



**SAR EVALUATION REPORT**

**FCC 47 CFR § 2.1093  
IEEE Std 1528-2013  
(Class II Permissive Change)**

*For*  
**Wireless Module  
(Tested inside of Panasonic Tablet PC FZ-G1)**

**Model: WL15A  
FCC ID: ACJ9TGWL15A**

**Report Number: 11188875H-C  
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<http://www.ul.com/japan/jpn/pages/services/emc/>

Revision History

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### 1. Attestation of Test Results

Applicant	PANASONIC CORPORATION OF NORTH AMERICA	
DUT description	Wireless Module (Tested inside of Panasonic Tablet PC FZ-G1)	
Model	WL15A	
Test device is	An identical prototype	
Device category	Portable	
Exposure category	General Population/Uncontrolled Exposure	
Date tested	March 16 to 22, 2016	
	Applicable Standards	Test Results
	FCC 47 CFR § 2.1093 Published RF exposure KDB procedures IEEE Std 1528-2013	Pass
<ol style="list-style-type: none"> <li>1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.</li> <li>2. The results in this report apply only to the sample tested.</li> <li>3. This sample tested is in compliance with the limits of the above regulation.</li> <li>4. The test results in this report are traceable to the national or international standards.</li> <li>5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.</li> </ol>		

Approved & Released For UL Japan, Inc By:

Tested By:



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## 1.1. Summary of Highest 1-g SAR Results

Worst Case SAR data for each Frequency Band

RF Exposure Rule	Freq. Range	Highest Reported SAR	Limit
15.247	2400-2480 MHz	WLAN: 0.707 W/kg (Edge 4) Bluetooth: 0.081 W/kg (Edge 4)	1.6 W/kg
15.407	5150-5250 MHz	Exclusion	
	5250-5350 MHz	0.434 W/kg (Edge 3)	
	5500-5700 MHz	0.435 W/kg (Edge 4)	
	5725-5850 MHz	0.531 W/kg (Edge 4)	
Simultaneous Transmission Condition		1.276 W/kg (refer to Section 14) (The highest across exposure conditions)	

### LEGEND:

- Bottom face = Rear of display
- Edge 1 = Top Edge
- Edge 2 = Left Edge
- Edge 3 = Bottom Edge
- Edge 4 = Right Edge

## 2. Test Methodology

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:

- 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- 865664 D02 SAR Reporting v01r02
- 447498 D01 General RF Exposure Guidance v06
- 248227 D01 802.11 Wi-Fi SAR v02r02
- 616217 D04 SAR for laptop and tablets v01r02

## 3. Facilities and Accreditation

\*Shielded room for SAR testings

The test sites and measurement facilities used to collect data are located at 4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN.

UL Japan, Inc. is accredited by NVLAP, Laboratory Code 200572-0

The full scope of accreditation can be viewed at

<http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>



## 4. Calibration and Uncertainty

### 4.1. Measuring Instrument Calibration

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

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MNA-03	Vector Reflectometer	Copper Mountain Technologies	PLANAR R140	0030913	SAR	2015/10/30 * 12
MDPK-03	Dielectric assessment kit	Schmid&Partner Engineering AG	DAK-3.5	0008	SAR	2015/03/10 * 12
MOS-37	Digital thermometer	LKM electronic	DTM3000	-	SAR	2015/07/07 * 12
COTS-MSAR-04	Dielectric assessment software	Schmid&Partner Engineering AG	DAK		SAR	-

**System check**

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MDAE-03	Data Acquisition Electronics	Schmid&Partner Engineering AG	DAE4	1372	SAR	2015/06/15 * 12
MPB-09	Dosimetric E-Field Probe	Schmid&Partner Engineering AG	EX3DV4	3922	SAR	2015/06/17 * 12
MPF-04	2mm Oval Flat Phantom	Schmid&Partner Engineering AG	QDOVA001BB	1207	SAR	2015/05/11 * 12
MDH-03	Device holder	Schmid&Partner Engineering AG	Mounting device for transmitter	-	SAR	Pre Check
MOS-35	Digital thermometer	HANNA	Checktemp 4	-	SAR	2015/07/07 * 12
COTS-MSAR-03	Dasy5	Schmid&Partner Engineering AG	DASY5	-	SAR	-
MRBT-04	SAR robot	Schmid&Partner Engineering AG	TX60 Lspeag	F13/5PPLA1/A /01	SAR	2015/06/23 * 12
MPM-11	Dual Power Meter	Agilent	E4419B	MY45102060	SAR	2015/08/04 * 12
MPSE-15	Power sensor	Agilent	E9301A	MY41498311	SAR	2015/08/04 * 12
MPSE-16	Power sensor	Agilent	E9301A	MY41498313	SAR	2015/08/04 * 12
MRFA-24	Pre Amplifier	R&K	R&K CGA020M602-2633R	B30550	SAR	2015/06/15 * 12
MSG-10	Signal Generator	Agilent	N5181A	MY47421098	SAR	2015/11/16 * 12
MOS-37	Digital thermometer	LKM electronic	DTM3000	-	SAR	2015/07/07 * 12
MAT-78	Attenuator	Telegartner	J01156A0011	0042294119	SAR	Pre Check
MPM-15	Power Meter	Agilent	N1914A	MY53060017	SAR	2015/06/15 * 12
MPSE-21	Power sensor	Agilent	N8482H	MY52460010	SAR	2015/06/15 * 12
MHDC-12	Dual Directional Coupler	Hewlett Packard	772D	2839A0016	SAR(2-18GHz)	Pre Check
MDA-07	Dipole Antenna	Schmid&Partner Engineering AG	D2450V2	713	SAR(D2450)	2013/09/10 * 36
MDA-08	Dipole Antenna	Schmid&Partner Engineering AG	D5GHzV2	1020	SAR(D5G)	2016/01/20 * 12

**Other**

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MPM-16	Power Meter	Agilent	8990B	MY51000271	Power	2015/04/01 * 12
MPSE-22	Power sensor	Agilent	N1923A	MY54070003	Power	2015/04/01 * 12
MPSE-23	Power sensor	Agilent	N1923A	MY54070004	Power	2015/04/01 * 12
MAT-88	Attenuator	Weinschel Associates	WA56-10	56100304	Power	2015/06/01 * 12
MAT-89	Attenuator	Weinschel Associates	WA56-10	56100305	Power	2015/06/01 * 12

**The expiration date of the calibration is the end of the expired month.**

**All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.**

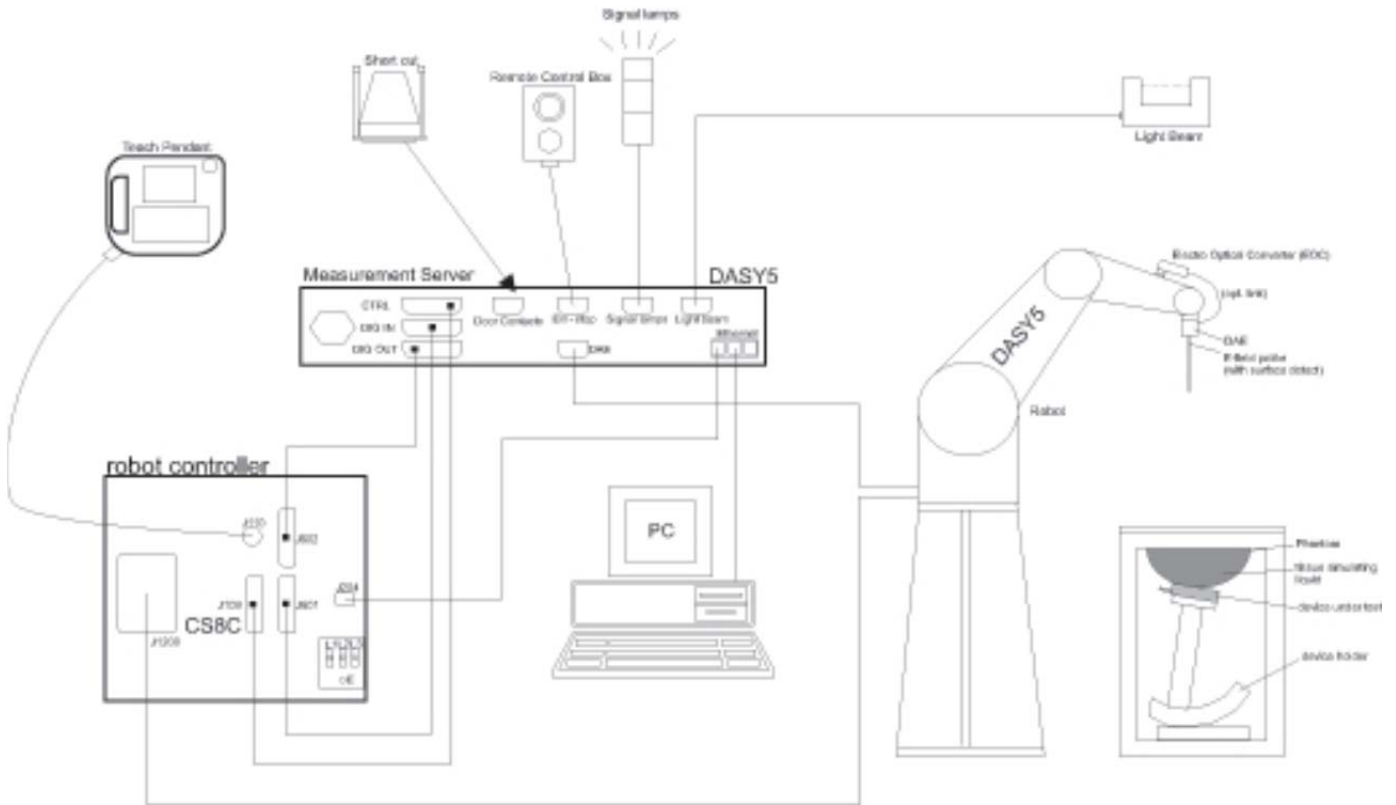
**As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.**

**4.2.Measurement Uncertainty**

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

## 5. Measurement System Description and Setup

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.

## 6. SAR Measurement Procedure

### 6.1. Normal SAR Measurement Procedure

#### Step 1: Power Reference Measurement

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

#### Step 2: Area Scan

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

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

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: $\Delta x_{Area}$ , $\Delta y_{Area}$	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

**Step 3: Zoom Scan**

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

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

		≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: $\Delta x_{Zoom}$ , $\Delta y_{Zoom}$		$\leq 2$ 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: $\Delta z_{Zoom}(n)$	$\leq 5$ mm	$3 - 4$ GHz: $\leq 4$ mm $4 - 5$ GHz: $\leq 3$ mm $5 - 6$ GHz: $\leq 2$ mm
	graded grid	$\Delta z_{Zoom}(1)$ : between 1 <sup>st</sup> two points closest to phantom surface	$\leq 4$ mm
		$\Delta z_{Zoom}(n>1)$ : between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$
Minimum zoom scan volume	x, y, z	$\geq 30$ 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.

## 6.2. Volume Scan Procedures

### Step 1: Repeat Step 1-4 in Section 6.1

### Step 2: Volume Scan

Volume Scans are used to assess peak SAR and averaged SAR measurements in largely extended 3-dimensional volumes within any phantom. This measurement does not need any previous area scan. The grid can be anchored to a user specific point or to the current probe location.

### Step 3: 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.

## 7. Device Under Test

Wireless Module (Tested inside of Panasonic Tablet PC FZ-G1) Model: WL15A	
Operating Configuration(s)	<ul style="list-style-type: none"> <li>Tablet modes</li> </ul>
Exposure Condition(s)	<ul style="list-style-type: none"> <li>The device is used in close proximity to the body. Specific details of the required test positions are provided in Section 8 "Exposure Conditions"</li> </ul>
Accessory	<ul style="list-style-type: none"> <li>None</li> </ul>

### 7.1. Band and Air Interfaces

Tx Frequency Bands	<ul style="list-style-type: none"> <li>802.11a/b/g/n/ac: 2412 - 2462 MHz, b / g / HT20 / HT40            5150 - 5250 MHz, a / HT20 / HT40 / HT80            5250 - 5350 MHz, a / HT20 / HT40 / HT80            5500 - 5720 MHz, a / HT20 / HT40 / HT80            5725 - 5850 MHz, a / HT20 / HT40 / HT80</li> <li>Bluetooth: 2402 - 2480 MHz</li> </ul>
Modulation	<ul style="list-style-type: none"> <li>802.11a/b/g/n/ac : BPSK, QPSK, CCK, 16-QAM and 64-QAM and 256-QAM</li> <li>Bluetooth 4.0+LE: GFSK, DQPSK, 8-DPSK</li> </ul>
Duty Cycle	<ul style="list-style-type: none"> <li>WLAN: 100%</li> <li>Bluetooth 89%</li> </ul>

### 7.2. Hotspot (Wireless Router) Exposure Condition

N/A



### 7.3. Testing Rationale for WLAN

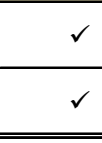
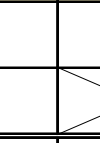
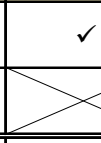
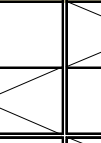
Test selection was performed in accordance with KDB248227 D01.

The standalone (SISO) SAR results were considered acceptable for the MIMO simultaneous transmission analysis as the MIMO power does not exceed the SISO power.

The antenna separation distance will not be less than 50mm.

Bluetooth transmits using the WLAN Aux Antenna. Bluetooth can transmit simultaneously with the WLAN Main Antenna. Bluetooth cannot transmit simultaneously with the WLAN Aux Antenna in WLAN MIMO mode.

#### Supported Simultaneous Scenarios of WLAN

Band	WLAN		Bluetooth
	Main Ant	Aux Ant	Aux Ant
2.4 GHz	✓	✓	
	✓		✓
5 GHz	✓	✓	
	✓		✓

### 7.4. Simultaneous Transmission

#### WWAN + Wi-Fi 2.4 GHz SISO (1 Tx)

Usage Scenario	Modes	Mode of Operation	BAND	CDMA 1xRTT	CDMA 1xEV-DO	WCDMA	HSDPA	HSUPA	HSPA+	DC-HSPA	LTE	Wi-Fi 2.4GHz Main	Wi-Fi 2.4GHz Aux	Wi-Fi 5 GHz Bands Main	Wi-Fi 5 GHz Bands Aux	BT 2.4 GHz		
Body SAR	WWAN + 2.4 GHz WLAN	CDMA 1xRTT	BC0	YES	No	No	No	No	No	No	No	YES	No	No	No	No		
		CDMA 1xRTT	BC1	YES	No	No	No	No	No	No	No	YES	No	No	No	No	No	
		CDMA 1xRTT	BC10	YES	No	No	No	No	No	No	No	YES	No	No	No	No	No	
		CDMA 1xEVDO	BC0	No	YES	No	No	No	No	No	No	YES	No	No	No	No	No	
		CDMA 1xEVDO	BC1	No	YES	No	No	No	No	No	No	YES	No	No	No	No	No	
		CDMA 1xEVDO	BC10	No	YES	No	No	No	No	No	No	YES	No	No	No	No	No	
		W-CDMA	850	No	No	YES	No	No	No	No	No	No	YES	No	No	No	No	No
		W-CDMA	1700	No	No	YES	No	No	No	No	No	No	YES	No	No	No	No	No
		W-CDMA	1900	No	No	YES	No	No	No	No	No	No	YES	No	No	No	No	No
		HSDPA	850	No	No	No	YES	No	YES	No	No	No	YES	No	No	No	No	No
		HSDPA	1700	No	No	No	YES	No	YES	No	No	No	YES	No	No	No	No	No
		HSDPA	1900	No	No	No	YES	No	YES	No	No	No	YES	No	No	No	No	No
		HSUPA	850	No	No	No	No	No	YES	No	No	No	YES	No	No	No	No	No
		HSUPA	1700	No	No	No	No	No	YES	No	No	No	YES	No	No	No	No	No
		HSUPA	1900	No	No	No	No	No	YES	No	No	No	YES	No	No	No	No	No
		HSPA+	850	No	No	No	No	No	No	YES	No	No	YES	No	No	No	No	No
		HSPA+	1700	No	No	No	No	No	No	YES	No	No	YES	No	No	No	No	No
		HSPA+	1900	No	No	No	No	No	No	YES	No	No	YES	No	No	No	No	No
		DC-HSDPA	850	No	No	No	No	No	No	No	YES	No	YES	No	No	No	No	No
		DC-HSDPA	1700	No	No	No	No	No	No	No	YES	No	YES	No	No	No	No	No
		DC-HSDPA	1900	No	No	No	No	No	No	No	YES	No	YES	No	No	No	No	No
		LTE	2	No	No	No	No	No	No	No	No	No	YES	YES	No	No	No	No
		LTE	4	No	No	No	No	No	No	No	No	No	YES	YES	No	No	No	No
		LTE	5	No	No	No	No	No	No	No	No	No	YES	YES	No	No	No	No
		LTE	13	No	No	No	No	No	No	No	No	No	YES	YES	No	No	No	No
		LTE	17	No	No	No	No	No	No	No	No	No	YES	YES	No	No	No	No
		LTE	25	No	No	No	No	No	No	No	No	No	YES	YES	No	No	No	No
		CDMA 1xRTT	BC0	YES	No	No	No	No	No	No	No	No	No	No	YES	No	No	No
		CDMA 1xRTT	BC1	YES	No	No	No	No	No	No	No	No	No	No	YES	No	No	No
		CDMA 1xRTT	BC10	YES	No	No	No	No	No	No	No	No	No	No	YES	No	No	No
		CDMA 1xEVDO	BC0	No	YES	No	No	No	No	No	No	No	No	No	YES	No	No	No
		CDMA 1xEVDO	BC1	No	YES	No	No	No	No	No	No	No	No	No	YES	No	No	No
		CDMA 1xEVDO	BC10	No	YES	No	No	No	No	No	No	No	No	No	YES	No	No	No
		W-CDMA	850	No	No	YES	No	No	No	No	No	No	No	No	YES	No	No	No
		W-CDMA	1700	No	No	YES	No	No	No	No	No	No	No	No	YES	No	No	No
		W-CDMA	1900	No	No	YES	No	No	No	No	No	No	No	No	YES	No	No	No
		HSDPA	850	No	No	No	YES	No	YES	No	No	No	No	No	YES	No	No	No
		HSDPA	1700	No	No	No	YES	No	YES	No	No	No	No	No	YES	No	No	No
		HSDPA	1900	No	No	No	YES	No	YES	No	No	No	No	No	YES	No	No	No
		HSUPA	850	No	No	No	No	No	YES	No	No	No	No	No	YES	No	No	No
		HSUPA	1700	No	No	No	No	No	YES	No	No	No	No	No	YES	No	No	No
		HSUPA	1900	No	No	No	No	No	YES	No	No	No	No	No	YES	No	No	No
		HSPA+	850	No	No	No	No	No	No	YES	No	No	No	No	YES	No	No	No
		HSPA+	1700	No	No	No	No	No	No	YES	No	No	No	No	YES	No	No	No
		HSPA+	1900	No	No	No	No	No	No	YES	No	No	No	No	YES	No	No	No
DC-HSDPA	850	No	No	No	No	No	No	No	YES	No	No	No	YES	No	No	No		
DC-HSDPA	1700	No	No	No	No	No	No	No	YES	No	No	No	YES	No	No	No		
DC-HSDPA	1900	No	No	No	No	No	No	No	YES	No	No	No	YES	No	No	No		
LTE	2	No	No	No	No	No	No	No	No	No	YES	No	YES	No	No	No		
LTE	4	No	No	No	No	No	No	No	No	No	YES	No	YES	No	No	No		
LTE	5	No	No	No	No	No	No	No	No	No	YES	No	YES	No	No	No		
LTE	13	No	No	No	No	No	No	No	No	No	YES	No	YES	No	No	No		
LTE	17	No	No	No	No	No	No	No	No	No	YES	No	YES	No	No	No		
LTE	25	No	No	No	No	No	No	No	No	No	YES	No	YES	No	No	No		

**WWAN + Wi-Fi 5 GHz Bands SISO (1 Tx)**

Usage Scenario	Modes	Mode of Operation	BAND	CDMA 1xRTT	CDMA 1xEV-DO	WCDMA	HSDPA	HSUPA	HSPA+	DC-HSPA	LTE	Wi-Fi 2.4GHz Main	Wi-Fi 2.4GHz Aux	Wi-Fi 5 GHz Bands Main	Wi-Fi 5 GHz Bands Aux	BT 2.4 GHz		
Body SAR	WWAN + 5 GHz Bands WLAN	CDMA 1xRTT	BC0	YES	No	No	No	No	No	No	No	No	No	YES	No	No		
		CDMA 1xRTT	BC1	YES	No	No	No	No	No	No	No	No	No	No	YES	No	No	
		CDMA 1xRTT	BC10	YES	No	No	No	No	No	No	No	No	No	No	YES	No	No	
		CDMA 1xEVDO	BC0	No	YES	No	No	No	No	No	No	No	No	No	YES	No	No	
		CDMA 1xEVDO	BC1	No	YES	No	No	No	No	No	No	No	No	No	YES	No	No	
		CDMA 1xEVDO	BC10	No	YES	No	No	No	No	No	No	No	No	No	YES	No	No	
		W-CDMA	850	No	No	YES	No	No	No	No	No	No	No	No	No	YES	No	No
		W-CDMA	1700	No	No	YES	No	No	No	No	No	No	No	No	No	YES	No	No
		W-CDMA	1900	No	No	YES	No	No	No	No	No	No	No	No	No	YES	No	No
		HSDPA	850	No	No	No	YES	No	No	No	No	No	No	No	No	YES	No	No
		HSDPA	1700	No	No	No	YES	No	No	No	No	No	No	No	No	YES	No	No
		HSDPA	1900	No	No	No	YES	No	No	No	No	No	No	No	No	YES	No	No
		HSUPA	850	No	No	No	No	No	YES	No	No	No	No	No	No	YES	No	No
		HSUPA	1700	No	No	No	No	No	YES	No	No	No	No	No	No	YES	No	No
		HSUPA	1900	No	No	No	No	No	YES	No	No	No	No	No	No	YES	No	No
		HSPA+	850	No	No	No	No	No	No	YES	No	No	No	No	No	YES	No	No
		HSPA+	1700	No	No	No	No	No	No	YES	No	No	No	No	No	YES	No	No
		HSPA+	1900	No	No	No	No	No	No	YES	No	No	No	No	No	YES	No	No
		DC-HSDPA	850	No	No	No	No	No	No	No	YES	No	No	No	No	YES	No	No
		DC-HSDPA	1700	No	No	No	No	No	No	No	YES	No	No	No	No	YES	No	No
		DC-HSDPA	1900	No	No	No	No	No	No	No	YES	No	No	No	No	YES	No	No
		LTE	2	No	No	No	No	No	No	No	No	No	YES	No	No	YES	No	No
		LTE	4	No	No	No	No	No	No	No	No	No	YES	No	No	YES	No	No
		LTE	5	No	No	No	No	No	No	No	No	No	YES	No	No	YES	No	No
		LTE	13	No	No	No	No	No	No	No	No	No	YES	No	No	YES	No	No
		LTE	17	No	No	No	No	No	No	No	No	No	YES	No	No	YES	No	No
		LTE	25	No	No	No	No	No	No	No	No	No	YES	No	No	YES	No	No
		CDMA 1xRTT	BC0	YES	No	No	No	No	No	No	No	No	No	No	No	No	YES	No
		CDMA 1xRTT	BC1	YES	No	No	No	No	No	No	No	No	No	No	No	No	YES	No
		CDMA 1xRTT	BC10	YES	No	No	No	No	No	No	No	No	No	No	No	No	YES	No
		CDMA 1xEVDO	BC0	No	YES	No	No	No	No	No	No	No	No	No	No	No	YES	No
		CDMA 1xEVDO	BC1	No	YES	No	No	No	No	No	No	No	No	No	No	No	YES	No
		CDMA 1xEVDO	BC10	No	YES	No	No	No	No	No	No	No	No	No	No	No	YES	No
		W-CDMA	850	No	No	YES	No	No	No	No	No	No	No	No	No	No	YES	No
		W-CDMA	1700	No	No	YES	No	No	No	No	No	No	No	No	No	No	YES	No
		W-CDMA	1900	No	No	YES	No	No	No	No	No	No	No	No	No	No	YES	No
		HSDPA	850	No	No	No	YES	No	No	No	No	No	No	No	No	No	YES	No
		HSDPA	1700	No	No	No	YES	No	No	No	No	No	No	No	No	No	YES	No
		HSDPA	1900	No	No	No	YES	No	No	No	No	No	No	No	No	No	YES	No
		HSUPA	850	No	No	No	No	No	YES	No	No	No	No	No	No	No	YES	No
		HSUPA	1700	No	No	No	No	No	YES	No	No	No	No	No	No	No	YES	No
		HSUPA	1900	No	No	No	No	No	YES	No	No	No	No	No	No	No	YES	No
		HSPA+	850	No	No	No	No	No	No	YES	No	No	No	No	No	No	YES	No
		HSPA+	1700	No	No	No	No	No	No	YES	No	No	No	No	No	No	YES	No
		HSPA+	1900	No	No	No	No	No	No	YES	No	No	No	No	No	No	YES	No
DC-HSDPA	850	No	No	No	No	No	No	No	YES	No	No	No	No	No	YES	No		
DC-HSDPA	1700	No	No	No	No	No	No	No	YES	No	No	No	No	No	YES	No		
DC-HSDPA	1900	No	No	No	No	No	No	No	YES	No	No	No	No	No	YES	No		
LTE	2	No	No	No	No	No	No	No	No	No	YES	No	No	No	YES	No		
LTE	4	No	No	No	No	No	No	No	No	No	YES	No	No	No	YES	No		
LTE	5	No	No	No	No	No	No	No	No	No	YES	No	No	No	YES	No		
LTE	13	No	No	No	No	No	No	No	No	No	YES	No	No	No	YES	No		
LTE	17	No	No	No	No	No	No	No	No	No	YES	No	No	No	YES	No		
LTE	25	No	No	No	No	No	No	No	No	No	YES	No	No	No	YES	No		

**WWAN + Bluetooth**

Usage Scenario	Modes	Mode of Operation	BAND	CDMA 1xRTT	CDMA 1xEV-DO	WCDMA	HSDPA	HSUPA	HSPA+	DC-HSPA	LTE	Wi-Fi 2.4GHz Main	Wi-Fi 2.4GHz Aux	Wi-Fi 5 GHz Bands Main	Wi-Fi 5 GHz Bands Aux	BT 2.4 GHz		
Body SAR	WWAN + BT	CDMA 1xRTT	BC0	YES	No	No	No	No	No	No	No	No	No	No	No	YES		
		CDMA 1xRTT	BC1	YES	No	No	No	No	No	No	No	No	No	No	No	No	YES	
		CDMA 1xRTT	BC10	YES	No	No	No	No	No	No	No	No	No	No	No	No	YES	
		CDMA 1xEVDO	BC0	No	YES	No	No	No	No	No	No	No	No	No	No	No	YES	
		CDMA 1xEVDO	BC1	No	YES	No	No	No	No	No	No	No	No	No	No	No	YES	
		CDMA 1xEVDO	BC10	No	YES	No	No	No	No	No	No	No	No	No	No	No	YES	
		W-CDMA	850	No	No	YES	No	No	No	No	No	No	No	No	No	No	No	YES
		W-CDMA	1700	No	No	YES	No	No	No	No	No	No	No	No	No	No	No	YES
		W-CDMA	1900	No	No	YES	No	No	No	No	No	No	No	No	No	No	No	YES
		HSDPA	850	No	No	No	YES	No	No	No	No	No	No	No	No	No	No	YES
		HSDPA	1700	No	No	No	YES	No	No	No	No	No	No	No	No	No	No	YES
		HSDPA	1900	No	No	No	YES	No	No	No	No	No	No	No	No	No	No	YES
		HSUPA	850	No	No	No	No	YES	No	No	No	No	No	No	No	No	No	YES
		HSUPA	1700	No	No	No	No	YES	No	No	No	No	No	No	No	No	No	YES
		HSUPA	1900	No	No	No	No	YES	No	No	No	No	No	No	No	No	No	YES
		HSPA+	850	No	No	No	No	No	YES	No	No	No	No	No	No	No	No	YES
		HSPA+	1700	No	No	No	No	No	YES	No	No	No	No	No	No	No	No	YES
		HSPA+	1900	No	No	No	No	No	YES	No	No	No	No	No	No	No	No	YES
		DC-HSDPA	850	No	No	No	No	No	No	YES	No	No	No	No	No	No	No	YES
		DC-HSDPA	1700	No	No	No	No	No	No	YES	No	No	No	No	No	No	No	YES
DC-HSDPA	1900	No	No	No	No	No	No	YES	No	No	No	No	No	No	No	YES		
LTE	2	No	No	No	No	No	No	No	No	YES	No	No	No	No	No	YES		
LTE	4	No	No	No	No	No	No	No	No	YES	No	No	No	No	No	YES		
LTE	5	No	No	No	No	No	No	No	No	YES	No	No	No	No	No	YES		
LTE	13	No	No	No	No	No	No	No	No	YES	No	No	No	No	No	YES		
LTE	17	No	No	No	No	No	No	No	No	YES	No	No	No	No	No	YES		
LTE	25	No	No	No	No	No	No	No	No	YES	No	No	No	No	No	YES		

**WWAN + Wi-Fi SISO (1 Tx) + Bluetooth**

Usage Scenario	Modes	Mode of Operation	BAND	CDMA 1xRTT	CDMA 1xEV-DO	WCDMA	HSDPA	HSUPA	HSPA+	DC-HSPA	LTE	Wi-Fi 2.4GHz Main	Wi-Fi 2.4GHz Aux	Wi-Fi 5 GHz Bands Main	Wi-Fi 5 GHz Bands Aux	BT 2.4 GHz	
Body SAR	WWAN + 2.4GHz WLAN + BT	CDMA 1xRTT	BC0	YES	No	No	No	No	No	No	No	YES	No	No	No	YES	
		CDMA 1xRTT	BC1	YES	No	No	No	No	No	No	No	YES	No	No	No	YES	
		CDMA 1xRTT	BC10	YES	No	No	No	No	No	No	No	YES	No	No	No	YES	
		CDMA 1xEVDO	BC0	No	YES	No	No	No	No	No	No	YES	No	No	No	YES	
		CDMA 1xEVDO	BC1	No	YES	No	No	No	No	No	No	YES	No	No	No	YES	
		CDMA 1xEVDO	BC10	No	YES	No	No	No	No	No	No	YES	No	No	No	YES	
		W-CDMA	850	No	No	YES	No	No	No	No	No	YES	No	No	No	YES	
		W-CDMA	1700	No	No	YES	No	No	No	No	No	YES	No	No	No	YES	
		W-CDMA	1900	No	No	YES	No	No	No	No	No	YES	No	No	No	YES	
		HSDPA	850	No	No	No	YES	No	No	No	No	YES	No	No	No	YES	
		HSDPA	1700	No	No	No	YES	No	No	No	No	YES	No	No	No	YES	
		HSDPA	1900	No	No	No	YES	No	No	No	No	YES	No	No	No	YES	
		HSUPA	850	No	No	No	No	YES	No	No	No	YES	No	No	No	YES	
		HSUPA	1700	No	No	No	No	YES	No	No	No	YES	No	No	No	YES	
		HSUPA	1900	No	No	No	No	YES	No	No	No	YES	No	No	No	YES	
		HSPA+	850	No	No	No	No	No	YES	No	No	YES	No	No	No	YES	
		HSPA+	1700	No	No	No	No	No	YES	No	No	YES	No	No	No	YES	
		HSPA+	1900	No	No	No	No	No	YES	No	No	YES	No	No	No	YES	
		DC-HSDPA	850	No	No	No	No	No	No	YES	No	YES	No	No	No	YES	
		DC-HSDPA	1700	No	No	No	No	No	No	YES	No	YES	No	No	No	YES	
	DC-HSDPA	1900	No	No	No	No	No	No	YES	No	YES	No	No	No	YES		
	LTE	2	No	No	No	No	No	No	No	No	YES	YES	No	No	No	YES	
	LTE	4	No	No	No	No	No	No	No	No	YES	YES	No	No	No	YES	
	LTE	5	No	No	No	No	No	No	No	No	YES	YES	No	No	No	YES	
	LTE	13	No	No	No	No	No	No	No	No	YES	YES	No	No	No	YES	
	LTE	17	No	No	No	No	No	No	No	No	YES	YES	No	No	No	YES	
	LTE	25	No	No	No	No	No	No	No	No	YES	YES	No	No	No	YES	
	WWAN + 5 GHz Bands WLAN + BT	CDMA 1xRTT	BC0	YES	No	No	No	No	No	No	No	No	No	No	YES	No	YES
		CDMA 1xRTT	BC1	YES	No	No	No	No	No	No	No	No	No	No	YES	No	YES
		CDMA 1xRTT	BC10	YES	No	No	No	No	No	No	No	No	No	No	YES	No	YES
		CDMA 1xEVDO	BC0	No	YES	No	No	No	No	No	No	No	No	No	YES	No	YES
		CDMA 1xEVDO	BC1	No	YES	No	No	No	No	No	No	No	No	No	YES	No	YES
		CDMA 1xEVDO	BC10	No	YES	No	No	No	No	No	No	No	No	No	YES	No	YES
		W-CDMA	850	No	No	YES	No	No	No	No	No	No	No	No	YES	No	YES
		W-CDMA	1700	No	No	YES	No	No	No	No	No	No	No	No	YES	No	YES
		W-CDMA	1900	No	No	YES	No	No	No	No	No	No	No	No	YES	No	YES
		HSDPA	850	No	No	No	YES	No	No	No	No	No	No	No	YES	No	YES
		HSDPA	1700	No	No	No	YES	No	No	No	No	No	No	No	YES	No	YES
		HSDPA	1900	No	No	No	YES	No	No	No	No	No	No	No	YES	No	YES
		HSUPA	850	No	No	No	No	YES	No	No	No	No	No	No	YES	No	YES
HSUPA		1700	No	No	No	No	YES	No	No	No	No	No	No	YES	No	YES	
HSUPA		1900	No	No	No	No	YES	No	No	No	No	No	No	YES	No	YES	
HSPA+		850	No	No	No	No	No	YES	No	No	No	No	No	YES	No	YES	
HSPA+		1700	No	No	No	No	No	YES	No	No	No	No	No	YES	No	YES	
HSPA+		1900	No	No	No	No	No	YES	No	No	No	No	No	YES	No	YES	
DC-HSDPA		850	No	No	No	No	No	No	YES	No	No	No	No	YES	No	YES	
DC-HSDPA		1700	No	No	No	No	No	No	YES	No	No	No	No	YES	No	YES	
DC-HSDPA	1900	No	No	No	No	No	No	YES	No	No	No	No	YES	No	YES		
LTE	2	No	No	No	No	No	No	No	No	YES	No	No	YES	No	YES		
LTE	4	No	No	No	No	No	No	No	No	YES	No	No	YES	No	YES		
LTE	5	No	No	No	No	No	No	No	No	YES	No	No	YES	No	YES		
LTE	13	No	No	No	No	No	No	No	No	YES	No	No	YES	No	YES		
LTE	17	No	No	No	No	No	No	No	No	YES	No	No	YES	No	YES		
LTE	25	No	No	No	No	No	No	No	No	YES	No	No	YES	No	YES		

**WWAN + Wi-Fi MIMO (2 Tx)**

Usage Scenario	Modes	Mode of Operation	BAND	CDMA 1xRTT	CDMA 1xEV-DO	WCDMA	HSDPA	HSUPA	HSPA+	DC-HSPA	LTE	Wi-Fi 2.4GHz Main	Wi-Fi 2.4GHz Aux	Wi-Fi 5 GHz Bands Main	Wi-Fi 5 GHz Bands Aux	BT 2.4 GHz	
Body SAR	WWAN + 2.4GHz WLAN MIMO (2 Tx on WLAN)	CDMA 1xRTT	BC0	YES	No	No	No	No	No	No	No	YES	YES	No	No	No	
		CDMA 1xRTT	BC1	YES	No	No	No	No	No	No	No	YES	YES	No	No	No	
		CDMA 1xRTT	BC10	YES	No	No	No	No	No	No	No	YES	YES	No	No	No	
		CDMA 1xEVDO	BC0	No	YES	No	No	No	No	No	No	YES	YES	No	No	No	
		CDMA 1xEVDO	BC1	No	YES	No	No	No	No	No	No	YES	YES	No	No	No	
		CDMA 1xEVDO	BC10	No	YES	No	No	No	No	No	No	YES	YES	No	No	No	
		W-CDMA	850	No	No	YES	No	No	No	No	No	YES	YES	No	No	No	
		W-CDMA	1700	No	No	YES	No	No	No	No	No	YES	YES	No	No	No	
		W-CDMA	1900	No	No	YES	No	No	No	No	No	YES	YES	No	No	No	
		HSDPA	850	No	No	No	YES	No	No	No	No	YES	YES	No	No	No	
		HSDPA	1700	No	No	No	YES	No	No	No	No	YES	YES	No	No	No	
		HSDPA	1900	No	No	No	YES	No	No	No	No	YES	YES	No	No	No	
		HSUPA	850	No	No	No	No	YES	No	No	No	YES	YES	No	No	No	
		HSUPA	1700	No	No	No	No	YES	No	No	No	YES	YES	No	No	No	
		HSUPA	1900	No	No	No	No	YES	No	No	No	YES	YES	No	No	No	
		HSPA+	850	No	No	No	No	No	YES	No	No	YES	YES	No	No	No	
		HSPA+	1700	No	No	No	No	No	YES	No	No	YES	YES	No	No	No	
		HSPA+	1900	No	No	No	No	No	YES	No	No	YES	YES	No	No	No	
		DC-HSDPA	850	No	No	No	No	No	No	YES	No	YES	YES	No	No	No	
		DC-HSDPA	1700	No	No	No	No	No	No	YES	No	YES	YES	No	No	No	
	DC-HSDPA	1900	No	No	No	No	No	No	YES	No	YES	YES	No	No	No		
	LTE	2	No	No	No	No	No	No	No	No	YES	YES	YES	No	No	No	
	LTE	4	No	No	No	No	No	No	No	No	YES	YES	YES	No	No	No	
	LTE	5	No	No	No	No	No	No	No	No	YES	YES	YES	No	No	No	
	LTE	13	No	No	No	No	No	No	No	No	YES	YES	YES	No	No	No	
	LTE	17	No	No	No	No	No	No	No	No	YES	YES	YES	No	No	No	
	LTE	25	No	No	No	No	No	No	No	No	YES	YES	YES	No	No	No	
	WWAN + 5 GHz Bands WLAN MIMO (2 Tx on WLAN)	CDMA 1xRTT	BC0	YES	No	No	No	No	No	No	No	No	No	No	YES	YES	No
		CDMA 1xRTT	BC1	YES	No	No	No	No	No	No	No	No	No	No	YES	YES	No
		CDMA 1xRTT	BC10	YES	No	No	No	No	No	No	No	No	No	No	YES	YES	No
		CDMA 1xEVDO	BC0	No	YES	No	No	No	No	No	No	No	No	No	YES	YES	No
		CDMA 1xEVDO	BC1	No	YES	No	No	No	No	No	No	No	No	No	YES	YES	No
		CDMA 1xEVDO	BC10	No	YES	No	No	No	No	No	No	No	No	No	YES	YES	No
		W-CDMA	850	No	No	YES	No	No	No	No	No	No	No	No	YES	YES	No
		W-CDMA	1700	No	No	YES	No	No	No	No	No	No	No	No	YES	YES	No
		W-CDMA	1900	No	No	YES	No	No	No	No	No	No	No	No	YES	YES	No
		HSDPA	850	No	No	No	YES	No	No	No	No	No	No	No	YES	YES	No
		HSDPA	1700	No	No	No	YES	No	No	No	No	No	No	No	YES	YES	No
		HSDPA	1900	No	No	No	YES	No	No	No	No	No	No	No	YES	YES	No
		HSUPA	850	No	No	No	No	YES	No	No	No	No	No	No	YES	YES	No
HSUPA		1700	No	No	No	No	YES	No	No	No	No	No	No	YES	YES	No	
HSUPA		1900	No	No	No	No	YES	No	No	No	No	No	No	YES	YES	No	
HSPA+		850	No	No	No	No	No	YES	No	No	No	No	No	YES	YES	No	
HSPA+		1700	No	No	No	No	No	YES	No	No	No	No	No	YES	YES	No	
HSPA+		1900	No	No	No	No	No	YES	No	No	No	No	No	YES	YES	No	
DC-HSDPA		850	No	No	No	No	No	No	YES	No	No	No	No	YES	YES	No	
DC-HSDPA		1700	No	No	No	No	No	No	YES	No	No	No	No	YES	YES	No	
DC-HSDPA	1900	No	No	No	No	No	No	YES	No	No	No	No	YES	YES	No		
LTE	2	No	No	No	No	No	No	No	No	YES	No	No	YES	YES	No		
LTE	4	No	No	No	No	No	No	No	No	YES	No	No	YES	YES	No		
LTE	5	No	No	No	No	No	No	No	No	YES	No	No	YES	YES	No		
LTE	13	No	No	No	No	No	No	No	No	YES	No	No	YES	YES	No		
LTE	17	No	No	No	No	No	No	No	No	YES	No	No	YES	YES	No		
LTE	25	No	No	No	No	No	No	No	No	YES	No	No	YES	YES	No		

**Notes:**

1. Bluetooth transmits using the WLAN Aux Antenna
2. Bluetooth can transmit simultaneously with the WLAN Main Antenna, in either of the WLAN bands.
3. Bluetooth cannot transmit simultaneously with the WLAN Aux Antenna, in either of the WLAN bands; this also precludes the transmission of Bluetooth when WLAN is in MIMO mode.

## 8. Exposure Conditions

Refer to Section 17 “Antenna Dimensions and Separation Distances” for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

### 8.1. Test Configurations for the Main Antenna, SISO and MIMO Modes

#### Tablet Mode

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Bottom face	13.0 mm	Yes	
Front	-	No	SAR is not required as this is not a typical use scenario.
Edge 1	184.5 mm	Yes	Though SAR was not required for standalone, the test was performed for simultaneous transmitting evaluation. Refer to section 12.1.
Edge 2	228.3 mm	No	Refer to section 12.1 for SAR exclusion justification.
Edge 3	3.3 mm	Yes	
Edge 4	23.7 mm	Yes	

### 8.2. Test Configurations for the Auxiliary Antenna, SISO and MIMO Modes

#### Tablet Mode

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Bottom face	13.0 mm	Yes	
Front	-	No	SAR is not required as this is not a typical use scenario.
Edge 1	31.5 mm	Yes	
Edge 2	265.5 mm	No	Refer to section 12.1 for SAR exclusion justification.
Edge 3	139.0 mm	No	Refer to section 12.1 for SAR exclusion justification.
Edge 4	3.3 mm	Yes	

### 8.3. Test Configurations for the Auxiliary Antenna, Bluetooth

#### Tablet Mode

Test Configurations	Antenna-to-edge/surface	SAR Required	Note
Bottom face	13.0 mm	Yes	
Front	-	No	SAR is not required as this is not a typical use scenario.
Edge 1	31.5 mm	Yes	
Edge 2	265.5 mm	No	Refer to section 12.1 for SAR exclusion justification.
Edge 3	139.0 mm	No	Refer to section 12.1 for SAR exclusion justification.
Edge 4	3.3 mm	Yes	

#### LEGEND:

- Bottom face = Rear of display
- Edge 1 = Top Edge
- Edge 2 = Left Edge
- Edge 3 = Bottom Edge
- Edge 4 = Right Edge



## 9. Summary of Required Test Modes

The initial test configuration for 2.4 GHz and 5 GHz OFDM transmission modes is determined by the 802.11 configuration with the highest maximum output power specified for production units, including tune-up tolerance, in each standalone and aggregated frequency band. SAR for the initial test configuration is measured using the highest maximum output power channel determined by the default power measurement procedures. When multiple configurations in a frequency band have the same specified maximum output power, the initial test configuration is determined according to the following steps applied sequentially.

- 1) The largest channel bandwidth configuration is selected among the multiple configurations with the same specified maximum output power.
- 2) If multiple configurations have the same specified maximum output power and largest channel bandwidth, the lowest order modulation among the largest channel bandwidth configurations is selected.
- 3) If multiple configurations have the same specified maximum output power, largest channel bandwidth and lowest order modulation, the lowest data rate configuration among these configurations is selected.
- 4) When multiple transmission modes (802.11a/g/n/ac) have the same specified maximum output power, largest channel bandwidth, lowest order modulation and lowest data rate, the lowest order 802.11 mode is selected; i.e., 802.11a is chosen over 802.11n then 802.11ac or 802.11g is chosen over 802.11n.

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

#### SISO

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Measured average Power (dBm)		Tune-up upper Power (dBm)		SAR Test (Yes/No)	Note(s)		
					Main Ant Tx	Sub Ant Tx	Main Ant Tx	Sub Ant Tx				
2.4	802.11b	1 Mbps	1	2412	15.00	14.98	15.0	15.0	Yes	3		
			6	2437	14.97	14.94						
			11	2462	14.89	14.97						
			12	2467	14.91	14.85						
			13	2472	Not Required	Not Required					12.0	12.0
	802.11g	6 Mbps	1	2412	Not Required	Not Required	15.0	15.0	No	1		
			6	2437	Not Required	Not Required						
			11	2462	Not Required	Not Required						
			12	2467	Not Required	Not Required					13.5	13.5
			13	2472	Not Required	Not Required					2.0	2.0
	802.11n (HT20)	6.5 Mbps	1	2412	Not Required	Not Required	15.0	15.0	No	1		
			6	2437	Not Required	Not Required						
			11	2462	Not Required	Not Required						
			12	2467	Not Required	Not Required					13.5	13.5
			13	2472	Not Required	Not Required					2.0	2.0
	802.11n (HT40)	13.5 Mbps	3	2422	14.99	14.98	15.0	15.0	No	1		
			6	2437	14.88	14.91						
9			2452	14.92	14.99							
10			2457	Not Required	Not Required	12.5					12.5	
11			2462	Not Required	Not Required	1.0					-1.0	

#### MIMO

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Measured average Power (dBm)	Tune-up upper Power (dBm)	SAR Test (Yes/No)	Note(s)
					Main&Sub Ant Simultaneous Tx	Main&Sub Ant Simultaneous Tx		
2.4	802.11n (HT20)	6.5 Mbps	1	2412	Not Required	13.0	No	2
			6	2437	Not Required	15.0		
			11	2462	Not Required	15.0		
			12	2467	Not Required	11.0		
			13	2472	Not Required	-0.5		
	802.11n (HT40)	13.5 Mbps	3	2422	Not Required	12.5	No	2
			6	2437	Not Required	15.0		
			9	2452	Not Required	15.0		
			10	2457	Not Required	11.0		
			11	2462	Not Required	-2.5		

#### Note(s):

- Output Power and SAR is not required for 802.11g/n HT20/HT40 channels when the highest *reported* SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg.
- The standalone (SISO) SAR results were considered acceptable for the MIMO simultaneous transmission analysis as the MIMO power does not exceed the SISO power. The antenna separation distance will not be less than 50mm.
- According to KDB248227D01, SAR test channel was chosen. (shaded blue frame)

## 9.2. Wi-Fi 5GHz (U-NII-1 and U-NII-2A Bands)

### SISO

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Measured average Power (dBm)		Tune-up upper Power (dBm)		SAR Test (Yes/No)	Note(s)	
					Main Ant Tx	Sub Ant Tx	Main Ant Tx	Sub Ant Tx			
5.2 (U-NII-1)	802.11a	6 Mbps	36	5180	Not Required	Not Required	13.5	13.5	No	3	
			40	5200	Not Required	Not Required					
			44	5220	Not Required	Not Required					
			48	5240	Not Required	Not Required					
	802.11n (HT20)	6.5 Mbps	6.5 Mbps	36	5180	Not Required	Not Required	13.5	13.5	No	3
				40	5200	Not Required	Not Required				
				44	5220	Not Required	Not Required				
				48	5240	Not Required	Not Required				
	802.11n (HT40)	13.5 Mbps	13.5 Mbps	38	5190	Not Required	Not Required	13.5	13.5	No	3
				46	5230	Not Required	Not Required				
	802.11ac (VHT20)	6.5 Mbps	6.5 Mbps	36	5180	Not Required	Not Required	13.5	13.5	No	3
				40	5200	Not Required	Not Required				
				44	5220	Not Required	Not Required				
				48	5240	Not Required	Not Required				
802.11ac (VHT40)	13.5 Mbps	13.5 Mbps	38	5190	Not Required	Not Required	13.5	13.5	No	3	
			46	5230	Not Required	Not Required					
802.11ac (VHT80)	29.3 Mbps	29.3 Mbps	42	5210	13.41	13.40	13.5	13.5	No	3	
5.3 (U-NII-2A)	802.11a	6 Mbps	52	5260	Not Required	Not Required	13.5	13.5	No	1,2	
			56	5280	Not Required	Not Required					
			60	5300	Not Required	Not Required					
			64	5320	Not Required	Not Required					
	802.11n (HT20)	6.5 Mbps	6.5 Mbps	52	5260	Not Required	Not Required	13.5	13.5	No	1,2
				56	5280	Not Required	Not Required				
				60	5300	Not Required	Not Required				
				64	5320	Not Required	Not Required				
	802.11n (HT40)	13.5 Mbps	13.5 Mbps	54	5270	Not Required	Not Required	13.5	13.5	No	1,2
				62	5310	Not Required	Not Required				
	802.11ac (VHT20)	6.5 Mbps	6.5 Mbps	52	5260	Not Required	Not Required	13.5	13.5	No	1,2
				56	5280	Not Required	Not Required				
				60	5300	Not Required	Not Required				
				64	5320	Not Required	Not Required				
	802.11ac (VHT40)	13.5 Mbps	13.5 Mbps	54	5270	Not Required	Not Required	13.5	13.5	No	1,2
				62	5310	Not Required	Not Required				
	802.11ac (VHT80)	29.3 Mbps	29.3 Mbps	58	5290	13.35	13.27	13.5	13.5	Yes	5

**MIMO (continued)**

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Measured average Power (dBm)	Tune-up upper Power (dBm)	SAR Test (Yes/No)	Note(s)
					Main&Sub Ant Simultaneous Tx	Main&Sub Ant Simultaneous Tx		
5.2 (U-NII-1)	802.11n (HT20)	6.5 Mbps	36	5180	Not Required	13.5	No	4
			40	5200	Not Required			
			44	5220	Not Required			
			48	5240	Not Required			
	802.11n (HT40)	13.5 Mbps	38	5190	Not Required	13.5	No	4
			46	5230	Not Required			
	802.11ac (VHT20)	6.5 Mbps	36	5180	Not Required	13.5	No	4
			40	5200	Not Required			
			44	5220	Not Required			
			48	5240	Not Required			
	802.11ac (VHT40)	13.5 Mbps	38	5190	Not Required	13.5	No	4
			46	5230	Not Required			
	802.11ac (VHT80)	29.3 Mbps	42	5210	Not Required	13.5	No	4
	5.3 (U-NII-2A)	802.11n (HT20)	6.5 Mbps	52	5260	Not Required	13.5	No
56				5280	Not Required			
60				5300	Not Required			
64				5320	Not Required			
802.11n (HT40)		13.5 Mbps	54	5270	Not Required	13.5	No	4
			62	5310	Not Required			
802.11ac (VHT20)		6.5 Mbps	52	5260	Not Required	13.5	No	4
			56	5280	Not Required			
			60	5300	Not Required			
			64	5320	Not Required			
802.11ac (VHT40)		13.5 Mbps	54	5270	Not Required	13.5	No	4
			62	5310	Not Required			
802.11ac (VHT80)		29.3 Mbps	58	5290	Not Required	13.5	No	4

**Note(s):**

- Output Power and SAR measurement is not required for 802.11a/n/ac VHT20/VHT40 channels when the specified tune-up tolerances for 802.11a/n/ac VHT20/VHT40 are lower than 802.11ac VHT80 by more than 1/2 dB and the measured SAR is ≤ 1.2 W/Kg.
- When the same transmission mode configurations have the same maximum output power on the same channel for the 802.11 a/g/n/ac modes, the channel with the largest bandwidth and lowest data rate is selected (i.e. 802.11ac VHT80).
- When the specified maximum output power is the same for both UNII band I and UNII band 2A, begin SAR measurement in UNII band 2A; and if the highest *reported* SAR for UNII band 2A is
  - ≤ 1.2 W/kg, SAR is not required for UNII band I
  - > 1.2 W/kg, both bands should be tested independently for SAR.
- The standalone (SISO) SAR results were considered acceptable for the MIMO simultaneous transmission analysis as the MIMO power does not exceed the SISO power. The antenna separation distance will not be less than 50mm.
- According to KDB248227D01, SAR test channel was chosen. (shaded blue frame)

### 9.3. Wi-Fi 5GHz (U-NII-2C Band)

#### SISO

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Measured average Power (dBm)		Tune-up upper Power (dBm)		SAR Test (Yes/No)	Note(s)					
					Main Ant Tx	Sub Ant Tx	Main Ant Tx	Sub Ant Tx							
5.5 (U-NII-2C)	802.11a	6 Mbps	100	5500	Not Required	Not Required	13.5	13.5	No	1,2					
			104	5520	Not Required	Not Required									
			108	5540	Not Required	Not Required									
			112	5560	Not Required	Not Required									
			116	5580	Not Required	Not Required									
			120	5600	Not Required	Not Required									
			124	5620	Not Required	Not Required									
			128	5640	Not Required	Not Required									
			132	5660	Not Required	Not Required									
			136	5680	Not Required	Not Required									
			140	5700	Not Required	Not Required									
			100	5500	Not Required	Not Required									
			104	5520	Not Required	Not Required									
			108	5540	Not Required	Not Required									
	802.11n (HT20)	6.5 Mbps	112	5560	Not Required	Not Required	13.5	13.5	No	1,2					
			116	5580	Not Required	Not Required									
			120	5600	Not Required	Not Required									
			124	5620	Not Required	Not Required									
			128	5640	Not Required	Not Required									
			132	5660	Not Required	Not Required									
			136	5680	Not Required	Not Required									
			140	5700	Not Required	Not Required									
			102	5510	Not Required	Not Required									
			110	5550	Not Required	Not Required									
			118	5590	Not Required	Not Required									
			126	5630	Not Required	Not Required									
			134	5670	Not Required	Not Required									
			802.11n (HT40)	13.5 Mbps	100	5500					Not Required	Not Required	13.5	13.5	No
	104	5520			Not Required	Not Required									
	108	5540			Not Required	Not Required									
	112	5560			Not Required	Not Required									
	116	5580			Not Required	Not Required									
	120	5600			Not Required	Not Required									
	124	5620			Not Required	Not Required									
	128	5640			Not Required	Not Required									
	132	5660			Not Required	Not Required									
	136	5680			Not Required	Not Required									
	140	5700			Not Required	Not Required									
	144	5720			Not Required	Not Required									
	102	5510			Not Required	Not Required									
	110	5550			Not Required	Not Required									
	802.11ac (VHT20)	6.5 Mbps	118	5590	Not Required	Not Required	13.5	13.5	No	1,2					
			126	5630	Not Required	Not Required									
			134	5670	Not Required	Not Required									
			142	5710	Not Required	Not Required									
			102	5510	Not Required	Not Required									
			110	5550	Not Required	Not Required									
			118	5590	Not Required	Not Required									
126			5630	Not Required	Not Required										
134			5670	Not Required	Not Required										
142			5710	Not Required	Not Required										
802.11ac (VHT40)			13.5 Mbps	106	5530	13.33					13.45	13.5	13.5	Mo	1,2
				122	5610	13.25					13.28				
				138	5690	13.33					13.40				
				106	5530	13.33					13.45				
	122	5610		13.25	13.28										
	138	5690		13.33	13.40										
802.11ac (VHT80)	29.3 Mbps	106	5530	13.33	13.45	13.5	13.5	Yes	4						
		122	5610	13.25	13.28										
		138	5690	13.33	13.40										

**MIMO (continued)**

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Measured average Power (dBm)	Tune-up upper Power (dBm)	SAR Test (Yes/No)	Note(s)	
					Main&Sub Ant Simultaneous Tx	Main&Sub Ant Simultaneous Tx			
5.5 (U-NII-2C)	802.11n (HT20)	6.5 Mbps	100	5500	Not Required	13.5	No	3	
			104	5520	Not Required				
			108	5540	Not Required				
			112	5560	Not Required				
			116	5580	Not Required				
			120	5600	Not Required				
			124	5620	Not Required				
			128	5640	Not Required				
			132	5660	Not Required				
			136	5680	Not Required				
	802.11n (HT40)	13.5 Mbps	140	5700	Not Required	13.5	No	3	
			102	5510	Not Required				
			110	5550	Not Required				
			118	5590	Not Required				
	802.11ac (VHT20)	6.5 Mbps	126	5630	Not Required	13.5	No	3	
			134	5670	Not Required				
			100	5500	Not Required				
			104	5520	Not Required				
			108	5540	Not Required				
			112	5560	Not Required				
			116	5580	Not Required				
			120	5600	Not Required				
			124	5620	Not Required				
			128	5640	Not Required				
			132	5660	Not Required				
			136	5680	Not Required				
			140	5700	Not Required				
			802.11ac (VHT40)	13.5 Mbps	144				5720
	102	5510			Not Required				
	110	5550			Not Required				
	118	5590			Not Required				
	802.11ac (VHT80)	29.3 Mbps	126	5630	Not Required	13.5	No	3	
			134	5670	Not Required				
			142	5710	Not Required				
			106	5530	Not Required				
				122	5610	Not Required			
				138	5690	Not Required			

**Note(s):**

1. Output Power and SAR measurement is not required for 802.11a/n/ac VHT20/VHT40 channels when the specified tune-up tolerances for 802.11a/n/ac VHT20/VHT40 are lower than 802.11ac VHT80 by more than ½ dB and the measured SAR is ≤ 1.2 W/Kg.
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 with the largest bandwidth and lowest data rate is selected (i.e. 802.11ac VHT80).
3. The standalone (SISO) SAR results were considered acceptable for the MIMO simultaneous transmission analysis as the MIMO power does not exceed the SISO power. The antenna separation distance will not be less than 50mm.
4. SAR test channel was chosen according to KDB248227D01. (shaded blue frame)

### 9.4. Wi-Fi 5GHz (U-NII-3 Band)

#### SISO

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Measured average Power (dBm)		Tune-up upper Power (dBm)		SAR Test (Yes/No)	Note(s)
					Main Ant Tx	Sub Ant Tx	Main Ant Tx	Sub Ant Tx		
5.8 (U-NII-3)	802.11a	6 Mbps	149	5745	Not Required	Not Required	13.5	13.5	No	1.2
			153	5765	Not Required	Not Required				
			157	5785	Not Required	Not Required				
			161	5805	Not Required	Not Required				
			165	5825	Not Required	Not Required				
	802.11n (HT20)	6.5 Mbps	149	5745	Not Required	Not Required	13.5	13.5	No	1.2
			153	5765	Not Required	Not Required				
			157	5785	Not Required	Not Required				
			161	5805	Not Required	Not Required				
			165	5825	Not Required	Not Required				
	802.11n (HT40)	13.5 Mbps	151	5755	Not Required	Not Required	13.5	13.5	No	1.2
			159	5795	Not Required	Not Required				
	802.11ac (VHT20)	6.5 Mbps	149	5745	Not Required	Not Required	13.5	13.5	No	1.2
			153	5765	Not Required	Not Required				
			157	5785	Not Required	Not Required				
			161	5805	Not Required	Not Required				
			165	5825	Not Required	Not Required				
	802.11ac (VHT40)	13.5 Mbps	151	5755	Not Required	Not Required	13.5	13.5	No	1.2
			159	5795	Not Required	Not Required				
	802.11ac (VHT80)	29.3 Mbps	155	5775	13.45	13.34	13.5	13.5	Yes	4

#### MIMO

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Measured average Power (dBm)	Tune-up upper Power (dBm)	SAR Test (Yes/No)	Note(s)
					Main&Sub Ant Simultaneous Tx	Main&Sub Ant Simultaneous Tx		
5.8 (U-NII-3)	802.11n (HT20)	6.5 Mbps	149	5745	Not Required	13.5	No	3
			153	5765	Not Required	13.5		
			157	5785	Not Required	13.5		
			161	5805	Not Required	13.5		
			165	5825	Not Required	13.5		
	802.11n (HT40)	13.5 Mbps	151	5755	Not Required	13.5	No	3
			159	5795	Not Required	13.5		
			149	5745	Not Required	13.5		
	802.11ac (VHT20)	6.5 Mbps	153	5765	Not Required	13.5	No	3
			157	5785	Not Required	13.5		
			161	5805	Not Required	13.5		
			165	5825	Not Required	13.5		
			151	5755	Not Required	13.5		
	802.11ac (VHT40)	13.5 Mbps	159	5795	Not Required	13.5	No	3
			155	5775	Not Required	13.5		
	802.11ac (VHT80)	29.3 Mbps	155	5775	Not Required	13.5	No	3

#### Note(s):

- Output Power and SAR measurement is not required for 802.11a/n/ac VHT20/VHT40 channels when the specified tune-up tolerances for 802.11a/n/ac VHT20/VHT40 are lower than 802.11ac VHT80 by more than 1/2 dB and the measured SAR is ≤ 1.2 W/Kg.
- When the same transmission mode configurations have the same maximum output power on the same channel for the 802.11 a/g/n/ac modes, the channel with the largest bandwidth and lowest data rate is selected (i.e. 802.11ac VHT80).
- The standalone (SISO) SAR results were considered acceptable for the MIMO simultaneous transmission analysis as the MIMO power does not exceed the SISO power. The antenna separation distance will not be less than 50mm.
- SAR test channel was chosen according to KDB248227D01. (shaded blue frame)

### 9.5. Bluetooth

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Measured average Power (dBm)		Tune-up upper Power (dBm)		SAR Test (Yes/No)	Note(s)
					Main Ant Tx	Sub Ant Tx	Main Ant Tx	Sub Ant Tx		
2.4	BDR	DH5	0	2402	-	3.65	-	5.00	Yes	
			39	2441	-	3.90				
			78	2480	-	4.02				
	EDR	2DH5	0	2402	-	3.84	-	4.90	No	1
			39	2441	-	4.08				
			78	2480	-	4.15				
	EDR	3DH5	0	2402	-	3.84	-	4.90	No	1
			39	2441	-	4.21				
			78	2480	-	4.15				
	LE	-	0	2402	-	2.82	-	4.00	No	1
			40	2442	-	2.88				
			78	2480	-	2.99				

**Note(s):**

- SAR measurement is not required for EDR and LE when the specified tune-up tolerances for EDR and LE are lower than BDR.



## 9.6. Correlation of Output Power

### Correlation of Output Power between latest test report and this SAR tests

It was checked that measured average power of the antenna port was correlated with Tune-up upper power. Tune-up upper power in this report is equivalent to latest original test report(FCC ID PD98260NG & PD98260NGU/ IC Number 100M-8260NG RF Exposure Lab, LLC Report No: SAR. 20150610). That is, EMC power is the maximum power including the tune-up tolerance range. Measured average Power used for SAR testing can be regarded to be correlated with the Tune-up upper power is within -2dB.

Band (GHz)	Mode	Data Rate	Ch #	Freq. (MHz)	Maximum measured average Power of Original test report (dBm)		Measured average Power in this SAR test (dBm)		Tune-up upper Power (dBm)		Note(s)
					Main Ant Tx	Aux Ant Tx	Main Ant Tx	Aux Ant Tx	Main Ant Tx	Sub Ant Tx	
2.4	802.11b	1 Mbps	6	2437	15.00	-	14.97	-	15.0	15.0	
	802.11g	6 Mbps	6	2437	14.95	-	15.00	-			
	802.11n (HT20)	HT4	6	2437	14.92	-	14.81	-			
	802.11n (HT40)	HT4	6	2437	14.87	-	14.84	-			
5.2 (U-NII-1)	802.11a	6Mbps	44	5220	13.50	-	13.42	-	13.50	13.50	
	802.11n (HT20)	HT4	48	5240	13.45	-	13.49	-			
	802.11n (HT40)	HT4	38	5190	-	13.42	-	13.39			
	802.11ac (VHT80)	VHT6	42	5210	13.35	-	13.39	-			
5.3 (U-NII-2A)	802.11a	6Mbps	60	5300	13.50	-	13.48	-	13.50	13.50	
	802.11n (HT20)	HT4	52	5260	13.42	-	13.47	-			
	802.11n (HT40)	HT4	62	5310	13.39	-	13.41	-			
	802.11ac (VHT80)	VHT6	58	5290	-	13.33	-	13.30			
5.5 (U-NII-2C)	802.11a	6Mbps	116	5580	13.50	-	13.34	-	13.50	13.50	
	802.11n (HT20)	HT4	120	5600	13.46	-	13.36	-			
	802.11n (HT40)	HT4	126	5630	-	13.44	-	13.26			
	802.11ac (VHT80)	VHT6	106	5530	13.40	-	13.26	-			
5.8 (U-NII-3)	802.11a	6Mbps	157	5785	13.50	-	13.39	-	13.50	13.50	
	802.11n (HT20)	HT8	157	5785	13.42	-	13.44	-			
	802.11n (HT40)	HT8	159	5795	-	13.38	-	13.13			
	802.11ac (VHT80)	VHT6	155	5775	-	13.36	-	13.20			

## 10. Dielectric Property Measurements

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within  $\pm 2^\circ\text{C}$  of the temperature when the tissue parameters are characterized.

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

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

### Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

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

### IEEE Std 1528-2013

Refer to Table 3 within the IEEE Std 1528-2013

**Dielectric Property Measurements Results:**

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized.

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

Date	Freq. (MHz)	Liquid Parameters	Measured	Target	Delta (%)	Limit ±(%)
2016/3/16	Body 2450	Relative Permittivity ( $\epsilon_r$ ):	50.66	52.70	-3.87	5
		Conductivity ( $\sigma$ ):	2.01	1.95	3.18	5
	Body 2412	Relative Permittivity ( $\epsilon_r$ ):	50.81	52.76	-3.70	5
		Conductivity ( $\sigma$ ):	1.96	1.91	2.86	5
	Body 2472	Relative Permittivity ( $\epsilon_r$ ):	50.58	52.67	-3.97	5
		Conductivity ( $\sigma$ ):	2.04	1.98	3.28	5
2016/3/16	Body 2450	Relative Permittivity ( $\epsilon_r$ ):	50.66	52.70	-3.87	5
		Conductivity ( $\sigma$ ):	2.01	1.95	3.18	5
	Body 2400	Relative Permittivity ( $\epsilon_r$ ):	50.88	52.77	-3.59	5
		Conductivity ( $\sigma$ ):	1.94	1.90	2.42	5
	Body 2480	Relative Permittivity ( $\epsilon_r$ ):	50.55	52.66	-4.01	5
		Conductivity ( $\sigma$ ):	2.05	1.99	3.10	5
2016/3/17	Body 5250	Relative Permittivity ( $\epsilon_r$ ):	47.55	48.95	-2.86	10
		Conductivity ( $\sigma$ ):	5.37	5.35	0.28	5
	Body 5180	Relative Permittivity ( $\epsilon_r$ ):	47.83	49.05	-2.48	10
		Conductivity ( $\sigma$ ):	5.21	5.30	-1.64	5
	Body 5320	Relative Permittivity ( $\epsilon_r$ ):	47.54	48.86	-2.70	10
		Conductivity ( $\sigma$ ):	5.52	5.43	1.48	5
2016/3/18	Body 5600	Relative Permittivity ( $\epsilon_r$ ):	47.26	48.48	-2.51	10
		Conductivity ( $\sigma$ ):	5.75	5.76	-0.23	5
	Body 5500	Relative Permittivity ( $\epsilon_r$ ):	47.48	48.61	-2.33	10
		Conductivity ( $\sigma$ ):	5.69	5.64	0.84	5
	Body 5720	Relative Permittivity ( $\epsilon_r$ ):	47.40	48.32	-1.89	10
		Conductivity ( $\sigma$ ):	5.71	5.90	-3.27	5
2016/3/22	Body 5750	Relative Permittivity ( $\epsilon_r$ ):	46.96	48.27	-2.72	10
		Conductivity ( $\sigma$ ):	6.09	5.94	2.66	5
	Body 5745	Relative Permittivity ( $\epsilon_r$ ):	46.97	48.28	-2.71	10
		Conductivity ( $\sigma$ ):	6.08	5.93	2.51	5
	Body 5825	Relative Permittivity ( $\epsilon_r$ ):	46.91	48.20	-2.67	10
		Conductivity ( $\sigma$ ):	6.07	6.00	1.18	5

## 11. System Performance 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 remeasured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

### System Performance Check Measurement Conditions

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness:  $2.0 \pm 0.2$  mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be  $\geq 15.0$  cm  $\pm$  0.5 cm for SAR measurements.
- 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 1GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 12 mm (1GHz to 3GHz) and 15 mm (below 1GHz) 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 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(For 5GHz band) or 250 mW(For 2.4GHz band).
- The results are normalized to 1 W input power.

**Reference Target SAR Values**

The target(reference) SAR values can be obtained from the calibration certificate of system validation dipoles(Section 14). The target SAR values are SAR measured value in the calibration certificate scaled to 1W.

System Dipole	Serial No.	Cal. Date	Freq. (MHz)	Target SAR Values (mW/g)		
				1g/10g	Head	Body
D2450V2	713	9/3/2013	2450	1g	52.0	50.4
				10g	24.2	23.6
D5GHV2	1020	1/20/2016	5250	1g	80.0	73.6
				10g	23.1	20.9
			5600	1g	84.2	78.2
				10g	24.3	22.1
			5750	1g	79.6	73.9
				10g	22.8	20.7

**System Check Results**

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

Date Tested	System Dipole		T.S. Liquid	Measured Results		Target (Ref. Value)	Delta ±10 %	
	Type	Serial #		Zoom Scan	Normalize to 1 W			
3/16/2016	D2450V2	713	Body	1g	13.30	53.2	50.4	5.56
				10g	6.17	24.7	23.6	4.58
3/17/2016	D5GHzV2 5.25 GHz	1020	Body	1g	7.67	76.7	73.6	4.21
				10g	2.13	21.3	20.9	1.91
3/18/2016	D5GHzV2 5.6 GHz	1020	Body	1g	7.85	78.5	78.2	0.38
				10g	2.14	21.4	22.1	-3.17
3/22/2016	D5GHzV2 5.75 GHz	1020	Body	1g	6.92	69.2	73.9	-6.36
				10g	1.92	19.2	20.7	-7.25

## 12. RF Exposure Conditions (Test Configurations)

Refer to Section 17 "Antenna Dimensions and Separation Distances" for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

### 12.1. Standalone SAR Test Exclusion Considerations

Standalone SAR test exclusion was based upon the following criteria:

1. According to KDB 447498D01 § 4.1 f) if the antenna is at close proximity to user then the outer surface of the DUT should be treated as the radiating surface. The test separation distance is then determined by the smallest distance between the outer surface of the device and the user. For the purposes of this report close proximity has been defined as closer than 50 mm. For antennas <50 mm from the bottom face or edge the separation distance used for the SAR exclusion calculations is 5 mm.
2. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.
3. If the antenna to DUT adjacent bottom face or edge separation distance is >50mm, the actual antenna to user separation distance is used to determine SAR exclusion and estimated SAR value.
4. Output power is the maximum rated power (including tune-up or manufacturing tolerances) and includes source-based averaging.
5. According to KDB248227D01, SAR is not required for 802.11g/n HT20 channels when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg.

### 12.1.1. SAR exclusion calculations for Wi-Fi SISO (1 Tx) and Bluetooth for antenna <50mm from the user

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Bottom face	Edge 1	Edge 2	Edge 3	Edge 4	Front	Bottom face	Edge 1	Edge 2	Edge 3	Edge 4	Front
<b>WiFi - Main Antenna</b>																
WLAN Aux	WiFi	2462	15.00	32	13.00	184.50	228.30	3.30	23.70		10 -MEASURE-	> 50 mm	>200 mm	10 -MEASURE-	10 -MEASURE-	
WLAN Aux	WiFi	5240	13.50	22	13.00	184.50	228.30	3.30	23.70		10.1 -MEASURE-	> 50 mm	>200 mm	10.1 -MEASURE-	10.1 -MEASURE-	
WLAN Aux	WiFi	5320	13.50	22	13.00	184.50	228.30	3.30	23.70		10.1 -MEASURE-	> 50 mm	>200 mm	10.1 -MEASURE-	10.1 -MEASURE-	
WLAN Aux	WiFi	5700	13.50	22	13.00	184.50	228.30	3.30	23.70		10.5 -MEASURE-	> 50 mm	>200 mm	10.5 -MEASURE-	10.5 -MEASURE-	
WLAN Aux	WiFi	5825	13.50	22	13.00	184.50	228.30	3.30	23.70		10.6 -MEASURE-	> 50 mm	>200 mm	10.6 -MEASURE-	10.6 -MEASURE-	
<b>Bluetooth / WiFi - Aux Antenna</b>																
WLAN Aux	WiFi	2462	15.00	32	13.00	31.50	265.50	139.00	3.30		10 -MEASURE-	10 -MEASURE-	>200 mm	> 50 mm	10 -MEASURE-	
WLAN Aux	WiFi	5240	13.50	22	13.00	31.50	265.50	139.00	3.30		10.1 -MEASURE-	10.1 -MEASURE-	>200 mm	> 50 mm	10.1 -MEASURE-	
WLAN Aux	WiFi	5320	13.50	22	13.00	31.50	265.50	139.00	3.30		10.1 -MEASURE-	10.1 -MEASURE-	>200 mm	> 50 mm	10.1 -MEASURE-	
WLAN Aux	WiFi	5700	13.50	22	13.00	31.50	265.50	139.00	3.30		10.5 -MEASURE-	10.5 -MEASURE-	>200 mm	> 50 mm	10.5 -MEASURE-	
WLAN Aux	WiFi	5825	13.50	22	13.00	31.50	265.50	139.00	3.30		10.6 -MEASURE-	10.6 -MEASURE-	>200 mm	> 50 mm	10.6 -MEASURE-	
WLAN Aux	Bluetooth	2480	5.00	3	13.00	31.50	265.50	139.00	3.30		0.9 -MEASURE-	0.9 -MEASURE-	>200 mm	> 50 mm	0.9 -MEASURE-	

**Note(s):**

1. According to KDB 447498D01, if the calculated threshold value is >3 then SAR testing is required.
2. SAR exclusion was not assessed for 2 Tx (MIMO) as the higher 1 Tx (SISO) SAR values were used for simultaneous transmission analysis.
3. The separation distances from antennas to the bottom face or the edge were input. For antennas <50 mm from the bottom face or edge (shaded blue frame in above table) the separation distance used for the SAR exclusion calculations is 5 mm.
4. The SAR test of bottom face and some edge with Bluetooth was excluded, but we measured bottom face and some edge with Bluetooth for simultaneous transmission consideration (Values shaded yellow).



**12.1.2. SAR exclusion calculations for Wi-Fi SISO (1 Tx) and Bluetooth for antenna >50mm from the user**

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
			dBm	mW	Bottom face	Edge 1	Edge 2	Edge 3	Edge 4	Front	Bottom face	Edge 1	Edge 2	Edge 3	Edge 4	Front
<b>WiFi - Main Antenna</b>																
WLAN Main	WiFi	2462	15.00	32	13.00	184.50	228.30	3.30	23.70		< 50 mm	1440.6 mW -MEASURE-	>200 mm	< 50 mm	< 50 mm	
WLAN Main	WiFi	5240	13.50	22	13.00	184.50	228.30	3.30	23.70		< 50 mm	1410.5 mW -MEASURE-	>200 mm	< 50 mm	< 50 mm	
WLAN Main	WiFi	5320	13.50	22	13.00	184.50	228.30	3.30	23.70		< 50 mm	1410 mW -MEASURE-	>200 mm	< 50 mm	< 50 mm	
WLAN Main	WiFi	5700	13.50	22	13.00	184.50	228.30	3.30	23.70		< 50 mm	1407.8 mW -MEASURE-	>200 mm	< 50 mm	< 50 mm	
WLAN Main	WiFi	5825	13.50	22	13.00	184.50	228.30	3.30	23.70		< 50 mm	1407.2 mW -MEASURE-	>200 mm	< 50 mm	< 50 mm	
<b>Bluetooth / WiFi - Aux Antenna</b>																
WLAN Aux	WiFi	2462	15.00	32	13.00	31.50	265.50	139.00	3.30		< 50 mm	< 50 mm	>200 mm	985.6 mW -EXEMPT-	< 50 mm	
WLAN Aux	WiFi	5240	13.50	22	13.00	31.50	265.50	139.00	3.30		< 50 mm	< 50 mm	>200 mm	955.5 mW -EXEMPT-	< 50 mm	
WLAN Aux	WiFi	5320	13.50	22	13.00	31.50	265.50	139.00	3.30		< 50 mm	< 50 mm	>200 mm	955 mW -EXEMPT-	< 50 mm	
WLAN Aux	WiFi	5700	13.50	22	13.00	31.50	265.50	139.00	3.30		< 50 mm	< 50 mm	>200 mm	952.8 mW -EXEMPT-	< 50 mm	
WLAN Aux	WiFi	5825	13.50	22	13.00	31.50	265.50	139.00	3.30		< 50 mm	< 50 mm	>200 mm	952.2 mW -EXEMPT-	< 50 mm	
WLAN Aux	Bluetooth	2480	5.00	3	13.00	31.50	265.50	139.00	3.30		< 50 mm	< 50 mm	>200 mm	985.3 mW -EXEMPT-	< 50 mm	

**Note(s):**

1. According to KDB 447498D01, if the calculated Power threshold is less than the output power then SAR testing is required.
2. SAR exclusion was not assessed for 2 Tx (MIMO) as the higher 1 Tx (SISO) SAR values were used for simultaneous transmission analysis.
3. The separation distances from antennas to the bottom face or the edge were input. For antennas <50 mm from the bottom face or edge (shaded blue frame in above table) the separation distance used for the SAR exclusion calculations is 5 mm.
4. The SAR test of Edge 1 with WLAN Main antenna was excluded, but we measured Edge 1 with WLAN Main antenna for simultaneous transmission consideration (Values shaded yellow).

## 12.2. Estimated SAR for Simultaneous Transmission SAR Analysis

### Considerations for using estimated SAR values:

1. According to KDB 447498D01 § 4.1 f) if the antenna is at close proximity to user then the outer surface of the DUT should be treated as the radiating surface. The test separation distance is then determined by the smallest distance between the outer surface of the device and the user. For the purposes of this report close proximity has been defined as closer than 50 mm. For antennas <50 mm from the Bottom face or edge the separation distance used for the estimated SAR calculations is 5 mm.
2. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.
3. Output power is the maximum rated power (including tune-up or manufacturing tolerances) and includes source-based averaging.
4. If the antenna separation distance is > 50mm then the estimated SAR value is 0.4 W/Kg.
5. Formulas round separation distance to nearest mm and power to nearest mW before calculating estimated SAR

### 12.2.1. Estimated SAR for Wi-Fi 1 Tx (SISO) and Bluetooth

Antenna	Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Estimated 1-g SAR Value (W/kg)					
			dBm	mW	Bottom face	Edge 1	Edge 2	Edge 3	Edge 4	Front	Bottom face	Edge 1	Edge 2	Edge 3	Edge 4	Front
<b>WiFi - Main Antenna</b>																
WLAN Main	WiFi	2462	15.00	32	13.00	184.50	228.30	3.30	23.70		-MEASURE-	-MEASURE-	>200 mm	-MEASURE-	-MEASURE-	
WLAN Main	WiFi	5240	13.50	22	13.00	184.50	228.30	3.30	23.70		-MEASURE-	-MEASURE-	>200 mm	-MEASURE-	-MEASURE-	
WLAN Main	WiFi	5320	13.50	22	13.00	184.50	228.30	3.30	23.70		-MEASURE-	-MEASURE-	>200 mm	-MEASURE-	-MEASURE-	
WLAN Main	WiFi	5700	13.50	22	13.00	184.50	228.30	3.30	23.70		-MEASURE-	-MEASURE-	>200 mm	-MEASURE-	-MEASURE-	
WLAN Main	WiFi	5825	13.50	22	13.00	184.50	228.30	3.30	23.70		-MEASURE-	-MEASURE-	>200 mm	-MEASURE-	-MEASURE-	
<b>Bluetooth / WiFi - Aux Antenna</b>																
WLAN Aux	WiFi	2462	15.00	32	13.00	31.50	265.50	139.00	3.30		-MEASURE-	-MEASURE-	>200 mm	0.400	-MEASURE-	
WLAN Aux	WiFi	5240	13.50	22	13.00	31.50	265.50	139.00	3.30		-MEASURE-	-MEASURE-	>200 mm	0.400	-MEASURE-	
WLAN Aux	WiFi	5320	13.50	22	13.00	31.50	265.50	139.00	3.30		-MEASURE-	-MEASURE-	>200 mm	0.400	-MEASURE-	
WLAN Aux	WiFi	5700	13.50	22	13.00	31.50	265.50	139.00	3.30		-MEASURE-	-MEASURE-	>200 mm	0.400	-MEASURE-	
WLAN Aux	WiFi	5825	13.50	22	13.00	31.50	265.50	139.00	3.30		-MEASURE-	-MEASURE-	>200 mm	0.400	-MEASURE-	
WLAN Aux	Bluetooth	2480	5.00	3	13.00	31.50	265.50	139.00	3.30		-MEASURE-	-MEASURE-	>200 mm	0.400	-MEASURE-	

### Notes:

1. Estimated SAR for 2 Tx (MIMO) was not assessed as the higher 1 Tx (SISO) SAR values were used for simultaneous transmission analysis.
2. As Simultaneous Transmission SAR of the DUT was compliant under the higher power conditions of Wi-Fi 1 Tx, it was judged that such analyses would be unnecessary for Wi-Fi 2 Tx (MIMO), given the substantially lower MIMO power levels and considerable separation distance between WLAN Main and the WLAN Auxiliary antennas.
3. Wherever appropriate, Wi-Fi 1 Tx (SISO) SAR values were used to represent those of Wi-Fi 2 Tx (MIMO); if compliance can be shown with the more conservative Wi-Fi 1 Tx values, then there is no need to perform separate assessment for Wi-Fi 2 Tx.
4. The separation distances from antennas to the Bottom face or the edge were input. For antennas <50 mm from the Bottom face or edge (shaded blue frame in above table) the separation distance used for the SAR exclusion calculations is 5 mm.
5. The SAR test of Edge 1 with WLAN Main antenna was excluded, but we measured Edge 1 with WLAN Main antenna for simultaneous transmission consideration. The SAR test of bottom face and some edge with Bluetooth was excluded, but we measured bottom face and some edge with Bluetooth for simultaneous transmission consideration.

### 13. Measured and Reported (Scaled) SAR Results

SAR Test Reduction criteria are as follows:

#### KDB 248227 D01 SAR meas for 802.11 v02:

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

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

When the reported SAR for the initial test position is:

- $\leq 0.4$  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.

### 13.1. Wi-Fi 2.4 GHz Band

#### Main Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Bottom face	802.11b	0	1	2412	15.00	15.00	0.164	0.164	1	
			6	2437	15.00	14.97				
			11	2462	15.00	14.89				
Edge 1	802.11b	0	1	2412	15.00	15.00	0.001	0.001	2	
			6	2437	15.00	14.97				
			11	2462	15.00	14.89				
Edge 3	802.11b	0	1	2412	15.00	15.00	0.466	0.466	3	
			6	2437	15.00	14.97				
			11	2462	15.00	14.89				
Edge 4	802.11b	0	1	2412	15.00	15.00	0.088	0.088	4	
			6	2437	15.00	14.97				
			11	2462	15.00	14.89				

#### Auxiliary Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Bottom face	802.11b	0	1	2412	15.00	14.98	0.213	0.214	5	
			6	2437	15.00	14.94				
			11	2462	15.00	14.97				
Edge 1	802.11b	0	1	2412	15.00	14.98	0.082	0.082	6	
			6	2437	15.00	14.94				
			11	2462	15.00	14.97				
Edge 4	802.11b	0	1	2412	15.00	14.98	0.704	0.707	7	
			6	2437	15.00	14.94				
			11	2462	15.00	14.97				

#### Note(s):

- Highest reported SAR is  $\leq 0.4$  W/kg. Therefore, further SAR measurements within this exposure condition are not required.
- Highest reported SAR is  $> 0.4$  W/kg. Due to the highest reported SAR for this test position, other test positions in standalone exposure condition were evaluated until a SAR  $\leq 0.8$  W/kg was reported.
- 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.

**13.2. Bluetooth**  
**Auxiliary Antenna**

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Bottom face	BDR DH5	0	0	2402	5.00	3.65				
			39	2441	5.00	3.90				
			78	2480	5.00	4.02	0.018	0.023	8	
Edge 1	BDR DH5	0	0	2402	5.00	3.65				
			39	2441	5.00	3.90				
			78	2480	5.00	4.02	0.005	0.006	9	
Edge 4	BDR DH5	0	0	2402	5.00	3.65				
			39	2441	5.00	3.90				
			78	2480	5.00	4.02	0.065	0.081	10	

**Note(s):**

According to KDB 447498 D01 General RF Exposure Guidance v06, 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

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

### 13.3. Wi-Fi 5.3 GHz Band

#### Main Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Bottom face	802.11ac 80	0	58	5290	13.50	13.35	0.105	0.109	11	
Edge 1	802.11ac 80	0	58	5290	13.50	13.35	0.000	0.000	12	
Edge 3	802.11ac 80	0	58	5290	13.50	13.35	0.419	0.434	13	
Edge 4	802.11ac 80	0	58	5290	13.50	13.35	0.046	0.048	14	

#### Auxiliary Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Bottom face	802.11ac 80	0	58	5290	13.50	13.27	0.109	0.115	15	
Edge 1	802.11ac 80	0	58	5290	13.50	13.27	0.006	0.006	16	
Edge 4	802.11ac 80	0	58	5290	13.50	13.27	0.336	0.354	17	

#### Note(s):

1. Highest reported SAR is  $\leq 0.4$  W/kg. Therefore, further SAR measurements within this exposure condition are not required.
2. Highest reported SAR is  $> 0.4$  W/kg. Due to the highest reported SAR for this test position, other test positions in standalone exposure condition were evaluated until a SAR  $\leq 0.8$  W/kg was reported.
3. 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.

### 13.4. Wi-Fi 5.5 GHz Band

#### Main Antenna

#### Initial test configuration

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Bottom face	802.11ac 80	0	106	5530	13.50	13.33	0.127	0.132	18	
			122	5610	13.50	13.25				
			138	5690	13.50	13.33				
Edge 1	802.11ac 80	0	106	5530	13.50	13.33	0.000	0.000	19	
			122	5610	13.50	13.25				
			138	5690	13.50	13.33				
Edge 3	802.11ac 80	0	106	5530	13.50	13.33	0.354	0.368	20	
			122	5610	13.50	13.25				
			138	5690	13.50	13.33				
Edge 4	802.11ac 80	0	106	5530	13.50	13.33	0.035	0.036	21	
			122	5610	13.50	13.25				
			138	5690	13.50	13.33				

#### Auxiliary Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Bottom face	802.11ac 80	0	106	5530	13.50	13.45	0.154	0.156	22	
			122	5610	13.50	13.28				
			138	5690	13.50	13.40				
Edge 1	802.11ac 80	0	106	5530	13.50	13.45	0.020	0.020	23	
			122	5610	13.50	13.28				
			138	5690	13.50	13.40				
Edge 4	802.11ac 80	0	106	5530	13.50	13.45	0.430	0.435	24	
			122	5610	13.50	13.28				
			138	5690	13.50	13.40				

#### Note(s):

1. Highest reported SAR is  $\leq 0.4$  W/kg. Therefore, further SAR measurements within this exposure condition are not required.
2. Highest reported SAR is  $> 0.4$  W/kg. Due to the highest reported SAR for this test position, other test positions in standalone exposure condition were evaluated until a SAR  $\leq 0.8$  W/kg was reported.
3. 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.



### 13.5. Wi-Fi 5.8 GHz Band

#### Main Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Bottom face	802.11ac 80	0	155	5775	13.50	13.45	0.114	0.115	25	
Edge 1	802.11ac 80	0	155	5775	13.50	13.45	0.000	0.000	26	
Edge 3	802.11ac 80	0	155	5775	13.50	13.45	0.333	0.337	27	
Edge 4	802.11ac 80	0	155	5775	13.50	13.45	0.020	0.020	28	

#### Auxiliary Antenna

Test Position	Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Power (dBm)		1-g SAR (W/kg)		Plot No.	Note
					Tune-up limit	Meas.	Meas.	Scaled		
Bottom face	802.11ac 80	0	155	5775	13.50	13.34	0.162	0.168	29	
Edge 1	802.11ac 80	0	155	5775	13.50	13.34	0.013	0.013	30	
Edge 4	802.11ac 80	0	155	5775	13.50	13.34	0.512	0.531	31	

**Note(s):**

- Highest reported SAR is  $\leq 0.4$  W/kg. Therefore, further SAR measurements within this exposure condition are not required.
- Highest reported SAR is  $> 0.4$  W/kg. Due to the highest reported SAR for this test position, other test positions in standalone exposure condition were evaluated until a SAR  $\leq 0.8$  W/kg was reported.
- 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.

### 13.6. Summary of Highest SAR Values

Technology/ Band	Test configuration			Mode	Dist. (mm)	Freq. (Mhz)	Power (dBm)	1g SAR (W/kg)
	Transmit Antenna	Exposure	Position					
Wi-Fi 2.4 GHz	Auxiliary	Body	Edge 4	802.11b	0	2412	14.98	0.707
Bluetooth	Auxiliary	Body	Edge 4	DH5	0	2480	4.02	0.081
Wi-Fi 5.3 GHz	Main	Body	Edge 3	802.11ac80	0	5290	13.35	0.434
Wi-Fi 5.5 GHz	Auxiliary	Body	Edge 4	802.11ac80	0	5530	13.45	0.435
Wi-Fi 5.8 GHz	Auxiliary	Body	Edge 4	802.11ac80	0	5775	13.34	0.531

Results for the highest scaled SAR values in each frequency band and mode.

### 13.7. SAR Measurement Variability and Uncertainty

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz v01. 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.

Repeated measurement was not performed since the original highest measured SAR is < 0.80 W/kg

Wireless Technologies	Test Configuration			Mode	Dist. (mm)	Ch #.	Freq. (MHz)	Meas. SAR (W/kg)		Largest to Smallest SAR Ratio	Plot No.
	Transmit Antenna	Exposure	Position					Original	Repeated		
Wi-Fi 2.4 GHz	Auxiliary	Body	Edge 4	802.11b	0	1	2412	0.704	N/A	N/A	-
Bluetooth	Auxiliary	Body	Edge 4	DH5	0	78	2480	0.065	N/A	N/A	-
Wi-Fi 5.3 GHz	Main	Body	Edge 3	802.11ac80 VHT0	0	58	5290	0.419	N/A	N/A	-
Wi-Fi 5.5 GHz	Auxiliary	Body	Edge 4	802.11ac80 VHT0	0	106	5530	0.430	N/A	N/A	-
Wi-Fi 5.8 GHz	Auxiliary	Body	Edge 4	802.11ac80 VHT0	0	155	5775	0.512	N/A	N/A	-

**Note(s):**

Repeated Measurement is not required since the original highest measured SAR for all band is < 0.80 W/kg.

## **14. Appendixes**

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

- 14.1. System Performance Check Plots**
- 14.2. SAR Test Plots for Wi-Fi 2.4 GHz Band**
- 14.3. SAR Test Plots for Bluetooth**
- 14.4. SAR Test Plots for Wi-Fi 5.3 GHz Bands**
- 14.5. SAR Test Plots for Wi-Fi 5.5 GHz Bands**
- 14.6. SAR Test Plots for Wi-Fi 5.8 GHz Bands**
- 14.7. Simultaneous Transmission SAR Analysis**
- 14.8. Calibration Certificate for E-Field Probe EX3DV4 - SN 3922**
- 14.9. Calibration Certificate for D2450V2 - SN 713**
- 14.10. Calibration Certificate for D5GHzV2 - SN 1020**
- 14.11. SAR Tissue Ingredients**