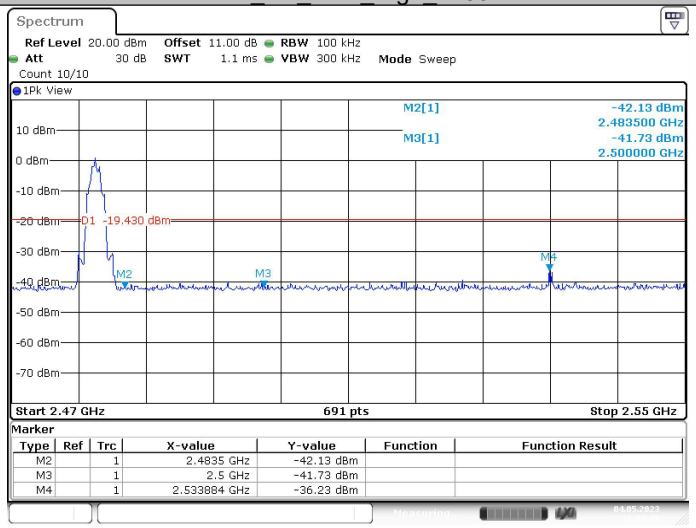
BLE_2M_Ant1_High_2480



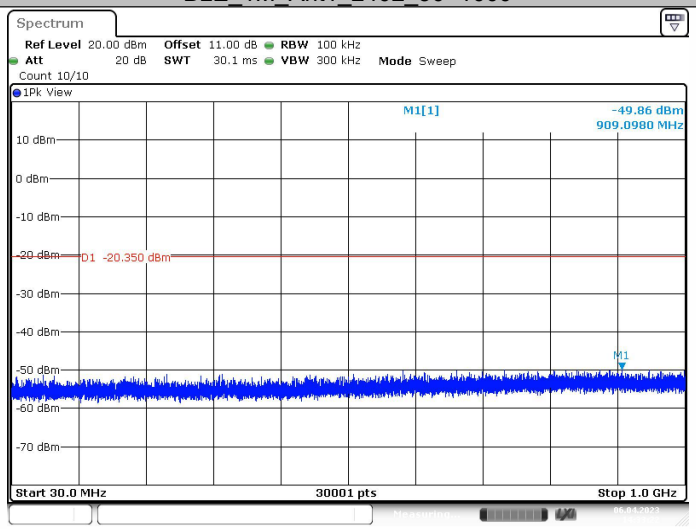
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M2		1	2.4835 GHz	-42.13 dBm		
M3		1	2.5 GHz	-41.73 dBm		
M4		1	2.533884 GHz	-36.23 dBm		

Date: 4.MAY.2023 16:05:50

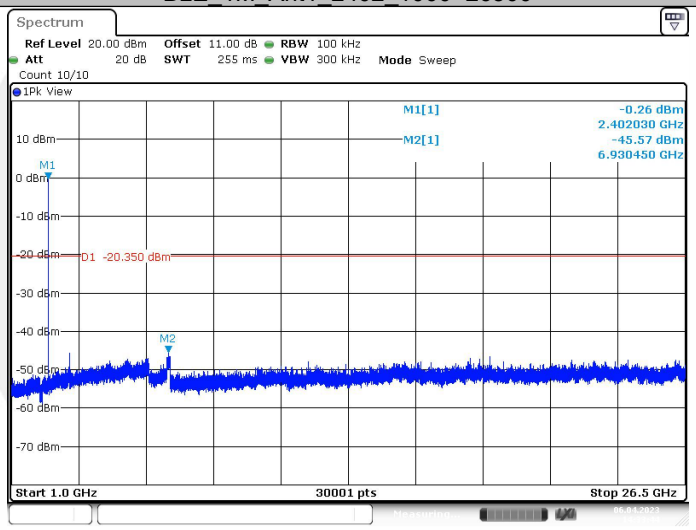
Conducted Spurious Emission

BLE_1M_Ant1_2402_30~1000



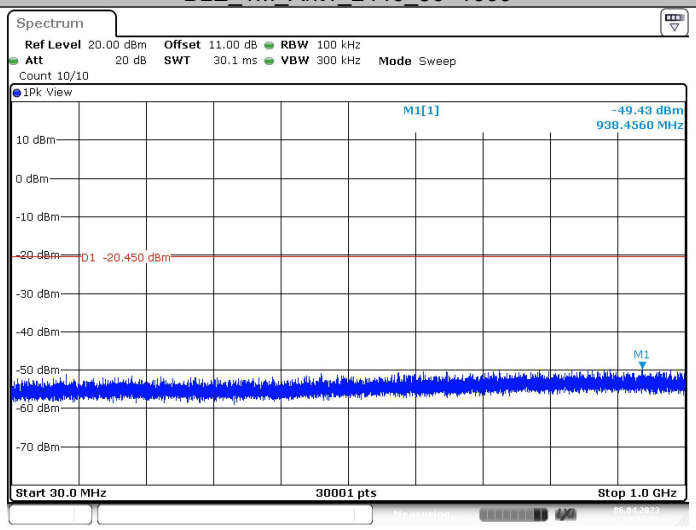
Date: 6.APR.2023 14:33:23

BLE_1M_Ant1_2402_1000~26500



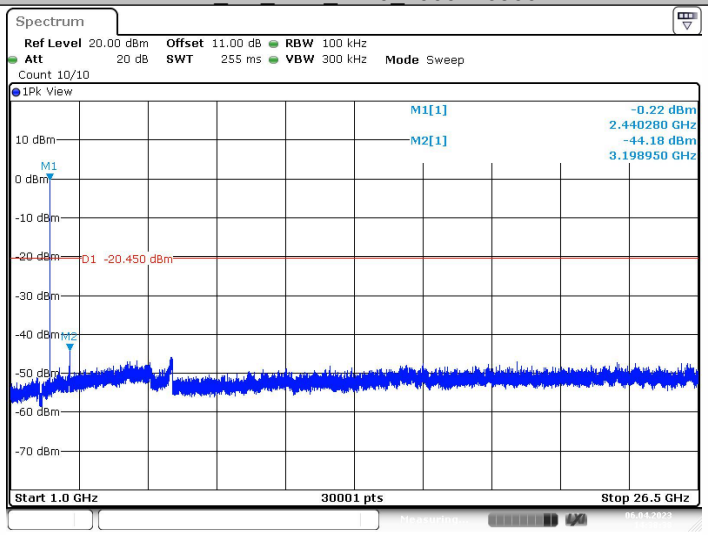
Date: 6.APR.2023 14:33:45

BLE_1M_Ant1_2440_30~1000



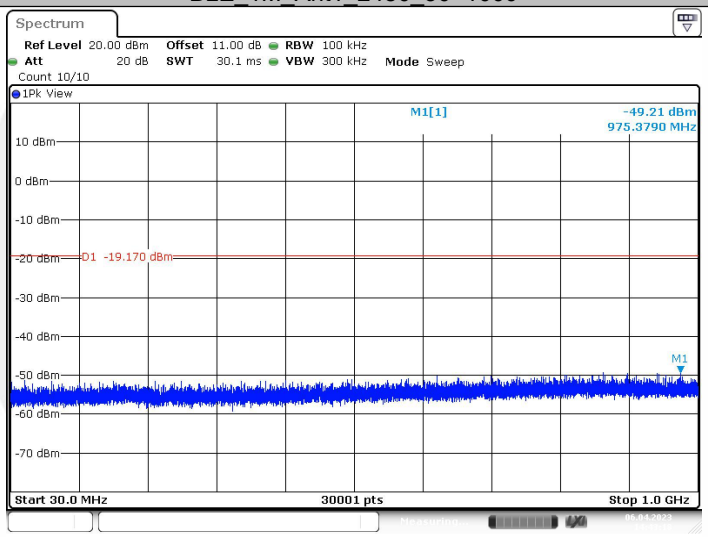
Date: 6.APR.2023 14:38:16

BLE_1M_Ant1_2440_1000~26500



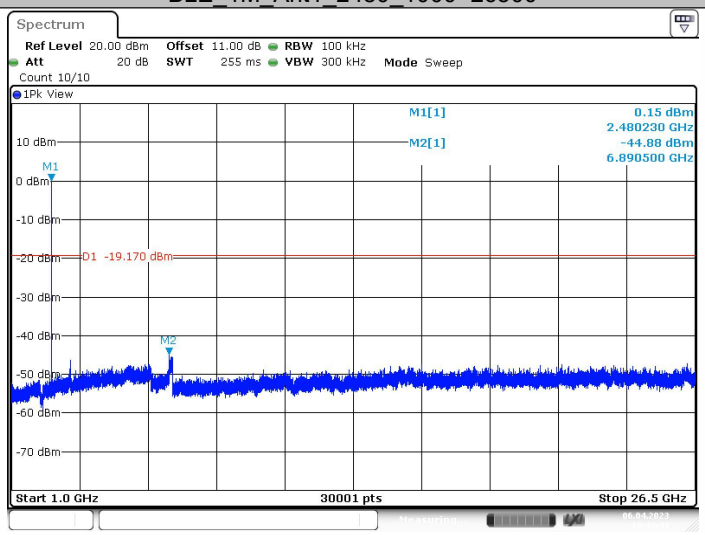
Date: 6.APR.2023 14:38:39

BLE_1M_Ant1_2480_30~1000



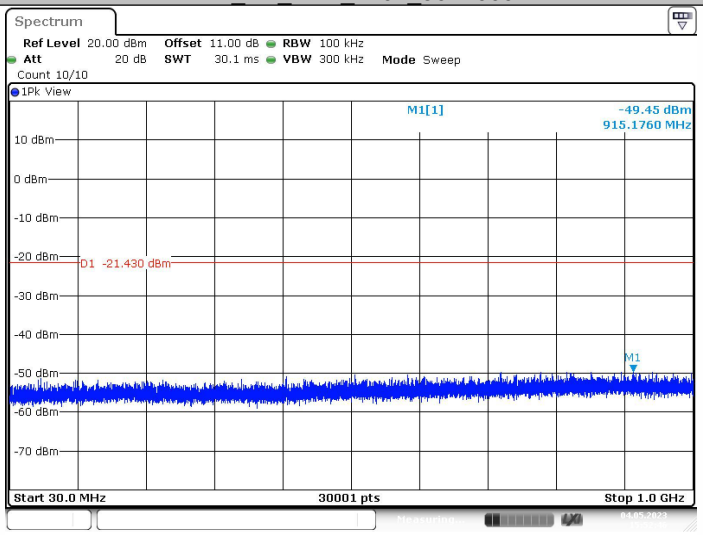
Date: 6.APR.2023 14:43:19

BLE_1M_Ant1_2480_1000~26500



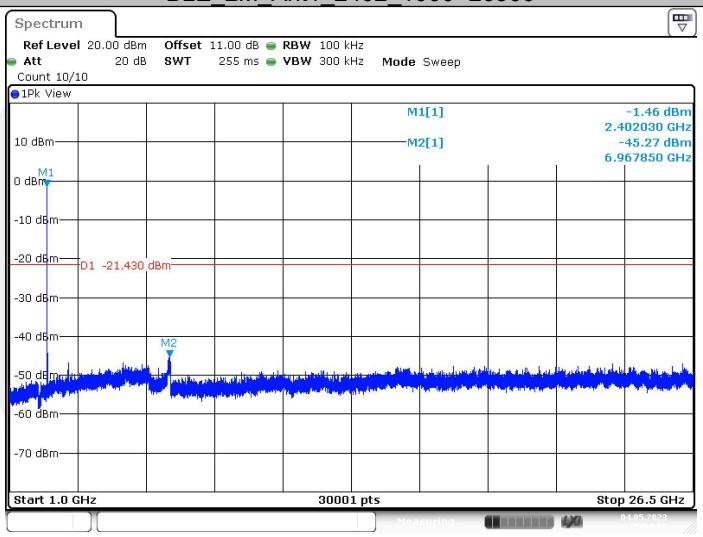
Date: 6.APR.2023 14:43:41

BLE_2M_Ant1_2402_30~1000



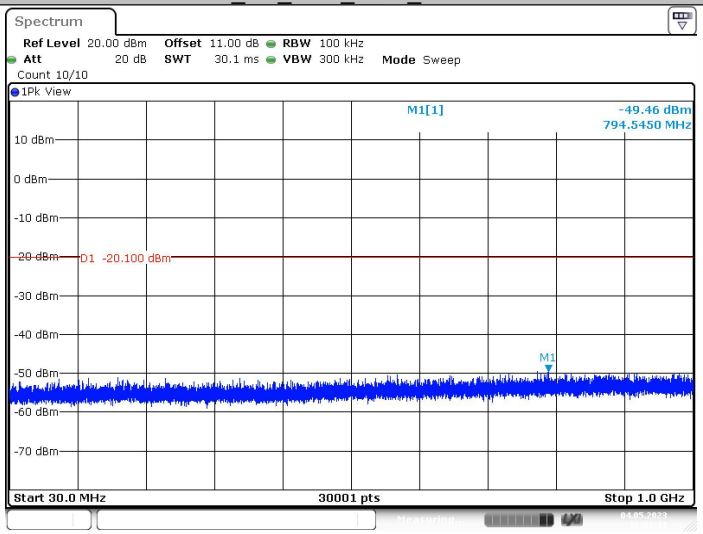
Date: 4.MAY.2023 15:52:47

BLE_2M_Ant1_2402_1000~26500



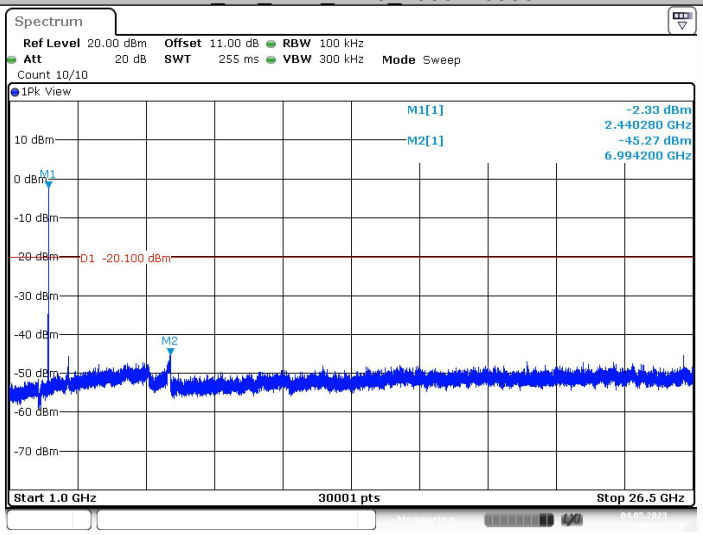
Date: 4.MAY.2023 15:53:09

BLE_2M_Ant1_2440_30~1000



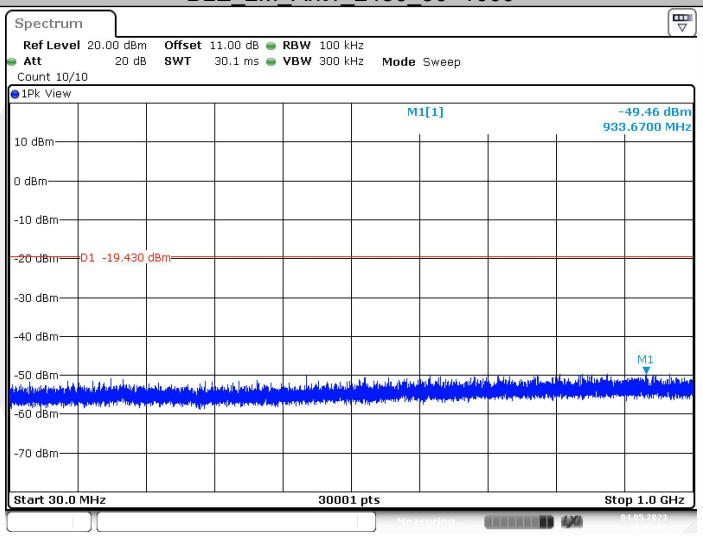
Date: 4.MAY.2023 16:03:11

BLE_2M_Ant1_2440_1000~26500



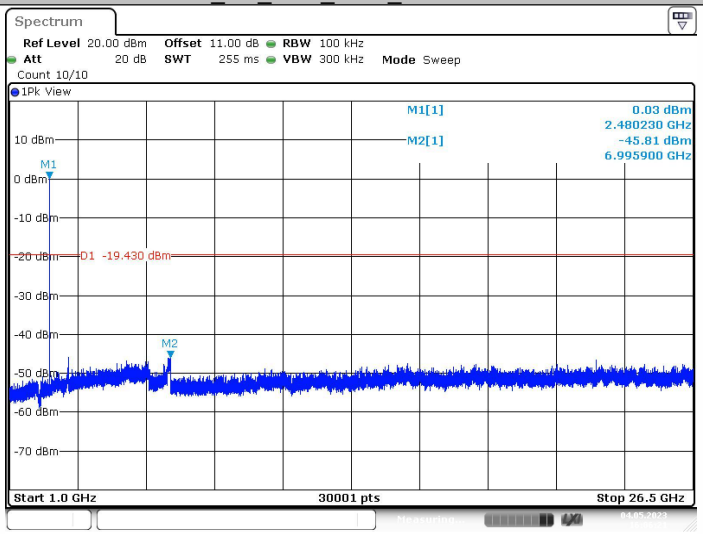
Date: 4.MAY.2023 16:03:33

BLE_2M_Ant1_2480_30~1000



Date: 4.MAY.2023 16:05:58

BLE_2M_Ant1_2480_1000~26500



Date: 4.MAY.2023 16:06:20

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:	60%
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)

Bluetooth 5.0 DTS mode have been tested, and the worst result was report as below:

Test mode: BLE(1M) 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
11390.6	V	59.93	41.44	74	54	14.07	12.56
14557.5	V	63.16	45.06	74	54	10.84	8.94
17619.3	V	69.88	47.44	74	54	4.12	6.56
11368.1	H	60.17	41.71	74	54	13.83	12.29
14617.5	H	63.19	46.06	74	54	10.81	7.94
17598.7	H	69.18	48.51	74	54	4.82	5.49

Test mode: BLE(1M) 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
11409.3	V	59.95	42.04	74	54	14.05	11.96
14658.7	V	63.37	45.09	74	54	10.63	8.91
17636.2	V	69.93	47.05	74	54	4.07	6.95
11345.6	H	59.56	41.83	74	54	14.44	12.17
14568.7	H	63.87	45.50	74	54	10.13	8.50
17615.6	H	69.24	48.20	74	54	4.76	5.80

Test mode: BLE(1M) 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
11505	V	59.21	42.82	74	54	14.79	11.18
14598.7	V	64.08	46.22	74	54	9.92	7.78
17610	V	69.09	47.06	74	54	4.91	6.94
11512.5	H	60.10	43.07	74	54	13.90	10.93
14593.1	H	64.79	46.75	74	54	9.21	7.25
17615.6	H	70.05	47.66	74	54	3.95	6.34

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(1M) Frequency: Channel 0: 2402MHz

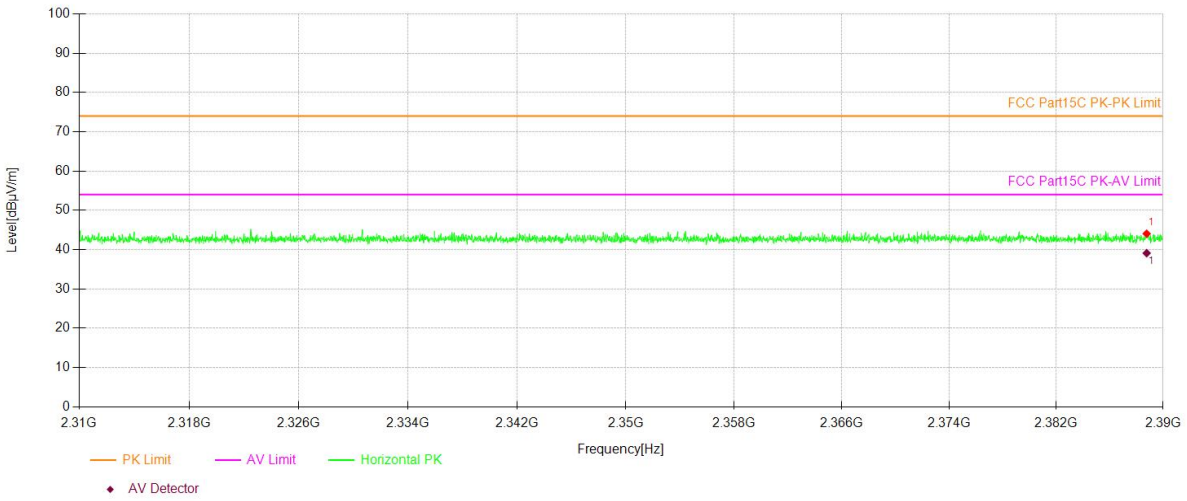
Frequency (MHz)	Polarity	PK(dBuV/m) (VBW=3MHz)	Limit 3m (dBuV/m)	Margin (dB)	AV(dBuV/m) (VBW=10Hz)	Limit 3m (dBuV/m)	Margin (dB)
2388.77	H	44.04	74	29.96	39.10	54	14.90
2389.73	V	44.40	74	29.60	39.62	54	14.38

Test mode: BLE(1M) Frequency: Channel 39: 2480MHz

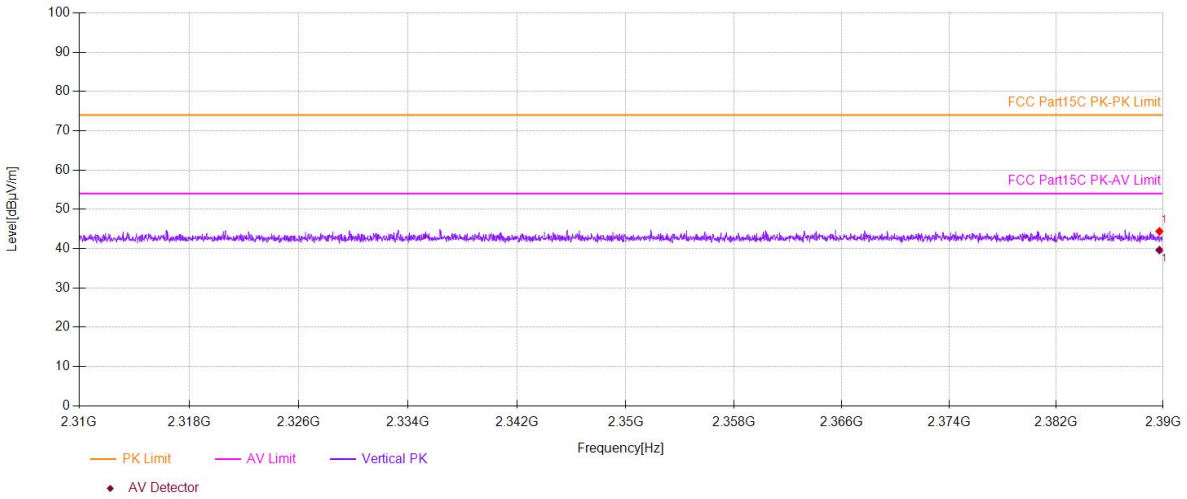
Frequency (MHz)	Polarity	PK(dBuV/m) (VBW=3MHz)	Limit 3m (dBuV/m)	Margin (dB)	AV(dBuV/m) (VBW=10Hz)	Limit 3m (dBuV/m)	Margin (dB)
2483.74	H	49.14	74	24.86	39.15	54	14.85
2483.65	V	44.89	74	29.11	40.00	54	14.00

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.

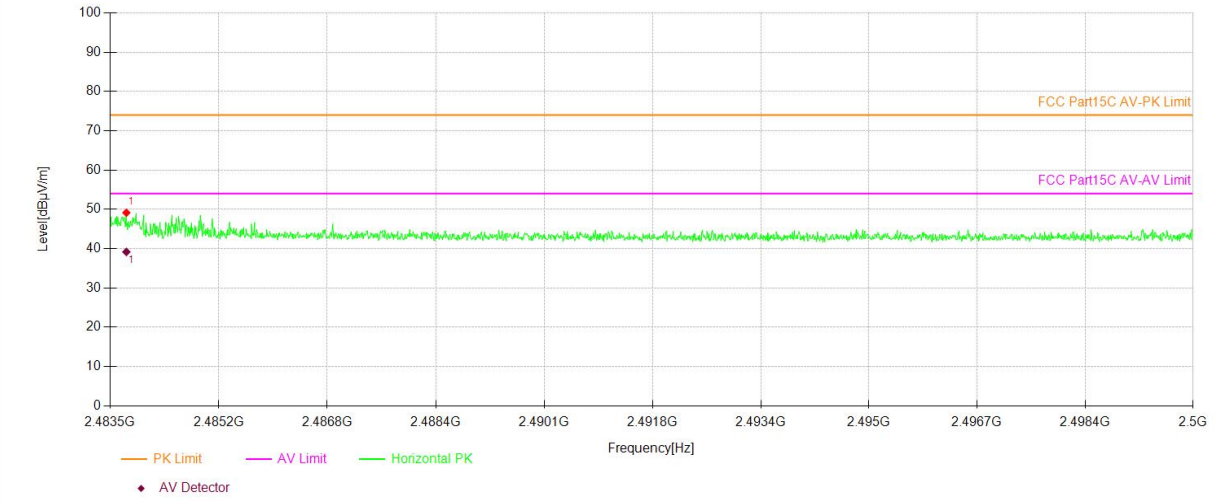
Test Model	Spurious Emission in Restricted Band 2310-2390MHz Bluetooth 5.0 DTS Channel 0: 2402MHz	H



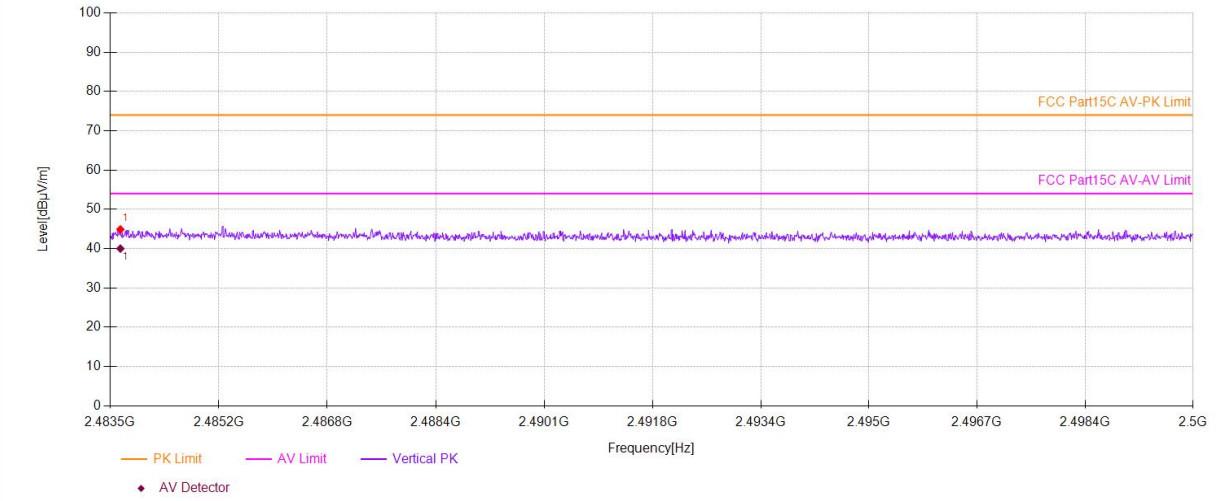
Test Model	Spurious Emission in Restricted Band 2310-2390MHz Bluetooth 5.0 DTS Channel 0: 2402MHz	V



Test Model	Spurious Emission in Restricted Band 2483.5-2500MHz Bluetooth 5.0 DTS Channel 39: 2480MHz	H



Test Model	Spurious Emission in Restricted Band 2483.5-2500MHz Bluetooth 5.0 DTS Channel 39: 2480MHz	V

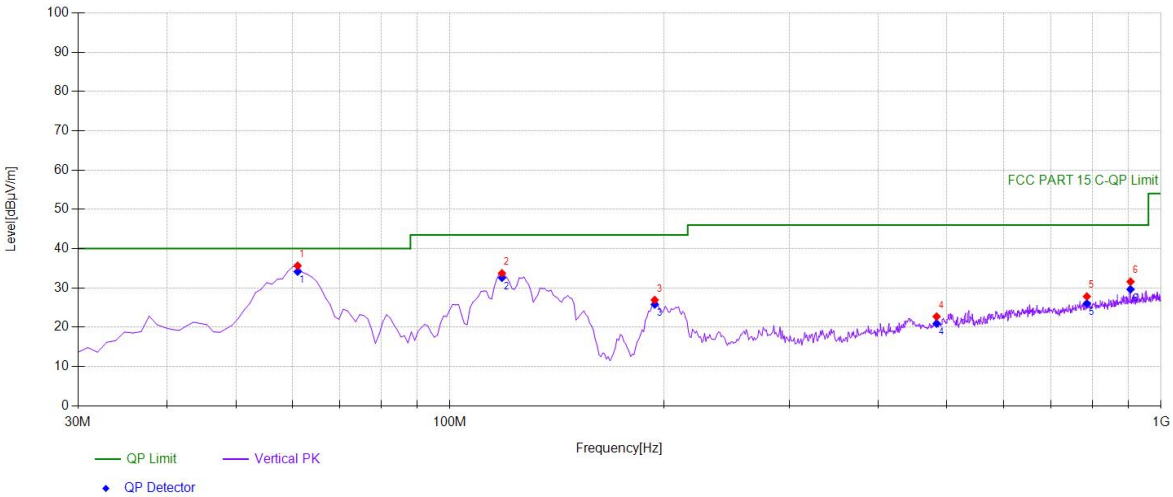


Note: (1) All Readings are Peak Value (VBW=3MHz) and Average Value (VBW=10Hz).
(2) Emission Level= Reading Level+Correct Factor.
(3) Correct Factor= Ant_F + Cab_L - Preamp
(4) The reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be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

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

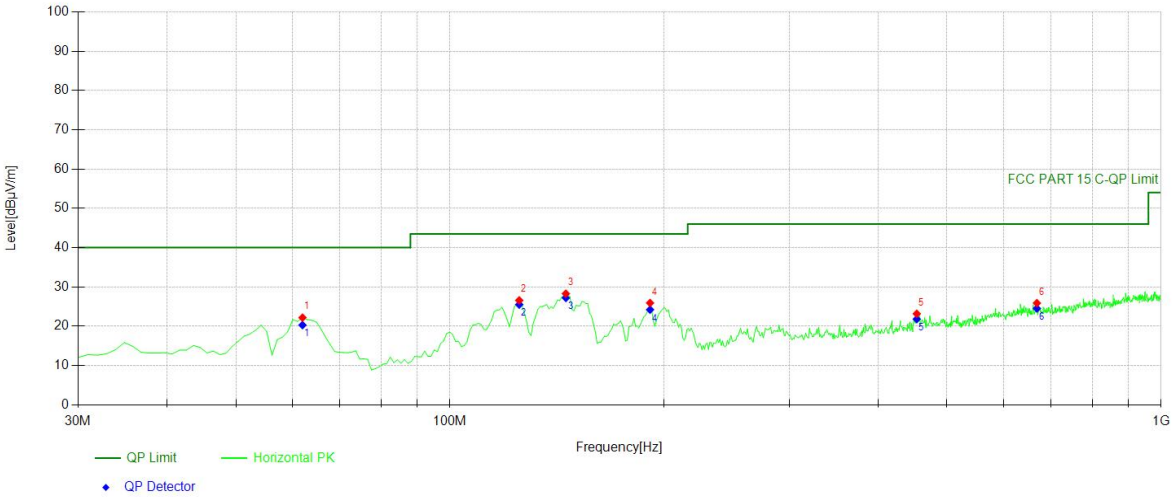
All modes have been tested, and the worst result recorded was report as below:

Mode:	2402



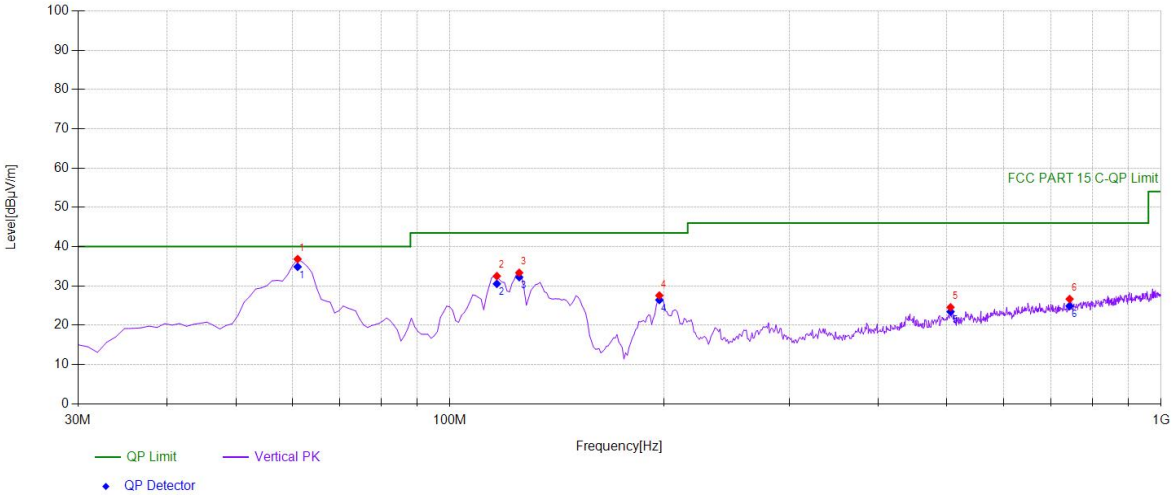
Suspected Data List								
NO.	Freq. [MHz]	Reading [dBµV]	Factor [dB/m]	Level [dBµV/m]	Detector	Limit [dBµV/m]	Margin [dB]	Polarity
1	61.0711	54.34	-18.70	35.64	PK	40.00	4.36	Vertical
2	118.358	51.56	-17.83	33.73	PK	43.50	9.77	Vertical
3	194.094	44.41	-17.49	26.92	PK	43.50	16.58	Vertical
4	483.443	32.49	-9.79	22.70	PK	46.00	23.30	Vertical
5	786.386	32.37	-4.56	27.81	PK	46.00	18.19	Vertical
6	905.815	34.41	-2.83	31.58	PK	46.00	14.42	Vertical

Mode:	2402



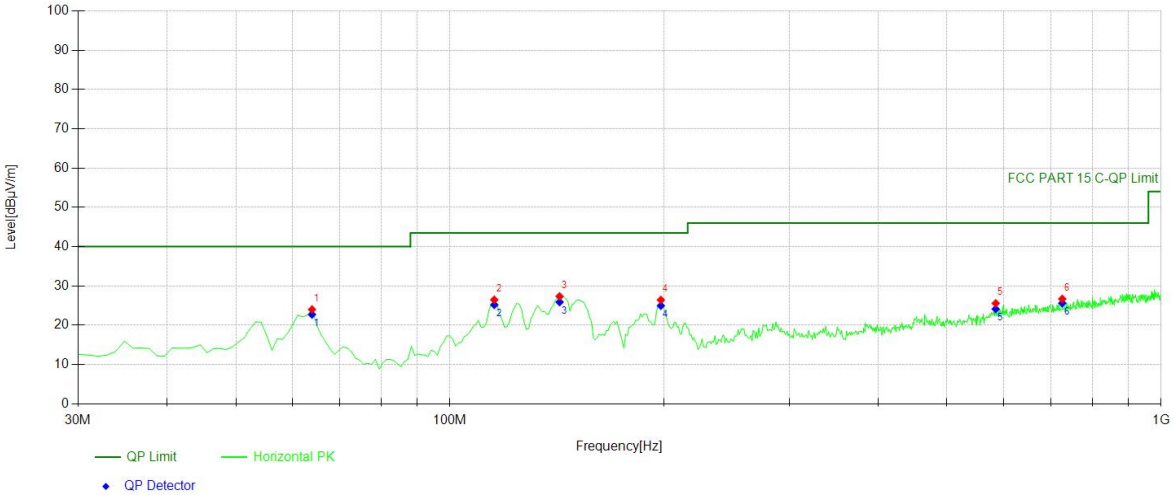
Suspected Data List								
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity
1	62.042	41.01	-18.84	22.17	PK	40.00	17.83	Horizontal
2	125.155	45.03	-18.47	26.56	PK	43.50	16.94	Horizontal
3	145.545	48.13	-19.87	28.26	PK	43.50	15.24	Horizontal
4	191.181	43.58	-17.68	25.90	PK	43.50	17.60	Horizontal
5	453.343	34.25	-11.10	23.15	PK	46.00	22.85	Horizontal
6	668.898	32.00	-6.14	25.86	PK	46.00	20.14	Horizontal

Mode:	2440



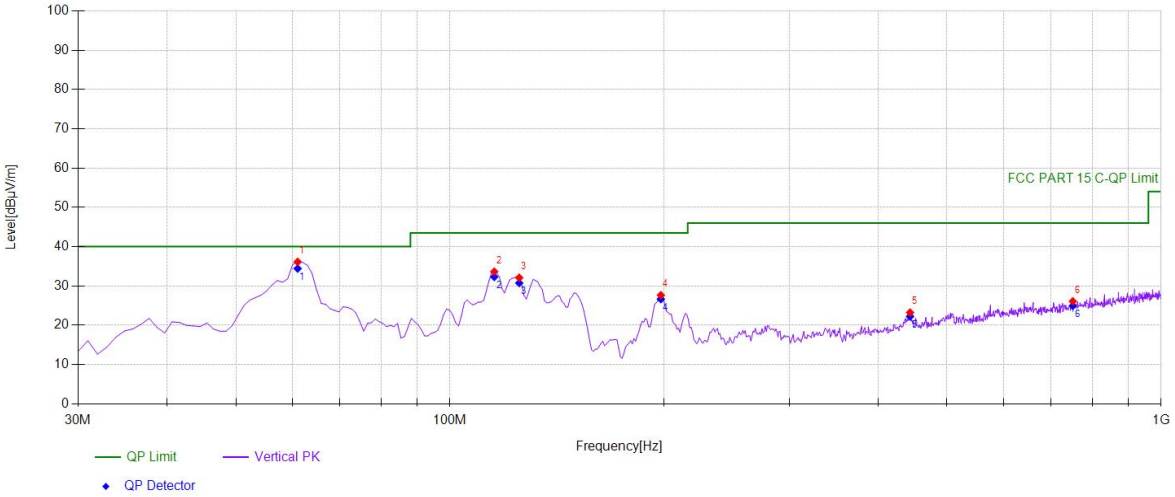
Suspected Data List								
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity
1	61.0711	55.52	-18.70	36.82	PK	40.00	3.18	Vertical
2	116.416	50.20	-17.71	32.49	PK	43.50	11.01	Vertical
3	125.155	51.82	-18.47	33.35	PK	43.50	10.15	Vertical
4	197.007	44.85	-17.31	27.54	PK	43.50	15.96	Vertical
5	505.775	34.32	-9.77	24.55	PK	46.00	21.45	Vertical
6	743.663	31.98	-5.34	26.64	PK	46.00	19.36	Vertical

Mode:	2440



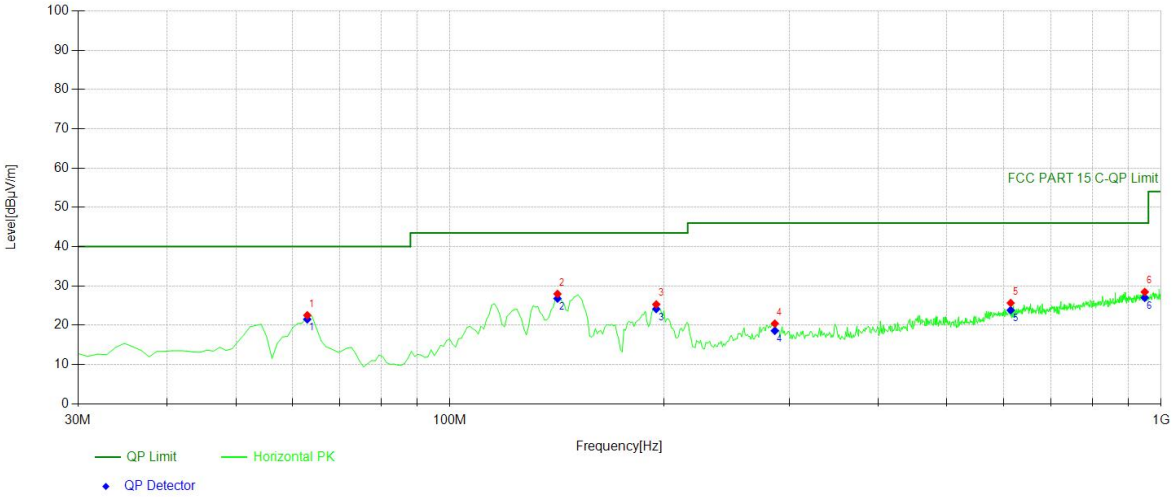
Suspected Data List								
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity
1	63.984	43.10	-19.11	23.99	PK	40.00	16.01	Horizontal
2	115.445	44.11	-17.65	26.46	PK	43.50	17.04	Horizontal
3	142.632	47.27	-19.94	27.33	PK	43.50	16.17	Horizontal
4	197.978	43.66	-17.25	26.41	PK	43.50	17.09	Horizontal
5	585.395	32.69	-7.14	25.55	PK	46.00	20.45	Horizontal
6	726.186	32.38	-5.70	26.68	PK	46.00	19.32	Horizontal

Mode:	2480



Suspected Data List								
NO.	Freq. [MHz]	Reading [dBµV]	Factor [dB/m]	Level [dBµV/m]	Detector	Limit [dBµV/m]	Margin [dB]	Polarity
1	61.0711	54.82	-18.70	36.12	PK	40.00	3.88	Vertical
2	115.445	51.29	-17.65	33.64	PK	43.50	9.86	Vertical
3	125.155	50.55	-18.47	32.08	PK	43.50	11.42	Vertical
4	197.978	44.88	-17.25	27.63	PK	43.50	15.87	Vertical
5	443.633	34.37	-11.16	23.21	PK	46.00	22.79	Vertical
6	751.431	31.41	-5.33	26.08	PK	46.00	19.92	Vertical

Mode:	2480



Suspected Data List								
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity
1	63.013	41.49	-18.98	22.51	PK	40.00	17.49	Horizontal
2	141.661	47.92	-19.97	27.95	PK	43.50	15.55	Horizontal
3	195.065	42.72	-17.43	25.29	PK	43.50	18.21	Horizontal
4	286.336	34.56	-14.17	20.39	PK	46.00	25.61	Horizontal
5	614.524	32.73	-7.10	25.63	PK	46.00	20.37	Horizontal
6	948.538	30.79	-2.35	28.44	PK	46.00	17.56	Horizontal

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

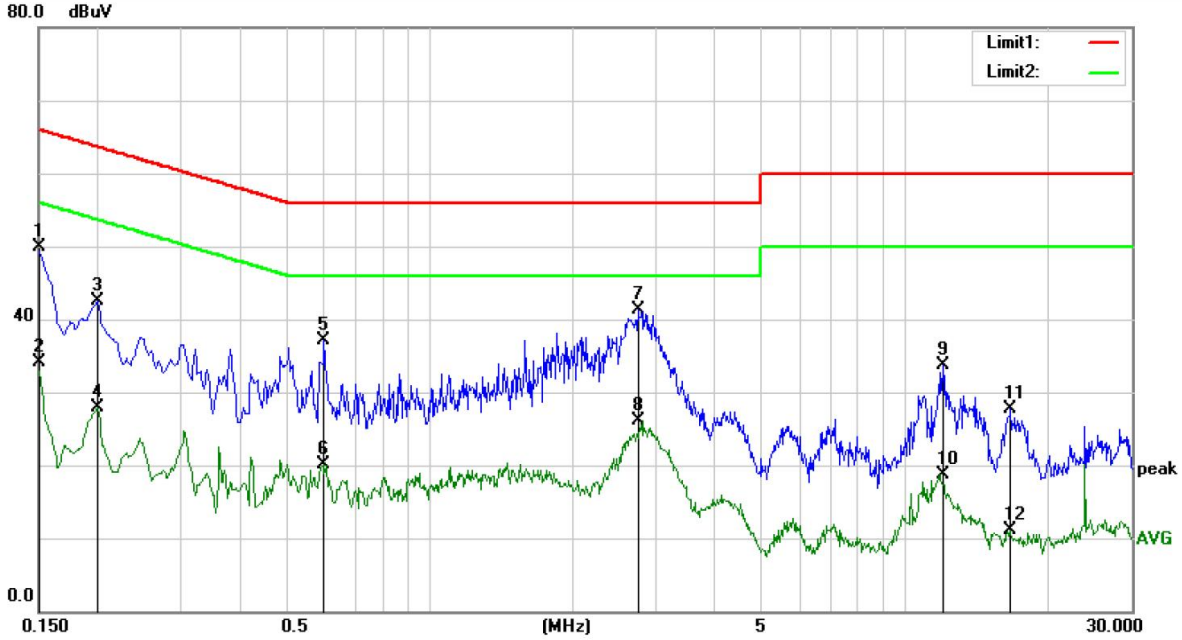
8.6.4 Test Procedure

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

The 120V &240V voltagehave been tested, and the worst result recorded was report as below:



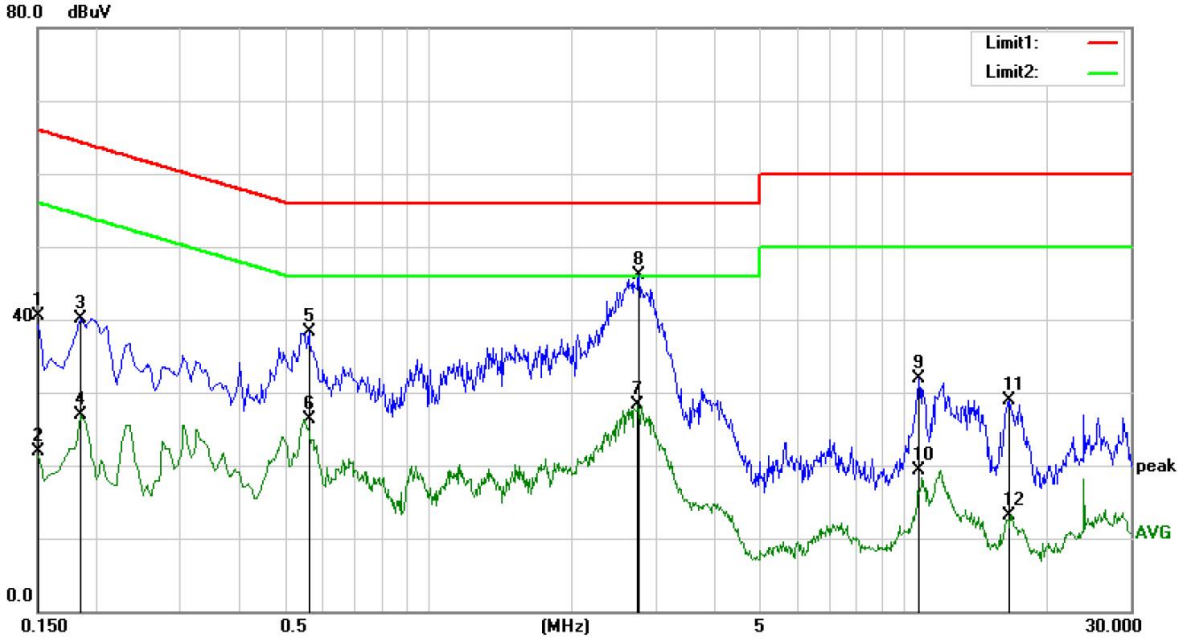
Site Conduction #1 Phase: *N* Temperature: 21.9

Limit: (CE)FCC PART 15 class B_QP Power: AC 120V/60Hz Humidity: 58 %

Mode: BLE Mode

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1500	40.29	9.53	49.82	66.00	-16.18	QP	
2		0.1500	24.53	9.53	34.06	56.00	-21.94	AVG	
3		0.2000	32.99	9.53	42.52	63.61	-21.09	QP	
4		0.2000	18.38	9.53	27.91	53.61	-25.70	AVG	
5		0.6000	27.56	9.54	37.10	56.00	-18.90	QP	
6		0.6000	10.57	9.54	20.11	46.00	-25.89	AVG	
7	*	2.7450	31.74	9.56	41.30	56.00	-14.70	QP	
8		2.7450	16.55	9.56	26.11	46.00	-19.89	AVG	
9		12.0050	23.90	9.74	33.64	60.00	-26.36	QP	
10		12.0050	8.99	9.74	18.73	50.00	-31.27	AVG	
11		16.6800	17.80	9.86	27.66	60.00	-32.34	QP	
12		16.6800	1.25	9.86	11.11	50.00	-38.89	AVG	



Site Conduction #1 Phase: *L1* Temperature: 21.9

Limit: (CE)FCC PART 15 class B_QP Power: AC 120V/60Hz Humidity: 58 %

Mode: BLE Mode

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1500	30.95	9.53	40.48	66.00	-25.52	QP	
2		0.1500	12.32	9.53	21.85	56.00	-34.15	AVG	
3		0.1850	30.56	9.53	40.09	64.26	-24.17	QP	
4		0.1850	17.29	9.53	26.82	54.26	-27.44	AVG	
5		0.5600	28.80	9.53	38.33	56.00	-17.67	QP	
6		0.5600	16.78	9.53	26.31	46.00	-19.69	AVG	
7		2.7550	18.84	9.56	28.40	46.00	-17.60	AVG	
8	*	2.7750	36.57	9.56	46.13	56.00	-9.87	QP	
9		10.7550	22.16	9.72	31.88	60.00	-28.12	QP	
10		10.7550	9.67	9.72	19.39	50.00	-30.61	AVG	
11		16.5800	18.95	9.86	28.81	60.00	-31.19	QP	
12		16.5800	3.32	9.86	13.18	50.00	-36.82	AVG	

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.
FCC 47 CFR Part 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.
RSS-Gen Section 6.8	The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.
RSS-247 Section 5.4	If the transmitter employs an antenna system that emits multiple directional beams, but does not emit multiple directional beams simultaneously, the total output power conducted to the array or arrays that comprise the device (i.e. the sum of the power supplied to all antennas, antenna elements, staves, etc., and summed across all carriers or frequency channels) shall not exceed the applicable output power limit. However, the total conducted output power shall be reduced by 1 dB below the specified limits for each 3 dB that the directional gain of the antenna/antenna array exceeds 6 dBi. The directional antenna gain shall be computed as the sum of 10 log (number of array elements or staves) plus the directional gain of the element or stave having the highest gain.

8.7.2 Result

PASS.

Note:
- ☑ Antenna use 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)

Please refer to the attached documentInternal Photos to show the antenna connector.

*** End of Report ***