

4.4 Conducted Band Edges and Spurious Emission Measurement

4.4.1 Limit of Conducted Band Edges and Spurious Emission

FCC §15.247 (d)

IC RSS-247 5.5

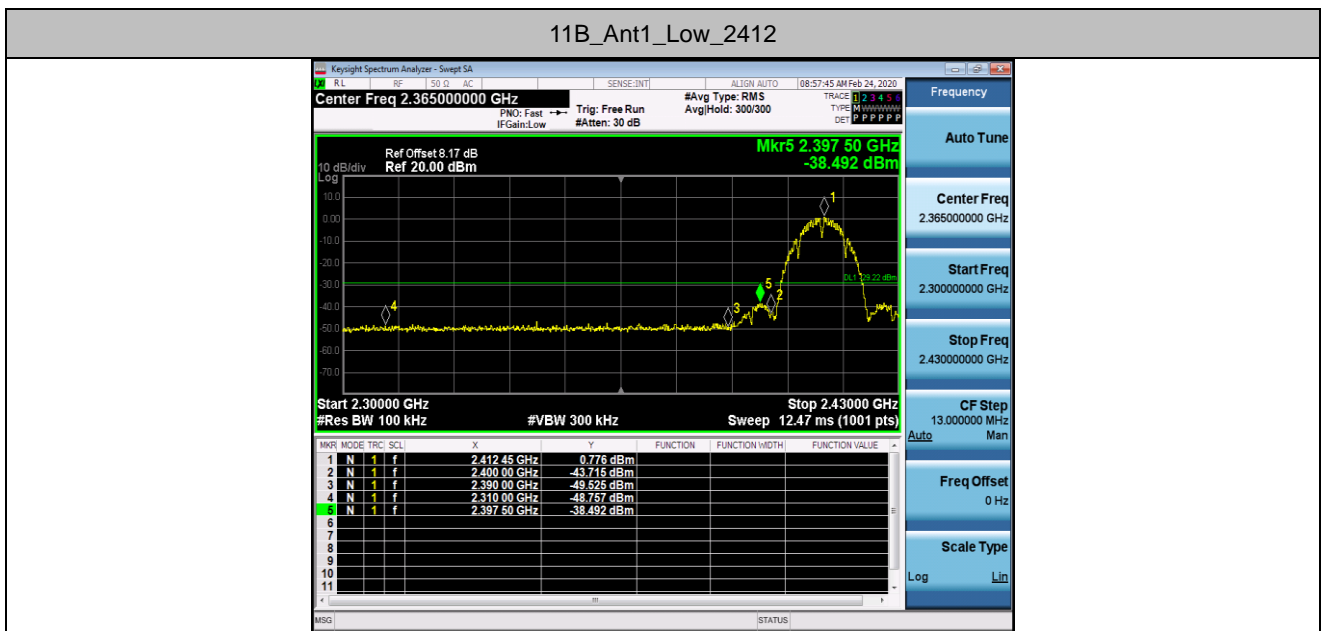
Maximum conducted (average) output power was used to determine compliance, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 30 dBc).

4.4.2 Test Procedures

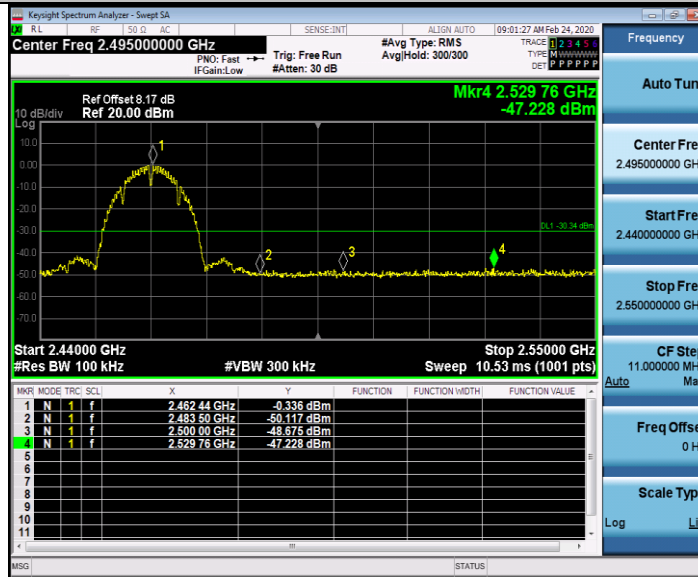
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect it to measurement instrument.
3. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d).
4. Measure and record the results in the test report.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

4.4.3 Test Result of Conducted Band Edges

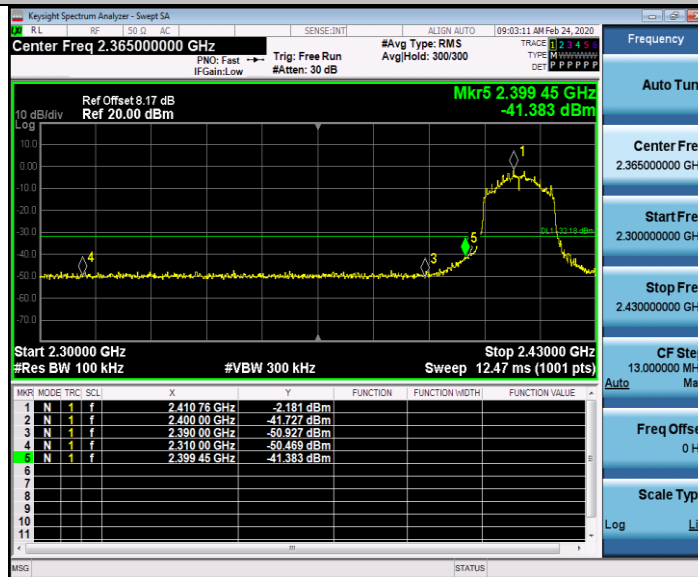
TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
11B	Ant1	Low	2412	0.78	-38.49	<=-29.22	PASS
		High	2462	-0.34	-47.23	<=-30.34	PASS
11G	Ant1	Low	2412	-2.18	-41.38	<=-32.18	PASS
		High	2462	-1.74	-46.24	<=-31.74	PASS
11N20SISO	Ant1	Low	2412	-2.64	-43.58	<=-32.64	PASS
		High	2462	-2.55	-46.32	<=-32.55	PASS
11N40SISO	Ant1	Low	2422	-5.34	-37.69	<=-35.34	PASS
		High	2452	-5.68	-47.63	<=-35.68	PASS



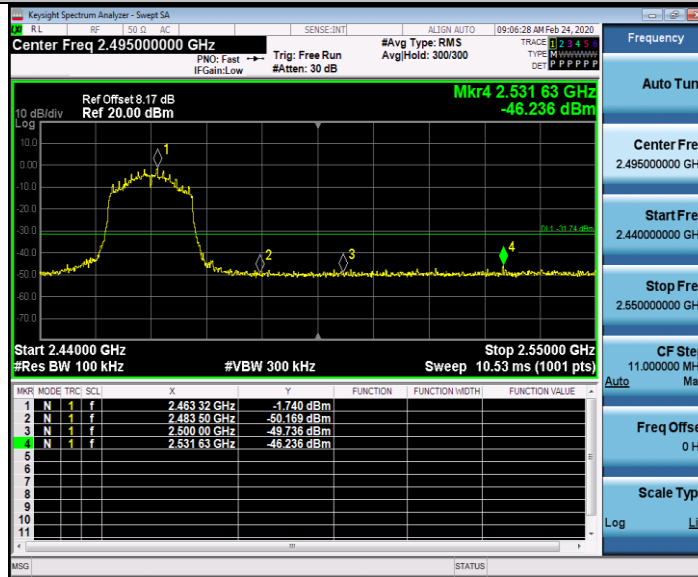
11B_Ant1_High_2462



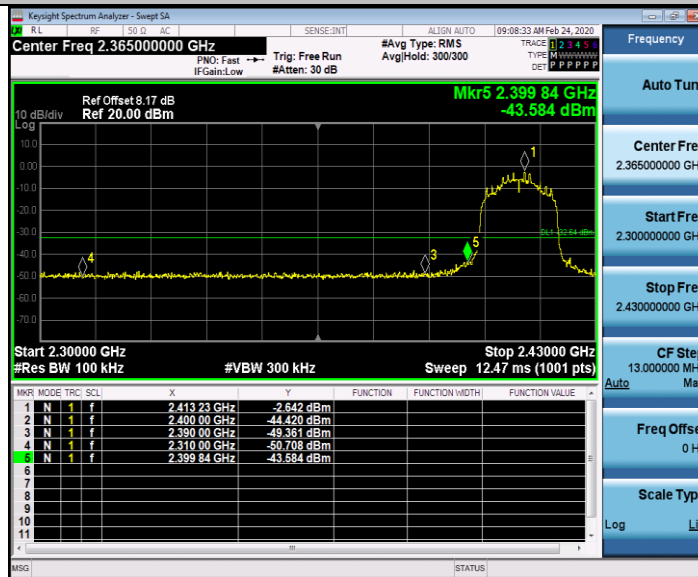
11G_Ant1_Low_2412



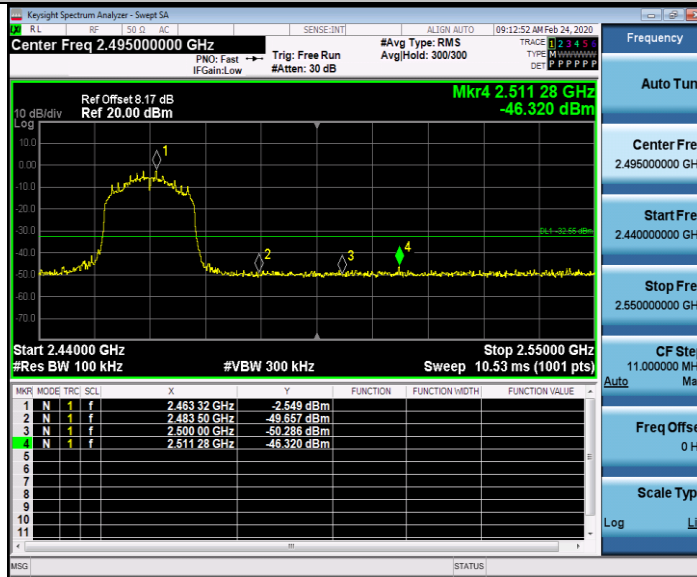
11G_Ant1_High_2462



11N20SISO_Ant1_Low_2412



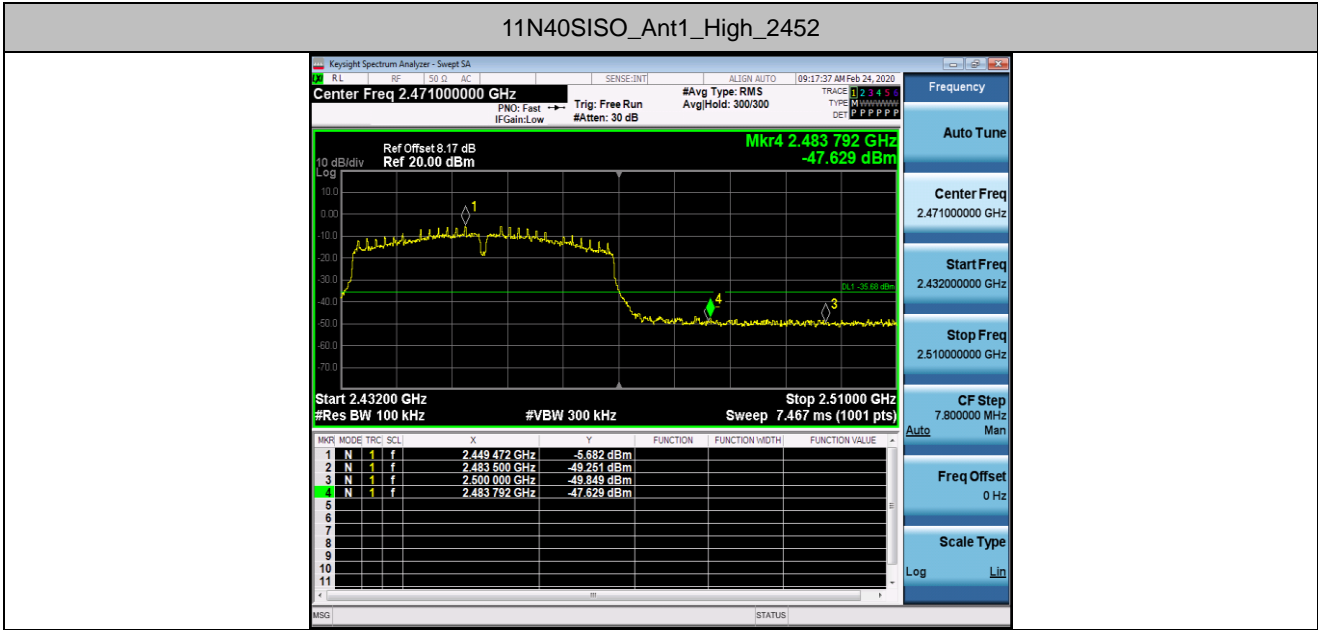
11N20SISO_Ant1_High_2462



11N40SISO_Ant1_Low_2422



11N40SISO_Ant1_High_2452



4.4.4 Test Result of Conducted Spurious Emission

TestMode	Antenna	Channel	FreqRange [Mhz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
11B	Ant1	2412	Reference	0.38	0.38	---	PASS
			30~1000	30~1000	-57.631	<=-29.616	PASS
			1000~26500	1000~26500	-39.223	<=-29.616	PASS
		2437	Reference	-0.06	-0.06	---	PASS
			30~1000	30~1000	-57.558	<=-30.055	PASS
			1000~26500	1000~26500	-38.869	<=-30.055	PASS
		2462	Reference	-0.40	-0.40	---	PASS
			30~1000	30~1000	-57.006	<=-30.398	PASS
			1000~26500	1000~26500	-38.958	<=-30.398	PASS
11G	Ant1	2412	Reference	-1.66	-1.66	---	PASS
			30~1000	30~1000	-57.106	<=-31.66	PASS
			1000~26500	1000~26500	-39.552	<=-31.66	PASS
		2437	Reference	-1.99	-1.99	---	PASS
			30~1000	30~1000	-57.492	<=-31.985	PASS
			1000~26500	1000~26500	-38.843	<=-31.985	PASS
		2462	Reference	-2.64	-2.64	---	PASS
			30~1000	30~1000	-57.354	<=-32.643	PASS
			1000~26500	1000~26500	-38.363	<=-32.643	PASS
11N20SISO	Ant1	2412	Reference	-3.33	-3.33	---	PASS
			30~1000	30~1000	-56.997	<=-33.333	PASS
			1000~26500	1000~26500	-38.713	<=-33.333	PASS
		2437	Reference	-2.49	-2.49	---	PASS
			30~1000	30~1000	-58.139	<=-32.487	PASS
			1000~26500	1000~26500	-38.384	<=-32.487	PASS
		2462	Reference	-3.19	-3.19	---	PASS
			30~1000	30~1000	-57.088	<=-33.19	PASS
			1000~26500	1000~26500	-38.651	<=-33.19	PASS
11N40SISO	Ant1	2422	Reference	-5.37	-5.37	---	PASS
			30~1000	30~1000	-57.685	<=-35.371	PASS
			1000~26500	1000~26500	-38.69	<=-35.371	PASS
		2437	Reference	-5.81	-5.81	---	PASS



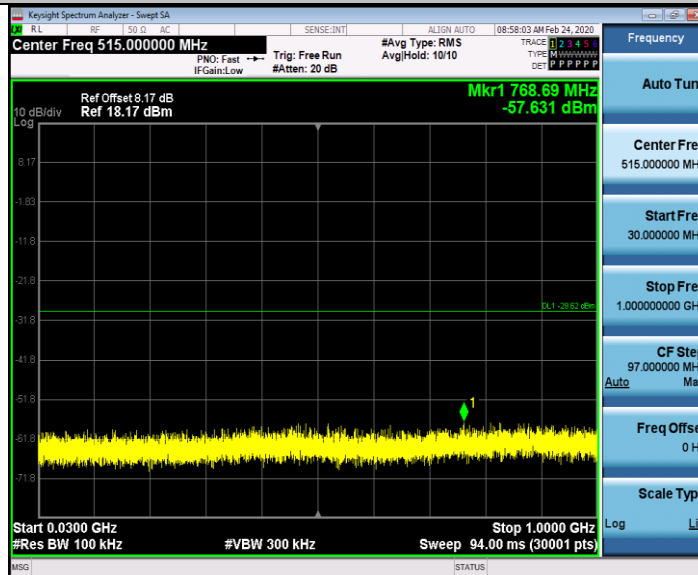
			30~1000	30~1000	-57.141	<=-35.808	PASS
			1000~26500	1000~26500	-39.468	<=-35.808	PASS
		2452	Reference	-5.73	-5.73	---	PASS
			30~1000	30~1000	-57.291	<=-35.734	PASS
			1000~26500	1000~26500	-39.308	<=-35.734	PASS

Conducted Band Edges and Spurious Emission Plot

11B_Ant1_2412_0~Reference



11B_Ant1_2412_30~1000



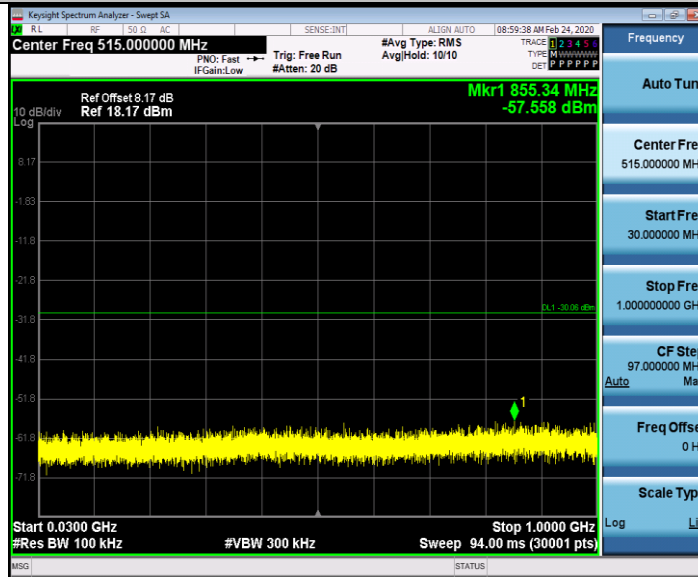
11B_Ant1_2412_1000~26500



11B_Ant1_2437_0~Reference



11B_Ant1_2437_30~1000



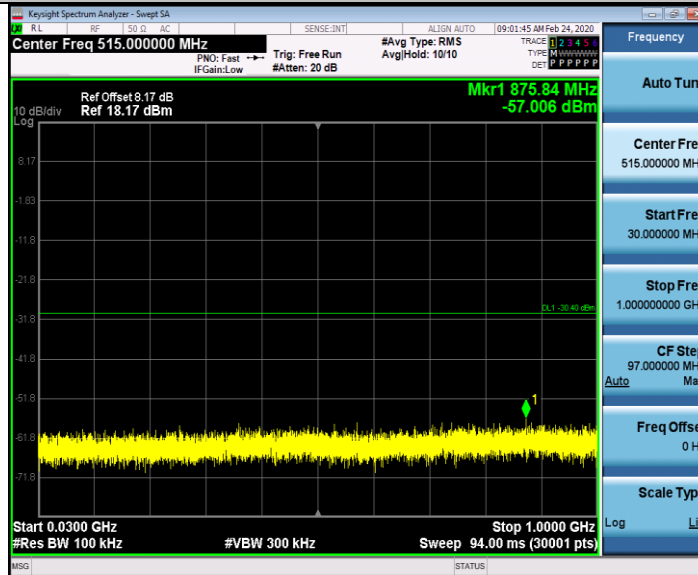
11B_Ant1_2437_1000~26500



11B_Ant1_2462_0~Reference



11B_Ant1_2462_30~1000



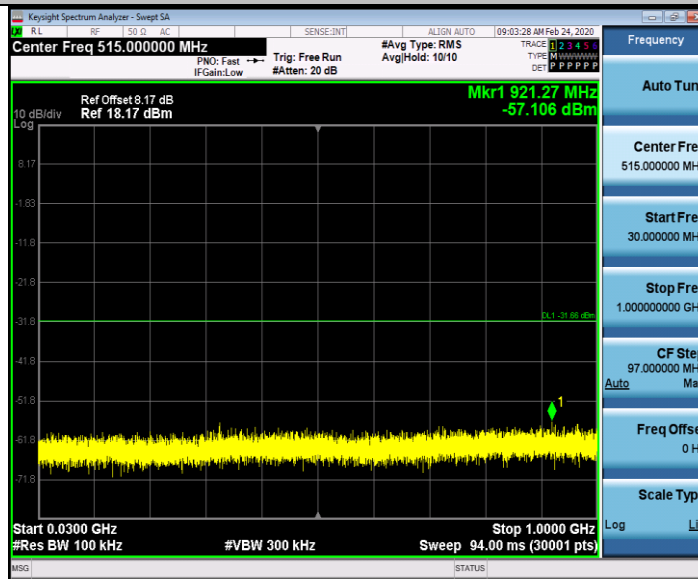
11B_Ant1_2462_1000~26500



11G_Ant1_2412_0~Reference



11G_Ant1_2412_30~1000



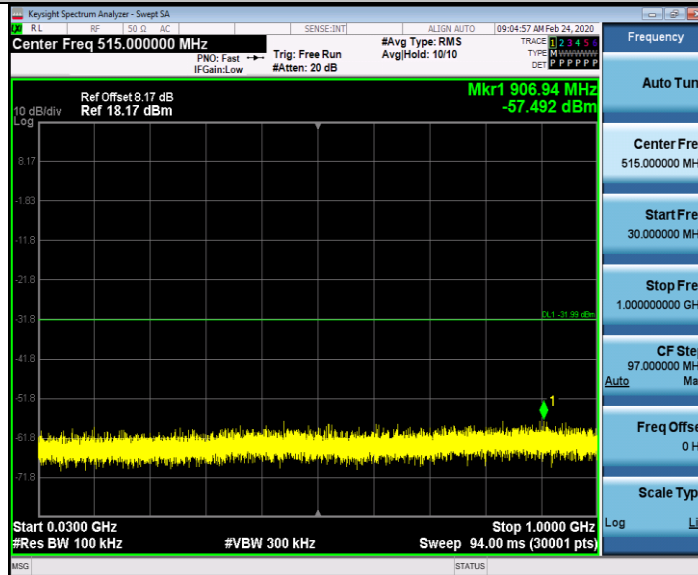
11G_Ant1_2412_1000~26500



11G_Ant1_2437_0~Reference



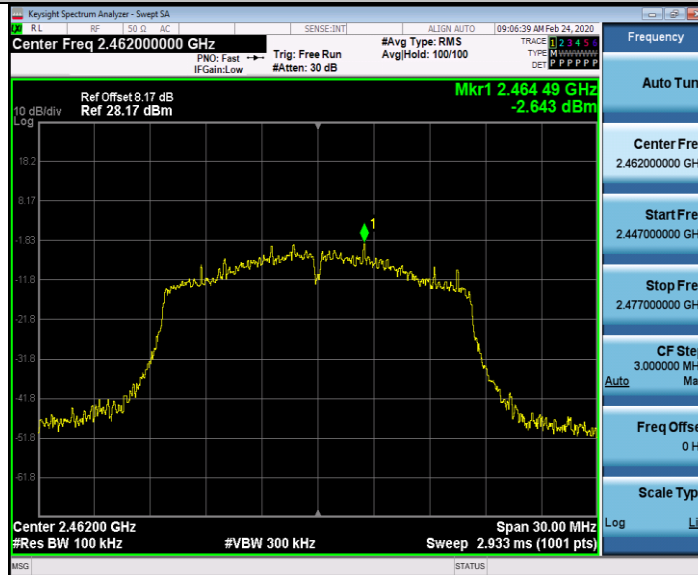
11G_Ant1_2437_30~1000



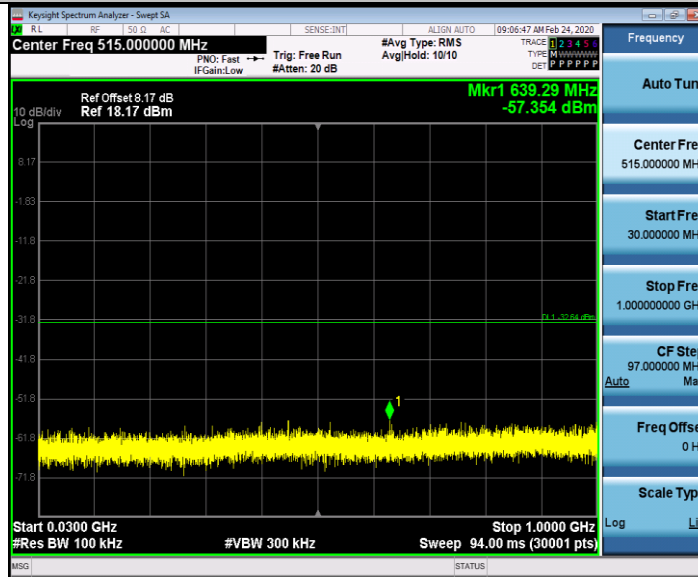
11G_Ant1_2437_1000~26500



11G_Ant1_2462_0~Reference



11G_Ant1_2462_30~1000



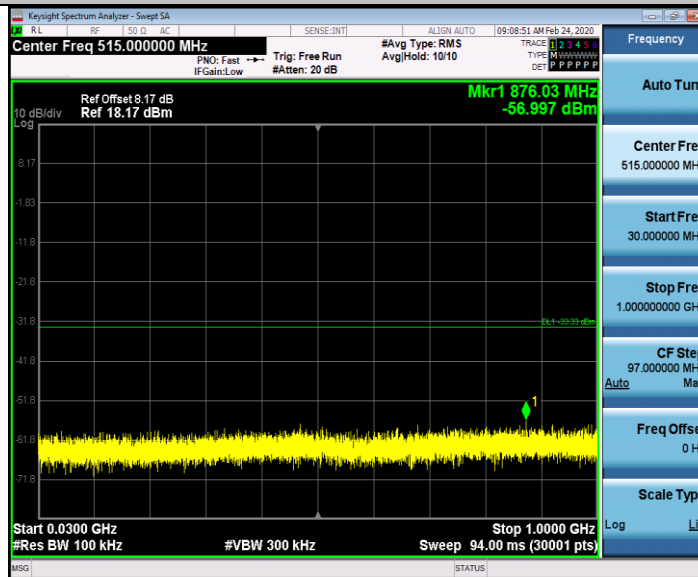
11G_Ant1_2462_1000~26500



11N20SISO_Ant1_2412_0~Reference



11N20SISO_Ant1_2412_30~1000



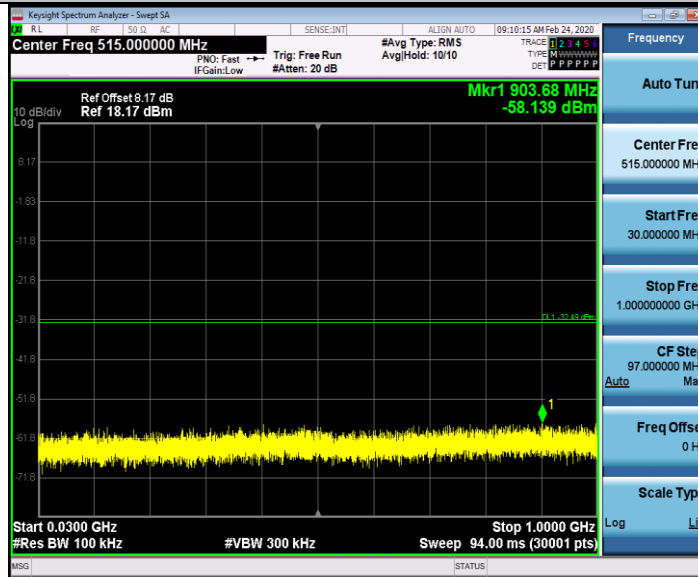
11N20SISO_Ant1_2412_1000~26500



11N20SISO_Ant1_2437_0~Reference



11N20SISO_Ant1_2437_30~1000



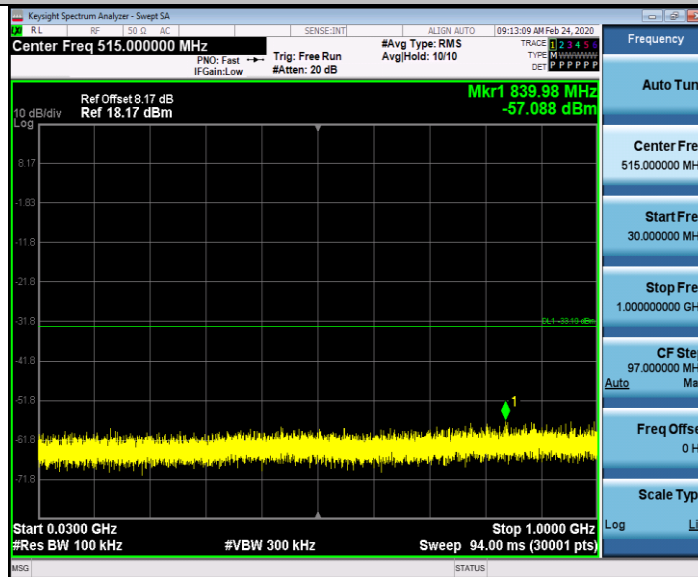
11N20SISO_Ant1_2437_1000~26500



11N20SISO_Ant1_2462_0~Reference



11N20SISO_Ant1_2462_30~1000



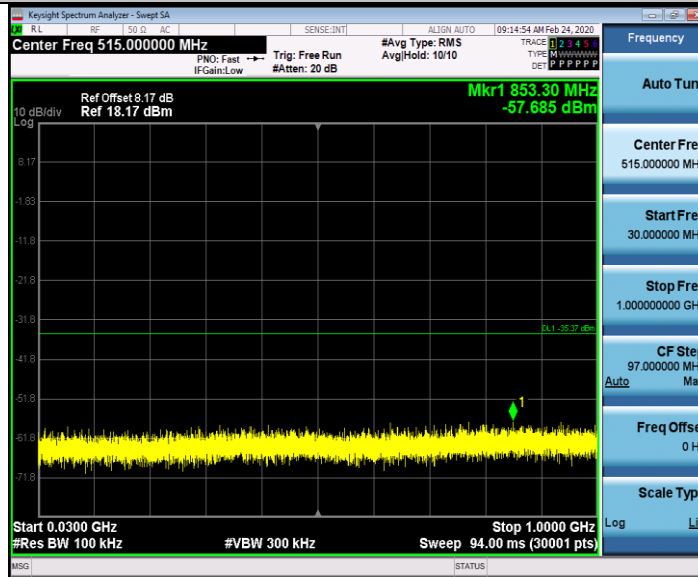
11N20SISO_Ant1_2462_1000~26500



11N40SISO_Ant1_2422_0~Reference



11N40SISO_Ant1_2422_30~1000



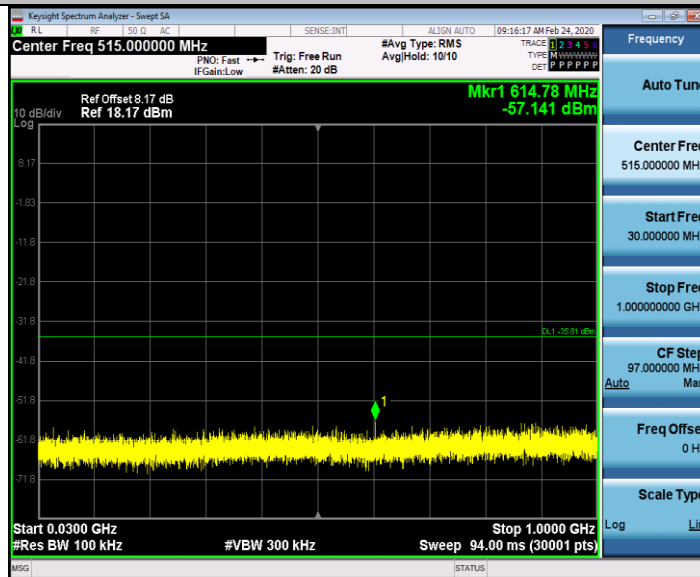
11N40SISO_Ant1_2422_1000~26500



11N40SISO_Ant1_2437_0~Reference



11N40SISO_Ant1_2437_30~1000



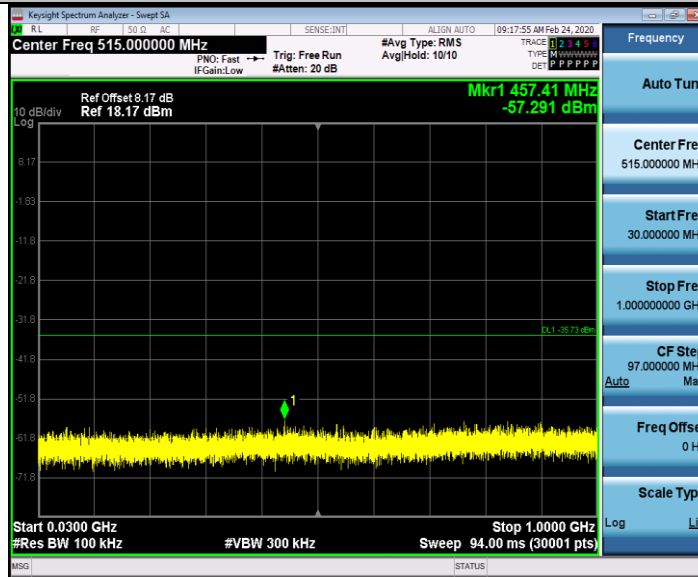
11N40SISO_Ant1_2437_1000~26500



11N40SISO_Ant1_2452_0~Reference



11N40SISO_Ant1_2452_30~1000



11N40SISO_Ant1_2452_1000~26500



4.5 Radiated Band Edges and Spurious Emission Measurement

4.5.1 Limit of Radiated Band Edges and Spurious Emission

FCC §15.247 (d)

IC RSS-247 5.5

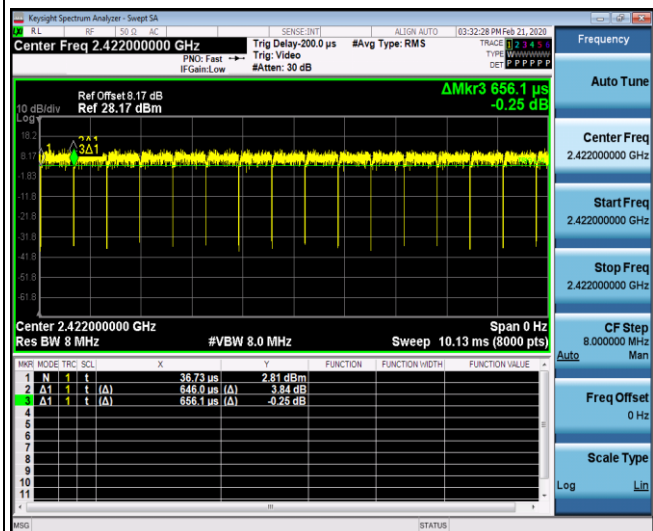
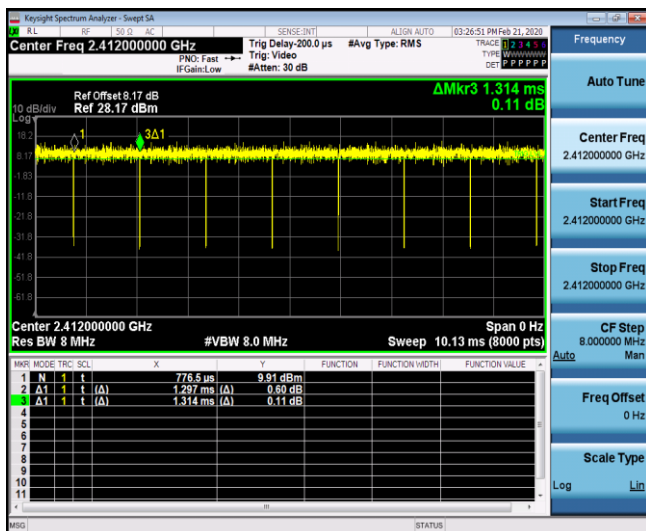
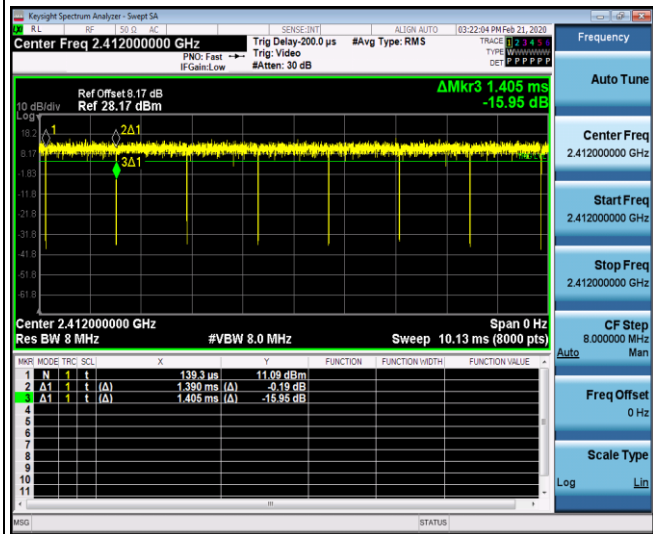
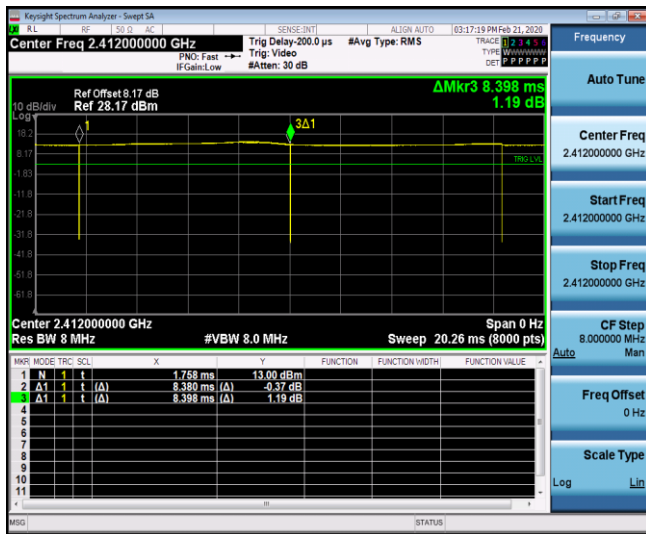
In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as 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

4.5.2 Test Procedures

1. 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.
2. The measurement distance is 3 meter.
3. For each suspected emission, 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 to comply with the guidelines.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. 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, RBW=1MHz for $f > 1$ GHz ; VBW = RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
 - (3) For average measurement:
VBW = 10 Hz, when duty cycle is no less than 98 percent.
VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

Band	Duty Cycle(%)	VBW Setting
802.11b	99.79	10 Hz
802.11g	98.92	10 Hz
2.4GHz 802.11n HT20	98.75	10 Hz
2.4GHz 802.11n HT40	98.46	10 Hz



6. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

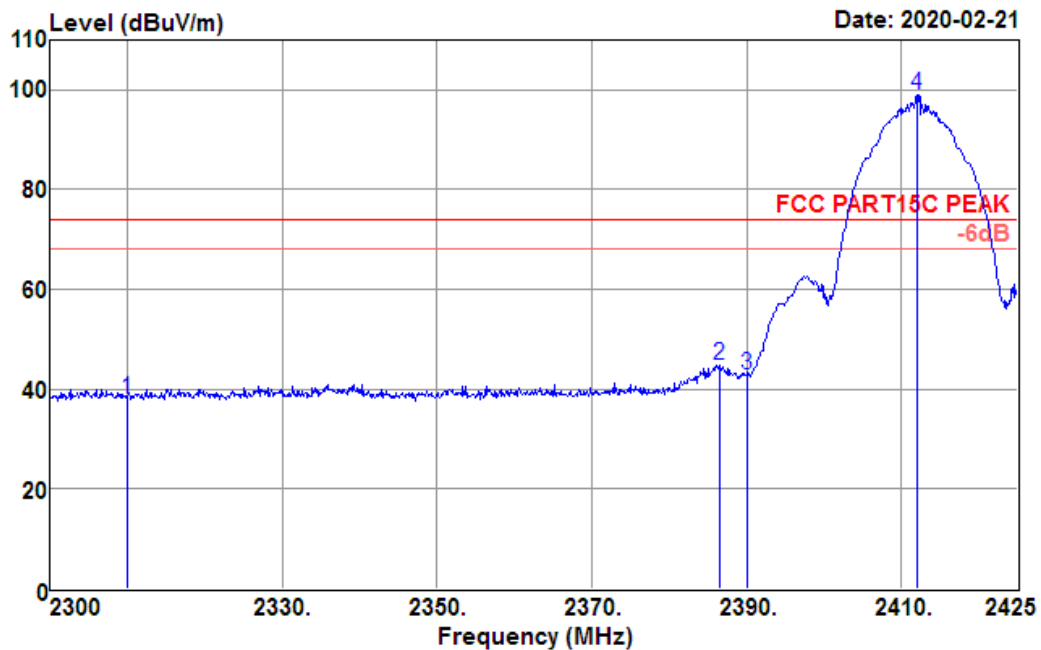
4.5.3 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

4.5.4 Test Result of Radiated Spurious at Band Edges

Test Mode :	802.11b CH01 (2412 MHz)	Temperature :	21~23°C
Test Engineer :	Jack Liu	Relative Humidity :	63~65%
Frequency Range	2.3GHz~2.425GHz	Polarization :	Horizontal

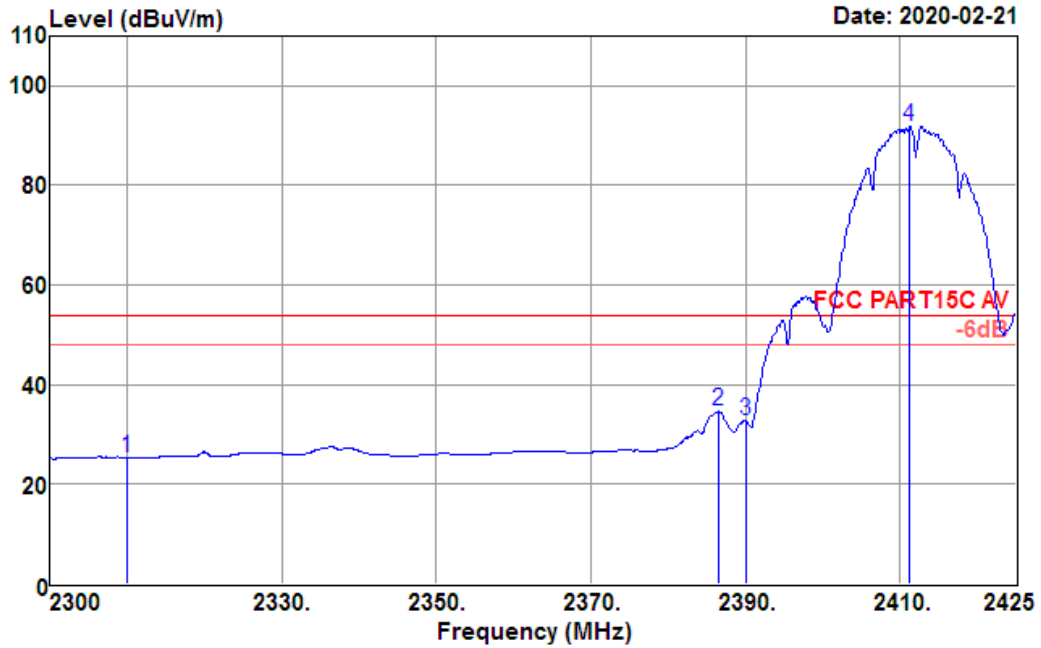
Data: 237



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2310.000	43.30	26.91	3.48	35.61	38.08	74.00	-35.92	Peak
2386.625	49.99	27.11	3.53	35.78	44.85	74.00	-29.15	Peak
2390.000	48.09	27.11	3.53	35.79	42.94	74.00	-31.06	Peak
2412.000	104.21	27.17	3.55	35.84	99.09	74.00	25.09	Peak

Test Mode :	802.11b CH01 (2412 MHz)	Temperature :	21~23°C
Test Engineer :	Jack Liu	Relative Humidity :	63~65%
Frequency Range	2.3GHz~2.425GHz	Polarization :	Horizontal

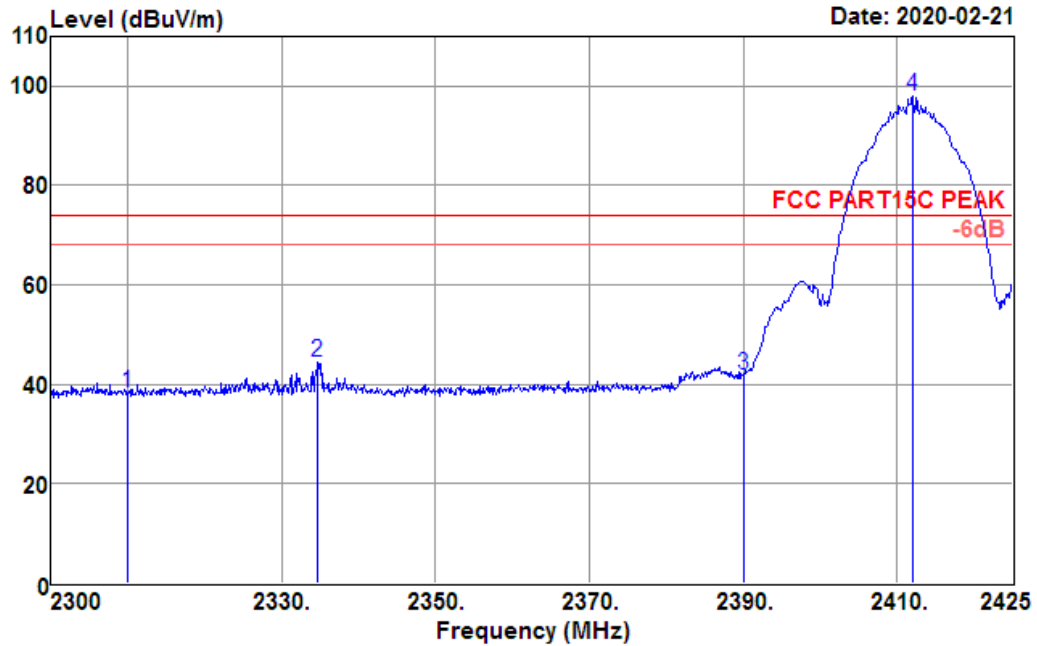
Data: 238



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2310.000	30.64	26.91	3.48	35.61	25.42	54.00	-28.58	Average
2386.500	39.73	27.10	3.53	35.78	34.58	54.00	-19.42	Average
2390.000	37.80	27.11	3.53	35.79	32.65	54.00	-21.35	Average
2411.250	97.06	27.17	3.55	35.84	91.94	54.00	37.94	Average

Test Mode :	802.11b CH01 (2412 MHz)	Temperature :	21~23°C
Test Engineer :	Jack Liu	Relative Humidity :	63~65%
Frequency Range	2.3GHz~2.425GHz	Polarization :	Vertical

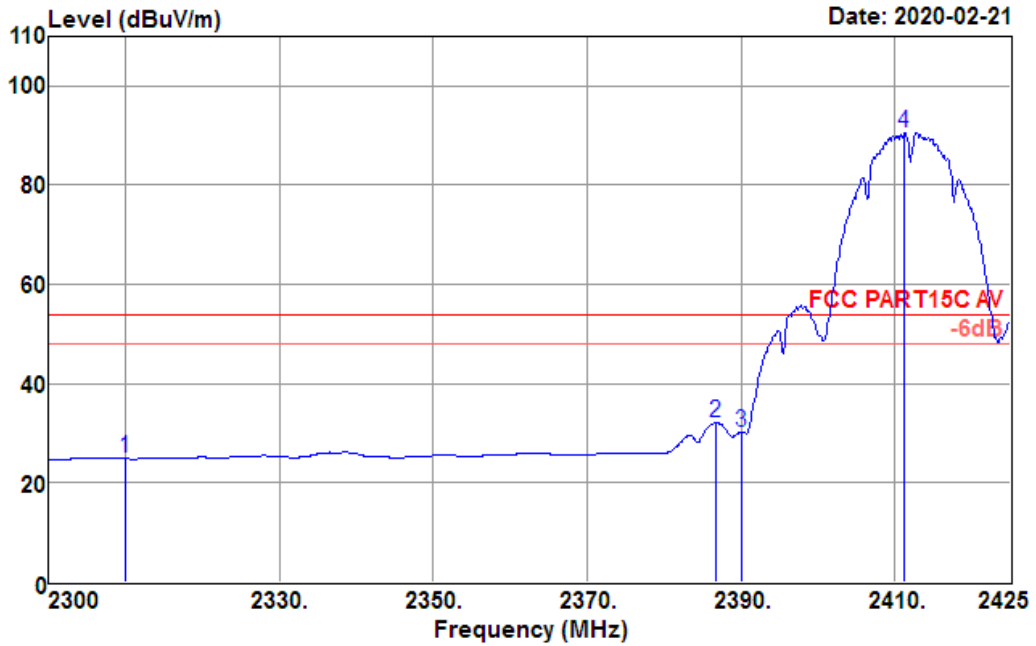
Data: 240



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2310.000	43.48	26.91	3.48	35.61	38.26	74.00	-35.74	Peak
2334.750	49.70	26.97	3.49	35.66	44.50	74.00	-29.50	Peak
2390.000	47.03	27.11	3.53	35.79	41.88	74.00	-32.12	Peak
2412.125	103.00	27.17	3.55	35.84	97.88	74.00	23.88	Peak

Test Mode :	802.11b CH01 (2412 MHz)	Temperature :	21~23°C
Test Engineer :	Jack Liu	Relative Humidity :	63~65%
Frequency Range	2.3GHz~2.425GHz	Polarization :	Vertical

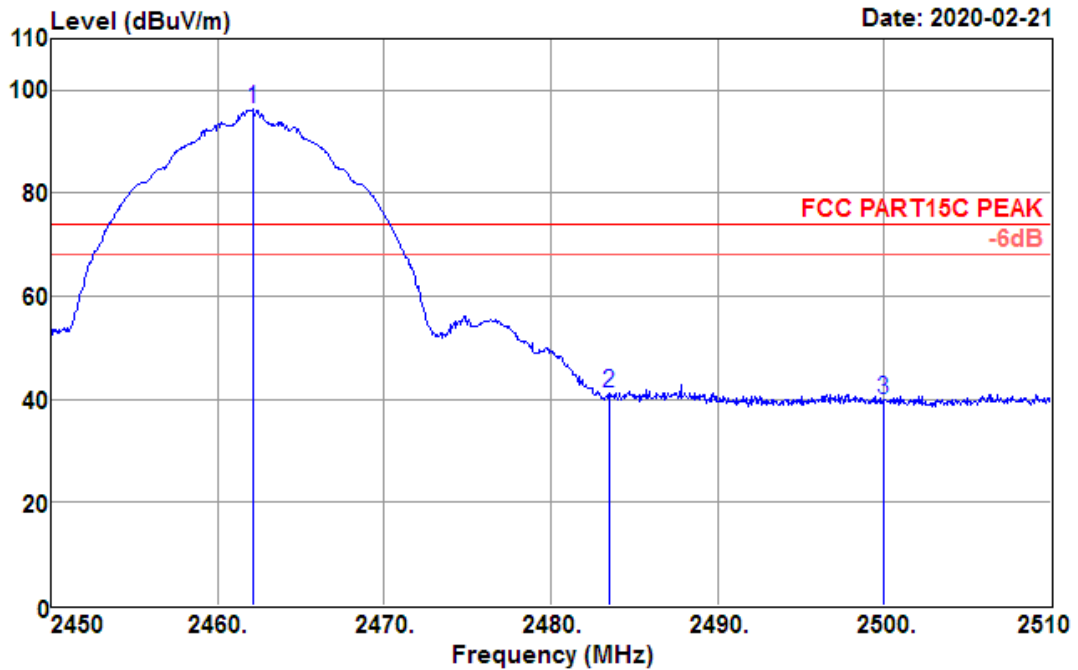
Data: 241



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2310.000	30.10	26.91	3.48	35.61	24.88	54.00	-29.12	Average
2386.750	37.31	27.11	3.53	35.78	32.17	54.00	-21.83	Average
2390.000	35.43	27.11	3.53	35.79	30.28	54.00	-23.72	Average
2411.250	95.82	27.17	3.55	35.84	90.70	54.00	36.70	Average

Test Mode :	802.11b CH11 (2462 MHz)	Temperature :	21~23°C
Test Engineer :	Jack Liu	Relative Humidity :	63~65%
Frequency Range	2.45GHz~2.51GHz	Polarization :	Horizontal

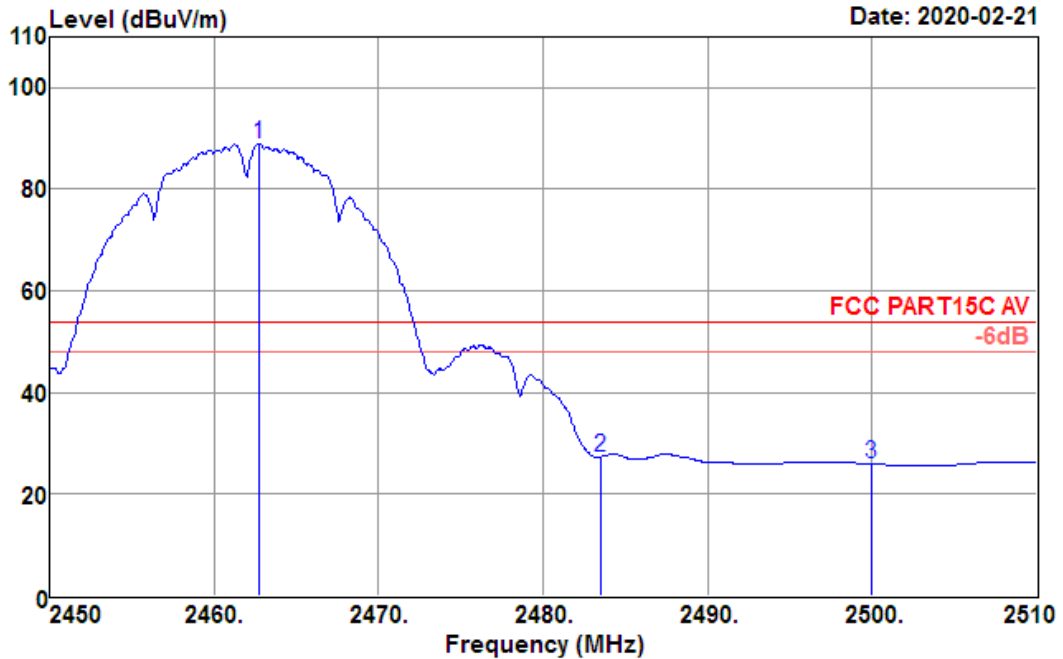
Data: 234



Freq MHz	Reading level dBUV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBUV/m	Limit level dBUV/m	Over limit dB	Remark
2462.120	101.32	27.30	3.58	35.95	96.25	74.00	22.25	Peak
2483.500	46.24	27.36	3.59	36.00	41.19	74.00	-32.81	Peak
2500.000	44.92	27.40	3.60	36.04	39.88	74.00	-34.12	Peak

Test Mode :	802.11b CH11 (2462 MHz)	Temperature :	21~23°C
Test Engineer :	Jack Liu	Relative Humidity :	63~65%
Frequency Range	2.45GHz~2.51GHz	Polarization :	Horizontal

Data: 235



Freq MHz	Reading level dBUV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBUV/m	Limit level dBUV/m	Over limit dB	Remark
2462.720	94.03	27.30	3.58	35.96	88.95	54.00	34.95	Average
2483.500	32.39	27.36	3.59	36.00	27.34	54.00	-26.66	Average
2500.000	31.02	27.40	3.60	36.04	25.98	54.00	-28.02	Average