



# FCC RADIO TEST REPORT

**FCC ID** : Z64-CC3235MOD  
**Equipment** : Dual-Band Wi-Fi® Module  
**Brand Name** : Texas Instruments  
**Model Name** : CC3235MODASM2MON  
CC3235MODASF12MON  
**Marketing Name** : SimpleLink™ Wi-Fi® CC3235MOD Dual-Band  
Wireless Microcontroller Module  
**Applicant** : Texas Instruments Incorporated  
12500 TI BLVD., Dallas Texas, 75243  
**Manufacturer** : Texas Instruments Incorporated  
12500 TI BLVD., Dallas Texas, 75243  
**Standard** : FCC Part 15 Subpart C §15.247

The product was received on Dec. 19, 2018 and testing was started from Oct. 23, 2019 and completed on Nov. 08, 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 variant 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.

*Louis Wu*

Approved by: Louis Wu

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

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



## Table of Contents

History of this test report.....	3
Summary of Test Result.....	4
<b>1 General Description .....</b>	<b>5</b>
1.1 Product Feature of Equipment Under Test.....	5
1.2 Modification of EUT .....	5
1.3 Testing Location .....	6
1.4 Applicable Standards.....	6
<b>2 Test Configuration of Equipment Under Test .....</b>	<b>7</b>
2.1 Carrier Frequency and Channel .....	7
2.2 Test Mode.....	7
2.3 Connection Diagram of Test System.....	8
2.4 Support Unit used in test configuration and system .....	8
2.5 EUT Operation Test Setup .....	8
<b>3 Test Result .....</b>	<b>9</b>
3.1 Output Power Measurement.....	9
3.2 Radiated Band Edges and Spurious Emission Measurement .....	10
3.3 Antenna Requirements.....	14
<b>4 List of Measuring Equipment.....</b>	<b>15</b>
<b>5 Uncertainty of Evaluation .....</b>	<b>17</b>
<b>Appendix A. Conducted Test Results</b>	
<b>Appendix B. Conducted Spurious Emission</b>	
<b>Appendix C. Conducted Spurious Emission Plots</b>	
<b>Appendix D. Cabinet Radiated Spurious Emission</b>	
<b>Appendix E. Cabinet Radiated Spurious Emission Plots</b>	
<b>Appendix F. Duty Cycle Plots</b>	
<b>Appendix G. Setup Photographs</b>	
<b>Appendix H. Original Report</b>	



### History of this test report

Report No.	Version	Description	Issued Date
FR8D1924A	01	Initial issue of report	Nov. 14, 2019



### Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
-	15.247(a)(2)	6dB Bandwidth	Not Required	-
-	2.1049	99% Occupied Bandwidth	Not Required	-
3.1	15.247(b)	Power Output Measurement	Pass	-
-	15.247(e)	Power Spectral Density	Not Required	-
-	15.247(d)	Conducted Band Edges	Not Required	-
		Conducted Spurious Emission	Not Required	-
3.2	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	Pass	Under limit 0.58 dB at 65.890 MHz
-	15.207	AC Conducted Emission	Not Required	-
3.3	15.203 & 15.247(b)	Antenna Requirement	Pass	-

**Remark:**

1. Not required means after assessing, test items are not necessary to carry out.
2. This is a variant report by changing model name and adding a new antenna model. All the test cases were performed on original report which can be referred to Sporton Report Number FR8D1930A as appendix H. Based on the original report, the test cases were verified.

**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: Tina Chuang**



# 1 General Description

## 1.1 Product Feature of Equipment Under Test

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

Antenna Information					
	Antenna Type	Brand Name	Model	2.4GHz ~ 2.5GHz Gain(dBi)	4.9GHz ~ 5.8GHz Gain(dBi)
1.	PCB	Texas Instruments	CC3235MODAx Dual-Band Wi-Fi Antenna	3.5	4.5
2.	Chip	Pulse	W3078	1.7	4.3
3.		Yageo	ANT5320LL04R2455A	2.17	3.51
4.		Ethertronics	M830520	1	2.6
5.	1000423		-0.6	4.5	
6.	PCB	Laird	CAF94504	2	4
7.			CAF94505	2	4
8.	Dipole	LSR	001-0012	2	2
9.			080-0013	2	2
10.			080-0014	2	2
11.	PIFA		001-0016	2.5	3
12.			001-0021	2.5	3

Note: The EUT used a Dual-Band Wi-Fi Antenna (Antenna 1 from Texas Instruments)

## 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. EMC & Wireless Communications Laboratory
<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

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

<b>Test Site</b>	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
<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>
	03CH15-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

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:, radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Z plane) were recorded in this report.

### 2.1 Carrier Frequency and Channel

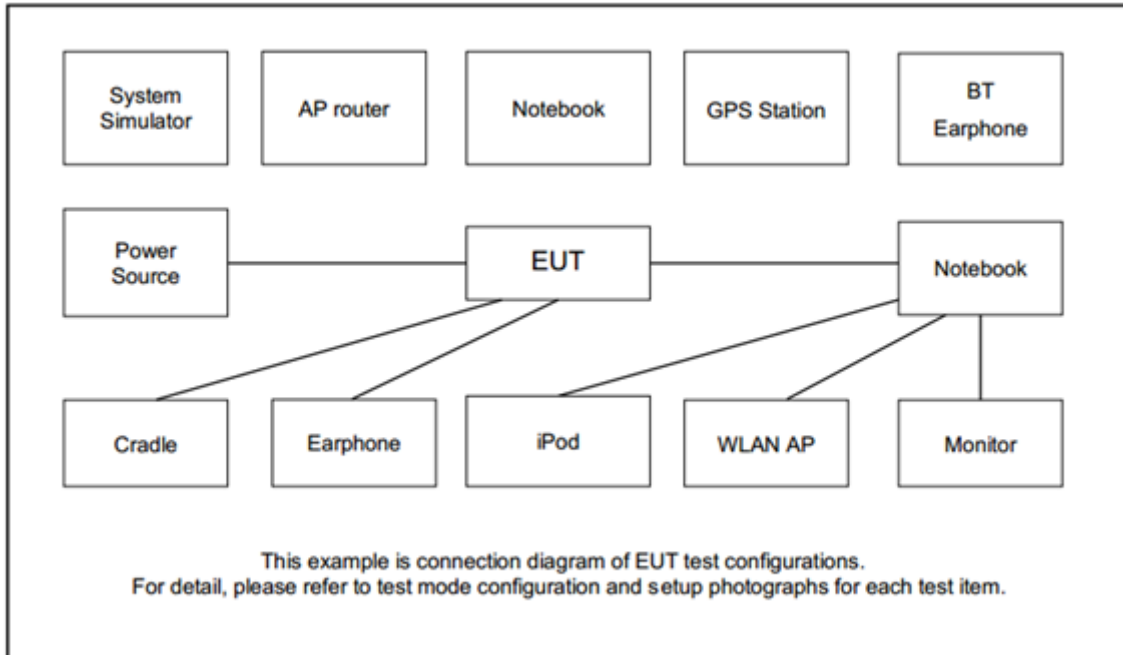
Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437		

### 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

### 2.3 Connection Diagram of Test System



### 2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Notebook	Lenovo	L570	FCC DoC	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m

### 2.5 EUT Operation Test Setup

The RF test items, utility “CC31XX/CC32XX Radio Tool\_v1.0.3.12” 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.



### 3 Test Result

#### 3.1 Output Power Measurement

##### 3.1.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna 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.

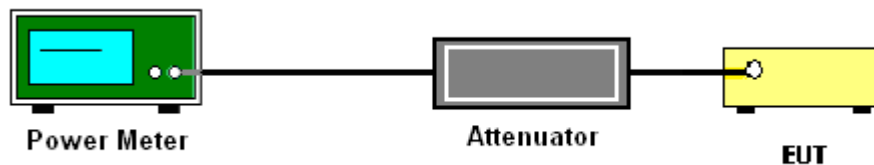
##### 3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

##### 3.1.3 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 ANSI C63.10 Section 11.9.2.3.2 Method AVGPM-G
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.

##### 3.1.4 Test Setup



##### 3.1.5 Test Result of Peak Output Power

Please refer to Appendix A.

##### 3.1.6 Test Result of Average Output Power (Reporting Only)

Please refer to Appendix A.



### 3.2 Radiated Band Edges and Spurious Emission Measurement

#### 3.2.1 Limit of Radiated band edge and Spurious Emission Measurement

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

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

#### 3.2.2 Measuring Instruments

See list of measuring equipment of this test report.

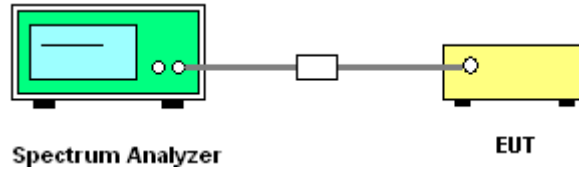


### 3.2.3 Test Procedures

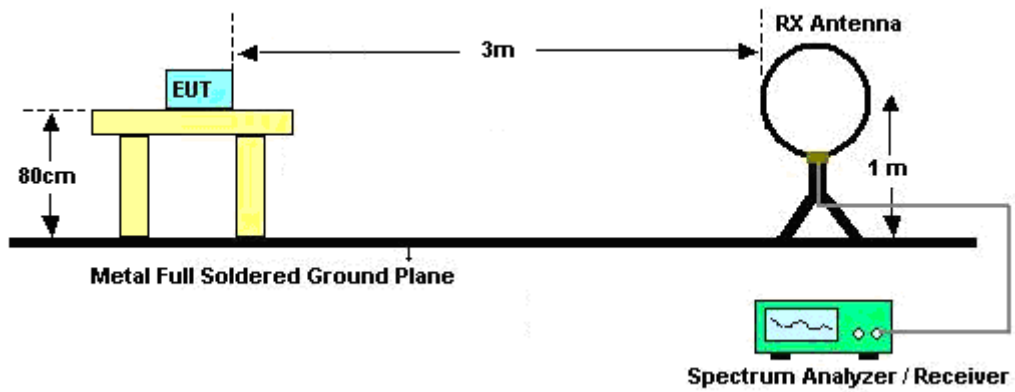
1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the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

### 3.2.4 Test Setup

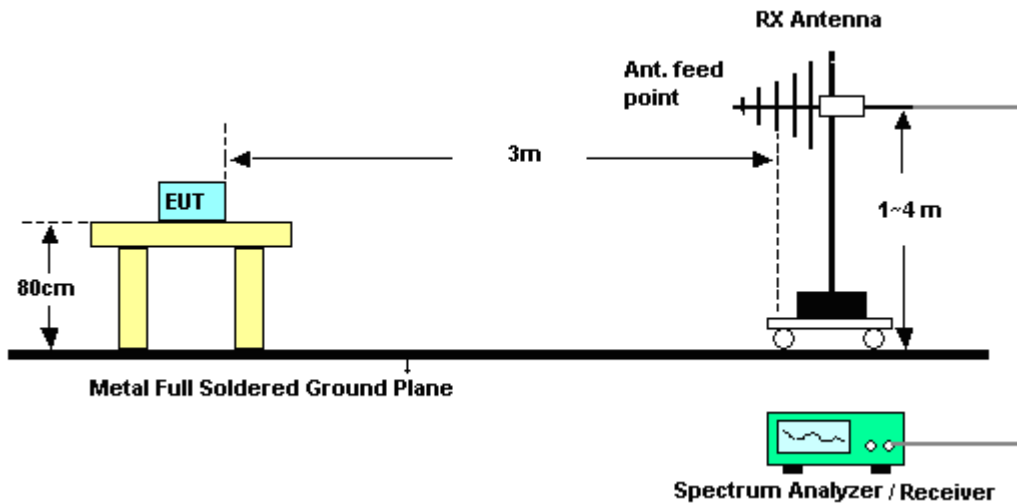
For Conducted Measurement Setup:



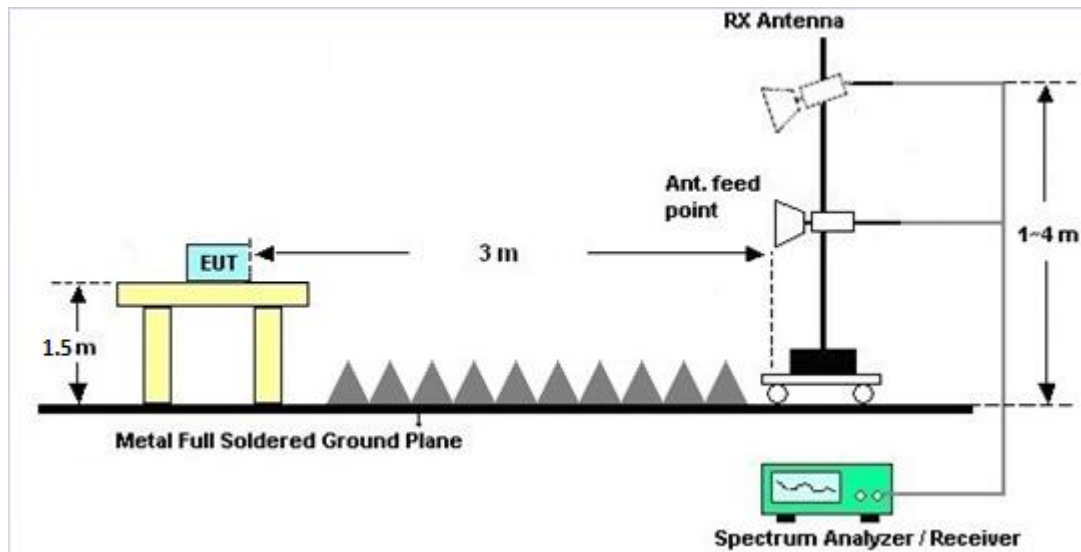
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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

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

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.

### 3.2.6 Test Result of Conduced Spurious at Band Edges in the Restricted Band

Please refer to Appendix B and C.

### 3.2.7 Test Result of Conduced Spurious Emission in the Restricted Band

Please refer to Appendix B and C.

### 3.2.8 Test Result of Cabinet Radiated Spurious at Band Edges

Please refer to Appendix D and E.

### 3.2.9 Test Result of Cabinet Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix D and E.

### 3.2.10 Duty Cycle

Please refer to Appendix F.



### **3.3 Antenna Requirements**

#### **3.3.1 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.

#### **3.3.2 Antenna Anti-Replacement Construction**

An embedded-in antenna design is used.

#### **3.3.3 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	RPR3006W	16I00054S NO10	10MHz~6GHz	Dec. 19, 2018	Oct. 23, 2019	Dec. 18, 2019	Conducted (TH05-HY)
Power Meter	Anritsu	ML2495A	0932001	N/A	Oct. 03, 2019	Oct. 23, 2019	Oct. 02, 2020	Conducted (TH05-HY)
Power Sensor	Anritsu	MA2411B	1207349	300MHz~40GHz	Sep. 06, 2019	Oct. 23, 2019	Sep. 05, 2020	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101397	10Hz~40GHz	Nov. 13, 2018	Oct. 23, 2019	Nov. 12, 2019	Conducted (TH05-HY)
Switch Box & RF Cable	Burgeon	ETF-058	EC120838 2	N/A	Mar. 27, 2019	Oct. 23, 2019	Mar. 26, 2020	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSV40	101565	10Hz~40GHz	Jul. 12, 2019	Nov. 05, 2019~ Nov. 06, 2019	Jul. 11, 2020	Conducted (TH05-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2859/2	30MHz-40GHz	Mar. 13, 2019	Nov. 05, 2019~ Nov. 06, 2019	Mar. 12, 2020	Conducted (TH05-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY4274/2	30MHz-40GHz	Mar. 13, 2019	Nov. 05, 2019~ Nov. 06, 2019	Mar. 12, 2020	Conducted (TH05-HY)
Filter	Wainwright	WLKS1200-1 2SS	SN2	1.2 GHz Lowpass	Sep. 22, 2019	Nov. 05, 2019~ Nov. 06, 2019	Sep. 21, 2020	Conducted (TH05-HY)
Filter	Wainwright	WHKX12-270 0-3000-18000 -60SS	SN2	3 GHz Highpass	Sep. 15, 2019	Nov. 05, 2019~ Nov. 06, 2019	Sep. 14, 2020	Conducted (TH05-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Jan. 07, 2019	Oct. 31, 2019~ Nov. 08, 2019	Jan. 06, 2020	Radiation (03CH15-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz ~ 40GHz	Dec. 06, 2018	Oct. 31, 2019~ Nov. 08, 2019	Dec. 05, 2019	Radiation (03CH15-HY)
Bilog Antenna	TESEQ	CBL6111D&0 0800N1D01N- 06	41912&05	30MHz to 1GHz	Feb. 12, 2019	Oct. 31, 2019~ Nov. 08, 2019	Feb. 11, 2020	Radiation (03CH15-HY)
Horn Antenna	SCHWARZBE CK	BBHA 9120 D	9120D-211 4	1-18GHz	Jul. 31, 2019	Oct. 31, 2019~ Nov. 08, 2019	Jul. 30, 2020	Radiation (03CH15-HY)
SHF-EHF Horn Antenna	SCHWARZBE CK	BBHA 9170	BBHA9170 584	18GHz- 40GHz	Dec. 05, 2018	Oct. 31, 2019~ Nov. 08, 2019	Dec. 04, 2019	Radiation (03CH15-HY)
Amplifier	SONOMA	310N	363440	9kHz~1GHz	Dec. 28, 2018	Oct. 31, 2019~ Nov. 08, 2019	Dec. 27, 2019	Radiation (03CH15-HY)
Preamplifier	Jet-Power	JPA0118-55-3 03	171000180 0054001	1GHz~18GHz	May 19, 2019	Oct. 31, 2019~ Nov. 08, 2019	May 18, 2020	Radiation (03CH15-HY)
Preamplifier	Keysight	83017A	MY532701 95	1GHz~26.5GHz	Aug. 23, 2019	Oct. 31, 2019~ Nov. 08, 2019	Aug. 22, 2020	Radiation (03CH15-HY)
EMI Test Receiver	Keysight	N9038A(MXE )	MY554201 70	20MHz~8.4GHz	Mar. 08, 2019	Oct. 31, 2019~ Nov. 08, 2019	Mar. 07, 2020	Radiation (03CH15-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100390	20Hz~26.5GHz	Dec. 27, 2018	Oct. 31, 2019~ Nov. 08, 2019	Dec. 26, 2019	Radiation (03CH15-HY)
Controller	ChainTek	3000-1	N/A	Control Turn table & Ant Mast	N/A	Oct. 31, 2019~ Nov. 08, 2019	N/A	Radiation (03CH15-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Oct. 31, 2019~ Nov. 08, 2019	N/A	Radiation (03CH15-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Oct. 31, 2019~ Nov. 08, 2019	N/A	Radiation (03CH15-HY)
Software	Audix	E3 6.2009-8-24(k 5)	RK-00045 1	N/A	N/A	Oct. 31, 2019~ Nov. 08, 2019	N/A	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY36980/ 4	30M-18G	Apr. 15, 2019	Oct. 31, 2019~ Nov. 08, 2019	Apr. 14, 2020	Radiation (03CH15-HY)



Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9838/4 PE	30M-18G	Apr. 15, 2019	Oct. 31, 2019~ Nov. 08, 2019	Apr. 14, 2020	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY802430 /4	30M~18GHz	May 13, 2019	Oct. 31, 2019~ Nov. 08, 2019	May 12, 2020	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2859/2	30MHz-40GHz	Mar. 13, 2019	Oct. 31, 2019~ Nov. 08, 2019	Mar. 12, 2020	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY4274/2	30MHz-40GHz	Mar. 13, 2019	Oct. 31, 2019~ Nov. 08, 2019	Mar. 12, 2020	Radiation (03CH15-HY)
Filter	Wainwright	WLK4-1000-1 530-8000-40S S	SN4	1.53G Low Pass	Jul. 04, 2019	Oct. 31, 2019~ Nov. 08, 2019	Jul. 03, 2020	Radiation (03CH15-HY)
Filter	Wainwright	WHKX12-270 0-3000-18000 -60ST	SN2	3GHz High Pass Filter	Jul. 17, 2019	Oct. 31, 2019~ Nov. 08, 2019	Jul. 16, 2020	Radiation (03CH15-HY)





## 5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	5.2
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### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

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

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

Test Engineer:	Rebecca Li	Temperature:	21~25	°C
Test Date:	2019/10/23	Relative Humidity:	51~54	%

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

2.4GHz Band																
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
					Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	
11b	1Mbps	1	1	2412	17.28	-	-	30.00	-	3.50	-	20.78	-	36.00	-	Pass
11b	1Mbps	1	6	2437	17.45	-	-	30.00	-	3.50	-	20.95	-	36.00	-	Pass
11b	1Mbps	1	11	2462	17.33	-	-	30.00	-	3.50	-	20.83	-	36.00	-	Pass
11g	6Mbps	1	1	2412	19.01	-	-	30.00	-	3.50	-	22.51	-	36.00	-	Pass
11g	6Mbps	1	6	2437	19.64	-	-	30.00	-	3.50	-	23.14	-	36.00	-	Pass
11g	6Mbps	1	11	2462	19.07	-	-	30.00	-	3.50	-	22.57	-	36.00	-	Pass
HT20	MCS0	1	1	2412	19.05	-	-	30.00	-	3.50	-	22.55	-	36.00	-	Pass
HT20	MCS0	1	6	2437	19.53	-	-	30.00	-	3.50	-	23.03	-	36.00	-	Pass
HT20	MCS0	1	11	2462	18.98	-	-	30.00	-	3.50	-	22.48	-	36.00	-	Pass

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

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

2.4GHz Band									
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power (dBm)		
					Ant 1	Ant 2	Ant 1	Ant 2	SUM
11b	1Mbps	1	1	2412	-	-	15.10	-	-
11b	1Mbps	1	6	2437	-	-	15.40	-	
11b	1Mbps	1	11	2462	-	-	15.30	-	
11g	6Mbps	1	1	2412	-	-	10.50	-	
11g	6Mbps	1	6	2437	-	-	15.00	-	
11g	6Mbps	1	11	2462	-	-	10.30	-	
HT20	MCS0	1	1	2412	-	-	10.30	-	
HT20	MCS0	1	6	2437	-	-	14.90	-	
HT20	MCS0	1	11	2462	-	-	10.10	-	



### Appendix B. Conducted Spurious Emission

Test Engineer :	Richard Qiu	Temperature :	23~25°C
		Relative Humidity :	52~58%

#### 2.4GHz 2400~2483.5MHz

#### WIFI 802.11b (Band Edge)

WIFI Ant.	Note	Frequency ( MHz )	Level ( dBm )	Over Limit ( dB )	Limit Line ( dBm )	Read Level (dBm)	Antenna Gain ( dBi )	Path Loss ( dB )	MIMO Factor ( dB )	Grounding Factor ( dB )	Peak Avg. (P/A)
802.11b CH 01 2412MHz		2373.525	-36.44	-15.24	-21.2	-42.16	3.5	2.22	0	0	P
		2387.805	-48.52	-7.32	-41.2	-54.25	3.5	2.23	0	0	A
	*	2412	12.26	-	-	6.51	3.5	2.25	0	0	P
	*	2412	8.83	-	-	3.08	3.5	2.25	0	0	A
802.11b CH 06 2437MHz		2355.5	-38.71	-17.51	-21.2	-44.43	3.5	2.22	0	0	P
		2357.6	-48.12	-6.92	-41.2	-53.84	3.5	2.22	0	0	A
	*	2437	12.83	-	-	7.07	3.5	2.26	0	0	P
	*	2437	9.14	-	-	3.38	3.5	2.26	0	0	A
		2490.27	-38.14	-16.94	-21.2	-43.93	3.5	2.29	0	0	P
		2493.7	-49.67	-8.47	-41.2	-55.46	3.5	2.29	0	0	A
802.11b CH 11 2462MHz	*	2462	13.66	-	-	7.89	3.5	2.27	0	0	P
	*	2462	9.13	-	-	3.36	3.5	2.27	0	0	A
		2487.48	-34.95	-13.75	-21.2	-40.74	3.5	2.29	0	0	P
		2496.96	-46.51	-5.31	-41.2	-52.3	3.5	2.29	0	0	A
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)

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dBm )	Over Limit ( dB )	Limit Line ( dBm )	Read Level (dBm)	Antenna Gain ( dBi )	Path Loss ( dB )	MIMO Factor ( dB )	Grounding Factor ( dB )	Peak Avg. (P/A)
802.11b CH 01 2412MHz		4018.7	-46.28	-25.08	-21.2	-53.45	3.5	3.67	0	0	P
		4824	-57.83	-36.63	-21.2	-65.19	3.5	3.86	0	0	P
802.11b CH 06 2437MHz		4061.4	-47.13	-25.93	-21.2	-54.33	3.5	3.7	0	0	P
		4874	-51.27	-30.07	-21.2	-58.65	3.5	3.88	0	0	P
		7311	-63.35	-42.15	-21.2	-71.7	3.5	4.85	0	0	P
802.11b CH 11 2462MHz		4098	-48.9	-27.7	-21.2	-56.13	3.5	3.73	0	0	P
		4924	-48.77	-27.57	-21.2	-56.16	3.5	3.89	0	0	P
		7386	-60.83	-39.63	-21.2	-69.26	3.5	4.93	0	0	P
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)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	MIMO	Groun	Peak
Ant.				Limit	Line	Level	Gain	Loss	Factor	ding	Avg.
1		( MHz )	( dBm )	( dB )	( dBm )	(dBm)	( dBi )	( dB )	( dB )	( dB )	(P/A)
802.11g CH 01 2412MHz		2389.485	-36.61	-15.41	-21.2	-42.34	3.5	2.23	0	0	P
		2389.17	-47.29	-6.09	-41.2	-53.02	3.5	2.23	0	0	A
	*	2412	10.21	-	-	4.46	3.5	2.25	0	0	P
	*	2412	1.7	-	-	-4.05	3.5	2.25	0	0	A
802.11g CH 06 2437MHz		2381.54	-38.32	-17.12	-21.2	-44.05	3.5	2.23	0	0	P
		2380.7	-47.82	-6.62	-41.2	-53.55	3.5	2.23	0	0	A
	*	2437	14.57	-	-	8.81	3.5	2.26	0	0	P
	*	2437	6.6	-	-	0.84	3.5	2.26	0	0	A
		2483.9	-37.52	-16.32	-21.2	-43.31	3.5	2.29	0	0	P
	2483.62	-46.86	-5.66	-41.2	-52.65	3.5	2.29	0	0	A	
802.11g CH 11 2462MHz	*	2462	10.07	-	-	4.3	3.5	2.27	0	0	P
	*	2462	2.05	-	-	-3.72	3.5	2.27	0	0	A
		2483.6	-33.46	-12.26	-21.2	-39.25	3.5	2.29	0	0	P
		2483.64	-46.52	-5.32	-41.2	-52.31	3.5	2.29	0	0	A
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)

Table with 12 columns: WIFI Ant. 1, Note, Frequency (MHz), Level (dBm), Over Limit (dB), Limit Line (dBm), Read Level (dBm), Antenna Gain (dBi), Path Loss (dB), MIMO Factor (dB), Grounding Factor (dB), Peak Avg. (P/A). Rows include data for 802.11g CH 01 (2412MHz), CH 06 (2437MHz), and CH 11 (2462MHz), plus a Remark section.





2.4GHz 2400~2483.5MHz

WIFI 802.11n HT20 (Band Edge)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	MIMO	Groun	Peak
Ant.				Limit	Line	Level	Gain	Loss	Factor	ding	Avg.
1		( MHz )	( dBm )	( dB )	( dBm )	(dBm)	( dBi )	( dB )	( dB )	( dB )	(P/A)
802.11n HT20 CH 01 2412MHz		2388.645	-34.78	-13.58	-21.2	-40.51	3.5	2.23	0	0	P
		2389.8	-46.74	-5.54	-41.2	-52.47	3.5	2.23	0	0	A
	*	2412	10.18	-	-	4.43	3.5	2.25	0	0	P
	*	2412	1.97	-	-	-3.78	3.5	2.25	0	0	A
802.11n HT20 CH 06 2437MHz		2324.42	-38.31	-17.11	-21.2	-44.02	3.5	2.21	0	0	P
		2323.44	-48.95	-7.75	-41.2	-54.66	3.5	2.21	0	0	A
	*	2437	13.58	-	-	7.82	3.5	2.26	0	0	P
	*	2437	5.34	-	-	-0.42	3.5	2.26	0	0	A
		2483.48	-38.87	-17.67	-21.2	-44.66	3.5	2.29	0	0	P
	2484.32	-48.37	-7.17	-41.2	-54.16	3.5	2.29	0	0	A	
802.11n HT20 CH 11 2462MHz	*	2462	9.75	-	-	3.98	3.5	2.27	0	0	P
	*	2462	1.73	-	-	-4.04	3.5	2.27	0	0	A
		2483.64	-31.63	-10.43	-21.2	-37.42	3.5	2.29	0	0	P
		2483.64	-46.06	-4.86	-41.2	-51.85	3.5	2.29	0	0	A
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)**

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dBm )	Over Limit ( dB )	Limit Line ( dBm )	Read Level (dBm)	Antenna Gain ( dBi )	Path Loss ( dB )	MIMO Factor ( dB )	Grounding Factor ( dB )	Peak Avg. (P/A)
802.11n HT20 CH 01 2412MHz		4024.8	-46.19	-24.99	-21.2	-53.36	3.5	3.67	0	0	P
		4824	-65.43	-44.23	-21.2	-72.79	3.5	3.86	0	0	P
802.11n HT20 CH 06 2437MHz		4061.4	-45.61	-24.41	-21.2	-52.81	3.5	3.7	0	0	P
		4874	-53.83	-32.63	-21.2	-61.21	3.5	3.88	0	0	P
		7311	-58.84	-37.64	-21.2	-67.19	3.5	4.85	0	0	P
802.11n HT20 CH 11 2462MHz		4098	-50.54	-29.34	-21.2	-57.77	3.5	3.73	0	0	P
		4924	-54.78	-33.58	-21.2	-62.17	3.5	3.89	0	0	P
		7386	-63.12	-41.92	-21.2	-71.55	3.5	4.93	0	0	P
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 HT20 (LF)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	MIMO	Grounding	Peak	
Ant.				Limit	Line	Level	Gain	Loss	Factor	Factor	Avg.	
1		( MHz )	( dBm )	( dB )	( dBm )	(dBm)	( dBi )	( dB )	( dB )	( dB )	(P/A)	
2.4GHz 802.11n HT20 LF		83.46	-82.47	-27.27	-55.2	-91.21	3.5	0.54	0	4.7	P	
		167.16	-77.94	-26.24	-51.7	-86.89	3.5	0.75	0	4.7	P	
		261.66	-80.1	-30.9	-49.2	-89.12	3.5	0.82	0	4.7	P	
		351.8	-80.6	-31.4	-49.2	-89.7	3.5	0.9	0	4.7	P	
		518.4	-79.71	-30.51	-49.2	-89.02	3.5	1.11	0	4.7	P	
		825.7	-78.47	-29.27	-49.2	-88.11	3.5	1.44	0	4.7	P	
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average 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</b> or <b>Average</b>



A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	MIMO	Grounding	Peak
Ant.				Limit	Line	Level	Gain	Loss	Factor	Factor	Avg.
1		( MHz )	( dBm )	( dB )	( dBm )	( dBm )	( dBi )	( dB )	( dB )	( dB )	( P/A )
802.11b		2386.545	-39.03	-17.83	-21.2	-44.06	2	3.03	0	0	P
CH 01											
2412MHz		2386.125	-48.1	-6.9	-41.2	-53.13	2	3.03	0	0	A

1. Level(dBm) =

$$\text{Antenna Gain(dBi)} + \text{Path Loss(dB)} + \text{Read Level(dBm)} + \text{MIMO Factor(dB)} + \text{Grounding Factor(dB)}$$

2. Over Limit(dB) = Level(dBm) – Limit Line(dBm)

**For Peak Limit @ 2386.545MHz:**

1. Level(dBm)

$$= \text{Antenna Gain(dBi)} + \text{Path Loss(dB)} + \text{Read Level(dBm)} + \text{MIMO Factor(dB)} + \text{Grounding Factor(dB)}$$

$$= 2(\text{dB}) + 3.03(\text{dB}) - 44.06(\text{dBm})$$

$$= -39.03(\text{dBm})$$

2. Over Limit(dB)

$$= \text{Level(dBm)} - \text{Limit Line(dBm)}$$

$$= -39.03(\text{dBm}) + 21.2(\text{dBm})$$

$$= -17.83(\text{dB})$$

**For Average Limit @ 2386.125MHz:**

1. Level(dBm)

$$= \text{Antenna Gain(dBi)} + \text{Path Loss(dB)} + \text{Read Level(dBm)} + \text{MIMO Factor(dB)} + \text{Grounding Factor(dB)}$$

$$= 2(\text{dBi}) + 3.03(\text{dB}) - 53.13(\text{dBm})$$

$$= -48.1(\text{dBm})$$

2. Over Limit(dB)

$$= \text{Level(dB}\mu\text{V/m)} - \text{Limit Line(dB}\mu\text{V/m)}$$

$$= 43.54(\text{dB}\mu\text{V/m}) - 54(\text{dB}\mu\text{V/m})$$

$$= -6.9(\text{dB})$$

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



## Appendix C. Conducted Spurious Emission Plots

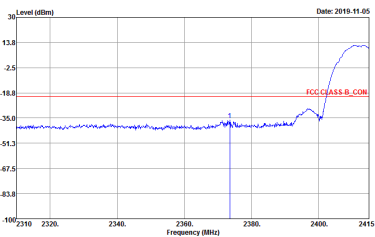
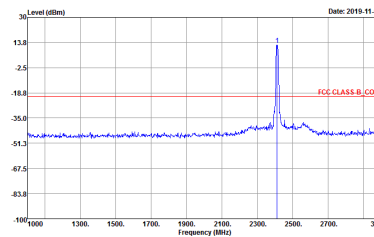
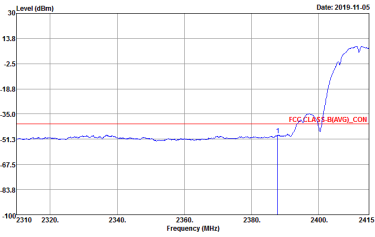
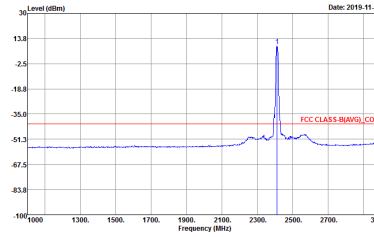
Test Engineer :	Richard Qiu	Temperature :	23~25°C
		Relative Humidity :	52~58%

### Note symbol

-L	Low channel location
-R	High channel location



2.4GHz 2400~2483.5MHz  
WIFI 802.11b (Band Edge)

WIFI	2.4GHz 2400~2483.5MHz Band Edge	
ANT	802.11b CH01 2412MHz	
1	CSE	Fundamental
Peak	 <p>Site : TH05-HY Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL RBW: 1000.000kHz VBW: 3000.000kHz Detector : Peak Project : 8D1924 Mode : 1 Setting : default</p>	 <p>Site : TH05-HY Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL RBW: 1000.000kHz VBW: 3000.000kHz Detector : Peak Project : 8D1924 Mode : 1 Setting : default</p>
Avg.	 <p>Site : TH05-HY Condition : FCC CLASS-B(AVG)_CON ANT GAIN +3.5 HORIZONTAL RBW: 1000.000kHz VBW: 3.000kHz Detector : Peak Project : 8D1924 Mode : 1 Setting : default</p>	 <p>Site : TH05-HY Condition : FCC CLASS-B(AVG)_CON ANT GAIN +3.5 HORIZONTAL RBW: 1000.000kHz VBW: 3.000kHz Detector : Peak Project : 8D1924 Mode : 1 Setting : default</p>



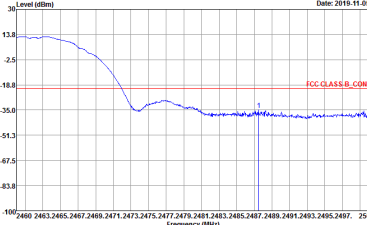
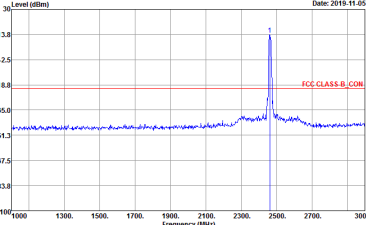
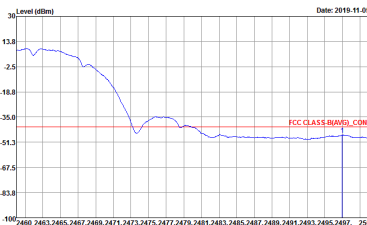
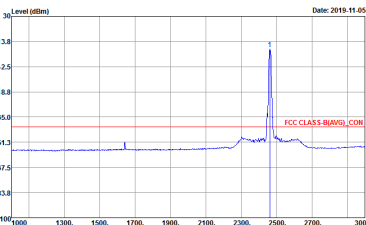
WIFI	2.4GHz 2400~2483.5MHz Band Edge	
ANT	802.11b CH06 2437MHz - L	
1	CSE	Fundamental
Peak	<p>Site : TH05-HY            Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : 2            Setting : default</p>	<p>Site : TH05-HY            Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : 2            Setting : default</p>
Avg.	<p>Site : TH05-HY            Condition : FCC CLASS-B(AVG)_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : 2            Setting : default</p>	<p>Site : TH05-HY            Condition : FCC CLASS-B(AVG)_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : 2            Setting : default</p>





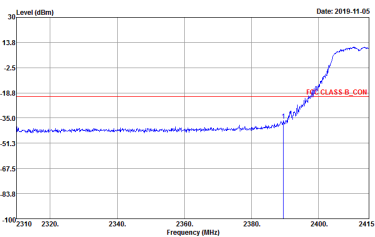
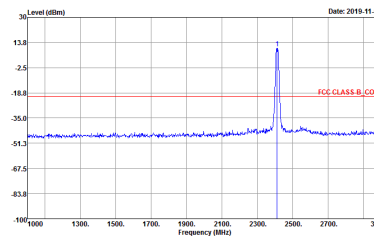
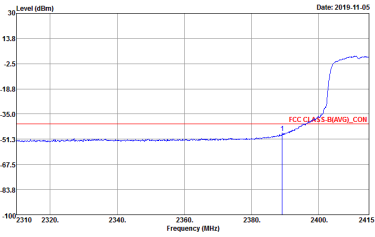
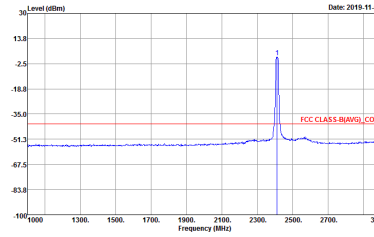
WIFI	2.4GHz 2400~2483.5MHz Band Edge	
ANT	802.11b CH06 2437MHz - R	
1	CSE	Fundamental
Peak	<p>Site : TH05-HY            Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : 2            Setting : default</p>	Left blank
Avg.	<p>Site : TH05-HY            Condition : FCC CLASS-B(AVG)_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : 2            Setting : default</p>	Left blank



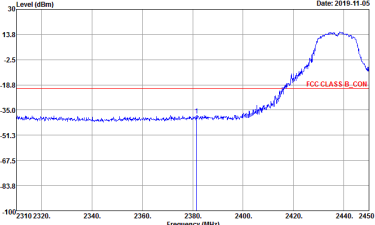
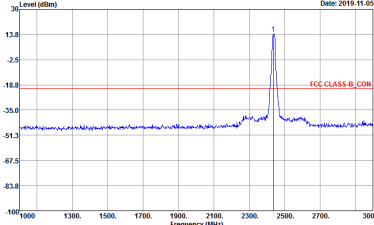
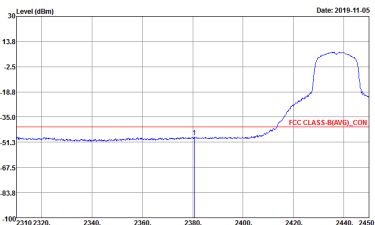
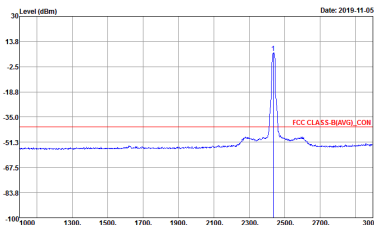
WIFI	2.4GHz 2400~2483.5MHz Band Edge	
ANT	802.11b CH11 2462MHz	
1	CSE	Fundamental
Peak	 <p>Site : TH05-HY            Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : 3            Setting : default</p>	 <p>Site : TH05-HY            Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : 3            Setting : default</p>
Avg.	 <p>Site : TH05-HY            Condition : FCC CLASS-B(AVG)_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : 3            Setting : default</p>	 <p>Site : TH05-HY            Condition : FCC CLASS-B(AVG)_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : 3            Setting : default</p>



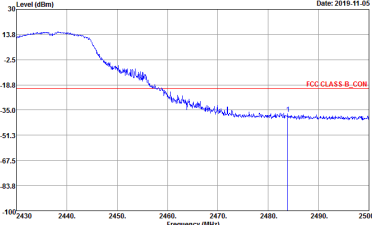
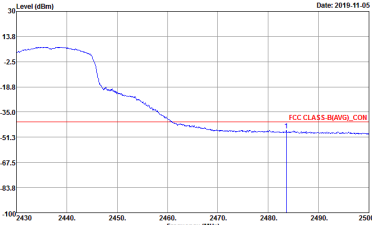
2.4GHz 2400~2483.5MHz  
WIFI 802.11g (Band Edge)

WIFI	2.4GHz 2400~2483.5MHz Band Edge	
ANT	802.11g CH01 2412MHz	
1	CSE	Fundamental
Peak	 <p>Site : TH05-HY Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL Detector : Peak Project : 8D1924 Mode : 4 Setting : default</p>	 <p>Site : TH05-HY Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL Detector : Peak Project : 8D1924 Mode : 4 Setting : default</p>
Avg.	 <p>Site : TH05-HY Condition : FCC CLASS-B(AVG)_CON ANT GAIN +3.5 HORIZONTAL Detector : Peak Project : 8D1924 Mode : 4 Setting : default</p>	 <p>Site : TH05-HY Condition : FCC CLASS-B(AVG)_CON ANT GAIN +3.5 HORIZONTAL Detector : Peak Project : 8D1924 Mode : 4 Setting : default</p>

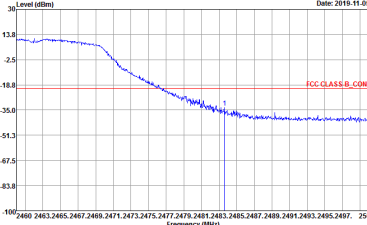
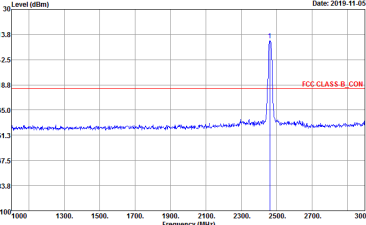
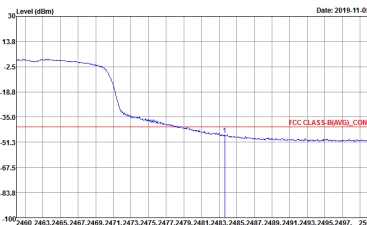
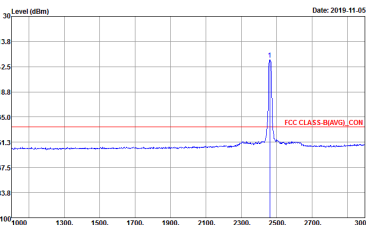


WIFI	2.4GHz 2400~2483.5MHz Band Edge	
ANT	802.11g CH06 2437MHz - L	
1	CSE	Fundamental
Peak	 <p>Date: 2019-11-05</p> <p>Site : TH05-HY            Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : S            Setting : default</p>	 <p>Date: 2019-11-05</p> <p>Site : TH05-HY            Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : S            Setting : default</p>
Avg.	 <p>Date: 2019-11-05</p> <p>Site : TH05-HY            Condition : FCC CLASS-B(AVG)_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : S            Setting : default</p>	 <p>Date: 2019-11-05</p> <p>Site : TH05-HY            Condition : FCC CLASS-B(AVG)_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : S            Setting : default</p>



WIFI	2.4GHz 2400~2483.5MHz Band Edge	
ANT	802.11g CH06 2437MHz - R	
1	CSE	Fundamental
<p><b>Peak</b></p>	 <p>Site : TH05-HY            Condition : FCC CLASS-B_OCN ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : S            Setting : default</p>	<p>Left blank</p>
<p><b>Avg.</b></p>	 <p>Site : TH05-HY            Condition : FCC CLASS-B(AVG)_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : S            Setting : default</p>	<p>Left blank</p>



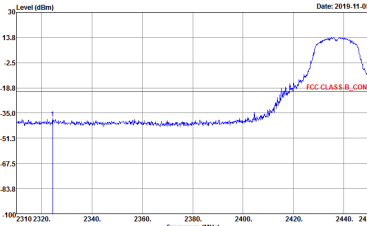
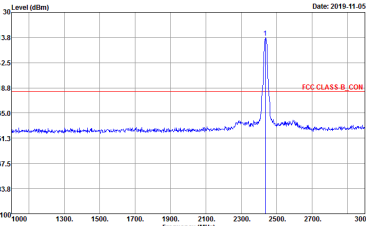
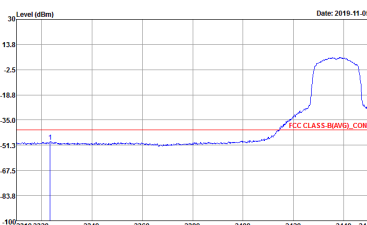
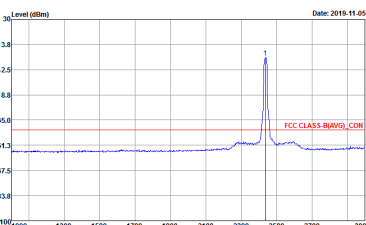
WIFI	2.4GHz 2400~2483.5MHz Band Edge	
ANT	802.11g CH11 2462MHz	
1	CSE	Fundamental
Peak	 <p>Site : TH05-HY            Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : 6            Setting : default</p>	 <p>Site : TH05-HY            Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : 6            Setting : default</p>
Avg.	 <p>Site : TH05-HY            Condition : FCC CLASS-B(AVG)_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : 6            Setting : default</p>	 <p>Site : TH05-HY            Condition : FCC CLASS-B(AVG)_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : 6            Setting : default</p>



2.4GHz 2400~2483.5MHz  
WIFI 802.11n HT20 (Band Edge)

WIFI	2.4GHz 2400~2483.5MHz Band Edge	
ANT	802.11n HT20 CH01 2412MHz	
1	CSE	Fundamental
Peak	<p>Site : TH05-HY Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL RBW: 1000.000kHz VBW: 3000.000kHz Detector : Peak Project : 8D1924 Mode : 7 Setting : default</p>	<p>Site : TH05-HY Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL RBW: 1000.000kHz VBW: 3000.000kHz Detector : Peak Project : 8D1924 Mode : 7 Setting : default</p>
Avg.	<p>Site : TH05-HY Condition : FCC CLASS-B(AVG)_CON ANT GAIN +3.5 HORIZONTAL RBW: 1000.000kHz VBW: 10.000kHz Detector : Peak Project : 8D1924 Mode : 7 Setting : default</p>	<p>Site : TH05-HY Condition : FCC CLASS-B(AVG)_CON ANT GAIN +3.5 HORIZONTAL RBW: 1000.000kHz VBW: 10.000kHz Detector : Peak Project : 8D1924 Mode : 7 Setting : default</p>



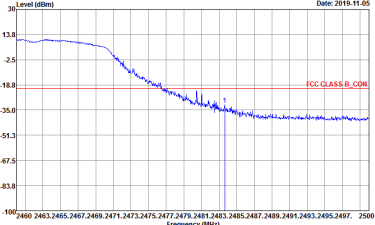
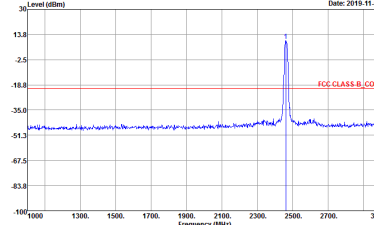
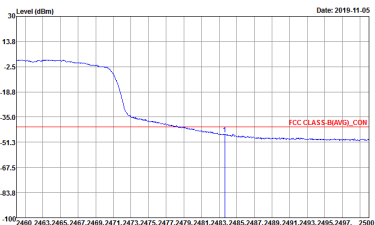
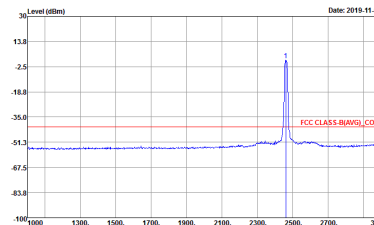
WIFI	2.4GHz 2400~2483.5MHz Band Edge	
ANT	802.11n HT20 CH06 2437MHz - L	
1	CSE	Fundamental
Peak	 <p>Date: 2019-11-05</p> <p>Site : TH05-HY            Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : S            Setting : default</p>	 <p>Date: 2019-11-05</p> <p>Site : TH05-HY            Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : S            Setting : default</p>
Avg.	 <p>Date: 2019-11-05</p> <p>Site : TH05-HY            Condition : FCC CLASS-B(AVG)_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : S            Setting : default</p>	 <p>Date: 2019-11-05</p> <p>Site : TH05-HY            Condition : FCC CLASS-B(AVG)_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : S            Setting : default</p>





WIFI	2.4GHz 2400~2483.5MHz Band Edge	
ANT	802.11n HT20 CH06 2437MHz - R	
1	CSE	Fundamental
<p><b>Peak</b></p>	<p>Site : TH05-HY            Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : S            Setting : default</p>	<p>Left blank</p>
<p><b>Avg.</b></p>	<p>Site : TH05-HY            Condition : FCC CLASS-B(AVG)_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : S            Setting : default</p>	<p>Left blank</p>



WIFI	2.4GHz 2400~2483.5MHz Band Edge	
ANT	802.11n HT20 CH11 2462MHz	
1	CSE	Fundamental
Peak	 <p>Site : TH05-HY            Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : 9            Setting : default</p>	 <p>Site : TH05-HY            Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : 9            Setting : default</p>
Avg.	 <p>Site : TH05-HY            Condition : FCC CLASS-B(AVG)_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : 9            Setting : default</p>	 <p>Site : TH05-HY            Condition : FCC CLASS-B(AVG)_CON ANT GAIN +3.5 HORIZONTAL            Detector : Peak            Project : 8D1924            Mode : 9            Setting : default</p>



2.4GHz 2400~2483.5MHz  
WIFI 802.11b (Harmonic)

WIFI	2.4GHz 2400~2483.5MHz Harmonic	
ANT	802.11b	
1	CH01 2412MHz	CH06 2437MHz
Peak Avg.	<p>Site : TH05-HY Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL Detector : Peak Project : 8D1924 Mode : 1 Setting : default</p>	<p>Site : TH05-HY Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL Detector : Peak Project : 8D1924 Mode : 2 Setting : default</p>



WIFI	2.4GHz 2400~2483.5MHz Harmonic	
ANT	802.11b	
1	CH11 2462MHz	-
Peak Avg.	<p>Site : TH05-HY Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL Detector : Peak Project : 801924 Mode : 3 Setting : default</p>	Left blank



**2.4GHz 2400~2483.5MHz**

**WIFI 802.11g (Harmonic)**

<b>WIFI</b>	<b>2.4GHz 2400~2483.5MHz Harmonic</b>	
<b>ANT</b>	<b>802.11g</b>	
<b>1</b>	<b>CH01 2412MHz</b>	<b>CH06 2437MHz</b>
<b>Peak Avg.</b>	<p>Site : TH05-HY Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL Detector : Peak Project : 8D1924 Mode : 4 Setting : default</p>	<p>Site : TH05-HY Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL Detector : Peak Project : 8D1924 Mode : 5 Setting : default</p>



WIFI	2.4GHz 2400~2483.5MHz Harmonic	
ANT	802.11g	
1	CH11 2462MHz	-
Peak Avg.	<p>Site : TH05-HY Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL Detector : Peak Project : 801924 Mode : S Setting : default</p>	Left blank



**2.4GHz 2400~2483.5MHz  
WIFI 802.11n HT20 (Harmonic)**

<b>WIFI</b>	<b>2.4GHz 2400~2483.5MHz Harmonic</b>	
<b>ANT</b>	<b>802.11n HT20</b>	
<b>1</b>	<b>CH01 2412MHz</b>	<b>CH06 2437MHz</b>
<b>Peak Avg.</b>	<p>Site : TH05-HY Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL Detector : Peak Project : 8D1924 Mode : S Setting : default</p>	<p>Site : TH05-HY Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL Detector : Peak Project : 8D1924 Mode : S Setting : default</p>



<b>WIFI</b>	<b>2.4GHz 2400~2483.5MHz Harmonic</b>	
<b>ANT</b>	<b>802.11n HT20</b>	
<b>1</b>	<b>CH11 2462MHz</b>	<b>-</b>
<b>Peak Avg.</b>	<p>Site : TH05-HY Condition : FCC CLASS-B_CON ANT GAIN +3.5 HORIZONTAL Detector : Peak Project : 801924 Mode : S Setting : default</p>	<b>Left blank</b>





Emission below 1GHz  
2.4GHz WIFI 802.11n HT20 (LF)

<b>WIFI</b>	<b>2.4GHz 2400~2483.5MHz</b>	
<b>ANT</b>	<b>802.11n HT20</b>	
<b>1</b>		
<b>QP / Peak</b>	<p>Site : TH05-HY Condition : FCC CLASS-B限值 ANT GAIN +3.5 HORIZONTAL Detector : Peak Project : ED1924 Mode : 50 Setting : default</p>	<b>Left blank</b>



## Appendix D. Cabinet Radiated Spurious Emission

Test Engineer :	Bigshow Wang	Temperature :	24.3~25.2°C
		Relative Humidity :	55~64%

### 2.4GHz 2400~2483.5MHz

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

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )	
802.11b CH 11 2462MHz	*	2462	93.43	-	-	80.53	27.78	16.23	31.11	236	251	P	H	
	*	2462	90.29	-	-	77.39	27.78	16.23	31.11	236	251	A	H	
		2496.76	56.35	-17.65	74	43.46	27.71	16.27	31.09	236	251	P	H	
		2497.6	47.8	-6.2	54	34.92	27.7	16.27	31.09	236	251	A	H	
													H	
														H
	*	2462	100.51	-	-	87.61	27.78	16.23	31.11	329	197	P	V	
	*	2462	97.34	-	-	84.44	27.78	16.23	31.11	329	197	A	V	
		2483.6	57.61	-16.39	74	44.73	27.73	16.25	31.1	329	197	P	V	
		2499.92	48.17	-5.83	54	35.29	27.7	16.27	31.09	329	197	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 )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
<b>802.11b CH 11 2462MHz</b>		4110	54.76	-19.24	74	74.24	29.72	8.9	58.1	299	243	P	H
		4110	50.08	-3.92	54	69.56	29.72	8.9	58.1	299	243	A	H
		4924	42.59	-31.41	74	59.73	31.4	9.59	58.13	100	0	P	H
		7386	47.61	-26.39	74	56.71	36.63	11.67	57.4	100	0	P	H
		4104	54.68	-19.32	74	74.17	29.71	8.9	58.1	100	276	P	V
		4104	50	-4	54	69.49	29.71	8.9	58.1	100	276	A	V
		4924	43.54	-30.46	74	60.68	31.4	9.59	58.13	100	0	P	V
		7386	45.34	-28.66	74	54.44	36.63	11.67	57.4	100	0	P	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

Emission below 1GHz

2.4GHz WIFI 802.11b (LF)

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )	
2.4GHz 802.11b LF		66.86	37.37	-2.63	40	56.76	12.06	1.11	32.56	273	323	Q	H	
	*	66.86	43.56	-	-	62.95	12.06	1.11	32.56	273	323	P	H	
		167.74	33.34	-10.16	43.5	48.18	15.83	1.83	32.5			P	H	
		192.96	29.73	-13.77	43.5	45.49	14.8	1.93	32.49			P	H	
		307.42	38.18	-7.82	46	49.11	19.3	2.31	32.54			P	H	
		385.02	32.52	-13.48	46	41.23	21.3	2.54	32.55			P	H	
		548.95	30.78	-15.22	46	35.25	24.97	3.14	32.58			P	H	
														H
														H
														H
														H
														H
			65.89	32.89	-7.11	40	52.52	11.82	1.11	32.56	100	241	Q	V
			65.89	39.42	-0.58	40	59.05	11.82	1.11	32.56	100	241	P	V
			167.74	28.35	-15.15	43.5	43.19	15.83	1.83	32.5			P	V
			192.96	27.13	-16.37	43.5	42.89	14.8	1.93	32.49			P	V
			308.39	34.09	-11.91	46	45.03	19.3	2.3	32.54			P	V
			382.11	32.95	-13.05	46	41.79	21.18	2.53	32.55			P	V
			514.03	31.11	-14.89	46	36.64	24.1	2.94	32.57			P	V
														V
													V	
													V	
													V	
													V	
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</b> or <b>Average</b>
H/V	<b>H</b> orizontal or <b>V</b> ertical



A calculation example for radiated spurious emission is shown as below:

WIFI Ant. 1	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11b CH 01		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
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(dBμV/m) = Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

**For Peak Limit @ 2390MHz:**

1. Level(dBμV/m) = Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB) = 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB) = 55.45 (dBμV/m)
2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m) = 55.45(dBμV/m) – 74(dBμV/m) = -18.55(dB)

**For Average Limit @ 2390MHz:**

1. Level(dBμV/m) = Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB) = 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB) = 43.54 (dBμV/m)
2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m) = 43.54(dBμV/m) – 54(dBμV/m) = -10.46(dB)

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



## Appendix E. Cabinet Radiated Spurious Emission Plots

Test Engineer :	Bigshow Wang	Temperature :	24.3~25.2°C
		Relative Humidity :	55~64%

### Note symbol

-L	Low channel location
-R	High channel location

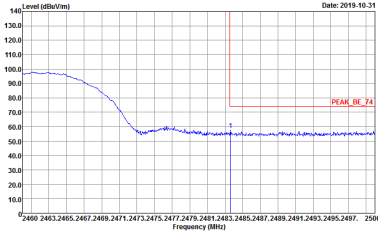
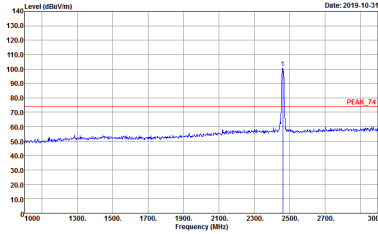
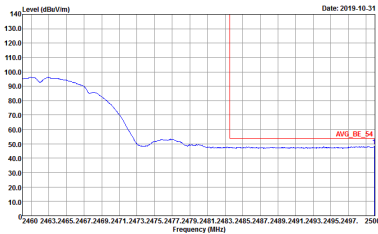
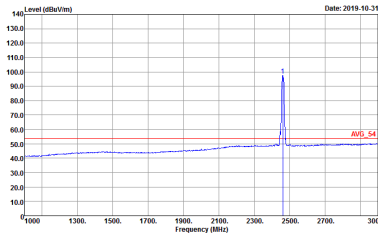


2.4GHz 2400~2483.5MHz  
WIFI 802.11b (Band Edge @ 3m)

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH11 2462MHz	
1	Horizontal	Fundamental
<b>Peak</b>	<p>Site : 03CH15-IHY Condition : PEAK_BE_74 3m HORN_9120D_2114 HORIZONTAL Detector : Peak Project : 8D1924</p>	<p>Site : 03CH15-IHY Condition : PEAK_74 3m HORN_9120D_2114 HORIZONTAL Detector : Peak Project : 8D1924</p>
<b>Avg.</b>	<p>Site : 03CH15-IHY Condition : AVG_BE_54 3m HORN_9120D_2114 HORIZONTAL Detector : Peak Project : 8D1924</p>	<p>Site : 03CH15-IHY Condition : AVG_54 3m HORN_9120D_2114 HORIZONTAL Detector : Peak Project : 8D1924</p>



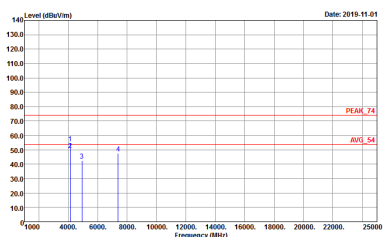
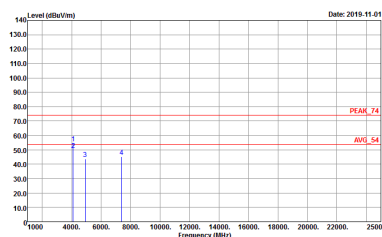


WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH11 2462MHz	
1	Vertical	Fundamental
Peak	 <p>Site : 03CH15-HY            Condition : PEAK_BE_74 3m HORN_91200_2114 VERTICAL            RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 8D1924</p>	 <p>Site : 03CH15-HY            Condition : PEAK_74 3m HORN_91200_2114 VERTICAL            RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 8D1924</p>
Avg.	 <p>Site : 03CH15-HY            Condition : AVG_BE_54 3m HORN_91200_2114 VERTICAL            RBW:1000.000KHz VBW:3.000KHz SWT:Auto            Detector : Peak            Project : 8D1924</p>	 <p>Site : 03CH15-HY            Condition : AVG_54 3m HORN_91200_2114 VERTICAL            RBW:1000.000KHz VBW:3.000KHz SWT:Auto            Detector : Peak            Project : 8D1924</p>



2.4GHz 2400~2483.5MHz

WIFI 802.11b (Harmonic @ 3m)

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11b CH11 2462MHz	
1	Horizontal	Vertical
<p>Peak</p> <p>Avg.</p>	 <p>Site : 03CH15-1FY          Condition : PEAK_74 3m HORN_9120D_2114 HORIZONTAL          Detector : Peak          Project : 8D1924</p>	 <p>Site : 03CH15-1FY          Condition : PEAK_74 3m HORN_9120D_2114 VERTICAL          Detector : Peak          Project : 8D1924</p>



Emission below 1GHz  
2.4GHz WIFI 802.11b (LF)

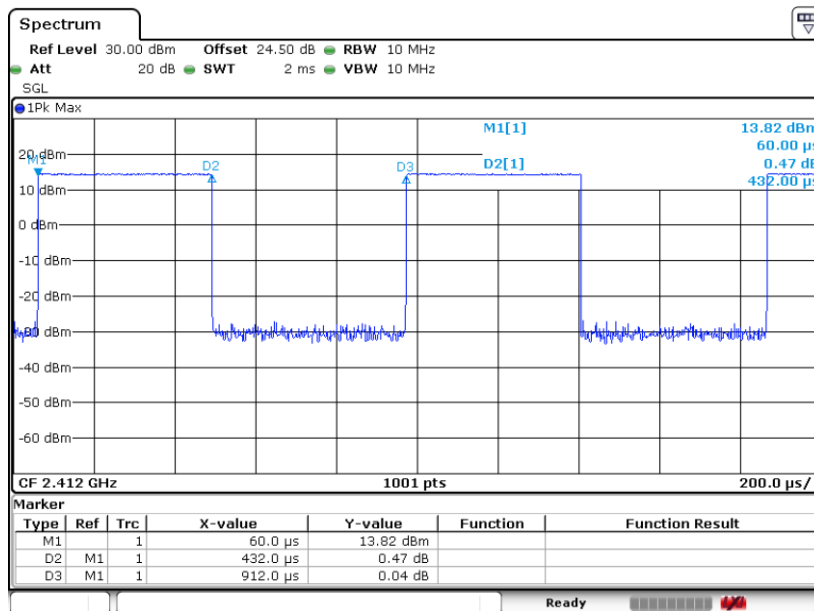
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ANT	802.11b LF	
1	Horizontal	Vertical
QP / Peak	<p>Site : 03CH15-FY Condition : QP 3m BTL0G_15_41912 HORIZONTAL Detector : Peak Project : 8D1924</p>	<p>Site : 03CH15-FY Condition : QP 3m BTL0G_15_41912 VERTICAL Detector : Peak Project : 8D1924</p>



## Appendix F. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
802.11b	47.37	432	2.31	3kHz	3.24
802.11g	45.71	160	6.25	10kHz	3.40
2.4GHz 802.11n HT20	40.00	160	6.25	10kHz	3.98

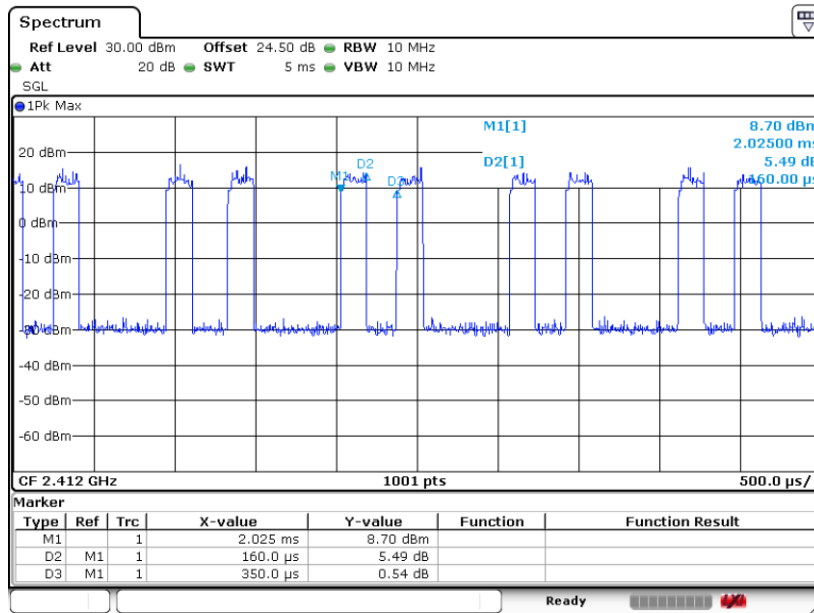
### 802.11b



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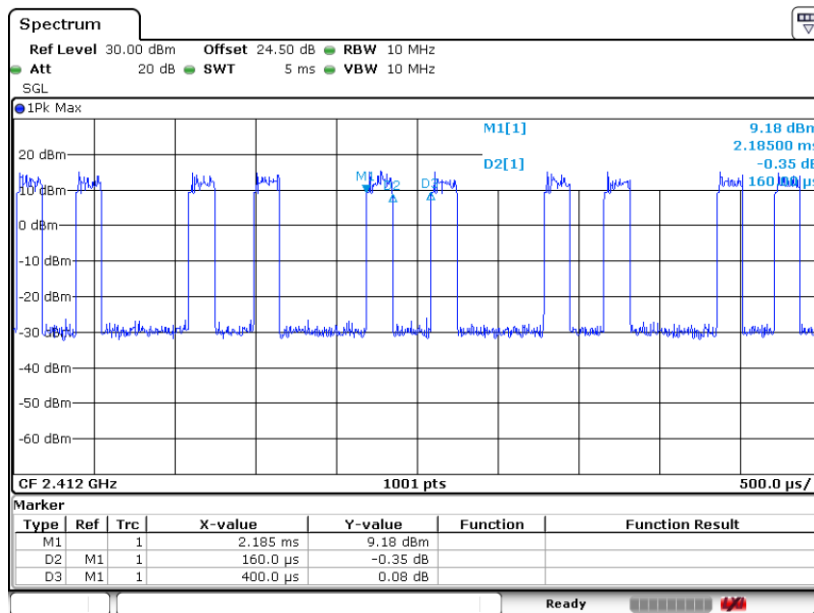


802.11g



Date: 23.OCT.2019 11:22:43

802.11n HT20



Date: 23.OCT.2019 11:25:40