FCC RADIO TEST REPORT

FCC ID	:	**2AJ3Y-1013**
Equipment	:	**Wireless Game Controller**
Model Name	:	**T28B69**
Applicant	:	**Zippy Hippie Twister Limited Liability Company** **2000 Town Center, Suite 1900** **Southfield, MI 48075** **United States**
Standard	:	**FCC Part 15 Subpart E §15.407**

The product was received on Oct. 31, 2019 and testing was started from Jan. 14, 2020 and completed on Feb. 20, 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 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.)

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History of this test report

Report No.	Version	Description	Issued Date
FR952805-03E	01	Initial issue of report	Feb. 21, 2020

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)
3.1	15.403 (i)	6dB & 26dB Bandwidth	Pass
3.1	2.1049	99% Occupied Bandwidth	Reporting only
3.2	15.407 (a)	Maximum Conducted Output Power	Pass
3.3	15.407 (a)	Power Spectral Density	Pass
3.4	15.407(b)	Unwanted Emissions	Pass
3.5	15.207	AC Conducted Emission	Pass
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: Lucy Wu

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	Wireless Game Controller
Model Name	T28B69
FCC ID	2AJ3Y-1013
EUT supports Radios application	WLAN 11a/b/g/n HT20 WLAN 11ac VHT20 Bluetooth BR/EDR/LE

1.2 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency Range	5745 MHz ~ 5825 MHz
Maximum Output Power	802.11a : 16.30 dBm / 0.0427 W 802.11n HT20 : 16.20 dBm / 0.0417 W 802.11ac VHT20: 16.10 dBm / 0.0407 W
99% Occupied Bandwidth	802.11a : 17.63 MHz 802.11n HT20 : 18.68 MHz
Type of Modulation	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)
Antenna Type / Gain	Stamped PIFA Antenna with gain 5.25 dBi

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.**		
	TH05-HY	CO05-HY	03CH07-HY

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

FCC designation No.: TW1190

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.
- FCC KDB 414788 D01 Radiated Test Site v01r01.
- 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 three orthogonal panels, X, Y, Z. The worst cases (X plane) were recorded in this report.

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

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5725-5850 MHz Band 4 (U-NII-3)	149	5745	157	5785
	-	-	-	-
	153	5765	161	5805
	-	-	165	5825

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
802.11ac VHT20 (Covered by HT20)	MCS0

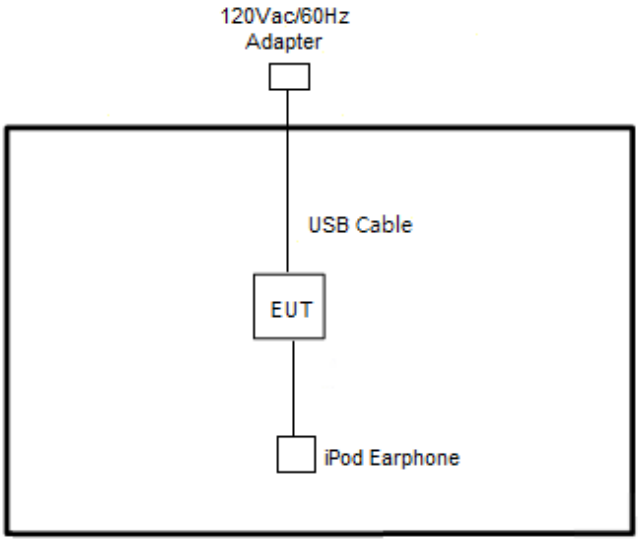
Test Cases	
AC Conducted Emission	Mode 1 : USB-C Power from AC Adapter + WLAN (5GHz) Link + Bluetooth Link + Motor 100% + Audio USB Stream to Headphone

Ch. #		Band IV：5725-5850 MHz	
		802.11a	802.11n HT20
L	Low	149	149
M	Middle	157	157
H	High	165	165

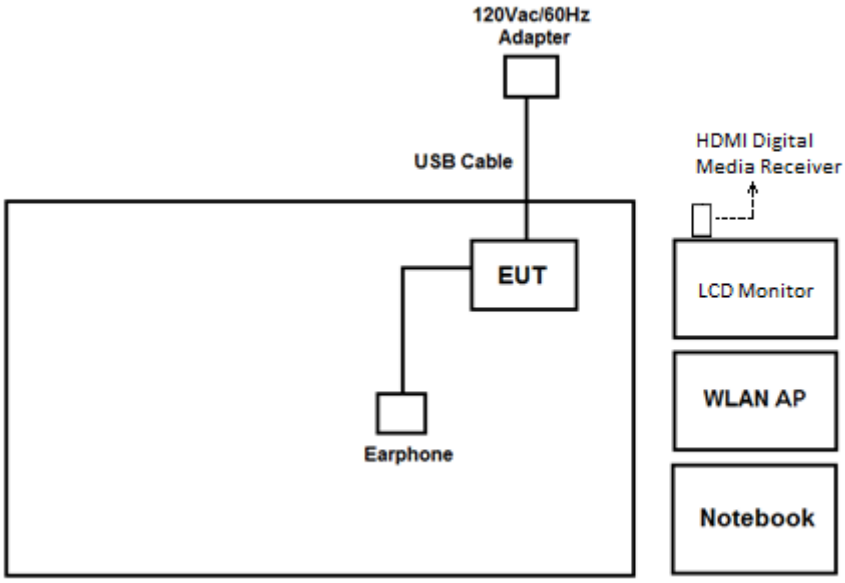
Remark: For radiation spurious emission, the final modulation and the worst data rate was reference the max RF conducted power.

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.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 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.	LCD Monitor	SONY	KD-55X8500D	FCC DoC	Shielded, 1.6m	Unshielded,1.8m
4.	HDMI Digital Media Receiver	N/A	E9L29Y	2AQIQ-6247	N/A	Unshielded, 1.5 m
5.	Earphone	N/A	N/A	N/A	Unshielded, 1.15 m	N/A
6.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A

2.5 EUT Operation Test Setup

The RF test items, utility “Compliance tool (1.0.0.57)” 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.

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

= 4.2 + 10 = 14.2 (dB)

3 Test Result

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

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

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

26dB and 99% Occupied bandwidth are reporting only.

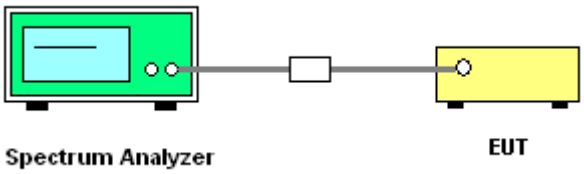
3.1.2 Measuring Instruments

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 for the band 5.725-5.85GHz
2. Set RBW = 100kHz.
3. Set the VBW ≥ 3 x RBW.
4. Detector = Peak.
5. Trace mode = max hold
6. Measure the maximum width of the emission that is 6 dB down from the peak of the emission.
7. Measure and record the results in the test report.

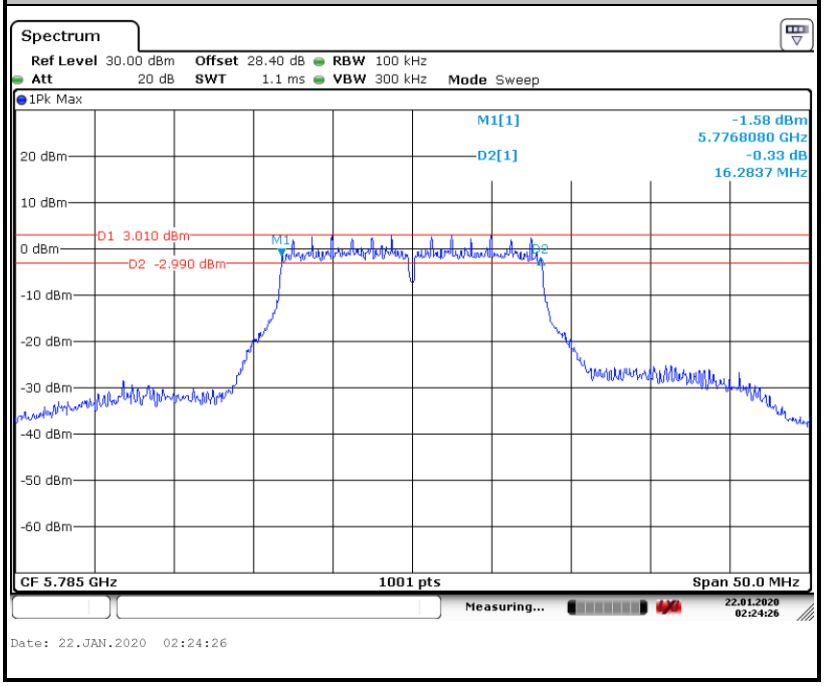
3.1.4 Test Setup



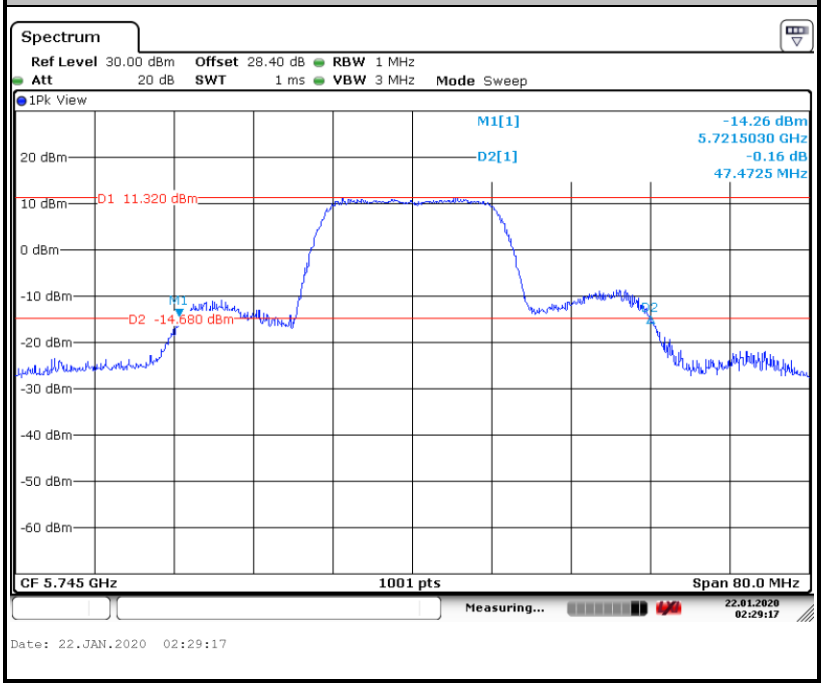
3.1.5 Test Result of 6dB and 26dB and 99% Occupied Bandwidth

Please refer to Appendix A.

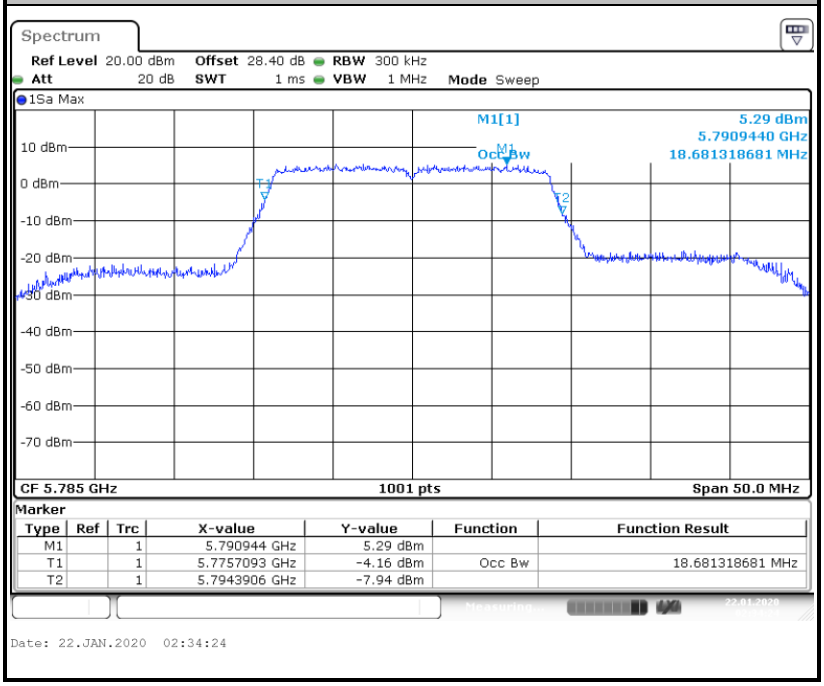
Minimum 6dB Bandwidth



Maximum 26dB Bandwidth



Maximum 99% Occupied Bandwidth



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

3.2 Maximum Conducted Output Power Measurement

3.2.1 Limit of Maximum Conducted Output Power

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

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

3.2.2 Measuring Instruments

See list of measuring equipment of this test report.

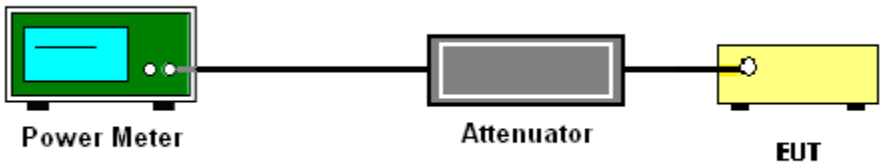
3.2.3 Test Procedures

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 continuously with a consistent duty cycle at its maximum power control level.
3. Measure the average power of the transmitter, and the average power is corrected with duty factor, 10 log(1/x), where x is the duty cycle.

3.2.4 Test Setup



3.2.5 Test Result of Maximum Conducted Output Power

Please refer to Appendix A.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

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

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

3.3.2 Measuring Instruments

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.

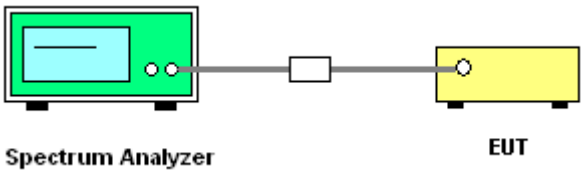
 # Method SA-2 #

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

- Measure the duty cycle.
- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 300 kHz.
- Set VBW ≥ 1 MHz.
- Number of points in sweep ≥ 2 Span / RBW.
- Sweep time = auto.
- Detector = RMS
- Trace average at least 100 traces in power averaging mode.
- Add 10 log(500kHz/RBW) to the test result.
- Add 10 log(1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times. For example, add 10 log(1/0.25) = 6 dB if the duty cycle is 25 percent.

1. The RF output of EUT 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.

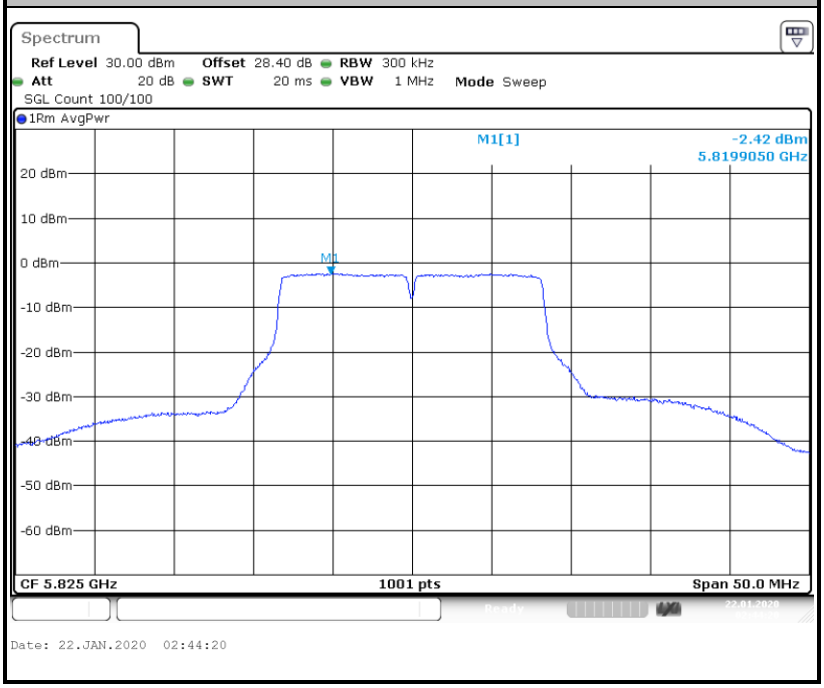
3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

Worst Case Power Density (dBm/MHz)



3.4 Unwanted Emissions Measurement

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

3.4.1 Limit of Unwanted Emissions

(1) For transmitters operating in the 5.725-5.85 GHz band:

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

(2) Unwanted spurious emissions 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.

3.4.2 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 ≥ 3 MHz
- Detector = Peak
- Sweep time = auto
- Trace mode = max hold

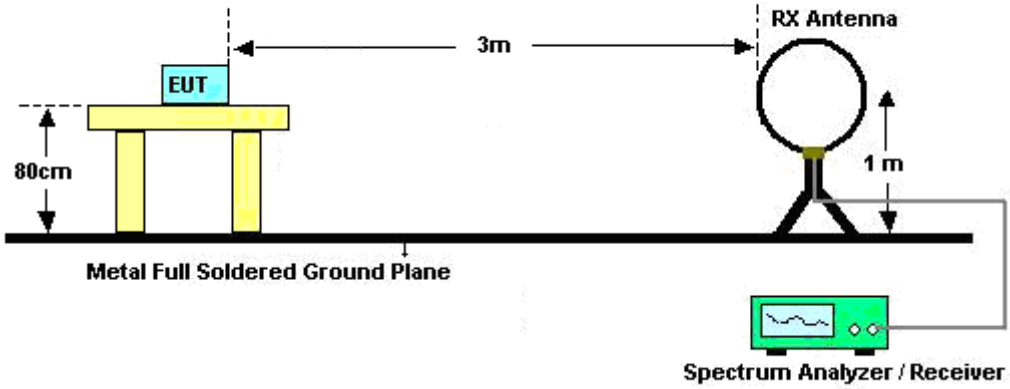
(3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

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

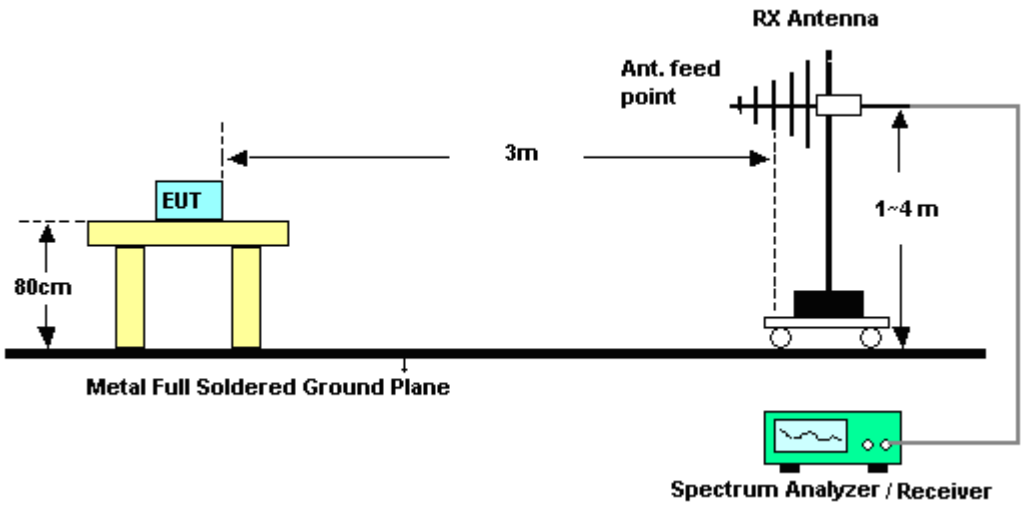
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband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

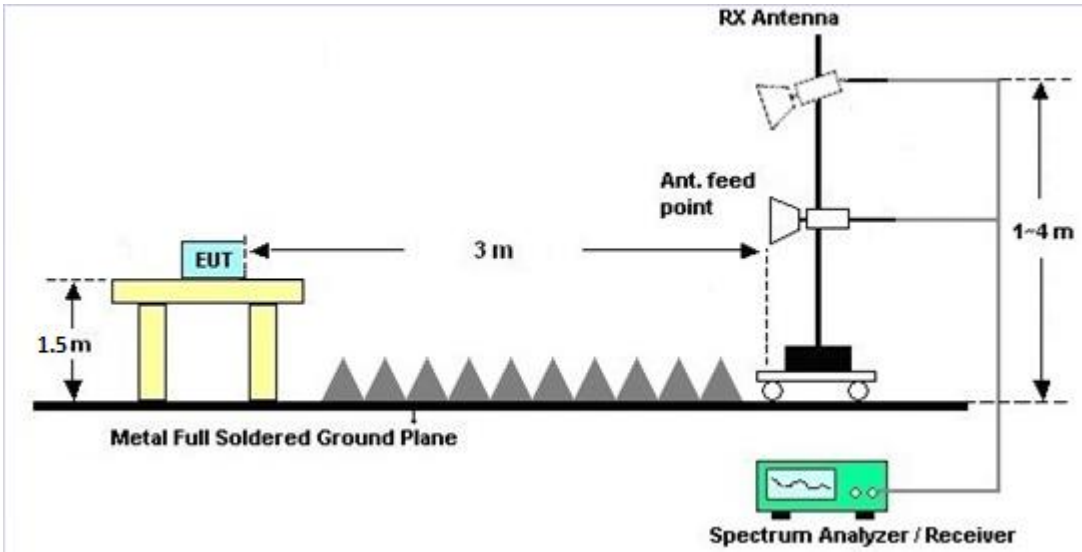
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.4.5 Test Results of Radiated 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 Band Edges

Please refer to Appendix C and D.

3.4.7 Duty Cycle

Please refer to Appendix E.

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

Please refer to Appendix C and D.

3.5 AC Conducted Emission Measurement

3.5.1 Limit of AC Conducted Emission

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

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

*Decreases with the logarithm of the frequency.

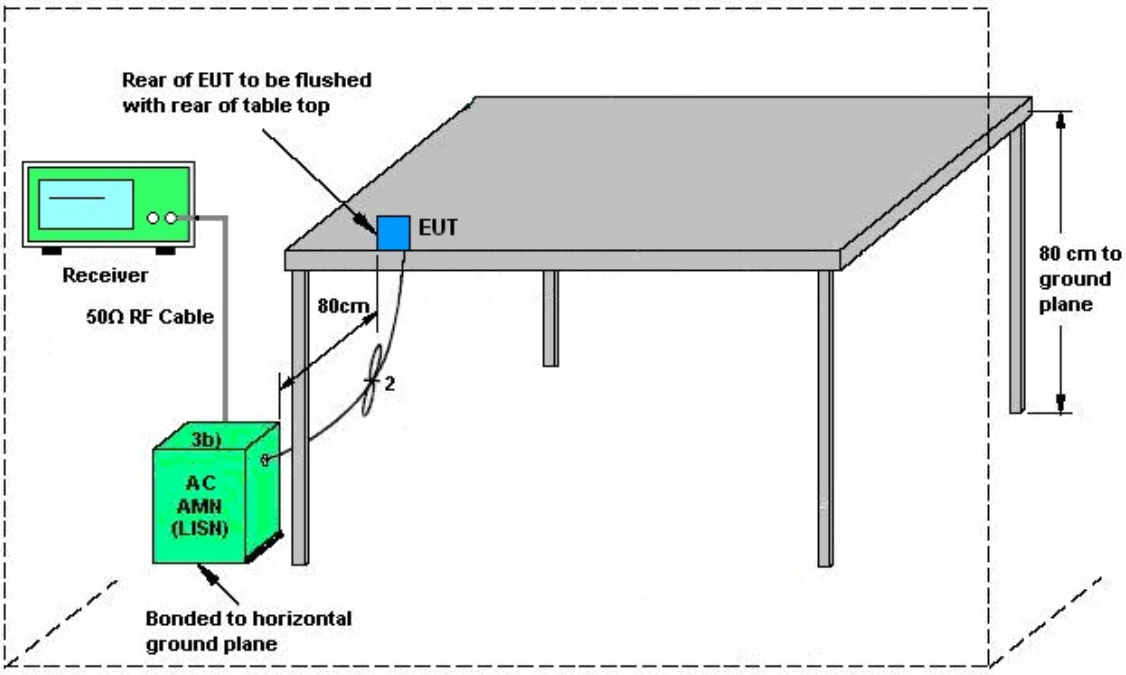
3.5.2 Measuring Instruments

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



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

3.5.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.6 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

EUT is verified this characteristic during the function check of normal sample associated with an access point:

A. Information start: make EUT supply information to the access point.

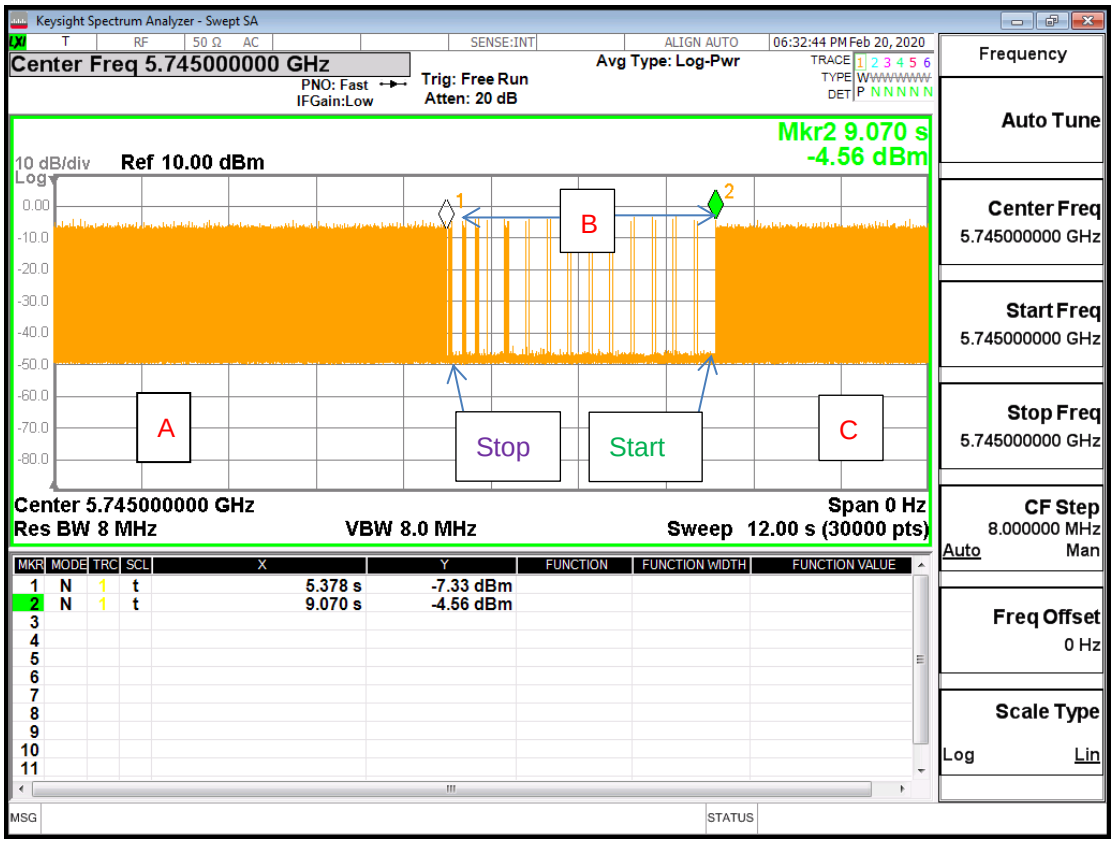
B. Information stop: stop supplying information to the access point.

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving.

C. Information start: make EUT supply information to the access point again.

The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

5745MHz



Note: The control / signalling information during the period B is precluded.

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

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
Hygrometer	Testo	608-H2	41410069	N/A	Jun. 17, 2019	Jan. 21, 2020~ Jan. 22, 2020	Jun. 16, 2020	Conducted (TH05-HY)
Power Sensor	DARE	RPR3006W	16I00054SNO10	10MHz~6GHz	Dec. 23, 2019	Jan. 21, 2020~ Jan. 22, 2020	Dec. 22, 2020	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz~40GHz	Jul. 15, 2019	Jan. 21, 2020~ Jan. 22, 2020	Jul. 14, 2020	Conducted (TH05-HY)
Switch Box & RF Cable	Burgeon	ETF-058	EC1208382	N/A	Mar. 27, 2019	Jan. 21, 2020~ Jan. 22, 2020	Mar. 26, 2020	Conducted (TH05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Feb. 14, 2020	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Nov. 15, 2019	Feb. 14, 2020	Nov. 14, 2020	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Mar. 19, 2019	Feb. 14, 2020	Mar. 18, 2020	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 20, 2019	Feb. 14, 2020	Nov. 19, 2020	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Feb. 14, 2020	N/A	Conduction (CO05-HY)
LF Cable	HUBER + SUHNER	RG-214/U	LF01	N/A	Jan. 02, 2020	Feb. 14, 2020	Jan. 01, 2021	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Jan. 02, 2020	Feb. 14, 2020	Jan. 01, 2021	Conduction (CO05-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N-06	35419 & 03	30MHz~1GHz	Apr. 30, 2019	Jan. 14, 2020~ Jan. 22, 2020	Apr. 29, 2020	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Dec. 06, 2019	Jan. 14, 2020~ Jan. 22, 2020	Dec. 05, 2020	Radiation (03CH07-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100472	20Hz~26.5GHz	Jan. 10, 2020	Jan. 14, 2020~ Jan. 22, 2020	Jan. 09, 2021	Radiation (03CH07-HY)
Hygrometer	驥展	HTC-2	1	N/A	Jun. 17, 2019	Jan. 14, 2020~ Jan. 22, 2020	Jun. 16, 2020	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Dec. 26, 2019	Jan. 14, 2020~ Jan. 22, 2020	Dec. 25, 2020	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-00101800-30-10P	1590075	1GHz~18GHz	Apr. 24, 2019	Jan. 14, 2020~ Jan. 22, 2020	Apr. 23, 2020	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10MHz~1GHz	May 20, 2019	Jan. 14, 2020~ Jan. 22, 2020	May 19, 2020	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A02362	1GHz~26.5GHz	Nov. 01, 2019	Jan. 14, 2020~ Jan. 22, 2020	Oct. 31, 2020	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24971/4, MY28655/4	9kHz~30MHz	Feb. 26, 2019	Jan. 14, 2020~ Jan. 22, 2020	Feb. 25, 2020	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655/4, MY24971/4, MY15682/4	30MHz~1GHz	Feb. 26, 2019	Jan. 14, 2020~ Jan. 22, 2020	Feb. 25, 2020	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655/4, MY24971/4, MY15682/4	1GHz~18GHz	Feb. 26, 2019	Jan. 14, 2020~ Jan. 22, 2020	Feb. 25, 2020	Radiation (03CH07-HY)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Controller	ChainTek	Chaintek 3000	N/A	Control Turn table	N/A	Jan. 14, 2020~ Jan. 22, 2020	N/A	Radiation (03CH07-HY)
Controller	Max-Full	MF7802	MF780208368	Control Ant Mast	N/A	Jan. 14, 2020~ Jan. 22, 2020	N/A	Radiation (03CH07-HY)
Antenna Mast	Max-Full	MFA520BS	N/A	1m~4m	N/A	Jan. 14, 2020~ Jan. 22, 2020	N/A	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	N/A	Jan. 14, 2020~ Jan. 22, 2020	N/A	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170576	18GHz~40GHz	May 14, 2019	Jan. 14, 2020~ Jan. 22, 2020	May 13, 2020	Radiation (03CH07-HY)
Spectrum Analyzer	Agilent	N9030A	MY52350276	3Hz~44GHz	Apr. 02, 2019	Jan. 14, 2020~ Jan. 22, 2020	Apr. 01, 2020	Radiation (03CH07-HY)
Software	Audix	E3 6.2009-8-24	N/A	N/A	N/A	Jan. 14, 2020~ Jan. 22, 2020	N/A	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2858/2	18GHz~40GHz	Feb. 26, 2019	Jan. 14, 2020~ Jan. 22, 2020	Feb. 25, 2020	Radiation (03CH07-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz~40GHz	Dec. 13, 2019	Jan. 14, 2020~ Jan. 22, 2020	Dec. 12, 2020	Radiation (03CH07-HY)
Spectrum Analyzer	Keysight	N9010A	MY56070412	10Hz~7GHz	Aug. 27, 2019	Feb. 20, 2020	Aug. 26, 2020	DFS (DFS02-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 (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.6

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.2

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.3

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Luffy Lin/Richard Qiu	Temperature:	21~25	°C
Test Date:	2020/01/21~2020/01/22	Relative Humidity:	51~54	%

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

Band IV single antenna												
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Bandwidth (MHz)		26dB Bandwidth (MHz)		6 dB Bandwidth (MHz)		6 dB Bandwidth Min. Limit (MHz)	Pass/Fail
					Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2		
11a	6Mbps	1	149	5745	17.53	-	41.60	-	16.33	-	0.5	Pass
11a	6Mbps	1	157	5785	17.63	-	37.64	-	16.28	-	0.5	Pass
11a	6Mbps	1	165	5825	17.38	-	40.69	-	16.28	-	0.5	Pass
HT20	MCS0	1	149	5745	18.48	-	47.47	-	17.58	-	0.5	Pass
HT20	MCS0	1	157	5785	18.68	-	46.43	-	17.58	-	0.5	Pass
HT20	MCS0	1	165	5825	18.48	-	45.96	-	17.58	-	0.5	Pass

Report Number : FR952805-03E

TEST RESULTS DATA
Average Power Table

Band IV 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	149	5745	15.80	-		30.00	-	5.25	-	Pass
11a	6Mbps	1	157	5785	15.90	-		30.00	-	5.25	-	Pass
11a	6Mbps	1	165	5825	16.30	-		30.00	-	5.25	-	Pass
HT20	MCS0	1	149	5745	15.70	-		30.00	-	5.25	-	Pass
HT20	MCS0	1	157	5785	15.90	-		30.00	-	5.25	-	Pass
HT20	MCS0	1	165	5825	16.20	-		30.00	-	5.25	-	Pass
VHT20	MCS0	1	149	5745	15.60	-		30.00	-	5.25	-	Pass
VHT20	MCS0	1	157	5785	15.80	-		30.00	-	5.25	-	Pass
VHT20	MCS0	1	165	5825	16.10	-		30.00	-	5.25	-	Pass

TEST RESULTS DATA
Power Spectral Density

Band IV single antenna																	
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)		10log (500kHz /RBW) Factor (dB)		Average Power Density with Duty Factor (dBm/500kHz)			Average PSD Limit (dBm/500kHz)		DG (dBi)		Pass /Fail
					Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	
11a	6Mbps	1	149	5745	0.06		2.22	-	-0.87	-		30.00	-	5.25	-	Pass
11a	6Mbps	1	157	5785	0.06		2.22	-	-0.48	-		30.00	-	5.25	-	Pass
11a	6Mbps	1	165	5825	0.06		2.22	-	-0.14	-		30.00	-	5.25	-	Pass
HT20	MCS0	1	149	5745	0.07		2.22	-	-0.97	-		30.00	-	5.25	-	Pass
HT20	MCS0	1	157	5785	0.07		2.22	-	-0.60	-		30.00	-	5.25	-	Pass
HT20	MCS0	1	165	5825	0.07		2.22	-	-0.49	-		30.00	-	5.25	-	Pass

Note: PSD Sum = Max PSD(Ant. 1, Ant. 2) + 10 log (n)

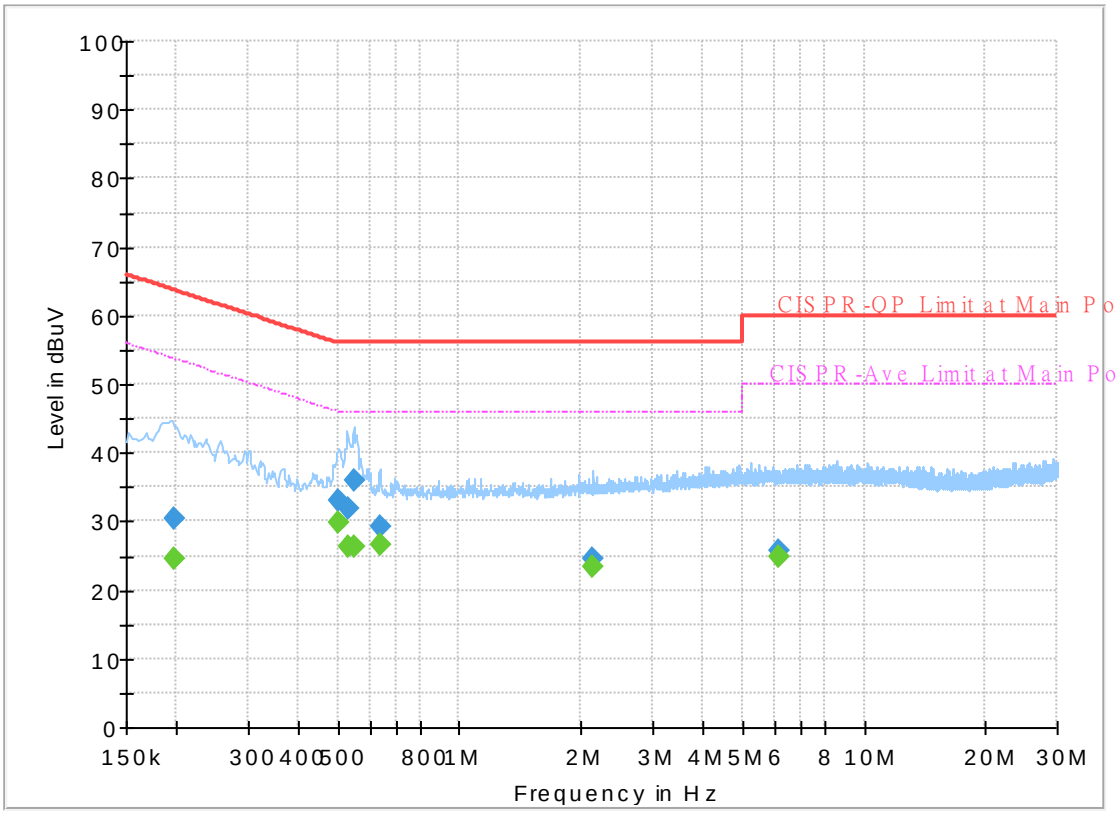
Appendix B. AC Conducted Emission Test Results

Test Engineer :	Howard Huang	**Temperature :**	22~25℃
		Relative Humidity :	40~43%

EUT Information

Report NO :	952805-03
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Line

Full Spectrum



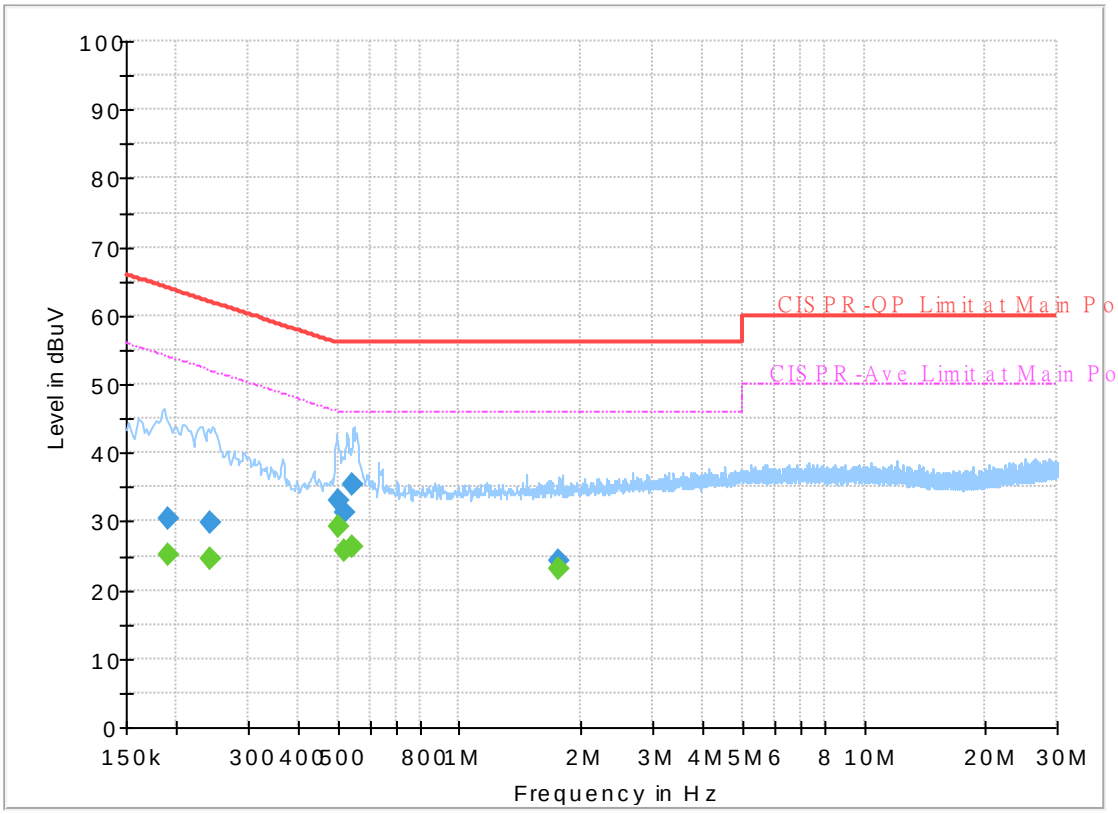
Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.196890	---	24.65	53.74	29.09	L1	OFF	19.5
0.196890	30.55	---	63.74	33.19	L1	OFF	19.5
0.503250	---	29.73	46.00	16.27	L1	OFF	19.5
0.503250	33.11	---	56.00	22.89	L1	OFF	19.5
0.532500	---	26.36	46.00	19.64	L1	OFF	19.5
0.532500	31.83	---	56.00	24.17	L1	OFF	19.5
0.547800	---	26.34	46.00	19.66	L1	OFF	19.5
0.547800	36.08	---	56.00	19.92	L1	OFF	19.5
0.634110	---	26.55	46.00	19.45	L1	OFF	19.5
0.634110	29.12	---	56.00	26.88	L1	OFF	19.5
2.139090	---	23.36	46.00	22.64	L1	OFF	19.7
2.139090	24.57	---	56.00	31.43	L1	OFF	19.7
6.155250	---	24.89	50.00	25.11	L1	OFF	19.8
6.155250	25.76	---	60.00	34.24	L1	OFF	19.8

EUT Information

Report NO :	952805-03
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)
0.190500	---	25.14	54.02	28.88	N	OFF	19.6
0.190500	30.54	---	64.02	33.48	N	OFF	19.6
0.242880	---	24.65	52.00	27.35	N	OFF	19.6
0.242880	29.82	---	62.00	32.18	N	OFF	19.6
0.501000	---	29.30	46.00	16.70	N	OFF	19.6
0.501000	32.93	---	56.00	23.07	N	OFF	19.6
0.521250	---	25.78	46.00	20.22	N	OFF	19.6
0.521250	31.27	---	56.00	24.73	N	OFF	19.6
0.545730	---	26.36	46.00	19.64	N	OFF	19.6
0.545730	35.43	---	56.00	20.57	N	OFF	19.6
1.765410	---	23.05	46.00	22.95	N	OFF	19.6
1.765410	24.16	---	56.00	31.84	N	OFF	19.6

Appendix C. Radiated Spurious Emission

Test Engineer :	Jesse Wang , Stan Hsieh , Ken Wu	Temperature :	21~24°C
		Relative Humidity :	56~60%

Band 4 - 5725~5850MHz

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.
1		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11a CH 149 5745MHz		5606.6	47.58	-20.62	68.2	36.21	35	11.68	35.31	101	296	P	H
		5693	52.15	-47.89	100.04	40.69	35	11.78	35.32	101	296	P	H
		5713.6	63.25	-45.76	109.01	51.74	35	11.83	35.32	101	296	P	H
		5724	74.56	-45.36	119.92	63.05	35	11.83	35.32	101	296	P	H
	*	5745	108.58	-	-	97.02	35	11.88	35.32	101	296	P	H
	*	5745	100.59	-	-	89.03	35	11.88	35.32	101	296	A	H
		5612.6	47.94	-20.26	68.2	36.57	35	11.68	35.31	101	322	P	V
		5695.2	52.17	-49.49	101.66	40.71	35	11.78	35.32	101	322	P	V
		5719.8	63.16	-47.58	110.74	51.65	35	11.83	35.32	101	322	P	V
		5724	72.9	-47.02	119.92	61.39	35	11.83	35.32	101	322	P	V
	*	5745	107.33	-	-	95.77	35	11.88	35.32	101	322	P	V
	*	5745	99.36	-	-	87.8	35	11.88	35.32	101	322	A	V

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)
802.11a CH 157 5785MHz		5646.8	48.06	-20.14	68.2	36.84	34.8	11.73	35.31	100	284	P	H
		5682.4	48.15	-44.06	92.21	36.84	34.85	11.78	35.32	100	284	P	H
		5714.4	48.98	-60.25	109.23	37.47	35	11.83	35.32	100	284	P	H
		5724.6	50.75	-70.54	121.29	39.24	35	11.83	35.32	100	284	P	H
	*	5785	108.27	-	-	96.67	35	11.93	35.33	100	284	P	H
	*	5785	100	-	-	88.4	35	11.93	35.33	100	284	A	H
		5850.8	49.19	-71.19	120.38	37.55	35	11.98	35.34	100	284	P	H
		5866.8	50.42	-57.07	107.49	38.67	35.07	12.02	35.34	100	284	P	H
		5883.6	49.98	-48.83	98.81	38.17	35.13	12.02	35.34	100	284	P	H
		5941	49.76	-18.44	68.2	37.79	35.2	12.11	35.34	100	284	P	H
		5630.6	48.02	-20.18	68.2	36.7	34.9	11.73	35.31	101	328	P	V
		5687.4	48.7	-47.21	95.91	37.24	35	11.78	35.32	101	328	P	V
		5709.8	49.17	-58.78	107.95	37.66	35	11.83	35.32	101	328	P	V
		5724.4	48.61	-72.22	120.83	37.1	35	11.83	35.32	101	328	P	V
	*	5785	107.9	-	-	96.3	35	11.93	35.33	101	328	P	V
	*	5785	99.7	-	-	88.1	35	11.93	35.33	101	328	A	V
		5851	48.86	-71.06	119.92	37.22	35	11.98	35.34	101	328	P	V
		5856.4	49.8	-60.61	110.41	38.09	35.07	11.98	35.34	101	328	P	V
		5895.6	49.5	-40.42	89.92	37.62	35.2	12.02	35.34	101	328	P	V
		5931	50.54	-17.66	68.2	38.61	35.2	12.07	35.34	101	328	P	V

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)
802.11a CH 165 5825MHz	*	5825	108.61	-	-	96.96	35	11.98	35.33	100	288	P	H
	*	5825	100.59	-	-	88.94	35	11.98	35.33	100	288	A	H
		5850	60.68	-61.52	122.2	49.03	35	11.98	35.33	100	288	P	H
		5857	57.72	-52.52	110.24	46.01	35.07	11.98	35.34	100	288	P	H
		5904.8	50.54	-32.57	83.11	38.61	35.2	12.07	35.34	100	288	P	H
		5939	50.48	-17.72	68.2	38.55	35.2	12.07	35.34	100	288	P	H
	*	5825	106.24	-	-	94.59	35	11.98	35.33	100	324	P	V
	*	5825	98.14	-	-	86.49	35	11.98	35.33	100	324	A	V
		5850	57.29	-64.91	122.2	45.64	35	11.98	35.33	100	324	P	V
		5859.6	62.21	-47.3	109.51	50.5	35.07	11.98	35.34	100	324	P	V
		5899	49.99	-37.41	87.4	38.11	35.2	12.02	35.34	100	324	P	V
		5939.2	49.69	-18.51	68.2	37.76	35.2	12.07	35.34	100	324	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

WIFI 802.11a (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)
802.11a CH 149 5745MHz		11490	45.7	-28.3	74	46.61	38.18	18.37	57.46	100	0	P	H
		17235	49.17	-19.03	68.2	40.99	41.53	22.68	56.03	100	0	P	H
		11490	45.07	-28.93	74	45.98	38.18	18.37	57.46	100	0	P	V
		17235	49.16	-19.04	68.2	40.98	41.53	22.68	56.03	100	0	P	V
802.11a CH 157 5785MHz		11570	44.91	-29.09	74	45.53	38.33	18.41	57.36	100	0	P	H
		17355	49.07	-19.13	68.2	40.71	41.5	22.8	55.94	100	0	P	H
		11570	45.32	-28.68	74	45.94	38.33	18.41	57.36	100	0	P	V
		17355	49.32	-18.88	68.2	40.96	41.5	22.8	55.94	100	0	P	V
802.11a CH 165 5825MHz		11650	45.32	-28.68	74	45.72	38.44	18.45	57.29	100	0	P	H
		17475	49.9	-18.3	68.2	41.52	41.33	22.9	55.85	100	0	P	H
		11650	46.03	-27.97	74	46.43	38.44	18.45	57.29	100	0	P	V
		17475	50.26	-17.94	68.2	41.88	41.33	22.9	55.85	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

WIFI 802.11n HT20 (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)
802.11n HT20 CH 149 5745MHz		5648	48.18	-20.02	68.2	36.96	34.8	11.73	35.31	101	296	P	H
		5699.8	53.55	-51.5	105.05	42.09	35	11.78	35.32	101	296	P	H
		5719.6	64.38	-46.31	110.69	52.87	35	11.83	35.32	101	296	P	H
		5725	75.41	-46.79	122.2	63.9	35	11.83	35.32	101	296	P	H
	*	5745	108.75	-	-	97.19	35	11.88	35.32	101	296	P	H
	*	5745	100.26	-	-	88.7	35	11.88	35.32	101	296	A	H
		5609.8	47.88	-20.32	68.2	36.51	35	11.68	35.31	101	322	P	V
		5688.4	53.1	-43.54	96.64	41.64	35	11.78	35.32	101	322	P	V
		5719.2	61.5	-49.08	110.58	49.99	35	11.83	35.32	101	322	P	V
		5724.6	73.94	-47.35	121.29	62.43	35	11.83	35.32	101	322	P	V
	*	5745	107.26	-	-	95.7	35	11.88	35.32	101	322	P	V
	*	5745	99.06	-	-	87.5	35	11.88	35.32	101	322	A	V

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 HT20 CH 157 5785MHz		5618.8	48.65	-19.55	68.2	37.38	34.9	11.68	35.31	100	284	P	H
		5699.2	48.74	-55.87	104.61	37.28	35	11.78	35.32	100	284	P	H
		5718.8	51.27	-59.19	110.46	39.76	35	11.83	35.32	100	284	P	H
		5722.4	49.37	-66.9	116.27	37.86	35	11.83	35.32	100	284	P	H
	*	5785	108.44	-	-	96.84	35	11.93	35.33	100	284	P	H
	*	5785	99.7	-	-	88.1	35	11.93	35.33	100	284	A	H
		5854	49.33	-63.75	113.08	37.62	35.07	11.98	35.34	100	284	P	H
		5857	49.46	-60.78	110.24	37.75	35.07	11.98	35.34	100	284	P	H
		5902.8	49.61	-34.98	84.59	37.68	35.2	12.07	35.34	100	284	P	H
		5935.8	49.76	-18.44	68.2	37.83	35.2	12.07	35.34	100	284	P	H
		5633	47.79	-20.41	68.2	36.57	34.8	11.73	35.31	101	328	P	V
		5678.2	48.07	-41.04	89.11	36.76	34.85	11.78	35.32	101	328	P	V
		5719.4	49.66	-60.97	110.63	38.15	35	11.83	35.32	101	328	P	V
		5724.4	48.95	-71.88	120.83	37.44	35	11.83	35.32	101	328	P	V
	*	5785	108.7	-	-	97.1	35	11.93	35.33	101	328	P	V
	*	5785	99.8	-	-	88.2	35	11.93	35.33	101	328	A	V
		5853	47.62	-67.74	115.36	35.98	35	11.98	35.34	101	328	P	V
		5873.8	48.32	-57.22	105.54	36.51	35.13	12.02	35.34	101	328	P	V
		5892.6	49.2	-42.94	92.14	37.32	35.2	12.02	35.34	101	328	P	V
		5932	50.94	-17.26	68.2	39.01	35.2	12.07	35.34	101	328	P	V

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 HT20 CH 165 5825MHz	*	5825	109.99	-	-	98.34	35	11.98	35.33	100	296	P	H
	*	5825	102.32	-	-	90.67	35	11.98	35.33	100	296	A	H
		5850.4	69.19	-52.1	121.29	57.55	35	11.98	35.34	100	296	P	H
		5860.8	62.02	-47.15	109.17	50.27	35.07	12.02	35.34	100	296	P	H
		5883.4	51.19	-47.77	98.96	39.38	35.13	12.02	35.34	100	296	P	H
		5929.2	48.97	-19.23	68.2	37.04	35.2	12.07	35.34	100	296	P	H
	*	5825	106.77	-	-	95.12	35	11.98	35.33	249	331	P	V
	*	5825	98.97	-	-	87.32	35	11.98	35.33	249	331	A	V
		5850.2	62.52	-59.22	121.74	50.88	35	11.98	35.34	249	331	P	V
		5855	57.35	-53.45	110.8	45.64	35.07	11.98	35.34	249	331	P	V
		5896.8	50.29	-38.74	89.03	38.41	35.2	12.02	35.34	249	331	P	V
		5947.6	49.51	-18.69	68.2	37.54	35.2	12.11	35.34	249	331	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Band 4 5725~5850MHz

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		11490	46.04	-27.96	74	46.95	38.18	18.37	57.46	100	0	P	H
HT20		17235	49.56	-18.64	68.2	41.38	41.53	22.68	56.03	100	0	P	H
CH 149		11490	45.76	-28.24	74	46.67	38.18	18.37	57.46	100	0	P	V
5745MHz		17235	49.52	-18.68	68.2	41.34	41.53	22.68	56.03	100	0	P	V
802.11n		11570	45.96	-28.04	74	46.58	38.33	18.41	57.36	100	0	P	H
HT20		17355	49.51	-18.69	68.2	41.15	41.5	22.8	55.94	100	0	P	H
CH 157		11570	47.09	-26.91	74	47.71	38.33	18.41	57.36	100	0	P	V
5785MHz		17355	51.02	-17.18	68.2	42.66	41.5	22.8	55.94	100	0	P	V
802.11n		11650	45.64	-28.36	74	46.04	38.44	18.45	57.29	100	0	P	H
HT20		17475	50.49	-17.71	68.2	42.11	41.33	22.9	55.85	100	0	P	H
CH 165		11650	46.11	-27.89	74	46.51	38.44	18.45	57.29	100	0	P	V
5825MHz		17475	51.18	-17.02	68.2	42.8	41.33	22.9	55.85	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission above 18GHz

WIFI 802.11n HT20 (SHF @ 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 HT20 SHF		18132	43.48	-30.52	74	48.07	37.9	11.64	54.13	100	0	P	H
		39626	43.06	-30.94	74	43.34	44.59	10.02	54.89	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

Emission below 1GHz

5GHz WIFI 802.11n HT20 (LF @ 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)
5GHz 802.11n HT20 LF		30	21.73	-18.27	40	25.91	24.6	1.2	29.98	-	-	P	H
		47.01	19.74	-20.26	40	33.05	15.48	1.2	29.99	-	-	P	H
		71.85	17.41	-22.59	40	33.32	12.5	1.58	29.99	-	-	P	H
		602.4	32.63	-13.37	46	32.97	25.46	3.91	29.71	-	-	P	H
		870.5	32.66	-13.34	46	27.83	28.97	4.89	29.03	-	-	P	H
		942.6	33.7	-12.3	46	27.29	29.97	5.06	28.62	100	0	P	H
		30	29.78	-10.22	40	33.96	24.6	1.2	29.98	100	0	P	V
		38.1	23.44	-16.56	40	31.8	20.42	1.2	29.98	-	-	P	V
		58.35	21.32	-18.68	40	38.05	12.05	1.21	29.99	-	-	P	V
		602.4	29.05	-16.95	46	29.39	25.46	3.91	29.71	-	-	P	V
		889.4	31.69	-14.31	46	26.93	28.81	4.92	28.97	-	-	P	V
		959.4	33.42	-12.58	46	26.01	30.85	5.06	28.5	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

Note symbol

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

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

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

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

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

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

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

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

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

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

= 43.54 (dBμV/m)

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

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

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

Appendix D. Radiated Spurious Emission Plots

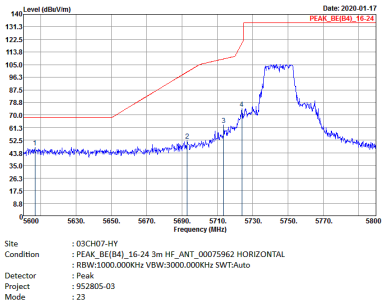
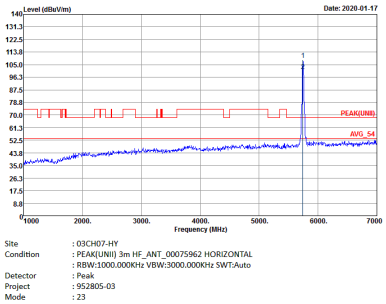
Test Engineer :	Jesse Wang , Stan Hsieh , Ken Wu	**Temperature :**	21~24°C
		Relative Humidity :	56~60%

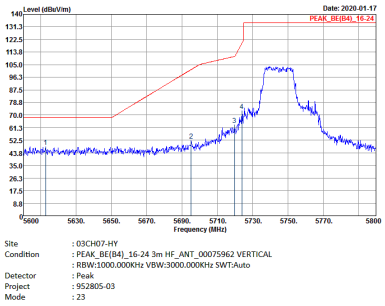
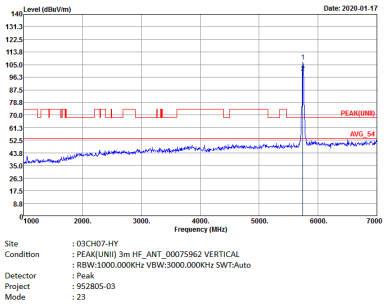
Note symbol

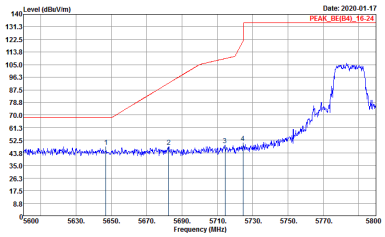
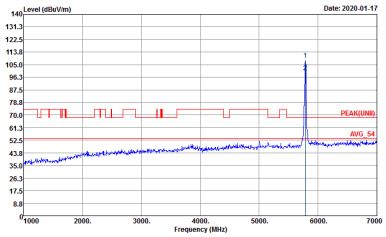
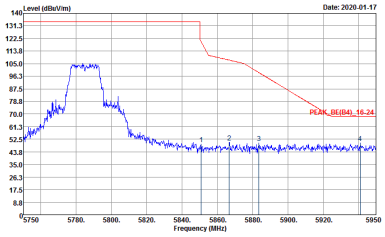
-L	**Low channel location**
-R	**High channel location**

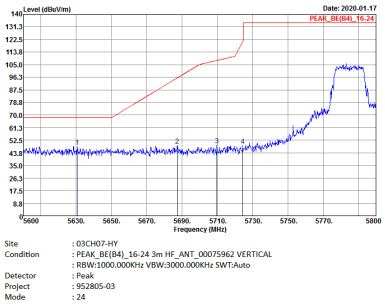
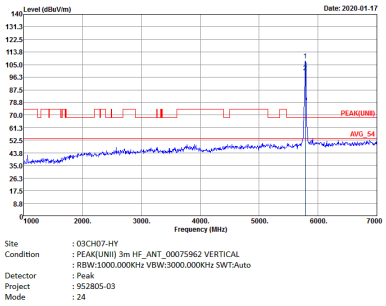
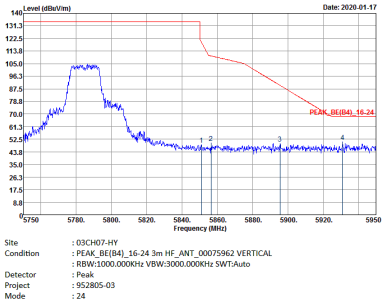
Band 4 - 5725~5850MHz

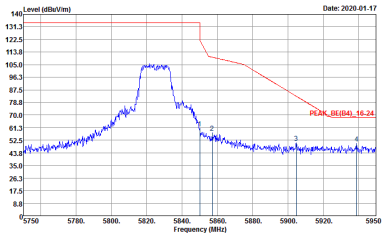
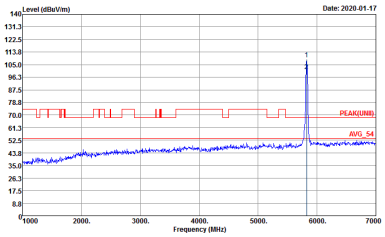
WIFI 802.11a (Band Edge @ 3m)

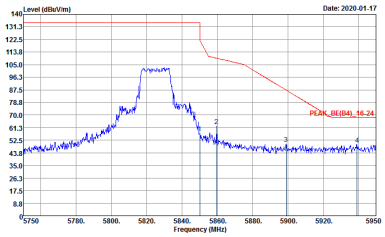
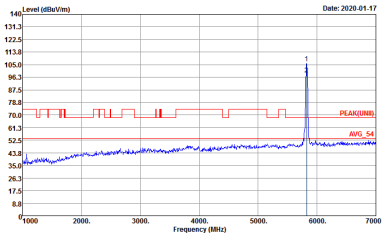
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH149 5745MHz	
1	Horizontal	Fundamental
Peak		

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH149 5745MHz	
1	Vertical	Fundamental
Peak		

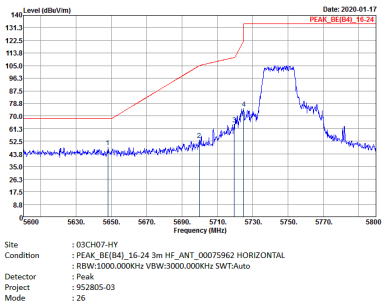
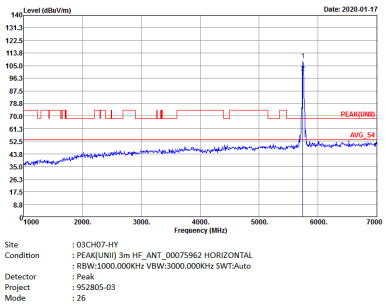
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH157 5785MHz	
1	Horizontal	Fundamental
Peak	 Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 952805-03 Mode : 24	 Site : 03CH07-HY Condition : PEAK(UNII) 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 952805-03 Mode : 24
Peak	 Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 952805-03 Mode : 24	Left blank

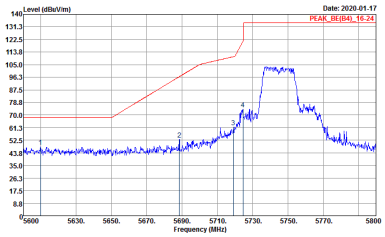
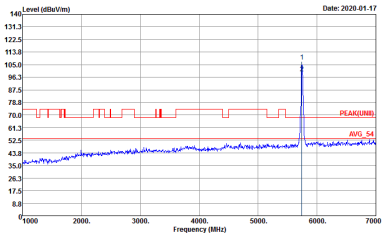
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH157 5785MHz	
1	Vertical	Fundamental
Peak		
Peak		Left blank

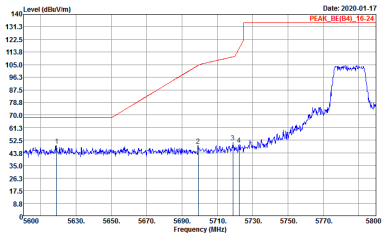
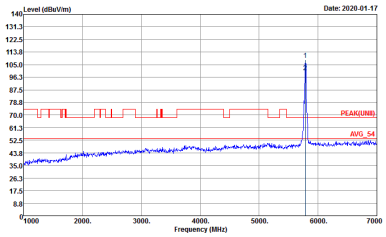
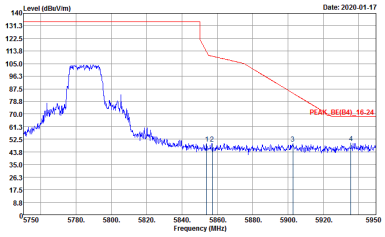
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH165 5825MHz	
1	Horizontal	Fundamental
Peak	 Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 952805-03 Mode : 25	 Site : 03CH07-HY Condition : PEAK(UNII) 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 952805-03 Mode : 25

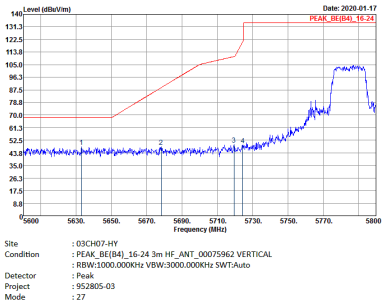
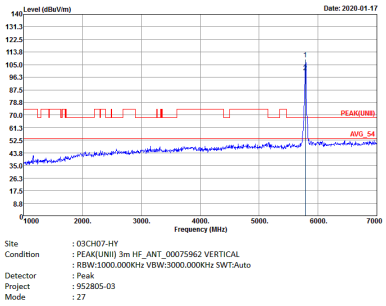
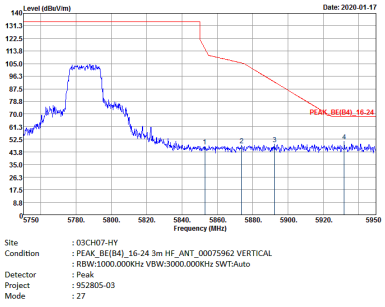
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH165 5825MHz	
1	Vertical	Fundamental
Peak	 Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 952805-03 Mode : 25	 Site : 03CH07-HY Condition : PEAK(UNII) 3m HF_ANT_00075962 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 952805-03 Mode : 25

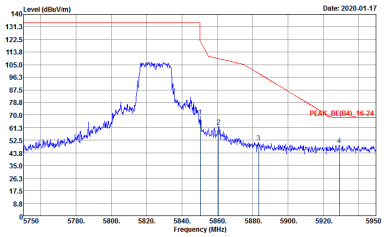
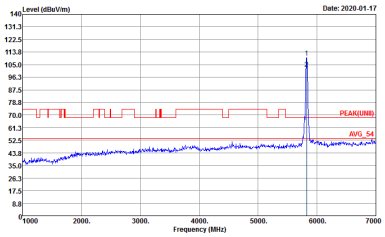
Band 4 5725~5850MHz
WIFI 802.11n HT20 (Band Edge @ 3m)

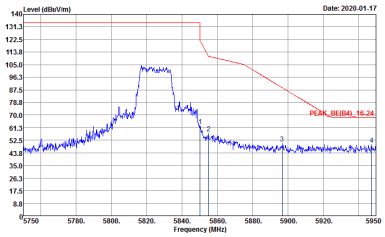
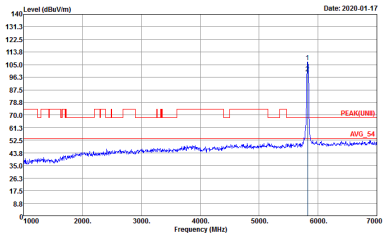
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH149 5745MHz	
1	Horizontal	Fundamental
Peak		

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH149 5745MHz	
1	Vertical	Fundamental
Peak	 Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 952805-03 Mode : 26	 Site : 03CH07-HY Condition : PEAK(UNII) 3m HF_ANT_00075962 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 952805-03 Mode : 26

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
1	Horizontal	Fundamental
Peak	 Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 952805-03 Mode : 27	 Site : 03CH07-HY Condition : PEAK(UNII) 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 952805-03 Mode : 27
Peak	 Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 952805-03 Mode : 27	Left blank

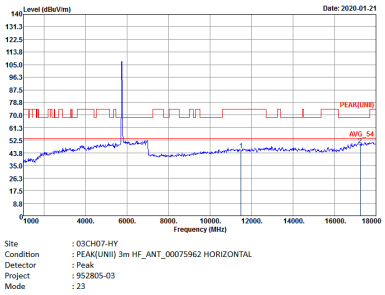
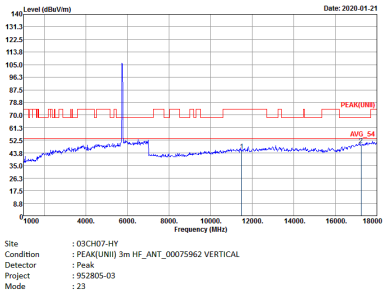
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
1	Vertical	Fundamental
Peak		
Peak		Left blank

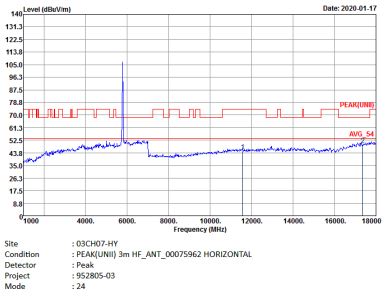
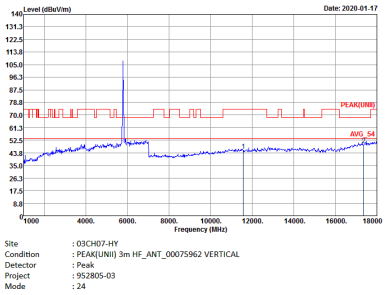
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH165 5825MHz	
1	Horizontal	Fundamental
Peak	 Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 952805-03 Mode : 28	 Site : 03CH07-HY Condition : PEAK(UNII) 3m HF_ANT_00075962 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 952805-03 Mode : 28

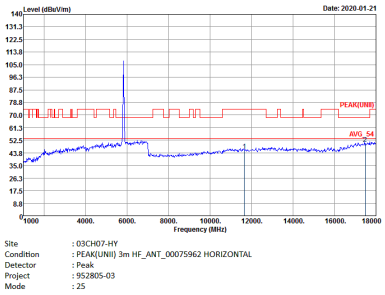
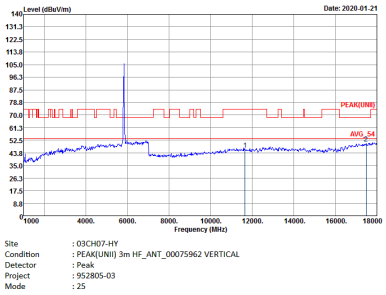
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH165 5825MHz	
1	Vertical	Fundamental
Peak	 Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 952805-03 Mode : 28	 Site : 03CH07-HY Condition : PEAK(UNII) 3m HF_ANT_00075962 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 952805-03 Mode : 28

Band 4 - 5725~5850MHz

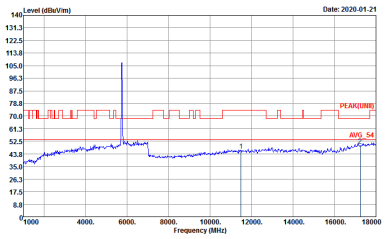
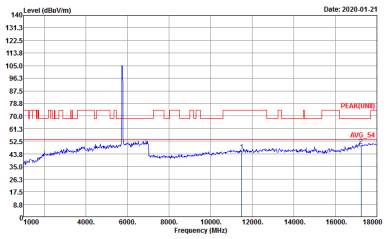
WIFI 802.11a (Harmonic @ 3m)

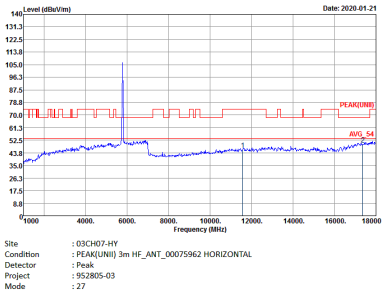
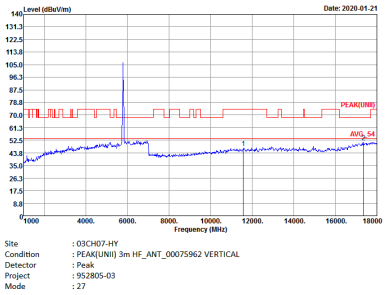
WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11a CH149 5745MHz	
1	Horizontal	Vertical
Peak Avg.		

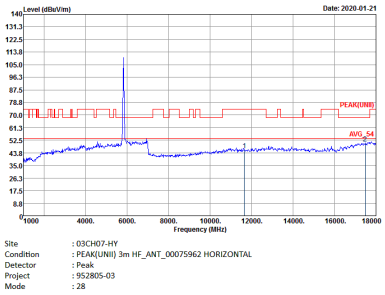
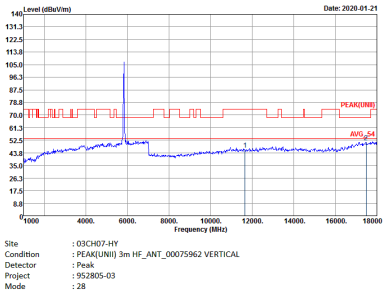
WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11a CH157 5785MHz	
1	Horizontal	Vertical
Peak Avg.		

WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11a CH165 5825MHz	
1	Horizontal	Vertical
Peak Avg.		

Band 4 5725~5850MHz
WIFI 802.11n HT20 (Harmonic @ 3m)

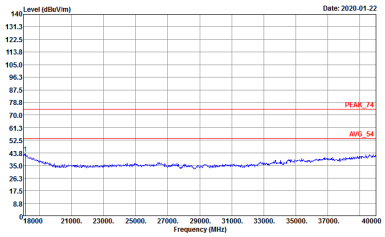
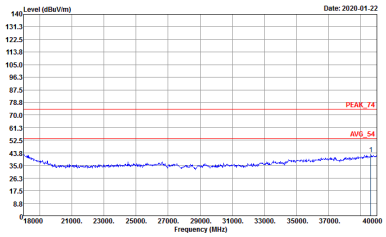
WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT20 CH149 5745MHz	
1	Horizontal	Vertical
Peak Avg.	 Site : 03CH07-HY Condition : PEAK(UNII) 3m HF_ANT_00075962 HORIZONTAL Detector : Peak Project : 952805-03 Mode : 26	 Site : 03CH07-HY Condition : PEAK(UNII) 3m HF_ANT_00075962 VERTICAL Detector : Peak Project : 952805-03 Mode : 26

WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
1	Horizontal	Vertical
Peak Avg.		

WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT20 CH165 5825MHz	
1	Horizontal	Vertical
Peak Avg.		

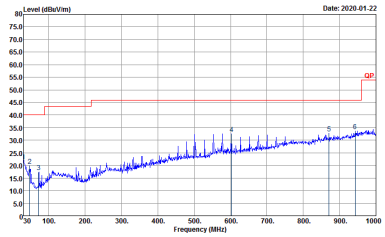
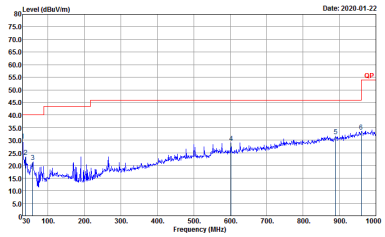
Emission above 18GHz

5GHz WIFI 802.11n HT20 (SHF)

WIFI	5GHz WIFI	
ANT	802.11n HT20 SHF	
1	Horizontal	Vertical
QP / Peak	 Site : 03CH07-HY Condition : PEAK_74 1m SHF-EHF_9170576 HORIZONTAL Detector : Peak Project : 952805-03 Mode : 30	 Site : 03CH07-HY Condition : PEAK_74 1m SHF-EHF_9170576 VERTICAL Detector : Peak Project : 952805-03 Mode : 30

Emission below 1GHz

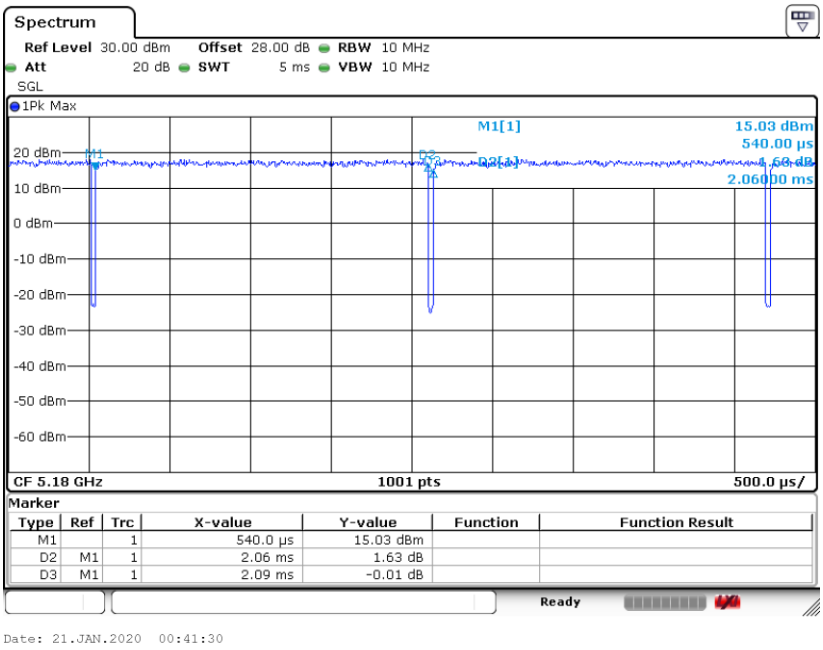
5GHz WIFI 802.11n HT20 (LF)

WIFI	5GHz 5725~5850MHz	
ANT	802.11n HT20 LF	
1	Horizontal	Vertical
QP / Peak	 Site : 03CH07-HY Condition : QP 3m LF-ANT-35419(6) HORIZONTAL Detector : Peak Project : 952805-03 Mode : 29	 Site : 03CH07-HY Condition : QP 3m LF-ANT-35419(6) VERTICAL Detector : Peak Project : 952805-03 Mode : 29

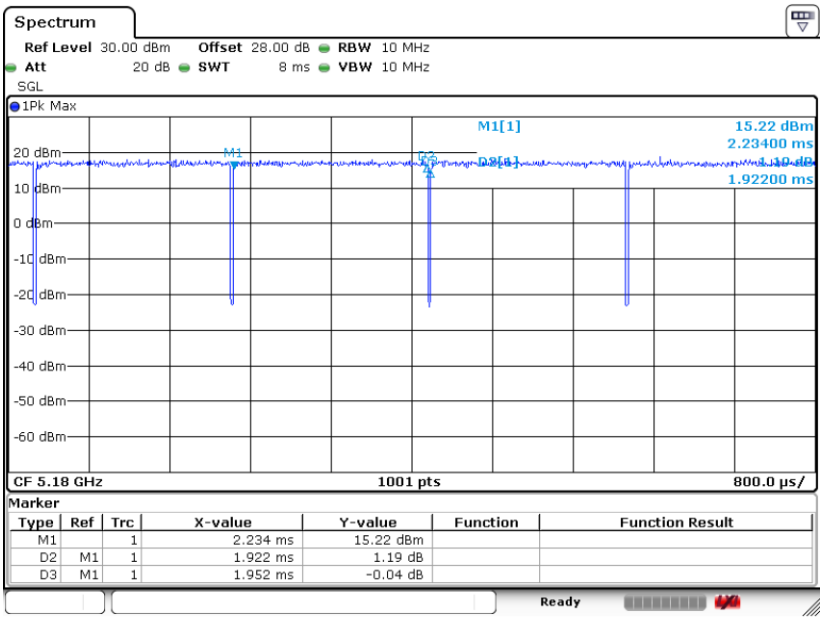
Appendix E. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
1	802.11a	98.56	-	-	10Hz	0.06
1	5GHz 802.11n HT20	98.46	-	-	10Hz	0.07
1	5GHz 802.11ac VHT20	98.47	-	-	10Hz	0.07

802.11a

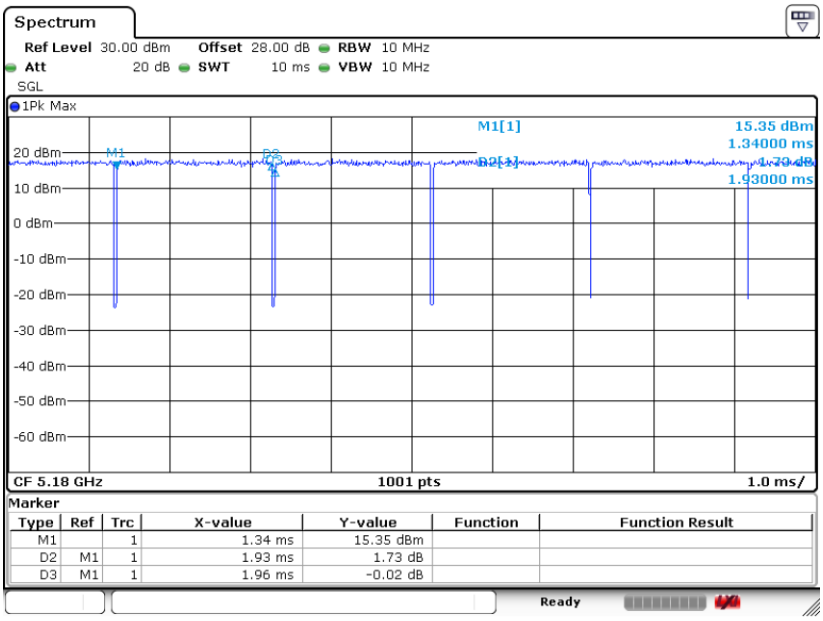


802.11n HT20



Date: 21.JAN.2020 00:42:36

802.11ac VHT20



Date: 21.JAN.2020 00:45:52

———THE END———