

Product Name: Wireless Module	Report No:ITEZA2-202400444RF1
Model: PIOT-V3(GA)	Security Classification: Open
Version: V1.0	Total Page:138

TIRT Testing Report

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Radio Test Report

FCC ID: ACJ-V3GA

According to

47 CFR FCC Part 15, Subpart C(Section 15.247)

ANSI C63.10:2013

Applicant:	Panasonic Corporation of North America
Address:	Two Riverfront Plaza, Newark, NJ 07102 5490
Factory:	Dalian Golden Hualu Digital Technology Co.,Ltd.
Address:	No.1 Hua Road,Qixianling,High-Tech Industrial Zone,Dalian,Liaoning Province, China
Sample No:	1000046278
Product Name:	Wireless Module
Brand Name:	Panasonic
Model No.:	PIOT-V3(GA)
Test No.:	PIOT-V3(GA)

Date of Receipt:	2024/11/25
Date of Test:	2024/11/25~2025/01/22
Issued Date:	2025/03/12
Testing Lab:	TIRT

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REPORT ISSUED HISTORY

Report No.	Version	Description	Issued Date	Note
ITEZA2-202400444RF1	V1.0	Original Report.	2025.03.12	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
FCC Part 15: 15.207 ANSI C63.10 :2013	AC Power Line Conducted Emissions	APPENDIX A	PASS	-----
15.247(d) 15.205(a) 15.209(a) ANSI C63.10 :2013	Radiated Emissions	APPENDIX B APPENDIX C APPENDIX D	PASS	-----
FCC PART 15:15.247(a)(2) ANSI C63.10 :2013	Bandwidth	APPENDIX E	PASS	-----
15.247(b)(3) ANSI C63.10 :2013	Maximum Output Power	APPENDIX F	PASS	-----
15.247(d) ANSI C63.10 :2013	Conducted Spurious Emission& Band Edge Emission	APPENDIX G	PASS	-----
FCC PART 15:15.247(e) ANSI C63.10 :2013	Power Spectral Density	APPENDIX H	PASS	-----
FCC Part 15: 15.203	Antenna Requirement	-----	PASS	Note(5)

Note:

- (1) N/A denotes test is not applicable to this device.
- (2) P is an abbreviation for Pass.
- (3) F is an abbreviation for Fail.
- (4) Conclusion determination rules of this report: Unless there are clear provisions on measurement uncertainty in the standard or customer requirements, decision by actual test data without considering measurement uncertainty.
- (5) 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
CNAS Registration Number:	CNAS L14158
A2LA Registration Number:	6049.01
FCC Accredited Lab.Designation Number:	CN1366
FCC Test Firm Registration Number:	820690
CAB identifier	CN0159
Company Number	31418
Telephone:	+86-0755-27087573

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 measurement uncertainty as below table:

Uncertainty	
Parameter	Uncertainty
Occupied Channel Bandwidth	± 142.12 KHz
RF power conducted	± 0.74 dB
RF power radiated	± 3.25 dB
Spurious emissions, conducted	± 1.78 dB
Spurious emissions, radiated (30MHz~1GHz)	± 4.6 dB
Spurious emissions, radiated (1GHz ~ 18GHz)	± 4.9 dB
Conduction Emissions(150kHz~30MHz)	± 3.1 dB
Humidity	$\pm 4.6\%$
Temperature	$\pm 0.7^{\circ}\text{C}$
Time	$\pm 1.25\%$

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	24.5°C	50%	DC 5V from PC	Aaron Long
Radiated Emissions-9 kHz to 30 MHz	24.5°C	50%	DC 5V from PC	Aaron Long
Radiated Emissions-30 MHz to 1000 MHz	24°C	53%	DC 5V from PC	Aaron Long
Radiated Emissions-Above 1000 MHz	26°C	53%	DC 5V from PC	Aaron Long
Bandwidth	25°C	56%	DC 5V from PC	Aaron Long
Maximum Output Power	24°C	54%	DC 5V from PC	Aaron Long
ConductedSpurious Emission	25°C	62%	DC 5V from PC	Aaron Long
Power Spectral Density	26°C	60%	DC 5V from PC	Aaron Long

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	Wireless Module
Brand Name	Panasonic
Test Model	PIOT-V3(GA)
Model No.	PIOT-V3(GA)
Model Difference(s)	N/A
Software Version	V0.1
Hardware Version//FVIN	JJBWB4321-V1.0-R0
Power Rating	DC 4.5-5.5V
Power Supply	DC 5V from PC
Operation Frequency	2402 MHz ~ 2480 MHz
Modulation Type	GFSK
Bit Rate of Transmitter	1Mbps, 2Mbps, 125kbps, 500Kbps
Max. Output Power	1Mbps: 7.88dBm (0.006138W)

Note:

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

This product contains 2 PCB Antenna(Ant Left and Ant Right), does not support MIMO, can only support SISO

2.2 DESCRIPTION OF TEST MODES

The test software was used to control EUT work in Continuous TX mode, and select test channel, wireless mode

Tested mode, channel, and data rate information		
Mode	Channel	Frequency (MHz)
GFSK (1M/2M/125K/500K)	Low :CH00	2402
	Middle: CH19	2440
	High: CH39	2480

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

Table for Filed Antenna:

Ant.	Manufactured	Model Name	Antenna Type	Antenna location	Gain (dBi)
1	Dalian GOLDEN Hualu DIGITAL Technology Co., Ltd.	WF4321	PCB	Left	2.59
	Dalian GOLDEN Hualu DIGITAL Technology Co., Ltd.	WF4321	PCB	Right	2.30

Note: Antenna information is provided by applicant.

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	Bluetooth RF Test Tool		
	TX Gain K Setting		
Frequency (MHz)	2402	2440	2480
1Mbps, 2 Mbps, 125Kbps, 500Kbps	0X02	0X03	0X03

2.4. ACCESSORIES OF DEVICE (EUT)

Accessories : /

Manufacturer : /

Model : /

Rating : /

2.5 BLOCKDIAGRAMSHOWINGTHECONFIGURATIONOFSYSTEMTESTED



2.6 SUPPORT UNITS

No.	Description	Manufacturer	Model	Serial Number	Certification or SDOC
1	USB TO TTL USART	N/A	N/A	N/A	N/A
2	PC	acer	N19C5	N/A	N/A
3	AC/DC ADAPTER	DELTA ELECTRONICS, INC	ADP-135NB B	N/A	N/A

3.AC POWER LINE CONDUCTED EMISSIONS

3.1LIMIT

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.

3.2TEST 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 groundplane 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.

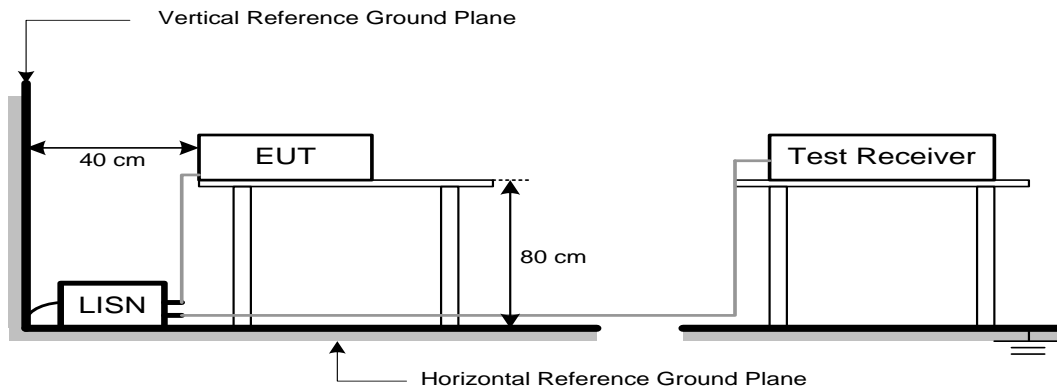
The following table is the setting of the receiver:

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

3.3DEVIATIONFROMTESTSTANDARD

No deviation.

3.4 TEST SETUP



The LISN edge is arranged parallel to the edge of the test table
The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT

3.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion -GFSK (1M/2M/125K/500K) mode, 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

4. RADIATED EMISSIONS

4.1 LIMIT

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

15.205 Restricted frequency band

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	2690 - 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	(²)

15.209 Limit

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		μV/m	dB(μV)/m
0.009-0.490	300	2400/F(KHz)	/
0.490-1.705	30	24000/F(KHz)	/
1.705-30	30	30	29.5
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

Note: The peak limit is 20 dB higher than the average limit

Table 5 – General field strength limits at frequencies above 30 MHz

Frequency (MHz)	Field strength ($\mu\text{V/m}$ at 3 m)
30 – 88	100
88 – 216	150
216 – 960	200
Above 960	500

Table 6 – General field strength limits at frequencies below 30 MHz

Frequency	Magnetic field strength (H-Field) ($\mu\text{A/m}$)	Measurement distance (m)
9 - 490 kHz ^{Note 1}	$6.37/F$ (F in kHz)	300
490 - 1705 kHz	$63.7/F$ (F in kHz)	30
1.705 - 30 MHz	0.08	30

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

4.2 TEST PROCEDURE

- 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 1GHz)
- 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 1GHz)
- 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.
- 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).
- The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.
- 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.
- 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 1GHz)
- 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 1GHz)
- 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)	1MHz / 3MHz for PK value 1MHz / 1/THz for AVG value

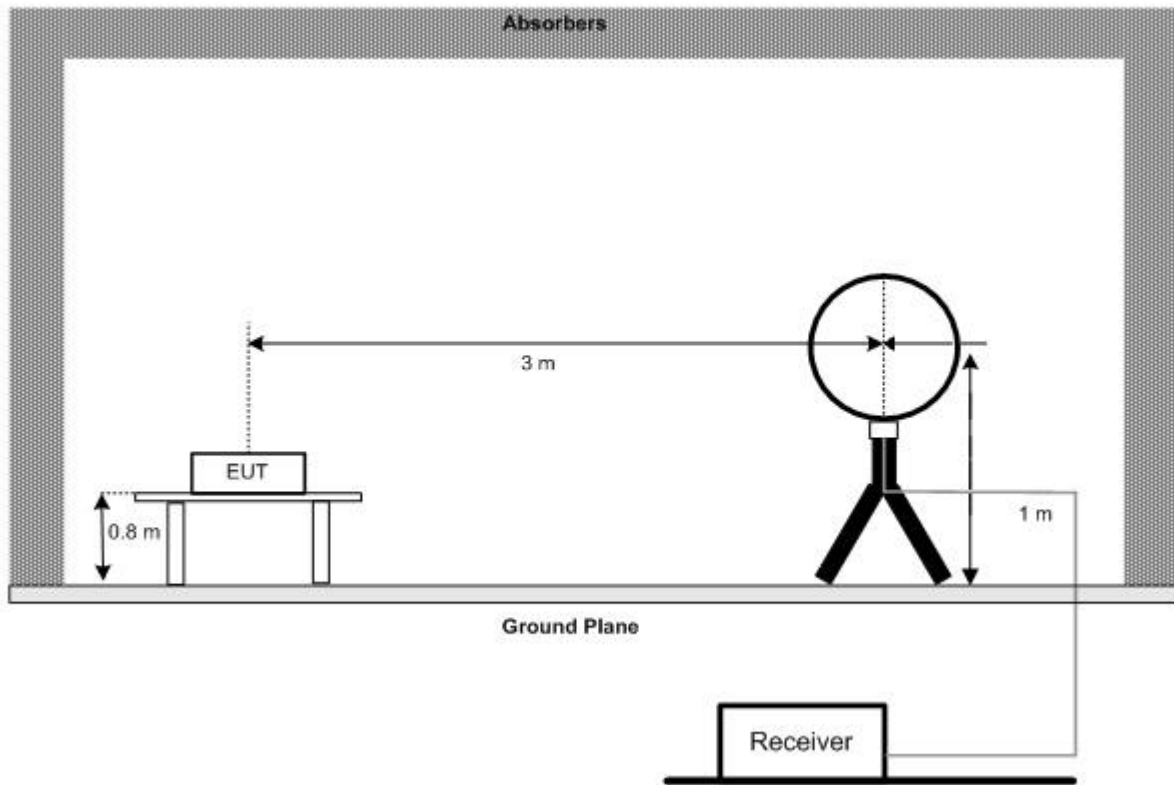
Spectrum Parameters	Setting
Start ~ Stop Frequency	9 kHz~90 kHz for PK/AVG detector
Start ~ Stop Frequency	90 kHz~110 kHz for QP detector
Start ~ Stop Frequency	110 kHz~490 kHz for PK/AVG detector
Start ~ Stop Frequency	490 kHz~30 MHz for QP detector
Start ~ Stop Frequency	30MHz~1000MHz for QP detector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

4.3 DEVIATION FROM TEST STANDARD

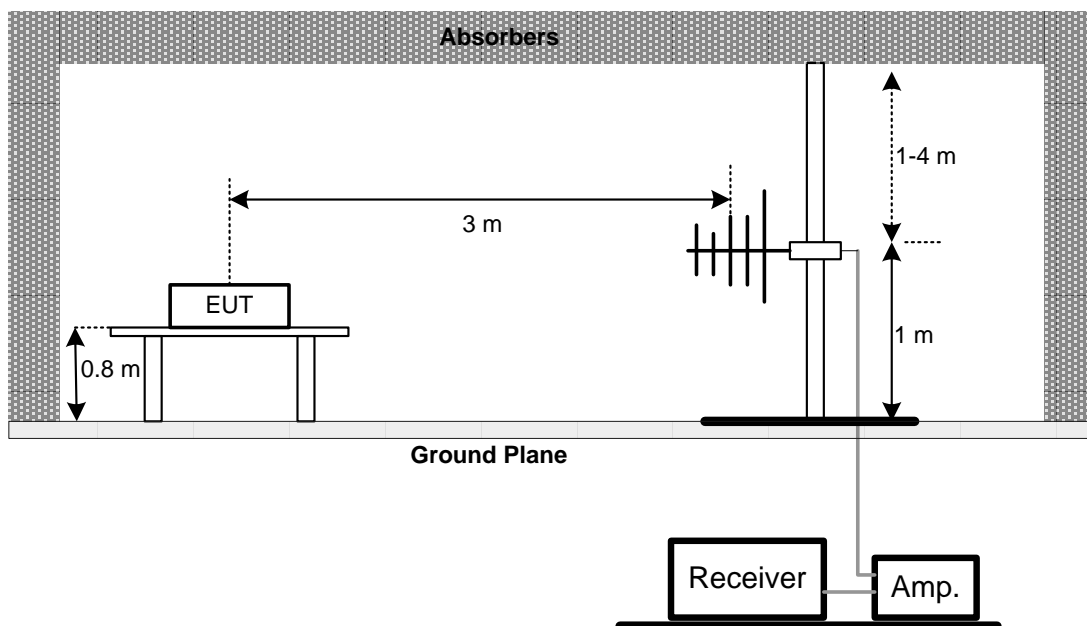
No deviation.

4.4 TEST SETUP

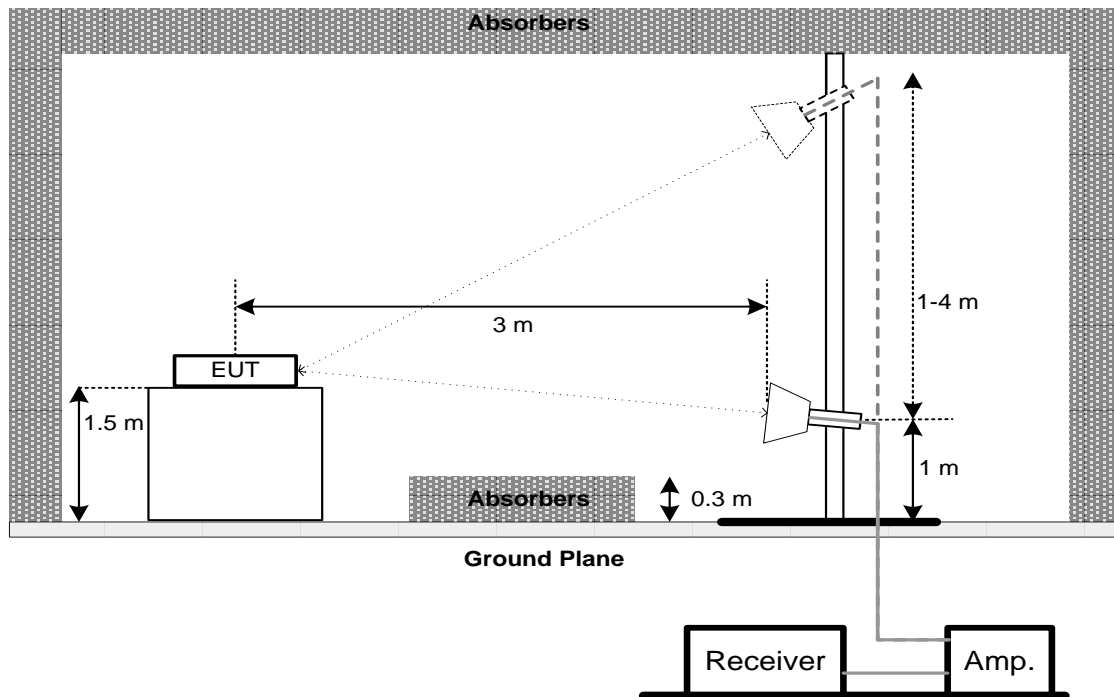
9 kHz to 30 MHz



30 MHz to 1 GHz



Above 1 GHz



4.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

4.6 TEST RESULT- 9kHz TO 30MHz

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- 30MHz TO 1000MHz

Please refer to the APPENDIX-C

4.8 TEST RESULT- ABOVE 1000MHz

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

5.1LIMIT

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

5.2TEST 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	300kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

For 99% Emission Bandwidth:

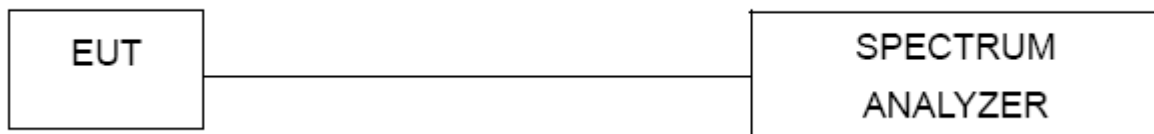
Spectrum Parameters	Setting
Span Frequency	Between 1.5 times and 5.0 times the OBW
RBW	50kHz
VBW	200kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

- Compute the trace by integrating the spectrum, finally, maxhold displays the View

5.3DEVIATION FROM STANDARD

No deviation.

5.4TEST SETUP



5.5EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

5.6TESTRESULTS

Please refer to the APPENDIX-E

6.MAXIMUM OUTPUT POWER

6.1LIMIT

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

6.2TEST 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:

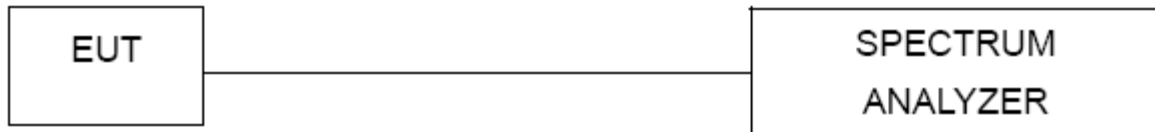
Spectrum Parameters	Setting
Span Frequency	$\geq 3 \times \text{RBW}$
RBW	2 MHz
VBW	5 MHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

- Compute the trace by integrating the spectrum, finally, maxhold displays the View

6.3DEVIATION FROM STANDARD

No deviation.

6.4TEST SETUP



6.5EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

6.6TESTRESULTS

Please refer to the APPENDIX-F

7.CONDUCTED SPURIOUS EMISSION

7.1LIMIT

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. Please refer section 15.247.

7.2TEST 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

- Compute the trace by integrating the spectrum, finally, maxhold displays the View

7.3DEVIATION FROM STANDARD

No deviation.

7.4TEST SETUP



7.5EUT 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

- Compute the trace by integrating the spectrum, finally, maxhold displays the View

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. ANTENNA REQUIREMENT**9.1STANDARD REQUIREMENT**

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

9.2ANTENNA CONNECTED CONSTRUCTION

The antenna connector is unique antenna and no consideration of replacement. Please see EUT photo for details.

9.3RESULTS

The EUT antenna is PCB antenna. It complies with the standard requirement.

10. 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	2025/01/05	2026/01/04
Integral Antenna	Schwarzbeck	VULB 9163	01314	2023/12/11	2025/12/10
Integral Antenna	Rohde&Schwarz	HF907	RSM2991424	2023/12/11	2025/12/10
Preamplifier	Emtrace	RP01A	'02017	2025/01/05	2026/01/04
Preamplifier	Schwarzbeck	BBV9744	00143	2025/01/05	2026/01/04
Loop Antenna	ZHINAN	ZN30900A	12024	2025/01/05	2026/01/04
Horn Antenna	Schwarzbeck	BBHA9170	00956	2025/01/05	2026/01/04
RF Cable	/	LMR400UF-NMNM-7.0M	/	2025/01/05	2026/01/04
RF Cable	/	SFT2050PUR-NMNM-7.0M	/	2025/01/05	2026/01/04
EMI Receiver	Rohde&Schwarz	ESR7	1316.3003K07-102611-mk	2024/11/02	2025/11/01
LISN	Rohde&Schwarz	ENV216	3560.655.12-102915-Bp	2024/11/02	2025/11/01
RF Cable	\	SFT2050PUR-NMNM-2.0M	\	2025/01/05	2026/01/04
Spectrum analyzer	ROHDE&SCHWARZ	FSU26	200732	2025/01/05	2026/01/04
Spectrum analyzer	ROHDE&SCHWARZ	FSV40-N	101722	2025/01/05	2026/01/04
Filter	HEWLETT PACKARD	JS0806-F	19K8060209	2025/01/05	2026/01/04

11. PHOTOS OF TEST SETUP

Reference to the appendix I Test Setup Photo for details.

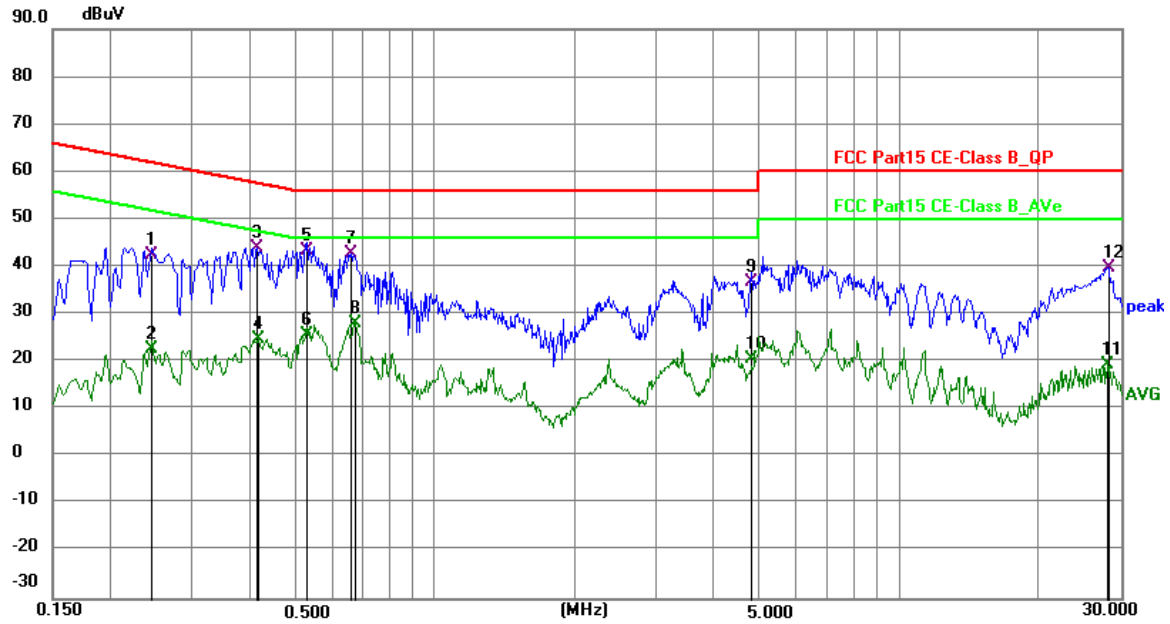
12. PHOTOS OF EUT

Reference to the appendix II external photos and appendix III internal photos for details.

APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS

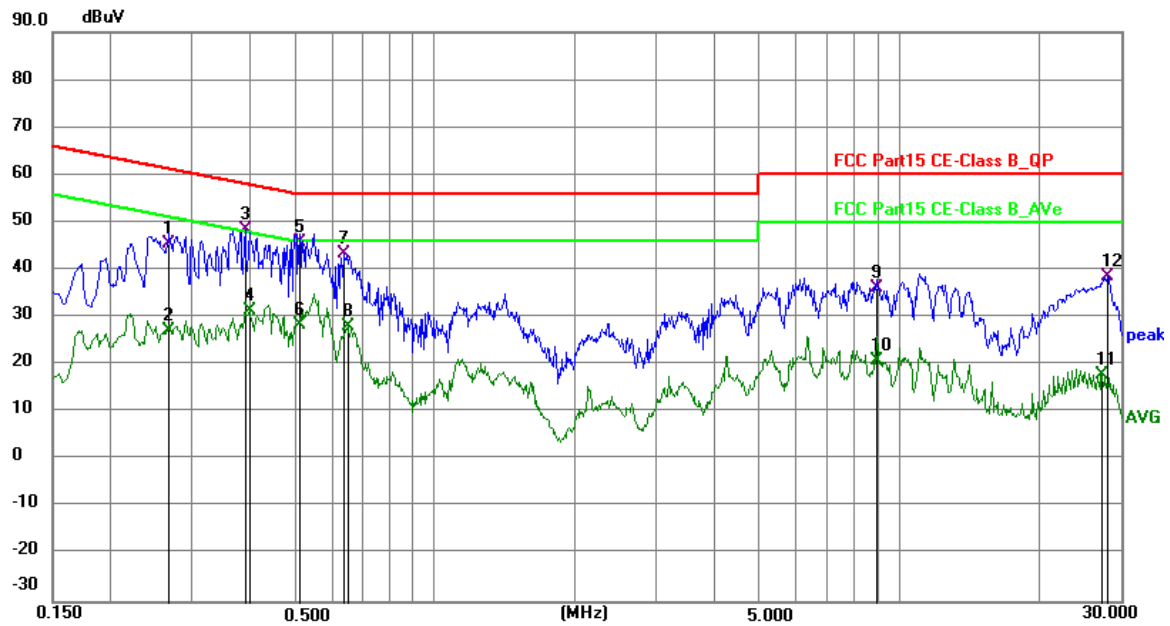
Only show the worst mode: Ant Left GFSK 1M 2402MHz

Polarization: Line



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.2444	32.75	9.63	42.38	61.95	-19.57	QP	P	
2	0.2444	13.00	9.63	22.63	51.95	-29.32	AVG	P	
3	0.4110	34.20	9.63	43.83	57.63	-13.80	QP	P	
4	0.4153	15.18	9.63	24.81	47.54	-22.73	AVG	P	
5 *	0.5280	33.59	9.62	43.21	56.00	-12.79	QP	P	
6	0.5280	16.04	9.62	25.66	46.00	-20.34	AVG	P	
7	0.6582	33.27	9.63	42.90	56.00	-13.10	QP	P	
8	0.6720	18.56	9.63	28.19	46.00	-17.81	AVG	P	
9	4.8163	27.12	9.68	36.80	56.00	-19.20	QP	P	
10	4.8163	10.88	9.68	20.56	46.00	-25.44	AVG	P	
11	28.0140	9.67	9.74	19.41	50.00	-30.59	AVG	P	
12	28.2435	29.94	9.74	39.68	60.00	-20.32	QP	P	

Polarization: Neutral



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.2670	35.68	9.63	45.31	61.21	-15.90	QP	P	
2	0.2670	17.40	9.63	27.03	51.21	-24.18	AVG	P	
3 *	0.3885	38.70	9.63	48.33	58.10	-9.77	QP	P	
4	0.3975	21.63	9.63	31.26	47.91	-16.65	AVG	P	
5	0.5100	36.04	9.62	45.66	56.00	-10.34	QP	P	
6	0.5100	18.73	9.62	28.35	46.00	-17.65	AVG	P	
7	0.6360	33.64	9.63	43.27	56.00	-12.73	QP	P	
8	0.6493	18.50	9.63	28.13	46.00	-17.87	AVG	P	
9	8.9385	26.55	9.72	36.27	60.00	-23.73	QP	P	
10	8.9385	11.01	9.72	20.73	50.00	-29.27	AVG	P	
11	27.2713	7.99	9.74	17.73	50.00	-32.27	AVG	P	
12	28.1083	28.77	9.74	38.51	60.00	-21.49	QP	P	

APPENDIX B - RADIATED EMISSION -9 KHZ TO 30 MHZ

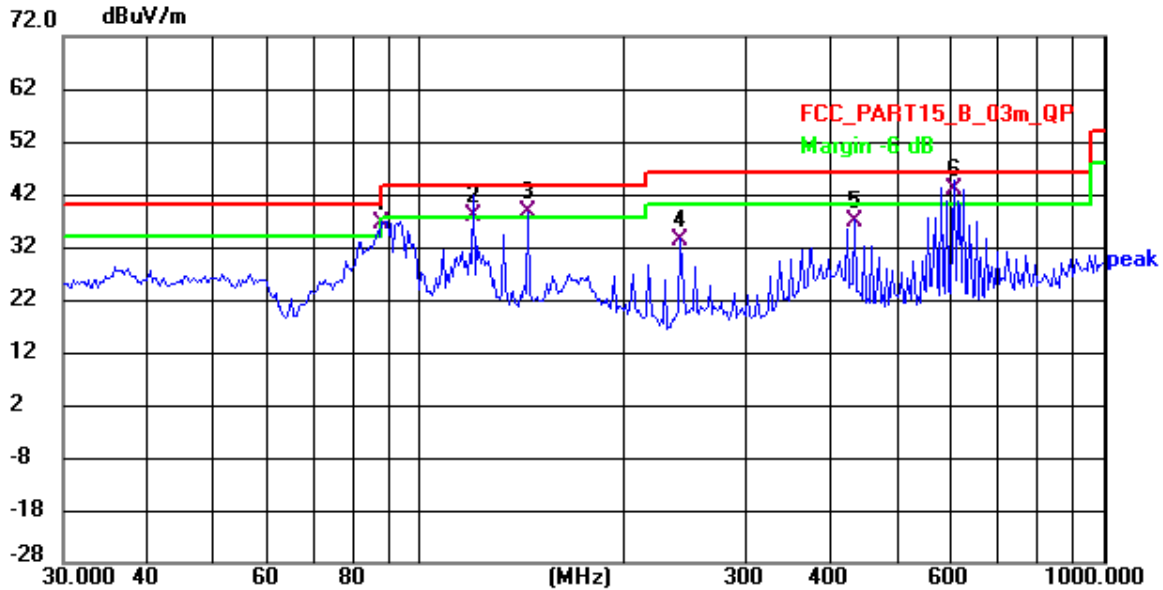
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

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

Only show the worst mode: Ant Left GFSK 1M

Test Mode	TX Mode_1Mbps Channel 00	Polarization	Vertical
-----------	--------------------------	--------------	----------

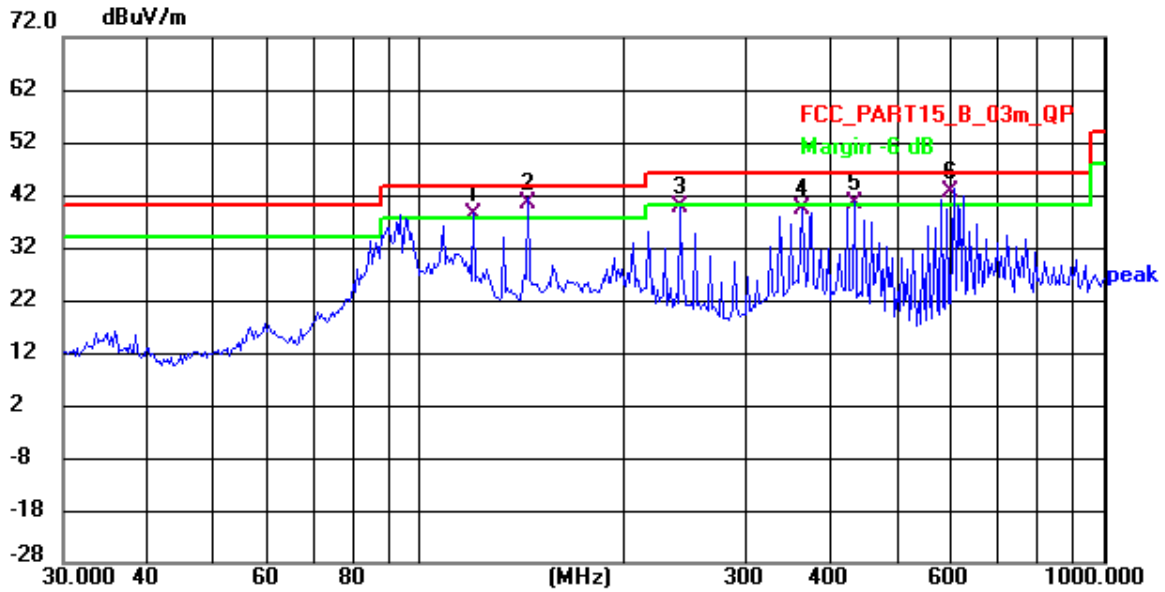


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1 !	87.914	62.37	-25.76	36.61	40.00	-3.39	QP	200	237	P	
2 !	120.002	60.83	-22.78	38.05	43.50	-5.45	QP	100	138	P	
3 !	143.776	59.77	-21.30	38.47	43.50	-5.03	QP	200	0	P	
4	240.144	57.34	-23.97	33.37	46.00	-12.63	QP	100	208	P	
5	433.340	55.08	-18.19	36.89	46.00	-9.11	QP	100	81	P	
6 *	602.984	56.54	-13.71	42.83	46.00	-3.17	QP	100	138	P	

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	Height (cm)	Azimuth (deg.)	P/F	Remark
1 !	119.767	61.21	-22.80	38.41	43.50	-5.09	QP	200	16	P	
2 *	144.021	61.63	-21.28	40.35	43.50	-3.15	QP	200	87	P	
3	240.144	63.56	-23.97	39.59	46.00	-6.41	QP	200	152	P	
4	360.977	59.52	-20.30	39.22	46.00	-6.78	QP	100	263	P	
5 !	433.340	58.74	-18.19	40.55	46.00	-5.45	QP	200	224	P	
6 !	602.294	56.35	-13.73	42.62	46.00	-3.38	QP	200	311	P	

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 EMISSION-1000MHz TO 25GHz, Only show the worst mode: Ant Left GFSK 1M

Test Mode : GFSK TX Low

No.	Freq MHz	Polarity	Reading (dBuV/m)	Correct Factor	Result (dBuV/m)	Limit (dBuV/m)	Margin	Remark
1	4804	V	88.50	-27.21	61.29	74	-12.71	Peak
2	4804	V	69.71	-27.21	42.50	54	-11.50	Avg
3	7206	--	--	--		--		--
4	9608	--	--	--		--		--
5	4804	H	90.38	-27.21	63.17	74	-10.83	Peak
6	4804	H	68.46	-27.21	41.25	54	-12.75	Avg
7	7206	--	--	--		--		--
8	9608	--	--	--		--		--

Test Mode : GFSK TX Mid

1	4880	V	90.49	-27.84	62.65	74	-11.35	Peak
2	4880	V	70.41	-27.84	42.57	54	-11.43	Avg
3	7320	--	--	--		--		--
4	9760	--	--	--		--		--
5	4880	H	91.20	-27.84	63.36	74	-10.64	Peak
6	4880	H	71.74	-27.84	43.90	54	-10.10	Avg
7	7320	--	--	--		--		--
8	9760	--	--	--		--		--

Test Mode : GFSK TX High

1	4960	V	90.75	-28.49	62.26	74	-11.74	Peak
2	4960	V	69.80	-28.49	41.31	54	-12.69	Avg
3	7440	--	--	--		--		--
4	9920	--	--	--		--		--
5	4960	H	90.92	-28.49	62.43	74	-11.57	Peak
6	4960	H	69.56	-28.49	41.07	54	-12.93	Avg
7	7440	--	--	--		--		--
8	9920	--	--	--		--		--

Note:

1. Means other frequency and mode comply with standard requirements and at least have 20dB margin.

2. Correct Factor=Cable Loss+ Antenna Factor-Amplifier Gain.

Result=Reading + Correct Factor. Margin= Result-Limit.

Test Result of Radiated Spurious at Band edges
Only show the worst mode: Ant Left GFSK 1M

Test Results					PASS			
Frequency Range					2310MHz~2410MHz			
Test Mode					1Mbps: GFSK TX 2402MHz			
No.	Freq MHz	Polarity	Reading (dBuV/m)	Correct Factor	Result (dBuV/m)	Limit (dBuV/m)	Margin	Remark
1	2390	H	74.88	-21.47	53.41	74.00	-20.59	Peak
2	2390	H	--	-21.47	--	54.00	--	Avg
3	2400	H	79.08	-26.12	52.96	74.00	-21.04	Peak
4	2400	H	--	-26.12	--	54.00	--	Avg

1	2390	V	74.29	-21.47	52.82	74.00	-21.18	Peak
2	2390	V	--	-21.47	--	54.00	--	Avg
3	2400	V	78.91	-26.12	52.79	74.00	-21.21	Peak
4	2400	V	--	-26.12	--	54.00	--	Avg

Test Results					PASS			
Frequency Range					2450MHz~2550MHz			
Test Mode					1Mbps: GFSK TX 2480MHz			
1	2483.5	H	78.54	-25.29	53.25	74.00	-20.75	Peak
2	2483.5	H	--	-25.29	--	54.00	--	Avg
1	2483.5	V	78.95	-25.29	53.66	74.00	-20.34	Peak
2	2483.5	V	--	-25.29	--	54.00	--	Avg

Note: 1. Means other frequency and mode comply with standard requirements and at least have 20dB margin.

2. Correct Factor=Cable Loss+ Antenna Factor-Amplifier Gain.

Result=Reading + Correct Factor.

Margin= Result-Limit.

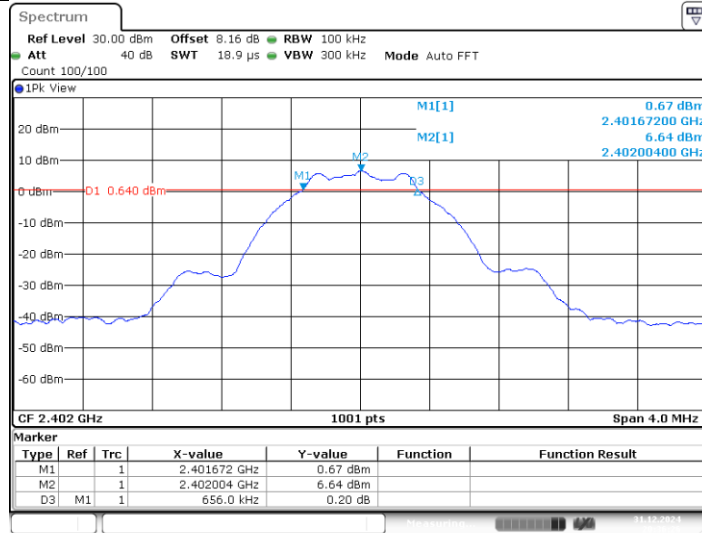
3. If the limits for the measurement with the average detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector need not be carried out.

APPENDIX E - BANDWIDTH

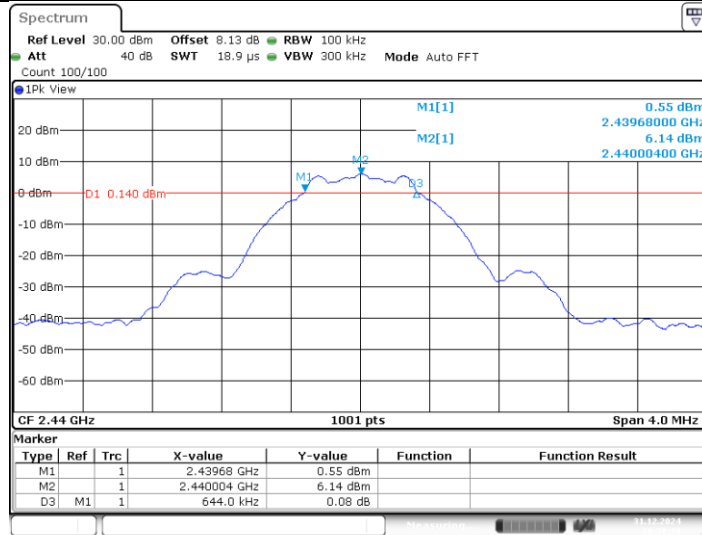
-6dB Bandwidth

TestMode	Antenna	Freq(MHz)	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant Left	2402	0.66	2401.67	2402.33	0.5	PASS
		2440	0.64	2439.68	2440.32	0.5	PASS
		2480	0.66	2479.67	2480.33	0.5	PASS
BLE_2M	Ant Left	2402	1.12	2401.46	2402.58	0.5	PASS
		2440	1.12	2439.46	2440.58	0.5	PASS
		2480	0.98	2479.44	2480.42	0.5	PASS

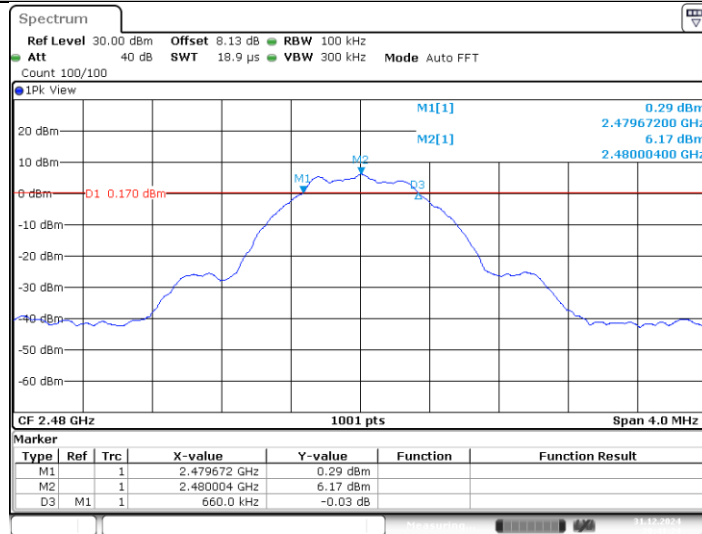
BLE_1M_Ant Left_2402



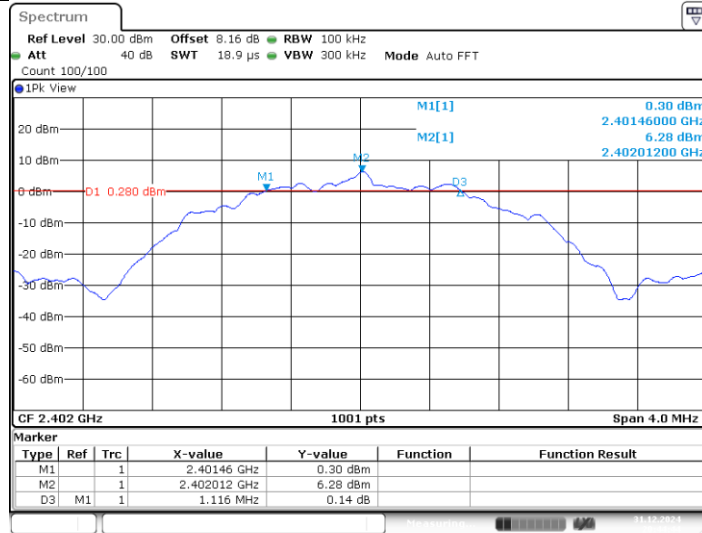
BLE_1M_Ant Left_2440



BLE_1M_Ant Left_2480

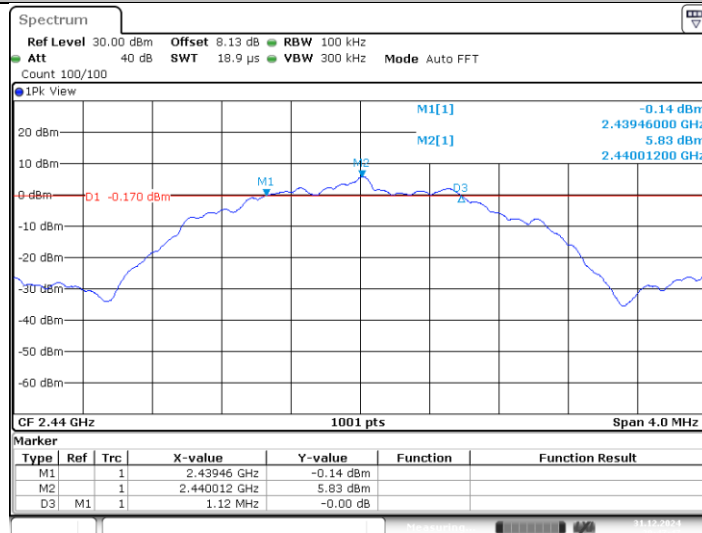


BLE_2M_Ant Left _2402



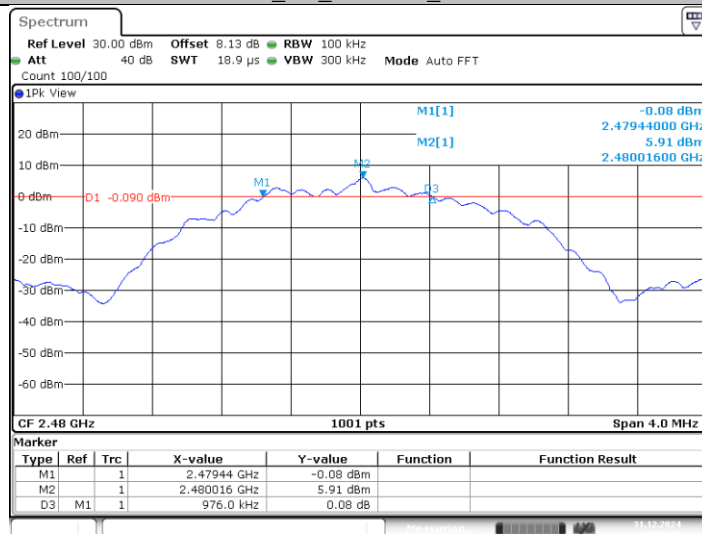
Date: 31.DEC.2024 20:44:44

BLE_2M_Ant Left _2440



Date: 31.DEC.2024 20:47:47

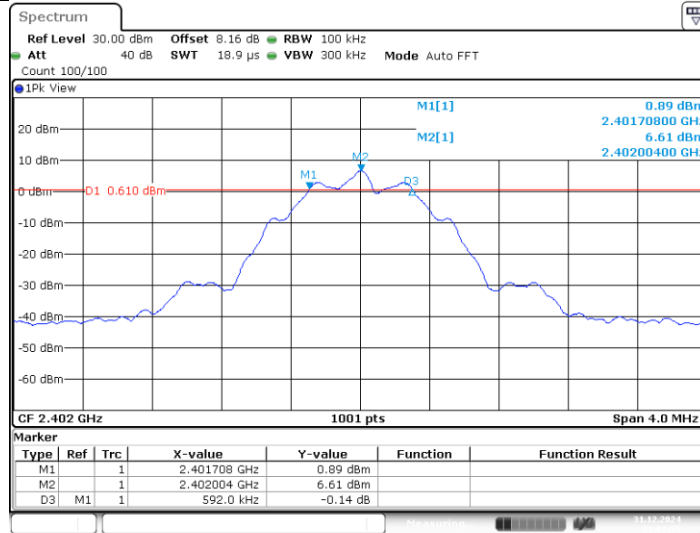
BLE_2M_Ant Left _2480



Date: 31.DEC.2024 20:49:35

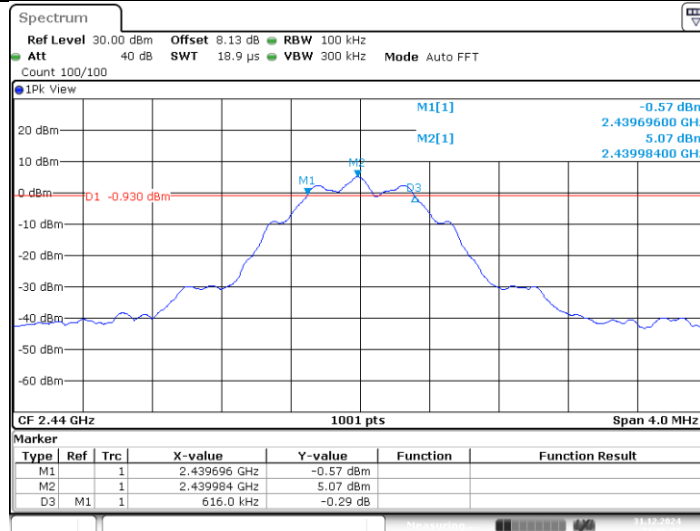
TestMode	Antenna	Freq(MHz)	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_125K	Ant Left	2402	0.59	2401.71	2402.30	0.5	PASS
		2440	0.62	2439.70	2440.31	0.5	PASS
		2480	0.60	2479.70	2480.30	0.5	PASS
BLE_500K	Ant Left	2402	0.66	2401.68	2402.34	0.5	PASS
		2440	0.66	2439.68	2440.34	0.5	PASS
		2480	0.66	2479.68	2480.34	0.5	PASS

BLE_125K_Ant Left_2402



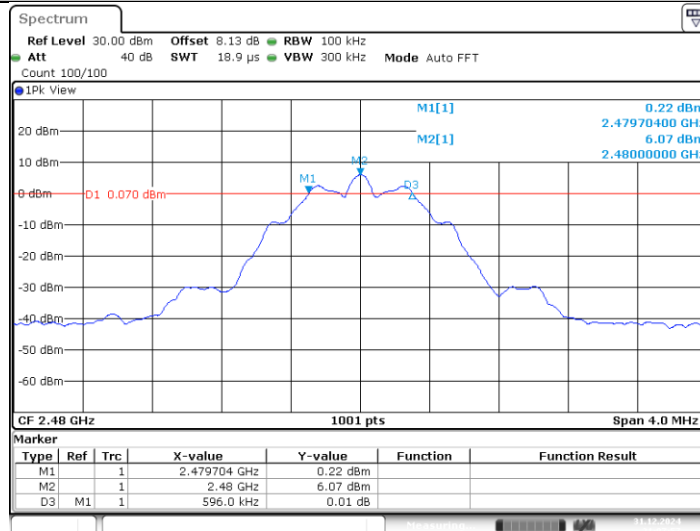
Date: 31.DEC.2024 21:02:55

BLE_125K_Ant Left_2440



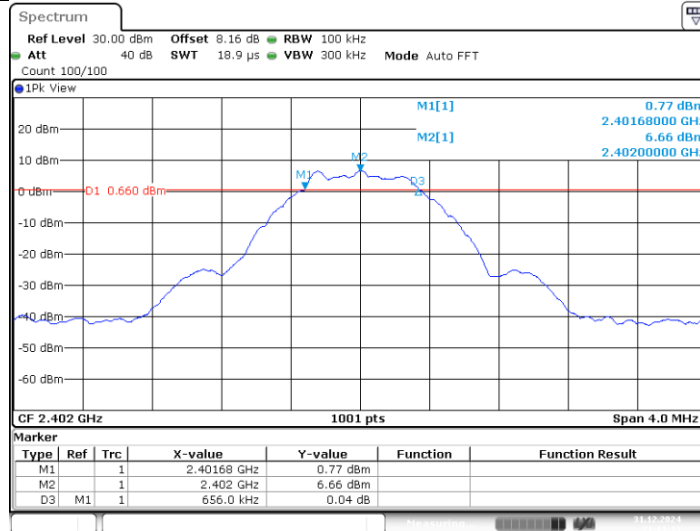
Date: 31.DEC.2024 21:06:07

BLE_125K_Ant Left_2480



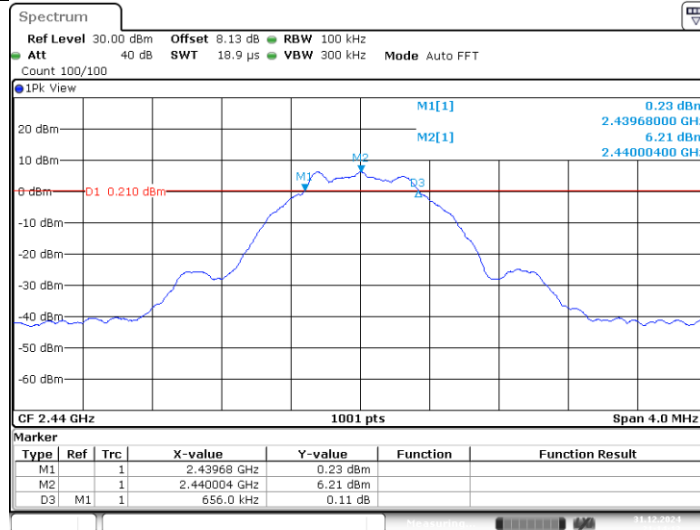
Date: 31.DEC.2024 21:07:58

BLE_500K_Ant Left_2402



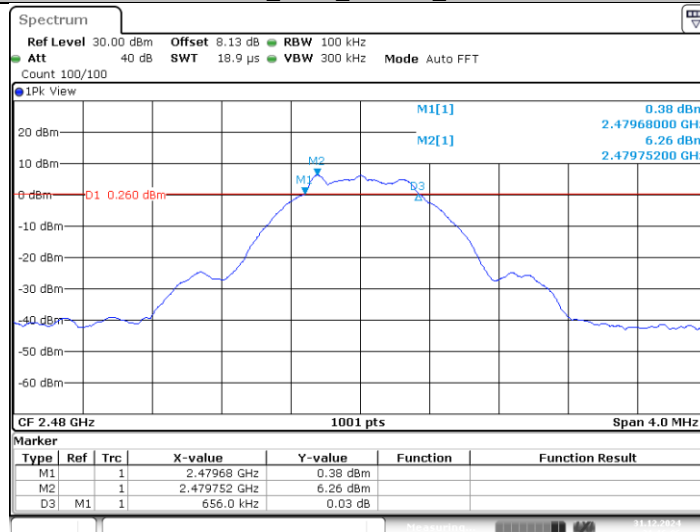
Date: 31.DEC.2024 21:11:13

BLE_500K_Ant Left_2440



Date: 31.DEC.2024 21:14:13

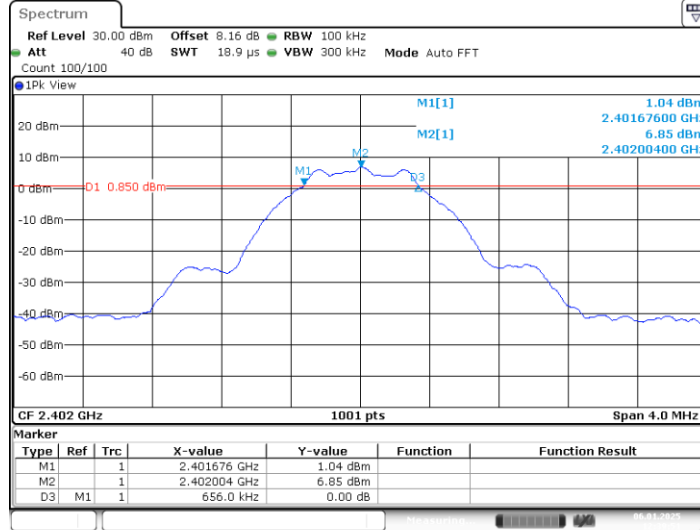
BLE_500K_Ant Left_2480



Date: 31.DEC.2024 21:16:06

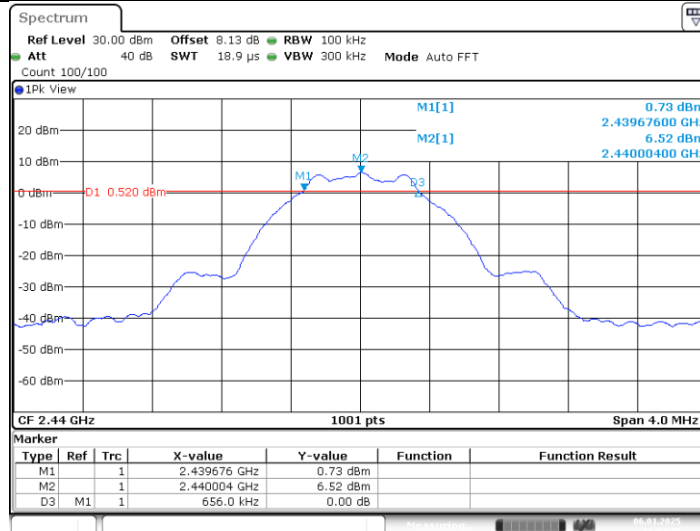
TestMode	Antenna	Freq(MHz)	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant Right	2402	0.66	2401.68	2402.33	0.5	PASS
		2440	0.66	2439.68	2440.33	0.5	PASS
		2480	0.66	2479.68	2480.33	0.5	PASS
BLE_2M	Ant Right	2402	0.96	2401.46	2402.42	0.5	PASS
		2440	0.96	2439.46	2440.42	0.5	PASS
		2480	1.12	2479.46	2480.58	0.5	PASS

BLE_1M_Ant Right_2402



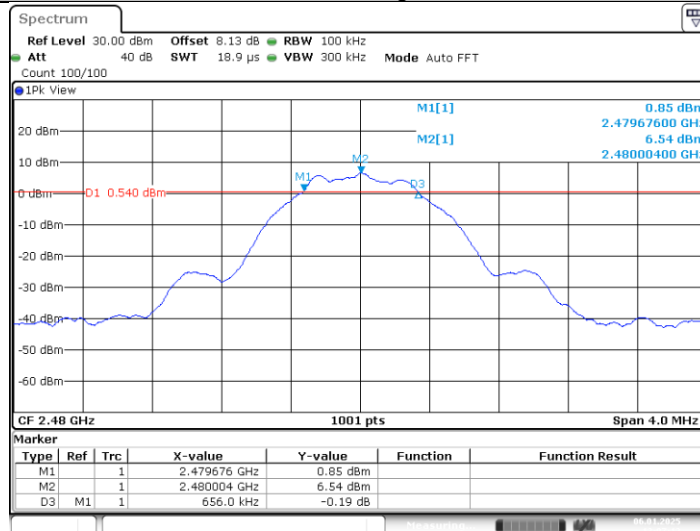
Date: 6.JAN.2025 12:39:51

BLE_1M_Ant Right_2440



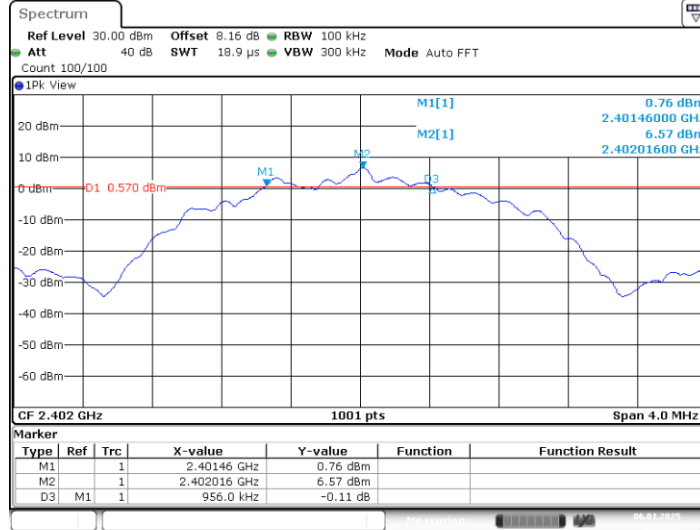
Date: 6.JAN.2025 13:04:25

BLE_1M_Ant Right_2480



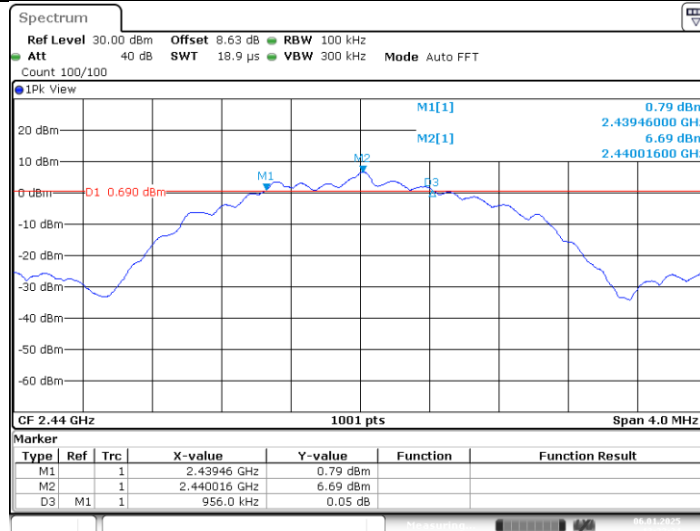
Date: 6.JAN.2025 13:07:13

BLE_2M_Ant Right_2402



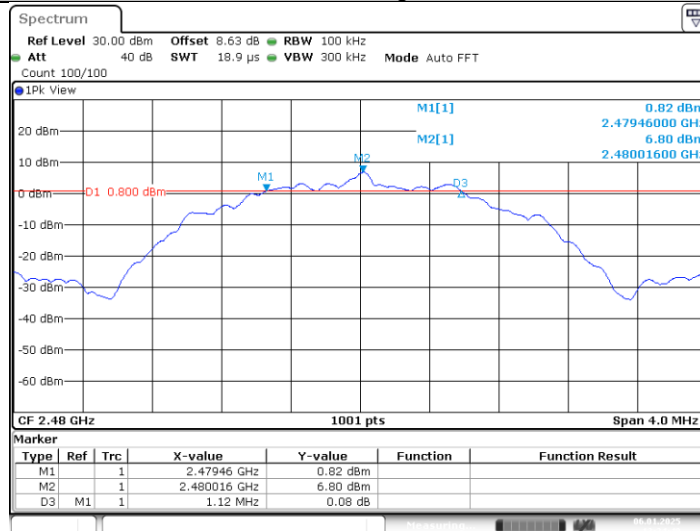
Date: 6.JAN.2025 13:11:28

BLE_2M_Ant Right_2440



Date: 6.JAN.2025 13:22:34

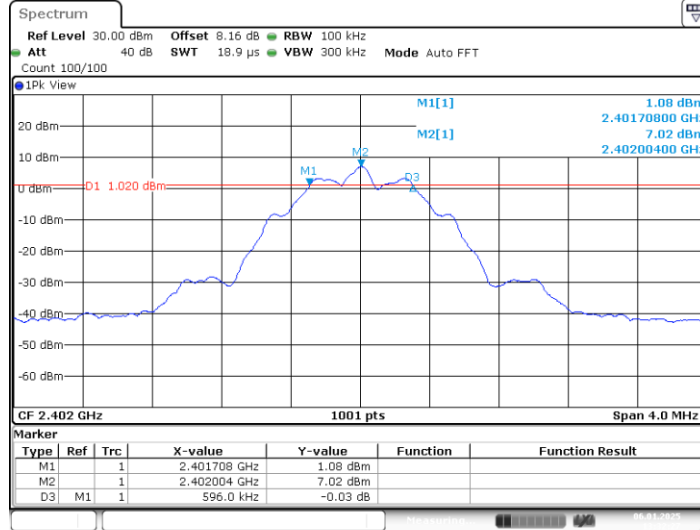
BLE_2M_Ant Right_2480



Date: 6.JAN.2025 13:24:49

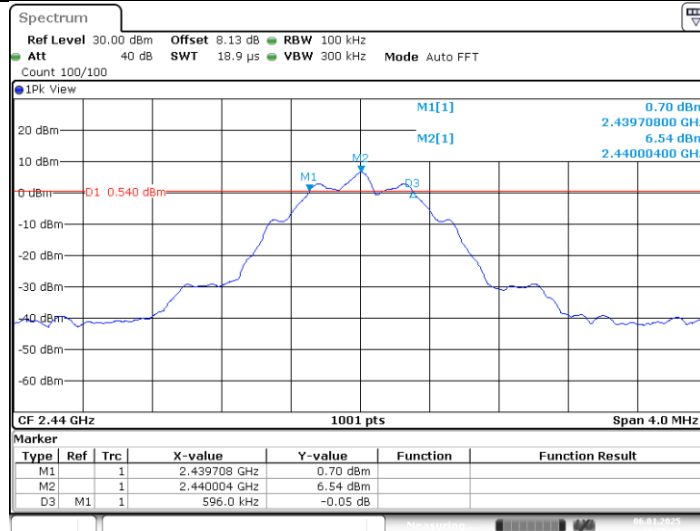
TestMode	Antenna	Freq(MHz)	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_125K	Ant Right	2402	0.60	2401.71	2402.00	0.5	PASS
		2440	0.60	2439.71	2440.30	0.5	PASS
		2480	0.60	2479.71	2480.30	0.5	PASS
BLE_500K	Ant Right	2402	0.65	2401.68	2402.34	0.5	PASS
		2440	0.65	2439.68	2440.34	0.5	PASS
		2480	0.65	2479.68	2480.34	0.5	PASS

BLE_125K_Ant Right_2402



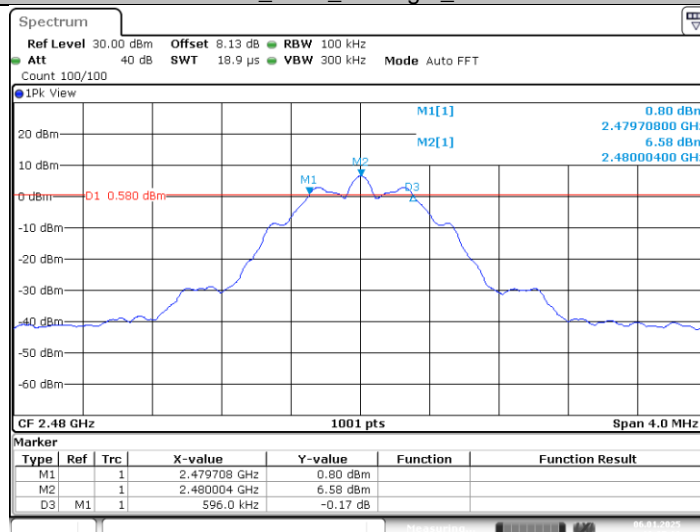
Date: 6.JAN.2025 13:32:27

BLE_125K_Ant Right_2440



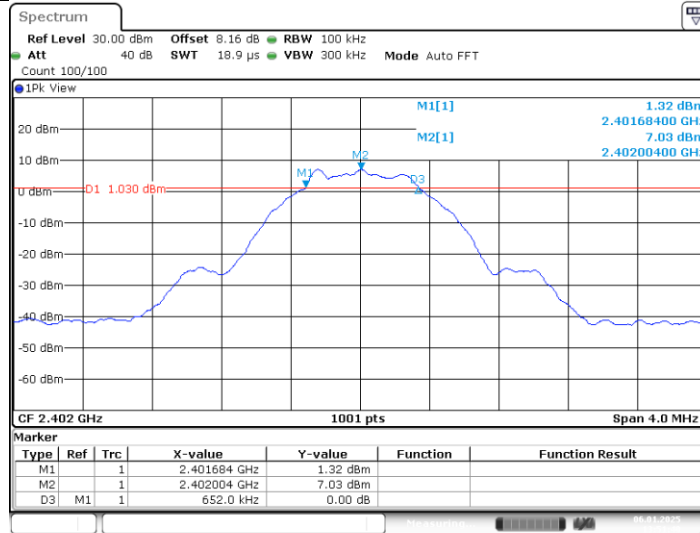
Date: 6.JAN.2025 13:35:40

BLE_125K_Ant Right_2480



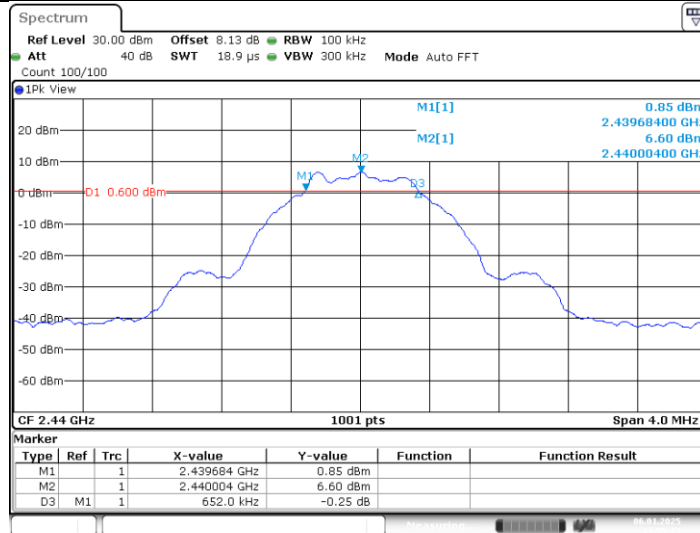
Date: 6.JAN.2025 13:37:36

BLE_500K_Ant Right_2402



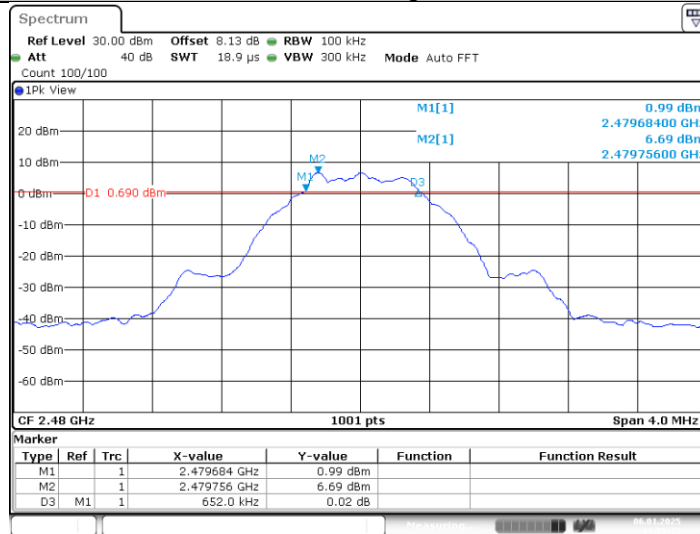
Date: 6.JAN.2025 13:51:41

BLE_500K_Ant Right_2440



Date: 6.JAN.2025 13:55:13

BLE_500K_Ant Right_2480

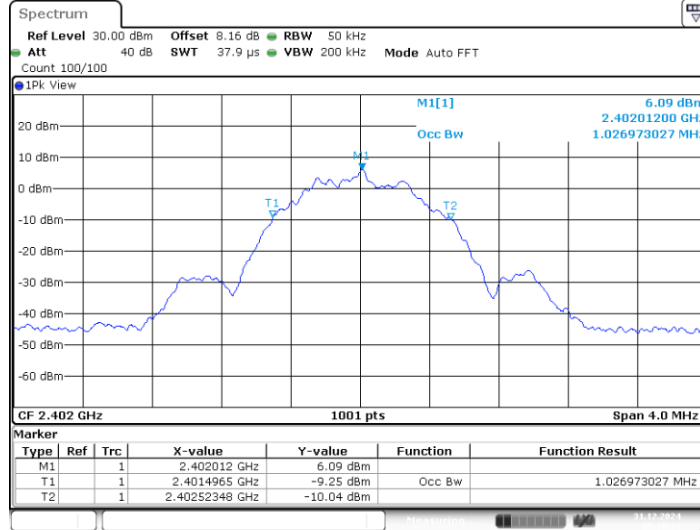


Date: 6.JAN.2025 13:58:12

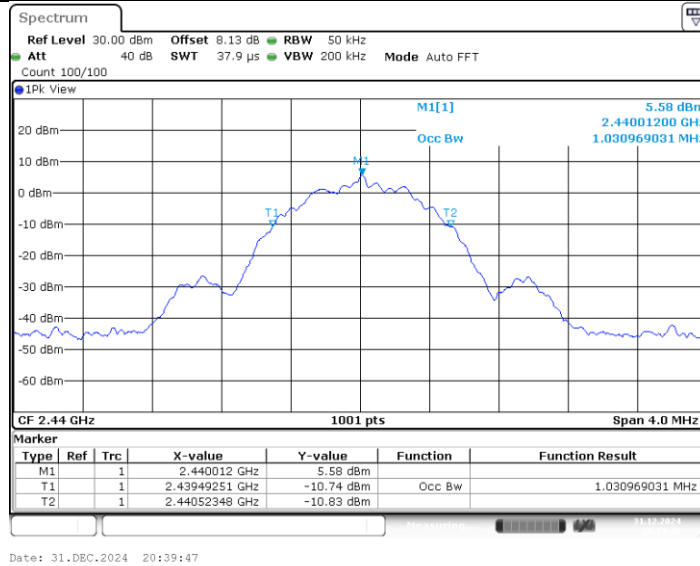
99% Occupied Bandwidth

TestMode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant Left	2402	1.027	2401.4965	2402.5235	---	---
		2440	1.031	2439.4925	2440.5235	---	---
		2480	1.031	2479.4925	2480.5235	---	---
BLE_2M	Ant Left	2402	2.054	2401.0090	2403.0629	---	---
		2440	2.062	2439.0050	2441.0669	---	---
		2480	2.054	2479.0010	2481.0549	---	---

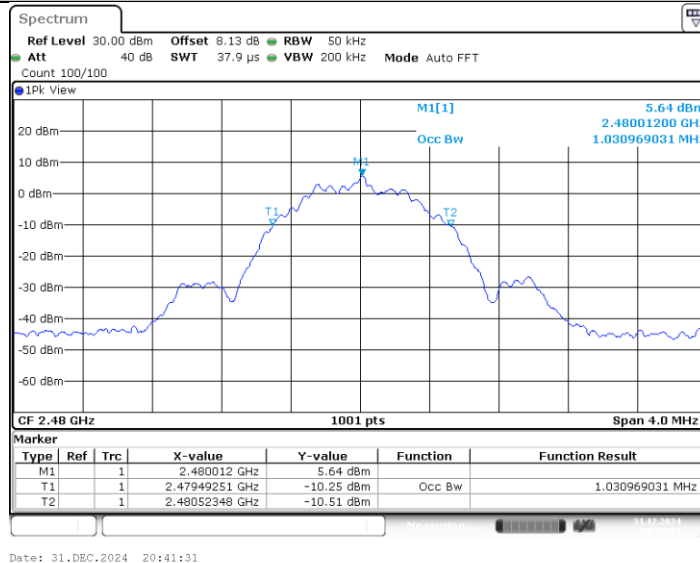
BLE_1M_Ant Left_2402



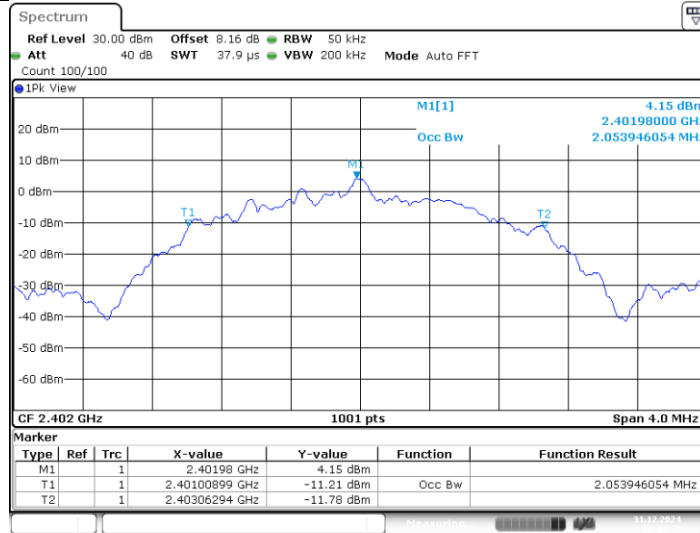
BLE_1M_Ant Left_2440



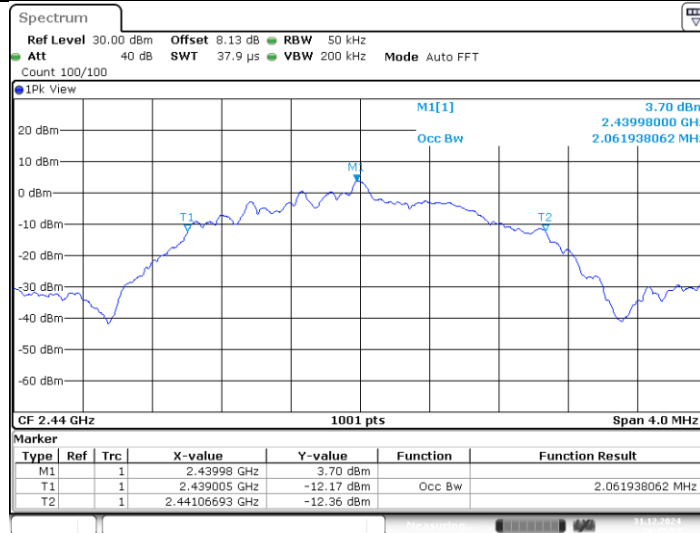
BLE_1M_Ant Left_2480



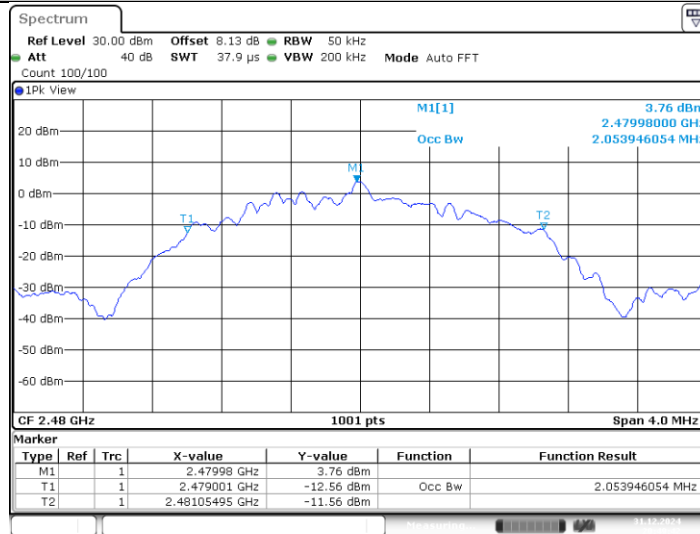
BLE_2M_Ant Left_2402



BLE_2M_Ant Left_2440



BLE_2M_Ant Left_2480



TestMode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_125K	Ant Left	2402	1.039	2401.4845	2402.5235	---	---
		2440	1.035	2439.4845	2440.5195	---	---
		2480	1.035	2479.4845	2480.5195	---	---
BLE_500K	Ant Left	2402	1.023	2401.4925	2402.5155	---	---
		2440	1.023	2439.4925	2440.5155	---	---
		2480	1.019	2479.4965	2480.5155	---	---