FCC RF Test Report

APPLICANT	:	Vantiva USA LLC
EQUIPMENT	:	Wireless router
BRAND NAME	:	Vantiva
MODEL NAME	:	OWA0111TCH1, OWA0111TCH2, OWA0111XXXXX (where X can be alphanumeric, -, or blank)
FCC ID	:	G95OWA0111
STANDARD	:	FCC Part 15 Subpart E §15.407
CLASSIFICATION	:	(NII) Unlicensed National Information Infrastructure
TEST DATE(S)	:	Jul. 10, 2023 ~ Jul. 11, 2023

We, Sporton International Inc. (Kunshan), 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. (Kunshan), the test report shall not be reproduced except in full.

Jason Jia

Approved by: Jason Jia

ACCREDITED Cert #5145.02

Sporton International Inc. (Kunshan)
No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300
People's Republic of China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR2N0411-02	Rev. 01	Initial issue of report	Jul. 20, 2023

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit for U-NII-1/2A/2C	Result	Remark
3.1	2.1049 & 15.403(i)	26dB & 99% Bandwidth	-	Pass	-
3.2	15.407(a)	Maximum Conducted Output Power	≤24 dBm for UNII-2C	Pass	-
3.3	15.407(a)	Power Spectral Density	≤11 dBm/MHz for UNII-2C	Pass	-
3.4	15.407(b)	Unwanted Emissions	15.407(b) & 15.209(a)	Pass	Under limit 0.64 dB at 5456.08 MHz
3.5	15.203 & 15.407(a)	Antenna Requirement	N/A	Pass	-

Note:

This is a variant report, the difference is to enable TDWR 5600~5650MHz by software. According to the change, only the TDWR related cases were tested, all the other test results can be referred to the original report (Sporton Report Number FR2N0411B).

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

Vantiva USA LLC
4855 Peachtree Industrial Blvd. Suite 200 Norcross, Georgia 30092

1.2 Manufacturer

Cal-Comp Electronics (Thailand) Public Co.,Ltd
138 MOO 4 Petchkasem Road, Sapang,Khaoyoi,Petchburi 76140, THAILAND

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Wireless router
Brand Name	Vantiva
Model Name	OWA0111TCH1, OWA0111TCH2, OWA0111XXXXX (where X can be alphanumeric, -, or blank)
FCC ID	G95OWA0111
HW Version	FGR
SW Version	17.10.188.6401 (r808804)
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency Range	5180 MHz ~ 5240 MHz 5260 MHz ~ 5320 MHz 5500 MHz ~ 5720 MHz 5745 MHz ~ 5825 MHz
Maximum Output Power to Antenna	**<MIMO Ant.1+2>** **<5500 MHz ~ 5720 MHz >** 802.11ac VHT80 : 23.68 dBm / 0.2333 W 802.11ac VHT160 : 18.97 dBm / 0.0789 W 802.11ax HE80: 23.77 dBm / 0.2382 W 802.11ax HE160: 19.05 dBm / 0.0804 W
Antenna Type	Offboard pcb antenna with coaxial RF cable
Type of Modulation	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac/ax : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM / 1024QAM)
Antenna Function Description	

	Ant. 1	Ant. 2
802.11 a/n/ac/ax SISO	V	V
802.11 a/n/ac/ax CDD 1S2T	V	V

		802.11 n/ac/ax Tx Beamforming 1S2T	V	V	

Note:

1. For SISO&MIMO mode, the whole testing has assessed only MIMO mode by referring to their higher conducted power
2. The device supports BW 20MHz/40MHz/80MHz/160MHz, to enable TDWR 5600~5650MHz by software and the power setting is the same as the original project, thus the power level of BW 20MHz/40MHz could refer to the original report.
3. For 802.11 ac VHT80 / ax HE80 mode and 802.11 ac VHT160 / ax HE160, the whole testing have assessed only 802.11ax HE80/HE160 by referring to their maximum conducted power.
4. The device does not support partial RU tone and channel puncturing function for 802.11ax mode.
5. The device supports 1S2T(CDD&TXBF) mode; 1S2T: NSS=1, MIMO 2Tx.
6. Please refer to the antenna report for the maximum Single antenna gain and CDD (Cyclic Delay Diversity) directional gain and TXBF (Tx Beamforming) directional gain.

Frequency Band	Max Single Antenna gain (dBi)		CDD DG (dBi)		TXBF DG (dBi)	
	ANT1	ANT2	For Power	For PSD	For Power	For PSD
5GHz UNII-1	5.25	3.85	5.25	6.39	6.39	6.39
5GHz UNII-2A	5.30	3.69	5.30	6.39	6.39	6.39
5GHz UNII-2C	5.79	4.21	5.79	6.41	6.41	6.41
5GHz UNII-3	5.81	4.21	5.81	6.47	6.47	6.47

1.5 Modification of EUT

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

1.6 Specification of Accessory

Specification of Accessory				
AC Adapter 1	**Brand Name**	Honor	**Model Name**	ADS-12HG-12 12012EPCU
AC Adapter 2	**Brand Name**	Masspower	**Model Name**	E012-1O120100VU

1.7 Testing Location

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	03CH05-KS TH01-KS	CN1257	314309

1.8 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH05-KS	AUDIX	E3	6.2009-8-24

1.9 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

a. 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: conduction emission (150 kHz to 30 MHz), 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 (X plane) were recorded in this report.

b. AC power line Conducted Emission was tested under maximum output power.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
TDWR Channel	114[2]	5570	124	5620
	118*	5590	126*	5630
	120	5600	128	5640
	122[#]	5610		

Note:

1. The above Frequency and Channel in "*" were 802. 11n HT40 and 802.11ac VHT40 and 802.11ax HE40.
2. The above Frequency and Channel in "[#]" were 802. 11ac VHT80 and 802.11ax HE80.
3. The above Frequency and Channel in "2" were 802.11ac VHT160 and 802.11ax HE160.

2.2 Test Mode

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

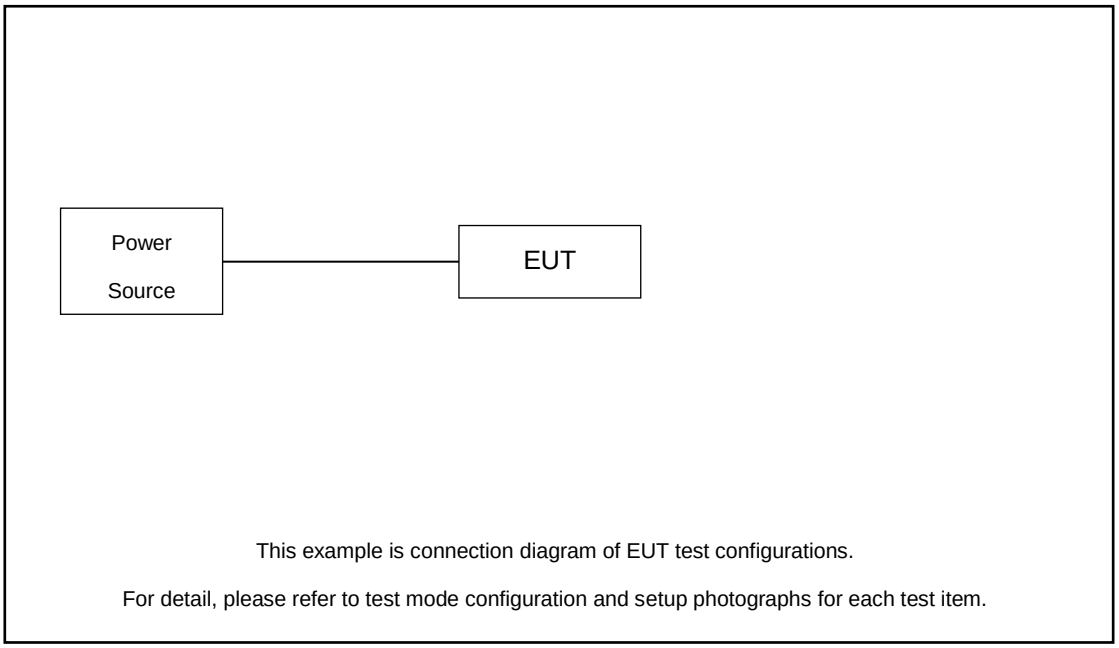
MIMO Mode (CDD 1S2T)

Modulation	Data Rate
802.11ax HE80	**MCS0**
802.11ax HE160	**MCS0**

TXBF Mode (1S2T)

Modulation	Data Rate
802.11ax HE80	**MCS0**
802.11ax HE160	**MCS0**

2.3 Connection Diagram of Test System



This example is connection diagram of EUT test configurations.

For detail, please refer to test mode configuration and setup photographs for each test item.

2.4 EUT Operation Test Setup

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

2.5 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 6.75 dB and 10dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 6.75 + 10 = 16.75 (dB)

3 Test Result

3.1 26dB & 99% Occupied Bandwidth Measurement

3.1.1 Description of 26dB & 99% Occupied Bandwidth

26dB Occupied bandwidth are reporting only.

3.1.2 Measuring Instruments

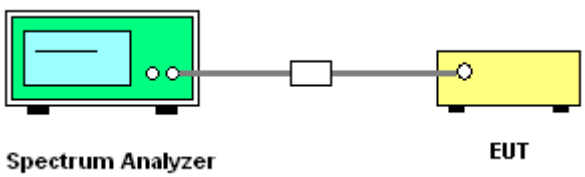
The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

☒	Section C) Bandwidth Measurement 1. Emission Bandwidth (EBW) and 99% OBW
	1. Set RBW = approximately 1% of the emission bandwidth. **2.** Set the VBW > RBW. **3.** Detector = Peak. **4.** Trace mode = max hold **5.** Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%. **6.** For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set to 1%~5% of the OBW and set the Video bandwidth (VBW) ≥ 3 * RBW. **7.** Measure and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.

3.2 Maximum Conducted Output Power Measurement

3.2.1 Limit of Maximum Conducted Output Power

<FCC 14-30 CFR 15.407>

For the 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm 10 log B, where B is the 26 dB emission bandwidth in megahertz.

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.

Note that U-NII-2 band, devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

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3.2.2 Measuring Instruments

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

3.2.3 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.

<TXBF Modes>

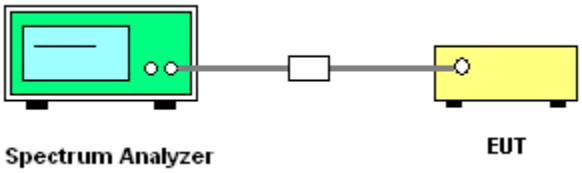
The testing follows Method PM-G of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01 for TXBF modes.

Method PM-G (Measurement using a gated RF average power meter):

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit at its maximum power control level.

3. Measure the average power of the transmitter
4. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

3.2.4 Test Setup



3.2.5 Test Result of Maximum Conducted Output Power

CDD 1S2T

FCC U-NII-2C MIMO														
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Average Conducted Power with duty factor (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		EIRP Power Limit (dBm)	Pass/Fail	Power setting
						Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2			
VHT80	MCS0	2	122	5610	/	20.45	20.89	23.68	23.98		5.79		30	Pass	21
VHT160	MCS0	2	114	5570	/	16.29	15.60	18.97	23.98		5.79		30	Pass	14
HE80	MCS0	2	122	5610	Full	20.51	20.98	23.77	23.98		5.79		30	Pass	21
HE160	MCS0	2	114	5570	Full	16.37	15.68	19.05	23.98		5.79		30	Pass	14

TX BF 1S2T

FCC U-NII-2C MIMO														
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Average Conducted Power with duty factor (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		EIRP Power Limit (dBm)	Pass/Fail	Power setting
						Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2			
VHT80	MCS0	2	122	5610	/	19.92	20.41	23.18	23.57		6.41		30	Pass	20.5
VHT160	MCS0	2	114	5570	/	15.75	15.01	18.40	23.57		6.41		30	Pass	13.5
HE80	MCS0	2	122	5610	Full	20.00	20.50	23.27	23.57		6.41		30	Pass	20.5
HE160	MCS0	2	114	5570	Full	15.85	15.17	18.53	23.57		6.41		30	Pass	13.5

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

<FCC 14-30 CFR 15.407>

For the 5.47–5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

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.

3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r04. Section F) Maximum power spectral density.

 # Method SA-2 #

(trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

- Measure the duty cycle.
- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 1 MHz.
- Set VBW ≥ 3 MHz.
- Number of points in sweep ≥ 2 Span / RBW.
- Sweep time = auto.
- Detector = RMS
- Trace average at least 100 traces in power averaging mode.
- Add 10 log(1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times. For example, add 10 log(1/0.25) = 6 dB if the duty cycle is 25 percent.

<TXBF Modes>

 # Method SA-3 #

(power averaging (rms) detection with max hold):

- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 1 MHz.
- Set VBW ≥ 3 MHz
- Number of points in sweep ≥ 2 Span / RBW.
- Sweep time ≤ (number of points in sweep) × T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
- Detector = power averaging (rms).
- Trace mode = max hold.
- Allow max hold to run for at least 60 seconds, or longer as needed to allow the trace to stabilize.

1. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
2. Each plot has already offset with cable loss, and attenuator loss. Measure the PPSD and record it.
3. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

Method (a): Measure and sum the spectra across the outputs.

The total final Power Spectral Density is the bin-by-bin summation to obtain the combined spectrum. For the device with 2 transmitter outputs. The spectrum measurements of the individual outputs are all performed with the same span and number of points, the spectrum value in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 to obtain the value for the first frequency bin of the summed spectrum.

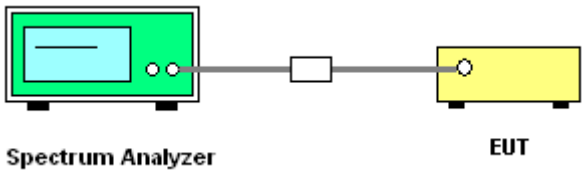
Method (b): Measure and sum spectral maxima across the outputs.

The measurement on each individual output were performed with the same span and number on each individual output. The maximum value (peak) of each spectrum is determined. These maximum values are then summed mathematically in linear power units across the outputs.

Method (c): Measure and add 10 log(N_{ANT}) dB, where N_{ANT} is the number of outputs.

The measurement on each individual output were performed with the same span and number on each individual output. The quantity 10 log(N_{ANT}) dB is added to each spectrum value before comparing to the emission limit.

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

3.4 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.

3.4.1 Limit of Unwanted Emissions

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

(2) 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

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

3.4.2 Measuring Instruments

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

3.4.3 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 and is transmitting at its maximum power control level for the tested mode of operation.

   For average measurement (for TXBF):

   - RBW = 1 MHz
   - VBW = 3 MHz
   - The correction factor shall be offset is 10 log (1/x), where x is the duty cycle;
   - Correction factors are compensated in the data.

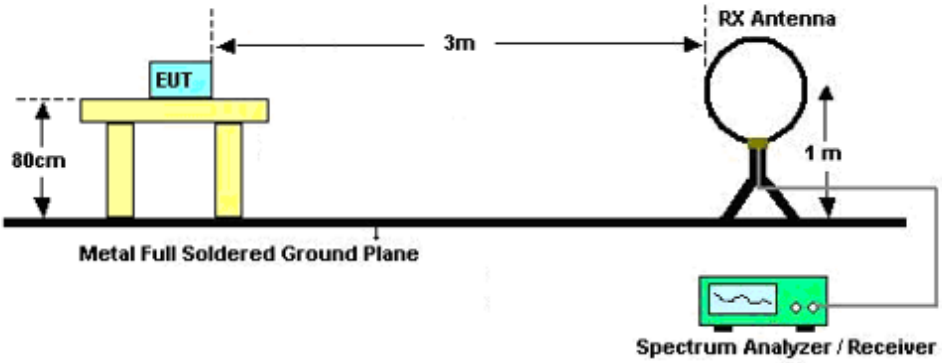
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband 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.

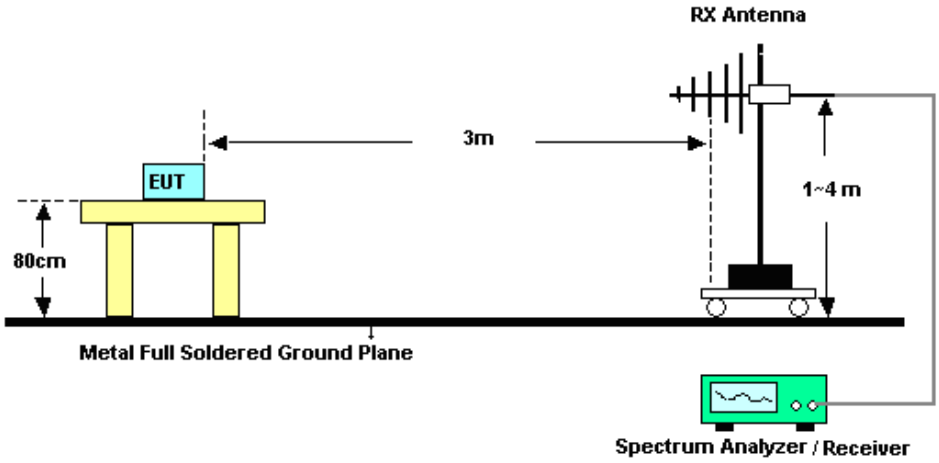
3.4.4 Test Setup

For radiated emissions below 30MHz

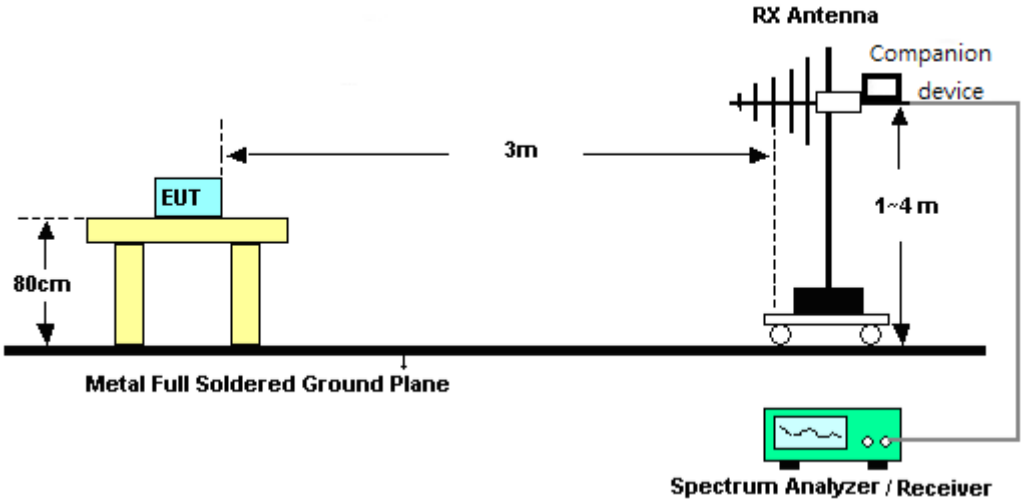


For radiated emissions from 30MHz to 1GHz

<CDD Mode>

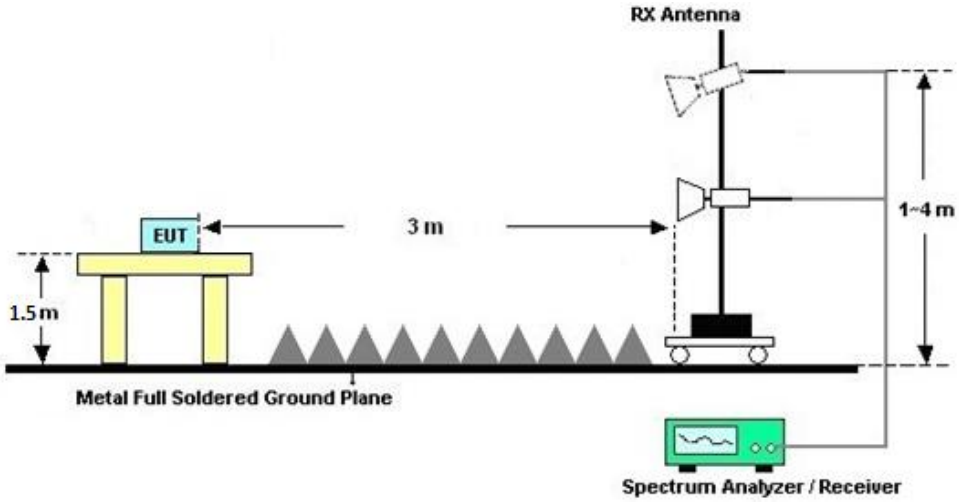


<TXBF Modes>

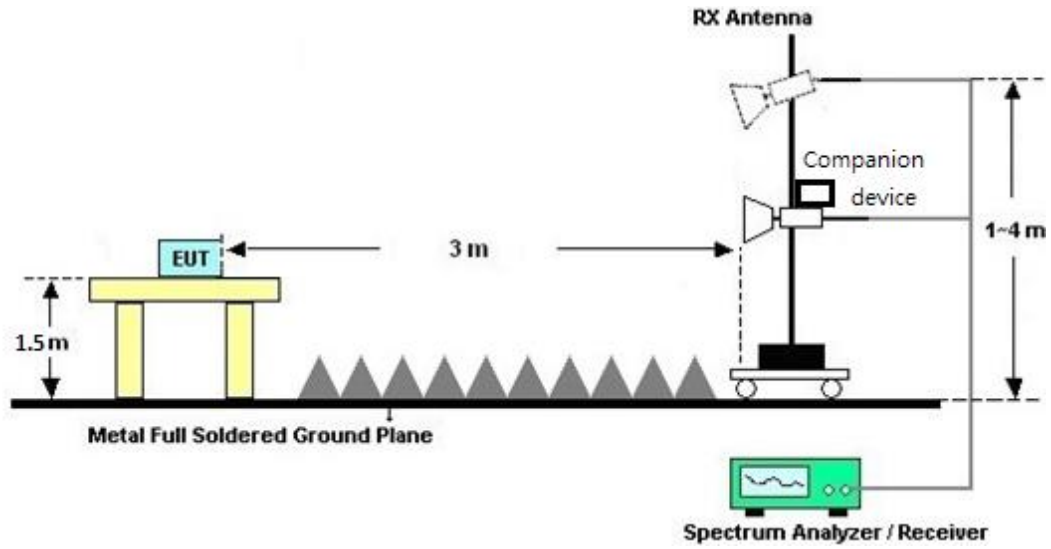


For radiated emissions above 1GHz

<CDD Mode>



<TXBF Modes>



3.4.5 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.

3.4.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B&C.

3.4.7 Duty Cycle

Please refer to Appendix D.

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

Please refer to Appendix B&C.

3.5 Antenna Requirements

3.5.1 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.

3.5.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.5.3 Antenna Gain

<CDD Modes >

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows.

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

Array Gain = 10 log(N_{ANT}/N_{SS}=1) dB.

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$.

The EUT supports CDD for 802.11b/g/n/ac/ax modes

For power, the directional gain G_{ANT} 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).

Directional gain = 10 log[($10^{G1/20}$ + $10^{G2/20}$ + … + $10^{GN/20}$)2 /N_{ANT}] dBi

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

TXBF modes

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For TXBF 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).

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

The directional gain “DG” is as following table.

Frequency Band	Max Single Antenna gain (dBi)		CDD DG (dBi)		TXBF DG (dBi)	
	ANT1	ANT2	For Power	For PSD	For Power	For PSD
5GHz UNII-1	5.25	3.85	5.25	6.39	6.39	6.39
5GHz UNII-2A	5.30	3.69	5.30	6.39	6.39	6.39
5GHz UNII-2C	5.79	4.21	5.79	6.41	6.41	6.41
5GHz UNII-3	5.81	4.21	5.81	6.47	6.47	6.47

Note:

1. Please refer to the antenna report for the maximum Single antenna gain and CDD (Cyclic Delay Diversity) directional gain and TXBF (Tx Beamforming) directional gain.
2. The device supports 1S2T(CDD&TXBF) mode;

   1S2T: NSS=1, MIMO 2Tx

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Oct. 12, 2022	Jul. 11, 2023	Oct. 11, 2023	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 05, 2023	Jul. 11, 2023	Jan. 04, 2024	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 05, 2023	Jul. 11, 2023	Jan. 04, 2024	Conducted (TH01-KS)
Temperature & humidity chamber	Hongzhan	LP-150U	H2014011440	-40~+150°C 20%~95%RH	Jul. 15, 2022	Jul. 11, 2023	Jul. 14, 2023	Conducted (TH01-KS)
EMI Test Receiver	Keysight	N9038A	MY56400004	3Hz~8.5GHz;Max 30dBm	Oct. 13, 2022	Jul. 10, 2023	Oct. 12, 2023	Radiation (03CH05-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150244	10Hz-44G,MAX 30dB	Mar. 24, 2023	Jul. 10, 2023	Mar. 23, 2024	Radiation (03CH05-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 16, 2022	Jul. 10, 2023	Oct. 15, 2023	Radiation (03CH05-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz-1GHz	Apr. 09, 2023	Jul. 10, 2023	Apr. 08, 2024	Radiation (03CH05-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00218642	1GHz~18GHz	Apr. 06, 2023	Jul. 10, 2023	Apr. 05, 2024	Radiation (03CH05-KS)
SHF-EHF Horn	Com-power	AH-840	101093	18GHz~40GHz	Jan. 08, 2023	Jul. 10, 2023	Jan. 07, 2024	Radiation (03CH05-KS)
Amplifier	SONOMA	310N	380826	9KHz-1GHz	Jul. 11, 2022	Jul. 10, 2023	Jul. 10, 2023	Radiation (03CH05-KS)
Amplifier	EM	EM18G40GA	060852	18~40GHz	Jan. 05, 2023	Jul. 10, 2023	Jan. 04, 2024	Radiation (03CH05-KS)
high gain Amplifier	EM	EM01G18GA	060839	1Ghz-18Ghz	Oct. 12, 2022	Jul. 10, 2023	Oct. 11, 2023	Radiation (03CH05-KS)
Amplifier	EM	EM01G18GA	060833	1Ghz-18Ghz	Jan. 05, 2023	Jul. 10, 2023	Jan. 04, 2024	Radiation (03CH05-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Jul. 10, 2023	NCR	Radiation (03CH05-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Jul. 10, 2023	NCR	Radiation (03CH05-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Jul. 10, 2023	NCR	Radiation (03CH05-KS)

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	±0.46 dB
Conducted Emissions	±2.26 dB
Occupied Channel Bandwidth	±0.1 %
Conducted Power Spectral Density	±0.88 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	6.28 dB

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.88 dB

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.26 dB

Appendix A. Conducted Test Results

Case No. : 2N0411-02
Ambient Condition: 25 ℃, 45 %RH
According Standard: ■Part15E
Test Engineer: Gene Wang

CDD 1S2T

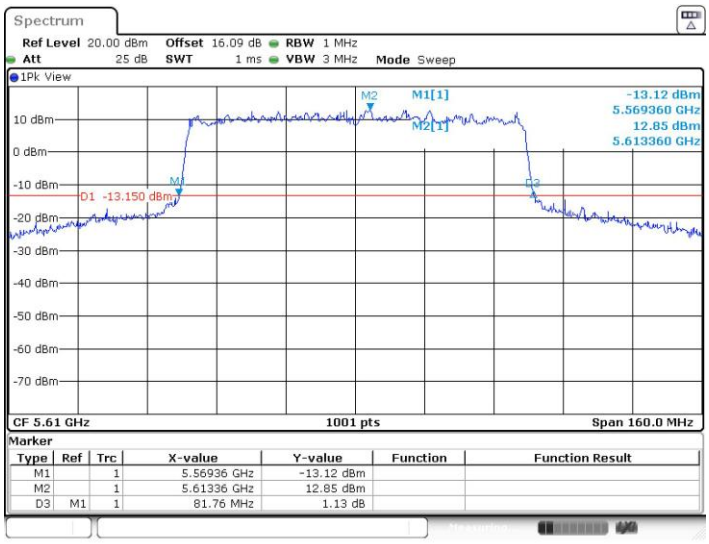
Emission Bandwidth

Test Result

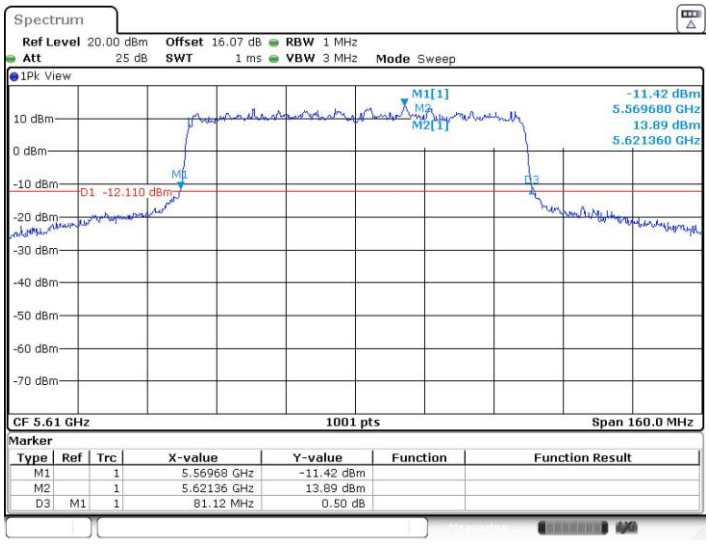
TestMode	Antenna	Freq(MHz)	26dB EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11AX80MIMO	Ant1	5610	81.76	5569.36	5651.12	---	---
	Ant2	5610	81.12	5569.68	5650.80	---	---
11AX160MIMO	Ant1	5570	163.52	5488.72	5652.24	---	---
	Ant2	5570	164.16	5488.72	5652.88	---	---

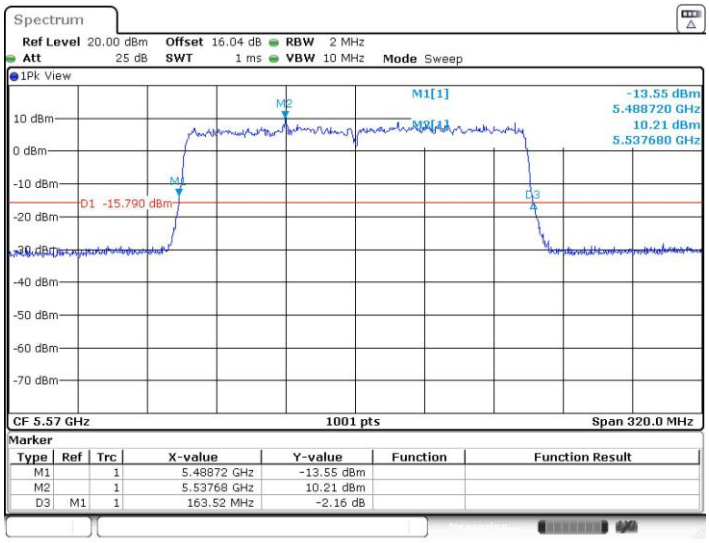
Test Graphs

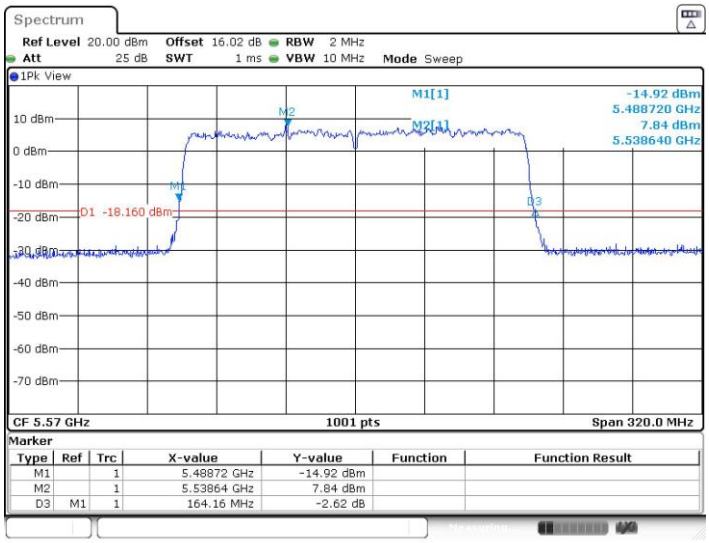
11AX80MIMO_Ant1_5610



11AX80MIMO_Ant2_5610



11AX160MIMO_Ant1_5570


11AX160MIMO_Ant2_5570


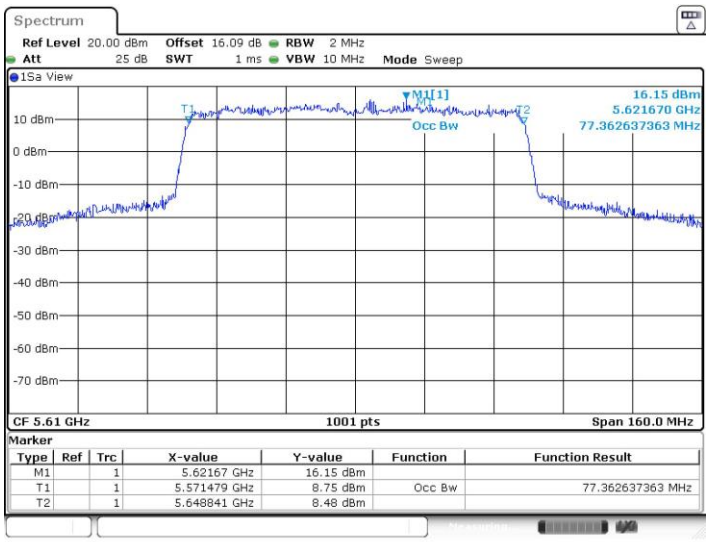
Occupied channel bandwidth

Test Result

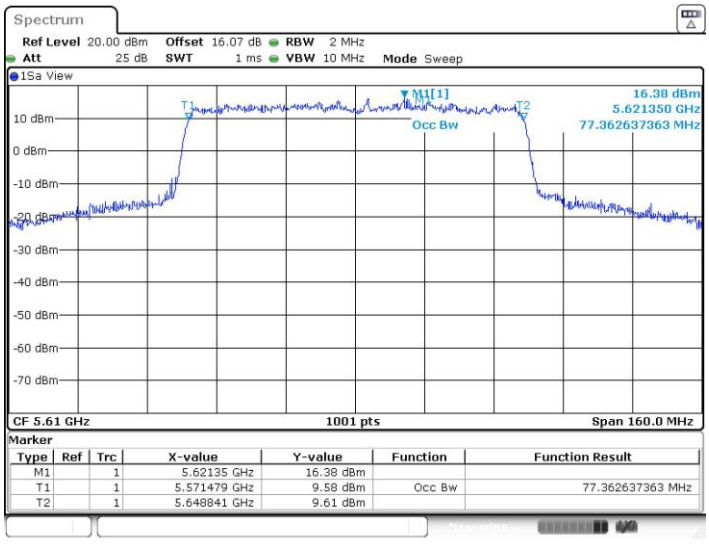
TestMode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11AX80MIMO	Ant1	5610	77.363	5571.4785	5648.8412	---	---
	Ant2	5610	77.363	5571.4785	5648.8412	---	---
11AX160MIMO	Ant1	5570	156.963	5491.6783	5648.6414	---	---
	Ant2	5570	156.963	5491.6783	5648.6414	---	---

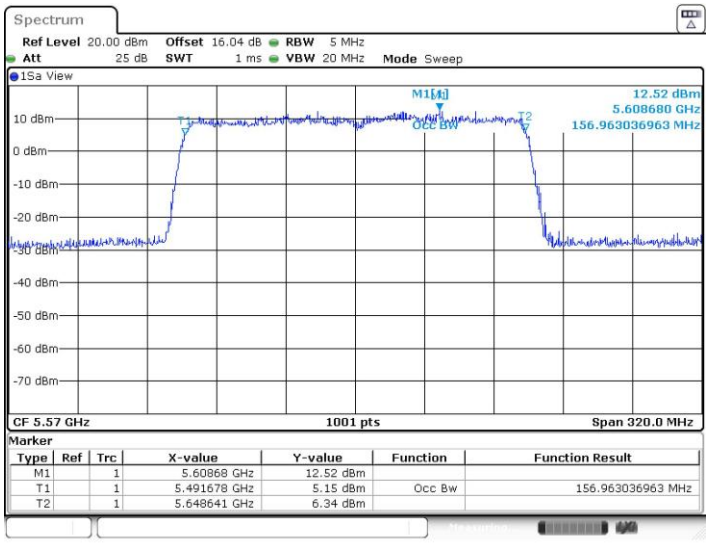
Test Graphs

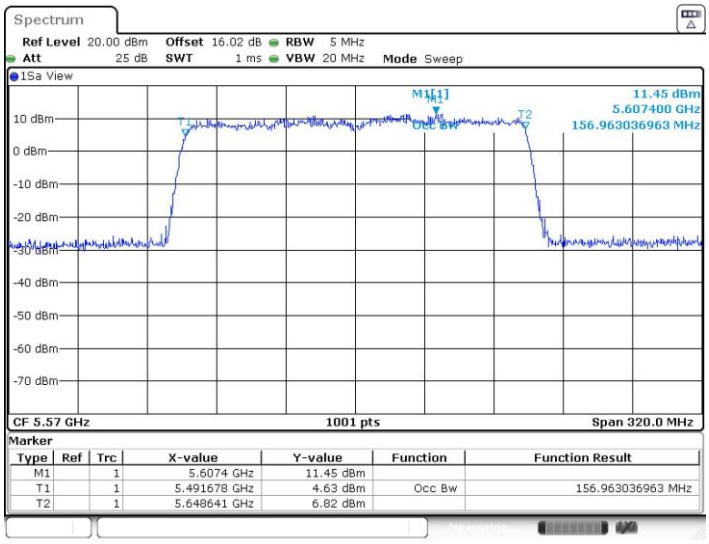
11AX80MIMO_Ant1_5610



11AX80MIMO_Ant2_5610



11AX160MIMO_Ant1_5570


11AX160MIMO_Ant2_5570


Maximum power spectral density

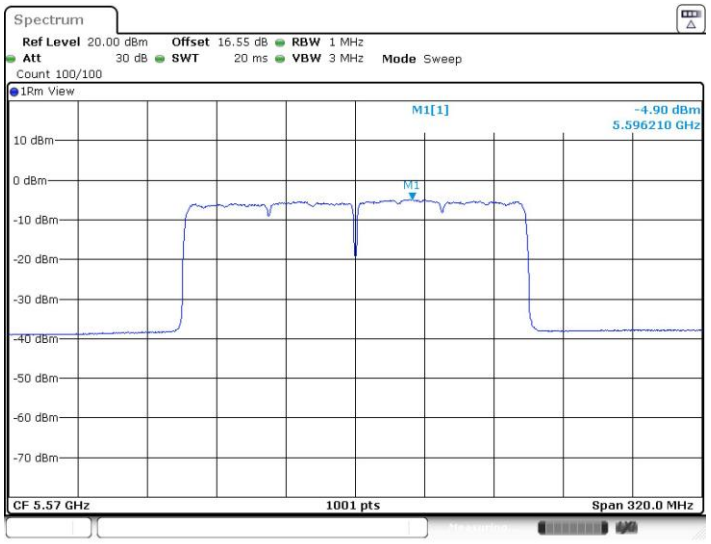
Test Result

TestMode	Antenna	Freq(MHz)	Result [dBm/MHz]	Limit[dBm/MHz]	Verdict
11AX80MIMO	Ant1	5610	2.1	≤10.59	PASS
	Ant2	5610	2.53	≤10.59	PASS
	total	5610	5.33	≤10.59	PASS
11AX160MIMO	Ant1	5570	-4.9	≤10.59	PASS
	Ant2	5570	-5.76	≤10.59	PASS
	total	5570	-2.30	≤10.59	PASS

Test Graphs

11AX80MIMO_Ant1_5610

11AX80MIMO_Ant2_5610

11AX160MIMO_Ant1_5570


11AX160MIMO_Ant2_5570


Case No. : 2N0411-02
Ambient Condition: 25 ℃, 45 %RH
According Standard: ■Part15E
Test Engineer: Gene Wang

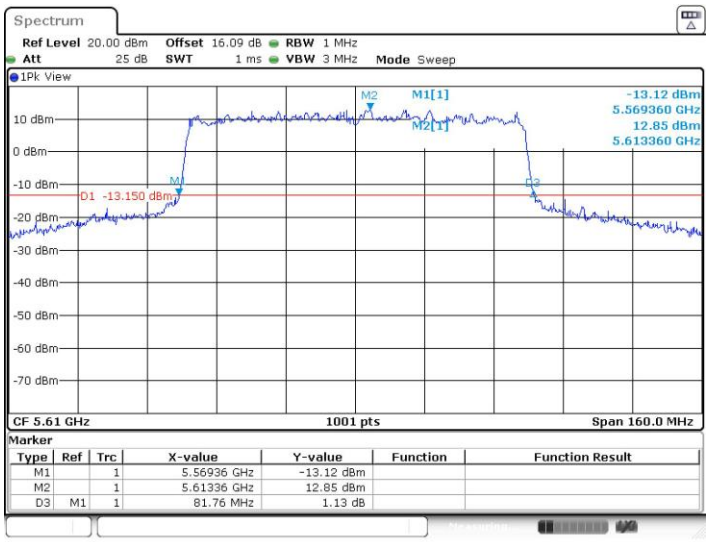
TX BF 1S2T

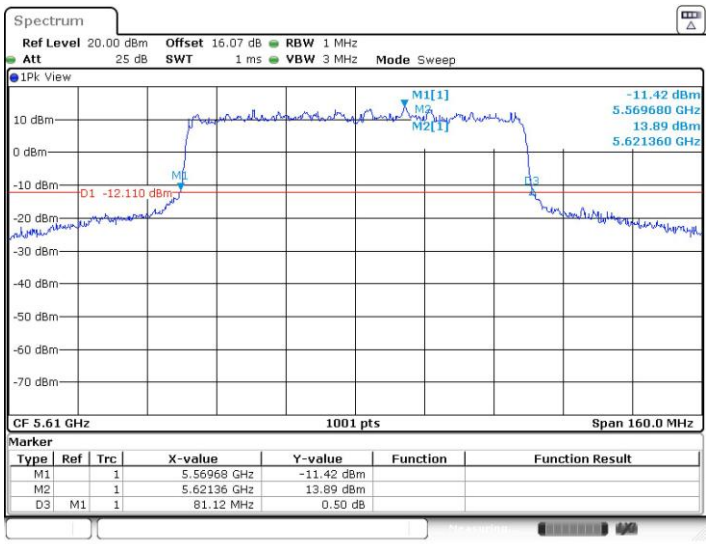
Emission Bandwidth

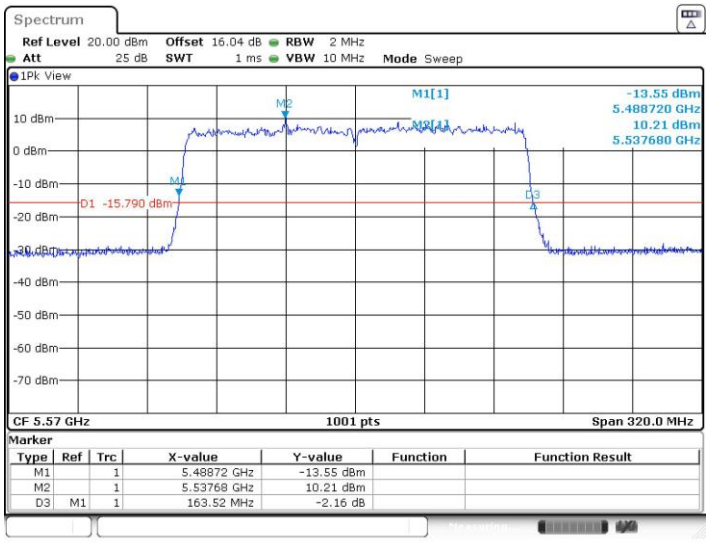
Test Result

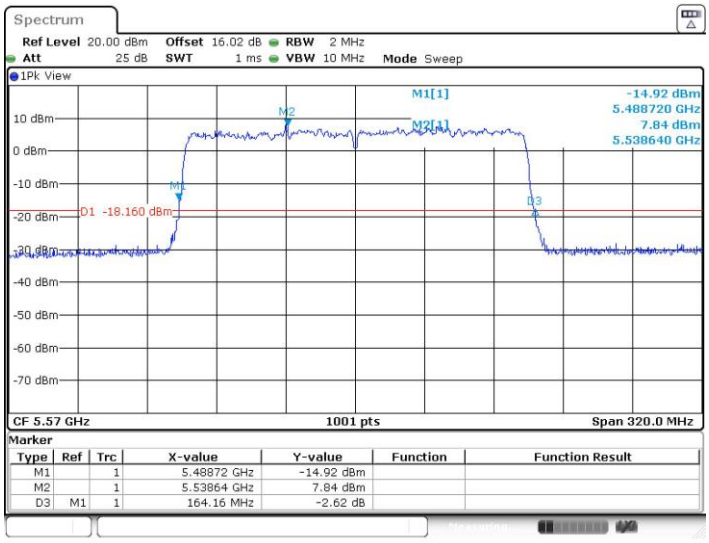
TestMode	Antenna	Freq(MHz)	26dB EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11AX80MIMO	Ant1	5610	81.76	5569.36	5651.12	---	---
	Ant2	5610	81.12	5569.68	5650.80	---	---
11AX160MIMO	Ant1	5570	163.52	5488.72	5652.24	---	---
	Ant2	5570	164.16	5488.72	5652.88	---	---

Test Graphs

11AX80MIMO_Ant1_5610


11AX80MIMO_Ant2_5610


11AX160MIMO_Ant1_5570


11AX160MIMO_Ant2_5570


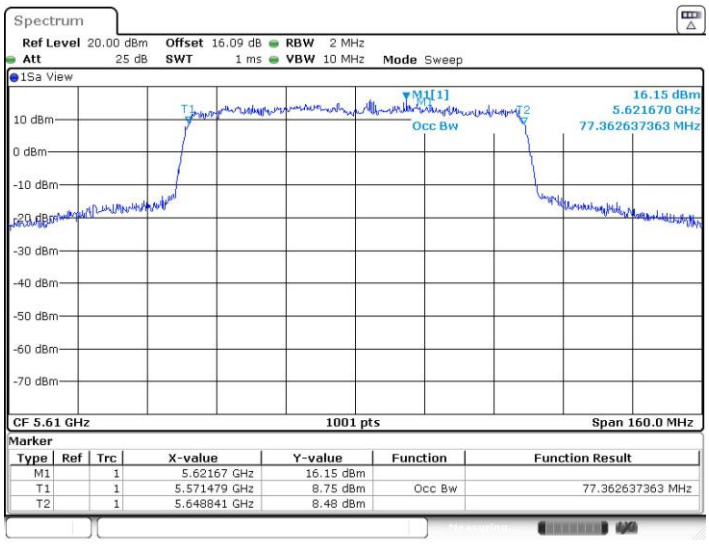
Occupied channel bandwidth

Test Result

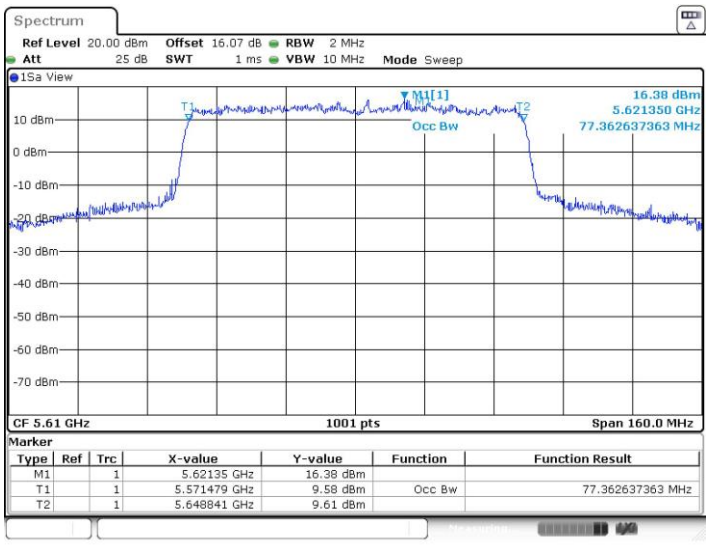
TestMode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11AX80MIMO	Ant1	5610	77.363	5571.4785	5648.8412	---	---
	Ant2	5610	77.363	5571.4785	5648.8412	---	---
11AX160MIMO	Ant1	5570	156.963	5491.6783	5648.6414	---	---
	Ant2	5570	156.963	5491.6783	5648.6414	---	---

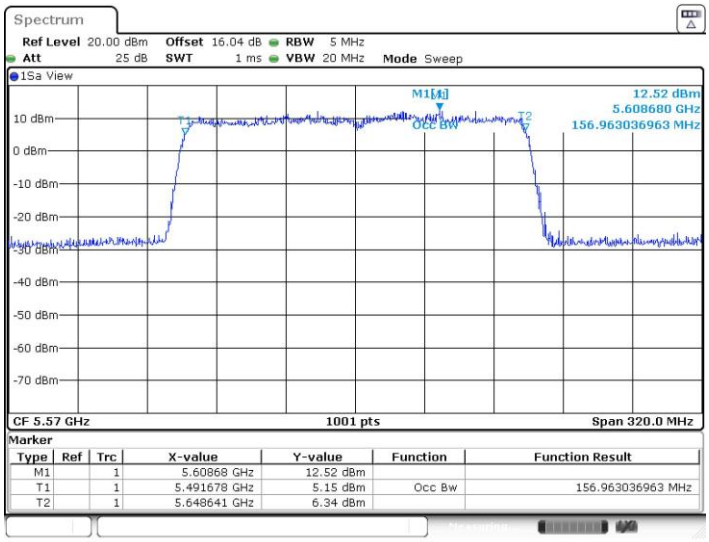
Test Graphs

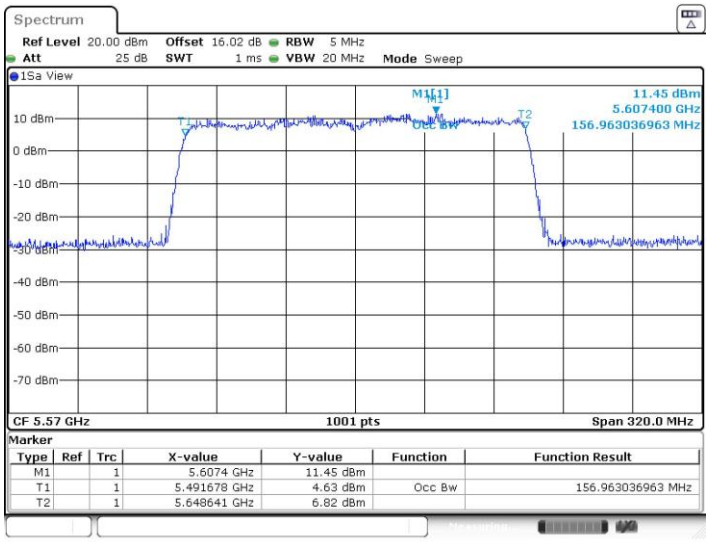
11AX80MIMO_Ant1_5610



11AX80MIMO_Ant2_5610



11AX160MIMO_Ant1_5570


11AX160MIMO_Ant2_5570


Maximum power spectral density

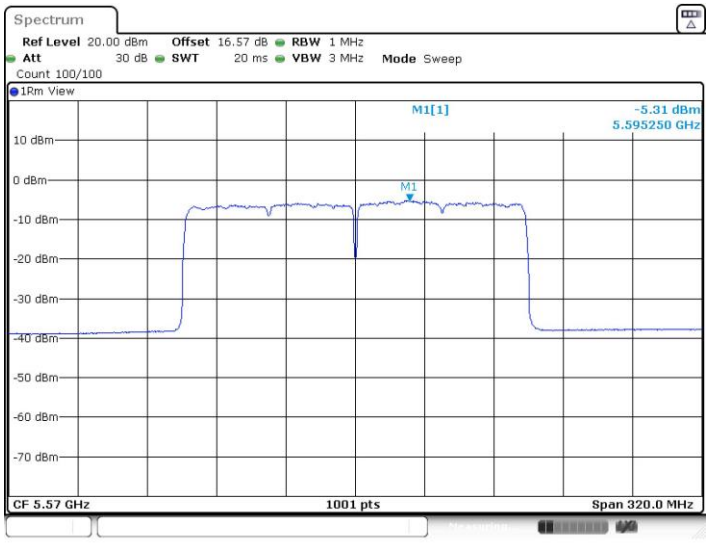
Test Result

TestMode	Antenna	Freq(MHz)	Result [dBm/MHz]	Limit[dBm/MHz]	Verdict
11AX80MIMO	Ant1	5610	1.72	≤10.59	PASS
	Ant2	5610	2.48	≤10.59	PASS
	total	5610	5.13	≤10.59	PASS
11AX160MIMO	Ant1	5570	-5.31	≤10.59	PASS
	Ant2	5570	-5.87	≤10.59	PASS
	total	5570	-2.57	≤10.59	PASS

Test Graphs

11AX80MIMO_Ant1_5610

11AX80MIMO_Ant2_5610

11AX160MIMO_Ant1_5570


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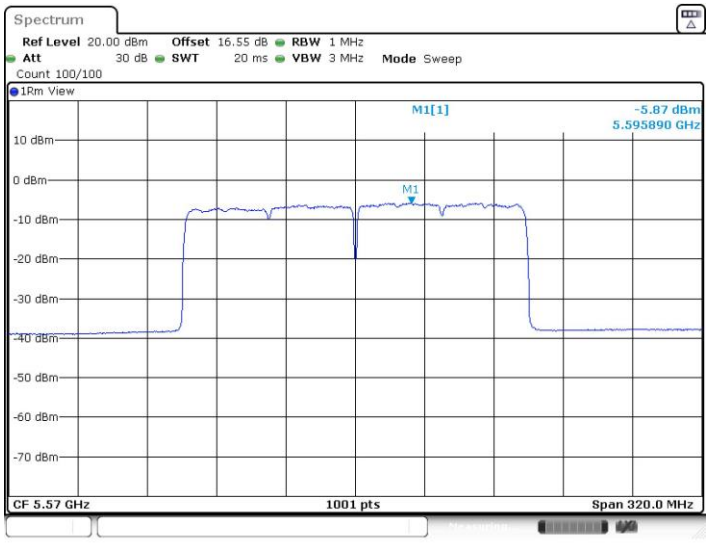


Appendix B. Radiated Spurious Emission

Radiated Spurious Emission Test Modes

Mode	Band	Band (GHz)	Antenna	Modulation	Channel	Frequency	Data Rate	RU	Remark
Mode 1	U-NII-2C	5.47-5.725	CDD 1S2T	802.11ax HE80	122	5610	MCS0	Full RU	-
Mode 2	U-NII-2C	5.47-5.725	CDD 1S2T	802.11ax HE160	114	5570	MCS0	Full RU	-
Mode 3	U-NII-2C	5.47-5.725	BF 1S2T	802.11ax HE80	122	5610	MCS0	Full RU	-
Mode 4	U-NII-2C	5.47-5.725	BF 1S2T	802.11ax HE160	114	5570	MCS0	Full RU	-

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 HE80	122	5458.80	52.04	54.00	-1.96	V	AVERAGE	Pass	Band Edge
	802.11ax HE80	122	11224.00	44.64	74.00	-29.36	V	PEAK	Pass	Harmonic
2	802.11ax HE160	114	5456.08	53.36	54.00	-0.64	V	AVERAGE	Pass	Band Edge
	802.11ax HE160	114	11136.00	44.48	74.00	-29.52	H	PEAK	Pass	Harmonic
3	802.11ax HE80	122	5726.04	66.68	68.20	-1.52	V	PEAK	Pass	Band Edge
	802.11ax HE80	122	11224.00	44.74	74.00	-29.26	V	PEAK	Pass	Harmonic
4	802.11ax HE160	114	5457.36	53.00	54.00	-1.00	V	AVERAGE	Pass	Band Edge
	802.11ax HE160	114	11136.00	44.78	74.00	-29.22	H	PEAK	Pass	Harmonic

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is **over limit** line.
P/A	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
CDD 1S2T		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) = Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

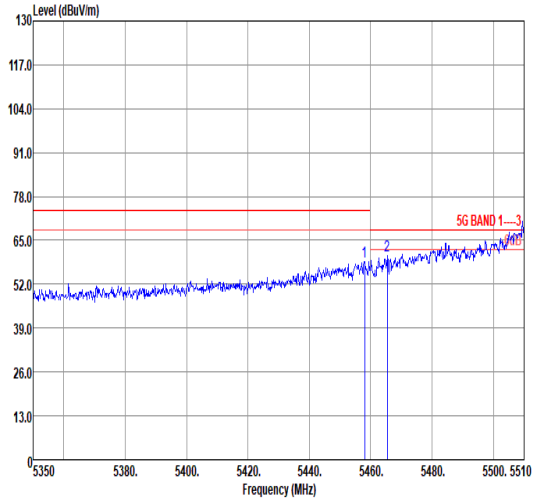
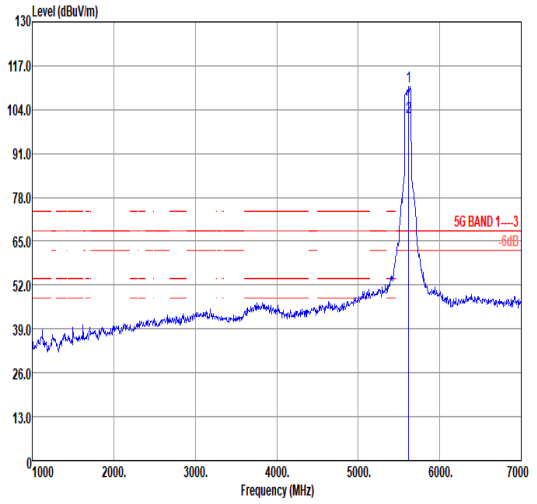
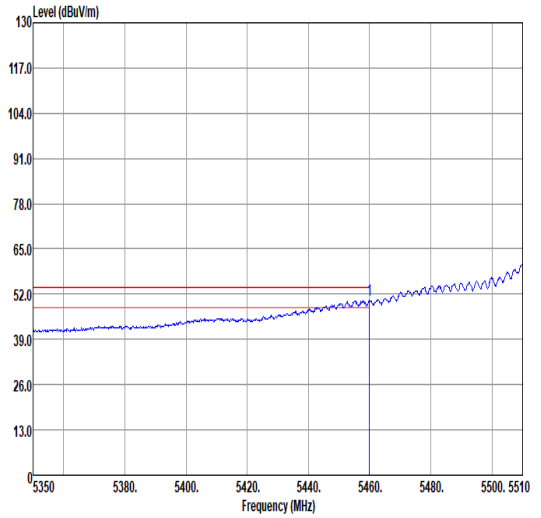
= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.

Appendix C. Radiated Spurious Emission Test Plots

Note symbol

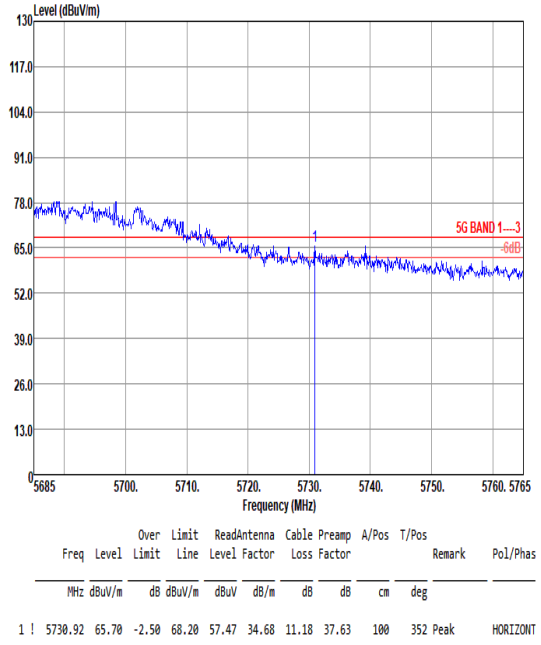
-L	**Low channel location**
-R	**High channel location**

Mode	1	
	Band Edge - L	
	U-NII-2C_5.47-5.725_802.11ax HE80_CH122_Full RU_5610MHz	
ANT	CDD 1S2T	
Pol.	Horizontal	Fundamental
Peak		
Avg		Blank

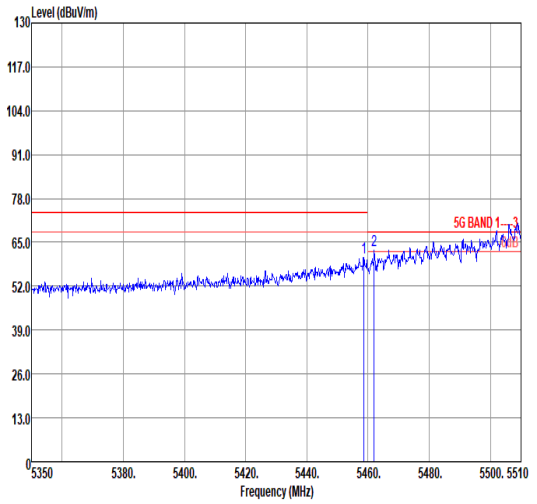
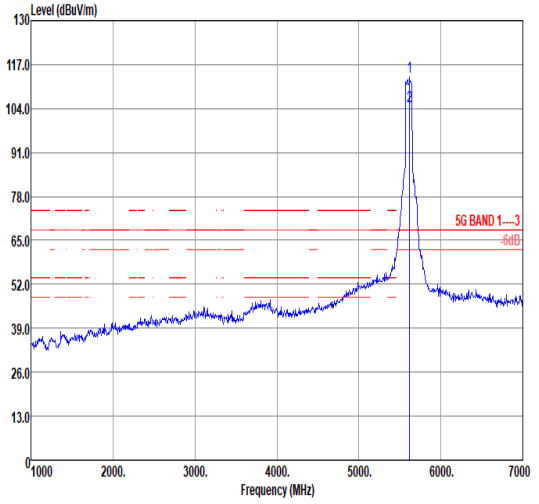
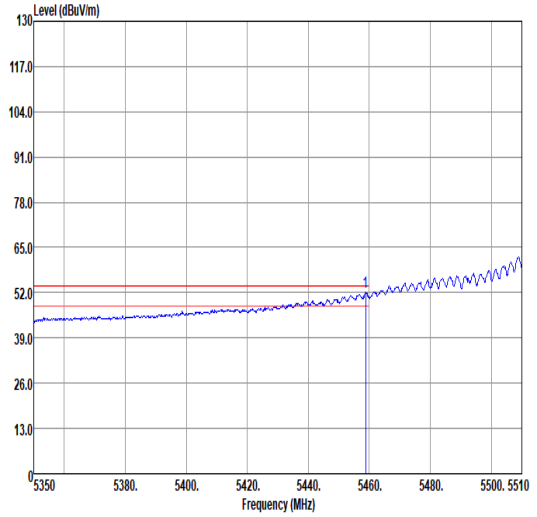
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamp Loss	A/Pos Factor	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5458.00	58.53	-15.47	74.00	49.57	34.58	10.85	36.47	100	352	Peak HORIZONT
2	5465.36	60.62	-7.58	68.20	51.64	34.57	10.85	36.44	100	352	Peak HORIZONT

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamp Loss	A/Pos Factor	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 *	5620.00	110.96	42.76	68.20	101.57	34.51	11.03	36.15	100	352	Peak HORIZONT
2	5620.00	101.64	------	------	92.25	34.51	11.03	36.15	100	352	Average HORIZONT

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamp Loss	A/Pos Factor	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 !	5459.92	50.19	-3.81	54.00	41.23	34.58	10.85	36.47	100	352	Average HORIZONT

Mode	1	
	Band Edge - R	
	U-NII-2C_5.47-5.725_802.11ax HE80_CH122_Full RU_5610MHz	
ANT	CDD 1S2T	
Pol.	Horizontal	Fundamental
Peak		Blank

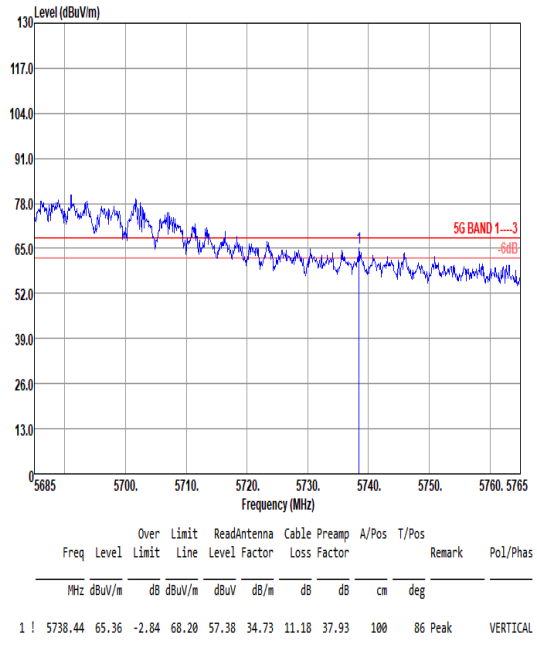
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1 !	5730.92	65.70	-2.50	68.20	57.47	34.68	11.18	37.63	100	352	Peak	HORIZONT

Mode	1	
	Band Edge - L	
	U-NII-2C_5.47-5.725_802.11ax HE80_CH122_Full RU_5610MHz	
ANT	CDD 1S2T	
Pol.	Vertical	Fundamental
Peak		
Avg		Blank

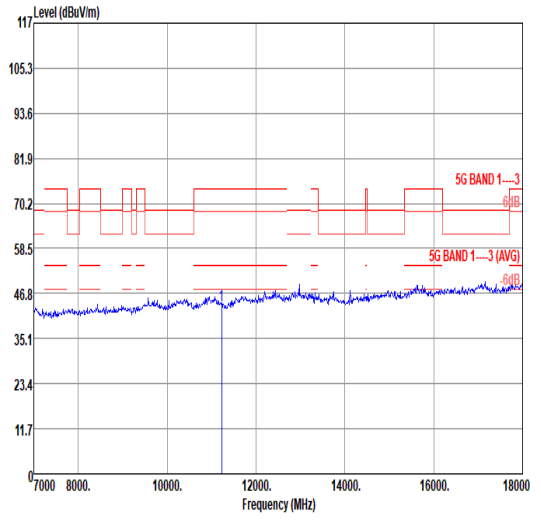
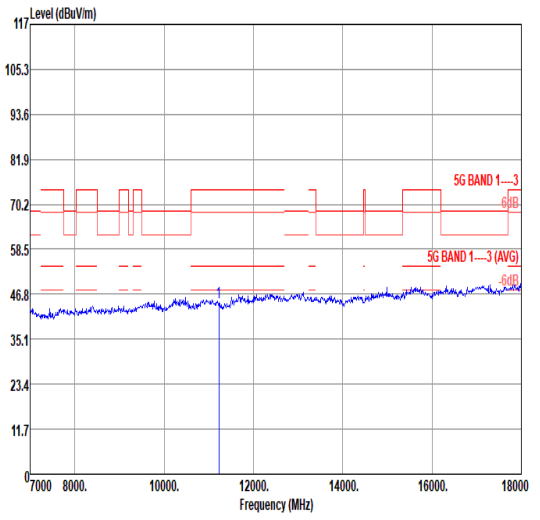
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamp Loss	A/Pos Factor	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5458.64	60.58	-13.42	74.00	51.62	34.58	10.85	36.47	100	86	Peak VERTICAL
2 !	5462.00	62.80	-5.40	68.20	53.84	34.58	10.85	36.47	100	86	Peak VERTICAL

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamp Loss	A/Pos Factor	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 *	5620.00	113.26	45.06	68.20	103.87	34.51	11.03	36.15	100	86	Peak VERTICAL
2	5620.00	104.55	------	------	95.16	34.51	11.03	36.15	100	86	Average VERTICAL

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamp Loss	A/Pos Factor	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 !	5458.80	52.04	-1.96	54.00	43.08	34.58	10.85	36.47	100	86	Average VERTICAL

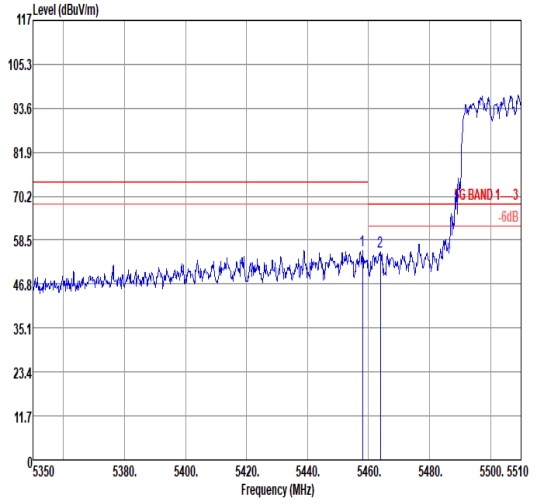
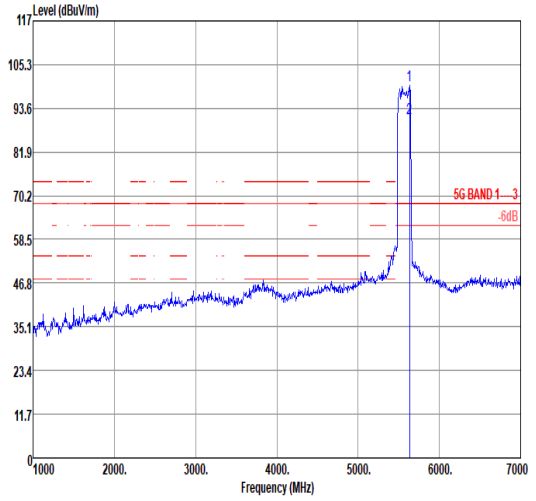
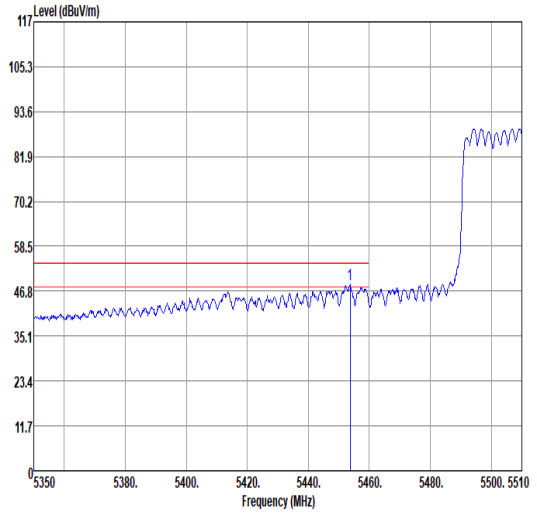
Mode	1	
	Band Edge - R	
	U-NII-2C_5.47-5.725_802.11ax HE80_CH122_Full RU_5610MHz	
ANT	CDD 1S2T	
Pol.	Vertical	Fundamental
Peak		Blank

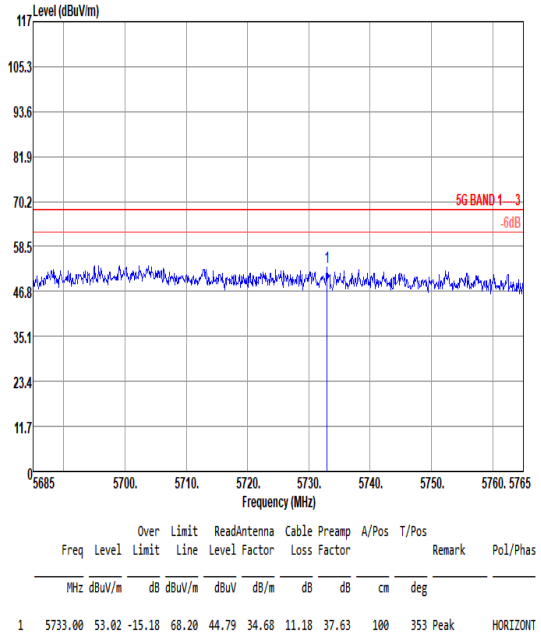
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1 !	5738.44	65.36	-2.84	68.20	57.38	34.73	11.18	37.93	100	86	Peak	VERTICAL

Mode	1	
	Harmonic	
	U-NII-2C_5.47-5.725_802.11ax HE80_CH122_Full RU_5610MHz	
ANT	CDD 1S2T	
Pol.	Horizontal	Vertical
Peak Avg		

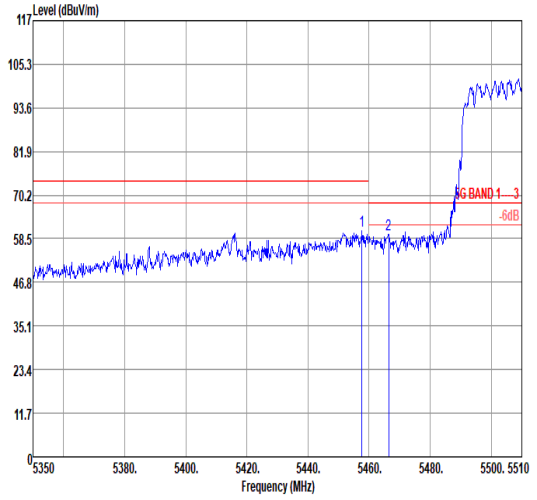
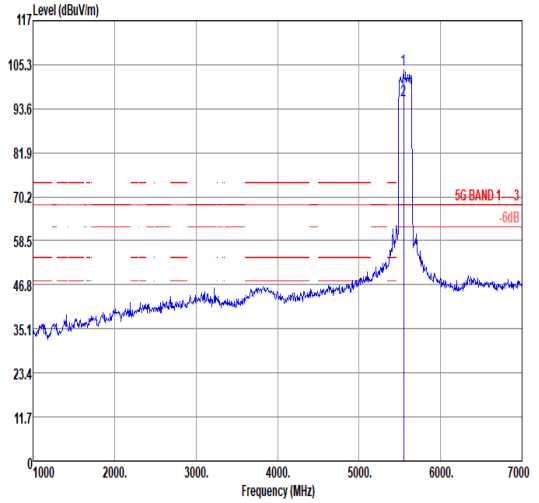
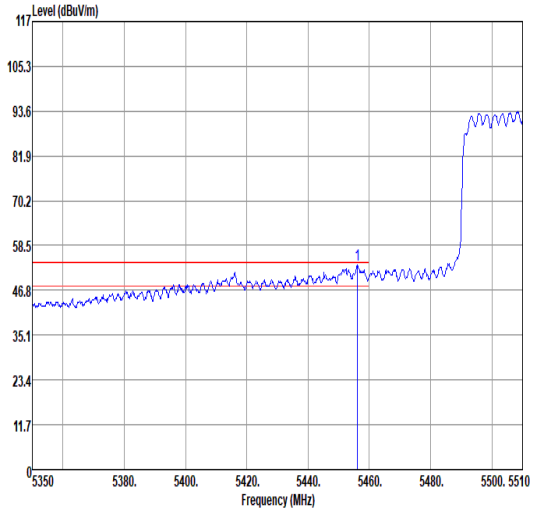
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1	11224.00	43.80	-30.20	74.00	56.37	38.08	16.18	66.83	300	0	Peak	HORIZONT

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1	11224.00	44.64	-29.36	74.00	57.21	38.08	16.18	66.83	100	0	Peak	VERTICAL

Mode	2	
	Band Edge - L	
	U-NII-2C_5.47-5.725_802.11ax HE160_CH114_Full RU_5570MHz	
ANT	CDD 1S2T	
Pol.	Horizontal	Fundamental
Peak	 Freq Level Over Limit Limit ReadAntenna Level Cable Loss Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 5458.00 55.72 -18.28 74.00 46.76 34.58 10.85 36.47 100 353 Peak HORIZONT 2 5463.92 55.55 -12.65 68.20 46.57 34.57 10.85 36.44 100 353 Peak HORIZONT	 Freq Level Over Limit Limit ReadAntenna Level Cable Loss Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 * 5632.00 99.58 31.38 68.20 90.17 34.51 11.05 36.15 100 353 Peak HORIZONT 2 5632.00 91.07 ------ ------ 81.66 34.51 11.05 36.15 100 353 Average HORIZONT
Avg	 Freq Level Over Limit Limit ReadAntenna Level Cable Loss Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 ! 5453.68 48.41 -5.59 54.00 39.48 34.58 10.82 36.47 100 353 Average HORIZONT	Blank

Mode	2	
	Band Edge - R	
	U-NII-2C_5.47-5.725_802.11ax HE160_CH114_Full RU_5570MHz	
ANT	CDD 1S2T	
Pol.	Horizontal	Fundamental
Peak		Blank

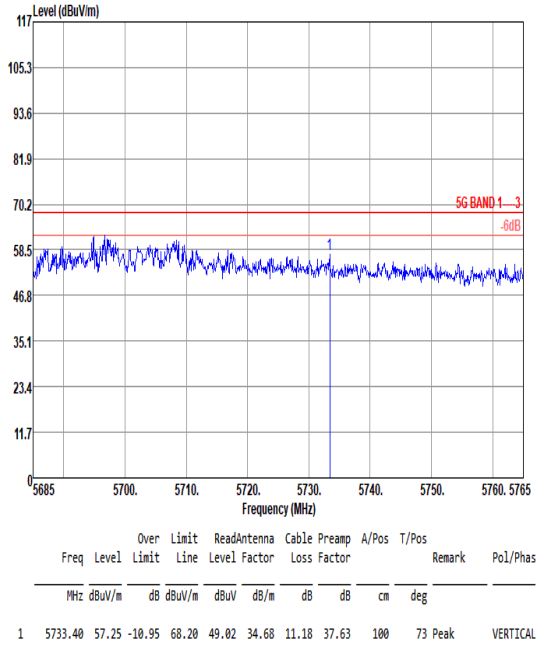
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1	5733.00	53.02	-15.18	68.20	44.79	34.68	11.18	37.63	100	353	Peak	HORIZONT

Mode	2	
	Band Edge - L	
	U-NII-2C_5.47-5.725_802.11ax HE160_CH114_Full RU_5570MHz	
ANT	CDD 1S2T	
Pol.	Vertical	Fundamental
Peak		
Avg		Blank

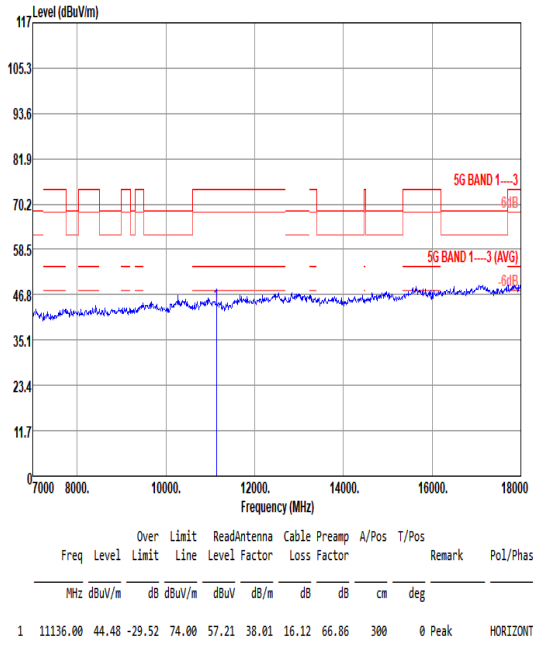
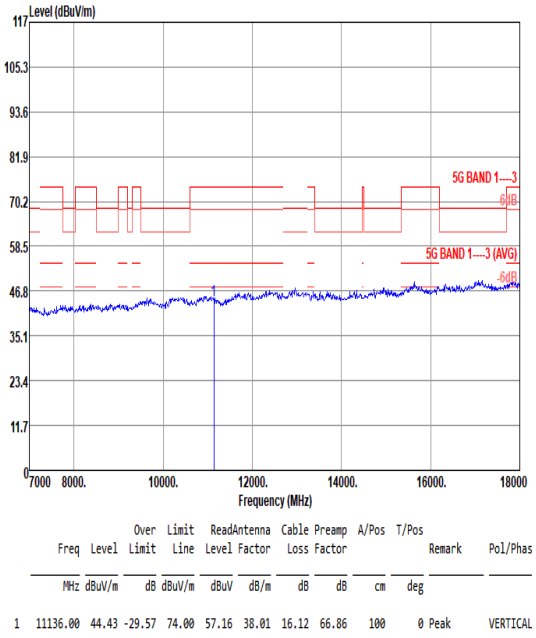
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1	5457.68	60.46	-13.54	74.00	51.50	34.58	10.85	36.47	100	73	Peak	VERTICAL
2	5466.48	59.62	-8.58	68.20	50.64	34.57	10.85	36.44	100	73	Peak	VERTICAL

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1 *	5548.00	103.93	35.73	68.20	94.74	34.54	10.93	36.28	100	73	Peak	VERTICAL
2	5548.00	95.74	------	------	86.55	34.54	10.93	36.28	100	73	Average	VERTICAL

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1 !	5456.08	53.36	-0.64	54.00	44.40	34.58	10.85	36.47	100	73	Average	VERTICAL

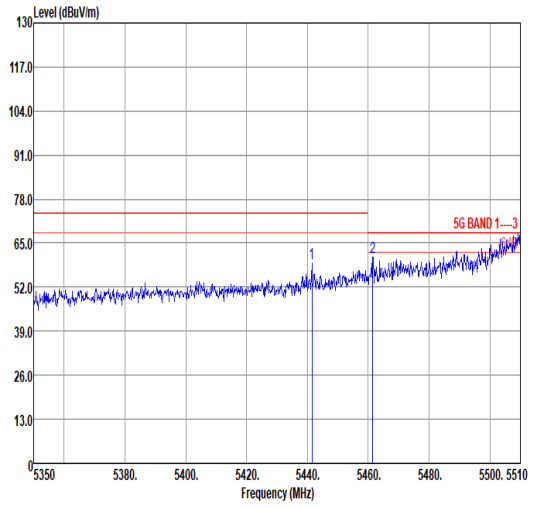
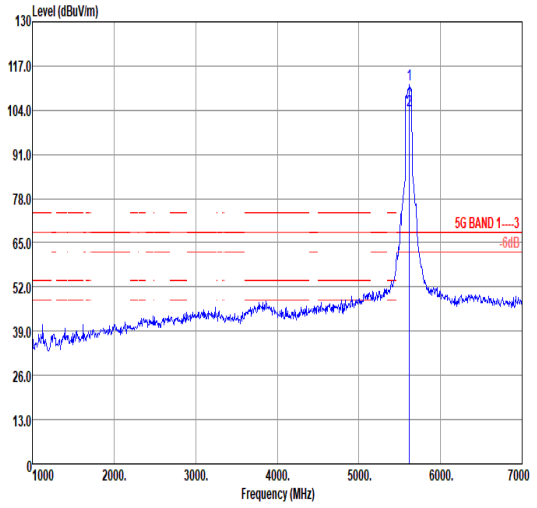
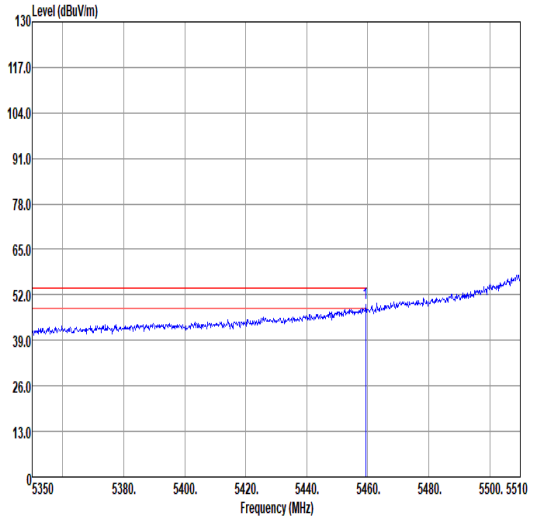
Mode	2	
	Band Edge - R	
	U-NII-2C_5.47-5.725_802.11ax HE160_CH114_Full RU_5570MHz	
ANT	CDD 1S2T	
Pol.	Vertical	Fundamental
Peak		Blank

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1	5733.40	57.25	-10.95	68.20	49.02	34.68	11.18	37.63	100	73	Peak	VERTICAL

Mode	2	
	Harmonic	
	U-NII-2C_5.47-5.725_802.11ax HE160_CH114_Full RU_5570MHz	
ANT	CDD 1S2T	
Pol.	Horizontal	Vertical
Peak Avg		

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1	11136.00	44.48	-29.52	74.00	57.21	38.01	16.12	66.86	300	0	Peak	HORIZONT

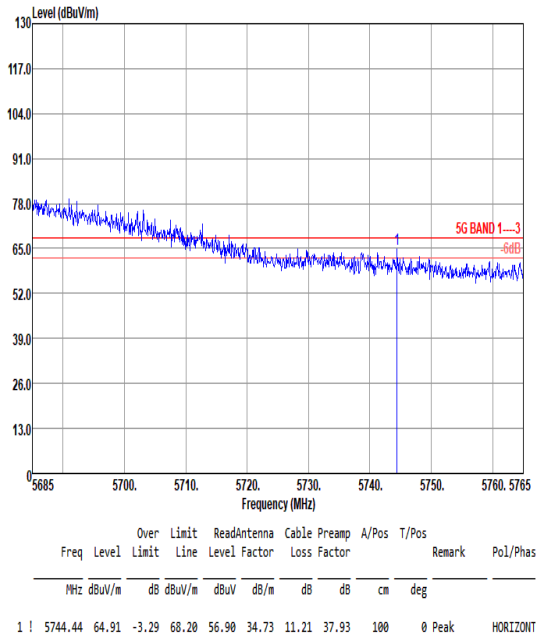
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1	11136.00	44.43	-29.57	74.00	57.16	38.01	16.12	66.86	100	0	Peak	VERTICAL

Mode	3	
	Band Edge - L	
	U-NII-2C_5.47-5.725_802.11ax HE80_CH122_Full RU_5610MHz	
ANT	BF 1S2T	
Pol.	Horizontal	Fundamental
Peak		
Avg		Blank

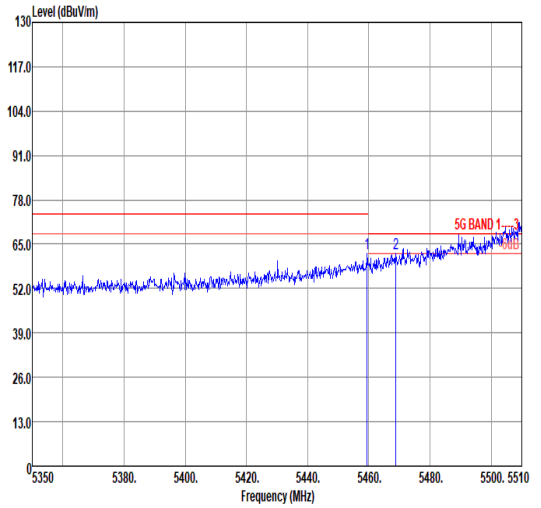
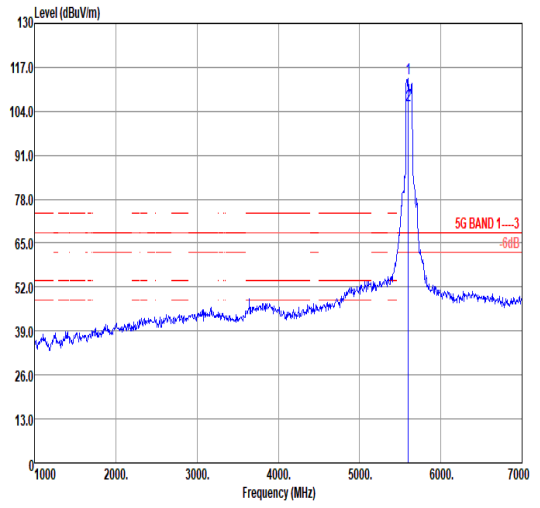
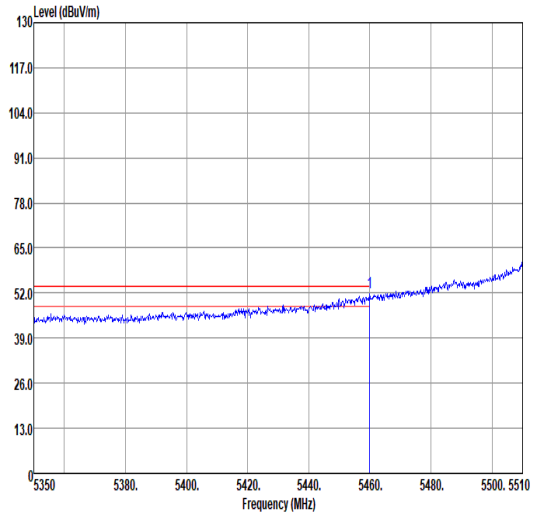
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1	5441.52	58.88	-15.12	74.00	49.98	34.59	10.82	36.51	100	0	Peak	HORIZONT
2	5461.52	60.81	-7.39	68.20	51.85	34.58	10.85	36.47	100	0	Peak	HORIZONT

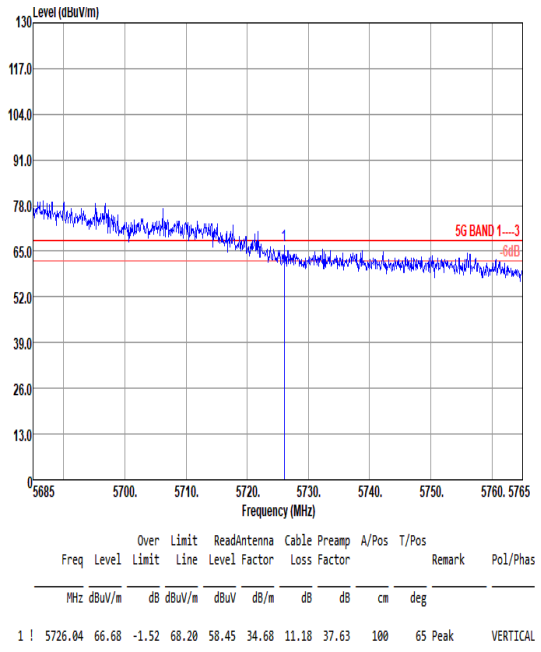
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1 *	5620.00	111.67	43.47	68.20	102.28	34.51	11.03	36.15	100	0	Peak	HORIZONT
2	5620.00	103.95	------	------	94.56	34.51	11.03	36.15	100	0	Average	HORIZONT

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1 !	5459.28	49.65	-4.35	54.00	40.69	34.58	10.85	36.47	100	0	Average	HORIZONT

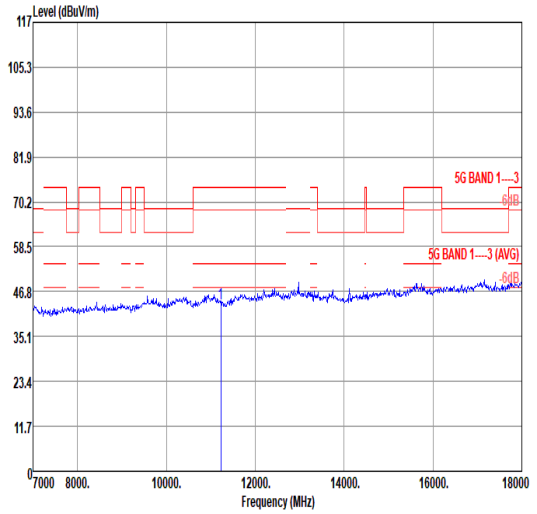
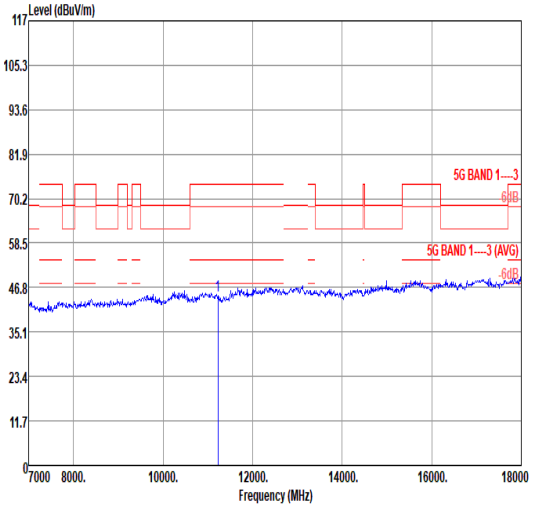
Mode	3	
	Band Edge - R	
	U-NII-2C_5.47-5.725_802.11ax HE80_CH122_Full RU_5610MHz	
ANT	BF 1S2T	
Pol.	Horizontal	Fundamental
Peak		Blank

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1 !	5744.44	64.91	-3.29	68.20	56.90	34.73	11.21	37.93	100	0	Peak	HORIZONT

Mode	3	
	Band Edge - R	
	U-NII-2C_5.47-5.725_802.11ax HE80_CH122_Full RU_5610MHz	
ANT	BF 1S2T	
Pol.	Vertical	Fundamental
Peak	 Freq Level Over Limit Limit Read Level Antenna Factor Cable Loss Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 5459.44 62.21 -11.79 74.00 53.25 34.58 10.85 36.47 100 65 Peak VERTICAL 2 5468.88 62.13 -6.07 68.20 53.15 34.57 10.85 36.44 100 65 Peak VERTICAL	 Freq Level Over Limit Limit Read Level Antenna Factor Cable Loss Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 * 5602.00 113.75 45.55 68.20 104.41 34.52 11.00 36.18 100 65 Peak VERTICAL 2 5602.00 105.92 ------ ------ 96.58 34.52 11.00 36.18 100 65 Average VERTICAL
Avg	 Freq Level Over Limit Limit Read Level Antenna Factor Cable Loss Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 ! 5459.92 52.05 -1.95 54.00 43.09 34.58 10.85 36.47 100 65 Average VERTICAL	Blank

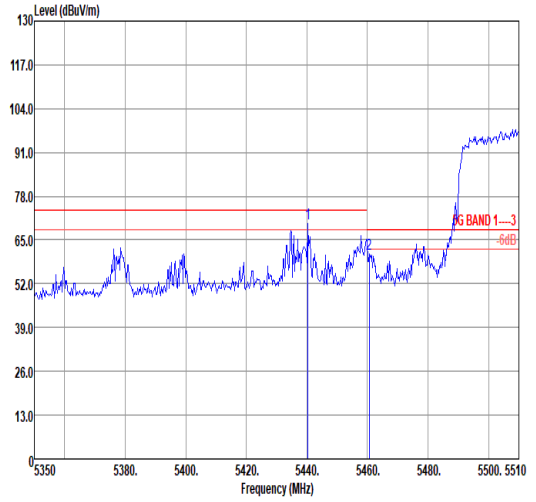
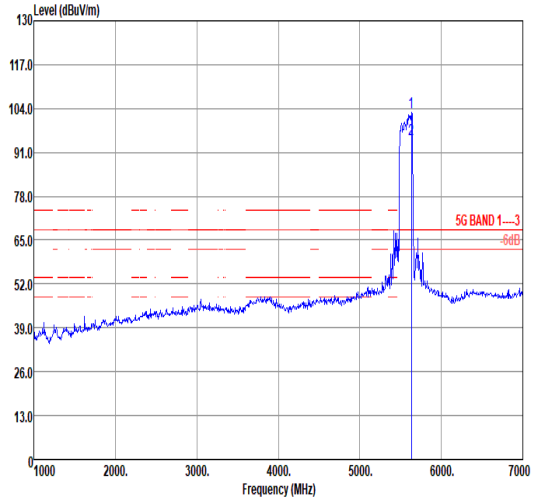
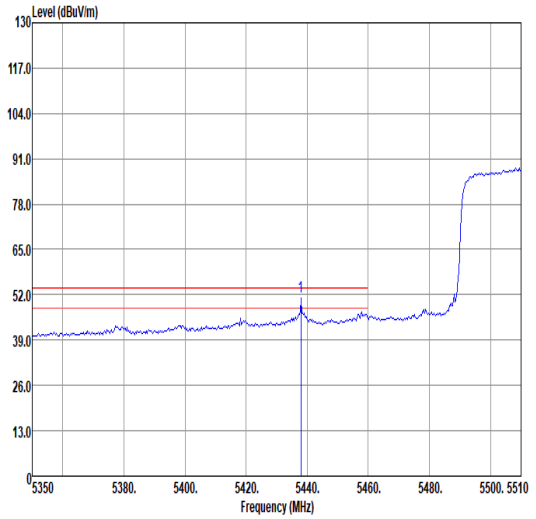
Mode	1	
	Band Edge - R	
	U-NII-2C_5.47-5.725_802.11ax HE80_CH122_Full RU_5610MHz	
ANT	BF 1S2T	
Pol.	Vertical	Fundamental
Peak		Blank

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1 !	5726.04	66.68	-1.52	68.20	58.45	34.68	11.18	37.63	100	65	Peak	VERTICAL

Mode	3	
	Harmonic	
	U-NII-2C_5.47-5.725_802.11ax HE80_CH122_Full RU_5610MHz	
ANT	BF 1S2T	
Pol.	Horizontal	Vertical
Peak Avg		

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1	11224.00	43.79	-30.21	74.00	56.36	38.08	16.18	66.83	300	0	Peak	HORIZONT

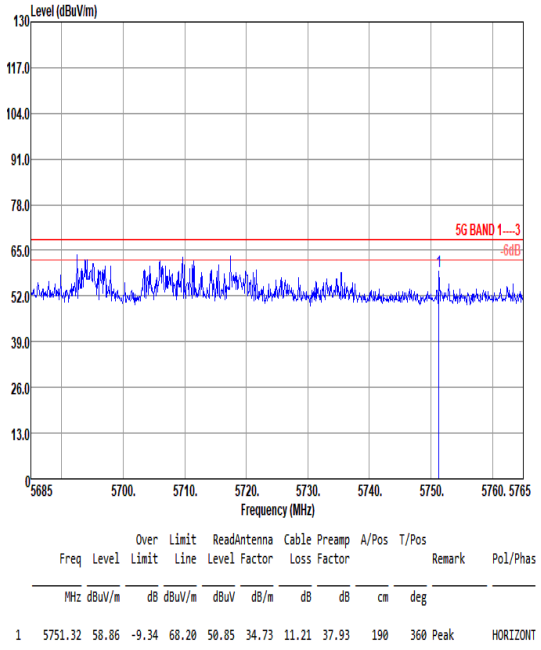
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1	11224.00	44.74	-29.26	74.00	57.31	38.08	16.18	66.83	100	0	Peak	VERTICAL

Mode	4	
	Band Edge - L	
	U-NII-2C_5.47-5.725_802.11ax HE160_CH114_Full RU_5570MHz	
ANT	BF 1S2T	
Pol.	Horizontal	Fundamental
Peak		
Avg		Blank

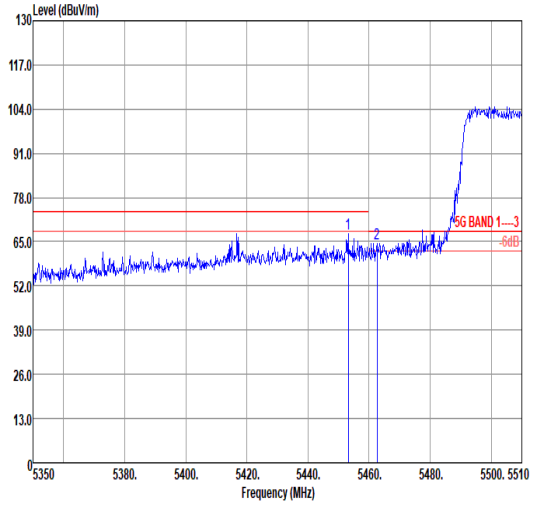
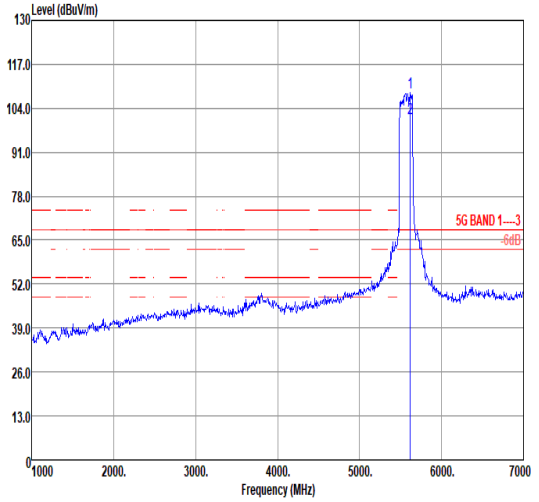
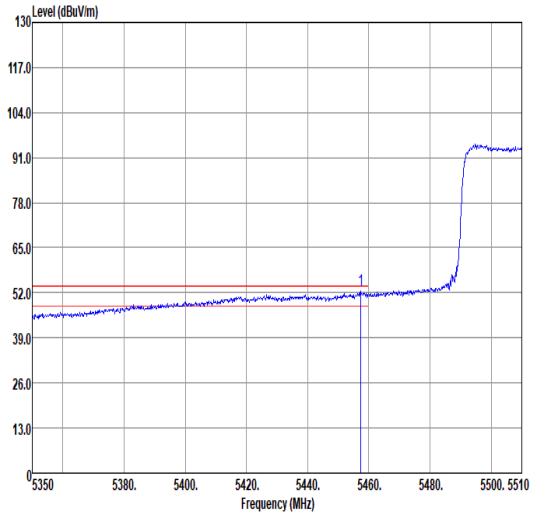
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1 !	5440.32	69.74	-4.26	74.00	60.84	34.59	10.82	36.51	190	360	Peak	HORIZONT
2	5460.60	60.94	-7.26	68.20	51.98	34.58	10.85	36.47	190	360	Peak	HORIZONT

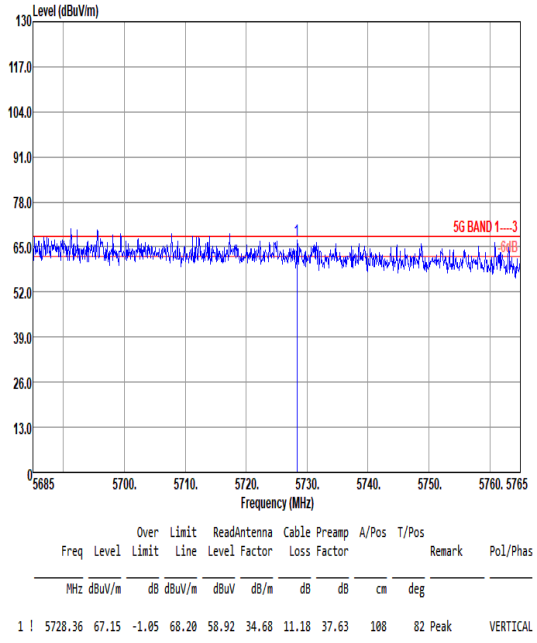
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1 *	5632.00	102.75	34.55	68.20	93.34	34.51	11.05	36.15	190	360	Peak	HORIZONT
2	5632.00	95.00	------	------	85.59	34.51	11.05	36.15	190	360	Average	HORIZONT

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1 !	5437.98	51.30	-2.70	54.00	42.40	34.59	10.82	36.51	190	360	Average	HORIZONT

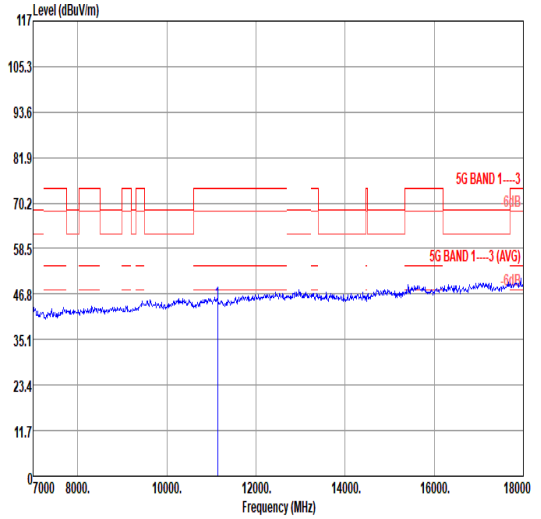
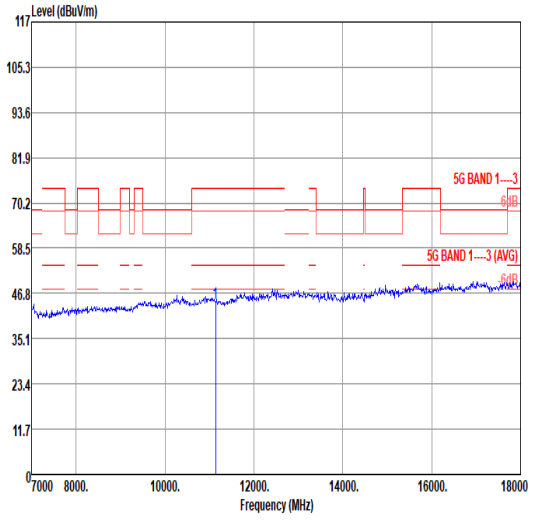
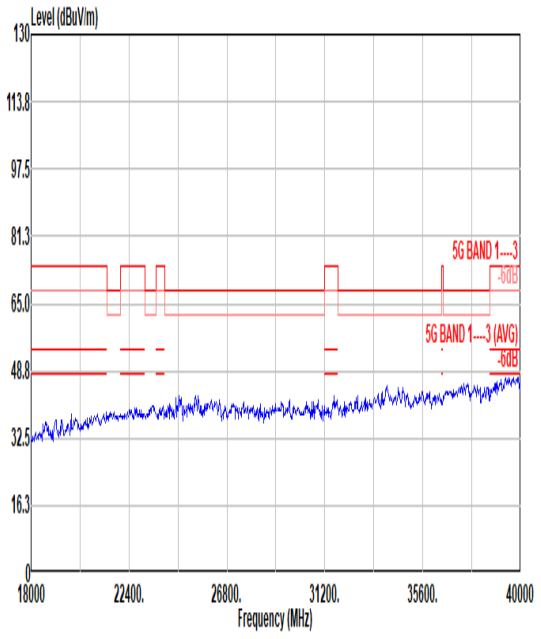
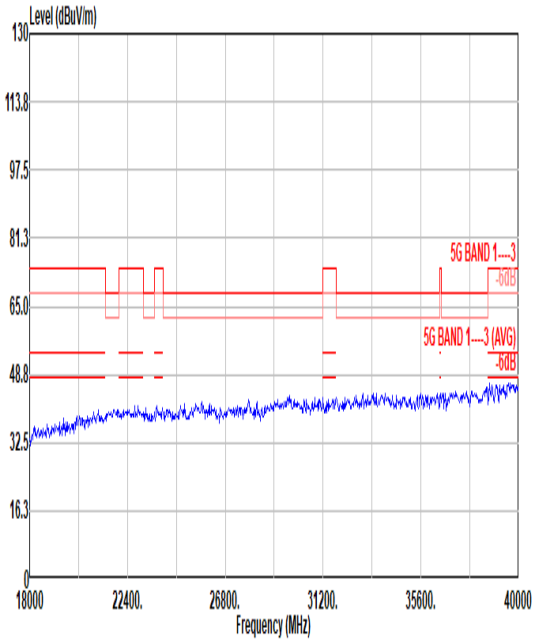
Mode	4	
	Band Edge -R	
	U-NII-2C_5.47-5.725_802.11ax HE160_CH114_Full RU_5570MHz	
ANT	BF 1S2T	
Pol.	Horizontal	Fundamental
Peak		Blank

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1	5751.32	58.86	-9.34	68.20	50.85	34.73	11.21	37.93	190	360	Peak	HORIZONT

Mode	4	
	Band Edge - L	
	U-NII-2C_5.47-5.725_802.11ax HE160_CH114_Full RU_5570MHz	
ANT	BF 1S2T	
Pol.	Vertical	Fundamental
Peak	 Freq Level Over Limit Limit Line ReadAntenna Level Factor Cable Loss Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 5453.20 67.45 -6.55 74.00 58.52 34.58 10.82 36.47 108 82 Peak VERTICAL 2 ! 5462.64 64.46 -3.74 68.20 55.48 34.57 10.85 36.44 108 82 Peak VERTICAL	 Freq Level Over Limit Limit Line ReadAntenna Level Factor Cable Loss Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 * 5620.00 108.75 40.55 68.20 99.36 34.51 11.03 36.15 108 82 Peak VERTICAL 2 5620.00 100.97 ------ ------ 91.58 34.51 11.03 36.15 108 82 Average VERTICAL
Avg	 Freq Level Over Limit Limit Line ReadAntenna Level Factor Cable Loss Preamp Factor A/Pos T/Pos Remark Pol/Phas MHz dBuV/m dB dBuV/m dBuV dB/m dB dB cm deg 1 ! 5457.36 53.00 -1.00 54.00 44.04 34.58 10.85 36.47 108 82 Average VERTICAL	Blank

Mode	4	
	Band Edge -R	
	U-NII-2C_5.47-5.725_802.11ax HE160_CH114_Full RU_5570MHz	
ANT	BF 1S2T	
Pol.	Vertical	Fundamental
Peak		Blank

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1 !	5728.36	67.15	-1.05	68.20	58.92	34.68	11.18	37.63	108	82	Peak	VERTICAL

Mode	4	
	Harmonic	
	U-NII-2C_5.47-5.725_802.11ax HE160_CH114_Full RU_5570MHz	
ANT	BF 1S2T	
Pol.	Horizontal	Vertical
Peak Avg		
Peak Avg		

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamp Loss	A/Pos Factor	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	11136.00	44.78	-29.22	74.00	57.51	38.01	16.12	66.86	300	0	Peak HORIZONT

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamp Loss	A/Pos Factor	T/Pos	Remark	Pol/Phas
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	11136.00	44.44	-29.56	74.00	57.17	38.01	16.12	66.86	100	0	Peak VERTICAL

Note: Only the worst case has assessed 18G ~40GHz to test.

Appendix D. Duty Cycle Plots

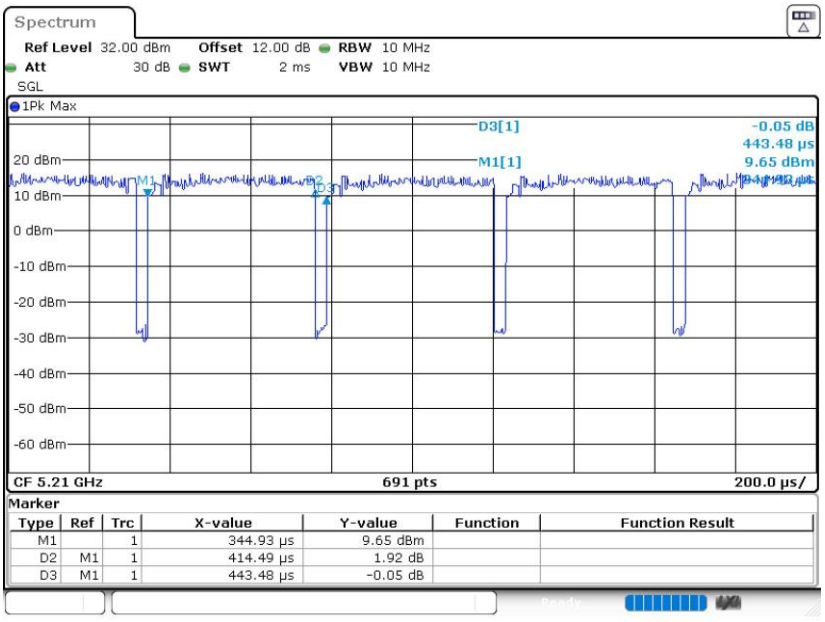
For CDD mode

Antenna	Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
1+2	802.11ax HE80	93.46	0.414	2.413	2.7kHz
1+2	802.11ax HE160	89.01	0.235	4.259	4.3kHz

For TXBF mode

Antenna	Band	Duty Cycle(%)	Duty Factor
1+2	802.11ax HE80	85.0	0.71
1+2	802.11ax HE160	84.6	0.73

802.11ax HE80



802.11ax HE160