

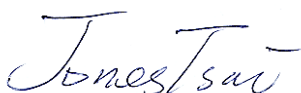
FCC CO-LOCATION RADIO TEST REPORT

FCC ID : NM82Q6U100
Equipment : Smart Hub
Model Name : 2Q6U100
Applicant : HTC Corporation
No.88, Sec. 3, Zhongxing Rd., Xindian Dist.,
New Taipei City 231, Taiwan (R.O.C.)
Manufacturer : HTC Corporation
No.88, Sec. 3, Zhongxing Rd., Xindian Dist.,
New Taipei City 231, Taiwan (R.O.C.)
Standard : FCC Part 15 Subpart E §15.407

The product was received on Dec. 20, 2018 and testing was started from Dec. 27, 2018 and completed on Mar. 09, 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
FR8D2018F	01	Initial issue of report	Mar. 13, 2019

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.407(b)	Unwanted Emissions	Pass	Under limit 0.67 dB at 2483.520 MHz
3.2	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: Natasha Hsieh

1 General Description

1.1 Product Feature of Equipment Under Test

LTE, Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n/ac, Wi-Fi 5GHz 802.11a/n/ac, WiGig, and 5G NR.

Product Specification subjective to this standard	
Antenna Type	WWAN: <Ant. 1>: Fixed Internal PIFA Antenna <Ant. 2>: Fixed Internal Dipole Antenna <Ant. 3>: Fixed Internal PCB Antenna WLAN: <Ant. 1>: Fixed Internal PCB Antenna <Ant. 2>: Fixed Internal PIFA Antenna Bluetooth: Fixed Internal PCB Antenna WiGig: Fixed Internal Array Antenna 5G NR: Fixed Internal PCB Antenna

1.2 Modification of EUT

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

1.3 Testing Location

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.	Sporton Site No. 03CH15-HY

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

FCC Designation No.: TW0007



1.4 Applicable Standards

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

- ♦ FCC Part 15 Subpart E
- ♦ FCC Part 15 Subpart C §15.247
- ♦ FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- ♦ FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r01
- ♦ 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

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: 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 and Y plane) were recorded in this report.

2.1 Carrier Frequency and Channel

2400-2483.5 MHz Bluetooth 3Mbps 8-DPSK		2400-2483.5 MHz Bluetooth-LE GFSK	
Channel	Freq. (MHz)	Channel	Freq. (MHz)
78	2480	19	2440

2400-2483.5 MHz 802.11g		5150~5250MHz 802.11a	
Channel	Freq. (MHz)	Channel	Freq. (MHz)
11	2462	36	5180

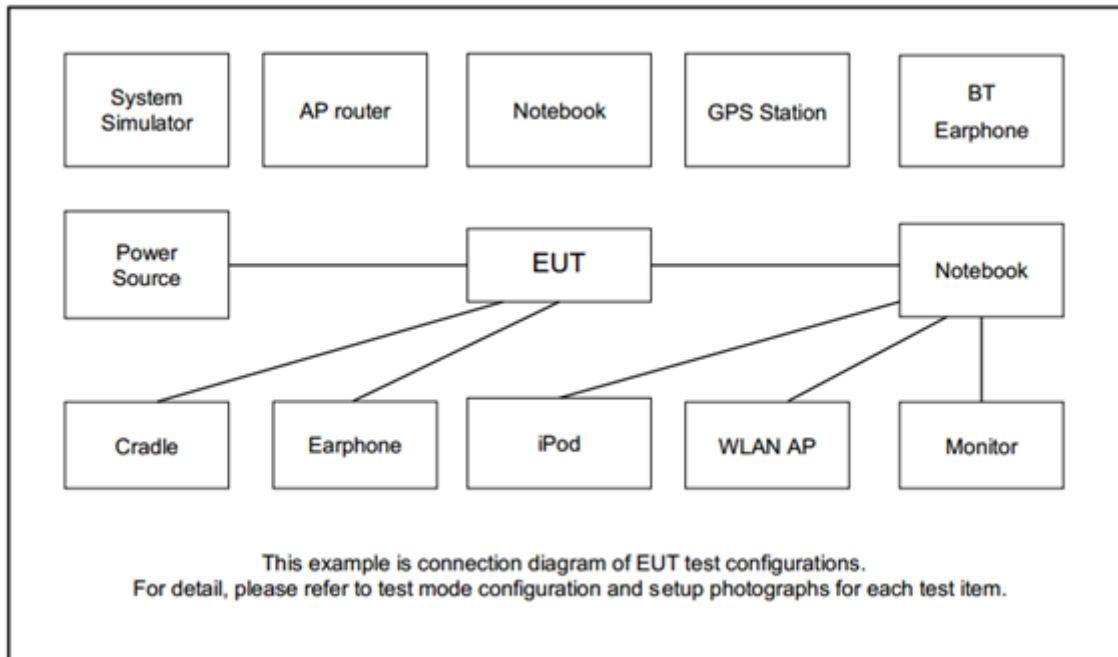
2.2 Test Mode

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

<Co-Location>

Modulation	Data Rate
Bluetooth + 802.11a	3Mbps + MCS0
Bluetooth LE + 802.11a	2Mbps + MCS0
802.11g + 802.11a	6Mbps + MCS0

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

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

2.5 EUT Operation Test Setup

The Bluetooth test items, utility “QRCT” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to contact with base station to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

The WLAN and Bluetooth-LE 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 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.

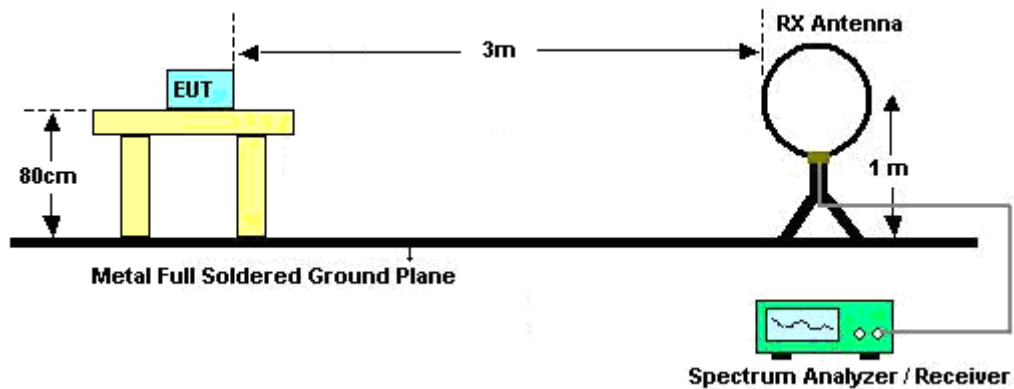
3.1.3 Test Procedures

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.

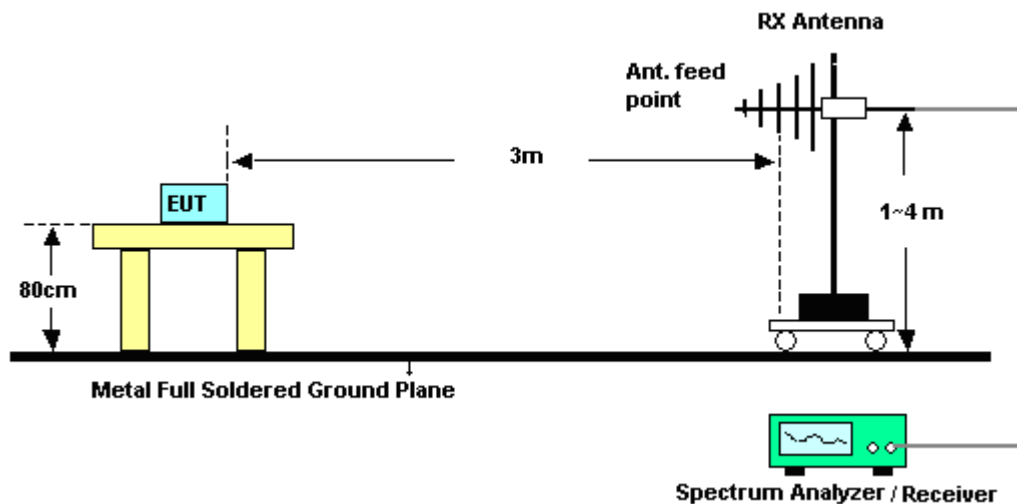
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level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

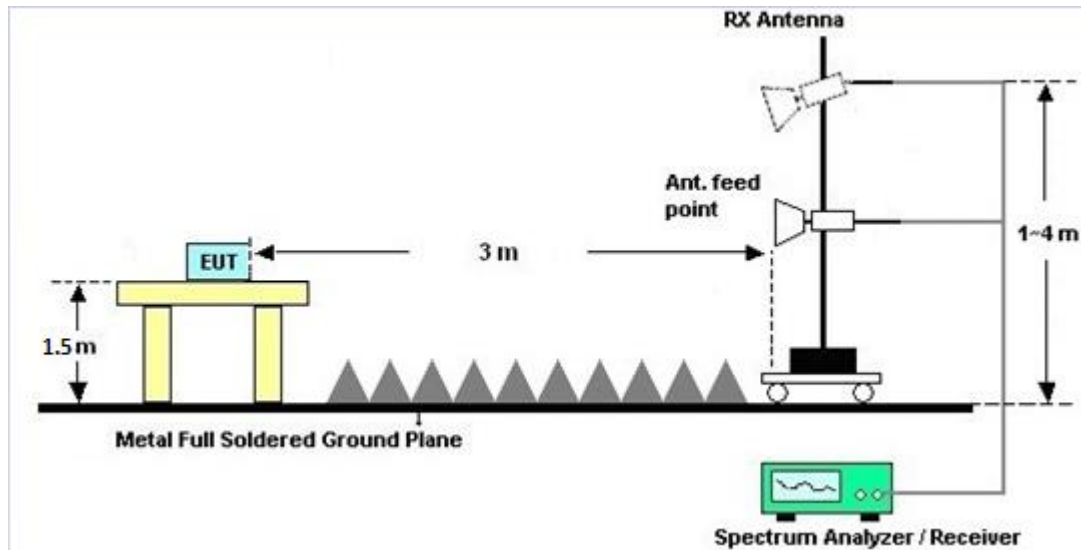
For radiated emissions below 30MHz



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.



3.2 Antenna Requirements

3.2.1 Standard Applicable

If transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

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
Loop Antenna	TESEQ	HLA 6120	31244	9 kHz~30 MHz	Mar. 29, 2018	Dec. 27, 2018~ Mar. 09, 2019	Mar. 28, 2019	Radiation (03CH15-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz ~ 40GHz	Dec. 06, 2018	Dec. 27, 2018~ Mar. 09, 2019	Dec. 05, 2019	Radiation (03CH15-HY)
Bilog Antenna	TESEQ	CBL6111D& 00802N1D01N -06	47020&06	30MHz to 1GHz	Oct. 13, 2018	Dec. 27, 2018~ Mar. 09, 2019	Oct. 12, 2019	Radiation (03CH15-HY)
Horn Antenna	SCHWARZBE CK	BBHA 9120D	9120D-1620	1G~18GHz	Oct. 17, 2018	Dec. 27, 2018~ Mar. 09, 2019	Oct. 16, 2019	Radiation (03CH15-HY)
SHF-EHF Horn Antenna	SCHWARZBE CK	BBHA 9170	BBHA917057 6	18GHz ~ 40GHz	May 08, 2018	Dec. 27, 2018~ Mar. 09, 2019	May 07, 2019	Radiation (03CH15-HY)
Amplifier	SONOMA	310N	363440	9kHz~1GHz	Dec. 28, 2018	Dec. 27, 2018~ Mar. 09, 2019	Dec. 27, 2019	Radiation (03CH15-HY)
Preamplifier	Jet-Power	JPA0118-55-3 03	1710001800 0550006	1GHz~18GHz	Jul. 10, 2018	Dec. 27, 2018~ Mar. 09, 2019	Jul. 09, 2019	Radiation (03CH15-HY)
Preamplifier	Jet-Power	JAP00101800- 30-10P	16011855000 4	1GHz~18GHz	Apr. 17, 2018	Dec. 27, 2018~ Mar. 09, 2019	Apr. 16, 2019	Radiation (03CH15-HY)
Preamplifier	Keysight	83017A	MY53270195	1GHz~26.5GHz	Aug. 23, 2018	Dec. 27, 2018~ Mar. 09, 2019	Aug. 22, 2019	Radiation (03CH15-HY)
EMI Test Receiver	Keysight	N9038A (MXE)	MY54130085	20Hz ~ 8.4GHz	Nov. 01, 2018	Dec. 27, 2018~ Mar. 09, 2019	Oct. 31, 2019	Radiation (03CH15-HY)
Spectrum Analyzer	Agilent	E4446A	MY50180136	3Hz~44GHz	Apr. 25, 2018	Dec. 27, 2018~ Mar. 09, 2019	Apr. 24, 2019	Radiation (03CH15-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Dec. 27, 2018~ Mar. 09, 2019	N/A	Radiation (03CH15-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Dec. 27, 2018~ Mar. 09, 2019	N/A	Radiation (03CH15-HY)
Software	Audix	E3 6.2009-8-24	RK-000451	N/A	N/A	Dec. 27, 2018~ Mar. 09, 2019	N/A	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY36980/4	30M-18G	Apr. 16, 2018	Dec. 27, 2018~ Mar. 09, 2019	Apr. 15, 2019	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9838/4	30M-18G	Apr. 16, 2018	Dec. 27, 2018~ Mar. 09, 2019	Apr. 15, 2019	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	MTJ	000000-MT1 8A-100D321 0	30M-18G	Apr. 16, 2018	Dec. 27, 2018~ Mar. 09, 2019	Apr. 15, 2019	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2859/2	30MHz-40GHz	Mar. 14, 2018	Dec. 27, 2018~ Mar. 09, 2019	Mar. 13, 2019	Radiation (03CH15-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY4274/2	30MHz-40GHz	Mar. 14, 2018	Dec. 27, 2018~ Mar. 09, 2019	Mar. 13, 2019	Radiation (03CH15-HY)
Filter	Wainwright	WHKX8-5872. 5-6750-18000- 40ST	SN3	6.75 GHz Highpass	Sep. 16, 2018	Dec. 27, 2018~ Mar. 09, 2019	Sep. 15, 2019	Radiation (03CH15-HY)
Filter	Wainwright	WLK4-1000-15 30-8000-40SS	SN11	1G Low Pass	Sep. 16, 2018	Dec. 27, 2018~ Mar. 09, 2019	Sep. 15, 2019	Radiation (03CH15-HY)



5 Uncertainty of Evaluation

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

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

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.2
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Appendix A. Radiated Spurious Emission

Test Engineer :	Watt Tseng, Karl Hou, and Bigshow Wang	Temperature :	24~26°C
		Relative Humidity :	47~58%

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT 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)
BT CH 78 2480MHz	*	2480	104.86	-	-	102.23	27.47	5.98	30.82	100	151	P	H
	*	2480	80.1	-	-	-	-	-	-	-	-	A	H
		2483.6	55.39	-18.61	74	52.75	27.47	5.99	30.82	100	151	P	H
		2483.6	30.63	-23.37	54	-	-	-	-	-	-	A	H
													H
													H
	*	2480	102.27	-	-	99.64	27.47	5.98	30.82	292	130	P	V
	*	2480	77.51	-	-	-	-	-	-	-	-	A	V
		2483.52	54.74	-19.26	74	52.1	27.47	5.99	30.82	292	130	P	V
		2483.52	29.98	-24.02	54	-	-	-	-	-	-	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Band 1 - 5150~5250MHz

WIFI 802.11a (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11a CH 36 5180MHz		5148.2	51.65	-22.35	74	41.32	31.8	8.63	30.1	220	306	P	H
		5149.76	42.87	-11.13	54	32.54	31.8	8.63	30.1	220	306	A	H
	*	5180	107.44	-	-	97.22	31.67	8.65	30.1	220	306	P	H
	*	5180	100.12	-	-	89.9	31.67	8.65	30.1	220	306	A	H
													H
													H
		5145.6	54.97	-19.03	74	44.64	31.8	8.63	30.1	207	307	P	V
		5149.76	45.78	-8.22	54	35.45	31.8	8.63	30.1	207	307	A	V
	*	5180	111.54	-	-	101.32	31.67	8.65	30.1	207	307	P	V
	*	5180	104.22	-	-	94	31.67	8.65	30.1	207	307	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz and Band 1 - 5150~5250MHz (Harmonic @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
Simultaneously		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT CH 78 2480MHz Ant. 1 + 802.11a CH 36 5180MHz Ant. 1		4960	45.11	-28.89	74	62.91	31.47	8.9	58.17	100	0	P	H
		7440	45.26	-28.74	74	55.39	36.6	11.58	58.31	100	0	P	H
		10360	46.91	-21.29	68.2	55.56	39.37	13.33	61.35	100	0	P	H
		15540	46.76	-27.24	74	54.6	37.93	16.67	62.44	100	0	P	H
		4960	49.86	-24.14	74	67.66	31.47	8.9	58.17	100	0	P	V
		7440	45.04	-28.96	74	55.17	36.6	11.58	58.31	100	0	P	V
		10360	47.05	-21.15	68.2	55.7	39.37	13.33	61.35	100	0	P	V
		15540	47.69	-26.31	74	55.53	37.93	16.67	62.44	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 1 - 5150~5250MHz (LF)

WIFI	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)
BT CH 78 2480MHz Ant. 1 + 802.11a CH 36 5180MHz Ant. 1		30.97	23.32	-16.68	40	30.45	24.81	0.68	32.62			P	H
		206.54	27.96	-15.54	43.5	43.38	15.2	1.72	32.49			P	H
		303.54	25.24	-20.76	46	36.27	19.3	2.08	32.54			P	H
		406.36	24.46	-21.54	46	32.37	22.13	2.43	32.55			P	H
		607.15	27.87	-18.13	46	31.63	25.76	2.93	32.59			P	H
		710.94	30.83	-15.17	46	33.21	26.74	3.14	32.38	100	0	P	H
													H
													H
													H
													H
													H
													H
		30	23.29	-16.71	40	30.04	25.2	0.67	32.62			P	V
		208.48	31.86	-11.64	43.5	47.27	15.2	1.73	32.49	100	0	P	V
		378.23	24.13	-21.87	46	33.2	21.06	2.33	32.55			P	V
		550.89	27.56	-18.44	46	31.96	25.24	2.76	32.59			P	V
		738.1	29.57	-16.43	46	30.57	28.02	3.18	32.32			P	V
		894.27	33.32	-12.68	46	32.47	28.81	3.51	31.68			P	V
													V
													V
													V
													V
													V
												V	
												V	
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH 19 2440MHz		2321.9	53.25	-20.75	74	40.7	27.77	15.67	30.89	385	145	P	H
		2342.06	45.83	-8.17	54	33.31	27.7	15.7	30.88	385	145	A	H
	*	2440	94.33	-	-	81.72	27.6	15.85	30.84	385	145	P	H
	*	2440	93.08	-	-	80.47	27.6	15.85	30.84	385	145	A	H
		2492.16	52.45	-21.55	74	39.94	27.4	15.92	30.81	385	145	P	H
		2497.48	44.89	-9.11	54	32.37	27.4	15.93	30.81	385	145	A	H
		2388.12	53.71	-20.29	74	41.2	27.6	15.77	30.86	300	131	P	V
		2320.64	46.65	-7.35	54	34.1	27.77	15.67	30.89	300	131	A	V
	*	2440	94.12	-	-	81.51	27.6	15.85	30.84	300	131	P	V
	*	2440	92.63	-	-	80.02	27.6	15.85	30.84	300	131	A	V
		2496.01	53.16	-20.84	74	40.65	27.4	15.92	30.81	300	131	P	V
		2491.95	45.4	-8.6	54	32.89	27.4	15.92	30.81	300	131	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Band 1 - 5150~5250MHz

WIFI 802.11a (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11a CH 36 5180MHz		5140.92	52.1	-21.9	74	41.77	31.8	8.63	30.1	220	306	P	H
		5146.9	43.45	-10.55	54	33.12	31.8	8.63	30.1	220	306	A	H
	*	5180	107.98	-	-	97.76	31.67	8.65	30.1	220	306	P	H
	*	5180	100.62	-	-	90.4	31.67	8.65	30.1	220	306	A	H
													H
													H
		5147.94	55.8	-18.2	74	45.47	31.8	8.63	30.1	209	307	P	V
		5141.44	46.21	-7.79	54	35.88	31.8	8.63	30.1	209	307	A	V
	*	5180	112.06	-	-	101.84	31.67	8.65	30.1	209	307	P	V
	*	5180	104.73	-	-	94.51	31.67	8.65	30.1	209	307	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz and Band 1 - 5150~5250MHz (Harmonic @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
Simultaneously		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH 19 2440MHz Ant. 1 + 802.11a CH 36 5180MHz Ant. 1		4880	43.96	-30.04	74	62.09	31.3	8.67	58.1	100	0	P	H
		7320	44.06	-29.94	74	54.56	36.23	11.61	58.34	100	0	P	H
		10360	46.29	-21.91	68.2	54.94	39.37	13.33	61.35	100	0	P	H
		15540	45.6	-28.4	74	53.44	37.93	16.67	62.44	100	0	P	H
		4880	46.99	-27.01	74	65.12	31.3	8.67	58.1	100	0	P	V
		7320	45.76	-28.24	74	56.26	36.23	11.61	58.34	100	0	P	V
		10360	47.19	-21.01	68.2	55.84	39.37	13.33	61.35	100	0	P	V
		15540	45.87	-28.13	74	53.71	37.93	16.67	62.44	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 1 - 5150~5250MHz (LF)

WIFI	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 CH 19 2440MHz Ant. 1 + 802.11a CH 36 5180MHz Ant. 1		30.97	22.93	-17.07	40	30.06	24.81	0.68	32.62			P	H	
		87.23	21.51	-18.49	40	38.48	14.32	1.24	32.53			P	H	
		293.84	21.43	-24.57	46	32.57	19.18	2.22	32.54			P	H	
		418	24.58	-21.42	46	32.08	22.52	2.53	32.55			P	H	
		607.15	27.56	-18.44	46	31.32	25.76	3.07	32.59			P	H	
		903	38.94	-7.06	46	37.81	29.02	3.73	31.62	100	0	P	H	
													H	
													H	
													H	
													H	
													H	
													H	
													H	
		30	23.02	-16.98	40	29.77	25.2	0.67	32.62				P	V
		148.34	17.49	-26.01	43.5	31.13	17.27	1.59	32.5				P	V
		311.3	22.73	-23.27	46	33.73	19.33	2.21	32.54				P	V
		385.99	25.71	-20.29	46	34.48	21.34	2.44	32.55				P	V
		564.47	27.09	-18.91	46	30.3	26.39	2.99	32.59				P	V
		853.53	31.32	-14.68	46	30.38	29.2	3.64	31.9	100	0		P	V
														V
														V
														V
														V
														V
													V	
													V	
Remark	1. No other spurious found. 2. All results are PASS against limit line.													



2.4GHz 2400~2483.5MHz

WIFI 802.11g (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11g CH 11 2462MHz	*	2462	110.42	-	-	97.84	27.53	15.88	30.83	354	120	P	H
	*	2462	102.76	-	-	90.18	27.53	15.88	30.83	354	120	A	H
		2484.16	65.84	-8.16	74	53.28	27.47	15.91	30.82	354	120	P	H
		2483.52	53.33	-0.67	54	40.77	27.47	15.91	30.82	354	120	A	H
												P	H
												A	H
	*	2462	106.54	-	-	93.96	27.53	15.88	30.83	100	232	P	V
	*	2462	98.84	-	-	86.26	27.53	15.88	30.83	100	232	A	V
		2484.16	62.67	-11.33	74	50.11	27.47	15.91	30.82	100	232	P	V
		2483.56	49.83	-4.17	54	37.27	27.47	15.91	30.82	100	232	A	V
												P	V
												A	V
Remark - No other spurious found. - All results are PASS against Peak and Average limit line.													



Band 1 - 5150~5250MHz

WIFI 802.11a (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11a CH 36 5180MHz		5148.46	52.48	-21.52	74	42.15	31.8	8.63	30.1	305	231	P	H
		5150	44.81	-9.19	54	34.47	31.8	8.64	30.1	305	231	A	H
	*	5180	108	-	-	97.78	31.67	8.65	30.1	305	231	P	H
	*	5180	100.65	-	-	90.43	31.67	8.65	30.1	305	231	A	H
													H
													H
		5147.42	53.98	-20.02	74	43.65	31.8	8.63	30.1	376	217	P	V
		5150	45.25	-8.75	54	34.91	31.8	8.64	30.1	376	217	A	V
	*	5180	108.18	-	-	97.96	31.67	8.65	30.1	376	217	P	V
	*	5180	100.82	-	-	90.6	31.67	8.65	30.1	376	217	A	V
													V
													V
Remark	3. No other spurious found.												
	4. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz and Band 1 - 5150~5250MHz (Harmonic @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
Simultaneously		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11g CH 11 2462MHz Ant. 1 + 802.11a CH 36 5180MHz Ant. 2		4924	43.17	-30.83	74	61.14	31.37	8.8	58.14	100	0	P	H
		7386	44.22	-29.78	74	54.45	36.5	11.59	58.32	100	0	P	H
		10360	47.34	-20.86	68.2	55.99	39.37	13.33	61.35	100	0	P	H
		15540	44.98	-29.02	74	52.82	37.93	16.67	62.44	100	0	P	H
		4924	41.34	-32.66	74	59.31	31.37	8.8	58.14	100	0	P	V
		7386	45	-29	74	55.23	36.5	11.59	58.32	100	0	P	V
		10360	46.54	-21.66	68.2	55.19	39.37	13.33	61.35	100	0	P	V
		15540	44.34	-29.66	74	52.18	37.93	16.67	62.44	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 1 - 5150~5250MHz (LF)

WIFI	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)	
802.11g CH 11 2462MHz Ant. 1 + 802.11a CH 36 5180MHz Ant. 2		30.97	23.39	-16.61	40	30.52	24.81	0.68	32.62			P	H	
		100.81	18.32	-25.18	43.5	33.45	16.08	1.3	32.51			P	H	
		295.78	22.55	-23.45	46	33.66	19.22	2.21	32.54			P	H	
		400.54	24.24	-21.76	46	32.37	21.92	2.5	32.55			P	H	
		638.19	28.97	-17.03	46	31.7	26.66	3.13	32.52			P	H	
		729.37	31.8	-14.2	46	33.19	27.66	3.29	32.34	100	0	P	H	
													H	
													H	
													H	
													H	
													H	
													H	
		30	23.69	-16.31	40	30.44	25.2	0.67	32.62				P	V
		141.55	17.73	-25.77	43.5	31.2	17.5	1.53	32.5				P	V
		315.18	22.63	-23.37	46	33.56	19.4	2.21	32.54				P	V
		444.19	24.82	-21.18	46	31.82	22.98	2.58	32.56				P	V
		563.5	27.21	-18.79	46	30.45	26.37	2.98	32.59				P	V
		896.21	39.55	-6.45	46	38.68	28.82	3.72	31.67	100	0		P	V
														V
														V
														V
														V
														V
													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	P eak or A verage
H/V	H orizontal or V ertical

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

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(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”.



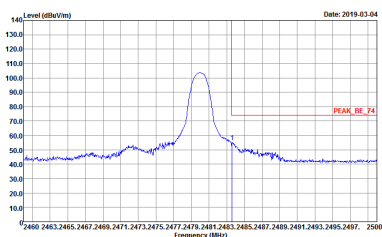
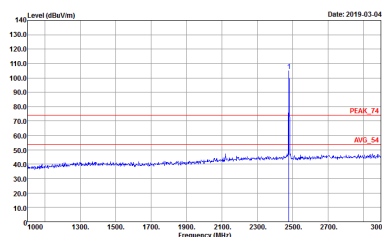
Appendix B. Radiated Spurious Emission Plots

Test Engineer :	Watt Tseng, Karl Hou, and Bigshow Wang	Temperature :	24~26°C
		Relative Humidity :	47~58%

Note symbol

-L	Low channel location
-R	High channel location

2.4GHz 2400~2483.5MHz
BT (Band Edge @ 3m)

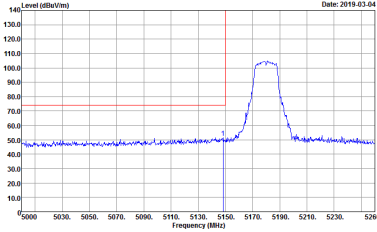
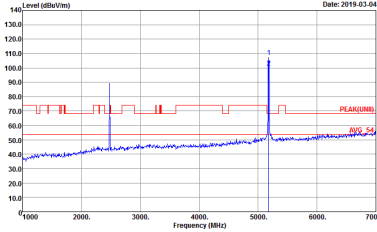
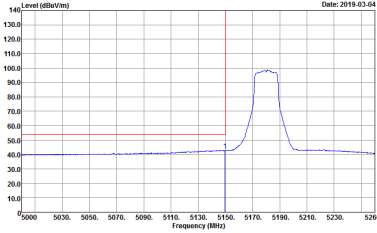
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH78 2480MHz	
1	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_15_1620 HORIZONTAL RBW:1000.0000Hz VBW:3000.0000Hz SWT:Auto Detector : Peak Project : 8D2018 Mode : 31	 Site : 03CH15-HY Condition : PEAK_74 3m 91200_15_1620 HORIZONTAL RBW:1000.0000Hz VBW:3000.0000Hz SWT:Auto Detector : Peak Project : 8D2018 Mode : 31



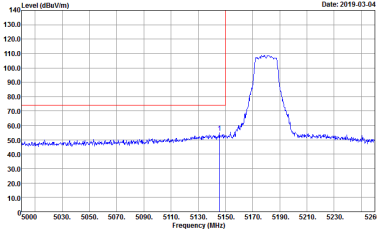
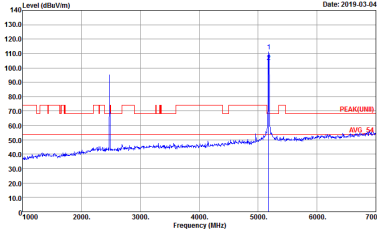
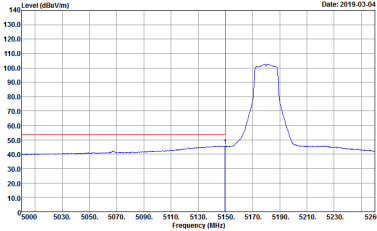
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH78 2480MHz	
1	Vertical	Fundamental
Peak	Level (dBuV/m) Date: 2019-03-04 2460 2463.2465.2467.2469.2471.2473.2475.2477.2479.2481.2483.2485.2487.2489.2491.2493.2495.2497. 2500 Frequency (MHz) Site : 03CH15-14Y Condition : PEAK_BE_74 3m 91200_15_1620 VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 802018 Mode : 31	Level (dBuV/m) Date: 2019-03-04 1000 1300 1600 1900 2100 2300 2500 2700 3000 Frequency (MHz) Site : 03CH15-14Y Condition : PEAK_74 3m 91200_15_1620 VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 802018 Mode : 31



Band 1 - 5150~5250MHz
WIFI 802.11a (Band Edge @ 3m)

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11a CH36 5180MHz	
1	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_15_1620 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8D2018 Mode : 31	 Site : 03CH15-HY Condition : PEAK(LINE) 3m 91200_15_1620 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 8D2018 Mode : 31
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m 91200_15_1620 HORIZONTAL RBW:1000.000KHz VBW:1000KHz SWT:Auto Detector : Peak Project : 8D2018 Mode : 31	Left blank



WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11a CH36 5180MHz	
1	Vertical	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_15_1620 VERTICAL Detector : Peak Project : 8D2018 Mode : 31	 Site : 03CH15-HY Condition : PEAK(UNIT) 3m 91200_15_1620 VERTICAL Detector : Peak Project : 8D2018 Mode : 31
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m 91200_15_1620 VERTICAL Detector : Peak Project : 8D2018 Mode : 31	Left blank



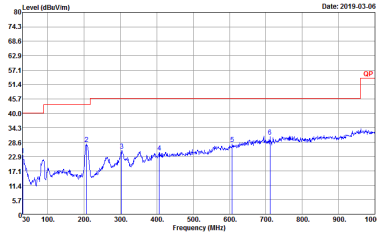
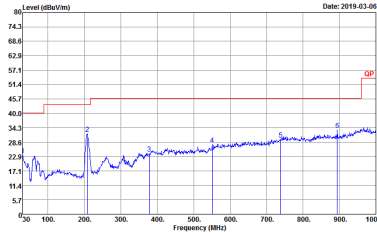
2.4GHz 2400~2483.5MHz and Band 1 - 5150~5250MHz (Harmonic @ 3m)

ANT	BT CH00 2402MHz Ant. 1 + 802.11a CH36 5180MHz Ant. 1	
Simultaneously	Horizontal	Vertical
Peak Avg.	Site : 03CH15-HV Condition : PEAK(UNIT) 3m 91200_15_1620 HORIZONTAL Detector : Peak Project : 802018 Mode : 31	Site : 03CH15-HV Condition : PEAK(UNIT) 3m 91200_15_1620 VERTICAL Detector : Peak Project : 802018 Mode : 31



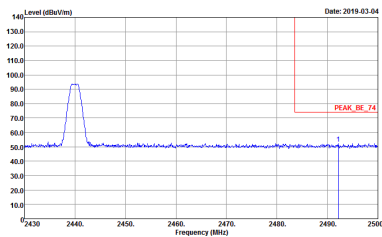
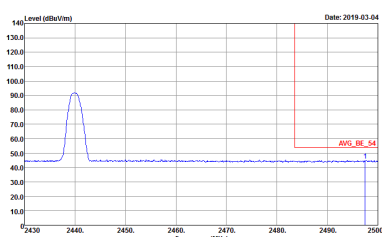
Emission below 1GHz

2.4GHz 2400~2483.5MHz and Band 1 - 5150~5250MHz (LF)

ANT	BT CH00 2402MHz Ant. 1 + 802.11a CH36 5180MHz Ant. 1	
Simultaneously	Horizontal	Vertical
QP / Peak	 Site : 03CH15-14Y Condition : QP 3m RELO6_15_41912 HORIZONTAL Detector : Peak Project : 8D2018 Mode : 31	 Site : 03CH15-14Y Condition : QP 3m RELO6_15_41912 VERTICAL Detector : Peak Project : 8D2018 Mode : 31

**2.4GHz 2400~2483.5MHz****BLE (Band Edge @ 3m)**

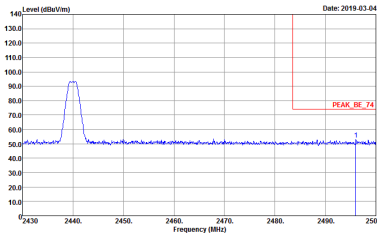
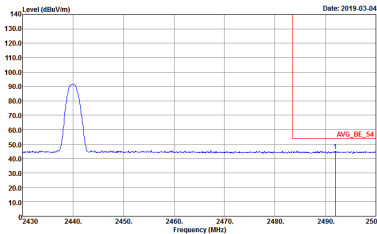
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - L	
1	Horizontal	Fundamental
Peak	Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_15_1620 HORIZONTAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak Mode : 8D2018 Date: 2019-03-04	Site : 03CH15-HY Condition : PEAK_74 3m 91200_15_1620 HORIZONTAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak Mode : 8D2018 Date: 2019-03-04
Avg.	Site : 03CH15-HY Condition : AVG_BE_54 3m 91200_15_1620 HORIZONTAL Detector : RBW:1000.000KHz VBW:10.000KHz SWT:Auto Project : Peak Mode : 8D2018 Date: 2019-03-04	Site : 03CH15-HY Condition : AVG_54 3m 91200_15_1620 HORIZONTAL Detector : RBW:1000.000KHz VBW:10.000KHz SWT:Auto Project : Peak Mode : 8D2018 Date: 2019-03-04

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - R	
1	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_15_1620 HORIZONTAL Detector : Peak Project : BD2018 Mode : 32	Left blank
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m 91200_15_1620 HORIZONTAL Detector : Peak Project : BD2018 Mode : 32	Left blank



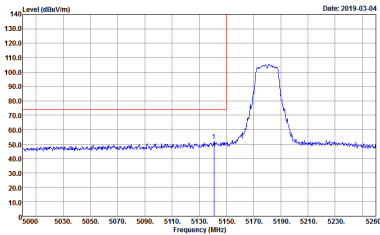
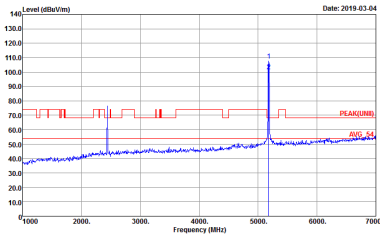
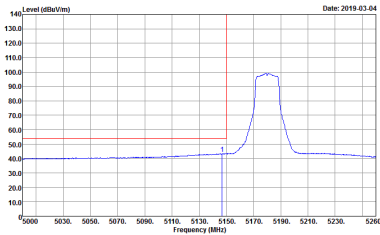
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - L	
1	Vertical	Fundamental
Peak	Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_15_1620 VERTICAL Detector : Peak Project : 8D2018 Mode : 32	Site : 03CH15-HY Condition : PEAK_74 3m 91200_15_1620 VERTICAL Detector : Peak Project : 8D2018 Mode : 32
Avg.	Site : 03CH15-HY Condition : AVG_BE_54 3m 91200_15_1620 VERTICAL Detector : Peak Project : 8D2018 Mode : 32	Site : 03CH15-HY Condition : AVG_54 3m 91200_15_1620 VERTICAL Detector : Peak Project : 8D2018 Mode : 32



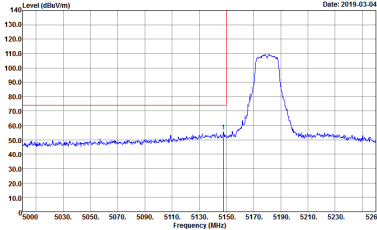
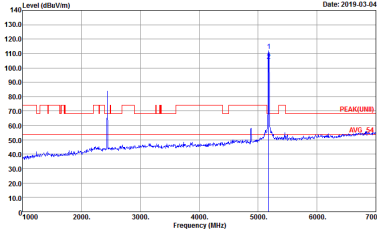
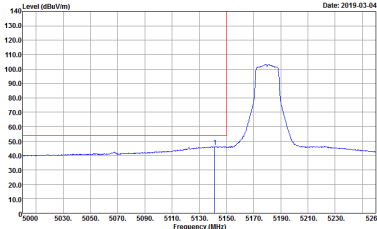
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - R	
1	Vertical	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_15_1620 VERTICAL Detector : Peak Project : 8D2018 Mode : 32	Left blank
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m 91200_15_1620 VERTICAL Detector : Peak Project : 8D2018 Mode : 32	Left blank



Band 1 - 5150~5250MHz
WIFI 802.11a (Band Edge @ 3m)

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11a CH36 5180MHz	
1	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m 9120D_15_1620 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : RD2018 Mode : 32	 Site : 03CH15-HY Condition : PEAK(FUND) 3m 9120D_15_1620 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : RD2018 Mode : 32
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m 9120D_15_1620 HORIZONTAL RBW:1000.000KHz VBW:1000KHz SWT:Auto Detector : Peak Project : RD2018 Mode : 32	Left blank



WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11a CH36 5180MHz	
1	Vertical	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_15_1620 VERTICAL Detector : Peak Project : 8D2018 Mode : 32	 Site : 03CH15-HY Condition : PEAK(UNIT) 3m 91200_15_1620 VERTICAL Detector : Peak Project : 8D2018 Mode : 32
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m 91200_15_1620 VERTICAL Detector : Peak Project : 8D2018 Mode : 32	Left blank



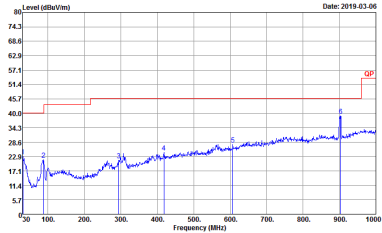
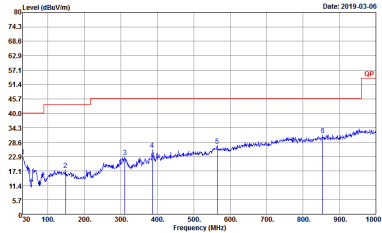
2.4GHz 2400~2483.5MHz and Band 1 - 5150~5250MHz (Harmonic @ 3m)

Ant.	BLE CH19 2440MHz Ant. 1 + 802.11a CH36 5180MHz Ant. 1	
Simultaneously	Horizontal	Vertical
Peak Avg.	Site : 03CH15-HY Condition : PEAK(UNII) 3m 91200_15_1620 HORIZONTAL Detector : Peak Project : 8D2018 Mode : 32	Site : 03CH15-HY Condition : PEAK(UNII) 3m 91200_15_1620 VERTICAL Detector : Peak Project : 8D2018 Mode : 32



Emission below 1GHz

2.4GHz 2400~2483.5MHz and Band 1 - 5150~5250MHz (LF)

Ant.	BLE CH19 2440MHz Ant. 1 + 802.11a CH36 5180MHz Ant. 1 LF	
Simultaneously	Horizontal	Vertical
QP / Peak	 Site : 03CH15-14Y Condition : QP-3m RIL06_15_41912 HORIZONTAL Detector : Peak Project : BD2018 Mode : 32	 Site : 03CH15-14Y Condition : QP-3m RIL06_15_41912 VERTICAL Detector : Peak Project : BD2018 Mode : 32



2.4GHz 2400~2483.5MHz

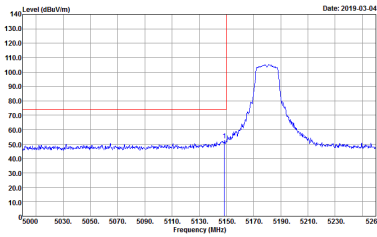
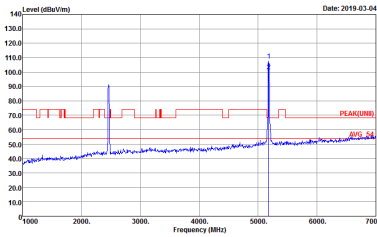
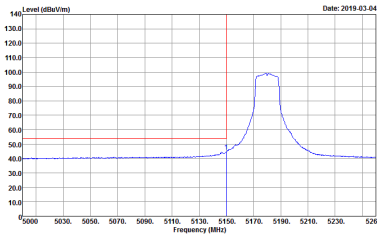
WIFI 802.11g (Band Edge @ 3m)

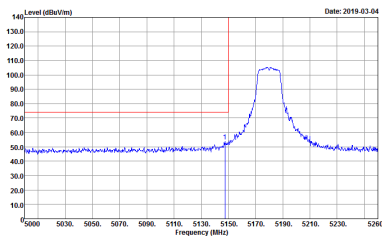
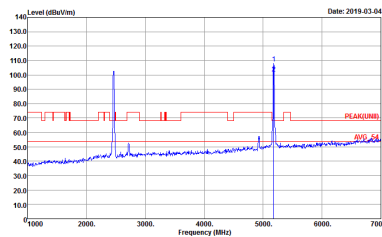
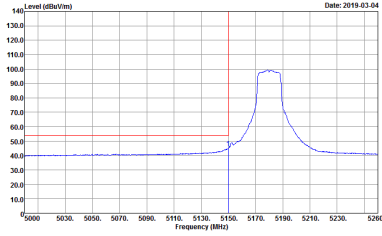
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH11 2462MHz	
1	Horizontal	Fundamental
Peak	Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_15_1620 HORIZONTAL Detector : Peak Project : 8D2018 Mode : 33	Site : 03CH15-HY Condition : PEAK_74 3m 91200_15_1620 HORIZONTAL Detector : Peak Project : 8D2018 Mode : 33
Avg.	Site : 03CH15-HY Condition : AVG_BE_54 3m 91200_15_1620 HORIZONTAL Detector : Peak Project : 8D2018 Mode : 33	Site : 03CH15-HY Condition : AVG_54 3m 91200_15_1620 HORIZONTAL Detector : Peak Project : 8D2018 Mode : 33



WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH11 2462MHz	
1	Vertical	Fundamental
Peak	Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_15_1620 VERTICAL Detector : Peak Project : 8D2018 Mode : 33	Site : 03CH15-HY Condition : PEAK_74 3m 91200_15_1620 VERTICAL Detector : Peak Project : 8D2018 Mode : 33
	Site : 03CH15-HY Condition : AVG_BE_54 3m 91200_15_1620 VERTICAL Detector : Peak Project : 8D2018 Mode : 33	Site : 03CH15-HY Condition : AVG_54 3m 91200_15_1620 VERTICAL Detector : Peak Project : 8D2018 Mode : 33

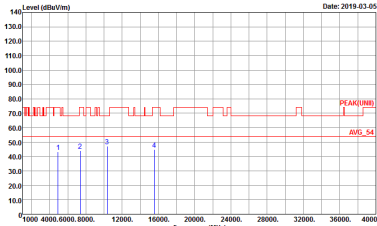
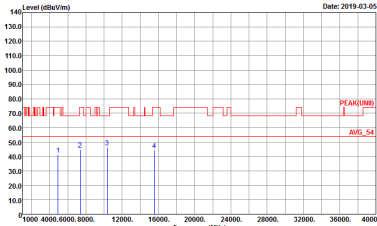
Band 1 - 5150~5250MHz
WIFI 802.11a (Band Edge @ 3m)

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11a CH36 5180MHz	
2	Horizontal	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m 9120D_15_1620 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : RD2018 Mode : 33	 Site : 03CH15-HY Condition : PEAK(FUND) 3m 9120D_15_1620 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : RD2018 Mode : 33
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m 9120D_15_1620 HORIZONTAL RBW:1000.000KHz VBW:1000KHz SWT:Auto Detector : Peak Project : RD2018 Mode : 33	Left blank

WIFI	Band 1 5150~5250MHz Band Edge @ 3m	
ANT	802.11a CH36 5180MHz	
2	Vertical	Fundamental
Peak	 Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_15_1620 VERTICAL Detector : Peak Project : 8D2018 Mode : 33	 Site : 03CH15-HY Condition : PEAK(UNIT) 3m 91200_15_1620 VERTICAL Detector : Peak Project : 8D2018 Mode : 33
Avg.	 Site : 03CH15-HY Condition : AVG_BE_54 3m 91200_15_1620 VERTICAL Detector : Peak Project : 8D2018 Mode : 33	Left blank



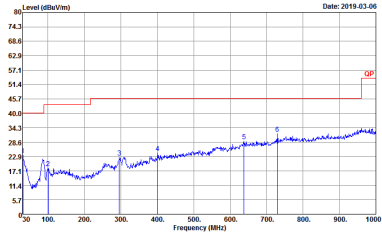
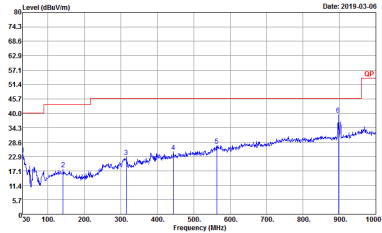
2.4GHz 2400~2483.5MHz and Band 1 - 5150~5250MHz (Harmonic @ 3m)

ANT	802.11g CH11 2462MHz Ant. 1 + 802.11a CH36 5180MHz Ant. 2	
Simultaneously	Horizontal	Vertical
Peak Avg.	 Site : 03CH15-HY Condition : PEAK(UNIT) 3m 91200_15_1620 HORIZONTAL Detector : Peak Project : 8D2018 Mode : 33	 Site : 03CH15-HY Condition : PEAK(UNIT) 3m 91200_15_1620 VERTICAL Detector : Peak Project : 8D2018 Mode : 33



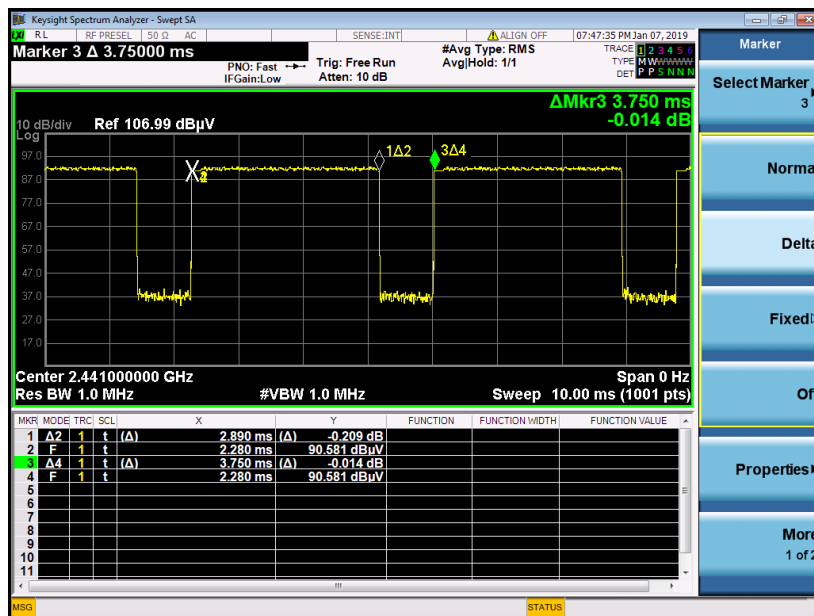
Emission below 1GHz

2.4GHz 2400~2483.5MHz and Band 1 - 5150~5250MHz (LF)

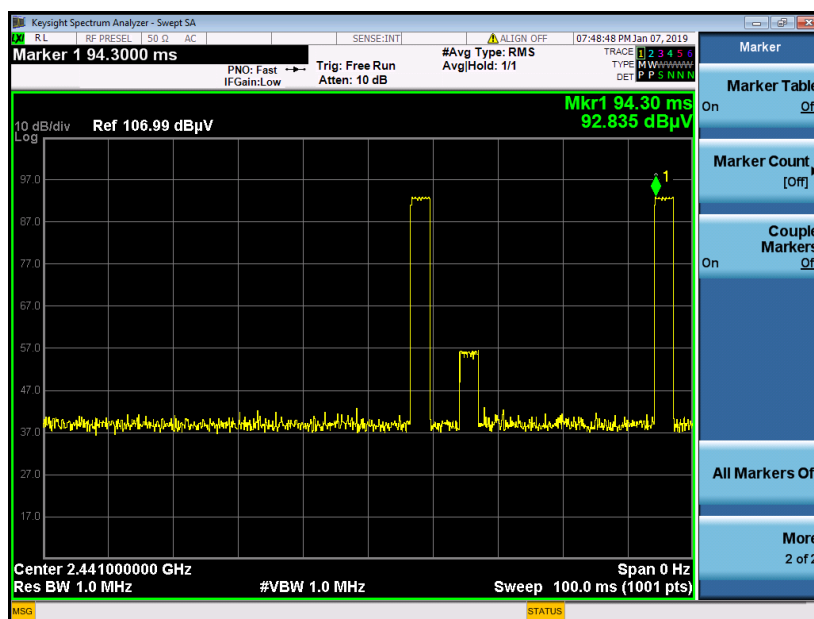
ANT	802.11g CH11 2462MHz Ant. 1 + 802.11a CH36 5180MHz Ant. 2 LF	
Simultaneously	Horizontal	Vertical
QP / Peak	 Site : 03CH15-14Y Condition : QP 3m RELO6_15_41912 HORIZONTAL Detector : Peak Project : BD2018 Mode : 33	 Site : 03CH15-14Y Condition : QP 3m RELO6_15_41912 VERTICAL Detector : Peak Project : BD2018 Mode : 33

Appendix C. Duty Cycle Plots

3DH5 on time (One Pulse) Plot on Channel 39



on time (Count Pulses) Plot on Channel 39



Note:

1. Worst case Duty cycle = on time/100 milliseconds = $2 * 2.89 / 100 = 5.78 \%$
2. Worst case Duty cycle correction factor = $20 * \log(\text{Duty cycle}) = -24.76 \text{ dB}$
3. **3DH5** has the highest duty cycle worst case and is reported.

Duty Cycle Correction Factor Consideration for AFH mode:

Bluetooth normal hopping rate is 1600Hz and reduced to 800Hz in AFH mode; due to the reduced number of hopping frequencies, with the same packet configuration the dwell time in each channel frequency within 100msec period is longer in AFH mode than normal mode.

In AFH mode, the minimum hopping frequencies are 20, to get the longest dwell time DH5 packet is observed; the period to have DH5 packet completing one hopping sequence is

$$2.89 \text{ ms} \times 20 \text{ channels} = 57.8 \text{ ms}$$

There cannot be 2 complete hopping sequences within 100ms period, considering the random hopping behavior, maximum 2 hops can be possibly observed within the period. $[100\text{ms} / 57.6\text{ms}] = 2 \text{ hops}$

Thus, the maximum possible ON time:

$$2.89 \text{ ms} \times 2 = 5.78 \text{ ms}$$

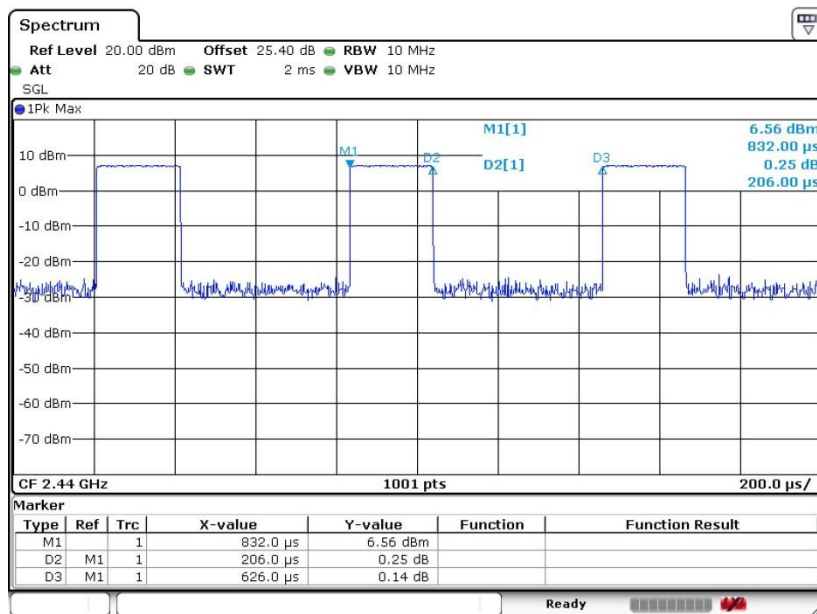
Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

$$20 \times \log(5.78 \text{ ms}/100\text{ms}) = -24.76 \text{ dB}$$

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
1	Bluetooth – LE 2Mbps	32.91	206	4.85	10kHz	4.83
1	802.11g	98.33	2065	0.48	10Hz	0.07
1	802.11a	97.73	2066	0.48	1kHz	0.10
2	802.11a	96.99	2060	0.49	1kHz	0.13

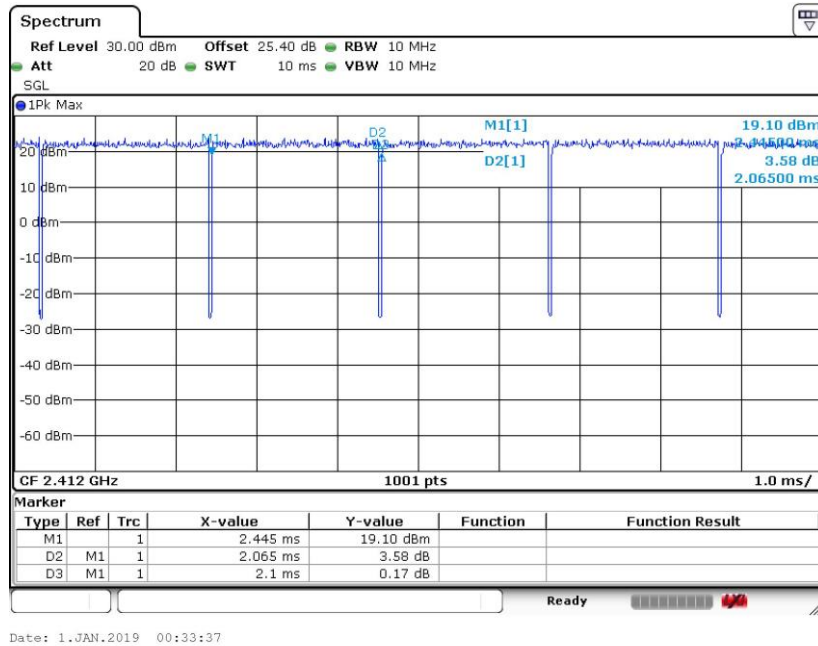
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Bluetooth-LE 2 Mbps

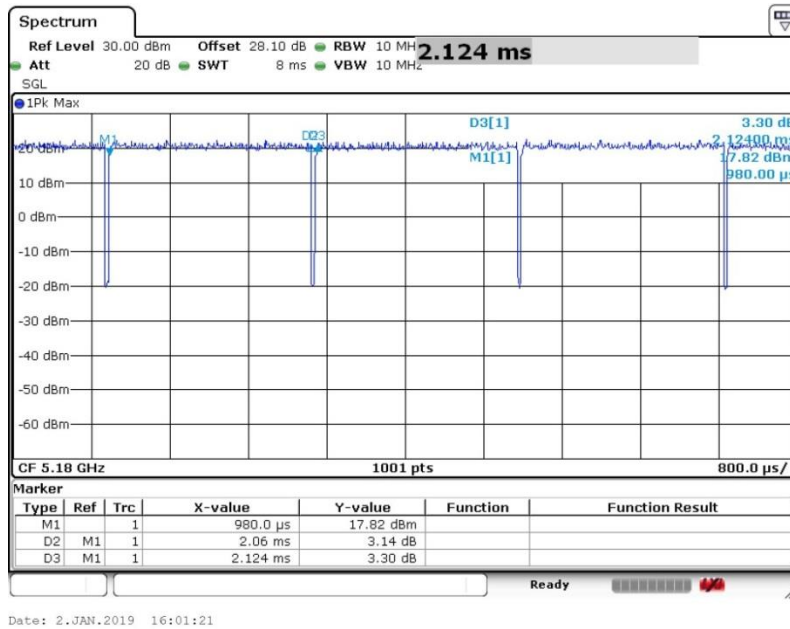


Date: 2.JAN.2019 19:57:59

802.11g



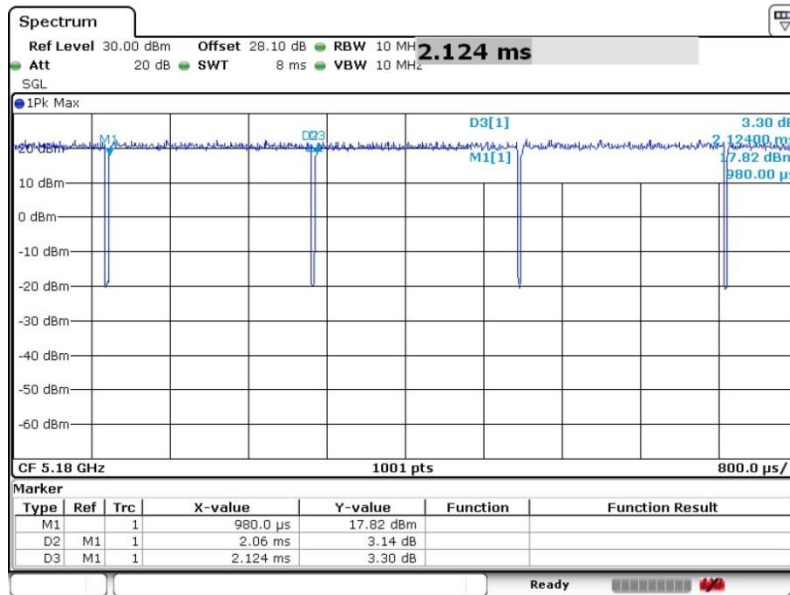
802.11a





<Ant. 2>

802.11a



Date: 2.JAN.2019 16:01:21

————THE END————