

Product Name: Projector	Report No: ITEZA2-202300405RF1
Product Model: ZMLF2001, ZMLF2002, ZMLF2003, ZMLF2004, ZMLF2005, ZMLF2006, ZMLF2007, ZMLF2008, ZMLF2009, ZMLF2010	Security Classification: Open
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TIRT Testing Report

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FCC Radio Test Report

FCC ID: 2A6K3-ZMLF2001

This report concerns: Original Grant

Equipment : Projector
Brand Name : ZEEMR
Test Model : ZMLF2001, ZMLF2002, ZMLF2003, ZMLF2004, ZMLF2005,
ZMLF2006, ZMLF2007, ZMLF2008, ZMLF2009, ZMLF2010
Applicant : Jiangsu Golden Vision Legend Technology Co.,Ltd
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Manufacturer : Jiangsu Golden Vision Legend Technology Co.,Ltd
Address : Room 105-7, Building 17, Phase I, HR Service Industrial Park,
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New District, Nanjing, China
Date of Receipt : Dec. 13, 2023
Date of Test : Dec. 13, 2023~ Dec. 28, 2023
Issued Date : Jan. 12, 2024
Report Version : V1.0
Test Sample : Engineering Sample No.: 1000024292
Standard(s) : FCC CFR Title 47, Part 15, Subpart C
FCC KDB 558074 D01 15.247 Meas Guidance v05r02
ANSI C63.10-2013

- The test result referred exclusively to the presented test model /sample.
- Without written approval of TIRT Inc. the test report shall not reproduced except in full.

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REPORT ISSUED HISTORY

Report No.	Version	Description	Issued Date	Note
ITEZA2-202300405RF1	V1.0	Original Report.	2024.01.12	Valid

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC CFR Title 47, Part 15, Subpart C				
Standard(s) Section	Test Item	Test Result	Judgment	Remark
15.207	AC Power Line Conducted Emissions	APPENDIX A	PASS	-----
15.247(d) 15.205(a) 15.209(a)	Radiated Emissions	APPENDIX B APPENDIX C APPENDIX D	PASS	-----
15.247(a)(2)	Bandwidth	APPENDIX E	PASS	-----
15.247(b)(3)	Maximum Output Power	APPENDIX F	PASS	-----
15.247(d)	Conducted Spurious Emission	APPENDIX G	PASS	-----
15.247(e)	Power Spectral Density	APPENDIX H	PASS	-----
15.203	Antenna Requirement	-----	PASS	Note(2)

Note:

- (1) "N/A" denotes test is not applicable to this device.
- (2) The device what use a permanently attached antenna were considered sufficient to comply with the provisions of 15.203.

1.1 TEST FACILITY

Company:	Beijing TIRT Technology Service Co.,Ltd Shenzhen
Address:	104 Building C, Xinmingsheng Industrial Park No.132, Zhangge Old Village East Zone, Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong, P. R. China
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1.2 MEASUREMENT UNCERTAINTY

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))
The BTL measurement uncertainty as below table:

Uncertainty	
Parameter	Uncertainty
Occupied Channel Bandwidth	±142.12 KHz
Power Spectral Density	±0.75dB
RF power conducted	±0.74dB
RF power radiated	±3.25dB
Spurious emissions, conducted	±1.78dB
Spurious emissions, radiated (30MHz~1GHz)	±4.6dB
Spurious emissions, radiated (1GHz ~ 26.5GHz)	±4.9dB
Conduction Emissions(150kHz~30MHz)	±3.1dB
Humidity	±4.6%
Temperature	±0.7°C
Time	±1.25%

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

1.3 TEST ENVIRONMENT CONDITIONS

Test Item	Temperature	Humidity	Test Voltage	Tested By
AC Power Line Conducted Emissions	24.3°C	52%	AC 120V/60Hz	Stone Tang
Radiated Emissions-9 kHz to 30 MHz	24.1°C	50%	AC 120V/60Hz	Stone Tang
Radiated Emissions-30 MHz to 1000 MHz	24.2°C	53%	AC 120V/60Hz	Stone Tang
Radiated Emissions-Above 1000 MHz	25.6°C	53%	AC 120V/60Hz	Stone Tang
Bandwidth	25.5°C	56%	AC 120V/60Hz	Stone Tang
Maximum Output Power	25.1°C	54%	AC 120V/60Hz	Stone Tang
Conducted Spurious Emission	25.2°C	62%	AC 120V/60Hz	Stone Tang
Power Spectral Density	25.5°C	60%	AC 120V/60Hz	Stone Tang

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	Projector
Brand Name	ZEEMR
Test Model	ZMLF2001
Series Model	ZMLF2001, ZMLF2002, ZMLF2003, ZMLF2004, ZMLF2005, ZMLF2006, ZMLF2007, ZMLF2008, ZMLF2009, ZMLF2010
Model Difference(s)	There is no difference except the name of the model
Software Version	v2.1.2
Hardware Version	v1.0.0
Power Source	AC 100-240V, 50/60Hz 2.3A
Power Rating	AC 120V/60Hz
Operation Frequency	2402MHz ~ 2480MHz
Modulation Type	GFSK
Bit Rate of Transmitter	1Mbps, 2Mbps
Max. Output Power	2.97dBm (0.001982W)

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

2. Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	20	2442
01	2404	21	2444
02	2406	22	2446
03	2408	23	2448
04	2410	24	2450
05	2412	25	2452
06	2414	26	2454
07	2416	27	2456
08	2418	28	2458
09	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480

3. Table for Filed Antenna:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	BBT076-S7C-I	FPC	N/A	1.75

Note:

- The antenna gain is provided by the manufacturer.
- The antenna is for testing purposes only.

2.2 DESCRIPTION OF TEST MODES

The test system was pre-tested based on the consideration of all possible combinations of EUT operation mode.

Pretest Mode	Description
Mode 1	TX Mode_1Mbps Channel 00/19/39
Mode 2	TX Mode_2Mbps Channel 00/19/39

Following mode(s) was (were) found to be the worst case(s) and selected for the final test.

AC power line conducted emissions test	
Final Test Mode	Description
Mode 1	TX Mode_1Mbps Channel 00

Radiated emissions test - Below 1GHz	
Final Test Mode	Description
Mode 1	TX Mode_1Mbps Channel 00

Radiated emissions test - Above 1GHz	
Final Test Mode	Description
Mode 1	TX Mode_1Mbps Channel 00/19/39
Mode 2	TX Mode_2Mbps Channel 00/19/39

Conducted test	
Final Test Mode	Description
Mode 1	TX Mode_1Mbps Channel 00/19/39
Mode 2	TX Mode_2Mbps Channel 00/19/39

Note:

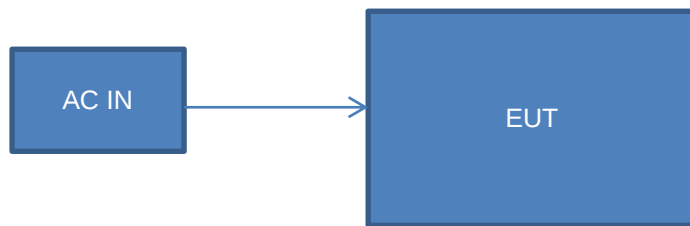
- (1) For radiated emission above 1 GHz test, the spurious points of 1GHz~26.5GHz have been pre-tested and in this report only recorded the worst case. The remaining spurious points are all below the limit value of 20dB.
- (2) For AC power line conducted emissions and radiated emissions below 1 GHz test, the 1Mbps Channel 00 is found to be the worst case and recorded.

2.3 PARAMETERS OF TEST SOFTWARE

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level.

Test Software Version	Secure CRT		
Frequency (MHz)	2402	2440	2480
1Mbps/2Mbps	default	default	default

2.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



2.5 SUPPORT UNITS

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	N/A	N/A	N/A	N/A

2.6 ANCILLARY EQUIPMENT DETAILS

No.	Description	Manufacturer	Model	Serial Number	Certification or SDoC
1.	Notebook PC	Lenovo	ThinkPad S3-S440	N/A	N/A

3. AC POWER LINE CONDUCTED EMISSIONS

3.1 LIMIT

Frequency of Emission (MHz)	Limit (dB μ V)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56*	56 to 46*
0.5 - 5.0	56	6
5.0 - 30.0	60	50

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

3.2 TEST PROCEDURE

- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

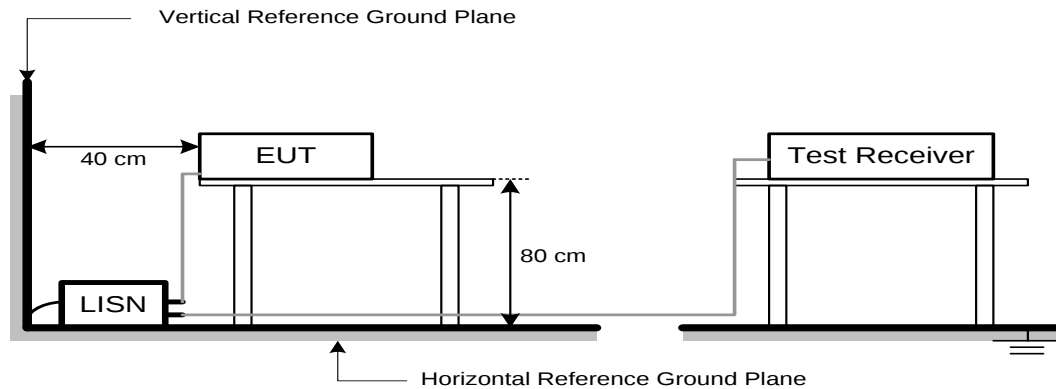
The following table is the setting of the receiver:

Receiver Parameters	Setting
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.3 DEVIATION FROM TEST STANDARD

No deviation.

3.4 TEST SETUP



3.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

3.6 TEST RESULTS

Please refer to the APPENDIX A.

Remark:

- (1) All readings are QP Mode value unless otherwise stated AVG in column of 『Note』 . If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform. In this case, a " * " marked in AVG Mode column of Interference Voltage Measured.
- (2) Measuring frequency range from 150 kHz to 30 MHz.

4. RADIATED EMISSIONS

4.1 LIMIT

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

LIMITS OF RADIATED EMISSION MEASUREMENT (9 kHz-1000 MHz)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000 MHz)

Frequency (MHz)	(dBuV/m at 3 m)	
	Peak	Average
Above 1000	74	54

Note:

- (1) The limit for radiated test was performed according to FCC CFR Title 47, Part 15, Subpart C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

4.2 TEST PROCEDURE

- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1 GHz)
- b. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1 GHz)
- c. The height of the equipment or of the substitution antenna shall be 0.8m or 1.5m; the height of the test antenna shall vary between 1 m to 4 m. 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 find the maximum reading (used Bore sight function).
- e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.
(below 1 GHz)
- h. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1 GHz)
- i. For the actual test configuration, please refer to the related Item –EUT Test Photos.

The following table is the setting of the receiver:

Spectrum Parameters	Setting
Start ~ Stop Frequency	9 kHz~150 kHz for RBW 200 Hz
Start ~ Stop Frequency	0.15 MHz~30 MHz for RBW 9 kHz
Start ~ Stop Frequency	30 MHz~1000 MHz for RBW 100 kHz

Spectrum Parameters	Setting
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW (Emission in restricted band)	1 MHz / 3 MHz for PK value 1 MHz / 1/T Hz for AVG value

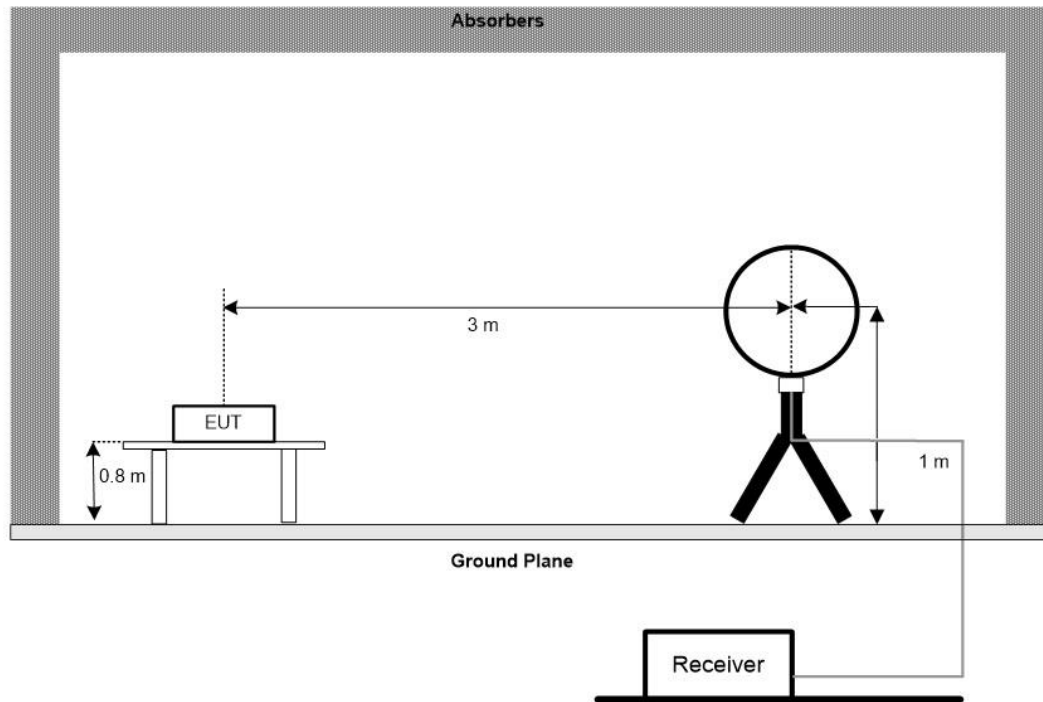
Spectrum Parameters	Setting
Start ~ Stop Frequency	9 kHz~90 kHz for PK/AVG detector
Start ~ Stop Frequency	90 kHz~110 kHz for QP detector
Start ~ Stop Frequency	110 kHz~490 kHz for PK/AVG detector
Start ~ Stop Frequency	490 kHz~30 MHz for QP detector
Start ~ Stop Frequency	30 MHz~1000 MHz for QP detector
Start ~ Stop Frequency	1 GHz~26.5 GHz for PK/AVG detector

4.3 DEVIATION FROM TEST STANDARD

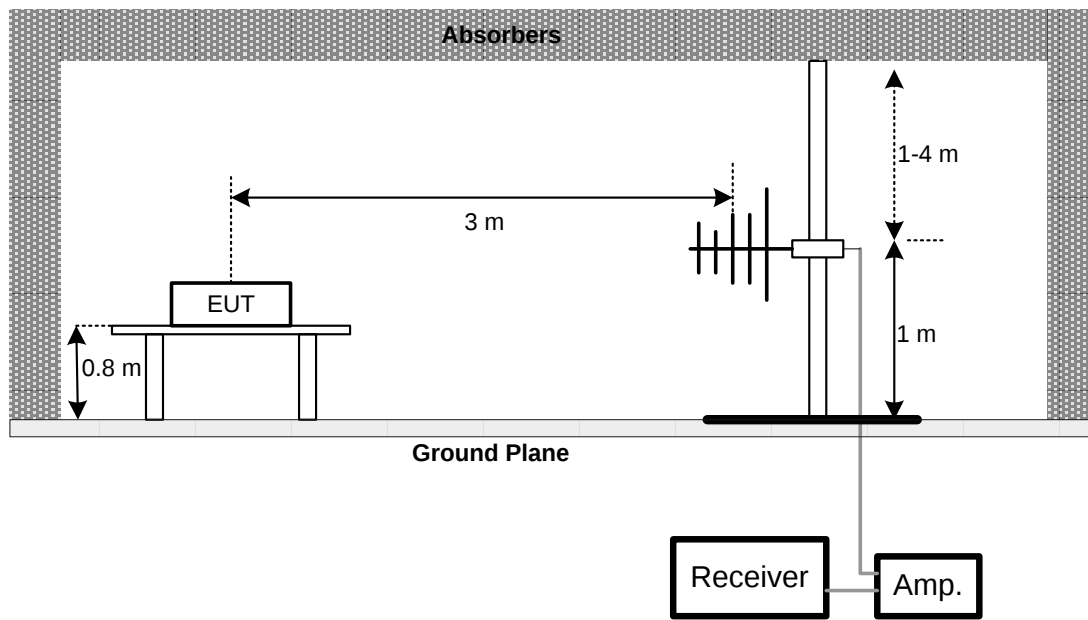
No deviation.

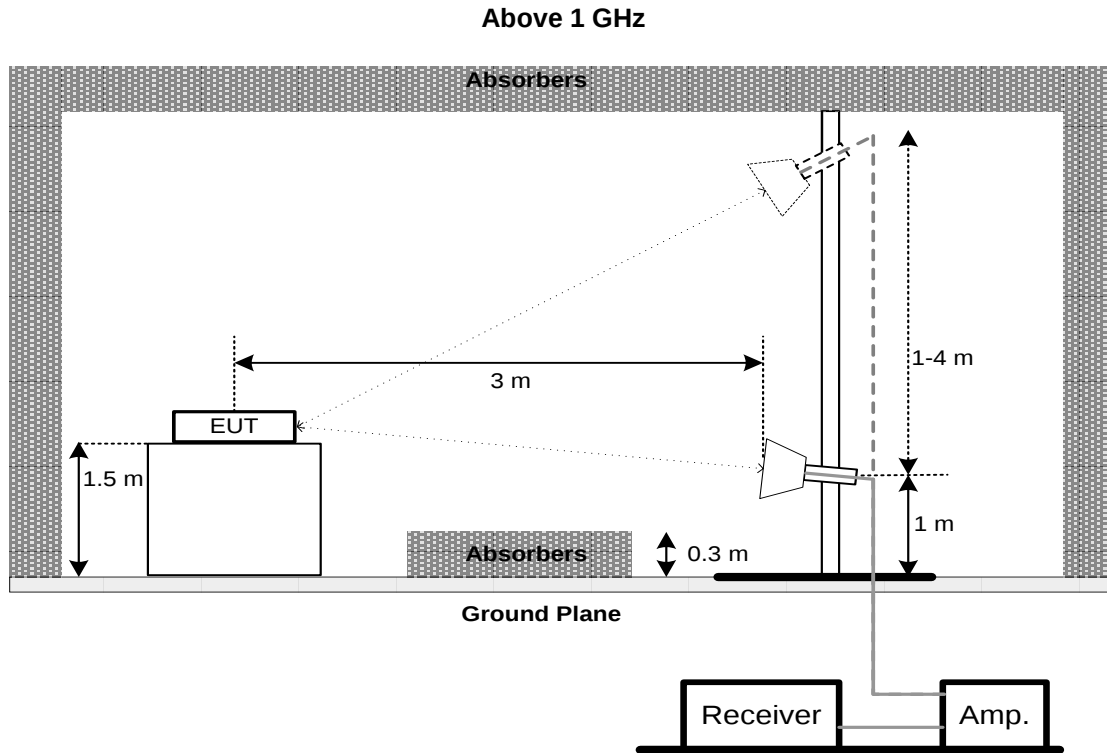
4.4 TEST SETUP

9 kHz to 30 MHz



30 MHz to 1 GHz





4.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

4.6 TEST RESULT - 9 kHz TO 30 MHz

Please refer to the APPENDIX B.

Remark:

- (1) Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB).
- (2) Limit line = specific limits (dBuV) + distance extrapolation factor.

4.7 TEST RESULT - 30 MHz TO 1000 MHz

Please refer to the APPENDIX C.

4.8 TEST RESULT - ABOVE 1000 MHz

Please refer to the APPENDIX D.

Remark:

- (1) No limit: This is fundamental signal, the judgment is not applicable.
For fundamental signal judgment was referred to Peak output test.

5. BANDWIDTH

5.1 LIMIT

Section	Test Item	Limit
FCC 15.247(a)(2)	6 dB Bandwidth	≥ 500 kHz
	99% Emission Bandwidth	-

5.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- The following table is the setting of the spectrum analyzer:

For 6 dB Bandwidth:

Spectrum Parameters	Setting
Span Frequency	$>$ Measurement Bandwidth
RBW	100 kHz
VBW	300 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

For 99% Emission Bandwidth:

Spectrum Parameters	Setting
Span Frequency	Between 1.5 times and 5.0 times the OBW
RBW	30 kHz
VBW	100 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

5.3 DEVIATION FROM STANDARD

No deviation.

5.4 TEST SETUP



5.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

5.6 TEST RESULTS

Please refer to the APPENDIX E.

6. MAXIMUM OUTPUT POWER

6.1 LIMIT

Section	Test Item	Limit
FCC 15.247(b)(3)	Maximum Output Power	1.0000 watt or 30.00 dBm

6.2 TEST PROCEDURE

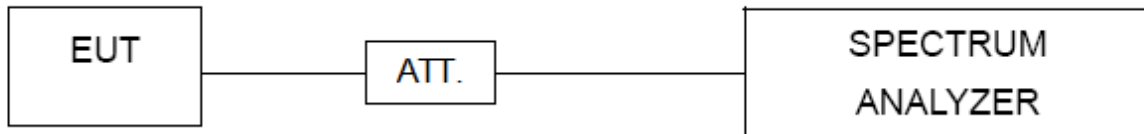
- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- The following table is the setting of the spectrum analyzer:

Spectrum Parameters	Setting
Span Frequency	$\geq 3 \times \text{RBW}$
RBW	3 MHz
VBW	3 MHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

6.3 DEVIATION FROM STANDARD

No deviation.

6.4 TEST SETUP



6.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

6.6 TEST RESULTS

Please refer to the APPENDIX F.

7. CONDUCTED SPURIOUS EMISSION

7.1 LIMIT

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 Output Power limits. If the transmitter complies with the Output 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. Attenuation below the general limits specified in Section 15.209(a) is not required.

7.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- The following table is the setting of the spectrum analyzer:

Spectrum Parameters	Setting
Start Frequency	30 MHz
Stop Frequency	26.5 GHz
RBW	100 kHz
VBW	300 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

7.3 DEVIATION FROM STANDARD

No deviation.

7.4 TEST SETUP



7.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

7.6 TEST RESULTS

Please refer to the APPENDIX G.

8. POWER SPECTRAL DENSITY

8.1 LIMIT

Section	Test Item	Limit
FCC 15.247(e)	Power Spectral Density	8 dBm (in any 3 kHz)

8.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- The following table is the setting of the spectrum analyzer:

Spectrum Parameters	Setting
Span Frequency	2 MHz (1 Mbps) / 4 MHz (2 Mbps)
RBW	3 kHz
VBW	10 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

8.3 DEVIATION FROM STANDARD

No deviation.

8.4 TEST SETUP



8.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

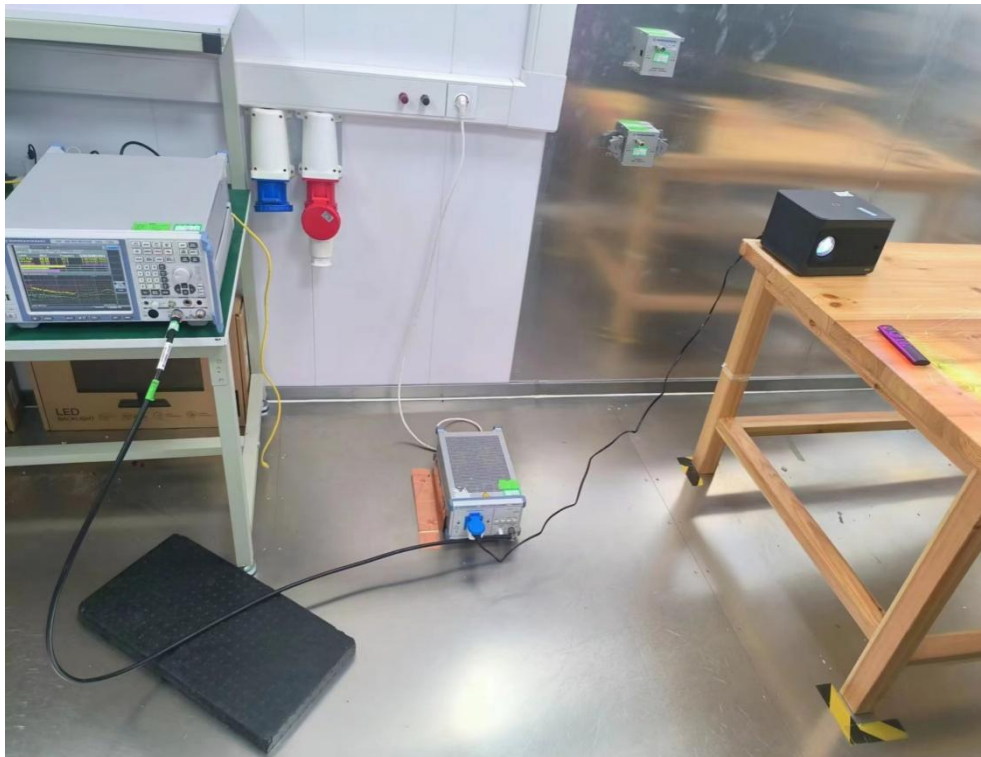
8.6 TEST RESULTS

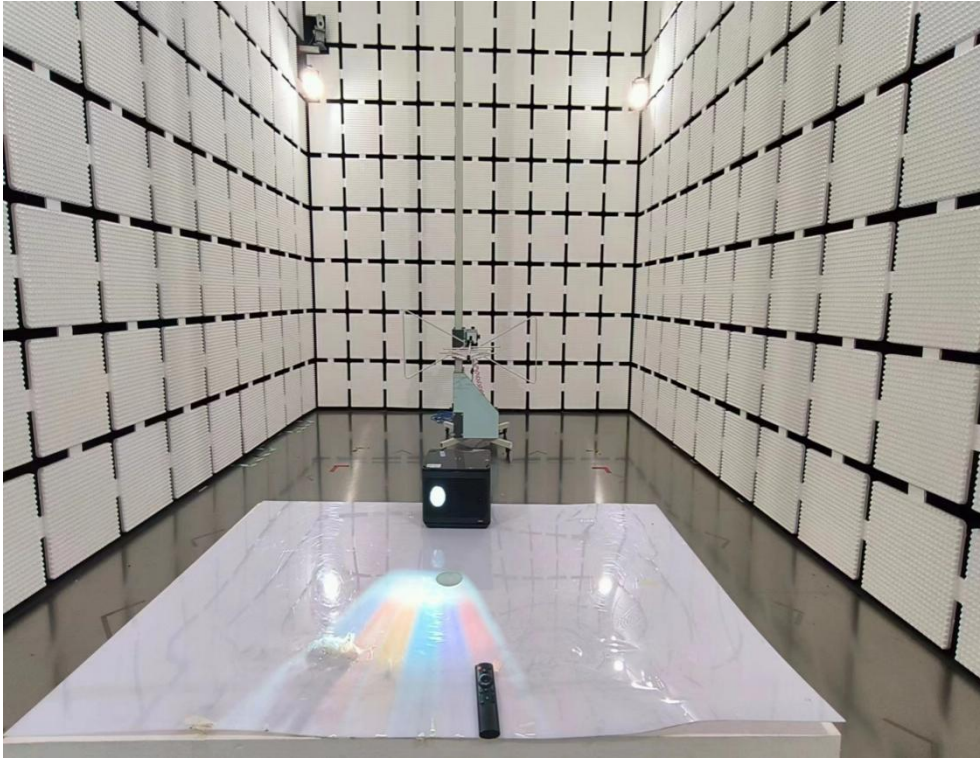
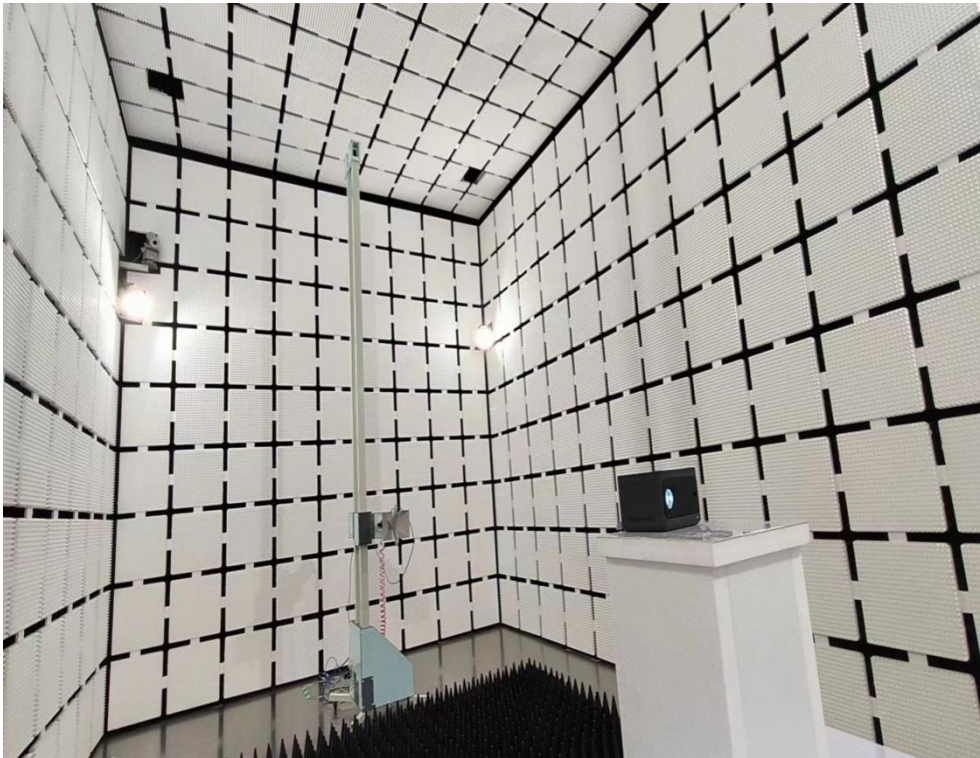
Please refer to the APPENDIX H.

9. MEASUREMENT INSTRUMENTS LIST

Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
EMI Receiver	Rohde&Schwarz	ESIB 40	YH-TIRT-SAC-966-20220911	2023/01/05	2024/01/04
Integral Antenna	Schwarzbeck	VULB 9168	01314	2023.12.16	2024.12.15
Integral Antenna	Rohde&Schwarz	HF907	RSM2991424	2023.12.16	2024.12.15
Preamplifier	Emtrace	RP01A	02017	2023/01/05	2024/01/04
Preamplifier	Schwarzbeck	BBV9744	00143	2023/01/05	2024/01/04
Loop Antenna	ZHINAN	ZN30900A	12024	2023/01/05	2024/01/04
Exposure Level Tester	narda	ELT-400	N-0925	2023/01/05	2024/01/04
Horn Antenna	Schwarzbeck	BBHA9170	00956	2023/01/05	2024/01/04
RF Cable	/	LMR400UF-NMNM-7.0M	/	2023/01/05	2024/01/04
RF Cable	/	SFT2050PUR-NMNM-7.0M	/	2023/01/05	2024/01/04
EMI Receiver	Rohde&Schwarz	ESR7	1316.3003K07-102611-mk	2023.12.24	2024.10.23
LISN	Rohde&Schwarz	ENV216	3560.655.12-102915-Bp	2023/12/24	2024/12/23
ISN	Schwarzbeck	ENY81	1309.8510.03	2023/03/08	2024/03/07
ISN	Schwarzbeck	ENY81-CAT6	1309.8526.03-101976-kh	2023/03/08	2024/03/07
RF Cable	\	SFT2050PUR-NMNM-2.0M	\	2023/01/05	2024/01/04
CMW500	ROHDE&SCHWARZ	CMW500	120434	2023/01/05	2024/01/04
Spectrum analyzer	ROHDE&SCHWARZ	FSU26	200732	2023/10/25	2024/10/24
Spectrum analyzer	ROHDE&SCHWARZ	FSV40-N	101722	2023/10/25	2024/10/24
vector Signal Generator	KEYSIGHT	N5182B	MY56200458	2023/01/05	2024/01/04
vector Signal Generator	HEWLETT PACKARD	83752A	3610A02458	2023/10/25	2024/10/24
Filter	Tonscend	JS0806-F	19K8060209	/	/
RF Control Unit	Tonscend	JS0806-2	19K8060209	2023/01/05	2024/01/04
Wireless comprehensive tester	ANRISTU	MT8821C	SN6262170409	2023/01/05	2024/01/04
Wireless comprehensive tester	ANRISTU	MT8000A	SN6262166782	2023/01/05	2024/01/04
Wireless broadband test system	Tonscend	JS1120-3	/	/	/

Remark: "/" denotes no model name, serial no. or calibration specified.

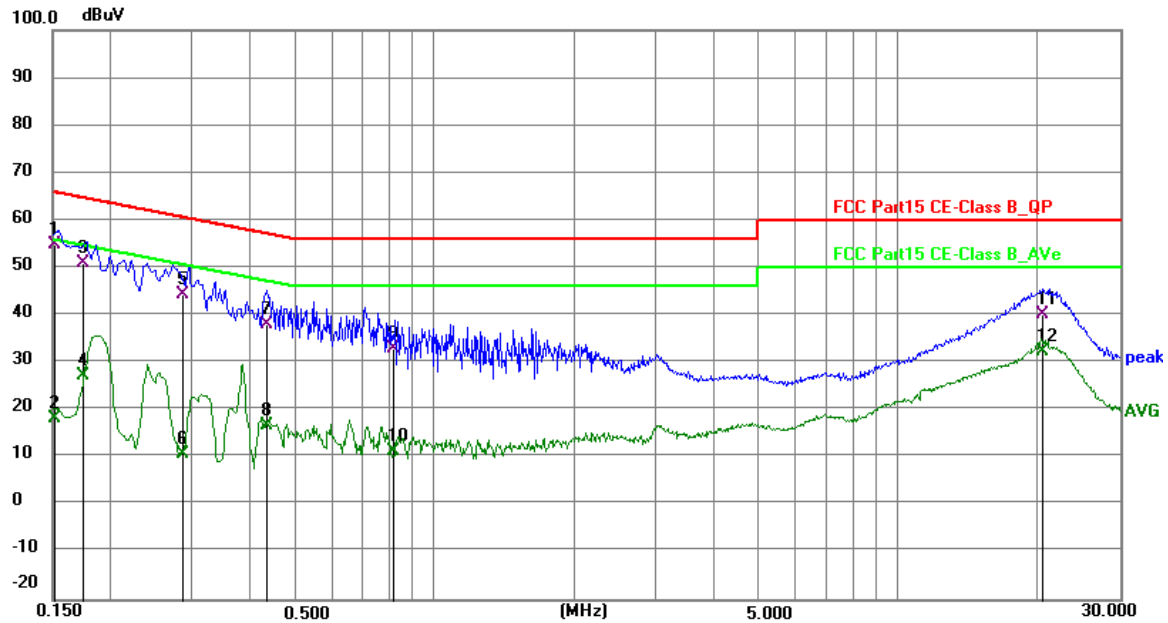
10. EUT TEST PHOTO**AC Power Line Conducted Emissions Test Photos**

Radiated Emissions Test Photos**30 MHz to 1000 MHz****Radiated Emissions Test Photos****Above 1 GHz**

Conducted Test Photos

APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS

Test Mode	TX Mode_1Mbps Channel 00	Phase	Line
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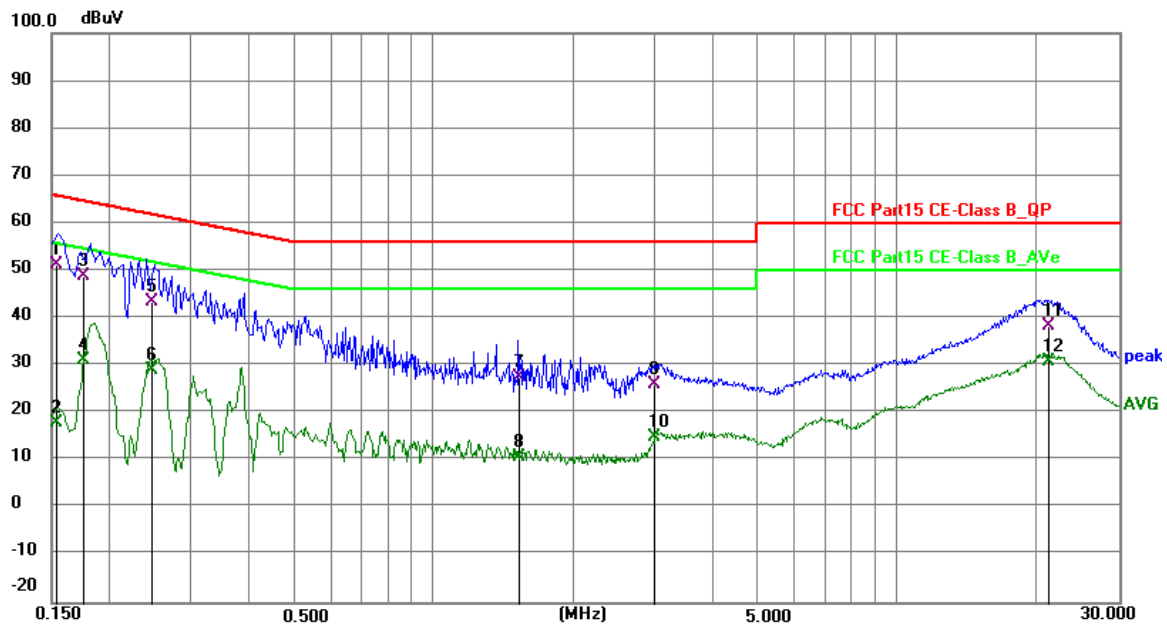
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1 *	0.1515	45.22	9.63	54.85	65.92	-11.07	QP	P
2	0.1515	8.52	9.63	18.15	55.92	-37.77	AVG	P
3	0.1740	41.40	9.62	51.02	64.77	-13.75	QP	P
4	0.1740	17.57	9.62	27.19	54.77	-27.58	AVG	P
5	0.2870	34.60	9.63	44.23	60.61	-16.38	QP	P
6	0.2870	1.03	9.63	10.66	50.61	-39.95	AVG	P
7	0.4371	28.51	9.63	38.14	57.12	-18.98	QP	P
8	0.4371	7.08	9.63	16.71	47.12	-30.41	AVG	P
9	0.8203	23.22	9.63	32.85	56.00	-23.15	QP	P
10	0.8203	1.68	9.63	11.31	46.00	-34.69	AVG	P
11	20.3913	30.48	9.78	40.26	60.00	-19.74	QP	P
12	20.3913	22.68	9.78	32.46	50.00	-17.54	AVG	P

REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX Mode_1Mbps Channel 00	Phase	Neutral
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No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1 *	0.1536	41.50	9.62	51.12	65.80	-14.68	QP	P
2	0.1536	8.42	9.62	18.04	55.80	-37.76	AVG	P
3	0.1761	39.36	9.63	48.99	64.67	-15.68	QP	P
4	0.1761	21.55	9.63	31.18	54.67	-23.49	AVG	P
5	0.2472	33.72	9.63	43.35	61.85	-18.50	QP	P
6	0.2472	19.56	9.63	29.19	51.85	-22.66	AVG	P
7	1.5357	17.88	9.65	27.53	56.00	-28.47	QP	P
8	1.5357	1.11	9.65	10.76	46.00	-35.24	AVG	P
9	3.0102	16.51	9.65	26.16	56.00	-29.84	QP	P
10	3.0102	5.32	9.65	14.97	46.00	-31.03	AVG	P
11	21.2615	28.56	9.82	38.38	60.00	-21.62	QP	P
12	21.2615	20.89	9.82	30.71	50.00	-19.29	AVG	P

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

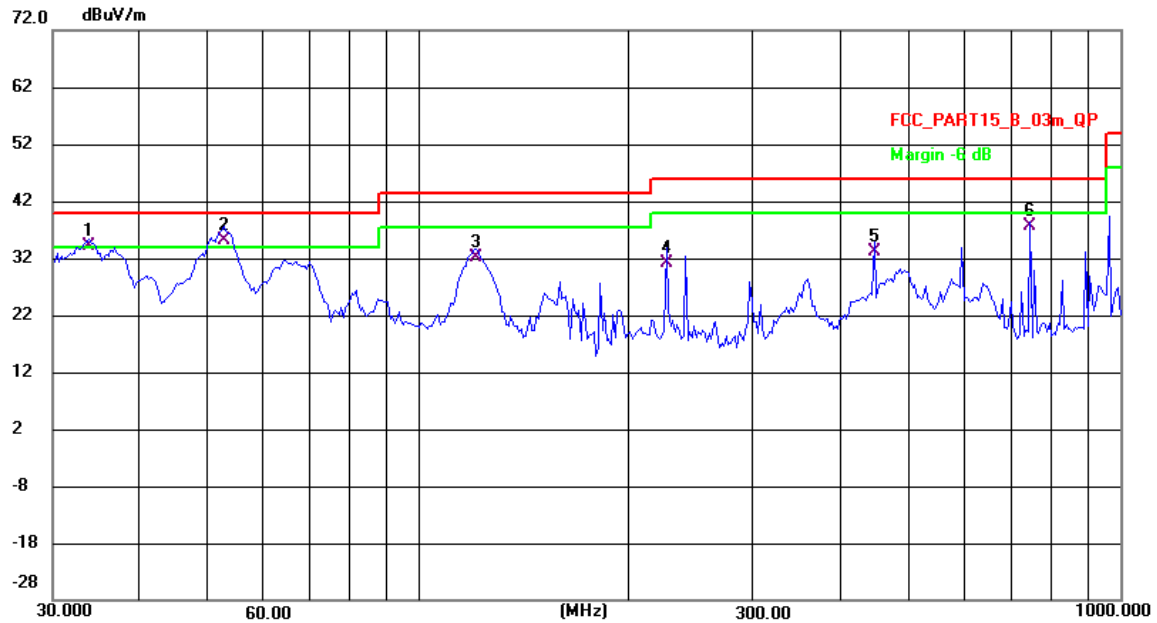
APPENDIX B - RADIATED EMISSION - 9 KHZ TO 30 MHZ

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1000 MHZ

Test Mode	TX Mode_1Mbps Channel 00	Polarization	Vertical
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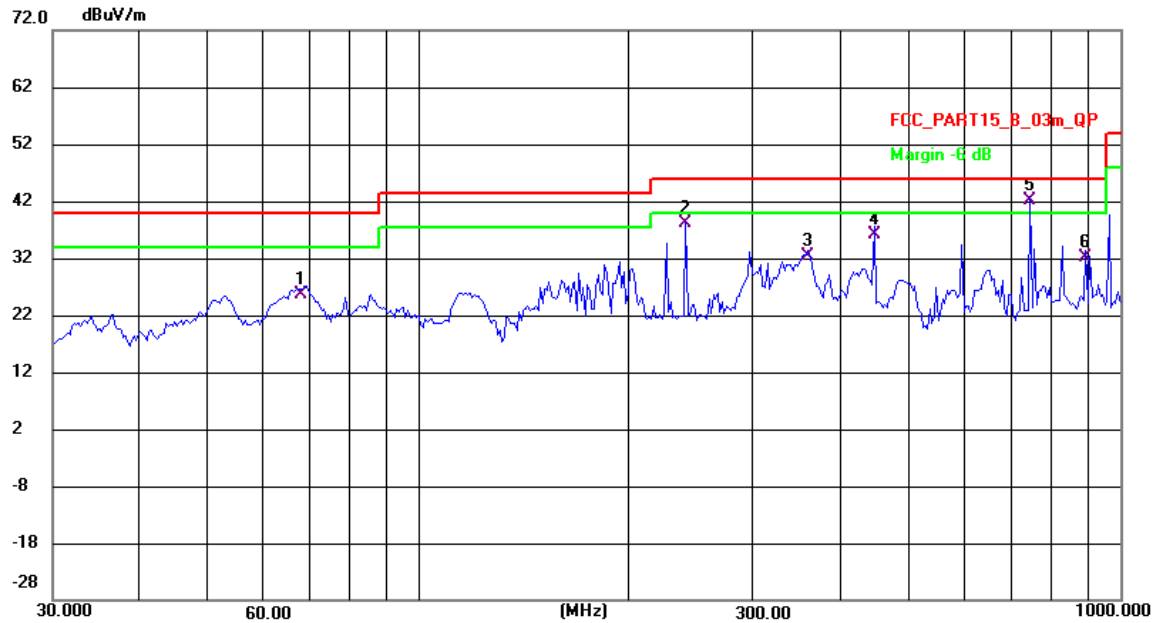


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 !	33.8066	54.22	-19.97	34.25	40.00	-5.75	QP
2 *	52.6343	54.97	-19.76	35.21	40.00	-4.79	QP
3	120.6115	54.10	-22.09	32.01	43.50	-11.49	QP
4	225.4267	56.61	-25.36	31.25	46.00	-14.75	QP
5	445.6931	51.36	-18.22	33.14	46.00	-12.86	QP
6	744.4265	48.65	-11.12	37.53	46.00	-8.47	QP

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX Mode_1Mbps Channel 00	Polarization	Horizontal
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No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	67.7853	47.29	-21.68	25.61	40.00	-14.39	QP
2	240.1442	62.43	-24.22	38.21	46.00	-7.79	QP
3	358.4497	52.98	-20.62	32.36	46.00	-13.64	QP
4	445.6931	54.43	-18.22	36.21	46.00	-9.79	QP
5 *	744.4265	53.32	-11.12	42.20	46.00	-3.80	QP
6	893.6556	41.12	-8.98	32.14	46.00	-13.86	QP

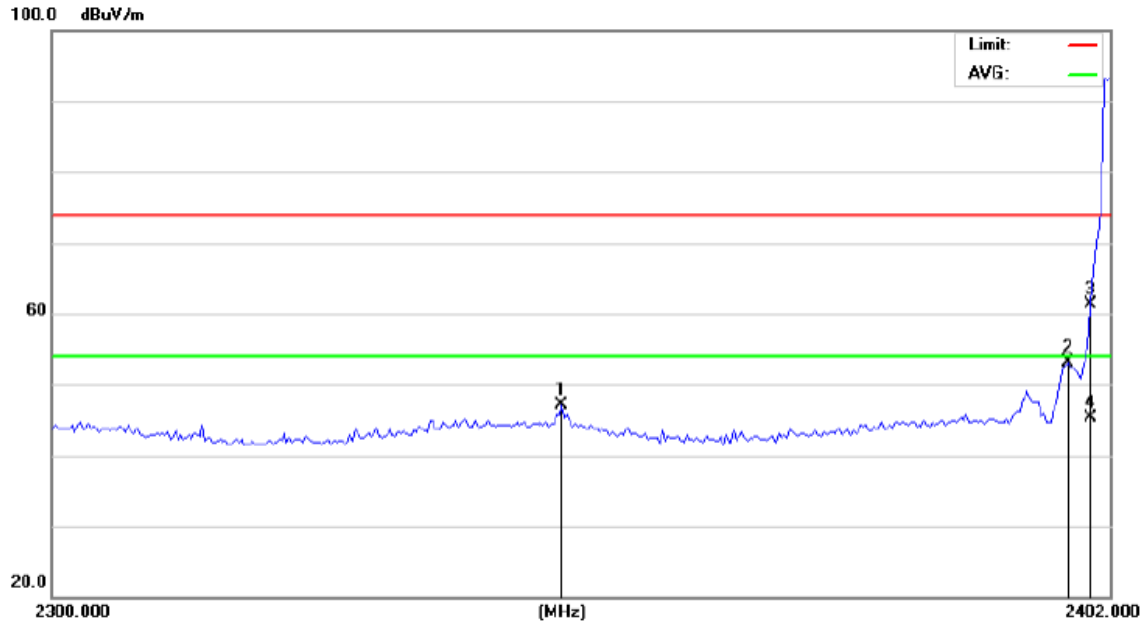
REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

APPENDIX D - RADIATED EMISSION - ABOVE 1000 MHZ

Test Result of Radiated Spurious at Band edges

Test Mode	TX 2402 MHz _CH00_1Mbps	Polarization	Vertical
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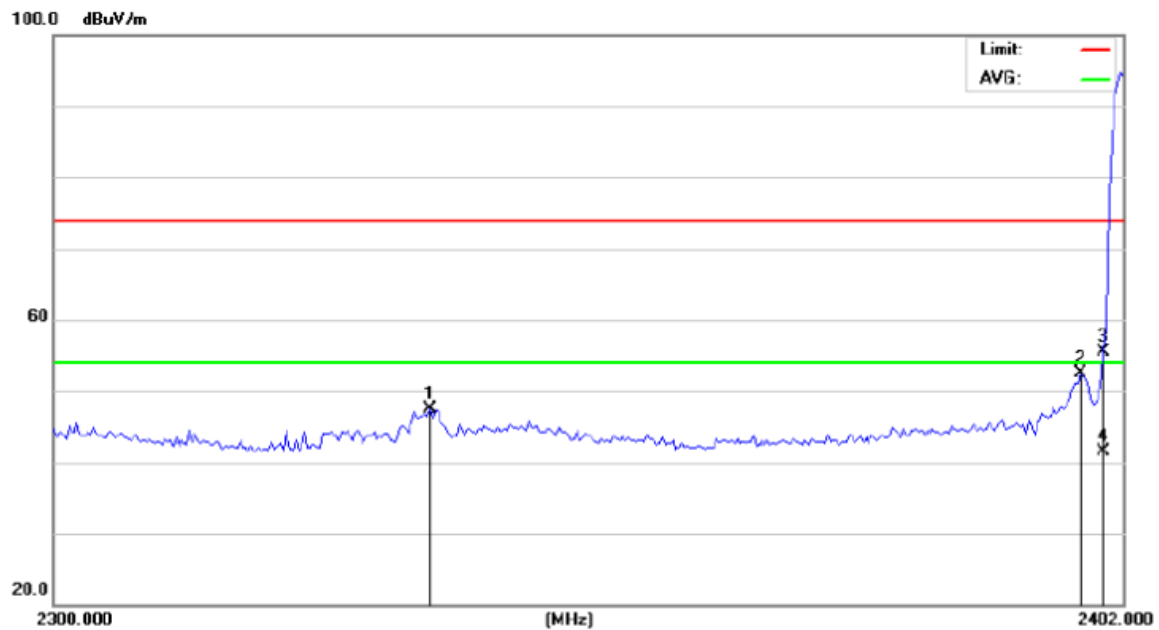


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector	Antenna Height cm	Table Degree	Comment
1		2348.663	52.12	-5.11	47.01	74.00	-26.99	peak			
2		2397.834	57.86	-4.77	53.09	74.00	-20.91	peak			
3		2400.000	66.00	-4.75	61.25	74.00	-12.75	peak			
4	*	2400.000	50.00	-4.75	45.25	54.00	-8.75	AVG			

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX 2402 MHz _CH00_1Mbps	Polarization	Horizontal
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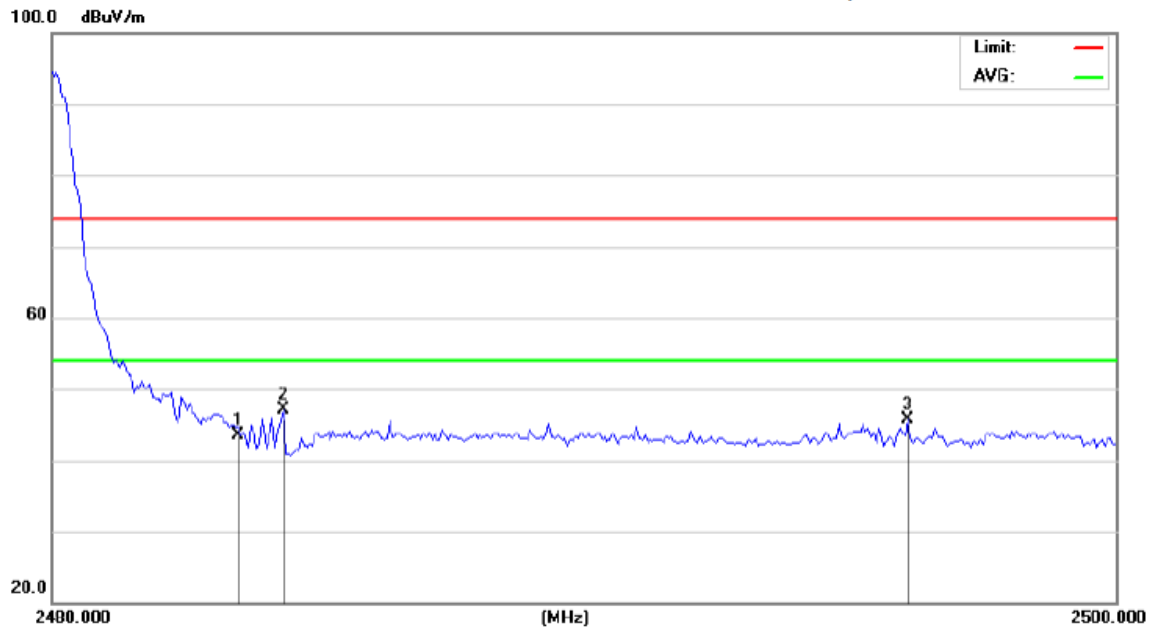
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Antenna Height cm	Table Degree	Comment
1		2335.451	52.66	-5.19	47.47	74.00	-26.53	peak		
2		2397.834	57.23	-4.77	52.46	74.00	-21.54	peak		
3		2400.000	60.20	-4.75	55.45	74.00	-18.55	peak		
4	*	2400.000	46.25	-4.75	41.50	54.00	-12.50	AVG		

REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX 2480 MHz _CH39_1Mbps	Polarization	Vertical
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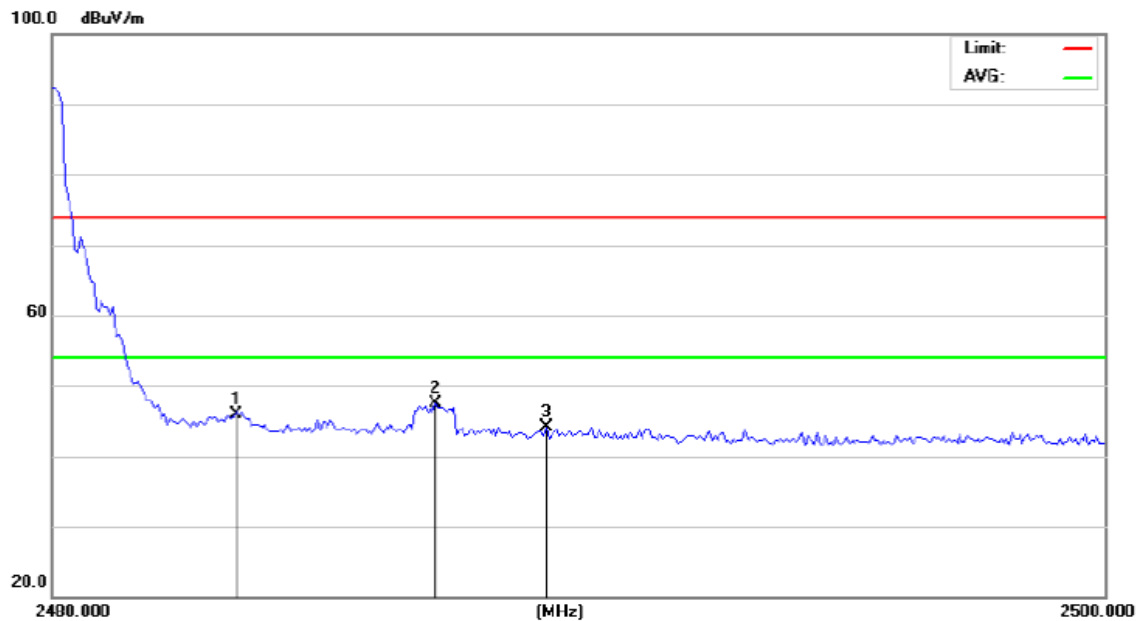


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	cm	degree	Comment
1		2483.500	47.72	-4.19	43.53	74.00	-30.47	peak		
2	*	2484.336	51.29	-4.19	47.10	74.00	-26.90	peak		
3		2496.087	49.84	-4.11	45.73	74.00	-28.27	peak		

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX 2480 MHz _CH39_1Mbps	Polarization	Horizontal
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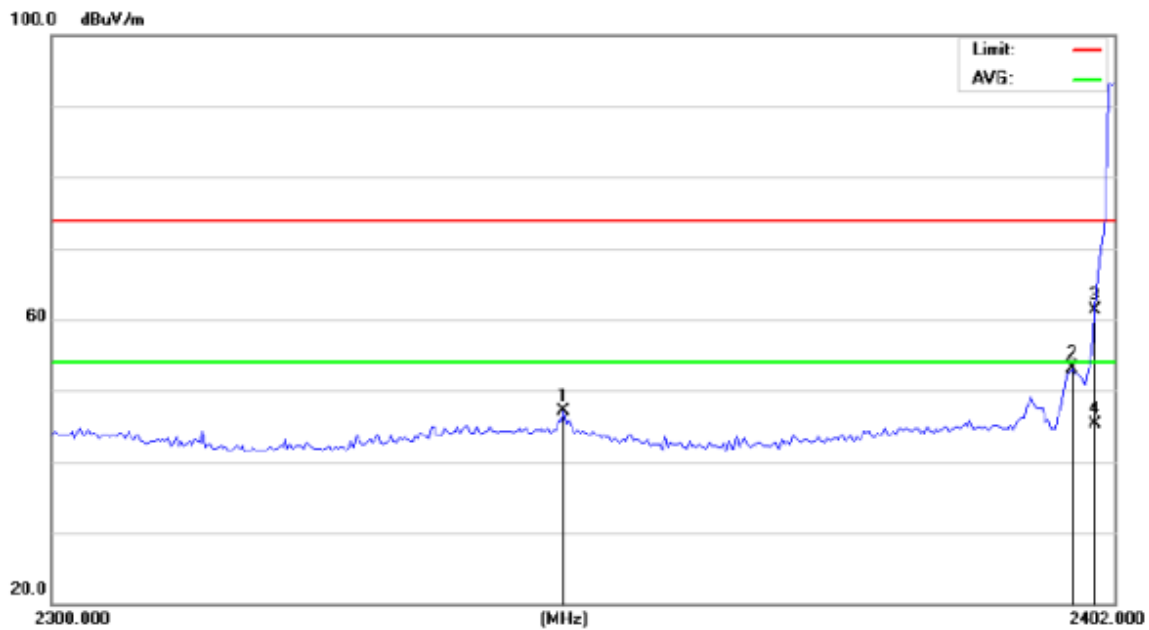
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Antenna Height cm	Table Degree	Comment
1		2483.500	50.12	-4.19	45.93	74.00	-28.07	peak		
2	*	2487.281	51.58	-4.17	47.41	74.00	-26.59	peak		
3		2489.380	48.18	-4.16	44.02	74.00	-29.98	peak		

REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX 2402 MHz _CH00_2Mbps	Polarization	Vertical
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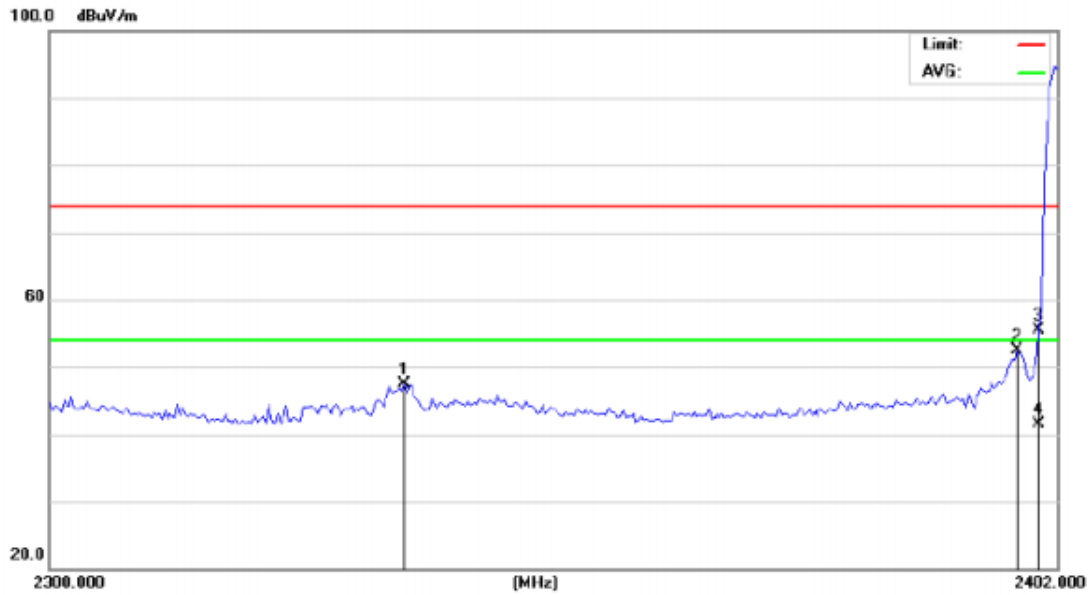


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		2348.663	52.12	-5.11	47.01	74.00	-26.99	peak
2		2397.834	57.86	-4.77	53.09	74.00	-20.91	peak
3		2400.000	66.00	-4.75	61.25	74.00	-12.75	peak
4	*	2400.000	50.00	-4.75	45.25	54.00	-8.75	AVG

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX 2402 MHz _CH00_2Mbps	Polarization	Horizontal
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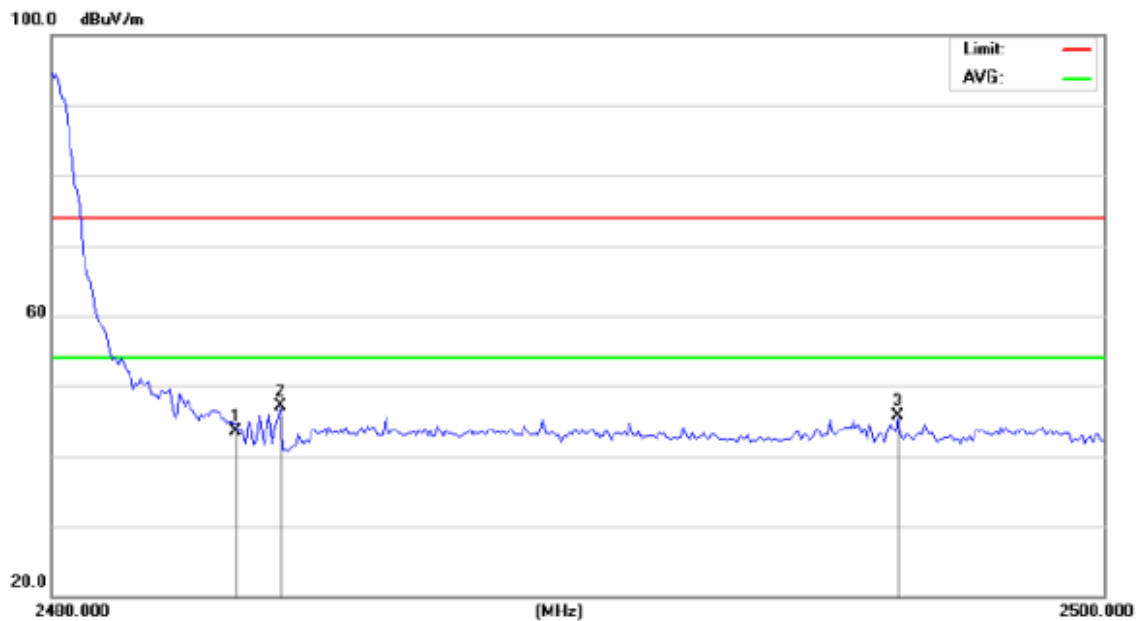
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		2335.451	52.66	-5.19	47.47	74.00	-26.53	peak
2		2397.834	57.23	-4.77	52.46	74.00	-21.54	peak
3		2400.000	60.20	-4.75	55.45	74.00	-18.55	peak
4	*	2400.000	46.25	-4.75	41.50	54.00	-12.50	AVG

REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX 2480 MHz _CH39_2Mbps	Polarization	Vertical
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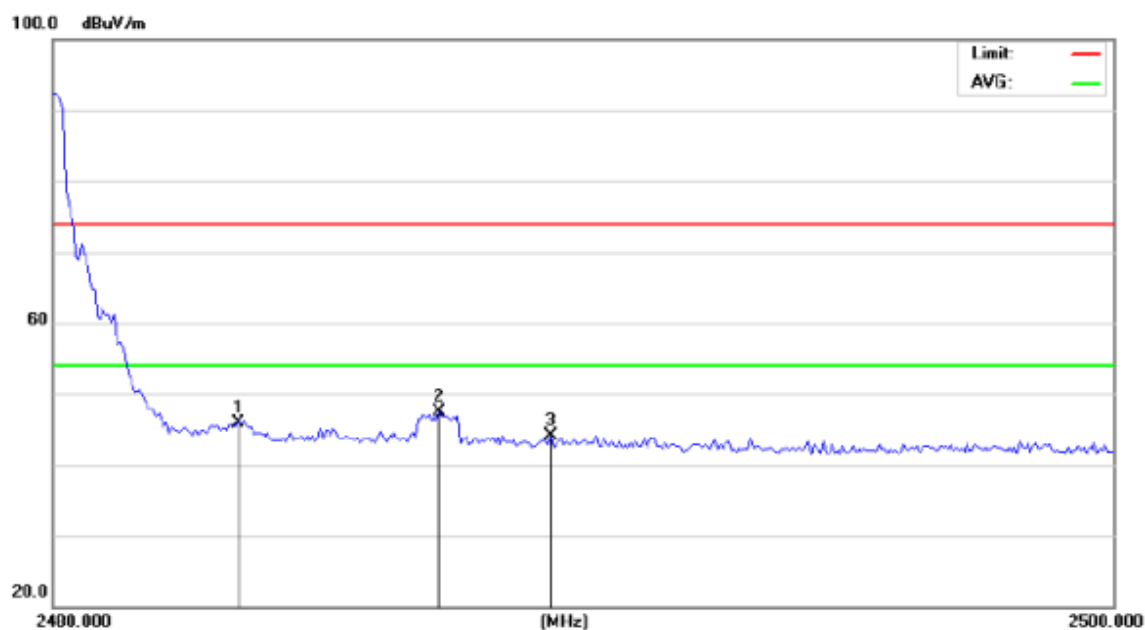


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		2483.500	47.72	-4.19	43.53	74.00	-30.47	peak
2	*	2484.336	51.29	-4.19	47.10	74.00	-26.90	peak
3		2496.087	49.84	-4.11	45.73	74.00	-28.27	peak

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX 2480 MHz _CH39_2Mbps	Polarization	Horizontal
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No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		2483.500	50.12	-4.19	45.93	74.00	-28.07	peak
2	*	2487.281	51.58	-4.17	47.41	74.00	-26.59	peak
3		2489.380	48.18	-4.16	44.02	74.00	-29.98	peak

REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

ABOVE 1000 MHz
Modulation Type: BLE 1M

Low channel:2402									
Frequency	Ant.Pol. H/V	Peak reading (dBuV)	AV reading (dBuV)	Correction Factor	Emission Level		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)			
2390	H	48.26	---	-8.27	39.99	---	74	54	-34.01
4804	H	45.98	---	0.66	46.64	---	74	54	-27.36
7206	H	37.30	---	9.5	46.80	---	74	54	-27.20
2390	V	46.29	---	-8.27	38.02	---	74	54	-35.98
4804	V	44.62	---	0.66	45.28	---	74	54	-28.72
7206	V	37.75	---	9.5	47.25	---	74	54	-26.75

Low channel:2440									
Frequency	Ant.Pol. H/V	Peak reading (dBuV)	AV reading (dBuV)	Correction Factor	Emission Level		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)			
4880.00	H	47.70	---	0.99	48.69	---	74	54	-25.31
7320.00	H	38.09	---	9.87	47.96	---	74	54	-26.04
---	H	---	---	---	---	---	---	---	---
4880.00	V	46.90	---	0.99	47.89	---	74	54	-26.11
7320.00	V	38.22	---	9.87	48.09	---	74	54	-25.91
---	V	---	---	---	---	---	---	---	---

Low channel:2480									
Frequency	Ant.Pol. H/V	Peak reading (dBuV)	AV reading (dBuV)	Correction Factor	Emission Level		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)			
2483.5	H	47.19	---	-7.83	39.36	---	74	54	-34.64
4960	H	46.07	---	1.33	47.40	---	74	54	-26.60
7440	H	36.14	---	10.22	46.36	---	74	54	-27.64
2483.5	V	47.94	---	-7.83	40.11	---	74	54	-33.89
4960	V	48.11	---	1.33	49.21	---	74	54	-24.79
7440	V	36.93	---	10.22	46.39	---	74	54	-27.61

Modulation Type: BLE 2M

Low channel:2402									
Frequency	Ant.Pol. H/V	Peak reading (dBuV)	AV reading (dBuV)	Correction Factor	Emission Level		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)			
2390	H	47.96	---	-8.27	39.69	---	74	54	-34.31
4804	H	45.56	---	0.66	46.22	---	74	54	-27.78
7206	H	36.84	---	9.5	46.34	---	74	54	-27.66
2390	V	46.30	---	-8.27	38.03	---	74	54	-35.97
4804	V	44.46	---	0.66	45.12	---	74	54	-28.88
7206	V	37.87	---	9.5	47.37	---	74	54	-26.63

Low channel:2440									
Frequency	Ant.Pol. H/V	Peak reading (dBuV)	AV reading (dBuV)	Correction Factor	Emission Level		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)			
4880	H	47.45	---	0.99	48.44	---	74	54	-25.56
7320	H	38.19	---	9.87	48.06	---	74	54	-25.94
---	H	---	---	---	---	---	---	---	---
4880	V	47.01	---	0.99	48.00	---	74	54	-26.00
7320	V	38.15	---	9.87	48.02	---	74	54	-25.98
---	V	---	---	---	---	---	---	---	---

Low channel:2480									
Frequency	Ant.Pol. H/V	Peak reading (dBuV)	AV reading (dBuV)	Correction Factor	Emission Level		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)			
2483.5	H	47.40	---	-7.83	39.57	---	74	54	-34.43
4960	H	46.14	---	1.33	47.47	---	74	54	-26.53
7440	H	36.42	---	10.22	46.64	---	74	54	-27.36
2483.5	V	47.87	---	-7.83	40.04	---	74	54	-33.96
4960	V	48.18	---	1.33	49.21	---	74	54	-24.79
7440	V	36.41	---	10.22	46.39	---	74	54	-27.61

Notes:

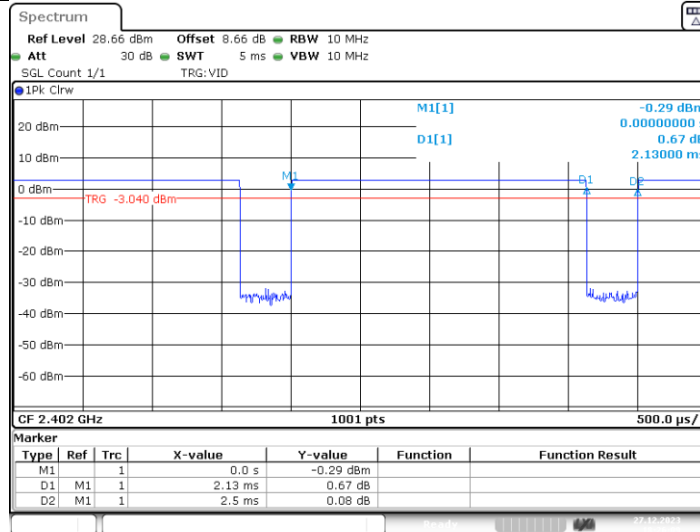
- 1). Radiated emissions measured in frequency range from 9 KHz–10th harmonic or 26.5GHz (which is less) were made with an instrument using Peak detector mode.
- 2). Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 3). Measured Level = Reading Level + Correction Factor, Margin = Measured Level – Limit

Duty Cycle

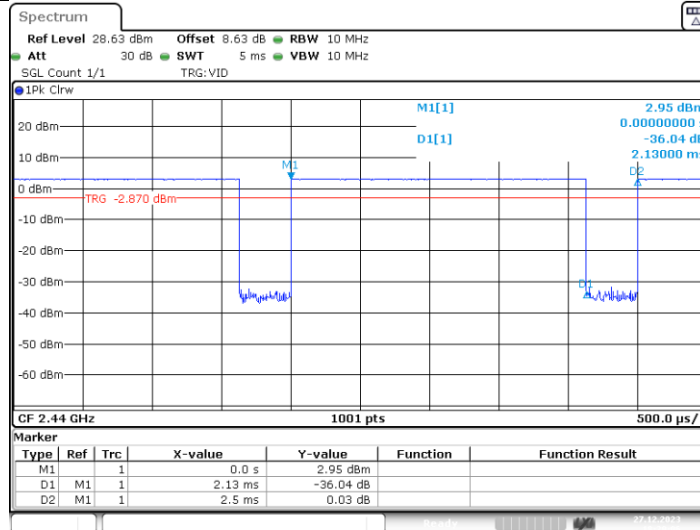
TestMode	Antenna	Freq(MHz)	ON Time [ms]	Period [ms]	X	DC [%]	xFactor	Limit	Verdict
BLE_1M	Ant1	2402	2.13	2.50	0.8520	85.20	0.70	---	---
		2440	2.13	2.50	0.8520	85.20	0.70	---	---
		2480	2.13	2.50	0.8520	85.20	0.70	---	---
BLE_2M	Ant1	2402	1.07	1.88	0.5691	56.91	2.45	---	---
		2440	1.07	1.88	0.5691	56.91	2.45	---	---
		2480	1.07	1.88	0.5691	56.91	2.45	---	---

TEST GRAPHS

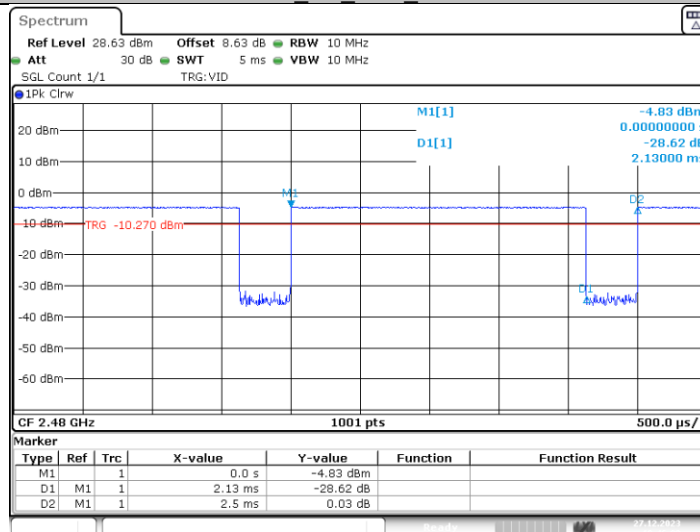
BLE_1M_Ant1_2402



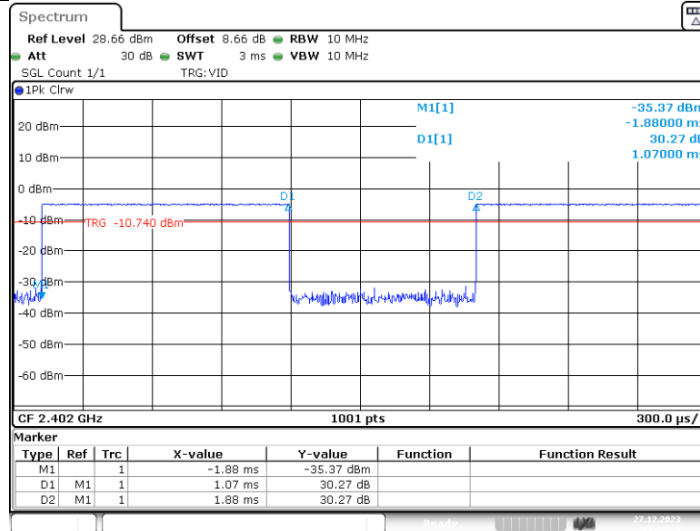
BLE_1M_Ant1_2440



BLE_1M_Ant1_2480

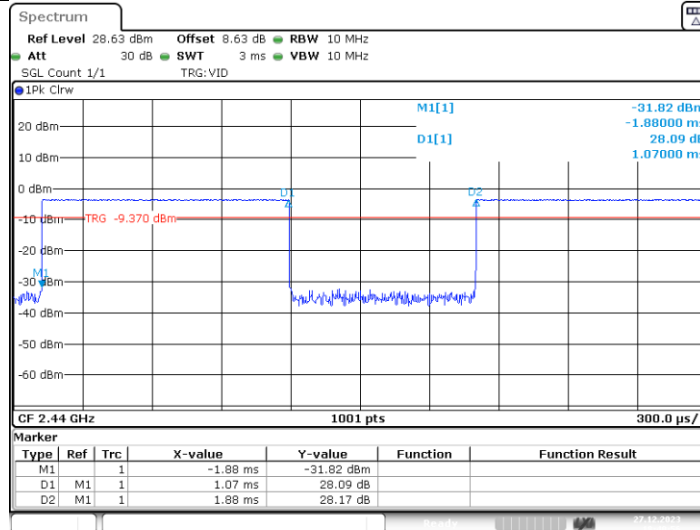


BLE 2M Ant1 2402



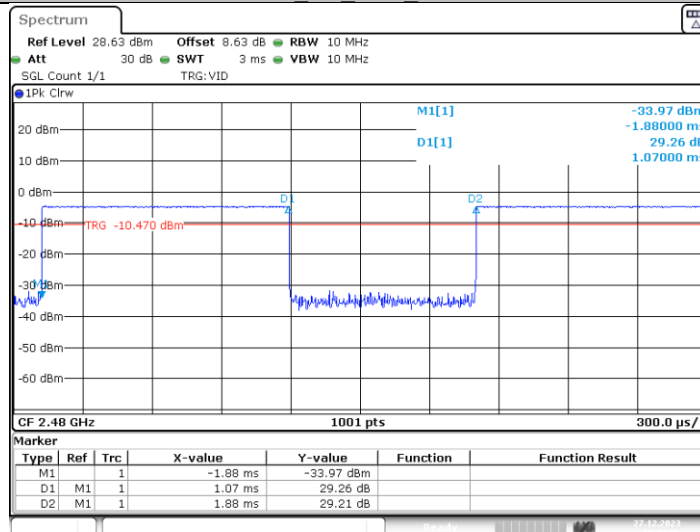
Date: 27.DEC.2023 18:38:08

BLE 2M Ant1 2440



Date: 27.DEC.2023 18:40:56

BLE 2M Ant1 2480



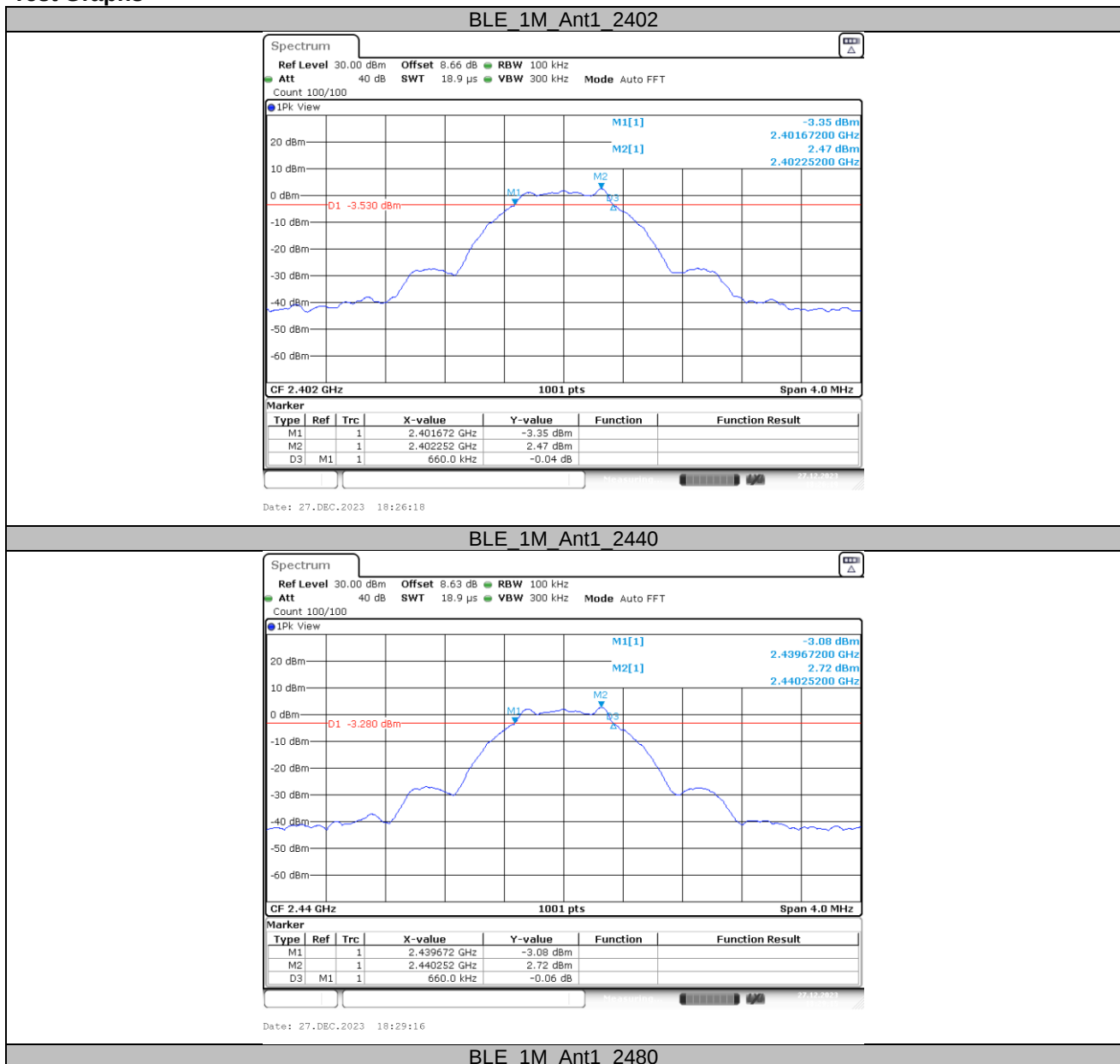
Date: 27.DEC.2023 18:43:06

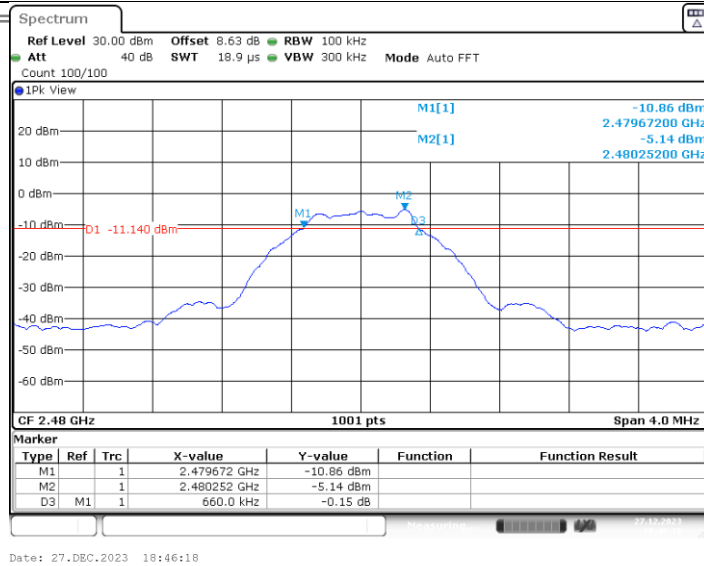
APPENDIX E - BANDWIDTH

DTS Bandwidth

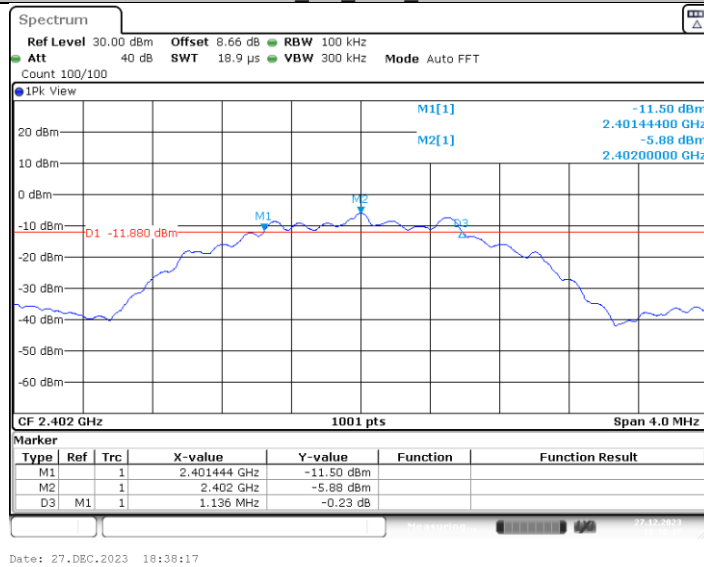
TestMode	Antenna	Freq(MHz)	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.66	2401.67	2402.33	0.5	PASS
		2440	0.66	2439.67	2440.33	0.5	PASS
		2480	0.66	2479.67	2480.33	0.5	PASS
BLE_2M	Ant1	2402	1.14	2401.44	2402.58	0.5	PASS
		2440	1.16	2439.42	2440.58	0.5	PASS
		2480	1.16	2479.42	2480.58	0.5	PASS

Test Graphs

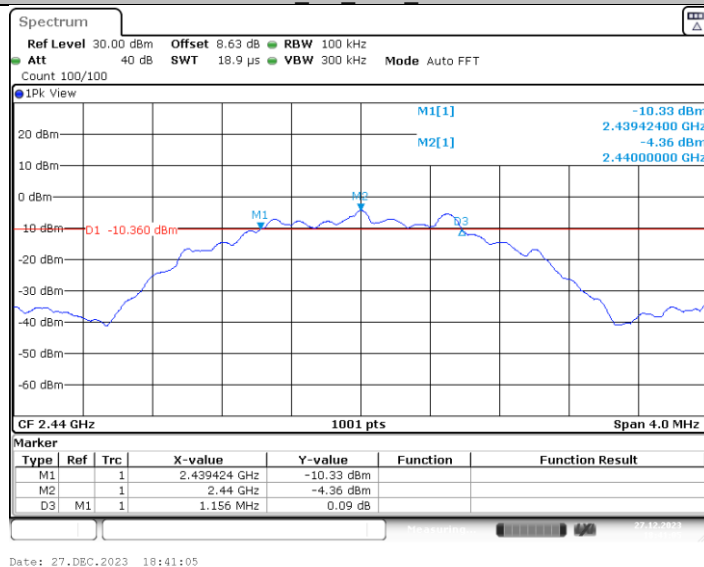




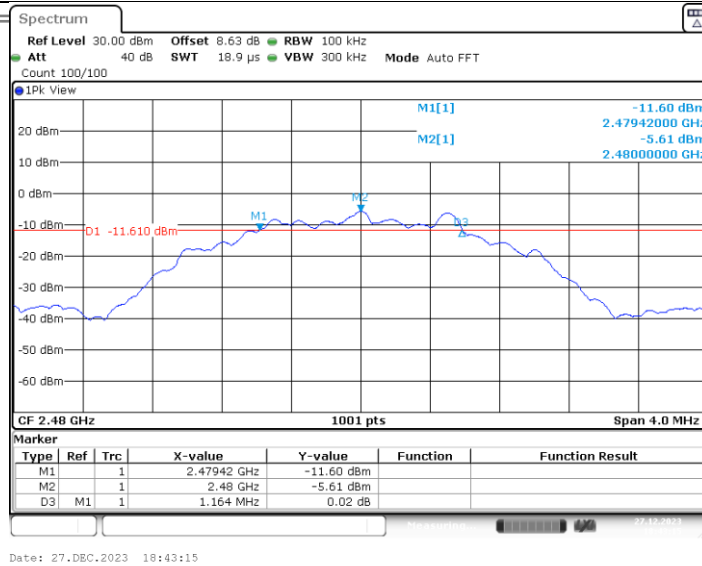
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



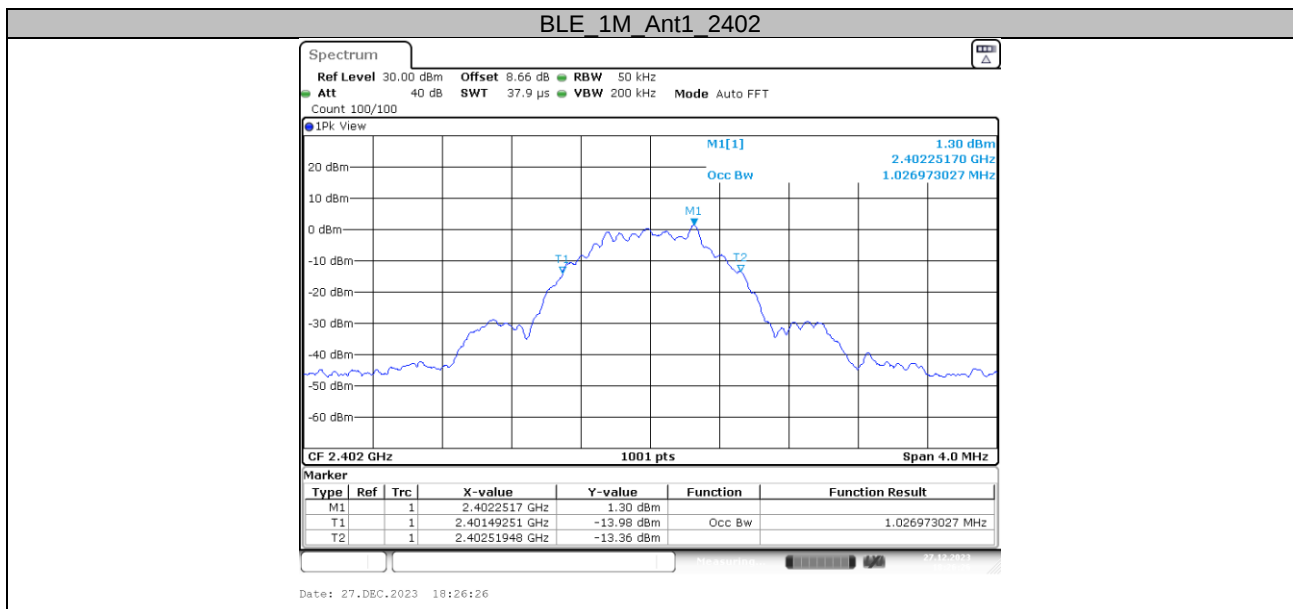
BLE_2M_Ant1_2480



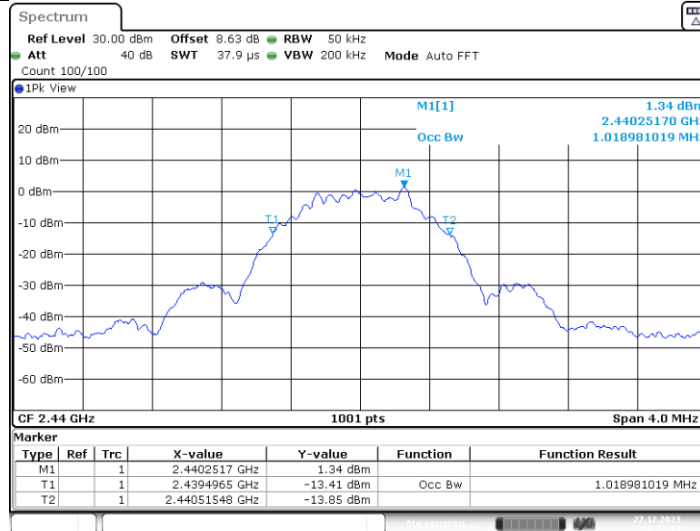
Occupied Channel Bandwidth

TestMode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	1.027	2401.4925	2402.5195	---	---
		2440	1.019	2439.4965	2440.5155	---	---
		2480	1.059	2479.4725	2480.5315	---	---
BLE_2M	Ant1	2402	2.078	2400.9730	2403.0509	---	---
		2440	2.078	2438.9730	2441.0509	---	---
		2480	2.078	2478.9730	2481.0509	---	---

Test Graphs

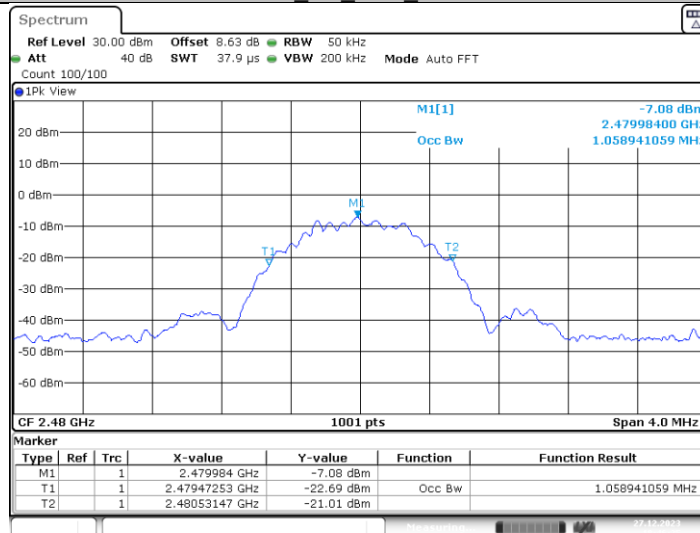


BLE 1M Ant1 2440



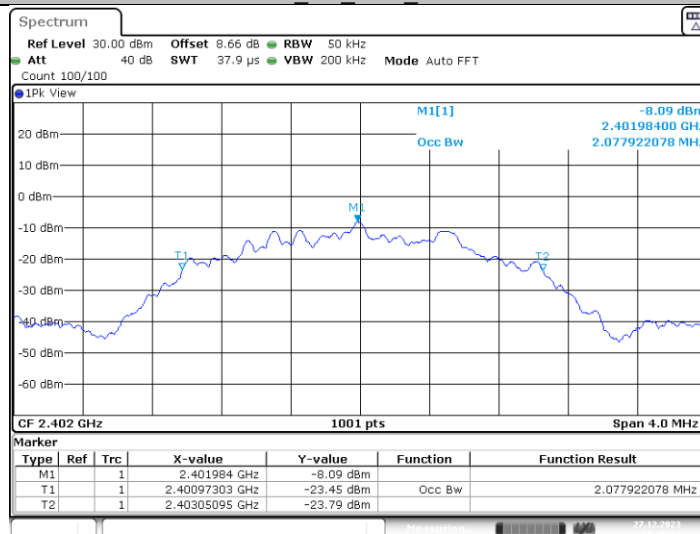
Date: 27.DEC.2023 18:29:23

BLE 1M Ant1 2480

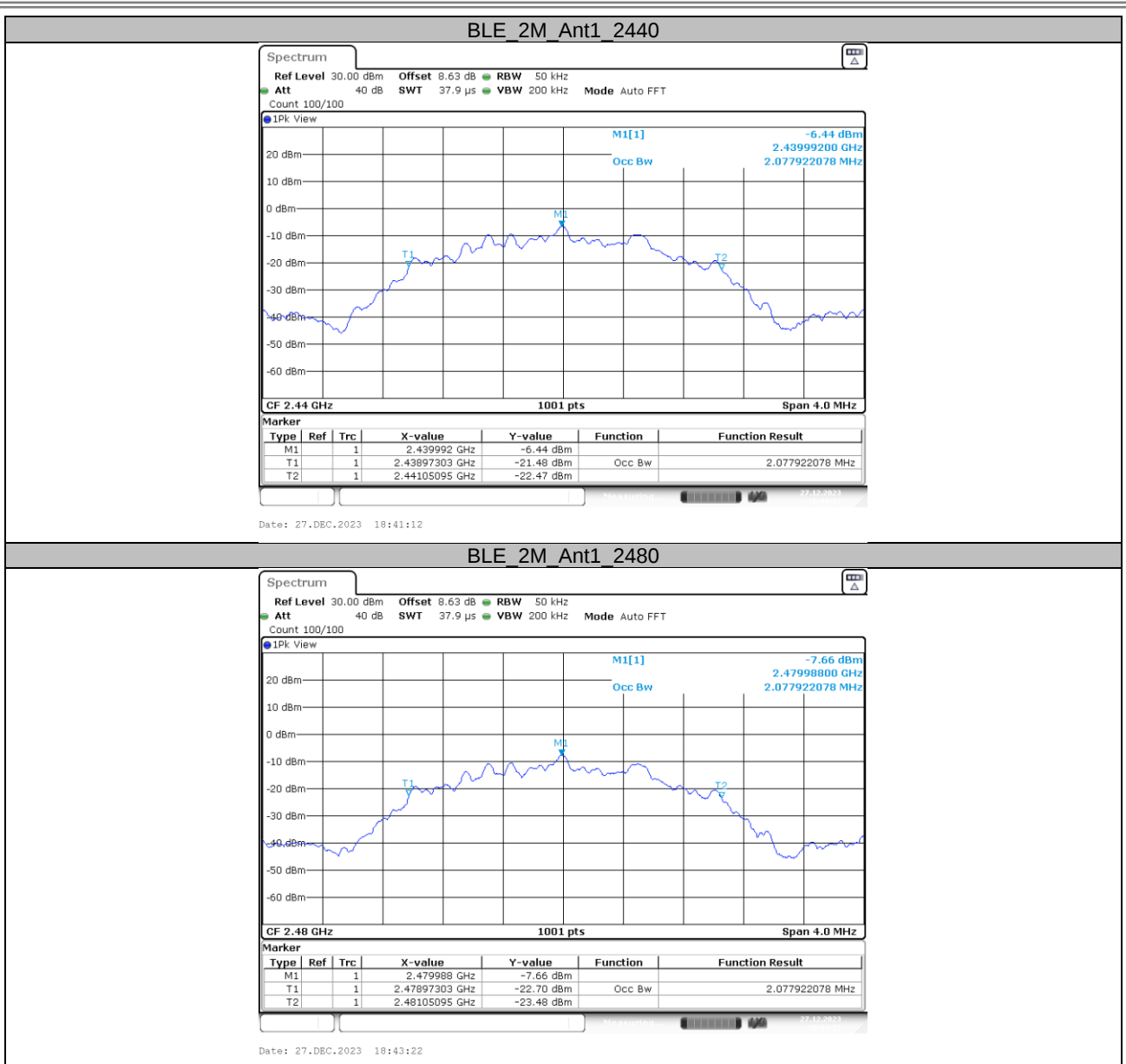


Date: 27.DEC.2023 18:46:25

BLE 2M Ant1 2402



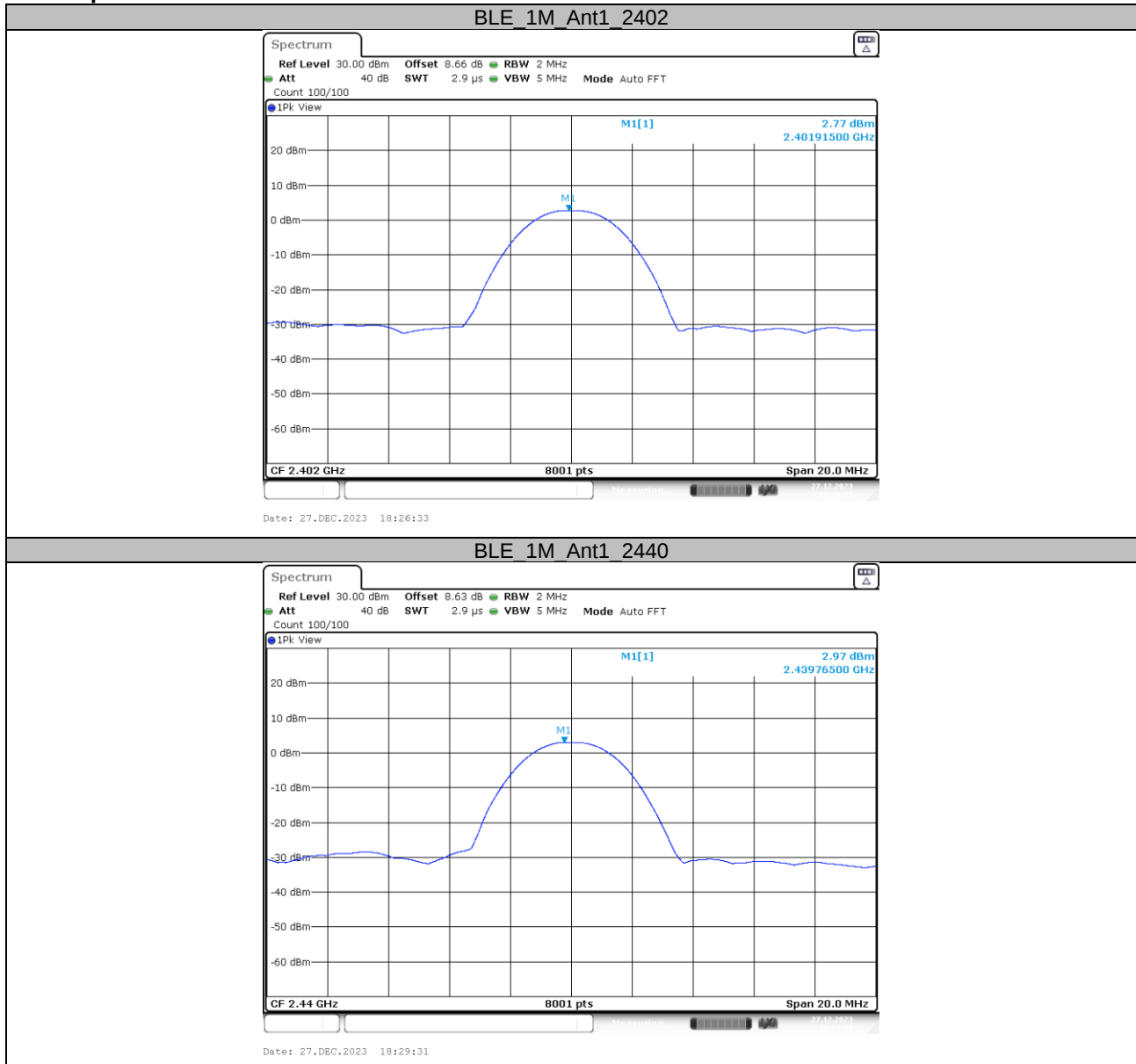
Date: 27.DEC.2023 18:38:24



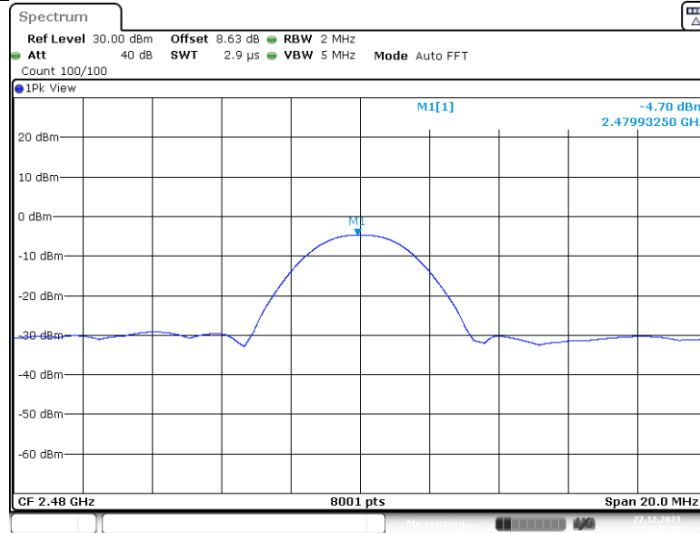
APPENDIX F - MAXIMUM OUTPUT POWER

TestMode	Antenna	Freq(MHz)	Conducted Peak Power[dBm]	Conducted Limit[dBm]	EIRP[dBm]	EIRP Limit[dBm]	Verdict
BLE_1M	Ant1	2402	2.77	≤30	4.52	≤36	PASS
		2440	2.97	≤30	4.72	≤36	PASS
		2480	-4.70	≤30	-2.95	≤36	PASS
BLE_2M	Ant1	2402	-5.08	≤30	-3.33	≤36	PASS
		2440	-3.62	≤30	-1.87	≤36	PASS
		2480	-4.75	≤30	-3	≤36	PASS

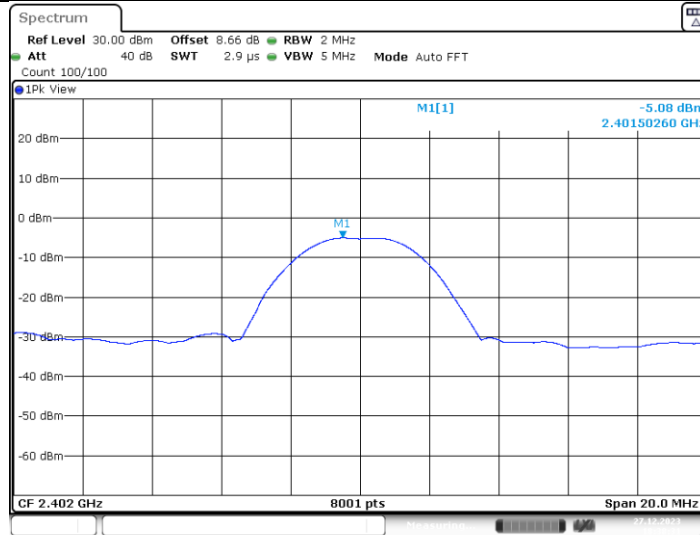
Test Graphs Peak



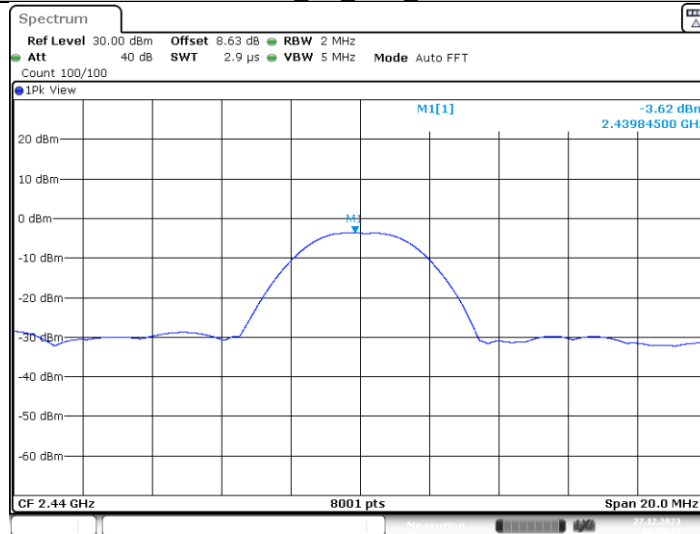
BLE_1M_Ant1_2480

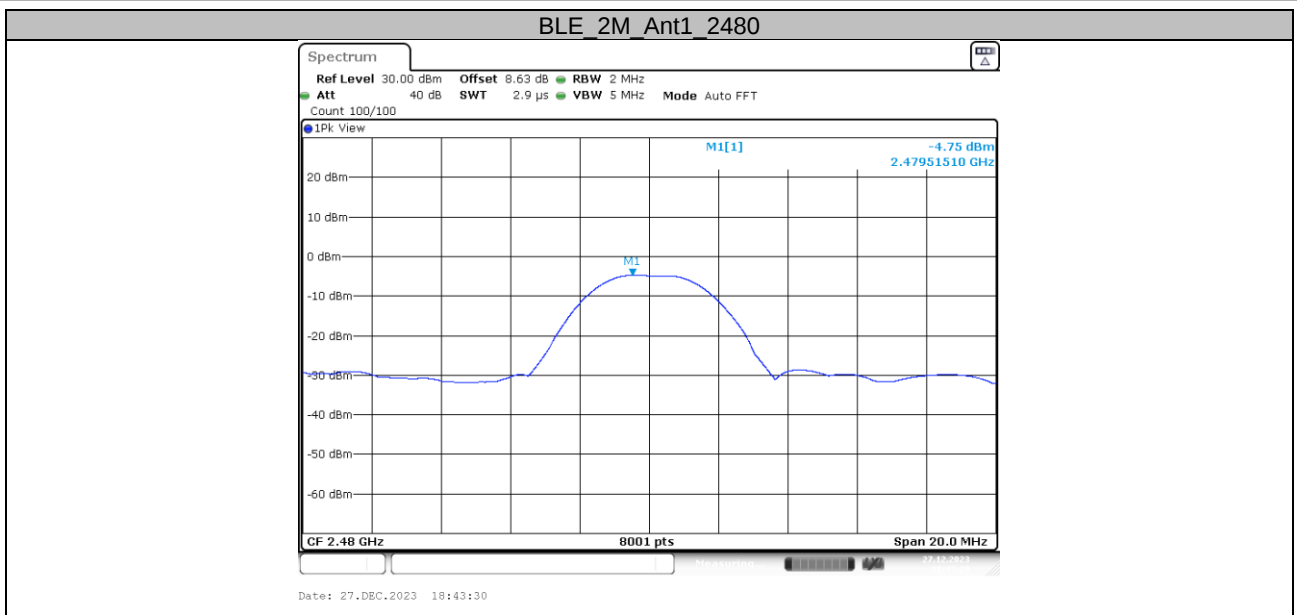


BLE_2M_Ant1_2402



BLE_2M_Ant1_2440

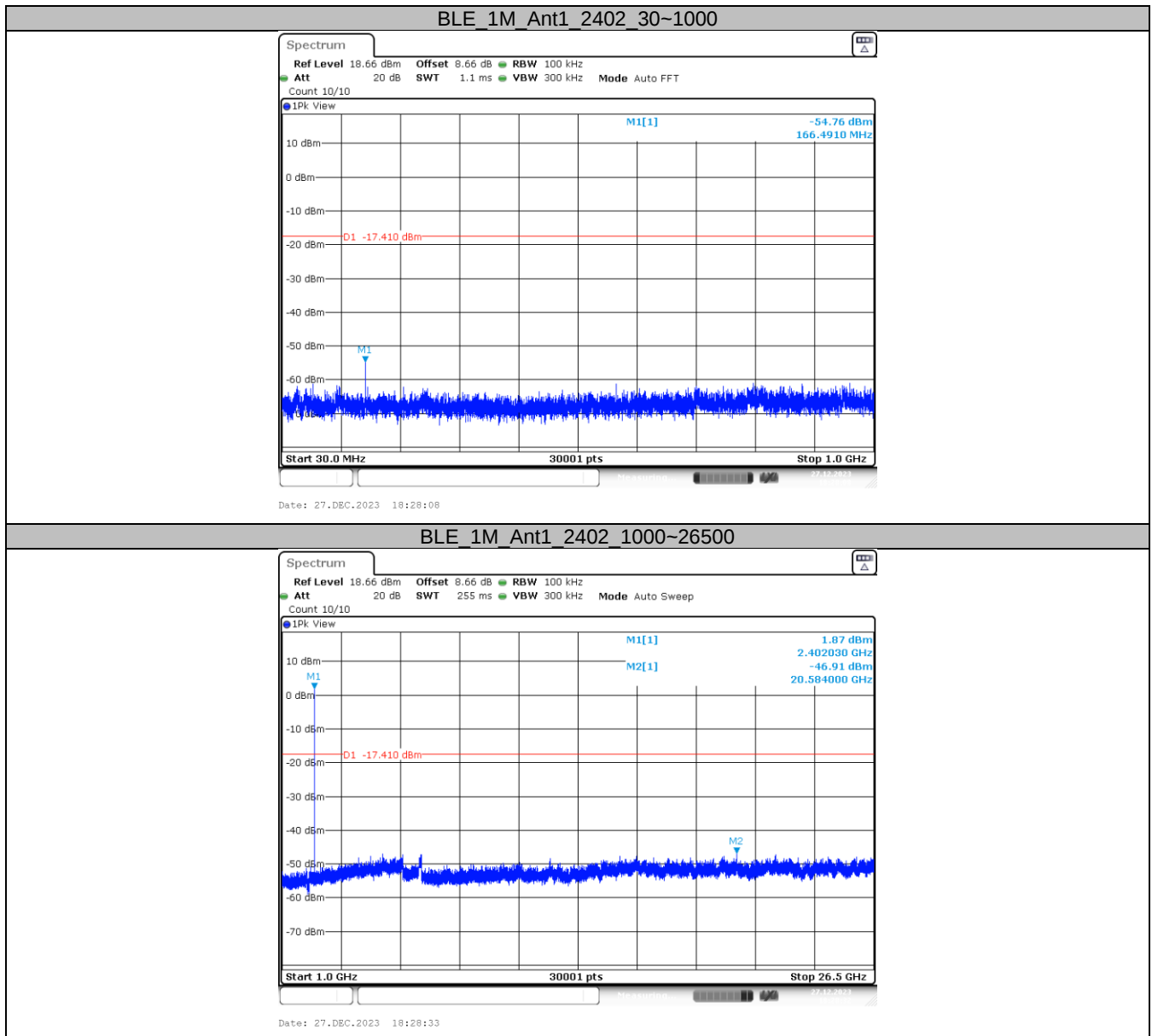




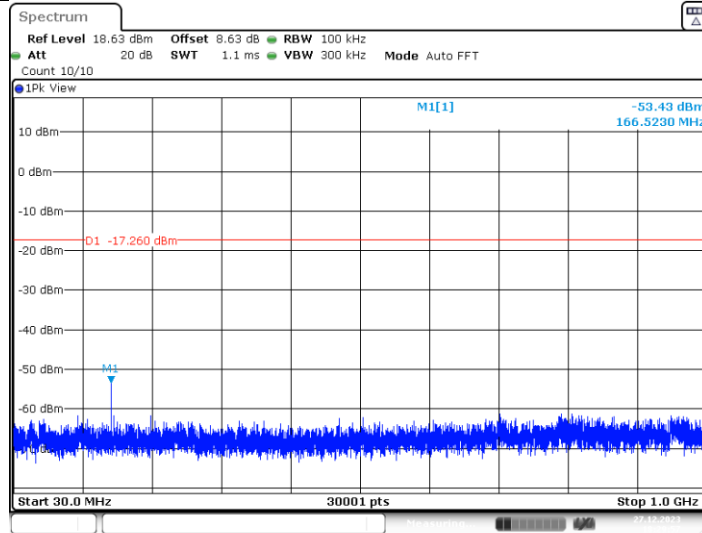
APPENDIX G - CONDUCTED SPURIOUS EMISSION

TestMode	Antenna	Freq(MHz)	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	30~1000	2.59	-54.76	≤-17.41	PASS
			1000~26500	2.59	-46.91	≤-17.41	PASS
		2440	30~1000	2.74	-53.43	≤-17.26	PASS
			1000~26500	2.74	-47.01	≤-17.26	PASS
		2480	30~1000	-5.20	-53.14	≤-25.2	PASS
			1000~26500	-5.20	-46.54	≤-25.2	PASS
BLE_2M	Ant1	2402	30~1000	-5.86	-53.54	≤-25.86	PASS
			1000~26500	-5.86	-46.84	≤-25.86	PASS
		2440	30~1000	-4.43	-52.96	≤-24.43	PASS
			1000~26500	-4.43	-45.93	≤-24.43	PASS
		2480	30~1000	-5.61	-52.97	≤-25.61	PASS
			1000~26500	-5.61	-47.24	≤-25.61	PASS

TEST GRAPHS

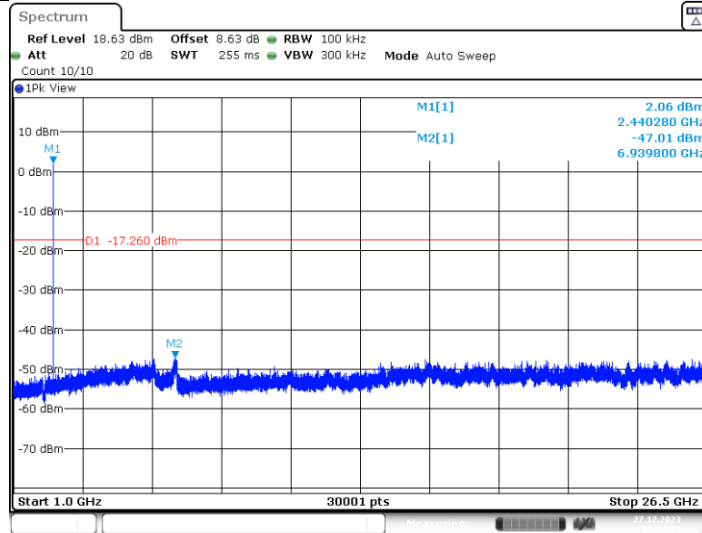


BLE 1M Ant1 2440 30~1000



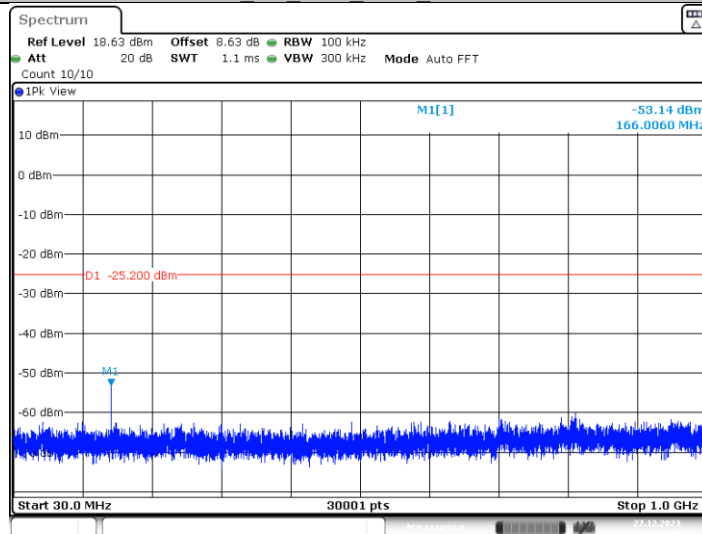
Date: 27.DEC.2023 18:29:57

BLE 1M Ant1 2440 1000~26500



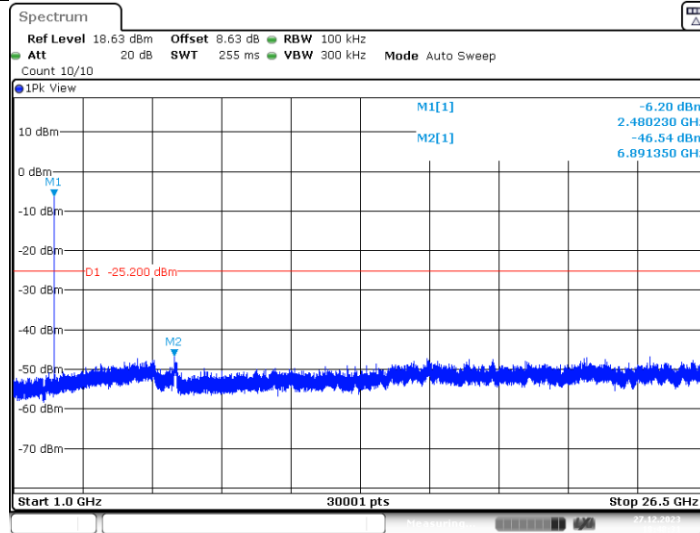
Date: 27.DEC.2023 18:30:22

BLE 1M Ant1 2480 30~1000

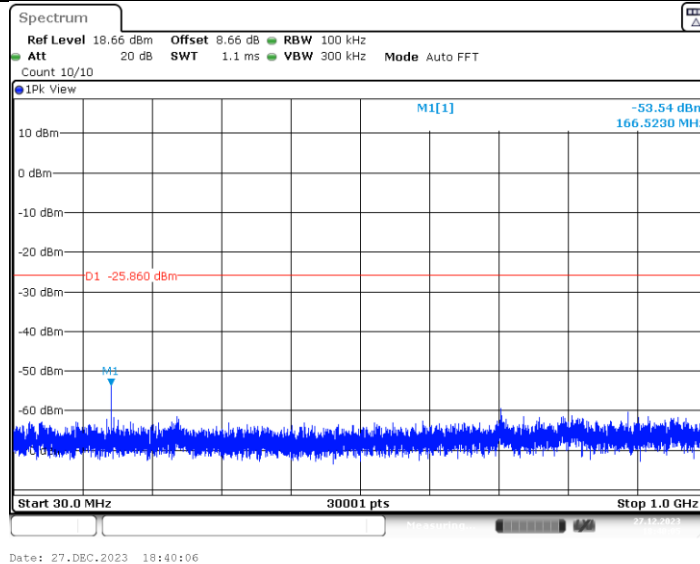


Date: 27.DEC.2023 18:48:07

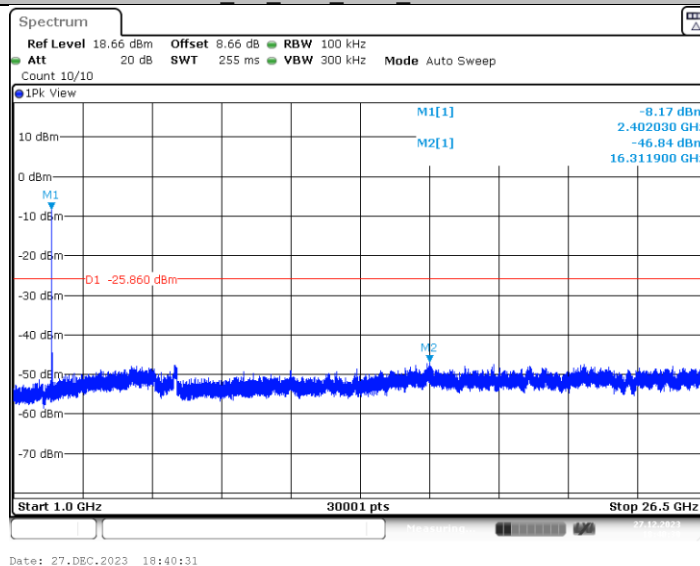
BLE_1M_Ant1_2480_1000-26500



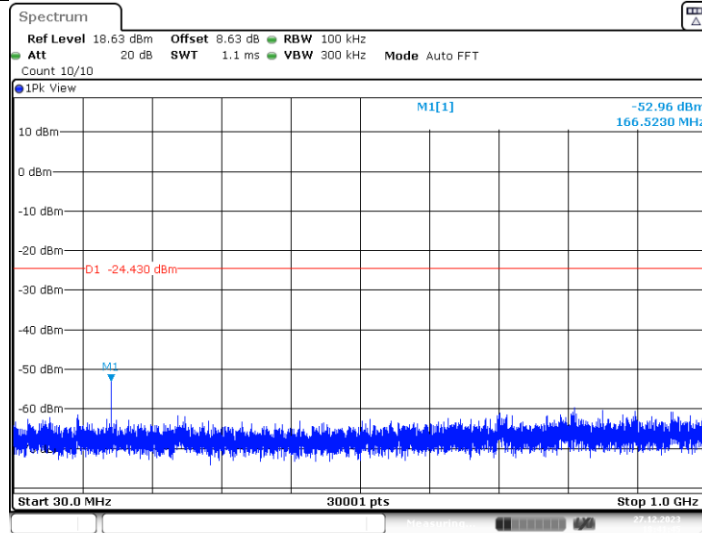
BLE_2M_Ant1_2402_30-1000



BLE_2M_Ant1_2402_1000-26500

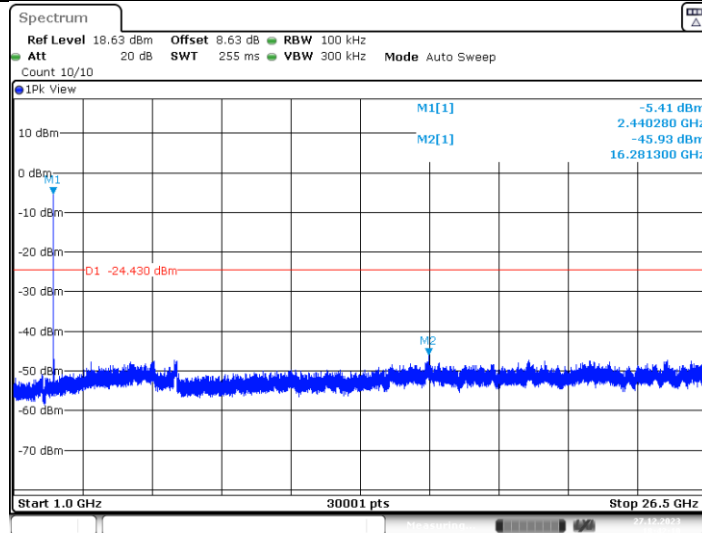


BLE_2M_Ant1_2440_30~1000



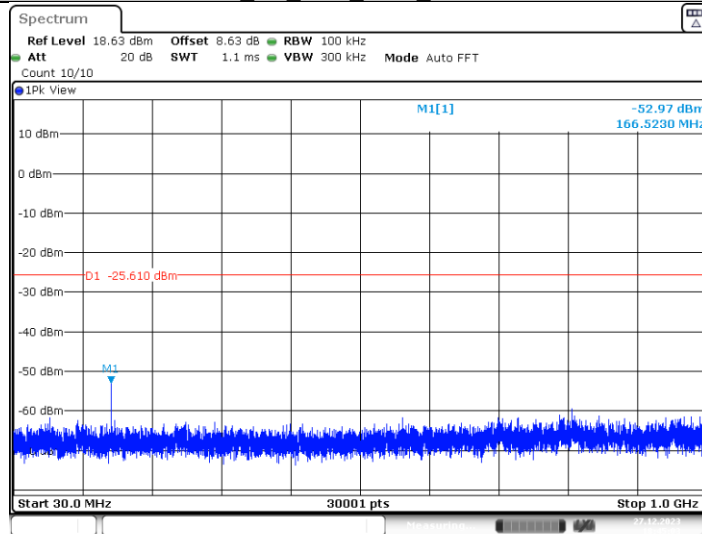
Date: 27.DEC.2023 18:41:46

BLE_2M_Ant1_2440_1000~26500

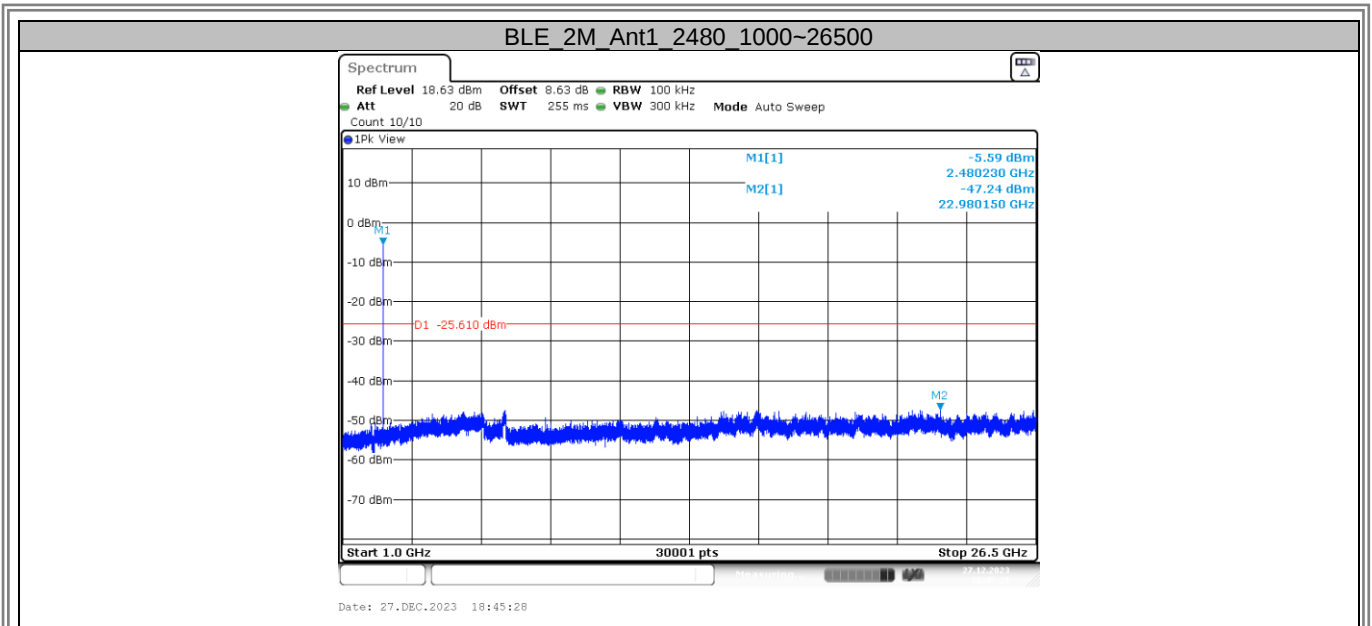


Date: 27.DEC.2023 18:42:10

BLE_2M_Ant1_2480_30~1000



Date: 27.DEC.2023 18:45:04

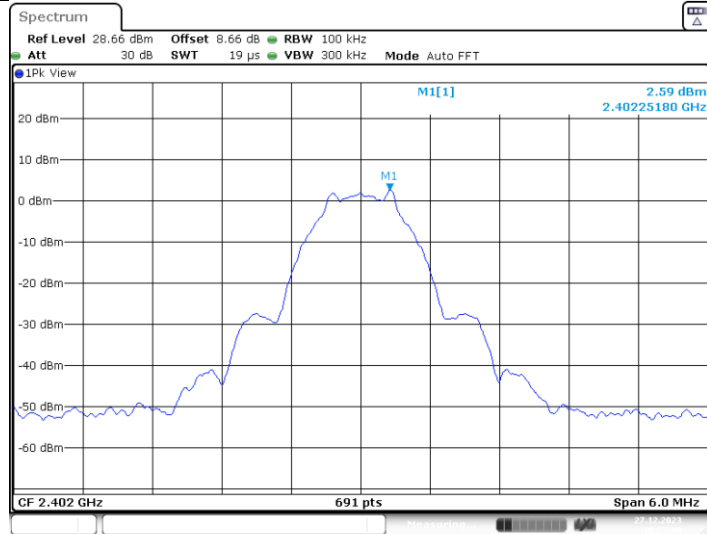


Reference level measurement

TestMode	Antenna	Freq(MHz)	Max.Point[MHz]	Result[dBm]
BLE_1M	Ant1	2402	2402.25	2.59
		2440	2440.25	2.74
		2480	2480.25	-5.20
BLE_2M	Ant1	2402	2402.00	-5.86
		2440	2440.00	-4.43
		2480	2480.00	-5.61

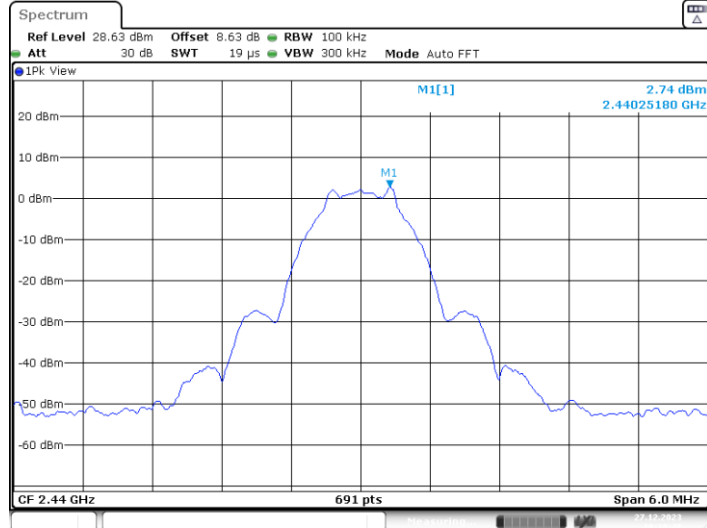
TEST GRAPHS

BLE_1M_Ant1_2402



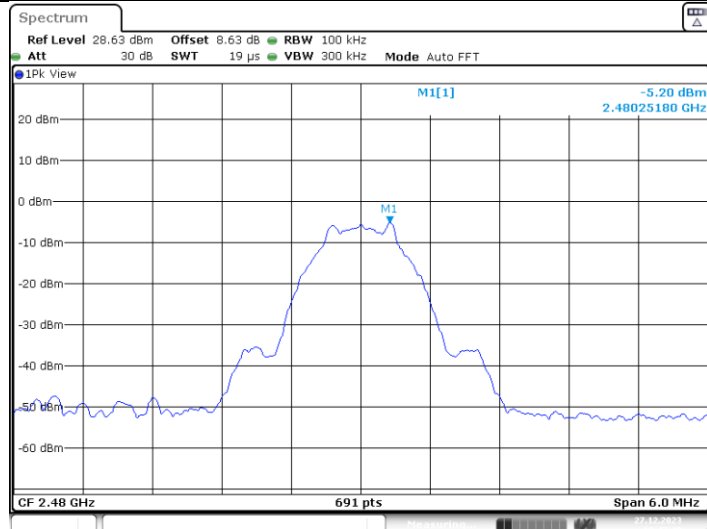
Date: 27.DEC.2023 18:27:49

BLE_1M_Ant1_2440



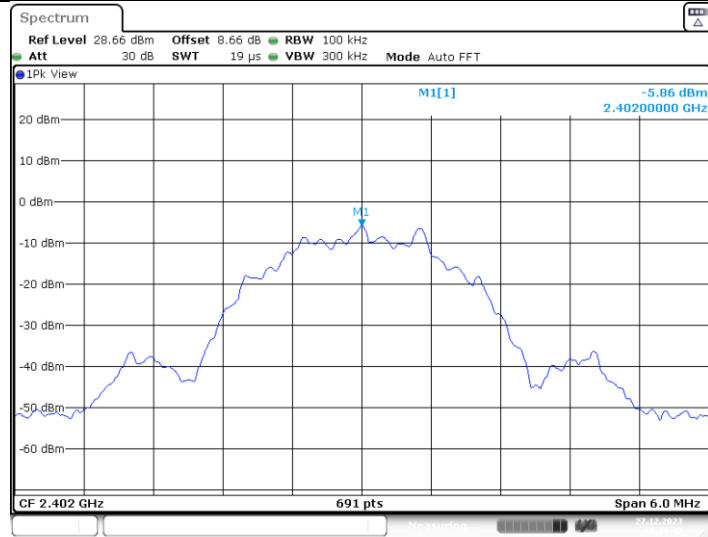
Date: 27.DEC.2023 18:29:49

BLE_1M_Ant1_2480



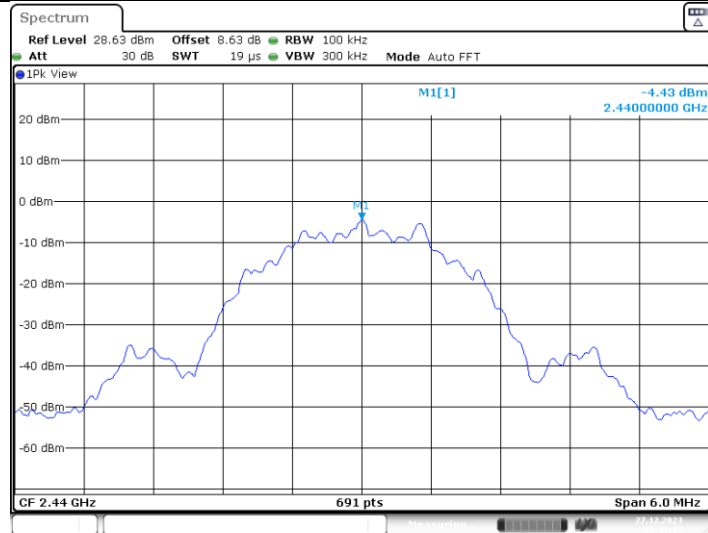
Date: 27.DEC.2023 18:47:48

BLE_2M_Ant1_2402



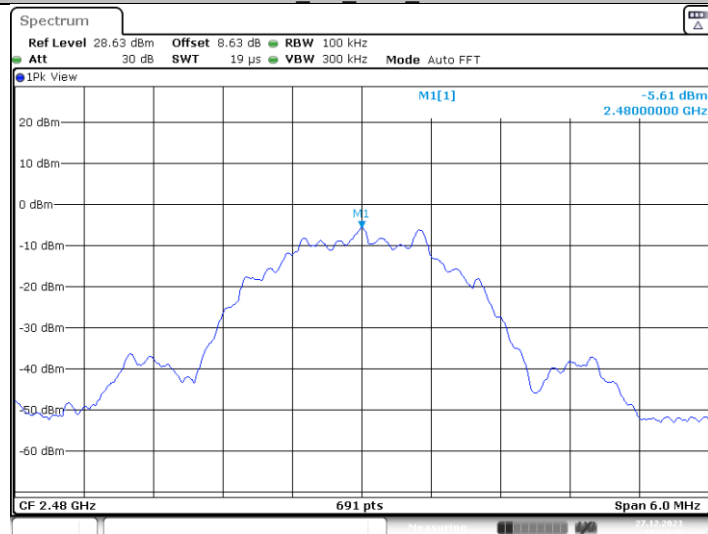
Date: 27.DEC.2023 18:39:47

BLE_2M_Ant1_2440



Date: 27.DEC.2023 18:41:38

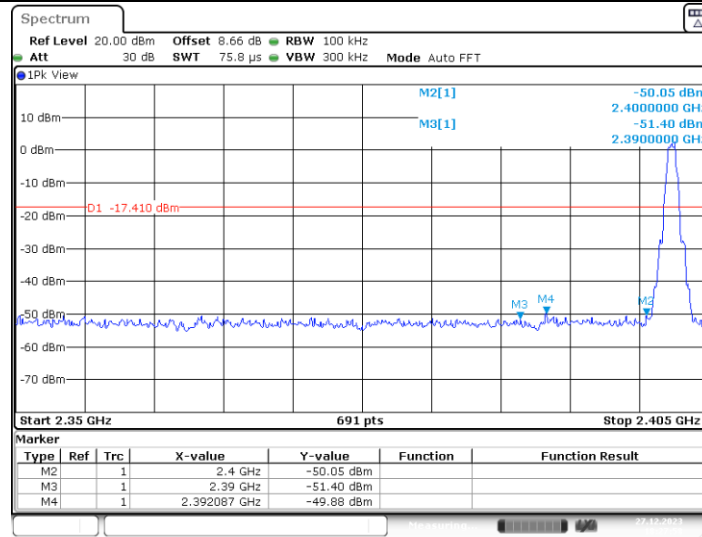
BLE_2M_Ant1_2480



Date: 27.DEC.2023 18:44:45

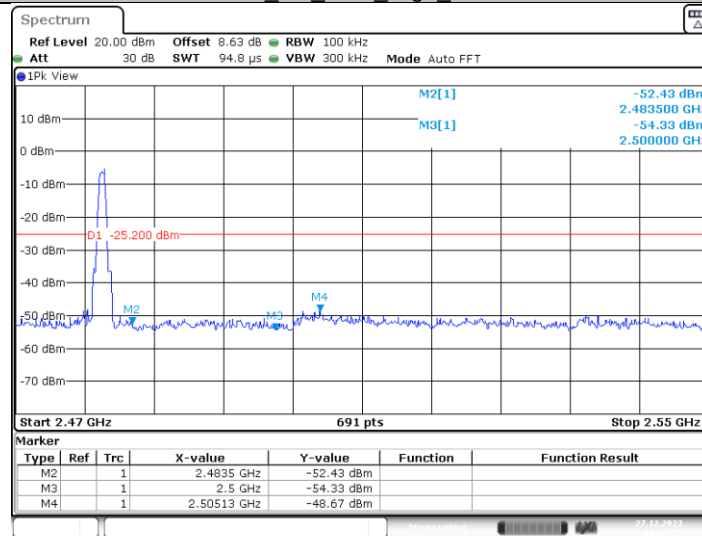
TestMode	Antenna	ChName	Freq(MHz)	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	2.59	-49.88	≤-17.41	PASS
		High	2480	-5.20	-48.67	≤-25.2	PASS
BLE_2M	Ant1	Low	2402	-5.86	-38.36	≤-25.86	PASS
		High	2480	-5.61	-48.91	≤-25.61	PASS

BLE 1M Ant1 Low 2402



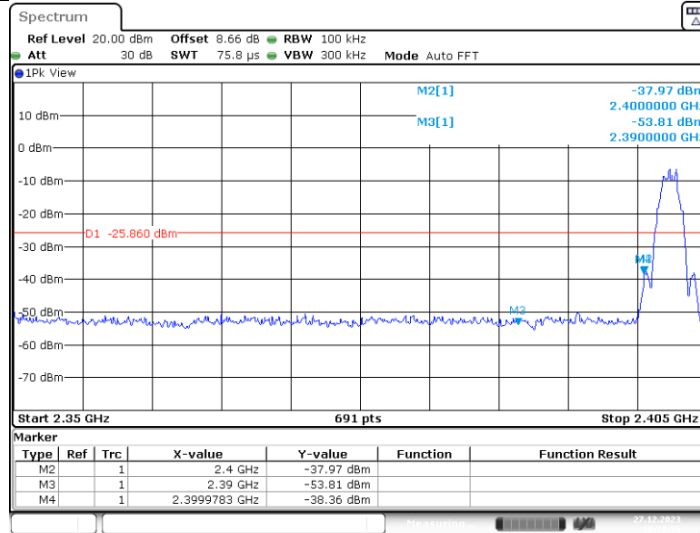
Date: 27.DEC.2023 18:27:59

BLE 1M Ant1 High 2480

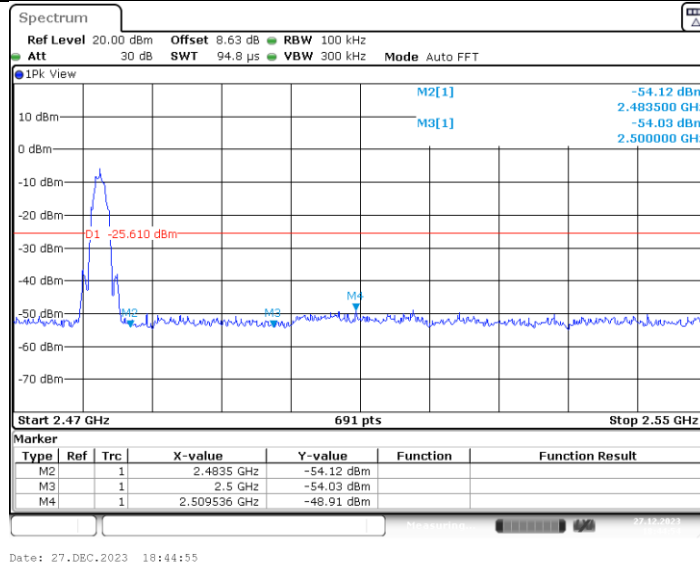


Date: 27.DEC.2023 18:47:58

BLE 2M Ant1_Low_2402



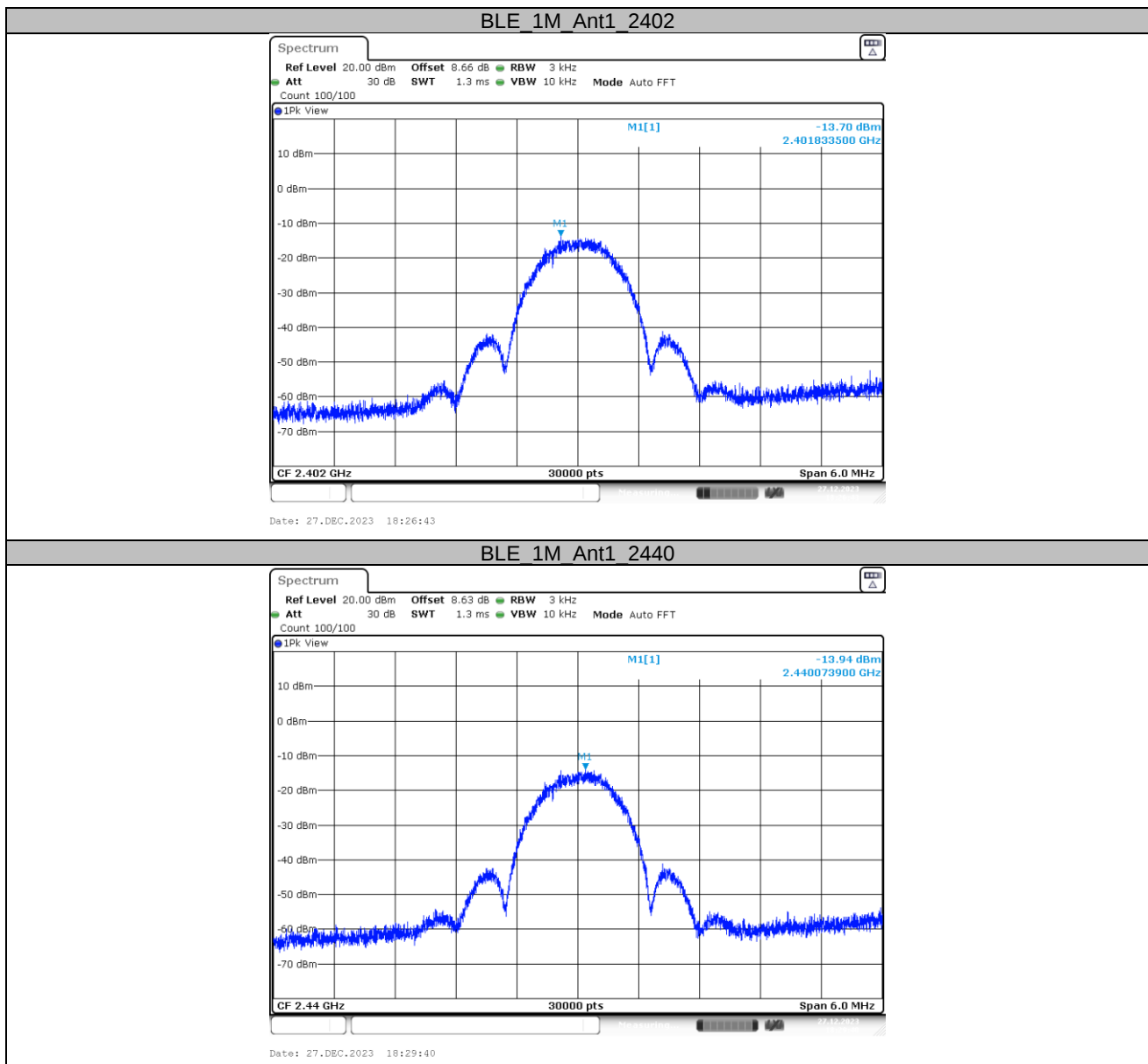
BLE 2M Ant1_High_2480



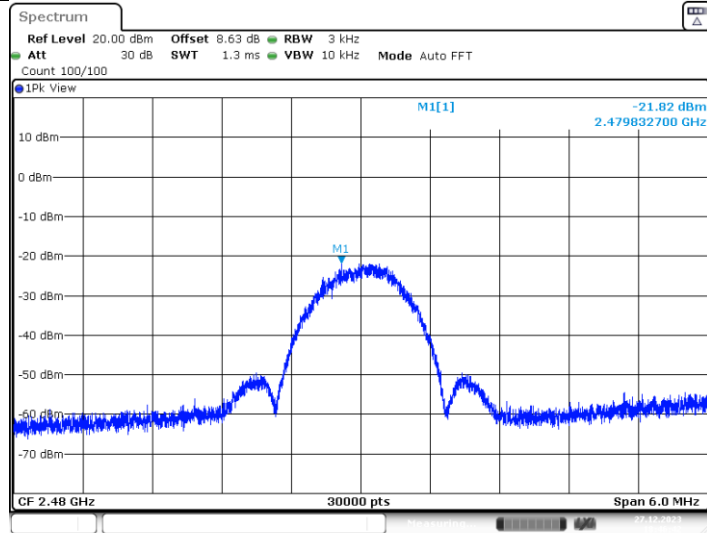
APPENDIX H - POWER SPECTRAL DENSITY

TestMode	Antenna	Freq(MHz)	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-13.70	≤8.00	PASS
		2440	-13.94	≤8.00	PASS
		2480	-21.82	≤8.00	PASS
BLE_2M	Ant1	2402	-24.70	≤8.00	PASS
		2440	-22.83	≤8.00	PASS
		2480	-25.65	≤8.00	PASS

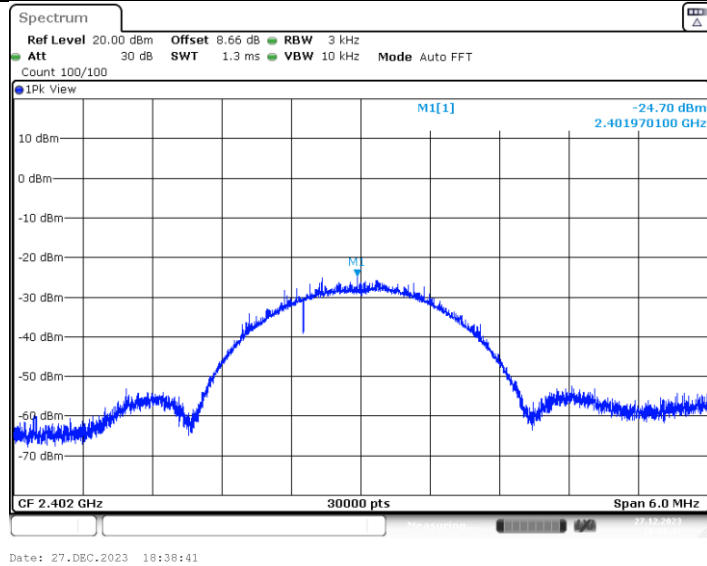
Test Graphs



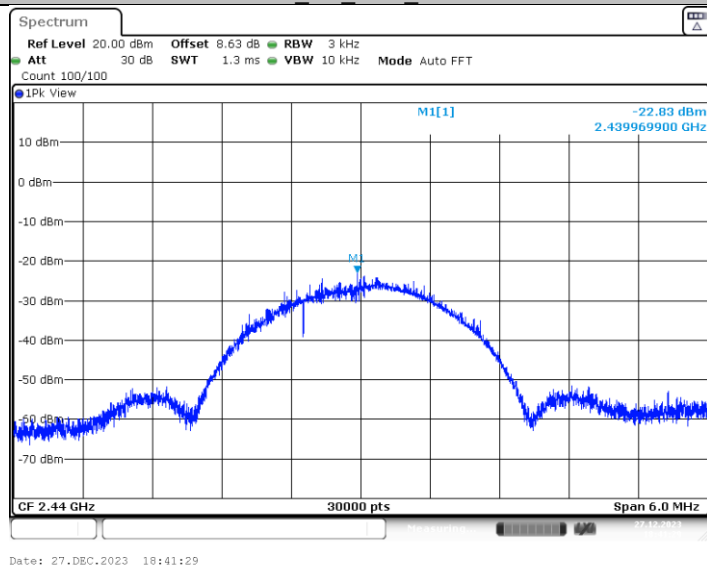
BLE_1M_Ant1_2480

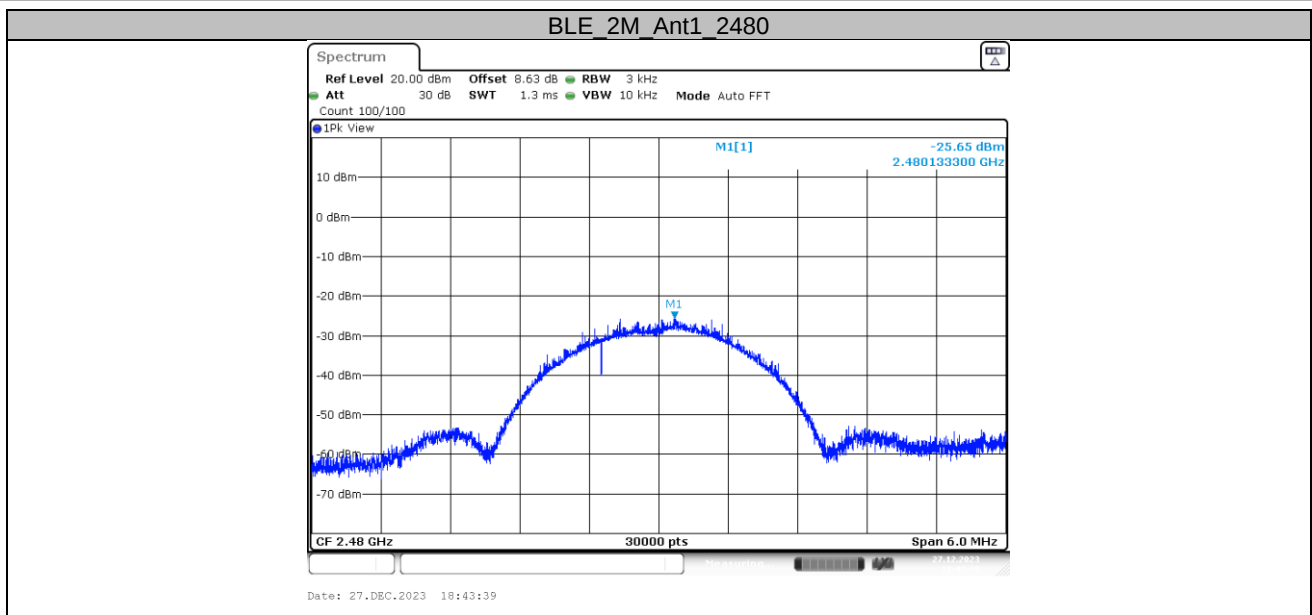


BLE_2M_Ant1_2402



BLE_2M_Ant1_2440





End of Test Report