FCC RADIO TEST REPORT

FCC ID	:	**Q3K-5XACULCHG**
Equipment	:	**5 GHz Outdoor PtP/PtMP High Gain Radio Unit**
Brand Name	:	**RADWIN 2000, RADWIN 5000**
Model Name	:	**Alpha INT, SU-Air INT, SU-Pro INT**
Applicant	:	**Radwin Ltd. Habarzel 27 Tel Aviv ISRAEL**
Manufacturer	:	**Radwin Ltd. Habarzel 27 Tel Aviv ISRAEL**
Standard	:	**FCC Part 15 Subpart C §15.247**

The product was received on Oct. 31, 2018 and testing was started from Nov. 06, 2018 and completed on Nov. 15, 2018. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Joseph Lin

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

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Appendix B. AC Conducted Emission Test Result

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History of this test report

Report No.	Version	Description	Issued Date
FR8O3134A	01	Initial issue of report	Nov. 27, 2018

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.247(a)(2)	6dB Bandwidth	Pass	-
3.1	2.1049	99% Occupied Bandwidth	Reporting only	-
3.2	15.247(b)	Power Output Measurement	Pass	-
3.3	15.247(e)	Power Spectral Density	Pass	-
3.4	15.247(d)	Conducted Band Edges	Pass	-
		Conducted Spurious Emission	Pass	-
3.5	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	Pass	Under limit 0.47 dB at 2388.680 MHz
3.6	15.207	AC Conducted Emission	Pass	Under limit 7.71 dB at 0.470 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	Pass	-

Declaration of Conformity:
The judgment of conformity in the report is based on the measurement results excluding the measurement uncertainty.
Comments and Explanations:
None

Reviewed by: Wii Chang

Report Producer: Nancy Yang

1 General Description

1.1 Product Feature of Equipment Under Test

Wireless 2.4GHz and Wireless 5GHz

Product Specification subjective to this standard	
Antenna Type	Wireless 2.4GHz: Printed PCB Antenna Wireless 5GHz: Integrated FP Xpole Antenna

1.2 Modification of EUT

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

1.3 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1190 and 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, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978	
Test Site No.	**Sporton Site No.**	
	TH05-HY	CO05-HY

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.**
	03CH13-HY

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

1.4 Applicable Standards

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

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05
- FCC KDB 414788 D01 Radiated Test Site v01r01.
- 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).

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		

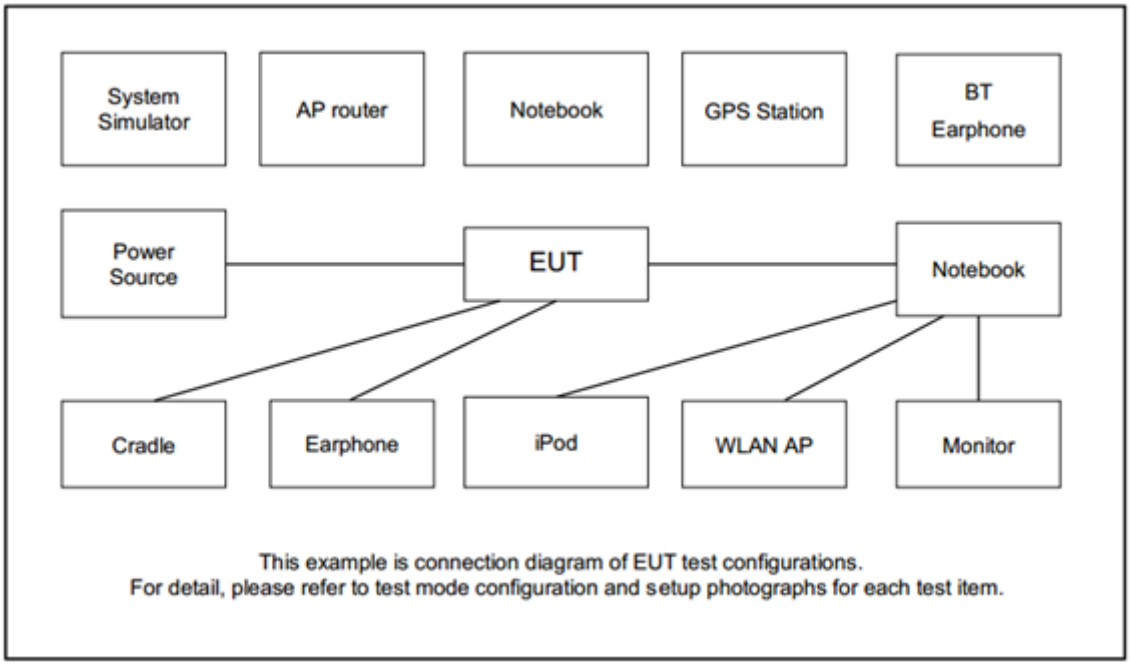
2.2 Test Mode

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

Modulation	Data Rate
802.11n HT20	**MCS0**
802.11n HT40	**MCS0**

Test Cases	
AC Conducted Emission	Mode 1 :WLAN (2.4GHz) Tx + LAN Link + POE Adapter

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.	Notebook	Vostro	Vostro3360	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m

2.5 EUT Operation Test Setup

The RF test items, utility “QRCT” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

2.6 Measurement Results Explanation Example

For all conducted test items:

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

Example:

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

Offset = RF cable loss + attenuator factor.

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

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

= 4.2 + 10 = 14.2 (dB)

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

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

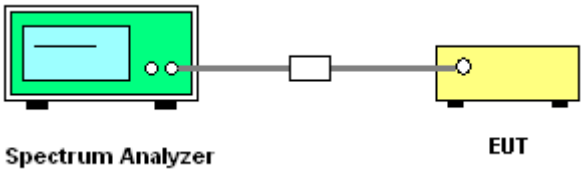
3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

3.1.3 Test Procedures

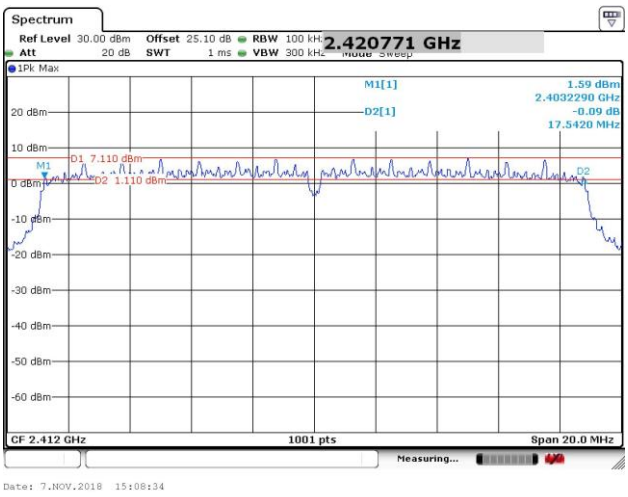
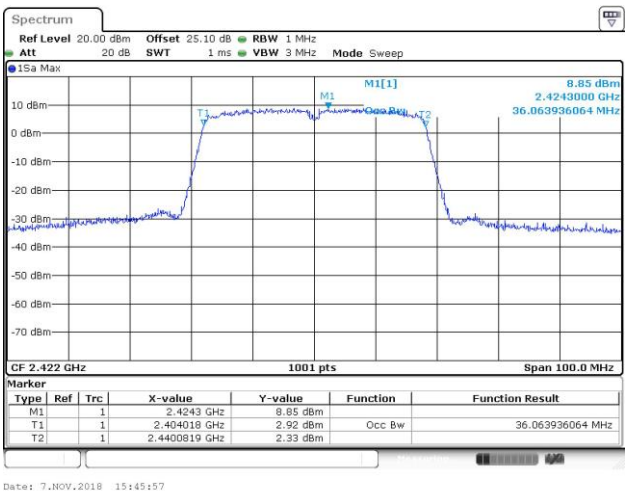
1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v05.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 1-5% of the emission bandwidth and set the Video bandwidth (VBW) ≥ 3 * RBW.
6. Measure and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of 6dB and 99% Occupied Bandwidth

Please refer to Appendix A.

Minimum 6dB Bandwidth	Maximum 99% Occupied Bandwidth
	

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

3.2 Output Power Measurement

3.2.1 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 with directional gain greater than 6dBi is 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.

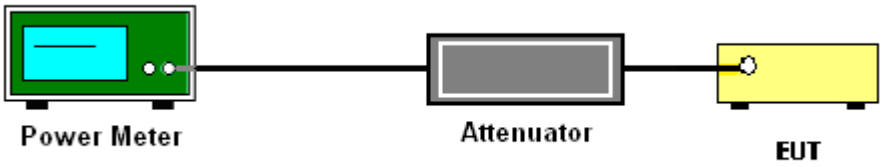
3.2.2 Measuring Instruments

See list of measuring equipment of this test report.

3.2.3 Test Procedures

1. For Peak Power, the testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v05 section 9.1.3 PKPM1 Peak power meter method.
2. For Average Power, the testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v05 section 9.2.3.1 Method AVGPM.
3. 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.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. Measure the conducted output power and record the results in the test report.

3.2.4 Test Setup



3.2.5 Test Result of Peak Output Power

Please refer to Appendix A.

3.2.6 Test Result of Average output Power (Reporting Only)

Please refer to Appendix A.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

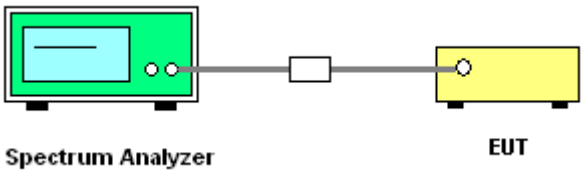
3.3.2 Measuring Instruments

See list of measuring equipment of this test report.

3.3.3 Test Procedures

1. The testing follows Measurement Procedure 10.2 Method PKPSD of FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05
2. The RF output of EUT was connected to the spectrum analyzer 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. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.

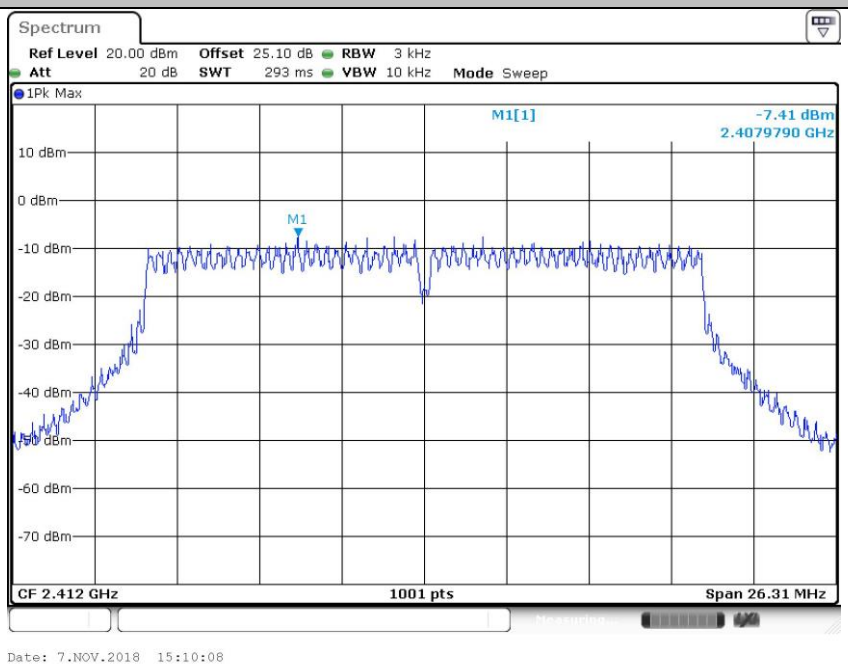
3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

Worst Case Power Density (dBm/3kHz)



3.4 Conducted Band Edges and Spurious Emission Measurement

3.4.1 Limit of Conducted Band Edges and Spurious Emission Measurement

In any 100 kHz bandwidth outside of the authorized frequency band, the emissions which fall in the non-restricted bands shall be attenuated at least 20 dB / 30dB relative to the maximum PSD level in 100 kHz by RF conducted measurement.

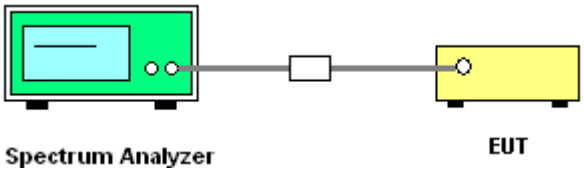
3.4.2 Measuring Instruments

See list of measuring equipment of this test report.

3.4.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05.
2. The RF output of EUT was connected to the spectrum analyzer 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. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d).
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.4.4 Test Setup

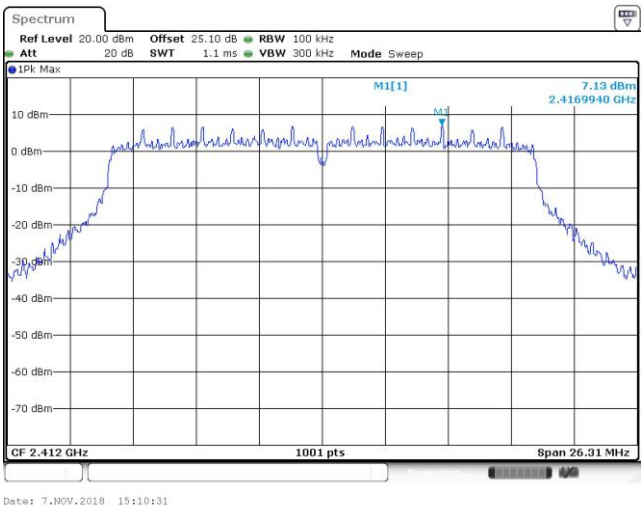


3.4.5 Test Result of Conducted Band Edges and Spurious Emission

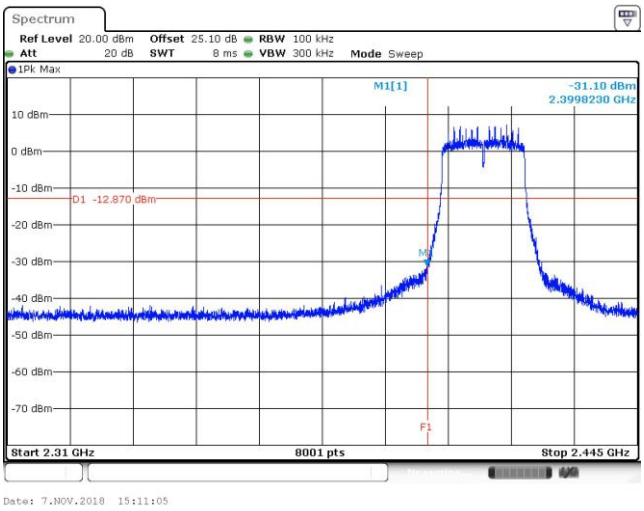
Test Engineer :	Tommy Lee	**Temperature :**	21~25℃
		Relative Humidity :	51~54%

Test Mode :	802.11n HT20	**Test Channel :**	01

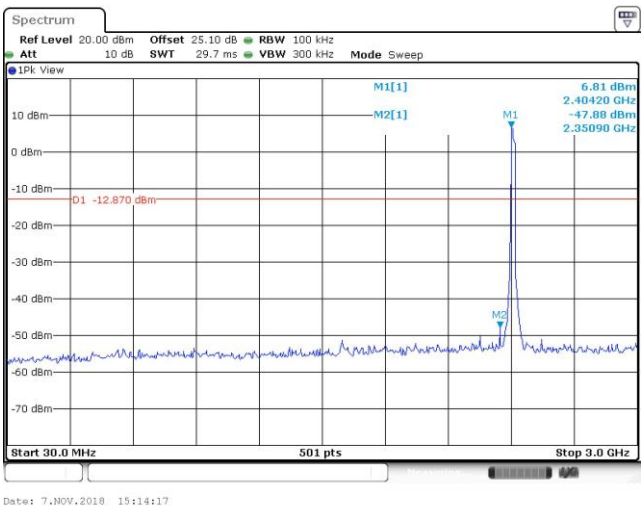
100kHz PSD reference Level



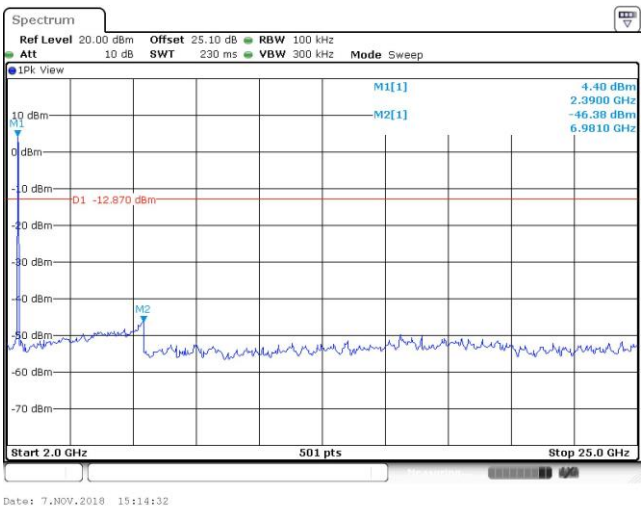
Channel Plot



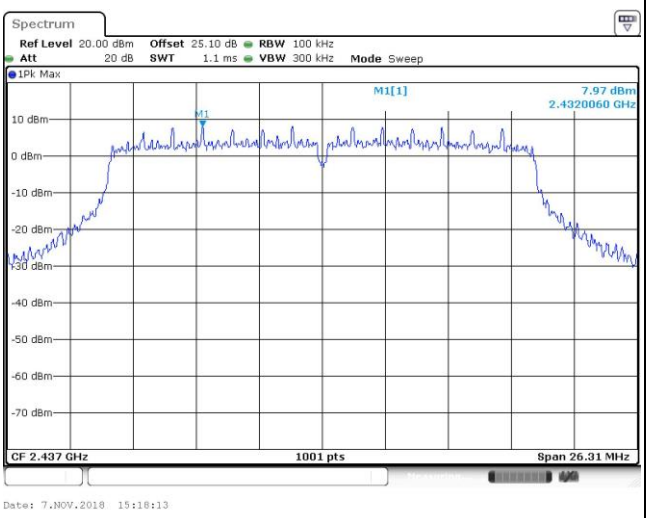
Spurious Emission 30MHz~3GHz

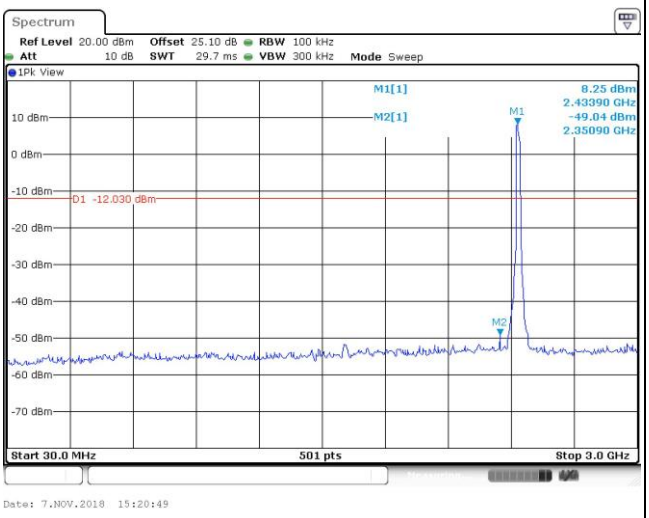
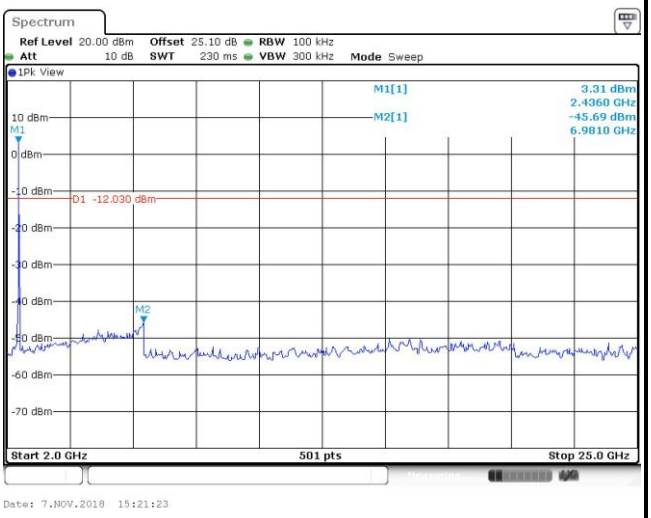


Spurious Emission 2GHz~25GHz

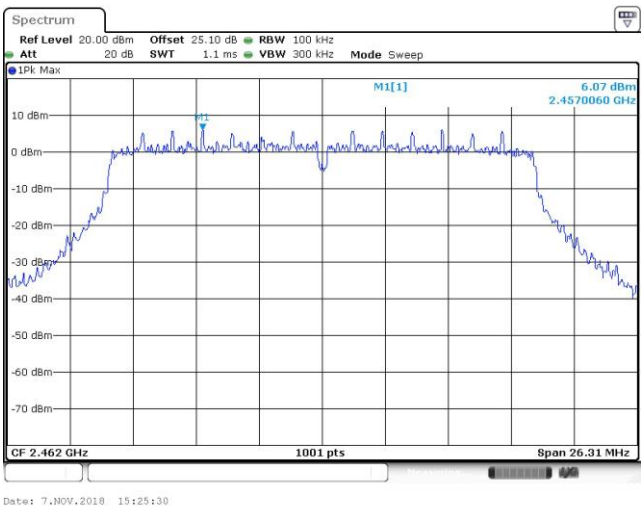
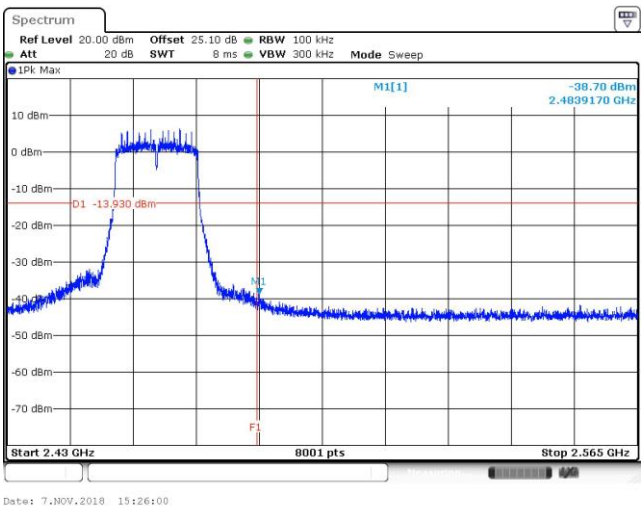
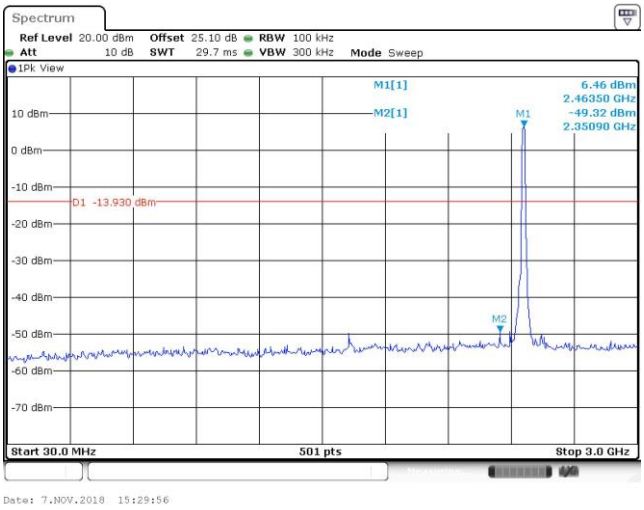
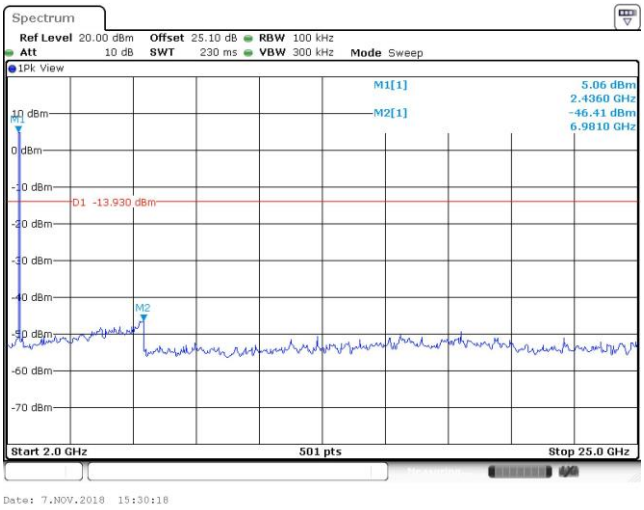


Test Mode :	802.11n HT20	Test Channel :	06

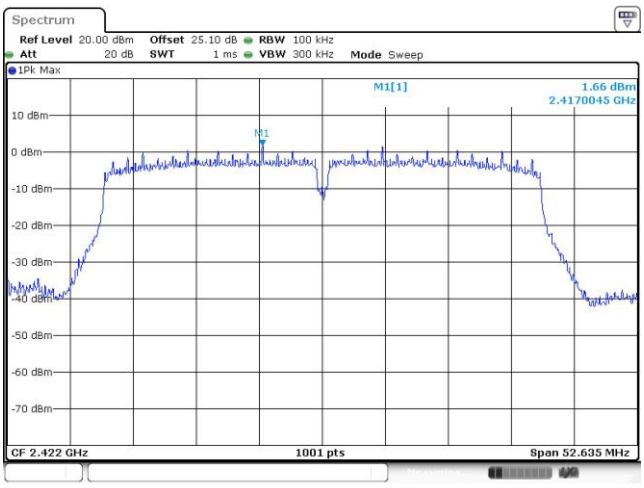
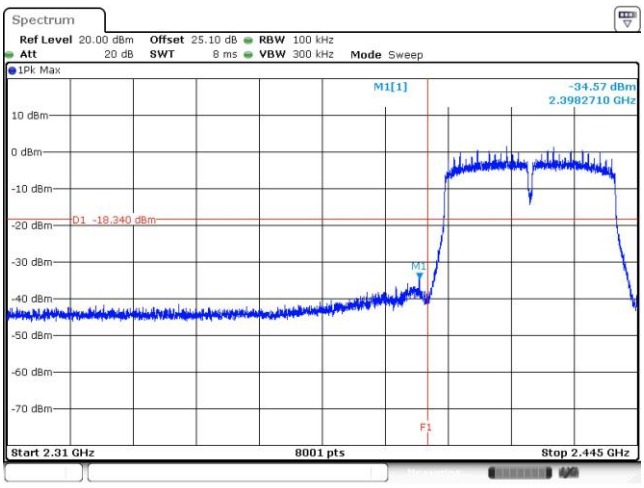
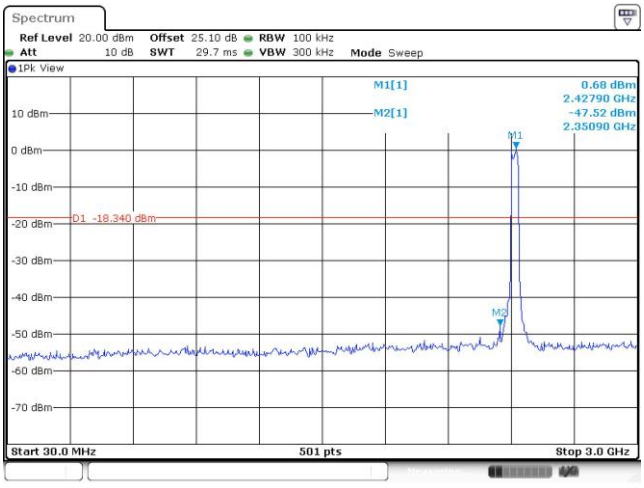
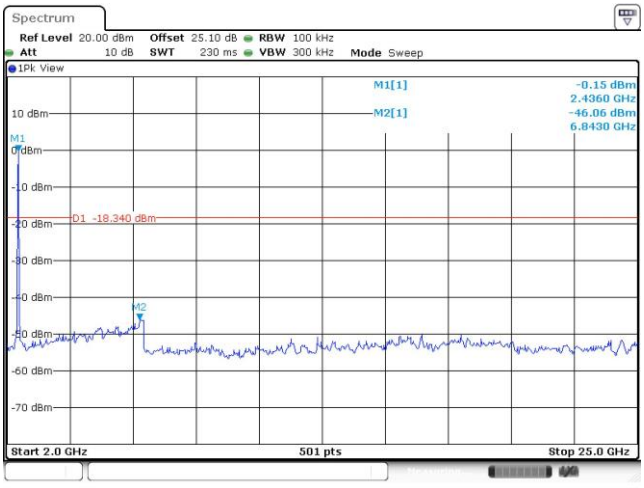
100kHz PSD reference Level	Channel Plot
	

Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

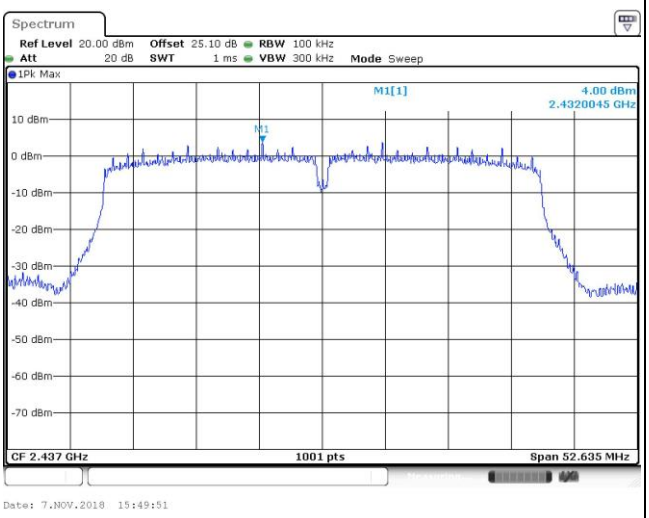
Test Mode :	802.11n HT20	Test Channel :	11

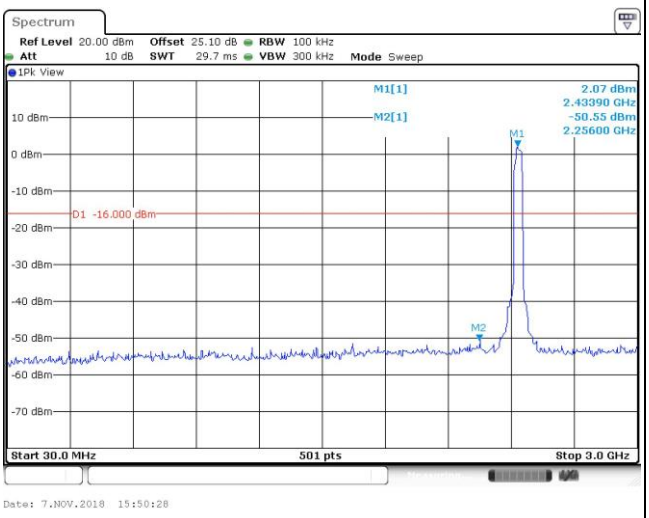
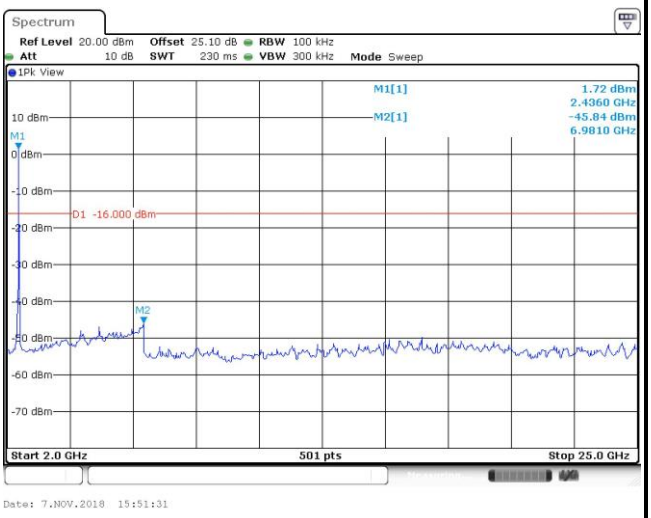
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT40	Test Channel :	03

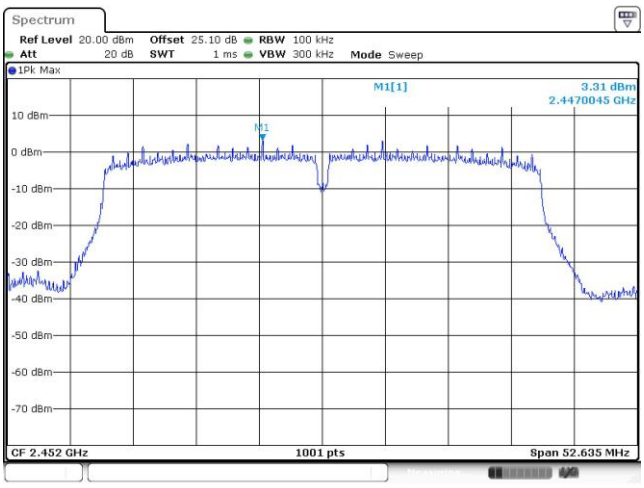
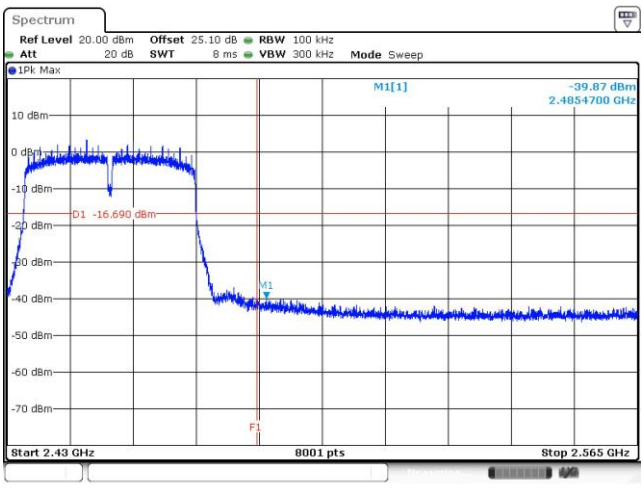
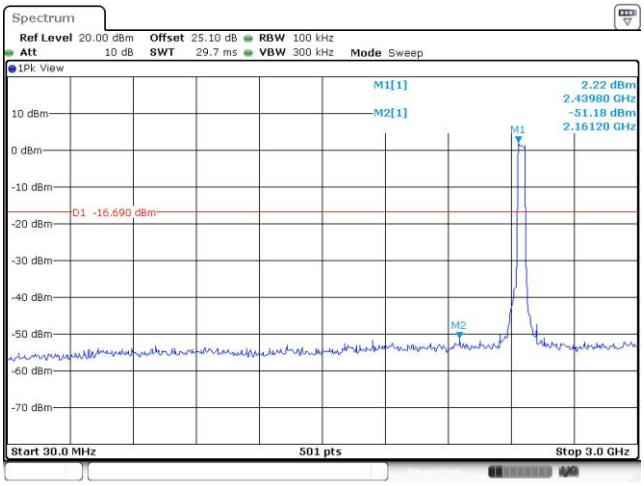
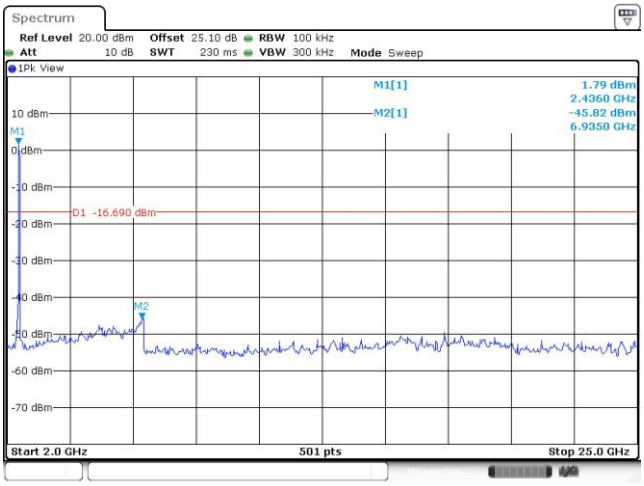
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

Test Mode :	802.11n HT40	Test Channel :	06

100kHz PSD reference Level	Channel Plot
	

Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

Test Mode :	802.11n HT40	Test Channel :	09

100kHz PSD reference Level	Channel Plot
	
Date: 7.NOV.2018 15:58:47	Date: 7.NOV.2018 15:59:27
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 7.NOV.2018 16:00:10	Date: 7.NOV.2018 16:00:35

3.5 Radiated Band Edges and Spurious Emission Measurement

3.5.1 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

3.5.2 Measuring Instruments

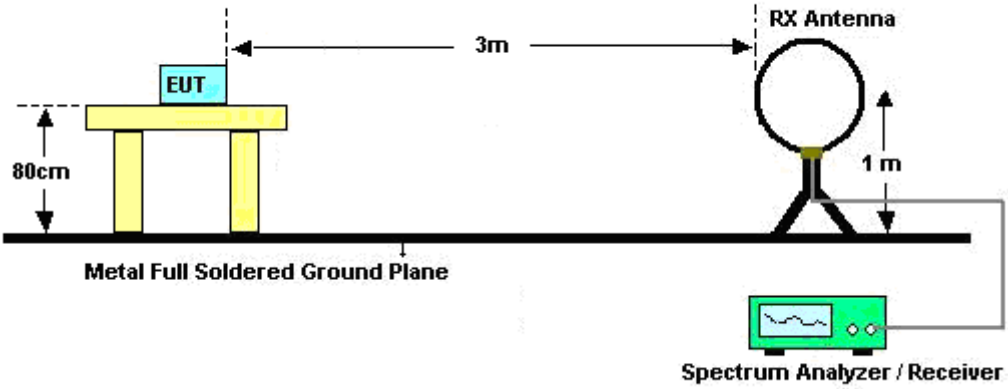
See list of measuring equipment of this test report.

3.5.3 Test Procedures

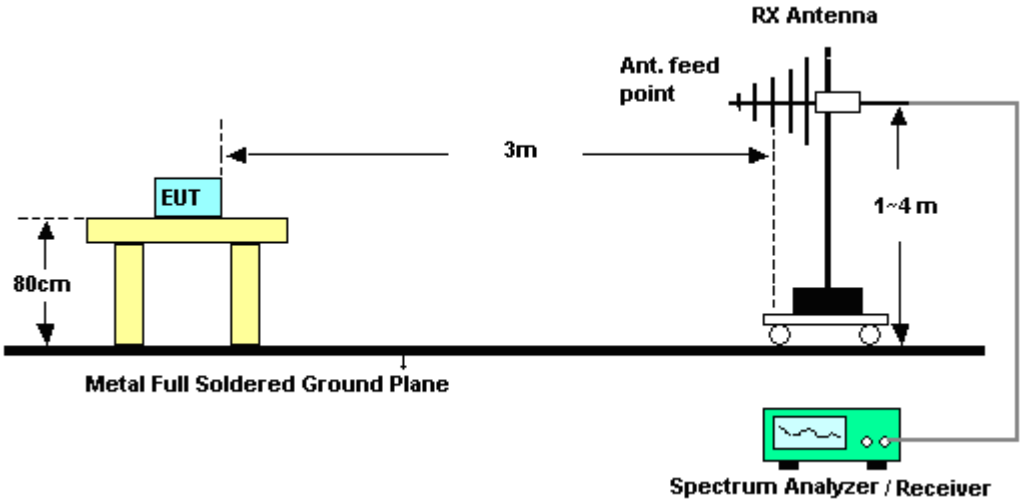
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test 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 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.
8. 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 ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
   (3) Set RBW = 1 MHz, VBW= 3MHz for f ≥ 1 GHz for peak measurement.
   For average measurement:
   - 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.

3.5.4 Test Setup

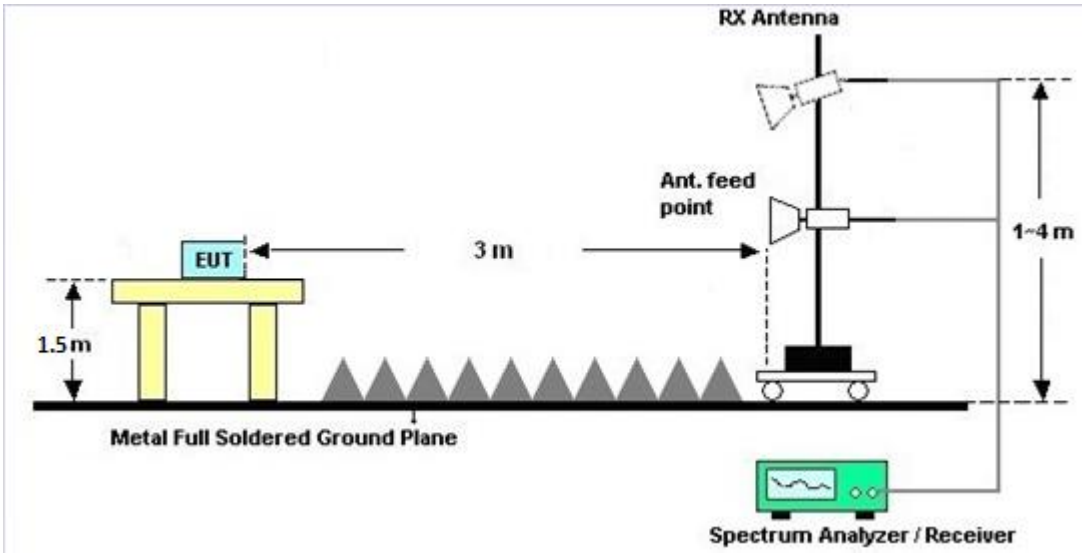
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.5.5 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.

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C and D.

3.5.7 Duty Cycle

Please refer to Appendix E.

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

Please refer to Appendix C and D.

3.6 AC Conducted Emission Measurement

3.6.1 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.

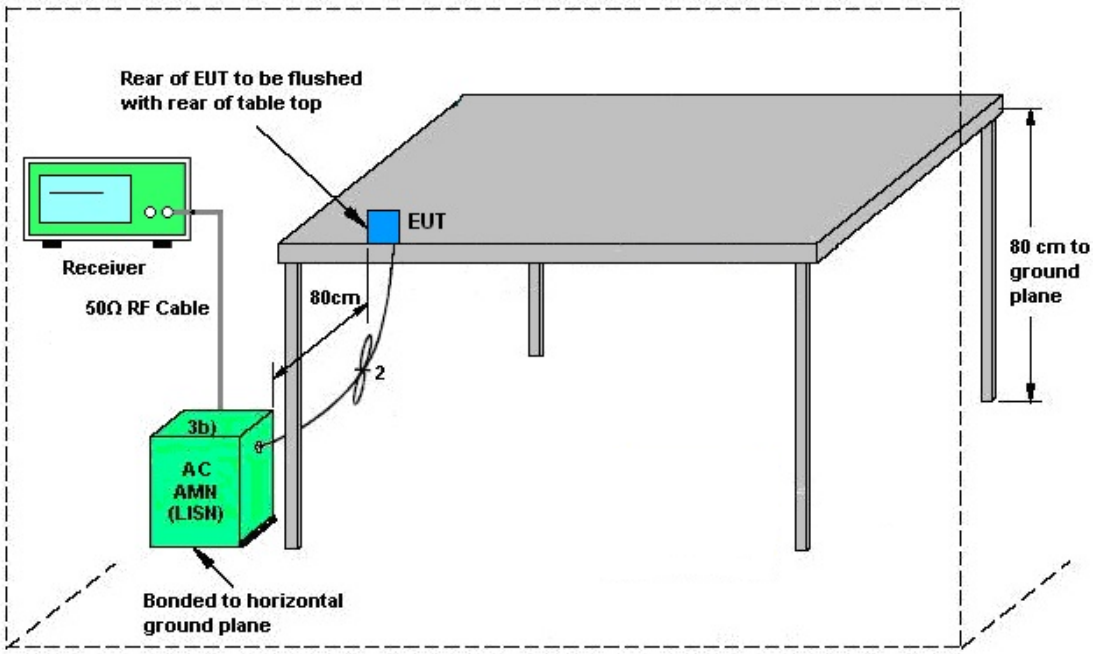
3.6.2 Measuring Instruments

See list of measuring equipment of this test report.

3.6.3 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.

3.6.4 Test Setup



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

3.6.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.7 Antenna Requirements

3.7.1 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. 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.

3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.7.3 Antenna Gain

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

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Power Meter	Anritsu	ML2495A	1218006	N/A	Oct. 08, 2018	Nov. 07, 2018	Oct. 07, 2019	Conducted (TH05-HY)
Power Sensor	Anritsu	MA2411B	1207363	300MHz~ 40GHz	Oct. 08, 2018	Nov. 07, 2018	Oct. 07, 2019	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSV 30	100895	9kHz~30GHz	Apr. 20, 2018	Nov. 07, 2018	Apr. 19, 2019	Conducted (TH05-HY)
Switch Box & RF Cable	Burgeon	ETF-058	EC1300484	N/A	Mar. 01, 2018	Nov. 07, 2018	Feb. 28, 2019	Conducted (TH05-HY)
Amplifier	Sonoma-Instrument	310 N	187282	9KHz~1GHz	Dec. 21, 2016	Nov. 06, 2018~ Nov. 15, 2018	Dec. 20, 2018	Radiation (03CH13-HY)
Preamplifier	MITEQ	AMF-7D-00101800-30-10P	1590074	1GHz~18GHz	May 21, 2018	Nov. 06, 2018~ Nov. 15, 2018	May 20, 2019	Radiation (03CH13-HY)
Preamplifier	Keysight	83017A	MY53270147	1GHz~26.5GHz	Feb. 02, 2018	Nov. 06, 2018~ Nov. 15, 2018	Feb. 01, 2019	Radiation (03CH13-HY)
Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz, VSWR : 2.5:1 max	Jul. 16, 2018	Nov. 06, 2018~ Nov. 15, 2018	Jul. 15, 2019	Radiation (03CH13-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Nov. 23, 2017	Nov. 06, 2018~ Nov. 15, 2018	Nov. 22, 2018	Radiation (03CH13-HY)
Bilog Antenna	TESEQ	CBL 6111D&00800N1D01N-06	40103&07	30MHz to 1GHz	Jan. 10, 2018	Nov. 06, 2018~ Nov. 15, 2018	Jan. 09, 2019	Radiation (03CH13-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1241	1GHz ~ 18GHz	Jun. 29, 2018	Nov. 06, 2018~ Nov. 15, 2018	Jun. 28, 2019	Radiation (03CH13-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170584	18GHz- 40GHz	Nov. 27, 2017	Nov. 06, 2018~ Nov. 15, 2018	Nov. 26, 2018	Radiation (03CH13-HY)
EMI Test Receiver	Agilent	N9038A (MXE)	MY53290053	20Hz to 26.5GHz	Jan. 16, 2018	Nov. 06, 2018~ Nov. 15, 2018	Jan. 15, 2019	Radiation (03CH13-HY)
Spectrum Analyzer	Keysight	N9010A	MY55370526	10Hz~44GHz	Mar. 15, 2018	Nov. 06, 2018~ Nov. 15, 2018	Mar. 14, 2019	Radiation (03CH13-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Nov. 06, 2018~ Nov. 15, 2018	N/A	Radiation (03CH13-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Nov. 06, 2018~ Nov. 15, 2018	N/A	Radiation (03CH13-HY)
Filter	Microwave	H3G018G1	SN477219	3.0G High Pass	Nov. 02, 2018	Nov. 06, 2018~ Nov. 15, 2018	Nov. 01, 2019	Radiation (03CH13-HY)
Filter	Wainwright	WLKS1200-8SS	SN3	1.2G Low Pass	Nov. 02, 2018	Nov. 06, 2018~ Nov. 15, 2018	Nov. 01, 2019	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126E	0030/126E	30M-18G	Jan. 22, 2018	Nov. 06, 2018~ Nov. 15, 2018	Jan. 21, 2019	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	335041/4	30M-18G	Jan. 22, 2018	Nov. 06, 2018~ Nov. 15, 2018	Jan. 21, 2019	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24961/4	30M~18GHz	Jan. 22, 2018	Nov. 06, 2018~ Nov. 15, 2018	Jan. 21, 2019	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2859/2	30M~40GHz	Mar. 14, 2018	Nov. 06, 2018~ Nov. 15, 2018	Mar. 13, 2019	Radiation (03CH13-HY)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Nov. 08, 2018	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9KHz~3.6GHz	Dec. 08, 2017	Nov. 08, 2018	Dec. 07, 2018	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 30, 2017	Nov. 08, 2018	Nov. 29, 2018	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Nov. 08, 2018	N/A	Conduction (CO05-HY)
LF Cable	HUBER + SUHNER	RG-214/U	LF01	N/A	Jan. 03, 2018	Nov. 08, 2018	Jan. 02, 2019	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Jan. 03, 2018	Nov. 08, 2018	Jan. 02, 2019	Conduction (CO05-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.2

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.9

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

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

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.3

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Tommy Lee	Temperature:	21~25	°C
Test Date:	2018/11/7	Relative Humidity:	51~54	%

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

2.4GHz Band										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)		6dB BW (MHz)		6dB BW Limit (MHz)	Pass/Fail
					Ant 1	Ant 2	Ant 1	Ant 2		
HT20	MCS0	1	1	2412	17.63	-	17.54	-	0.50	Pass
HT20	MCS0	1	6	2437	17.68	-	17.54	-	0.50	Pass
HT20	MCS0	1	11	2462	17.63	-	17.54	-	0.50	Pass
HT40	MCS0	1	3	2422	36.06	-	35.09	-	0.50	Pass
HT40	MCS0	1	6	2437	36.06	-	35.09	-	0.50	Pass
HT40	MCS0	1	9	2452	36.06	-	35.09	-	0.50	Pass

Report Number : FR8O3134A

TEST RESULTS DATA
Peak Output Power

2.4GHz Band																
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
					Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	
HT20	MCS0	1	1	2412	23.63	-	-	30.00	-	3.00	-	26.63	-	36.00	-	Pass
HT20	MCS0	1	6	2437	24.10	-	-	30.00	-	3.00	-	27.10	-	36.00	-	Pass
HT20	MCS0	1	11	2462	23.03	-	-	30.00	-	3.00	-	26.03	-	36.00	-	Pass
HT40	MCS0	1	3	2422	21.82	-	-	30.00	-	3.00	-	24.82	-	36.00	-	Pass
HT40	MCS0	1	6	2437	23.21	-	-	30.00	-	3.00	-	26.21	-	36.00	-	Pass
HT40	MCS0	1	9	2452	22.81	-	-	30.00	-	3.00	-	25.81	-	36.00	-	Pass

Note: Measured power (dBm) has offset with cable loss.

TEST RESULTS DATA
Average Output Power

2.4GHz Band									
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power (dBm)		
					Ant 1	Ant 2	Ant 1	Ant 2	SUM
HT20	MCS0	1	1	2412	0.25	-	18.16	-	-
HT20	MCS0	1	6	2437	0.25	-	19.18	-	
HT20	MCS0	1	11	2462	0.25	-	17.27	-	
HT40	MCS0	1	3	2422	0.46	-	15.34	-	
HT40	MCS0	1	6	2437	0.46	-	17.38	-	
HT40	MCS0	1	9	2452	0.46	-	16.76	-	

Note: Measured power (dBm) has offset with cable loss.

Report Number : FR8O3134A

TEST RESULTS DATA
Peak Power Spectral Density

2.4GHz Band												
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm/3kHz)			DG (dBi)		Peak PSD Limit (dBm/3kHz)		Pass/Fail
					Ant 1	Ant 2	Worse + 3.01	Ant 1	Ant 2	Ant 1	Ant 2	
HT20	MCS0	1	1	2412	-7.41	-	-	3.00	-	8.00	-	Pass
HT20	MCS0	1	6	2437	-7.58	-	-	3.00	-	8.00	-	Pass
HT20	MCS0	1	11	2462	-9.19	-	-	3.00	-	8.00	-	Pass
HT40	MCS0	1	3	2422	-13.90	-	-	3.00	-	8.00	-	Pass
HT40	MCS0	1	6	2437	-10.18	-	-	3.00	-	8.00	-	Pass
HT40	MCS0	1	9	2452	-11.76	-	-	3.00	-	8.00	-	Pass

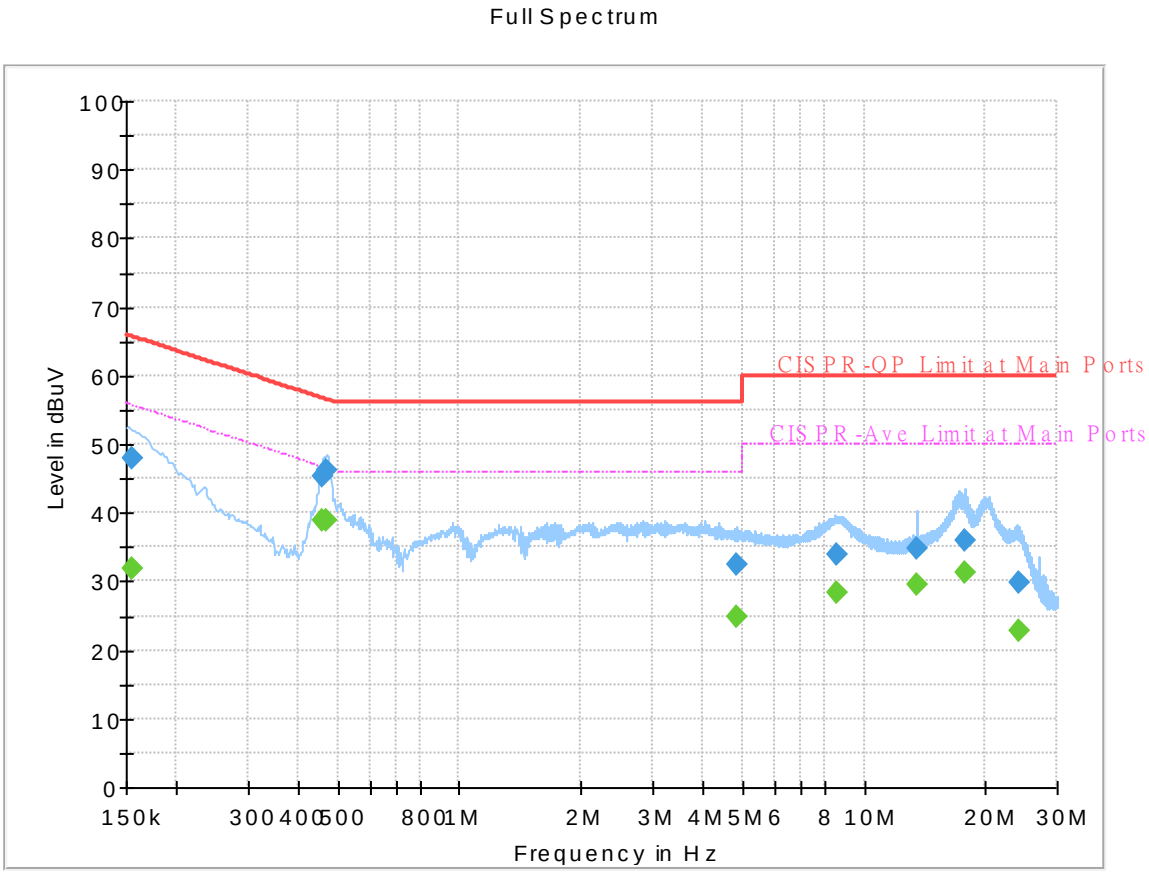
Measured power density (dBm) has offset with cable loss.

Appendix B. AC Conducted Emission Test Results

Test Engineer :	Jimmy Chang and Rick Lin	**Temperature :**	24~26℃
		Relative Humidity :	52~53%

EUT Information

Report NO :	8O3134
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Line

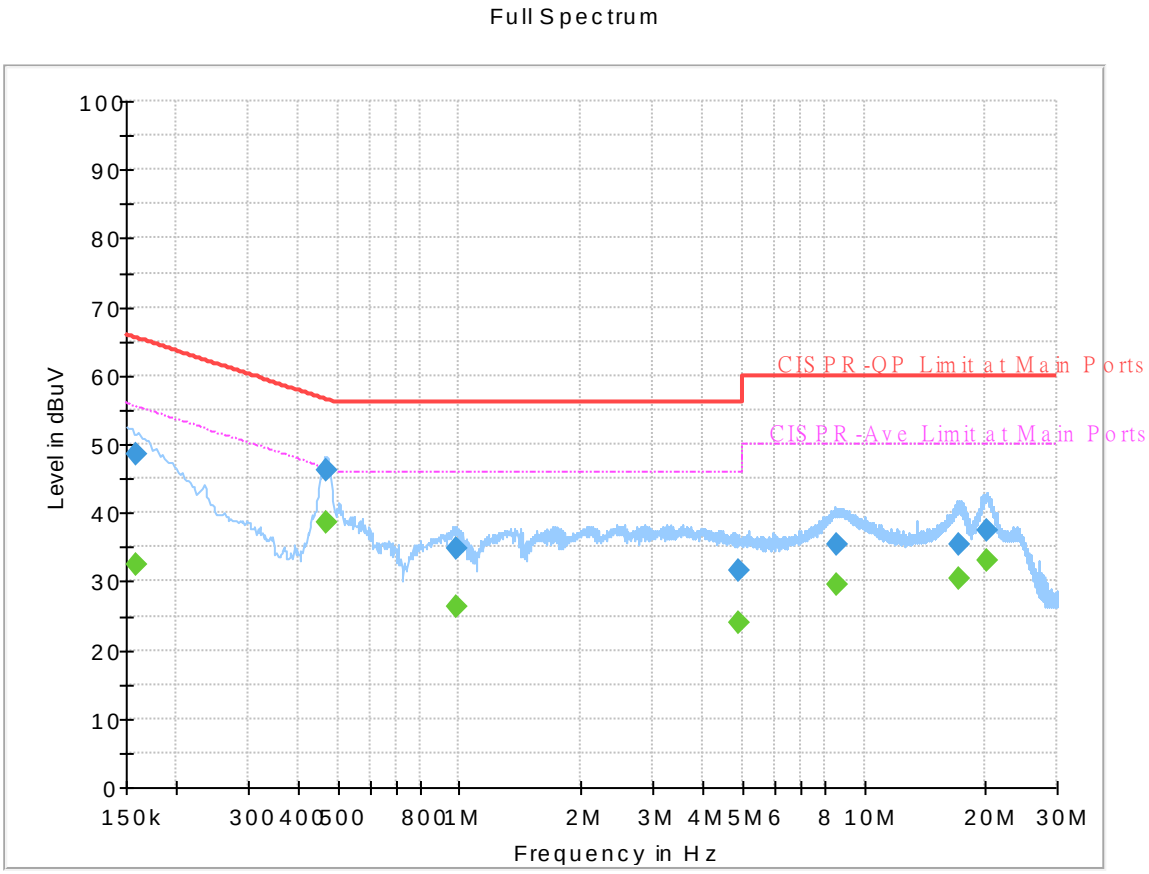


Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.154500	---	31.82	55.75	23.93	L1	OFF	19.5
0.154500	47.85	---	65.75	17.90	L1	OFF	19.5
0.458250	---	38.88	46.72	7.84	L1	OFF	19.5
0.458250	45.39	---	56.72	11.33	L1	OFF	19.5
0.469500	---	38.81	46.52	7.71	L1	OFF	19.5
0.469500	46.27	---	56.52	10.25	L1	OFF	19.5
4.834500	---	24.71	46.00	21.29	L1	OFF	19.6
4.834500	32.50	---	56.00	23.50	L1	OFF	19.6
8.565000	---	28.25	50.00	21.75	L1	OFF	19.7
8.565000	33.88	---	60.00	26.12	L1	OFF	19.7
13.560000	---	29.67	50.00	20.33	L1	OFF	19.7
13.560000	34.75	---	60.00	25.25	L1	OFF	19.7
17.684250	---	31.19	50.00	18.81	L1	OFF	19.8
17.684250	36.06	---	60.00	23.94	L1	OFF	19.8
24.198000	---	22.67	50.00	27.33	L1	OFF	19.8
24.198000	29.80	---	60.00	30.20	L1	OFF	19.8

EUT Information

Report NO :	8O3134
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Neutral



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.159000	---	32.37	55.52	23.15	N	OFF	19.5
0.159000	48.39	---	65.52	17.13	N	OFF	19.5
0.469500	---	38.70	46.52	7.82	N	OFF	19.5
0.469500	46.08	---	56.52	10.44	N	OFF	19.5
0.982500	---	26.29	46.00	19.71	N	OFF	19.5
0.982500	34.79	---	56.00	21.21	N	OFF	19.5
4.888500	---	23.95	46.00	22.05	N	OFF	19.6
4.888500	31.53	---	56.00	24.47	N	OFF	19.6
8.592000	---	29.61	50.00	20.39	N	OFF	19.7
8.592000	35.27	---	60.00	24.73	N	OFF	19.7
17.187000	---	30.27	50.00	19.73	N	OFF	19.8
17.187000	35.34	---	60.00	24.66	N	OFF	19.8
20.190750	---	33.01	50.00	16.99	N	OFF	19.9
20.190750	37.50	---	60.00	22.50	N	OFF	19.9

Appendix C. Radiated Spurious Emission

Test Engineer :	Alex Jeng, Fu Chen, and Wilson Wu	Temperature :	24~25°C
		Relative Humidity :	50~51%

2.4GHz 2400~2483.5MHz

WIFI 802.11n HT20 (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11n HT20 CH 01 2412MHz		2389.17	62.79	-11.21	74	49.96	27.23	15.5	29.9	285	66	P	H
		2389.695	53.16	-0.84	54	40.33	27.23	15.5	29.9	285	66	A	H
	*	2412	107.02	-	-	94.11	27.28	15.52	29.89	285	66	P	H
	*	2412	98.62	-	-	85.71	27.28	15.52	29.89	285	66	A	H
													H
													H
		2390	61.04	-12.96	74	48.2	27.23	15.5	29.89	205	352	P	V
		2389.8	50.42	-3.58	54	37.58	27.23	15.5	29.89	205	352	A	V
	*	2412	104.29	-	-	91.38	27.28	15.52	29.89	205	352	P	V
	*	2412	95.48	-	-	82.57	27.28	15.52	29.89	205	352	A	V
													V
													V
802.11n HT20 CH 06 2437MHz		2387.28	55.32	-18.68	74	42.49	27.23	15.5	29.9	265	67	P	H
		2388.96	45.46	-8.54	54	32.63	27.23	15.5	29.9	265	67	A	H
	*	2437	106.66	-	-	93.63	27.37	15.55	29.89	265	67	P	H
	*	2437	98.11	-	-	85.08	27.37	15.55	29.89	265	67	P	H
		2496.71	53.9	-20.1	74	40.65	27.5	15.62	29.87	265	67	P	H
		2485.86	44	-10	54	30.82	27.46	15.6	29.88	265	67	A	H
		2389.94	54.9	-19.1	74	42.06	27.23	15.5	29.89	382	359	P	V
		2388.54	45.16	-8.84	54	32.33	27.23	15.5	29.9	382	359	A	V
	*	2437	107.13	-	-	94.1	27.37	15.55	29.89	382	359	P	V
	*	2437	98.29	-	-	85.26	27.37	15.55	29.89	382	359	A	V
		2498.81	54.22	-19.78	74	40.97	27.5	15.62	29.87	382	359	P	V
		2487.47	44.27	-9.73	54	31.08	27.46	15.61	29.88	382	359	A	V

802.11n HT20 CH 11 2462MHz	*	2462	104.77	-	-	91.66	27.41	15.58	29.88	287	69	P	H
	*	2462	96.63	-	-	83.52	27.41	15.58	29.88	287	69	A	H
		2484.48	60.31	-13.69	74	47.13	27.46	15.6	29.88	287	69	P	H
		2483.52	50.25	-3.75	54	37.07	27.46	15.6	29.88	287	69	A	H
													H
													H
	*	2462	104.11	-	-	91	27.41	15.58	29.88	204	351	P	V
	*	2462	95.79	-	-	82.68	27.41	15.58	29.88	204	351	A	V
		2483.52	61.33	-12.67	74	48.15	27.46	15.6	29.88	204	351	P	V
		2483.52	51.58	-2.42	54	38.4	27.46	15.6	29.88	204	351	A	V
													V
													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 HT20 (Harmonic @ 3m)

WIFI	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 01 2412MHz		4824	55.36	-18.64	74	73.43	31.26	8.22	57.55	206	74	P	H
		4824	44.99	-9.01	54	63.06	31.26	8.22	57.55	206	74	A	H
													H
													H
		4824	55.43	-18.57	74	73.5	31.26	8.22	57.55	214	351	P	V
		4824	45.03	-8.97	54	63.1	31.26	8.22	57.55	214	351	A	V
													V
													V
802.11n HT20 CH 06 2437MHz		4874	59.42	-14.58	74	77.07	31.36	8.44	57.45	208	77	P	H
		4874	49.88	-4.12	54	67.53	31.36	8.44	57.45	208	77	A	H
		7311	49.84	-24.16	74	60.25	36.18	10.68	57.27	100	0	P	H
													H
		4874	59.01	-14.99	74	76.66	31.36	8.44	57.45	212	348	P	V
		4874	48.07	-5.93	54	65.72	31.36	8.44	57.45	212	348	A	V
		7311	56.7	-17.3	74	67.11	36.18	10.68	57.27	247	347	P	V
		7311	46.33	-7.67	54	56.74	36.18	10.68	57.27	247	347	A	V
802.11n HT20 CH 11 2462MHz		4924	58.01	-15.99	74	75.22	31.46	8.68	57.35	217	73	P	H
		4924	47.46	-6.54	54	64.67	31.46	8.68	57.35	217	73	A	H
		7386	49.05	-24.95	74	59.37	36.37	10.67	57.36	100	0	P	H
													H
		4924	58.36	-15.64	74	75.57	31.46	8.68	57.35	220	349	P	V
		4924	47.78	-6.22	54	64.99	31.46	8.68	57.35	220	349	A	V
		7386	55.25	-18.75	74	65.57	36.37	10.67	57.36	206	347	P	V
		7386	44.49	-9.51	54	54.81	36.37	10.67	57.36	206	347	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 (Band Edge @ 3m)

WIFI	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 03 2422MHz		2389.8	63.28	-10.72	74	50.44	27.23	15.5	29.89	227	312	P	H
		2388.68	53.53	-0.47	54	40.7	27.23	15.5	29.9	227	312	A	H
	*	2422	101.02	-	-	88.06	27.32	15.53	29.89	227	312	P	H
	*	2422	92.97	-	-	80.01	27.32	15.53	29.89	227	312	A	H
		2487.33	53.69	-20.31	74	40.5	27.46	15.61	29.88	227	312	P	H
		2490.62	44.71	-9.29	54	31.48	27.5	15.61	29.88	227	312	A	H
		2381.4	60.6	-13.4	74	47.82	27.19	15.49	29.9	374	0	P	V
		2389.8	51.41	-2.59	54	38.57	27.23	15.5	29.89	374	0	A	V
	*	2422	100.3	-	-	87.34	27.32	15.53	29.89	374	0	P	V
	*	2422	91.84	-	-	78.88	27.32	15.53	29.89	374	0	A	V
		2493.91	54.14	-19.86	74	40.9	27.5	15.61	29.87	374	0	P	V
		2498.6	44.83	-9.17	54	31.58	27.5	15.62	29.87	374	0	A	V
802.11n HT40 CH 06 2437MHz		2388.82	61.3	-12.7	74	48.47	27.23	15.5	29.9	265	67	P	H
		2388.26	52.18	-1.82	54	39.35	27.23	15.5	29.9	265	67	A	H
	*	2437	102.22	-	-	89.19	27.37	15.55	29.89	265	67	P	H
	*	2437	94.1	-	-	81.07	27.37	15.55	29.89	265	67	A	H
		2486.7	54.86	-19.14	74	41.67	27.46	15.61	29.88	265	67	P	H
		2483.55	45.72	-8.28	54	32.54	27.46	15.6	29.88	265	67	A	H
		2389.52	59.65	-14.35	74	46.82	27.23	15.5	29.9	375	358	P	V
		2388.12	50.79	-3.21	54	37.96	27.23	15.5	29.9	375	358	A	V
	*	2437	102.34	-	-	89.31	27.37	15.55	29.89	375	358	P	V
	*	2437	94.16	-	-	81.13	27.37	15.55	29.89	375	358	A	V
		2483.76	56.03	-17.97	74	42.85	27.46	15.6	29.88	375	358	P	V
		2483.5	47.12	-6.88	54	33.94	27.46	15.6	29.88	375	358	A	V

802.11n HT40 CH 09 2452MHz		2388.82	58.66	-15.34	74	45.83	27.23	15.5	29.9	266	67	P	H
		2389.52	48.89	-5.11	54	36.06	27.23	15.5	29.9	266	67	A	H
	*	2452	101.98	-	-	88.92	27.37	15.57	29.88	266	67	P	H
	*	2452	93.46	-	-	80.4	27.37	15.57	29.88	266	67	A	H
		2487.05	58.72	-15.28	74	45.53	27.46	15.61	29.88	266	67	P	H
		2484.11	49.37	-4.63	54	36.19	27.46	15.6	29.88	266	67	A	H
		2389.24	59.93	-14.07	74	47.1	27.23	15.5	29.9	375	356	P	V
		2389.94	47.83	-6.17	54	34.99	27.23	15.5	29.89	375	356	A	V
	*	2452	101.84	-	-	88.78	27.37	15.57	29.88	375	356	P	V
	*	2452	93.55	-	-	80.49	27.37	15.57	29.88	375	356	A	V
		2484.32	61.47	-12.53	74	48.29	27.46	15.6	29.88	375	356	P	V
		2483.55	52.16	-1.84	54	38.98	27.46	15.6	29.88	375	356	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	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 03 2422MHz		4844	48.69	-25.31	74	66.6	31.29	8.31	57.51	100	0	P	H
		7266	45.71	-28.29	74	56.14	36.11	10.68	57.22	100	0	P	H
													H
													H
		4844	46.55	-27.45	74	64.46	31.29	8.31	57.51	100	0	P	V
		7266	45.87	-28.13	74	56.3	36.11	10.68	57.22	100	0	P	V
													V
													V
802.11n HT40 CH 06 2437MHz		4874	54.84	-19.16	74	72.49	31.36	8.44	57.45	222	76	P	H
		4874	44.63	-9.37	54	62.28	31.36	8.44	57.45	222	76	A	H
		7311	47	-27	74	57.41	36.18	10.68	57.27	100	0	P	H
													H
		4874	49.31	-24.69	74	66.96	31.36	8.44	57.45	100	0	P	V
		7311	46.91	-27.09	74	57.32	36.18	10.68	57.27	100	0	P	V
													V
													V
802.11n HT40 CH 09 2452MHz		4904	53.84	-20.16	74	71.22	31.43	8.58	57.39	217	75	P	H
		4904	44.86	-9.14	54	62.24	31.43	8.58	57.39	217	75	A	H
		7356	45.41	-28.59	74	55.77	36.3	10.67	57.33	100	0	P	H
													H
		4904	48.49	-25.51	74	65.87	31.43	8.58	57.39	100	0	P	V
		7356	46.32	-27.68	74	56.68	36.3	10.67	57.33	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	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz 802.11n HT40 LF		55.38	28.52	-11.48	40	47.37	12.48	0.99	32.32	-	-	P	H
		68.34	29.83	-10.17	40	48.61	12.38	1.15	32.31	100	0	P	H
		107.76	32.7	-10.8	43.5	46.95	16.67	1.37	32.29	-	-	P	H
		377	32.66	-13.34	46	41.33	21.1	2.38	32.15	-	-	P	H
		843.2	33.1	-12.9	46	32.39	28.98	3.51	31.78	-	-	P	H
		958	33.86	-12.14	46	30.07	31.06	3.71	30.98	-	-	P	H
													H
													H
													H
													H
													H
													H
		38.91	36.85	-3.15	40	48.08	20.27	0.83	32.33	100	0	P	V
		53.76	35.44	-4.56	40	53.77	13.01	0.98	32.32	-	-	P	V
		77.25	33.98	-6.02	40	51.7	13.37	1.21	32.3	-	-	P	V
		341.3	29.69	-16.31	46	39.38	20.2	2.25	32.14	-	-	P	V
		447	30.88	-15.12	46	37.36	23.14	2.55	32.17	-	-	P	V
		947.5	33.7	-12.3	46	30.59	30.49	3.7	31.08	-	-	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	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) =

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

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

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

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

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

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

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

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

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

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

Appendix D. Radiated Spurious Emission Plots

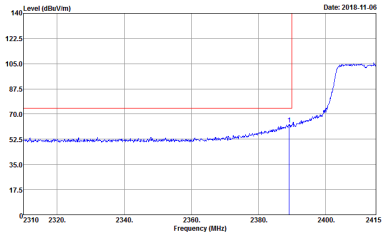
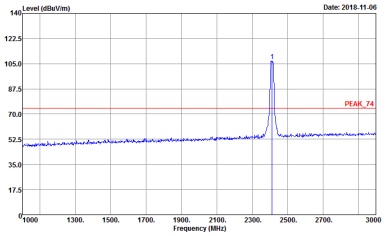
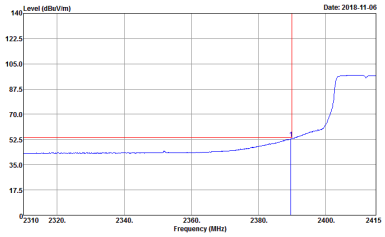
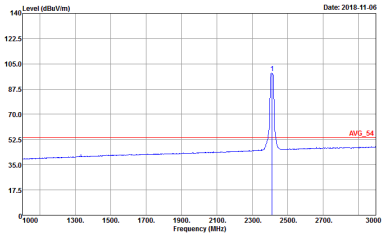
Test Engineer :	Alex Jeng, Fu Chen, and Wilson Wu	**Temperature :**	24~25°C
		Relative Humidity :	50~51%

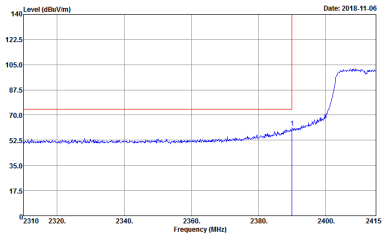
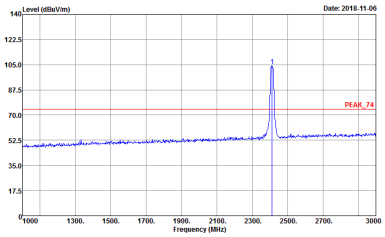
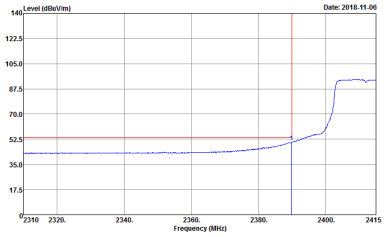
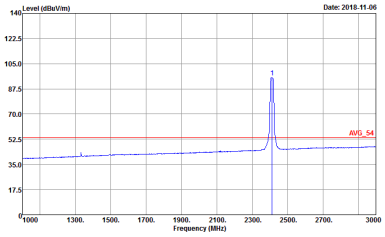
Note symbol

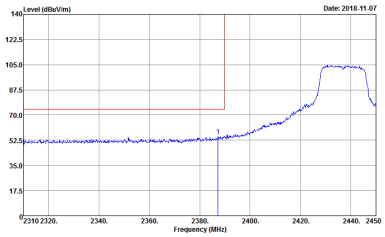
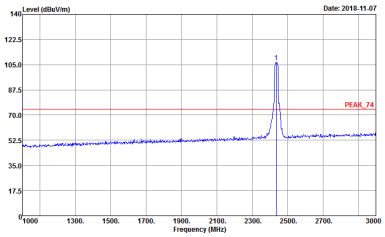
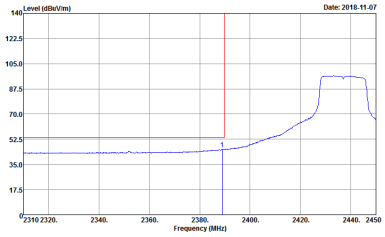
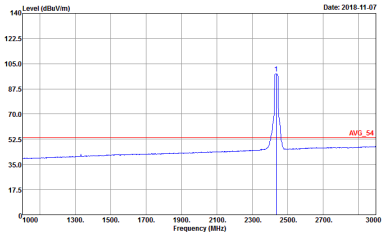
-L	**Low channel location**
-R	**High channel location**

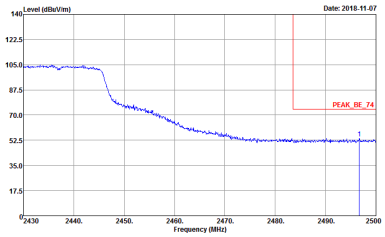
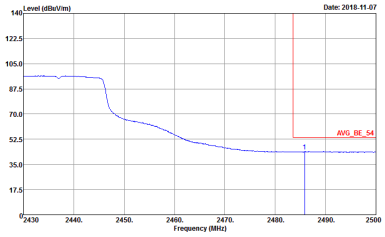
2.4GHz 2400~2483.5MHz

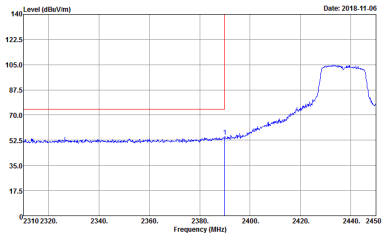
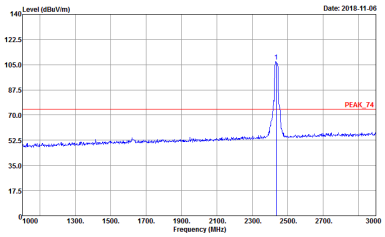
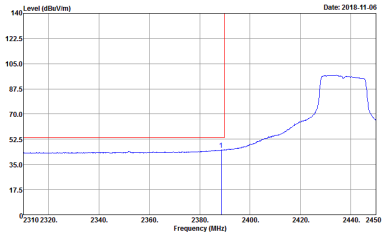
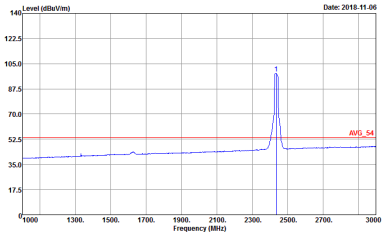
WIFI 802.11n HT20 (Band Edge @ 3m)

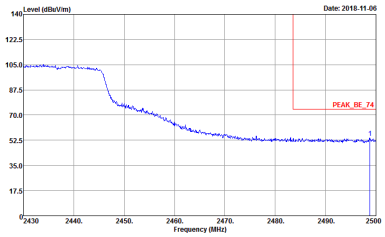
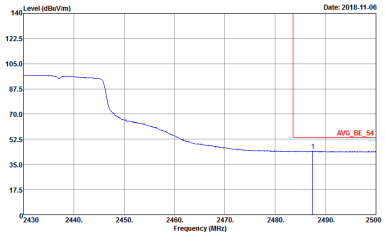
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	802.11n HT20 CH01 2412MHz	
	Horizontal	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 1 Power : 18.5	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 1 Power : 18.5
Avg.	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 1 Power : 18.5	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 1 Power : 18.5

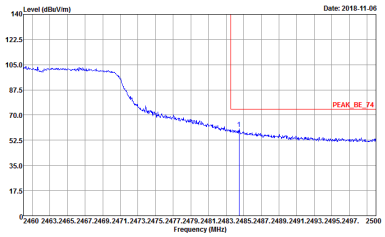
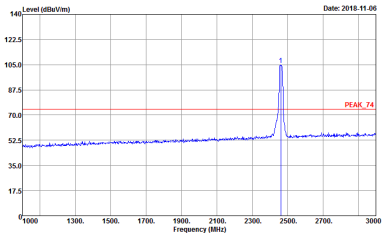
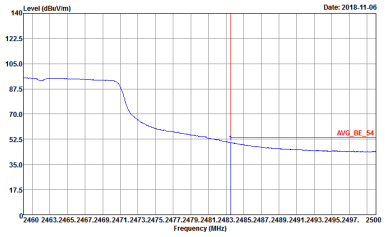
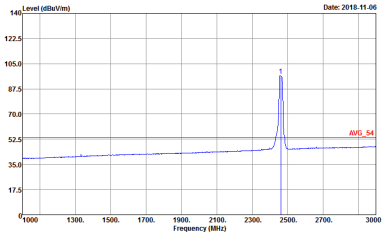
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	802.11n HT20 CH01 2412MHz	
	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 1 Power : 18.5	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 1 Power : 18.5
Avg.	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 1 Power : 18.5	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 1 Power : 18.5

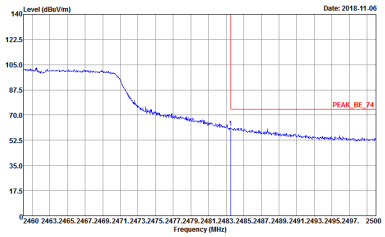
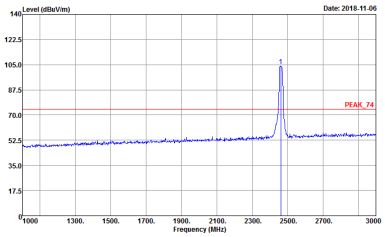
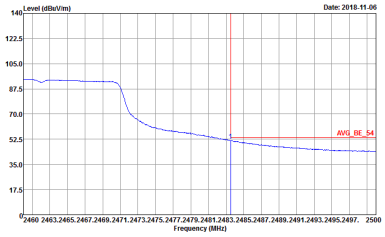
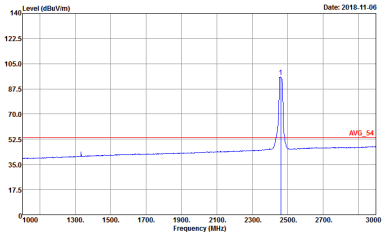
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	802.11n HT20 CH06 2437MHz - L	
	Horizontal	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 2 Power : 18.5	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 2 Power : 18.5
Avg.	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 2 Power : 18.5	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 2 Power : 18.5

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	802.11n HT20 CH06 2437MHz - R	
	Horizontal	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 2 Power : 18.5	Left blank
Avg.	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 2 Power : 18.5	Left blank

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	802.11n HT20 CH06 2437MHz - L	
	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 2 Power : 18.5	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 2 Power : 18.5
Avg.	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 2 Power : 18.5	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 2 Power : 18.5

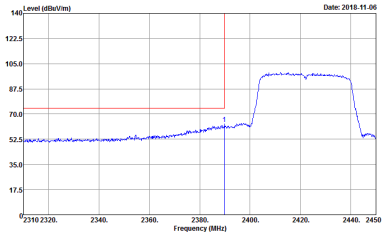
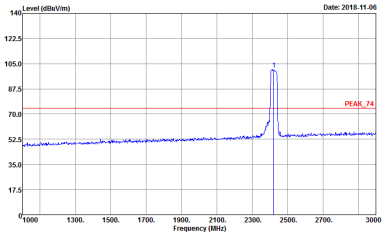
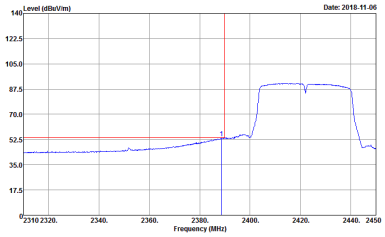
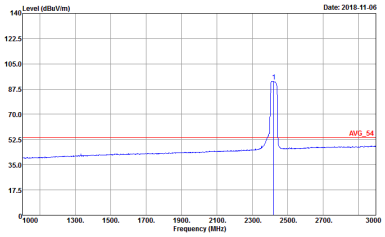
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	802.11n HT20 CH06 2437MHz - R	
	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 2 Power : 18.5	Left Blank
Avg.	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 2 Power : 18.5	Left Blank

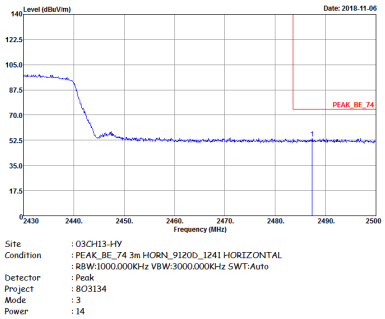
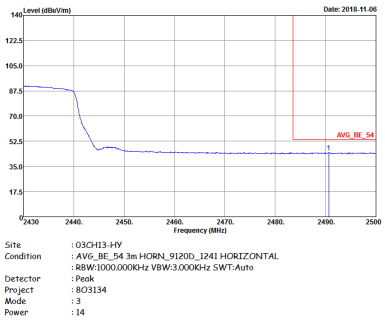
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	802.11n HT20 CH11 2462MHz	
	Horizontal	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 3 Power : 18	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 3 Power : 18
Avg.	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 3 Power : 18	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 3 Power : 18

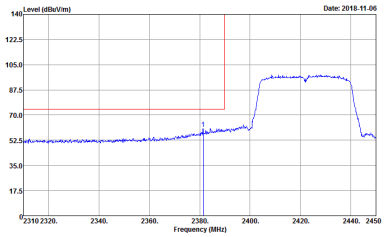
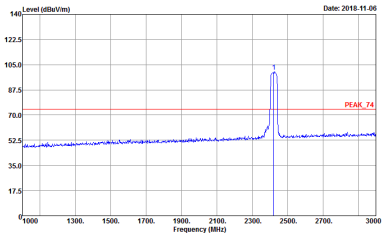
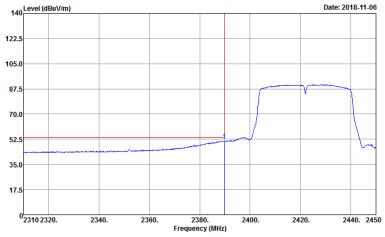
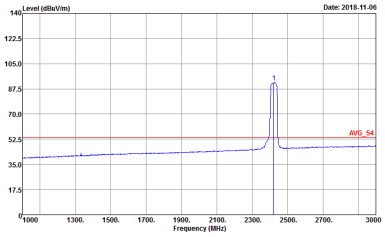
WIFI	2.4GHz 2400~2483.5MHz Fundamental @ 3m	
	802.11n HT20 CH11 2462MHz	
	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 3 Power : 18	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 3 Power : 18
Avg.	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 3 Power : 18	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 3 Power : 18

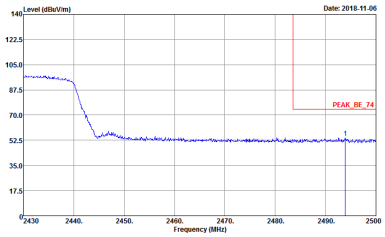
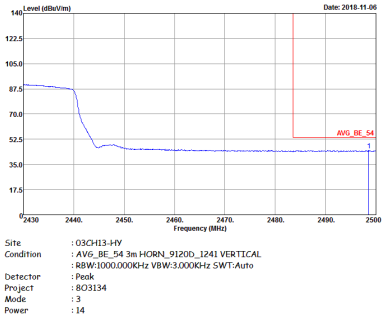
2.4GHz 2400~2483.5MHz

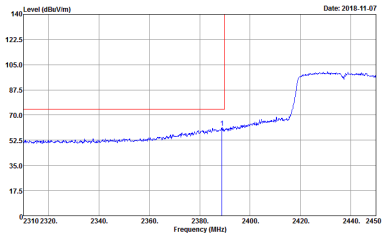
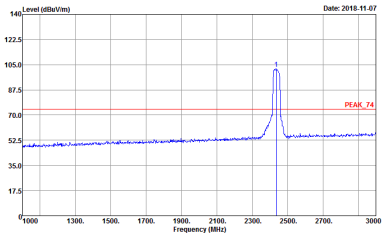
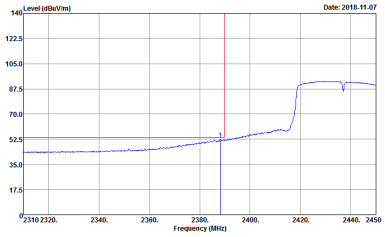
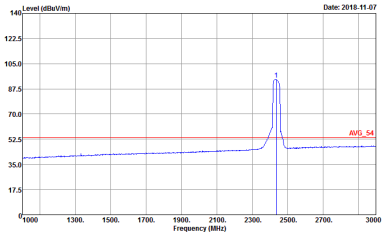
WIFI 802.11n HT40 (Band Edge @ 3m)

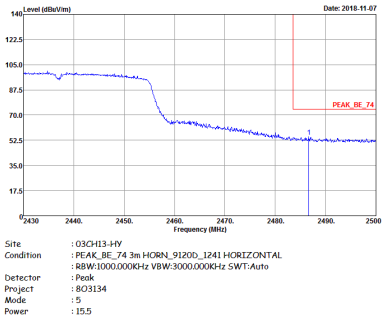
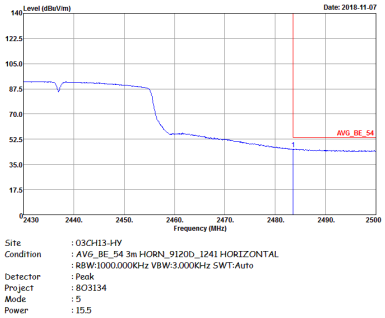
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	802.11n HT40 CH03 2422MHz - L	
	Horizontal	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 3 Power : 14	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 3 Power : 14
Avg.	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 3 Power : 14	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 3 Power : 14

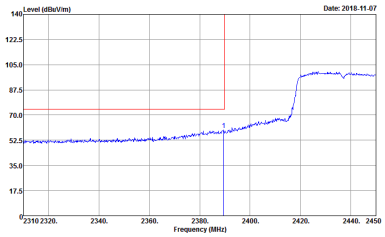
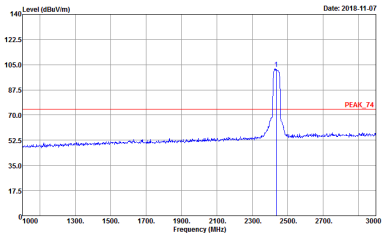
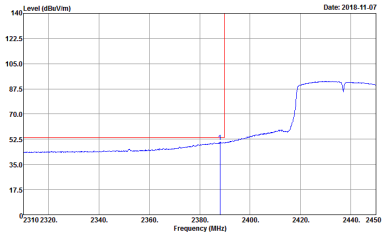
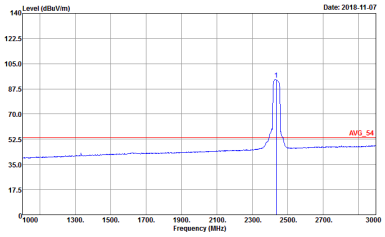
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	802.11n HT40 CH03 2422MHz - R	
	Horizontal	Fundamental
Peak		Left Blank
Avg.		Left Blank

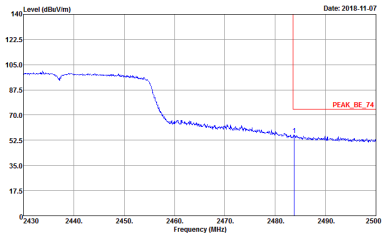
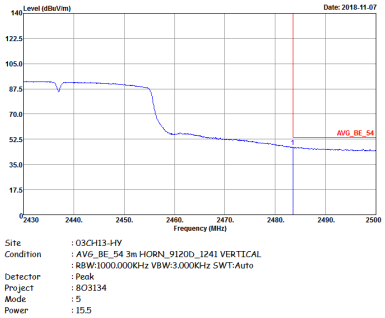
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	802.11n HT40 CH03 2422MHz - L	
	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 3 Power : 14	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 3 Power : 14
Avg.	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 3 Power : 14	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 3 Power : 14

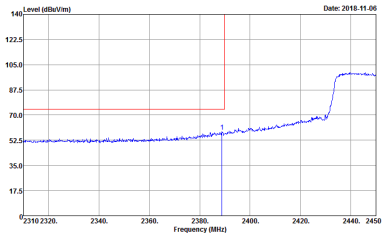
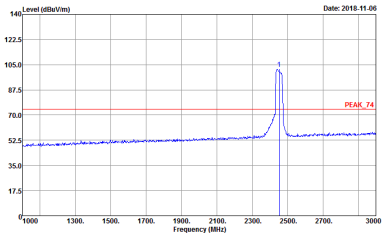
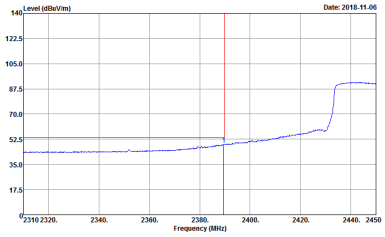
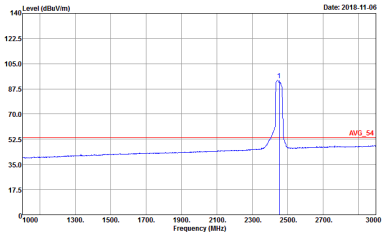
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	802.11n HT40 CH03 2422MHz - R	
	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

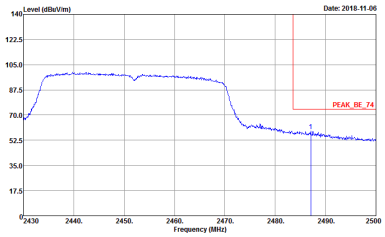
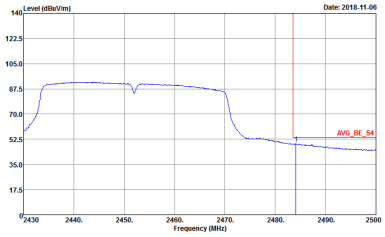
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	802.11n HT40 CH06 2437MHz - L	
	Horizontal	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 5 Power : 15.5	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 5 Power : 15.5
Avg.	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 5 Power : 15.5	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 5 Power : 15.5

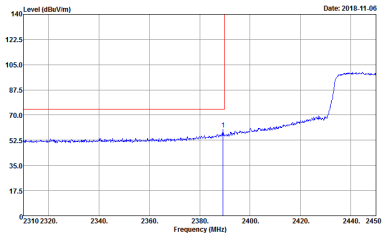
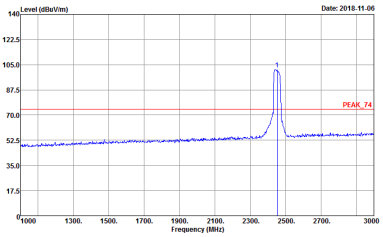
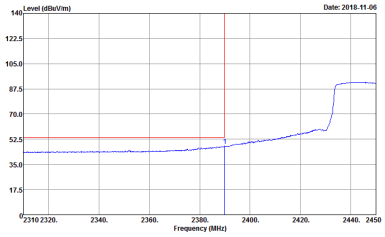
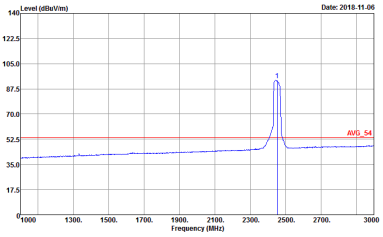
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	802.11n HT40 CH06 2437MHz - R	
	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

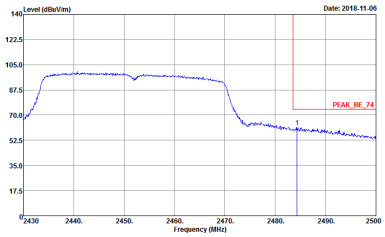
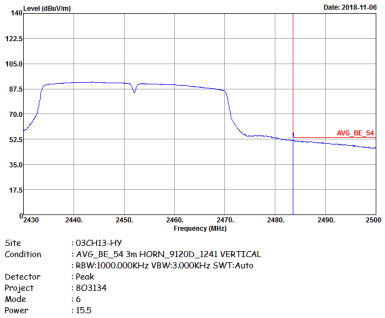
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	802.11n HT40 CH06 2437MHz - L	
	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 5 Power : 15.5	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 5 Power : 15.5
Avg.	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 5 Power : 15.5	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 5 Power : 15.5

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	802.11n HT40 CH06 2437MHz - R	
	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	802.11n HT40 CH09 2452MHz - L	
	Horizontal	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 6 Power : 15.5	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 6 Power : 15.5
Avg.	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 6 Power : 15.5	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 6 Power : 15.5

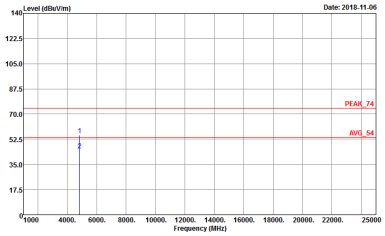
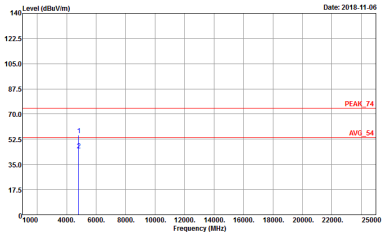
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	802.11n HT40 CH09 2452MHz - R	
	Horizontal	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 6 Power : 15.5	Left blank
Avg.	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 6 Power : 15.5	Left blank

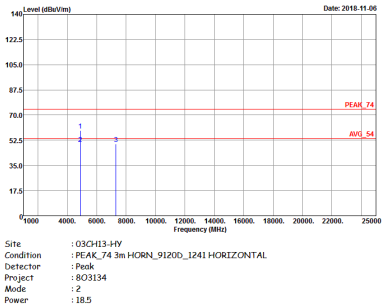
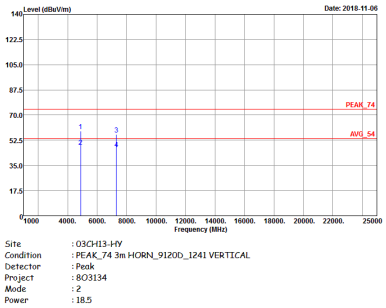
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	802.11n HT40 CH09 2452MHz - L	
	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 6 Power : 15.5	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 6 Power : 15.5
Avg.	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 6 Power : 15.5	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 8O3134 Mode : 6 Power : 15.5

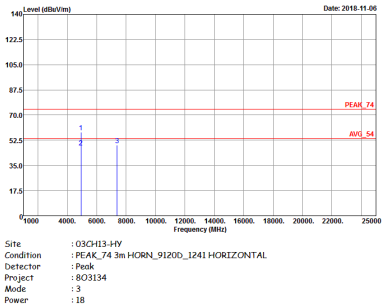
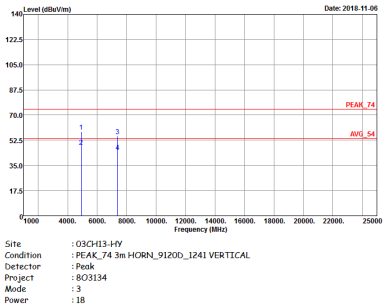
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	802.11n HT40 CH09 2452MHz - R	
	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

2.4GHz 2400~2483.5MHz

WIFI 802.11n HT20 (Harmonic @ 3m)

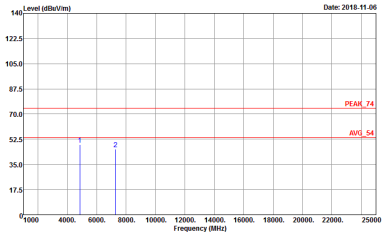
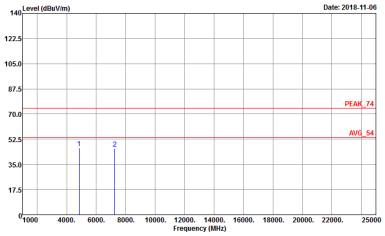
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	802.11n HT20 CH01 2412MHz	
	Horizontal	Vertical
Peak Avg.	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL Detector : Peak Project : 8O3134 Mode : 1 Power : 18.5	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL Detector : Peak Project : 8O3134 Mode : 1 Power : 18.5

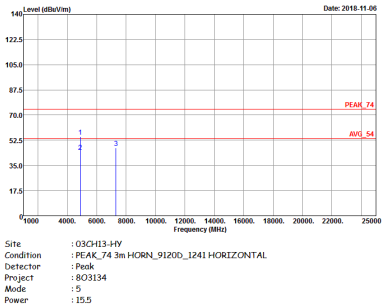
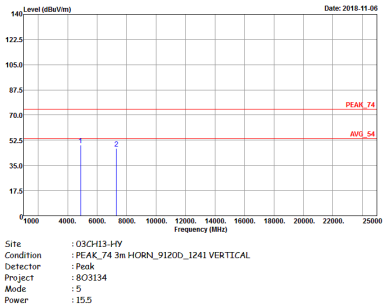
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	802.11n HT20 CH06 2437MHz	
	Horizontal	Vertical
Peak Avg.	 	

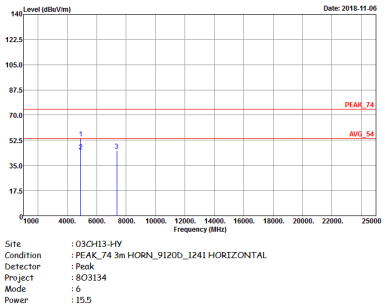
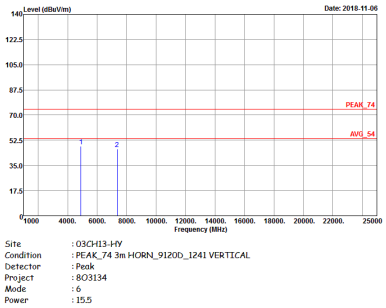
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	802.11n HT20 CH11 2462MHz	
	Horizontal	Vertical
Peak Avg.		

2.4GHz 2400~2483.5MHz

WIFI 802.11n HT40 (Harmonic @ 3m)

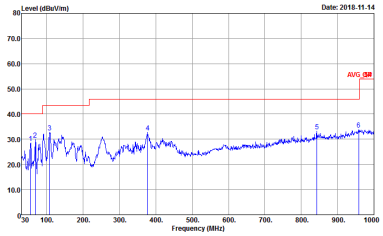
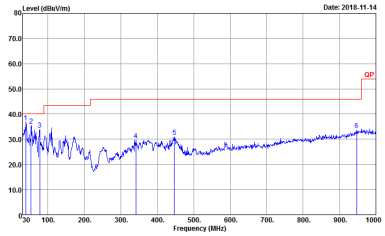
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	802.11n HT40 CH03 2422MHz	
	Horizontal	Vertical
Peak Avg.	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL Detector : Peak Project : 8O3134 Mode : 4 Power : 14	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL Detector : Peak Project : 8O3134 Mode : 4 Power : 14

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	802.11n HT40 CH06 2437MHz	
	Horizontal	Vertical
Peak Avg.	 	

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	802.11n HT40 CH09 2452MHz	
	Horizontal	Vertical
Peak Avg.	 	

Emission below 1GHz

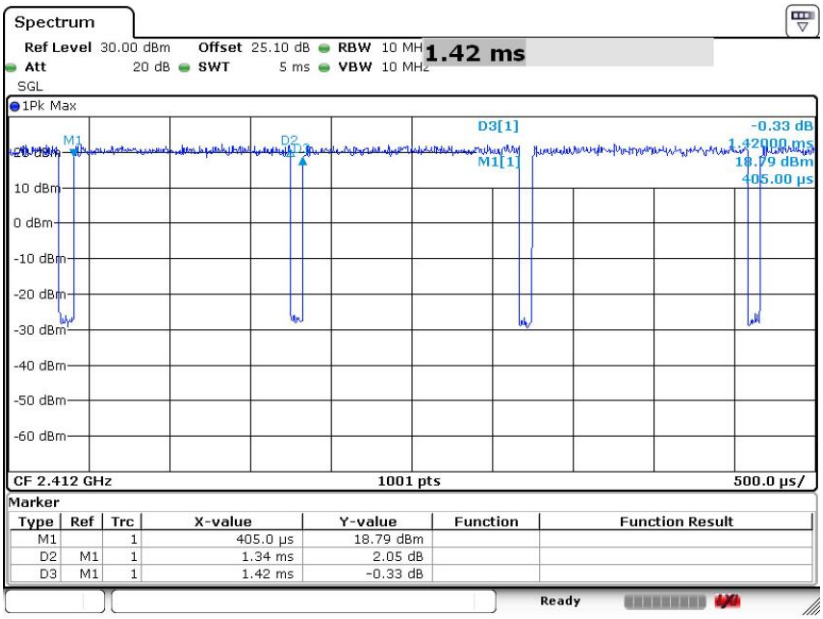
2.4GHz WIFI 802.11n HT40 (LF)

WIFI	2.4GHz 2400~2483.5MHz	
	802.11n HT40 LF	
	Horizontal	Vertical
QP / Peak	 Site : 03CH13-HY Condition : QP 3m BILOG_40103 HORIZONTAL Detector : Peak Project : 8O3134 Mode : 7	 Site : 03CH13-HY Condition : QP 3m BILOG_40103 VERTICAL Detector : Peak Project : 8O3134 Mode : 7

Appendix E. Duty Cycle Plots

Band	Duty Cycle (%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor (dB)
2.4GHz 802.11n HT20	94.37	1340	0.75	1kHz	0.25
2.4GHz 802.11n HT40	89.86	665	1.50	3kHz	0.46

802.11n HT20



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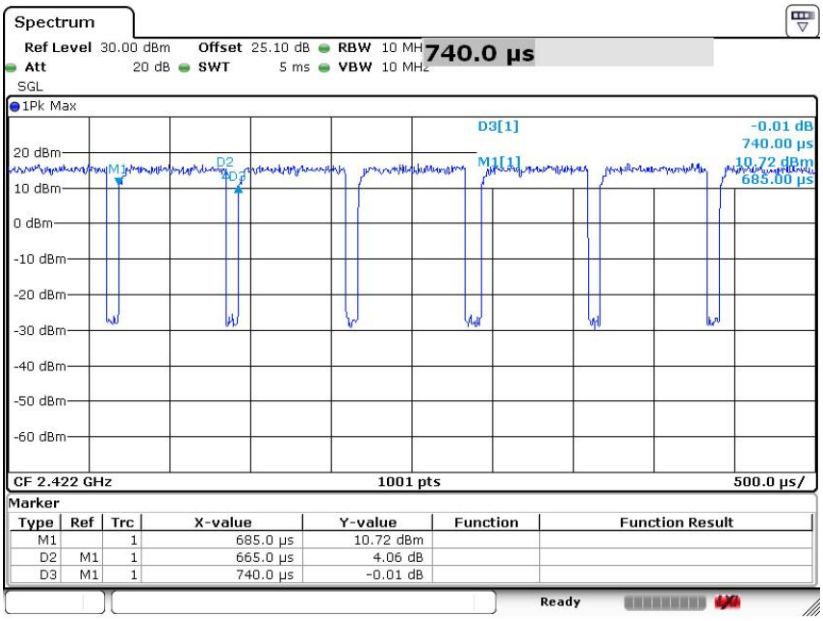
802.11n HT40



Date: 7.NOV.2018 14:56:06