N° 1-6736
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CERTIFICATE #3478.01

TEST REPORT

EUT Description	**WLAN and BT, 2x2 PCIe M.2 1216 SD adapter card**
Brand Name	**Intel® Wi-Fi 6E AX210**
Model Name	**AX210D2W**
FCC ID	**PD9AX210D2**
Date of Test Start/End	**2021-01-19 /2021-01-27**
Features	**802.11ax, Dual Band, 2x2 Wi-Fi 6 + Bluetooth® 5.2** (see section 5)

Applicant	**Intel Mobile Communications**
Address	**100 Center Point Circle, Suite 200** **Columbia, South Carolina 29210** **USA**
Contact Person	**Steven Hackett**
Telephone/Fax/ Email	**steven.c.hackett@intel.com**

Reference Standards	**FCC CFR Title 47 Part 15 E** (see section 1)

Test Report identification	**200921-01.TR04**
Revision Control	**Rev. 00** **This test report revision replaces any previous test report revision** (see section 3)

The test results relate only to the samples tested.
Reference to accreditation shall be used only by full reproduction of test report.

Issued by	Reviewed by
Digitally signed by Khodor RIDA Date: 2021.07.08 11:20:46 +02'00'	Digitally signed by In Cheiel Date: 2021.07.08 16:12:04 +02'00'
Khodor RIDA (Test Engineer Lead)	Cheiel IN (Technical Manager Deputy)

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1. Table of Contents

1. Standards, reference documents and applicable test methods

FCC	1. FCC Title 47 eCFR part 15 – Subpart E - Unlicensed National Information Infrastructure Devices. 2021-02-08 Online edition 2. FCC Title 47 eCFR part 15 – Subpart C – §15.209 Radiated emission limits; general requirements. 2021-02-08 Online edition 3. FCC OET KDB 987594 D01 U-NII 6GHz General Requirements v01r02 4. FCC OET KDB 987594 D02 U-NII 6 GHz EMC Measurement v01r01 5. FCC OET KDB 987594 D03 U-NII 6 GHz QA v01 6. FCC OET KDB 789033 D02 v02r01 General U-NII Test Procedures New Rules – Guidelines for compliance testing of Unlicensed National Information Infrastructure (U-NII) Devices (Part 15, Subpart E). 7. ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

2. General conditions, competences and guarantees

- ✓ Intel Corporation SAS Wireless RF Lab (Intel WRF Lab) is an Accredited Test Firm recognized by the FCC, with Designation Number FR0011.
- ✓ Intel WRF Lab declines any responsibility with respect to the identified information provided by the customer and that may affect the validity of results.
- ✓ Intel WRF Lab only provides testing services and is committed to providing reliable, unbiased test results and interpretations.
- ✓ Intel WRF Lab is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.
- ✓ Intel WRF Lab has developed calibration and proficiency programs for its measurement equipment to ensure correlated and reliable results to its customers.
- ✓ This report is only referred to the item that has undergone the test.
- ✓ This report does not imply an approval of the product by the Certification Bodies or competent Authorities.

3. Environmental Conditions

- ✓ At the site where the measurements were performed the following limits were not exceeded during the tests:

Temperature	21ºC ± 2ºC
Humidity	40% ± 10%

4. Test samples

Sample	Control #	Description	Model	Serial #	Date of receipt	Note
#1	200611-04.S07	WiFi 6E Module	AX210D2W	WFM:BC17B87707B8	2020-09-18	Used for 30MHz-40GHz Radiated Spurious Emissions tests
	200615-05.S09	Laptop	Latitude 5401	GVGLK13	2020-06-02	
	200611-03.S31	Extender	ADEXELEC	-	2020-08-19	
	180001-01.S16	Socket	Socket WsP/ThP	8882-017	2018-11-22	
	200921-01.S01	Wieson Antenna	-	-	2020-09-28	
	200921-01.S02	Wieson Antenna	-	-	2020-09-28	

5. EUT Features

The herein information is provided by the customer.

Brand Name	Intel® Wi-Fi 6E AX210
Model Name	AX210D2W
Software Version	DRTU 01465_99_3500_57W
Driver Version	V0.17.2
Prototype / Production	Production
Supported Radios	802.11b/g/n/ax 2.4GHz (2400.0 – 2483.5 MHz) 802.11a/n/ac/ax 5.2GHz (5150.0 – 5350.0 MHz) 5.6GHz (5470.0 – 5725.0 MHz) 5.8GHz (5725.0 – 5850.0 MHz) 6.0GHz (5925.0 - 7125.0MHz) Bluetooth 5.2 2.4GHz (2400.0 – 2483.5 MHz)

Antenna Information

Transmitter	Chain A (Main)	Chain B (Aux)
Manufacturer	Wieson	Wieson
Antenna type	Dipole	Dipole
Part number	NA	NA
Declared Antenna gain (dBi) - 2.4GHz	+3.10	+3.10
Declared Antenna gain (dBi) – 5.2 & 5.3GHz	+4.11	+4.11
Declared Antenna gain (dBi) – 5.5GHz	+5.17	+5.17
Declared Antenna gain (dBi) – 5.8 GHz	+5.17	+5.17

6. Remarks and comments

For all bands UNII 5 to UNII 8, the worst case identified from modular test report among low, mid and high channels and the different modes have been tested in this report

Radiated spurious emissions were performed using output power rated at +21dBm.

2. Test Verdicts summary

The statement of conformity to applicable standards in the table below are based on the measured values, without taking into account the measurement uncertainties.

2.1. 802.11 ax – U-NII- 5 to U-NII-8

FCC part	Test name	Verdict
15.407 (b) (5) 15.209	Undesirable emissions limits (radiated)	P

3. Document Revision History

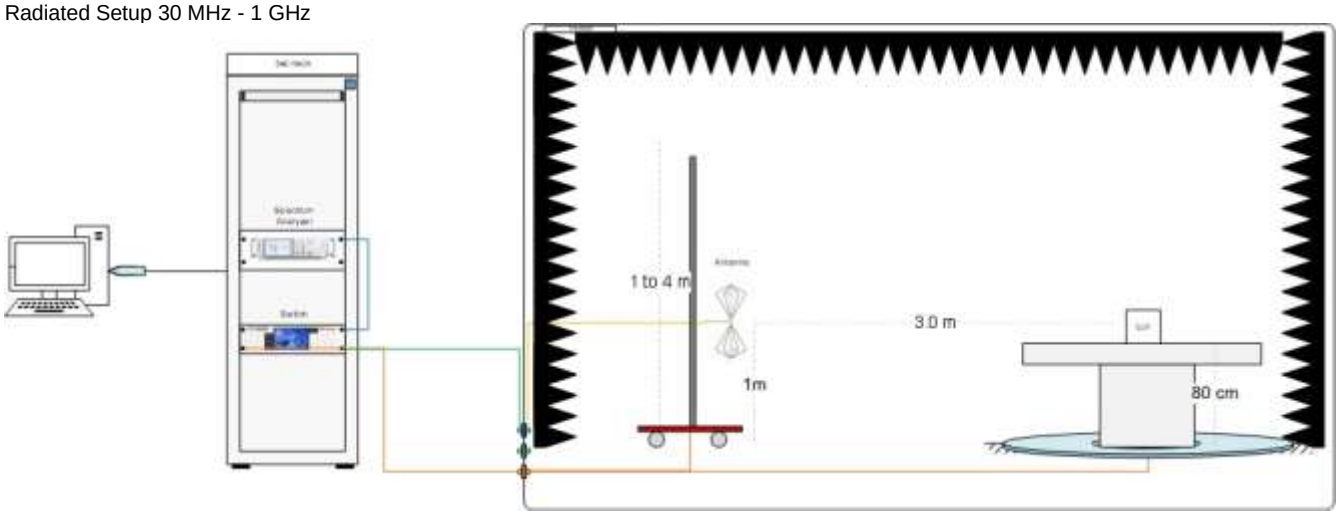
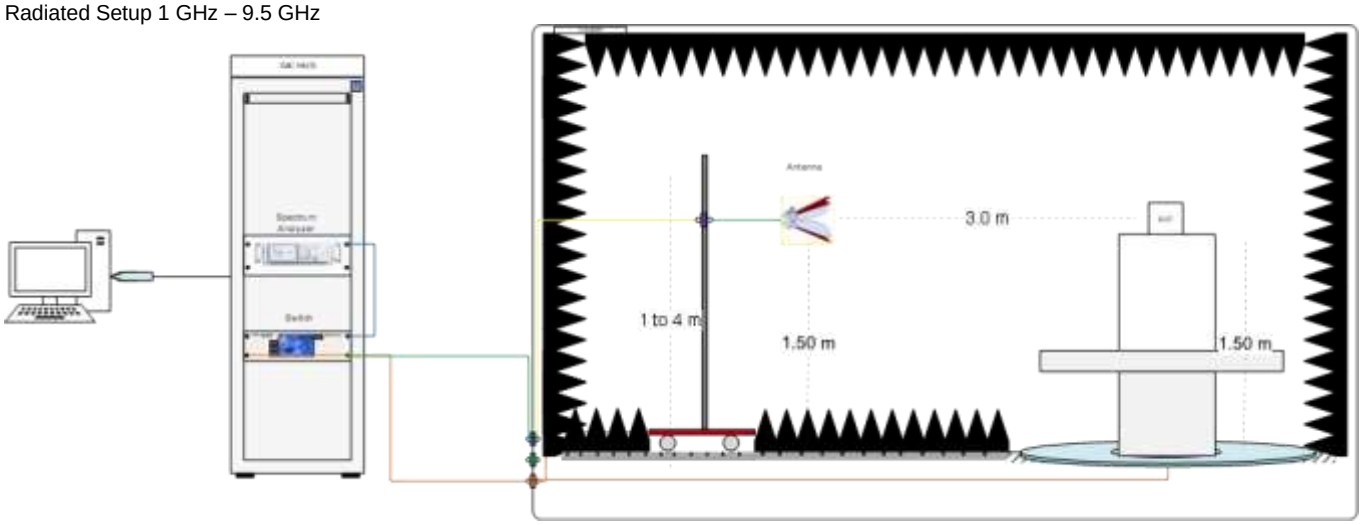
Revision #	Modified by	Revision Details
Rev. 00	K. RIDA	First Issue

Annex A. Test & System Description

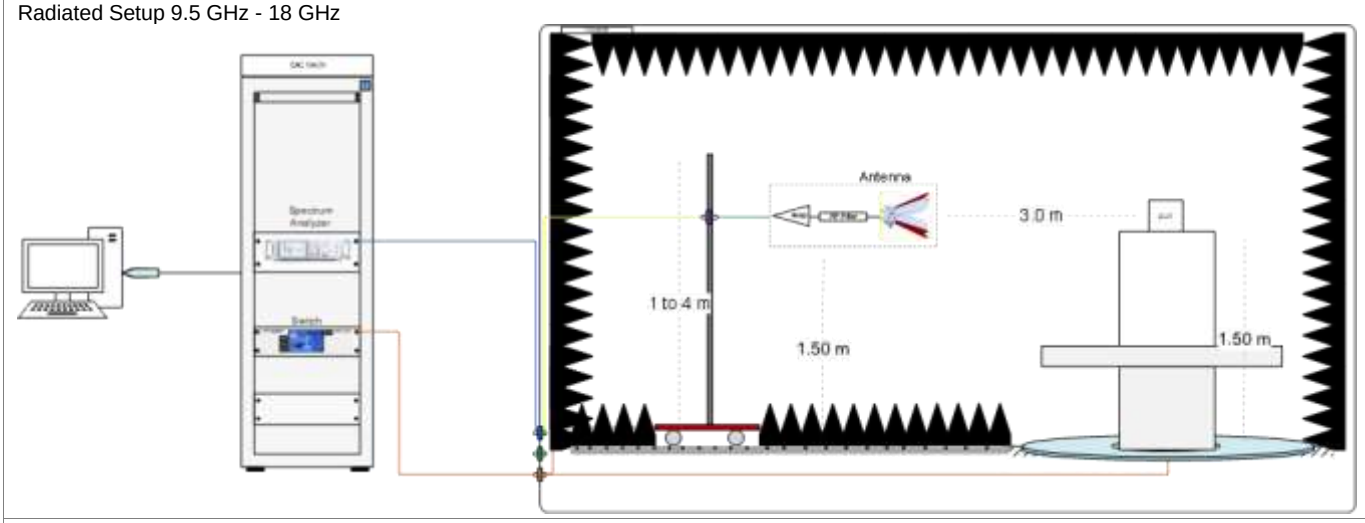
A.1 Measurement System

Measurements were performed using the following setups, made in accordance to the general provisions of ANSI 63.10-2013 Test Procedures.

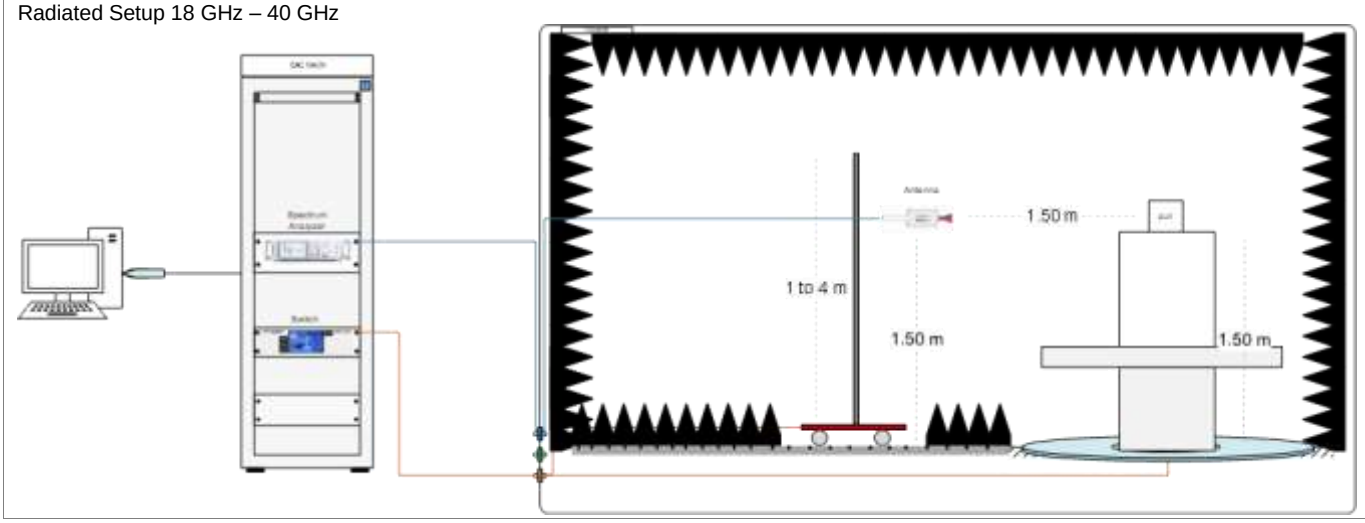
The DUT is installed in a test fixture and this test fixture is connected to a laptop computer and AC/DC power adapter. The laptop computer was used to configure the EUT to continuously transmit at a specified output power using all different modes and modulation schemes, using the Intel proprietary tool DRTU.

Radiated test setup
Radiated Setup 30 MHz - 1 GHz

Radiated Setup 1 GHz – 9.5 GHz


Radiated Setup 9.5 GHz - 18 GHz



Radiated Setup 18 GHz – 40 GHz



Sample Calculation

The spurious received voltage V(dBµV) in the spectrum Analyzer is converted to Electric field strength using the transducer factor F corresponding to the Rx path Loss:

F (dB/m)= Rx Antenna Factor (dB/m) + Cable losses (dB) – Amplifiers Gain (dBi)
E (dBµV/m) = V(dBµV) + F (dB/m)

For field strength measurements made at other than the distance at which the applicable limit is specified, the field strength of the emission at the distance specified by the limit is deduced as follows:

$$E_{SpecLimit} = E_{Meas} + 20*\log(D_{Meas}/D_{SpecLimit})$$

where

$E_{SpecLimit}$ is the field strength of the emission at the distance specified by the limit, in dBµV/m
E_{Meas} is the field strength of the emission at the measurement distance, in dBµV/m
D_{Meas} is the measurement distance, in m
$D_{SpecLimit}$ is the distance specified by the limit, in m

A.2 Test Equipment List

Radiated Setup #1

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
1076	Spectrum analyzer	FSW43	101847	Rohde & Schwarz	2020-11-02	2022-11-02
0993	BiConical antenna 25 MHz – 1 GHz	UBAA9115+BBVU9135 +DGA9552N	0286+CH 9044	Schwarzbeck	2019-11-22	2021-11-22
0141	Double Ridged Horn Antenna 1 GHz – 18 GHz	3117	00157736	ETS Lindgren	2020-04-01	2022-04-01
0325	Double Ridged Horn Antenna 1 GHz – 18 GHz	3117	00157734	ETS Lindgren	2019-08-12	2021-08-12
0139	Horn Antenna 3116+ Amplifier 18GHz – 26.5GHz	3116	00167100	ETS Lindgren	2020-03-19	2022-03-19
0140	Horn Antenna 3116+ Amplifier 26.5GHz – 40GHz	3116	00169638	ETS Lindgren	2020-04-06	2022-04-06
0135	Anechoic chamber	FACT 3	5720	ETS Lindgren	2020-07-06	2022-01-07
0530	Measurement Software	EMC32 V10.40.10	100401	Rohde & Schwarz	N/A	N/A
0797	Temperature & Humidity logger	RA12E-TH1-RAS	RA12-D0EB1A	AVTECH	2019-07-04	2021-07-04
0147	Switch & Positioning	EMC center	00159757	ETS Lindgren	N/A	N/A
1033	Antenna tower	BAM 4.0-P	P/278/2890.01	Maturo	N/A	N/A
0136	Turntable	-		ETS Lindgren	N/A	N/A
0859	RF Cable 2.5m	0500990992500KE	19.23.395	Radiall	2020-11-27	2021-05-27
0809	RF Cable 7.0m	R286304009	-	Radiall	2020-08-24	2021-02-24
1098	RF Cable 1.5m	CBL-1.5M-SMSM+	202879	Mini-Circuit	2020-11-26	2021-05-26
1099	RF Cable 7.0m	0501051057000GX	19.35.850	Radiall	2020-11-27	2021-05-27
0371	RF Cable 1.0m	UFB311A-0-0590-50U50U	MFR 64639 223230-001	MICRO-COAX	2020-11-27	2021-05-27
0263	RF Cable 1.0m	UFA147A	-	Utilflex	2020-08-25	2021-02-25
0206	RF Cable 1.0m	UFA147A-0-0480-200200	MFR 64639223720-003	Micro-Coax	2020-08-24	2021-02-24
0616	Power Sensor	NRP-Z81	104385	Rohde & Schwarz	2020-04-08	2022-04-08

N/A: Not Applicable

A.3 Measurement Uncertainty Evaluation

The system uncertainty evaluation is shown in the table below with a coverage factor of k = 2 to indicate a 95% level of confidence:

Measurement type	Uncertainty	Unit
Radiated tests <1GHz	±5.26	dB
Radiated tests 1GHz – 40 GHz	±5.19	dB

Annex B. Test Results

The herein test results were performed by:

Test case measurement	Test Personnel
Radiated spurious emissions	A. Lounes

B.1 Test Conditions

For 802.11ax20 (20 MHz channel bandwidth), 802.11ax40 (40MHz channel bandwidth), 802.11ax80 (80MHz channel bandwidth) and 802.11ax160 (160MHz channel bandwidth) modes the EUT can transmit at both CHAIN A and CHAIN B RF outputs individually, and also simultaneously.

The following data rates were selected based on preliminary testing that identified those rates as the worst cases for output power and spurious levels at the band edges:

Transmission	Mode	Bandwidth (MHz)	Worst Case Data Rate
SISO	802.11ax	20/40/80/160	HE0
MIMO	802.11ax	20/40/80/160	HE0

B.2 Radiated spurious emission

Standard references

<table>
<tr><th>FCC part</th><th>Limits</th></tr>
<tr><td>15.407 (b) (5)</td><td>For transmitters operating within the 5.925-7.125 GHz band: Any emissions outside of the 5.925-7.125 GHz band must not exceed an e.i.r.p. of −27 dBm/MHz.</td></tr>
<tr><td>15.35 (b)</td><td>When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified, e.g., see §§15.250, 15.252, 15.253(d), 15.255, 15.256, and 15.509 through 15.519, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.</td></tr>
<tr><td>15.407 (b) (8)</td><td>Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.</td></tr>
<tr><td>15.209</td><td>Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a):
<table>
<tr><th>Freq Range (MHz)</th><th>Field Strength (µV/m)</th><th>Field Strength (dBµV/m)</th><th>Meas. Distance (m)</th></tr>
<tr><td>30-88</td><td>100</td><td>40</td><td>3</td></tr>
<tr><td>88-216</td><td>150</td><td>43.5</td><td>3</td></tr>
<tr><td>216-960</td><td>200</td><td>46</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>54</td><td>3</td></tr>
</table>
The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands above 1000 MHz. Radiated emission limits in this band is based on measurements employing an average detector.
For average radiated emission measurements above 1000 MHz, there is also a limit specified when measuring with peak detector function, corresponding to 20 dB above the indicated values in the table.</td></tr>
</table>

Test procedure

The radiated setups shown in section *Test & System Description* were used to measure the radiated spurious emissions.

Depending of the frequency range and bands being tested, different antennas and filters were used.

- For frequencies less than or equal to 1000 MHz, measurements were made with the CISPR quasi-peak detector with a resolution bandwidth of 120kHz and a video bandwith 3 times of the resolution bandwidth.
- For restricted bands, measurements above 1000 MHz were performed using average and peak detectors with a minimum resolution bandwidth of 1 MHz and a video bandwith 3 times of the resolution bandwidth
- For unrestricted bands, measurements above 1000 MHz were performed using RMS and peak detectors with a minimum resolution bandwidth of 1 MHz and a video bandwith 3 times of the resolution bandwidth

The final measurement is performed by varying the antenna height from 1 m to 4 m, the EUT rotating in azimuth over 360º for both vertical and horizontal polarizations.

Test Results

B.2.1 802.11ax U-NII-5 to U-NII-8

UNII-5

30 MHz – 1 GHz, 802.11ax20, HE0, Chain A

Radiated Spurious – CH1

Frequency	QuasiPeak	Limit	Margin	Polar
MHz	dBµV/m	dBµV/m	dBµV/m	---
30.2	30.2	40.0	9.8	V

1 GHz – 40 GHz, 802.11ax20, HE0, Chain A

Radiated Spurious – CH1

Frequency	MaxPeak	Average	Limit	Margin	Polar
MHz	dBµV/m	dBµV/m	dBµV/m	dB	---
4755.5	---	45.1	54.0	8.9	V
4755.5	53.3	---	74.0	20.8	V
4763.8	52.5	---	74.0	21.5	V
4763.8	---	45.1	54.0	8.9	V
5646.9	55.3	---	88.2	32.9	V
5646.9	---	46.0	68.2	22.3	V
17796.9	54.2	---	74.0	19.9	V
17796.9	---	43.1	54.0	10.9	V
23820.1	50.3	---	74.0	23.7	V
23820.1	---	49.2	54.0	4.8	H

UNII-6

30 MHz – 1 GHz, 802.11ax160, HE0, Chain A

Radiated Spurious – CH111

Frequency	QuasiPeak	Limit	Margin	Polar
MHz	dBµV/m	dBµV/m	dBµV/m	---
278.7	41.7	46.0	4.3	H
282.9	42.2	46.0	3.8	H

1 GHz – 40 GHz, 802.11ax160, HE0, Chain A

Radiated Spurious – CH111

Frequency	MaxPeak	Average	Limit	Margin	Polar
MHz	dBµV/m	dBµV/m	dBµV/m	dB	---
5125.5	---	47.5	54.0	6.5	V
5126.0	56.4	---	74.0	17.6	H
5204.0	---	44.5	68.2	23.7	V
5210.5	54.4	---	88.2	33.8	V
7727.8	---	50.7	54.0	3.3	V
7727.8	59.0	---	74.0	15.0	V
12853.7	---	48.2	68.2	20.0	V
12854.7	58.0	---	88.2	30.2	V
19280.7	48.2	---	74.0	25.8	H
19280.7	---	40.7	54.0	13.3	H
25707.6	---	39.1	68.2	29.1	H
25709.0	48.9	---	88.2	39.3	H
26019.8	45.5	---	88.2	42.7	V
26020.2	---	40.7	68.2	27.5	V
39667.8	55.0	---	74.0	19.0	V
39667.8	---	47.0	54.0	7.0	V

UNII-7

30 MHz – 1 GHz, 802.11ax80, HE0, Chain A+B

Radiated Spurious – CH135

Frequency	QuasiPeak	Limit	Margin	Polar
MHz	dBµV/m	dBµV/m	dBµV/m	---
30.2	29.7	40.0	10.3	V

1 GHz – 40 GHz, 802.11ax80, HE0, Chain A+B

Radiated Spurious – CH135

Frequency	MaxPeak	Average	Limit	Margin	Polar
MHz	dBµV/m	dBµV/m	dBµV/m	dB	---
5262.5	---	47.8	68.2	20.4	V
5262.5	56.9	---	88.2	31.3	V
5300.1	54.7	---	88.2	33.5	V
5300.1	---	46.4	68.2	21.8	V
13173.9	59.5	---	88.2	28.7	H
13173.9	---	50.8	68.2	17.4	H
19760.9	51.7	---	74.0	22.4	V
19760.9	---	43.3	54.0	10.7	V
26348.9	53.3	---	88.2	34.9	V
26348.9	---	44.2	68.2	24.0	V
26500.0	49.6	---	88.2	38.6	V
26500.0	---	41.7	68.2	26.6	V

UNII-8

30 MHz – 1 GHz, 802.11ax160, HE0, Chain A+B

Radiated Spurious – CH207

Frequency	QuasiPeak	Limit	Margin	Polar
MHz	dBµV/m	dBµV/m	dBµV/m	---
31.7	28.2	40.0	11.8	V

1 GHz – 40 GHz, 802.11ax160, HE0, Chain A+B

Radiated Spurious – CH207

Frequency	MaxPeak	Average	Limit	Margin	Polar
MHz	dBµV/m	dBµV/m	dBµV/m	dB	---
5509.9	58.2	---	88.2	30.1	V
5509.9	---	50.8	68.2	17.5	V
5587.9	---	48.4	68.2	19.8	V
5587.9	55.3	---	88.2	32.9	V
7605.7	58.8	---	74.0	15.2	H
7605.7	---	49.0	54.0	5.0	V
13814.2	56.8	---	88.2	31.5	V
13814.2	---	49.0	68.2	19.2	V
20720.9	50.2	---	74.0	23.8	V
20720.9	---	41.2	54.0	12.8	V