



# FCC RADIO TEST REPORT

**FCC ID** : 2AJOTTA1140  
**Equipment** : Smart Phone  
**Brand Name** : NOKIA  
**Model Name** : TA1140, TA1141  
**Applicant** : HMD Global Oy  
Bertel Jungin aukio 9, 02600 Espoo, Finland  
**Manufacturer** : HMD Global Oy  
Bertel Jungin aukio 9, 02600 Espoo, Finland  
**Standard** : FCC Part 15 Subpart C §15.247

The product was received on Oct. 11, 2018 and testing was started from Oct. 16, 2018 and completed on Jan. 09, 2019. 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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## History of this test report



## 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 1.49 dB at 2484.740 MHz
3.6	15.207	AC Conducted Emission	Pass	Under limit 11.42 dB at 0.773 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	Pass	-

Reviewed by: Wii Chang

Report Producer: Polly Tsai



## 1 General Description

### 1.1 Product Feature of Equipment Under Test

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

Product Specification subjective to this standard	
<b>Sample 1</b>	EUT with PCB 1 and Battery 1
<b>Sample 2</b>	EUT with PCB 2 and Battery 2
<b>Antenna Type</b>	WWAN: PIFA Antenna WLAN: Monopole Antenna Bluetooth: Monopole Antenna GPS/Glonass: PIFA Antenna FM: using earphone as antenna

### 1.2 Modification of EUT

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

### 1.3 Testing Location

<b>Test Site</b>	SPORTON INTERNATIONAL INC.	
<b>Test Site Location</b>	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978	
<b>Test Site No.</b>	<b>Sporton Site No.</b>	
	TH05-HY	CO05-HY

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

<b>Test Site</b>	SPORTON INTERNATIONAL INC.	
<b>Test Site Location</b>	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	
<b>Test Site No.</b>	<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 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). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Y plane) were recorded in this report.
- b. AC power line Conducted Emission was tested under maximum output power.

### 2.1 Carrier Frequency and Channel

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



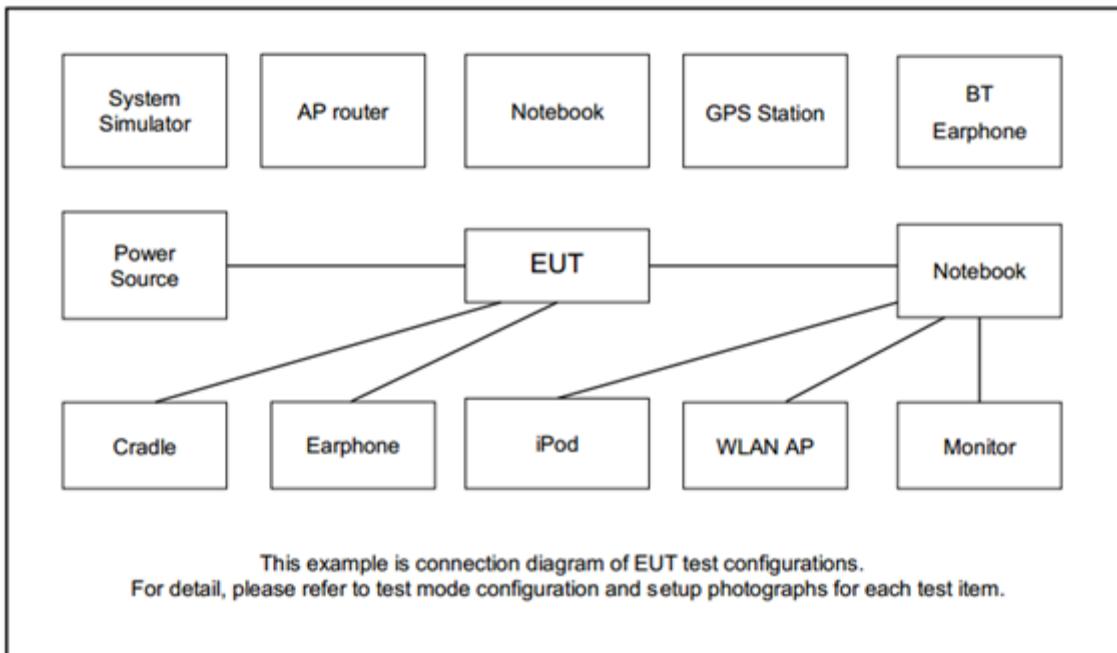
## 2.2 Test Mode

Final test 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 WCDMA Band V Idle + WLAN (2.4GHz) Link + Bluetooth Link + MPEG4 + Earphone + USB Type C Cable (Charging from Adapter 2) for Sample 1
Remark: For Radiated Test Cases, the tests were performed with Adapter 1	

## 2.3 Connection Diagram of Test System





## 2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
3.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
4.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A
5.	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
6.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A

## 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.

$$\text{Offset} = \text{RF cable loss} + \text{attenuator factor}.$$

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

$$\text{Offset(dB)} = \text{RF cable loss(dB)} + \text{attenuator factor(dB)}.$$

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



### 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.

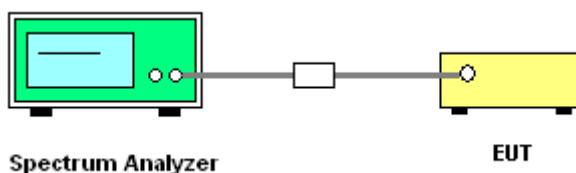
##### 3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

##### 3.1.3 Test Procedures

1. The testing follows 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)  $\geq 3 * \text{RBW}$ .
6. Measure and record the results in the test report.

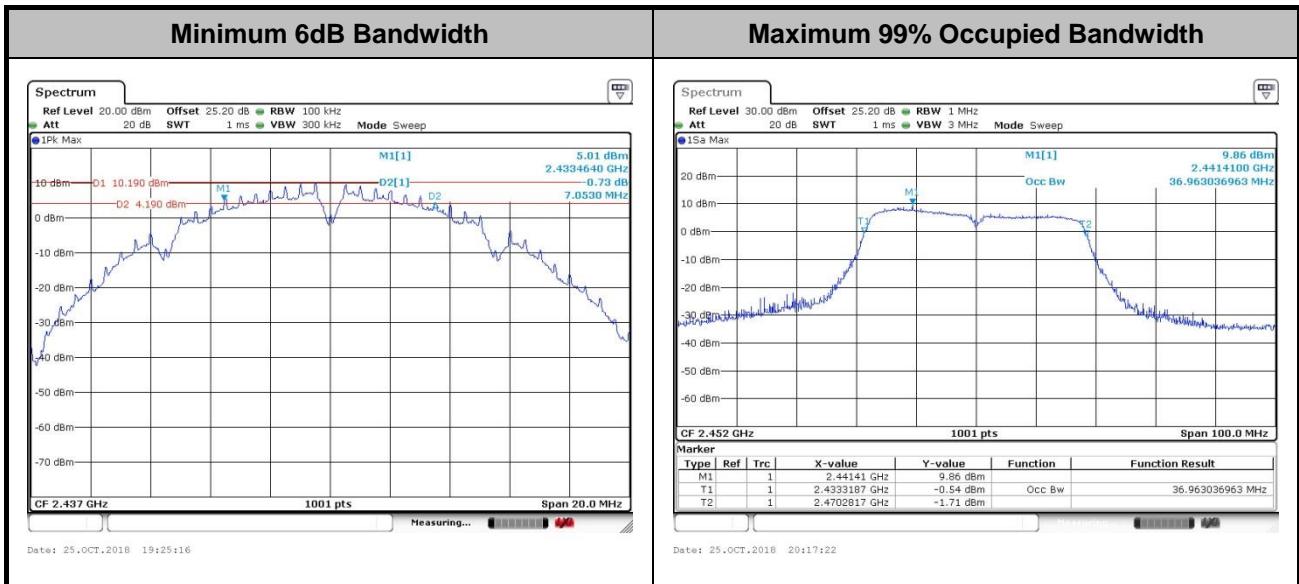
##### 3.1.4 Test Setup





### 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.

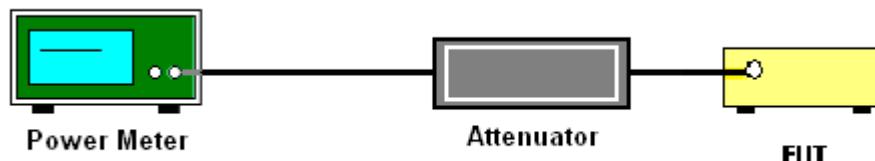
### 3.2.2 Measuring Instruments

See list of measuring equipment of this test report.

### 3.2.3 Test Procedures

1. For Peak Power, the testing follows 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.

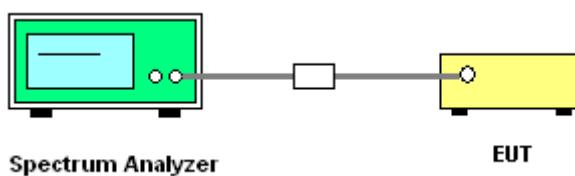
#### 3.3.2 Measuring Instruments

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.

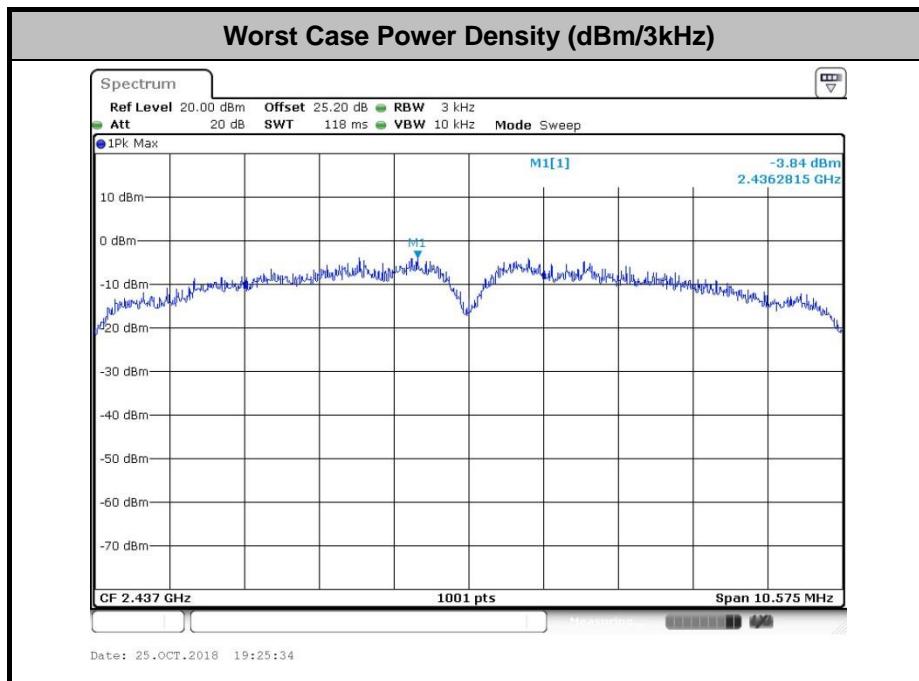
#### 3.3.4 Test Setup





### 3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.





## 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.

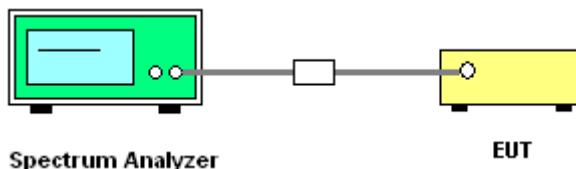
### 3.4.2 Measuring Instruments

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



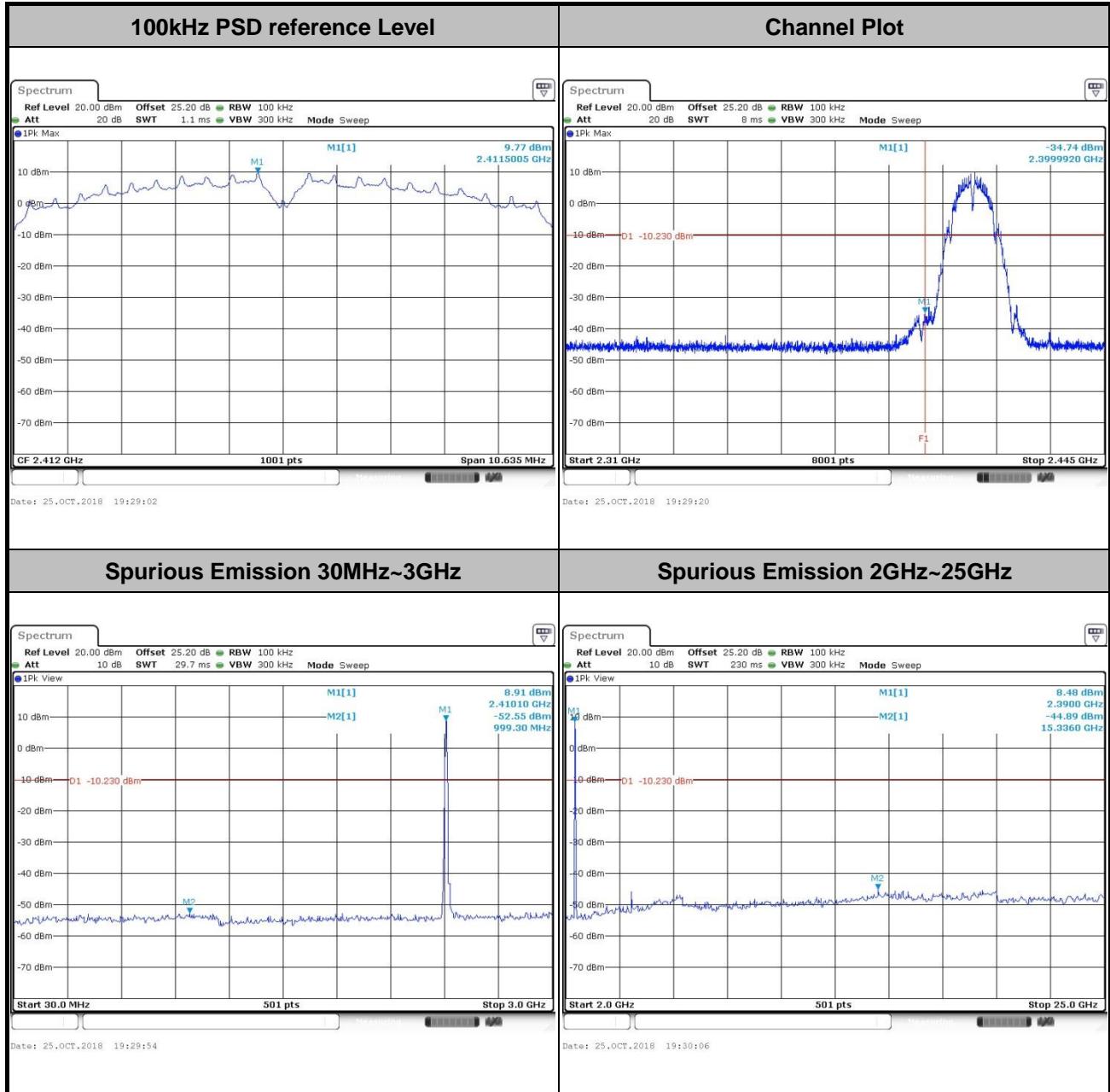


### 3.4.5 Test Result of Conducted Band Edges and Spurious Emission

<b>Test Engineer :</b>	Allen Lin and Derek Hsu	<b>Temperature :</b>	21~25°C
		<b>Relative Humidity :</b>	51~54%

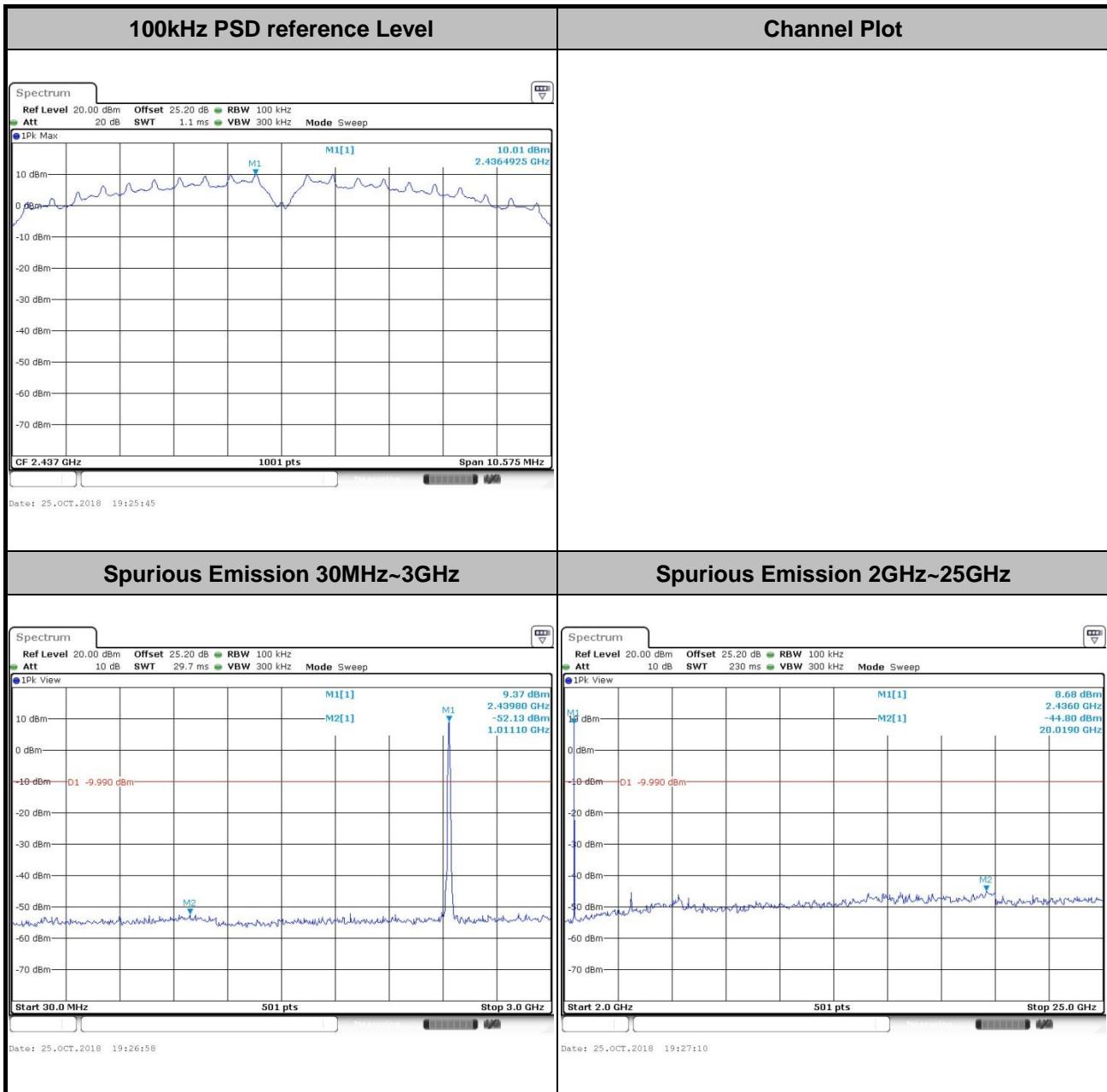
Number of TX = 1, Ant. 1 (Measured)

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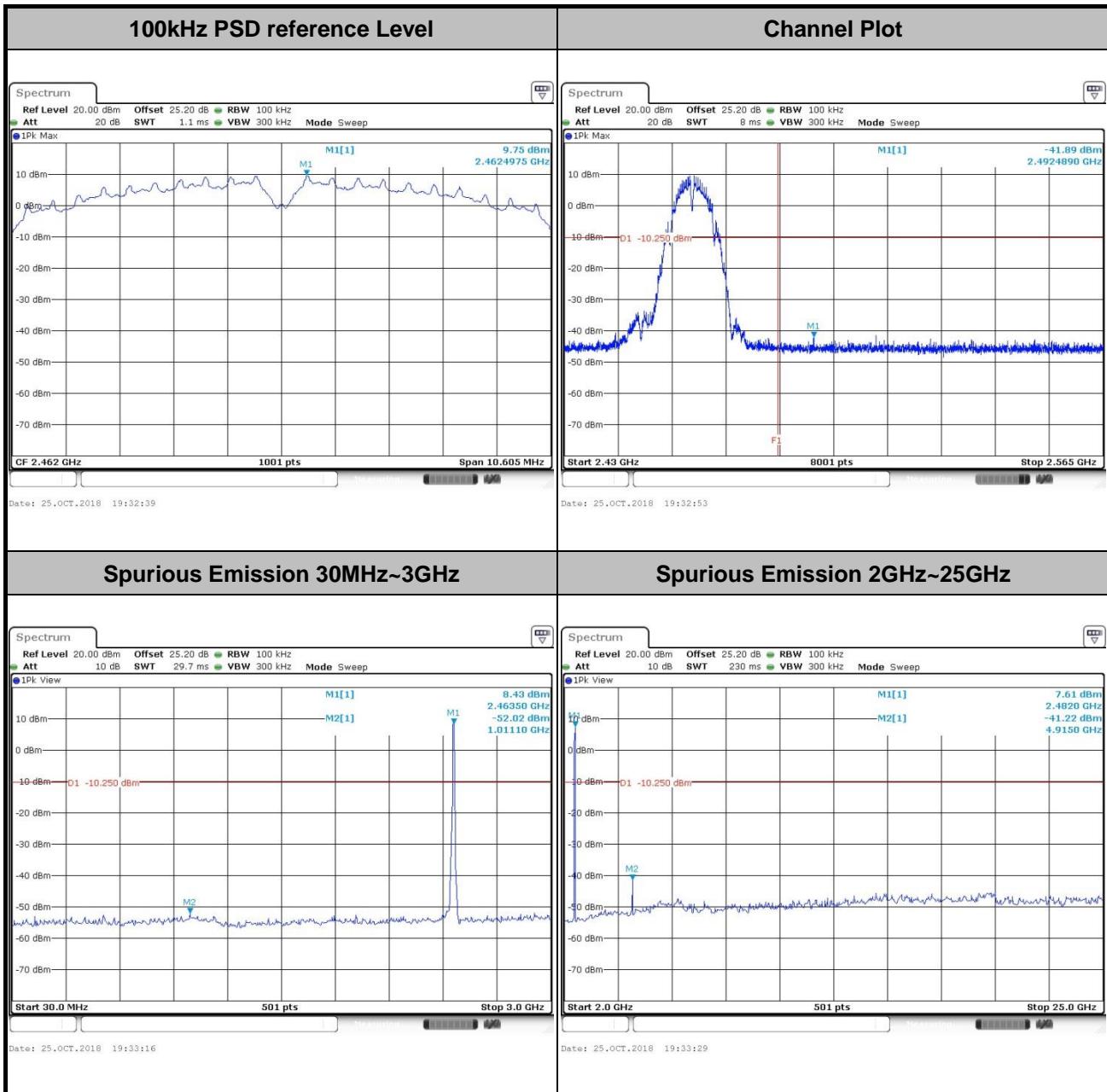


Test Mode :	802.11b	Test Channel :	06
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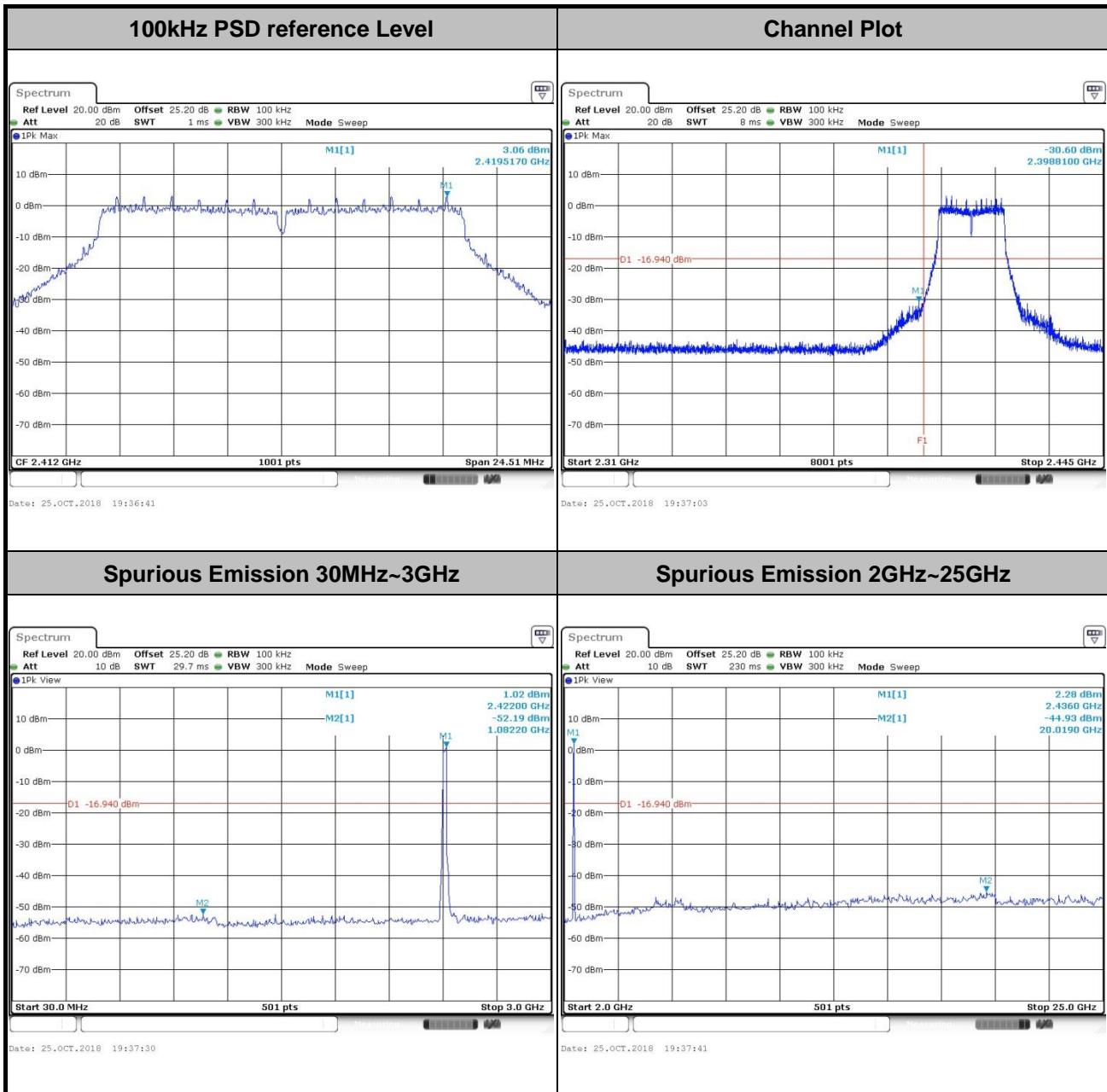


Test Mode :	802.11b	Test Channel :	11
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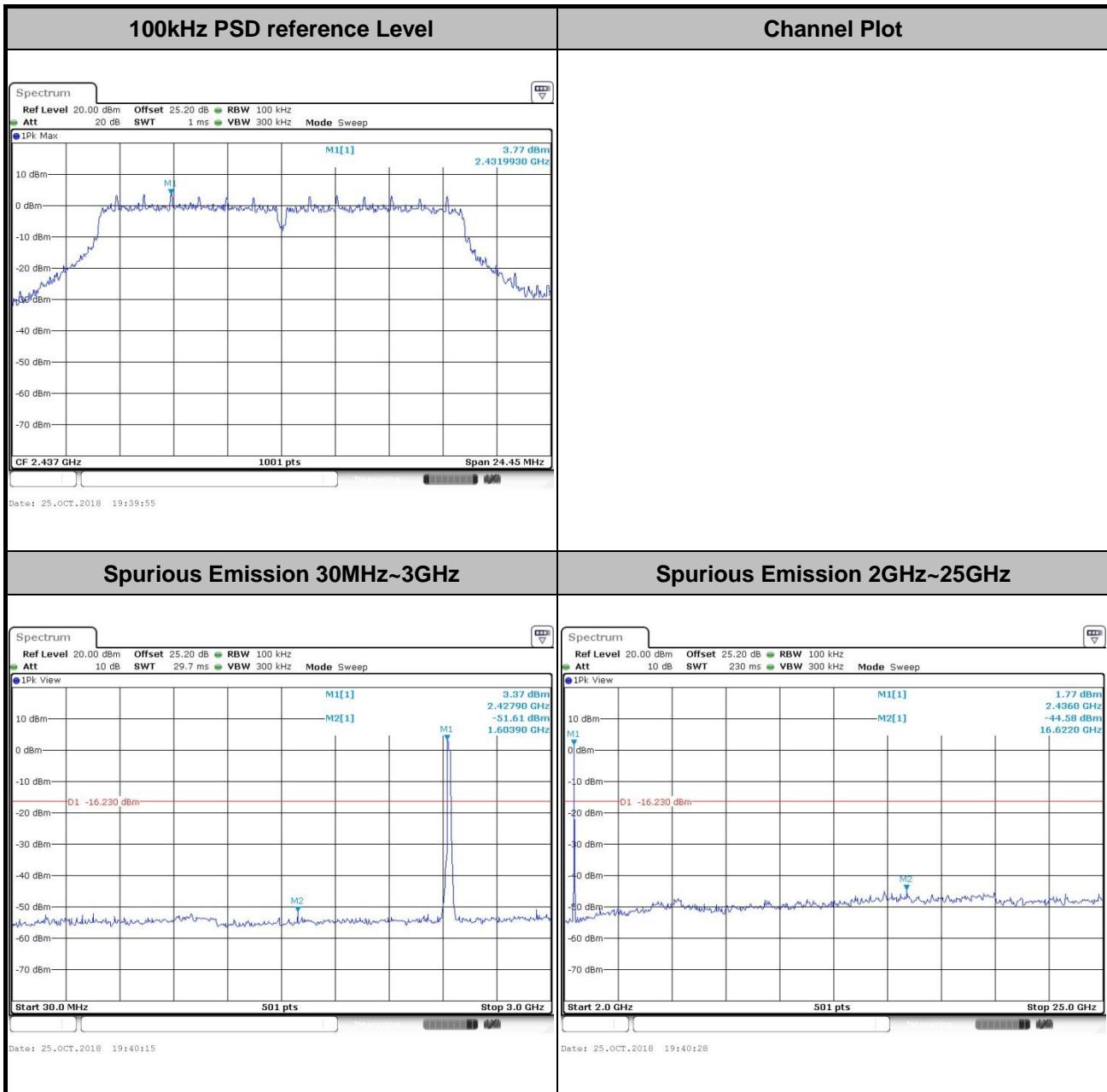


Test Mode :	802.11g	Test Channel :	01
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Test Mode :	802.11g	Test Channel :	06
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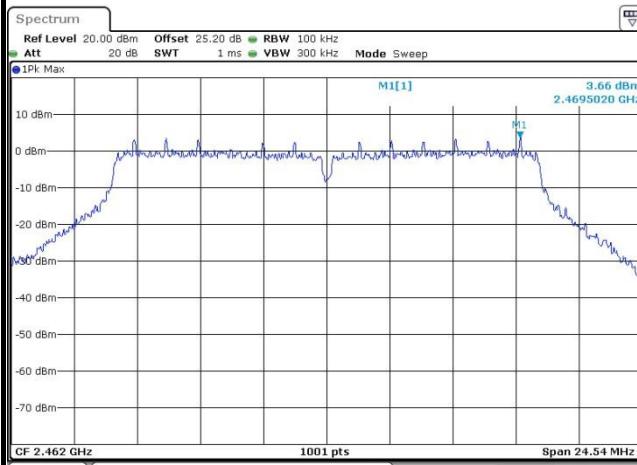




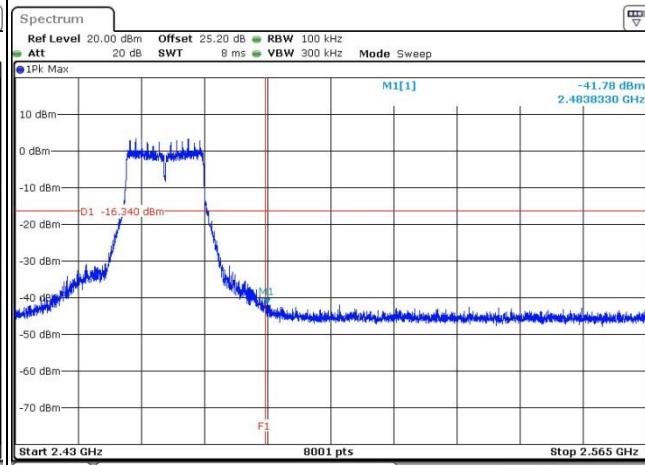
Test Mode : 802.11g

Test Channel : 11

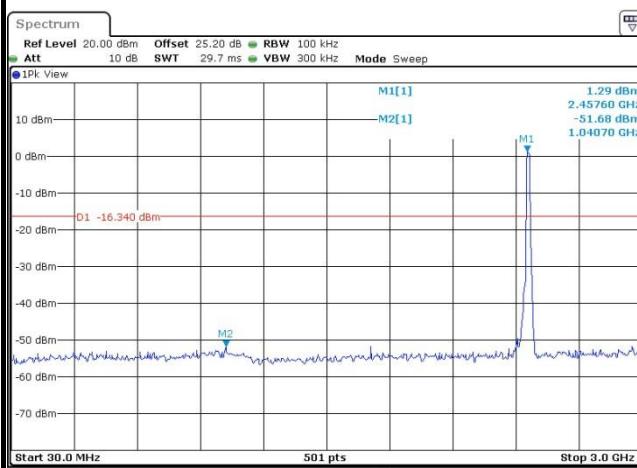
## 100kHz PSD reference Level



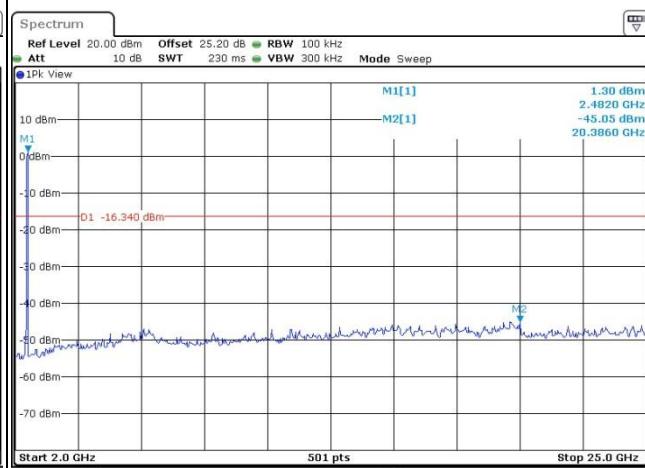
## Channel Plot



## Spurious Emission 30MHz~3GHz

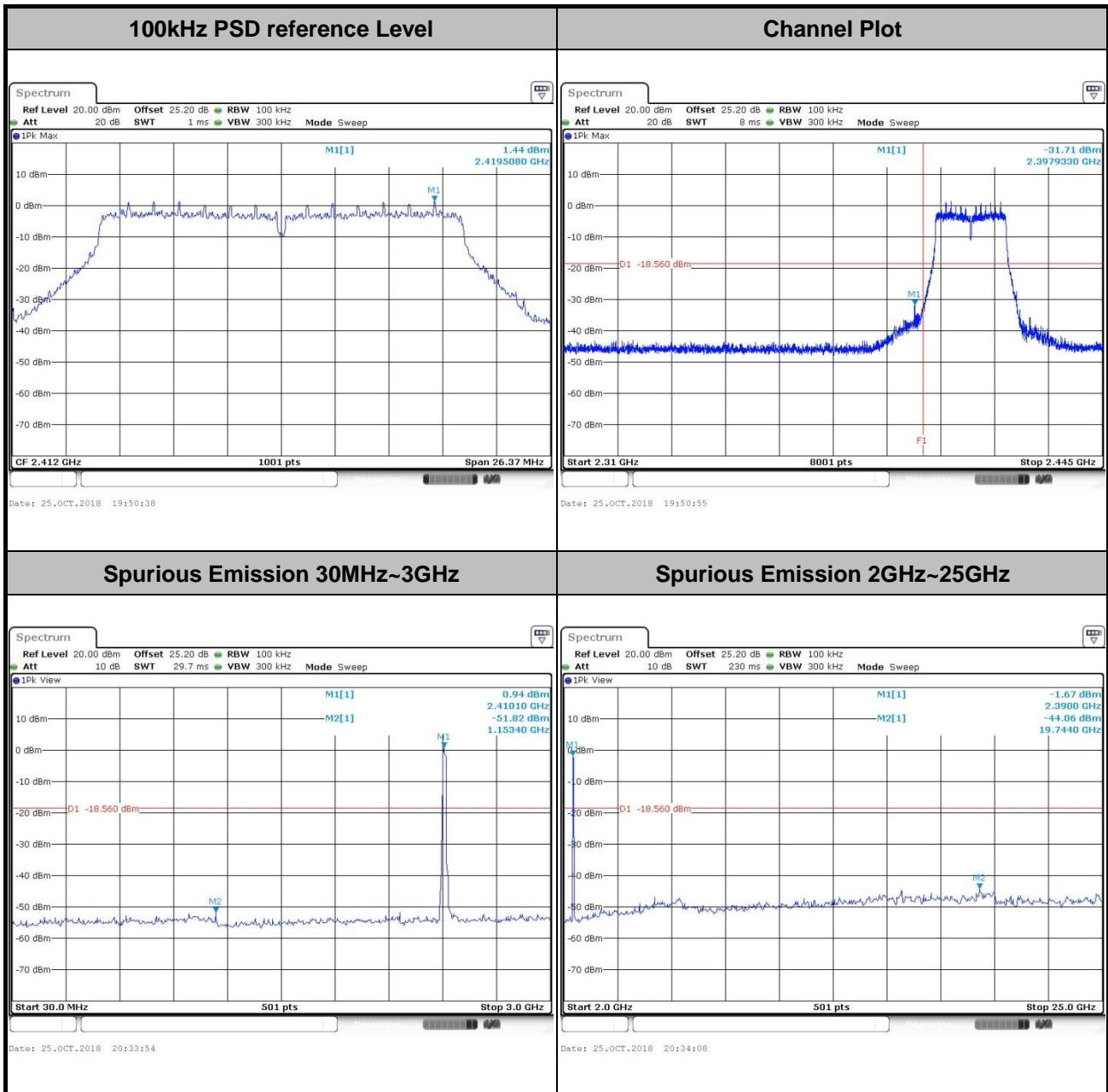


## Spurious Emission 2GHz~25GHz



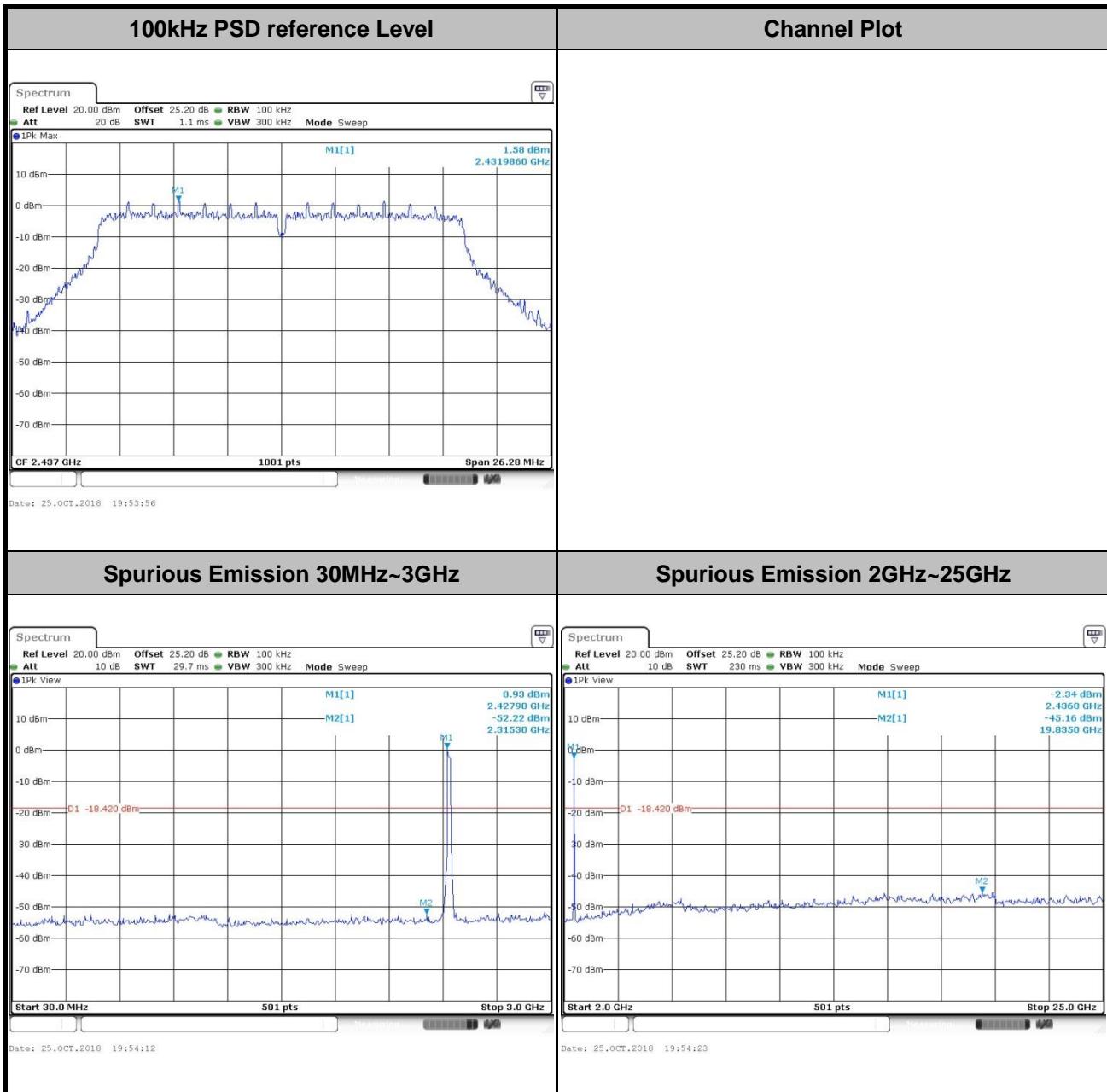


Test Mode :	802.11n HT20	Test Channel :	01
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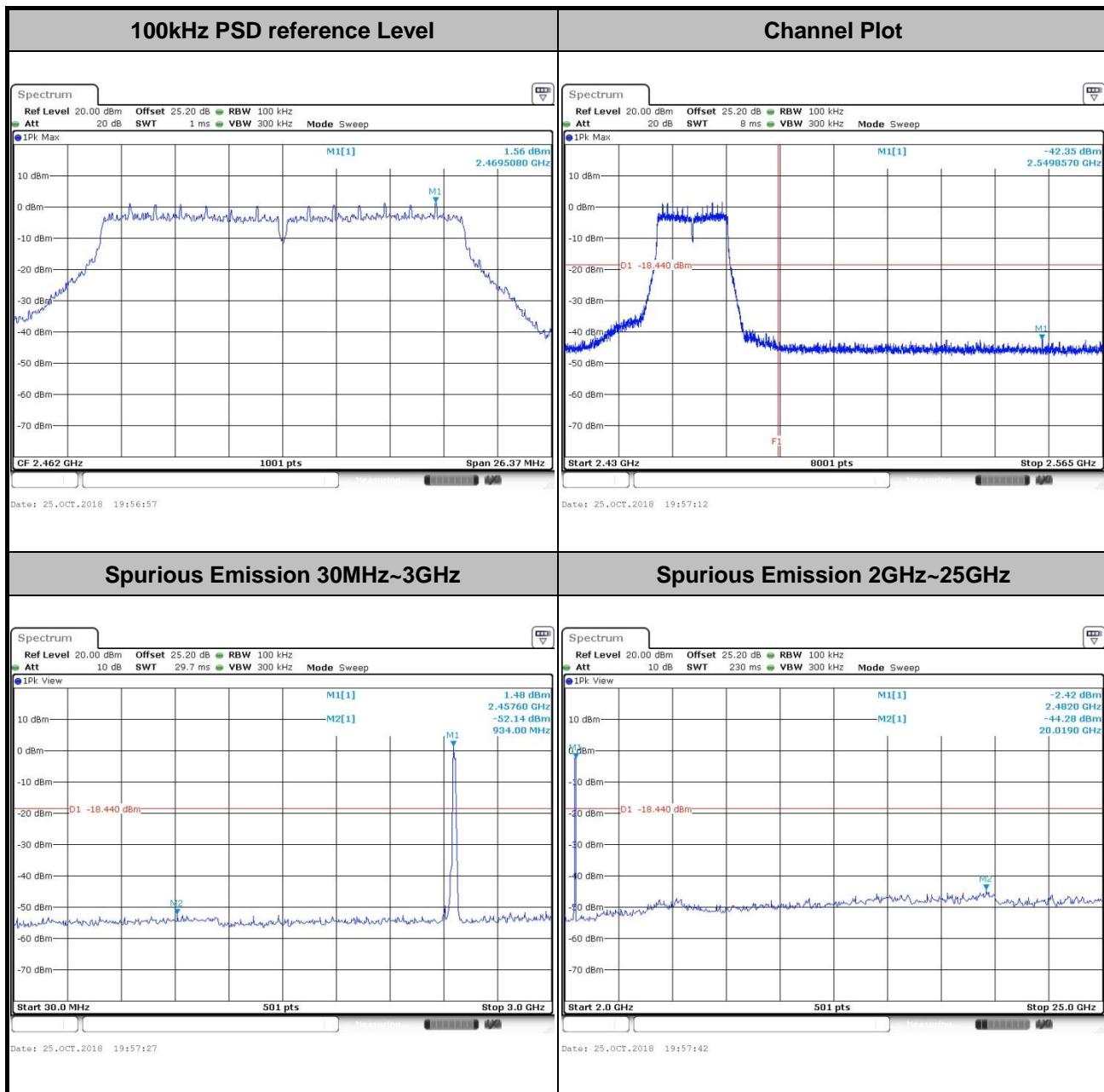
Test Mode :	802.11n HT20	Test Channel :	06
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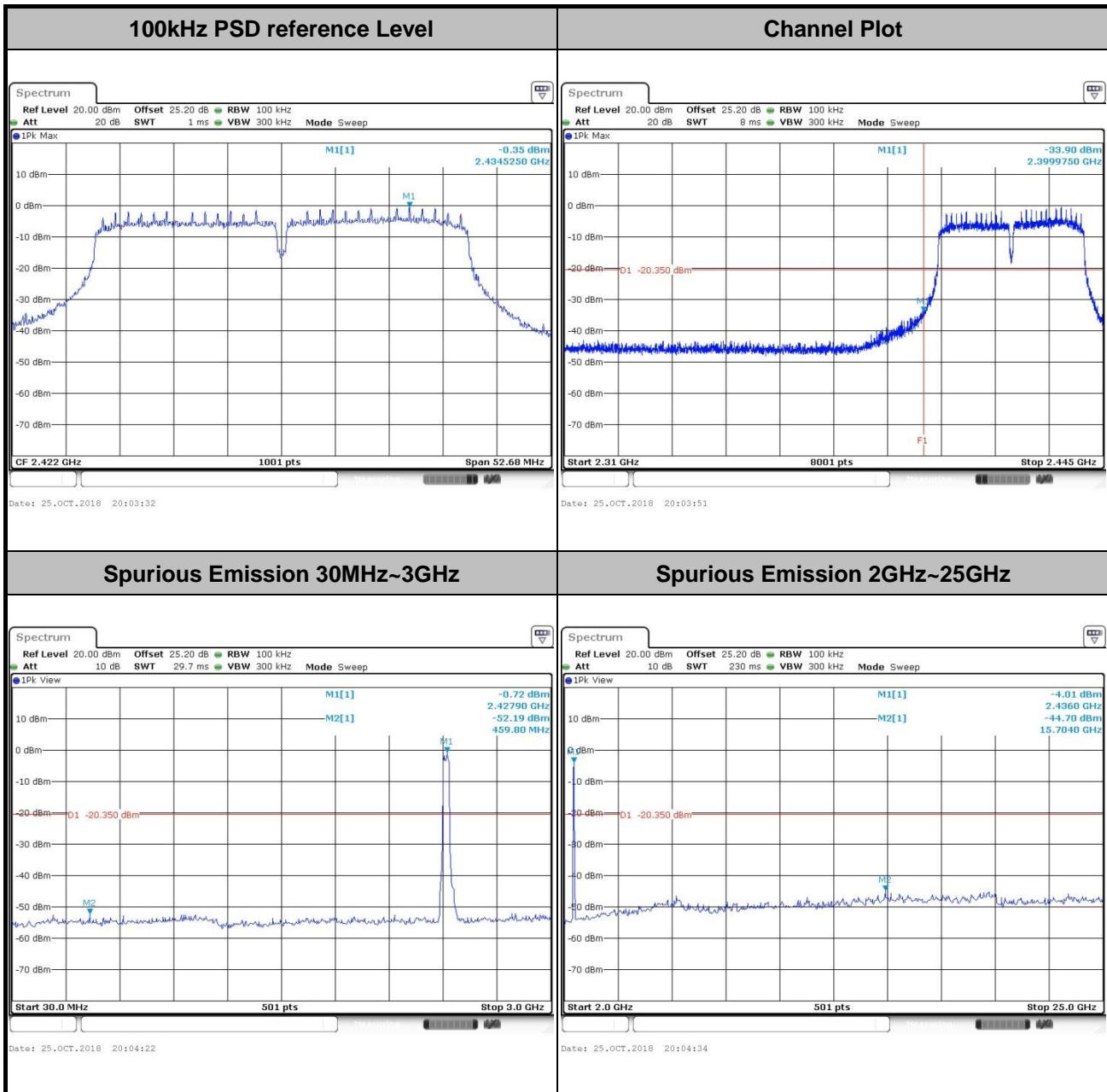
Test Mode : 802.11n HT20

Test Channel : 11



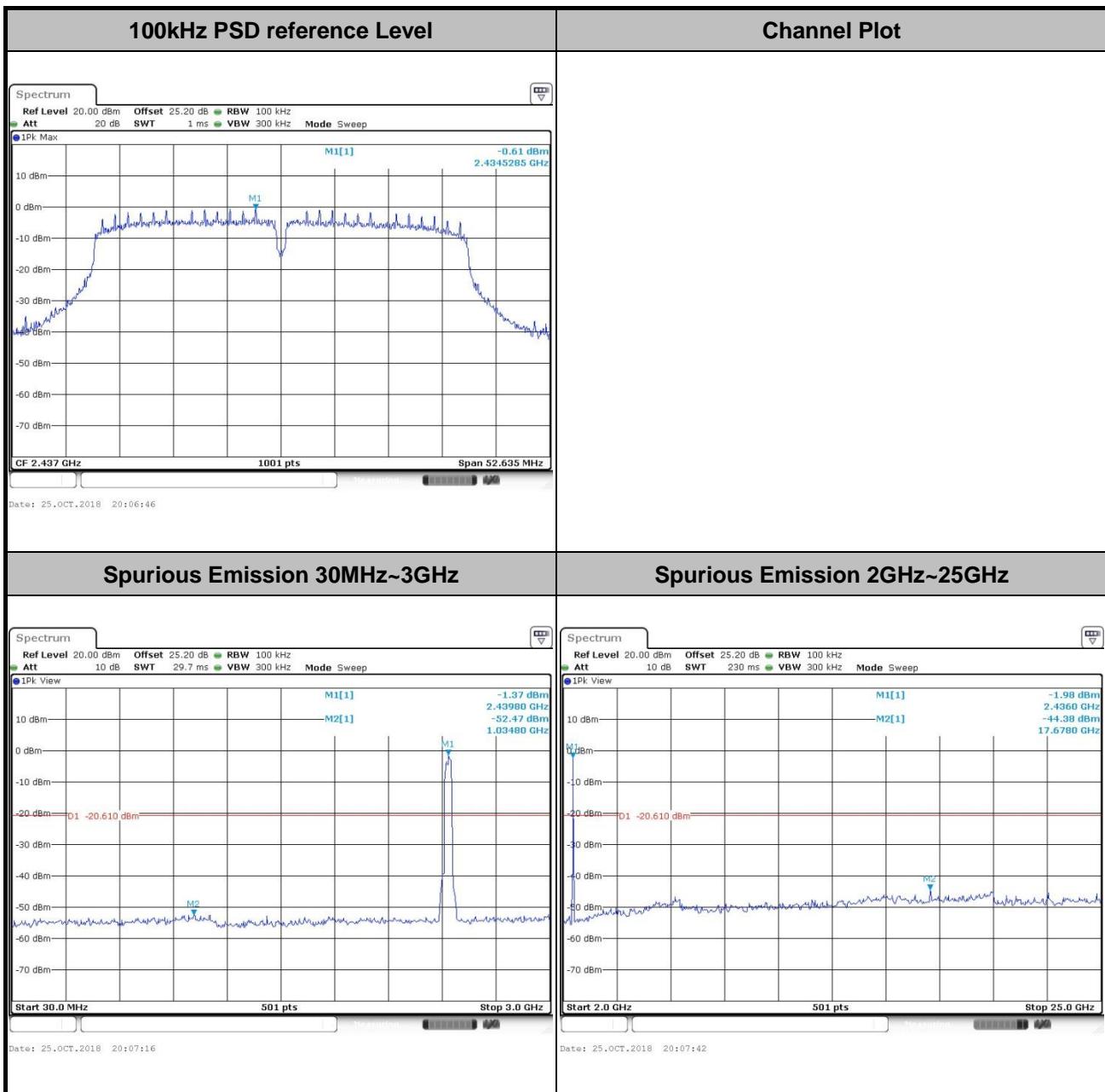


Test Mode :	802.11n HT40	Test Channel :	03
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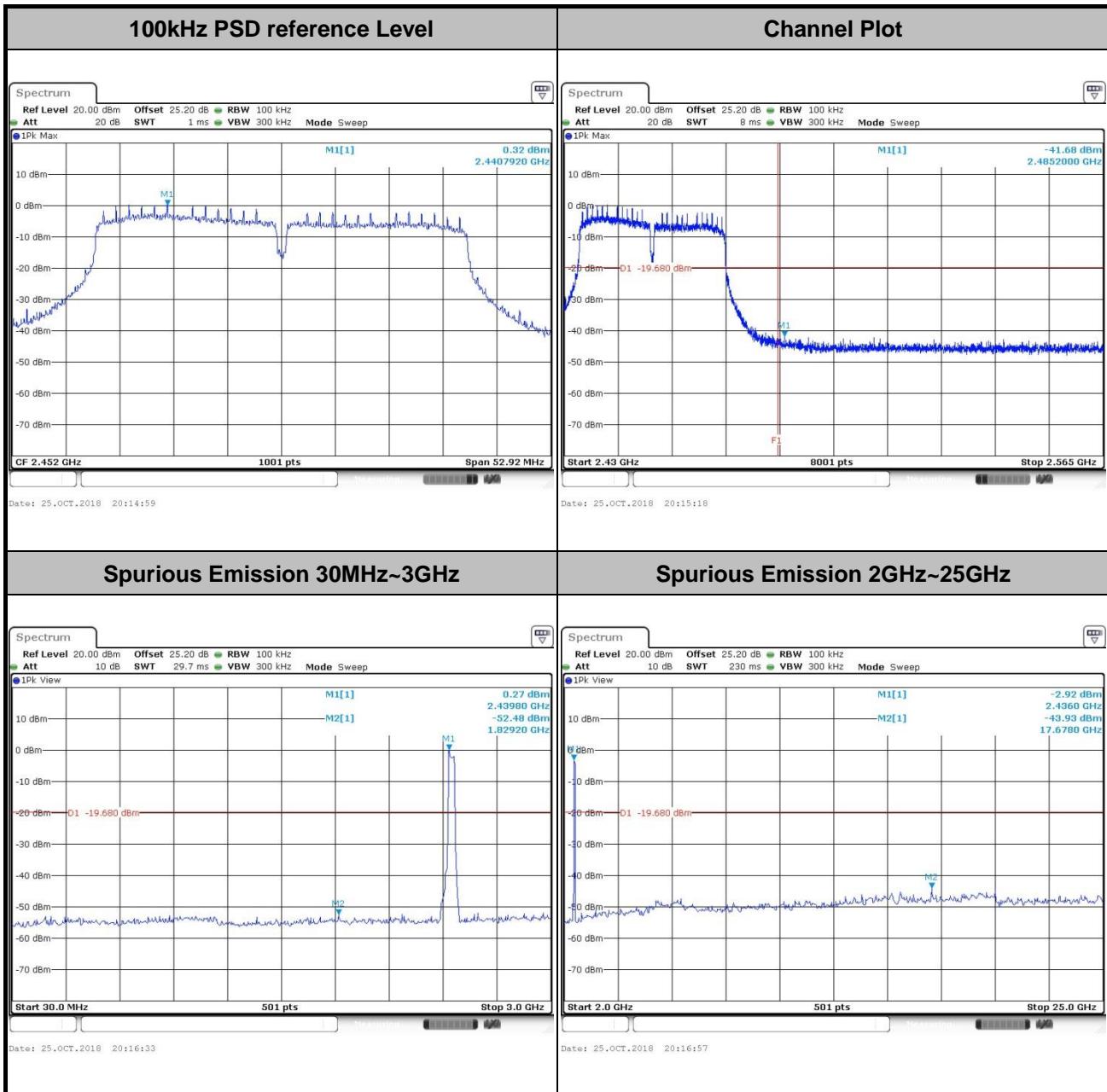


Test Mode :	802.11n HT40	Test Channel :	06
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Test Mode :	802.11n HT40	Test Channel :	09
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### 3.5 Radiated Band Edges and Spurious Emission Measurement

#### 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

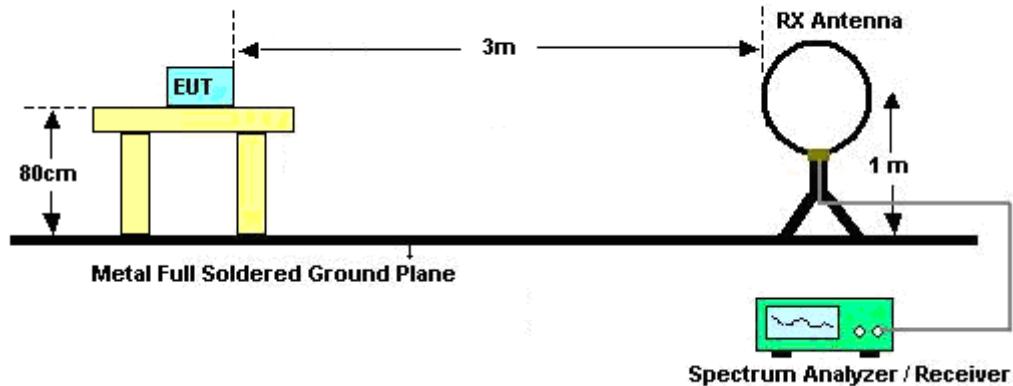
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test 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  $\geq$  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:

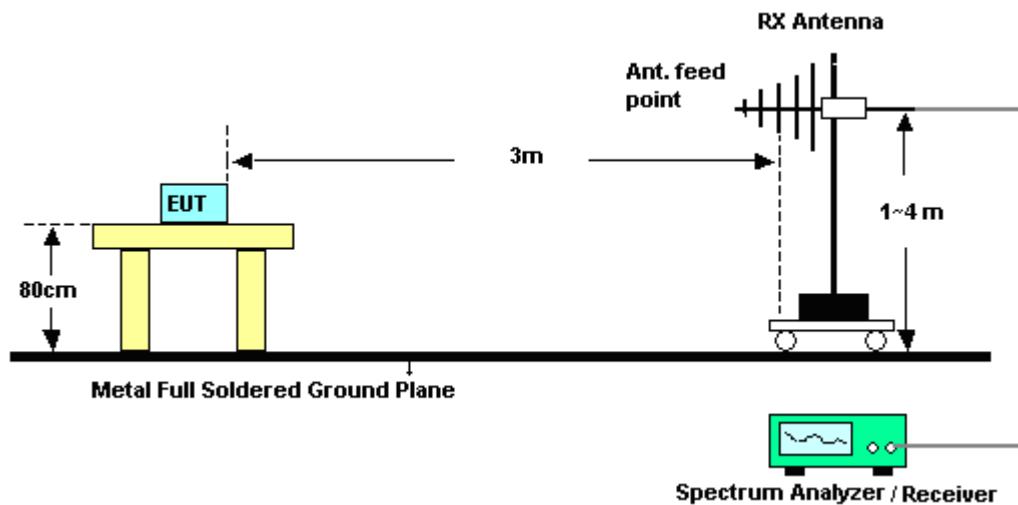
  - VBW = 10 Hz, when duty cycle is no less than 98 percent.
  - $VBW \geq 1/T$ , when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

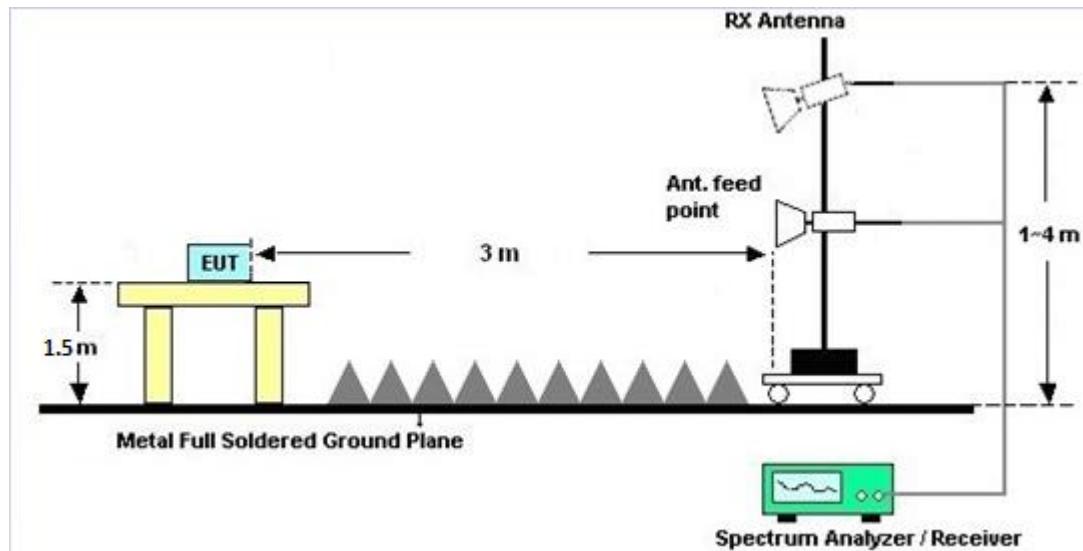
### 3.5.4 Test Setup

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.

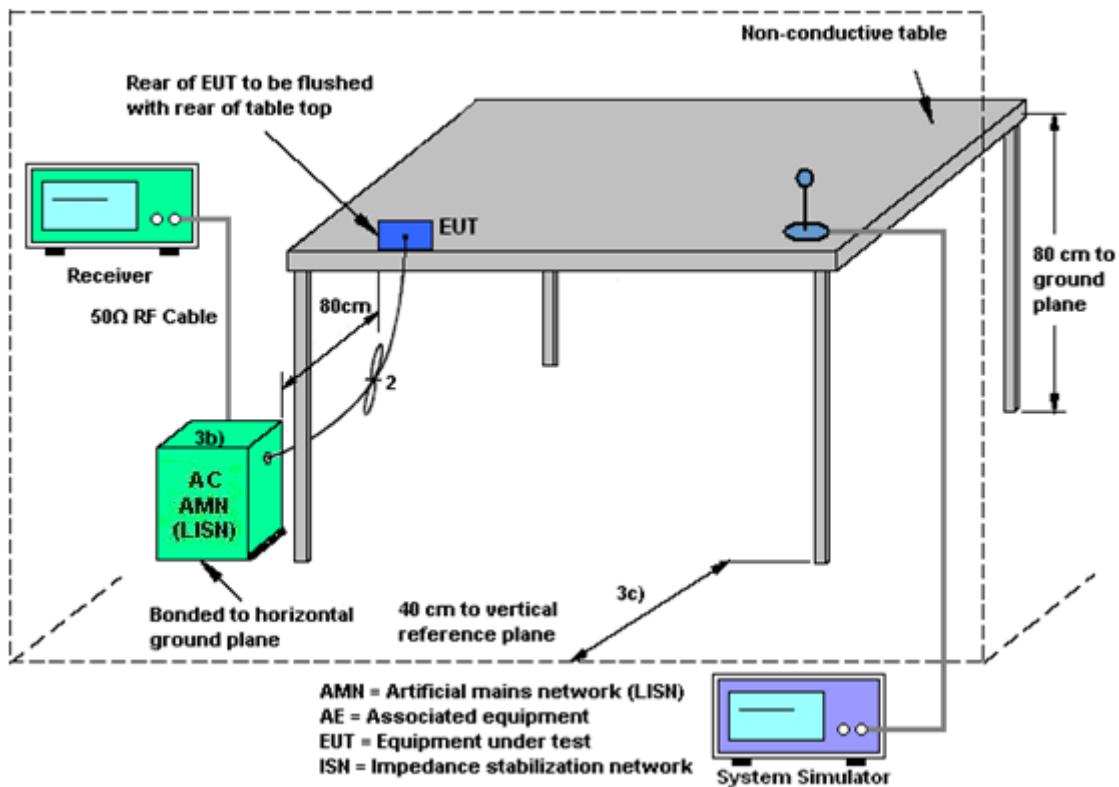
### 3.6.2 Measuring Instruments

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 Meter	Anritsu	ML2495A	1132003	N/A	Aug. 16, 2018	Oct. 16, 2018~ Oct. 25, 2018	Aug. 15, 2019	Conducted (TH05-HY)
Power Sensor	Anritsu	MA2411B	1126017	300MHz~40GHz	Aug. 16, 2018	Oct. 16, 2018~ Oct. 25, 2018	Aug. 15, 2019	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100057	9kHz-40GHz	Nov. 21, 2017	Oct. 16, 2018~ Oct. 25, 2018	Nov. 20, 2018	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101397	10Hz~40GHz	Nov. 07, 2017	Oct. 16, 2018~ Oct. 25, 2018	Nov. 06, 2018	Conducted (TH05-HY)
Switch Box & RF Cable	Burgeon	ETF-058	EC130048-4	N/A	Mar. 01, 2018	Oct. 16, 2018~ Oct. 25, 2018	Feb. 28, 2019	Conducted (TH05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Oct. 16, 2018	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9KHz~3.6GHz	Dec. 08, 2017	Oct. 16, 2018	Dec. 07, 2018	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 30, 2017	Oct. 16, 2018	Nov. 29, 2018	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Oct. 16, 2018	N/A	Conduction (CO05-HY)
LF Cable	HUBER + SUHNER	RG-214/U	LF01	N/A	Jan. 03, 2018	Oct. 16, 2018	Jan. 02, 2019	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Jan. 03, 2018	Oct. 16, 2018	Jan. 02, 2019	Conduction (CO05-HY)
Filter	Microwave	H3G018G1	SN477219	3.0G High Pass	Nov. 21, 2017	Oct. 19, 2018~ Oct. 20, 2018	Nov. 20, 2018	Radiation (03CH13-HY)
Filter	Microwave	H3G018G1	SN477219	3.0G High Pass	Nov. 02, 2018	Jan. 08, 2019~ Jan. 09, 2019	Nov. 01, 2019	Radiation (03CH13-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Nov. 10, 2017	Oct. 19, 2018~ Oct. 20, 2018	Nov. 09, 2018	Radiation (03CH13-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Nov. 23, 2018	Jan. 08, 2019~ Jan. 09, 2019	Nov. 22, 2019	Radiation (03CH13-HY)
Filter	Wainwright	WLKS1200-8 SS	SN3	1.2G Low Pass	Nov. 21, 2017	Oct. 19, 2018~ Oct. 20, 2018	Nov. 20, 2018	Radiation (03CH13-HY)
Filter	Wainwright	WLKS1200-8 SS	SN3	1.2G Low Pass	Nov. 02, 2018	Jan. 08, 2019~ Jan. 09, 2019	Nov. 01, 2019	Radiation (03CH13-HY)
Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz, VSWR : 2.5:1 max	Jul. 16, 2018	Oct. 19, 2018~ Jan. 09, 2019	Jul. 15, 2019	Radiation (03CH13-HY)
Amplifier	Sonoma-Instrument	310 N	187282	9KHz~1GHz	Dec. 21, 2016	Oct. 19, 2018~ Oct. 20, 2018	Dec. 20, 2018	Radiation (03CH13-HY)
Amplifier	Sonoma-Instrument	310 N	187282	9KHz~1GHz	Dec. 18, 2018	Jan. 08, 2019~ Jan. 09, 2019	Dec. 17, 2019	Radiation (03CH13-HY)
Bilog Antenna	TESEQ	CBL 6111D&00800 N1D01N-06	40103&07	30MHz to 1GHz	Jan. 10, 2018	Oct. 19, 2018~ Oct. 20, 2018	Jan. 09, 2019	Radiation (03CH13-HY)
Bilog Antenna	TESEQ	CBL 6111D&N-6-06	35414&AT-N0602	30MHz to 1GHz	Oct. 13, 2018	Jan. 08, 2019~ Jan. 09, 2019	Oct. 12, 2019	Radiation (03CH13-HY)



## FCC RADIO TEST REPORT

Report No. : FR8O1133C

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-124 1	1GHz ~ 18GHz	Jun. 29, 2018	Oct. 19, 2018~Jan. 09, 2019	Jun. 28, 2019	Radiation (03CH13-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590074	1GHz~18GHz	May 21, 2018	Oct. 19, 2018~Jan. 09, 2019	May 20, 2019	Radiation (03CH13-HY)
Preamplifier	Keysight	83017A	MY532701 47	1GHz~26.5GHz	Feb. 02, 2018	Oct. 19, 2018~Jan. 09, 2019	Feb. 01, 2019	Radiation (03CH13-HY)
Spectrum Analyzer	Keysight	N9010A	MY553705 26	10Hz~44GHz	Mar. 15, 2018	Oct. 19, 2018~Jan. 09, 2019	Mar. 14, 2019	Radiation (03CH13-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Oct. 19, 2018~Jan. 09, 2019	N/A	Radiation (03CH13-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Oct. 19, 2018~Jan. 09, 2019	N/A	Radiation (03CH13-HY)
EMI Test Receiver	Agilent	N9038A (MXE)	MY532900 53	20Hz to 26.5GHz	Jan. 16, 2018	Oct. 19, 2018~Jan. 09, 2019	Jan. 15, 2019	Radiation (03CH13-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170 584	18GHz- 40GHz	Nov. 27, 2017	Oct. 19, 2018~Oct. 20, 2018	Nov. 26, 2018	Radiation (03CH13-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170 584	18GHz- 40GHz	Nov. 20, 2018	Jan. 08, 2019~Jan. 09, 2019	Nov. 19, 2019	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126E	0030/126E	30M-18G	Jan. 22, 2018	Oct. 19, 2018~Jan. 09, 2019	Jan. 21, 2019	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	335041/4	30M-18G	Jan. 22, 2018	Oct. 19, 2018~Jan. 09, 2019	Jan. 21, 2019	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24961/4	30M~18GHz	Jan. 22, 2018	Oct. 19, 2018~Jan. 09, 2019	Jan. 21, 2019	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2859/2	30M~40GHz	Mar. 14, 2018	Oct. 19, 2018~Jan. 09, 2019	Mar. 13, 2019	Radiation (03CH13-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY4274/2	30M~40GHz	Mar. 14, 2018	Oct. 19, 2018~Jan. 09, 2019	Mar. 13, 2019	Radiation (03CH13-HY)
Software	AUDIX	E3 6.2009-8-24c	RK-001124	N/A	N/A	Oct. 19, 2018~Jan. 09, 2019	N/A	Radiation (03CH13-HY)



## 5 Uncertainty of Evaluation

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

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

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

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

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

Test Engineer:	Allen Lin/Derek Hsu	Temperature:	21~25	°C
Test Date:	2018/10/16~2018/10/25	Relative Humidity:	51~54	%

**TEST RESULTS DATA**  
**6dB and 99% Occupied Bandwidth**

2.4GHz Band										
Mod.	Data Rate	N <sub>TX</sub>	CH.	Freq. (MHz)	99% Occupied BW (MHz)		6dB BW (MHz)		6dB BW Limit (MHz)	Pass/Fail
					Ant 1	Ant 2	Ant 1	Ant 2		
11b	1Mbps	1	1	2412	12.14	-	7.09	-	0.50	Pass
11b	1Mbps	1	6	2437	12.34	-	7.05	-	0.50	Pass
11b	1Mbps	1	11	2462	12.09	-	7.07	-	0.50	Pass
11g	6Mbps	1	1	2412	17.23	-	16.34	-	0.50	Pass
11g	6Mbps	1	6	2437	17.18	-	16.30	-	0.50	Pass
11g	6Mbps	1	11	2462	17.28	-	16.36	-	0.50	Pass
HT20	MCS0	1	1	2412	18.18	-	17.58	-	0.50	Pass
HT20	MCS0	1	6	2437	18.03	-	17.52	-	0.50	Pass
HT20	MCS0	1	11	2462	18.23	-	17.58	-	0.50	Pass
HT40	MCS0	1	3	2422	36.76	-	35.13	-	0.50	Pass
HT40	MCS0	1	6	2437	36.16	-	35.09	-	0.50	Pass
HT40	MCS0	1	9	2452	36.96	-	35.29	-	0.50	Pass

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

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 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2
11b	1Mbps	1	1	2412	20.98	-	-	30.00	-	1.78	-	22.76	-	36.00	-	Pass	
11b	1Mbps	1	6	2437	20.69	-	-	30.00	-	1.78	-	22.47	-	36.00	-	Pass	
11b	1Mbps	1	11	2462	21.01	-	-	30.00	-	1.78	-	22.79	-	36.00	-	Pass	
11g	6Mbps	1	1	2412	23.18	-	-	30.00	-	1.78	-	24.96	-	36.00	-	Pass	
11g	6Mbps	1	6	2437	22.95	-	-	30.00	-	1.78	-	24.73	-	36.00	-	Pass	
11g	6Mbps	1	11	2462	23.41	-	-	30.00	-	1.78	-	25.19	-	36.00	-	Pass	
HT20	MCS0	1	1	2412	22.05	-	-	30.00	-	1.78	-	23.83	-	36.00	-	Pass	
HT20	MCS0	1	6	2437	21.69	-	-	30.00	-	1.78	-	23.47	-	36.00	-	Pass	
HT20	MCS0	1	11	2462	22.32	-	-	30.00	-	1.78	-	24.10	-	36.00	-	Pass	
HT40	MCS0	1	3	2422	22.34	-	-	30.00	-	1.78	-	24.12	-	36.00	-	Pass	
HT40	MCS0	1	6	2437	21.95	-	-	30.00	-	1.78	-	23.73	-	36.00	-	Pass	
HT40	MCS0	1	9	2452	22.36	-	-	30.00	-	1.78	-	24.14	-	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 2	Ant 1	Ant 2	SUM
11b	1Mbps	1	1	2412	0.13	-	17.94	-	-
11b	1Mbps	1	6	2437	0.13	-	17.86	-	
11b	1Mbps	1	11	2462	0.13	-	17.97	-	
11g	6Mbps	1	1	2412	0.59	-	14.61	-	
11g	6Mbps	1	6	2437	0.59	-	14.86	-	
11g	6Mbps	1	11	2462	0.59	-	14.60	-	
HT20	MCS0	1	1	2412	0.66	-	12.74	-	
HT20	MCS0	1	6	2437	0.66	-	12.80	-	
HT20	MCS0	1	11	2462	0.66	-	12.72	-	
HT40	MCS0	1	3	2422	0.65	-	12.95	-	
HT40	MCS0	1	6	2437	0.65	-	12.88	-	
HT40	MCS0	1	9	2452	0.65	-	12.97	-	

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 2	Worse + 3.01	Ant 1	Ant 2	Ant 1	Ant 2	
11b	1Mbps	1	1	2412	-4.07	-	-	1.78	-	8.00	-	Pass
11b	1Mbps	1	6	2437	-3.84	-	-	1.78	-	8.00	-	Pass
11b	1Mbps	1	11	2462	-4.13	-	-	1.78	-	8.00	-	Pass
11g	6Mbps	1	1	2412	-10.77	-	-	1.78	-	8.00	-	Pass
11g	6Mbps	1	6	2437	-10.90	-	-	1.78	-	8.00	-	Pass
11g	6Mbps	1	11	2462	-10.38	-	-	1.78	-	8.00	-	Pass
HT20	MCS0	1	1	2412	-12.70	-	-	1.78	-	8.00	-	Pass
HT20	MCS0	1	6	2437	-11.60	-	-	1.78	-	8.00	-	Pass
HT20	MCS0	1	11	2462	-12.92	-	-	1.78	-	8.00	-	Pass
HT40	MCS0	1	3	2422	-15.23	-	-	1.78	-	8.00	-	Pass
HT40	MCS0	1	6	2437	-14.80	-	-	1.78	-	8.00	-	Pass
HT40	MCS0	1	9	2452	-13.35	-	-	1.78	-	8.00	-	Pass

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



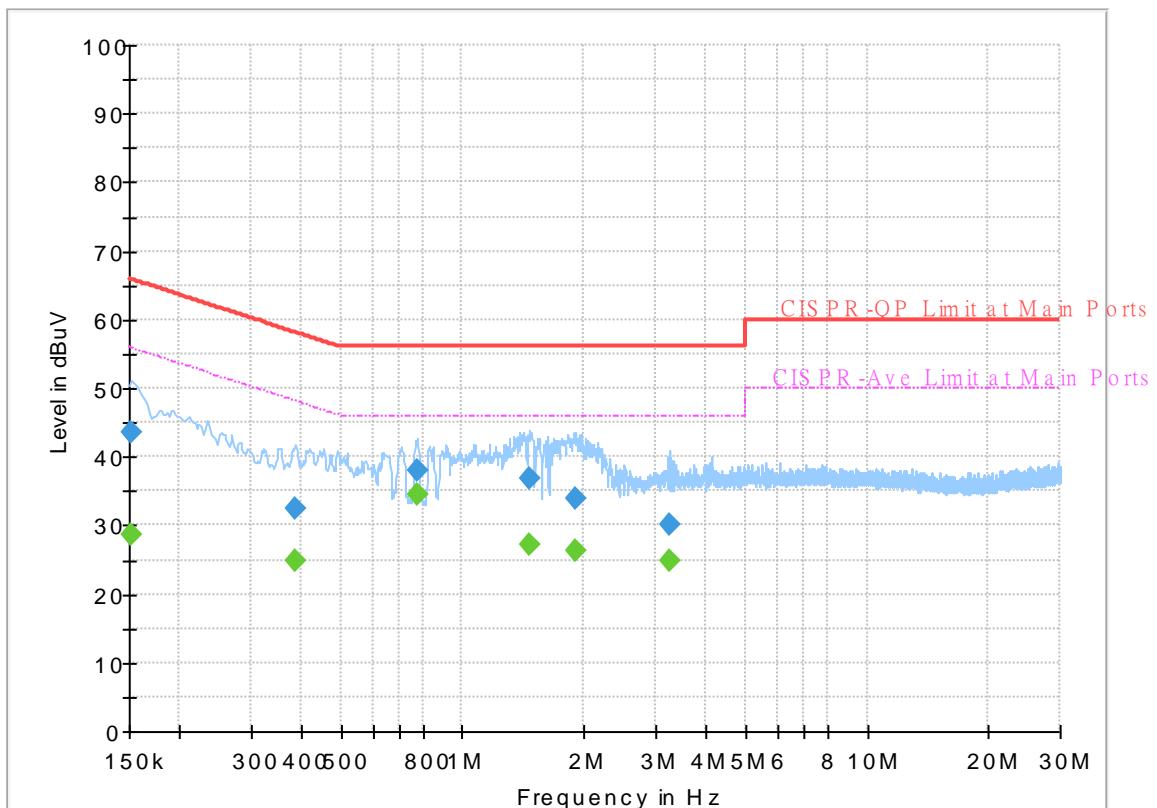
## Appendix B. AC Conducted Emission Test Results

<b>Test Engineer :</b>	Rick Lin	<b>Temperature :</b>	22~24°C
		<b>Relative Humidity :</b>	61~63%

## EUT Information

Report NO : 801133  
 Test Mode : Mode 1  
 Test Voltage : 120Vac/60Hz  
 Phase : Line

Full Spectrum



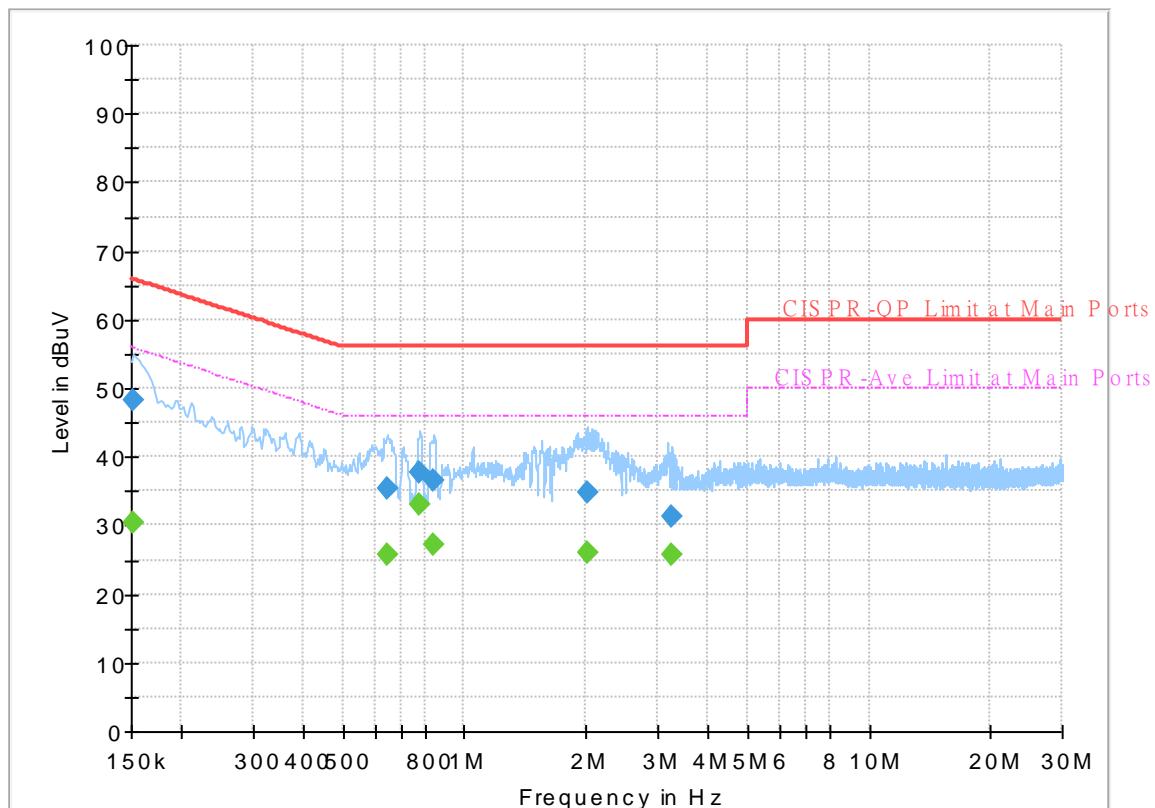
## Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	28.61	55.88	27.27	L1	OFF	19.5
0.152250	43.44	---	65.88	22.44	L1	OFF	19.5
0.386250	---	24.84	48.14	23.30	L1	OFF	19.5
0.386250	32.52	---	58.14	25.62	L1	OFF	19.5
0.773250	---	34.58	46.00	11.42	L1	OFF	19.6
0.773250	38.03	---	56.00	17.97	L1	OFF	19.6
1.468500	---	27.08	46.00	18.92	L1	OFF	19.6
1.468500	36.90	---	56.00	19.10	L1	OFF	19.6
1.898250	---	26.22	46.00	19.78	L1	OFF	19.6
1.898250	33.92	---	56.00	22.08	L1	OFF	19.6
3.255000	---	24.84	46.00	21.16	L1	OFF	19.7
3.255000	30.09	---	56.00	25.91	L1	OFF	19.7

## EUT Information

Report NO : 801133  
 Test Mode : Mode 1  
 Test Voltage : 120Vac/60Hz  
 Phase : Neutral

Full Spectrum



## Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	30.39	55.88	25.49	N	OFF	19.5
0.152250	48.12	---	65.88	17.76	N	OFF	19.5
0.642750	---	25.59	46.00	20.41	N	OFF	19.6
0.642750	35.25	---	56.00	20.75	N	OFF	19.6
0.777750	---	33.09	46.00	12.91	N	OFF	19.6
0.777750	37.82	---	56.00	18.18	N	OFF	19.6
0.840750	---	27.09	46.00	18.91	N	OFF	19.6
0.840750	36.61	---	56.00	19.39	N	OFF	19.6
2.004000	---	26.03	46.00	19.97	N	OFF	19.6
2.004000	34.88	---	56.00	21.12	N	OFF	19.6
3.237000	---	25.62	46.00	20.38	N	OFF	19.6
3.237000	31.31	---	56.00	24.69	N	OFF	19.6



## Appendix C. Radiated Spurious Emission

Test Engineer :	Alex Jheng, Fu Chen, and Wilson Wu	Temperature :	24.2~24.9°C
		Relative Humidity :	49~55%

<Sample 1>

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1		( MHz )	( dB $\mu$ V/m )	( dB )	( dB $\mu$ V/m )	( dB $\mu$ V )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
802.11b CH 01 2412MHz		2389.275	54.05	-19.95	74	41.23	27.23	15.49	29.9	100	144	P	H
		2389.59	43.88	-10.12	54	31.06	27.23	15.49	29.9	100	144	A	H
	*	2412	108.27	-	-	95.35	27.28	15.53	29.89	100	144	P	H
	*	2412	105.1	-	-	92.18	27.28	15.53	29.89	100	144	A	H
													H
													H
		2329.95	53.03	-20.97	74	40.46	27.05	15.43	29.91	249	298	P	V
		2389.275	43.38	-10.62	54	30.56	27.23	15.49	29.9	249	298	A	V
	*	2412	107.15	-	-	94.23	27.28	15.53	29.89	249	298	P	V
	*	2412	103.97	-	-	91.05	27.28	15.53	29.89	249	298	A	V
													V
													V



802.11b CH 06 2437MHz		2382.38	52.95	-21.05	74	40.17	27.19	15.49	29.9	100	146	P	H
		2387.7	42.82	-11.18	54	30	27.23	15.49	29.9	100	146	A	H
	*	2437	109	-	-	95.97	27.37	15.55	29.89	100	146	P	H
	*	2437	105.78	-	-	92.75	27.37	15.55	29.89	100	146	A	H
		2494.75	53.06	-20.94	74	39.82	27.5	15.61	29.87	100	146	P	H
		2483.83	43.25	-10.75	54	30.06	27.46	15.61	29.88	100	146	A	H
		2327.92	53.23	-20.77	74	40.66	27.05	15.43	29.91	246	292	P	V
		2389.8	42.68	-11.32	54	29.85	27.23	15.49	29.89	246	292	A	V
	*	2437	106.5	-	-	93.47	27.37	15.55	29.89	246	292	P	V
	*	2437	103.25	-	-	90.22	27.37	15.55	29.89	246	292	A	V
		2489.57	52.82	-21.18	74	39.59	27.5	15.61	29.88	246	292	P	V
		2490.62	43.09	-10.91	54	29.86	27.5	15.61	29.88	246	292	A	V
802.11b CH 11 2462MHz	*	2462	109.74	-	-	96.64	27.41	15.57	29.88	100	152	P	H
	*	2462	106.51	-	-	93.41	27.41	15.57	29.88	100	152	A	H
		2487.32	53.82	-20.18	74	40.63	27.46	15.61	29.88	100	152	P	H
		2486.6	44.25	-9.75	54	31.06	27.46	15.61	29.88	100	152	A	H
													H
													H
	*	2462	108.02	-	-	94.92	27.41	15.57	29.88	244	293	P	V
	*	2462	104.8	-	-	91.7	27.41	15.57	29.88	244	293	A	V
		2487.32	54.63	-19.37	74	41.44	27.46	15.61	29.88	244	293	P	V
		2486.28	43.8	-10.2	54	30.61	27.46	15.61	29.88	244	293	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 802.11b (Harmonic @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.	
		( 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 CH 01 2412MHz	1	4824	43.73	-30.27	74	60.77	31.26	8.27	56.57	100	0	P	H	
													H	
													H	
													H	
		4824	44.33	-29.67	74	61.37	31.26	8.27	56.57	100	0	P	V	
													V	
													V	
													V	
802.11b CH 06 2437MHz		4874	41.9	-32.1	74	58.6	31.36	8.49	56.55	100	0	P	H	
		7311	41.17	-32.83	74	50.54	36.18	10.68	56.23	100	0	P	H	
													H	
													H	
		4874	42.29	-31.71	74	58.99	31.36	8.49	56.55	100	0	P	V	
		7311	40.6	-33.4	74	49.97	36.18	10.68	56.23	100	0	P	V	
													V	
													V	
802.11b CH 11 2462MHz		4924	43.84	-30.16	74	60.27	31.46	8.64	56.53	100	0	P	H	
		7386	42.13	-31.87	74	51.21	36.37	10.67	56.12	100	0	P	H	
													H	
													H	
		4924	43.37	-30.63	74	59.8	31.46	8.64	56.53	100	0	P	V	
		7386	41.88	-32.12	74	50.96	36.37	10.67	56.12	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	63.82	-10.18	74	50.99	27.23	15.49	29.89	100	145	P	H
		2390	49.81	-4.19	54	36.98	27.23	15.49	29.89	100	145	A	H
	*	2412	106.74	-	-	93.82	27.28	15.53	29.89	100	145	P	H
	*	2412	98.94	-	-	86.02	27.28	15.53	29.89	100	145	A	H
													H
													H
		2389.905	59.61	-14.39	74	46.78	27.23	15.49	29.89	251	296	P	V
		2390	48.59	-5.41	54	35.76	27.23	15.49	29.89	251	296	A	V
	*	2412	104.91	-	-	91.99	27.28	15.53	29.89	251	296	P	V
	*	2412	97.17	-	-	84.25	27.28	15.53	29.89	251	296	A	V
													V
													V
802.11g CH 06 2437MHz		2363.9	53.8	-20.2	74	41.1	27.14	15.47	29.91	100	145	P	H
		2389.94	43.48	-10.52	54	30.65	27.23	15.49	29.89	100	145	A	H
	*	2437	107.57	-	-	94.54	27.37	15.55	29.89	100	145	P	H
	*	2437	98.73	-	-	85.7	27.37	15.55	29.89	100	145	A	H
		2490.06	53.88	-20.12	74	40.65	27.5	15.61	29.88	100	145	P	H
		2489.29	44.15	-9.85	54	30.92	27.5	15.61	29.88	100	145	A	H
		2339.68	53.18	-20.82	74	40.54	27.1	15.45	29.91	223	294	P	V
		2360.68	43.34	-10.66	54	30.64	27.14	15.47	29.91	223	294	A	V
	*	2437	106.1	-	-	93.07	27.37	15.55	29.89	223	294	P	V
	*	2437	97.38	-	-	84.35	27.37	15.55	29.89	223	294	A	V
		2492.16	53.83	-20.17	74	40.59	27.5	15.61	29.87	223	294	P	V
		2488.87	43.78	-10.22	54	30.55	27.5	15.61	29.88	223	294	A	V



	*	2462	107.75	-	-	94.65	27.41	15.57	29.88	100	150	P	H
802.11g CH 11 2462MHz	*	2462	99.07	-	-	85.97	27.41	15.57	29.88	100	150	A	H
		2483.56	67.4	-6.6	74	54.21	27.46	15.61	29.88	100	150	P	H
		2483.56	51.47	-2.53	54	38.28	27.46	15.61	29.88	100	150	A	H
													H
													H
	*	2462	105.18	-	-	92.08	27.41	15.57	29.88	223	305	P	V
	*	2462	96.9	-	-	83.8	27.41	15.57	29.88	223	305	A	V
		2483.64	63.37	-10.63	74	50.18	27.46	15.61	29.88	223	305	P	V
		2483.52	48.13	-5.87	54	34.94	27.46	15.61	29.88	223	305	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 802.11g (Harmonic @ 3m)**

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		( MHz )	( dB $\mu$ V/m )	( dB )	( dB $\mu$ V/m )	( dB $\mu$ V )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
802.11g CH 01 2412MHz	1	4824	37.9	-36.1	74	54.94	31.26	8.27	56.57	100	0	P	H
													H
													H
													H
		4824	37.4	-36.6	74	54.44	31.26	8.27	56.57	100	0	P	V
													V
													V
													V
802.11g CH 06 2437MHz		4874	37.14	-36.86	74	53.84	31.36	8.49	56.55	100	0	P	H
		7311	40.97	-33.03	74	50.34	36.18	10.68	56.23	100	0	P	H
													H
		4874	36.72	-37.28	74	53.42	31.36	8.49	56.55	100	0	P	V
		7311	41.53	-32.47	74	50.9	36.18	10.68	56.23	100	0	P	V
													V
													V
													V
802.11g CH 11 2462MHz		4924	39.41	-34.59	74	55.84	31.46	8.64	56.53	100	0	P	H
		7386	42.05	-31.95	74	51.13	36.37	10.67	56.12	100	0	P	H
													H
		4924	39.46	-34.54	74	55.89	31.46	8.64	56.53	100	0	P	V
		7386	42.13	-31.87	74	51.21	36.37	10.67	56.12	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		2389.8	63.91	-10.09	74	51.08	27.23	15.49	29.89	100	144	P	H
		2390	48.38	-5.62	54	35.55	27.23	15.49	29.89	100	144	A	H
	*	2412	105.43	-	-	92.51	27.28	15.53	29.89	100	144	P	H
	*	2412	97.58	-	-	84.66	27.28	15.53	29.89	100	144	A	H
													H
													H
		2390	61.32	-12.68	74	48.49	27.23	15.49	29.89	253	295	P	V
		2389.905	46.52	-7.48	54	33.69	27.23	15.49	29.89	253	295	A	V
	*	2412	103.6	-	-	90.68	27.28	15.53	29.89	253	295	P	V
	*	2412	95.36	-	-	82.44	27.28	15.53	29.89	253	295	A	V
													V
													V
802.11n HT20 CH 06 2437MHz		2364.46	53.39	-20.61	74	40.68	27.14	15.47	29.9	100	146	P	H
		2385.6	43.39	-10.61	54	30.57	27.23	15.49	29.9	100	146	A	H
	*	2437	105.39	-	-	92.36	27.37	15.55	29.89	100	146	P	H
	*	2437	97.29	-	-	84.26	27.37	15.55	29.89	100	146	A	H
		2491.11	53.79	-20.21	74	40.56	27.5	15.61	29.88	100	146	P	H
		2488.38	44.19	-9.81	54	30.96	27.5	15.61	29.88	100	146	A	H
		2383.36	53.02	-20.98	74	40.24	27.19	15.49	29.9	223	295	P	V
		2367.4	43.24	-10.76	54	30.53	27.14	15.47	29.9	223	295	A	V
	*	2437	103.92	-	-	90.89	27.37	15.55	29.89	223	295	P	V
	*	2437	95.77	-	-	82.74	27.37	15.55	29.89	223	295	A	V
		2492.44	53.38	-20.62	74	40.14	27.5	15.61	29.87	223	295	P	V
		2488.31	43.8	-10.2	54	30.57	27.5	15.61	29.88	223	295	A	V



802.11n HT20 CH 11 2462MHz	*	2462	106.51	-	-	93.41	27.41	15.57	29.88	100	152	P	H
	*	2462	98.38	-	-	85.28	27.41	15.57	29.88	100	152	A	H
		2484.24	66.99	-7.01	74	53.8	27.46	15.61	29.88	100	152	P	H
		2483.52	50.54	-3.46	54	37.35	27.46	15.61	29.88	100	152	A	H
													H
													H
	*	2462	103.81	-	-	90.71	27.41	15.57	29.88	218	296	P	V
	*	2462	96.03	-	-	82.93	27.41	15.57	29.88	218	296	A	V
		2484	61.66	-12.34	74	48.47	27.46	15.61	29.88	218	296	P	V
		2483.6	47.82	-6.18	54	34.63	27.46	15.61	29.88	218	296	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 HT20 (Harmonic @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.	
		( MHz )	( dB $\mu$ V/m )	( dB )	( dB $\mu$ V/m )	( dB $\mu$ V )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )	
802.11n HT20 CH 01 2412MHz	1	4824	36.66	-37.34	74	53.7	31.26	8.27	56.57	100	0	P	H	
													H	
													H	
													H	
		4824	36.84	-37.16	74	53.88	31.26	8.27	56.57	100	0	P	V	
													V	
													V	
802.11n HT20 CH 06 2437MHz		4874	36.63	-37.37	74	53.33	31.36	8.49	56.55	100	0	P	H	
		7311	41.6	-32.4	74	50.97	36.18	10.68	56.23	100	0	P	H	
													H	
													H	
		4874	36.32	-37.68	74	53.02	31.36	8.49	56.55	100	0	P	V	
		7311	41.36	-32.64	74	50.73	36.18	10.68	56.23	100	0	P	V	
													V	
802.11n HT20 CH 11 2462MHz		4924	37.67	-36.33	74	54.1	31.46	8.64	56.53	100	0	P	H	
		7386	42.5	-31.5	74	51.58	36.37	10.67	56.12	100	0	P	H	
													H	
													H	
		4924	37.76	-36.24	74	54.19	31.46	8.64	56.53	100	0	P	V	
		7386	41.72	-32.28	74	50.8	36.37	10.67	56.12	100	0	P	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		2389.1	62.87	-11.13	74	50.05	27.23	15.49	29.9	100	145	P	H
		2389.94	51.85	-2.15	54	39.02	27.23	15.49	29.89	100	145	A	H
	*	2422	102.16	-	-	89.2	27.32	15.53	29.89	100	145	P	H
	*	2422	94.73	-	-	81.77	27.32	15.53	29.89	100	145	A	H
		2485.58	53.06	-20.94	74	39.87	27.46	15.61	29.88	100	145	P	H
		2484.95	44.57	-9.43	54	31.38	27.46	15.61	29.88	100	145	A	H
		2389.38	60.05	-13.95	74	47.23	27.23	15.49	29.9	250	295	P	V
		2389.8	50.28	-3.72	54	37.45	27.23	15.49	29.89	250	295	A	V
	*	2422	100.08	-	-	87.12	27.32	15.53	29.89	250	295	P	V
	*	2422	92.52	-	-	79.56	27.32	15.53	29.89	250	295	A	V
802.11n HT40 CH 06 2437MHz		2485.93	54.03	-19.97	74	40.84	27.46	15.61	29.88	250	295	P	V
		2494.33	44.27	-9.73	54	31.03	27.5	15.61	29.87	250	295	A	V
		2388.68	54.9	-19.1	74	42.08	27.23	15.49	29.9	100	146	P	H
		2389.94	45	-9	54	32.17	27.23	15.49	29.89	100	146	A	H
	*	2437	102.29	-	-	89.26	27.37	15.55	29.89	100	146	P	H
	*	2437	94.45	-	-	81.42	27.37	15.55	29.89	100	146	A	H
		2484.18	58.66	-15.34	74	45.47	27.46	15.61	29.88	100	146	P	H
		2483.5	45.28	-8.72	54	32.09	27.46	15.61	29.88	100	146	A	H
		2389.52	53.1	-20.9	74	40.28	27.23	15.49	29.9	219	294	P	V
		2389.38	44.27	-9.73	54	31.45	27.23	15.49	29.9	219	294	A	V
802.11n HT40 CH 06 2437MHz	*	2437	100.42	-	-	87.39	27.37	15.55	29.89	219	294	P	V
	*	2437	92.77	-	-	79.74	27.37	15.55	29.89	219	294	A	V
		2484.95	54.01	-19.99	74	40.82	27.46	15.61	29.88	219	294	P	V
		2484.39	45.01	-8.99	54	31.82	27.46	15.61	29.88	219	294	A	V



802.11n		2386.16	53.26	-20.74	74	40.44	27.23	15.49	29.9	100	145	P	H
		2387.84	44.25	-9.75	54	31.43	27.23	15.49	29.9	100	145	A	H
	*	2452	103.88	-	-	90.82	27.37	15.57	29.88	100	145	P	H
	*	2452	95.85	-	-	82.79	27.37	15.57	29.88	100	145	A	H
		2486.98	63.97	-10.03	74	50.78	27.46	15.61	29.88	100	145	P	H
	HT40	2484.74	52.51	-1.49	54	39.32	27.46	15.61	29.88	100	145	A	H
	CH 09	2342.06	53.51	-20.49	74	40.87	27.1	15.45	29.91	222	292	P	V
	2452MHz	2388.68	44.07	-9.93	54	31.25	27.23	15.49	29.9	222	292	A	V
	*	2452	101.25	-	-	88.19	27.37	15.57	29.88	222	292	P	V
	*	2452	93.73	-	-	80.67	27.37	15.57	29.88	222	292	A	V
Remark													
1. No other spurious found. 2. All results are PASS against Peak and Average limit line.													



## 2.4GHz 2400~2483.5MHz

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

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.	
		( MHz )	( dB $\mu$ V/m )	( dB )	( dB $\mu$ V/m )	( dB $\mu$ V )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )	
802.11n HT40 CH 03 2422MHz	1	4844	36.13	-37.87	74	53.06	31.29	8.34	56.56	100	0	P	H	
		7266	42.38	-31.62	74	51.86	36.11	10.68	56.27	100	0	P	H	
													H	
													H	
		4844	36.36	-37.64	74	53.29	31.29	8.34	56.56	100	0	P	V	
		7266	41.7	-32.3	74	51.18	36.11	10.68	56.27	100	0	P	V	
													V	
802.11n HT40 CH 06 2437MHz		4874	36.51	-37.49	74	53.21	31.36	8.49	56.55	100	0	P	H	
		7311	41.62	-32.38	74	50.99	36.18	10.68	56.23	100	0	P	H	
													H	
													H	
		4874	36.1	-37.9	74	52.8	31.36	8.49	56.55	100	0	P	V	
		7311	40.93	-33.07	74	50.3	36.18	10.68	56.23	100	0	P	V	
													V	
802.11n HT40 CH 09 2452MHz		4904	36.78	-37.22	74	53.32	31.43	8.56	56.53	100	0	P	H	
		7356	42.91	-31.09	74	52.11	36.3	10.67	56.17	100	0	P	H	
													H	
													H	
		4904	36.37	-37.63	74	52.91	31.43	8.56	56.53	100	0	P	V	
		7356	43.73	-30.27	74	52.93	36.3	10.67	56.17	100	0	P	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 Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.	
1		( MHz )	( 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		30.81	22.31	-17.69	40	29.9	23.96	0.79	32.34	-	-	P	H	
		43.23	23.17	-16.83	40	37.11	17.41	0.98	32.33	-	-	P	H	
		161.22	24.83	-18.67	43.5	38.98	16.57	1.56	32.28	-	-	P	H	
		745.9	29.3	-16.7	46	30.22	27.94	3.23	32.09	-	-	P	H	
		892.9	34.19	-11.81	46	33.17	29.01	3.55	31.54	100	0	P	H	
		958.7	33.24	-12.76	46	29.43	31.07	3.71	30.97	-	-	P	H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
Remark	1. No other spurious found. 2. All results are PASS against limit line.													



&lt;Sample 2&gt;

## 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.				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 CH 11 2462MHz	*	2462	108.05	-	-	94.94	27.41	15.58	29.88	118	150	P	H
	*	2462	104.75	-	-	91.64	27.41	15.58	29.88	118	150	A	H
		2487.44	54.67	-19.33	74	41.48	27.46	15.61	29.88	118	150	P	H
		2483.84	43.92	-10.08	54	30.74	27.46	15.6	29.88	118	150	A	H
													H
													H
	*	2462	107.39	-	-	94.28	27.41	15.58	29.88	169	211	P	V
	*	2462	104.2	-	-	91.09	27.41	15.58	29.88	169	211	A	V
		2486.12	55.05	-18.95	74	41.87	27.46	15.6	29.88	169	211	P	V
		2485	44.13	-9.87	54	30.95	27.46	15.6	29.88	169	211	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 802.11b (Harmonic @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.	
1		( MHz )	( dB $\mu$ V/m )	( dB )	( dB $\mu$ V/m )	( dB $\mu$ V )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )	
802.11b CH 11 2462MHz		4924	48.7	-25.3	74	65.91	31.46	8.68	57.35	100	0	P	H	
		7386	43.22	-30.78	74	53.54	36.37	10.67	57.36	100	0	P	H	
													H	
													H	
		4924	49.19	-24.81	74	66.4	31.46	8.68	57.35	100	0	P	V	
		7386	42.44	-31.56	74	52.76	36.37	10.67	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 09 2452MHz		2333.66	54.11	-19.89	74	41.53	27.05	15.44	29.91	151	7	P	H
		2389.94	44.37	-9.63	54	31.53	27.23	15.5	29.89	151	7	A	H
	*	2452	102.97	-	-	89.91	27.37	15.57	29.88	151	7	P	H
	*	2452	94.55	-	-	81.49	27.37	15.57	29.88	151	7	A	H
		2484.39	61.46	-12.54	74	48.28	27.46	15.6	29.88	151	7	P	H
		2484.53	48.35	-5.65	54	35.17	27.46	15.6	29.88	151	7	A	H
		2377.2	53.76	-20.24	74	40.99	27.19	15.48	29.9	172	214	P	V
		2389.1	44.29	-9.71	54	31.46	27.23	15.5	29.9	172	214	A	V
	*	2452	101.05	-	-	87.99	27.37	15.57	29.88	172	214	P	V
	*	2452	93.4	-	-	80.34	27.37	15.57	29.88	172	214	A	V
		2486.98	62.64	-11.36	74	49.45	27.46	15.61	29.88	172	214	P	V
		2485.65	48.67	-5.33	54	35.49	27.46	15.6	29.88	172	214	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



## 2.4GHz 2400~2483.5MHz

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

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.	
1		( MHz )	( dB $\mu$ V/m )	( dB )	( dB $\mu$ V/m )	( dB $\mu$ V )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )	
802.11n		4904	36.88	-37.12	74	54.26	31.43	8.58	57.39	100	0	P	H	
		7356	42.75	-31.25	74	53.11	36.3	10.67	57.33	100	0	P	H	
HT40													H	
CH 09		4904	37.28	-36.72	74	54.66	31.43	8.58	57.39	100	0	P	V	
2452MHz		7356	42.97	-31.03	74	53.33	36.3	10.67	57.33	100	0	P	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 Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.	
1		( MHz )	( 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		30.54	22.4	-17.6	40	29.8	24.16	0.73	32.29	-	-	P	H	
		46.2	23.96	-16.04	40	39.05	16.29	0.91	32.29	-	-	P	H	
		104.79	24.88	-18.62	43.5	39.17	16.56	1.36	32.21	-	-	P	H	
		349.7	27.93	-18.07	46	37.32	20.48	2.28	32.15	-	-	P	H	
		839.7	33.87	-12.13	46	33.13	28.94	3.5	31.7	-	-	P	H	
		900.6	38.13	-7.87	46	36.94	29.04	3.55	31.4	100	0	P	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>	24.2~24.9°C
		<b>Relative Humidity :</b>	49~55%

### Note symbol

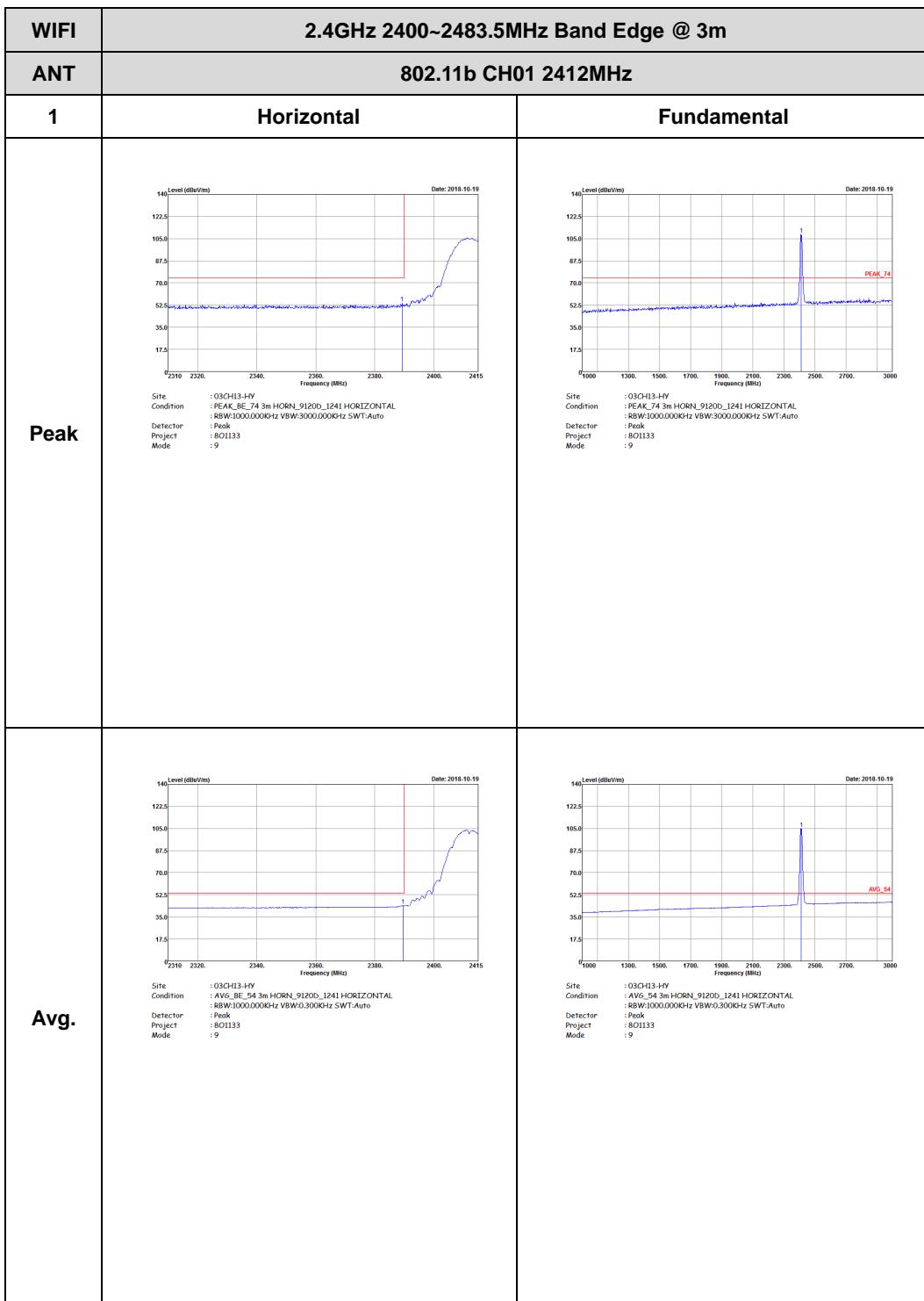
-L	Low channel location
-R	High channel location

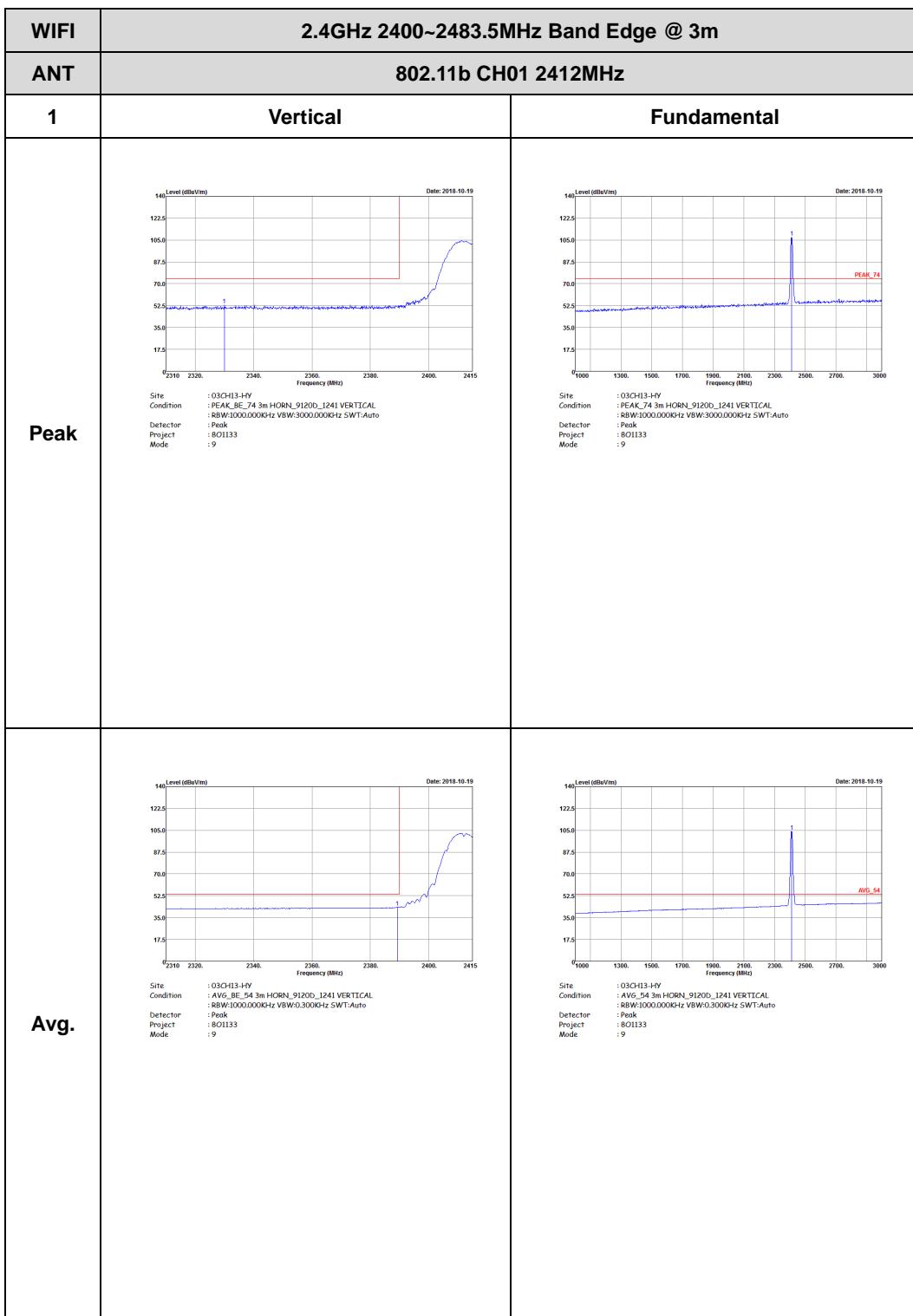


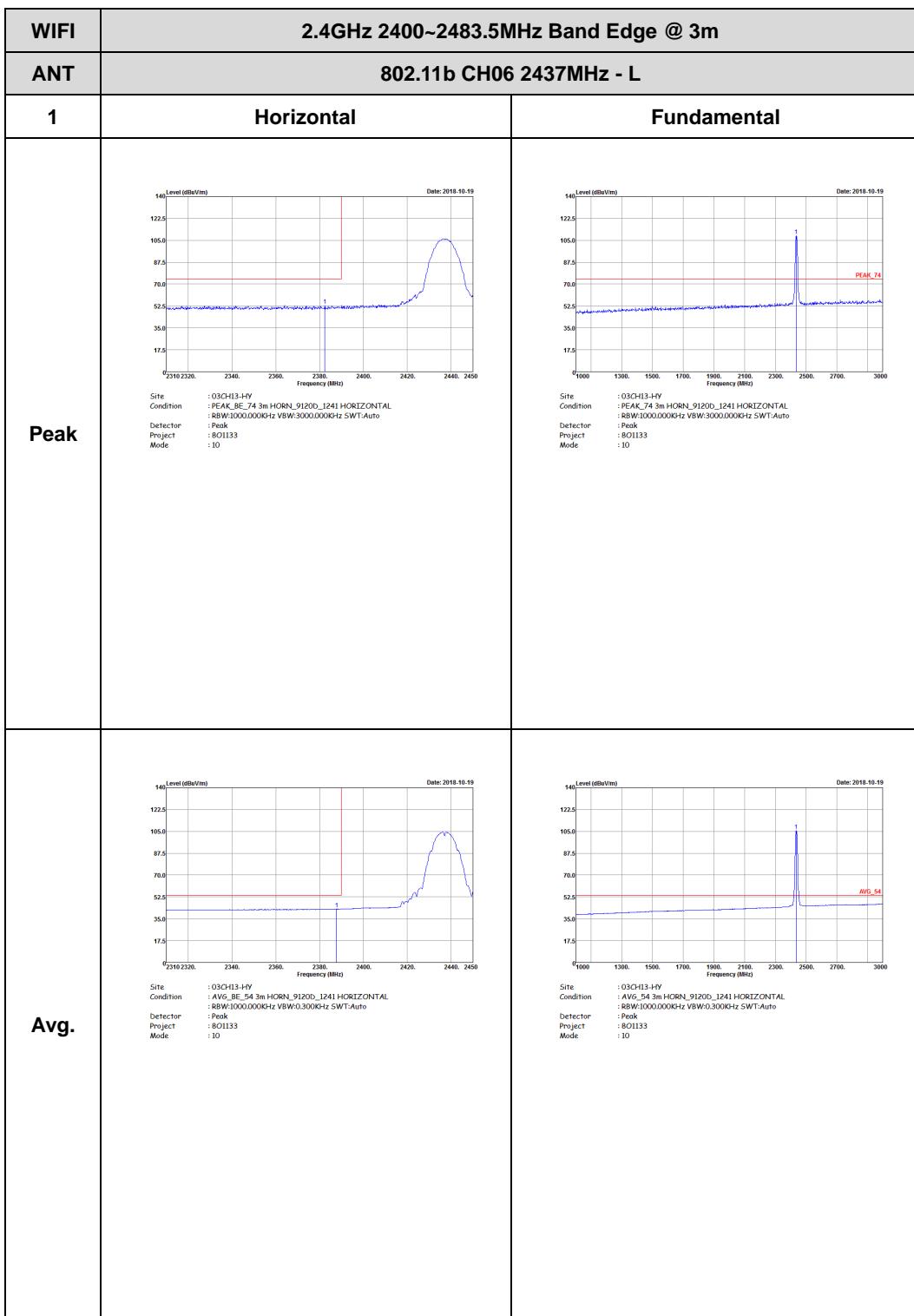
&lt;Sample 1&gt;

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 3m)

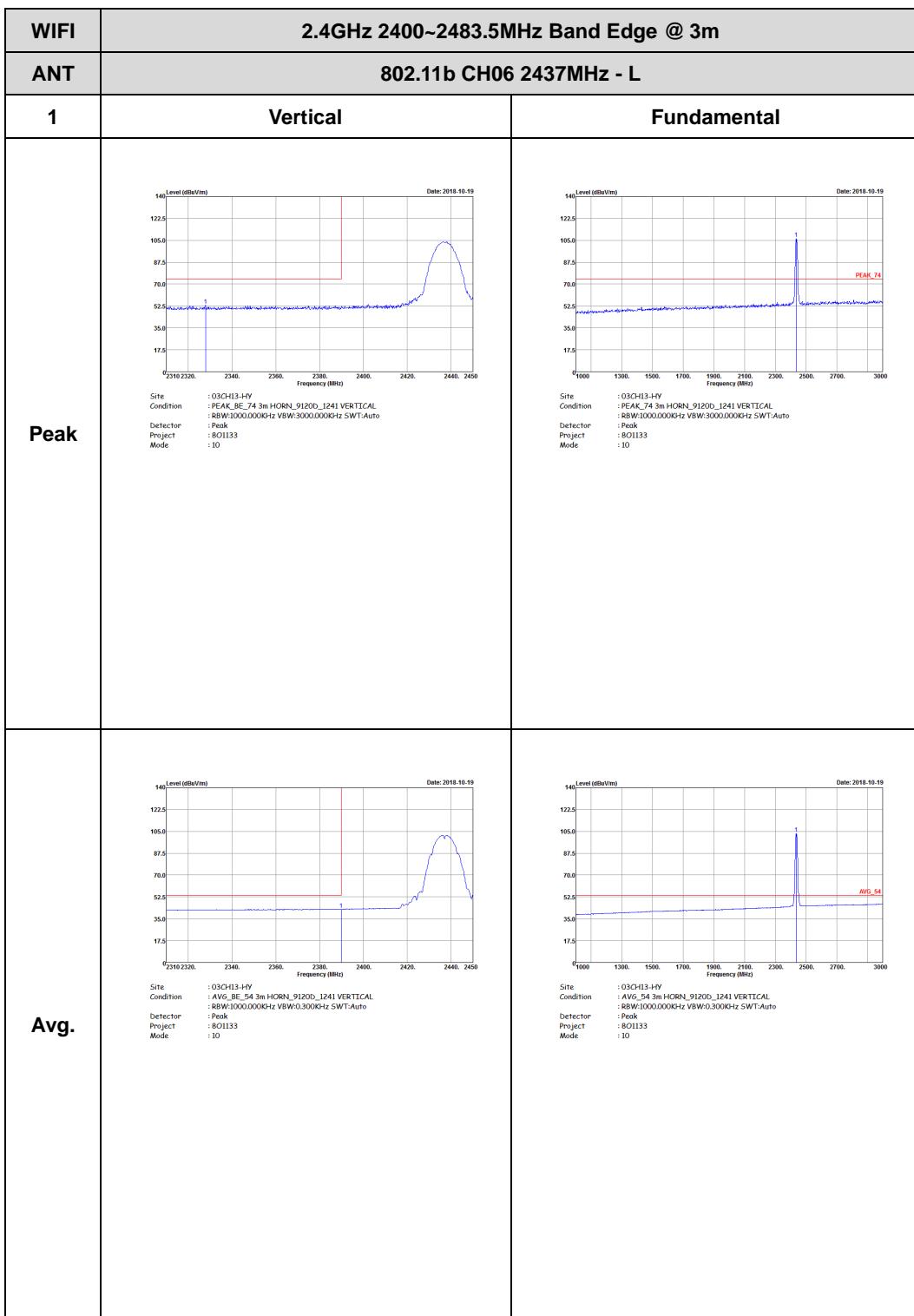






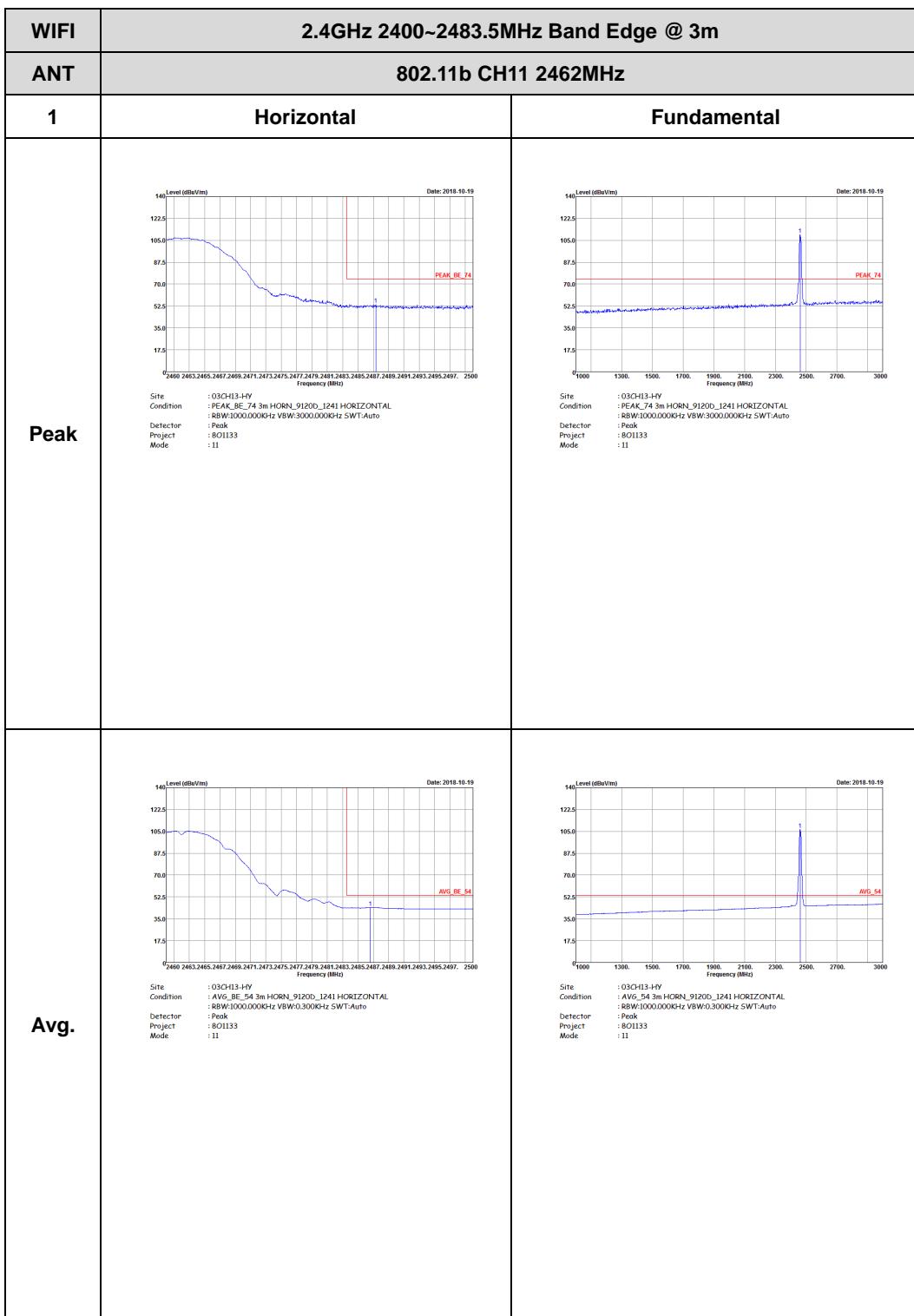


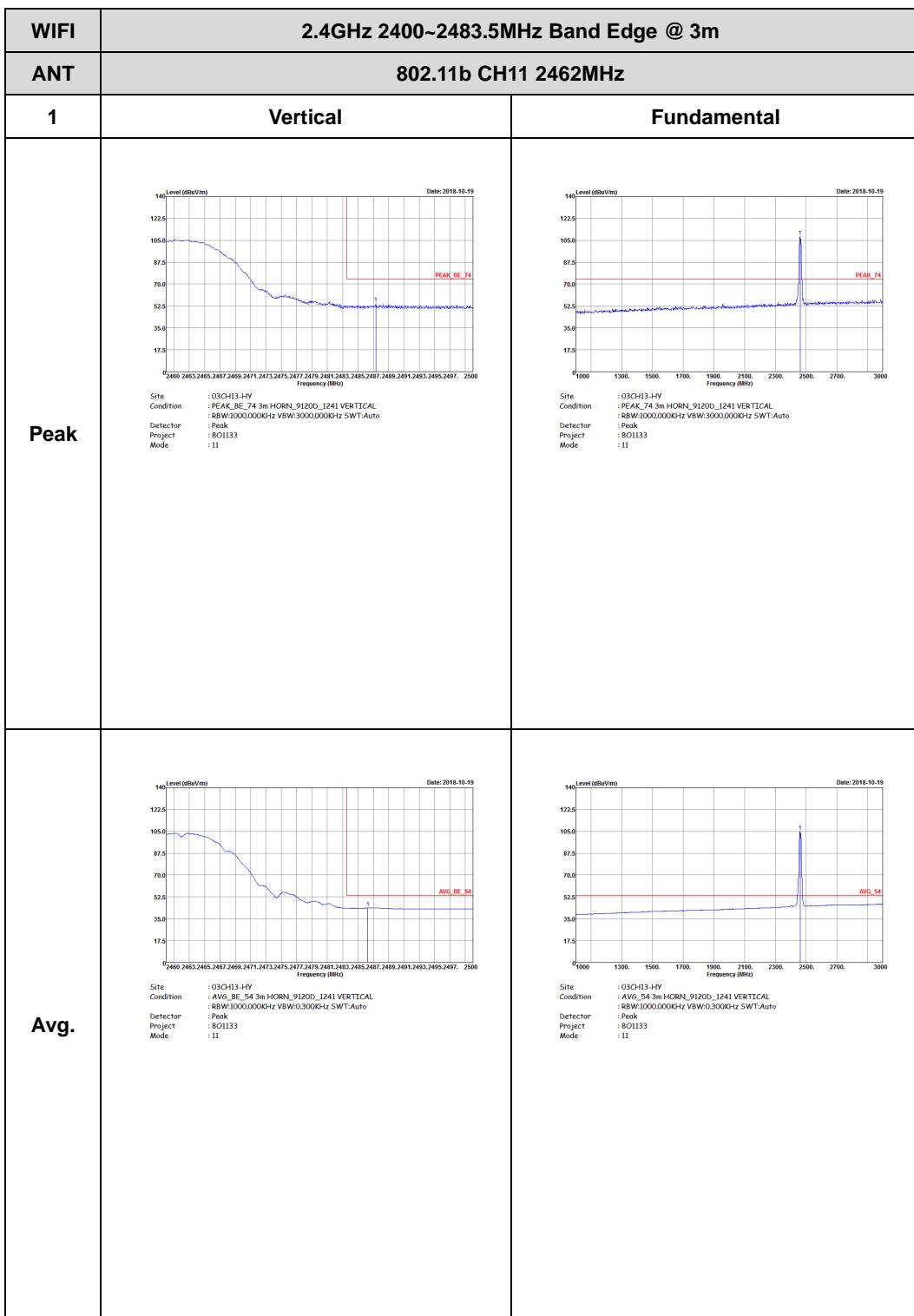
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH06 2437MHz - R	
1	Horizontal	Fundamental
Peak	<p>Level (dBmV/m)</p> <p>Date: 2018-10-19</p> <p>Frequency (MHz)</p> <p>PEAK_BE_74</p> <p>Site : 03CH13-HY Condition : PCMK_BE_74 3m HORN_91200,_1241 HORIZONTAL Detector : R8W:1000.000KHz VBW:3000.000Hz SWT:Auto Project : 801133 Mode : IO</p>	Left blank
Avg.	<p>Level (dBmV/m)</p> <p>Date: 2018-10-19</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:0.3000Hz SWT:Auto Detector : Peak Project : 801133 Mode : IO</p>	Left blank





WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH06 2437MHz - R	
1	Vertical	Fundamental
Peak	<p>Site : 03CH13-HY Condition : PCMK_BE_74 3m HORN_91200,_J241 VERTICAL Detector : R8W:1000.000KHz VBW:3000.000Hz SWT:Auto Project : 801133 Mode : IO</p>	Left blank
Avg.	<p>Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_91200,_J241 VERTICAL Detector : R8W:1000.000KHz VBW:0.3000Hz SWT:Auto Project : 801133 Mode : IO</p>	Left blank

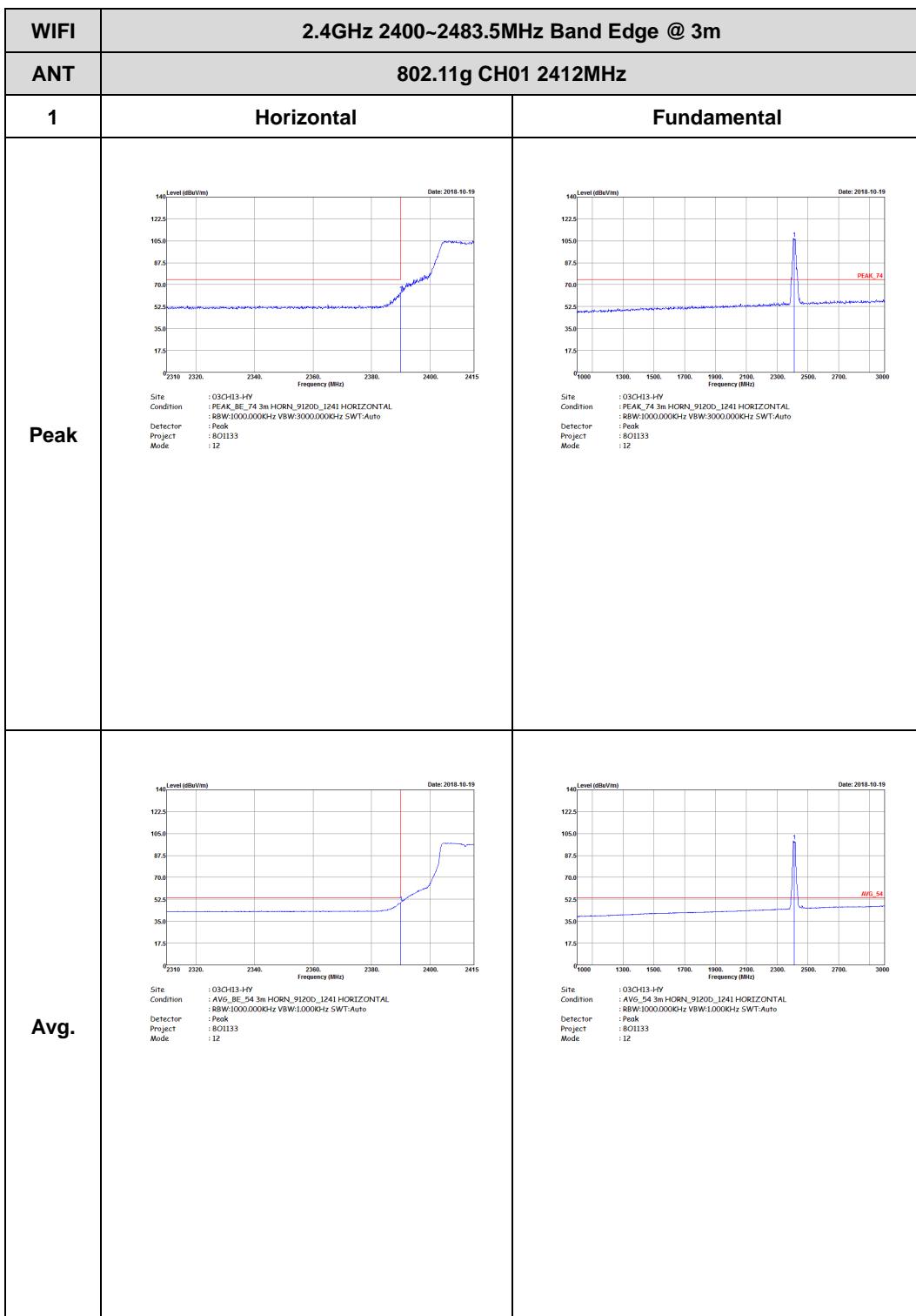


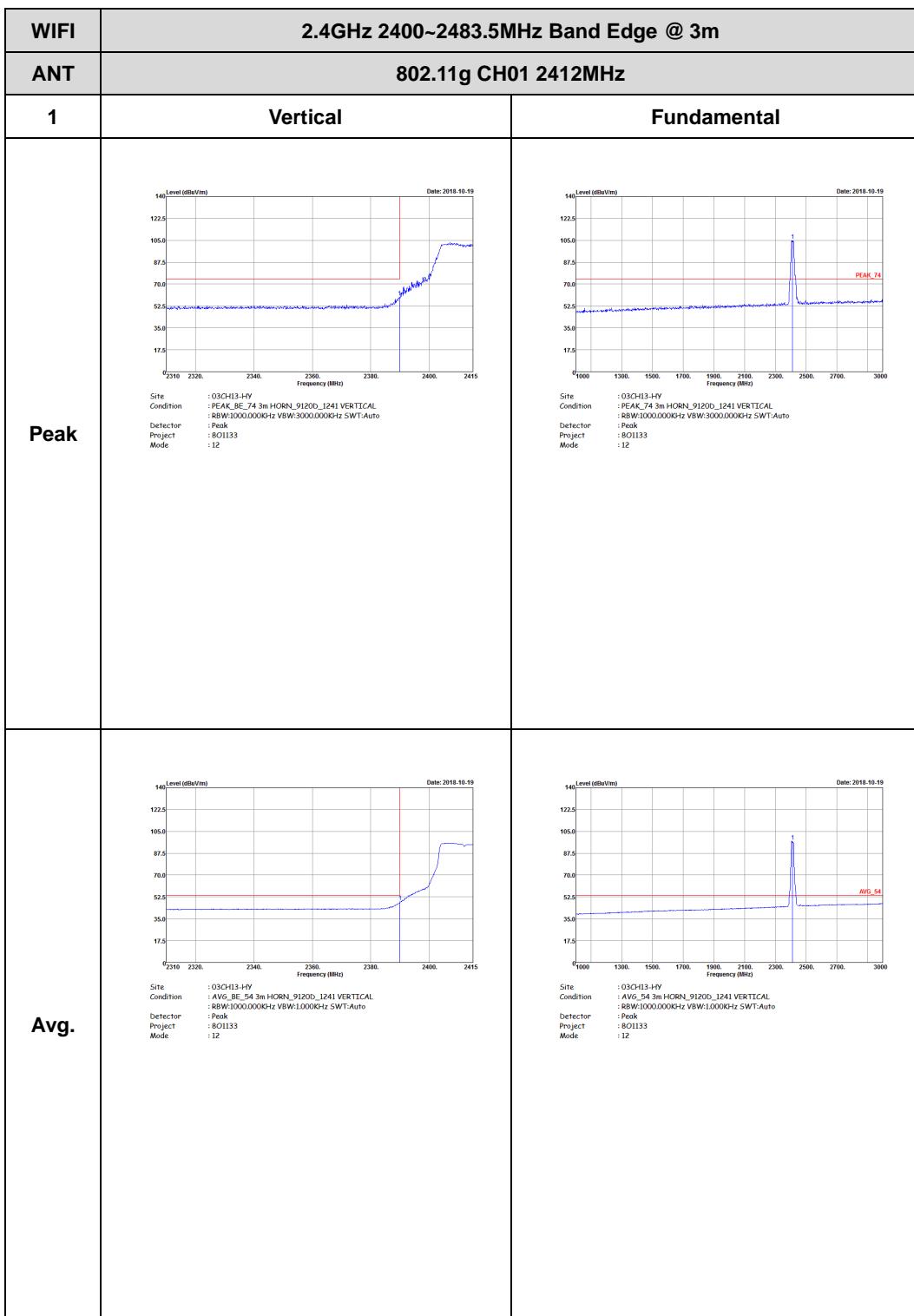


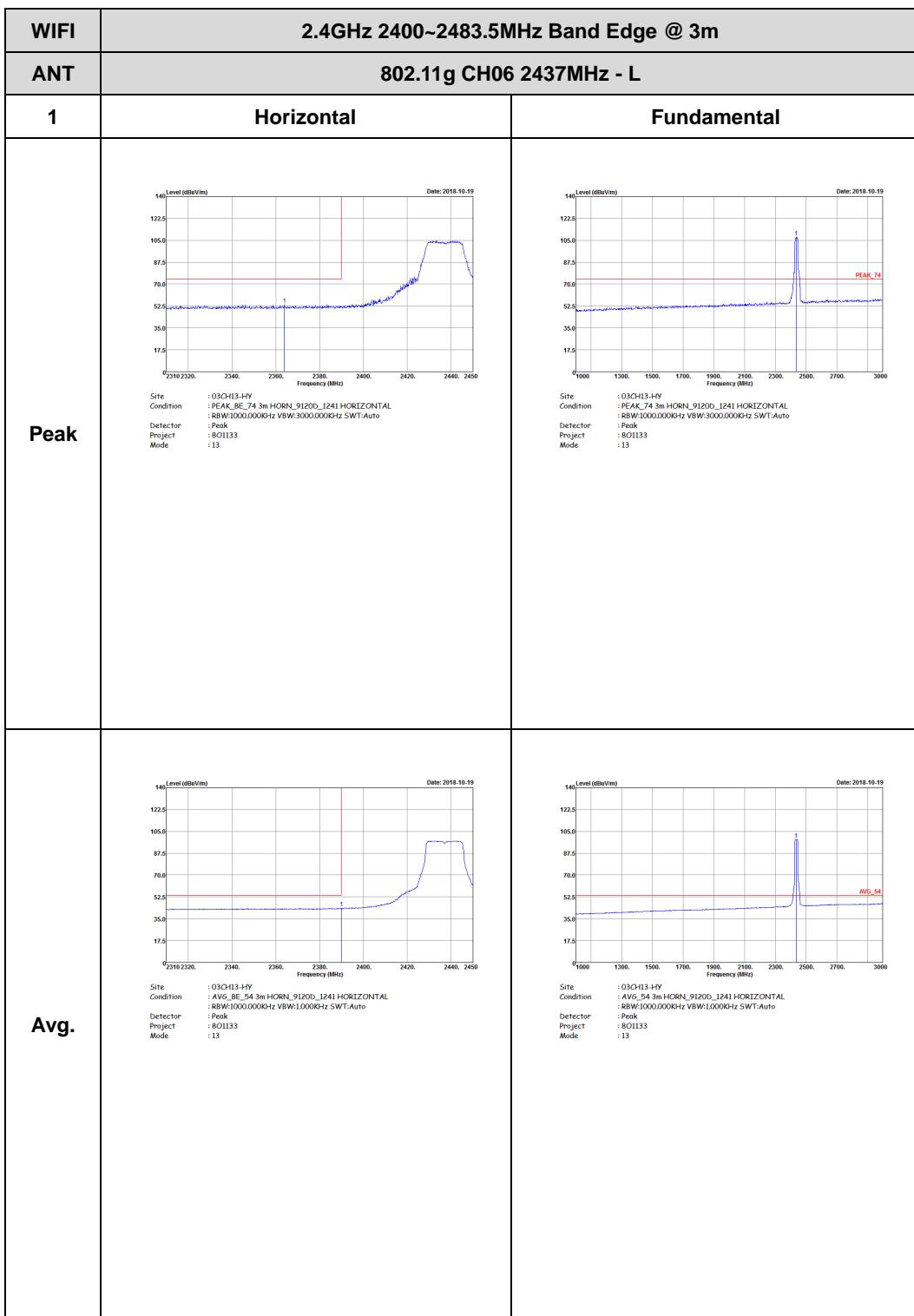


## 2.4GHz 2400~2483.5MHz

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

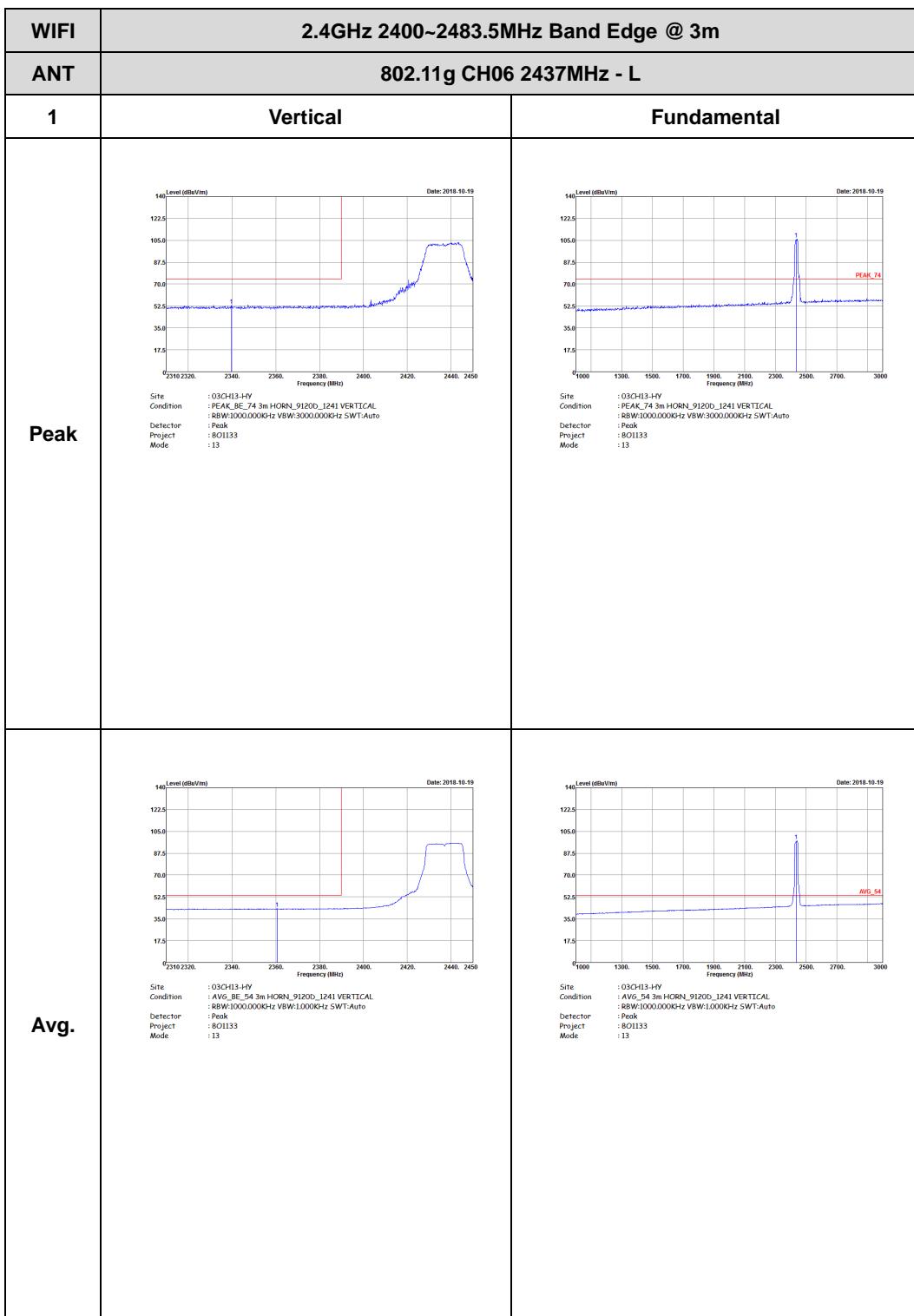






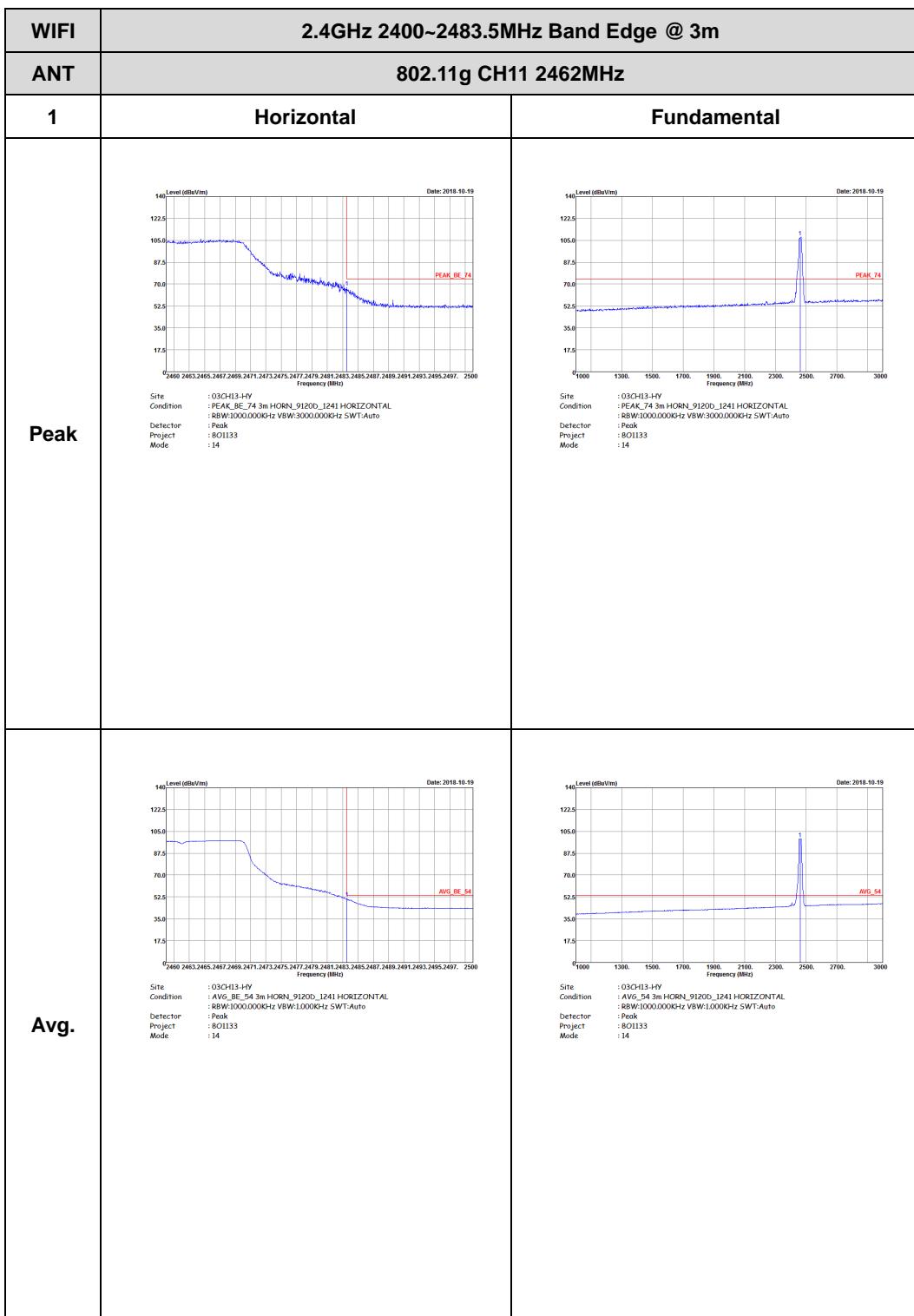


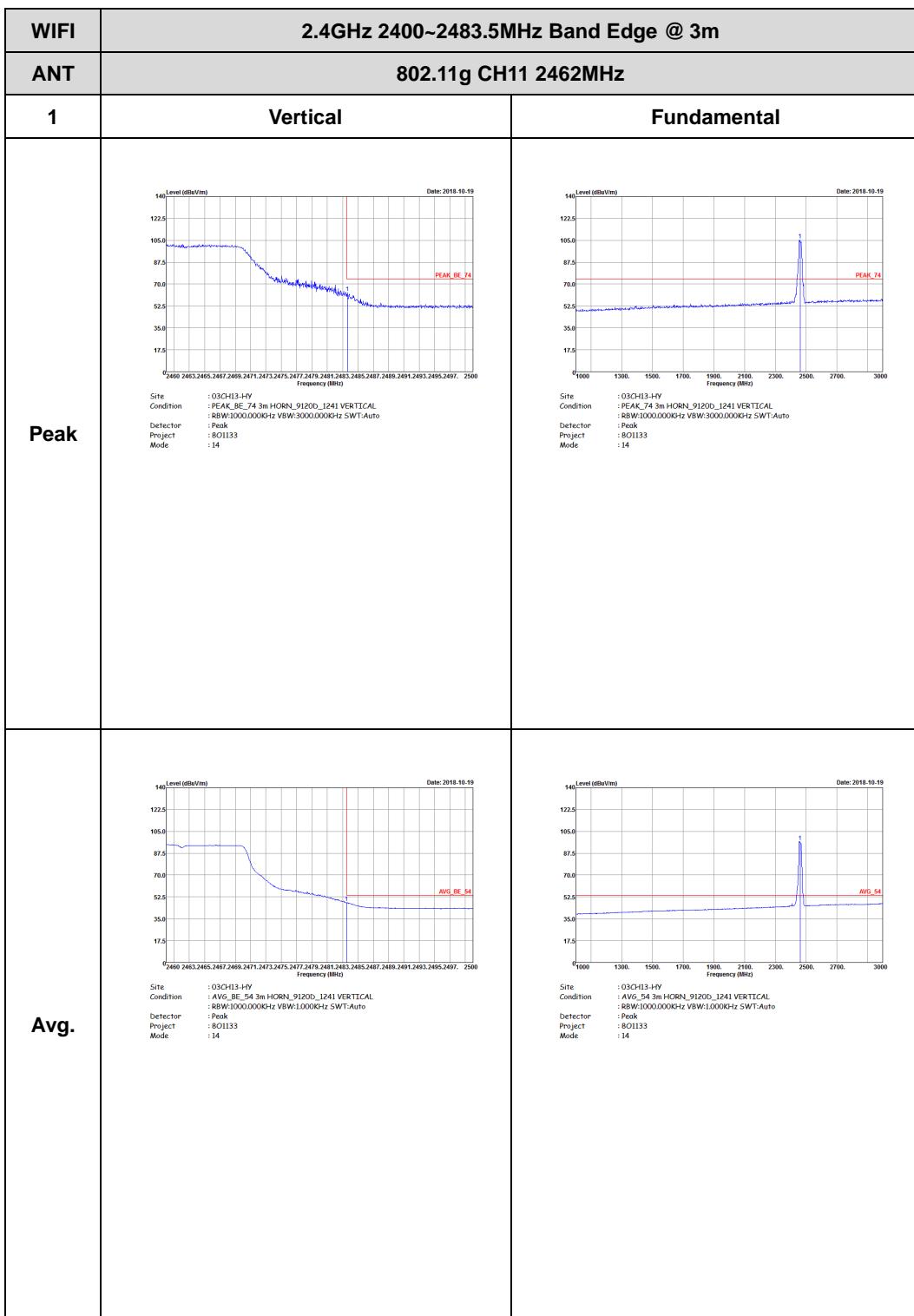
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH06 2437MHz - R	
1	Horizontal	Fundamental
Peak	<p>Level (dBmV/m)</p> <p>Date: 2018-10-19</p> <p>Frequency (MHz)</p> <p>Site : 03CH13-HY Condition : PCMK_BE_74 3m HORN_91200_J241 HORIZONTAL Detector : RBW:1000.000KHz VBW:1.000KHz SWT:Auto Project : 801133 Mode : 13</p>	Left blank
Avg.	<p>Level (dBmV/m)</p> <p>Date: 2018-10-19</p> <p>Frequency (MHz)</p> <p>Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_91200_J241 HORIZONTAL Detector : RBW:1000.000KHz VBW:1.000KHz SWT:Auto Project : 801133 Mode : 13</p>	Left blank





WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH06 2437MHz - R	
1	Vertical	Fundamental
Peak	<p>Site : 03CH13-HY Condition : PCMK_BE_74 3m HORN_91200_J241 VERTICAL Detector : R8W:1000.000KHz VBW:1.000KHz SWT:Auto Project : 801133 Mode : 13</p>	Left Blank
Avg.	<p>Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_91200_J241 VERTICAL Detector : R8W:1000.000KHz VBW:1.000KHz SWT:Auto Project : 801133 Mode : 13</p>	Left Blank

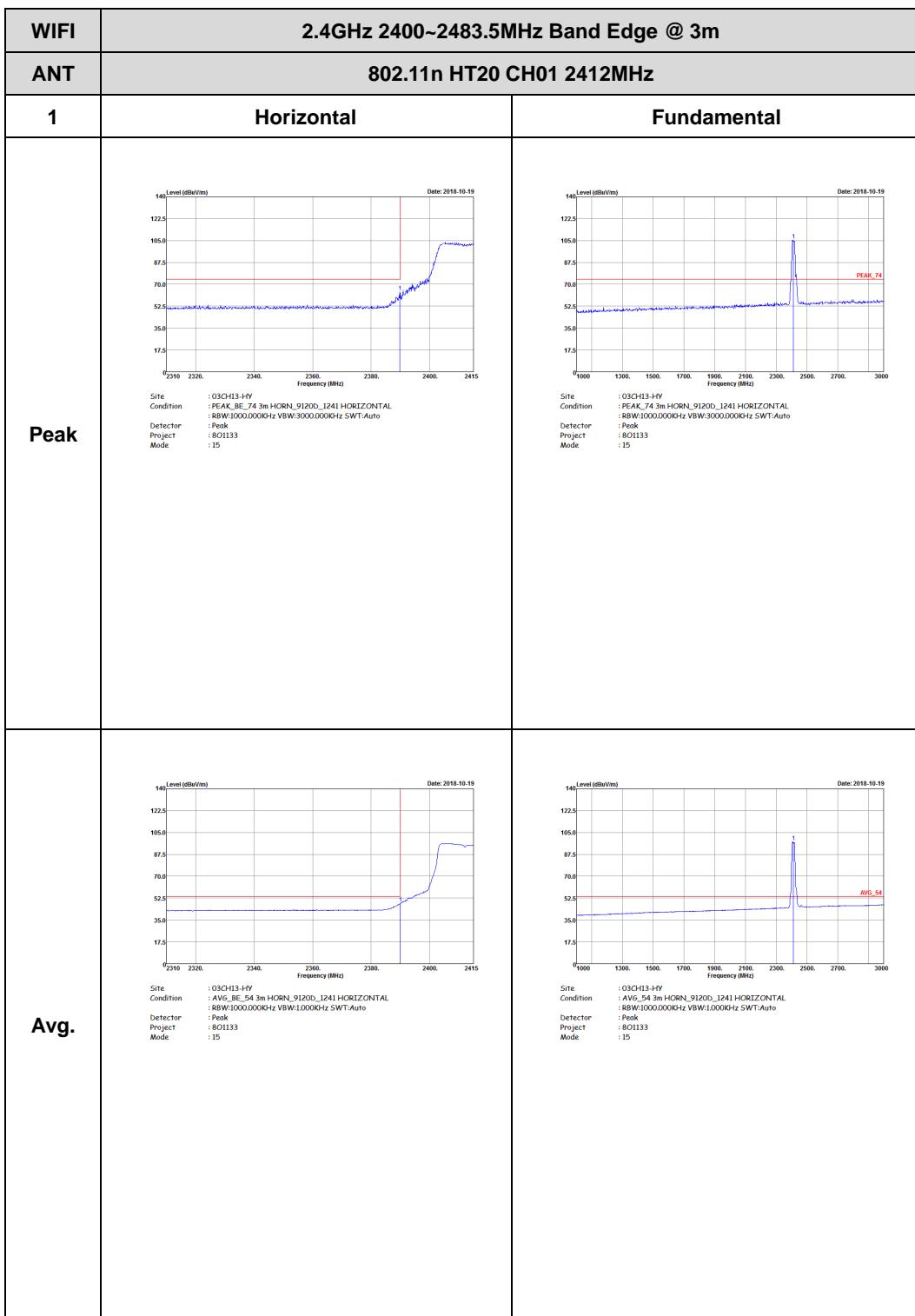


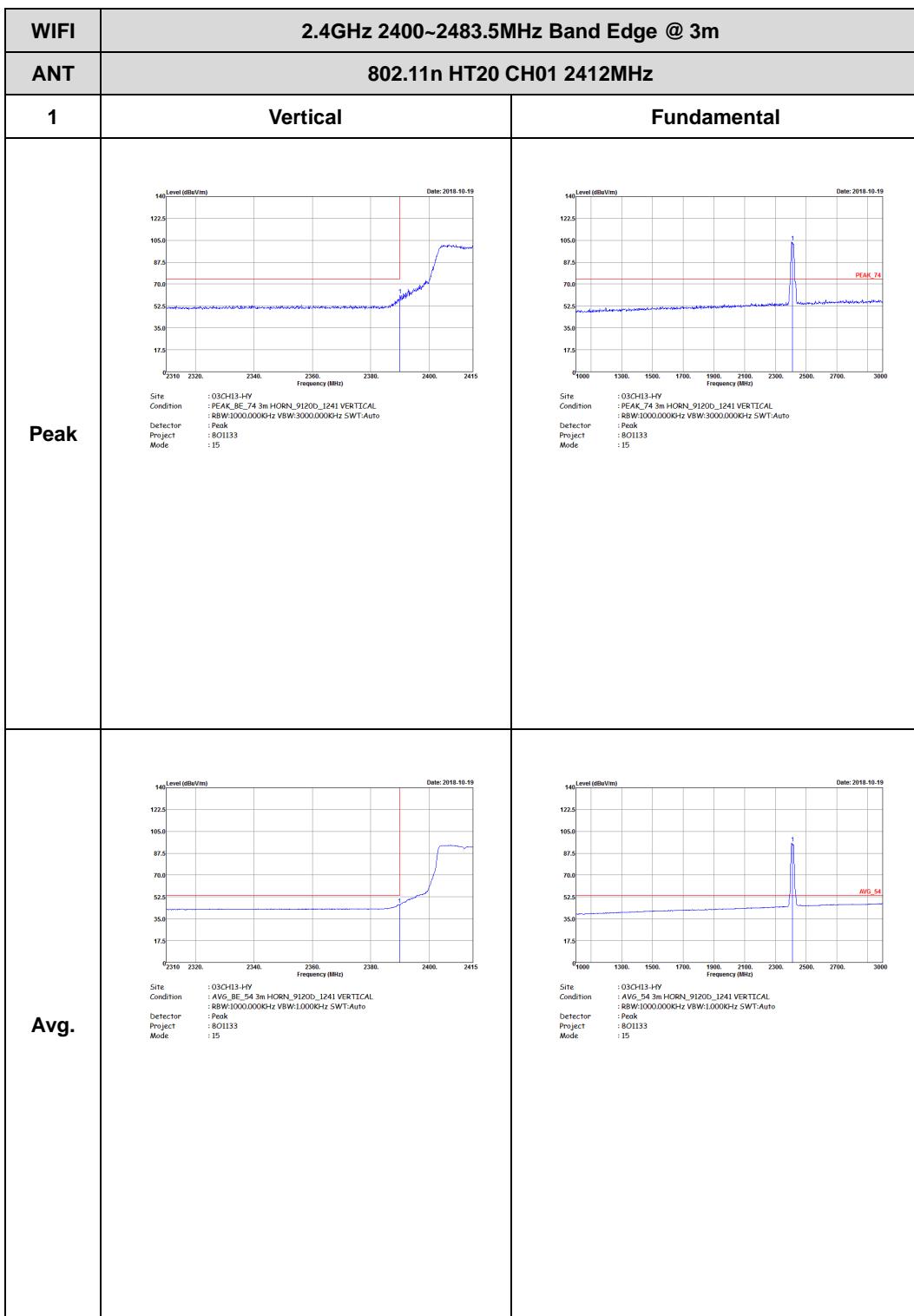


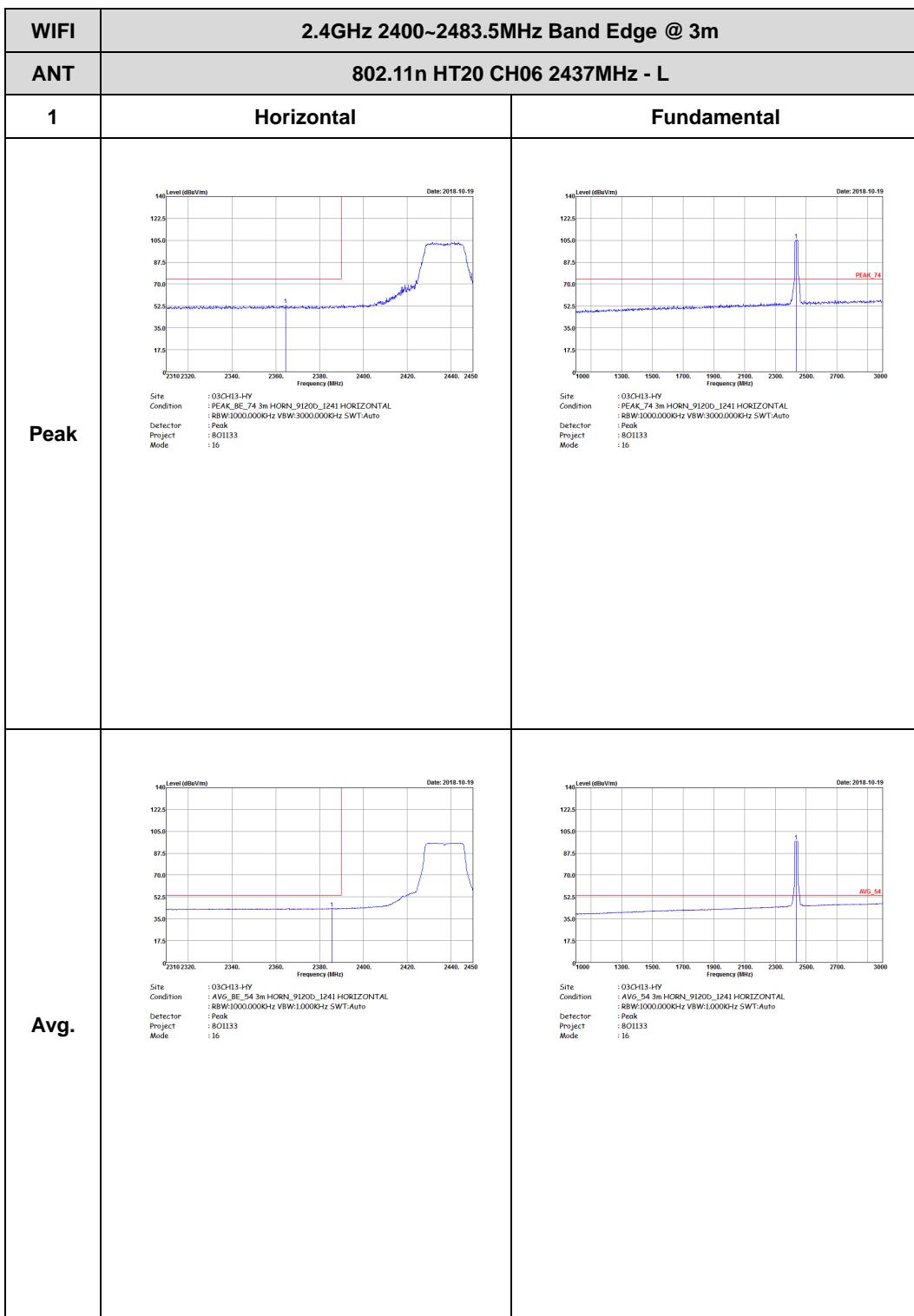


## 2.4GHz 2400~2483.5MHz

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

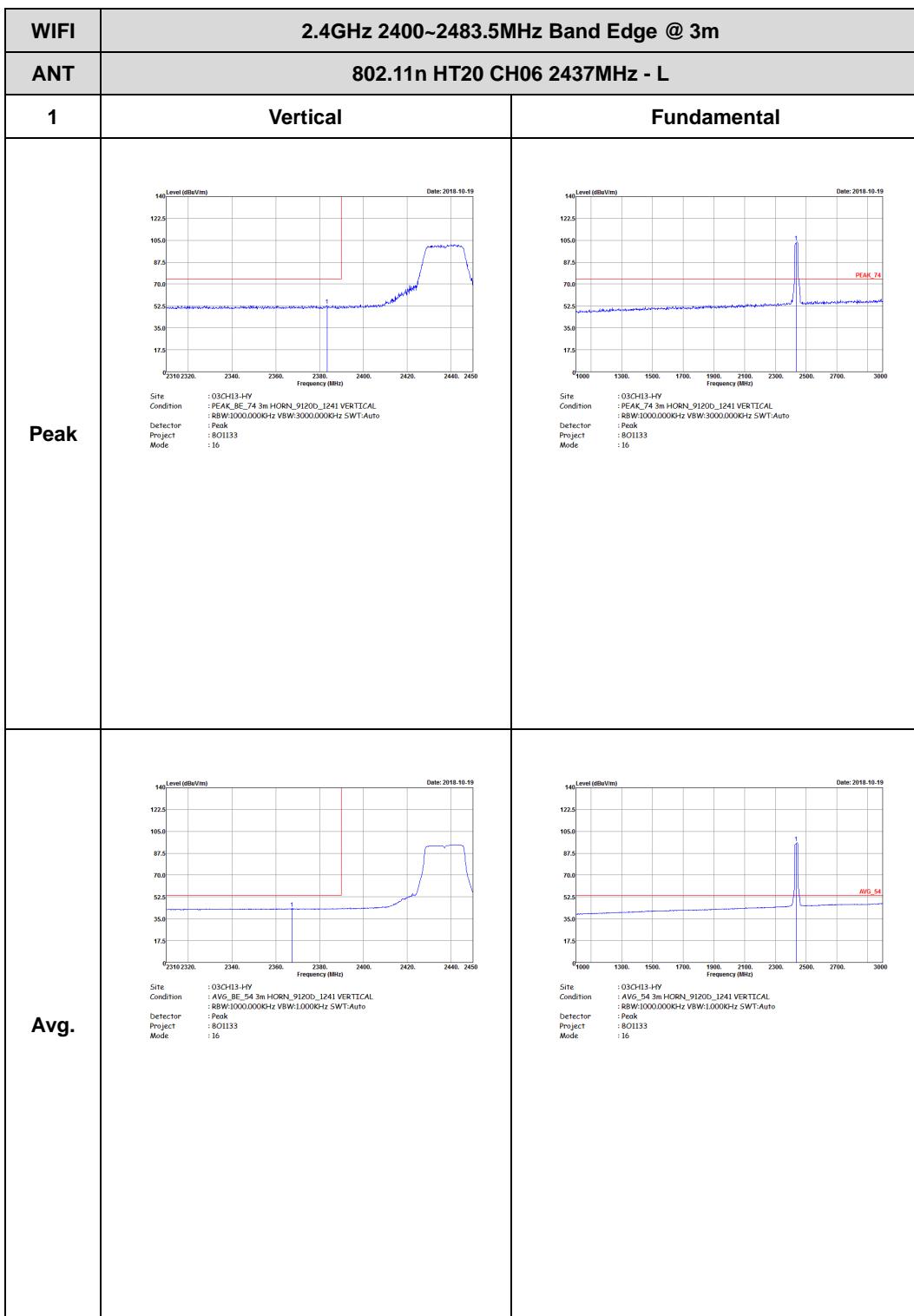






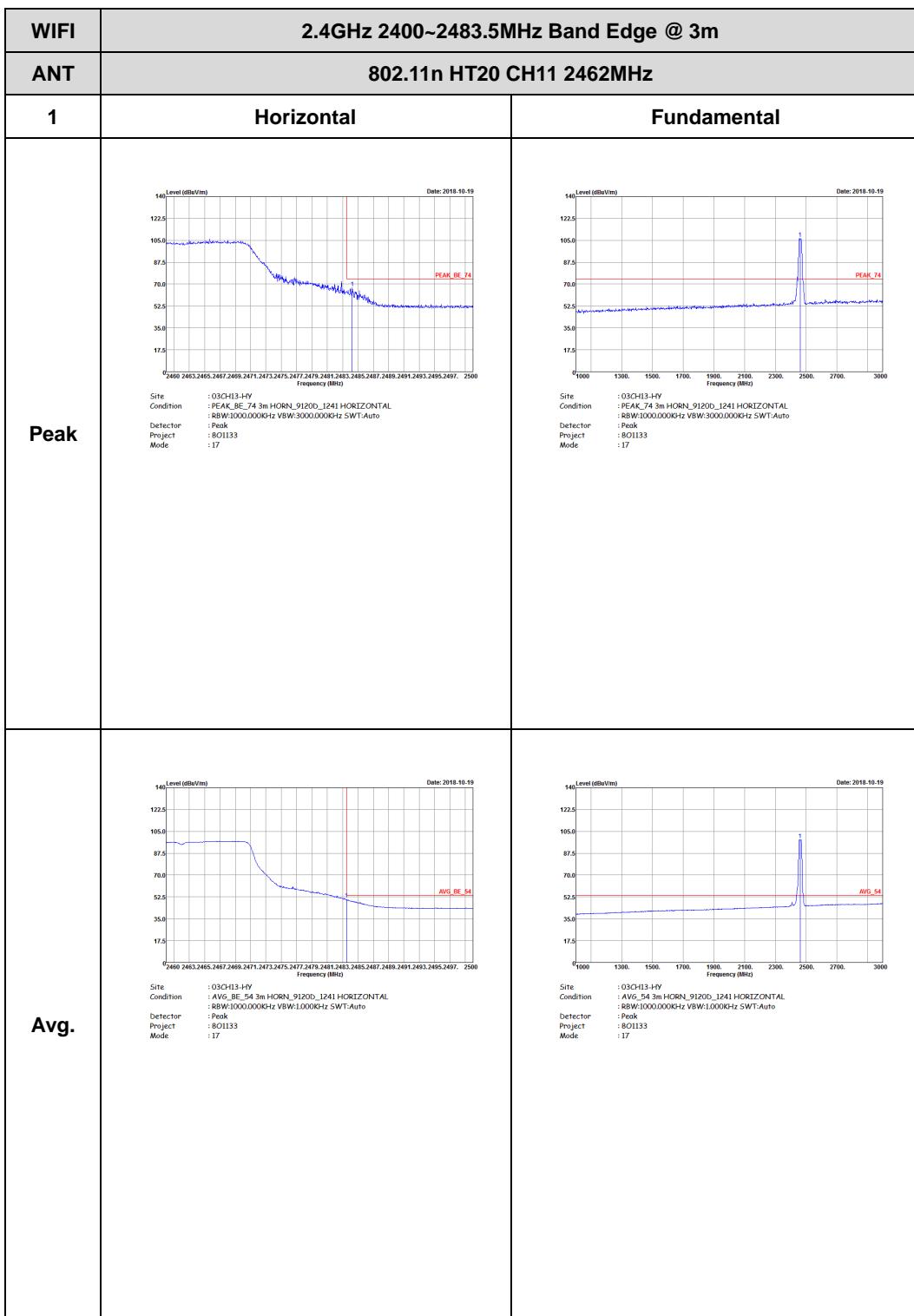


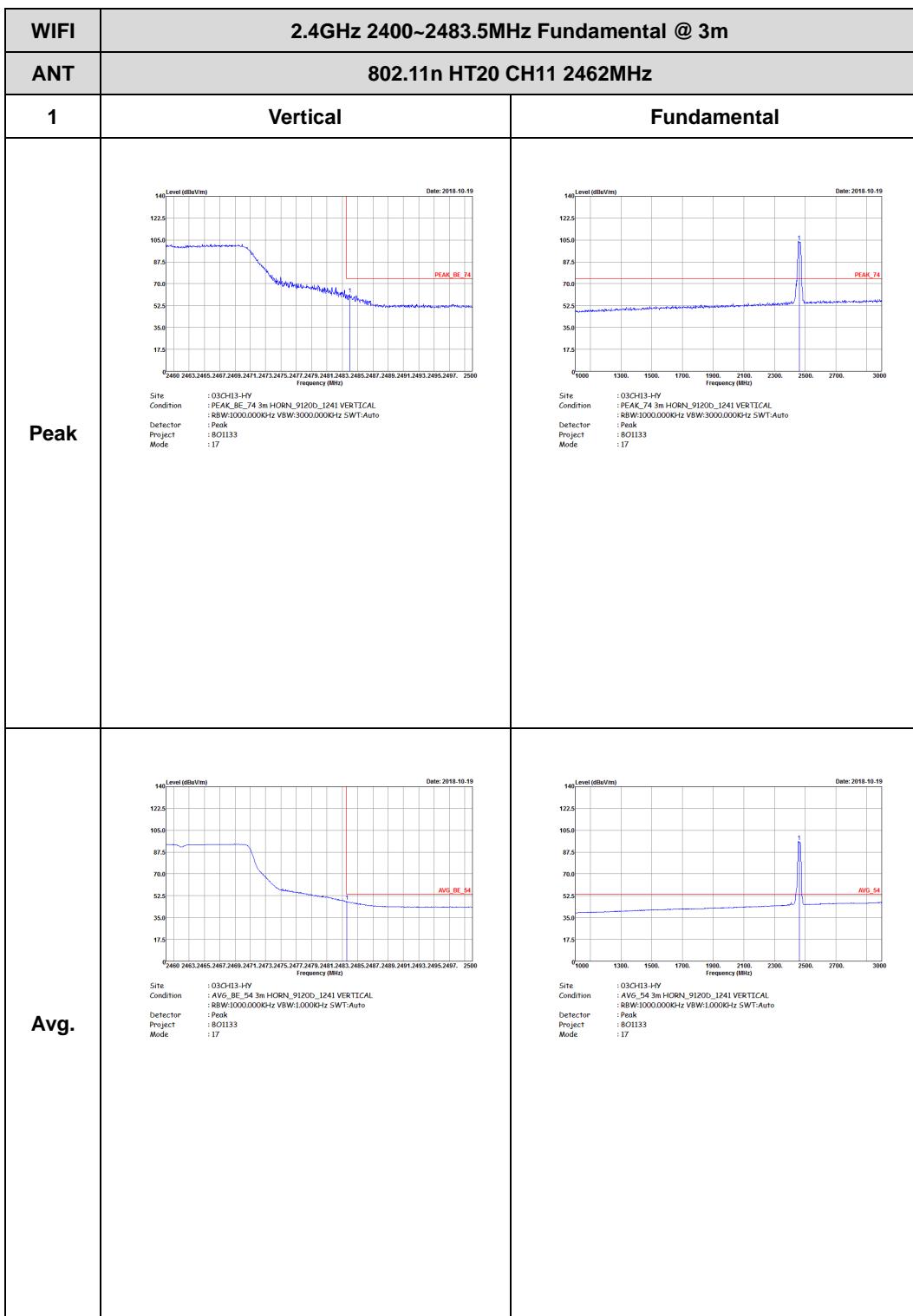
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT20 CH06 2437MHz - R	
1	Horizontal	Fundamental
Peak	<p>Level (dBmV/m)</p> <p>Date: 2018-10-19</p> <p>Frequency (MHz)</p> <p>Site : 03CH13-HY Condition : PCMK_BE_74 3m HORN_91200,_1241 HORIZONTAL Detector : RBW:1000.000KHz VBW:1.000KHz SWT:Auto Project : Peak Mode : 801133 : 16</p>	Left blank
Avg.	<p>Level (dBmV/m)</p> <p>Date: 2018-10-19</p> <p>Frequency (MHz)</p> <p>Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_91200,_1241 HORIZONTAL Detector : RBW:1000.000KHz VBW:1.000KHz SWT:Auto Project : Peak Mode : 801133 : 16</p>	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: 2018-10-19</p> <p>Frequency (MHz)</p> <p>Site : 03CH13-HY Condition : PCMK_BE_74 3m HORN_91200_J241 VERTICAL Detector : RBW:1000.000KHz VBW:1.000KHz SWT:Auto Project : Peak Mode : 801133 : 16</p>	Left Blank
Avg.	<p>Level (dBmV/m)</p> <p>Date: 2018-10-19</p> <p>Frequency (MHz)</p> <p>Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_91200_J241 VERTICAL Detector : RBW:1000.000KHz VBW:1.000KHz SWT:Auto Project : Peak Mode : 801133 : 16</p>	Left Blank

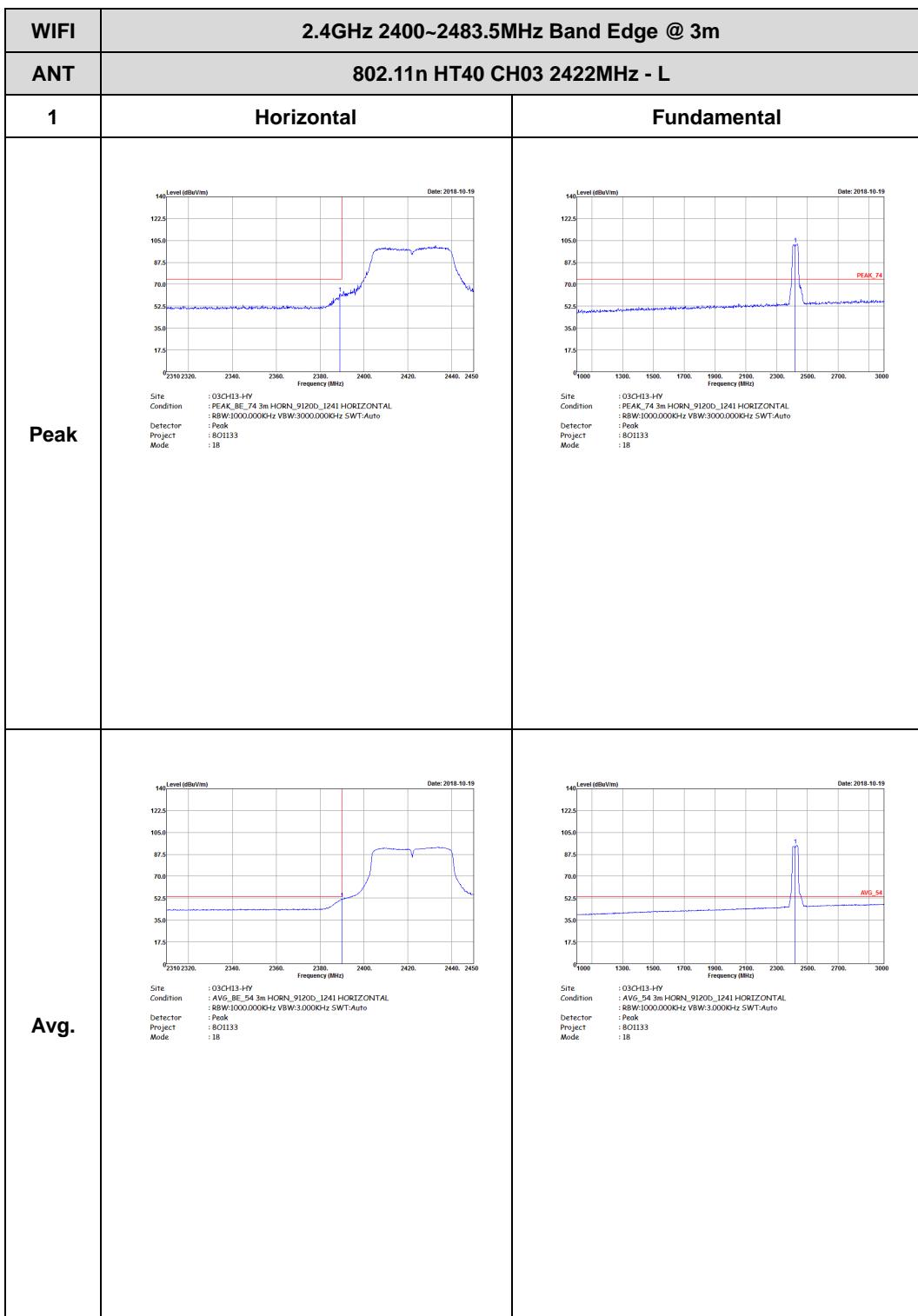






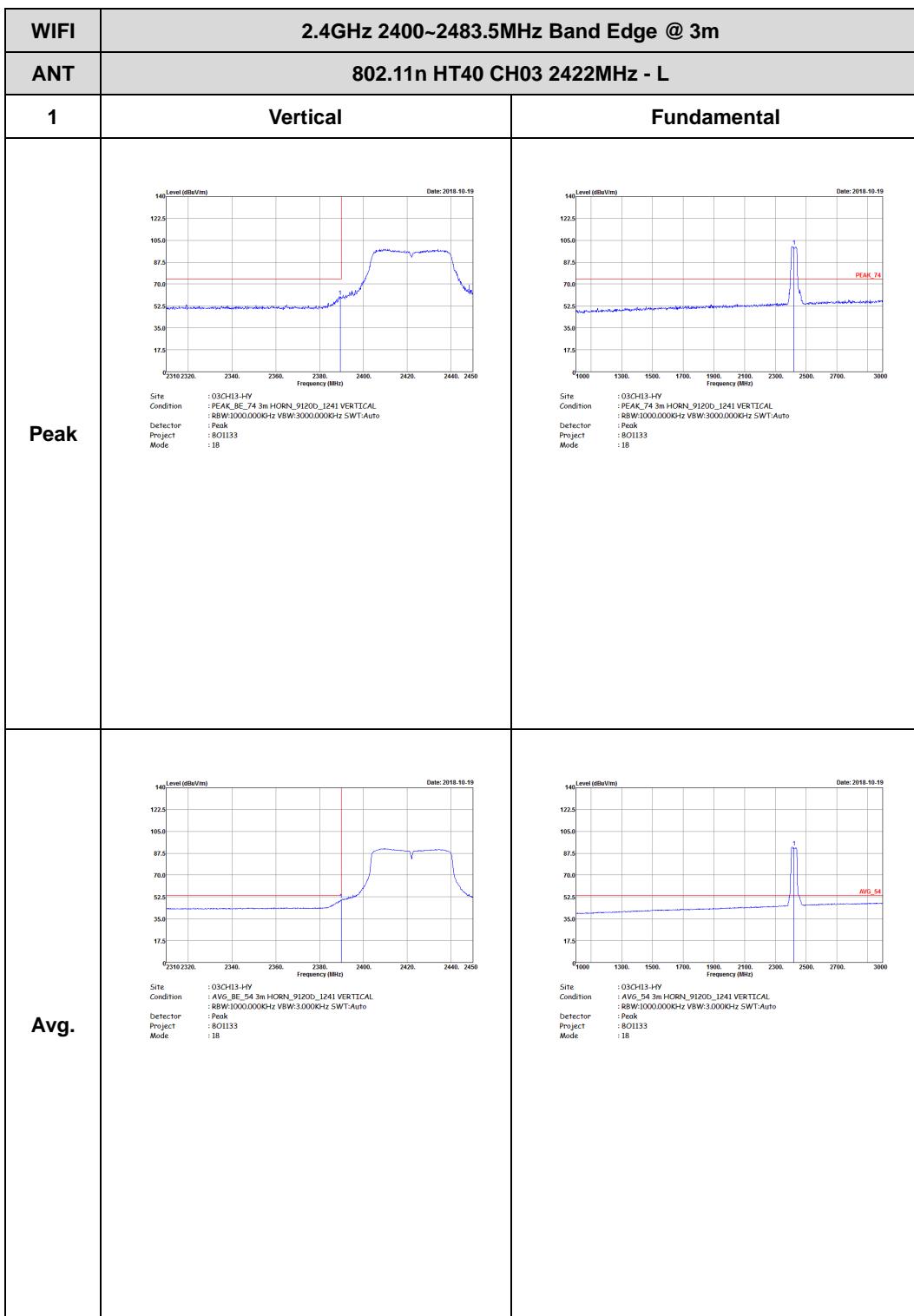
## 2.4GHz 2400~2483.5MHz

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



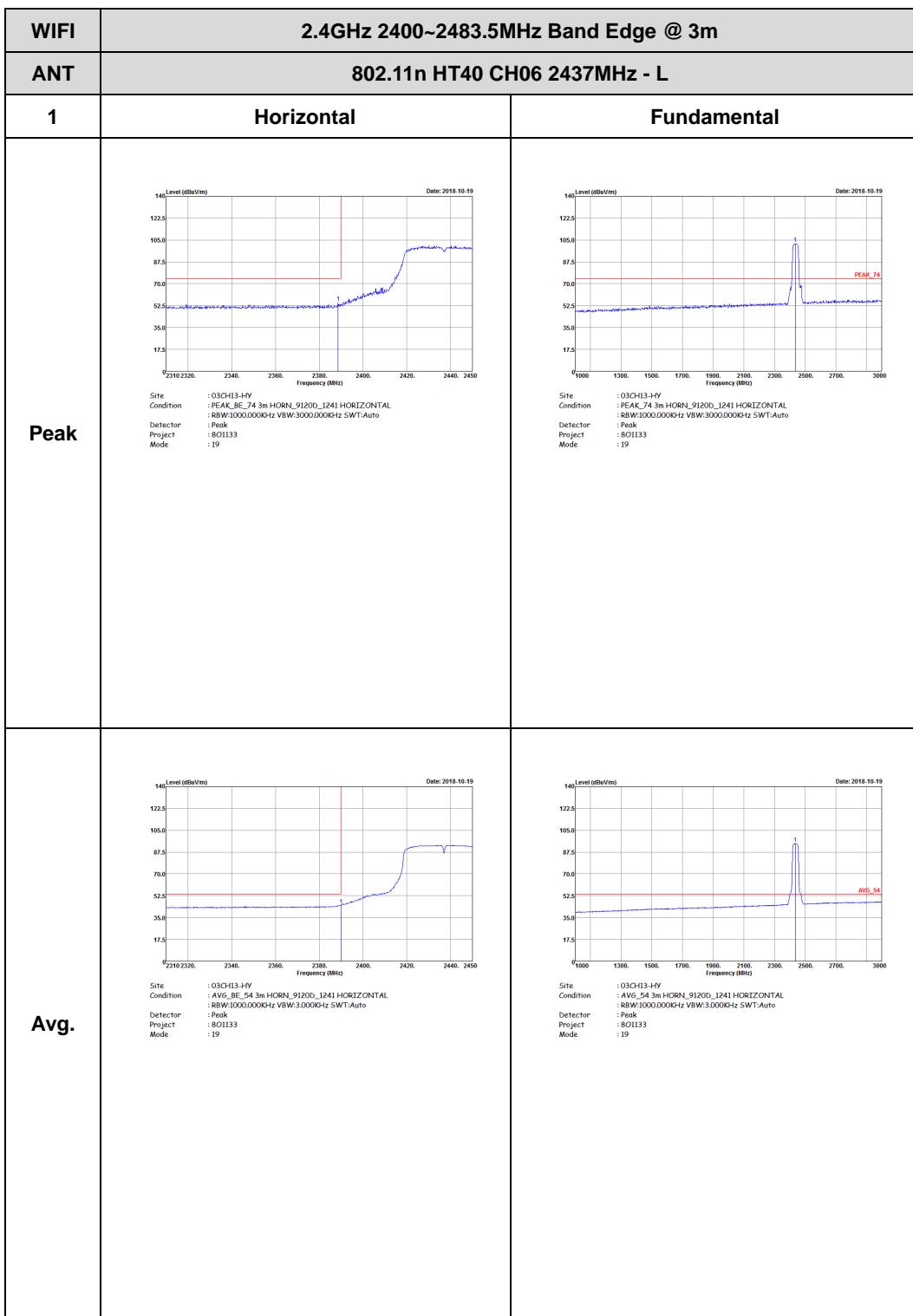


WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH03 2422MHz - R	
1	Horizontal	Fundamental
Peak	<p>Site : 03CH13-HY Condition : PCMK_BE_74 3m HORN_91200,_1241 HORIZONTAL Detector : R8W:1000.000KHz VBW:3.000KHz SWT:Auto Project : 801133 Mode : 1B</p>	Left Blank
Avg.	<p>Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_91200,_1241 HORIZONTAL Detector : R8W:1000.000KHz VBW:3.000KHz SWT:Auto Project : 801133 Mode : 1B</p>	Left Blank



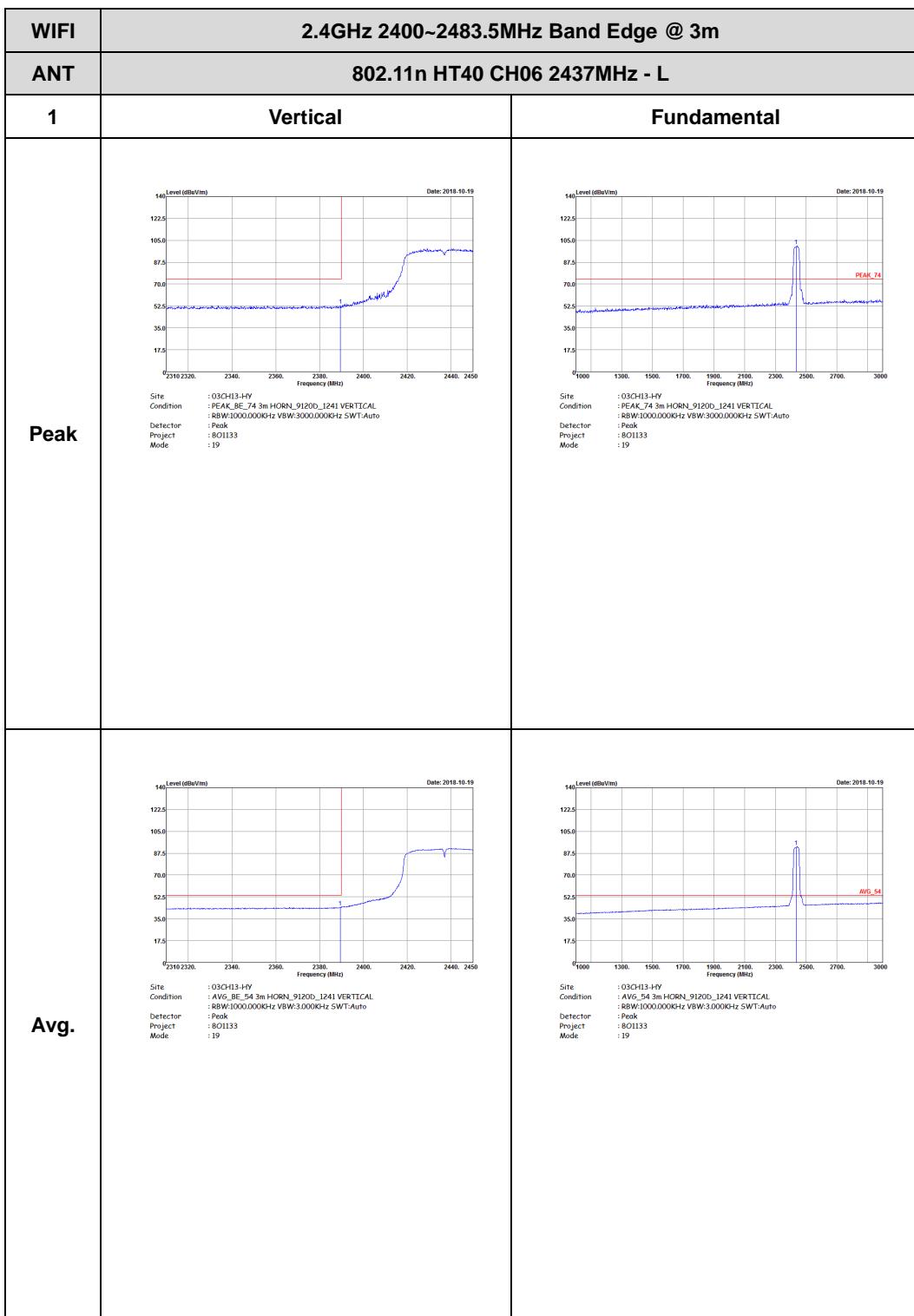


WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH03 2422MHz - R	
1	Vertical	Fundamental
Peak	<p>Level (dBm/V/m) vs Frequency (MHz) Date: 2018-10-19</p> <p>Site : 03CH13-HY Condition : PCMK_BE_74 3m HORN_91200,_J241 VERTICAL Detector : R8W:1000.000KHz VBW:3.000KHz SWT:Auto Project : 801133 Mode : 18</p>	Left blank
Avg.	<p>Level (dBm/V/m) vs Frequency (MHz) Date: 2018-10-19</p> <p>Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_91200,_J241 VERTICAL Detector : R8W:1000.000KHz VBW:3.000KHz SWT:Auto Project : 801133 Mode : 18</p>	Left blank



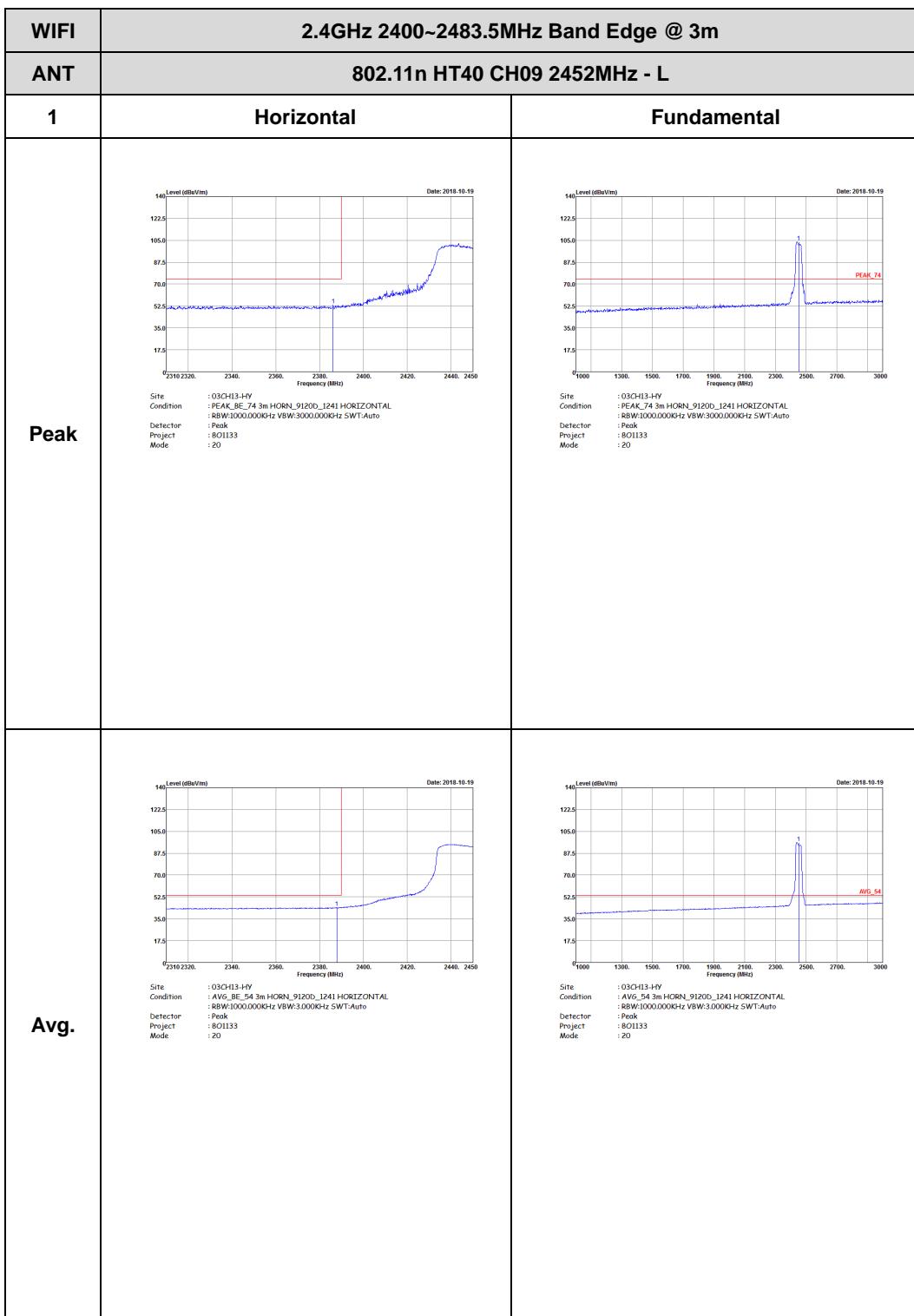


WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH06 2437MHz - R	
1	Horizontal	Fundamental
Peak	<p>Level (dBmV/m)</p> <p>Date: 2018-10-19</p> <p>Frequency (MHz)</p> <p>Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_91200,_1241 HORIZONTAL Detector : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Project : Peak Mode : 801133 : 19</p>	Left blank
Avg.	<p>Level (dBmV/m)</p> <p>Date: 2018-10-19</p> <p>Frequency (MHz)</p> <p>Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_91200,_1241 HORIZONTAL Detector : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Project : Peak Mode : 801133 : 19</p>	Left blank



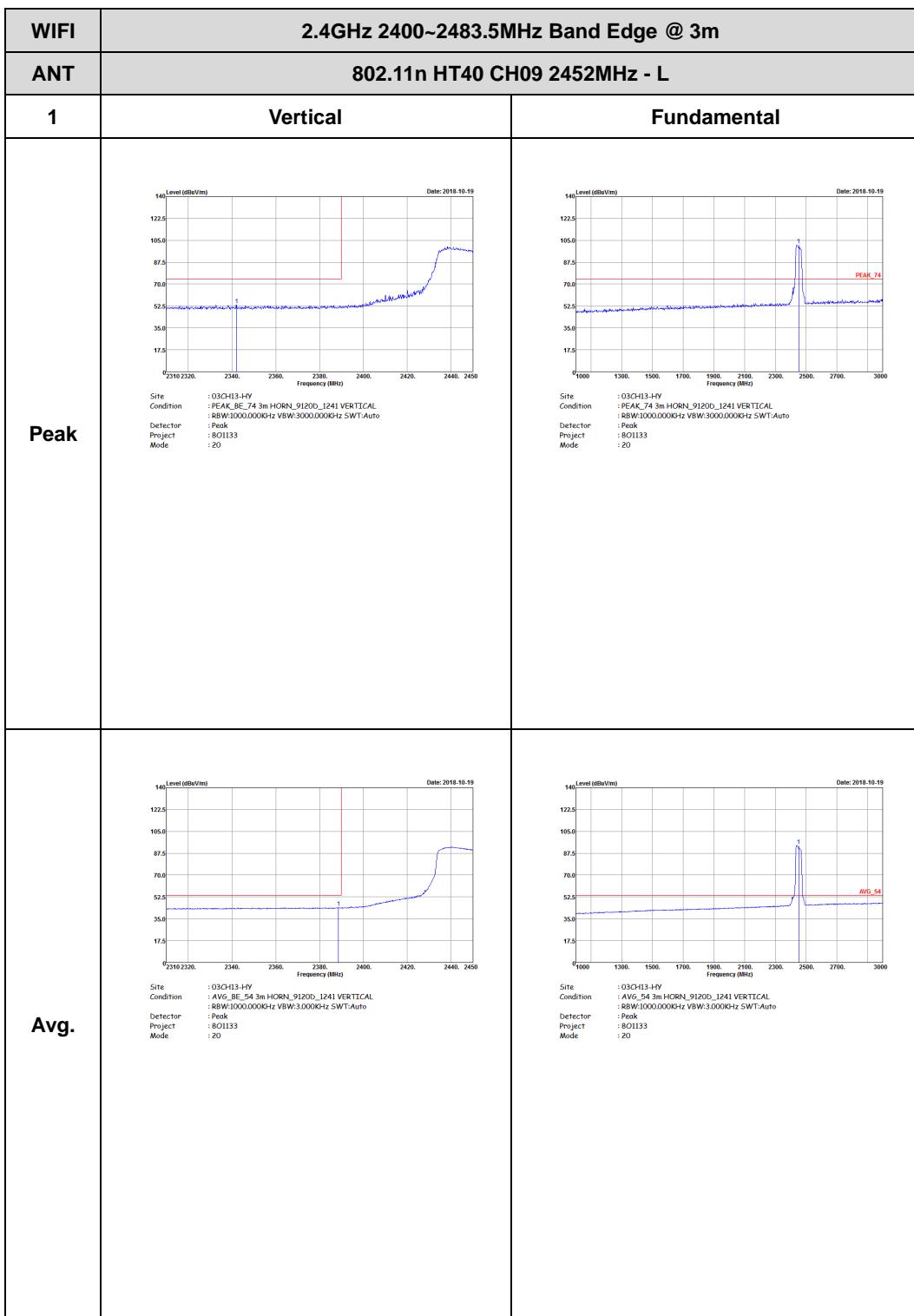


WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH06 2437MHz - R	
1	Horizontal	Fundamental
Peak	<p>Level (dBmV/m)</p> <p>Date: 2018-10-19</p> <p>Frequency (MHz)</p> <p>PEAK_BE_74</p> <p>Site : 03CH13-HY Condition : PCMK_BE_74 3m HORN_91200,_J241 VERTICAL Detector : R8W:1000.000KHz VBW:3.000KHz SWT:Auto Project : 801133 Mode : 19</p>	Left blank
Avg.	<p>Level (dBmV/m)</p> <p>Date: 2018-10-19</p> <p>Frequency (MHz)</p> <p>AVG_BE_54</p> <p>Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_91200,_J241 VERTICAL Detector : R8W:1000.000KHz VBW:3.000KHz SWT:Auto Project : 801133 Mode : 19</p>	Left blank





WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH09 2452MHz - R	
1	Horizontal	Fundamental
Peak	<p>Level (dBmV/m)</p> <p>Date: 2018-10-19</p> <p>Frequency (MHz)</p> <p>Site : 03CH13-HY Condition : PCMK_BE_74 3m HORN_91200,_1241 HORIZONTAL Detector : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Project : Peak Mode : 801133 : 20</p>	Left blank
Avg.	<p>Level (dBmV/m)</p> <p>Date: 2018-10-19</p> <p>Frequency (MHz)</p> <p>Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_91200,_1241 HORIZONTAL Detector : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Project : Peak Mode : 801133 : 20</p>	Left blank



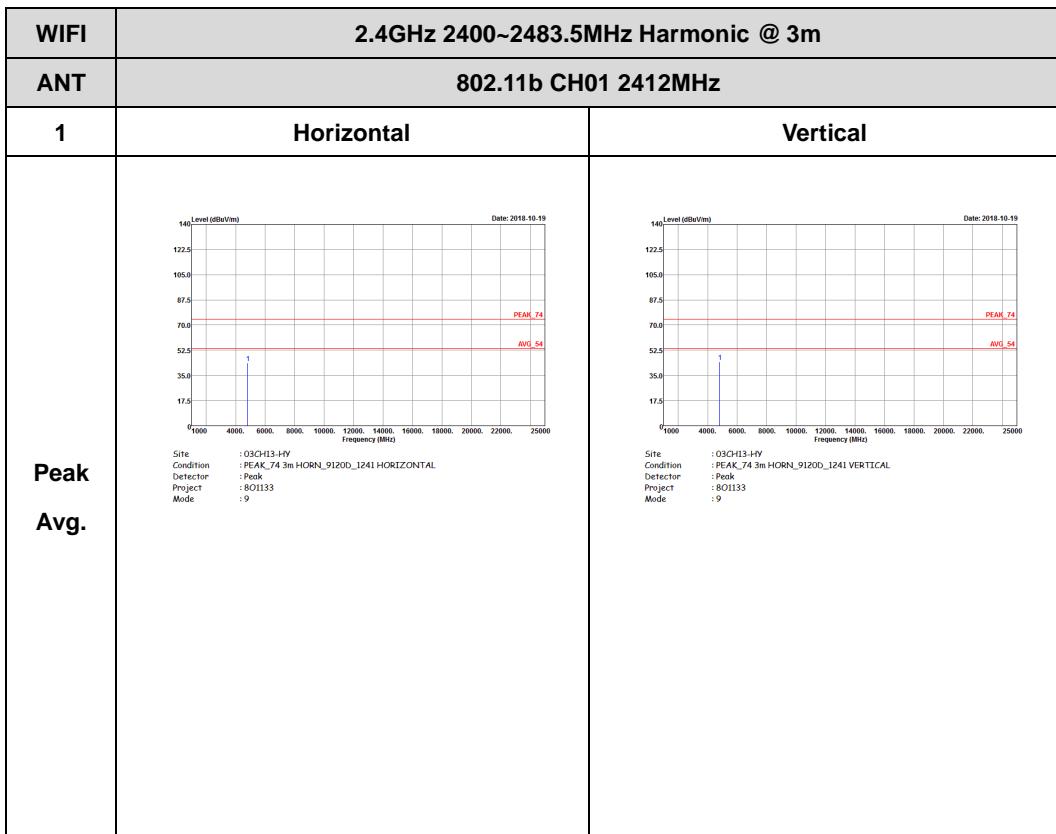


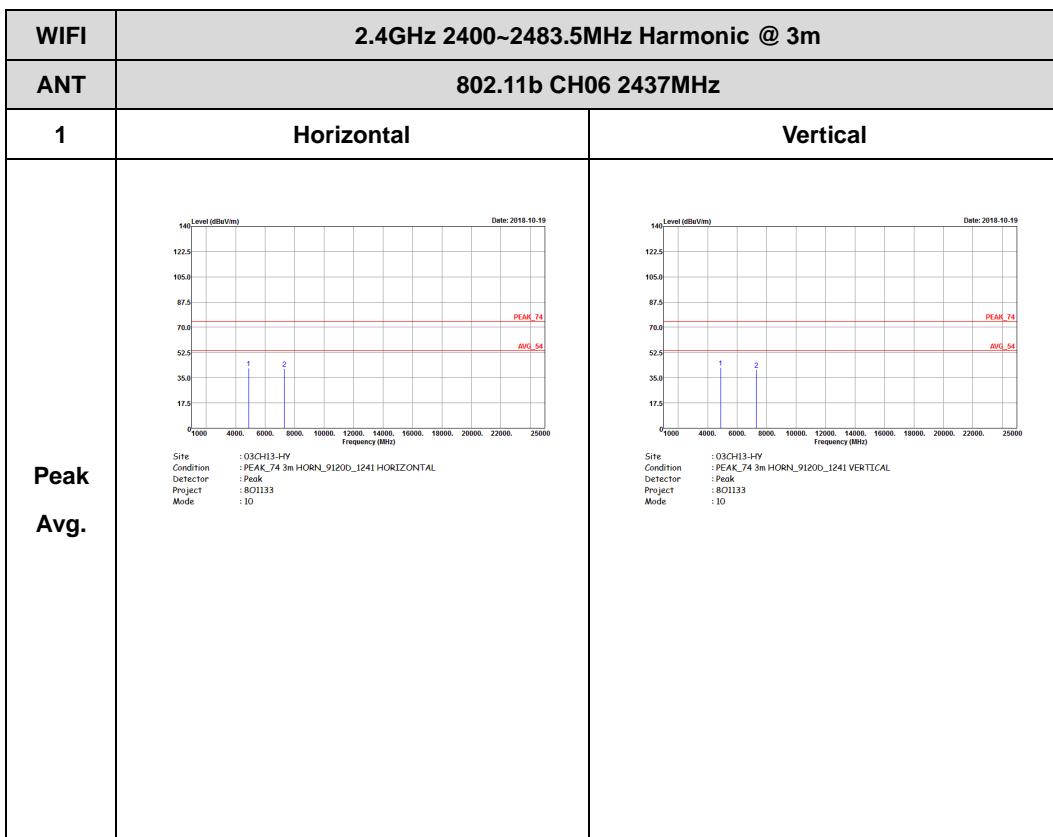
<b>WIFI</b>	<b>2.4GHz 2400~2483.5MHz Band Edge @ 3m</b>	
<b>ANT</b>	<b>802.11n HT40 CH09 2452MHz - R</b>	
<b>1</b>	<b>Vertical</b>	<b>Fundamental</b>
Peak	<p>Level (dBm/V/m)</p> <p>Date: 2018-10-19</p> <p>Frequency (MHz)</p> <p>Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_91200,_J241 VERTICAL Detector : R8W:1000.000KHz VBW:3.000KHz SWT:Auto Project : 801133 Mode : 20</p>	Left blank
Avg.	<p>Level (dBm/V/m)</p> <p>Date: 2018-10-19</p> <p>Frequency (MHz)</p> <p>Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_91200,_J241 VERTICAL Detector : R8W:1000.000KHz VBW:3.000KHz SWT:Auto Project : 801133 Mode : 20</p>	Left blank

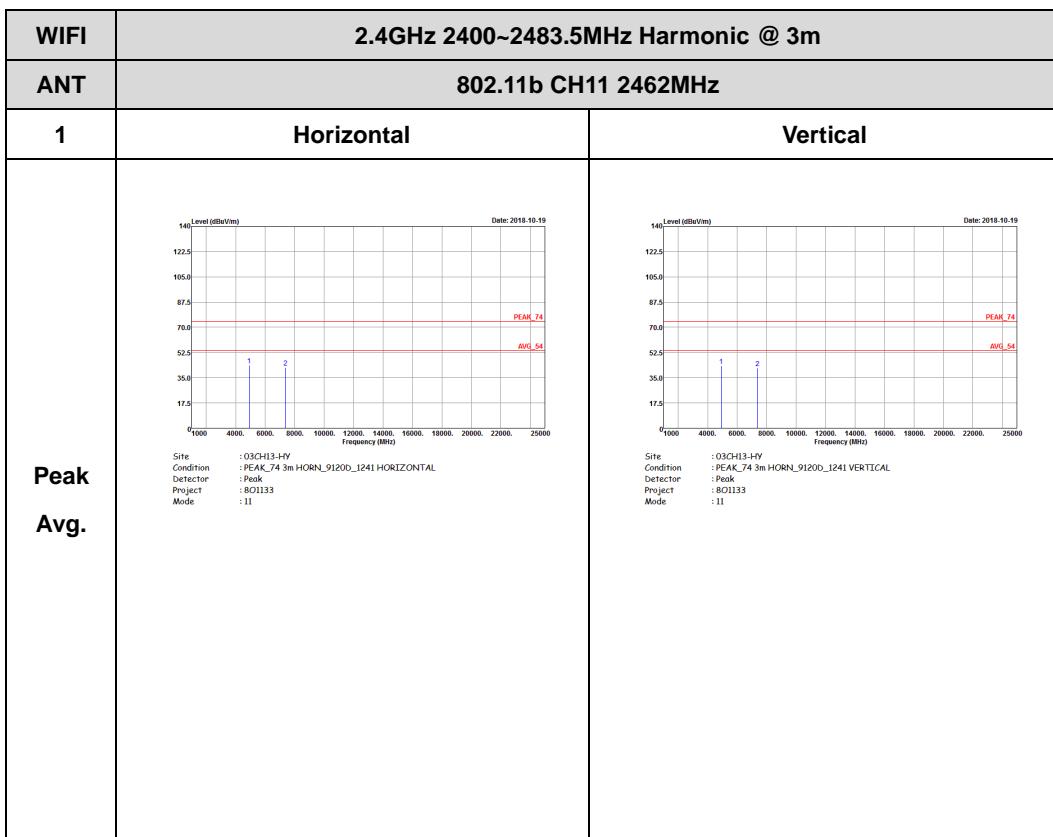


## 2.4GHz 2400~2483.5MHz

## WIFI 802.11b (Harmonic @ 3m)



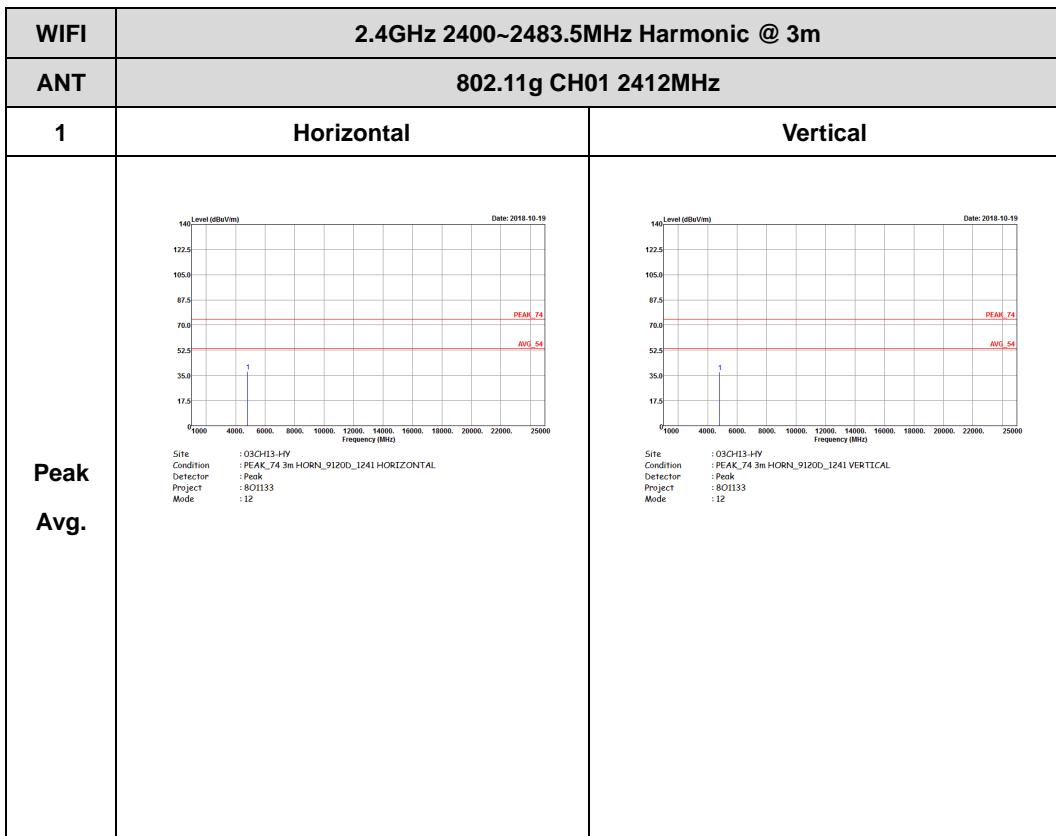


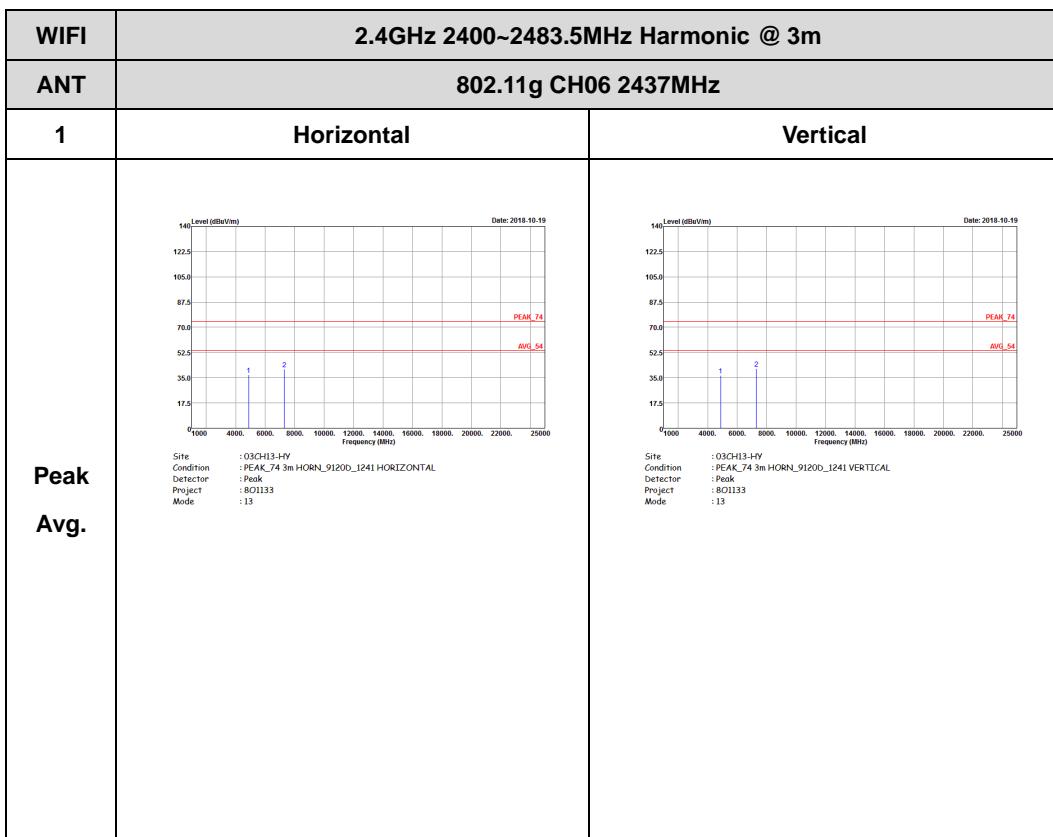


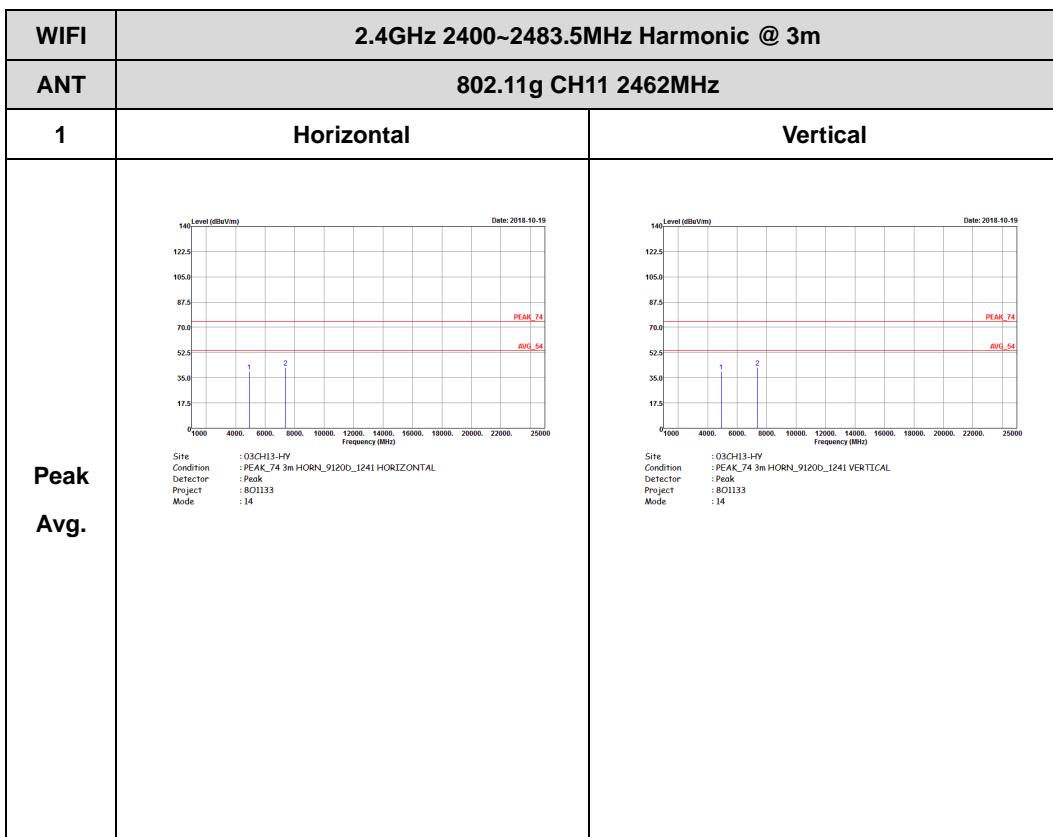


2.4GHz 2400~2483.5MHz

WIFI 802.11g (Harmonic @ 3m)



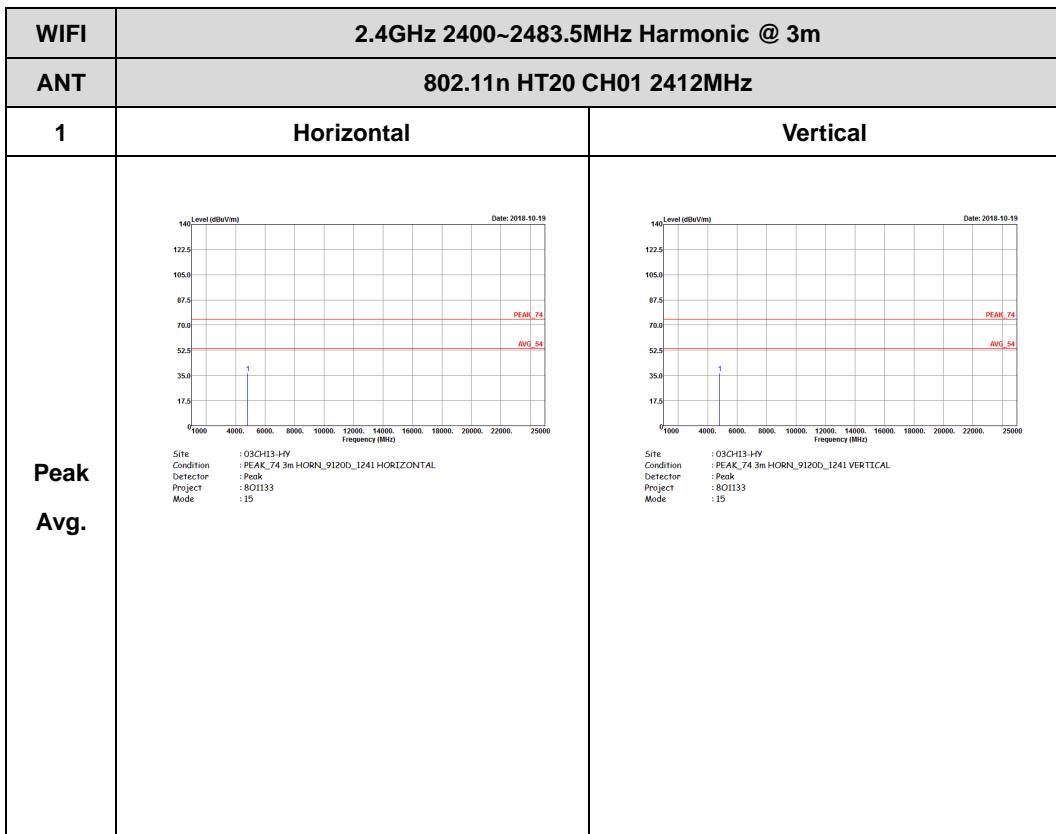


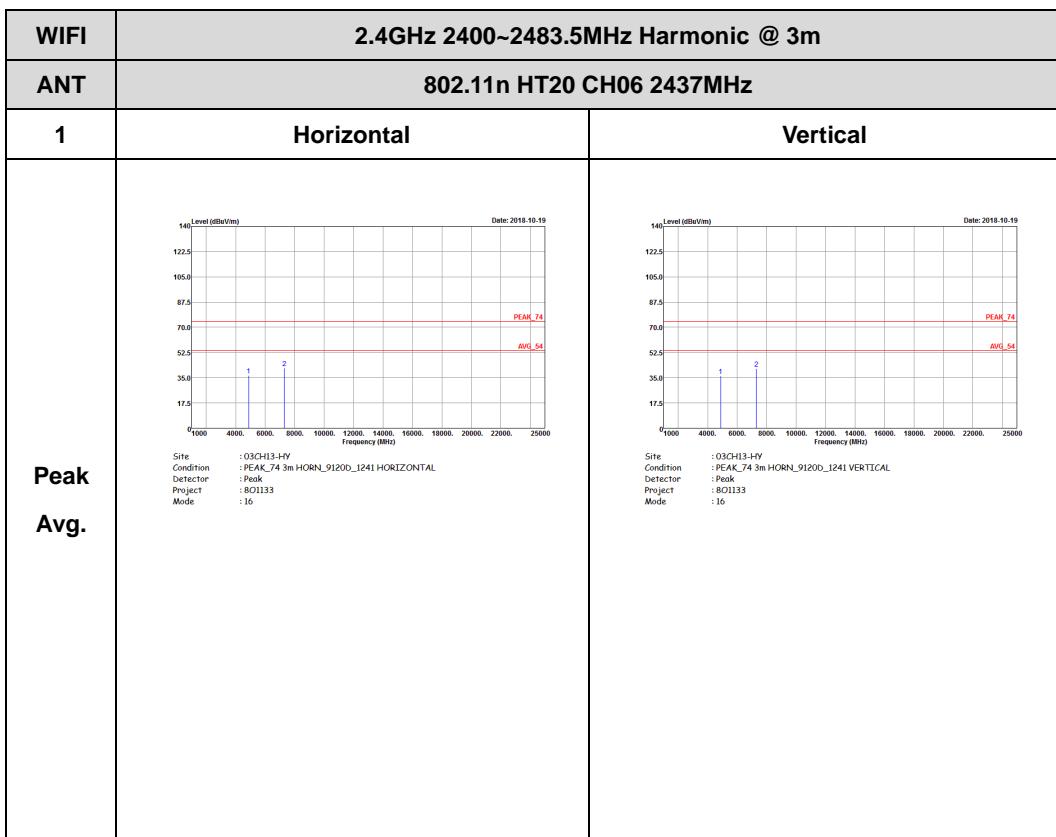


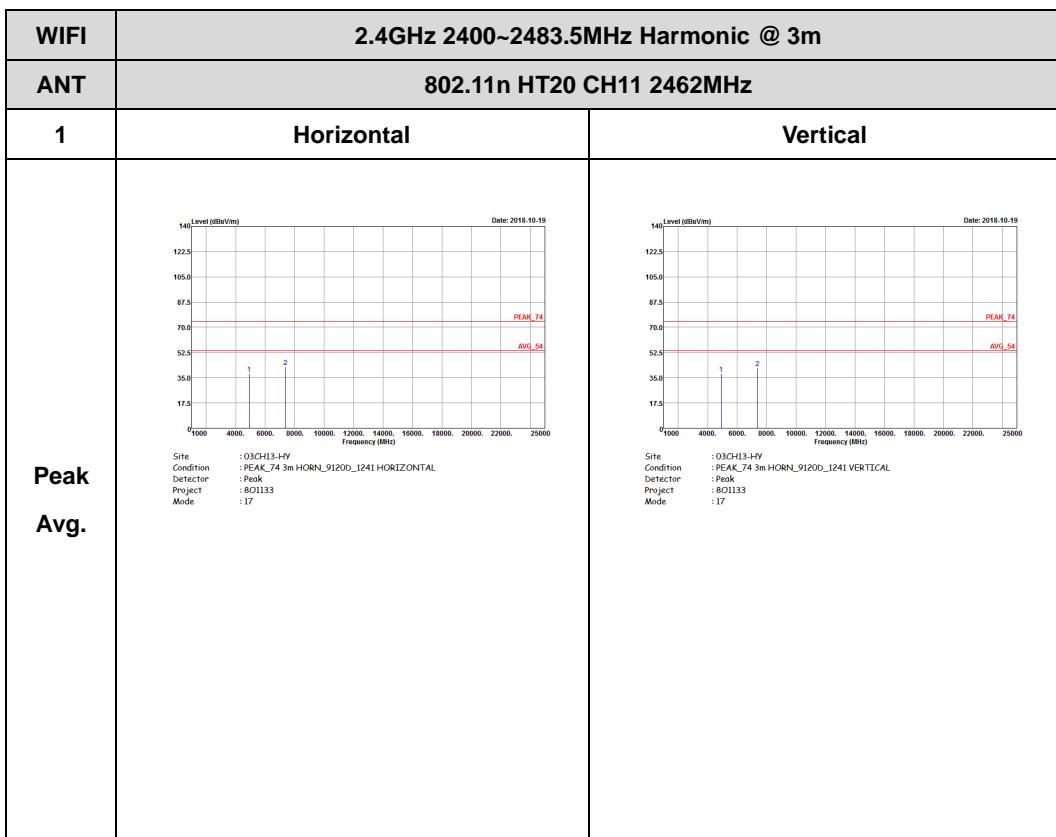


2.4GHz 2400~2483.5MHz

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



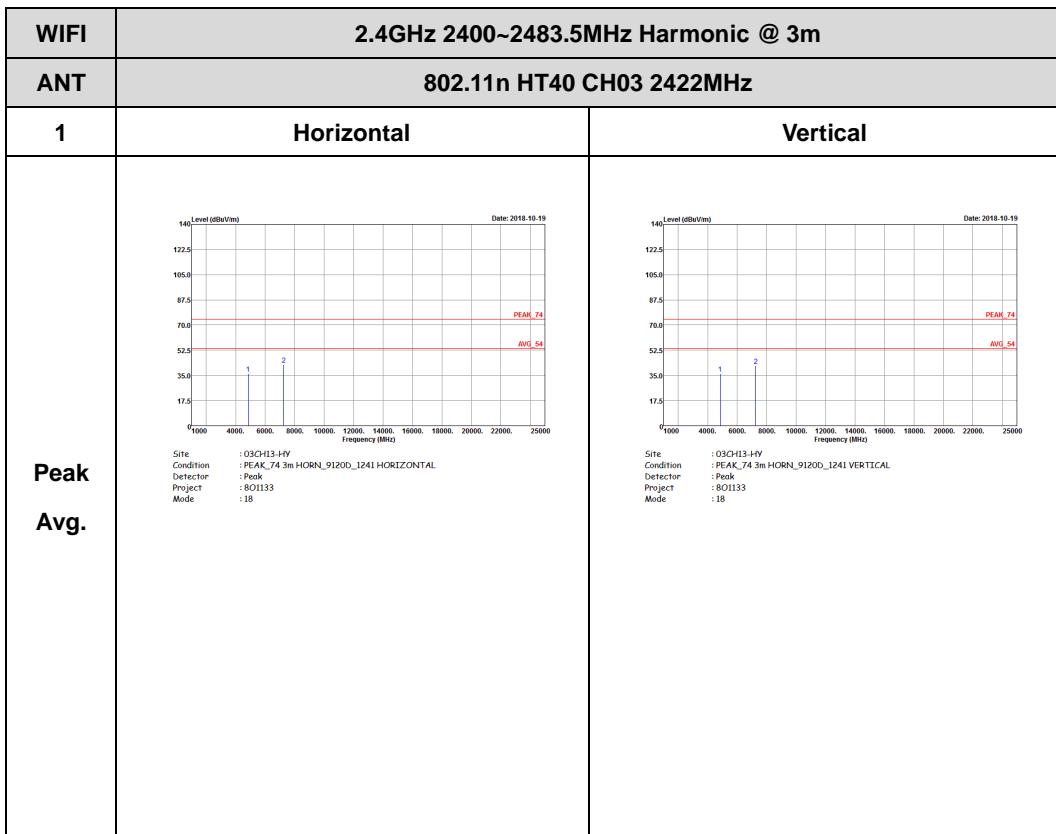


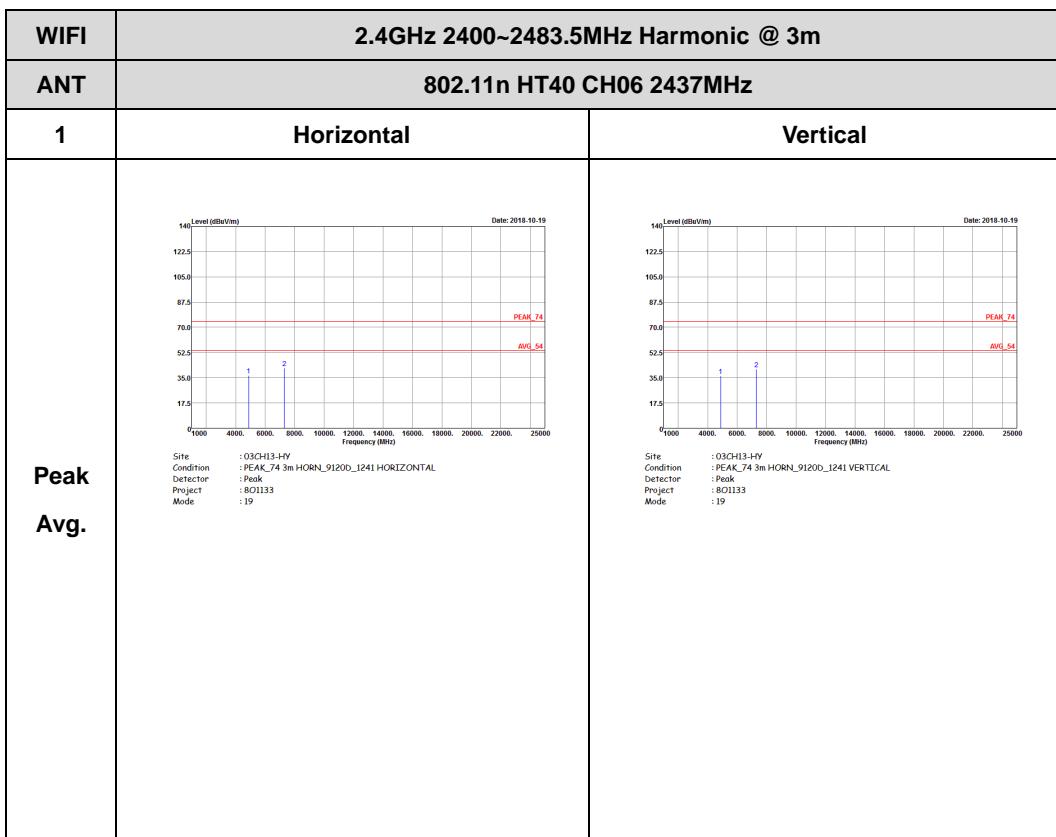


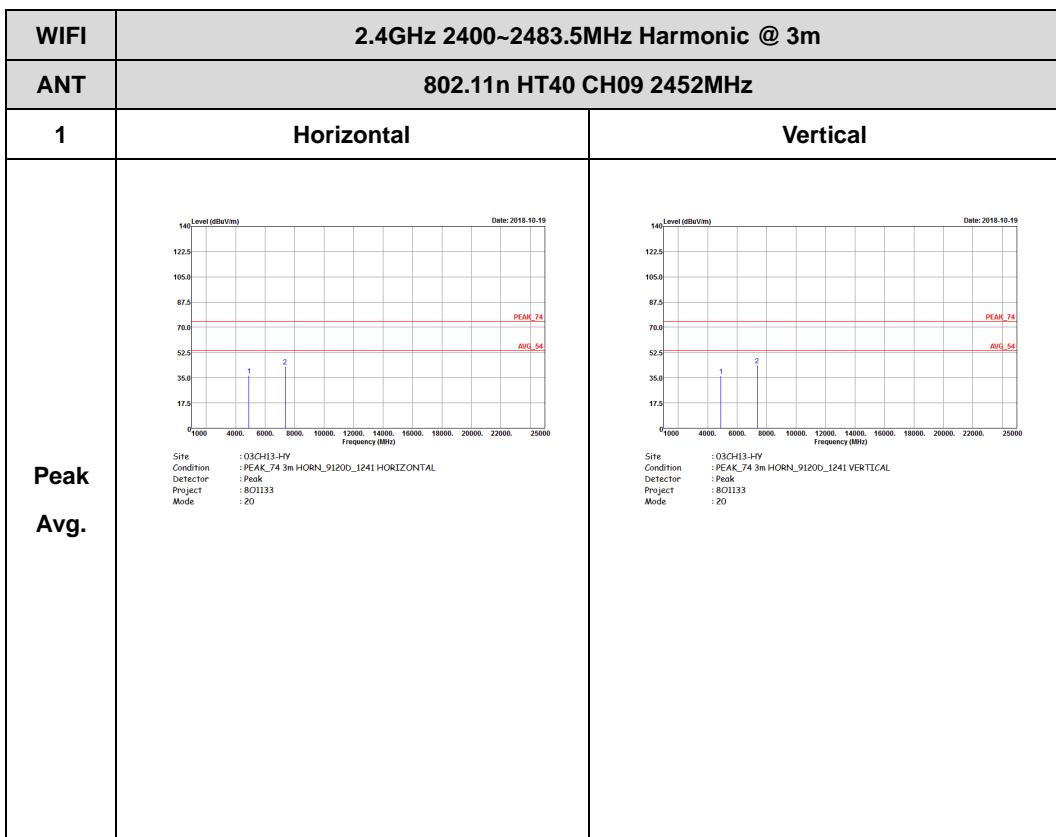


2.4GHz 2400~2483.5MHz

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

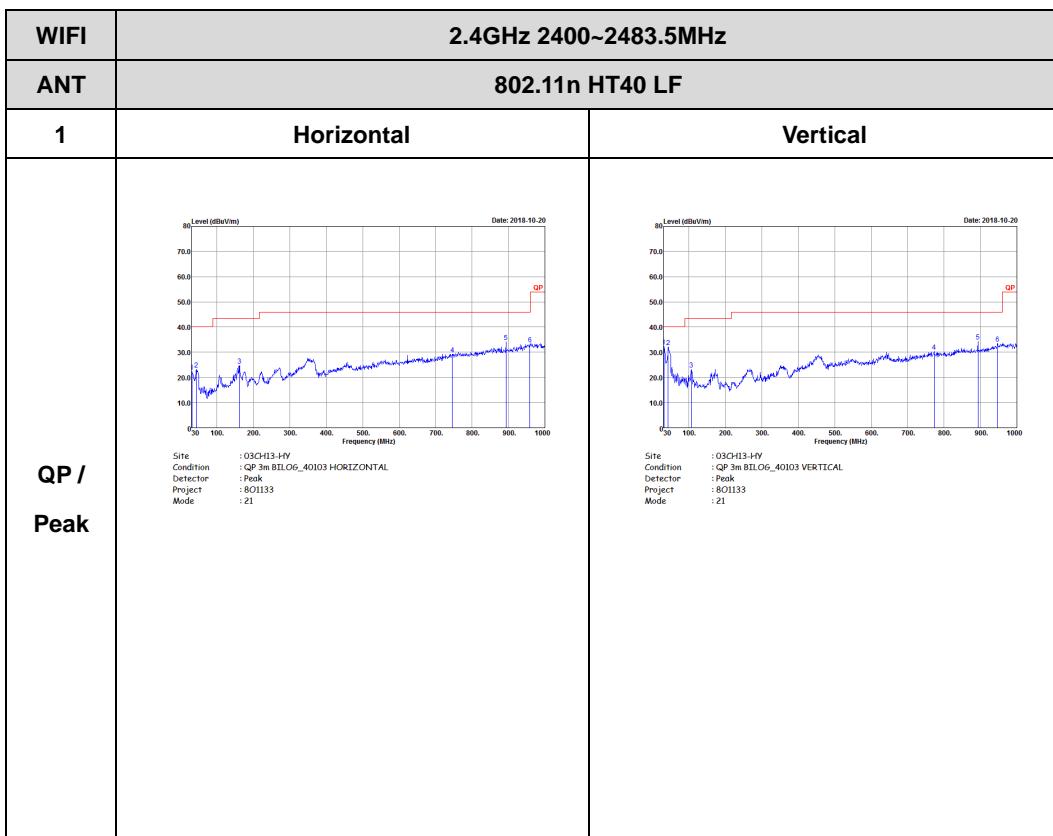








**Emission below 1GHz**  
**2.4GHz WIFI 802.11n HT40 (LF)**

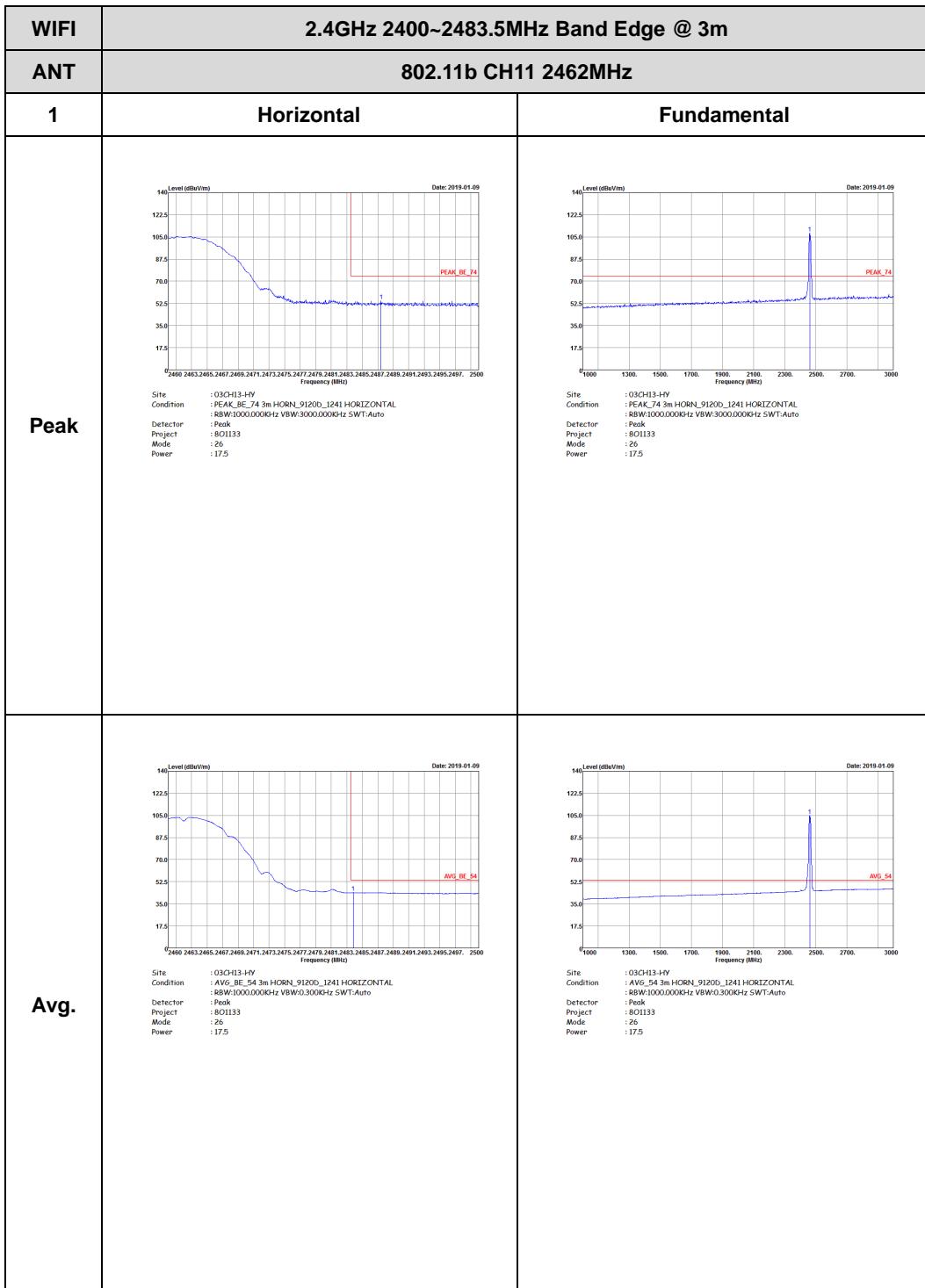


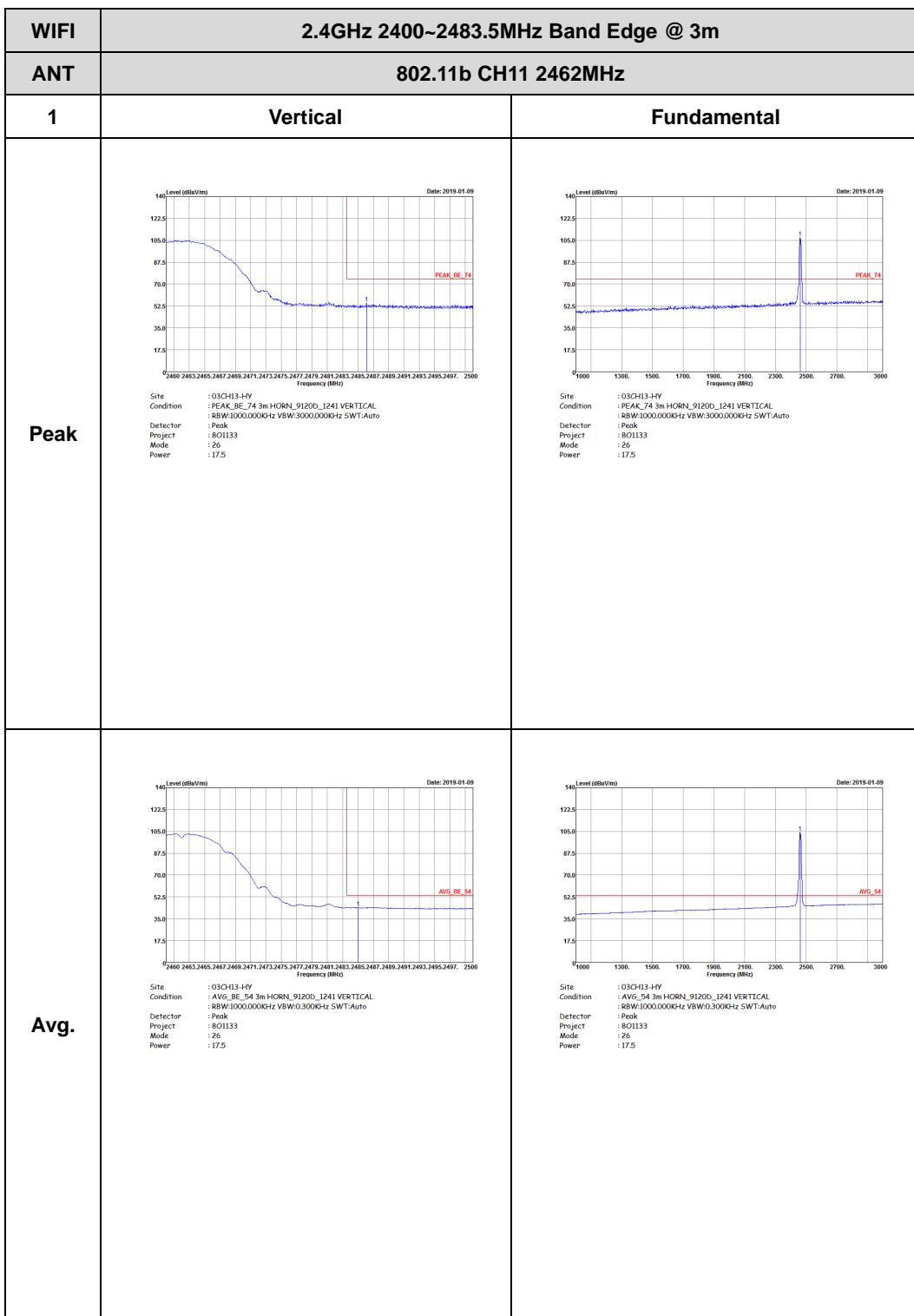


&lt;Sample 2&gt;

## 2.4GHz 2400~2483.5MHz

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

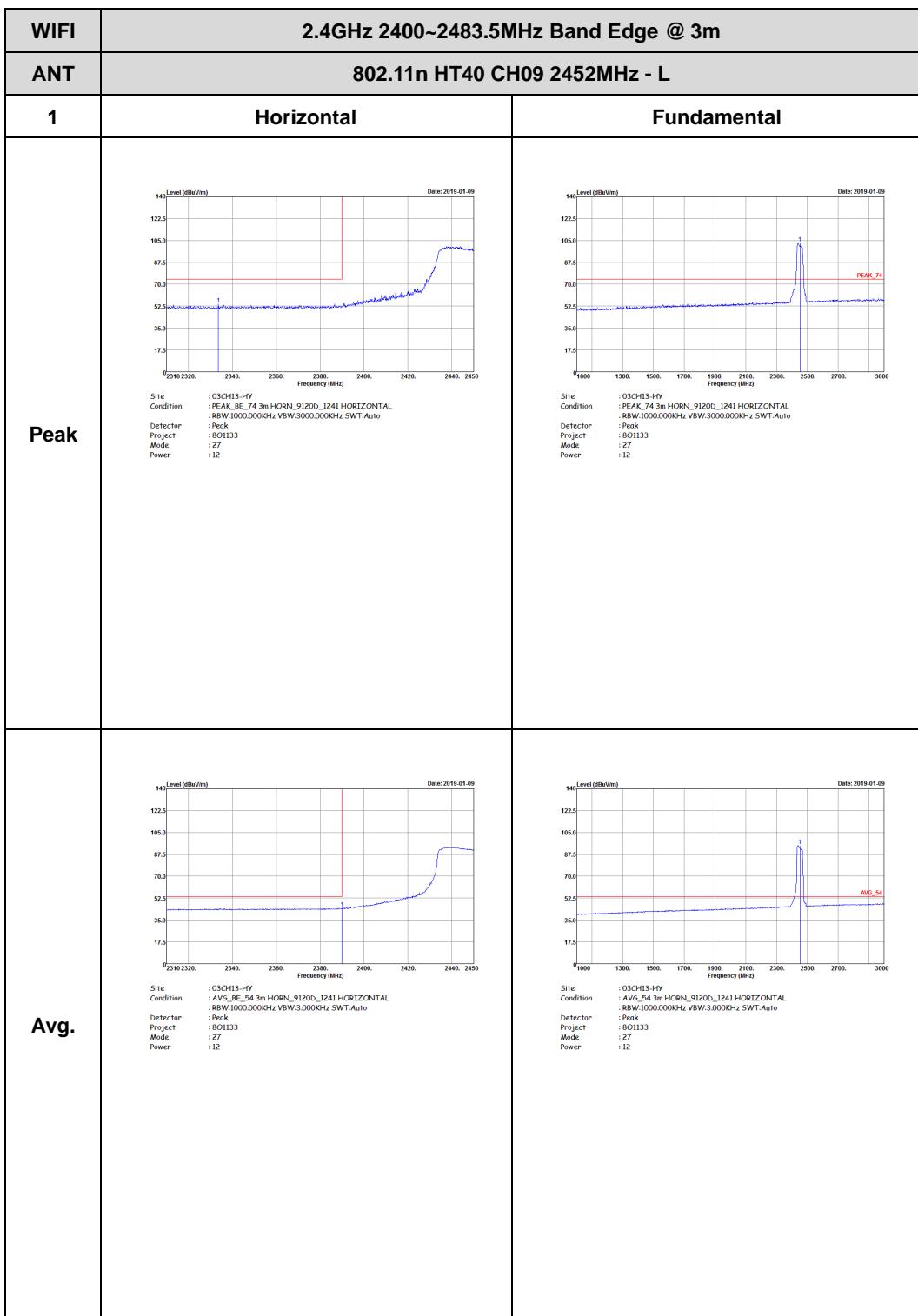






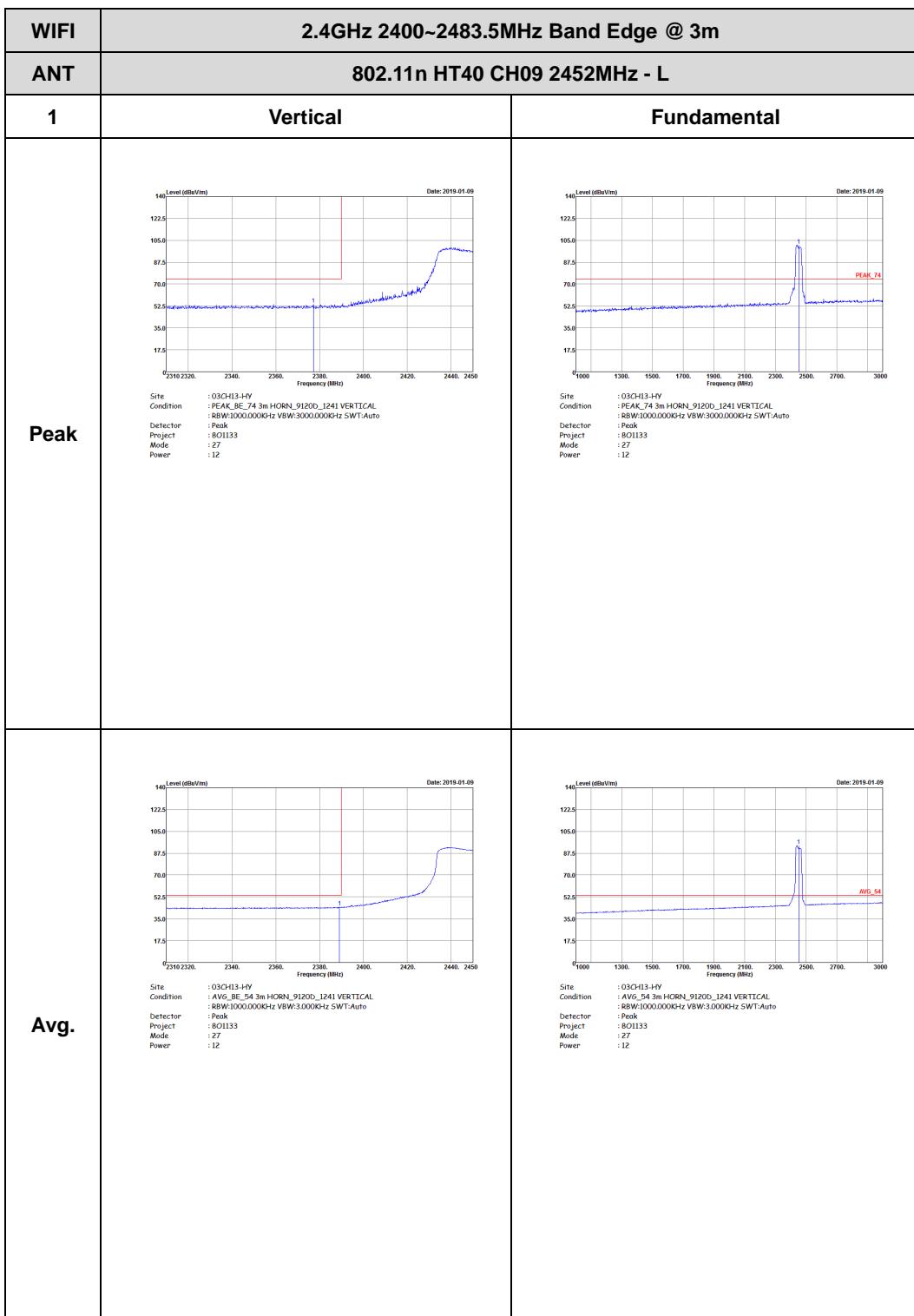
## 2.4GHz 2400~2483.5MHz

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





<b>WIFI</b>	<b>2.4GHz 2400~2483.5MHz Band Edge @ 3m</b>	
<b>ANT</b>	<b>802.11n HT40 CH09 2452MHz - R</b>	
<b>1</b>	<b>Horizontal</b>	<b>Fundamental</b>
<b>Peak</b>	<p>Date: 2019-01-09</p> <p>Site : 03CH13-HY Condition : PCMK_BE_74 3m HORN_91200_1241 HORIZONTAL Detector : R8W:1000.000KHz VBW:3.000KHz SWT:Auto Project : Peak Mode : 801133 Power : 27 : 12</p>	Left blank
<b>Avg.</b>	<p>Date: 2019-01-09</p> <p>Site : AVG_BE_54 3m HORN_91200_1241 HORIZONTAL Condition : R8W:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 801133 Mode : 27 Power : 12</p>	Left blank



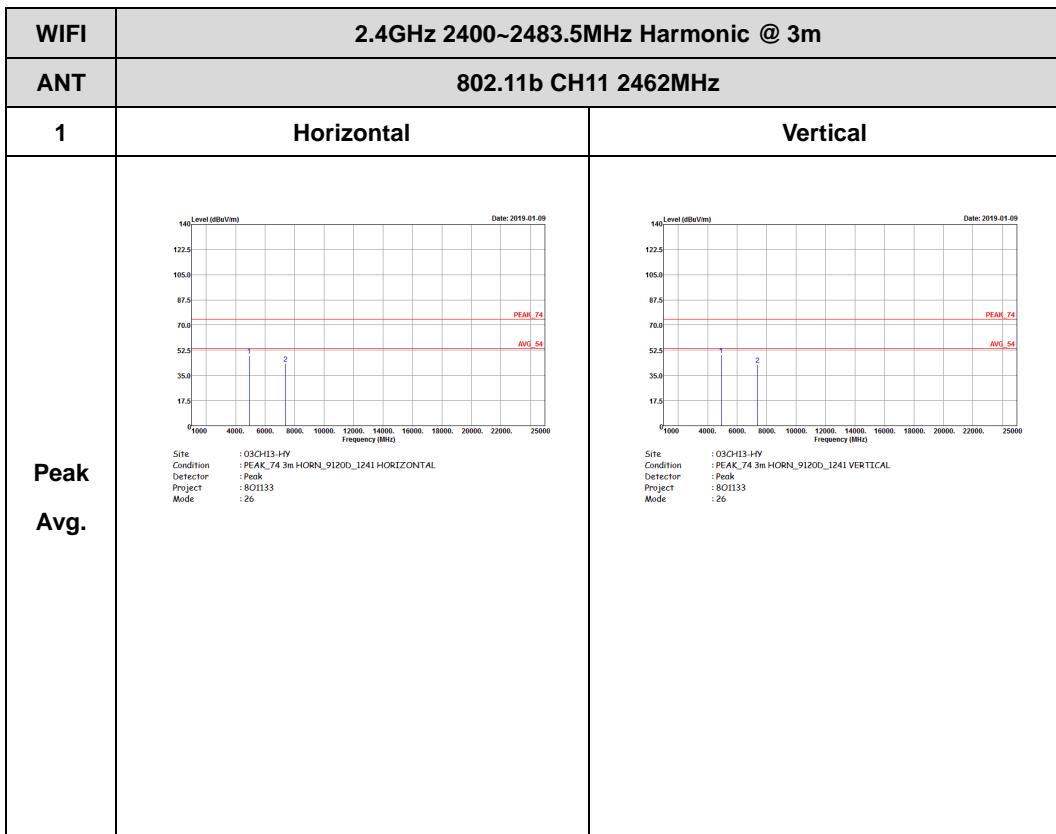


<b>WIFI</b>	<b>2.4GHz 2400~2483.5MHz Band Edge @ 3m</b>	
<b>ANT</b>	<b>802.11n HT40 CH09 2452MHz - R</b>	
<b>1</b>	<b>Vertical</b>	<b>Fundamental</b>
<b>Peak</b>	<p>Site : 03CH13-HY Condition : PCMK_BE_74 3m HORN_91200_1241 VERTICAL Detector : R8W:1000.000KHz VBW:3.000KHz SWT:Auto Project : Peak Mode : 801133 Power : 27 : 12</p>	Left blank
<b>Avg.</b>	<p>Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_91200_1241 VERTICAL Detector : R8W:1000.000KHz VBW:3.000KHz SWT:Auto Project : Peak Mode : 801133 Power : 27 : 12</p>	Left blank



2.4GHz 2400~2483.5MHz

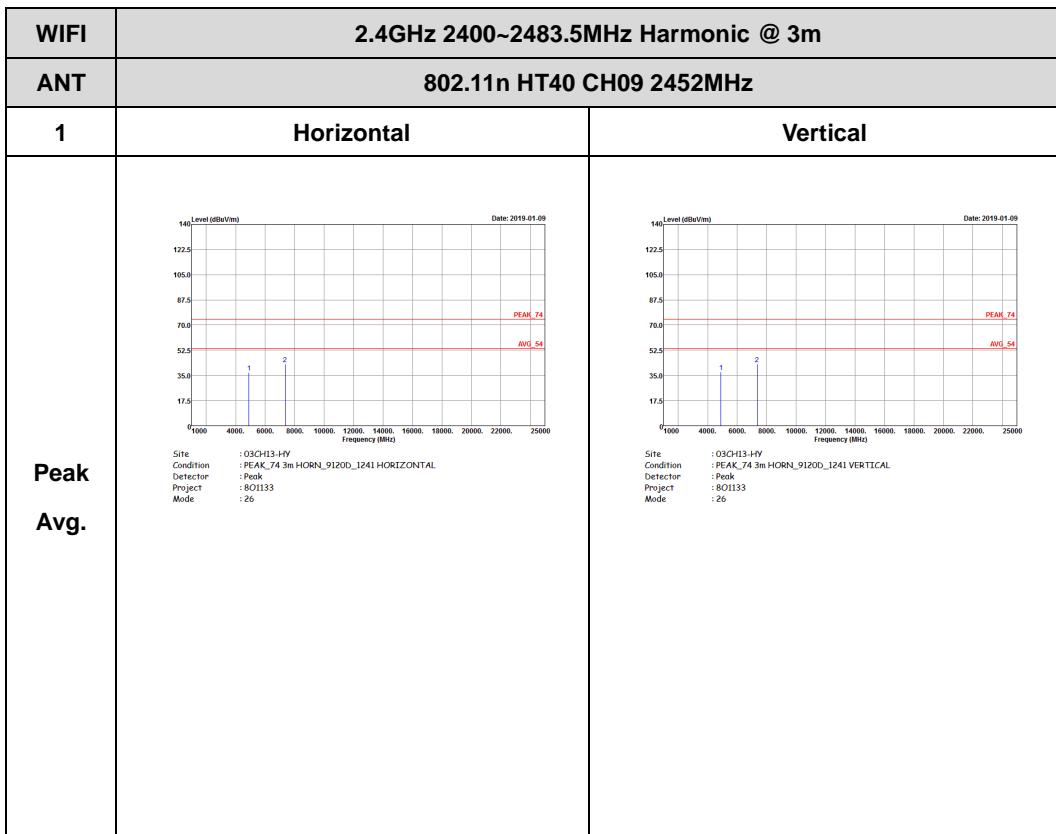
WIFI 802.11b (Harmonic @ 3m)





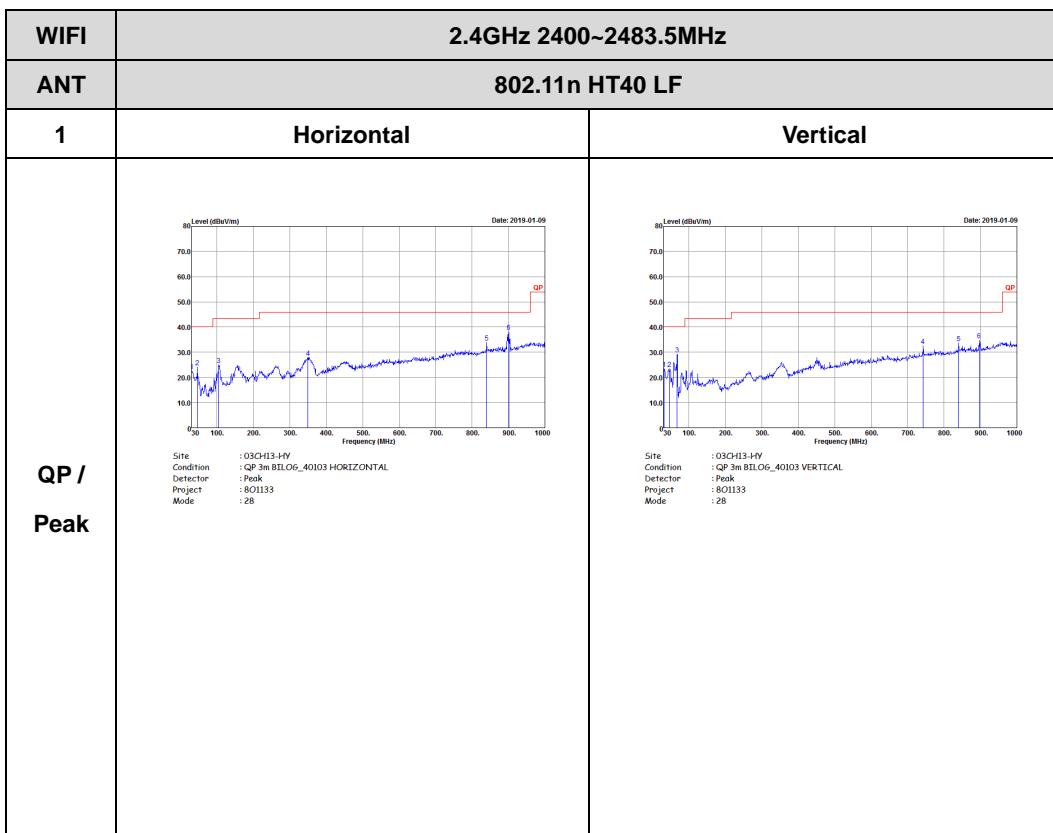
## 2.4GHz 2400~2483.5MHz

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





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





## Appendix E. Duty Cycle Plots

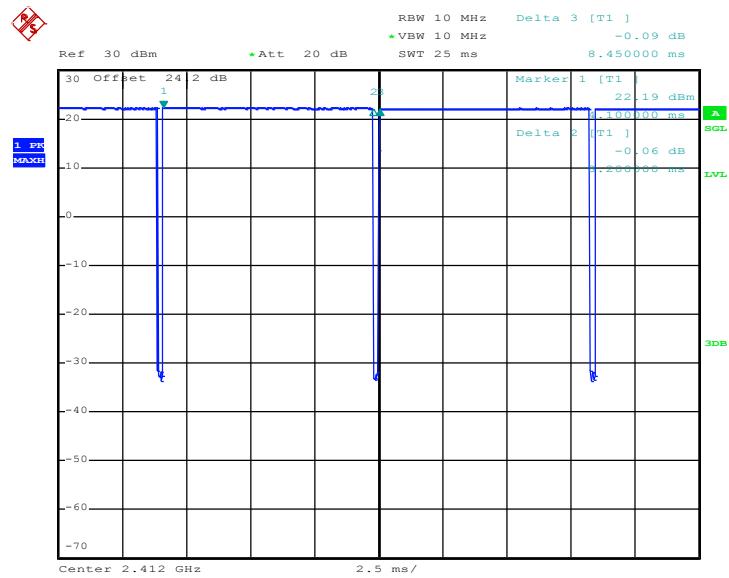
Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
802.11b	97.04	8200.00	0.12	300Hz	0.13
802.11g	87.26	1370.00	0.73	1kHz	0.59
2.4GHz 802.11n HT20	85.86	1275.00	0.78	1kHz	0.66
2.4GHz 802.11n HT40	86.14	634.00	1.58	3kHz	0.65



# FCC RADIO TEST REPORT

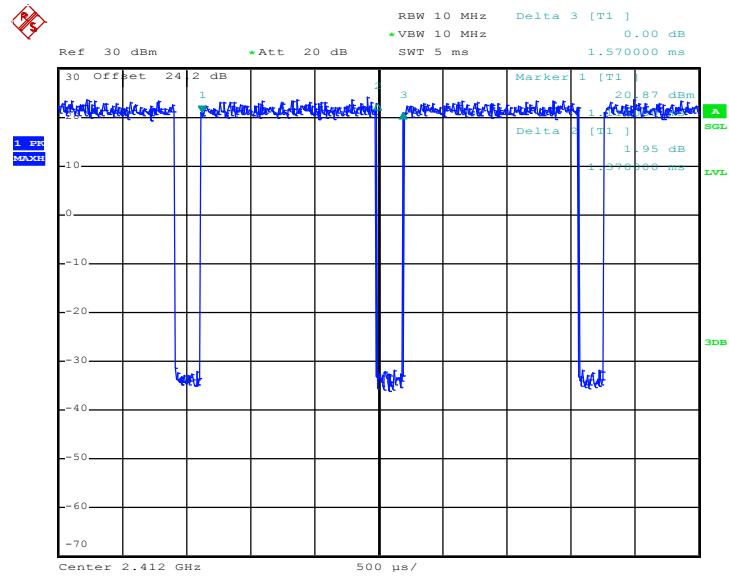
Report No. : FR8O1133C

## 802.11b



Date: 16.OCT.2018 11:19:22

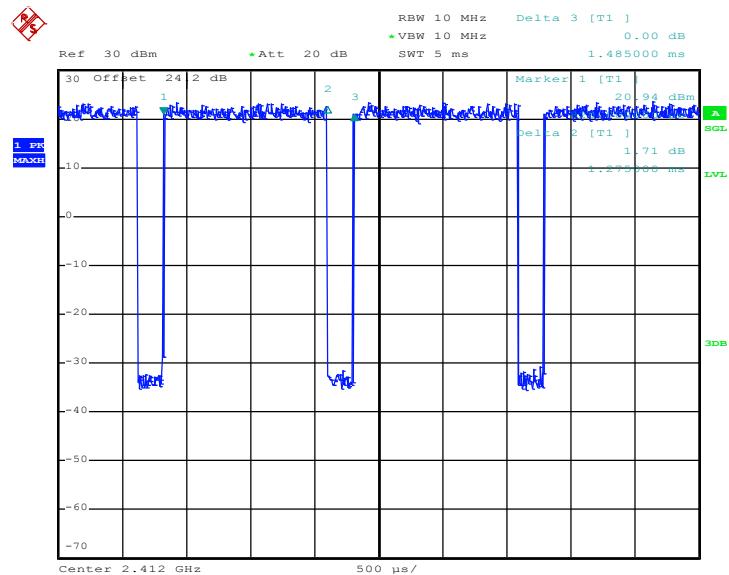
## 802.11g



Date: 16.OCT.2018 11:21:29

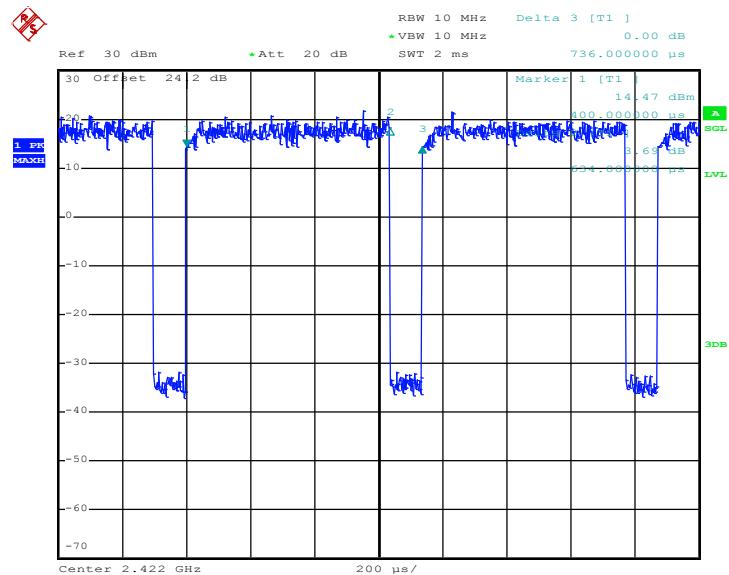


## 802.11n HT20



Date: 16.OCT.2018 11:23:05

## 802.11n HT40



Date: 16.OCT.2018 11:27:41