FCC RADIO TEST REPORT

FCC ID	:	**2ATUQ-6698**
Equipment	:	**Tablet**
Model Name	:	**K72LL4**
Applicant	:	**Mangled Horses LLC** **225 Wilmington-West Chester Pike,** **Suite 202 Chadds Ford, PA 19317**
Standard	:	**FCC Part 15 Subpart E §15.407**

The product was received on Nov. 12, 2019 and testing was started from Nov. 12, 2019 and completed on Jan. 16, 2020. 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 variant 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.

Louis Wu

Approved by: Louis Wu

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

Table of Contents

History of this test report **3**
Summary of Test Result **4**
1 General Description **5**
1.1 Product Feature of Equipment Under Test 5
1.2 Product Specification of Equipment Under Test 5
1.3 Modification of EUT 6
1.4 Testing Location 6
1.5 Applicable Standards 6
2 Test Configuration of Equipment Under Test **7**
2.1 Carrier Frequency and Channel 7
2.2 Test Mode 8
2.3 Connection Diagram of Test System 10
2.4 Support Unit used in test configuration and system 11
2.5 EUT Operation Test Setup 11
3 Test Result **12**
3.1 Maximum Conducted Output Power Measurement 12
3.2 Unwanted Emissions Measurement 14
3.3 AC Conducted Emission Measurement 17
3.4 Antenna Requirements 19
4 List of Measuring Equipment **20**
5 Uncertainty of Evaluation **22**
Appendix A. Conducted Test Results
Appendix B. AC Conducted Emission Test Result
Appendix C. Radiated Spurious Emission
Appendix D. Radiated Spurious Emission Plots
Appendix E. Duty Cycle Plots

History of this test report

Report No.	Version	Description	Issued Date
FR982217-02D	01	Initial issue of report	Jan. 10, 2020
FR982217-02D	02	Add the description of worst mode in section 2.2	Jan. 17, 2020
FR982217-02D	03	Adding conducted output power	Jan. 21, 2020
FR982217-02D	04	Add the near view of Radiated Emission in setup photo	Jan. 23, 2020

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)
-	15.403(i)	26dB Bandwidth	Not Required
-	2.1049	99% Occupied Bandwidth	Not Required
3.1	15.407(a)	Maximum Conducted Output Power	Pass
-	15.407(a)	Power Spectral Density	Not Required
3.2	15.407(b)	Unwanted Emissions	Pass
3.3	15.207	AC Conducted Emission	Pass
-	15.407(c)	Automatically Discontinue Transmission	Not Required
3.4	15.203 15.407(a)	Antenna Requirement	Pass

Remark:

1. Not required means after assessing, test items are not necessary to carry out, which is covered by previous report
2. This is a variant report by removing WPC function. All the test cases were performed on original report which can be referred to Sporton Report Number FR982217-01D. Based on the original report, the test cases were verified.

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: Ruby Zou

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	Tablet
Model Name	K72LL4
FCC ID	2ATUQ-6698
EUT supports Radios application	WLAN b/g/n HT20 WLAN 11a/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE

1.2 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	5150 MHz ~ 5250 MHz 5250 MHz ~ 5350 MHz 5470 MHz ~ 5720 MHz
Maximum (Average) Output Power to antenna	**<Ant. 1>** **<5180 MHz ~ 5240 MHz>** 802.11n HT40 : 13.80 dBm / 0.0240 W 802.11ac VHT80: 11.20 dBm / 0.0132 W **<5260 MHz ~ 5320 MHz>** 802.11n HT40 : 12.10 dBm / 0.0162 W 802.11ac VHT80: 11.20 dBm / 0.0132 W **<5500 MHz ~ 5720 MHz >** 802.11ac VHT80: 11.30 dBm / 0.0135 W **<Ant. 2>** **<5180 MHz ~ 5240 MHz>** 802.11a : 13.70 dBm / 0.0234 W 802.11ac VHT80: 11.30 dBm / 0.0135 W **<5260 MHz ~ 5320 MHz>** 802.11n HT20 : 13.80 dBm / 0.0240 W 802.11n HT40 : 13.70 dBm / 0.0234 W **<5500 MHz ~ 5720 MHz >** 802.11ac VHT80: 11.30 dBm / 0.0135 W
Maximum (Average) Output Power to antenna for Straddle Channel	**<Ant. 1>** 802.11n HT20 : 11.50 dBm / 0.0141 W **<Ant. 2>** 802.11a : 13.20 dBm / 0.0209 W
Antenna Gain / Gain	**<5150 MHz ~ 5250 MHz>** **Ant. 1:** IFA Antenna with gain 2.9 dBi **Ant. 2:** Monopole Antenna with gain 2.1 dBi **<5250 MHz ~ 5350 MHz>** **Ant. 1:** IFA Antenna with gain 3.0 dBi **Ant. 2:** Monopole Antenna with gain 2.6 dBi **<5470 MHz ~ 5720 MHz >** **Ant. 1:** IFA Antenna with gain 2.9 dBi **Ant. 2:** Monopole Antenna with gain 2.9 dBi
Type of Modulation	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)

1.3 Modification of EUT

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

1.4 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.**
	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	TH05-HY

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

FCC designation No.: TW1190 and TW0007

1.5 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.
- 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:, radiation emission (1 GHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Y plane) were recorded in this report.

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		

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5250-5350 MHz Band 2 (U-NII-2A)	52	5260	60	5300
	54*	5270	62*	5310
	56	5280	64	5320
	58#	5290		

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5470-5725 MHz Band 3 (U-NII-2C)	100	5500	112	5560
	102*	5510	116	5580
	104	5520	132	5660
	106#	5530	134*	5670
	108	5540	136	5680
	110*	5550	140	5700

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

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
Straddle Channel	138#	5690	144	5720
	142*	5710		

Note:

1. The above Frequency and Channel in "*" were 802.11n HT40.
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	**MCS0**
802.11n HT40	**MCS0**
802.11ac VHT80	**MCS0**

Test Cases	
AC Conducted Emission	Mode 1 : WLAN (5GHz) Link + Bluetooth Link + Play MPEG4 from SD Card + USB Cable (Charging from Adapter (AP16)) + Micro SD card
Remark: The AC Conducted Emission test case has leveraged from the worst mode of Part 15B AC Conducted Emission.	

Ch. #		Band I：5150-5250 MHz	Band III：5470-5725MHz
		802.11a	802.11a
L	Low	-	-
M	Middle	44	-
H	High	-	-
Straddle		-	144

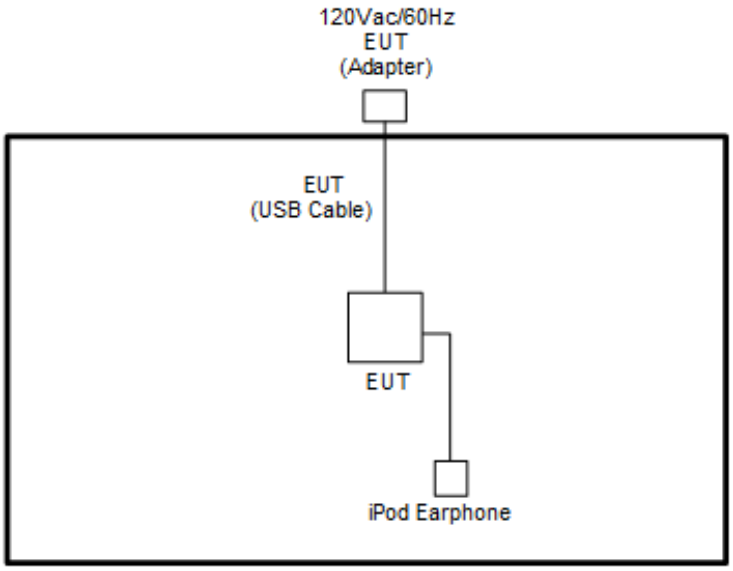
Ch. #		Band II：5250-5350 MHz	Band III：5470-5725MHz
		802.11n HT20	802.11n HT20
L	Low	-	-
M	Middle	-	-
H	High	64	-
Straddle		-	144

Ch. #		Band II：5250-5350 MHz
		802.11n HT40
L	Low	54
M	Middle	-
H	High	62

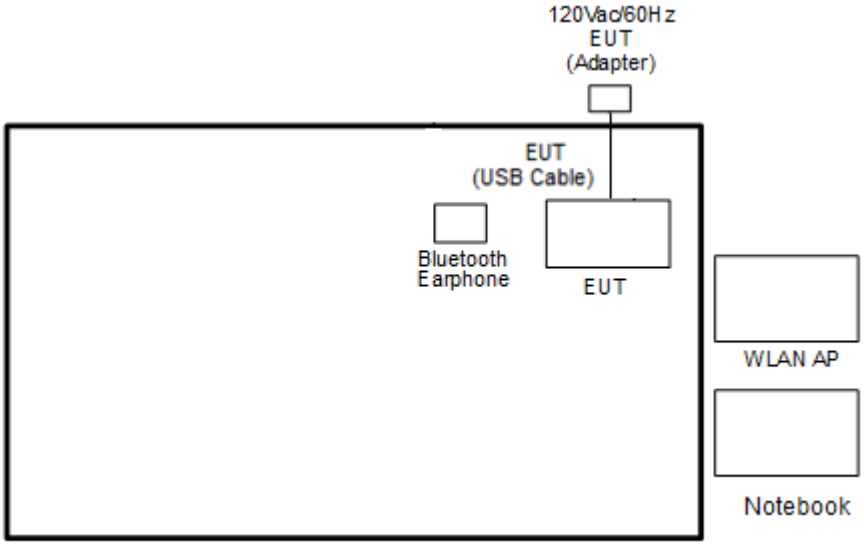
Ch. #		Band I：5150-5250 MHz	Band II：5250-5350 MHz	Band III：5470-5725MHz
		802.11ac VHT80	802.11ac VHT80	802.11ac VHT80
L	Low	-	-	106
M	Middle	42	58	-
H	High	-	-	-

2.3 Connection Diagram of Test System

<WLAN Tx Mode>



<AC Conducted Emission Mode>



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	iPhone Earphone	Apple	N/A	Verification	Unshielded, 1.0m	N/A
2.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
3.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
4.	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
5.	Notebook	DELL	Latitude E3400	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
6.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A

2.5 EUT Operation Test Setup

The RF test items, utility “CMD” 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.

3 Test Result

3.1 Maximum Conducted Output Power Measurement

3.1.1 Limit of Maximum Conducted Output Power

<FCC 14-30 CFR 15.407>

For 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.

For the 5.25–5.725 GHz bands:

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

For Straddle Channel, according to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, if the power and PSD of the devices are uniform and comply with the lower limits specified for the U-NII-2 bands, a single measurement over the entire emission bandwidth can be performed to show compliance.

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

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

3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

3.1.3 Test Procedures

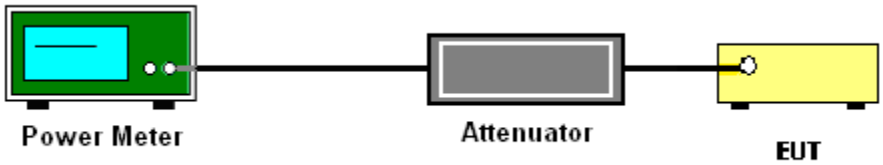
The testing follows Method PM-G of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

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.

For Straddle Channel, according to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, if the power and PSD of the devices are uniform and comply with the lower limits specified for the U-NII-2 bands, a single measurement over the entire emission bandwidth can be performed to show compliance.

3.1.4 Test Setup



3.1.5 Test Result of Maximum Conducted Output Power

Please refer to Appendix A.

3.2 Unwanted Emissions Measurement

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

3.2.1 Limit of Unwanted Emissions

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

For transmitters operating in the 5250-5350 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5250-5350 MHz band that generate emissions in the 5150-5250 MHz band must meet all applicable technical requirements for operation in the 5150-5250 MHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5150-5250 MHz band.

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

(2) 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.

$$E=\frac{1000000\sqrt{30P}}{3}$$ 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.

3.2.2 Measuring Instruments

See list of measuring equipment of this test report.

3.2.3 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 Peak Unwanted Emissions Measurements Above 1000 MHz

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

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

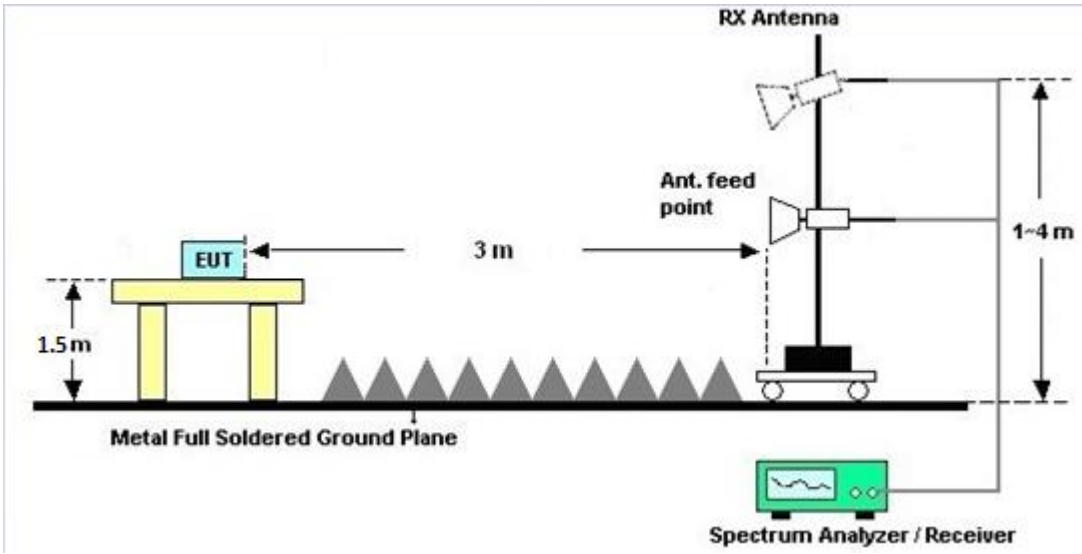
   - RBW = 1 MHz
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

2. The EUT was placed on a turntable with 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 above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

3.2.4 Test Setup

For radiated emissions above 1GHz



3.2.5 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C and D.

3.2.6 Duty Cycle

Please refer to Appendix E.

3.2.7 Test Result of Radiated Spurious Emissions

Please refer to Appendix C and D.

3.3 AC Conducted Emission Measurement

3.3.1 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.

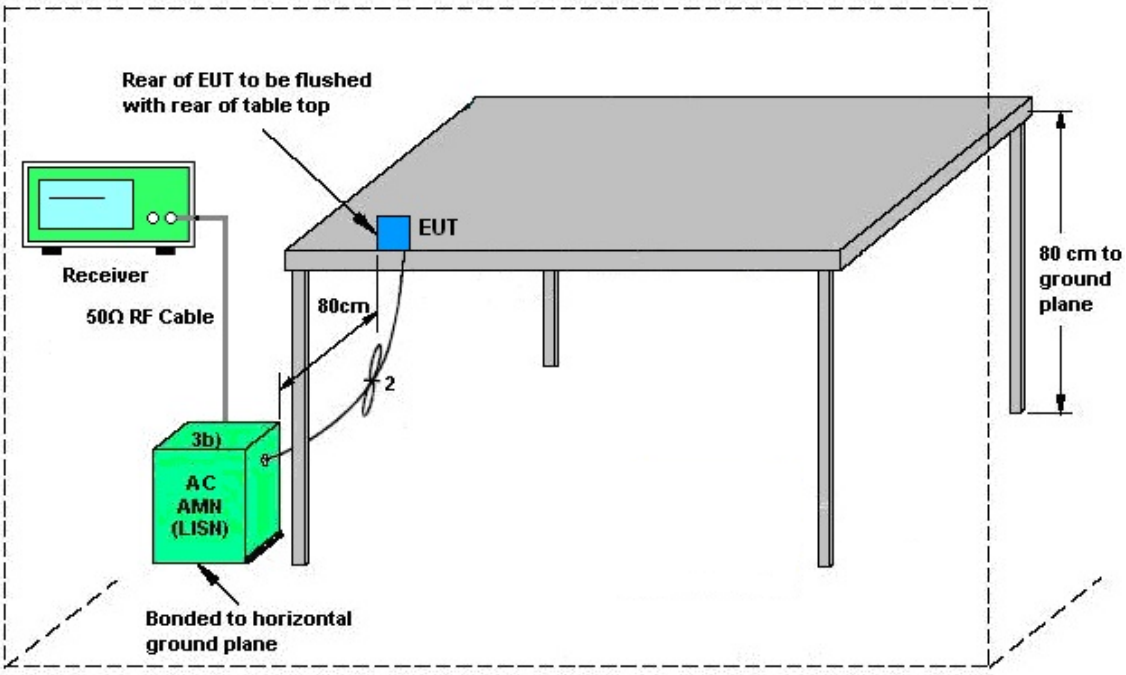
3.3.2 Measuring Instruments

See list of measuring equipment of this test report.

3.3.3 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.

3.3.4 Test Setup



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

3.3.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.4 Antenna Requirements

3.4.1 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.

3.4.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.4.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Preamplifier	EMEC	EM18G40G	060715	18GHz ~ 40GHz	Dec. 06, 2018	Nov. 12, 2019~ Nov. 27, 2019	Dec. 05, 2019	Radiation (03CH15-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-2114	1-18GHz	Jul. 31, 2019	Nov. 12, 2019~ Nov. 27, 2019	Jul. 30, 2020	Radiation (03CH15-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170584	18GHz- 40GHz	Dec. 05, 2018	Nov. 12, 2019~ Nov. 27, 2019	Dec. 04, 2019	Radiation (03CH15-HY)
Preamplifier	Jet-Power	JPA0118-55-303	1710001800055007	1GHz~18GHz	Apr. 01, 2019	Nov. 12, 2019~ Nov. 27, 2019	May 31, 2020	Radiation (03CH15-HY)
Preamplifier	Keysight	83017A	MY53270195	1GHz~26.5GHz	Aug. 23, 2019	Nov. 12, 2019~ Nov. 27, 2019	Aug. 22, 2020	Radiation (03CH15-HY)
EMI Test Receiver	Keysight	N9038A (MXE)	MY55420170	20MHz~8.4GHz	Mar. 08, 2019	Nov. 12, 2019~ Nov. 27, 2019	Mar. 07, 2020	Radiation (03CH15-HY
EMI Test Receiver	Rohde & Schwarz	ESU26	100390	20Hz~26.5GHz	Dec. 27, 2018	Nov. 12, 2019~ Nov. 27, 2019	Dec. 26, 2019	Radiation (03CH15-HY)
Controller	ChainTek	3000-1	N/A	Control Turn table & Ant Mast	N/A	Nov. 12, 2019~ Nov. 27, 2019	N/A	Radiation (03CH15-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Nov. 12, 2019~ Nov. 27, 2019	N/A	Radiation (03CH15-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Nov. 12, 2019~ Nov. 27, 2019	N/A	Radiation (03CH15-HY)
Software	Audix	E3 6.2009-8-24 (k5)	RK-000451	N/A	N/A	Nov. 12, 2019~ Nov. 27, 2019	N/A	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY36980/4	30M-18G	Apr. 15, 2019	Nov. 12, 2019~ Nov. 27, 2019	Apr. 14, 2020	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9838/4PE	30M-18G	Apr. 15, 2019	Nov. 12, 2019~ Nov. 27, 2019	Apr. 14, 2020	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY802430/4	30M~18G	May 13, 2019	Nov. 12, 2019~ Nov. 27, 2019	May 12, 2020	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	505134/2	30MHz-40GHz	Feb. 26, 2019	Nov. 12, 2019~ Nov. 27, 2019	Feb. 25, 2020	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	800740/2	30MHz-40GHz	Feb. 26, 2019	Nov. 12, 2019~ Nov. 27, 2019	Feb. 25, 2020	Radiation (03CH15-HY)
Filter	Wainwright	WHKX8-5872.5-6750-18000-40ST	SN6	6.75GHz High Pass Filter	Jul. 02, 2019	Nov. 12, 2019~ Nov. 27, 2019	Jul. 01, 2020	Radiation (03CH15-HY)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Jan. 07, 2020	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Nov. 15, 2019	Jan. 07, 2020	Nov. 14, 2020	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Mar. 19, 2019	Jan. 07, 2020	Mar. 18, 2020	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Nov. 15, 2019	Jan. 07, 2020	Nov. 14, 2020	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Jan. 07, 2020	N/A	Conduction (CO05-HY)
LF Cable	HUBER + SUHNER	RG-214/U	LF01	N/A	Jan. 02, 2020	Jan. 07, 2020	Jan. 01, 2021	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Jan. 02, 2020	Jan. 07, 2020	Jan. 01, 2021	Conduction (CO05-HY)
Hygrometer	Testo	608-H2	41410069	N/A	Jun. 17, 2019	Jan. 16, 2020	Jun. 16, 2020	Conducted (TH05-HY)
Power Sensor	DARE	RPR3006W	16I00054SNO10	10MHz~6GHz	Dec. 23, 2019	Jan. 16, 2020	Dec. 22 2020	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz~40GHz	Jul. 15, 2019	Jan. 16, 2020	Jul. 14, 2020	Conducted (TH05-HY)
Switch Box & RF Cable	Burgeon	ETF-058	EC1208382	N/A	Mar. 27, 2019	Jan. 16, 2020	Mar. 26, 2020	Conducted (TH05-HY)

5 Uncertainty of Evaluation

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

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

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.4

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

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

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Luffy Lin	Temperature:	21~25	°C
Test Date:	2020/1/16	Relative Humidity:	51~54	%

Report Number : FR982217-02D

TEST RESULTS DATA
Average Power Table

FCC Band I single antenna													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)			Pass/Fail
					Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2		
11a	6Mbps	1	44	5220	-	13.70		24.00	24.00	2.90	2.10		Pass
HT40	MCS0	1	38	5190	13.80	-		24.00	24.00	2.90	2.10		Pass
VHT80	MCS0	1	42	5210	11.20	11.30		24.00	24.00	2.90	2.10		Pass

TEST RESULTS DATA
Average Power Table

FCC Band II single antenna													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		EIRP Power Limit (dBm)	Pass/Fail
					Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2		
HT20	MCS0	1	64	5320	-	13.80		23.98	23.98	3.00	2.60	26.99	Pass
HT40	MCS0	1	54	5270	12.10	-		23.98	23.98	3.00	2.60	26.99	Pass
HT40	MCS0	1	62	5310	-	13.70		23.98	23.98	3.00	2.60	26.99	Pass
VHT80	MCS0	1	58	5290	11.20	-		23.98	23.98	3.00	2.60	26.99	Pass

TEST RESULTS DATA
Average Power Table

FCC Band III single antenna													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		EIRP Power Limit (dBm)	Pass/Fail
					Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2		
VHT80	MCS0	1	106	5530	11.30	11.30		23.98	23.98	2.90	2.90	26.99	Pass

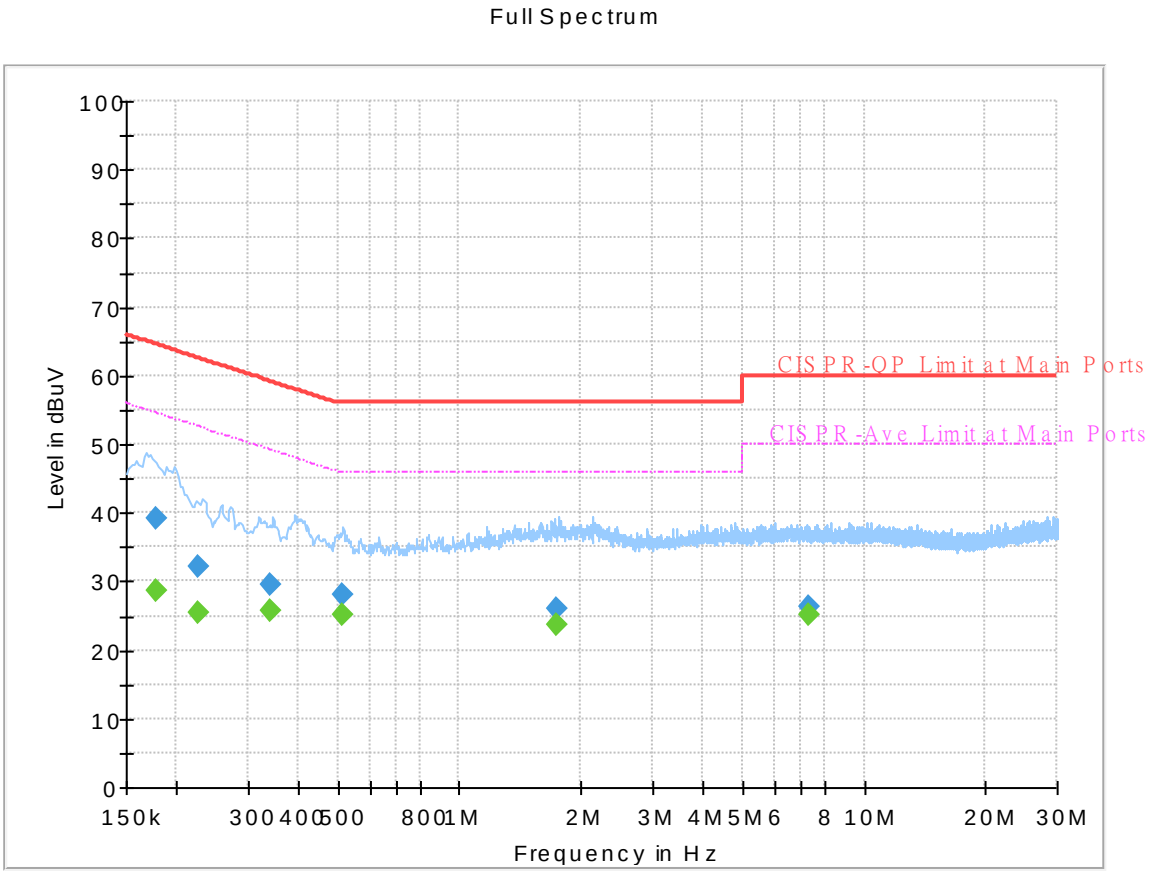
FCC Band III straddle channel single antenna													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		EIRP Power Limit (dBm)	Pass/Fail
					Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2		
11a	6Mbps	1	144	5720	-	13.20		22.94	22.87	2.90	2.90	26.99	Pass
HT20	MCS0	1	144	5720	11.50	-		22.94	23.02	2.90	2.90	26.99	Pass

Appendix B. AC Conducted Emission Test Results

Test Engineer :	Tom Lee and Howard Huang	**Temperature :**	22~25℃
		Relative Humidity :	45~53%

EUT Information

Report NO :	982217-02
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Line



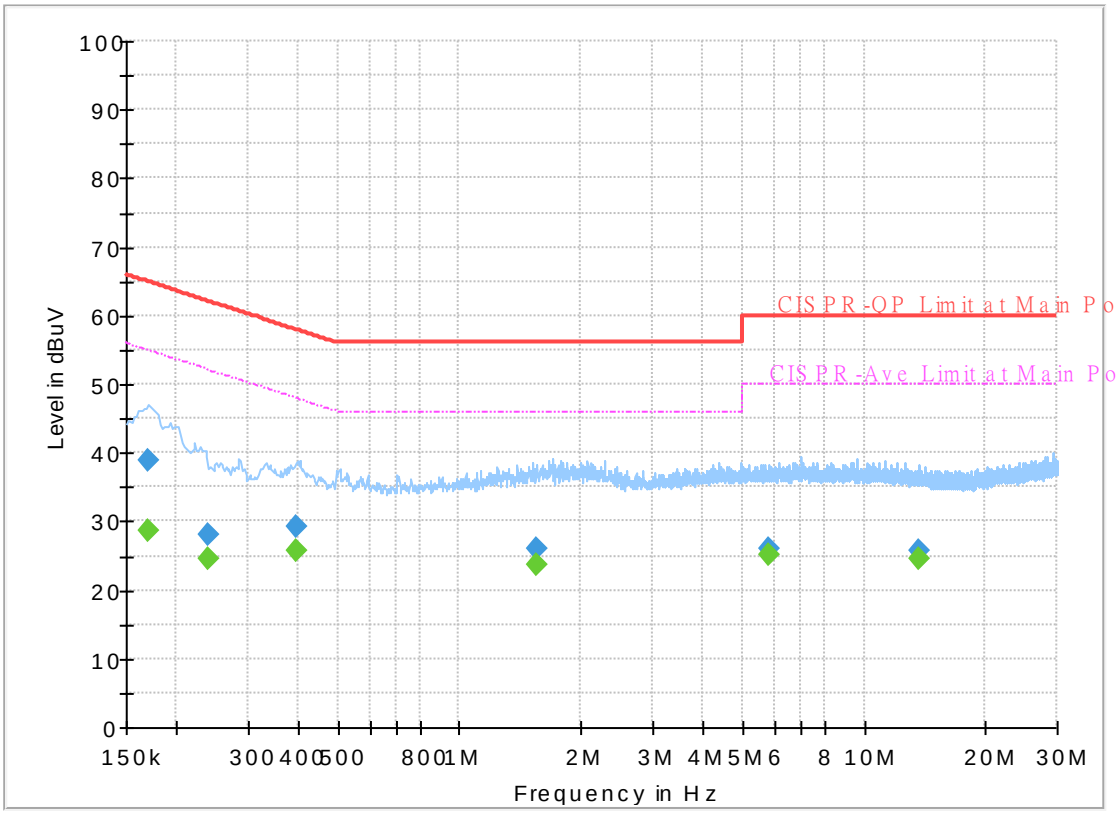
Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.177000	---	28.77	54.63	25.86	L1	OFF	19.5
0.177000	39.18	---	64.63	25.45	L1	OFF	19.5
0.226500	---	25.42	52.58	27.16	L1	OFF	19.5
0.226500	32.15	---	62.58	30.43	L1	OFF	19.5
0.341250	---	25.68	49.17	23.49	L1	OFF	19.5
0.341250	29.41	---	59.17	29.76	L1	OFF	19.5
0.512250	---	25.29	46.00	20.71	L1	OFF	19.5
0.512250	28.17	---	56.00	27.83	L1	OFF	19.5
1.729500	---	23.80	46.00	22.20	L1	OFF	19.6
1.729500	26.12	---	56.00	29.88	L1	OFF	19.6
7.273500	---	25.27	50.00	24.73	L1	OFF	19.9
7.273500	26.18	---	60.00	33.82	L1	OFF	19.9

EUT Information

Report NO :	982217-02
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)
0.170430	---	28.72	54.94	26.22	N	OFF	19.6
0.170430	38.84	---	64.94	26.10	N	OFF	19.6
0.240000	---	24.65	52.10	27.45	N	OFF	19.6
0.240000	28.20	---	62.10	33.90	N	OFF	19.6
0.393630	---	25.67	47.99	22.32	N	OFF	19.6
0.393630	29.33	---	57.99	28.66	N	OFF	19.6
1.547250	---	23.76	46.00	22.24	N	OFF	19.6
1.547250	26.01	---	56.00	29.99	N	OFF	19.6
5.792100	---	25.16	50.00	24.84	N	OFF	19.8
5.792100	26.13	---	60.00	33.87	N	OFF	19.8
13.682310	---	24.60	50.00	25.40	N	OFF	20.1
13.682310	25.78	---	60.00	34.22	N	OFF	20.1

Appendix C. Radiated Spurious Emission

Test Engineer :	Karl Hou	Temperature :	24.2~24.8°C
		Relative Humidity :	55~64 %

Band 1 - 5150~5250MHz

WIFI 802.11n HT40 (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.
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11n HT40 CH 38 5190MHz		5147.42	53.33	-20.67	74	42.42	32.09	9.25	30.43	338	187	P	H
		5149.76	42.92	-11.08	54	32	32.1	9.25	30.43	338	187	A	H
		5190	102.48	-	-	91.67	31.94	9.3	30.43	338	187	P	H
		5190	94.69	-	-	83.88	31.94	9.3	30.43	338	187	A	H
		5416.6	50.49	-23.51	74	39.63	31.8	9.49	30.43	338	187	P	H
		5460	40.12	-13.88	54	28.95	32.02	9.58	30.43	338	187	A	H
		5147.42	52.84	-21.16	74	41.93	32.09	9.25	30.43	100	274	P	V
		5149.76	43.08	-10.92	54	32.16	32.1	9.25	30.43	100	274	A	V
		5190	103.02	-	-	92.21	31.94	9.3	30.43	100	274	P	V
		5190	94.68	-	-	83.87	31.94	9.3	30.43	100	274	A	V
		5436.76	49.84	-24.16	74	38.82	31.92	9.53	30.43	100	274	P	V
		5458.32	40.2	-13.8	54	29.04	32.02	9.57	30.43	100	274	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. 1	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		10420	48.35	-19.85	68.2	55.74	39.9	13.62	60.91	100	0	P	H
VHT80		15630	47.14	-26.86	74	53.47	37.99	17.12	61.44	100	0	P	H
CH 42		10420	48.27	-19.93	68.2	55.66	39.9	13.62	60.91	100	0	P	V
5210MHz		15630	46.79	-27.21	74	53.12	37.99	17.12	61.44	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 2 - 5250~5350MHz

WIFI 802.11n HT40 (Harmonic @ 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.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11n		10540	47.98	-20.22	68.2	55.57	39.86	13.7	61.15	100	0	P	H
HT40		15810	47.33	-26.67	74	53.6	37.66	17.3	61.23	100	0	P	H
CH 54		10540	47.7	-20.5	68.2	55.29	39.86	13.7	61.15	100	0	P	V
5270MHz		15810	48.15	-25.85	74	54.42	37.66	17.3	61.23	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 2 5250~5350MHz

WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI Ant. 1	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 58 5290MHz		5142.46	50.44	-23.56	74	39.54	32.08	9.25	30.43	251	187	P	H
		5149.94	40.37	-13.63	54	29.45	32.1	9.25	30.43	251	187	A	H
	*	5290	96.43	-	-	86.06	31.42	9.38	30.43	251	187	P	H
	*	5290	89.1	-	-	78.73	31.42	9.38	30.43	251	187	A	H
		5350.8	53.12	-20.88	74	42.73	31.4	9.42	30.43	251	187	P	H
		5350.08	43.81	-10.19	54	33.42	31.4	9.42	30.43	251	187	A	H
		5071.74	50.11	-23.89	74	39.48	31.89	9.17	30.43	100	262	P	V
		5149.6	40.42	-13.58	54	29.5	32.1	9.25	30.43	100	262	A	V
	*	5290	98.14	-	-	87.77	31.42	9.38	30.43	100	262	P	V
	*	5290	90.24	-	-	79.87	31.42	9.38	30.43	100	262	A	V
		5353.2	54	-20	74	43.59	31.42	9.42	30.43	100	262	P	V
		5350.08	44.83	-9.17	54	34.44	31.4	9.42	30.43	100	262	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 3 - 5470~5725MHz

WIFI 802.11ac VHT80 (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.
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11ac VHT80 CH 106 5530MHz		5459.92	53.54	-20.46	74	42.37	32.02	9.58	30.43	250	72	P	H
		5469.76	54.72	-13.48	68.2	43.51	32.04	9.6	30.43	250	72	P	H
		5458.24	43.98	-10.02	54	32.82	32.02	9.57	30.43	250	72	A	H
	*	5530	95.89	-	-	84.59	32.04	9.71	30.45	250	72	P	H
	*	5530	88.34	-	-	77.04	32.04	9.71	30.45	250	72	A	H
		5750.825	50.2	-18	68.2	38.52	32.4	9.87	30.59	250	72	P	H
		5459.92	54.95	-19.05	74	43.78	32.02	9.58	30.43	100	85	P	V
		5468.56	56.19	-12.01	68.2	44.99	32.04	9.59	30.43	100	85	P	V
		5458.48	45.78	-8.22	54	34.62	32.02	9.57	30.43	100	85	A	V
	*	5530	97.72	-	-	86.42	32.04	9.71	30.45	100	85	P	V
	*	5530	89.36	-	-	78.06	32.04	9.71	30.45	100	85	A	V
		5756.18	51.11	-17.09	68.2	39.43	32.4	9.87	30.59	100	85	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 3 - Straddle Channel

WIFI 802.11n HT20 (Harmonic @ 3m)

WIFI Ant. 1	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)
802.11n		11440	49.43	-24.57	74	56.82	40.24	14.51	62.14	100	0	P	H
HT20		17160	50.02	-18.18	68.2	50.89	40.02	18.36	59.25	100	0	P	H
CH 144		11440	48.59	-25.41	74	55.98	40.24	14.51	62.14	100	0	P	V
5720MHz		17160	48.72	-19.48	68.2	49.59	40.02	18.36	59.25	100	0	P	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. 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 44 5220MHz		10440	48.52	-19.68	68.2	55.93	39.9	13.65	60.96	100	0	P	H
		15660	47.28	-26.72	74	53.75	37.78	17.16	61.41	100	0	P	H
		10440	48.91	-19.29	68.2	56.32	39.9	13.65	60.96	100	0	P	V
		15660	46.72	-27.28	74	53.19	37.78	17.16	61.41	100	0	P	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. 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		5150	52.2	-21.8	74	41.27	32.1	9.26	30.43	169	126	P	H
		5150	43.77	-10.23	54	32.84	32.1	9.26	30.43	169	126	A	H
	*	5210	95.78	-	-	85.07	31.82	9.32	30.43	169	126	P	H
	*	5210	87.3	-	-	76.59	31.82	9.32	30.43	169	126	A	H
		5425.84	50.65	-23.35	74	39.71	31.86	9.51	30.43	169	126	P	H
		5458.6	40.53	-13.47	54	29.37	32.02	9.57	30.43	169	126	A	H
		5149.24	52.81	-21.19	74	41.89	32.1	9.25	30.43	339	99	P	V
		5149.76	44.96	-9.04	54	34.04	32.1	9.25	30.43	339	99	A	V
	*	5210	96.34	-	-	85.63	31.82	9.32	30.43	339	99	P	V
	*	5210	88.17	-	-	77.46	31.82	9.32	30.43	339	99	A	V
		5365.36	50.37	-23.63	74	39.88	31.49	9.43	30.43	339	99	P	V
		5457.2	40.61	-13.39	54	29.46	32.01	9.57	30.43	339	99	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 2 - 5150~5250MHz

WIFI 802.11n HT20 (Harmonic @ 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.	
2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11n		10640	48.22	-25.78	74	55.89	39.88	13.72	61.27	100	0	P	H
HT20		15960	46.48	-27.52	74	53.02	37.18	17.33	61.05	100	0	P	H
CH 64		10640	48.84	-25.16	74	56.51	39.88	13.72	61.27	100	0	P	V
5320MHz		15960	47.43	-26.57	74	53.97	37.18	17.33	61.05	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 2 5250~5350MHz

WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI Ant. 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)
802.11n HT40 CH 62 5310MHz		5080.24	51.19	-22.81	74	40.52	31.92	9.18	30.43	100	126	P	H
		5144.84	40.66	-13.34	54	29.75	32.09	9.25	30.43	100	126	A	H
	*	5310	102.27	-	-	91.91	31.4	9.39	30.43	100	126	P	H
	*	5310	94.45	-	-	84.09	31.4	9.39	30.43	100	126	A	H
		5350.56	61.77	-12.23	74	51.38	31.4	9.42	30.43	100	126	P	H
		5350.08	46.72	-7.28	54	36.33	31.4	9.42	30.43	100	126	A	H
		5114.58	51.33	-22.67	74	40.51	32.03	9.22	30.43	266	91	P	V
		5145.52	40.49	-13.51	54	29.58	32.09	9.25	30.43	266	91	A	V
	*	5310	101.89	-	-	91.53	31.4	9.39	30.43	266	91	P	V
	*	5310	93.8	-	-	83.44	31.4	9.39	30.43	266	91	A	V
		5356.56	58.48	-15.52	74	48.04	31.44	9.43	30.43	266	91	P	V
		5350.08	45.29	-8.71	54	34.9	31.4	9.42	30.43	266	91	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 3 - 5470~5725MHz

WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI Ant. 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 106 5530MHz		5458.96	55.94	-18.06	74	44.78	32.02	9.57	30.43	100	128	P	H
		5470	58.5	-9.7	68.2	47.29	32.04	9.6	30.43	100	128	P	H
		5458.24	45.95	-8.05	54	34.79	32.02	9.57	30.43	100	128	A	H
	*	5530	97.98	-	-	86.68	32.04	9.71	30.45	100	128	P	H
	*	5530	89.96	-	-	78.66	32.04	9.71	30.45	100	128	A	H
		5746.1	49.83	-18.37	68.2	38.17	32.38	9.86	30.58	100	128	P	H
		5457.52	55.71	-18.29	74	44.55	32.02	9.57	30.43	266	94	P	V
		5469.52	58.2	-10	68.2	46.99	32.04	9.6	30.43	266	94	P	V
		5458.24	46.23	-7.77	54	35.07	32.02	9.57	30.43	266	94	A	V
	*	5530	98.51	-	-	87.21	32.04	9.71	30.45	266	94	P	V
	*	5530	90.11	-	-	78.81	32.04	9.71	30.45	266	94	A	V
		5741.375	50.93	-17.27	68.2	39.28	32.37	9.86	30.58	266	94	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 3 - Straddle Channel

WIFI 802.11a (Harmonic @ 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.	
2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11a CH 144 5720MHz		11440	49.35	-24.65	74	56.74	40.24	14.51	62.14	100	0	P	H
		17160	50.22	-17.98	68.2	51.09	40.02	18.55	59.25	100	0	P	H
		11440	48.72	-25.28	74	56.11	40.24	14.51	62.14	100	0	P	V
		17160	50.01	-18.19	68.2	50.88	40.02	18.55	59.25	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Note symbol

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

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

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

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

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

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

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

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

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

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

= 43.54 (dBμV/m)

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

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

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

Appendix D. Radiated Spurious Emission

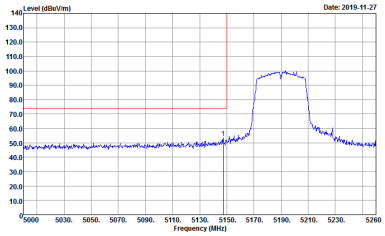
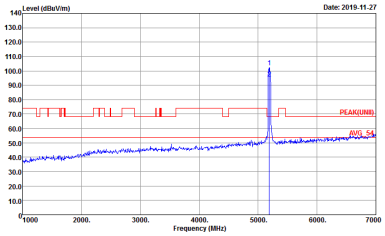
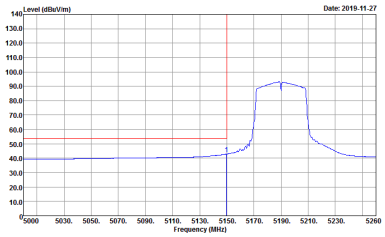
Test Engineer :	Karl Hou	**Temperature :**	24.2~24.8°C
		Relative Humidity :	55~64 %

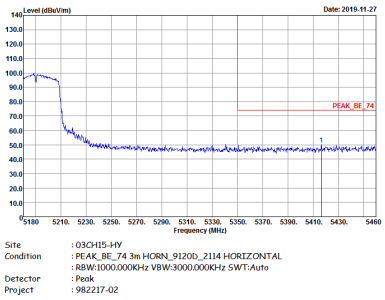
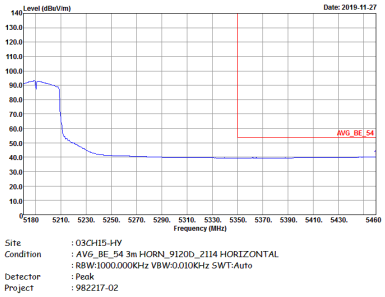
Note symbol

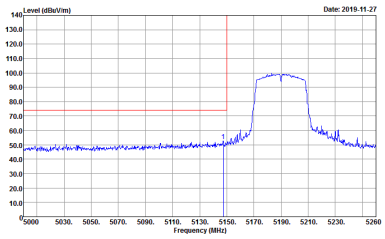
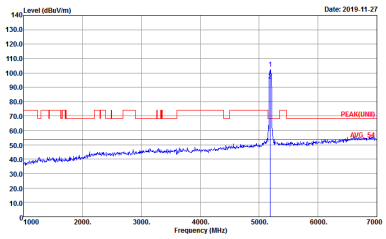
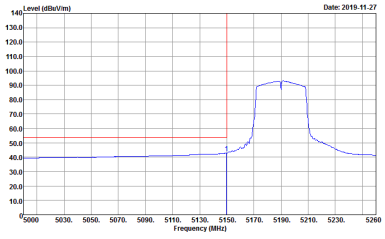
-L	**Low channel location**
-R	**High channel location**

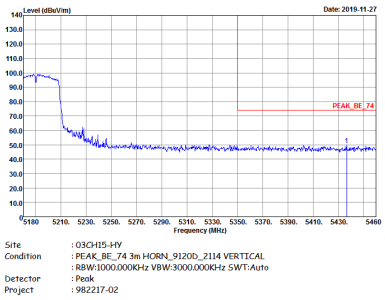
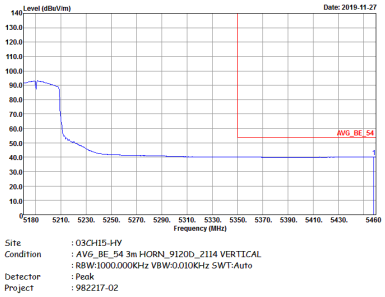
Band 1 - 5150~5250MHz

WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11n HT40 CH38 5190MHz - L	
1	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m HORN_9120D_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02	 Site : 03CH15-HY Condition : PEAK(UNII) 3m HORN_9120D_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m HORN_9120D_2114 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto Detector : Peak Project : 982217-02	Left blank

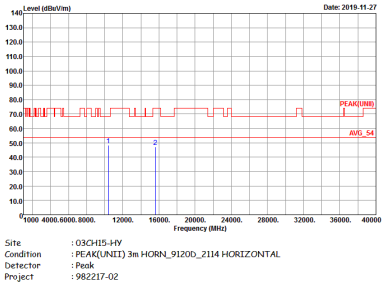
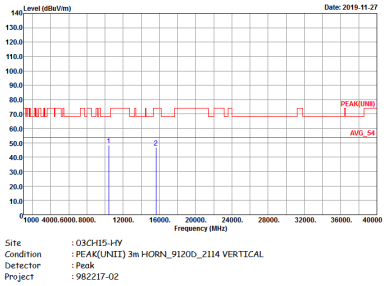
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11n HT40 CH38 5190MHz - R	
1	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11n HT40 CH38 5190MHz - L	
1	Vertical	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m HORN_9120D_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02	 Site : 03CH15-HY Condition : PEAK(UNII) 3m HORN_9120D_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m HORN_9120D_2114 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto Detector : Peak Project : 982217-02	Left blank

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11n HT40 CH38 5190MHz - R	
1	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

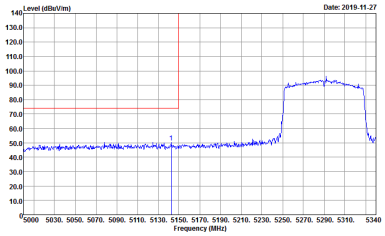
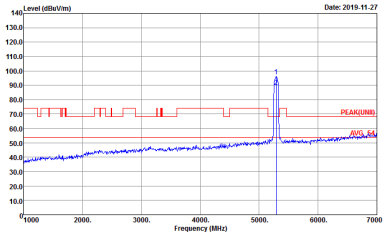
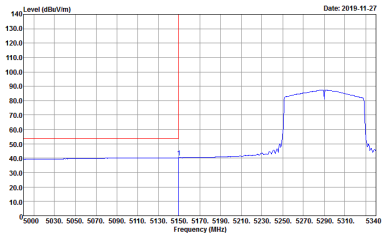
Band 1 - 5150~5250MHz

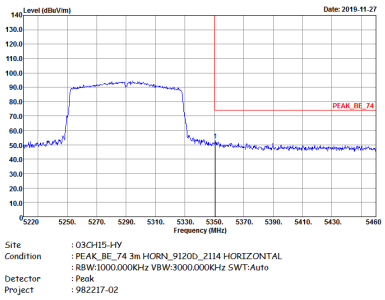
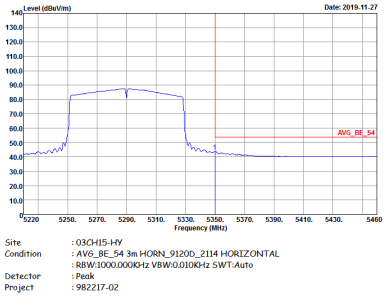
WIFI 802.11ac VHT80 (Harmonic @ 3m)

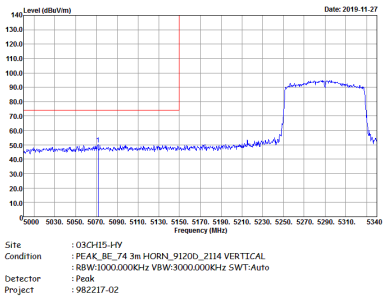
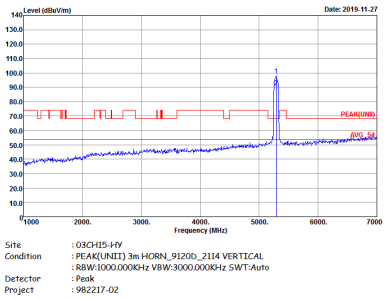
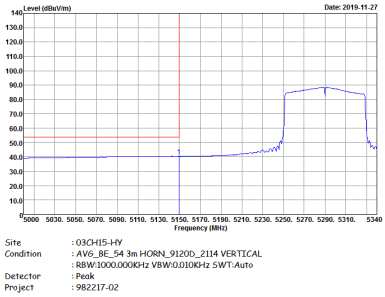
WIFI	Band 1 5150~5250MHz Harmonic @ 3m	
ANT	802.11ac VHT80 CH42 5210MHz	
1	Horizontal	Vertical
Peak Avg.		

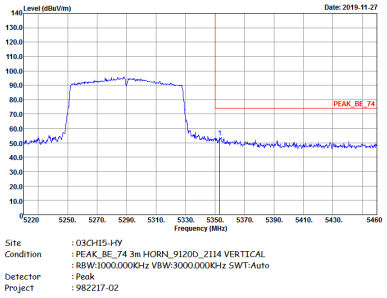
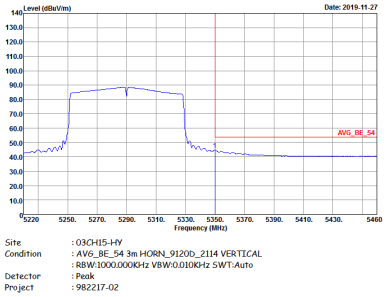
Band 2 - 5250~5350MHz

WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH58 5290MHz - L	
1	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m HORN_9120D_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02	 Site : 03CH15-HY Condition : PEAK(UNII) 3m HORN_9120D_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m HORN_9120D_2114 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto Detector : Peak Project : 982217-02	Left blank

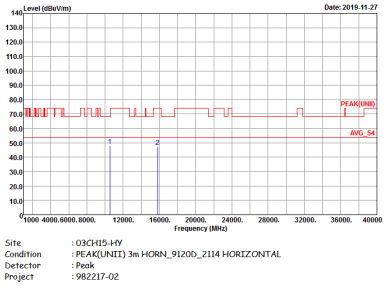
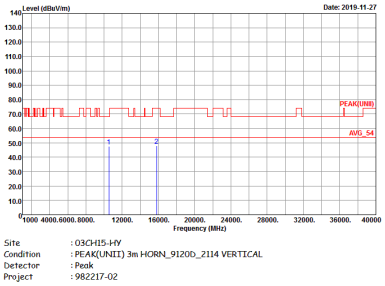
WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH58 5290MHz - R	
1	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH58 5290MHz - L	
1	Vertical	Fundamental
Peak		
Avg.		Left blank

WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH58 5290MHz - R	
1	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

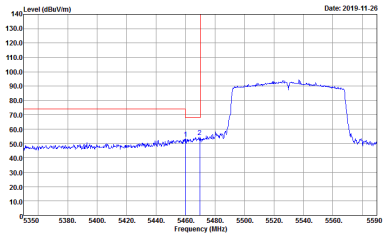
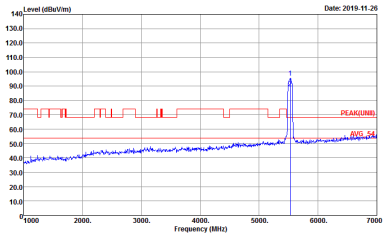
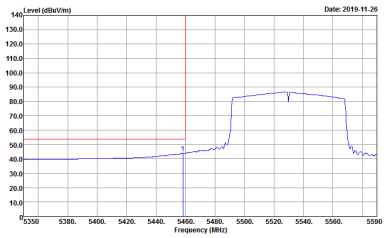
Band 2 - 5250~5350MHz

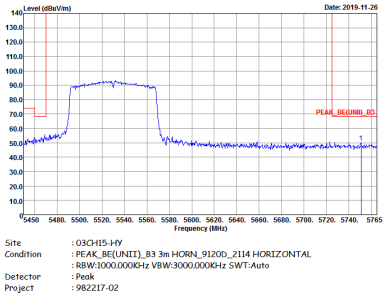
WIFI 802.11n HT40 (Harmonic @ 3m)

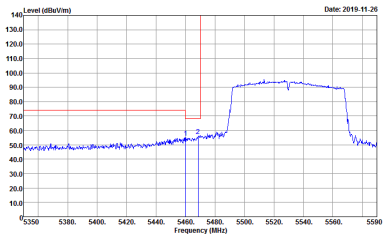
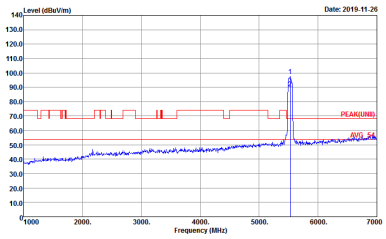
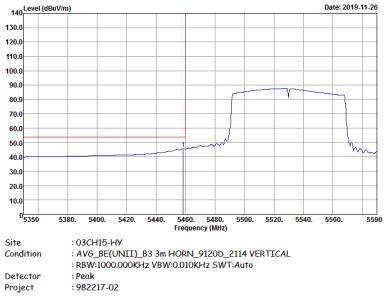
WIFI	Band 2 5250~5350MHz Harmonic @ 3m	
ANT	802.11n HT40 CH54 5270	
1	Horizontal	Vertical
Peak Avg.		

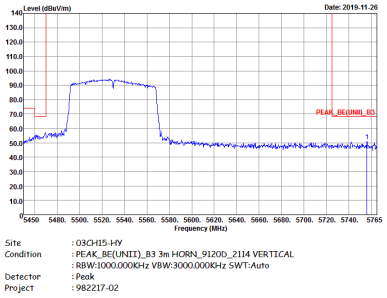
Band 3 - 5470~5725MHz

WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH106 5530MHz - L	
1	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE(UNII)_B3 3m HORN_9120D_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02	 Site : 03CH15-HY Condition : PEAK(UNII) 3m HORN_9120D_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02
Avg.	 Site : 03CH15-HY Condition : AVG_BE(UNII)_B3 3m HORN_9120D_2114 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto Detector : Peak Project : 982217-02	Left blank

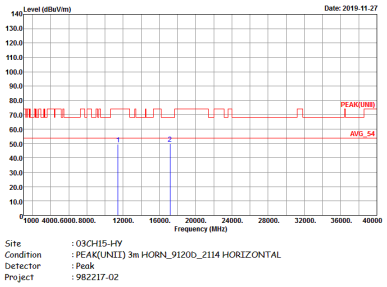
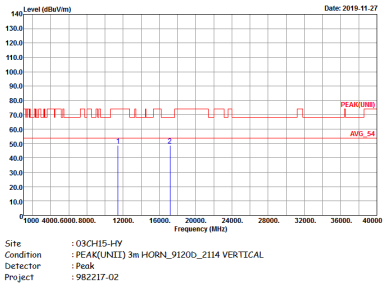
WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH106 5530MHz - R	
1	Horizontal	Fundamental
Peak		Left blank

WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH106 5530MHz - L	
1	Vertical	Fundamental
Peak		
Avg.		Left blank

WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH106 5530MHz - R	
1	Vertical	Fundamental
Peak		Left blank

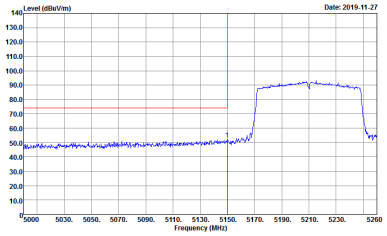
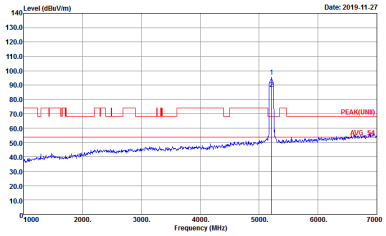
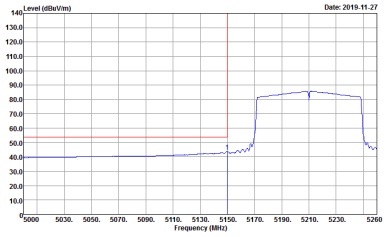
Band 3 - Straddle Channel

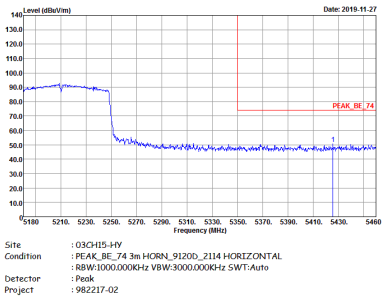
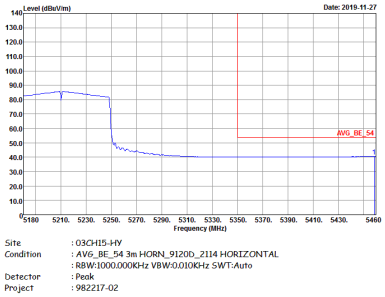
WIFI 802.11n HT20 (Harmonic @ 3m)

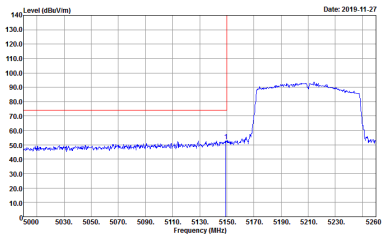
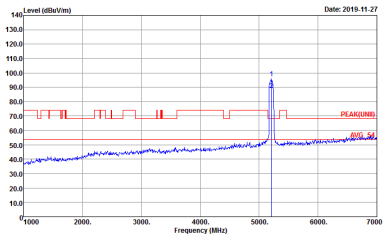
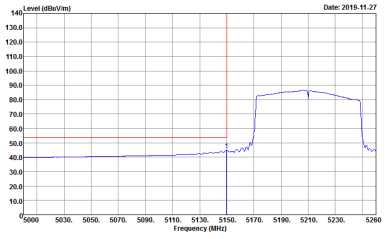
WIFI	Band 3 Straddle Channel Harmonic @ 3m	
ANT	802.11n HT20 CH144 5720MHz	
1	Horizontal	Vertical
Peak Avg.		

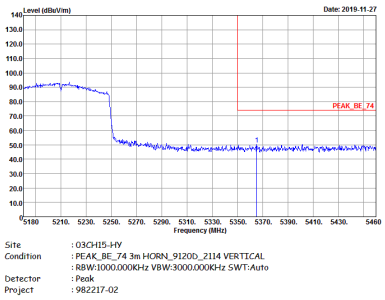
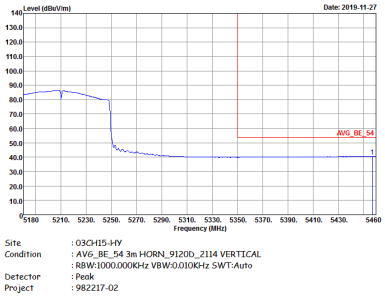
Band 1 - 5150~5250MHz

WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH42 5210MHz - L	
2	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m HORN_9120D_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02	 Site : 03CH15-HY Condition : PEAK(UNII) 3m HORN_9120D_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m HORN_9120D_2114 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto Detector : Peak Project : 982217-02	Left blank

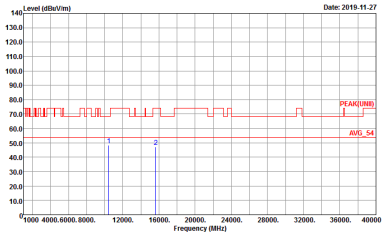
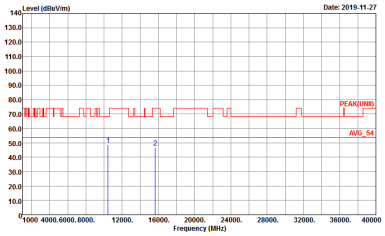
WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH42 5210MHz - R	
2	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH42 5210MHz - L	
2	Vertical	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m HORN_9120D_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02	 Site : 03CH15-HY Condition : PEAK(UNII) 3m HORN_9120D_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m HORN_9120D_2114 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto Detector : Peak Project : 982217-02	Left blank

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH42 5210MHz - R	
2	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

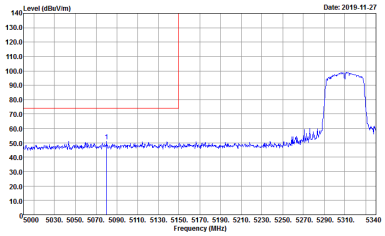
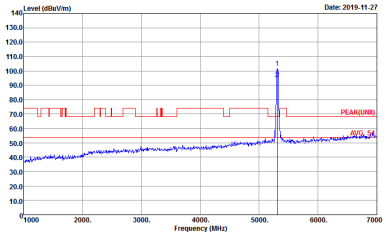
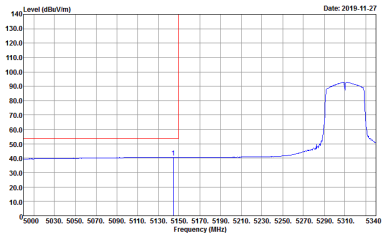
Band 1 - 5150~5250MHz

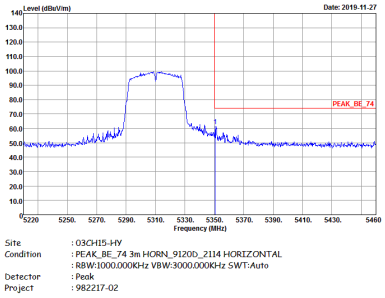
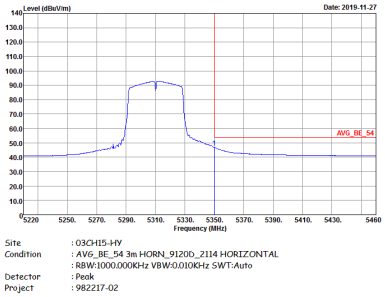
WIFI 802.11a (Harmonic @ 3m)

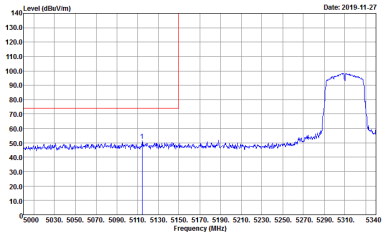
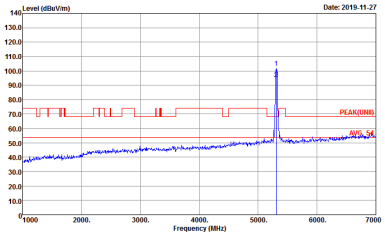
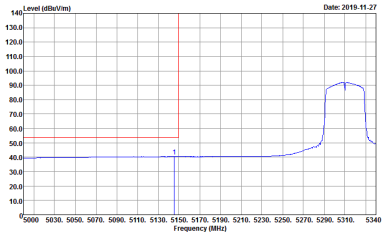
WIFI	Band 1 5150~5250MHz Harmonic @ 3m	
ANT	802.11a CH44 5220MHz	
2	Horizontal	Vertical
Peak Avg.	 Site : 03CH15-HY Condition : PEAK(UNII) 3m HORN_9120D_2114 HORIZONTAL Detector : Peak Project : 982217-02	 Site : 03CH15-HY Condition : PEAK(UNII) 3m HORN_9120D_2114 VERTICAL Detector : Peak Project : 982217-02

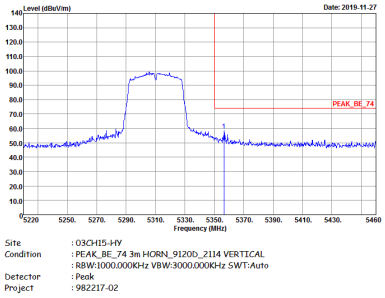
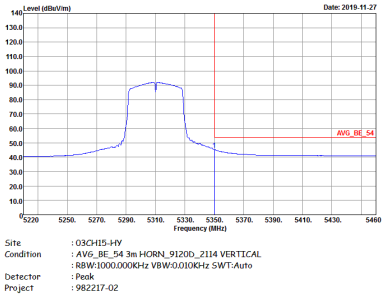
Band 2 - 5250~5350MHz

WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11n HT40 CH62 5310 - L	
2	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m HORN_9120D_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02	 Site : 03CH15-HY Condition : PEAK(UNII) 3m HORN_9120D_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m HORN_9120D_2114 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto Detector : Peak Project : 982217-02	Left blank

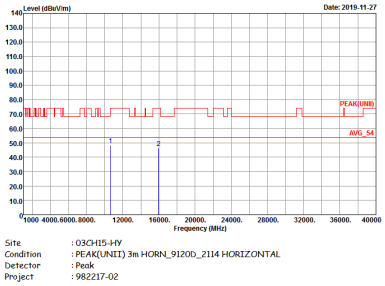
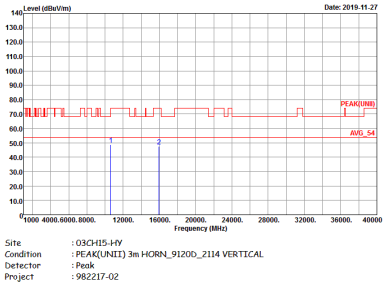
WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11n HT40 CH62 5310 - R	
2	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11n HT40 CH62 5310 - L	
2	Vertical	Fundamental
Peak	 Site : 03CH15-HV Condition : PEAK_BE_74 3m HORN_9120D_2114 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02	 Site : 03CH15-HV Condition : PEAK(UNII) 3m HORN_9120D_2114 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 982217-02
Avg.	 Site : 03CH15-HV Condition : AVG_BE_54 3m HORN_9120D_2114 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto Detector : Peak Project : 982217-02	Left blank

WIFI	Band 2 5250~5350MHz Band Edge @ 3m	
ANT	802.11n HT40 CH62 5310 - R	
2	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

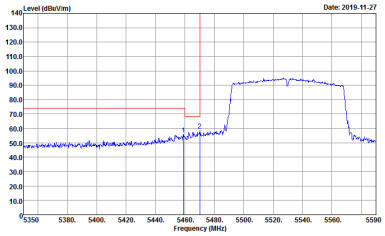
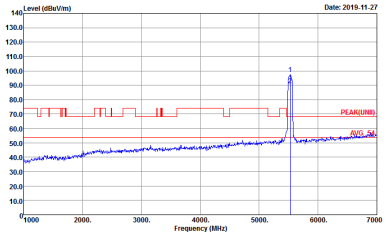
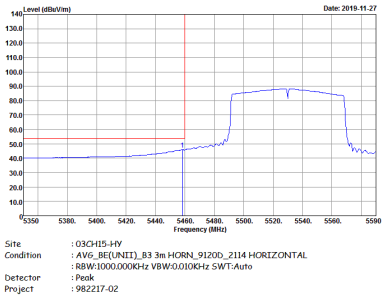
Band 2 - 5250~5350MHz

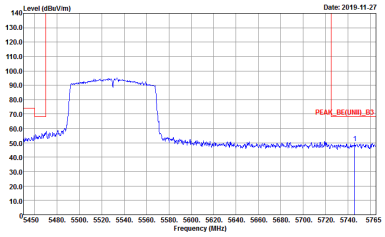
WIFI 802.11n HT20 (Harmonic @ 3m)

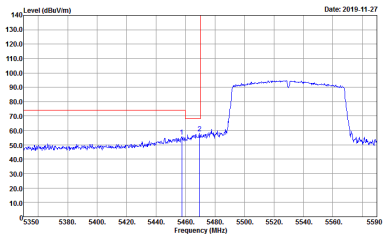
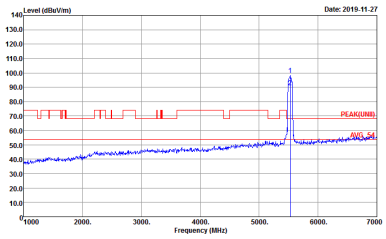
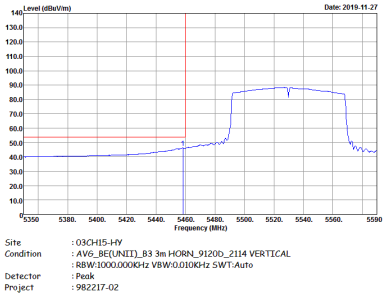
WIFI	Band 2 5250~5350MHz Harmonic @ 3m	
ANT	802.11n HT20 CH64 5320MHz	
2	Horizontal	Vertical
Peak Avg.		

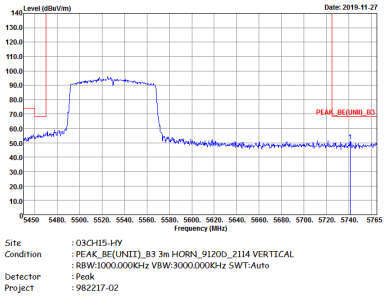
Band 3 - 5470~5725MHz

WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH106 5530MHz - L	
2	Horizontal	Fundamental
Peak		
Avg.		Left blank

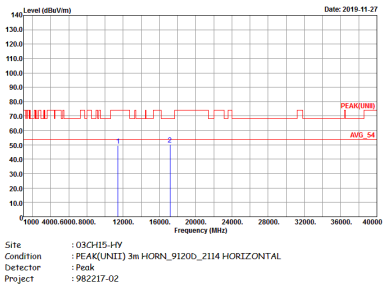
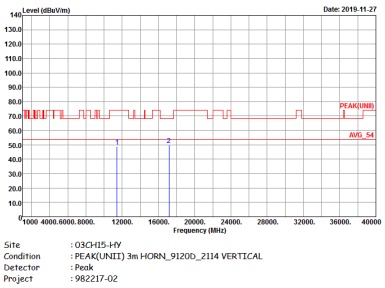
WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH106 5530MHz - R	
2	Horizontal	Fundamental
Peak		Left blank

WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH106 5530MHz - L	
2	Vertical	Fundamental
Peak		
Avg.		Left blank

WIFI	Band 3 5470~5725MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH106 5530MHz - R	
2	Vertical	Fundamental
Peak		Left blank

Band 3 - Straddle Channel

WIFI 802.11a (Harmonic @ 3m)

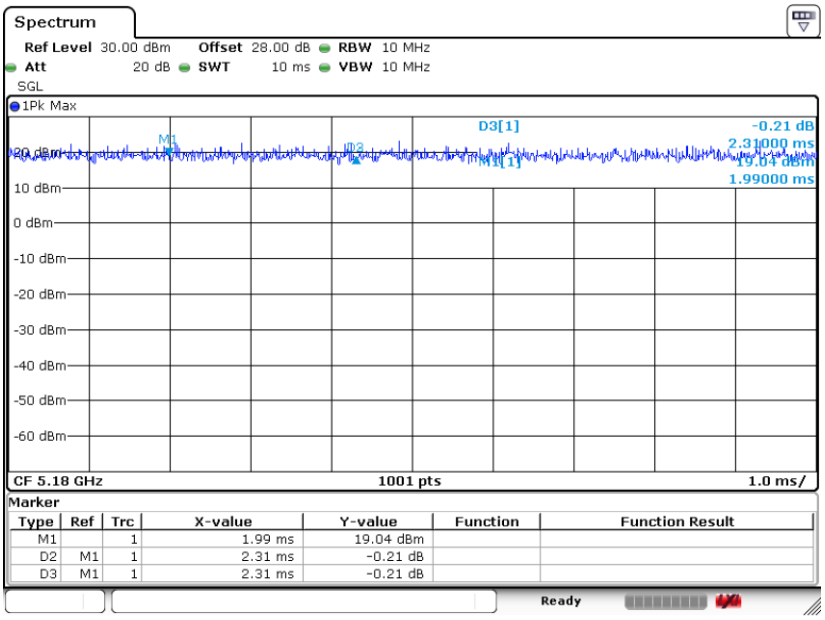
WIFI	Band 3 Straddle Channel Harmonic @ 3m	
ANT	802.11a CH144 5720MHz	
2	Horizontal	Vertical
Peak Avg.		

Appendix E. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
2	802.11a	100.00	-	-	10Hz	0.00
1	5GHz 802.11n HT20	100.00	-	-	10Hz	0.00
2	5GHz 802.11n HT20	100.00	-	-	10Hz	0.00
1	5GHz 802.11n HT40	100.00	-	-	10Hz	0.00
2	5GHz 802.11n HT40	100.00	-	-	10Hz	0.00
1	5GHz 802.11ac VHT80	100.00	-	-	10Hz	0.00
2	5GHz 802.11ac VHT80	100.00	-	-	10Hz	0.00

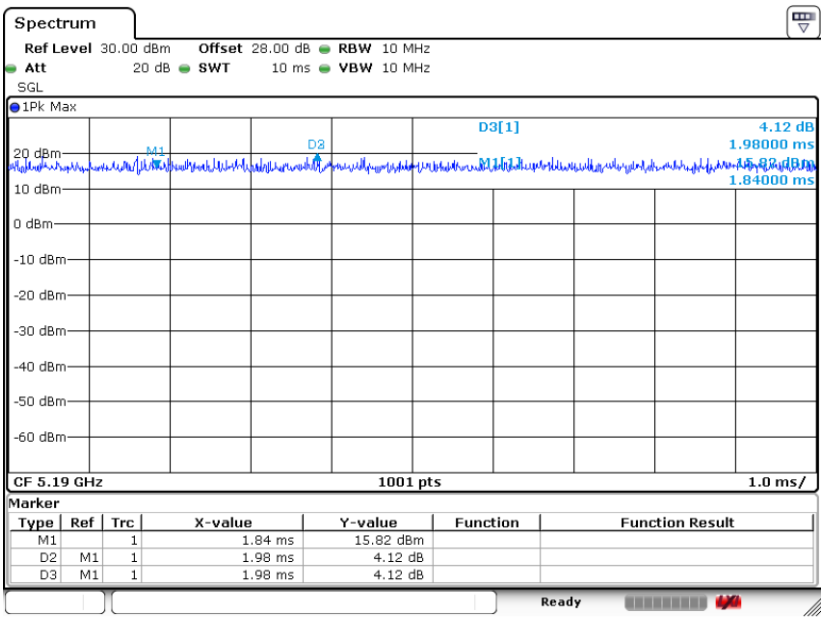
<Ant. 1>

802.11n HT20



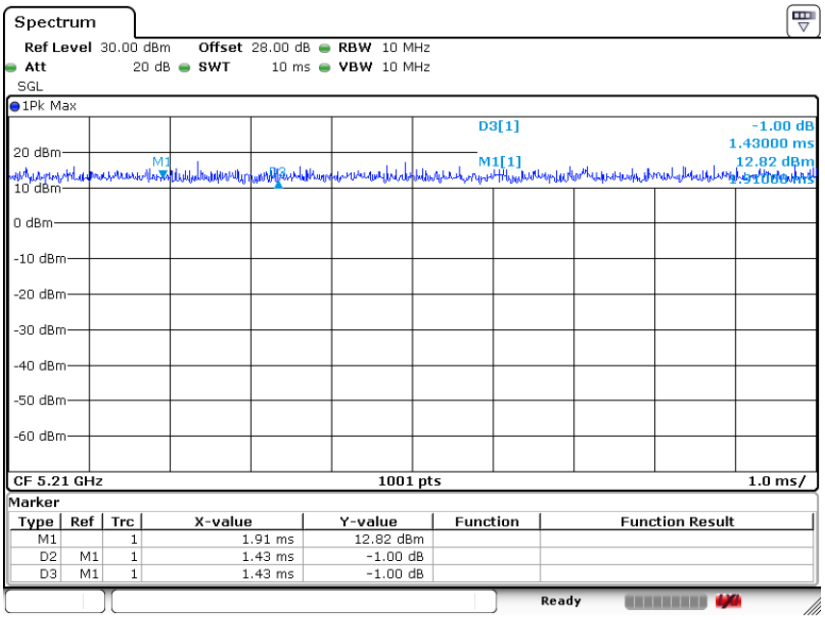
Date: 12.NOV.2019 22:30:04

802.11n HT40



Date: 12.NOV.2019 23:25:36

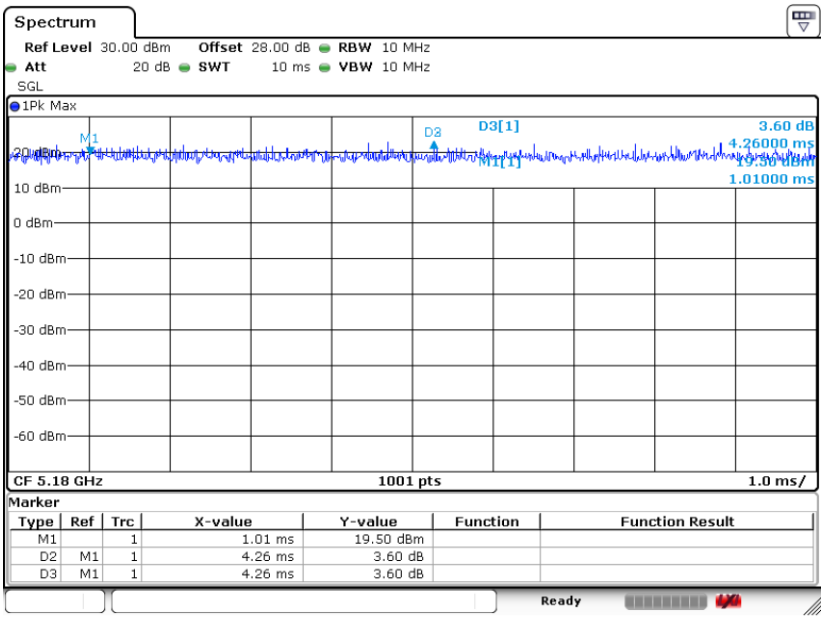
802.11ac VHT80



Date: 13.NOV.2019 02:25:26

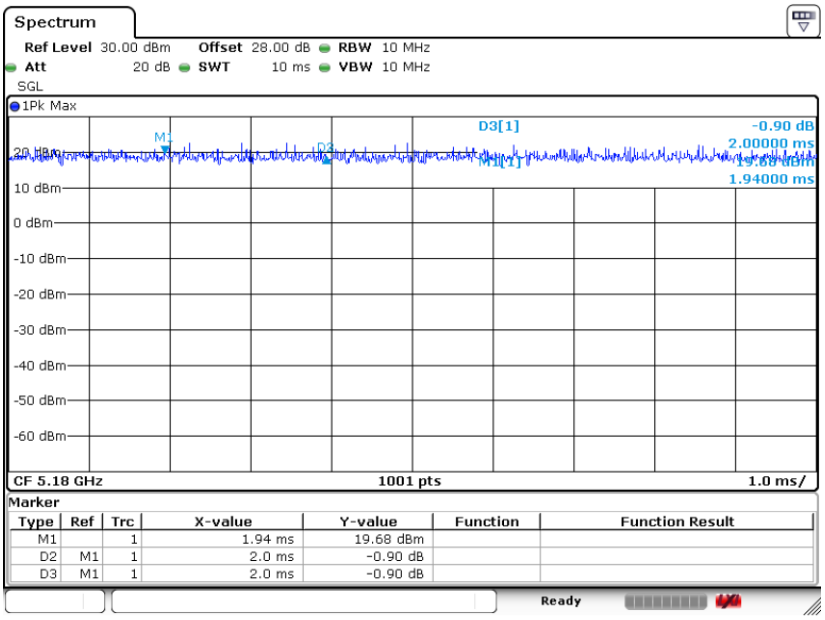
<Ant. 2>

802.11a



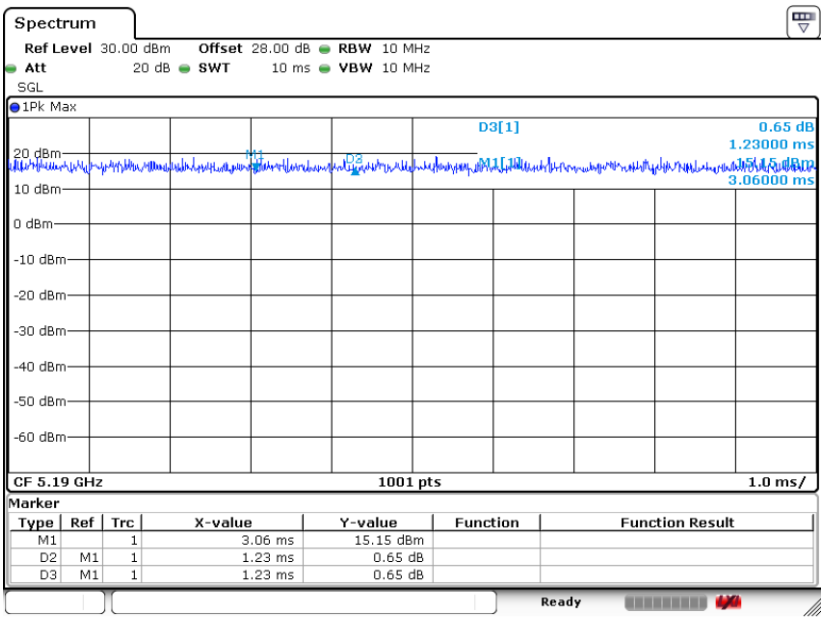
Date: 12.NOV.2019 21:59:28

802.11n HT20



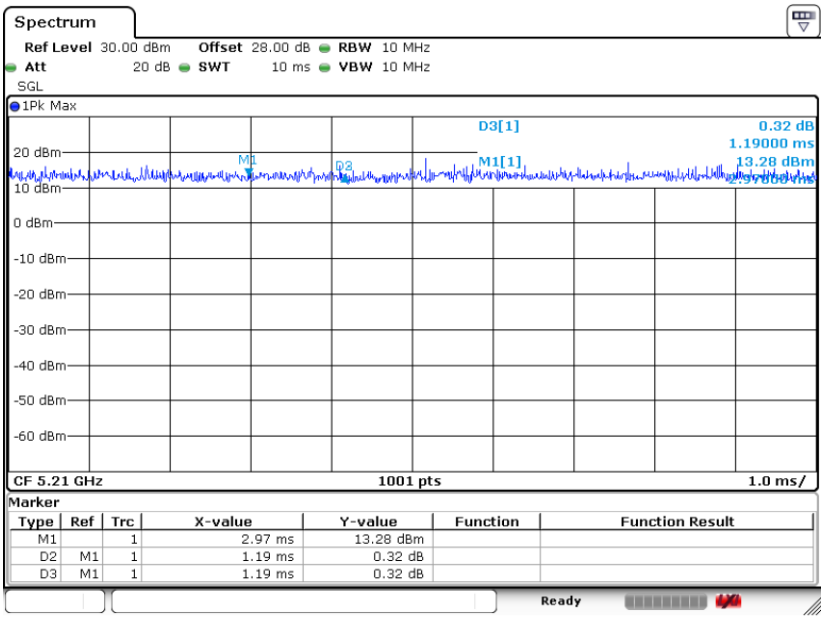
Date: 12.NOV.2019 22:50:56

802.11n HT40



Date: 12.NOV.2019 23:26:23

802.11ac VHT80



———THE END———