



SAR EVALUATION REPORT

PERMISSIVE CHANGE

**FCC 47 CFR § 2.1093
IEEE 1528:2013**

For
Radio Module
(Tested inside of Panasonic Tablet PC FZ-G2)

**FCC ID: ACJ9TGWL22A
Model Name: WL22A**

**Report Number: R14206457-S1V3
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Revision History



Rev.	Date	Revisions	Revised By
V1	8/23/2022	Initial Issue	--
V2	8/25/2022	Updated FCC ID to ACJ9TGWL22A, and model to WL22A	Richard Jankovics
V3	9/1/2022	Updated Battery Cover description in § 6.1	Richard Jankovics

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1. Attestation of Test Results

Applicant Name	Panasonic Corporation of North America			
FCC ID	ACJ9TGWL22A			
Model Name	WL22A			
Applicable Standards	Published RF exposure KDB procedures IEEE 1528:2013			
Exposure Category	SAR Limits (W/Kg)			
	Peak spatial-average (1g of tissue)		Extremities (hands, wrists, ankles, etc.) (10g of tissue)	
General population / Uncontrolled exposure	1.6		4	
RF Exposure Conditions	Highest Reported SAR (W/kg)			
	DTS	NII (5 GHz)	NII (6 GHz)	DSS
Body	0.925	0.854	0.428	0.138
Simultaneous Tx	1.076	1.209	0.703	0.573
Date Tested	2022-03-31 to 2022-07-01			
Test Results	Pass			
<p>UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.</p> <p>This report contains data provided by the customer which can impact the validity of results. UL LLC is only responsible for the validity of results after the integration of the data provided by the customer.</p> <p>The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.</p> <p>This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC 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 A2LA, NIST, or any agency of the U.S. Government, or any agency of the U.S. government.</p>				
Approved & Released By:		Prepared By:		
				
Dave Weaver Operations Leader UL Verification Services Inc.		Richard Jankovics Operations Leader UL LLC		

2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE 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
- 447498 D03 Supplement C Cross-Reference v01
- 616217 D04 SAR for laptop and tablets v01r02
- 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 2015; RF Exposure Procedures (KDB 941225 D05A)
- TCB Workshop October 2016; RF Exposure Procedures (Bluetooth Duty Factor)
- TCB Workshop October 2016; RF Exposure Procedures (DUT Holder Perturbations)
- TCB Workshop May 2017; RF Exposure Procedures (Broadband Liquid Above 3 GHz)
- TCB Workshop April 2019; RF Exposure Procedures (Tissue Simulating Liquids (TSL))
- TCB Workshop April 2019; RF Exposure Procedures (802.11ax SAR Testing)

3. Facilities and Accreditation

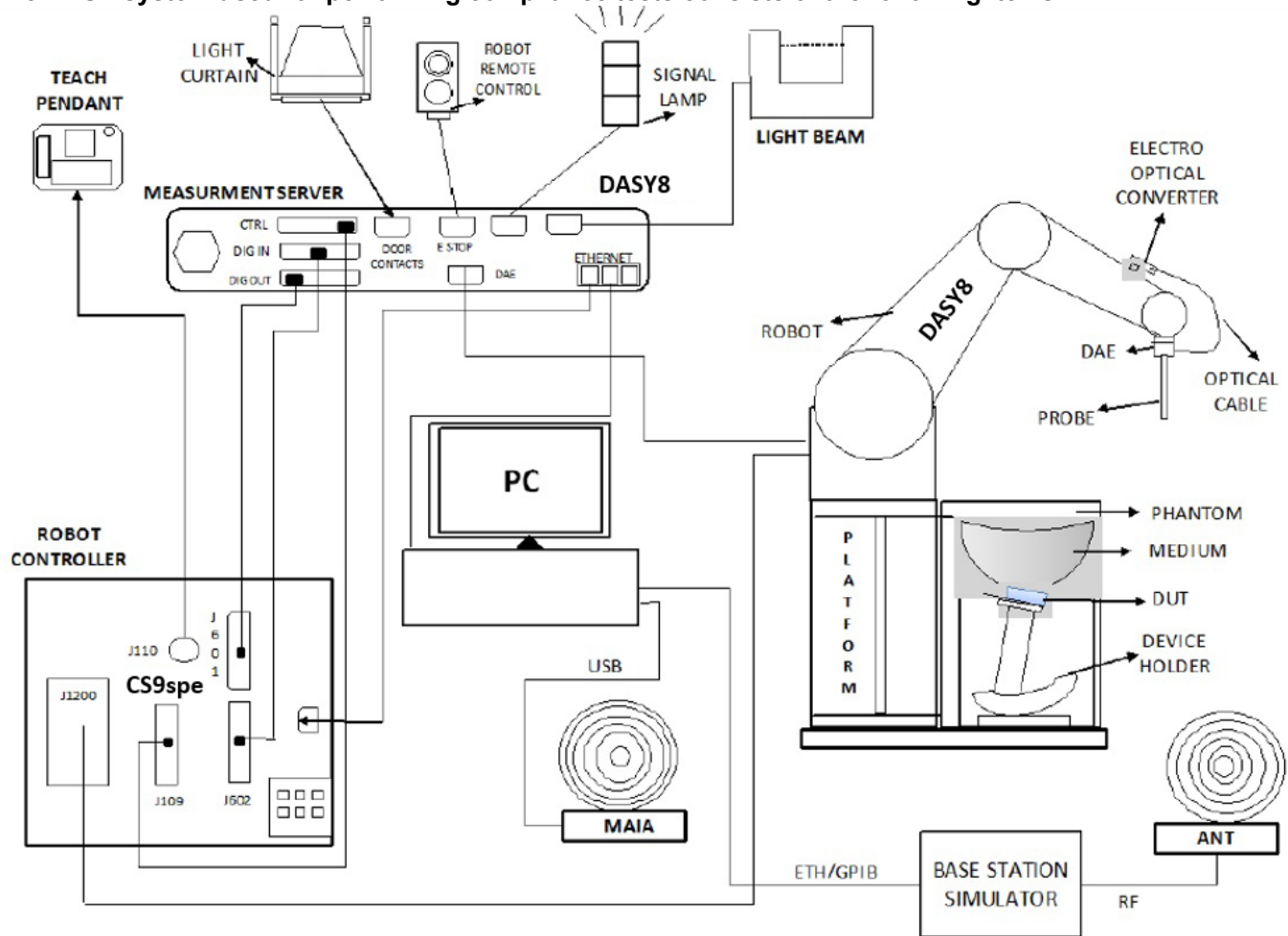
UL LLC is accredited by A2LA, cert. # 0751.06 for all testing performed within the scope of this report. Testing was performed at the locations noted below.

	Address	ISED CABID	ISED Company Number	FCC Registration
<input type="checkbox"/>	Building: 12 Laboratory Dr RTP, NC 27709, U.S.A	US0067	2180C	825374
<input checked="" type="checkbox"/>	Building: 2800 Perimeter Park Dr. Suite B Morrisville, NC 27560, U.S.A	US0067	27265	825374

4. SAR Measurement System & Test Equipment

4.1. SAR Measurement System

The DASY 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 Win7, Win10 and the DASY52¹ and DASY8² 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.

¹ DASY52 software used: DASY52.10.4 & S 14.6.14 and older generations.

² DASY8 software used: DASY16.0.0 and older generations.

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 IEC/IEEE 62209-1528, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

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

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

Step 3: Zoom Scan

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

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

		≤ 3 GHz	> 3 GHz	
Maximum zoom scan spatial resolution: $\Delta x_{Zoom}, \Delta y_{Zoom}$		≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*	
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$	≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm	
	graded grid	$\Delta z_{Zoom}(1)$: between 1 st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z	≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm	
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.				
* When zoom scan is required and the <i>reported</i> SAR from the <i>area scan based 1-g SAR estimation</i> procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

Step 4: Power drift measurement

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

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	Copper Mountain Technologies	R140	190514	5/19/2023
Network Analyzer	Keysight	E5063A	MY54100681	8/20/2022
Dielectric Probe	SPEAG	DAKS-3.5	1051	11/16/2022
Shorting Block	SPEAG	DAK-3.5 Short	SM DAK 200 DA	11/16/2022
Dielectric Probe	SPEAG	DAKS-12	1038	3/14/2023
Shorting Block	SPEAG	DAK-12 Short	SM DAK 220 AA	3/14/2023
Thermometer	Fisher Scientific	15-078-181	210204689	3/13/2023

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Signal Generator	Keysight	N5181A	MY50140788	12/9/2022
Signal Generator	Keysight	N5182B	MY61252718	12/6/2022
Signal Generator	Agilent	83640B	3844A00978	8/18/2022
Signal Generator	Rohde & Schwarz	SMA100B	105115	4/18/2023
Signal Generator	Keysight	N5182B	MY51350128	5/19/2023
Power Meter	Keysight	N1912A	MY55136012	7/16/2022
Power Sensor ¹	Keysight	N1921A	MY55090030	5/27/2022
Power Sensor	Keysight	N1921A	MY55090025	9/7/2022
Amplifier	Amplical	AMP0.4G6-34-27	150507	N/A
Amplifier	MITEQ	AMF-4D-00400600-50-30P	N/A	N/A
Directional coupler	Werlatone, Inc.	C8060-102	3266	N/A
Directional coupler	Mini-Circuits	ZUDC10-183+	1438	NA
DC Power Supply	Miteq	PS 15V1	1990186	N/A

Note(s):

1. Equipment not used past calibration due date.

Lab Equipment

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
E-Field Probe	SPEAG	EX3DV4	3989	1/19/2023
E-Field Probe ¹	SPEAG	EX3DV4	7569	4/26/2022
E-Field Probe	SPEAG	EX3DV4	3686	1/18/2023
E-Field Probe	SPEAG	EX3DV4	7711	3/11/2023
E-Field Probe	SPEAG	EX3DV4	7709	2/25/2023
Data Acquisition Electronics	SPEAG	DAE4	1716	3/8/2023
Data Acquisition Electronics	SPEAG	DAE4	1714	2/23/2023
Data Acquisition Electronics	SPEAG	DAE4	1259	8/19/2022
Data Acquisition Electronics	SPEAG	DAE4	1439	8/11/2022
System Validation Dipole	SPEAG	D2450V2	963	10/6/2022
System Validation Dipole	SPEAG	D5GHzV2	1213	10/12/2022
System Validation Dipole	SPEAG	D6500V2	1068	3/11/2023
Environmental Indicator	Control Company	06-662-4	200037610	2/24/2023
Environmental Indicator	Control Company	06-662-4	200037635	2/24/2023

Note(s):

1. Equipment not used past calibration due date.

Other

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
Power Meter ¹	Keysight	N1911A	MY55116001	6/17/2022
Power Meter	Keysight	N1911A	MT55116002	8/30/2022
Power Meter	Keysight	N1911A	MY55116003	8/17/2022
Power Meter	Keysight	N1912A	MY55116004	7/27/2022
Power Sensor	Keysight	N1921A	MY55120011	7/16/2022
Power Sensor	Keysight	N1921A	MY55090047	12/17/2022

Note(s):

1. Equipment not used past calibration due date.

5. Measurement Uncertainty

Measurement uncertainty for 300 MHz to 3 GHz

a	b	c	d	e f(d,k)	f	g	h = c×f/e	l = c×g/e
Uncertainty component	Reference	Tol. (±%)	Prob. Dist.	Div.	ci (1 g)	ci (10 g)	1 g ui (± %)	10 g ui (± %)
Measurement System								
Probe Calibration	E.2.1	6.00	Normal	1	1	1	6.00	6.00
Axial Isotropy	E.2.2	1.15	Rectangular	1.732	0.7	0.7	0.46	0.46
Hemispherical Isotropy	E.2.2	2.30	Rectangular	1.732	0.7	0.7	0.93	0.93
Boundary Effect	E.2.3	0.90	Rectangular	1.732	1	1	0.52	0.52
Linearity	E.2.4	3.45	Rectangular	1.732	1	1	1.99	1.99
System Detection Limits	E.2.4	1.00	Rectangular	1.732	1	1	0.58	0.58
Modulation Response	E.2.5	2.40	Rectangular	1.732	1	1	1.39	1.39
Readout Electronics	E.2.6	0.30	Normal	1	1	1	0.30	0.30
Response Time	E.2.7	0.80	Rectangular	1.732	1	1	0.46	0.46
Integration Time	E.2.8	2.60	Rectangular	1.732	1	1	1.50	1.50
RF Ambient Conditions—noise	E.6.1	3.00	Rectangular	1.732	1	1	1.73	1.73
RF Ambient Conditions—reflections	E.6.1	3.00	Rectangular	1.732	1	1	1.73	1.73
Probe Positioner Mechanical Tolerance	E.6.2	0.80	Rectangular	1.732	1	1	0.46	0.46
Probe Positioning with Respect to Phantom shell	E.6.3	6.70	Rectangular	1.732	1	1	3.87	3.87
Extrapolation, Interpolation, and Integration Algorithms for max. SAR Evaluation	E.5	4.00	Rectangular	1.732	1	1	2.31	2.31
Test Sample Related								
Test Sample Positioning	E.4.2	2.90	Normal	1	1	1	2.90	2.90
Device Holder Uncertainty	E.4.1	3.60	Normal	1	1	1	3.60	3.60
Output Power Variation—SAR drift measurement	E.2.9	5.00	Rectangular	1.732	1	1	2.89	2.89
SAR Scaling	E.6.5	0.00	Rectangular	1.732	1	1	0.00	0.00
Phantom and Tissue Parameters								
Phantom Uncertainty—shape, thickness and permittivity	E.3.1	7.90	Rectangular	1.732	1	1	4.56	4.56
Uncertainty in SAR Correction for Deviations in Permittivity and Conductivity	E.3.2	1.90	Normal	1	1	0.84	1.90	1.60
Liquid Conductivity - measurement	E.3.3	4.76	Normal	1	0.78	0.71	3.71	3.38
Liquid Permittivity - measurement	E.3.3	7.78	Normal	1	0.23	0.26	1.79	2.02
Liquid Conductivity - temperature uncertainty	E.3.4	3.40	Rectangular	1.732	0.78	0.71	1.53	1.39
Liquid Permittivity - temperature uncertainty	E.3.4	0.40	Rectangular	1.732	0.23	0.26	0.05	0.06
Combined Standard Uncertainty Uc(y) =	RSS						11.94	11.86
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =							23.87	23.72

Measurement uncertainty for 3 GHz to 6 GHz

a	b	c	d	e f(d,k)	f	g	h = c×f/e	l = c×g/e
Uncertainty component	Reference	Tol. (±%)	Prob. Dist.	Div.	ci (1 g)	ci (10 g)	1 g ui (± %)	10 g ui (± %)
Measurement System								
Probe Calibration	E.2.1	6.55	Normal	1	1	1	6.55	6.55
Axial Isotropy	E.2.2	1.15	Rectangular	1.732	0.7	0.7	0.46	0.46
Hemispherical Isotropy	E.2.2	2.30	Rectangular	1.732	0.7	0.7	0.93	0.93
Boundary Effect	E.2.3	0.90	Rectangular	1.732	1	1	0.52	0.52
Linearity	E.2.4	3.45	Rectangular	1.732	1	1	1.99	1.99
System Detection Limits	E.2.4	1.00	Rectangular	1.732	1	1	0.58	0.58
Modulation Response	E.2.5	2.40	Rectangular	1.732	1	1	1.39	1.39
Readout Electronics	E.2.6	0.30	Normal	1	1	1	0.30	0.30
Response Time	E.2.7	0.80	Rectangular	1.732	1	1	0.46	0.46
Integration Time	E.2.8	2.60	Rectangular	1.732	1	1	1.50	1.50
RF Ambient Conditions—noise	E.6.1	3.00	Rectangular	1.732	1	1	1.73	1.73
RF Ambient Conditions—reflections	E.6.1	3.00	Rectangular	1.732	1	1	1.73	1.73
Probe Positioner Mechanical Tolerance	E.6.2	0.80	Rectangular	1.732	1	1	0.46	0.46
Probe Positioning with Respect to Phantom shell	E.6.3	6.70	Rectangular	1.732	1	1	3.87	3.87
Extrapolation, Interpolation, and Integration Algorithms for max. SAR Evaluation	E.5	4.00	Rectangular	1.732	1	1	2.31	2.31
Test Sample Related								
Test Sample Positioning	E.4.2	2.90	Normal	1	1	1	2.90	2.90
Device Holder Uncertainty	E.4.1	3.60	Normal	1	1	1	3.60	3.60
Output Power Variation—SAR drift measurement	E.2.9	5.00	Rectangular	1.732	1	1	2.89	2.89
SAR Scaling	E.6.5	0.00	Rectangular	1.732	1	1	0.00	0.00
Phantom and Tissue Parameters								
Phantom Uncertainty—shape, thickness and permittivity	E.3.1	7.90	Rectangular	1.732	1	1	4.56	4.56
Uncertainty in SAR Correction for Deviations in Permittivity and Conductivity	E.3.2	1.90	Normal	1	1	0.84	1.90	1.60
Liquid Conductivity - measurement	E.3.3	-4.36	Normal	1	0.78	0.71	3.40	3.10
Liquid Permittivity - measurement	E.3.3	-4.73	Normal	1	0.23	0.26	1.09	1.23
Liquid Conductivity - temperature uncertainty	E.3.4	3.40	Rectangular	1.732	0.78	0.71	1.53	1.39
Liquid Permittivity - temperature uncertainty	E.3.4	0.40	Rectangular	1.732	0.23	0.26	0.05	0.06
Combined Standard Uncertainty Uc(y) =	RSS						12.05	11.96
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =							24.10	23.92

6. Device Under Test (DUT) Information

6.1. DUT Description

Device Dimension	Overall (Length x Width): 280.4 mm x 198.8 mm Overall Diagonal: 318 mm Display Diagonal: 281 mm This is a Tablet / laptop device (overall diagonal dimension of the keyboard and/or display section of a laptop or tablet is > 20 cm)		
Back Cover	Normal Battery Cover (cover integrated with battery)		
Battery Options	Standard – Lithium-ion battery, Rating 11.4 Vdc, 50 Wh		
Wireless Router (Hotspot)	Wi-Fi Hotspot mode permits the device to share its cellular data connection with other Wi-Fi-enabled devices. <input checked="" type="checkbox"/> Mobile Hotspot (Wi-Fi 2.4 GHz) <input checked="" type="checkbox"/> Mobile Hotspot (Wi-Fi 5 GHz (except DFS band))		
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 (except DFS band))		
Bluetooth Tethering (Hotspot)	BT Tethering mode permits the device to share its cellular data connection with other devices. <input checked="" type="checkbox"/> BT Tethering (Bluetooth 2.4 GHz)		
Test sample information	S/N	IMEI	Notes
	1JTSA76420	N/A	WLAN/BT Radiated/Conducted
	1JTSA76448	N/A	WLAN Radiated/Conducted
	1JTSA76422	N/A	WLAN Conducted
Hardware Version	N/A		
Software Version	DRTU.00514.22.110.0		

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) 802.11n (HT40)	99.3% ^{(802.11b) 1}
	5 GHz	802.11a 802.11n (HT20) 802.11n (HT40) 802.11ac (VHT20) 802.11ac (VHT40) 802.11ac (VHT80) 802.11ac (VHT160) 802.11ax (HE20) 802.11ax (HE40) 802.11ax (HE80) 802.11ax (HE160)	97.7% ^{(802.11a) 2} 99.4% ^{(802.11ac 80MHz BW) 2} 99.1% ^{(802.11ac 160MHz BW) 2}
	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		
	6 GHz	802.11ax (HE20) 802.11ax (HE40) 802.11ax (HE80) 802.11ax (HE160)	98.5% ^{(802.11ax 160MHz BW) 3}
Bluetooth	2.4 GHz	BR, EDR, LE, and HDR	76.8% ⁴

Notes:

1. Refer to §9.1 for WLAN 2.4GHz Duty Cycle Measurements
2. Refer to §9.2 for WLAN 5GHz Duty Cycle Measurements
3. Refer to §9.3 for WLAN 6GHz Duty Cycle Measurements
4. Refer to §9.4 for Bluetooth Duty Cycle Measurement

7. RF Exposure Conditions (Test Configurations)

Refer to Appendix A for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

7.1. Standalone SAR Test Exclusion Considerations

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

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

SAR Test Exclusion Calculations for WLAN

Tablet Mode

Antennas < 50mm to adjacent edges

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
WLAN #1 Antenna															
Wi-Fi 2.4 GHz	2472	14.50	28	21.1	3.8	214.8	181.3	29		2.1 -EXEMPT-	8.8 -MEASURE-	> 50 mm	> 50 mm	1.5 -EXEMPT-	
Wi-Fi 5.2 GHz	5240	13.00	20	21.1	3.8	214.8	181.3	29		2.2 -EXEMPT-	9.2 -MEASURE-	> 50 mm	> 50 mm	1.6 -EXEMPT-	
Wi-Fi 5.3 GHz	5320	13.00	20	21.1	3.8	214.8	181.3	29		2.2 -EXEMPT-	9.2 -MEASURE-	> 50 mm	> 50 mm	1.6 -EXEMPT-	
Wi-Fi 5.5 GHz	5700	13.00	20	21.1	3.8	214.8	181.3	29		2.3 -EXEMPT-	9.5 -MEASURE-	> 50 mm	> 50 mm	1.6 -EXEMPT-	
Wi-Fi 5.8 GHz	5825	13.00	20	21.1	3.8	214.8	181.3	29		2.3 -EXEMPT-	9.7 -MEASURE-	> 50 mm	> 50 mm	1.7 -EXEMPT-	
Wi-Fi 6E 5	6345	11.50	14	21.1	3.8	214.8	181.3	29		1.7 -EXEMPT-	7.1 -MEASURE-	> 50 mm	> 50 mm	1.2 -EXEMPT-	
Wi-Fi 6E 6	6505	11.50	14	21.1	3.8	214.8	181.3	29		1.7 -EXEMPT-	7.1 -MEASURE-	> 50 mm	> 50 mm	1.2 -EXEMPT-	
Wi-Fi 6E 7	6825	11.50	14	21.1	3.8	214.8	181.3	29		1.7 -EXEMPT-	7.3 -MEASURE-	> 50 mm	> 50 mm	1.3 -EXEMPT-	
Wi-Fi 6E 8	6985	11.75	15	21.1	3.8	214.8	181.3	29		1.9 -EXEMPT-	7.9 -MEASURE-	> 50 mm	> 50 mm	1.4 -EXEMPT-	
WLAN #2 Antenna															
Wi-Fi 2.4 GHz	2472	14.50	28	5.5	9.2	58.7	181.3	191.7		7.3 -MEASURE-	4.9 -MEASURE-	> 50 mm	> 50 mm	> 50 mm	
Wi-Fi 5.2 GHz	5240	10.50	11	5.5	9.2	58.7	181.3	191.7		4.2 -MEASURE-	2.8 -EXEMPT-	> 50 mm	> 50 mm	> 50 mm	
Wi-Fi 5.3 GHz	5320	10.50	11	5.5	9.2	58.7	181.3	191.7		4.2 -MEASURE-	2.8 -EXEMPT-	> 50 mm	> 50 mm	> 50 mm	
Wi-Fi 5.5 GHz	5700	10.50	11	5.5	9.2	58.7	181.3	191.7		4.4 -MEASURE-	2.9 -EXEMPT-	> 50 mm	> 50 mm	> 50 mm	
Wi-Fi 5.8 GHz	5825	10.00	10	5.5	9.2	58.7	181.3	191.7		4 -MEASURE-	2.7 -EXEMPT-	> 50 mm	> 50 mm	> 50 mm	
Wi-Fi 6E 5	6345	6.75	5	5.5	9.2	58.7	181.3	191.7		2.1 -EXEMPT-	1.4 -EXEMPT-	> 50 mm	> 50 mm	> 50 mm	
Wi-Fi 6E 6	6505	7.25	5	5.5	9.2	58.7	181.3	191.7		2.1 -EXEMPT-	1.4 -EXEMPT-	> 50 mm	> 50 mm	> 50 mm	
Wi-Fi 6E 7	6825	7.25	5	5.5	9.2	58.7	181.3	191.7		2.2 -EXEMPT-	1.5 -EXEMPT-	> 50 mm	> 50 mm	> 50 mm	
Wi-Fi 6E 8	6985	7.75	6	5.5	9.2	58.7	181.3	191.7		2.6 -EXEMPT-	1.8 -EXEMPT-	> 50 mm	> 50 mm	> 50 mm	
Bluetooth	2480	10.50	11	5.5	9.2	58.7	181.3	191.7		2.9 -EXEMPT-	1.9 -EXEMPT-	> 50 mm	> 50 mm	> 50 mm	

Note(s):

1. According to KDB 447498, if the calculated threshold value is >3 then SAR testing is required.
2. Tilt positions for the Rear surface were also considered, as the rear surface has a tiered shape allowing closer positioning to the body near the edges when tilted.

Tablet Mode

Antennas > 50mm to adjacent edges

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)						Calculated Threshold Value					
		dBm	mW	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front	Rear	Edge 1	Edge 2	Edge 3	Edge 4	Front
WLAN #1 Antenna															
Wi-Fi 2.4 GHz	2462	14.50	28	21.1	3.8	214.8	181.3	29		< 50 mm	< 50 mm	1743.6 mW -EXEMPT-	1408.6 mW -EXEMPT-	< 50 mm	
Wi-Fi 5.2 GHz	5240	13.00	20	21.1	3.8	214.8	181.3	29		< 50 mm	< 50 mm	1713.5 mW -EXEMPT-	1378.5 mW -EXEMPT-	< 50 mm	
Wi-Fi 5.3 GHz	5320	13.00	20	21.1	3.8	214.8	181.3	29		< 50 mm	< 50 mm	1713 mW -EXEMPT-	1378 mW -EXEMPT-	< 50 mm	
Wi-Fi 5.5 GHz	5700	13.00	20	21.1	3.8	214.8	181.3	29		< 50 mm	< 50 mm	1719.8 mW -EXEMPT-	1375.8 mW -EXEMPT-	< 50 mm	
Wi-Fi 5.8 GHz	5825	13.00	20	21.1	3.8	214.8	181.3	29		< 50 mm	< 50 mm	1710.2 mW -EXEMPT-	1375.2 mW -EXEMPT-	< 50 mm	
Wi-Fi 6E 5	6345	11.50	14	21.1	3.8	214.8	181.3	29		< 50 mm	< 50 mm	1707.5 mW -EXEMPT-	1372.5 mW -EXEMPT-	< 50 mm	
Wi-Fi 6E 6	6505	11.50	14	21.1	3.8	214.8	181.3	29		< 50 mm	< 50 mm	1706.8 mW -EXEMPT-	1371.8 mW -EXEMPT-	< 50 mm	
Wi-Fi 6E 7	6825	11.50	14	21.1	3.8	214.8	181.3	29		< 50 mm	< 50 mm	1705.4 mW -EXEMPT-	1370.4 mW -EXEMPT-	< 50 mm	
Wi-Fi 6E 8	6985	11.75	15	21.1	3.8	214.8	181.3	29		< 50 mm	< 50 mm	1704.8 mW -EXEMPT-	1369.8 mW -EXEMPT-	< 50 mm	
WLAN #2 Antenna															
Wi-Fi 2.4 GHz	2462	14.50	28	5.5	9.2	58.7	181.3	191.7		< 50 mm	< 50 mm	182.6 mW -EXEMPT-	1408.6 mW -EXEMPT-	1512.6 mW -EXEMPT-	
Wi-Fi 5.2 GHz	5240	10.50	11	5.5	9.2	58.7	181.3	191.7		< 50 mm	< 50 mm	152.5 mW -EXEMPT-	1378.5 mW -EXEMPT-	1482.5 mW -EXEMPT-	
Wi-Fi 5.3 GHz	5320	10.50	11	5.5	9.2	58.7	181.3	191.7		< 50 mm	< 50 mm	152 mW -EXEMPT-	1378 mW -EXEMPT-	1482 mW -EXEMPT-	
Wi-Fi 5.5 GHz	5700	10.50	11	5.5	9.2	58.7	181.3	191.7		< 50 mm	< 50 mm	149.8 mW -EXEMPT-	1375.8 mW -EXEMPT-	1479.8 mW -EXEMPT-	
Wi-Fi 5.8 GHz	5825	10.00	10	5.5	9.2	58.7	181.3	191.7		< 50 mm	< 50 mm	149.2 mW -EXEMPT-	1375.2 mW -EXEMPT-	1479.2 mW -EXEMPT-	
Wi-Fi 6E 5	6345	6.75	5	5.5	9.2	58.7	181.3	191.7		< 50 mm	< 50 mm	146.5 mW -EXEMPT-	1372.5 mW -EXEMPT-	1476.5 mW -EXEMPT-	
Wi-Fi 6E 6	6505	7.25	5	5.5	9.2	58.7	181.3	191.7		< 50 mm	< 50 mm	145.8 mW -EXEMPT-	1371.8 mW -EXEMPT-	1475.8 mW -EXEMPT-	
Wi-Fi 6E 7	6825	7.25	5	5.5	9.2	58.7	181.3	191.7		< 50 mm	< 50 mm	144.4 mW -EXEMPT-	1370.4 mW -EXEMPT-	1474.4 mW -EXEMPT-	
Wi-Fi 6E 8	6985	7.75	6	5.5	9.2	58.7	181.3	191.7		< 50 mm	< 50 mm	143.8 mW -EXEMPT-	1369.8 mW -EXEMPT-	1473.8 mW -EXEMPT-	
Bluetooth	2480	10.50	11	5.5	9.2	58.7	181.3	191.7		< 50 mm	< 50 mm	182.3 mW -EXEMPT-	1408.3 mW -EXEMPT-	1512.3 mW -EXEMPT-	

Note(s):

1. According to KDB 447498, if the calculated Power threshold is less than the output power then SAR testing is required.
2. Tilt positions for the Rear surface were also considered, as the rear surface has a tiered shape allowing closer positioning to the body near the edges when tilted.

Laptop Mode**Antennas < 50mm to adjacent edges**

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)	Calculated Threshold Value
		dBm	mW	Bottom	Bottom
WLAN #1 Antenna					
Wi-Fi 2.4 GHz	2462	21.00	126	227.5	> 50 mm
Wi-Fi 5.2 GHz	5240	21.00	126	227.5	> 50 mm
Wi-Fi 5.3 GHz	5320	21.00	126	227.5	> 50 mm
Wi-Fi 5.5 GHz	5700	20.00	100	227.5	> 50 mm
Wi-Fi 5.8 GHz	5825	19.50	89	227.5	> 50 mm
Wi-Fi 6E 5	6345	13.50	22	227.5	> 50 mm
Wi-Fi 6E 6	6505	13.50	22	227.5	> 50 mm
Wi-Fi 6E 7	6825	13.25	21	227.5	> 50 mm
Wi-Fi 6E 8	6985	13.25	21	227.5	> 50 mm
WLAN #2 Antenna					
Wi-Fi 2.4 GHz	2462	21.00	126	227.5	> 50 mm
Wi-Fi 5.2 GHz	5240	21.00	126	227.5	> 50 mm
Wi-Fi 5.3 GHz	5320	21.00	126	227.5	> 50 mm
Wi-Fi 5.5 GHz	5700	20.00	100	227.5	> 50 mm
Wi-Fi 5.8 GHz	5825	19.50	89	227.5	> 50 mm
Wi-Fi 6E 5	6345	13.50	22	227.5	> 50 mm
Wi-Fi 6E 6	6505	13.50	22	227.5	> 50 mm
Wi-Fi 6E 7	6825	13.25	21	227.5	> 50 mm
Wi-Fi 6E 8	6985	13.25	21	227.5	> 50 mm
Bluetooth	2480	10.50	11	227.5	> 50 mm

Note(s):

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

Laptop Mode

Antennas > 50mm to adjacent edges

Tx Interface	Frequency (MHz)	Output Power		Separation Distances (mm)	Calculated Threshold Value
		dBm	mW	Rear	Rear
WLAN #1 Antenna					
Wi-Fi 2.4 GHz	2462	21.00	126	227.5	1870.6 mW -EXEMPT-
Wi-Fi 5.2 GHz	5240	21.00	126	227.5	1840.5 mW -EXEMPT-
Wi-Fi 5.3 GHz	5320	21.00	126	227.5	1840 mW -EXEMPT-
Wi-Fi 5.5 GHz	5700	20.00	100	227.5	1837.8 mW -EXEMPT-
Wi-Fi 5.8 GHz	5825	19.50	89	227.5	1837.2 mW -EXEMPT-
Wi-Fi 6E 5	6345	13.50	22	227.5	1834.5 mW -EXEMPT-
Wi-Fi 6E 6	6505	13.50	22	227.5	1833.8 mW -EXEMPT-
Wi-Fi 6E 7	6825	13.25	21	227.5	1832.4 mW -EXEMPT-
Wi-Fi 6E 8	6985	13.25	21	227.5	1831.8 mW -EXEMPT-
WLAN #2 Antenna					
Wi-Fi 2.4 GHz	2462	21.00	126	227.5	1870.6 mW -EXEMPT-
Wi-Fi 5.2 GHz	5240	21.00	126	227.5	1840.5 mW -EXEMPT-
Wi-Fi 5.3 GHz	5320	21.00	126	227.5	1840 mW -EXEMPT-
Wi-Fi 5.5 GHz	5700	20.00	100	227.5	1837.8 mW -EXEMPT-
Wi-Fi 5.8 GHz	5825	19.50	89	227.5	1837.2 mW -EXEMPT-
Wi-Fi 6E 5	6345	13.50	22	227.5	1834.5 mW -EXEMPT-
Wi-Fi 6E 6	6505	13.50	22	227.5	1833.8 mW -EXEMPT-
Wi-Fi 6E 7	6825	13.25	21	227.5	1832.4 mW -EXEMPT-
Wi-Fi 6E 8	6985	13.25	21	227.5	1831.8 mW -EXEMPT-
Bluetooth	2480	10.50	11	227.5	1870.3 mW -EXEMPT-

Note(s):

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

7.2. Required Test Configurations

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

Test Configurations	Tablet							Laptop
	Rear	Rear Tilt (Edge1 side)	Rear Tilt (Edge4 side)	Edge 1	Edge 2	Edge 3	Edge 4	Bottom
				(Top Edge)	(Right Edge)	(Bottom Edge)	(Left Edge)	
WLAN #1 Antenna	Yes	Yes	Yes	Yes	No	No	Yes	No
WLAN #2 Antenna	Yes	Yes	No	Yes	No	No	No	No
Bluetooth	Yes	Yes	No	Yes	No	No	No	No

Note(s):

Yes = Testing is required.

No = Testing is not required.

8. Dielectric Property Measurements & System Check

8.1. Dielectric Property Measurements

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

The dielectric constant (ϵ_r) and conductivity (σ) of typical tissue-equivalent media recipes are expected to be within $\pm 5\%$ of the required target values; but for SAR measurement systems that have implemented the SAR error compensation algorithms documented in IEC/IEEE 62209-1528, to automatically compensate the measured SAR results for deviations between the measured and required tissue dielectric parameters, the tolerance for ϵ_r and σ may be relaxed to $\pm 10\%$. This is limited to frequencies ≤ 3 GHz.

Tissue Dielectric Parameters

FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz

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

Dielectric Property Measurements Results:

SAR Lab	Date	Band (MHz)	Tissue Type	Frequency (MHz)	Relative Permittivity (ϵ_r)			Conductivity (σ)		
					Measured	Target	Delta (%)	Measured	Target	Delta (%)
1A	2022-03-31	2450	Head	2450	37.76	39.20	-3.67	1.81	1.80	0.44
				2400	37.85	39.30	-3.67	1.77	1.75	0.93
				2480	37.72	39.16	-3.68	1.83	1.83	0.03
1A	2022-04-06	2450	Head	2450	37.12	39.20	-5.31	1.82	1.80	1.11
				2400	37.22	39.30	-5.28	1.78	1.75	1.62
				2480	37.08	39.16	-5.32	1.84	1.83	0.41
1A	2022-04-11	5250	Head	5250	36.08	35.93	0.41	4.57	4.70	-2.79
				5150	36.33	36.05	0.78	4.47	4.60	-2.76
				5350	35.97	35.82	0.42	4.76	4.80	-1.01
1A	2022-04-14	5250	Head	5250	36.36	35.93	1.19	4.55	4.70	-3.34
				5150	36.68	36.05	1.76	4.49	4.60	-2.30
				5350	36.24	35.82	1.18	4.78	4.80	-0.57
2A	2022-04-15	5250	Head	5250	37.35	35.93	3.94	4.65	4.70	-1.13
				5150	37.74	36.05	4.70	4.56	4.60	-0.95
				5350	37.36	35.82	4.30	4.88	4.80	1.57
2A	2022-04-19	5250	Head	5250	36.97	35.93	2.89	4.62	4.70	-1.66
				5150	37.28	36.05	3.42	4.55	4.60	-1.08
				5350	36.92	35.82	3.07	4.83	4.80	0.53
2A	2022-04-20	5600	Head	5600	36.08	35.53	1.54	5.06	5.06	-0.06
				5500	36.35	35.65	1.97	4.99	4.96	0.73
				5725	35.70	35.39	0.87	5.26	5.19	1.44
2A	2022-04-25	5750	Head	5750	34.50	35.36	-2.44	5.12	5.21	-1.80
				5700	34.50	35.42	-2.60	5.12	5.16	-0.82
				5850	34.39	35.30	-2.58	5.21	5.32	-2.14
1A	2022-04-26	2450	Head	2450	42.24	39.20	7.76	1.87	1.80	3.89
				2400	42.31	39.30	7.67	1.83	1.75	4.24
				2480	42.21	39.16	7.78	1.90	1.83	3.63
2A	2022-04-26	5600	Head	5600	34.74	35.53	-2.23	4.92	5.06	-2.87
				5500	35.03	35.65	-1.73	4.84	4.96	-2.46
				5725	34.43	35.39	-2.72	5.13	5.19	-1.22
2A	2022-04-28	5250	Head	5250	34.86	35.93	-2.99	4.50	4.70	-4.36
				5150	35.29	36.05	-2.10	4.47	4.60	-2.93
				5350	34.72	35.82	-3.07	4.73	4.80	-1.61
2A	2022-04-29	2450	Head	2450	40.11	39.20	2.32	1.88	1.80	4.28
				2400	40.21	39.30	2.32	1.84	1.75	4.76
				2480	40.07	39.16	2.32	1.90	1.83	3.85
1B	2022-05-02	6500	Head	6500	33.99	34.50	-1.48	6.14	6.07	1.15
				5925	35.01	35.20	-0.54	5.43	5.40	0.57
				7125	32.88	33.80	-2.72	6.91	6.80	1.59

SAR Lab	Date	Band (MHz)	Tissue Type	Frequency (MHz)	Relative Permittivity (ϵ_r)			Conductivity (σ)		
					Measured	Target	Delta (%)	Measured	Target	Delta (%)
2A	2022-05-03	5250	Head	5250	34.93	35.93	-2.79	4.56	4.70	-3.11
				5150	35.11	36.05	-2.60	4.44	4.60	-3.41
				5350	34.74	35.82	-3.01	4.66	4.80	-2.99
2A	2022-05-05	5600	Head	5600	34.56	35.53	-2.74	4.94	5.06	-2.42
				5500	34.75	35.65	-2.52	4.82	4.96	-2.70
				5725	34.35	35.39	-2.94	5.08	5.19	-2.10
1B	2022-05-05	6500	Head	6500	33.62	34.50	-2.55	6.07	6.07	-0.03
				5925	34.64	35.20	-1.59	5.38	5.40	-0.30
				7125	32.54	33.80	-3.73	6.82	6.80	0.22
2A	2022-05-06	5750	Head	5750	34.97	35.36	-1.11	5.17	5.21	-0.80
				5700	35.08	35.42	-0.96	5.12	5.16	-0.77
				5850	34.90	35.30	-1.13	5.24	5.32	-1.47
1A	2022-05-09	6500	Head	6500	33.93	34.50	-1.65	6.24	6.07	2.77
				5925	35.01	35.20	-0.54	5.54	5.40	2.52
				7125	32.80	33.80	-2.96	7.02	6.80	3.19
1A	2022-06-30	6500	Head	6500	33.24	34.50	-3.65	6.01	6.07	-0.94
				5925	34.28	35.20	-2.61	5.32	5.40	-1.50
				7125	32.20	33.80	-4.73	6.76	6.80	-0.63

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 5 mm (above 6 GHz), 10 mm (1-6 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- Distance between probe sensors and phantom surface was set to 3 mm.
For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was recorded and the results are normalized to 1 W input power.

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 $\pm 10\%$ of the manufacturer calibrated dipole SAR target. Refer to Appendix B for the SAR System Check Plots.

SAR Lab	Date	Tissue Type	Dipole Type_Serial #	Dipole Cal. Due Data	Dipole Power (dBm)	Measured Results for 1g SAR				Measured Results for 10g SAR				Plot No.
						Zoom Scan	Normalize to 1 W	Target (Ref. Value)	Delta $\pm 10\%$	Zoom Scan	Normalize to 1 W	Target (Ref. Value)	Delta $\pm 10\%$	
1A	3/31/2022	Head	D2450V2 SN: 963	10/6/2022	20.0	5.220	52.20	51.36	1.64	2.430	24.30	24.56	-1.06	
1A	4/6/2022	Head	D2450V2 SN: 963	10/6/2022	20.0	5.310	53.10	51.36	3.39	2.480	24.80	24.56	0.98	1,2
1A	4/11/2022	Head	D5GHzV2 SN: 1213 (5.25 GHz)	10/12/2022	13.0	1.440	72.17	76.20	-5.29	0.412	20.65	22.30	-7.40	3,4
1A	4/14/2022	Head	D5GHzV2 SN: 1213 (5.25 GHz)	10/12/2022	13.0	1.480	74.18	76.20	-2.66	0.428	21.45	22.30	-3.81	5,6
1A	4/26/2022	Head	D2450V2 SN: 963	10/6/2022	20.0	5.370	53.70	51.36	4.56	2.510	25.10	24.56	2.20	7,8
1B	5/2/2022	Head	D6.5GHzV2 SN: 1068	3/11/2023	11.0	3.360	266.89	278.00	-3.99	0.630	50.04	51.00	-1.88	
1B	5/5/2022	Head	D6.5GHzV2 SN: 1068	3/11/2023	20.0	25.900	259.00	278.00	-6.83	4.890	48.90	51.00	-4.12	
1B	5/9/2022	Head	D6.5GHzV2 SN: 1068	3/11/2023	20.0	29.800	298.00	278.00	7.19	5.480	54.80	51.00	7.45	9,10
1B	6/30/2022	Head	D6.5GHzV2 SN: 1068	3/11/2023	17.0	14.600	291.31	278.00	4.79	2.730	54.47	51.00	6.81	
2A	4/15/2022	Head	D5GHzV2 SN: 1213 (5.25 GHz)	10/12/2022	13.0	1.470	73.67	76.20	-3.31	0.429	21.50	22.30	-3.58	
2A	4/19/2022	Head	D5GHzV2 SN: 1213 (5.25 GHz)	10/12/2022	13.0	1.540	77.18	76.20	1.29	0.439	22.00	22.30	-1.34	
2A	4/20/2022	Head	D5GHzV2 SN: 1213 (5.60 GHz)	10/12/2022	12.0	1.330	83.92	81.80	2.59	0.377	23.79	23.60	0.79	
2A	4/25/2022	Head	D5GHzV2 SN: 1213 (5.75 GHz)	10/12/2022	11.0	1.000	79.43	75.50	5.21	0.285	22.64	22.00	2.90	
2A	4/26/2022	Head	D5GHzV2 SN: 1213 (5.60 GHz)	10/12/2022	12.0	1.390	87.70	81.80	7.22	0.396	24.99	23.60	5.87	11,12
2A	4/28/2022	Head	D5GHzV2 SN: 1213 (5.25 GHz)	10/12/2022	12.0	1.180	74.45	76.20	-2.29	0.342	21.58	22.30	-3.23	
2A	4/29/2022	Head	D2450V2 SN: 963	10/6/2022	20.0	5.070	50.70	51.36	-1.29	2.370	23.70	24.56	-3.50	13,14
2A	5/3/2022	Head	D5GHzV2 SN: 1213 (5.25 GHz)	10/12/2022	14.0	2.020	80.42	76.20	5.53	0.586	23.33	22.30	4.61	15,16
2A	5/5/2022	Head	D5GHzV2 SN: 1213 (5.60 GHz)	10/12/2022	20.0	8.140	81.40	81.80	-0.49	2.330	23.30	23.60	-1.27	
2A	5/6/2022	Head	D5GHzV2 SN: 1213 (5.75 GHz)	10/12/2022	12.0	1.260	79.50	75.50	5.30	0.366	23.09	22.00	4.97	17,18

9. Conducted Output Power Measurements

Tune-Up Power Limits provided by the manufacturer are used to scale measured SAR values.

9.1. Wi-Fi 2.4 GHz (DTS Band)

Maximum Output Power (Tune-up Limit) for Wi-Fi 2.4 GHz

The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures.

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 802.11b/g/n 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.

According to KDB 248227 D01, simultaneous SAR provisions in KDB 447498 D01 apply to determine simultaneous transmission SAR test exclusion for Wi-Fi MIMO. If the sum of 1-g single transmission chain SAR measurements is <1.6W/kg and/or the MIMO output power is equal or less than a single chain, then no additional SAR measurements for simultaneously at the specified maximum output power of MIMO operation.

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.

Maximum output power is only achieved during laptop mode (docked in laptop base). Reduced output power is active when the device is in tablet mode.

Mode	Bandwidth	Channel	Frequency (MHz)	Tune-up Power Limit (dBm)			
				WLAN #1 Antenna		WLAN #2 Antenna	
				Maximum	Reduced	Maximum	Reduced
802.11b DSSS (SISO)	20 MHz	1	2412	21.00	14.50	21.00	14.50
		6	2437	21.00	14.50	21.00	14.50
		11	2462	21.00	14.50	21.00	14.50
		12	2467	19.00	14.50	19.00	14.50
		13	2472	15.75	14.50	16.00	14.50
802.11g/n/ax OFDM (SISO)	20 MHz	1	2412	18.25	14.50	18.25	14.50
		6	2437	21.00	14.50	21.00	14.50
		11	2462	18.25	14.50	18.00	14.50
		12	2467	15.75	14.50	15.50	14.50
		13	2472	12.25	12.25	12.00	12.00
802.11g/n/ax OFDM (MIMO)	20 MHz	1	2412	18.25	14.50	18.25	14.50
		6	2437	21.00	14.50	21.00	14.50
		11	2462	18.25	14.50	18.00	14.50
		12	2467	15.75	14.50	15.50	14.50
		13	2472	12.25	12.25	12.00	12.00
802.11g/n/ax OFDM (MIMO)	40 MHz	3	2422	16.50	14.50	16.25	14.50
		6	2437	17.75	14.50	18.25	14.50
		9	2452	16.25	14.50	16.00	14.50
		10	2457	11.25	11.25	11.25	11.25
		11	2462	11.25	11.25	11.00	11.00

Wi-Fi 2.4GHz Measured Results – Laptop Mode (Full Power, Maximum)

Band	Mode	Data Rate	Ch #	Freq. (MHz)	WLAN #1 Average Power (dBm)			WLAN #2 Average Power (dBm)						
					Meas Pwr	Tune-up	SAR Test (Yes/No)	Meas Pwr	Tune-up	SAR Test (Yes/No)				
DSSS 2.4 GHz	802.11b	1 Mbps	1	2412	20.03	21.00	Yes	20.92	21.00	Yes				
			6	2437	20.72	21.00		20.94	21.00					
			11	2462	20.85	21.00		20.83	21.00					
			12	2467	18.76	19.00		18.73	19.00					
			13	2472	15.39	15.75		15.59	16.00					
OFDM 2.4 GHz	802.11g	6 Mbps	1	2412	(not required)	18.25	No	(not required)	18.25	No				
			2	2417	(not required)	20.00		(not required)	20.00					
			3	2422	(not required)	21.00		(not required)	21.00					
			6	2437	(not required)	21.00		(not required)	21.00					
			7	2442	(not required)	21.00		(not required)	21.00					
			8	2447	(not required)	20.50		(not required)	20.50					
			9	2452	(not required)	20.50		(not required)	20.50					
			10	2457	(not required)	20.00		(not required)	20.00					
			11	2462	(not required)	18.25		(not required)	18.00					
			12	2467	(not required)	15.75		(not required)	15.50					
			13	2472	(not required)	12.25		(not required)	12.00					
			802.11n (HT20)	6.5 Mbps	1	2412		(not required)	18.25		No	(not required)	18.25	No
					2	2417		(not required)	20.00			(not required)	20.00	
	3	2422			(not required)	21.00	(not required)	21.00						
	6	2437			(not required)	21.00	(not required)	21.00						
	7	2442			(not required)	21.00	(not required)	21.00						
	8	2447			(not required)	20.50	(not required)	20.50						
	9	2452			(not required)	20.50	(not required)	20.50						
	10	2457			(not required)	20.00	(not required)	20.00						
	11	2462			(not required)	18.25	(not required)	18.00						
	12	2467			(not required)	15.75	(not required)	15.50						
	13	2472			(not required)	12.25	(not required)	12.00						
	802.11ax (HE20)	6.5 Mbps			1	2412	(not required)	18.25	No	(not required)		18.25	No	
					2	2417	(not required)	20.00		(not required)		20.00		
			3	2422	(not required)	21.00	(not required)	21.00						
			6	2437	(not required)	21.00	(not required)	21.00						
			7	2442	(not required)	21.00	(not required)	21.00						
			8	2447	(not required)	20.50	(not required)	20.50						
			9	2452	(not required)	20.50	(not required)	20.50						
			10	2457	(not required)	20.00	(not required)	20.00						
			11	2462	(not required)	18.25	(not required)	18.00						
			12	2467	(not required)	15.75	(not required)	15.50						
			13	2472	(not required)	12.25	(not required)	12.00						
			802.11n (HT40)	13.5 Mbps	3	2422	(not required)	16.50		No	(not required)	16.25		No
					4	2417	(not required)	17.00			(not required)	17.00		
	5	2422			(not required)	17.50	(not required)	17.50						
	6	2437			(not required)	17.75	(not required)	18.25						
	7	2432			(not required)	17.00	(not required)	17.00						
	8	2437			(not required)	16.50	(not required)	16.00						
	9	2452			(not required)	16.25	(not required)	16.00						
	10	2457			(not required)	11.25	(not required)	11.25						
	802.11ax (HE40)	13.5 Mbps	3	2422	(not required)	16.50	No	(not required)	16.25	No				
4			2417	(not required)	17.00	(not required)		17.00						
5			2422	(not required)	17.50	(not required)		17.50						
6			2437	(not required)	17.75	(not required)		18.25						
7			2432	(not required)	17.00	(not required)		17.00						
8			2437	(not required)	16.50	(not required)		16.00						
9			2452	(not required)	16.25	(not required)		16.00						
10			2457	(not required)	11.25	(not required)		11.25						
11	2462	(not required)	11.25	(not required)	11.00									

Note(s):

SAR is not required for channel 12 and 13 because the tune-up limit and the measured output power for these two channels are not greater than those for the default test channels. Refer to KDB 248227 D01 section 3.1

Wi-Fi 2.4GHz Measured Results – Tablet Mode (Power Reduction)

Band	Mode	Data Rate	Ch #	Freq. (MHz)	WLAN #1 Average Power (dBm)			WLAN #2 Average Power (dBm)		
					Meas Pwr	Tune-up	SAR Test (Yes/No)	Meas Pwr	Tune-up	SAR Test (Yes/No)
DSSS 2.4 GHz	802.11b	1 Mbps	1	2412	14.08	14.50	Yes	14.40	14.50	Yes
			6	2437	14.29	14.50		14.38	14.50	
			11	2462	14.41	14.50		14.32	14.50	
			12	2467	14.37	14.50		14.36	14.50	
			13	2472	14.19	14.50		14.30	14.50	
OFDM 2.4 GHz	802.11g	6 Mbps	1	2412	(not required)	14.50	No	(not required)	14.50	No
			6	2437	(not required)	14.50		(not required)	14.50	
			11	2462	(not required)	14.50		(not required)	14.50	
			12	2467	(not required)	14.50		(not required)	14.50	
			13	2472	(not required)	12.25		(not required)	12.00	
	802.11n (HT20)	6.5 Mbps	1	2412	(not required)	14.50	No	(not required)	14.50	No
			6	2437	(not required)	14.50		(not required)	14.50	
			11	2462	(not required)	14.50		(not required)	14.50	
			12	2467	(not required)	14.50		(not required)	14.50	
			13	2472	(not required)	12.25		(not required)	12.00	
	802.11ax (HE20)	6.5 Mbps	1	2412	(not required)	14.50	No	(not required)	14.50	No
			6	2437	(not required)	14.50		(not required)	14.50	
			11	2462	(not required)	14.50		(not required)	14.50	
			12	2467	(not required)	14.50		(not required)	14.50	
			13	2472	(not required)	12.25		(not required)	12.00	
	802.11n (HT40)	13.5 Mbps	3	2422	(not required)	14.50	No	(not required)	14.50	No
			6	2437	(not required)	14.50		(not required)	14.50	
			9	2452	(not required)	14.50		(not required)	14.50	
			10	2457	(not required)	11.25		(not required)	11.25	
			11	2462	(not required)	11.25		(not required)	11.00	
	802.11ax (HE40)	13.5 Mbps	3	2422	(not required)	14.50	No	(not required)	14.50	No
			6	2437	(not required)	14.50		(not required)	14.50	
			9	2452	(not required)	14.50		(not required)	14.50	
			10	2457	(not required)	11.25		(not required)	11.25	
11			2462	(not required)	11.25	(not required)		11.00		

Note(s):

SAR is not required for channel 12 and 13 because the tune-up limit and the measured output power for these two channels are not greater than those for the default test channels. Refer to KDB 248227 D01 section 3.1

Duty Factor Measured Results

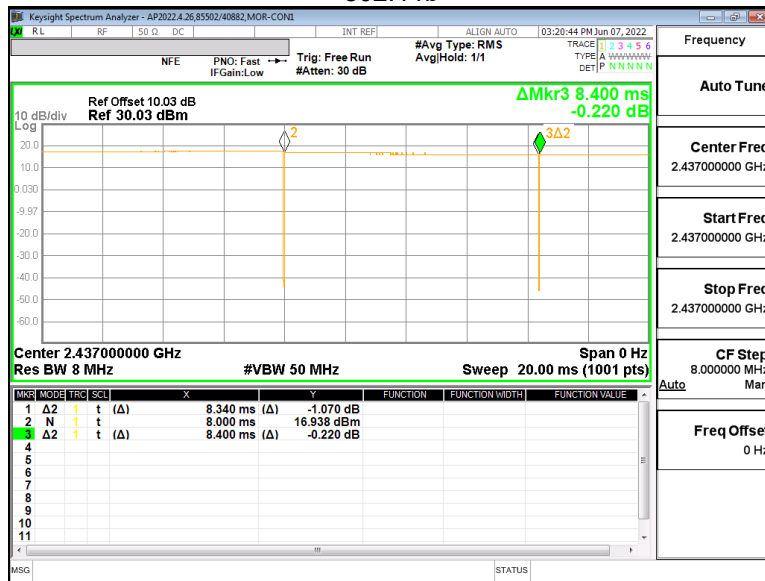
Mode	T _{on} (ms)	Period (ms)	Duty Cycle	Crest Factor (1/duty cycle)
802.11b	8.34	8.4	99.3%	1.01

Note(s):

Duty Cycle = (T_{on} / period) * 100%

WLAN 2.4GHz Duty Cycle

802.11b



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

Maximum Output Power (Tune-up Limit) for Wi-Fi 5 GHz

When the same transmission mode configurations have the same maximum output power on the same channel for the 802.11 a/g/n/ac/ax modes, the channel in the lower order/sequence 802.11 transmission mode is selected.

The maximum output power specified for production units are determined for all applicable 802.11 transmission modes in each standalone and aggregated frequency band. Maximum output power is measured for the highest maximum output power configuration(s) in each frequency band according to the default power measurement procedures.

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/ax 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.

According to KDB 248227 D01, simultaneous SAR provisions in KDB 447498 D01 apply to determine simultaneous transmission SAR test exclusion for Wi-Fi MIMO. If the sum of 1-g single transmission chain SAR measurements is $<1.6\text{W/kg}$ and/or the MIMO output power is equal or less than a single chain, then no additional SAR measurements for simultaneously at the specified maximum output power of MIMO operation.

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 $\leq 1.2\text{ W/kg}$, SAR is not required for UNII 1; otherwise treat the remaining bands separately and test them independently for SAR.

Mode	Bandwidth	Channel	Frequency (MHz)	Tune-up Power Limit (dBm)			
				WLAN #1 Antenna		WLAN #2 Antenna	
				Maximum	Reduced	Maximum	Reduced
U-NII-1 5.2 GHz	802.11a/n/ac/ax 20 MHz	36	5180	18.50	13.00	19.75	10.50
		40	5200	21.00	13.00	21.00	10.50
		44	5220	21.00	13.00	21.00	10.50
		48	5240	21.00	13.00	21.00	10.50
	802.11n/ac/ax 40 MHz	38	5190	17.75	13.00	19.50	10.50
		46	5230	19.25	13.00	20.50	10.50
802.11ac/ax 80 MHz	42	5210	17.50	13.00	18.75	10.50	
U-NII-2A 5.3 GHz	802.11a/n/ac/ax 20 MHz	52	5260	21.00	13.00	21.00	10.50
		56	5280	21.00	13.00	21.00	10.50
		60	5300	21.00	13.00	21.00	10.50
		64	5320	19.00	13.00	20.75	10.50
	802.11n/ac/ax 40 MHz	54	5270	20.50	13.00	20.50	10.50
		62	5310	17.00	13.00	18.25	10.50
802.11ac/ax 80 MHz	58	5290	18.00	13.00	17.75	10.50	
UNII-1 & 2A	802.11ac/ax 160 MHz	58	5290	15.00	13.00	15.25	10.50
U-NII-2C 5.5 GHz	802.11a/n/ac/ax 20 MHz	100	5500	20.00	13.00	20.00	10.50
		116	5580	20.00	13.00	20.00	10.50
		124	5620	20.00	13.00	20.00	10.50
		144	5720	20.00	13.00	20.00	10.50
	802.11n/ac/ax 40 MHz	102	5510	19.00	13.00	19.75	10.50
		118	5590	20.00	13.00	20.00	10.50
		126	5630	20.00	13.00	20.00	10.50
		142	5710	20.00	13.00	20.00	10.50
	802.11ac/ax 80 MHz	106	5530	18.50	13.00	19.50	10.50
		122	5610	20.00	13.00	20.00	10.50
		138	5690	20.00	13.00	20.00	10.50
	802.11ac/ax 160 MHz	114	5570	16.25	13.00	15.50	10.50
U-NII-3 5.8 GHz	802.11a/n/ac/ax 20 MHz	149	5745	19.50	13.00	19.50	10.00
		157	5785	19.50	13.00	19.50	10.00
		165	5825	19.50	13.00	19.50	10.00
	802.11n/ac/ax 40 MHz	151	5755	19.50	13.00	19.50	10.00
		159	5795	19.50	13.00	19.50	10.00
	802.11ac/ax 80 MHz	155	5775	19.50	13.00	19.50	10.00

Wi-Fi 5 GHz Measured Results – Laptop Mode (Full Power, Maximum)

Band	Mode	Ch #	Freq. (MHz)	Chain 0 Average Power (dBm)			Chain 1 Average Power (dBm)		
				Meas Pwr	Tune-up	SAR Test (Yes/No)	Meas Pwr	Tune-up	SAR Test (Yes/No)
UNII-1 5.2 GHz	802.11a	36	5180	17.94	18.50	Yes	17.82	19.75	Yes
		40	5200	19.54	21.00		19.50	21.00	
		44	5220	19.45	21.00		19.46	21.00	
		48	5240	19.30	21.00		19.39	21.00	
	802.11n (HT20)	36	5180	(not required)	18.50	No	(not required)	19.75	No
		40	5200	(not required)	21.00		(not required)	21.00	
		44	5220	(not required)	21.00		(not required)	21.00	
		48	5240	(not required)	21.00		(not required)	21.00	
	802.11ac (VHT20)	36	5180	(not required)	18.50	No	(not required)	19.75	No
		40	5200	(not required)	21.00		(not required)	21.00	
		44	5220	(not required)	21.00		(not required)	21.00	
		48	5240	(not required)	21.00		(not required)	21.00	
	802.11ax (HE20)	36	5180	(not required)	18.50	No	(not required)	19.75	No
		40	5200	(not required)	21.00		(not required)	21.00	
		44	5220	(not required)	21.00		(not required)	21.00	
		48	5240	(not required)	21.00		(not required)	21.00	
	802.11n (HT40)	38	5190	(not required)	17.75	No	(not required)	19.50	No
		46	5230	(not required)	19.25		(not required)	20.50	
802.11ac (VHT40)	38	5190	(not required)	17.75	No	(not required)	19.50	No	
	46	5230	(not required)	19.25		(not required)	20.50		
802.11ax (HE40)	38	5190	(not required)	17.75	No	(not required)	19.50	No	
	46	5230	(not required)	19.25		(not required)	20.50		
802.11ac (VHT80)	42	5210	(not required)	17.50	No	(not required)	18.75	No	
802.11ax (HE80)	42	5210	(not required)	17.50	No	(not required)	18.75	No	
Band	Mode	Ch #	Freq. (MHz)	Chain 0 Average Power (dBm)			Chain 1 Average Power (dBm)		
				Meas Pwr	Tune-up	SAR Test (Yes/No)	Meas Pwr	Tune-up	SAR Test (Yes/No)
UNII-2A 5.3 GHz	802.11a	52	5260	19.36	21.00	Yes	19.43	21.00	Yes
		56	5280	19.48	21.00		19.41	21.00	
		60	5300	19.54	21.00		19.47	21.00	
		64	5320	18.30	19.00		19.20	20.75	
	802.11n (HT20)	52	5260	(not required)	21.00	No	(not required)	21.00	No
		56	5280	(not required)	21.00		(not required)	21.00	
		60	5300	(not required)	21.00		(not required)	21.00	
		64	5320	(not required)	19.00		(not required)	20.75	
	802.11ac (VHT20)	52	5260	(not required)	21.00	No	(not required)	21.00	No
		56	5280	(not required)	21.00		(not required)	21.00	
		60	5300	(not required)	21.00		(not required)	21.00	
		64	5320	(not required)	19.00		(not required)	20.75	
	802.11ax (HE20)	52	5260	(not required)	21.00	No	(not required)	21.00	No
		56	5280	(not required)	21.00		(not required)	21.00	
		60	5300	(not required)	21.00		(not required)	21.00	
		64	5320	(not required)	19.00		(not required)	20.75	
	802.11n (HT40)	54	5270	(not required)	20.50	No	(not required)	20.50	No
		62	5310	(not required)	17.00		(not required)	18.25	
802.11ac (VHT40)	54	5270	(not required)	20.50	No	(not required)	20.50	No	
	62	5310	(not required)	17.00		(not required)	18.25		
802.11ax (HE40)	54	5270	(not required)	20.50	No	(not required)	20.50	No	
	62	5310	(not required)	17.00		(not required)	18.25		
802.11ac (VHT80)	58	5290	(not required)	18.00	No	(not required)	17.75	No	
802.11ax (HE80)	58	5290	(not required)	18.00	No	(not required)	17.75	No	
UNII-1 & 2A	802.11ac (VHT160)	50	5250	(not required)	15.00	No	(not required)	15.25	No
	802.11ax (HE160)	50	5250	(not required)	15.00	No	(not required)	15.25	No

Band	Mode	Ch #	Freq. (MHz)	Chain 0 Average Power (dBm)			Chain 1 Average Power (dBm)		
				Meas Pwr	Tune-up	SAR Test (Yes/No)	Meas Pwr	Tune-up	SAR Test (Yes/No)
UNII-2C 5.5 GHz	802.11a	100	5500	(not required)	20.00	No	(not required)	20.00	No
		116	5580	(not required)	20.00		(not required)	20.00	
		124	5620	(not required)	20.00		(not required)	20.00	
		144	5720	(not required)	20.00		(not required)	20.00	
	802.11n (HT20)	100	5500	(not required)	20.00	No	(not required)	20.00	No
		116	5580	(not required)	20.00		(not required)	20.00	
		144	5720	(not required)	20.00		(not required)	20.00	
	802.11ac (VHT20)	100	5500	(not required)	20.00	No	(not required)	20.00	No
		116	5580	(not required)	20.00		(not required)	20.00	
		124	5620	(not required)	20.00		(not required)	20.00	
		144	5720	(not required)	20.00		(not required)	20.00	
	802.11ax (HE20)	100	5500	(not required)	20.00	No	(not required)	20.00	No
		116	5580	(not required)	20.00		(not required)	20.00	
		124	5620	(not required)	20.00		(not required)	20.00	
		144	5720	(not required)	20.00		(not required)	20.00	
	802.11n (HT40)	102	5510	(not required)	19.00	No	(not required)	19.75	No
		118	5590	(not required)	20.00		(not required)	20.00	
		126	5630	(not required)	20.00		(not required)	20.00	
		142	5710	(not required)	20.00		(not required)	20.00	
	802.11ac (VHT40)	102	5510	(not required)	19.00	No	(not required)	19.75	No
		118	5590	(not required)	20.00		(not required)	20.00	
		126	5630	(not required)	20.00		(not required)	20.00	
		142	5710	(not required)	20.00		(not required)	20.00	
	802.11ax (HE40)	102	5510	(not required)	19.00	No	(not required)	19.75	No
118		5590	(not required)	20.00	(not required)		20.00		
126		5630	(not required)	20.00	(not required)		20.00		
142		5710	(not required)	20.00	(not required)		20.00		
802.11ac (VHT80)	106	5530	18.01	18.50	Yes	18.57	19.50	Yes	
	122	5610	19.50	20.00		19.78	20.00		
	138	5690	19.58	20.00		19.72	20.00		
802.11ax (HE80)	106	5530	(not required)	18.50	No	(not required)	19.50	No	
	122	5610	(not required)	20.00		(not required)	20.00		
	138	5690	(not required)	20.00		(not required)	20.00		
UNII-2C 5.5 GHz	802.11ac (VHT160)	114	5570	(not required)	16.25	No	(not required)	15.50	No
	802.11ax (HE160)	114	5570	(not required)	16.25	No	(not required)	15.50	No
Band	Mode	Ch #	Freq. (MHz)	Chain 0 Average Power (dBm)			Chain 1 Average Power (dBm)		
UNII-3 5.8 GHz	802.11a	149	5745	(not required)	19.50	No	(not required)	19.50	No
		157	5785	(not required)	19.50		(not required)	19.50	
		165	5825	(not required)	19.50		(not required)	19.50	
	802.11n (HT20)	149	5745	(not required)	19.50	No	(not required)	19.50	No
		157	5785	(not required)	19.50		(not required)	19.50	
		165	5825	(not required)	19.50		(not required)	19.50	
	802.11ac (VHT20)	149	5745	(not required)	19.50	No	(not required)	19.50	No
		157	5785	(not required)	19.50		(not required)	19.50	
		165	5825	(not required)	19.50		(not required)	19.50	
	802.11ax (HE20)	149	5745	(not required)	19.50	No	(not required)	19.50	No
		157	5785	(not required)	19.50		(not required)	19.50	
		165	5825	(not required)	19.50		(not required)	19.50	
	802.11n (HT40)	151	5755	(not required)	19.50	No	(not required)	19.50	No
		159	5795	(not required)	19.50		(not required)	19.50	
	802.11ac (VHT40)	151	5755	(not required)	19.50	No	(not required)	19.50	No
		159	5795	(not required)	19.50		(not required)	19.50	
	802.11ax (HE40)	151	5755	(not required)	19.50	No	(not required)	19.50	No
		159	5795	(not required)	19.50		(not required)	19.50	
	802.11ac (VHT80)	155	5775	18.99	19.50	Yes	19.03	19.50	Yes
	802.11ax (HE80)	155	5775	(not required)	19.50	No	(not required)	19.50	No

Wi-Fi 5 GHz Measured Results – Tablet Mode (Power Reduction)

Band	Mode	Ch #	Freq. (MHz)	Chain 0 Average Power (dBm)			Chain 1 Average Power (dBm)		
				Meas Pwr	Tune-up	SAR Test (Yes/No)	Meas Pwr	Tune-up	SAR Test (Yes/No)
UNII-1 5.2 GHz	802.11a	36	5180	(not required)	13.0	No	(not required)	10.5	No
		40	5200	(not required)	13.0		(not required)	10.5	
		44	5220	(not required)	13.0		(not required)	10.5	
		48	5240	(not required)	13.0		(not required)	10.5	
	802.11n (HT20)	36	5180	(not required)	13.0	No	(not required)	10.5	No
		40	5200	(not required)	13.0		(not required)	10.5	
		44	5220	(not required)	13.0		(not required)	10.5	
		48	5240	(not required)	13.0		(not required)	10.5	
	802.11ac (VHT20)	36	5180	(not required)	13.0	No	(not required)	10.5	No
		40	5200	(not required)	13.0		(not required)	10.5	
		44	5220	(not required)	13.0		(not required)	10.5	
		48	5240	(not required)	13.0		(not required)	10.5	
	802.11ax (HE20)	36	5180	(not required)	13.0	No	(not required)	10.5	No
		40	5200	(not required)	13.0		(not required)	10.5	
44		5220	(not required)	13.0	(not required)		10.5		
48		5240	(not required)	13.0	(not required)		10.5		
802.11n (HT40)	38	5190	(not required)	13.0	No	(not required)	10.5	No	
	46	5230	(not required)	13.0		(not required)	10.5		
802.11ac (VHT40)	38	5190	(not required)	13.0	No	(not required)	10.5	No	
	46	5230	(not required)	13.0		(not required)	10.5		
802.11ax (HE40)	38	5190	(not required)	13.0	No	(not required)	10.5	No	
	46	5230	(not required)	13.0		(not required)	10.5		
802.11ac (VHT80)	42	5210	12.85	13.0	Yes	10.14	10.5	Yes	
802.11ax (HE80)	42	5210	(not required)	13.0	No	(not required)	10.5	No	
Band	Mode	Ch #	Freq. (MHz)	Chain 0 Average Power (dBm)			Chain 1 Average Power (dBm)		
				Meas Pwr	Tune-up	SAR Test (Yes/No)	Meas Pwr	Tune-up	SAR Test (Yes/No)
UNII-2A 5.3 GHz	802.11a	52	5260	(not required)	13.0	No	(not required)	10.5	No
		56	5280	(not required)	13.0		(not required)	10.5	
		60	5300	(not required)	13.0		(not required)	10.5	
		64	5320	(not required)	13.0		(not required)	10.5	
	802.11n (HT20)	52	5260	(not required)	13.0	No	(not required)	10.5	No
		56	5280	(not required)	13.0		(not required)	10.5	
		60	5300	(not required)	13.0		(not required)	10.5	
		64	5320	(not required)	13.0		(not required)	10.5	
	802.11ac (VHT20)	52	5260	(not required)	13.0	No	(not required)	10.5	No
		56	5280	(not required)	13.0		(not required)	10.5	
		60	5300	(not required)	13.0		(not required)	10.5	
		64	5320	(not required)	13.0		(not required)	10.5	
	802.11ax (HE20)	52	5260	(not required)	13.0	No	(not required)	10.5	No
		56	5280	(not required)	13.0		(not required)	10.5	
		60	5300	(not required)	13.0		(not required)	10.5	
		64	5320	(not required)	13.0		(not required)	10.5	
	802.11n (HT40)	54	5270	(not required)	13.0	No	(not required)	10.5	No
		62	5310	(not required)	13.0		(not required)	10.5	
802.11ac (VHT40)	54	5270	(not required)	13.0	No	(not required)	10.5	No	
	62	5310	(not required)	13.0		(not required)	10.5		
802.11ax (HE40)	54	5270	(not required)	13.0	No	(not required)	10.5	No	
	62	5310	(not required)	13.0		(not required)	10.5		
802.11ac (VHT80)	58	5290	(not required)	13.0	No	(not required)	10.5	No	
802.11ax (HE80)	58	5290	(not required)	13.0	No	(not required)	10.5	No	
UNII-1 & 2A	802.11ac (VHT160)	50	5250	12.90	13.0	Yes	10.43	10.5	Yes
	802.11ax (HE160)	50	5250	(not required)	13.0	No	(not required)	10.5	No

Band	Mode	Ch #	Freq. (MHz)	Chain 0 Average Power (dBm)			Chain 1 Average Power (dBm)		
				Meas Pwr	Tune-up	SAR Test (Yes/No)	Meas Pwr	Tune-up	SAR Test (Yes/No)
UNII-2C 5.5 GHz	802.11a	100	5500	(not required)	13.0	No	(not required)	10.5	No
		116	5580	(not required)	13.0		(not required)	10.5	
		124	5620	(not required)	13.0		(not required)	10.5	
		144	5720	(not required)	13.0		(not required)	10.5	
	802.11n (HT20)	100	5500	(not required)	13.0	No	(not required)	10.5	No
		116	5580	(not required)	13.0		(not required)	10.5	
		144	5720	(not required)	13.0		(not required)	10.5	
	802.11ac (VHT20)	100	5500	(not required)	13.0	No	(not required)	10.5	No
		116	5580	(not required)	13.0		(not required)	10.5	
		124	5620	(not required)	13.0		(not required)	10.5	
		144	5720	(not required)	13.0		(not required)	10.5	
	802.11ax (HE20)	100	5500	(not required)	13.0	No	(not required)	10.5	No
		116	5580	(not required)	13.0		(not required)	10.5	
		124	5620	(not required)	13.0		(not required)	10.5	
		144	5720	(not required)	13.0		(not required)	10.5	
	802.11n (HT40)	102	5510	(not required)	13.0	No	(not required)	10.5	No
		118	5590	(not required)	13.0		(not required)	10.5	
		126	5630	(not required)	13.0		(not required)	10.5	
		142	5710	(not required)	13.0		(not required)	10.5	
	802.11ac (VHT40)	102	5510	(not required)	13.0	No	(not required)	10.5	No
		118	5590	(not required)	13.0		(not required)	10.5	
		126	5630	(not required)	13.0		(not required)	10.5	
		142	5710	(not required)	13.0		(not required)	10.5	
	802.11ax (HE40)	102	5510	(not required)	13.0	No	(not required)	10.5	No
		118	5590	(not required)	13.0		(not required)	10.5	
		126	5630	(not required)	13.0		(not required)	10.5	
		142	5710	(not required)	13.0		(not required)	10.5	
	802.11ac (VHT80)	106	5530	(not required)	13.0	No	(not required)	10.5	No
122		5610	(not required)	13.0	(not required)		10.5		
138		5690	(not required)	13.0	(not required)		10.5		
802.11ax (HE80)	106	5530	(not required)	13.0	No	(not required)	10.5	No	
	122	5610	(not required)	13.0		(not required)	10.5		
	138	5690	(not required)	13.0		(not required)	10.5		
UNII-2C 5.5 GHz	802.11ac (VHT160)	114	5570	12.88	13.0	Yes	10.24	10.5	Yes
	802.11ax (HE160)	114	5570	(not required)	13.0	No	(not required)	10.5	No
Band	Mode	Ch #	Freq. (MHz)	Chain 0 Average Power (dBm)			Chain 1 Average Power (dBm)		
				Meas Pwr	Tune-up	SAR Test (Yes/No)	Meas Pwr	Tune-up	SAR Test (Yes/No)
UNII-3 5.8 GHz	802.11a	149	5745	(not required)	13.0	No	(not required)	10.0	No
		157	5785	(not required)	13.0		(not required)	10.0	
		165	5825	(not required)	13.0		(not required)	10.0	
	802.11n (HT20)	149	5745	(not required)	13.0	No	(not required)	10.0	No
		157	5785	(not required)	13.0		(not required)	10.0	
		165	5825	(not required)	13.0		(not required)	10.0	
	802.11ac (VHT20)	149	5745	(not required)	13.0	No	(not required)	10.0	No
		157	5785	(not required)	13.0		(not required)	10.0	
		165	5825	(not required)	13.0		(not required)	10.0	
	802.11ax (HE20)	149	5745	(not required)	13.0	No	(not required)	10.0	No
		157	5785	(not required)	13.0		(not required)	10.0	
		165	5825	(not required)	13.0		(not required)	10.0	
	802.11n (HT40)	151	5755	(not required)	13.0	No	(not required)	10.0	No
		159	5795	(not required)	13.0		(not required)	10.0	
	802.11ac (VHT40)	151	5755	(not required)	13.0	No	(not required)	10.0	No
		159	5795	(not required)	13.0		(not required)	10.0	
802.11ax (HE40)	151	5755	(not required)	13.0	No	(not required)	10.0	No	
	159	5795	(not required)	13.0		(not required)	10.0		
802.11ac (VHT80)	155	5775	12.86	13.0	Yes	9.87	10.0	Yes	
802.11ax (HE80)	155	5775	(not required)	13.0	No	(not required)	10.0	No	

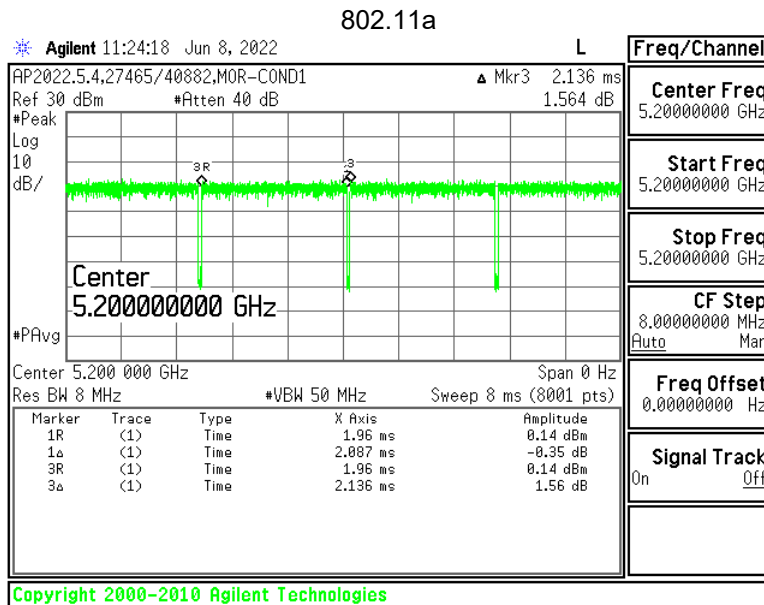
Duty Factor Measured Results

Mode	T _{on} (ms)	Period (ms)	Duty Cycle	Crest Factor (1/duty cycle)
802.11a	2.087	2.136	97.7%	1.02
802.11ac VHT80	7.885	7.934	99.4%	1.01
802.11ac VHT160	5.518	5.571	99.1%	1.01

Note(s):

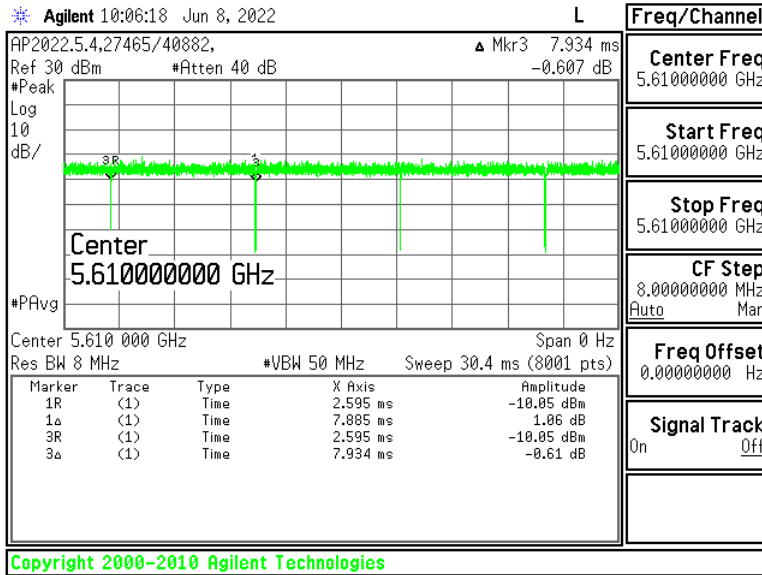
Duty Cycle = (T_{on} / period) * 100%

WLAN 5 GHz Duty Cycle



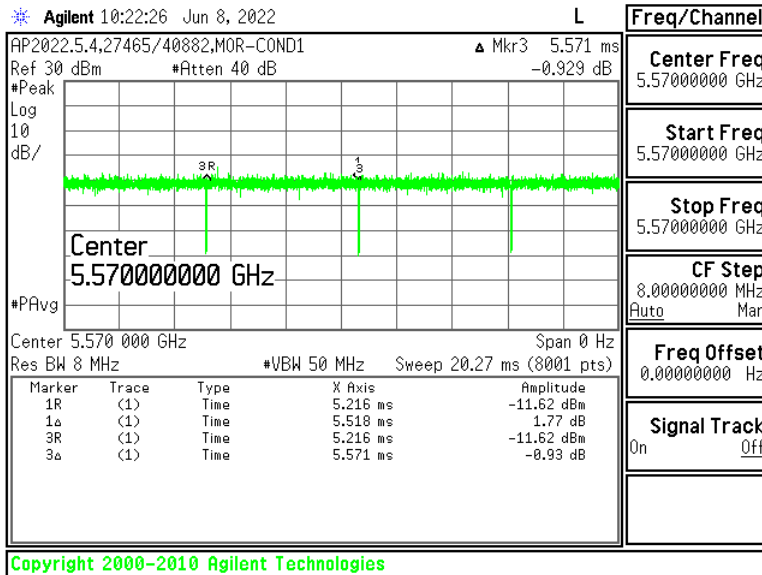
WLAN 5 GHz Duty Cycle

802.11ac VHT80



WLAN 5 GHz Duty Cycle

802.11ac VHT160



9.3. Wi-Fi 6 GHz (U-NII Bands)

Maximum Output Power (Tune-up Limit) for Wi-Fi 6 GHz

Mode	Bandwidth	Channel	Frequency (MHz)	Tune-up Power Limit (dBm)			
				WLAN #1 Antenna		WLAN #2 Antenna	
				Maximum	Reduced	Maximum	Reduced
802.11ax (HE20) 242T or SU	20 MHz	1	5955	5.50	5.50	5.50	5.50
		57	6235	5.50	5.50	5.50	5.50
		105	6475	5.50	5.50	5.50	5.50
		157	6735	4.75	4.75	4.75	4.75
		229	7095	4.75	4.75	4.75	4.75
802.11ax (HE40) 484T or SU	40 MHz	233	7115	0.50	0.50	0.50	0.50
		3	5965	8.75	8.75	8.75	8.75
		51	6205	8.75	8.75	8.75	8.75
		107	6485	8.75	8.75	8.75	8.75
		163	6765	8.00	8.00	8.00	8.00
802.11ax (HE80) 996T or SU	80 MHz	227	7085	8.00	8.00	8.00	8.00
		7	5965	11.25	11.25	11.25	11.25
		55	6225	11.25	11.25	11.25	11.25
		103	6465	11.25	11.25	11.25	11.25
		151	6705	10.50	10.50	10.50	10.50
802.11ax (HE160) 996T*2 or SU	160 MHz	215	7025	10.50	10.50	10.50	10.50
		15	6025	13.50	11.50	13.50	6.00
		47	6185	13.50	11.50	13.50	6.75
		79	6345	13.50	11.50	13.50	6.75
		111	6505	13.50	11.50	13.50	7.25
		143	6665	13.25	11.50	13.25	7.25
		175	6825	13.25	11.50	13.25	7.75
207	6985	13.25	11.75	13.25	7.75		

Wi-Fi 6 GHz Measured Results – Laptop Mode (Full Power, Maximum)

Band	Mode	Ch #	Freq. (MHz)	WLAN #1 Average Power (dBm)			WLAN #2 Average Power (dBm)		
				Meas Pwr	Tune-up	SAR Test (Yes/No)	Meas Pwr	Tune-up	SAR Test (Yes/No)
UNII-5/6/7/8 6 GHz	802.11ax (HE20) 242T or SU	1	5955	(not required)	5.50	No	(not required)	5.50	No
		57	6235	(not required)	5.50		(not required)	5.50	
		105	6475	(not required)	5.50		(not required)	5.50	
		157	6735	(not required)	4.75		(not required)	4.75	
		229	7095	(not required)	4.75		(not required)	4.75	
	802.11ax (HE40) 484T or SU	3	5965	(not required)	8.75	No	(not required)	8.75	No
		51	6205	(not required)	8.75		(not required)	8.75	
		107	6485	(not required)	8.75		(not required)	8.75	
		163	6765	(not required)	8.00		(not required)	8.00	
	802.11ax (HE80) 996T or SU	227	7085	(not required)	8.00	No	(not required)	8.00	No
		7	5965	(not required)	11.25		(not required)	11.25	
		55	6225	(not required)	11.25		(not required)	11.25	
		103	6465	(not required)	11.25		(not required)	11.25	
		151	6705	(not required)	10.50		(not required)	10.50	
	802.11ax (HE160) 996T*2 or SU	215	7025	(not required)	10.50	Yes	(not required)	10.50	Yes
		15	6025	13.33	13.50		13.30	13.50	
		47	6185	13.28	13.50		13.17	13.50	
		79	6345	13.29	13.50		13.43	13.50	
		111	6505	13.08	13.50		13.27	13.50	
		143	6665	13.10	13.25		13.24	13.25	
175	6825	12.71	13.25	12.87	13.25				
207	6985	12.03	13.25	12.23	13.25				

Wi-Fi 6 GHz Measured Results – Tablet Mode (Power Reduction)

Band	Mode	Ch #	Freq. (MHz)	WLAN #1 Average Power (dBm)			WLAN #2 Average Power (dBm)		
				Meas Pwr	Tune-up	SAR Test (Yes/No)	Meas Pwr	Tune-up	SAR Test (Yes/No)
UNII-5/6/7/8 6 GHz	802.11ax (HE20) 242T or SU	1	5955	(not required)	5.50	No	(not required)	5.50	No
		57	6235	(not required)	5.50		(not required)	5.50	
		105	6475	(not required)	5.50		(not required)	5.50	
		157	6735	(not required)	4.75		(not required)	4.75	
		229	7095	(not required)	4.75		(not required)	4.75	
		233	7115	(not required)	0.50		(not required)	0.50	
	802.11ax (HE40) 484T or SU	3	5965	(not required)	8.75	No	(not required)	8.75	No
		51	6205	(not required)	8.75		(not required)	8.75	
		107	6485	(not required)	8.75		(not required)	8.75	
		163	6765	(not required)	8.00		(not required)	8.00	
	802.11ax (HE80) 996T or SU	227	7085	(not required)	8.00	No	(not required)	8.00	No
		7	5965	(not required)	11.25		(not required)	11.25	
		55	6225	(not required)	11.25		(not required)	11.25	
		103	6465	(not required)	11.25		(not required)	11.25	
	802.11ax (HE160) 996T*2 or SU	151	6705	(not required)	10.50	Yes	(not required)	10.50	Yes
		215	7025	(not required)	10.50		(not required)	10.50	
		15	6025	10.84	11.50		5.36	6.00	
		47	6185	10.66	11.50		6.05	6.75	
		79	6345	10.87	11.50		6.27	6.75	
		111	6505	10.54	11.50		6.77	7.25	
143	6665	10.94	11.50	6.71	7.25				
175	6825	10.69	11.50	7.14	7.75				
207	6985	10.32	11.75	7.13	7.75				

Duty Factor Measured Results

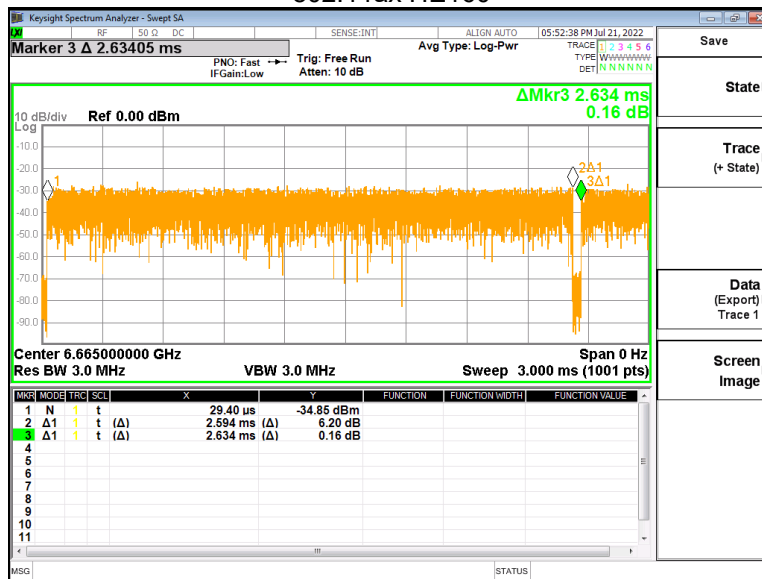
Mode	T _{on} (ms)	Period (ms)	Duty Cycle	Crest Factor (1/duty cycle)
802.11ax HE160	2.594	2.634	98.5%	1.02

Note(s):

Duty Cycle = (T_{on} / period) * 100%

WLAN 6 GHz Duty Cycle

802.11ax HE160



9.4. Bluetooth

Maximum Output Power (Tune-up Limit) for Bluetooth

SAR measurement is not required for the EDR and LE. When the secondary mode is $\leq \frac{1}{4}$ dB higher than the primary mode.

Band	Mode	Channel	Frequency (MHz)	Tune-up PowerLimit (dBm)
				WLAN #2 Antenna
Bluetooth 2.4 GHz	BR	0	2402	10.5
		39	2441	10.5
		78	2480	10.5
	EDR	0	2402	7.0
		39	2441	7.0
		78	2480	7.0
	LE	0	2402	7.0
		19	2440	7.0
		39	2480	7.0

Bluetooth Measured Results

Band	Mode	Ch #	Freq. (MHz)	Chain 0 Average Power (dBm)		
				Meas Pwr	Tune-up	SAR Test (Yes/No)
2.4	BR GFSK	0	2402	9.38	10.5	Yes
		39	2441	9.75	10.5	
		78	2480	10.08	10.5	
	EDR, $\pi/4$ DQPSK	0	2402	(not required)	7.0	No
		39	2441	(not required)	7.0	
		78	2480	(not required)	7.0	
	EDR, 8-DPSK	0	2402	(not required)	7.0	No
		39	2441	(not required)	7.0	
		78	2480	(not required)	7.0	
	LE GFSK	0	2402	(not required)	7.0	No
		19	2440	(not required)	7.0	
		39	2480	(not required)	7.0	

Duty Factor Measured Results

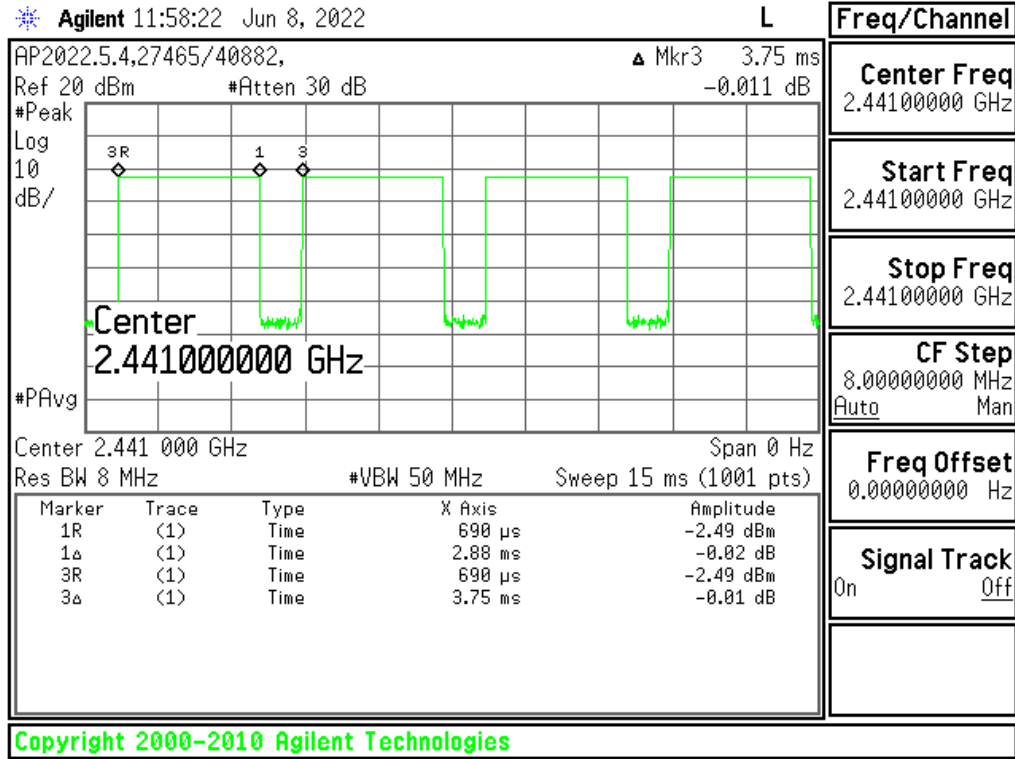
Mode	Type	T _{on} (ms)	Period (ms)	Duty Cycle	Crest Factor (1/duty cycle)
GFSK	DH5	2.88	3.75	76.8%	1.30

Note(s):

Duty Cycle = (T_{on} / period) * 100%

Duty Cycle Plot

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:

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

10.1. Wi-Fi (DTS Band)

RF Exposure Conditions	Mode	Antenna	Pwr State	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Duty Cycle	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Body	802.11b	WLAN #1	Power Reduction	0	Rear	6	2437	99.3%	14.5	14.29	0.071	0.075	
					Rear Tilt (Edge1 Side)	1	2412	99.3%	14.5	14.08	0.094	0.104	
						6	2437	99.3%	14.5	14.29	0.127	0.134	
						11	2462	99.3%	14.5	14.41	0.147	0.151	
					Rear Tilt (Edge4 Side)	6	2437	99.3%	14.5	14.3	0.027	0.029	
					Edge 1	6	2437	99.3%	14.5	14.3	0.399	0.422	1
Edge 4	6	2437	99.3%	14.5	14.3	0.033	0.035						
Body	802.11b	WLAN #2	Power Reduction	0	Rear	6	2437	99.3%	14.5	14.38	0.658	0.681	
					Rear Tilt (Edge 1 Side)	1	2412	99.3%	14.5	14.4	0.736	0.758	
						6	2437	99.3%	14.5	14.38	0.788	0.816	
						11	2462	99.3%	14.5	14.32	0.881	0.925	2
					Rear Tilt (Edge 4 Side)	6	2437	99.3%	14.5	14.4	0.011	0.011	
					Edge 1	6	2437	99.3%	14.5	14.4	0.259	0.268	
Edge 4	6	2437	99.3%	14.5	14.4	<0.01	<0.01						

Note(s):

- SAR testing is not required for OFDM mode(s) since the specified maximum output power for all modes of OFDM are ≤ that for DSSS.

10.2. Wi-Fi (U-NII1-3 Bands)

UNII 1 & UNII 2A Measured Results

RF Exposure Conditions	Mode	Antenna	Pwr State	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Duty Cycle	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Body	802.11ac (VHT160)	WLAN #1	Power Reduction	0	Rear	50	5250	99.1%	13.0	12.9	0.121	0.125	
					Rear Tilt (Edge1 Side)	50	5250	99.1%	13.0	12.9	0.219	0.226	
					Rear Tilt (Edge4 Side)	50	5250	99.1%	13.0	12.9	0.069	0.071	
					Edge 1	50	5250	99.1%	13.0	12.9	0.424	0.438	3
					Edge 4	50	5250	99.1%	13.0	12.9	0.033	0.034	
Body	802.11ac (VHT160)	WLAN #2	Power Reduction	0	Rear	50	5250	99.1%	10.5	10.4	0.382	0.392	
					Rear Tilt (Edge 1 Side)	50	5250	99.1%	10.5	10.4	0.833	0.854	4
					Rear Tilt (Edge 4 Side)	50	5250	99.1%	10.5	10.4	0.025	0.026	
					Edge 1	50	5250	99.1%	10.5	10.4	0.120	0.123	
					Edge 4	50	5250	99.1%	10.5	10.4	<0.01	<0.01	

UNII 2C Measured Results

RF Exposure Conditions	Mode	Antenna	Pwr State	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Duty Cycle	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Body	802.11ac (VHT160)	WLAN #1	Power Reduction	0	Rear	114	5570	99.1%	13.0	12.9	0.195	0.202	
					Rear Tilt (Edge1 Side)	114	5570	99.1%	13.0	12.9	0.322	0.334	
					Rear Tilt (Edge4 Side)	114	5570	99.1%	13.0	12.9	0.117	0.121	
					Edge 1	114	5570	99.1%	13.0	12.9	0.529	0.549	5
					Edge 4	114	5570	99.1%	13.0	12.9	0.027	0.028	
Body	802.11ac (VHT160)	WLAN #2	Power Reduction	0	Rear	114	5570	99.1%	10.5	10.2	0.525	0.562	
					Rear Tilt (Edge 1 Side)	114	5570	99.1%	10.5	10.2	0.786	0.842	6
					Rear Tilt (Edge 4 Side)	114	5570	99.1%	10.5	10.2	0.038	0.041	
					Edge 1	114	5570	99.1%	10.5	10.2	0.128	0.137	
					Edge 4	114	5570	99.1%	10.5	10.2	<0.01	<0.01	

UNII 3 Measured Results

RF Exposure Conditions	Mode	Antenna	Pwr State	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Duty Cycle	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Body	802.11ac (VHT80)	WLAN #1	Power Reduction	0	Rear	155	5775	99.4%	13.0	12.9	0.203	0.211	
					Rear Tilt (Edge1 Side)	155	5775	99.4%	13.0	12.9	0.342	0.355	
					Rear Tilt (Edge4 Side)	155	5775	99.4%	13.0	12.9	0.149	0.155	
					Edge 1	155	5775	99.4%	13.0	12.9	0.532	0.553	7
					Edge 4	155	5775	99.4%	13.0	12.9	0.015	0.016	
Body	802.11ac (VHT80)	WLAN #2	Power Reduction	0	Rear	155	5775	99.4%	10.0	9.9	0.419	0.434	
					Rear Tilt (Edge 1 Side)	155	5775	99.4%	10.0	9.9	0.778	0.806	8
					Rear Tilt (Edge 4 Side)	155	5775	99.4%	10.0	9.9	0.039	0.040	
					Edge 1	155	5775	99.4%	10.0	9.9	0.194	0.201	
					Edge 4	155	5775	99.1%	10.0	9.9	<0.01	<0.01	

10.3. Wi-Fi 6E (U-NII5-8 Bands)

RF Exposure Conditions	Mode	Antenna	Pwr State	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Duty Cycle	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Body	802.11ax (HE160)	WLAN #1	Power Reduction	0	Rear	15	6025	98.5%	11.5	10.8	0.112	0.132	
						79	6345	98.5%	11.5	10.9	0.131	0.154	
						111	6505	98.5%	11.5	10.5	0.130	0.165	
						143	6665	98.5%	11.5	10.9	0.076	0.088	
					Rear Tilt (Edge1)	207	6985	98.5%	11.8	10.3	0.047	0.066	
						15	6025	98.5%	11.5	10.8	0.130	0.154	
						79	6345	98.5%	11.5	10.9	0.156	0.183	
						111	6505	98.5%	11.5	10.5	0.218	0.276	
					Rear Tilt (Edge4)	143	6665	98.5%	11.5	10.9	0.158	0.182	
						207	6985	98.5%	11.8	10.3	0.074	0.104	
						15	6025	98.5%	11.5	10.8	0.045	0.053	
						79	6345	98.5%	11.5	10.9	0.070	0.082	
					Edge1	111	6505	98.5%	11.5	10.5	0.079	0.100	
						143	6665	98.5%	11.5	10.9	0.057	0.066	
						207	6985	98.5%	11.8	10.3	0.027	0.038	
						15	6025	98.5%	11.5	10.8	0.303	0.358	
					Edge4	79	6345	98.5%	11.5	10.9	0.312	0.366	
						111	6505	98.5%	11.5	10.5	0.268	0.340	
						143	6665	98.5%	11.5	10.9	0.303	0.350	
						207	6985	98.5%	11.8	10.3	0.303	0.428	9
Body	802.11ax (HE160)	WLAN #2	Power Reduction	0	Rear	15	6025	98.5%	6.0	5.4	0.145	0.171	
						79	6345	98.5%	6.8	6.3	0.165	0.187	
						111	6505	98.5%	7.3	6.8	0.201	0.228	
						143	6665	98.5%	7.3	6.7	0.244	0.281	
					Rear Tilt (Edge1)	207	6985	98.5%	7.8	7.1	0.204	0.239	
						15	6025	98.5%	6.0	5.4	0.222	0.261	
						79	6345	98.5%	6.8	6.3	0.237	0.269	
						111	6505	98.5%	7.3	6.8	0.327	0.371	
					Edge1	143	6665	98.5%	7.3	6.7	0.371	0.427	10
						207	6985	98.5%	7.8	7.1	0.339	0.397	
						15	6025	98.5%	6.0	5.4	0.039	0.046	
						79	6345	98.5%	6.8	6.3	0.018	0.020	
					Edge4	111	6505	98.5%	7.3	6.8	0.014	0.016	
						143	6665	98.5%	7.3	6.7	0.043	0.049	
						207	6985	98.5%	7.8	7.1	0.056	0.066	
						15	6025	98.5%	6.0	5.4	0.056	0.066	

10.4. Bluetooth

RF Exposure Conditions	Mode	Antenna	Pwr State	Dist. (mm)	Test Position	Ch #.	Freq. (MHz)	Duty Cycle	Power (dBm)		1-g SAR (W/kg)		Plot No.
									Tune-up Limit	Meas.	Meas.	Scaled	
Body-worn	BR GFSK	WLAN #2	Full Power	0	Rear	39	2441	76.8%	10.5	9.8	0.057	0.086	
					Rear Tilt (Edge1 side)	39	2441	76.8%	10.5	9.8	0.090	0.138	11
					Edge1	39	2441	76.8%	10.5	9.8	0.013	0.020	

11. SAR Measurement Variability

In accordance with published RF Exposure KDB 865664 D01 SAR measurement 100 MHz to 6 GHz. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

- 1) Repeated measurement is not required when the original highest measured SAR is < 0.8 or 2 W/kg (1-g or 10-g respectively); steps 2) through 4) do not apply.
- 2) When the original highest measured SAR is ≥ 0.8 or 2 W/kg (1-g or 10-g respectively), repeat that measurement once.
- 3) Perform a second repeated measurement only if the **ratio of largest to smallest SAR** for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 or 3.6 W/kg (~ 10% from the 1-g or 10-g respective SAR limit).
- 4) Perform a third repeated measurement only if the original, first, or second repeated measurement is ≥ 1.5 or 3.75 W/kg (1-g or 10-g respectively) and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

Frequency Band (MHz)	Air Interface	RF Exposure Conditions	Test Position	Ant	Pwr Level	Highest Measured SAR (W/kg)	First Repeated	
							Measured SAR (W/kg)	Largest to Smallest SAR Ratio
2400	Wi-Fi 802.11b/g/n	Body	Rear Tilt (Edge1 side)	WLAN #2	Tablet State	0.881	0.874	1.01
5300	Wi-Fi 802.11a/n/ac	Body	Rear Tilt (Edge1 side)	WLAN #2	Tablet State	0.827	0.800	1.03

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 < 1.20.

12. Simultaneous Transmission Conditions

Tx Mode	WLAN #1			WLAN #2			
	2.4 GHz	5 GHz	6 GHz	2.4 GHz	5 GHz	6 GHz	BT
1	x			x			
2		x			x		
3			x			x	
4	x						x
5		x					x
6			x				x

12.1. 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)

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.

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

RF Exposure conditions	Standalone SAR (W/kg)							Σ 1-g SAR (W/kg)					
	DTS		Nil 5GHz		Nil 6GHz		DSS (BT)	DTS	Nil 5GHz	Nil 6GHz	DTS + DSS	Nil 5GHz + DSS	Nil 6GHz + DSS
	Ant 1 ①	Ant 2 ②	Ant 1 ③	Ant 2 ④	Ant 1 ⑤	Ant 2 ⑥	Ant 2 ⑦	①+②	③+④	⑤+⑥	①+⑦	③+⑦	⑤+⑦
Rear	0.075	0.681	0.211	0.562	0.165	0.281	0.086	0.756	0.773	0.446	0.161	0.297	0.251
Rear Tilt (Edge 1 side)	0.151	0.925	0.355	0.854	0.276	0.427	0.138	1.076	1.209	0.703	0.289	0.493	0.414
Rear Tilt (Edge 4 side)	0.029	0.011	0.155	0.041	0.100			0.040	0.196	0.100	0.029	0.155	0.100
Edge 1	0.422	0.268	0.553	0.201	0.428	0.066	0.020	0.690	0.754	0.494	0.442	0.573	0.448
Edge 4	0.035	0.010	0.034	0.010	0.008			0.045	0.044	0.008	0.035	0.034	0.008

Conclusion:

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

Appendixes

Refer to separated files for the following appendixes.

Appendix A: SAR Setup Photos

Appendix B: SAR System Check Plots

Appendix C: SAR Highest Test Plots

Appendix D: SAR Tissue Ingredients

Appendix E: SAR Probe Certificates

Appendix F: SAR Dipole Certificates

END OF REPORT