FCC RF Test Report

APPLICANT	:	Veea Inc.
EQUIPMENT	:	Wireless Edge Server
BRAND NAME	:	VeeaHub
MODEL NAME	:	VHC25,VHC20
FCC ID	:	2ARXK-VHC25
STANDARD	:	FCC Part 15 Subpart E §15.407
CLASSIFICATION	:	(NII) Unlicensed National Information Infrastructure
TEST DATE(S)	:	Jul. 27, 2024 ~ Jul. 30, 2024

We, Sporton International Inc. (ShenZhen), would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (ShenZhen), the test report shall not be reproduced except in full.

Jason Jia

Approved by: Jason Jia

ACCREDITED
Cert #5145.01

Sporton International Inc. (ShenZhen)
1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055
People's Republic of China

TABLE OF CONTENTS

REVISION HISTORY **3**

SUMMARY OF TEST RESULT **4**

1 GENERAL DESCRIPTION **5**

1.1 Applicant 5
1.2 Manufacturer 5
1.3 Product Feature of Equipment Under Test 5
1.4 Product Specification of Equipment Under Test 6
1.5 Modification of EUT 6
1.6 Testing Location 7
1.7 Test Software 7
1.8 Applicable Standards 8

2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST **9**

2.1 Carrier Frequency and Channel 9
2.2 Test Mode 10
2.3 Connection Diagram of Test System 11
2.4 EUT Operation Test Setup 11

3 TEST RESULT **12**

3.1 Maximum Conducted Output Power Measurement 12
3.2 Unwanted Emissions Measurement 14
3.3 Antenna Requirements 20

4 LIST OF MEASURING EQUIPMENT **22**

5 MEASUREMENT UNCERTAINTY **23**

APPENDIX A. RADIATED SPURIOUS EMISSION

APPENDIX B. DUTY CYCLE PLOTS

APPENDIX C. SETUP PHOTOGRAPHS

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR452219C	Rev. 01	Initial issue of report	Sep. 14, 2024

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit for U-NII-1	Limit for U-NII-3	Result	Remark
3.1	15.407(a)	Maximum Conducted Output Power	≤ 30 dBm	≤ 30 dBm	Pass	-
0	15.407(b)	Unwanted Emissions	15.407(b) & 15.209(a)	15.407(b)(4)(i) &15.209(a)	Pass	Under limit 10.35 dB at 5147.80/125.06 MHz
3.3	15.203 & 15.407(a)	Antenna Requirement	15.203 & 15.407(a)	15.203 & 15.407(a)	Pass	-

Remark: This is a variant report, the change note could be referred to the Class II Permissive Change letter which is exhibit separately. According to the differences, only the related test cases were verified from original test report (Sporton Report Number FR172726AE).

Conformity Assessment Condition:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the section “Measurement Uncertainty”

Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

1 General Description

1.1 Applicant

Veea Inc.
164 E 83rd Street, NEW YORK, United States 10028

1.2 Manufacturer

Veea Inc.
164 E 83rd Street, NEW YORK, United States 10028

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Wireless Edge Server
Brand Name	VeeaHub
Model Name	VHC25,VHC20
FCC ID	2ARXK-VHC25
SN Code	Conducted: C25DCW00000000006194 Radiation: C25DCW00000000006195
EUT Stage	Identical Prototype

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. The different model name is different for market purpose. We choice model name VHC25 for testing.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency Range	5180 MHz ~ 5240 MHz 5745 MHz ~ 5825 MHz
Maximum Output Power to Antenna	**MIMO <Ant. 1 + 3>** **<5180 MHz ~ 5240 MHz>** 802.11a : 22.51 dBm / 0.1782 W 802.11ax HE20: 22.51 dBm / 0.1782 W 802.11ax HE40: 22.41 dBm / 0.1742 W 802.11ax HE80: 22.62 dBm / 0.1828 W **MIMO <Ant. 2 + 4>** **<5745 MHz ~ 5825 MHz>** 802.11a : 22.58 dBm / 0.1811 W 802.11ax HE20: 22.57 dBm / 0.1807 W 802.11ax HE40: 22.52 dBm / 0.1786 W 802.11ax HE80: 22.49 dBm / 0.1774 W
Antenna Type / Gain	**<5180 MHz ~ 5240 MHz>** <Ant. 1> : PIFA Antenna with gain 3.6 dBi <Ant. 3> : PIFA Antenna with gain 3.5 dBi TX-Beamforming gain : 6.56 dBi **<5745 MHz ~ 5825 MHz>** <Ant. 2> : PIFA Antenna with gain 3.3 dBi <Ant. 4> : PIFA Antenna with gain 3.4 dBi TX-Beamforming gain : 6.36 dBi
Type of Modulation	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM) 802.11ax: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM /1024QAM)

Note:

1. For 802.11n/ac & 802.11ax mode, the whole testing have assessed only 802.11ax HE20/40/80 by referring to the higher output power.
2. 802.11ax mode only supports full RU for this device, so only the full RU is evaluated.
3. For WLAN SISO & MIMO mode, the whole testing has assessed only MIMO mode by referring to their higher conducted power.
4. 802.11a does not support TXBF mode.
5. For CDD and Beamforming modes, the CDD mode is the worst case, thus only CDD mode was verified in this report by referring to the higher conducted power. The beamforming mode only evaluates the output power.

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Testing Location

Sporton International Inc. (ShenZhen) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

Test Firm	Sporton International Inc. (ShenZhen)		
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	TH01-SZ	CN1256	421272

Test Firm	Sporton International Inc. (ShenZhen)		
Test Site Location	101, 1st Floor, Block B, Building 1, No. 2, Tengfeng 4th Road, Fenghuang Community, Fuyong Street, Baoan District, Shenzhen City, Guangdong Province 518103 People's Republic of China TEL: +86-755-86066985		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	03CH01-SZ	CN1256	421272

1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH01-SZ	AUDIX	E3	6.2009-8-24

1.8 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR Part 15 Subpart E
- FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Y plane) were recorded in this report.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq.(MHz)	Channel	Freq. (MHz)
5180-5240 MHz U-NII-1	36	5180	44	5220
	38*	5190	46*	5230
	40	5200	48	5240
	42#	5210		

Frequency Band	Channel	Freq.(MHz)	Channel	Freq. (MHz)
5745-5825 MHz U-NII-3	149	5745	157	5785
	151*	5755	159*	5795
	153	5765	161	5805
	155#	5775	165	5825

Note:

1. The above Frequency and Channel in "*" are 40MHz bandwidth.
2. The above Frequency and Channel in "#" are 80MHz bandwidth.

2.2 Test Mode

Final test modes are considering the modulation and worse data rates as below table.

MIMO Mode

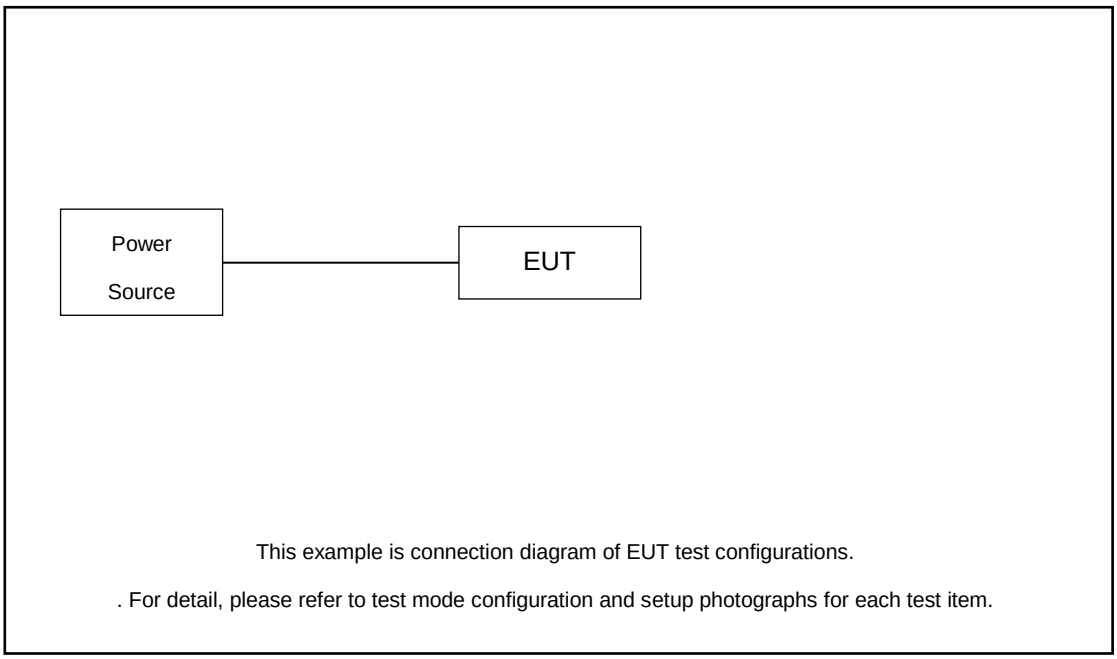
Modulation	Data Rate
802.11a	6 Mbps
802.11ax HE20	MCS0
802.11ax HE40	MCS0
802.11ax HE80	MCS0

Ch. #		U-NII-1	U-NII-3
		20M BW	20M BW
L	Low	36	149
M	Middle	44	157
H	High	48	165
Straddle		-	-

Ch. #		U-NII-1	U-NII-3
		40M BW	40M BW
L	Low	38	151
M	Middle	-	-
H	High	46	159
Straddle		-	-

Ch. #		U-NII-1	U-NII-3
		80M BW	80M BW
L	Low	-	-
M	Middle	42	155
H	High	-	-
Straddle		-	-

2.3 Connection Diagram of Test System



2.4 EUT Operation Test Setup

For WLAN RF test items, an engineering test program was provided and enabled to make EUT continuously transmit.

3 Test Result

3.1 Maximum Conducted Output Power Measurement

3.1.1 Limit of Maximum Conducted Output Power

<FCC 14-30 CFR 15.407>

For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

For the band 5.725–5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

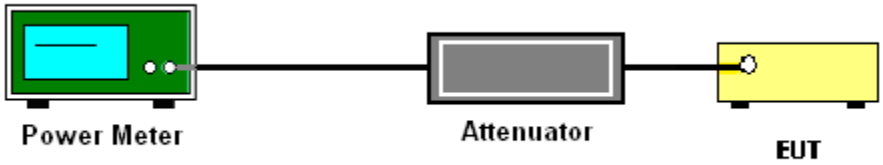
3.1.3 Test Procedures

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

Method PM (Measurement using an RF average power meter):

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit continuously with a consistent duty cycle at its maximum power control level.
3. Measure the average power of the transmitter, and the average power is corrected with duty factor, 10 log(1/x), where x is the duty cycle.
4. For MIMO mode, the measure-and-sum technique should be used for measuring the in-band transmit power of a device.

3.1.4 Test Setup



3.1.5 Test Result of Maximum Conducted Output Power

U-NII-1															
Mod.	Data Rate	NTX	CH.	RU Config	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		Pass/Fail
						Ant 1	Ant 3	Ant 1	Ant 3	SUM	Ant 1	Ant 3	Ant 1	Ant 3	
11a	6Mbps	2	36	/	5180	0.34	0.28	19.58	19.41	22.51	30.00		3.60		Pass
11a	6Mbps	2	44	/	5220	0.34	0.28	19.40	19.37	22.40	30.00		3.60		Pass
11a	6Mbps	2	48	/	5240	0.34	0.28	19.31	19.22	22.28	30.00		3.60		Pass
HE20	MCS0	2	36	Full	5180	0.23	0.20	19.57	19.43	22.51	30.00		3.60		Pass
			44	Full	5220	0.23	0.20	19.41	19.36	22.39	30.00		3.60		Pass
			48	Full	5240	0.23	0.20	19.33	19.25	22.30	30.00		3.60		Pass
HE40	MCS0	2	38	Full	5190	0.20	0.23	19.47	19.32	22.41	30.00		3.60		Pass
			46	Full	5230	0.20	0.23	19.23	19.47	22.36	30.00		3.60		Pass
HE80	MCS0	2	42	Full	5210	0.27	0.23	19.60	19.62	22.62	30.00		3.60		Pass

U-NII-3															
Mod.	Data Rate	NTX	CH.	RU Config	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		Pass/Fail
						Ant 2	Ant 4	Ant 2	Ant 4	SUM	Ant 2	Ant 4	Ant 2	Ant 4	
11a	6Mbps	2	149	/	5745	0.34	0.28	19.42	19.71	22.58	30.00		3.40		Pass
11a	6Mbps	2	157	/	5785	0.34	0.28	19.17	19.80	22.51	30.00		3.40		Pass
11a	6Mbps	2	165	/	5825	0.34	0.28	19.16	19.85	22.53	30.00		3.40		Pass
HE20	MCS0	2	149	Full	5745	0.23	0.20	19.43	19.69	22.57	30.00		3.40		Pass
HE20	MCS0	2	157	Full	5785	0.23	0.20	19.02	19.76	22.42	30.00		3.40		Pass
HE20	MCS0	2	165	Full	5825	0.23	0.20	19.05	19.81	22.46	30.00		3.40		Pass
HE40	MCS0	2	151	Full	5755	0.20	0.23	19.35	19.66	22.52	30.00		3.40		Pass
HE40	MCS0	2	159	Full	5795	0.20	0.23	19.09	19.87	22.51	30.00		3.40		Pass
HE80	MCS0	2	155	Full	5775	0.27	0.23	19.35	19.60	22.49	30.00		3.40		Pass

For TX-Beamforming mode:

U-NII-1																
Mod.	Data Rate	NTX	CH.	RU Config	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		Pass/Fail
						Ant 1	Ant 3	Ant 1	Ant 3	SUM	Ant 1	Ant 3	Ant 1	Ant 3	
HE20	MCS0	2	36	Full	5180	0.23	0.20	19.57	19.43	22.51	30.00		6.56		Pass
			44	Full	5220	0.23	0.20	19.41	19.36	22.39	30.00		6.56		Pass
			48	Full	5240	0.23	0.20	19.33	19.25	22.30	30.00		6.56		Pass
HE40	MCS0	2	38	Full	5190	0.20	0.23	19.47	19.32	22.41	30.00		6.56		Pass
			46	Full	5230	0.20	0.23	19.23	19.47	22.36	30.00		6.56		Pass
HE80	MCS0	2	42	Full	5210	0.27	0.23	19.60	19.62	22.62	30.00		6.56		Pass

U-NII-3																
Mod.	Data Rate	NTX	CH.	RU Config	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		Pass/Fail
						Ant 2	Ant 4	Ant 2	Ant 4	SUM	Ant 2	Ant 4	Ant 2	Ant 4	
HE20	MCS0	2	149	Full	5745	0.23	0.20	19.43	19.69	22.57	29.64		6.36		Pass
HE20	MCS0	2	157	Full	5785	0.23	0.20	19.02	19.76	22.42	29.64		6.36		Pass
HE20	MCS0	2	165	Full	5825	0.23	0.20	19.05	19.81	22.46	29.64		6.36		Pass
HE40	MCS0	2	151	Full	5755	0.20	0.23	19.35	19.66	22.52	29.64		6.36		Pass
HE40	MCS0	2	159	Full	5795	0.20	0.23	19.09	19.87	22.51	29.64		6.36		Pass
HE80	MCS0	2	155	Full	5775	0.27	0.23	19.35	19.60	22.49	29.64		6.36		Pass

3.2 Unwanted Emissions Measurement

This section as specified in FCC Part 15.407(b) is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement. The unwanted emissions shall comply with 15.407(b)(1) to (6), and restricted bands per FCC Part15.205.

3.2.1 Limit of Unwanted Emissions

(1) For transmitters operating in the 5150-5250 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of –27dBm/MHz.

For transmitters operating in the 5470-5600 MHz and 5650-5725MHz band: all emissions outside of the 5470-5600 MHz and 5650-5725MHz band shall not exceed an EIRP of -27 dBm/MHz.

(2) For transmitters operating in the 5.725-5.85 GHz band:
15.407(b)(4)(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

(3) Unwanted spurious emissions fallen in restricted bands shall comply with the general field strength limits as below table,

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

(4) EIRP (dBm)	Field Strength at 3m (dBµV/m)
- 27	68.2

Note: The following formula is used to convert the EIRP to field strength.

$$EIRP = E_{Meas} + 20\log(d_{Meas}) - 104.7$$

where

EIRP is the equivalent isotropically radiated power, in dBm

E_{Meas} is the field strength of the emission at the measurement distance, in dBµV/m

d_{Meas} is the measurement distance, in m

(4) ANSI C63.10-2013 clause 12.7.3 note 97

As specified by regulatory requirements, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit. However, an out-of-band emission that complies with both the average and peak general regulatory limits is not required to satisfy the peak emission limit.

3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.2.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r04. Section G) Unwanted emissions measurement.

   (1) Procedure for Unwanted Emissions Measurements Below 1000MHz

   - RBW = 120 kHz
   - VBW = 300 kHz
   - Detector = Peak
   - Trace mode = max hold

   (2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz

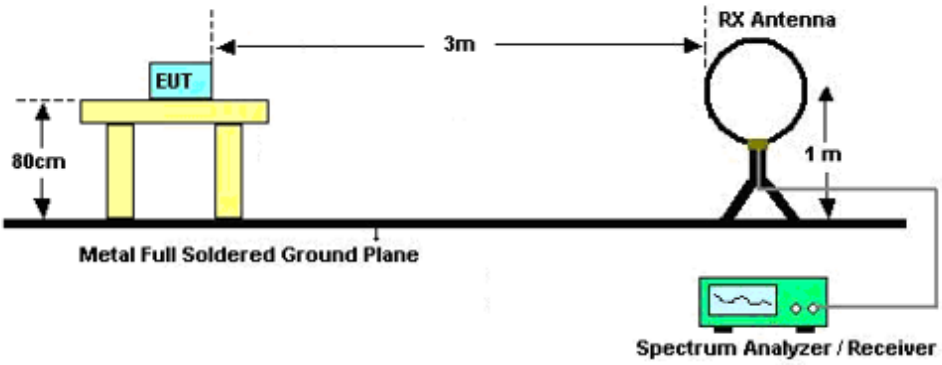
   - RBW = 1 MHz
   - VBW ≥ 3 MHz
   - Detector = Peak
   - Sweep time = auto
   - Trace mode = max hold

   (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

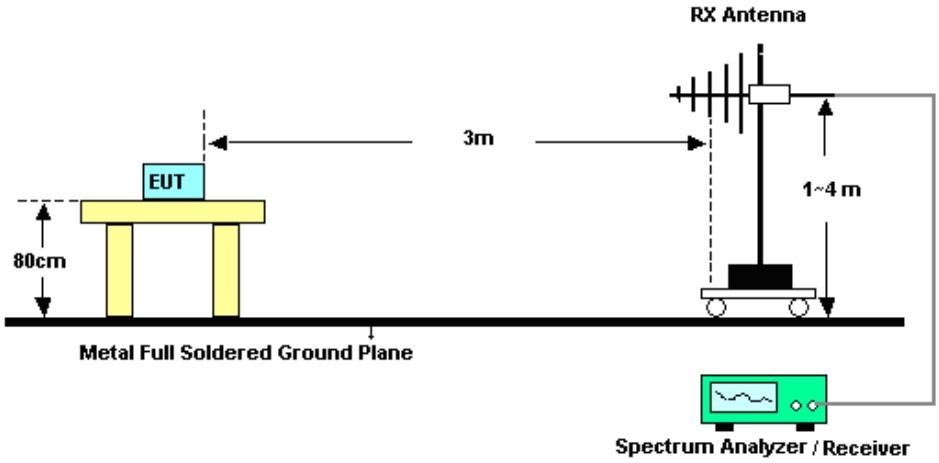
   - RBW = 1 MHz
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on.
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

3.2.4 Test Setup

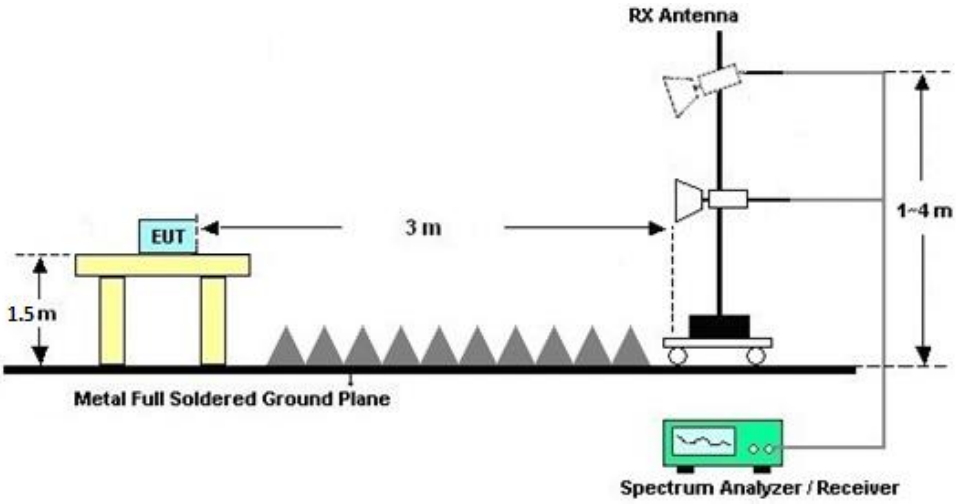
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.2.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

3.2.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A.

3.2.7 Duty Cycle

Please refer to Appendix B.

3.2.8 Test Result of Radiated Spurious Emissions (30MHz ~ 10th Harmonic)

Please refer to Appendix A.

3.3 Antenna Requirements

3.3.1 Standard Applicable

According to FCC 47 CFR Section 15.407(a)(1)(2) ,if transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.3.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.3.3 Antenna Gain

<CDD Modes >

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

Directional gain = GANT + Array Gain, where Array Gain is as follows.

For power spectral density (PSD) measurements on all devices,

Array Gain = 10 log(NANT/NSS=1) dB.

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for NANT ≤ 4.

Directional gain may be calculated by using the formulas applicable to equal gain antennas with GANT set equal to the gain of the antenna having the highest gain;

The EUT supports CDD mode.

For power, the directional gain GANT is set equal to the antenna having the highest gain, i.e., F)2)f)i).

For PSD, the directional gain calculation is following F)2)f)ii) of KDB 662911 D01 v02r01.

The power and PSD limit should be modified if the directional gain of EUT is over 6 dBi,

The directional gain “DG” is calculated as following table.

<CDD Modes>

	Ant. 1 (dBi)	Ant. 3 (dBi)	DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
UNII-1	3.60	3.50	3.60	6.56	0.00	0.56
	Ant. 2 (dBi)	**Ant. 4 (dBi)**	**Power (dBi)**	**PSD (dBi)**	**Reduction (dB)**	**Reduction (dB)**
UNII-3	3.30	3.40	3.40	6.36	0.00	0.36

Power limit reduction = Composite gain – 6dBi, (min = 0)

PSD limit reduction = Composite gain + PSD Array gain – 6dBi, (min = 0)

TXBF modes

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

where

Each antenna is driven by no more than one spatial stream;

N_{SS} = the number of independent spatial streams of data;

N_{ANT} = the total number of antennas

$g_{j,k} = 10^{G_k/20}$ if the kth antenna is being fed by spatial stream j, or zero if it is not;

G_k is the gain in dBi of the kth antenna.

The EUT supports beamforming for 802.11n/ac/ax modes.

The directional gain calculation is following F)2)e)ii) of KDB 662911 D01 v02r01.

The power and PSD limit should be modified if the directional gain of EUT is over 6 dBi,

The directional gain "DG" is calculated as following table.

	Ant 1 (dBi)	Ant 3 (dBi)	DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
UNII-1	3.60	3.50	6.56	6.56	0.56	0.56

	Ant 2 (dBi)	Ant 4 (dBi)	DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
UNII-3	3.30	3.40	6.36	6.36	0.36	0.36

Power Limit Reduction = DG(Power) – 6dBi, (min = 0)

PSD Limit Reduction = DG(PSD) – 6dBi, (min = 0)

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101078	10Hz~40GHz	Apr. 09, 2024	Jul. 29, 2024	Apr. 08, 2025	Conducted (TH01-SZ)
Pulse Power Senor	Anritsu	MA2411B	1339473	30MHz~40GHz	Dec. 29, 2023	Jul. 29, 2024	Dec. 28, 2024	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Aug. 21, 2023	Jul. 29, 2024	Aug. 20, 2024	Conducted (TH01-SZ)
EMI Test Receiver&SA	Agilent	N9038A	MY52260185	20Hz~26.5GHz	Dec. 27, 2023	Jul. 27, 2024~ Jul. 30, 2024	Dec. 26, 2024	Radiation (03CH01-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY55150213	10Hz~44GHz	Jul. 03, 2024	Jul. 27, 2024~ Jul. 30, 2024	Jul. 02, 2025	Radiation (03CH01-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	Jul. 27, 2023	Jul. 27, 2024~ Jul. 30, 2024	Jul. 26, 2025	Radiation (03CH01-SZ)
Bilog Antenna	TeseQ	CBL6112D	35407	30MHz-2GHz	Oct. 24, 2023	Jul. 27, 2024~ Jul. 30, 2024	Oct. 23, 2025	Radiation (03CH01-SZ)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00119436	1GHz~18GHz	Jul. 04, 2024	Jul. 27, 2024~ Jul. 30, 2024	Jul. 03, 2025	Radiation (03CH01-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18Ghz-40GHz	Apr. 09, 2024	Jul. 27, 2024~ Jul. 30, 2024	Apr. 08, 2025	Radiation (03CH01-SZ)
LF Amplifier	Burgeon	BPA-530	102209	0.01~3000Mhz	Apr. 09, 2024	Jul. 27, 2024~ Jul. 30, 2024	Apr. 08, 2025	Radiation (03CH01-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1943528	1GHz~18GHz	Oct. 18, 2023	Jul. 27, 2024~ Jul. 30, 2024	Oct. 17,2024	Radiation (03CH01-SZ)
HF Amplifier	KEYSIGHT	83017A	MY53270105	0.5GHz~26.5Ghz	Oct. 18, 2023	Jul. 27, 2024~ Jul. 30, 2024	Oct. 17,2024	Radiation (03CH01-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 03, 2024	Jul. 27, 2024~ Jul. 30, 2024	Jul. 02, 2025	Radiation (03CH01-SZ)
AC Power Source	Chroma	61601	616010001985	N/A	Oct. 18, 2023	Jul. 27, 2024~ Jul. 30, 2024	Oct. 17, 2024	Radiation (03CH01-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Jul. 27, 2024~ Jul. 30, 2024	NCR	Radiation (03CH01-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Jul. 27, 2024~ Jul. 30, 2024	NCR	Radiation (03CH01-SZ)

NCR: No Calibration Required

5 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

Uncertainty of Conducted Measurement

Test Item	Uncertainty
Conducted Power	±1.34 dB

Uncertainty of Radiated Emission Measurement (9 KHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.8dB

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.2dB

Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.0dB

Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.3dB

---------- THE END ----------

Appendix A. Radiated Spurious Emission Test Data

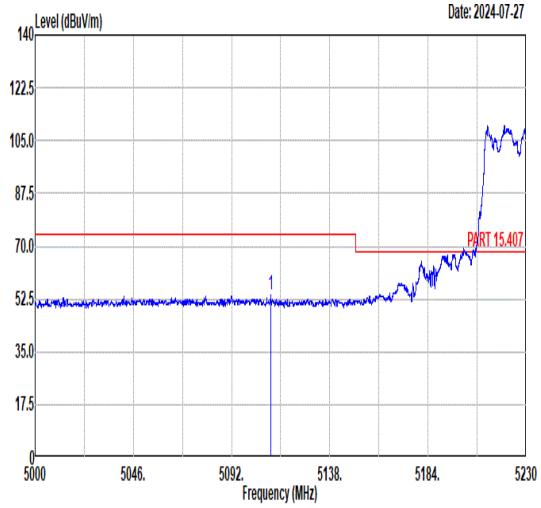
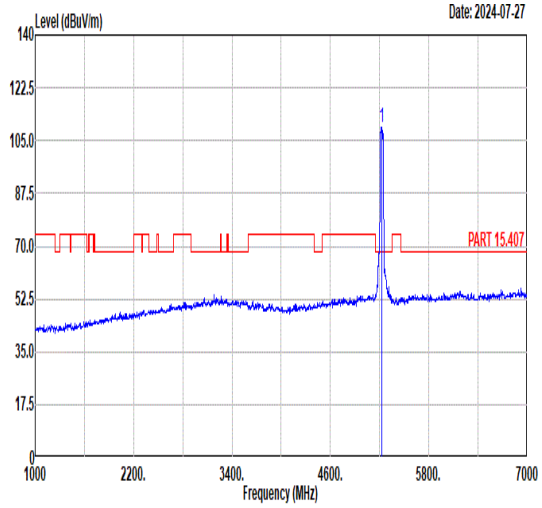
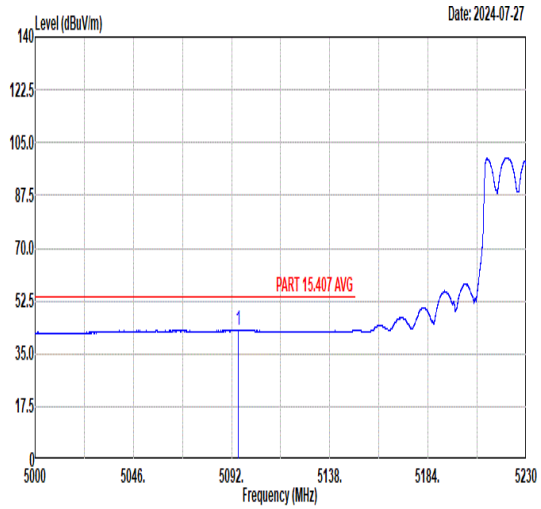
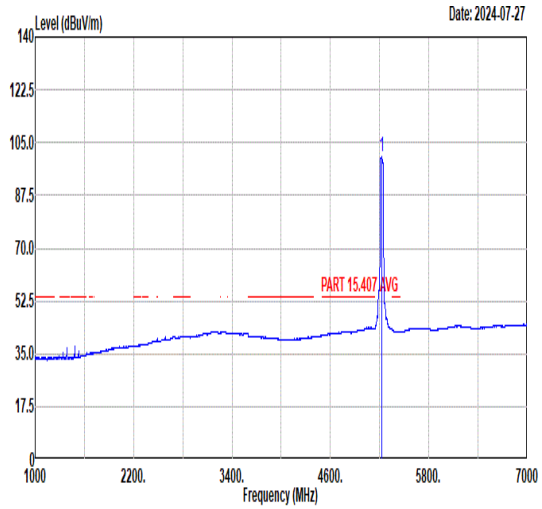
Test Engineer :	Zhaohui Liang	Relative Humidity :	50%
		Temperature :	20-22℃

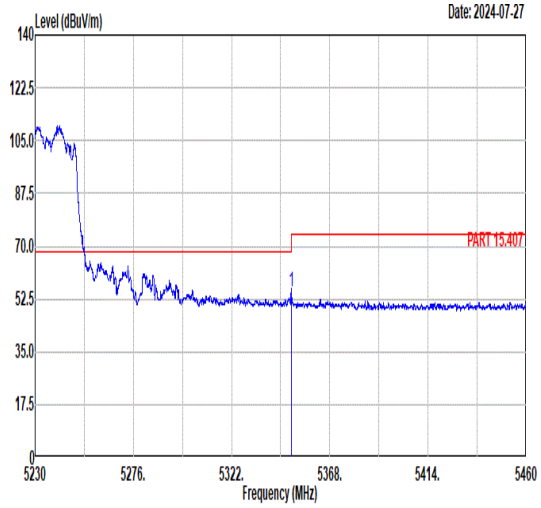
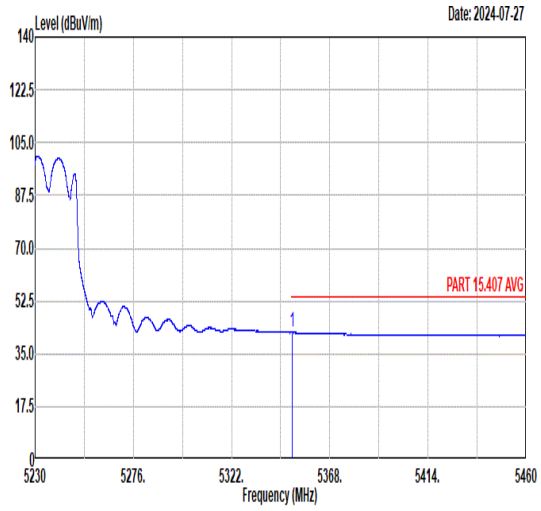
Radiated Spurious Emission Test Modes

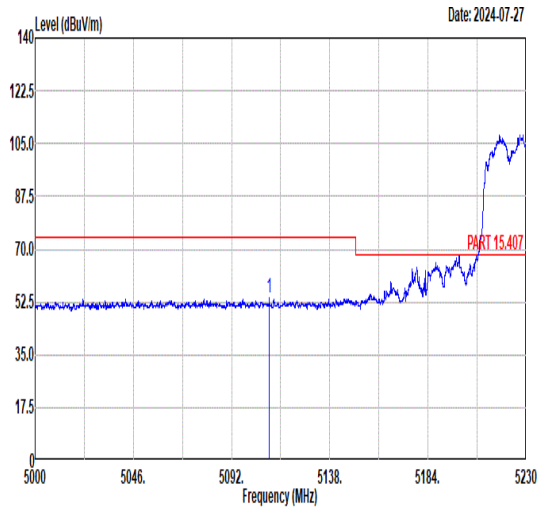
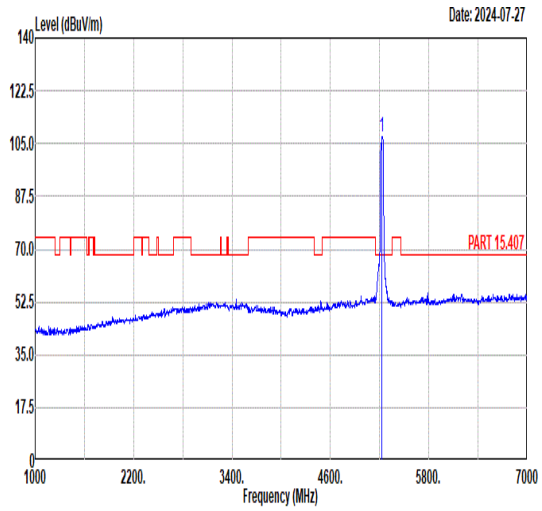
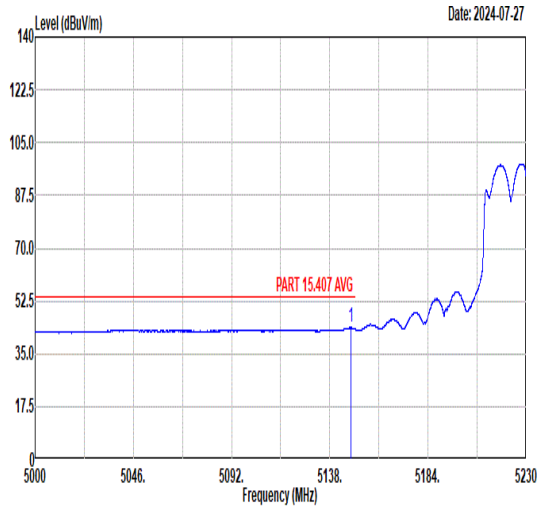
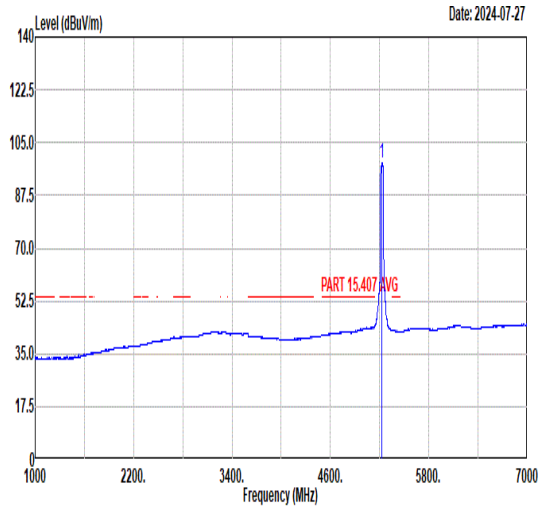
Mode	Band	Band (GHz)	Antenna	Modulation	Channel	Frequency	Data Rate	RU	Remark
Mode 1	U-NII-1	5.15-5.25	CDD1+3	802.11ax HE40	46	5230	MCS0	-	-
Mode 2	U-NII-1	5.15-5.25	CDD1+3	802.11ax HE40-LF	46	5230	MCS0	-	-

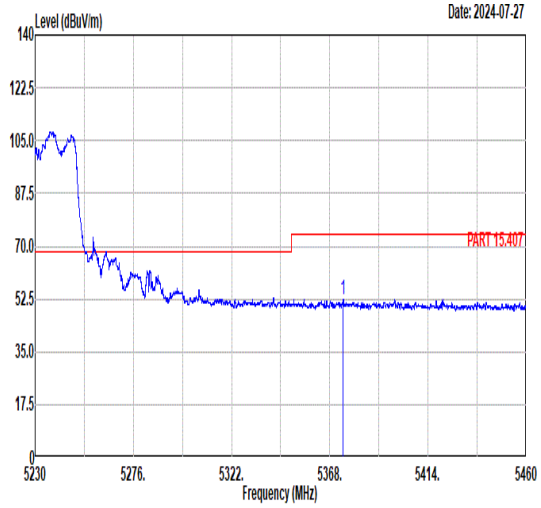
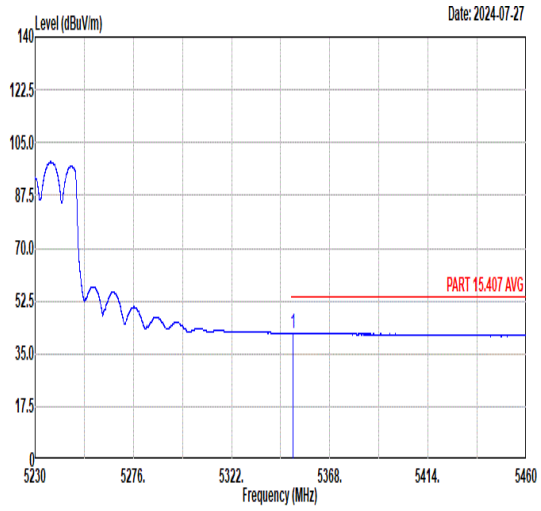
Summary of each worse mode

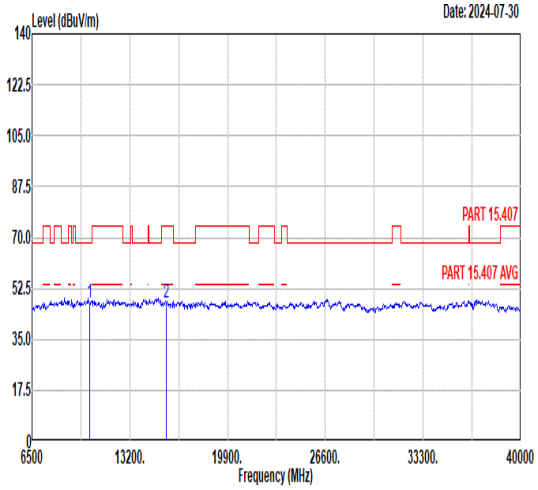
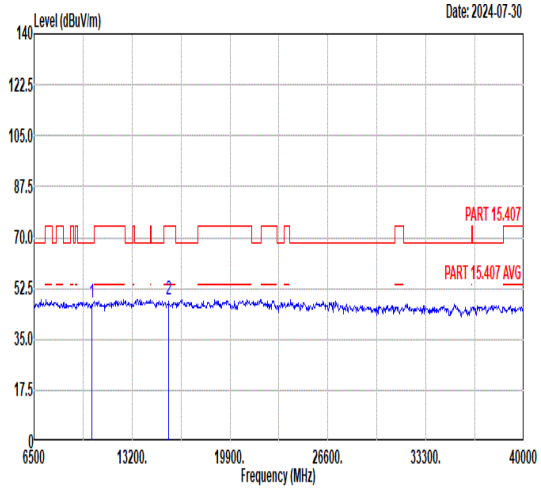
Mode	Modulation	Ch.	Freq. (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol.	Peak Avg.	Result	Remark
1	802.11ax HE40	46	5147.80	43.65	54.00	-10.35	V	AVERAGE	Pass	Band Edge
	802.11ax HE40	46	10460.00	47.68	68.30	-20.62	V	Peak	Pass	Harmonic
2	802.11ax HE40-LF	46	125.06	33.15	43.50	-10.35	V	Peak	Pass	LF

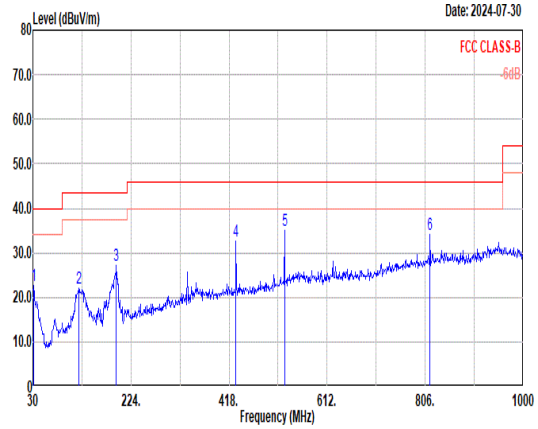
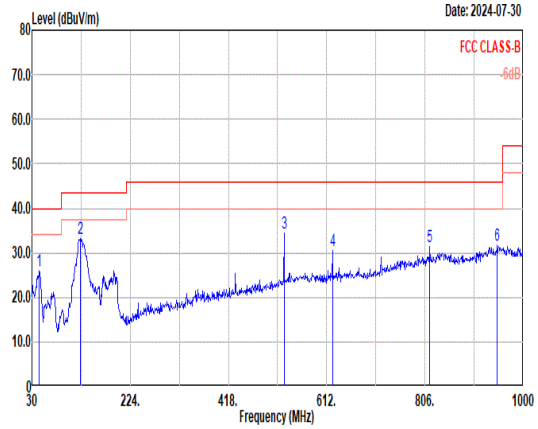
Mode	1	
	Band Edge - L	
	U-NII-1_5.15-5.25_802.11ax HE40_CH46_5230MHz	
ANT	CDD1+3	
Pol.	Horizontal	Fundamental
Peak	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 5110.31 54.02 74.00 -19.98 39.76 34.88 11.11 31.73 400 54 PEAK	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 5230.00 109.56 ------ ------ 95.55 34.85 11.04 31.88 400 54 PEAK
Avg	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 5095.13 42.83 54.00 -11.17 28.54 34.88 11.12 31.71 400 54 AVERAGE	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 5230.00 100.29 ------ ------ 86.28 34.85 11.04 31.88 400 54 AVERAGE

Mode	1	
	Band Edge - R	
	U-NII-1_5.15-5.25_802.11ax HE40_CH46_5230MHz	
ANT	CDD1+3	
Pol.	Horizontal	Fundamental
Peak	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 5350.01 54.86 74.00 -19.14 41.12 34.83 10.94 32.03 400 54 PEAK	Blank
Avg	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 5350.41 42.13 54.00 -11.87 28.39 34.83 10.94 32.03 400 54 AVERAGE	Blank

Mode	1	
	Band Edge - L	
	U-NII-1_5.15-5.25_802.11ax HE40_CH46_5230MHz	
ANT	CDD1+3	
Pol.	Vertical	Fundamental
Peak	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 5109.60 53.91 74.00 -20.09 39.65 34.88 11.11 31.73 400 246 PEAK	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 5230.00 107.09 ------ ------ 93.09 34.85 11.03 31.88 400 246 PEAK
Avg	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 5147.80 43.65 54.00 -10.35 29.47 34.87 11.09 31.78 400 246 AVERAGE	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 5230.00 98.33 ------ ------ 84.33 34.85 11.03 31.88 400 246 AVERAGE

Mode	1	
	Band Edge - R	
	U-NII-1_5.15-5.25_802.11ax HE40_CH46_5230MHz	
ANT	CDD1+3	
Pol.	Vertical	Fundamental
Peak	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 5374.35 52.47 74.00 -21.53 38.77 34.83 10.93 32.06 400 246 PEAK	Blank
Avg	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 5350.89 41.88 54.00 -12.12 28.14 34.83 10.94 32.03 400 246 AVERAGE	Blank

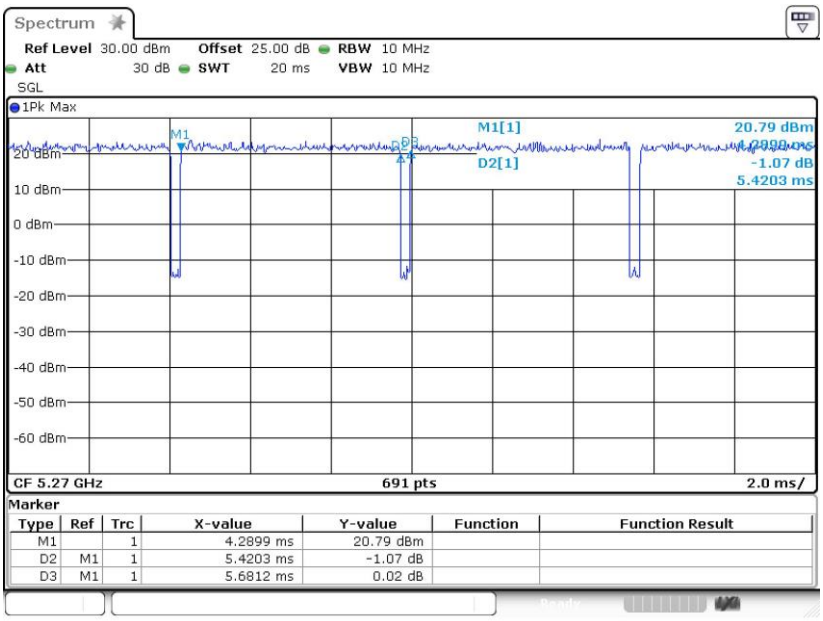
Mode	1	
	Harmonic	
	U-NII-1_5.15-5.25_802.11ax HE40_CH46_5230MHz	
ANT	CDD1+3	
Pol.	Horizontal	Vertical
Peak Avg	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 10460.00 47.36 68.30 -20.94 44.46 39.48 14.21 50.79 -- -- Peak 2 15690.00 47.73 74.00 -26.27 40.40 41.91 16.97 51.55 -- -- Peak	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg 1 10460.00 47.68 68.30 -20.62 44.78 39.48 14.21 50.79 -- -- Peak 2 15690.00 48.47 74.00 -25.53 41.14 41.91 16.97 51.55 -- -- Peak

Mode	2	
	LF	
	U-NII-1_5.15-5.25_802.11ax HE40-LF_CH46_5230MHz	
ANT	CDD1+3	
Pol.	Horizontal	Vertical
QP/ Peak		

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	cm	deg	
1	31.94	22.76	40.00	-17.24	28.88	24.04	1.04	31.20	--	--	Peak
2	121.18	22.08	43.50	-21.42	33.06	18.18	2.00	31.16	--	--	Peak
3	194.90	27.29	43.50	-16.21	40.32	15.35	2.54	30.92	--	--	Peak
4	431.58	32.65	46.00	-13.35	37.01	22.60	3.74	30.70	--	--	Peak
5	527.61	35.08	46.00	-10.92	37.41	24.41	4.13	30.87	--	--	Peak
6	815.70	34.06	46.00	-11.94	33.78	26.23	5.13	31.08	--	--	Peak

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	cm	deg	
1	44.55	25.99	40.00	-14.01	39.46	16.50	1.23	31.20	--	--	Peak
2	125.06	33.15	43.50	-10.35	44.17	18.10	2.03	31.15	--	--	Peak
3	527.61	34.50	46.00	-11.50	36.83	24.41	4.13	30.87	--	--	Peak
4	623.64	30.59	46.00	-15.41	31.99	25.04	4.51	30.95	--	--	Peak
5	815.70	31.36	46.00	-14.64	31.08	26.23	5.13	31.08	--	--	Peak
6	948.59	31.64	46.00	-14.36	29.98	27.09	5.57	31.00	--	--	Peak

Appendix B. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11ax HE40	95.41	5.420	0.184	300Hz

802.11ax HE40