FCC RADIO TEST REPORT

FCC ID	:	**S9GR850**
Equipment	:	**Wireless Access Point**
Brand Name	:	**RUCKUS**
Model Name	:	**R850**
Marketing Name	:	**Ruckus Access Point**
Applicant	:	**Ruckus Wireless Inc. 350 W. Java Dr., Sunnyvale CA 94089 USA**
Manufacturer	:	**Ruckus Wireless Inc. 350 W. Java Dr., Sunnyvale CA 94089 USA**
Standard	:	**FCC Part 15 Subpart C §15.247**

The product was received on Jan. 13, 2020 and testing was started from Feb. 20, 2020 and completed on Mar. 13, 2020. We, Sporton International (USA) Inc., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of government.

The test results in this partial report apply exclusively to the tested model / sample. Without written approval of Sporton International (USA) Inc., the test report shall not be reproduced except in full.

Approved by: Ken Chen

Sporton International (USA) Inc.
1175 Montague Expressway, Milpitas, CA 95035

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History of this test report

Report No.	Version	Description	Issued Date
FR200130001A	01	Initial issue of report	Apr. 14, 2020

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
-	15.247(a)(2)	6dB Bandwidth	-	See note.
-	2.1049	99% Occupied Bandwidth	-	See note.
3.1	15.247(b)(3)	Peak Output Power	Pass	-
-	15.247(e)	Power Spectral Density	-	See note.
-	15.247(d)	Conducted Band Edges and Spurious Emission	-	See note.
3.2	15.247(d)	Radiated Band Edges and Spurious Emission	Pass	Under limit 0.41 dB at 4960.000 MHz
3.3	15.207	AC Conducted Emission	Pass	Under limit 1.06 dB at 13.167 MHz
3.4	15.203 & 15.247(b)	Antenna Requirement	Pass	-

Note: This is a spot check data report and data performed in appendix of this report are chosen from the worst case of the original FCC ID (S9GR730) report.

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.

1 General Description

1.1 Product Feature of Equipment Under Test

Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n/ax, Wi-Fi 5GHz 802.11a/n/ac/ax, and Zigbee.

Product Specification subjective to this standard	
Antenna Type	WLAN <Ant. 1>: Internal Omni PCB Antenna <Ant. 2>: Internal Omni PCB Antenna <Ant. 3>: Internal Omni PCB Antenna <Ant. 4>: Internal Omni PCB Antenna <Ant. 5>: Internal Omni PCB Antenna <Ant. 6>: Internal Omni PCB Antenna <Ant. 7>: Internal Omni PCB Antenna <Ant. 8>: Internal Omni PCB Antenna Bluetooth: Internal Omni PCB Antenna Zigbee: Internal Omni 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 (USA) Inc.		
Test Site Location	1175 Montague Expressway, Milpitas, CA 95035 TEL : 408 9043300		
Test Site No.	**Sporton Site No.**		
	TH01-CA	CO01-CA	03CH01-CA

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

1.4 Applicable Standards

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

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance 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

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	0	2402	21	2444
	1	2404	22	2446
	2	2406	23	2448
	3	2408	24	2450
	4	2410	25	2452
	5	2412	26	2454
	6	2414	27	2456
	7	2416	28	2458
	8	2418	29	2460
	9	2420	30	2462
	10	2422	31	2464
	11	2424	32	2466
	12	2426	33	2468
	13	2428	34	2470
	14	2430	35	2472
	15	2432	36	2474
	16	2434	37	2476
	17	2436	38	2478
	18	2438	39	2480
	19	2440	-	-
	20	2442	-	-

2.2 Test Mode

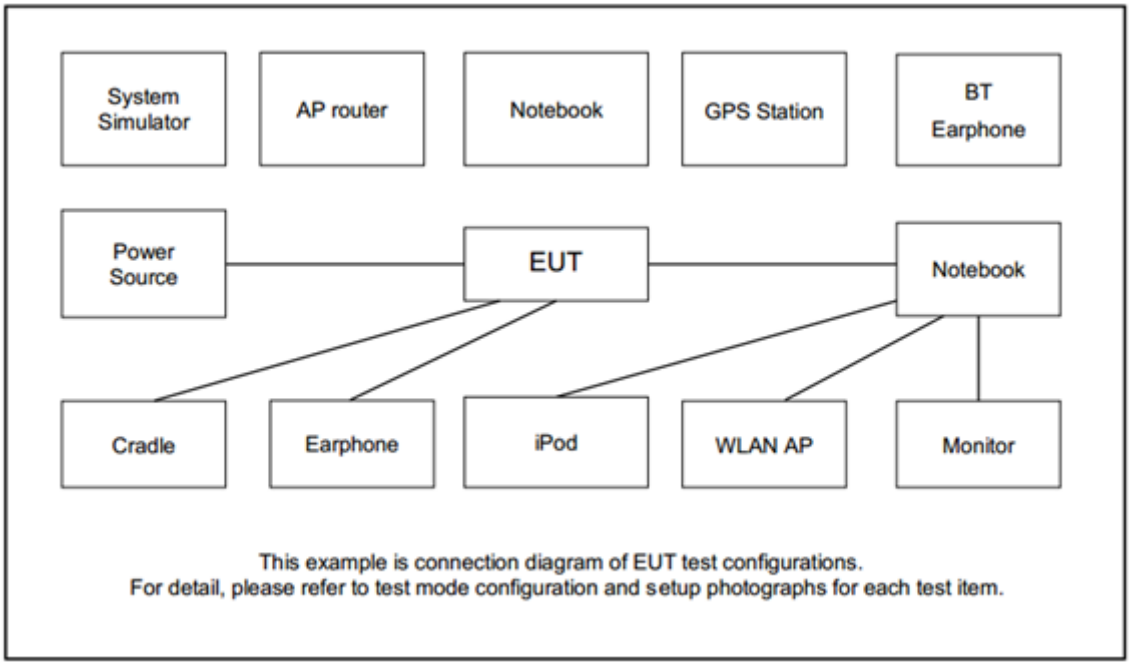
a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Y plane) were recorded in this report.

b. AC power line Conducted Emission was tested under maximum output power.

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

Summary table of Test Cases	
Test Item	**Data Rate / Modulation**
	Bluetooth – LE / GFSK
Radiated Test Cases	Mode 1: Bluetooth Tx CH39_2480 MHz_1Mbps
AC Conducted Emission	Mode 1: Bluetooth-LE TX + Charging from PoE + LAN Link

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.	Laptop	DELL	P79G	FCC DoC	N/A	N/A
2.	Laptop	DELL	E6430	N/A	N/A	N/A
3.	USB Flash drive	R&S	N/A	N/A	N/A	N/A

2.5 EUT Operation Test Setup

The RF test items, utility “QSPR (V5.0-00188)” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

3 Test Result

3.1 Output Power Measurement

3.1.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

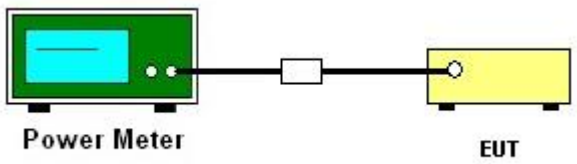
3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

3.1.3 Test Procedures

1. For Average Power, the testing follows ANSI C63.10 Section 11.9.2.3.2 Method AVGPM-G
2. The RF output of EUT was connected to the power meter by RF cable and attenuator.
3. The path loss was compensated to the results for each measurement.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. Measure the conducted output power and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of Average Output Power

Please refer to Appendix A.

3.2 Radiated Band Edges and Spurious Emission Measurement

3.2.1 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 limits as below.

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

3.2.2 Measuring Instruments

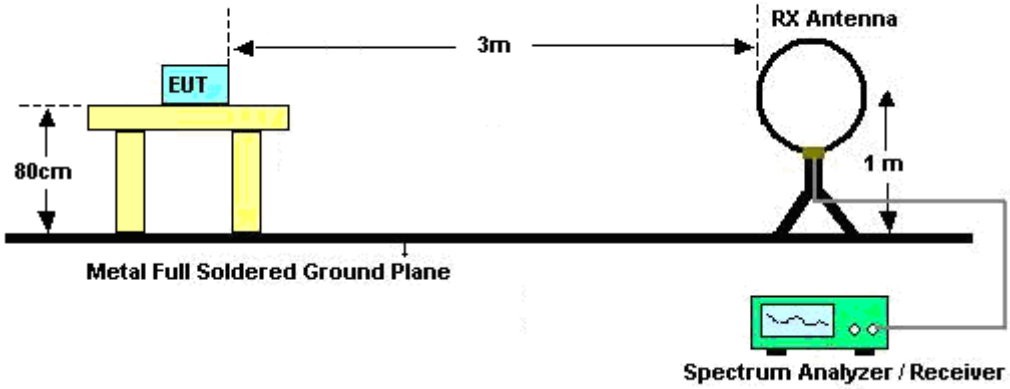
See list of measuring equipment of this test report.

3.2.3 Test Procedures

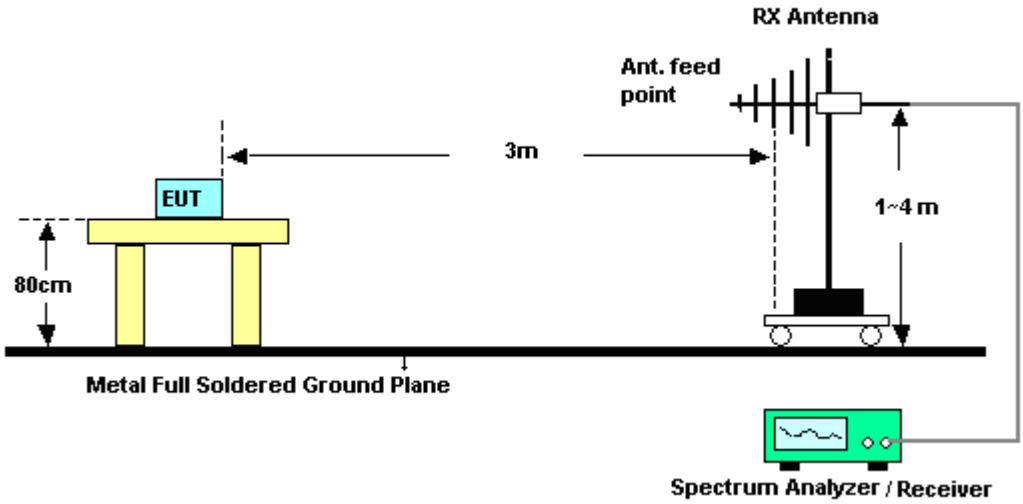
1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
8. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW=100 kHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
   (3) Set RBW = 1 MHz, VBW= 3MHz for f ≥ 1 GHz for peak measurement.
   For average measurement:
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.2.4 Test Setup

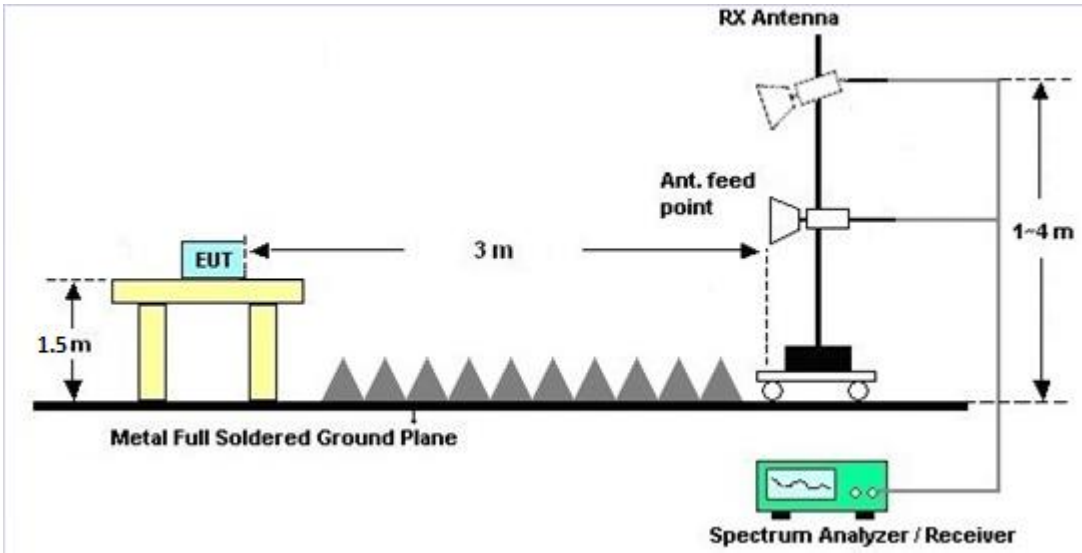
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.2.5 Test Results of Radiated Spurious Emissions (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.

3.2.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C and D.

3.2.7 Duty Cycle

Please refer to Appendix E.

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

Please refer to Appendix C and D.

3.3 AC Conducted Emission Measurement

3.3.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

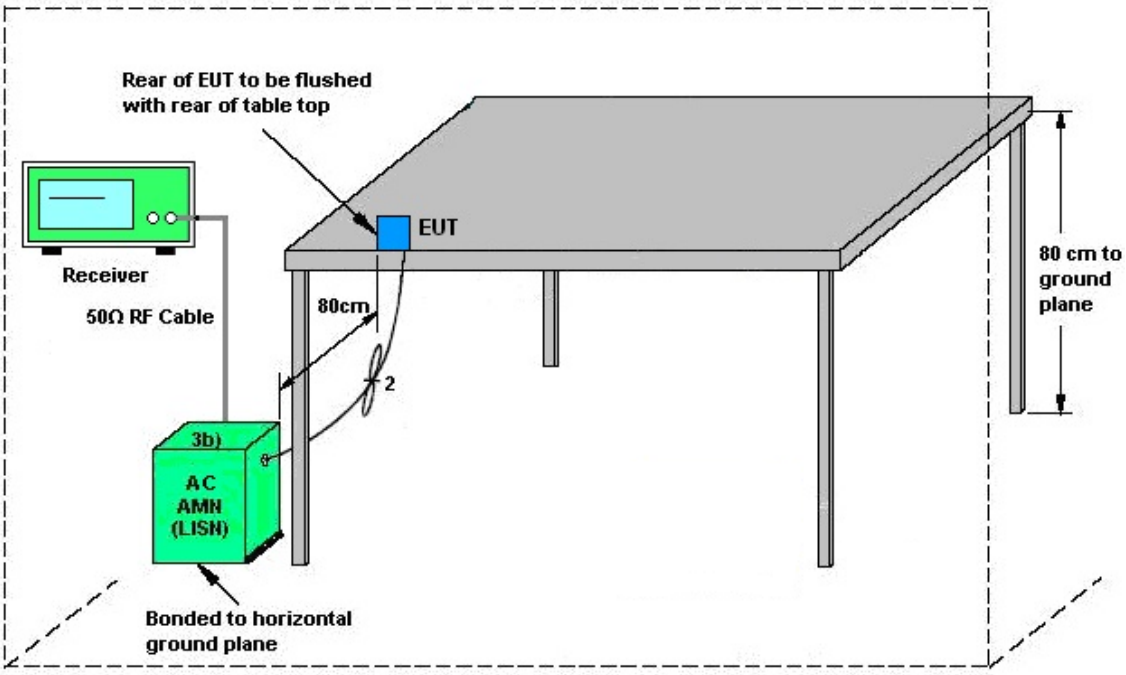
3.3.2 Measuring Instruments

See list of measuring equipment of this test report.

3.3.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

3.3.4 Test Setup



AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

3.3.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.4 Antenna Requirements

3.4.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

3.4.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.4.3 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
Preamplifier	Keysight	83017A	MY53270321	1GHz~26.5GHz	Sep. 18, 2019	Feb. 20, 2020~ Feb. 21, 2020	Sep. 17, 2020	Radiation (03CH01-CA)
Horn Antenna	SCHWARZBECK	BBHA 9120D	01894	1GHz~18GHz	Jul. 22, 2019	Feb. 20, 2020~ Feb. 21, 2020	Jul. 21, 2020	Radiation (03CH01-CA)
EMI Test Receiver	Rohde & Schward	ESU26	100049	20Hz~26.5GHz	Jul. 31, 2019	Feb. 20, 2020~ Feb. 21, 2020	Jul. 30, 2020	Radiation (03CH01-CA))
Hygrometer	TESTO	608-H1	45142559	N/A	Aug. 06, 2019	Feb. 20, 2020~ Feb. 21, 2020	Aug. 05, 2020	Radiation (03CH01-CA)
Controller	ChainTek	3000-1	N/A	Control Turn table & Ant Mast	N/A	Feb. 20, 2020~ Feb. 21, 2020	N/A	Radiation (03CH01-CA)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Feb. 20, 2020~ Feb. 21, 2020	N/A	Radiation (03CH01-CA)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Feb. 20, 2020~ Feb. 21, 2020	N/A	Radiation (03CH01-CA)
Software	Audix	E3	N/A	N/A	N/A	Feb. 20, 2020~ Feb. 21, 2020	N/A	Radiation (03CH01-CA)
LISN	TESEQ	NNB51	47407	N/A	May 26, 2019	Mar. 13, 2020	Jun. 25, 2020	Conduction (CO01-CA)
EMI Test Receiver	R&S	ESR7	102177	9KHz~7GHz	Jun. 27, 2019	Mar. 13, 2020	Jun. 26, 2020	Conduction (CO01-CA)
Pulse limiter with 10dB attenuation	R&S	VTSD 9561-F N	9561-F-N00412	N/A	Jun. 11, 2019	Mar. 13, 2020	Jun. 10, 2020	Conduction (CO01-CA)
Test Software	EMC32	N/A	N/A	N/A	N/A	Mar. 13, 2020	N/A	Conduction (CO01-CA)
Hygrometer	Testo	608-H1	45142595	N/A	Aug. 07, 2019	Feb. 27, 2020~ Mar. 03, 2020	Aug. 06, 2020	Conducted (TH01-CA)
Power Sensor	DARE	RPR3006W	RPR6W-1901027	50MHz~18GHz	Jun. 27, 2019	Feb. 27, 2020~ Mar. 03, 2020	Jun. 26, 2020	Conducted (TH01-CA))
Spectrum Analyzer	Rohde & Schwarz	FSV 40	100895	10Hz~40GHz	Aug. 29, 2019	Feb. 27, 2020~ Mar. 03, 2020	Aug. 28, 2020	Conducted (TH01-CA)
Switch Box & RF Cable	EM	EMSW18	SW1070902	N/A	N/A	Feb. 27, 2020~ Mar. 03, 2020	N/A	Conducted (TH01-CA)

5 Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	1.7

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.4

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	6.5

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	6.3

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Howard Lin	Temperature:	21~25	°C
Test Date:	2/27/2020~3/3/2020	Relative Humidity:	51~54	%

TEST RESULTS DATA
Average Power Table

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	1Mbps	1	0	2402	18.50	30.00	0.00	18.50	36.00	Pass
BLE	1Mbps	1	19	2440	18.35	30.00	0.00	18.35	36.00	Pass
BLE	1Mbps	1	39	2480	17.96	30.00	0.00	17.96	36.00	Pass

TEST RESULTS DATA
Peak Power Density

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm /100kHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
BLE	1Mbps	1	0	2402	17.13	1.38	0.00	8.00	Pass
BLE	1Mbps	1	19	2440	16.84	1.12	0.00	8.00	Pass
BLE	1Mbps	1	39	2480	4.23	-11.43	0.00	8.00	Pass

Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 30dBc limit.

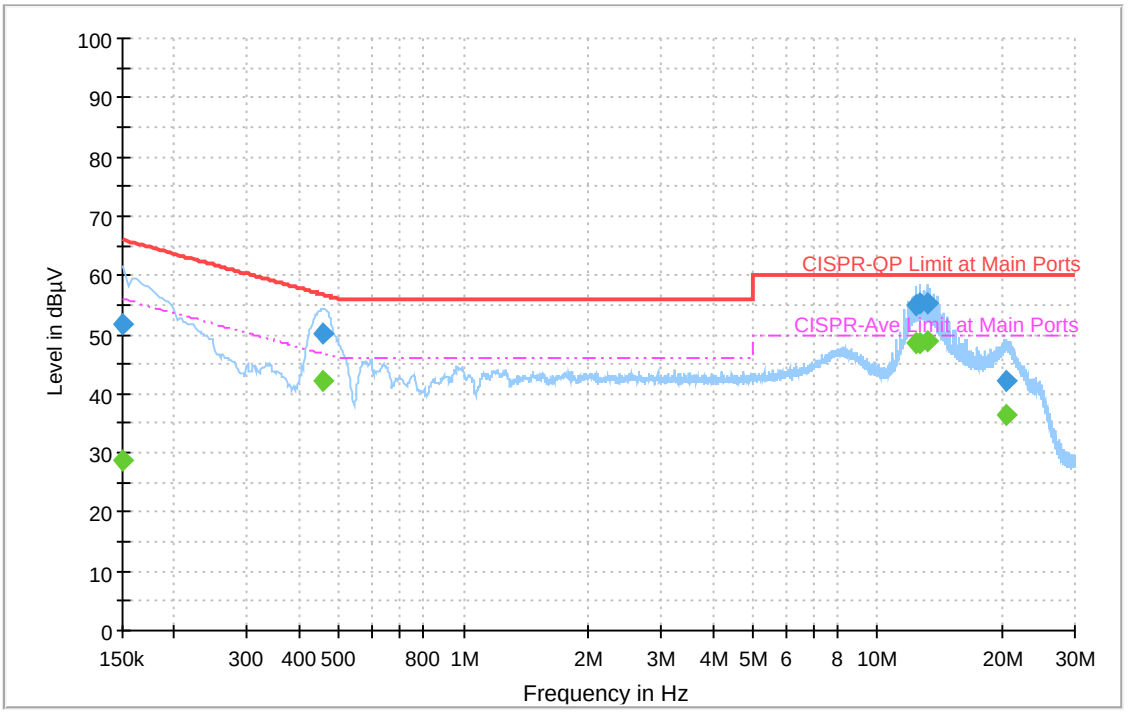
Appendix B. AC Conducted Emission Test Results

Test Engineer :	Leo Liu	**Temperature :**	19~20℃
		Relative Humidity :	30~35%

EUT Information

Site:	CO01-CA
Project:	200130001
Power:	120Vac/60Hz
Mode:	2
	BLE TX

Full Spectrum



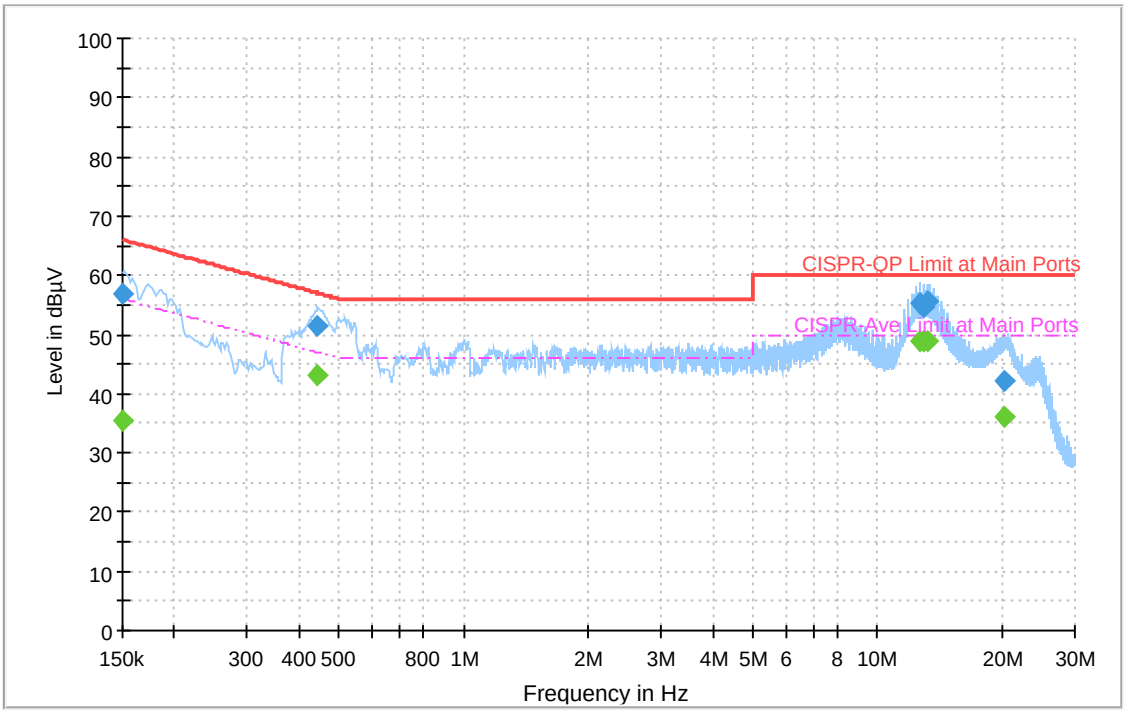
Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.150000	---	28.79	56.00	27.21	L1	OFF	20.3
0.150000	51.72	---	66.00	14.28	L1	OFF	20.3
0.456000	---	42.29	46.77	4.48	L1	OFF	20.4
0.456000	50.30	---	56.77	6.47	L1	OFF	20.4
12.380460	---	48.45	50.00	1.55	L1	OFF	20.6
12.380460	54.87	---	60.00	5.13	L1	OFF	20.6
12.640650	---	48.71	50.00	1.29	L1	OFF	20.6
12.640650	55.24	---	60.00	4.76	L1	OFF	20.6
13.157250	---	48.82	50.00	1.18	L1	OFF	20.6
13.157250	55.34	---	60.00	4.66	L1	OFF	20.6
20.550750	---	36.34	50.00	13.66	L1	OFF	20.7
20.550750	42.13	---	60.00	17.87	L1	OFF	20.7

EUT Information

Site:	CO01-CA
Project:	200130001
Power:	120Vac/60Hz
Mode:	2
	BLE TX

Full Spectrum



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.150000	---	35.34	56.00	20.66	N	OFF	20.3
0.150000	56.97	---	66.00	9.03	N	OFF	20.3
0.442500	---	43.20	47.02	3.81	N	OFF	20.4
0.442500	51.36	---	57.02	5.65	N	OFF	20.4
12.650100	---	48.79	50.00	1.21	N	OFF	20.6
12.650100	55.39	---	60.00	4.61	N	OFF	20.6
12.908850	---	48.74	50.00	1.26	N	OFF	20.6
12.908850	54.67	---	60.00	5.33	N	OFF	20.6
13.166700	---	48.94	50.00	1.06	N	OFF	20.6
13.166700	55.47	---	60.00	4.53	N	OFF	20.6
20.339880	---	36.16	50.00	13.84	N	OFF	20.7
20.339880	42.06	---	60.00	17.94	N	OFF	20.7

Appendix C. Radiated Spurious Emission

Test Engineer :	JC Liang, Leo Luo and Jacky Hong	Temperature :	18~21°C
		Relative Humidity :	38~42%

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH 39 2480MHz	*	2480	115.2	-	-	101.79	27.61	17.08	31.28	179	230	P	H
	*	2480	114.55	-	-	101.14	27.61	17.08	31.28	179	230	A	H
		2483.8	63.24	-10.76	74	49.82	27.61	17.09	31.28	179	230	P	H
		2483.52	52.81	-1.19	54	39.39	27.61	17.09	31.28	179	230	A	H
													H
													H
	*	2480	110.36	-	-	96.96	27.6	17.08	31.28	151	141	P	V
	*	2480	109.73	-	-	96.33	27.6	17.08	31.28	151	141	A	V
		2484	61.03	-12.97	74	47.61	27.61	17.09	31.28	151	141	P	V
		2483.52	49.23	-4.77	54	35.81	27.61	17.09	31.28	151	141	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

BLE (Harmonic @ 3m)

BLE	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 CH 39 2480MHz		4960	56.9	-17.1	74	71.25	31.38	10.87	56.6	179	171	P	H
		4960	53.59	-0.41	54	67.94	31.38	10.87	56.6	179	171	A	H
		7440	45.6	-28.4	74	52.87	36.33	12.9	56.5	100	0	P	H
													H
		4960	54.71	-19.29	74	69.01	31.43	10.87	56.6	309	230	P	V
		4960	51.16	-2.84	54	65.46	31.43	10.87	56.6	309	230	A	V
		7440	45.17	-28.83	74	52.4	36.37	12.9	56.5	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	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BLE LF		30	21.67	-18.33	40	27.9	25	1.2	32.43	-	-	P	H
		240.49	31.69	-14.31	46	43.93	17.36	2.83	32.43	-	-	P	H
		321	25.64	-20.36	46	35.64	19.52	2.97	32.49	-	-	P	H
		399.57	40.52	-5.48	46	48.22	21.78	3.11	32.59	100	0	P	H
		499.48	27.52	-18.48	46	32.86	23.89	3.5	32.73	-	-	P	H
		957.32	33.39	-12.61	46	28.66	31.05	5.1	31.42	-	-	P	H
													H
													H
													H
													H
													H
													H
		34.85	26.25	-13.75	40	34.87	22.48	1.32	32.42	-	-	P	V
		240.49	22.5	-23.5	46	34.74	17.36	2.83	32.43	-	-	P	V
		399.57	33.62	-12.38	46	41.32	21.78	3.11	32.59	100	0	P	V
		500.45	30.44	-15.56	46	35.77	23.9	3.5	32.73	-	-	P	V
		800.18	32.29	-13.71	46	31.96	28.3	4.6	32.57	-	-	P	V
		955.38	33.34	-12.66	46	28.67	31.01	5.1	31.44	-	-	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:

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH 00 2402MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		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 D. Radiated Spurious Emission Plots

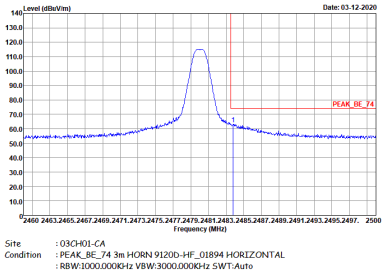
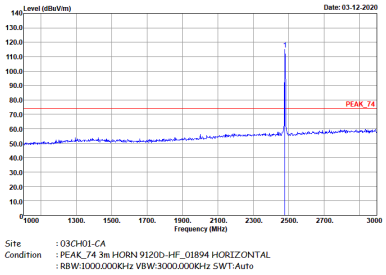
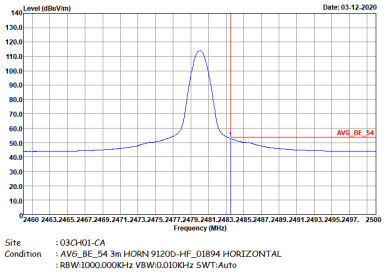
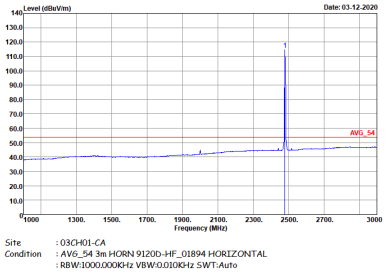
Test Engineer :	JC Liang, Leo Luo and Jacky Hong	**Temperature :**	18~21°C
		Relative Humidity :	38~42%

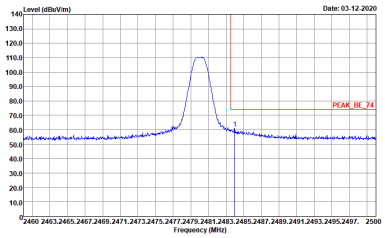
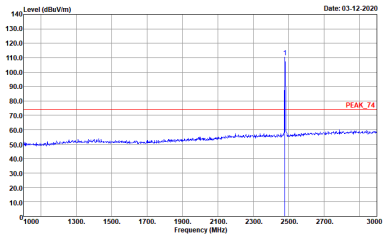
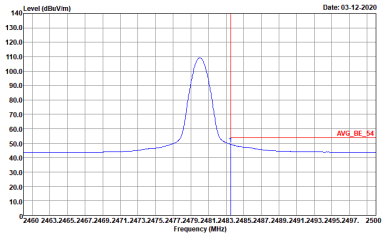
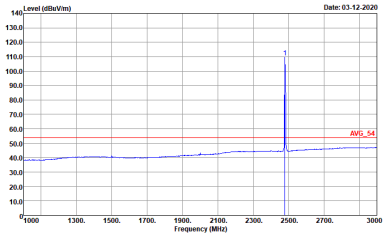
Note symbol

-L	**Low channel location**
-R	**High channel location**

2.4GHz 2400~2483.5MHz

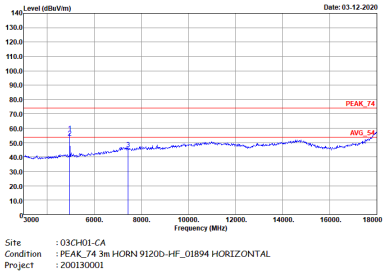
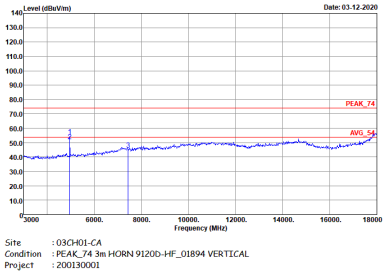
BLE (Band Edge @ 3m)

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
2	Horizontal	Fundamental
Peak		
Avg.		

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
2	Vertical	Fundamental
Peak	 Site : 03CH01-CA Condition : PEAK_BE_74 3m HORN 9120D-HF_01894 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH01-CA Condition : PEAK_74 3m HORN 9120D-HF_01894 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH01-CA Condition : AVG_BE_54 3m HORN 9120D-HF_01894 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH01-CA Condition : AVG_54 3m HORN 9120D-HF_01894 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

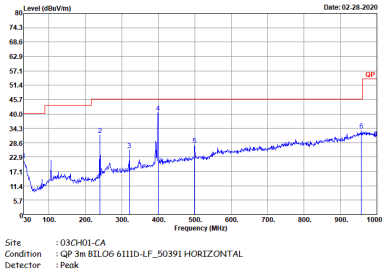
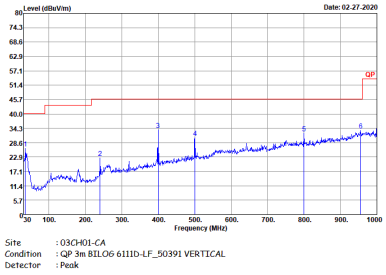
2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH39 2480MHz	
2	Horizontal	Vertical
Peak		

Emission below 1GHz

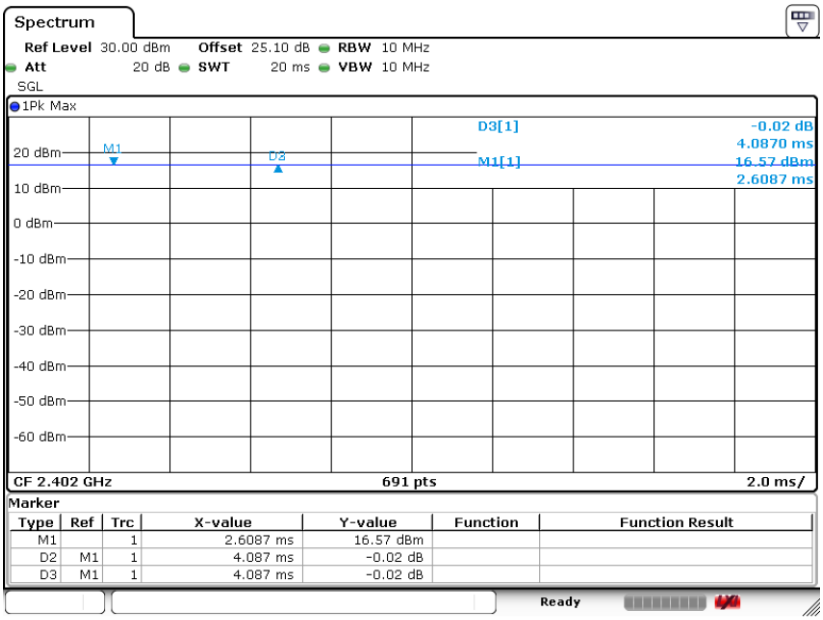
2.4GHz BLE (LF)

BLE	2.4GHz 2400~2483.5MHz	
ANT	BLE LF	
2	Horizontal	Vertical
QP / Peak		

Appendix E. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
Bluetooth -LE	100	0	0	10Hz	0.00

Bluetooth - LE



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