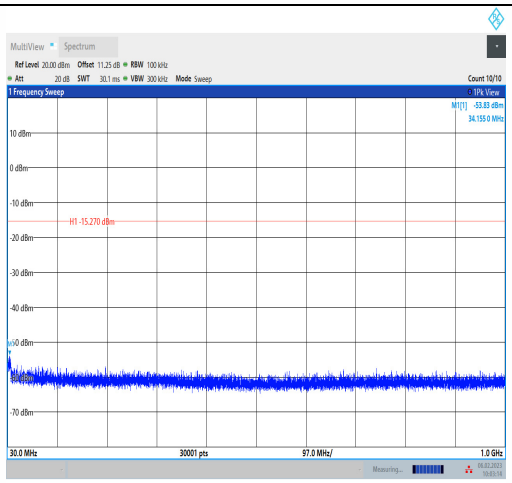

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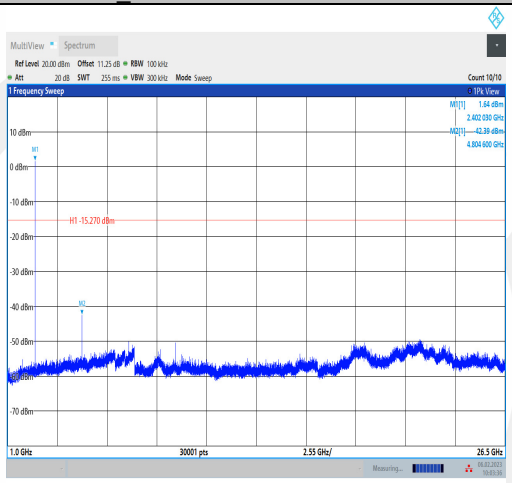
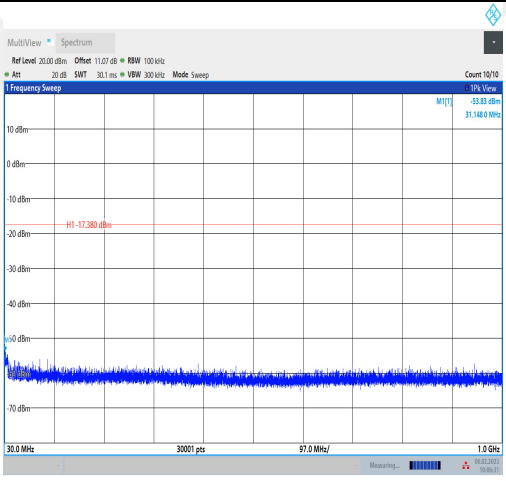
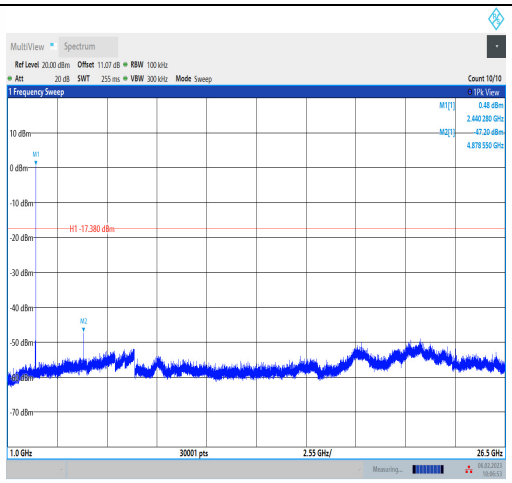


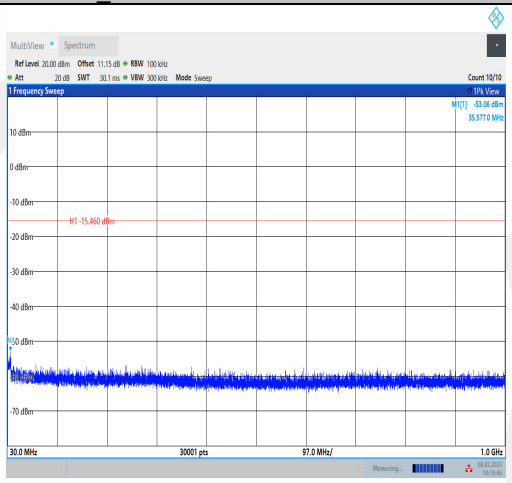
BLE_2M-Ant1-2402-1000~26500-4.73



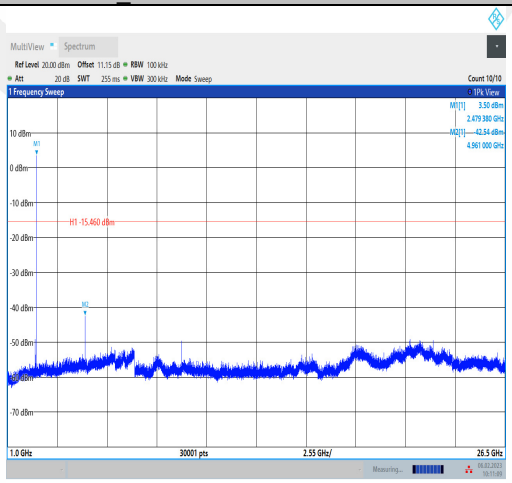
BLE_2M-Ant1-2440-30~1000-2.62



BLE_2M-Ant1-2440-1000~26500-2.62



BLE_2M-Ant1-2480-30~1000-4.54



BLE_2M-Ant1-2480-1000~26500-4.54

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)
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:	25° 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)
BLE mode have been tested, and the worst result was report as below:

Test mode: BLE(2M) Frequency: Channel 0: 2402MHz

Freq. (MHz)	Ant.Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
	H/V	PK	AV	PK	AV	PK	AV
4801.87	V	61.02	39.63	74	54	12.98	14.37
7207.5	V	62.61	50.24	74	54	11.39	3.76
9605.62	V	61.92	50.93	74	54	12.08	3.07
4803.75	H	58.19	44.86	74	54	15.81	9.14
7203.75	H	57.88	42.53	74	54	16.12	11.47
9605.62	H	63.43	49.14	74	54	10.57	4.86

Test mode: BLE(2M) Frequency: Channel 19: 2440MHz

Freq. (MHz)	Ant.Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
	H/V	PK	AV	PK	AV	PK	AV
4880.62	V	57.14	47.94	74	54	16.86	6.06
7318.12	V	59.72	47.30	74	54	14.28	6.70
9757.5	V	61.16	48.61	74	54	12.84	5.39
4880.62	H	57.14	44.74	74	54	16.86	9.26
7321.87	H	55.54	45.51	74	54	18.46	8.49
9757.5	H	60.49	48.68	74	54	13.51	5.32

Test mode: BLE(2M) Frequency: Channel 39: 2480MHz

Freq. (MHz)	Ant.Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
	H/V	PK	AV	PK	AV	PK	AV
4959.37	V	56.26	48.00	74	54	17.74	6.00
7438.12	V	56.06	44.15	74	54	17.94	9.85
9922.5	V	60.75	50.67	74	54	13.25	3.33
4959.37	H	59.83	51.24	74	54	14.17	2.76
7440	H	54.77	44.89	74	54	19.23	9.11
9922.5	H	61.35	51.67	74	54	12.65	2.33

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

Test mode: BLE(2M) Frequency: Channel 0: 2402MHz

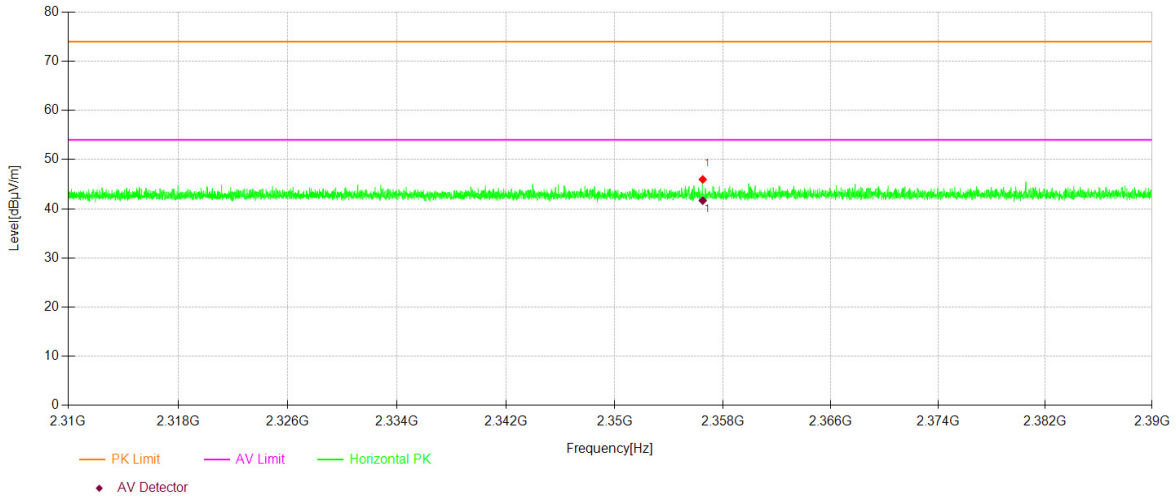
Frequency (MHz)	Polarity	PK(dBuV/m) (VBW=3MHz)	Limit 3m (dBuV/m)	Margin (dB)	AV(dBuV/m) (VBW=10Hz)	Limit 3m (dBuV/m)	Margin (dB)
2356.51	H	45.96	74	28.04	41.65	54	12.35
2355.84	V	46.02	74	27.98	41.22	54	12.78

Test mode: BLE(2M) Frequency: Channel 39: 2480MHz

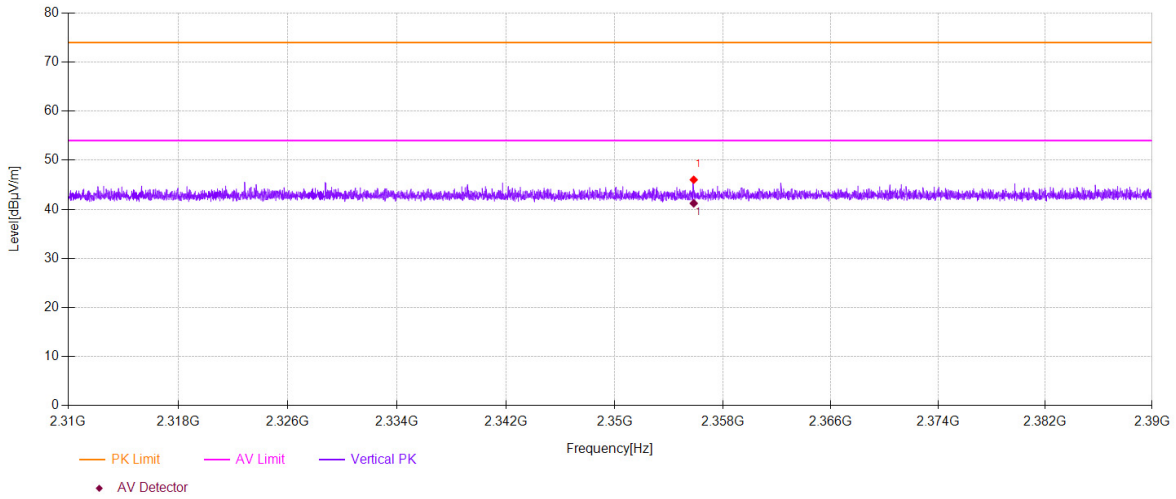
Frequency (MHz)	Polarity	PK(dBuV/m) (VBW=3MHz)	Limit 3m (dBuV/m)	Margin (dB)	AV(dBuV/m) (VBW=10Hz)	Limit 3m (dBuV/m)	Margin (dB)
2485.09	H	46.35	74	27.65	41.21	54	12.79
2483.61	V	47.14	74	26.86	41.34	54	12.66

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.

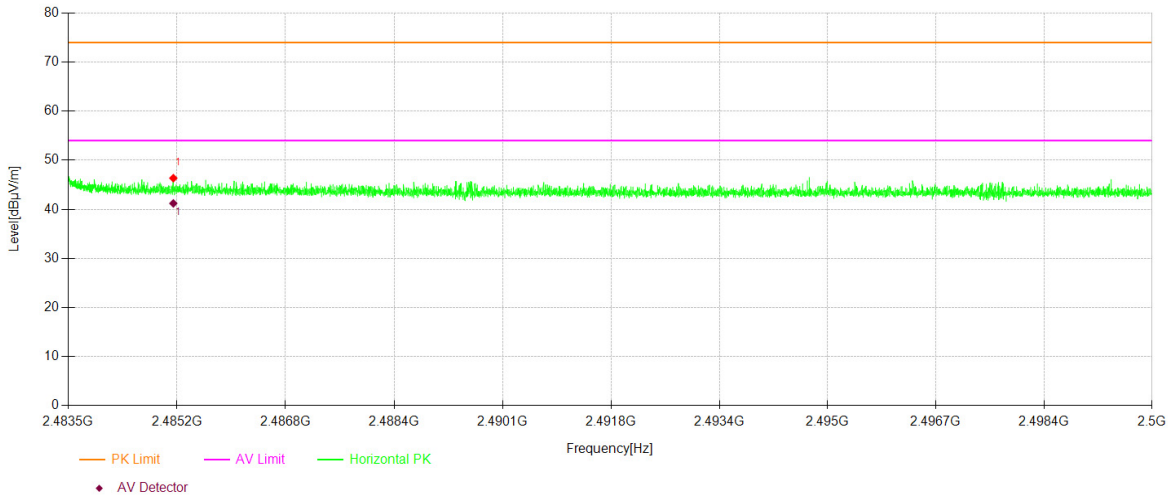
Test Model	Spurious Emission in Restricted Band 2310-2390MHz BLE Channel 0: 2402MHz H



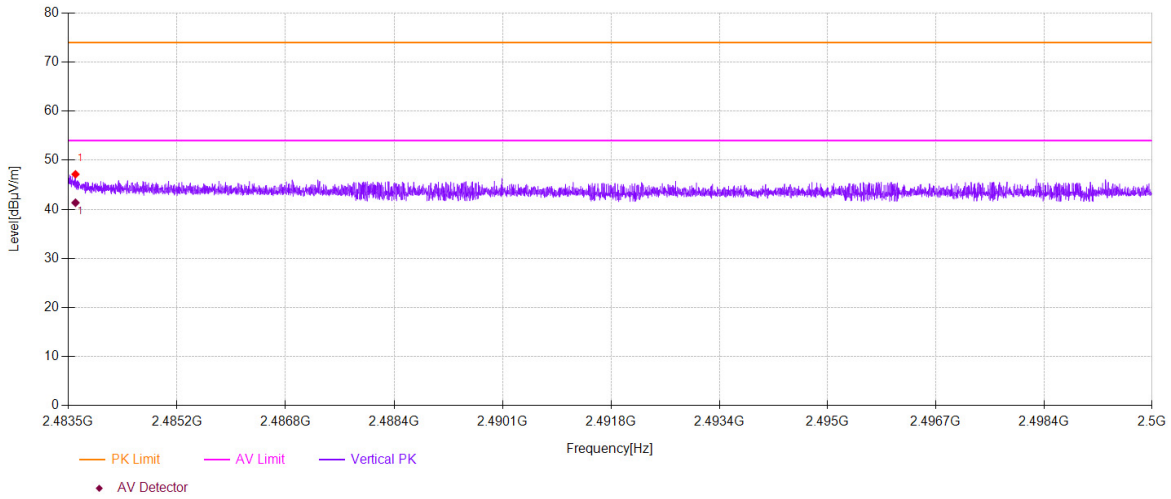
Test Model	Spurious Emission in Restricted Band 2310-2390MHz BLE Channel 0: 2402MHz V



Test Model	Spurious Emission in Restricted Band 2483.5-2500MHz BLE Channel 39: 2480MHz H



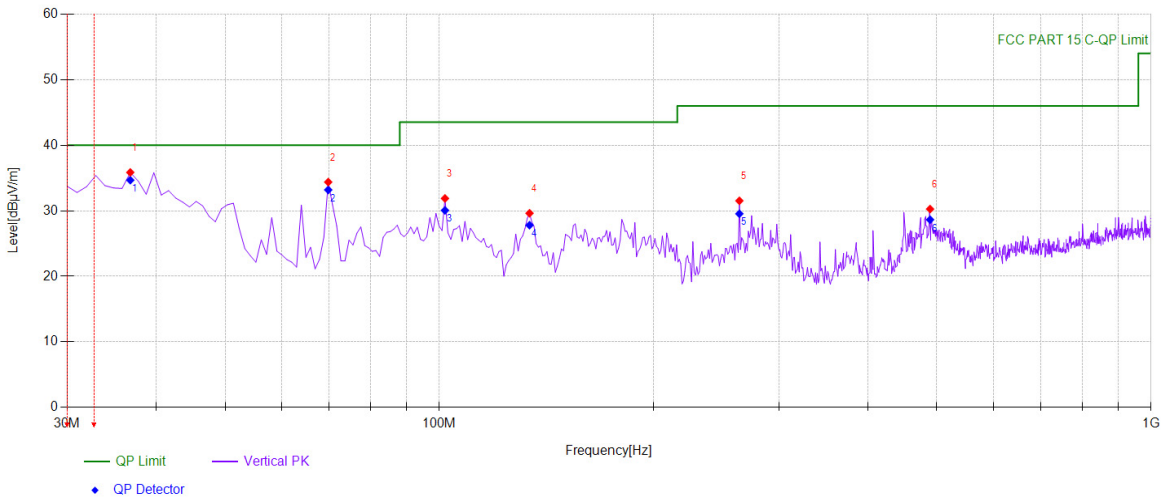
Test Model	Spurious Emission in Restricted Band 2483.5-2500MHz BLE Channel 39: 2480MHz V



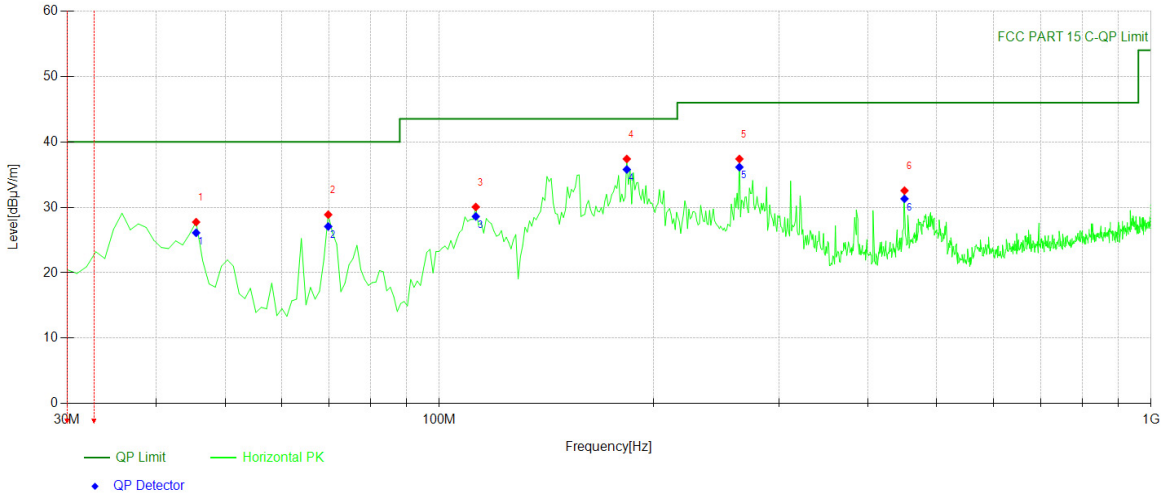
■ Spurious Emission below 1GHz (30MHz to 1GHz)

All modes have been tested, and the worst result recorded was report as below:

2402

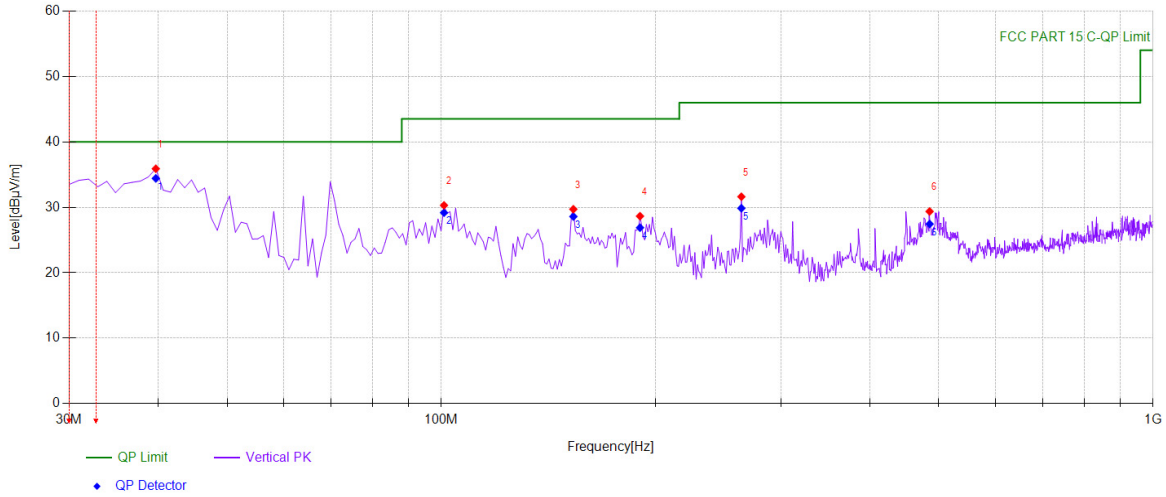


Suspected Data List										
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity	Angle[°]	Height[cm]
1	36.7968	53.96	-18.11	35.85	PK	40.00	4.15	Vertical	330	100
2	69.8098	54.31	-19.94	34.37	PK	40.00	5.63	Vertical	222	100
3	101.8519	48.78	-16.90	31.88	PK	43.50	11.62	Vertical	184	100
4	133.8939	49.02	-19.40	29.62	PK	43.50	13.88	Vertical	301	100
5	264.004	46.52	-15.00	31.52	PK	46.00	14.48	Vertical	180	100
6	489.2693	40.06	-9.80	30.26	PK	46.00	15.74	Vertical	217	100

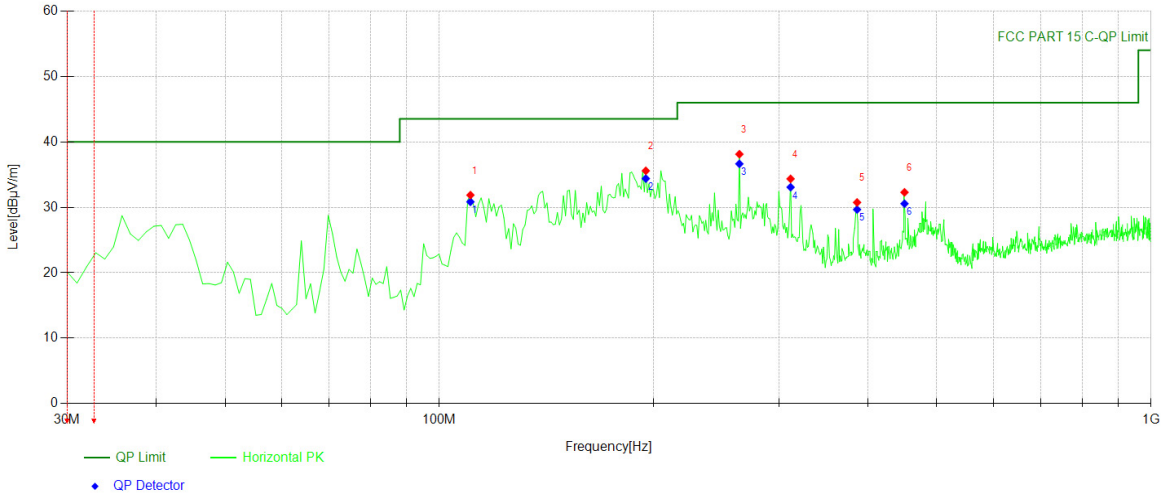


Suspected Data List										
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity	Angle[°]	Height[cm]
1	45.5355	45.28	-17.53	27.75	PK	40.00	12.25	Horizontal	328	100
2	69.8098	48.82	-19.94	28.88	PK	40.00	11.12	Horizontal	240	100
3	112.5325	47.52	-17.47	30.05	PK	43.50	13.45	Horizontal	272	100
4	183.4134	55.56	-18.17	37.39	PK	43.50	6.11	Horizontal	314	100
5	264.004	52.39	-15.00	37.39	PK	46.00	8.61	Horizontal	272	100
6	450.4304	43.68	-11.13	32.55	PK	46.00	13.45	Horizontal	124	100

2440

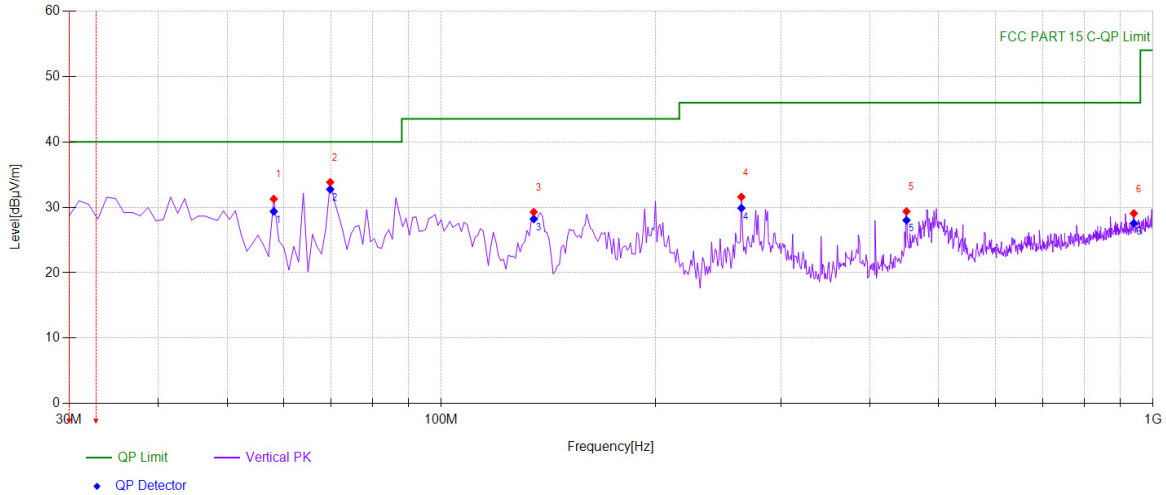


Suspected Data List										
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity	Angle[°]	Height[cm]
1	39.7097	53.83	-17.93	35.90	PK	40.00	4.10	Vertical	301	100
2	100.8809	47.14	-16.84	30.30	PK	43.50	13.20	Vertical	200	100
3	153.3133	49.42	-19.71	29.71	PK	43.50	13.79	Vertical	306	100
4	190.2102	46.39	-17.74	28.65	PK	43.50	14.85	Vertical	292	100
5	264.004	46.62	-15.00	31.62	PK	46.00	14.38	Vertical	159	100
6	485.3854	39.16	-9.79	29.37	PK	46.00	16.63	Vertical	209	100

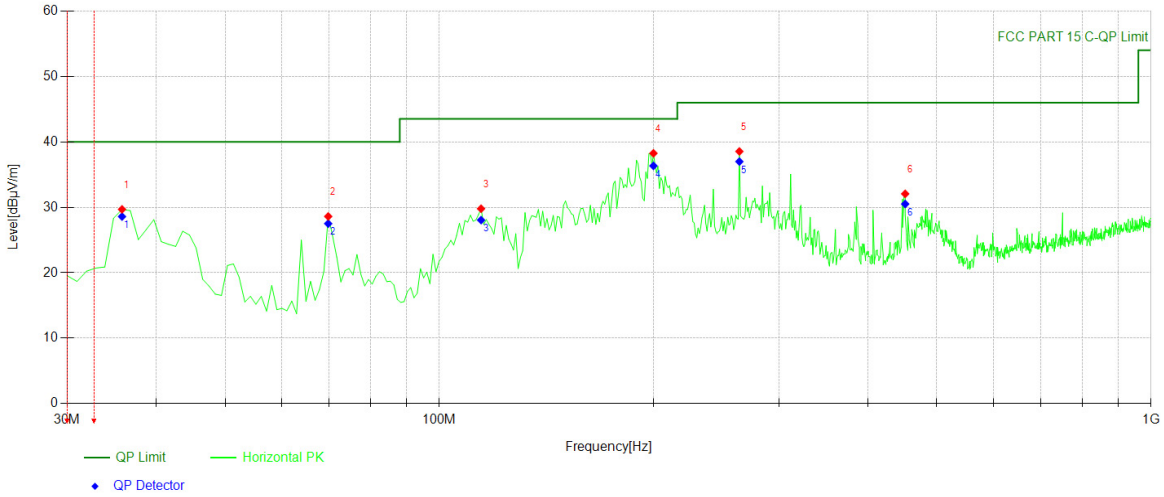


Suspected Data List										
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity	Angle[°]	Height[cm]
1	110.5906	49.22	-17.35	31.87	PK	43.50	11.63	Horizontal	218	100
2	195.0651	53.01	-17.43	35.58	PK	43.50	7.92	Horizontal	282	100
3	264.004	53.12	-15.00	38.12	PK	46.00	7.88	Horizontal	278	100
4	311.5816	48.50	-14.15	34.35	PK	46.00	11.65	Horizontal	287	100
5	386.3463	42.58	-11.83	30.75	PK	46.00	15.25	Horizontal	117	100
6	450.4304	43.42	-11.13	32.29	PK	46.00	13.71	Horizontal	103	100

2480



Suspected Data List										
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity	Angle[°]	Height[cm]
1	58.1582	49.58	-18.30	31.28	PK	40.00	8.72	Vertical	64	100
2	69.8098	53.77	-19.94	33.83	PK	40.00	6.17	Vertical	221	100
3	134.8649	48.77	-19.49	29.28	PK	43.50	14.22	Vertical	305	100
4	264.004	46.59	-15.00	31.59	PK	46.00	14.41	Vertical	157	100
5	450.4304	40.50	-11.13	29.37	PK	46.00	16.63	Vertical	330	100
6	939.7998	31.51	-2.44	29.07	PK	46.00	16.93	Vertical	101	100



Suspected Data List										
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity	Angle[°]	Height[cm]
1	35.8258	47.86	-18.17	29.69	PK	40.00	10.31	Horizontal	53	100
2	69.8098	48.55	-19.94	28.61	PK	40.00	11.39	Horizontal	247	100
3	114.4745	47.38	-17.59	29.79	PK	43.50	13.71	Horizontal	266	100
4	199.9199	55.38	-17.13	38.25	PK	43.50	5.25	Horizontal	266	100
5	264.004	53.54	-15.00	38.54	PK	46.00	7.46	Horizontal	256	100
6	451.4014	43.18	-11.12	32.06	PK	46.00	13.94	Horizontal	118	100

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 7.3 conducted 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