



# FCC RF Test Report

**APPLICANT** : Realtek Semiconductor Corp.  
**EQUIPMENT** : 802.11b/g/n RTL8723BS Combo module  
**BRAND NAME** : REALTEK  
**MODEL NAME** : RTL8723BS  
**FCC ID** : TX2-RTL8723BS  
**STANDARD** : FCC Part 15 Subpart C §15.247  
**CLASSIFICATION** : (DTS) Digital Transmission System

This is a partial report which is included the RF output power and radiated spurious emission test items. The product was received on Nov. 25, 2016 and testing was completed on Jan. 13, 2017. 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 test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager



## **SPORTON INTERNATIONAL INC.**

**No. 52, Hwa Ya 1<sup>st</sup> Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.**

**SPORTON INTERNATIONAL INC.**

TEL : 886-3-327-3456

FAX : 886-3-328-4978

FCC ID : TX2-RTL8723BS

Page Number : 1 of 15

Report Issued Date : Jan. 20, 2017

Report Version : Rev. 01

Report Template No.: BU5-FR15CBT4.0 Version 1.3



# TABLE OF CONTENTS

**SUMMARY OF TEST RESULT ..... 4**

**1 GENERAL DESCRIPTION..... 5**

    1.1 Applicant ..... 5

    1.2 Manufacturer..... 5

    1.3 Product Feature of Equipment Under Test..... 5

    1.4 Product Specification of Equipment Under Test..... 5

    1.5 Modification of EUT ..... 5

    1.6 Testing Location ..... 6

    1.7 Applicable Standards..... 6

**2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST..... 7**

    2.1 Descriptions of Test Mode ..... 7

    2.2 Test Mode ..... 7

    2.3 Connection Diagram of Test System ..... 8

    2.4 EUT Operation Test Setup ..... 8

**3 TEST RESULT ..... 9**

    3.1 Radiated Band Edges and Spurious Emission Measurement ..... 9

    3.2 Antenna Requirements ..... 13

**4 LIST OF MEASURING EQUIPMENT ..... 14**

**5 UNCERTAINTY OF EVALUATION..... 15**

**APPENDIX A. RADIATED SPURIOUS EMISSION**

**APPENDIX B. RADIATED SPURIOUS EMISSION PLOTS**

**APPENDIX C. DUTY CYCLE PLOTS**

**APPENDIX D. SETUP PHOTOGRAPHS**



### REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR6N2509B	Rev. 01	Initial issue of report	Jan. 20, 2017



### SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(d)	Radiated Band Edges and Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 8.67 dB at 34.590 MHz
3.2	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-



# 1 General Description

## 1.1 Applicant

**Realtek Semiconductor Corp.**

No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu 300, Taiwan

## 1.2 Manufacturer

**Realtek Semiconductor Corp.**

No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu 300, Taiwan

## 1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	802.11b/g/n RTL8723BS Combo module
Brand Name	REALTEK
Model Name	RTL8723BS
FCC ID	TX2-RTL8723BS
Installed into PC	Brand Name: UNICOM Model Name: U-BPCIB0, U-BPCIB1
EUT supports Radios application	WLAN 11b/g/n HT20/HT40 Bluetooth BR/EDR/LE
EUT Stage	Identical Prototype

**Remark:** The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

## 1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz
Number of Channels	40
Carrier Frequency of Each Channel	40 Channel(37 hopping + 3 advertising channel)
Maximum Output Power to Antenna	2.25 dBm (0.0017 W)
Antenna Type / Gain	Dipole Antenna type with gain 2.26 dBi
Type of Modulation	Bluetooth LE : GFSK

## 1.5 Modification of EUT

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



### 1.6 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1022 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

<b>Test Site</b>	SPORTON INTERNATIONAL INC.
<b>Test Site Location</b>	No. 52, Hwa Ya 1 <sup>st</sup> Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan 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.
<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.

### 1.7 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 v03r05
- ♦ 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

### 2.1 Descriptions of Test Mode

The RF output power was recorded in the following table:

Channel	Frequency	Bluetooth – LE RF Output Power	
		Data Rate / Modulation	
		GFSK	
		1Mbps	
Ch00	2402MHz	1.87 dBm	
Ch19	2440MHz	2.25 dBm	
Ch39	2480MHz	2.04 dBm	

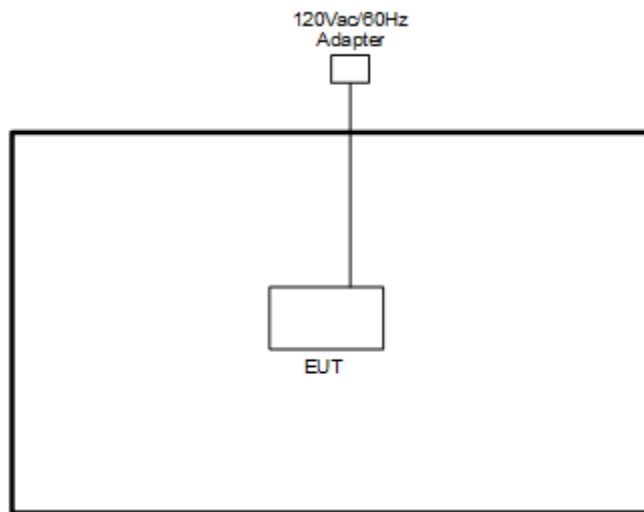
The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

### 2.2 Test Mode

The following summary table is showing all test modes to demonstrate in compliance with the standard.

Summary table of Test Cases	
<b>Radiated TCs</b>	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps

## 2.3 Connection Diagram of Test System



## 2.4 EUT Operation Test Setup

For Bluetooth function, programmed RF utility, "WLAN Tool" installed in the notebook make the EUT provide functions like channel selection and power level for continuous transmitting and receiving signals.





### 3 Test Result

#### 3.1 Radiated Band Edges and Spurious Emission Measurement

##### 3.1.1 Limit of Radiated Band Edges and Spurious Emission

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 FCC section 15.209 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

##### 3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

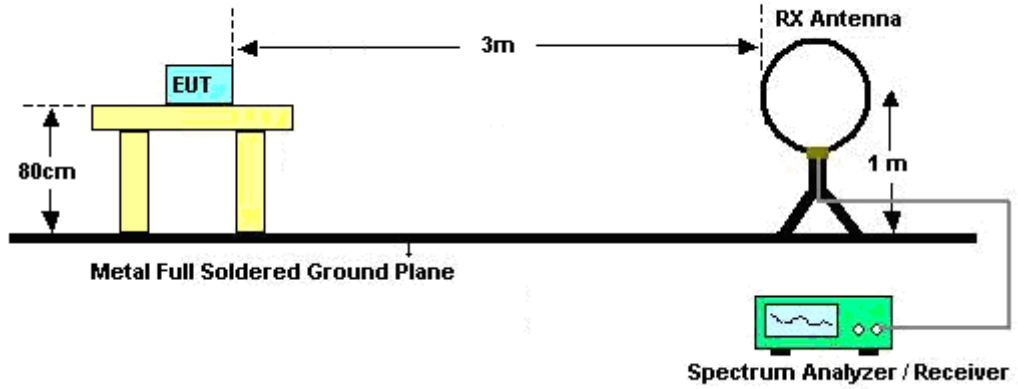


### 3.1.3 Test Procedures

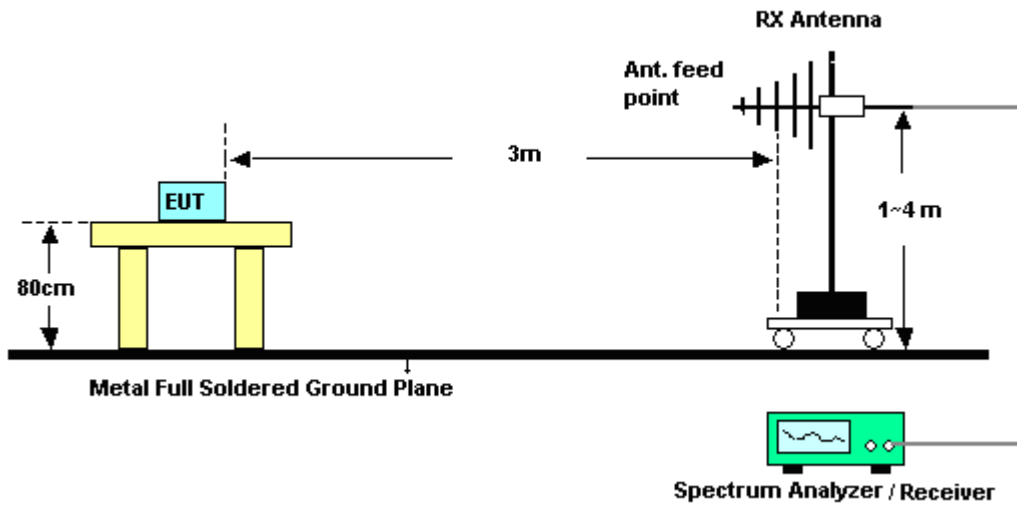
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the 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 measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. 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.

### 3.1.4 Test Setup

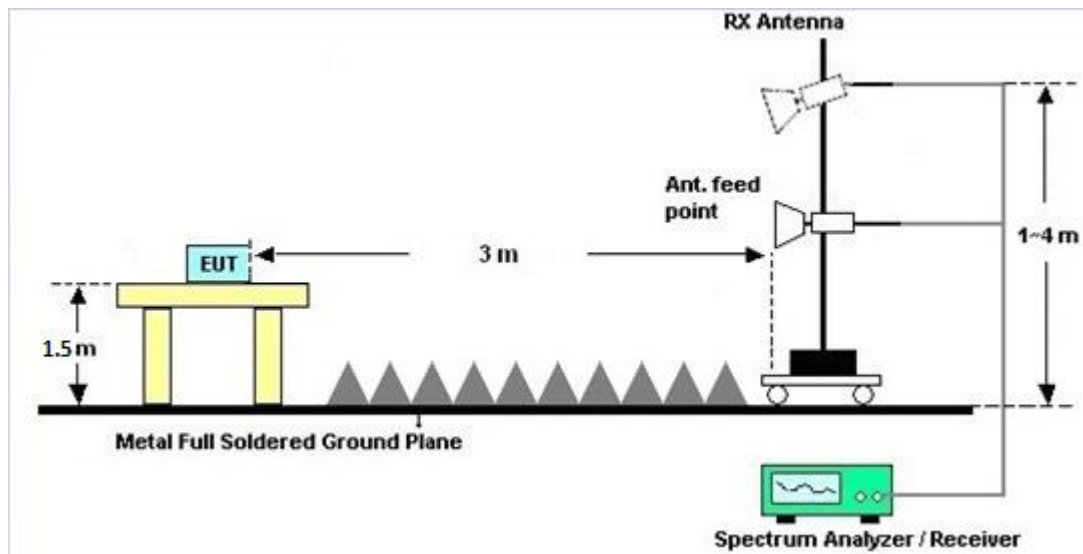
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

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

Please refer to Appendix A and B.

### 3.1.7 Duty Cycle

Please refer to Appendix C.

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

Please refer to Appendix A and B.



## **3.2 Antenna Requirements**

### **3.2.1 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 FCC rule.

### **3.2.2 Antenna Anti-Replacement Construction**

An embedded-in antenna design is used.

### **3.2.3 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	Agilent	E4416A	GB41292344	300MHz~40GHz	Dec. 26, 2016	Jan. 07, 2017	Dec. 25, 2017	Conducted (TH05-HY)
Power Sensor	Agilent	E9327A	US40441548	300MHz~40GHz	Dec. 26, 2016	Jan. 07, 2017	Dec. 25, 2017	Conducted (TH05-HY)
Hygrometer	Testo	608-H2	41410069	N/A	Aug. 28, 2016	Jan. 07, 2017	Aug. 27, 2017	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz-40GHz	Jul. 17, 2016	Dec.13.2016~Jan.07.2017	Jul. 16, 2017	Conducted (TH05-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Sep. 02, 2015	Dec. 16, 2016 ~ Jan. 13, 2017	Sep. 01, 2017	Radiation (03CH13-HY)
Amplifier	Sonoma-Instrument	310 N	187282	9KHz~1GHz	Dec. 31, 2015	Dec. 16, 2016 ~ Jan. 13, 2017	Dec. 30, 2016	Radiation (03CH13-HY)
Bilog Antenna	TESEQ	CBL 6111D&00800 N1D01N-06	40103&04	30MHz to 1GHz	Jan. 13, 2016	Dec. 16, 2016 ~ Jan. 13, 2017	Jan. 12, 2017	Radiation (03CH13-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY55420170	N/A	Mar. 10, 2016	Dec. 16, 2016 ~ Jan. 13, 2017	Mar. 09, 2017	Radiation (03CH13-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1241	1GHz ~ 18GHz	Apr. 25, 2016	Dec. 16, 2016 ~ Jan. 13, 2017	Apr. 24, 2017	Radiation (03CH13-HY)
Preamplifier	MITEQ	AMF-7D-00101 800-30-10P	1590074	1GHz~18GHz	Jun. 27, 2016	Dec. 16, 2016 ~ Jan. 13, 2017	Jun. 26, 2017	Radiation (03CH13-HY)
Preamplifier	MITEQ	JS44-1800400 0-33-8P	1840917	18GHz ~ 40GHz	Jun. 14, 2016	Dec. 16, 2016 ~ Jan. 13, 2017	Jun. 13, 2017	Radiation (03CH13-HY)
Preamplifier	Keysight	83017A	MY53270147	1GHz~26.5GHz	Jan. 30, 2016	Dec. 16, 2016 ~ Jan. 13, 2017	Jan. 29, 2017	Radiation (03CH13-HY)
Spectrum Analyzer	Keysight	N9010A	MY55370526	N/A	Mar. 14, 2016	Dec. 16, 2016 ~ Jan. 13, 2017	Mar. 13, 2017	Radiation (03CH13-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Dec. 16, 2016 ~ Jan. 13, 2017	N/A	Radiation (03CH13-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Dec. 16, 2016 ~ Jan. 13, 2017	N/A	Radiation (03CH13-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA91705 84	18GHz- 40GHz	Nov. 08, 2016	Dec. 16, 2016 ~ Jan. 13, 2017	Nov. 07, 2017	Radiation (03CH13-HY)



## 5 Uncertainty of Evaluation

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

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

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

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

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

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



## Appendix A. Radiated Spurious Emission

Test Engineer :	Alex Jheng, Bill Chang, and Wilson Wu	Temperature :	25~26°C
		Relative Humidity :	50~52%

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.	
		( MHz )	( dBµV/m )	( dB )	Limit	Level	Factor	Loss	Factor	Pos	Pos	Avg.		
					Line	( dBµV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )	
BLE CH 00 2402MHz		2377.305	52.69	-21.31	74	49.61	27.11	6.96	30.99	138	128	P	H	
		2374.68	43.46	-10.54	54	40.38	27.11	6.96	30.99	138	128	A	H	
	*	2402	89.41	-	-	86.27	27.15	6.98	30.99	138	128	P	H	
	*	2402	87.73	-	-	84.59	27.15	6.98	30.99	138	128	A	H	
													H	
														H
			2334.675	53.47	-20.53	74	50.54	27.03	6.91	31.01	204	151	P	V
			2361.975	44.77	-9.23	54	41.77	27.07	6.93	31	204	151	A	V
	*		2402	98.4	-	-	95.26	27.15	6.98	30.99	204	151	P	V
	*		2402	96.81	-	-	93.67	27.15	6.98	30.99	204	151	A	V
														V
													V	
BLE CH 19 2440MHz		2344.02	52.91	-21.09	74	49.97	27.03	6.91	31	112	141	P	H	
		2346.96	43.27	-10.73	54	40.33	27.03	6.91	31	112	141	A	H	
	*	2440	89.69	-	-	86.35	27.28	7.03	30.97	112	141	P	H	
	*	2440	88.67	-	-	85.33	27.28	7.03	30.97	112	141	A	H	
			2489.08	52.91	-21.09	74	49.38	27.4	7.09	30.96	112	141	P	H
			2484.25	43.67	-10.33	54	40.21	27.36	7.07	30.97	112	141	A	H
			2351.72	52.96	-21.04	74	49.96	27.07	6.93	31	198	152	P	V
			2327.78	44.5	-9.5	54	41.63	26.99	6.89	31.01	198	152	A	V
	*		2440	98.6	-	-	95.26	27.28	7.03	30.97	198	152	P	V
	*		2440	97.1	-	-	93.76	27.28	7.03	30.97	198	152	A	V
			2493.14	52.5	-21.5	74	48.97	27.4	7.09	30.96	198	152	P	V
		2497.62	43.64	-10.36	54	40.11	27.4	7.09	30.96	198	152	A	V	





<b>BLE CH 39 2480MHz</b>	*	2480	92.27	-	-	88.81	27.36	7.07	30.97	105	115	P	H
	*	2480	90.65	-	-	87.19	27.36	7.07	30.97	105	115	A	H
		2491.2	52.47	-21.53	74	48.94	27.4	7.09	30.96	105	115	P	H
		2487.36	43.56	-10.44	54	40.1	27.36	7.07	30.97	105	115	A	H
													H
													H
	*	2480	97.84	-	-	94.38	27.36	7.07	30.97	216	147	P	V
	*	2480	96.23	-	-	92.77	27.36	7.07	30.97	216	147	A	V
		2492.32	53.01	-20.99	74	49.48	27.4	7.09	30.96	216	147	P	V
		2487.12	43.51	-10.49	54	40.05	27.36	7.07	30.97	216	147	A	V
													V
													V
<b>Remark</b>	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

BLE	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )	
BLE CH 00 2402MHz		4804	31.1	-42.9	74	41.02	31.2	10.06	51.18	100	0	P	H	
													H	
													H	
													H	
		4804	28.76	-45.24	74	38.68	31.2	10.06	51.18	100	0	P	V	
														V
														V
BLE CH 19 2440MHz		4880	30.59	-43.41	74	40.32	31.31	10.11	51.15	100	0	P	H	
		7320	35.89	-38.11	74	37.8	36.32	12.57	50.8	100	0	P	H	
													H	
													H	
		4880	29.39	-44.61	74	39.12	31.31	10.11	51.15	100	0	P	V	
		7320	36.08	-37.92	74	37.99	36.32	12.57	50.8	100	0	P	V	
														V
BLE CH 39 2480MHz		4960	30.92	-43.08	74	40.43	31.44	10.17	51.12	100	0	P	H	
		7440	36.84	-37.16	74	38.18	36.66	12.8	50.8	100	0	P	H	
													H	
													H	
		4960	30.83	-43.17	74	40.34	31.44	10.17	51.12	100	0	P	V	
		7440	35.81	-38.19	74	37.15	36.66	12.8	50.8	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 BLE (LF)

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.	
		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )	
2.4GHz BLE LF		30.54	23.63	-16.37	40	29.56	25.34	0.68	31.95	-	-	P	H	
		119.91	24.12	-19.38	43.5	37.33	17.5	1.16	31.87	-	-	P	H	
		250.05	36.09	-9.91	46	47.46	18.7	1.71	31.78	100	51	P	H	
		374.9	27.44	-18.56	46	35.47	21.61	2.12	31.76	-	-	P	H	
		813.1	31.75	-14.25	46	32.37	27.93	3.32	31.87	-	-	P	H	
		936.3	31.44	-14.56	46	29.47	29.77	3.44	31.24	-	-	P	H	
														H
														H
														H
														H
														H
														H
			34.59	31.33	-8.67	40	39.53	23.1	0.64	31.94	100	10	P	V
			94.8	23.69	-19.81	43.5	39.11	15.45	1.02	31.89	-	-	P	V
			250.05	25.42	-20.58	46	36.79	18.7	1.71	31.78	-	-	P	V
			419.7	22.33	-23.67	46	29.35	22.48	2.28	31.78	-	-	P	V
			839.7	30.78	-15.22	46	30.94	28.2	3.41	31.77	-	-	P	V
			942.6	32.15	-13.85	46	29.95	29.94	3.44	31.18	-	-	P	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>Peak</b> or <b>Average</b>
H/V	<b>Horizontal</b> or <b>Vertical</b>



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

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( 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

- Level(dBμV/m) =  
Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
- Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

**For Peak Limit @ 2390MHz:**

- Level(dBμV/m)  
= Antenna Factor(dB/m) + Cable 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)
- Over Limit(dB)  
= Level(dBμV/m) – Limit Line(dBμV/m)  
= 55.45(dBμV/m) – 74(dBμV/m)  
= -18.55(dB)

**For Average Limit @ 2390MHz:**

- Level(dBμV/m)  
= Antenna Factor(dB/m) + Cable 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)
- 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 B. Radiated Spurious Emission

Test Engineer :	Alex Jheng, Bill Chang, and Wilson Wu	Temperature :	25~26°C
		Relative Humidity :	50~52%

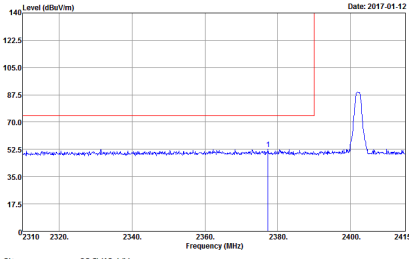
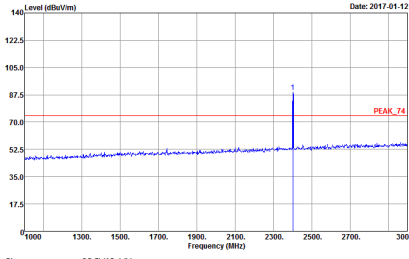
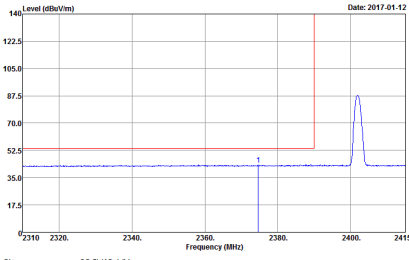
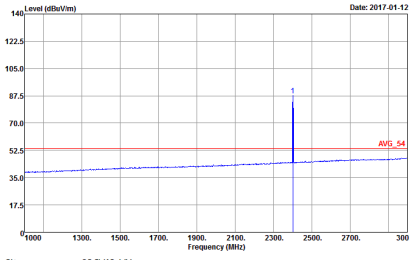
Note symbol

-L	Low channel location
-R	High channel location

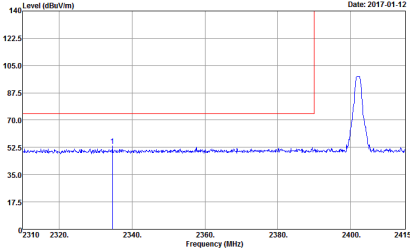
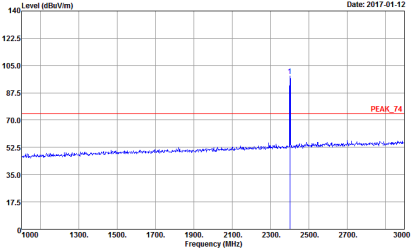
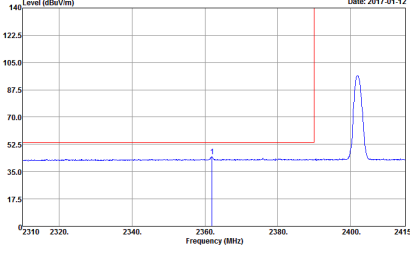
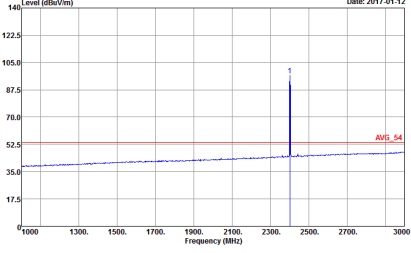


2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

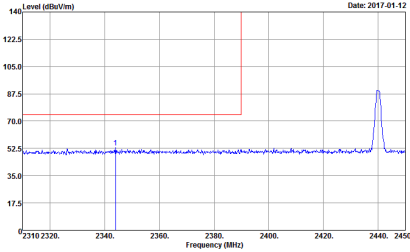
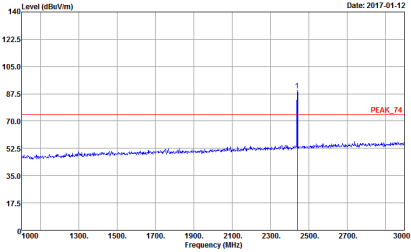
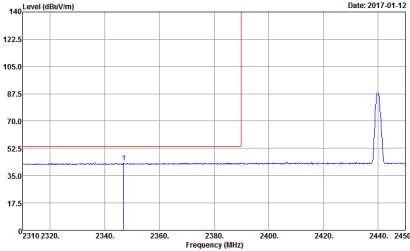
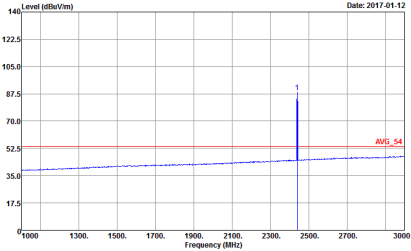
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH00 2402MHz	
1	Horizontal	Fundamental
Peak	 <p>Site : 03CH13-HY            Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL            Detector : Peak            Project : 6N2509            Mode : 4</p>	 <p>Site : 03CH13-HY            Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL            Detector : Peak            Project : 6N2509            Mode : 4</p>
Avg.	 <p>Site : 03CH13-HY            Condition : AV6_BE_54 3m HORN_9120D_1241 HORIZONTAL            Detector : Peak            Project : 6N2509            Mode : 4</p>	 <p>Site : 03CH13-HY            Condition : AV6_54 3m HORN_9120D_1241 HORIZONTAL            Detector : Peak            Project : 6N2509            Mode : 4</p>



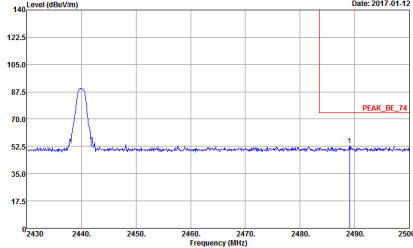
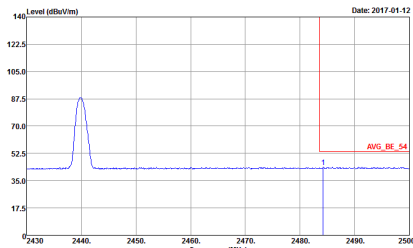
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH00 2402MHz	
<p style="text-align: center;"><b>1</b></p>	<p style="text-align: center;"><b>Vertical</b></p>  <p>Level (dBuV/m) vs Frequency (MHz) plot showing a peak at approximately 2402 MHz. The y-axis ranges from 17.5 to 140 dBuV/m, and the x-axis ranges from 2310 to 2415 MHz. A red horizontal line is drawn at approximately 70 dBuV/m.</p> <p>Site : 03CH13-HY            Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL            RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 6N2509            Mode : 4</p>	<p style="text-align: center;"><b>Fundamental</b></p>  <p>Level (dBuV/m) vs Frequency (MHz) plot showing a peak at approximately 2402 MHz. The y-axis ranges from 17.5 to 140 dBuV/m, and the x-axis ranges from 1000 to 3000 MHz. A red horizontal line is drawn at approximately 70 dBuV/m. A red label 'PEAK_74' is present.</p> <p>Site : 03CH13-HY            Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL            RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 6N2509            Mode : 4</p>
<p style="text-align: center;"><b>Peak</b></p>	 <p>Level (dBuV/m) vs Frequency (MHz) plot showing a peak at approximately 2402 MHz. The y-axis ranges from 17.5 to 140 dBuV/m, and the x-axis ranges from 2310 to 2415 MHz. A red horizontal line is drawn at approximately 52.5 dBuV/m.</p> <p>Site : 03CH13-HY            Condition : AV6_BE_54 3m HORN_9120D_1241 VERTICAL            RBW:1000.000KHz VBW:3.000KHz SWT:Auto            Detector : Peak            Project : 6N2509            Mode : 4</p>	 <p>Level (dBuV/m) vs Frequency (MHz) plot showing a peak at approximately 2402 MHz. The y-axis ranges from 17.5 to 140 dBuV/m, and the x-axis ranges from 1000 to 3000 MHz. A red horizontal line is drawn at approximately 52.5 dBuV/m. A red label 'AV6_54' is present.</p> <p>Site : 03CH13-HY            Condition : AV6_54 3m HORN_9120D_1241 VERTICAL            RBW:1000.000KHz VBW:3.000KHz SWT:Auto            Detector : Peak            Project : 6N2509            Mode : 4</p>
<p style="text-align: center;"><b>Avg</b></p>		



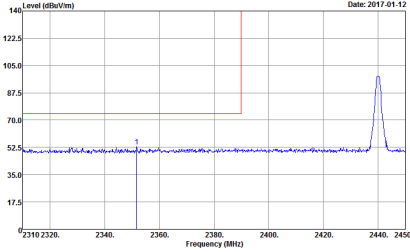
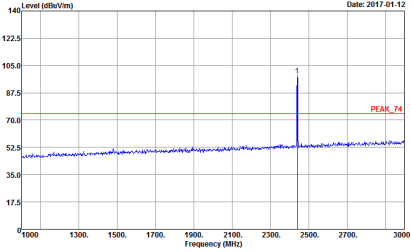
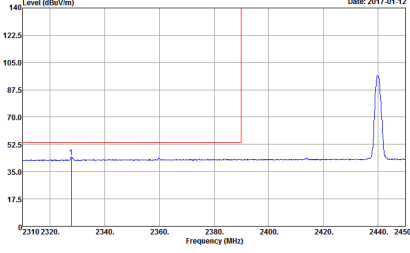
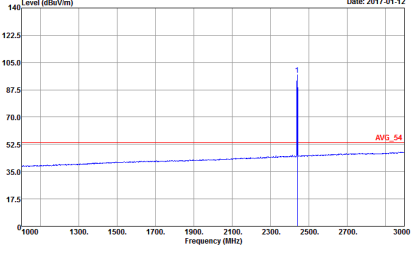


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - L	
1	Horizontal	Fundamental
Peak	 <p>Date: 2017-01-12</p> <p>Site : 03CH13-#Y            Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL            RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 6N2509            Mode : 5</p>	 <p>Date: 2017-01-12</p> <p>Site : 03CH13-#Y            Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL            RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 6N2509            Mode : 5</p>
Avg.	 <p>Date: 2017-01-12</p> <p>Site : 03CH13-#Y            Condition : AV6_BE_54 3m HORN_9120D_1241 HORIZONTAL            RBW:1000.000KHz VBW:3.000KHz SWT:Auto            Detector : Peak            Project : 6N2509            Mode : 5</p>	 <p>Date: 2017-01-12</p> <p>Site : 03CH13-#Y            Condition : AV6_54 3m HORN_9120D_1241 HORIZONTAL            RBW:1000.000KHz VBW:3.000KHz SWT:Auto            Detector : Peak            Project : 6N2509            Mode : 5</p>

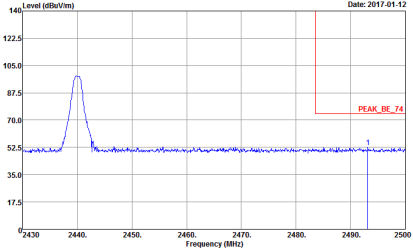
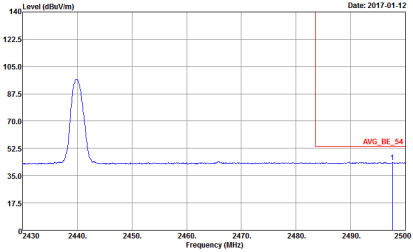


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - R	
1	Horizontal	Fundamental
<p><b>Peak</b></p>	 <p>Date: 2017-01-12</p> <p>Site : 03CH13-HY            Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL            RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 6N2509            Mode : 5</p>	<p>Left blank</p>
<p><b>Avg.</b></p>	 <p>Date: 2017-01-12</p> <p>Site : 03CH13-HY            Condition : AVG_BE_54 3m HORN_9120D_1241 HORIZONTAL            RBW:1000.000KHz VBW:3.000KHz SWT:Auto            Detector : Peak            Project : 6N2509            Mode : 5</p>	<p>Left blank</p>

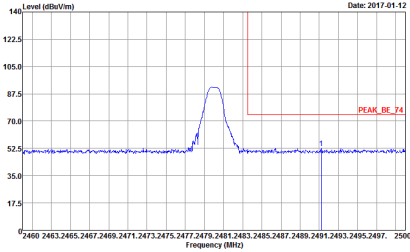
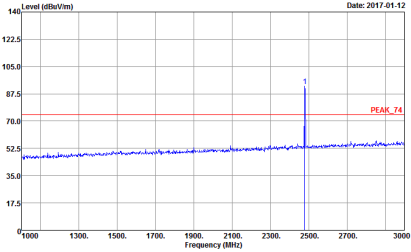
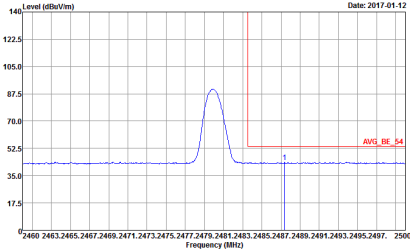
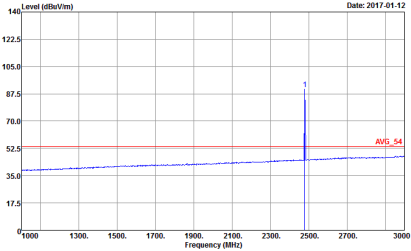


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - L	
<p style="text-align: center;"><b>1</b></p>	<p style="text-align: center;"><b>Vertical</b></p>  <p style="text-align: center;">Date: 2017-01-12</p> <p>Site : 03CH13-#Y            Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL            RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 6N2509            Mode : 5</p>	<p style="text-align: center;"><b>Fundamental</b></p>  <p style="text-align: center;">Date: 2017-01-12</p> <p>Site : 03CH13-#Y            Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL            RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 6N2509            Mode : 5</p>
<p style="text-align: center;"><b>Peak</b></p>	 <p style="text-align: center;">Date: 2017-01-12</p> <p>Site : 03CH13-#Y            Condition : AV6_BE_54 3m HORN_9120D_1241 VERTICAL            RBW:1000.000KHz VBW:3.000KHz SWT:Auto            Detector : Peak            Project : 6N2509            Mode : 5</p>	 <p style="text-align: center;">Date: 2017-01-12</p> <p>Site : 03CH13-#Y            Condition : AV6_54 3m HORN_9120D_1241 VERTICAL            RBW:1000.000KHz VBW:3.000KHz SWT:Auto            Detector : Peak            Project : 6N2509            Mode : 5</p>
<p style="text-align: center;"><b>Avg.</b></p>		

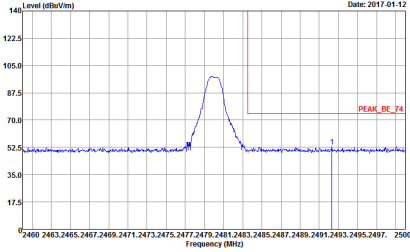
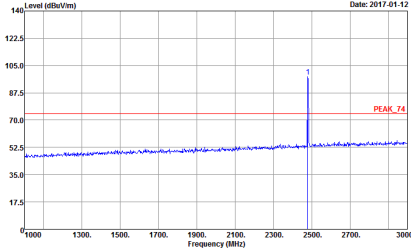
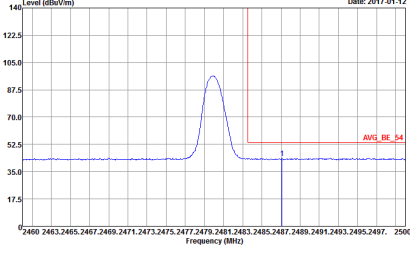
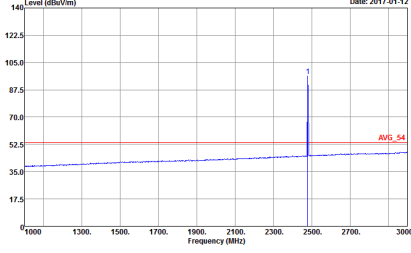


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - R	
1	Vertical	Fundamental
<p><b>Peak</b></p>	 <p>Date: 2017-01-12</p> <p>Site : 03CH13-HY            Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL            RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 6N2509            Mode : 5</p>	<p>Left blank</p>
<p><b>Avg.</b></p>	 <p>Date: 2017-01-12</p> <p>Site : 03CH13-HY            Condition : AVG_BE_54 3m HORN_9120D_1241 VERTICAL            RBW:1000.000KHz VBW:3.000KHz SWT:Auto            Detector : Peak            Project : 6N2509            Mode : 5</p>	<p>Left blank</p>



BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
1	Horizontal	Fundamental
Peak	 <p>Date: 2017-01-12</p> <p>Level (dBuV/m) vs Frequency (MHz)</p> <p>Site : 03CH13-#Y            Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL            RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 6N2509            Mode : 6</p>	 <p>Date: 2017-01-12</p> <p>Level (dBuV/m) vs Frequency (MHz)</p> <p>Site : 03CH13-#Y            Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL            RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 6N2509            Mode : 6</p>
Avg.	 <p>Date: 2017-01-12</p> <p>Level (dBuV/m) vs Frequency (MHz)</p> <p>Site : 03CH13-#Y            Condition : AV6_BE_54 3m HORN_9120D_1241 HORIZONTAL            RBW:1000.000KHz VBW:3.000KHz SWT:Auto            Detector : Peak            Project : 6N2509            Mode : 6</p>	 <p>Date: 2017-01-12</p> <p>Level (dBuV/m) vs Frequency (MHz)</p> <p>Site : 03CH13-#Y            Condition : AV6_54 3m HORN_9120D_1241 HORIZONTAL            RBW:1000.000KHz VBW:3.000KHz SWT:Auto            Detector : Peak            Project : 6N2509            Mode : 6</p>



BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
1	<p style="text-align: center;"><b>Vertical</b></p>  <p style="text-align: center;"><b>Peak</b></p> <p>Site : 03CH13-HY            Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL            RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 6N2509            Mode : 6</p>	<p style="text-align: center;"><b>Fundamental</b></p>  <p>Site : 03CH13-HY            Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL            RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 6N2509            Mode : 6</p>
Avg.	 <p>Site : 03CH13-HY            Condition : AVG_BE_54 3m HORN_9120D_1241 VERTICAL            RBW:1000.000KHz VBW:3.000KHz SWT:Auto            Detector : Peak            Project : 6N2509            Mode : 6</p>	 <p>Site : 03CH13-HY            Condition : AVG_54 3m HORN_9120D_1241 VERTICAL            RBW:1000.000KHz VBW:3.000KHz SWT:Auto            Detector : Peak            Project : 6N2509            Mode : 6</p>

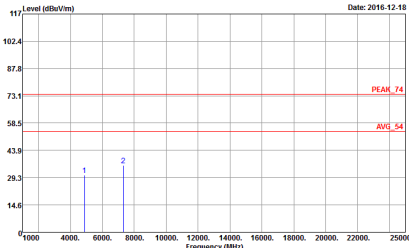
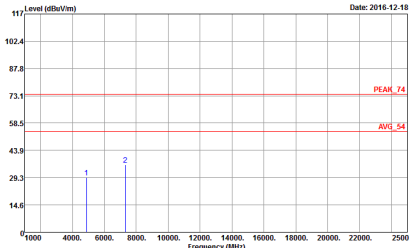


2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH00 2402MHz	
1	Horizontal	Vertical
<p><b>Peak</b></p> <p><b>Avg.</b></p>	<p>Site : 03CH13-#Y            Condition : PEAK_74 3m SHF_HORN_584 HORIZONTAL            Detector : Peak            Project : 6N2509            Mode : 4</p>	<p>Site : 03CH13-#Y            Condition : PEAK_74 3m SHF_HORN_584 VERTICAL            Detector : Peak            Project : 6N2509            Mode : 4</p>



BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH19 2440MHz	
1	Horizontal	Vertical
<p>Peak</p> <p>Avg.</p>	 <p>Site : 08CH13-#Y          Condition : PEAK_74 3m SHF_HORN_584 HORIZONTAL          Detector : Peak          Project : 6N2509          Mode : 5</p>	 <p>Site : 08CH13-#Y          Condition : PEAK_74 3m SHF_HORN_584 VERTICAL          Detector : Peak          Project : 6N2509          Mode : 5</p>



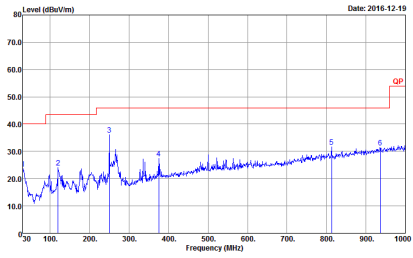
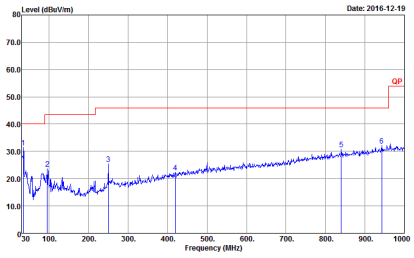


BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH39 2480MHz	
1	Horizontal	Vertical
Peak	<p>Site : 08CH13-#Y Condition : PEAK_74 3m SHF_HORN_584 HORIZONTAL Detector : Peak Project : 6N2509 Mode : 6</p>	<p>Site : 08CH13-#Y Condition : PEAK_74 3m SHF_HORN_584 VERTICAL Detector : Peak Project : 6N2509 Mode : 6</p>



Emission below 1GHz

2.4GHz BLE (LF)

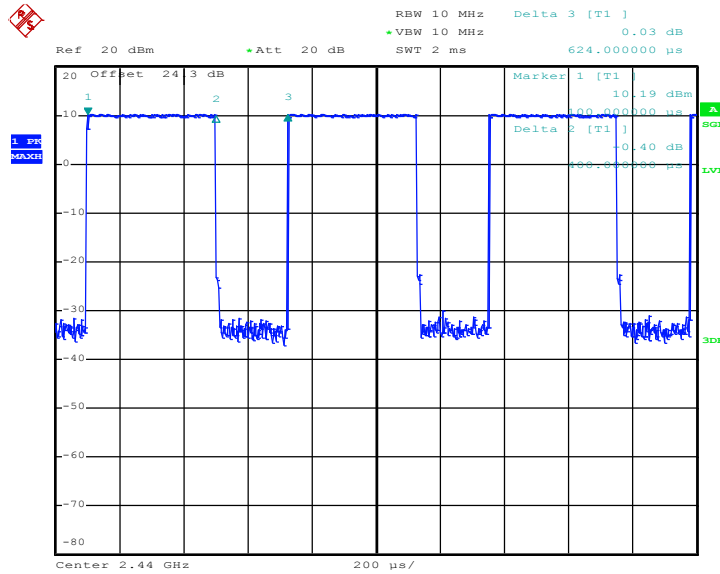
<b>BLE</b>	<b>2.4GHz 2400~2483.5MHz</b>	
<b>ANT</b>	<b>BLE LF</b>	
<b>1</b>	<b>Horizontal</b>	<b>Vertical</b>
<b>QP / Peak</b>	 <p>Site : 03CH13-HY  Condition : QP 3m 8TL06_40103 HORIZONTAL  Detector : Peak  Project : 6N2509  Mode : Z0</p>	 <p>Site : 03CH13-HY  Condition : QP 3m 8TL06_40103 VERTICAL  Detector : Peak  Project : 6N2509  Mode : Z0</p>



### Appendix C. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
Bluetooth 4.0 – LE	64.10	400.00	2.50	3kHz

#### Bluetooth 4.0 – LE



Date: 13.DEC.2016 23:57:42