FCC RF Test Report

APPLICANT	:	MTRLC LLC
EQUIPMENT	:	AX3000 Dual-band Mesh WiFi
BRAND NAME	:	Motorola
MODEL NAME	:	Q11
FCC ID	:	2AF5PQ11
STANDARD	:	FCC Part 15 Subpart E §15.407
CLASSIFICATION	:	(NII) Unlicensed National Information Infrastructure
TEST DATE(S)	:	Dec. 20, 2021 ~ Mar. 05, 2022

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

Reviewed by: Jason Jia / Supervisor

Alex Wang

Approved by: Alex Wang / Manager

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

TABLE OF CONTENTS

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR1D0112D	Rev. 01	Initial issue of report	Mar. 18, 2022

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Result	Remark
3.1	15.403(i)	6dB, 26dB and 99% Occupied Bandwidth	Pass	-
3.2	15.407(a)	Maximum Conducted Output Power	Pass	-
3.3	15.407(a)	Power Spectral Density	Pass	-
3.4	15.407(b)	Unwanted Emissions	Pass	Under limit 1.19 dB at 5630.800 MHz
3.5	15.207	AC Conducted Emission	Pass	Under limit 5.25 dB at 0.608 MHz
3.6	15.203 & 15.407(a)	Antenna Requirement	Pass	-

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1 General Description

1.1 Applicant

MTRLC LLC
275 Turnpike Street Suite 101 Canton, MA 02021

1.2 Manufacturer

MTRLC LLC
275 Turnpike Street Suite 101 Canton, MA 02021

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	AX3000 Dual-band Mesh WiFi
Brand Name	Motorola
Model Name	Q11
FCC ID	2AF5PQ11
HW Version	REV1.0
SW Version	REV1.0
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 Channel Frequency Range	5850 MHz ~ 5895 MHz
Maximum EIRP Output Power	**<CDD Mode>** 802.11a : 29.80 dBm / 0.9550 W 802.11n HT20 : 29.79 dBm / 0.9528 W 802.11n HT40 : 31.45 dBm / 1.3964 W 802.11ac VHT20: 29.81 dBm / 0.9572 W 802.11ac VHT40: 31.54 dBm / 1.4256 W 802.11ac VHT80: 29.05 dBm / 0.8035 W 802.11ax HE20: 30.17 dBm / 1.0399 W 802.11ax HE40: 31.71 dBm / 1.4825 W 802.11ax HE80: 29.17 dBm / 0.8260 W 802.11ax HE160: 24.66 dBm / 0.2924 W
99% Occupied Bandwidth	802.11a : 17.73 MHz 802.11ax HE20: 19.46 MHz 802.11ax HE40: 55.72 MHz 802.11ax HE80: 64.95 MHz 802.11ax HE160: 113.05 MHz
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)
Antenna Type / Gain	<Ant. 1> : Dipole Antenna with gain 3 dBi <Ant. 2> : Dipole Antenna with gain 3 dBi
Antenna Connector	I-PEX
Antenna Function Description	<table><tr><td></td><td>Ant. 1</td><td>Ant. 2</td></tr><tr><td>802.11 a/n/ac/ax SISO</td><td>V</td><td>V</td></tr><tr><td>802.11 a/n/ac/ax CDD/Beamforming</td><td colspan="2">V</td></tr></table>

Note:

1. For SISO&MIMO mode, the whole testing has assessed only MIMO mode by referring to their higher conducted power.
2. For 802.11n HT20 / ac VHT20 / ax HE20 and 802.11n HT40 / ac VHT40 / ax HE40 and 802.11ac VHT80 / ax HE80 mode, the whole testing have assessed only 802.11ax HE20 / ax HE40 / ax HE80 by referring to the higher output power.
3. The TxBF Power/EIRP of EUT will less than CDD mode power/EIRP when Beamforming mode is active. So we only evaluate CDD mode by referring to their maximum conducted power/EIRP.
4. The device does not support partial RU for 802.11ax mode

1.5 Modification of EUT

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

1.6 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 FAX : +86-512-57900958		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	CO01-KS 03CH02-KS TH01-KS	CN1257	314309

1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH02-KS	AUDIX	E3	6.2009-8-24a
2.	CO01-KS	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
- ANSI C63.10-2013
- FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- FCC KDB 291074 D01 General Requirements v01
- FCC KDB 291074 D02 EMC Measurement v01

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)
5850-5895 MHz	173	5865	175*	5875
	177	5885		

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
Straddle Channels	163##	5815	167*	5835
	169	5845	171#	5855

Note:

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

2.2 Test Mode

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

CDD Mode

Modulation	Data Rate
802.11a	**6 Mbps**
802.11ax HE20	**MCS0**
802.11ax HE40	**MCS0**
802.11ax HE80	**MCS0**
802.11ax HE160	**MCS0**

Test Modes: Radiated Spurious Emission	
802.11a	**802.11ax HE20**
CH169 (5845MHz) CH173 (5865MHz) CH177 (5885MHz)	**CH169 (5845MHz)** CH173 (5865MHz) CH177 (5885MHz)
802.11ax HE40	**802.11ax HE80**
CH167 (5835MHz) **CH175 (5875MHz)**	**CH171 (5855MHz)**
802.11ax HE160	
CH163 (5815MHz)	

Remark:

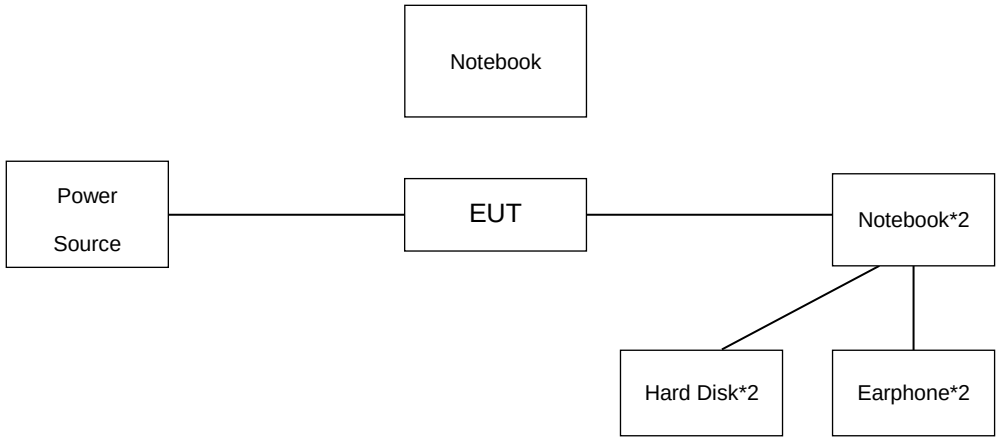
1. For Radiated Test Cases, The tests were performance with Adapter.
2. All test modes of the Radiated Spurious Emission (RSE) were tested; only the worse data in each bandwidth shown in bold for these modes is reported.

Test Modes: AC Conducted Emission
Mode 1 : WLAN (5G) Link+LAN Link+WAN Link+Power from Adapter

Ch. #		**U-NII-4：5850-5895 MHz**				
		802.11a	**802.11ax HE20**	**802.11ax HE40**	**802.11ax HE80**	**802.11ax HE160**
L	**Low**	169	169	167	-	-
M	**Middle**	173	173	-	171	163
H	**High**	177	177	175	-	-

2.3 Connection Diagram of Test System

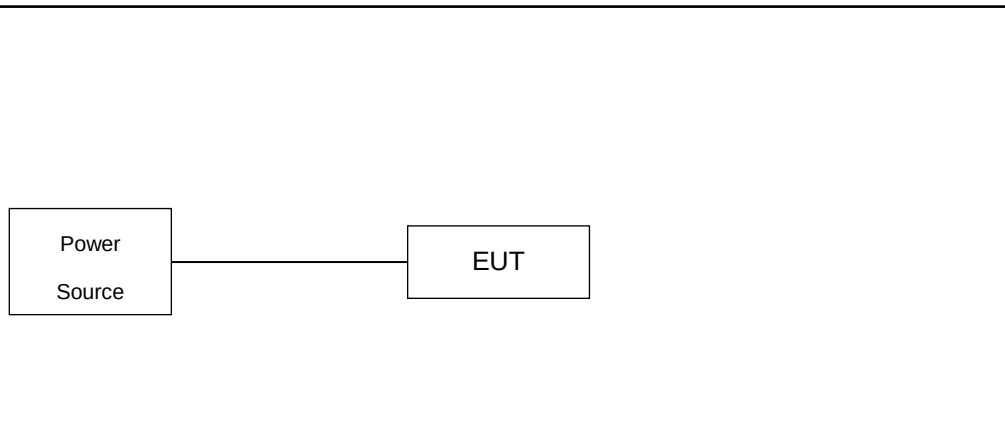
For Conducted Emission:



This example is connection diagram of EUT test configurations.

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

For Radiated Emission:



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 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Notebook	Lenovo	V130-15IKB005	N/A	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
2.	Hard Disk	WD	C6B	N/A	N/A	N/A
3.	Earphone	Lenovo	P121	N/A	N/A	Unshielded,1.2m

2.5 EUT Operation Test Setup

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

For AC power line conducted emissions, the EUT was set to connect with the notebook under large package sizes transmission.

2.6 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 7.4 dB and 20dB attenuator.

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

= 7.4 + 20 = 27.4 (dB)

3 Test Result

3.1 6dB and 26dB and 99% Occupied Bandwidth Measurement

3.1.1 Description of 6dB and 26dB and 99% Occupied Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

26dB and 99% Occupied bandwidth are reporting only.

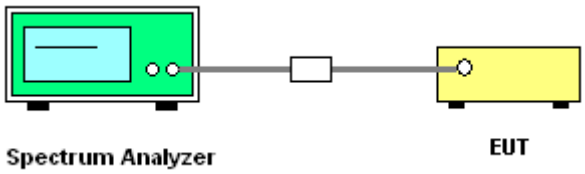
3.1.2 Measuring Instruments

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 II C for Emission Bandwidth and Section II D for 99% Occupied Bandwidth
2. For 6dB BW, Set RBW = 100kHz.
   For 26dB BW, Set RBW = approximately 1% of the emission bandwidth.
   For 99% OBW, Set RBW = 1% to 5% of the OBW.
3. For 26dB BW, Set the VBW > RBW.
   For 6dB BW & 99% OBW, Set the VBW ≥ 3 x RBW.
4. Detector = Peak.
5. Trace mode = max hold
6. Measure the maximum width of the emission that is 6 dB down from the peak of the emission.
7. Measure and record the results in the test report.

3.1.4 Test Setup



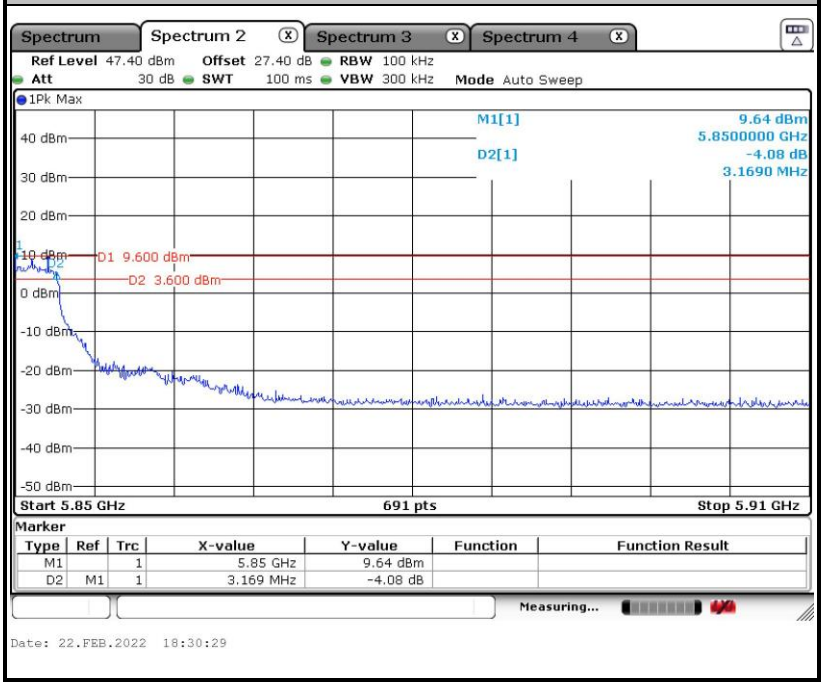
3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.

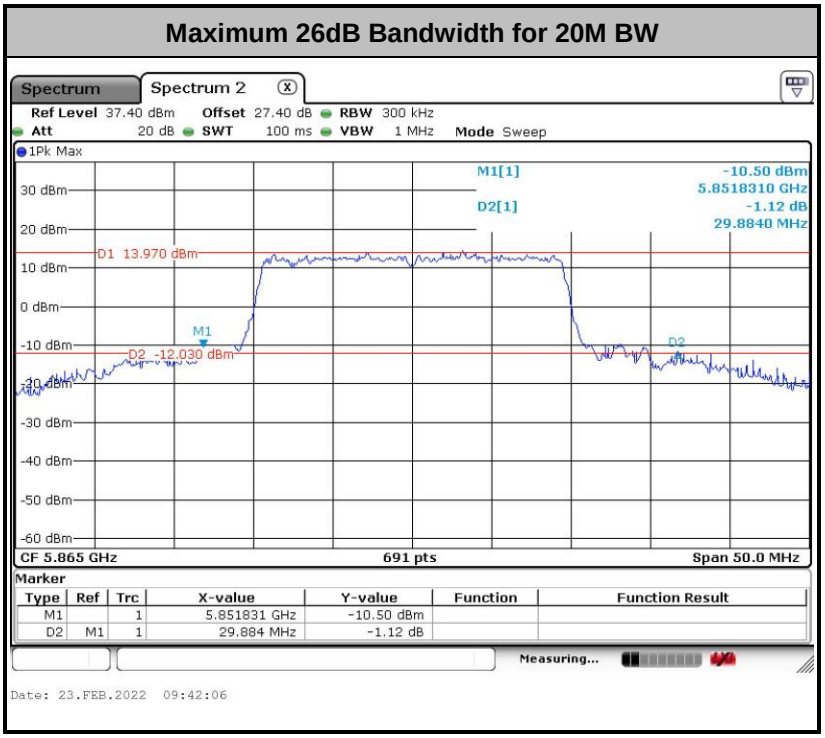
Only the maximum 6dB BW & 26dB & 99% OB plots of each bandwidth shown in the report.

<CDD Mode>

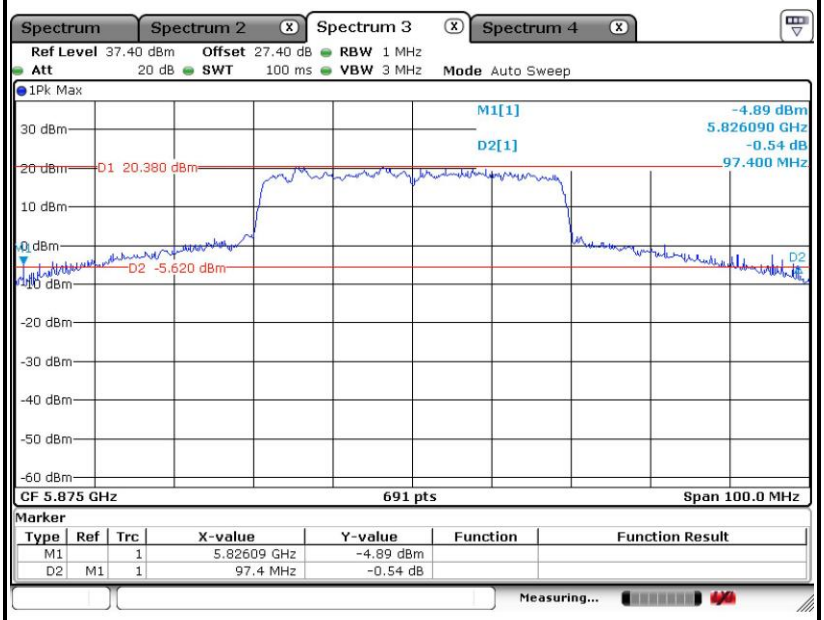
Minimum 6dB Bandwidth



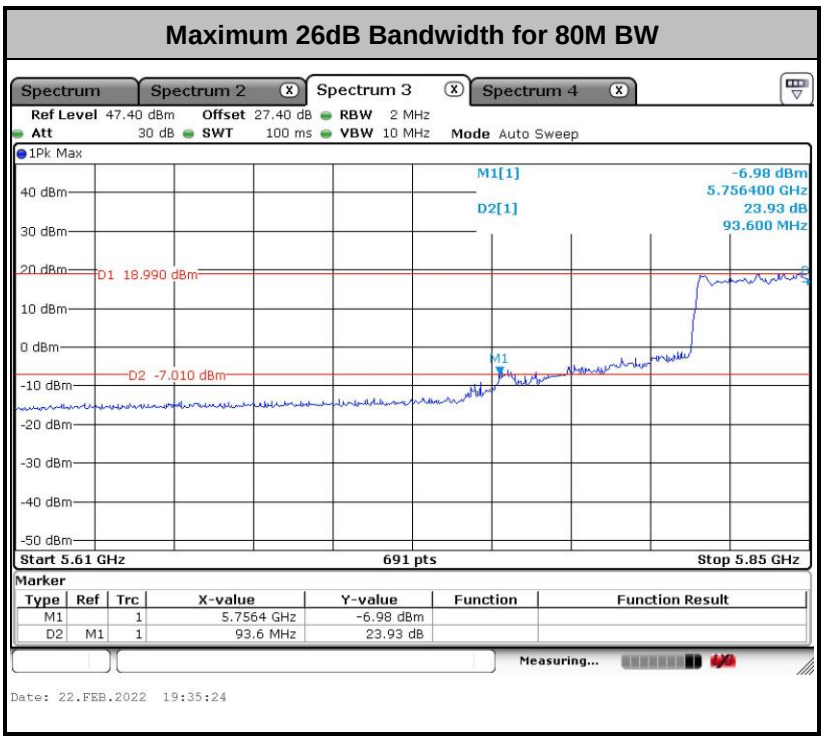
Maximum 26dB Bandwidth for 20M BW



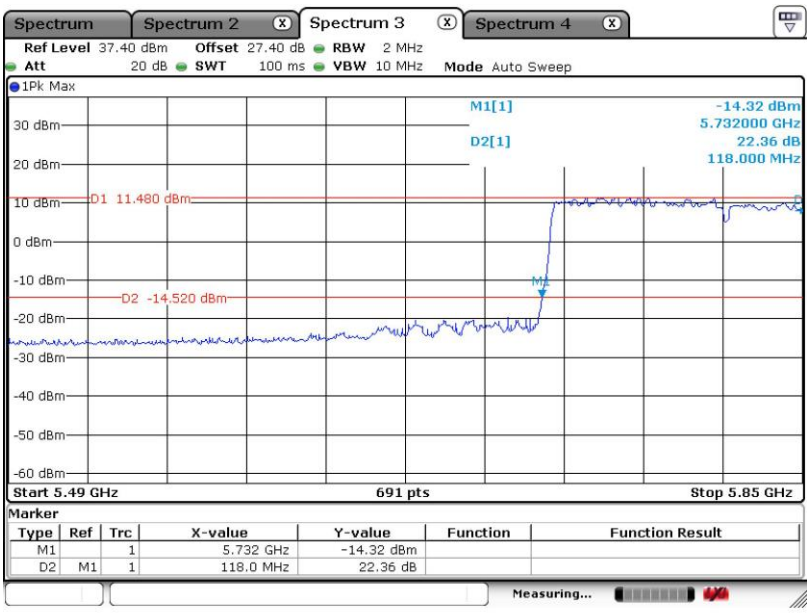
Maximum 26dB Bandwidth for 40M BW



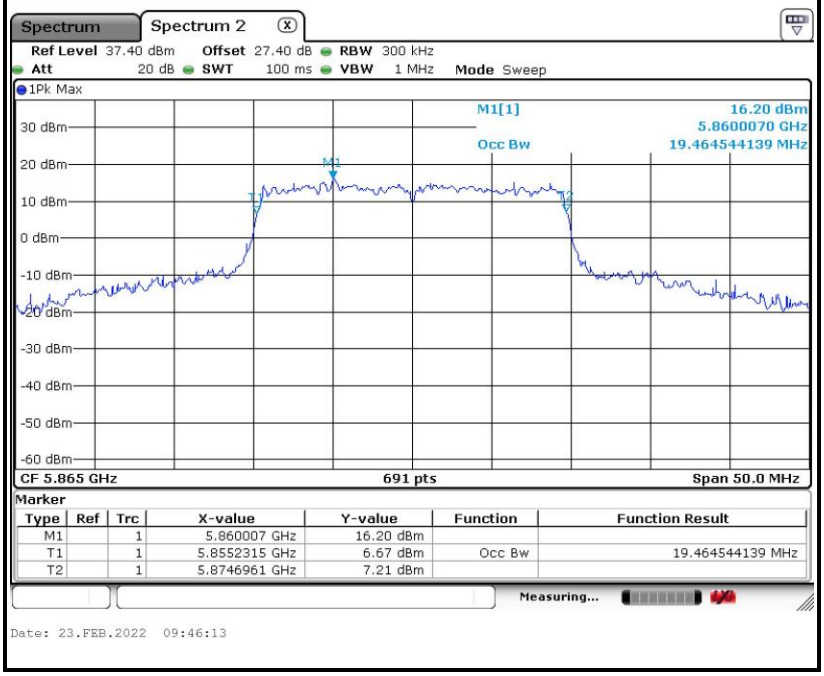
Maximum 26dB Bandwidth for 80M BW



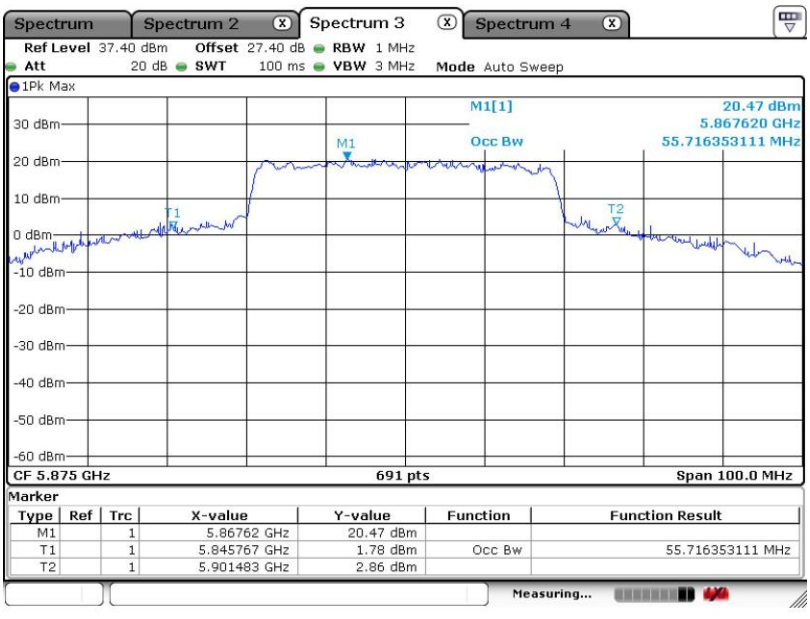
Maximum 26dB Bandwidth for 160M BW



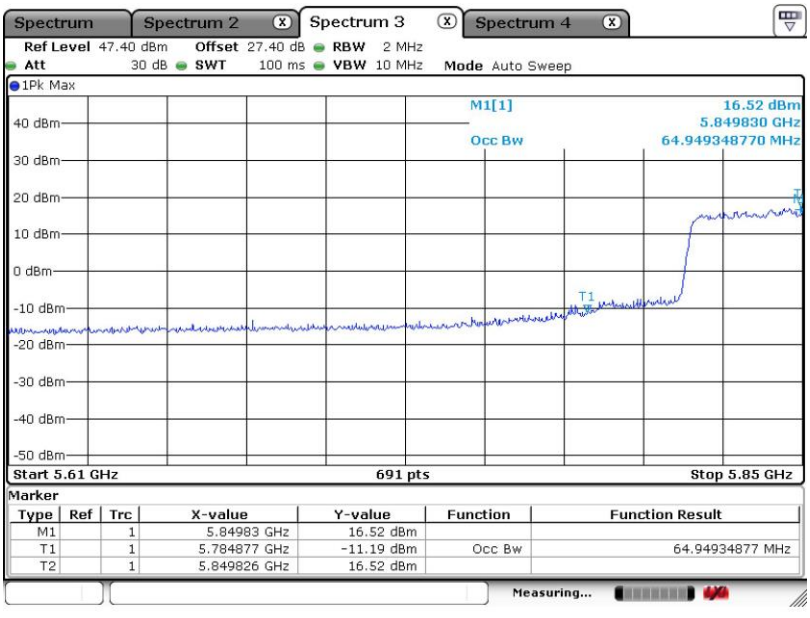
Maximum 99% Occupied Bandwidth for 20M BW



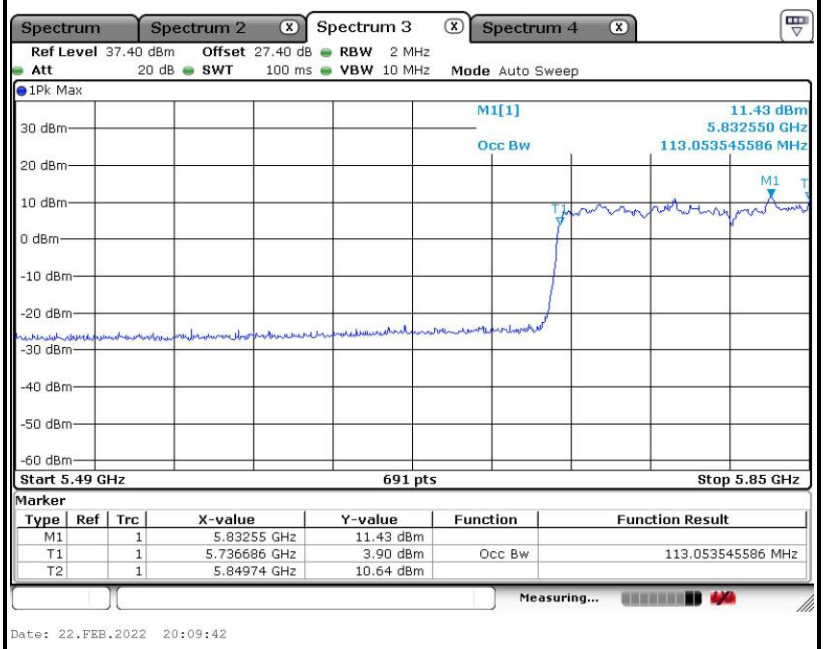
Maximum 99% Occupied Bandwidth for 40M BW



Maximum 99% Occupied Bandwidth for 80M BW



Maximum 99% Occupied Bandwidth for 160M BW



Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

3.2 Maximum Conducted Output Power Measurement

3.2.1 Limit of Maximum Conducted Output Power

For the 5.85-5.895 GHz band:

Device Category		Limit (dBm) (Maximum EIRP Average power)
Applied	**Indoor access point**	< 36
	Subordinate device	< 36
	Client device	< 30

3.2.2 Measuring Instruments

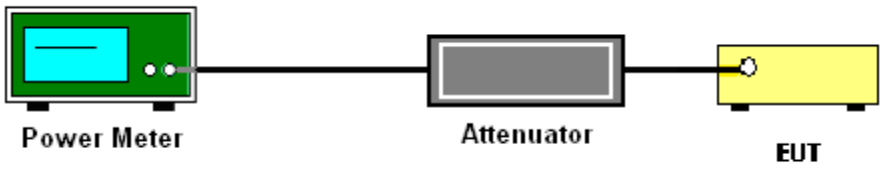
The measuring equipment is listed in the section 4 of this test report.

3.2.3 Test Procedures

The testing follows Section II E of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

Method PM (Measurement using an RF average power meter)

3.2.4 Test Setup



3.2.5 Test Result of Maximum Conducted Output Power

Please refer to Appendix A.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

Device Category		Limit (dBm/MHz) (Maximum EIRP PSD)
Applied	Indoor access point	< 20
	Subordinate device	< 20
	Client device	< 14

Note: For all U-NII-4 and U-NII-3 & -4 span channels shall met above EIRP values.

3.3.2 Measuring Instruments

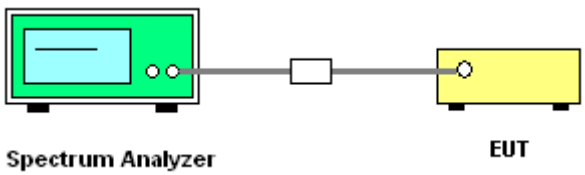
The measuring equipment is listed in the section 4 of this test report.

3.3.3 Test Procedures

The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01. Section F) Method SA-2 Maximum power spectral density. (trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction)

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 (b): Measure and sum spectral maxima across the outputs.
   With this technique, spectra are measured at each output of the device at the required resolution bandwidth. The maximum value of each spectrum is determined. These maximum values are then summed mathematically in linear power units across the outputs.

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

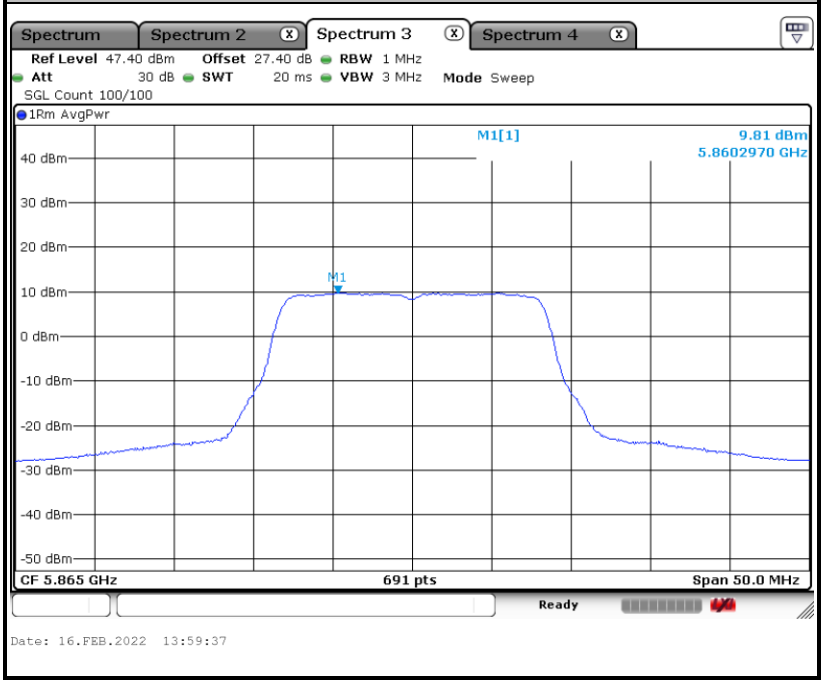
Please refer to Appendix A.

Only the maximum PSD plots of each bandwidth shown in the report

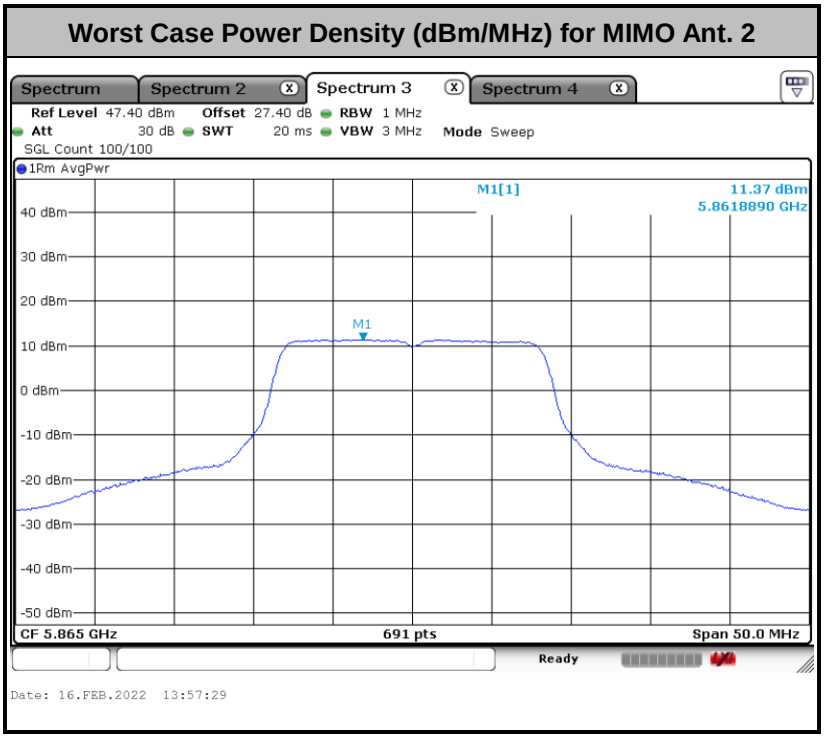
<CDD Modes>

802.11a

Worst Case Power Density (dBm/MHz) for MIMO Ant. 1

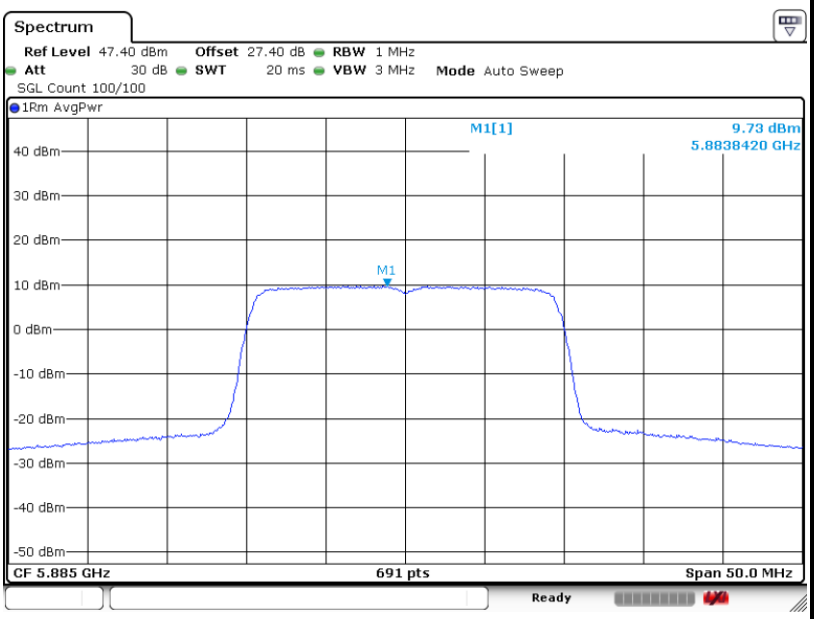


Worst Case Power Density (dBm/MHz) for MIMO Ant. 2

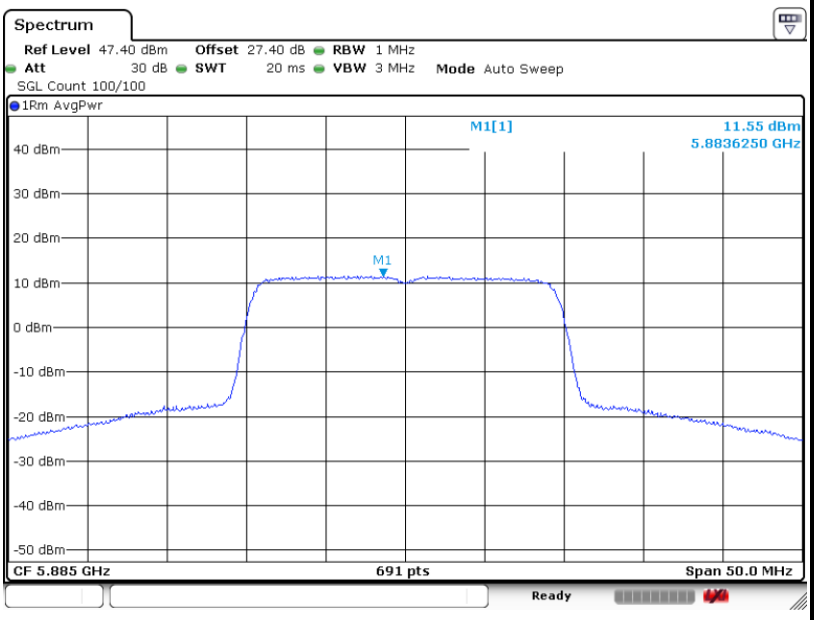


802.11ax HE20

Worst Case Power Density (dBm/MHz) for MIMO Ant. 1

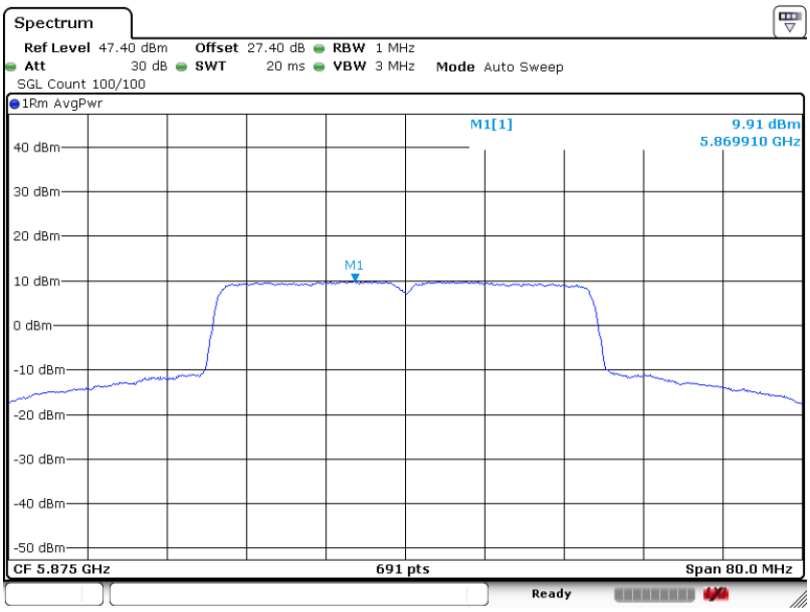


Worst Case Power Density (dBm/MHz) for MIMO Ant. 2

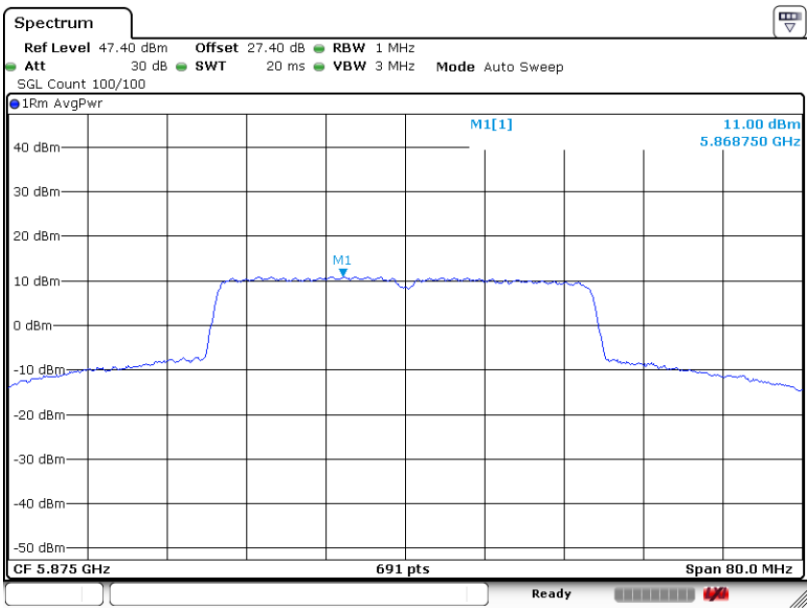


802.11ax HE40

Worst Case Power Density (dBm/MHz) for MIMO Ant. 1

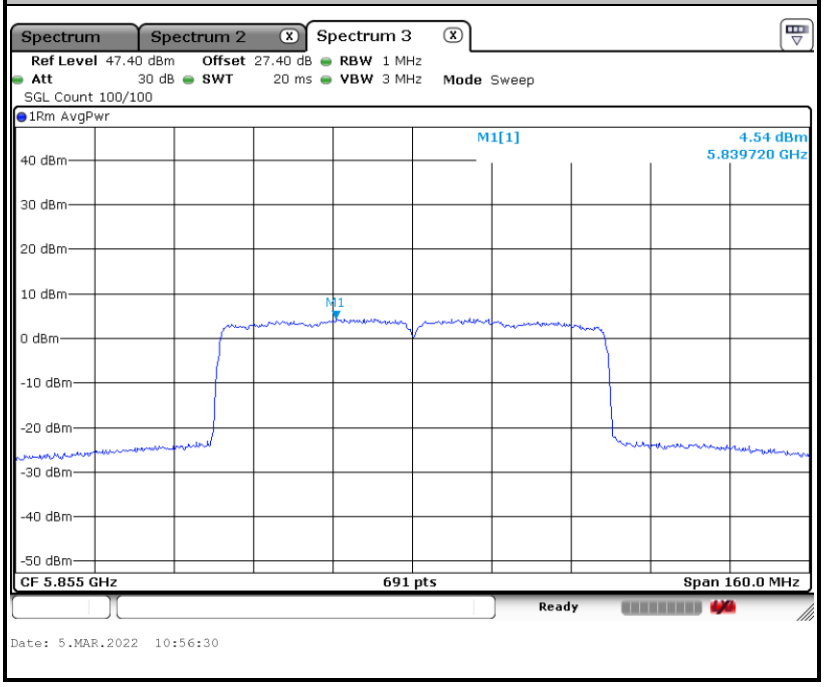


Worst Case Power Density (dBm/MHz) for MIMO Ant. 2

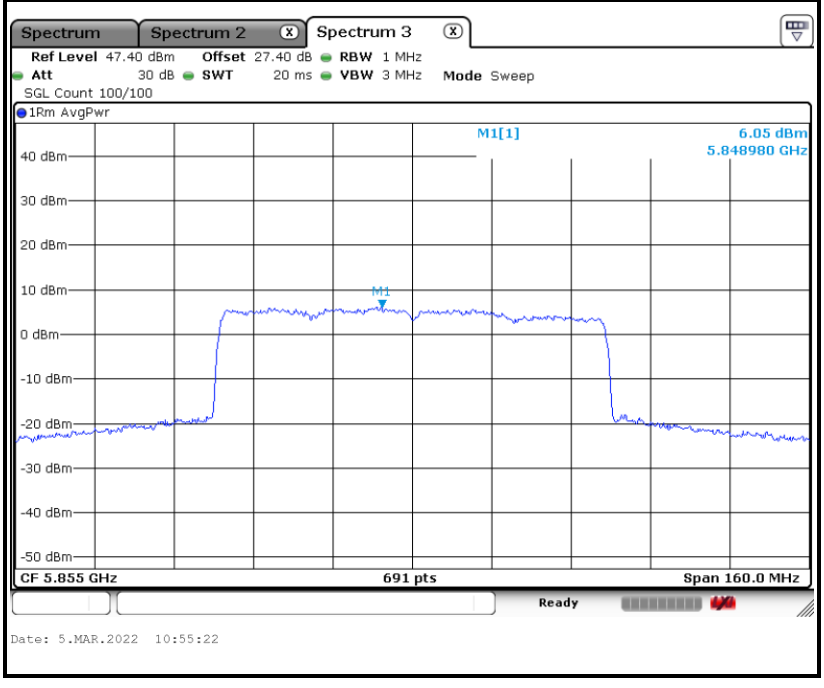


802.11ax HE80

Worst Case Power Density (dBm/MHz) for MIMO Ant. 1

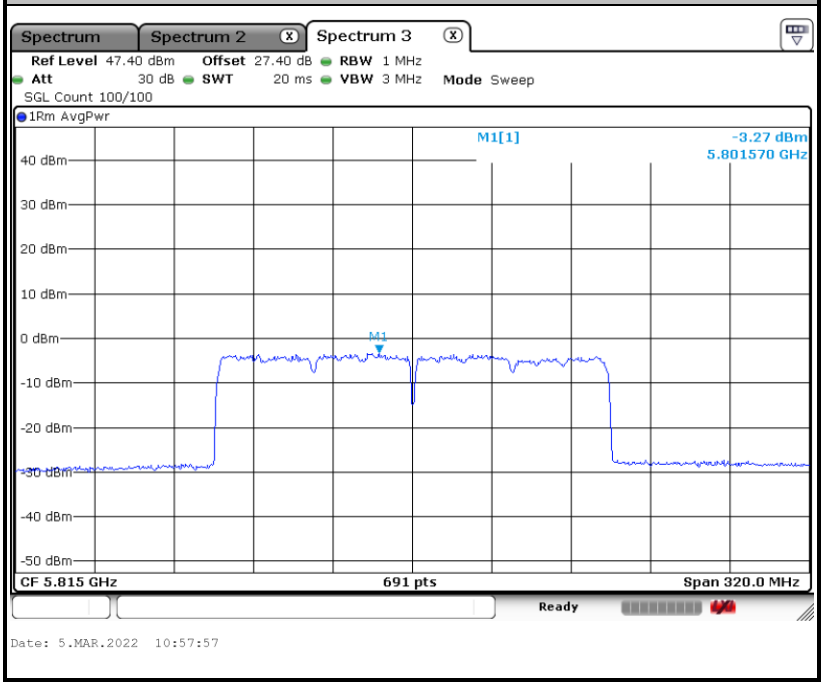


Worst Case Power Density (dBm/MHz) for MIMO Ant. 2

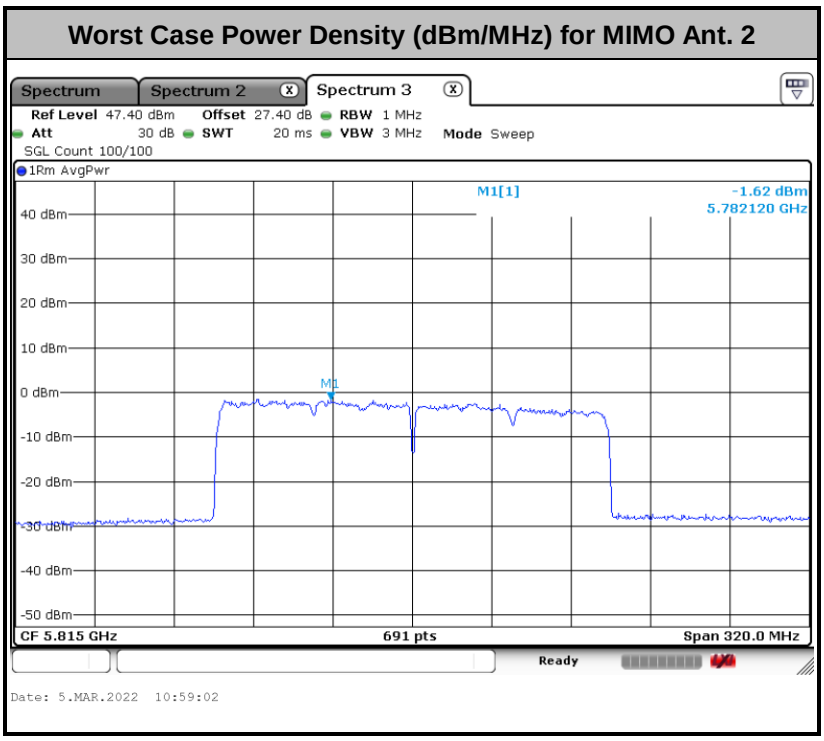


802.11ax HE160

Worst Case Power Density (dBm/MHz) for MIMO Ant. 1



Worst Case Power Density (dBm/MHz) for MIMO Ant. 2



3.4 Unwanted Emissions Measurement

This section is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement.

3.4.1 Limit of Unwanted Emissions

(1) 15.407(b)(5)(i) For an indoor access point or subordinate device, all emissions at or above 5.895 GHz shall not exceed an e.i.r.p. of 15 dBm/MHz and shall decrease linearly to an e.i.r.p. of - 7 dBm/MHz at or above 5.925 GHz.

(ii) For a client device, all emissions at or above 5.895 GHz shall not exceed an e.i.r.p. of -5 dBm/MHz and shall decrease linearly to an e.i.r.p. of -27 dBm/MHz at or above 5.925 GHz.

(iii) For a client device or indoor access point or subordinate device, all emissions below 5.725 GHz shall not exceed an e.i.r.p. of -27 dBm/MHz at 5.65 GHz increasing linearly to 10 dBm/ MHz at 5.7 GHz, and from 5.7 GHz increasing linearly to a level of 15.6 dBm/MHz at 5.72 GHz, and from 5.72 GHz increasing linearly to a level of 27 dBm/MHz at 5.725 GHz.

(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

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

$$EIRP = E_{Meas} + 20\log(d_{Meas}) - 104.77$$

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 v02r01. 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

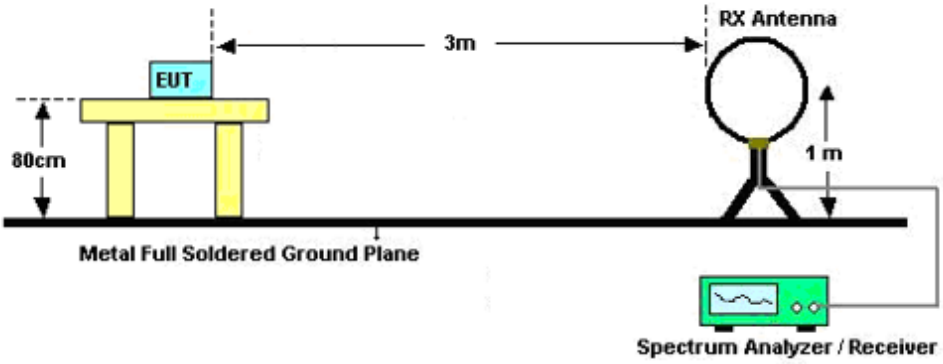
   - RBW = 1 MHz
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

2. Unwanted band-edge emissions below 5725 MHz should be measured using peak-detection while emission above 5895 MHz should be measured using average.
3. 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.
4. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
5. 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.
6. 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.
7. 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.
8. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than peak limit (that means the emission level in average mode also complies with the limit in average

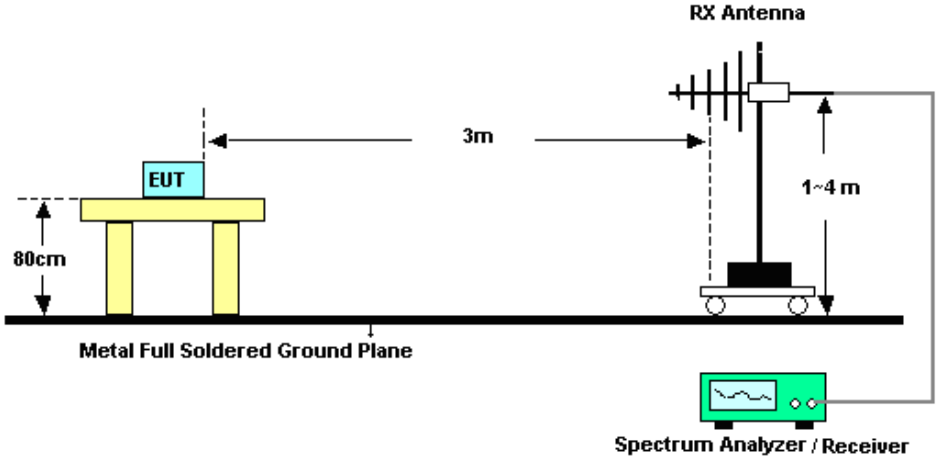
mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

3.4.4 Test Setup

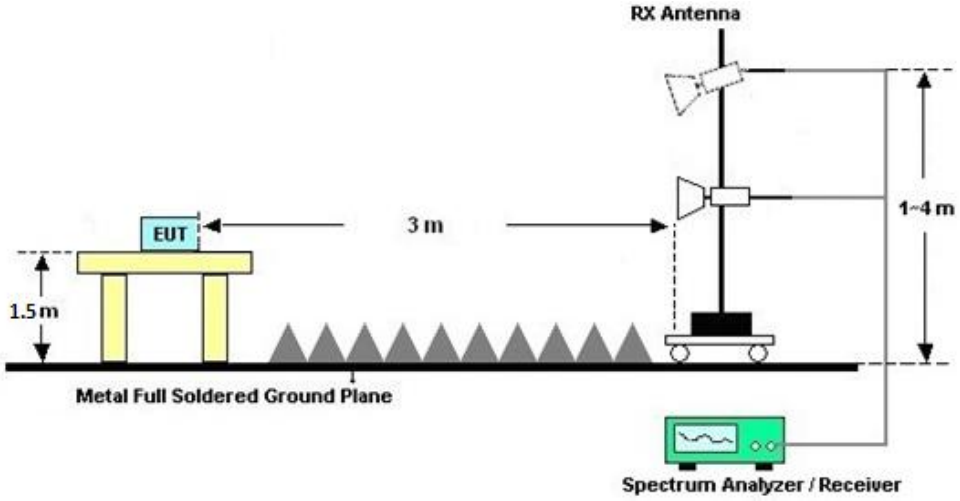
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.4.5 Test Results of Radiated 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 Band Edges

Please refer to Appendix C&D.

3.4.7 Duty Cycle

Please refer to Appendix E.

3.4.8 Test Result of Unwanted Radiated Emission (30MHz ~ 10th Harmonic or 40GHz, whichever is lower)

Please refer to Appendix C&D.

3.5 AC Conducted Emission Measurement

3.5.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

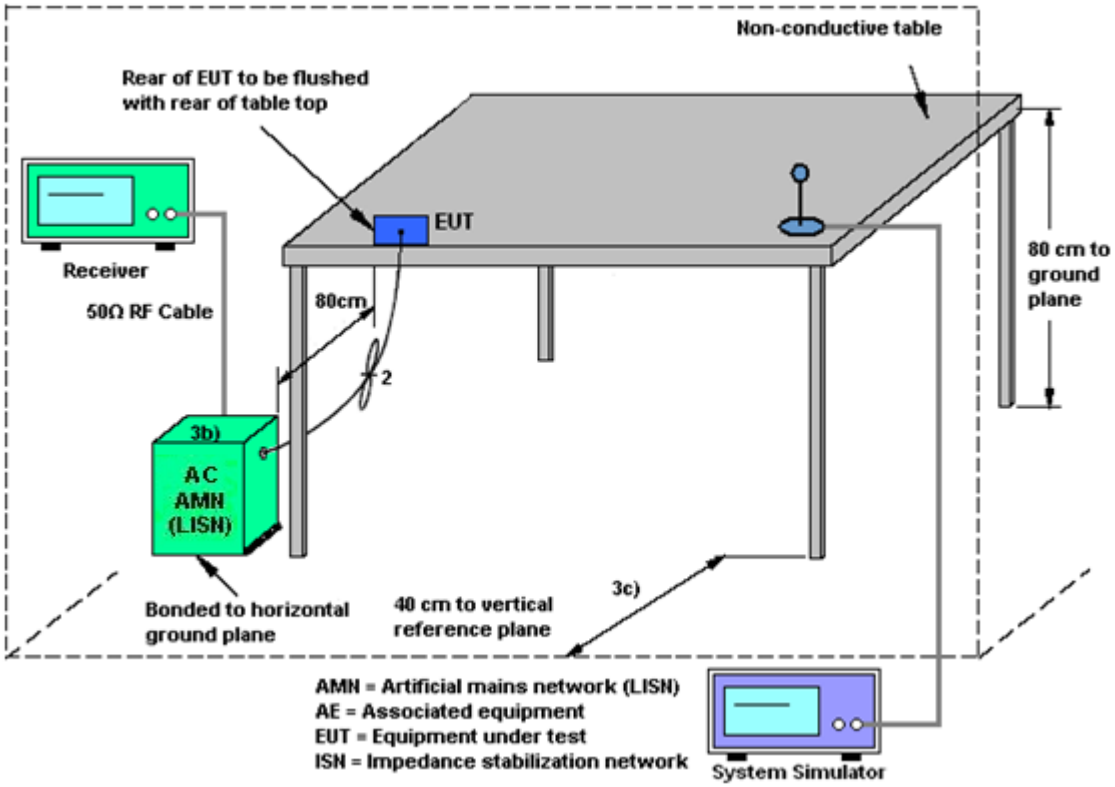
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

3.5.4 Test Setup



3.5.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.6 Antenna Requirements

3.6.1 Standard Applicable

Section 15.203 & 15.407(a)

3.6.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.6.3 Antenna Gain

<CDD Modes >

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

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

Directional gain = $G_{ANT\ MAX}$(Ant.1 Gain, Ant.2 Gain,…) + Array Gain, as following table for Power,

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

For PSD, the directional gain calculation is following,

Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + \ldots + 10^{Gn/20})^2 / N_{ANT}$] dBi, as following table for PSD.

N_{ANT} = number of transmit antennas

N_{SS} = number of spatial streams. (The worst case directional gain will occur when NSS = 1)

<CDD Modes>

	Ant. 1 (dBi)	Ant. 2 (dBi)	DG for Power (dBi)	DG for PSD (dBi)
Band IV	3.00	3.00	3.00	6.01

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. 14, 2021	Feb. 16, 2022~ Mar. 05, 2022	Oct. 13, 2022	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 05, 2022	Feb. 16, 2022~ Mar. 05, 2022	Jan. 04, 2023	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 05, 2022	Feb. 16, 2022~ Mar. 05, 2022	Jan. 04, 2023	Conducted (TH01-KS)
Temperature &humidity chamber	Hongzhan	LP-150U	H2014011440	-40~+150°C 20%~95%RH	Jul. 12, 2021	Feb. 16, 2022~ Mar. 05, 2022	Jul. 11, 2022	Conducted (TH01-KS)
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz;Max 30dBm	Oct. 16, 2021	Feb. 23, 2022	Oct. 15, 2022	Radiation (03CH02-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55370528	10Hz-44G,MAX 30dB	Oct. 16, 2021	Feb. 23, 2022	Oct. 15, 2022	Radiation (03CH02-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 30, 2021	Feb. 23, 2022	Oct. 29, 2022	Radiation (03CH02-KS)
Bilog Antenna	TeseQ	CBL6111D	44483	30MHz-1GHz	Dec. 22, 2021	Feb. 23, 2022	Dec. 21, 2022	Radiation (03CH02-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Oct. 30, 2021	Feb. 23, 2022	Oct. 29, 2022	Radiation (03CH02-KS)
high gain Amplifier	MITEQ	AMF-7D-00101800-30-10P	2025788	1Ghz-18Ghz	Jul. 30, 2021	Feb. 23, 2022	Jul. 29, 2023	Radiation (03CH02-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 05, 2022	Feb. 23, 2022	Jan. 04, 2023	Radiation (03CH02-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	Apr. 13, 2021	Feb. 23, 2022	Apr. 12, 2022	Radiation (03CH02-KS)
Amplifier	Keysight	83017A	MY53270316	500MHz~26.5GHz	Oct. 16, 2021	Feb. 23, 2022	Oct. 15, 2022	Radiation (03CH02-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 05, 2022	Feb. 23, 2022	Jan. 04, 2023	Radiation (03CH02-KS)
AC Power Source	Chroma	61601	616010002473	N/A	NCR	Feb. 23, 2022	NCR	Radiation (03CH02-KS)
Turn Table	MF	MF7802	N/A	0~360 degree	NCR	Feb. 23, 2022	NCR	Radiation (03CH02-KS)
Antenna Mast	MF	MF7802	N/A	1 m~4 m	NCR	Feb. 23, 2022	NCR	Radiation (03CH02-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	Apr. 21, 2021	Dec. 20, 2021	Apr. 20, 2022	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060103	9kHz~30MHz	Oct. 14, 2021	Dec. 20, 2021	Oct. 13, 2022	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060105	9kHz~30MHz	Apr. 13, 2021	Dec. 20, 2021	Apr. 12, 2022	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 14, 2021	Dec. 20, 2021	Oct. 13, 2022	Conduction (CO01-KS)

NCR: No Calibration Required

5 Uncertainty of Evaluation

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 Emission Measurement (150kHz ~ 30MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.94dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.9dB**

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

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

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.1dB**

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

Appendix A. Conducted Test Results

Report Number : FR1D0112D

Test Engineer:	Jiang Jun	Temperature:	21~25	°C
Test Date:	2022.2.16~2022.3.5	Relative Humidity:	51~54	%

Report Number : FR1D0112D

TEST RESULTS DATA
6dB and 26dB EBW and 99% OBW

U-NII-4 MIMO												
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Bandwidth (MHz)		26dB Bandwidth (MHz)		6 dB Bandwidth (MHz)		6 dB Bandwidth Min. Limit (MHz)	Pass/Fail
					Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2		
11a	6Mbps	2	169-L	5845	14.15	14.93	17.84	24.27	13.15	13.15	0.5	Pass
11a	6Mbps	2	169-H	5845	15.54	14.59	13.94	14.46	3.17	3.17	0.5	Pass
11a	6Mbps	2	173	5865	17.44	17.73	23.59	29.38	16.35	16.35	0.5	Pass
11a	6Mbps	2	177	5885	17.44	17.29	23.88	28.51	16.25	16.25	0.5	Pass
HE20	MCS0	2	169-L	5845	14.76	15.02	18.19	23.14	14.54	14.54	0.5	Pass
HE20	MCS0	2	169-H	5845	12.24	13.55	13.50	15.33	4.47	4.47	0.5	Pass
HE20	MCS0	2	173	5865	19.32	19.46	29.88	29.88	18.89	18.96	0.5	Pass
HE20	MCS0	2	177	5885	19.25	19.39	27.06	29.16	18.86	18.93	0.5	Pass
HE40	MCS0	2	167-L	5835	44.63	55.27	64.86	68.33	33.77	33.77	0.5	Pass
HE40	MCS0	2	167-H	5835	35.77	39.94	36.38	40.72	3.86	3.86	0.5	Pass
HE40	MCS0	2	175	5875	44.72	55.72	97.40	95.22	37.48	37.63	0.5	Pass
HE80	MCS0	2	171-L	5855	64.95	64.25	60.26	93.60	33.86	33.51	0.5	Pass
HE80	MCS0	2	171-H	5855	46.02	58.70	66.43	84.31	43.81	43.11	0.5	Pass
HE160	MCS0	2	163-L	5815	113.05	112.53	117.48	118.00	112.79	112.79	0.5	Pass
HE160	MCS0	2	163-H	5815	44.80	44.28	47.15	47.15	42.59	42.59	0.5	Pass

Note : "-L" means the span channel part in UNII-3; "-H" means the span channel part in UNII-4

Report Number : FR1D0112D

TEST RESULTS DATA
Average Power Table

U-NII-4 MIMO															
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power with duty factor (dBm)			EIRP power	EIRP Power Limit (dBm)		DG (dBi)		Pass/Fail
					Ant 1	Ant 2	Ant 1	Ant 2	SUM		Ant 1	Ant 2	Ant 1	Ant 2	
11a	6Mbps	2	169	5845	0.21	0.21	21.58	22.92	25.31	28.31	36.00		3.00		Pass
11a	6Mbps	2	173	5865	0.21	0.21	22.89	24.53	26.80	29.80	36.00		3.00		Pass
11a	6Mbps	2	177	5885	0.21	0.21	20.53	22.10	24.40	27.40	36.00		3.00		Pass
HT20	MCS0	2	169	5845	0.21	0.21	21.95	23.26	25.66	28.66	36.00		3.00		Pass
HT20	MCS0	2	173	5865	0.21	0.21	23.20	24.29	26.79	29.79	36.00		3.00		Pass
HT20	MCS0	2	177	5885	0.21	0.21	21.92	23.38	25.72	28.72	36.00		3.00		Pass
HT40	MCS0	2	167	5835	0.46	0.42	24.58	25.79	28.24	31.24	36.00		3.00		Pass
HT40	MCS0	2	175	5875	0.46	0.42	24.99	25.84	28.45	31.45	36.00		3.00		Pass
VHT20	MCS0	2	169	5845	0.07	0.07	21.99	23.30	25.70	28.70	36.00		3.00		Pass
VHT20	MCS0	2	173	5865	0.07	0.07	23.21	24.32	26.81	29.81	36.00		3.00		Pass
VHT20	MCS0	2	177	5885	0.07	0.07	21.99	23.38	25.75	28.75	36.00		3.00		Pass
VHT40	MCS0	2	167	5835	0.13	0.13	24.65	25.84	28.30	31.30	36.00		3.00		Pass
VHT40	MCS0	2	175	5875	0.13	0.13	25.06	25.95	28.54	31.54	36.00		3.00		Pass
VHT80	MCS0	2	171	5855	0.29	0.29	22.40	23.60	26.05	29.05	36.00		3.00		Pass
HE20	MCS0	2	169	5845	0.07	0.09	22.04	23.35	25.76	28.76	36.00		3.00		Pass
HE20	MCS0	2	173	5865	0.07	0.09	23.49	24.73	27.17	30.17	36.00		3.00		Pass
HE20	MCS0	2	177	5885	0.07	0.09	22.12	23.62	25.95	28.95	36.00		3.00		Pass
HE40	MCS0	2	167	5835	0.17	0.17	24.75	25.94	28.40	31.40	36.00		3.00		Pass
HE40	MCS0	2	175	5875	0.17	0.17	25.18	26.15	28.71	31.71	36.00		3.00		Pass
HE80	MCS0	2	171	5855	0.35	0.35	22.52	23.71	26.17	29.17	36.00		3.00		Pass
HE160	MCS0	2	163	5815	0.55	0.53	17.99	19.22	21.66	24.66	36.00		3.00		Pass

Note: EIRP = 10*log(10^(Ant 1 power/10)+10^(Ant 2 power/10)) + DG

Report Number : FR1D0112D

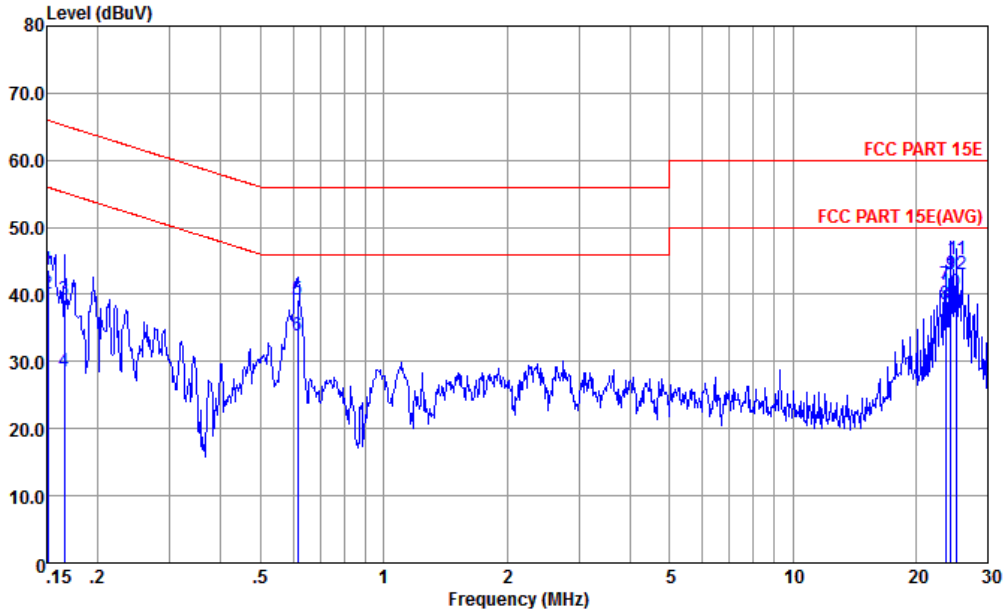
TEST RESULTS DATA
Power Spectral Density

U-NII-4 MIMO																
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)		Average Power Density (dBm/MHZ)		EIRP Power Density (dBm/MHZ)			EIRP PSD Limit (dBm)		DG (dBi)		Pass /Fail
					Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	
11a	6Mbps	2	169	5845	0.21	0.21	9.92	11.25			19.87	20.00		6.01		Pass
11a	6Mbps	2	173	5865	0.21	0.21	9.81	11.37			19.89	20.00		6.01		Pass
11a	6Mbps	2	177	5885	0.21	0.21	9.57	11.28			19.74	20.00		6.01		Pass
HE20	MCS0	2	169	5845	0.07	0.09	9.98	11.35			19.82	20.00		6.01		Pass
HE20	MCS0	2	173	5865	0.07	0.09	9.85	11.21			19.69	20.00		6.01		Pass
HE20	MCS0	2	177	5885	0.07	0.09	9.73	11.55			19.84	20.00		6.01		Pass
HE40	MCS0	2	167	5865	0.17	0.17	9.78	11.00			19.63	20.00		6.01		Pass
HE40	MCS0	2	175	5885	0.17	0.17	9.91	11.00			19.68	20.00		6.01		Pass
HE80	MCS0	2	171	5855	0.35	0.35	4.54	6.05			14.73	20.00		6.01		Pass
HE160	MCS0	2	163	5815	0.55	0.53	-3.27	-1.62			7.19	20.00		6.01		Pass

Note: EIRP PSD = 10*log(10^((Ant 1 power+DF)/10)+10^((Ant 2 power+DF)/10)) + DG

Appendix B. AC Conducted Emission Test Results

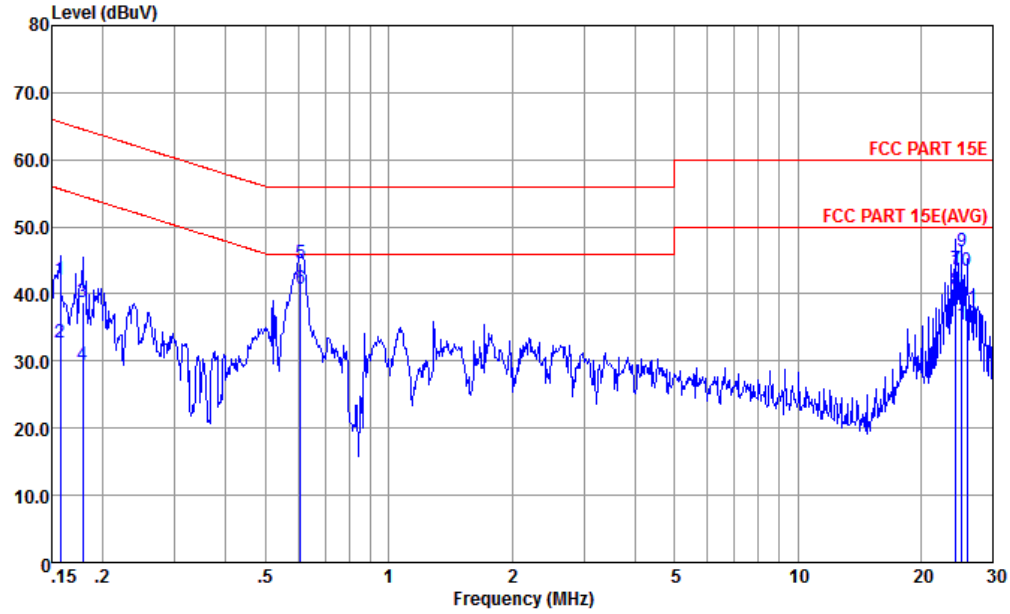
Test Engineer :	Amos Zhang	**Temperature :**	25.3~26.2℃
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-KS
Condition : FCC PART 15E LISN-060105-L LINE

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.151	43.70	-22.26	65.96	33.20	0.02	10.48	QP
2	0.151	40.20	-15.76	55.96	29.70	0.02	10.48	Average
3	0.166	39.27	-25.89	65.16	28.80	0.03	10.44	QP
4	0.166	28.57	-26.59	55.16	18.10	0.03	10.44	Average
5	0.617	39.24	-16.76	56.00	28.89	0.11	10.24	QP
6	0.617	33.84	-12.16	46.00	23.49	0.11	10.24	Average
7	23.636	41.37	-18.63	60.00	30.20	0.62	10.55	QP
8	23.636	38.47	-11.53	50.00	27.30	0.62	10.55	Average
9	24.400	43.11	-16.89	60.00	31.91	0.64	10.56	QP
10	24.400	40.31	-9.69	50.00	29.11	0.64	10.56	Average
11	25.188	45.33	-14.67	60.00	34.10	0.66	10.57	QP
12 *	25.188	43.03	-6.97	50.00	31.80	0.66	10.57	Average

Test Engineer :	Amos Zhang	**Temperature :**	25.3~26.2℃
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-KS
Condition : FCC PART 15E LISN-060105-N NEUTRAL

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.157	42.07	-23.53	65.60	31.50	0.11	10.46	QP
2		0.157	32.77	-22.83	55.60	22.20	0.11	10.46	Average
3		0.179	38.71	-25.84	64.55	28.20	0.10	10.41	QP
4		0.179	29.31	-25.24	54.55	18.80	0.10	10.41	Average
5		0.608	44.55	-11.45	56.00	34.20	0.11	10.24	QP
6	*	0.608	40.75	-5.25	46.00	30.40	0.11	10.24	Average
7		24.400	43.74	-16.26	60.00	32.51	0.67	10.56	QP
8		24.400	40.54	-9.46	50.00	29.31	0.67	10.56	Average
9		25.188	46.36	-13.64	60.00	35.10	0.69	10.57	QP
10		25.188	43.36	-6.64	50.00	32.10	0.69	10.57	Average
11		26.001	37.90	-22.10	60.00	26.60	0.72	10.58	QP
12		26.001	35.40	-14.60	50.00	24.10	0.72	10.58	Average

Note:

1. Level(dBμV) = Read Level(dBμV) + LISN Factor(dB) + Cable Loss(dB)
2. Over Limit(dB) = Level(dBμV) – Limit Line(dBμV)

Appendix B. Radiated Spurious Emission

Test Engineer :	Henzy Li	Temperature :	22~23°C
		Relative Humidity :	41~42%

U-NII-4 - 5850-5895 MHz

WIFI 802.11a (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
CDD 2*2		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11a CH 169 5845MHz		5836	117.76	-	-	112.11	35.05	13.11	42.51	146	281	P	H
		5836	107.43	-	-	101.78	35.05	13.11	42.51	146	281	A	H
		5578.6	57.6	-10.7	68.3	52.02	34.58	12.67	41.67	146	281	P	H
		5923.6	64.44	-24.88	89.32	58.68	35.2	13.27	42.71	146	281	P	H
		5848	124.11	-	-	118.44	35.08	13.13	42.54	100	45	P	V
		5848	112.95	-	-	107.28	35.08	13.13	42.54	100	45	A	V
		5641	60.41	-7.89	68.3	54.84	34.67	12.79	41.89	100	45	P	V
		5929	68.49	-19.81	88.3	62.74	35.2	13.28	42.73	100	45	P	V
802.11a CH 173 5865MHz		5631	58.39	-9.91	68.3	52.83	34.64	12.77	41.85	101	322	P	H
		5958	57.43	-30.87	88.3	51.66	35.25	13.32	42.8	101	322	P	H
		5860	112.4	-	-	106.72	35.1	13.15	42.57	101	322	P	H
		5860	105.45	-	-	99.77	35.1	13.15	42.57	101	322	A	H
		5872	118.81	-	-	113.12	35.12	13.17	42.6	100	45	P	V
		5872	111.26	-	-	105.57	35.12	13.17	42.6	100	45	A	V
		5614.2	59.84	-8.46	68.3	54.29	34.6	12.73	41.78	100	45	P	V
		5968.8	60.07	-28.23	88.3	54.3	35.25	13.34	42.82	100	45	P	V

WIFI Ant. CDD 2*2	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11a CH 177 5885MHz		5890	111.57	-	-	105.85	35.15	13.21	42.64	100	282	P	H
		5890	105.12	-	-	99.4	35.15	13.21	42.64	100	282	A	H
		5640.8	56.64	-11.66	68.3	51.08	34.67	12.78	41.89	100	282	P	H
		5895.2	94.83	-15.32	110.15	89.11	35.15	13.22	42.65	100	282	P	H
		5884	117.09	-	-	111.4	35.12	13.2	42.63	100	307	P	V
		5884	110.33	-	-	104.64	35.12	13.2	42.63	100	307	A	V
		5636.6	58.74	-9.56	68.3	53.16	34.67	12.78	41.87	100	307	P	V
		5895.2	104.06	-6.09	110.15	98.34	35.15	13.22	42.65	100	307	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

U-NII-4 5850-5895MHz

WIFI 802.11a (Harmonic @ 3m)

WIFI Ant. CDD 2*2	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11a		11686	48.49	-25.51	74	58.02	38.52	17.29	65.34	100	360	P	H
CH 169		11697	54.94	-19.06	74	64.47	38.52	17.29	65.34	109	122	P	V
5745MHz		11697	45.65	-8.35	54	55.18	38.52	17.29	65.34	109	122	A	V
802.11a		11730	47.44	-26.56	74	56.89	38.54	17.33	65.32	300	0	P	H
CH 173		11730	50.79	-23.21	74	60.24	38.54	17.33	65.32	100	360	P	V
5865MHz													
802.11a		11770	46.15	-27.85	74	55.49	38.57	17.38	65.29	100	0	P	H
CH 177		11770	50.76	-23.24	74	60.1	38.57	17.38	65.29	300	0	P	V
5885MHz													
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

U-NII-4 5850-5895MHz

WIFI 802.11ax HE20 (Band Edge @ 3m)

WIFI Ant. CDD 2*2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		5641.6	57.61	-10.69	68.3	52.04	34.67	12.79	41.89	100	321	P	H
		5921.2	64.41	-26.67	91.08	58.69	35.17	13.26	42.71	100	321	P	H
11ax		5854	117.16	-	-	111.47	35.1	13.14	42.55	100	321	P	H
HE20		5854	106.69	-	-	101	35.1	13.14	42.55	100	321	A	H
CH 169		5848	122.39	-	-	116.72	35.08	13.13	42.54	103	45	P	V
5845MHz		5848	112.74	-	-	107.07	35.08	13.13	42.54	103	45	A	V
		5593	62.35	-5.95	68.3	56.78	34.59	12.7	41.72	103	45	P	V
		5921.8	73.36	-17.28	90.64	67.61	35.2	13.26	42.71	103	45	P	V
		5612.2	56.92	-11.38	68.3	64.1	34.6	0	41.78	100	317	P	H
		5922.4	59.19	-31.01	90.2	66.7	35.2	0	42.71	100	317	P	H
802.11ax		5860	112.55	-	-	106.87	35.1	13.15	42.57	100	317	P	H
HE20		5860	102.22	-	-	96.54	35.1	13.15	42.57	100	317	A	H
CH 173		5860	118.54	-	-	112.86	35.1	13.15	42.57	118	44	P	V
5865MHz		5860	108.76	-	-	103.08	35.1	13.15	42.57	118	44	A	V
		5588.8	59.61	-8.69	68.3	54.03	34.59	12.69	41.7	118	44	P	V
		5923	66.43	-23.33	89.76	60.68	35.2	13.26	42.71	118	44	P	V
		5884	111.4	-	-	105.71	35.12	13.2	42.63	100	280	P	P
		5884	103.8	-	-	98.11	35.12	13.2	42.63	100	280	A	A
802.11ax		5603	57.61	-10.69	68.3	52.04	34.6	12.71	41.74	100	280	P	P
HE20		5895.2	102.1	-8.05	110.15	96.38	35.15	13.22	42.65	100	280	P	P
CH 177		5639	60.29	-8.01	68.3	67.49	34.67	0	41.87	100	43	P	V
5885MHz		5895.8	102.25	-7.46	109.71	96.53	35.15	13.22	42.65	100	43	P	V
		5884	118.11	-	-	112.42	35.12	13.2	42.63	100	43	P	V
		5884	110.02	-	-	104.33	35.12	13.2	42.63	100	43	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

U-NII-4 5850-5895MHz

WIFI 802.11ax HE20 (Harmonic @ 3m)

WIFI Ant. CDD 2*2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax HE20 CH 169 5845MHz		11686	48.3	-25.7	74	57.83	38.52	17.29	65.34	300	360	P	H
		11686	52.82	-21.18	74	62.35	38.52	17.29	65.34	152	108	P	V
		11686	47.29	-6.71	54	56.82	38.52	17.29	65.34	152	108	A	V
802.11ax HE20 CH 173 5865MHz		11730	46.35	-27.65	74	55.8	38.54	17.33	65.32	100	360	P	H
		11730	50.71	-23.29	74	60.16	38.54	17.33	65.32	100	360	P	V
802.11ax HE20 CH 177 5885MHz		11770	45.94	-28.06	74	55.28	38.57	17.38	65.29	300	360	P	H
		11770	50.61	-23.39	74	59.95	38.57	17.38	65.29	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

U-NII-4 5850-5895MHz

WIFI 802.11ax HE40(Band Edge @ 3m)

WIFI Ant. CDD 2*2	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax HE40 CH 167 5835MHz		5842	113.62	-	-	107.94	35.08	13.12	42.52	107	320	P	H
		5842	102.33	-	-	96.65	35.08	13.12	42.52	107	320	A	H
		5623	57.33	-10.97	68.3	51.78	34.64	12.74	41.83	107	320	P	H
		5927.8	67.09	-21.21	88.3	61.35	35.2	13.27	42.73	107	320	P	H
		5830	120.3	-	-	114.64	35.05	13.1	42.49	100	44	P	V
		5830	108.92	-	-	103.26	35.05	13.1	42.49	100	44	A	V
		5626	61.23	-7.07	68.3	55.66	34.64	12.76	41.83	110	44	P	V
		5923.6	76.04	-13.28	89.32	70.28	35.2	13.27	42.71	110	44	P	V
802.11ax HE40 CH 175 5875MHz		5872	111.41	-	-	105.72	35.12	13.17	42.6	112	320	P	H
		5872	101.33	-	-	95.64	35.12	13.17	42.6	112	320	A	H
		5597.2	57.98	-10.32	68.3	52.41	34.59	12.7	41.72	112	320	P	H
		5924.8	79.05	-9.4	88.45	73.29	35.2	13.27	42.71	112	320	P	H
		5878	117.85	-	-	112.15	35.12	13.19	42.61	106	43	P	V
		5878	107.5	-	-	101.8	35.12	13.19	42.61	106	43	A	V
		5602.6	60.62	-7.68	68.3	55.05	34.6	12.71	41.74	106	43	P	V
		5911	95.37	-3.18	98.55	89.64	35.17	13.24	42.68	106	43	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

U-NII-4 5850-5895MHz

WIFI 802.11ax HE40(Harmonic @ 3m)

WIFI Ant. CDD 2*2	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax HE40 CH 167 5835MHz		11670	48.59	-25.41	74	58.15	38.51	17.28	65.35	300	0	P	H
		11670	50.69	-23.31	74	60.29	38.5	17.26	65.36	100	360	P	V
802.11ax HE40 CH 175 5875MHz		11750	46.11	-27.89	74	55.53	38.55	17.34	65.31	300	0	P	H
		11752	50.17	-23.83	74	59.59	38.55	17.34	65.31	100	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

U-NII-4 5850-5895MHz

WIFI 802.11ax HE80 (Band Edge @ 3m)

WIFI Ant. CDD 2*2	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax HE80 CH 171 5855MHz		5848	106.63	-	-	100.96	35.08	13.13	42.54	117	75	P	H
		5848	97.36	-	-	91.69	35.08	13.13	42.54	117	75	A	H
		5582.8	57.34	-10.96	68.3	51.76	34.59	12.68	41.69	117	75	P	H
		5924.8	78.03	-10.42	88.45	72.27	35.2	13.27	42.71	117	75	P	H
		5848	114.95	-	-	109.28	35.08	13.13	42.54	101	258	P	V
		5848	103.28	-	-	97.61	35.08	13.13	42.54	101	258	A	V
		5585.8	60.52	-7.78	68.3	54.95	34.59	12.68	41.7	101	258	P	V
		5927.8	87.09	-1.21	88.3	81.35	35.2	13.27	42.73	101	258	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

U-NII-4 5850-5895MHz

WIFI 802.11ax HE80 (Harmonic @ 3m)

WIFI Ant. CDD 2*2	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11aX HE80 CH 171 5855MHz		11710	44.55	-29.45	74	54.04	38.53	17.31	65.33	100	0	P	H
		11719	47.13	-26.87	74	56.58	38.54	17.33	65.32	300	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

U-NII-4 5850-5895MHz

WIFI 802.11ax HE160 (Band Edge @ 3m)

WIFI Ant. CDD 2*2	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax HE160 CH 163 5815MHz		5794	102.34	-	-	96.7	35	13.04	42.4	152	280	P	H
		5794	90.07	-	-	84.43	35	13.04	42.4	152	280	A	H
		5653.6	60.64	-10.33	70.97	55.05	34.71	12.81	41.93	152	280	P	H
		5951.8	69.85	-18.45	88.3	64.11	35.22	13.31	42.79	152	280	P	H
		5776	108.34	-	-	102.7	34.96	13.01	42.33	100	44	P	V
		5776	96.14	-	-	90.5	34.96	13.01	42.33	100	44	A	V
		5630.8	67.11	-1.19	68.3	61.55	34.64	12.77	41.85	100	44	P	V
		5949.4	77.63	-10.67	88.3	71.87	35.22	13.31	42.77	100	44	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

U-NII-4 5850-5895MHz

WIFI 802.11ax HE160 (Harmonic @ 3m)

WIFI Ant. CDD 2*2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax HE160 CH 163 5815MHz		11631	44.14	-29.86	74	53.81	38.48	17.23	65.38	100	360	P	H
		11630	44.16	-29.84	74	53.83	38.48	17.23	65.38	300	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

5GHz WIFI 802.11ax HE160 (LF)

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 2*2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11ax HE160 LF		30	32.44	-7.56	40	38.78	25.1	0.76	32.2	-	-	P	H
		162.89	35.93	-7.57	43.5	49.91	16.26	1.86	32.1	-	-	P	H
		248.25	39.14	-6.86	46	50.51	18.74	2.09	32.2	-	-	P	H
		333.61	39.31	-6.69	46	48.79	20	2.69	32.17	-	-	P	H
		512.09	36.49	-9.51	46	41.39	24.33	3.15	32.38	-	-	P	H
		559.62	37.22	-8.78	46	40.76	25.48	3.28	32.3	-	-	P	H
		32.91	38.1	-1.9	40	46.03	23.51	0.76	32.2	-	-	P	V
		49.4	31.87	-8.13	40	48.19	14.89	0.99	32.2	-	-	P	V
		70.74	35.13	-4.87	40	53.54	12.6	1.19	32.2	-	-	P	V
		162.89	34.65	-8.85	43.5	48.63	16.26	1.86	32.1	-	-	P	V
		202.66	30.71	-12.79	43.5	45.59	15.13	2.09	32.1	-	-	P	V
		564.47	41.89	-4.11	46	45.35	25.52	3.32	32.3	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

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.	
1		(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”.

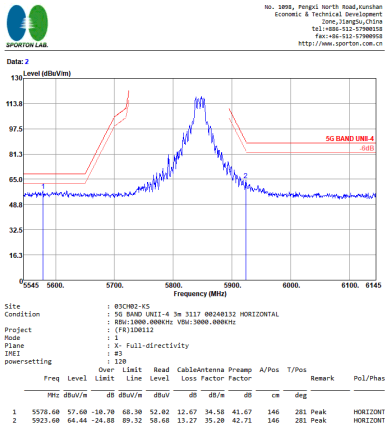
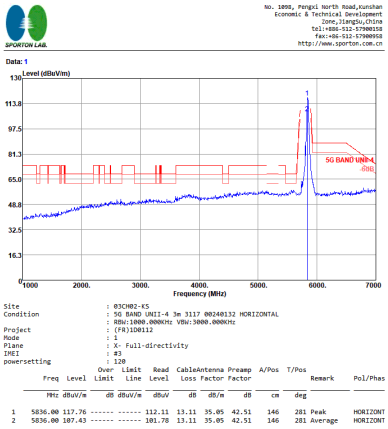
Appendix D. Radiated Spurious Emission Plots

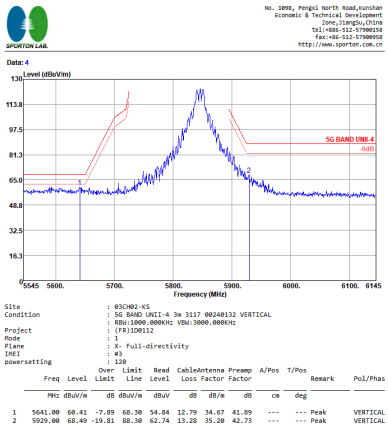
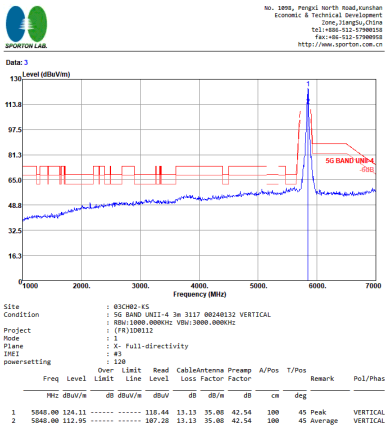
Note symbol

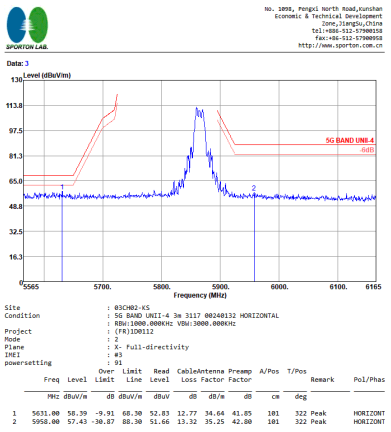
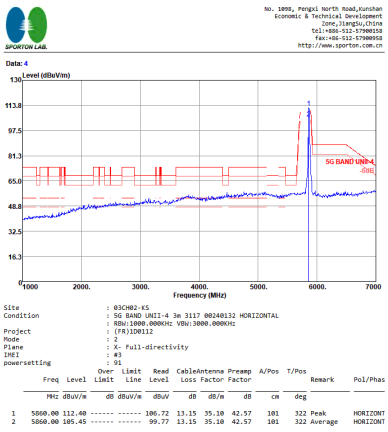
-L	**Low channel location**
-R	**High channel location**

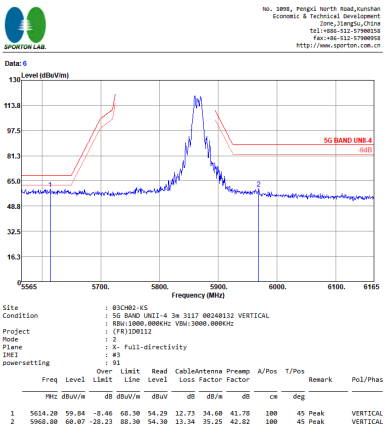
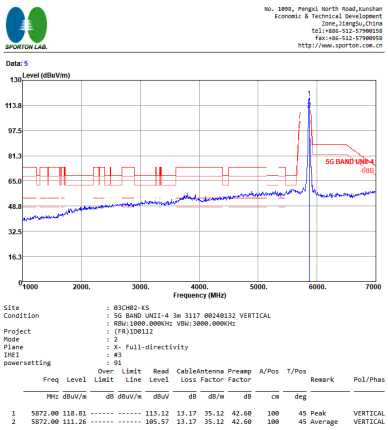
Band 4 - 5850-5895MHz

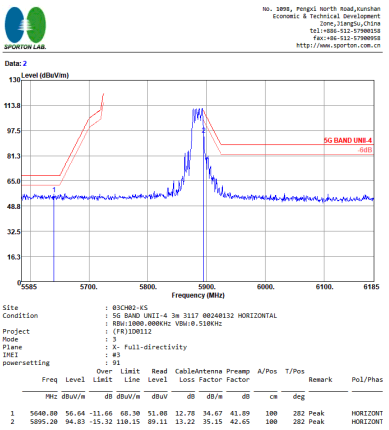
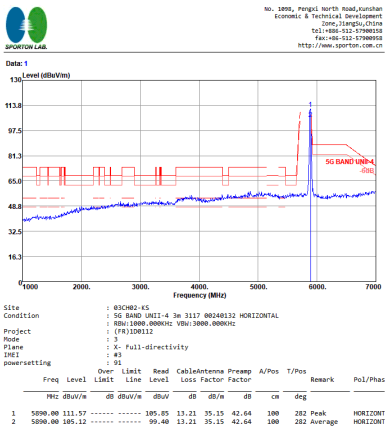
WIFI 802.11a (Band Edge @ 3m)

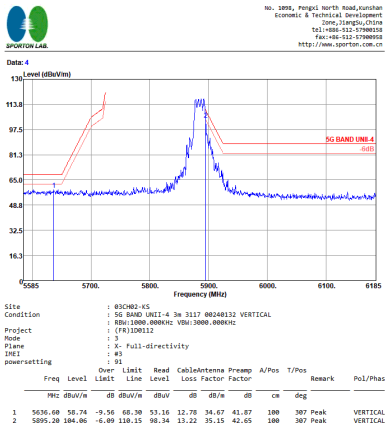
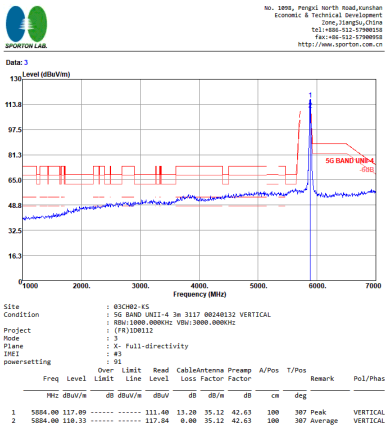
WIFI	Band 4 5850-5895MHz Band Edge @ 3m	
ANT	802.11a CH169 5845MHz	
1	Horizontal	Fundamental
Peak		

WIFI	Band 4 5850-5895MHz Band Edge @ 3m	
ANT	802.11a CH169 5845MHz	
1	Vertical	Fundamental
Peak		

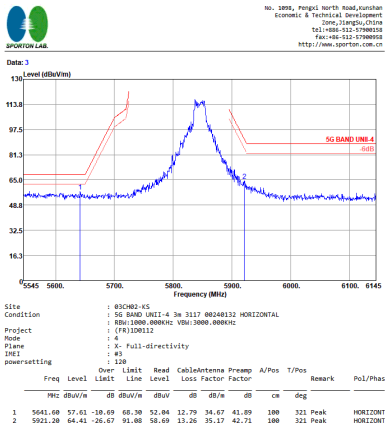
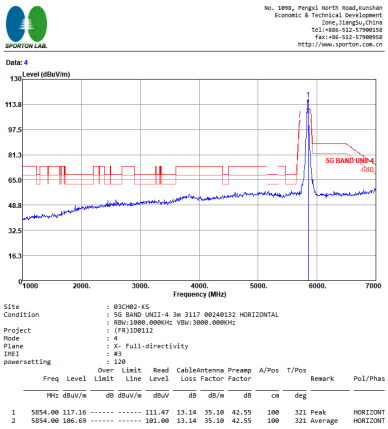
WIFI	Band 4 5850-5895MHz Band Edge @ 3m	
ANT	802.11a CH173 5865MHz	
1	Horizontal	Fundamental
Peak		
Peak	Left blank	Left blank

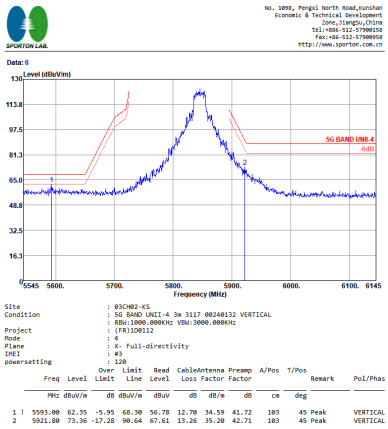
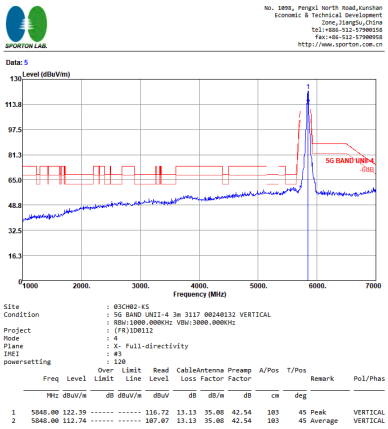
WIFI	Band 4 5850-5895MHz Band Edge @ 3m	
ANT	802.11a CH173 5865MHz	
1	Vertical	Fundamental
Peak		
Peak	Left blank	Left blank

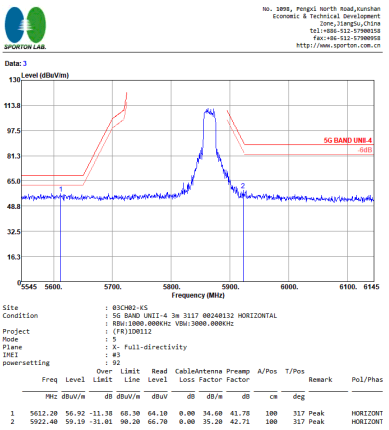
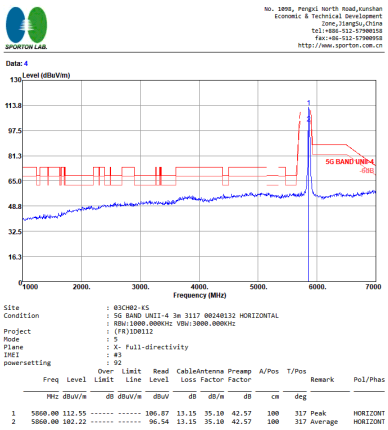
WIFI	Band 4 5850-5895MHz Band Edge @ 3m	
ANT	802.11a CH177 5885MHz	
1	Horizontal	Fundamental
Peak		

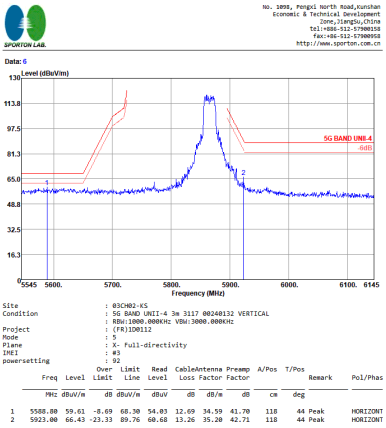
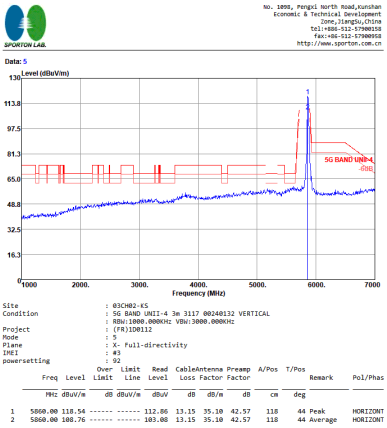
WIFI	Band 4 5850-5895MHz Band Edge @ 3m	
ANT	802.11a CH177 5885MHz	
1	Vertical	Fundamental
Peak		

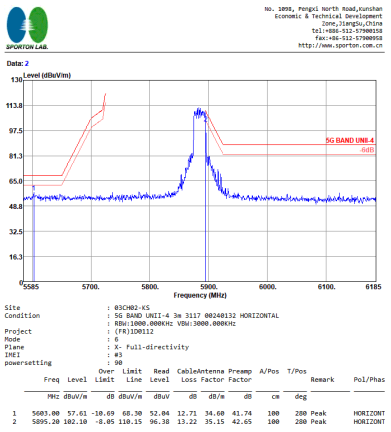
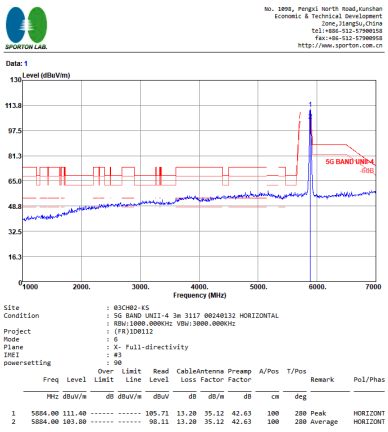
Band 4 5850-5895MHz
WIFI 802.11ax HE20 (Band Edge @ 3m)

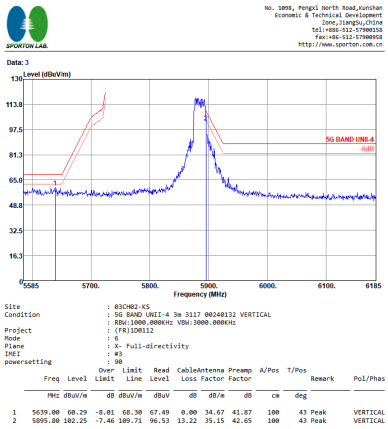
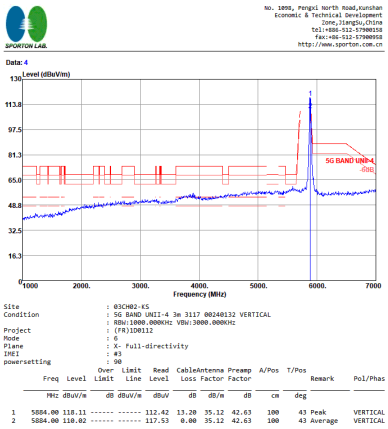
WIFI	Band 4 5850-5895MHz Band Edge @ 3m	
ANT	802.11ax HE20 CH169 5845MHz	
1	Horizontal	Fundamental
Peak		

WIFI	Band 4 5850-5895MHz Band Edge @ 3m	
ANT	802.11ax HE20 CH169 5845MHz	
1	Vertical	Fundamental
Peak		

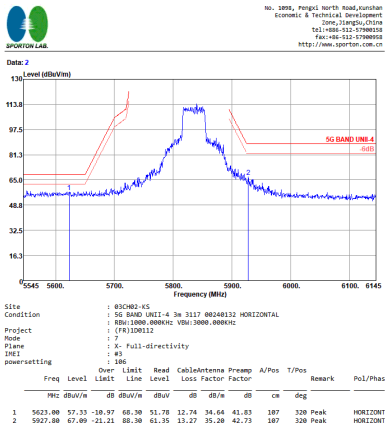
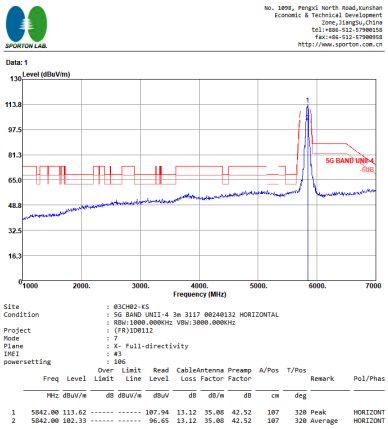
WIFI	Band 4 5850-5895MHz Band Edge @ 3m	
ANT	802.11ax HE20 CH173 5865MHz	
1	Horizontal	Fundamental
Peak		
Peak	Left blank	Left blank

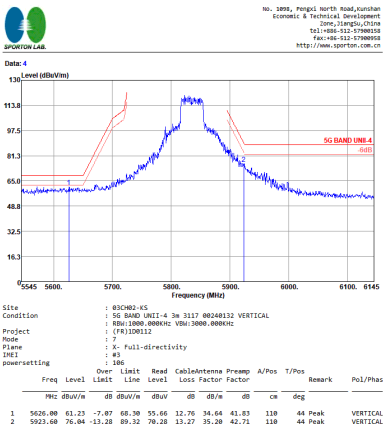
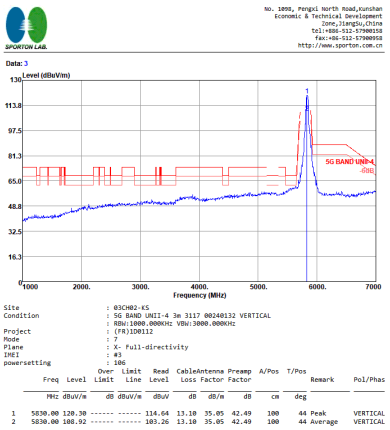
WIFI	Band 4 5850-5895MHz Band Edge @ 3m	
ANT	802.11ax HE20 CH173 5865MHz	
1	Vertical	Fundamental
Peak		
Peak	Left blank	Left blank

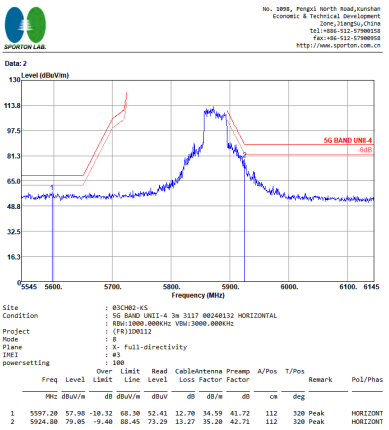
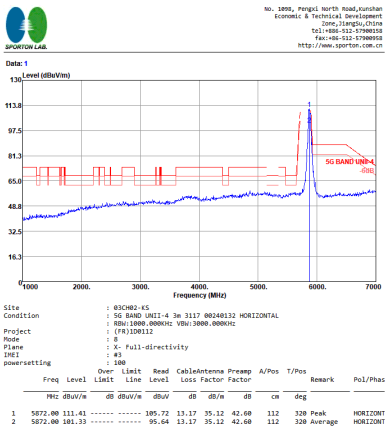
WIFI	Band 4 5850-5895MHz Band Edge @ 3m	
ANT	802.11ax HE20 CH177 5885MHz	
1	Horizontal	Fundamental
Peak		

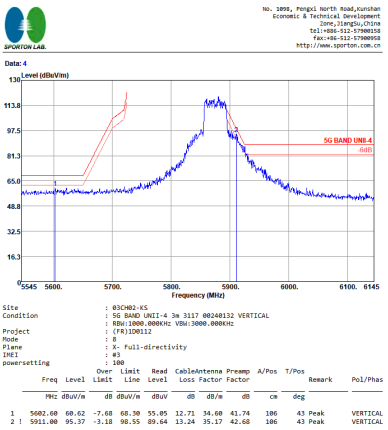
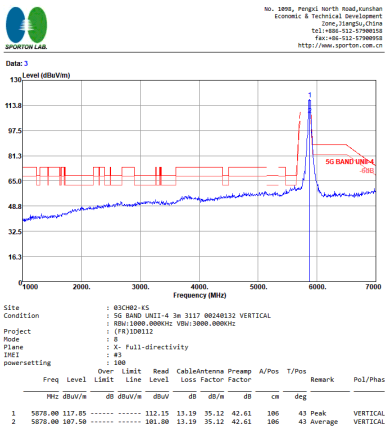
WIFI	Band 4 5850-5895MHz Band Edge @ 3m	
ANT	802.11ax HE20 CH177 5885MHz	
1	Vertical	Fundamental
Peak		

Band 4 5850-5895MHz
WIFI 802.11ax HE40 (Band Edge @ 3m)

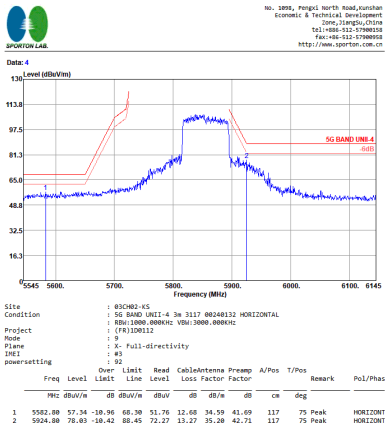
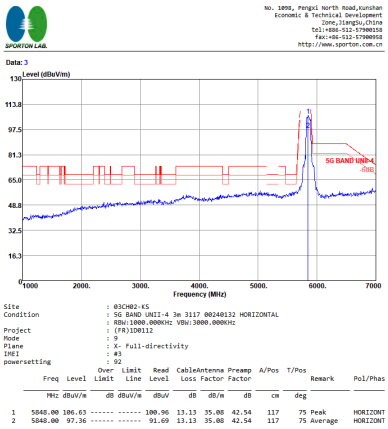
WIFI	Band 4 5850-5895MHz Band Edge @ 3m	
ANT	802.11ax HE40 CH167 5835MHz	
1	Horizontal	Fundamental
Peak		
Peak	Left blank	Left blank

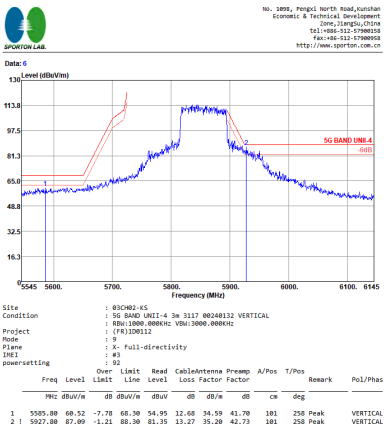
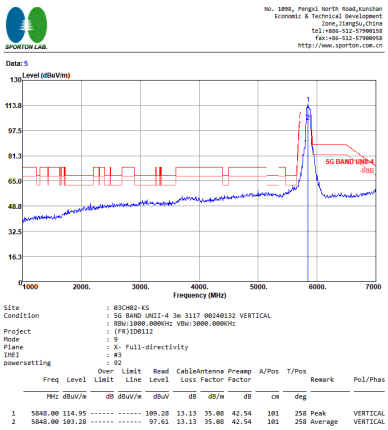
WIFI	Band 4 5850-5895MHz Band Edge @ 3m	
ANT	802.11ax HE40 CH167 5835MHz	
1	Vertical	Fundamental
Peak		
Peak	Left blank	Left blank

WIFI	Band 4 5850-5895MHz Band Edge @ 3m	
ANT	802.11ax HE40 CH175 5875MHz	
1	Horizontal	Fundamental
Peak		
Peak	Left blank	Left blank

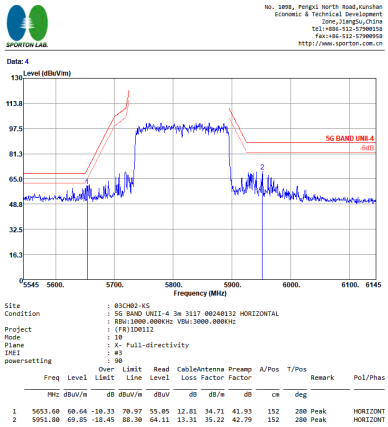
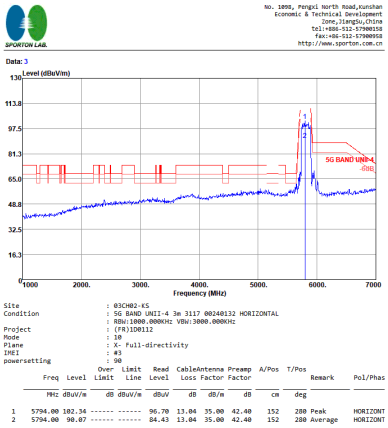
WIFI	Band 4 5850-5895MHz Band Edge @ 3m	
ANT	802.11ax HE40 CH175 5875MHz	
1	Vertical	Fundamental
Peak		
Peak	Left blank	Left blank

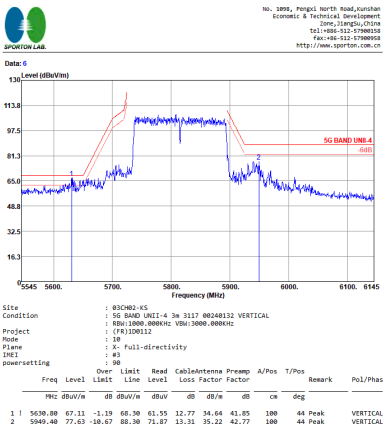
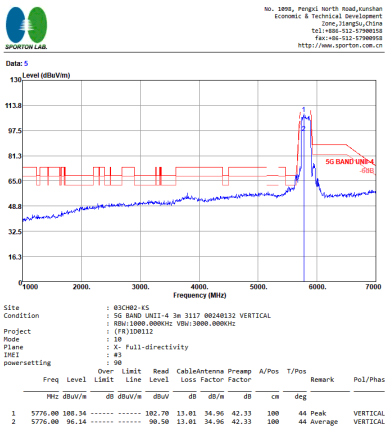
Band 4 5850-5895MHz
WIFI 802.11ax HE80 (Band Edge @ 3m)

WIFI	Band 4 5850-5895MHz Band Edge @ 3m	
ANT	802.11ax HE80 CH171 5855MHz	
1	Horizontal	Fundamental
Peak		
Peak	Left blank	Left blank

WIFI	Band 4 5850-5895MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH155 5775MHz	
1	Vertical	Fundamental
Peak		
Peak	Left blank	Left blank

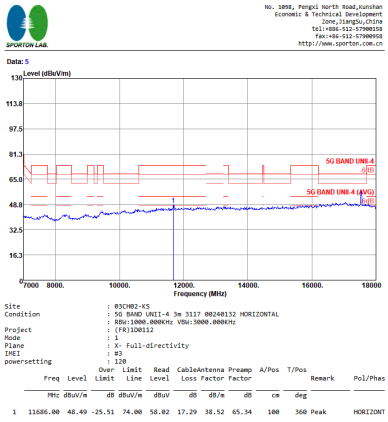
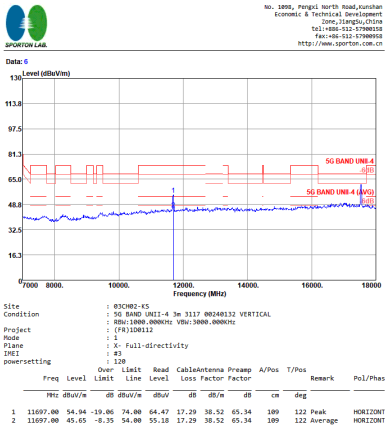
Band 4 5850-5895MHz
WIFI 802.11ax HE160 (Band Edge @ 3m)

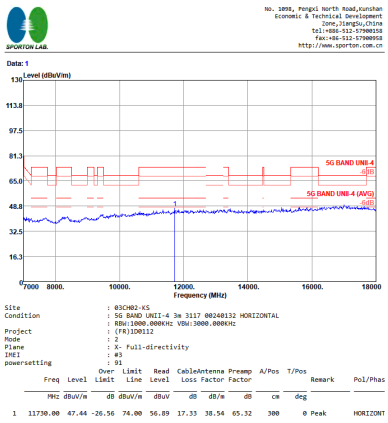
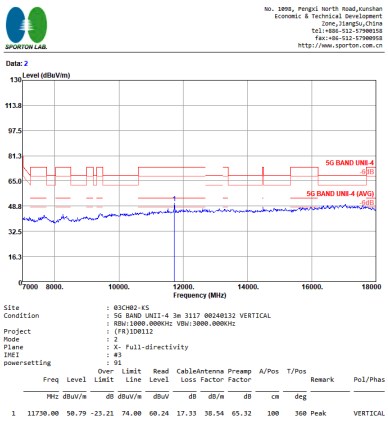
WIFI	Band 4 5850-5895MHz Band Edge @ 3m	
ANT	802.11ax HE160 CH163 5815MHz	
1	Horizontal	Fundamental
Peak		
Peak	Left blank	Left blank

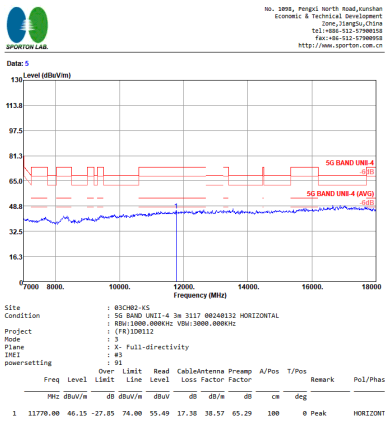
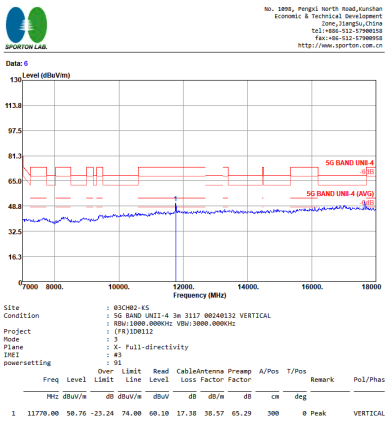
WIFI	Band 4 5850-5895MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH155 5775MHz	
1	Vertical	Fundamental
Peak		
Peak	Left blank	Left blank

Band 4 - 5850-5895MHz

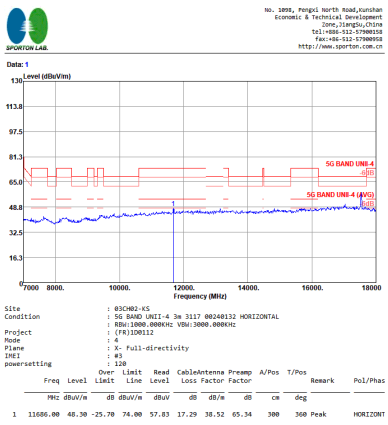
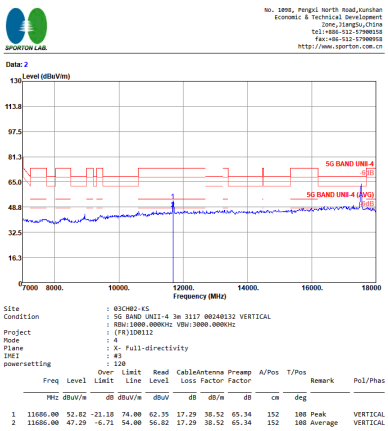
WIFI 802.11a (Harmonic @ 3m)

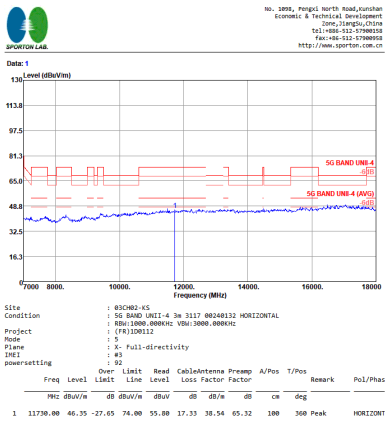
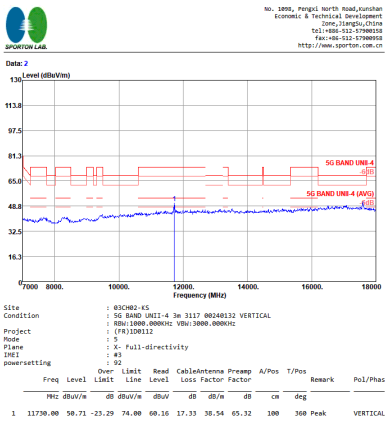
WIFI	Band 4 5850-5895MHz Harmonic @ 3m	
ANT	802.11a CH169 5845MHz	
1	Horizontal	Vertical
Peak Avg.		

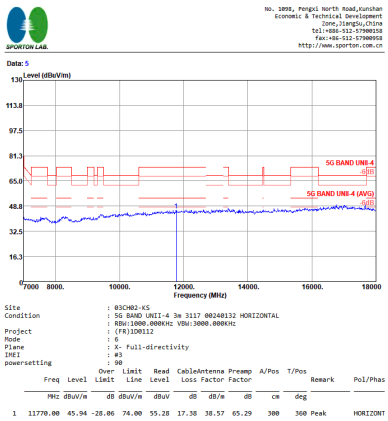
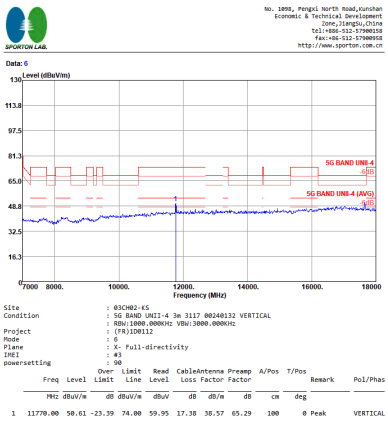
WIFI	Band 4 5850-5895MHz Harmonic @ 3m	
ANT	802.11a CH173 5865MHz	
1	Horizontal	Vertical
Peak Avg.		

WIFI	Band 4 5850-5895MHz Harmonic @ 3m	
ANT	802.11a CH177 5885MHz	
1	Horizontal	Vertical
Peak Avg.		

Band 4 5850-5895MHz
WIFI 802.11ax HE20 (Harmonic @ 3m)

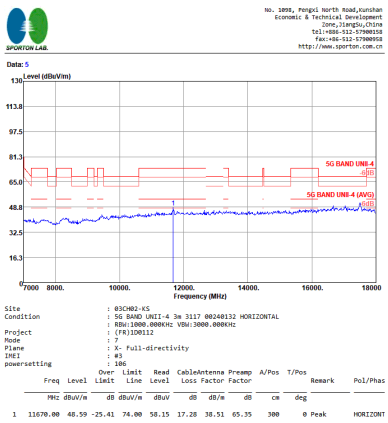
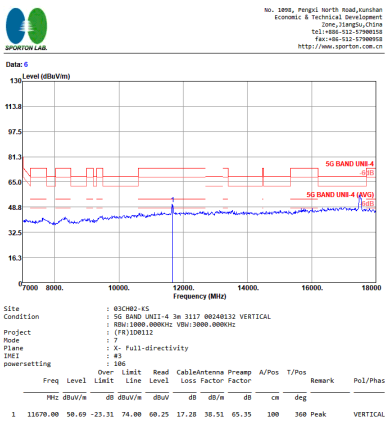
WIFI	Band 4 5850-5895MHz Harmonic @ 3m	
ANT	802.11ax HE20 CH169 5845MHz	
1	Horizontal	Vertical
Peak Avg.		

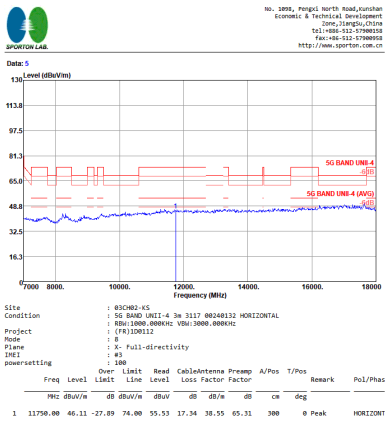
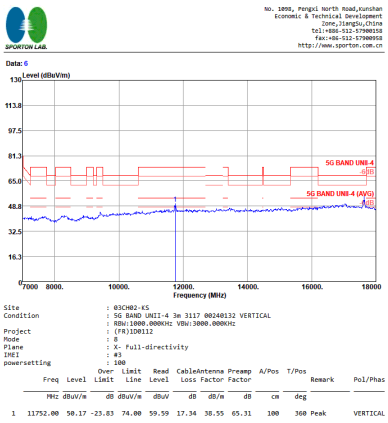
WIFI	Band 4 5850-5895MHz Harmonic @ 3m	
ANT	802.11ax HE20 CH173 5865MHz	
1	Horizontal	Vertical
Peak Avg.		

WIFI	Band 4 5850-5895MHz Harmonic @ 3m	
ANT	802.11ax HE20 CH177 5885MHz	
1	Horizontal	Vertical
Peak Avg.		

Band 4 5850-5895MHz

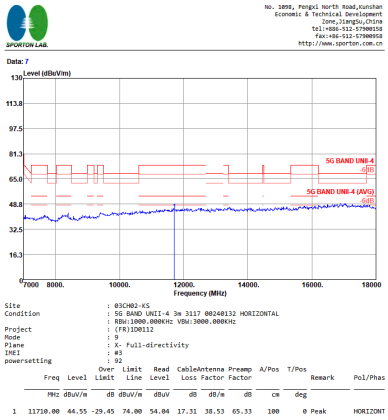
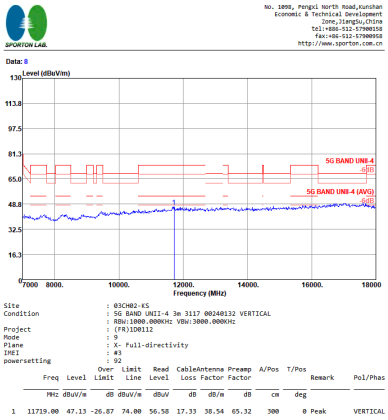
WIFI 802.11ax HE40 (Harmonic @ 3m)

WIFI	Band 4 5850-5895MHz Harmonic @ 3m	
ANT	802.11ax HE40 CH167 5835MHz	
1	Horizontal	Vertical
Peak Avg.		

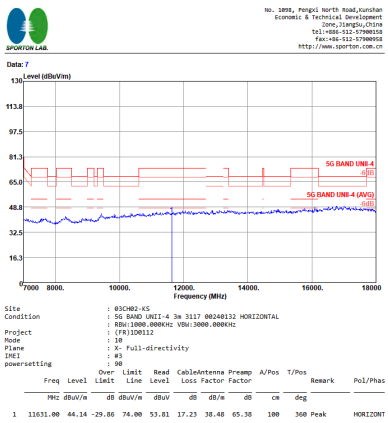
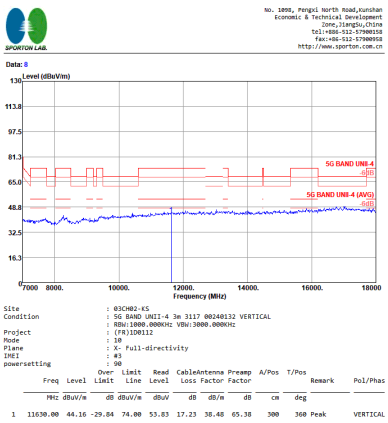
WIFI	Band 4 5850-5895MHz Harmonic @ 3m	
ANT	802.11ax HE40 CH175 5875MHz	
1	Horizontal	Vertical
Peak Avg.		

Band 4 5850-5895MHz

WIFI 802.11ax HE80 (Harmonic @ 3m)

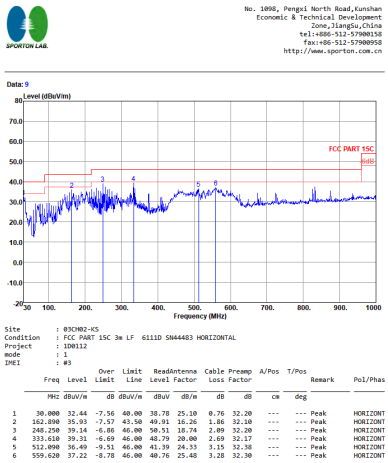
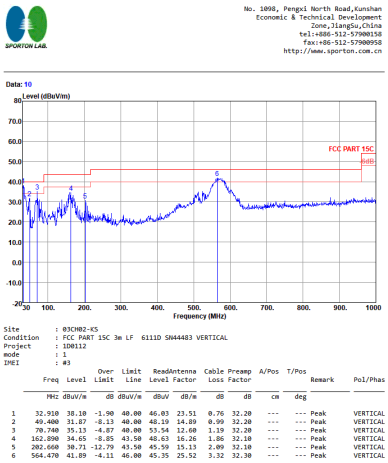
WIFI	Band 4 5850-5895MHz Harmonic @ 3m	
ANT	802.11ax HE80 CH171 5855MHz	
1	Horizontal	Vertical
Peak Avg.		

Band 4 5850-5895MHz
WIFI 802.11ax HE160 (Harmonic @ 3m)

WIFI	Band 4 5850-5895MHz Harmonic @ 3m	
ANT	802.11ax HE160 CH163 5815MHz	
1	Horizontal	Vertical
Peak Avg.		

Emission below 1GHz

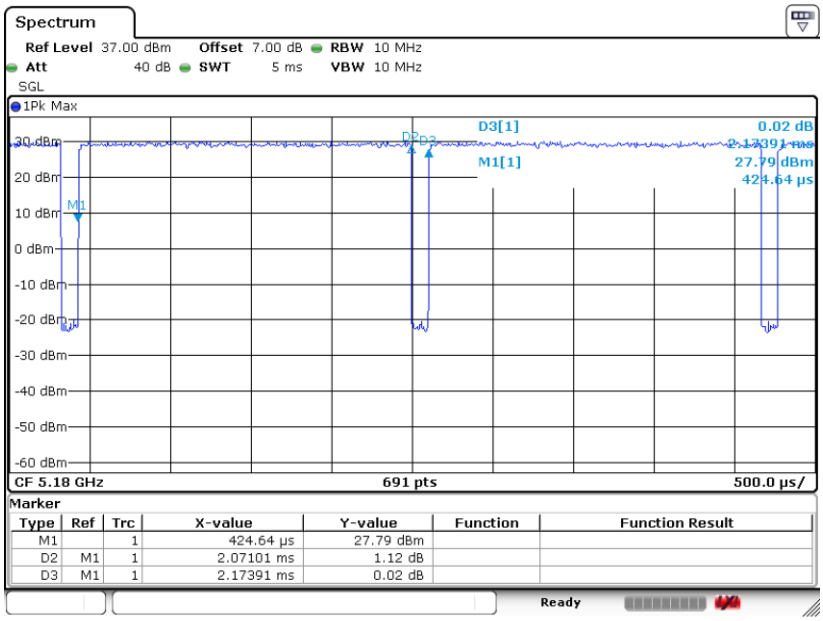
5GHz WIFI 802.11ax HE160 (LF)

WIFI	5GHz WIFI	
ANT	802.11ax HE160 LF	
1	Horizontal	Vertical
QP / Peak		

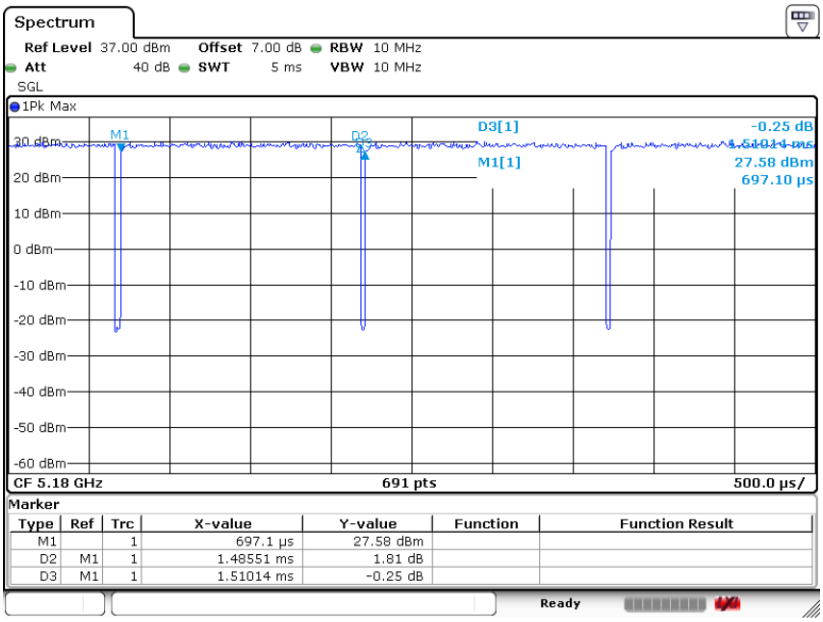
Appendix E. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
1+2	802.11a	95.27	2.071	0.483	0.51kHz
1+2	802.11ax HE20	98.37	-	-	10Hz
1+2	802.11ax HE40	96.07	0.780	1.283	1.3kHz
1+2	802.11ax HE80	92.21	0.412	2.430	2.7kHz
1+2	802.11ax HE160	88.11	0.236	4.237	4.3KHz

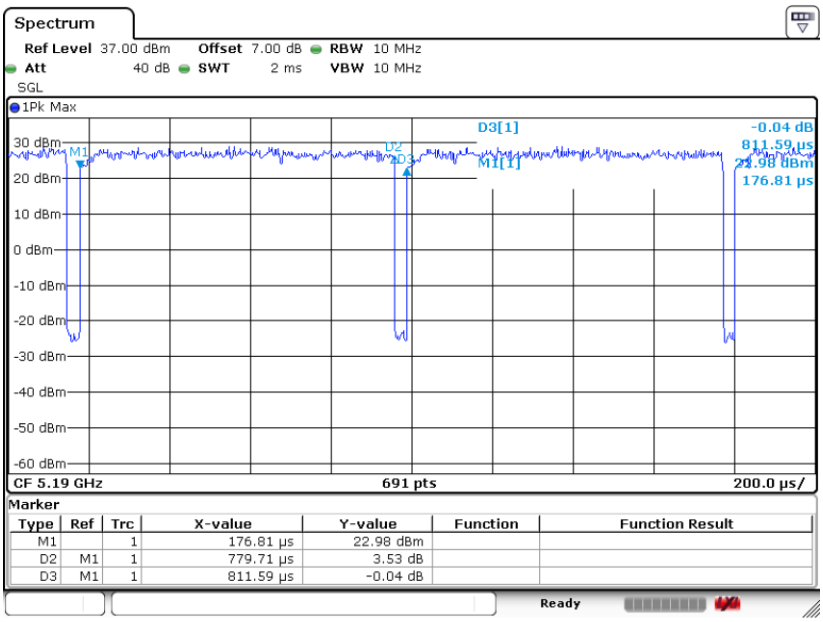
802.11a



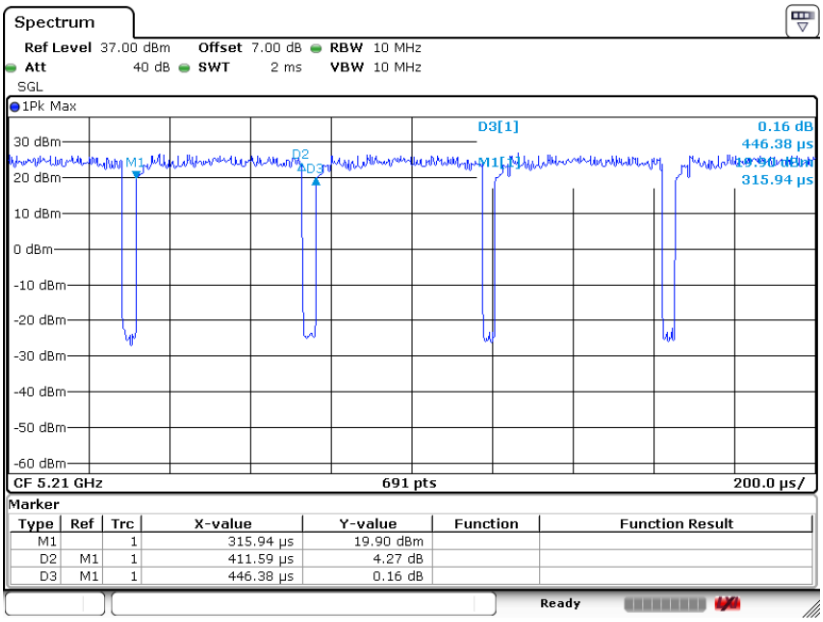
802.11ax HE20



802.11ax HE40



802.11ax HE80



802.11ax HE160