8.5 RADIATED SPURIOUS EMISSION

8.5.1 Applicable Standard

According to FCC Part 15.247(d) and 15.209 and KDB 558074 D01 15.247 Meas Guidance v05r02

8.5.2 Conformance Limit

According to FCC Part 15.247(d): radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).
According to FCC Part15.205, Restricted bands

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(2)
13.36-13.41			

According to FCC Part15.205,the level of any transmitter spurious emission in Restricted bands shall not exceed the level of the emission specified in the following table

Restricted Frequency(MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance
0.009-0.490	2400/F(KHz)	20 log (uV/m)	300
0.490-1.705	24000/F(KHz)	20 log (uV/m)	30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

8.5.3 Test Configuration

Test according to clause 7.2 radio frequency test setup 2

8.5.4 Test Procedure

This test is required for any spurious emission that falls in a Restricted Band, as defined in Section 15.205. It must be performed with the highest gain of each type of antenna proposed for use with the EUT. Use the following spectrum analyzer settings:
The EUT was placed on a turn table which is 0.8m above ground plane.
Maximum procedure was performed on the highest emissions to ensure EUT compliance.
Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1 GHz(1GHz to 25GHz), 100 kHz for f < 1 GHz(30MHz to 1GHz), 200Hz for f<150KHz(9KHz to 150KHz), 9KHz for f<30MHz(150KHz to 30KHz)
VBW ≥ RBW
Sweep = auto

Detector function = peak
Trace = max hold
Follow the guidelines in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization, etc. A pre-amp and a high pass filter are required for this test, in order to provide the measuring system with sufficient sensitivity. Allow the trace to stabilize. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, which must comply with the limit specified in Section 15.35(b). Submit this data.
Now set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from 20log(dwell time/100 ms), in an effort to demonstrate compliance with the 15.209 limit. Submit this data.
Repeat above procedures until all frequency measured was complete.

8.5.5 Test Results

Temperature:	22.5° C
Relative Humidity:	45%
ATM Pressure:	1011 mbar

■ Spurious Emission below 30MHz(9KHz to 30MHz)

Freq. (MHz)	Ant.Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
	H/V	PK	AV	PK	AV	PK	AV
--	--	--	--	--	--	--	--

Note: the amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.
Distance extrapolation factor =40log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor

■ Spurious Emission Above 1GHz(1GHz to 25GHz)

All modes 2.4G 802.11b/g/n have been tested, and the worst result 802.11b recorded was report as below:

Test mode: 802.11 b Frequency: Channel 1: 2412 MHz

Freq. (MHz)	Reading (dBμV)	Corr. (dB)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)	Det.	Pol.	Verdict
4824.00	57.51	-7.42	50.09	74.00	23.91	PK+	V	PASS
4824.00	44.18	-7.42	36.76	54.00	17.24	AVG	V	PASS
6880.50	45.35	-0.93	44.42	74.00	29.58	PK+	V	PASS
6880.50	32.30	-0.93	31.37	54.00	22.63	AVG	V	PASS
9647.50	46.90	3.15	50.05	74.00	23.95	PK+	V	PASS
9647.50	31.68	3.15	34.83	54.00	19.17	AVG	V	PASS

Freq. (MHz)	Reading (dBμV)	Corr. (dB)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)	Det.	Pol.	Verdict
4824.00	56.51	-7.42	49.09	74.00	24.91	PK+	H	PASS
4824.00	44.15	-7.42	36.73	54.00	17.27	AVG	H	PASS
7052.50	46.33	-0.41	45.92	74.00	28.08	PK+	H	PASS
7052.50	31.65	-0.41	31.24	54.00	22.76	AVG	H	PASS
11049.50	44.11	5.91	50.02	74.00	23.98	PK+	H	PASS
11049.50	29.00	5.91	34.91	54.00	19.09	AVG	H	PASS

Test mode: 802.11 b Frequency: Channel 6:2437 MHz

Freq. (MHz)	Reading (dBμV)	Corr. (dB)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)	Det.	Pol.	Verdict
4874.00	60.10	-7.08	53.02	74.00	20.98	PK+	V	PASS
4874.00	46.72	-7.08	39.64	54.00	14.36	AVG	V	PASS
7910.00	45.85	1.62	47.47	74.00	26.53	PK+	V	PASS
7910.00	30.84	1.62	32.46	54.00	21.54	AVG	V	PASS
9748.00	47.94	3.27	51.21	24.17	22.79	PK+	V	PASS
9748.00	34.67	3.27	37.94	19.39	16.06	AVG	V	PASS

Freq. (MHz)	Reading (dBμV)	Corr. (dB)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)	Det.	Pol.	Verdict
4874.50	56.63	-7.08	49.55	74.00	24.45	PK+	H	PASS
4874.50	41.65	-7.08	34.57	54.00	19.43	AVG	H	PASS
9748.00	48.41	3.27	51.68	74.00	22.32	PK+	H	PASS
9748.00	34.61	3.27	37.88	54.00	16.12	AVG	H	PASS
13714.00	43.89	8.39	52.28	74.00	21.72	PK+	H	PASS
13714.00	28.07	8.39	36.46	54.00	17.54	AVG	H	PASS

Test mode: 802.11 b Frequency: Channel 11:2462 MHz

Freq. (MHz)	Reading (dBμV)	Corr. (dB)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)	Det.	Pol.	Verdict
4924.00	59.85	-6.66	53.19	74.00	20.81	PK+	V	PASS
4924.00	47.47	-6.66	40.81	54.00	13.19	AVG	V	PASS
7973.50	47.82	1.36	49.18	74.00	24.82	PK+	V	PASS
7973.50	35.37	1.36	36.73	54.00	17.27	AVG	V	PASS
16509.00	44.23	9.2	53.43	74.00	20.57	PK+	V	PASS
16509.00	29.57	9.2	38.77	54.00	15.23	AVG	V	PASS

Freq. (MHz)	Reading (dBμV)	Corr. (dB)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)	Det.	Pol.	Verdict
4923.50	57.59	-6.67	50.92	74.00	23.08	PK+	H	PASS
4923.50	43.40	-6.67	36.73	54.00	17.27	AVG	H	PASS
9848.00	47.83	3.38	51.21	74.00	22.79	PK+	H	PASS
9848.00	33.79	3.38	37.17	54.00	16.83	AVG	H	PASS
13902.50	43.06	9.24	52.30	74.00	21.7	PK+	H	PASS
13902.50	30.19	9.24	39.43	54.00	14.57	AVG	H	PASS

Note: (1) All Readings are Peak Value (VBW=3MHz) and Average Value (VBW=10Hz).
(2) Emission Level= Reading Level+Correct Factor.
(3) Correct Factor= Ant_F + Cab_L - Preamp
(4) The reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

■ Spurious Emission in Restricted Band 2310-2390MHz and 2483.5-2500MHz

All modes 2.4G 802.11b/g/n have been tested, and the worst result 802.11 b recorded was report as below:

Test mode: 802.11 b Frequency: Channel 1: 2412MHz

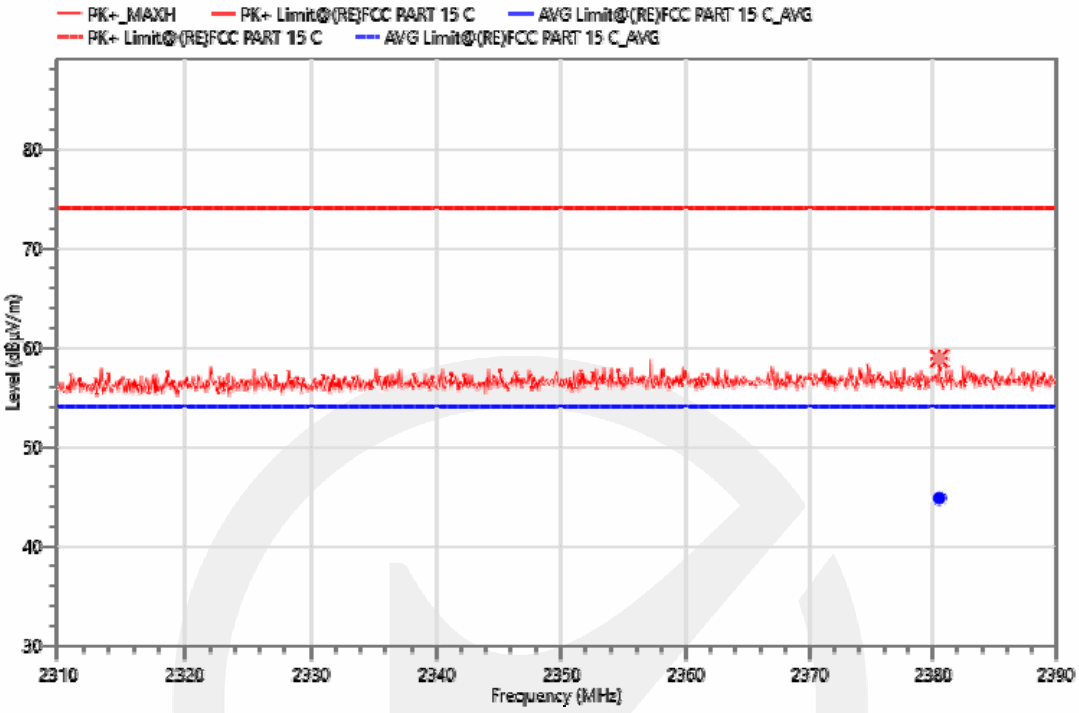
Frequency (MHz)	Polarity	PK(dBuV/m) (VBW=3MHz)	Limit 3m (dBuV/m)	AV(dBuV/m) (VBW=10Hz)	Limit 3m (dBuV/m)
2380.52	H	58.85	74.00	44.79	54.00
2354.12	V	58.75	74.00	44.31	54.00

Test mode: 802.11 b Frequency: Channel 11: 2462MHz

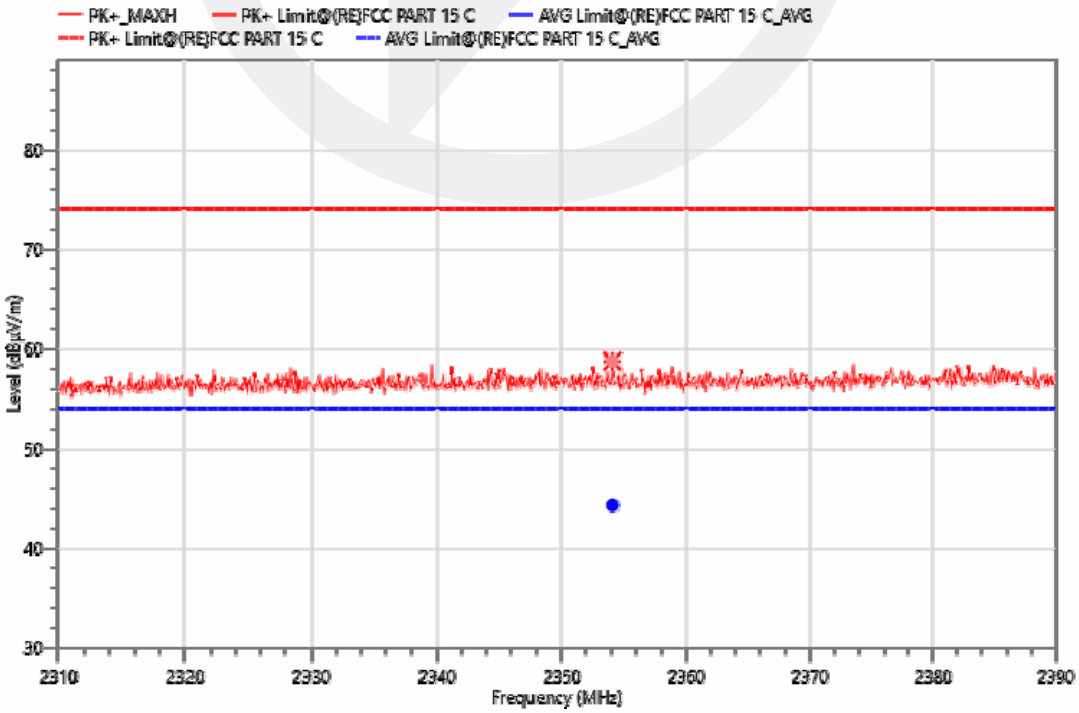
Frequency (MHz)	Polarity	PK(dBuV/m) (VBW=3MHz)	Limit 3m (dBuV/m)	AV(dBuV/m) (VBW=10Hz)	Limit 3m (dBuV/m)
2486.22	H	59.19	74.00	44.81	54.00
2494.53	V	59.85	74.00	44.76	54.00

Note: (1) All Readings are Peak Value (VBW=3MHz) and Average Value (VBW=10Hz).
(2) Emission Level= Reading Level+Correct Factor +Cable Loss.
(3) Correct Factor= Ant_F + Cab_L - Preamp
(4) The reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

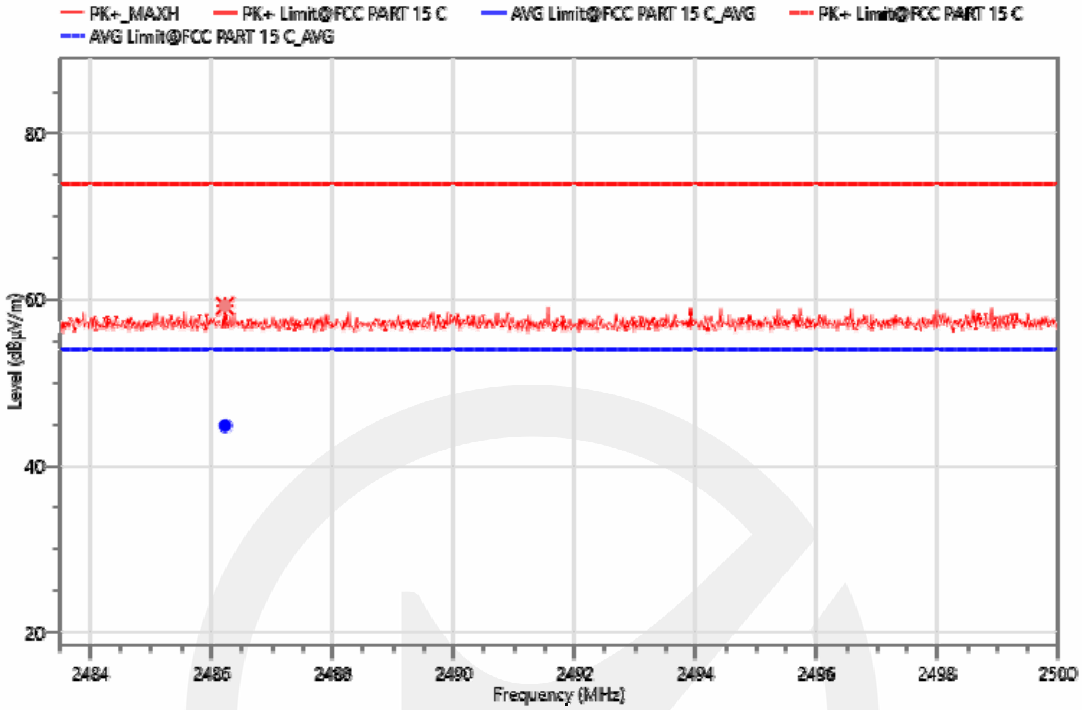
Test Model	Spurious Emission in Restricted Band 2310-2390MHz 802.11b Channel 1: 2412MHz Polarity: H



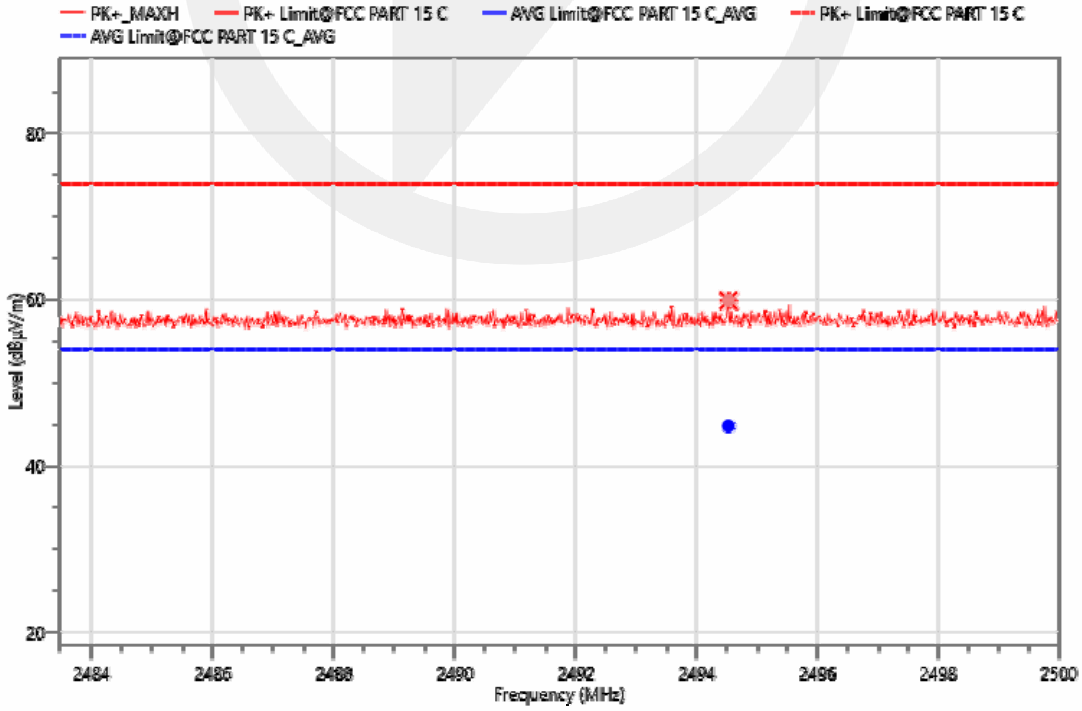
Test Model	Spurious Emission in Restricted Band 2310-2390MHz 802.11b Channel 1: 2412MHz Polarity: V



Test Model	Spurious Emission in Restricted Band 2483.5-2500MHz 802.11b Channel 11: 2462MHz Polarity: H

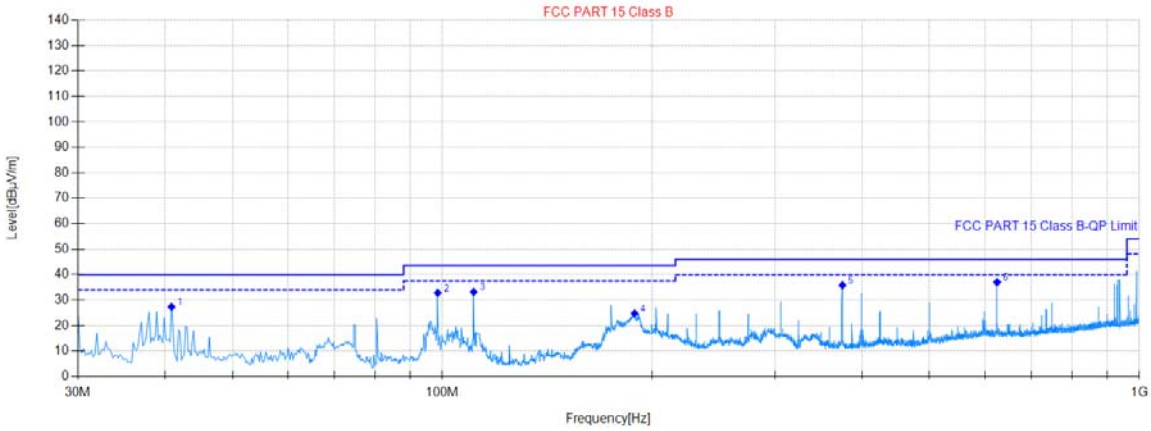


Test Model	Spurious Emission in Restricted Band2483.5-2500MHz 802.11b Channel 11: 2462MHz Polarity: V



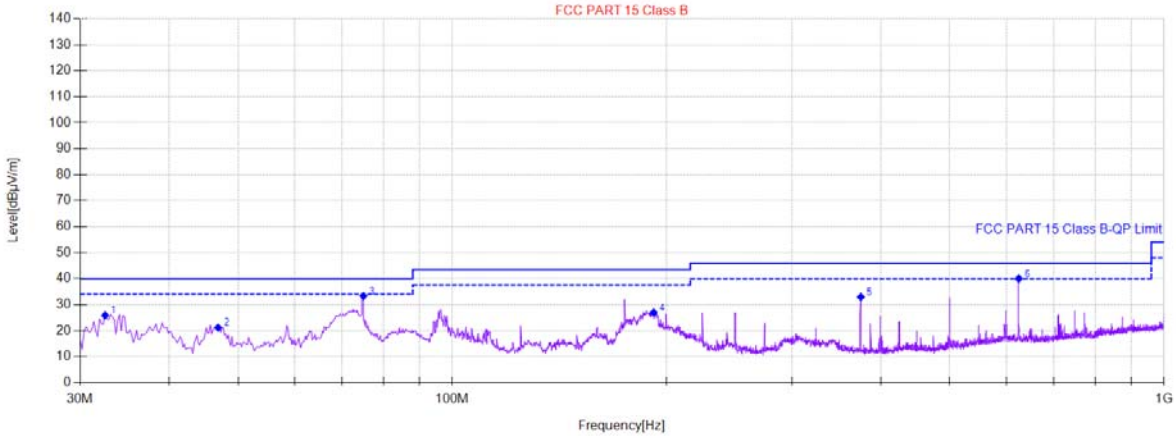
- Spurious Emission below 1GHz (30MHz to 1GHz)
- All modes 2.4G 802.11b/g/n have been tested, and the worst result 802.11b recorded was report as below:

Project Information			
Mode:	2412 MHz	Voltage:	AC 120V/60Hz
Environment:	Temp: 16℃; Humi:58%	Engineer:	JACK ZHANG



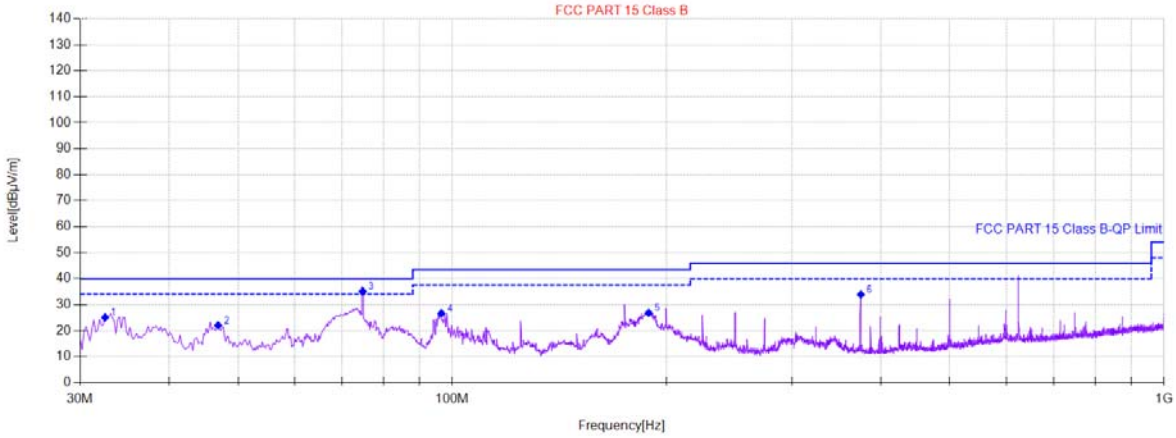
Final Data List										
NO.	Freq. [MHz]	QP Reading [dBμV/m]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity	Verdict
1	40.8662	57.79	-30.50	27.29	40.00	12.71	101	298	Horizontal	Pass
2	98.4957	64.21	-31.44	32.77	43.50	10.73	100	189	Horizontal	Pass
3	110.9142	65.31	-32.18	33.13	43.50	10.37	120	189	Horizontal	Pass
4	188.7237	56.32	-31.61	24.71	43.50	18.79	100	189	Horizontal	Pass
5	375.0010	62.05	-26.28	35.77	46.00	10.23	101	252	Horizontal	Pass
6	625.1170	58.09	-21.08	37.01	46.00	8.99	100	56	Horizontal	Pass

Project Information			
Mode:	2412 MHz	Voltage:	AC 120V/60Hz
Environment:	Temp: 16℃; Humi:58%	Engineer:	JACK ZHANG



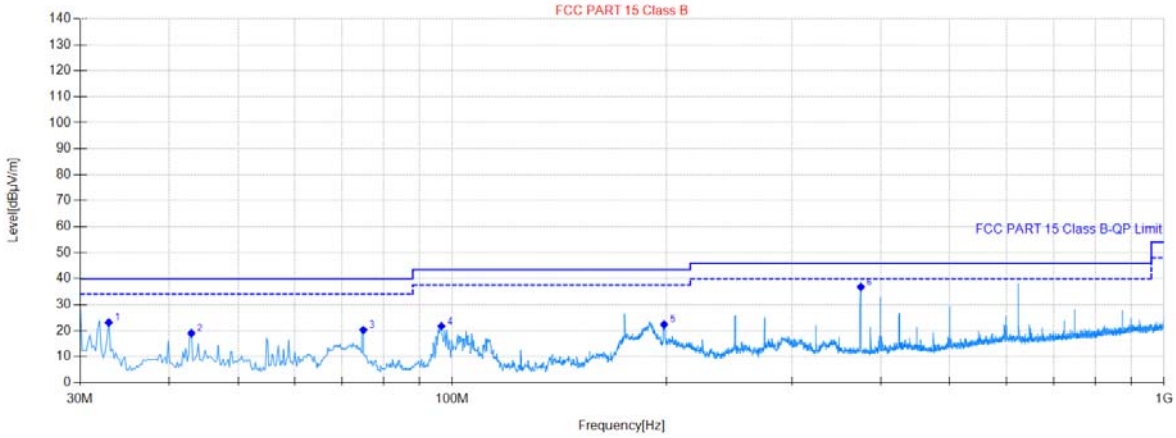
Final Data List										
NO.	Freq. [MHz]	QP Reading [dBμV/m]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity	Verdict
1	32.5225	57.04	-31.20	25.84	40.00	14.16	101	73	Vertical	Pass
2	46.8814	51.24	-30.13	21.11	40.00	18.89	100	180	Vertical	Pass
3	75.0170	66.31	-33.02	33.29	40.00	6.71	100	351	Vertical	Pass
4	191.8284	58.32	-31.41	26.91	43.50	16.59	110	188	Vertical	Pass
5	375.0010	59.22	-26.28	32.94	46.00	13.06	100	297	Vertical	Pass
6	625.1170	61.07	-21.08	39.99	46.00	6.01	100	251	Vertical	Pass

Project Information			
Mode:	2437 MHz	Voltage:	AC 120V/60Hz
Environment:	Temp: 16℃; Humi:58%	Engineer:	JACK ZHANG



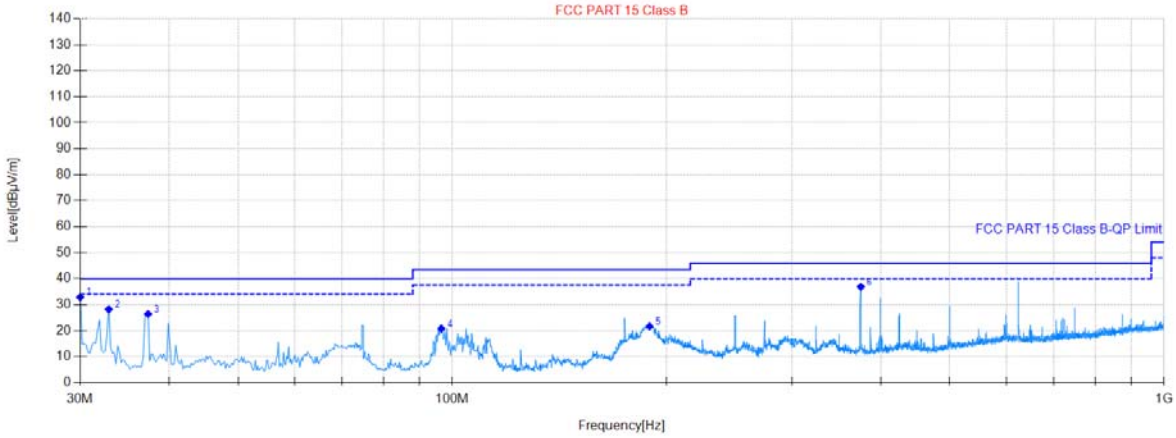
Final Data List										
NO.	Freq. [MHz]	QP Reading [dBμV/m]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity	Verdict
1	32.5225	56.24	-31.20	25.04	40.00	14.96	100	31	Vertical	Pass
2	46.8814	52.14	-30.13	22.01	40.00	17.99	100	175	Vertical	Pass
3	74.8230	68.05	-33.02	35.03	40.00	4.97	101	322	Vertical	Pass
4	96.5553	58.22	-31.60	26.62	43.50	16.88	100	142	Vertical	Pass
5	188.7237	58.39	-31.61	26.78	43.50	16.72	101	195	Vertical	Pass
6	375.0010	60.16	-26.28	33.88	46.00	12.12	100	311	Vertical	Pass

Project Information			
Mode:	2437 MHz	Voltage:	AC 120V/60Hz
Environment:	Temp: 16℃; Humi:58%	Engineer:	JACK ZHANG



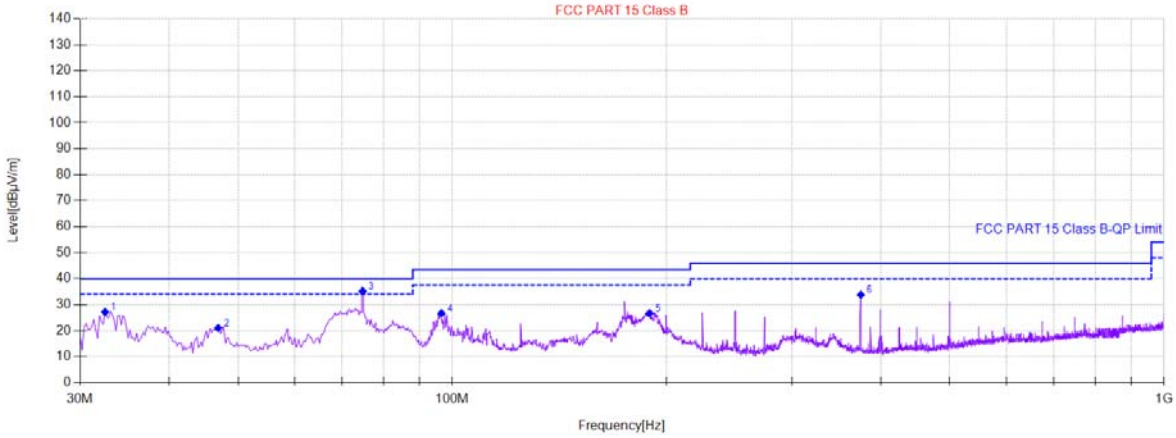
Final Data List										
NO.	Freq. [MHz]	QP Reading [dBμV/m]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity	Verdict
1	32.9106	54.26	-31.16	23.10	40.00	16.90	105	271	Horizontal	Pass
2	43.0006	49.25	-30.29	18.96	40.00	21.04	100	301	Horizontal	Pass
3	75.0170	53.21	-33.02	20.19	40.00	19.81	200	57	Horizontal	Pass
4	96.5553	53.26	-31.60	21.66	43.50	21.84	100	81	Horizontal	Pass
5	198.4257	53.21	-30.85	22.36	43.50	21.14	100	267	Horizontal	Pass
6	375.0010	63.01	-26.28	36.73	46.00	9.27	100	240	Horizontal	Pass

Project Information			
Mode:	2462 MHz	Voltage:	AC 120V/60Hz
Environment:	Temp: 16℃; Humi:58%	Engineer:	JACK ZHANG



Final Data List										
NO.	Freq. [MHz]	QP Reading [dBμV/m]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity	Verdict
1	30.0000	64.25	-31.40	32.85	40.00	7.15	100	298	Horizontal	Pass
2	32.9106	59.32	-31.16	28.16	40.00	11.84	100	298	Horizontal	Pass
3	37.3735	57.14	-30.80	26.34	40.00	13.66	100	286	Horizontal	Pass
4	96.5553	52.32	-31.60	20.72	43.50	22.78	200	116	Horizontal	Pass
5	189.3059	53.21	-31.59	21.62	43.50	21.88	100	350	Horizontal	Pass
6	375.0010	63.09	-26.28	36.81	46.00	9.19	100	249	Horizontal	Pass

Project Information			
Mode:	2462 MHz	Voltage:	AC 120V/60Hz
Environment:	Temp: 16℃; Humi:58%	Engineer:	JACK ZHANG



Final Data List										
NO.	Freq. [MHz]	QP Reading [dBμV/m]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity	Verdict
1	1	32.5225	58.32	-31.20	27.12	40.00	12.88	101	311	Pass
2	2	46.8814	51.14	-30.13	21.01	40.00	18.99	100	41	Pass
3	3	74.8230	68.14	-33.02	35.12	40.00	4.88	120	242	Pass
4	4	96.5553	58.26	-31.60	26.66	43.50	16.84	100	174	Pass
5	5	189.3059	58.24	-31.59	26.65	43.50	16.85	100	246	Pass
6	6	375.0010	60.05	-26.28	33.77	46.00	12.23	100	306	Pass

8.6 CONDUCTED EMISSIONS TEST

8.6.1 Applicable Standard

According to FCC Part 15.207(a)

8.6.2 Conformance Limit

Conducted Emission Limit

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

8.6.3 Test Configuration

Test according to clause 7.3conducted emission test setup

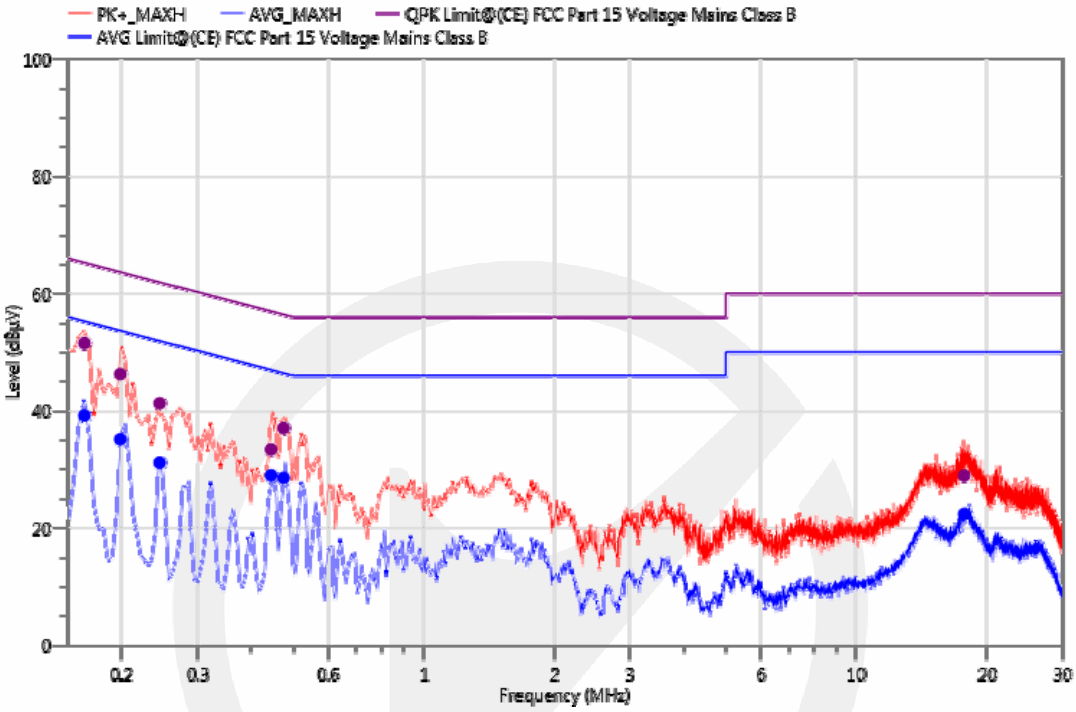
8.6.4 Test Procedure

The EUT was placed on a table which is 0.8m above ground plane.
Maximum procedure was performed on the highest emissions to ensure EUT compliance.
Repeat above procedures until all frequency measured were complete.

8.6.5 Test Results

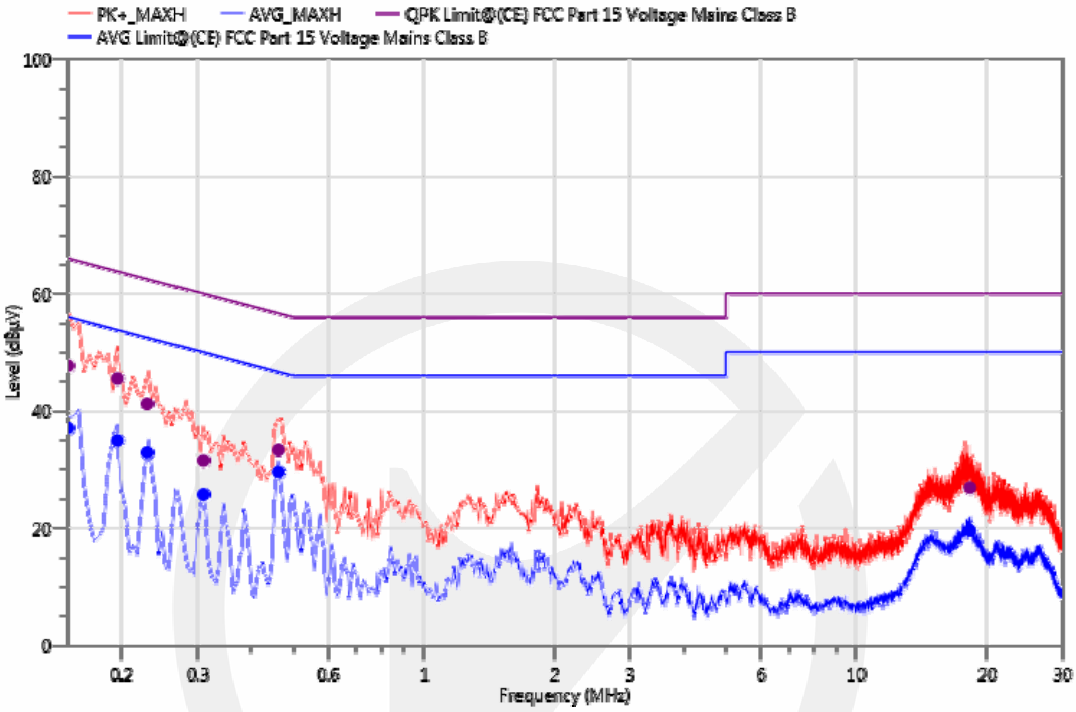
Pass

Project Information			
Mode:	TX	Voltage:	AC 120V/60Hz
Environment:	Temp: 25℃; Humi:52%	Engineer:	Allen Tang



Freq. (MHz)	Reading (dBµV)	Meas. (dBµV)	Limit (dBµV)	Margin (dB)	Det.	Line	Corr. (dB)	Verdict
0.16	41.45	51.52	65.26	13.74	QPK	L1	10.07	PASS
0.16	29.11	39.18	55.26	16.08	AVG	L1	10.07	PASS
0.20	36.10	46.23	63.65	17.42	QPK	L1	10.13	PASS
0.20	24.98	35.11	53.65	18.54	AVG	L1	10.13	PASS
0.25	31.13	41.25	61.89	20.64	QPK	L1	10.12	PASS
0.25	21.00	31.12	51.89	20.77	AVG	L1	10.12	PASS
0.45	23.03	33.38	56.97	23.59	QPK	L1	10.35	PASS
0.45	18.61	28.96	46.97	18.01	AVG	L1	10.35	PASS
0.48	26.82	37.02	56.41	19.39	QPK	L1	10.20	PASS
0.48	18.33	28.53	46.41	17.88	AVG	L1	10.20	PASS
17.79	17.93	28.92	60.00	31.08	QPK	L1	10.99	PASS
17.79	11.37	22.36	50.00	27.64	AVG	L1	10.99	PASS

Project Information			
Mode:	TX	Voltage:	AC 120V/60Hz
Environment:	Temp: 24℃; Humi:52%	Engineer:	Allen Tang



Freq. (MHz)	Reading (dBµV)	Meas. (dBµV)	Limit (dBµV)	Margin (dB)	Det.	Line	Corr. (dB)	Verdict
0.15	37.6	47.67	66.00	18.33	QPK	N	10.07	PASS
0.15	26.97	37.04	56.00	18.96	AVG	N	10.07	PASS
0.20	35.37	45.49	63.78	18.29	QPK	N	10.12	PASS
0.20	24.77	34.89	53.78	18.89	AVG	N	10.12	PASS
0.23	31.02	41.15	62.45	21.30	QPK	N	10.13	PASS
0.23	22.74	32.87	52.45	19.58	AVG	N	10.13	PASS
0.31	21.34	31.49	60.00	28.51	QPK	N	10.15	PASS
0.31	15.54	25.69	50.00	24.31	AVG	N	10.15	PASS
0.46	23.21	33.31	56.64	23.33	QPK	N	10.10	PASS
0.46	19.44	29.54	46.64	17.10	AVG	N	10.10	PASS
18.34	15.69	26.85	60.00	33.15	QPK	N	11.16	PASS
18.34	8.36	19.52	50.00	30.48	AVG	N	11.16	PASS

8.7 ANTENNA APPLICATION

8.7.1 Antenna Requirement

Standard	Requirement
FCC CRF Part15.203	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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 provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217,§15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

8.7.2 Result

PASS.

- The EUT has 1 antenna: one an PCB antenna for WIFI 2.4G, the gain is 3.16 dBi

Note:
- ☒ Antenna uses a permanently attached antenna which is not replaceable.
- ☐ Not using a standard antenna jack or electrical connector for antenna replacement
- ☐ The antenna has to be professionally installed (please provide method of installation)

Which in accordance to section 15.203, please refer to the internal photos.

*** End of Report ***

声 明
Statement

1. 本报告无授权批准人签字及“检验报告专用章”无效；
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   Objections shall be raised within 20 days from the date receiving the report.