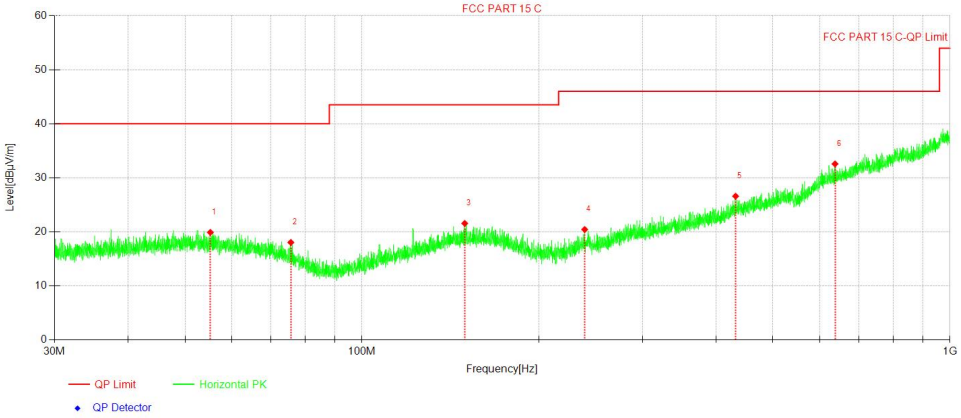
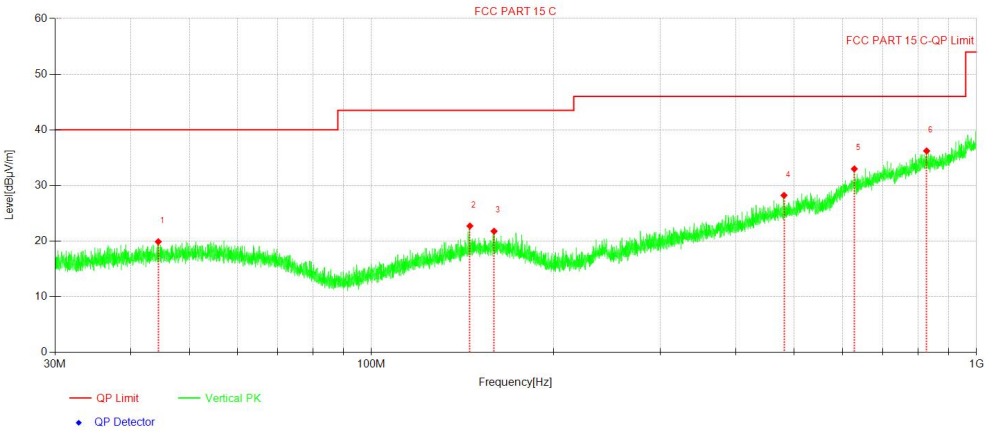
Test Configuration:	Measurements Below 1000MHz • RBW = 120 kHz • VBW = 300 kHz • Detector = Peak • Trace mode = max hold Peak Measurements Above 1000 MHz • RBW = 1 MHz • VBW ⩾ 3 MHz • Detector = Peak • Sweep time = auto • Trace mode = max hold Average Measurements Above 1000MHz • RBW = 1 MHz • VBW = 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



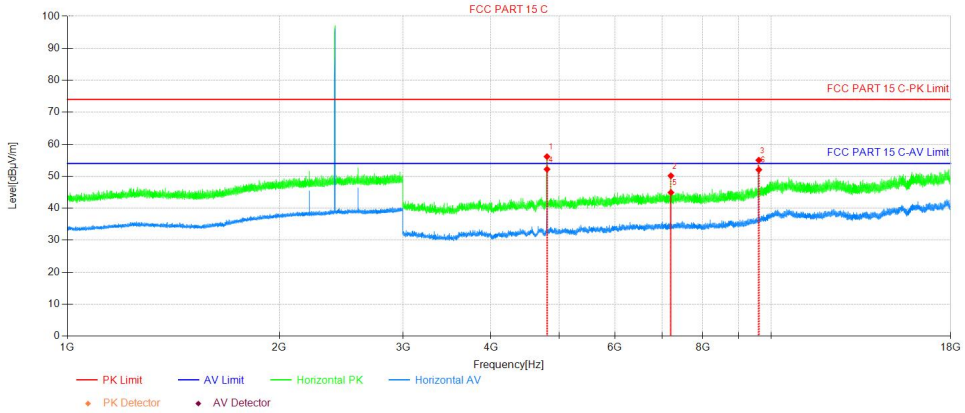
NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	55.22	28.20	-8.28	19.92	40.00	20.08	100	59	PK	Horizontal
2	75.68	29.44	-11.38	18.06	40.00	21.94	100	65	PK	Horizontal
3	149.54	29.48	-7.90	21.58	43.50	21.92	100	310	PK	Horizontal
4	239.23	29.77	-9.32	20.45	46.00	25.55	100	130	PK	Horizontal
5	431.94	29.90	-3.29	26.61	46.00	19.39	100	134	PK	Horizontal
6	637.47	31.31	1.27	32.58	46.00	13.42	100	5	PK	Horizontal



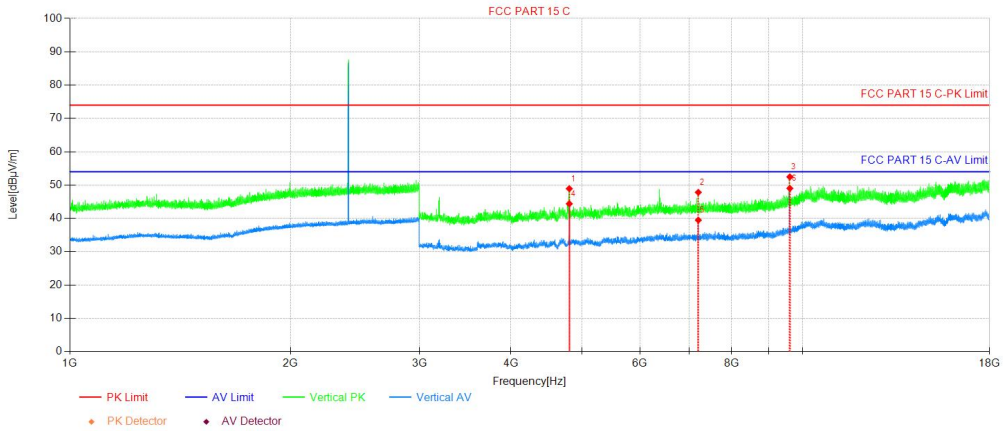
NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	44.43	28.19	-8.29	19.90	40.00	20.10	100	163	PK	Vertical
2	145.45	30.87	-8.14	22.73	43.50	20.77	100	271	PK	Vertical
3	159.45	29.58	-7.79	21.79	43.50	21.71	100	24	PK	Vertical
4	480.70	30.46	-2.23	28.23	46.00	17.77	100	94	PK	Vertical
5	628.15	31.87	1.12	32.99	46.00	13.01	100	37	PK	Vertical
6	827.20	31.39	4.83	36.22	46.00	9.78	100	5	PK	Vertical

For above 1GHz

BLE 1M 2402MHz

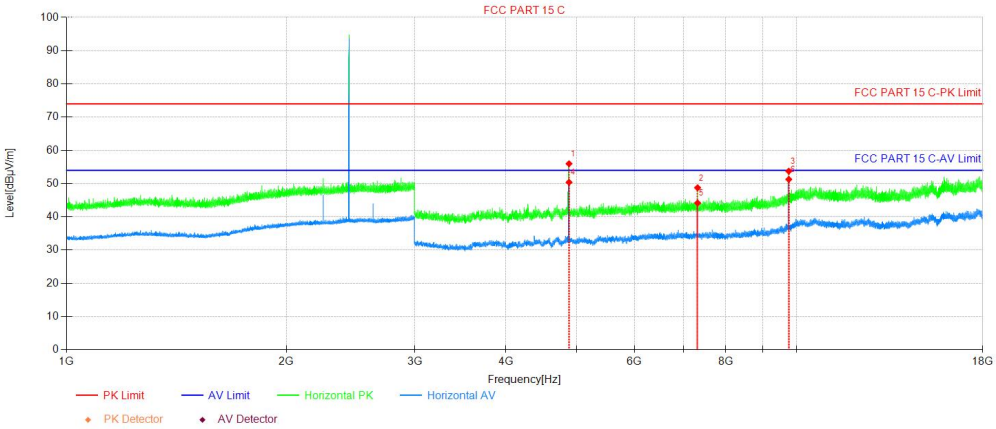


NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	4803.84	60.75	-4.61	56.14	74.00	17.86	150	50	PK	Horizontal
2	7206.21	51.90	-1.76	50.14	74.00	23.86	150	67	PK	Horizontal
3	9607.83	54.16	0.87	55.03	74.00	18.97	150	122	PK	Horizontal
4	4804.59	56.80	-4.61	52.19	54.00	1.81	150	67	AV	Horizontal
5	7206.96	46.68	-1.76	44.92	54.00	9.08	150	50	AV	Horizontal
6	9608.58	51.15	0.88	52.03	54.00	1.97	150	122	AV	Horizontal

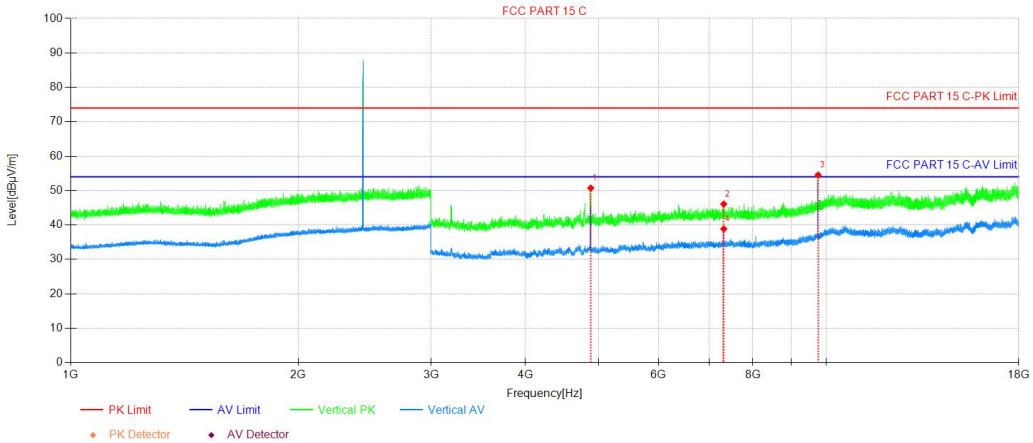


NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	AV Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	4803.84	53.53	-4.61	48.92	74.00	25.08	150	271	PK	Vertical
2	7206.21	49.58	-1.76	47.82	74.00	26.18	150	39	PK	Vertical
3	9607.83	51.60	0.87	52.47	74.00	21.53	150	288	PK	Vertical
4	4804.59	49.01	-4.61	44.40	54.00	9.60	150	306	AV	Vertical
5	7206.96	41.25	-1.76	39.49	54.00	14.51	150	39	AV	Vertical
6	9608.58	48.14	0.88	49.02	54.00	4.98	150	288	AV	Vertical

BLE 1M 2440MHz

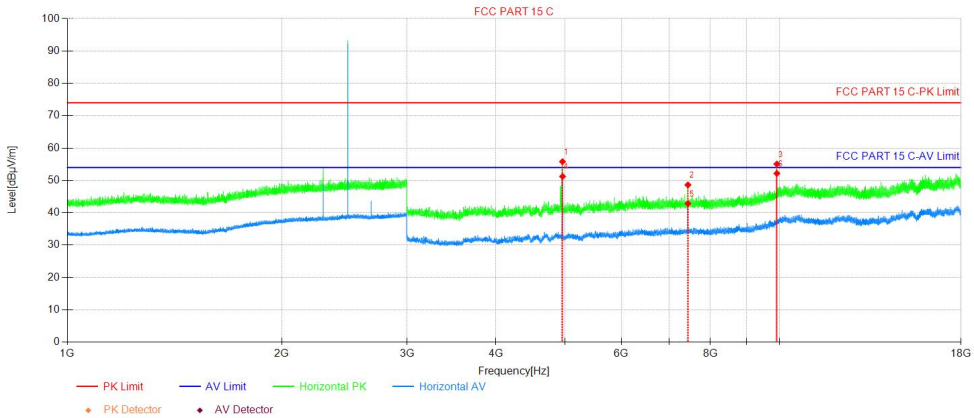


NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	AV Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	4879.59	60.70	-4.70	56.00	74.00	18.00	150	54	PK	Horizontal
2	7320.22	50.26	-1.49	48.77	74.00	25.23	150	110	PK	Horizontal
3	9760.09	52.13	1.62	53.75	74.00	20.25	150	126	PK	Horizontal
4	4880.34	55.12	-4.71	50.41	54.00	3.59	150	54	AV	Horizontal
5	7320.97	45.68	-1.49	44.19	54.00	9.81	150	36	AV	Horizontal
6	9760.84	49.66	1.63	51.29	54.00	2.71	150	126	AV	Horizontal

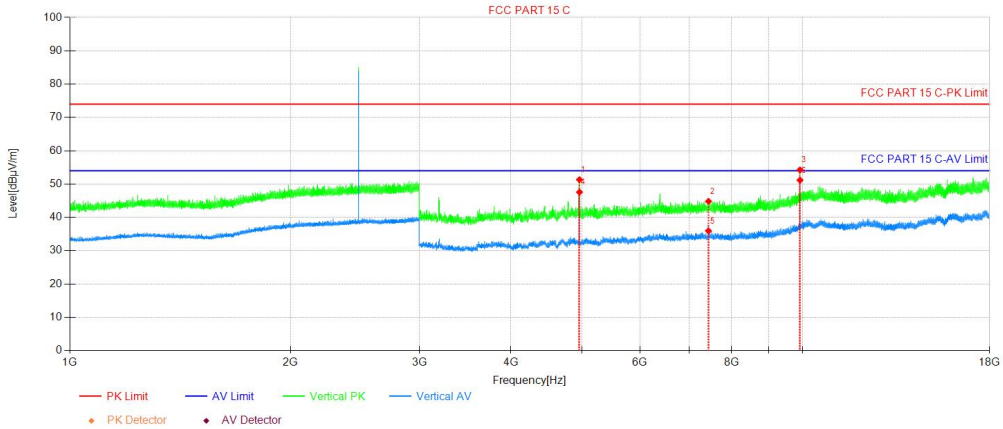


NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	AV Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	4880.34	55.43	-4.71	50.72	74.00	23.28	150	270	PK	Vertical
2	7320.22	47.57	-1.49	46.08	74.00	27.92	150	270	PK	Vertical
3	9760.09	52.92	1.62	54.54	74.00	19.46	150	288	PK	Vertical
4	7320.97	40.36	-1.49	38.87	54.00	15.13	150	198	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	60.67	-4.86	55.81	74.00	18.19	150	308	PK	Horizontal
2	7440.22	49.96	-1.34	48.62	74.00	25.38	150	39	PK	Horizontal
3	9919.85	52.80	2.26	55.06	74.00	18.94	150	84	PK	Horizontal
4	4960.60	56.09	-4.86	51.23	54.00	2.77	150	308	AV	Horizontal
5	7440.97	44.20	-1.34	42.86	54.00	11.14	150	39	AV	Horizontal
6	9920.60	49.89	2.27	52.16	54.00	1.84	150	103	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	56.20	-4.86	51.34	74.00	22.66	150	288	PK	Vertical
2	7440.22	46.16	-1.34	44.82	74.00	29.18	150	269	PK	Vertical
3	9919.85	52.01	2.26	54.27	74.00	19.73	150	55	PK	Vertical
4	4960.60	52.43	-4.86	47.57	54.00	6.43	150	288	AV	Vertical
5	7440.22	37.30	-1.34	35.96	54.00	18.04	150	40	AV	Vertical
6	9920.60	48.91	2.27	51.18	54.00	2.82	150	55	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:			

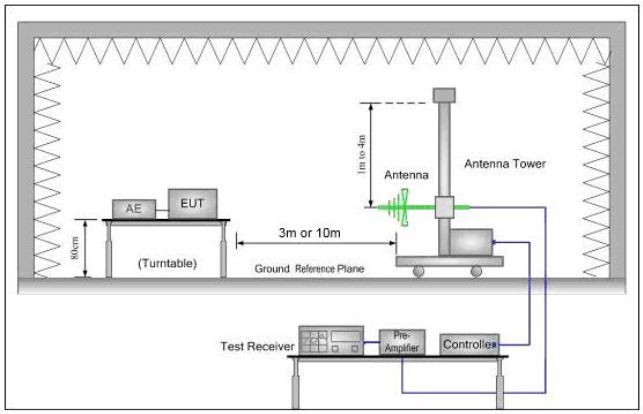


Figure 1. 30MHz to 1GHz

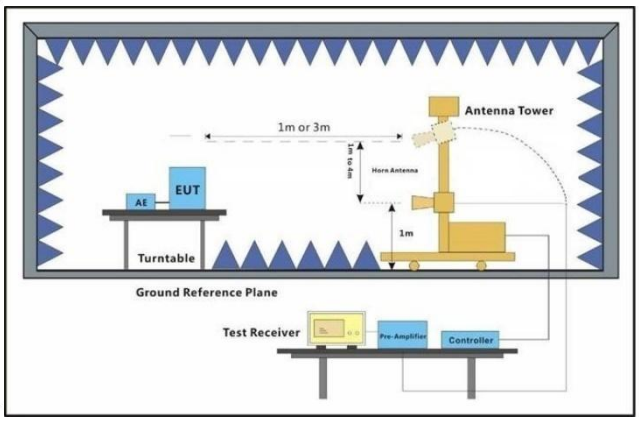
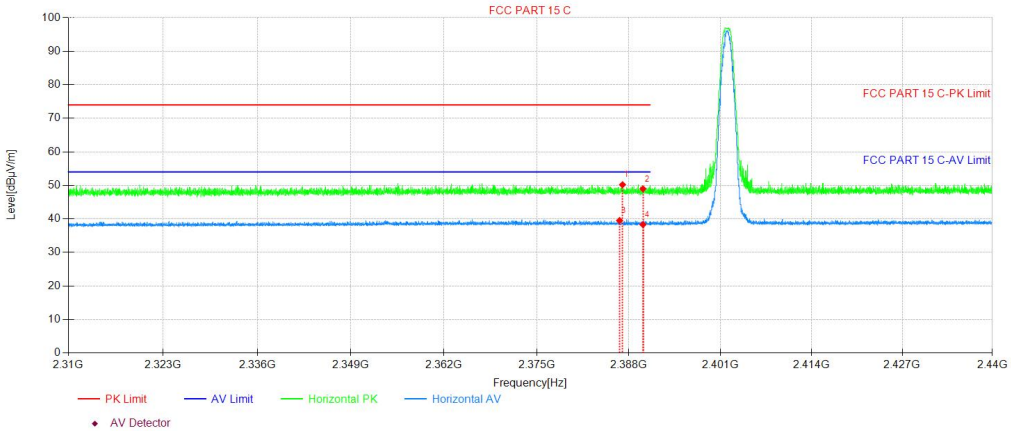


Figure 2. Above 1 GHz

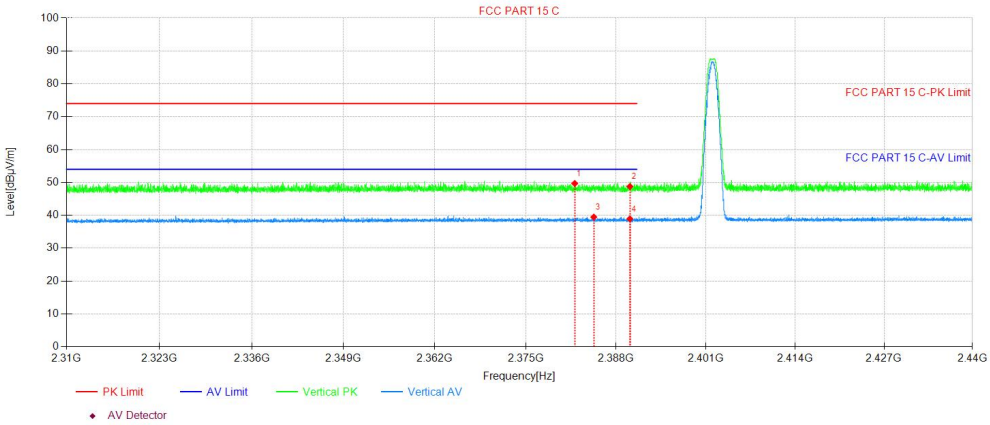
Test Procedure:	a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. b. For above 1GHz, the EUT was placed on the top of a rotating 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

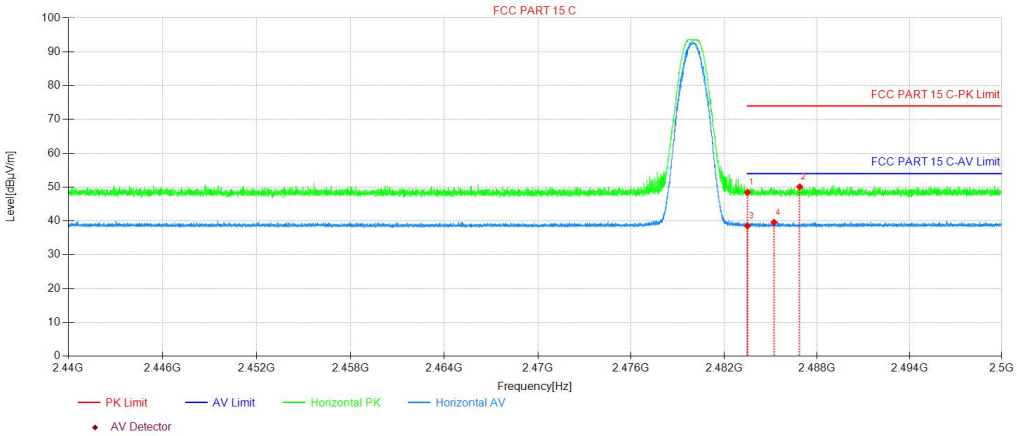


NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	AV Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	2387.11	51.01	-0.81	50.20	74.00	23.80	150	284	PK	Horizontal
2	2390.01	49.77	-0.80	48.97	74.00	25.03	150	216	PK	Horizontal
3	2386.69	40.33	-0.81	39.52	54.00	14.48	150	136	AV	Horizontal
4	2390.01	39.11	-0.80	38.31	54.00	15.69	150	160	AV	Horizontal

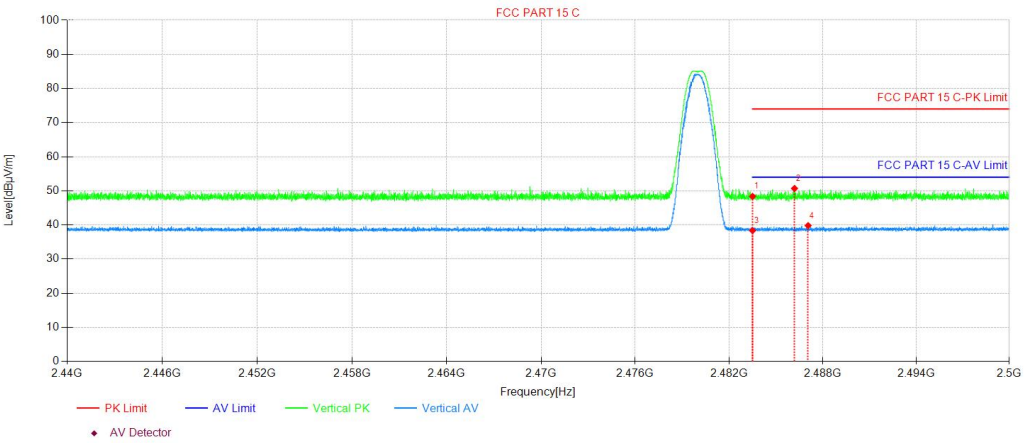


NO.	Freq. [MHz]	Reading Level [dBμV]	Correct Factor [dB/m]	Result Level [dBμV/m]	AV Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity
1	2382.05	50.53	-0.83	49.70	74.00	24.30	150	54	PK	Vertical
2	2390.01	49.59	-0.80	48.79	74.00	25.21	150	201	PK	Vertical
3	2384.80	40.30	-0.82	39.48	54.00	14.52	150	213	AV	Vertical
4	2390.01	39.73	-0.80	38.93	54.00	15.07	150	270	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	2483.51	48.74	-0.29	48.45	74.00	25.55	150	61	PK	Horizontal
2	2486.89	50.34	-0.26	50.08	74.00	23.92	150	299	PK	Horizontal
3	2483.51	38.81	-0.29	38.52	54.00	15.48	150	360	AV	Horizontal
4	2485.23	39.86	-0.27	39.59	54.00	14.41	150	137	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	48.68	-0.29	48.39	74.00	25.61	150	89	PK	Vertical
2	2486.19	50.98	-0.27	50.71	74.00	23.29	150	10	PK	Vertical
3	2483.50	38.67	-0.29	38.38	54.00	15.62	150	77	AV	Vertical
4	2487.07	40.09	-0.26	39.83	54.00	14.17	150	356	AV	Vertical

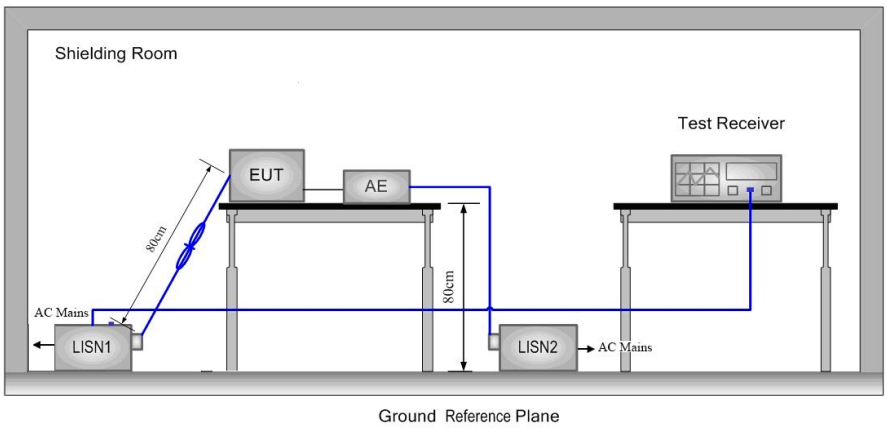
Note:

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

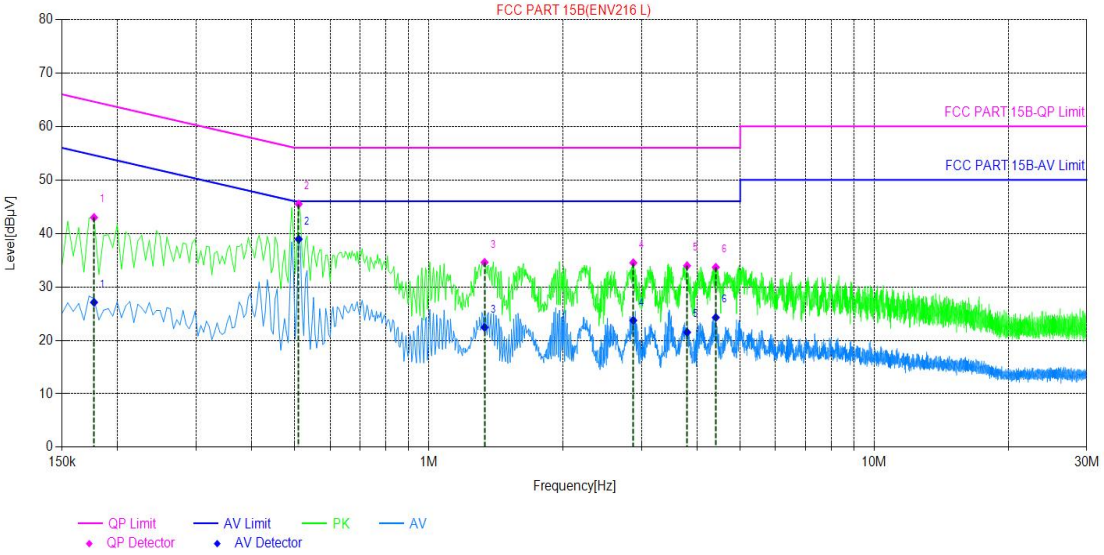
Test Requirement:	47 CFR Part 15C Section 15.207		
Test Method:	ANSI C63.10: 2013		
Test Frequency Range:	150kHz to 30MHz		
Limit:	Frequency range (MHz)	Limit (dBuV)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
	* Decreases with the logarithm of the frequency.		
Test Procedure:	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

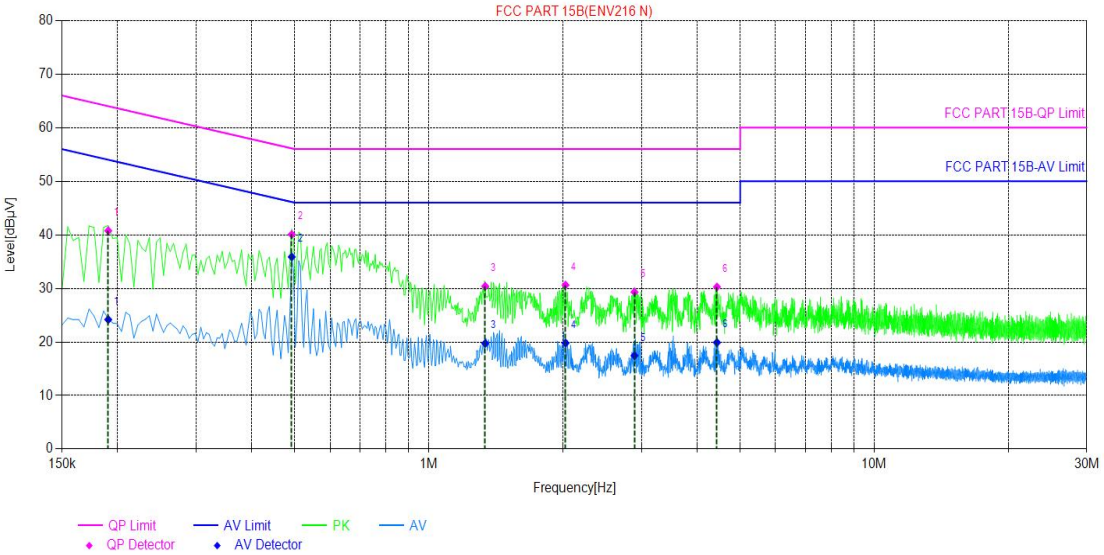
An initial pre-scan was performed on the live and neutral lines with peak detector.
Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

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	0.177	9.91	42.97	64.63	21.66	27.11	54.63	27.52	PASS
2	0.51	9.87	45.48	56.00	10.52	38.92	46.00	7.08	PASS
3	1.3335	9.73	34.57	56.00	21.43	22.43	46.00	23.57	PASS
4	2.877	9.74	34.50	56.00	21.50	23.72	46.00	22.28	PASS
5	3.7995	9.75	33.95	56.00	22.05	21.50	46.00	24.50	PASS
6	4.407	9.77	33.66	56.00	22.34	24.27	46.00	21.73	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	0.1905	9.85	40.76	64.01	23.25	24.18	54.01	29.83	PASS
2	0.492	9.72	40.07	56.13	16.06	35.87	46.13	10.26	PASS
3	1.338	9.71	30.39	56.00	25.61	19.73	46.00	26.27	PASS
4	2.0265	9.78	30.62	56.00	25.38	19.79	46.00	26.21	PASS
5	2.895	9.86	29.30	56.00	26.70	17.45	46.00	28.55	PASS
6	4.434	9.97	30.26	56.00	25.74	19.90	46.00	26.10	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

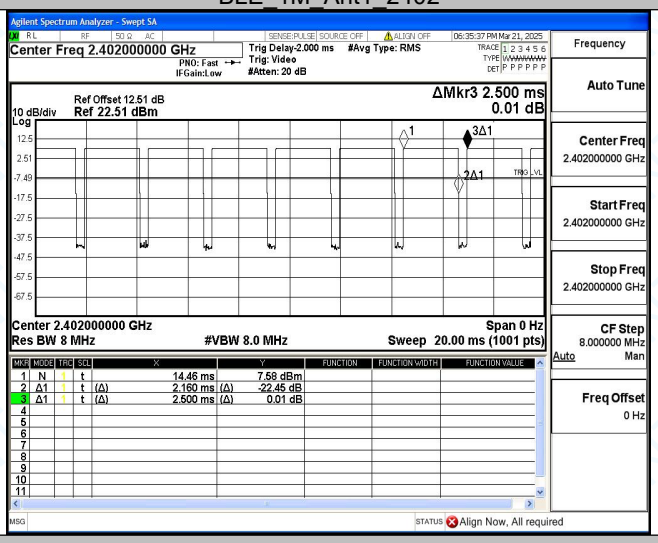
Appendix A: Duty Cycle

Test Result

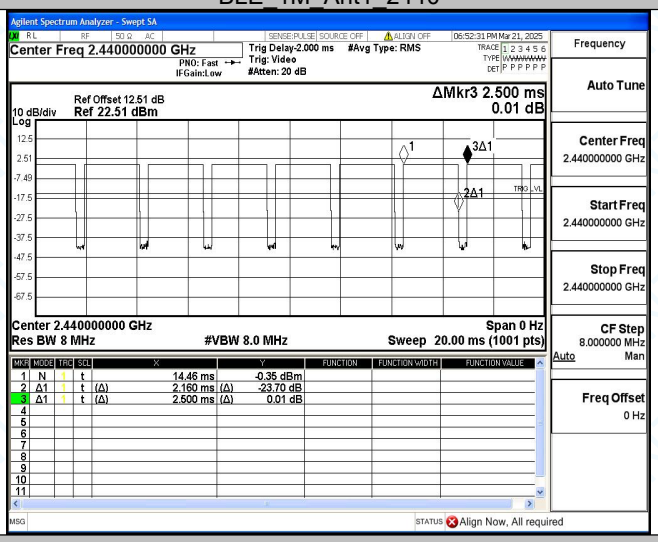
TestMode	Antenna	Freq(MHz)	ON Time [ms]	Period [ms]	X	DC [%]	xFactor	Limit	Verdict
BLE_1M	Ant1	2402	2.16	2.50	0.8640	86.40	0.63	---	---
		2440	2.16	2.50	0.8640	86.40	0.63	---	---
		2480	2.16	2.50	0.8640	86.40	0.63	---	---
BLE_2M	Ant1	2402	2.14	2.50	0.8560	85.60	0.68	---	---
		2440	2.14	2.50	0.8560	85.60	0.68	---	---
		2480	2.14	2.50	0.8560	85.60	0.68	---	---

Test Graphs

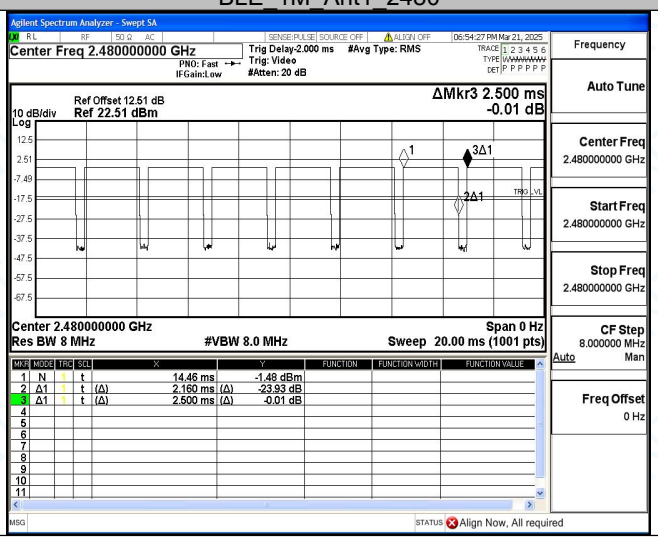
BLE_1M_Ant1_2402



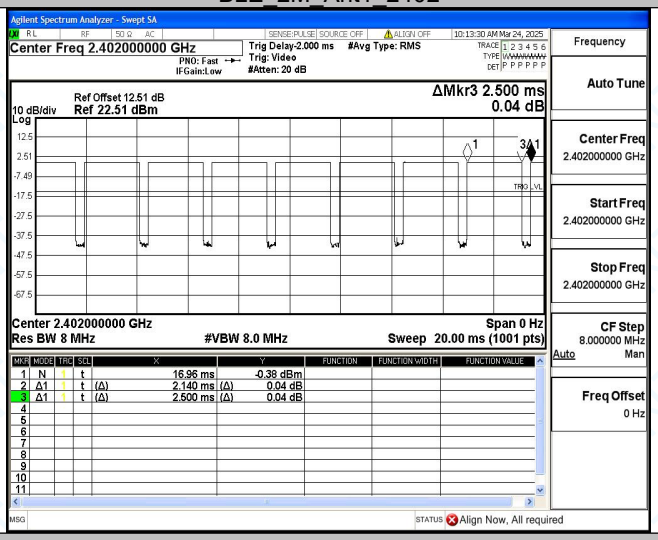
BLE_1M_Ant1_2440



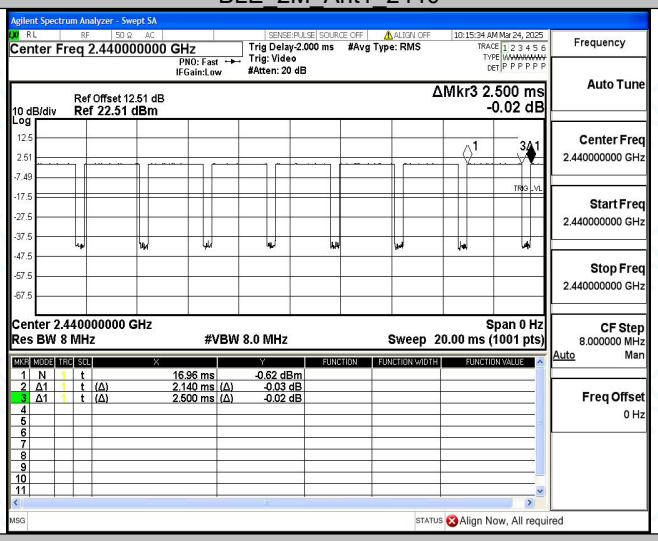
BLE_1M_Ant1_2480



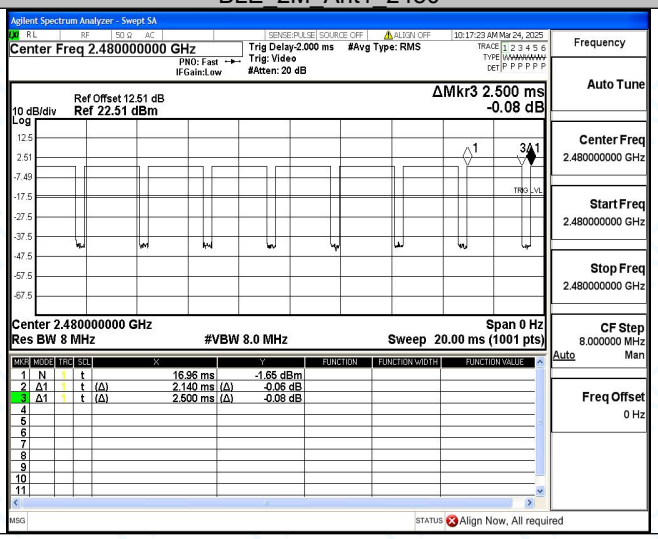
BLE_2M_Ant1_2402



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	0.732	2401.636	2402.368	0.5	PASS
		2440	0.656	2439.680	2440.336	0.5	PASS
		2480	0.656	2479.680	2480.336	0.5	PASS
BLE_2M	Ant1	2402	0.708	2401.648	2402.356	0.5	PASS
		2440	0.692	2439.668	2440.360	0.5	PASS
		2480	0.652	2479.688	2480.340	0.5	PASS