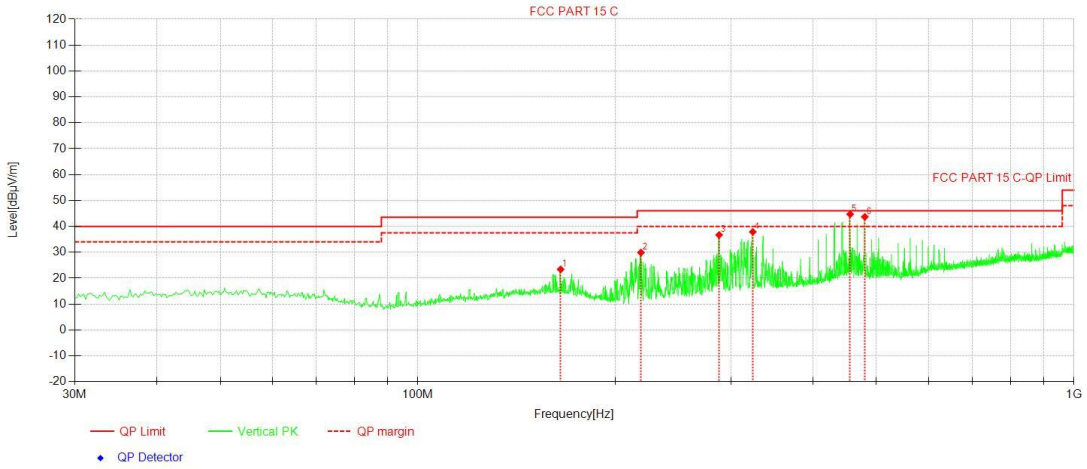
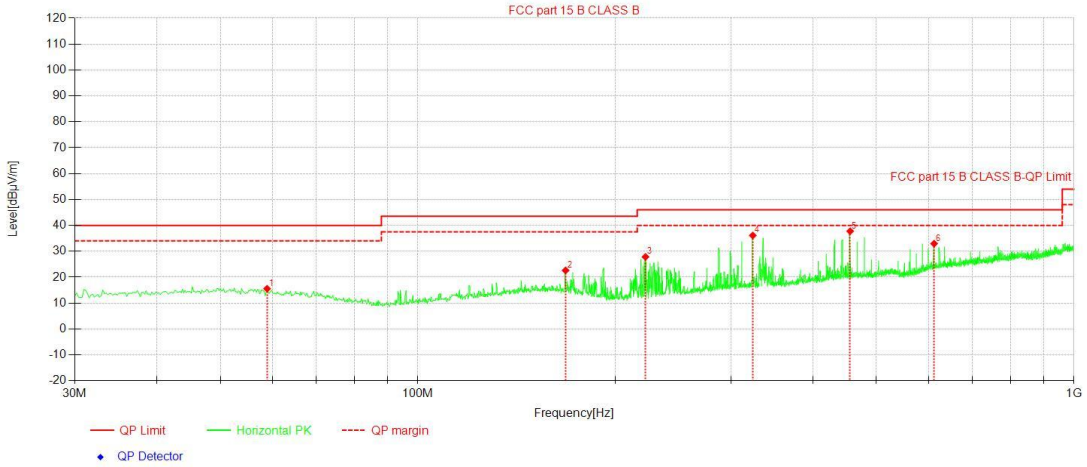
Test Configuration:	Measurements Below 1000MHz • RBW = 120 kHz • VBW = 300 kHz • Detector = Peak • Trace mode = max hold Peak Measurements Above 1000 MHz • RBW = 1 MHz • VBW ⩾ 3 MHz • Detector = Peak • Sweep time = auto • Trace mode = max hold Average Measurements Above 1000MHz • RBW = 1 MHz • VBW = 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.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Charge + Transmitting mode.
Final Test Mode:	Pretest the EUT at Charging+Transmitting mode. Through Pre-scan, find the worst case of GFSK,Only the worst case is recorded in the report.
Instruments Used:	Refer to section 2.9 for details
Test Results:	Pass

Test data

For 30-1000MHz



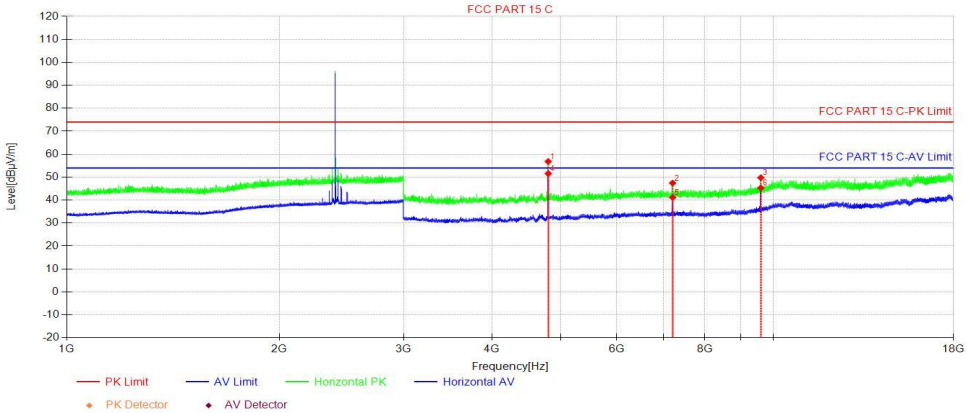
NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	165.05	31.38	-7.97	23.41	43.50	20.09	100	90	PK	Vertical
2	218.80	40.99	-11.09	29.90	46.00	16.10	100	0	PK	Vertical
3	287.88	44.01	-7.30	36.71	46.00	9.29	100	349	PK	Vertical
4	323.97	44.05	-6.16	37.89	46.00	8.11	100	0	PK	Vertical
5	455.92	47.38	-2.68	44.70	46.00	1.30	100	341	PK	Vertical
6	479.98	45.93	-2.24	43.69	46.00	2.31	100	356	PK	Vertical



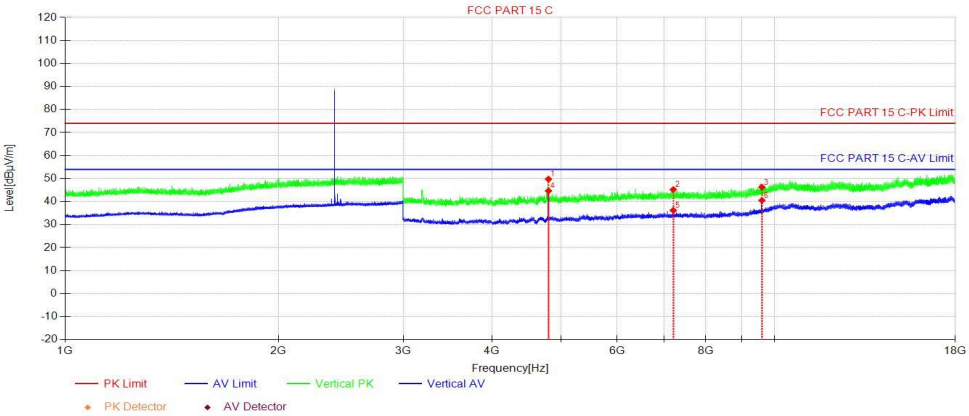
NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	58.91	24.20	-8.65	15.55	40.00	24.45	100	178	PK	Horizontal
2	167.96	30.77	-8.15	22.62	43.50	20.88	200	96	PK	Horizontal
3	222.29	38.88	-11.04	27.84	46.00	18.16	100	277	PK	Horizontal
4	323.97	42.28	-6.16	36.12	46.00	9.88	100	72	PK	Horizontal
5	455.92	40.44	-2.68	37.76	46.00	8.24	200	90	PK	Horizontal
6	612.12	32.00	0.95	32.95	46.00	13.05	100	272	PK	Horizontal

For above 1GHz

BLE 1M 2402MHz

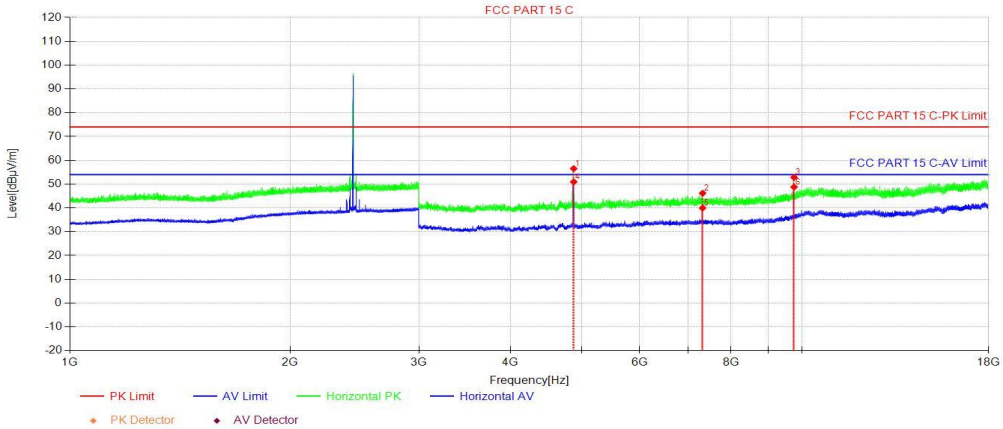


NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	4803.84	61.42	-4.61	56.81	74.00	17.19	150	56	PK	Horizontal
2	7205.46	49.19	-1.77	47.42	74.00	26.58	150	218	PK	Horizontal
3	9607.83	48.88	0.87	49.75	74.00	24.25	150	356	PK	Horizontal
4	4804.59	56.14	-4.61	51.53	54.00	2.47	150	73	AV	Horizontal
5	7206.96	42.91	-1.76	41.15	54.00	12.85	150	322	AV	Horizontal
6	9608.58	44.41	0.88	45.29	54.00	8.71	150	282	AV	Horizontal

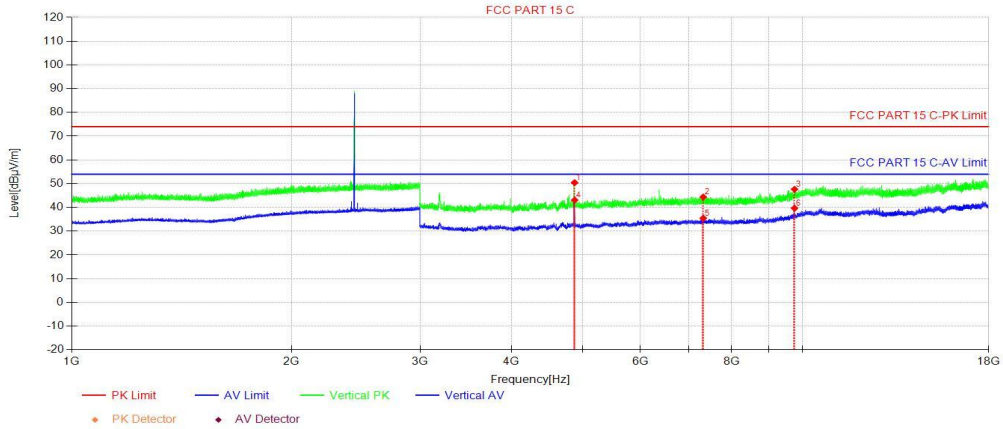


NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	AV Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	4804.59	54.36	-4.61	49.75	74.00	24.25	150	323	PK	Vertical
2	7206.21	46.98	-1.76	45.22	74.00	28.78	150	251	PK	Vertical
3	9608.58	45.37	0.88	46.25	74.00	27.75	150	19	PK	Vertical
4	4804.59	49.25	-4.61	44.64	54.00	9.36	150	323	AV	Vertical
5	7206.21	37.93	-1.76	36.17	54.00	17.83	150	323	AV	Vertical
6	9608.58	39.64	0.88	40.52	54.00	13.48	150	342	AV	Vertical

BLE 1M 2440MHz

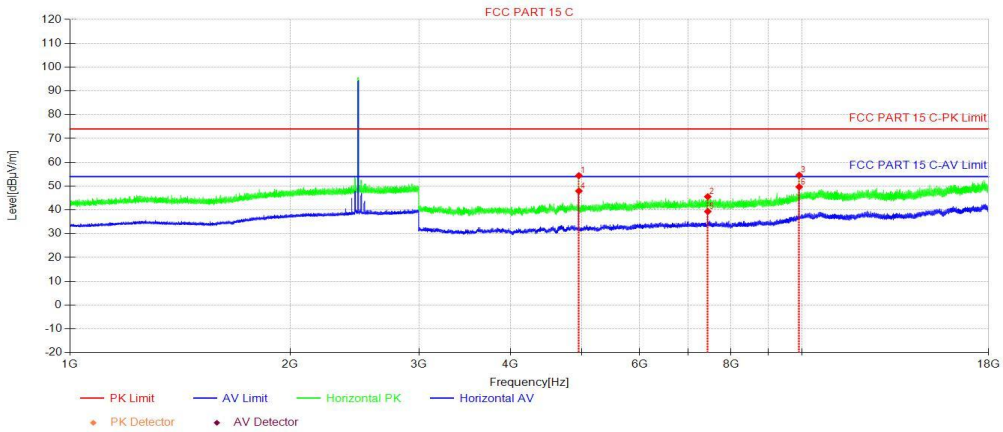


NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	AV Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	4879.59	61.20	-4.70	56.50	74.00	17.50	150	39	PK	Horizontal
2	7320.22	47.65	-1.49	46.16	74.00	27.84	150	327	PK	Horizontal
3	9760.09	51.24	1.62	52.86	74.00	21.14	150	358	PK	Horizontal
4	4880.34	55.64	-4.71	50.93	54.00	3.07	150	57	AV	Horizontal
5	7320.22	41.44	-1.49	39.95	54.00	14.05	150	309	AV	Horizontal
6	9760.84	47.14	1.63	48.77	54.00	5.23	150	346	AV	Horizontal

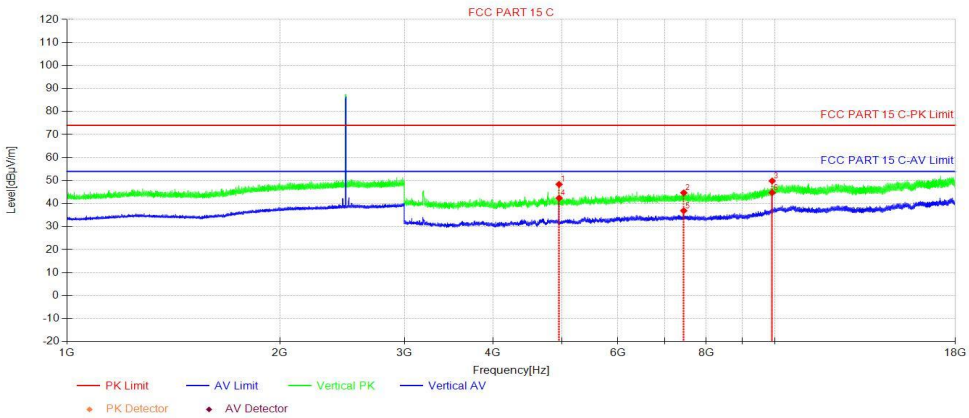


NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	AV Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	4879.59	55.12	-4.70	50.42	74.00	23.58	150	37	PK	Vertical
2	7320.22	45.85	-1.49	44.36	74.00	29.64	150	128	PK	Vertical
3	9760.09	45.99	1.62	47.61	74.00	26.39	150	164	PK	Vertical
4	4881.09	47.78	-4.71	43.07	54.00	10.93	150	37	AV	Vertical
5	7320.22	36.93	-1.49	35.44	54.00	18.56	150	360	AV	Vertical
6	9760.09	38.04	1.62	39.66	54.00	14.34	150	20	AV	Vertical

BLE 1M 2480MHz



NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	AV Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	4959.85	59.26	-4.86	54.40	74.00	19.60	150	56	PK	Horizontal
2	7440.22	46.89	-1.34	45.55	74.00	28.45	150	266	PK	Horizontal
3	9920.60	52.34	2.27	54.61	74.00	19.39	150	348	PK	Horizontal
4	4960.60	52.80	-4.86	47.94	54.00	6.06	150	56	AV	Horizontal
5	7440.97	40.66	-1.34	39.32	54.00	14.68	150	266	AV	Horizontal
6	9920.60	47.36	2.27	49.63	54.00	4.37	150	295	AV	Horizontal



NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	AV Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	4959.85	53.22	-4.86	48.36	74.00	25.64	150	318	PK	Vertical
2	7440.22	46.04	-1.34	44.70	74.00	29.30	150	284	PK	Vertical
3	9919.85	47.57	2.26	49.83	74.00	24.17	150	318	PK	Vertical
4	4960.60	47.24	-4.86	42.38	54.00	11.62	150	318	AV	Vertical
5	7440.22	38.24	-1.34	36.90	54.00	17.10	150	3	AV	Vertical
6	9920.60	42.47	2.27	44.74	54.00	9.26	150	318	AV	Vertical

Note:

1. The Measurement (Result Level) is calculated by Reading Level adding the Correct Factor(maybe including Ant.Factor and the Cable Factor etc.), The basic equation is as follows:

   Result Level= Reading Level + Correct Factor(including Ant.Factor, Cable Factor etc.)

2. The amplitude of 9KHz to 30MHz spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

3. The amplitude of 18GHz to 25GHz spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be report.

4. All channels had been pre-test,only the worst case was reported.

3.9 Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205		
Test Method:	ANSI C63.10: 2013 Section 11.12		
Test Site:	Measurement Distance: 3m or 10m (Semi-Anechoic Chamber)		
Limit:	Frequency	Limit (dBuV/m)	Remark
	30MHz-88MHz	40.0	Quasi-peak
	88MHz-216MHz	43.5	Quasi-peak
	216MHz-960MHz	46.0	Quasi-peak
	960MHz-1GHz	54.0	Quasi-peak
	Above 1GHz	54.0	Average Value
		74.0	Peak Value
Test Setup:			

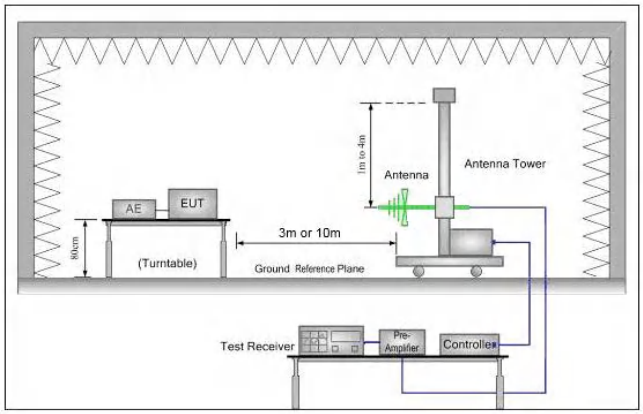


Figure 1. 30MHz to 1GHz

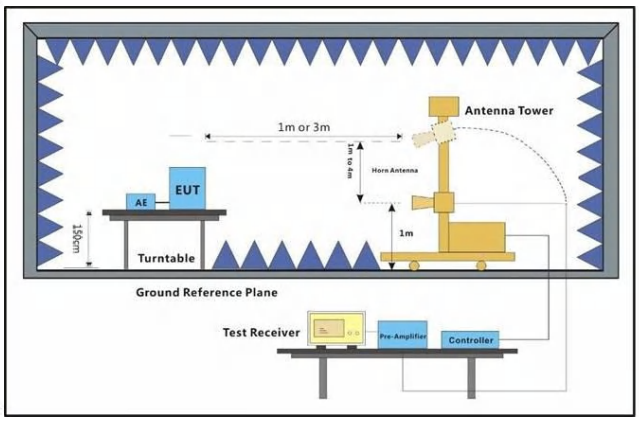
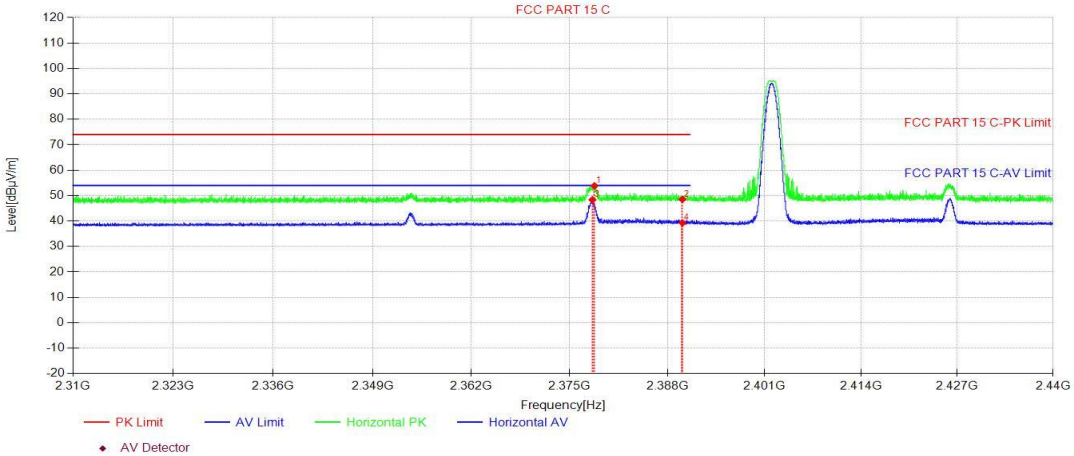


Figure 2. Above 1 GHz

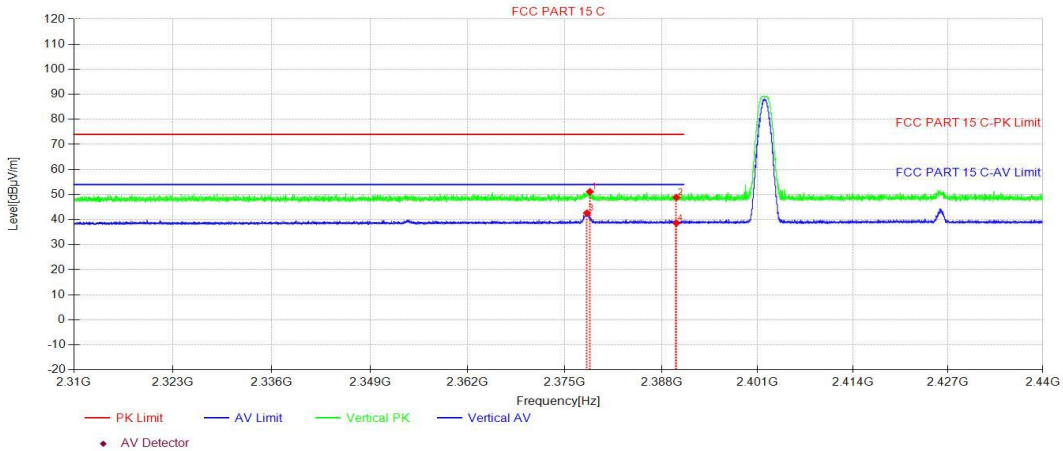
Test Procedure:	a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. g. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel h. Test the EUT in the lowest channel , the Highest channel i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode,And found the X axis positioning which it is worse case. j. Repeat above procedures until all frequencies measured was complete.
Test Configuration:	Measurements Below 1000MHz

	• RBW = 120 kHz • VBW = 300 kHz • Detector = Peak • Trace mode = max hold Peak Measurements Above 1000 MHz • RBW = 1 MHz • VBW ⩾ 3 MHz • Detector = Peak • Sweep time = auto • Trace mode = max hold Average Measurements Above 1000MHz • RBW = 1 MHz • 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.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Transmitting mode.
Final Test Mode:	Pretest the EUT at Charge + Transmitting mode. Through Pre-scan, find the worst case of GFSK Only the worst case is recorded in the report.
Instruments Used:	Refer to section 2.9 for details
Test Results:	Pass

Test Date
BLE 1M 2402MHz

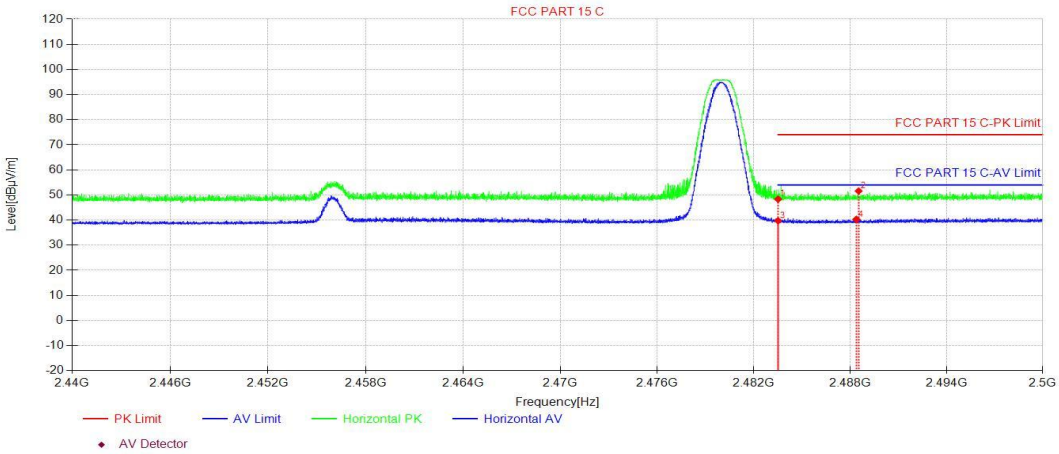


NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	AV Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	2378.28	54.66	-0.84	53.82	74.00	20.18	150	278	PK	Horizontal
2	2390.01	49.33	-0.80	48.53	74.00	25.47	150	268	PK	Horizontal
3	2378.02	49.19	-0.84	48.35	54.00	5.65	150	278	AV	Horizontal
4	2390.01	40.03	-0.80	39.23	54.00	14.77	150	278	AV	Horizontal

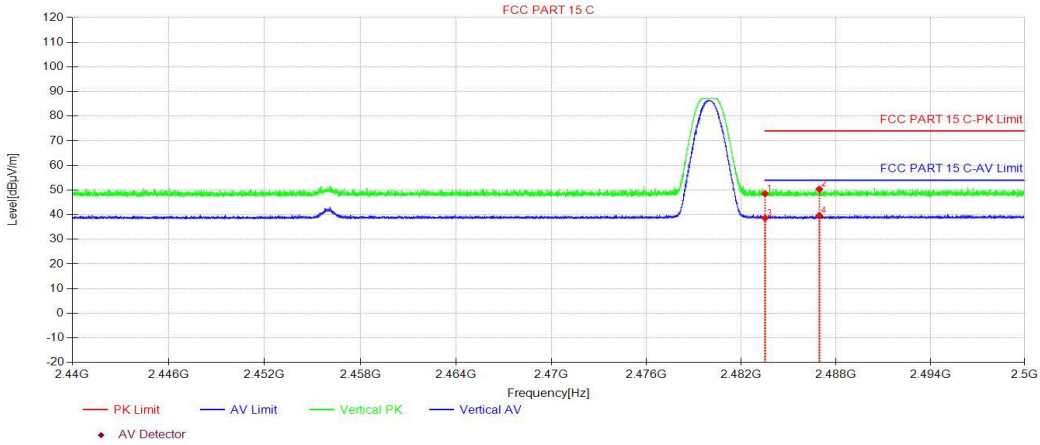


NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	AV Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	2378.36	51.95	-0.84	51.11	74.00	22.89	150	15	PK	Vertical
2	2390.01	49.63	-0.80	48.83	74.00	25.17	150	227	PK	Vertical
3	2377.97	43.45	-0.84	42.61	54.00	11.39	150	4	AV	Vertical
4	2390.01	39.39	-0.80	38.59	54.00	15.41	150	104	AV	Vertical

BLE 2480MHz



NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	AV Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	2483.50	48.60	-0.29	48.31	74.00	25.69	150	277	PK	Horizontal
2	2488.51	51.82	-0.25	51.57	74.00	22.43	150	38	PK	Horizontal
3	2483.50	39.99	-0.29	39.70	54.00	14.30	150	265	AV	Horizontal
4	2488.38	40.57	-0.26	40.31	54.00	13.69	150	287	AV	Horizontal



NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	AV Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	2483.50	48.81	-0.29	48.52	74.00	25.48	150	25	PK	Vertical
2	2486.94	50.60	-0.26	50.34	74.00	23.66	150	322	PK	Vertical
3	2483.50	38.89	-0.29	38.60	54.00	15.40	150	254	AV	Vertical
4	2486.94	39.90	-0.26	39.64	54.00	14.36	150	322	AV	Vertical

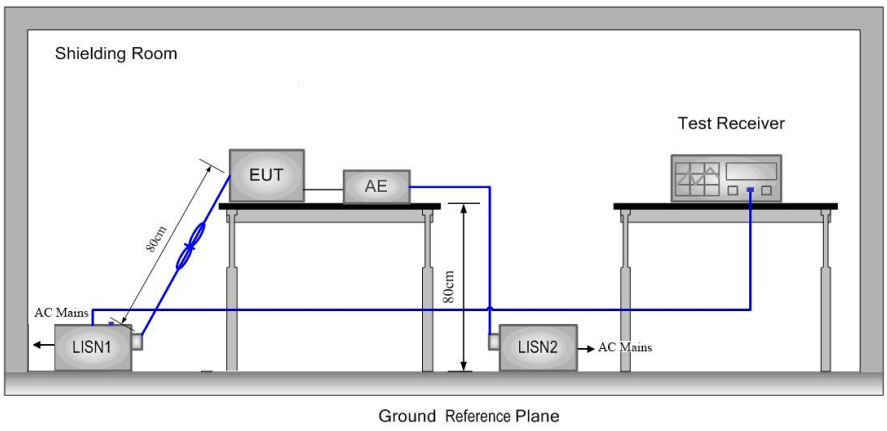
Note:

1. The BLE 1M is the worse case.

2. The Measurement (Result Level) is calculated by Reading Level adding the Correct Factor(maybe including Ant.Factor and the Cable Factor etc.), The basic equation is as follows:

Result Level= Reading Level + Correct Factor(including Ant.Factor ,Cable Factor etc.)

3.10AC Power Line Conducted Emissions

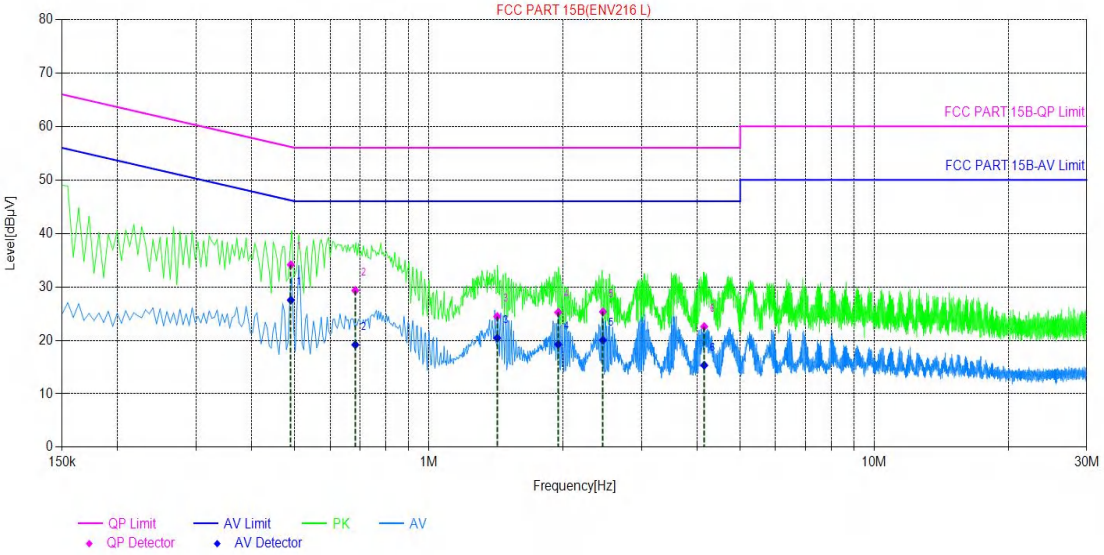
Test Requirement:	47 CFR Part 15C Section 15.207		
Test Method:	ANSI C63.10: 2013		
Test Frequency Range:	150kHz to 30MHz		
Limit:	Frequency range (MHz)	Limit (dBuV)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
	* Decreases with the logarithm of the frequency.		
Test Procedure:	1) The mains terminal disturbance voltage test was conducted in a shielded room. 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded. 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 2013 on conducted measurement.		
Test Setup:			

Exploratory Test Mode:	Transmitting with all kind of modulations, data rates at lowest, middle and highest channel. Charge + Transmitting mode.
Final Test Mode:	Through Pre-scan, find the the worst case of GFSK
Instruments Used:	Refer to section 2.9 for details
Test Results:	Pass

Measurement Data

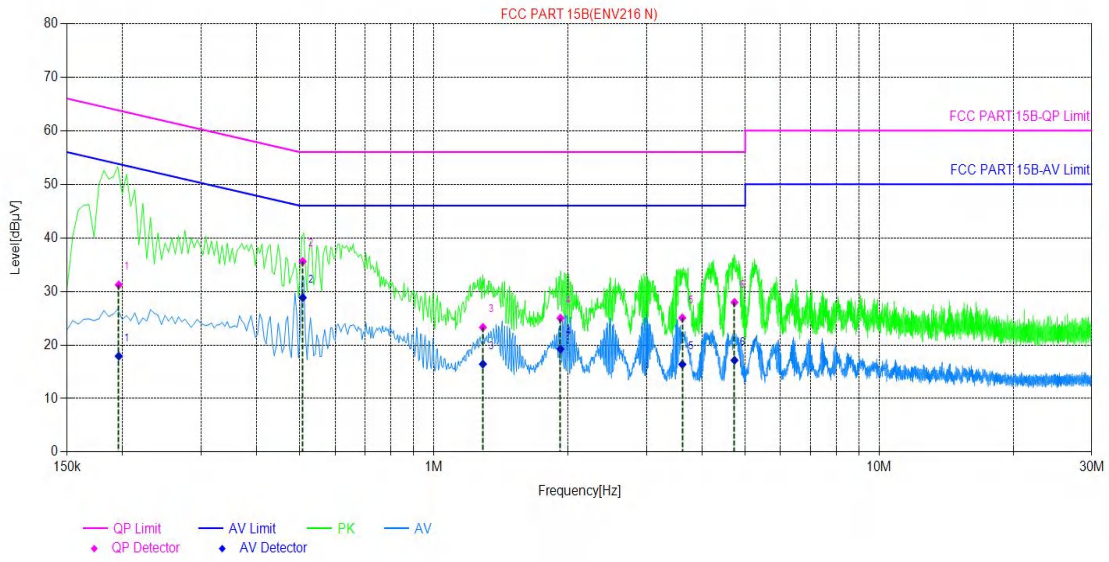
An initial pre-scan was performed on the live and neutral lines with peak detector.
Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Live Line:



Final Data List									
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Verdict
1	0.4897	9.87	34.14	56.17	22.03	27.52	46.17	18.65	PASS
2	0.6835	9.77	29.32	56.00	26.68	19.17	46.00	26.83	PASS
3	1.4235	9.73	24.46	56.00	31.54	20.43	46.00	25.57	PASS
4	1.9513	9.74	25.22	56.00	30.78	19.24	46.00	26.76	PASS
5	2.4589	9.74	25.33	56.00	30.67	20.03	46.00	25.97	PASS
6	4.1515	9.75	22.57	56.00	33.43	15.33	46.00	30.67	PASS

Neutral Line:



Final Data List									
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Verdict
1	0.1960	9.85	31.22	63.78	32.56	17.91	53.78	35.87	PASS
2	0.5075	9.72	35.59	56.00	20.41	28.83	46.00	17.17	PASS
3	1.2881	9.71	23.28	56.00	32.72	16.43	46.00	29.57	PASS
4	1.9240	9.76	25.00	56.00	31.00	19.23	46.00	26.77	PASS
5	3.6127	9.93	25.04	56.00	30.96	16.37	46.00	29.63	PASS
6	4.7308	9.97	27.95	56.00	28.05	17.14	46.00	28.86	PASS

Remark:

1. The BLE 1M is the worse case.
2. The following Quasi-Peak and Average measurements were performed on the EUT:
3. The Measurement (Result Level) is calculated by Reading Level adding the Correct Factor(maybe including LISN Factor and the Cable Factor etc.), The basic equation is as follows:

Result Level= Reading Level + Correct Factor(including LISN Factor, Cable Factor etc.)

4 Appendix

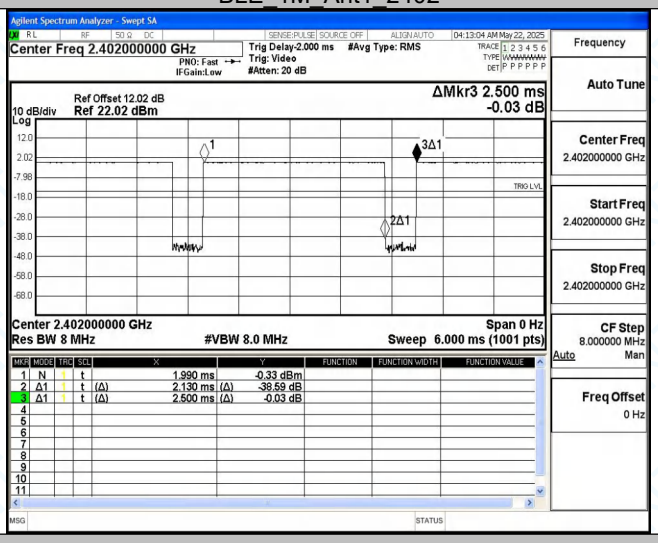
Appendix A: Duty Cycle

Test Result

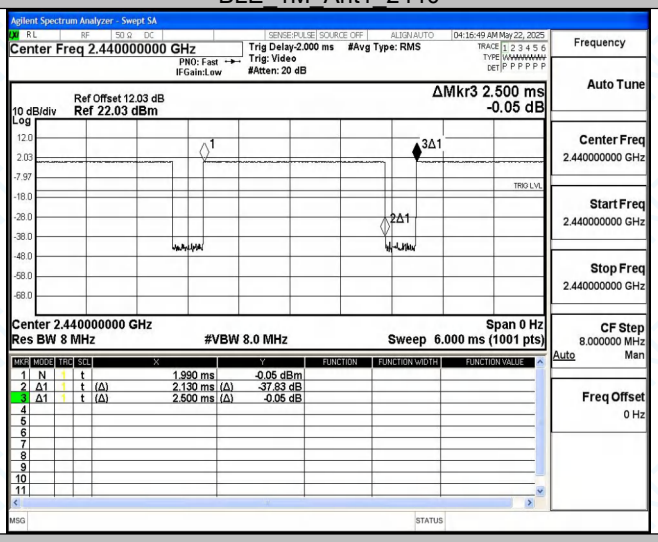
TestMode	Antenna	Freq(MHz)	ON Time [ms]	Period [ms]	X	DC [%]	xFactor	Limit	Verdict
BLE_1M	Ant1	2402	2.13	2.50	0.8520	85.20	0.70	---	---
		2440	2.13	2.50	0.8520	85.20	0.70	---	---
		2480	2.13	2.49	0.8554	85.54	0.68	---	---
BLE_2M	Ant1	2402	1.08	2.51	0.4303	43.03	3.66	---	---
		2440	1.07	2.50	0.4280	42.80	3.69	---	---
		2480	1.08	2.50	0.4320	43.20	3.65	---	---

Test Graphs

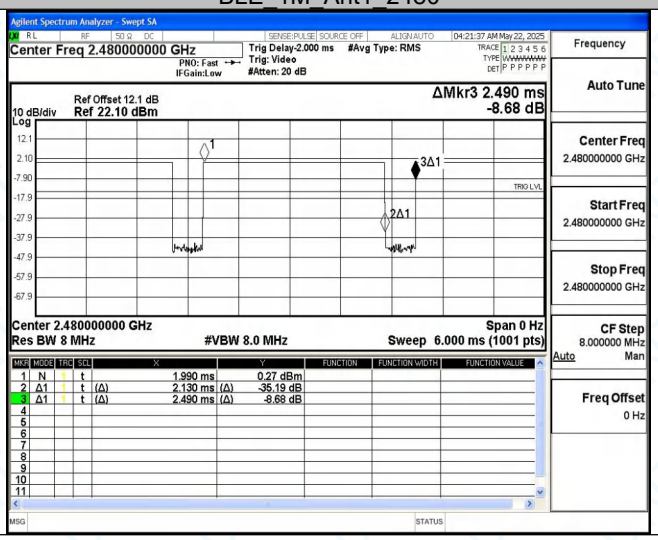
BLE_1M_Ant1_2402



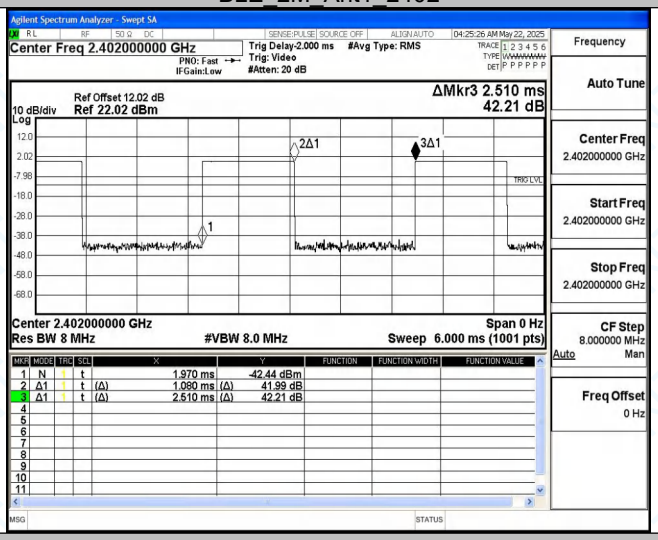
BLE_1M_Ant1_2440



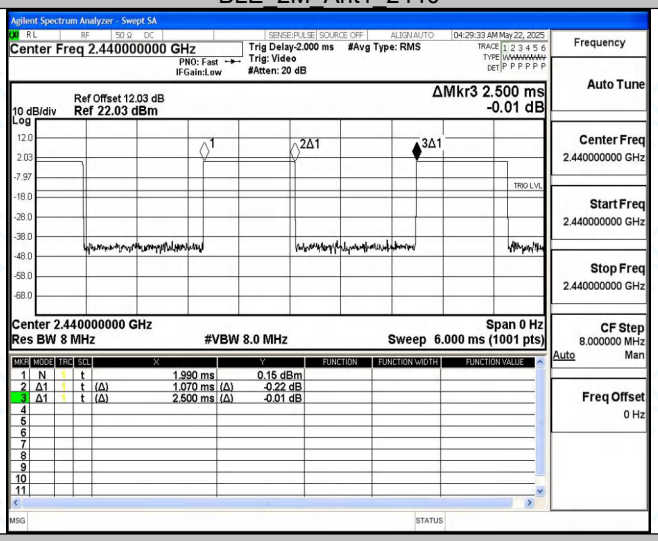
BLE_1M_Ant1_2480



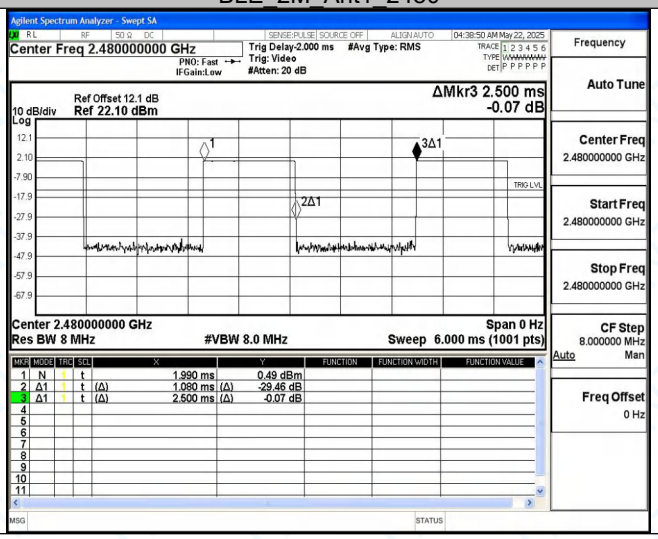
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_Ant1_2480



Appendix B: DTS Bandwidth

Test Result

TestMode	Antenna	Freq(MHz)	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.716	2401.664	2402.380	0.5	PASS
		2440	0.760	2439.620	2440.380	0.5	PASS
		2480	0.768	2479.616	2480.384	0.5	PASS
BLE_2M	Ant1	2402	1.216	2401.352	2402.568	0.5	PASS
		2440	1.172	2439.420	2440.592	0.5	PASS
		2480	1.184	2479.404	2480.588	0.5	PASS