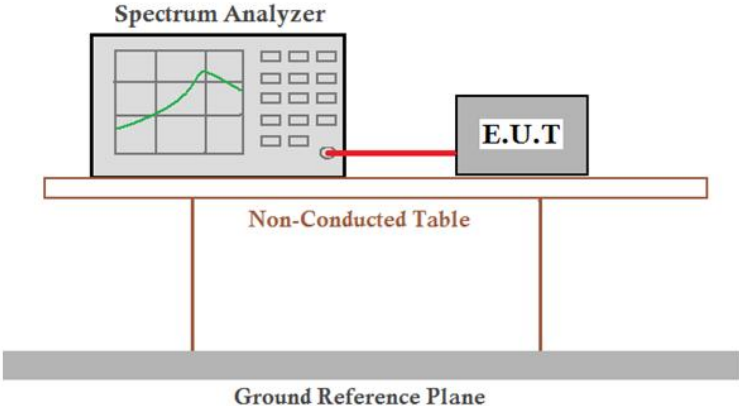
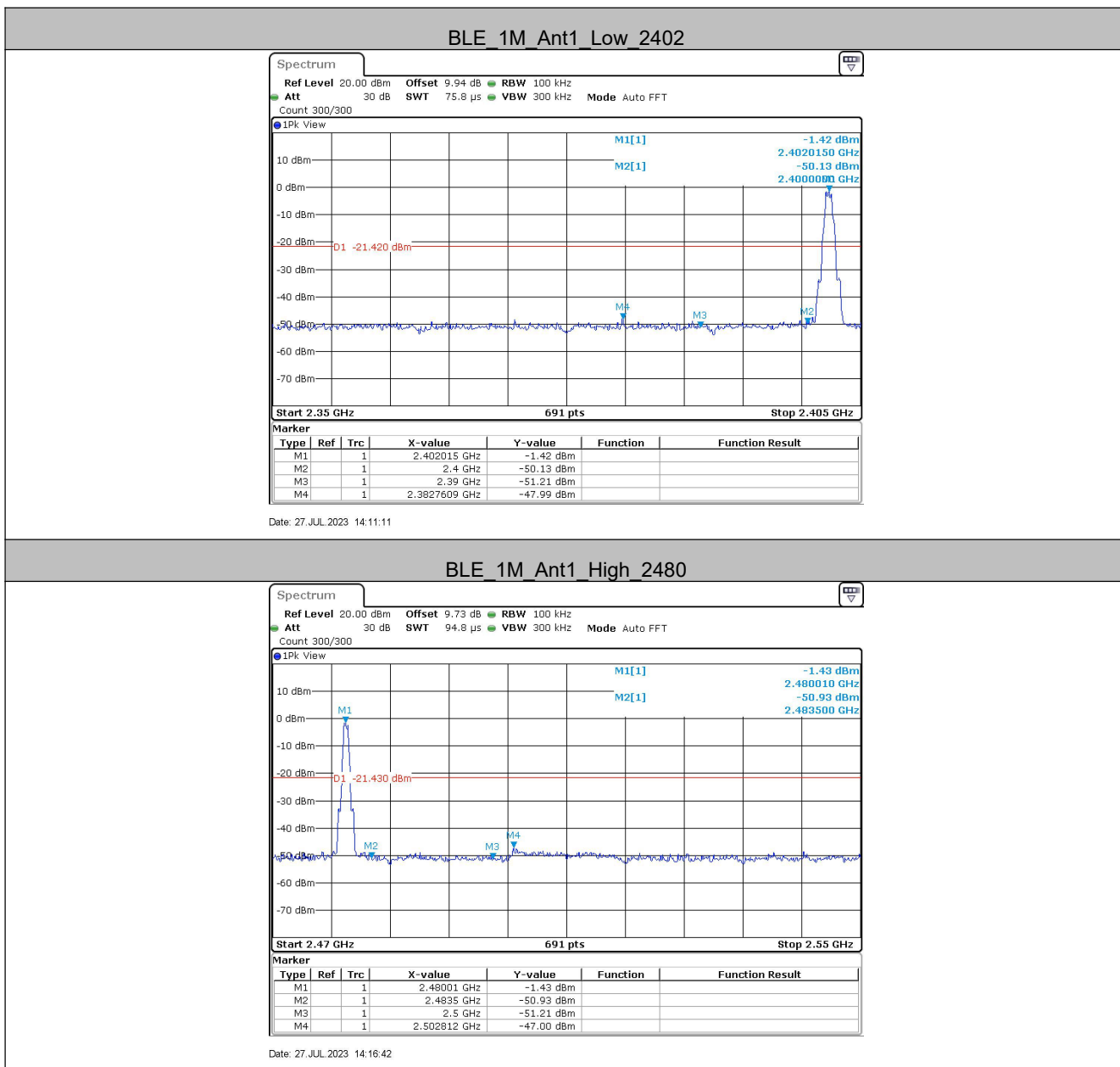


5.6 Band-edge for RF Conducted Emissions

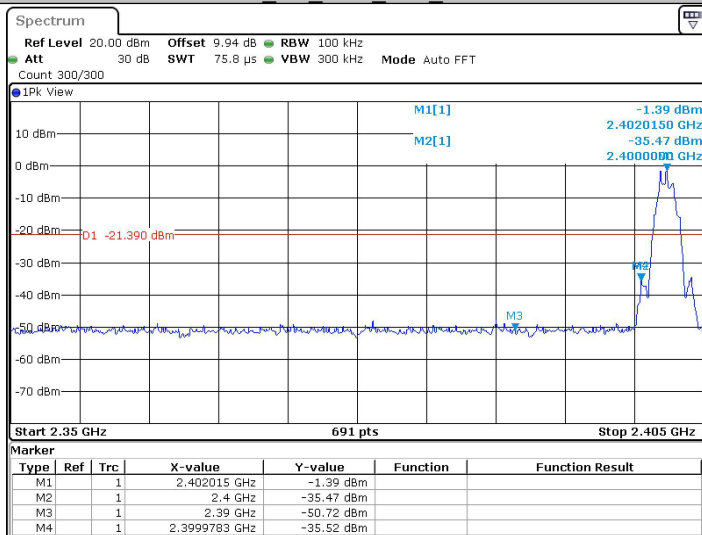
Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10 2013
Test Setup:	 Remark: Offset=Cable loss+ attenuation factor.
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test Mode:	Transmitting with GFSK modulation.
Test Results:	Pass

TestMode	ChName	Freq(MHz)	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Low	2402	-1.42	-47.99	≤-21.42	PASS
	High	2480	-1.43	-47	≤-21.43	PASS
BLE_2M	Low	2402	-1.39	-35.52	≤-21.39	PASS
	High	2480	-1.38	-47.55	≤-21.38	PASS

Test plot as follows:

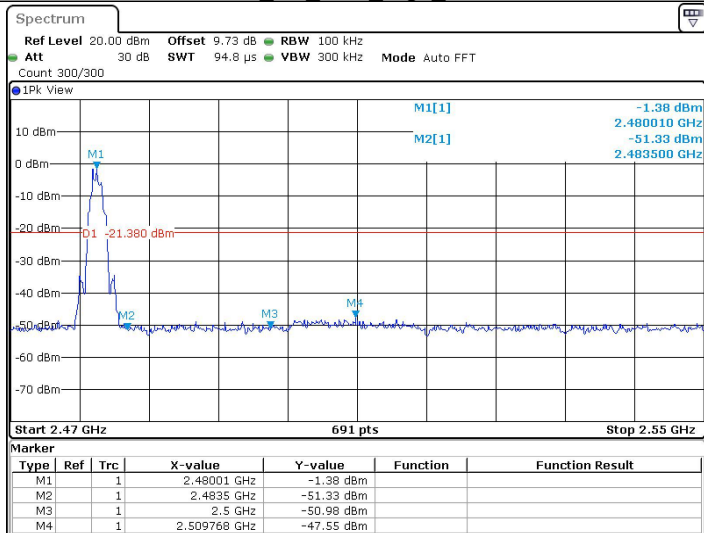


BLE 2M Ant1 Low 2402



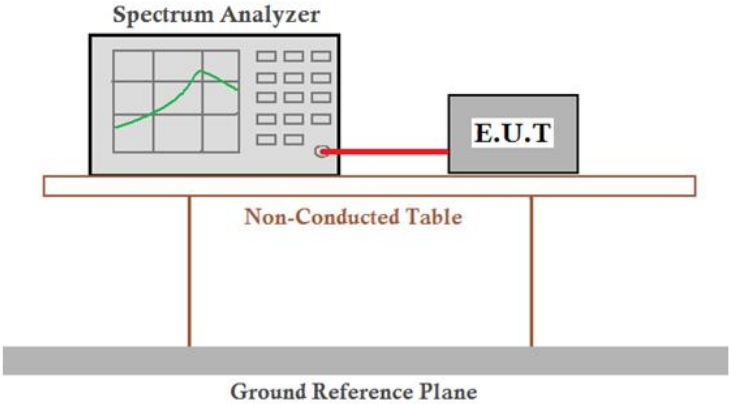
Date: 27 JUL 2023 14:19:51

BLE 2M Ant1 High 2480

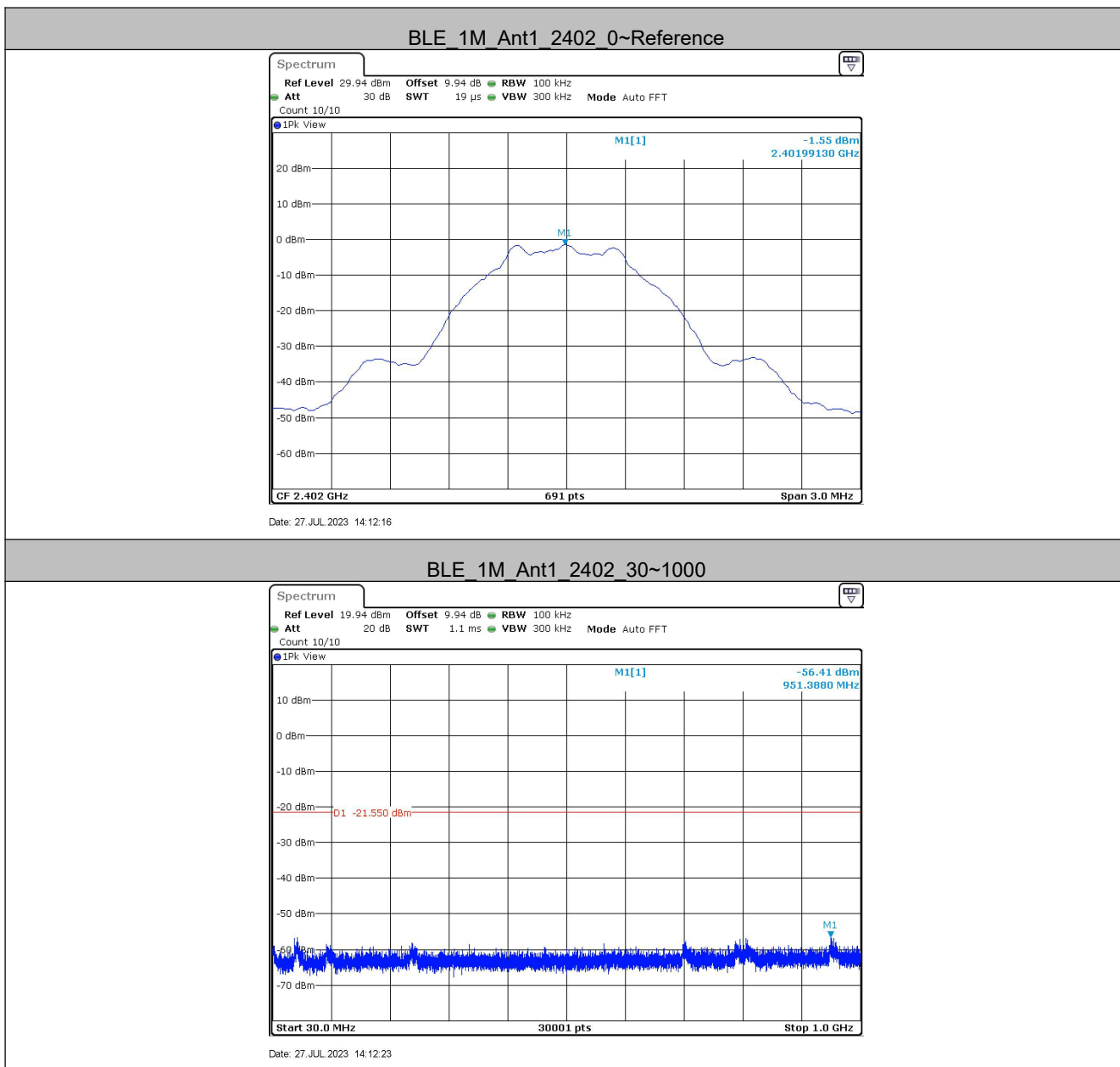


Date: 27 JUL 2023 14:26:29

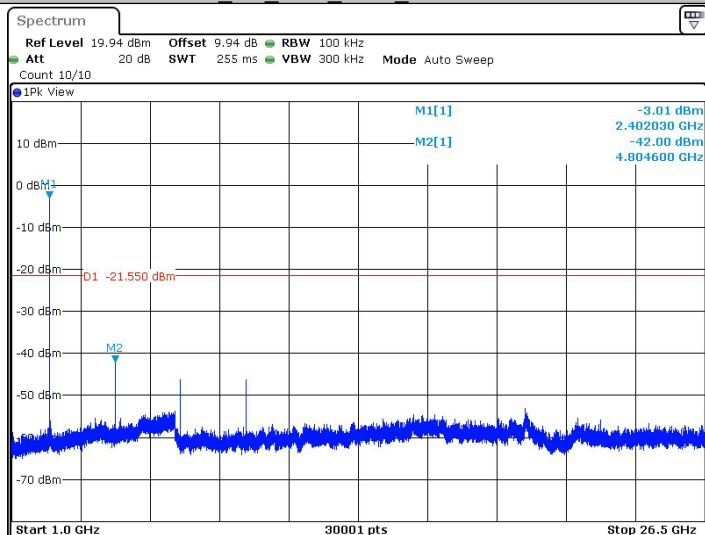
5.7 Spurious RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10 2013
Test Setup:	 <i>Remark: Offset=Cable loss+ attenuation factor.</i>
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test Mode:	Transmitting with GFSK modulation.
Test Results:	Pass

Test plot as follows:

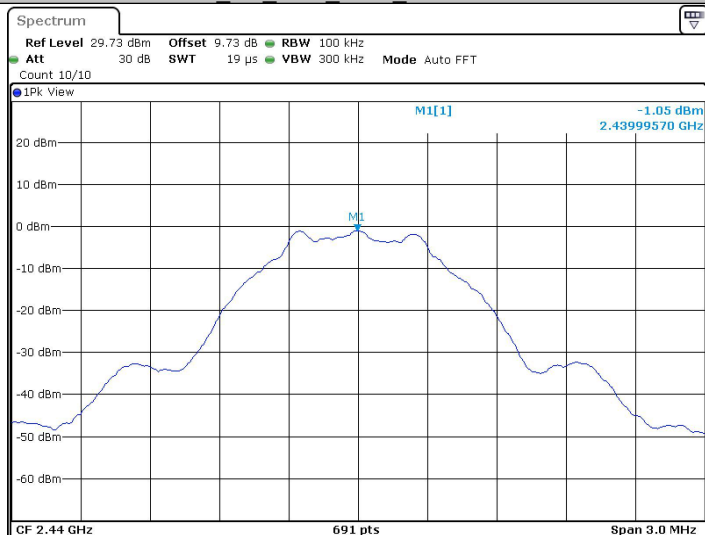


BLE_1M_Ant1_2402_1000~26500



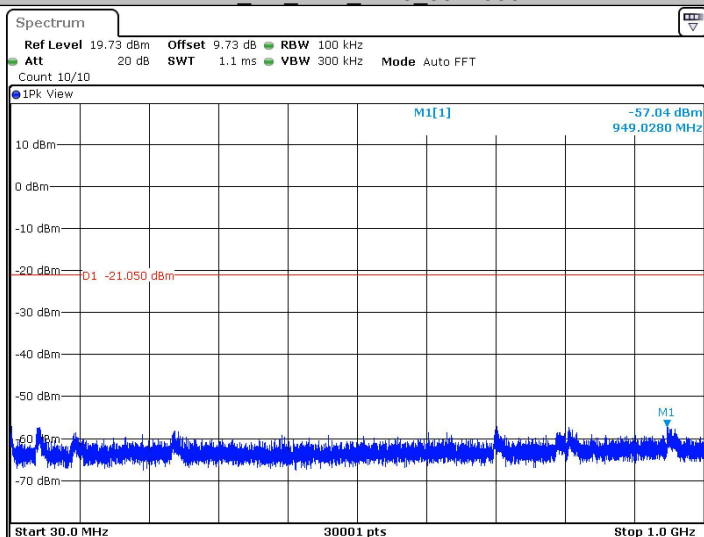
Date: 27.JUL.2023 14:12:45

BLE_1M_Ant1_2440_0~Reference



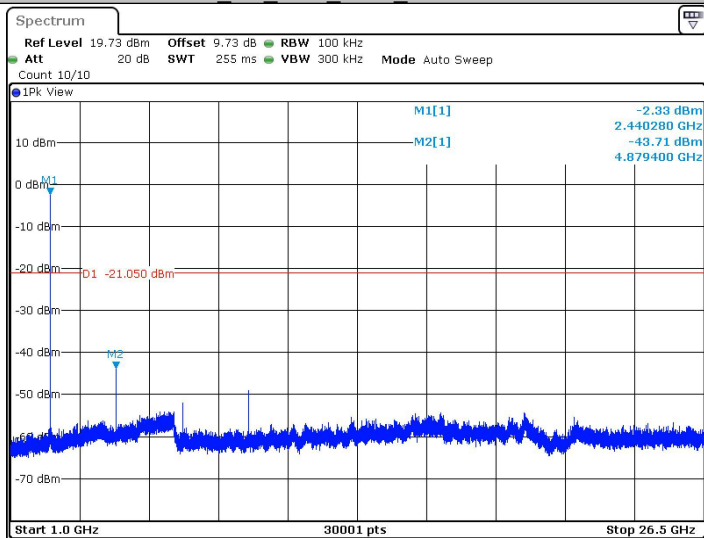
Date: 27.JUL.2023 14:14:40

BLE_1M_Ant1_2440_30~1000

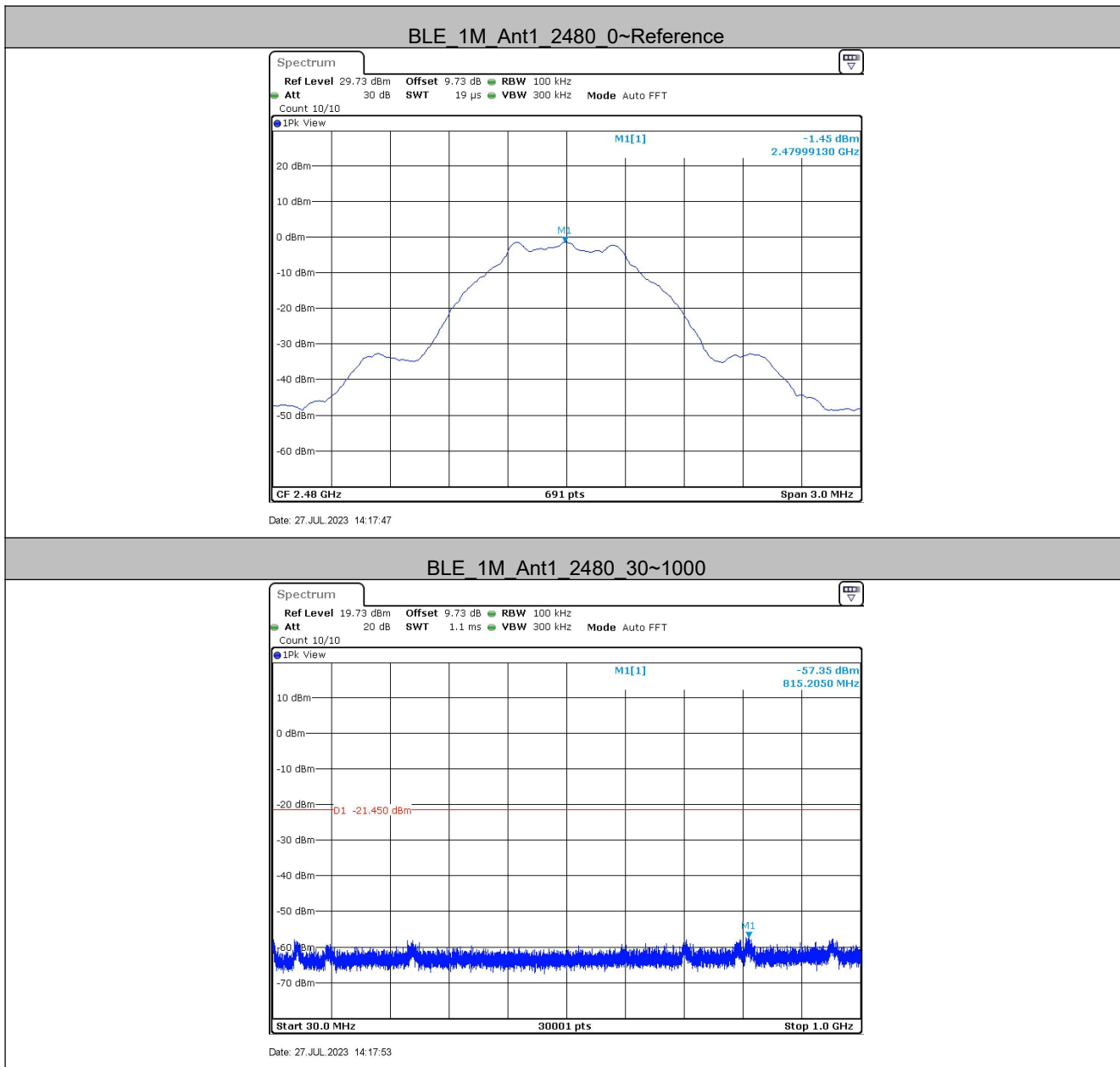


Date: 27.JUL.2023 14:14:47

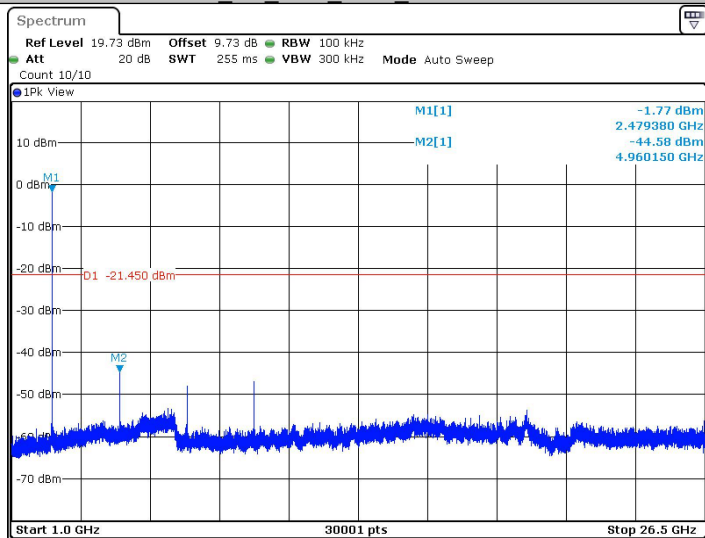
BLE_1M_Ant1_2440_1000~26500



Date: 27.JUL.2023 14:15:09

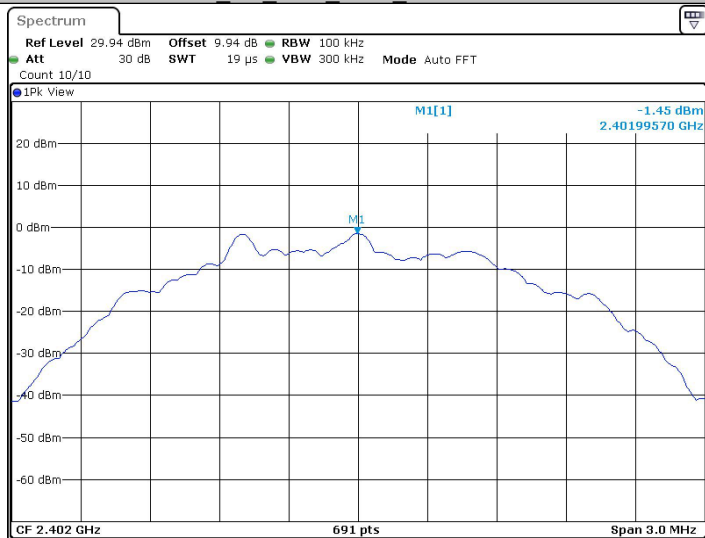


BLE_1M_Ant1_2480_1000~26500



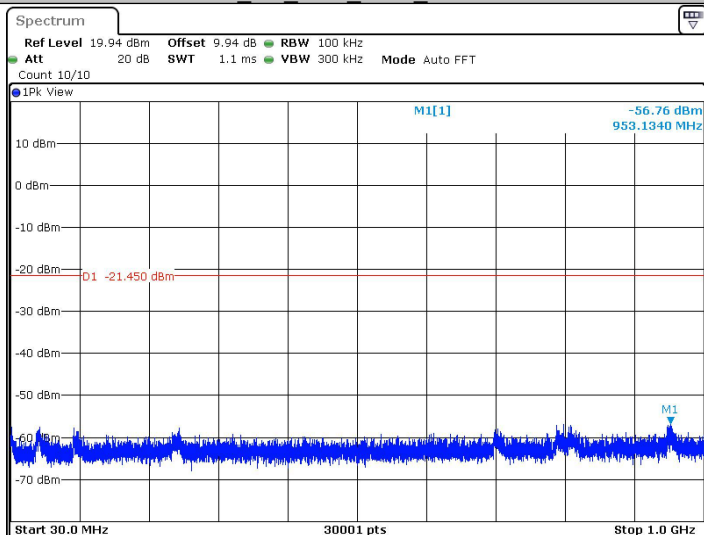
Date: 27.JUL.2023 14:18:16

BLE_2M_Ant1_2402_0~Reference



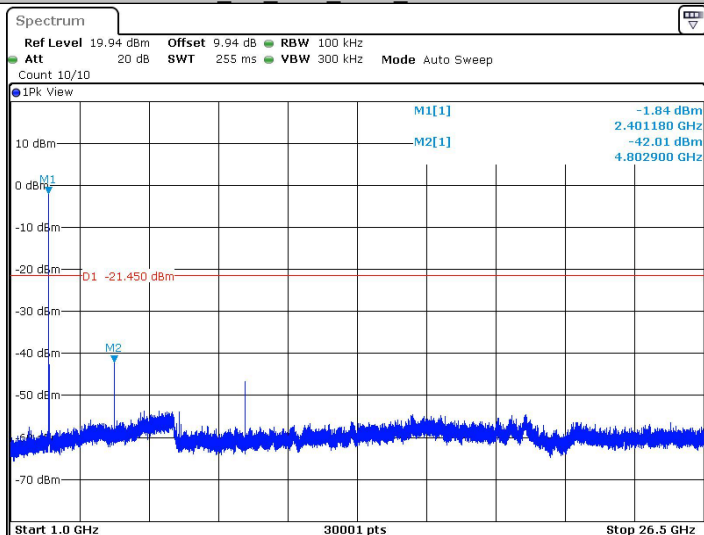
Date: 27.JUL.2023 14:20:56

BLE_2M_Ant1_2402_30~1000

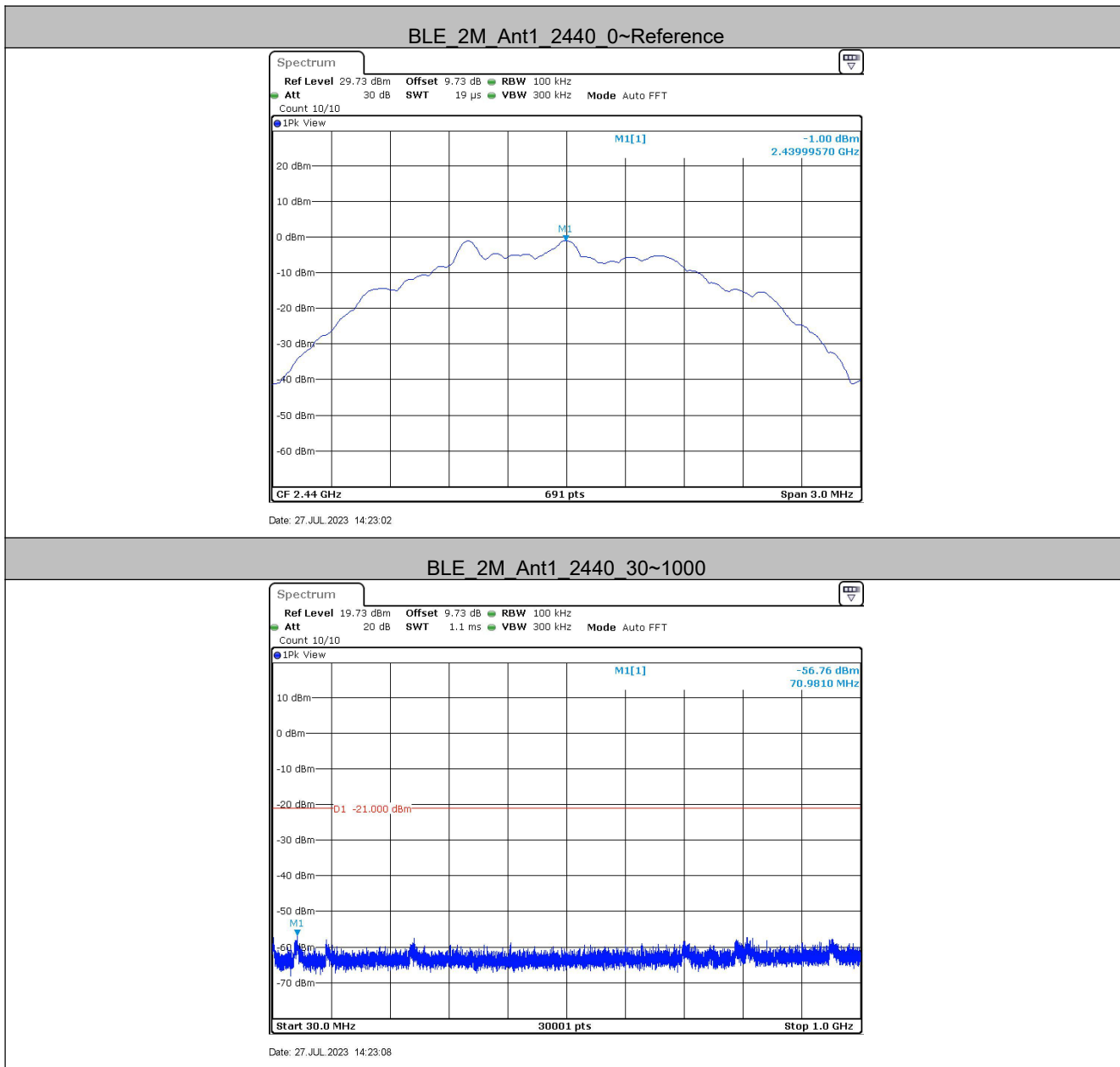


Date: 27.JUL.2023 14:21:03

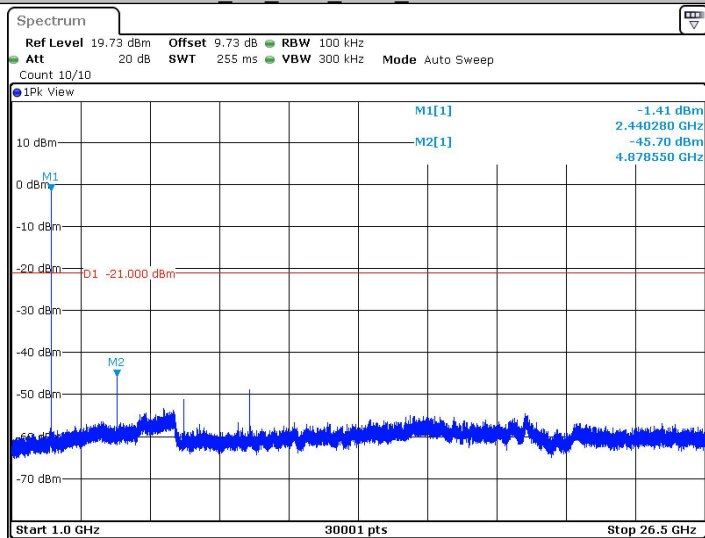
BLE_2M_Ant1_2402_1000~26500



Date: 27.JUL.2023 14:21:25

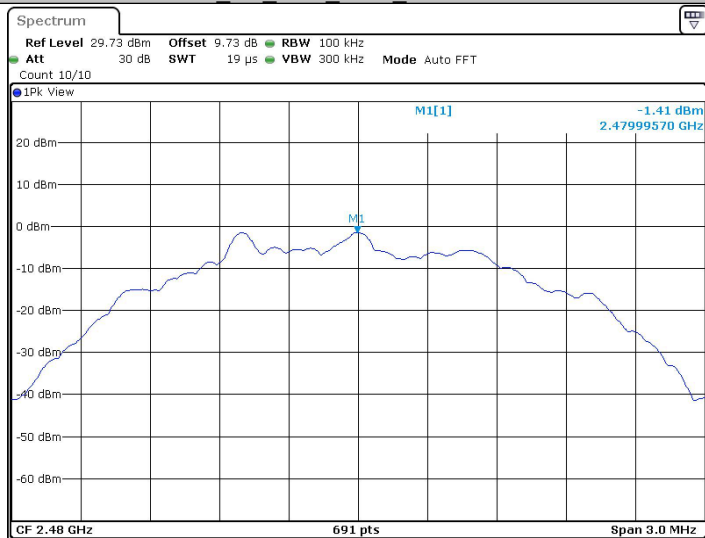


BLE_2M_Ant1_2440_1000~26500

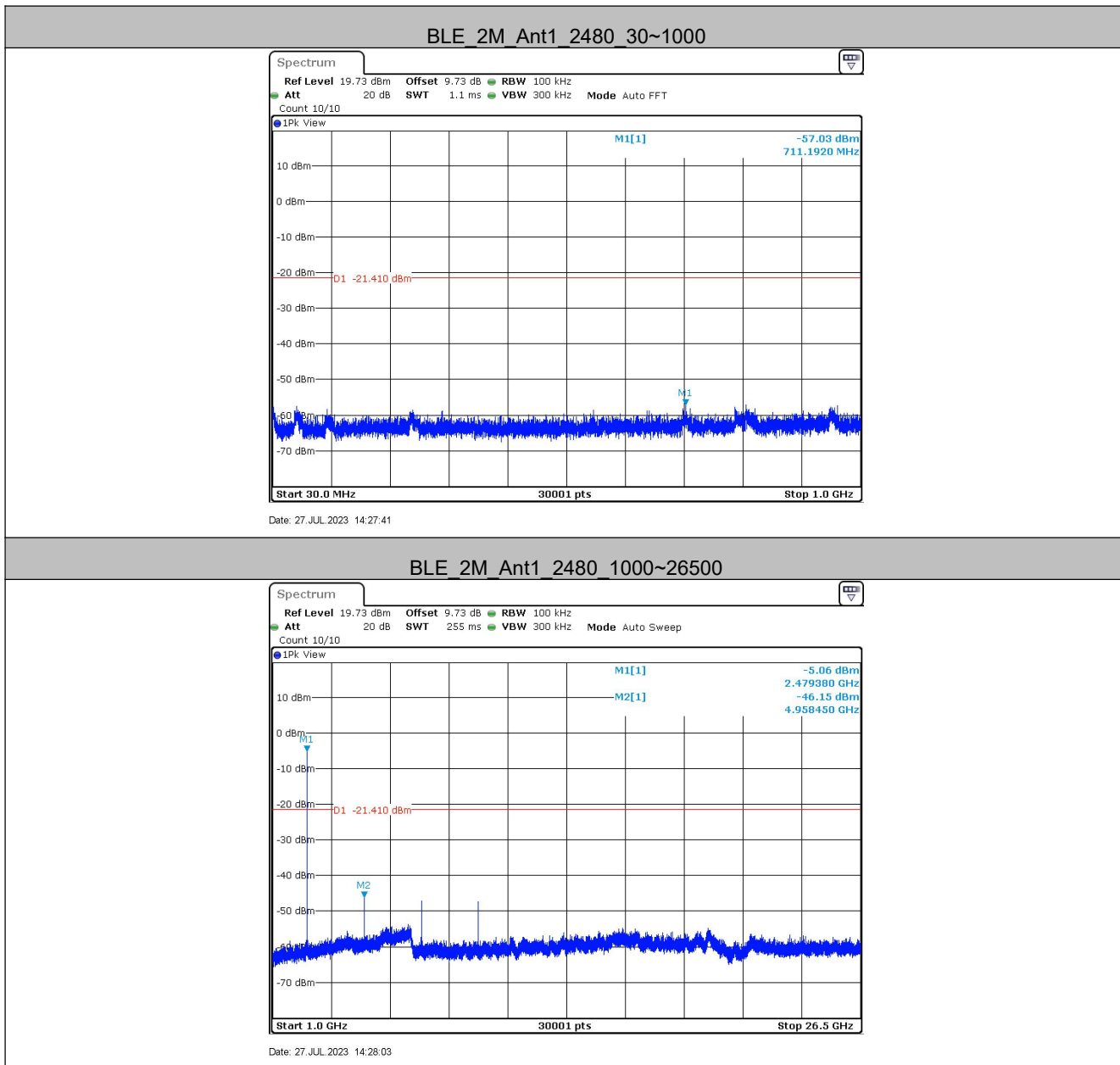


Date: 27.JUL.2023 14:23:31

BLE_2M_Ant1_2480_0~Reference



Date: 27.JUL.2023 14:27:34



Remark:

Pretest 9kHz to 25GHz, find the highest point when testing, so only the worst data were shown in the test report. Per FCC Part 15.33 (a) and 15.31 (o), The amplitude of spurious emissions from intentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.

5.8 Radiated Spurious Emission & Restricted bands

5.8.1 Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205				
Test Method:	ANSI C63.10 2013				
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
	0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
	0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
	0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
	0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	100 kHz	300kHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10Hz	Average
Limit:	Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz-88MHz	100	40.0	Quasi-peak	3
	88MHz-216MHz	150	43.5	Quasi-peak	3
	216MHz-960MHz	200	46.0	Quasi-peak	3
	960MHz-1GHz	500	54.0	Quasi-peak	3
	Above 1GHz	500	54.0	Average	3
Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.					

Test Setup:

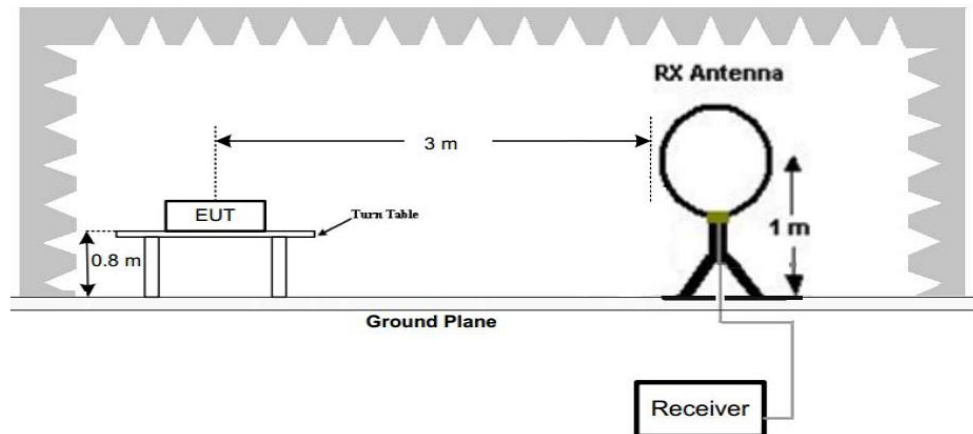


Figure 1. Below 30MHz

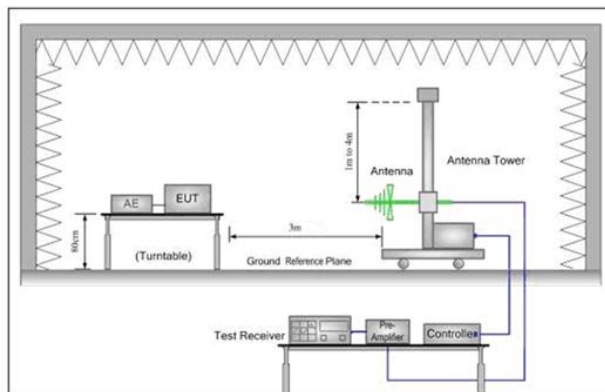


Figure 2. 30MHz to 1GHz

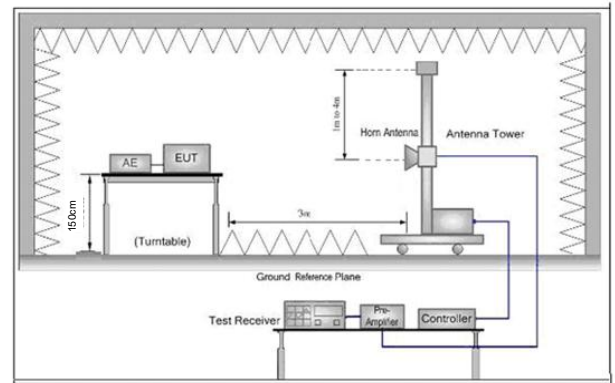


Figure 3. Above 1 GHz

Test Procedure:

- a. 1) Below 1G: The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
2) Above 1G: The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
Note: For the radiated emission test above 1GHz:
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both

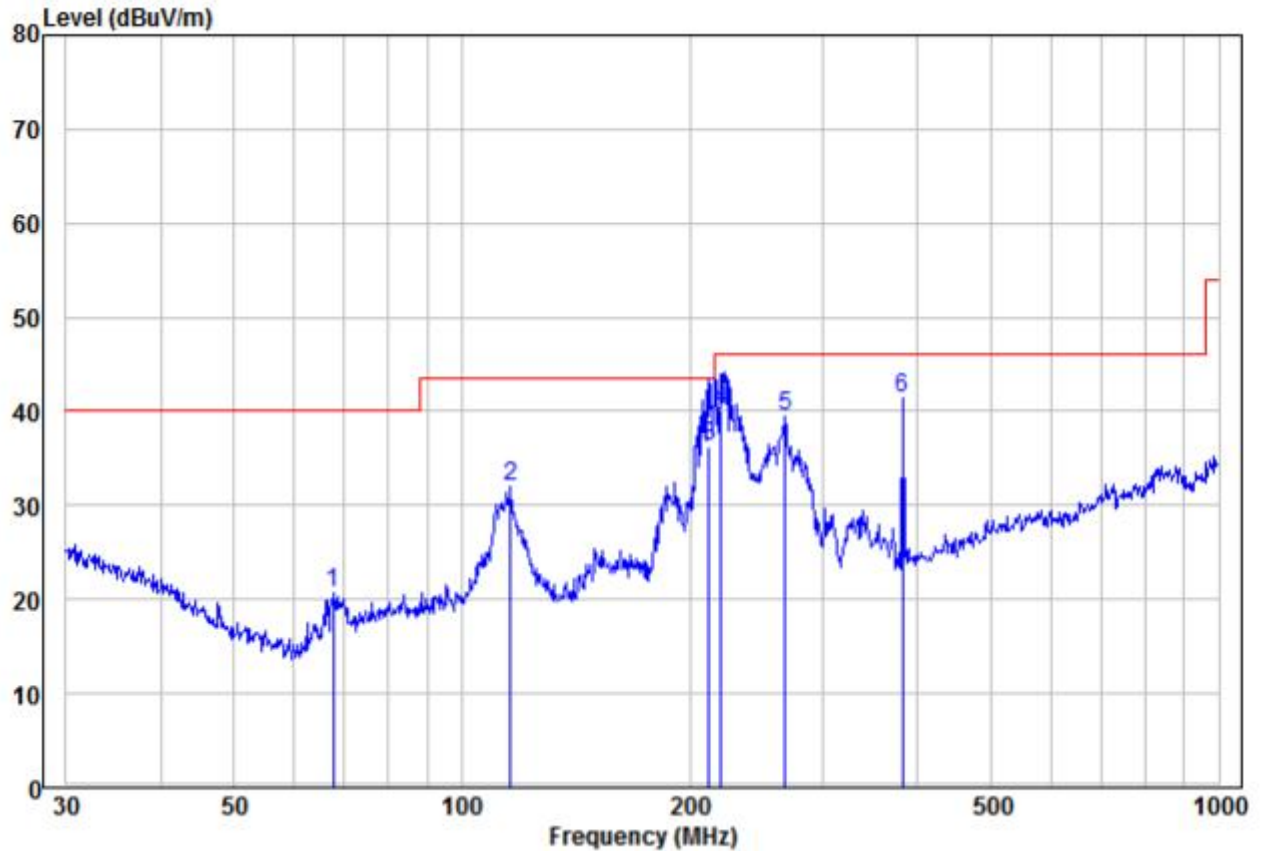
	horizontal and vertical polarizations of the antenna are set to make the measurement. d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. g. Test the EUT in the lowest channel (2402MHz),the middle channel (2440MHz),the Highest channel (2480MHz) h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case. i. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting with GFSK modulation. Transmitting mode.
Final Test Mode:	Through Pre-scan, find the 1Mbps of data type and GFSK modulation is the worst case. For below 1GHz part, through pre-scan, the worst case is the highest channel. Only the worst case is recorded in the report.
Test Results:	Pass

Radiated Emission below 1GHz

1#

30MHz~1GHz, the worst case

Test mode:	Transmitting mode	Horizontal
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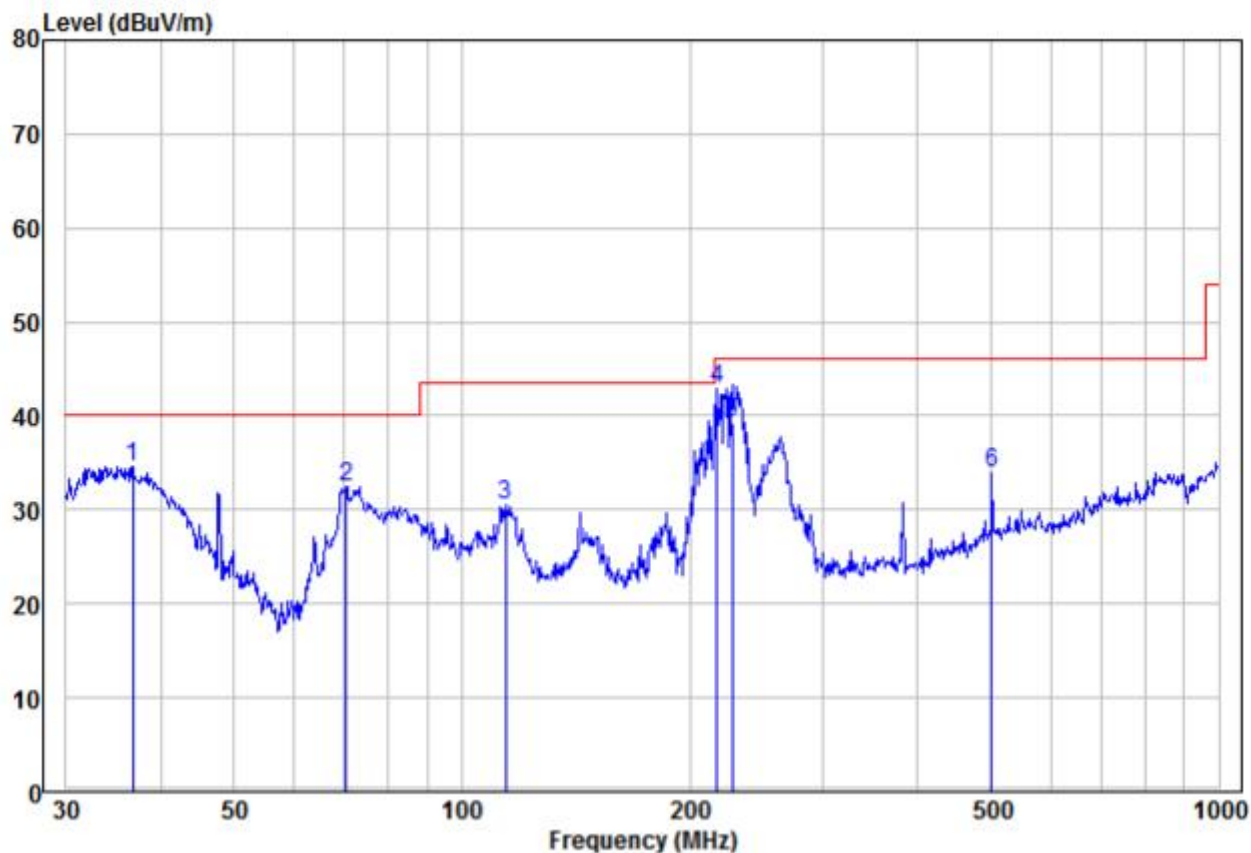
	Read			Limit	Over		
Freq	Level	Factor	Level	Line	Limit	Remark	Pol/Phase
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	67.68	13.23	7.43	20.66	40.00	-19.34 Peak	HORIZONTAL
2	116.13	21.42	10.50	31.92	43.50	-11.58 Peak	HORIZONTAL
3	212.27	27.44	8.88	36.32	43.50	-7.18 QP	HORIZONTAL
4 qp	219.84	30.87	9.13	40.00	46.00	-6.00 QP	HORIZONTAL
5	267.55	26.77	12.66	39.43	46.00	-6.57 Peak	HORIZONTAL
6 pp	382.59	26.64	14.73	41.37	46.00	-4.63 Peak	HORIZONTAL

30MHz~1GHz, the worst case

Test mode:

Transmitting mode

Vertical



	Read Freq	Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	36.77	20.69	13.96	34.65	40.00	-5.35	Peak	VERTICAL
2	70.34	24.22	8.21	32.43	40.00	-7.57	Peak	VERTICAL
3	114.11	20.12	10.39	30.51	43.50	-12.99	Peak	VERTICAL
4 pp	217.54	33.74	9.04	42.78	46.00	-3.22	Peak	VERTICAL
5 qp	227.69	29.07	10.14	39.21	46.00	-6.79	QP	VERTICAL
6	501.18	15.67	18.29	33.96	46.00	-12.04	Peak	VERTICAL

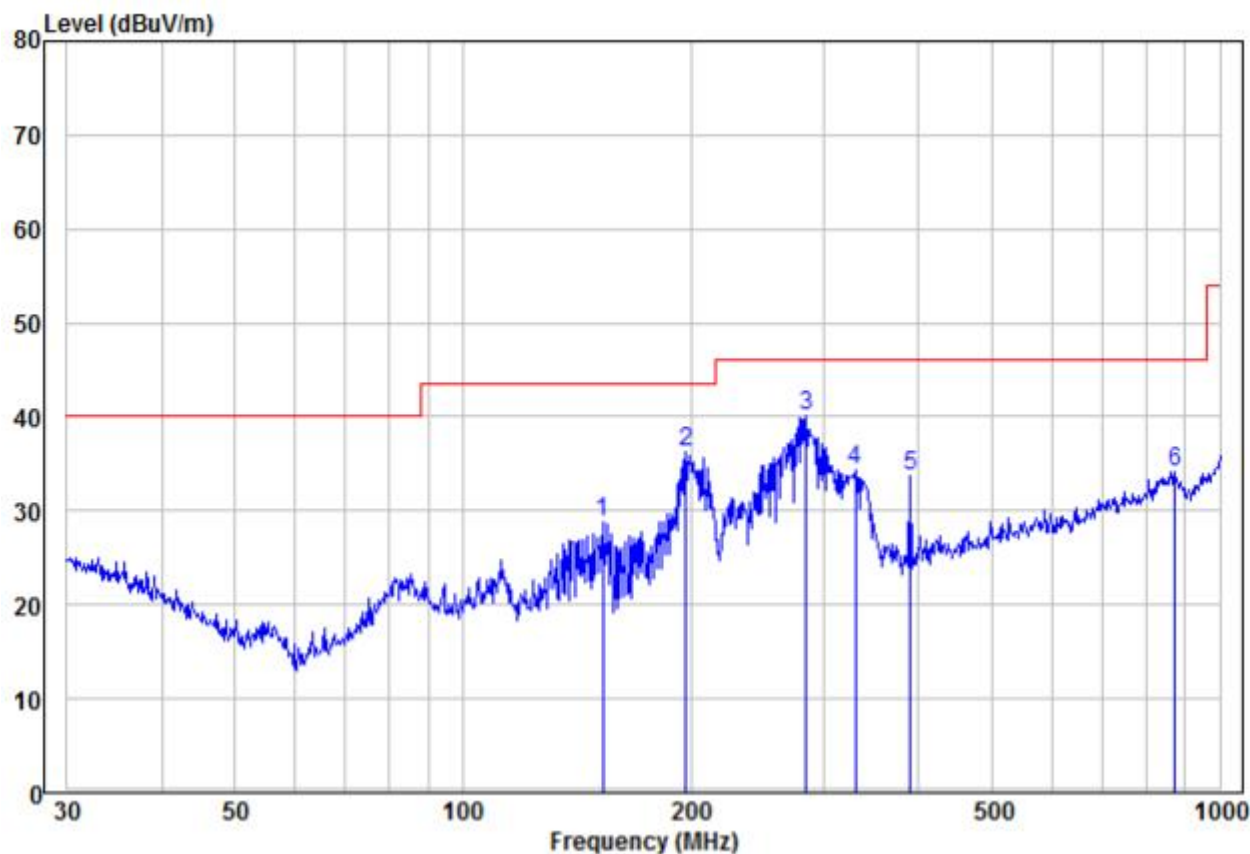
2#

30MHz~1GHz, the worst case

Test mode:

Transmitting mode

Horizontal



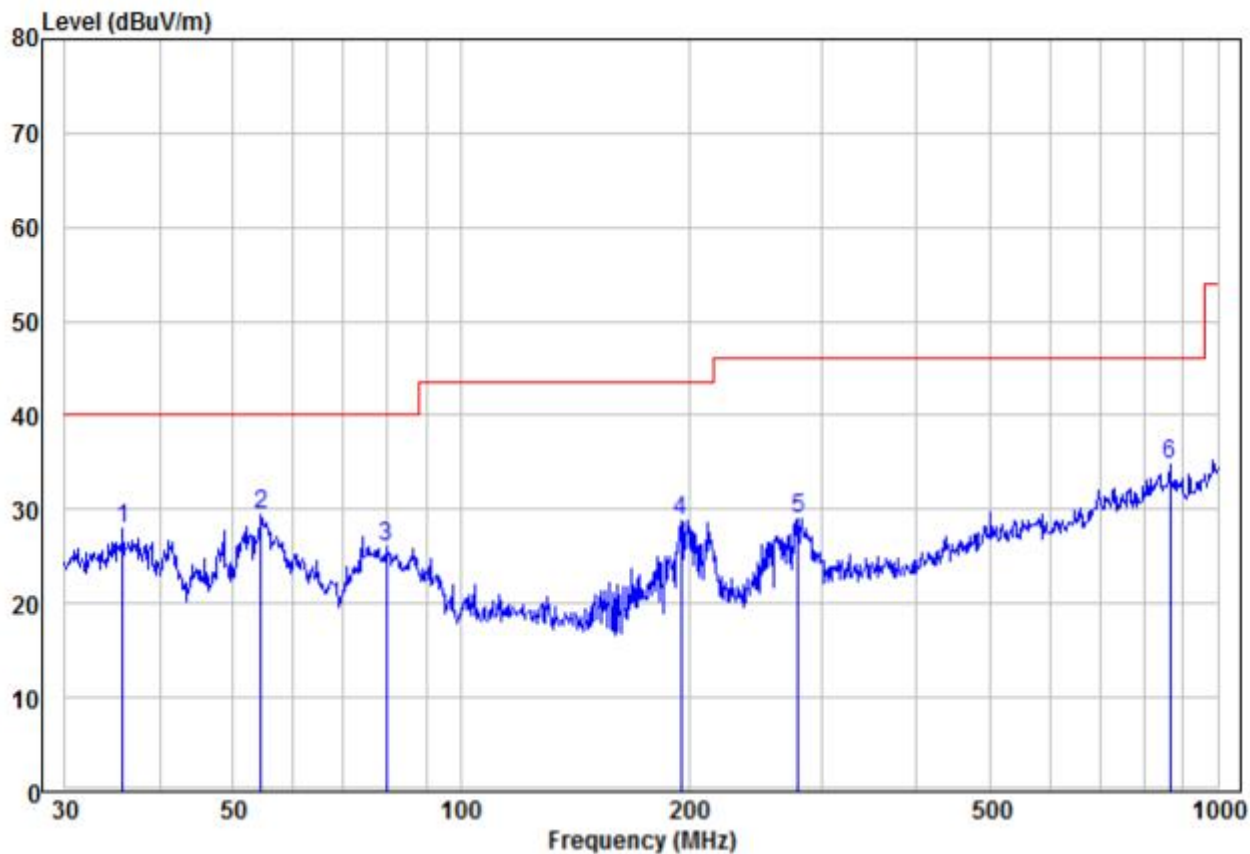
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	153.20	20.52	8.26	28.78	43.50	-14.72	Peak	HORIZONTAL
2	197.20	27.98	8.34	36.32	43.50	-7.18	Peak	HORIZONTAL
3 pp	283.98	26.88	13.20	40.08	46.00	-5.92	Peak	HORIZONTAL
4	330.19	19.80	14.46	34.26	46.00	-11.74	Peak	HORIZONTAL
5	390.72	18.83	14.93	33.76	46.00	-12.24	Peak	HORIZONTAL
6	872.18	10.21	23.96	34.17	46.00	-11.83	Peak	HORIZONTAL

30MHz~1GHz, the worst case

Test mode:

Transmitting mode

Vertical



	Freq	Read		Limit	Over		
	MHz	Level	Factor	Line	Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1	35.75	13.56	14.33	27.89	40.00	-12.11 Peak	VERTICAL
2	54.45	22.20	7.16	29.36	40.00	-10.64 Peak	VERTICAL
3	79.80	16.17	9.76	25.93	40.00	-14.07 Peak	VERTICAL
4	195.14	20.65	8.24	28.89	43.50	-14.61 Peak	VERTICAL
5	279.04	16.02	13.04	29.06	46.00	-16.94 Peak	VERTICAL
6	866.09	10.78	23.98	34.76	46.00	-11.24 Peak	VERTICAL