

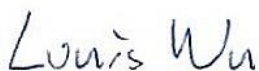
FCC RADIO TEST REPORT

FCC ID : TVE-121757B
Equipment : Network Security Gateway
Brand Name : FORTINET **FORTINET**
Model Name : FWF-41Fxxxxxx, FortiWiFi 41Fxxxxxx, FORTIWIFI-41Fxxxxxx
FWF-40Fxxxxxx, FortiWiFi 40Fxxxxxx, FORTIWIFI-40Fxxxxxx
FWF-41F-3G4Gxxxxxx, FortiWiFi 41F-3G4Gxxxxxx,
FORTIWIFI-41F-3G4Gxxxxxx
FWF-40F-3G4Gxxxxxx, FortiWiFi 40F-3G4Gxxxxxx,
FORTIWIFI-40F-3G4Gxxxxxx
(Where "x" can be used as "A-Z", or "0-9", or "-", or blank for software purposes or marketing purposes only)
Marketing Name : FortiWiFi 41F, FortiWiFi 40F, FortiWiFi 41F-3G4G, FortiWiFi 40F-3G4G
Applicant : Fortinet Inc.
899 KIFER RD
SUNNYVALE CA 94086-5301
UNITED STATES
Manufacturer : Fortinet Inc.
899 KIFER RD
SUNNYVALE CA 94086-5301
UNITED STATES
Standard : FCC Part 15 Subpart E §15.407

The product was received on Oct. 16, 2019 and testing was started from Oct. 22, 2019 and completed on Nov. 27, 2019. We, SPORTON INTERNATIONAL INC., EMC & Wireless Communications Laboratory, 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 report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.



Approved by: Louis Wu

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



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History of this test report

Report No.	Version	Description	Issued Date
FR992436-01B	01	Initial issue of report	Jan. 17, 2020

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.403(i)	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	Under limit 0.74 dB at 5150.000 MHz
3.5	15.207	AC Conducted Emission	Pass	Under limit 12.56 dB at 0.320 MHz
3.6	15.407(c)	Automatically Discontinue Transmission	Pass	-
3.7	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.

Reviewed by: Wii Chang

Report Producer: Dara Chiu



1 General Description

1.1 Product Feature of Equipment Under Test

Wi-Fi 2.4GHz 802.11b/g/n and Wi-Fi 5GHz 802.11a/n/ac

Product Specification subjective to this standard	
WLAN Antenna	Model Number: 5000846
Antenna Type	<Ant. 1>: Dipole Antenna <Ant. 2>: Dipole Antenna <Ant. 3>: Dipole Antenna

1.2 Modification of EUT

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

1.3 Testing Location

Test Site	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory	
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978	
Test Site No.	Sporton Site No.	
	TH05-HY	CO05-HY

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

Test Site	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory	
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855	
Test Site No.	Sporton Site No.	
	03CH15-HY	

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

FCC designation No.: TW1190 and TW0007

1.4 Applicable Standards

According to the specifications of 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: All test items were verified and recorded according to the standards and without any deviation during the test.

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 two type antenna degrees, 0° and 90°. The worst cases (Ant. 90°) 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)
5150-5250 MHz Band 1 (U-NII-1)	36	5180	44	5220
	38*	5190	46*	5230
	40	5200	48	5240
	42 [#]	5210		

Note:

1. The above Frequency and Channel in "*" were 802.11n HT40 and 802.11ac VHT40.
2. The above Frequency and Channel in "[#]" were 802.11ac VHT80.

2.2 Test Mode

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

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

Remark: The manufacturer defines worst case were Non Beamforming, other test items only test worst case and documented.

Test Cases	
AC Conducted Emission	Mode 1 : WLAN (5GHz) Link + WAN Link + LAN (1) Link + LAN (2) Link + LAN (3) Link + LAN (A) Load + Adapter

Ch. #		Band I : 5150-5250 MHz			
		802.11a	802.11ac VHT20	802.11ac VHT40	802.11ac VHT80
L	Low	36	36	38	-
M	Middle	44	44	-	42
H	High	48	48	46	-

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Notebook	DELL	Latitude E3340	FCC DoC/ Contains FCC ID: PD97260NGU	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
2.	Notebook	DELL	Latitude E3400	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	Notebook	DELL	Latitude E5480	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	Notebook	ASUS	8260NGW	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 “QSPR” 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 10dB attenuator.

$$\begin{aligned}\text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 4.2 + 10 = 14.2 \text{ (dB)}\end{aligned}$$

3 Test Result

3.1 26dB & 99% Occupied Bandwidth Measurement

3.1.1 Description of 26dB & 99% Occupied Bandwidth

This section is for reporting purpose only.

There is no restriction limits for bandwidth.

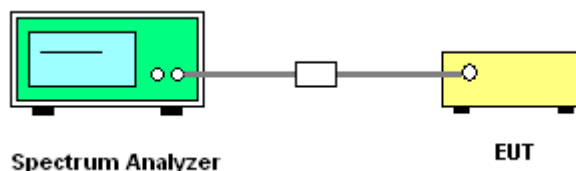
3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

3.1.3 Test Procedures

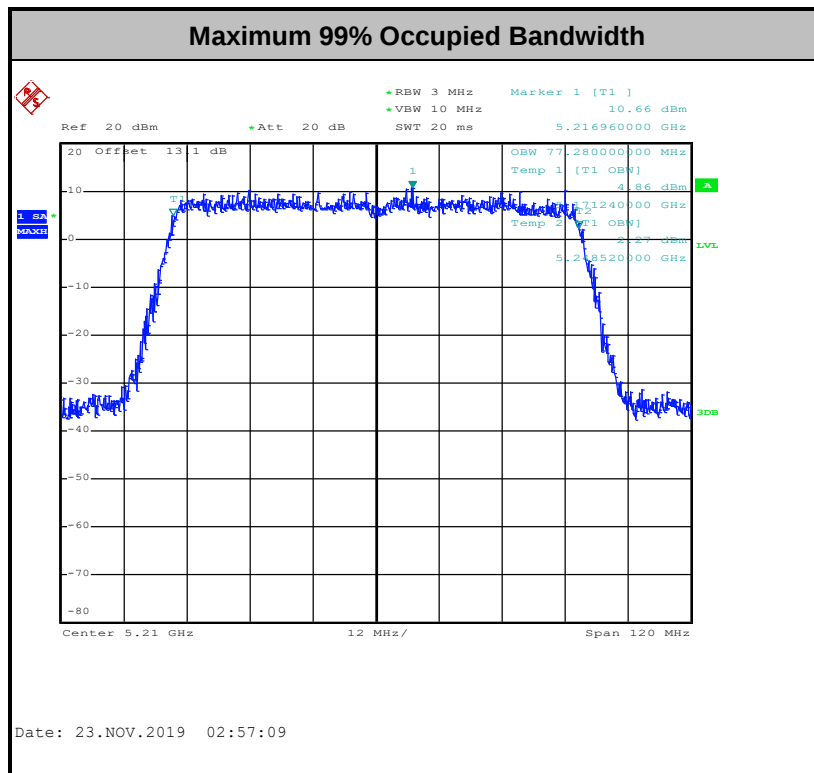
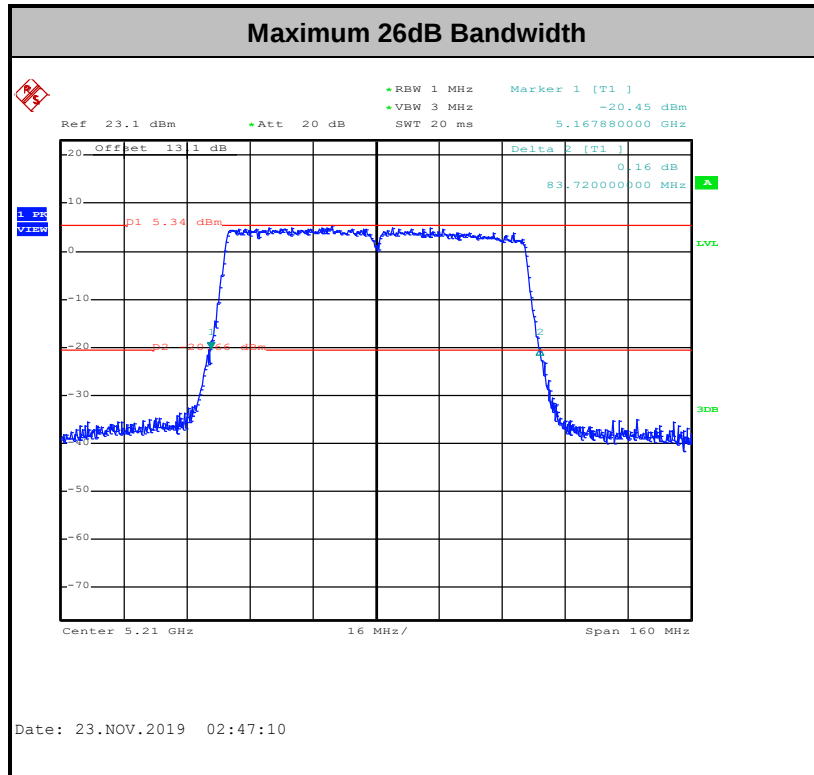
1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01. Section C) Emission bandwidth
2. Set RBW = approximately 1% of the emission bandwidth.
3. Set the VBW > RBW.
4. Detector = Peak.
5. Trace mode = max hold
6. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.
7. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 1-5% of the emission bandwidth and set the Video bandwidth (VBW) $\geq 3 * RBW$.
8. Measure and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of 26dB & 99% Occupied Bandwidth

Please refer to Appendix A.



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

<FCC 14-30 CFR 15.407>

For the 5.15–5.25 GHz bands:

- For mobile and portable client devices in the 5.15–5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW. For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

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

See list of measuring equipment of this test report.

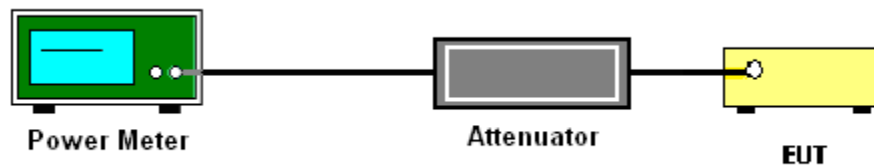
3.2.3 Test Procedures

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

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

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit at its maximum power control level.
3. Measure the average power of the transmitter
4. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

3.2.4 Test Setup



3.2.5 Test Result of Maximum Conducted Output Power

Please refer to Appendix A.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

<FCC 14-30 CFR 15.407>

For the 5.15–5.25 GHz bands:

For mobile and portable client devices in the 5.15–5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1.0 MHz band. For an indoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1.0 MHz 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

See list of measuring equipment 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) Maximum power spectral density.

Method SA-3

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

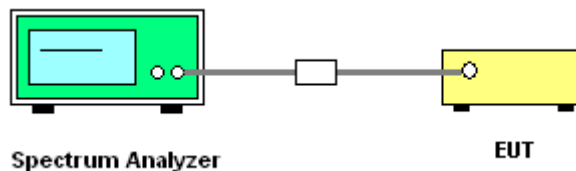
- Set span to encompass the entire emission bandwidth (EBW) of the signal.
 - Set RBW = 1 MHz.
 - Set VBW $\geq$ 3 MHz
 - Number of points in sweep $\geq$ 2 Span / RBW.
 - Sweep time $\leq$ (number of points in sweep) $\times$ T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
 - Detector = power averaging (rms).
 - Trace mode = max hold.
 - Allow max hold to run for at least 60 seconds, or longer as needed to allow the trace to stabilize.
-
1. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
 2. Each plot has already offset with cable loss, and attenuator loss. Measure the PPSD and record it.

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

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

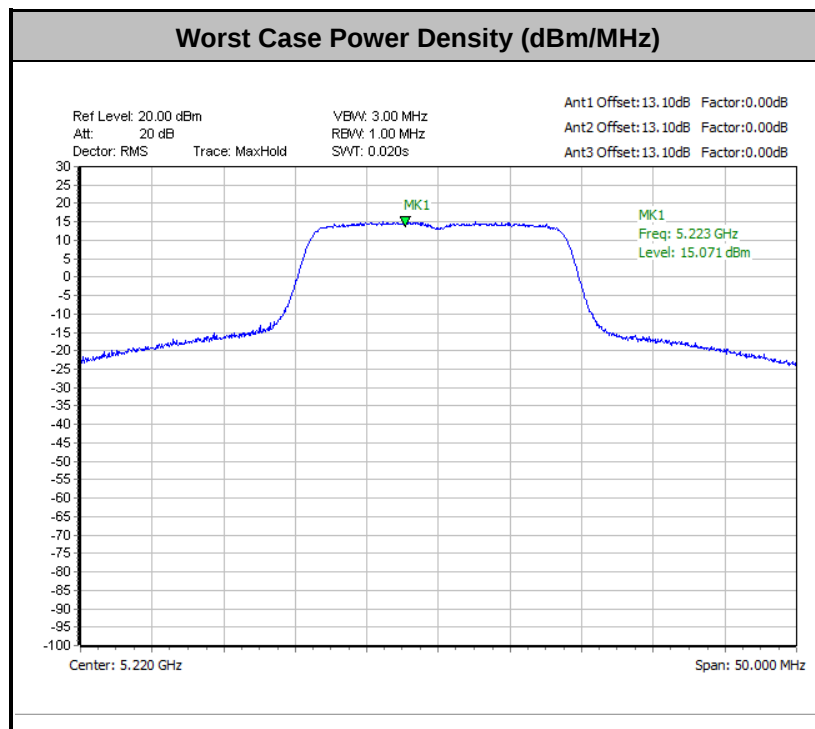
The total final Power Spectral Density is from a device with 3 transmitter outputs. The spectrum measurements of the individual outputs are all performed with the same span and number of points; the spectrum value in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and output 3 to obtain the value for the first frequency bin of the summed spectrum.

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.



3.4 Unwanted Emissions Measurement

This section 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 5150-5250 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of -27dBm/MHz.
- (2) Unwanted spurious emissions fallen in restricted bands shall comply with the general field strength limits as below table:

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

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

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

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

See list of measuring equipment of this test report.

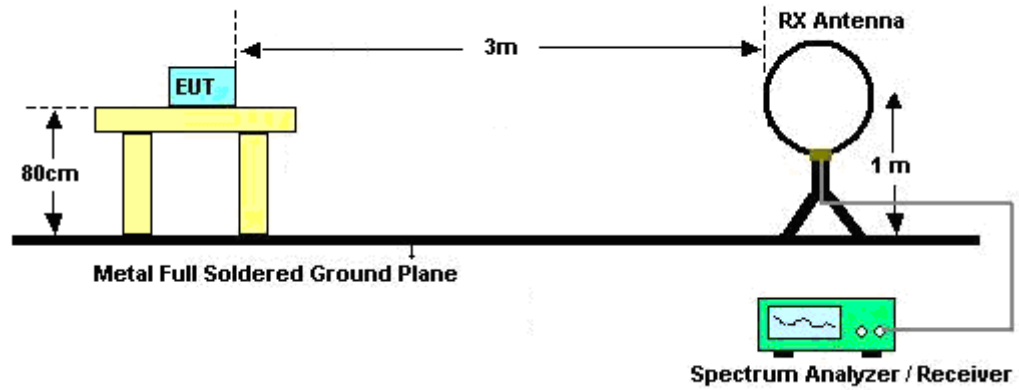


3.4.3 Test Procedures

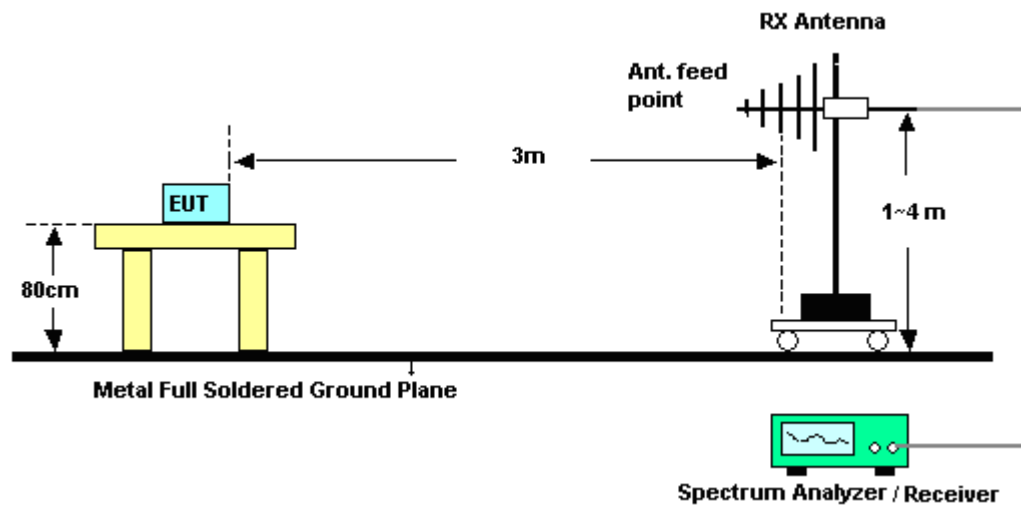
1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
Section G) Unwanted emissions measurement.
(1) Procedure for Unwanted Emissions Measurements Below 1000MHz
 - RBW = 120 kHz
 - VBW = 300 kHz
 - Detector = Peak
 - Trace mode = max hold(2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz
 - RBW = 1 MHz
 - VBW $\geq$ 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 $\geq$ 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 was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

3.4.4 Test Setup

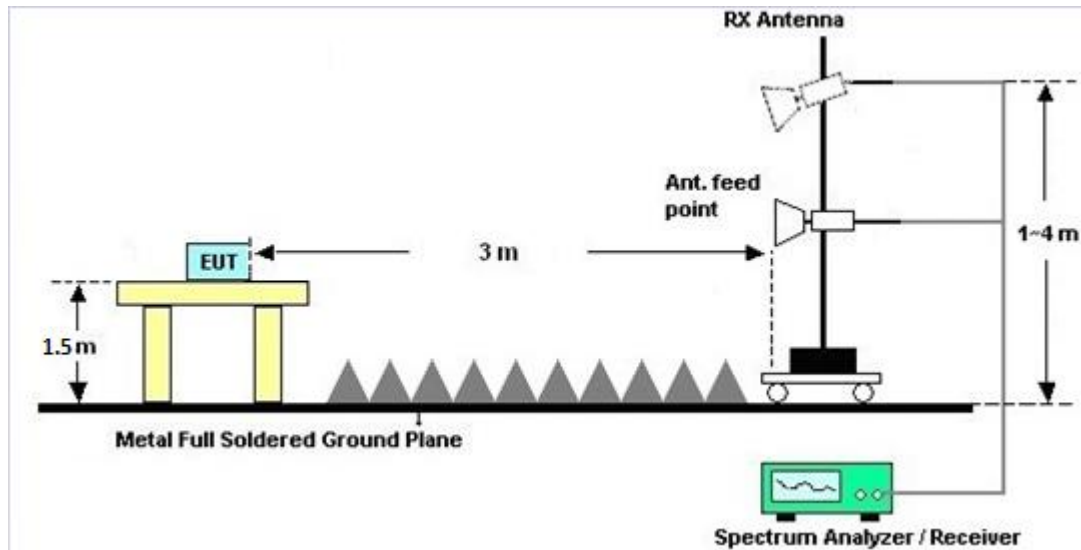
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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

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

There is a comparison data of both open-field test site and 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 Spurious at 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 Radiated Spurious Emissions (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 (dB μ V)	
	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.

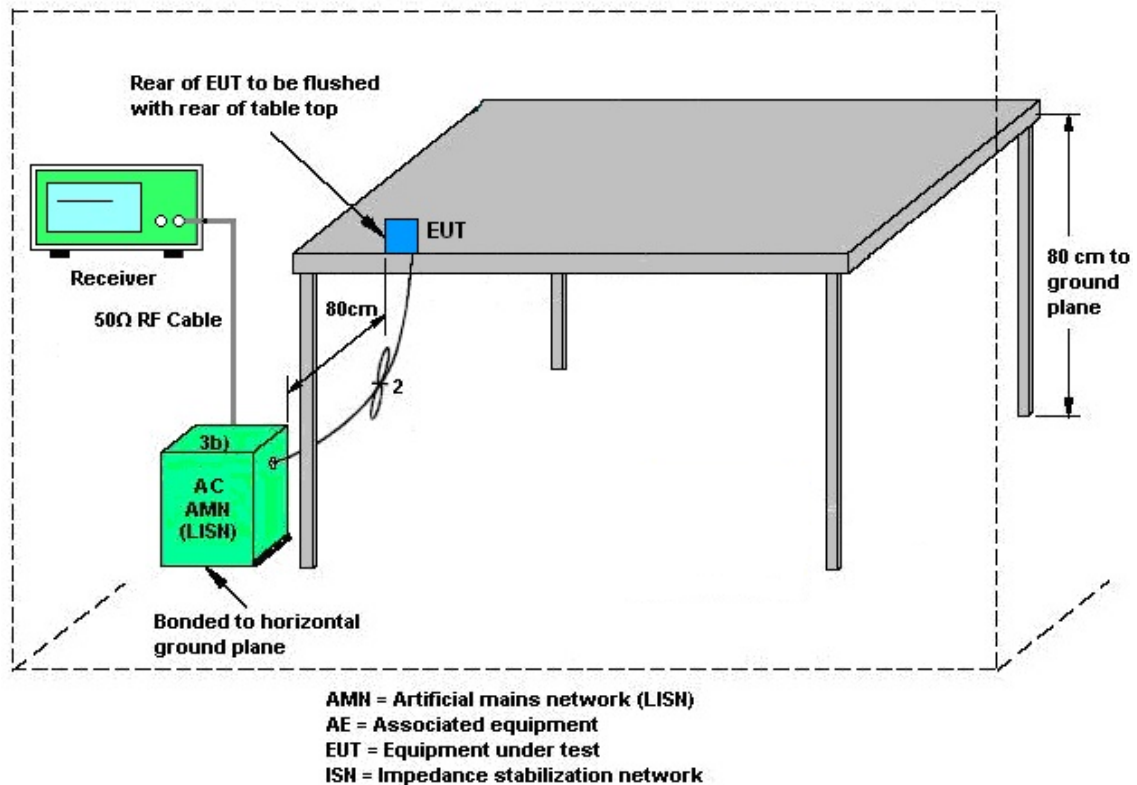
3.5.2 Measuring Instruments

See list of measuring equipment 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 Automatically Discontinue Transmission

3.6.1 Limit of Automatically Discontinue Transmission

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization to describe how this requirement is met.

3.6.2 Measuring Instruments

See list of measuring equipment of this test report.

3.6.3 Test Result of Automatically Discontinue Transmission

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

3.7 Antenna Requirements

3.7.1 Standard Applicable

If transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.7.3 Antenna Gain

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

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

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

Array Gain = $10 \log(\text{NANT}/\text{NSS}=1)$ dB.

For power measurements on IEEE 802.11 devices,

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

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

The EUT supports CDD mode.

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

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

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

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

<CDD Modes>							
				DG for Power	DG for PSD	Power Limit Reduction	PSD Limit Reduction
	Ant. 0 (dBi)	Ant. 1 (dBi)	Ant. 2 (dBi)	(dBi)	(dBi)	(dB)	(dB)
Band I	3.06	3.06	3.06	3.06	7.83	0.00	1.83

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

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



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Jan. 07, 2019	Nov. 21, 2019~ Nov. 25, 2019	Jan. 06, 2020	Radiation (03CH15-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz ~ 40GHz	Dec. 06, 2018	Nov. 21, 2019~ Nov. 25, 2019	Dec. 05, 2019	Radiation (03CH15-HY)
Bilog Antenna	TESEQ	CBL6111D&00 800N1D01N-0 6	41912&05	30MHz to 1GHz	Feb. 12, 2019	Nov. 21, 2019~ Nov. 25, 2019	Feb. 11, 2020	Radiation (03CH15-HY)
Horn Antenna	SCHWARZBE CK	BBHA 9120 D	9120D-2114	1-18GHz	Jul. 31, 2019	Nov. 21, 2019~ Nov. 25, 2019	Jul. 30, 2020	Radiation (03CH15-HY)
SHF-EHF Horn Antenna	SCHWARZBE CK	BBHA 9170	BBHA917058 4	18GHz- 40GHz	Dec. 05, 2018	Nov. 21, 2019~ Nov. 25, 2019	Dec. 04, 2019	Radiation (03CH15-HY)
Amplifier	SONOMA	310N	363440	9kHz~1GHz	Dec. 28, 2018	Nov. 21, 2019~ Nov. 25, 2019	Dec. 27, 2019	Radiation (03CH15-HY)
Preamplifier	Jet-Power	JPA0118-55-30 3	17100018000 55007	1GHz~18GHz	Apr. 01, 2019	Nov. 21, 2019~ Nov. 25, 2019	May 31, 2020	Radiation (03CH15-HY)
Preamplifier	Keysight	83017A	MY53270195	1GHz~26.5GHz	Aug. 23, 2019	Nov. 21, 2019~ Nov. 25, 2019	Aug. 22, 2020	Radiation (03CH15-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY54130085	20MHz~8.4GHz	Nov. 01, 2019	Nov. 21, 2019~ Nov. 25, 2019	Oct. 31, 2020	Radiation (03CH15-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100390	20Hz~26.5GHz	Dec. 27, 2018	Nov. 21, 2019~ Nov. 25, 2019	Dec. 26, 2019	Radiation (03CH15-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Nov. 21, 2019~ Nov. 25, 2019	N/A	Radiation (03CH15-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Nov. 21, 2019~ Nov. 25, 2019	N/A	Radiation (03CH15-HY)
Software	Audix	E3 6.2009-8-24 (k5)	RK-000451	N/A	N/A	Nov. 21, 2019~ Nov. 25, 2019	N/A	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY36980/4	30M-18G	Apr. 15, 2019	Nov. 21, 2019~ Nov. 25, 2019	Apr. 14, 2020	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9838/4PE	30M-18G	Apr. 15, 2019	Nov. 21, 2019~ Nov. 25, 2019	Apr. 14, 2020	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY802430/4	30M~18G	May 13, 2019	Nov. 21, 2019~ Nov. 25, 2019	May 12, 2020	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	505134/2	30MHz-40GHz	Feb. 26, 2019	Nov. 21, 2019~ Nov. 25, 2019	Feb. 25, 2020	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	800740/2	30MHz-40GHz	Feb. 26, 2019	Nov. 21, 2019~ Nov. 25, 2019	Feb. 25, 2020	Radiation (03CH15-HY)
Filter	Wainwright	WLK4-1000-15 30-8000-40SS	SN4	1.53G Low Pass	Jul. 04, 2019	Nov. 21, 2019~ Nov. 25, 2019	Jul. 03, 2020	Radiation (03CH15-HY)
Filter	Wainwright	WHKX8-5872. 5-6750-18000- 40ST	SN6	6.75GHz High Pass Filter	Jul. 02, 2019	Nov. 21, 2019~ Nov. 25, 2019	Jul. 01, 2020	Radiation (03CH15-HY)



Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Power Sensor	DARE	RPR3006W	16I00054SNO 10	10MHz~6GHz	Dec. 19, 2018	Oct. 22, 2019~ Nov. 27, 2019	Dec. 18 2019	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz-40GHz	Aug. 14, 2019	Oct. 22, 2019~ Nov. 27, 2019	Aug. 13, 2020	Conducted (TH05-HY)
Switch Control Manframe	E-IUSTRUMENT	ETF-1405-0	EC1900067	N/A	Aug. 15, 2019	Oct. 22, 2019~ Nov. 27, 2019	Aug. 14, 2020	Conducted (TH05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Nov. 26, 2019	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Nov. 15, 2019	Nov. 26, 2019	Nov. 14, 2020	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Nov. 15, 2019	Nov. 26, 2019	Nov. 14, 2020	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Nov. 26, 2019	N/A	Conduction (CO05-HY)
LF Cable	HUBER + SUHNER	RG-214/U	LF01	N/A	Dec. 31, 2018	Nov. 26, 2019	Dec. 30, 2019	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Dec. 31, 2018	Nov. 26, 2019	Dec. 30, 2019	Conduction (CO05-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.2
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.0
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.4
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.0
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Appendix A. Test Result of Conducted Test Items

Test Engineer	Hank Hsu	Temperature	21~25	°C
Test Date	2019/10/22~2019/11/27	Relative Humidity	51~54	%
Tool & Version	QSPR 5.0-00148			

<CDD Mode>

TEST RESULTS DATA
26dB and 99% OBW

Band I MIMO 3Tx Mode Ant 0 + 1 + 2													
Mod.	Data Rate	NTx	CH.	Freq. (MHz)	26 dB Bandwidth (MHz)				99% Bandwidth (MHz)				IC 99% Bandwidth EIRP Limit (dBm)
					Ant 0	Ant 1	Ant 2	Ant 3	Ant 0	Ant 1	Ant 2	Ant 3	Ant 0 + 1 + 2
11a	6Mbps	3	36	5180	21.10	21.20	20.90		16.50	16.55	16.50		22.17
11a	6Mbps	3	44	5220	27.25	30.15	21.75		16.70	16.70	16.60		22.20
11a	6Mbps	3	48	5240	23.75	26.05	20.80		16.65	16.70	16.55		22.19
VHT20	MCS0	3	36	5180	22.25	21.58	21.80		17.70	17.70	17.70		22.48
VHT20	MCS0	2	44	5220	29.00	32.75	21.80		17.80	17.85	17.65		22.47
VHT20	MCS0	2	48	5240	25.40	28.90	21.75		17.70	17.85	17.65		22.47
VHT40	MCS0	3	38	5190	40.86	40.63	40.59		36.20	36.20	36.20		23.01
VHT40	MCS0	3	46	5230	41.17	40.59	40.67		36.20	36.30	36.20		23.01
VHT80	MCS0	3	42	5210	83.72	82.96	82.80		77.04	77.16	77.28		23.01

TEST RESULTS DATA
Average Power Table

FCC Band I MIMO 3Tx Mode Ant 0 + 1 + 2												
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)					FCC Conducted Power Limit (dBm)	DG (dBi)	Pass /Fail
					Ant 0	Ant 1	Ant 2	Ant 3	SUM			
11a	6Mbps	3	36	5180	16.70	17.50	16.00		21.55	30.00	3.06	Pass
11a	6Mbps	3	44	5220	19.80	20.60	19.50		24.76	30.00	3.06	Pass
11a	6Mbps	3	48	5240	19.60	20.60	19.50		24.70	30.00	3.06	Pass
HT20	MCS0	3	36	5180	17.30	18.20	16.70		22.22	30.00	3.06	Pass
HT20	MCS0	3	44	5220	20.20	21.10	20.20		25.29	30.00	3.06	Pass
HT20	MCS0	3	48	5240	19.40	20.50	19.50		24.60	30.00	3.06	Pass
HT40	MCS0	3	38	5190	15.30	16.00	14.70		20.14	30.00	3.06	Pass
HT40	MCS0	3	46	5230	18.90	19.70	18.40		23.80	30.00	3.06	Pass
VHT20	MCS0	3	36	5180	17.40	18.30	16.80		22.32	30.00	3.06	Pass
VHT20	MCS0	3	44	5220	20.20	21.10	20.30		25.32	30.00	3.06	Pass
VHT20	MCS0	3	48	5240	19.40	20.70	19.70		24.74	30.00	3.06	Pass
VHT40	MCS0	3	38	5190	15.40	16.10	14.80		20.24	30.00	3.06	Pass
VHT40	MCS0	3	46	5230	19.00	19.80	18.50		23.90	30.00	3.06	Pass
VHT80	MCS0	3	42	5210	14.10	15.00	13.90		19.13	30.00	3.06	Pass

Setting
3Tx
19
21.5
21.5
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22.5
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18
21
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22
18
21
16.5

TEST RESULTS DATA
Power Spectral Density

FCC Band I MIMO 3Tx Mode Ant 0 + 1 + 2								
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	Average Power Density (dBm/MHz)	Average PSD Limit (dBm/MHz)	DG (dBi)	Pass /Fail
					Ant 0 + 1 + 2	Ant 0 + 1 + 2	Ant 0 + 1 + 2	
11a	6Mbps	3	36	5180	11.95	15.17	7.83	Pass
11a	6Mbps	3	44	5220	14.86	15.17	7.83	Pass
11a	6Mbps	3	48	5240	14.99	15.17	7.83	Pass
VHT20	MCS0	3	36	5180	12.68	15.17	7.83	Pass
VHT20	MCS0	3	44	5220	15.07	15.17	7.83	Pass
VHT20	MCS0	3	48	5240	14.95	15.17	7.83	Pass
VHT40	MCS0	3	38	5190	6.94	15.17	7.83	Pass
VHT40	MCS0	3	46	5230	10.54	15.17	7.83	Pass
VHT80	MCS0	3	42	5210	2.19	15.17	7.83	Pass

<TXBF Mode>

Report Number : FR992436-01B

TEST RESULTS DATA
Average Power Table
(Reporting Only)

FCC Band I MIMO 3Tx Mode Ant 0 + 1 + 2												
Mod.	Data Rate	NTx	CH.	Freq. (MHz)	Average Conducted Power (dBm)					FCC Conducted Power Limit (dBm)	DG (dBi)	Pass /Fail
					Ant 0	Ant 1	Ant 2	Ant 3	SUM			
HT20	MCS0	3	36	5180	17.00	17.50	16.20		21.70	28.17	7.83	Pass
HT20	MCS0	3	44	5220	19.50	20.00	19.00		24.29	28.17	7.83	Pass
HT20	MCS0	3	48	5240	19.20	20.00	18.90		24.16	28.17	7.83	Pass
HT40	MCS0	3	38	5190	14.80	15.30	14.30		19.59	28.17	7.83	Pass
HT40	MCS0	3	46	5230	18.60	19.20	17.80		23.34	28.17	7.83	Pass
VHT20	MCS0	3	36	5180	17.10	17.60	16.30		21.80	28.17	7.83	Pass
VHT20	MCS0	3	44	5220	19.60	20.10	19.10		24.39	28.17	7.83	Pass
VHT20	MCS0	3	48	5240	19.30	20.10	19.00		24.26	28.17	7.83	Pass
VHT40	MCS0	3	38	5190	14.90	15.40	14.40		19.69	28.17	7.83	Pass
VHT40	MCS0	3	46	5230	18.70	19.30	17.90		23.44	28.17	7.83	Pass
VHT80	MCS0	3	42	5210	13.70	14.40	13.30		18.60	28.17	7.83	Pass

Setting
3Tx
19.5
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21.5
17.5
20.5
16



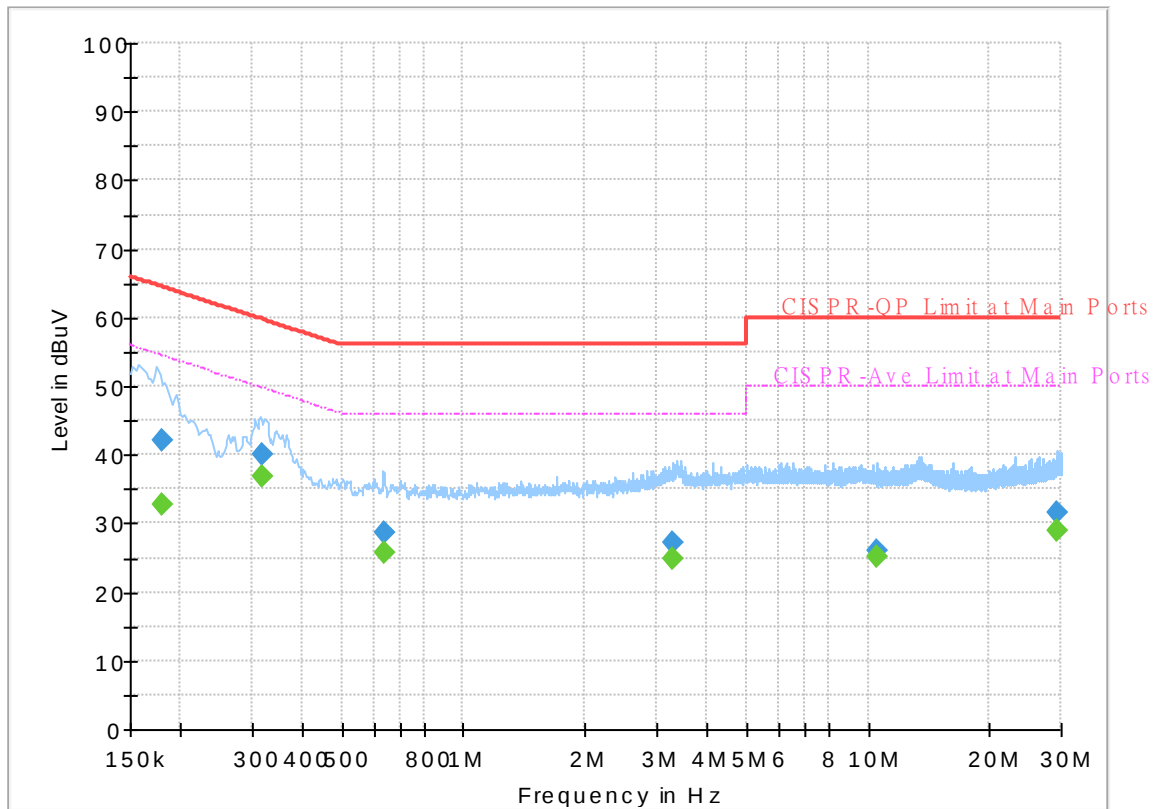
Appendix B. AC Conducted Emission Test Results

Test Engineer :	Tom Lee	Temperature :	23~26℃
		Relative Humidity :	48~54%

EUT Information

Report NO : 992436-01
Test Mode : Mode 1
Test Voltage : 120Vac/60Hz
Phase : Line

Full Spectrum



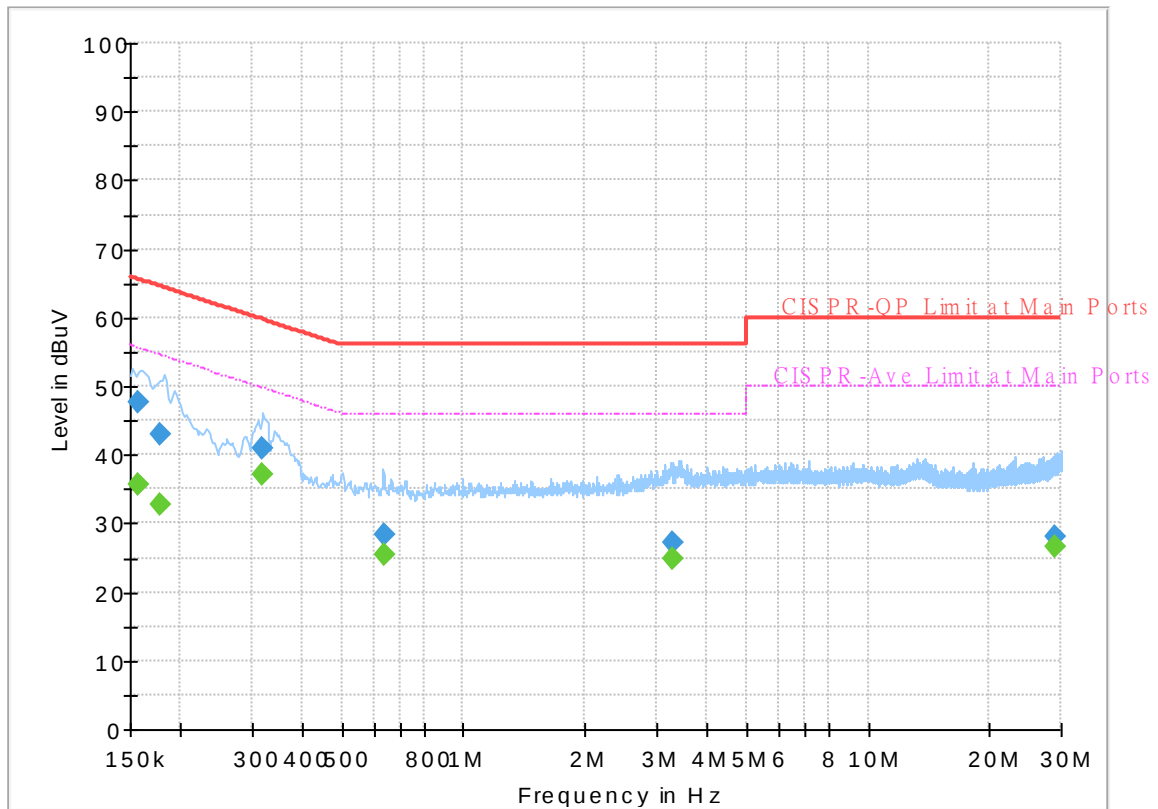
Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.179250	---	32.64	54.52	21.88	L1	OFF	19.5
0.179250	42.19	---	64.52	22.33	L1	OFF	19.5
0.318750	---	36.90	49.74	12.84	L1	OFF	19.5
0.318750	40.18	---	59.74	19.56	L1	OFF	19.5
0.634020	---	25.67	46.00	20.33	L1	OFF	19.5
0.634020	28.52	---	56.00	27.48	L1	OFF	19.5
3.293880	---	24.96	46.00	21.04	L1	OFF	19.6
3.293880	27.14	---	56.00	28.86	L1	OFF	19.6
10.484790	---	25.12	50.00	24.88	L1	OFF	19.9
10.484790	26.10	---	60.00	33.90	L1	OFF	19.9
29.233950	---	28.94	50.00	21.06	L1	OFF	20.4
29.233950	31.52	---	60.00	28.48	L1	OFF	20.4

EUT Information

Report NO : 992436-01
Test Mode : Mode 1
Test Voltage : 120Vac/60Hz
Phase : Neutral

Full Spectrum



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.156750	---	35.63	55.63	20.00	N	OFF	19.5
0.156750	47.53	---	65.63	18.10	N	OFF	19.5
0.177270	---	32.73	54.61	21.88	N	OFF	19.5
0.177270	42.98	---	64.61	21.63	N	OFF	19.5
0.319650	---	37.16	49.72	12.56	N	OFF	19.5
0.319650	40.85	---	59.72	18.87	N	OFF	19.5
0.635100	---	25.53	46.00	20.47	N	OFF	19.6
0.635100	28.28	---	56.00	27.72	N	OFF	19.6
3.301890	---	24.91	46.00	21.09	N	OFF	19.6
3.301890	27.07	---	56.00	28.93	N	OFF	19.6
28.923630	---	26.54	50.00	23.46	N	OFF	20.6
28.923630	27.93	---	60.00	32.07	N	OFF	20.6



Appendix C. Radiated Spurious Emission

Test Engineer :	Leo Li, Karl Hou, and Bigshow Wang	Temperature :	24.2~25.1 °C
		Relative Humidity :	55~64%

Band 1 - 5150~5250MHz

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.
0+1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11a CH 36 5180MHz		5149.76	59.59	-14.41	74	48.67	32.1	9.25	30.43	372	296	P	H
		5150	49.49	-4.51	54	38.56	32.1	9.26	30.43	372	296	A	H
	*	5180	113.43	-	-	102.59	31.98	9.29	30.43	372	296	P	H
	*	5180	105.51	-	-	94.67	31.98	9.29	30.43	372	296	A	H
													H
													H
		5149.24	62.38	-11.62	74	51.46	32.1	9.25	30.43	245	188	P	V
		5150	53.26	-0.74	54	42.33	32.1	9.26	30.43	245	188	A	V
	*	5180	121.1	-	-	110.26	31.98	9.29	30.43	245	188	P	V
	*	5180	112.28	-	-	101.44	31.98	9.29	30.43	245	188	A	V
													V
													V
802.11a CH 44 5220MHz		5083.98	50.57	-23.43	74	39.88	31.94	9.18	30.43	400	287	P	H
		5074.62	42.5	-11.5	54	31.86	31.9	9.17	30.43	400	287	A	H
	*	5220	115.14	-	-	104.5	31.74	9.33	30.43	400	287	P	H
	*	5220	107.19	-	-	96.55	31.74	9.33	30.43	400	287	A	H
		5449.64	49.31	-24.69	74	38.18	32	9.56	30.43	400	287	P	H
		5364.8	41.12	-12.88	54	30.63	31.49	9.43	30.43	400	287	A	H
		5083.72	53.65	-20.35	74	42.97	31.93	9.18	30.43	243	186	P	V
		5073.58	45.41	-8.59	54	34.78	31.89	9.17	30.43	243	186	A	V
	*	5220	122.66	-	-	112.02	31.74	9.33	30.43	243	186	P	V
	*	5220	114.23	-	-	103.59	31.74	9.33	30.43	243	186	A	V
		5370.96	52.78	-21.22	74	42.24	31.53	9.44	30.43	243	186	P	V
		5362.28	44.84	-9.16	54	34.37	31.47	9.43	30.43	243	186	A	V



802.11a CH 48 5240MHz		5097.5	51.23	-22.77	74	40.47	31.99	9.2	30.43	358	61	P	H
		5098.02	43.52	-10.48	54	32.76	31.99	9.2	30.43	358	61	A	H
	*	5240	117.22	-	-	106.73	31.58	9.34	30.43	358	61	P	H
	*	5240	109.1	-	-	98.61	31.58	9.34	30.43	358	61	A	H
		5414.08	50.65	-23.35	74	39.81	31.78	9.49	30.43	358	61	P	H
		5386.92	42.15	-11.85	54	31.51	31.62	9.45	30.43	358	61	A	H
		5103.48	54.65	-19.35	74	43.87	32.01	9.2	30.43	226	187	P	V
		5093.6	46.22	-7.78	54	35.49	31.97	9.19	30.43	226	187	A	V
	*	5240	123.85	-	-	113.36	31.58	9.34	30.43	226	187	P	V
	*	5240	115.53	-	-	105.04	31.58	9.34	30.43	226	187	A	V
		5391.12	53.32	-20.68	74	42.65	31.65	9.45	30.43	226	187	P	V
		5382.44	45.14	-8.86	54	34.53	31.59	9.45	30.43	226	187	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Band 1 5150~5250MHz

WIFI 802.11a (Harmonic @ 3m)

WIFI Ant. 0+1+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 36 5180MHz		10360	49.09	-19.11	68.2	56.62	39.66	13.57	60.76	100	0	P	H
		15540	45.72	-28.28	74	51.76	38.5	17.01	61.55	100	0	P	H
													H
													H
		10360	47.11	-21.09	68.2	54.64	39.66	13.57	60.76	100	0	P	V
		15540	47.08	-26.92	74	53.12	38.5	17.01	61.55	100	0	P	V
													V
													V
802.11a CH 44 5220MHz		10440	47.44	-20.76	68.2	54.85	39.9	13.65	60.96	100	0	P	H
		15660	48.65	-25.35	74	55.12	37.78	17.16	61.41	100	0	P	H
													H
													H
		10440	48.61	-19.59	68.2	56.02	39.9	13.65	60.96	100	0	P	V
		15660	60.27	-13.73	74	66.74	37.78	17.16	61.41	100	11	P	V
		15660	48.06	-5.94	54	54.53	37.78	17.16	61.41	100	11	A	V
													V
802.11a CH 48 5240MHz		10480	49.32	-18.88	68.2	56.79	39.9	13.68	61.05	100	0	P	H
		15720	59.79	-14.21	74	66.38	37.54	17.21	61.34	204	61	P	H
		15720	47.83	-6.17	54	54.42	37.54	17.21	61.34	204	61	A	H
													H
		10480	49.16	-19.04	68.2	56.63	39.9	13.68	61.05	100	0	P	V
		15720	60.56	-13.44	74	67.15	37.54	17.21	61.34	100	307	P	V
		15720	48.51	-5.49	54	55.1	37.54	17.21	61.34	100	307	A	V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Band 1 5150~5250MHz

WIFI 802.11ac VHT20 (Band Edge @ 3m)

WIFI Ant. 0+1+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)
802.11ac VHT20 CH 36 5180MHz		5150	56.3	-17.7	74	45.37	32.1	9.26	30.43	394	292	P	H
		5150	48.34	-5.66	54	37.41	32.1	9.26	30.43	394	292	A	H
	*	5180	114.54	-	-	103.7	31.98	9.29	30.43	394	292	P	H
	*	5180	105.61	-	-	94.77	31.98	9.29	30.43	394	292	A	H
													H
													H
		5148.72	63.06	-10.94	74	52.14	32.1	9.25	30.43	245	191	P	V
		5149.76	51.47	-2.53	54	40.55	32.1	9.25	30.43	245	191	A	V
	*	5180	120.95	-	-	110.11	31.98	9.29	30.43	245	191	P	V
	*	5180	111.92	-	-	101.08	31.98	9.29	30.43	245	191	A	V
													V
													V
802.11ac VHT20 CH 44 5220MHz		5148.46	53.95	-20.05	74	43.03	32.1	9.25	30.43	394	299	P	H
		5149.5	42.05	-11.95	54	31.13	32.1	9.25	30.43	394	299	A	H
	*	5220	116.04	-	-	105.4	31.74	9.33	30.43	394	299	P	H
	*	5220	107.39	-	-	96.75	31.74	9.33	30.43	394	299	A	H
		5459.44	50.42	-23.58	74	39.25	32.02	9.58	30.43	394	299	P	H
		5363.12	41.13	-12.87	54	30.65	31.48	9.43	30.43	394	299	A	H
		5071.24	53.92	-20.08	74	43.3	31.88	9.17	30.43	245	178	P	V
		5150	45.57	-8.43	54	34.64	32.1	9.26	30.43	245	178	A	V
	*	5220	122.49	-	-	111.85	31.74	9.33	30.43	245	178	P	V
	*	5220	114.25	-	-	103.61	31.74	9.33	30.43	245	178	A	V
		5356.12	52.86	-21.14	74	42.42	31.44	9.43	30.43	245	178	P	V
		5356.4	44.62	-9.38	54	34.18	31.44	9.43	30.43	245	178	A	V



802.11ac VHT20 CH 48 5240MHz		5150	52.18	-21.82	74	41.25	32.1	9.26	30.43	397	289	P	H
		5149.76	43.97	-10.03	54	33.05	32.1	9.25	30.43	397	289	A	H
	*	5240	116.76	-	-	106.27	31.58	9.34	30.43	397	289	P	H
	*	5240	108.14	-	-	97.65	31.58	9.34	30.43	397	289	A	H
		5369.56	49.83	-24.17	74	39.3	31.52	9.44	30.43	397	289	P	H
		5350	41.52	-12.48	54	31.13	31.4	9.42	30.43	397	289	A	H
		5147.94	55.48	-18.52	74	44.56	32.1	9.25	30.43	255	186	P	V
		5090.48	46.39	-7.61	54	35.67	31.96	9.19	30.43	255	186	A	V
	*	5240	123.72	-	-	113.23	31.58	9.34	30.43	255	186	P	V
	*	5240	115.41	-	-	104.92	31.58	9.34	30.43	255	186	A	V
		5379.36	53.6	-20.4	74	43.01	31.58	9.44	30.43	255	186	P	V
		5381.6	45.27	-8.73	54	34.66	31.59	9.45	30.43	255	186	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Band 1 5150~5250MHz

WIFI 802.11ac VHT20 (Harmonic @ 3m)

WIFI Ant. 0+1+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)
802.11ac VHT20 CH 36 5180MHz		10360	47.42	-20.78	68.2	54.95	39.66	13.57	60.76	100	0	P	H
		15540	46.94	-27.06	74	52.98	38.5	17.01	61.55	100	0	P	H
													H
													H
		10360	47.8	-20.4	68.2	55.33	39.66	13.57	60.76	100	0	P	V
		15540	49.67	-24.33	74	55.71	38.5	17.01	61.55	100	0	P	V
													V
													V
802.11ac VHT20 CH 44 5220MHz		10440	47.41	-20.79	68.2	54.82	39.9	13.65	60.96	400	0	P	H
		15660	59.5	-14.5	74	65.97	37.78	17.16	61.41	210	88	P	H
		15660	47.2	-6.8	54	53.67	37.78	17.16	61.41	210	88	A	H
													H
		10440	48.09	-20.11	68.2	55.5	39.9	13.65	60.96	100	0	P	V
		15660	60.51	-13.49	74	66.98	37.78	17.16	61.41	100	3	P	V
		15660	47.95	-6.05	54	54.42	37.78	17.16	61.41	100	3	A	V
													V
802.11ac VHT20 CH 48 5240MHz		10480	47.9	-20.3	68.2	55.37	39.9	13.68	61.05	100	0	P	H
		15720	59.93	-14.07	74	66.52	37.54	17.21	61.34	206	78	P	H
		15720	47.84	-6.16	54	54.43	37.54	17.21	61.34	206	78	A	H
													H
		10480	48.72	-19.48	68.2	56.19	39.9	13.68	61.05	100	0	P	V
		15720	60.99	-13.01	74	67.58	37.54	17.21	61.34	100	2	P	V
		15720	48.59	-5.41	54	55.18	37.54	17.21	61.34	100	2	A	V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Band 1 5150~5250MHz

WIFI 802.11ac VHT40 (Band Edge @ 3m)

WIFI Ant. 0+1+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)
802.11ac VHT40 CH 38 5190MHz		5150.02	60.32	-89.68	150	49.39	32.1	9.26	30.43	329	59	P	H
		5150	51.2	-2.8	54	40.27	32.1	9.26	30.43	329	59	A	H
	*	5190	108.94	-	-	98.13	31.94	9.3	30.43	329	59	P	H
	*	5190	101.48	-	-	90.67	31.94	9.3	30.43	329	59	A	H
		5361.44	49.87	-24.13	74	39.4	31.47	9.43	30.43	329	59	P	H
		5460	40.98	-13.02	54	29.81	32.02	9.58	30.43	329	59	A	H
		5148.46	63.98	-10.02	74	53.06	32.1	9.25	30.43	229	184	P	V
		5148.46	52.91	-1.09	54	41.99	32.1	9.25	30.43	229	184	A	V
	*	5190	116.13	-	-	105.32	31.94	9.3	30.43	229	184	P	V
	*	5190	107.99	-	-	97.18	31.94	9.3	30.43	229	184	A	V
		5458.04	53.05	-20.95	74	41.89	32.02	9.57	30.43	229	184	P	V
		5350.24	42.34	-11.66	54	31.95	31.4	9.42	30.43	229	184	A	V
802.11ac VHT40 CH 46 5230MHz		5148.98	57.07	-16.93	74	46.15	32.1	9.25	30.43	318	57	P	H
		5148.72	48.43	-5.57	54	37.51	32.1	9.25	30.43	318	57	A	H
	*	5230	112.54	-	-	101.98	31.66	9.33	30.43	318	57	P	H
	*	5230	103.92	-	-	93.36	31.66	9.33	30.43	318	57	A	H
		5389.44	50.57	-23.43	74	39.91	31.64	9.45	30.43	318	57	P	H
		5350.24	41.59	-12.41	54	31.2	31.4	9.42	30.43	318	57	A	H
		5142.74	61.13	-12.87	74	50.22	32.09	9.25	30.43	227	178	P	V
		5150	51.79	-2.21	54	40.86	32.1	9.26	30.43	227	178	A	V
	*	5230	119.72	-	-	109.16	31.66	9.33	30.43	227	178	P	V
	*	5230	111.08	-	-	100.52	31.66	9.33	30.43	227	178	A	V
		5350.8	53.31	-20.69	74	42.92	31.4	9.42	30.43	227	178	P	V
		5352.76	45.31	-8.69	54	34.9	31.42	9.42	30.43	227	178	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Band 1 5150~5250MHz

WIFI 802.11ac VHT40 (Harmonic @ 3m)

WIFI Ant. 0+1+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)
802.11ac VHT40 CH 38 5190MHz		10380	47.9	-20.3	68.2	55.34	39.78	13.59	60.81	100	0	P	H
		15570	46.74	-27.26	74	52.86	38.35	17.05	61.52	100	0	P	H
													H
													H
		10380	47.85	-20.35	68.2	55.29	39.78	13.59	60.81	100	0	P	V
		15570	46.08	-27.92	74	52.2	38.35	17.05	61.52	100	0	P	V
													V
													V
802.11ac VHT40 CH 46 5230MHz		10460	48.14	-20.06	68.2	55.58	39.9	13.66	61	100	0	P	H
		15690	45.99	-28.01	74	52.6	37.57	17.19	61.37	100	0	P	H
													H
													H
		10460	47.67	-20.53	68.2	55.11	39.9	13.66	61	100	0	P	V
		15690	46.16	-27.84	74	52.77	37.57	17.19	61.37	100	0	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Band 1 5150~5250MHz

WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI Ant. 0+1+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)
802.11ac VHT80 CH 42 5210MHz		5147.68	58.12	-15.88	74	47.2	32.1	9.25	30.43	330	57	P	H
		5135.98	48.19	-5.81	54	37.31	32.07	9.24	30.43	330	57	A	H
	*	5210	105.19	-	-	94.48	31.82	9.32	30.43	330	57	P	H
	*	5210	96.25	-	-	85.54	31.82	9.32	30.43	330	57	A	H
		5433.12	50.68	-23.32	74	39.69	31.9	9.52	30.43	330	57	P	H
		5352.76	41.02	-12.98	54	30.61	31.42	9.42	30.43	330	57	A	H
		5128.96	65	-9	74	54.14	32.06	9.23	30.43	200	189	P	V
		5138.32	52.25	-1.75	54	41.36	32.08	9.24	30.43	200	189	A	V
	*	5210	111.25	-	-	100.54	31.82	9.32	30.43	200	189	P	V
	*	5210	102.39	-	-	91.68	31.82	9.32	30.43	200	189	A	V
		5350	52.92	-21.08	74	42.53	31.4	9.42	30.43	200	189	P	V
		5350	44.37	-9.63	54	33.98	31.4	9.42	30.43	200	189	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 1 5150~5250MHz

WIFI 802.11ac VHT80 (Harmonic @ 3m)

WIFI Ant. 0+1+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)
802.11ac VHT80 CH 42 5210MHz		10420	48.21	-19.99	68.2	55.6	39.9	13.62	60.91	100	0	P	H
		15630	45.71	-28.29	74	52.04	37.99	17.12	61.44	100	0	P	H
													H
													H
		10420	47.8	-20.4	68.2	55.19	39.9	13.62	60.91	100	0	P	V
		15630	46.09	-27.91	74	52.42	37.99	17.12	61.44	100	0	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

WIFI 802.11a (LF @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
0+1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11a LF		59.1	26.08	-13.92	40	45.71	11.91	1.04	32.58	-	-	P	H
		208.48	27.22	-16.28	43.5	42.54	15.2	1.97	32.49	-	-	P	H
		322.94	37.99	-8.01	46	48.62	19.56	2.35	32.54	100	0	P	H
		378.23	35.57	-10.43	46	44.55	21.06	2.51	32.55	-	-	P	H
		499.48	29.84	-16.16	46	35.56	23.99	2.86	32.57	-	-	P	H
		874.87	36.66	-9.34	46	35.55	29	3.9	31.79	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
		33.88	32.37	-7.63	40	40.98	23.25	0.75	32.61	100	0	P	V
		210.42	28.74	-14.76	43.5	44.09	15.17	1.98	32.5	-	-	P	V
		327.79	32.14	-13.86	46	42.62	19.71	2.35	32.54	-	-	P	V
		377.26	32.96	-13.04	46	41.95	21.05	2.51	32.55	-	-	P	V
		450.01	29.72	-16.28	46	36.47	23.1	2.71	32.56	-	-	P	V
		874.87	34.24	-11.76	46	33.13	29	3.9	31.79	-	-	P	V
													V
													V
													V
													V
													V
												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	Peak or Average
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+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		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

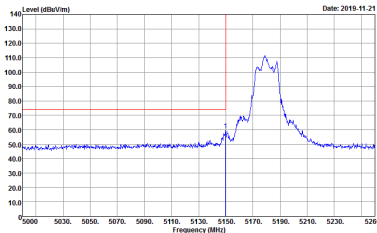
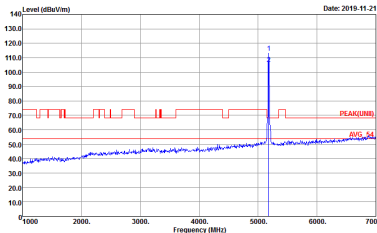
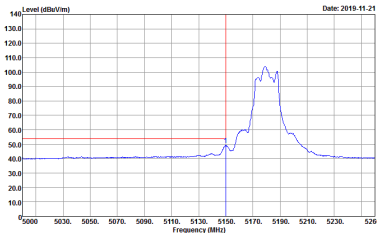
Test Engineer :	Leo Li, Karl Hou, and Bigshow Wang	Temperature :	24.2~25.1 °C
		Relative Humidity :	55~64%

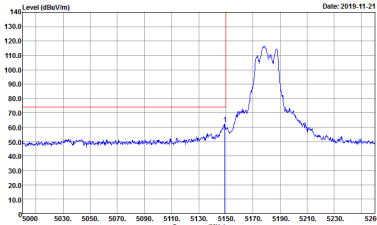
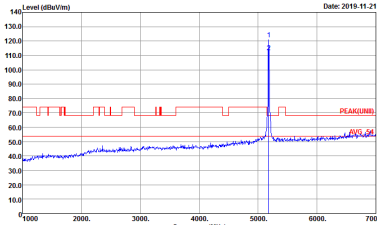
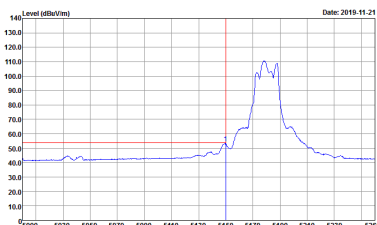
Note symbol

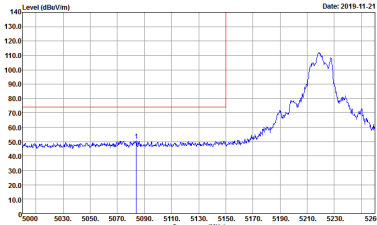
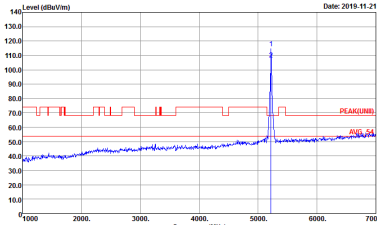
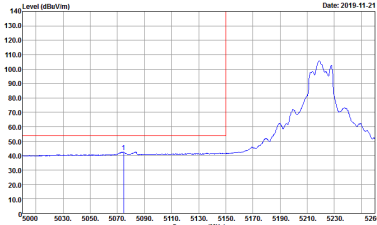
-L	Low channel location
-R	High channel location

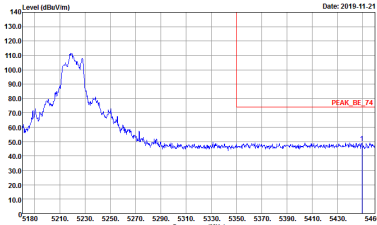
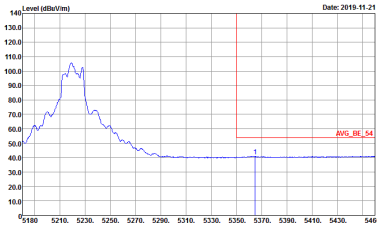


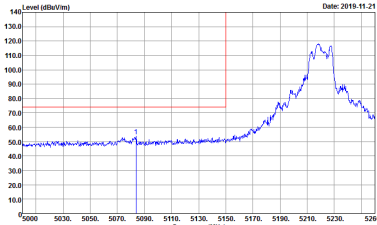
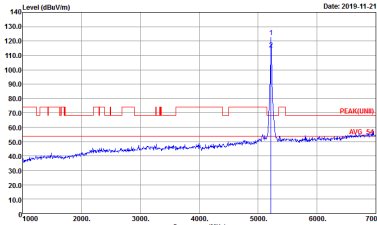
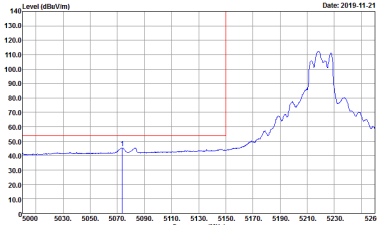
Band 1 - 5150~5250MHz
WIFI 802.11a (Band Edge @ 3m)

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11a CH36 5180MHz	
0+1+2	Horizontal	Fundamental
Peak	 Site Condition : 03CH15-HY : PEAK_BE_74 3m HORN_9120D_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site Condition : 03CH15-HY : PEAK(UNIT) 3m HORN_9120D_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site Condition : 03CH15-HY : AVG_BE_54 3m HORN_9120D_2114 HORIZONTAL : RBW:1000.000KHz VBW:1000KHz SWT:Auto	Left blank

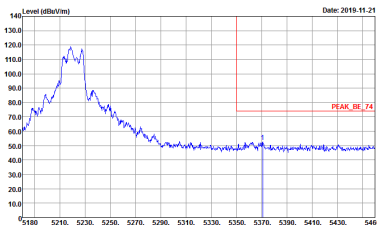
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11a CH36 5180MHz	
0+1+2	Vertical	Fundamental
Peak	 Site Condition : 03CH15-HY : PEAK_BE_74 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site Condition : 03CH15-HY : PEAK(UNIT) 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site Condition : 03CH15-HY : AVG_BE_54 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	Left blank

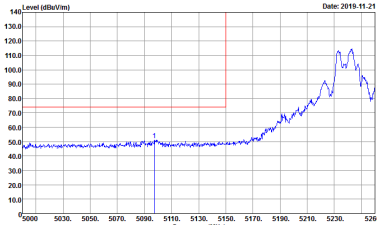
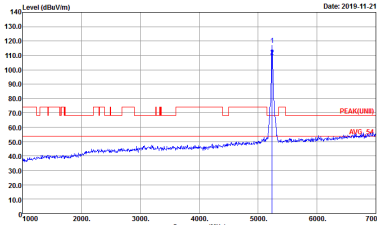
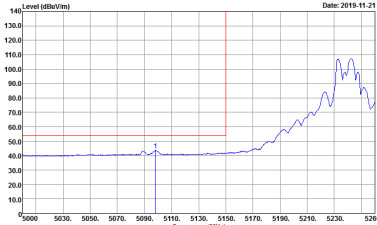
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11a CH44 5220MHz - L	
0+1+2	Horizontal	Fundamental
Peak	 Site Condition : 03CH15-HY : PEAK_BE_74 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site Condition : 03CH15-HY : PEAK(UNIT) 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site Condition : 03CH15-HY : AVG_BE_54 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	Left blank

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11a CH44 5220MHz - R	
0+1+2	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	Left blank

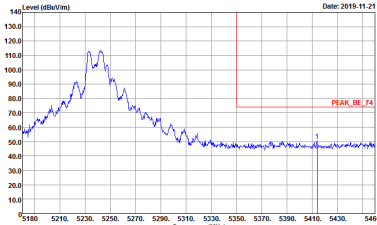
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11a CH44 5220MHz - L	
0+1+2	Vertical	Fundamental
Peak	 Site Condition : 03CH15-HY : PEAK_BE_74 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site Condition : 03CH15-HY : PEAK(UNIT) 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site Condition : 03CH15-HY : AVG_BE_54 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	Left blank

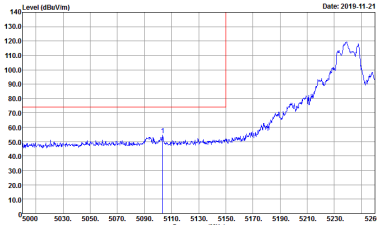
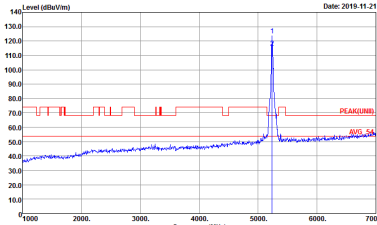
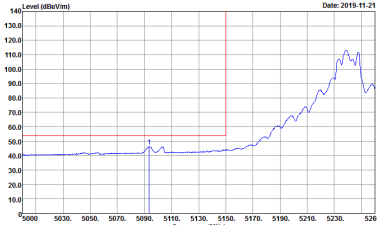


WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11a CH44 5220MHz - R	
0+1+2	Vertical	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	Left blank

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11a CH48 5240MHz - L	
0+1+2	Horizontal	Fundamental
Peak	 Site Condition : 03CH15-HY : PEAK_BE_74 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site Condition : 03CH15-HY : PEAK(UNIT) 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site Condition : 03CH15-HY : AVG_BE_54 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	Left blank



WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11a CH48 5240MHz - R	
0+1+2	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	Left blank

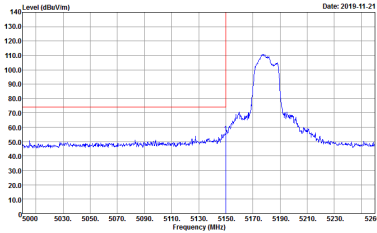
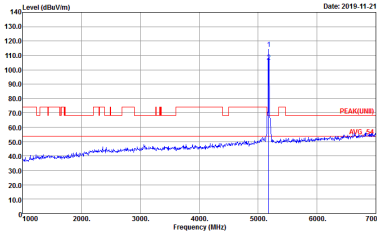
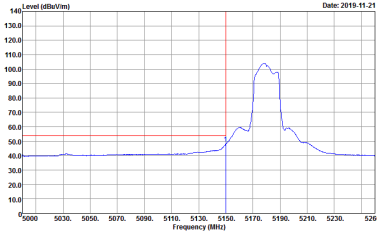
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11a CH48 5240MHz - L	
0+1+2	Vertical	Fundamental
Peak	 Site Condition : 03CH15-HY : PEAK_BE_74 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site Condition : 03CH15-HY : PEAK(UNIT) 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site Condition : 03CH15-HY : AVG_BE_54 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	Left blank

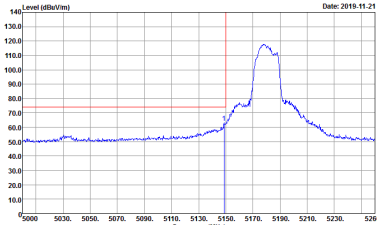
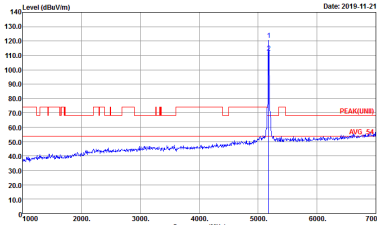
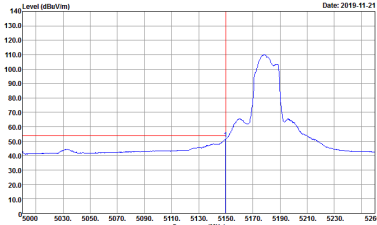


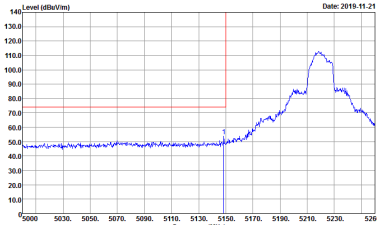
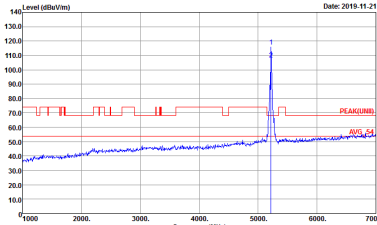
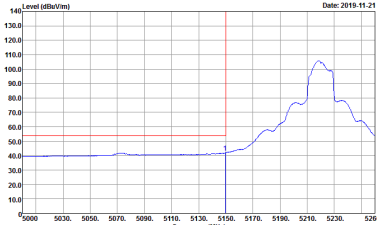
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11a CH48 5240MHz - R	
0+1+2	Vertical	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	Left blank



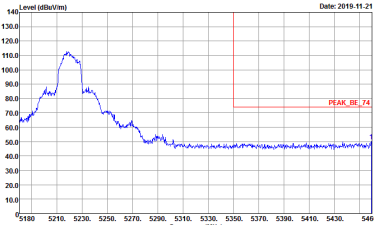
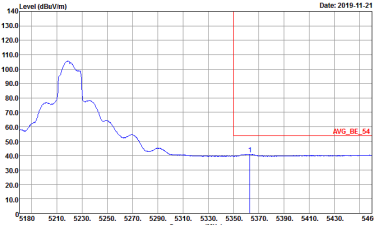
Band 1 5150~5250MHz
WIFI 802.11ac VHT20 (Band Edge @ 3m)

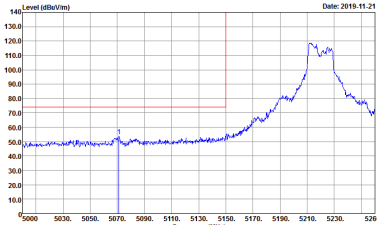
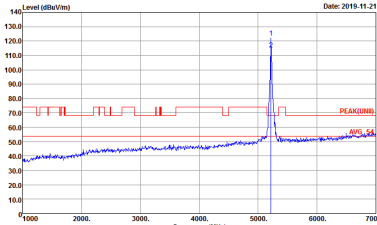
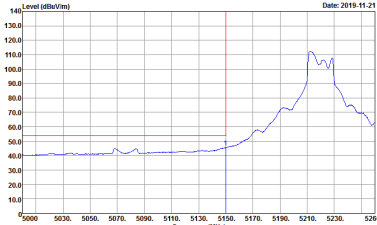
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT20 CH36 5180MHz	
0+1+2	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH15-HY Condition : PEAK(UNIT) 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto	Left blank

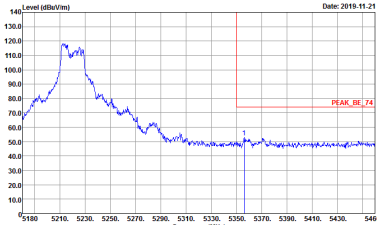
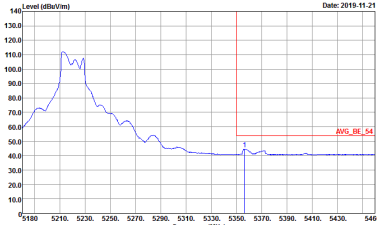
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT20 CH36 5180MHz	
0+1+2	Vertical	Fundamental
Peak	 Site Condition : 03CH15-HY : PEAK_BE_74 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site Condition : 03CH15-HY : PEAK(UNIT) 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site Condition : 03CH15-HY : AVG_BE_54 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:0.300KHz SWT:Auto	Left blank

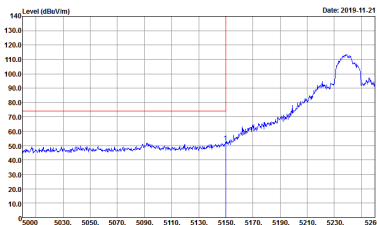
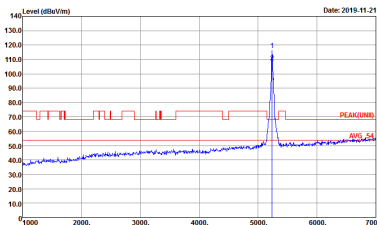
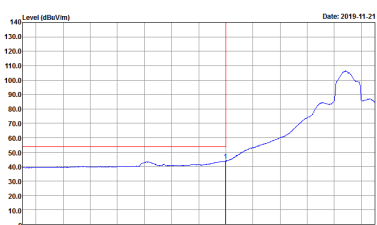
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT20 CH44 5220MHz - L	
0+1+2	Horizontal	Fundamental
Peak	 Site Condition : 03CH15-HY : PEAK_BE_74 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site Condition : 03CH15-HY : PEAK(UNIT) 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site Condition : 03CH15-HY : AVG_BE_54 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:0.300KHz SWT:Auto	Left blank



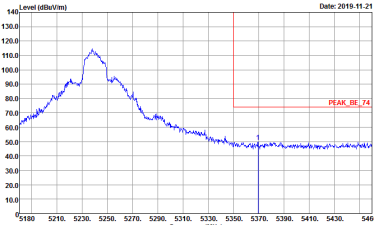
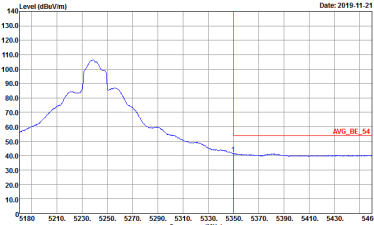
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT20 CH44 5220MHz - R	
0+1+2	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank

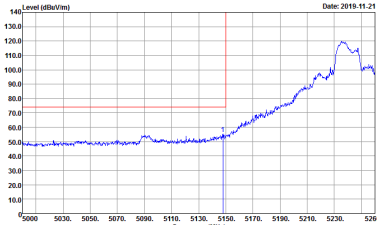
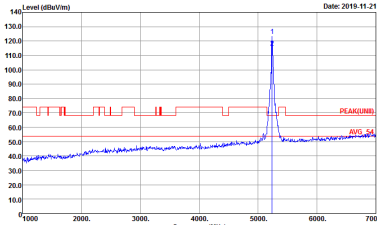
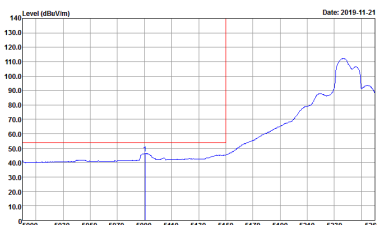
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT20 CH44 5220MHz - L	
0+1+2	Vertical	Fundamental
Peak	 Site Condition : 03CH15-HY : PEAK_BE_74 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site Condition : 03CH15-HY : PEAK(UNIT) 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site Condition : 03CH15-HY : AVG_BE_54 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:0.300KHz SWT:Auto	Left blank

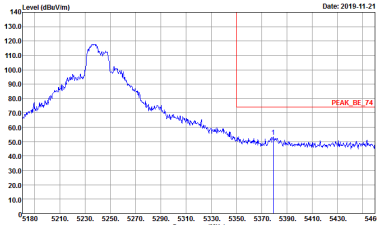
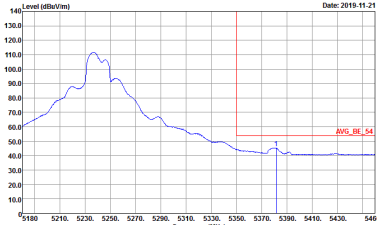
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT20 CH44 5220MHz - R	
0+1+2	Vertical	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT20 CH48 5240MHz - L	
0+1+2	Horizontal	Fundamental
Peak	 Site Condition : 03CH15-HY : PEAK_BE_74 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site Condition : 03CH15-HY : PEAK(UNIT) 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site Condition : 03CH15-HY : AVG_BE_54 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank

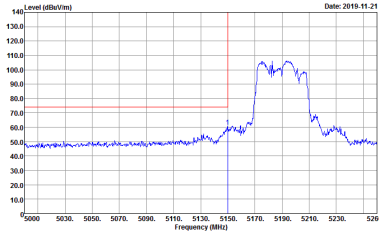
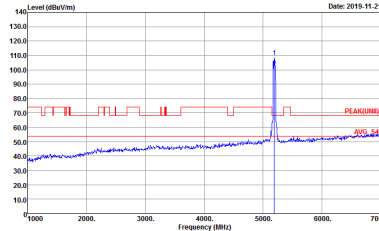
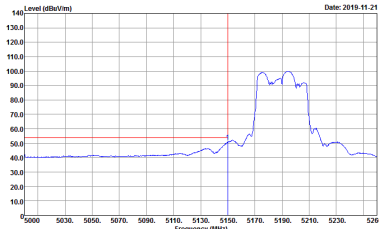


WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT20 CH48 5240MHz - R	
0+1+2	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:0.300KHz SWT:Auto	Left blank

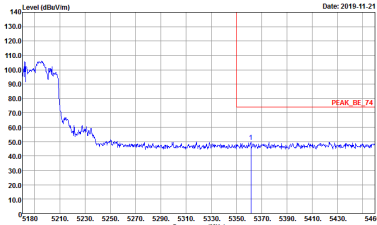
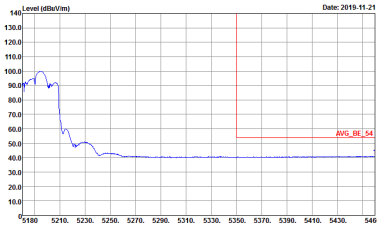
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT20 CH48 5240MHz - L	
0+1+2	Vertical	Fundamental
Peak	 Site Condition : 03CH15-HY : PEAK_BE_74 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site Condition : 03CH15-HY : PEAK(UNIT) 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site Condition : 03CH15-HY : AVG_BE_54 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:0.300KHz SWT:Auto	Left blank

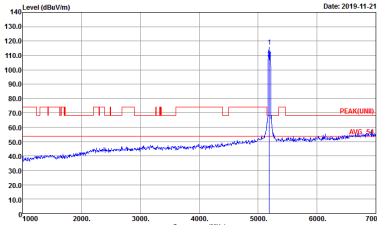
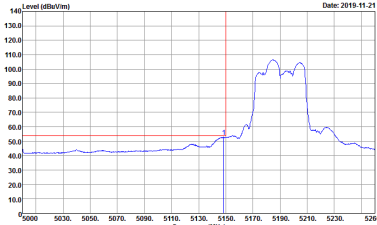
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT20 CH48 5240MHz - R	
0+1+2	Vertical	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:0.300KHz SWT:Auto	Left blank

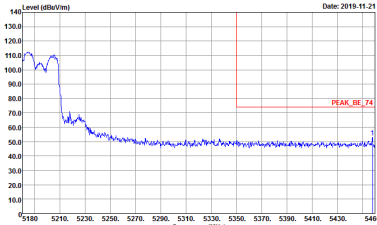
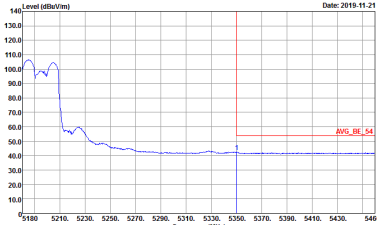
Band 1 5150~5250MHz
WIFI 802.11ac VHT40 (Band Edge @ 3m)

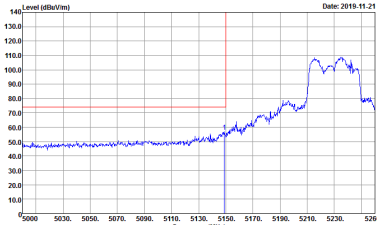
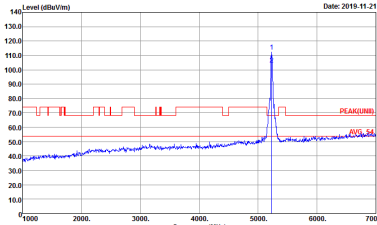
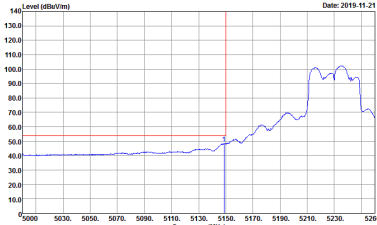
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT40 CH38 5190MHz - L	
0+1+2	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH15-HY Condition : PEAK(UNIT) 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	Left blank

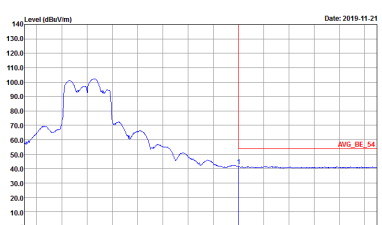


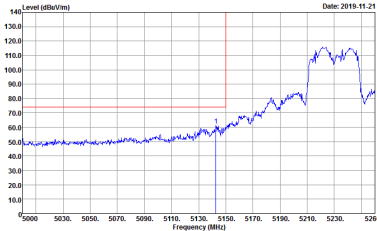
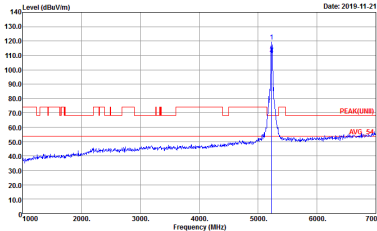
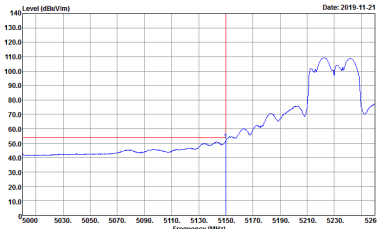
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT40 CH38 5190MHz - R	
0+1+2	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	Left blank

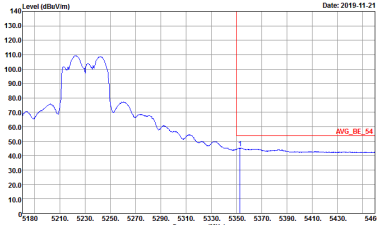
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT40 CH38 5190MHz - L	
0+1+2	Vertical	Fundamental
Peak	 Site Condition : 03CH15-HY : PEAK_BE_74 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site Condition : 03CH15-HY : PEAK(UNIT) 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site Condition : 03CH15-HY : AVG_BE_54 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	Left blank

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT40 CH38 5190MHz - R	
0+1+2	Vertical	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	Left blank

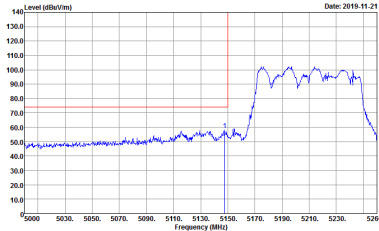
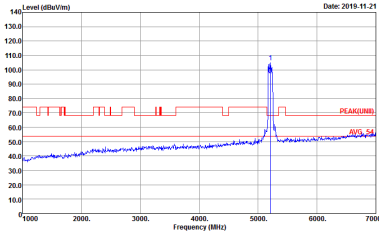
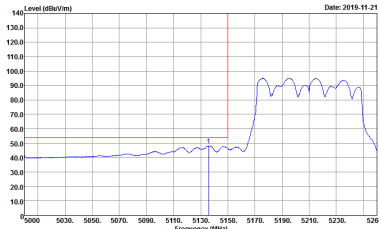
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT40 CH46 5230MHz - L	
0+1+2	Horizontal	Fundamental
Peak	 Site Condition : 03CH15-HY : PEAK_BE_74 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site Condition : 03CH15-HY : PEAK(UNIT) 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site Condition : 03CH15-HY : AVG_BE_54 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	Left blank

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT40 CH46 5230MHz - R	
0+1+2	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	Left blank

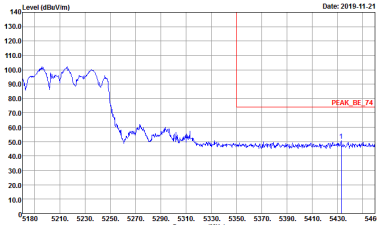
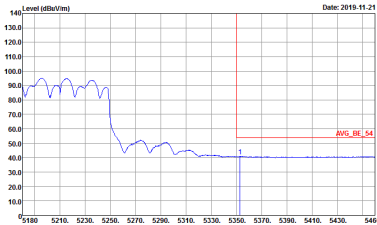
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT40 CH46 5230MHz - L	
0+1+2	Vertical	Fundamental
Peak	 Site Condition : 03CH15-HY : PEAK_BE_74 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site Condition : 03CH15-HY : PEAK(UNIT) 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site Condition : 03CH15-HY : AVG_BE_54 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	Left blank

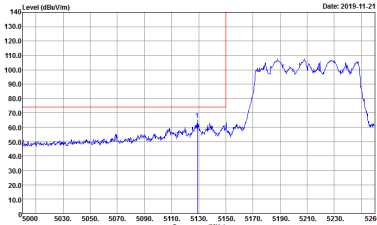
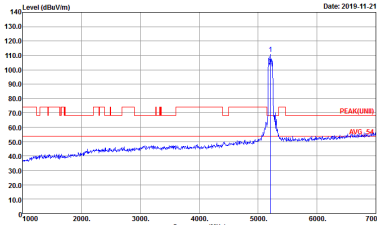
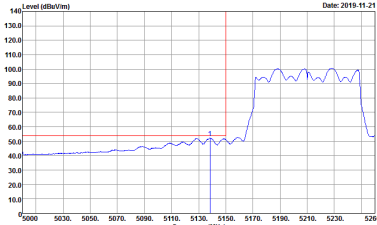
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT40 CH46 5230MHz - R	
0+1+2	Vertical	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	Left blank

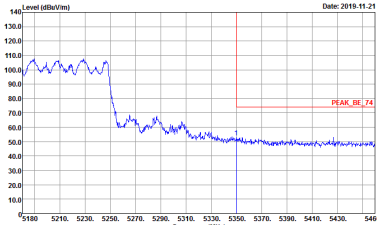
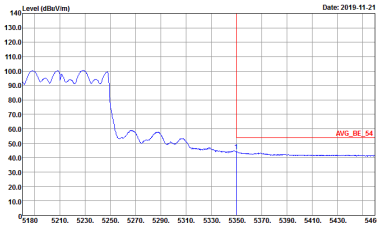
Band 1 5150~5250MHz
WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH42 5210MHz - L	
0+1+2	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH15-HY Condition : PEAK(UNIT) 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank



WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH42 5210MHz - R	
0+1+2	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m HORN_91200_2114 HORIZONTAL : RBW:1000.000KHz VBW:0.300KHz SWT:Auto	Left blank

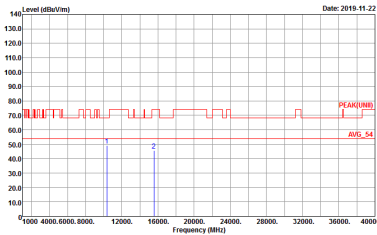
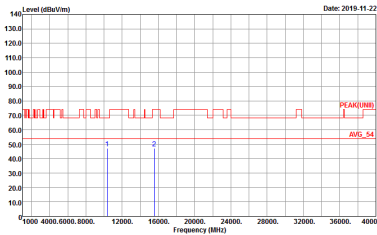
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH42 5210MHz - L	
0+1+2	Vertical	Fundamental
Peak	 Site Condition : 03CH15-HY : PEAK_BE_74 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site Condition : 03CH15-HY : PEAK(UNIT) 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site Condition : 03CH15-HY : AVG_BE_54 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH42 5210MHz - R	
0+1+2	Vertical	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m HORN_91200_2114 VERTICAL : RBW:1000.000KHz VBW:0.300KHz SWT:Auto	Left blank

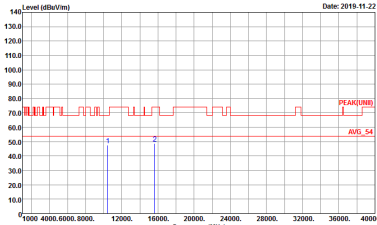
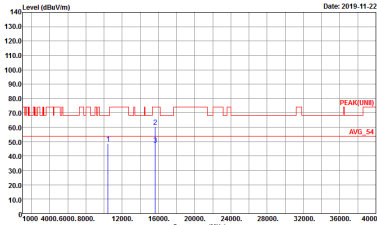


Band 1 - 5150~5250MHz

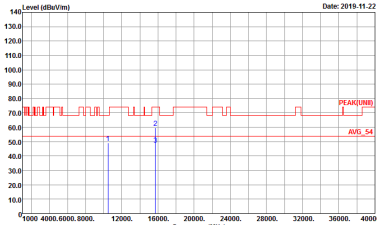
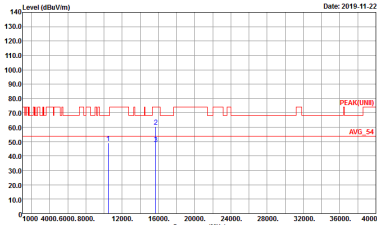
WIFI 802.11a (Harmonic @ 3m)

WIFI	Band 1 5150~5250MHz Harmonic @ 3m	
ANT	802.11a CH36 5180MHz	
0+1+2	Horizontal	Vertical
Peak Avg.	 Site : 03CH15-HY Condition : PEAK(UNIT) 3m HORN_91200_2114 HORIZONTAL Detector : Peak	 Site : 03CH15-HY Condition : PEAK(UNIT) 3m HORN_91200_2114 VERTICAL Detector : Peak

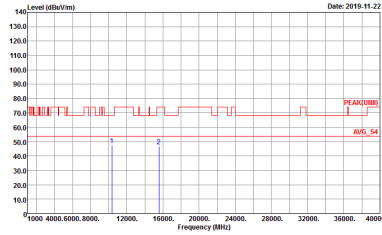
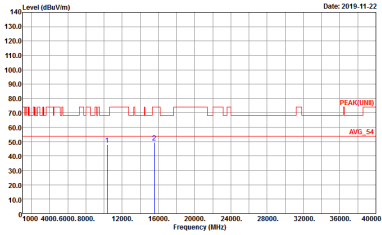


WIFI	Band 1 5150~5250MHz Harmonic @ 3m	
ANT	802.11a CH44 5220MHz	
0+1+2	Horizontal	Vertical
Peak Avg.	 Site : 03CH15-HY Condition : PEAK(UNII) 3m HORN_9120D_2114 HORIZONTAL Detector : Peak	 Site : 03CH15-HY Condition : PEAK(UNII) 3m HORN_9120D_2114 VERTICAL Detector : Peak

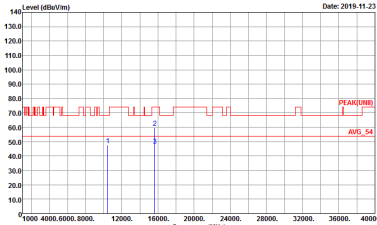
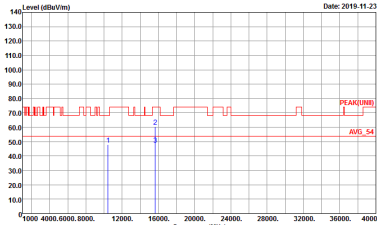


WIFI	Band 1 5150~5250MHz Harmonic @ 3m	
ANT	802.11a CH48 5240MHz	
0+1+2	Horizontal	Vertical
Peak Avg.	 Site : 03CH15-HY Condition : PEAK(UNIT) 3m HORN_9120D_2114 HORIZONTAL Detector : Peak	 Site : 03CH15-HY Condition : PEAK(UNIT) 3m HORN_9120D_2114 VERTICAL Detector : Peak

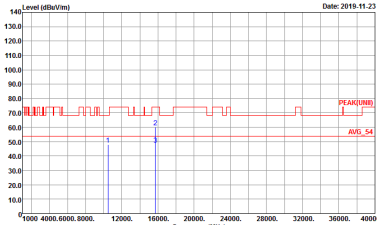
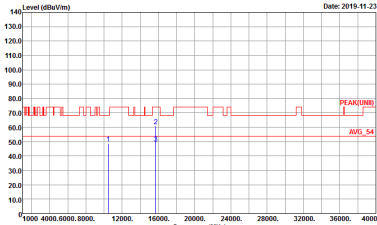
Band 1 5150~5250MHz
WIFI 802.11ac VHT20 (Harmonic @ 3m)

WIFI	Band 1 5150~5250MHz Harmonic @ 3m	
ANT	802.11ac VHT20 CH36 5180MHz	
0+1+2	Horizontal	Vertical
Peak Avg.	 Site : 03CH15-14Y Condition : PEAK(UNII) 3m HORN_91200_2114 HORIZONTAL Detector : Peak	 Site : 03CH15-14Y Condition : PEAK(UNII) 3m HORN_91200_2114 VERTICAL Detector : Peak

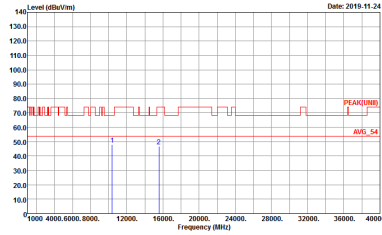
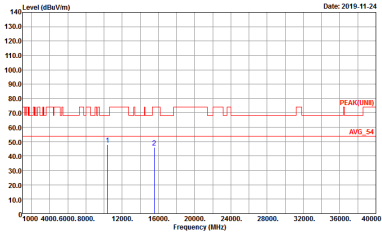


WIFI	Band 1 5150~5250MHz Harmonic @ 3m	
ANT	802.11ac VHT20 CH44 5220MHz	
0+1+2	Horizontal	Vertical
Peak Avg.	 Site : 03CH15-HY Condition : PEAK(UNIT) 3m HORN_9120D_2114 HORIZONTAL Detector : Peak	 Site : 03CH15-HY Condition : PEAK(UNIT) 3m HORN_9120D_2114 VERTICAL Detector : Peak

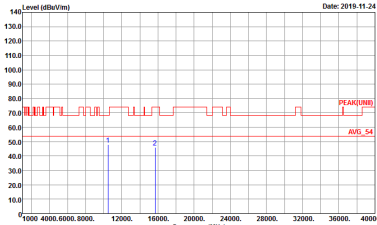
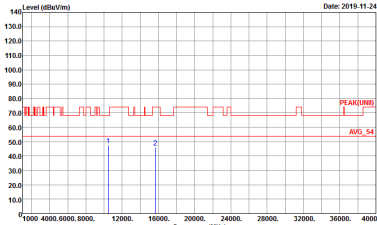


WIFI	Band 1 5150~5250MHz Harmonic @ 3m	
ANT	802.11ac VHT20 CH48 5240MHz	
1+2v	Horizontal	Vertical
Peak Avg.	 Site : 03CH15-HY Condition : PEAK(UNIT) 3m HORN_9120D_2114 HORIZONTAL Detector : Peak	 Site : 03CH15-HY Condition : PEAK(UNIT) 3m HORN_9120D_2114 VERTICAL Detector : Peak

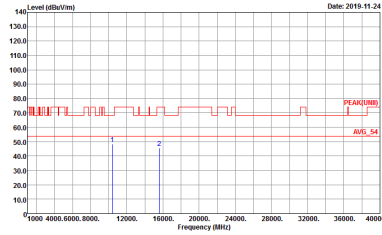
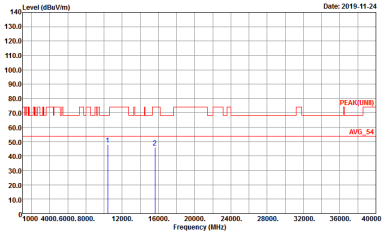
Band 1 5150~5250MHz
WIFI 802.11ac VHT40 (Harmonic @ 3m)

WIFI	Band 1 5150~5250MHz Harmonic @ 3m	
ANT	802.11ac VHT40 CH38 5190MHz	
0+1+2	Horizontal	Vertical
Peak Avg.	 Site : 03CH15-14Y Condition : PEAK(UNII) 3m HORN_91200_2114 HORIZONTAL Detector : Peak	 Site : 03CH15-14Y Condition : PEAK(UNII) 3m HORN_91200_2114 VERTICAL Detector : Peak

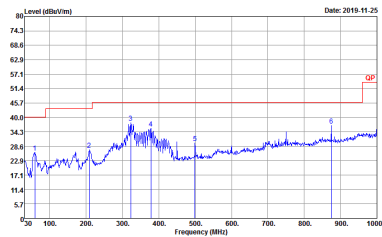
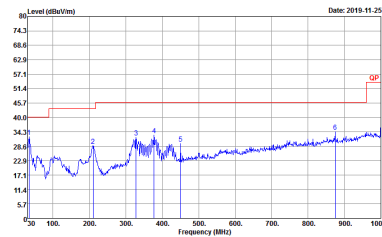


WIFI	Band 1 5150~5250MHz Harmonic @ 3m	
ANT	802.11ac VHT40 CH46 5230MHz	
0+1+2	Horizontal	Vertical
Peak Avg.	 Site : 03CH15-HY Condition : PEAK(UNIT) 3m HORN_9120D_2114 HORIZONTAL Detector : Peak	 Site : 03CH15-HY Condition : PEAK(UNIT) 3m HORN_9120D_2114 VERTICAL Detector : Peak

Band 1 5150~5250MHz
WIFI 802.11ac VHT80 (Harmonic @ 3m)

WIFI	Band 1 5150~5250MHz Harmonic @ 3m	
ANT	802.11ac VHT80 CH42 5210MHz	
0+1+2	Horizontal	Vertical
Peak Avg.	 Site : 03CH15-14Y Condition : PEAK(UNII) 3m HORN_91200_2114 HORIZONTAL Detector : Peak	 Site : 03CH15-14Y Condition : PEAK(UNII) 3m HORN_91200_2114 VERTICAL Detector : Peak

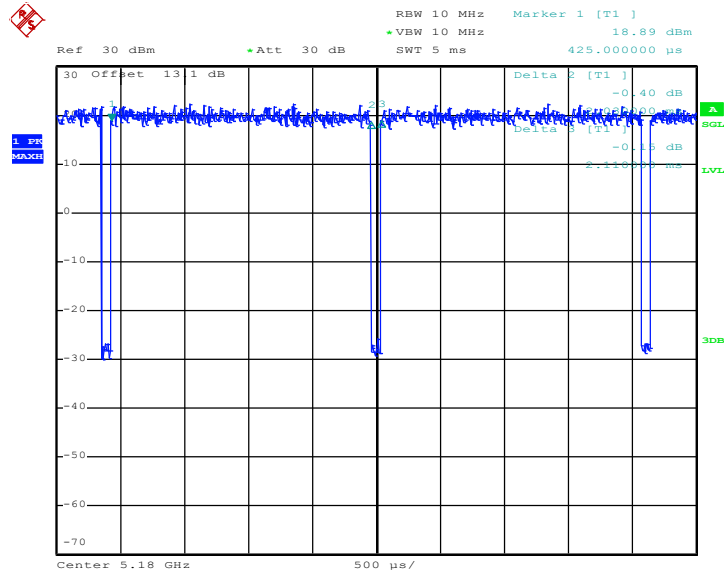
Emission below 1GHz
5GHz WIFI 802.11a (LF)

WIFI	5GHz WIFI	
ANT	802.11a LF	
0+1+2	Horizontal	Vertical
QP / Peak	 Site : 03CH15-HY Condition : QP 3m BIL06_15_41912 HORIZONTAL Detector : Peak	 Site : 03CH15-HY Condition : QP 3m BIL06_15_41912 VERTICAL Detector : Peak

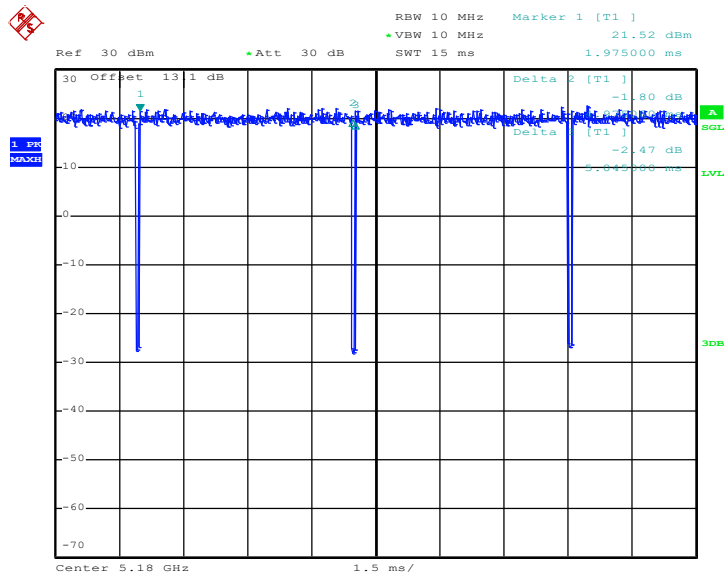


Appendix E. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
0+1+2	802.11a for Ant. 0	96.21	2030	0.49	1kHz	0.17
0+1+2	802.11a for Ant. 1	96.68	2040	0.49	1kHz	0.15
0+1+2	802.11a for Ant. 2	96.21	2030	0.49	1kHz	0.17
0+1+2	5GHz 802.11n HT20 for Ant. 0	98.61	-	-	10Hz	0.06
0+1+2	5GHz 802.11n HT20 for Ant. 1	98.02	-	-	10Hz	0.09
0+1+2	5GHz 802.11n HT20 for Ant. 2	98.31	-	-	10Hz	0.07
0+1+2	5GHz 802.11n HT40 for Ant. 0	95.80	2395	0.42	1kHz	0.19
0+1+2	5GHz 802.11n HT40 for Ant. 1	96.19	2400	0.42	1kHz	0.17
0+1+2	5GHz 802.11n HT40 for Ant. 2	96.41	2420	0.41	1kHz	0.16
0+1+2	5GHz 802.11ac VHT20 for Ant. 0	90.28	4970	0.20	300Hz	0.44
0+1+2	5GHz 802.11ac VHT20 for Ant. 1	90.45	4975	0.20	300Hz	0.44
0+1+2	5GHz 802.11ac VHT20 for Ant. 2	91.07	4995	0.20	300Hz	0.41
0+1+2	5GHz 802.11ac VHT40 for Ant. 0	82.39	2410	0.41	1kHz	0.84
0+1+2	5GHz 802.11ac VHT40 for Ant. 1	82.20	2425	0.41	1kHz	0.85
0+1+2	5GHz 802.11ac VHT40 for Ant. 2	82.31	2420	0.41	1kHz	0.85
0+1+2	5GHz 802.11ac VHT80 for Ant. 0	86.19	3340	0.30	300Hz	0.65
0+1+2	5GHz 802.11ac VHT80 for Ant. 1	86.69	3355	0.30	300Hz	0.62
0+1+2	5GHz 802.11ac VHT80 for Ant. 2	86.34	3350	0.30	300Hz	0.64

MIMO <Ant. 0>
802.11a


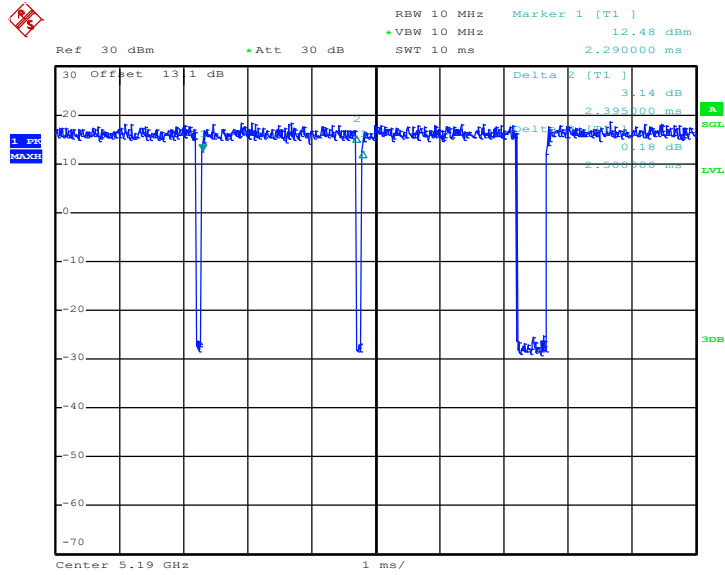
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802.11n HT20


Date: 22.OCT.2019 16:05:48

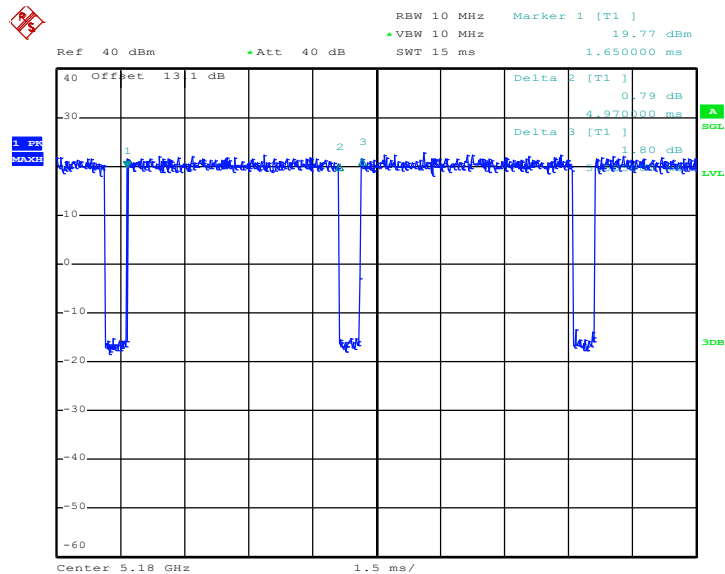


802.11n HT40



Date: 22.OCT.2019 16:10:01

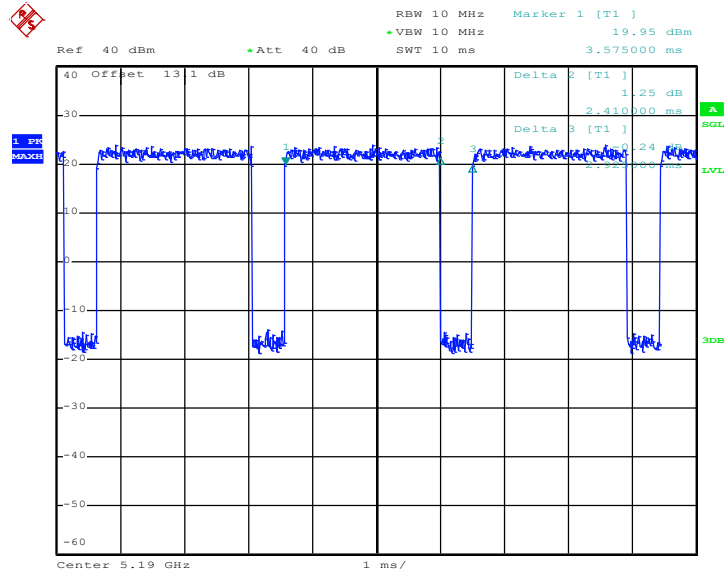
802.11ac VHT20



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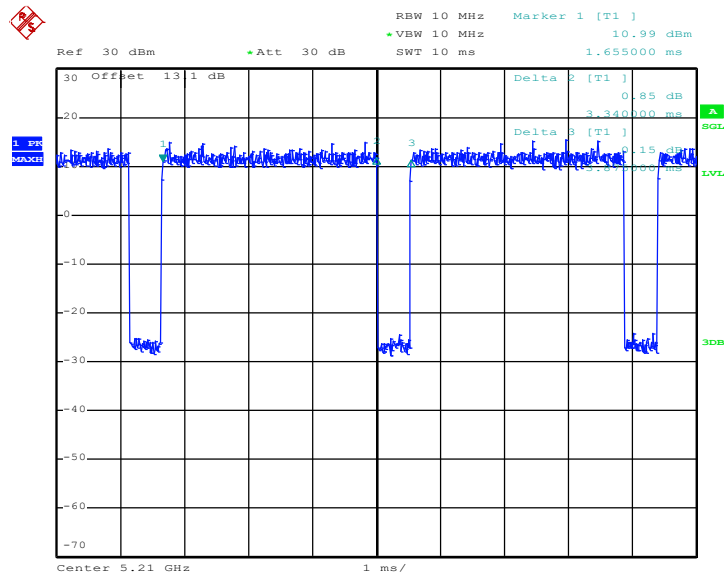


802.11ac VHT40

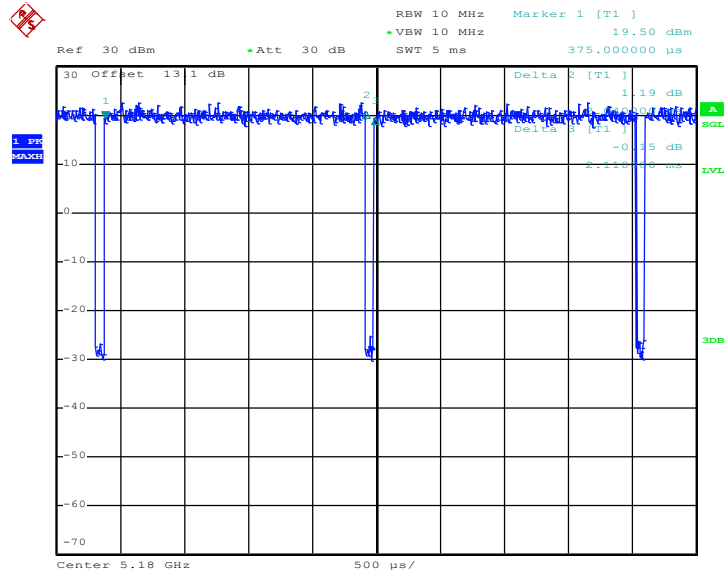


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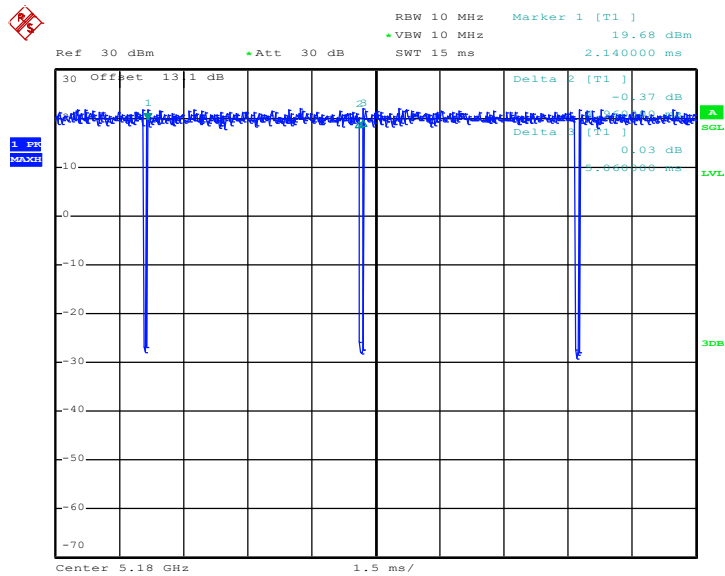
802.11ac VHT80



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MIMO <Ant. 1>
802.11a


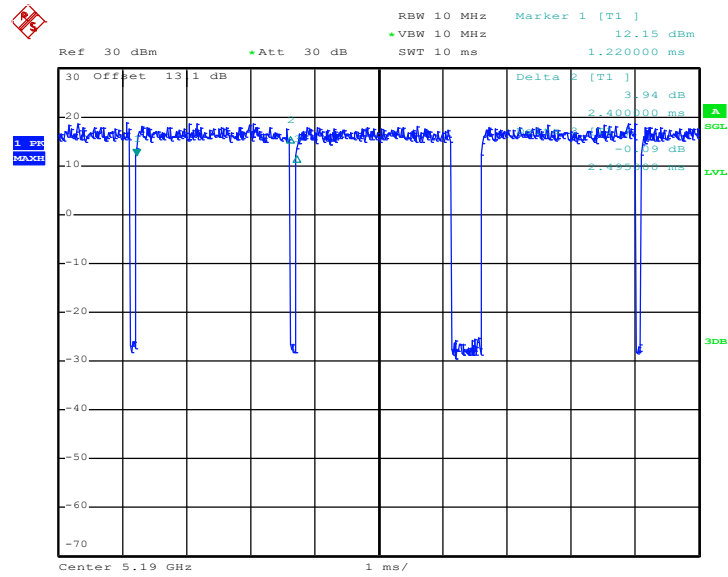
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802.11n HT20


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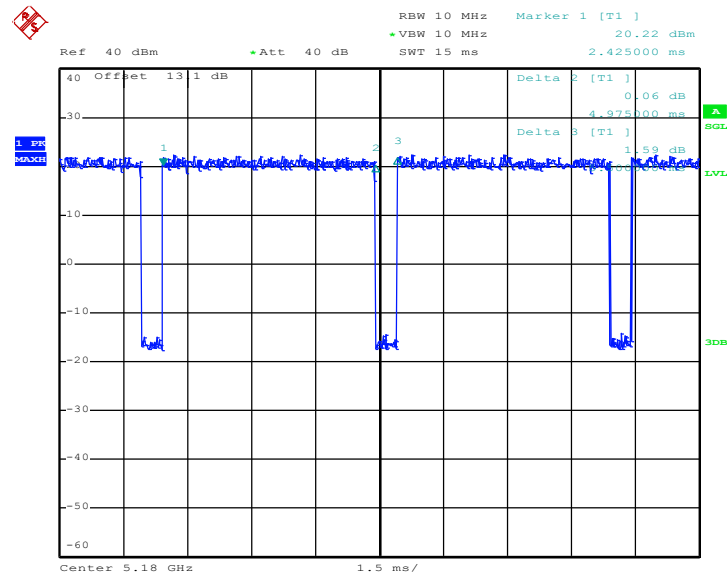


802.11n HT40

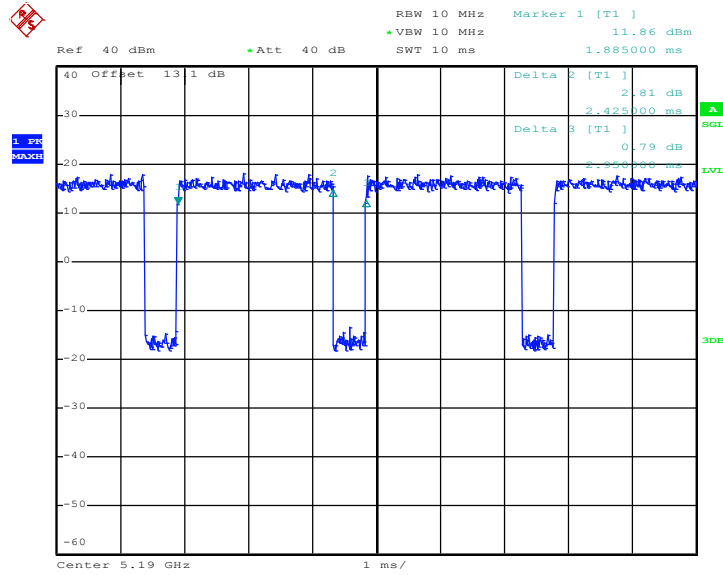


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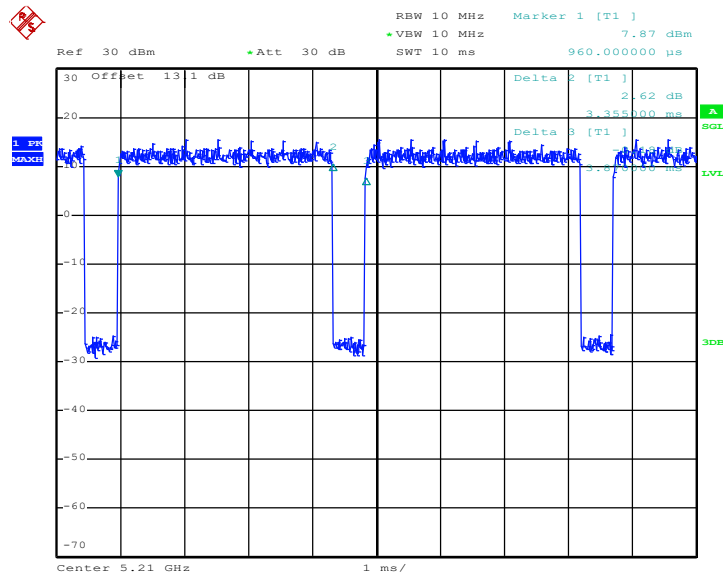
802.11ac VHT20



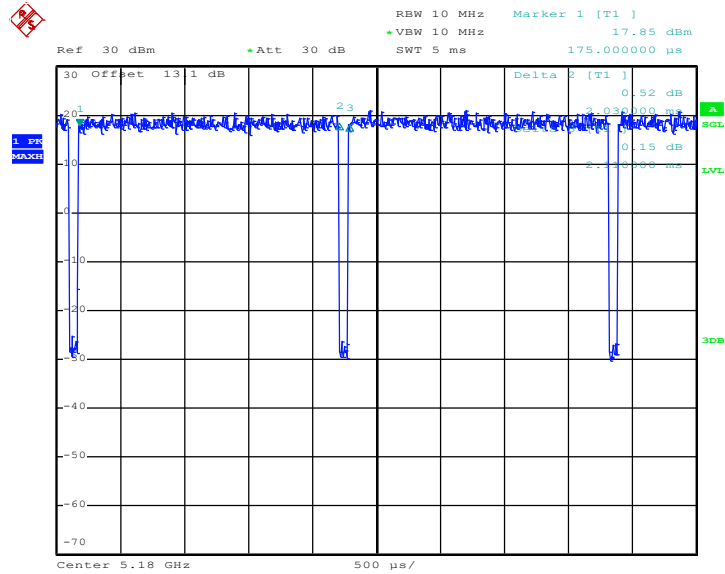
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802.11ac VHT40


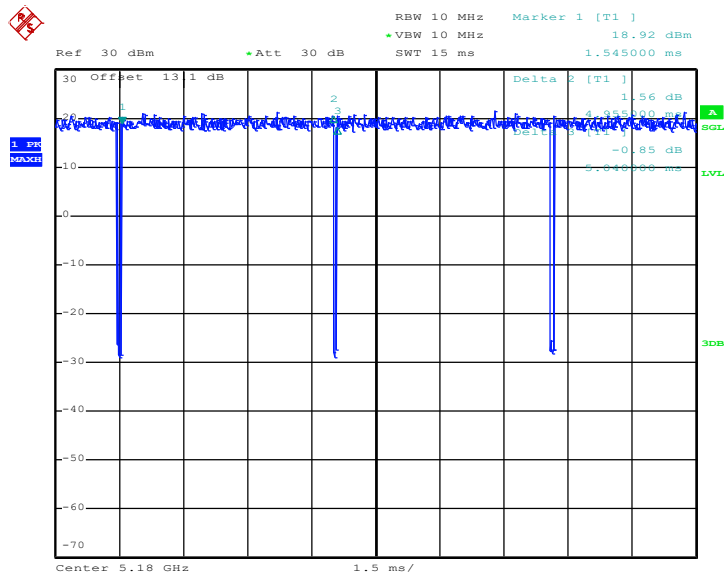
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802.11ac VHT80


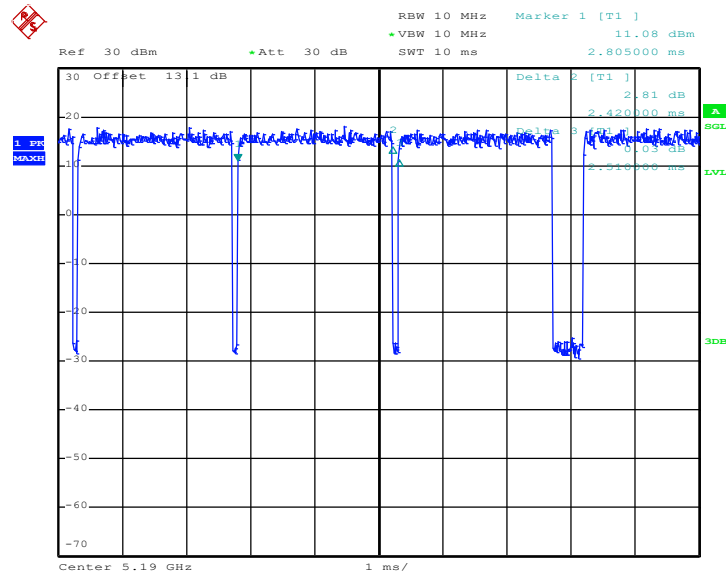
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MIMO <Ant. 2>
802.11a


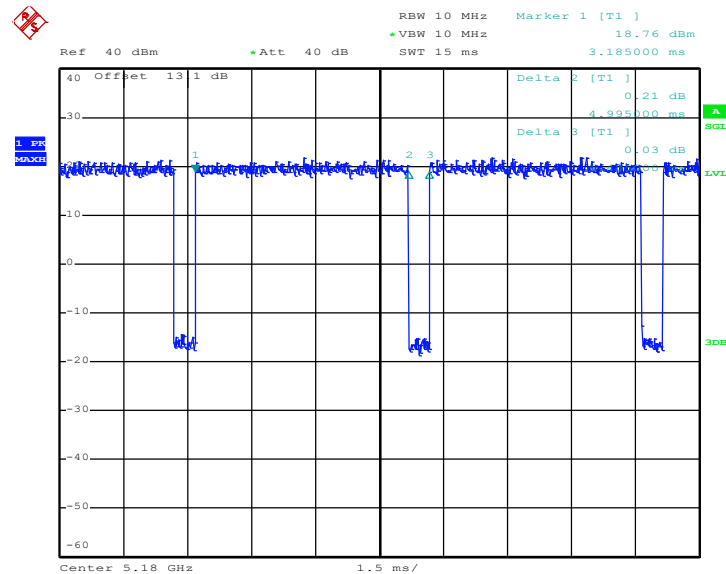
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802.11n HT20


Date: 22.OCT.2019 16:08:21

802.11n HT40


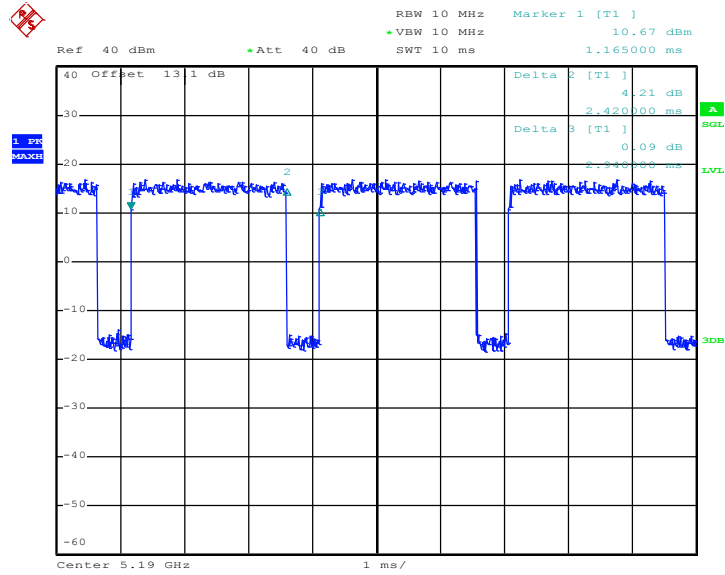
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802.11ac VHT20


Date: 23.OCT.2019 10:39:19

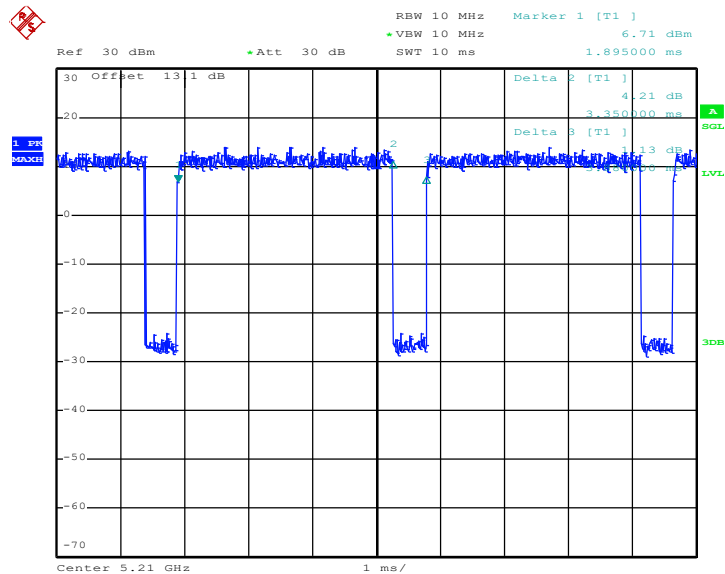


802.11ac VHT40



Date: 23.OCT.2019 11:34:19

802.11ac VHT80



Date: 23.OCT.2019 11:53:57