7. 6dB BANDWIDTH

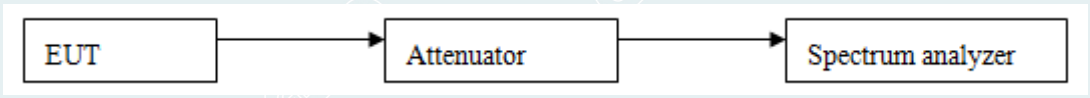
7.1 LIMITS

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

7.2 TEST PROCEDURES

1) Remove the antenna from the EUT, and then connect a low loss RF cable from antenna port to the spectrum analyzer.
2) Set resolution bandwidth (RBW) = 100kHz.Set the video bandwidth (VBW) ≥ 3 x RBW. Detector = Peak. Trace mode = max hold. Sweep = auto couple. Allow the trace to stabilize, record 6dB bandwidth value.
3) Repeat above procedures until all frequencies measured were complete.

7.3 TEST SETUP



7.4 TEST RESULTS

Environment: 22.6℃/48%RH Voltage: AC 120V/60Hz
Tested By: Deng Weihao Date: 2022-04-18

BLE_1M

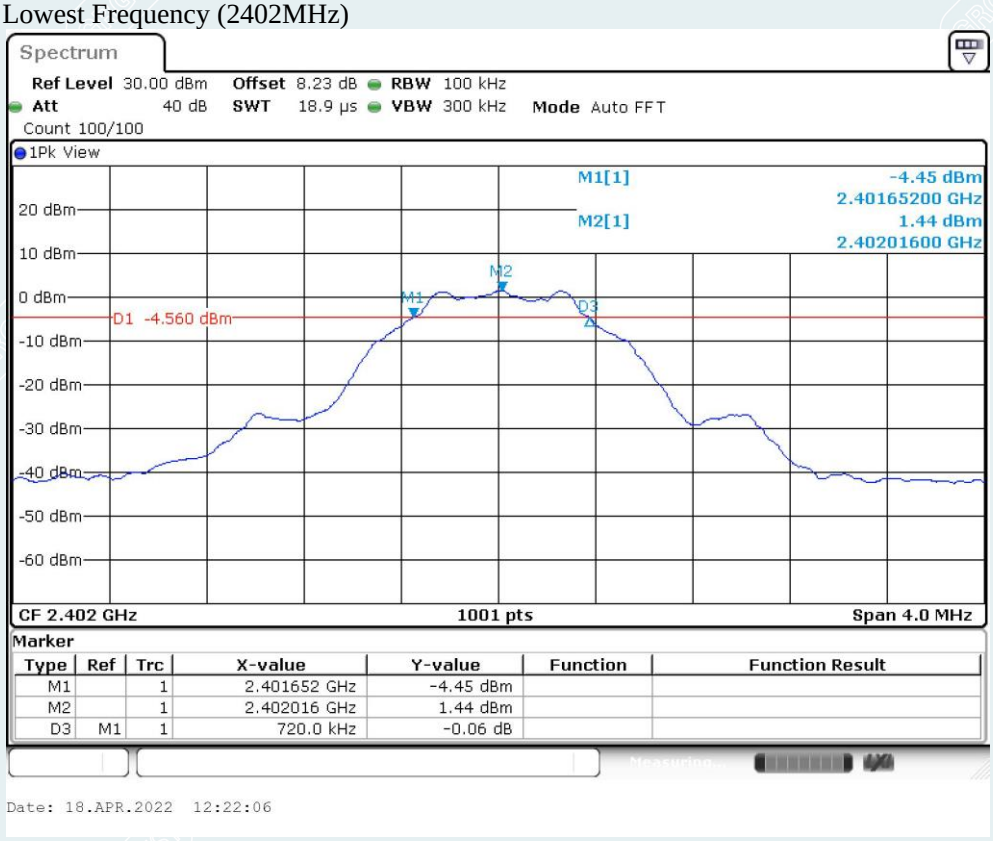
Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Lowest	2402	720	≥500	PASS
Middle	2440	720		PASS
Highest	2480	720		PASS

BLE_2M

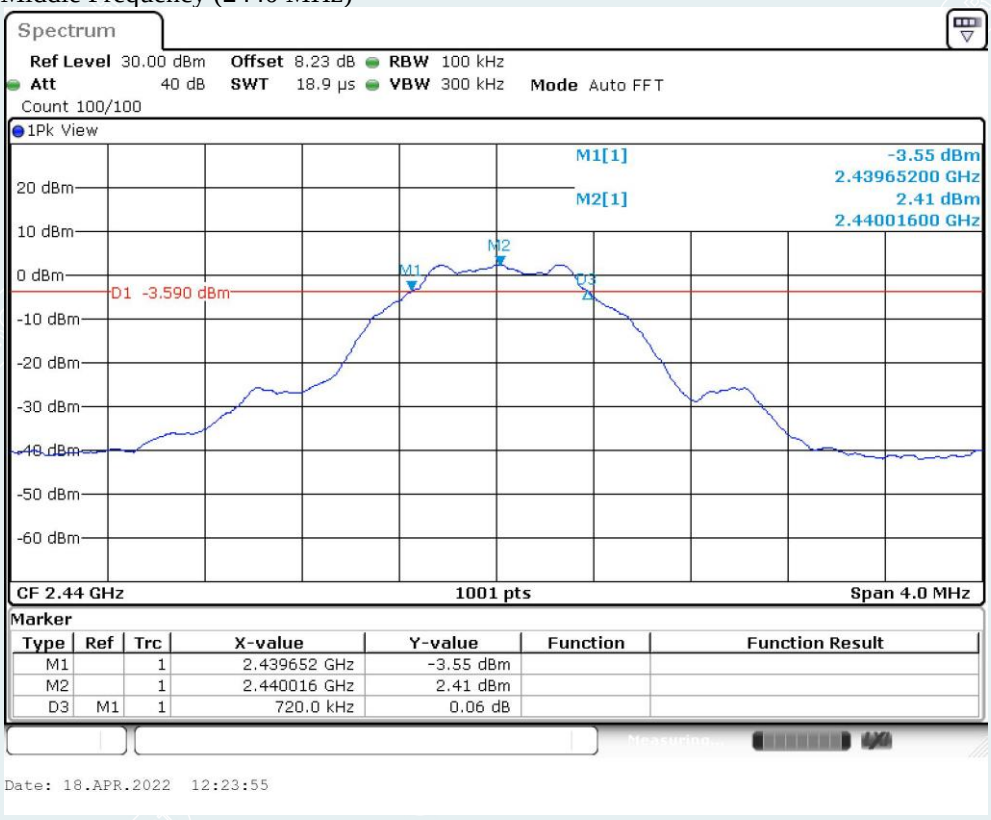
Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Lowest	2402	1104	≥500	PASS
Middle	2440	1104		PASS
Highest	2480	1100		PASS

BLE_1M

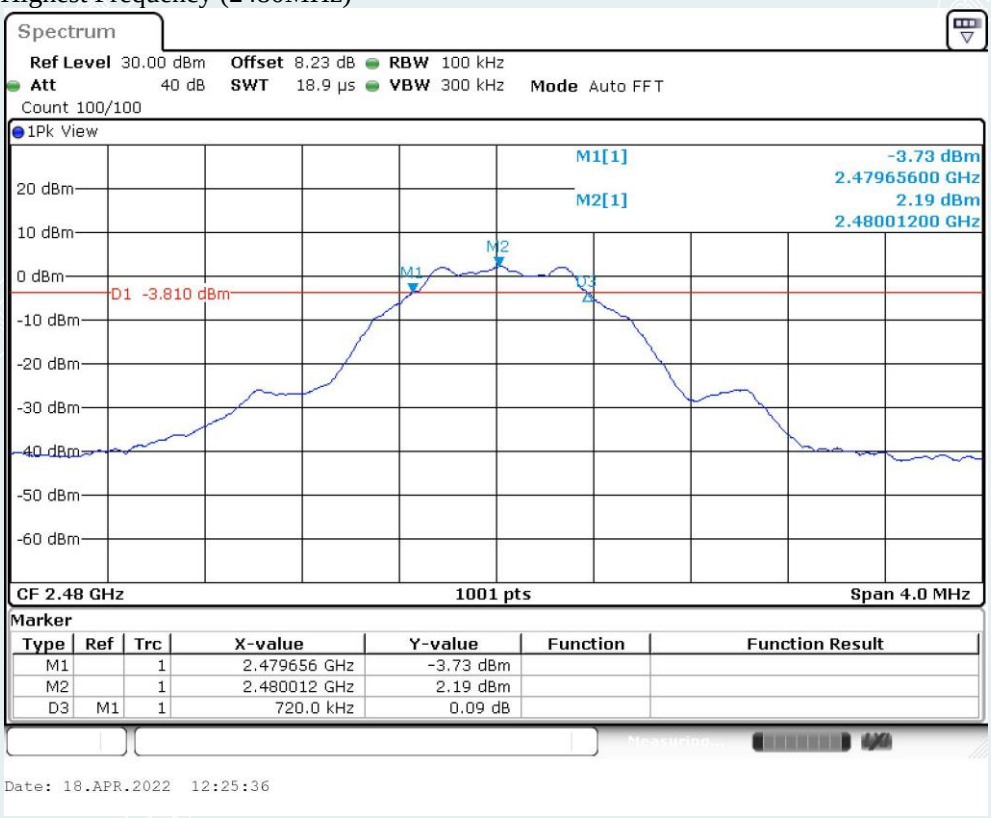
Lowest Frequency (2402MHz)



Middle Frequency (2440 MHz)



Highest Frequency (2480MHz)



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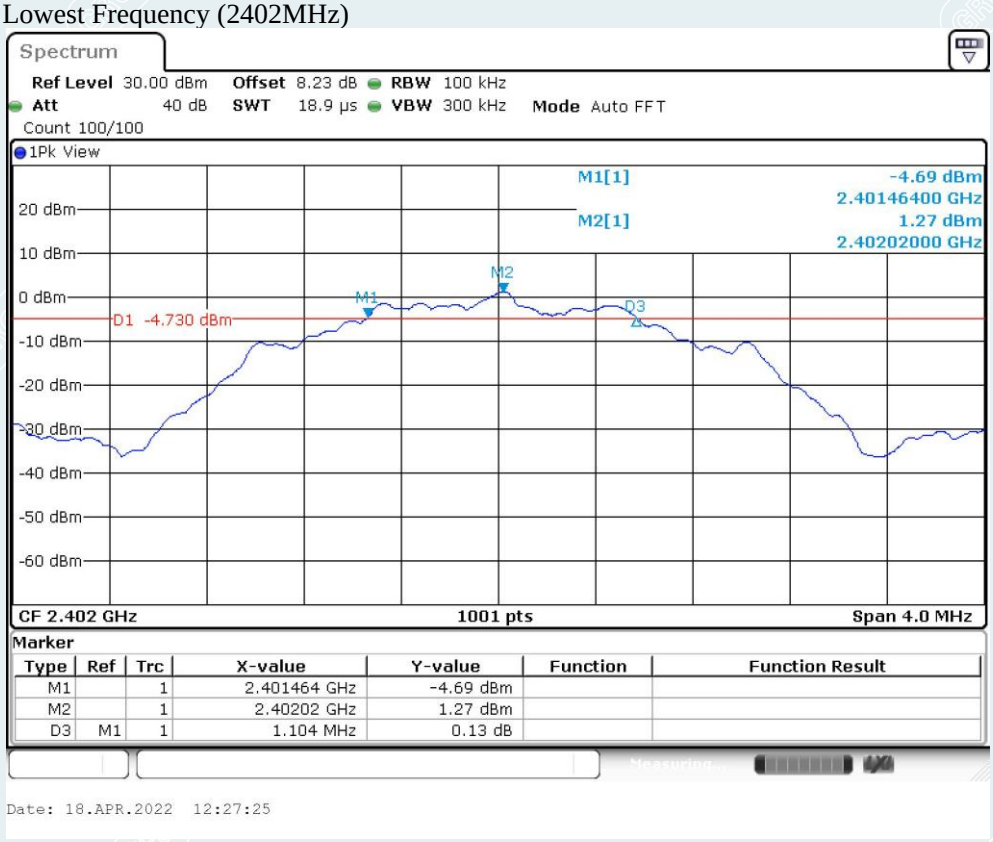
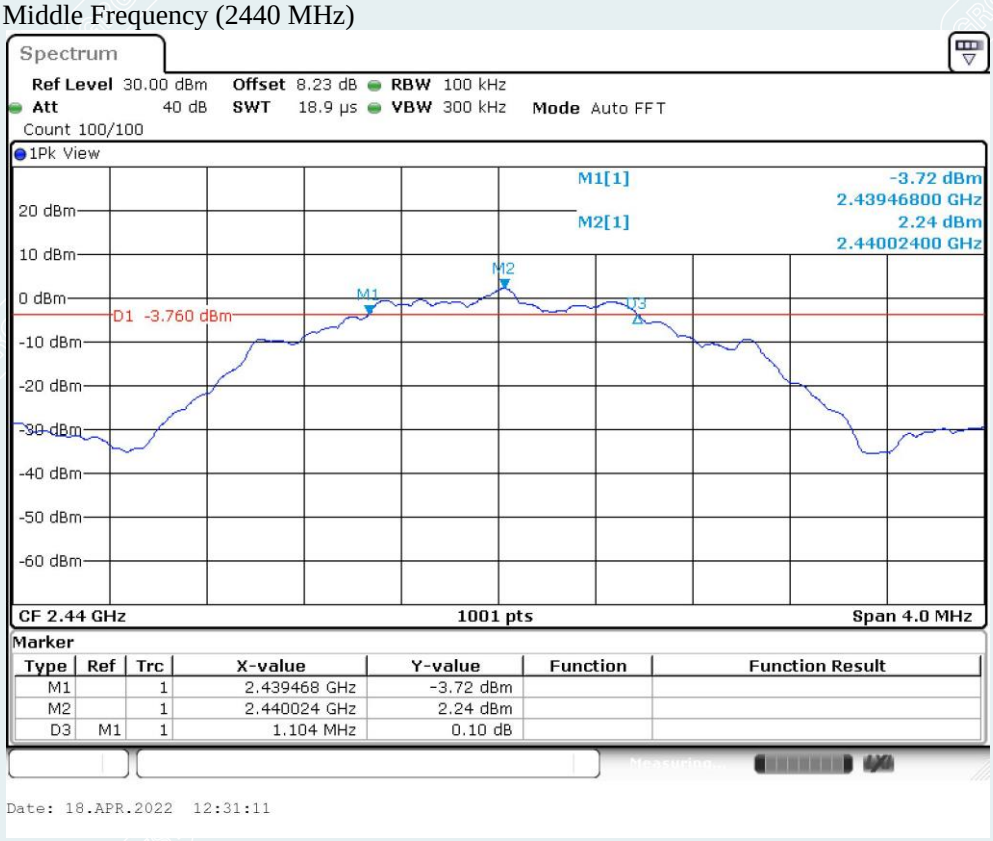
BLE_2M

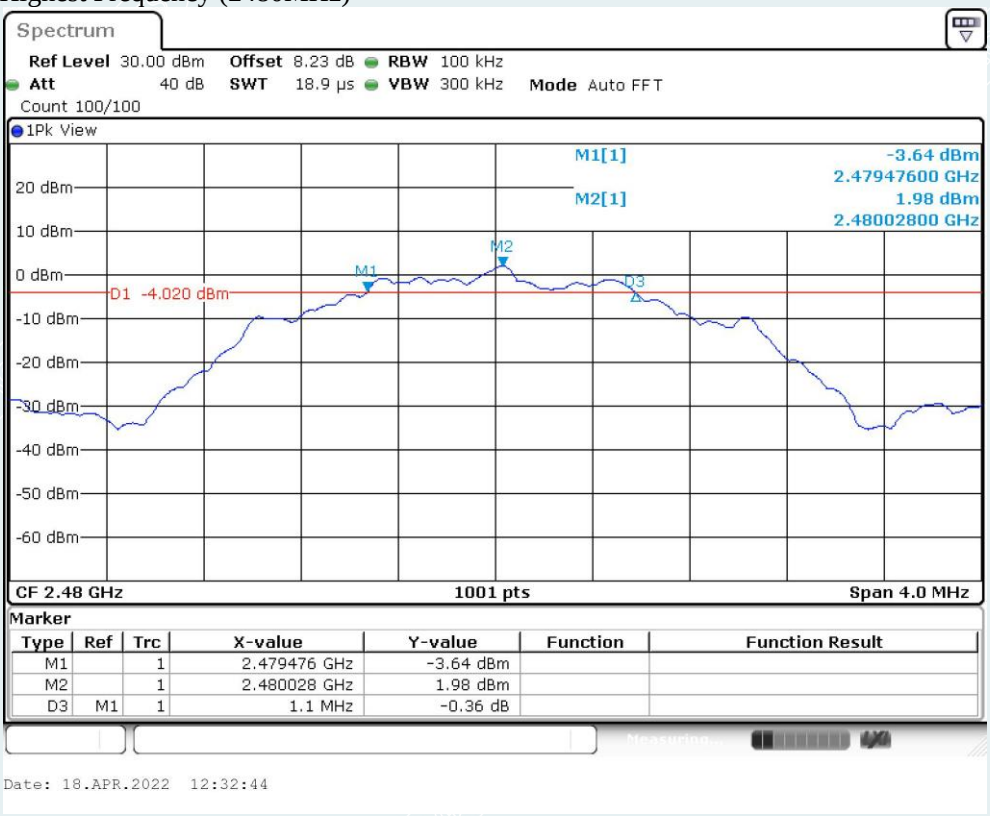
Lowest Frequency (2402MHz)



Middle Frequency (2440 MHz)



Highest Frequency (2480MHz)



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8. MAXIMUM PEAK OUTPUT POWER

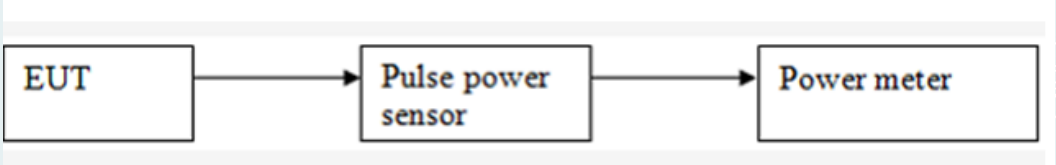
8.1 LIMITS

The maximum Peak output power measurement is 1W

8.2 TEST PROCEDURES

1) RF output of EUT was connected to the broadband peak RF power meter by RF cable. The path loss was compensated to the results for each measurement.
2) Set to the maximum power setting and enable the EUT transmit continuously.
3) Measure the conducted output power and record the results in the test report.

8.3 TEST SETUP



8.4 TEST RESULTS

Environment: 22.6℃/48%RH Voltage: AC 120V/60Hz
Tested By: Deng Weihao Date: 2022-02-16

BLE_1M

Channel	Frequency (MHz)	Measured Channel Power (dBm)	Limit	Peak/ Average	Result
Lowest	2402	2.28	1W (30dBm)	Peak	Pass
Middle	2440	3.28			Pass
Highest	2480	3.02			Pass

BLE_2M

Channel	Frequency (MHz)	Measured Channel Power (dBm)	Limit	Peak/ Average	Result
Lowest	2402	2.27	1W (30dBm)	Peak	Pass
Middle	2440	3.19			Pass
Highest	2480	2.96			Pass

9. POWER SPECTRAL DENSITY

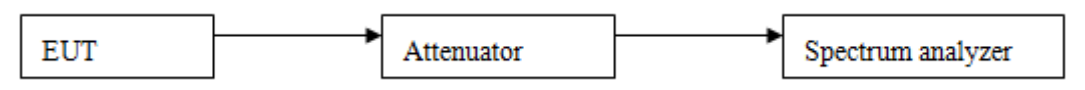
9.1 LIMITS

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

9.2 TEST PROCEDURES

1) Remove the antenna from the EUT, and then connect a low loss RF cable from antenna port to the spectrum analyzer.
2) Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3) Set the analyzer span to 1.5 times the DTS bandwidth. Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz. Set the VBW ≥ [3 × RBW]. Detector = peak. Sweep time = auto couple.Trace mode = max hold. Allow trace to fully stabilize. Use the peak marker function to determine the maximum amplitude level within the RBW. If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.
4) Repeat above procedures until all frequencies measured were complete.

9.3 TEST SETUP



9.4 TEST RESULTS

Environment: 22.6℃/48%RH Voltage: AC 120V/60Hz
Tested By: Deng Weihao Date: 2022-04-18

BLE_1M

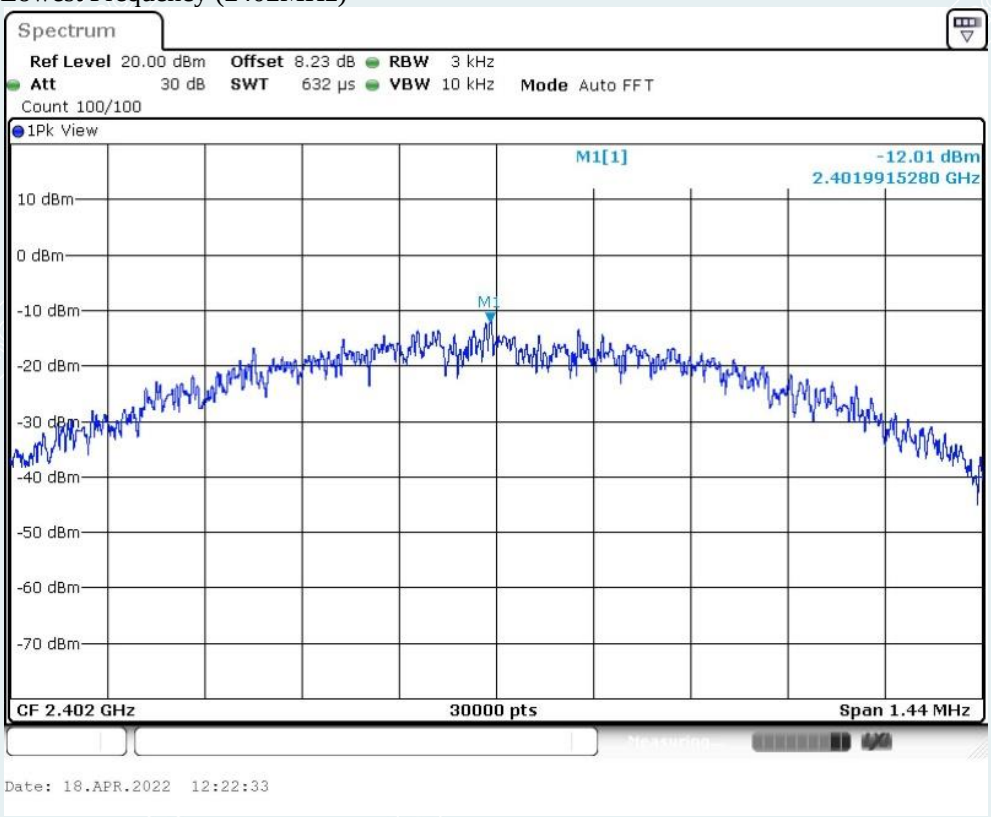
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Test Result
Lowest	2402	-12.01	8.00	PASS
Middle	2440	-10.97		PASS
Highest	2480	-11.25		PASS

BLE_2M

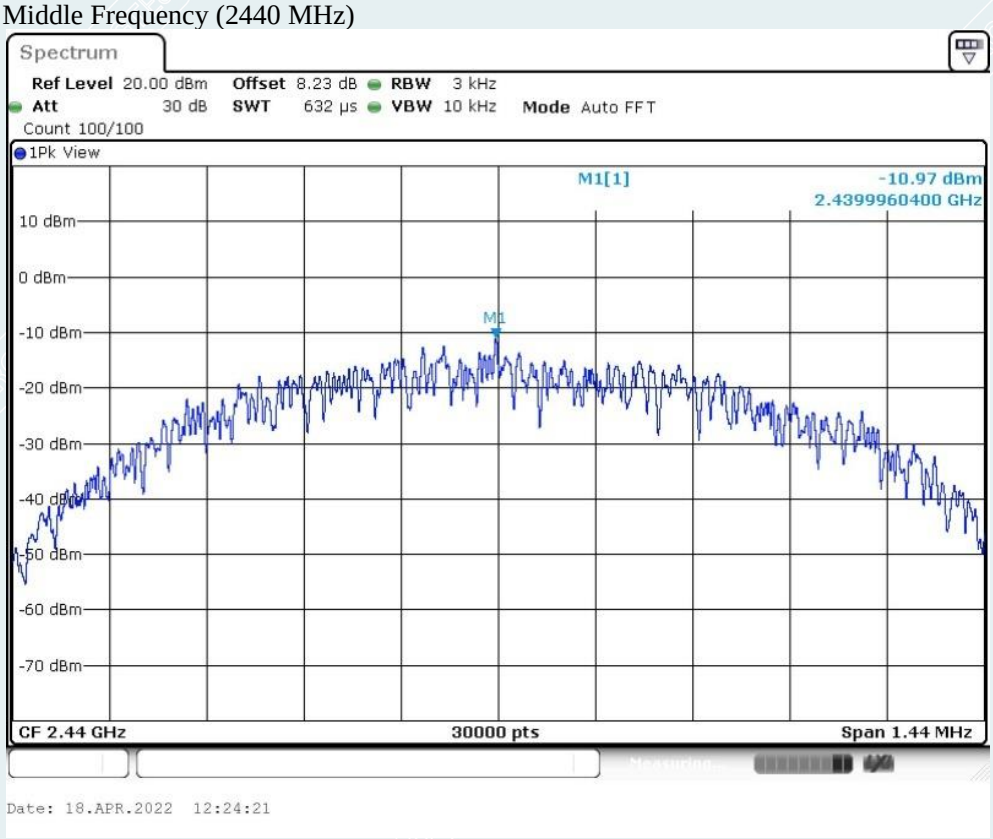
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Test Result
Lowest	2402	-15.19	8.00	PASS
Middle	2440	-14.19		PASS
Highest	2480	-14.55		PASS

BLE_1M

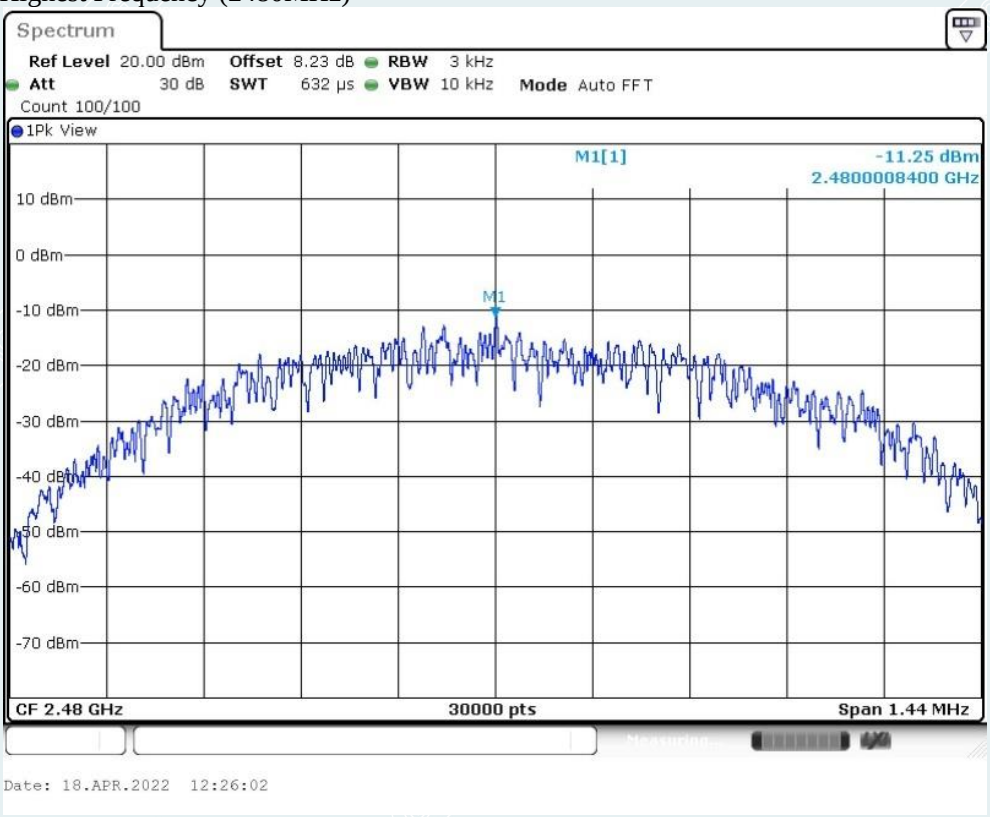
Lowest Frequency (2402MHz)



Middle Frequency (2440 MHz)



Highest Frequency (2480MHz)



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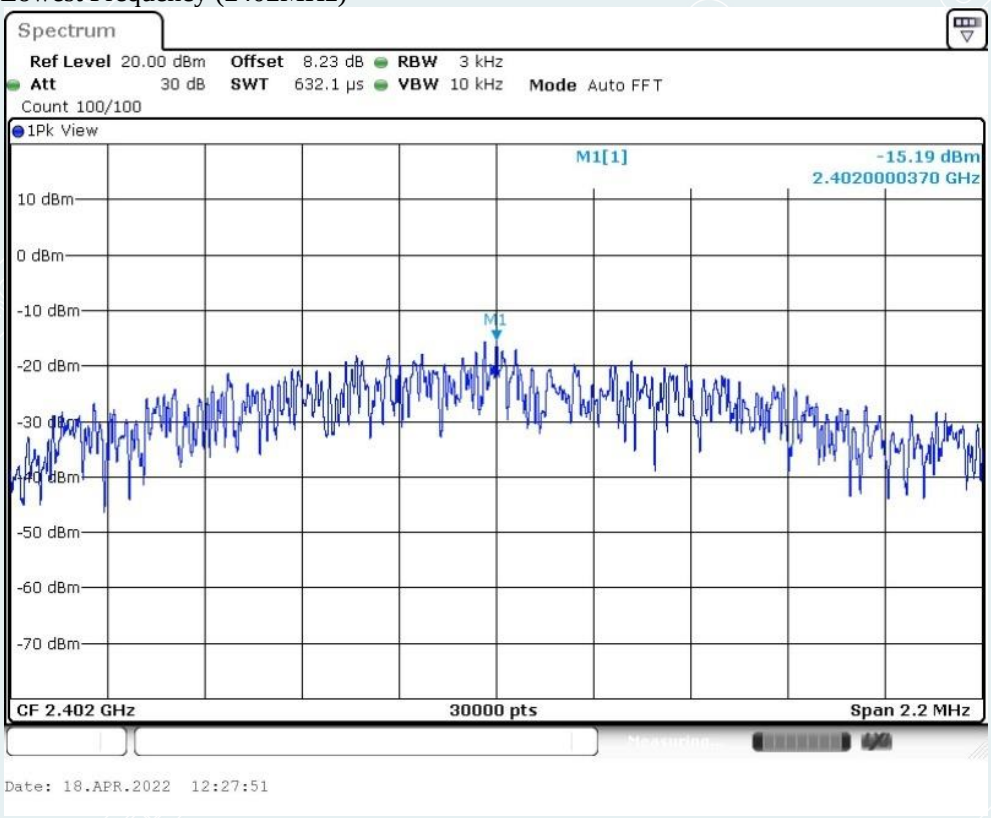
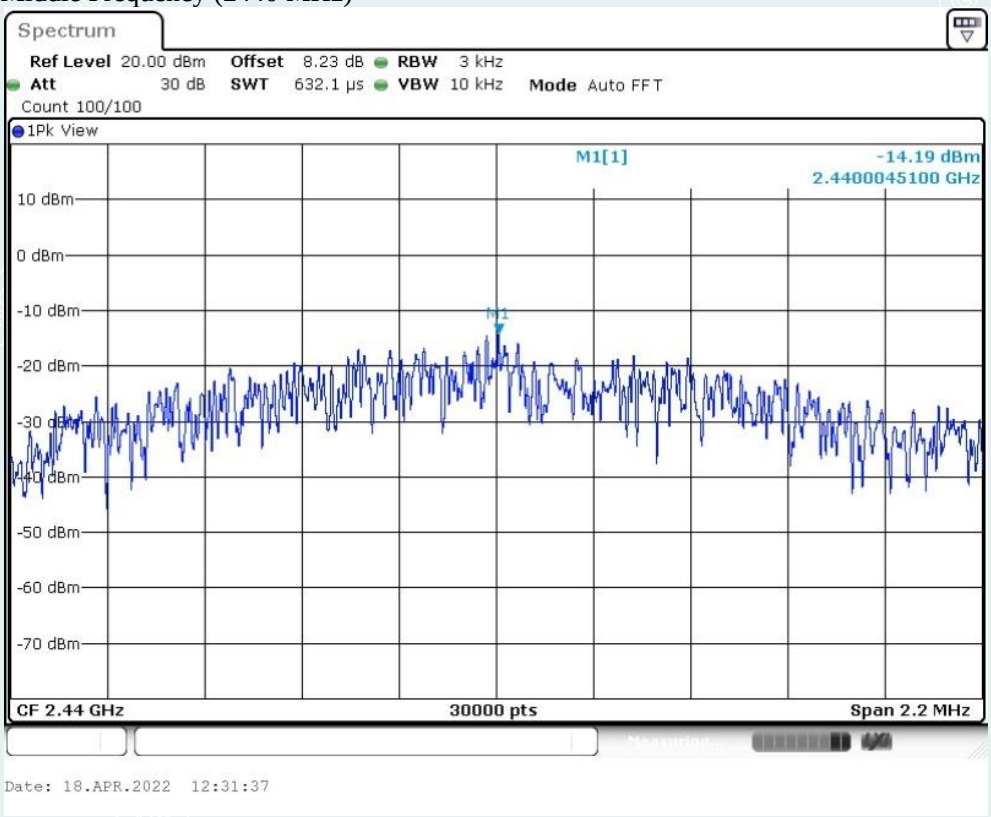
BLE_2M

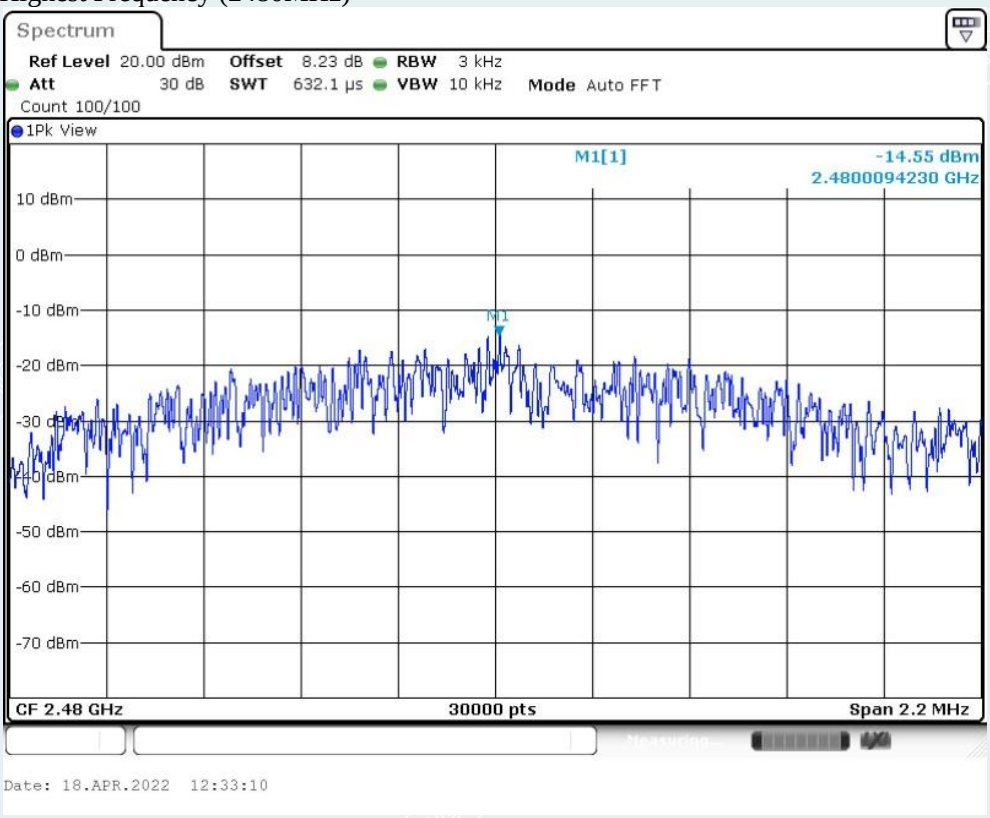
Lowest Frequency (2402MHz)



Middle Frequency (2440 MHz)



Highest Frequency (2480MHz)



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10. CONDUCTED BAND EDGES AND SPURIOUS EMISSIONS

10.1 LIMITS

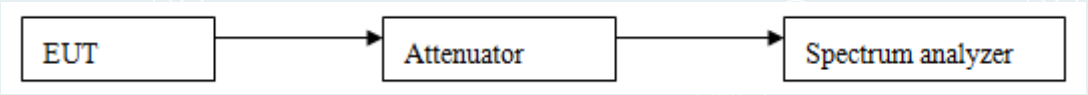
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

10.2 TEST PROCEDURES

Test procedures follow KDB 558074 D01 15.247 measurement guidance v05r02.
Remove the antenna from the EUT and then connect a low attenuation cable from the antenna port to the spectrum.

1) Remove the antenna from the EUT and then connect a low attenuation cable from the antenna port to the spectrum.
2) Set the spectrum analyzer: RBW =100kHz; VBW =300kHz, Frequency range = 30MHz to 26.5GHz; Sweep = auto; Detector Function = Peak. Trace = Max, hold.
3) Measure and record the results in the test report.
4) The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

10.3 TEST SETUP

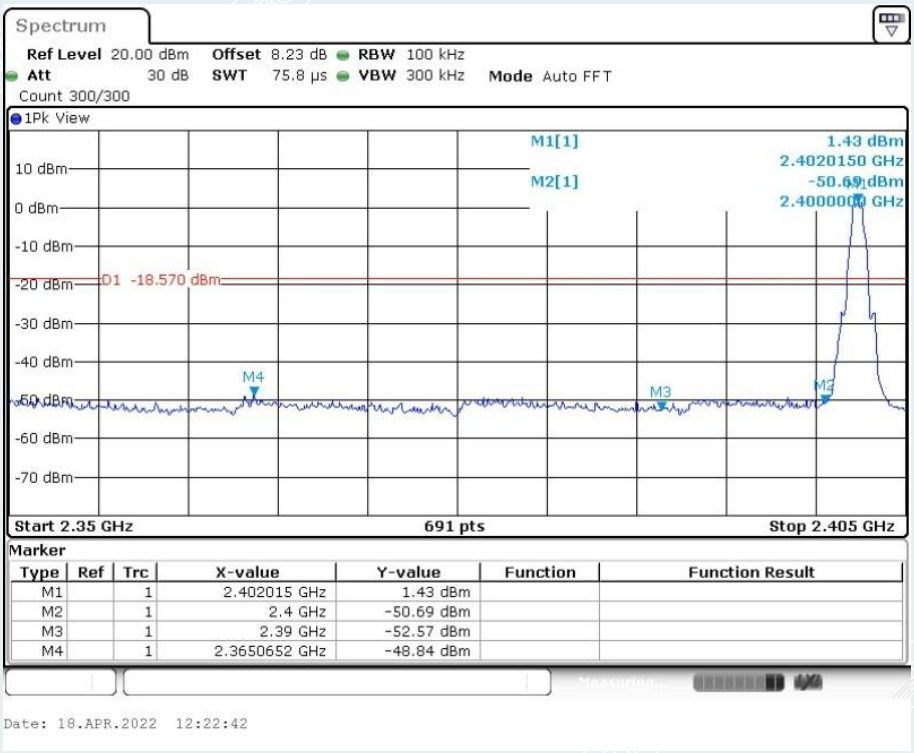


10.4 TEST RESULTS

Environment: 22.6℃/48%RH Voltage: AC 120V/60Hz
Tested By: Deng Weihao Date: 2022-04-18

BLE_1M

Lowest Frequency (2402MHz)
2.35GHz-2.405GHz



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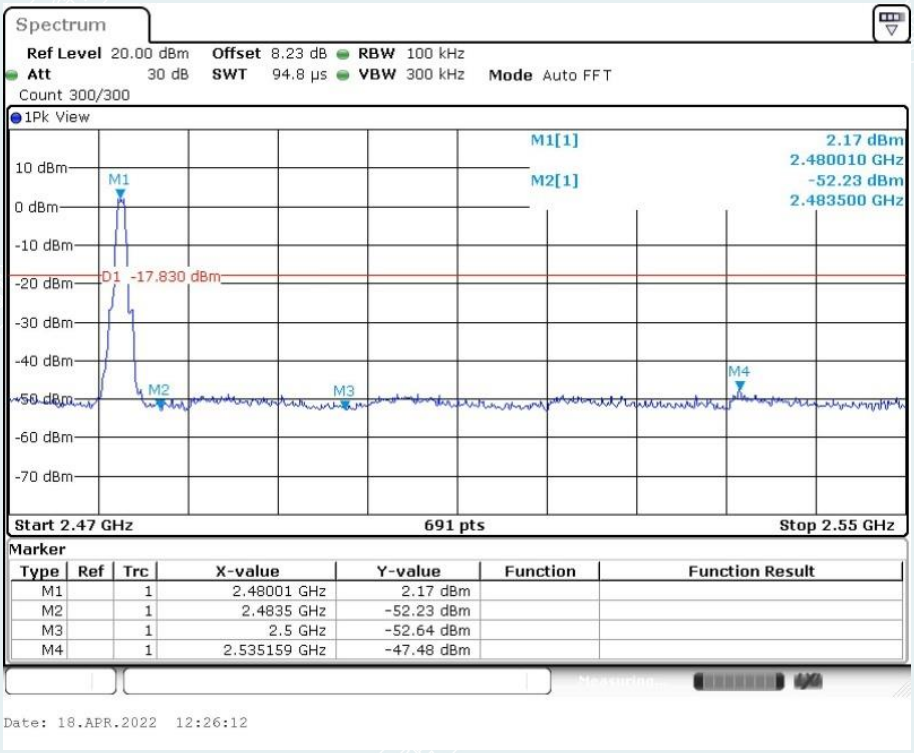
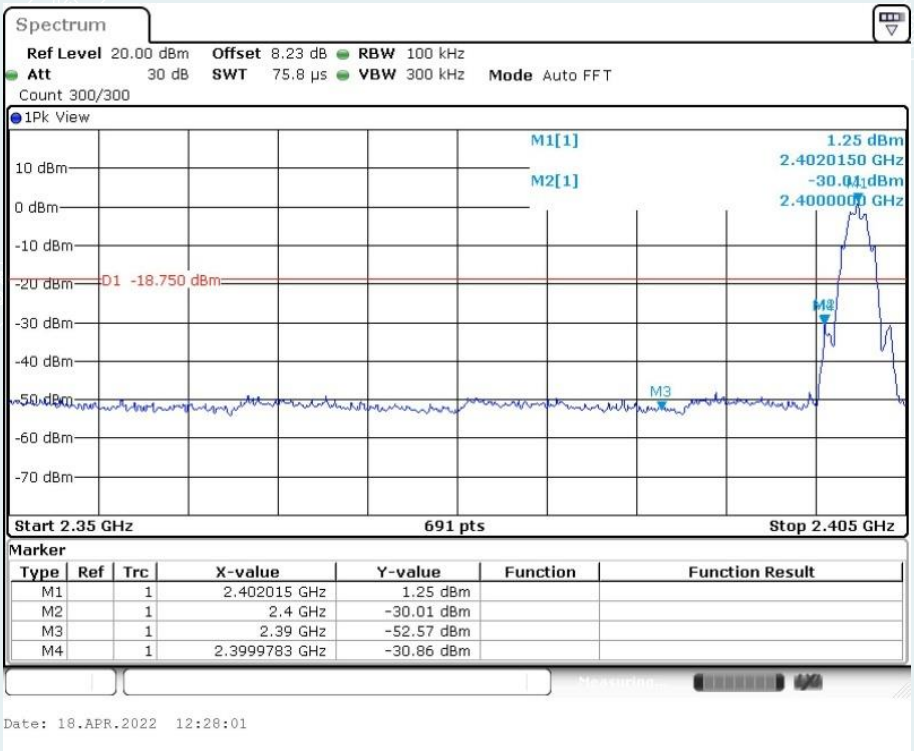
Highest Frequency (2480MHz)
2.47GHz-2.55GHz

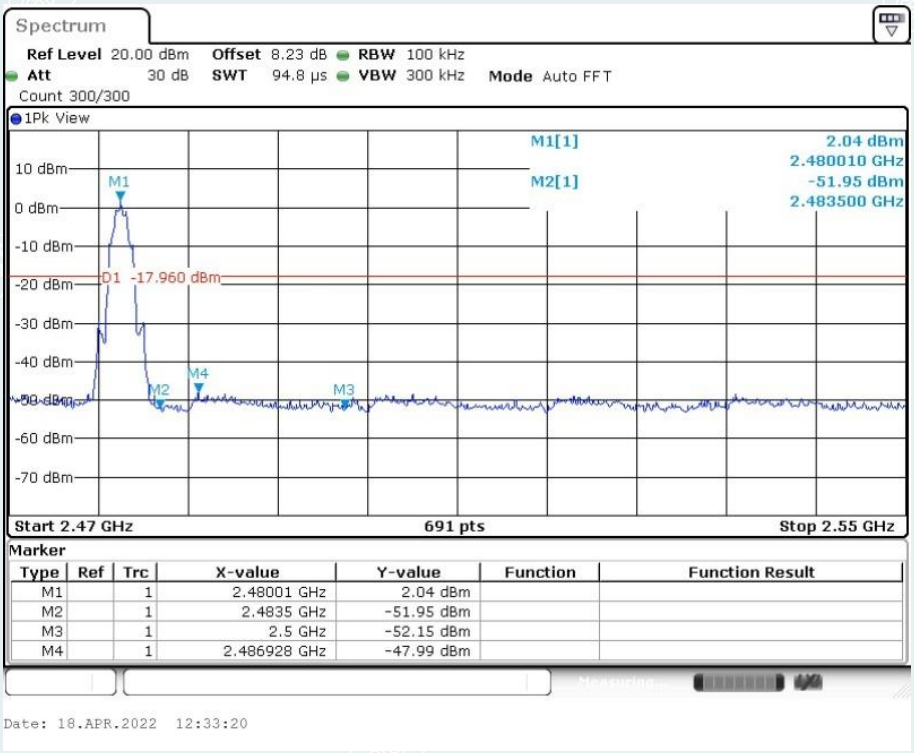


BLE_2M

Lowest Frequency (2402MHz)
2.35GHz-2.405GHz

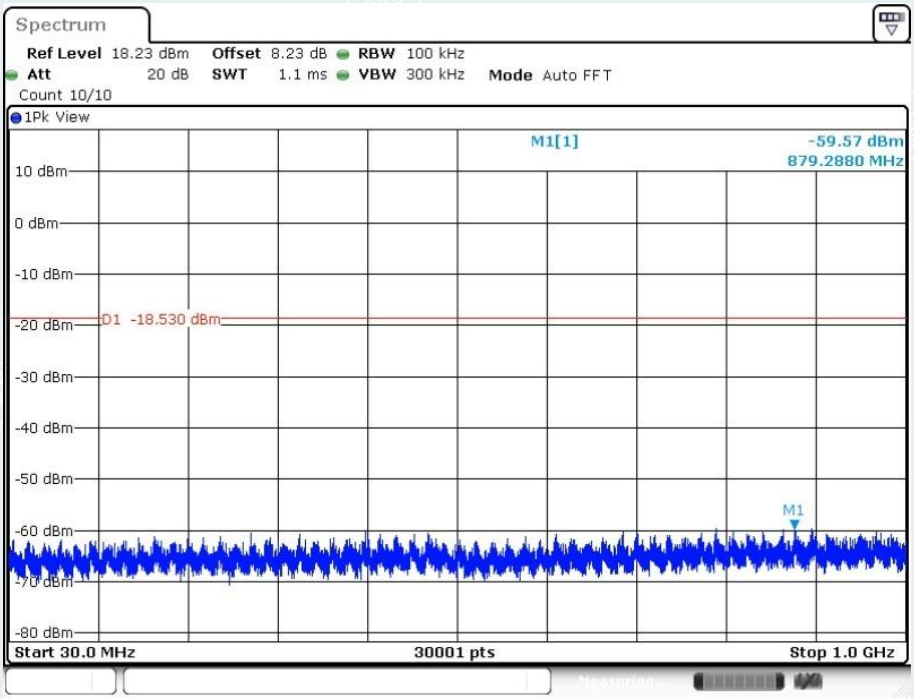


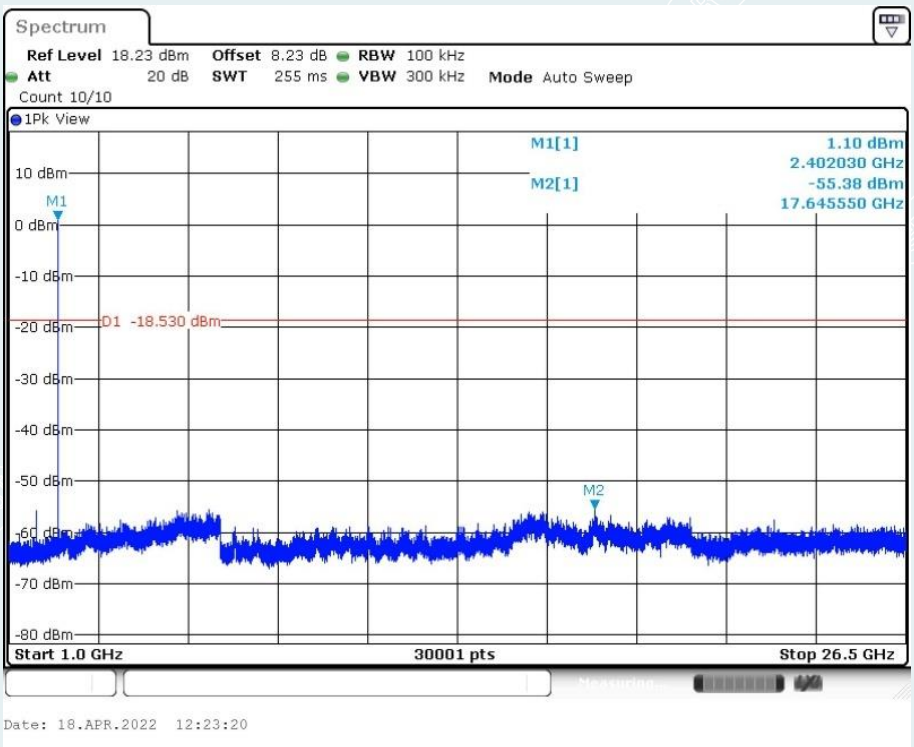
Highest Frequency (2480MHz)
2.47GHz-2.55GHz



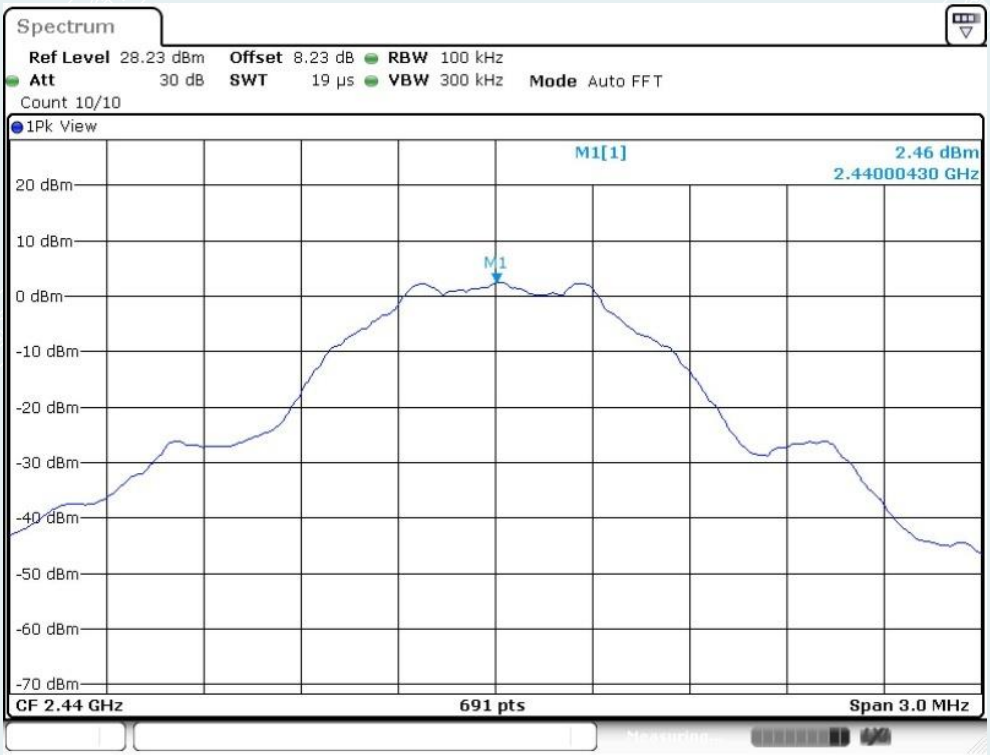
BLE_1M

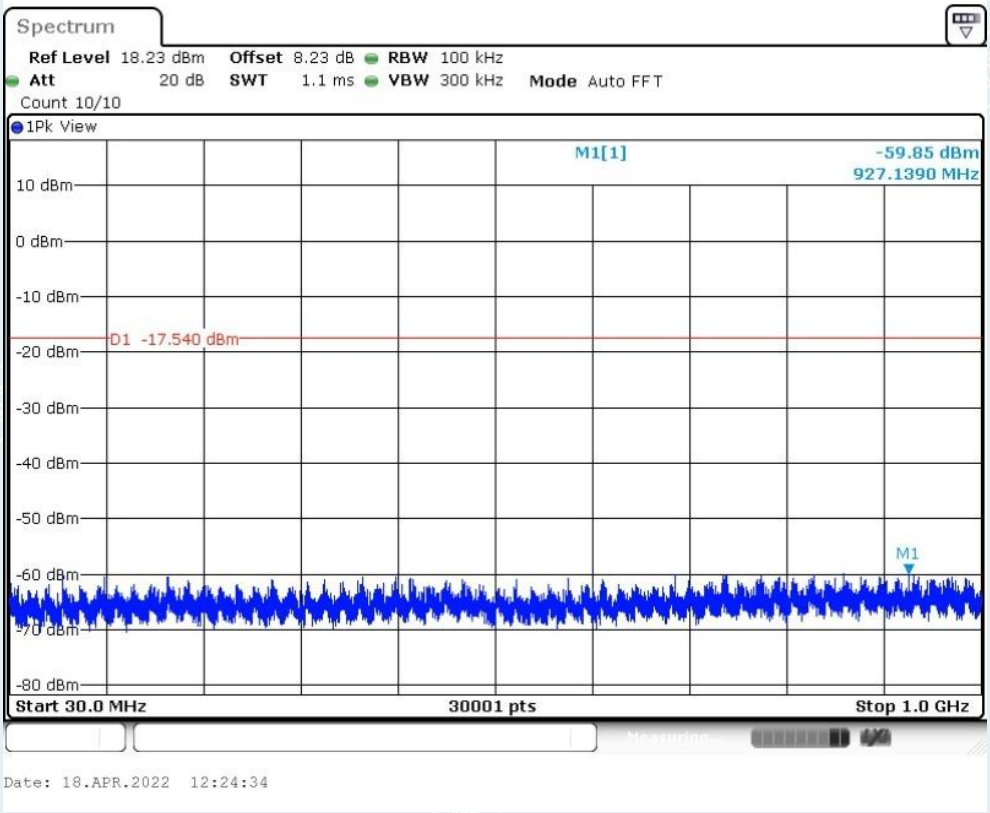
Lowest Frequency (2402MHz)

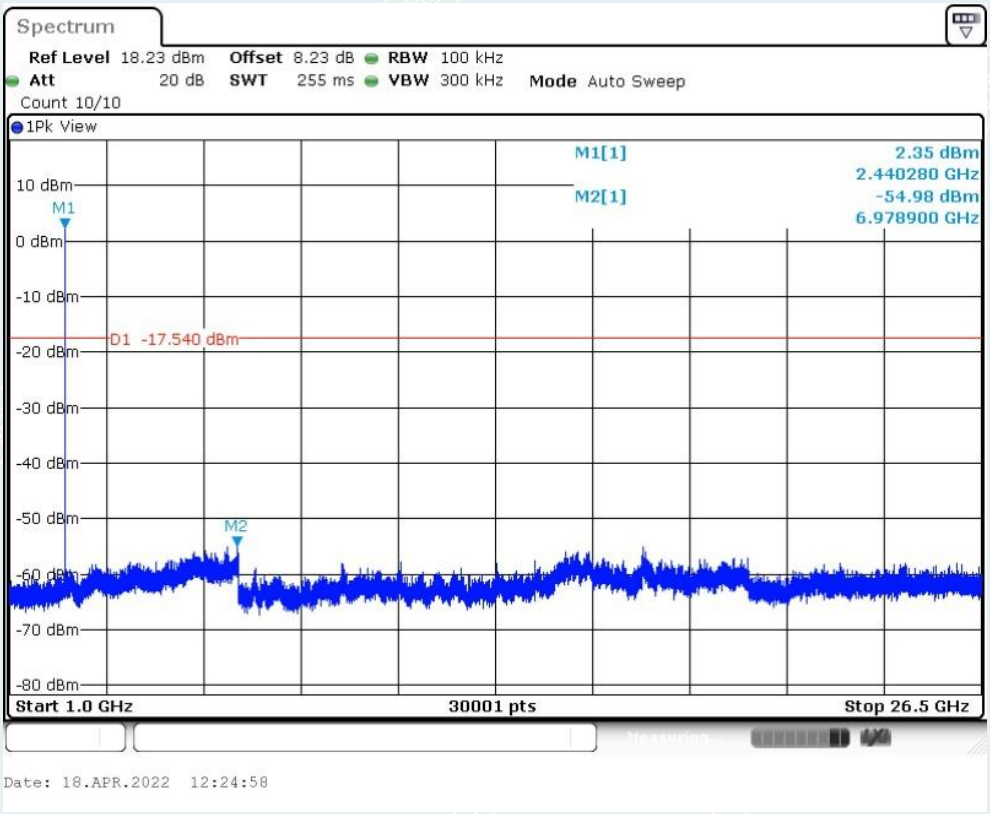

Spectrum
Ref Level 18.23 dBm Offset 8.23 dB RBW 100 kHz
Att 20 dB SWT 1.1 ms VBW 300 kHz Mode Auto FFT
Count 10/10
1Pk View
M1[1] -59.57 dBm
879.2880 MHz
10 dBm
0 dBm
-10 dBm
-20 dBm
D1 -18.530 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
M1
Start 30.0 MHz
30001 pts
Stop 1.0 GHz
Date: 18.APR.2022 12:22:56


Spectrum
Ref Level 18.23 dBm Offset 8.23 dB RBW 100 kHz
Att 20 dB SWT 255 ms VBW 300 kHz Mode Auto Sweep
Count 10/10
1Pk View
M1[1] 1.10 dBm
2.402030 GHz
M2[1] -55.38 dBm
17.645550 GHz
10 dBm
M1
0 dBm
-10 dBm
-20 dBm
D1 -18.530 dBm
-30 dBm
-40 dBm
-50 dBm
M2
-60 dBm
-70 dBm
-80 dBm
Start 1.0 GHz
30001 pts
Stop 26.5 GHz
Date: 18.APR.2022 12:23:20

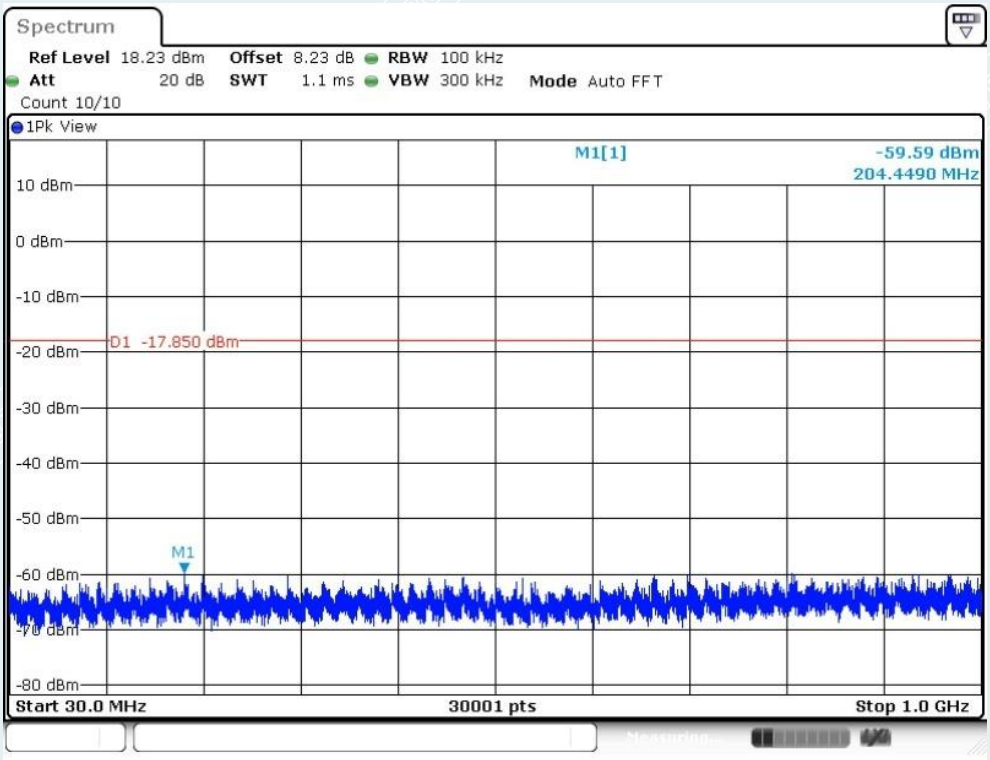
Middle Frequency (2440MHz)



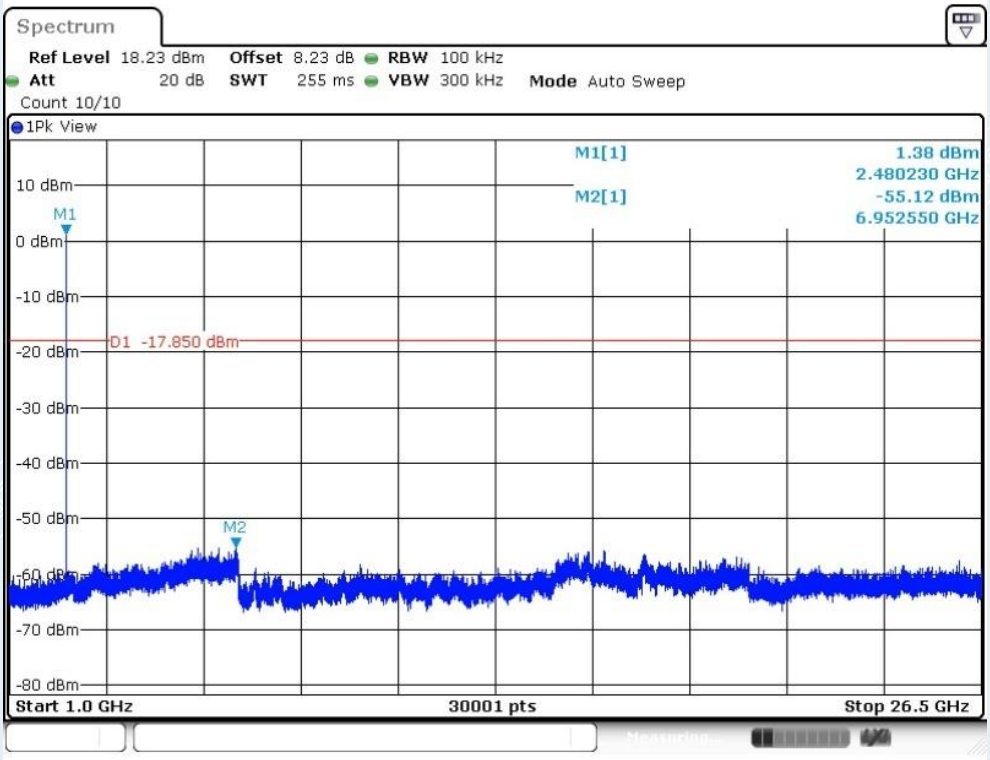




Highest Frequency (2480MHz)



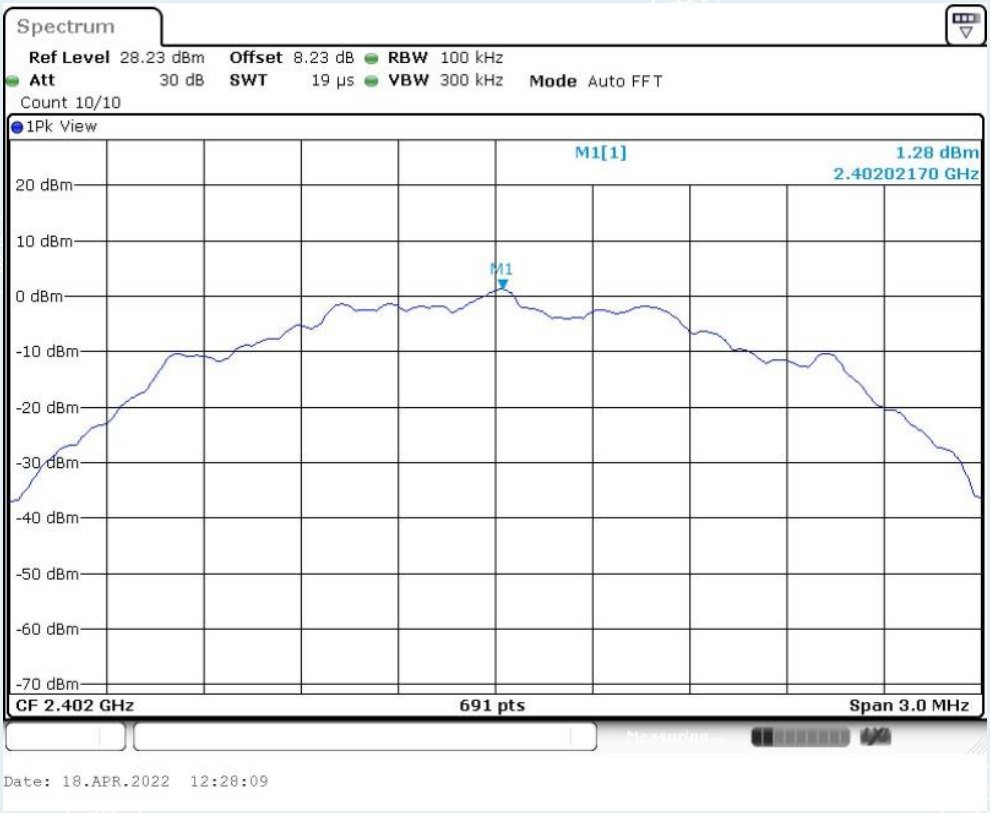
Date: 18.APR.2022 12:26:25

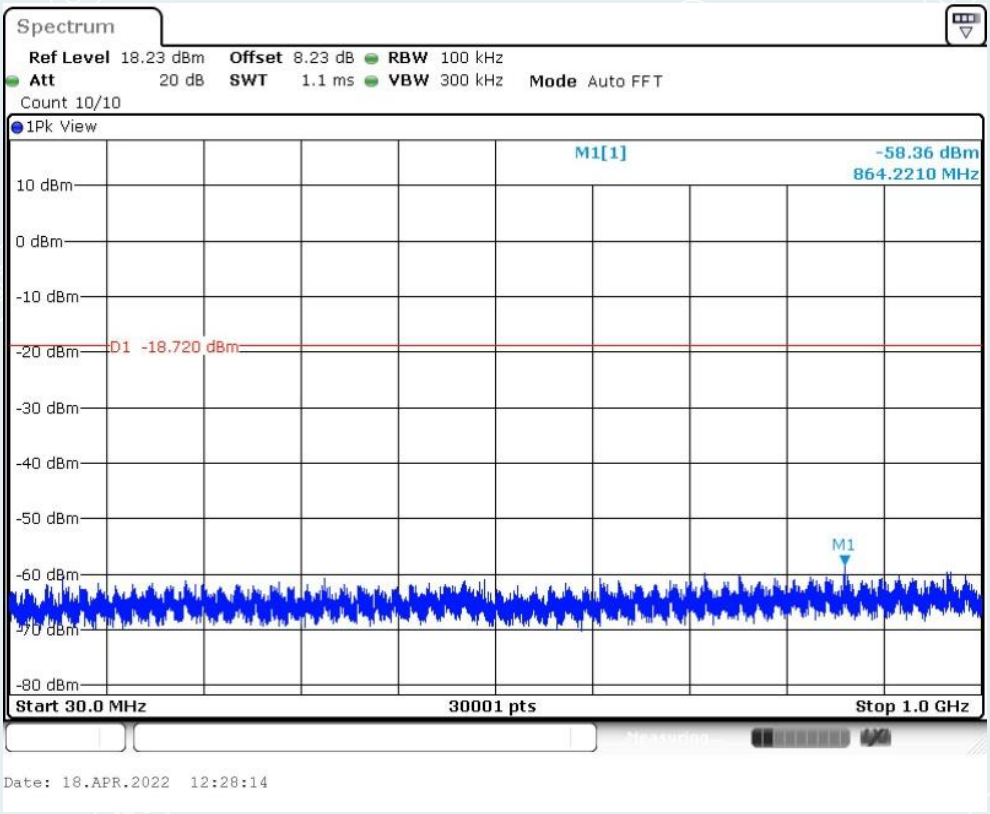


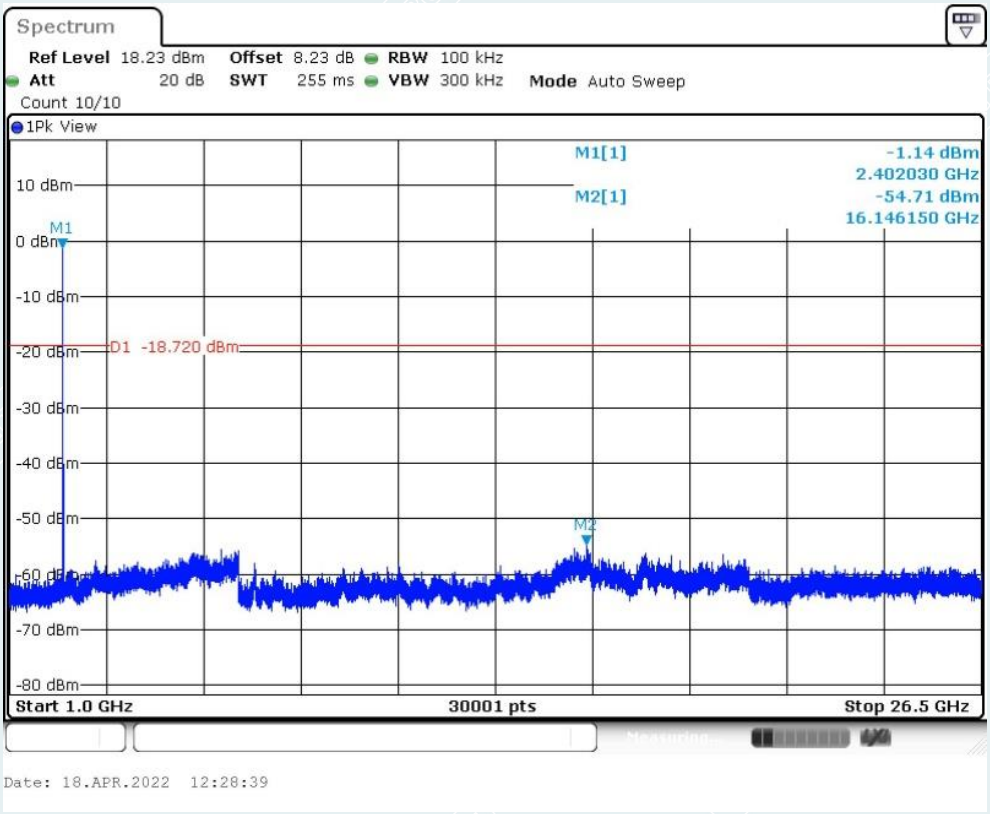
Date: 18.APR.2022 12:26:49

BLE_2M

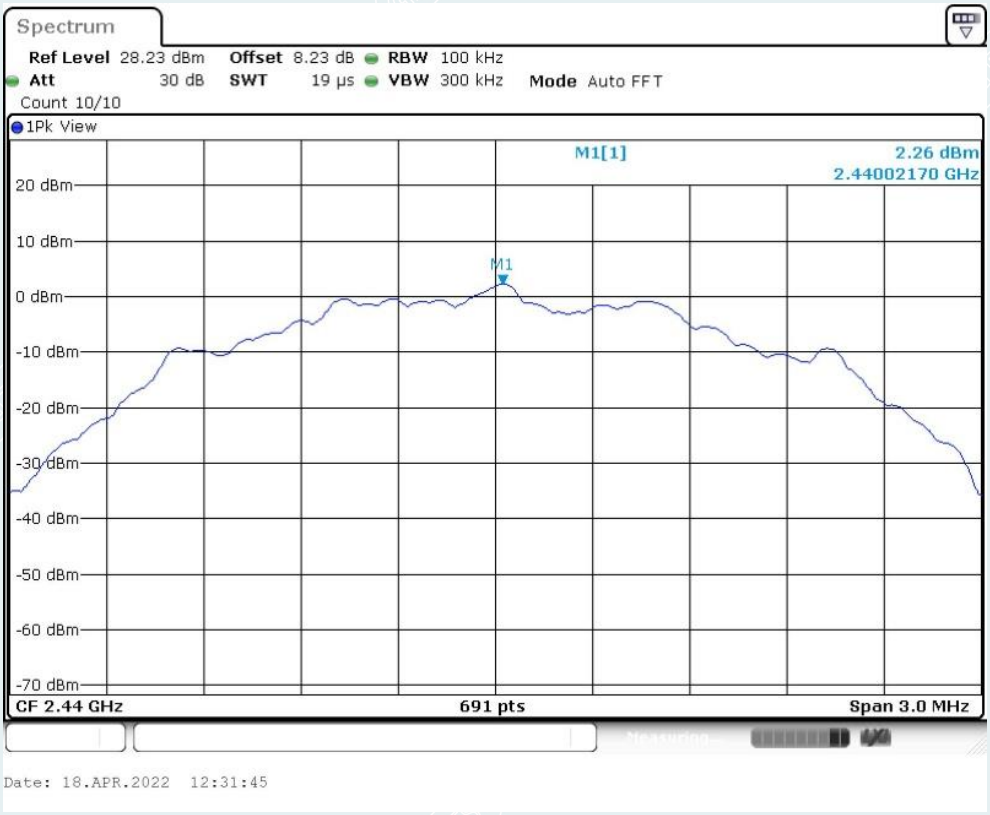
Lowest Frequency (2402MHz)

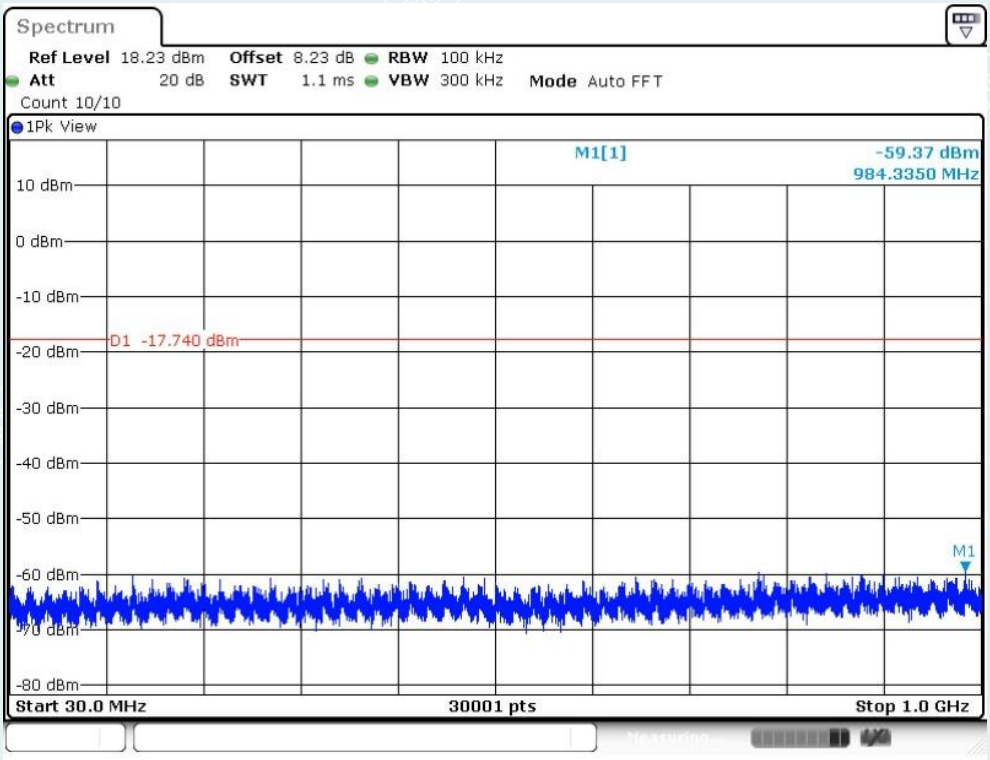




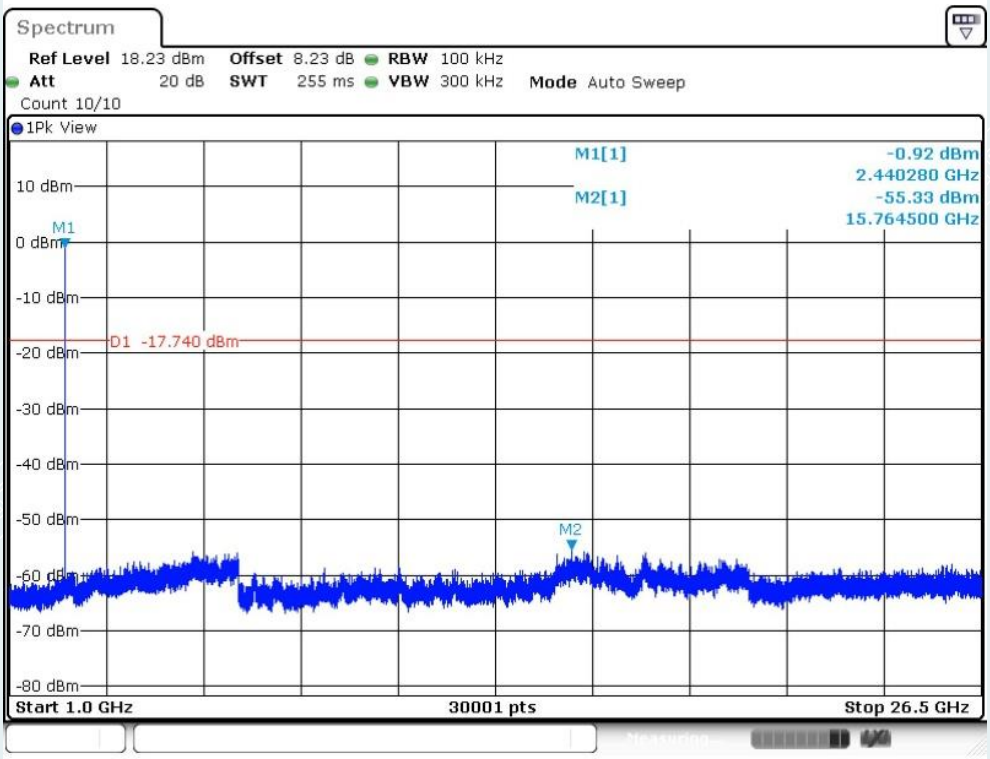


Middle Frequency (2440MHz)



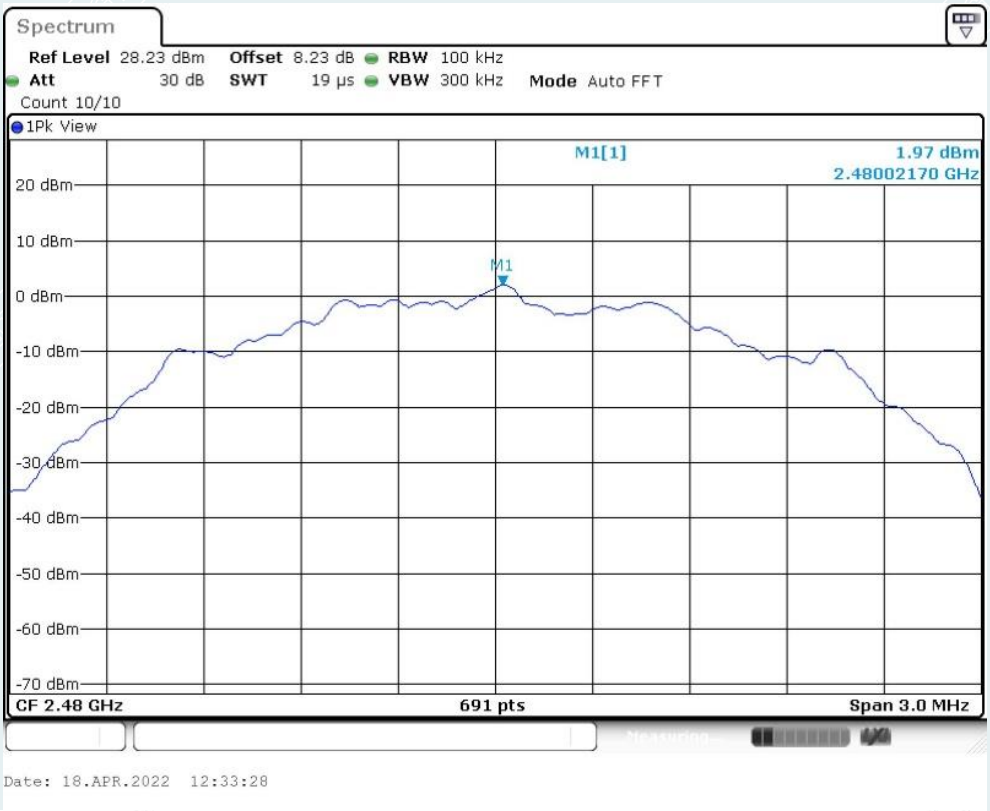


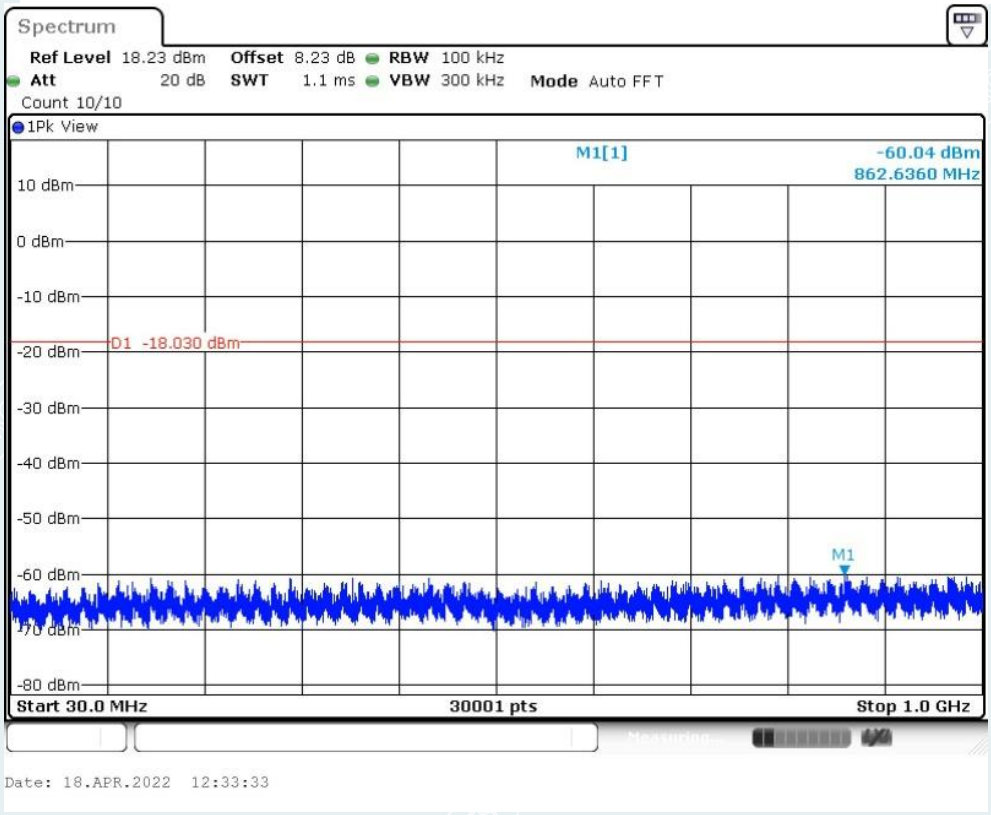
Date: 18.APR.2022 12:31:50

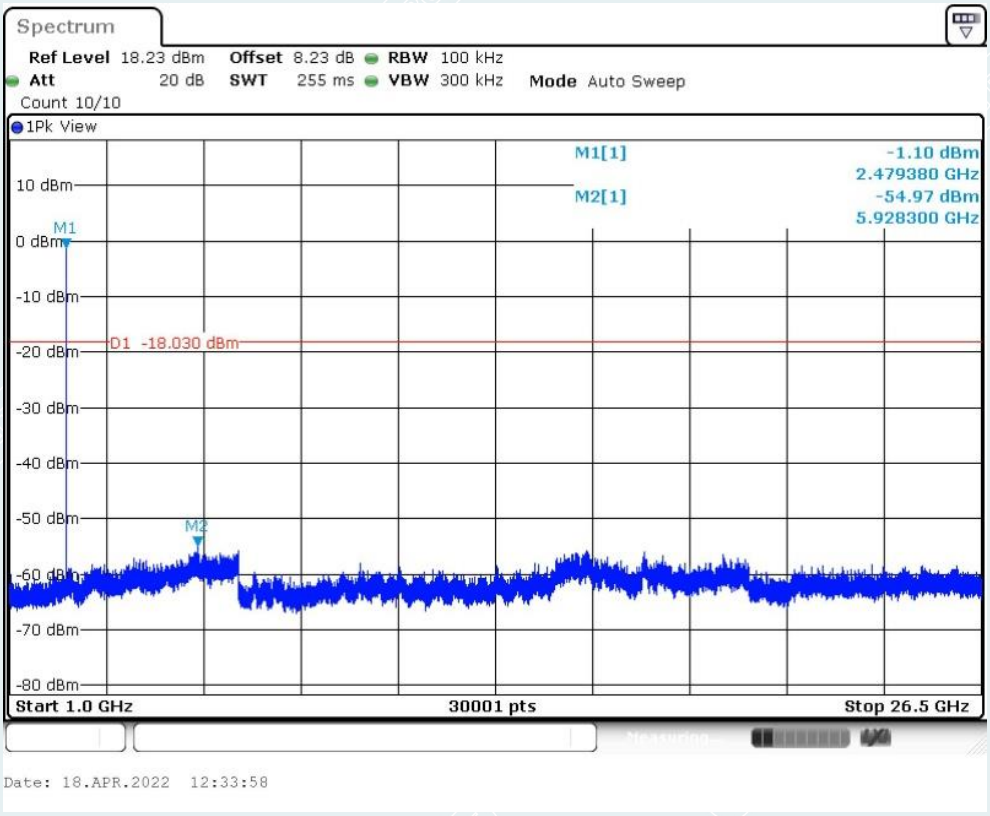


Date: 18.APR.2022 12:32:14

Highest Frequency (2480MHz)







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11. RESTRICTED BANDS OF OPERATION

11.1 LIMITS

Section 15.247(d) In addition, 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)).

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 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	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	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	2655 - 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	
13.36 - 13.41			

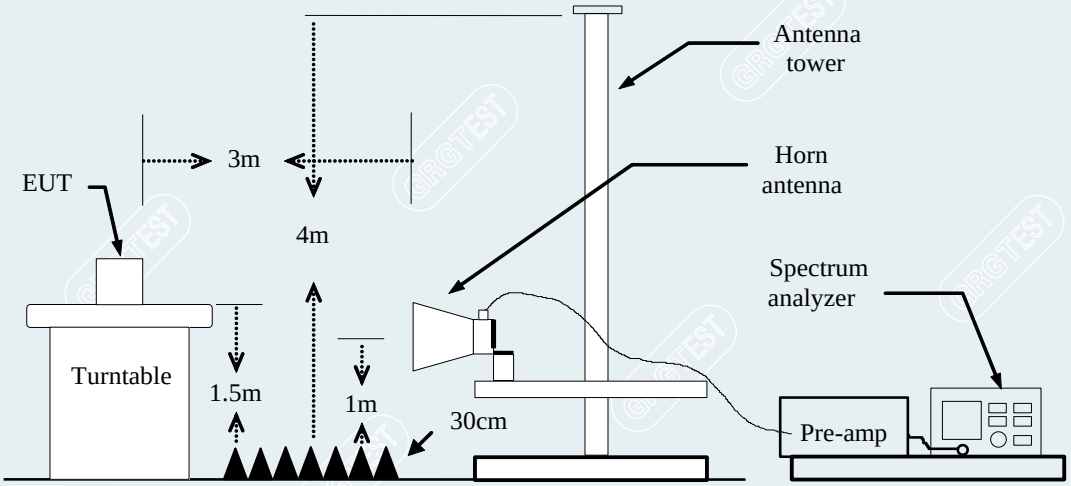
Frequency (MHz)	Quasi-peak(μV/m)	Measurement distance(m)	Quasi-peak(dBμV/m)@distance 3m
0.009-0.490	2400/F(kHz)	300	128.5~93.8
0.490-1.705	24000/F(kHz)	30	73.8~63
1.705-30.0	30	30	69.5
30 ~ 88	100	3	40
88~216	150	3	43.5
216 ~ 960	200	3	46
Above 960	500	3	54

11.2 TEST PROCEDURES

Test procedures follow KDB 558074 D01 15.247 measurement guidance v05r02.

1) The EUT is placed on a turntable, which is 1.5m above the ground plane.
2) The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3) EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4) Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
   a) PEAK: RBW=1MHz / VBW=1MHz / Sweep=AUTO
   b) AVERAGE: Set RBW=1MHz, if the EUT is configured to transmit with duty cycle ≥98%, set VBW≤RBW/100(i.e.,10kHz) but not less than 10Hz, Where duty cycle is defined in section 2.9. If the EUT duty cycle is ＜98%, set VBW≥1/T, Where T is defined in section 2.9.
5) Repeat the procedures until all the PEAK and AVERAGE versus polarization are measured.

11.3 TEST SETUP

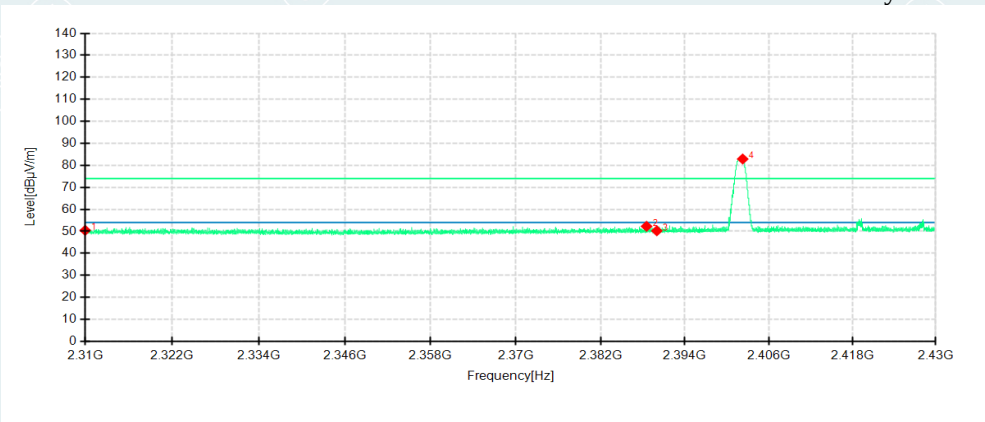


---------- **The following blanks** ----------

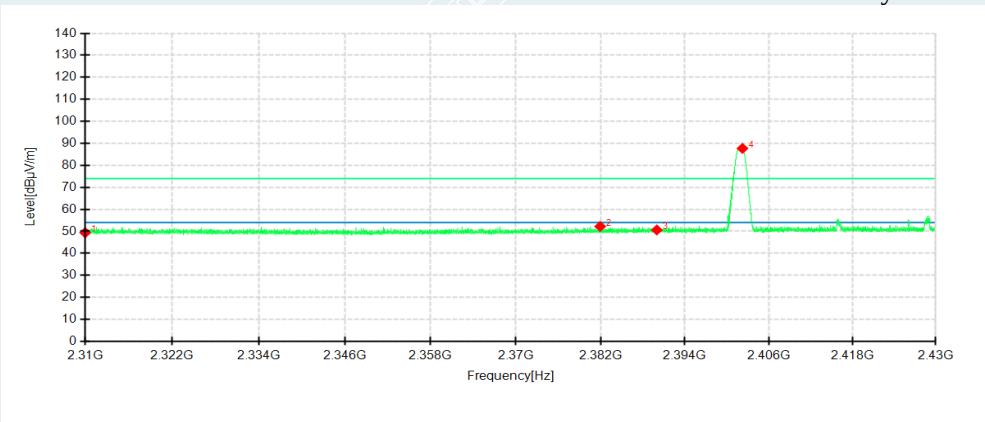
11.4 TEST RESULTS

Equipment:	Table top touch screen	Test Date	2022-01-12
Model No.:	UCTTA-42	Test Engineer:	Chen Xiaocong
Test Voltage:	AC 120V/60Hz	Environment:	25℃/60%RH

BLE 1M
Lowest Frequency
Frequency 2402MHz
Detector mode: Peak Polarity: Horizontal

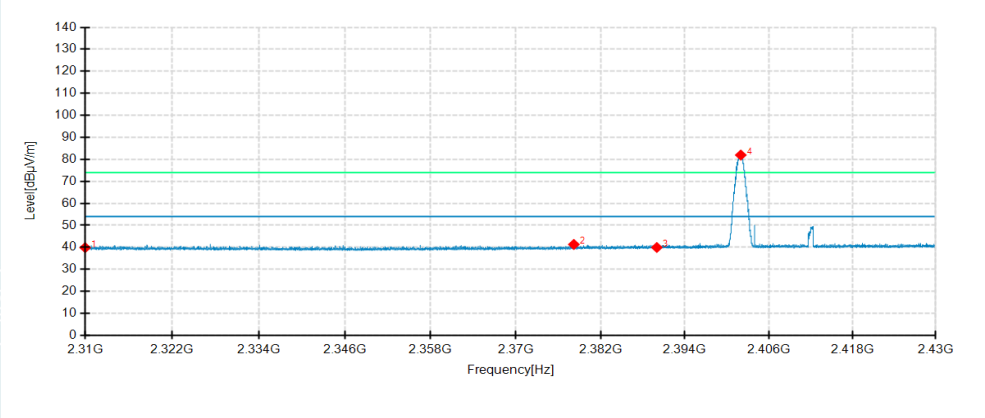


Detector mode: Peak Polarity: Vertical

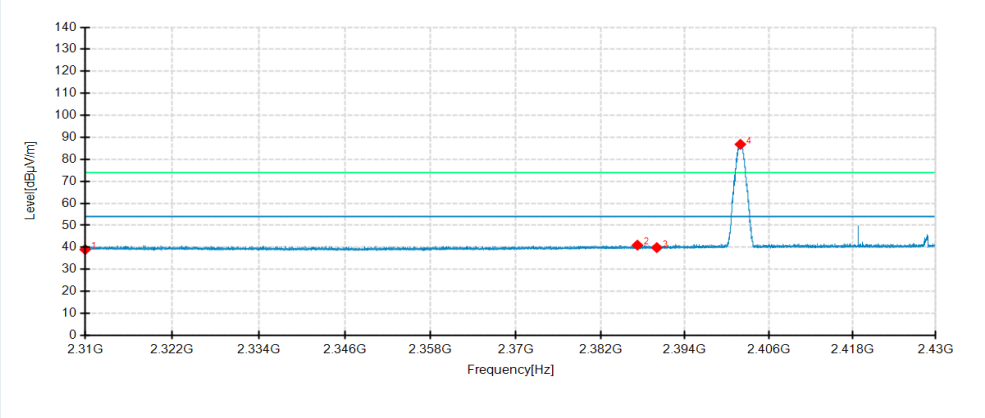


No.	Frequency MHz	Reading dBµV/m	Level dBµV/m	Factor dB	Limit dBuV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2310.0000	46.95	50.43	3.48	74.00	23.57	100	68	Horizontal	/
2	2388.5400	48.48	52.27	3.79	74.00	21.73	100	218	Horizontal	/
3	2390.0000	46.42	50.23	3.81	74.00	23.77	100	218	Horizontal	/
4	2402.2560	78.88	82.87	3.99	74.00	-8.87	200	251	Horizontal	No limit
1	2310.0000	45.89	49.37	3.48	74.00	24.63	100	176	Vertical	/
2	2381.9520	48.56	52.23	3.67	74.00	21.77	200	218	Vertical	/
3	2390.0000	46.82	50.63	3.81	74.00	23.37	100	280	Vertical	/
4	2402.2200	83.69	87.68	3.99	74.00	-13.68	200	218	Vertical	No limit

Lowest Frequency
Frequency 2402MHz
Detector mode: Average Polarity: Horizontal

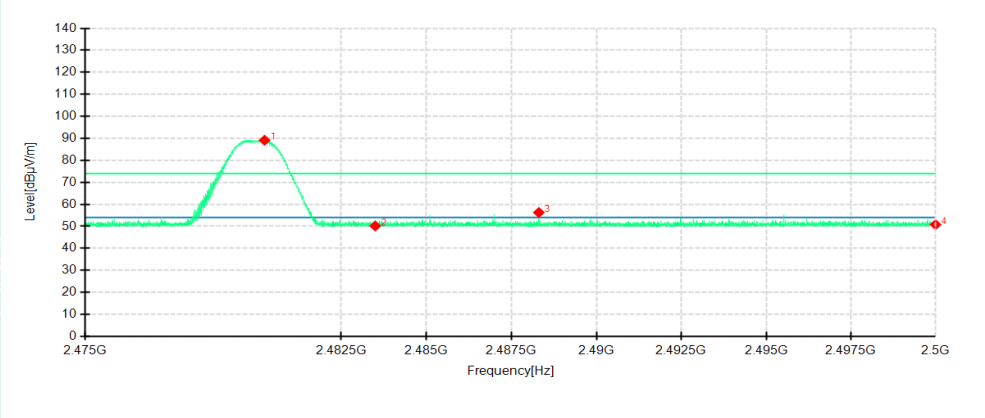


Detector mode: Average Polarity: Vertical

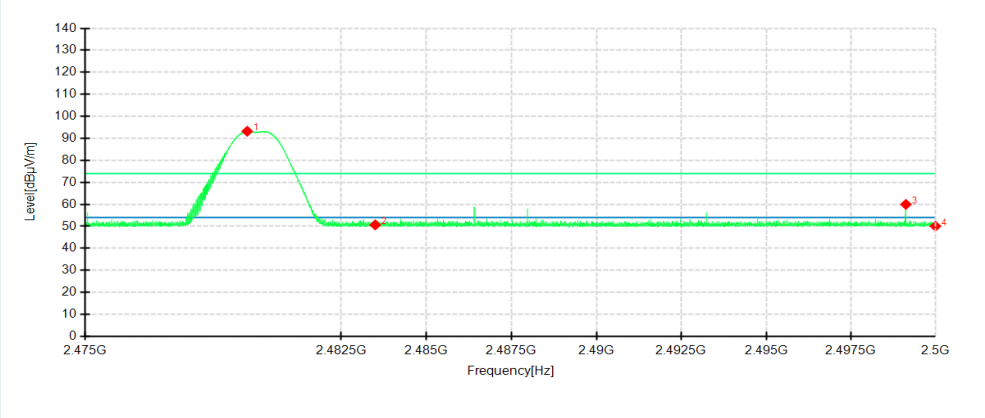


No.	Frequency MHz	Reading dBµV/m	Level dBµV/m	Factor dB	Limit dBuV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2310.0000	36.37	39.85	3.48	54.00	14.15	100	218	Horizontal	/
2	2378.2200	37.71	41.32	3.61	54.00	12.68	100	1	Horizontal	/
3	2390.0000	36.12	39.93	3.81	54.00	14.07	100	218	Horizontal	/
4	2401.9800	77.95	81.94	3.99	54.00	-27.94	200	299	Horizontal	No limit
1	2310.0000	35.52	39.00	3.48	54.00	15.00	200	8	Vertical	/
2	2387.2440	37.22	40.98	3.76	54.00	13.02	100	273	Vertical	/
3	2390.0000	36.05	39.86	3.81	54.00	14.14	200	41	Vertical	/
4	2401.9320	82.81	86.80	3.99	54.00	-32.80	200	218	Vertical	No limit

Highest Frequency
Frequency 2480MHz
Detector mode: Peak Polarity: Horizontal

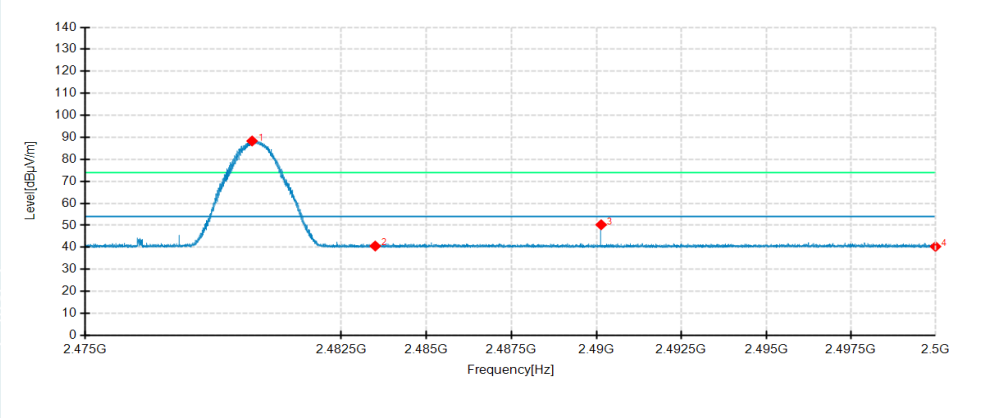


Detector mode: Peak Polarity: Vertical

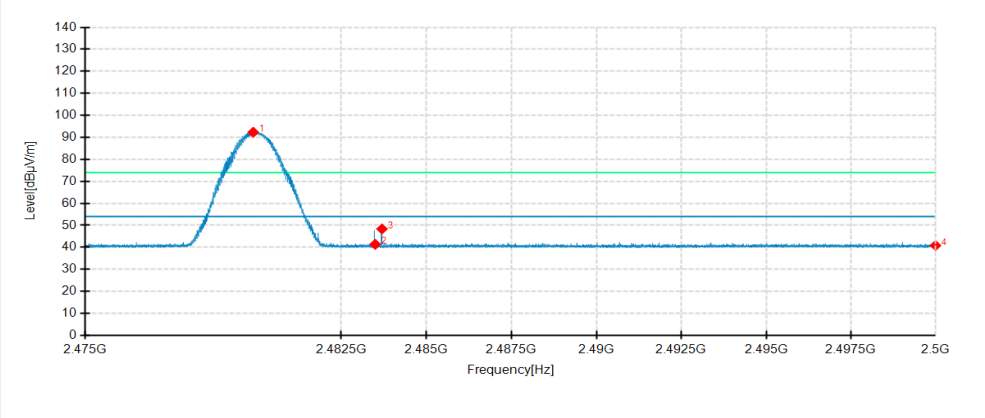


No.	Frequency MHz	Reading dBµV/m	Level dBµV/m	Factor dB	Limit dBuV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2480.2525	84.80	89.12	4.32	74.00	-15.12	200	211	Horizontal	No limit
2	2483.5000	45.84	50.17	4.33	74.00	23.83	200	266	Horizontal	/
3	2488.3075	51.93	56.27	4.34	74.00	17.73	100	197	Horizontal	/
4	2500.0000	46.40	50.78	4.38	74.00	23.22	200	300	Horizontal	/
1	2479.7450	88.88	93.20	4.32	74.00	-19.20	200	218	Vertical	No limit
2	2483.5000	46.32	50.65	4.33	74.00	23.35	100	142	Vertical	/
3	2499.1250	55.58	59.96	4.38	74.00	14.04	100	348	Vertical	/
4	2500.0000	45.67	50.05	4.38	74.00	23.95	100	342	Vertical	/

Highest Frequency
Frequency 2480MHz
Detector mode: Average Polarity: Horizontal



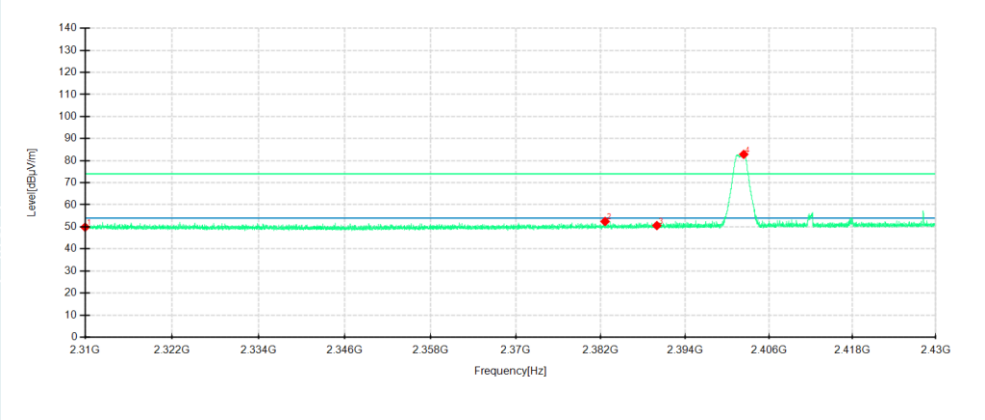
Detector mode: Average Polarity: Vertical



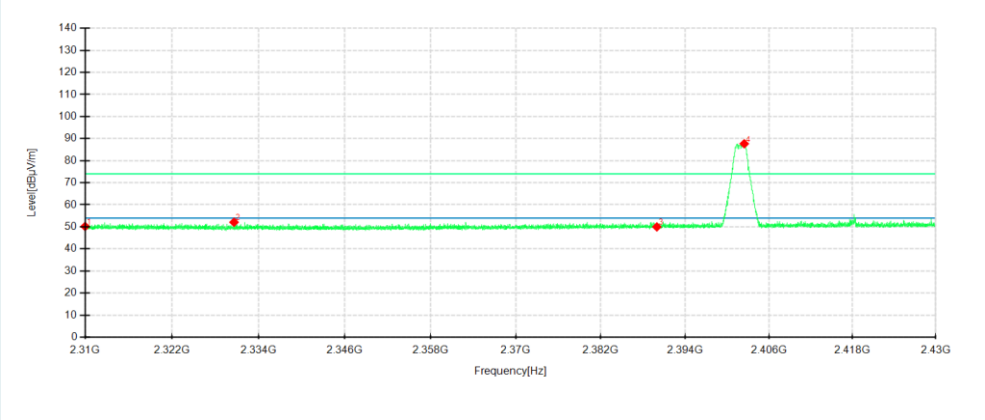
No.	Frequency MHz	Reading dBµV/m	Level dBµV/m	Factor dB	Limit dBuV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2479.8875	84.01	88.33	4.32	54.00	-34.33	200	211	Horizontal	No limit
2	2483.5000	36.27	40.60	4.33	54.00	13.40	100	55	Horizontal	/
3	2490.1400	45.90	50.25	4.35	54.00	3.75	200	142	Horizontal	/
4	2500.0000	35.98	40.36	4.38	54.00	13.64	200	348	Horizontal	/
1	2479.9225	87.98	92.30	4.32	54.00	-38.30	200	218	Vertical	No limit
2	2483.5000	37.03	41.36	4.33	54.00	12.64	100	142	Vertical	/
3	2483.6975	44.02	48.35	4.33	54.00	5.65	200	74	Vertical	/
4	2500.0000	36.47	40.85	4.38	54.00	13.15	200	218	Vertical	/

Remark: Max field strength in 3m distance. No any other emission which falls in restricted bands can be detected and be reported.

BLE 2M
Lowest Frequency
Frequency 2402MHz
Detector mode: Peak Polarity: Horizontal

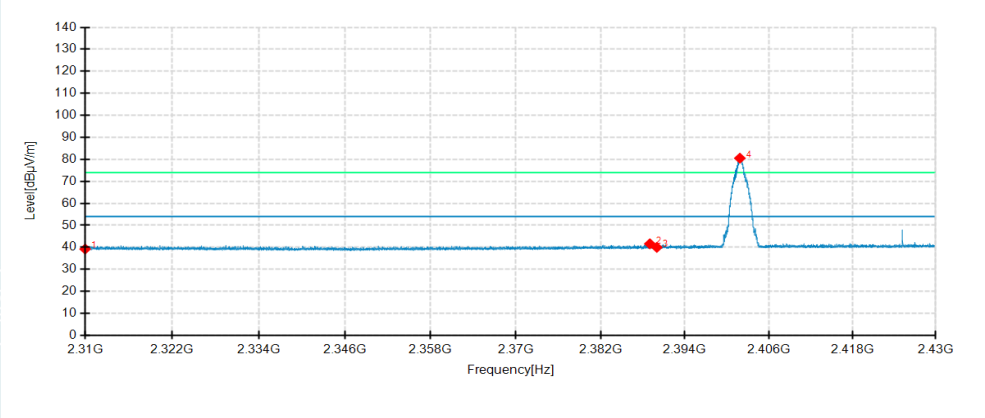


Detector mode: Peak Polarity: Vertical

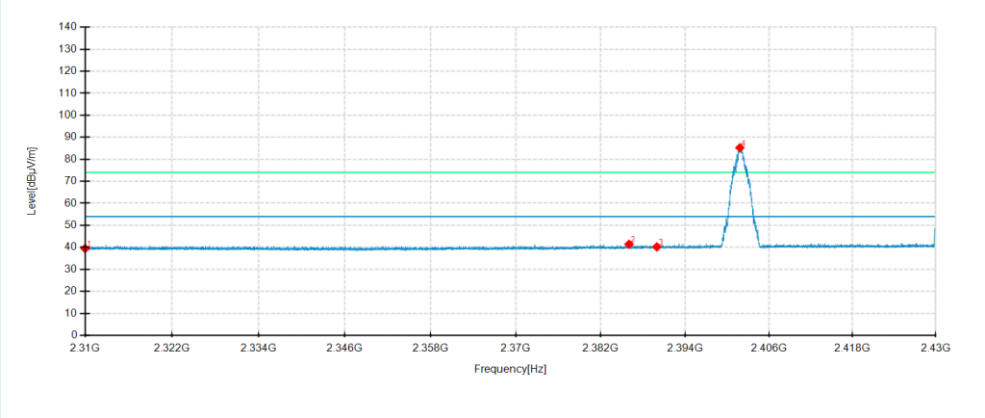


No.	Frequency MHz	Reading dBµV/m	Level dBµV/m	Factor dB	Limit dBuV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2310.0000	46.37	49.85	3.48	74.00	24.15	100	122	Horizontal	/
2	2382.6480	48.74	52.43	3.69	74.00	21.57	200	334	Horizontal	/
3	2390.000	46.76	50.57	3.81	74.00	23.43	100	218	Horizontal	/
4	2402.4000	78.87	82.86	3.99	74.00	-8.86	100	218	Horizontal	No limit
1	2310.0000	46.70	50.18	3.48	74.00	23.82	200	142	Vertical	/
2	2330.5800	48.79	52.09	3.30	74.00	21.91	100	293	Vertical	/
3	2390.0000	46.17	49.98	3.81	74.00	24.02	200	142	Vertical	/
4	2402.4720	83.67	87.66	3.99	74.00	-13.66	200	218	Vertical	No limit

Lowest Frequency
Frequency 2402MHz
Detector mode: Average Polarity: Horizontal

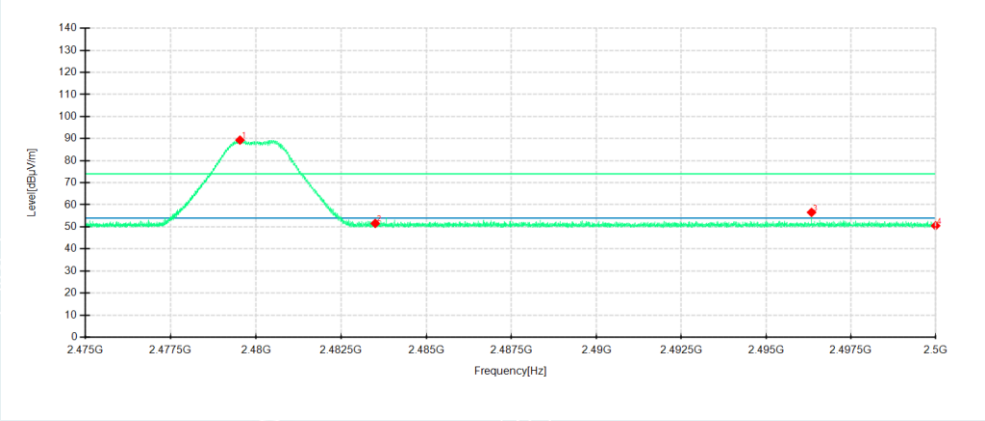


Detector mode: Average Polarity: Vertical

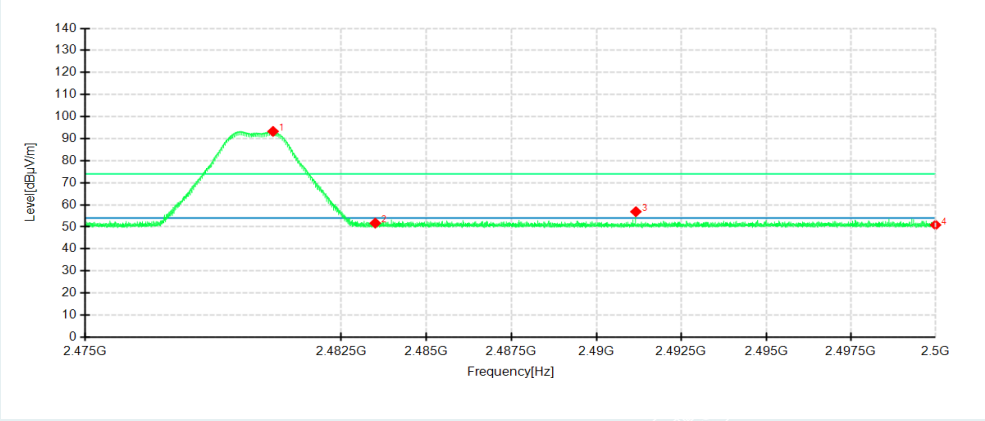


No.	Frequency MHz	Reading dBµV/m	Level dBµV/m	Factor dB	Limit dBuV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2310.0000	35.75	39.23	3.48	54.00	14.77	100	218	Horizontal	/
2	2389.0080	37.81	41.60	3.79	54.00	12.40	100	12	Horizontal	/
3	2390.0000	36.17	39.98	3.81	54.00	14.02	200	177	Horizontal	/
4	2401.8480	76.52	80.51	3.99	54.00	-26.51	200	300	Horizontal	No limit
1	2310.0000	35.96	39.44	3.48	54.00	14.56	100	142	Vertical	/
2	2386.0440	37.65	41.39	3.74	54.00	12.61	100	333	Vertical	/
3	2390.0000	36.38	40.19	3.81	54.00	13.81	100	231	Vertical	/
4	2401.8480	81.25	85.24	3.99	54.00	-31.24	200	218	Vertical	No limit

Highest Frequency
Frequency 2480MHz
Detector mode: Peak Polarity: Horizontal

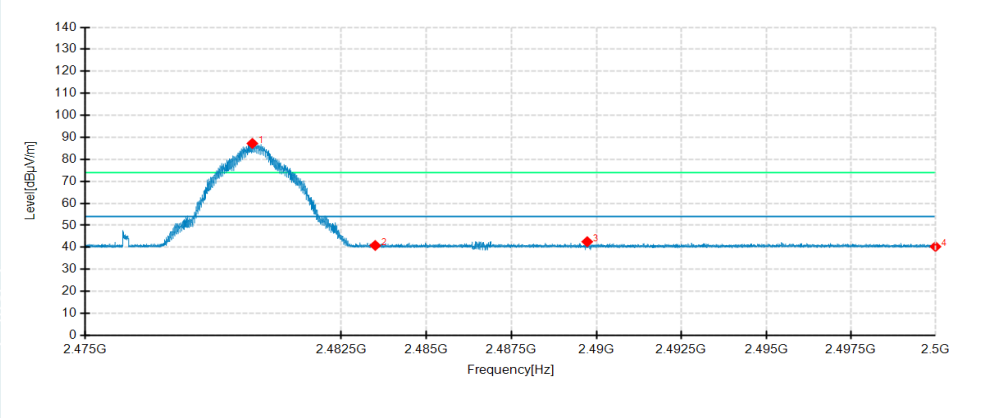


Detector mode: Peak Polarity: Vertical

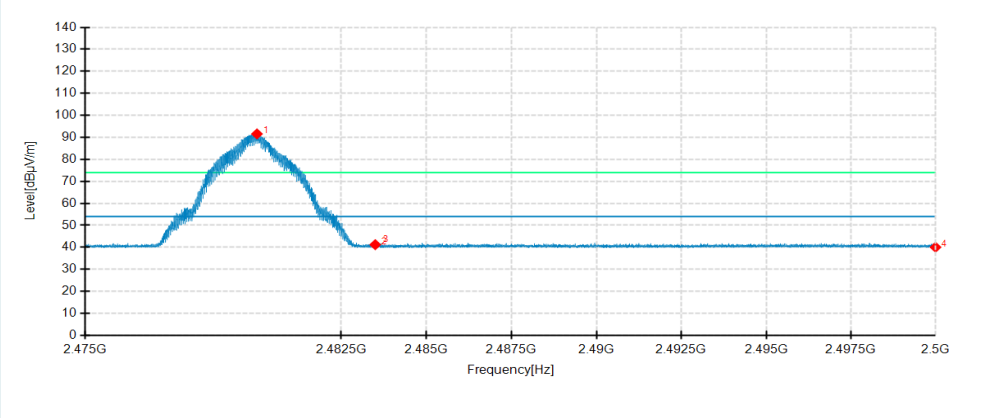


No.	Frequency MHz	Reading dBµV/m	Level dBµV/m	Factor dB	Limit dBuV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2479.5350	85.00	89.32	4.32	74.00	-15.32	200	211	Horizontal	No limit
2	2483.5000	47.22	51.55	4.33	74.00	22.45	200	177	Horizontal	/
3	2496.3375	52.19	56.56	4.37	74.00	17.44	200	142	Horizontal	/
4	2500.0000	46.11	50.49	4.38	74.00	23.51	100	218	Horizontal	/
1	2480.5025	88.97	93.29	4.32	74.00	-19.29	200	218	Vertical	No limit
2	2483.5000	47.37	51.70	4.33	74.00	22.30	100	359	Vertical	/
3	2491.1625	52.53	56.88	4.35	74.00	17.12	200	218	Vertical	/
4	2500.0000	46.49	50.87	4.38	74.00	23.13	200	115	Vertical	/

Highest Frequency
Frequency 2480MHz
Detector mode: Average Polarity: Horizontal



Detector mode: Average Polarity: Vertical



No.	Frequency MHz	Reading dBµV/m	Level dBµV/m	Factor dB	Limit dBuV/m	Margin dB	Height cm	Angle °	Pole	Remark
1	2479.8950	82.91	87.23	4.32	54.00	-33.23	200	211	Horizontal	No limit
2	2483.5000	36.52	40.85	4.33	54.00	13.15	100	142	Horizontal	/
3	2489.7300	38.21	42.56	4.35	54.00	11.44	100	176	Horizontal	/
4	2500.0000	35.94	40.32	4.38	54.00	13.68	100	218	Horizontal	/
1	2480.0300	87.22	91.54	4.32	54.00	-37.54	200	218	Vertical	No limit
2	2483.5000	36.88	41.21	4.33	54.00	12.79	200	218	Vertical	/
3	2483.5550	37.76	42.09	4.33	54.00	11.91	100	217	Vertical	/
4	2500.0000	35.67	40.05	4.38	54.00	13.95	200	218	Vertical	/

Remark: Max field strength in 3m distance. No any other emission which falls in restricted bands can be detected and be reported.

APPENDIX A. PHOTOGRAPH OF THE TEST CONNECTION DIAGRAM

Please refer to the attached document E202112276794-19-Test Photo.

APPENDIX B. PHOTOGRAPH OF THE EUT

Please refer to the attached document E202112276794-20-EUT Photo.

---------- End of Report ----------