FCC RADIO TEST REPORT

FCC ID	:	**S9GR550**
Equipment	:	**Wireless Access Point**
Brand Name	:	**Ruckus**
Model Name	:	**R550**
Marketing Name	:	**RUCKUS 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 Jul. 06, 2022 and testing was performed from Jul. 11, 2022 to Jul. 26, 2022. 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 test results in this variant report apply exclusively to the tested model / sample. Without written approval from Sporton International (USA) Inc., the test report shall not be reproduced except in full.

Neil Kao

Approved by: Neil Kao

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

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History of this test report

Report No.	Version	Description	Issue Date
FR200117001-08A	01	Initial issue of report	Aug. 08, 2022

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
-	15.247(a)(2)	6dB Bandwidth	Not Required	-
-	2.1049	99% Occupied Bandwidth	Not Required	-
3.1	15.247(b)	Power Output Measurement	Pass	-
-	15.247(e)	Power Spectral Density	Not Required	-
-	15.247(d)	Conducted Band Edges	Not Required	-
		Conducted Spurious Emission	Not Required	-
3.2	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	Pass	0.48 dB under the limit at 2483.600 MHz
-	15.207	AC Conducted Emission	Not Required	-
3.3	15.203 & 15.247(b)	Antenna Requirement	Pass	-

Note:

1. Not required means after assessing, test items are not necessary to carry out.
2. This is a variant report in which the section 1.1 can be referred for detailed product information and the change notes. All the test cases performed and presented in this test report are basically the worst cases identified from the original report (Sporton Report Number FR200117001A) in order to validate the representativeness of the original report in the light of the change notes declared by the manufacturer.

Conformity Assessment Condition:
1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account. 2. Please refer to the section " Uncertainty of Evaluation " for measurement uncertainty.
Comments and Explanations:
The product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity.

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 Feature	
Antenna Type	WLAN: <Ant. 1>: Internal Antenna <Ant. 2>: Internal Antenna Bluetooth: Metal Antenna Zigbee: Metal Antenna

Antenna information		
2400 MHz ~ 2483.5 MHz	Peak Gain (dBi)	Ant. 1: 1.50 Ant. 2: 0.50

Remark:

1. The EUT's information above is declared by manufacturer. Please refer to Comments and Explanations in report summary.
2. R550 is a product previously certified, according to the manufacturer's declaration, due to components shortage, some changes of passive components have been made to the PCB.

   Hereunder is the main change list:

   1. Change Wi-Fi Diplexer which needs RF schematic, layout and BOM change, needs add another two filter on 2G circuit to align with new diplexer.
   2. Digital component replacements are made that require schematic, layout and BOM change.

   The new design will be electrically identical to the original one as declared by the manufacturer.

   - Dimensions of the PCB board and enclosure remains the same, slight change on the layout.
   - Transmitting frequency does not change.
   - Output power does not exceed the original modular approval.
   - I/O ports are identical to original product and internal clocks are not touched.

   As requested by the manufacturer, spot checks on RF portion including power check and the worst cases of radiated spurious emission identified from the original test reports are required to be performed, while EMC will be fully retested to substantiate there is no degradation of the RF parameters, no RF power increase in order to maintain the representativeness of the original test reports issued for the initial design.

1.2 Modification of EUT

No modifications made to the EUT during the testing.

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.**
	03CH02-CA, TH01-CA

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

FCC Designation No.: US1250

1.4 Applicable Standards

According to the specifications declared by 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 662911 D01 Multiple Transmitter Output v02r01.
- ANSI C63.10-2013

Remark:

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
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

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 (1 GHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and find Z plane as worst plane.

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

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437		

2.2 Test Mode

The final test modes consider the modulation and the worst data rates as shown in the table below.

MIMO Mode

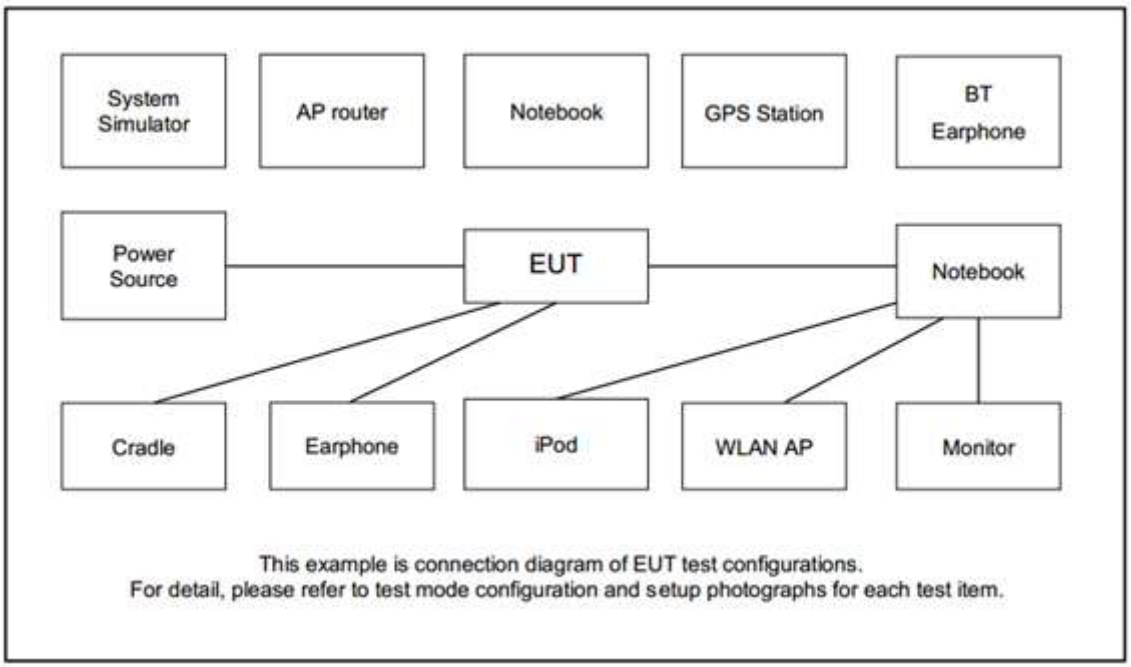
Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps
802.11ax HE40	MCS0

Remark: The conducted power level of each chain in MIMO mode is equal or higher than SISO mode.

Ch. #	2400-2483.5 MHz		
	802.11b	802.11g	802.11ax HE40
Low	-	01	-
Middle	06	-	07
			08
High	-	-	09

Remark: For radiation spurious emission, the modulation and the data rate picked for testing are determined by the Max. RF conducted power.

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Notebook	Lenovo	SL11H55466	N/A	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m

2.5 EUT Operation Test Setup

The RF test items, utility “PuTTY Release 0.62” 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 2400-2483.5 MHz, the limit for output power is 30 dBm. If transmitting antenna with directional gain greater than 6 dBi 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 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

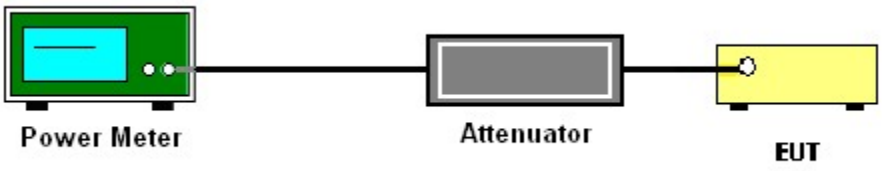
3.1.2 Measuring Instruments

Please refer to the measuring equipment list in 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 is connected to the power meter by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Measure the conducted output power and record the results in the test report.
5. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

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 edge and Spurious Emission Measurement

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 is 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

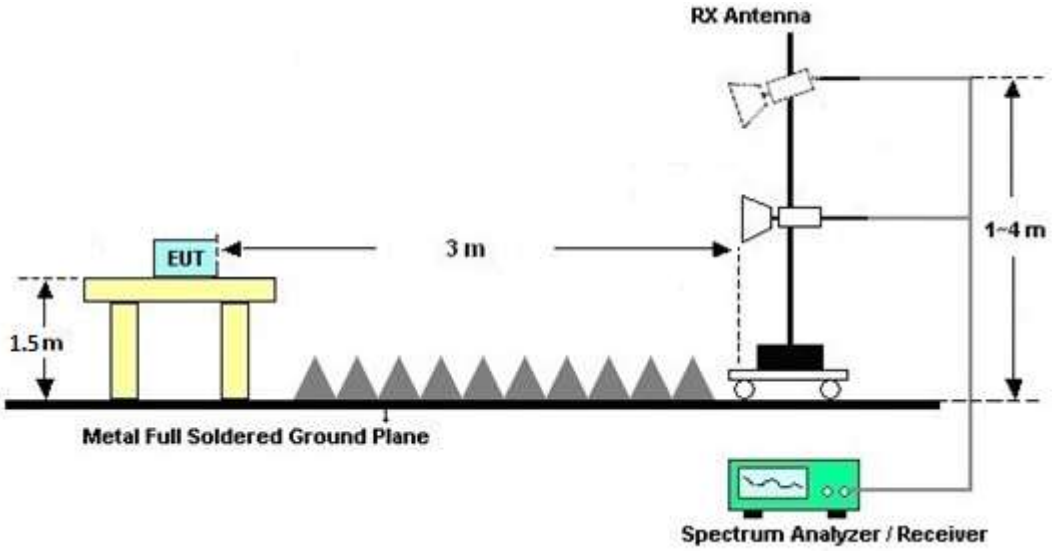
Please refer to the measuring equipment list in this test report.

3.2.3 Test Procedures

1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements
2. The EUT is 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 is placed on a turntable with 1.5 meter for frequency above 1 GHz respectively above ground.
4. The EUT is set 3 meters away from the receiving antenna, which is mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. Radiated testing above 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading for scanning all frequencies. When there is no suspected emission found and the harmonic emission level is with at least 6 dB margin against average limit line, the position is marked as "-".
7. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW=100 kHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
   (3) Set RBW = 1 MHz, VBW = 3 MHz 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 test above 1GHz



3.2.5 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B and C.

3.2.6 Duty Cycle

Please refer to Appendix D.

3.2.7 Test Result of Radiated Spurious Emission

Please refer to Appendix B and C.

3.3 Antenna Requirements

3.3.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi. 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	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Hygrometer	Testo	608-H1	45142595	N/A	Aug. 30, 2021	Jul. 11, 2022	Aug. 29, 2022	Conducted (TH01-CA)
Power Sensor	EM Electronics Corporation	RPR3006W	RPR6W-1901026	10MHz-6GHz	May 10, 2022	Jul. 11, 2022	May 09, 2023	Conducted (TH01-CA)
Switch Box & RF Cable	EM Electronics	EMSW18	SW1070902	N/A	Aug. 03, 2021	Jul. 11, 2022	Aug. 02, 2022	Conducted (TH01-CA)
Spectrum Analyzer	Rohde & Schwarz	FSL6	101303	9kHz-6GHz	May 31, 2022	Jul. 11, 2022	May 30, 2023	Conducted (TH01-CA)
Horn Antenna	SCHWARZBECK	BBHA 9120D	01895	1GHz~18GHz	Aug. 25, 2021	Jul. 12, 2022~ Jul. 26, 2022	Aug. 24, 2022	Radiation (03CH02-CA)
Preamplifier	Keysight	83017A	MY53270323	1GHz~26.5GHz	May 11, 2022	Jul. 12, 2022~ Jul. 26, 2022	May 10, 2023	Radiation (03CH02-CA)
Preamplifier	E-instrument	ERA-100M-18G-56-01-A70	EC1900251	1GHz~18GHz	May 10, 2022	Jul. 12, 2022~ Jul. 26, 2022	May 09, 2023	Radiation (03CH02-CA)
RF Cable	HUBER+SUHNER	SUCOFLEX 102	8024032/2, 802406/2, 802875/2	N/A	Jun. 22, 2022	Jul. 12, 2022~ Jul. 26, 2022	Jun. 21, 2023	Radiation (03CH02-CA)
Spectrum Analyzer	Keysight	N9010A	MY57420221	10Hz~44GHz	Sep. 22, 2021	Jul. 12, 2022~ Jul. 26, 2022	Sep. 21, 2022	Radiation (03CH02-CA)
Filter	Wainwright	WHKX12-2700-3000-18000-60ST	SN10	3GHz High Pass Filter	Jul. 22, 2021	Jul. 12, 2022~ Jul. 20, 2022	Jul. 21, 2022	Radiation (03CH02-CA)
Filter	Wainwright	WHKX12-2700-3000-18000-60ST	SN10	3GHz High Pass Filter	Jul. 21, 2022	Jul. 21, 2022~ Jul. 26, 2022	Jul. 20, 2023	Radiation (03CH02-CA)
Hygrometer	TESEO	608-H1	45142602	N/A	Aug. 04, 2021	Jul. 12, 2022~ Jul. 26, 2022	Aug. 03, 2022	Radiation (03CH02-CA)
Controller	ChainTek	EM-1000	060876	NA	N/A	Jul. 12, 2022~ Jul. 26, 2022	N/A	Radiation (03CH02-CA)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Jul. 12, 2022~ Jul. 26, 2022	N/A	Radiation (03CH02-CA)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Jul. 12, 2022~ Jul. 26, 2022	N/A	Radiation (03CH02-CA)
Software	Audix	E3	N/A	N/A	N/A	Jul. 12, 2022~ Jul. 26, 2022	N/A	Radiation (03CH02-CA)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**6.2 dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**6.4 dB**

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Liliana Gonzalez	Temperature:	23.2~23.8	°C
Test Date:	2022/07/11	Relative Humidity:	51.1~52	%

TEST RESULTS DATA
Average Output Power

2.4GHz Band MMO											
Mod.	Data Rate	N_{TX}	CH.	Freq. (MHz)	Average Conducted Power (dBm)			DG (dBi)		EIRP Power (dBm)	
					Ant1	Ant2	SUM	Ant1	Ant2	Ant1	Ant2
11b	1Mbps	2	6	2437	21.94	22.41	25.19	1.50		26.69	
11g	6Mbps	2	1	2412	20.22	21.00	23.64	1.50		25.14	

Note: Measured power (dBm) has offset with cable loss.

TEST RESULTS DATA
Average Output Power

2.4GHz Band MIMO												
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Average Conducted Power (dBm)			DG (dBi)		EIRP Power (dBm)	
						Ant1	Ant2	SUM	Ant1	Ant2	Ant1	Ant2
HE40	MCS0	2	7	2442	Full	18.35	18.20	21.29	1.50		22.79	
HE40	MCS0	2	8	2447	Full	17.31	17.27	20.30	1.50		21.80	
HE40	MCS0	2	9	2452	Full	16.85	16.82	19.85	1.50		21.35	

Note: Measured power (dBm) has offset with cable loss.

Appendix B. Radiated Spurious Emission

Test Engineer :	Fu Chen	**Temperature :**	20~23°C
		Relative Humidity :	42~47%

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Harmonic @ 3m)

WIFI	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
		4874	42.63	-31.37	74	67.61	31.45	11.48	67.91	100	115	P	H
		4874	37.57	-16.43	54	62.55	31.45	11.48	67.91	100	115	A	H
		7311	43.85	-30.15	74	60.6	36.33	13.91	66.99	-	-	P	H
		11610	49.57	-24.43	74	59.33	39.94	17.87	67.57	-	-	P	H
		11610	38.95	-15.05	54	48.71	39.94	17.87	67.57	-	-	A	H
		14490	51.73	-22.27	74	57.57	41.94	20.2	67.98	-	-	P	H
		14490	42.17	-11.83	54	48.01	41.94	20.2	67.98	-	-	A	H
		17985	59.07	-14.93	74	58.64	48.43	21.9	69.9	-	-	P	H
		17985	49.17	-4.83	54	48.74	48.43	21.9	69.9	-	-	A	H
													H
													H
802.11b													H
CH 06		4874	39.35	-34.65	74	64.37	31.41	11.48	67.91	-	-	P	V
2437MHz		7311	44.04	-29.96	74	60.75	36.37	13.91	66.99	-	-	P	V
		12150	49.66	-24.34	74	59.03	39.28	18.38	67.03	-	-	P	V
		12150	38.98	-15.02	54	48.35	39.28	18.38	67.03	-	-	A	V
		14490	51.65	-22.35	74	57.49	41.94	20.2	67.98	-	-	P	V
		14490	42.19	-11.81	54	48.03	41.94	20.2	67.98	-	-	A	V
		18000	59.96	-14.04	74	58.73	49.04	21.91	69.72	-	-	P	V
		18000	50.05	-3.95	54	48.82	49.04	21.91	69.72	-	-	A	V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.
3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.
4. The emission level close to 18GHz is checked that the average emission level is noise floor only.

2.4GHz 2400~2483.5MHz

WIFI 802.11g (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBµV/m)	Margin (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)
802.11g CH 01 2412MHz		2321.445	55.21	-18.79	74	41.52	27.92	17.3	31.53	385	195	P	H
		2389.59	45.03	-8.97	54	31.43	27.68	17.42	31.5	385	195	A	H
	*	2412	115.88	-	-	102.25	27.66	17.46	31.49	385	195	P	H
	*	2412	108.34	-	-	94.71	27.66	17.46	31.49	385	195	A	H
													H
													H
		2389.905	54.59	-19.41	74	40.89	27.78	17.42	31.5	264	136	P	V
		2389.695	44.96	-9.04	54	31.26	27.78	17.42	31.5	264	136	A	V
	*	2412	117.67	-	-	104	27.7	17.46	31.49	264	136	P	V
	*	2412	109.71	-	-	96.04	27.7	17.46	31.49	264	136	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

WIFI 802.11ax HE40 Full (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBµV/m)	Margin (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)
		2370.8	55.45	-18.55	74	41.85	27.73	17.39	31.52	100	233	P	H
		2318.8	44.35	-9.65	54	30.64	27.94	17.3	31.53	100	233	A	H
	*	2442	109.83	-	-	96.13	27.66	17.51	31.47	100	233	P	H
	*	2442	100.31	-	-	86.61	27.66	17.51	31.47	100	233	A	H
802.11ax		2483.68	58.67	-15.33	74	44.93	27.62	17.58	31.46	100	233	P	H
HE40 Full		2483.52	49.14	-4.86	54	35.4	27.62	17.58	31.46	100	233	A	H
CH 07		2355.12	54.95	-19.05	74	41.22	27.9	17.36	31.53	389	146	P	V
2442MHz		2346.48	44.51	-9.49	54	30.78	27.91	17.34	31.52	389	146	A	V
	*	2442	111.09	-	-	97.47	27.58	17.51	31.47	389	146	P	V
	*	2442	101.23	-	-	87.61	27.58	17.51	31.47	389	146	A	V
		2485.84	61.47	-12.53	74	47.84	27.5	17.59	31.46	389	146	P	V
		2486.96	51.09	-2.91	54	37.46	27.5	17.59	31.46	389	146	A	V
		2326.64	55.7	-18.3	74	42.02	27.9	17.31	31.53	100	218	P	H
		2341.68	44.36	-9.64	54	30.74	27.82	17.33	31.53	100	218	A	H
	*	2447	108.26	-	-	94.54	27.66	17.53	31.47	100	218	P	H
	*	2447	99.5	-	-	85.78	27.66	17.53	31.47	100	218	A	H
802.11ax		2484.48	58.99	-15.01	74	45.24	27.62	17.59	31.46	100	218	P	H
HE40 Full		2484.8	48.79	-5.21	54	35.04	27.62	17.59	31.46	100	218	A	H
CH 08		2388.88	55.4	-18.6	74	41.69	27.79	17.42	31.5	389	151	P	V
2447MHz		2363.92	44.49	-9.51	54	30.77	27.87	17.38	31.53	389	151	A	V
	*	2447	109.07	-	-	95.45	27.56	17.53	31.47	389	151	P	V
	*	2447	100.61	-	-	86.99	27.56	17.53	31.47	389	151	A	V
		2483.68	64.53	-9.47	74	50.9	27.51	17.58	31.46	389	151	P	V
		2483.6	53.52	-0.48	54	39.89	27.51	17.58	31.46	389	151	A	V

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBµV/m)	Margin (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)
802.11ax HE40 Full CH 09 2452MHz		2353.52	55.19	-18.81	74	41.59	27.77	17.35	31.52	341	215	P	H
		2337.52	44.29	-9.71	54	30.65	27.84	17.33	31.53	341	215	A	H
	*	2452	108.75	-	-	95.03	27.66	17.53	31.47	341	215	P	H
	*	2452	99.91	-	-	86.19	27.66	17.53	31.47	341	215	A	H
		2486.64	62.44	-11.56	74	48.69	27.62	17.59	31.46	341	215	P	H
		2486.24	50.86	-3.14	54	37.11	27.62	17.59	31.46	341	215	A	H
		2346.8	55.3	-18.7	74	41.57	27.91	17.34	31.52	392	148	P	V
		2350.8	44.46	-9.54	54	30.72	27.91	17.35	31.52	392	148	A	V
	*	2452	111.57	-	-	97.96	27.55	17.53	31.47	392	148	P	V
	*	2452	101.11	-	-	87.5	27.55	17.53	31.47	392	148	A	V
		2484.4	64.76	-9.24	74	51.12	27.51	17.59	31.46	392	148	P	V
		2487.44	53.12	-0.88	54	39.49	27.5	17.59	31.46	392	148	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average 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	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		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. Margin(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. Margin(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. Margin(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

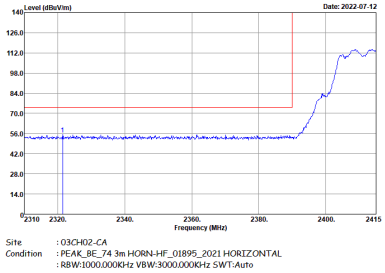
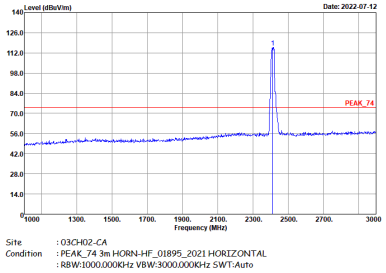
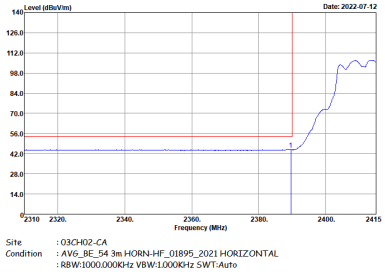
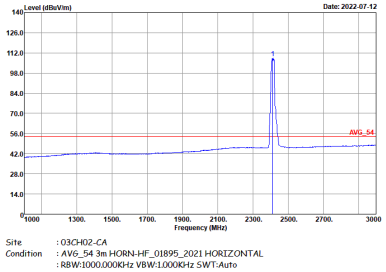
Test Engineer :	Fu Chen	**Temperature :**	20~23°C
		Relative Humidity :	42~47%

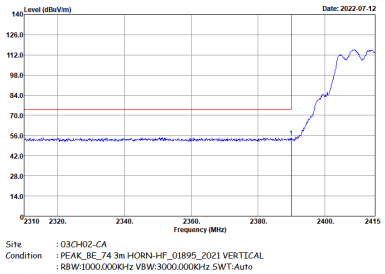
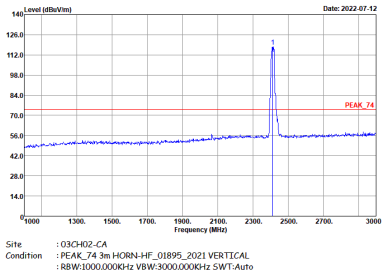
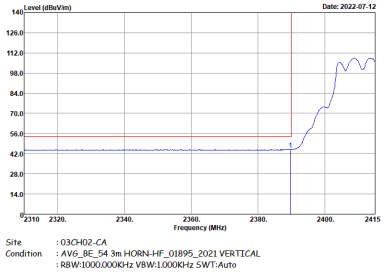
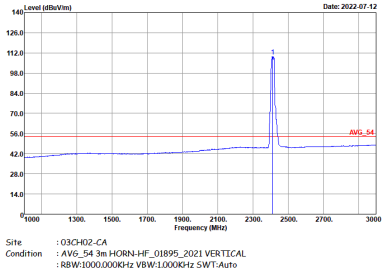
Note symbol

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

2.4GHz 2400~2483.5MHz

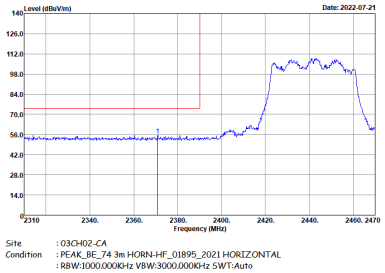
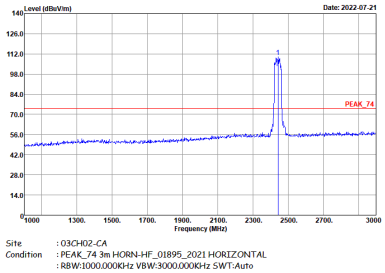
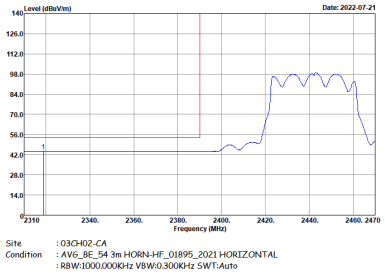
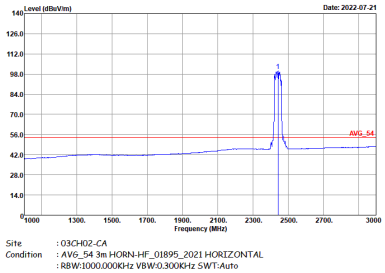
WIFI 802.11g (Band Edge @ 3m)

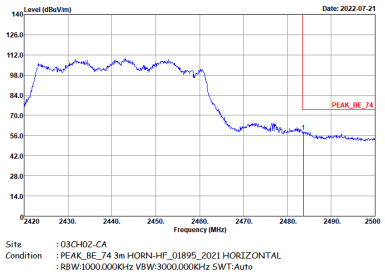
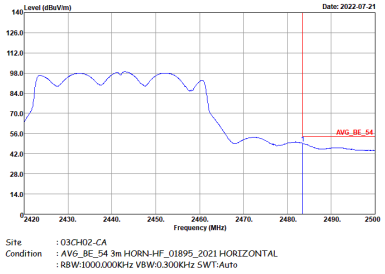
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH01 2412MHz	
1+2	Horizontal	Fundamental
Peak		
Avg.		

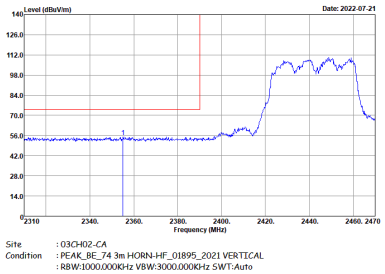
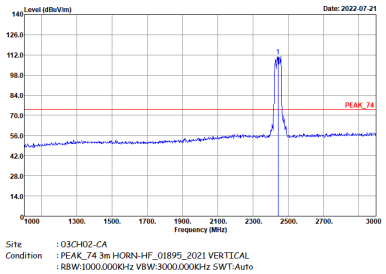
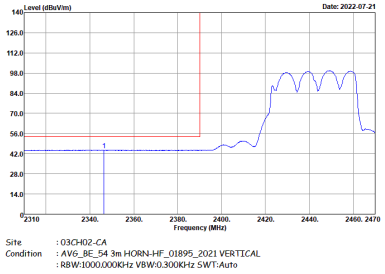
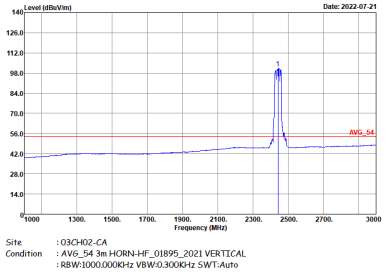
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH01 2412MHz	
1+2	Vertical	Fundamental
Peak		
Avg.		

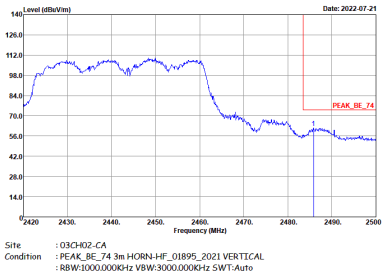
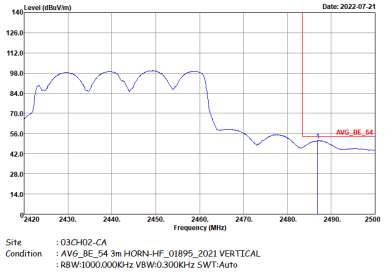
2.4GHz 2400~2483.5MHz

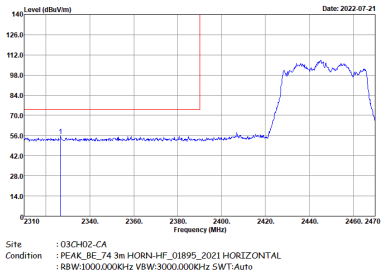
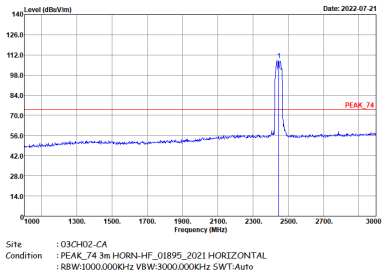
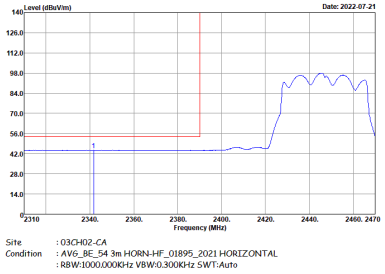
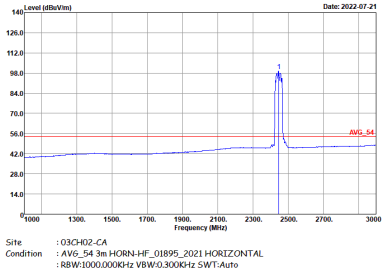
WIFI 802.11ax HE40 Full (Band Edge @ 3m)

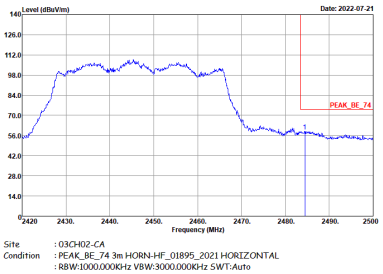
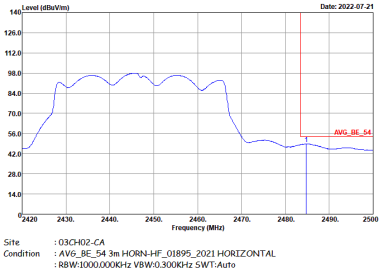
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH07 2442MHz - L	
1+2	Horizontal	Fundamental
Peak		
Avg.		

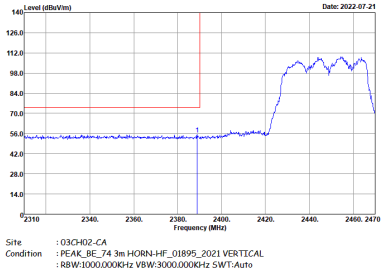
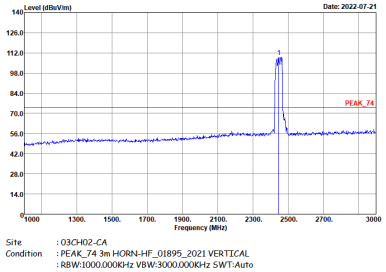
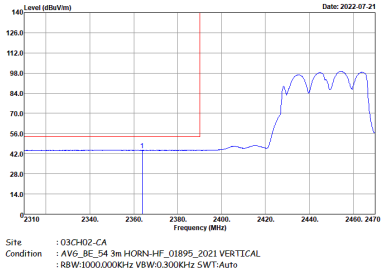
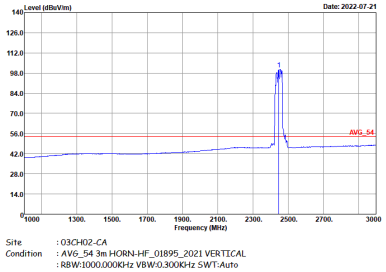
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH07 2442MHz - R	
1+2	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

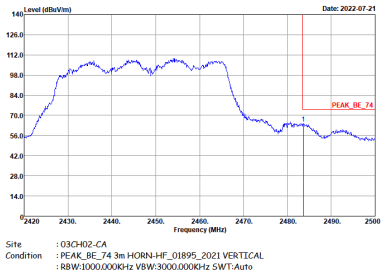
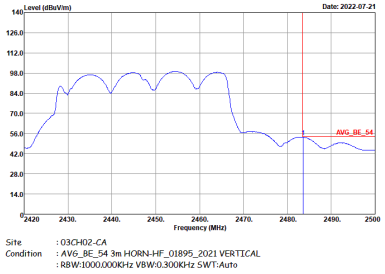
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH07 2442MHz - L	
1+2	Vertical	Fundamental
Peak		
Avg.		

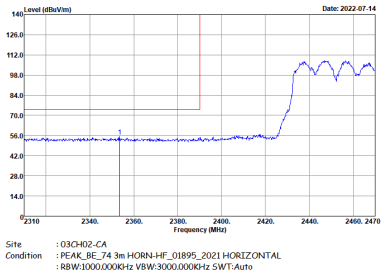
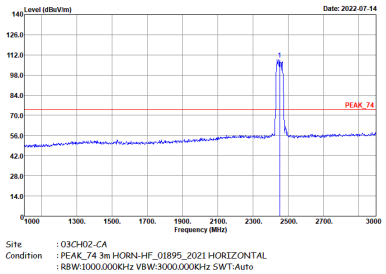
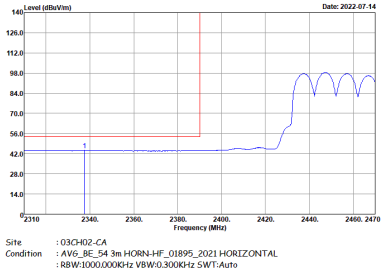
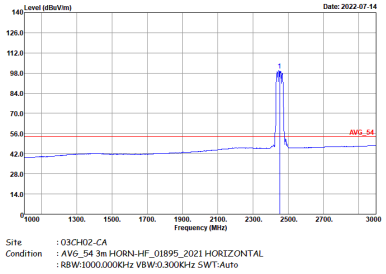
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH07 2442MHz - R	
1+2	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

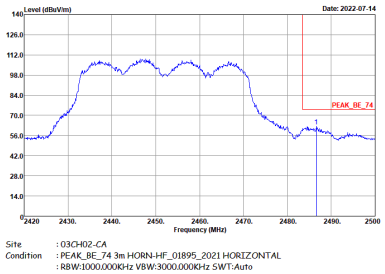
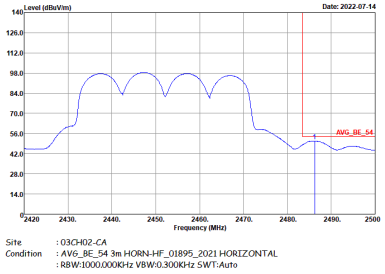
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH08 2447MHz - L	
1+2	Horizontal	Fundamental
Peak		
Avg.		

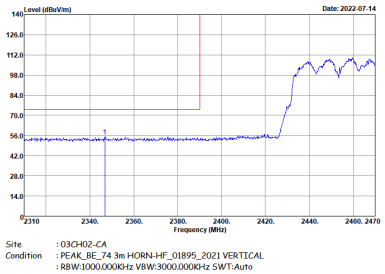
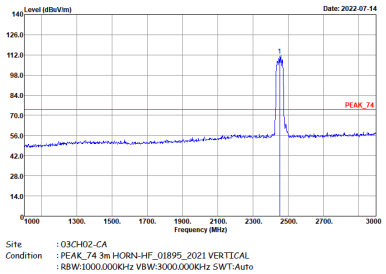
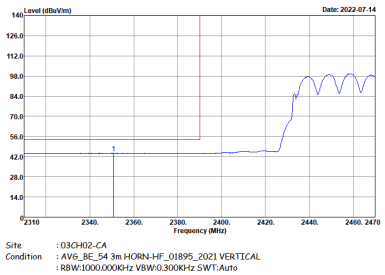
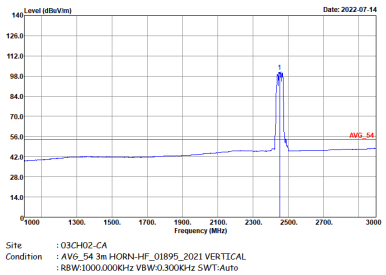
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH08 2447MHz - R	
1+2	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

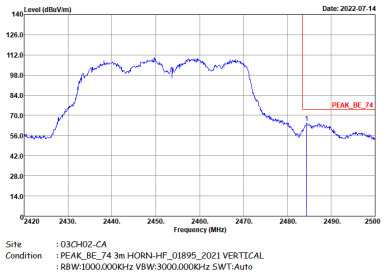
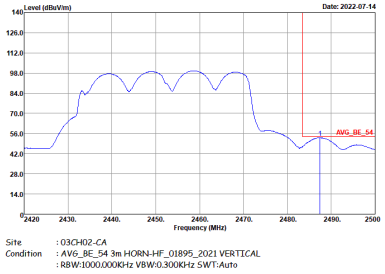
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH08 2447MHz - L	
1+2	Vertical	Fundamental
Peak		
Avg.		

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH08 2447MHz - R	
1+2	Vertical	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN-HF_01895_2021 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank
Avg.	 Site : 03CH02-CA Condition : AVG_BE_54 3m HORN-HF_01895_2021 VERTICAL : RBW:1000.000KHz VBW:0.300KHz SWT:Auto	Left blank

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH09 2452MHz - L	
1+2	Horizontal	Fundamental
Peak		
Avg.		

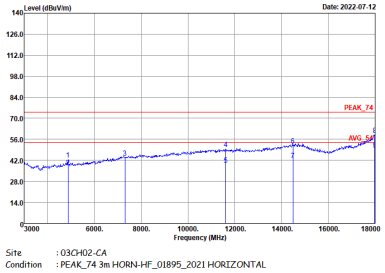
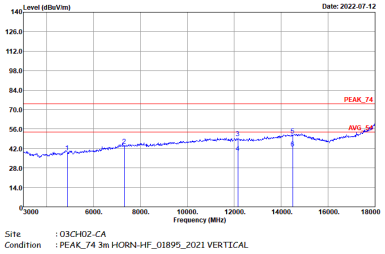
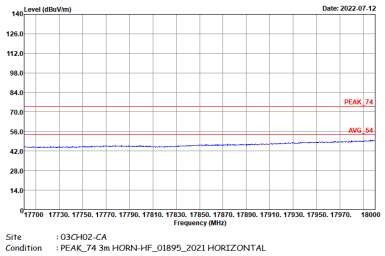
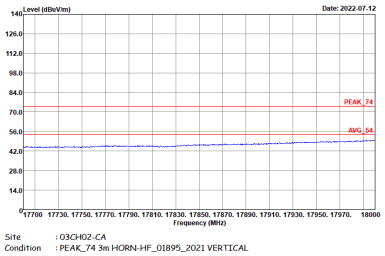
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH09 2452MHz - R	
1+2	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH09 2452MHz - L	
1+2	Vertical	Fundamental
Peak		
Avg.		

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH09 2452MHz - R	
1+2	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Harmonic @ 3m)

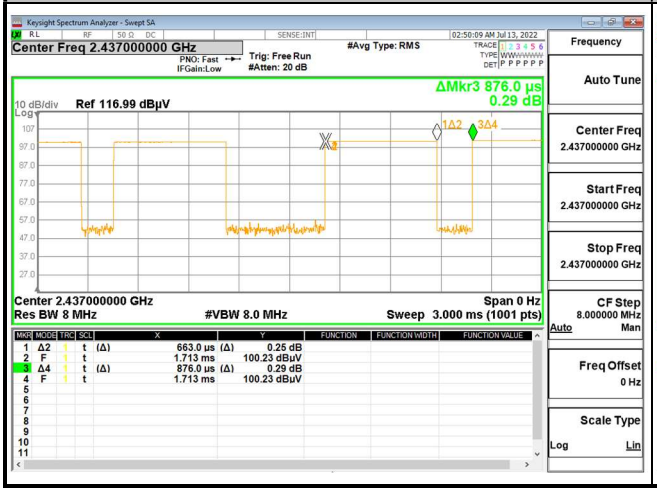
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11b CH06 2437MHz	
1+2	Horizontal	Vertical
Peak		
Avg.		

Appendix D. Duty Cycle Plots

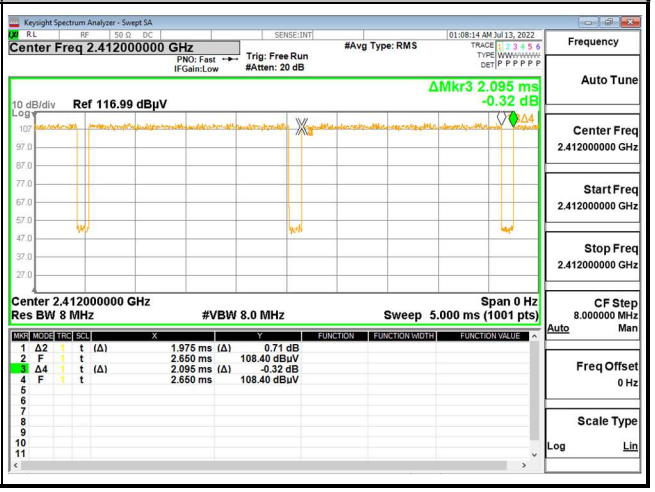
Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
1+2	802.11b	75.68	663	1.51	3kHz
1+2	802.11g	94.27	1975	0.51	1kHz
1+2	2.4GHz 802.11ax HE40 Full RU	94.50	5415	0.18	300Hz

MIMO <Ant. 1+2>

802.11b



802.11g



802.11ax HE40 Full RU