



FCC TEST REPORT

FCC ID: 2AZFE-AAO-YG

On Behalf of

Shenzhen Shadow Crown Technology Co., Ltd.

LED Projector

**Model No.: YG691 Movin, W1K, YG691, YG561, YG531, YG491,
YG471, PJ30**

Prepared for : Shenzhen Shadow Crown Technology Co., Ltd.
Address : A9 East 5th floor, Industrial Building, Longwang Miao, Fuyong street,
Baoan district, Shenzhen

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 : A2307263-C01-R01
Date of Receipt : July 27, 2023
Date of Test : July 27, 2023- August 16, 2023
Date of Report : August 16, 2023
Version Number : V0

TABLE OF CONTENTS

Description	Page
TABLE OF CONTENTS	2
1. Summary of Standards And Results	5
1.1. Description of Standards and Results	5
2. General Information	6
2.1. Description of Device (EUT)	6
2.2. Accessories of Device (EUT)	7
2.3. Tested Supporting System Details	7
2.4. Block Diagram of connection between EUT and simulators	7
2.5. Test Mode Description	7
2.6. Test Conditions	8
2.7. Test Facility	8
2.8. Measurement Uncertainty	8
2.9. Test Equipment List	9
3. Spurious Emission	10
3.1. Test Limits	10
3.2. Test Procedure	10
3.3. Test Setup	11
3.4. Test Results	12
4. Power Line Conducted Emission	22
4.1. Test Limits	22
4.2. Test Procedure	22
4.3. Test Setup	22
4.4. Test Results	22
5. Conducted Maximum peak Output Power	25
5.1. Test limits	25
5.2. Test Procedure	25
5.3. Test Setup	25
5.4. Test Results	25
6. Peak Power Spectral Density	29
6.1. Test limits	29
6.2. Test Procedure	29
6.3. Test Setup	29
6.4. Test Results	29
7. Bandwidth	34
7.1. Test limits	34
7.2. Test Procedure	34
7.3. Test Setup	34
7.4. Test Results	34
8. Band Edge Check	42
8.1. Test limits	42
8.2. Test Procedure	42
8.3. Test Setup	42
8.4. Test Results	42
9. Antenna Requirement	48
9.1. Standard Requirement	48
9.2. Antenna Connected Construction	48
9.3. Results	48
10. Test setup photo	49
10.1. Photo of Radiated Emission test	49
10.2. Photo of Conducted Emission test	50

TEST REPORT DECLARATION

Applicant : Shenzhen Shadow Crown Technology Co., Ltd.
 Address : A9 East 5th floor, Industrial Building, Longwang Miao, Fuyong street, Baoan district, Shenzhen
 Manufacturer : Shenzhen Shadow Crown Technology Co., Ltd.
 Address : A9 East 5th floor, Industrial Building, Longwang Miao, Fuyong street, Baoan district, Shenzhen
 EUT Description : LED Projector
 (A) Model No. YG691 Movin, W1K, YG691, YG561, YG531, YG491, YG471, PJ30
 (B) Trademark /

Measurement Standard Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.247
ANSI C63.10-2013

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

Yannis Wen

Approved by (name + signature).....: Reak Yang
Project Manager

Reak Yang

Date of issue..... : August 16, 2023

Revision History

Revision	Issue Date	Revisions	Revised By
V0	August 16, 2023	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	Test Requirement	Standards Paragraph	Result
Conducted Emission	FCC PART 15	15.207	P
6dB Bandwidth	FCC PART 15	15.247 (a)(2)	P
Conducted Maximum Peak Output Power	FCC PART 15	15.247 (b)(3)	P
Radiated Spurious Emission	FCC PART 15	15.247 (c)	P
Conducted Spurious & Band Edge Emission	FCC PART 15	15.247 (d)	P
Power Spectral Density	FCC PART 15	15.247 (e)	P
Radiated Band Edge Emission	FCC PART 15	15.205	P
Antenna Requirement	FCC PART 15	15.203	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.

4. 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	: LED Projector
Model Number	: YG691 Movin, W1K, YG691, YG561, YG531, YG491, YG471, PJ30
Diff	: There is no difference except the name of the model. All tests are made with the YG691 Movin model.
Power supply	: AC 120V/60Hz
Radio Technology	: Bluetooth BLE
Operation frequency	: 2402-2480MHz
Channel No.	: 40 Channels
Channel spacing	: 2MHz
Rate	: 1Mbps, 2Mbps
Modulation type	: GFSK
Antenna Type	: Internal antenna 3, max gain 4.73dBi (Antenna information is provided by applicant.)
Software version	: V1.0
Hardware version	: V1.0
Connector cable loss	: N/A
Intend use environment	: Residential, commercial and light industrial environment

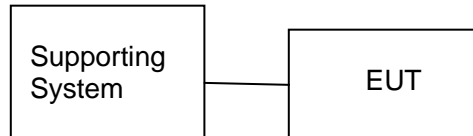
2.2. Accessories of Device (EUT)

Accessories : /
 Manufacturer : /
 Model : /
 Ratings : /

2.3. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or SDoC
1	Notebook PC	Lenovo	ThinkPad E14	N/A	N/A

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 (1M/2Mbps)	Low :CH1	2402
	Middle: CH20	2440
	High: CH40	2480

2.6. Test Conditions

Items	Required	Actual
Temperature range:	15-35°C	24°C
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 25, 2017 Certificated by IC
 Registration Number: 12315A

2.8. Measurement Uncertainty

(95% confidence levels, k=2)

Item	Uncertainty
Uncertainty for Power point Conducted Emissions Test	2.74dB
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	2.13 dB(Polarize: V)
	2.57dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.77dB(Polarize: V)
	3.80dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	4.13dB(Polarize: H)
	4.16dB(Polarize: V)
Uncertainty for radio frequency	5.4×10^{-8}
Uncertainty for conducted RF Power	0.37dB
Uncertainty for temperature	0.2°C
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	2022.08.22	1Year
Spectrum analyzer	Agilent	N9020A	A.14.16	MY499100060	2022.08.22	1Year
Receiver	ROHDE&SCHWARZ	ESR	2.28 SP1	1316.3003K03-10 2082-Wa	2022.08.22	1Year
Receiver	R&S	ESCI	4.42 SP1	101165	2022.08.22	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	/	VULB 9168#627	2021.08.30	2Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	/	2106	2021.08.30	2Year
Active Loop Antenna	SCHWARZBECK	FMZB 1519B	/	00059	2021.08.30	2Year
RF Cable	Resenberger	Cable 1	/	RE1	2022.08.22	1Year
RF Cable	Resenberger	Cable 2	/	RE2	2022.08.22	1Year
RF Cable	Resenberger	Cable 3	/	CE1	2022.08.22	1Year
Pre-amplifier	HP	HP8347A	/	2834A00455	2022.08.22	1Year
Pre-amplifier	Agilent	8449B	/	3008A02664	2022.08.22	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	/	8126-466	2022.08.22	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	/	101043	2022.08.23	1 Year
Horn Antenna	SCHWARZBECK	BBHA9170	/	00946	2021.08.30	2 Year
Preamplifier	SKET	LNPA_1840 -50	/	SK2018101801	2022.08.22	1 Year
Power Meter	Agilent	E9300A	/	MY41496628	2022.08.22	1 Year
Power Sensor	DARE	RPR3006W	/	15100041SNO91	2022.08.22	1 Year
Temp. & Humid. Chamber	Weihuang	WHTH-1000 -40-880	/	100631	2023.04.18	1 Year
Switching Mode Power Supply	JUNKE	JK12010S	/	20140927-6	2022.08.22	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

Frequencies (MHz)	Field Strength (micorvolts/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

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.

NOTE:

- a) The tighter limit applies at the band edges.
- b) Emission Level(dB uV/m)=20log Emission Level(uv/m)

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

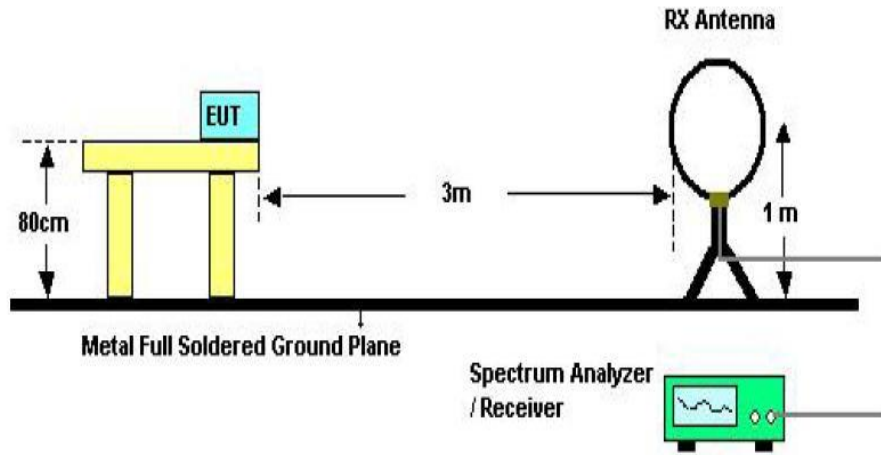
The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set of make measurement.

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

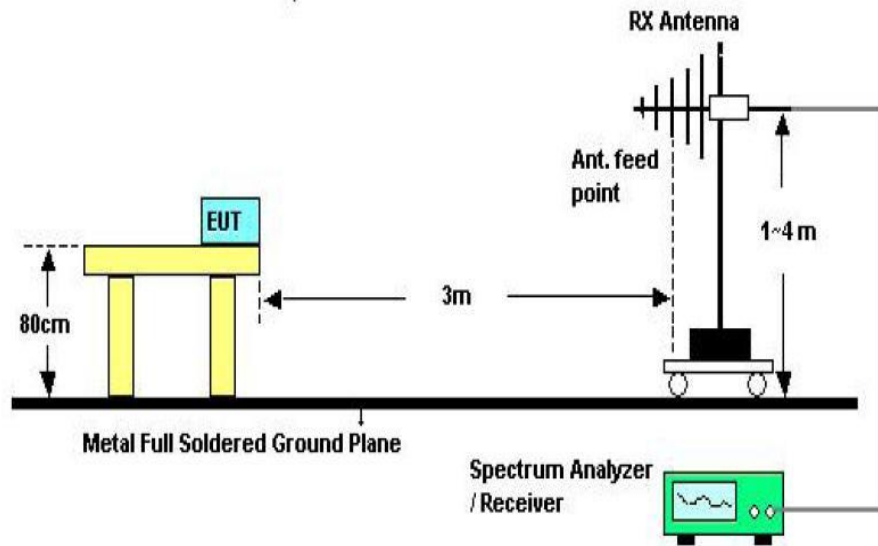
If Peak value comply with QP limit Below 1GHz.The EUT deemed to comply with QP limit. But the Peak value and average value both need to comply with applicable limit above 1GHz.

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

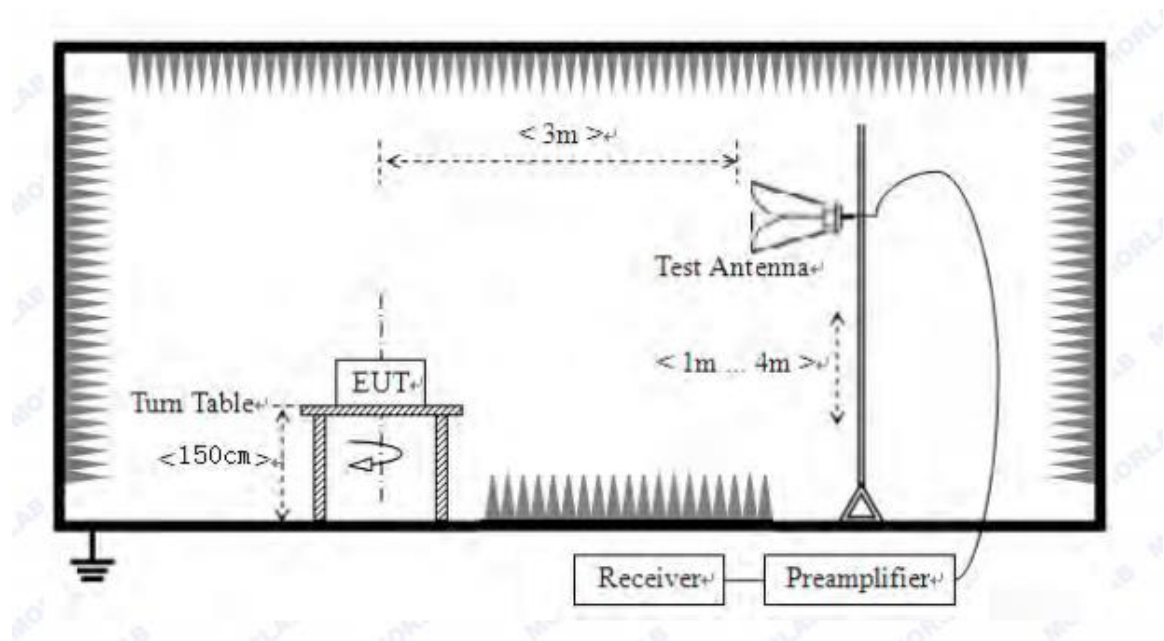
3.3. Test Setup



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.

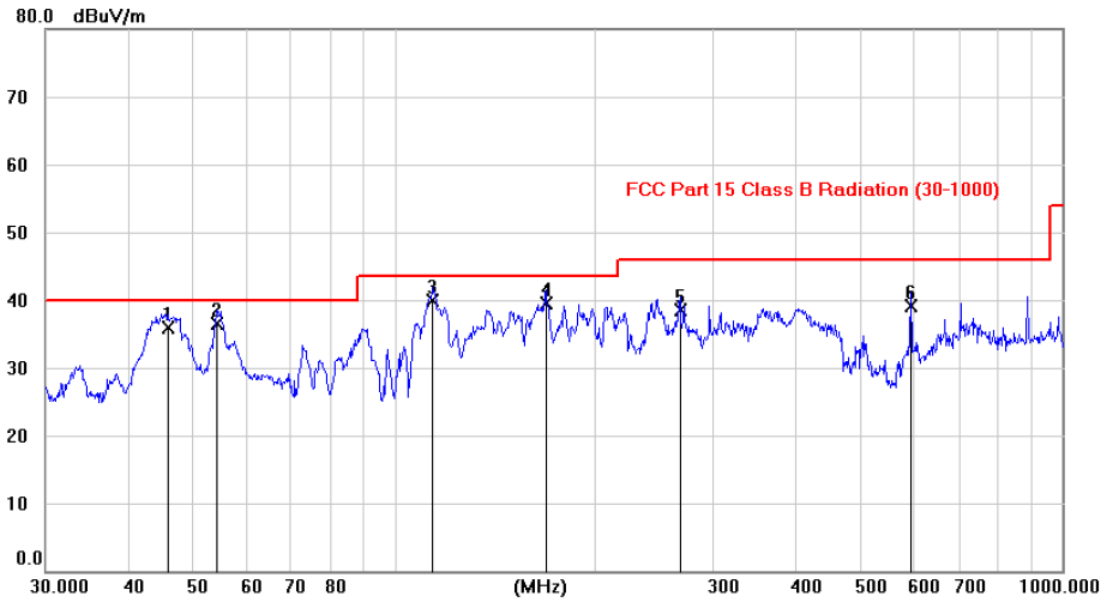
Detailed information please see the following page.

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

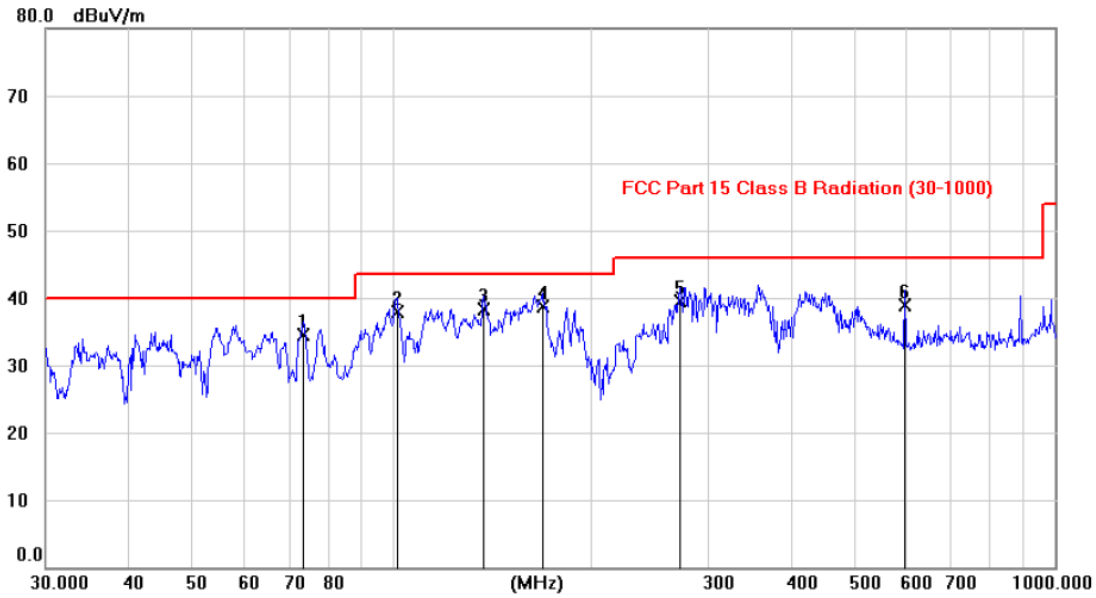


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		45.7642	21.85	14.11	35.96	40.00	-4.04			QP
2	*	54.1912	22.82	13.69	36.51	40.00	-3.49			QP
3		114.5012	27.59	12.37	39.96	43.50	-3.54			QP
4		168.6895	25.38	14.21	39.59	43.50	-3.91			QP
5		268.4224	25.18	13.24	38.42	46.00	-7.58			QP
6		593.3963	19.06	20.09	39.15	46.00	-6.85			QP

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. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Height cm	Table Degree degree	Comment
1	73.3850	23.65	10.81	34.46	40.00	-5.54	QP			
2	101.7750	26.92	11.02	37.94	43.50	-5.56	QP			
3	137.8866	24.17	14.16	38.33	43.50	-5.17	QP			
4 *	168.4333	24.51	14.23	38.74	43.50	-4.76	QP			
5	272.1820	26.21	13.35	39.56	46.00	-6.44	QP			
6	593.3962	18.91	20.09	39.00	46.00	-7.00	QP			

Note:1. *:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

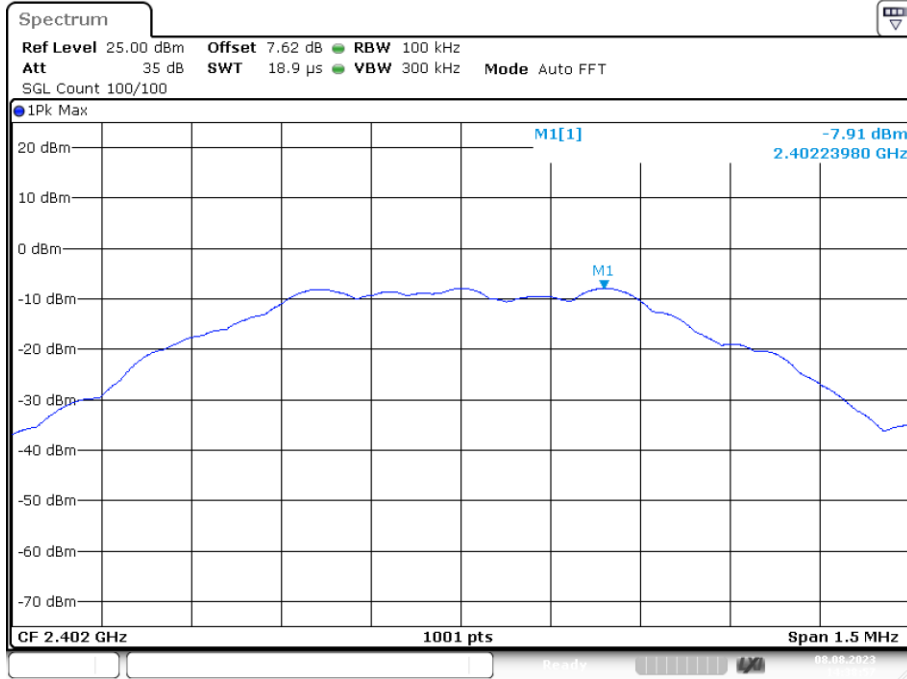
Notes: Above is below 1GHz test data. This report only shall the worst case mode for TX 2402MHz.

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	47.73	V	33.95	10.18	34.26	57.60	74	-16.40	PK
4804	39.14	V	33.95	10.18	34.26	49.01	54	-4.99	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
4804	44.40	H	33.95	10.18	34.26	54.27	74	-19.73	PK
4804	37.54	H	33.95	10.18	34.26	47.41	54	-6.59	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
Test Mode: TX Mid									
4880	44.41	V	33.93	10.2	34.29	54.25	74	-19.75	PK
4880	34.34	V	33.93	10.2	34.29	44.18	54	-9.82	AV
7320	/	/	/	/	/	/	/	/	/
9760	/	/	/	/	/	/	/	/	/
4880	43.64	H	33.93	10.2	34.29	53.48	74	-20.52	PK
4880	32.88	H	33.93	10.2	34.29	42.72	54	-11.28	AV
7320	/	/	/	/	/	/	/	/	/
9760	/	/	/	/	/	/	/	/	/
Test Mode: TX High									
4960	44.93	V	33.98	10.22	34.25	54.88	74	-19.12	PK
4960	36.73	V	33.98	10.22	34.25	46.68	54	-7.32	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/
4960	44.72	H	33.98	10.22	34.25	54.67	74	-19.33	PK
4960	34.17	H	33.98	10.22	34.25	44.12	54	-9.88	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.									

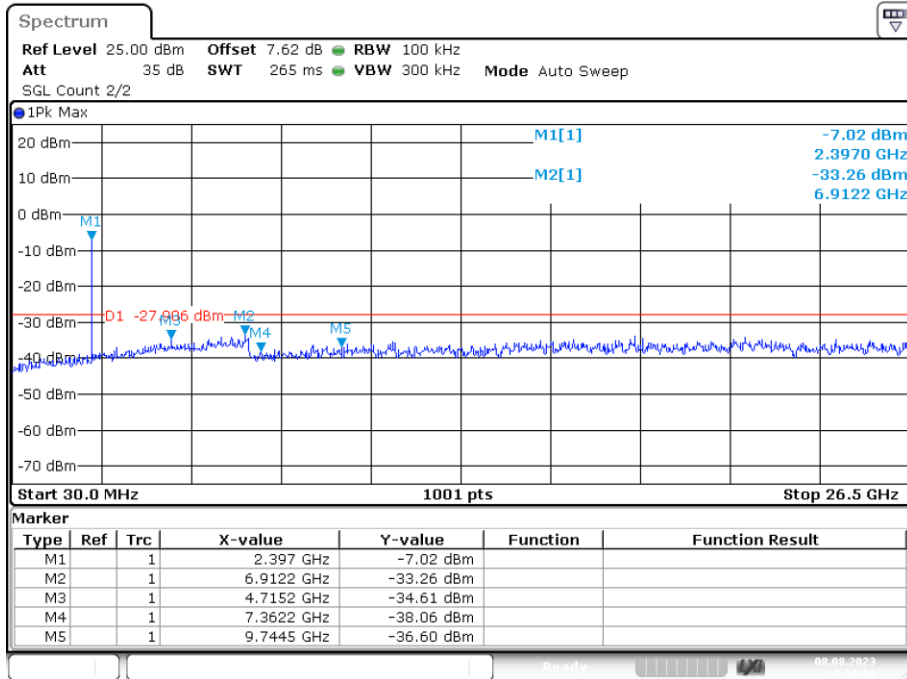
Conducted RF Spurious Emission

Tx. Spurious NVNT BLE 1M 2402MHz Ant1 Ref



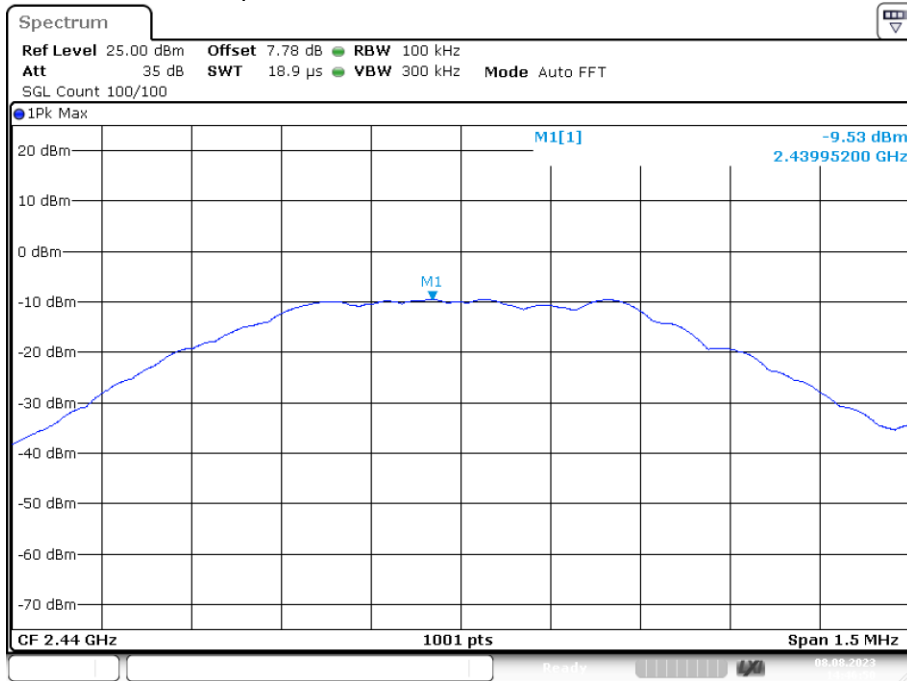
Date: 8.AUG.2023 14:38:57

Tx. Spurious NVNT BLE 1M 2402MHz Ant1 Emission



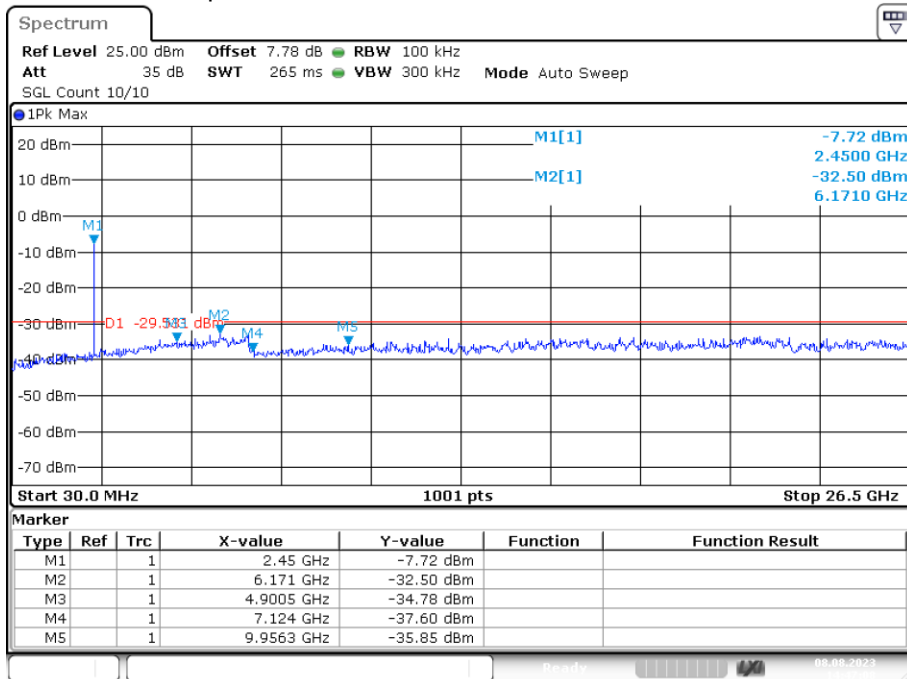
Date: 8.AUG.2023 14:39:03

Tx. Spurious NVNT BLE 1M 2440MHz Ant1 Ref



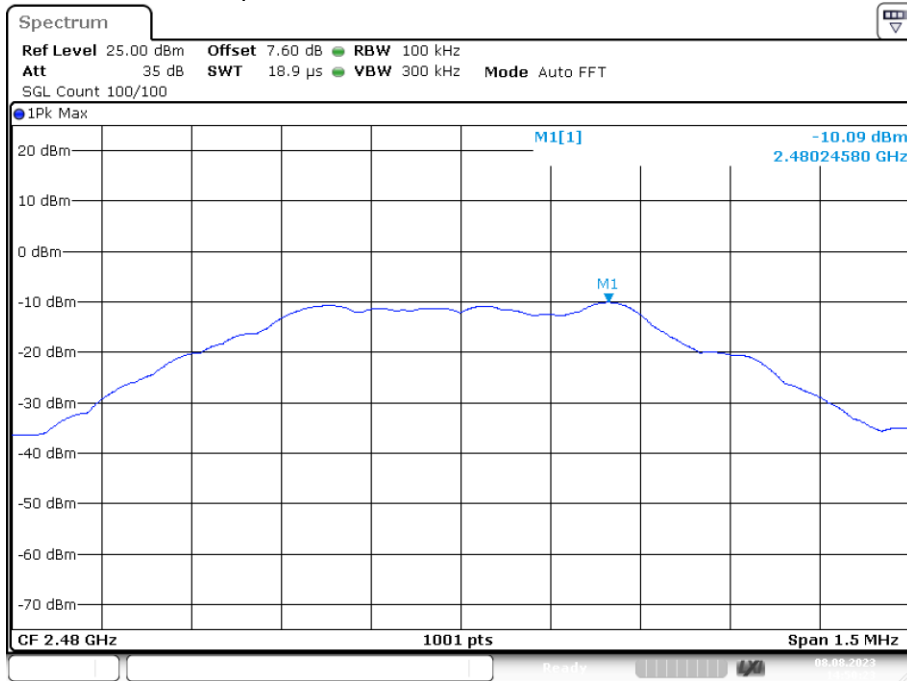
Date: 8.AUG.2023 14:46:50

Tx. Spurious NVNT BLE 1M 2440MHz Ant1 Emission



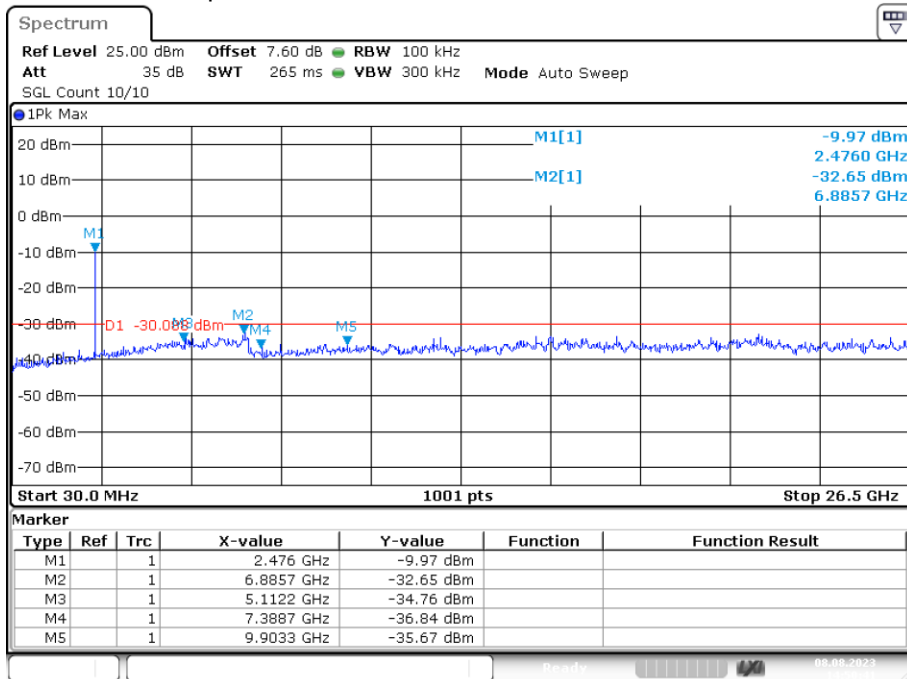
Date: 8.AUG.2023 14:47:07

Tx. Spurious NVNT BLE 1M 2480MHz Ant1 Ref



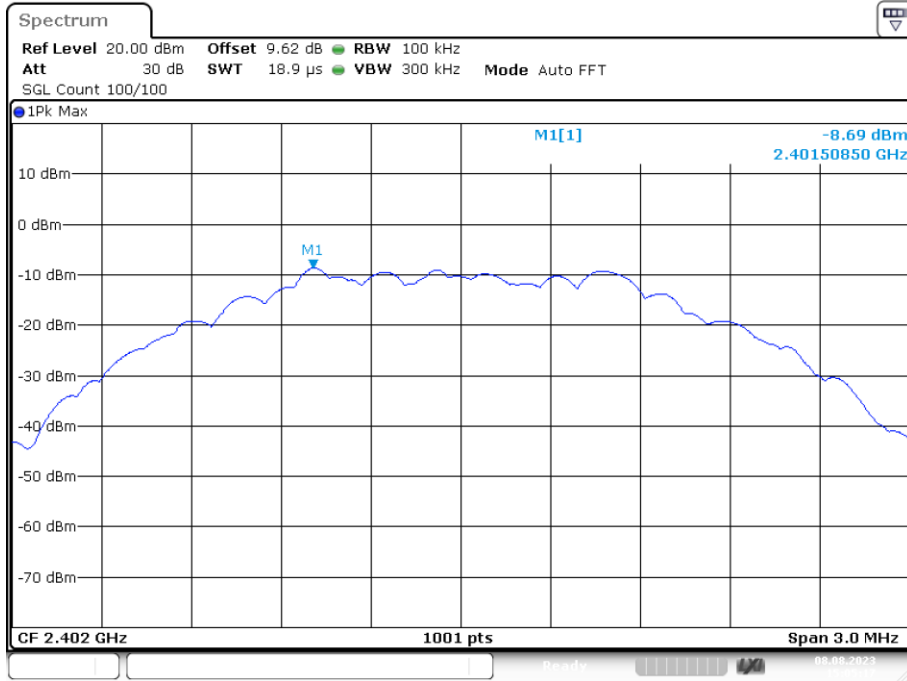
Date: 8.AUG.2023 14:50:23

Tx. Spurious NVNT BLE 1M 2480MHz Ant1 Emission



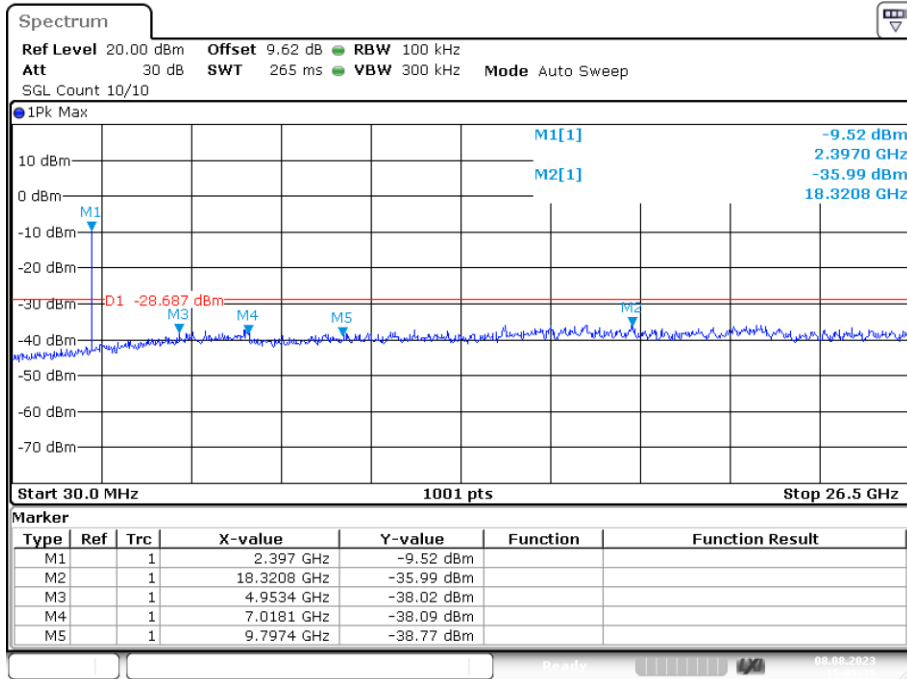
Date: 8.AUG.2023 14:50:41

Tx. Spurious NVNT BLE 2M 2402MHz Ant1 Ref



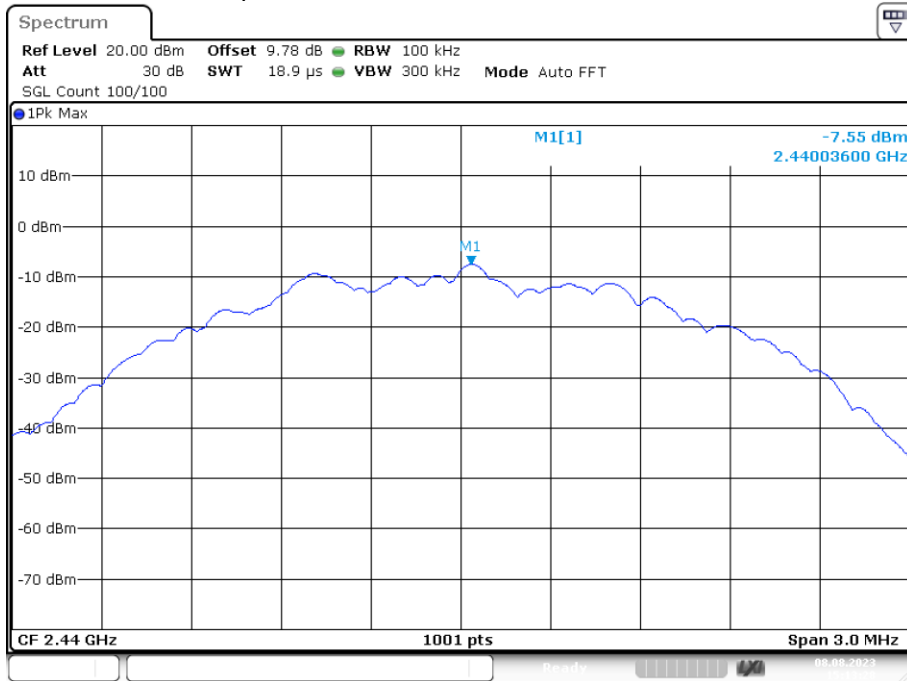
Date: 8.AUG.2023 15:05:17

Tx. Spurious NVNT BLE 2M 2402MHz Ant1 Emission



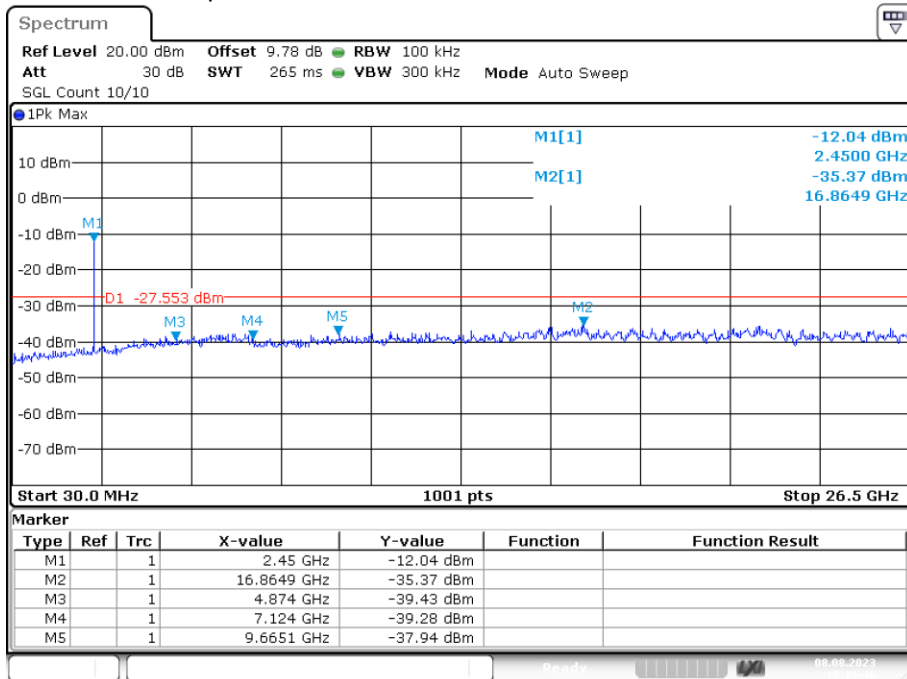
Date: 8.AUG.2023 15:05:35

Tx. Spurious NVNT BLE 2M 2440MHz Ant1 Ref



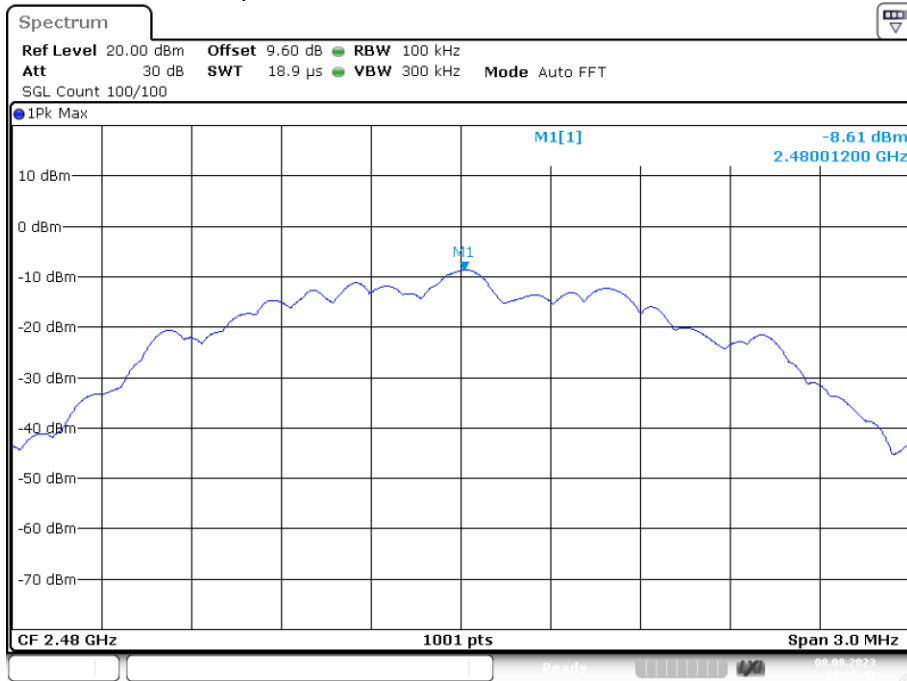
Date: 8.AUG.2023 15:13:28

Tx. Spurious NVNT BLE 2M 2440MHz Ant1 Emission



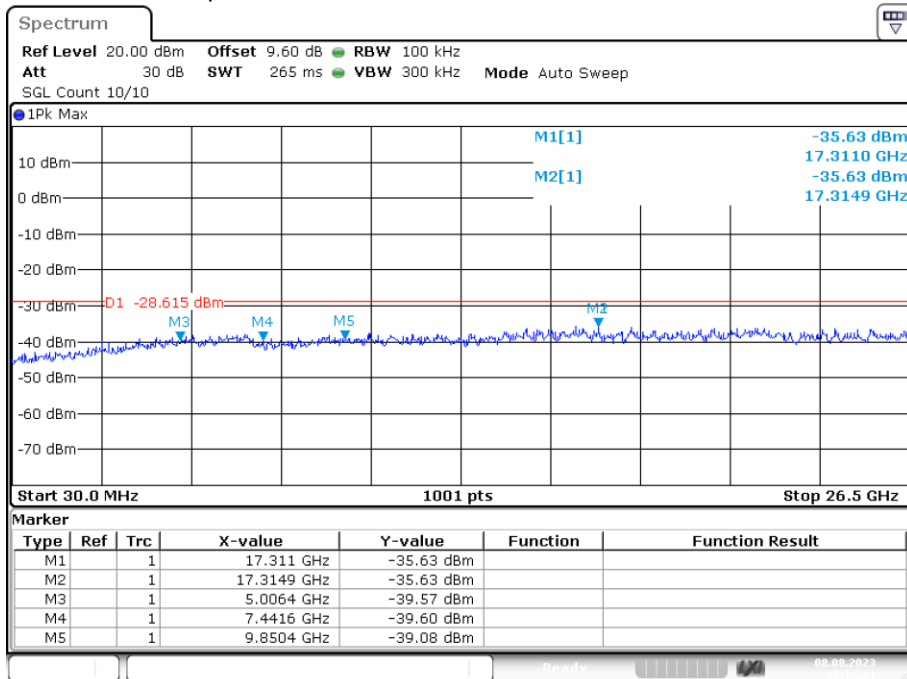
Date: 8.AUG.2023 15:13:46

Tx. Spurious NVNT BLE 2M 2480MHz Ant1 Ref



Date: 8.AUG.2023 15:15:42

Tx. Spurious NVNT BLE 2M 2480MHz Ant1 Emission



Date: 8.AUG.2023 15:16:00

4. POWER LINE CONDUCTED EMISSION

4.1. Test Limits

Frequency MHz	Limits dB(μ V)	
	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.

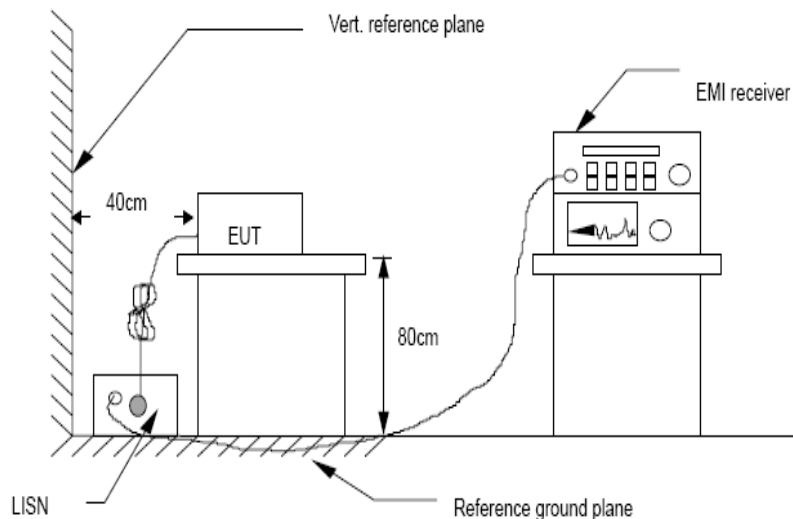
3. The limit decreases in line with the logarithm of the frequency in rang of 0.15 to 0.50 MHz.

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.

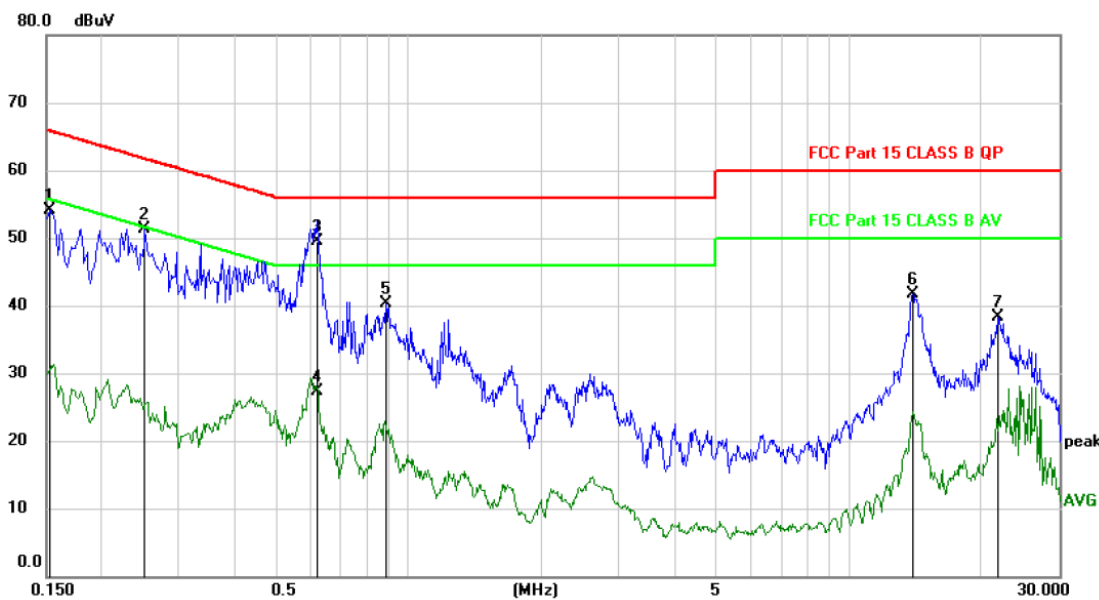
4.3. Test Setup



4.4. Test Results

Pass

Polarity: L



No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measurement dBuV	Limit dBuV	Margin dB	Detector	Comment
1	0.1530	44.17	9.94	54.11	65.84	-11.73	peak	
2	0.2519	41.41	9.97	51.38	61.69	-10.31	peak	
3 *	0.6180	39.55	9.92	49.47	56.00	-6.53	QP	
4	0.6180	17.29	9.92	27.21	46.00	-18.79	AVG	
5	0.8850	30.43	9.97	40.40	56.00	-15.60	peak	
6	13.9710	31.44	10.31	41.75	60.00	-18.25	peak	
7	21.7260	27.90	10.46	38.36	60.00	-21.64	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. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	0.1500	44.71	9.94	54.65	66.00	-11.35	peak	
2	0.2280	42.03	9.95	51.98	62.52	-10.54	peak	
3	0.6028	39.12	9.92	49.04	56.00	-6.96	QP	
4 *	0.6028	29.21	9.92	39.13	46.00	-6.87	AVG	
5	0.8880	34.20	9.97	44.17	56.00	-11.83	peak	
6	14.0907	29.71	10.31	40.02	60.00	-19.98	peak	
7	22.0947	27.30	10.46	37.76	60.00	-22.24	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 BLE 2402MHz(1Mbps) mode with the worst data is listed.

5. CONDUCTED MAXIMUM PEAK OUTPUT POWER

5.1. Test limits

Please refer section RSS-247 & 15.247.

5.2. Test Procedure

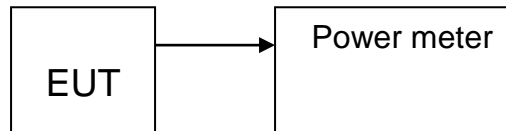
Details see the KDB 558074 D01 15.247 Meas Guidance v05r02

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

GFSK (1M)

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Total Power (dBm)	Limit (dBm)	Verdict
NVNT	BLE 1M	2402	Ant1	-7.366	-7.366	30	Pass
NVNT	BLE 1M	2440	Ant1	-8.318	-8.318	30	Pass
NVNT	BLE 1M	2480	Ant1	-9.598	-9.598	30	Pass

GFSK (2M)

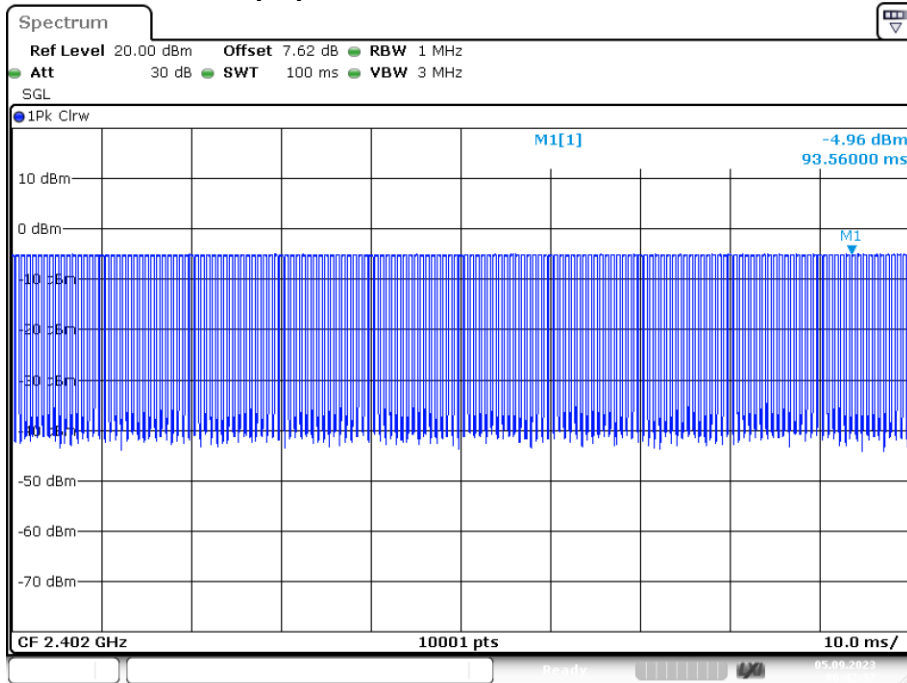
Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Total Power (dBm)	Limit (dBm)	Verdict
NVNT	BLE 2M	2402	Ant1	-5.452	-5.452	30	Pass
NVNT	BLE 2M	2440	Ant1	-6.32	-6.32	30	Pass
NVNT	BLE 2M	2480	Ant1	-7.705	-7.705	30	Pass

Duty Cycle

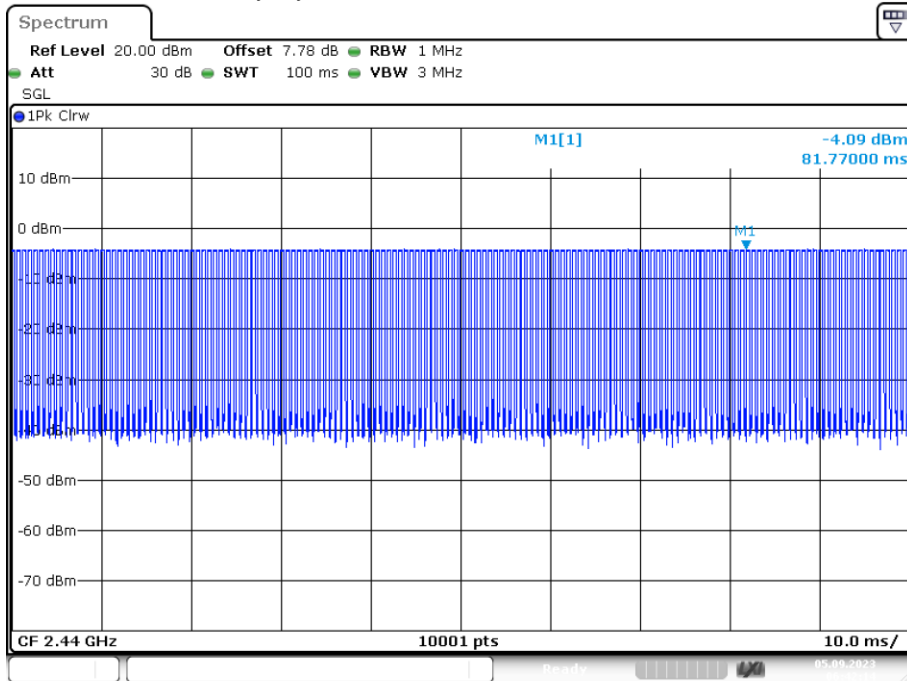
Condition	Mode	Frequency (MHz)	Antenna	Duty Cycle (%)
NVNT	BLE 1M	2402	Ant1	88.58
NVNT	BLE 1M	2440	Ant1	91.5
NVNT	BLE 1M	2480	Ant1	91.64

Condition	Mode	Frequency (MHz)	Antenna	Duty Cycle (%)
NVNT	BLE 2M	2402	Ant1	88.94
NVNT	BLE 2M	2440	Ant1	90.91
NVNT	BLE 2M	2480	Ant1	91.67

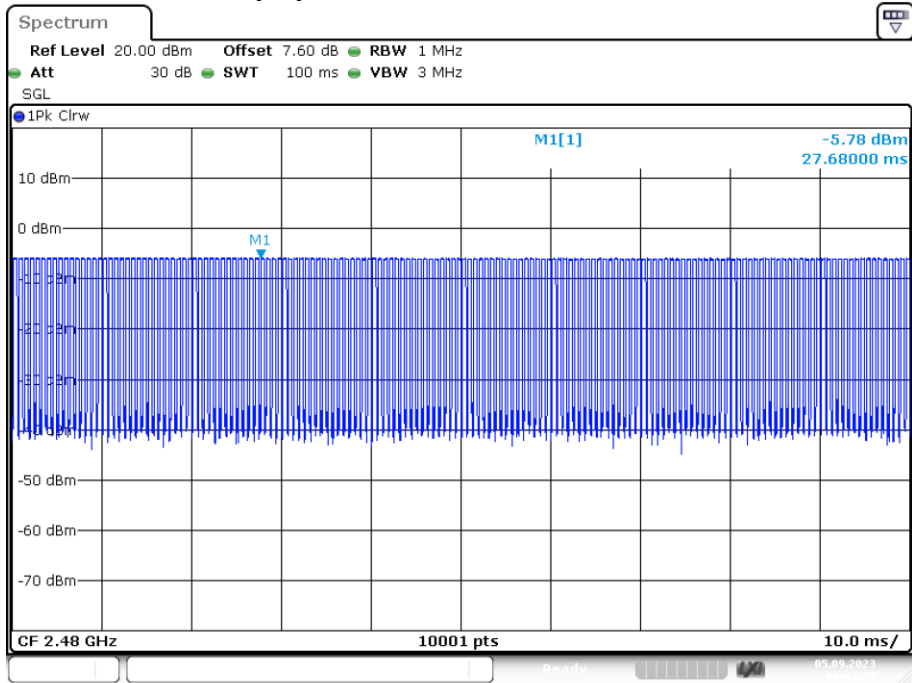
Duty Cycle NVNT BLE 1M 2402MHz Ant1



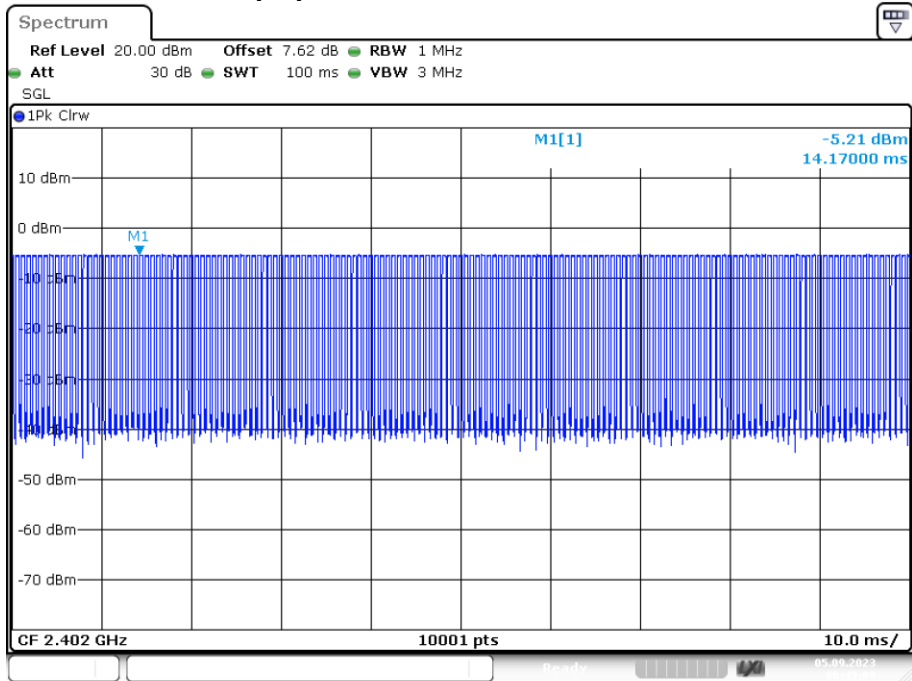
Duty Cycle NVNT BLE 1M 2440MHz Ant1



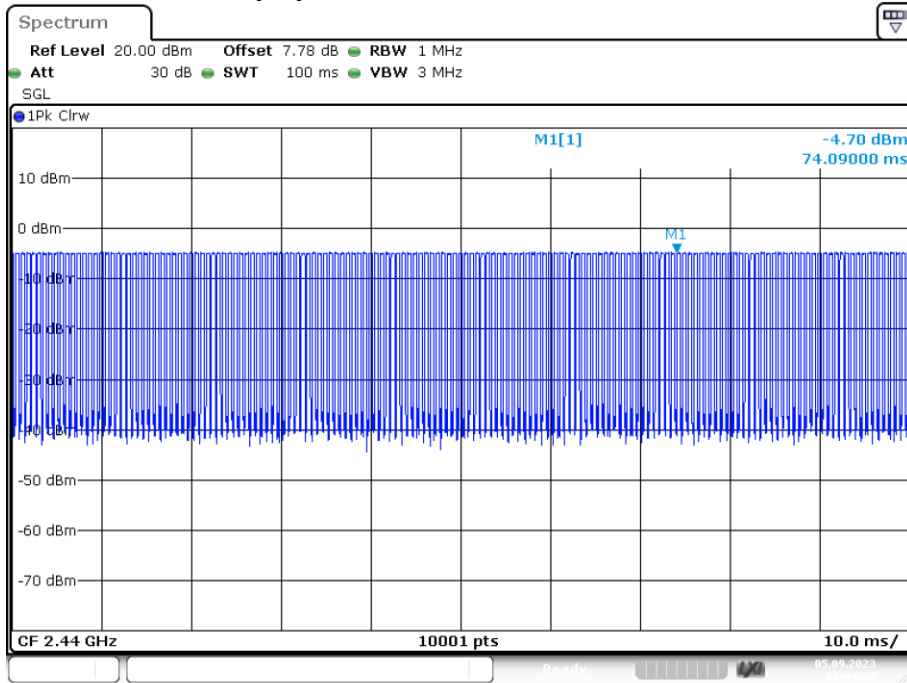
Duty Cycle NVNT BLE 1M 2480MHz Ant1



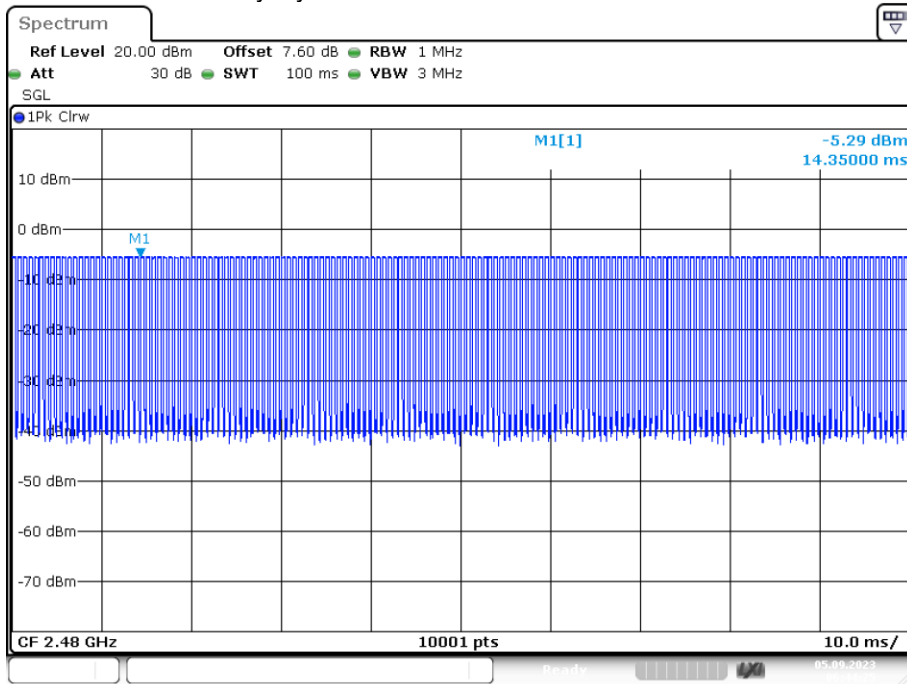
Duty Cycle NVNT BLE 2M 2402MHz Ant1



Duty Cycle NVNT BLE 2M 2440MHz Ant1



Duty Cycle NVNT BLE 2M 2480MHz Ant1



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.

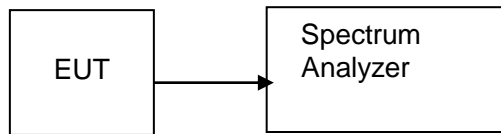
6.2.2 Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

6.2.3 Set the spectrum analyzer as RBW = 3kHz(Set the RBW to: $3\text{ kHz} \leq \text{RBW} \leq 100\text{ kHz}$.), VBW = 10kHz(Set the $\text{VBW} \geq 3 \times \text{RBW}$), 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

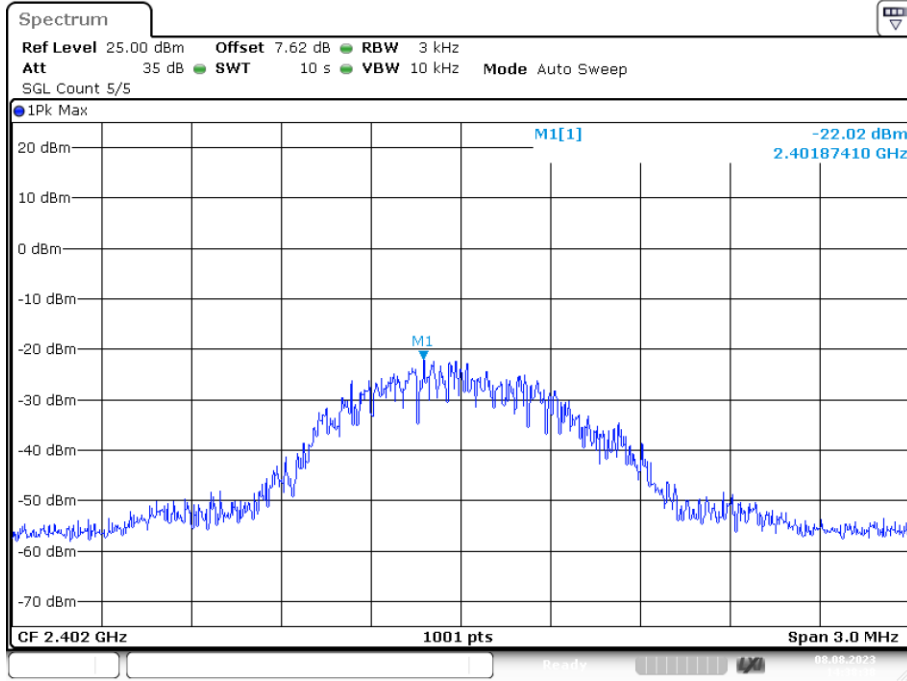
The test results are listed in next pages.

.....

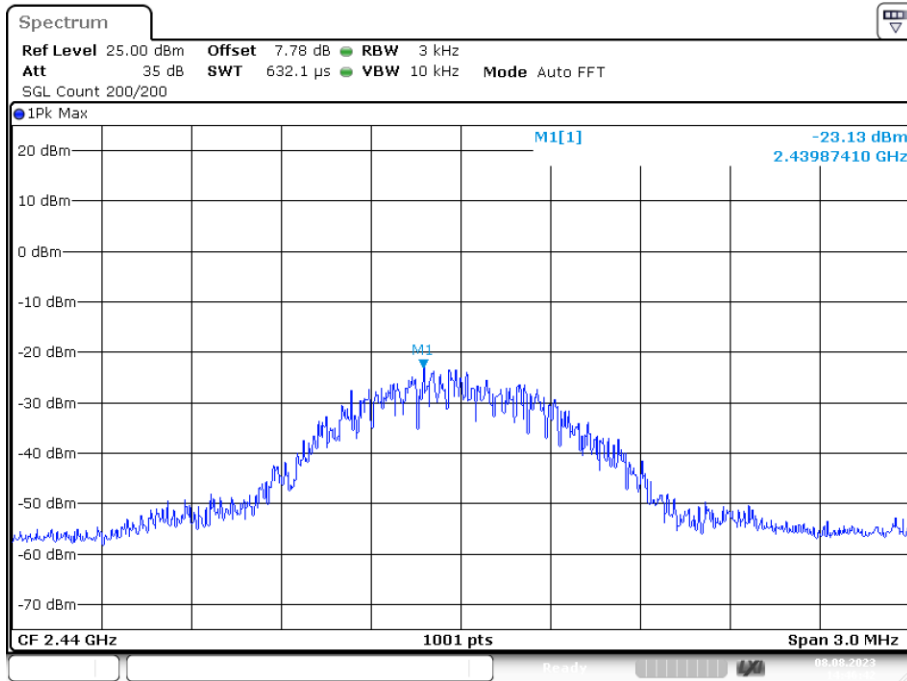
GFSK (1M)

Condition	Mode	Frequency (MHz)	Antenna	Max PSD (dBm)	Limit (dBm)	Verdict
NVNT	BLE 1M	2402	Ant1	-22.016	8	Pass
NVNT	BLE 1M	2440	Ant1	-23.135	8	Pass
NVNT	BLE 1M	2480	Ant1	-24.122	8	Pass

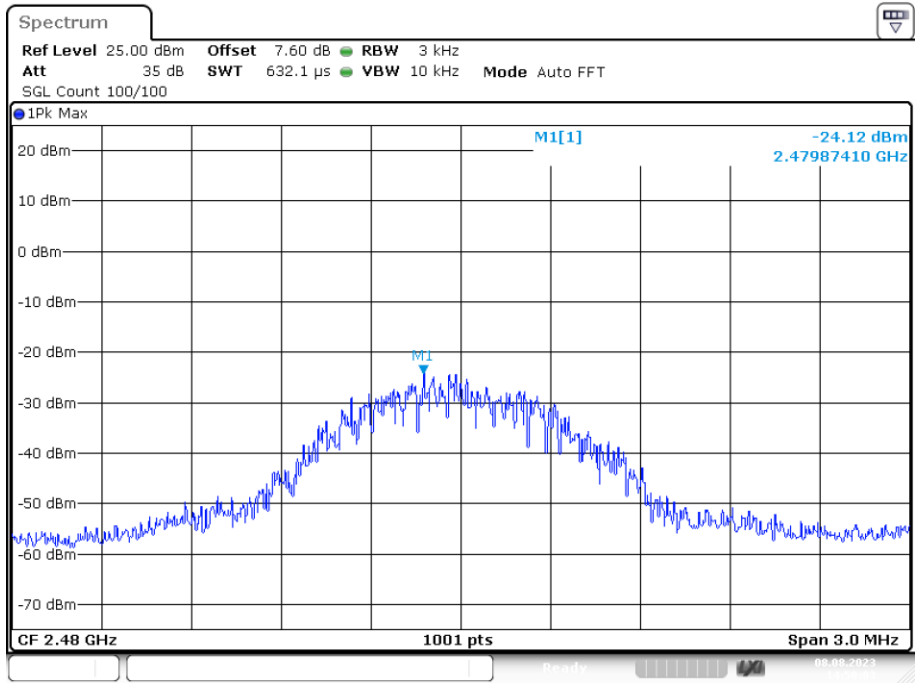
PSD NVNT BLE 1M 2402MHz Ant1



PSD NVNT BLE 1M 2440MHz Ant1



PSD NVNT BLE 1M 2480MHz Ant1

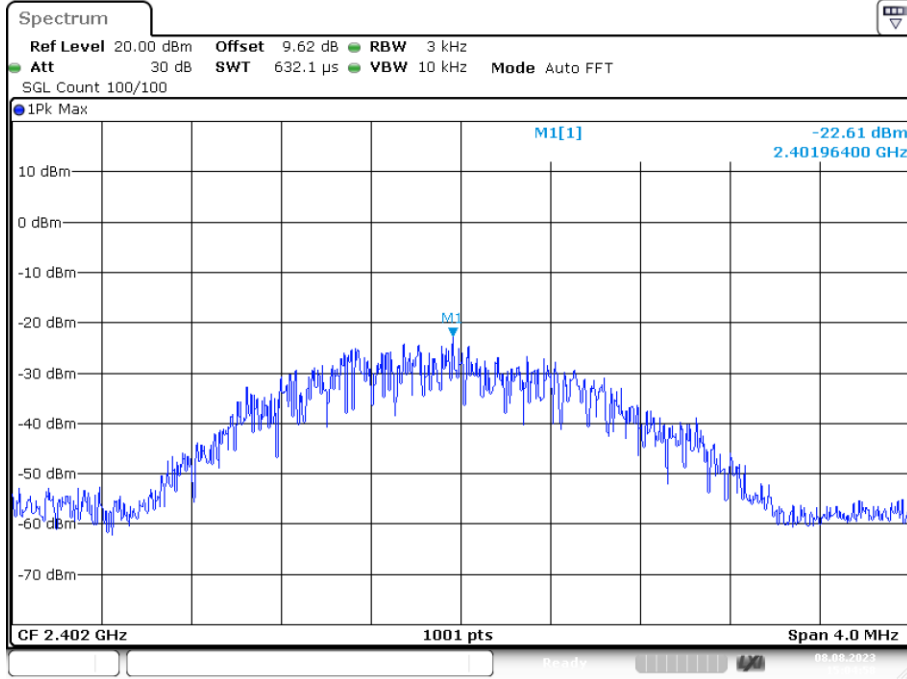


Date: 8.AUG.2023 14:50:02

GFSK (2M)

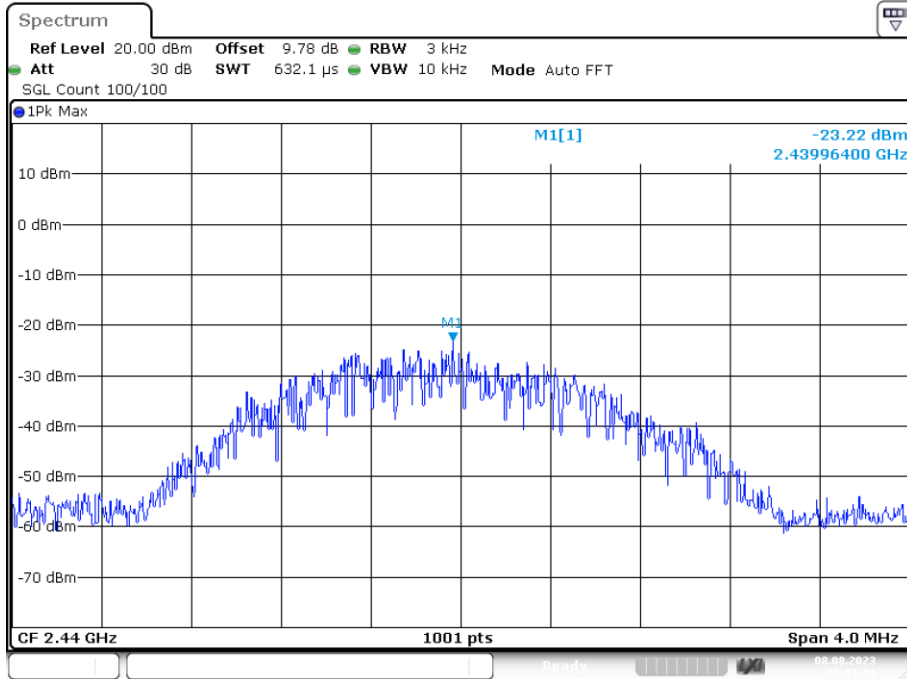
Condition	Mode	Frequency (MHz)	Antenna	Max PSD (dBm)	Limit (dBm)	Verdict
NVNT	BLE 2M	2402	Ant1	-22.611	8	Pass
NVNT	BLE 2M	2440	Ant1	-23.216	8	Pass
NVNT	BLE 2M	2480	Ant1	-24.646	8	Pass

PSD NVNT BLE 2M 2402MHz Ant1



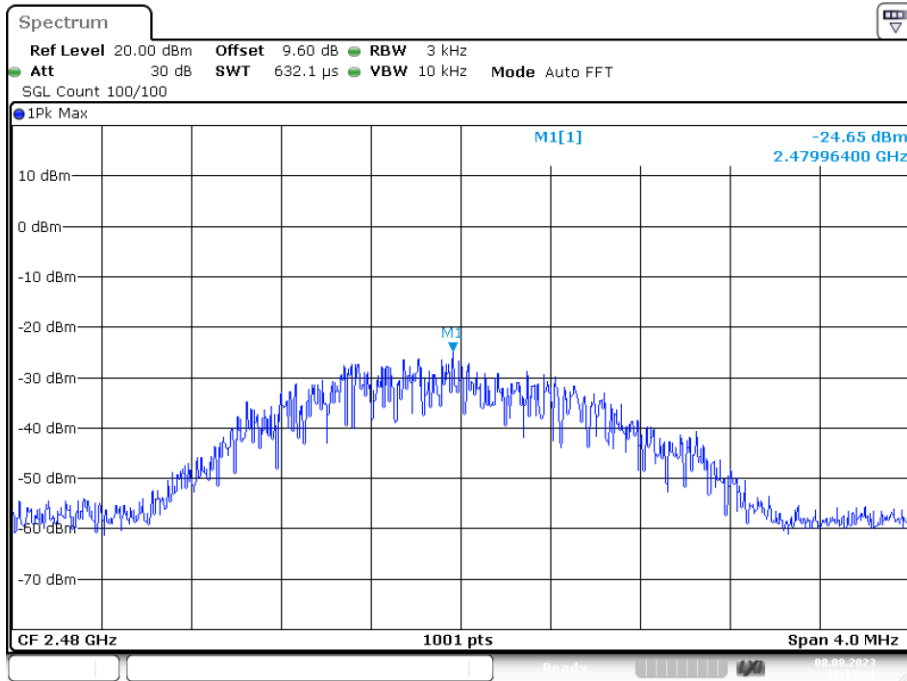
Date: 8.AUG.2023 15:04:58

PSD NVNT BLE 2M 2440MHz Ant1



Date: 8.AUG.2023 15:13:21

PSD NVNT BLE 2M 2480MHz Ant1



Date: 8.AUG.2023 15:15:21

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.

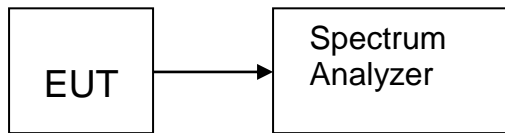
7.2. Test Procedure

Details see the KDB 558074 D01 15.247 Meas Guidance v05r02

a) The bandwidth is measured at an amplitude level reduced 20dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

b) The test receiver set RBW = 100kHz, VBW \geq 3*RBW =300kHz, sweep time set auto, detail see the test plot.

7.3. Test Setup

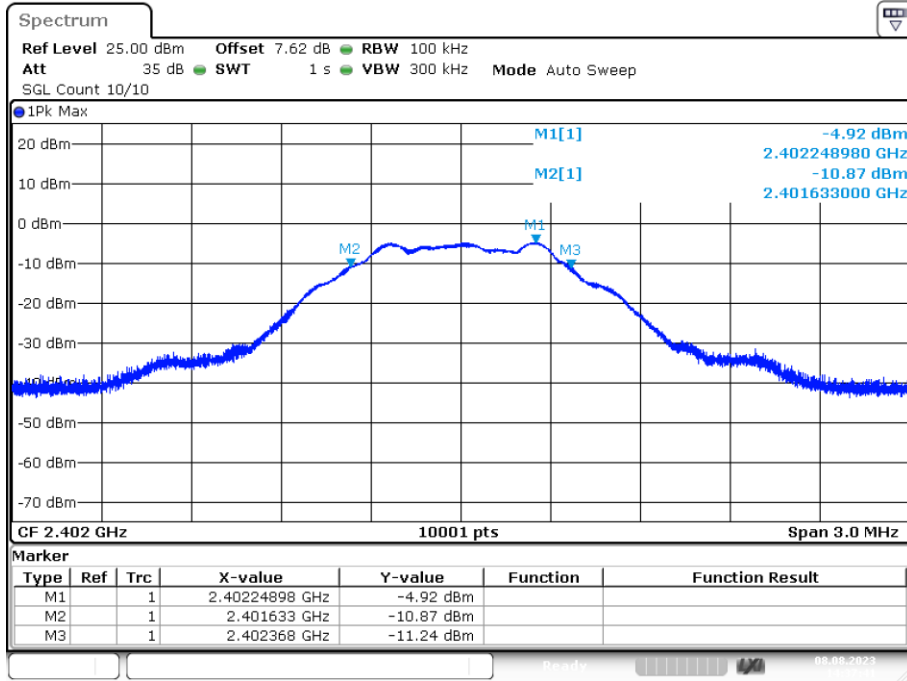


7.4. Test Results

GFSK(1M)

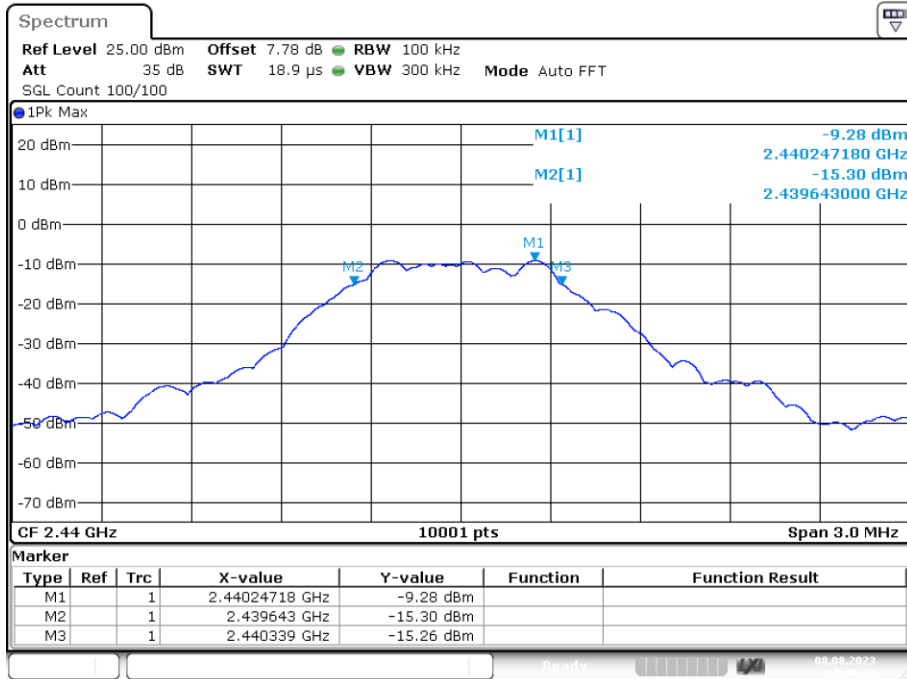
Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	BLE	2402	Ant 1	1.055	0.734	0.5	Pass
NVNT	BLE	2440	Ant 1	1.049	0.696	0.5	Pass
NVNT	BLE	2480	Ant 1	1.067	0.704	0.5	Pass

-6dB Bandwidth NVNT BLE 1M 2402MHz Ant1



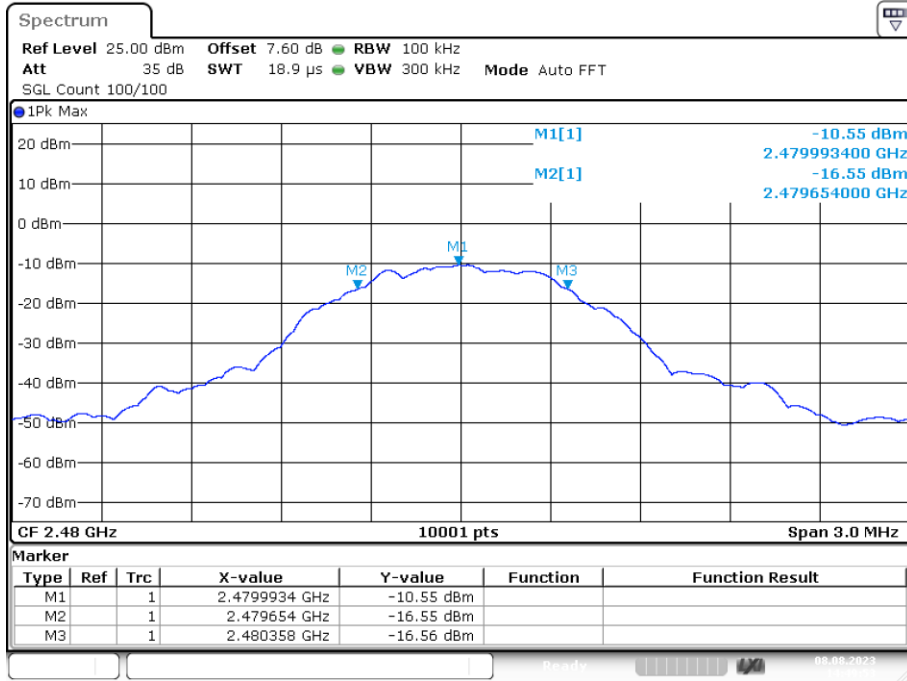
Date: 8.AUG.2023 14:37:41

-6dB Bandwidth NVNT BLE 1M 2440MHz Ant1



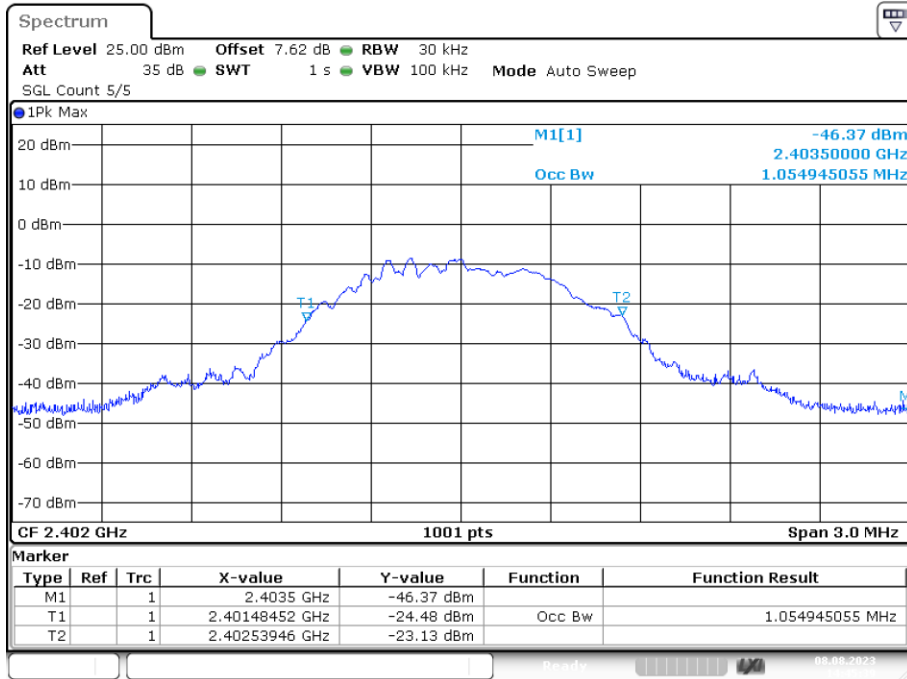
Date: 8.AUG.2023 14:46:34

-6dB Bandwidth NVNT BLE 1M 2480MHz Ant1



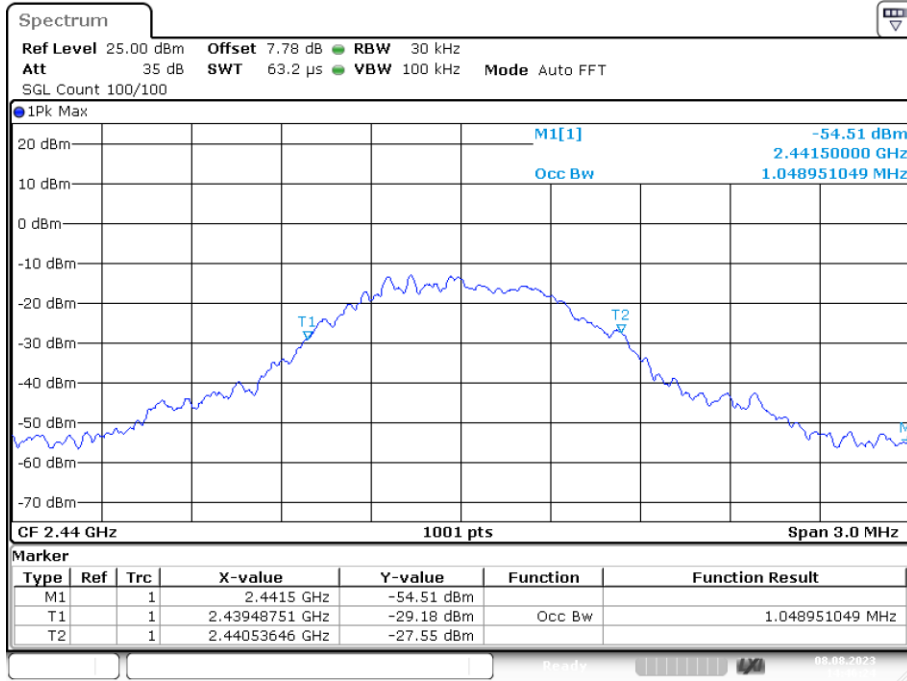
Date: 8.AUG.2023 14:49:54

OBW NVNT BLE 1M 2402MHz Ant1



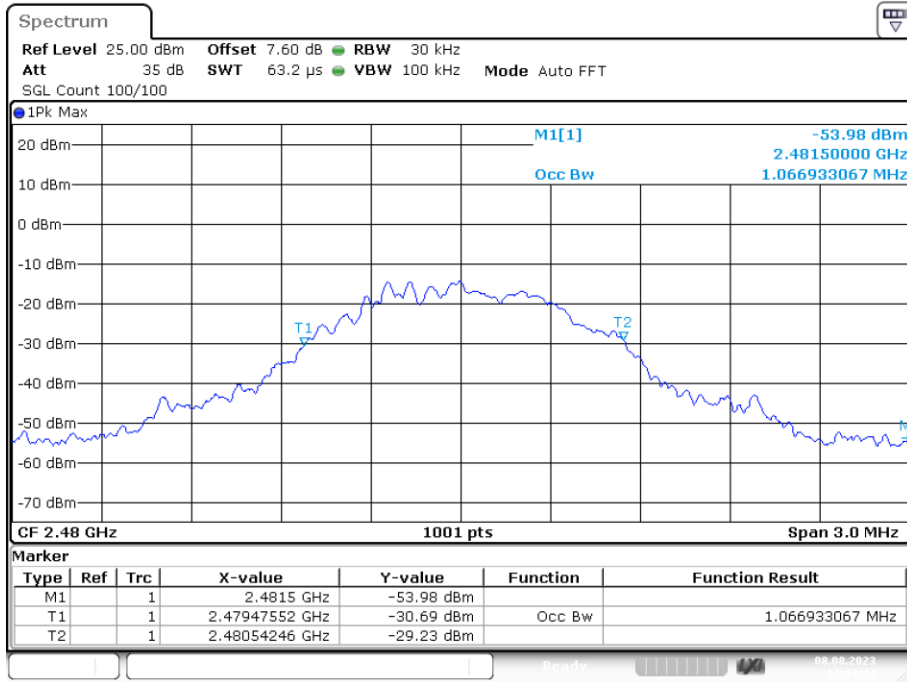
Date: 8.AUG.2023 14:45:39

OBW NVNT BLE 1M 2440MHz Ant1



Date: 8.AUG.2023 14:46:25

OBW NVNT BLE 1M 2480MHz Ant1

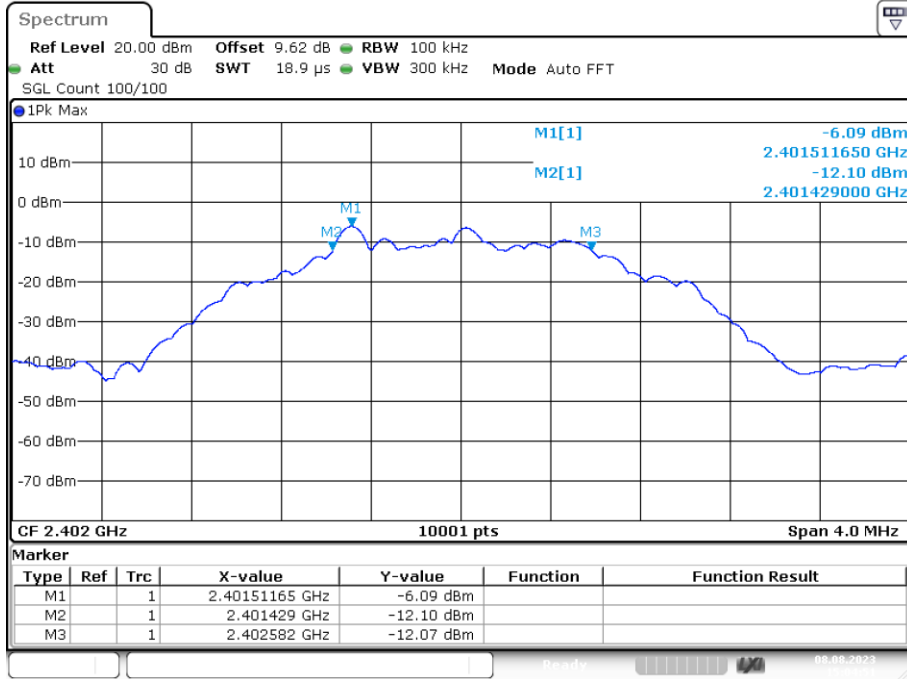


Date: 8.AUG.2023 14:49:44

GFSK(2M)

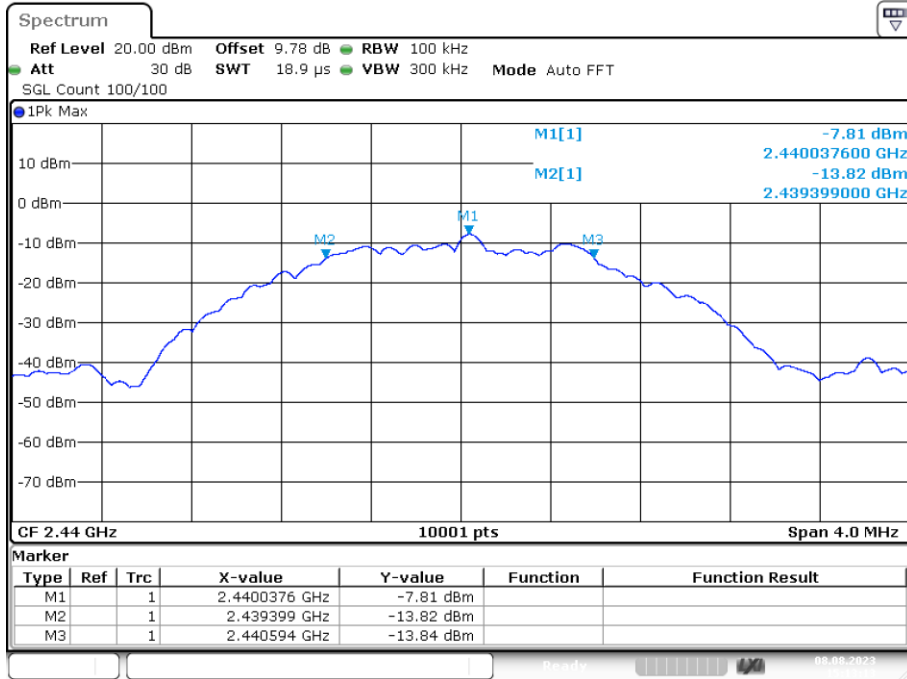
Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	BLE	2402	Ant 1	2.038	1.153	0.5	Pass
NVNT	BLE	2440	Ant 1	2.046	1.194	0.5	Pass
NVNT	BLE	2480	Ant 1	2.038	1.141	0.5	Pass

-6dB Bandwidth NVNT BLE 2M 2402MHz Ant1



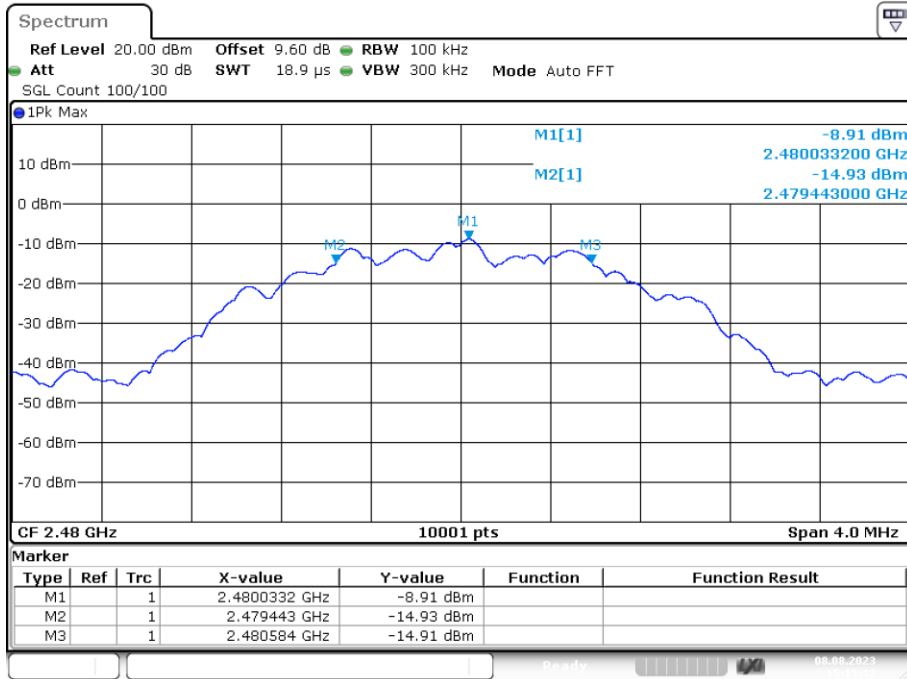
Date: 8.AUG.2023 15:04:50

-6dB Bandwidth NVNT BLE 2M 2440MHz Ant1



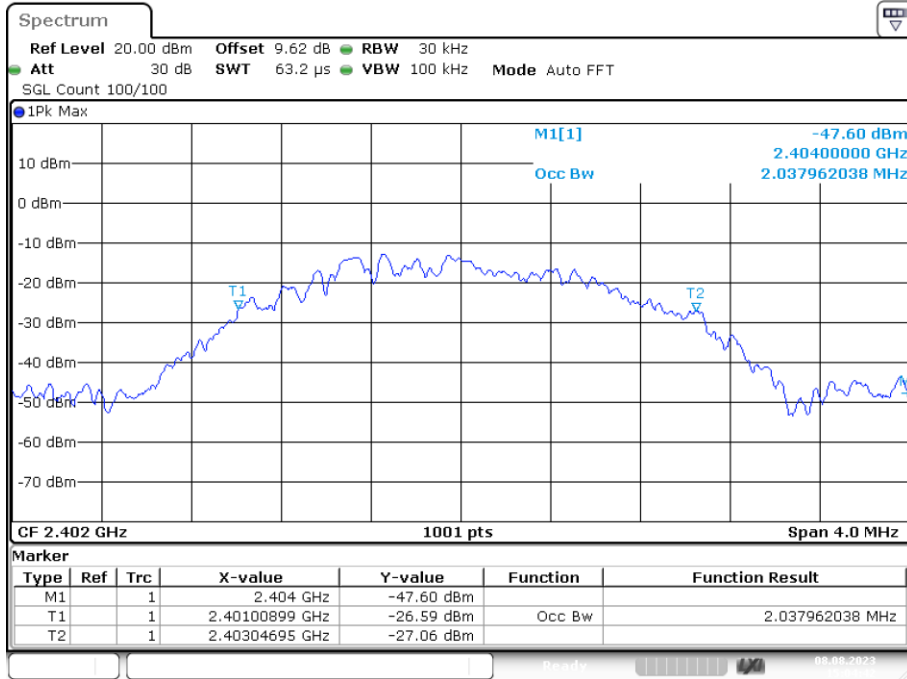
Date: 8.AUG.2023 15:13:13

-6dB Bandwidth NVNT BLE 2M 2480MHz Ant1



Date: 8.AUG.2023 15:15:12

OBW NVNT BLE 2M 2402MHz Ant1



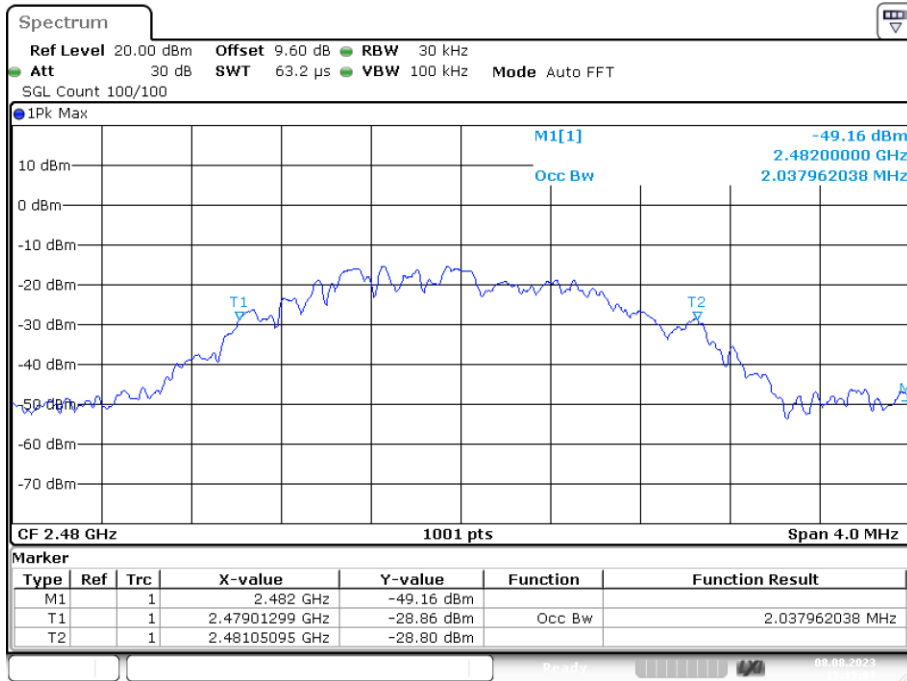
Date: 8.AUG.2023 15:04:42

OBW NVNT BLE 2M 2440MHz Ant1



Date: 8.AUG.2023 15:13:04

OBW NVNT BLE 2M 2480MHz Ant1



Date: 8.AUG.2023 15:15:03

8. BAND EDGE CHECK

8.1. Test limits

Please refer section RSS-GEN&15.247.

8.2. Test Procedure

Details see the KDB 558074 D01 15.247 Meas Guidance v05r02

8.2.1 Put the EUT on a 0.8m high table, power on the EUT. Emissions were scanned and measured rotating the EUT to 360 degrees, Find the maximum Emission

8.2.2 Check the spurious emissions out of band.

8.2.3 RBW 1MHz, VBW 3MHz, peak detector for peak value, RBW 1MHz, VBW 3MHz, RMS detector for AV value.

8.3. Test Setup

Same as 5.2.2.

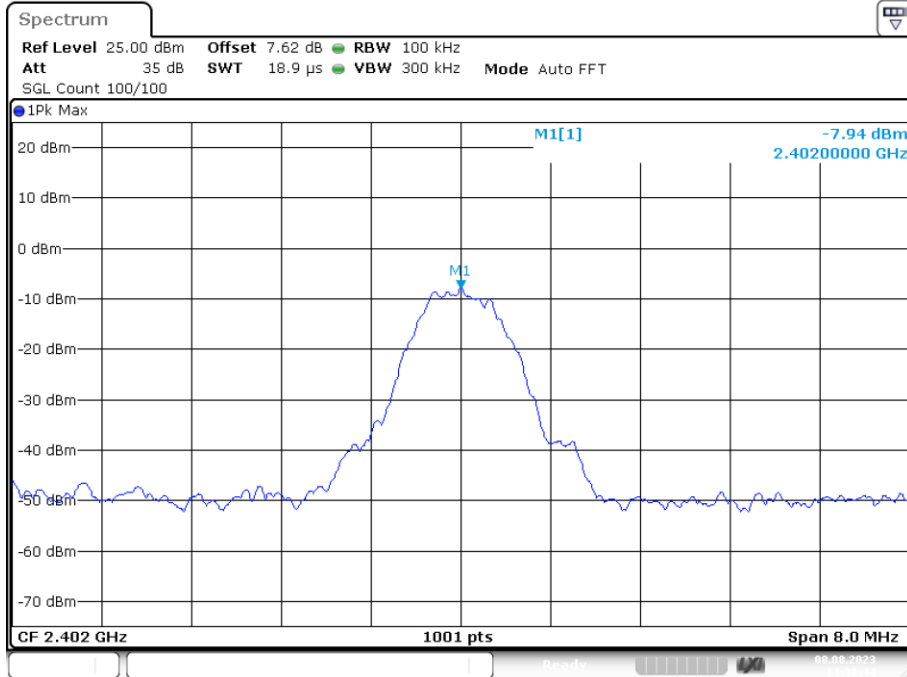
8.4. Test Results

Pass

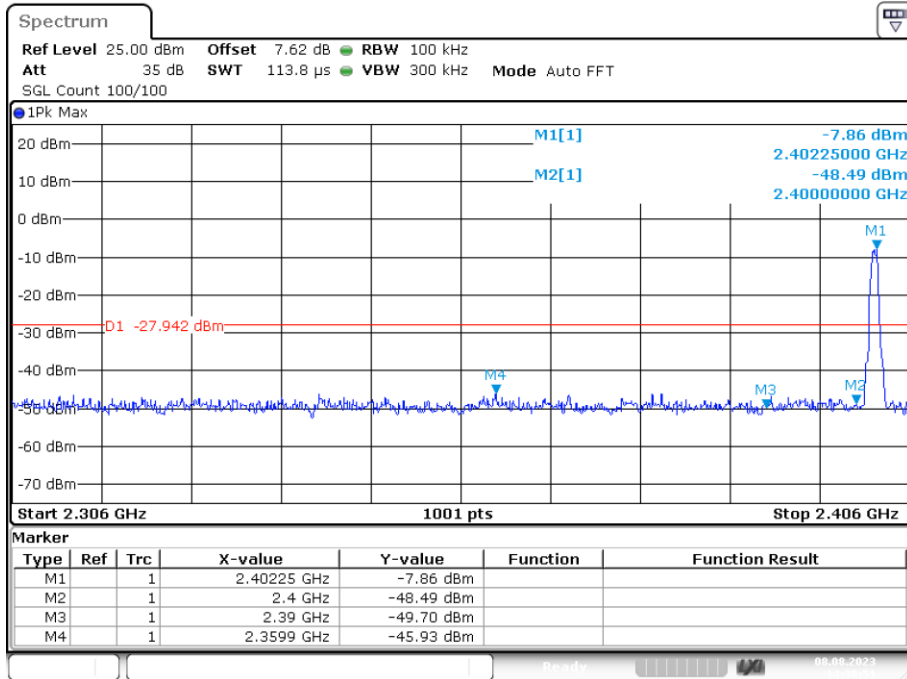
The test results are listed in next pages.

GFSK (1M)

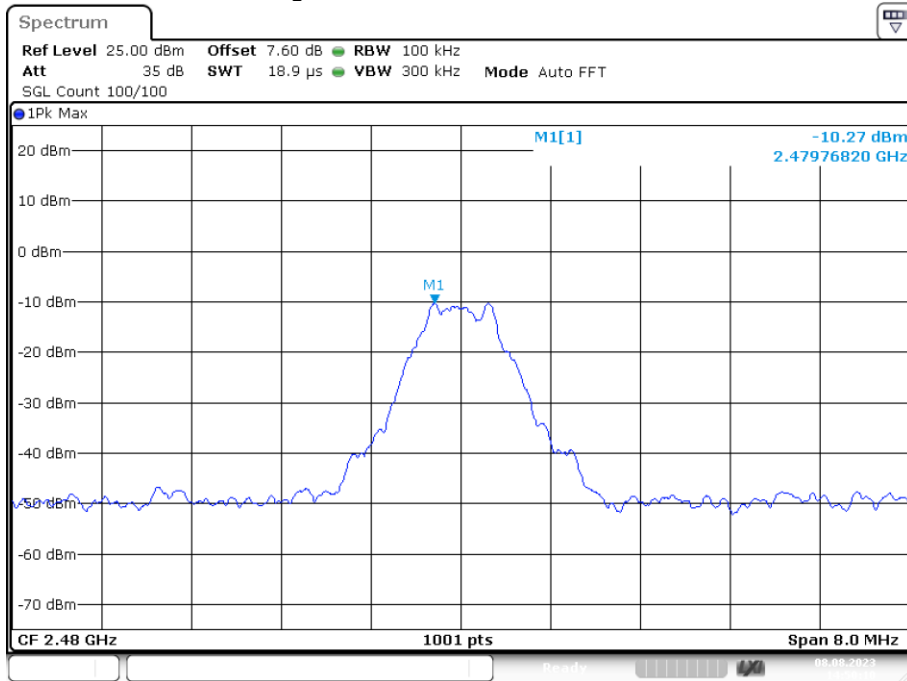
Band Edge NVNT BLE 1M 2402MHz Ant1 Ref



Band Edge NVNT BLE 1M 2402MHz Ant1 Emission

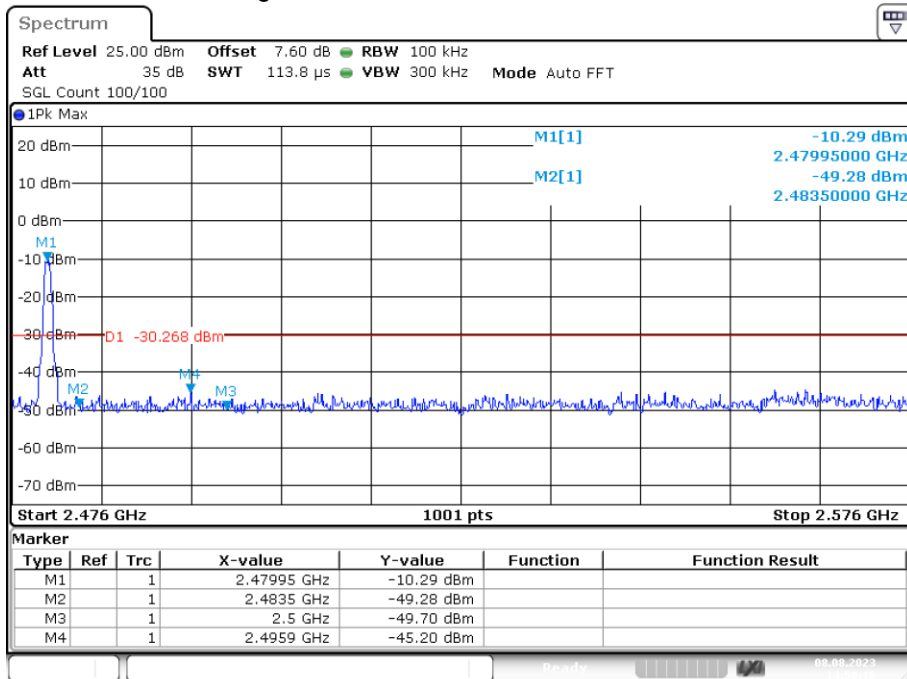


Band Edge NVNT BLE 1M 2480MHz Ant1 Ref



Date: 8.AUG.2023 14:50:10

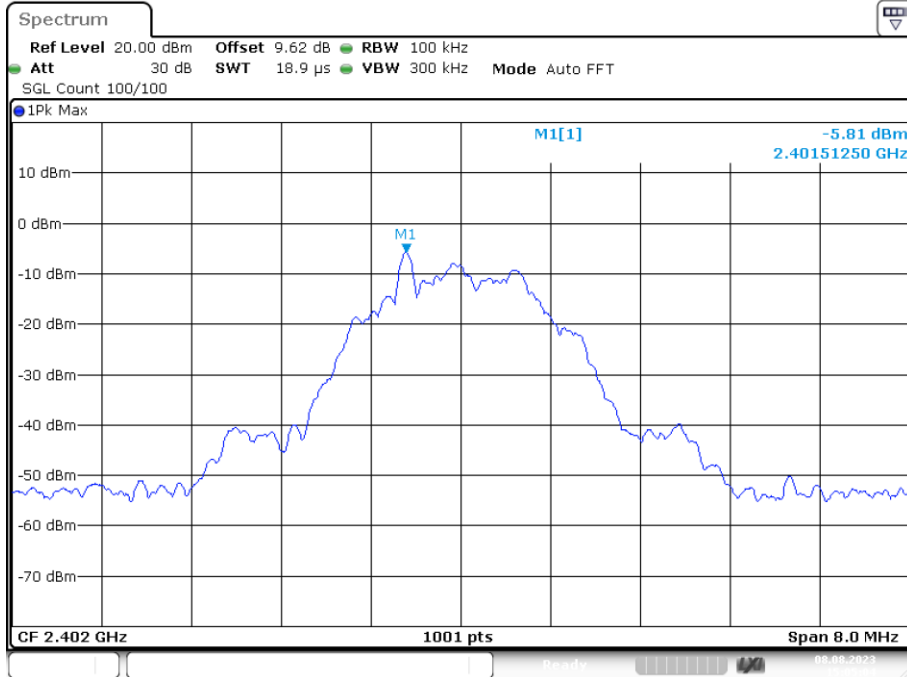
Band Edge NVNT BLE 1M 2480MHz Ant1 Emission



Date: 8.AUG.2023 14:50:15

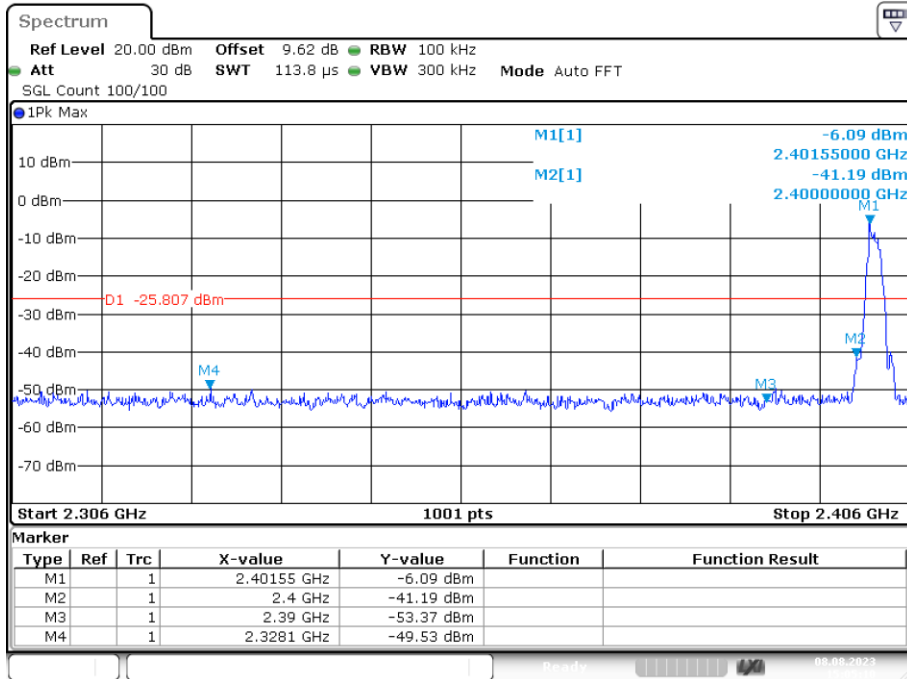
GFSK (2M)

Band Edge NVNT BLE 2M 2402MHz Ant1 Ref



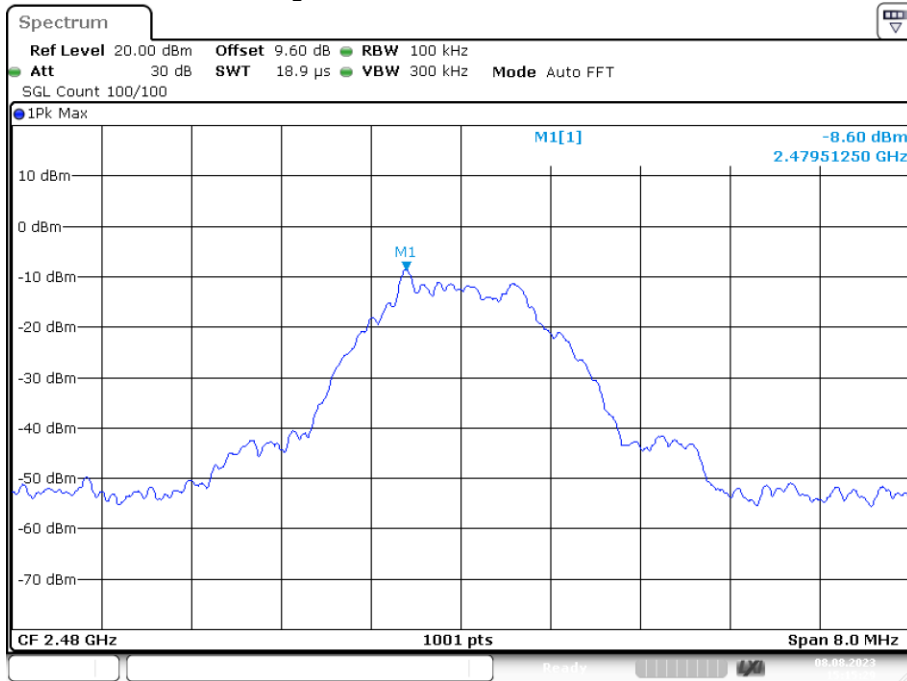
Date: 8.AUG.2023 15:05:04

Band Edge NVNT BLE 2M 2402MHz Ant1 Emission



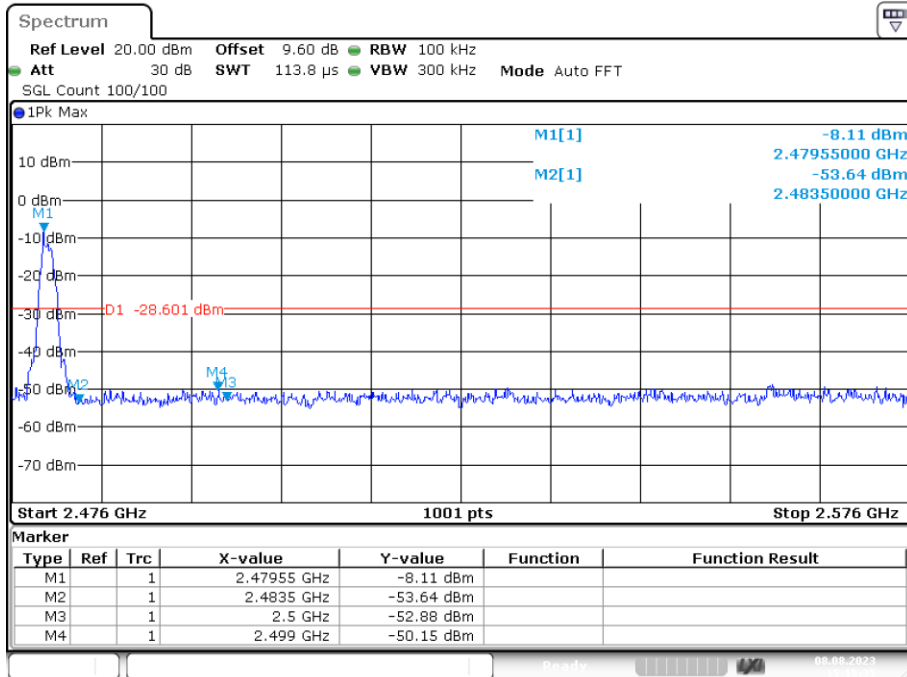
Date: 8.AUG.2023 15:05:10

Band Edge NVNT BLE 2M 2480MHz Ant1 Ref



Date: 8.AUG.2023 15:15:29

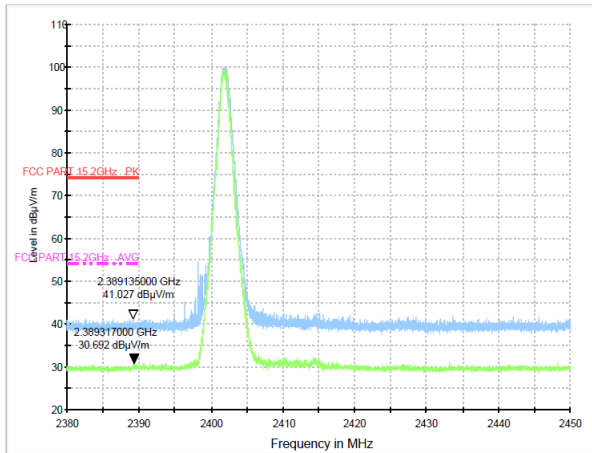
Band Edge NVNT BLE 2M 2480MHz Ant1 Emission



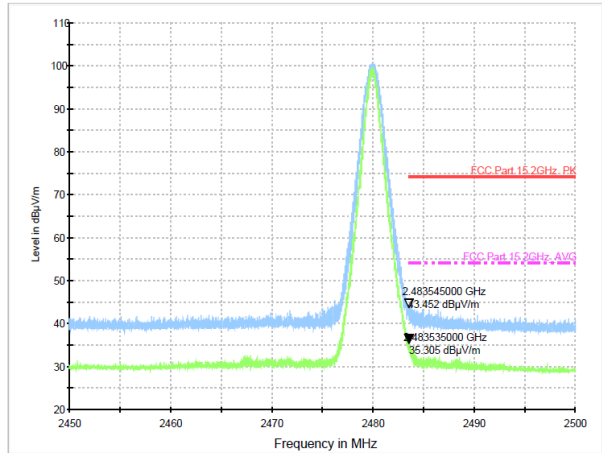
Date: 8.AUG.2023 15:15:35

Radiated Method: GFSK(1M)

Test Mode: CH-L

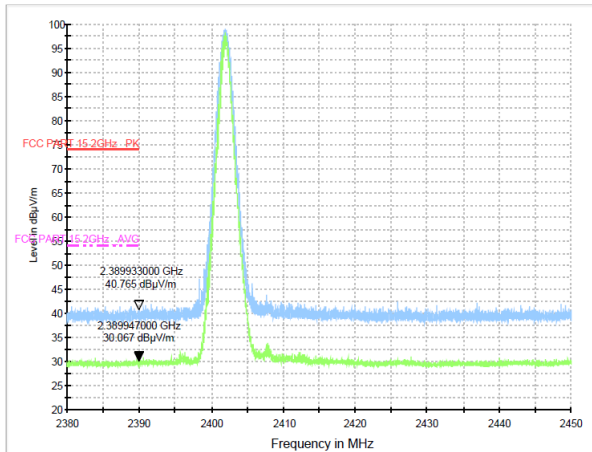


Test Mode: CH-H

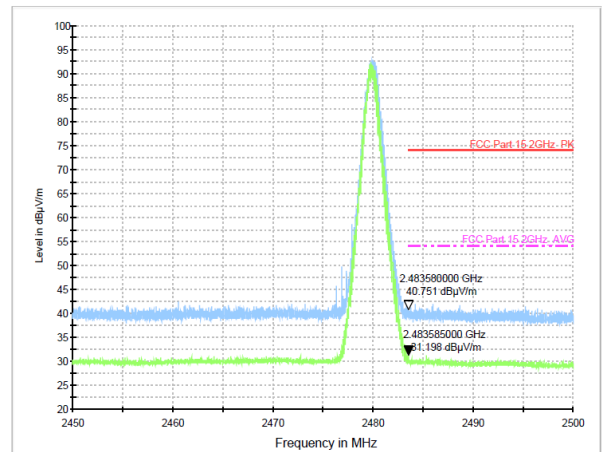


Radiated Method: GFSK(2M)

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

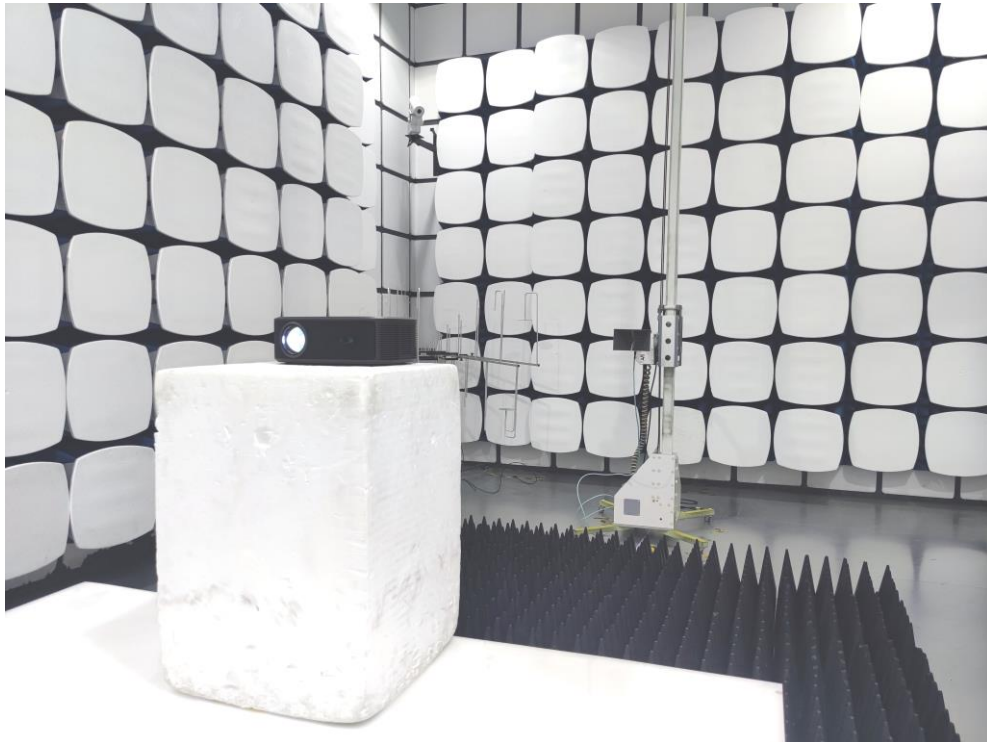
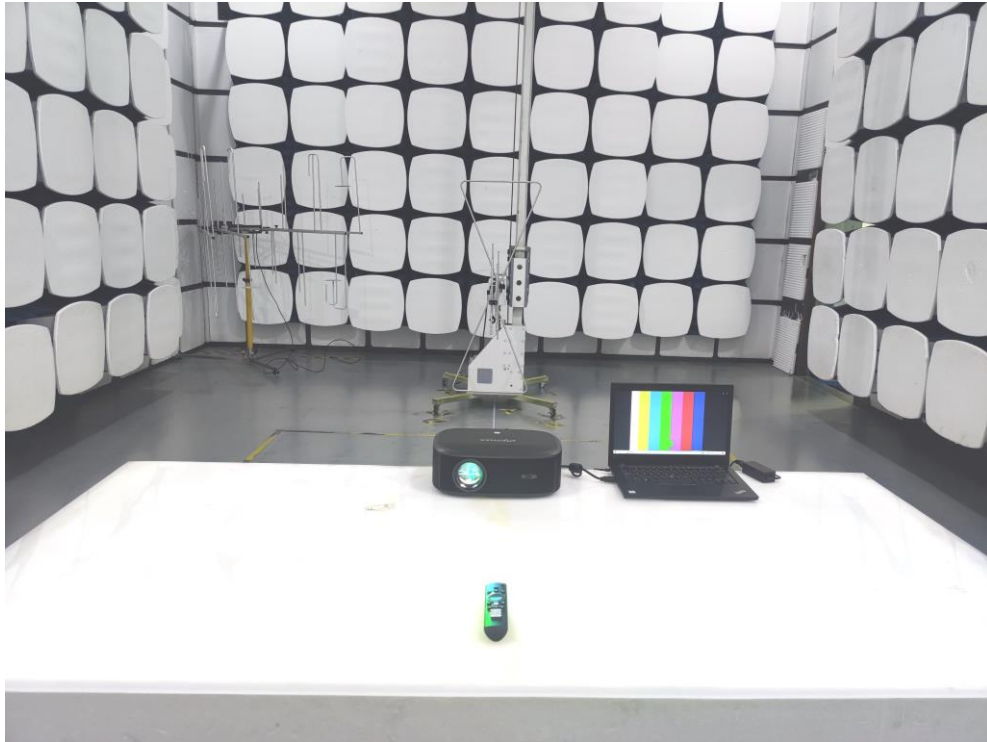
The antenna is internal antenna and no consideration of replacement. Please see EUT photo for details.

9.3. Results

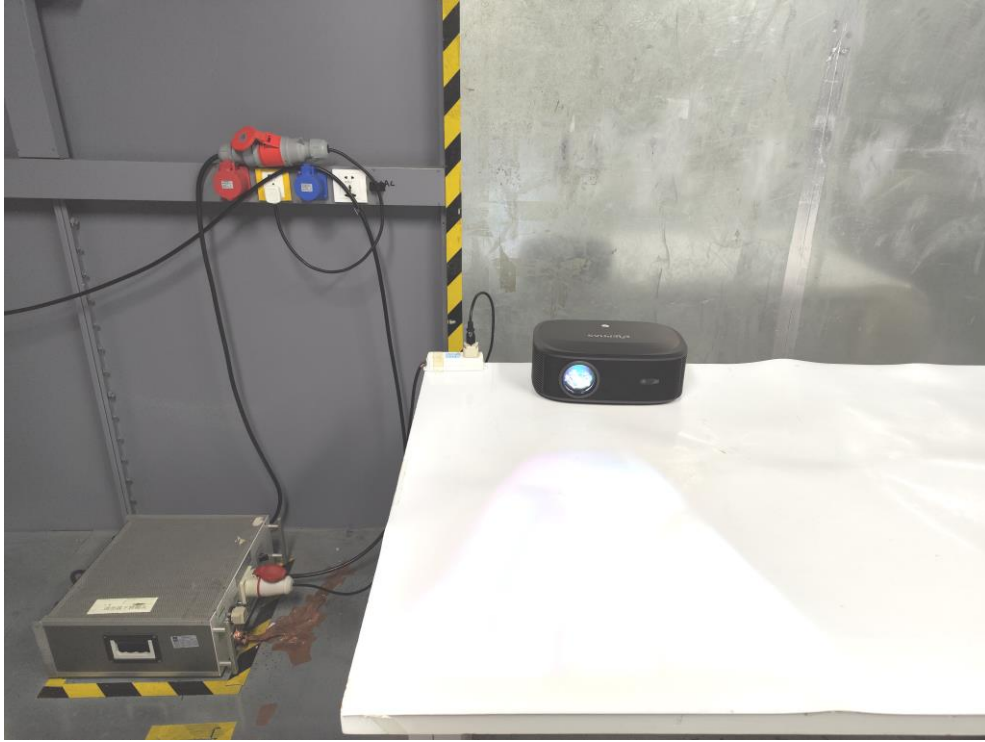
The EUT antenna is Internal Antenna. It complies with the standard requirement.

10. TEST SETUP PHOTO

10.1. Photo of Radiated Emission test



10.2.Photo of Conducted Emission test



-----END OF REPORT-----