

FCC CO-LOCATION RADIO TEST REPORT

FCC ID : 2AS3Y-6275
Equipment : Digital Media Receiver
Model Name : R9P2A5
Applicant : Engineering Cowboys US LLC
7 Skyline Drive, 3rd Floor,
Hawthorne, New York, 10532, USA
Standard : FCC Part 15 Subpart E §15.407

The product was received on Mar. 01, 2019 and testing was started from Jun. 10, 2019 and completed on Jun. 12, 2019. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

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

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



Approved by: Jones Tsai

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



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History of this test report

Report No.	Version	Description	Issued Date
FR930103-01F	01	Initial issue of report	Jul. 18, 2019

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)
3.1	15.407(b)	Unwanted Emissions	Pass
-	15.203 15.407(a)	Antenna Requirement	Pass

Declaration of Conformity:

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

Comments and Explanations:

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

Reviewed by: Wii Chang

Report Producer: Maggie Chiang

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	Digital Media Receiver
Model Name	R9P2A5
FCC ID	2AS3Y-6275
EUT supports Radios application	WLAN 11b/g/n HT20 WLAN 11a/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth LE

1.2 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency Range	WLAN 802.11g: 2412 MHz ~ 2472 MHz WLAN 802.11a: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Antenna Type / Gain	Bluetooth : PCB Inv F type Antenna with gain 3.84 dBi <2412 MHz ~ 2472 MHz> PCB Inv F type Antenna with gain 4.37 dBi <5745 MHz ~ 5825 MHz> PCB Inv F type Antenna with gain 3.9 dBi
Type of Modulation	Bluetooth LE : GFSK 802.11g : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11a : OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.3 Modification of EUT

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



1.4 Testing Location

Test Site	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
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.	Sporton Site No.
	03CH12-HY

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

FCC Designation No. TW0007

1.5 Applicable Standards

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

- ♦ FCC Part 15 Subpart E
- ♦ FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01.
- ♦ 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 two configurations, with accessories and without accessories. The worst case (with accessories) was recorded in this report.

2.1 Carrier Frequency and Channel

2400-2483.5 MHz Bluetooth - LE		2400-2483.5 MHz 802.11g		5745-5825 MHz 802.11a	
Channel	Freq. (MHz)	Channel	Channel	Channel	Channel
39	2480	01	2412	157	5785

2.2 Test Mode

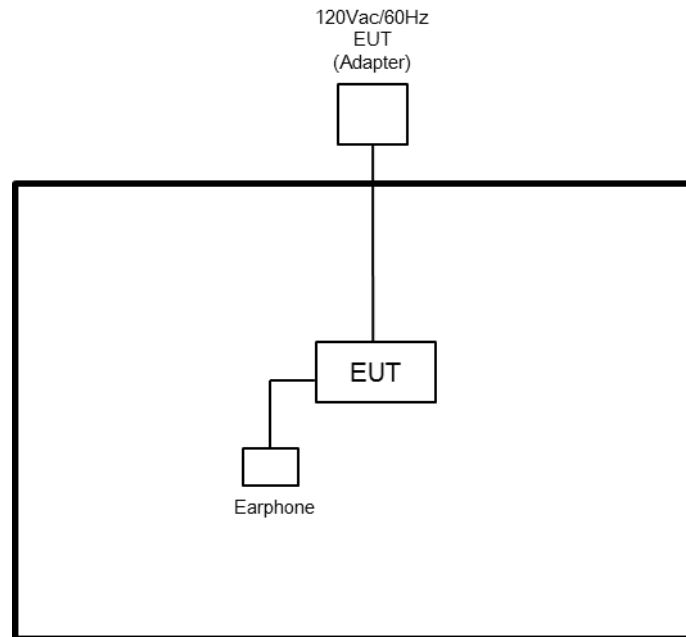
Final test modes are considering the modulation and worse data rates as below table.

<Co-Location>

Modulation	Data Rate
Bluetooth - LE + 2.4GHz 802.11g	2Mbps + 6Mbps
Bluetooth - LE + 5GHz 802.11a	2Mbps + MCS0

2.3 Connection Diagram of Test System

<Co-Location Mode>



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A

2.5 EUT Operation Test Setup

The RF test items, utility "Compliance.exe 1.0.0.49" 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 Unwanted Emissions Measurement

This section is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement.

3.1.1 Limit of Unwanted Emissions

- (1) Unwanted spurious emissions fallen in restricted bands shall comply with the general field strength limits as below table,

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

Note: The following formula is used to convert the EIRP to field strength.

$$E = \frac{1000000\sqrt{30P}}{3} \text{ } \mu\text{V/m, where P is the eirp (Watts)}$$

EIRP (dBm)	Field Strength at 3m (dBμV/m)
- 27	68.3

- (2) KDB789033 D02 v02r01 G)2)c)

- (i) Section 15.407(b)(1) to (b)(3) specify the unwanted emission limits for the U-NII-1 and U-NII-2 bands. As specified, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz.³
- (ii) Section 15.407(b)(4) specifies the unwanted emission limit for the U-NII-3 band. A band emissions mask is specified in Section 15.407(b)(4)(i). The emission limits are in terms of a Peak detector. An alternative to the band emissions mask is specified in Section 15.407(b)(4)(ii). The alternative limits are based on the highest antenna gain specified in the filing. There are also marketing and importation restrictions for the devices using the alternative limit.⁴

Note 3: An out-of-band emission that complies with both the average and peak limits of Section 15.209 is not required to satisfy the -27 dBm/MHz peak emission limit.

Note 4: Only devices with antenna gains of 10 dBi or less may be approved using the emission limits specified in Section 15.247(d) till March 2, 2018; all other devices operating in this band must use the mask specified in Section 15.407(b)(4)(i).

3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

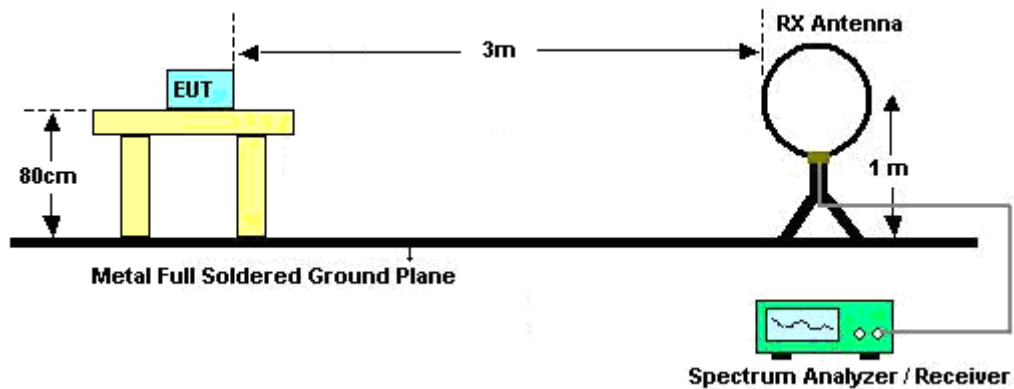
3.1.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
Section G) Unwanted emissions measurement.
(1) Procedure for Unwanted Emissions Measurements Below 1000MHz
 - RBW = 120 kHz
 - VBW = 300 kHz
 - Detector = Peak
 - Trace mode = max hold
(2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz
 - RBW = 1 MHz
 - VBW $\geq$ 3 MHz
 - Detector = Peak
 - Sweep time = auto
 - Trace mode = max hold
(3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz
 - RBW = 1 MHz
 - 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.
2. 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.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.

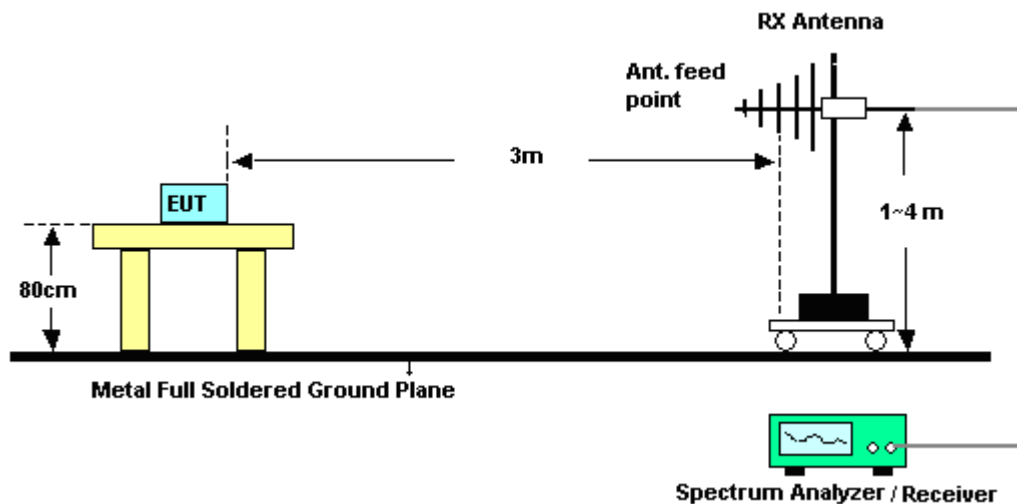
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level 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.

3.1.4 Test Setup

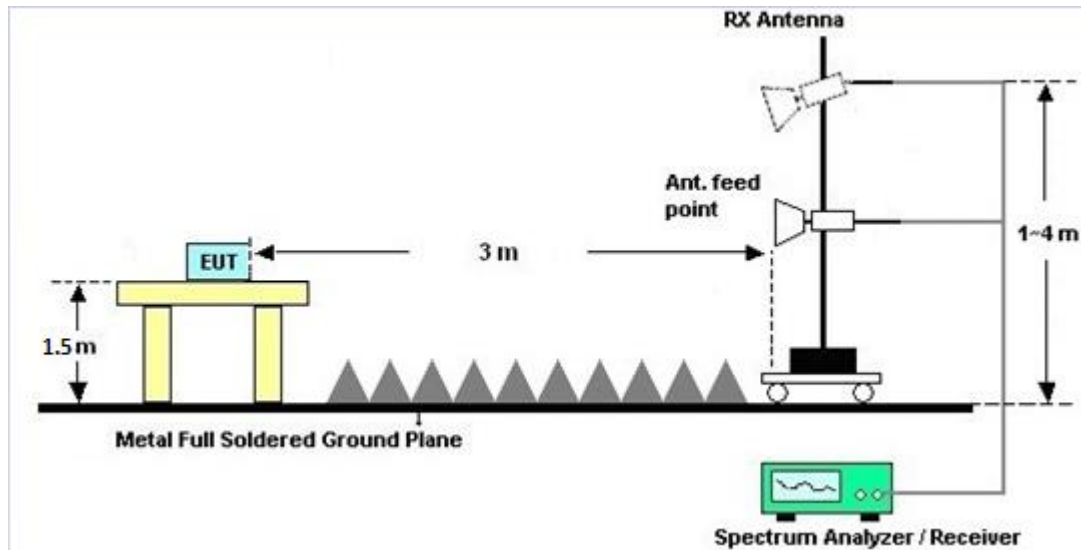
For radiated emissions below 30MHz



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 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.

3.1.6 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 Emissions (30MHz ~ 10th Harmonic)

Please refer to Appendix A and B.



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Bilog Antenna	TESEQ	CBL 6111D&00800 N1D01N-06	37059&01	30MHz~1GHz	Oct. 13, 2018	Jun. 10, 2019~Jun. 12, 2019	Oct. 12, 2019	Radiation (03CH12-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1328	1GHz ~ 18GHz	Nov. 09, 2018	Jun. 10, 2019~Jun. 12, 2019	Nov. 08, 2019	Radiation (03CH12-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170584	18GHz ~ 40GHz	Dec. 05, 2018	Jun. 10, 2019~Jun. 12, 2019	Dec. 04, 2019	Radiation (03CH12-HY)
Preamplifier	COM-POWER	PA-103	161075	10MHz~1GHz	Mar. 25, 2019	Jun. 10, 2019~Jun. 12, 2019	Mar. 24, 2020	Radiation (03CH12-HY)
Preamplifier	Agilent	8449B	3008A02375	1GHz~26.5GHz	May 27, 2019	Jun. 10, 2019~Jun. 12, 2019	May 26, 2020	Radiation (03CH12-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590074	1GHz~18GHz	May 20, 2019	Jun. 10, 2019~Jun. 12, 2019	May 19, 2020	Radiation (03CH12-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz ~ 40GHz	Dec. 06, 2018	Jun. 10, 2019~Jun. 12, 2019	Dec. 05, 2019	Radiation (03CH12-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100390	20Hz~26.5GHz	Dec. 26, 2018	Jun. 10, 2019~Jun. 12, 2019	Dec. 25, 2019	Radiation (03CH12-HY)
Spectrum Analyzer	Keysight	N9010A	MY55370526	10Hz~44GHz	Mar. 19, 2019	Jun. 10, 2019~Jun. 12, 2019	Mar. 18, 2020	Radiation (03CH12-HY)
Filter	Wainwright	WLK4-1000-15 30-6000-40SS	SN11	1 GHz Lowpass	Sep. 16, 2018	Jun. 10, 2019~Jun. 12, 2019	Sep. 15, 2019	Radiation (03CH12-HY)
Filter	Wainwright	WHKX12-2700 -3000-18000-6 0SS	SN3	3 GHz Highpass	Sep. 16, 2018	Jun. 10, 2019~Jun. 12, 2019	Sep. 15, 2019	Radiation (03CH12-HY)
Filter	Woken	WHKX8-5272. 5-6750-18000-40ST	SN2	6.75G Highpass	Sep. 17, 2018	Jun. 10, 2019~Jun. 12, 2019	Sep.16, 2019	Radiation (03CH12-HY)
Notch Filter	Wainwright	WRCGV2400/ 2483-2390/249 3-35/10SS	SN4	2.4G	Nov. 02, 2018	Jun. 10, 2019~Jun. 12, 2019	Nov. 01, 2019	Radiation (03CH12-HY)
Notch Filter	Wainwright	WRCJV12-569 5-5725-5850-5 880-40SS	SN6	5GBand4	Jul. 05, 2018	Jun. 10, 2019~Jun. 12, 2019	Jul. 04, 2019	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126E	0058/126E	30M-18G	Mar. 13, 2019	Jun. 10, 2019~Jun. 12, 2019	Mar. 12, 2020	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	505134/2	30M~40GHz	Oct. 16, 2018	Jun. 10, 2019~Jun. 12, 2019	Oct. 15, 2019	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	800740/2	30M~40GHz	Oct. 16, 2018	Jun. 10, 2019~Jun. 12, 2019	Oct. 15, 2019	Radiation (03CH12-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Jun. 10, 2019~Jun. 12, 2019	N/A	Radiation (03CH12-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Jun. 10, 2019~Jun. 12, 2019	N/A	Radiation (03CH12-HY)
Software	Audix	E3 6.2009-8-24	RK-000989	N/A	N/A	Jun. 10, 2019~Jun. 12, 2019	N/A	Radiation (03CH12-HY)



5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.1
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.2
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.7
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Appendix A. Radiated Spurious Emission

Test Engineer :	Jack Cheng, Lance Chiang, and Chuan Chu	Temperature :	21~24°C
		Relative Humidity :	56~68%

BLE (Band Edge @ 3m)

Ant. Simultaneously	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)
BLE(2M)	*	2480	108.94	-	-	98.16	27.34	16.71	33.27	145	293	P	H
CH39	*	2480	107.35	-	-	96.57	27.34	16.71	33.27	145	293	A	H
2480 MHz		2484.32	62.04	-11.96	74	51.27	27.33	16.71	33.27	145	293	P	H
Ant 2		2483.52	52	-2	54	41.23	27.33	16.71	33.27	145	293	A	H
+													
802.11g	*	2480	102.8	-	-	92.02	27.34	16.71	33.27	110	161	P	V
CH01	*	2480	101.22	-	-	90.44	27.34	16.71	33.27	110	161	A	V
2412 MHz		2484.4	57.83	-16.17	74	47.06	27.33	16.71	33.27	110	161	P	V
Ant 1		2483.52	48.62	-5.38	54	37.85	27.33	16.71	33.27	110	161	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



WIFI 802.11g (Band Edge @ 3m)

Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
Simultaneously		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE(2M) CH39 2480 MHz Ant 2 + 802.11g CH01 2412 MHz Ant 1		2389.8	69.52	-4.48	74	58.53	27.52	16.63	33.16	203	140	P	H
		2390	53.33	-0.67	54	42.34	27.52	16.63	33.16	203	140	A	H
	*	2412	113.3	-	-	102.35	27.48	16.65	33.18	203	140	P	H
	*	2412	106	-	-	95.05	27.48	16.65	33.18	203	140	A	H
		2390	67.67	-6.33	74	56.68	27.52	16.63	33.16	100	192	P	V
		2390	52.51	-1.49	54	41.52	27.52	16.63	33.16	100	192	A	V
	*	2412	110.14	-	-	99.19	27.48	16.65	33.18	100	192	P	V
	*	2412	103.18	-	-	92.23	27.48	16.65	33.18	100	192	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz (Harmonic @ 3m)

Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
Simultaneously		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE(2M) CH39 2480 MHz Ant 2 + 802.11g CH01 2412 MHz Ant 1		4824	44.46	-29.54	74	60.45	31.1	10.46	57.55	100	0	P	H
		4960	38.43	-35.57	74	53.99	31.32	10.4	57.28	100	0	P	H
		7440	44.53	-29.47	74	52.53	36.38	13.05	57.43	100	0	P	H
		4824	45.78	-28.22	74	61.77	31.1	10.46	57.55	100	0	P	V
		4960	39.03	-34.97	74	54.59	31.32	10.4	57.28	100	0	P	V
		7440	43.77	-30.23	74	51.77	36.38	13.05	57.43	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Emission below 1GHz

2.4GHz 2400~2483.5MHz (LF @ 3m)

	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
Simultaneously		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE(2M) CH39 2480 MHz Ant 2 + 802.11g CH01 2412 MHz Ant 1		32.7	23.43	-16.57	40	29.9	22.98	0.78	30.23	-	-	P	H
		116.67	24.08	-19.42	43.5	35.92	17.14	1.43	30.41	-	-	P	H
		195.24	22.34	-21.16	43.5	36.02	14.95	1.7	30.33	-	-	P	H
		781.6	32.52	-13.48	46	29.57	28.14	4.14	29.33	-	-	P	H
		896.4	35.72	-10.28	46	31.41	29.01	4.45	29.15	-	-	P	H
		956.6	36.39	-9.61	46	29.87	30.75	4.75	28.98	100	0	P	H
		45.93	26.24	-13.76	40	39.59	16.28	0.78	30.41	-	-	P	V
		75.36	23.49	-16.51	40	40.05	12.83	1.06	30.45	-	-	P	V
		105.87	25.41	-18.09	43.5	37.78	16.62	1.43	30.42	-	-	P	V
		714.4	34.65	-11.35	46	33.29	26.96	3.89	29.49	100	0	P	V
		855.1	33.59	-12.41	46	29.34	29.18	4.28	29.21	-	-	P	V
		894.3	34.51	-11.49	46	30.19	29.02	4.45	29.15	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



BLE (Band Edge @ 3m)

	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
Simultaneously		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE(2M) CH39 2480 MHz Ant 2 + 802.11a CH157 5785 MHz Ant 1	*	2480	110.26	-	-	99.48	27.34	16.71	33.27	143	277	P	H
	*	2480	108.76	-	-	97.98	27.34	16.71	33.27	143	277	A	H
		2483.6	58.67	-15.33	74	47.9	27.33	16.71	33.27	143	277	P	H
		2483.52	51.6	-2.4	54	40.83	27.33	16.71	33.27	143	277	A	H
	*	2480	105.36	-	-	94.58	27.34	16.71	33.27	115	183	P	V
	*	2480	103.7	-	-	92.92	27.34	16.71	33.27	115	183	A	V
		2483.52	57.01	-16.99	74	46.24	27.33	16.71	33.27	115	183	P	V
		2483.52	48.21	-5.79	54	37.44	27.33	16.71	33.27	115	183	A	V
Remark	1. No other spurious found.												
	2. All results are PASS against Peak and Average limit line.												



WIFI 802.11a (Band Edge @ 3m)

Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
Simultaneously		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE(2M) CH39 2480 MHz Ant 2 + 802.11a CH157 5785 MHz Ant 1		5642.8	52.91	-15.29	68.2	44.2	31.71	10.45	33.45	184	4	P	H
		5662.4	54.28	-23.13	77.41	45.5	31.77	10.46	33.45	184	4	P	H
		5700.2	55.72	-49.54	105.26	46.69	32	10.49	33.46	184	4	P	H
		5754.6	66.58	-67.62	134.2	57.42	32.11	10.52	33.47	184	4	P	H
	*	5785	112.31	-	-	103.08	32.17	10.53	33.47	184	4	P	H
	*	5785	104.96	-	-	95.73	32.17	10.53	33.47	184	4	A	H
		5852	53.68	-63.96	117.64	44.27	32.3	10.59	33.48	184	4	P	H
		5864.6	54.31	-53.8	108.11	44.86	32.33	10.6	33.48	184	4	P	H
		5891.8	54.25	-38.48	92.73	44.73	32.38	10.62	33.48	184	4	P	H
		5938	52.1	-16.1	68.2	42.38	32.55	10.66	33.49	184	4	P	H
		5623.2	50.93	-17.27	68.2	42.19	31.75	10.44	33.45	280	182	P	V
		5654	52.77	-18.4	71.17	44.04	31.72	10.46	33.45	280	182	P	V
		5716.8	53.93	-55.98	109.91	44.87	32.03	10.49	33.46	280	182	P	V
		5753.6	59.92	-74.28	134.2	50.77	32.11	10.51	33.47	280	182	P	V
	*	5785	110.19	-	-	100.96	32.17	10.53	33.47	280	182	P	V
	*	5785	102.47	-	-	93.24	32.17	10.53	33.47	280	182	A	V
		5853.4	52.18	-62.27	114.45	42.76	32.31	10.59	33.48	280	182	P	V
		5864.8	52.92	-55.13	108.05	43.47	32.33	10.6	33.48	280	182	P	V
		5892.8	52.67	-39.32	91.99	43.14	32.39	10.62	33.48	280	182	P	V
		5948.6	51.99	-16.21	68.2	42.22	32.59	10.67	33.49	280	182	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz and Band 4 5725~5850MHz (Harmonic @ 3m)

Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
Simultaneously		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE(2M) CH39 2480 MHz Ant 2 + 802.11a CH157 5785 MHz Ant 1		4960	52.44	-21.56	74	44.99	31.32	9.61	33.48	100	0	P	H
		4960	42.44	-11.56	54	34.99	31.32	9.61	33.48	100	0	A	H
		7440	44.73	-29.27	74	52.25	36.38	13.53	57.43	100	0	P	H
		11570	62.32	-11.68	74	62.66	39.66	16.3	56.3	101	172	P	H
		11570	49.53	-4.47	54	49.87	39.66	16.3	56.3	101	172	A	H
		17355	50.69	-17.51	68.2	45.1	41.4	21	56.81	100	0	P	H
		4960	51.92	-22.08	74	44.47	31.32	9.61	33.48	100	0	P	V
		4960	41.92	-12.08	54	34.47	31.32	9.61	33.48	100	0	A	V
		7440	44.21	-29.79	74	51.73	36.38	13.53	57.43	100	0	P	V
		11570	63.96	-10.04	74	64.3	39.66	16.3	56.3	100	284	P	V
		11570	53.49	-0.51	54	53.83	39.66	16.3	56.3	100	284	A	V
		17355	50.07	-18.13	68.2	44.48	41.4	21	56.81	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Emission below 1GHz

2.4GHz 2400~2483.5MHz and Band 4 5725~5850MHz (LF @ 3m)

	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
Simultaneously		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE(2M) CH39 2480 MHz Ant 2 + 802.11a CH157 5785 MHz Ant 1		30	23.93	-16.07	40	29.16	24.17	0.78	30.18	-	-	P	H
		99.93	24.29	-19.21	43.5	37.84	15.82	1.06	30.43	-	-	P	H
		118.56	25.58	-17.92	43.5	37.24	17.32	1.43	30.41	-	-	P	H
		776.7	32.47	-13.53	46	29.72	28.12	3.97	29.34	-	-	P	H
		895.7	35.54	-10.46	46	31.22	29.02	4.45	29.15	100	0	P	H
		947.5	35.16	-10.84	46	28.97	30.44	4.75	29	-	-	P	H
		38.91	26.35	-13.65	40	36.08	19.8	0.78	30.31	-	-	P	V
		89.13	21.26	-22.24	43.5	35.93	14.71	1.06	30.44	-	-	P	V
		133.41	22.96	-20.54	43.5	34.54	17.38	1.43	30.39	-	-	P	V
		813.1	32.78	-13.22	46	29.75	28.16	4.14	29.27	-	-	P	V
		890.1	35.94	-10.06	46	31.59	29.05	4.45	29.15	100	0	P	V
		943.3	34.59	-11.41	46	28.55	30.3	4.75	29.01	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



Note symbol

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

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

	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
Simultaneously		(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

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”.



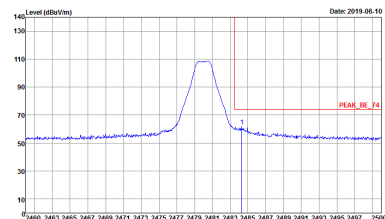
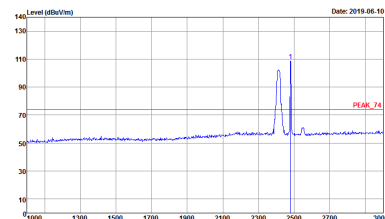
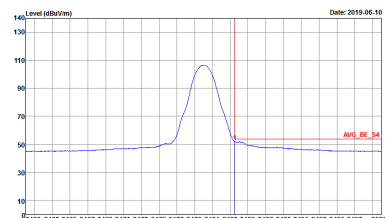
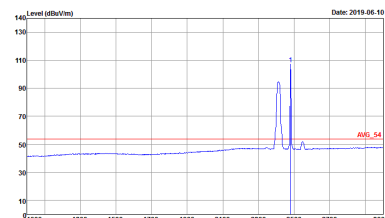
Appendix B. Radiated Spurious Emission Plots

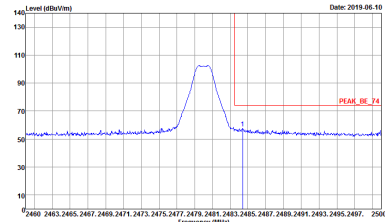
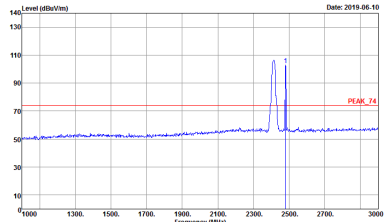
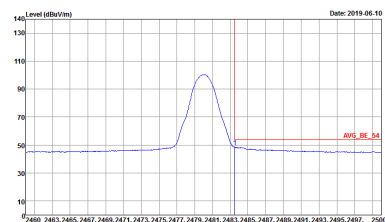
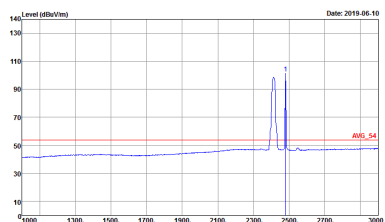
Test Engineer :	Jack Cheng, Lance Chiang, and Chuan Chu	Temperature :	21~24°C
		Relative Humidity :	56~68%

Note symbol

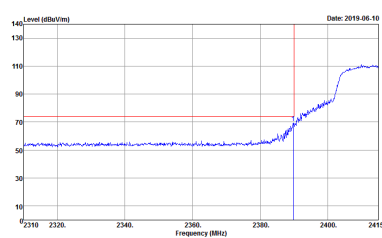
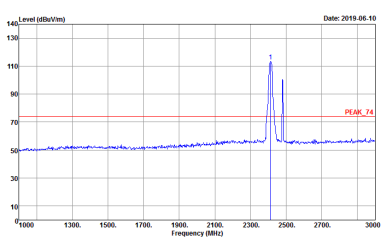
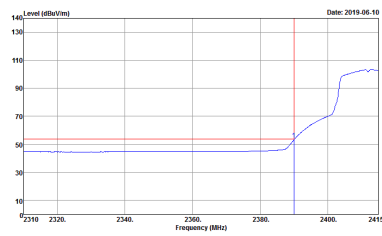
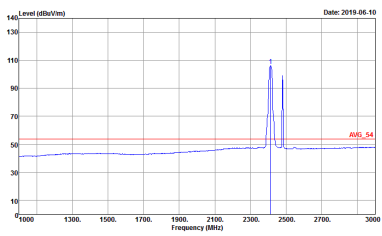
-L	Low channel location
-R	High channel location

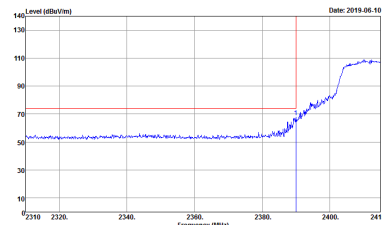
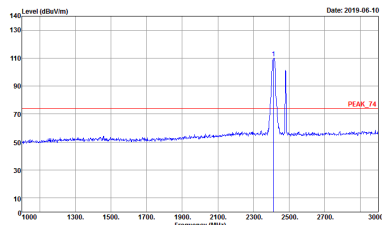
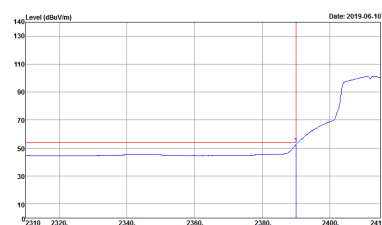
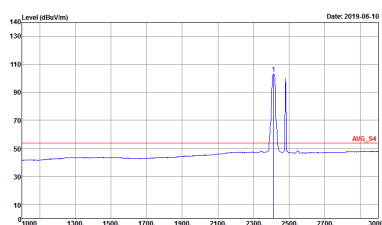
BLE (Band Edge @ 3m)

Ant.	BLE(2M)_Ch39_Ant 2 + WIFI 802.11g_Ch01_Ant 1	
Simultaneously	Horizontal	Fundamental
Peak	 Site : 03CH12-HY Condition : PEAK_BE_74 3m HORN_9120D_1328 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 930103-01 Mode : 1 Setting : 7/2	 Site : 03CH12-HY Condition : PEAK_74 3m HORN_9120D_1328 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 930103-01 Mode : 1 Setting : 7/2
Avg.	 Site : 03CH12-HY Condition : AVG_BE_54 3m HORN_9120D_1328 HORIZONTAL RBW:1000.000KHz VBW:1000KHz SWT:Auto Detector : Peak Project : 930103-01 Mode : 1 Setting : 7/2	 Site : 03CH12-HY Condition : AVG_54 3m HORN_9120D_1328 HORIZONTAL RBW:1000.000KHz VBW:1000KHz SWT:Auto Detector : Peak Project : 930103-01 Mode : 1 Setting : 7/2

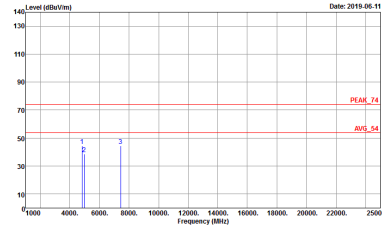
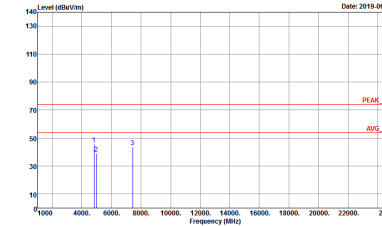
Ant.	BLE(2M)_Ch39_Ant 2 + WIFI 802.11g_Ch01_Ant 1	
Simultaneously	Vertical	Fundamental
Peak	 Site : 03CH12-HY Condition : PEAK_BE_74 3m HORN_9120D_1328 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 930103-01 Mode : 1 Setting : 7/2	 Site : 03CH12-HY Condition : PEAK_74 3m HORN_9120D_1328 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 930103-01 Mode : 1 Setting : 7/2
Avg.	 Site : 03CH12-HY Condition : AVG_BE_54 3m HORN_9120D_1328 VERTICAL RBW:1000.000KHz VBW:1000KHz SWT:Auto Detector : Peak Project : 930103-01 Mode : 1 Setting : 7/2	 Site : 03CH12-HY Condition : AVG_54 3m HORN_9120D_1328 VERTICAL RBW:1000.000KHz VBW:1000KHz SWT:Auto Detector : Peak Project : 930103-01 Mode : 1 Setting : 7/2

WIFI 802.11g (Band Edge @ 3m)

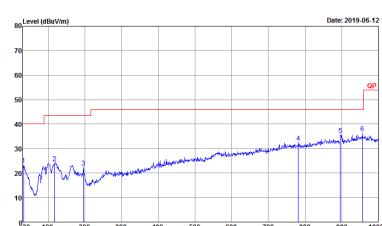
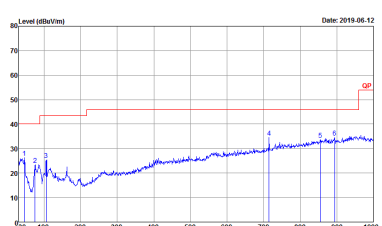
Ant.	BLE(2M)_Ch39_Ant 2 + WIFI 802.11g_Ch01_Ant 1	
Simultaneously	Horizontal	Fundamental
Peak	 Site : 03CH12-HY Condition : PEAK_BE_74 3m HORN_91200_1328 HORIZONTAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak Mode : 930103-01 WLAN Setting : 18.5 BLE Setting : 7/2	 Site : 03CH12-HY Condition : PEAK_74 3m HORN_91200_1328 HORIZONTAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak Mode : 930103-01 WLAN Setting : 18.5 BLE Setting : 7/2
Avg.	 Site : 03CH12-HY Condition : AVG_BE_54 3m HORN_91200_1328 HORIZONTAL Detector : RBW:1000.000KHz VBW:0.010KHz SWT:Auto Project : Peak Mode : 930103-01 WLAN Setting : 18.5 BLE Setting : 7/2	 Site : 03CH12-HY Condition : AVG_54 3m HORN_91200_1328 HORIZONTAL Detector : RBW:1000.000KHz VBW:0.010KHz SWT:Auto Project : Peak Mode : 930103-01 WLAN Setting : 18.5 BLE Setting : 7/2

Ant.	BLE(2M)_Ch39_Ant 2 + WIFI 802.11g_Ch01_Ant 1	
Simultaneously	Vertical	Fundamental
Peak	 Site : 03CH12-HY Condition : PEAK_BE_74 3m HORN_91200_1328 VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak Mode : 930103-01 WLAN Setting : 18.5 BLE Setting : 7/2	 Site : 03CH12-HY Condition : PEAK_74 3m HORN_91200_1328 VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak Mode : 930103-01 WLAN Setting : 18.5 BLE Setting : 7/2
Avg.	 Site : 03CH12-HY Condition : AVG_BE_54 3m HORN_91200_1328 VERTICAL Detector : RBW:1000.000KHz VBW:0.010KHz SWT:Auto Project : Peak Mode : 930103-01 WLAN Setting : 18.5 BLE Setting : 7/2	 Site : 03CH12-HY Condition : AVG_54 3m HORN_91200_1328 VERTICAL Detector : RBW:1000.000KHz VBW:0.010KHz SWT:Auto Project : Peak Mode : 930103-01 WLAN Setting : 18.5 BLE Setting : 7/2

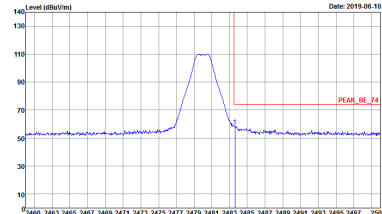
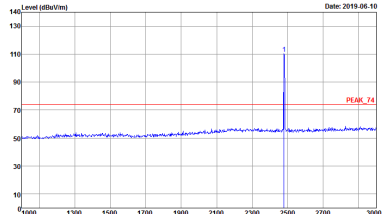
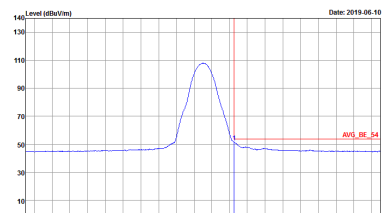
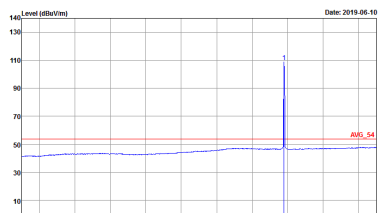
2.4GHz 2400~2483.5MHz (Harmonic @ 3m)

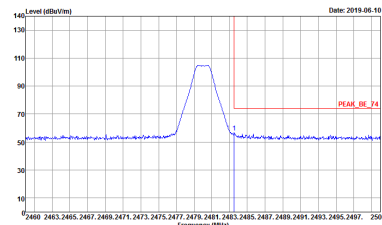
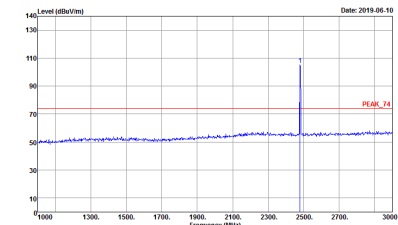
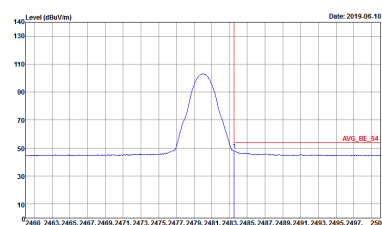
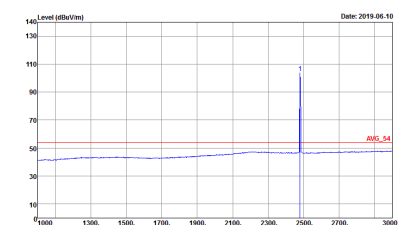
Ant.	BLE(2M)_Ch39_Ant 2 + WIFI 802.11g_Ch01_Ant 1	
Simultaneously	Horizontal	Vertical
Peak Avg.	 Site : 03CH12-HY Condition : PEAK_74 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 930103-01 Mode : 1 WLAN Setting : 18.5 BLE Setting : 7/2	 Site : 03CH12-HY Condition : PEAK_74 3m HORN_9120D_1328 VERTICAL Detector : Peak Project : 930103-01 Mode : 1 WLAN Setting : 18.5 BLE Setting : 7/2

Emission below 1GHz
2.4GHz 2400~2483.5MHz (LF)

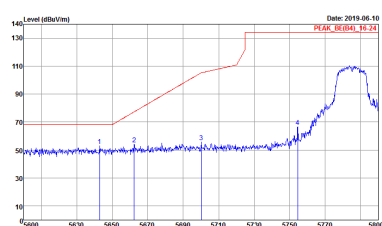
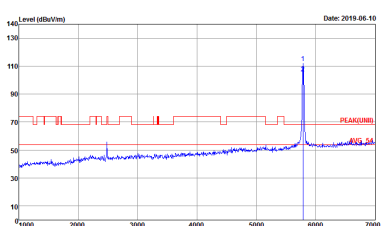
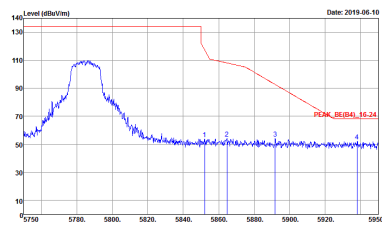
Ant.	BLE(2M)_Ch39_Ant 2 + WIFI 802.11g_Ch01_Ant 1	
Simultaneously	Horizontal	Vertical
QP / Peak	 Site : 03CH12-HY Condition : QP 3m B1LO6_6111D_37059 HORIZONTAL Detector : Peak Project : 930103-01 Mode : 1 WLAN Setting : 18.5 BLE Setting : 7/2	 Site : 03CH12-HY Condition : QP 3m B1LO6_6111D_37059 VERTICAL Detector : Peak Project : 930103-01 Mode : 1 WLAN Setting : 18.5 BLE Setting : 7/2

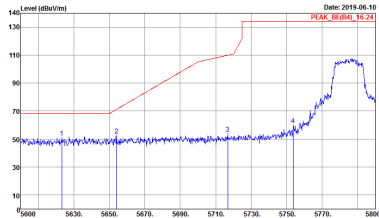
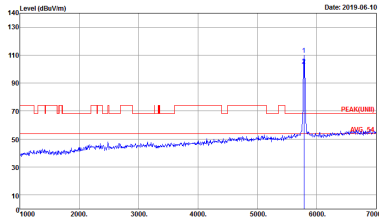
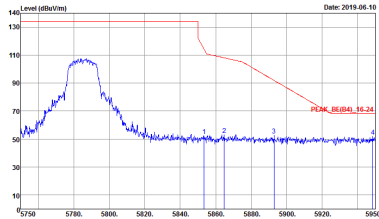
BLE (Band Edge @ 3m)

Ant.	BLE(2M)_Ch39_Ant 2 + WIFI 802.11a_Ch157_Ant 1	
Simultaneously	Horizontal	Fundamental
Peak	 Site : 03CH12-HY Condition : PEAK_BE_74 3m HORN_91200_1328 HORIZONTAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : 930103-01 Mode : 2 Setting : 7/0	 Site : 03CH12-HY Condition : PEAK_74 3m HORN_91200_1328 HORIZONTAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : 930103-01 Mode : 2 Setting : 7/0
Avg.	 Site : 03CH12-HY Condition : AVG_BE_54 3m HORN_91200_1328 HORIZONTAL Detector : RBW:1000.000KHz VBW:1000KHz SWT:Auto Project : 930103-01 Mode : 2 Setting : 7/0	 Site : 03CH12-HY Condition : AVG_54 3m HORN_91200_1328 HORIZONTAL Detector : RBW:1000.000KHz VBW:1000KHz SWT:Auto Project : 930103-01 Mode : 2 Setting : 7/0

Ant.	BLE(2M)_Ch39_Ant 2 + WIFI 802.11a_Ch157_Ant 1	
Simultaneously	Vertical	Fundamental
Peak	 Site : 03CH12-HY Condition : PEAK_BE_74 3m HORN_9120D_1328 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 930103-01 Mode : Z Setting : 7/0	 Site : 03CH12-HY Condition : PEAK_74 3m HORN_9120D_1328 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 930103-01 Mode : Z Setting : 7/0
Avg.	 Site : 03CH12-HY Condition : AVG_BE_54 3m HORN_9120D_1328 VERTICAL RBW:1000.000KHz VBW:1000KHz SWT:Auto Detector : Peak Project : 930103-01 Mode : Z Setting : 7/0	 Site : 03CH12-HY Condition : AVG_54 3m HORN_9120D_1328 VERTICAL RBW:1000.000KHz VBW:1000KHz SWT:Auto Detector : Peak Project : 930103-01 Mode : Z Setting : 7/0

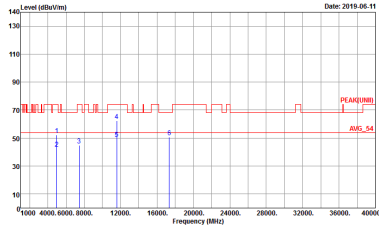
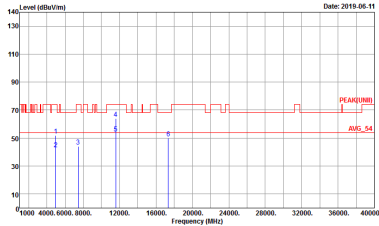
WIFI 802.11a (Band Edge @ 3m)

Ant.	BLE(2M)_Ch39_Ant 2 + WIFI 802.11a_Ch157_Ant 1	
Simultaneously	Horizontal	Fundamental
Peak	 Site : 03CH12-HY Condition : PEAK_BE(B4)_16-24 3m HORN_9120D_1328 HORIZONTAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : 930103-01 Mode : 2 WLAN Setting : 19 BLE Setting : 7/0 Add 2.4GHz Notch Filter	 Site : 03CH12-HY Condition : PEAK(UNIT) 3m HORN_9120D_1328 HORIZONTAL Detector : Peak Project : 930103-01 Mode : 2 WLAN Setting : 19 BLE Setting : 7/0 Add 2.4GHz Notch Filter
Peak	 Site : 03CH12-HY Condition : PEAK_BE(B4)_16-24 3m HORN_9120D_1328 HORIZONTAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : 930103-01 Mode : 2 WLAN Setting : 19 BLE Setting : 7/0 Add 2.4GHz Notch Filter	Left blank

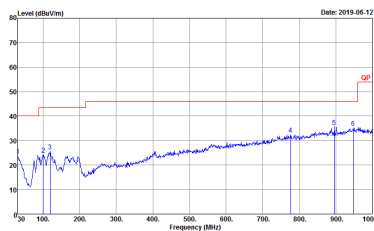
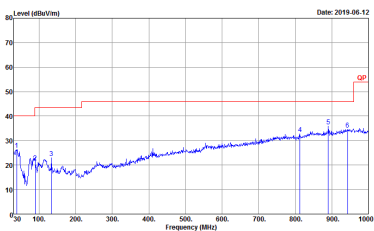
Ant.	BLE(2M)_Ch39_Ant 2 + WIFI 802.11a_Ch157_Ant 1	
Simultaneously	Horizontal	Fundamental
Peak	 Site : 03CH12-HY Condition : PEAK_BE(B4)_16-24 3m HORN_9120D_1328 VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : 930103-01 Mode : 2 WLAN Setting : 19 BLE Setting : 7/0 Add 2.4GHz Notch Filter	 Site : 03CH12-HY Condition : PEAK(UNIT) 3m HORN_9120D_1328 VERTICAL Detector : Peak Project : 930103-01 Mode : 2 WLAN Setting : 19 BLE Setting : 7/0 Add 2.4GHz Notch Filter
Peak	 Site : 03CH12-HY Condition : PEAK_BE(B4)_16-24 3m HORN_9120D_1328 VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : 930103-01 Mode : 2 WLAN Setting : 19 BLE Setting : 7/0 Add 2.4GHz Notch Filter	Left blank



2.4GHz 2400~2483.5MHz and Band 4 5725~5850MHz (Harmonic @ 3m)

Ant.	BLE(2M)_Ch39_Ant 2 + WIFI 802.11a_Ch157_Ant 1	
Simultaneously	Horizontal	Vertical
Peak Avg.	 Site : 03CH12-HY Condition : PEAK(UNIT) 3m HORN_91200_1328 HORIZONTAL Detector : Peak Project : 930103-01 Mode : 2 WLAN Setting : 19 BLE Setting : 770	 Site : 03CH12-HY Condition : PEAK(UNIT) 3m HORN_91200_1328 VERTICAL Detector : Peak Project : 930103-01 Mode : 2 WLAN Setting : 19 BLE Setting : 770

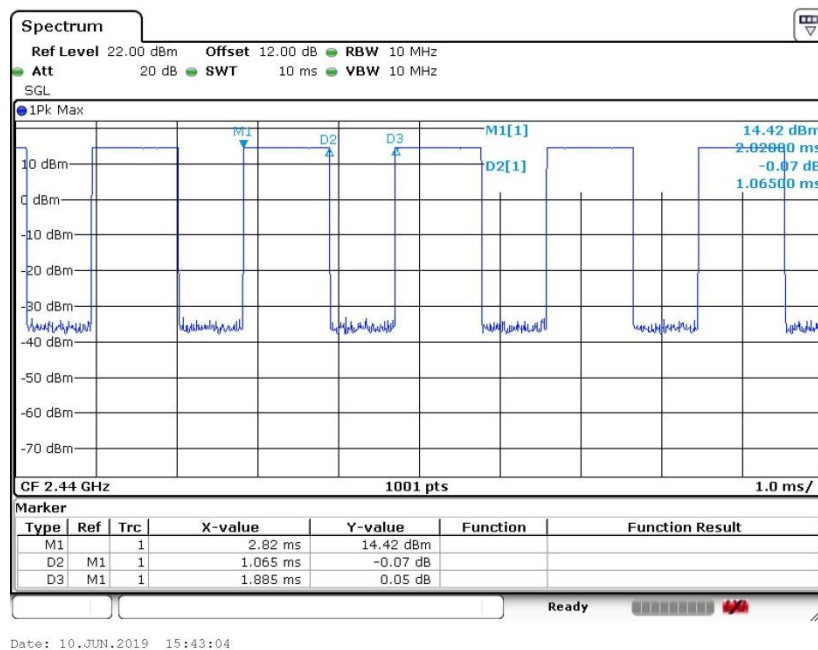
Emission below 1GHz
2.4GHz 2400~2483.5MHz and Band 4 5725~5850MHz (LF)

Ant.	BLE(2M)_Ch39_Ant 2 + WIFI 802.11a_Ch157_Ant 1	
Simultaneously	Horizontal	Vertical
QP / Peak	 Site : 03CH12-HY Condition : QP 3m B106_6111D_37059 HORIZONTAL Detector : Peak Project : 930103-01 Mode : 2 WLAN Setting : 19 BLE Setting : 770	 Site : 03CH12-HY Condition : QP 3m B106_6111D_37059 VERTICAL Detector : Peak Project : 930103-01 Mode : 2 WLAN Setting : 19 BLE Setting : 770

Appendix C. Duty Cycle Plots

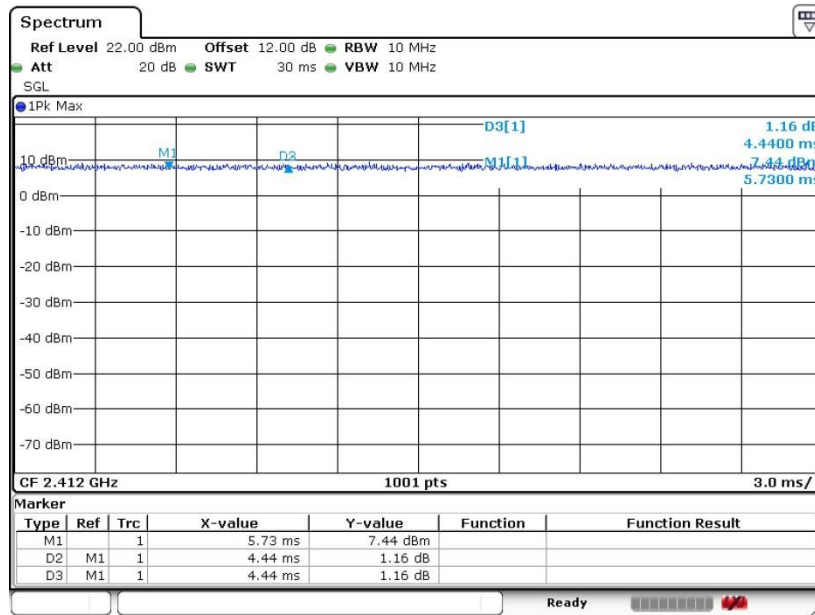
Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
Bluetooth – LE for 2Mbps	56.5	1065	0.94	1kHz	2.48
2.4GHz 802.11g	100.00	-	-	10Hz	0.00
5GHz 802.11a	100.00	-	-	10Hz	0.00

Bluetooth – LE for 2Mbps



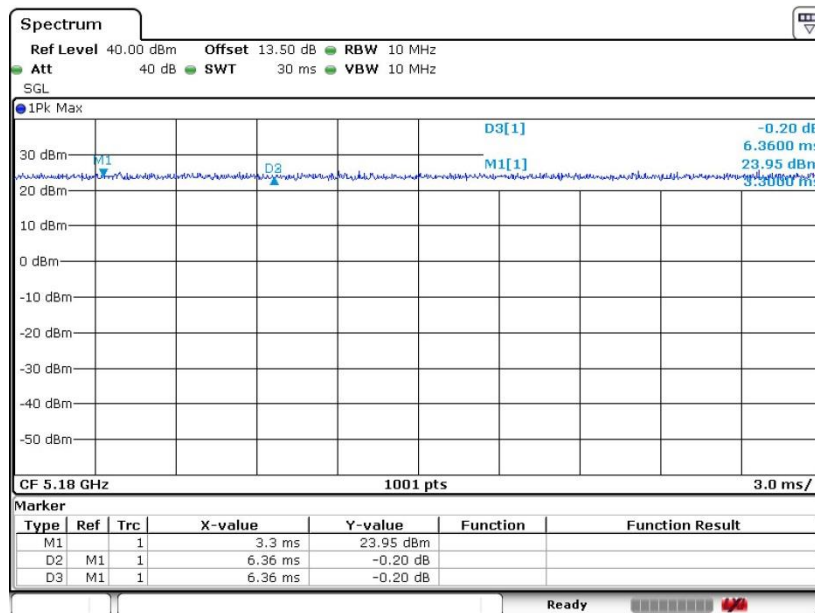


2.4GHz 802.11g



Date: 10.JUN.2019 14:15:21

5GHz 802.11a



Date: 10.JUN.2019 14:18:56

—THE END—