



POWER DENSITY EVALUATION REPORT

FCC 47 CFR § 2.1093

For
SMARTPHONE

FCC ID: BCG-E8440A
Model Name: A3105

Report Number: 14523772-S10V1
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1. Attestation of Test Results

Applicant Name	APPLE INC.	
FCC ID	BCG-E8440A	
Model Name	A3105	
Applicable Standards	FCC 47 CFR § 2.1093	
Exposure Category	Radiofrequency (RF) Radiation Exposure (above 6GHz)	
	Uncontrol (mW/cm ² over 4 cm ²) 30 min average	Occupational/controlled (mW/cm ² over 4 cm ²) 6 min average
	1.0	5
Applicable limit	☒ Uncontrol / ☐ Occupational/controlled	
PD Result (mW/cm ² over 4cm ²)	0.702	
Simultaneous TX (ratio<1)	0.999	
Date Tested	7/6/2023 to 8/1/2023	
Test Results	Pass	
UL Verification Services Inc. 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. This report contains data provided by the customer which can impact the validity of results. UL Verification Services Inc. is only responsible for the validity of results after the integration of the data provided by the customer. 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. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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.		
Approved & Released By:		Prepared By:
		
Devin Chang Senior Test Engineer UL Verification Services Inc.		Christopher Kuwatani Laboratory Engineer UL Verification Services Inc.

2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, the following FCC Published RF exposure KDB procedures:

- 447498 D01 General RF Exposure Guidance v06
- 865664 D02 RF Exposure Reporting v01r02
- SPEAG cDASY6/8 System Handbook; part 4 cDASY6 Module mmWave
- SPEAG, DASY8 Application Note: SAR, APD & PD at 6 – 10 GHz (Version 5), April 2022
- IEC TR 63170: 2018

In addition to the above, [TCB workshop](#) information was used.

- [TCB workshop](#) November, 2017; RF Exposure Procedures (Power Density Evaluation)
- [TCB workshop](#) October, 2018; RF Exposure Procedures (Millimeter Wave Assessment)
- [TCB workshop](#) April, 2019; RF Exposure Procedures (Millimeter Wave RF Exposure Evaluation)
- [TCB workshop](#) November, 2019; RF Exposure Procedures (Millimeter Wave Scan Requirements)
- [TCB workshop](#) October 2020; RF Exposure Procedures (U NII 6-7 GHz RF Exposure)
- [TCB workshop](#) October 2022; RF Exposure Policies and Procedures (f-above-6 GHz Portable Devices)

3. Facilities and Accreditation

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

47266 Benicia Street
SAR Lab 3 and SAR Lab 6

UL Verification Services Inc. is accredited by A2LA, Certificate Number 0751.05

4. Measurement System & Test Equipment

4.1. EUmmWVx / E-Field 5G Probe

E-Field mm-Wave Probe for General Near-Field Measurements

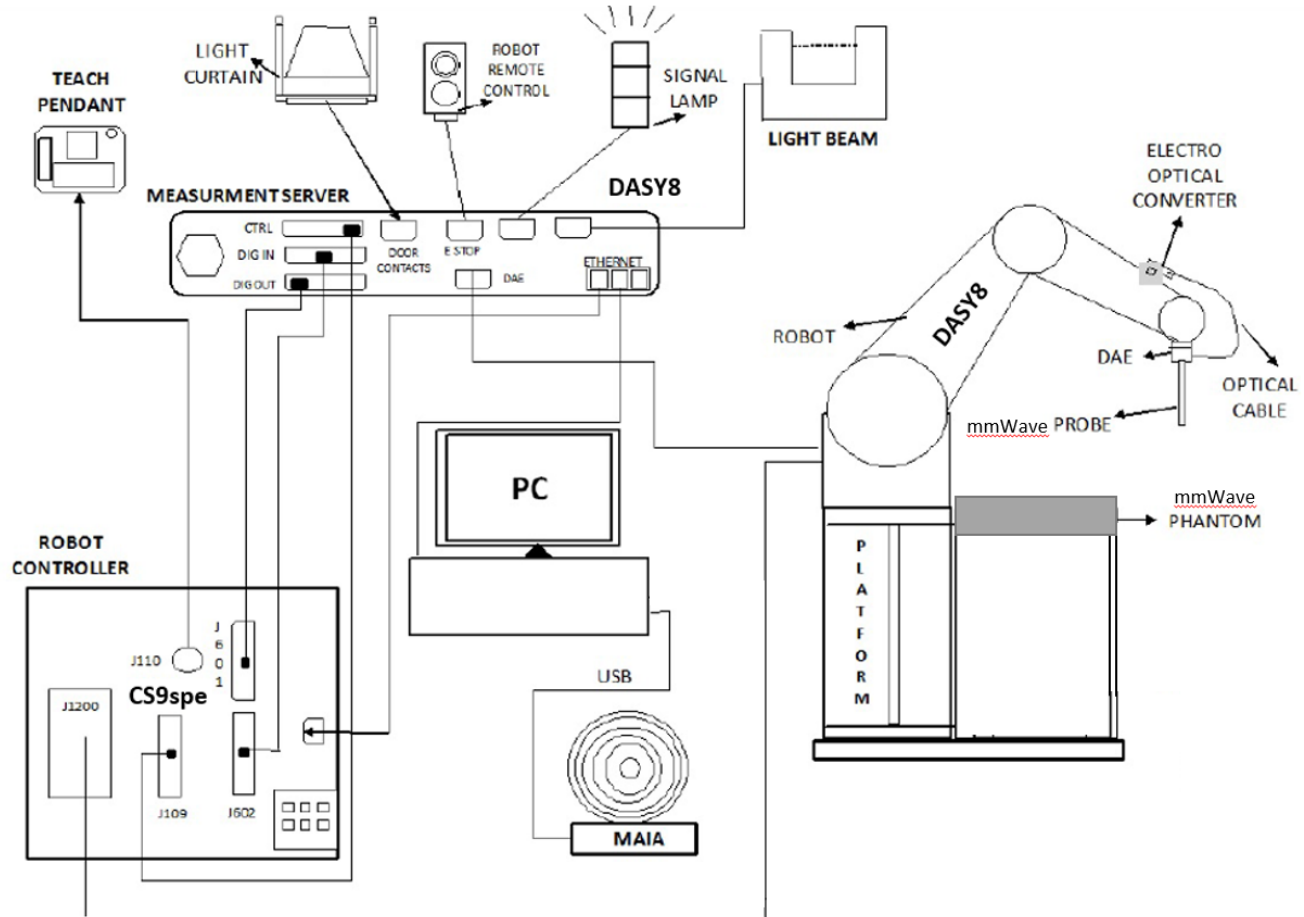
	Two dipoles optimally arranged to obtain pseudo-vector information Minimum 3 measurements/point, 120° rotated around probe axis Sensors (0.8mm length) printed on glass substrate protected by high density foam Low perturbation of the measured field Requires positioner which can do accurate probe rotation
Frequency Range	750 MHz – 110 GHz (EUmmWV4)
Dynamic Range	< 20 V/m - 10'000 V/m with PRE-10 (min < 50 V/m - 3000 V/m)
Position Precision	< 0.2 mm (DASY8)
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: encapsulation 8 mm (internal sensor < 1mm) Distance from probe tip to dipole centers: < 2 mm Sensor displacement to probe's calibration point: < 0.3 mm
Applications	E-field measurements of 5G devices and other mm-wave transmitters operating above 6GHz in < 2 mm distance from device (free-space) Power density, H-field and far-field analysis using total field reconstruction (DASY8 Module mmWave)
Compatibility	cDASY6/8 Module mmWave V3.2.2.2358

4.2. Data Acquisition Electronics(DAE)

	Serial optical link for communication with DASY embedded system (fully remote controlled) Two-step probe touch detector for mechanical surface detection and emergency robot stop
Measurement Range	-100 – +300 mV (16 bit resolution and two range settings: 4 mV, 400 mV)
Input Offset Voltage	<5 µV (with auto zero)
Input Resistance	200 Mohm
Input Bias Current	<50 fA
Battery Power	>10 hours of operation (with two 9.6 V NiMH batteries)
Dimensions (L × W × H)	60 × 60 × 68 mm

4.3. Measurement System

The DASY8 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).
- The EUmmWVx probe is based on the pseudo-vector probe design, which not only measures the field magnitude but also derives its polarization ellipse.
- 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 Win10 and the DASY6/8¹ software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom which is specialized for 5G other accessories according to the targeted measurement.

¹ DASY8 software used: DASY6/8 mmWave V3.2.2.2358 and older generations.

4.4. Measurement Procedures

4.4.1. System Verification Scan Procedures

cDASY6/8 Module mmWave supports “5G Scan”, a fine resolution scan performed on two different planes which is used to reconstruct the E- and H-fields as well as the power density; the average power density is derived from this measurement.

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 device under test.

Step 2: 5G Scan

The steps in the X, Y, and Z directions are specified in terms of fractions of the signal wavelength, lambda. Area Scan Parameters extracted from SPEAG cDASY6 System Handbook; part 4 cDASY6/8 Module mmWave.

Recommended settings for measurement of verification sources

Frequency [GHz]	Grid step	Grid extent X/Y [mm]	Measurement points
10	0.125 $\left(\frac{\lambda}{8}\right)$	60/60	18×18
30	0.25 $\left(\frac{\lambda}{4}\right)$	60/60	26×26
45	0.25 $\left(\frac{\lambda}{4}\right)$	42/42	28×28
60	0.25 $\left(\frac{\lambda}{4}\right)$	32.5/32.5	28×28
90	0.25 $\left(\frac{\lambda}{4}\right)$	30/30	38×38

The minimum distance of probe sensors to the verification source surface, horn antenna, is 10 mm for 10 GHz and 5.55mm for 30 GHz and above.

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.

When the drift is larger than $\pm 5\%$, test is repeated from step1.

4.4.2. Scan Procedures

Step 1: Power Reference Measurement

Same as System Verification Scan Procedures step 1.

Step 2: 5G Scan

Same as System Verification Scan Procedures step 2. But measurement area is defined based on TCB work shop April 2019, “A sufficiently large measurement region and proper measurement spatial resolution are required to maintain field reconstruction accuracy”.

–Fields at the measurement region boundary should be ~20-30 dB below the peaks

Step 3: Power drift measurement

Same as System Verification Scan Procedures step 3.

When the drift is smaller than $\pm 5\%$, it is considered in the uncertainty budget if drifts larger than 5%, uncertainty is re-calculate.

4.5. 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.

System Check

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
MXG Analog Signal Generator	Agilent	N5181A	MY50140610	1/31/2024
Power Meter	HP	437B	3125U11364	1/31/2024
Power Meter	HP	437B	3125U11347	1/31/2024
Power Sensor	HP	8481A	3318A92374	1/31/2024
Power Sensor	HP	8481A	1926A27049	1/31/2024
Amplifier	Miteq	AMF-4D-00400600-50-30P	1795093	N/A
Bi-directional coupler	Werlatone	C8060-102	2711	N/A
DC Power Supply	Sorensen	XT 15-4	1802A01877	N/A
MXG Analog Signal Generator	Agilent	N5181A	MY50140630	1/31/2024
Power Meter	Keysight	N1912A	MY55196004	1/31/2024
Power Sensor	Agilent	N1921A	MY53260010	1/31/2024
Power Sensor	Agilent	N1921A	MY52260009	1/31/2024
Amplifier	Miteq	AMF-4D-00400600-50-30P	1795092	N/A
Bi-directional coupler	Werlatone	C8060-102	2149	N/A
DC Power Supply	Sorensen	XT 15-4	PRE0178948	N/A
Signal Generator	R&S	SMB 100A	171706	2/29/2024
Power Meter	Keysight	N1912A	MY55196007	1/31/2024
Power Sensor	Agilent	N1921A	MY53020038	1/31/2024
Power Sensor	R&S	NRP18A	171503	2/29/2024
Bi-directional coupler	Werlatone	C8060-102	4054	N/A
Signal Generator	R&S	SMB 100A	171705	2/29/2024
Power Meter	HP	437B	3125U09248	1/31/2024
Power Sensor	HP	8481A	2237A31744	1/31/2024
Power Sensor	R&S	NRP8S	199180	2/29/2024
Bi-directional coupler	Werlatone	C8060-102	2710	N/A
Signal Generator	R&S	SMB 100A	171705	2/29/2024
Power Meter	HP	437B	3125U09248	1/31/2024
Power Sensor	R&S	NRP18A	171443	2/29/2024
Power Sensor	Agilent	8481A	2237A31744	1/26/2024
Bi-directional coupler	Werlatone	C8060-102	2710	N/A

Lab Equipment

Name of Equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
E-Field Probe (SAR Lab 3)	SPEAG	EUmmWV4	9589	9/20/2024
E-Field Probe (SAR Lab 6)	SPEAG	EUmmWV4	9496	2/20/2024
Data Acquisition Electronics	SPEAG	DAE4	1540	1/23/2024
Data Acquisition Electronics	SPEAG	DAE4	1377	9/15/2023
System Validation Dipole	SPEAG	5G Verification Source 10GHz	1015	9/13/2023

5. Measurement Uncertainty

a		b	c	d f(d,k)	e	f = b×e/d	g
Error Description		Unc.Value (±dB)	Probab. Distri.	Div.	ci	Std. Unc. (±dB)	vi
Uncertainty terms dependent on the measurement system							
CAL	Calibration Repeatability	0.49	Normal	1	1	0.49	∞
COR	Probe correction	0	Rectangular	1.732	1	0.00	∞
FRS	Frequency response (BW 1 GHz)	0.20	Rectangular	1.732	1	0.12	∞
SCC	Sensor cross coupling	0	Rectangular	1.732	1	0.00	∞
ISO	Isotropy	0.50	Rectangular	1.732	1	0.29	∞
LIN	Linearity	0.20	Rectangular	1.732	1	0.12	∞
PSC	Probe scattering	0	Rectangular	1.732	1	0.00	∞
PPO	Probe positioning o set	0.30	Rectangular	1.732	1	0.17	∞
PPR	Probe positioning repeatability	0.04	Rectangular	1.732	1	0.02	∞
SMO	Sensor mechanical o set	0	Rectangular	1.732	1	0.00	∞
PSR	Probe spatial resolution	0	Rectangular	1.732	1	0.00	∞
FLD	Field impedance dependance	0	Rectangular	1.732	1	0.00	∞
APD	Amplitude and phase drift	0	Rectangular	1.732	1	0.00	∞
APN	Amplitude and phase noise	0.04	Rectangular	1.732	1	0.02	∞
TR	Measurement area truncation	0	Rectangular	1.732	1	0.00	∞
DAQ	Data acquisition	0.03	Normal	1	1	0.03	∞
SMP	Sampling	0	Rectangular	1.732	1	0.00	∞
REC	Field reconstruction	0.60	Rectangular	1.732	1	0.35	∞
TRA	Forward transformation	0	Rectangular	1.732	1	0.00	∞
SCA	Power density scaling	-	Rectangular	1.732	1	-	∞
SAV	Spatial averaging	0.10	Rectangular	1.732	1	0.06	∞
SDL	System detection limit	0.04	Rectangular	1.732	1	0.02	∞
Uncertainty terms dependent on the DUT and environmental factors							
PC	Probe coupling with DUT	0	Rectangular	1.732	1	0	∞
MOD	Modulation response	0.40	Rectangular	1.732	1	0.23	∞
IT	Integration time	0	Rectangular	1.732	1	0	∞
RT	Response time	0	Rectangular	1.732	1	0	∞
DH	Device holder influence	0.10	Rectangular	1.732	1	0.06	∞
DAQ	DUT alignment	0	Rectangular	1.732	1	0	∞
AC	RF ambient conditions	0.04	Rectangular	1.732	1	0.02	∞
AR	Ambient reflections	0.04	Rectangular	1.732	1	0.02	∞
MSI	Immunity / secondary reception	0	Rectangular	1.732	1	0	∞
DRI	Drift of the DUT	0.21	Rectangular	1.732	1	0.12	∞
Combined Standard Uncertainty Uc(f) =			RSS			0.76	∞
Expanded Uncertainty U, Coverage Factor = 2, > 95 % Confidence =						1.52	

6. Device Under Test (DUT) Information

6.1. DUT Description

The Apple iPhone is a smartphone with cellular GSM, GPRS, EGPRS, UMTS, LTE, 5G, IEEE 802.11a/b/g/n/ac/ax, Bluetooth, Ultra-Wideband, GPS, NFC, NB UNII, 802.15.4, 802.15.4ab-NB and MSS technologies. All models except reference model support at least one UICC based SIM. The second SIM is either an UICC based p-SIM (physical SIM) or e-SIM (electronic SIM). The device supports a built-in inductive charging transmitter and receiver. The rechargeable battery is not user accessible.

All Models have the same PCB layout, circuit design, common components, antennas, and antenna locations their respective reference model. Their cellular modem, Wi-Fi, BT, NFC, WPT, UWB, NB UNII, 802.15.4, 802.15.4ab-NB, and MSS transmitters are identical.

BCM4388 has 2 vendors. The Wi-Fi/BT radio modules have the same mechanical outline (e.g., the same package dimension and pin-out layout), use the same on-board antenna matching circuit, have an identical antenna structure, and are built and tested to conform to the same specifications and to operate within the same tolerances. Baseline testing was performed on the variants to determine the worst case on all conducted power and radiated emissions.

Device Dimension	Refer to Appendix A
Back Cover	The Back Cover is not removable
Battery Options	The rechargeable battery is not user accessible.
Accessory	Headset
Wireless Router (Hotspot)	Wi-Fi Hotspot mode permits the device to share its cellular data connection with other Wi-Fi-enabled devices. ☒ Mobile Hotspot (Wi-Fi 2.4 GHz) ☒ Mobile Hotspot Wi-Fi 5.2(UNII-1)/5.8 GHz(UNII-3)
AirPlay	AirPlay mode enabled devices transfer data directly between each other ☒ AirPlay (Wi-Fi 2.4 GHz) ☒ AirPlay (Wi-Fi 5 GHz)
Bluetooth Tethering (Hotspot)	BT Tethering mode permits the device to share its cellular data connection with other devices. ☒ BT Tethering (Bluetooth 2.4 GHz)

6.2. Wireless Technologies

Wireless technologies	Frequency bands	Operating mode	Duty Cycle used for PD testing
Wi-Fi	6E ¹	802.11a 802.11ax (HE20) 802.11ax (HE40) 802.11ax (HE80) 802.11ax (HE160)	98.95% (802.11a 20MHz BW) 98.24% (802.11ax 80MHz BW) 92.06% (802.11ax 160MHz BW)

Notes:

- Duty cycle for Wi-Fi is referenced from the SAR report. (14523772-S1V1)

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.

Antenna	Band	Back	Front	Edge Top	Edge Right	Edge Bottom	Edge Left
ANT5	Wi-Fi 6E	Yes	Yes	No	No	Yes	Yes
ANT6	Wi-Fi 6E	Yes	Yes	Yes	No	No	Yes

7.1. Test Rationale

An investigation was performed to determine the worst-case position per antenna. After completing the investigation, it was determined that Back yielded the highest field strength for both antennas; thus, Back was the only position tested. Refer to §10.1 for worst case positions results per antenna.

8. System Performance Check

Per Nov 2017,TCB Workshop

System validation is required before a system is deployed for measurement.

System check is also required before each series of continuous measurement and, as applicable, repeated at least weekly.

Peak and spatially averaged power density at the peak location(s) must be compared to calibrated results according to the defined test conditions

- the same spatial resolution and measurement region used in the waveguide calibration should be applied to system validation and system check.
- 1 cm² and 4 cm² spatial averaging have been recommended in the AHG10 draft TR with reference targets available for specific waveguide.
- power density distribution should also be verified, both spatially (shape) and numerically (level) through visual inspection for noticeable differences.
- the measured results should be within 10% of the calibrated targets.

The system components, software settings and other system parameters shall be the same as those used for the compliance tests. The system check shall be performed at closest probe calibration frequency point as in the compliance tests, e.g., if the EUT operates at 35 GHz, it is recommended to perform the validation at 30 GHz.

SAR Lab	Date	Frequency (GHz)	5G Verification Source SN	Source Cal. Due Data	Measured psPDn (W/m ²) over 4cm ²	Normalized to 19.9 dBm (W/m ²)	Target psPDn (W/m ²) over 4cm ²	Deviation (dB)	Delta ±10 %	Measured psPDtot (W/m ²) over 4cm ²	Normalized to 19.9 dBm (W/m ²)	Target psPDtot (W/m ²) over 4cm ²	Deviation (dB)	Delta ±10 %	Plot
3	7/23/2023	10	1015	9/13/2023	38.6	43.8	56.0	-1.07	-22%	39.1	44.4	57.1	-1.10	-22%	1
3	7/27/2023	10	1015	9/13/2023	48.3	54.8	56.0	-0.09	-2%	48.6	55.2	57.1	-0.15	-3%	
3	7/31/2023	10	1015	9/13/2023	42.8	48.6	56.0	-0.62	-13%	43.0	48.8	57.1	-0.68	-15%	
6	7/6/2023	10	1015	9/13/2023	40.2	45.6	57.9	-1.03	-21%	40.3	45.7	58.8	-1.09	-22%	2

Note(s):

Input power that was used, 19.3 dBm, is same as calibration data.

9. Conducted Output Power Measurements

9.1. Wi-Fi 6E (U-NII 5-8 Bands)

When the same transmission mode configurations have the same maximum output power on the same channel for the 802.11 a/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.

Wi-Fi 6E Test channels were determined in one of two ways:

- Wi-Fi 6E was Aggregated due to the same transmission mode being selected for SAR testing. 5 total test channels from across all U-NII 5/6/7/8 were selected.
- Wi-Fi 6E was Split due to different transmission modes being selected for SAR testing. A minimum of 3 test channels were selected for each individual U-NII Band.

Maximum Output Power for Wi-Fi 6E

The table below is the maximum output power for this device. The highlighted values indicate what the overall worst case transmission mode will be required for iPD testing per channel. In the Wi-Fi 6E (Power State) table, the highlighted worst case Low/Mid/High channels are selected for Mode A and Mode B.

[illegible][illegible]

Wi-Fi 6E(Power States)

For Wi-Fi 6E bands, there are use 6 difference power states:

- Power state 1: 802.15.4ab-NB_{OFF} | P_{mid} | CELL_{OFF}
- Power state 2: 802.15.4ab-NB_{ON} | P_{mid} | CELL_{OFF}
- Power state 3: 802.15.4ab-NB_{OFF} | P_{high} | CELL_{OFF}
- Power state 4: 802.15.4ab-NB_{OFF} | P_{low} | CELL_{ON}
- Power state 5: 802.15.4ab-NB_{ON} | P_{high} | CELL_{OFF}
- Power state 6: 802.15.4ab-NB_{ON} | P_{low} | CELL_{ON}

Antenna	Mode	Bandwidth	Channel	Frequency	Maximum Output Power (dBm)											
					Power State 1		Power State 2		Power State 3		Power State 4		Power State 5		Power State 6	
					Mode A	Mode B	Mode A	Mode B	Mode A	Mode B	Mode A	Mode B	Mode A	Mode B	Mode A	Mode B
ANT5	U-NII-5	802.11a 20 MHz	1	5955	11.50	11.50	11.50	11.50	11.50	11.50	11.00	11.00	11.50	11.50	10.00	10.00
			5	5975	11.50	11.50	11.50	11.50	11.50	11.50	11.00	11.00	11.50	11.50	10.00	10.00
			9-29	5995-6095	11.50	11.50	11.50	11.50	11.50	11.50	11.00	11.00	11.50	11.50	10.00	10.00
			33-61	6115-6255	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.75
			65-85	6275-6375	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50
			89	6395	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50
			93	6415	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50
		802.11ax 40 MHz	3	5965	12.00	12.00	12.00	12.00	12.00	12.00	11.00	11.00	11.50	11.50	10.00	10.00
			11	6005	12.00	12.00	12.00	12.00	12.00	12.00	11.00	11.00	11.50	11.50	10.00	10.00
			19-27	6045-6085	12.00	12.00	12.00	12.00	12.00	12.00	11.00	11.00	11.50	11.50	10.00	10.00
			35-59	6125-6245	12.00	12.00	12.00	12.00	12.00	12.00	11.00	11.00	11.50	11.50	10.00	10.00
			67-75	6285-6325	12.00	12.00	12.00	12.00	12.00	12.00	11.00	11.00	11.50	11.50	10.00	10.00
			83	6365	12.00	12.00	12.00	12.00	12.00	12.00	11.00	11.00	11.50	11.50	10.00	10.00
			91	6405	12.00	12.00	12.00	12.00	12.00	12.00	11.00	11.00	11.50	11.50	10.00	10.00
		802.11ax 80 MHz	7	5985	12.00	12.00	12.00	12.00	12.00	12.00	11.00	11.00	11.50	11.50	10.00	10.00
			23	6065	12.00	12.00	12.00	12.00	12.00	12.00	11.00	11.00	11.50	11.50	10.00	10.00
			39-55	6145-6225	12.00	12.00	12.00	12.00	12.00	12.00	11.00	11.00	11.50	11.50	10.00	10.00
			71	6305	12.00	12.00	12.00	12.00	12.00	12.00	11.00	11.00	11.50	11.50	10.00	10.00
			87	6385	12.00	12.00	12.00	12.00	12.00	12.00	11.00	11.00	11.50	11.50	10.00	10.00
		802.11ax 160 MHz	15	6025	12.00	12.00	12.00	12.00	12.00	12.00	11.00	11.00	11.50	11.50	10.00	10.00
			47	6185	12.00	12.00	12.00	12.00	12.00	12.00	11.00	11.00	11.50	11.50	10.00	10.00
			79	6345	12.00	12.00	12.00	12.00	12.00	12.00	11.00	11.00	11.50	11.50	10.00	10.00
	Mode	Bandwidth	Channel	Frequency	Maximum Output Power (dBm)											
	U-NII-6	802.11a 20 MHz	97-109	6435-6495	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.00	9.00
			113	6515	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.00	9.00
		802.11ax 40 MHz	99-107	6445-6485	11.00	11.00	11.00	11.00	11.00	11.00	10.00	10.00	10.50	10.50	9.00	9.00
			115	6525	11.00	11.00	11.00	11.00	11.00	11.00	10.00	10.00	10.50	10.50	9.00	9.00
		802.11ax 80 MHz	103	6465	11.00	11.00	11.00	11.00	11.00	11.00	10.00	10.00	10.50	10.50	9.00	9.00
			119	6545	11.00	11.00	11.00	11.00	11.00	11.00	10.00	10.00	10.50	10.50	9.00	9.00
		802.11ax 160 MHz	111	6505	11.00	11.00	11.00	11.00	11.00	11.00	10.00	10.00	10.50	10.50	9.00	9.00
	Mode	Bandwidth	Channel	Frequency	Maximum Output Power (dBm)											
	U-NII-7	802.11a 20 MHz	117-125	6535-6575	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
			125-157	6575-6735	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
			161-181	6735-6855	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
			185	6875	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50
		802.11ax 40 MHz	123	6565	11.00	11.00	11.00	11.00	11.00	11.00	10.00	10.00	10.50	10.50	9.00	9.00
			131-155	6605-6725	11.00	11.00	11.00	11.00	11.00	11.00	10.25	10.25	10.75	10.75	9.25	9.25
			163-179	6765-6845	11.00	11.00	11.00	11.00	11.00	11.00	10.25	10.25	10.75	10.75	9.25	9.25
			187	6885	10.50	10.50	10.50	10.50	10.50	10.50	10.25	10.25	10.50	10.50	9.25	9.25
		802.11ax 80 MHz	135-151	6625-6705	11.25	11.25	11.25	11.25	11.25	11.25	10.25	10.25	10.75	10.75	9.25	9.25
			167	6785	11.25	11.25	11.25	11.25	11.25	11.25	10.25	10.25	10.75	10.75	9.25	9.25
			183	6865	11.25	11.25	11.25	11.25	11.25	11.25	10.25	10.25	10.75	10.75	9.25	9.25
		802.11ax 160 MHz	143	6665	11.25	11.25	11.25	11.25	11.25	11.25	10.25	10.25	10.75	10.75	9.25	9.25
			175	6825	11.25	11.25	11.25	11.25	11.25	11.25	10.25	10.25	10.75	10.75	9.25	9.25
	Mode	Bandwidth	Channel	Frequency	Maximum Output Power (dBm)											
	U-NII-8	802.11a 20 MHz	189-225	6895-7075	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50
			229	7095	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50
			233	7115	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00
		802.11ax 40 MHz	195-219	6925-7045	9.75	9.75	9.75	9.75	9.75	9.75	8.75	8.75	9.25	9.25	7.75	7.75
			227	7085	9.75	9.75	9.75	9.75	9.75	9.75	8.75	8.75	9.25	9.25	7.75	7.75
		802.11ax 80 MHz	199	6945	9.75	9.75	9.75	9.75	9.75	9.75	8.75	8.75	9.25	9.25	7.75	7.75
			215	7025	9.75	9.75	9.75	9.75	9.75	9.75	8.75	8.75	9.25	9.25	7.75	7.75
		802.11ax 160 MHz	207	6985	9.75	9.75	9.75	9.75	9.75	9.75	8.75	8.75	9.25	9.25	7.75	7.75

Note(s):

Power State 2 and 3 maximum output power same as Power State 1

Antenna	Mode	Bandwidth	Channel	Frequency	Maximum Output Power (dBm)											
					Power State 1		Power State 2		Power State 3		Power State 4		Power State 5		Power State 6	
					Mode A	Mode B	Mode A	Mode B	Mode A	Mode B	Mode A	Mode B	Mode A	Mode B	Mode A	Mode B
ANT6	U-NII-5	802.11a 20 MHz	1	5955	10.00	10.00	10.00	10.00	10.00	10.00	9.00	9.00	9.50	9.50	8.00	8.00
			5	5975	10.00	10.00	10.00	10.00	10.00	10.00	9.00	9.00	9.50	9.50	8.00	8.00
			9-29	5995-6095	10.00	10.00	10.00	10.00	10.00	10.00	9.00	9.00	9.50	9.50	8.00	8.00
			33-61	6115-6255	9.75	9.75	9.75	9.75	9.75	9.75	9.00	9.00	9.50	9.50	8.00	8.00
			65-85	6275-6375	8.50	8.50	8.50	8.50	8.50	8.50	7.50	7.50	8.00	8.00	6.50	6.50
			89	6395	8.50	8.50	8.50	8.50	8.50	8.50	7.50	7.50	8.00	8.00	6.50	6.50
		802.11ax 40 MHz	93	6415	8.50	8.50	8.50	8.50	8.50	8.50	7.50	7.50	8.00	8.00	6.50	6.50
			3	5965	10.00	10.00	10.00	10.00	10.00	10.00	9.00	9.00	9.50	9.50	8.00	8.00
			11	6005	10.00	10.00	10.00	10.00	10.00	10.00	9.00	9.00	9.50	9.50	8.00	8.00
			19-27	6045-6085	10.00	10.00	10.00	10.00	10.00	10.00	9.00	9.00	9.50	9.50	8.00	8.00
			35-59	6125-6245	10.00	10.00	10.00	10.00	10.00	10.00	9.00	9.00	9.50	9.50	8.00	8.00
			67-75	6285-6325	8.50	8.50	8.50	8.50	8.50	8.50	7.50	7.50	8.00	8.00	6.50	6.50
		802.11ax 80 MHz	83	6365	8.50	8.50	8.50	8.50	8.50	8.50	7.50	7.50	8.00	8.00	6.50	6.50
			91	6405	8.50	8.50	8.50	8.50	8.50	8.50	7.50	7.50	8.00	8.00	6.50	6.50
			7	5985	10.00	10.00	10.00	10.00	10.00	10.00	9.00	9.00	9.50	9.50	8.00	8.00
			23	6065	10.00	10.00	10.00	10.00	10.00	10.00	9.00	9.00	9.50	9.50	8.00	8.00
			39-55	6145-6225	10.00	10.00	10.00	10.00	10.00	10.00	9.00	9.00	9.50	9.50	8.00	8.00
		802.11ax 160 MHz	71	6305	8.50	8.50	8.50	8.50	8.50	8.50	7.50	7.50	8.00	8.00	6.50	6.50
			87	6385	8.50	8.50	8.50	8.50	8.50	8.50	7.50	7.50	8.00	8.00	6.50	6.50
			15	6025	10.00	10.00	10.00	10.00	10.00	10.00	9.00	9.00	9.50	9.50	8.00	8.00
			47	6185	10.00	10.00	10.00	10.00	10.00	10.00	9.00	9.00	9.50	9.50	8.00	8.00
			79	6345	8.50	8.50	8.50	8.50	8.50	8.50	7.50	7.50	8.00	8.00	6.50	6.50
	U-NII-6	802.11a 20 MHz	97-109	6435-6495	8.75	8.75	8.75	8.75	8.75	8.75	7.75	7.75	8.25	8.25	6.75	6.75
			113	6515	8.00	8.00	8.00	8.00	8.00	8.00	7.00	7.00	7.50	7.50	6.00	6.00
		802.11ax 40 MHz	99-107	6445-6485	8.75	8.75	8.75	8.75	8.75	8.75	7.75	7.75	8.25	8.25	6.75	6.75
			115	6525	8.00	8.00	8.00	8.00	8.00	8.00	7.00	7.00	7.50	7.50	6.00	6.00
		802.11ax 80 MHz	103	6465	8.75	8.75	8.75	8.75	8.75	8.75	7.75	7.75	8.25	8.25	6.75	6.75
			119	6545	8.00	8.00	8.00	8.00	8.00	8.00	7.00	7.00	7.50	7.50	6.00	6.00
		802.11ax 160 MHz	111	6505	8.00	8.00	8.00	8.00	8.00	8.00	7.00	7.00	7.50	7.50	6.00	6.00
	U-NII-7	802.11a 20 MHz	117-125	6535-6575	8.00	8.00	8.00	8.00	8.00	8.00	7.00	7.00	7.50	7.50	6.00	6.00
			129-181	6595-6855	8.00	8.00	8.00	8.00	8.00	8.00	7.00	7.00	7.50	7.50	6.00	6.00
			185	6875	7.50	7.50	7.50	7.50	7.50	7.50	7.00	7.00	7.50	7.50	6.00	6.00
		802.11ax 40 MHz	123	6565	8.00	8.00	8.00	8.00	8.00	8.00	7.00	7.00	7.50	7.50	6.00	6.00
			131-179	6605-6845	8.00	8.00	8.00	8.00	8.00	8.00	7.00	7.00	7.50	7.50	6.00	6.00
			187	6885	8.00	8.00	8.00	8.00	8.00	8.00	7.00	7.00	7.50	7.50	6.00	6.00
		802.11ax 80 MHz	135-151	6625-6705	8.00	8.00	8.00	8.00	8.00	8.00	7.00	7.00	7.50	7.50	6.00	6.00
			167	6785	8.00	8.00	8.00	8.00	8.00	8.00	7.00	7.00	7.50	7.50	6.00	6.00
			183	6865	8.00	8.00	8.00	8.00	8.00	8.00	7.00	7.00	7.50	7.50	6.00	6.00
		802.11ax 160 MHz	143	6665	8.00	8.00	8.00	8.00	8.00	8.00	7.00	7.00	7.50	7.50	6.00	6.00
			175	6825	8.00	8.00	8.00	8.00	8.00	8.00	7.00	7.00	7.50	7.50	6.00	6.00
	U-NII-8	802.11a 20 MHz	189	6895	7.50	7.50	7.50	7.50	7.50	7.50	7.00	7.00	7.50	7.50	6.00	6.00
			193-225	6915-7075	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	6.50	6.50	5.00	5.00
			229	7095	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	6.50	6.50	5.00	5.00
			233	7115	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00
		802.11ax 40 MHz	195-219	6925-7045	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	6.50	6.50	5.00	5.00
			227	7085	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	6.50	6.50	5.00	5.00
		802.11ax 80 MHz	199	6945	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	6.50	6.50	5.00	5.00
			215	7025	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	6.50	6.50	5.00	5.00
		802.11ax 160 MHz	207	6985	7.00	7.00	7.00	7.00	7.00	7.00	6.00	6.00	6.50	6.50	5.00	5.00

Note(s):

Power State 2 and 3 maximum output power same as Power State 1

Wi-Fi 6E Measured Results

Power Mode	Antenna	Power Mode A							Power Mode B							
		Band	Mode	Ch #	Freq. (MHz)	Meas Pwr (dBm)	Max Output Pwr (dBm)	SAR Test (Yes/Yes)	Band	Mode	Ch #	Freq. (MHz)	Meas Pwr (dBm)	Max Output Pwr (dBm)	SAR Test (Yes/Yes)	
Power State 1 & Power State 2 & Power State 3	ANT5	U-NII-5	802.11ax 160 MHz	15	6025	10.56	12.00	Yes	U-NII-5	802.11ax 160 MHz	15	6025	10.56	12.00	Yes	
				47	6185	11.10	12.00	Yes			47	6185	11.10	12.00	Yes	
				79	6345	10.82	12.00	Yes			79	6345	10.82	12.00	Yes	
		U-NII-6	802.11ax 160 MHz	111	6505	9.94	11.00	Yes	U-NII-6	802.11ax 160 MHz	111	6505	9.94	11.00	Yes	
				U-NII-7	802.11ax 160 MHz	143	6665	10.13			11.25	Yes	U-NII-7	802.11ax 160 MHz	143	6665
		175	6825			10.56	11.25	Yes	175	6825	10.56	11.25			Yes	
		U-NII-8	802.11ax 160 MHz	207	6985	9.75	9.75	Yes	U-NII-8	802.11ax 160 MHz	207	6985	9.75	9.75	Yes	
				ANT6	U-NII-5	802.11ax 160 MHz	15	6025			9.73	10.00	Yes	U-NII-5	802.11ax 160 MHz	15
		47	6185				9.51	10.00	Yes	47	6185	9.51	10.00			Yes
		79	6345				7.27	8.50	Yes	79	6345	7.27	8.50			Yes
	U-NII-6	802.11ax 80 MHz	103		6465	8.25	8.75	Yes	U-NII-6	802.11ax 80 MHz	103	6465	8.25	8.75	Yes	
			119		6545	6.96	8.00	Yes			119	6545	6.96	8.00	Yes	
	U-NII-7	802.11ax 160 MHz	143		6665	7.55	8.00	Yes	U-NII-7	802.11ax 160 MHz	143	6665	7.55	8.00	Yes	
			175		6825	6.99	8.00	Yes			175	6825	6.99	8.00	Yes	
	U-NII-8	802.11ax 20 MHz	189		6895	6.29	7.50	Yes	U-NII-8	802.11ax 20 MHz	189	6895	6.29	7.50	Yes	
			209		6995	5.91	7.00	Yes			209	6995	5.91	7.00	Yes	
			229		7095	5.77	7.00	Yes			229	7095	5.77	7.00	Yes	
	Power Mode	Antenna	Power Mode A							Power Mode B						
			Band	Mode	Ch #	Freq. (MHz)	Meas Pwr (dBm)	Max Output Pwr (dBm)	SAR Test (Yes/Yes)	Band	Mode	Ch #	Freq. (MHz)	Meas Pwr (dBm)	Max Output Pwr (dBm)	SAR Test (Yes/Yes)
	Power State 4	ANT5	U-NII-5	802.11ax 160 MHz	15	6025	9.90	11.00	Yes	U-NII-5	802.11ax 160 MHz	15	6025	9.90	11.00	Yes
47					6185	9.67	11.00	Yes	47			6185	9.67	11.00	Yes	
79					6345	9.89	11.00	Yes	79			6345	9.89	11.00	Yes	
U-NII-6			802.11ax 160 MHz	111	6505	8.92	10.00	Yes	U-NII-6	802.11ax 160 MHz	111	6505	8.92	10.00	Yes	
				U-NII-7	802.11ax 160 MHz	143	6665	9.23			10.25	Yes	U-NII-7	802.11ax 160 MHz	143	6665
175			6825			9.09	10.25	Yes	175	6825	9.09	10.25			Yes	
U-NII-8			802.11ax 160 MHz	207	6985	7.48	8.75	Yes	U-NII-8	802.11ax 160 MHz	207	6985	7.48	8.75	Yes	
				ANT6	U-NII-5	802.11ax 160 MHz	15	6025			7.77	9.00	Yes	U-NII-5	802.11ax 160 MHz	15
47			6185				7.96	9.00	Yes	47	6185	7.96	9.00			Yes
79			6345				6.43	7.50	Yes	79	6345	6.43	7.50			Yes
U-NII-6		802.11ax 80 MHz	103		6465	6.54	7.75	Yes	U-NII-6	802.11ax 80 MHz	103	6465	6.54	7.75	Yes	
			119		6545	5.51	7.00	Yes			119	6545	5.51	7.00	Yes	
U-NII-7		802.11ax 160 MHz	143		6665	5.80	7.00	Yes	U-NII-7	802.11ax 160 MHz	143	6665	5.80	7.00	Yes	
			175		6825	5.97	7.00	Yes			175	6825	5.97	7.00	Yes	
U-NII-8		802.11ax 20 MHz	189		6895	5.70	7.00	Yes	U-NII-8	802.11ax 20 MHz	189	6895	5.70	7.00	Yes	
			209		6995	4.93	6.00	Yes			209	6995	4.93	6.00	Yes	
			229		7095	4.68	6.00	Yes			229	7095	4.68	6.00	Yes	

Power Mode	Antenna	Power Mode A							Power Mode B						
		Band	Mode	Ch #	Freq. (MHz)	Meas Pwr (dBm)	Max Output Pwr (dBm)	SAR Test (Yes/Yes)	Band	Mode	Ch #	Freq. (MHz)	Meas Pwr (dBm)	Max Output Pwr (dBm)	SAR Test (Yes/Yes)
Power State 5	ANT5	U-NII-5	802.11ax 160 MHz	15	6025	10.15	11.50	Yes	U-NII-5	802.11ax 160 MHz	15	6025	10.15	11.50	Yes
				47	6185	10.38	11.50	Yes			47	6185	10.38	11.50	Yes
				79	6345	10.01	11.50	Yes			79	6345	10.01	11.50	Yes
		U-NII-6	802.11ax 160 MHz	111	6505	9.28	10.50	Yes	U-NII-6	802.11ax 160 MHz	111	6505	9.28	10.50	Yes
		U-NII-7	802.11ax 160 MHz	143	6665	9.57	10.75	Yes	U-NII-7	802.11ax 160 MHz	143	6665	9.57	10.75	Yes
				175	6825	9.64	10.75	Yes			175	6825	9.64	10.75	Yes
		U-NII-8	802.11ax 160 MHz	207	6985	9.03	9.25	Yes	U-NII-8	802.11ax 160 MHz	207	6985	9.03	9.25	Yes
		ANT6	U-NII-5	802.11ax 160 MHz	15	6025	8.20	9.50	Yes	U-NII-5	802.11ax 160 MHz	15	6025	8.20	9.50
	47				6185	8.15	9.50	Yes	47			6185	8.15	9.50	Yes
	79				6345	6.74	8.00	Yes	79			6345	6.74	8.00	Yes
	U-NII-6		802.11ax 80 MHz	103	6465	8.25	8.25	Yes	U-NII-6	802.11ax 80 MHz	103	6465	8.25	8.25	Yes
				119	6545	6.22	7.50	Yes			119	6545	6.22	7.50	Yes
	U-NII-7		802.11ax 160 MHz	143	6665	6.49	7.50	Yes	U-NII-7	802.11ax 160 MHz	143	6665	6.49	7.50	Yes
				175	6825	6.46	7.50	Yes			175	6825	6.46	7.50	Yes
	U-NII-8		802.11ax 20 MHz	189	6895	6.22	7.50	Yes	U-NII-8	802.11ax 20 MHz	189	6895	6.22	7.50	Yes
				209	6995	5.48	6.50	Yes			209	6995	5.48	6.50	Yes
		229		7095	5.02	6.50	Yes	229			7095	5.02	6.50	Yes	
Power Mode	Antenna	Power Mode A							Power Mode B						
		Band	Mode	Ch #	Freq. (MHz)	Meas Pwr (dBm)	Max Output Pwr (dBm)	SAR Test (Yes/Yes)	Band	Mode	Ch #	Freq. (MHz)	Meas Pwr (dBm)	Max Output Pwr (dBm)	SAR Test (Yes/Yes)
Power State 6	ANT5	U-NII-5	802.11ax 160 MHz	15	6025	8.67	10.00	Yes	U-NII-5	802.11ax 160 MHz	15	6025	8.67	10.00	Yes
				47	6185	8.99	10.00	Yes			47	6185	8.99	10.00	Yes
				79	6345	8.68	10.00	Yes			79	6345	8.68	10.00	Yes
		U-NII-6	802.11ax 160 MHz	111	6505	7.77	9.00	Yes	U-NII-6	802.11ax 160 MHz	111	6505	7.77	9.00	Yes
		U-NII-7	802.11ax 160 MHz	143	6665	8.06	9.25	Yes	U-NII-7	802.11ax 160 MHz	143	6665	8.06	9.25	Yes
				175	6825	7.98	9.25	Yes			175	6825	7.98	9.25	Yes
		U-NII-8	802.11ax 160 MHz	207	6985	6.73	7.75	Yes	U-NII-8	802.11ax 160 MHz	207	6985	6.73	7.75	Yes
		ANT6	U-NII-5	802.11ax 160 MHz	15	6025	6.75	8.00	Yes	U-NII-5	802.11ax 160 MHz	15	6025	6.75	8.00
	47				6185	6.72	8.00	Yes	47			6185	6.72	8.00	Yes
	79				6345	5.42	6.50	Yes	79			6345	5.42	6.50	Yes
	U-NII-6		802.11ax 80 MHz	103	6465	5.75	6.75	Yes	U-NII-6	802.11ax 80 MHz	103	6465	5.75	6.75	Yes
				119	6545	4.95	6.00	Yes			119	6545	4.95	6.00	Yes
	U-NII-7		802.11ax 160 MHz	143	6665	4.91	6.00	Yes	U-NII-7	802.11ax 160 MHz	143	6665	4.91	6.00	Yes
				175	6825	4.83	6.00	Yes			175	6825	4.83	6.00	Yes
	U-NII-8		802.11ax 20 MHz	189	6895	4.97	6.00	Yes	U-NII-8	802.11ax 20 MHz	189	6895	4.97	6.00	Yes
				209	6995	3.97	5.00	Yes			209	6995	3.97	5.00	Yes
		229		7095	3.74	5.00	Yes	229			7095	3.74	5.00	Yes	

Duty Factor Measured Results

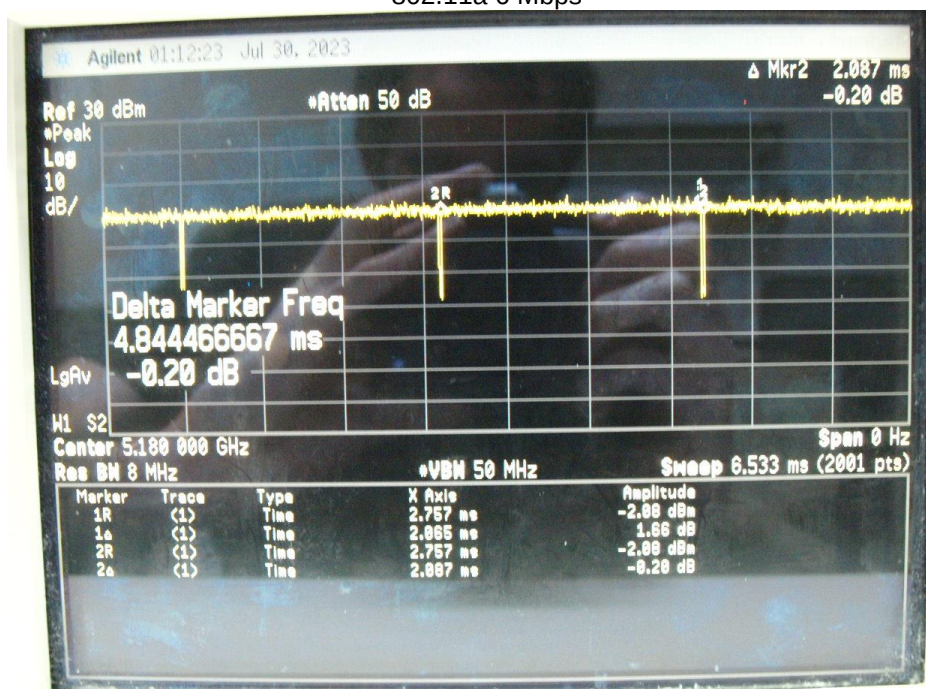
Mode	Type	T on (ms)	Period (ms)	Duty Cycle	Crest Factor (1/duty cycle)
802.11a	6 Mbps	2.065	2.087	98.95%	1.01
802.11ax HE40	MCS0	1.47	1.49	98.66%	1.01
802.11ax HE80	MCS0	1.395	1.42	98.24%	1.02
802.11ax HE160	MCS0	0.232	0.252	92.06%	1.09

Note(s):

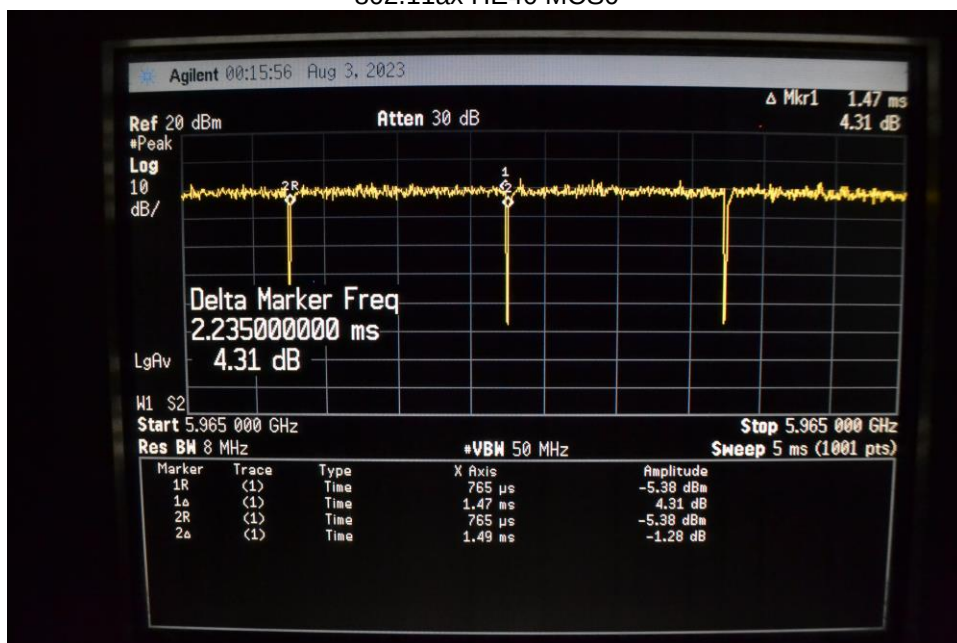
Duty Cycle = (T on / period) * 100%

Duty Cycle plots

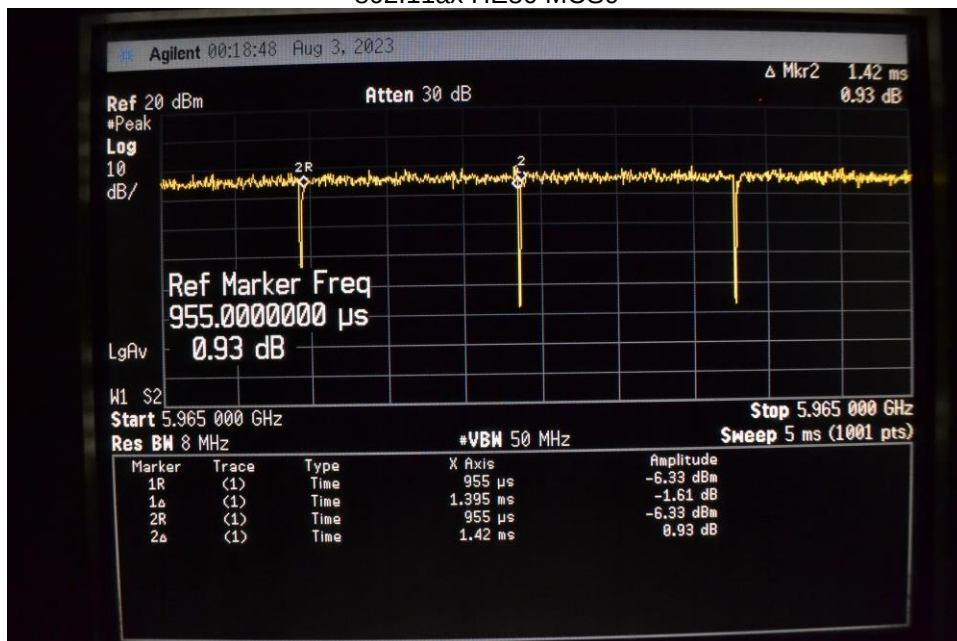
802.11a 6 Mbps



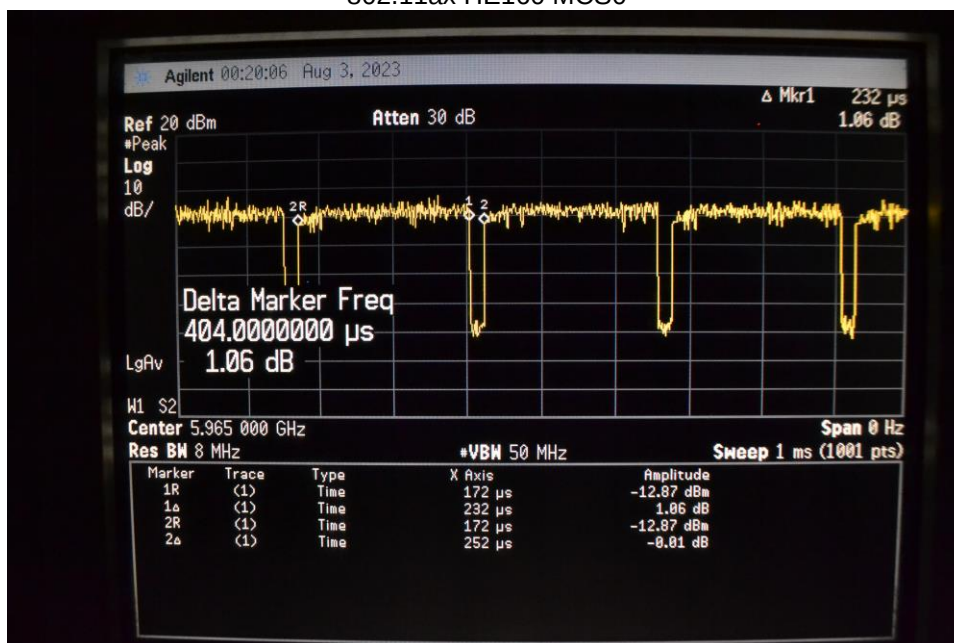
802.11ax HE40 MCS0



802.11ax HE80 MCS0



802.11ax HE160 MCS0



10. Measured and Reported (Scaled) Results

Per TCB workshop October 2018, 4 cm² averaging area is considered.

1. psPD value (mW/cm²) used the psPD_{tot+} avg value (W/m²) of test result plot.

Wi-Fi 6E Test Rationale:

- iPD testing was performed on 5 selected channels spread across all the 6E spectrum. Channels were determined based on the highest maximum output power and transmission mode combination per applicable U-NII band.
 - No channels that could transmit below 6GHz were selected for testing so as to use the ESR Test Methodology only.
- The test position for iPD was determined using the worst-case V/m (field strength) on each required test position needed for consideration.
- As iPD evaluations used source reconstruction (SR) methods from Cuija et al² additional SAR testing detailed in KDB 388624 D02 - OVER6G was not required.

10.1. Wi-Fi 6E Worst Position Results

ANT	RF Exposure Conditions	Mode	Power Mode	U-NII Band	Dist. (mm)	Test Position	Ch No.	Freq. (MHz)	eMax (V/m)
ANT 5	Body & Hotspot	802.11ax (160 MHz)	Power State 1 & 2 & 3	U-NII 5	2	Rear	15	6025.0	52.5
						Front			51.3
						Edge Right			10.2
						Edge Bottom			11.6
						Edge Left			31.4
ANT 6	Body & Hotspot	802.11ax (160 MHz)	Power State 1 & 2 & 3	U-NII 5	2	Rear	47	6185.0	242.0
						Front			24.5
						Edge Top			20.3
						Edge Right			26.4
						Edge Left			29.2

Note(s):

1. Additional worst position testing is not needed for U-NII 6/7/8, as they share the same antennas across bands (i.e., ANT 5 supports U-NII 5/6/7/8 and ANT 6 supports U-NII 5/6/7/8).

² K. S. Cuija, et al., "Experimental Exposure Evaluation From the Very Close Near-to the Far-Field Using a Multiple-Multipole Source Reconstruction Algorithm," *IEEE Trans. Ant. Propag.*, vol. 70, no. 9, pp. 8461-8472, Sep. 2022, doi: 10.1109/TAP.2022.3177564.

10.2. Wi-Fi 6E Test Results

ANT	RF Exposure Conditions	Mode	Power Mode	U-NII Band	Dist. (mm)	Duty Cycle (%)	Test Position	Ch No.	Freq. (MHz)	TuP Limit (dBm)	Meas. (dBm)	psPDtot-Meas (mW/cm ²)	psPDtot-Scaled (mW/cm ²)	Plot No.
ANT 5	Body & Hotspot	802.11ax (160 MHz)	Power State 1 & 2 & 3	UNII-5	2	92.06%	Rear	15	6025.0	12.00	10.56	0.412	0.623	
		802.11ax (160 MHz)		UNII-5		92.06%		47	6185.0	12.00	11.10	0.522	0.698	
		802.11ax (160 MHz)		UNII-6		92.06%		111	6505.0	11.00	9.94	0.416	0.577	
		802.11ax (160 MHz)		UNII-7		92.06%		175	6825.0	11.25	10.56	0.473	0.602	
		802.11ax (160 MHz)		UNII-8		92.06%		207	6985.0	9.75	9.75	0.646	0.702	
ANT 5	Body & Hotspot	802.11ax (160 MHz)	Power State 5	UNII-8	2	92.06%	Rear	207	6985.0	9.25	9.03	0.610	0.697	
		802.11ax (160 MHz)	Power State 4	UNII-8	2	92.06%		207	6985.0	8.75	7.48	0.368	0.536	
		802.11ax (160 MHz)		UNII-8	5	92.06%		207	6985.0	8.75	7.48	0.133	0.194	
		802.11ax (160 MHz)	Power State 6	UNII-8	2	92.06%		207	6985.0	7.75	6.73	0.206	0.283	
		802.11ax (160 MHz)		UNII-8	5	92.06%		207	6985.0	7.75	6.73	0.116	0.159	
ANT 6	Body & Hotspot	802.11ax (160 MHz)	Power State 1 & 2 & 3	UNII-5	2	92.06%	Rear	15	6025.0	10.00	9.73	0.593	0.685	
		802.11ax (160 MHz)		UNII-5		92.06%		47	6185.0	10.00	9.51	0.553	0.672	
		802.11ax (80 MHz)		UNII-6		98.24%		103	6465.0	8.75	8.25	0.615	0.702	1
		802.11ax (160 MHz)		UNII-7		92.06%		143	6665.0	8.00	7.55	0.521	0.628	
		802.11a (20 MHz)		UNII-8		98.95%		189	6895.0	7.50	6.48	0.475	0.607	
ANT 6	Body & Hotspot	802.11ax (80 MHz)	Power State 5	UNII-6	2	98.24%	Rear	103	6465.0	8.25	8.25	0.615	0.626	
		802.11ax (80 MHz)	Power State 4	UNII-6	2	98.24%		103	6465.0	7.75	6.54	0.423	0.569	
		802.11ax (80 MHz)		UNII-6	5	98.24%		103	6465.0	7.75	6.54	0.126	0.169	
		802.11ax (80 MHz)	Power State 6	UNII-6	2	98.24%		103	6465.0	6.75	5.75	0.357	0.457	
		802.11ax (80 MHz)		UNII-6	5	98.24%		103	6465.0	6.75	5.75	0.156	0.200	

11. Simultaneous Transmission Conditions

Total exposure ratio calculated by taking ratio of reported iPD or SAR divided by iPD or SAR limit and adding it to measured power density or SAR divided by power density or SAR limit. Numerical sum of the two ratios should be less than 1

$$TER = \sum_{a=1}^A \frac{SAR_a}{SAR_{a, limit}} + \sum_{b=1}^B \frac{psPD_b}{psPD_{b, limit}} < 1$$

The simultaneous transmission possibilities for this device are listed as below:

RF Exposure Condition		Capable Transmit Configurations						Item
Head Body Worn Accessory Hotspot	WWAN & 5G OFF (CELLULAR ANTENNAS OFF)	+	Wi-Fi 2.4 GHz			+	NB UNII (P _{high})	1
		+	Wi-Fi 2.4 GHz			+	NB UNII (P _{mid})	2
		+	Wi-Fi 2.4 GHz					3
		+	Wi-Fi 5 GHz/6E	+	Bluetooth (P _{high})			4
		+	Wi-Fi 5 GHz/6E	+	Bluetooth (P _{mid})			5
		+	Wi-Fi 5 GHz/6E				802.15.4 (P _{high})	6
		+	Wi-Fi 5 GHz/6E				802.15.4 (P _{mid})	7
		+	Wi-Fi 5 GHz/6E					8
		+	Wi-Fi 5 GHz/6E	+	Bluetooth (P _{high})			9
		+	Wi-Fi 5 GHz/6E	+	Bluetooth (P _{mid})			10
		+	Wi-Fi 5 GHz/6E				802.15.4 (P _{high})	11
		+	Wi-Fi 5 GHz/6E				802.15.4 (P _{mid})	12
	WWAN & 5G ON (CELLULAR ANTENNAS ON)	+	Wi-Fi 2.4 GHz					13
				+	Bluetooth (P _{high})			14
						+	NB UNII (P _{high})	15
							802.15.4 (P _{high})	16
								17
		+	Wi-Fi 2.4 GHz			+	NB UNII (P _{low})	18
		+	Wi-Fi 2.4 GHz					19
				+	Bluetooth (P _{high})			20
							802.15.4 (P _{high})	21
		+	Wi-Fi 5 GHz/6E					22
		+	Wi-Fi 5 GHz/6E	+	Bluetooth (P _{low})			23
		+	Wi-Fi 5 GHz/6E				802.15.4 (P _{low})	24
		+	Wi-Fi 5 GHz/6E					25
		+	Wi-Fi 5 GHz/6E	+	Bluetooth (P _{low})			26
		+	Wi-Fi 5 GHz/6E				802.15.4 (P _{low})	27

Note(s):

- Wi-Fi 2.4GHz & Bluetooth cannot transmit simultaneously.
- Wi-Fi 2.4GHz & Wi-Fi 5GHz cannot transmit simultaneously.
- NB UNII can only transmit simultaneously with Wi-Fi 2.4GHz.
- 802.15.4ab-NB cannot transmit simultaneously with NB UNII.
- 802.15.4ab-NB cannot transmit simultaneously on ANT 5 and ANT 6.
- Only Wi-Fi 2.4GHz, Wi-Fi 5GHz, Wi-Fi 6E support MIMO transmission.
- Wi-Fi 2.4/5/6E Power State 1: 802.15.4ab-NB OFF | P_{Mid} | CELL OFF
- Wi-Fi 2.4/5/6E Power State 2: 802.15.4ab-NB ON | P_{Mid} | CELL OFF
- Wi-Fi 2.4/5/6E Power State 3: 802.15.4ab-NB OFF | P_{high} | CELL OFF
- Wi-Fi 2.4/5/6E Power State 4: 802.15.4ab-NB OFF | P_{low} | CELL ON
- Wi-Fi 2.4/5/6E Power State 5: 802.15.4ab-NB ON | P_{high} | CELL OFF
- Wi-Fi 2.4/5/6E Power State 6: 802.15.4ab-NB ON | P_{low} | CELL ON
- Bluetooth/NB UNII/802.15.4: P_{low} is used when both Wi-Fi and WWAN antennas are active.
- Bluetooth/NB UNII/802.15.4: P_{Mid} is used when Wi-Fi antenna is active and WWAN antenna is inactive. P_{Mid} power state occurs during Wi-Fi states 1/2.
- Bluetooth/NB UNII/802.15.4: P_{high} is used when Wi-Fi antenna is active and WWAN antenna is inactive or with Wi-Fi inactive and WWAN antenna is active. P_{high} power state occurs during Wi-Fi states 3/5.
- Bluetooth/NB UNII/802.15.4: P_{standalone} is used when Wi-Fi and WWAN antennas are inactive.
- Wi-Fi SISO mode SAR result can also represent for MIMO mode SAR and is used for MIMO mode simultaneous transmission analysis because antennas are not overlapping, and the MIMO mode maximum power is equal or less than SISO mode.
- 5G NR only supported NSA mode.

For EN-DC mode, Qualcomm Smart Transmit algorithm in WWAN adds directly the time-averaged RF exposure from 4G(LTE) and time-averaged RF exposure from 5G NR. Smart Transmit algorithm controls the total RF exposure from both 4G and 5G NR to not exceed FCC limit. Therefore, simultaneous transmission compliance between 4G+5G NR operation is demonstrated in the Part 2 Report during algorithm validation. In Part 1 Report, simultaneous transmission compliance was evaluated individually with other Radios (WLAN or BT) using one of 4G or 5G NR.

11.1. Simultaneous Transmission Result

11.1.1. CELL OFF State 1 & 2 & 3 (Wi-Fi + BT/802.15.4)

ANT 5	Standalone SAR (W/kg) or PD (mW/cm ²)		Σ Ratio	ANT 6	Standalone SAR (W/kg) or PD (mW/cm ²)		Σ Ratio
	Wi-Fi 6E Pstate 1 ANT 5	BT (P _{high})			Wi-Fi 6E Pstate 1 ANT 6	BT (P _{high})	
	mW/cm ²	W/kg			mW/cm ²	W/kg	
Combinations	1	2	1+2	Combinations	1	2	1+2
Applicable Limit	1	1.6	1	Applicable Limit	1	1.6	1
Reported Measurements	0.702	0.397	-	Reported Measurements	0.702	0.397	-
Ratio to Limit	0.702	0.248	0.950	Ratio to Limit	0.702	0.248	0.950

Note(s):

1. Reported SAR measurements are referenced from the FCC SAR report (14523772-S1).

11.1.2. CELL ON State 4 (CELL + 6E + BT/802.15.4)

ANT 5	Standalone SAR (W/kg) or PD (mW/cm ²)			Σ Ratio	ANT 6	Standalone SAR (W/kg) or PD (mW/cm ²)			Σ Ratio
	Wi-Fi 6E Pstate 4 ANT 5	BT (P _{low})	WWAN Cell-on			Wi-Fi 6E Pstate 4 ANT 6	BT (P _{low})	WWAN Cell-on	
	mW/cm ²	W/kg	W/kg			mW/cm ²	W/kg	W/kg	
Combinations	1	2	3	1+3+6	Combinations	1	2	3	1+2+4
Applicable Limit	1	1.6	1.6	1.0	Applicable Limit	1	1.6	1.6	1.0
Reported Measurements	0.194	0.089	0.949	-	Reported Measurements	0.169	0.089	0.949	-
Ratio to Limit	0.194	0.056	0.593	0.843	Ratio to Limit	0.169	0.056	0.593	0.819

Note(s):

1. Reported SAR measurements are referenced from the FCC SAR report (14523772-S1).

11.1.3. CELL OFF State 5 (Wi-Fi + BT/802.15.4 + 802.15.4ab)

ANT 5	Standalone SAR (W/kg) or PD (mW/cm ²)			Σ Ratio	ANT 6	Standalone SAR (W/kg) or PD (mW/cm ²)			Σ Ratio
	Wi-Fi 6E Pstate 5 ANT 5	BT (P _{high})	802.15.4ab			Wi-Fi 6E Pstate 5 ANT 6	BT (P _{high})	802.15.4ab	
	mW/cm ²	W/kg	W/kg			mW/cm ²	W/kg	W/kg	
Combinations	1	2	3	1+2+3	Combinations	1	2	3	1+2+3
Applicable Limit	1	1.6	1.6	1.0	Applicable Limit	1	1.6	1.6	1.0
Reported Measurements	0.697	0.397	0.087	-	Reported Measurements	0.626	0.397	0.087	-
Ratio to Limit	0.697	0.248	0.054	0.999	Ratio to Limit	0.626	0.248	0.054	0.928

Note(s):

1. Reported SAR measurements are referenced from the FCC SAR report (14523772-S1).

11.1.4. CELL ON State 6 (CELL + 6E + BT/802.15.4 + 802.15.4ab)

ANT 5	Standalone SAR (W/kg) or PD (mW/cm ²)				Σ Ratio	ANT 6	Standalone SAR (W/kg) or PD (mW/cm ²)				Σ Ratio
	Wi-Fi 6E Pstate 6 ANT 5	BT (P _{low})	802.15.4ab	WWAN Cell-on			Wi-Fi 6E Pstate 6 ANT 6	BT (P _{low})	802.15.4ab	WWAN Cell-on	
	mW/cm ²	W/kg	W/kg	W/kg			mW/cm ²	W/kg	W/kg	W/kg	
Combinations	1	2	3	4	1+2+3+4	Combinations	1	2	3	4	1+2+3+4
Applicable Limit	1	1.6	1.6	1.6	1.0	Applicable Limit	1	1.6	1.6	1.6	1.0
Reported Measurements	0.159	0.089	0.087	0.949	-	Reported Measurements	0.200	0.089	0.087	0.949	-
Ratio to Limit	0.159	0.056	0.054	0.593	0.863	Ratio to Limit	0.200	0.056	0.054	0.593	0.903

Note(s):

1. Reported SAR measurements are referenced from the FCC SAR report (14523772-S1).

Appendices

Refer to separated files for the following appendixes.

Appendix A: Setup Photos

Appendix B: System Check Plots

Appendix C: Highest PD Test Plots

Appendix D: Probe Certificates

Appendix E: Verification source Certificates

END OF REPORT