



FCC RF Test Report

APPLICANT : IEI Integration Corp.
EQUIPMENT : Tablet PC
BRAND NAME : iEi
MODEL NAME : TRN-3200T
FCC ID : RFH-TRN3200T
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

This is a variant report which is only valid together with the original test report. The product was received on Sep. 22, 2017 and testing was completed on Oct. 24, 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



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
FR690221-01C	Rev. 01	Initial issue of report.	Nov. 02, 2017
FR690221-01C	Rev. 02	Revising power in Appendix A.	Nov. 16, 2017



SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
-	15.247(a)(2)	6dB Bandwidth	≥ 0.5MHz	Not Required	-
-	-	99% Bandwidth	-	Not Required	-
3.1	15.247(b)	Power Output Measurement	≤ 30dBm	Pass	-
-	15.247(e)	Power Spectral Density	≤ 8dBm/3kHz	Not Required	-
-	15.247(d)	Conducted Band Edges	≤ 20dBc	Not Required	-
		Conducted Spurious Emission		Not Required	-
3.2	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 1.61 dB at 2483.500 MHz
3.3	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 14.10 dB at 4.510 MHz
3.4	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-

Remark :

- Not required means after assessing, test items are not necessary to carry out.
- This is a variant report which can be referred Product Equality Declaration. All the test cases were performed on original report which can be referred to Sporton Report Number FR690221C. Based on the original report, the test cases were verified.



1 General Description

1.1 Applicant

IEI Integration Corp.
No. 29, Zhongxing Rd., Xizhi Dist., New Taipei City 221. Taiwan (R.O.C)

1.2 Manufacturer

IEI Integration Corp.
No. 29, Zhongxing Rd., Xizhi Dist., New Taipei City 221. Taiwan (R.O.C)

1.3 Product Feature of Equipment Under Test

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

Product Specification subjective to this standard	
Antenna Type	WLAN: PCB Antenna Bluetooth: PCB 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. 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, Hwa Ya 1 st 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	03CH07-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 C §15.247
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04
- ♦ ANSI C63.10-2013

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



2 Test Configuration of Equipment Under Test

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

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437	-	-



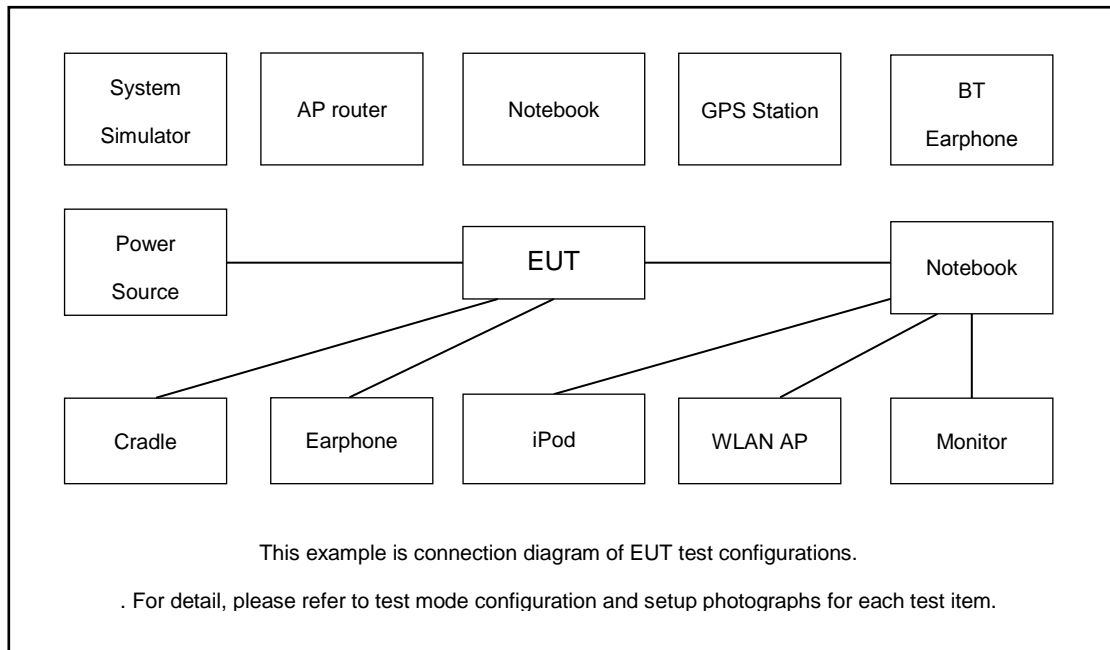
2.2 Test Mode

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
802.11b	1 Mbps
802.11g	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0

Test Cases	
AC Conducted Emission	Mode 1: Bluetooth Link + WLAN (2.4GHz) Link + TC + TF
Remark: 1. TF stands for Test Function, and consists of H-Pattern, MPEG4, and Camera. 2. TC stands for Test Configuration, and consists of SD Card, Earphone, LCD Monitor (Mini HDMI Out), USB HD, RJ-45 Link, Ultrasound Probe (Load), and Adapter 2.	

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.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A
2.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
3.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded,1.8m
4.	Notebook	DELL	P20G	FCC DoC/ Contains FCC ID: QDS-BRCM1051	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	LCD Monitor	DELL	U2410	FCC DoC	Shielded, 1.6 m	Unshielded, 1.8 m
6.	USB HD	WD	WDBAAR3200 ABK-PESN	FCC DoC	Unshielded, 0.5 m	N/A
7.	USB HD	DigiFusion	HD-326U3S	FCC DoC	Shielded, 0.5m	N/A
8.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A

2.5 EUT Operation Test Setup

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

3 Test Result

3.1 Output Power Measurement

3.1.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi are used the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

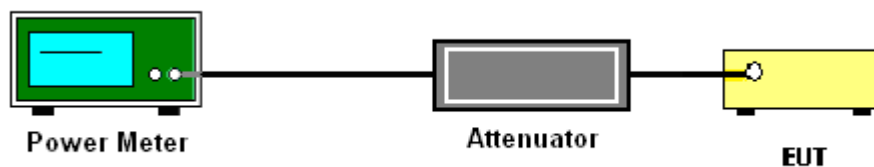
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v04 section 9.1.2 PKPM1 Peak power meter method.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of Peak Output Power

Please refer to Appendix A.

3.1.6 Test Result of Average output Power (Reporting Only)

Please refer to Appendix A.



3.2 Radiated Band Edges and Spurious Emission Measurement

3.2.1 Limit of Radiated band edge and Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

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

3.2.2 Measuring Instruments

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

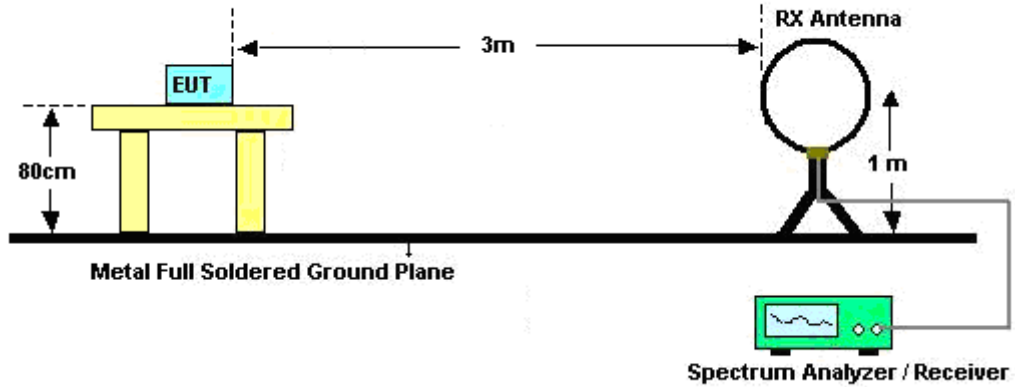


3.2.3 Test Procedures

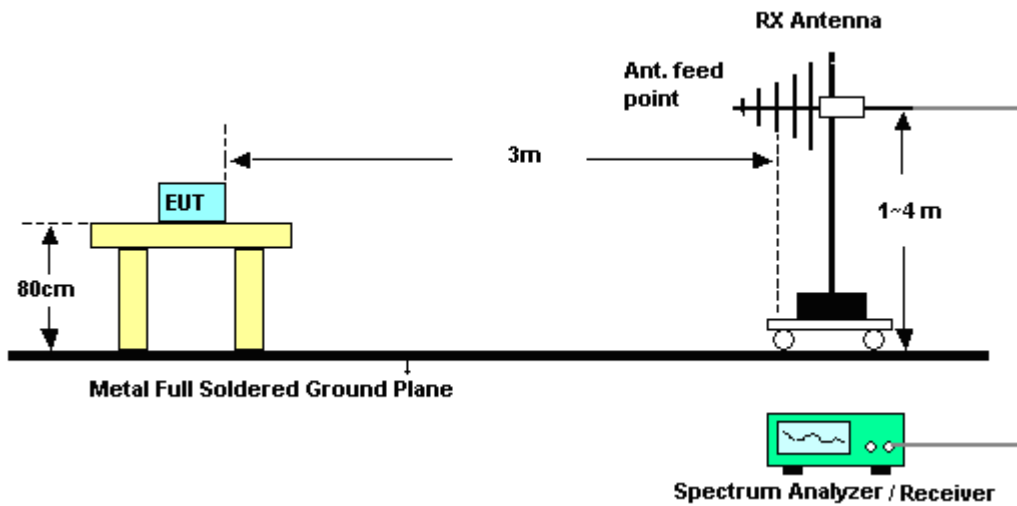
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. 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.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for $f < 1$ GHz; VBW \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement.
For average measurement:
 - 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.

3.2.4 Test Setup

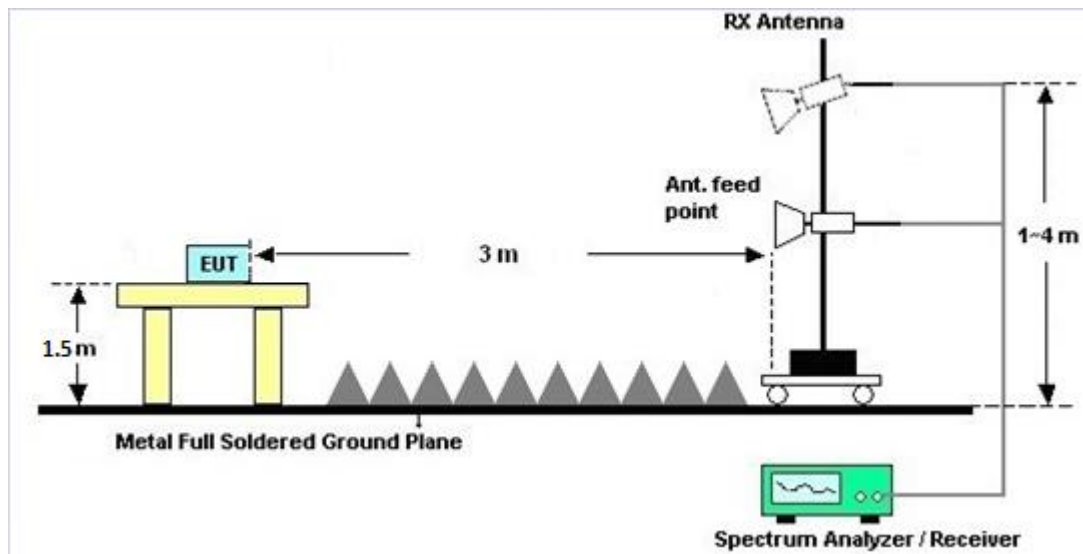
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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

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.

3.2.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C and D.

3.2.7 Duty Cycle

Please refer to Appendix E.

3.2.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix C and D.



3.3 AC Conducted Emission Measurement

3.3.1 Limit of AC Conducted Emission

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

Frequency of Emission (MHz)	Conducted Limit (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.

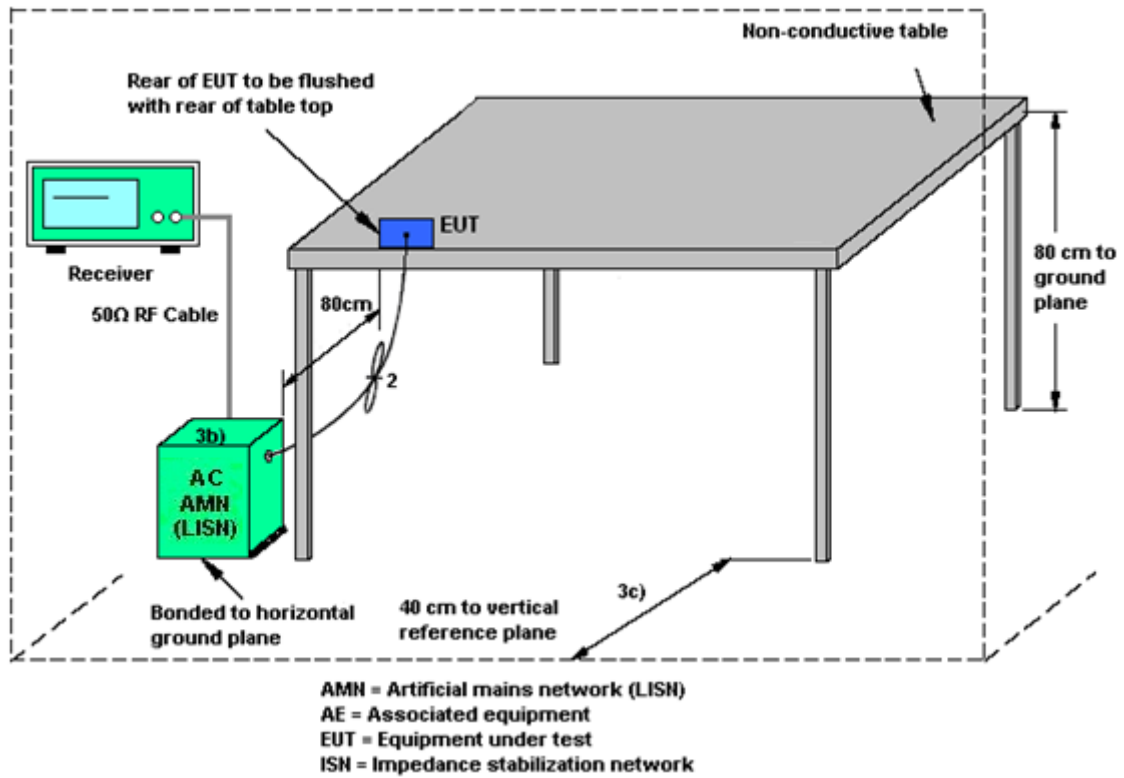
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it 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 (IF bandwidth = 9kHz) with Maximum Hold Mode.

3.3.4 Test Setup



3.3.5 Test Result of AC Conducted Emission

Please refer to Appendix B.



3.4 Antenna Requirements

3.4.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

3.4.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.4.3 Antenna Gain

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



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Power Sensor	DARE	RadiPower	15I00041S NO09	10MHz ~ 6GHz	May 03,2017	Oct. 15, 2017~ Nov. 15, 2017	May 02, 2018	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101397	10Hz ~ 40GHz	Nov. 04,2016	Oct. 15, 2017~ Nov. 02, 2017	Nov. 03, 2017	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101397	10Hz ~ 40GHz	Nov. 07, 2017	Nov. 07, 2017~ Nov. 15, 2017	Nov. 06, 2018	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP30	101067	9kHz ~ 30GHz	Nov. 17, 2016	Oct. 15, 2017~ Nov. 15, 2017	Nov. 16, 2017	Conducted (TH05-HY)
Programmable Power Supply	GW Instek	PSS-2005	EL890001	1V ~ 20V 0.5A~4A	Oct. 03, 2017	Oct. 15, 2017~ Nov. 15, 2017	Oct. 02, 2018	Conducted (TH05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Oct. 23, 2017	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9kHz ~ 7GHz	Sep. 20, 2017	Oct. 23, 2017	Sep. 19, 2018	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz ~ 30MHz	Nov. 29, 2016	Oct. 23, 2017	Nov. 28, 2017	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz ~ 30MHz	Dec. 06, 2016	Oct. 23, 2017	Dec. 05, 2017	Conduction (CO05-HY)
Bilog Antenna	TESEQ	CBL 6111D&00800 N1D01N-06	35419&03	30MHz ~ 1GHz	Jan. 07, 2017	Oct. 24, 2017	Jan. 06, 2018	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Aug. 23, 2017	Oct. 24, 2017	Aug. 22, 2018	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	May 15, 2017	Oct. 24, 2017	May 14, 2019	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-00101 800-30-10P	1590075	1GHz ~ 18GHz	Apr. 25, 2017	Oct. 24, 2017	Apr. 24, 2018	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10MHz ~ 1GHz	Mar. 14, 2017	Oct. 24, 2017	Mar. 13, 2018	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A023 62	1GHz~ 26.5GHz	Oct. 13, 2017	Oct. 24, 2017	Oct. 12, 2018	Radiation (03CH07-HY)
Spectrum Analyzer	Agilent	N9010A	MY534701 18	10Hz~44GHz	Apr. 17, 2017	Oct. 24, 2017	Apr. 16, 2018	Radiation (03CH07-HY)
Antenna Mast	Max-Full	MFA520BS	N/A	1m ~ 4m	N/A	Oct. 24, 2017	N/A	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	N/A	Oct. 24, 2017	N/A	Radiation (03CH07-HY)
Amplifier	MITEQ	TTA1840-35-H G	1871923	18GHz ~ 40GHz,VSWR : 2.5:1 max	Jul. 18, 2017	Oct. 24, 2017	Jul. 17, 2018	Radiation (03CH07-HY)
EMI Test Receiver	Agilent	N9038A(MXE)	MY532900 53	20Hz to 26.5GHz	Jan. 12, 2017	Oct. 24, 2017	Jan. 11, 2018	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170 584	18GHz ~ 40GHz	Nov. 08, 2016	Oct. 24, 2017	Nov. 07, 2017	Radiation (03CH07-HY)



5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.70
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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
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.5
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

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

Test Engineer:	Reece Lin	Temperature:	21~25	°C
Test Date:	2017/10/13	Relative Humidity:	51~54	%

TEST RESULTS DATA
Peak Power Table

2.4GHz Band										
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
11b	1Mbps	1	1	2412	18.06	30.00	2.00	20.06	36.00	Pass
11b	1Mbps	1	6	2437	18.04	30.00	2.00	20.04	36.00	Pass
11b	1Mbps	1	11	2462	17.90	30.00	2.00	19.90	36.00	Pass
11g	6Mbps	1	1	2412	22.56	30.00	2.00	24.56	36.00	Pass
11g	6Mbps	1	6	2437	22.36	30.00	2.00	24.36	36.00	Pass
11g	6Mbps	1	11	2462	22.06	30.00	2.00	24.06	36.00	Pass
HT20	MCS0	1	1	2412	21.25	30.00	2.00	23.25	36.00	Pass
HT20	MCS0	1	6	2437	21.13	30.00	2.00	23.13	36.00	Pass
HT20	MCS0	1	11	2462	20.98	30.00	2.00	22.98	36.00	Pass
HT40	MCS0	1	3	2422	21.06	30.00	2.00	23.06	36.00	Pass
HT40	MCS0	1	6	2437	21.14	30.00	2.00	23.14	36.00	Pass
HT40	MCS0	1	9	2452	21.03	30.00	2.00	23.03	36.00	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

2.4GHz Band						
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
11b	1Mbps	1	1	2412	0.00	15.80
11b	1Mbps	1	6	2437	0.00	15.77
11b	1Mbps	1	11	2462	0.00	15.68
11g	6Mbps	1	1	2412	0.00	13.90
11g	6Mbps	1	6	2437	0.00	13.75
11g	6Mbps	1	11	2462	0.00	13.66
HT20	MCS0	1	1	2412	0.00	12.87
HT20	MCS0	1	6	2437	0.00	12.68
HT20	MCS0	1	11	2462	0.00	12.60
HT40	MCS0	1	3	2422	0.00	12.60
HT40	MCS0	1	6	2437	0.00	12.62
HT40	MCS0	1	9	2452	0.00	12.50



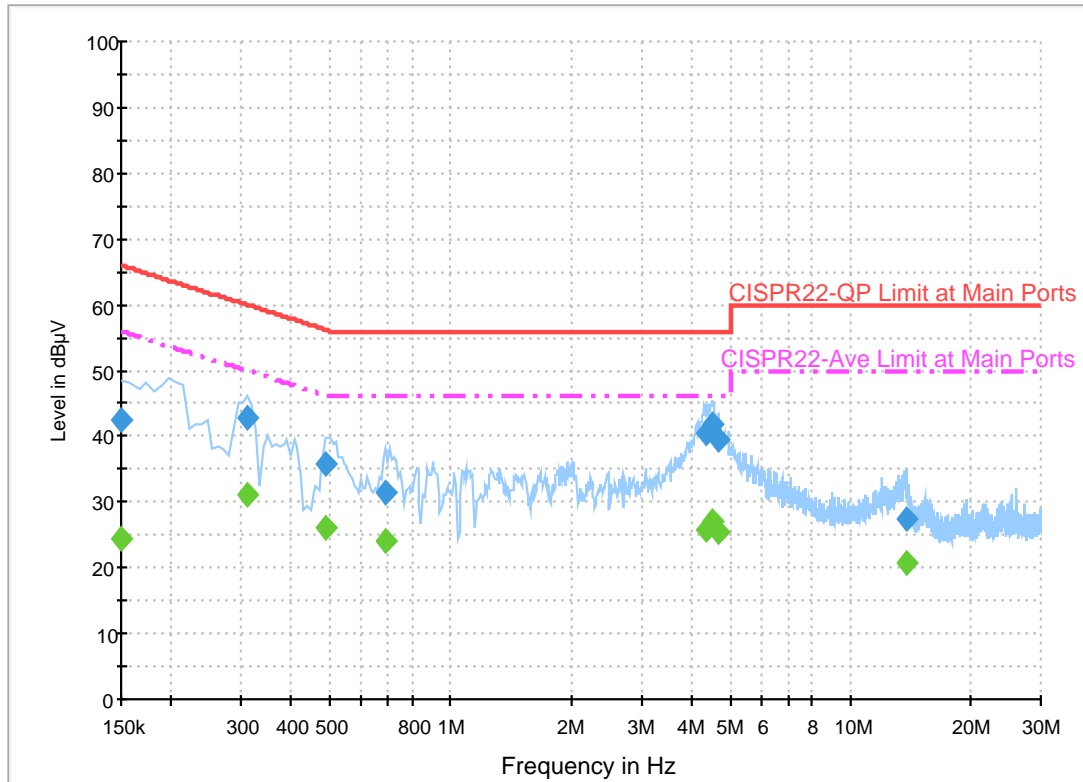
Appendix B. AC Conducted Emission Test Results

Test Engineer :	Blue Lan	Temperature :	23~24°C
		Relative Humidity :	37~38%

EUT Information

Report NO : 690221-01
 Test Mode : Mode 1
 Test Voltage : 120Vac/60Hz
 Phase : Line

ENV216 Auto Test-L



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	42.4	Off	L1	19.6	23.6	66.0
0.310000	42.7	Off	L1	19.5	17.3	60.0
0.486000	35.8	Off	L1	19.5	20.4	56.2
0.686000	31.5	Off	L1	19.5	24.5	56.0
4.350000	40.5	Off	L1	19.6	15.5	56.0
4.510000	41.9	Off	L1	19.6	14.1	56.0
4.694000	39.4	Off	L1	19.6	16.6	56.0
13.814000	27.5	Off	L1	19.7	32.5	60.0

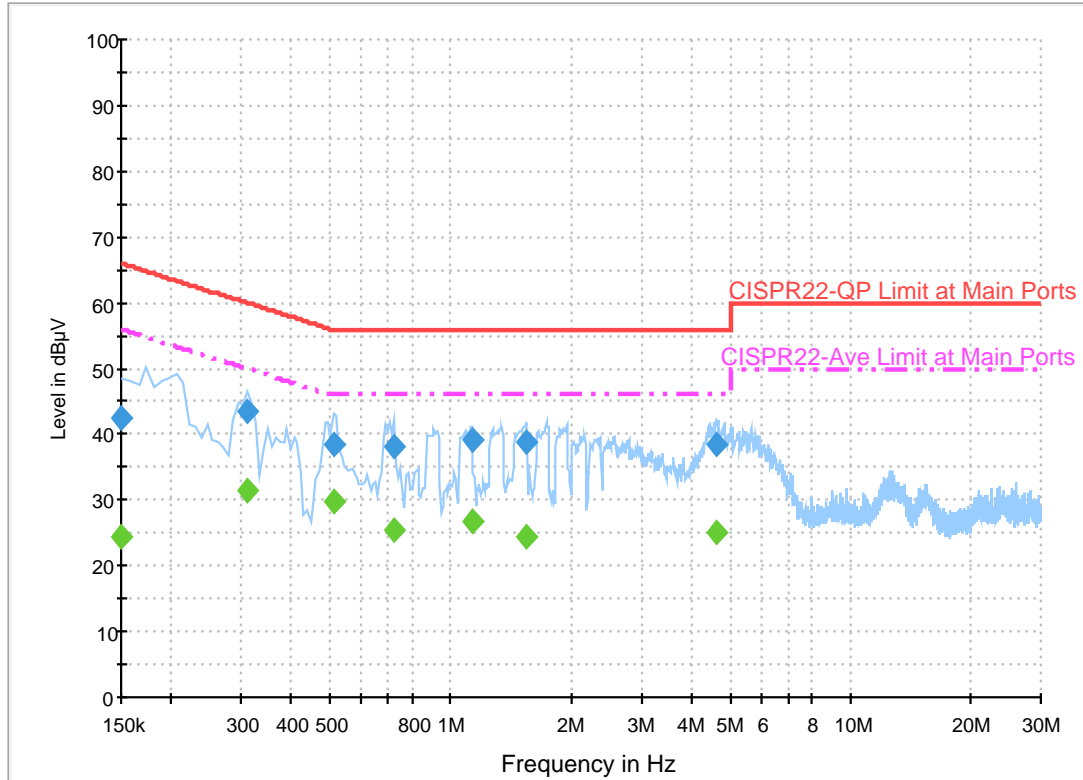
Final Result 2

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	24.4	Off	L1	19.6	31.6	56.0
0.310000	31.1	Off	L1	19.5	18.9	50.0
0.486000	25.9	Off	L1	19.5	20.3	46.2
0.686000	24.0	Off	L1	19.5	22.0	46.0
4.350000	25.8	Off	L1	19.6	20.2	46.0
4.510000	27.1	Off	L1	19.6	18.9	46.0
4.694000	25.6	Off	L1	19.6	20.4	46.0
13.814000	20.6	Off	L1	19.7	29.4	50.0

EUT Information

Report NO : 690221-01
 Test Mode : Mode 1
 Test Voltage : 120Vac/60Hz
 Phase : Neutral

ENV216 Auto Test-N



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	42.5	Off	N	19.5	23.5	66.0
0.310000	43.6	Off	N	19.5	16.4	60.0
0.510000	38.4	Off	N	19.5	17.6	56.0
0.726000	38.0	Off	N	19.5	18.0	56.0
1.134000	39.1	Off	N	19.5	16.9	56.0
1.550000	38.8	Off	N	19.5	17.2	56.0
4.654000	38.5	Off	N	19.6	17.5	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	24.4	Off	N	19.5	31.6	56.0
0.310000	31.5	Off	N	19.5	18.5	50.0
0.510000	29.7	Off	N	19.5	16.3	46.0
0.726000	25.4	Off	N	19.5	20.6	46.0
1.134000	26.9	Off	N	19.5	19.1	46.0
1.550000	24.3	Off	N	19.5	21.7	46.0
4.654000	25.2	Off	N	19.6	20.8	46.0



Appendix C. Radiated Spurious Emission

Test Engineer :	Jesse Wang and James Chiu	Temperature :	23~24°C
		Relative Humidity :	54~55%

2.4GHz 2400~2483.5MHz

WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI Ant.	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 09 2452MHz		2334.64	58.09	-15.91	74	52.08	31.83	8.28	34.1	120	148	P	H
		2389.24	46.67	-7.33	54	40.64	31.95	8.24	34.16	120	148	A	H
	*	2452	100.9	-	-	94.79	32.08	8.27	34.24	120	148	P	H
	*	2452	93.2	-	-	87.09	32.08	8.27	34.24	120	148	A	H
		2486	62.91	-11.09	74	56.72	32.16	8.3	34.27	120	148	P	H
		2483.5	51.28	-2.72	54	45.09	32.16	8.3	34.27	120	148	A	H
		2328.48	57.15	-16.85	74	51.18	31.79	8.28	34.1	149	168	P	V
		2389.52	47	-7	54	40.97	31.95	8.24	34.16	149	168	A	V
	*	2452	102.64	-	-	96.53	32.08	8.27	34.24	149	168	P	V
	*	2452	94.98	-	-	88.87	32.08	8.27	34.24	149	168	A	V
		2485.86	64.51	-9.49	74	58.32	32.16	8.3	34.27	149	168	P	V
	2483.5	52.39	-1.61	54	46.2	32.16	8.3	34.27	149	168	A	V	
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



**2.4GHz 2400~2483.5MHz
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 09 2452MHz		4904	41.46	-32.54	74	54.61	34.22	11.87	59.24	100	0	P	H	
		7356	42.6	-31.4	74	50	35.68	15.01	58.09	100	0	P	H	
													H	
													H	
			4904	41.49	-32.51	74	54.64	34.22	11.87	59.24	-	-	P	V
			7356	43.77	-30.23	74	51.17	35.68	15.01	58.09	100	0	P	V
														V
													V	
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.													



Emission below 1GHz
2.4GHz WIFI 802.11n HT40 (LF)

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)	
2.4GHz 802.11n HT40 LF		79.95	35.6	-4.4	40	51.88	13.19	2.11	31.58	100	51	P	H	
		184.98	33.7	-9.8	43.5	47.73	14.72	2.72	31.47	-	-	P	H	
		291.63	38.87	-7.13	46	47.87	19.03	3.28	31.31	-	-	P	H	
		323.8	38.47	-7.53	46	46.81	19.49	3.43	31.26	-	-	P	H	
		356	37.92	-8.08	46	45.03	20.53	3.57	31.21	-	-	P	H	
		576.5	38.17	-7.83	46	39.27	25.57	4.2	30.87	-	-	P	H	
														H
														H
														H
														H
														H
														H
			81.84	30.39	-9.61	40	46.43	13.43	2.11	31.58	-	-	P	V
			185.25	24.9	-18.6	43.5	38.93	14.72	2.72	31.47	-	-	P	V
			291.09	28.09	-17.91	46	37.11	19.01	3.28	31.31	-	-	P	V
			454	36.53	-9.47	46	40.63	23.07	3.88	31.05	-	-	P	V
			575.8	37.27	-8.73	46	38.37	25.57	4.2	30.87	100	110	P	V
			899.9	35.42	-10.58	46	31.75	28.92	5.27	30.52	-	-	P	V
													V	
													V	
													V	
													V	
													V	
													V	
Remark	1. No other spurious found. 2. All results are PASS against limit line.													



Note symbol

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



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		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

- Level(dBμV/m) =
Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
- Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

- 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)
- Over Limit(dB)
= Level(dBμV/m) – Limit Line(dBμV/m)
= 55.45(dBμV/m) – 74(dBμV/m)
= -18.55(dB)

For Average Limit @ 2390MHz:

- 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)
- 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”.

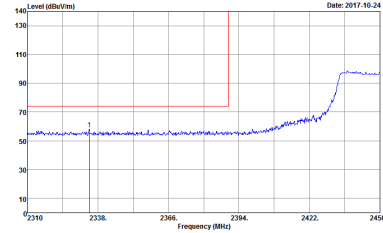
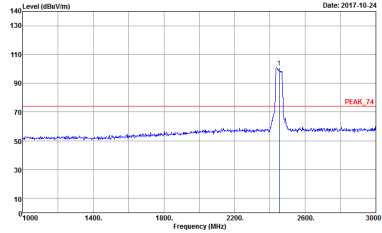
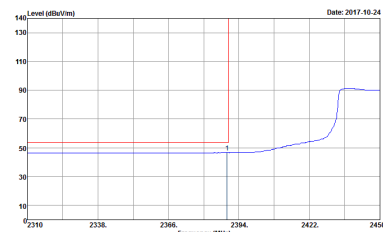
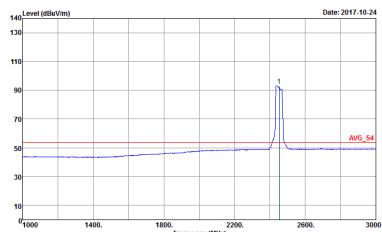


Appendix D. Radiated Spurious Emission Plots

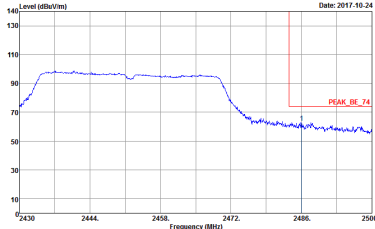
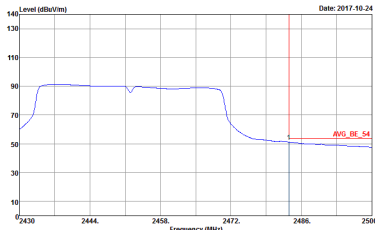
Test Engineer :	Jesse Wang and James Chiu	Temperature :	23~24°C
		Relative Humidity :	54~55%



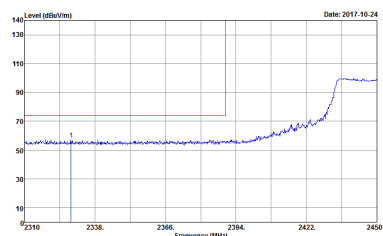
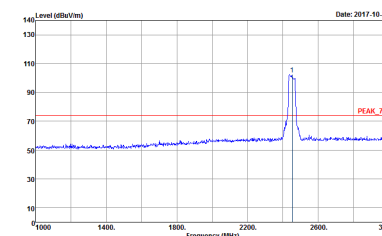
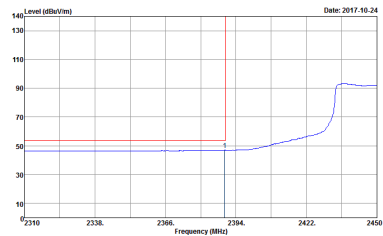
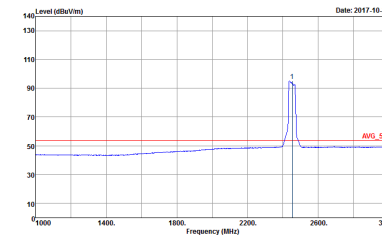
2.4GHz 2400~2483.5MHz
WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH09 2452MHz - L	
1	Horizontal	Fundamental
Peak	 <p>Site : 03CH07-HY Condition : PEAK_BE_74 3m HF_ANT_00075962 HORIZONTAL Detector : Peak Project : 690221-01 Mode : 5</p>	 <p>Site : 03CH07-HY Condition : PEAK_74 3m HF_ANT_00075962 HORIZONTAL Detector : Peak Project : 690221-01 Mode : 5</p>
Avg.	 <p>Site : 03CH07-HY Condition : AVG_BE_54 3m HF_ANT_00075962 HORIZONTAL Detector : Peak Project : 690221-01 Mode : 5</p>	 <p>Site : 03CH07-HY Condition : AVG_54 3m HF_ANT_00075962 HORIZONTAL Detector : Peak Project : 690221-01 Mode : 5</p>

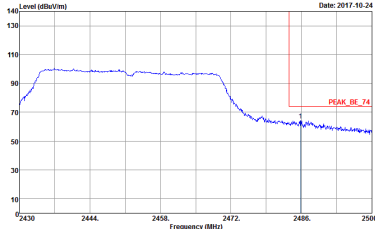
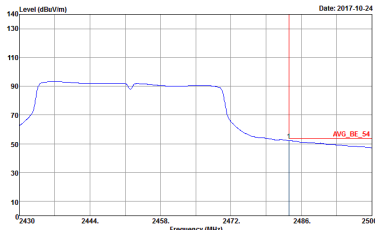


WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH09 2452MHz - R	
1	Horizontal	Fundamental
<p>Peak</p>	 <p>Site : 03CH07-HY Condition : PEAK_BE_74 3m HF_ANT_00075962 HORIZONTAL RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Detector : Peak Project : 690221-01 Mode : S</p>	<p>Left blank</p>
<p>Avg.</p>	 <p>Site : 03CH07-HY Condition : AVG_BE_54 3m HF_ANT_00075962 HORIZONTAL RBW:1000.000kHz VBW:0.010kHz SWT:Auto Detector : Peak Project : 690221-01 Mode : S</p>	<p>Left blank</p>



WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH09 2452MHz - L	
1	Vertical	Fundamental
Peak	 <p>Site : 03CH07-4Y Condition : PEAK_BE_74 3m HF_ANT_00075962 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 690221-01 Mode : 5</p>	 <p>Site : 03CH07-4Y Condition : PEAK_74 3m HF_ANT_00075962 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 690221-01 Mode : 5</p>
Avg.	 <p>Site : 03CH07-4Y Condition : AVG_BE_54 3m HF_ANT_00075962 VERTICAL RBW:1000.000KHz VBW:0.010KHz SWT:Auto Detector : Peak Project : 690221-01 Mode : 5</p>	 <p>Site : 03CH07-4Y Condition : AVG_54 3m HF_ANT_00075962 VERTICAL RBW:1000.000KHz VBW:0.010KHz SWT:Auto Detector : Peak Project : 690221-01 Mode : 5</p>



WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH09 2452MHz - R	
1	Vertical	Fundamental
<p>Peak</p>	 <p>Site : 03CH07-HY Condition : PEAK_BE_74 3m HF_ANT_00075962 VERTICAL RBW:1000.000kHz VBW:3000.000kHz SWF:Auto Detector : Peak Project : 690221-01 Mode : 5</p>	<p>Left blank</p>
<p>Avg.</p>	 <p>Site : 03CH07-HY Condition : AVG_BE_54 3m HF_ANT_00075962 VERTICAL RBW:1000.000kHz VBW:0.010kHz SWF:Auto Detector : Peak Project : 690221-01 Mode : 5</p>	<p>Left blank</p>

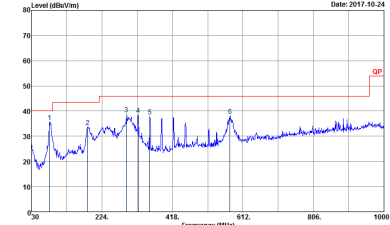
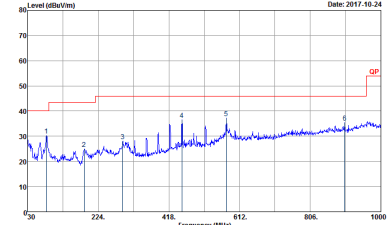


**2.4GHz 2400~2483.5MHz
WIFI 802.11n HT40 (Harmonic @ 3m)**

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11n HT40 CH09 2452MHz	
1	Horizontal	Vertical
Peak Avg.	<p>Site : 03CH07-11Y Condition : PEAK_74 3m SHF-EHF_131029 HORIZONTAL Detector : Peak Project : 690221-01 Mode : S</p>	<p>Site : 03CH07-11Y Condition : PEAK_74 3m SHF-EHF_131029 VERTICAL Detector : Peak Project : 690221-01 Mode : S</p>



Emission below 1GHz
2.4GHz WIFI 802.11n HT40 (LF)

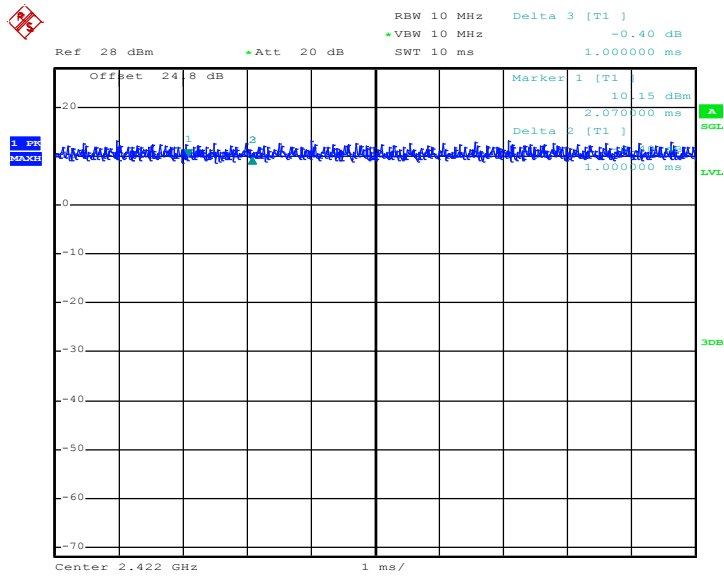
WIFI	2.4GHz 2400~2483.5MHz	
ANT	802.11n HT40 LF	
1	Horizontal	Vertical
QP / Peak	 <p>Site : 03CH07-4FY Condition : QP 3m LF-ANT-35419(6) HORIZONTAL Detector : Peak Project : 690221-01 Mode : 6</p>	 <p>Site : 03CH07-4FY Condition : QP 3m LF-ANT-35419(6) VERTICAL Detector : Peak Project : 690221-01 Mode : 6</p>



Appendix E. Duty Cycle Plots

Band	Duty Cycle (%)	T(us)	1/T(kHz)	VBW Setting
2.4GHz 802.11n HT40	100	-	-	10Hz

802.11n HT40



Date: 13.OCT.2017 11:51:09