FCC RADIO TEST REPORT

FCC ID	:	**S9GR550**
Equipment	:	**Wireless Access Point**
Brand Name	:	**Ruckus**
Model Name	:	**R550**
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. 22, 2020 and testing was started from Feb. 06, 2020 and completed on Mar. 10, 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
FR200117001B	01	Initial issue of report	Apr. 01, 2020
FR200117001B	02	Revise Antenna information in section 1.1	Apr. 16, 2020

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.247(d)	Radiated Band Edges and Spurious Emission	Pass	Under limit 0.37 dB at 7425.000 MHz
3.2	15.207	AC Conducted Emission	Pass	Under limit 2.48 dB at 0.461 MHz
3.3	15.203 & 15.247(b)	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.

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 Antenna <Ant. 2> Internal Antenna Bluetooth: Metal Antenna Zigbee: Metal 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.**	
	CO01-CA	03CH02-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:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	11	2405	19	2445
	12	2410	20	2450
	13	2415	21	2455
	14	2420	22	2460
	15	2425	23	2465
	16	2430	24	2470
	17	2435	25	2475
	18	2440	26	2480

2.2 Test Mode

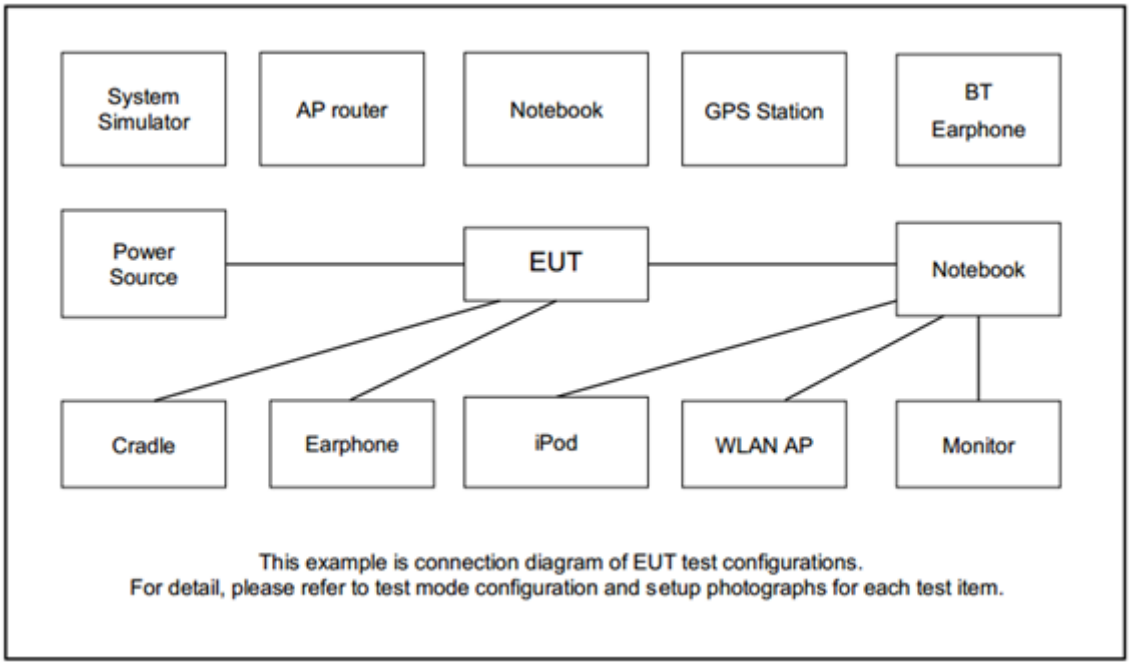
a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental 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**
	250 kbps / OQPSK
Radiated Test Cases	Mode 1: Zigbee Tx CH11_2405 MHz Mode 2: Zigbee Tx CH18_2440 MHz Mode 3: Zigbee Tx CH25_2475 MHz
AC Conducted Emission	Mode 1: WLAN (2.4GHz) Link + WLAN (5GHz) Idle + Zigbee Idle + 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.	Notebook	HP	15t-cu000	PD97265NG	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	USB Flash drive	SanDisk	N/A	N/A	N/A	N/A
5.	PoE Adapter	Ruckus Wireless Inc.	N/A	N/A	N/A	N/A
6.	Adapter	Ruckus Wireless Inc.	APH-5020	N/A	N/A	N/A

2.5 EUT Operation Test Setup

The RF test items, utility “Putty” 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 Radiated Band Edges and Spurious Emission Measurement

3.1.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

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

3.1.2 Measuring Instruments

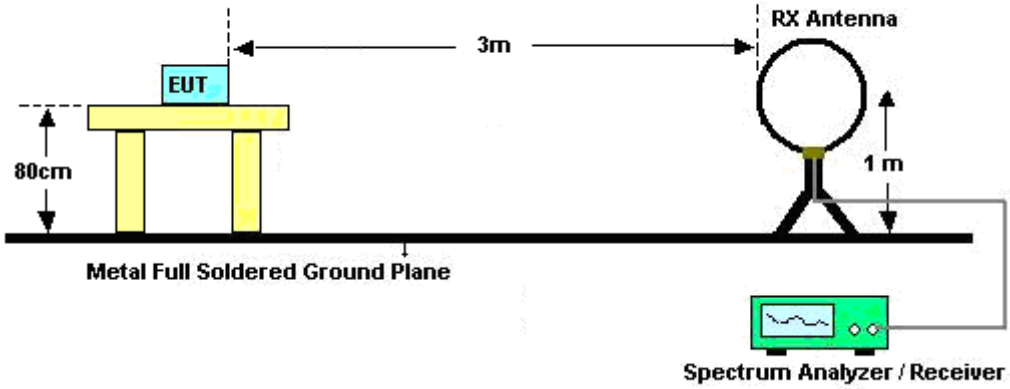
See list of measuring equipment of this test report.

3.1.3 Test Procedures

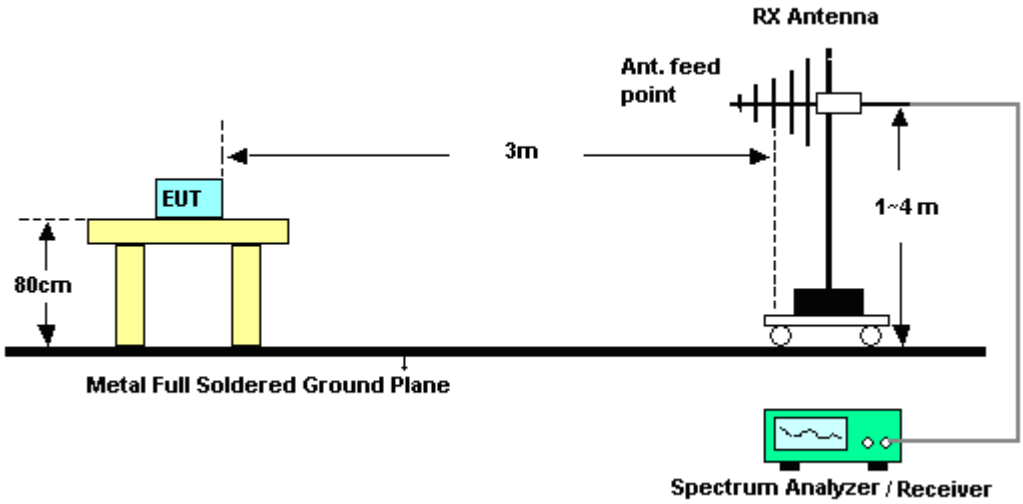
1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the 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.

3.1.4 Test Setup

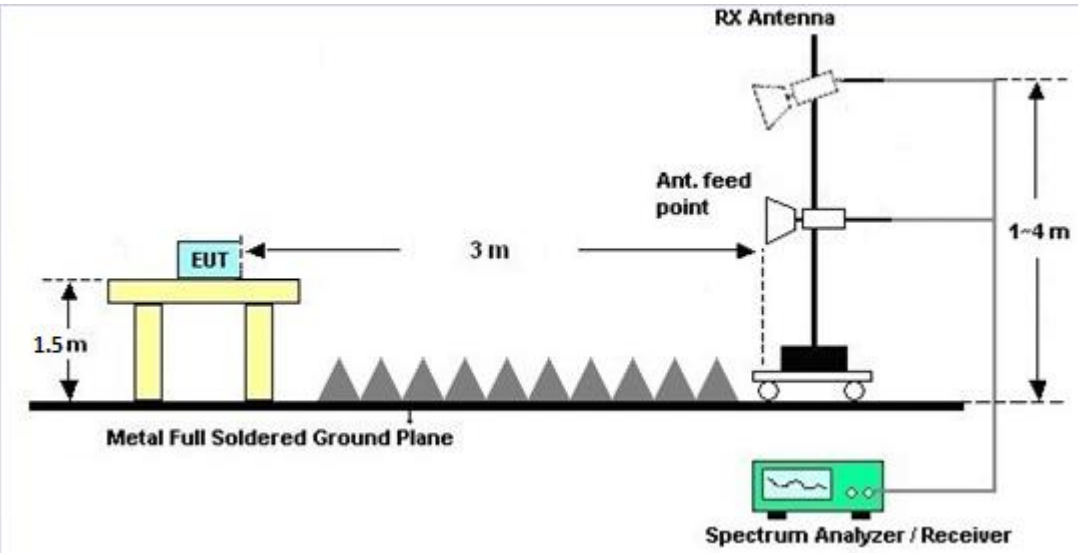
For radiated emissions below 30MHz



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 B and C.

3.1.7 Duty Cycle

Please refer to Appendix D.

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

Please refer to Appendix B and C.

3.2 AC Conducted Emission Measurement

3.2.1 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.

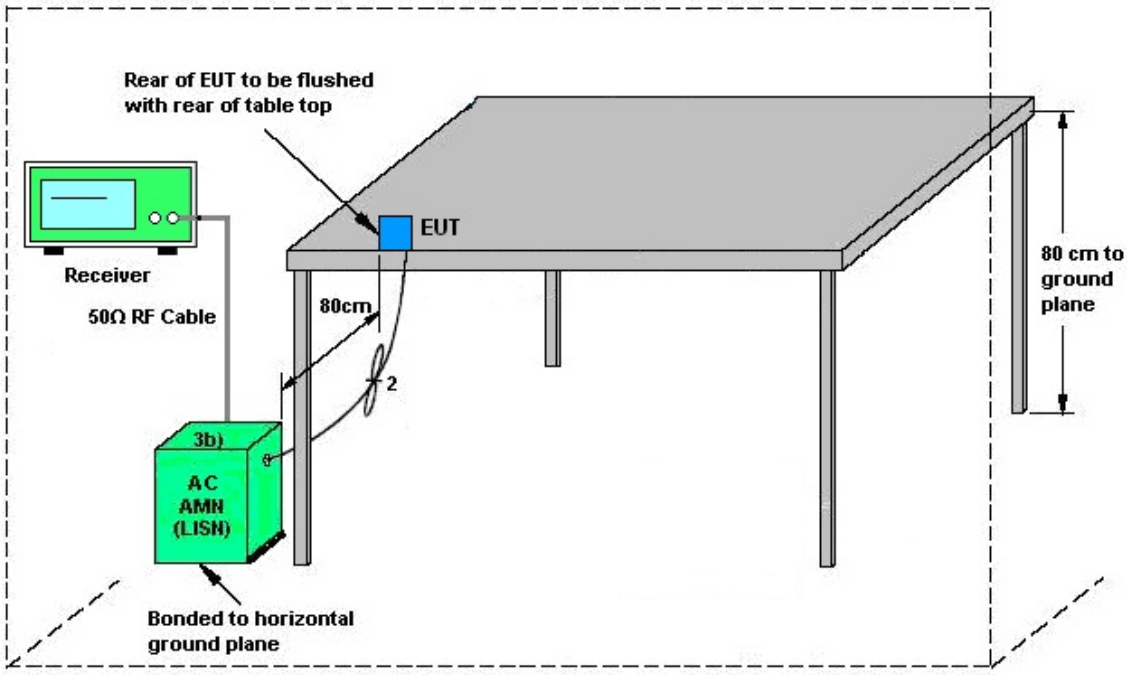
3.2.2 Measuring Instruments

See list of measuring equipment of this test report.

3.2.3 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.

3.2.4 Test Setup



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

3.2.5 Test Result of AC Conducted Emission

Please refer to Appendix A.

3.3 Antenna Requirements

3.3.1 Standard Applicable

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

3.3.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.3.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
LISN	TESEQ	NNB51	47407	N/A	Jun. 26, 2019	Feb. 25, 2020	Jun. 25, 2020	Conduction (CO01-CA)
EMI Test Receiver	R&S	ESR7	102177	9KHz~7GHz	Jun. 27, 2019	Feb. 25, 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	Feb. 25, 2020	Jun. 10, 2020	Conduction (CO01-CA)
Test Software	EMC32	N/A	N/A	N/A	N/A	Feb. 25, 2020	N/A	Conduction (CO01-CA)
Bilog Antenna	TESEQ	6111D	50392	30MHz~1GHz	May 15, 2019	Feb. 06, 2020~ Mar. 10, 2020	May 14, 2020	Radiation (03CH02-CA)
Horn Antenna	SCHWARZBECK	BBHA 9120D	01894	1GHz~18GHz	Jul. 22, 2019	Feb. 06, 2020~ Mar. 10, 2020	Jul. 21, 2020	Radiation (03CH02-CA)
Amplifier	SONOMA	310N	372241	N/A	Jul. 26, 2019	Feb. 06, 2020~ Mar. 10, 2020	Jul. 25, 2020	Radiation (03CH02-CA)
Preamplifier	Keysight	83017A	MY53270321	1GHz~26.5GHz	Jul. 26, 2019	Feb. 06, 2020~ Mar. 10, 2020	Jul. 25, 2020	Radiation (03CH02-CA)
Preamplifier	Jet-Power	JPA0118-55-303	1710001800055007	1GHz~18GHz	Apr. 01, 2019	Feb. 06, 2020~ Mar. 10, 2020	Mar. 31, 2020	Radiation (03CH02-CA)
Spectrum Analyzer	Keysight	N9010A	MY57420221	10Hz~44GHz	Sep. 11, 2019	Feb. 06, 2020~ Mar. 10, 2020	Sep. 10, 2020	Radiation (03CH02-CA)
Filter	Wainwright	WLK12-1200-1272-11000-40SS	SN2	1.2G Low Pass	Aug. 02, 2019	Feb. 06, 2020~ Mar. 10, 2020	Aug. 01, 2020	Radiation (03CH02-CA)
Filter	Wainwright	WHKX12-2700-3000-18000-60ST	SN10	3G Highpass	Aug. 02, 2019	Feb. 06, 2020~ Mar. 10, 2020	Aug. 01, 2020	Radiation (03CH02-CA)
Hygrometer	TESEO	608-H1	45142602	N/A	Jul. 25, 2019	Feb. 06, 2020~ Mar. 10, 2020	Jul. 24, 2020	Radiation (03CH02-CA)
Controller	ChainTek	3000-1	N/A	Control Turn table & Ant Mast	N/A	Feb. 06, 2020~ Mar. 10, 2020	N/A	Radiation (03CH02-CA)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Feb. 06, 2020~ Mar. 10, 2020	N/A	Radiation (03CH02-CA)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Feb. 06, 2020~ Mar. 10, 2020	N/A	Radiation (03CH02-CA)

5 Uncertainty of Evaluation

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

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**

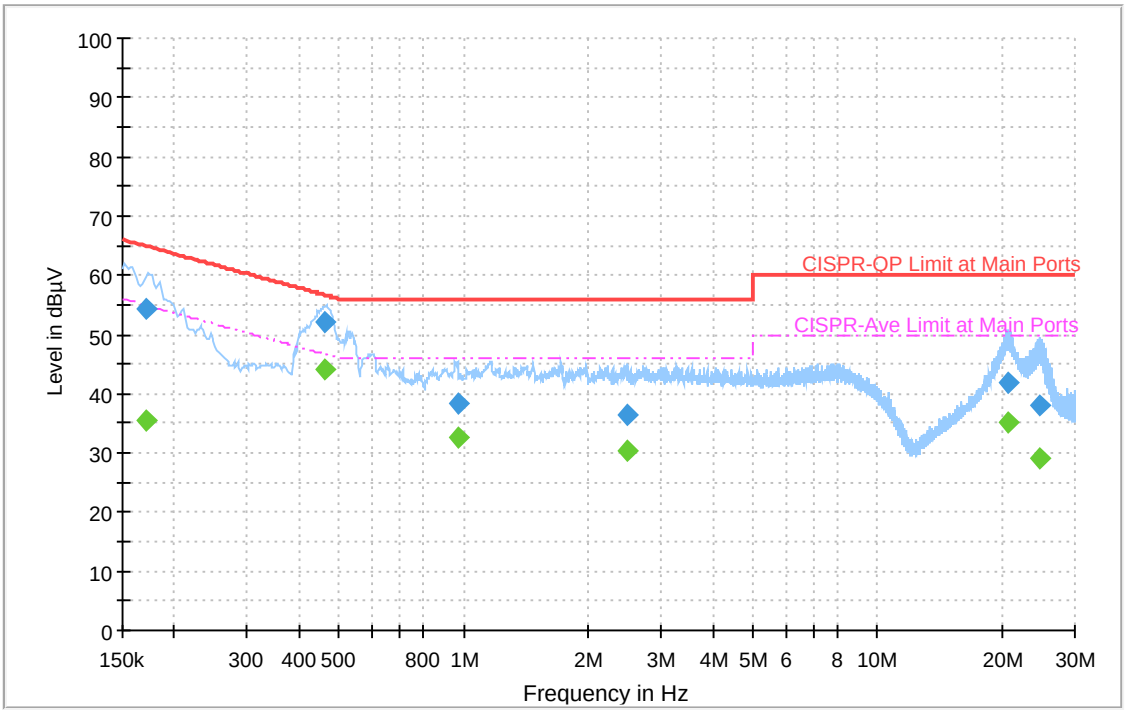
Appendix A. AC Conducted Emission Test Results

Test Engineer :	JC Liang	**Temperature :**	24~26℃
		Relative Humidity :	22~25%

EUT Information

Site:	CO01-CA
Project:	200117001
Power:	120Vac/60Hz
Mode:	1

Full Spectrum



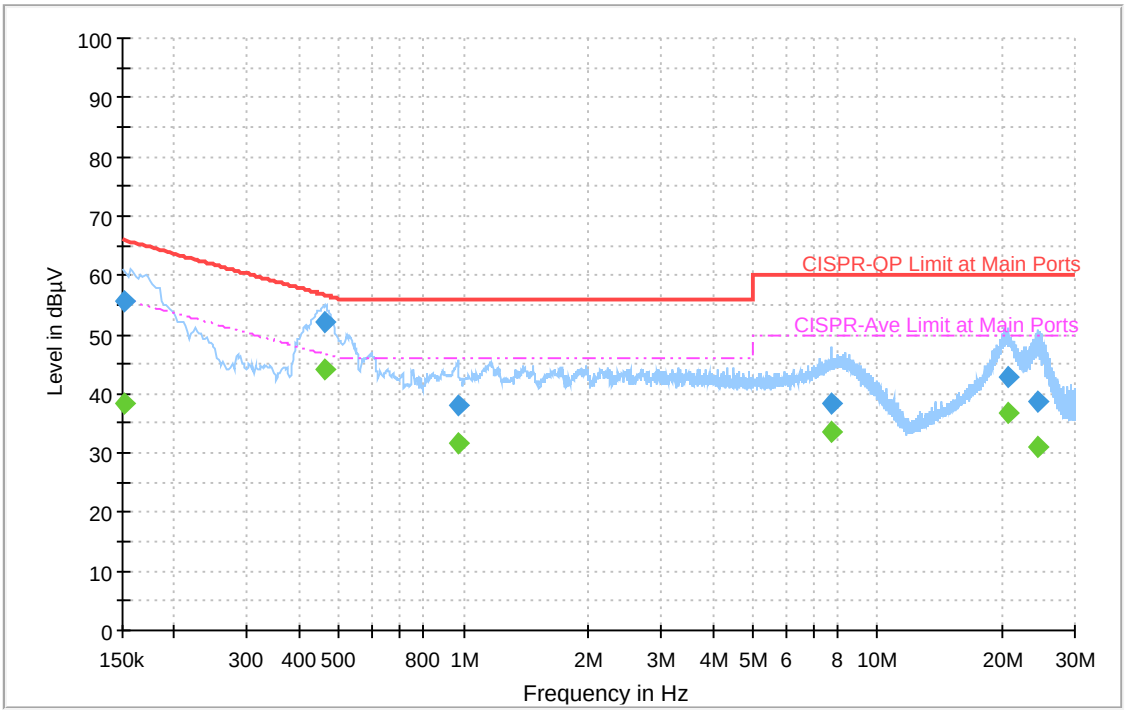
Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.170250	---	35.62	54.95	19.33	L1	OFF	20.3
0.170250	54.31	---	64.95	10.64	L1	OFF	20.3
0.460500	---	44.12	46.68	2.56	L1	OFF	20.4
0.460500	51.95	---	56.68	4.73	L1	OFF	20.4
0.971250	---	32.49	46.00	13.51	L1	OFF	20.4
0.971250	38.47	---	56.00	17.53	L1	OFF	20.4
2.484330	---	30.21	46.00	15.79	L1	OFF	20.4
2.484330	36.36	---	56.00	19.64	L1	OFF	20.4
20.640750	---	35.14	50.00	14.86	L1	OFF	20.7
20.640750	41.76	---	60.00	18.24	L1	OFF	20.7
24.702000	---	29.18	50.00	20.82	L1	OFF	20.8
24.702000	37.87	---	60.00	22.13	L1	OFF	20.8

EUT Information

Site:	CO01-CA
Project:	200117001
Power:	120Vac/60Hz
Mode:	1

Full Spectrum



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	38.43	55.88	17.45	N	OFF	20.3
0.152250	55.63	---	65.88	10.25	N	OFF	20.3
0.460500	---	44.20	46.68	2.48	N	OFF	20.4
0.460500	51.93	---	56.68	4.75	N	OFF	20.4
0.971250	---	31.73	46.00	14.27	N	OFF	20.4
0.971250	37.90	---	56.00	18.10	N	OFF	20.4
7.741500	---	33.48	50.00	16.52	N	OFF	20.5
7.741500	38.49	---	60.00	21.51	N	OFF	20.5
20.715000	---	36.76	50.00	13.24	N	OFF	20.7
20.715000	42.79	---	60.00	17.21	N	OFF	20.7
24.384750	---	30.98	50.00	19.02	N	OFF	20.8
24.384750	38.52	---	60.00	21.48	N	OFF	20.8

Appendix B. Radiated Spurious Emission

Test Engineer :	Calvin Wu, Leo Liu and Jacky Hong	Temperature :	19~22℃
		Relative Humidity :	36~45%

2.4GHz 2400~2483.5MHz

ZigBee (Band Edge @ 3m)

Zigbee	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)
ZigBee CH 11 2405MHz		2366.175	59.14	-14.86	74	45.3	27.73	17.29	31.18	100	185	P	H
		2366.49	52.35	-1.65	54	38.51	27.73	17.29	31.18	100	185	A	H
	*	2405	116.91	-	-	103.19	27.53	17.35	31.16	100	185	P	H
	*	2405	115.06	-	-	101.34	27.53	17.35	31.16	100	185	A	H
													H
		2366.595	57.9	-16.1	74	43.93	27.86	17.29	31.18	348	138	P	V
		2366.49	49.68	-4.32	54	35.71	27.86	17.29	31.18	348	138	A	V
	*	2405	114.41	-	-	100.66	27.56	17.35	31.16	348	138	P	V
	*	2405	112.58	-	-	98.83	27.56	17.35	31.16	348	138	A	V
													V
ZigBee CH 18 2440MHz		2344.56	55.13	-18.87	74	41.21	27.85	17.26	31.19	166	181	P	H
		2310.96	43.89	-10.11	54	29.88	28.01	17.21	31.21	166	181	A	H
	*	2440	114.15	-	-	100.4	27.48	17.41	31.14	166	181	P	H
	*	2440	112.29	-	-	98.54	27.48	17.41	31.14	166	181	A	H
		2494.72	54.87	-19.13	74	40.95	27.53	17.5	31.11	166	181	P	H
		2495.52	43.91	-10.09	54	29.99	27.53	17.5	31.11	166	181	A	H
		2350.32	55.19	-18.81	74	41.11	28	17.27	31.19	335	129	P	V
		2351.28	44.06	-9.94	54	29.99	27.99	17.27	31.19	335	129	A	V
	*	2440	111.72	-	-	98.02	27.43	17.41	31.14	335	129	P	V
	*	2440	109.78	-	-	96.08	27.43	17.41	31.14	335	129	A	V
		2490.16	54.45	-19.55	74	40.58	27.5	17.49	31.12	335	129	P	V
		2494.96	43.82	-10.18	54	29.91	27.52	17.5	31.11	335	129	A	V

ZigBee CH 25 2475MHz	*	2475	117.43	-	-	103.59	27.5	17.46	31.12	117	175	P	H
	*	2475	115.58	-	-	101.74	27.5	17.46	31.12	117	175	A	H
		2483.84	62.39	-11.61	74	48.52	27.51	17.48	31.12	117	175	P	H
		2483.52	51.51	-2.49	54	37.64	27.51	17.48	31.12	117	175	A	H
													H
													H
	*	2475	114.51	-	-	100.71	27.46	17.46	31.12	264	124	P	V
	*	2475	112.62	-	-	98.82	27.46	17.46	31.12	264	124	A	V
		2483.72	59.79	-14.21	74	45.95	27.48	17.48	31.12	264	124	P	V
		2483.52	49.41	-4.59	54	35.57	27.48	17.48	31.12	264	124	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

ZigBee (Harmonic @ 3m)

Zigbee	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)
ZigBee CH 11 2405MHz		4810	44.92	-29.08	74	68.27	31.38	11.55	66.28	100	0	P	H
		12025	57.43	-16.57	74	67.14	39.28	17.67	66.66	178	24	A	H
		12025	50.37	-3.63	54	60.08	39.28	17.67	66.66	178	24	A	H
													H
		4810	44.25	-29.75	74	67.58	31.4	11.55	66.28	100	0	P	V
		12025	52.67	-21.33	74	62.31	39.35	17.67	66.66	111	341	P	V
		12025	44.05	-9.95	54	53.69	39.35	17.67	66.66	111	341	A	V
													V
ZigBee CH 18 2440MHz		4880	47.81	-26.19	74	71.25	31.31	11.39	66.14	100	0	P	H
		7320	57.68	-16.32	74	73.61	36.35	13.58	65.86	252	279	P	H
		7320	51.81	-2.19	54	67.74	36.35	13.58	65.86	252	279	A	H
													H
		4880	46.15	-27.85	74	69.65	31.25	11.39	66.14	100	0	P	V
		7320	59.1	-14.9	74	75.04	36.34	13.58	65.86	240	170	P	V
		7320	53.62	-0.38	54	69.56	36.34	13.58	65.86	240	170	A	V
													V
ZigBee CH 25 2475MHz		4950	49.81	-24.19	74	73.19	31.38	11.24	66	100	0	P	H
		7425	59.14	-14.86	74	74.93	36.45	13.65	65.89	245	310	P	H
		7425	53.63	-0.37	54	69.42	36.45	13.65	65.89	245	310	A	H
		12375	59.8	-14.2	74	68.78	39.26	17.86	66.1	316	0	P	H
		12375	52.51	-1.49	54	61.49	39.26	17.86	66.1	316	0	A	H
		4950	48.78	-25.22	74	72.16	31.38	11.24	66	100	0	P	V
		7425	58.22	-15.78	74	74.02	36.44	13.65	65.89	112	301	P	V
		7425	52.13	-1.87	54	67.93	36.44	13.65	65.89	112	301	A	V
		12375	51.76	-22.24	74	61.28	38.72	17.86	66.1	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

ZigBee (LF)

Zigbee	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)
ZigBee LF		30	22.18	-17.82	40	29.03	24.7	0.93	32.48	-	-	P	H
		105.66	22.11	-21.39	43.5	36.17	16.67	1.69	32.42	-	-	P	H
		132.82	25.64	-17.86	43.5	38.42	17.7	1.95	32.43	-	-	P	H
		186.17	20.11	-23.39	43.5	35.5	14.8	2.22	32.41	-	-	P	H
		782.72	30.54	-15.46	46	30.13	28.1	4.56	32.25	-	-	P	H
		915.61	32.51	-13.49	46	29.76	29.31	4.94	31.5	100	0	P	H
													H
													H
													H
													H
													H
													H
		30	25.68	-14.32	40	32.53	24.7	0.93	32.48	-	-	P	V
		37.76	25.48	-14.52	40	35.86	21.02	1.06	32.46	-	-	P	V
		57.16	26.97	-13.03	40	45.99	11.88	1.54	32.44	-	-	P	V
		124.09	28.88	-14.62	43.5	41.89	17.6	1.81	32.42	-	-	P	V
		703.18	28.06	-17.94	46	29.46	26.66	4.45	32.51	-	-	P	V
		959.26	34.19	-11.81	46	29.21	30.99	5.08	31.09	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:

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 C. Radiated Spurious Emission Plots

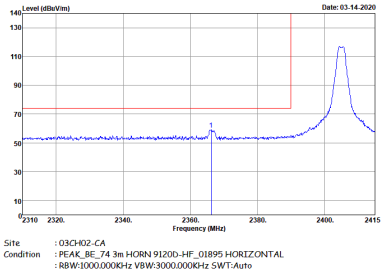
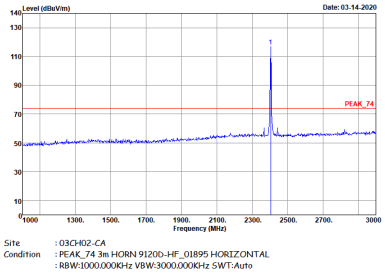
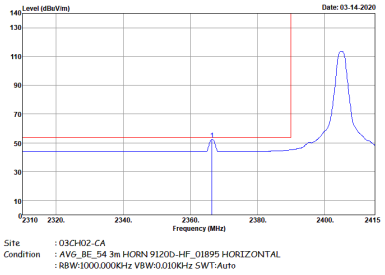
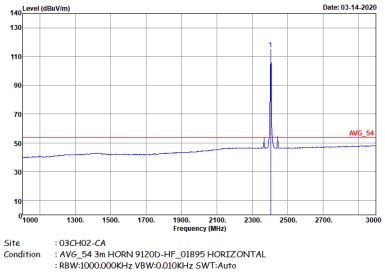
Test Engineer :	Calvin Wu, Leo Liu and Jacky Hong	**Temperature :**	19~22℃
		Relative Humidity :	36~45%

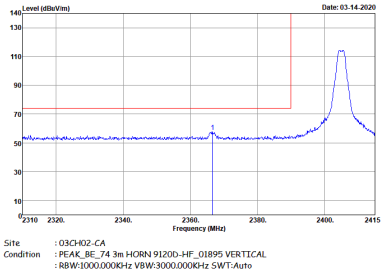
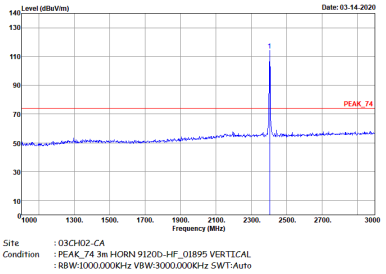
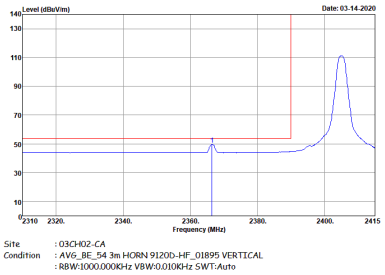
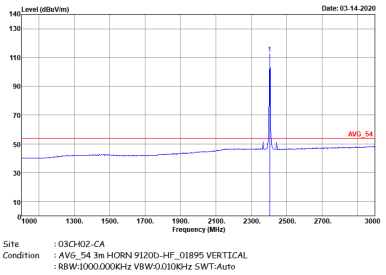
Note symbol

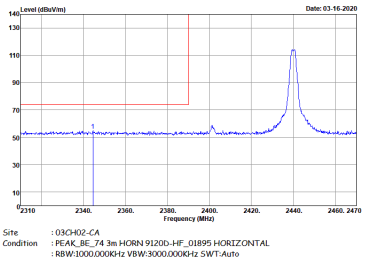
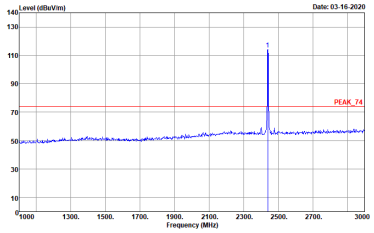
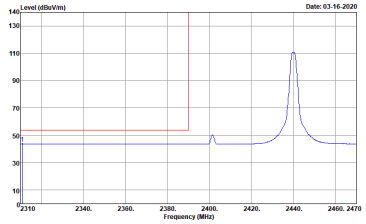
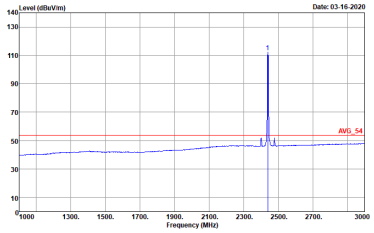
-L	**Low channel location**
-R	**High channel location**

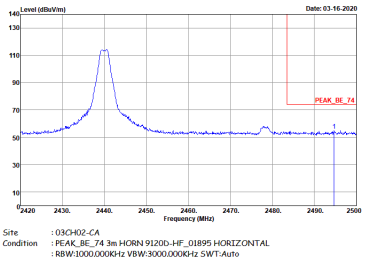
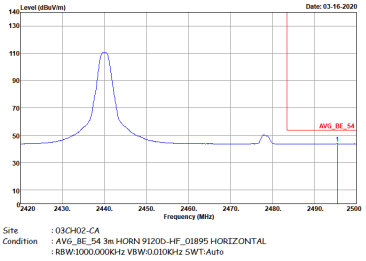
2.4GHz 2400~2483.5MHz

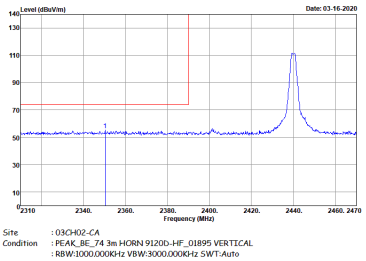
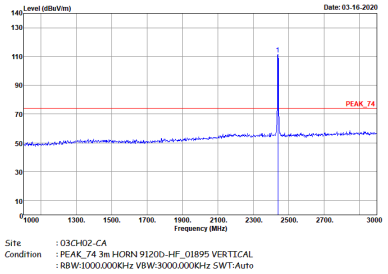
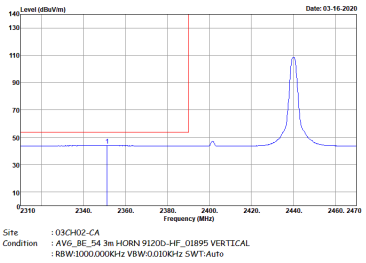
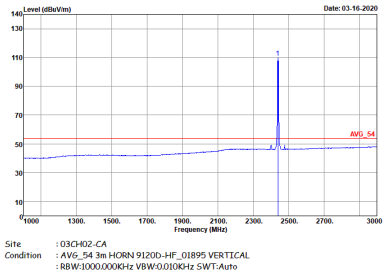
ZIGBEE (Band Edge @ 3m)

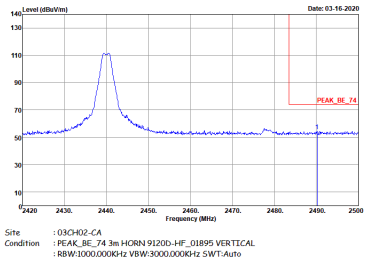
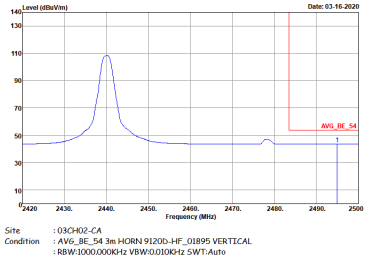
ZIGBEE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	ZIGBEE CH11 2405MHz	
	Horizontal	Fundamental
Peak		
Avg.		

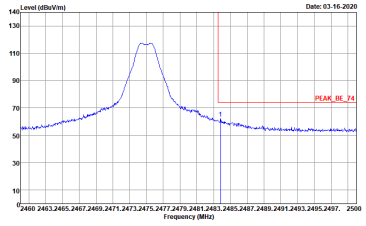
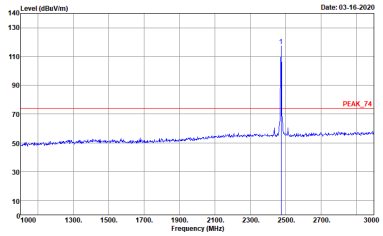
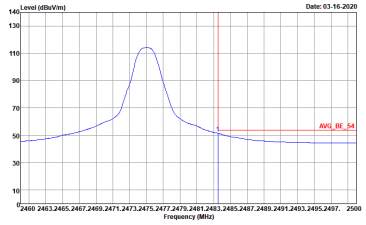
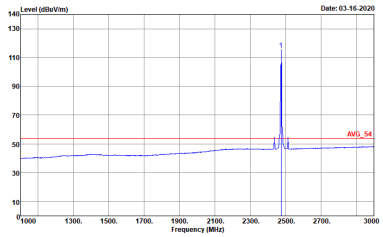
ZIGBEE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	ZIGBEE CH11 2405MHz	
	Vertical	Fundamental
Peak		
Avg		

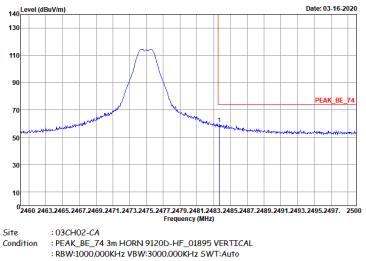
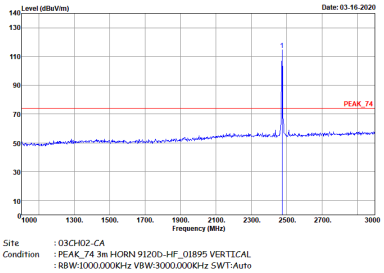
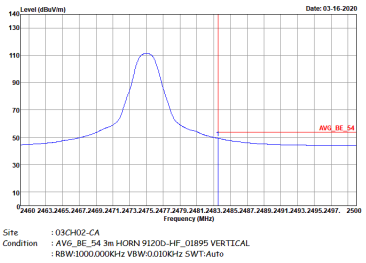
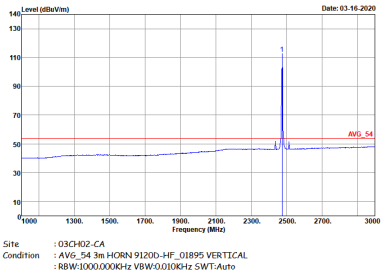
ZIGBEE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	ZIGBEE CH18 2440MHz - L	
	Horizontal	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN 9120D-HF_01895 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH02-CA Condition : PEAK_74 3m HORN 9120D-HF_01895 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH02-CA Condition : AVG_BE_54 3m HORN 9120D-HF_01895 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH02-CA Condition : AVG_54 3m HORN 9120D-HF_01895 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

ZIGBEE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	ZIGBEE CH18 2440MHz - R	
	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

ZIGBEE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	ZIGBEE CH18 2440MHz - L	
	Vertical	Fundamental
Peak		
Avg.		

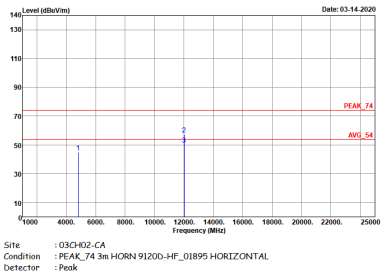
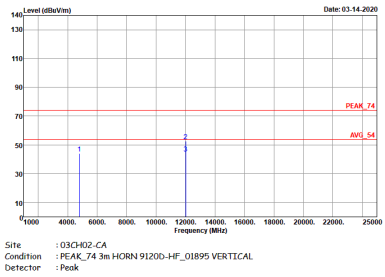
ZIGBEE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	ZIGBEE CH18 2440MHz - R	
	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

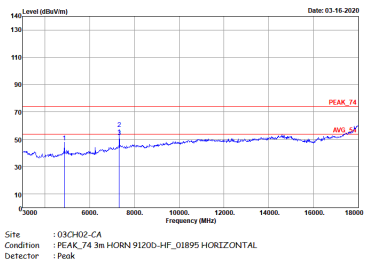
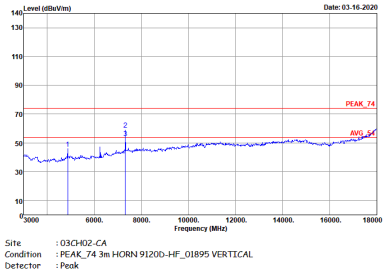
ZIGBEE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	ZIGBEE CH25 2475MHz	
	Horizontal	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN 9120D-HF_01895 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH02-CA Condition : PEAK_74 3m HORN 9120D-HF_01895 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH02-CA Condition : AVG_BE_54 3m HORN 9120D-HF_01895 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH02-CA Condition : AVG_54 3m HORN 9120D-HF_01895 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

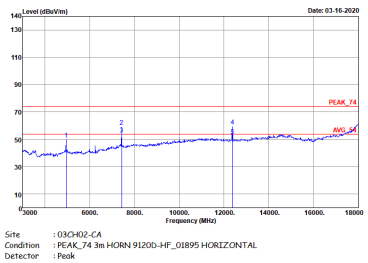
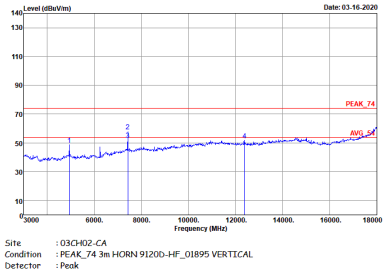
ZIGBEE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	ZIGBEE CH25 2475MHz	
	Vertical	Fundamental
Peak		
Avg.		

2.4GHz 2400~2483.5MHz

ZIGBEE (Harmonic @ 3m)

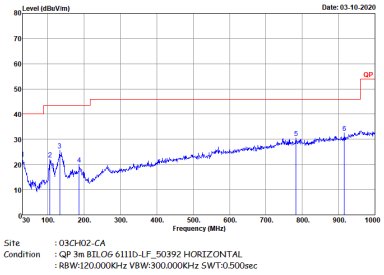
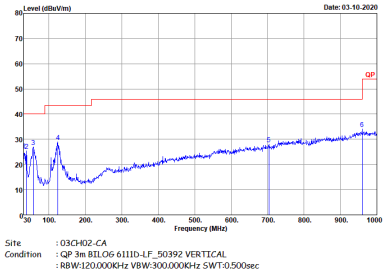
ZIGBEE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	ZIGBEE CH11 2405MHz	
	Horizontal	Vertical
Peak Avg.		

ZIGBEE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	ZIGBEE CH18 2440MHz	
	Horizontal	Vertical
Peak Avg.		

ZIGBEE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	ZIGBEE CH25 2475MHz	
	Horizontal	Vertical
Peak		

Emission below 1GHz

2.4GHz ZIGBEE (LF)

ZIGBEE	2.4GHz 2400~2483.5MHz	
	ZIGBEE LF	
	Horizontal	Vertical
QP / Peak		

Appendix D. Duty Cycle Plots

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

Zigbee