

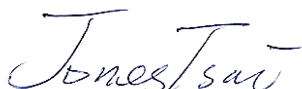
# FCC RADIO TEST REPORT

FCC ID : 2AKJ5-N2  
Equipment : Nauto 2  
Brand Name : Nauto 2  
Model Name : Nauto 2  
Marketing Name : Nauto 2  
Applicant : Nauto Corporation  
220 Portage Avenue Palo Alto, CA 94306  
Manufacturer : Qisda Corporation  
18 Jihu Road. Neihsu, Taipei 114, Taiwan  
Standard : FCC Part 15 Subpart C §15.247

The product was received on Mar. 27, 2018 and testing was started from Jun. 13, 2018 and completed on Jun. 28, 2018. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

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

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



Approved by: Jones Tsai

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

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



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## History of this test report

Report No.	Version	Description	Issued Date
FR6D1501-07C	01	Initial issue of report	Jul. 06, 2018



## Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.247(b)	Power Output Measurement	Pass	-
3.2	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	Pass	Under limit 3.05 dB at 31.890 MHz
3.3	15.203 & 15.247(b)	Antenna Requirement	Pass	-

**Reviewed by: Joseph Lin**

**Report Producer: Natasha Hsieh**

# 1 General Description

## 1.1 Product Feature of Equipment Under Test

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

Product Specification subjective to this standard	
Antenna Type	WWAN: PIFA Antenna WLAN: Monopole Antenna Bluetooth: Monopole Antenna GPS/Glonass: Chip Antenna

## 1.2 Modification of EUT

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

## 1.3 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1190 and TW0007 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

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

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

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	<b>Sporton Site No.</b> 03CH11-HY

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



## **1.4 Applicable Standards**

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

- ♦ FCC Part 15 Subpart C §15.247
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04
- ♦ ANSI C63.10-2013

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

## 2 Test Configuration of Equipment Under Test

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 (X plane) were recorded in this report.

### 2.1 Carrier Frequency and Channel

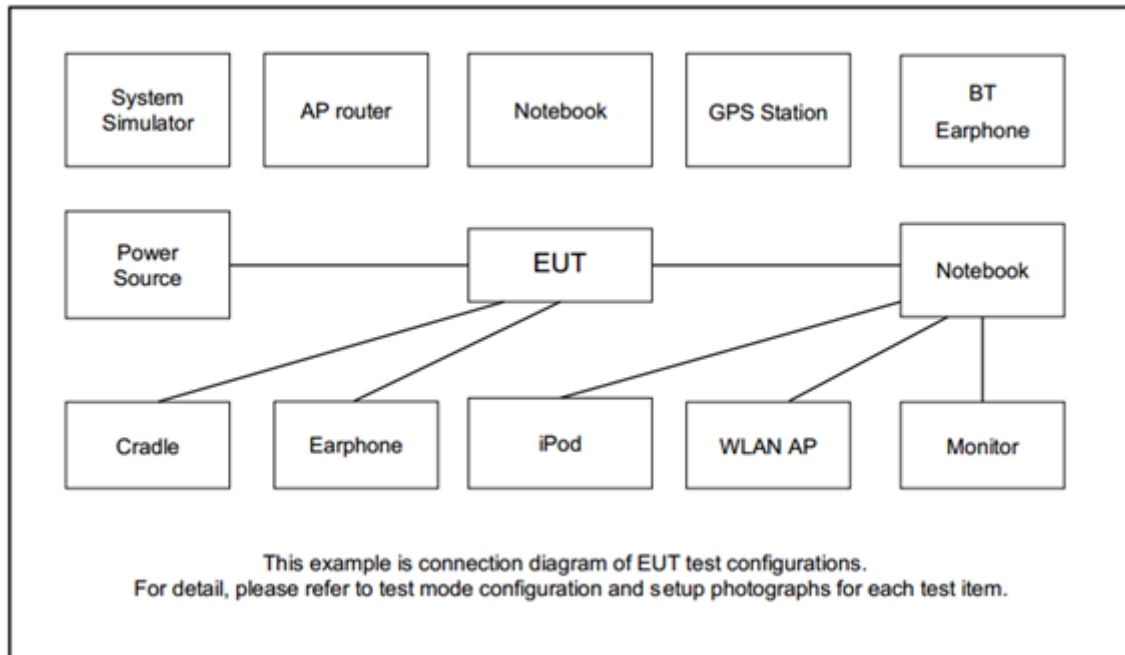
Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437		

### 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
802.11n HT40	MCS0

## 2.3 Connection Diagram of Test System



## 2.4 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.

### 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.

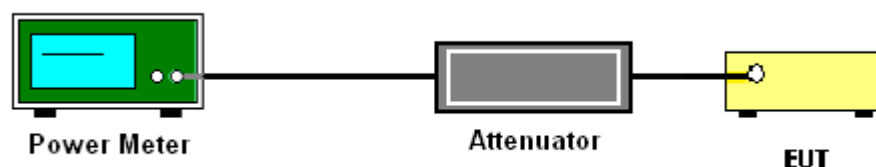
##### 3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

##### 3.1.3 Test Procedures

1. For Peak Power, the testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v04 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 v04 section 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

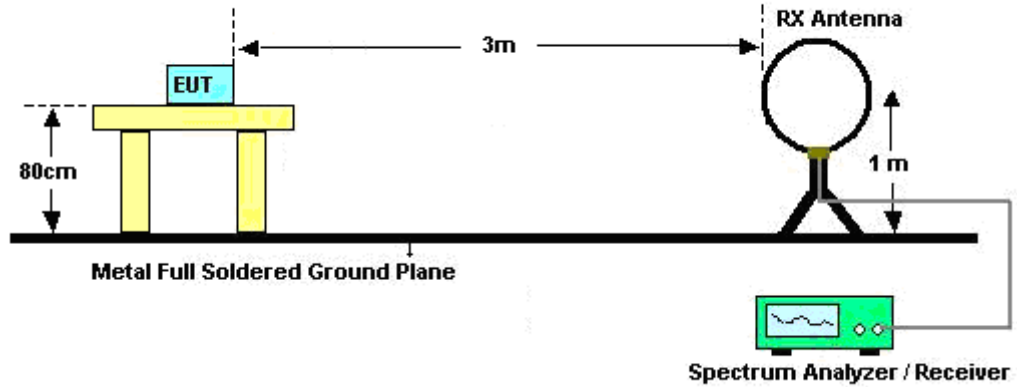
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For 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:

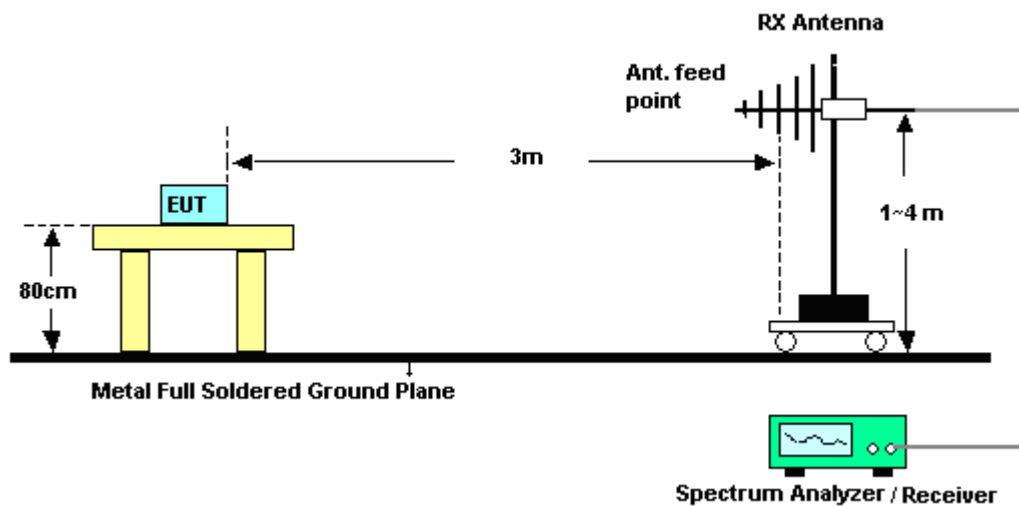
    - VBW = 10 Hz, when duty cycle is no less than 98 percent.
    - VBW  $\geq 1/T$ , when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

### 3.2.4 Test Setup

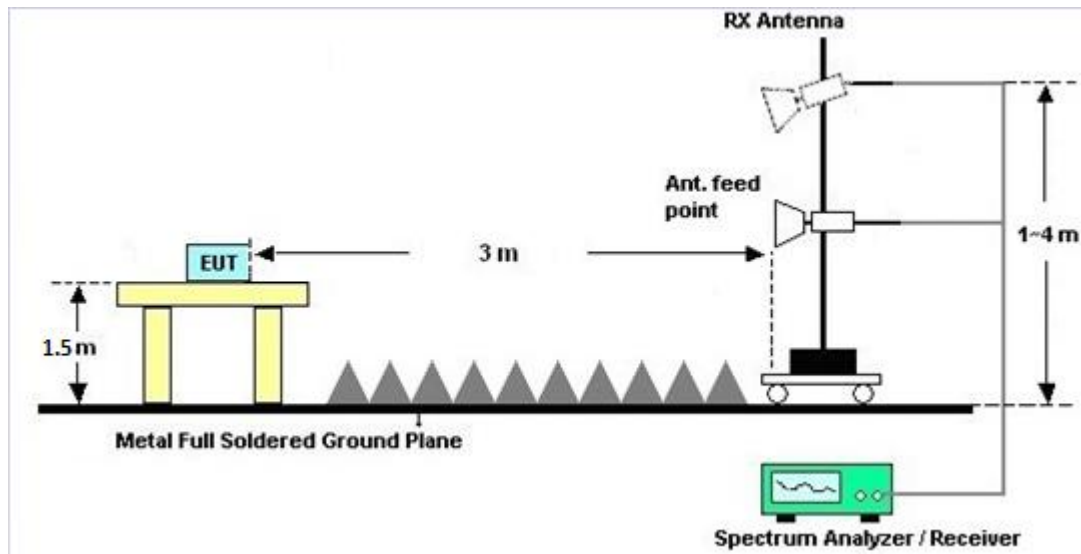
For radiated emissions below 30MHz



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 semi-Anechoic chamber, and the result came out very similar.

### 3.2.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B and C.

### 3.2.7 Duty Cycle

Please refer to Appendix D.

### 3.2.8 Test Result of Radiated Spurious Emission (30MHz ~ 10<sup>th</sup> Harmonic)

Please refer to Appendix B and C.



### **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 Meter	Anritsu	ML2495A	1240001	N/A	Sep. 07, 2017	Jun. 13, 2018	Sep. 06, 2018	Conducted (TH05-HY)
Power Sensor	Anritsu	MA2411B	1207349	300MHz~40GHz	Sep. 07, 2017	Jun. 13, 2018	Sep. 06, 2018	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz~40GHz	Jun. 20, 2017	Jun. 13, 2018	Jun. 19, 2018	Conducted (TH05-HY)
Programmable Power Supply	GW Instek	PSS-2005	EL890001	1V~20V 0.5A~4A	Oct. 06, 2017	Jun. 13, 2018	Oct. 05, 2018	Conducted (TH05-HY)
Switch Box & RF Cable	Burgeon	ETF-058	EC130048 4	N/A	Mar. 01, 2018	Jun. 13, 2018	Feb. 28, 2019	Conducted (TH05-HY)
Amplifier	MITEQ	TTA1840-35-H G	1871923	18GHz~40GHz, VSWR : 2.5:1 max	Jul. 18, 2017	Jun. 27, 2018 ~ Jun. 28, 2018	Jul. 17, 2018	Radiation (03CH11-HY)
Amplifier	SONOMA	310N	187312	9kHz~1GHz	Jan. 16, 2018	Jun. 27, 2018 ~ Jun. 28, 2018	Jan. 15, 2019	Radiation (03CH11-HY)
Bilog Antenna	TESEQ	CBL 6111D&N-6-06	35414&AT- N0602	30MHz~1GHz	Oct. 14, 2017	Jun. 27, 2018 ~ Jun. 28, 2018	Oct. 13, 2018	Radiation (03CH11-HY)
Horn Antenna	SCHWARZBE CK	BBHA 9120 D	9120D-132 6	1GHz ~ 18GHz	Oct. 16, 2017	Jun. 27, 2018 ~ Jun. 28, 2018	Oct. 15, 2018	Radiation (03CH11-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Nov. 23, 2017	Jun. 27, 2018 ~ Jun. 28, 2018	Nov. 22, 2018	Radiation (03CH11-HY)
Preamplifier	Keysight	83017A	MY532700 80	1GHz~26.5GHz	Jan. 16, 2018	Jun. 27, 2018 ~ Jun. 28, 2018	Jan. 15, 2020	Radiation (03CH11-HY)
Spectrum Analyzer	Keysight	N9010A	MY542004 86	10Hz ~ 44GHz	Oct. 19, 2017	Jun. 27, 2018 ~ Jun. 28, 2018	Oct. 18, 2018	Radiation (03CH11-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Jun. 27, 2018 ~ Jun. 28, 2018	N/A	Radiation (03CH11-HY)
Turn Table	EMEC	TT 2000	N/A	0~360 Degree	N/A	Jun. 27, 2018 ~ Jun. 28, 2018	N/A	Radiation (03CH11-HY)
SHF-EHF Horn Antenna	SCHWARZBE CK	BBHA 9170	BBHA9170 584	18GHz- 40GHz	Nov. 27, 2017	Jun. 27, 2018 ~ Jun. 28, 2018	Nov. 26, 2018	Radiation (03CH11-HY)
Preamplifier	Jet-Power	JPA0118-55-3 03K	17100018 00054002	1GHz~18GHz	Apr. 17, 2018	Jun. 27, 2018 ~ Jun. 28, 2018	Apr. 16, 2019	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4	9K-30M	Mar. 20, 2018	Jun. 27, 2018 ~ Jun. 28, 2018	Mar. 19, 2019	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4	30M-18G	Mar. 15, 2018	Jun. 27, 2018 ~ Jun. 28, 2018	Mar. 14, 2019	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2589/2	30M-18G	Mar. 15, 2018	Jun. 27, 2018 ~ Jun. 28, 2018	Mar. 14, 2019	Radiation (03CH11-HY)
Filter	Wainwright	WHKX12-2700 -3000-18000-6 0SS	SN3	2.7G High Pass	Sep. 18, 2017	Jun. 27, 2018 ~ Jun. 28, 2018	Sep. 17, 2018	Radiation (03CH11-HY)
Filter	Wainwright	WLK4-1000-15 30-8000-40SS	SN11	1G Low Pass	Sep. 18, 2017	Jun. 27, 2018 ~ Jun. 28, 2018	Sep. 17, 2018	Radiation (03CH11-HY)
Software	Audix	E3 6.2009-8-24	RK-00104 2	N/A	N/A	Jun. 27, 2018 ~ Jun. 28, 2018	N/A	Radiation (03CH11-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:	Ethan Lin	Temperature:	21~25	°C
Test Date:	2018/6/13	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	18.41	-	-	30.00	-	3.60	-	22.01	-	36.00	-	Pass
11b	1Mbps	1	6	2437	18.38	-	-	30.00	-	3.60	-	21.98	-	36.00	-	Pass
11b	1Mbps	1	11	2462	18.33	-	-	30.00	-	3.60	-	21.93	-	36.00	-	Pass
11g	6Mbps	1	1	2412	19.05	-	-	30.00	-	3.60	-	22.65	-	36.00	-	Pass
11g	6Mbps	1	6	2437	18.93	-	-	30.00	-	3.60	-	22.53	-	36.00	-	Pass
11g	6Mbps	1	11	2462	18.95	-	-	30.00	-	3.60	-	22.55	-	36.00	-	Pass
HT20	MCS0	1	1	2412	19.86	-	-	30.00	-	3.60	-	23.46	-	36.00	-	Pass
HT20	MCS0	1	6	2437	19.73	-	-	30.00	-	3.60	-	23.33	-	36.00	-	Pass
HT20	MCS0	1	11	2462	19.65	-	-	30.00	-	3.60	-	23.25	-	36.00	-	Pass
HT40	MCS0	1	3	2422	17.96	-	-	30.00	-	3.60	-	21.56	-	36.00	-	Pass
HT40	MCS0	1	6	2437	17.95	-	-	30.00	-	3.60	-	21.55	-	36.00	-	Pass
HT40	MCS0	1	9	2452	18.05	-	-	30.00	-	3.60	-	21.65	-	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	0.05	-	15.77	-	-
11b	1Mbps	1	6	2437	0.05	-	15.72	-	
11b	1Mbps	1	11	2462	0.05	-	15.79	-	
11g	6Mbps	1	1	2412	0.21	-	12.55	-	
11g	6Mbps	1	6	2437	0.21	-	12.51	-	
11g	6Mbps	1	11	2462	0.21	-	12.64	-	
HT20	MCS0	1	1	2412	0.24	-	13.19	-	
HT20	MCS0	1	6	2437	0.24	-	13.15	-	
HT20	MCS0	1	11	2462	0.24	-	13.02	-	
HT40	MCS0	1	3	2422	0.47	-	10.94	-	
HT40	MCS0	1	6	2437	0.47	-	10.92	-	
HT40	MCS0	1	9	2452	0.47	-	10.98	-	

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



## Appendix B. Radiated Spurious Emission

Test Engineer :	Hao Hsu and Ken Wu	Temperature :	21~26°C
		Relative Humidity :	51~56%

## 2.4GHz 2400~2483.5MHz

## WIFI 802.11n HT40 (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 )
802.11n HT40 CH 09 2452MHz		2348.1	52.42	-21.58	74	42.87	27	16.15	33.6	169	165	P	H
		2389.2	42.97	-11.03	54	33.15	27.13	16.29	33.6	169	165	A	H
	*	2452	104.56	-	-	94.56	27.27	16.31	33.58	169	165	P	H
	*	2452	96.82	-	-	86.82	27.27	16.31	33.58	169	165	A	H
		2485.2	60.18	-13.82	74	50.08	27.36	16.32	33.58	169	165	P	H
		2483.6	48.2	-5.8	54	38.11	27.36	16.31	33.58	169	165	A	H
		2342.7	51.94	-22.06	74	42.39	27	16.15	33.6	380	277	P	V
		2388.6	42.6	-11.4	54	32.78	27.13	16.29	33.6	380	277	A	V
	*	2452	101.45	-	-	91.45	27.27	16.31	33.58	380	277	P	V
	*	2452	93.87	-	-	83.87	27.27	16.31	33.58	380	277	A	V
		2483.92	54.03	-19.97	74	43.94	27.36	16.31	33.58	380	277	P	V
		2484.16	44.74	-9.26	54	34.65	27.36	16.31	33.58	380	277	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 )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
802.11n HT40 CH 09 2452MHz		4904	39.81	-34.19	74	54.91	31.44	9.99	56.53	100	0	P	H
		7356	41.72	-32.28	74	49.78	36.4	11.71	56.17	100	0	P	H
													H
													H
		4904	39.77	-34.23	74	54.87	31.44	9.99	56.53	100	0	P	V
		7356	41.74	-32.26	74	49.8	36.4	11.71	56.17	100	0	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



## Emission below 1GHz

## 2.4GHz WIFI 802.11n HT40 (LF)

WIFI 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 802.11n HT40 LF		202.8	32.53	-10.97	43.5	48.24	14.9	1.78	32.39	-	-	P	H
		221.16	37.82	-8.18	46	53.25	15.18	1.78	32.39	100	169	P	H
		233.58	36.43	-9.57	46	50.38	16.41	2.02	32.38	-	-	P	H
		335	23.85	-22.15	46	34.04	19.72	2.45	32.36	-	-	P	H
		668.9	27.95	-18.05	46	30.77	26.26	3.39	32.47	-	-	P	H
		945.4	33.19	-12.81	46	30.09	30.36	3.99	31.25	-	-	P	H
													H
													H
													H
													H
													H
													H
		31.89	36.95	-3.05	40	45.36	23.24	0.84	32.49	100	356	P	V
		56.46	35.59	-4.41	40	54.95	12.1	1.03	32.49	-	-	P	V
		62.94	36.25	-3.75	40	56.07	11.64	1.03	32.49	-	-	P	V
		306.3	23.8	-22.2	46	34.64	19.13	2.4	32.37	-	-	P	V
		651.4	27.75	-18.25	46	30.64	26.27	3.31	32.47	-	-	P	V
		951.7	33.93	-12.07	46	30.46	30.66	3.99	31.18	-	-	P	V
													V
													V
													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>P</b> eak or <b>A</b> verage
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”.



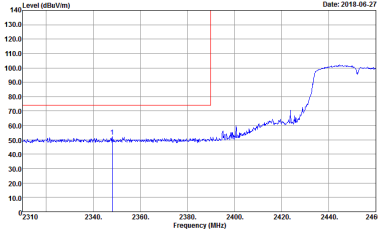
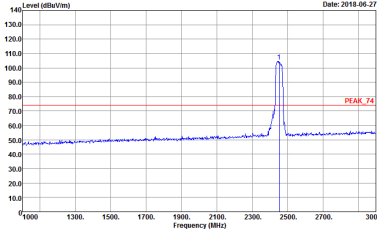
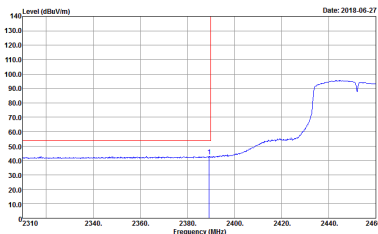
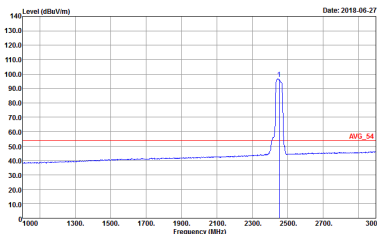
## Appendix C. Radiated Spurious Emission Plots

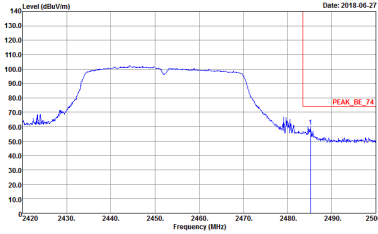
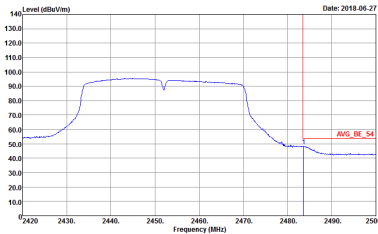
<b>Test Engineer :</b>	Hao Hsu and Ken Wu	<b>Temperature :</b>	21~26°C
		<b>Relative Humidity :</b>	51~56%

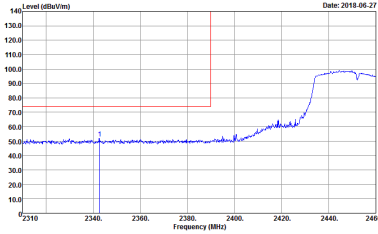
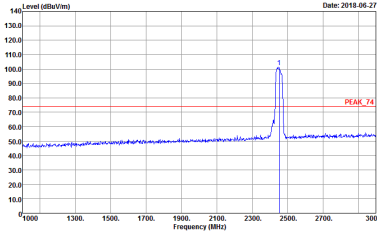
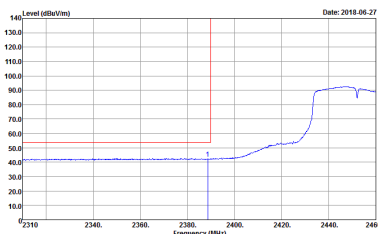
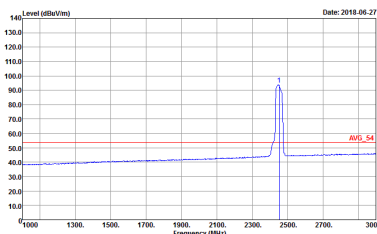
### Note symbol

-L	Low channel location
-R	High channel location

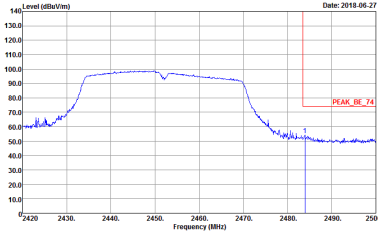
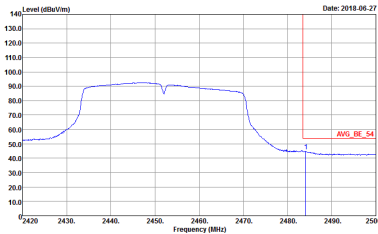
**2.4GHz 2400~2483.5MHz**
**WIFI 802.11n HT40 (Band Edge @ 3m)**

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH09 2452MHz - L	
1	Horizontal	Fundamental
<b>Peak</b>	 <p>Site : 03CH11-HY Condition : PEAK_BE_74 3m HORN 91200-HF HORIZONTAL Detector : Peak Project : 6D1501-07</p>	 <p>Site : 03CH11-HY Condition : PEAK_74 3m HORN 91200-HF HORIZONTAL Detector : Peak Project : 6D1501-07</p>
<b>Avg.</b>	 <p>Site : 03CH11-HY Condition : AVG_BE_54 3m HORN 91200-HF HORIZONTAL Detector : Peak Project : 6D1501-07</p>	 <p>Site : 03CH11-HY Condition : AVG_54 3m HORN 91200-HF HORIZONTAL Detector : Peak Project : 6D1501-07</p>

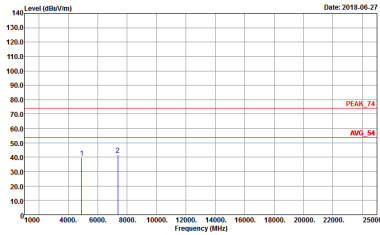
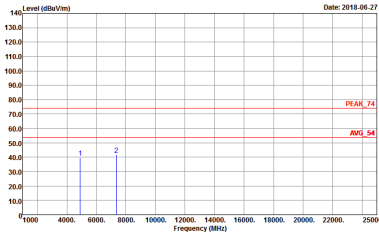
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH09 2452MHz - R	
1	Horizontal	Fundamental
Peak	 <p>Site : 03CH11-HY Condition : PEAK_BE_74 3m HORN 91200-HF HORIZONTAL RBW:3000.000kHz VBW:3000.000kHz SWT:Auto Detector : Peak Project : 6D1501-07</p>	Left blank
Avg.	 <p>Site : 03CH11-HY Condition : AVG_BE_54 3m HORN 91200-HF HORIZONTAL RBW:3000.000kHz VBW:3000.000kHz SWT:Auto Detector : Peak Project : 6D1501-07</p>	Left blank

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH09 2452MHz - L	
1	Vertical	Fundamental
Peak	 <p>Site : 03CH11-HY Condition : PEAK_BE_74 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6D1501-07</p>	 <p>Site : 03CH11-HY Condition : PEAK_74 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6D1501-07</p>
Avg.	 <p>Site : 03CH11-HY Condition : AVG_BE_54 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6D1501-07</p>	 <p>Site : 03CH11-HY Condition : AVG_54 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6D1501-07</p>

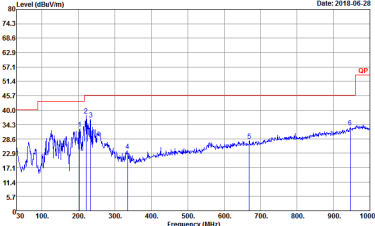
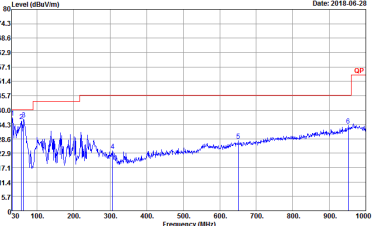


WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11n HT40 CH09 2452MHz - R	
1	Vertical	Fundamental
Peak	<div><p>Site : 03CH11-HY Condition : PEAK_BE_74 3m HORN 91200-HF VERTICAL RBW:3000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6D1501-07</p></div>	Left blank
Avg.	<div><p>Site : 03CH11-HY Condition : AVG_BE_54 3m HORN 91200-HF VERTICAL RBW:3000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6D1501-07</p></div>	Left blank

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

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11n HT40 CH09 2452MHz	
1	Horizontal	Vertical
<b>Peak</b>  <b>Avg.</b>	 <p>Site : 03CH11-4FY Condition : PEAK_74 3m HORN 91200-HF HORIZONTAL Detector : Peak Project : 601501-07</p>	 <p>Site : 03CH11-4FY Condition : PEAK_74 3m HORN 91200-HF VERTICAL Detector : Peak Project : 601501-07</p>

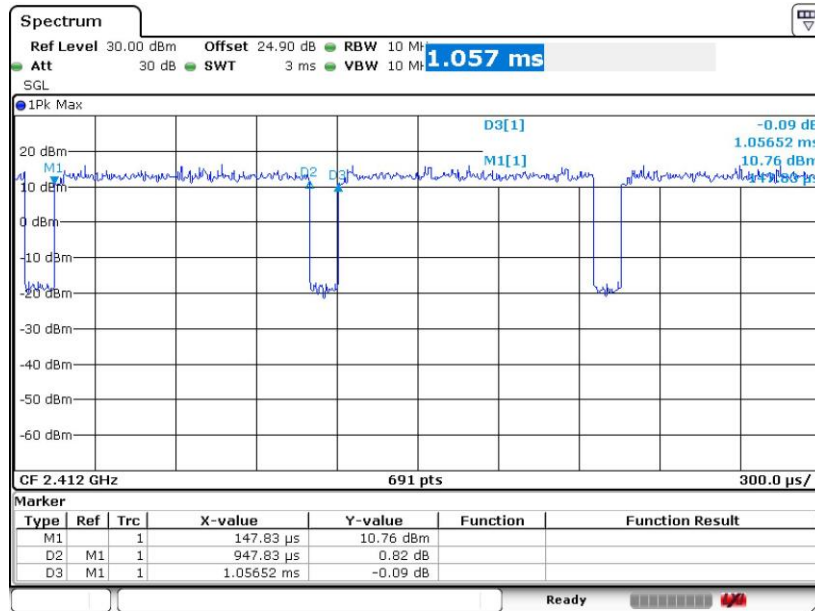
**Emission below 1GHz**  
**2.4GHz WIFI 802.11n HT40 (LF)**

WIFI	2.4GHz 2400~2483.5MHz	
ANT	802.11n HT40 LF	
1	Horizontal	Vertical
<b>QP / Peak</b>	 <p> Site : 03CH11-44Y  Condition : QP 3m BT-LOG 6111D-LF_ETC HORIZONTAL  Detector : Peak  Project : 601501-07 </p>	 <p> Site : 03CH11-44Y  Condition : QP 3m BT-LOG 6111D-LF_ETC VERTICAL  Detector : Peak  Project : 601501-07 </p>

## Appendix D. Duty Cycle Plots

Band	Duty Cycle (%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor (dB)
2.4GHz 802.11n HT40	89.71	947.83	1.06	3kHz	0.47

### 802.11n HT40



Date: 13.JUN.2018 17:02:18