FCC RF Test Report

APPLICANT	:	HMD Global Oy
EQUIPMENT	:	Smart Phone
BRAND NAME	:	NOKIA
MODEL NAME	:	TA-1044
FCC ID	:	2AJOTTA-1044
STANDARD	:	FCC Part 15 Subpart E §15.407
CLASSIFICATION	:	(UNII) Unlicensed National Information Infrastructure

The product was received on Jan. 20, 2017 and testing was completed on Mar. 02, 2017. 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 test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager

Testing Laboratory 1190

SPORTON INTERNATIONAL INC.
No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR712016G	Rev. 01	Initial issue of report	Mar. 24, 2017

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.403(i)	6dB, 26dB and 99% Occupied Bandwidth	> 500kHz	Pass	-
3.2	15.407(a)	Maximum Conducted Output Power	≤ 30 dBm	Pass	-
3.3	15.407(a)	Power Spectral Density	≤ 30 dBm/500kHz	Pass	-
3.4	15.407(b)	Unwanted Emissions	15.407(b)(4)(i) &15.209(a)	Pass	Under limit 5.13 dB at 36.750 MHz
3.5	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 16.90 dB at 13.558 MHz
0	15.407(g)	Frequency Stability	Within Operation Band	Pass	-
3.7	15.407(c)	Automatically Discontinue Transmission	Discontinue Transmission	Pass	-
3.8	15.203 & 15.407(a)	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

HMD Global Oy
Karaportti 2, 02610 Espoo, Finland

1.2 Manufacturer

HMD Global Oy
Karaportti 2, 02610 Espoo, Finland

1.3 Product Feature of Equipment Under Test

GSM/WCDMA/LTE, Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n, Wi-Fi 5GHz 802.11a/n, Ant.+, FM Receiver, NFC, and GPS.

Product Specification subjective to this standard	
Antenna Type	WWAN: PIFA Antenna WLAN: PIFA Antenna Bluetooth: PIFA Antenna Ant.+: PIFA Antenna GPS/Glonass/Beidou : Monopole Antenna NFC : Loop Antenna

1.4 Modification of EUT

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

1.5 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW0007 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.	
Test Site Location	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978	
Test Site No.	**Sporton Site No.**	
	TH05-HY	CO05-HY

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

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd. Guishan Dist, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	03CH11-HY

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

1.6 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 v01r03.
- 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 (Z 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
	-	-	165	5825

Note: The above Frequency and Channel in "*" were 802.11n HT40 and 802.11ac VHT40.

2.2 Test Mode

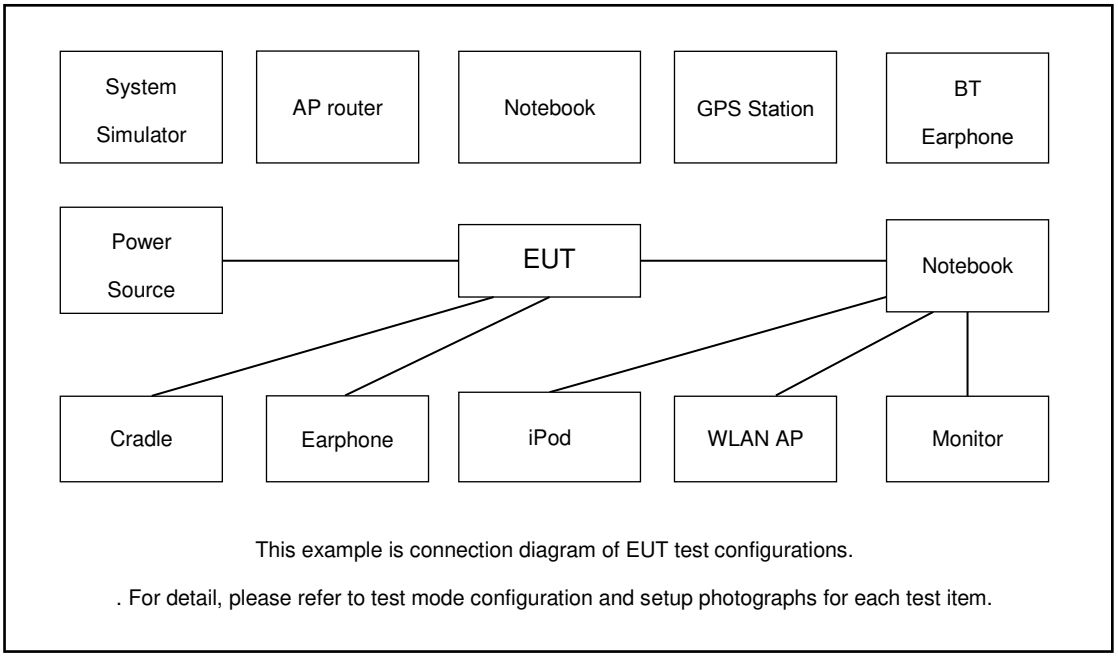
Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates as below table.

Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0

Test Cases	
AC Conducted Emission	Mode 1 : GSM 850 Idle + Bluetooth Link + WLAN (5GHz) Link + NFC On + Earphone + USB Cable (Charging from Adapter)

Ch. #		Band IV：5725-5850 MHz		
		802.11a	802.11n HT20	802.11n HT40
L	Low	149	149	151
M	Middle	157	157	-
H	High	165	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.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
3.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded,1.8m
4.	Notebook	DELL	Latitude E6320	FCC DoC/ Contains FCC ID: QDS-BRCM1054	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A

2.5 EUT Operation Test Setup

The RF test items, programmed RF utility, “QRCT.exe” installed in the notebook make the EUT provide functions like channel selection and power level for continuous transmitting and receiving 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.

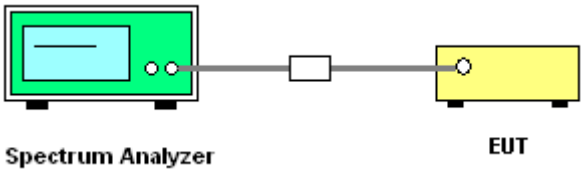
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r03. 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.

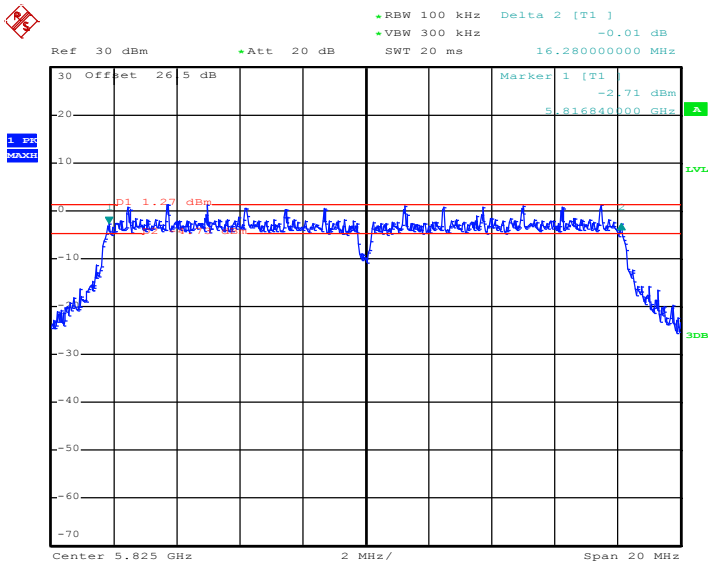
3.1.4 Test Setup



3.1.5 Test Result of 6dB Bandwidth

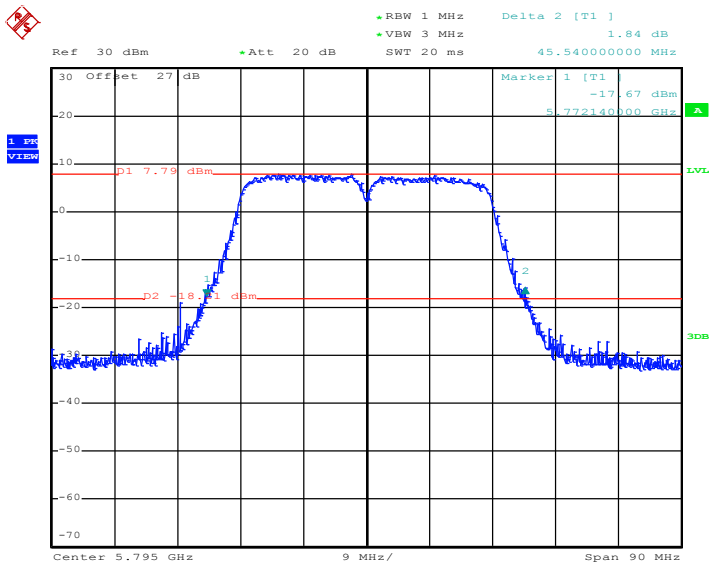
Please refer to Appendix A.

Minimum 6dB Bandwidth



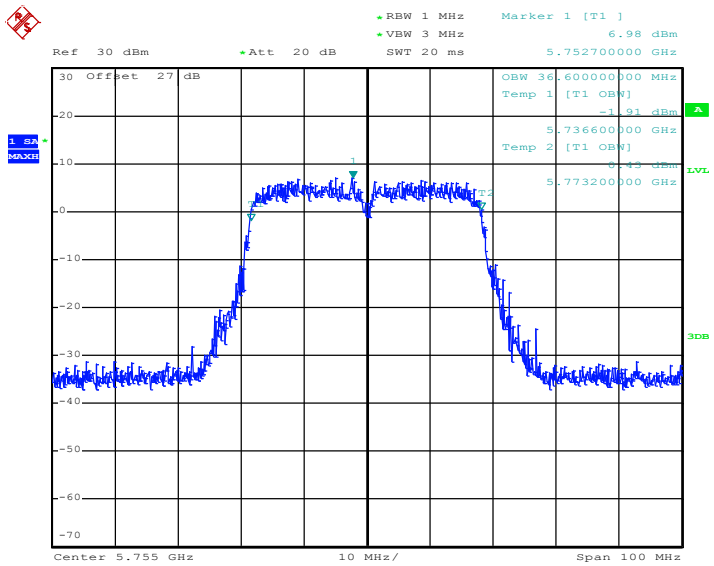
Date: 11.FEB.2017 01:28:31

Maximum 26dB Bandwidth



Date: 24.FEB.2017 20:32:40

Maximum 99% Occupied Bandwidth



Date: 24.FEB.2017 20:13:06

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

The measuring equipment is listed in the section 4 of this test report.

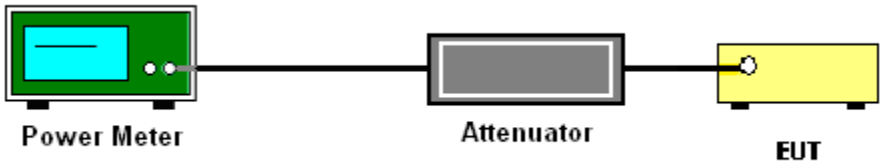
3.2.3 Test Procedures

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r03.

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

The measuring equipment is listed in the section 4 of this test report.

3.3.3 Test Procedures

The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r03. Section F) Maximum power spectral density.

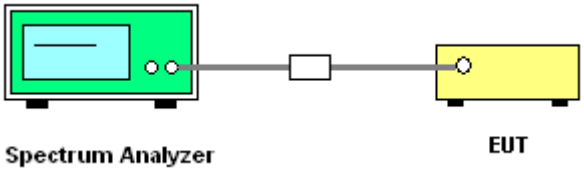
 # Method SA-2 #

(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.

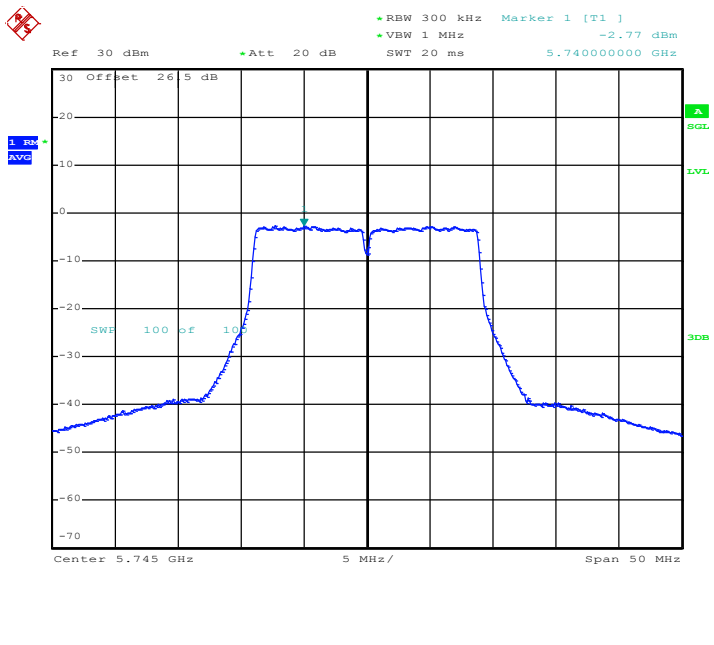
3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

Worst Case Power Density (dBm/300kHz)



3.4 Unwanted Emissions Measurement

This section as specified in FCC Part 15.407(b) is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement. The unwanted emissions shall comply with 15.407(b)(1) to (6), and restricted bands per FCC Part15.205.

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 per FCC Part15.205 shall comply with the general field strength limits set forth in § 15.209 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)
-17	78.3
- 27	68.3

(3) KDB 789033 D02 General UNII Test Procedures New Rules v01r03 G)2)c) As specified in 15.407(b), emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz (or -17 dBm/MHz as specified in 15.407(b)(4)). However, an out-of-band emission that complies with both the average and peak limits of 15.209 is not required to satisfy the -27 dBm/MHz or -17 dBm/MHz peak emission limit.

3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.4.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r03. 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

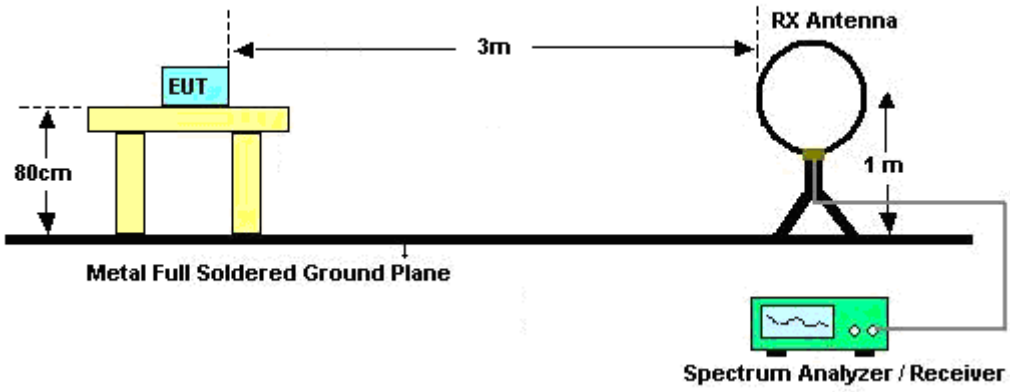
   (2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz
   - RBW = 1 MHz
   - VBW ≥ 3 MHz
   - Detector = Peak
   - Sweep time = auto
   - Trace mode = max hold

   (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.

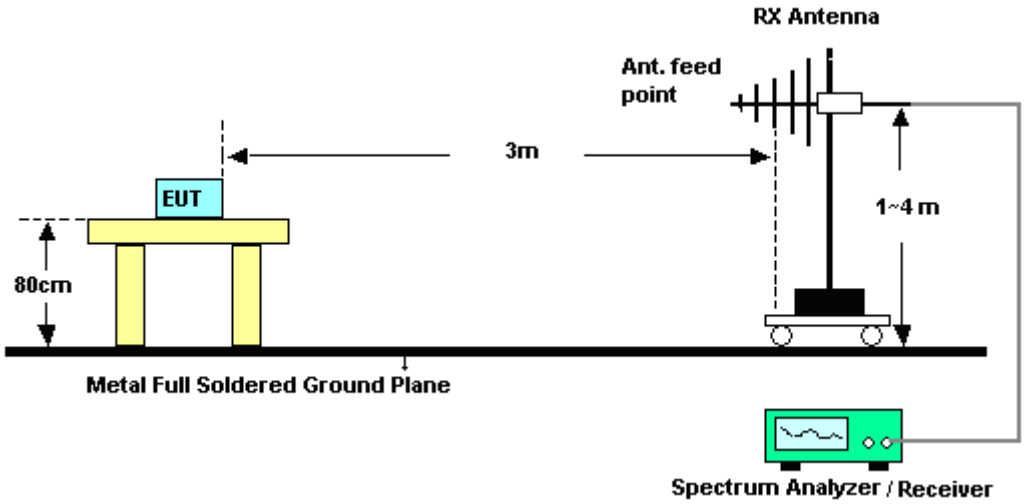
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again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

3.4.4 Test Setup

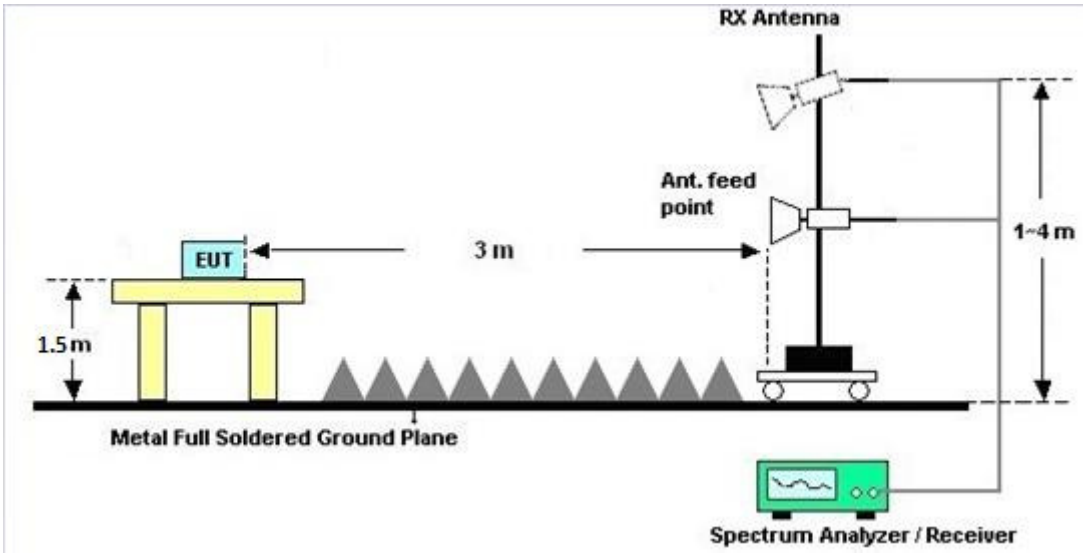
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

3.4.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C and D.

3.4.7 Duty Cycle

Please refer to Appendix E.

3.4.8 Test Result of Radiated Spurious Emissions (30MHz ~ 10th Harmonic)

Please refer to Appendix C and D.

3.5 AC Conducted Emission Measurement

3.5.1 Limit of AC Conducted Emission

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

Frequency of emission (MHz)	Conducted limit (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.

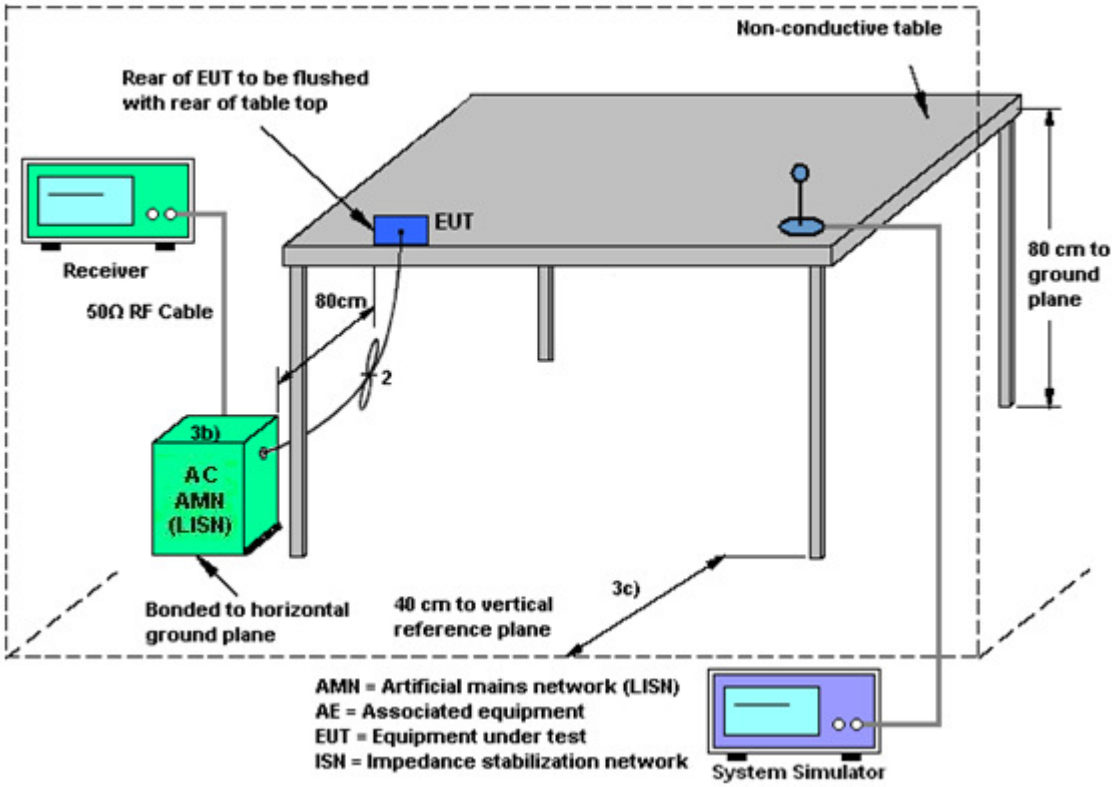
3.5.2 Measuring Instruments

The measuring equipment is listed in the section 4 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 Frequency Stability Measurement

3.6.1 Limit of Frequency Stability

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

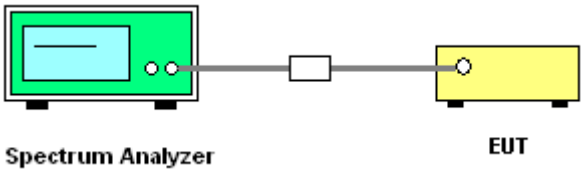
3.6.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.6.3 Test Procedures

1. To ensure emission at the band edge is maintained within the authorized band, those values shall be measured by radiation emissions at upper and lower frequency points, and finally compensated by frequency deviation as procedures below.
2. The EUT was operated at the maximum output power, and connected to the spectrum analyzer, which is set to maximum hold function and peak detector. The peak value of the power envelope was measured and noted. The upper and lower frequency points were respectively measured relatively 10dB lower than the measured peak value.
3. The frequency deviation was calculated by adding the upper frequency point and the lower frequency point divided by two. Those detailed values of frequency deviation are provided in table below.

3.6.4 Test Setup



3.6.5 Test Result of Frequency Stability

Please refer to Appendix A.

3.7 Automatically Discontinue Transmission

3.7.1 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.

3.7.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.7.3 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.

3.8 Antenna Requirements

3.8.1 Standard Applicable

According to FCC 47 CFR Section 15.407(a)(1)(2) ,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.

3.8.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.8.3 Antenna Gain

The antenna gain 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	300MHz~40GHz	Sep. 29, 2016	Feb. 09, 2017 ~ Feb. 27, 2017	Sep. 28, 2017	Conducted (TH05-HY)
Power Sensor	Anritsu	MA2411B	0846202	300MHz~40GHz	Sep. 29, 2016	Feb. 09, 2017 ~ Feb. 27, 2017	Sep. 28, 2017	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz-40GHz	Jul. 17, 2016	Feb. 09, 2017 ~ Feb. 27, 2017	Jul. 16, 2017	Conducted (TH05-HY)
Temperature Chamber	ESPEC	SH-641	92013720	-40℃ ~90℃	Sep. 01, 2016	Feb. 09, 2017 ~ Feb. 27, 2017	Aug. 31, 2017	Conducted (TH05-HY)
Programmable Power Supply	GW Instek	PSS-2005	EL890094	1V~20V 0.5A~5A	Oct. 11, 2016	Feb. 09, 2017 ~ Feb. 27, 2017	Oct. 10, 2017	Conducted (TH05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Feb. 09, 2017	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9kHz~7GHz	Aug. 30, 2016	Feb. 09, 2017	Aug. 29, 2017	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 29, 2016	Feb. 09, 2017	Nov. 28, 2017	Conduction (CO05-HY)
Amplifier	SONOMA	310N	187312	9kHz~1GHz	Nov. 10, 2016	Feb. 11, 2017 ~ Mar. 02, 2017	Nov. 09, 2017	Radiation (03CH11-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Sep. 02, 2015	Feb. 11, 2017 ~ Mar. 02, 2017	Sep. 01, 2017	Radiation (03CH11-HY)
Bilog Antenna	TESEQ	CBL 6111D	35414	30MHz~1GHz	Oct. 15, 2016	Feb. 11, 2017 ~ Mar. 02, 2017	Oct. 14, 2017	Radiation (03CH11-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1522	1GHz ~ 18GHz	Mar. 30, 2016	Feb. 11, 2017 ~ Mar. 02, 2017	Mar. 31, 2017	Radiation (03CH11-HY)
Preamplifier	Keysight	83017A	MY53270080	1GHz~26.5GHz	Nov. 10, 2016	Feb. 11, 2017 ~ Mar. 02, 2017	Nov. 09, 2017	Radiation (03CH11-HY)
Spectrum Analyzer	Keysight	N9010A	MY52350276	10Hz ~ 44GHZ	Mar. 21, 2016	Feb. 11, 2017 ~ Mar. 02, 2017	Mar. 20, 2017	Radiation (03CH11-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Feb. 11, 2017 ~ Mar. 02, 2017	N/A	Radiation (03CH11-HY)
Turn Table	EMEC	TT 2000	N/A	0~360 Degree	N/A	Feb. 11, 2017 ~ Mar. 02, 2017	N/A	Radiation (03CH11-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1815698	1GHz~18GHz	Dec. 01, 2016	Feb. 11, 2017 ~ Mar. 02, 2017	Nov. 30, 2017	Radiation (03CH11-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170584	18GHz- 40GHz	Nov. 08, 2016	Feb. 11, 2017 ~ Mar. 02, 2017	Nov. 07, 2017	Radiation (03CH11-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

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

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

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

Appendix A. Conducted Test Results

Report Number : FR712016G

Test Engineer:	Derek Hsu	Temperature:	21~25	°C
Test Date:	2017/02/09~2017/02/25	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)	26 dB Bandwidth (MHz)	6 dB Bandwidth (MHz)	6dB Bandwidth min. Limit (MHz)	Pass/Fail
11a	6M bps	1	149	5745	18.15	30	16.32	0.5	Pass
11a	6Mbps	1	157	5785	18.1	23.5	16.32	0.5	Pass
11a	6Mbps	1	165	5825	18.3	24.2	16.28	0.5	Pass
HT20	MCS 0	1	149	5745	19	24.24	17.56	0.5	Pass
HT20	MCS 0	1	157	5785	18.8	27.12	17.56	0.5	Pass
HT20	MCS 0	1	165	5825	18.75	26.46	17.56	0.5	Pass
HT40	MCS 0	1	151	5755	36.6	45.4275	35.08	0.5	Pass
HT40	MCS 0	1	159	5795	36.5	45.54	35.12	0.5	Pass

Report Number : FR712016G

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
11a	6M bps	1	149	5745	0.59	14.29	30.00	-5.20		Pass
11a	6Mbps	1	157	5785	0.59	14.20	30.00	-5.20		Pass
11a	6Mbps	1	165	5825	0.59	14.04	30.00	-5.20		Pass
HT20	MCS 0	1	149	5745	0.63	14.43	30.00	-5.20		Pass
HT20	MCS 0	1	157	5785	0.63	14.34	30.00	-5.20		Pass
HT20	MCS 0	1	165	5825	0.63	14.07	30.00	-5.20		Pass
HT40	MCS 0	1	151	5755	0.63	14.34	30.00	-5.20		Pass
HT40	MCS 0	1	159	5795	0.63	14.05	30.00	-5.20		Pass

Report Number : FR712016G

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
11a	6M bps	1	149	5745	0.59	2.22	-0.14	30.00	-5.20	Pass
11a	6Mbps	1	157	5785	0.59	2.22	-0.21	30.00	-5.20	Pass
11a	6Mbps	1	165	5825	0.59	2.22	-1.02	30.00	-5.20	Pass
HT20	MCS 0	1	149	5745	0.63	2.22	0.08	30.00	-5.20	Pass
HT20	MCS 0	1	157	5785	0.63	2.22	0.05	30.00	-5.20	Pass
HT20	MCS 0	1	165	5825	0.63	2.22	-0.92	30.00	-5.20	Pass
HT40	MCS 0	1	151	5755	0.63	2.22	-3.50	30.00	-5.20	Pass
HT40	MCS 0	1	159	5795	0.63	2.22	-3.43	30.00	-5.20	Pass

Report Number : FR712016G

TEST RESULTS DATA
Frequency Stability

Band IV										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Center Frequency (MHz)	Frequency Deviation (MHz)	Frequency Stablility (ppm)	Temperature (℃)	Voltage (V)	Note
11a	6M bps	1	149	5745	5744.950	-0.050	-8.70	55	3.8	
11a	6M bps	1	149	5745	5745.000	0.000	0.00	-30	3.8	
11a	6M bps	1	149	5745	5745.000	0.000	0.00	20	4.2	
11a	6M bps	1	149	5745	5744.950	-0.050	-8.70	20	3.5	
11a	6M bps	1	149	5745	5745.000	0.000	0.00	20	3.8	

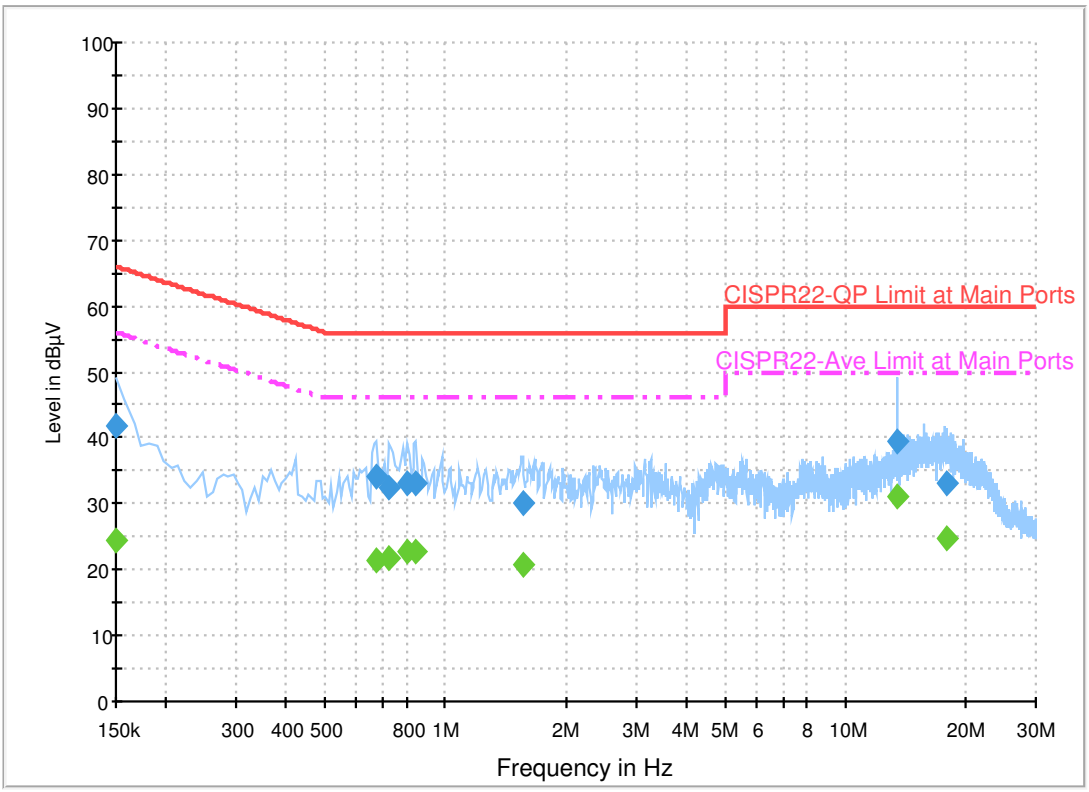
Appendix B. AC Conducted Emission Test Results

Test Engineer :	Arthur Hsieh	**Temperature :**	21~22℃
		Relative Humidity :	58~60%

EUT Information

Report NO :	712016
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Line

ENV216 Auto Test FCC Power Bar - L



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	41.9	Off	L1	19.6	24.1	66.0
0.670000	34.2	Off	L1	19.6	21.8	56.0
0.726000	32.5	Off	L1	19.6	23.5	56.0
0.806000	33.1	Off	L1	19.6	22.9	56.0
0.846000	33.3	Off	L1	19.6	22.7	56.0
1.558000	30.0	Off	L1	19.6	26.0	56.0
13.558000	39.3	Off	L1	20.2	20.7	60.0
18.054000	33.2	Off	L1	20.5	26.8	60.0

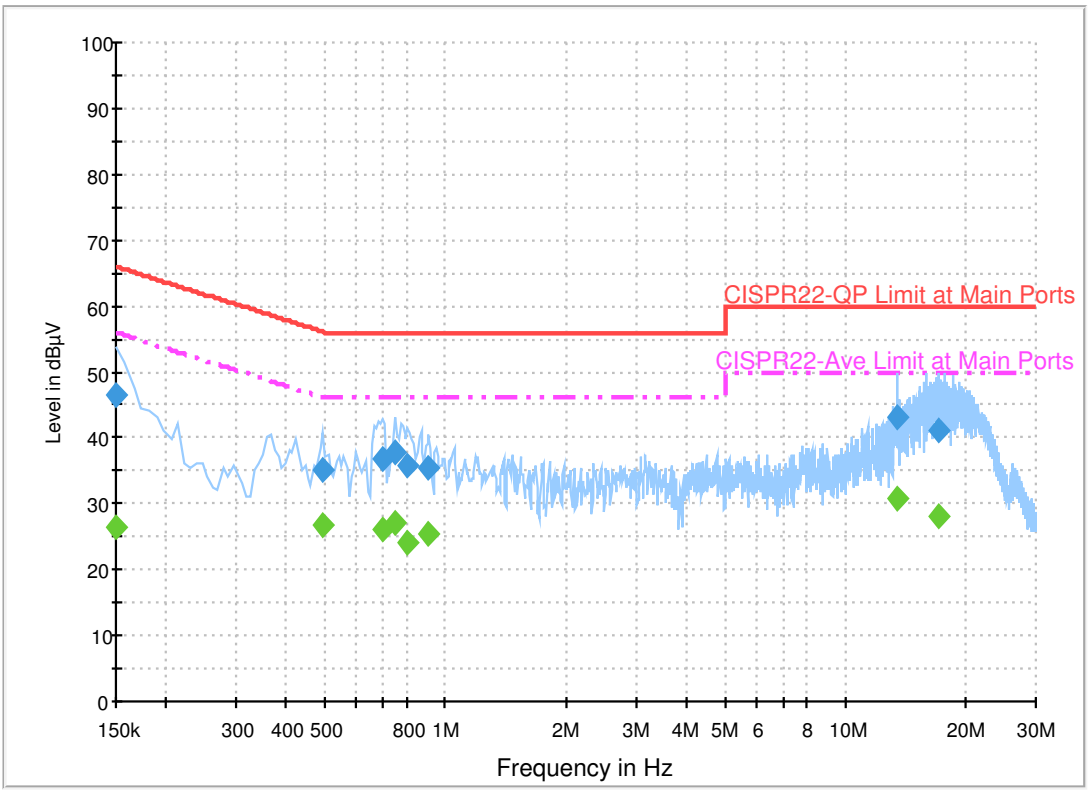
Final Result 2

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	24.4	Off	L1	19.6	31.6	56.0
0.670000	21.6	Off	L1	19.6	24.4	46.0
0.726000	21.8	Off	L1	19.6	24.2	46.0
0.806000	22.7	Off	L1	19.6	23.3	46.0
0.846000	22.7	Off	L1	19.6	23.3	46.0
1.558000	20.7	Off	L1	19.6	25.3	46.0
13.558000	31.0	Off	L1	20.2	19.0	50.0
18.054000	24.8	Off	L1	20.5	25.2	50.0

EUT Information

Report NO :	712016
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Neutral

ENV216 Auto Test FCC Power Bar - N



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	46.6	Off	N	19.5	19.4	66.0
0.494000	35.1	Off	N	19.5	21.0	56.1
0.694000	36.9	Off	N	19.5	19.1	56.0
0.750000	37.7	Off	N	19.6	18.3	56.0
0.806000	35.8	Off	N	19.6	20.2	56.0
0.910000	35.5	Off	N	19.5	20.5	56.0
13.558000	43.1	Off	N	20.3	16.9	60.0
17.078000	41.3	Off	N	20.5	18.7	60.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	26.3	Off	N	19.5	29.7	56.0
0.494000	26.7	Off	N	19.5	19.4	46.1
0.694000	26.0	Off	N	19.5	20.0	46.0
0.750000	27.2	Off	N	19.6	18.8	46.0
0.806000	24.1	Off	N	19.6	21.9	46.0
0.910000	25.5	Off	N	19.5	20.5	46.0
13.558000	30.8	Off	N	20.3	19.2	50.0
17.078000	28.1	Off	N	20.5	21.9	50.0

Appendix C. Radiated Spurious Emission

Test Engineer :	J.C. Liang, Jacky Hung and Ken Wu	Temperature :	20~24°C
		Relative Humidity :	50~54%

Band 4 - 5725~5850MHz

WIFI 802.11a (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)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11a CH 149 5745MHz		5603	50.31	-17.89	68.2	39.07	32.84	11.48	33.08	206	242	P	H
		5653.6	50.21	-20.66	70.87	38.92	32.92	11.47	33.1	206	242	P	H
		5718.4	55.39	-54.96	110.35	44.05	33.01	11.46	33.13	206	242	P	H
		5722.4	55.65	-60.62	116.27	44.31	33.01	11.46	33.13	206	242	P	H
	*	5745	105.46	-	-	94.11	33.04	11.46	33.15	206	242	P	H
	*	5745	97.18	-	-	85.83	33.04	11.46	33.15	206	242	A	H
													H
													H
		5630.8	50.36	-17.84	68.2	39.12	32.87	11.47	33.1	107	203	P	V
		5694.6	50.54	-50.68	101.22	39.22	32.97	11.47	33.12	107	203	P	V
		5718.8	50.55	-59.91	110.46	39.21	33.01	11.46	33.13	107	203	P	V
		5725	53.1	-69.1	122.2	41.76	33.01	11.46	33.13	107	203	P	V
	*	5745	99.53	-	-	88.18	33.04	11.46	33.15	107	203	P	V
	*	5745	91.51	-	-	80.16	33.04	11.46	33.15	107	203	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)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11a CH 157 5785MHz		5621.2	50.65	-17.55	68.2	39.39	32.87	11.47	33.08	221	243	P	H
		5686.8	51.13	-44.33	95.46	39.81	32.97	11.47	33.12	221	243	P	H
		5706	50.41	-56.47	106.88	39.09	32.99	11.46	33.13	221	243	P	H
		5720.2	49.77	-61.49	111.26	38.43	33.01	11.46	33.13	221	243	P	H
	*	5785	105.62	-	-	94.25	33.09	11.45	33.17	221	243	P	H
	*	5785	96.74	-	-	85.37	33.09	11.45	33.17	221	243	A	H
		5853	50.94	-64.42	115.36	39.42	33.18	11.53	33.19	221	243	P	H
		5857.4	50.77	-59.36	110.13	39.22	33.21	11.53	33.19	221	243	P	H
		5896.8	51.33	-37.7	89.03	39.69	33.26	11.6	33.22	221	243	P	H
		5938	50.91	-17.29	68.2	39.18	33.3	11.67	33.24	221	243	P	H
													H
													H
		5648.6	50.3	-17.9	68.2	39.04	32.89	11.47	33.1	106	202	P	V
		5690.4	50.96	-47.16	98.12	39.64	32.97	11.47	33.12	106	202	P	V
		5712.2	50.25	-58.37	108.62	38.93	32.99	11.46	33.13	106	202	P	V
		5721.4	49.7	-64.29	113.99	38.36	33.01	11.46	33.13	106	202	P	V
	*	5785	100.16	-	-	88.79	33.09	11.45	33.17	106	202	P	V
	*	5785	92.59	-	-	81.22	33.09	11.45	33.17	106	202	A	V
		5855	50.07	-60.73	110.8	38.52	33.21	11.53	33.19	106	202	P	V
		5866.2	50.56	-57.1	107.66	38.96	33.21	11.6	33.21	106	202	P	V
		5910.2	50.24	-28.88	79.12	38.52	33.28	11.67	33.23	106	202	P	V
		5949.2	51.03	-17.17	68.2	39.2	33.33	11.74	33.24	106	202	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)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
	*	5825	105.1	-	-	93.59	33.16	11.53	33.18	222	238	P	H
	*	5825	97.13	-	-	85.62	33.16	11.53	33.18	222	238	A	H
		5850	50.26	-71.94	122.2	38.74	33.18	11.53	33.19	222	238	P	H
		5856.8	51.52	-58.78	110.3	39.97	33.21	11.53	33.19	222	238	P	H
		5902.6	52.3	-32.44	84.74	40.59	33.26	11.67	33.22	222	238	P	H
		5937.2	50.33	-17.87	68.2	38.6	33.3	11.67	33.24	222	238	P	H
													H
802.11a													H
CH 165	*	5825	98.62	-	-	87.11	33.16	11.53	33.18	125	202	P	V
5825MHz	*	5825	91.38	-	-	79.87	33.16	11.53	33.18	125	202	A	V
		5851	50.82	-69.1	119.92	39.3	33.18	11.53	33.19	125	202	P	V
		5865.4	51.19	-56.7	107.89	39.59	33.21	11.6	33.21	125	202	P	V
		5875.8	53.41	-51.2	104.61	41.79	33.23	11.6	33.21	125	202	P	V
		5945.8	51.13	-17.07	68.2	39.3	33.33	11.74	33.24	125	202	P	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)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11a CH 149 5745MHz		11490	45.66	-28.34	74	48.26	39.12	15.85	57.57	100	0	P	H
		17235	49.08	-19.12	68.2	42.5	42.84	20.57	56.83	100	0	P	H
													H
													H
		11490	45.94	-28.06	74	48.54	39.12	15.85	57.57	100	0	P	V
		17235	48.49	-19.71	68.2	41.91	42.84	20.57	56.83	100	0	P	V
													V
													V
802.11a CH 157 5785MHz		11570	45.87	-28.13	74	48.49	39.07	15.91	57.6	100	0	P	H
		17355	48.91	-19.29	68.2	42.17	43.26	20.78	57.3	100	0	P	H
													H
													H
		11570	44.02	-29.98	74	46.64	39.07	15.91	57.6	100	0	P	V
		17355	48.1	-20.1	68.2	41.36	43.26	20.78	57.3	100	0	P	V
													V
													V
802.11a CH 165 5825MHz		11650	45.39	-28.61	74	47.98	39.04	15.97	57.6	100	0	P	H
		17475	48.82	-19.38	68.2	41.92	43.68	20.99	57.77	100	0	P	H
													H
													H
		11650	45.54	-28.46	74	48.13	39.04	15.97	57.6	100	0	P	V
		17475	49.08	-19.12	68.2	42.18	43.68	20.99	57.77	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 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)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		5629.2	50.94	-17.26	68.2	39.7	32.87	11.47	33.1	226	217	P	H
		5693.4	50.78	-49.55	100.33	39.46	32.97	11.47	33.12	226	217	P	H
		5719.4	51.56	-59.07	110.63	40.22	33.01	11.46	33.13	226	217	P	H
		5724.6	58.4	-62.89	121.29	47.06	33.01	11.46	33.13	226	217	P	H
	*	5745	103.42	-	-	92.07	33.04	11.46	33.15	226	217	P	H
	*	5745	103.42	-	-	92.07	33.04	11.46	33.15	226	217	A	H
802.11n													H
HT20													H
CH 149		5630	51.27	-16.93	68.2	40.03	32.87	11.47	33.1	112	202	P	V
5745MHz		5692.8	52.2	-47.69	99.89	40.88	32.97	11.47	33.12	112	202	P	V
		5719.6	50.89	-59.8	110.69	39.55	33.01	11.46	33.13	112	202	P	V
		5724.2	53.5	-66.88	120.38	42.16	33.01	11.46	33.13	112	202	P	V
	*	5745	97.81	-	-	86.46	33.04	11.46	33.15	112	202	P	V
	*	5745	90.85	-	-	79.5	33.04	11.46	33.15	112	202	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)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		5640.2	49.73	-18.47	68.2	38.47	32.89	11.47	33.1	223	239	P	H
		5699.8	50.34	-54.71	105.05	39.02	32.97	11.47	33.12	223	239	P	H
		5706.4	49.87	-57.12	106.99	38.55	32.99	11.46	33.13	223	239	P	H
		5724.2	49.87	-70.51	120.38	38.53	33.01	11.46	33.13	223	239	P	H
	*	5785	105.01	-	-	93.64	33.09	11.45	33.17	223	239	P	H
	*	5785	96.03	-	-	84.66	33.09	11.45	33.17	223	239	A	H
		5853.2	50.36	-64.54	114.9	38.84	33.18	11.53	33.19	223	239	P	H
		5865.4	51.66	-56.23	107.89	40.06	33.21	11.6	33.21	223	239	P	H
		5884.6	51.4	-46.67	98.07	39.79	33.23	11.6	33.22	223	239	P	H
		5938.2	50.42	-17.78	68.2	38.69	33.3	11.67	33.24	223	239	P	H
802.11n													H
HT20													H
CH 157		5640.2	50.56	-17.64	68.2	39.3	32.89	11.47	33.1	121	202	P	V
5785MHz		5666.6	50.14	-30.38	80.52	38.84	32.94	11.47	33.11	121	202	P	V
		5718.6	50.19	-60.22	110.41	38.85	33.01	11.46	33.13	121	202	P	V
		5721.4	49.97	-64.02	113.99	38.63	33.01	11.46	33.13	121	202	P	V
	*	5785	98.45	-	-	87.08	33.09	11.45	33.17	121	202	P	V
	*	5785	90.82	-	-	79.45	33.09	11.45	33.17	121	202	A	V
		5852.4	50.78	-65.95	116.73	39.26	33.18	11.53	33.19	121	202	P	V
		5872.2	50.97	-55.01	105.98	39.35	33.23	11.6	33.21	121	202	P	V
		5902.4	50.95	-33.94	84.89	39.24	33.26	11.67	33.22	121	202	P	V
		5941.8	52.5	-15.7	68.2	40.67	33.33	11.74	33.24	121	202	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)	Cable 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	105.43	-	-	93.92	33.16	11.53	33.18	225	216	P	H
	*	5825	96.66	-	-	85.15	33.16	11.53	33.18	225	216	A	H
		5851	53.89	-66.03	119.92	42.37	33.18	11.53	33.19	225	216	P	H
		5855	51.22	-59.58	110.8	39.67	33.21	11.53	33.19	225	216	P	H
		5876.8	52.4	-51.46	103.86	40.78	33.23	11.6	33.21	225	216	P	H
		5949	51.55	-16.65	68.2	39.72	33.33	11.74	33.24	225	216	P	H
													H
													H
	*	5825	99.23	-	-	87.72	33.16	11.53	33.18	121	204	P	V
	*	5825	90.82	-	-	79.31	33.16	11.53	33.18	121	204	A	V
		5851	52.28	-67.64	119.92	40.76	33.18	11.53	33.19	121	204	P	V
		5870	51.05	-55.55	106.6	39.45	33.21	11.6	33.21	121	204	P	V
		5877.2	50.54	-53.03	103.57	38.92	33.23	11.6	33.21	121	204	P	V
		5933.2	50.42	-17.78	68.2	38.68	33.3	11.67	33.23	121	204	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 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)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 149 5745MHz		11490	46.59	-27.41	74	49.19	39.12	15.85	57.57	100	0	P	H
		17235	48.37	-19.83	68.2	41.79	42.84	20.57	56.83	100	0	P	H
													H
													H
		11490	44.92	-29.08	74	47.52	39.12	15.85	57.57	100	0	P	V
		17235	48.03	-20.17	68.2	41.45	42.84	20.57	56.83	100	0	P	V
													V
													V
802.11n HT20 CH 157 5785MHz		11570	45.1	-28.9	74	47.72	39.07	15.91	57.6	100	0	P	H
		17355	48.87	-19.33	68.2	42.13	43.26	20.78	57.3	100	0	P	H
													H
													H
		11570	45.35	-28.65	74	47.97	39.07	15.91	57.6	100	0	P	V
		17355	48.65	-19.55	68.2	41.91	43.26	20.78	57.3	100	0	P	V
													V
													V
802.11n HT20 CH 165 5825MHz		11650	45.69	-28.31	74	48.28	39.04	15.97	57.6	100	0	P	H
		17475	49.03	-19.17	68.2	42.13	43.68	20.99	57.77	100	0	P	H
													H
													H
		11650	45.7	-28.3	74	48.29	39.04	15.97	57.6	100	0	P	V
		17475	49.3	-18.9	68.2	42.4	43.68	20.99	57.77	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)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		5623	50.8	-17.4	68.2	39.54	32.87	11.47	33.08	225	241	P	H
		5651.6	52.8	-16.59	69.39	41.51	32.92	11.47	33.1	225	241	P	H
		5718.6	59.54	-50.87	110.41	48.2	33.01	11.46	33.13	225	241	P	H
		5724.8	60.52	-61.22	121.74	49.18	33.01	11.46	33.13	225	241	P	H
	*	5755	100.94	-	-	89.57	33.06	11.46	33.15	225	241	P	H
	*	5755	93.16	-	-	81.79	33.06	11.46	33.15	225	241	A	H
		5853.8	49.77	-63.77	113.54	38.22	33.21	11.53	33.19	225	241	P	H
		5858.4	50.47	-59.38	109.85	38.94	33.21	11.53	33.21	225	241	P	H
		5911.4	50.35	-27.88	78.23	38.63	33.28	11.67	33.23	225	241	P	H
		5927.4	50.25	-17.95	68.2	38.51	33.3	11.67	33.23	225	241	P	H
802.11n													H
HT40													H
CH 151		5608.8	50.09	-18.11	68.2	38.85	32.84	11.48	33.08	131	203	P	V
5755MHz		5698.8	51.23	-53.09	104.32	39.91	32.97	11.47	33.12	131	203	P	V
		5716.2	53.09	-56.65	109.74	41.77	32.99	11.46	33.13	131	203	P	V
		5725	58.2	-64	122.2	46.86	33.01	11.46	33.13	131	203	P	V
	*	5755	96.18	-	-	84.81	33.06	11.46	33.15	131	203	P	V
	*	5755	87.83	-	-	76.46	33.06	11.46	33.15	131	203	A	V
		5855	48.77	-62.03	110.8	37.22	33.21	11.53	33.19	131	203	P	V
		5871.4	50.65	-55.56	106.21	39.03	33.23	11.6	33.21	131	203	P	V
		5917.4	50.68	-23.12	73.8	38.96	33.28	11.67	33.23	131	203	P	V
		5930.2	51.28	-16.92	68.2	39.54	33.3	11.67	33.23	131	203	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)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		5613.4	50.43	-17.77	68.2	39.19	32.84	11.48	33.08	222	239	P	H
		5662.8	50.38	-27.32	77.7	39.1	32.92	11.47	33.11	222	239	P	H
		5702.8	49.84	-56.15	105.99	38.51	32.99	11.46	33.12	222	239	P	H
		5724.2	49.06	-71.32	120.38	37.72	33.01	11.46	33.13	222	239	P	H
	*	5795	101.09	-	-	89.7	33.11	11.45	33.17	222	239	P	H
	*	5795	92.94	-	-	81.55	33.11	11.45	33.17	222	239	A	H
		5852	50.23	-67.41	117.64	38.71	33.18	11.53	33.19	222	239	P	H
		5871.4	51.14	-55.07	106.21	39.52	33.23	11.6	33.21	222	239	P	H
		5924.4	51.15	-17.49	68.64	39.41	33.3	11.67	33.23	222	239	P	H
		5925.8	50.3	-17.9	68.2	38.56	33.3	11.67	33.23	222	239	P	H
802.11n													H
HT40													H
CH 159		5634	50.16	-18.04	68.2	38.9	32.89	11.47	33.1	125	203	P	V
5795MHz		5650.6	50.45	-18.2	68.65	39.16	32.92	11.47	33.1	125	203	P	V
		5715	49.65	-59.75	109.4	38.33	32.99	11.46	33.13	125	203	P	V
		5720.6	48.37	-63.8	112.17	37.03	33.01	11.46	33.13	125	203	P	V
	*	5795	95.78	-	-	84.39	33.11	11.45	33.17	125	203	P	V
	*	5795	87.78	-	-	76.39	33.11	11.45	33.17	125	203	A	V
		5852	50.38	-67.26	117.64	38.86	33.18	11.53	33.19	125	203	P	V
		5869.4	50.08	-56.69	106.77	38.48	33.21	11.6	33.21	125	203	P	V
		5911.4	50.87	-27.36	78.23	39.15	33.28	11.67	33.23	125	203	P	V
		5947.8	50.9	-17.3	68.2	39.07	33.33	11.74	33.24	125	203	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 (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)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 151 5755MHz		11510	46.4	-27.6	74	49.02	39.1	15.88	57.6	100	0	P	H
		17265	48.25	-19.95	68.2	41.62	42.96	20.64	56.97	100	0	P	H
													H
													H
		11510	44.32	-29.68	74	46.94	39.1	15.88	57.6	100	0	P	V
		17265	48.3	-19.9	68.2	41.67	42.96	20.64	56.97	100	0	P	V
													V
													V
802.11n HT40 CH 159 5795MHz		11590	45.06	-28.94	74	47.65	39.07	15.94	57.6	100	0	P	H
		17385	48.93	-19.27	68.2	42.13	43.38	20.85	57.43	100	0	P	H
													H
													H
		11590	44.02	-29.98	74	46.61	39.07	15.94	57.6	100	0	P	V
		17385	48.83	-19.37	68.2	42.03	43.38	20.85	57.43	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

Emission below 1GHz

5GHz WIFI 802.11n HT20 (LF @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable 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)
5GHz 802.11n HT20 LF		99.39	25.9	-17.6	43.5	40.77	16.1	1.51	32.48	-	-	P	H
		200.91	28.94	-14.56	43.5	43.7	16.02	2.1	32.88	-	-	P	H
		276.24	28	-18	46	38.67	19.24	2.58	32.49	-	-	P	H
		694.1	29	-17	46	30.89	26.64	3.94	32.47	-	-	P	H
		843.9	32.68	-13.32	46	31.41	28.83	4.39	31.95	-	-	P	H
		941.2	33.56	-12.44	46	29.8	30.35	4.69	31.28	255	314	P	H
													H
													H
													H
													H
													H
													H
		36.75	34.87	-5.13	40	44.09	21.98	1.29	32.49	169	244	P	V
		54.3	26.21	-13.79	40	43.71	13.7	1.29	32.49	-	-	P	V
		197.4	25.28	-18.22	43.5	40.2	15.86	2.1	32.88	-	-	P	V
		674.5	28.3	-17.7	46	30.39	26.44	3.94	32.47	-	-	P	V
		771.8	30.26	-15.74	46	30.46	27.97	4.09	32.26	-	-	P	V
		930.7	33.66	-12.34	46	30.32	30.08	4.63	31.37	-	-	P	V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is **over limit** line.
P/A	**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	Cable	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. Level(dBμV/m) =

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

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

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable 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) + Cable 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

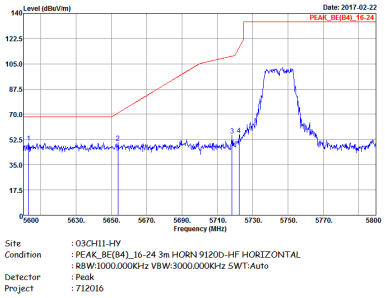
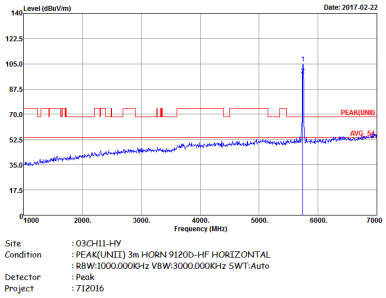
Test Engineer :	J.C. Liang, Jacky Hung and Ken Wu	Temperature :	20~24°C
		Relative Humidity :	50~54%

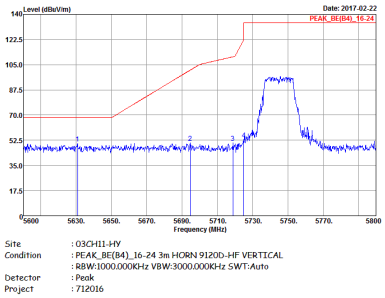
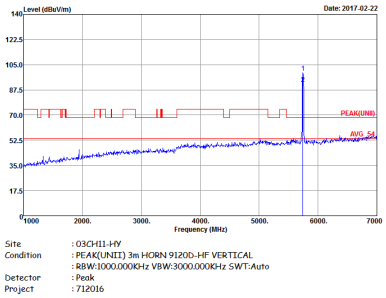
Note symbol

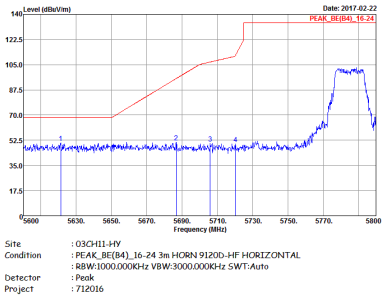
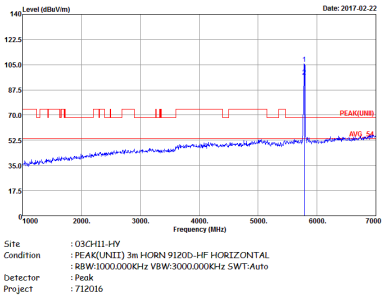
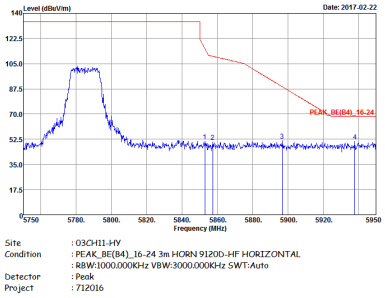
-L	**Low channel location**
-R	**High channel location**

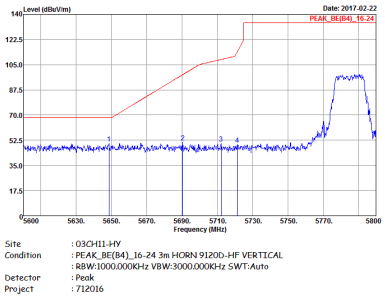
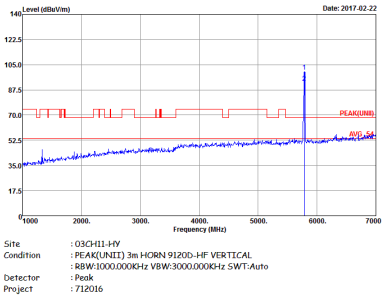
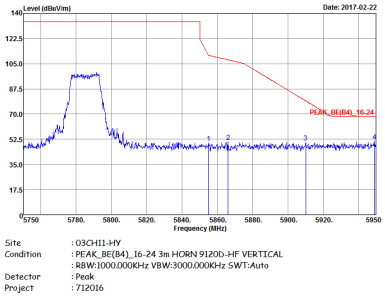
Band 4 - 5725~5850MHz

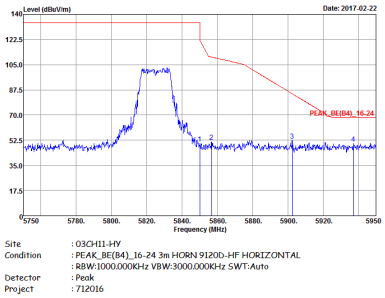
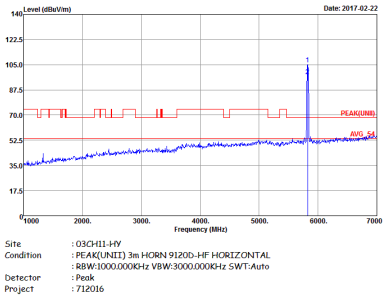
WIFI 802.11a (Band Edge @ 3m)

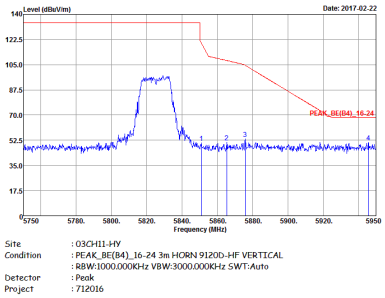
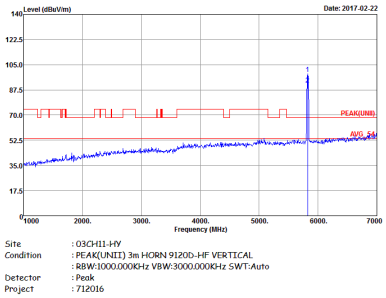
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH149 5745MHz	
1	Horizontal	Fundamental
Peak		

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		
Peak		Left blank

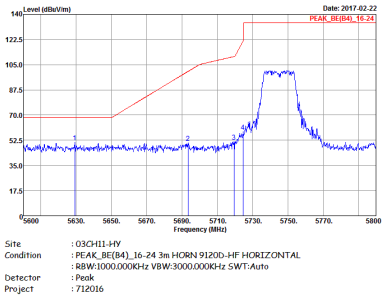
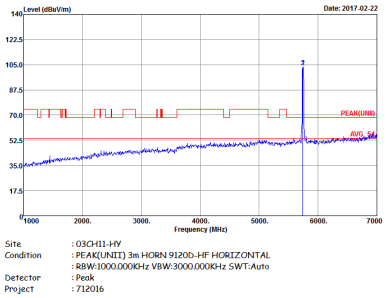
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH157 5785MHz	
1	Vertical	Fundamental
Peak		
Peak		Left blank

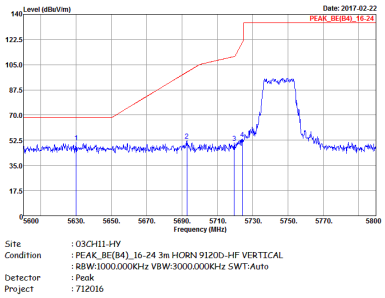
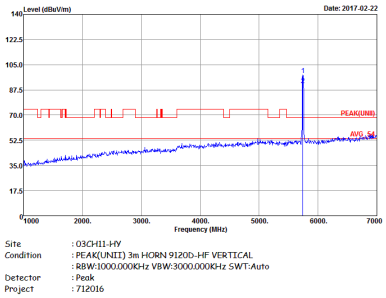
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH165 5825MHz	
1	Horizontal	Fundamental
Peak		

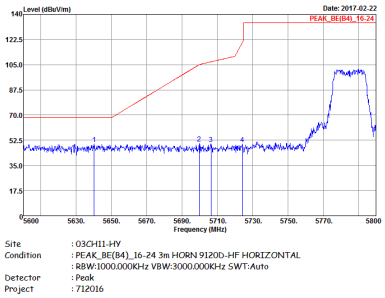
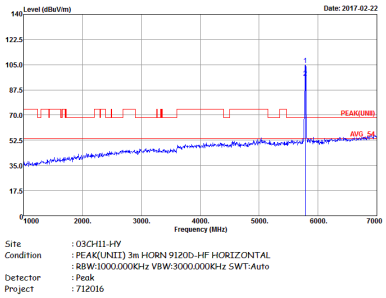
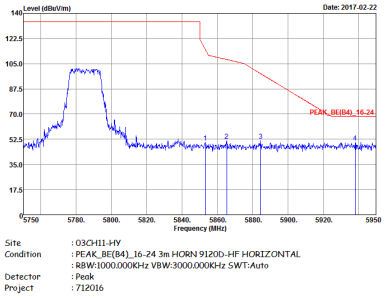
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH165 5825MHz	
1	Vertical	Fundamental
Peak		

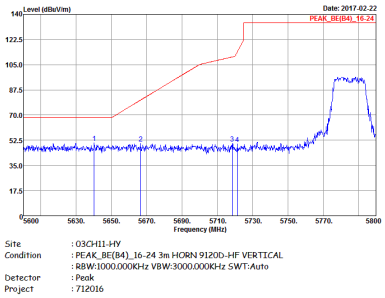
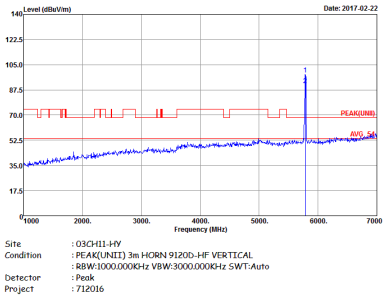
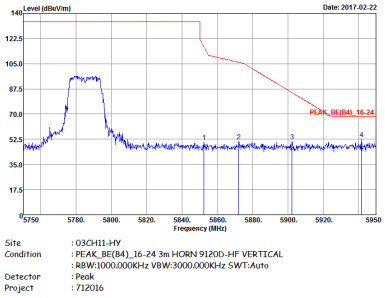
Band 4 5725~5850MHz

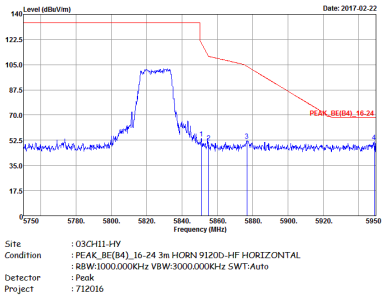
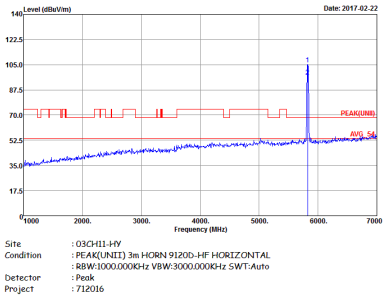
WIFI 802.11n HT20 (Band Edge @ 3m)

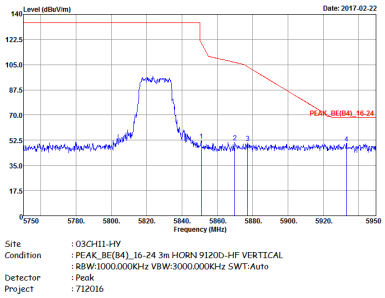
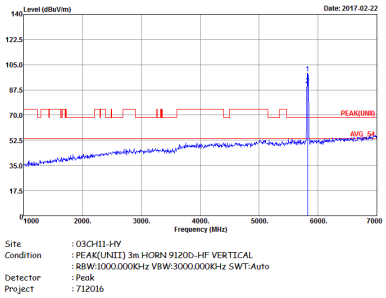
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH149 5745MHz	
1	Horizontal	Fundamental
Peak		

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

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

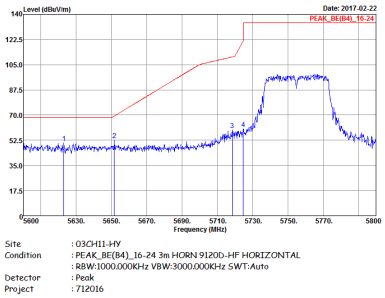
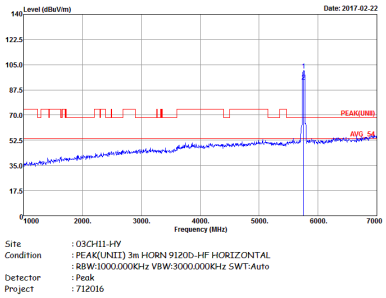
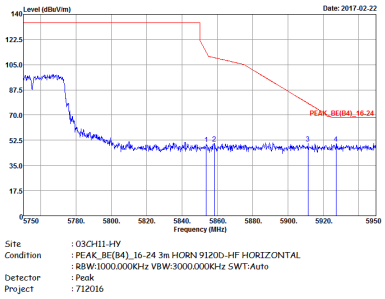
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
1	Vertical	Fundamental
Peak		
Peak		Left blank

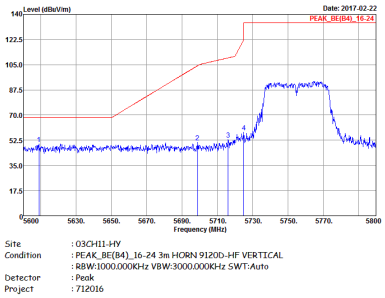
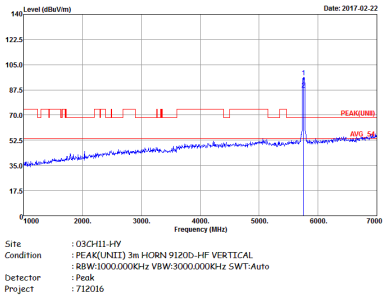
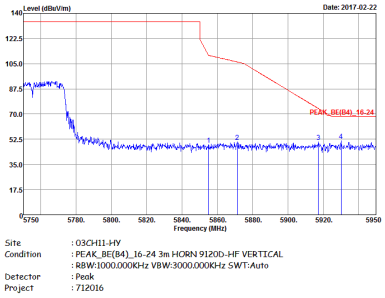
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH165 5825MHz	
1	Horizontal	Fundamental
Peak		

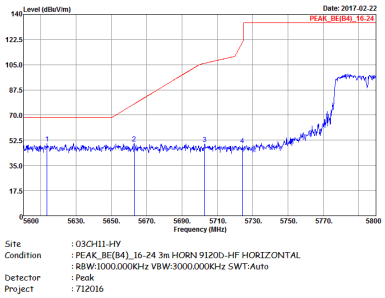
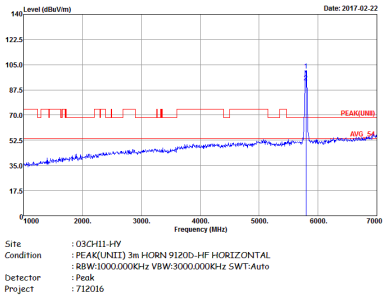
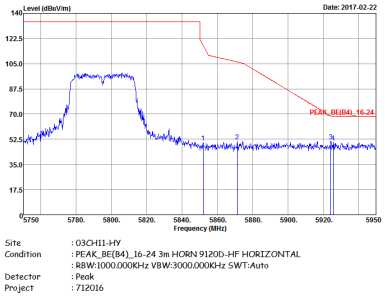
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH165 5825MHz	
1	Vertical	Fundamental
Peak		

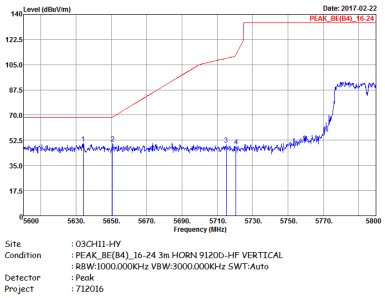
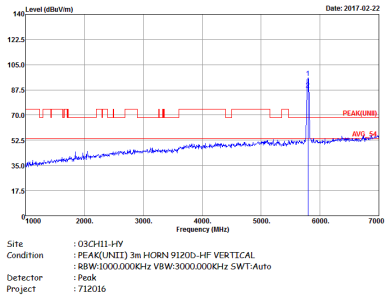
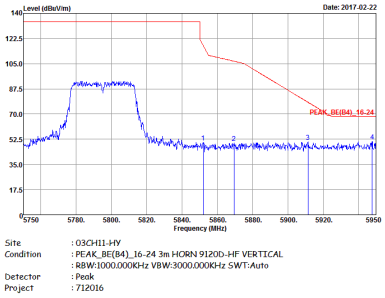
Band 4 5725~5850MHz

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		
Peak		Left blank

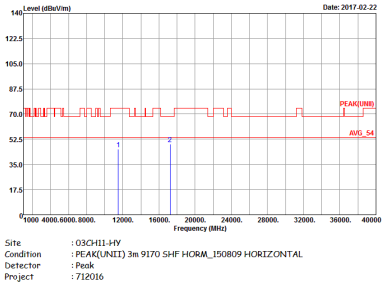
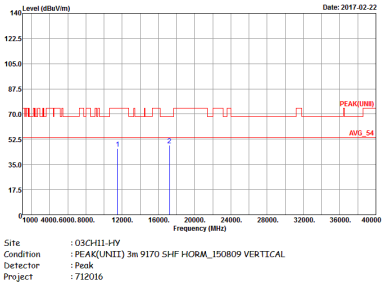
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT40 CH151 5755MHz	
1	Vertical	Fundamental
Peak		
Peak		Left blank

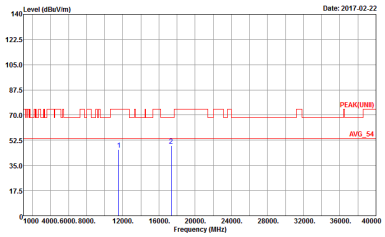
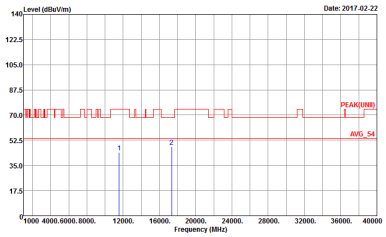
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT40 CH159 5795MHz	
1	Horizontal	Fundamental
Peak		
Peak		Left blank

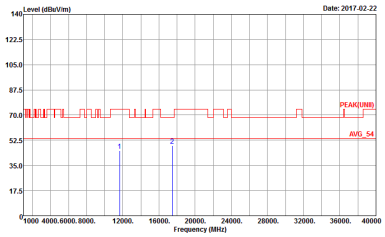
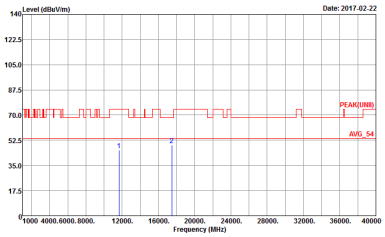
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT40 CH159 5795MHz	
1	Vertical	Fundamental
Peak		
Peak		Left blank

Band 4 - 5725~5850MHz

WIFI 802.11a (Harmonic @ 3m)

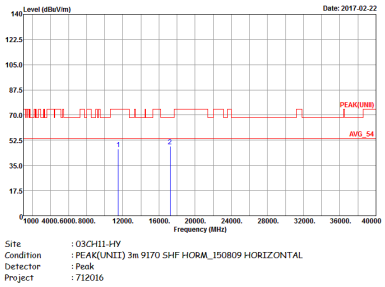
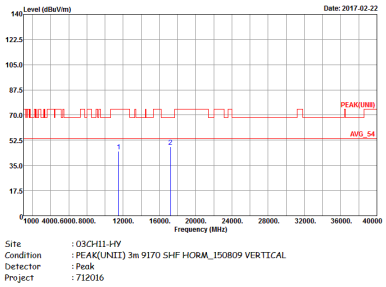
WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11a CH149 5745MHz	
1	Horizontal	Vertical
Peak Avg.		

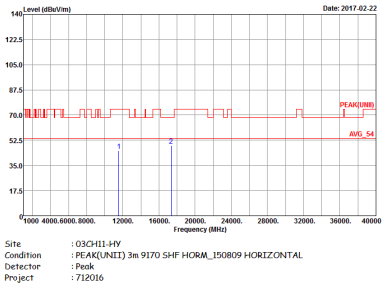
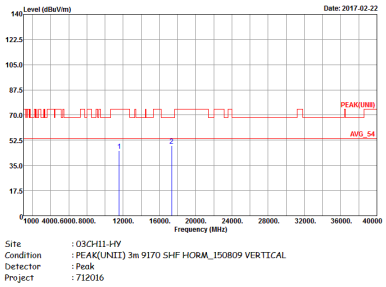
WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11a CH157 5785MHz	
1	Horizontal	Vertical
Peak Avg.	 Site : 03CH11-HY Condition : PEAK(UNII) 3m 9170 SHF HORM_150809 HORIZONTAL Detector : Peak Project : 712016	 Site : 03CH11-HY Condition : PEAK(UNII) 3m 9170 SHF HORM_150809 VERTICAL Detector : Peak Project : 712016

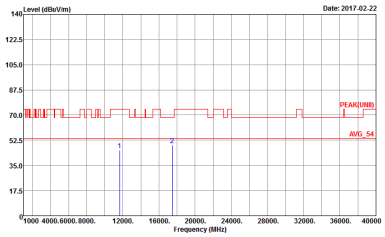
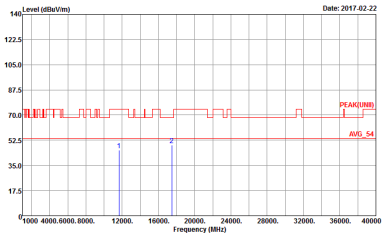
WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11a CH165 5825MHz	
1	Horizontal	Vertical
Peak Avg.	 Site : 03CH11-HY Condition : PEAK(UNII) 3m 9170 SHF HORM_150809 HORIZONTAL Detector : Peak Project : 712016	 Site : 03CH11-HY Condition : PEAK(UNII) 3m 9170 SHF HORM_150809 VERTICAL Detector : Peak Project : 712016

Band 4 5725~5850MHz

WIFI 802.11n HT20 (Harmonic @ 3m)

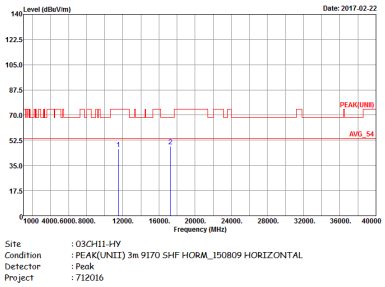
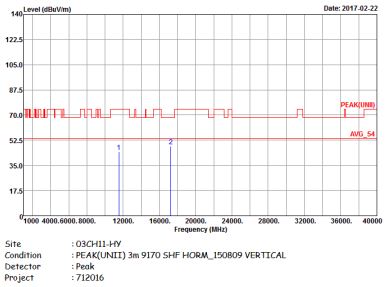
WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT20 CH149 5745MHz	
1	Horizontal	Vertical
Peak Avg.		

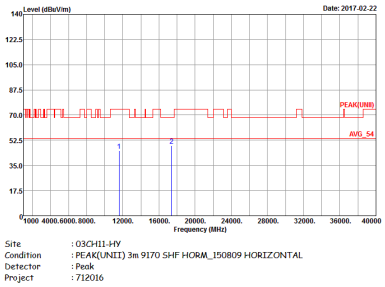
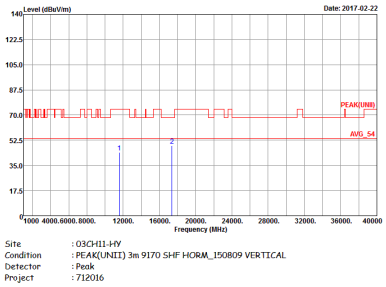
WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
1	Horizontal	Vertical
Peak Avg.		

WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT20 CH165 5825MHz	
1	Horizontal	Vertical
Peak Avg.	 Site : 03CH11-HY Condition : PEAK(UNII) 3m 9170 SHF HORM_150809 HORIZONTAL Detector : Peak Project : 712016	 Site : 03CH11-HY Condition : PEAK(UNII) 3m 9170 SHF HORM_150809 VERTICAL Detector : Peak Project : 712016

Band 4 5725~5850MHz

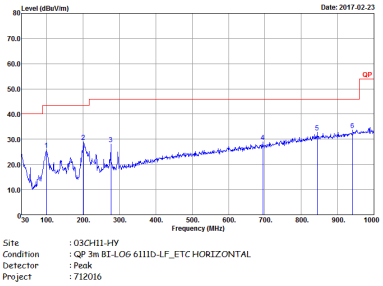
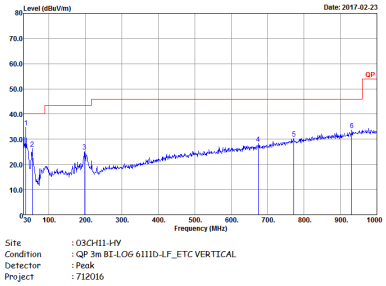
WIFI 802.11n HT40 (Harmonic @ 3m)

WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT40 CH151 5755MHz	
1	Horizontal	Vertical
Peak Avg.		

WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT40 CH159 5795MHz	
1	Horizontal	Vertical
Peak Avg.		

Emission below 1GHz

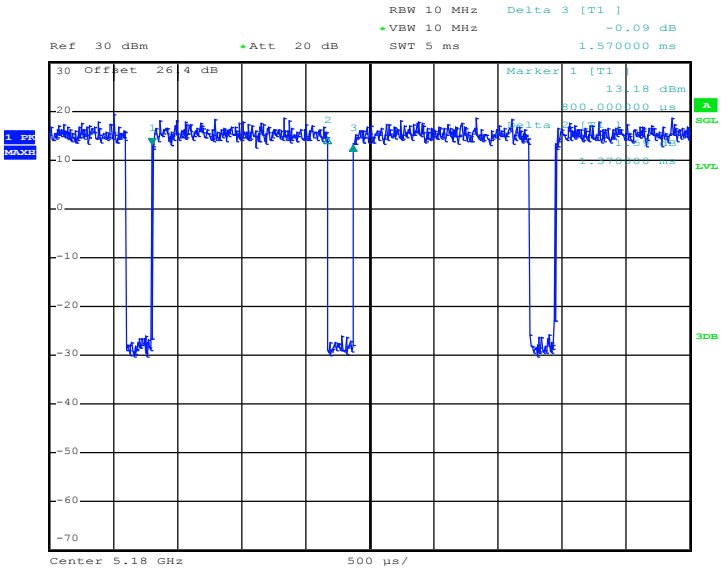
5GHz WIFI 802.11n HT20 (LF)

WIFI	5GHz 5725~5850MHz	
ANT	802.11n HT20 LF	
1	Horizontal	Vertical
QP / Peak		

Appendix E. Duty Cycle Plots

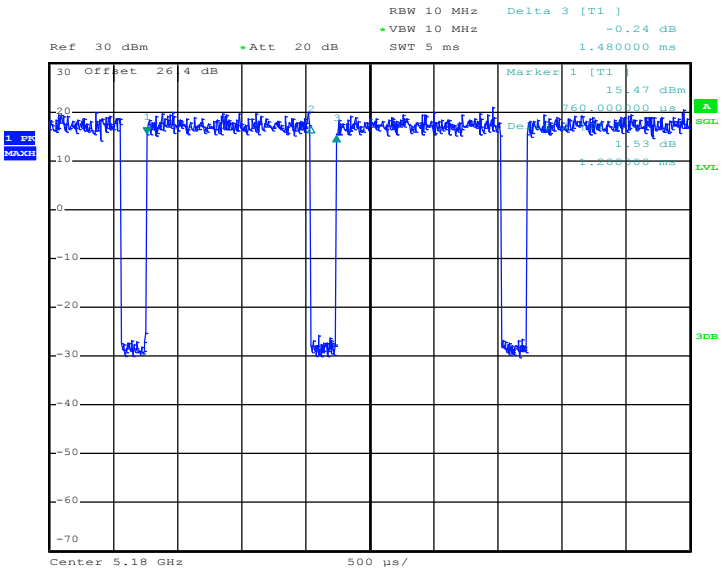
Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
1	802.11a	87.26	1370	0.73	1kHz
1	5GHz 802.11n HT20	86.49	1280	0.78	1kHz
1	5GHz 802.11n HT40	86.49	640	1.56	3kHz

802.11a



Date: 9.FEB.2017 21:06:17

5GHz 802.11n HT20



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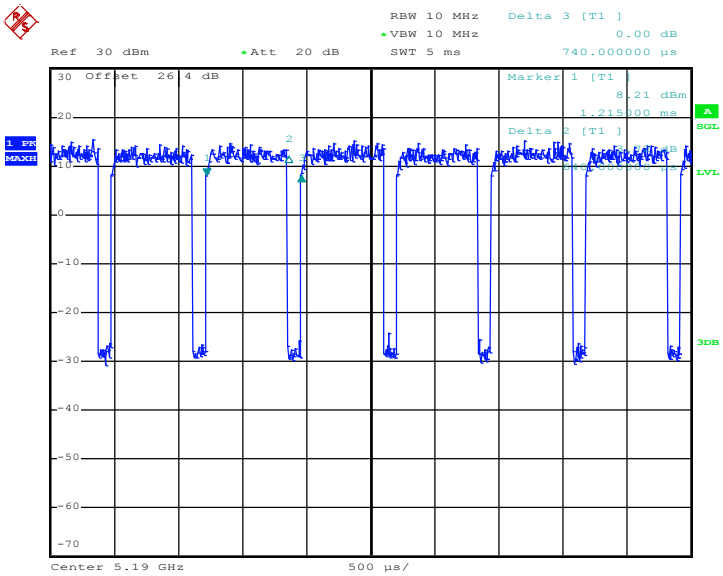
5GHz 802.11n HT40



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