

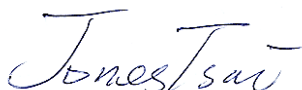
FCC RADIO TEST REPORT

FCC ID : 2AJOTTA-1112
Equipment : Smart Phone
Brand Name : NOKIA
Model name : TA-1112
Applicant : HMD Global Oy
Karaportti 2, 02610 Espoo, Finland
Manufacturer : HMD Global Oy
Karaportti 2, 02610 Espoo, Finland
Standard : FCC Part 15 Subpart E §15.407

The product was received on May 14, 2018 and testing was started from May 14, 2018 and completed on Jun. 21, 2018. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The 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.



Approved by: Jones Tsai

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
FR852420-01E	01	Initial issue of report	Jul. 05, 2018



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.403 (i)	6dB & 26dB Bandwidth	Pass	-
3.1	2.1049	99% Occupied Bandwidth	Reporting only	-
3.2	15.407 (a)	Maximum Conducted Output Power	Pass	-
3.3	15.407 (a)	Power Spectral Density	Pass	-
3.4	15.407(b)	Unwanted Emissions	Pass	Under limit 9.16 dB at 38.100 MHz
3.5	15.207	AC Conducted Emission	Pass	Under limit 13.79 dB at 0.152 MHz
3.6	15.407 (c)	Automatically Discontinue Transmission	Pass	-
3.7	15.203 & 15.407 (a)	Antenna Requirement	Pass	-
Remark: This is a variant report which can be referred Product Equality Declaration. Since the test result is not affected by the changes, the FR852420-01E test report reuses test data from the FR852420E test report.				

Reviewed by: Joseph Lin

Report Producer: Nancy Yang

1 General Description

1.1 Product Feature of Equipment Under Test

GSM/WCDMA/LTE, Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n, Wi-Fi 5GHz 802.11a/n/ac, FM Receiver, and GNSS

Product Specification subjective to this standard	
Antenna Type	WWAN: Monopole Antenna WLAN: Monopole Antenna Bluetooth: Monopole Antenna GPS / Glonass / BDS / Galileo: PIFA Antenna FM: using earphone as antenna

1.2 Modification of EUT

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

1.3 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1190 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.		
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.

1.4 Applicable Standards

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

- ♦ FCC Part 15 Subpart E
- ♦ FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- ♦ ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (X plane) were recorded in this report.
- b. AC power line Conducted Emission was tested under maximum output power.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5725-5850 MHz Band 4 (U-NII-3)	149	5745	157	5785
	151*	5755	159*	5795
	153	5765	161	5805
	155 [#]	5775	165	5825

Note:

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

2.2 Test Mode

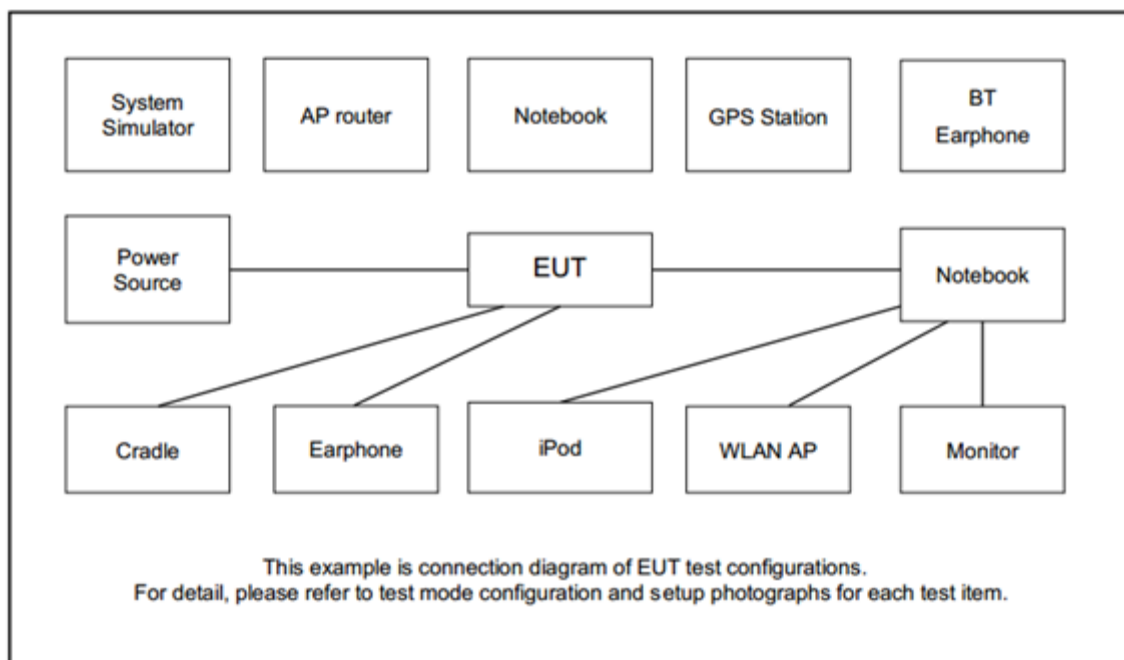
Final test modes are considering the modulation and worse data rates as below table.

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

Test Cases	
AC Conducted Emission	Mode 1 : LTE Band 17 Idle + Bluetooth Link + WLAN (5GHz) Link + FM Rx + Earphone + USB Cable (Charging from Adapter 1)
Remark: For Radiated Test Cases, the tests were performed with Adapter 1.	

Ch. #		Band IV : 5725-5850 MHz		
		802.11a	802.11n HT40	802.11ac VHT80
L	Low	149	151	-
M	Middle	157	-	155
H	High	165	159	-

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
3.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
4.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
5.	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
6.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A



2.5 EUT Operation Test Setup

The RF test items, make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

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

3 Test Result

3.1 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.

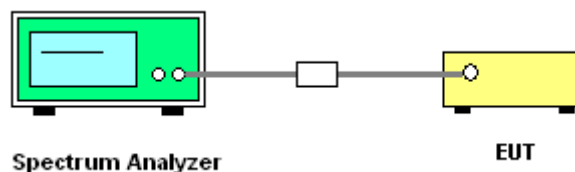
3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

3.1.3 Test Procedures

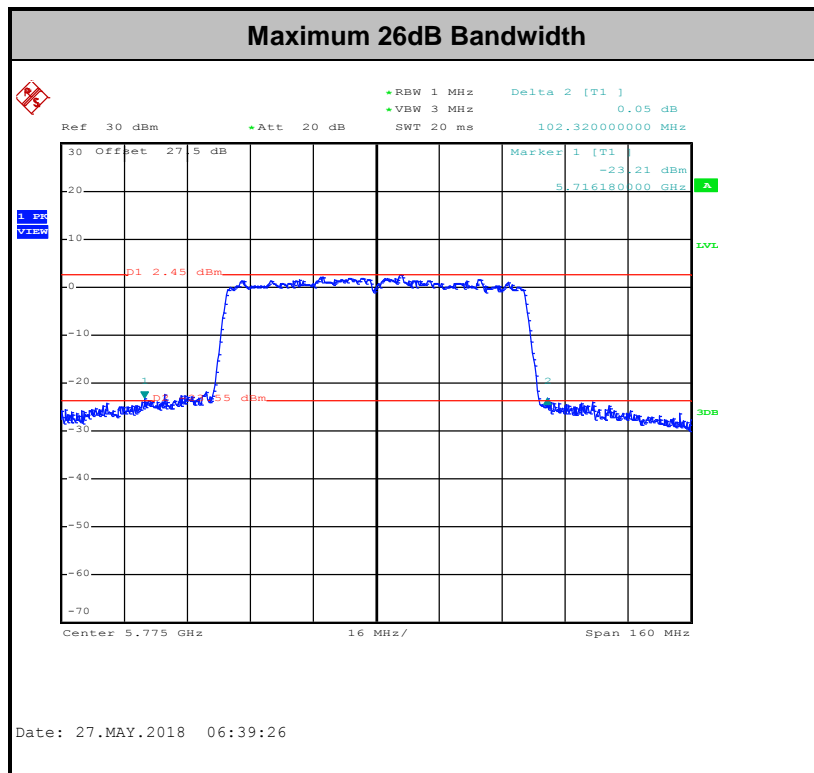
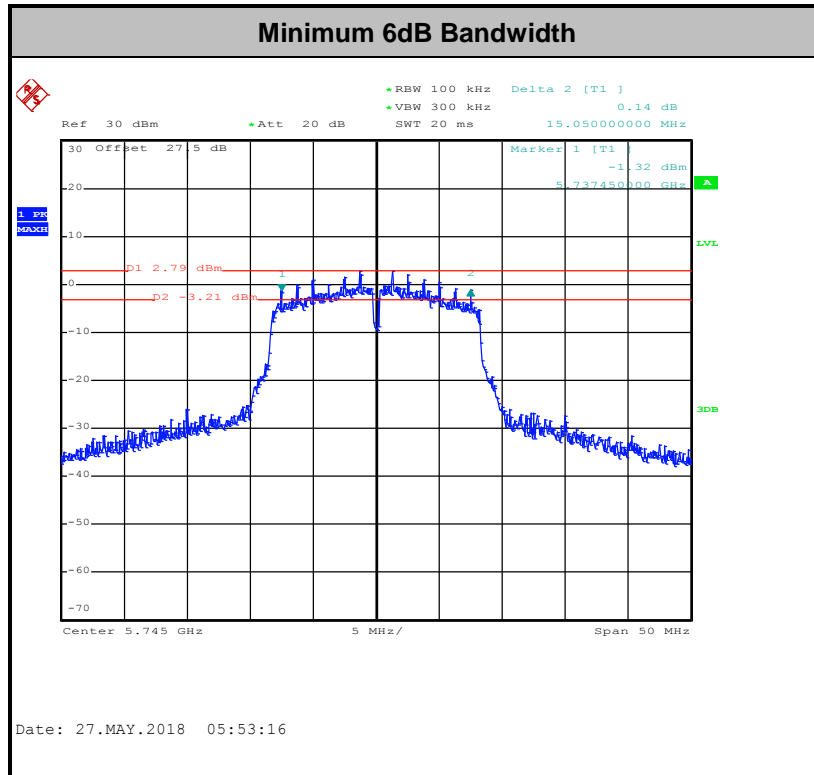
1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
Section C) Emission bandwidth for the band 5.725-5.85GHz
2. Set RBW = 100kHz.
3. Set the VBW $\geq 3 \times$ RBW.
4. Detector = Peak.
5. Trace mode = max hold
6. Measure the maximum width of the emission that is 6 dB down from the peak of the emission.
7. Measure and record the results in the test report.

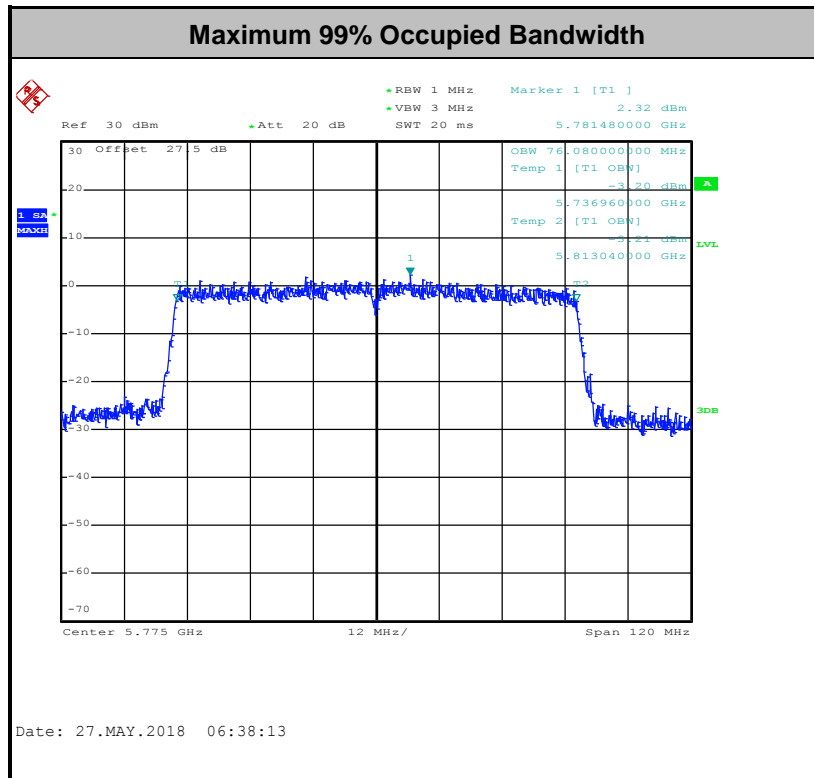
3.1.4 Test Setup



3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.





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.

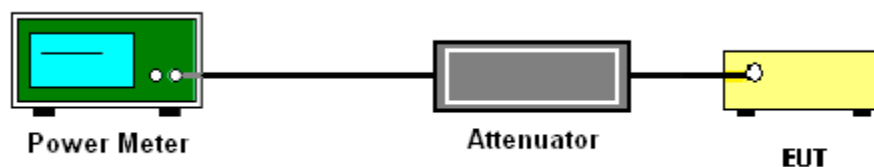
3.2.3 Test Procedures

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

Method PM (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

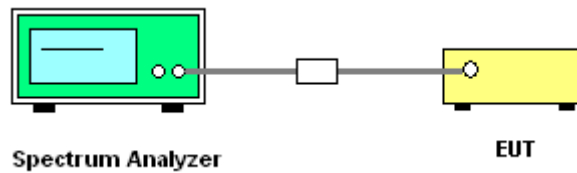
The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
Section F) Maximum power spectral density.

Method SA-2

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

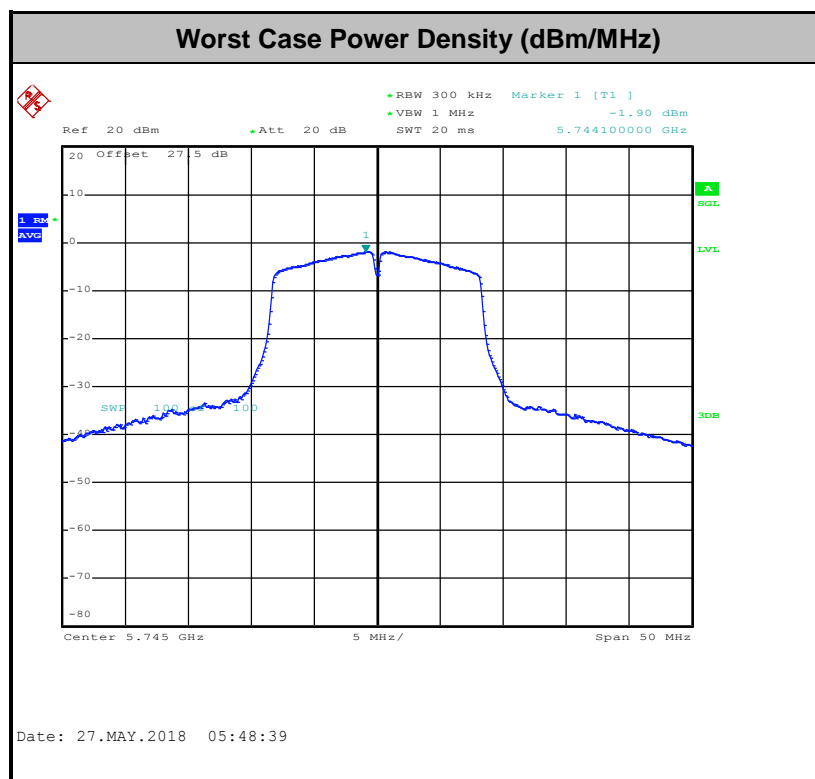
- Measure the duty cycle.
 - Set span to encompass the entire emission bandwidth (EBW) of the signal.
 - Set RBW = 300 kHz.
 - Set VBW \geq 1 MHz.
 - Number of points in sweep \geq 2 Span / RBW.
 - Sweep time = auto.
 - Detector = RMS
 - Trace average at least 100 traces in power averaging mode.
 - Add $10 \log(500\text{kHz}/\text{RBW})$ 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.



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.

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



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

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

- (i) Section 15.407(b)(1) to (b)(3) specify the unwanted emission limits 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.³
- (ii) Section 15.407(b)(4) specifies the unwanted emission limit for the U-NII-3 band. A band emissions mask is specified in Section 15.407(b)(4)(i). The emission limits are in terms of a Peak detector. An alternative to the band emissions mask is specified in Section 15.407(b)(4)(ii). The alternative limits are based on the highest antenna gain specified in the filing. There are also marketing and importation restrictions for the devices using the alternative limit.⁴

Note 3: An out-of-band emission that complies with both the average and peak limits of Section 15.209 is not required to satisfy the -27 dBm/MHz peak emission limit.

Note 4: Only devices with antenna gains of 10 dBi or less may be approved using the emission limits specified in Section 15.247(d) till March 2, 2018; all other devices operating in this band must use the mask specified in Section 15.407(b)(4)(i).

3.4.2 Measuring Instruments

See list of measuring equipment of this test report.



3.4.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

Section G) Unwanted emissions measurement.

(1) Procedure for Unwanted Emissions Measurements Below 1000MHz

- RBW = 120 kHz
- VBW = 300 kHz
- Detector = Peak
- Trace mode = max hold

(2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz

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

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

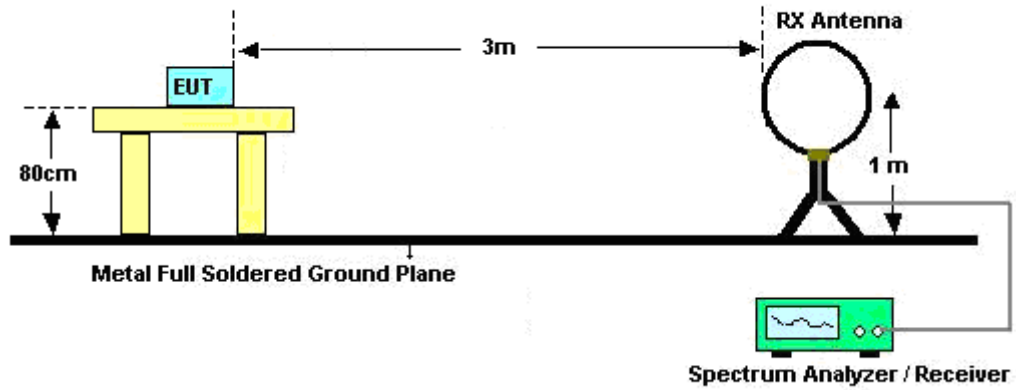
- RBW = 1 MHz
- VBW = 10 Hz, when duty cycle is no less than 98 percent.
- VBW \geq 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.



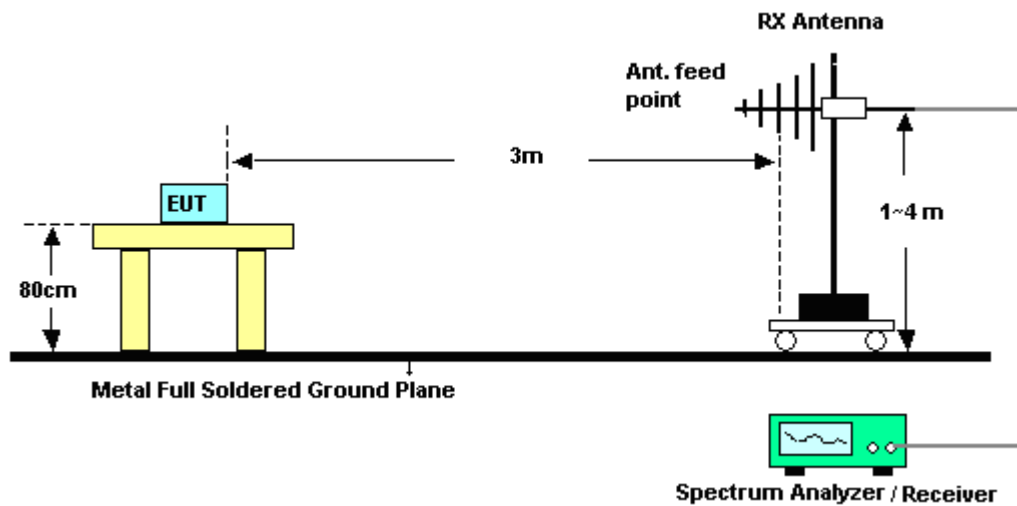
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

3.4.4 Test Setup

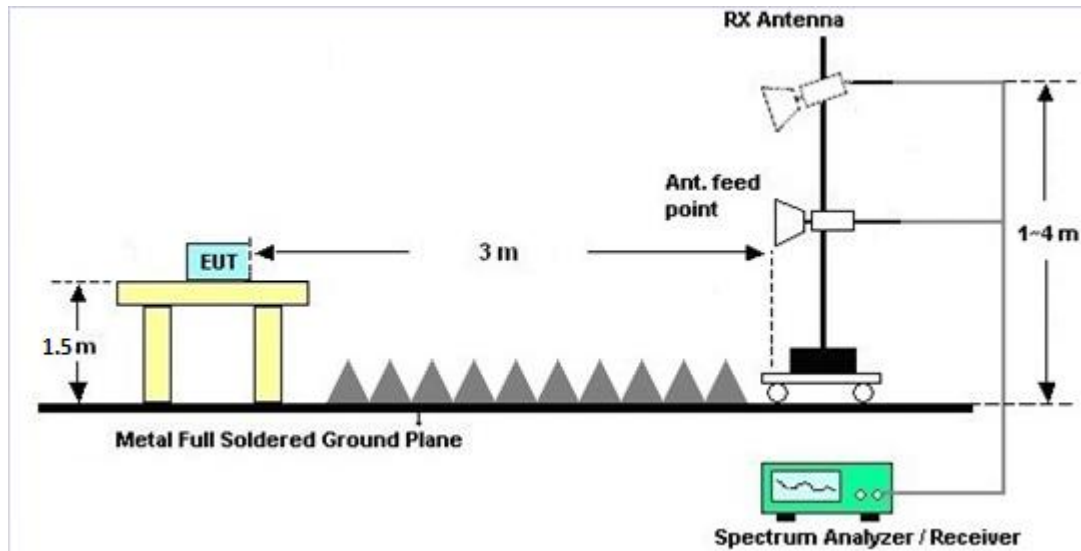
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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

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

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

3.4.6 Test Result of Radiated Band Edges

Please refer to Appendix C 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 (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

3.5.2 Measuring Instruments

See list of measuring equipment of this test report.

3.5.3 Test Procedures

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

3.5.4 Test Setup



3.5.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.6 Automatically Discontinue Transmission

3.6.1 Limit of Automatically Discontinue Transmission

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

3.6.2 Measuring Instruments

See list of measuring equipment of this test report.

3.6.3 Test Result of Automatically Discontinue Transmission

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



3.7 Antenna Requirements

3.7.1 Standard Applicable

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

3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.7.3 Antenna Gain

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
Power Meter	Anritsu	ML2495A	0932001	N/A	Sep. 26, 2017	May 14, 2018~ Jun. 19, 2018	Sep. 25, 2018	Conducted (TH05-HY)
Power Sensor	Anritsu	MA2411B	0846202	300MHz~40GHz	Sep. 26, 2017	May 14, 2018~ Jun. 19, 2018	Sep. 25, 2018	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP30	101067	9kHz ~ 30GHz	Nov. 13, 2017	May 14, 2018~ Jun. 19, 2018	Nov. 12, 2018	Conducted (TH05-HY)
Programmable Power Supply	GW Instek	PSS-2005	EL890001	1V~20V 0.5A~4A	Oct. 06, 2017	May 14, 2018~ Jun. 19, 2018	Oct. 05, 2018	Conducted (TH05-HY)
Switch Box & RF Cable	Burgeon	ETF-058	EC130048 4	N/A	Mar. 01, 2018	May 14, 2018~ Jun. 19, 2018	Feb. 28, 2019	Conducted (TH05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Jun. 18, 2018	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	3.6GHz	Dec. 08, 2017	Jun. 18, 2018	Dec. 07, 2018	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 30, 2017	Jun. 18, 2018	Nov. 29, 2018	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Jun. 18, 2018	N/A	Conduction (CO05-HY)
LF Cable	HUBER + SUHNER	RG-214/U	LF01	N/A	Jan. 03, 2018	Jun. 18, 2018	Jan. 02, 2019	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Jan. 03, 2018	Jun. 18, 2018	Jan. 02, 2019	Conduction (CO05-HY)



Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Bilog Antenna	TESEQ	CBL 6111D&00800 N1D01N-06	35419&03	30MHz to 1GHz	Dec. 18, 2017	May 18, 2018~ Jun. 21, 2018	Dec. 17, 2018	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Aug. 23, 2017	May 18, 2018~ Jun. 21, 2018	Aug. 22, 2018	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Nov. 10, 2017	May 18, 2018~ Jun. 21, 2018	Nov. 09, 2018	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590075	1GHz ~ 18GHz	Apr. 25, 2018	May 18, 2018~ Jun. 21, 2018	Apr. 24, 2019	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A023 62	1GHz~ 26.5GHz	Oct. 30, 2017	May 18, 2018~ Jun. 21, 2018	Oct. 29, 2018	Radiation (03CH07-HY)
Spectrum Analyzer	Agilent	N9010A	MY534701 18	10Hz~44GHz	Apr. 17, 2018	May 18, 2018~ Jun. 21, 2018	Apr. 16, 2019	Radiation (03CH07-HY)
Antenna Mast	Max-Full	MFA520BS	N/A	1m~4m	N/A	May 18, 2018~ Jun. 21, 2018	N/A	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	N/A	May 18, 2018~ Jun. 21, 2018	N/A	Radiation (03CH07-HY)
Amplifier	MITEQ	TTA1840-35- HG	1871923	18GHz~40GHz, VSWR : 2.5:1 max	Jul. 18, 2017	May 18, 2018~ Jun. 21, 2018	Jul. 17, 2018	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBE CK	BBHA 9170	BBHA9170 251	18GHz- 40GHz	Nov. 10, 2017	May 18, 2018~ Jun. 21, 2018	Nov. 09, 2018	Radiation (03CH07-HY)
Amplifier	SONOMA	310N	187231	9kHz~1GHz	Jan. 08, 2018	May 18, 2018~ Jun. 21, 2018	Jan. 07, 2019	Radiation (03CH07-HY)
EMI Test Receiver	Agilent	N9038A (MXE)	MY532900 53	20Hz to 26.5GHz	Jan. 16, 2018	May 18, 2018~ Jun. 21, 2018	Jan. 15, 2019	Radiation (03CH07-HY)
Software	Audix	E3 6.2009-8- 24	N/A	N/A	N/A	May 18, 2018~ Jun. 21, 2018	N/A	Radiation (03CH07-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.7
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.7
---	-----

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.5
---	-----

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.2
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Appendix A. Test Result of Conducted Test Items

Test Engineer:	Kai Liao/Shiming Liu	Temperature:	21~25	°C
Test Date:	2018/5/14 ~2018/6/19	Relative Humidity:	51~54	%

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

Band IV													
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	Ant 1	Ant 2	
11a	6Mbps	1	149	5745	17.45	-	23.90	-	15.05	-	0.5	-	Pass
11a	6Mbps	1	157	5785	17.65	-	26.30	-	15.10	-	0.5	-	Pass
11a	6Mbps	1	165	5825	17.55	-	24.35	-	15.05	-	0.5	-	Pass
HT40	MCS0	1	151	5755	36.30	-	65.79	-	35.13	-	0.5	-	Pass
HT40	MCS0	1	159	5795	36.50	-	68.80	-	33.88	-	0.5	-	Pass
VHT80	MCS0	1	155	5775	76.08	-	102.32	-	75.62	-	0.5	-	Pass

TEST RESULTS DATA
Average Power Table

Band IV														
Mod.	Data Rate	NTx	CH.	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		Pass/Fail
					Ant 1	Ant 2	Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	
11a	6Mbps	1	149	5745	0.12	-	13.83	-		30.00	-	-5.36	-	Pass
11a	6Mbps	1	157	5785	0.12	-	13.98	-		30.00	-	-5.36	-	Pass
11a	6Mbps	1	165	5825	0.12	-	13.62	-		30.00	-	-5.36	-	Pass
HT20	MCS0	1	149	5745	0.13	-	13.74	-		30.00	-	-5.36	-	Pass
HT20	MCS0	1	157	5785	0.13	-	13.96	-		30.00	-	-5.36	-	Pass
HT20	MCS0	1	165	5825	0.13	-	13.90	-		30.00	-	-5.36	-	Pass
HT40	MCS0	1	151	5755	0.28	-	13.92	-		30.00	-	-5.36	-	Pass
HT40	MCS0	1	159	5795	0.28	-	13.88	-		30.00	-	-5.36	-	Pass
VHT20	MCS0	1	149	5745	0.13	-	11.63	-		30.00	-	-5.36	-	Pass
VHT20	MCS0	1	157	5785	0.13	-	11.99	-		30.00	-	-5.36	-	Pass
VHT20	MCS0	1	165	5825	0.13	-	11.96	-		30.00	-	-5.36	-	Pass
VHT40	MCS0	1	151	5755	0.27	-	11.67	-		30.00	-	-5.36	-	Pass
VHT40	MCS0	1	159	5795	0.27	-	11.87	-		30.00	-	-5.36	-	Pass
VHT80	MCS0	1	155	5775	0.46	-	11.70	-		30.00	-	-5.36	-	Pass

TEST RESULTS DATA
Power Spectral Density

Band IV																
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)		10log (500kHz /RBW) Factor (dB)		Average Power Density (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	0.12	-	2.22	-	0.44	-		30.00	-	-5.36	-	Pass
11a	6Mbps	1	157	5785	0.12	-	2.22	-	0.11	-		30.00	-	-5.36	-	Pass
11a	6Mbps	1	165	5825	0.12	-	2.22	-	0.43	-		30.00	-	-5.36	-	Pass
HT40	MCS0	1	151	5755	0.28	-	2.22	-	-2.43	-		30.00	-	-5.36	-	Pass
HT40	MCS0	1	159	5795	0.28	-	2.22	-	-2.95	-		30.00	-	-5.36	-	Pass
VHT80	MCS0	1	155	5775	0.46	-	2.22	-	-8.93	-		30.00	-	-5.36	-	Pass

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



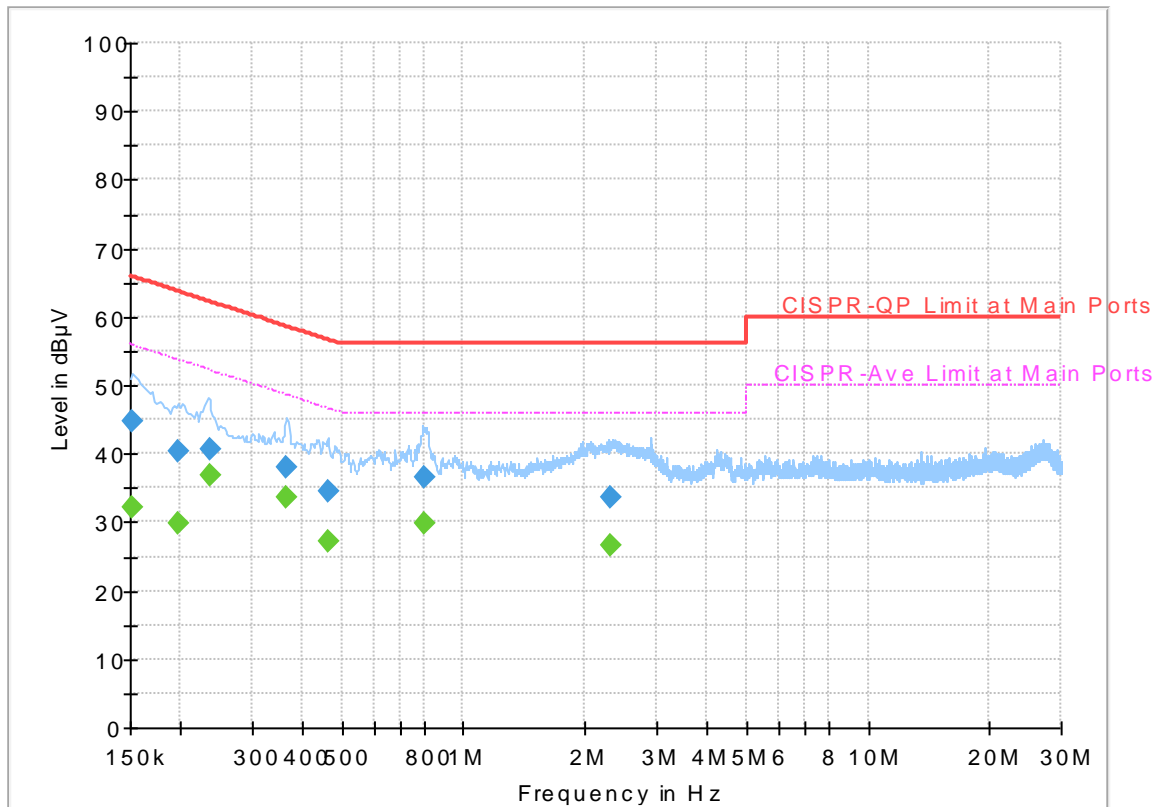
Appendix B. AC Conducted Emission Test Results

Test Engineer :	Arthur Hsieh	Temperature :	21~25°C
		Relative Humidity :	51~55%

EUT Information

Test Mode : Mode 1
 Test Voltage : 120Vac/60Hz
 Phase : Line

Full Spectrum



Final_Result

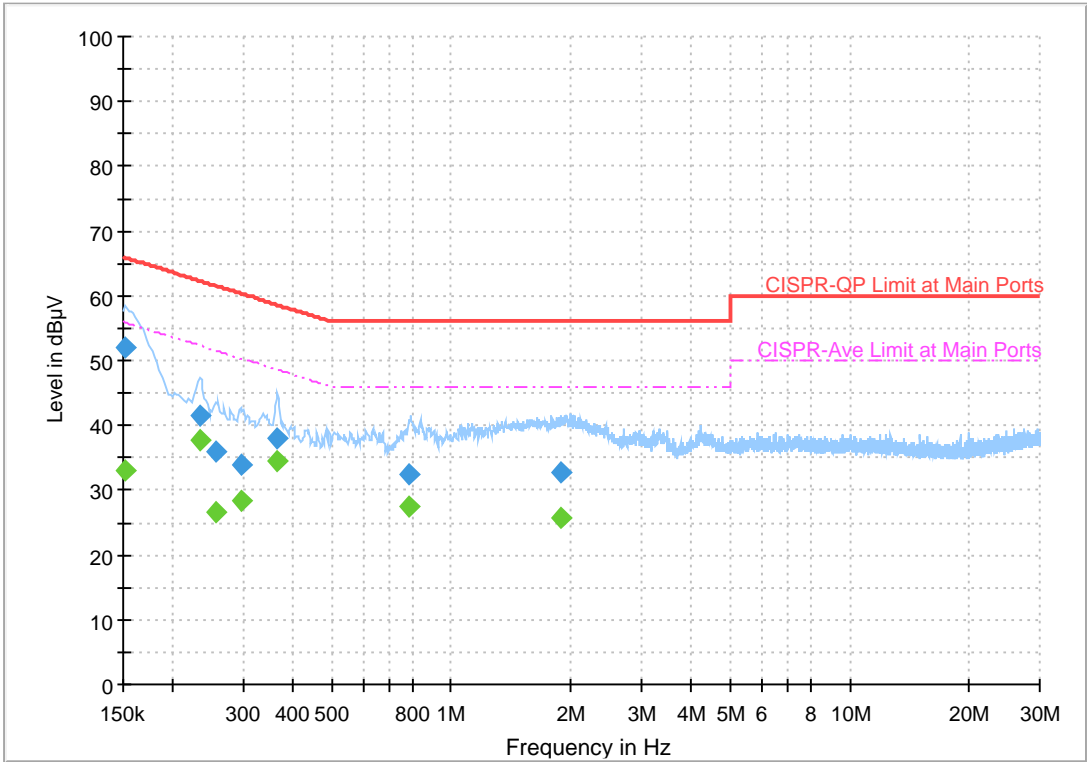
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	32.06	55.88	23.82	L1	OFF	19.5
0.152250	44.79	---	65.88	21.09	L1	OFF	19.5
0.197250	---	29.76	53.73	23.97	L1	OFF	19.5
0.197250	40.48	---	63.73	23.25	L1	OFF	19.5
0.235500	---	36.81	52.25	15.44	L1	OFF	19.5
0.235500	40.67	---	62.25	21.58	L1	OFF	19.5
0.366000	---	33.54	48.59	15.05	L1	OFF	19.5
0.366000	37.99	---	58.59	20.60	L1	OFF	19.5
0.462750	---	27.23	46.64	19.41	L1	OFF	19.5
0.462750	34.59	---	56.64	22.05	L1	OFF	19.5
0.802500	---	29.69	46.00	16.31	L1	OFF	19.6
0.802500	36.49	---	56.00	19.51	L1	OFF	19.6
2.310000	---	26.67	46.00	19.33	L1	OFF	19.5
2.310000	33.75	---	56.00	22.25	L1	OFF	19.5

EUT Information

Test Mode :
Test Voltage :
Phase :

Mode 1
120Vac/60Hz
Neutral

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	32.96	55.88	22.92	N	OFF	19.5
0.152250	52.09	---	65.88	13.79	N	OFF	19.5
0.233250	---	37.84	52.33	14.49	N	OFF	19.5
0.233250	41.58	---	62.33	20.75	N	OFF	19.5
0.255750	---	26.59	51.57	24.98	N	OFF	19.5
0.255750	36.05	---	61.57	25.52	N	OFF	19.5
0.296250	---	28.26	50.35	22.09	N	OFF	19.5
0.296250	33.87	---	60.35	26.48	N	OFF	19.5
0.366000	---	34.36	48.59	14.23	N	OFF	19.5
0.366000	37.91	---	58.59	20.68	N	OFF	19.5
0.782250	---	27.62	46.00	18.38	N	OFF	19.6
0.782250	32.34	---	56.00	23.66	N	OFF	19.6
1.887000	---	25.85	46.00	20.15	N	OFF	19.6
1.887000	32.73	---	56.00	23.27	N	OFF	19.6



Appendix C. Radiated Spurious Emission

Test Engineer :	Jesse Wang, Stan Hsieh, and Lance Chuang	Temperature :	22~24°C
		Relative Humidity :	51~53%

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		5622.4	52.97	-15.23	68.2	41.65	35.07	11.43	35.18	385	45	P	H
		5667.8	50.92	-30.49	81.41	39.51	35.14	11.46	35.19	385	45	P	H
		5718.8	53.64	-56.82	110.46	42.13	35.21	11.5	35.2	385	45	P	H
		5722.2	58.17	-57.65	115.82	46.66	35.21	11.5	35.2	385	45	P	H
	*	5745	95.39	-	-	83.83	35.24	11.53	35.21	385	45	P	H
	*	5745	87.69	-	-	76.13	35.24	11.53	35.21	385	45	A	H
													H
													H
		5640.8	50.71	-17.49	68.2	39.38	35.09	11.43	35.19	100	300	P	V
		5673.2	51.62	-33.79	85.41	40.21	35.14	11.46	35.19	100	300	P	V
		5716.6	58.03	-51.82	109.85	46.54	35.19	11.5	35.2	100	300	P	V
		5722.2	61.42	-54.4	115.82	49.91	35.21	11.5	35.2	100	300	P	V
	*	5745	100.04	-	-	88.48	35.24	11.53	35.21	100	300	P	V
	*	5745	92.79	-	-	81.23	35.24	11.53	35.21	100	300	A	V
													V
													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		5642.2	51.48	-16.72	68.2	40.15	35.09	11.43	35.19	400	56	P	H
		5656.8	50.84	-22.41	73.25	39.48	35.12	11.43	35.19	400	56	P	H
		5716.2	50.1	-59.64	109.74	38.61	35.19	11.5	35.2	400	56	P	H
		5720.8	49.26	-63.36	112.62	37.75	35.21	11.5	35.2	400	56	P	H
	*	5785	92.95	-	-	81.32	35.29	11.56	35.22	400	56	P	H
	*	5785	85.43	-	-	73.8	35.29	11.56	35.22	400	56	A	H
		5851.8	48.73	-69.37	118.1	36.98	35.38	11.6	35.23	400	56	P	H
		5872.4	48.31	-57.62	105.93	36.47	35.43	11.65	35.24	400	56	P	H
		5898.8	49.41	-38.14	87.55	37.54	35.46	11.65	35.24	400	56	P	H
		5933.8	49.77	-18.43	68.2	37.82	35.5	11.69	35.24	400	56	P	H
													H
													H
		5607.8	50.87	-17.33	68.2	39.61	35.04	11.4	35.18	100	298	P	V
		5698.4	50.8	-53.22	104.02	39.37	35.17	11.46	35.2	100	298	P	V
		5710.2	50.25	-57.81	108.06	38.76	35.19	11.5	35.2	100	298	P	V
		5724.8	50.13	-71.61	121.74	38.62	35.21	11.5	35.2	100	298	P	V
	*	5785	98.84	-	-	87.21	35.29	11.56	35.22	100	298	P	V
	*	5785	91.46	-	-	79.83	35.29	11.56	35.22	100	298	A	V
		5854.6	49.11	-62.6	111.71	37.33	35.41	11.6	35.23	100	298	P	V
		5855.8	49.82	-60.76	110.58	38.04	35.41	11.6	35.23	100	298	P	V
		5891.6	49.95	-42.93	92.88	38.08	35.46	11.65	35.24	100	298	P	V
		5933.6	49.33	-18.87	68.2	37.38	35.5	11.69	35.24	100	298	P	V
													V
													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	92.08	-	-	80.34	35.36	11.6	35.22	375	58	P	H
	*	5825	84.39	-	-	72.65	35.36	11.6	35.22	375	58	A	H
		5851.6	49.98	-68.57	118.55	38.23	35.38	11.6	35.23	375	58	P	H
		5866	48.96	-58.76	107.72	37.14	35.41	11.65	35.24	375	58	P	H
		5886.8	49.25	-47.19	96.44	37.41	35.43	11.65	35.24	375	58	P	H
		5926.4	49.47	-18.73	68.2	37.52	35.5	11.69	35.24	375	58	P	H
													H
													H
	*	5825	97.39	-	-	85.65	35.36	11.6	35.22	109	298	P	V
	*	5825	90.3	-	-	78.56	35.36	11.6	35.22	109	298	A	V
		5851.4	52.62	-66.39	119.01	40.87	35.38	11.6	35.23	109	298	P	V
		5856	52.32	-58.2	110.52	40.54	35.41	11.6	35.23	109	298	P	V
		5880	49.85	-51.64	101.49	38.01	35.43	11.65	35.24	109	298	P	V
		5950	49.81	-18.39	68.2	37.79	35.53	11.74	35.25	109	298	P	V
													V
													V
													V
													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	46.21	-27.79	74	47.07	38.38	18.1	57.34	100	0	P	H
		17235	49.97	-18.23	68.2	42.69	41.77	21.26	55.75	100	0	P	H
													H
													H
		11490	46.76	-27.24	74	47.62	38.38	18.1	57.34	100	0	P	V
		17235	50.77	-17.43	68.2	43.49	41.77	21.26	55.75	100	0	P	V
													V
													V
802.11a CH 157 5785MHz		11570	47.11	-26.89	74	47.69	38.46	18.16	57.2	100	0	P	H
		17355	49.85	-18.35	68.2	42.62	41.61	21.35	55.73	100	0	P	H
													H
													H
		11570	46.32	-27.68	74	46.9	38.46	18.16	57.2	100	0	P	V
		17355	49.59	-18.61	68.2	42.36	41.61	21.35	55.73	100	0	P	V
													V
													V
802.11a CH 165 5825MHz		11650	46.52	-27.48	74	46.85	38.51	18.27	57.11	100	0	P	H
		17475	49.63	-18.57	68.2	42.46	41.45	21.43	55.71	100	0	P	H
													H
													H
		11650	46.06	-27.94	74	46.39	38.51	18.27	57.11	100	0	P	V
		17475	49.17	-19.03	68.2	42	41.45	21.43	55.71	100	0	P	V
													V
													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 HT40 (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 HT40 CH 151 5755MHz		5619.8	50.63	-17.57	68.2	39.34	35.07	11.4	35.18	386	58	P	H
		5661.6	51.21	-25.6	76.81	39.82	35.12	11.46	35.19	386	58	P	H
		5716.8	53.7	-56.21	109.91	42.21	35.19	11.5	35.2	386	58	P	H
		5722.8	54.38	-62.8	117.18	42.87	35.21	11.5	35.2	386	58	P	H
	*	5755	89.17	-	-	77.59	35.26	11.53	35.21	386	58	P	H
	*	5755	81.91	-	-	70.33	35.26	11.53	35.21	386	58	A	H
		5852.6	48.03	-68.24	116.27	36.28	35.38	11.6	35.23	386	58	P	H
		5866.6	49.11	-58.44	107.55	37.29	35.41	11.65	35.24	386	58	P	H
		5898.2	49.4	-38.59	87.99	37.53	35.46	11.65	35.24	386	58	P	H
		5939	48.69	-19.51	68.2	36.72	35.53	11.69	35.25	386	58	P	H
													H
													H
		5637.8	51.24	-16.96	68.2	39.91	35.09	11.43	35.19	100	297	P	V
		5696.6	51.05	-51.64	102.69	39.62	35.17	11.46	35.2	100	297	P	V
		5719.4	61.21	-49.42	110.63	49.7	35.21	11.5	35.2	100	297	P	V
		5723	62.97	-54.67	117.64	51.46	35.21	11.5	35.2	100	297	P	V
	*	5755	94.23	-	-	82.65	35.26	11.53	35.21	100	297	P	V
	*	5755	86.81	-	-	75.23	35.26	11.53	35.21	100	297	A	V
		5852	50.26	-67.38	117.64	38.51	35.38	11.6	35.23	100	297	P	V
		5858.2	49.26	-60.64	109.9	37.49	35.41	11.6	35.24	100	297	P	V
		5892	49.35	-43.23	92.58	37.48	35.46	11.65	35.24	100	297	P	V
		5934.6	49.8	-18.4	68.2	37.86	35.5	11.69	35.25	100	297	P	V
													V
													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 HT40 CH 159 5795MHz		5635	50.66	-17.54	68.2	39.33	35.09	11.43	35.19	361	60	P	H
		5680.4	51.18	-39.55	90.73	39.78	35.14	11.46	35.2	361	60	P	H
		5718.6	51.18	-59.23	110.41	39.67	35.21	11.5	35.2	361	60	P	H
		5721.6	49.2	-65.25	114.45	37.69	35.21	11.5	35.2	361	60	P	H
	*	5795	89.21	-	-	77.56	35.31	11.56	35.22	361	60	P	H
	*	5795	81.97	-	-	70.32	35.31	11.56	35.22	361	60	A	H
		5851.4	49.36	-69.65	119.01	37.61	35.38	11.6	35.23	361	60	P	H
		5860.8	49.28	-59.89	109.17	37.46	35.41	11.65	35.24	361	60	P	H
		5920.2	50.33	-21.41	71.74	38.4	35.48	11.69	35.24	361	60	P	H
		5929	49.11	-19.09	68.2	37.16	35.5	11.69	35.24	361	60	P	H
													H
													H
		5606	50.15	-18.05	68.2	38.89	35.04	11.4	35.18	100	298	P	V
		5680.6	50.55	-40.33	90.88	39.15	35.14	11.46	35.2	100	298	P	V
		5709.4	50.97	-56.86	107.83	39.48	35.19	11.5	35.2	100	298	P	V
		5724.4	50.22	-70.61	120.83	38.71	35.21	11.5	35.2	100	298	P	V
	*	5795	94.32	-	-	82.67	35.31	11.56	35.22	100	298	P	V
	*	5795	86.74	-	-	75.09	35.31	11.56	35.22	100	298	A	V
		5853.4	50.64	-63.81	114.45	38.89	35.38	11.6	35.23	100	298	P	V
		5860.8	49.94	-59.23	109.17	38.12	35.41	11.65	35.24	100	298	P	V
		5886.2	48.89	-47.99	96.88	37.05	35.43	11.65	35.24	100	298	P	V
		5937	50.19	-18.01	68.2	38.25	35.5	11.69	35.25	100	298	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Band 4 5725~5850MHz

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 155 5775MHz		5628.6	50.06	-18.14	68.2	38.75	35.07	11.43	35.19	399	47	P	H
		5696	51.35	-50.9	102.25	39.92	35.17	11.46	35.2	399	47	P	H
		5702.6	52.55	-53.38	105.93	41.06	35.19	11.5	35.2	399	47	P	H
		5720.4	50.48	-61.23	111.71	38.97	35.21	11.5	35.2	399	47	P	H
	*	5775	81.72	-	-	70.12	35.29	11.53	35.22	399	47	P	H
	*	5775	74.65	-	-	63.05	35.29	11.53	35.22	399	47	A	H
		5851.6	48.89	-69.66	118.55	37.14	35.38	11.6	35.23	399	47	P	H
		5869.2	49.06	-57.76	106.82	37.24	35.41	11.65	35.24	399	47	P	H
		5895.6	49.16	-40.76	89.92	37.29	35.46	11.65	35.24	399	47	P	H
		5941.6	48.99	-19.21	68.2	36.97	35.53	11.74	35.25	399	47	P	H
													H
													H
		5637	50.65	-17.55	68.2	39.32	35.09	11.43	35.19	100	92	P	V
		5699.6	55.45	-49.46	104.91	44.02	35.17	11.46	35.2	100	92	P	V
		5716.4	57.46	-52.33	109.79	45.97	35.19	11.5	35.2	100	92	P	V
		5720.6	57.8	-54.37	112.17	46.29	35.21	11.5	35.2	100	92	P	V
	*	5775	88.41	-	-	76.81	35.29	11.53	35.22	100	92	P	V
	*	5775	81.7	-	-	70.1	35.29	11.53	35.22	100	92	A	V
		5852	55.98	-61.66	117.64	44.23	35.38	11.6	35.23	100	92	P	V
		5860	52.98	-56.42	109.4	41.21	35.41	11.6	35.24	100	92	P	V
		5888	50.95	-44.6	95.55	39.08	35.46	11.65	35.24	100	92	P	V
		5949.2	49.29	-18.91	68.2	37.27	35.53	11.74	35.25	100	92	P	V
													V
													V
Remark	1. No other spurious found.												
	2. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

5GHz WIFI 802.11a (LF @ 3m)

[illegible]

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		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

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

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)
 = Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
 = 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)
 = 55.45 (dBμV/m)
2. Over Limit(dB)
 = Level(dBμV/m) – Limit Line(dBμV/m)
 = 55.45(dBμV/m) – 74(dBμV/m)
 = -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)
 = Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
 = 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)
 = 43.54 (dBμV/m)
2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)
 = 43.54(dBμV/m) – 54(dBμV/m)
 = -10.46(dB)

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



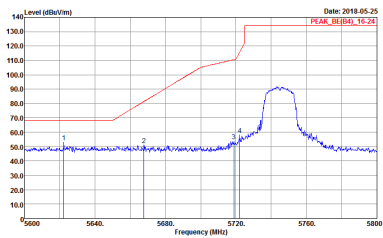
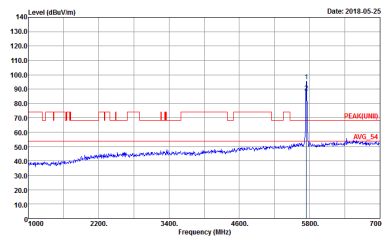
Appendix D. Radiated Spurious Emission Plots

Test Engineer :	Jesse Wang, Stan Hsieh, and Lance Chuang	Temperature :	22~24°C
		Relative Humidity :	51~53%

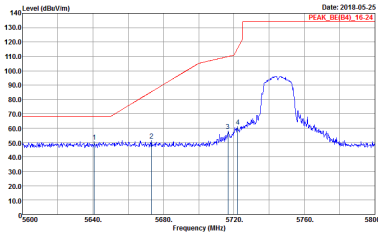
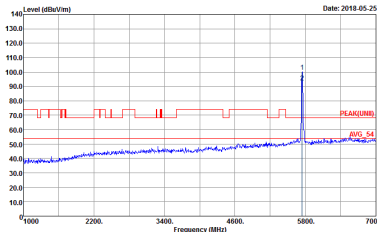
Note symbol

-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	 <p>Site : 03CH07-4HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 HORIZONTAL Detector : RBW:1000.000KHz VBW:3000.000KHz 5WT:Auto Detector : Peak</p>	 <p>Site : 03CH07-4HY Condition : PEAK(UNI) 3m HF_ANT_00075962 HORIZONTAL Detector : RBW:1000.000KHz VBW:3000.000KHz 5WT:Auto Detector : Peak</p>

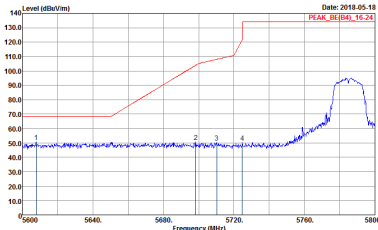
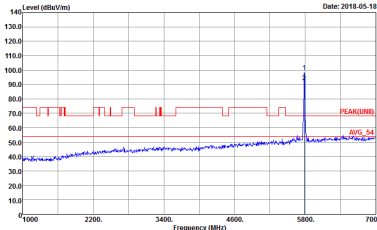
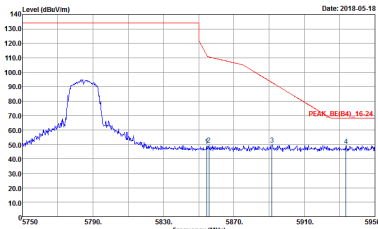


WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH149 5745MHz	
1	Vertical	Fundamental
Peak	<div><p>Date: 2018-05-25 PEAK_RE(B4)_16-24</p><p>Site : 03CH07-HY Condition : PEAK_RE(B4)_16-24 3m HF_ANT_00075962 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak</p></div>	<div><p>Date: 2018-05-25 PEAK_RE(B4)_16-24</p><p>Site : 03CH07-HY Condition : PEAK_RE(B4)_16-24 3m HF_ANT_00075962 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak</p></div>

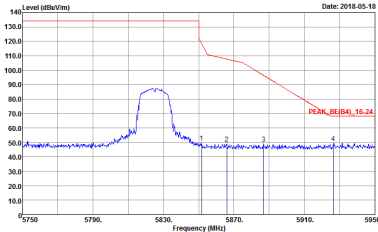
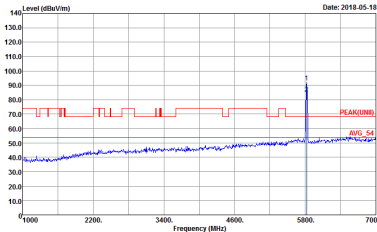


WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH157 5785MHz	
1	Horizontal	Fundamental
Peak	<p>Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak</p>	<p>Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962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

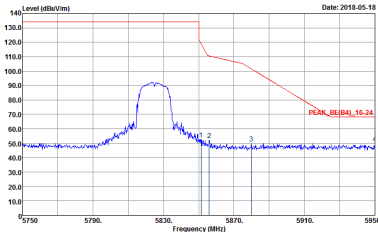
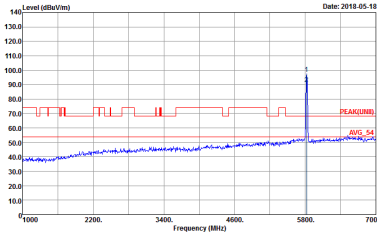


WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH157 5785MHz	
1	Vertical	Fundamental
Peak	 <p>Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak</p>	 <p>Site : 03CH07-HY Condition : PEAK(UNIT) 3m HF_ANT_00075962 VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak</p>
	 <p>Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak</p>	Left blank



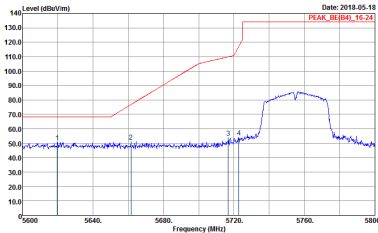
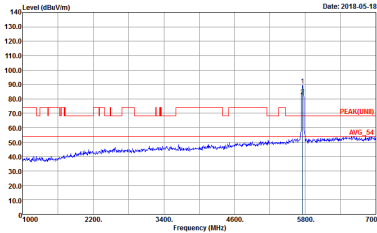
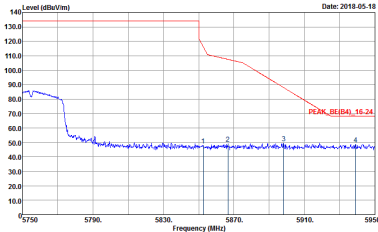
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH165 5825MHz	
1	Horizontal	Fundamental
Peak	<div><p>Site : 03CH07-1V Condition : PEAK_86(B4)_16-24 3m HF_ANT_00075962 HORIZONTAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Peak</p></div>	<div><p>Site : 03CH07-1V Condition : PEAK(UNIT) 3m HF_ANT_00075962 HORIZONTAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Peak</p></div>

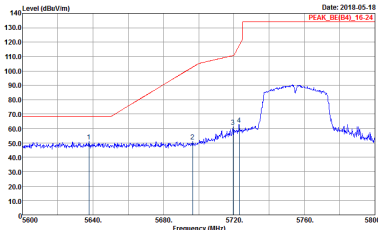
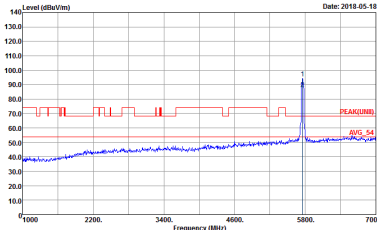
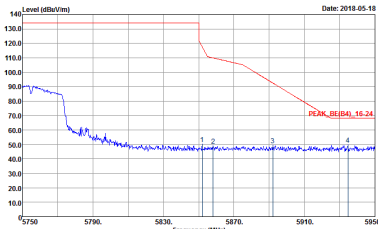


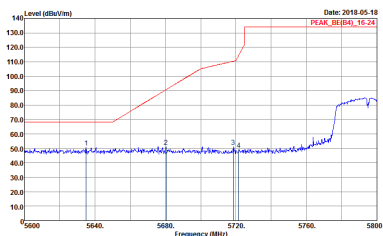
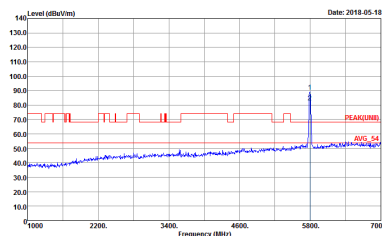
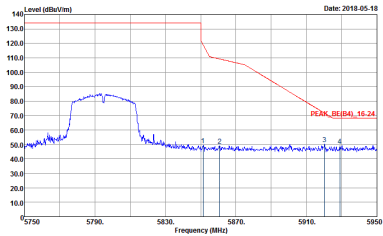
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH165 5825MHz	
1	Vertical	Fundamental
Peak	<div><p>Site : 03CH07-HV Condition : PEAK_8E(B4)_16-24 3m HF_ANT_00075962 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak</p></div>	<div><p>Site : 03CH07-HV Condition : PEAK(LINE) 3m HF_ANT_00075962 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak</p></div>

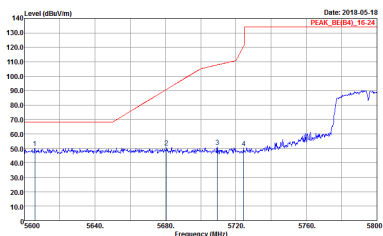
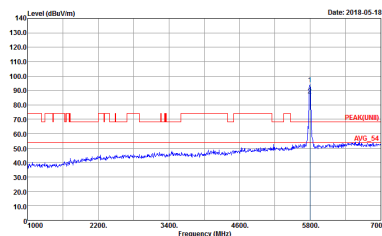
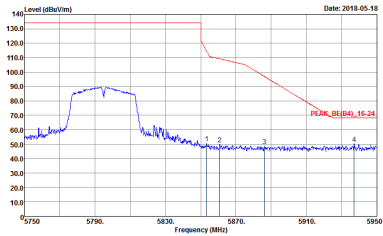


Band 4 5725~5850MHz
WIFI 802.11n HT40 (Band Edge @ 3m)

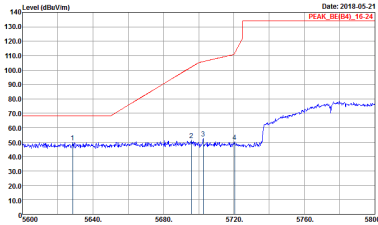
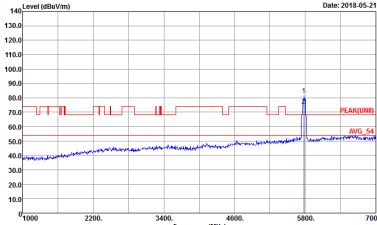
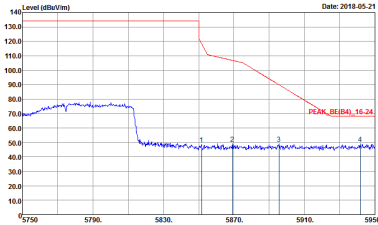
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT40 CH151 5755MHz	
1	Horizontal	Fundamental
Peak	<div><p>Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak</p></div>	<div><p>Site : 03CH07-HY Condition : PEAK(UB) 3m HF_ANT_00075962 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak</p></div>
Peak	<div><p>Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak</p></div>	Left blank

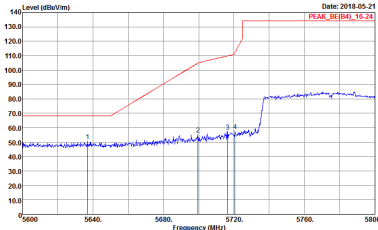
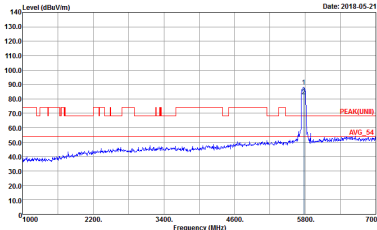
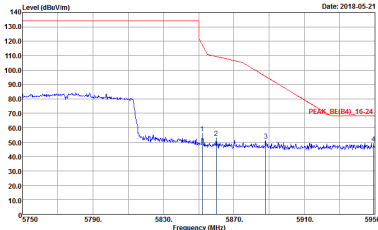
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT40 CH151 5755MHz	
1	Vertical	Fundamental
Peak	 <p>Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 VERTICAL Detector : Peak</p>	 <p>Site : 03CH07-HY Condition : PEAK(LINE) 3m HF_ANT_00075962 VERTICAL Detector : Peak</p>
	 <p>Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 VERTICAL Detector : Peak</p>	Left blank

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT40 CH159 5795MHz	
1	Horizontal	Fundamental
Peak	 <p>Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak</p>	 <p>Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak</p>
	 <p>Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak</p>	Left blank

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT40 CH159 5795MHz	
1	Vertical	Fundamental
Peak	 <p> Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak </p>	 <p> Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak </p>
	 <p> Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak </p>	Left blank

Band 4 5725~5850MHz
WIFI 802.11ac VHT80 (Band Edge @ 3m)

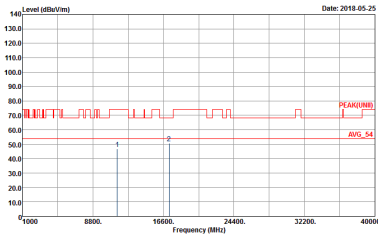
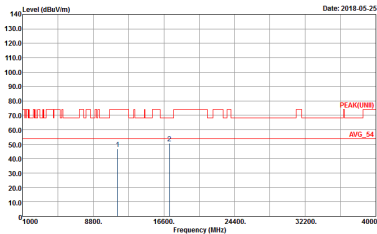
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH155 5775MHz	
1	Horizontal	Fundamental
Peak	 <p>Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak</p>	 <p>Site : 03CH07-HY Condition : PEAK(FUND) 3m HF_ANT_00075962 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak</p>
	 <p>Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak</p>	Left blank

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11ac VHT80 CH155 5775MHz	
1	Vertical	Fundamental
Peak	 <p>Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak</p>	 <p>Site : 03CH07-HY Condition : PEAK(LN1) 3m HF_ANT_00075962 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak</p>
	 <p>Site : 03CH07-HY Condition : PEAK_BE(B4)_16-24 3m HF_ANT_00075962 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak</p>	Left blank

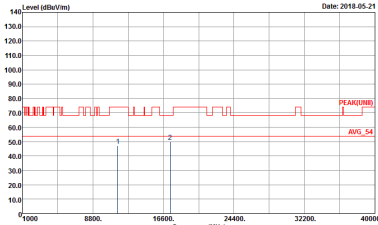
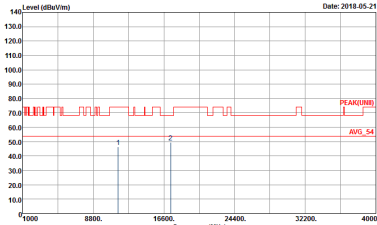


Band 4 - 5725~5850MHz

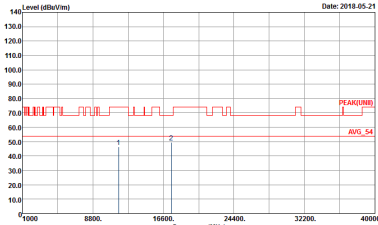
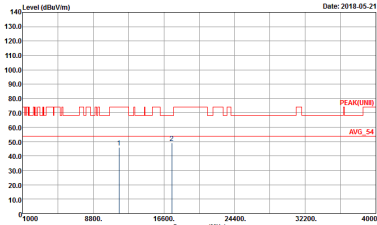
WIFI 802.11a (Harmonic @ 3m)

WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11a CH149 5745MHz	
1	Horizontal	Vertical
Peak Avg.	 <p>Site : 03CH07-4HY Condition : PEAK(UNIT) 3m SHF-EHF_131029 VERTICAL Detector : Peak</p>	 <p>Site : 03CH07-4HY Condition : PEAK(UNIT) 3m SHF-EHF_131029 VERTICAL Detector : Peak</p>



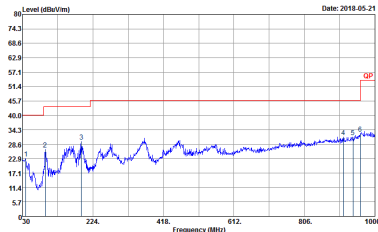

WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11a CH157 5785MHz	
1	Horizontal	Vertical
Peak Avg.	<div><p>Site : 03CH07-HY Condition : PEAK(UNII) 3m SHF-EHF_131029 HORIZONTAL Detector : Peak</p></div>	<div><p>Site : 03CH07-HY Condition : PEAK(UNII) 3m SHF-EHF_131029 VERTICAL Detector : Peak</p></div>



WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11a CH165 5825MHz	
1	Horizontal	Vertical
Peak Avg.	 <p>Site : 03CH07-HY Condition : PEAK(UNII) 3m SHF-EHF_131029 HORIZONTAL Detector : Peak</p>	 <p>Site : 03CH07-HY Condition : PEAK(UNII) 3m SHF-EHF_131029 VERTICAL Detector : Peak</p>



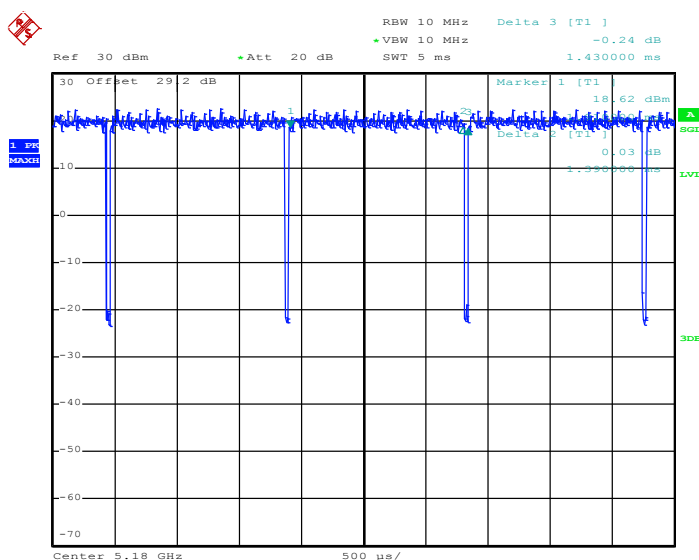
Emission below 1GHz
5GHz WIFI 802.11a (LF)

WIFI	5GHz 5725~5850MHz	
ANT	802.11a LF	
1	Horizontal	Vertical
QP / Peak	 <p>Site : 03CH07-4HY Condition : QP 3m LF-ANT-35419(6) HORIZONTAL Detector : Peak</p>	 <p>Site : 03CH07-4HY Condition : QP 3m LF-ANT-35419(6) VERTICAL Detector : Peak Project : 843024 Mode : 27</p>

Appendix E. Duty Cycle Plots

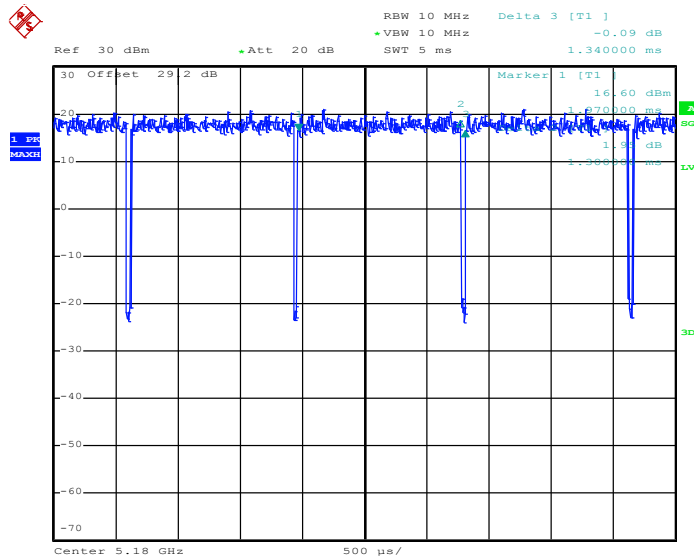
Band	Duty Cycle (%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor (dB)
802.11a	97.20	1390	0.72	1kHz	0.12
5GHz 802.11n HT20	97.01	1300	0.77	1kHz	0.13
5GHz 802.11n HT40	93.86	642	1.56	3kHz	0.28
5GHz 802.11ac VHT20	97.04	1310	0.76	1kHz	0.13
5GHz 802.11ac VHT40	93.91	648	1.54	3kHz	0.27
5GHz 802.11ac VHT80	90.00	324	3.09	10kHz	0.46

802.11a



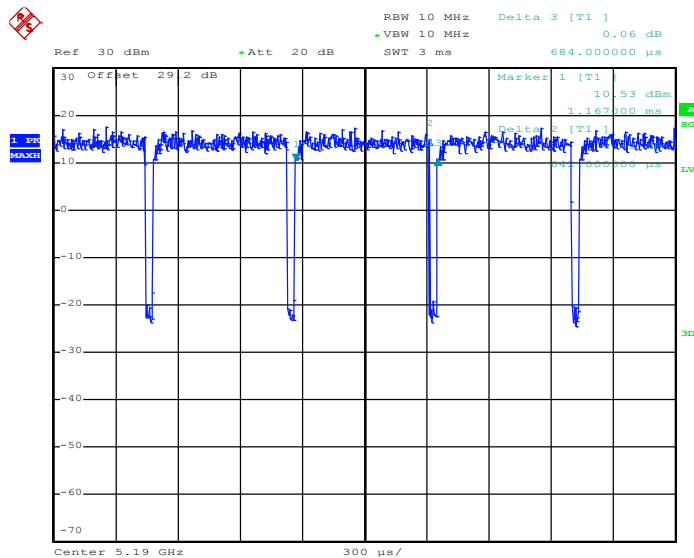
Date: 15.MAY.2018 00:25:03

802.11n HT20



Date: 15.MAY.2018 00:42:25

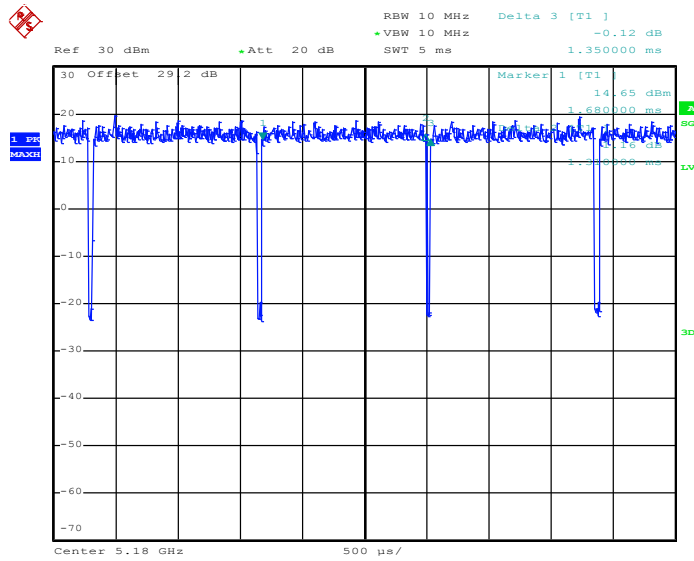
802.11n HT40



Date: 15.MAY.2018 00:50:34

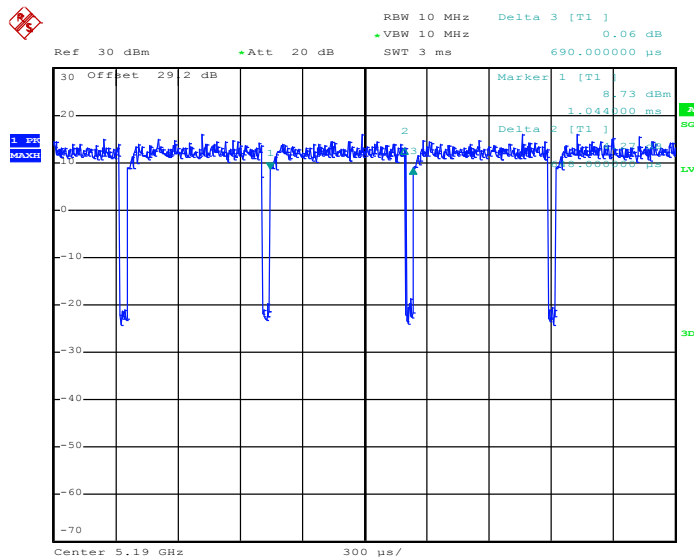


802.11ac VHT20



Date: 15.MAY.2018 01:07:42

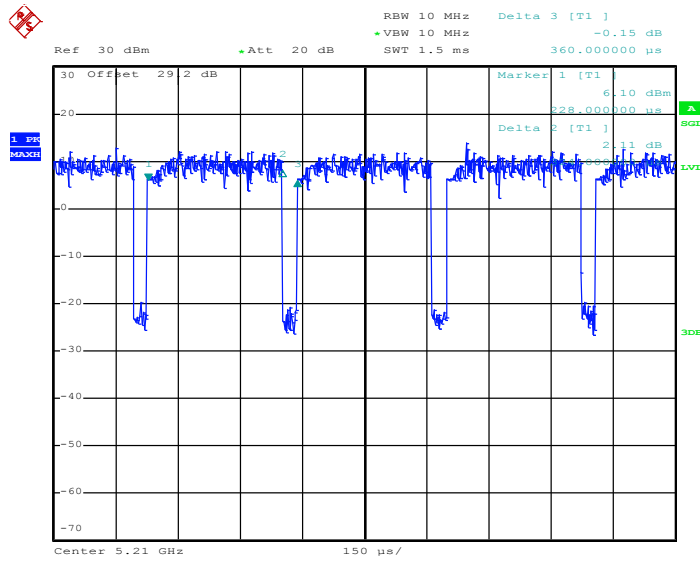
802.11ac VHT40



Date: 15.MAY.2018 01:21:39



802.11ac VHT80



Date: 15.MAY.2018 01:34:12