FCC RADIO TEST REPORT

FCC ID	:	**S9GR560**
Equipment	:	**R560 Access Point**
Brand Name	:	**RUCKUS**
Model Name	:	**R560**
Applicant	:	**Ruckus Wireless, Inc. 350 W. Java Dr., Sunnyvale CA 94089 USA**
Manufacturer	:	**Ruckus Wireless, Inc. 350 W. Java Dr., Sunnyvale CA 94089 USA**
Standard	:	**FCC Part 15 Subpart E §15.407**

The product was received on Jun. 26, 2022 and testing was performed from Jul. 14, 2022 to Sep. 09, 2022. We, Sporton International (USA) Inc., 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 from Sporton International (USA) Inc., the test report shall not be reproduced except in full.

Neil Kao

Approved by: Neil Kao

Sporton International (USA) Inc.
1175 Montague Expressway, Milpitas, CA 95035

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History of this test report

Report No.	Version	Description	Issue Date
FR220302001E	01	Initial issue of report	Sep. 21, 2022
FR220302001E	02	1. Revise section 1.1 2. Revise section 2.2	Oct. 05, 2022

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.403(i)	6dB & 26dB Bandwidth	Pass	-
3.1	2.1049	99% Occupied Bandwidth	Reporting only	-
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	0.81 dB under the limit at 11650.000 MHz
3.5	15.207	AC Conducted Emission	Pass	2.36 dB under the limit at 0.605 MHz
3.6	15.203	Antenna Requirement	Pass	-

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. Please refer to the section " Uncertainty of Evaluation " for measurement uncertainty.

Comments and Explanations:

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

1 General Description

1.1 Product Feature of Equipment Under Test

Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n/ac/ax, Wi-Fi 5GHz 802.11a/n/ac/ax, Wi-Fi 6GHz 802.11a/n/ac/ax and ZigBee.

Product Feature	
Antenna Type	**WLAN:** <Ant. 1>: Omni-Directional Antenna <Ant. 2>: Omni-Directional Antenna <Ant. 3>: Omni-Directional Antenna <Ant. 4>: Omni-Directional Antenna **Bluetooth:** Omni-Directional Antenna **ZigBee:** Omni-Directional Antenna

Antenna information			
5725 MHz ~ 5850 MHz	Peak Gain (dBi)	Horizontal	**<Ant. 3>:** 2.4
		Vertical	**<Ant. 1>:** 3.6

Remark:

1. The device is a special case of MIMO system with two outputs driving a cross-polarized pair of linearly polarized antennas which are vertically/horizontally mounted on the main board as indicated in equipment photo exhibits.
2. The EUT information mentioned or listed above is declared by manufacturer.

1.1.1 Antenna Gain

<For CDD Mode>

Follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01 F)2)c)i)

Cross-polarized antennas. For a system in which the antennas have fixed orientations relative to one another that ensure that the antennas are cross-polarized regardless of any user actions, the directional gain is computed as follows.

(i) Cross-polarized antennas with NANT = 2. In the case of a transmitter with only two outputs driving a pair of antennas that are cross-polarized (e.g., vertical and horizontal or left-circular and right-circular), directional gain is the gain of an individual antenna. If the two antennas have different gains, the larger gain applies.

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

	Ant 1 (dBi)	Ant 3 (dBi)	DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
Band IV	3.60	2.40	3.60	3.60	0.00	0.00

Calculation example:

If a device has two cross-polarized antenna, G_{ANT1}= 3.60dBi; G_{ANT2}=2.40dBi

Directional gain of power measurement = max(3.60, 2.40) = 3.60 dBi

Directional gain of PSD measurement = max(3.60, 2.40) = 3.60 dBi

Power and PSD limit reduction = Directional gain – 6dBi, (min = 0)

1.2 Modification of EUT

No modifications made to the EUT during the testing.

1.3 Testing Location

Test Site	Sporton International (USA) Inc.
Test Site Location	1175 Montague Expressway, Milpitas, CA 95035 TEL : 408 9043300
Test Site No.	**Sporton Site No.**
	TH01-CA, CO01-CA, 03CH02-CA

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC Designation No.: US1250

1.4 Applicable Standards

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

- FCC Part 15 Subpart E
- FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- FCC KDB 414788 D01 Radiated Test Site v01r01.
- FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ANSI C63.10-2013

Remark:

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.

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, the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and only the worst case emissions were reported 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)
5725-5850 MHz Band 4 (U-NII-3)	149	5745	157	5785
	151*	5755	159*	5795
	153	5765	161	5805
	155#	5775	165	5825

Note:

1. The above Frequency and Channel with "*" are 802.11n HT40 and 802.11ac VHT40 and 802.11ax HE40.
2. The above Frequency and Channel with "#" are 802.11ac VHT80 and 802.11ax HE80.

2.2 Test Mode

The final test modes include the worst data rates for each modulation shown in the table below.

MIMO Mode

Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20 (Covered by HE20)	MCS0
802.11n HT40 (Covered by HE40)	MCS0
802.11ac VHT20 (Covered by HE20)	MCS0
802.11ac VHT40 (Covered by HE40)	MCS0
802.11ac VHT80 (Covered by HE80)	MCS0
802.11ax HE20	MCS0
802.11ax HE40	MCS0
802.11ax HE80	MCS0

Remark:

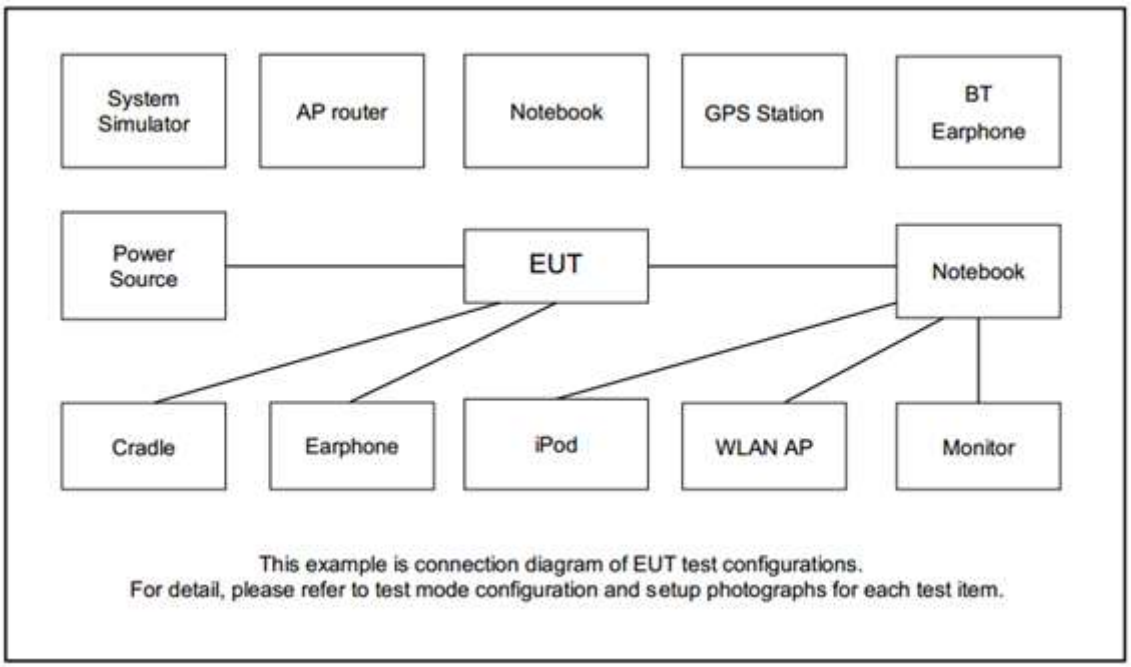
1. Based on the manufacturer's declaration, 802.11ax covers the 802.11n and 11ac due to the same modulation family scheme. For 802.11ax, only full resource unit assignment mode is tested since the EUT does not support partial resource unit assignment mode.
2. Based on the manufacturer's declaration, RF power on each chain in MIMO mode is parameterized to be greater than the power in SISO mode, giving the condition that the SISO Mode is covered by MIMO Mode which is deemed the worst case selected for testing.

Test Cases	
AC Conducted Emission	Mode 1 : WLAN (2.4GHz) Link + Zigbee Tx + WLAN (5GHz) Link + Lan 1 Link + Lan 2 Link + USB Dongle (Load) + PoE

Ch. #		Band IV : 5725-5850 MHz			
		802.11a	802.11ax HE20	802.11ax HE40	802.11ax HE80
L	Low	149	149	151	-
M	Middle	157	157	-	155
H	High	165	165	159	-

Remark: For radiation spurious emission, the modulation and the data rate picked for testing are determined by the Max. RF conducted power.

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	PoE Adapter	Ruckus	740-64214-001	NA	NA	Unshielded, 1.8 m
2.	USB Dongle	SanDisk	SDCZ60-016G	NA	NA	NA
3.	Notebook	Lenovo	20BX001CUS	NA	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	Notebook	Lenovo	21EB0020US	NA	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	Notebook	Acer	Altos PS548-G1	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m

2.5 EUT Operation Test Setup

The RF test items, utility “PuTTY Release 0.75” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

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 4.2 dB and 10 dB attenuator.

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

= 4.2 + 10 = 14.2 (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.

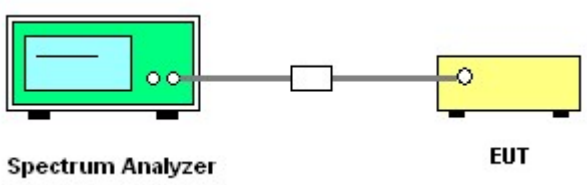
3.1.2 Measuring Instruments

Please refer to the measuring equipment list in 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) Emission bandwidth for the band 5.725-5.85 GHz
2. Set RBW = 100 kHz.
3. 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

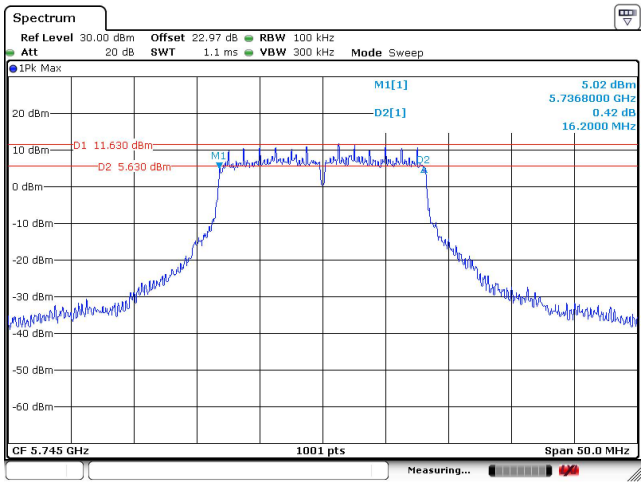
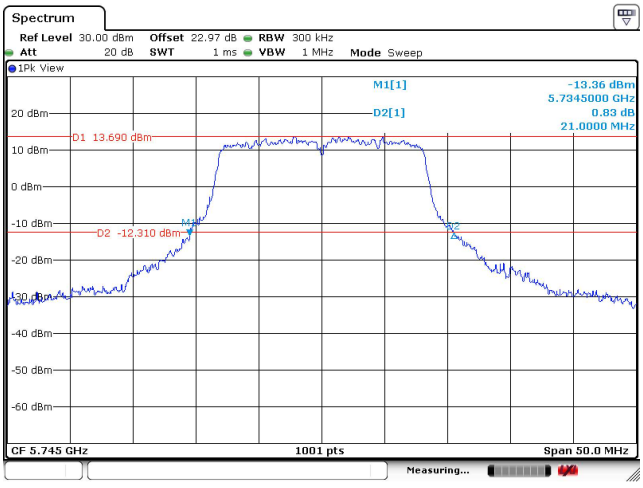
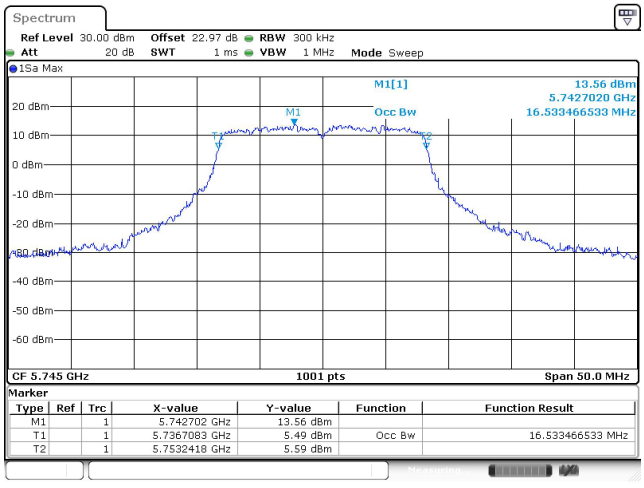


3.1.5 Test Result of 6dB and 26dB and 99% Occupied Bandwidth

Please refer to Appendix A.

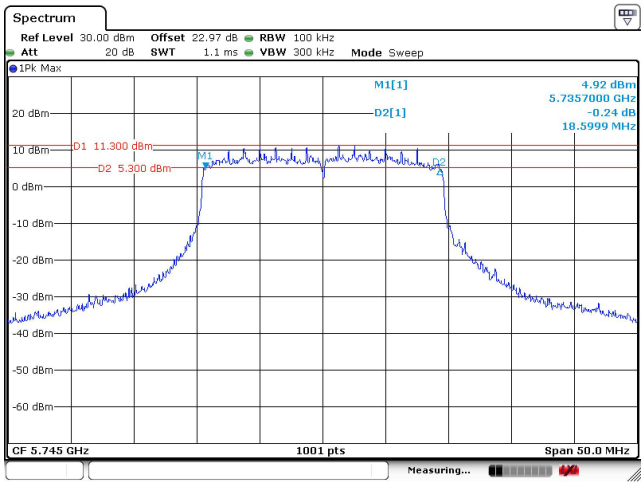
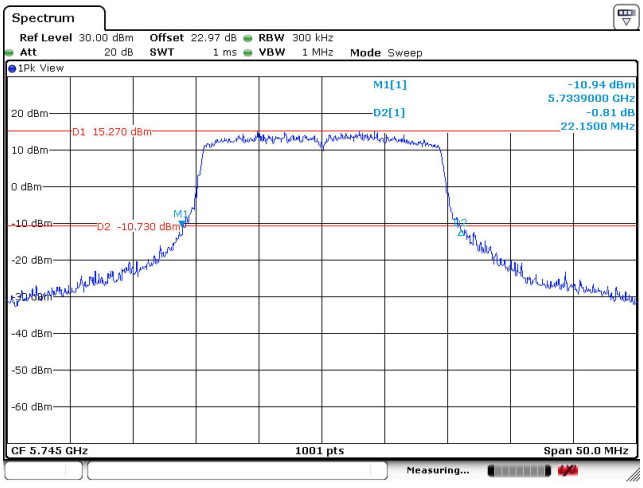
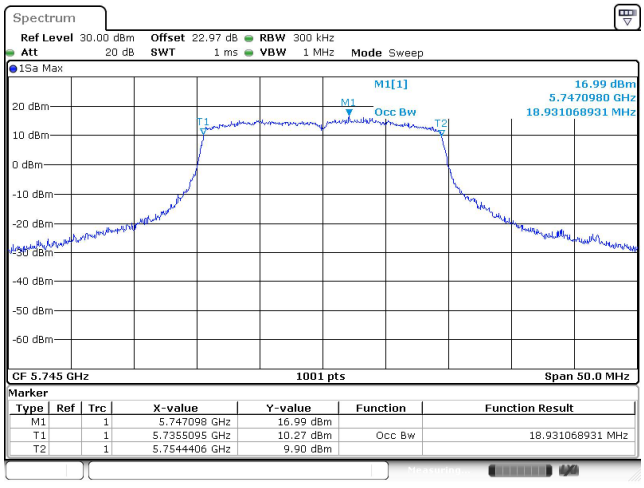
MIMO <Ant. 1 + Ant. 3>

<802.11a>

6dB Bandwidth	26dB Bandwidth
	
99% Occupied Bandwidth	**NA**
	

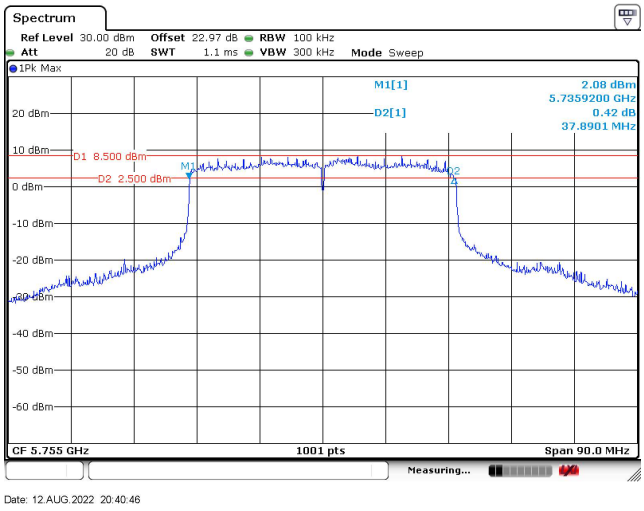
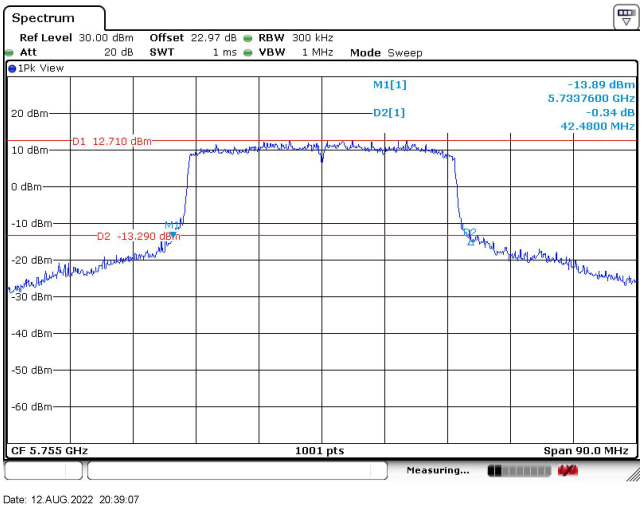
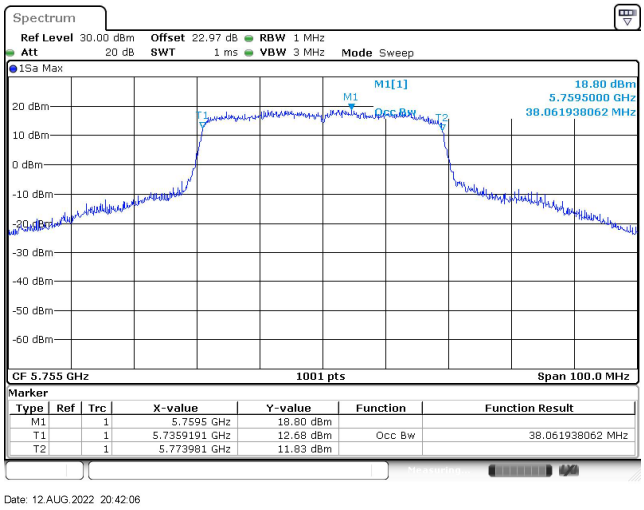
Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

<802.11ax HE20>

6dB Bandwidth	26dB Bandwidth
	
99% Occupied Bandwidth	**NA**
	

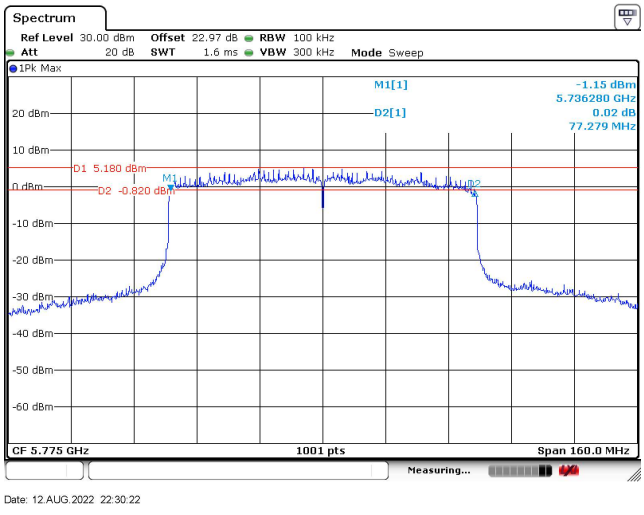
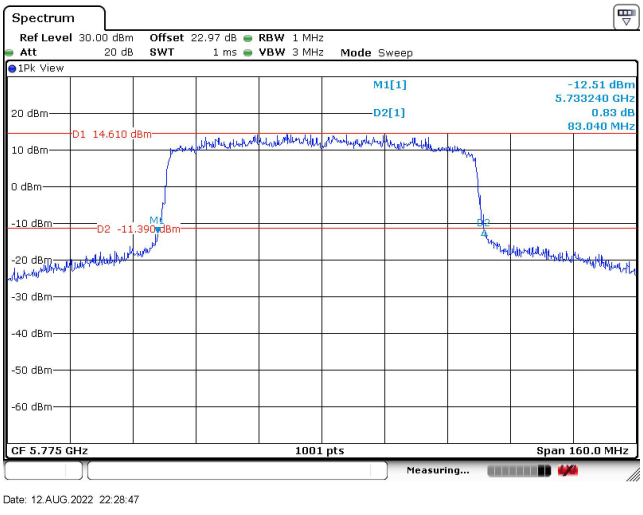
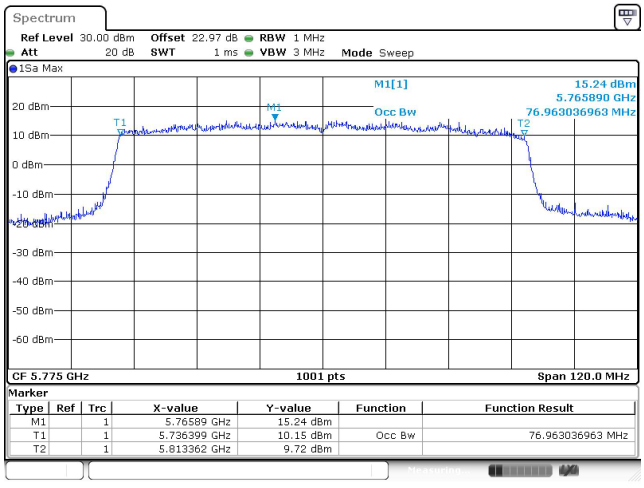
Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

<802.11ax HE40>

6dB Bandwidth	26dB Bandwidth
	
99% Occupied Bandwidth	**NA**
	

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

<802.11ax HE80>

6dB Bandwidth	26dB Bandwidth
	
99% Occupied Bandwidth	**NA**
	

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

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

3.2.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

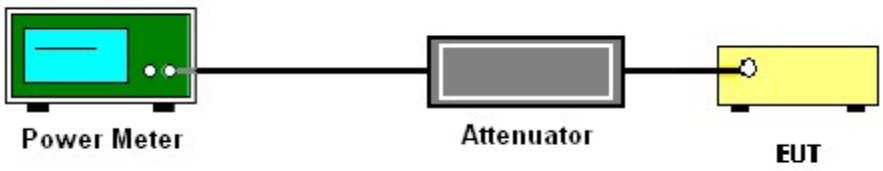
3.2.3 Test Procedures

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

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.
5. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01

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

For the band 5.725–5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz 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

Please refer to the measuring equipment list in this test report.

3.3.3 Test Procedures

The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01. Section F) Maximum power spectral density.

 # Method SA-2 #

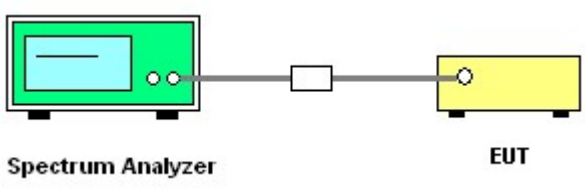
(trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

- Measure the duty cycle.
- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 300kHz.
- Set VBW ≥ 1 MHz.
- Add 10 log (500 kHz/RBW) to the measured result, whereas RBW (<500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement
- 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.

1. The RF output of EUT is 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 (c): Measure and add 10 log(N_{ANT}) dB.
With this technique, spectrum measurements are performed at each output of the device, but rather than summing the spectra or the spectral peaks across the outputs, the quantity 10 log(N_{ANT}) dB is added to each spectrum value before comparing to the emission limit. The addition of 10 log(N_{ANT}) dB serves to apportion the emission limit among the N_{ANT} outputs so that each output is permitted to contribute no more than $1/N_{ANT}$ th of the PSD limit.

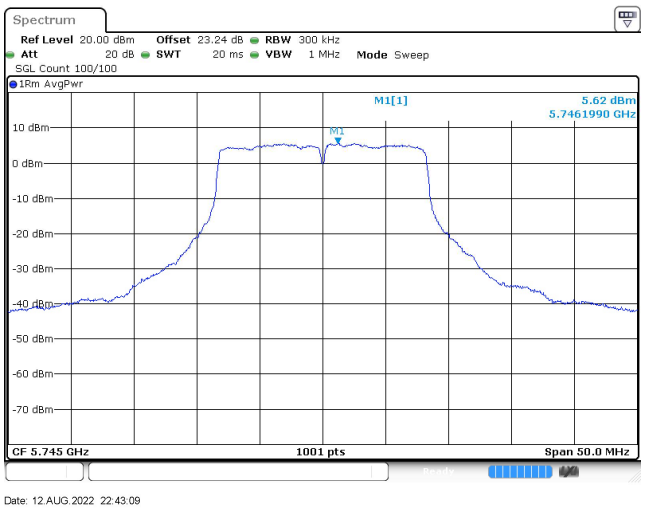
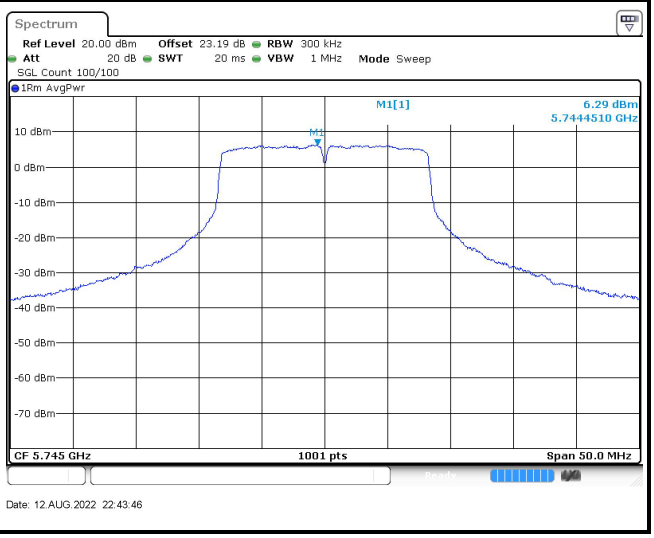
3.3.4 Test Setup



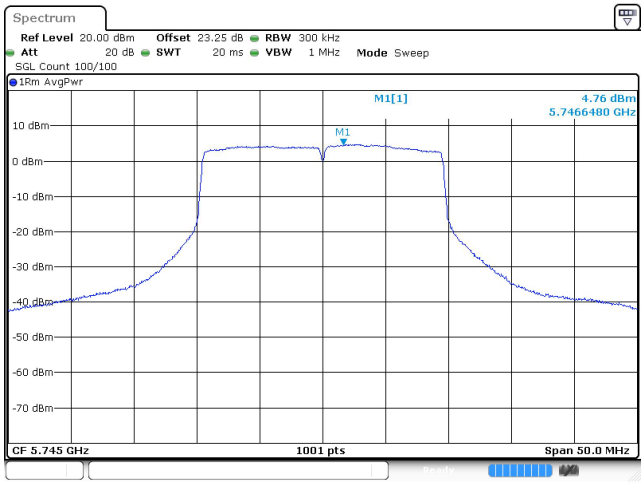
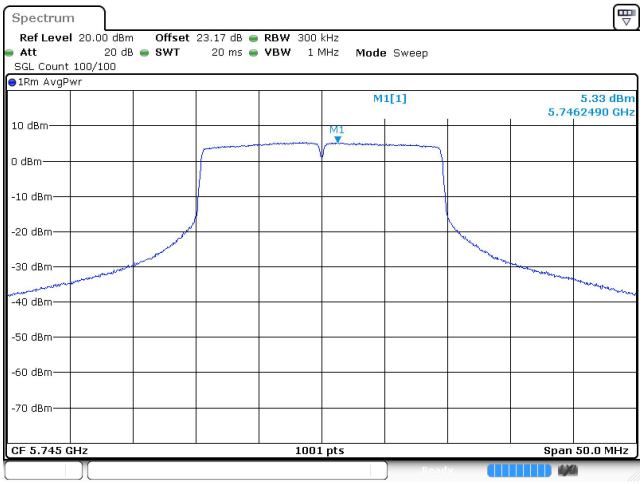
3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

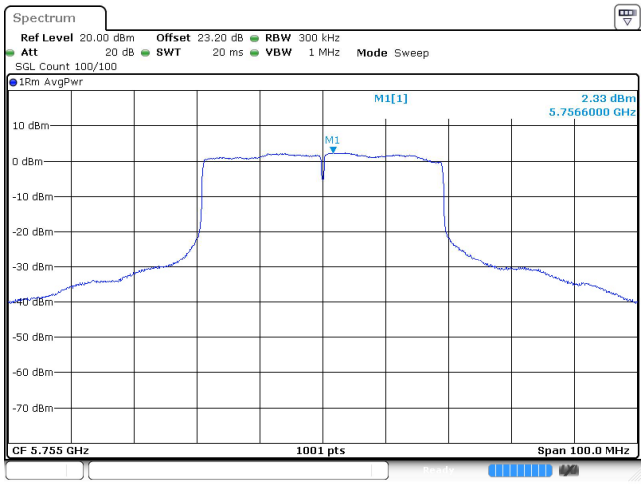
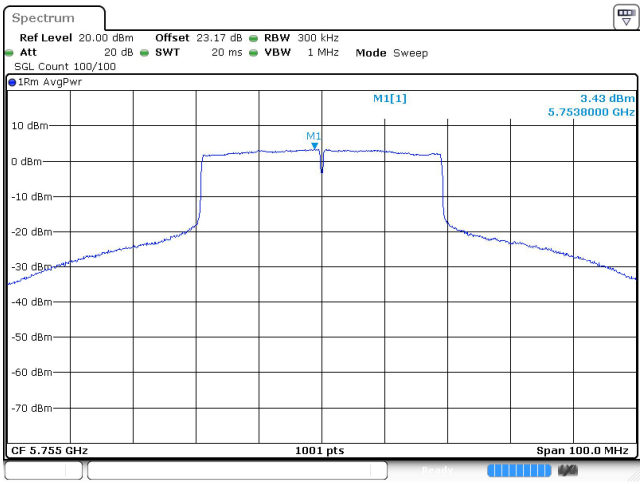
<802.11a>

Maximum Power Density Plot (dBm/300kHz)	
MIMO Ant. 1	**MIMO Ant. 3**
	

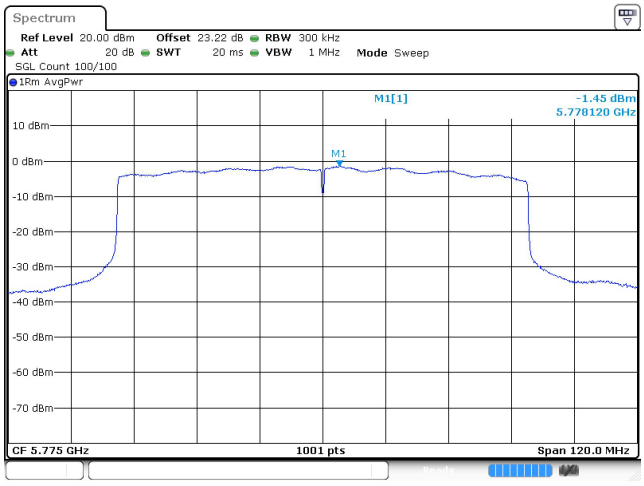
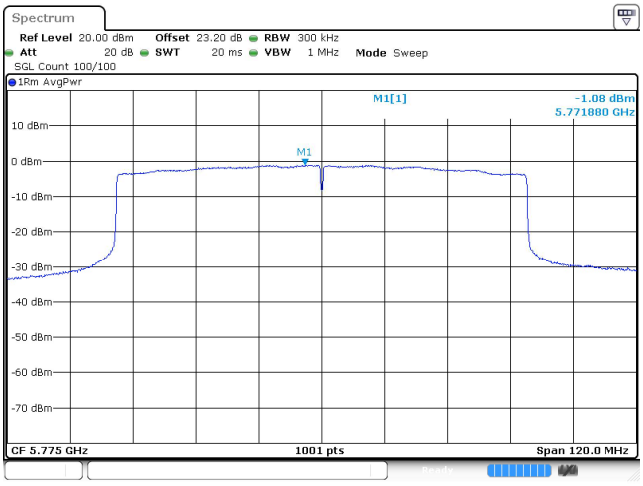
<802.11ax HE20>

Maximum Power Density Plot (dBm/300kHz)	
MIMO Ant. 1	**MIMO Ant. 3**
	

<802.11ax HE40>

Maximum Power Density Plot (dBm/300kHz)	
MIMO Ant. 1	**MIMO Ant. 2**
	

<802.11ax HE80>

Maximum Power Density Plot (dBm/300kHz)	
MIMO Ant. 1	**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) For transmitters operating in the 5.725-5.85 GHz band:

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

(2) Unwanted spurious emissions falls 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

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

$$E=\frac{1000000\sqrt{30P}}{3}$$ μV/m, where P is the eirp (Watts)

EIRP (dBm)	Field Strength at 3m (dBμV/m)
- 27	68.3

(3) KDB789033 D02 v02r01 G)2)c)

(i) Sections 15.407(b)(1-3) specifies the unwanted emissions limit for the U-NII-1 and U-NII-2 bands. As specified, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of −27 dBm/MHz.

(ii) Section 15.407(b)(4) specifies the unwanted emissions limit for the U-NII-3 band. A band emissions mask is specified in Section 15.407(b)(4)(i). The emission limits are based on the use of a peak detector.

3.4.2 Measuring Instruments

Please refer to the measuring equipment list in 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 1000 MHz

   - 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 1000 MHz

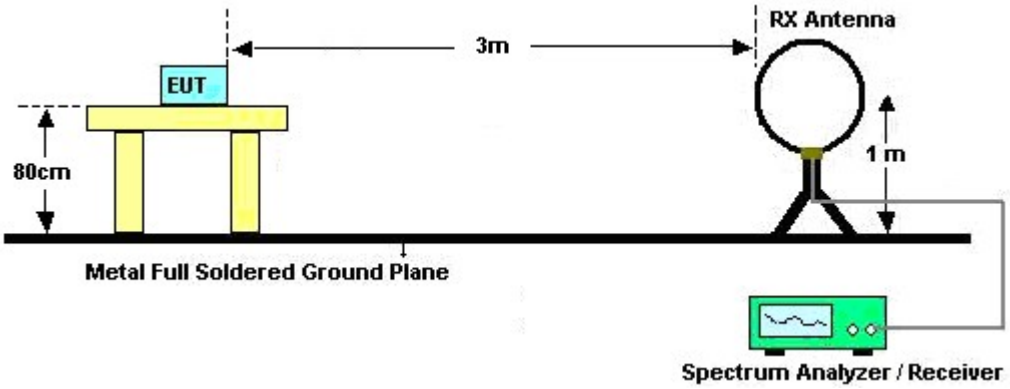
   - RBW = 1 MHz
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
2. The EUT is placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
3. The EUT is set 3 meters away from the receiving antenna which is 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 is 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. Radiated testing below 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6 dB margin

against QP limit line, the position is marked as "-"..

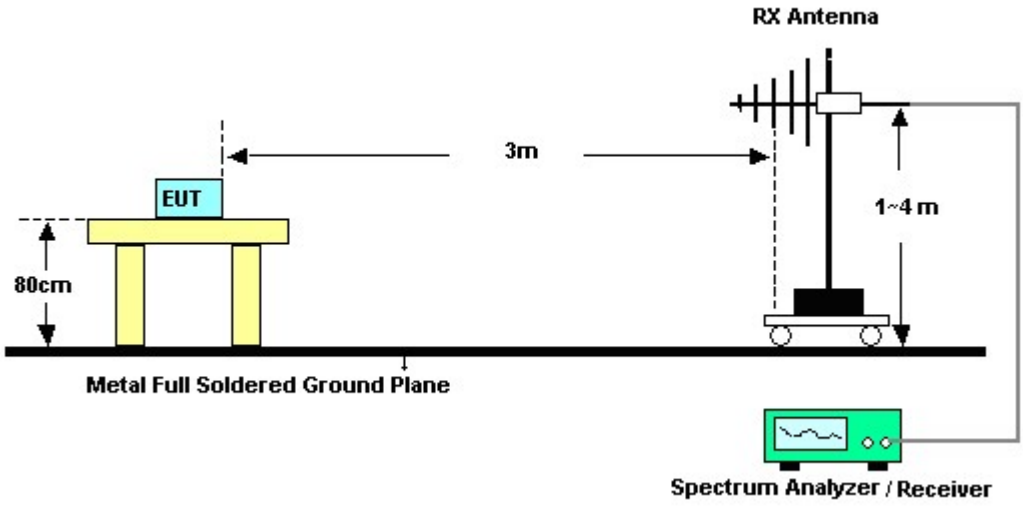
7. Radiated testing above 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading for scanning all frequencies.
   When there is no suspected emission found and the harmonic emission level is with at least 6 dB margin against average limit line, the position is marked as "-".

3.4.4 Test Setup

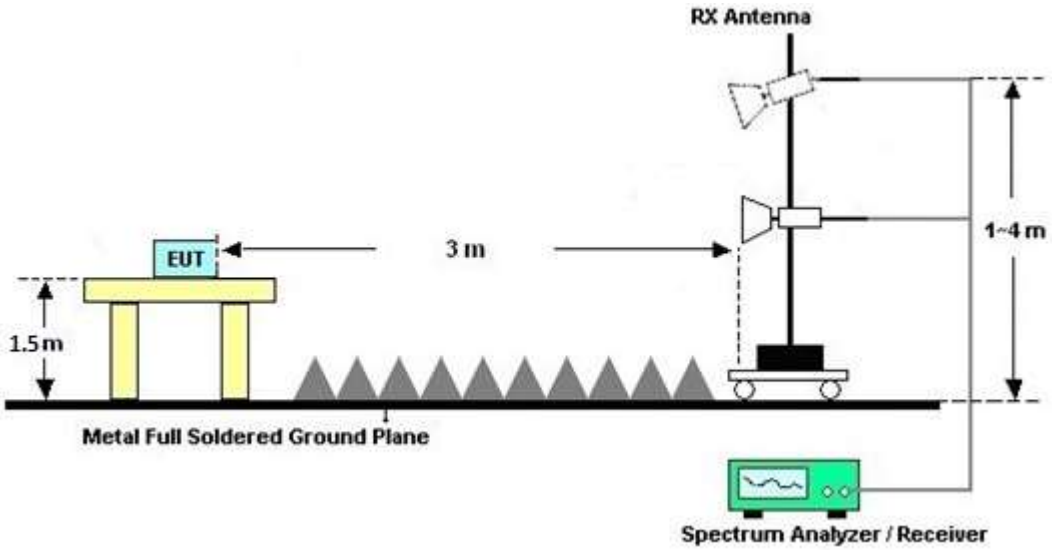
For radiated emissions below 30MHz



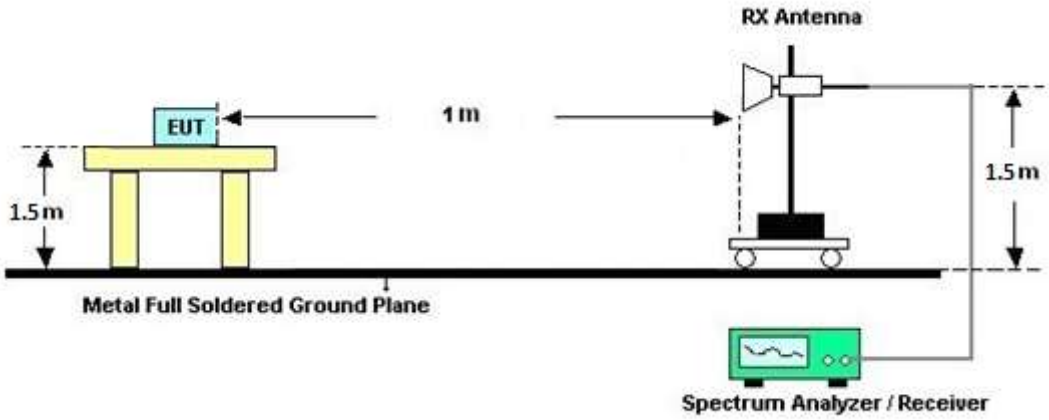
For radiated emissions from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated test above 18GHz



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

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

There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

3.4.6 Test Result of Radiated Band Edges

Please refer to Appendix C and D.

3.4.7 Duty Cycle

Please refer to Appendix E.

3.4.8 Test Result of Unwanted Radiated Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix C and 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.

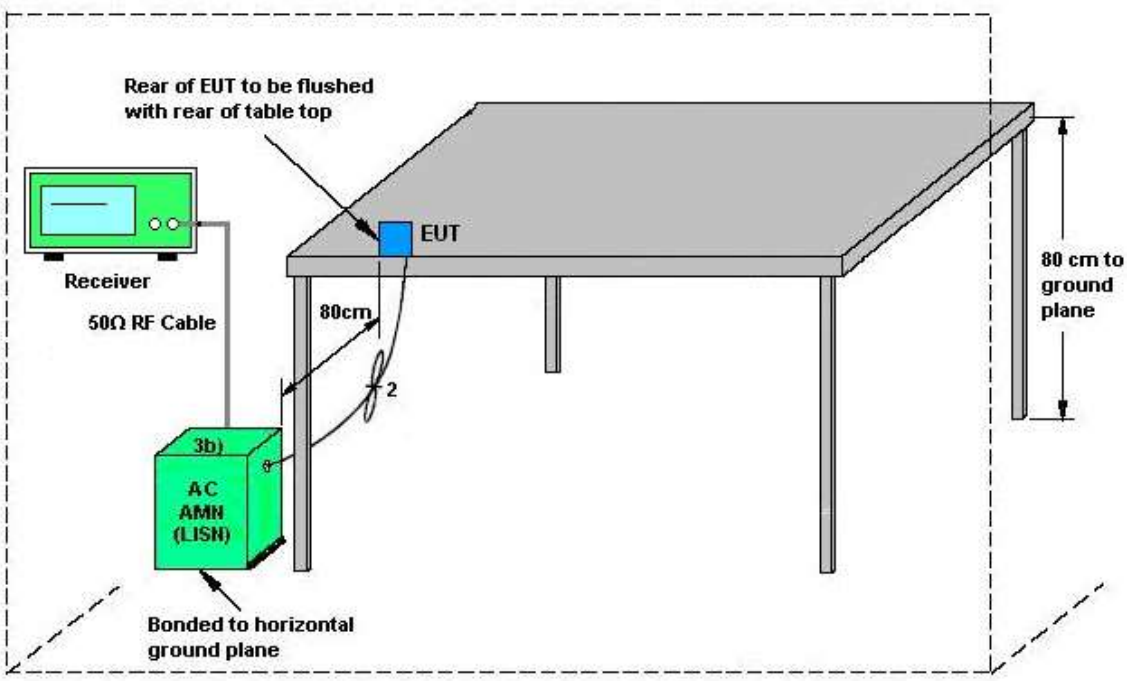
3.5.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.5.3 Test Procedures

1. The EUT is placed 0.4 meter away from the conducting wall of the shielding room, and is 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 shall be used.
6. Both Line and Neutral shall be tested in order to find out the maximum conducted emission.
7. The frequency range from 150 kHz to 30 MHz is scanned.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

3.5.4 Test Setup



AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

3.5.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.6 Antenna Requirements

3.6.1 Standard Applicable

The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

3.6.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
LISN	TESEQ	NNB51	47407	N/A	May 10, 2022	Aug. 18, 2022~ Sep. 08, 2022	May 09, 2023	Conduction (CO01-CA)
LISN	TESEQ	NNB51	47415	N/A	May 10, 2022	Aug. 18, 2022~ Sep. 08, 2022	May 09, 2023	Conduction (CO01-CA)
EMI Test Receiver	R&S	ESR7	102177	9kHz~7GHz	May 31, 2022	Aug. 18, 2022~ Sep. 08, 2022	May 30, 2023	Conduction (CO01-CA)
Pulse limiter with 10dB attenuation	R&S	VTSD 9561-F N	9561-F-N00412	N/A	Jul. 05, 2022	Aug. 18, 2022~ Sep. 08, 2022	Jul. 04, 2023	Conduction (CO01-CA)
Test Software	R&S	EMC32 V10.30.0	N/A	N/A	N/A	Aug. 18, 2022~ Sep. 08, 2022	N/A	Conduction (CO01-CA)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100840	9kHz~30MHz	Jul. 05, 2022	Jul. 14, 2022~ Sep. 09, 2022	Jul. 04, 2023	Radiation (03CH02-CA)
Bilog Antenna	TESEQ	6111D	50392	30MHz~1GHz	Jul. 11, 2022	Jul. 14, 2022~ Sep. 09, 2022	Jul. 10, 2023	Radiation (03CH02-CA)
Horn Antenna	SCHWARZBECK	BBHA 9120D	01895	1GHz~18GHz	Aug. 25, 2021	Jul. 14, 2022~ Aug. 23, 2022	Aug. 24, 2022	Radiation (03CH02-CA)
Horn Antenna	SCHWARZBECK	BBHA 9120D	02113	1GHz~18GHz	Jun. 22, 2022	Aug. 24, 2022~ Sep. 09, 2022	Jun. 21, 2023	Radiation (03CH02-CA)
Horn Antenna	SCHWARZBECK	BBHA 9170D	00841	18GHz~40GHz	Aug. 26, 2021	Jul. 14, 2022~ Aug. 24, 2022	Aug. 25, 2022	Radiation (03CH02-CA)
Horn Antenna	SCHWARZBECK	BBHA 9170D	00842	18GHz~40GHz	Aug. 16, 2022	Aug. 25, 2022~ Sep. 09, 2022	Aug. 15, 2023	Radiation (03CH02-CA)
Amplifier	SONOMA	310N	372240	N/A	May 10, 2022	Jul. 14, 2022~ Sep. 09, 2022	May 09, 2023	Radiation (03CH02-CA)
Preamplifier	Keysight	83017A	MY53270323	1GHz~26.5GHz	May 11, 2022	Jul. 14, 2022~ Sep. 09, 2022	May 10, 2023	Radiation (03CH02-CA)
Preamplifier	E-instrument	ERA-100M-18G-56-01-A70	EC1900251	1GHz~18GHz	May 10, 2022	Jul. 14, 2022~ Sep. 09, 2022	May 09, 2023	Radiation (03CH02-CA)
Preamplifier	EMEC	EMC18G40G	060726	18GHz-40GHz	Feb. 10, 2022	Jul. 14, 2022~ Sep. 09, 2022	Feb. 09, 2023	Radiation (03CH02-CA)
RF Cable	HUBER+SUHNER	SUCOFLEX 102	8024032/2, 802406/2, 802875/2	N/A	Jun. 22, 2022	Jul. 14, 2022~ Sep. 09, 2022	Jun. 21, 2023	Radiation (03CH02-CA)
Spectrum Analyzer	Keysight	N9010A	MY57420221	10Hz~44GHz	Sep. 22, 2021	Jul. 14, 2022~ Sep. 09, 2022	Sep. 21, 2022	Radiation (03CH02-CA)
Filter	Wainwright	WHKX8-5872.5-6750-18000-40ST	SN8	6.75GHz High Pass Filter	Jul. 22, 2021	Jul. 14, 2022~ Jul. 20, 2022	Jul. 21, 2022	Radiation (03CH02-CA)
Filter	Wainwright	WHKX8-5872.5-6750-18000-40ST	SN8	6.75GHz High Pass Filter	Jul. 21, 2022	Jul. 21, 2022~ Sep. 09, 2022	Jul. 20, 2023	Radiation (03CH02-CA)
Filter	Wainwright	WLK12-1200-12 72-11000-40SS	SN1	1.2GHz Low Pass Filter	Jul. 22, 2021	Jul. 14, 2022~ Jul. 20, 2022	Jul. 21, 2022	Radiation (03CH02-CA)
Filter	Wainwright	WLK12-1200-12 72-11000-40SS	SN1	1.2GHz Low Pass Filter	Jul. 21, 2022	Jul. 21, 2022~ Sep. 09, 2022	Jul. 20, 2023	Radiation (03CH02-CA)
Hygrometer	TESEO	608-H1	45142602	N/A	Aug. 30, 2021	Jul. 14, 2022~ Aug. 15, 2022	Aug. 29, 2022	Radiation (03CH02-CA)
Hygrometer	TESEO	608-H1	45142601	N/A	Jul. 27, 2022	Aug. 16, 2022~ Sep. 09, 2022	Jul. 26, 2023	Radiation (03CH02-CA)
Controller	ChainTek	EM-1000	060876	NA	N/A	Jul. 14, 2022~ Sep. 09, 2022	N/A	Radiation (03CH02-CA)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Jul. 14, 2022~ Sep. 09, 2022	N/A	Radiation (03CH02-CA)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Jul. 14, 2022~ Sep. 09, 2022	N/A	Radiation (03CH02-CA)
Software	Audix	E3	N/A	N/A	N/A	Jul. 14, 2022~ Sep. 09, 2022	N/A	Radiation (03CH02-CA)

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Hygrometer	Testo	608-H1	45142595	N/A	Aug. 30, 2021	Aug. 12, 2022	Aug. 29, 2022	Conducted (TH01-CA)
Power Sensor	DARE!!	RPR3006W	RPR6W-1901026	10MHz-6GHz	May 10, 2022	Aug. 12, 2022	May 09, 2023	Conducted (TH01-CA)
Switch Box	EM Electronics	EMSW26	1090304	N/A	Mar. 30, 2022	Aug. 12, 2022	Mar. 29, 2023	Conducted (TH01-CA)
Spectrum Analyzer	Rohde & Schwarz	FSV40	101089	10Hz-40GHz	Jun. 01, 2022	Aug. 12, 2022	May 31, 2023	Conducted (TH01-CA)

5 Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.0 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.7dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	6.2 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	6.4 dB

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Liliana Gonzalez	Temperature:	22.5~24	°C
Test Date:	2022/8/12	Relative Humidity:	49.5~50.2	%

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

Band IV 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 3	Ant 1	Ant 3	Ant 1	Ant 3		
11a	6Mbps	2	149	5745	16.53	16.58	21.00	22.75	16.20	16.05	0.5	Pass
11a	6Mbps	2	157	5785	16.53	16.88	21.55	26.85	15.75	16.40	0.5	Pass
11a	6Mbps	2	165	5825	16.98	20.28	28.35	35.65	15.45	16.40	0.5	Pass

TEST RESULTS DATA
Average Power Table

Band IV MIMO												
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		Pass/Fail
					Ant 1	Ant 3	SUM	Ant 1	Ant 3	Ant 1	Ant 3	
11a	6Mbps	2	149	5745	22.39	23.22	25.84	30.00		3.60		Pass
11a	6Mbps	2	157	5785	21.60	22.64	25.16	30.00		3.60		Pass
11a	6Mbps	2	165	5825	21.51	22.72	25.17	30.00		3.60		Pass
HT20	MCS0	2	149	5745	21.92	23.00	25.50	30.00		3.60		Pass
HT20	MCS0	2	157	5785	21.40	22.26	24.86	30.00		3.60		Pass
HT20	MCS0	2	165	5825	21.24	22.55	24.95	30.00		3.60		Pass
HT40	MCS0	2	151	5755	22.76	23.89	26.37	30.00		3.60		Pass
HT40	MCS0	2	159	5795	22.40	23.37	25.92	30.00		3.60		Pass
VHT20	MCS0	2	149	5745	21.84	23.07	25.51	30.00		3.60		Pass
VHT20	MCS0	2	157	5785	21.19	22.42	24.86	30.00		3.60		Pass
VHT20	MCS0	2	165	5825	21.39	22.52	25.00	30.00		3.60		Pass
VHT40	MCS0	2	151	5755	22.71	23.93	26.37	30.00		3.60		Pass
VHT40	MCS0	2	159	5795	22.39	23.38	25.92	30.00		3.60		Pass
VHT80	MCS0	2	155	5775	21.36	22.22	24.82	30.00		3.60		Pass

Note 1: The device has 2 antennas, each one has polarization which is orthogonal to the other.

TEST RESULTS DATA
Power Spectral Density

Band IV MIMO																
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)		10log (500kHz /RBW) Factor (dB)		Average Power Density with Duty Factor (dBm/500kHz)			Average PSD Limit (dBm/500kHz)		DG (dBi)		Pass /Fail
					Ant 1	Ant 3	Ant 1	Ant 3	Ant 1	Ant 3	SUM	Ant 1	Ant 3	Ant 1	Ant 3	
11a	6Mbps	2	149	5745	0.27	0.27	2.22		8.11	8.77	11.78	30.00		3.60		Pass
11a	6Mbps	2	157	5785	0.27	0.27	2.22		7.55	8.23	11.24	30.00		3.60		Pass
11a	6Mbps	2	165	5825	0.27	0.27	2.22		7.43	8.54	11.55	30.00		3.60		Pass

Note 1: The device has 2 antennas, each one has polarization which is orthogonal to the other.
Note 2: PSD Sum = Max PSD(Ant. 1, Ant. 3) + 10 log (n)

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

Band IV MIMO													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	99% Bandwidth (MHz)		26dB Bandwidth (MHz)		6 dB Bandwidth (MHz)		6 dB Bandwidth Min. Limit (MHz)	Pass/Fail
						Ant 1	Ant 3	Ant 1	Ant 3	Ant 1	Ant 3		
HE20	MCS0	2	149	5745	Full	18.93	18.98	22.15	22.45	18.60	18.55	0.5	Pass
HE20	MCS0	2	157	5785	Full	18.98	19.13	22.40	26.40	18.50	18.60	0.5	Pass
HE20	MCS0	2	165	5825	Full	19.18	20.28	30.10	36.35	18.35	18.35	0.5	Pass
HE40	MCS0	2	151	5755	Full	38.06	38.66	42.48	63.45	37.89	38.25	0.5	Pass
HE40	MCS0	2	159	5795	Full	38.56	46.05	64.17	82.44	38.16	38.16	0.5	Pass
HE80	MCS0	2	155	5775	Full	76.96	77.20	83.04	83.20	77.28	75.52	0.5	Pass

TEST RESULTS DATA
Average Power Table

Band IV MIMO													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		Pass/Fail
						Ant 1	Ant 3	SUM	Ant 1	Ant 3	Ant 1	Ant 3	
HE20	MCS0	2	149	5745	Full	22.16	22.89	25.55	30.00		3.60		Pass
HE20	MCS0	2	157	5785	Full	21.27	22.40	24.88	30.00		3.60		Pass
HE20	MCS0	2	165	5825	Full	21.46	22.53	25.04	30.00		3.60		Pass
HE40	MCS0	2	151	5755	Full	22.77	23.91	26.39	30.00		3.60		Pass
HE40	MCS0	2	159	5795	Full	22.41	23.40	25.94	30.00		3.60		Pass
HE80	MCS0	2	155	5775	Full	21.41	22.21	24.84	30.00		3.60		Pass

Note 1: The device has 2 antennas, each one has polarization which is orthogonal to the other.

TEST RESULTS DATA
Power Spectral Density

Band IV MIMO																	
Mod.	Data Rate	NTx	CH.	Freq. (MHz)	RU Config.	Duty Factor (dB)		10log (500kHz /RBW) Factor (dB)		Average Power Density with Duty Factor (dBm/500kHz)			Average PSD Limit (dBm/500kHz)		DG (dBi)		Pass /Fail
						Ant 1	Ant 3	Ant 1	Ant 3	Ant 1	Ant 3	SUM	Ant 1	Ant 3	Ant 1	Ant 3	
HE20	MCS0	2	149	5745	Full	0.28	0.25	2.22		7.26	7.80	10.81	30.00		3.60		Pass
HE20	MCS0	2	157	5785	Full	0.28	0.25	2.22		6.57	7.26	10.27	30.00		3.60		Pass
HE20	MCS0	2	165	5825	Full	0.28	0.25	2.22		6.56	7.73	10.74	30.00		3.60		Pass
HE40	MCS0	2	151	5755	Full	0.23	0.25	2.22		4.78	5.90	8.91	30.00		3.60		Pass
HE40	MCS0	2	159	5795	Full	0.23	0.25	2.22		4.83	5.44	8.45	30.00		3.60		Pass
HE80	MCS0	2	155	5775	Full	0.25	0.28	2.22		1.02	1.42	4.43	30.00		3.60		Pass

Note 1: The device has 2 antennas, each one has polarization which is orthogonal to the other.
Note 2: PSD Sum = Max PSD(Ant. 1, Ant. 3) + 10 log (n)

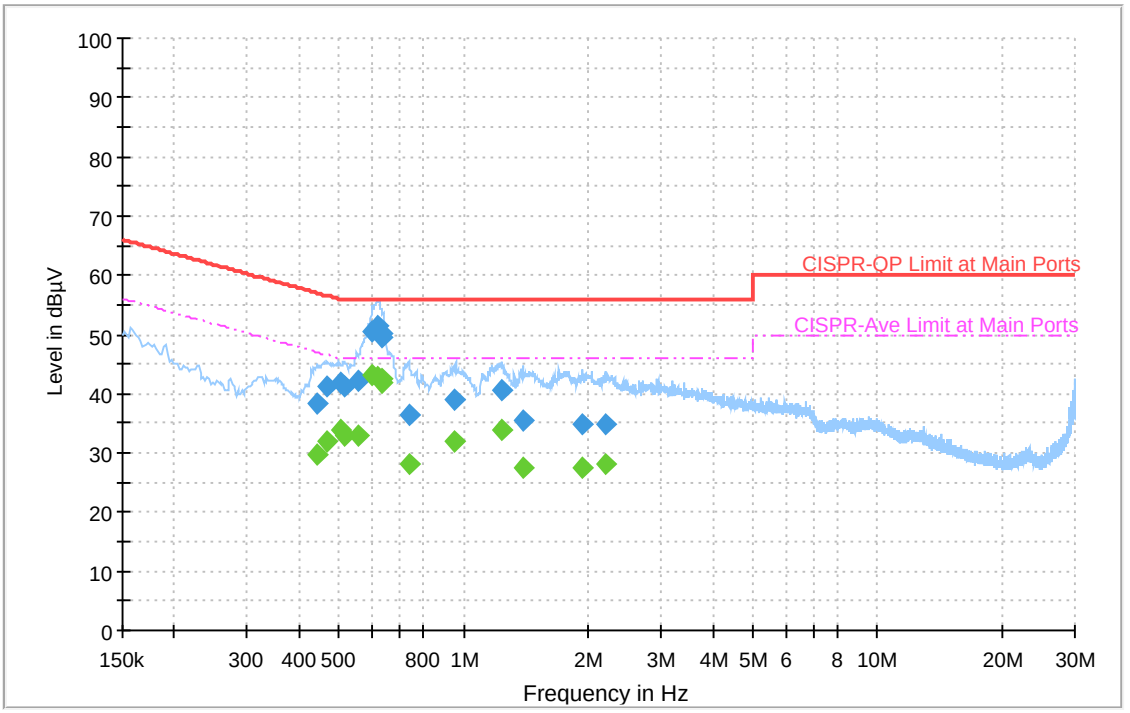
Appendix B. AC Conducted Emission Test Results

Test Engineer :	Venkata Kondepud and Leo Liu	**Temperature :**	23~25℃
		Relative Humidity :	43~47%

EUT Information

Site:	CO01-CA
Power:	120Vac/60Hz
Mode:	1
Project	220302001

Full Spectrum



Final_Result

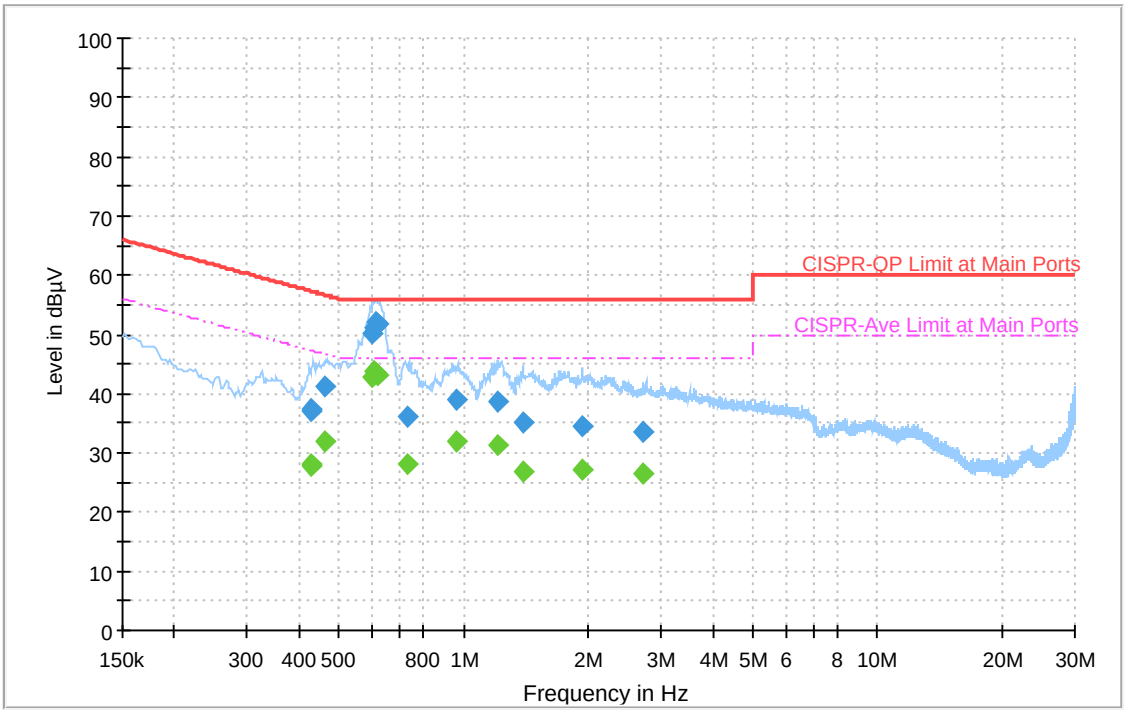
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.440475	38.49	---	57.05	18.56	L1	OFF	20.3
0.440475	---	29.79	47.05	17.26	L1	OFF	20.3
0.468105	41.06	---	56.55	15.49	L1	OFF	20.3
0.468105	---	31.82	46.55	14.73	L1	OFF	20.3
0.504096	41.79	---	56.00	14.21	L1	OFF	20.3
0.504096	---	33.94	46.00	12.06	L1	OFF	20.3
0.517623	41.28	---	56.00	14.72	L1	OFF	20.3
0.517623	---	32.81	46.00	13.19	L1	OFF	20.3
0.555900	42.06	---	56.00	13.94	L1	OFF	20.3
0.555900	---	32.93	46.00	13.07	L1	OFF	20.3
0.602340	50.43	---	56.00	5.57	L1	OFF	20.3
0.602340	---	43.04	46.00	2.96	L1	OFF	20.3
0.618198	51.56	---	56.00	4.44	L1	OFF	20.3
0.618198	---	42.92	46.00	3.08	L1	OFF	20.3
0.631887	50.13	---	56.00	5.87	L1	OFF	20.3
0.631887	---	42.43	46.00	3.57	L1	OFF	20.3
0.634146	49.63	---	56.00	6.37	L1	OFF	20.3
0.634146	---	41.97	46.00	4.03	L1	OFF	20.3
0.738537	36.35	---	56.00	19.65	L1	OFF	20.3
0.738537	---	28.06	46.00	17.94	L1	OFF	20.3
0.955284	38.89	---	56.00	17.11	L1	OFF	20.3

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.955284	---	31.84	46.00	14.16	L1	OFF	20.3
1.233069	40.44	---	56.00	15.56	L1	OFF	20.3
1.233069	---	33.76	46.00	12.24	L1	OFF	20.3
1.385637	35.35	---	56.00	20.65	L1	OFF	20.3
1.385637	---	27.37	46.00	18.63	L1	OFF	20.3
1.924134	34.89	---	56.00	21.11	L1	OFF	20.3
1.924134	---	27.57	46.00	18.43	L1	OFF	20.3
2.193000	34.97	---	56.00	21.03	L1	OFF	20.3
2.193000	---	28.00	46.00	18.00	L1	OFF	20.3

EUT Information

Site:	CO01-CA
Power:	120Vac/60Hz
Mode:	1
Project	220302001

Full Spectrum



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.428523	---	28.06	47.28	19.22	N	OFF	20.3
0.428523	37.00	---	57.28	20.28	N	OFF	20.3
0.429396	---	27.87	47.26	19.39	N	OFF	20.3
0.429396	37.35	---	57.26	19.91	N	OFF	20.3
0.464388	---	32.07	46.61	14.54	N	OFF	20.3
0.464388	41.23	---	56.61	15.38	N	OFF	20.3
0.597489	---	42.95	46.00	3.05	N	OFF	20.3
0.597489	50.22	---	56.00	5.78	N	OFF	20.3
0.604590	---	43.64	46.00	2.36	N	OFF	20.3
0.604590	51.23	---	56.00	4.77	N	OFF	20.3
0.613986	---	43.42	46.00	2.58	N	OFF	20.3
0.613986	52.10	---	56.00	3.90	N	OFF	20.3
0.622581	---	43.06	46.00	2.94	N	OFF	20.3
0.622581	51.74	---	56.00	4.26	N	OFF	20.3
0.734325	---	28.21	46.00	17.79	N	OFF	20.3
0.734325	36.25	---	56.00	19.75	N	OFF	20.3
0.963699	---	32.09	46.00	13.91	N	OFF	20.3
0.963699	38.93	---	56.00	17.07	N	OFF	20.3
1.204926	---	31.21	46.00	14.79	N	OFF	20.3
1.204926	38.76	---	56.00	17.24	N	OFF	20.3
1.388652	---	26.99	46.00	19.01	N	OFF	20.3

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
1.388652	35.09	---	56.00	20.91	N	OFF	20.3
1.931433	---	27.07	46.00	18.93	N	OFF	20.3
1.931433	34.40	---	56.00	21.60	N	OFF	20.3
2.714397	---	26.58	46.00	19.42	N	OFF	20.3
2.714397	33.53	---	56.00	22.47	N	OFF	20.3

Appendix C. Radiated Spurious Emission

Test Engineer :	Fu Chen	**Temperature :**	20~25°C
		Relative Humidity :	41~48%