



# FCC RADIO TEST REPORT

**FCC ID** : WR92221123114  
**Equipment** : thermostat  
**Brand Name** : ecobee  
**Model Name** : ECB402  
**Applicant** : ecobee Inc.  
                          207 Queens Quay West, Suite 600, Toronto, ON, Canada  
**Manufacturer** : ecobee Inc.  
                          207 Queens Quay West, Suite 600, Toronto, ON, Canada  
**Standard** : FCC Part 15 Subpart C §15.247

The product was received on Jan. 17, 2019 and testing was started from Feb. 12, 2019 and completed on Apr. 02, 2019. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

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

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

Approved by: Jones Tsai

**SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory**

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



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## History of this test report

Report No.	Version	Description	Issued Date
FR911708C	01	Initial issue of report	Apr. 18, 2019



## 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 0.38 dB at 2389.940 MHz
3.6	15.207	AC Conducted Emission	Pass	Under limit 22.67 dB at 0.767 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	Pass	-

### Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

### Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Wii Chang

Report Producer: Polly Tsai



## 1 General Description

### 1.1 Product Feature of Equipment Under Test

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

Product Specification subjective to this standard	
Antenna Type	WLAN: Ceramic Chip Antenna Bluetooth: FPC Antenna Proprietary Sensor: IFA Meander Printed PCB Type Antenna

### 1.2 Modification of EUT

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

### 1.3 Testing Location

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.	<b>Sporton Site No.</b>	
	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.	<b>Sporton Site No.</b>	
	03CH13-HY	

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

FCC Designation No. TW1190 and TW0007



## 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 v05r02
- ♦ 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		

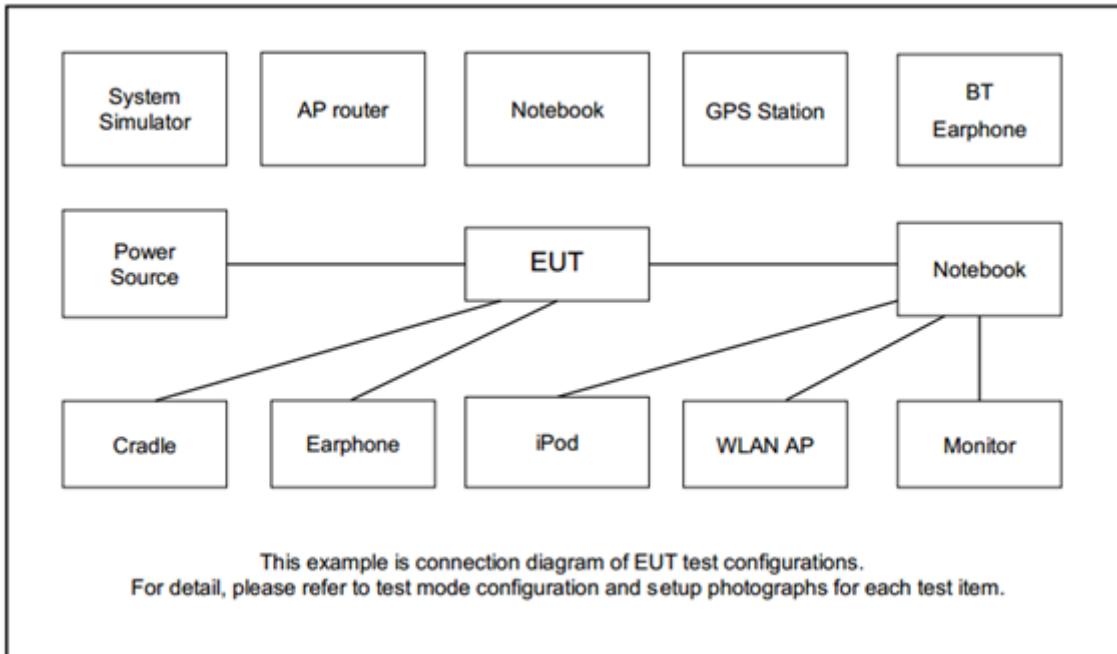
### 2.2 Test Mode

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

Modulation	Data Rate
802.11b	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 + Sub-gigahertz on + Infrared on + PEK with 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.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
2.	Notebook	DELL	Latitude E6320	FCC DoC/ Contains FCC ID: QDS-BRCM1054	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	Bluetooth Base Station	R&S	CBT32	N/A	N/A	Unshielded, 1.8 m
4.	Adapter	Jameco	ADU240050	FCC DoC	N/A	AC I/P: Unshielded, 6 m

## 2.5 EUT Operation Test Setup

The RF test items, utility “Putty” 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).*

$$= 4.2 + 10 = 14.2 \text{ (dB)}$$



### 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.

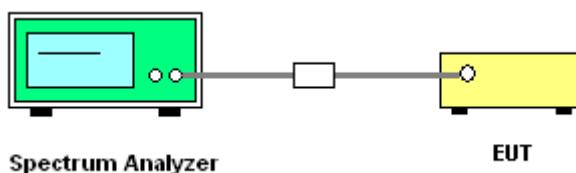
##### 3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

##### 3.1.3 Test Procedures

1. The testing follows the ANSI C63.10 Section 6.9.3 (OBW) and 11.8.1 (6dB BW).
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)  $\geq 3 * \text{RBW}$ .
6. Measure and record the results in the test report.

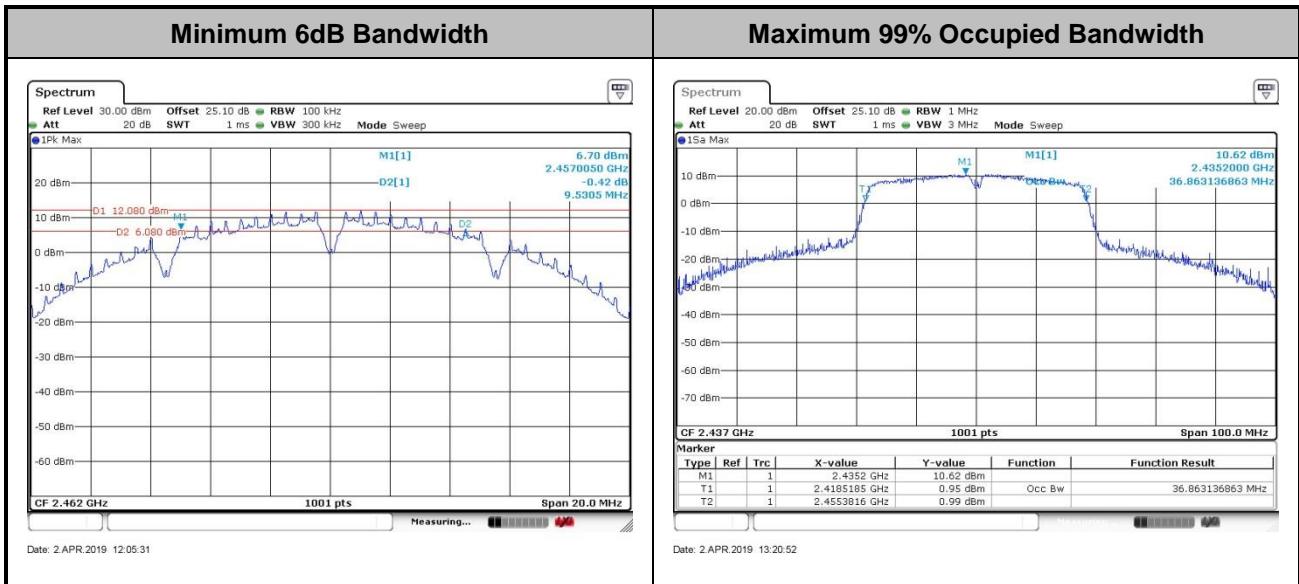
##### 3.1.4 Test Setup





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

Please refer to Appendix A.



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.

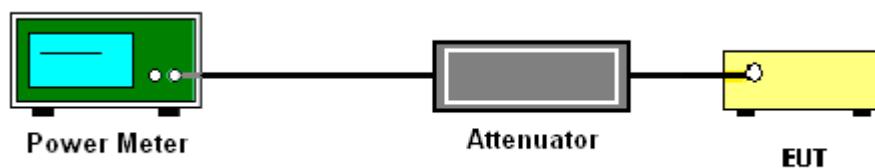
### 3.2.2 Measuring Instruments

See list of measuring equipment of this test report.

### 3.2.3 Test Procedures

1. For Peak Power, the testing follows ANSI C63.10 Section 11.9.1.3 PKPM1
2. For Average Power, the testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v05r02 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.

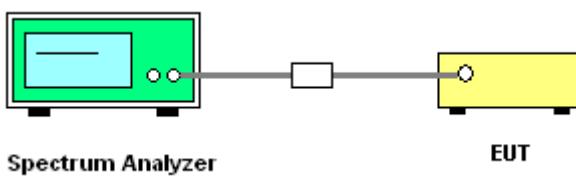
#### 3.3.2 Measuring Instruments

See list of measuring equipment of this test report.

#### 3.3.3 Test Procedures

1. The testing follows the ANSI C63.10 Section 11.10.2 Method PKPSD.
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.

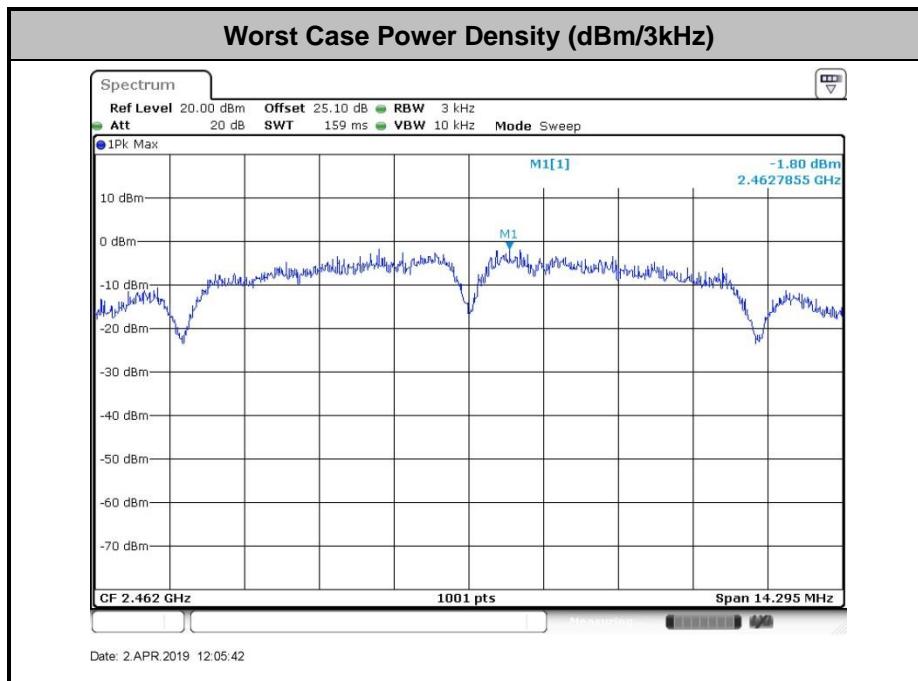
#### 3.3.4 Test Setup





### 3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.





## 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.

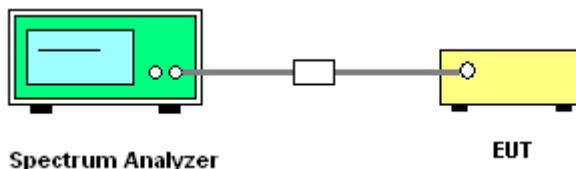
### 3.4.2 Measuring Instruments

See list of measuring equipment of this test report.

### 3.4.3 Test Procedures

1. The testing follows the ANSI C63.10 Section 11.11.3 Emission level measurement.
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



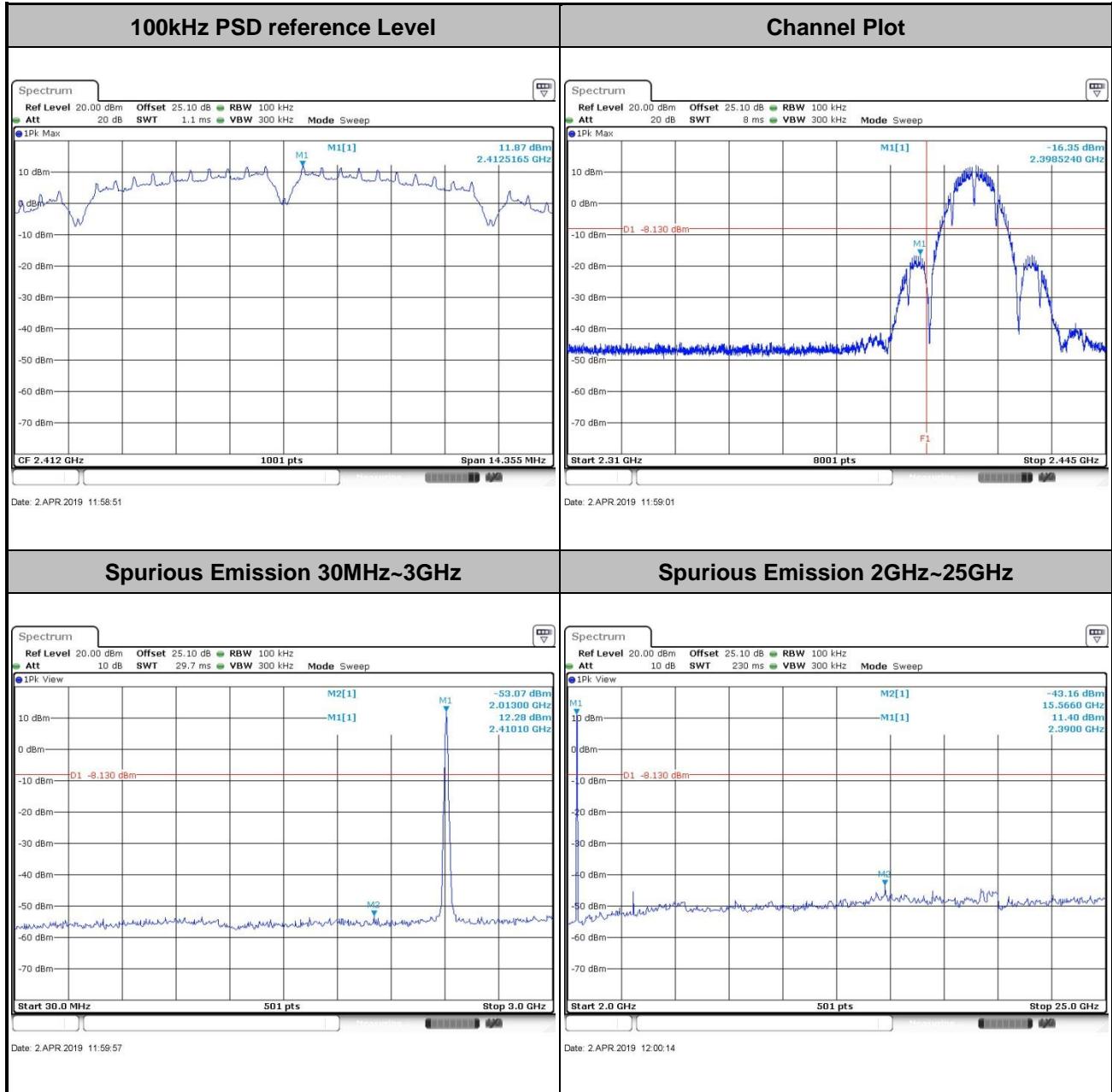


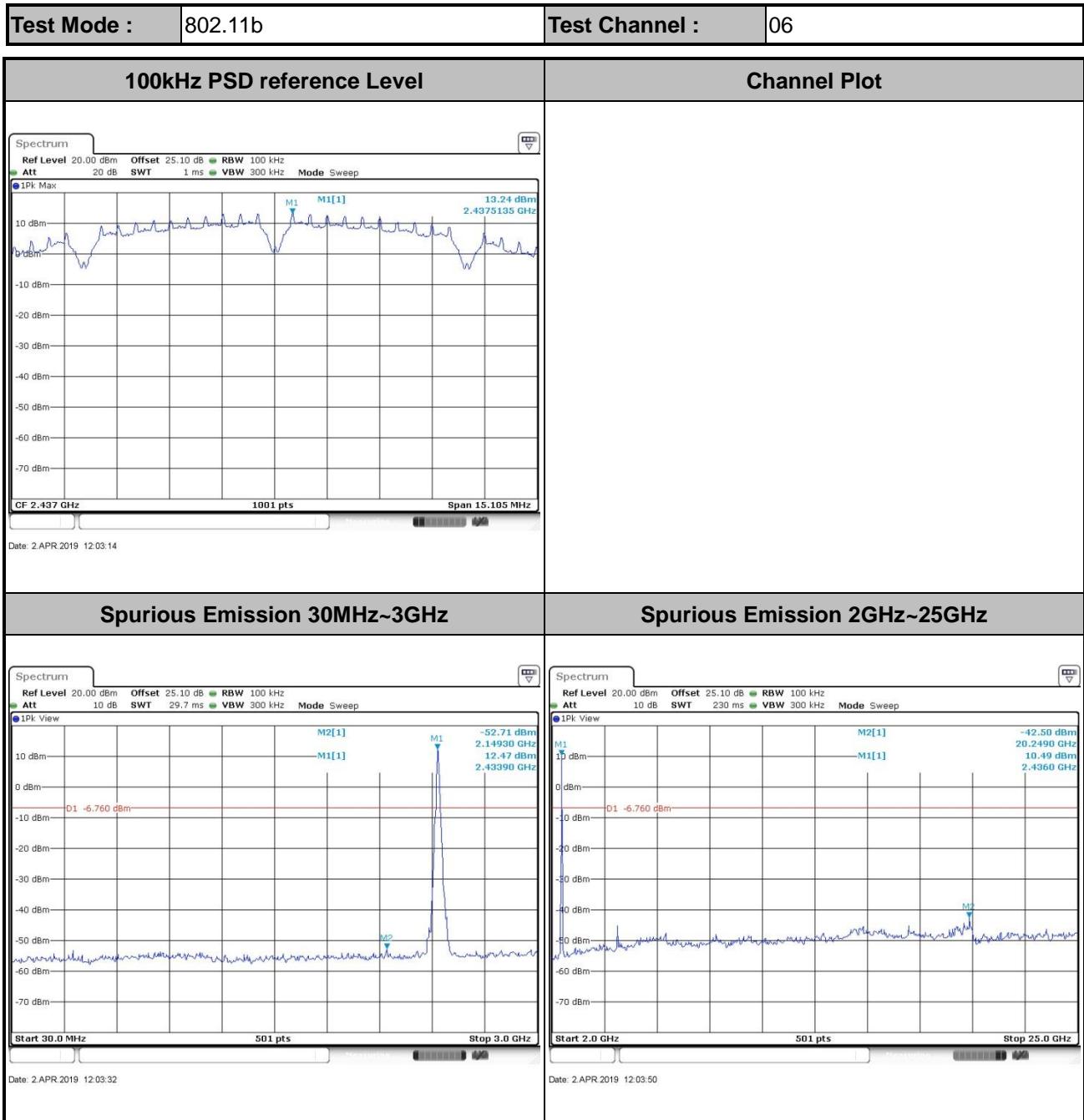
### 3.4.5 Test Result of Conducted Band Edges and Spurious Emission

<b>Test Engineer :</b>	Howard Lin	<b>Temperature :</b>	21~25°C
		<b>Relative Humidity :</b>	51~54%

Number of TX = 1, Ant. 1 (Measured)

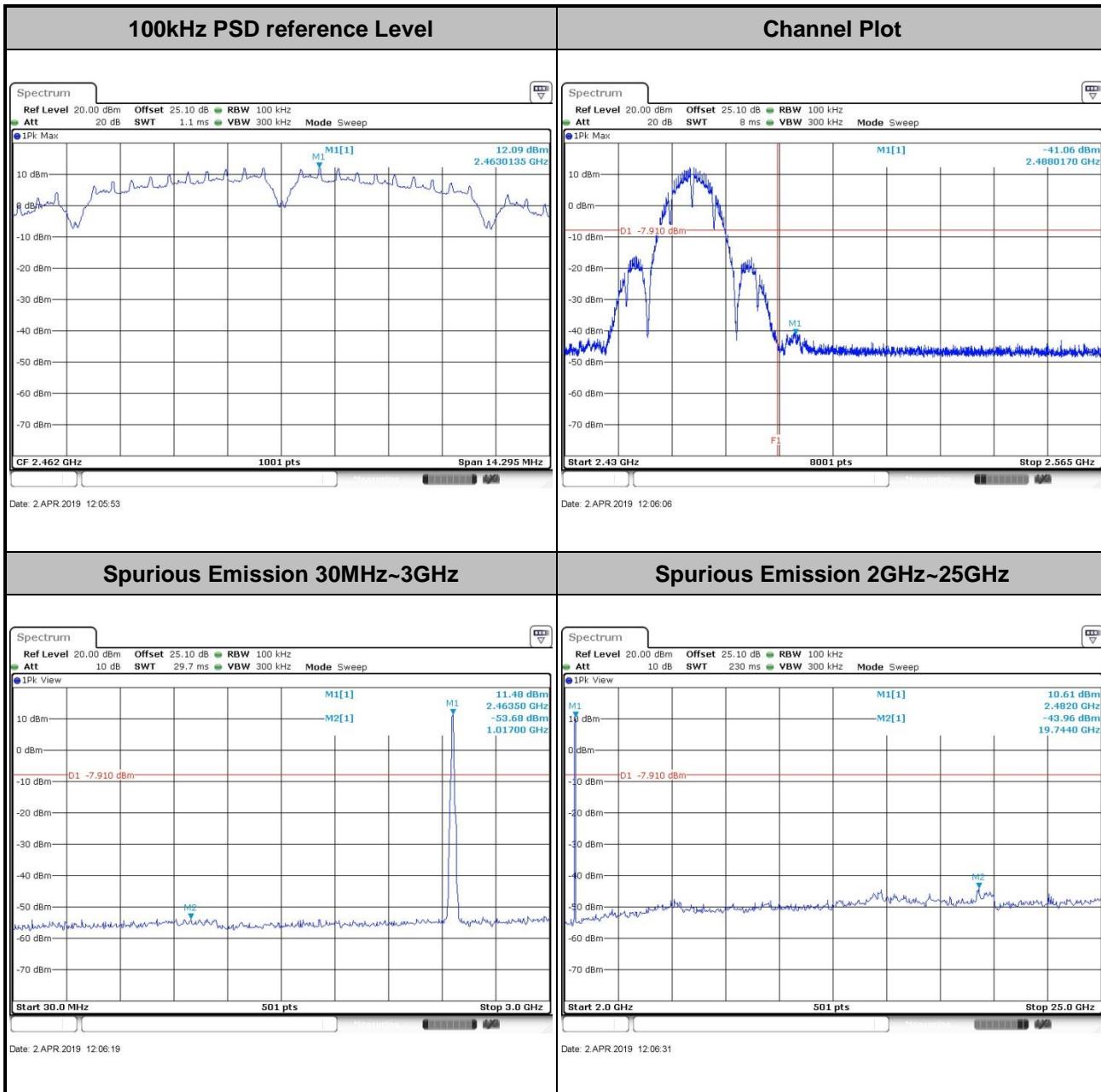
<b>Test Mode :</b>	802.11b	<b>Test Channel :</b>	01
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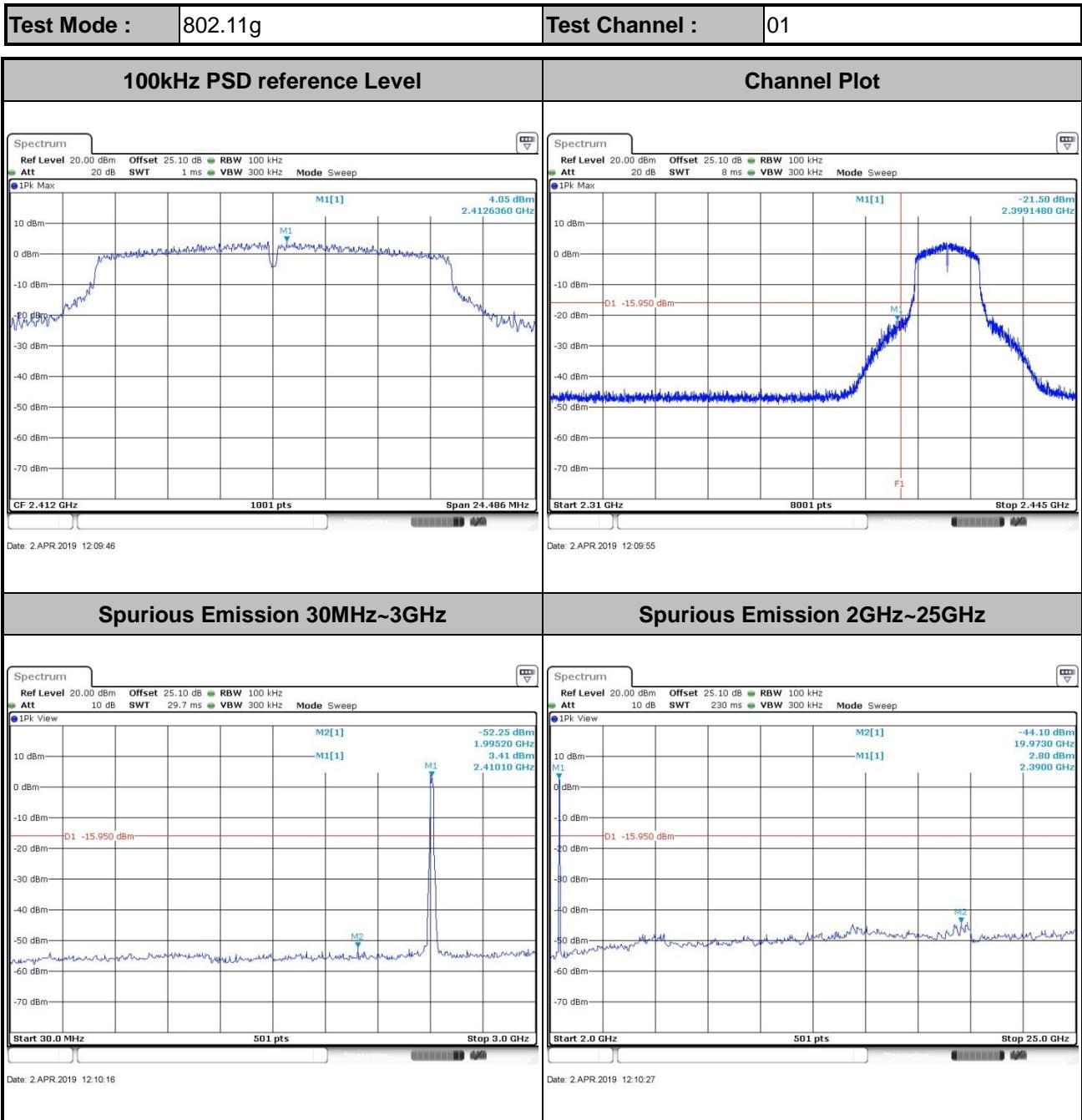






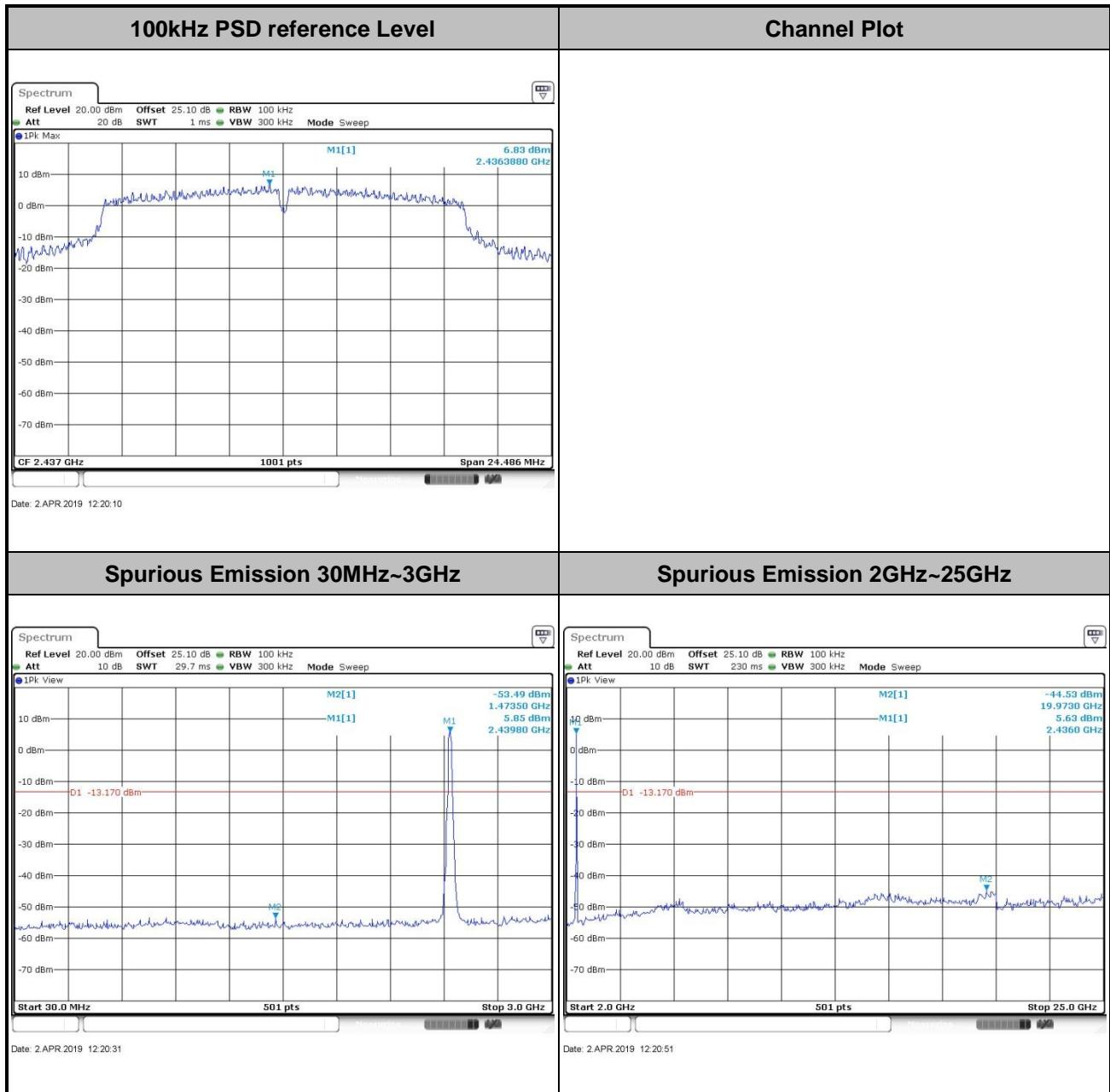
Test Mode :	802.11b	Test Channel :	11
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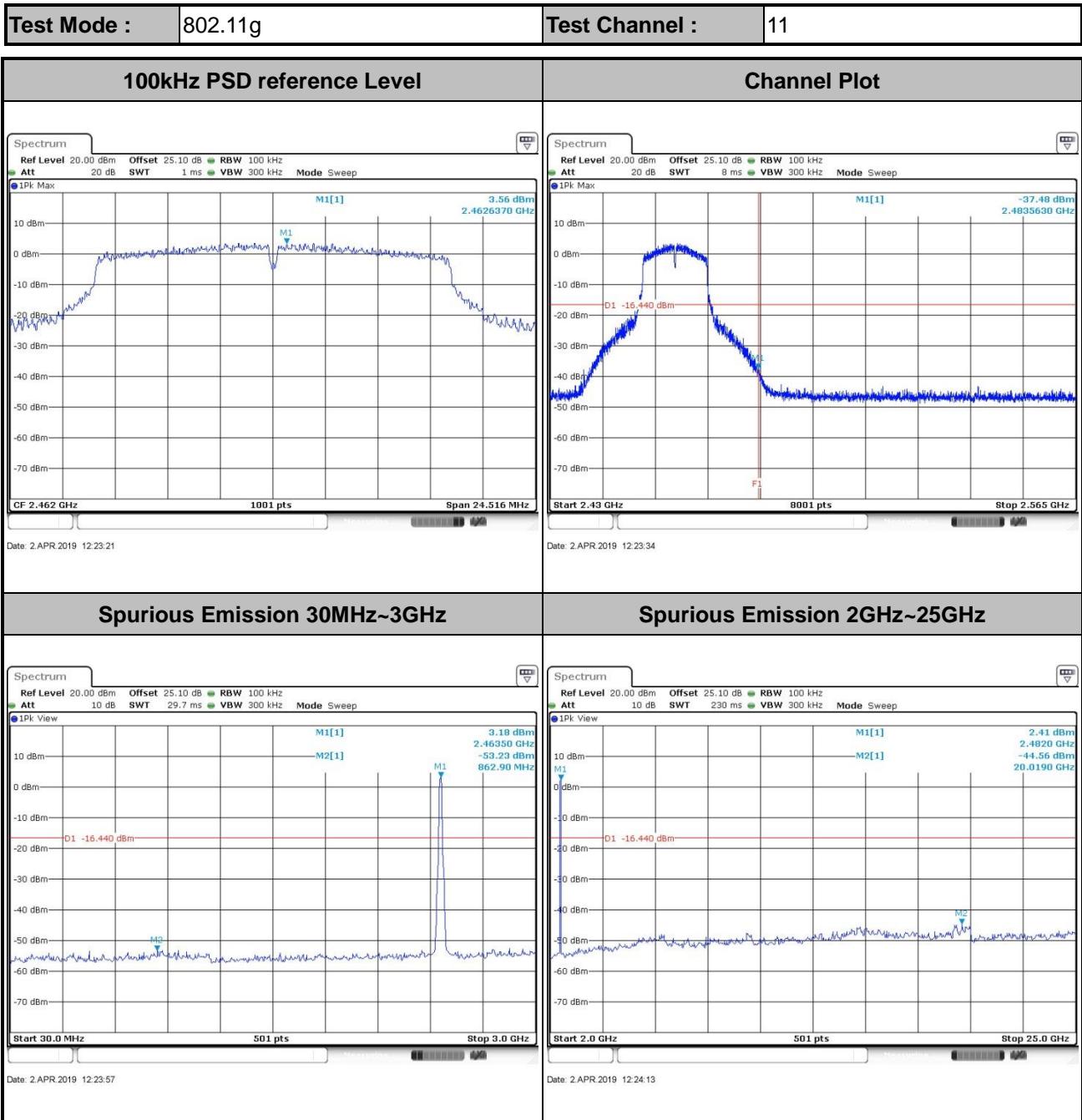


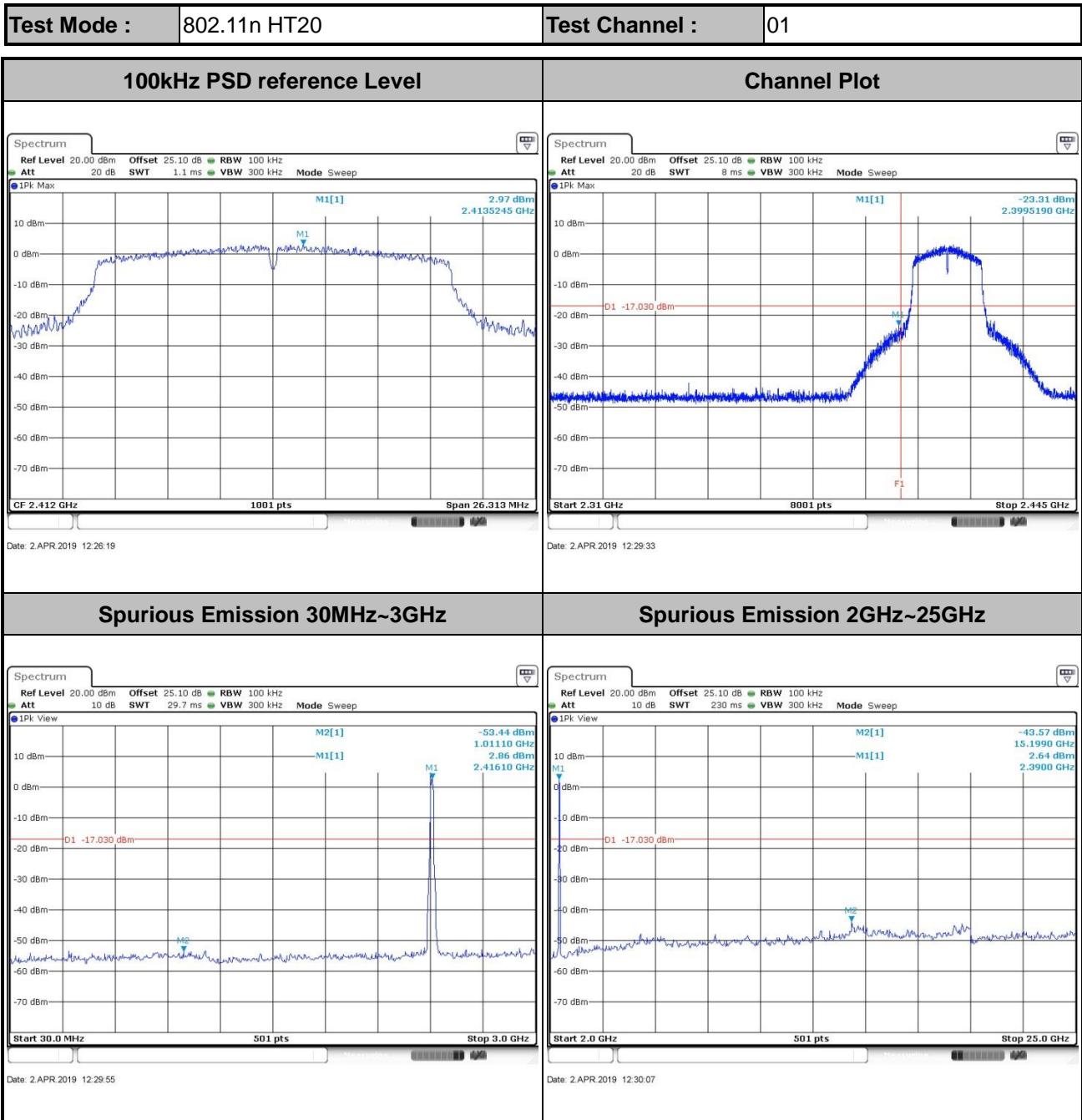




Test Mode :	802.11g	Test Channel :	06
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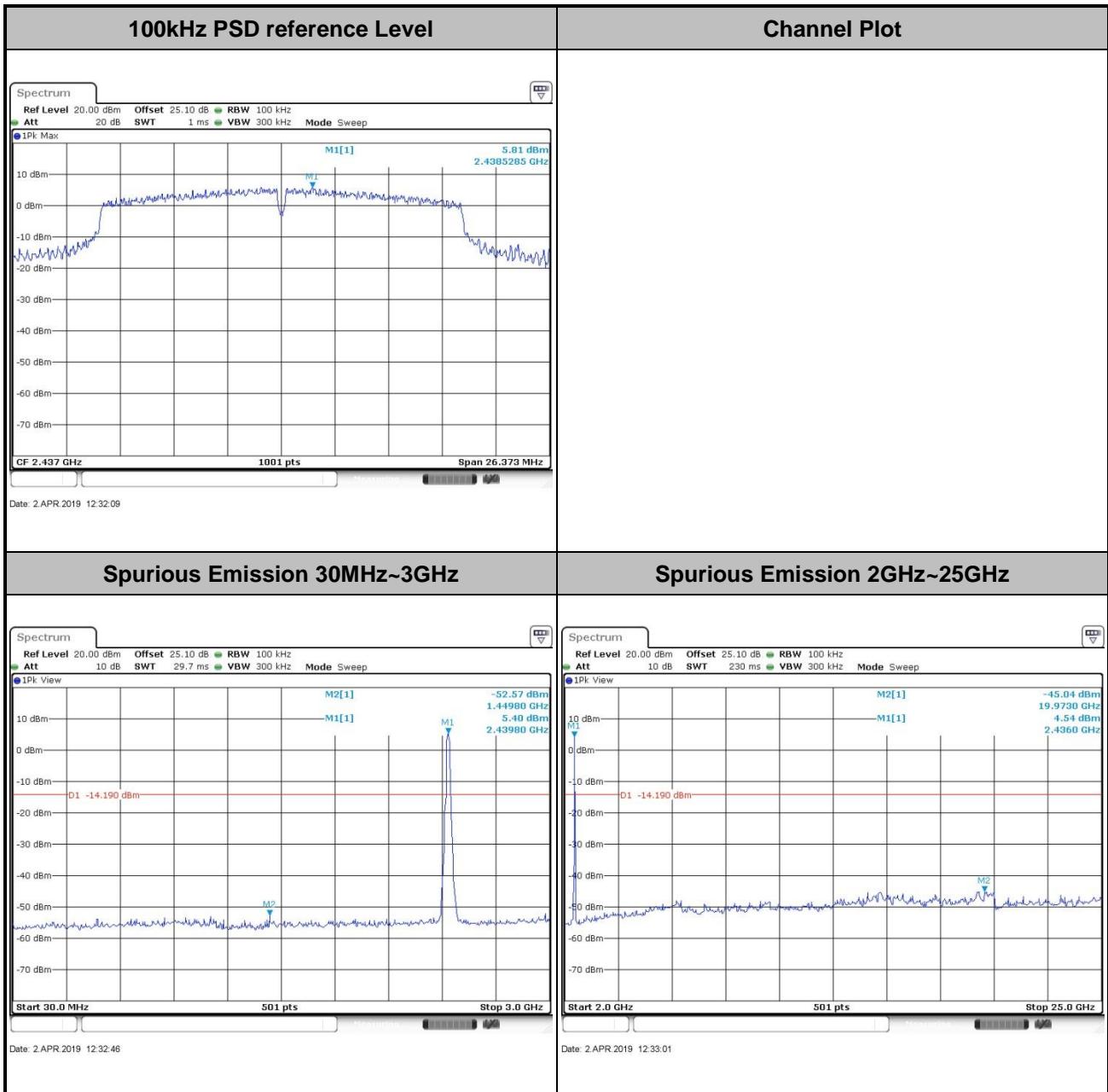






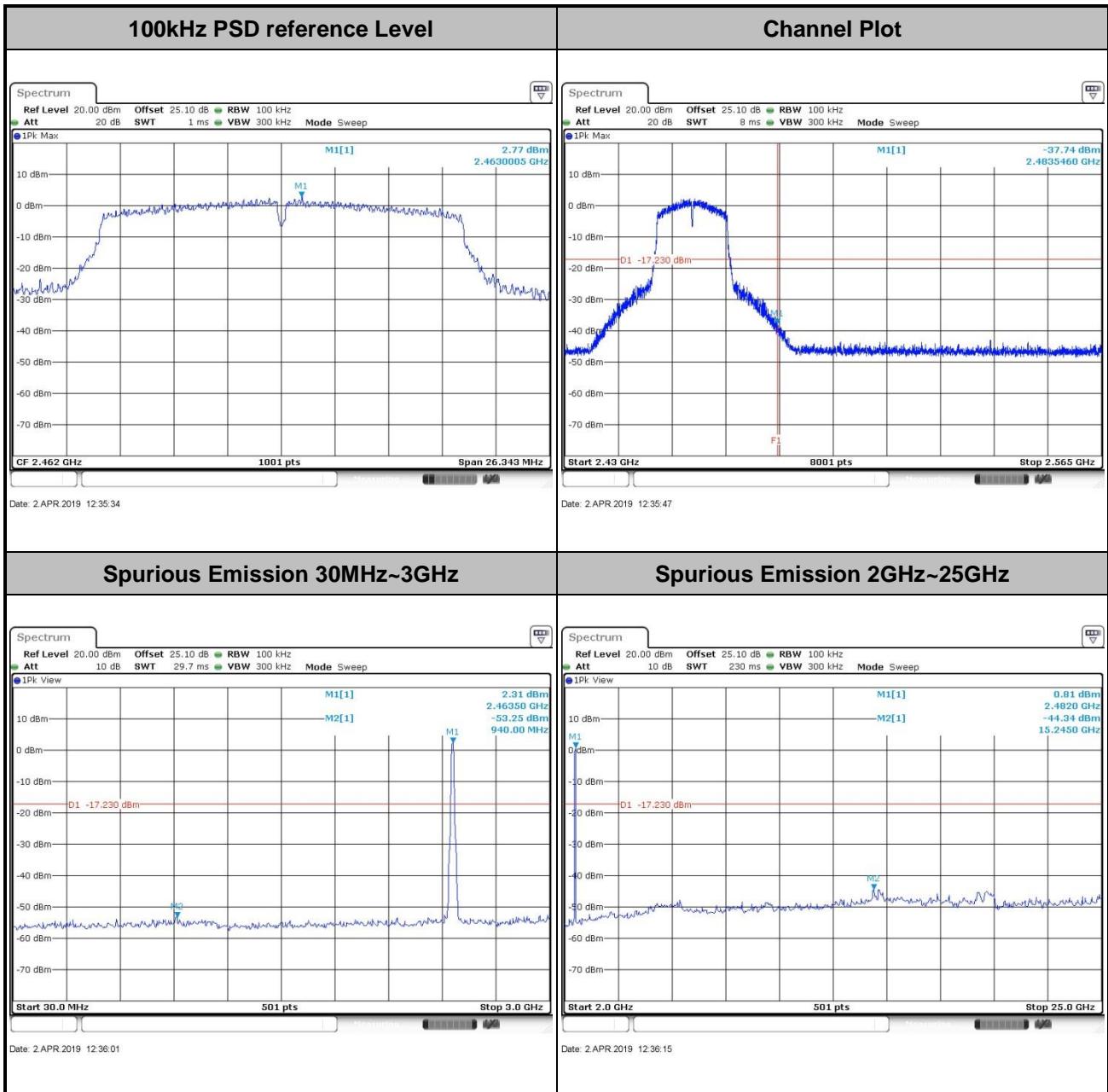


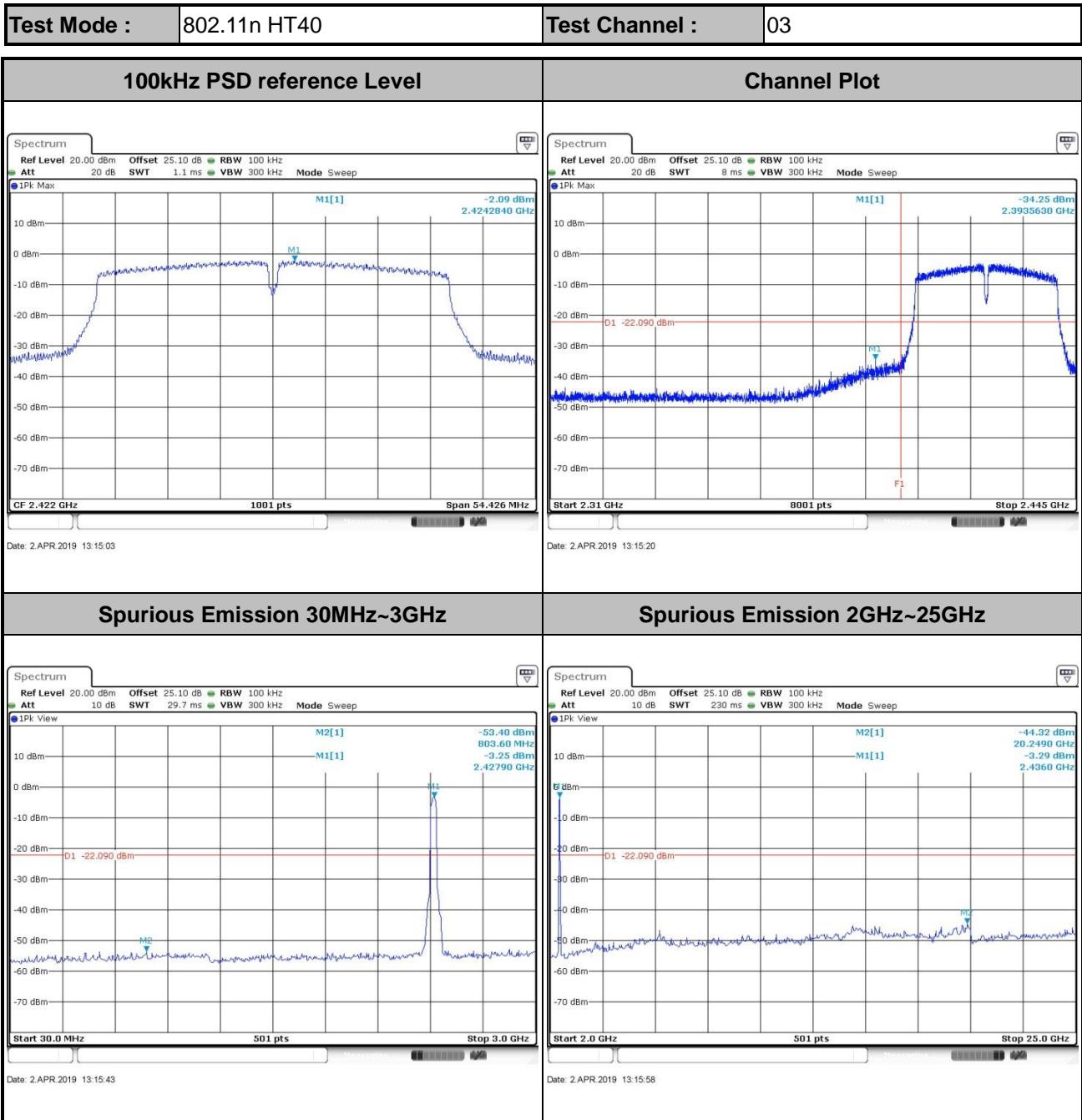
Test Mode :	802.11n HT20	Test Channel :	06
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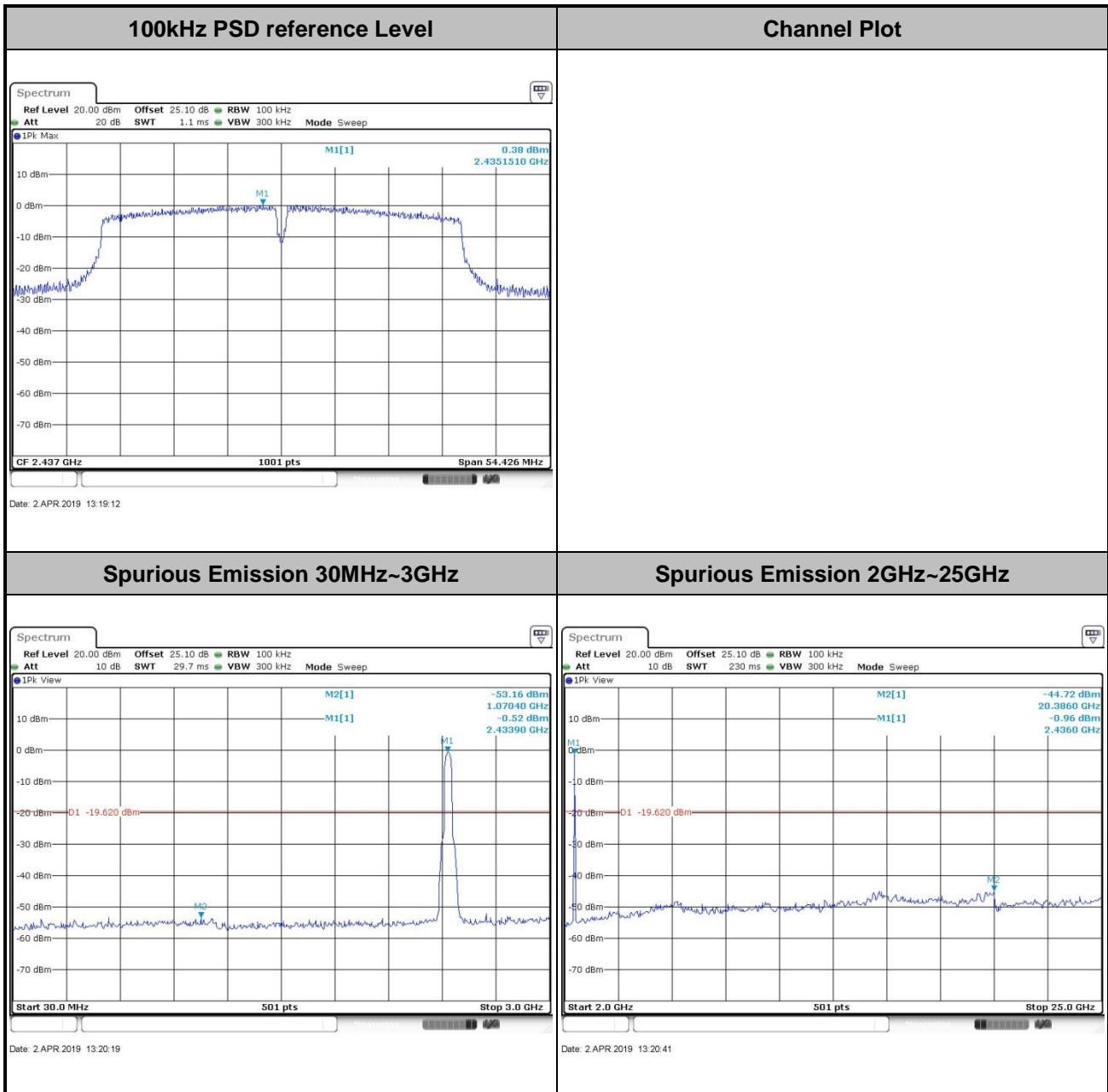
Test Mode :	802.11n HT20	Test Channel :	11
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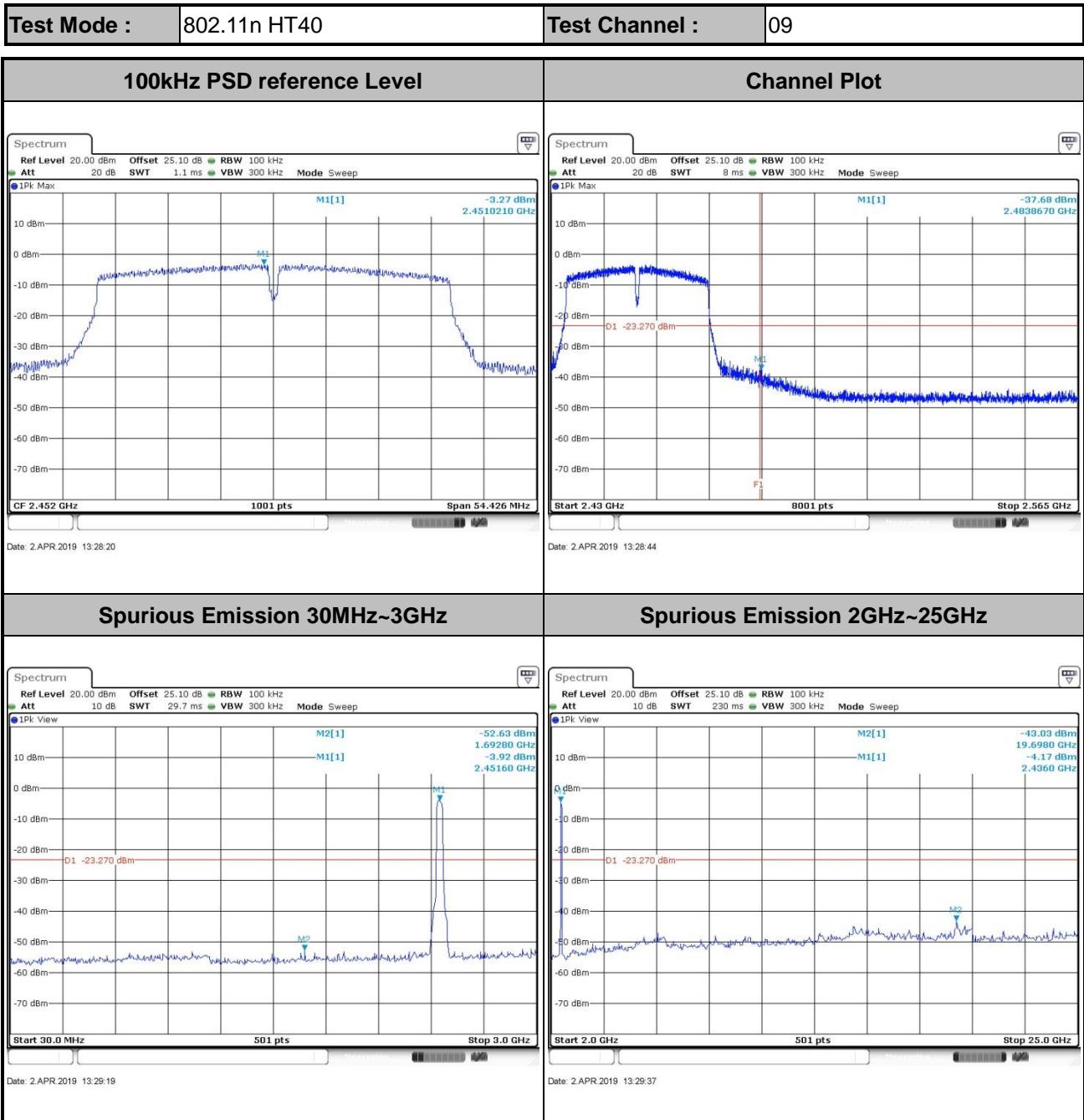






Test Mode :	802.11n HT40	Test Channel :	06
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## 3.5 Radiated Band Edges and Spurious Emission Measurement

### 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

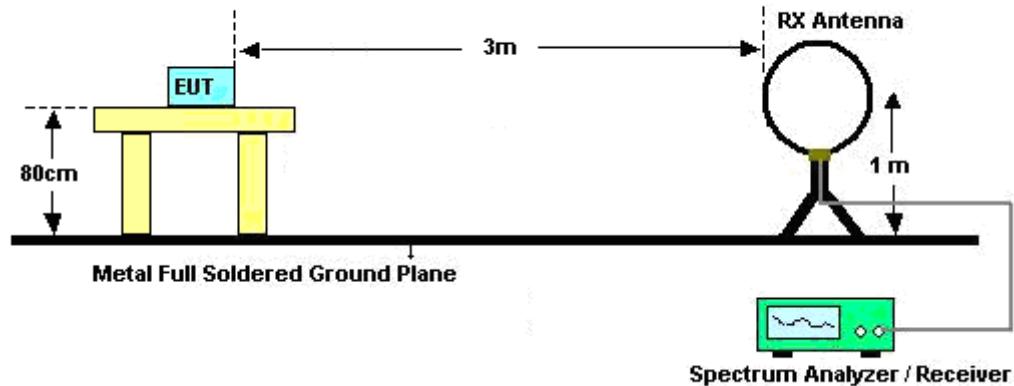
1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the 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  $\geq$  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:

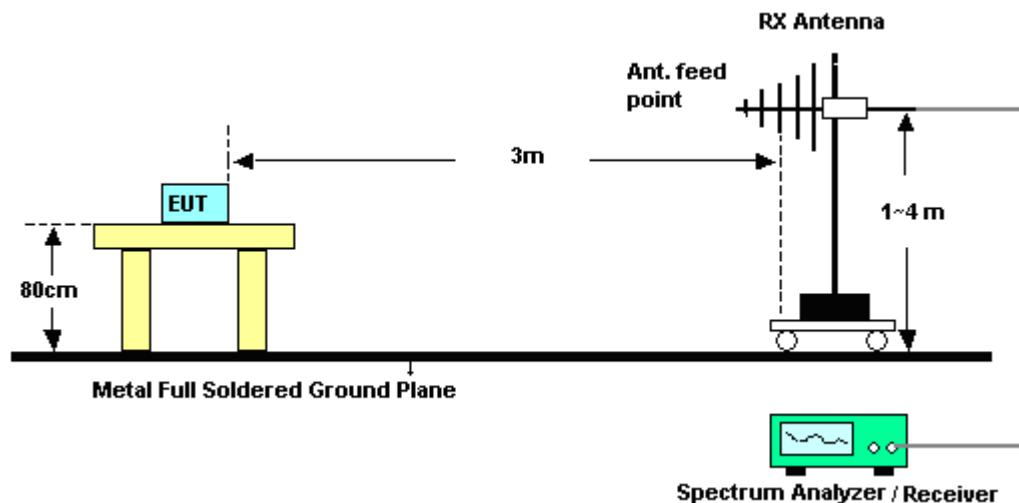
  - VBW = 10 Hz, when duty cycle is no less than 98 percent.
  - $VBW \geq 1/T$ , when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

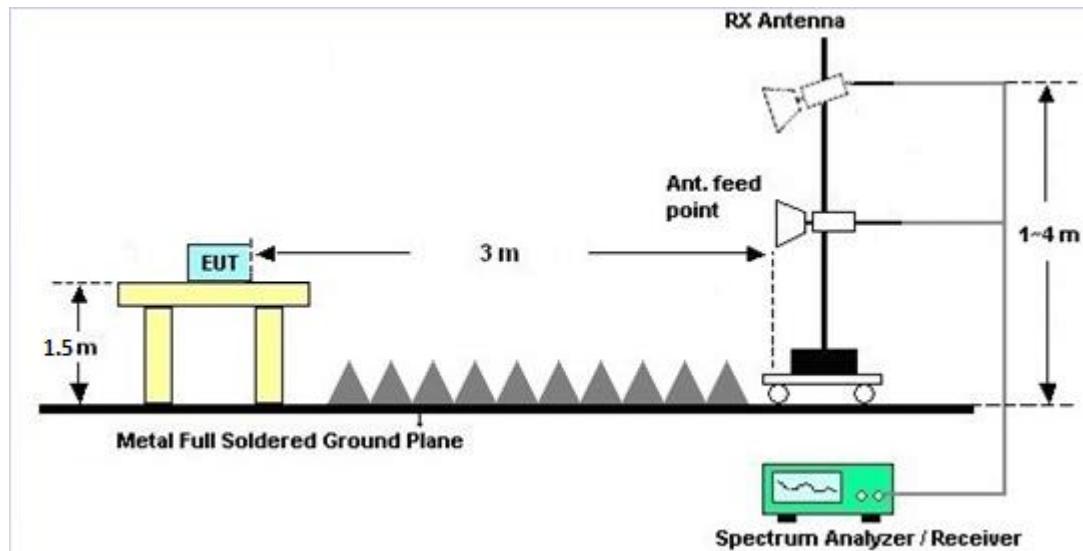
### 3.5.4 Test Setup

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 ~ 10<sup>th</sup> 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 (dB $\mu$ 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.

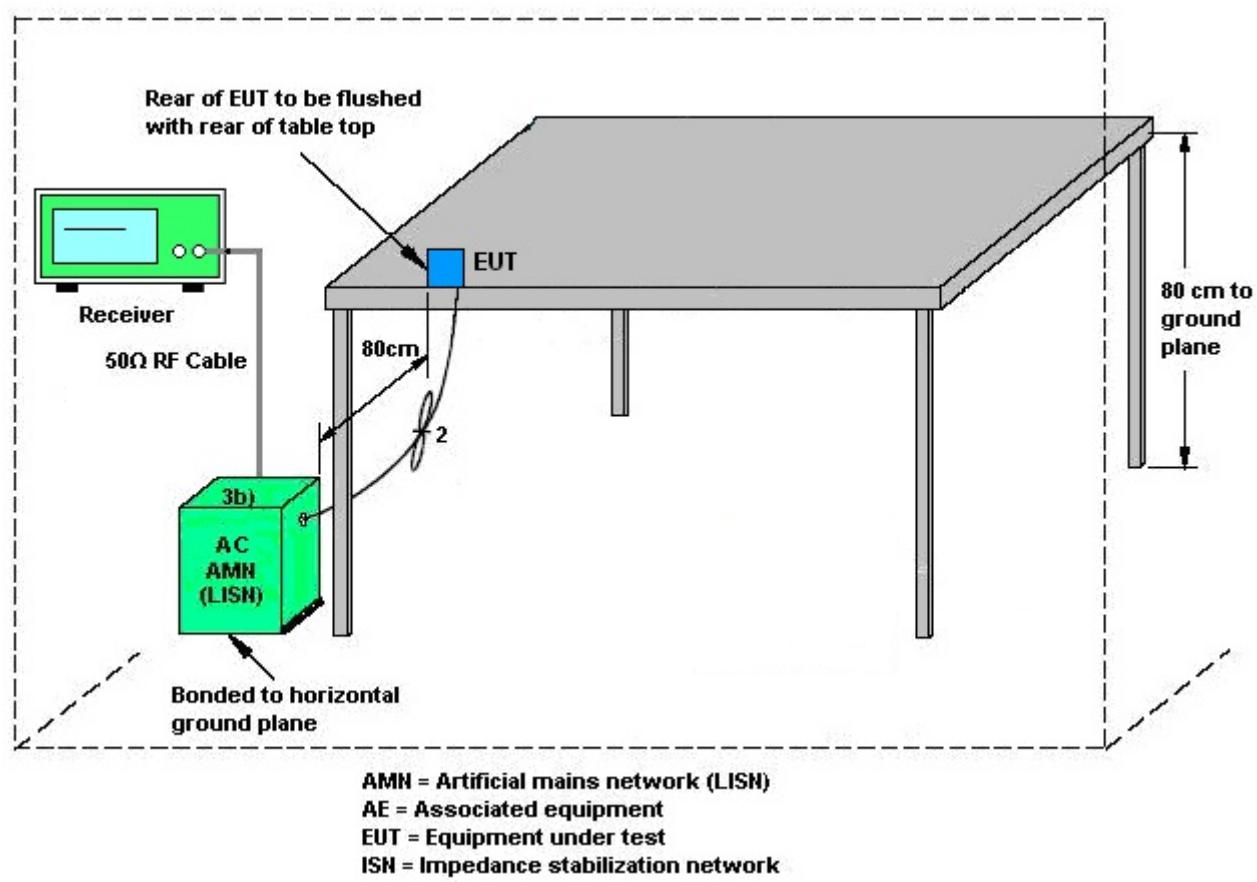
### 3.6.2 Measuring Instruments

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



### 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 Sensor	DARE	RadiPower	15I00041S NO09	10MHz~6GHz	May 07, 2018	Feb. 12, 2019~Apr. 02, 2019	May 06, 2019	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSV 30	100895	9kHz~30GHz	Apr. 20, 2018	Feb. 12, 2019~Apr. 02, 2019	Apr. 19, 2019	Conducted (TH05-HY)
Switch Box & RF Cable	EM	EMSW18	SW107090 3	N/A	Dec. 19, 2018	Feb. 12, 2019~Apr. 02, 2019	Dec. 18, 2019	Conducted (TH05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Mar. 05, 2019	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9KHz~3.6GHz	Nov. 12, 2018	Mar. 05, 2019	Nov. 11, 2019	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 14, 2018	Mar. 05, 2019	Nov. 13, 2019	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Nov. 09, 2018	Mar. 05, 2019	Nov. 08, 2019	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Mar. 05, 2019	N/A	Conduction (CO05-HY)
RF Cable	HUBER + SUHNER	RG 214/U	1358175	9kHz~30MHz	Sep. 14, 2018	Mar. 05, 2019	Sep. 13, 2019	Conduction (CO05-HY)
Pulse Limiter	SCHWARZBECK	VTSD 9561-F N	9561-F N00373	9kHz-200MHz	Nov. 08, 2018	Mar. 05, 2019	Nov. 07, 2019	Conduction (CO05-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Jan. 07, 2019	Feb. 15, 2019~Mar. 29, 2019	Jan. 06, 2020	Radiation (03CH13-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-124 1	1GHz ~ 18GHz	Jun. 29, 2018	Feb. 15, 2019~Mar. 29, 2019	Jun. 28, 2019	Radiation (03CH13-HY)
Bilog Antenna	TESEQ	CBL 6111D&00800 N1D01N-06	37059&01	30MHz~1GHz	Oct. 13, 2018	Feb. 15, 2019~Mar. 29, 2019	Oct. 12, 2019	Radiation (03CH13-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170 584	18GHz- 40GHz	Dec. 05, 2018	Feb. 15, 2019~Mar. 29, 2019	Dec. 04, 2019	Radiation (03CH13-HY)
Preamplifier	Keysight	83017A	MY532700 80	1GHz~26.5GHz	Nov. 14, 2018	Feb. 15, 2019~Mar. 29, 2019	Nov. 13, 2020	Radiation (03CH13-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590074	1GHz~18GHz	May 21, 2018	Feb. 15, 2019~Mar. 29, 2019	May 20, 2019	Radiation (03CH13-HY)
Amplifier	Sonoma-Instrument	310 N	187282	9KHz~1GHz	Dec. 18, 2018	Feb. 15, 2019~Mar. 29, 2019	Dec. 17, 2019	Radiation (03CH13-HY)
Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz, VSWR : 2.5:1 max	Jul. 16, 2018	Feb. 15, 2019~Mar. 29, 2019	Jul. 15, 2019	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126E	0030/126E	30M-18G	Feb. 13, 2019	Feb. 15, 2019~Mar. 29, 2019	Feb. 12, 2020	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	804793/4	30M-18G	Feb. 13, 2019	Feb. 15, 2019~Mar. 29, 2019	Feb. 12, 2020	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24961/4	30M-18G	Feb. 13, 2019	Feb. 15, 2019~Mar. 29, 2019	Feb. 12, 2020	Radiation (03CH13-HY)
Spectrum Analyzer	Agilent	N9010A	MY534701 18	10Hz~44GHz	Apr. 17, 2018	Feb. 15, 2019~Mar. 29, 2019	Apr. 16, 2019	Radiation (03CH13-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Feb. 15, 2019~Mar. 29, 2019	N/A	Radiation (03CH13-HY)

**FCC RADIO TEST REPORT**

Report No. : FR911708C

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Feb. 15, 2019~Mar. 29, 2019	N/A	Radiation (03CH13-HY)
Software	AUDIX	E3 6.2009-8-24c	RK-001124	N/A	N/A	Feb. 15, 2019~Mar. 29, 2019	N/A	Radiation (03CH13-HY)
EMI Test Receiver	Keysight	N9038A (MXE)	MY541300 85	20Hz ~ 8.4GHz	Nov. 01, 2018	Feb. 15, 2019~Mar. 29, 2019	Oct. 31, 2019	Radiation (03CH13-HY)
Filter	Wainwright	WHKX12-270 0-3000-18000 -60SS	SN2	3G High Pass	Jul. 16, 2018	Feb. 15, 2019~Mar. 29, 2019	Jul. 15, 2019	Radiation (03CH13-HY)
Filter	Wainwright	WHKX12-108 0-1200-15000 -60ST	SN3	1.2G Low Pass	Jul. 05, 2018	Feb. 15, 2019~Mar. 29, 2019	Jul. 04, 2019	Radiation (03CH13-HY)



## 5 Uncertainty of Evaluation

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

<b>Measuring Uncertainty for a Level of Confidence of 95% (<math>U = 2U_{c(y)}</math>)</b>	<b>2.2</b>
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### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

<b>Measuring Uncertainty for a Level of Confidence of 95% (<math>U = 2U_{c(y)}</math>)</b>	<b>4.9</b>
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### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

<b>Measuring Uncertainty for a Level of Confidence of 95% (<math>U = 2U_{c(y)}</math>)</b>	<b>5.4</b>
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### Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

<b>Measuring Uncertainty for a Level of Confidence of 95% (<math>U = 2U_{c(y)}</math>)</b>	<b>4.3</b>
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## Appendix A. Test Result of Conducted Test Items

Test Engineer:	Howard Lin	Temperature:	21~25	°C
Test Date:	2019/2/12~2019/4/2	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 1		
11b	1Mbps	1	1	2412	15.58	9.57	0.50	Pass
11b	1Mbps	1	6	2437	23.73	10.07	0.50	Pass
11b	1Mbps	1	11	2462	15.49	9.53	0.50	Pass
11g	6Mbps	1	1	2412	17.23	16.32	0.50	Pass
11g	6Mbps	1	6	2437	19.88	16.32	0.50	Pass
11g	6Mbps	1	11	2462	16.88	16.34	0.50	Pass
HT20	MCS0	1	1	2412	17.93	17.54	0.50	Pass
HT20	MCS0	1	6	2437	20.48	17.58	0.50	Pass
HT20	MCS0	1	11	2462	17.88	17.56	0.50	Pass
HT40	MCS0	1	3	2422	36.46	36.28	0.50	Pass
HT40	MCS0	1	6	2437	36.86	36.28	0.50	Pass
HT40	MCS0	1	9	2452	36.46	36.28	0.50	Pass

**TEST RESULTS DATA**  
**Peak Output Power**

2.4GHz Band										
Mod.	Data Rate	N <sub>Tx</sub>	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 1	Ant 1	Ant 1	Ant 1	
11b	1Mbps	1	1	2412	22.51	30.00	2.20	24.71	36.00	Pass
11b	1Mbps	1	6	2437	23.43	30.00	2.20	25.63	36.00	Pass
11b	1Mbps	1	11	2462	22.36	30.00	2.20	24.56	36.00	Pass
11g	6Mbps	1	1	2412	22.86	30.00	2.20	25.06	36.00	Pass
11g	6Mbps	1	6	2437	23.40	30.00	2.20	25.60	36.00	Pass
11g	6Mbps	1	11	2462	22.70	30.00	2.20	24.90	36.00	Pass
HT20	MCS0	1	1	2412	23.09	30.00	2.20	25.29	36.00	Pass
HT20	MCS0	1	6	2437	23.46	30.00	2.20	25.66	36.00	Pass
HT20	MCS0	1	11	2462	22.52	30.00	2.20	24.72	36.00	Pass
HT40	MCS0	1	3	2422	21.40	30.00	2.20	23.60	36.00	Pass
HT40	MCS0	1	6	2437	22.85	30.00	2.20	25.05	36.00	Pass
HT40	MCS0	1	9	2452	21.26	30.00	2.20	23.46	36.00	Pass

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

**TEST RESULTS DATA**  
**Average Output Power**

2.4GHz Band						
Mod.	Data Rate	N <sub>Tx</sub>	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
					Ant 1	Ant 1
11b	1Mbps	1	1	2412	0.00	20.92
11b	1Mbps	1	6	2437	0.00	22.50
11b	1Mbps	1	11	2462	0.00	20.74
11g	6Mbps	1	1	2412	0.00	16.73
11g	6Mbps	1	6	2437	0.00	19.04
11g	6Mbps	1	11	2462	0.00	16.12
HT20	MCS0	1	1	2412	0.00	15.97
HT20	MCS0	1	6	2437	0.00	19.23
HT20	MCS0	1	11	2462	0.00	15.02
HT40	MCS0	1	3	2422	0.00	13.12
HT40	MCS0	1	6	2437	0.00	16.45
HT40	MCS0	1	9	2452	0.00	12.76

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

**TEST RESULTS DATA**  
**Peak Power Spectral Density**

2.4GHz Band								
Mod.	Data Rate	N <sub>Tx</sub>	CH.	Freq. (MHz)	Peak PSD (dBm/3kHz)	DG (dBi)	Peak PSD Limit (dBm/3kHz)	Pass/Fail
					Ant 1	Ant 1	Ant 1	
11b	1Mbps	1	1	2412	-1.90	2.20	8.00	Pass
11b	1Mbps	1	6	2437	-1.81	2.20	8.00	Pass
11b	1Mbps	1	11	2462	-1.80	2.20	8.00	Pass
11g	6Mbps	1	1	2412	-7.33	2.20	8.00	Pass
11g	6Mbps	1	6	2437	-4.77	2.20	8.00	Pass
11g	6Mbps	1	11	2462	-8.07	2.20	8.00	Pass
HT20	MCS0	1	1	2412	-8.44	2.20	8.00	Pass
HT20	MCS0	1	6	2437	-5.05	2.20	8.00	Pass
HT20	MCS0	1	11	2462	-8.85	2.20	8.00	Pass
HT40	MCS0	1	3	2422	-13.65	2.20	8.00	Pass
HT40	MCS0	1	6	2437	-12.03	2.20	8.00	Pass
HT40	MCS0	1	9	2452	-14.41	2.20	8.00	Pass

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



## Appendix B. AC Conducted Emission Test Results

<b>Test Engineer :</b>	Jimmy Chang	<b>Temperature :</b>	24~26°C
		<b>Relative Humidity :</b>	51~53%



## Appendix C. Radiated Spurious Emission

Test Engineer :	Alex Jheng, Fu Chen, and Wilson Wu	Temperature :		24.5~25.3°C	
		Relative Humidity :		50~55%	

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.		( MHz )	( dB $\mu$ V/m )	( dB )	( dB $\mu$ V/m )	( dB $\mu$ V )	( dB/m )	( dB )	( dB )	( cm )	Pos	Pos	Avg.
1		2388.435	57.18	-16.82	74	45.61	27.23	13.92	29.58	399	303	P	H
802.11b CH 01 2412MHz		2386.125	51.11	-2.89	54	39.54	27.23	13.92	29.58	399	303	A	H
	*	2412	112.01	-	-	100.37	27.28	13.94	29.58	399	303	P	H
	*	2412	108.98	-	-	97.34	27.28	13.94	29.58	399	303	A	H
													H
													H
		2387.07	56.55	-17.45	74	44.98	27.23	13.92	29.58	141	80	P	V
		2386.125	49.78	-4.22	54	38.21	27.23	13.92	29.58	141	80	A	V
	*	2412	110.64	-	-	99	27.28	13.94	29.58	141	80	P	V
	*	2412	107.46	-	-	95.82	27.28	13.94	29.58	141	80	A	V
													V
802.11b CH 06 2437MHz		2383.08	52.72	-21.28	74	41.19	27.19	13.92	29.58	383	301	P	H
		2388.4	44.02	-9.98	54	32.45	27.23	13.92	29.58	383	301	A	H
	*	2437	112.1	-	-	100.35	27.37	13.96	29.58	383	301	P	H
	*	2437	108.98	-	-	97.23	27.37	13.96	29.58	383	301	A	H
		2484.18	53.69	-20.31	74	41.8	27.46	14	29.57	383	301	P	H
		2484.81	45.09	-8.91	54	33.2	27.46	14	29.57	383	301	A	H
		2388.82	52.86	-21.14	74	41.29	27.23	13.92	29.58	226	294	P	V
		2388.54	42.69	-11.31	54	31.12	27.23	13.92	29.58	226	294	A	V
	*	2437	110.64	-	-	98.89	27.37	13.96	29.58	226	294	P	V
	*	2437	107.65	-	-	95.9	27.37	13.96	29.58	226	294	A	V
		2484.04	53.28	-20.72	74	41.39	27.46	14	29.57	226	294	P	V
		2484.74	44.02	-9.98	54	32.13	27.46	14	29.57	226	294	A	V



<b>802.11b CH 11 2462MHz</b>	*	2462	111.68	-	-	99.86	27.41	13.98	29.57	343	41	P	H
	*	2462	108.66	-	-	96.84	27.41	13.98	29.57	343	41	A	H
		2487.56	56.53	-17.47	74	44.6	27.5	14	29.57	343	41	P	H
		2487.8	49.66	-4.34	54	37.73	27.5	14	29.57	343	41	A	H
													H
													H
	*	2462	110.13	-	-	98.31	27.41	13.98	29.57	170	292	P	V
	*	2462	107.01	-	-	95.19	27.41	13.98	29.57	170	292	A	V
		2487.76	55.79	-18.21	74	43.86	27.5	14	29.57	170	292	P	V
		2487.8	48.34	-5.66	54	36.41	27.5	14	29.57	170	292	A	V
													V
													V
<b>Remark</b>	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



## 2.4GHz 2400~2483.5MHz

## WIFI 802.11b (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dB $\mu$ V/m )	Over Limit ( dB )	Limit Line ( dB $\mu$ V/m )	Read Level ( dB $\mu$ V )	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. (P/A)	Pol. (H/V)
802.11b CH 01 2412MHz		4824	45.36	-28.64	74	65.23	31.26	6.42	57.55	100	0	P	H
													H
													H
													H
		4824	46.21	-27.79	74	66.08	31.26	6.42	57.55	100	0	P	V
													V
													V
													V
802.11b CH 06 2437MHz		4874	47.29	-26.71	74	66.82	31.36	6.56	57.45	100	0	P	H
		7311	47.42	-26.58	74	60.31	36.18	8.2	57.27	100	0	P	H
													H
		4874	47.83	-26.17	74	67.36	31.36	6.56	57.45	100	0	P	V
		7311	48.59	-25.41	74	61.48	36.18	8.2	57.27	100	0	P	V
													V
													V
													V
802.11b CH 11 2462MHz		4924	48.95	-25.05	74	68.14	31.46	6.7	57.35	100	0	P	H
		7386	47.53	-26.47	74	60.38	36.37	8.14	57.36	100	0	P	H
													H
		4924	50.04	-23.96	74	69.23	31.46	6.7	57.35	100	0	P	V
		7386	48.44	-25.56	74	61.29	36.37	8.14	57.36	100	0	P	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 802.11g (Band Edge @ 3m)

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dB $\mu$ V/m )	Over Limit ( dB )	Limit Line ( dB $\mu$ V/m )	Read Level ( dB $\mu$ V )	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 01 2412MHz		2390	68.52	-5.48	74	56.95	27.23	13.92	29.58	392	299	P	H
		2390	52.54	-1.46	54	40.97	27.23	13.92	29.58	392	299	A	H
	*	2412	109.45	-	-	97.81	27.28	13.94	29.58	392	299	P	H
	*	2412	102.2	-	-	90.56	27.28	13.94	29.58	392	299	A	H
													H
													H
		2390	66.92	-7.08	74	55.35	27.23	13.92	29.58	197	55	P	V
		2390	50.5	-3.5	54	38.93	27.23	13.92	29.58	197	55	A	V
	*	2412	107.47	-	-	95.83	27.28	13.94	29.58	197	55	P	V
	*	2412	99.97	-	-	88.33	27.28	13.94	29.58	197	55	A	V
													V
													V
802.11g CH 06 2437MHz		2387	53.39	-20.61	74	41.82	27.23	13.92	29.58	310	303	P	H
		2389.66	41.93	-12.07	54	30.36	27.23	13.92	29.58	310	303	A	H
	*	2437	111.54	-	-	99.79	27.37	13.96	29.58	310	303	P	H
	*	2437	103.83	-	-	92.08	27.37	13.96	29.58	310	303	A	H
		2485.58	52.64	-21.36	74	40.75	27.46	14	29.57	310	303	P	H
		2483.5	42.01	-11.99	54	30.12	27.46	14	29.57	310	303	A	H
		2384.06	52.77	-21.23	74	41.24	27.19	13.92	29.58	168	68	P	V
		2388.4	41.69	-12.31	54	30.12	27.23	13.92	29.58	168	68	A	V
	*	2437	110.04	-	-	98.29	27.37	13.96	29.58	168	68	P	V
	*	2437	101.91	-	-	90.16	27.37	13.96	29.58	168	68	A	V
		2486.35	52.72	-21.28	74	40.83	27.46	14	29.57	168	68	P	V
		2483.55	41.88	-12.12	54	29.99	27.46	14	29.57	168	68	A	V



<b>802.11g CH 11 2462MHz</b>	*	2462	108.88	-	-	97.06	27.41	13.98	29.57	382	303	P	H
	*	2462	101.43	-	-	89.61	27.41	13.98	29.57	382	303	A	H
		2483.52	69.21	-4.79	74	57.32	27.46	14	29.57	382	303	P	H
		2483.52	52.39	-1.61	54	40.5	27.46	14	29.57	382	303	A	H
													H
													H
	*	2462	106.59	-	-	94.77	27.41	13.98	29.57	133	84	P	V
	*	2462	99.01	-	-	87.19	27.41	13.98	29.57	133	84	A	V
		2483.56	64.95	-9.05	74	53.06	27.46	14	29.57	133	84	P	V
		2483.52	48.57	-5.43	54	36.68	27.46	14	29.57	133	84	A	V
													V
													V
<b>Remark</b>	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



## 2.4GHz 2400~2483.5MHz

## WIFI 802.11g (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dB $\mu$ V/m )	Over Limit ( dB )	Limit Line ( dB $\mu$ V/m )	Read Level ( dB $\mu$ V )	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 01 2412MHz		4824	43.19	-30.81	74	63.04	31.26	6.44	57.55	100	0	P	H
													H
													H
													H
		4824	41.6	-32.4	74	61.45	31.26	6.44	57.55	100	0	P	V
													V
													V
													V
802.11g CH 06 2437MHz		4874	43.52	-30.48	74	63.03	31.36	6.58	57.45	100	0	P	H
		7311	43.4	-30.6	74	56.24	36.18	8.25	57.27	100	0	P	H
													H
		4874	44.01	-29.99	74	63.52	31.36	6.58	57.45	100	0	P	V
		7311	44.2	-29.8	74	57.04	36.18	8.25	57.27	100	0	P	V
													V
													V
													V
802.11g CH 11 2462MHz		4924	41.33	-32.67	74	60.49	31.46	6.73	57.35	100	0	P	H
		7386	44.06	-29.94	74	56.85	36.37	8.2	57.36	100	0	P	H
													H
		4924	43.58	-30.42	74	62.74	31.46	6.73	57.35	100	0	P	V
		7386	44.41	-29.59	74	57.2	36.37	8.2	57.36	100	0	P	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 (Band Edge @ 3m)

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dB $\mu$ V/m )	Over Limit ( dB )	Limit Line ( dB $\mu$ V/m )	Read Level ( dB $\mu$ V )	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		2390	70.15	-3.85	74	58.58	27.23	13.92	29.58	391	303	P	H
		2390	52.88	-1.12	54	41.31	27.23	13.92	29.58	391	303	A	H
	*	2412	108.49	-	-	96.85	27.28	13.94	29.58	391	303	P	H
	*	2412	101.06	-	-	89.42	27.28	13.94	29.58	391	303	A	H
													H
													H
		2390	69.08	-4.92	74	57.51	27.23	13.92	29.58	199	81	P	V
		2390	52.16	-1.84	54	40.59	27.23	13.92	29.58	199	81	A	V
	*	2412	106.9	-	-	95.26	27.28	13.94	29.58	199	81	P	V
	*	2412	98.98	-	-	87.34	27.28	13.94	29.58	199	81	A	V
													V
													V
802.11n HT20 CH 06 2437MHz		2389.1	53.17	-20.83	74	41.6	27.23	13.92	29.58	301	299	P	H
		2388.96	41.82	-12.18	54	30.25	27.23	13.92	29.58	301	299	A	H
	*	2437	111.43	-	-	99.68	27.37	13.96	29.58	301	299	P	H
	*	2437	103.8	-	-	92.05	27.37	13.96	29.58	301	299	A	H
		2488.1	53.66	-20.34	74	41.73	27.5	14	29.57	301	299	P	H
		2483.69	42.06	-11.94	54	30.17	27.46	14	29.57	301	299	A	H
		2371.88	52.82	-21.18	74	41.31	27.19	13.91	29.59	138	276	P	V
		2388.26	41.33	-12.67	54	29.76	27.23	13.92	29.58	138	276	A	V
	*	2437	108.38	-	-	96.63	27.37	13.96	29.58	138	276	P	V
	*	2437	100.39	-	-	88.64	27.37	13.96	29.58	138	276	A	V
		2488.59	52.86	-21.14	74	40.92	27.5	14.01	29.57	138	276	P	V
		2483.9	41.85	-12.15	54	29.96	27.46	14	29.57	138	276	A	V



	*	2462	107.84	-	-	96.02	27.41	13.98	29.57	294	301	P	H
	*	2462	100.32	-	-	88.5	27.41	13.98	29.57	294	301	A	H
		2484.08	67.89	-6.11	74	56	27.46	14	29.57	294	301	P	H
		2483.52	52.45	-1.55	54	40.56	27.46	14	29.57	294	301	A	H
													H
													H
<b>802.11n</b>													
<b>HT20</b>													
<b>CH 11</b>	*	2462	105.28	-	-	93.46	27.41	13.98	29.57	132	291	P	V
<b>2462MHz</b>	*	2462	97.69	-	-	85.87	27.41	13.98	29.57	132	291	A	V
		2484	66.13	-7.87	74	54.24	27.46	14	29.57	132	291	P	V
		2483.52	50.39	-3.61	54	38.5	27.46	14	29.57	132	291	A	V
													V
													V
<b>Remark</b>	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 Ant. 1	Note	Frequency ( MHz )	Level ( dB $\mu$ V/m )	Over Limit ( dB )	Limit Line ( dB $\mu$ V/m )	Read Level ( dB $\mu$ V )	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	42.24	-31.76	74	62.09	31.26	6.44	57.55	100	0	P	H
													H
													H
													H
		4824	40.61	-33.39	74	60.46	31.26	6.44	57.55	100	0	P	V
													V
													V
													V
802.11n HT20 CH 06 2437MHz		4874	44.41	-29.59	74	63.92	31.36	6.58	57.45	100	0	P	H
		7311	43.44	-30.56	74	56.28	36.18	8.25	57.27	100	0	P	H
													H
													H
		4874	44.19	-29.81	74	63.7	31.36	6.58	57.45	100	0	P	V
		7311	43.8	-30.2	74	56.64	36.18	8.25	57.27	100	0	P	V
													V
													V
802.11n HT20 CH 11 2462MHz		4924	40.4	-33.6	74	59.56	31.46	6.73	57.35	100	0	P	H
		7386	43.63	-30.37	74	56.42	36.37	8.2	57.36	100	0	P	H
													H
													H
		4924	42.08	-31.92	74	61.24	31.46	6.73	57.35	100	0	P	V
		7386	44.05	-29.95	74	56.84	36.37	8.2	57.36	100	0	P	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 HT40 (Band Edge @ 3m)

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dB $\mu$ V/m )	Over Limit ( dB )	Limit Line ( dB $\mu$ V/m )	Read Level ( dB $\mu$ V )	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		2389.24	66.49	-7.51	74	54.92	27.23	3.99	29.58	307	300	P	H
		2389.94	53.62	-0.38	54	42.05	27.23	3.99	29.58	307	300	A	H
	*	2422	100.69	-	-	89	27.32	4.02	29.58	307	300	P	H
	*	2422	92.93	-	-	81.24	27.32	4.02	29.58	307	300	A	H
		2493.14	53.69	-20.31	74	41.75	27.5	4.08	29.57	307	300	P	H
		2484.6	41.72	-12.28	54	29.83	27.46	4.07	29.57	307	300	A	H
		2389.66	60.91	-13.09	74	49.34	27.23	3.99	29.58	112	274	P	V
		2389.94	47.87	-6.13	54	36.3	27.23	3.99	29.58	112	274	A	V
	*	2422	96.95	-	-	85.26	27.32	4.02	29.58	112	274	P	V
	*	2422	89.27	-	-	77.58	27.32	4.02	29.58	112	274	A	V
802.11n HT40 CH 06 2437MHz		2486.28	53.42	-20.58	74	41.53	27.46	4.07	29.57	112	274	P	V
		2495.8	41.66	-12.34	54	29.72	27.5	4.08	29.57	112	274	A	V
		2389.38	69.03	-4.97	74	57.46	27.23	13.92	29.58	309	302	P	H
		2389.94	53.23	-0.77	54	41.66	27.23	13.92	29.58	309	302	A	H
	*	2437	107	-	-	95.25	27.37	13.96	29.58	309	302	P	H
	*	2437	98.5	-	-	86.75	27.37	13.96	29.58	309	302	A	H
		2484.67	65.68	-8.32	74	53.79	27.46	14	29.57	309	302	P	H
		2483.5	51.44	-2.56	54	39.55	27.46	14	29.57	309	302	A	H
		2389.94	58.98	-15.02	74	47.41	27.23	13.92	29.58	165	296	P	V
		2389.94	46.56	-7.44	54	34.99	27.23	13.92	29.58	165	296	A	V
802.11n HT40 CH 06 2437MHz	*	2437	102.65	-	-	90.9	27.37	13.96	29.58	165	296	P	V
	*	2437	94.75	-	-	83	27.37	13.96	29.58	165	296	A	V
		2484.04	67.26	-6.74	74	55.37	27.46	14	29.57	165	296	P	V
		2483.5	50.51	-3.49	54	38.62	27.46	14	29.57	165	296	A	V



		2361.66	52.69	-21.31	74	41.24	27.14	13.9	29.59	379	301	P	H
		2388.26	41.56	-12.44	54	29.99	27.23	13.92	29.58	379	301	A	H
	*	2452	103.68	-	-	91.92	27.37	13.97	29.58	379	301	P	H
	*	2452	95.01	-	-	83.25	27.37	13.97	29.58	379	301	A	H
		2484.95	66.43	-7.57	74	54.54	27.46	14	29.57	379	301	P	H
	<b>HT40</b>	2483.5	51.84	-2.16	54	39.95	27.46	14	29.57	379	301	A	H
	<b>CH 09</b>	2383.36	52.01	-21.99	74	40.48	27.19	13.92	29.58	168	296	P	V
	<b>2452MHz</b>	2388.82	41.24	-12.76	54	29.67	27.23	13.92	29.58	168	296	A	V
	*	2452	99.31	-	-	87.55	27.37	13.97	29.58	168	296	P	V
	*	2452	91.52	-	-	79.76	27.37	13.97	29.58	168	296	A	V
		2483.83	62.73	-11.27	74	50.84	27.46	14	29.57	168	296	P	V
		2483.5	49.41	-4.59	54	37.52	27.46	14	29.57	168	296	A	V
<b>Remark</b>	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 ( dB $\mu$ V/m )	Over Limit ( dB )	Limit Line ( dB $\mu$ V/m )	Read Level ( dB $\mu$ V )	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	38.22	-35.78	74	57.94	31.29	5.99	57.51	100	0	P	H
		7266	43.52	-30.48	74	56.36	36.11	7.8	57.22	100	0	P	H
													H
													H
		4844	38.62	-35.38	74	58.34	31.29	5.99	57.51	100	0	P	V
		7266	43.07	-30.93	74	55.91	36.11	7.8	57.22	100	0	P	V
													V
													V
802.11n HT40 CH 06 2437MHz		4874	39.57	-34.43	74	59.08	31.36	6.58	57.45	100	0	P	H
		7311	43.92	-30.08	74	56.76	36.18	8.25	57.27	100	0	P	H
													H
													H
		4874	39.59	-34.41	74	59.1	31.36	6.58	57.45	100	0	P	V
		7311	43.88	-30.12	74	56.72	36.18	8.25	57.27	100	0	P	V
													V
													V
802.11n HT40 CH 09 2452MHz		4904	38.45	-35.55	74	57.74	31.43	6.67	57.39	100	0	P	H
		7356	43.69	-30.31	74	56.5	36.3	8.22	57.33	100	0	P	H
													H
													H
		4904	38.37	-35.63	74	57.66	31.43	6.67	57.39	100	0	P	V
		7356	43.95	-30.05	74	56.76	36.3	8.22	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.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		( MHz )	( dB $\mu$ V/m )	( dB )	( dB $\mu$ V/m )	(dB $\mu$ V)	( dB/m )	( dB )	( dB )	( cm )	( deg )	(P/A)	(H/V)
2.4GHz 802.11n HT40 LF		30.97	22.97	-17.03	40	31.06	23.74	0.46	32.29	-	-	P	H
		95.96	20.05	-23.45	43.5	36.08	15.4	0.79	32.22	-	-	P	H
		208.48	20.06	-23.44	43.5	35.84	15.1	1.26	32.14	-	-	P	H
		358.83	29.09	-16.91	46	39.01	20.67	1.57	32.16	-	-	P	H
		663.41	37.39	-8.61	46	40.96	26.36	2.21	32.14	100	0	P	H
		947.62	34.26	-11.74	46	32.16	30.45	2.66	31.01	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
Remark	1.	No other spurious found.											
	2.	All results are PASS against limit line.											

**Note symbol**

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



**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 )	( dB $\mu$ V/m )	( dB )	( dB $\mu$ V/m )	( dB $\mu$ V )	( dB/m )	( dB )	( dB )	( cm )	( deg )	(P/A)	(H/V)
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)

2. Level(dB $\mu$ V/m) =

Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dB $\mu$ V) - Preamp Factor(dB)

3. Over Limit(dB) = Level(dB $\mu$ V/m) – Limit Line(dB $\mu$ V/m)

#### For Peak Limit @ 2390MHz:

1. Level(dB $\mu$ V/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dB $\mu$ V) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dB $\mu$ V) – 35.86 (dB)

= 55.45 (dB $\mu$ V/m)

2. Over Limit(dB)

= Level(dB $\mu$ V/m) – Limit Line(dB $\mu$ V/m)

= 55.45(dB $\mu$ V/m) – 74(dB $\mu$ V/m)

= -18.55(dB)

#### For Average Limit @ 2390MHz:

1. Level(dB $\mu$ V/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dB $\mu$ V) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dB $\mu$ V) – 35.86 (dB)

= 43.54 (dB $\mu$ V/m)

2. Over Limit(dB)

= Level(dB $\mu$ V/m) – Limit Line(dB $\mu$ V/m)

= 43.54(dB $\mu$ V/m) – 54(dB $\mu$ V/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

<b>Test Engineer :</b>	Alex Jheng, Fu Chen, and Wilson Wu	<b>Temperature :</b>	24.5~25.3°C
		<b>Relative Humidity :</b>	50~55%

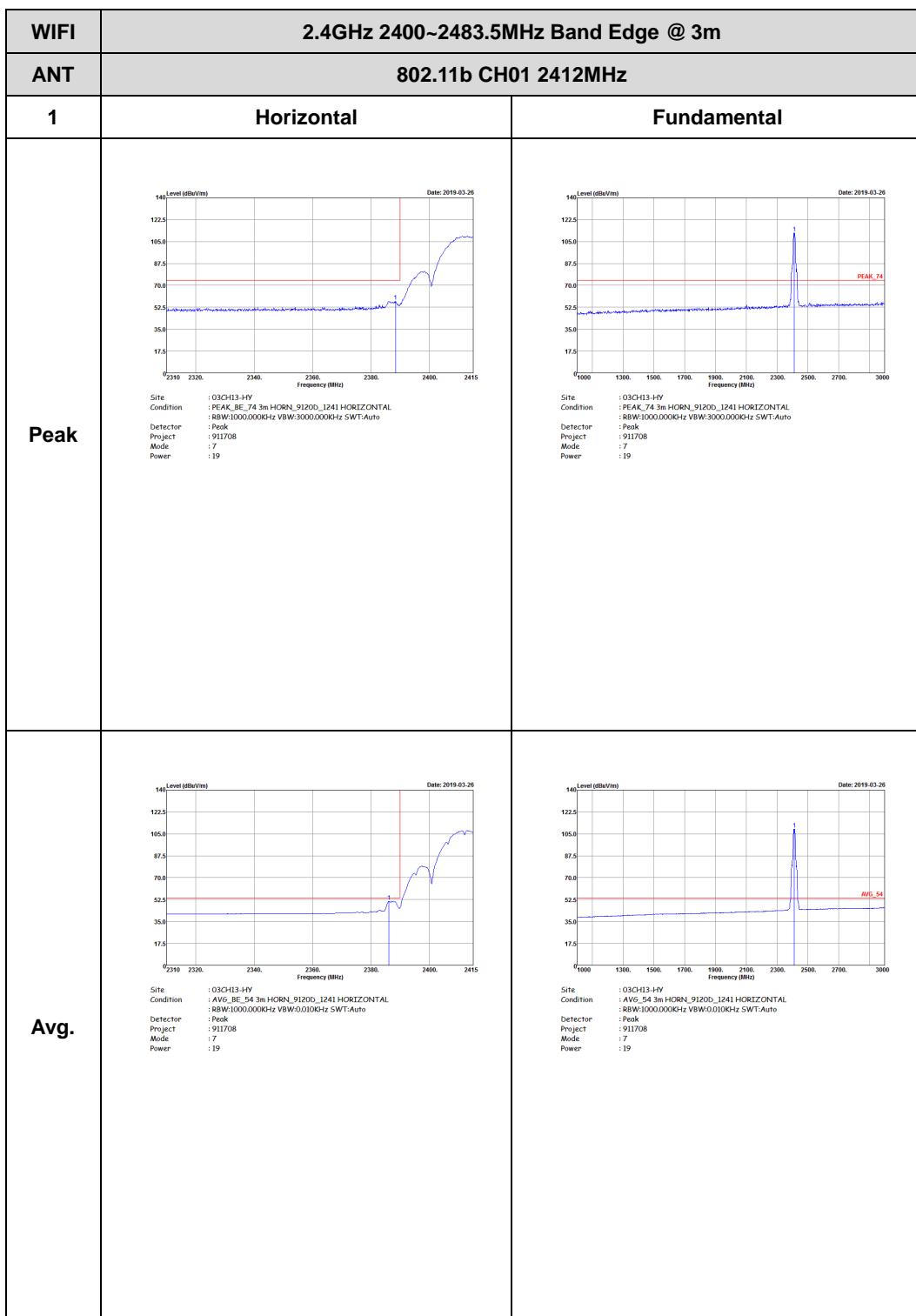
### Note symbol

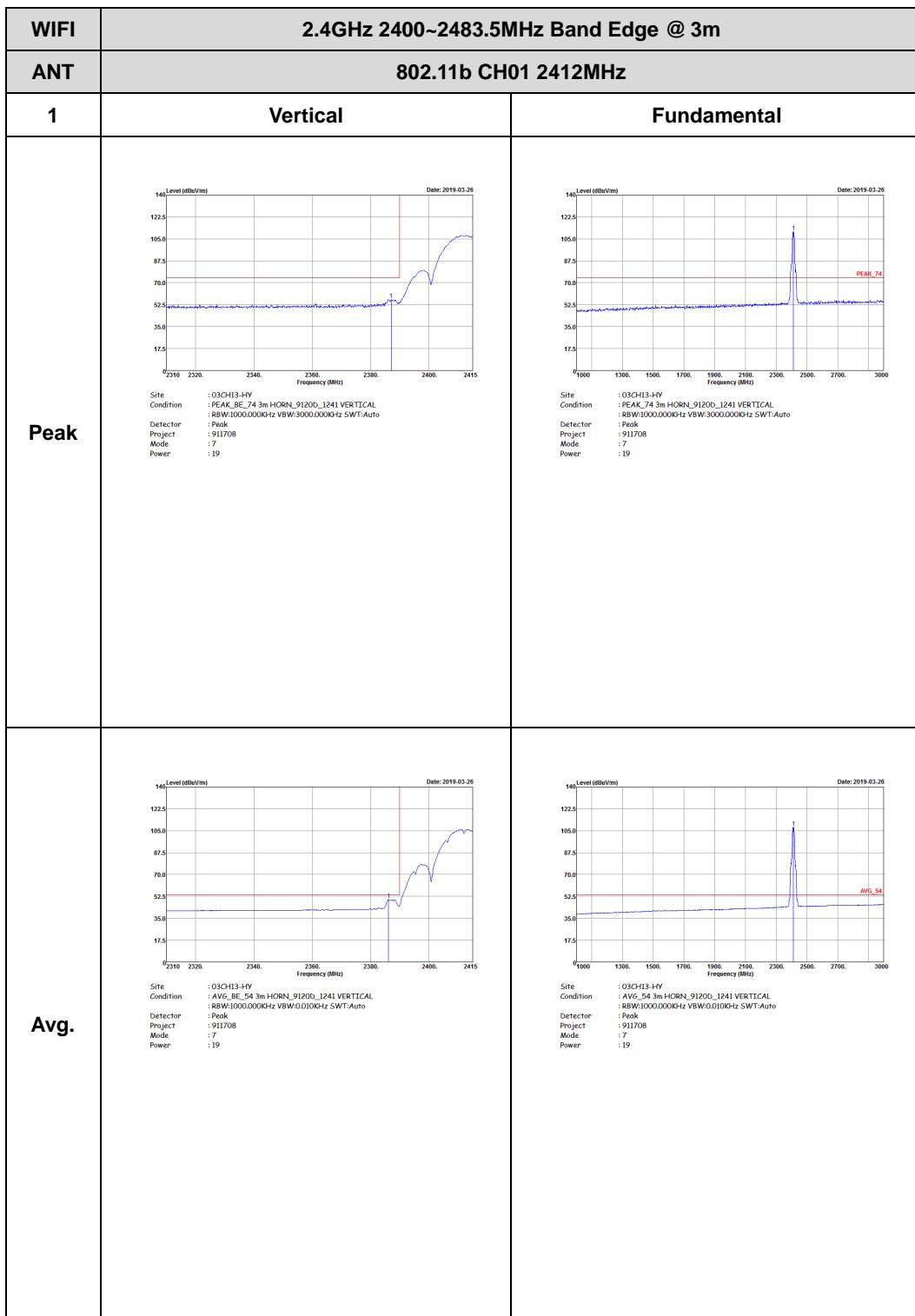
-L	<b>Low channel location</b>
-R	<b>High channel location</b>

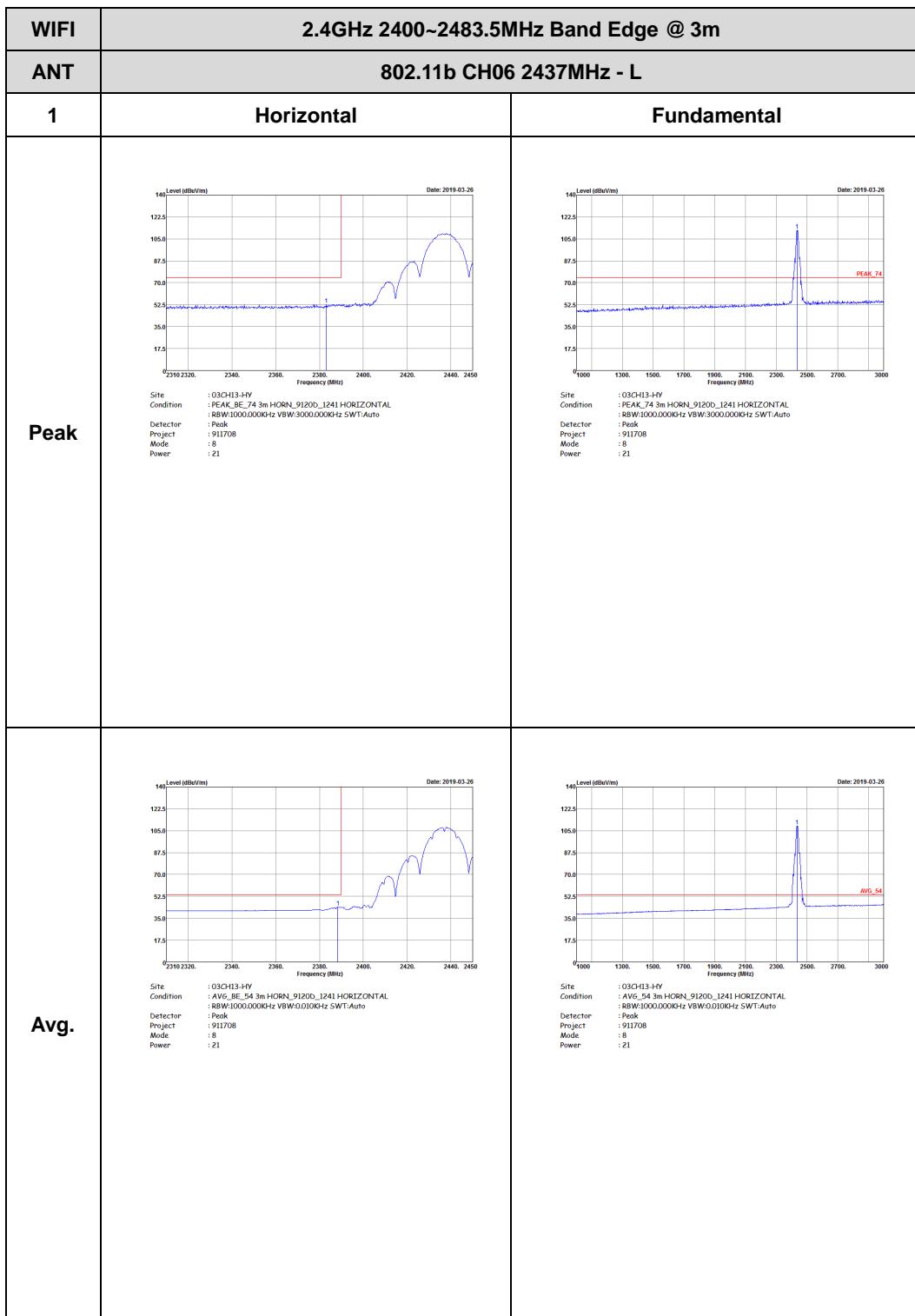


## 2.4GHz 2400~2483.5MHz

## WIFI 802.11b (Band Edge @ 3m)

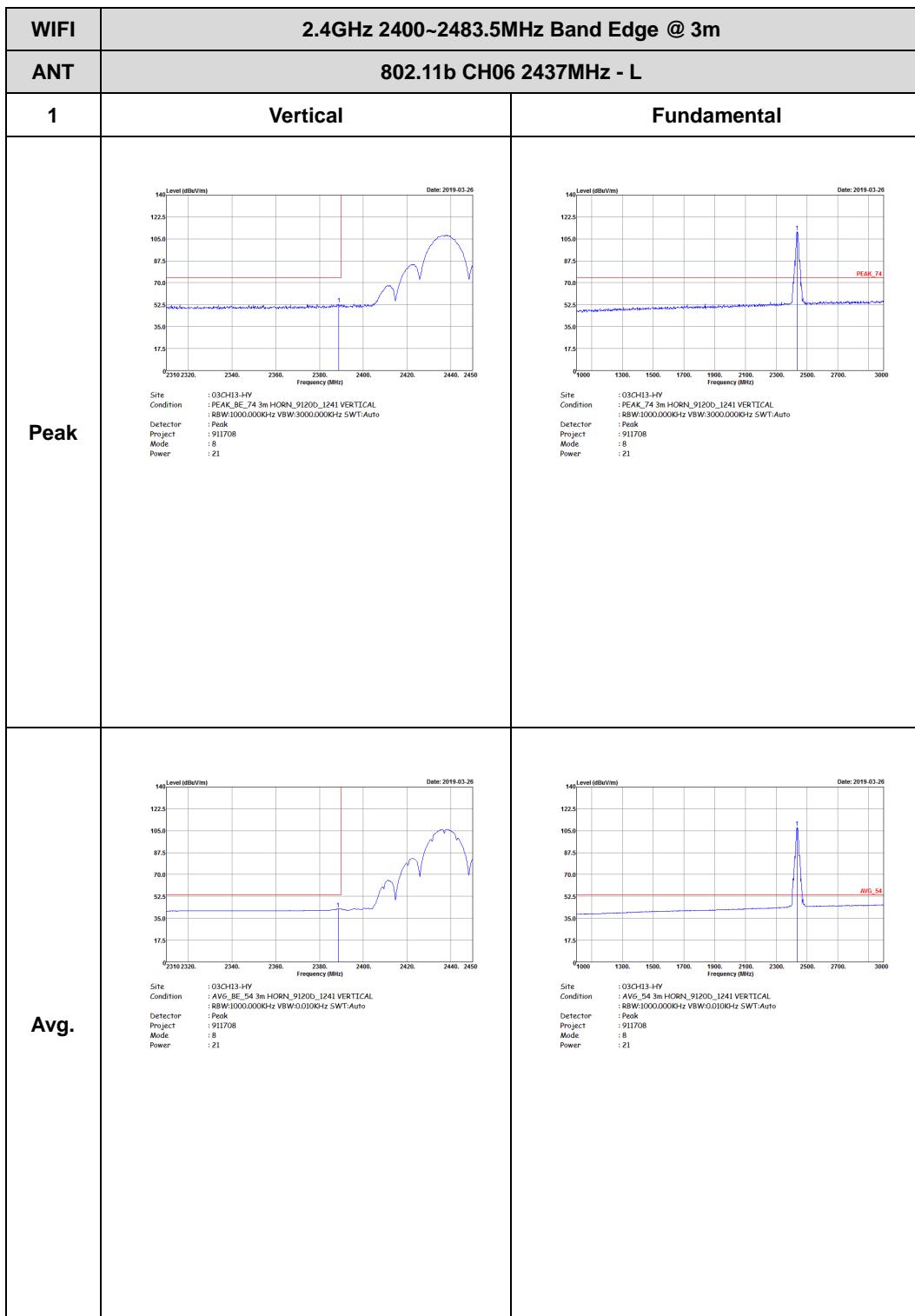






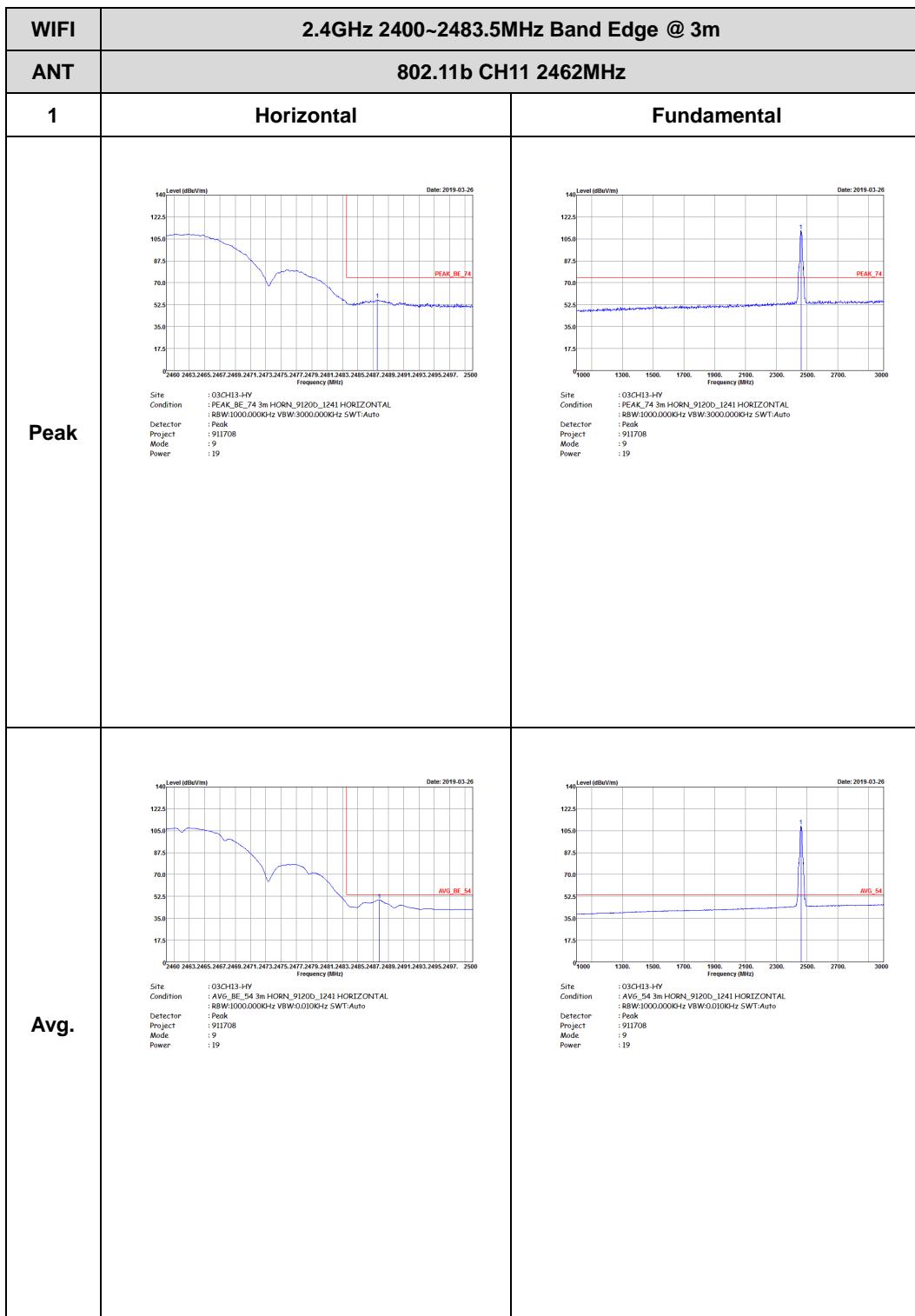


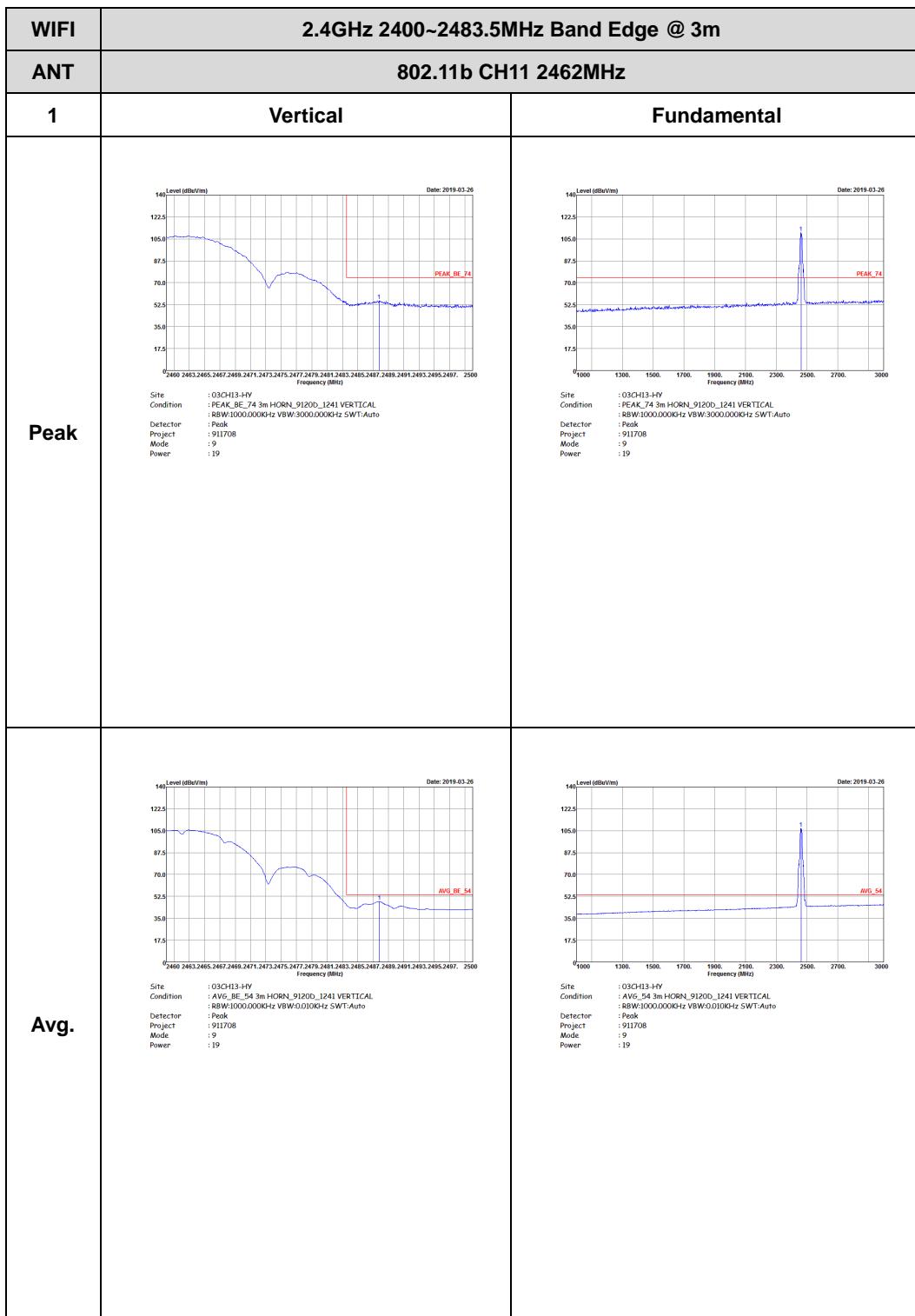
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH06 2437MHz - R	
1	Horizontal	Fundamental
Peak	<p>Site : 03CH13-HV Condition : PCMK_BE_74 3m HORN_91200_1241 HORIZONTAL Detector : R8W:1000.000KHz VBW:3000.000KHz SWT:Auto Project : 911708 Mode : 8 Power : 21</p>	Left blank
Avg.	<p>Site : 03CH13-HV Condition : AVG_BE_54 3m HORN_91200_1241 HORIZONTAL Detector : R8W:1000.000KHz VBW:0.010KHz SWT:Auto Project : 911708 Mode : 8 Power : 21</p>	Left blank





WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH06 2437MHz - R	
1	Vertical	Fundamental
Peak	<p>Date: 2019-03-26</p> <p>Site : 03CH13-HV Condition : PCAK_BE_74 3m HORN_91200,_1241 VERTICAL Detector : R8W:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak Mode : 8 Power : 21</p>	Left blank
Avg.	<p>Date: 2019-03-26</p> <p>Site : 03CH13-HV Condition : AVG_BE_54 3m HORN_91200,_1241 VERTICAL Detector : R8W:1000.000KHz VBW:0.010KHz SWT:Auto Project : Peak Mode : 8 Power : 21</p>	Left blank

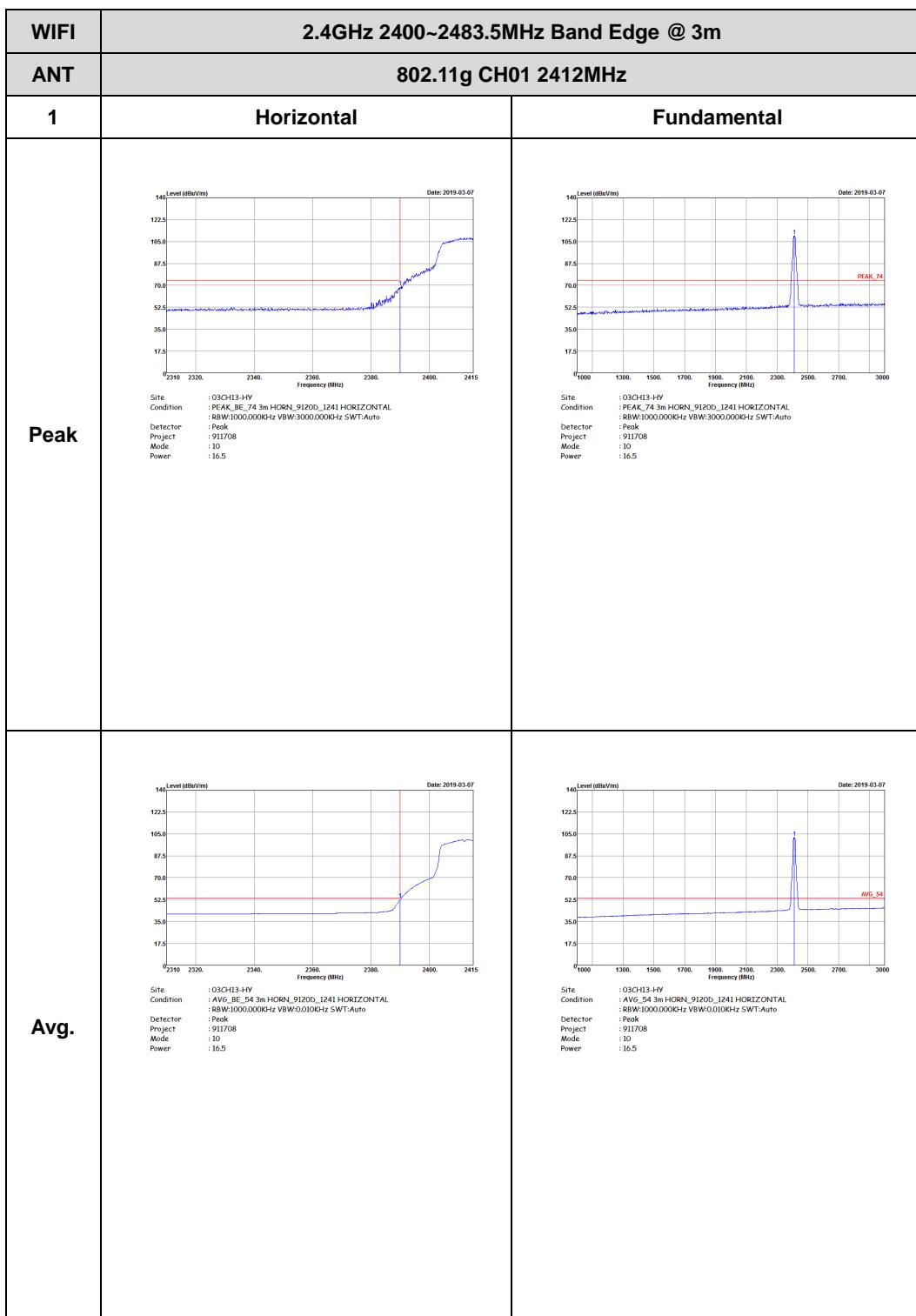


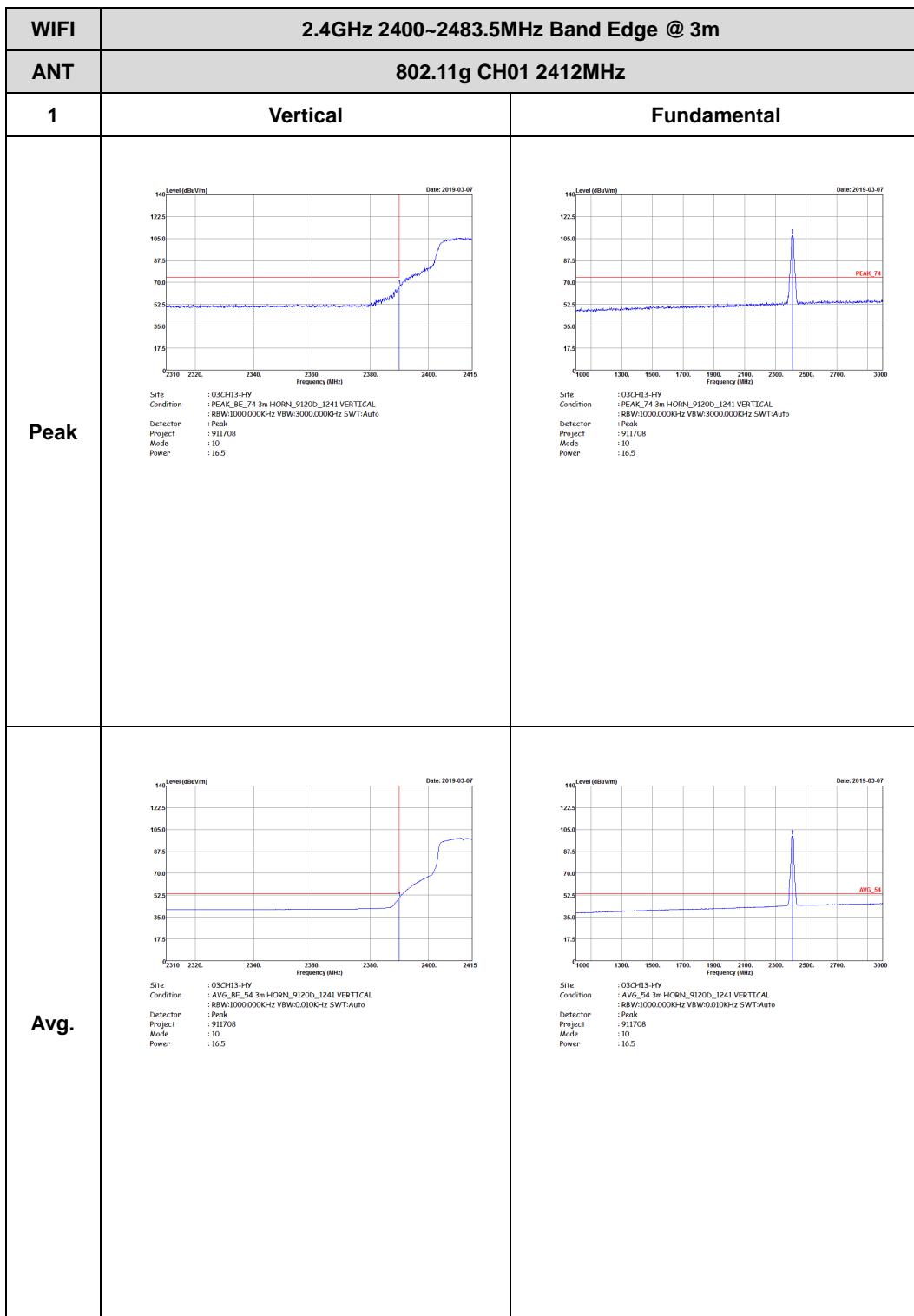


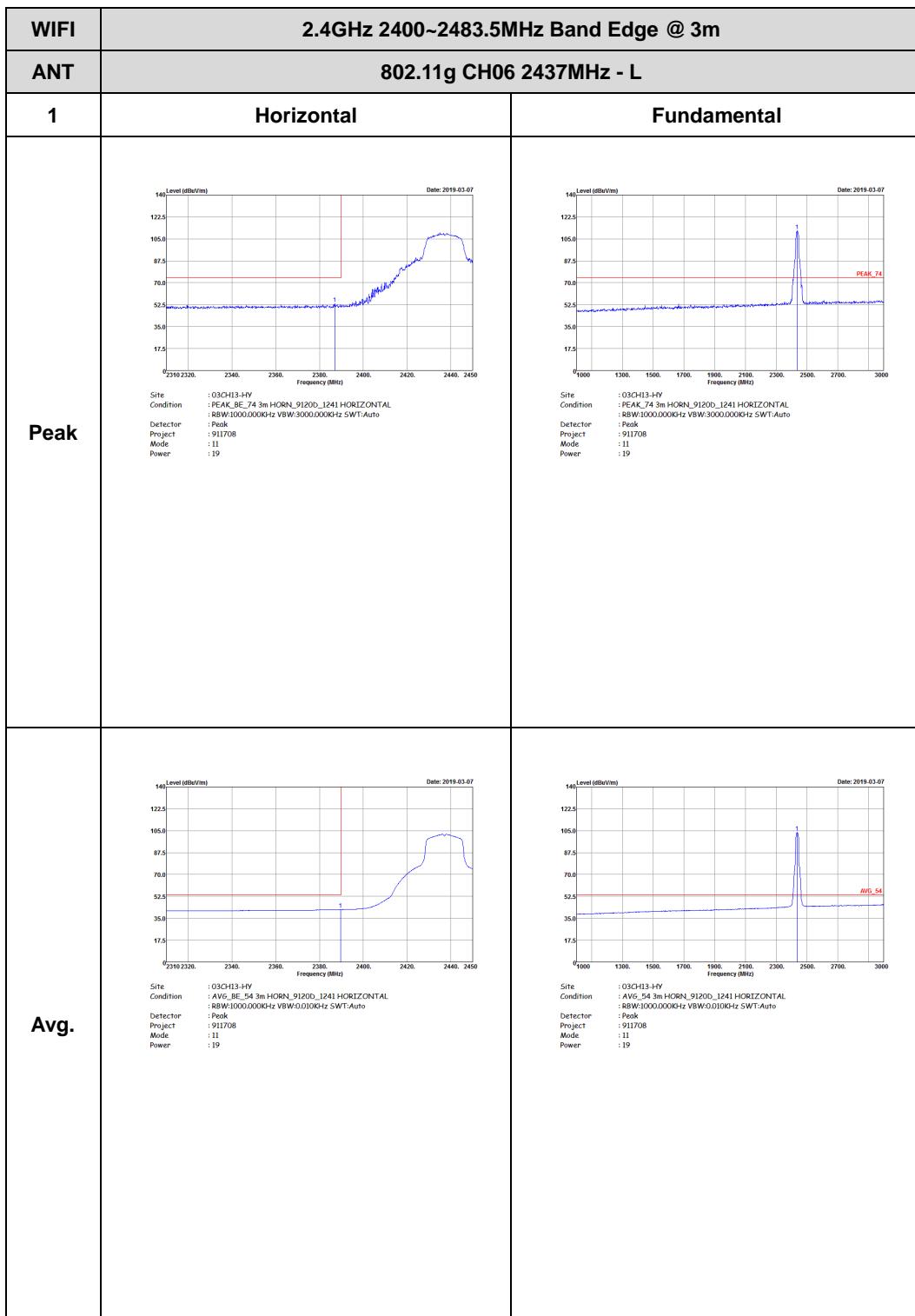


## 2.4GHz 2400~2483.5MHz

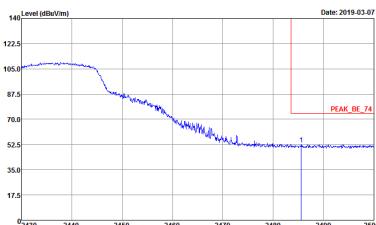
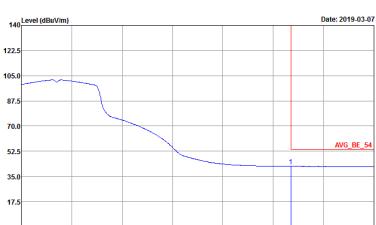
## WIFI 802.11g (Band Edge @ 3m)

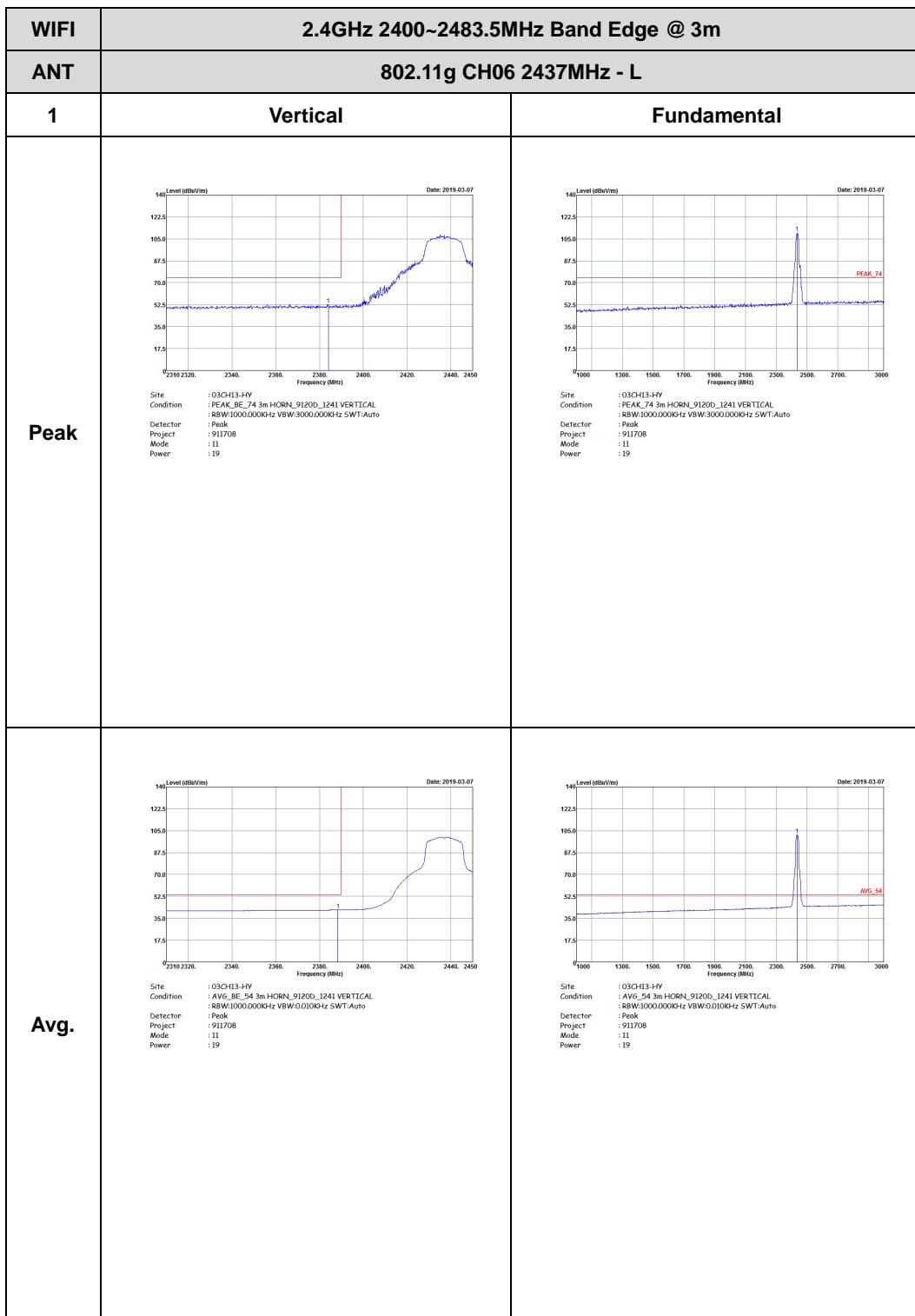




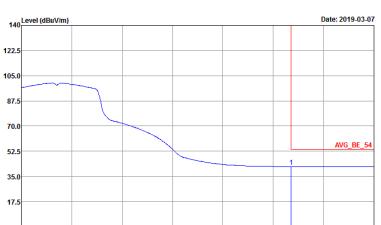


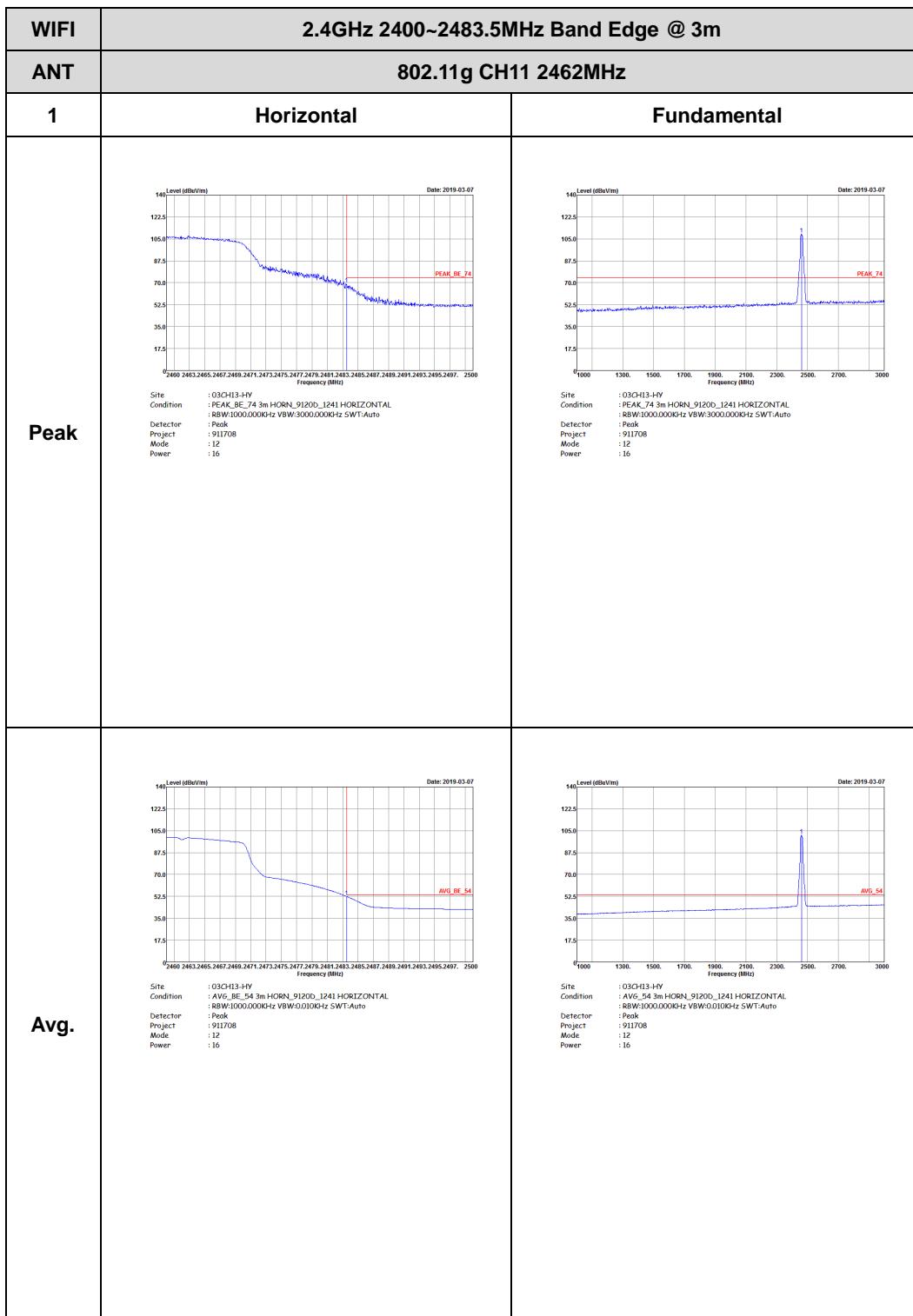


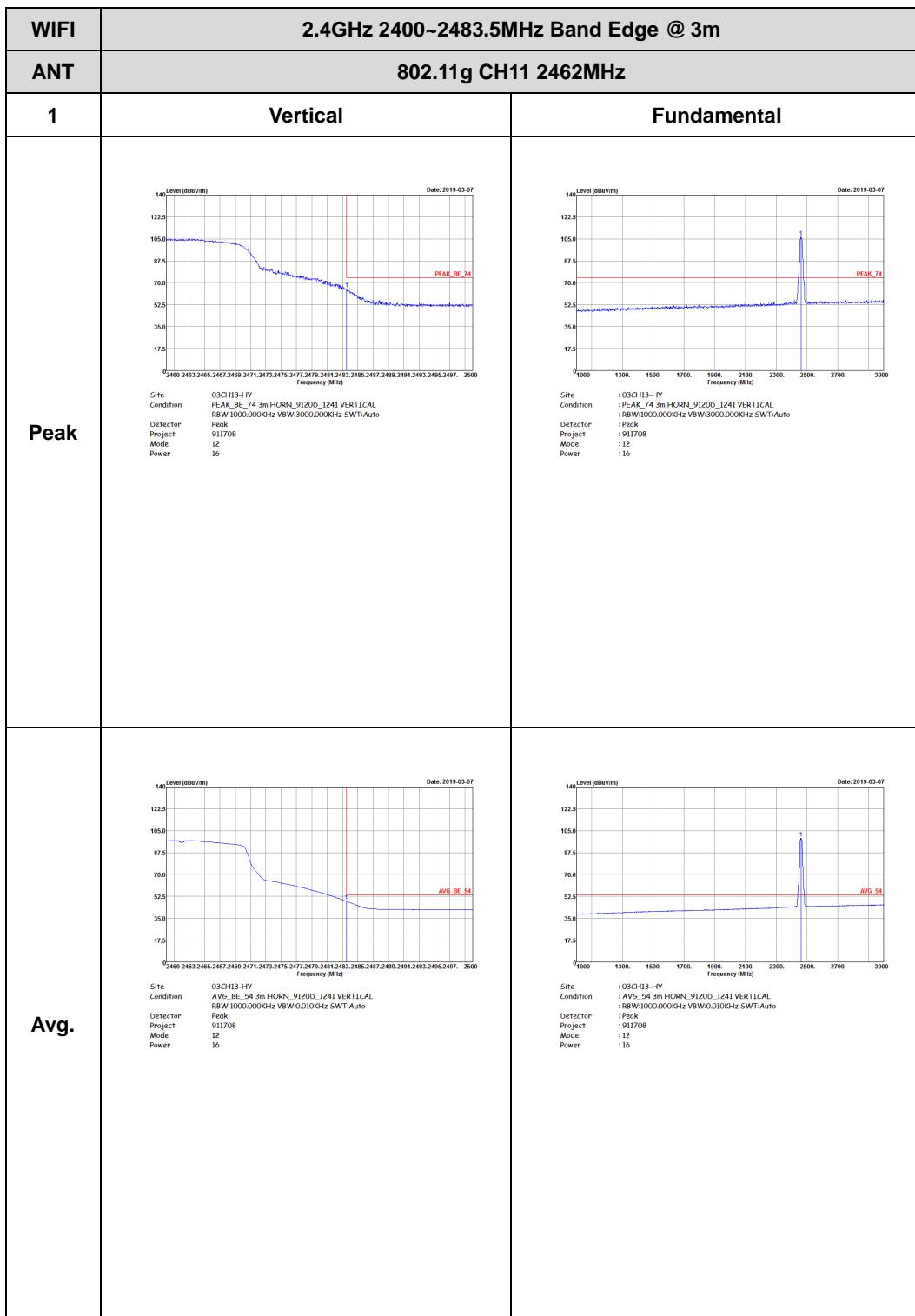
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH06 2437MHz - R	
1	Horizontal	Fundamental
Peak	 <p>Level (dBmV/m)</p> <p>Date: 2019-03-07</p> <p>Frequency (MHz)</p> <p>PEAK_BE_74</p> <p>Site : 03CH13-HY Condition : PCMK_BE_74 3m HORN_91200_1241 HORIZONTAL Detector : R8W:1000.000KHz VBW:3000.000KHz SWF:Auto Project : Peak Mode : 11 Power : 19</p>	Left blank
Avg.	 <p>Level (dBmV/m)</p> <p>Date: 2019-03-07</p> <p>Frequency (MHz)</p> <p>AVG_BE_54</p> <p>Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_91200_1241 HORIZONTAL Detector : R8W:1000.000KHz VBW:0.010KHz SWF:Auto Project : Peak Mode : 11 Power : 19</p>	Left blank





WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH06 2437MHz - R	
1	Vertical	Fundamental
Peak	 <p>Level (dBmV/m)</p> <p>Date: 2019-03-07</p> <p>Frequency (MHz)</p> <p>PEAK_BE_74</p> <p>Site : 03CH13-HY Condition : PC4K_BE_74 3m HORN_91200,_1241 VERTICAL Detector : R8W:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak Mode : 11 Power : 19</p>	Left Blank
Avg.	 <p>Level (dBmV/m)</p> <p>Date: 2019-03-07</p> <p>Frequency (MHz)</p> <p>AVG_BE_54</p> <p>Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_91200,_1241 VERTICAL Detector : R8W:1000.000KHz VBW:0.010KHz SWT:Auto Project : Peak Mode : 11 Power : 19</p>	Left Blank



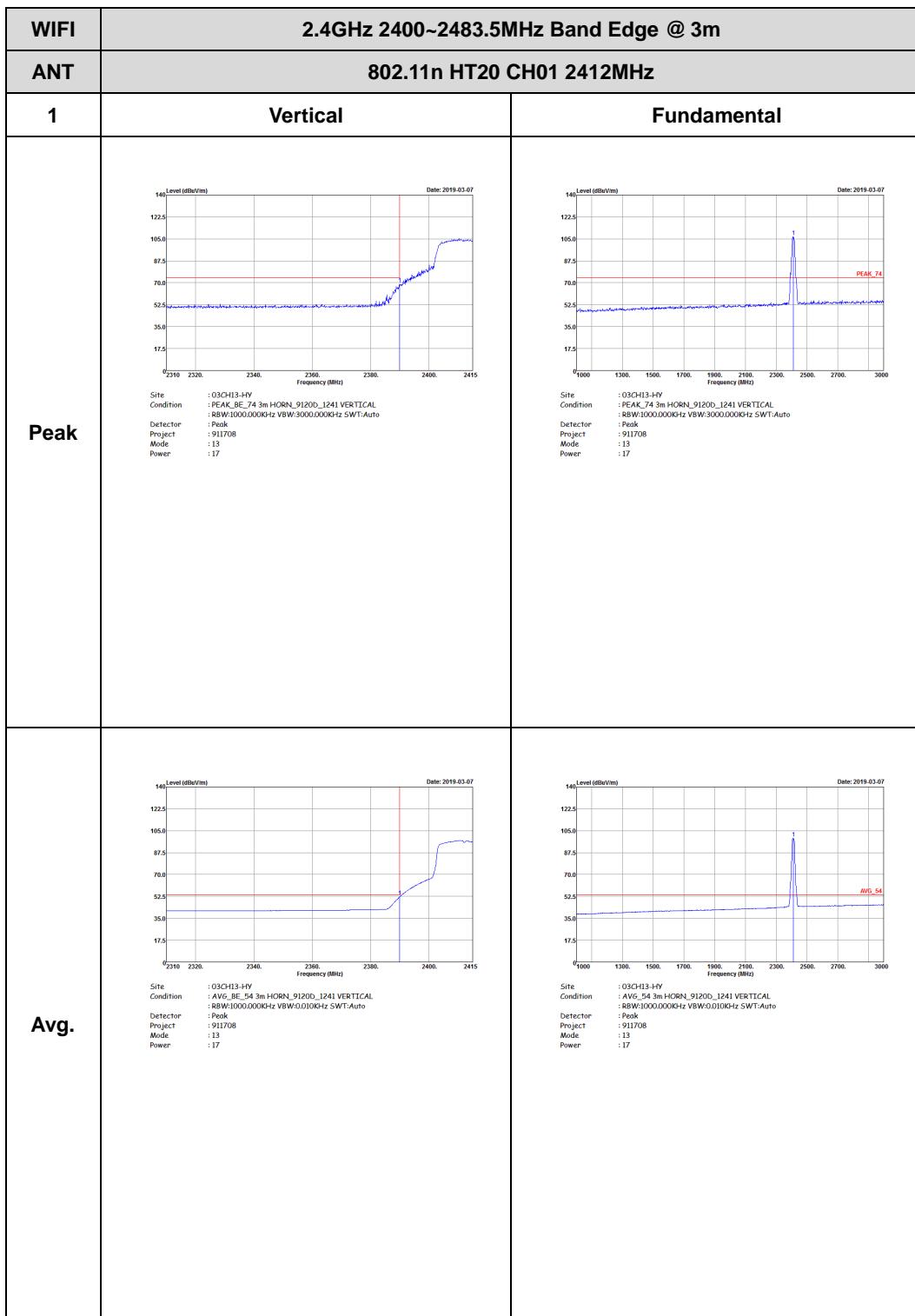


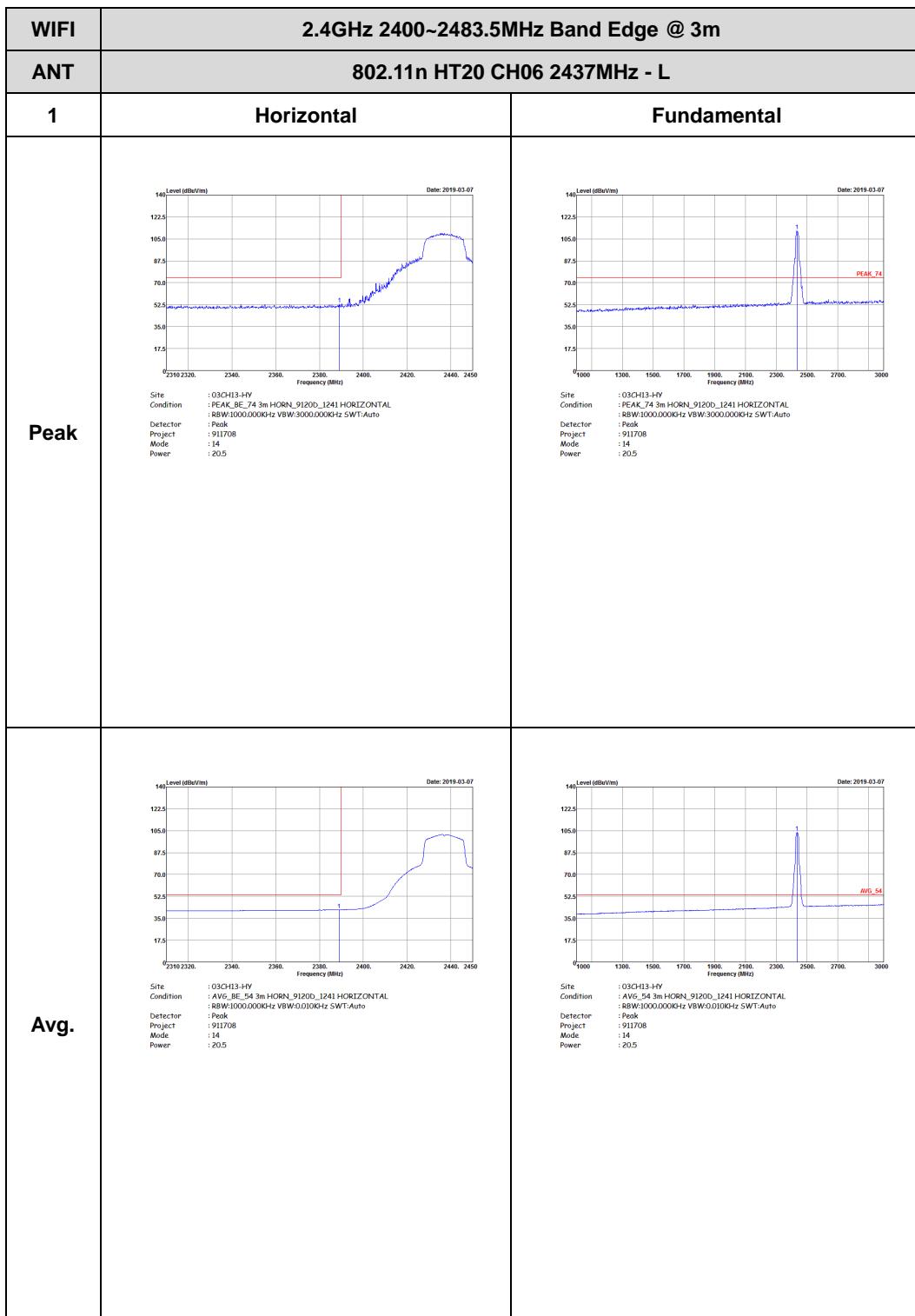


## 2.4GHz 2400~2483.5MHz

## WIFI 802.11n HT20 (Band Edge @ 3m)

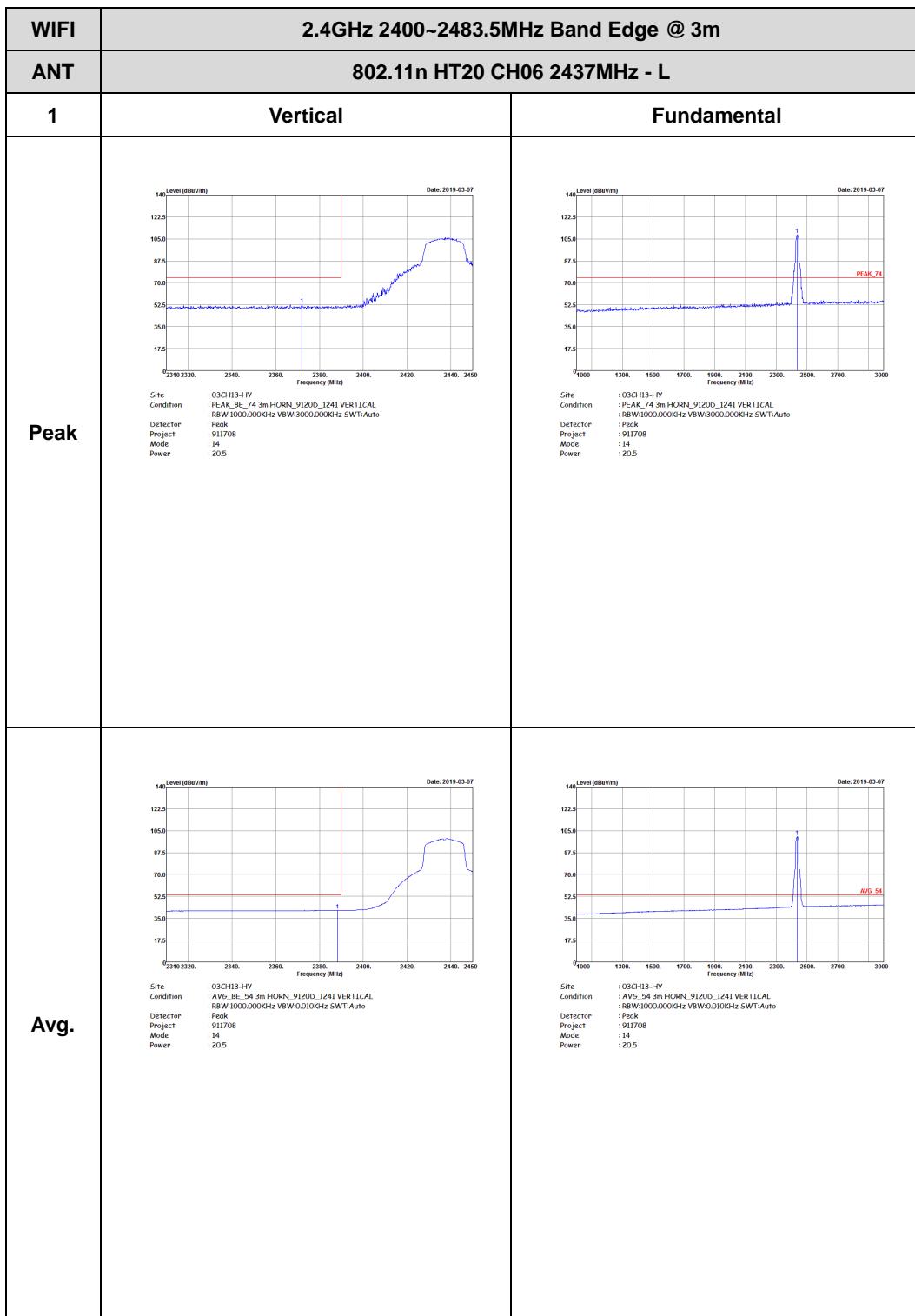
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT20 CH01 2412MHz	
1	Horizontal	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74_3m_HORN_91200_1241_HORIZONTAL Detector : R8W:1000.0000kHz VBW:3000.0000Hz SWT:Auto Project : 911708 Mode : 13 Power : 17 Date: 2019-03-07	 Site : 03CH13-HY Condition : PEAK_74_3m_HORN_91200_1241_HORIZONTAL Detector : R8W:1000.0000kHz VBW:3000.0000Hz SWT:Auto Project : 911708 Mode : 13 Power : 17 Date: 2019-03-07
Avg.	 Site : 03CH13-HY Condition : AVG_BE_54_3m_HORN_91200_1241_HORIZONTAL Detector : R8W:1000.0000kHz VBW:0.0100Hz SWT:Auto Project : 911708 Mode : 13 Power : 17 Date: 2019-03-07	 Site : 03CH13-HY Condition : AVG_54_3m_HORN_91200_1241_HORIZONTAL Detector : R8W:1000.0000kHz VBW:0.0100Hz SWT:Auto Project : 911708 Mode : 13 Power : 17 Date: 2019-03-07





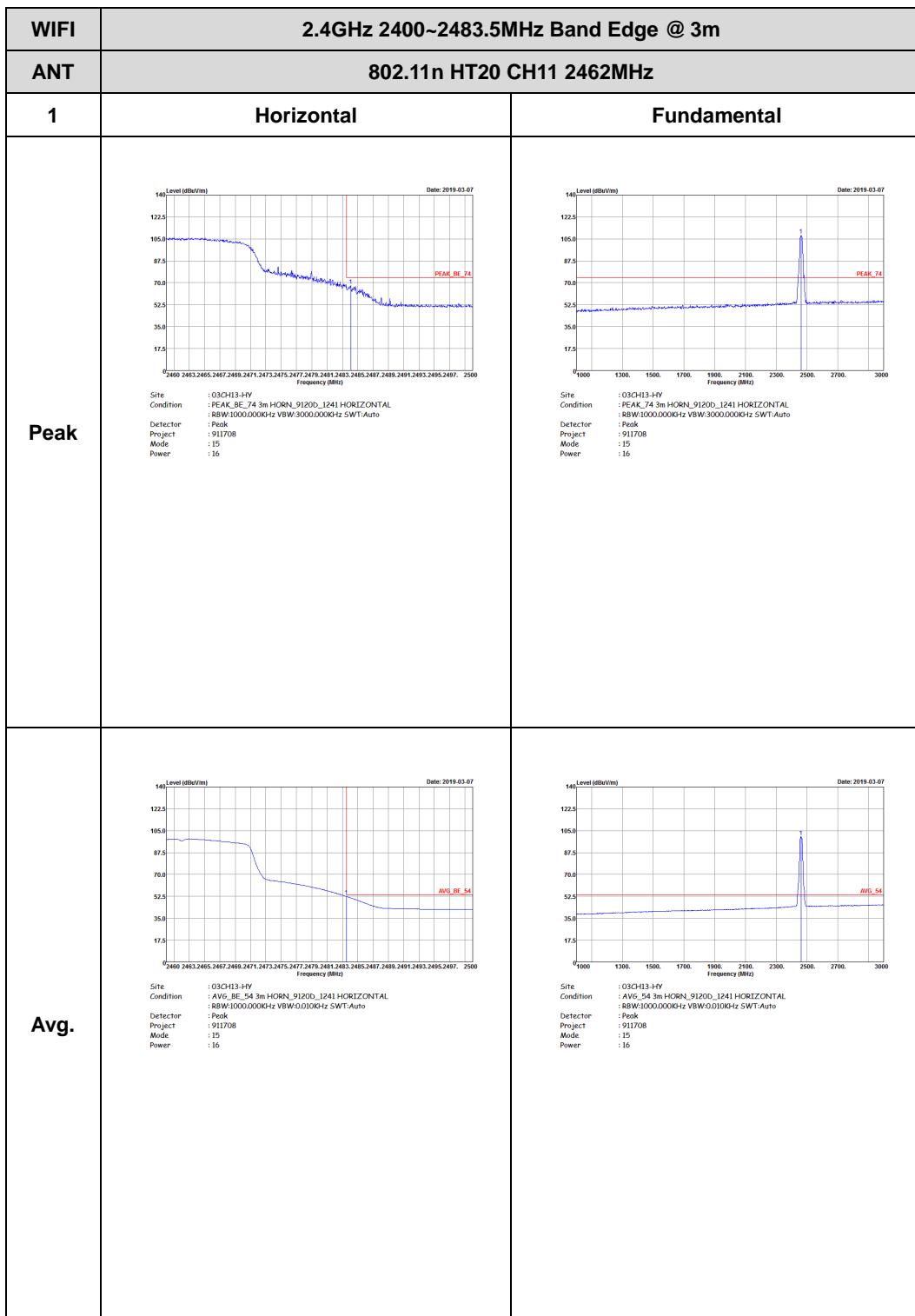


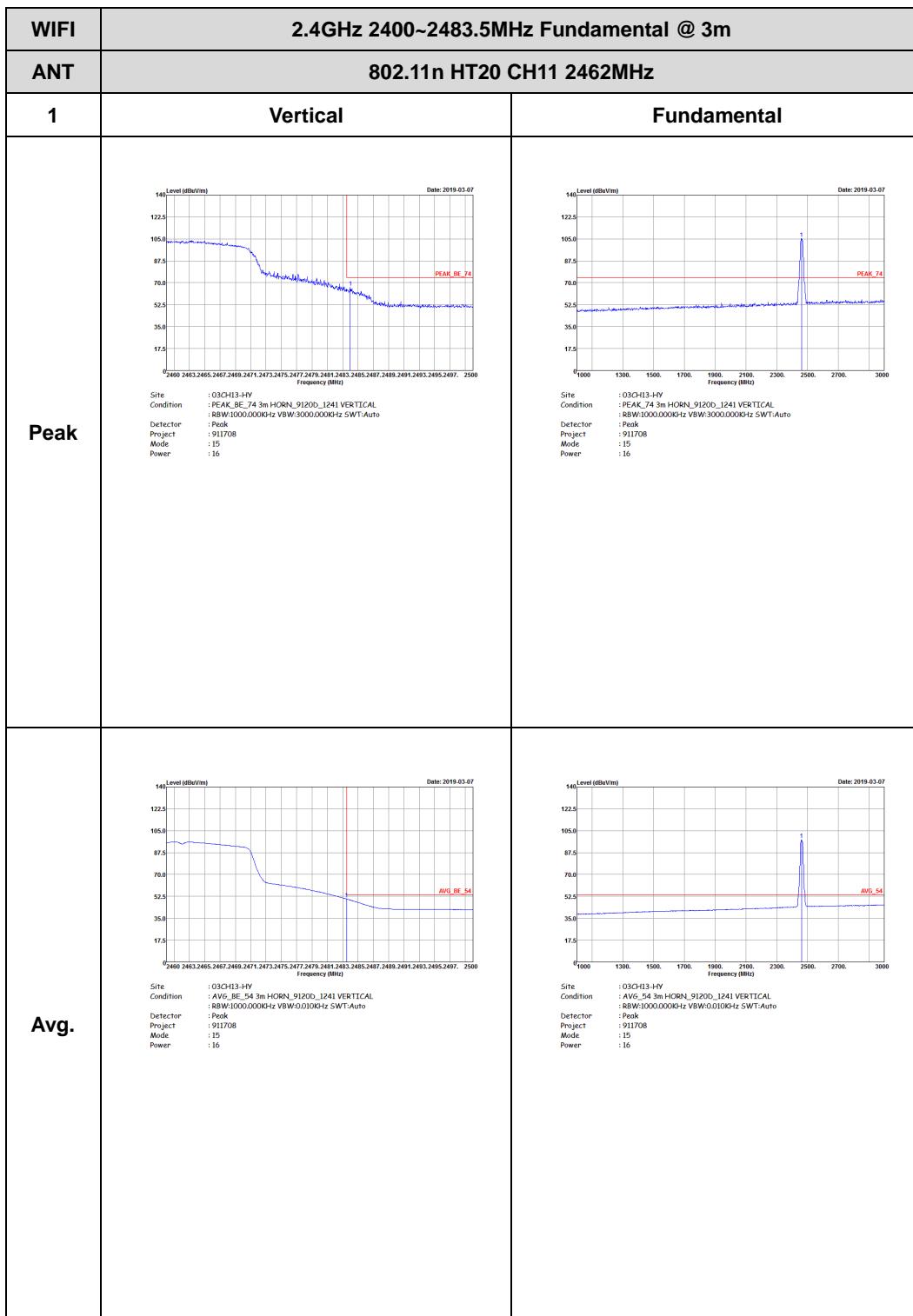
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT20 CH06 2437MHz - R	
1	Horizontal	Fundamental
Peak	 Date: 2019-03-07 Site : 03CH13-HV Condition : PCMK_BE_74 3m HORN_91200_1241 HORIZONTAL Detector : R8W:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak Mode : 911708 Power : 14 Power : 20.5 Left blank	
Avg.	 Date: 2019-03-07 Site : AVG_BE_54 3m HORN_91200_1241 HORIZONTAL Condition : R8W:1000.000KHz VBW:0.010KHz SWT:Auto Detector : Peak Project : 911708 Mode : 14 Power : 20.5 Left blank	





WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT20 CH06 2437MHz - R	
1	Vertical	Fundamental
Peak	<p>Level (dBmV/m)</p> <p>Date: 2019-03-07</p> <p>Frequency (MHz)</p> <p>PEAK_BE_74</p> <p>Site : 03CH13-HY Condition : PCMK_BE_74 3m HORN_N_91200,_1241 VERTICAL Detector : R8W:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak Mode : 911708 Power : 14 Power : 20.5</p>	Left Blank
Avg.	<p>Level (dBmV/m)</p> <p>Date: 2019-03-07</p> <p>Frequency (MHz)</p> <p>AVG_BE_54</p> <p>Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_N_91200,_1241 VERTICAL Detector : R8W:1000.000KHz VBW:0.010KHz SWT:Auto Project : Peak Mode : 911708 Power : 14 Power : 20.5</p>	Left Blank

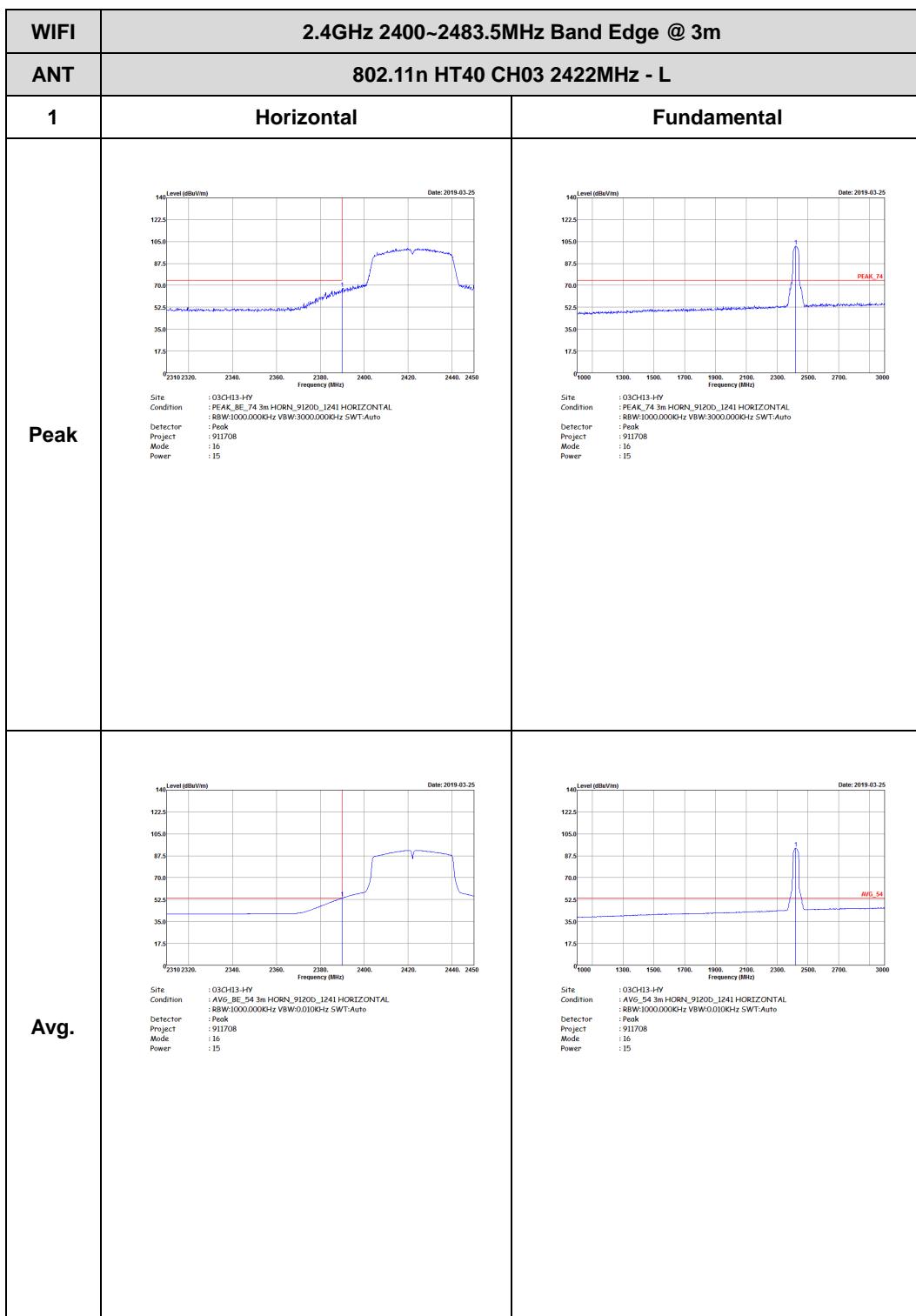






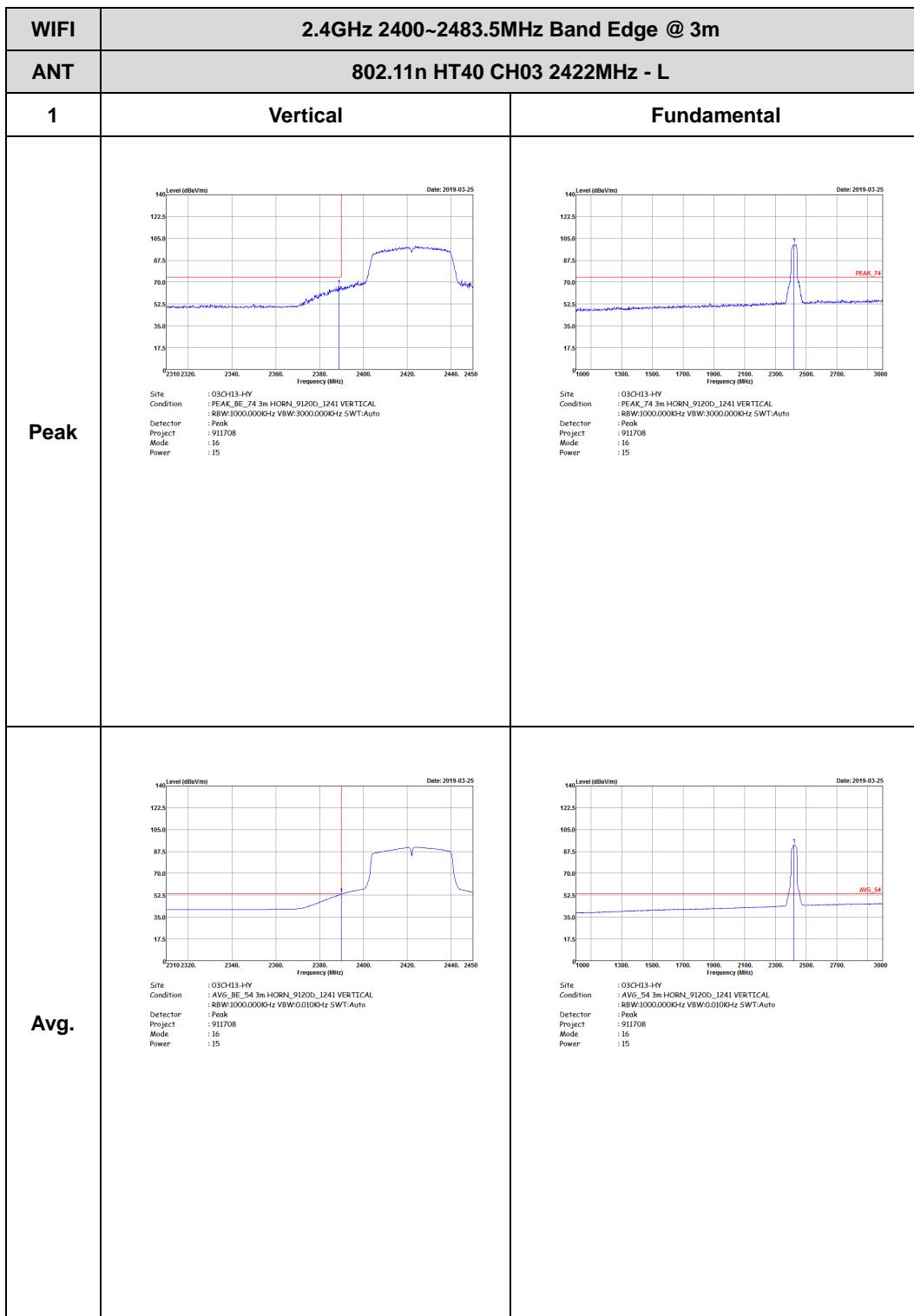
## 2.4GHz 2400~2483.5MHz

## WIFI 802.11n HT40 (Band Edge @ 3m)



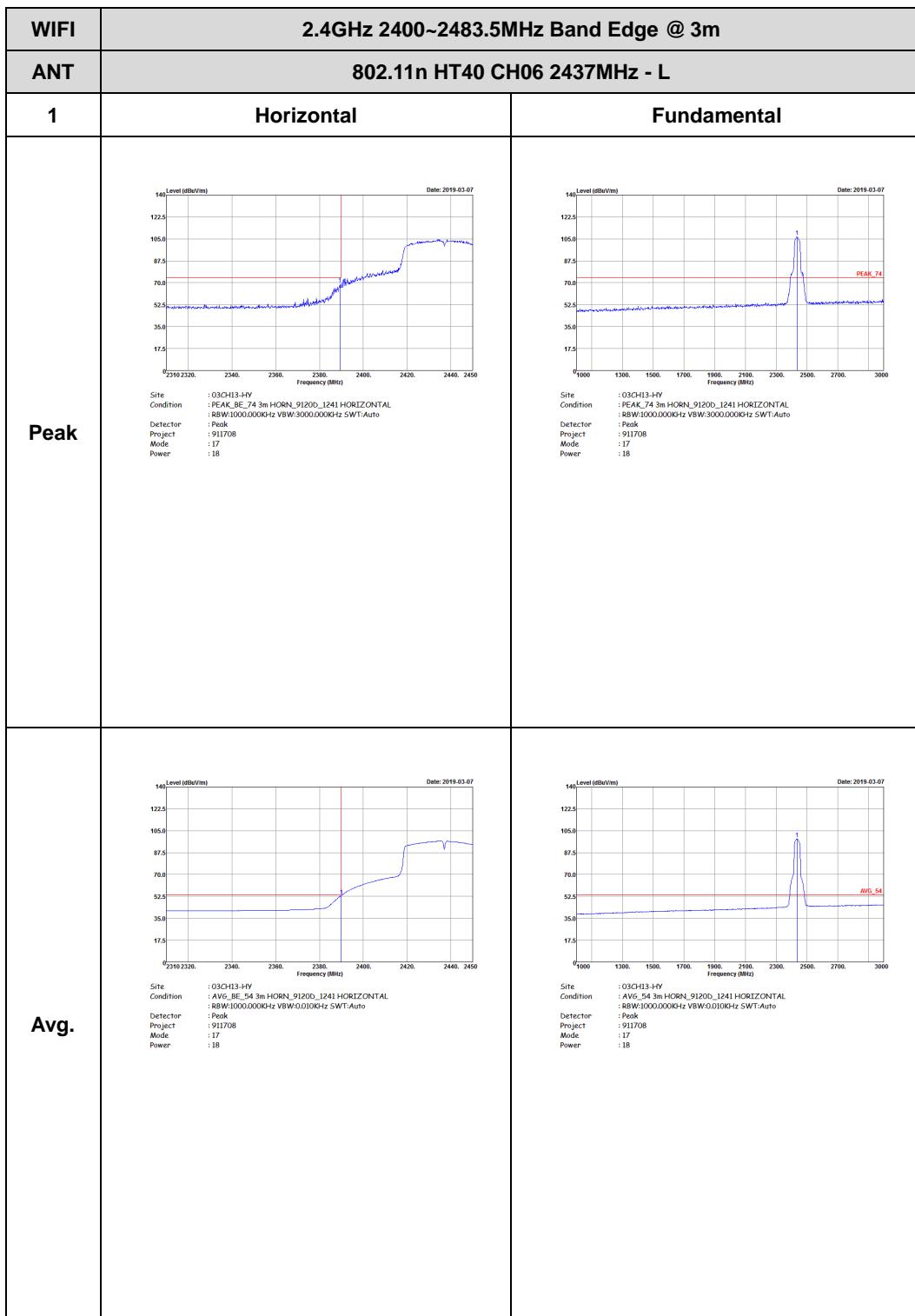


WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH03 2422MHz - R	
1	Horizontal	Fundamental
Peak	<p>Level (dBmV/m)</p> <p>Date: 2019-03-25</p> <p>Frequency (MHz)</p> <p>PEAK_BE_74</p> <p>Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_91200_1241 HORIZONTAL Detector : R8W:1000.000KHz VBW:3000.000KHz SWT:Auto Project : 911708 Mode : 16 Power : 15</p>	Left Blank
Avg.	<p>Level (dBmV/m)</p> <p>Date: 2019-03-25</p> <p>Frequency (MHz)</p> <p>AVG_BE_54</p> <p>Site : AVG_BE_54 3m HORN_91200_1241 HORIZONTAL Condition : R8W:1000.000KHz VBW:0.010KHz SWT:Auto Detector : Peak Project : 911708 Mode : 16 Power : 15</p>	Left Blank

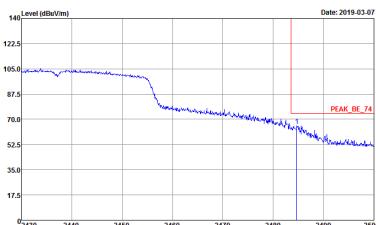


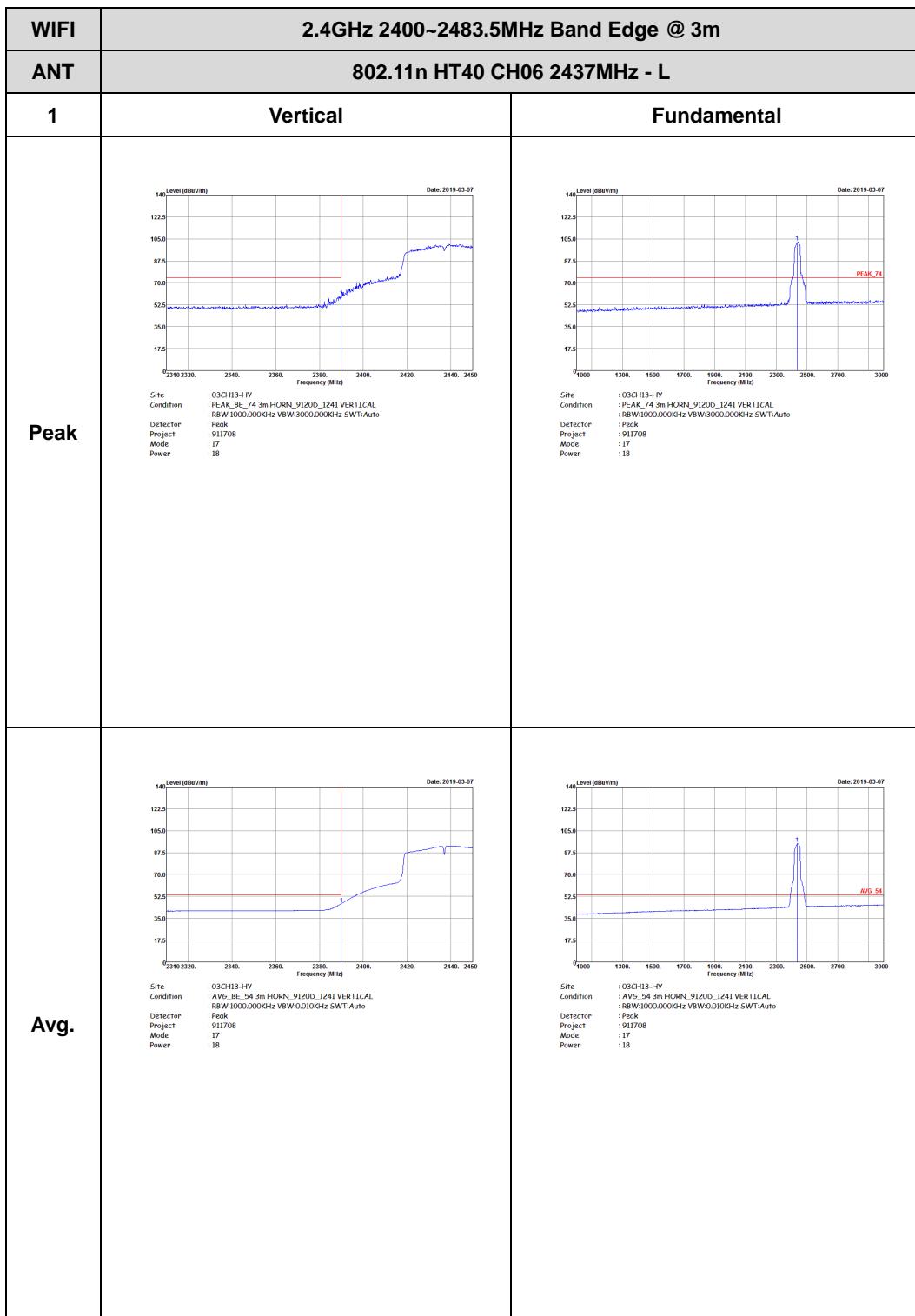


WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH03 2422MHz - R	
1	Vertical	Fundamental
Peak	<p>Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_91200_1241 VERTICAL Detector : R8W:1000.000KHz VBW:3000.000GHz SWT:Auto Project : 911708 Mode : 16 Power : 15</p>	Left blank
Avg.	<p>Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_91200_1241 VERTICAL Detector : R8W:1000.000KHz VBW:0.010KHz SWT:Auto Project : 911708 Mode : 16 Power : 15</p>	Left blank



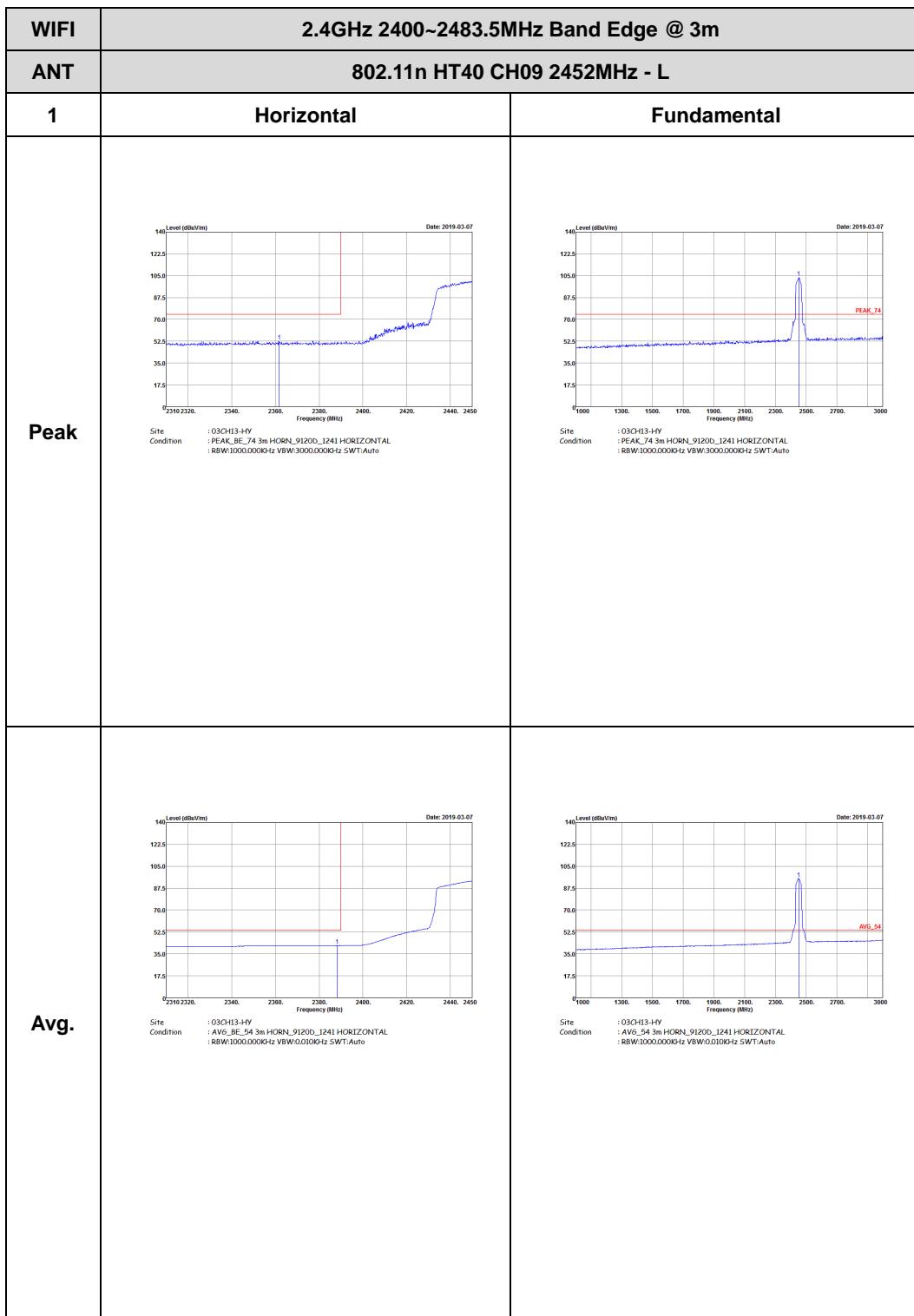


WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH06 2437MHz - R	
1	Horizontal	Fundamental
Peak	 <p>Level (dBmV/m)</p> <p>Date: 2019-03-07</p> <p>Frequency (MHz)</p> <p>Site : 03CH13-HY Condition : PCAK_BE_74 3m HORN_91200_1241 HORIZONTAL Detector : R8W:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak Mode : 911708 Power : 17 : 18</p>	Left blank
Avg.	 <p>Level (dBmV/m)</p> <p>Date: 2019-03-07</p> <p>Frequency (MHz)</p> <p>Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_91200_1241 HORIZONTAL Detector : R8W:1000.000KHz VBW:0.010KHz SWT:Auto Project : Peak Mode : 911708 Power : 17 : 18</p>	Left blank



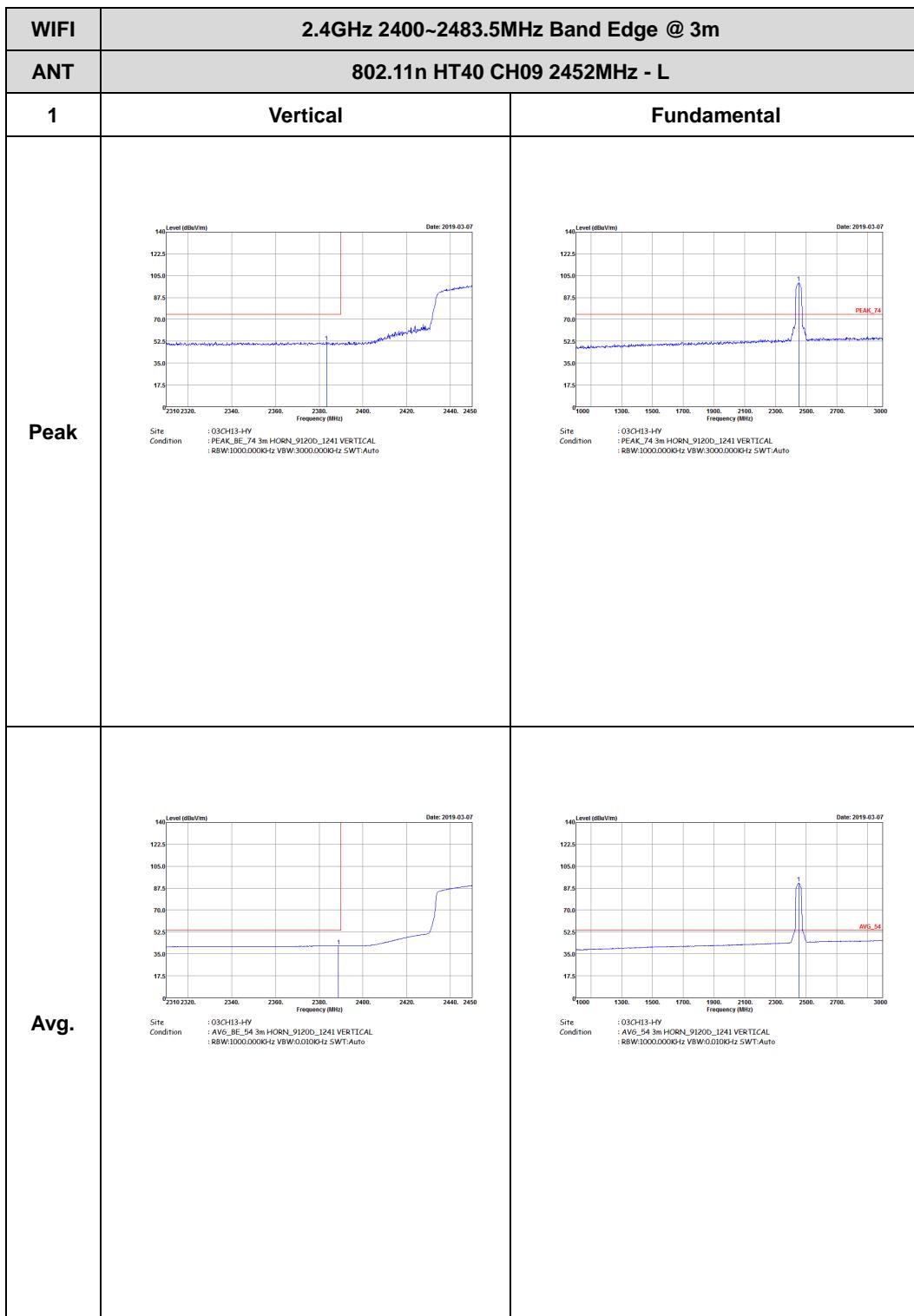


WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH06 2437MHz - R	
1	Vertical	Fundamental
Peak	 Date: 2019-03-07 Site : 03CH13-HV Condition : PCMK_BE_74 3m HORN_91200,_1241 VERTICAL Detector : R8W:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak Mode : 911708 Power : 17 Power : 18	Left blank
Avg.	 Date: 2019-03-07 Site : 03CH13-HV Condition : AVG_BE_54 3m HORN_91200,_1241 VERTICAL Detector : R8W:1000.000KHz VBW:0.010KHz SWT:Auto Project : Peak Mode : 911708 Power : 17 Power : 18	Left blank





WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH09 2452MHz - R	
1	Horizontal	Fundamental
Peak	<p>A spectrum plot titled "PEAK_BE_74" showing the power level (dBm/V/m) versus frequency (MHz). The x-axis ranges from 2430 to 2500 MHz, and the y-axis ranges from 17.5 to 140 dBm/V/m. A blue curve shows a sharp peak at approximately 2452 MHz. A red vertical line marks the peak at 2452 MHz. The plot is dated 2019-03-07.</p> <p>Site Condition : 030H13-HV : PC4K_BE_74 3m HORN_91200_1241 HORIZONTAL .RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	Left blank
Avg.	<p>A spectrum plot titled "AVG_BE_54" showing the power level (dBm/V/m) versus frequency (MHz). The x-axis ranges from 2430 to 2500 MHz, and the y-axis ranges from 17.5 to 140 dBm/V/m. A blue curve shows a broad peak around 2452 MHz. A red vertical line marks the peak at 2452 MHz. The plot is dated 2019-03-07.</p> <p>Site Condition : 030H13-HV : AVG_BE_54 3m HORN_91200_1241 HORIZONTAL .RBW:1000.000KHz VBW:0.0100Hz SWT:Auto</p>	Left blank



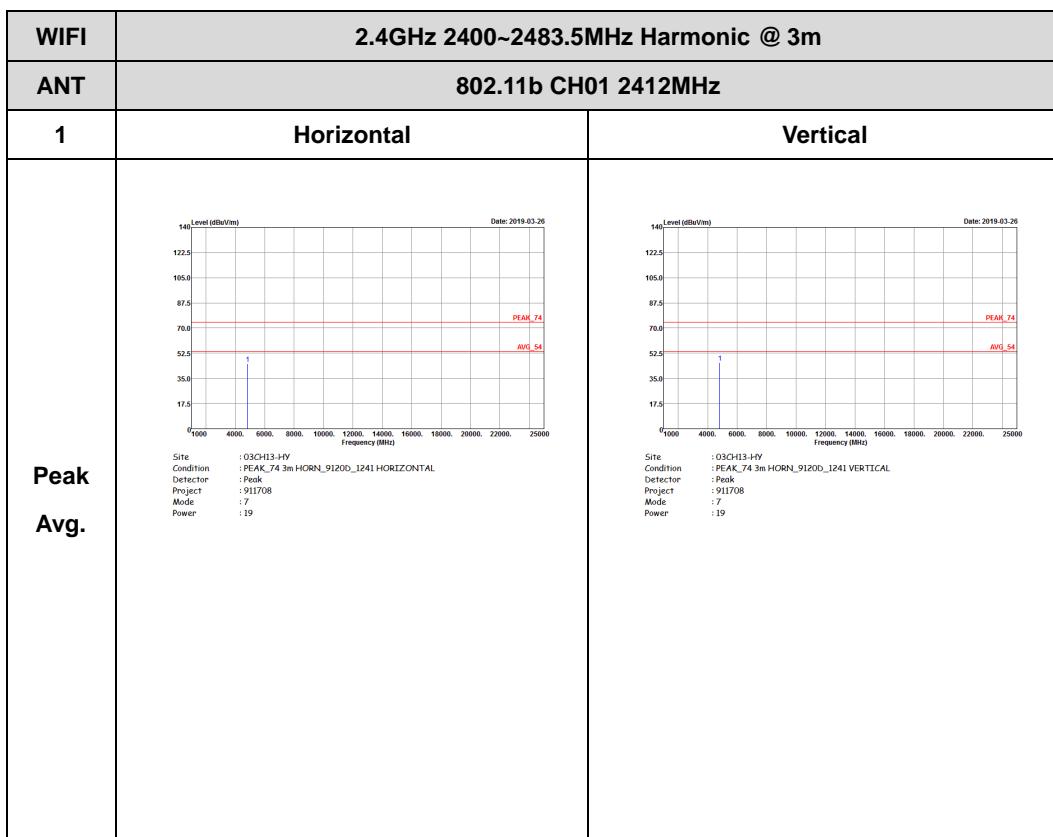


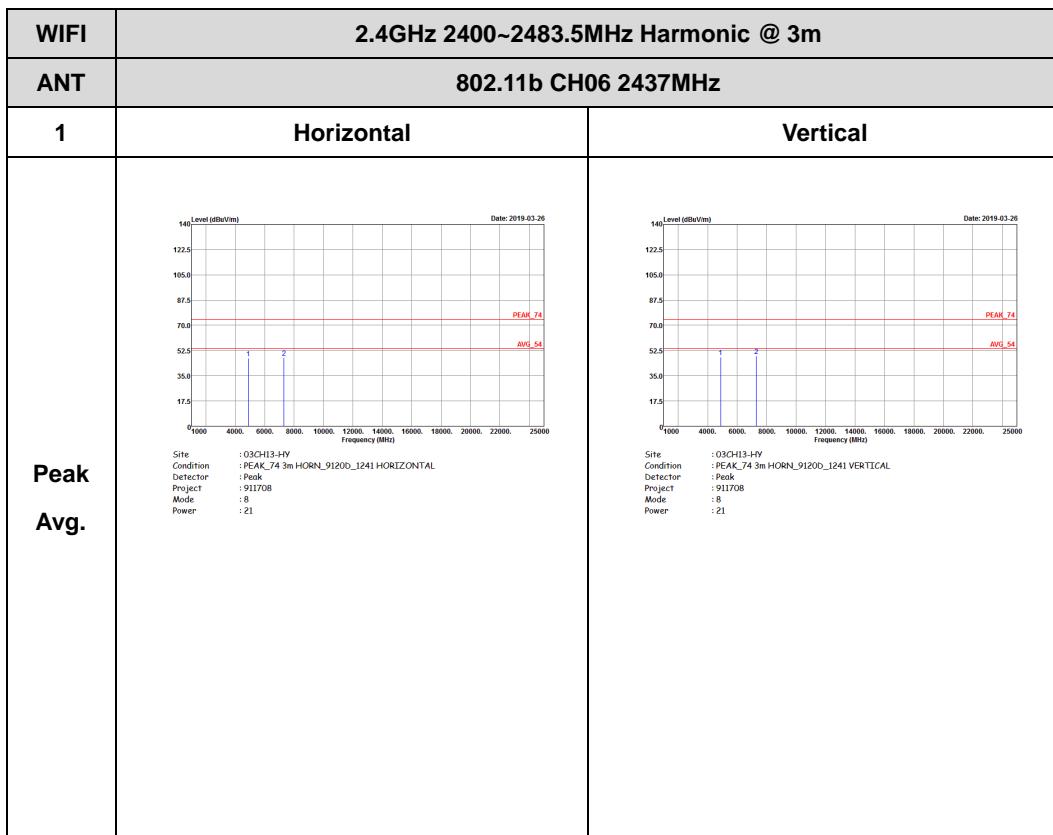
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH09 2452MHz - R	
1	Vertical	Fundamental
Peak	<p>Site Condition : 030H13-HV : PC4K_BE_74 3m HORN_91200_1241 VERTICAL .RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p>	Left blank
Avg.	<p>Site Condition : 030H13-HV : AVG_BE_54 3m HORN_91200_1241 VERTICAL .RBW:1000.000KHz VBW:0.0100Hz SWT:Auto</p>	Left blank

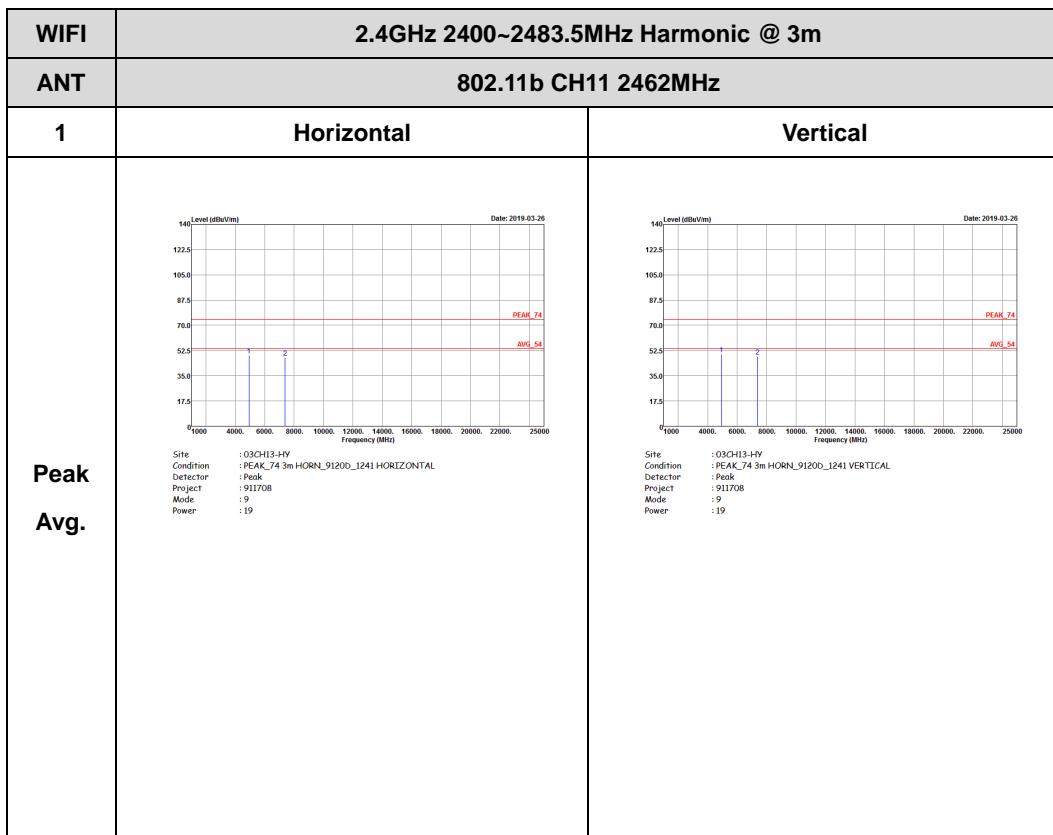


## 2.4GHz 2400~2483.5MHz

## WIFI 802.11b (Harmonic @ 3m)



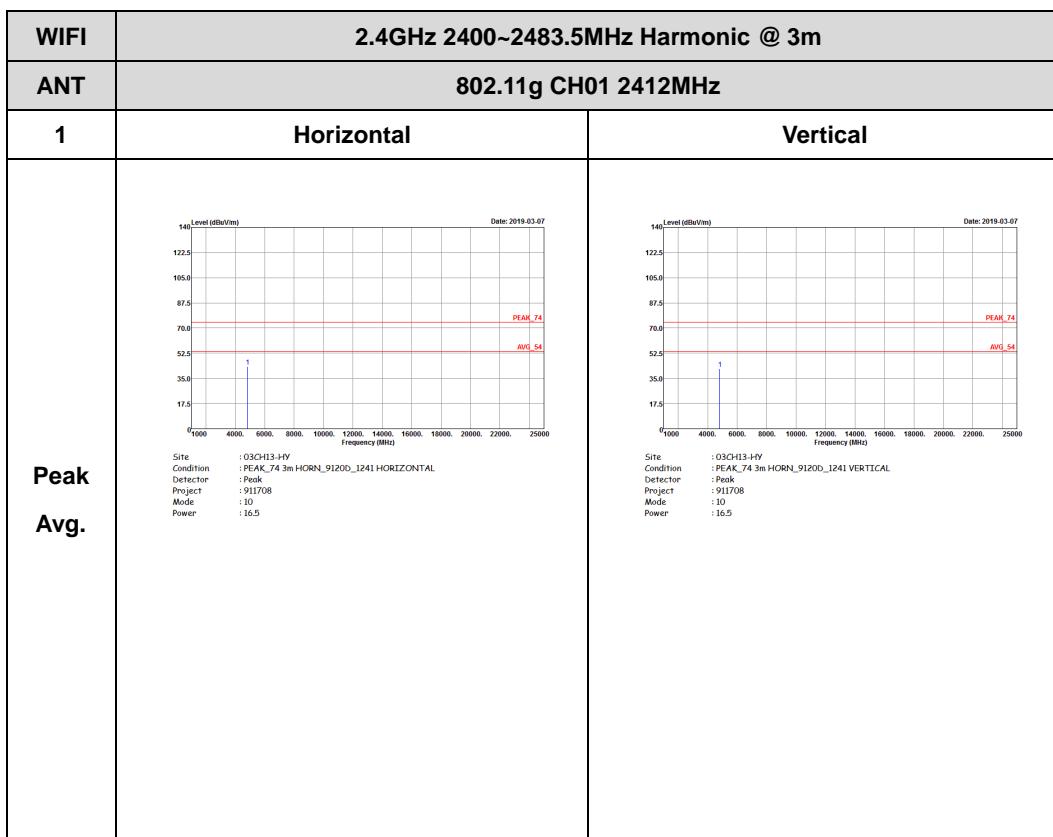


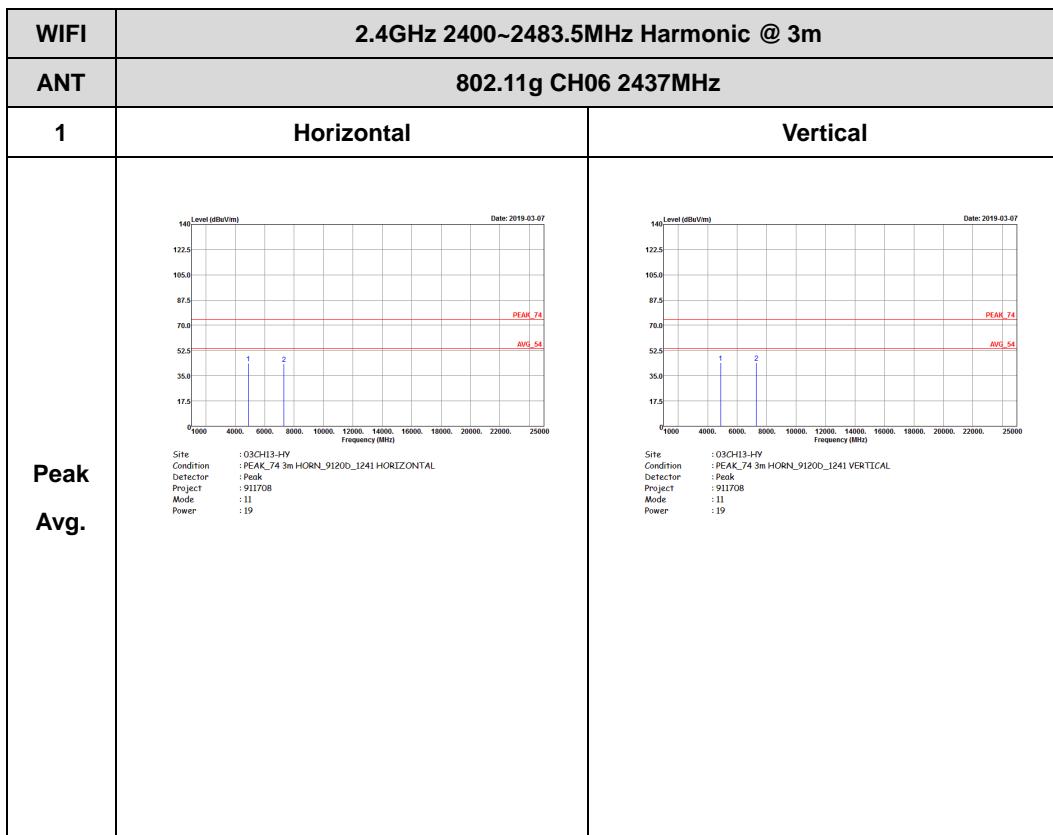


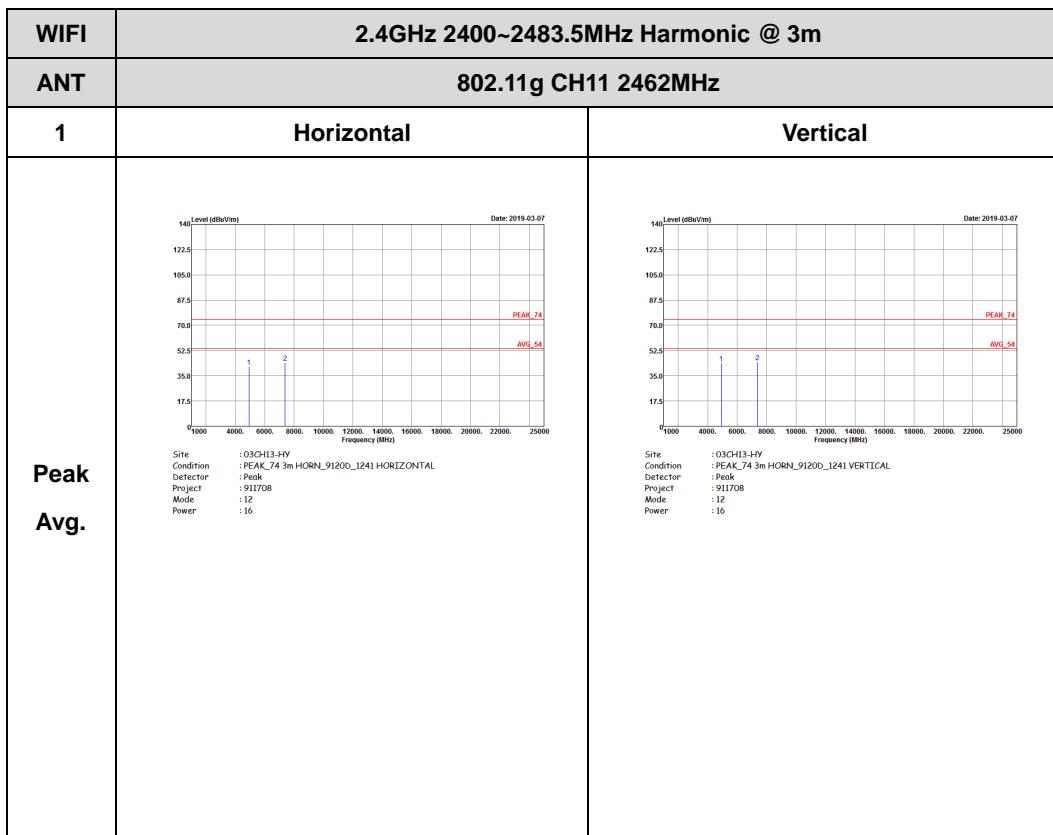


## 2.4GHz 2400~2483.5MHz

## WIFI 802.11g (Harmonic @ 3m)



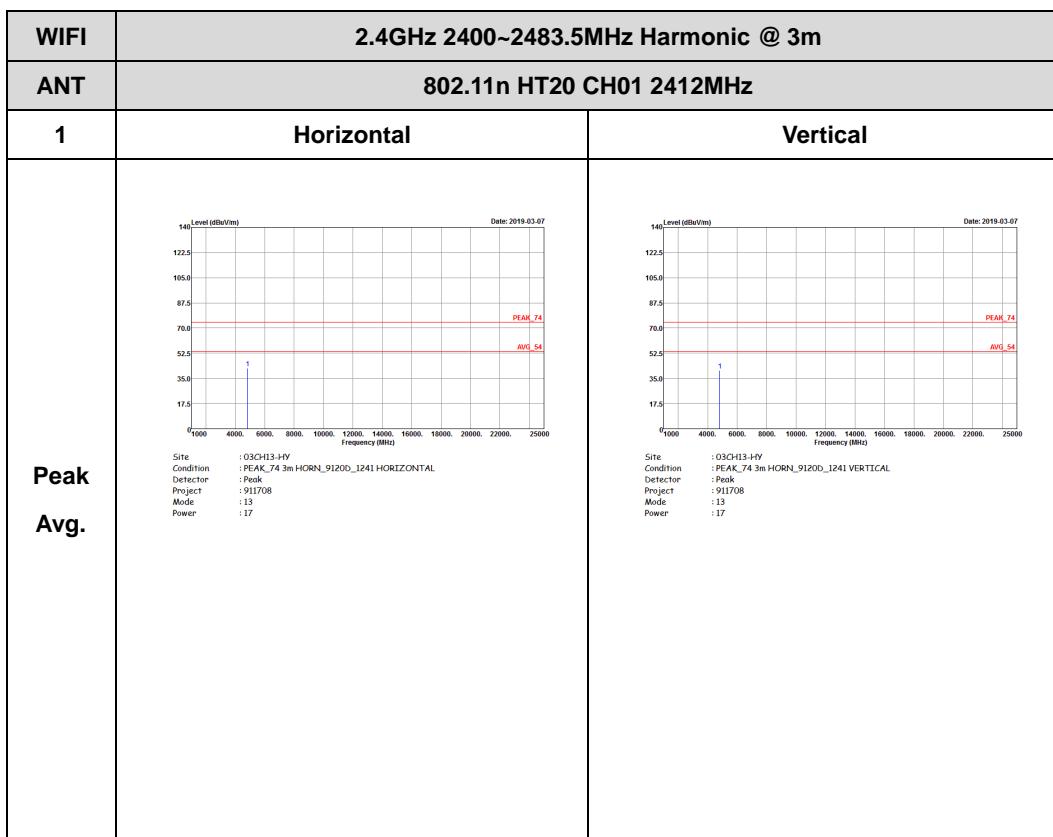


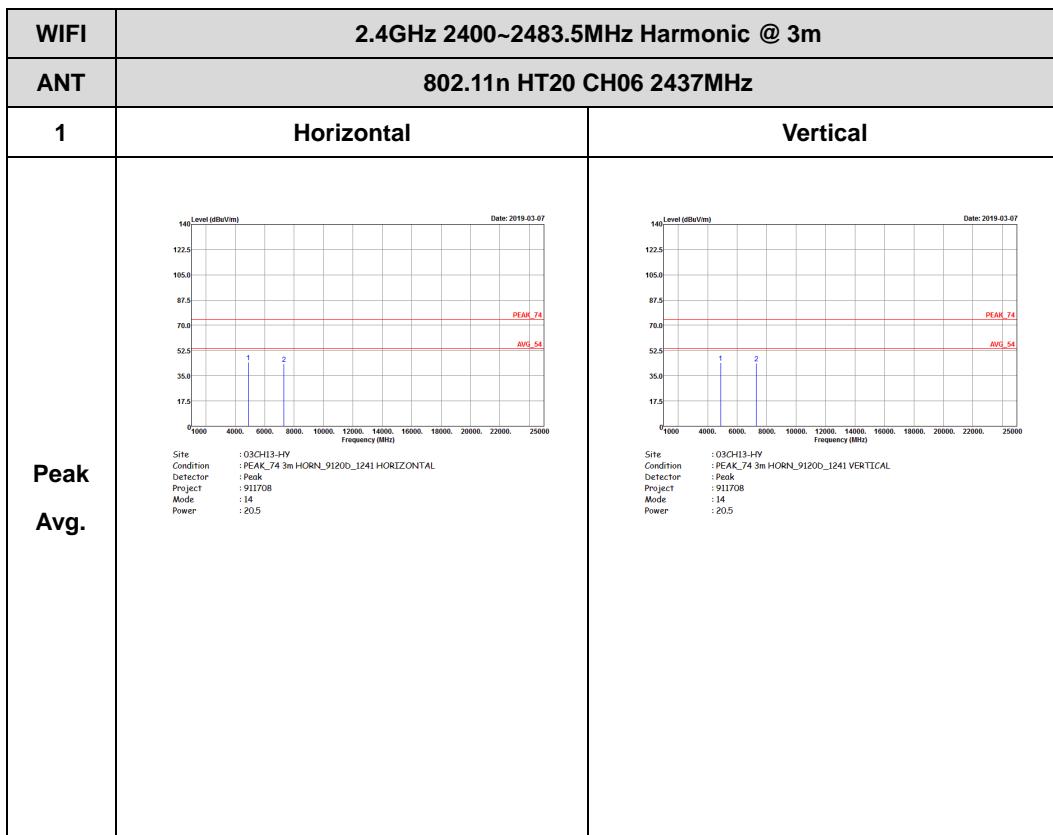


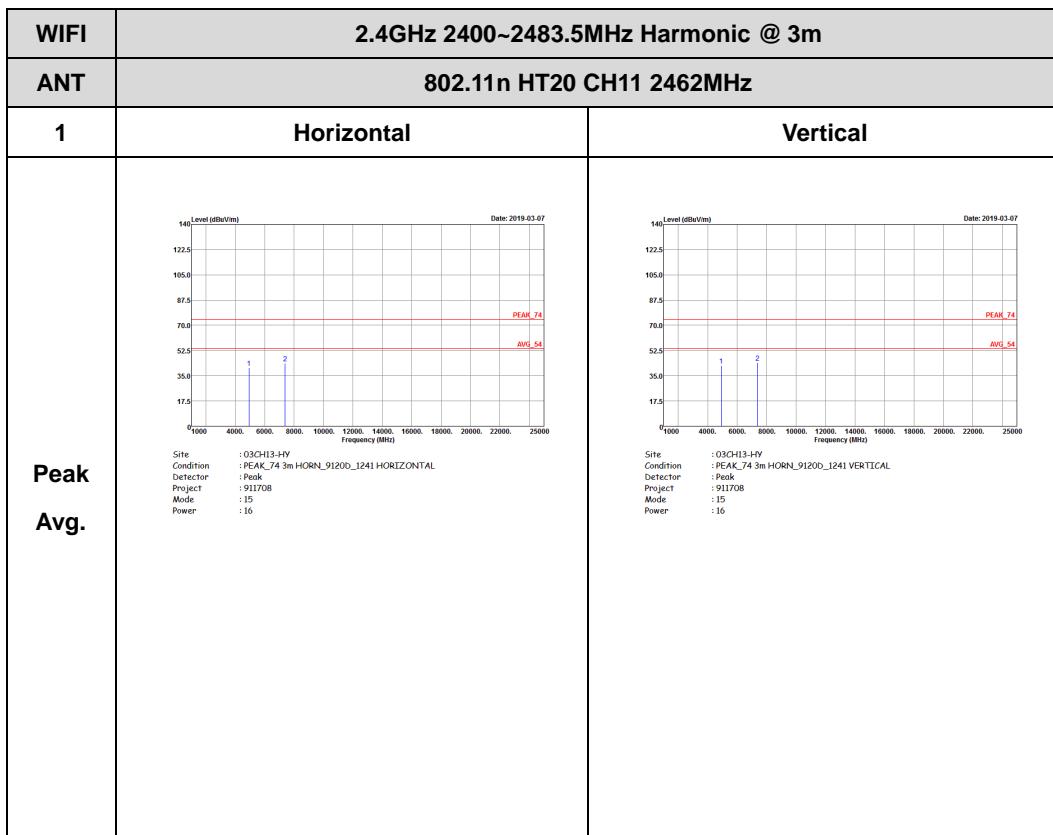


## 2.4GHz 2400~2483.5MHz

## WIFI 802.11n HT20 (Harmonic @ 3m)



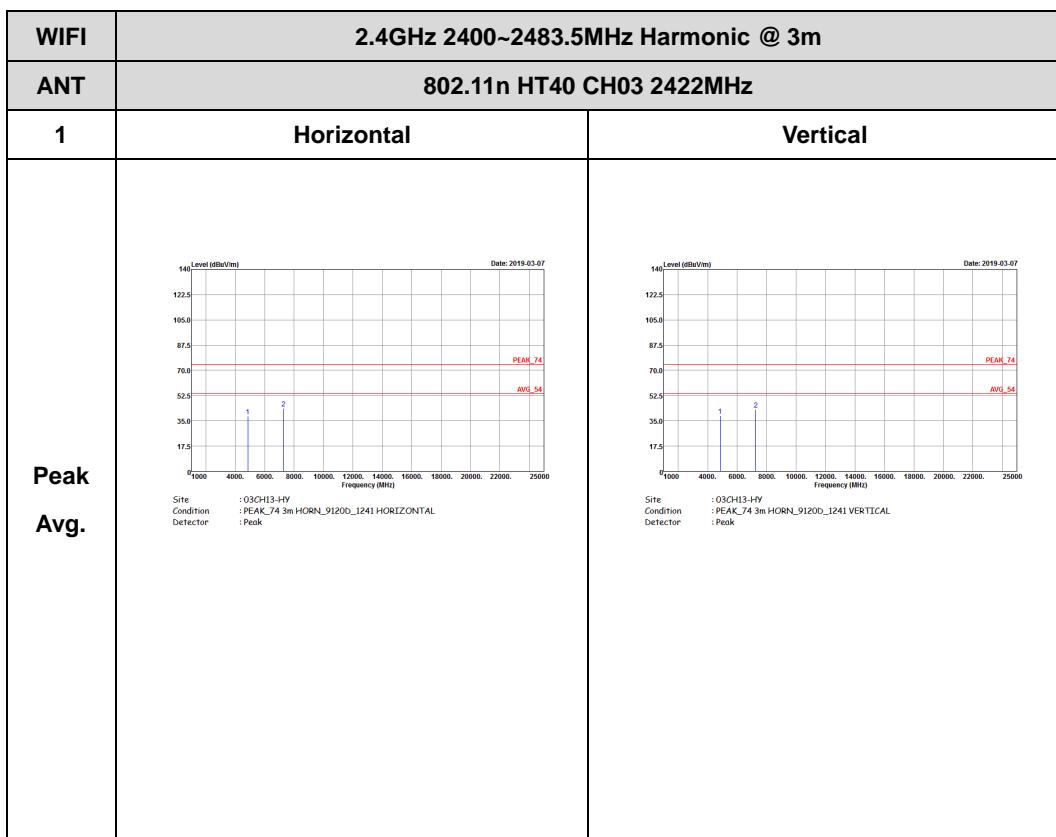


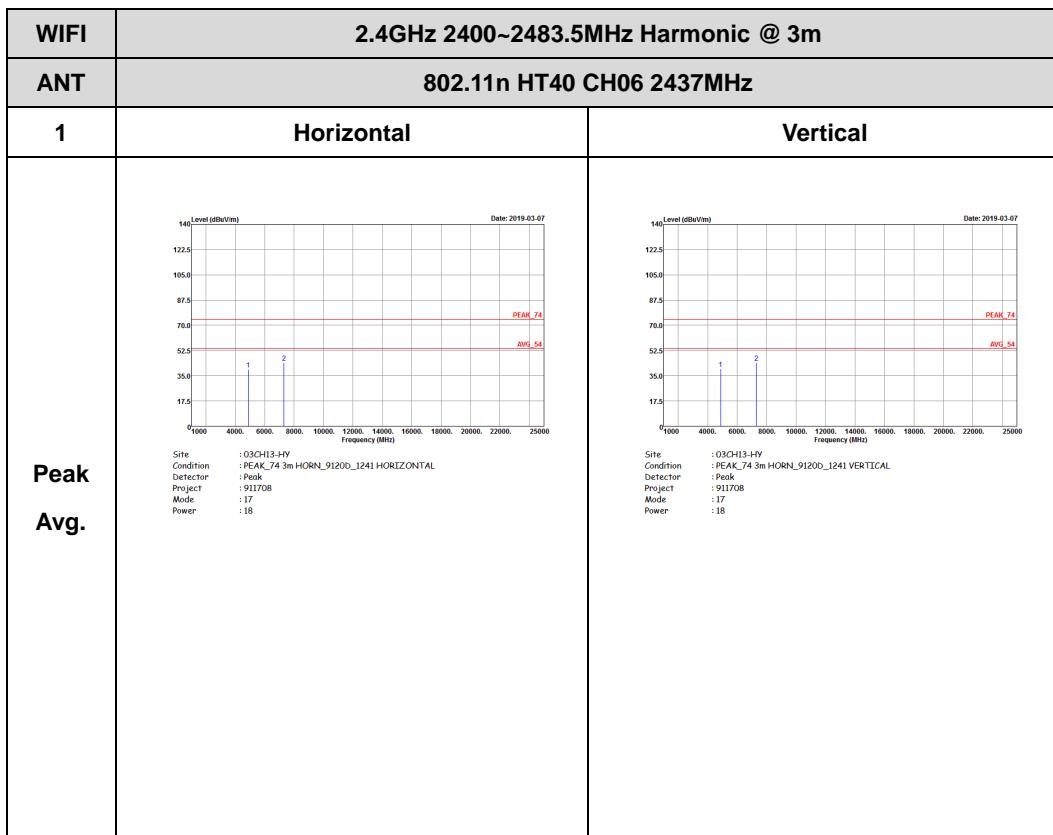


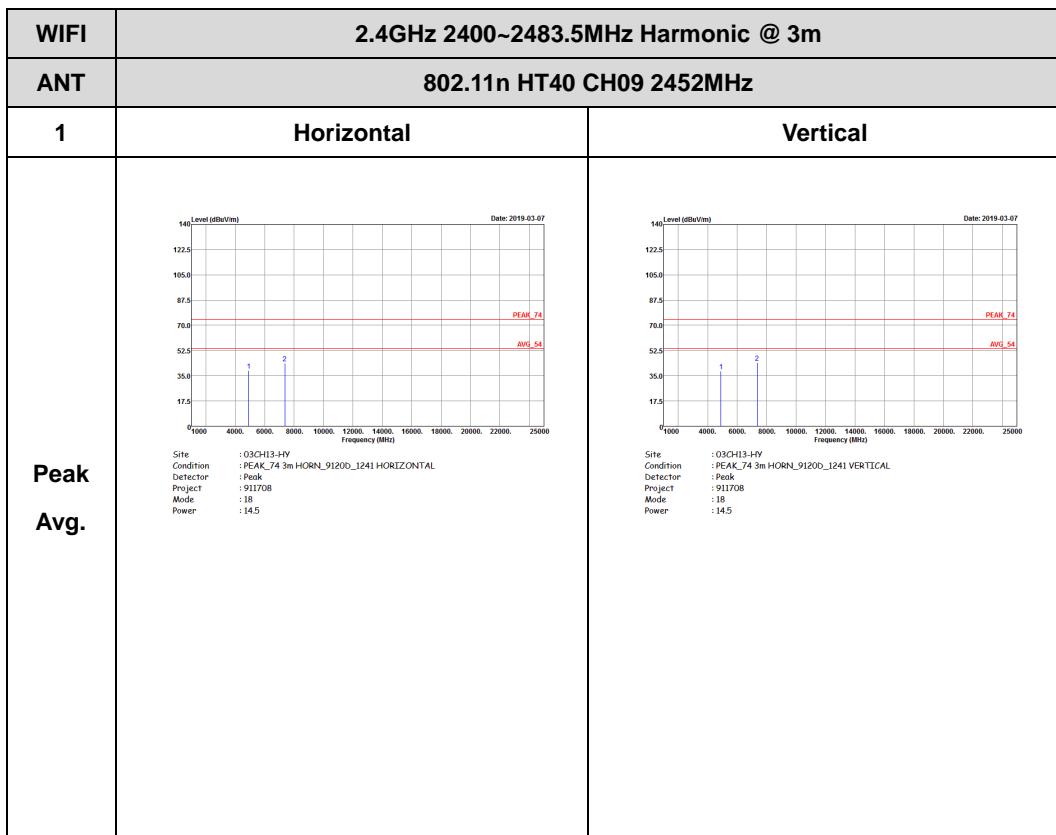


## 2.4GHz 2400~2483.5MHz

## WIFI 802.11n HT40 (Harmonic @ 3m)



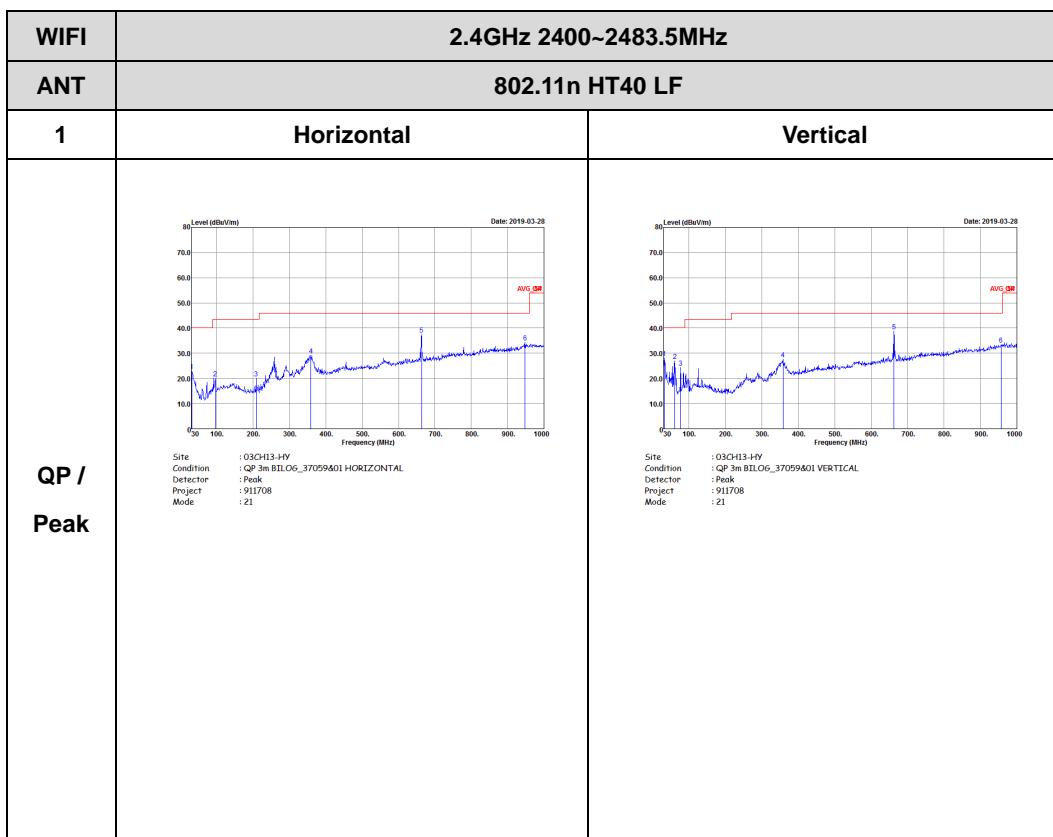






## Emission below 1GHz

## 2.4GHz WIFI 802.11n HT40 (LF)



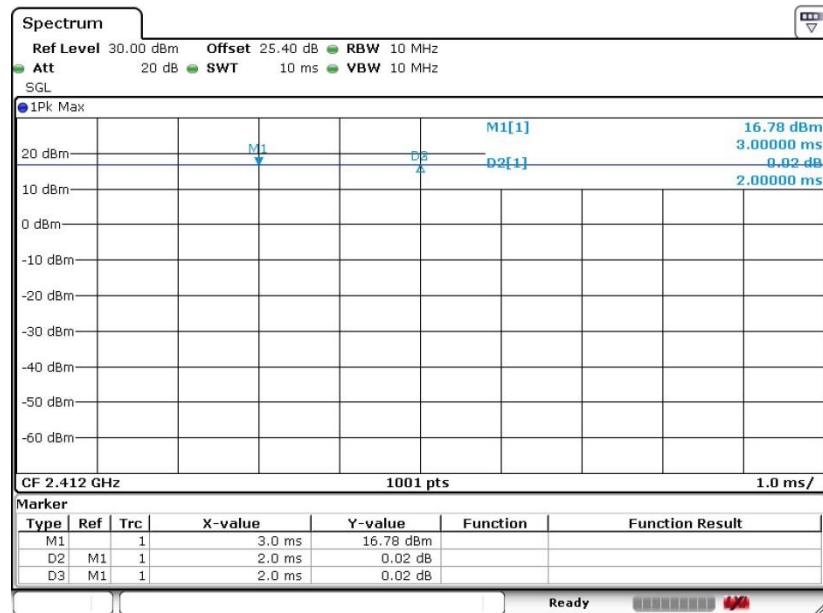


## Appendix E. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
802.11b	100.00	-	-	10Hz	0.00
802.11g	100.00	-	-	10Hz	0.00
2.4GHz 802.11n HT20	100.00	-	-	10Hz	0.00
2.4GHz 802.11n HT40	100.00	-	-	10Hz	0.00

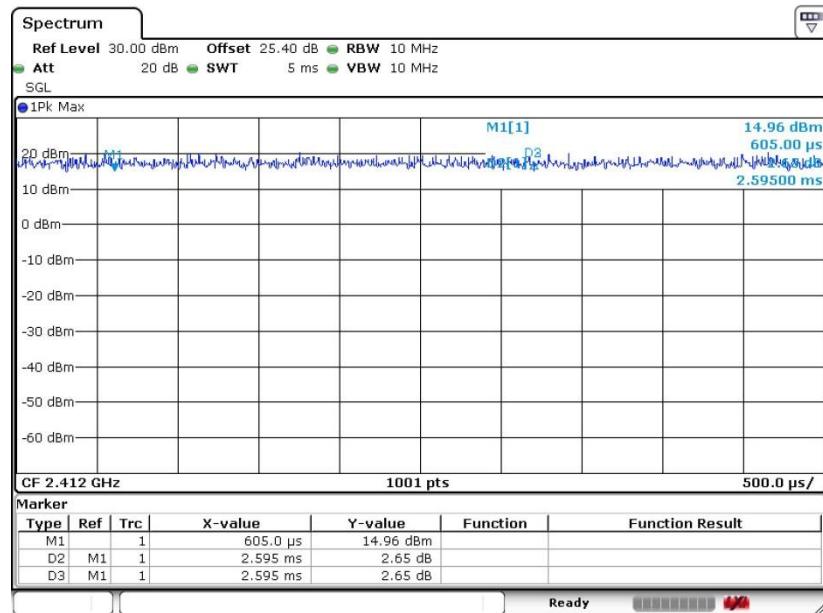


## 802.11b



Date: 12.FEB.2019 16:27:08

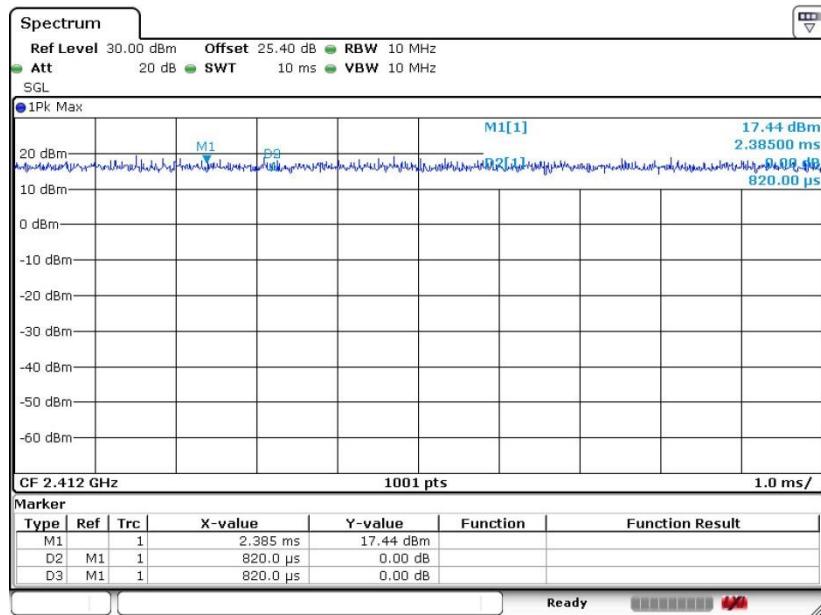
## 802.11g



Date: 12.FEB.2019 16:31:45

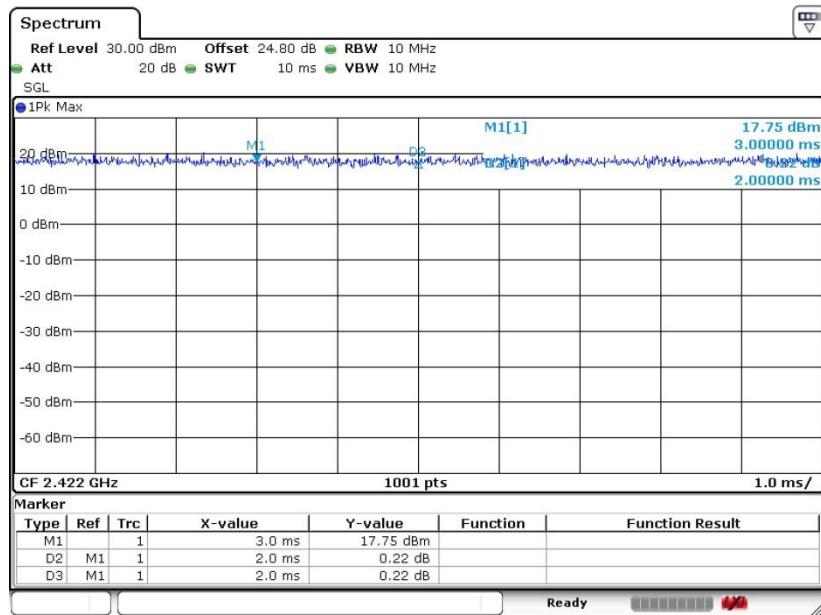


## 802.11n HT20



Date: 12.FEB.2019 16:34:02

## 802.11n HT40



Date: 15.FEB.2019 16:55:35

THE END