FCC TEST REPORT

FCC ID: 2AVYW-ADPROS

On Behalf of

TOPDON TECHNOLOGY Co., Ltd.

Professional Diagnostic Tool

Model No.: ArtiDiag Pro

Prepared for	:	TOPDON TECHNOLOGY Co., Ltd.
Address	:	Unit 2005 20/F, Qianhai Shimao Tower, Qianhai Shenzhen-Hong kong Cooperation Zone, Shenzhen, China

Prepared By	:	Shenzhen Alpha Product Testing Co., Ltd.
Address	:	Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103, Shenzhen, Guangdong, China

Report Number	:	A2406118-C01-R06
Date of Receipt	:	April 9, 2024
Date of Test	:	April 9, 2024 – August 6, 2024
Date of Report	:	August 6, 2024
Version Number	:	V0
Test Result	**:**	**Pass**

TABLE OF CONTENTS

TEST REPORT DECLARATION

Applicant	:	TOPDON TECHNOLOGY Co., Ltd.
Address	:	Unit 2005 20/F, Qianhai Shimao Tower, Qianhai Shenzhen-Hong kong Cooperation Zone, Shenzhen, China
Manufacturer	:	TOPDON TECHNOLOGY Co., Ltd.
Address	:	Unit 2005 20/F, Qianhai Shimao Tower, Qianhai Shenzhen-Hong kong Cooperation Zone, Shenzhen, China
EUT Description	:	Professional Diagnostic Tool
		(A) Model No. ArtiDiag Pro
		(B) Trademark **TOPDON**

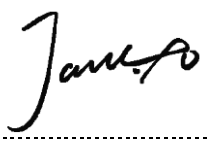
Measurement Standard Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.247

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits both conducted and radiated emissions. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After the test, our opinion is that EUT compliance with the requirement of the above standards.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....…..:	Yannis Wen Project Engineer	
Approved by (name + signature)…....:	Jack Xu Project Manager	
Date of issue……..:	August 6, 2024	

Revision History

Revision	Issue Date	Revisions	Revised By
V0	August 6, 2024	Initial released Issue	Yannis Wen

1. SUMMARY OF STANDARDS AND RESULTS

1.1. Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

Test Item	Standards Paragraph	Result
Conducted Emission	FCC Part 15: 15.207 RSS-GEN(8.8), ANSI C63.10 :2013	P
Occupied Channel Bandwidth&-6dB Bandwidth	FCC PART 15:15.247(a)(2) RSS-247(5.2 a), RSS GEN 6.7, ANSI C63.10 :2013	P
Output Power	FCC Part 15: 15.247(b)(3) RSS-247(5.4 d), ANSI C63.10 :2013	P
Radiated Spurious Emission	FCC Part 15: 15.209, FCC Part 15: 15.247(d) RSS-Gen(8.9), RSS-247(5.5), ANSI C63.10 :2013	P
Conducted Spurious & Band Edge Emission	FCC Part 15: 15.247(d) RSS-Gen(8.9), RSS-247(5.5), ANSI C63.10 :2013	P
Power Spectral Density	FCC PART 15:15.247(e) RSS-247(5.2 b), ANSI C63.10 :2013	P
Radiated Band Edge Emission	FCC Part 15: 15.247(d) RSS-GEN(6.13), ANSI C63.10 :2013	P
Frequency stability	RSS-GEN(6.11)	P
Antenna Requirement	FCC Part 15: 15.203 RSS-GEN(6.8)	P
Note:	1. P is an abbreviation for Pass. 2. F is an abbreviation for Fail. 3. N/A is an abbreviation for Not Applicable.	

1. Pass: The EUT complies with the essential requirements in the standard.

2. Frequency Stability: The manufacturer stated in the user's manual.

3. The conclusion of this test report is judged by actual test data without considering measurement uncertainty.

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

Description	:	Professional Diagnostic Tool
Model Number	:	ArtiDiag Pro
Diff	:	N/A
Power supply	:	DC 3.7V by battery, DC 5V from adapter
Radio Technology	:	Bluetooth BLE
Operation frequency	:	2402-2480MHz
Channel No.	:	40 Channels
Channel spacing	:	2MHz
Rate	:	1Mbps, 2Mbps
Modulation type	:	GFSK
Antenna Type	:	FPC antenna, Maximum Gain is 4.49dBi (Antenna information is provided by applicant.)
Software version	:	V100
Hardware version	:	V1
Connector cable loss	:	N/A
Intend use environment	:	Residential, commercial and light industrial environment

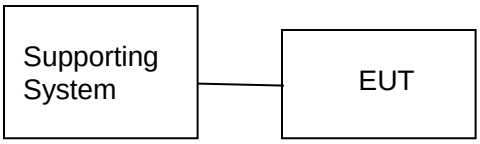
2.2. Accessories of Device (EUT)

Accessories 1	:	SWITCHING POWER SUPPLY
Manufacturer	:	SHENZHEN PENGSHENGYE ELECTRONIC CO.,LTD
Model	:	PSY0502000 18
Ratings	:	INPUT:100-240V~50/60Hz 0.6A Max OUTPUT: 5.0V⎓2.0A
Accessories 2	:	Switching Power Supply
Manufacturer		Dong Guan Royal Intelligent Co., Ltd.
Model		BI12T-050200-IU
Ratings		INPUT: 100-240V~50/60Hz, 0.5A Max. INPUT :5.0VDC, 2.0A, 10.0W

2.3. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or SDoC
1	Notebook PC	Lenovo	Thinkpad E14	--	--

2.4. Block Diagram of connection between EUT and simulators



2.5. Test Mode Description

Tested mode, channel, and data rate information		
Mode	**Channel**	**Frequency (MHz)**
GFSK (1Mbps/2Mbps)	Low :CH1	2402
	Middle: CH20	2440
	High: CH40	2480

2.6. Test Conditions

Items	Required	Actual
Temperature range:	15-35℃	24℃
Humidity range:	25-75%	56%
Pressure range:	86-106kPa	980kPa

2.7. Test Facility

Shenzhen Alpha Product Testing Co., Ltd
Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103,
Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission
Registration Number: 293961

July 15, 2019 Certificated by IC
Registration Number: 12135A

2.8. Measurement Uncertainty

(95% confidence levels, k=2)

Item	**Uncertainty**
Uncertainty for Power point Conducted Emissions Test	1.63dB
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	3.5dB
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.74dB(Polarize: V)
	3.76dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	3.77dB(Polarize: V)
	3.80dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (18GHz to 40GHz)	4.31 dB(Polarize: V)
	4.30 dB(Polarize: H)
Uncertainty for radio frequency	5.06×10^{-8}GHz
Uncertainty for conducted RF Power	0.40dB
Uncertainty for temperature	0.2℃
Uncertainty for humidity	1%
Uncertainty for DC and low frequency voltages	0.06%

2.9. Test Equipment List

Equipment	Manufacture	Model No.	Firmware version	Serial No.	Last cal.	Cal Interval
9*6*6 anechoic chamber	CHENYU	9*6*6	/	N/A	2022.05.17	3Year
Spectrum analyzer	ROHDE&SCHWARZ	FSV40-N	2.3	102137	2023.08.16	1Year
Spectrum analyzer	Agilent	N9020A	A.14.16	MY499100060	2023.08.16	1Year
Receiver	ROHDE&SCHWARZ	ESR	2.28 SP1	1316.3003K03-102082-Wa	2023.08.16	1Year
Receiver	R&S	ESCI	4.42 SP1	101165	2023.08.16	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	/	VULB 9168#627	2023.08.28	1Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	/	2106	2023.08.19	1Year
Loop Antenna	SCHWARZBECK	FMZB 1519B	/	00128	2023.08.19	1Year
RF Cable	Resenberger	Cable 1	/	RE1	2023.08.16	1Year
RF Cable	Resenberger	Cable 2	/	RE2	2023.08.16	1Year
RF Cable	Resenberger	Cable 3	/	CE1	2023.08.16	1Year
Pre-amplifier	HP	HP8347A	/	2834A00455	2023.08.16	1Year
Pre-amplifier	Agilent	8449B	/	3008A02664	2023.08.16	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	/	8126-466	2023.08.16	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	/	101043	2023.08.16	1Year
Horn Antenna	SCHWARZBECK	BBHA 9170	/	00946	2023.08.19	1Year
Preamplifier	SKET	LNPA_1840-50	/	SK2018101801	2023.08.16	1 Year
Power Meter	Agilent	E9300A	/	MY41496628	2023.08.16	1 Year
Power Sensor	DARE	RPR3006W	/	15100041SNO91	2023.08.16	1 Year
Temp. & Humid. Chamber	Teelong	TL-HW408S	/	TL-20191205-01	2023.07.25	1 Year
Switching Mode Power Supply	JUNKE	JK12010S	/	20140927-6	2023.08.16	1 Year
Adjustable attenuator	MWRFtest	N/A	/	N/A	N/A	N/A
10dB Attenuator	Mini-Circuits	DC-6G	/	N/A	N/A	N/A

Software Information			
Test Item	Software Name	Manufacturer	Version
RE	EZ-EMC	EZ	Alpha-3A1
CE	EZ-EMC	EZ	Alpha-3A1
RF-CE	MTS 8310	MW	V2.0.0.0

3. SPURIOUS EMISSION

3.1. Test Limits

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])

RSS-GEN Restricted frequency band

Table 7 – Restricted frequency bands Note 1

MHz	MHz	GHz
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 – 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12
6.215 - 6.218	608 - 614	23.6 - 24.0

6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	
8.37625 - 8.38675	1718.8 - 1722.2	
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 - 2390	
12.51975 - 12.52025	2483.5 - 2500	
12.57675 - 12.57725	2655 - 2900	
13.36 - 13.41	3260 – 3267	
16.42 - 16.423	3332 - 3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 – 8500	
108 – 138		

Note 1: Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

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 1: The peak limit is 20 dB higher than the average limit			
Note 2: Peak limit applies (AVG limit + 20 dB) as well as RSS-247 Section 5.5			

Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

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

Frequency (MHz)	Field strength (μV/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) (μA/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.

3.2. Test Procedure

The measuring distance of 3m shall be used for measurements at frequency up to 1GH and above 1GHz, The EUT was placed on a rotating 0.8 m high above ground for below 1GHz and 1.5m high for above1GHz testing, The table was rotated 360 degrees to determine the position of the highest radiation

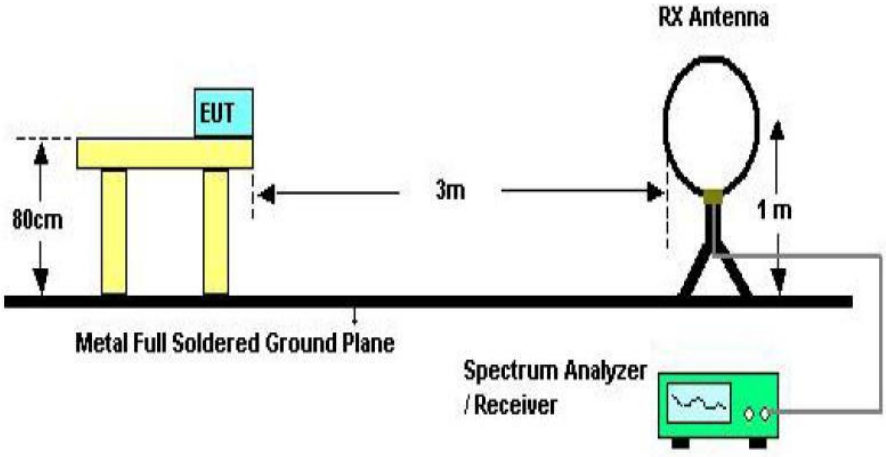
The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set of make measurement.

The initial step in collecting conducted emission data is a spectrum analyzer Peak detector mode pre-scanning the measurement frequency range. Significant Peaks are then marked. and then Qusia Peak Detector mode premeasured

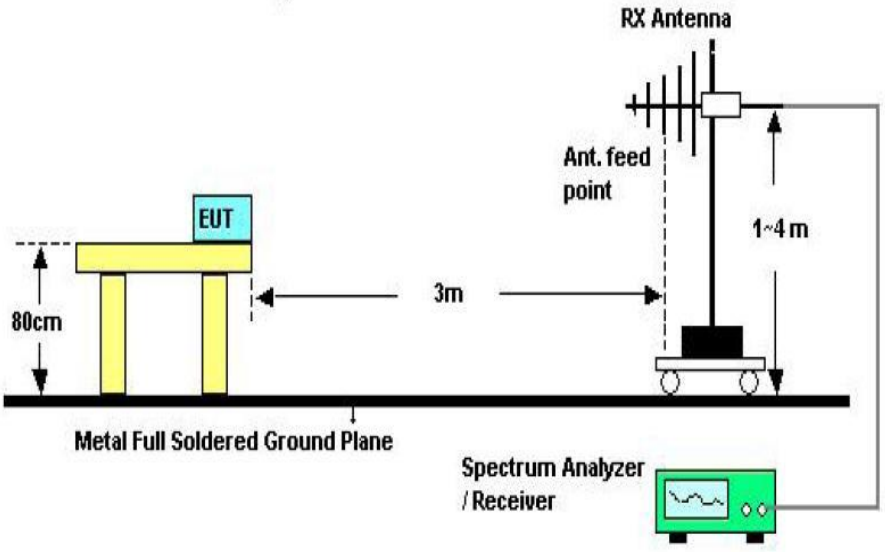
If Peak value comply with QP limit Below 1GHz.The EUT deemed to comply with QP limit. But the Peak value and average value both need to comply with applicable limit above 1GHz.

For the actual test configuration, please see the test setup photo.

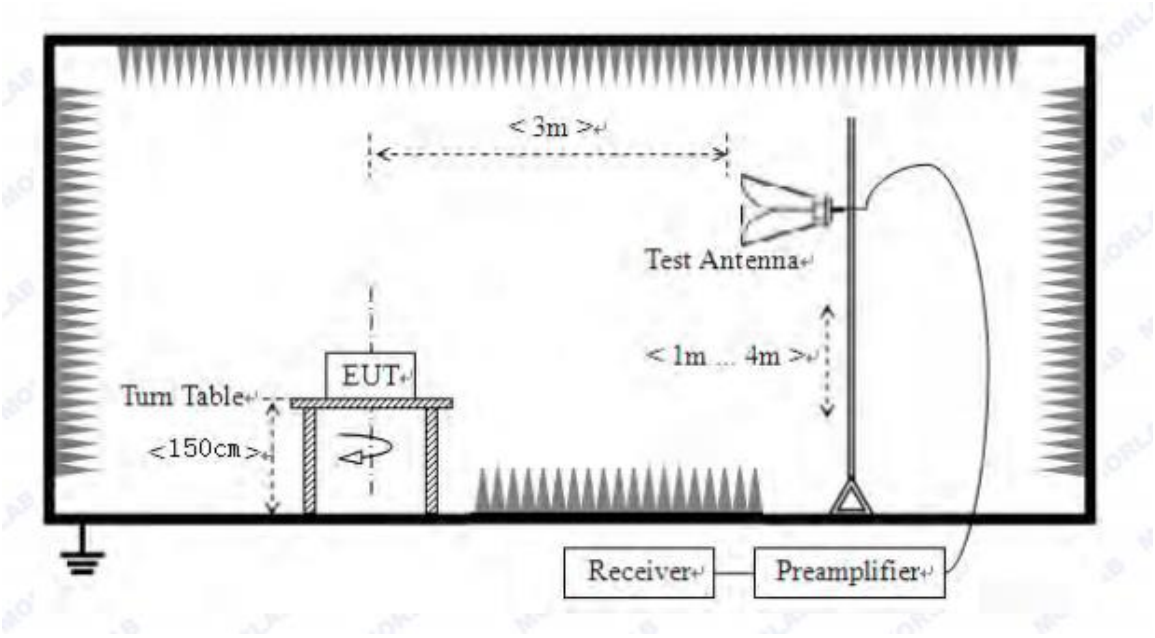
3.3. Test Setup



Below 30MHz Test Setup



Above 30MHz Test Setup



Above 1GHz Test Setup

3.4. Test Results

Test Condition

Continual Transmitting in maximum power.

9KHz~150KHz	RBW200Hz	VBW1KHz
150KHz~30MHz	RBW9KHz	VBW 30KHz
30MHZ~1GHz	RBW120KHz	VBW 300KHz
Above1GHz	RBW1MHz	VBW 3MHz

We have scanned the 10th harmonic from 9 kHz to the EUT.

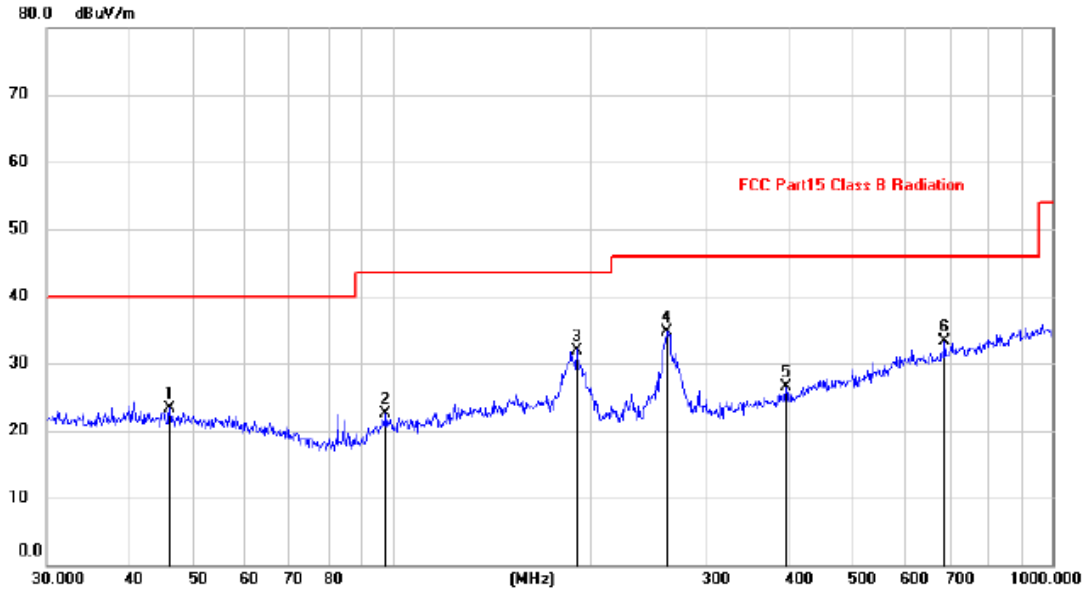
Detailed information please see the following page.

From 9KHz to 30MHz: Conclusion: PASS

Note: 1.The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

2. Only show the test data of the worst Channel in this report.

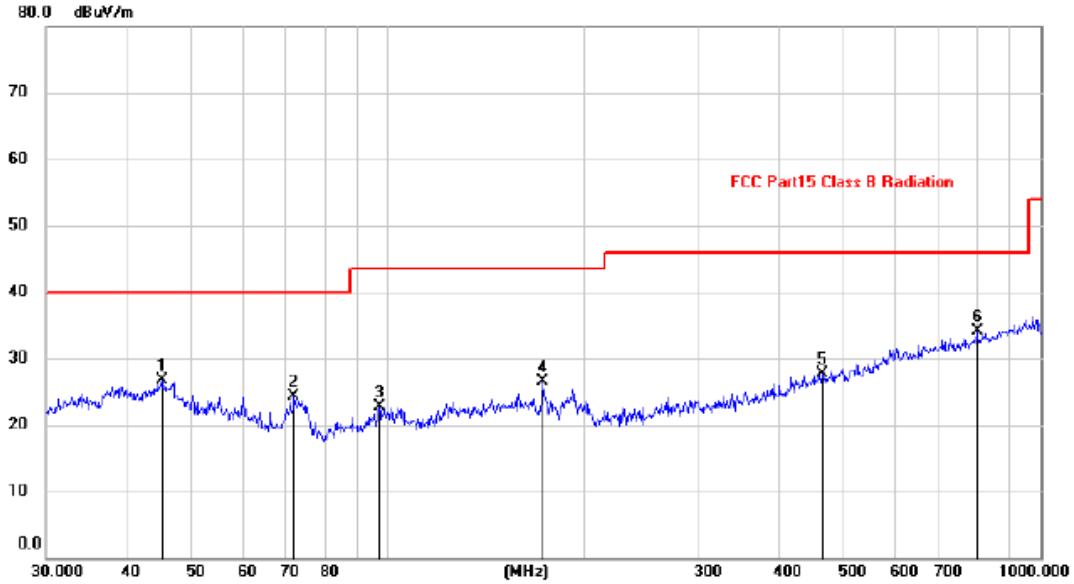
Antenna polarity: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		46.1240	9.26	14.10	23.36	40.00	-16.64	peak
2		98.1074	11.78	10.70	22.48	43.50	-21.02	peak
3		190.8059	20.58	11.42	32.00	43.50	-11.50	peak
4	*	261.1802	21.63	13.01	34.64	46.00	-11.36	peak
5		395.8712	10.27	16.17	26.44	46.00	-19.56	peak
6		688.5979	11.70	21.53	33.23	46.00	-12.77	peak

Note:1. *:Maximum data; x:Over limit; !:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Antenna polarity: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		45.0741	12.61	14.10	26.71	40.00	-13.29	peak
2		71.8992	13.29	11.11	24.40	40.00	-15.60	peak
3		97.4332	12.00	10.68	22.68	43.50	-20.82	peak
4		172.6997	12.81	13.70	26.51	43.50	-16.99	peak
5		462.7781	10.02	17.68	27.70	46.00	-18.30	peak
6	*	799.4467	11.15	22.90	34.05	46.00	-11.95	peak

Note:1. *:Maximum data; x:Over limit; !:over margin.
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Notes: Above is below 1GHz test data. This report only shall the worst case mode for GFSK 1M 2402MHz.

1Mbps
From 1G-25GHz

Test Mode: TX Low									
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804	44.74	V	33.95	10.18	34.26	54.61	74	-19.39	PK
4804	35.27	V	33.95	10.18	34.26	45.14	54	-8.86	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
4804	46.19	H	33.95	10.18	34.26	56.06	74	-17.94	PK
4804	34.34	H	33.95	10.18	34.26	44.21	54	-9.79	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
Test Mode: TX Mid									
4880	42.21	V	33.93	10.2	34.29	52.05	74	-21.95	PK
4880	35.96	V	33.93	10.2	34.29	45.80	54	-8.20	AV
7320	/	/	/	/	/	/	/	/	/
9760	/	/	/	/	/	/	/	/	/
4880	43.00	H	33.93	10.2	34.29	52.84	74	-21.16	PK
4880	33.32	H	33.93	10.2	34.29	43.16	54	-10.84	AV
7320	/	/	/	/	/	/	/	/	/
9760	/	/	/	/	/	/	/	/	/
Test Mode: TX High									
4960	43.80	V	33.98	10.22	34.25	53.75	74	-20.25	PK
4960	33.72	V	33.98	10.22	34.25	43.67	54	-10.33	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/
4960	41.90	H	33.98	10.22	34.25	51.85	74	-22.15	PK
4960	33.58	H	33.98	10.22	34.25	43.53	54	-10.47	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/

Note:
1, Result = Read level + Antenna factor + cable loss-Amp factor
2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.

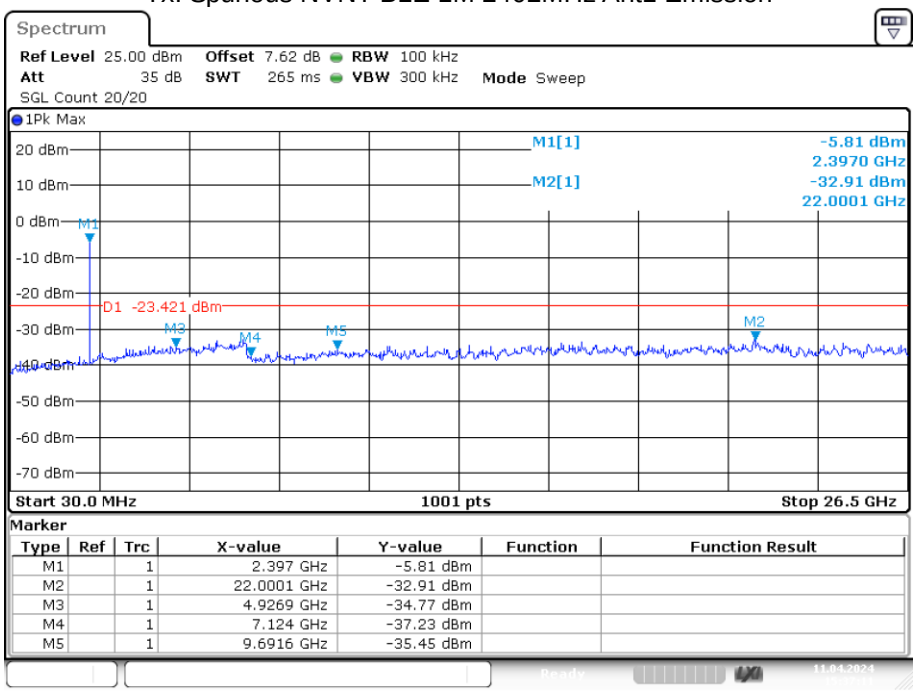
2Mbps
From 1G-25GHz

Test Mode: TX Low									
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804	45.10	V	33.95	10.18	34.26	54.97	74	-19.03	PK
4804	35.76	V	33.95	10.18	34.26	45.63	54	-8.37	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
4804	43.00	H	33.95	10.18	34.26	52.87	74	-21.13	PK
4804	35.87	H	33.95	10.18	34.26	45.74	54	-8.26	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
Test Mode: TX Mid									
4880	41.73	V	33.93	10.2	34.29	51.57	74	-22.43	PK
4880	36.16	V	33.93	10.2	34.29	46.00	54	-8.00	AV
7320	/	/	/	/	/	/	/	/	/
9760	/	/	/	/	/	/	/	/	/
4880	43.56	H	33.93	10.2	34.29	53.40	74	-20.60	PK
4880	35.49	H	33.93	10.2	34.29	45.33	54	-8.67	AV
7320	/	/	/	/	/	/	/	/	/
9760	/	/	/	/	/	/	/	/	/
Test Mode: TX High									
4960	43.68	V	33.98	10.22	34.25	53.63	74	-20.37	PK
4960	35.90	V	33.98	10.22	34.25	45.85	54	-8.15	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/
4960	43.98	H	33.98	10.22	34.25	53.93	74	-20.07	PK
4960	33.36	H	33.98	10.22	34.25	43.31	54	-10.69	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/

Note:
1, Result = Read level + Antenna factor + cable loss-Amp factor
2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.

Conducted RF Spurious Emission

Tx. Spurious NVNT BLE 1M 2402MHz Ant1 Emission

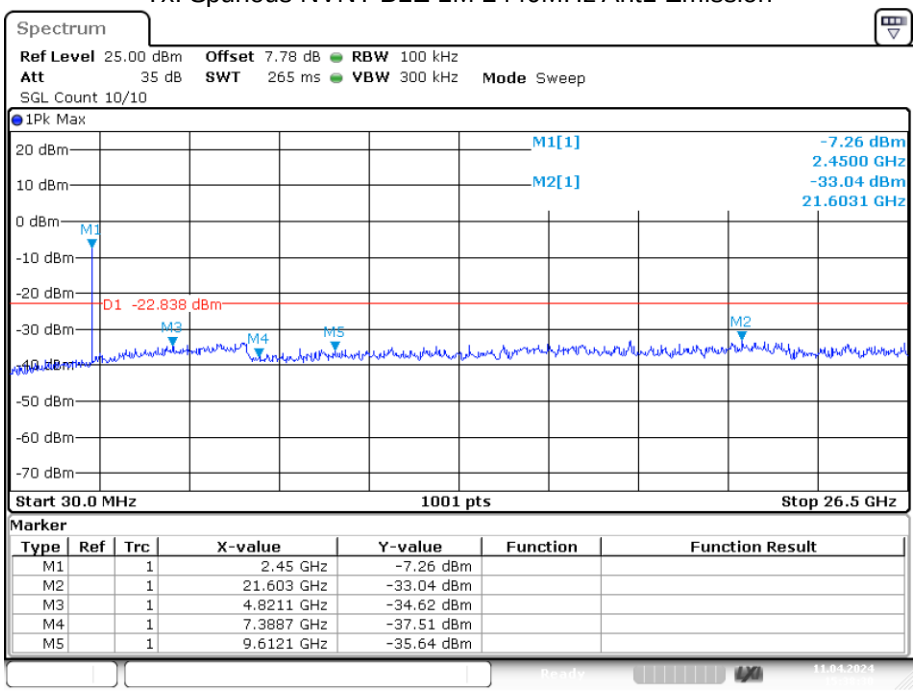


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.397 GHz	-5.81 dBm		
M2		1	22.0001 GHz	-32.91 dBm		
M3		1	4.9269 GHz	-34.77 dBm		
M4		1	7.124 GHz	-37.23 dBm		
M5		1	9.6916 GHz	-35.45 dBm		

Date: 11.APR.2024 15:37:10

Tx. Spurious NVNT BLE 1M 2440MHz Ant1 Emission

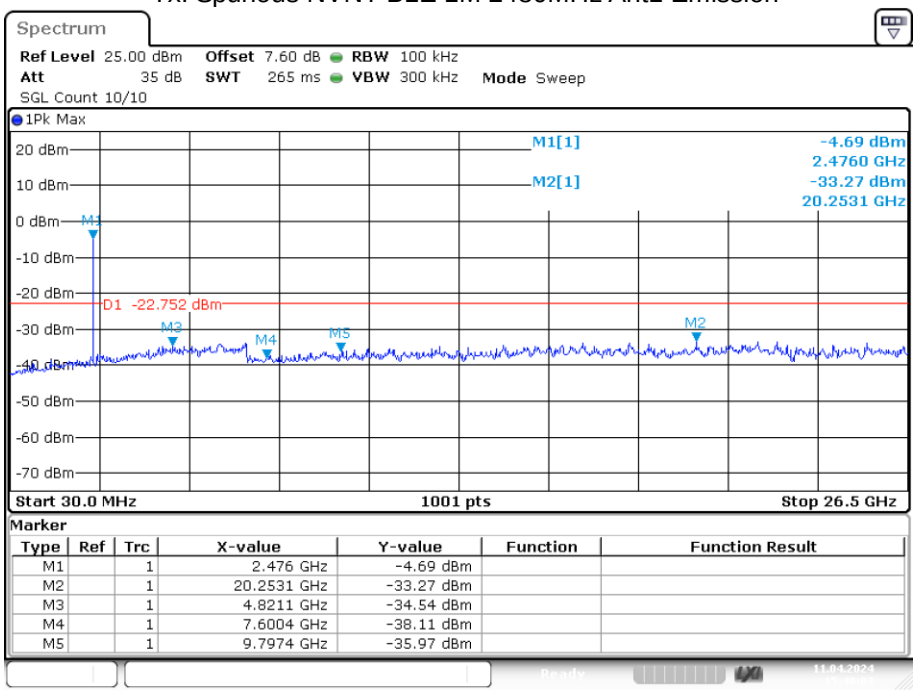


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45 GHz	-7.26 dBm		
M2		1	21.603 GHz	-33.04 dBm		
M3		1	4.8211 GHz	-34.62 dBm		
M4		1	7.3887 GHz	-37.51 dBm		
M5		1	9.6121 GHz	-35.64 dBm		

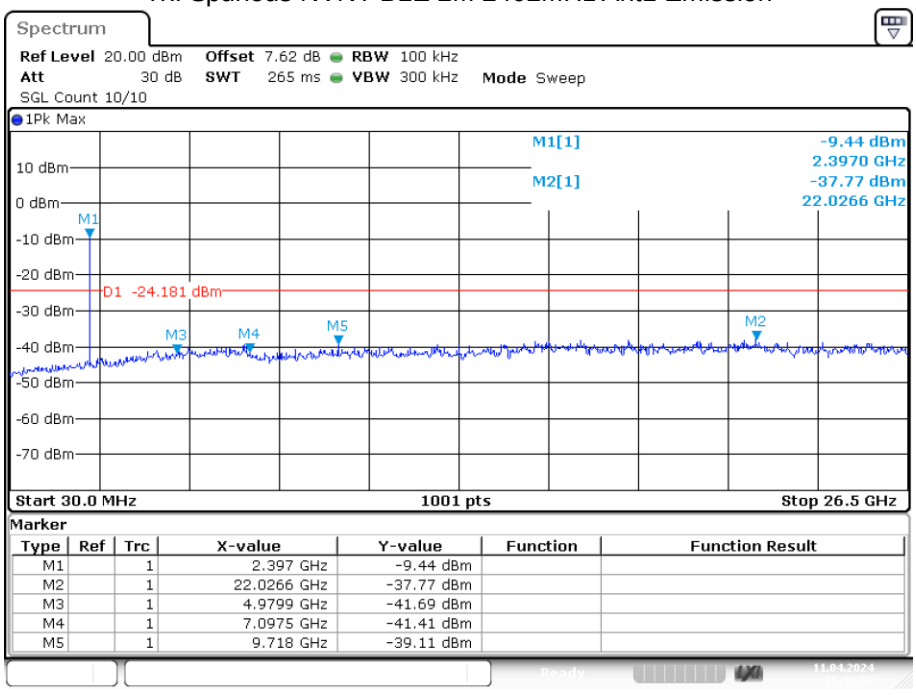
Date: 11.APR.2024 15:38:30

Tx. Spurious NVNT BLE 1M 2480MHz Ant1 Emission



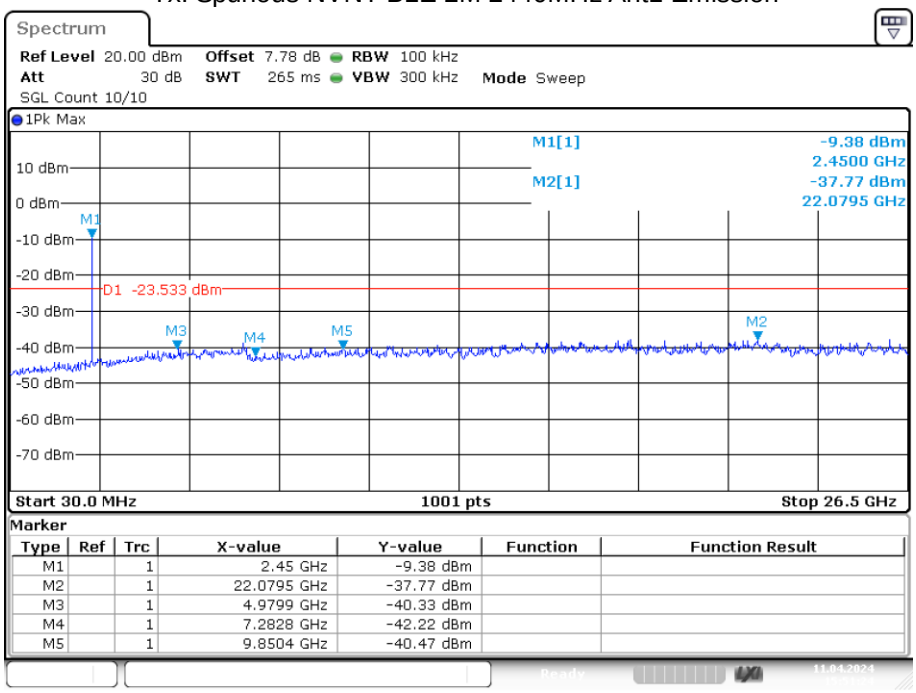
Date: 11.APR.2024 15:40:03

Tx. Spurious NVNT BLE 2M 2402MHz Ant1 Emission



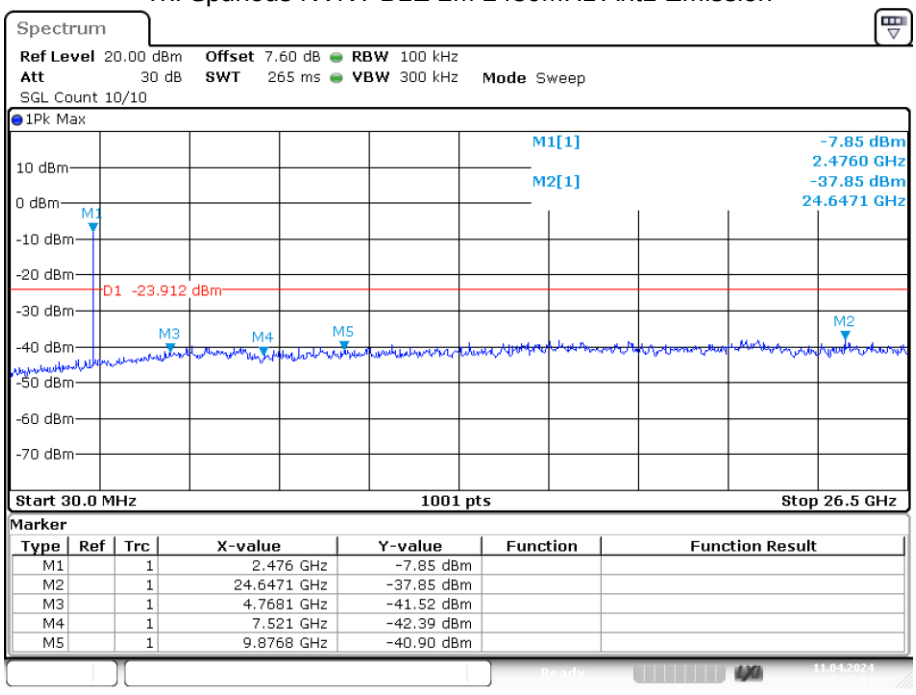
Date: 11.APR.2024 15:48:50

Tx. Spurious NVNT BLE 2M 2440MHz Ant1 Emission



Date: 11.APR.2024 15:51:23

Tx. Spurious NVNT BLE 2M 2480MHz Ant1 Emission



Date: 11.APR.2024 15:52:51

4. POWER LINE CONDUCTED EMISSION

4.1. Test Limits

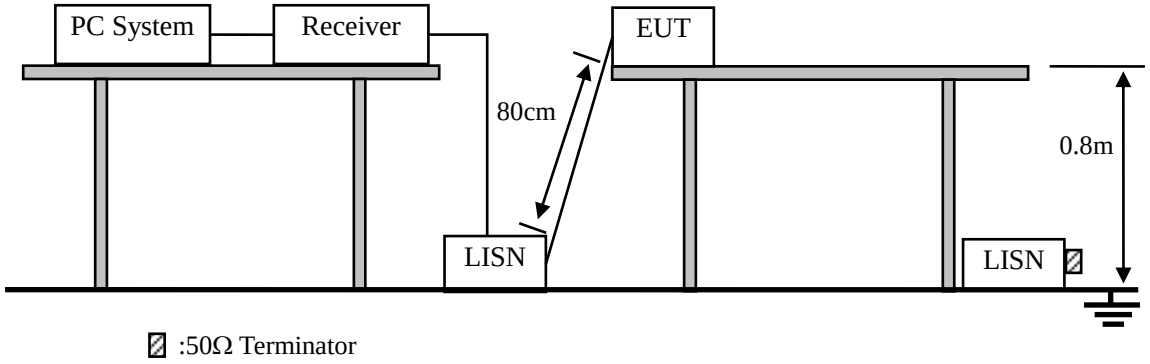
Frequency	Limits dB(μV)	
MHz	Quasi-peak Level	Average Level
0.15 -0.50	66 -56*	56 - 46*
0.50 -5.00	56	46
5.00 -30.00	60	50

Notes: 1. *Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.
3. The limit decreases in line with the logarithm of the frequency in rang of 0.15 to 0.50 MHz.

4.2. Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.10:2013 on Conducted Emission Measurement.
The bandwidth of test receiver is set at 9 kHz.

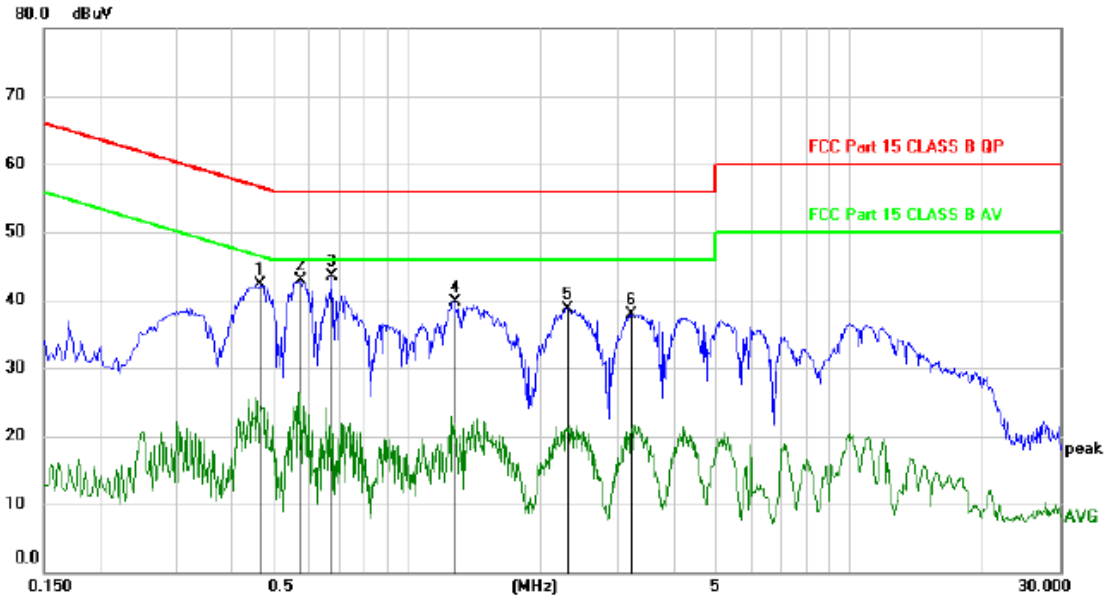
4.3. Test Setup



4.4. Test Results

Pass

Polarity: L

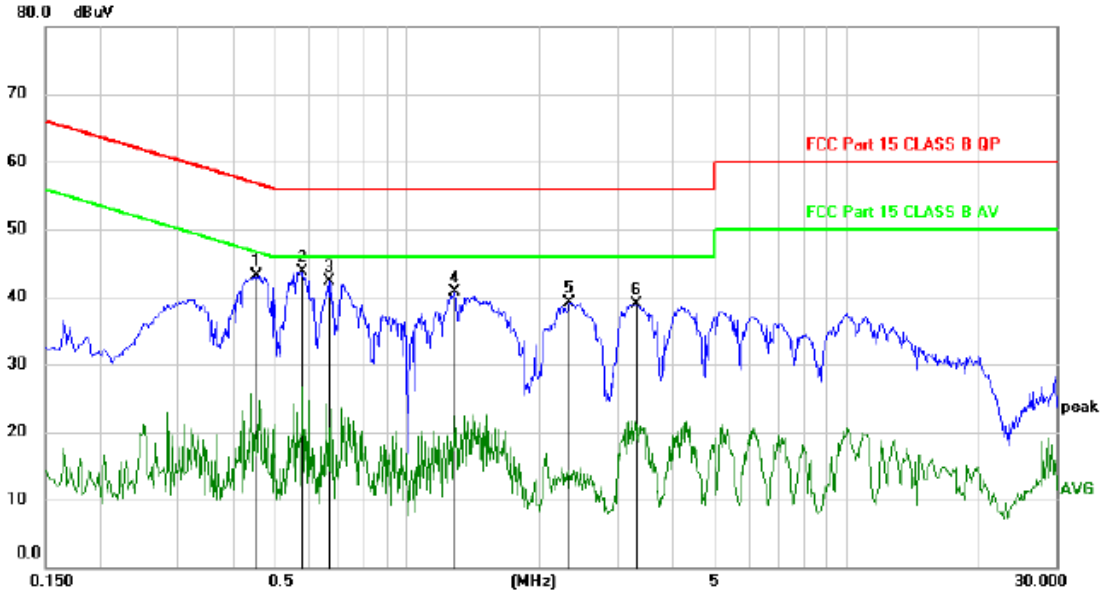


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.4620	32.43	9.95	42.38	56.66	-14.28	peak	
2		0.5760	32.92	9.93	42.85	56.00	-13.15	peak	
3	*	0.6720	33.62	9.93	43.55	56.00	-12.45	peak	
4		1.2810	29.88	9.89	39.77	56.00	-16.23	peak	
5		2.3010	28.83	9.90	38.73	56.00	-17.27	peak	
6		3.2100	27.96	9.96	37.92	56.00	-18.08	peak	

*:Maximum data x:Over limit !:over margin (Reference Only

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

Polarity: N



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.4530	33.24	9.95	43.19	56.82	-13.63	peak	
2	*	0.5790	33.86	9.93	43.79	56.00	-12.21	peak	
3		0.6630	32.29	9.93	42.22	56.00	-13.78	peak	
4		1.2780	30.76	9.89	40.65	56.00	-15.35	peak	
5		2.3340	29.25	9.90	39.15	56.00	-16.85	peak	
6		3.3300	29.04	9.95	38.99	56.00	-17.01	peak	

*:Maximum data x:Over limit !:over margin 〈Reference Only

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

Note: All modes and channels have been tested and only the GFSK 1M 2402MHz mode with the worst data is listed.

5. CONDUCTED MAXIMUM OUTPUT POWER

5.1. Test limits

Please refer section RSS-247 & 15.247.

5.2. Test Procedure

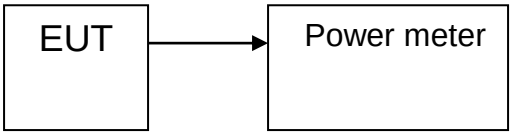
Details see the KDB 558074 D01 15.247 Meas Guidance v05r02

5.2.1 Place the EUT on the table and set it in transmitting mode.

5.2.2 Measure out each mode and each bands peak output power of EUT.

Note: The cable loss and attenuator loss were offset into measure device as amplitude offset.

5.3. Test Setup



5.4. Test Results

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	EIRP(dBm)	Limit (dBm)	Verdict
NVNT	BLE 1M	2402	Ant1	-4.803	-0.313	30	Pass
NVNT	BLE 1M	2440	Ant1	-4.459	0.031	30	Pass
NVNT	BLE 1M	2480	Ant1	-4.048	0.442	30	Pass

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	EIRP(dBm)	Limit (dBm)	Verdict
NVNT	BLE 2M	2402	Ant1	-4.884	-0.394	30	Pass
NVNT	BLE 2M	2440	Ant1	-4.28	0.21	30	Pass
NVNT	BLE 2M	2480	Ant1	-3.893	0.597	30	Pass

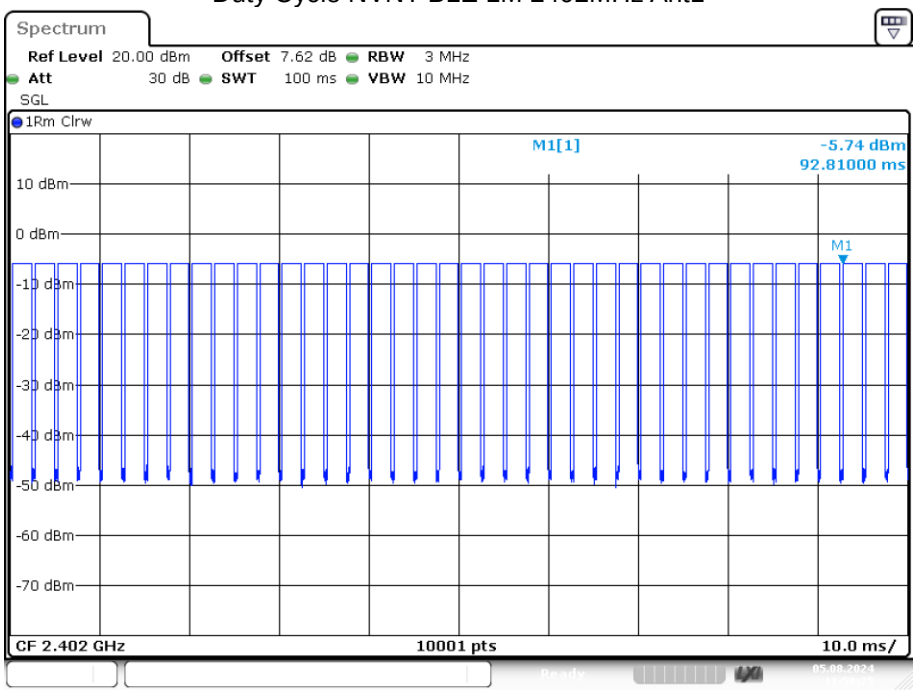
EIRP(dBm)= Conducted Power (dBm) + Gain(dBi)

Duty Cycle

Condition	Mode	Frequency (MHz)	Antenna	Duty Cycle (%)	Correction Factor (dB)
NVNT	BLE 1M	2402	Ant1	85.59	0.68
NVNT	BLE 1M	2440	Ant1	85.2	0.7
NVNT	BLE 1M	2480	Ant1	85.6	0.68

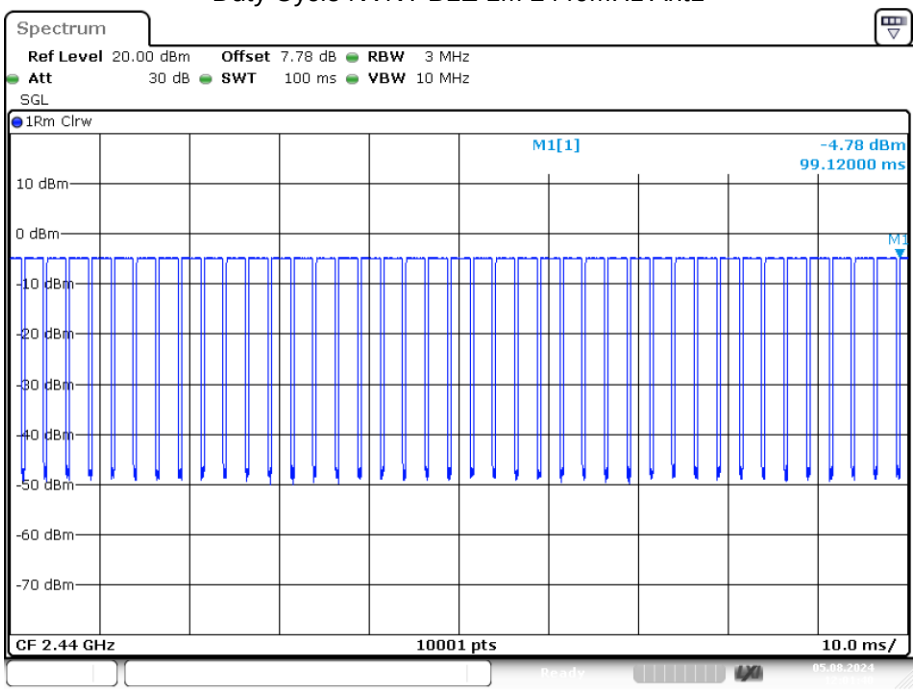
Condition	Mode	Frequency (MHz)	Antenna	Duty Cycle (%)	Correction Factor (dB)
NVNT	BLE 2M	2402	Ant1	57.49	2.4
NVNT	BLE 2M	2440	Ant1	58.13	2.36
NVNT	BLE 2M	2480	Ant1	57.35	2.41

Duty Cycle NVNT BLE 1M 2402MHz Ant1



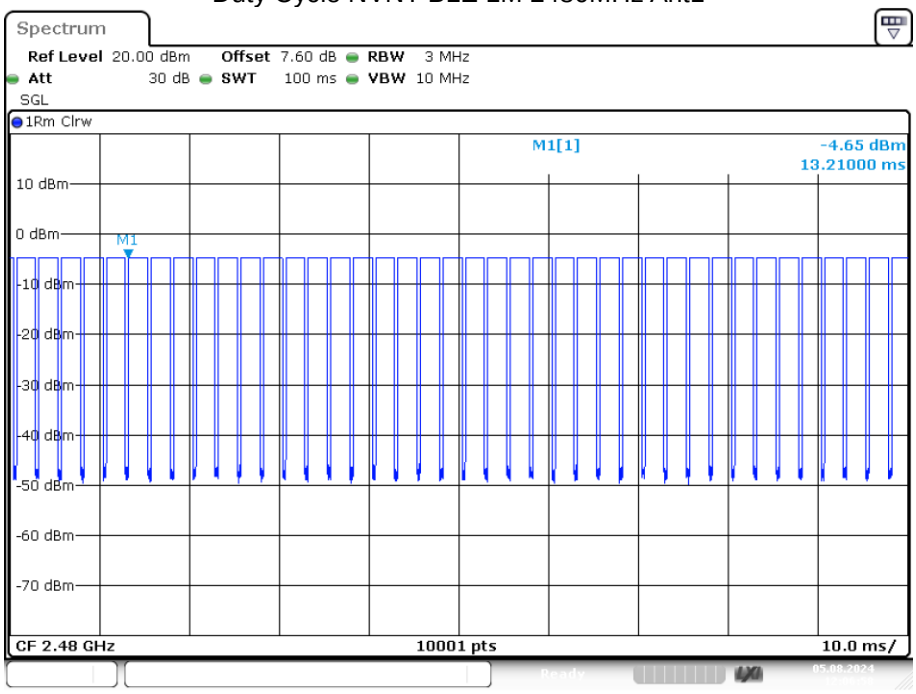
Date: 5.AUG.2024 11:58:25

Duty Cycle NVNT BLE 1M 2440MHz Ant1



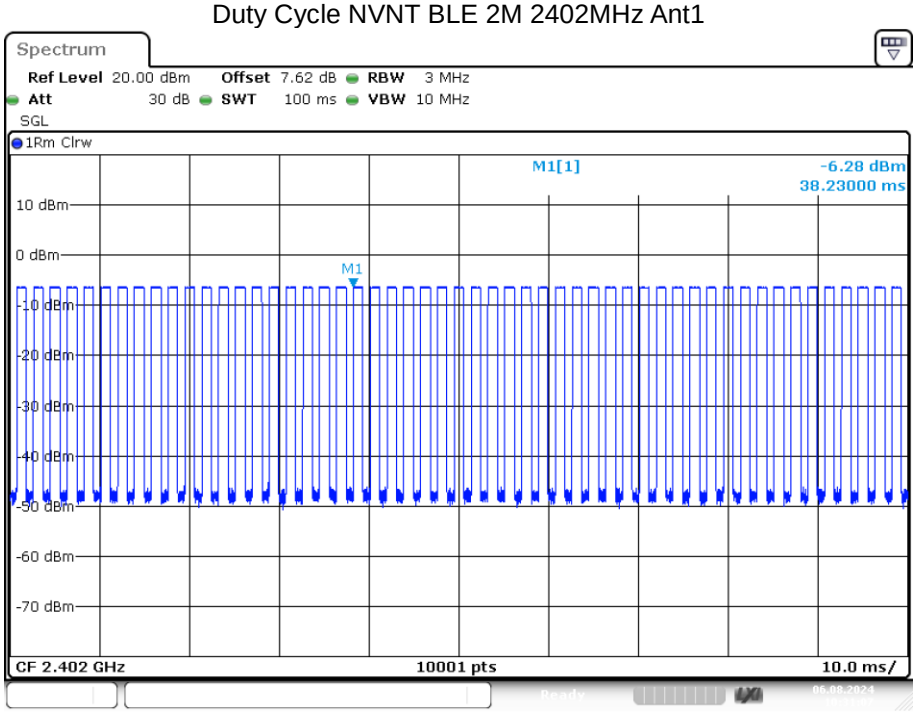
Date: 5.AUG.2024 12:01:40

Duty Cycle NVNT BLE 1M 2480MHz Ant1



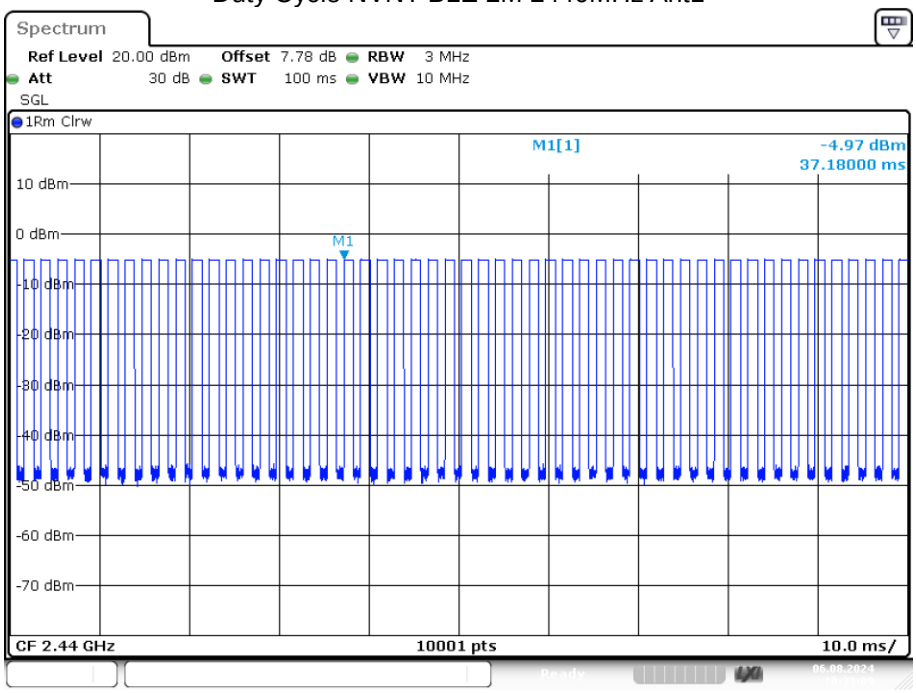
Date: 5.AUG.2024 12:06:58

Duty Cycle NVNT BLE 2M 2402MHz Ant1



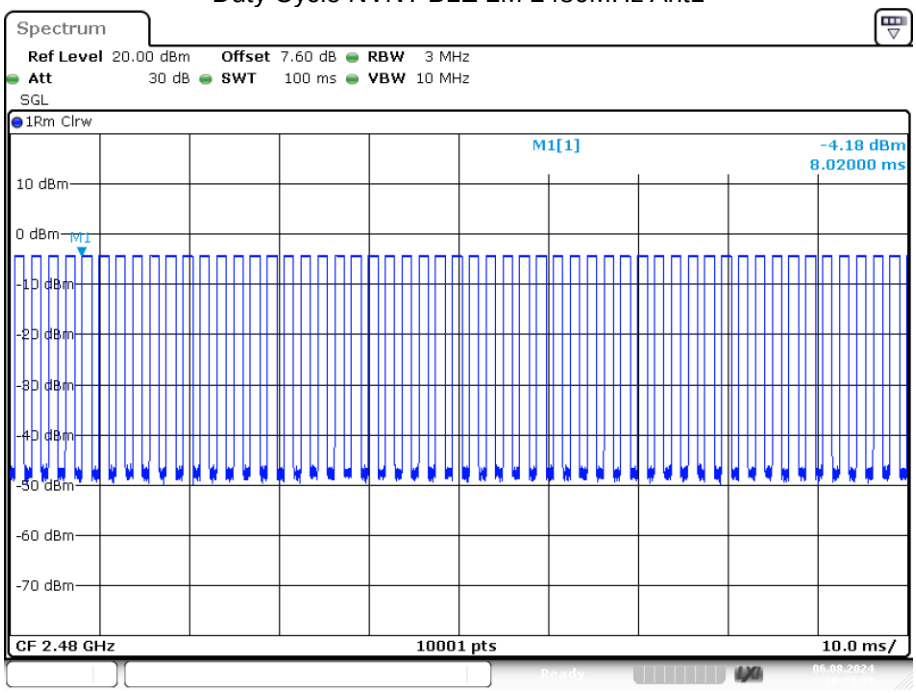
Date: 6.AUG.2024 10:31:07

Duty Cycle NVNT BLE 2M 2440MHz Ant1



Date: 6.AUG.2024 10:33:09

Duty Cycle NVNT BLE 2M 2480MHz Ant1



Date: 6.AUG.2024 10:34:38

6. PEAK POWER SPECTRAL DENSITY

6.1. Test limits

6.1.1 Please refer section RSS-247 & 15.247.

6.1.2 For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

6.1.3 The direct sequence operating of the hybrid system, with the frequency hopping operation turned off, shall comply with the power density requirements of paragraph (d) of this section.

6.2. Test Procedure

Details see the KDB 558074 D01 15.247 Meas Guidance v05r02

6.2.1 Place the EUT on the table and set it in transmitting mode.

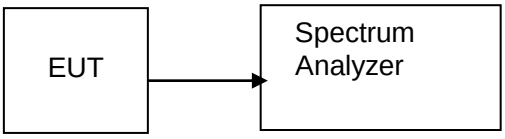
6.2.2 Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

6.2.3 Set the spectrum analyzer as RBW = 3kHz(Set the RBW to: 3 kHz≤RBW≤100 kHz.), VBW = 10kHz(Set the VBW≥3×RBW), span=1.5×DTS bandwidth., detail see the test plot.

6.2.4 Record the max reading.

6.2.5 Repeat the above procedure until the measurements for all frequencies are completed.

6.3. Test Setup



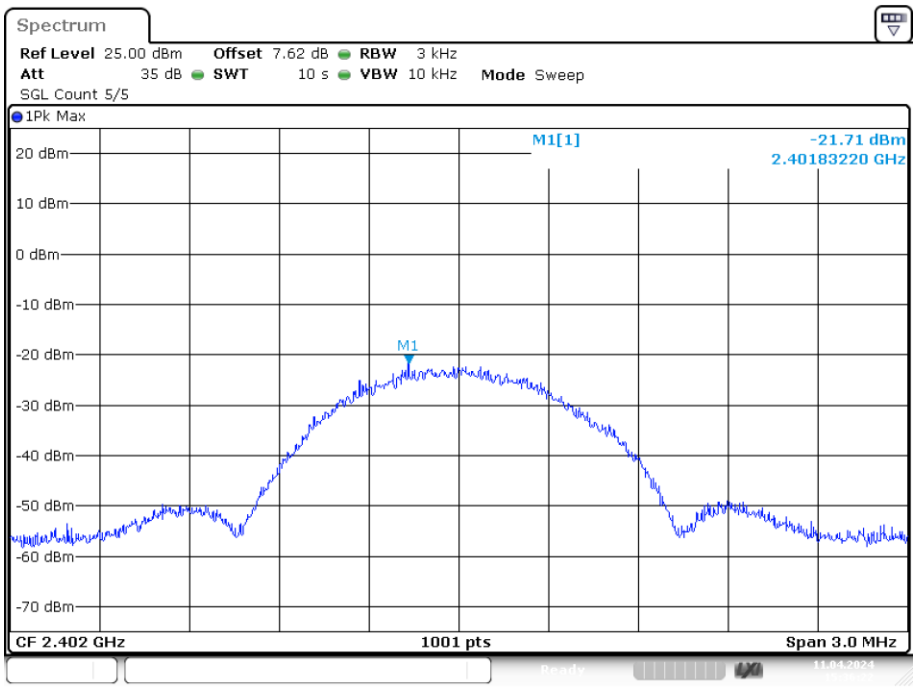
6.4. Test Results

Pass

The test results are listed in next pages.

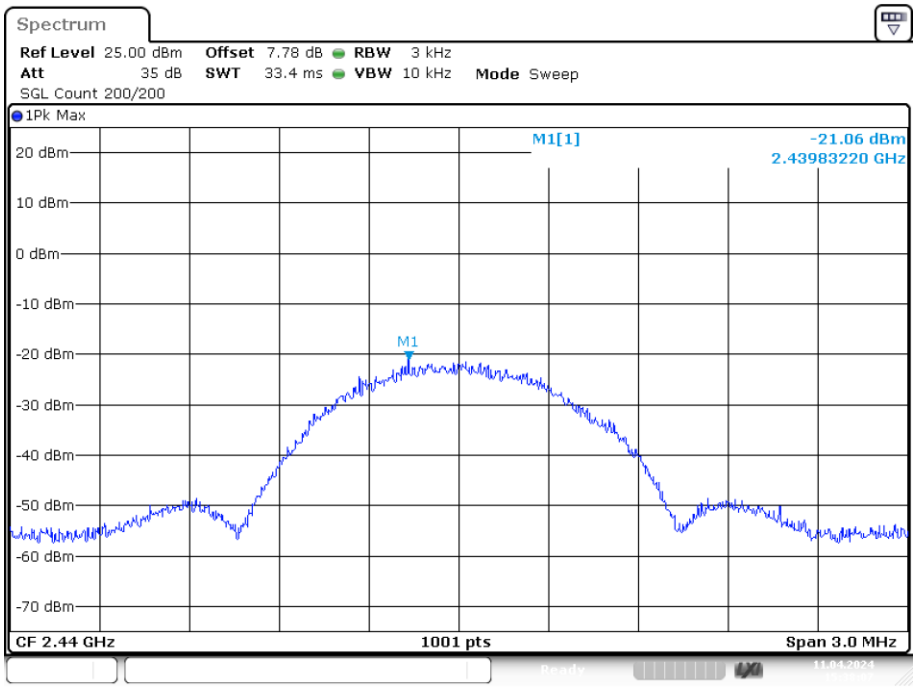
Condition	Mode	Frequency (MHz)	Antenna	Max PSD (dBm)	Limit (dBm)	Verdict
NVNT	BLE 1M	2402	Ant1	-21.706	8	Pass
NVNT	BLE 1M	2440	Ant1	-21.062	8	Pass
NVNT	BLE 1M	2480	Ant1	-20.871	8	Pass

PSD NVNT BLE 1M 2402MHz Ant1



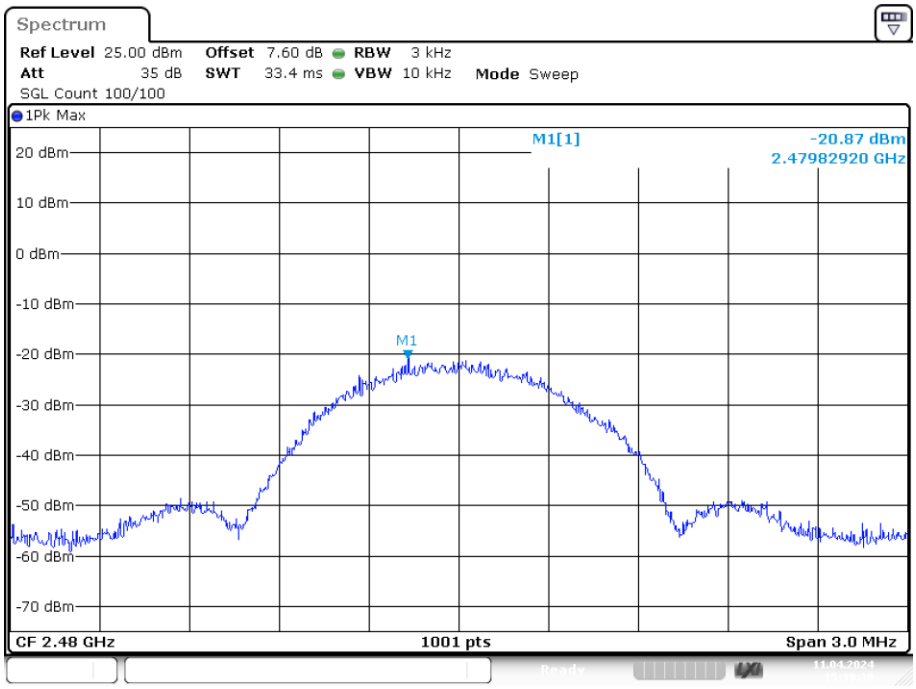
Date: 11.APR.2024 15:36:21

PSD NVNT BLE 1M 2440MHz Ant1



Date: 11.APR.2024 15:38:06

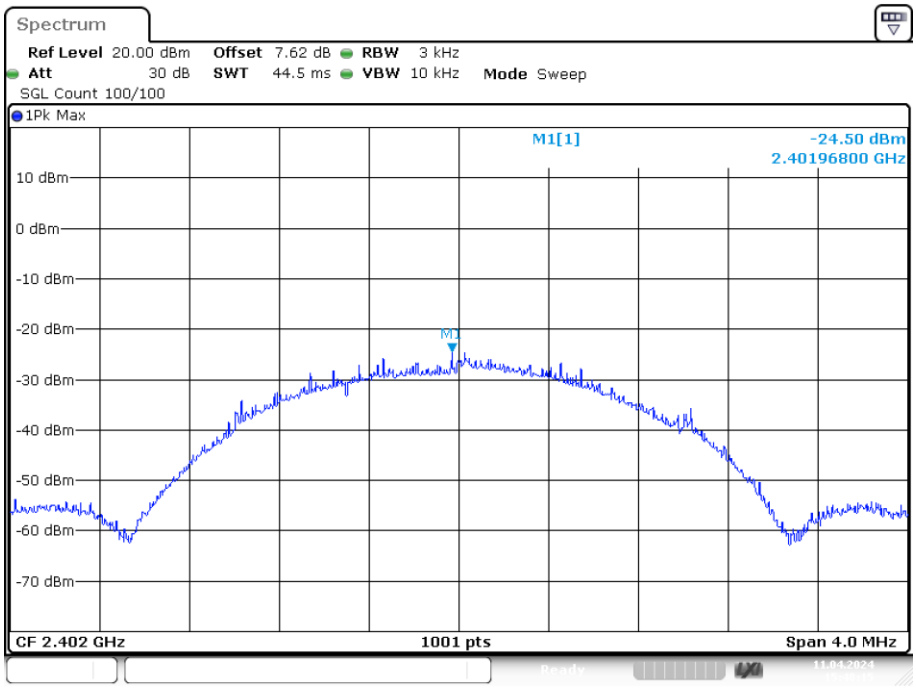
PSD NVNT BLE 1M 2480MHz Ant1



Date: 11.APR.2024 15:39:29

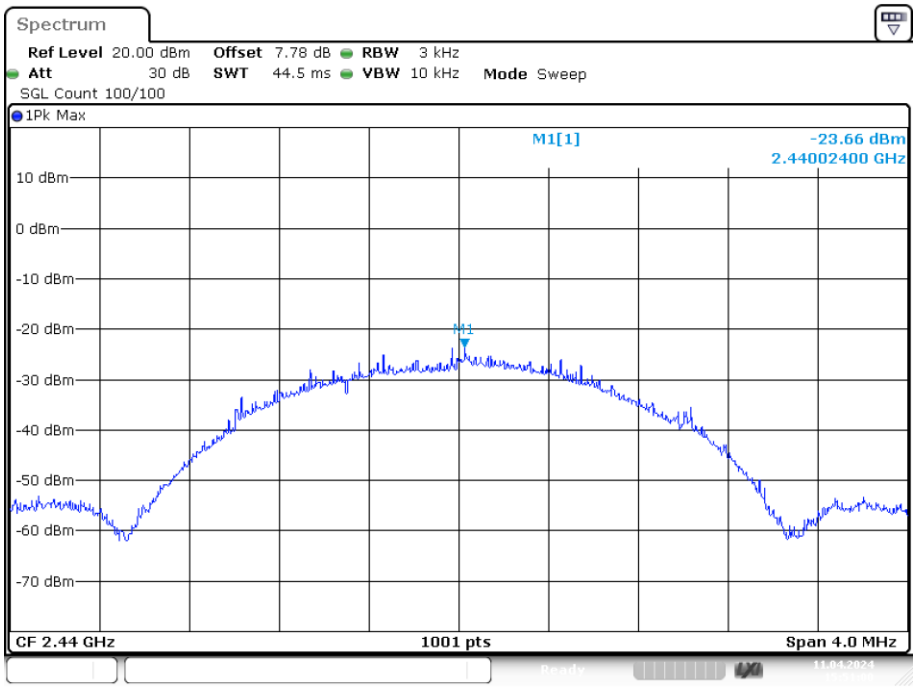
Condition	Mode	Frequency (MHz)	Antenna	Max PSD (dBm)	Limit (dBm)	Verdict
NVNT	BLE 2M	2402	Ant1	-24.505	8	Pass
NVNT	BLE 2M	2440	Ant1	-23.661	8	Pass
NVNT	BLE 2M	2480	Ant1	-23.28	8	Pass

PSD NVNT BLE 2M 2402MHz Ant1



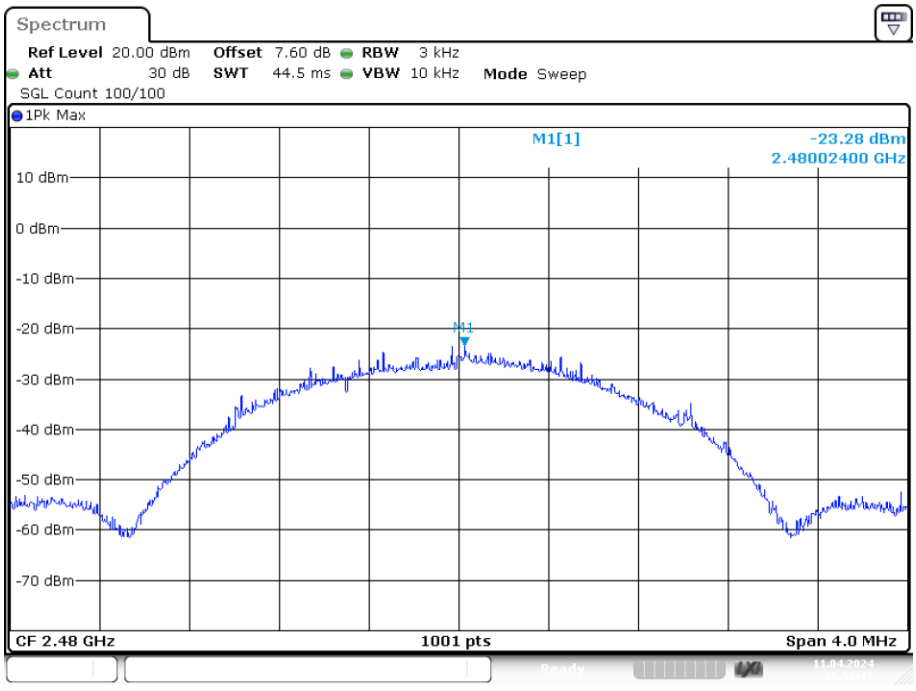
Date: 11.APR.2024 15:48:16

PSD NVNT BLE 2M 2440MHz Ant1



Date: 11.APR.2024 15:50:59

PSD NVNT BLE 2M 2480MHz Ant1



Date: 11.APR.2024 15:52:17

7. BANDWIDTH

7.1. Test limits

Please refer section RSS-247 & 15.247

For direct sequence systems, the minimum 6dB bandwidth shall be at least 500 kHz.

7.2. Test Procedure

The following procedure shall be used for measuring 99% power bandwidth:

a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.

b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.

c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2.

d) Step a) through step c) might require iteration to adjust within the specified range.

e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.

f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.

g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.

h) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

The following procedure shall be used for measuring -6dB bandwidth:

a) Set RBW = shall be in the range of 1% to 5% of the OBW but not less than 100 kHz.

b) Set the VBW $\geqslant$ [3XRBW].

c) Detector = peak.

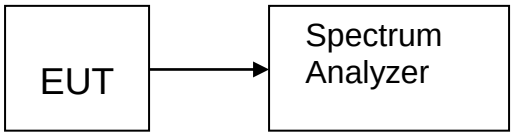
d) Trace mode = max-hold.

e) Sweep = No faster than coupled (auto) time.

f) Allow the trace to stabilize.

g) Measure the maximum width of the emission by placing two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the “−6 dB down amplitude”. If a marker is below this “−6 dB down amplitude” value, then it shall be as close as possible to this value.

7.3. Test Setup

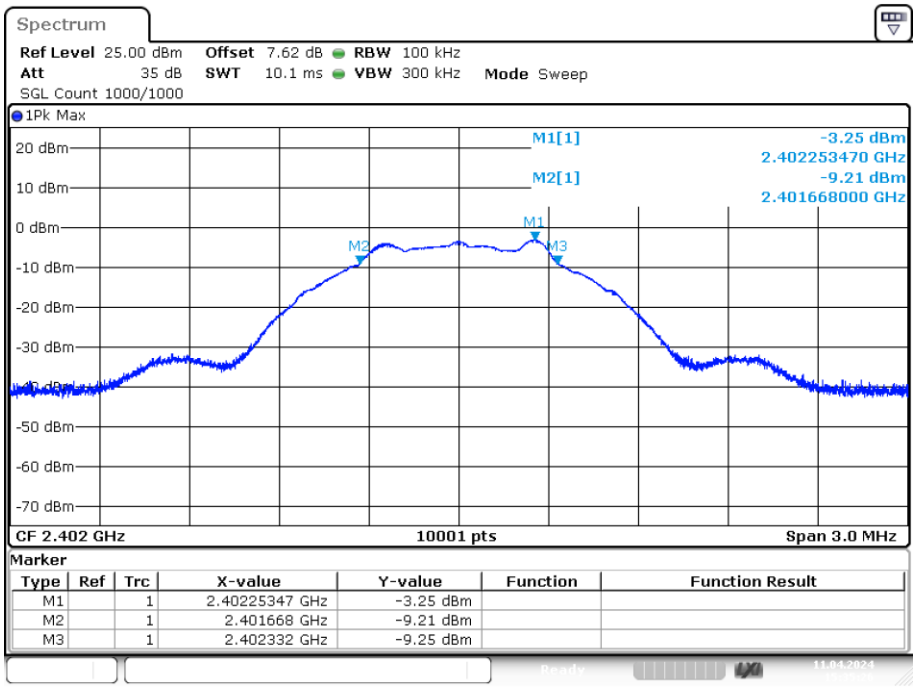


7.4. Test Results

-6dB Bandwidth

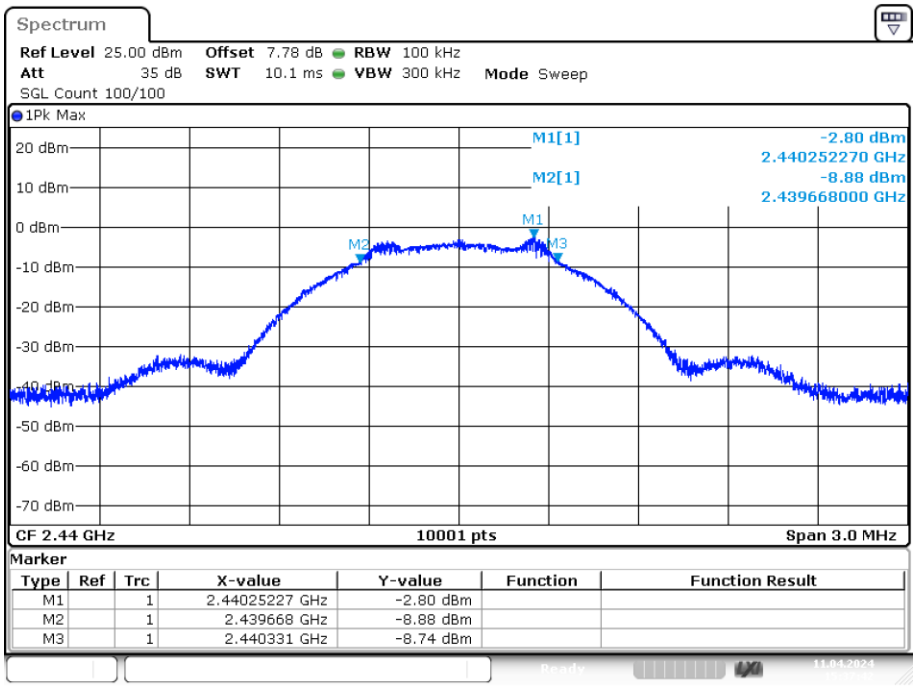
Condition	Mode	Frequency (MHz)	Antenna	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	BLE 1M	2402	Ant1	0.665	0.5	Pass
NVNT	BLE 1M	2440	Ant1	0.663	0.5	Pass
NVNT	BLE 1M	2480	Ant1	0.666	0.5	Pass

-6dB Bandwidth NVNT BLE 1M 2402MHz Ant1



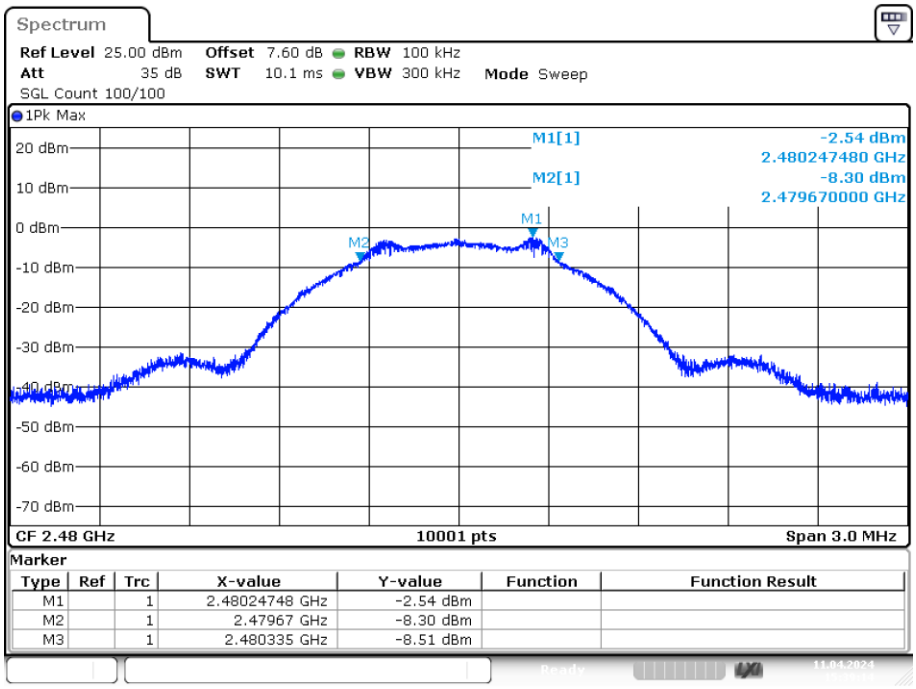
Date: 11.APR.2024 15:35:25

-6dB Bandwidth NVNT BLE 1M 2440MHz Ant1



Date: 11.APR.2024 15:37:42

-6dB Bandwidth NVNT BLE 1M 2480MHz Ant1

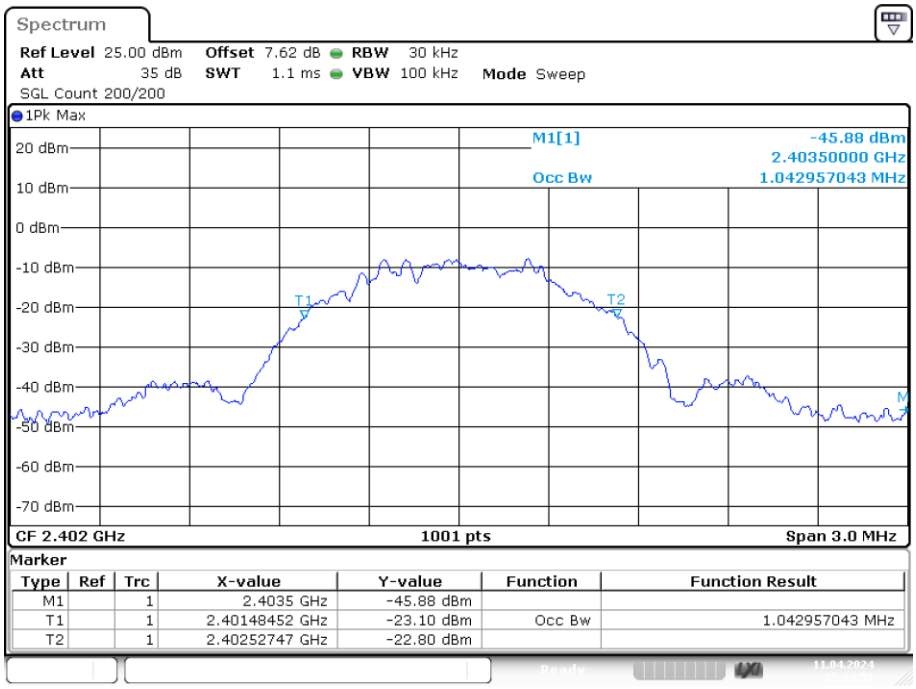


Date: 11.APR.2024 15:39:14

Occupied Channel Bandwidth

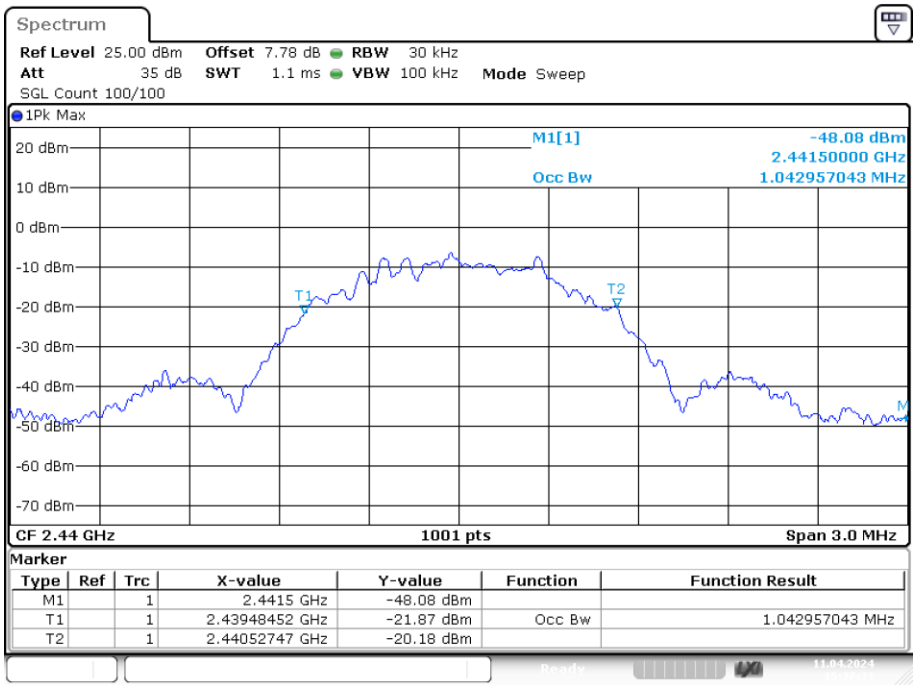
Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
NVNT	BLE 1M	2402	Ant1	1.043
NVNT	BLE 1M	2440	Ant1	1.043
NVNT	BLE 1M	2480	Ant1	1.037

OBW NVNT BLE 1M 2402MHz Ant1



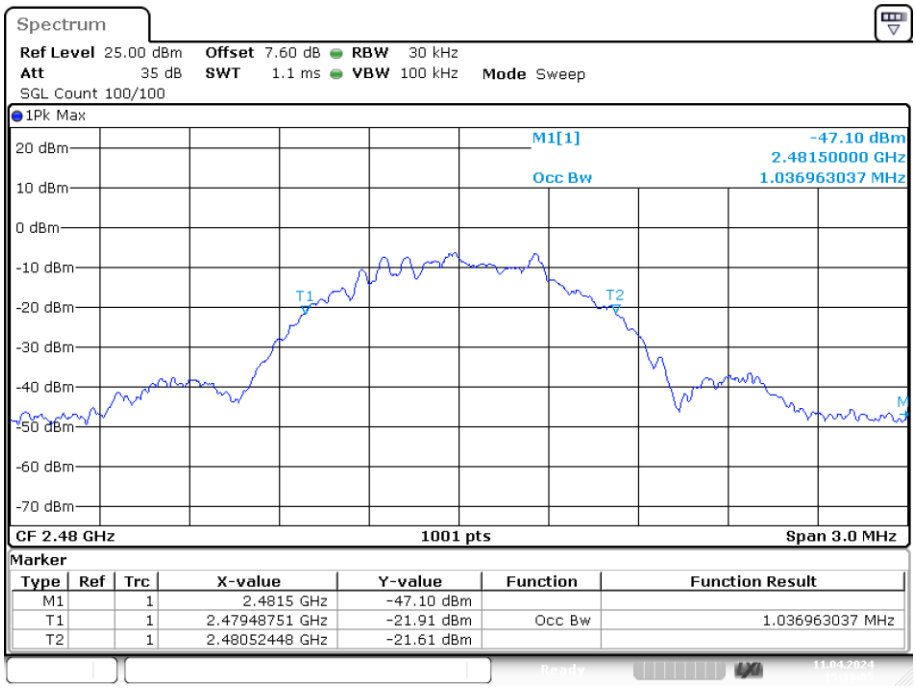
Date: 11.APR.2024 15:34:53

OBW NVNT BLE 1M 2440MHz Ant1



Date: 11.APR.2024 15:37:32

OBW NVNT BLE 1M 2480MHz Ant1

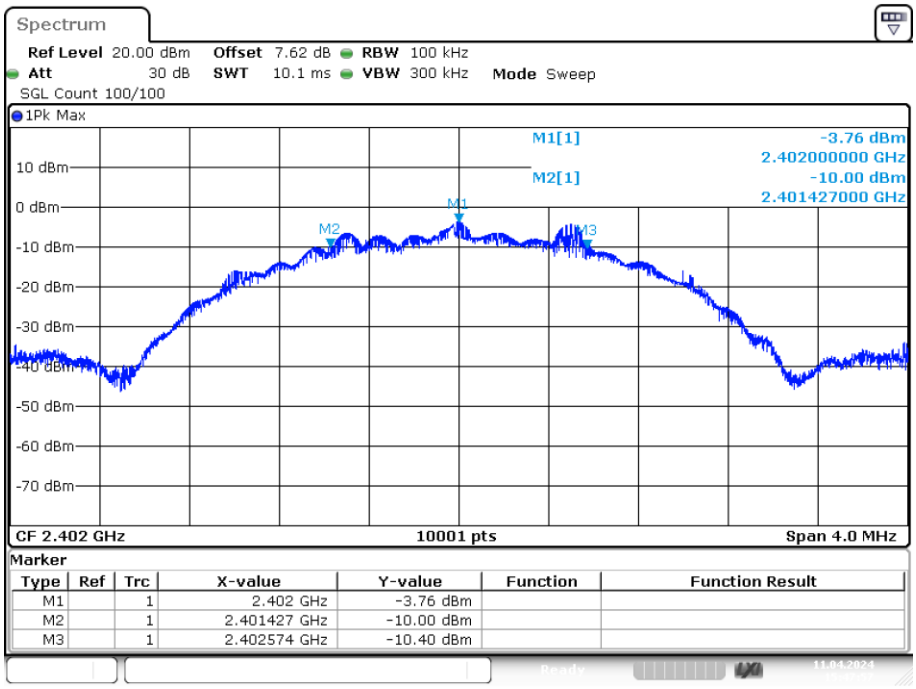


Date: 11.APR.2024 15:39:04

-6dB Bandwidth

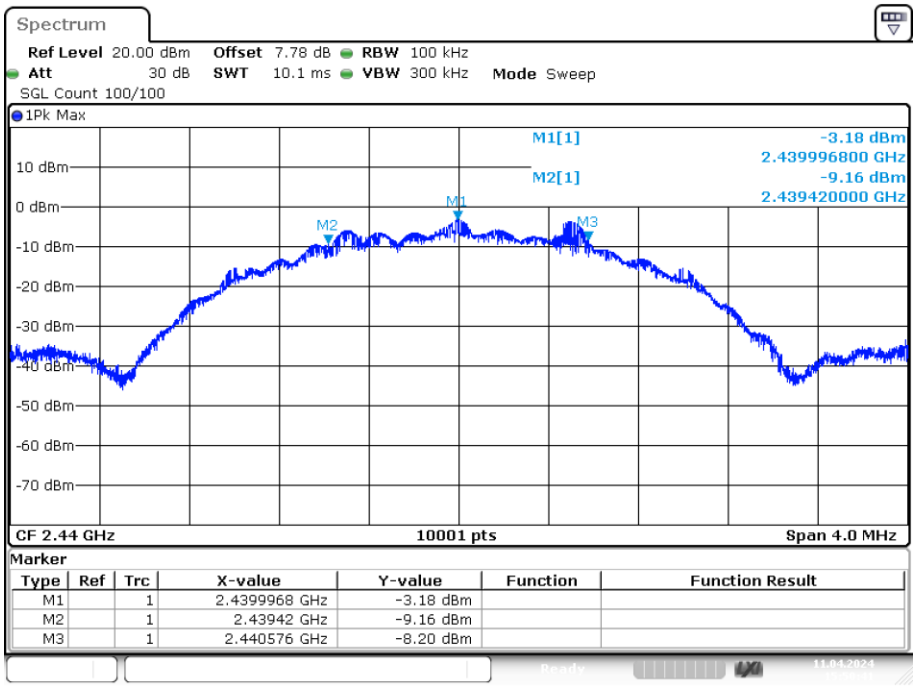
Condition	Mode	Frequency (MHz)	Antenna	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	BLE 2M	2402	Ant1	1.146	0.5	Pass
NVNT	BLE 2M	2440	Ant1	1.157	0.5	Pass
NVNT	BLE 2M	2480	Ant1	1.145	0.5	Pass

-6dB Bandwidth NVNT BLE 2M 2402MHz Ant1



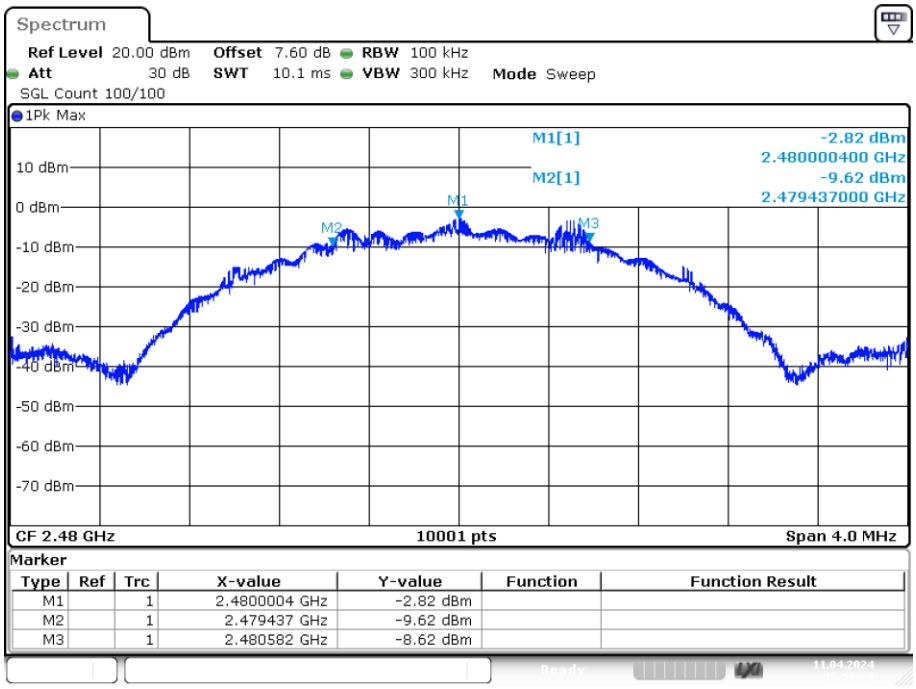
Date: 11.APR.2024 15:47:58

-6dB Bandwidth NVNT BLE 2M 2440MHz Ant1



Date: 11.APR.2024 15:50:41

-6dB Bandwidth NVNT BLE 2M 2480MHz Ant1

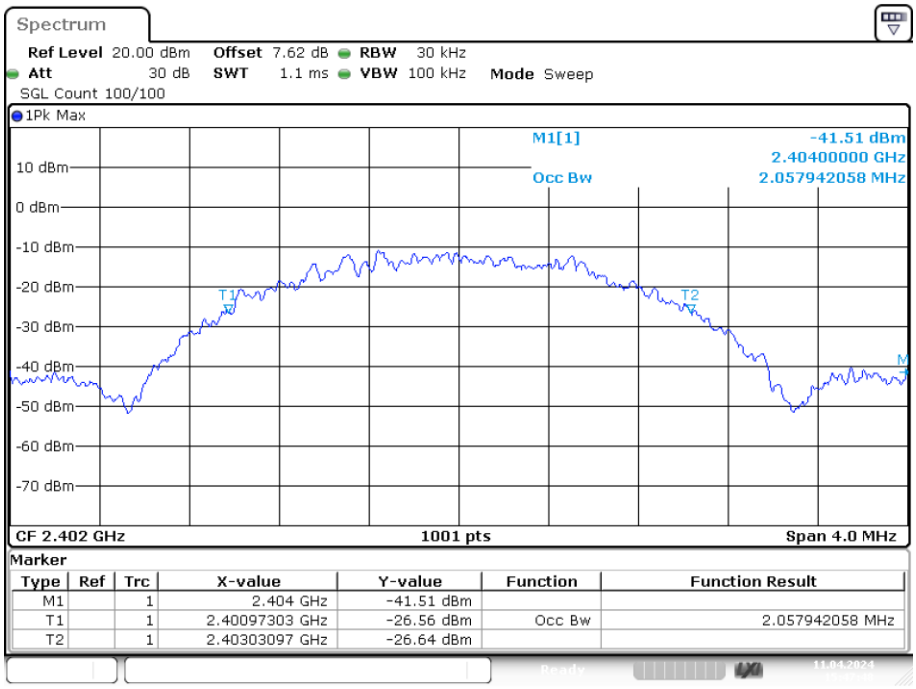


Date: 11.APR.2024 15:51:59

Occupied Channel Bandwidth

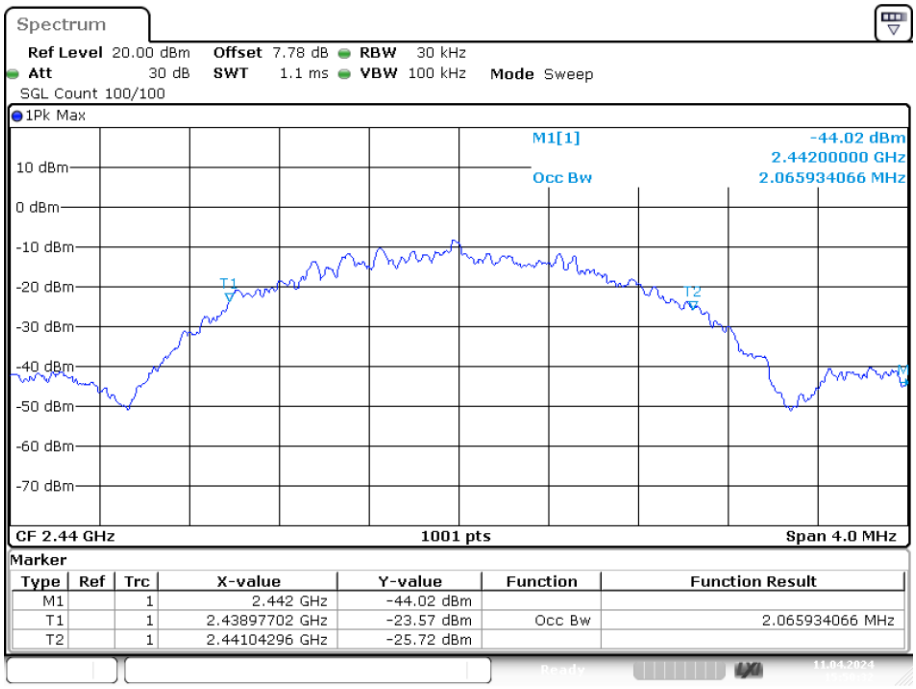
Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
NVNT	BLE 2M	2402	Ant1	2.058
NVNT	BLE 2M	2440	Ant1	2.066
NVNT	BLE 2M	2480	Ant1	2.062

OBW NVNT BLE 2M 2402MHz Ant1



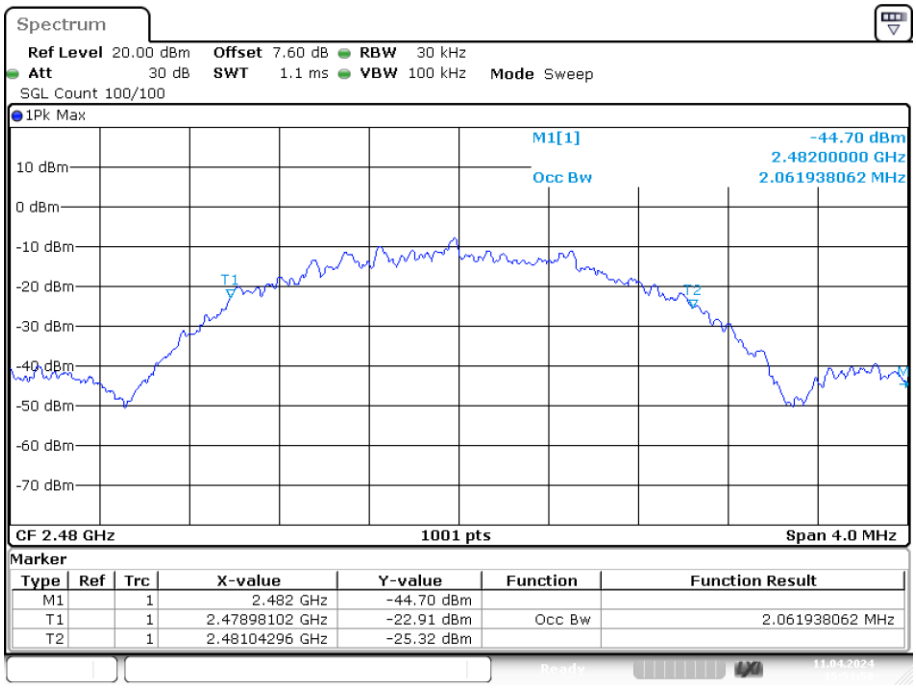
Date: 11.APR.2024 15:47:48

OBW NVNT BLE 2M 2440MHz Ant1



Date: 11.APR.2024 15:50:32

OBW NVNT BLE 2M 2480MHz Ant1



Date: 11.APR.2024 15:51:50

8. BAND EDGE CHECK

8.1. Test limits

Please refer section RSS-GEN&15.247.

8.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance v05r02

8.2.1 For radiated method:

1) Put the EUT on a 1.5m high table, power on the EUT. Emissions were scanned and measured rotating the EUT to 360 degrees, Find the maximum Emission

2) Check the spurious emissions out of band.

3) RBW 1MHz, VBW 3MHz, peak detector for peak value, RBW 1MHz, VBW 10Hz, RMS detector for AV value.

8.2.2For conducted method:

1) Span: Wide enough to capture the peak level of the emission operating on the channel closest to the band-edge, as well as any modulation products that fall outside of the authorized band of operation.

2) Reference level: As required to keep the signal from exceeding the maximum instrument input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.6.2.

3) Attenuation: Auto (at least 10 dB preferred).

4) Sweep time: No faster than coupled (auto) time.

5) Resolution bandwidth: 100 kHz.54

6) Video bandwidth: 300 kHz.

7) Detector: Peak.

8) Trace: Max-hold.

8.3. Test Setup

Same as 5.2.2.

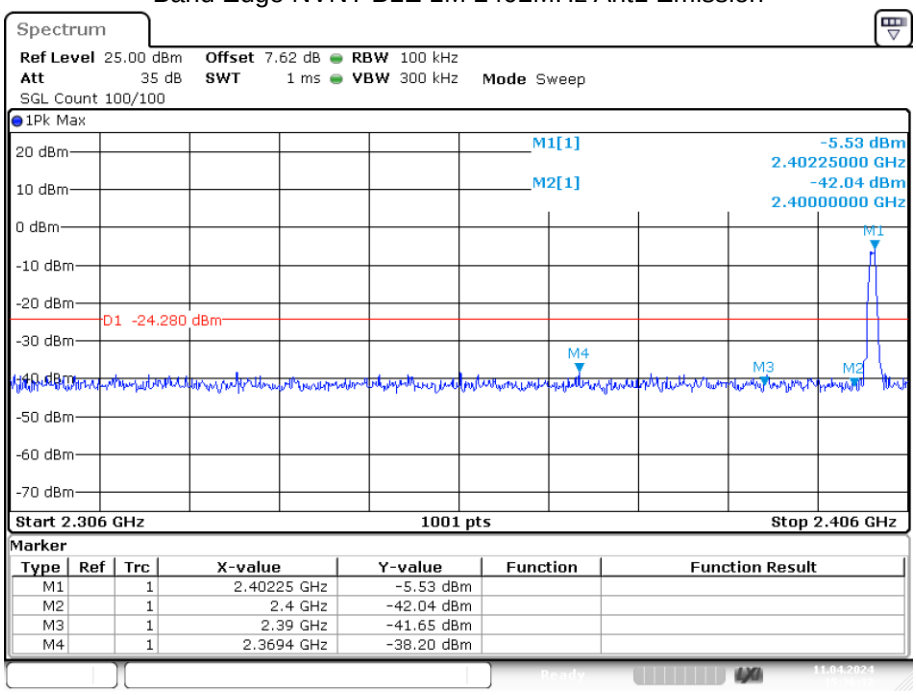
8.4. Test Results

Pass

The test results are listed in next pages.

Conducted method

Band Edge NVNT BLE 1M 2402MHz Ant1 Emission

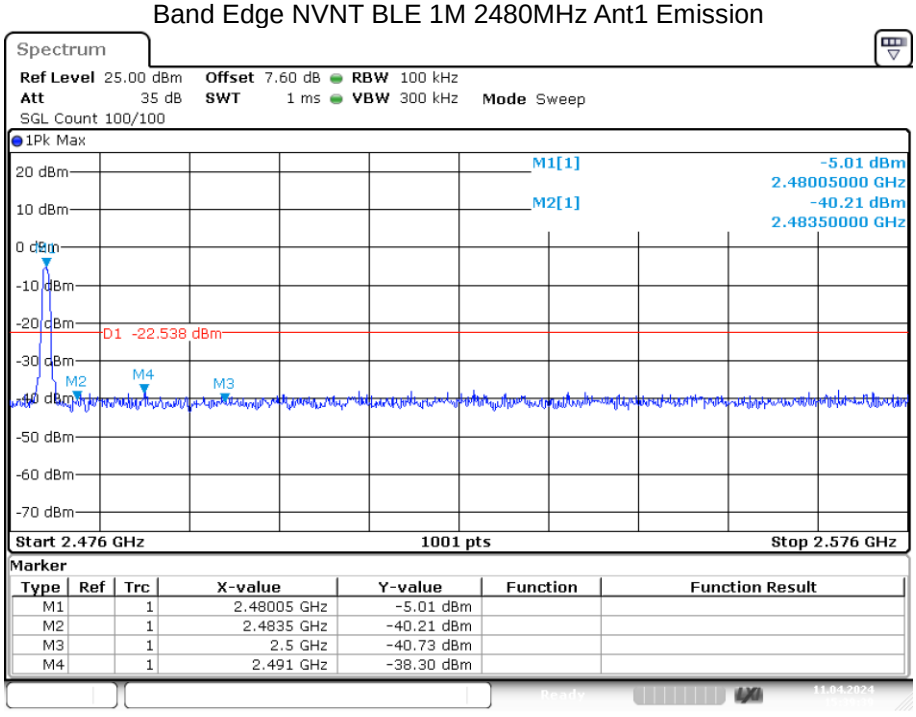


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40225 GHz	-5.53 dBm		
M2		1	2.4 GHz	-42.04 dBm		
M3		1	2.39 GHz	-41.65 dBm		
M4		1	2.3694 GHz	-38.20 dBm		

Date: 11.APR.2024 15:36:31

Band Edge NVNT BLE 1M 2480MHz Ant1 Emission

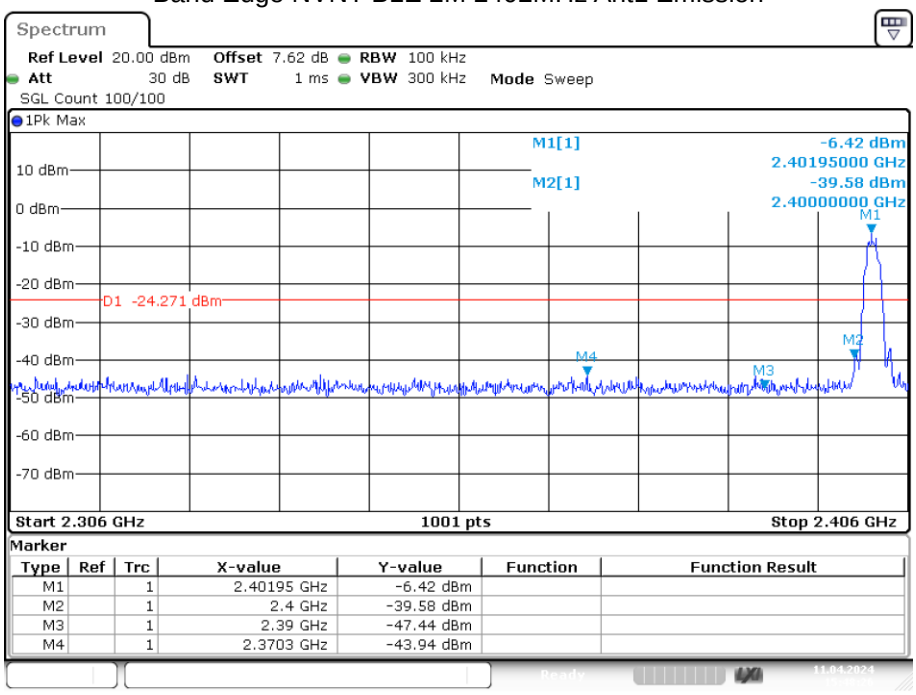


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.48005 GHz	-5.01 dBm		
M2		1	2.4835 GHz	-40.21 dBm		
M3		1	2.5 GHz	-40.73 dBm		
M4		1	2.491 GHz	-38.30 dBm		

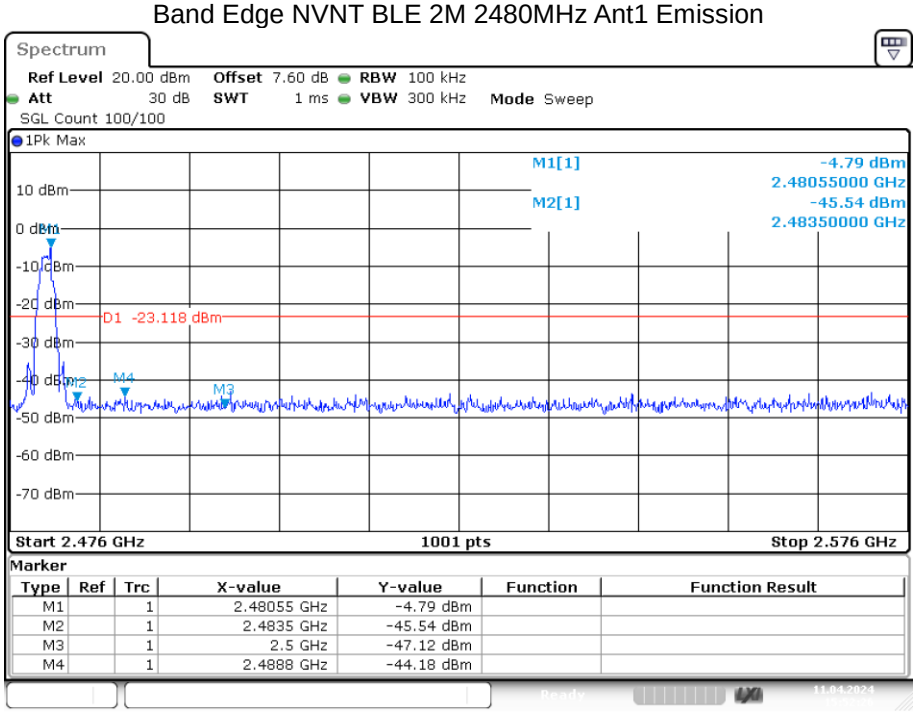
Date: 11.APR.2024 15:39:39

Band Edge NVNT BLE 2M 2402MHz Ant1 Emission



Date: 11.APR.2024 15:48:25

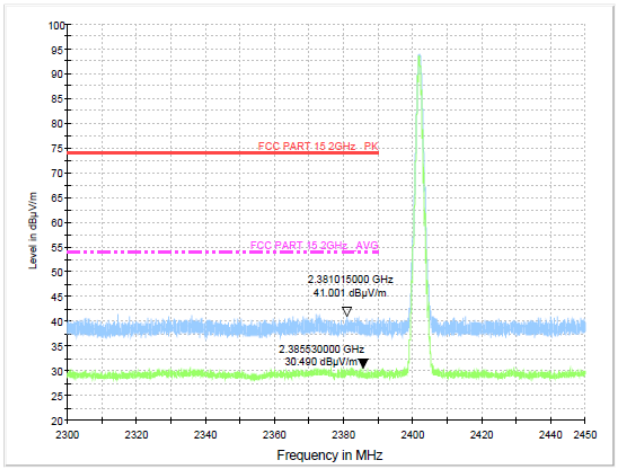
Band Edge NVNT BLE 2M 2480MHz Ant1 Emission



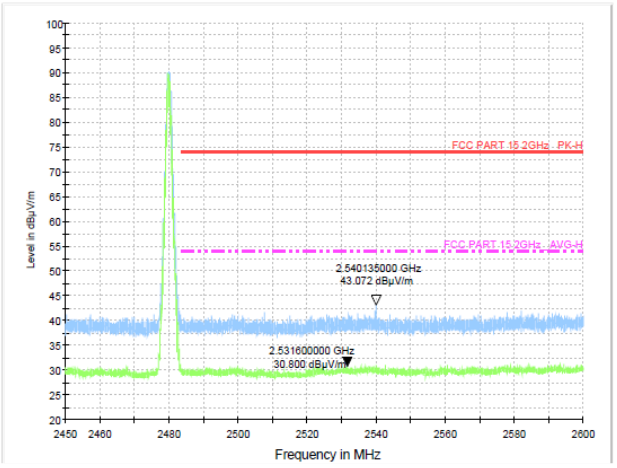
Date: 11.APR.2024 15:52:27

Radiated Method: GFSK(1M)

Test Mode: CH-L

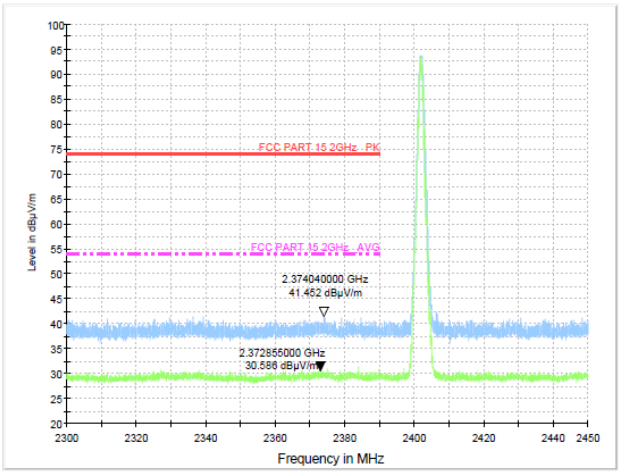


Test Mode: CH-H

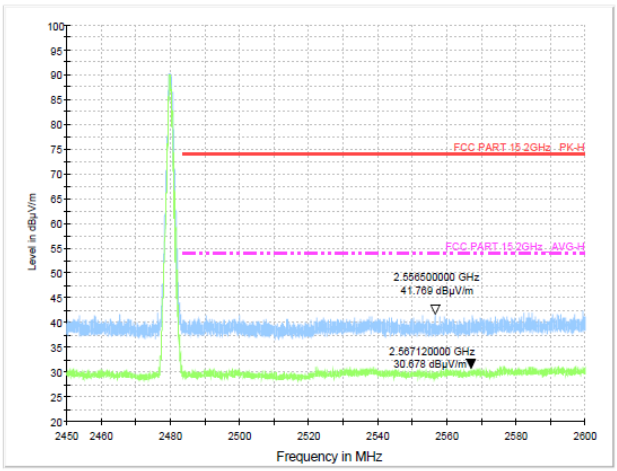


Radiated Method: GFSK(2M)

Test Mode: CH-L



Test Mode: CH-H



9. ANTENNA REQUIREMENT

9.1. Standard 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.

9.2. Antenna Connected Construction

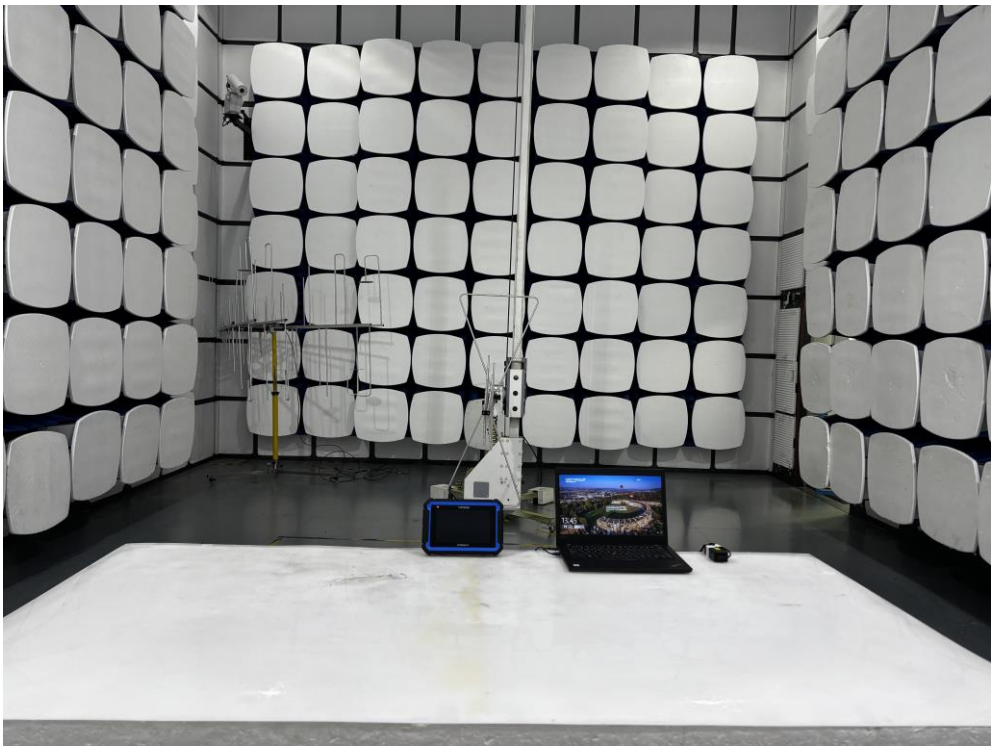
The antenna is internal antenna and no consideration of replacement. Please see EUT photo for details.

9.3. Results

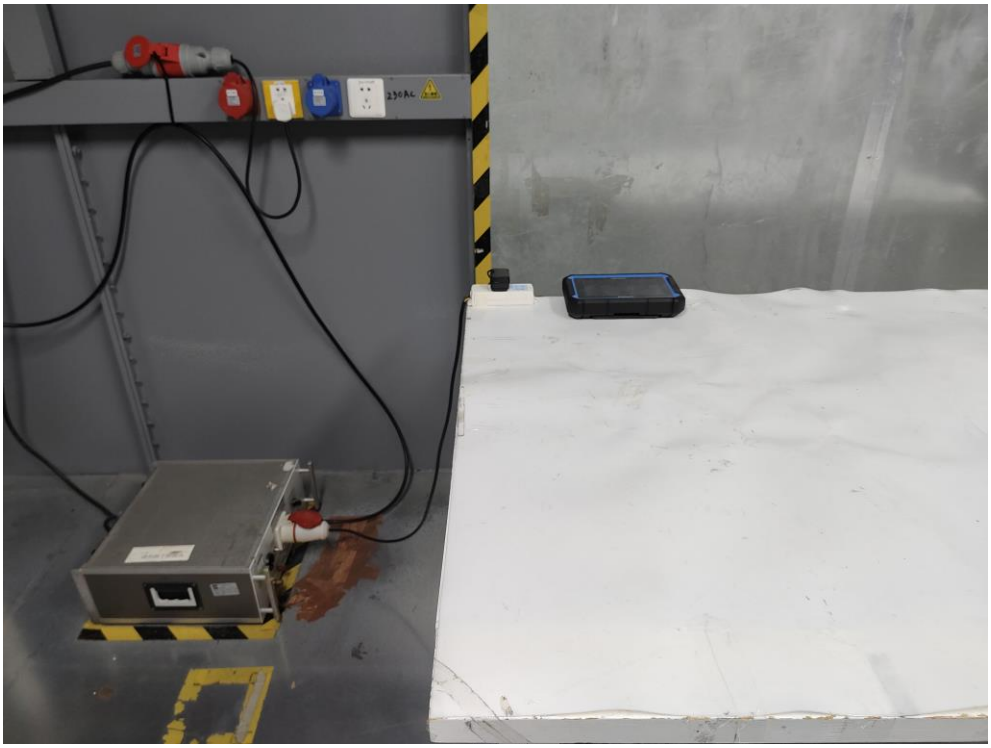
The EUT antenna is FPC Antenna. It complies with the standard requirement.

10. TEST SETUP PHOTO

10.1.Photo of Radiated Emission test



10.2.Photo of Conducted Emission test



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