85	5	
		e"	15.7600	Conductivity ( $\sigma$ ):	5.10	5.27	-3.14	5	
	4-15-2021	Head 5250	e'	34.7700	Relative Permittivity ( $\epsilon_r$ ):	34.77	35.93	-3.24	5
			e"	15.9300	Conductivity ( $\sigma$ ):	4.65	4.70	-1.10	5
Head 5260		e'	34.7600	Relative Permittivity ( $\epsilon_r$ ):	34.76	35.92	-3.23	5	
		e"	15.9300	Conductivity ( $\sigma$ ):	4.66	4.71	-1.13	5	
Head 5600		e'	34.3000	Relative Permittivity ( $\epsilon_r$ ):	34.30	35.53	-3.47	5	
		e"	15.9500	Conductivity ( $\sigma$ ):	4.97	5.06	-1.85	5	
Head 5750		e'	34.0400	Relative Permittivity ( $\epsilon_r$ ):	34.04	35.36	-3.74	5	
		e"	15.9900	Conductivity ( $\sigma$ ):	5.11	5.21	-1.95	5	
Head 5825		e'	33.9600	Relative Permittivity ( $\epsilon_r$ ):	33.96	35.30	-3.80	5	
		e"	16.0200	Conductivity ( $\sigma$ ):	5.19	5.27	-1.54	5	
4-26-2021		Head 5250	e'	35.6300	Relative Permittivity ( $\epsilon_r$ ):	35.63	35.93	-0.84	5
			e"	16.1100	Conductivity ( $\sigma$ ):	4.70	4.70	0.01	5
	Head 5260	e'	35.6100	Relative Permittivity ( $\epsilon_r$ ):	35.61	35.92	-0.87	5	
		e"	16.1100	Conductivity ( $\sigma$ ):	4.71	4.71	-0.01	5	
	Head 5600	e'	34.9800	Relative Permittivity ( $\epsilon_r$ ):	34.98	35.53	-1.56	5	
		e"	16.4100	Conductivity ( $\sigma$ ):	5.11	5.06	0.98	5	
	Head 5750	e'	34.6700	Relative Permittivity ( $\epsilon_r$ ):	34.67	35.36	-1.96	5	
		e"	16.5400	Conductivity ( $\sigma$ ):	5.29	5.21	1.43	5	
	Head 5825	e'	34.5600	Relative Permittivity ( $\epsilon_r$ ):	34.56	35.30	-2.10	5	
		e"	16.5900	Conductivity ( $\sigma$ ):	5.37	5.27	1.96	5	

**SAR 3 Room**

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)		
4-14-2021	Head 5250	e'	36.0400	Relative Permittivity ( $\epsilon_r$ ):	36.04	35.93	0.30	5	
		e"	15.7800	Conductivity ( $\sigma$ ):	4.61	4.70	-2.04	5	
	Head 5260	e'	36.0200	Relative Permittivity ( $\epsilon_r$ ):	36.02	35.92	0.27	5	
		e"	15.7800	Conductivity ( $\sigma$ ):	4.62	4.71	-2.06	5	
	Head 5600	e'	35.3700	Relative Permittivity ( $\epsilon_r$ ):	35.37	35.53	-0.46	5	
		e"	16.0700	Conductivity ( $\sigma$ ):	5.00	5.06	-1.11	5	
	Head 5750	e'	35.0900	Relative Permittivity ( $\epsilon_r$ ):	35.09	35.36	-0.77	5	
		e"	16.2100	Conductivity ( $\sigma$ ):	5.18	5.21	-0.60	5	
	Head 5825	e'	34.9600	Relative Permittivity ( $\epsilon_r$ ):	34.96	35.30	-0.96	5	
		e"	16.2600	Conductivity ( $\sigma$ ):	5.27	5.27	-0.07	5	
	4-19-2021	Head 2450	e'	40.7200	Relative Permittivity ( $\epsilon_r$ ):	40.72	39.20	3.88	5
			e"	13.2600	Conductivity ( $\sigma$ ):	1.81	1.80	0.35	5
Head 2400		e'	40.7700	Relative Permittivity ( $\epsilon_r$ ):	40.77	39.30	3.75	5	
		e"	13.2200	Conductivity ( $\sigma$ ):	1.76	1.75	0.72	5	
Head 2480		e'	40.6900	Relative Permittivity ( $\epsilon_r$ ):	40.69	39.16	3.90	5	
		e"	13.2700	Conductivity ( $\sigma$ ):	1.83	1.83	-0.14	5	
4-19-2021	Head 5250	e'	36.1900	Relative Permittivity ( $\epsilon_r$ ):	36.19	35.93	0.71	5	
		e"	15.6000	Conductivity ( $\sigma$ ):	4.55	4.70	-3.15	5	
	Head 5260	e'	36.1700	Relative Permittivity ( $\epsilon_r$ ):	36.17	35.92	0.69	5	
		e"	15.5900	Conductivity ( $\sigma$ ):	4.56	4.71	-3.24	5	
	Head 5600	e'	35.5300	Relative Permittivity ( $\epsilon_r$ ):	35.53	35.53	-0.01	5	
		e"	15.9100	Conductivity ( $\sigma$ ):	4.95	5.06	-2.10	5	
	Head 5750	e'	35.3000	Relative Permittivity ( $\epsilon_r$ ):	35.30	35.36	-0.18	5	
		e"	16.0700	Conductivity ( $\sigma$ ):	5.14	5.21	-1.45	5	
	Head 5825	e'	36.1900	Relative Permittivity ( $\epsilon_r$ ):	36.19	35.30	2.52	5	
		e"	16.0900	Conductivity ( $\sigma$ ):	5.21	5.27	-1.11	5	

**SAR 4 Room**

Date	Freq. (MHz)	Liquid Parameters		Measured	Target	Delta (%)	Limit ±(%)	
4-5-2021	Head 2450	e'	37.7600	Relative Permittivity ( $\epsilon_r$ ):	37.76	39.20	-3.67	5
		e"	13.7000	Conductivity ( $\sigma$ ):	1.87	1.80	3.68	5
	Head 2400	e'	37.9500	Relative Permittivity ( $\epsilon_r$ ):	37.95	39.30	-3.43	5
		e"	13.6200	Conductivity ( $\sigma$ ):	1.82	1.75	3.76	5
	Head 2480	e'	37.6500	Relative Permittivity ( $\epsilon_r$ ):	37.65	39.16	-3.86	5
		e"	13.7300	Conductivity ( $\sigma$ ):	1.89	1.83	3.32	5
4-8-2021	Head 2450	e'	38.6900	Relative Permittivity ( $\epsilon_r$ ):	38.69	39.20	-1.30	5
		e"	13.5800	Conductivity ( $\sigma$ ):	1.85	1.80	2.78	5
	Head 2400	e'	38.8900	Relative Permittivity ( $\epsilon_r$ ):	38.89	39.30	-1.03	5
		e"	13.4400	Conductivity ( $\sigma$ ):	1.79	1.75	2.39	5
	Head 2480	e'	38.5600	Relative Permittivity ( $\epsilon_r$ ):	38.56	39.16	-1.54	5
		e"	13.6400	Conductivity ( $\sigma$ ):	1.88	1.83	2.64	5
4-12-2021	Head 2450	e'	38.6100	Relative Permittivity ( $\epsilon_r$ ):	38.61	39.20	-1.51	5
		e"	13.2100	Conductivity ( $\sigma$ ):	1.80	1.80	-0.02	5
	Head 2400	e'	38.8200	Relative Permittivity ( $\epsilon_r$ ):	38.82	39.30	-1.21	5
		e"	13.0600	Conductivity ( $\sigma$ ):	1.74	1.75	-0.50	5
	Head 2480	e'	38.5000	Relative Permittivity ( $\epsilon_r$ ):	38.50	39.16	-1.69	5
		e"	13.3000	Conductivity ( $\sigma$ ):	1.83	1.83	0.09	5
4-26-2021	Head 2450	e'	38.9500	Relative Permittivity ( $\epsilon_r$ ):	38.95	39.20	-0.64	5
		e"	13.2300	Conductivity ( $\sigma$ ):	1.80	1.80	0.13	5
	Head 2400	e'	39.0800	Relative Permittivity ( $\epsilon_r$ ):	39.08	39.30	-0.55	5
		e"	13.1200	Conductivity ( $\sigma$ ):	1.75	1.75	-0.05	5
	Head 2480	e'	38.8700	Relative Permittivity ( $\epsilon_r$ ):	38.87	39.16	-0.75	5
		e"	13.2800	Conductivity ( $\sigma$ ):	1.83	1.83	-0.06	5

## 8.2 System Check

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

### System Performance Check Measurement Conditions:

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ±0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.  
For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- Distance between probe sensors and phantom surface was set to 2.5 mm.  
For 5 GHz band - Distance between probe sensors and phantom surface was set to 1.4 mm
- The dipole input power (forward power) was 100 mW.
- The results are normalized to 1 W input power.

### Reference Target SAR Values

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

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (W/kg)	
				1g/10g	Head
D2450V2	939	7-25-2019	2450	1g	53.20
				10g	25.10
D5GHzV2	1209	2-27-2020	5250	1g	79.90
				10g	22.60
			5600	1g	83.60
				10g	23.60
			5750	1g	80.20
				10g	22.60

#### Note(s):

Refer to Appendix F that mentioned about justification for Extended SAR Dipole Calibrations  
D2450(SN : 939), D5GHz(SN : 1209))

**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				
4-7-2021	D5GHzV2	1209	Head	1g	7.58	75.8	79.90	-5.13	
				10g	2.15	21.5	22.60	-4.87	
4-7-2021	D5GHzV2	1209	Head	1g	7.83	78.3	83.60	-6.34	1, 2
				10g	2.20	22.0	23.60	-6.78	
4-7-2021	D5GHzV2	1209	Head	1g	7.53	75.30	80.20	-6.11	
				10g	2.13	21.30	22.60	-5.75	

**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				
4-12-2021	D5GHzV2	1209	Head	1g	8.20	82.0	79.90	2.63	
				10g	2.31	23.1	22.60	2.21	
4-12-2021	D5GHzV2	1209	Head	1g	8.91	89.1	83.60	6.58	
				10g	2.50	25.0	23.60	5.93	
4-12-2021	D5GHzV2	1209	Head	1g	8.09	80.9	80.20	0.87	
				10g	2.28	22.8	22.60	0.88	
4-15-2021	D5GHzV2	1209	Head	1g	8.44	84.4	79.90	5.63	
				10g	2.41	24.1	22.60	6.64	
4-15-2021	D5GHzV2	1209	Head	1g	8.75	87.5	83.60	4.67	
				10g	2.47	24.7	23.60	4.66	
4-15-2021	D5GHzV2	1209	Head	1g	8.41	84.1	80.20	4.86	
				10g	2.39	23.9	22.60	5.75	
4-26-2021	D5GHzV2	1209	Head	1g	7.36	73.6	79.90	-7.88	3, 4
				10g	2.08	20.8	22.60	-7.96	
4-26-2021	D5GHzV2	1209	Head	1g	8.41	84.1	83.60	0.60	
				10g	2.35	23.5	23.60	-0.42	
4-26-2021	D5GHzV2	1209	Head	1g	7.99	79.9	80.20	-0.37	
				10g	2.24	22.4	22.60	-0.88	

**SAR 3 Room**

Date Tested	System Dipole		T.S. Liquid	Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.	
	Type	Serial #		Zoom Scan to 100 mW	Normalize to 1 W				
4-14-2021	D5GHzV2	1209	Head	1g	8.20	82.0	79.90	2.63	5, 6
				10g	2.39	23.9	22.60	5.75	
4-14-2021	D5GHzV2	1209	Head	1g	8.93	89.3	83.60	6.82	
				10g	2.53	25.3	23.60	7.20	
4-14-2021	D5GHzV2	1209	Head	1g	8.00	80.0	80.20	-0.25	
				10g	2.31	23.1	22.60	2.21	
4-19-2021	D2450V2	939	Head	1g	5.48	54.8	53.20	3.01	
				10g	2.60	26.0	25.10	3.59	
4-19-2021	D5GHzV2	1209	Head	1g	8.04	80.4	79.90	0.63	
				10g	2.32	23.2	22.60	2.65	
4-19-2021	D5GHzV2	1209	Head	1g	8.75	87.5	83.60	4.67	
				10g	2.51	25.1	23.60	6.36	
4-19-2021	D5GHzV2	1209	Head	1g	8.14	81.4	80.20	1.50	
				10g	2.36	23.6	22.60	4.42	

**SAR 4 Room**

Date Tested	System Dipole		T.S. Liquid	Measured Results		Target (Ref. Value)	Delta ±10 %	Plot No.	
	Type	Serial #		Zoom Scan to 100 mW	Normalize to 1 W				
4-5-2021	D2450V2	939	Head	1g	5.29	52.9	53.20	-0.56	7, 8
				10g	2.42	24.2	25.10	-3.59	
4-8-2021	D2450V2	939	Head	1g	5.32	53.2	53.20	0.00	
				10g	2.42	24.2	25.10	-3.59	
4-12-2021	D2450V2	939	Head	1g	5.12	51.2	53.20	-3.76	
				10g	2.34	23.4	25.10	-6.77	
4-26-2021	D2450V2	939	Head	1g	5.08	50.8	53.20	-4.51	
				10g	2.34	23.4	25.10	-6.77	

## 9 Conducted Output Power Measurements

### 9.1 Wi-Fi 2.4GHz (DTS Band)

#### Measured Results

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Max Pwr.			Reduction Pwr.		
					Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)
2.4 SISO Ant 1	802.11b	1 Mbps	1	2412	18.0	19.0	Yes	10.4	12.0	Yes
			6	2437	18.3	19.0		10.3	12.0	
			11	2462	18.3	19.0		11.1	12.0	
			12	2467	Not Require	5.0		Not Require	5.0	
			13	2472		2.0			2.0	
	802.11g	6 Mbps	1	2412	Not Require	16.0	No	Not Require	12.0	No
			6	2437		19.0			12.0	
			11	2462		16.0			12.0	
			12	2467		5.0			5.0	
			13	2472		2.0			2.0	
	802.11n (HT20)	6.5 Mbps	1	2412	Not Require	16.0	No	Not Require	12.0	No
			6	2437		18.0			12.0	
			11	2462		16.0			12.0	
			12	2467		5.0			5.0	
			13	2472		2.0			2.0	
2.4 SISO Ant 2	802.11b	1 Mbps	1	2412	18.0	19.0	Yes	9.9	12.0	Yes
			6	2437	18.6	19.0		10.4	12.0	
			11	2462	18.2	19.0		10.6	12.0	
			12	2467	Not Require	5.0		Not Require	5.0	
			13	2472		2.0			2.0	
	802.11g	6 Mbps	1	2412	Not Require	16.0	No	Not Require	12.0	No
			6	2437		19.0			12.0	
			11	2462		16.0			12.0	
			12	2467		5.0			5.0	
			13	2472		2.0			2.0	
	802.11n (HT20)	6.5 Mbps	1	2412	Not Require	16.0	No	Not Require	12.0	No
			6	2437		18.0			12.0	
			11	2462		16.0			12.0	
			12	2467		5.0			5.0	
			13	2472		2.0			2.0	

#### Note(s):

- SAR is not required for 802.11g/n modes when the adjusted SAR for 802.11b is < 1.2 W/kg.
- For "Not required", SAR Test reduction was applied from KDB 248227 guidance, Sec. 2.1, b), 1) when the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11n/g mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band. Additional output power measurements were not deemed necessary.

## 9.2 Wi-Fi 5GHz (U-NII Bands)

### Measured Results

Antenna	Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Max Pwr.			Reduction Pwr.		
						Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Avg Pwr (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)
SISO Ant.1	5.3 (U-NII 2A)	802.11a	6 Mbps	52	5260.0	16.1	17.0	Yes	Not Required	9.5	No
				56	5280.0	16.1			Not Required		
				60	5300.0	15.8			Not Required		
				64	5320.0	15.7			Not Required		
		802.11n (HT20)	6.5 Mbps	52	5260.0	Not Required	17.0	No	Not Required	9.5	No
				56	5280.0	Not Required			Not Required		
				60	5300.0	Not Required			Not Required		
		802.11n (HT40)	13.5 Mbps	54	5270.0	Not Required	14.0	No	Not Required	9.5	No
				62	5310.0	Not Required			Not Required		
		802.11ac (VHT20)	6.5 Mbps	52	5260.0	Not Required	17.0	No	Not Required	9.5	No
				56	5280.0	Not Required			Not Required		
				60	5300.0	Not Required			Not Required		
	802.11ac (VHT40)	13.5 Mbps	54	5270.0	Not Required	14.0	No	Not Required	9.5	No	
			62	5310.0	Not Required			Not Required			
	802.11ac (VHT80)	29.3 Mbps	58	5290.0	Not Required	13.0	No	8.6	9.5	Yes	
	5.5 (U-NII 2C)	802.11a	6 Mbps	100	5500.0	15.8	17.0	Yes	Not Required	9.5	No
				120	5600.0	15.8			Not Required		
				124	5620.0	15.7			Not Required		
				144	5720.0	15.6			Not Required		
		802.11n (HT20)	6.5 Mbps	100	5500.0	Not Required	17.0	No	Not Required	9.5	No
				120	5600.0	Not Required			Not Required		
				124	5620.0	Not Required			Not Required		
				144	5720.0	Not Required			Not Required		
		802.11n (HT40)	13.5 Mbps	102	5510.0	Not Required	14.0	No	Not Required	9.5	No
				118	5590.0	Not Required			Not Required		
				126	5630.0	Not Required			Not Required		
				142	5710.0	Not Required			Not Required		
		802.11ac (VHT20)	6.5 Mbps	100	5500.0	Not Required	17.0	No	Not Required	9.5	No
				120	5600.0	Not Required			Not Required		
				124	5620.0	Not Required			Not Required		
802.11ac (VHT40)		13.5 Mbps	102	5510.0	Not Required	14.0	No	Not Required	9.5	No	
			118	5590.0	Not Required			Not Required			
			126	5630.0	Not Required			Not Required			
802.11ac (VHT80)		29.3 Mbps	106	5530.0	Not Required	13.0	No	8.3	9.5	Yes	
			122	5610.0	Not Required			8.3			
			138	5690.0	Not Required			8.4			
5.8 (U-NII 3)		802.11a	6 Mbps	149	5745.0	15.8	17.0	Yes	Not Required	9.5	No
				157	5785.0	15.6			Not Required		
				165	5825.0	15.8			Not Required		
	802.11n (HT20)	6.5 Mbps	149	5745.0	Not Required	17.0	No	Not Required	9.5	No	
			157	5785.0	Not Required			Not Required			
			165	5825.0	Not Required			Not Required			
	802.11n (HT40)	13.5 Mbps	151	5755.0	Not Required	14.0	No	Not Required	9.5	No	
			159	5795.0	Not Required			Not Required			
	802.11ac (VHT20)	6.5 Mbps	149	5745.0	Not Required	17.0	No	Not Required	9.5	No	
			157	5785.0	Not Required			Not Required			
	802.11ac (VHT40)	13.5 Mbps	151	5755.0	Not Required	14.0	No	Not Required	9.5	No	
			159	5795.0	Not Required			Not Required			
802.11ac (VHT80)	29.3 Mbps	155	5775.0	Not Required	13.0	No	8.2	9.5	Yes		

Antenna	Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Max Pw r.			Reduction Pw r.				
						Avg Pw r (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Avg Pw r (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)		
SISO Ant.2	5.3 (UNII 2A)	802.11a	6 Mbps	52	5260.0	15.4	17.0	Yes	Not Required	9.5	No		
				56	5280.0	15.4			Not Required				
				60	5300.0	15.3			Not Required				
				64	5320.0	15.2			Not Required				
		802.11n (HT20)	6.5 Mbps	52	5260.0	Not Required	17.0	No	Not Required	9.5	No		
				56	5280.0	Not Required			Not Required				
				60	5300.0	Not Required			Not Required				
				64	5320.0	Not Required			Not Required				
		802.11n (HT40)	13.5 Mbps	54	5270.0	Not Required	14.0	No	Not Required	9.5	No		
				62	5310.0	Not Required			Not Required				
		802.11ac (VHT20)	6.5 Mbps	52	5260.0	Not Required	17.0	No	Not Required	9.5	No		
				56	5280.0	Not Required			Not Required				
				60	5300.0	Not Required			Not Required				
		802.11ac (VHT40)	13.5 Mbps	54	5270.0	Not Required	14.0	No	Not Required	9.5	No		
				62	5310.0	Not Required			Not Required				
		802.11ac (VHT80)	29.3 Mbps	58	5290.0	Not Required	13.0	No	8.3	9.5	Yes		
		SISO Ant.2	5.5 (U-NII 2C)	802.11a	6 Mbps	100	5500.0	15.5	17.0	Yes	Not Required	9.5	No
						120	5600.0	15.8			Not Required		
	124					5620.0	15.7	Not Required					
	144					5720.0	15.5	Not Required					
	802.11n (HT20)			6.5 Mbps	100	5500.0	Not Required	17.0	No	Not Required	9.5	No	
					120	5600.0	Not Required			Not Required			
					124	5620.0	Not Required			Not Required			
					144	5720.0	Not Required			Not Required			
	802.11n (HT40)			13.5 Mbps	102	5510.0	Not Required	14.0	No	Not Required	9.5	No	
					118	5590.0	Not Required			Not Required			
					126	5630.0	Not Required			Not Required			
802.11ac (VHT20)	6.5 Mbps			100	5500.0	Not Required	17.0	No	Not Required	9.5	No		
				120	5600.0	Not Required			Not Required				
				124	5620.0	Not Required			Not Required				
				144	5720.0	Not Required			Not Required				
802.11ac (VHT40)	13.5 Mbps			102	5510.0	Not Required	14.0	No	Not Required	9.5	No		
				118	5590.0	Not Required			Not Required				
				126	5630.0	Not Required			Not Required				
802.11ac (VHT80)	29.3 Mbps		106	5530.0	Not Required	13.0	No	8.3	9.5	Yes			
			122	5610.0	Not Required			8.6					
			138	5690.0	Not Required			8.5					
5.8 (U-NII 3)	802.11a		6 Mbps	149	5745.0	15.3	17.0	Yes	Not Required	9.5	No		
				157	5785.0	15.3			Not Required				
				165	5825.0	15.4			Not Required				
	802.11n (HT20)		6.5 Mbps	149	5745.0	Not Required	17.0	No	Not Required	9.5	No		
				157	5785.0	Not Required			Not Required				
				165	5825.0	Not Required			Not Required				
	802.11n (HT40)	13.5 Mbps	151	5755.0	Not Required	14.0	No	Not Required	9.5	No			
			159	5795.0	Not Required			Not Required					
	802.11ac (VHT20)	6.5 Mbps	149	5745.0	Not Required	17.0	No	Not Required	9.5	No			
			157	5785.0	Not Required			Not Required					
	802.11ac (VHT40)	13.5 Mbps	151	5755.0	Not Required	14.0	No	Not Required	9.5	No			
			159	5795.0	Not Required			Not Required					
802.11ac (VHT80)	29.3 Mbps	155	5775.0	Not Required	13.0	No	8.3	9.5	Yes				



Antenna	Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Max Pw r.			Reduction Pw r.		
						Avg Pw r (dBm)	Max Output Pow er (dBm)	SAR Test (Yes/No)	Avg Pw r (dBm)	Max Output Pow er (dBm)	SAR Test (Yes/No)
MIMO Ant.1	5.3 (UNII 2A)	802.11a	6 Mbps	52	5260.0	15.9	17.0	Yes	Not Required	9.5	No
				56	5280.0	15.9			Not Required		
				60	5300.0	15.6			Not Required		
				64	5320.0	15.6			Not Required		
		802.11n (HT20)	6.5 Mbps	52	5260.0	Not Required	17.0	No	Not Required	9.5	No
				56	5280.0	Not Required			Not Required		
				60	5300.0	Not Required			Not Required		
				64	5320.0	Not Required			Not Required		
		802.11n (HT40)	13.5 Mbps	54	5270.0	Not Required	14.0	No	Not Required	9.5	No
				62	5310.0	Not Required			Not Required		
		802.11ac (VHT20)	6.5 Mbps	52	5260.0	Not Required	17.0	No	Not Required	9.5	No
				56	5280.0	Not Required			Not Required		
				60	5300.0	Not Required			Not Required		
		802.11ac (VHT40)	13.5 Mbps	54	5270.0	Not Required	14.0	No	Not Required	9.5	No
	62			5310.0	Not Required	Not Required					
	802.11ac (VHT80)	29.3 Mbps	58	5290.0	Not Required	13.0	No	8.7	9.5	Yes	
	5.5 (U-NII 2C)	802.11a	6 Mbps	100	5500.0	15.7	17.0	Yes	Not Required	9.5	No
				120	5600.0	15.6			Not Required		
				124	5620.0	15.4			Not Required		
				144	5720.0	15.4			Not Required		
		802.11n (HT20)	6.5 Mbps	100	5500.0	Not Required	17.0	No	Not Required	9.5	No
				120	5600.0	Not Required			Not Required		
				124	5620.0	Not Required			Not Required		
				144	5720.0	Not Required			Not Required		
		802.11n (HT40)	13.5 Mbps	102	5510.0	Not Required	14.0	No	Not Required	9.5	No
				118	5590.0	Not Required			Not Required		
				126	5630.0	Not Required			Not Required		
		802.11ac (VHT20)	6.5 Mbps	100	5500.0	Not Required	17.0	No	Not Required	9.5	No
120				5600.0	Not Required	Not Required					
124				5620.0	Not Required	Not Required					
144				5720.0	Not Required	Not Required					
802.11ac (VHT40)		13.5 Mbps	102	5510.0	Not Required	14.0	No	Not Required	9.5	No	
			118	5590.0	Not Required			Not Required			
			126	5630.0	Not Required			Not Required			
802.11ac (VHT80)		29.3 Mbps	106	5530.0	Not Required	13.0	No	8.6	9.5	Yes	
			122	5610.0	Not Required			8.1			
			138	5690.0	Not Required			8.1			
5.8 (U-NII 3)		802.11a	6 Mbps	149	5745.0	15.5	17.0	Yes	Not Required	9.5	No
				157	5785.0	15.3			Not Required		
				165	5825.0	15.4			Not Required		
	802.11n (HT20)	6.5 Mbps	149	5745.0	Not Required	17.0	No	Not Required	9.5	No	
			157	5785.0	Not Required			Not Required			
			165	5825.0	Not Required			Not Required			
	802.11n (HT40)	13.5 Mbps	151	5755.0	Not Required	14.0	No	Not Required	9.5	No	
			159	5795.0	Not Required			Not Required			
	802.11ac (VHT20)	6.5 Mbps	149	5745.0	Not Required	17.0	No	Not Required	9.5	No	
			157	5785.0	Not Required			Not Required			
802.11ac (VHT40)	13.5 Mbps	151	5755.0	Not Required	14.0	No	Not Required	9.5	No		
		159	5795.0	Not Required			Not Required				
802.11ac (VHT80)	29.3 Mbps	155	5775.0	Not Required	13.0	No	7.9	9.5	Yes		

Antenna	Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Max Pw r.			Reduction Pw r.		
						Avg Pw r (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)	Avg Pw r (dBm)	Max Output Power (dBm)	SAR Test (Yes/No)
MIMO Ant.2	5.3 (UNII 2A)	802.11a	6 Mbps	52	5260.0	15.4	17.0	Yes	Not Required	9.5	No
				56	5280.0	15.4			Not Required		
				60	5300.0	15.3			Not Required		
				64	5320.0	15.2			Not Required		
		802.11n (HT20)	6.5 Mbps	52	5260.0	Not Required	17.0	No	Not Required	9.5	No
				56	5280.0	Not Required			Not Required		
				60	5300.0	Not Required			Not Required		
				64	5320.0	Not Required			Not Required		
		802.11n (HT40)	13.5 Mbps	54	5270.0	Not Required	14.0	No	Not Required	9.5	No
				62	5310.0	Not Required			Not Required		
		802.11ac (VHT20)	6.5 Mbps	52	5260.0	Not Required	17.0	No	Not Required	9.5	No
				56	5280.0	Not Required			Not Required		
	60			5300.0	Not Required	Not Required					
	802.11ac (VHT40)	13.5 Mbps	54	5270.0	Not Required	14.0	No	Not Required	9.5	No	
			62	5310.0	Not Required			Not Required			
	802.11ac (VHT80)	29.3 Mbps	58	5290.0	Not Required	13.0	No	8.2	9.5	Yes	
	5.5 (U-NII 2C)	802.11a	6 Mbps	100	5500.0	15.6	17.0	Yes	Not Required	9.5	No
				120	5600.0	15.8			Not Required		
				124	5620.0	15.7			Not Required		
				144	5720.0	15.5			Not Required		
		802.11n (HT20)	6.5 Mbps	100	5500.0	Not Required	17.0	No	Not Required	9.5	No
120				5600.0	Not Required	Not Required					
124				5620.0	Not Required	Not Required					
144				5720.0	Not Required	Not Required					
802.11n (HT40)		13.5 Mbps	102	5510.0	Not Required	14.0	No	Not Required	9.5	No	
			118	5590.0	Not Required			Not Required			
			126	5630.0	Not Required			Not Required			
			142	5710.0	Not Required			Not Required			
802.11ac (VHT20)		6.5 Mbps	100	5500.0	Not Required	17.0	No	Not Required	9.5	No	
			120	5600.0	Not Required			Not Required			
			124	5620.0	Not Required			Not Required			
			144	5720.0	Not Required			Not Required			
802.11ac (VHT40)		13.5 Mbps	102	5510.0	Not Required	14.0	No	Not Required	9.5	No	
			118	5590.0	Not Required			Not Required			
	126		5630.0	Not Required	Not Required						
	142		5710.0	Not Required	Not Required						
802.11ac (VHT80)	29.3 Mbps	106	5530.0	Not Required	13.0	No	8.2	9.5	Yes		
		122	5610.0	Not Required			8.6				
		138	5690.0	Not Required			8.5				
5.8 (U-NII 3)	802.11a	6 Mbps	149	5745.0	15.3	17.0	Yes	Not Required	9.5	No	
			157	5785.0	15.3			Not Required			
			165	5825.0	15.3			Not Required			
	802.11n (HT20)	6.5 Mbps	149	5745.0	Not Required	17.0	No	Not Required	9.5	No	
			157	5785.0	Not Required			Not Required			
			165	5825.0	Not Required			Not Required			
	802.11n (HT40)	13.5 Mbps	151	5755.0	Not Required	14.0	No	Not Required	9.5	No	
			159	5795.0	Not Required			Not Required			
	802.11ac (VHT20)	6.5 Mbps	149	5745.0	Not Required	17.0	No	Not Required	9.5	No	
			157	5785.0	Not Required			Not Required			
			165	5825.0	Not Required			Not Required			
	802.11ac (VHT40)	13.5 Mbps	151	5755.0	Not Required	14.0	No	Not Required	9.5	No	
159			5795.0	Not Required	Not Required						
802.11ac (VHT80)	29.3 Mbps	155	5775.0	Not Required	13.0	No	8.1	9.5	Yes		

**Note(s):**

1. For "Not required", SAR Test reduction was applied from KDB 248227 guidance, Sec. 2.1, b), 1) when the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel in the initial test configuration, for each frequency band. Additional output power
2. When the same transmission mode configurations have the same maximum output power on the same channel for the 802.11 a/g/n/ac modes, the channel in the lower order/sequence 802.11 mode (i.e. a, g, n then ac) is selected.
3. When the specified maximum output power is the same for both UNII band I and UNII band 2A, begin SAR measurement in UNII band 2A; and if the highest reported SAR for UNII band 2A is
  - $\leq 1.2$  W/kg, SAR is not required for UNII band I
  - $> 1.2$  W/kg, both bands should be tested independently for SAR.
4. MIMO UNII SAR test were additionally evaluated for determining simultaneous transmission SAR test exclusion.

### 9.3 Bluetooth

#### Average Power Measured Results

Band (GHz)	Mode	Ch #	Freq. (MHz)	Maximum Average Power (dBm)		Reduced Average Power (dBm)	
				Meas. Pwr	Tune-up Limit	Meas. Pwr	Tune-up Limit
2.4	GFSK	0	2402	16.5	18.0	8.4	10.0
		39	2441	17.8		9.2	
		78	2480	16.4		9.2	
	EDR, 8-DPSK	0	2402	14.0	16.0	8.2	10.0
		39	2441	15.9		8.9	
		78	2480	15.0		8.9	
	LE, GFSK-1M (37 pkt)	0	2402	6.8	8.0	6.8	8.0
		39	2441	7.6		7.6	
		78	2480	7.6		7.6	
	LE, GFSK-2M (37 pkt)	0	2402	6.5	8.0	6.5	8.0
		19	2440	7.3		7.3	
		39	2480	7.3		7.3	

**Note(s):**

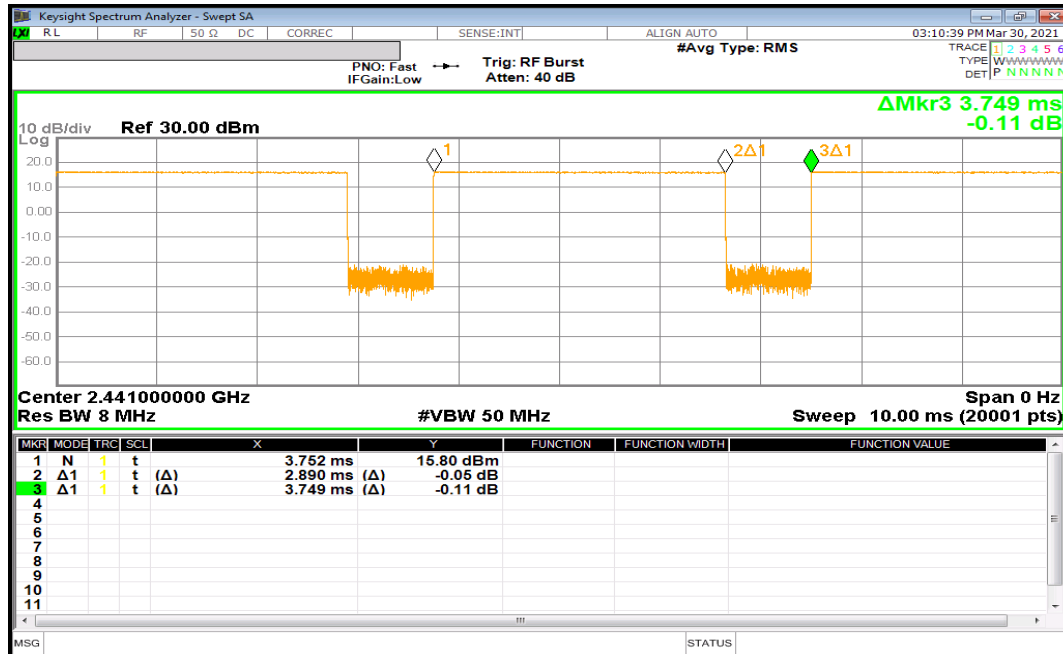
SAR test is evaluated at GFSK mode in Bluetooth

#### Duty Factor Measured Results

Mode	Type	T on (ms)	Period (ms)	Duty Cycle	Crest Factor (1/duty cycle)
GFSK	DH5	2.890	3.749	77.1%	1.30

#### Duty Cycle plots

GFSK



## 10 Measured and Reported (Scaled) SAR Results

### SAR Test Reduction criteria are as follows:

- Reported SAR(W/kg) for WWAN= Measured SAR \*Tune-up Scaling Factor
- Reported SAR(W/kg) for Wi-Fi and Bluetooth= Measured SAR \* Tune-up scaling factor \* Duty Cycle scaling factor
- Duty Cycle scaling factor = 1 / Duty cycle (%)

### 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:

- $\leq 0.8$  W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is  $\leq 100$  MHz
- $\leq 0.6$  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
- $\leq 0.4$  W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is  $\geq 200$  MHz

### KDB 248227 D01 SAR meas for 802.11:

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

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

- $\leq 0.4$  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  $\leq 0.8$  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  $\leq 1.2$  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  $\leq 1.2$  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  $\leq 1.2$  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 Wi-Fi (DTS Band)

Frequency Band	Mode	RF Exposure Conditions	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle (%)	Power (dBm)		1-g SAR (W/kg)		Note	Plot No.
										Tune-up limit	Meas.	Meas.	Scaled		
2.4GHz SISO Ant 1	802.11b 1 Mbps	Standalone	Off	17	Rear	6	2437.0	0.030	98.8%	19.0	18.3				
				20	Edge 1	6	2437.0	0.010	98.8%	19.0	18.3				
				9	Edge 2	6	2437.0	0.078	98.8%	19.0	18.3	0.048	0.057	1	
				15	Corner A	6	2437.0	0.020	98.8%	19.0	18.3				
			On	0	Rear	11	2462.0	0.227	98.8%	12.0	11.1				
					Edge 1	11	2462.0	0.292	98.8%	12.0	11.1	0.140	0.176	1	1
					Edge 2	11	2462.0	0.287	98.8%	12.0	11.1				
					Corner A	11	2462.0	0.139	98.8%	12.0	11.1				
2.4GHz SISO Ant 2	802.11b 1 Mbps	Standalone	Off	16	Rear	6	2437.0	0.035	98.8%	19.0	18.6				
				19	Edge 1	6	2437.0	0.012	98.8%	19.0	18.6				
				6	Edge 4	6	2437.0	0.240	98.8%	19.0	18.6	0.143	0.157	1	
				13	Corner B	6	2437.0	0.022	98.8%	19.0	18.6				
			On	0	Rear	11	2462.0	0.166	98.8%	12.0	10.6				
					Edge 1	11	2462.0	0.063	98.8%	12.0	10.6				
					Edge 4	11	2462.0	0.337	98.8%	12.0	10.6	0.187	0.262	1	2
					Corner B	11	2462.0	0.099	98.8%	12.0	10.6				

#### Additional Test Accessory SAR

Frequency Band	Mode	RF Exposure Conditions	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle (%)	Power (dBm)		1-g SAR (W/kg)		Plot No.
										Tune-up limit	Meas.	Meas.	Scaled	
2.4GHz SISO Ant 2	802.11b 1 Mbps	Standalone	On	0	Edge 4	11	2462.0	0.019	98.8%	12.0	10.6	0.013	0.018	

#### Note(s):

- Highest reported SAR is ≤ 0.4 or 1.0 W/kg (1-g or 10-g respectively). Therefore, further SAR measurements within this exposure condition are not required.
- Highest reported SAR is > 0.4 or 1.0 W/kg (1-g or 10-g respectively). Due to the highest reported SAR for this test position, other test positions in this exposure condition were evaluated until a SAR ≤ 0.8 or 2.0 W/kg (1-g or 10-g respectively) was reported.
- Testing for a second channel was required because the reported SAR for this test position was > 0.8 or 2.0 W/kg (1-g or 10-g respectively).
- SAR testing is not required for OFDM mode(s) when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.
- In the case of Accessory SAR, the highest reported SAR by frequency was further measured in the band.

**10.2 Bluetooth**

Frequency Band	Mode	RF Exposure Conditions	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Duty Cycle (%)	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.	Meas.	Scaled	
2.4GHz	GFSK	Standalone	Off	17	Rear	39	2441.0	77.1%	18.0	17.8	0.034	0.046	
				20	Edge 1	39	2441.0	77.1%	18.0	17.8	0.019	0.025	
				9	Edge 2	39	2441.0	77.1%	18.0	17.8	0.183	0.247	
				15	Corner A	39	2441.0	77.1%	18.0	17.8	0.046	0.062	
			On	0	Rear	39	2441.0	77.1%	10.0	9.2	0.204	0.316	3
				0	Edge 1	39	2441.0	77.1%	10.0	9.2	0.114	0.176	
				0	Edge 2	39	2441.0	77.1%	10.0	9.2	0.193	0.299	
				0	Corner A	39	2441.0	77.1%	10.0	9.2	0.097	0.149	

**Additional Test Accessory SAR**

Frequency Band	Mode	RF Exposure Conditions	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Duty Cycle (%)	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up limit	Meas.	Meas.	Scaled	
2.4GHz	GFSK	Standalone	On	0	Rear	39	2441.0	77.1%	10.0	9.2	0.168	0.260	

**Note(s):**

In the case of Accessory SAR, the highest reported SAR by frequency was further measured in the band.

### 10.3 Wi-Fi (U-NII Band)

Frequency Band	Mode	RF Exposure Conditions	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle (%)	Power (dBm)		1-g SAR (W/kg)		Note	Plot No.
										Tune-up limit	Meas.	Meas.	Scaled		
5.3 GHz U-NII 2A SISO Ant 1	802.11a 6 Mbps	Standalone	Off	17	Rear	56	5280.0	0.159	98.7%	17.0	16.1				
				20	Edge 1	56	5280.0	0.181	98.7%	17.0	16.1				
				9	Edge 2	56	5280.0	1.433	98.7%	17.0	16.1	0.636	0.797		
				15	Corner A	56	5280.0	0.455	98.7%	17.0	16.1	0.206	0.258	2	
	802.11ac (VHT80) MCS0		On	0	Rear	58	5290.0	0.538	98.6%	9.5	8.6				
				0	Edge 1	58	5290.0	0.361	98.6%	9.5	8.6				
				0	Edge 2	58	5290.0	1.005	98.6%	9.5	8.6	0.722	0.895		4
	0	Corner A	58	5290.0	1.255	98.6%	9.5	8.6	0.496	0.615	2				
5.3 GHz U-NII 2A SISO Ant 2	802.11a 6 Mbps	Standalone	Off	16	Rear	56	5280.0	0.081	98.7%	17.0	15.4				
				19	Edge 1	56	5280.0	0.181	98.7%	17.0	15.4	0.094	0.139	2	
				6	Edge 4	56	5280.0	0.822	98.7%	17.0	15.4	0.355	0.524		
				13	Corner B	56	5280.0	0.148	98.7%	17.0	15.4				
	802.11ac (VHT80) MCS0		On	0	Rear	58	5290.0	1.391	98.6%	9.5	8.3	0.449	0.603		5
				0	Edge 1	58	5290.0	0.598	98.6%	9.5	8.3				
				0	Edge 4	58	5290.0	0.721	98.6%	9.5	8.3	0.204	0.274	2	
	0	Corner B	58	5290.0	0.595	98.6%	9.5	8.3							
5.3 GHz U-NII 2A MIMO Ant 1	802.11a 6 Mbps	Standalone	Off	16	Rear	56	5280.0	0.286	98.7%	17.0	15.9				
				19	Edge 1	56	5280.0	0.239	98.7%	17.0	15.9				
				9	Edge 2	52	5260.0	1.486	98.7%	17.0	15.9	0.684	0.885	3	
						56	5280.0	1.528	98.7%	17.0	15.9	0.709	0.925		
				6	Edge 4	56	5280.0	0.402	98.7%	17.0	15.9				
				15	Corner A	56	5280.0	0.443	98.7%	17.0	15.9	0.223	0.291	2	
	13		Corner B	56	5280.0	0.181	98.7%	17.0	15.9						
	802.11ac (VHT80) MCS0		On	0	Rear	58	5290.0	1.400	97.3%	9.5	8.7	0.515	0.640	2	
				0	Edge 1	58	5290.0	0.602	97.3%	9.5	8.7				
				0	Edge 2	58	5290.0	2.712	97.3%	9.5	8.7	0.948	1.177	6	
0		Edge 4		58	5290.0	1.554	97.3%	9.5	8.7						
	0	Corner A	58	5290.0	1.275	97.3%	9.5	8.7							
	0	Corner B	58	5290.0	0.395	97.3%	9.5	8.7							
5.3 GHz U-NII 2A MIMO Ant 2	802.11a 6 Mbps	Standalone	Off	16	Rear	56	5280.0	0.286	98.7%	17.0	15.4				
				19	Edge 1	56	5280.0	0.239	98.7%	17.0	15.4				
				9	Edge 2	52	5260.0	1.486	98.7%	17.0	15.4				
						56	5280.0	1.528	98.7%	17.0	15.4				
				6	Edge 4	56	5280.0	0.402	98.7%	17.0	15.4				
				15	Corner A	56	5280.0	0.443	98.7%	17.0	15.4				
	13		Corner B	56	5280.0	0.181	98.7%	17.0	15.4						
	802.11ac (VHT80) MCS0		On	0	Rear	58	5290.0	1.400	97.3%	9.5	8.2	0.471	0.655	2	
				0	Edge 1	58	5290.0	0.602	97.3%	9.5	8.2				
				0	Edge 2	58	5290.0	2.712	97.3%	9.5	8.2				
0		Edge 4		58	5290.0	1.554	97.3%	9.5	8.2	0.588	0.817				
	0	Corner A	58	5290.0	1.275	97.3%	9.5	8.2							
	0	Corner B	58	5290.0	0.395	97.3%	9.5	8.2							

**Note(s):**

- Highest reported SAR is ≤ 0.4 or 1.0 W/kg (1-g or 10-g respectively). Therefore, further SAR measurements within this exposure condition are not required.
- Highest reported SAR is > 0.4 or 1.0 W/kg (1-g or 10-g respectively). Due to the highest reported SAR for this test position, other test positions in this exposure condition were evaluated until a SAR ≤ 0.8 or 2.0 W/kg (1-g or 10-g respectively) was reported.
- Testing for a second channel was required because the reported SAR for this test position was > 0.8 or 2.0 W/kg (1-g or 10-g respectively).
- MIMO SAR test were additionally evaluated for determining simultaneous transmission SAR test exclusion.



Frequency Band	Mode	RF Exposure Conditions	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle (%)	Power (dBm)		1-g SAR (W/kg)		Note	Plot No.
										Tune-up limit	Meas.	Meas.	Scaled		
5.5 GHz U-NII 2C SISO Ant 1	802.11a 6 Mbps	Standalone	Off	17	Rear	120	5600.0	0.153	98.7%	17.0	15.8				
				20	Edge 1	120	5600.0	0.221	98.7%	17.0	15.8				
				9	Edge 2	100	5500.0	1.344	98.7%	17.0	15.8	0.634	0.851	3	
						120	5600.0	1.714	98.7%	17.0	15.8	0.743	0.997		
	15		Corner A	120	5600.0	0.419	98.7%	17.0	15.8	0.197	0.264	2			
	802.11ac (VHT80) MCS0		On	0	Rear	138	5690.0	0.616	98.6%	9.5	8.4				
				0	Edge 1	138	5690.0	0.345	98.6%	9.5	8.4				
				0	Edge 2	122	5610.0	2.239	98.6%	9.5	8.3	0.820	1.102	3	7
						138	5690.0	2.181	98.6%	9.5	8.4	0.799	1.051		
				0	Corner A	138	5690.0	1.442	98.6%	9.5	8.4	0.464	0.611	2	
5.5 GHz U-NII 2C SISO Ant 2	802.11a 6 Mbps	Standalone	Off	16	Rear	120	5600.0	0.082	98.7%	17.0	15.8				
				19	Edge 1	120	5600.0	0.213	98.7%	17.0	15.8	0.088	0.119	2	
				6	Edge 4	120	5600.0	0.765	98.7%	17.0	15.8	0.380	0.514		8
				13	Corner B	120	5600.0	0.157	98.7%	17.0	15.8				
	802.11ac (VHT80) MCS0		On	0	Rear	122	5610.0	0.932	98.6%	9.5	8.6	0.334	0.414		
				0	Edge 1	122	5610.0	0.677	98.6%	9.5	8.6				
				0	Edge 4	122	5610.0	0.868	98.6%	9.5	8.6	0.240	0.297	2	
				0	Corner B	122	5610.0	0.407	98.6%	9.5	8.6				
5.5 GHz U-NII 2C MIMO Ant 1	802.11a 6 Mbps	Standalone	Off	16	Rear	120	5600.0	0.190	98.7%	17.0	15.6				
				19	Edge 1	120	5600.0	0.174	98.7%	17.0	15.6				
				9	Edge 2	120	5600.0	1.442	98.7%	17.0	15.6	0.656	0.924		
						124	5620.0	1.423	98.7%	17.0	15.4	0.639	0.929	3	
				6	Edge 4	120	5600.0	0.825	98.7%	17.0	15.6				
				15	Corner A	120	5600.0	0.338	98.7%	17.0	15.6				
	13		Corner B	120	5600.0	0.200	98.7%	17.0	15.6						
	802.11ac (VHT80) MCS0		On	0	Rear	106	5530.0	1.040	97.3%	9.5	8.6	0.660	0.837	3	
						122	5610.0	1.851	97.3%	9.5	8.1				
				0	Edge 1	122	5610.0	0.348	97.3%	9.5	8.1				
				0	Edge 2	106	5530.0	2.088	97.3%	9.5	8.6	0.768	0.974	3	
						122	5610.0	2.506	97.3%	9.5	8.1	0.851	1.200		9
0		Edge 4		122	5610.0	1.003	97.3%	9.5	8.1						
0	Corner A	122	5610.0	0.952	97.3%	9.5	8.1								
0	Corner B	122	5610.0	0.424	97.3%	9.5	8.1								
5.5 GHz U-NII 2C MIMO Ant 2	802.11a 6 Mbps	Standalone	Off	16	Rear	120	5600.0	0.190	98.7%	17.0	15.8				
				19	Edge 1	120	5600.0	0.174	98.7%	17.0	15.8				
				9	Edge 2	120	5600.0	1.442	98.7%	17.0	15.8				
						124	5620.0	1.423	98.7%	17.0	15.7				
				6	Edge 4	120	5600.0	0.825	98.7%	17.0	15.8	0.378	0.510	2	
				15	Corner A	120	5600.0	0.338	98.7%	17.0	15.8				
				13	Corner B	120	5600.0	0.200	98.7%	17.0	15.8				
	802.11ac (VHT80) MCS0		On	0	Rear	106	5530.0	1.040	97.3%	9.5	8.2	0.350	0.485	3	
						122	5610.0	1.851	97.3%	9.5	8.6	0.650	0.822		
				0	Edge 1	122	5610.0	0.348	97.3%	9.5	8.6				
				0	Edge 2	106	5530.0	2.088	97.3%	9.5	8.2				
						122	5610.0	2.506	97.3%	9.5	8.6				
				0	Edge 4	122	5610.0	1.003	97.3%	9.5	8.6	0.276	0.349	2	
				0	Corner A	122	5610.0	0.952	97.3%	9.5	8.6				
0	Corner B	122	5610.0	0.424	97.3%	9.5	8.6								

**Note(s):**

- Highest reported SAR is ≤ 0.4 or 1.0 W/kg (1-g or 10-g respectively). Therefore, further SAR measurements within this exposure condition are not required.
- Highest reported SAR is > 0.4 or 1.0 W/kg (1-g or 10-g respectively). Due to the highest reported SAR for this test position, other test positions in this exposure condition were evaluated until a SAR ≤ 0.8 or 2.0 W/kg (1-g or 10-g respectively) was reported.
- Testing for a second channel was required because the reported SAR for this test position was > 0.8 or 2.0 W/kg (1-g or 10-g respectively).
- MIMO SAR test were additionally evaluated for determining simultaneous transmission SAR test exclusion.

Frequency Band	Mode	RF Exposure Conditions	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle (%)	Power (dBm)		1-g SAR (W/kg)		Note	Plot No.
										Tune-up limit	Meas.	Meas.	Scaled		
5.8 GHz U-NII 3 SISO Ant 1	802.11a 6 Mbps	Standalone	Off	17	Rear	165	5825.0	0.167	98.7%	17.0	15.8				
				20	Edge 1	165	5825.0	0.129	98.7%	17.0	15.8				
				9	Edge 2	165	5825.0	1.142	98.7%	17.0	15.8	0.467	0.631		
				15	Corner A	165	5825.0	0.334	98.7%	17.0	15.8	0.147	0.199	2	
	802.11ac (VHT80) MCS0		On	0	Rear	155	5775.0	0.931	98.6%	9.5	8.2	0.496	0.680	2	
				0	Edge 1	155	5775.0	0.323	98.6%	9.5	8.2				
				0	Edge 2	155	5775.0	2.224	98.6%	9.5	8.2	0.810	1.111		10
				0	Corner A	155	5775.0	1.907	98.6%	9.5	8.2	0.586	0.804		
5.8 GHz U-NII 3 SISO Ant 2	802.11a 6 Mbps	Standalone	Off	16	Rear	165	5825.0	0.081	98.7%	17.0	15.4				
				19	Edge 1	165	5825.0	0.069	98.7%	17.0	15.4				
				6	Edge 4	165	5825.0	0.981	98.7%	17.0	15.4	0.369	0.547		
				13	Corner B	165	5825.0	0.101	98.7%	17.0	15.4	0.039	0.058	2	
	802.11ac (VHT80) MCS0		On	0	Rear	155	5775.0	1.460	98.6%	9.5	8.3	0.748	1.009		11
				0	Edge 1	155	5775.0	0.377	98.6%	9.5	8.3				
				0	Edge 4	155	5775.0	0.730	98.6%	9.5	8.3	0.224	0.302	2	
				0	Corner B	155	5775.0	0.669	98.6%	9.5	8.3				
5.8 GHz U-NII 3 MIMO Ant 1	802.11a 6 Mbps	Standalone	Off	16	Rear	149	5745.0	0.213	98.7%	17.0	15.5				
				19	Edge 1	149	5745.0	0.160	98.7%	17.0	15.5				
				9	Edge 2	149	5745.0	1.461	98.7%	17.0	15.5	0.656	0.931		
						165	5825.0	1.269	98.7%	17.0	15.4	0.556	0.822	3	
				6	Edge 4	149	5745.0	0.770	98.7%	17.0	15.5				
				15	Corner A	149	5745.0	0.327	98.7%	17.0	15.5				
	802.11ac (VHT80) MCS0		On	0	Rear	155	5775.0	1.305	97.3%	9.5	7.9	0.467	0.696	2	
				0	Edge 1	155	5775.0	0.471	97.3%	9.5	7.9				
				0	Edge 2	155	5775.0	2.197	97.3%	9.5	7.9	0.759	1.131		12
				0	Edge 4	155	5775.0	0.546	97.3%	9.5	7.9				
				0	Corner A	155	5775.0	1.550	97.3%	9.5	7.9	0.544	0.810		
				0	Corner B	155	5775.0	0.646	97.3%	9.5	7.9				
5.8 GHz U-NII 3 MIMO Ant 2	802.11a 6 Mbps	Standalone	Off	16	Rear	149	5745.0	0.213	98.7%	17.0	15.3				
				19	Edge 1	149	5745.0	0.160	98.7%	17.0	15.3				
				9	Edge 2	149	5745.0	1.461	98.7%	17.0	15.3				
						165	5825.0	1.269	98.7%	17.0	15.3				
				6	Edge 4	149	5745.0	0.770	98.7%	17.0	15.3	0.297	0.450	2	
				15	Corner A	149	5745.0	0.327	98.7%	17.0	15.3				
	802.11ac (VHT80) MCS0		On	0	Rear	155	5775.0	1.305	97.3%	9.5	8.1	0.309	0.436	2	
				0	Edge 1	155	5775.0	0.471	97.3%	9.5	8.1				
				0	Edge 2	155	5775.0	2.197	97.3%	9.5	8.1				
				0	Edge 4	155	5775.0	0.546	97.3%	9.5	8.1				
				0	Corner A	155	5775.0	1.550	97.3%	9.5	8.1				
				0	Corner B	155	5775.0	0.646	97.3%	9.5	8.1				

**Note(s):**

- Highest reported SAR is ≤ 0.4 or 1.0 W/kg (1-g or 10-g respectively). Therefore, further SAR measurements within this exposure condition are not required.
- Highest reported SAR is > 0.4 or 1.0 W/kg (1-g or 10-g respectively). Due to the highest reported SAR for this test position, other test positions in this exposure condition were evaluated until a SAR ≤ 0.8 or 2.0 W/kg (1-g or 10-g respectively) was reported.
- Testing for a second channel was required because the reported SAR for this test position was > 0.8 or 2.0 W/kg (1-g or 10-g respectively).
- MIMO SAR test were additionally evaluated for determining simultaneous transmission SAR test exclusion.

**Additional Test Accessory SAR**

Frequency Band	Mode	RF Exposure Conditions	PWR Back-off	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Area Scan Max. SAR (W/kg)	Duty Cycle (%)	Power (dBm)		1-g SAR (W/kg)		Plot No.
										Tune-up limit	Meas.	Meas.	Scaled	
5.8 GHz U-NII 3 SISO Ant 1	802.11ac (VHT80) MCS0	Standalone	On	0	Edge 2	155	5775.0	1.890	98.6%	9.5	8.2	0.695	0.953	
5.8 GHz U-NII 3 SISO Ant 2	802.11ac (VHT80) MCS0	Standalone	On	0	Rear	155	5775.0	0.713	98.6%	9.5	8.3	0.224	0.302	
5.5 GHz U-NII 2C MIMO Ant 1	802.11ac (VHT80) MCS0	Standalone	On	0	Edge 2	122	5610.0	2.166	97.3%	9.5	8.1	0.824	1.161	

**Note(s):**

1. In the case of Accessory SAR, the highest reported SAR by frequency was further measured in the band.

## 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  $\geq 0.80$  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  $\geq 1.45$  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  $\geq 1.5$  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
2400	Wi-Fi 802.11b/g/n	Standalone	Edge 4	No	0.187	N/A	N/A
	Bluetooth	Standalone	Rear	No	0.204	N/A	N/A
5300	Wi-Fi 802.11a/n	Standalone	Edge 2	Yes	0.948	0.945	1.00
5500	Wi-Fi 802.11a/n	Standalone	Edge 2	Yes	0.851	0.846	1.01
5800	Wi-Fi 802.11a/n	Standalone	Edge 2	Yes	0.810	0.807	1.00

### 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

### Simultaneous Transmission Condition

RF Exposure Condition	Item	Capable Transmit Configurations	
Standalone	1	DTS_Ant.1	+ DTS_Ant.2
	2	U-NII_Ant.1	+ U-NII_Ant.2
	3	U-NII_Ant.1 or 2	+ BT
	4	U-NII_MIMO	+ BT

Notes:

1. DTS supports Wi-Fi Direct
2. U-NII supports Wi-Fi Direct
3. U-NII Radio can transmit simultaneously with Bluetooth Radio.
4. DTS Radio cannot transmit simultaneously with Bluetooth Radio.

### Simultaneous transmission SAR test exclusion considerations

KDB 447498 D01 General RF Exposure Guidance provides two procedures for determining simultaneous transmission SAR test exclusion: Sum of SAR and SAR to Peak Location Ratio (SPLSR)

### Estimated SAR for Simultaneous Transmission SAR Analysis

#### Considerations for SAR estimation

1. When standalone SAR test exclusion applies, standalone SAR must also be estimated to determine simultaneous transmission SAR test exclusion.
2. Dedicated Host Approach criteria for SAR test exclusion is likewise applied to SAR estimation, with certain distinctions between test exclusion and SAR estimation:
  - o When the separation distance from the antenna to an adjacent edge is  $\leq 5$  mm, a distance of 5 mm is applied for SAR estimation; this is the same between test exclusion and SAR estimation calculations.
  - o When the separation distance from the antenna to an adjacent edge is  $> 5$  mm but  $\leq 50$  mm, the actual antenna-to-edge separation distance is applied for SAR estimation.
  - o When the minimum test separation distance is  $> 50$  mm, the estimated SAR value is 0.4 W/kg
3. 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.

### Sum of SAR

To qualify for simultaneous transmission SAR test exclusion based upon Sum of SAR the sum of the reported standalone SARs for all simultaneously transmitting antennas shall be below the applicable standalone SAR limit. If the sum of the SARs is above the applicable limit then simultaneous transmission SAR test exclusion may still apply if the requirements of the SAR to Peak Location Ratio (SPLSR) evaluation are met.

### SAR to Peak Location Ratio (SPLSR)

KDB 447498 D01 General RF Exposure Guidance explains how to calculate the SAR to Peak Location Ratio (SPLSR) between pairs of simultaneously transmitting antennas:

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

Where:

**SAR<sub>1</sub>** is the highest reported or estimated SAR for the first of a pair of simultaneous transmitting antennas, in a specific test operating mode and exposure condition

**SAR<sub>2</sub>** is the highest reported 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

$R_i$  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:

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

When an individual antenna transmits at on two bands simultaneously, the sum of the highest *reported* SAR for the frequency bands should be used to determine  $SAR_1$ , or  $SAR_2$ . When SPLSR is necessary, the smallest distance between the peak SAR locations for the antenna pair with respect to the peaks from each antenna should be used. The antennas in all antenna pairs that do not qualify for simultaneous transmission SAR test exclusion must be tested for SAR compliance, according to the enlarged zoom scan and volume scan post-processing procedures in KDB Publication 865664 D01

The antennas for the unlicensed transmitters are closely situated. As a result, the associated SAR hotspots are also closely situated. Some of the sum of SAR calculations yielded results over 1.6 W/kg. The SPLSR calculations for these situations were performed by treating the unlicensed SAR values as a single transmitter. The most conservative distance between all the unlicensed hotspots to the licensed hotspot was used for the value of  $d$  in the SPLSR calculation.

## Simultaneous transmission SAR measurement

When simultaneous transmission SAR measurements are required in different frequency bands not covered by a single probe calibration point then separate tests for each frequency band are performed. The tests are performed using enlarged zoom scans which are processed, by means of superposition, using the DASY5 volume scan postprocessing procedures to determine the 1-g SAR for the aggregate SAR distribution.

The spatial resolution used for all enlarged zoom scans is the same as used for the most stringent zoom scans. I.E. the scan parameters required for the highest frequency assessed are used for all enlarged zoom scans. The scans cover the complete area of the device to ensure all transmitting antennas and radiating structures are assessed.

DASY5 provides the ability to perform Multiband Evaluations according to the latest standards using the Volume Scan job as well as appropriate routines for the Post-processing.

In order to extract and process measurements within different frequency bands, the SEMCAD X Post-processor performs the combination and subsequent superposition of these measurement data via DASY5= Combined MultiBand Averaged SAR.

Combined Multi Band Averaged SAR allows - in addition to the data extraction - an evaluation of the 1 g, 10 g and/or arbitrary averaged mass SAR.

Power Scaling Factor is used to allow the volume scans to be scaled by a value other than "1", this is important when the results need to be scaled to different maximum power levels. The Power Scaling Factor is applied to each individual point of the scan. When power scaling is used in multi-band combinations the scaling factor is applied to each individual point of the first scan, the second factor is then applied to each individual point of the second scan and so on. The scans are then combined.

**Estimated SAR for WLAN**

<b>SISO Max</b>															
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
<b>Wi-Fi Antenna 1</b>															
Wi-Fi 2.4 GHz	2462	19.00	79	0	0	0	272.1	138		-MEASURE	-MEASURE	-MEASURE	0.400	0.400	
Wi-Fi 5.3 GHz	5320	17.00	50	0	0	0	272.1	138		-MEASURE	-MEASURE	-MEASURE	0.400	0.400	
Wi-Fi 5.5 GHz	5700	17.00	50	0	0	0	272.1	138		-MEASURE	-MEASURE	-MEASURE	0.400	0.400	
Wi-Fi 5.8 GHz	5825	17.00	50	0	0	0	272.1	138		-MEASURE	-MEASURE	-MEASURE	0.400	0.400	
Bluetooth	2480	18.00	63	0	0	0	272.1	138		0.336	0.336	0.336	0.400	0.400	
<b>Wi-Fi Antenna 2</b>															
Wi-Fi 2.4 GHz	2462	18.00	63	0	0	138	272.1	0		-MEASURE	-MEASURE	0.400	0.400	-MEASURE	
Wi-Fi 5.3 GHz	5320	17.00	50	0	0	138	272.1	0		-MEASURE	-MEASURE	0.400	0.400	-MEASURE	
Wi-Fi 5.5 GHz	5700	17.00	50	0	0	138	272.1	0		-MEASURE	-MEASURE	0.400	0.400	-MEASURE	
Wi-Fi 5.8 GHz	5825	17.00	50	0	0	138	272.1	0		-MEASURE	-MEASURE	0.400	0.400	-MEASURE	
<b>SISO Reduce</b>															
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
<b>Wi-Fi Antenna 1</b>															
Wi-Fi 2.4 GHz	2462	12.00	79	0	0	0	272.1	138		-MEASURE	-MEASURE	-MEASURE	0.400	0.400	
Wi-Fi 5.3 GHz	5320	9.50	50	0	0	0	272.1	138		-MEASURE	-MEASURE	-MEASURE	0.400	0.400	
Wi-Fi 5.5 GHz	5700	9.50	50	0	0	0	272.1	138		-MEASURE	-MEASURE	-MEASURE	0.400	0.400	
Wi-Fi 5.8 GHz	5825	9.50	50	0	0	0	272.1	138		-MEASURE	-MEASURE	-MEASURE	0.400	0.400	
Bluetooth	2480	10.00	50	0	0	0	272.1	138		-MEASURE	-MEASURE	-MEASURE	0.400	0.400	
<b>Wi-Fi Antenna 2</b>															
Wi-Fi 2.4 GHz	2462	12.00	63	0	0	138	272.1	0		-MEASURE	-MEASURE	0.400	0.400	-MEASURE	
Wi-Fi 5.3 GHz	5320	9.50	50	0	0	138	272.1	0		-MEASURE	-MEASURE	0.400	0.400	-MEASURE	
Wi-Fi 5.5 GHz	5700	9.50	50	0	0	138	272.1	0		-MEASURE	-MEASURE	0.400	0.400	-MEASURE	
Wi-Fi 5.8 GHz	5825	9.50	50	0	0	138	272.1	0		-MEASURE	-MEASURE	0.400	0.400	-MEASURE	
<b>MIMO Max</b>															
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
<b>Wi-Fi Antenna 1</b>															
Wi-Fi 5.3 GHz	5320	17.00	50	0	0	0	272.1	138		-MEASURE	-MEASURE	-MEASURE	0.400	0.400	
Wi-Fi 5.5 GHz	5700	17.00	50	0	0	0	272.1	138		-MEASURE	-MEASURE	-MEASURE	0.400	0.400	
Wi-Fi 5.8 GHz	5825	17.00	50	0	0	0	272.1	138		-MEASURE	-MEASURE	-MEASURE	0.400	0.400	
<b>Wi-Fi Antenna 2</b>															
Wi-Fi 5.3 GHz	5320	17.00	50	0	0	138	272.1	0		-MEASURE	-MEASURE	0.400	0.400	-MEASURE	
Wi-Fi 5.5 GHz	5700	17.00	50	0	0	138	272.1	0		-MEASURE	-MEASURE	0.400	0.400	-MEASURE	
Wi-Fi 5.8 GHz	5825	17.00	50	0	0	138	272.1	0		-MEASURE	-MEASURE	0.400	0.400	-MEASURE	
<b>MIMO Reduce</b>															
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
<b>Wi-Fi Antenna 1</b>															
Wi-Fi 5.3 GHz	5320	9.50	50	0	0	0	272.1	138		-MEASURE	-MEASURE	-MEASURE	0.400	0.400	
Wi-Fi 5.5 GHz	5700	9.50	50	0	0	0	272.1	138		-MEASURE	-MEASURE	-MEASURE	0.400	0.400	
Wi-Fi 5.8 GHz	5825	9.50	50	0	0	0	272.1	138		-MEASURE	-MEASURE	-MEASURE	0.400	0.400	
<b>Wi-Fi Antenna 2</b>															
Wi-Fi 5.3 GHz	5320	9.50	50	0	0	138	272.1	0		-MEASURE	-MEASURE	0.400	0.400	-MEASURE	
Wi-Fi 5.5 GHz	5700	9.50	50	0	0	138	272.1	0		-MEASURE	-MEASURE	0.400	0.400	-MEASURE	
Wi-Fi 5.8 GHz	5825	9.50	50	0	0	138	272.1	0		-MEASURE	-MEASURE	0.400	0.400	-MEASURE	

**Note(s):**

1. Bluetooth SAR test were additionally evaluated for determining simultaneous transmission SAR test exclusion.
2. MIMO UNII SAR test were additionally evaluated for determining simultaneous transmission SAR test exclusion.

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

Test Position							$\Sigma$ 1-g SAR (W/kg)			
	DTS Ant 1	DTS Ant 2	U-NII Ant 1	U-NII Ant 2	U-NII MIMO	BT	DTS Ant 1 + DTS Ant 2	U-NII Ant 1 + BT	U-NII Ant 2 + BT	U-NII MIMO + BT
	1	2	3	4	5	6	1+2	3+6	4+6	5+6
Rear	0.176	0.262	0.680	1.009	0.837	0.316	0.438	0.996	1.325	1.153
Edge 1	0.176	0.262	1.111	0.139	1.200	0.176	0.438	1.287	0.315	1.376
Edge 2	0.057	0.400	1.111	0.400	1.200	0.299	0.457	1.410	0.699	1.499
Edge 3	0.400	0.400	0.400	0.400	0.400	0.400	0.800	0.800	0.800	0.800
Edge 4	0.400	0.262	0.400	0.547	0.817	0.400	0.662	0.800	0.947	1.217

**Conclusion:**

Simultaneous Transmission SAR analysis results is satisfied the FCC Limit requirement according to procedures of "Sum of SAR" or "SPLSR"



## **Appendixes**

**Refer to separated files for the following appendixes.**

**4789867697-S1 FCC Report SAR\_App A\_Photos & Ant. Locations**

**4789867697-S1 FCC Report SAR\_App B\_Highest SAR Test Plots**

**4789867697-S1 FCC Report SAR\_App C\_System Check Plots**

**4789867697-S1 FCC Report SAR\_App D\_SAR Tissue Ingredients**

**4789867697-S1 FCC Report SAR\_App E\_Probe Cal. Certificates**

**4789867697-S1 FCC Report SAR\_App F\_Dipole Cal. Certificates**

**END OF REPORT**