FCC TEST REPORT

FCC ID: 2BC8I-E7

On Behalf of

Shenzhen Engine Technology Co., Ltd.

SPORT DVR

Model No.: E7, E9, E10, E11, E12, E14, E15, E16, F16, F22, F35

Prepared for	:	Shenzhen Engine Technology Co., Ltd.
Address	:	9/F Block B, JinKai Technology Park, ZhangKengJingShangWei, GuanLan, Long Hua, ShenZhen, China 518110

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	:	A2309091-C01-R02
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TEST REPORT DECLARATION

Applicant	:	Shenzhen Engine Technology Co., Ltd.
Address	:	9/F Block B, JinKai Technology Park, ZhangKengJingShangWei, GuanLan, Long Hua, ShenZhen, China 518110
Manufacturer	:	Shenzhen Engine Technology Co., Ltd.
Address	:	9/F Block B, JinKai Technology Park, ZhangKengJingShangWei, GuanLan, Long Hua, ShenZhen, China 518110
EUT Description	:	SPORT DVR
		(A) Model No. : E7, E9, E10, E11, E12, E14, E15, E16, F16, F22, F35
		(B) Trademark : **Gogloo, ENGINE, OEM'S**

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	Yannis Wen
Approved by (name + signature)…....:	Reak Yang Project Manager	
Date of issue…… ……..:	October 11, 2023	

Revision History

Revision	Issue Date	Revisions	Revised By
V0	October 11, 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	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: 15.209 FCC Part 15: 15.247(d)	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: 15.247(d)	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/PMN	:	SPORT DVR
Model Number	:	E7, E9, E10, E11, E12, E14, E15, E16, F16, F22, F35
Diff.	:	There is no difference except the name of the model. All tests are made with the E7 model.
Test Voltage	:	DC 5V from Type-C port, DC 3.7V from battery
Operation frequency	:	2412MHz-2462MHz for IEEE 802.11 b, g, n20 2422MHz-2452MHz for IEEE 802.11 n40
Modulation type	:	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n :OFDM(64QAM, 16QAM, QPSK, BPSK)
Channel No.	:	802.11b/802.11g /802.11n(HT20): 11 802.11n(HT40): 7
Antenna Type	:	Internal antenna, max gain 2.28dBi (Antenna information is provided by applicant.)
Software version	:	V1.0
Hardware version	:	V1.0

Remark:
1. The worst-case simultaneous transmission configuration was evaluated with no non-compliance found. Results in this report are only for 2.4G WIFI function, and there is no other transmitter involved.

2.2. Accessories of Device (EUT)

Accessories : /

Manufacturer : /

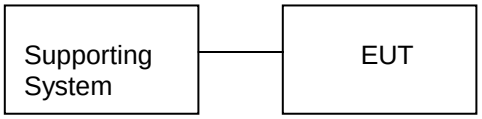
Model : /

Ratings : /

2.3. Tested Supporting System Details

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

2.4. Block Diagram of connection between EUT and simulators



2.5. Test Mode Description

Mode	data rate (Mbps)(see Note)	Channel	Frequency (MHz)
IEEE 802.11b	1	Low :CH1	2412
	1	Middle: CH6	2437
	1	High: CH11	2462
IEEE 802.11g	6	Low :CH1	2412
	6	Middle: CH6	2437
	6	High: CH11	2462
IEEE 802.11 n/HT20	6.5	Low :CH1	2412
	6.5	Middle: CH6	2437
	6.5	High: CH11	2462
IEEE 802.11 n/HT40	13.5	Low :CH3	2422
	13.5	Middle: CH6	2437
	13.5	High: CH9	2452

Note: According exploratory test, EUT will have maximum output power in those data rate. so those data rate were used for all test.

Channel list:

For IEEE 802.11b, g, n20, n40 with 2.4G

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
CH1	2412	CH5	2432	CH9	2452
CH2	2417	CH6	2437	CH10	2457
CH3	2422	CH7	2442	CH11	2462
CH4	2427	CH8	2447		

2.6. Test Conditions

Items	Required	Actual
Temperature range:	15-35℃	24℃
Humidity range:	25-75%	56%
Pressure range:	86-106kPa	98kPa

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
Designation Number: CN1236

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 (25GHz to 40GHz)	4.31dB(Polarize: V)
	4.30dB(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	Farad	Alpha-3A1
CE	EZ-EMC	Farad	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])

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

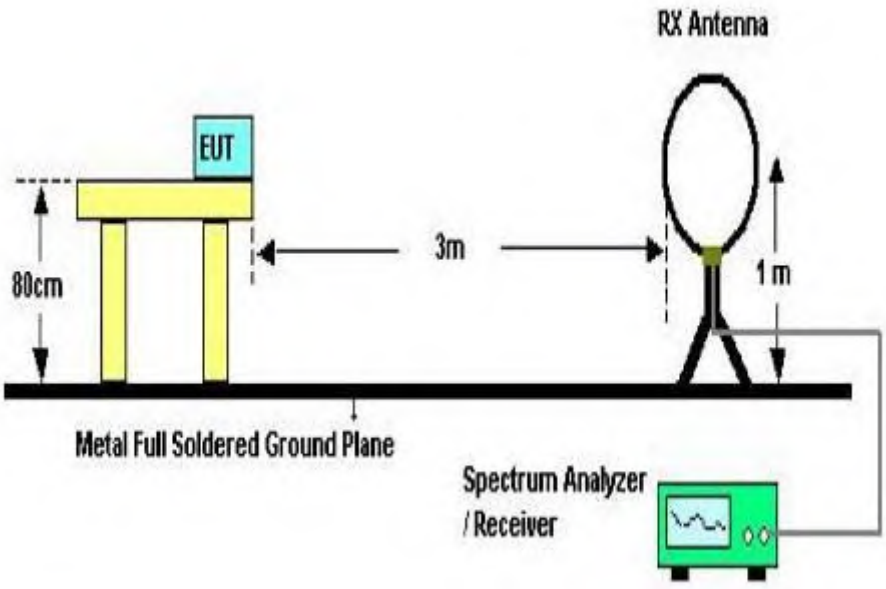
The Test antenna shall vary between 1m and 4m, both Horizontal and Vertical antenna are set of make measurement.

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

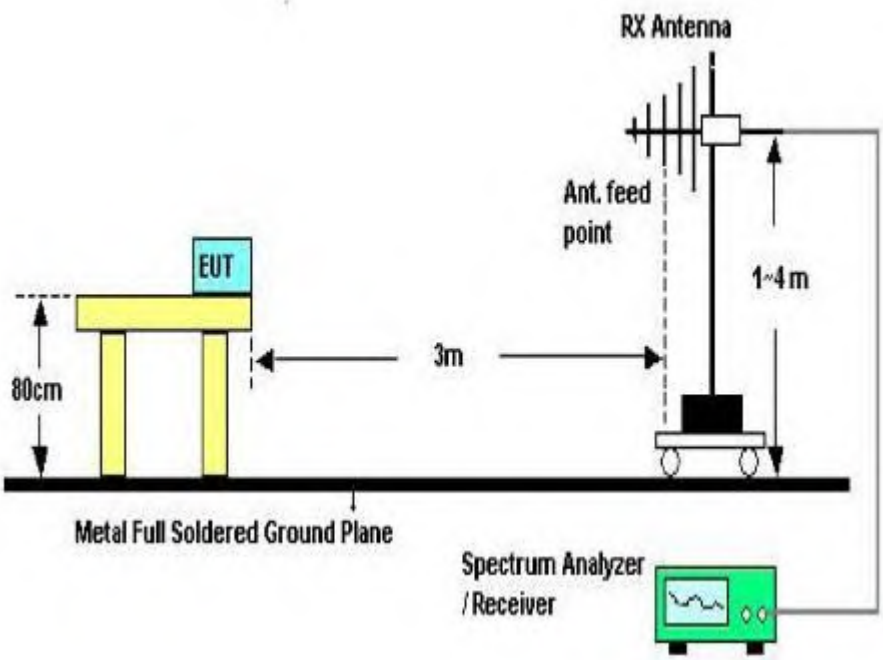
If Peak value comply with QP limit below 1GHz, the EUT deemed to comply with QP limit. But the Peak value and average value both need to comply with applicable limit above 1GHz.

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

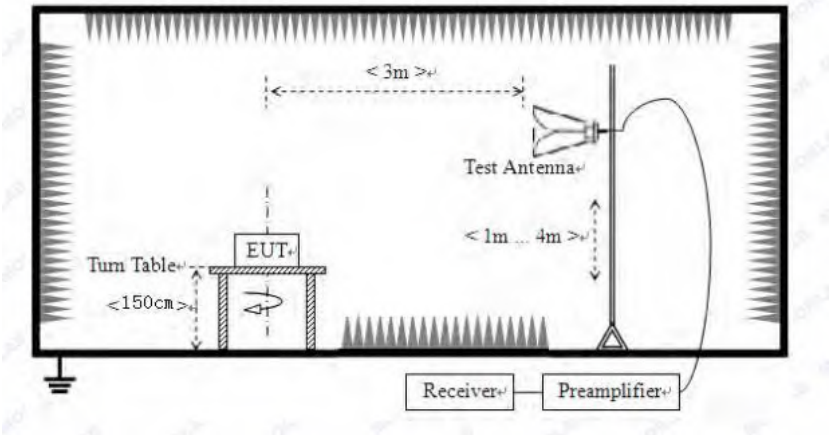
3.3. Test Setup



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 EUT from 9kHz up to the 10th harmonic of the fundamental.

Detailed information please see the following page.

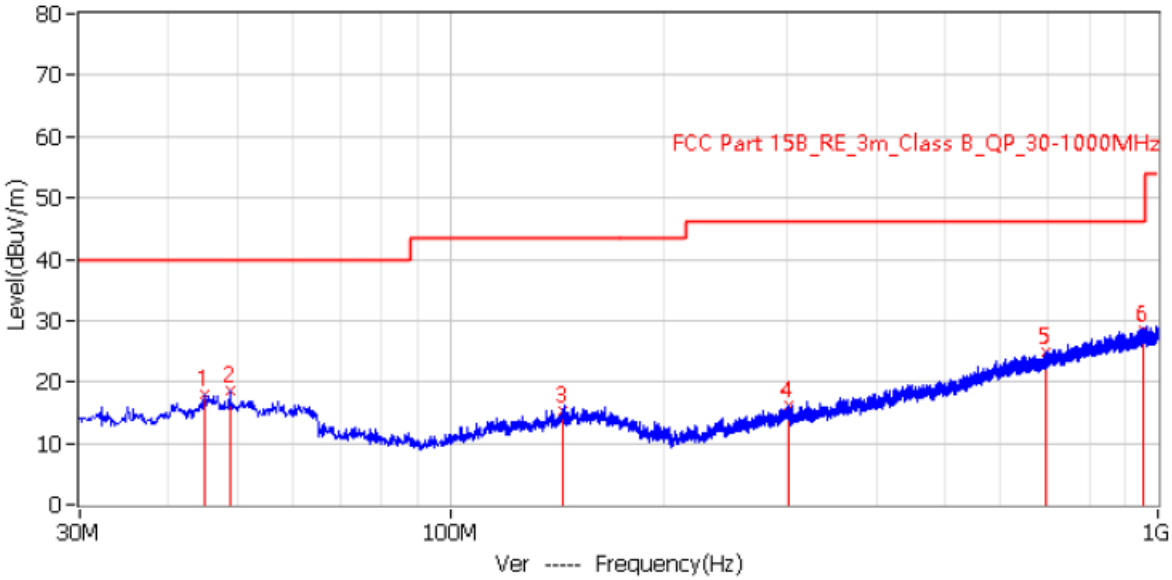
From 9KHz to 30MHz: Conclusion: PASS

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.

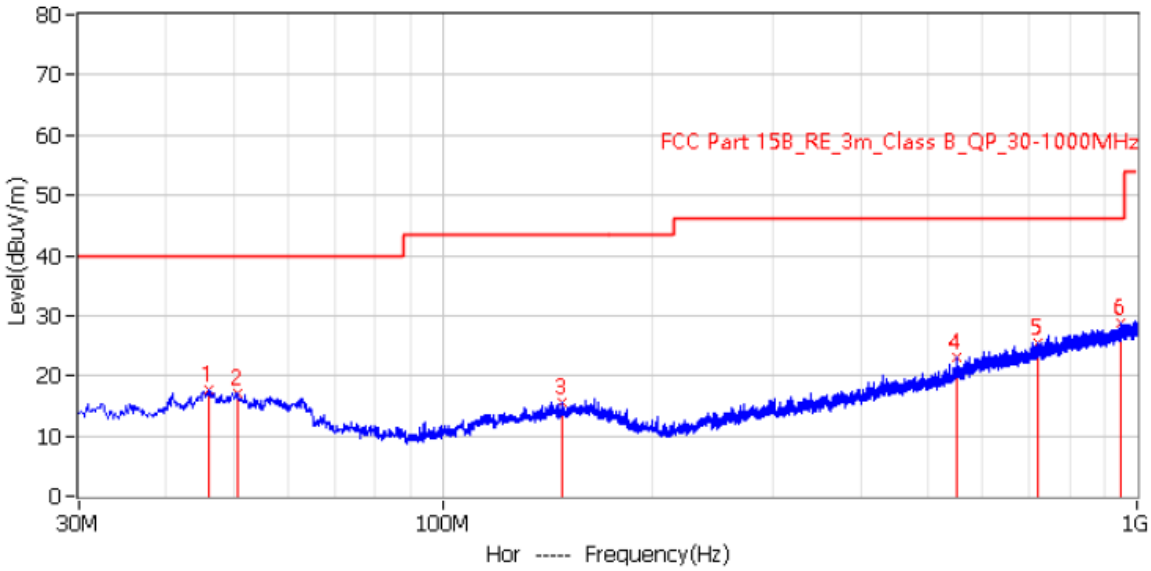
3. Except for mode b/g, other modes test the MIMO status

From 30MHz to 1000MHz: Conclusion: PASS
Vertical:



No.	Frequency	Level dBuV/m	Factor dB/m	Limit dBuV/m	Margin dB	Detector	Height cm	Height cm	Angle deg
1*	45.156MHz	17.9	18.4	40.0	-22.1	PK	Ver	100.0	348.0
2*	48.915MHz	18.6	18.4	40.0	-21.4	PK	Ver	100.0	21.0
3*	144.581MHz	15.4	15.6	43.5	-28.1	PK	Ver	100.0	56.0
4*	300.994MHz	16.1	15.6	46.0	-29.9	PK	Ver	100.0	360.0
5*	695.541MHz	24.9	23.7	46.0	-21.1	PK	Ver	100.0	329.0
6*	952.349MHz	28.6	27.3	46.0	-17.4	PK	Ver	100.0	21.0

Horizontal:



No.	Frequency	Level dBuV/m	Factor dB/m	Limit dBuV/m	Margin dB	Detector	Height cm	Height cm	Angle deg
1*	46.126MHz	17.7	18.4	40.0	-22.3	PK	Hor	200.0	63.0
2*	50.613MHz	17.1	18.3	40.0	-22.9	PK	Hor	200.0	280.0
3*	149.068MHz	15.7	15.9	43.5	-27.8	PK	Hor	200.0	132.0
4*	551.739MHz	23.0	21.3	46.0	-23.0	PK	Hor	200.0	182.0
5*	719.913MHz	25.5	24.2	46.0	-20.5	PK	Hor	200.0	127.0
6*	945.195MHz	28.9	27.2	46.0	-17.1	PK	Hor	200.0	329.0

Remark: All modes have been tested, and only worst data of n20 mode, Channel 2437MHz was listed in this report.

From 1G-25GHz

Test Mode: IEEE 802.11b 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
4824	43.62	V	33.95	10.18	34.26	53.49	74	-20.51	PK
4824	34.41	V	33.95	10.18	34.26	44.28	54	-9.72	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
4824	42.40	H	33.95	10.18	34.26	52.27	74	-21.73	PK
4824	34.83	H	33.95	10.18	34.26	44.70	54	-9.30	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11b TX Mid									
4874	43.29	V	33.93	10.2	34.29	53.13	74	-20.87	PK
4874	34.61	V	33.93	10.2	34.29	44.45	54	-9.55	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
4874	44.21	H	33.93	10.2	34.29	54.05	74	-19.95	PK
4874	34.95	H	33.93	10.2	34.29	44.79	54	-9.21	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11b TX High									
4924	45.62	V	33.98	10.22	34.25	55.57	74	-18.43	PK
4924	37.69	V	33.98	10.22	34.25	47.64	54	-6.36	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/
4924	49.41	H	33.98	10.22	34.25	59.36	74	-14.64	PK
4924	34.57	H	33.98	10.22	34.25	44.52	54	-9.48	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/

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.

Test Mode: IEEE 802.11g 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
4824	43.13	V	33.95	10.18	34.26	53.00	74	-21.00	PK
4824	35.51	V	33.95	10.18	34.26	45.38	54	-8.62	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
4824	43.46	H	33.95	10.18	34.26	53.33	74	-20.67	PK
4824	36.18	H	33.95	10.18	34.26	46.05	54	-7.95	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11g TX Mid									
4874	46.63	V	33.93	10.2	34.29	56.47	74	-17.53	PK
4874	34.01	V	33.93	10.2	34.29	43.85	54	-10.15	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
4874	44.14	H	33.93	10.2	34.29	53.98	74	-20.02	PK
4874	34.00	H	33.93	10.2	34.29	43.84	54	-10.16	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11g TX High									
4924	46.44	V	33.98	10.22	34.25	56.39	74	-17.61	PK
4924	34.90	V	33.98	10.22	34.25	44.85	54	-9.15	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/
4924	45.58	H	33.98	10.22	34.25	55.53	74	-18.47	PK
4924	36.19	H	33.98	10.22	34.25	46.14	54	-7.86	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/

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.

Test Mode: IEEE 802.11n HT20 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
4824	43.26	V	33.95	10.18	34.26	53.13	74	-20.87	PK
4824	37.33	V	33.95	10.18	34.26	47.20	54	-6.80	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
4824	43.46	H	33.95	10.18	34.26	53.33	74	-20.67	PK
4824	35.65	H	33.95	10.18	34.26	45.52	54	-8.48	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11n HT20 TX Mid									
4874	45.99	V	33.93	10.2	34.29	55.83	74	-18.17	PK
4874	33.54	V	33.93	10.2	34.29	43.38	54	-10.62	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
4874	47.03	H	33.93	10.2	34.29	56.87	74	-17.13	PK
4874	35.49	H	33.93	10.2	34.29	45.33	54	-8.67	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11n HT20 TX High									
4924	48.05	V	33.98	10.22	34.25	58.00	74	-16.00	PK
4924	36.84	V	33.98	10.22	34.25	46.79	54	-7.21	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/
4924	47.09	H	33.98	10.22	34.25	57.04	74	-16.96	PK
4924	36.44	H	33.98	10.22	34.25	46.39	54	-7.61	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/

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.

Test ModeI: EEE 802.11n40 HT40 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
4844	44.46	V	33.95	10.18	34.26	54.33	74	-19.67	PK
4844	34.84	V	33.95	10.18	34.26	44.71	54	-9.29	AV
7266	/	/	/	/	/	/	/	/	/
9688	/	/	/	/	/	/	/	/	/
4844	44.10	H	33.95	10.18	34.26	53.97	74	-20.03	PK
4844	35.71	H	33.95	10.18	34.26	45.58	54	-8.42	AV
7266	/	/	/	/	/	/	/	/	/
9688	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11n40 HT40 TX Mid									
4884	42.92	V	33.93	10.2	34.29	52.76	74	-21.24	PK
4884	34.37	V	33.93	10.2	34.29	44.21	54	-9.79	AV
7326	/	/	/	/	/	/	/	/	/
9768	/	/	/	/	/	/	/	/	/
4884	47.46	H	33.93	10.2	34.29	57.30	74	-16.70	PK
4884	32.02	H	33.93	10.2	34.29	41.86	54	-12.14	AV
7326	/	/	/	/	/	/	/	/	/
9768	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11n40 HT40 TX High									
4924	47.17	V	33.98	10.22	34.25	57.12	74	-16.88	PK
4924	36.03	V	33.98	10.22	34.25	45.98	54	-8.02	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/
4924	47.54	H	33.98	10.22	34.25	57.49	74	-16.51	PK
4924	33.71	H	33.98	10.22	34.25	43.66	54	-10.34	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/

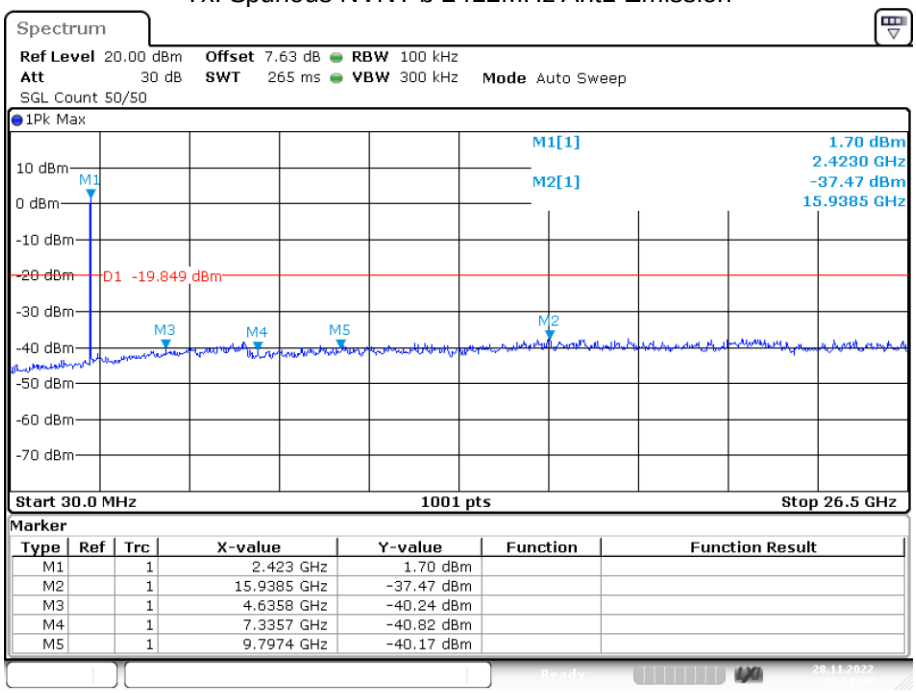
Note:

1, Result = Read level + Antenna factor + cable loss-Amp factor

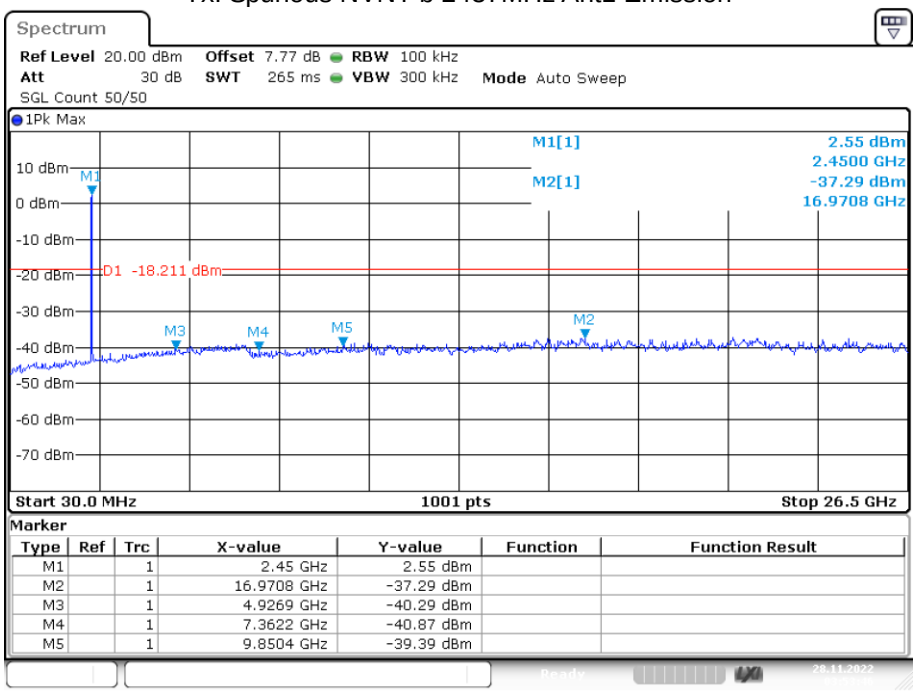
2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.

Conducted RF Spurious Emission

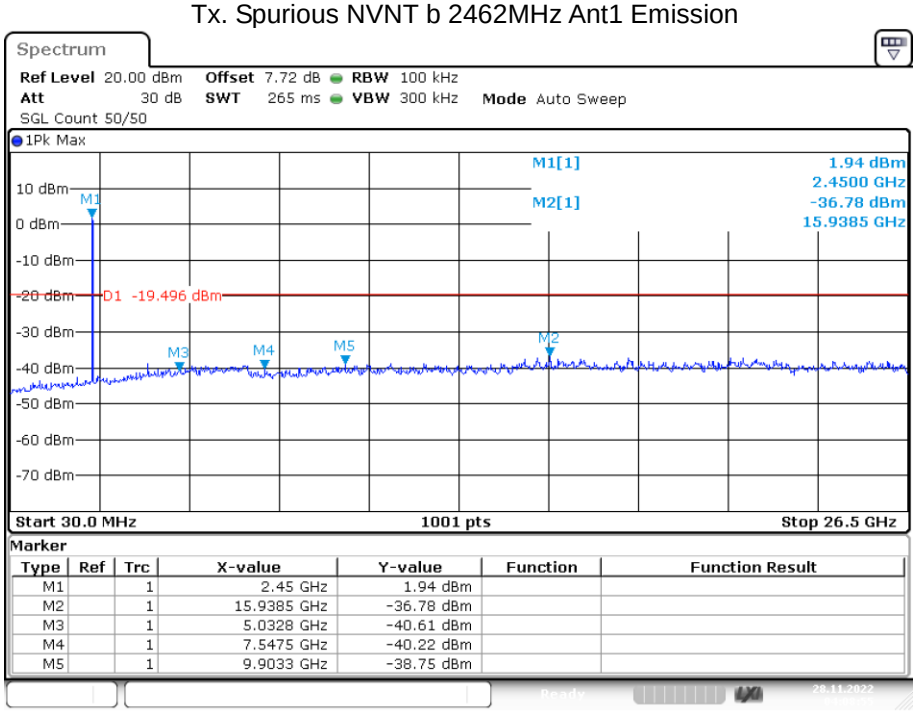
Tx. Spurious NVNT b 2412MHz Ant1 Emission



Tx. Spurious NVNT b 2437MHz Ant1 Emission



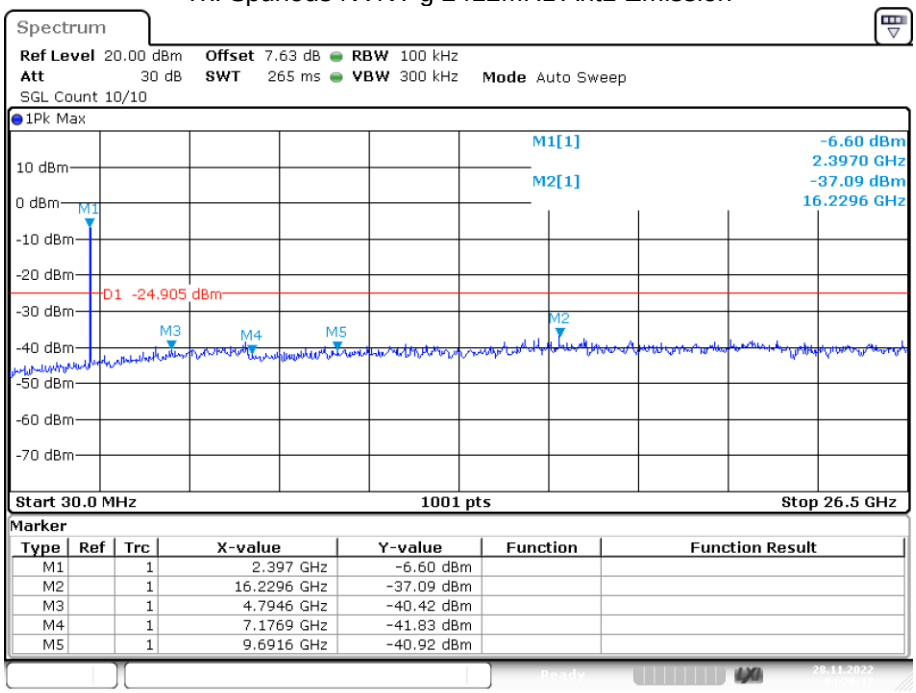
Tx. Spurious NVNT b 2462MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45 GHz	1.94 dBm		
M2		1	15.9385 GHz	-36.78 dBm		
M3		1	5.0328 GHz	-40.61 dBm		
M4		1	7.5475 GHz	-40.22 dBm		
M5		1	9.9033 GHz	-38.75 dBm		

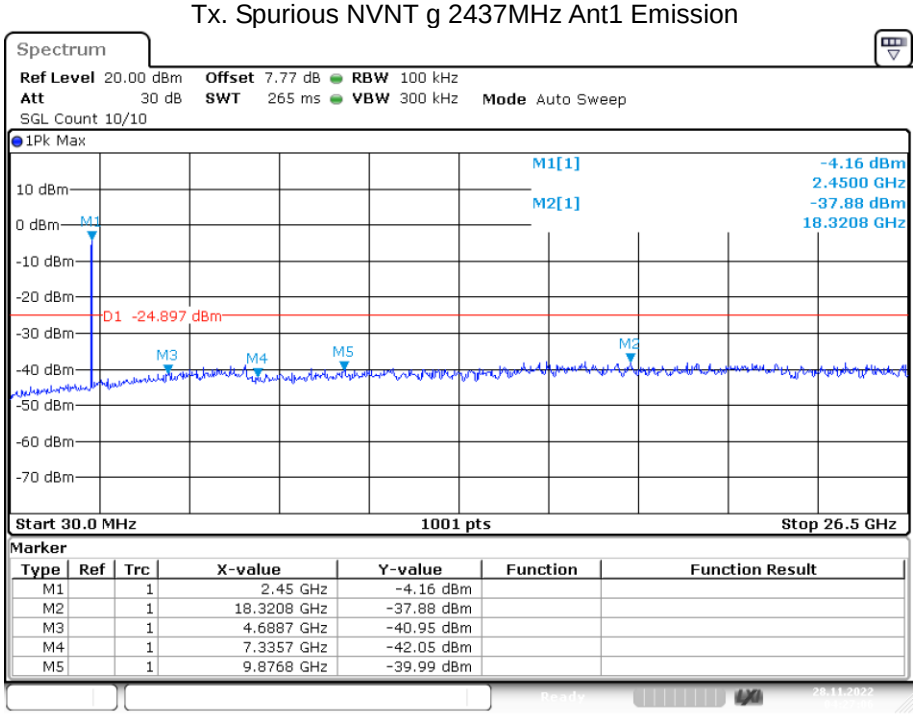
Tx. Spurious NVNT g 2412MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.397 GHz	-6.60 dBm		
M2		1	16.2296 GHz	-37.09 dBm		
M3		1	4.7946 GHz	-40.42 dBm		
M4		1	7.1769 GHz	-41.83 dBm		
M5		1	9.6916 GHz	-40.92 dBm		

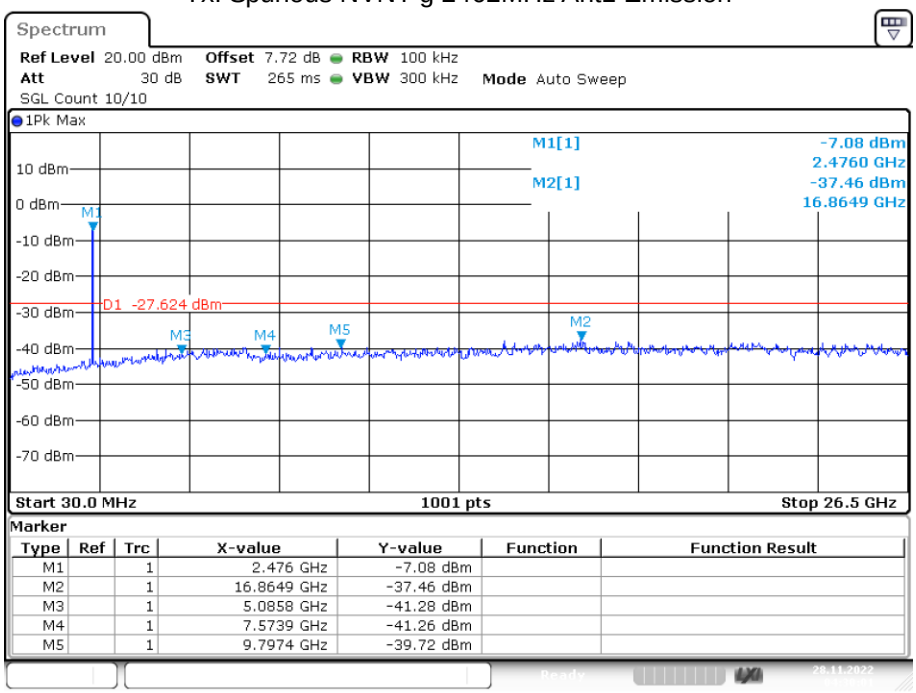
Tx. Spurious NVNT g 2437MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45 GHz	-4.16 dBm		
M2		1	18.3208 GHz	-37.88 dBm		
M3		1	4.6887 GHz	-40.95 dBm		
M4		1	7.3357 GHz	-42.05 dBm		
M5		1	9.8768 GHz	-39.99 dBm		

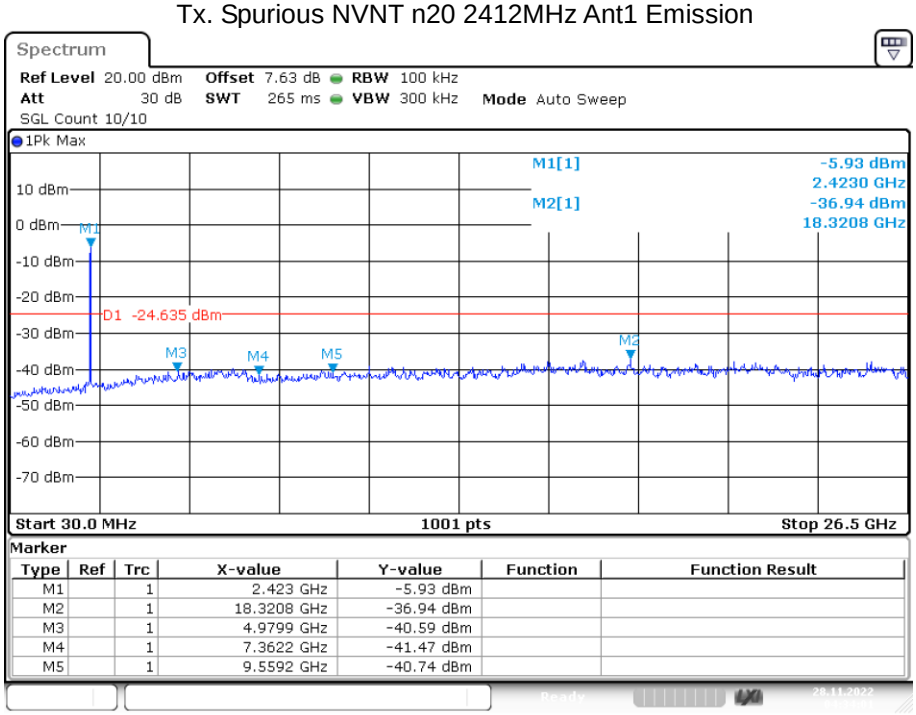
Tx. Spurious NVNT g 2462MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.476 GHz	-7.08 dBm		
M2		1	16.8649 GHz	-37.46 dBm		
M3		1	5.0858 GHz	-41.28 dBm		
M4		1	7.5739 GHz	-41.26 dBm		
M5		1	9.7974 GHz	-39.72 dBm		

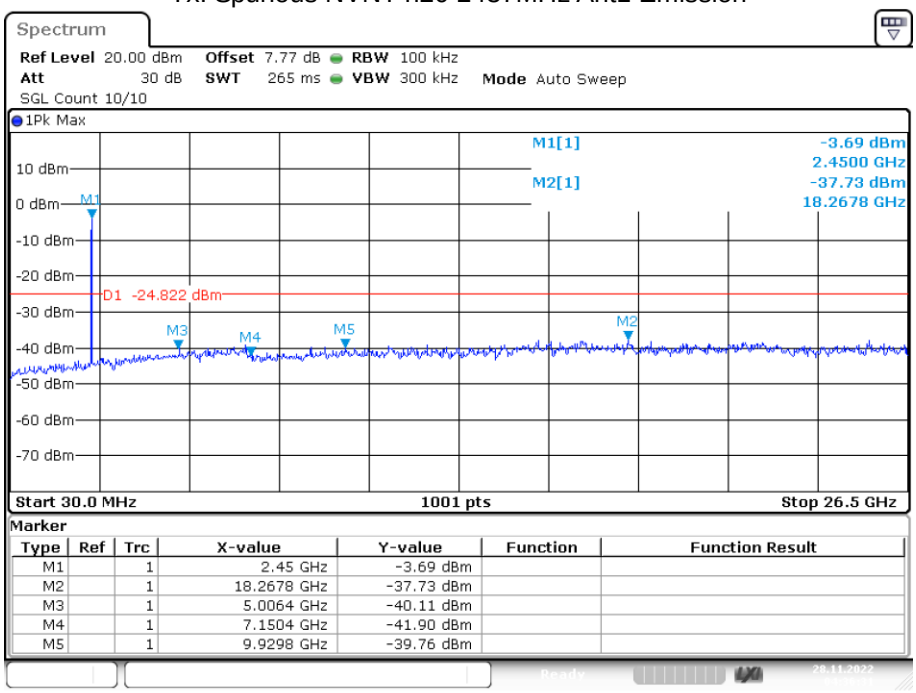
Tx. Spurious NVNT n20 2412MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.423 GHz	-5.93 dBm		
M2		1	18.3208 GHz	-36.94 dBm		
M3		1	4.9799 GHz	-40.59 dBm		
M4		1	7.3622 GHz	-41.47 dBm		
M5		1	9.5592 GHz	-40.74 dBm		

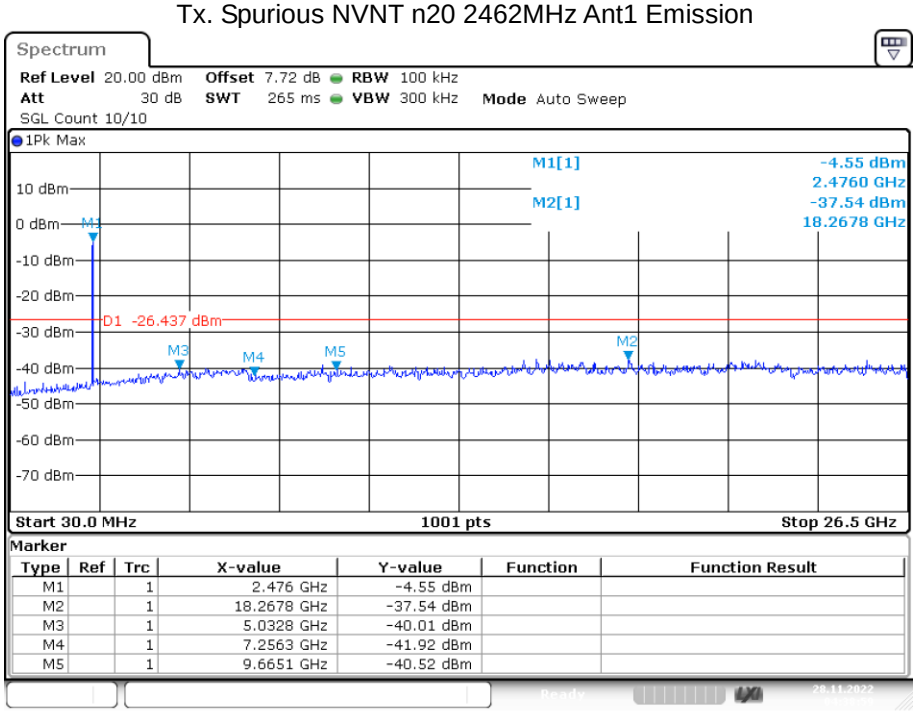
Tx. Spurious NVNT n20 2437MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45 GHz	-3.69 dBm		
M2		1	18.2678 GHz	-37.73 dBm		
M3		1	5.0064 GHz	-40.11 dBm		
M4		1	7.1504 GHz	-41.90 dBm		
M5		1	9.9298 GHz	-39.76 dBm		

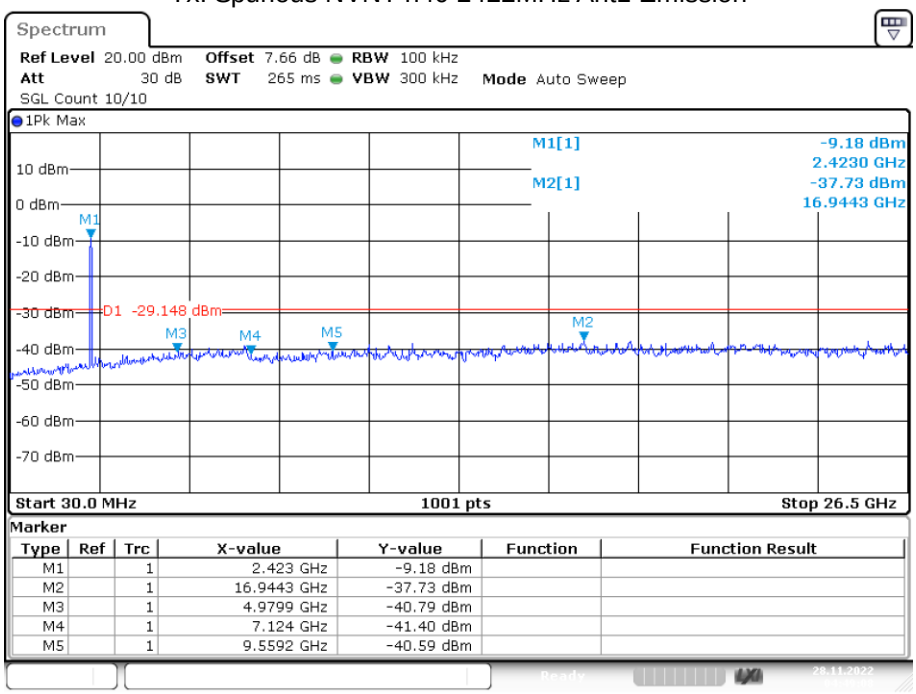
Tx. Spurious NVNT n20 2462MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.476 GHz	-4.55 dBm		
M2		1	18.2678 GHz	-37.54 dBm		
M3		1	5.0328 GHz	-40.01 dBm		
M4		1	7.2563 GHz	-41.92 dBm		
M5		1	9.6651 GHz	-40.52 dBm		

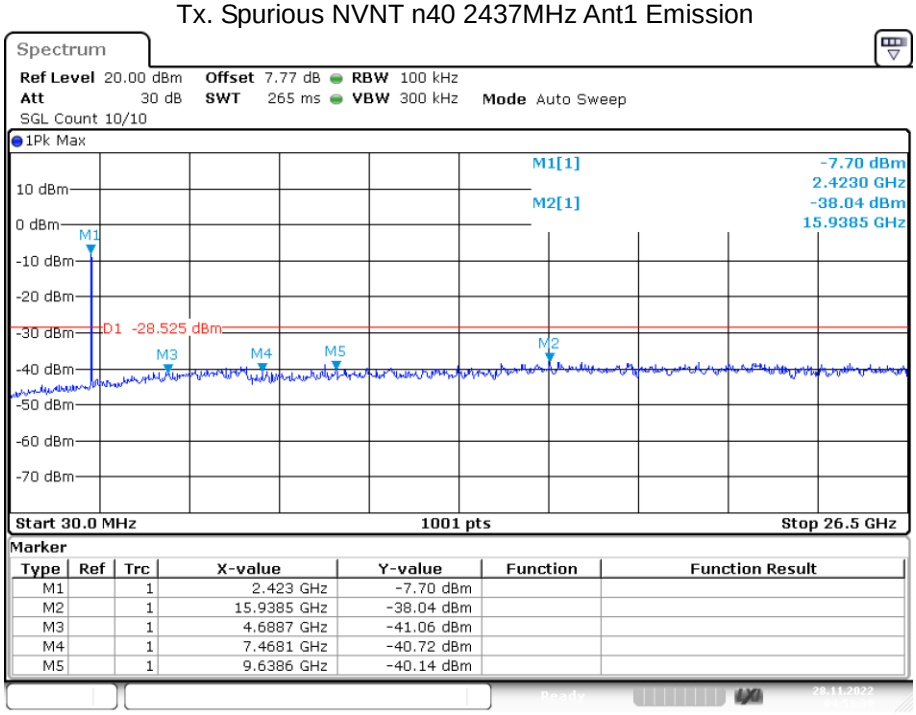
Tx. Spurious NVNT n40 2422MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.423 GHz	-9.18 dBm		
M2		1	16.9443 GHz	-37.73 dBm		
M3		1	4.9799 GHz	-40.79 dBm		
M4		1	7.124 GHz	-41.40 dBm		
M5		1	9.5592 GHz	-40.59 dBm		

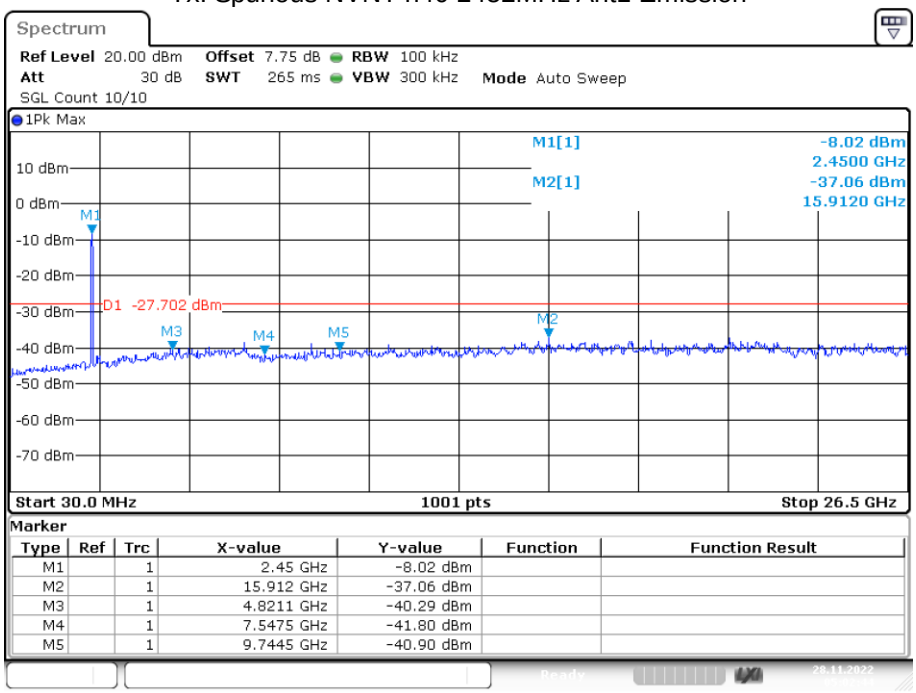
Tx. Spurious NVNT n40 2437MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.423 GHz	-7.70 dBm		
M2		1	15.9385 GHz	-38.04 dBm		
M3		1	4.6887 GHz	-41.06 dBm		
M4		1	7.4681 GHz	-40.72 dBm		
M5		1	9.6386 GHz	-40.14 dBm		

Tx. Spurious NVNT n40 2452MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45 GHz	-8.02 dBm		
M2		1	15.912 GHz	-37.06 dBm		
M3		1	4.8211 GHz	-40.29 dBm		
M4		1	7.5475 GHz	-41.80 dBm		
M5		1	9.7445 GHz	-40.90 dBm		

4. Power Line Conducted Emission

4.1. Test Limits

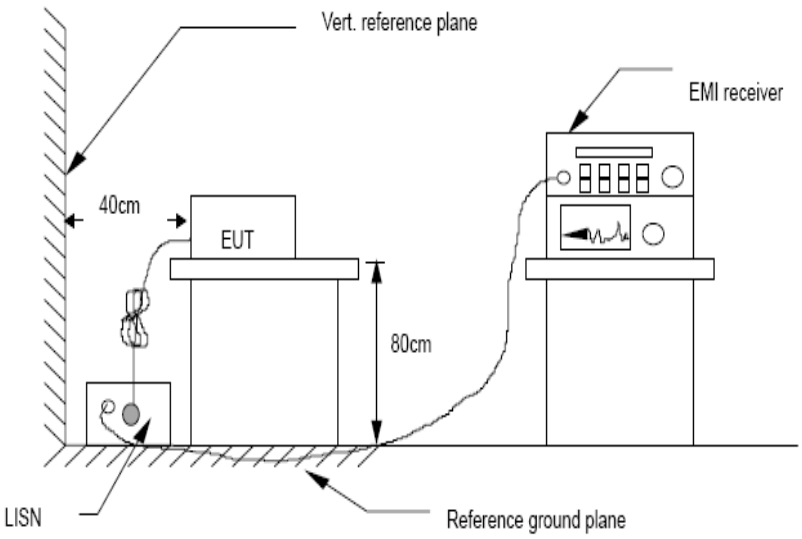
Frequency	Limits dB(μV)	
MHz	Quasi-peak Level	Average Level
0.15 -0.50	66 -56*	56 - 46*
0.50 -5.00	56	46
5.00 -30.00	60	50

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 the 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.

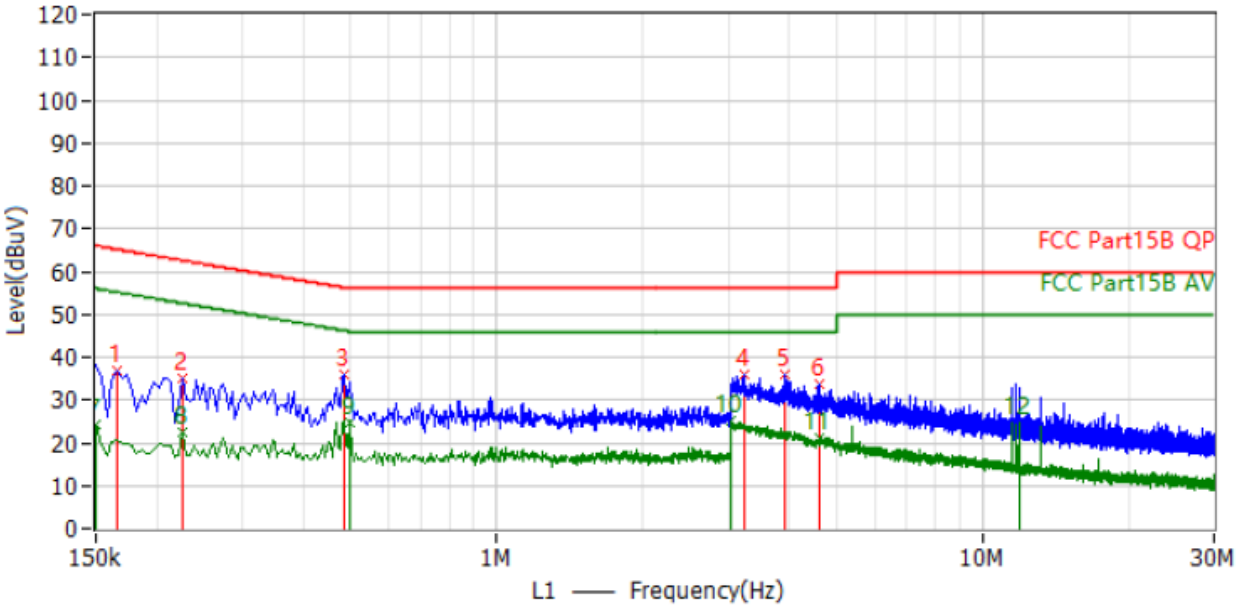
4.3. Test Setup



4.4. Test Results

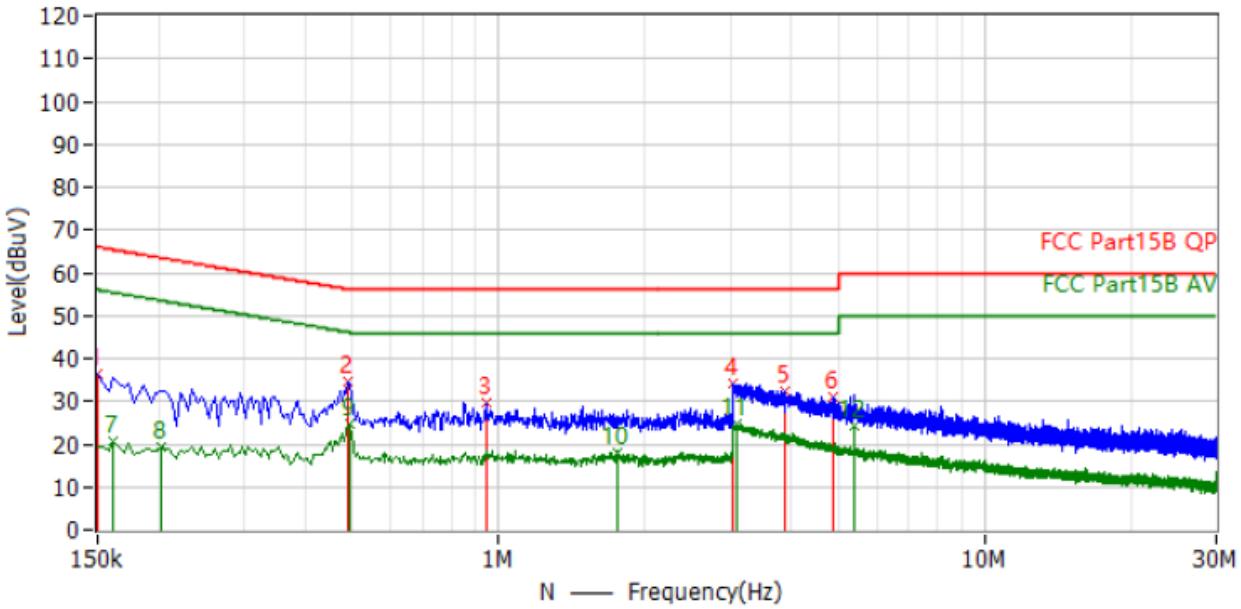
Pass

Polarity: L



No.	Frequency	Limit dBuV	Level dBuV	Delta dB	Factor dB	Detector	Polar
1*	166.000 kHz	65.2	36.9	-28.2	9.7	PK	L1
2*	226.000 kHz	62.6	35.2	-27.4	9.7	PK	L1
3*	486.000 kHz	56.2	35.8	-20.4	9.8	PK	L1
4*	3.250 MHz	56.0	36.1	-19.9	9.9	PK	L1
5*	3.934 MHz	56.0	35.9	-20.1	9.9	PK	L1
6*	4.618 MHz	56.0	33.5	-22.5	9.9	PK	L1
7*	150.000 kHz	56.0	24.2	-31.8	9.7		L1
8*	226.000 kHz	52.6	22.3	-30.3	9.7	AV	L1
9*	498.000 kHz	46.0	24.9	-21.1	9.8	AV	L1
10*	3.046 MHz	46.0	25.2	-20.8	9.9	AV	L1
11*	4.634 MHz	46.0	21.3	-24.7	9.9	AV	L1
12*	11.906 MHz	50.0	24.7	-25.3	10.1	AV	L1

Polarity: N



No.	Frequency	Limit dBuV	Level dBuV	Delta dB	Factor dB	Detector	Polar
1*	150.000 kHz	66.0	36.2	-29.8	9.7	PK	N
2*	490.000 kHz	56.2	34.4	-21.7	9.7	PK	N
3*	946.000 kHz	56.0	29.7	-26.3	9.7	PK	N
4*	3.050 MHz	56.0	34.2	-21.8	9.9	PK	N
5*	3.906 MHz	56.0	32.4	-23.6	9.9	PK	N
6*	4.870 MHz	56.0	31.1	-24.9	9.9	PK	N
7*	162.000 kHz	55.4	20.6	-34.7	9.7	AV	N
8*	202.000 kHz	53.5	19.2	-34.3	9.7	AV	N
9*	494.000 kHz	46.1	24.5	-21.6	9.7	AV	N
10*	1.762 MHz	46.0	18.2	-27.8	9.8	AV	N
11*	3.090 MHz	46.0	24.7	-21.3	9.9	AV	N
12*	5.414 MHz	50.0	24.2	-25.8	9.9	AV	N

Note: All modes and channels have been tested and only the n20 2437MHz mode with the worst data is listed.

5. Conducted Maximum Peak Output Power

5.1. Test limits

Please refer RSS-247 & FCC PART 15: 15.247.

Regulation 15.247(b) The limit of Maximum Peak Output Power Measurement is 1 W(30dBm)

5.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance v05r02

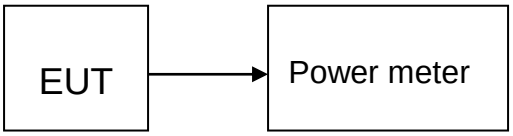
5.2.1 Place the EUT on the table and set it in transmitting mode.

5.2.2 Connected the EUT's antenna port to peak power meter by 20dB attenuator.

5.2.3 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

PASS

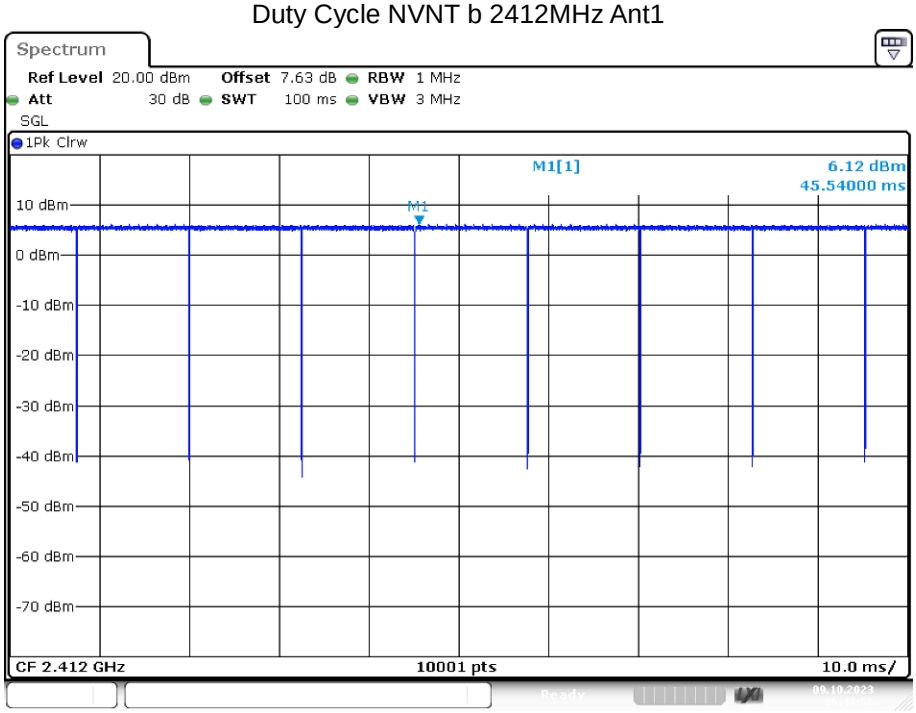
Detailed information please sees the following page.

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Duty Factor (dB)	E.I.R.P. (dBm)	Limit (dBm)	Verdict
NVNT	b	2412	Ant1	7.068	0.01	9.348	30	Pass
NVNT	b	2437	Ant1	6.896	0.01	9.176	30	Pass
NVNT	b	2462	Ant1	7.061	0.01	9.341	30	Pass
NVNT	g	2412	Ant1	7.538	0.06	9.818	30	Pass
NVNT	g	2437	Ant1	6.809	0.06	9.089	30	Pass
NVNT	g	2462	Ant1	6.506	0.06	8.786	30	Pass
NVNT	n20	2412	Ant1	6.794	0.09	9.074	30	Pass
NVNT	n20	2437	Ant1	6.991	0.05	9.271	30	Pass
NVNT	n20	2462	Ant1	6.703	0.07	8.983	30	Pass
NVNT	n40	2422	Ant1	7.292	0.04	9.572	30	Pass
NVNT	n40	2437	Ant1	6.385	0.04	8.665	30	Pass
NVNT	n40	2452	Ant1	6.74	0.03	9.02	30	Pass

Duty Cycle

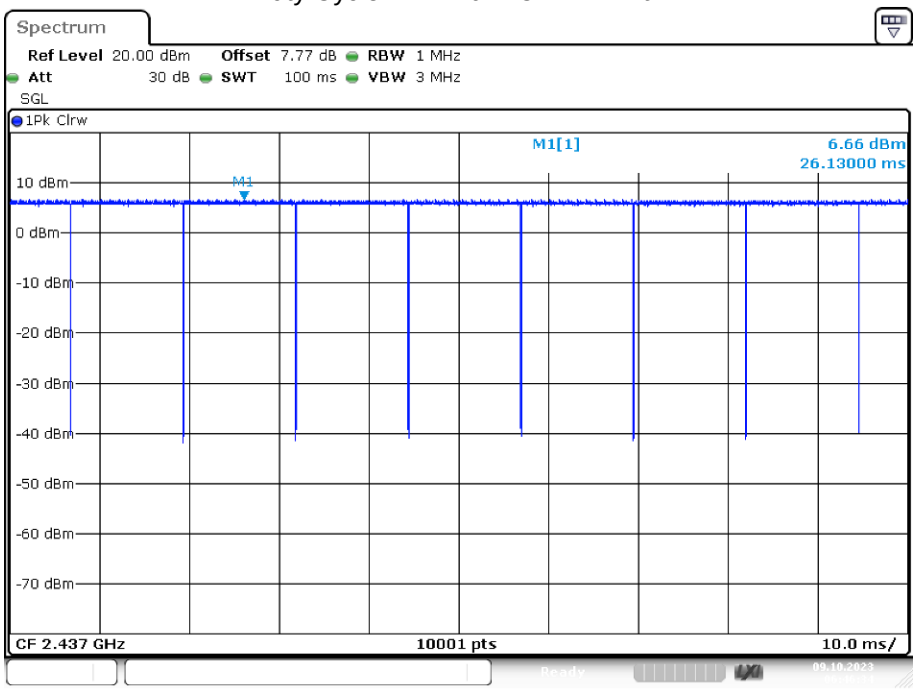
Condition	Mode	Frequency (MHz)	Antenna	Duty Cycle (%)	Correction Factor (dB)
NVNT	b	2412	Ant1	99.67	0.01
NVNT	b	2437	Ant1	99.84	0.01
NVNT	b	2462	Ant1	99.81	0.01
NVNT	g	2412	Ant1	98.59	0.06
NVNT	g	2437	Ant1	98.59	0.06
NVNT	g	2462	Ant1	98.69	0.06
NVNT	n20	2412	Ant1	98	0.09
NVNT	n20	2437	Ant1	98.75	0.05
NVNT	n20	2462	Ant1	98.48	0.07
NVNT	n40	2422	Ant1	99.05	0.04
NVNT	n40	2437	Ant1	99.13	0.04
NVNT	n40	2452	Ant1	99.32	0.03

Duty Cycle NVNT b 2412MHz Ant1



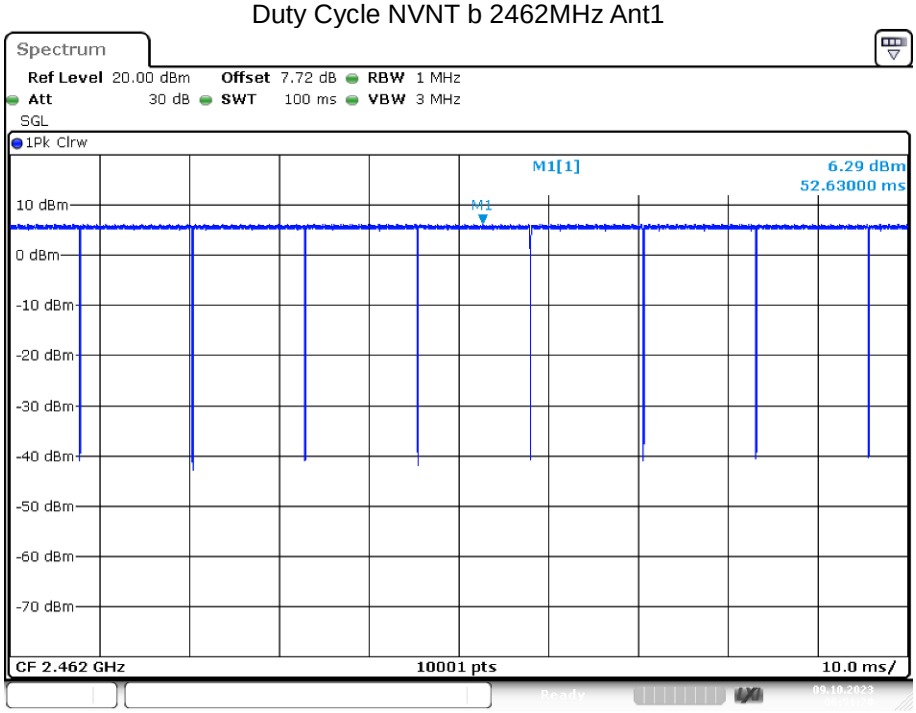
Date: 9.OCT.2023 06:43:55

Duty Cycle NVNT b 2437MHz Ant1



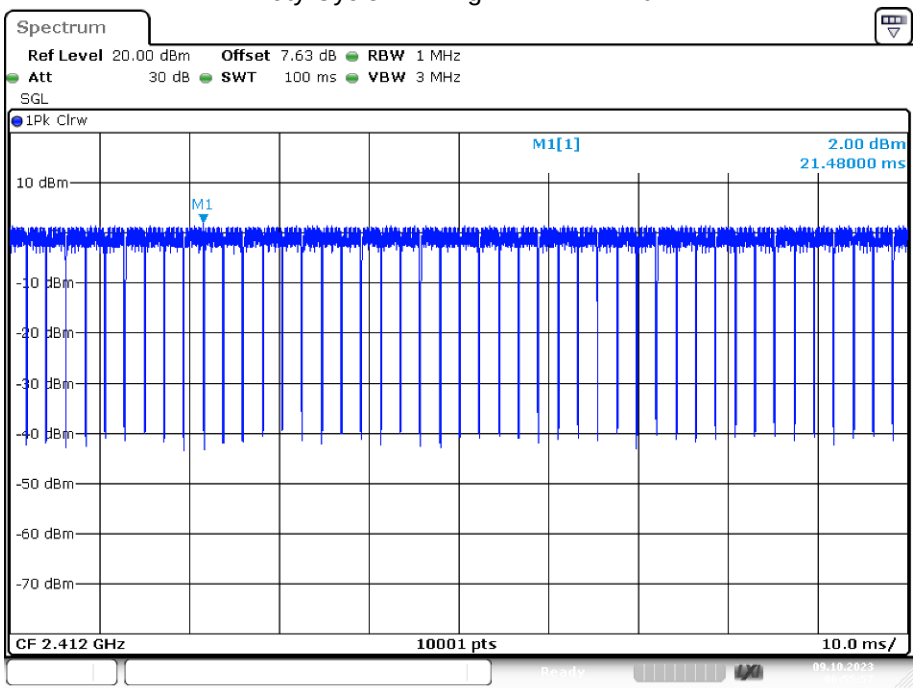
Date: 9.OCT.2023 06:46:33

Duty Cycle NVNT b 2462MHz Ant1



Date: 9.OCT.2023 06:51:28

Duty Cycle NVNT g 2412MHz Ant1



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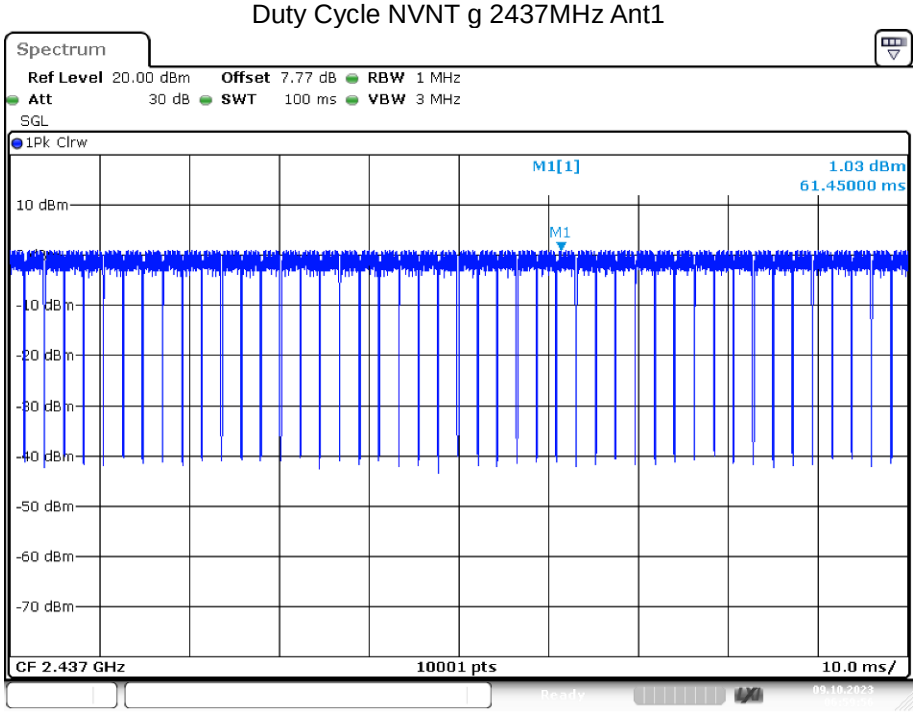
Duty Cycle NVNT g 2437MHz Ant1



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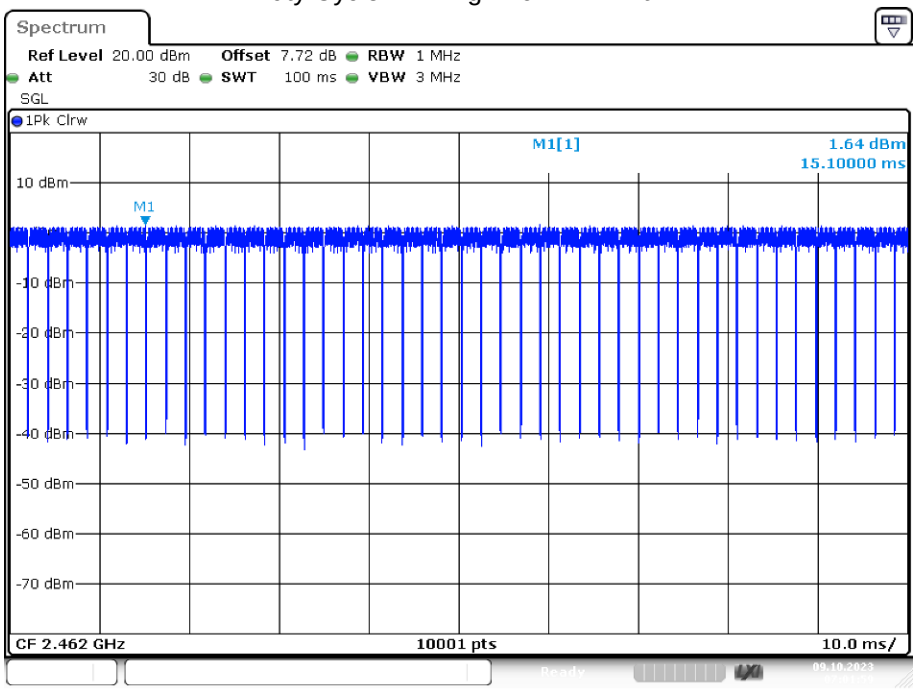
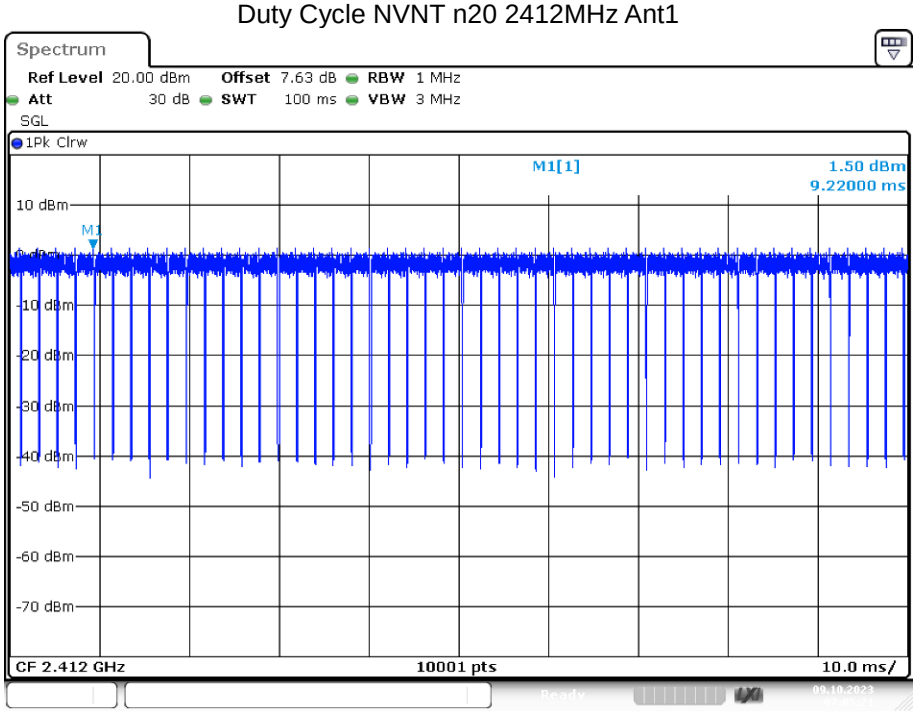


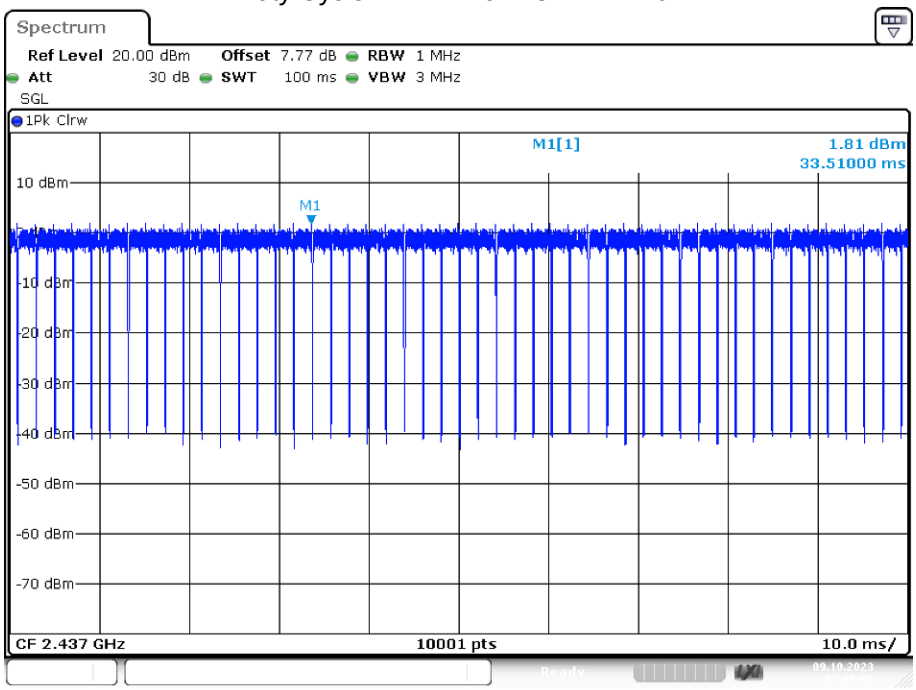
Date: 9.OCT.2023 07:01:58

Duty Cycle NVNT n20 2412MHz Ant1



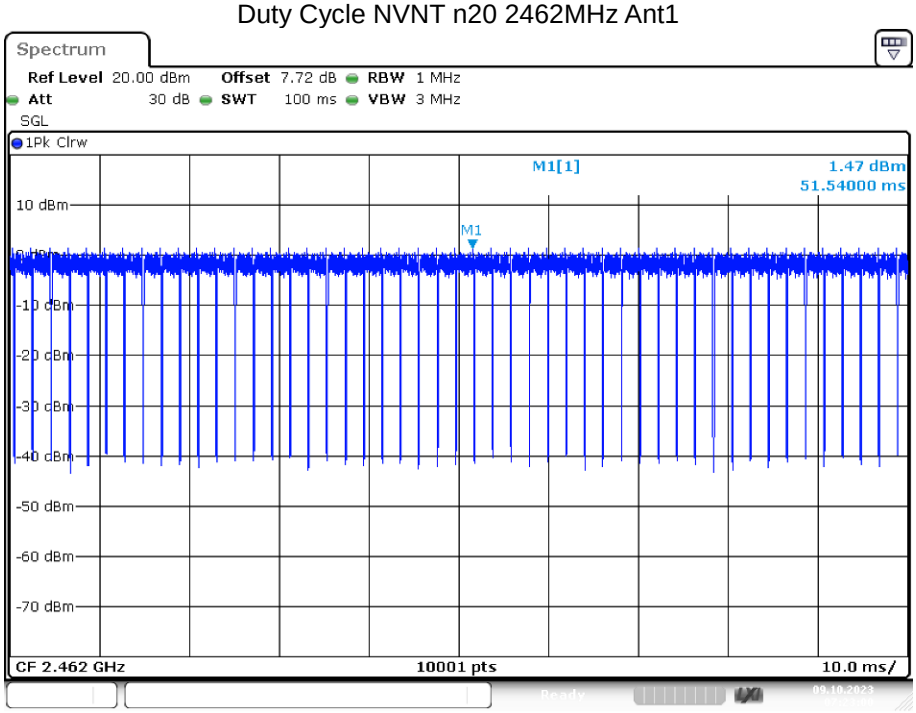
Date: 9.OCT.2023 07:05:20

Duty Cycle NVNT n20 2437MHz Ant1



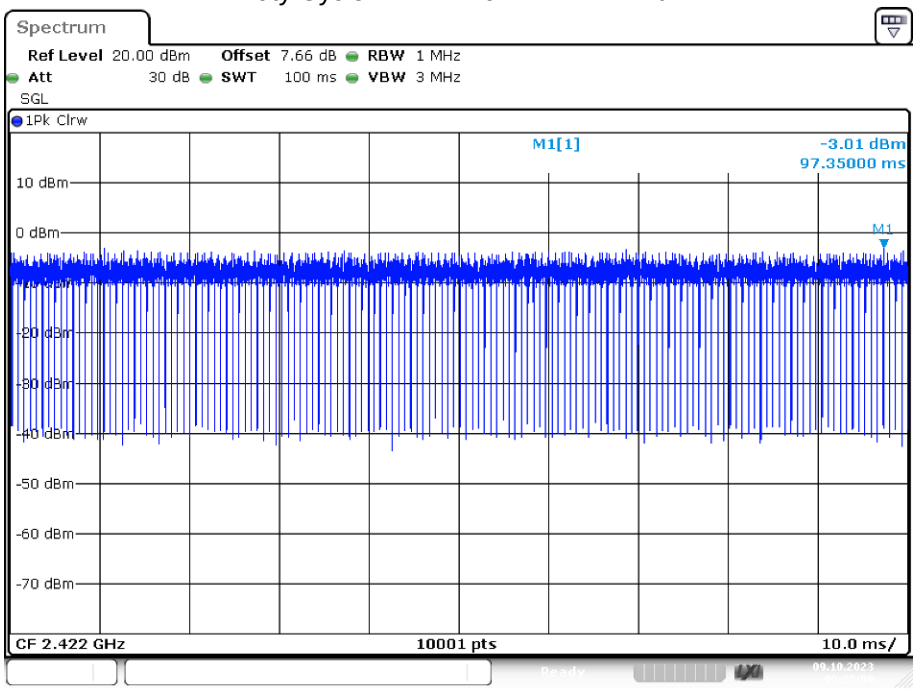
Date: 9.OCT.2023 07:09:05

Duty Cycle NVNT n20 2462MHz Ant1



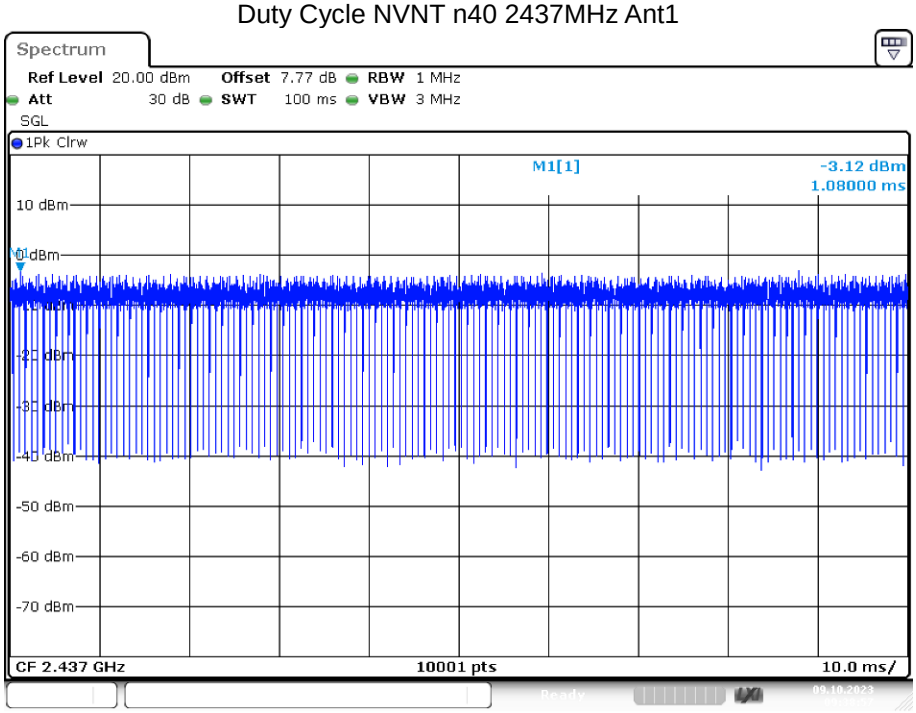
Date: 9.OCT.2023 07:23:00

Duty Cycle NVNT n40 2422MHz Ant1



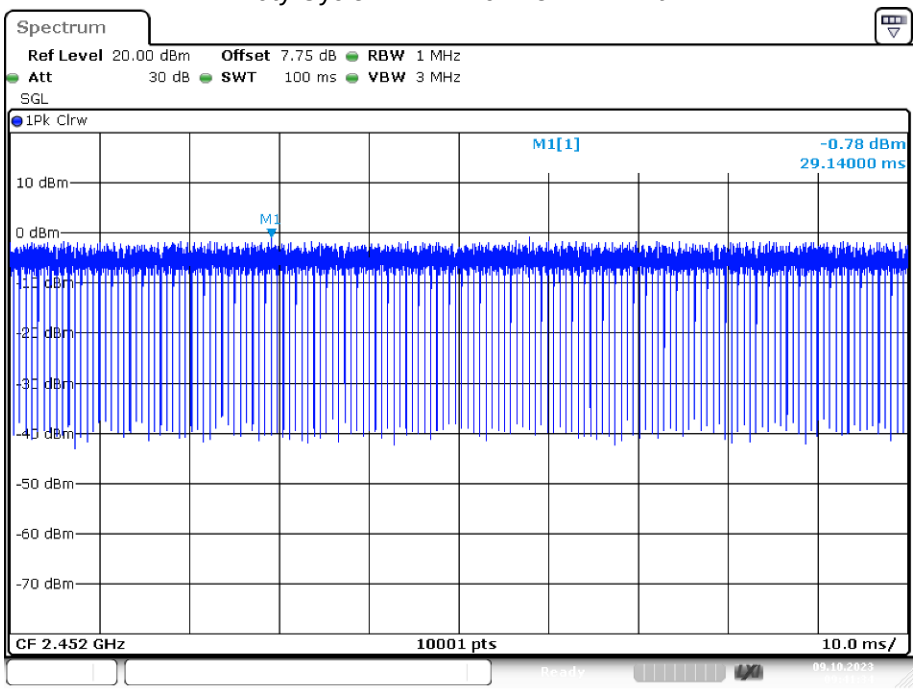
Date: 9.OCT.2023 09:24:59

Duty Cycle NVNT n40 2437MHz Ant1



Date: 9.OCT.2023 09:38:57

Duty Cycle NVNT n40 2452MHz Ant1



Date: 9.OCT.2023 09:41:35

6. Peak Power Spectral Density

6.1. Test limits

6.1.1 Please refer RSS-247 & FCC PART 15: 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 KDB558074 D01 Meas Guidance v05r02

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

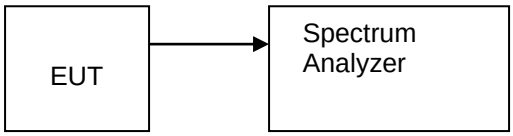
6.2.2 Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

6.2.3 Set the spectrum analyzer as RBW = 100kHz(Set the RBW to: 3 kHz≤RBW≤100 kHz.), VBW = 300kHz(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.

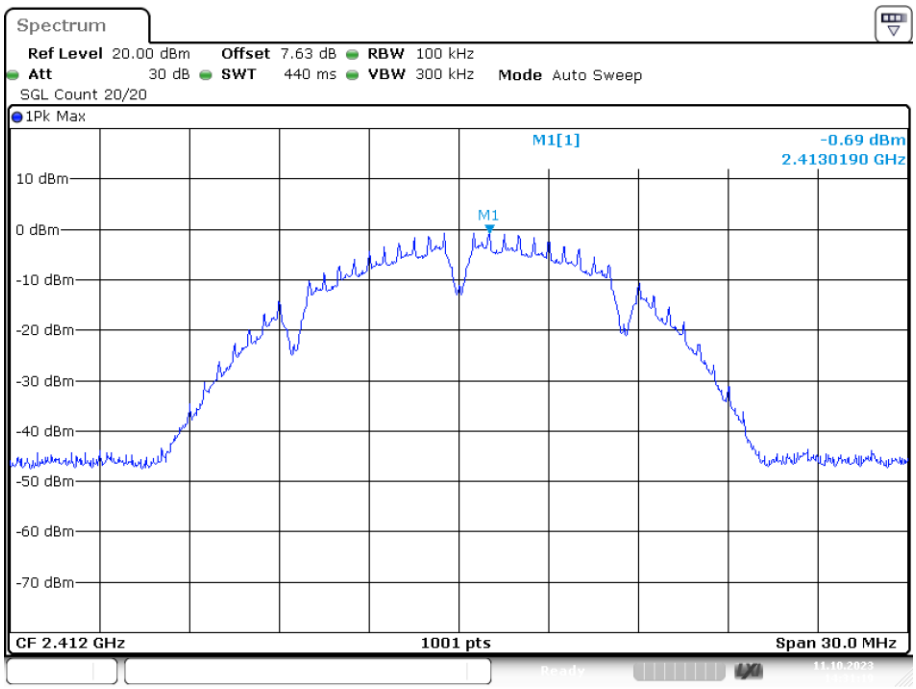
6.3. Test Setup



6.4. Test Results

Condition	Mode	Frequency (MHz)	Antenna	Max PSD (dBm)	Limit (dBm)	Verdict
NVNT	b	2412	Ant1	-0.686	8	Pass
NVNT	b	2437	Ant1	0.055	8	Pass
NVNT	b	2462	Ant1	-0.168	8	Pass
NVNT	g	2412	Ant1	-5.741	8	Pass
NVNT	g	2437	Ant1	-7.398	8	Pass
NVNT	g	2462	Ant1	-6.244	8	Pass
NVNT	n20	2412	Ant1	-6.419	8	Pass
NVNT	n20	2437	Ant1	-7.286	8	Pass
NVNT	n20	2462	Ant1	-6.34	8	Pass
NVNT	n40	2422	Ant1	-9.507	8	Pass
NVNT	n40	2437	Ant1	-12.105	8	Pass
NVNT	n40	2452	Ant1	-10.185	8	Pass

PSD NVNT b 2412MHz Ant1



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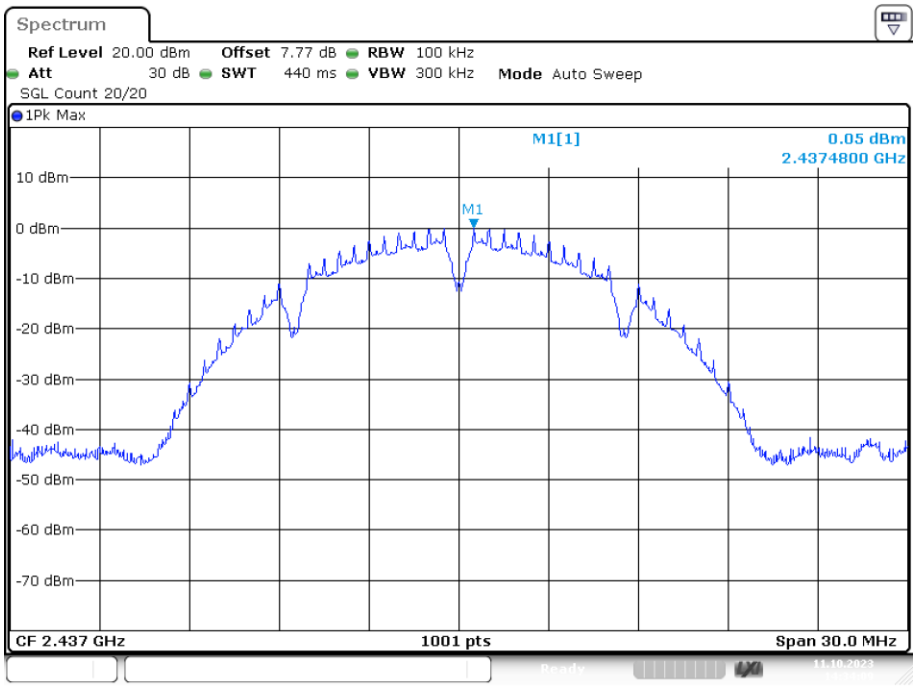
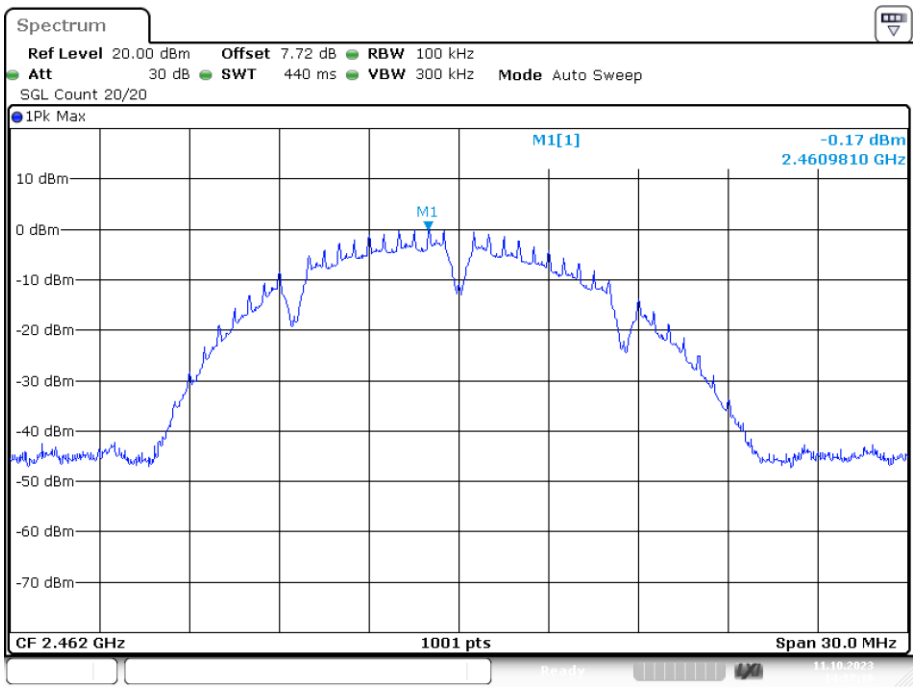
PSD NVNT b 2437MHz Ant1



Date: 11.OCT.2023 14:34:09

PSD NVNT b 2462MHz Ant1



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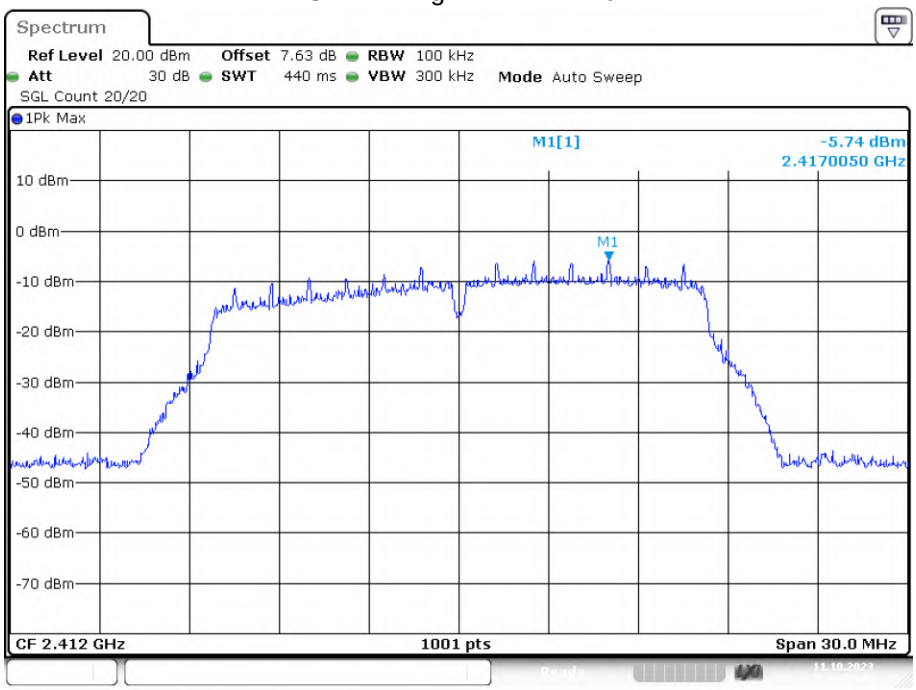
PSD NVNT g 2412MHz Ant1



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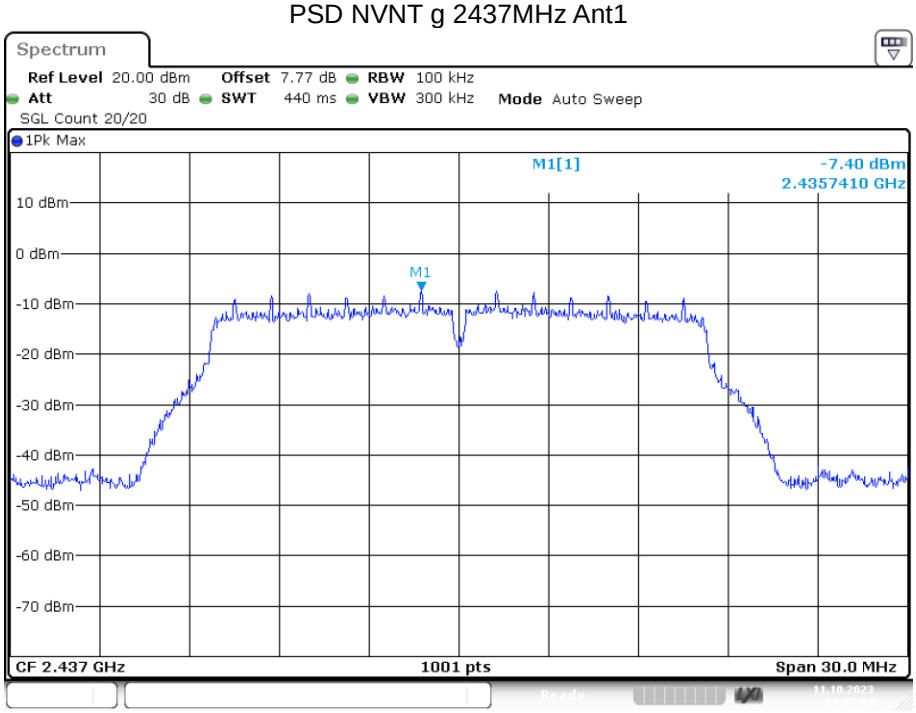
PSD NVNT g 2437MHz Ant1



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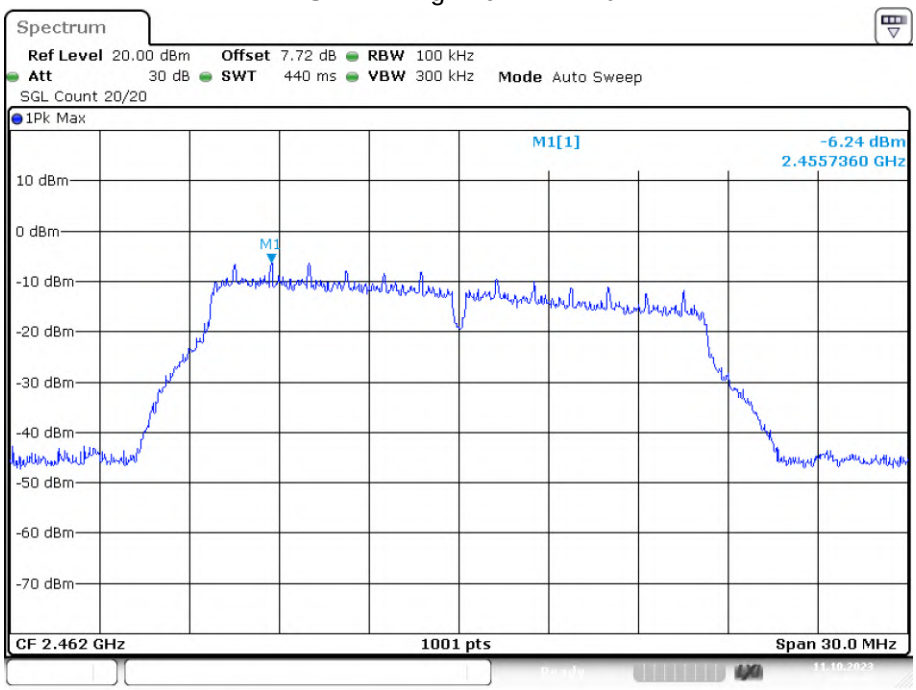
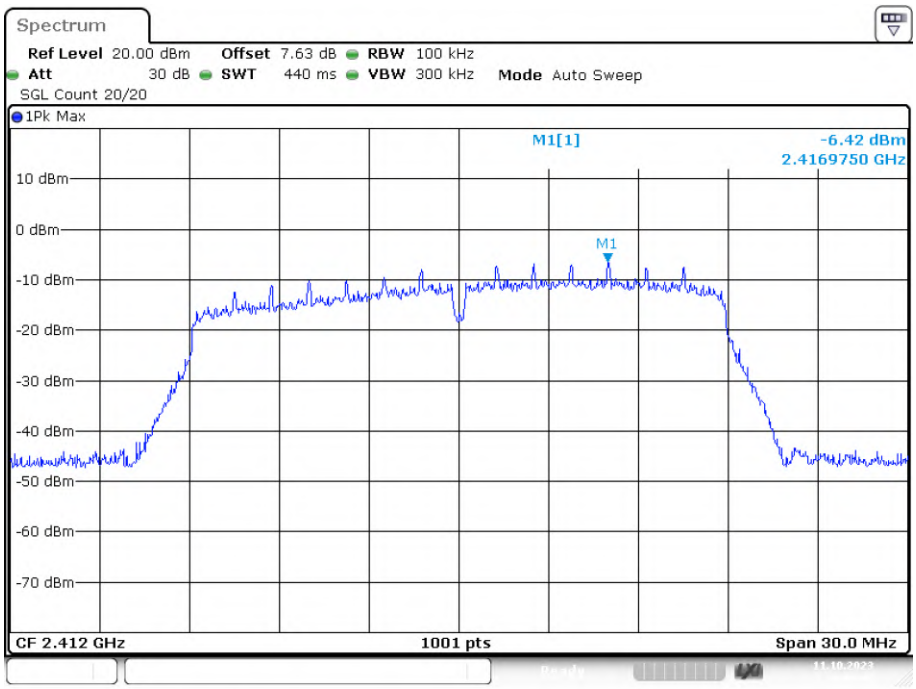
PSD NVNT g 2462MHz Ant1



Date: 11.OCT.2023 14:46:42

PSD NVNT n20 2412MHz Ant1



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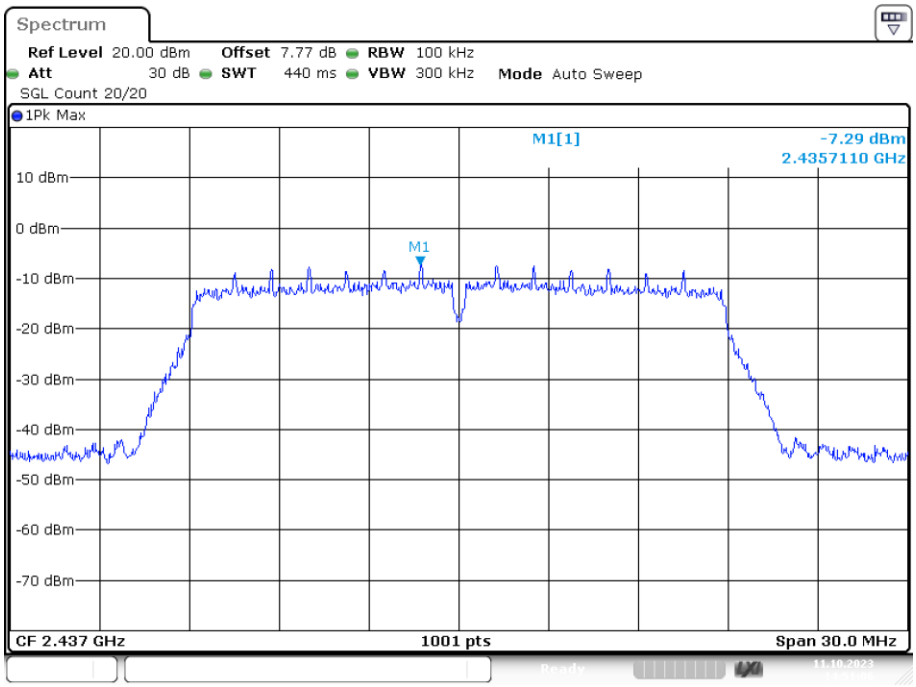
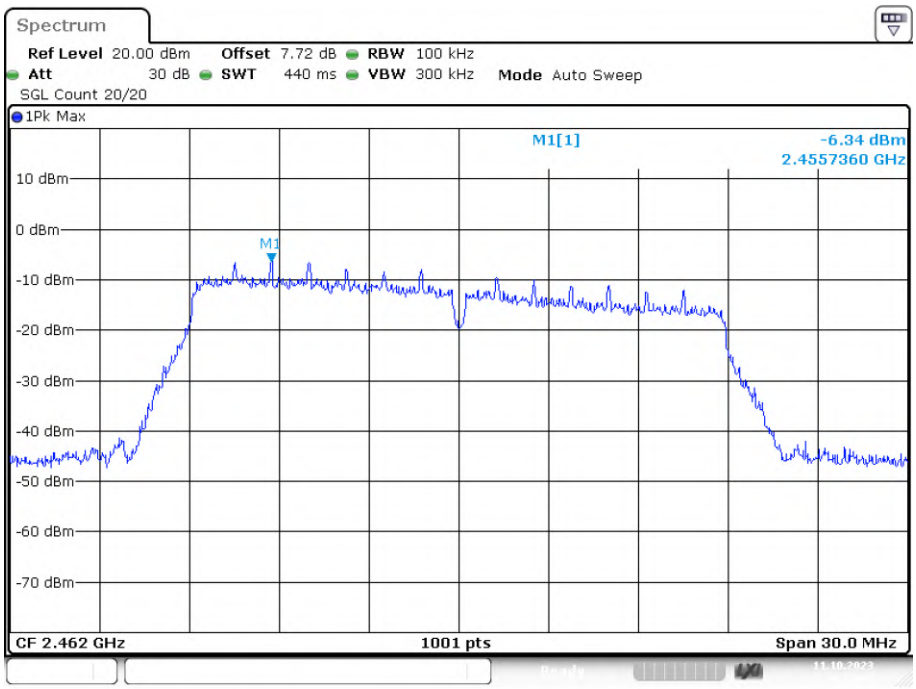
PSD NVNT n20 2437MHz Ant1



Date: 11.OCT.2023 14:51:05

PSD NVNT n20 2462MHz Ant1



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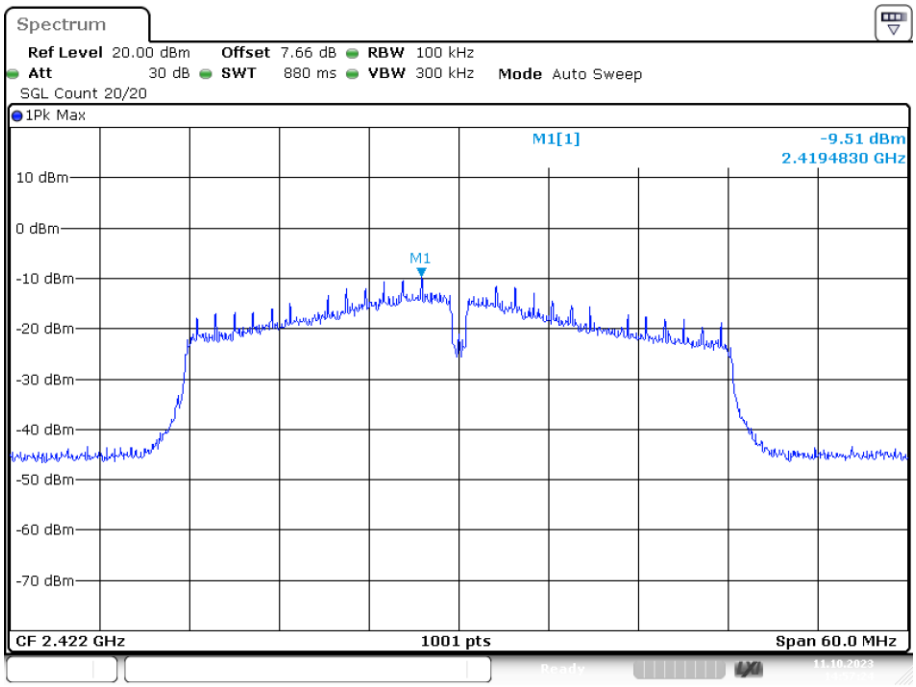
PSD NVNT n40 2422MHz Ant1



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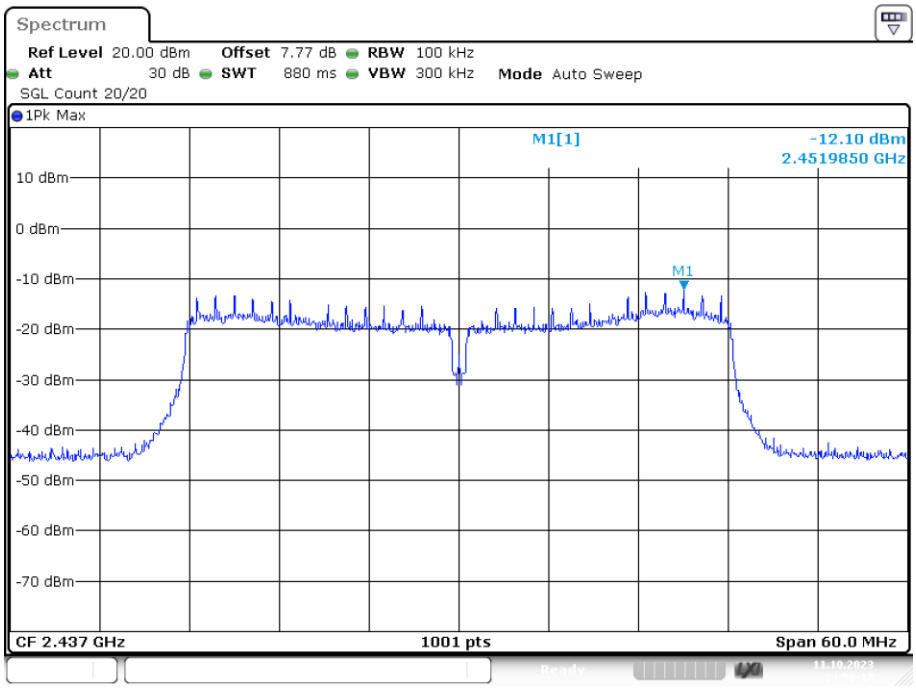
PSD NVNT n40 2437MHz Ant1



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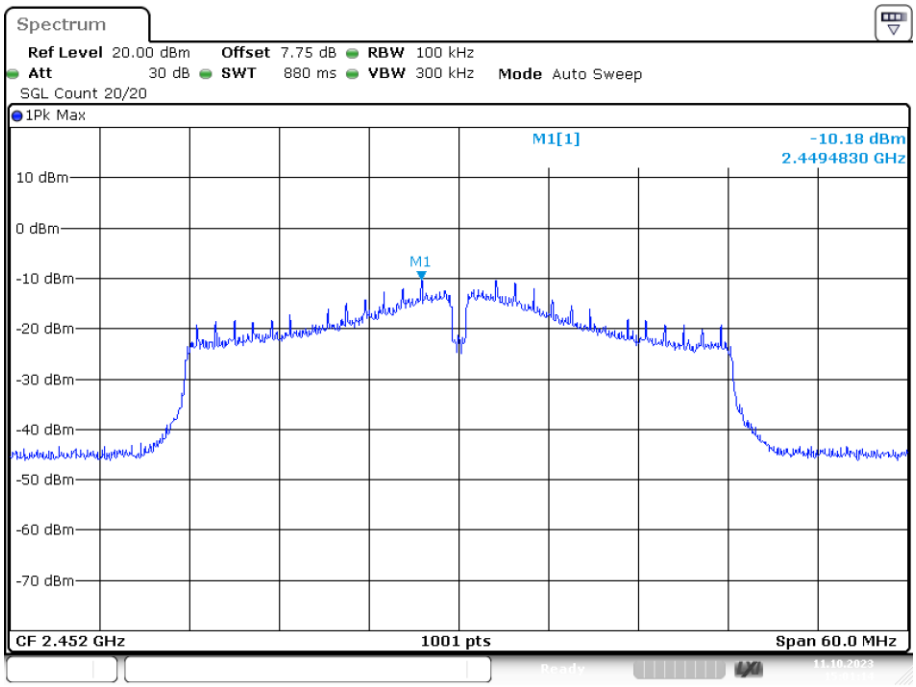
PSD NVNT n40 2452MHz Ant1



Date: 11.OCT.2023 15:01:14

7. Bandwidth

7.1. Test limits

Please refer RSS-247 & FCC PART 15: 15.247
For direct sequence systems, the minimum 6dB bandwidth shall be at least 500 kHz.

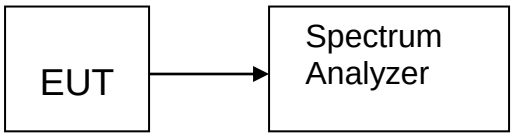
7.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance v05r02

a) The bandwidth is measured at an amplitude level reduced 6dB 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≥3*RBW =300kHz,, Peak Detector, Sweep time set auto, detail see the test plot.

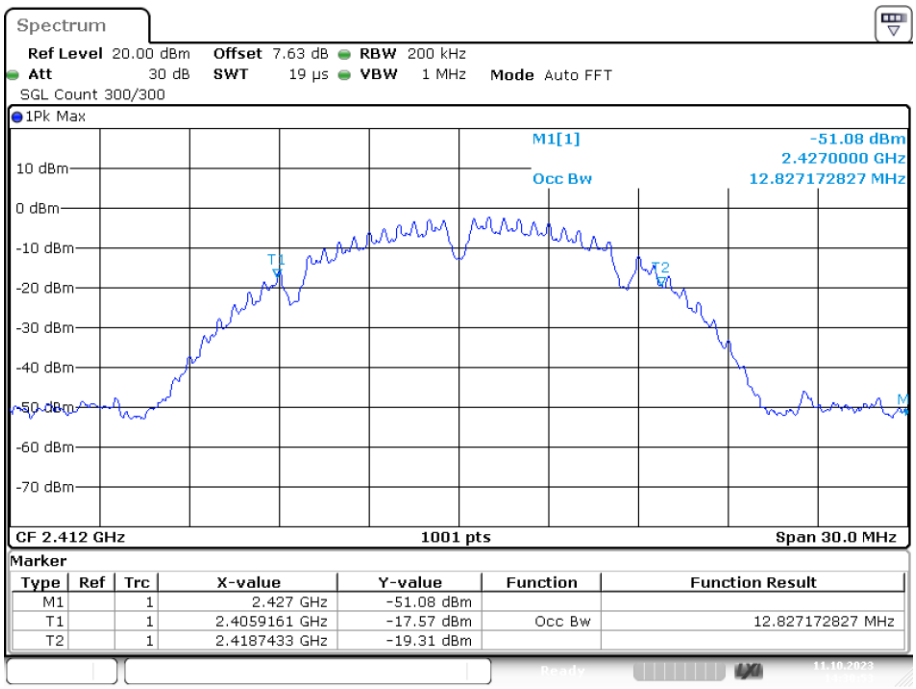
7.3. Test Setup



7.4. Test Results

Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	b	2412	Ant 1	12.827	8.07	0.5	Pass
NVNT	b	2437	Ant 1	13.067	9.06	0.5	Pass
NVNT	b	2462	Ant 1	13.157	8.55	0.5	Pass
NVNT	g	2412	Ant 1	16.484	15.99	0.5	Pass
NVNT	g	2437	Ant 1	16.783	16.53	0.5	Pass
NVNT	g	2462	Ant 1	16.693	15.72	0.5	Pass
NVNT	n20	2412	Ant 1	17.532	15.45	0.5	Pass
NVNT	n20	2437	Ant 1	17.772	17.58	0.5	Pass
NVNT	n20	2462	Ant 1	17.742	16.38	0.5	Pass
NVNT	n40	2422	Ant 1	35.485	14.58	0.5	Pass
NVNT	n40	2437	Ant 1	36.503	35.34	0.5	Pass
NVNT	n40	2452	Ant 1	35.544	13.8	0.5	Pass

OBW NVNT b 2412MHz Ant1



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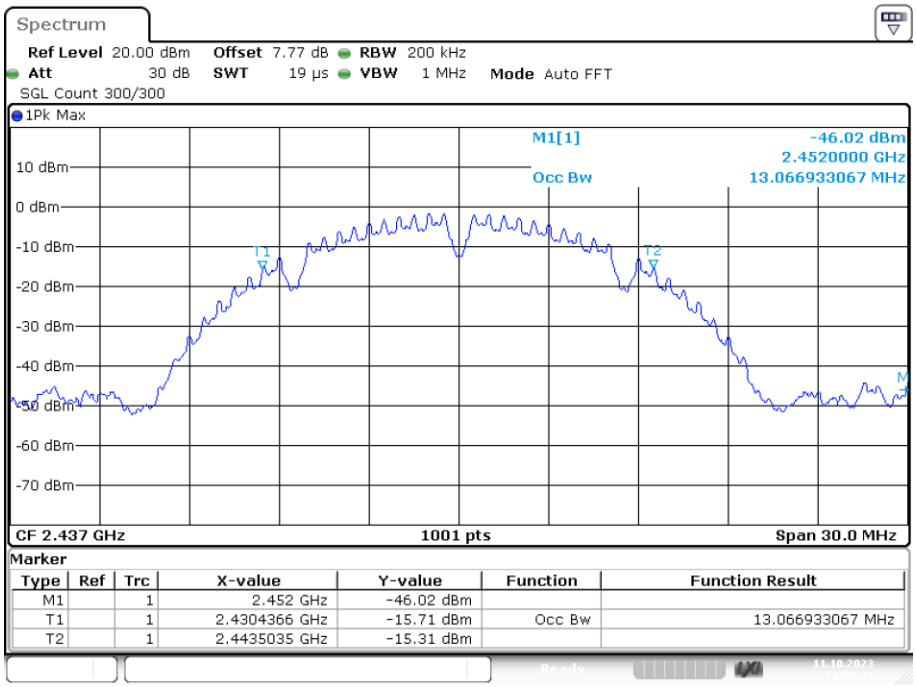
OBW NVNT b 2437MHz Ant1



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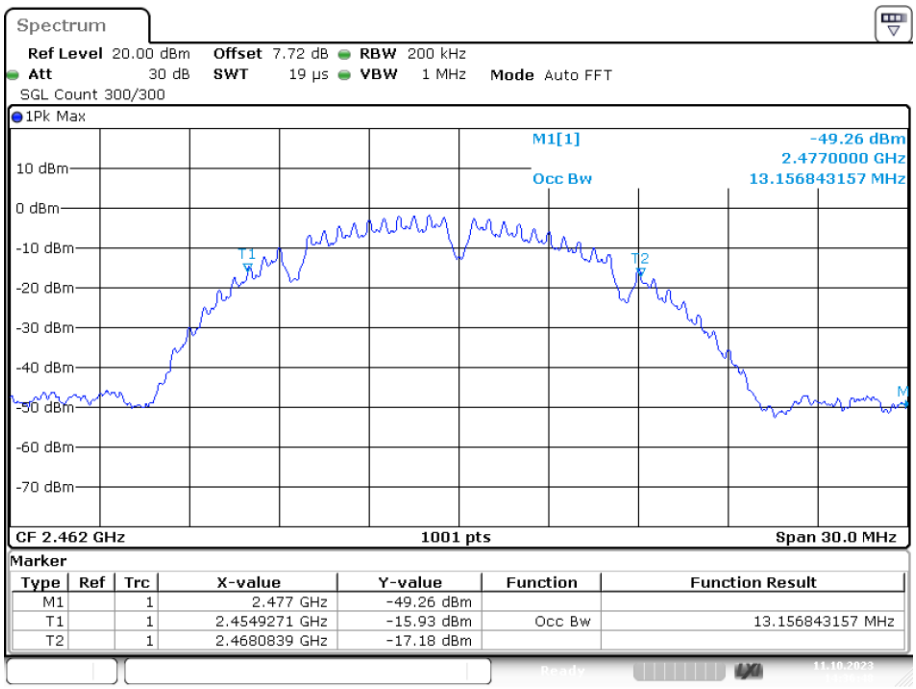
OBW NVNT b 2462MHz Ant1



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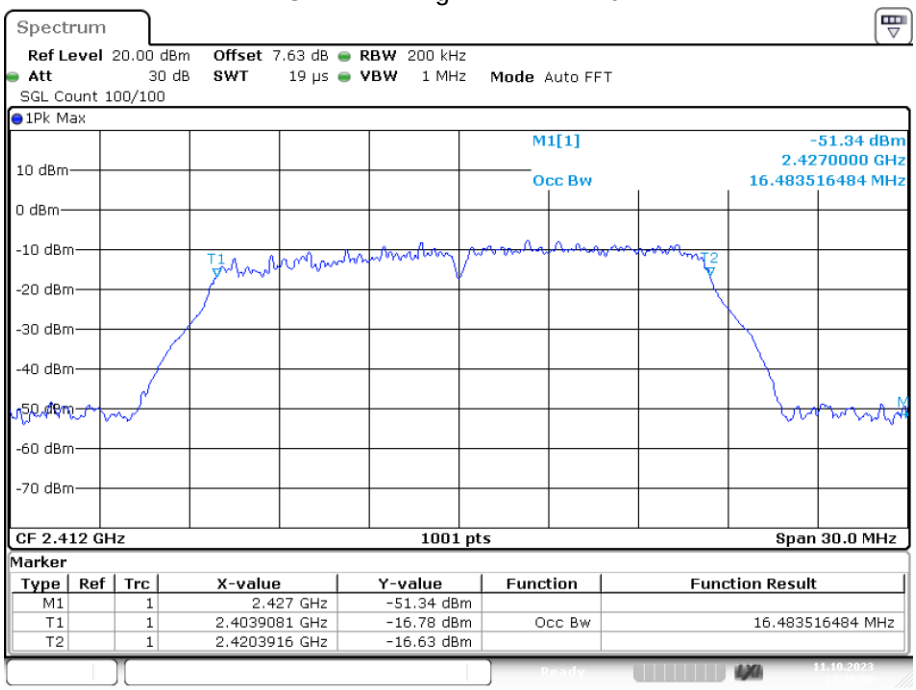
OBW NVNT g 2412MHz Ant1



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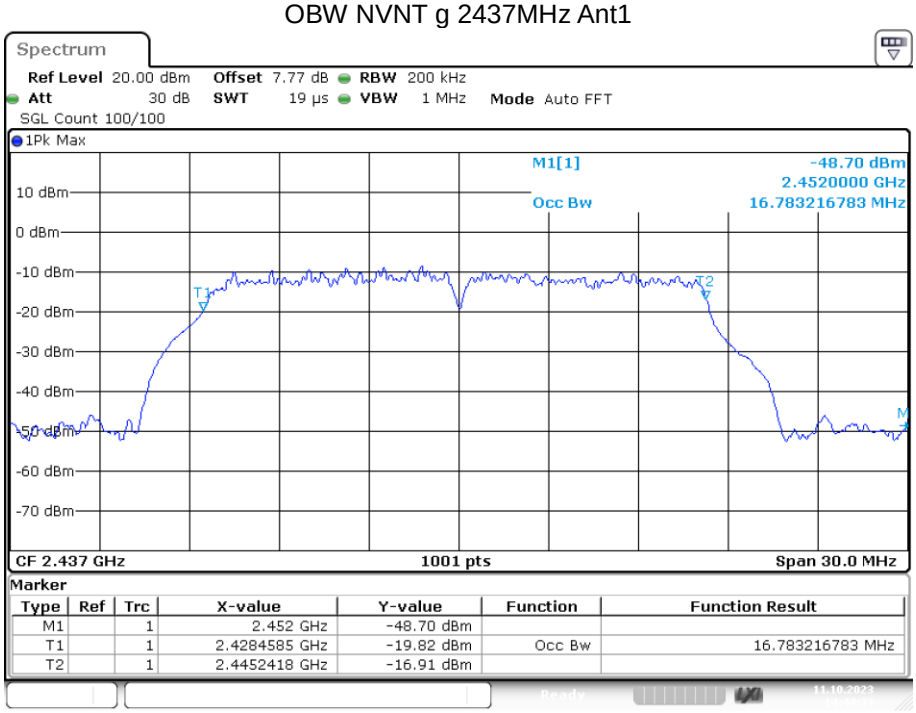
OBW NVNT g 2437MHz Ant1



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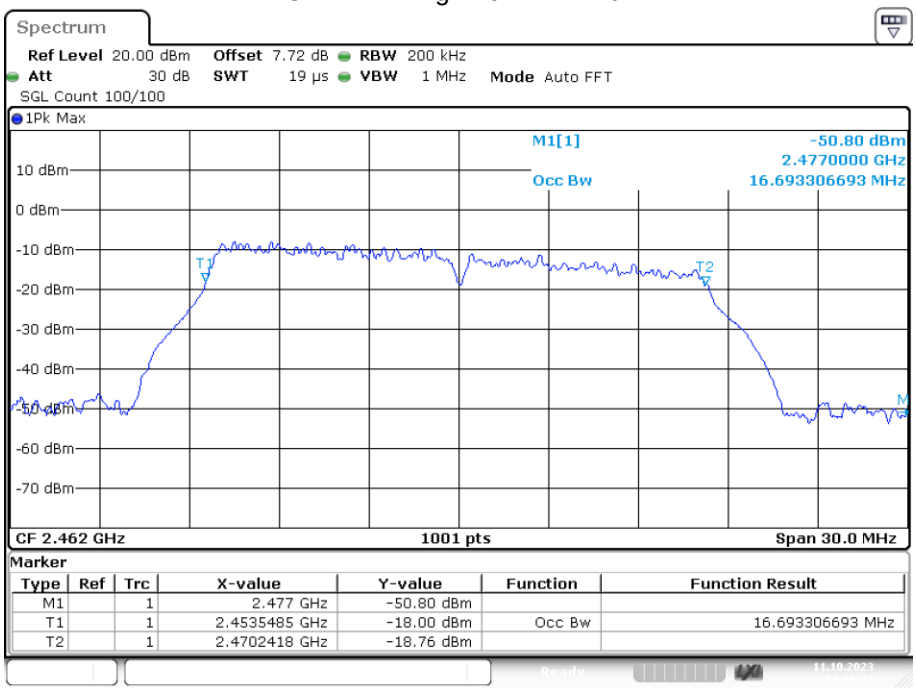

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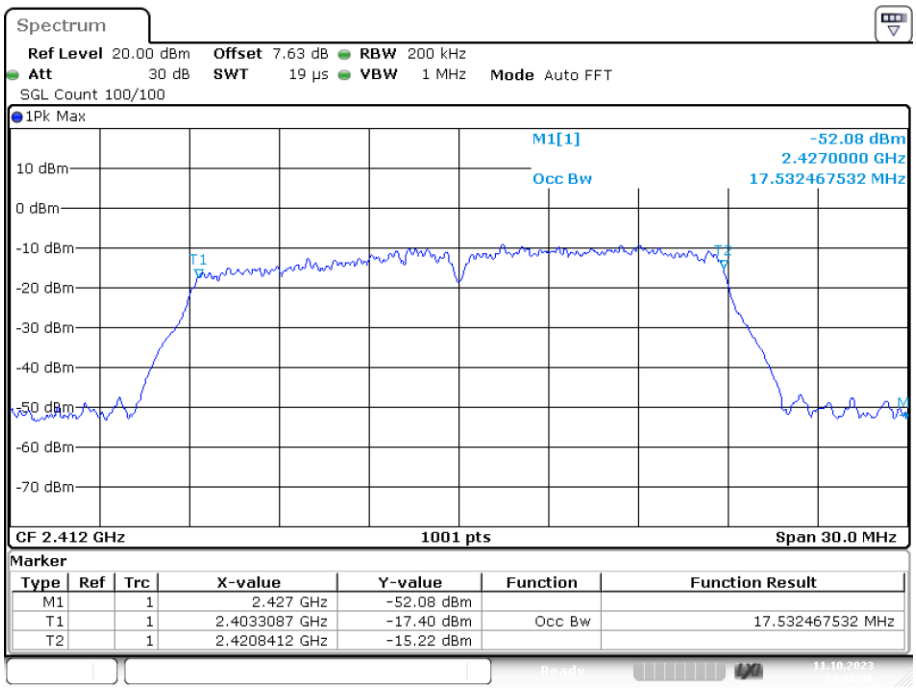
OBW NVNT n20 2412MHz Ant1



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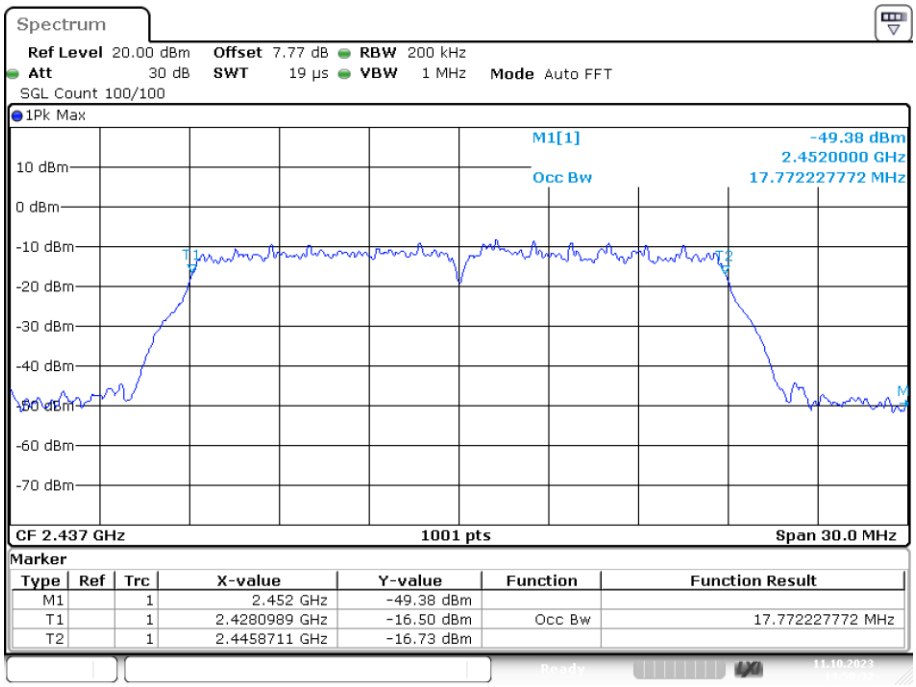
OBW NVNT n20 2437MHz Ant1



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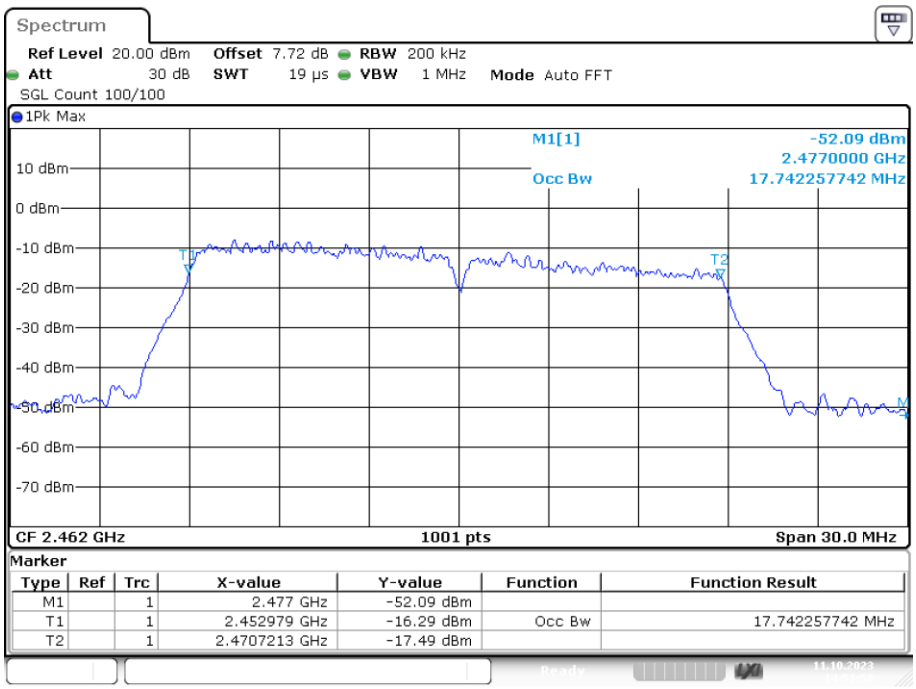

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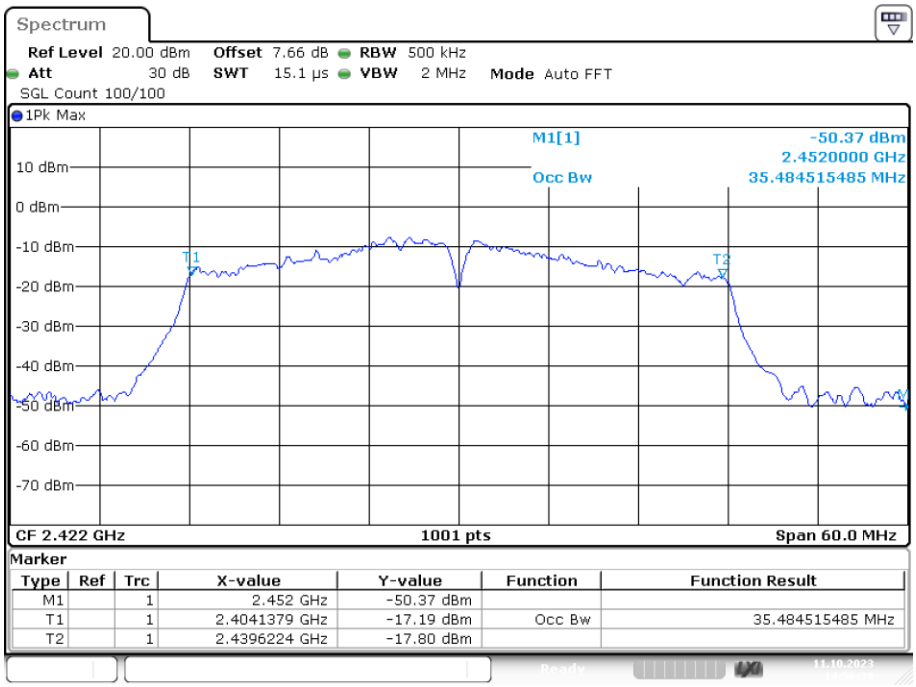
OBW NVNT n40 2422MHz Ant1



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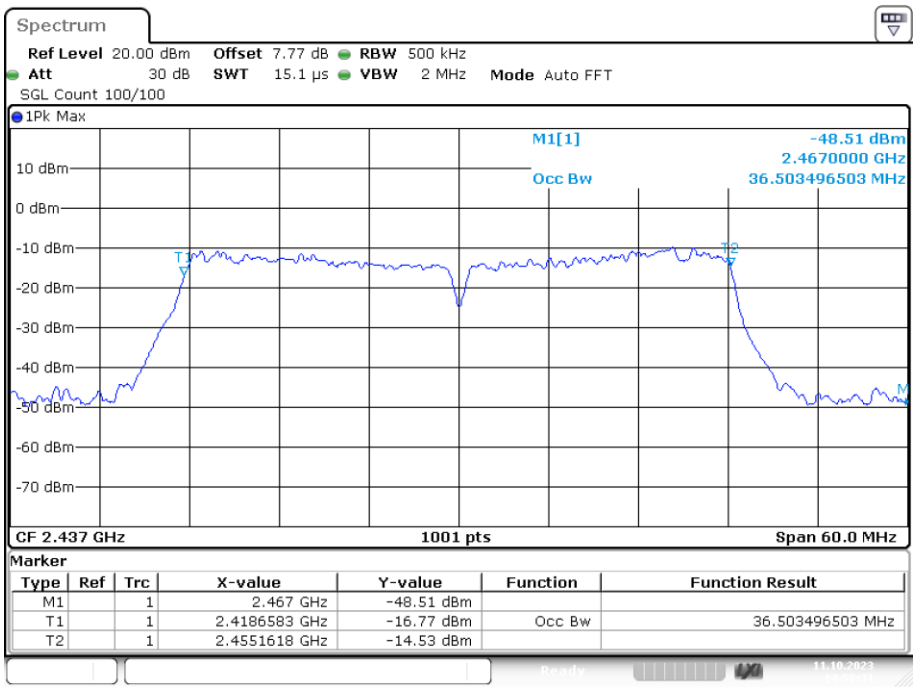
OBW NVNT n40 2437MHz Ant1



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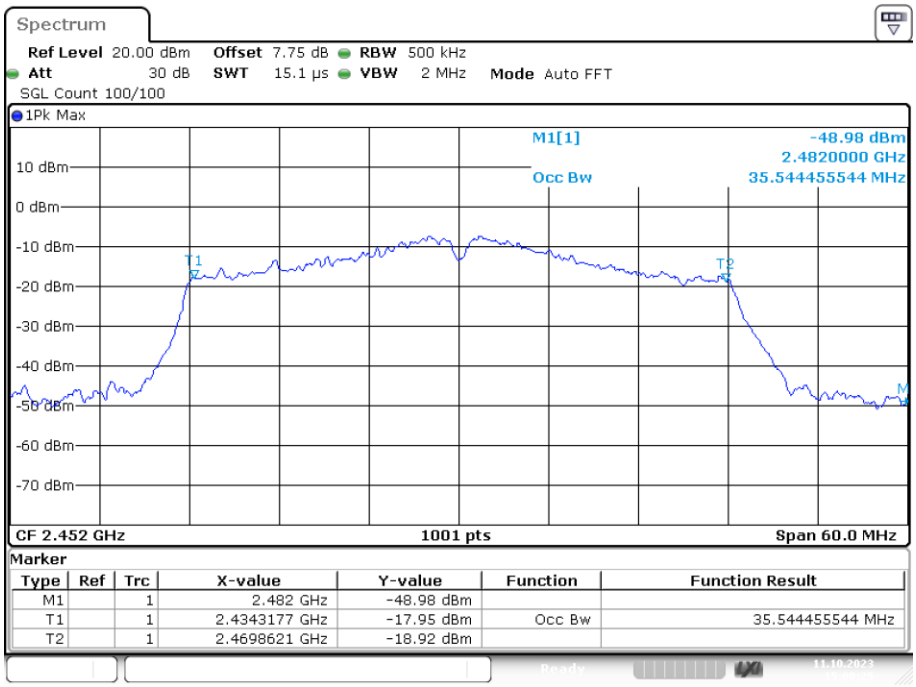
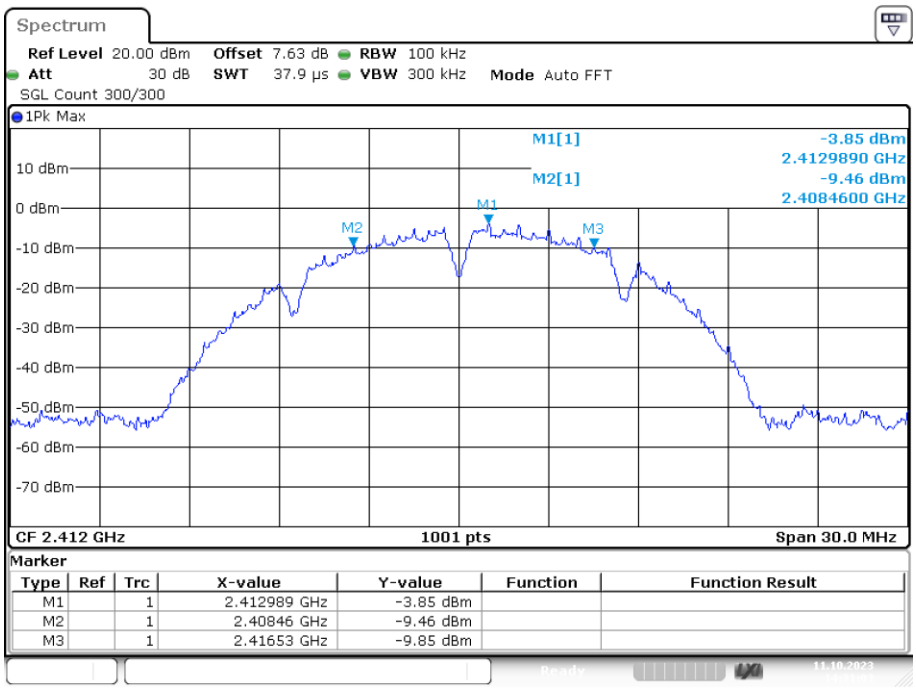
OBW NVNT n40 2452MHz Ant1



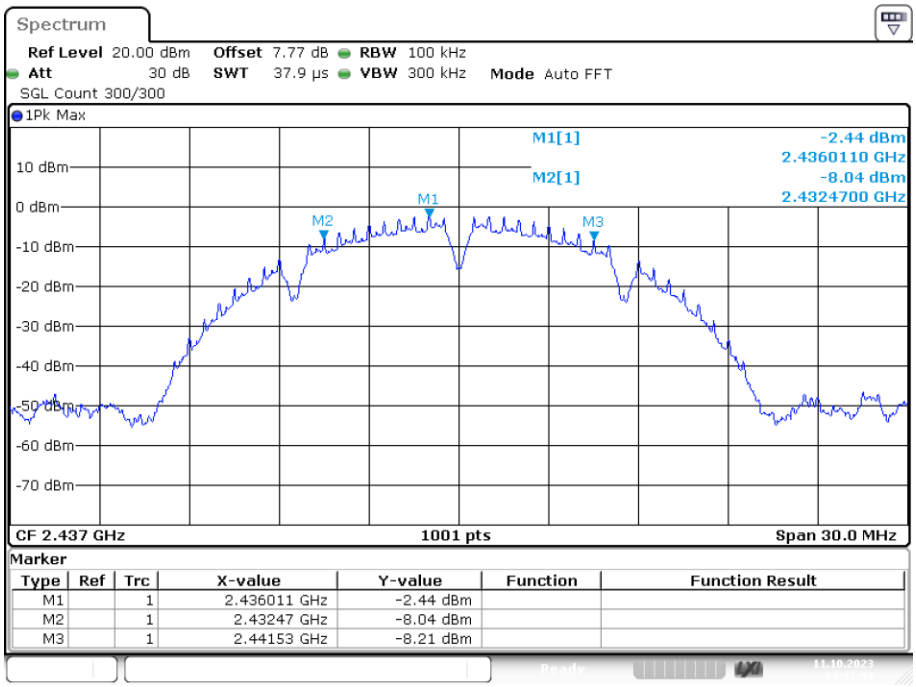
Date: 11.OCT.2023 15:00:26

-6dB Bandwidth NVNT b 2412MHz Ant1



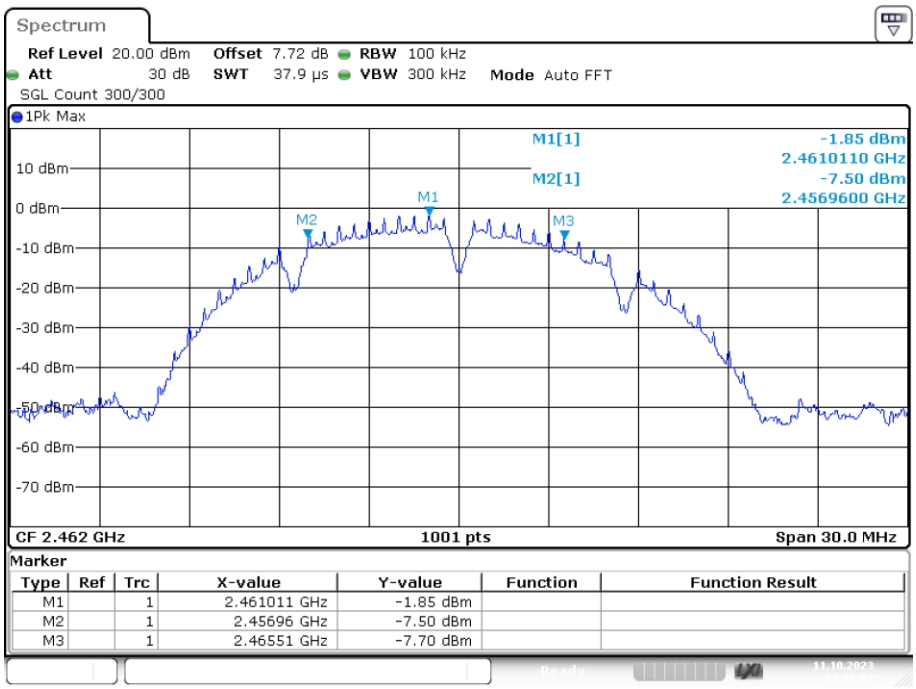
Date: 11.OCT.2023 14:31:03

-6dB Bandwidth NVNT b 2437MHz Ant1



Date: 11.OCT.2023 14:33:53

-6dB Bandwidth NVNT b 2462MHz Ant1



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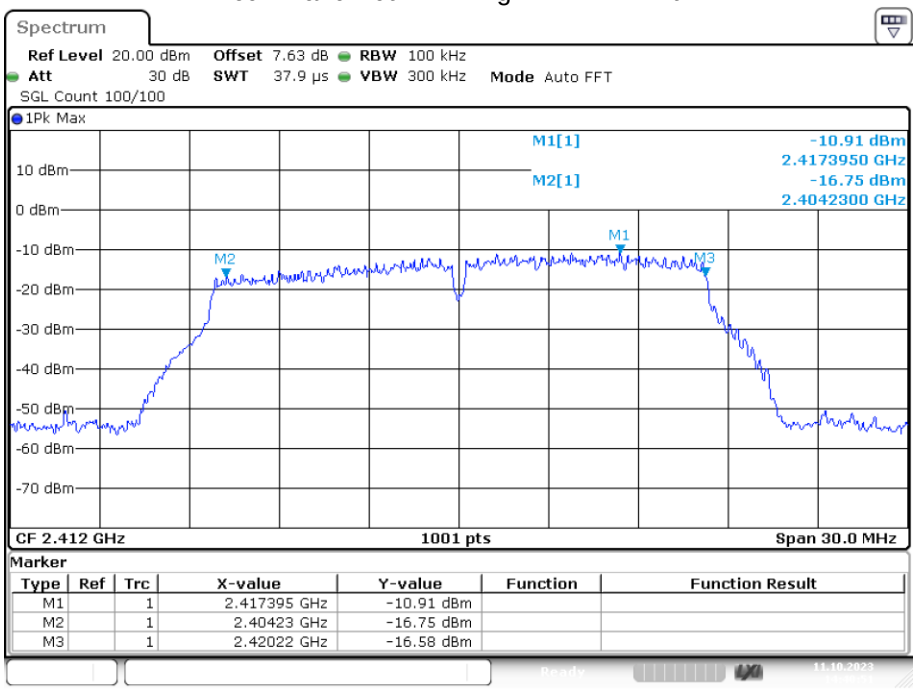
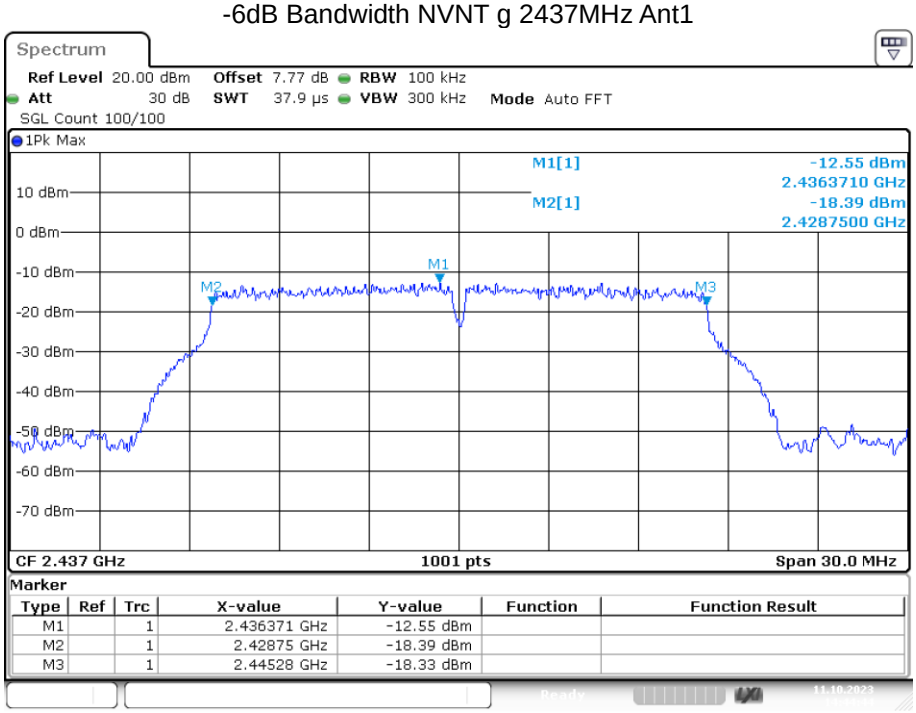
-6dB Bandwidth NVNT g 2412MHz Ant1



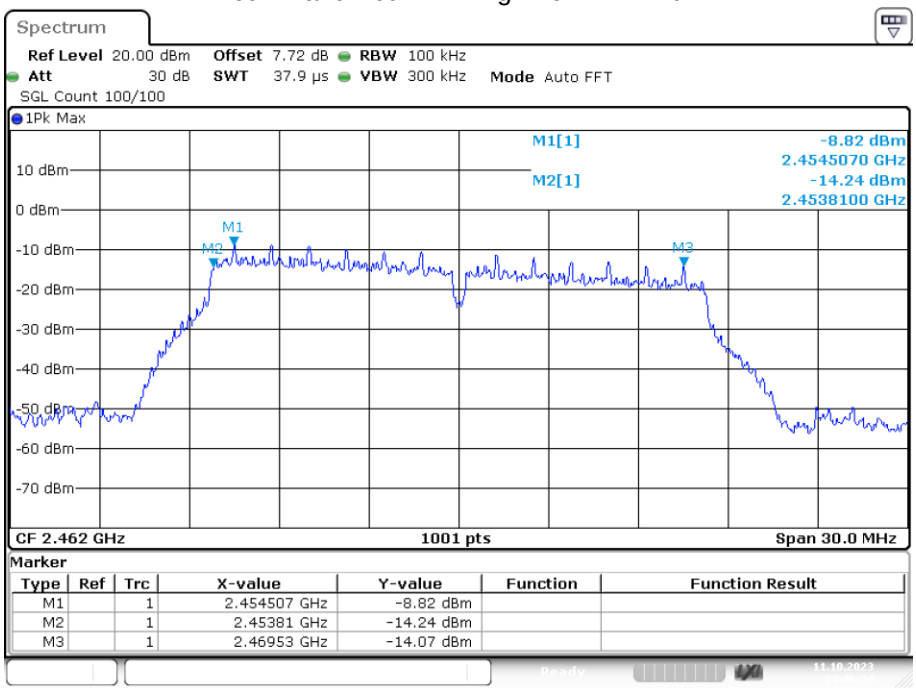
Date: 11.OCT.2023 14:40:51

-6dB Bandwidth NVNT g 2437MHz Ant1



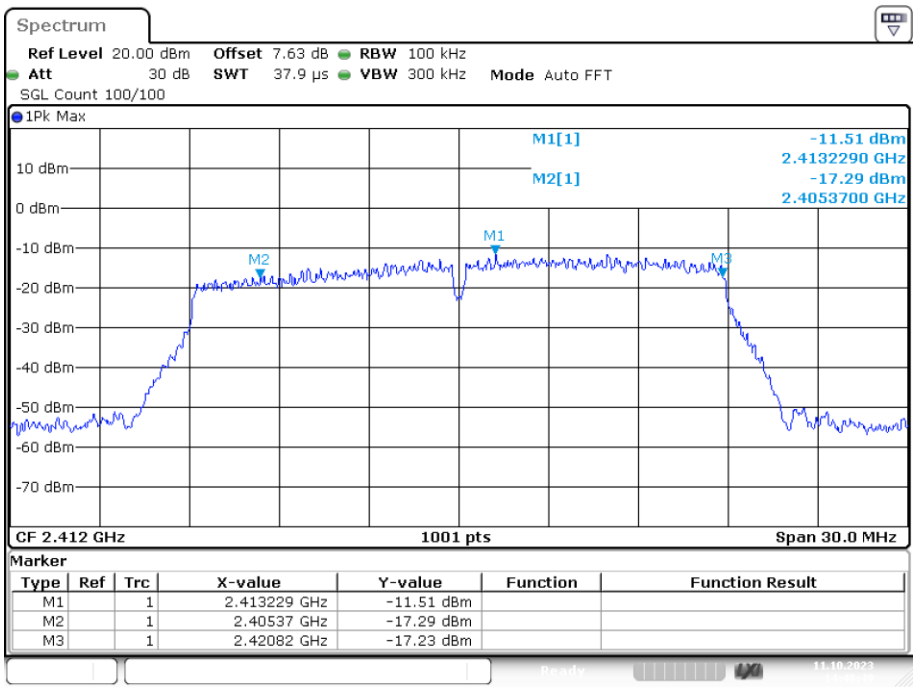
Date: 11.OCT.2023 14:44:45

-6dB Bandwidth NVNT g 2462MHz Ant1



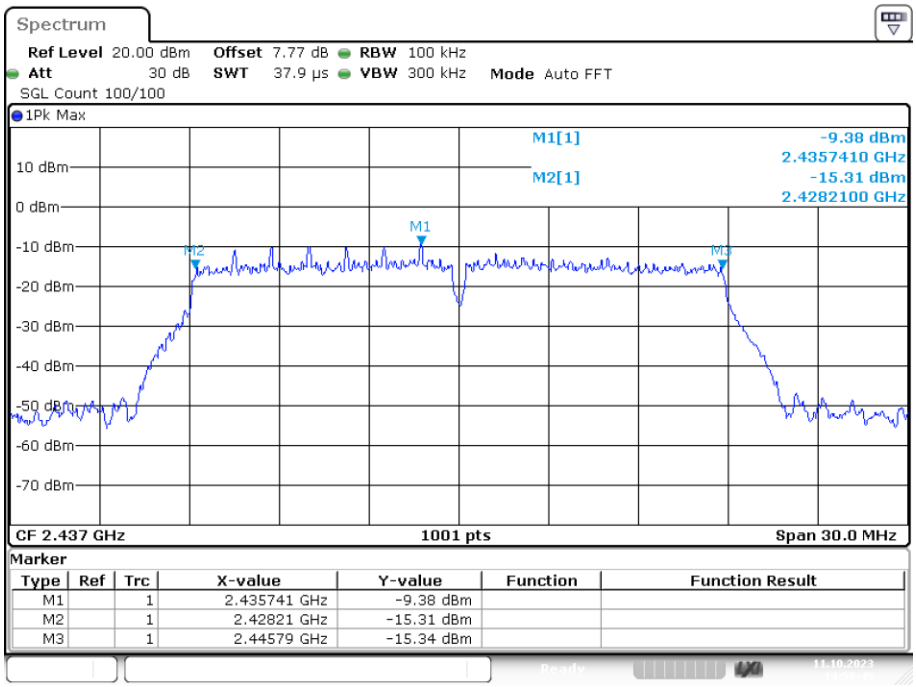
Date: 11.OCT.2023 14:46:23

-6dB Bandwidth NVNT n20 2412MHz Ant1



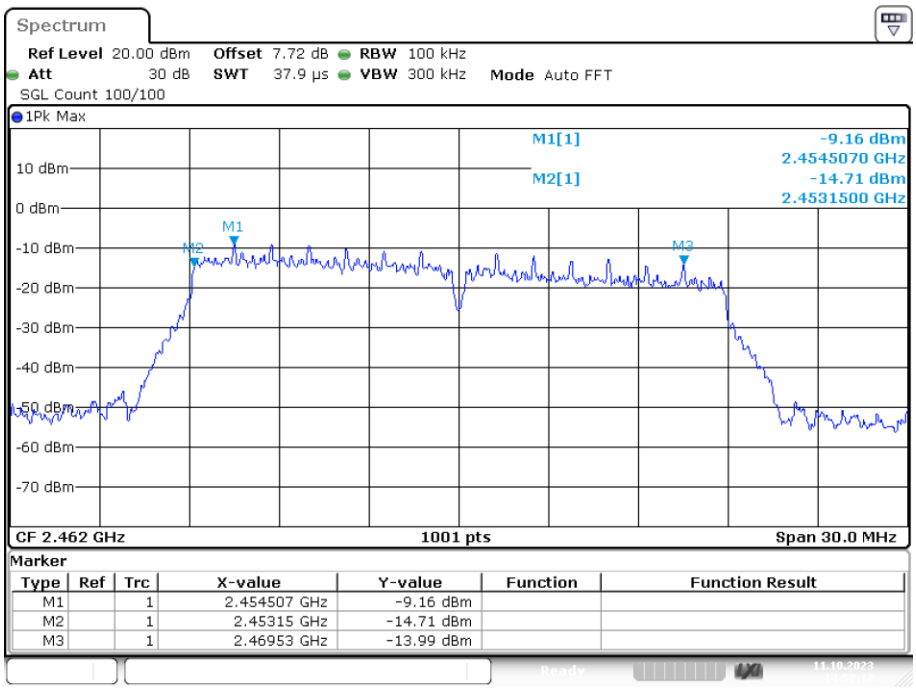
Date: 11.OCT.2023 14:48:49

-6dB Bandwidth NVNT n20 2437MHz Ant1



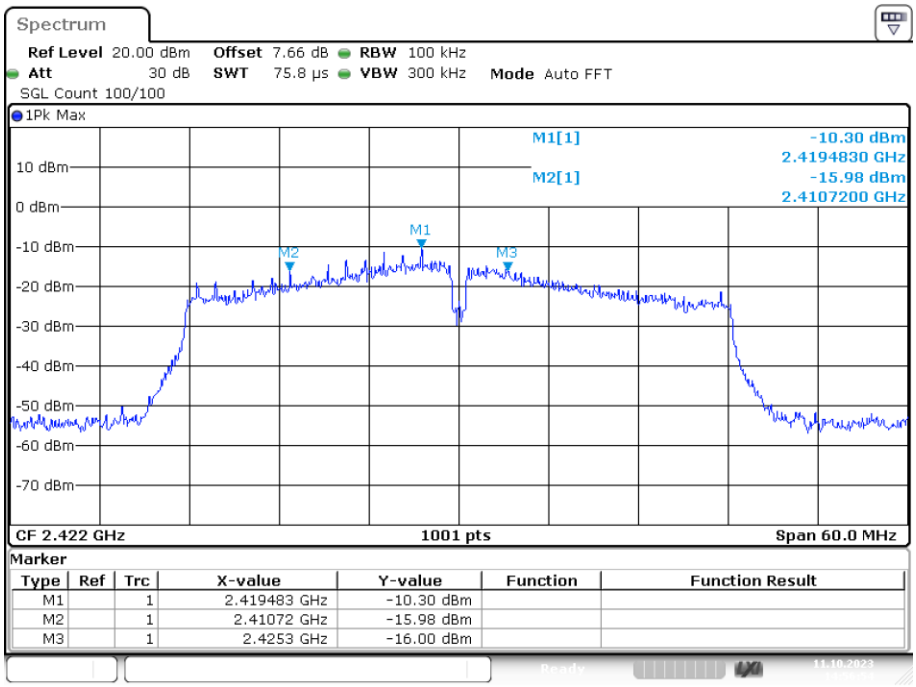
Date: 11.OCT.2023 14:50:44

-6dB Bandwidth NVNT n20 2462MHz Ant1



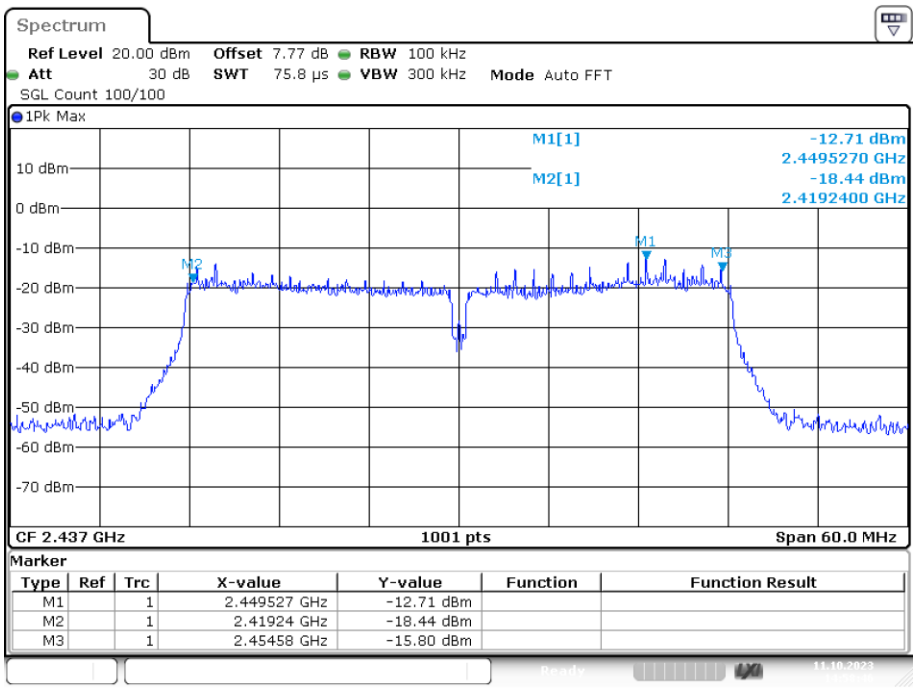
Date: 11.OCT.2023 14:52:12

-6dB Bandwidth NVNT n40 2422MHz Ant1



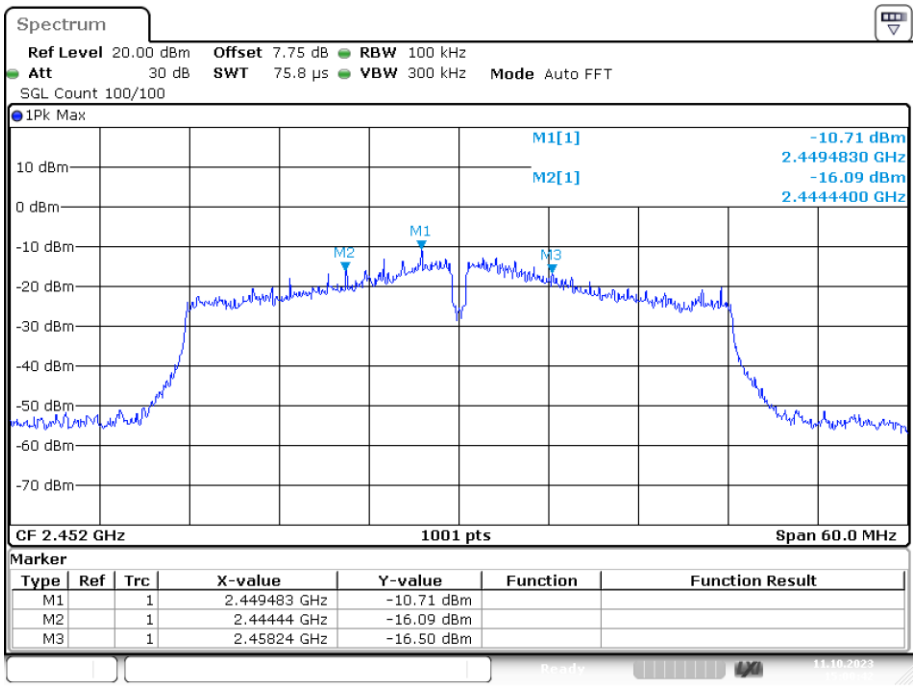
Date: 11.OCT.2023 14:56:54

-6dB Bandwidth NVNT n40 2437MHz Ant1



Date: 11.OCT.2023 14:58:46

-6dB Bandwidth NVNT n40 2452MHz Ant1



Date: 11.OCT.2023 15:00:42

8. Band Edge Check

8.1. Test limits

Please refer RSS-GEN & FCC PART 15: 15.247

All the lower and upper band-edges emissions appearing within 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits and RSS-GEN limits.

8.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance v05r02

9.2.1 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

9.2.2 Check the spurious emissions out of band.

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

8.3. Test Setup

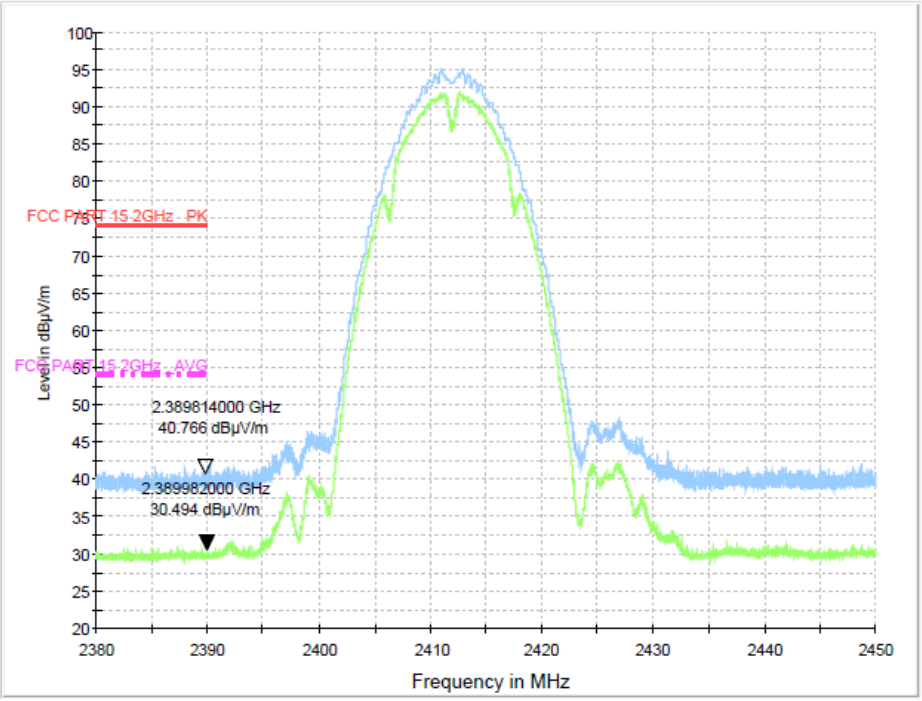
Same as 5.2.2.

8.4. Test Results

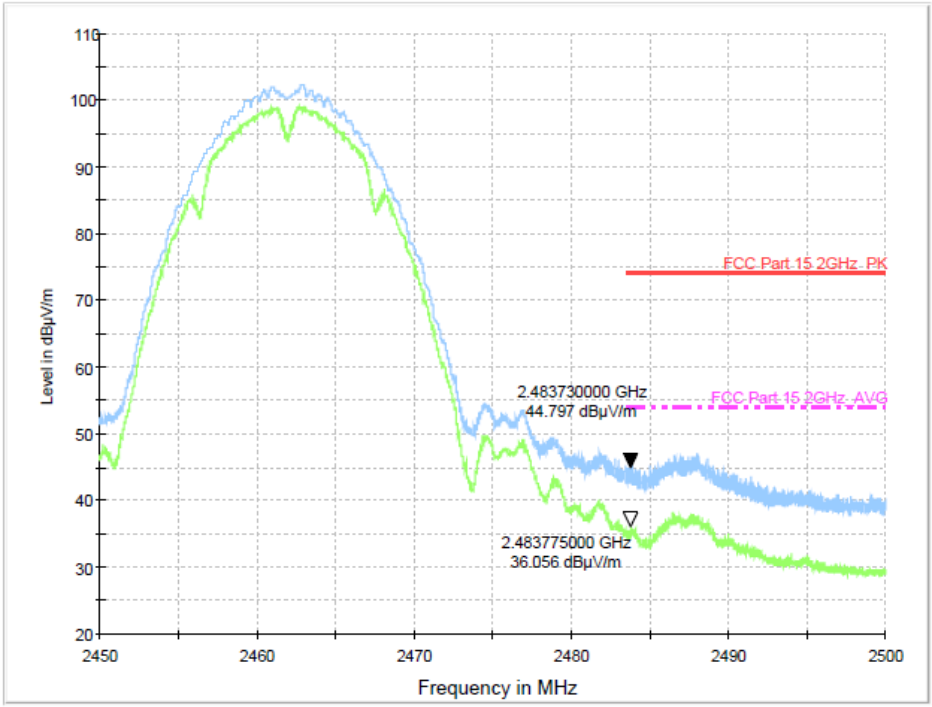
PASS.

Detailed information please see the following page.

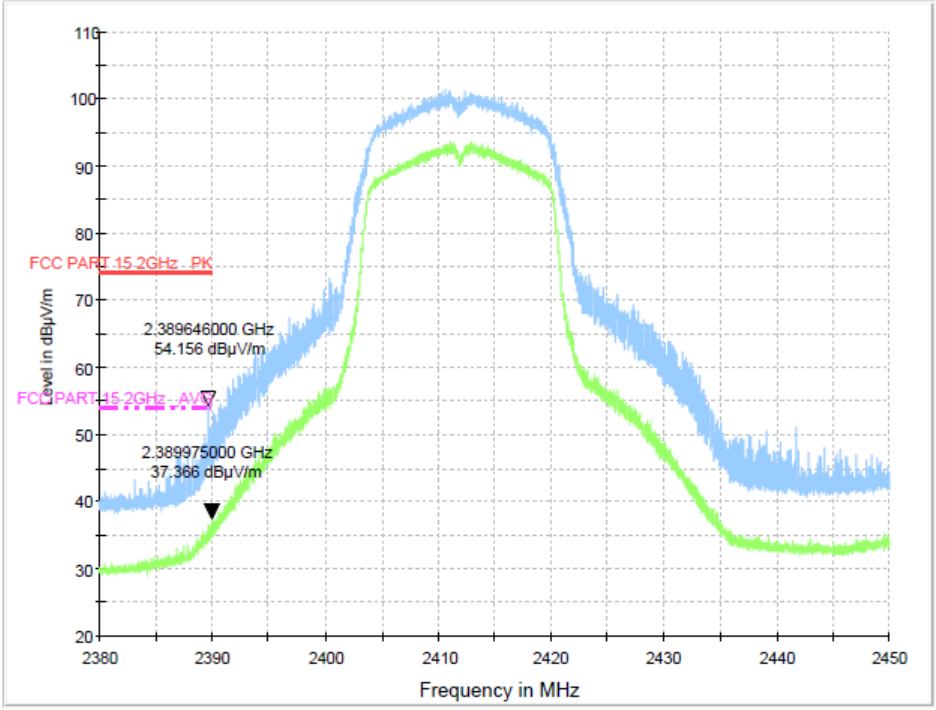
Test Mode: IEEE 802.11b-Low



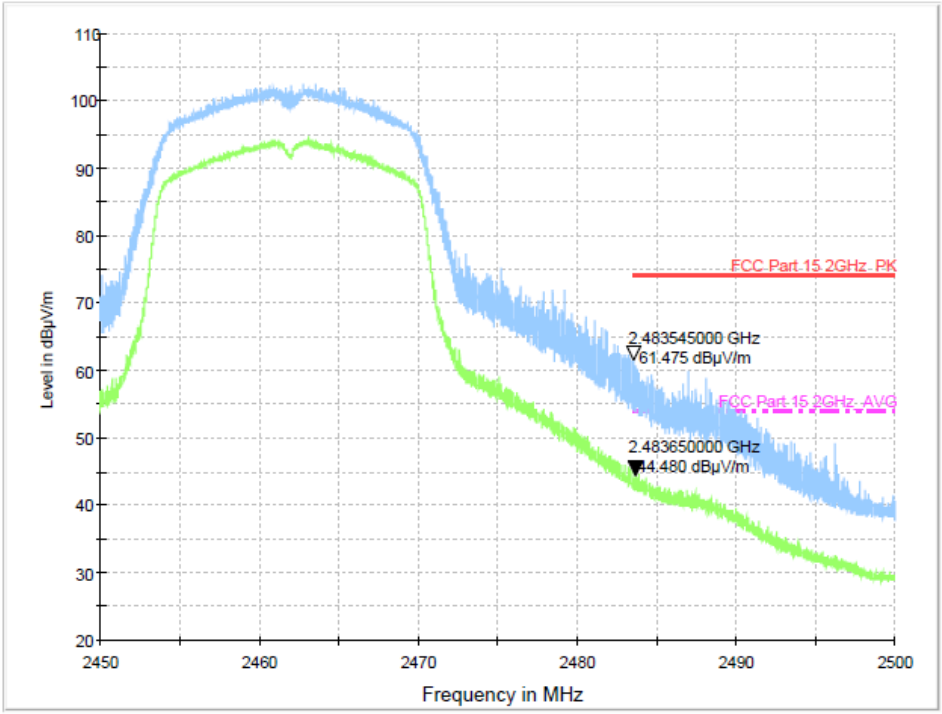
Test Mode: IEEE 802.11b-High



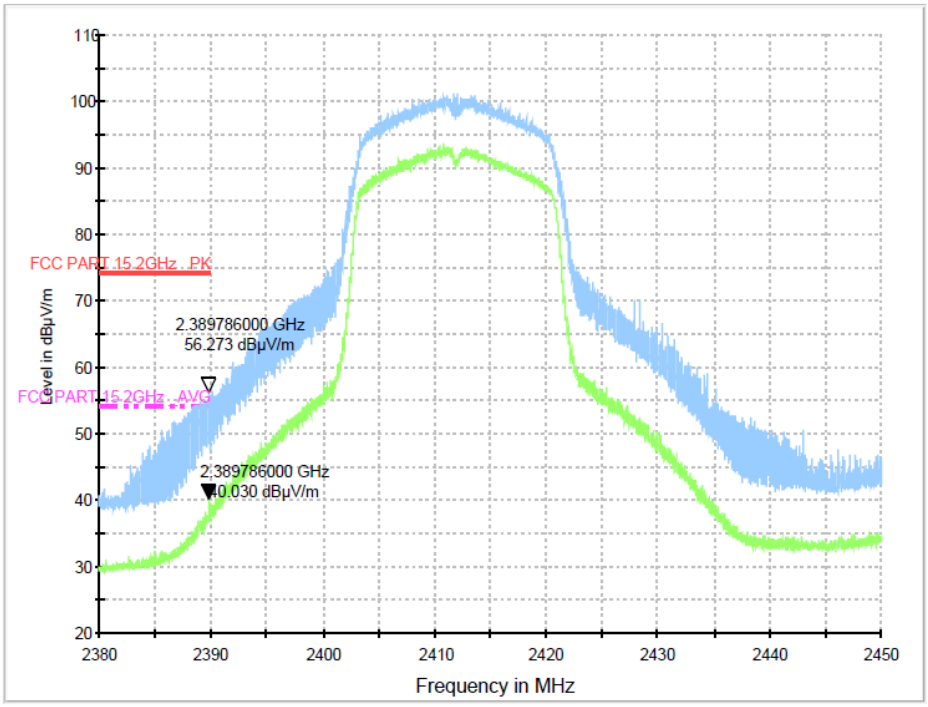
Test Mode: IEEE 802.11g-Low



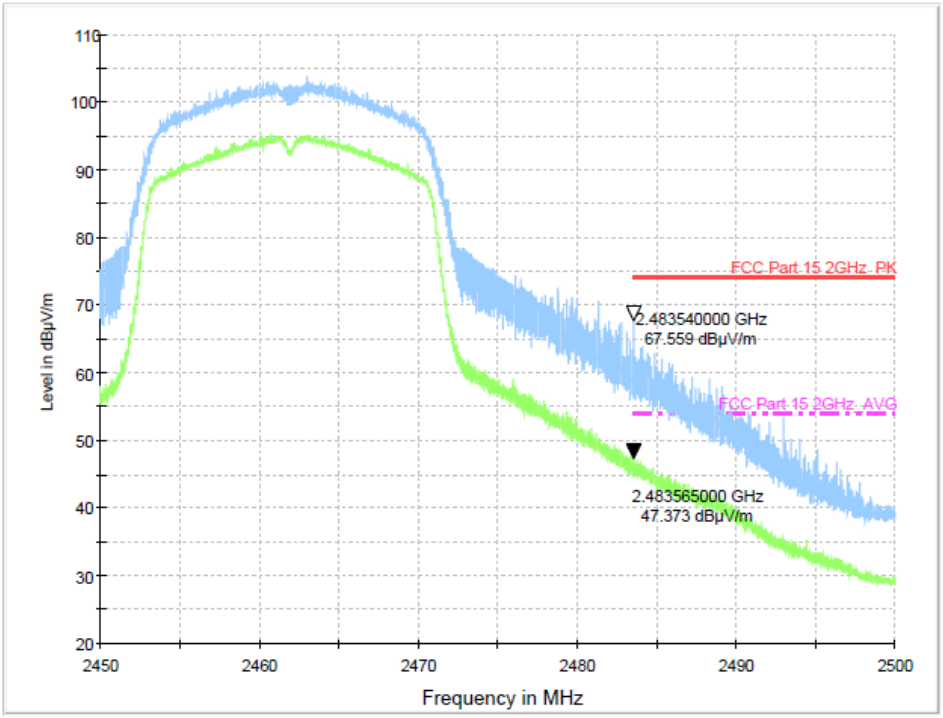
Test Mode: IEEE 802.11g-High



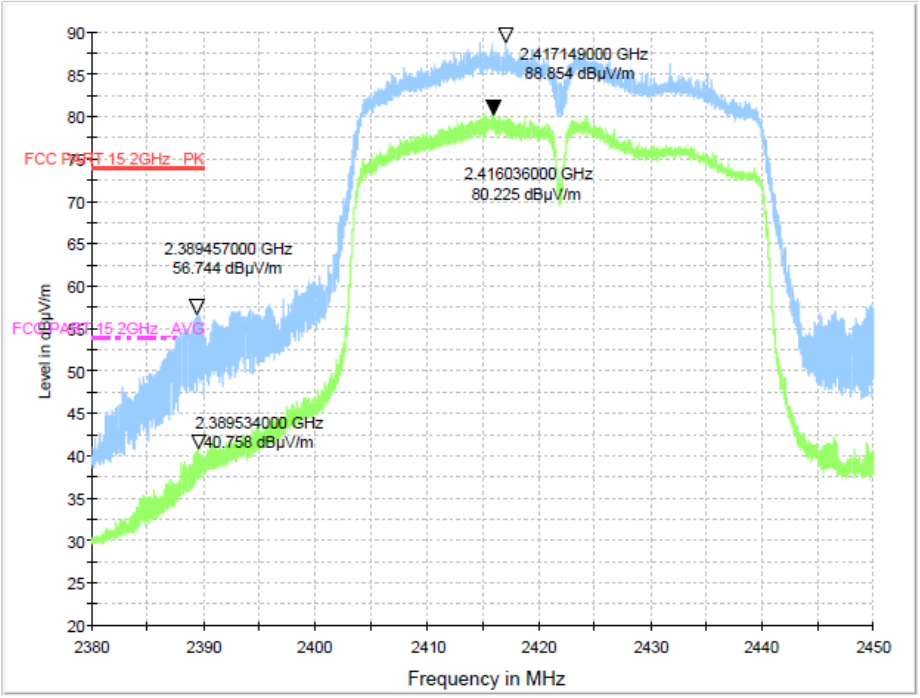
Test Mode: IEEE 802.11n20-Low



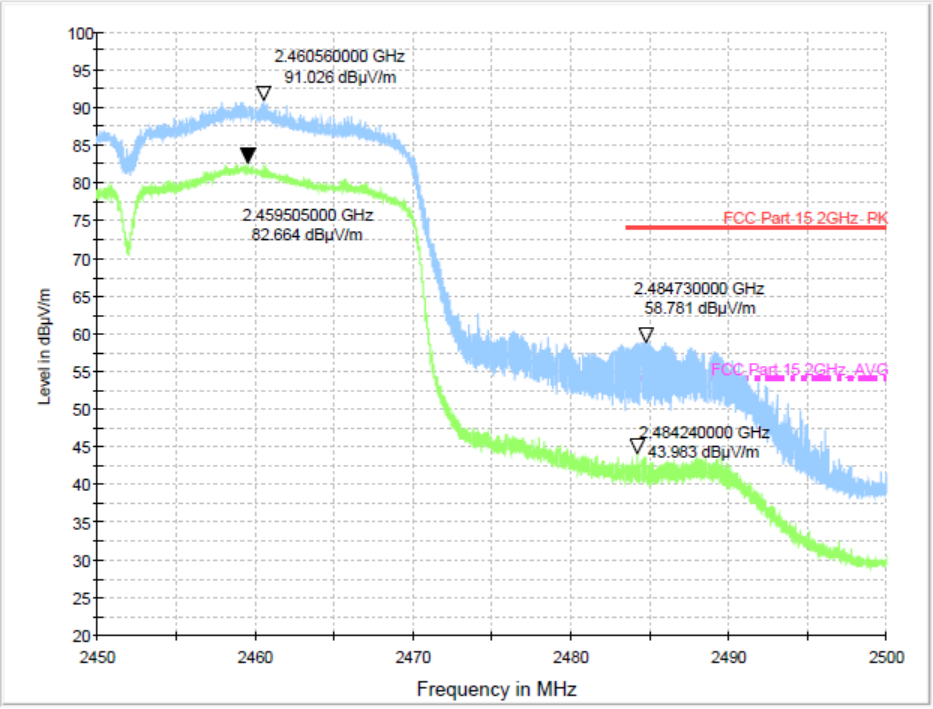
Test Mode: IEEE 802.11n20-High



Test Mode: IEEE 802.11n40-Low

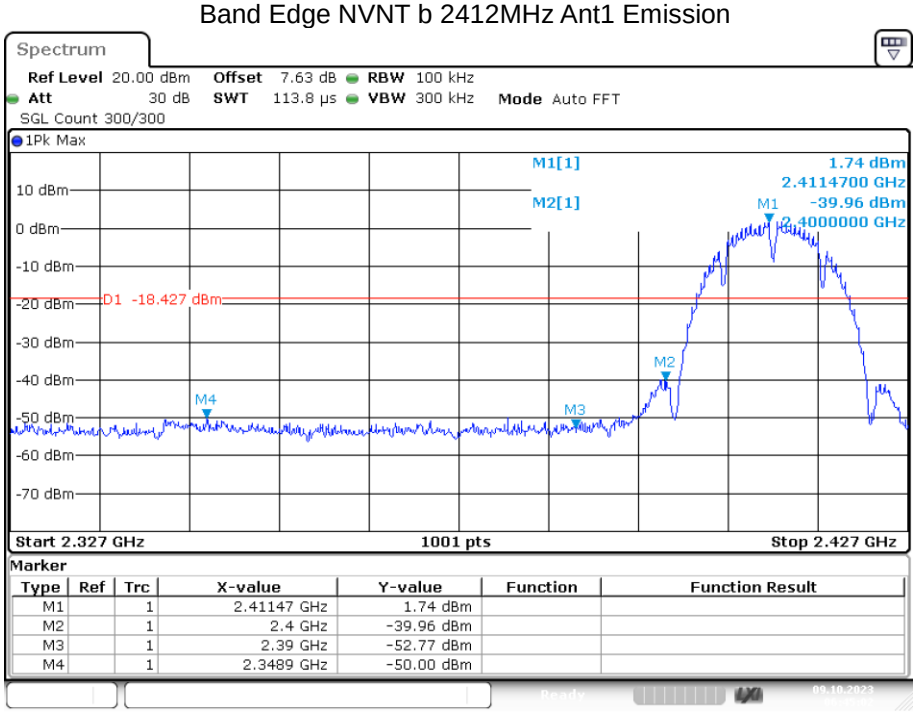


Test Mode: IEEE 802.11n40-High



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

Band Edge NVNT b 2412MHz Ant1 Emission

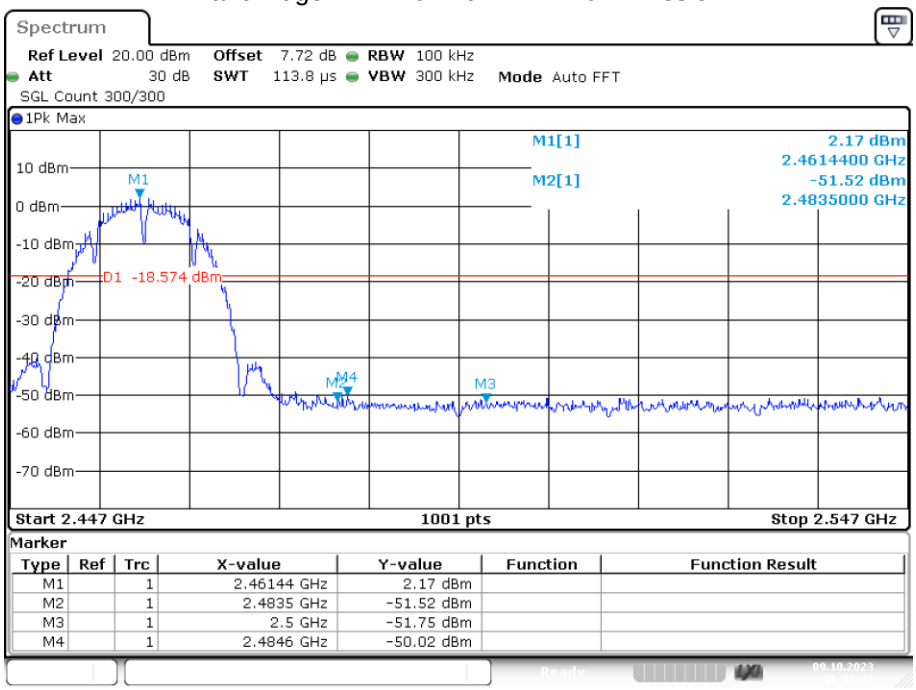


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.41147 GHz	1.74 dBm		
M2		1	2.4 GHz	-39.96 dBm		
M3		1	2.39 GHz	-52.77 dBm		
M4		1	2.3489 GHz	-50.00 dBm		

Date: 9.OCT.2023 06:45:02

Band Edge NVNT b 2462MHz Ant1 Emission

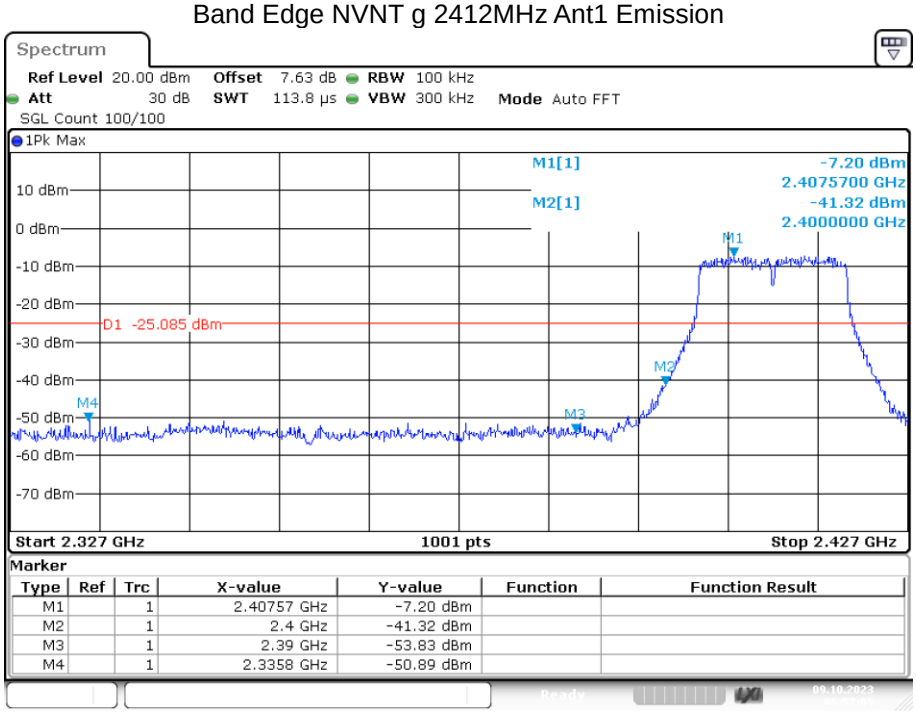


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.46144 GHz	2.17 dBm		
M2		1	2.4835 GHz	-51.52 dBm		
M3		1	2.5 GHz	-51.75 dBm		
M4		1	2.4846 GHz	-50.02 dBm		

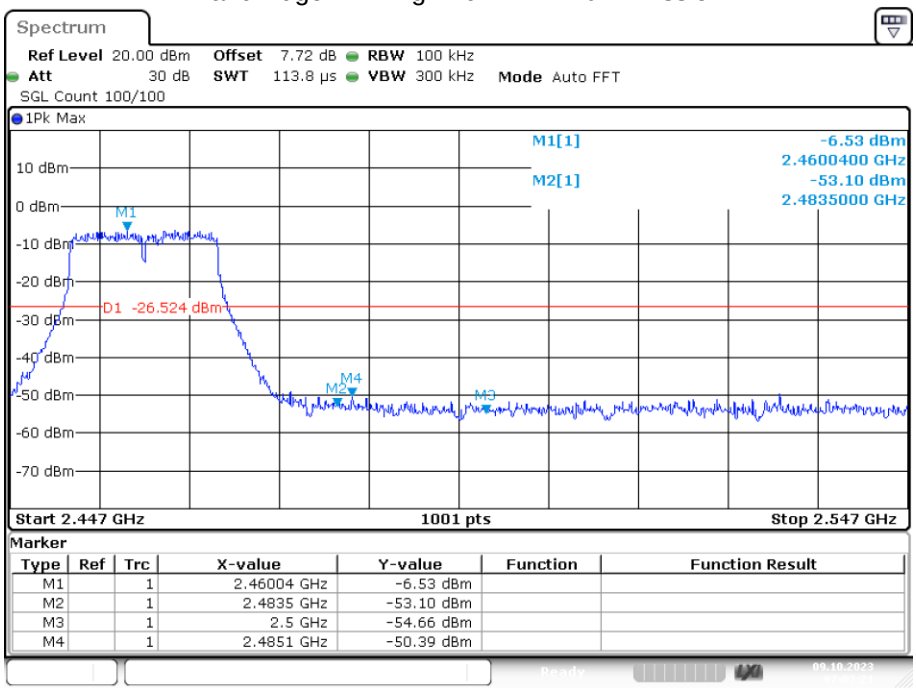
Date: 9.OCT.2023 06:52:40

Band Edge NVNT g 2412MHz Ant1 Emission



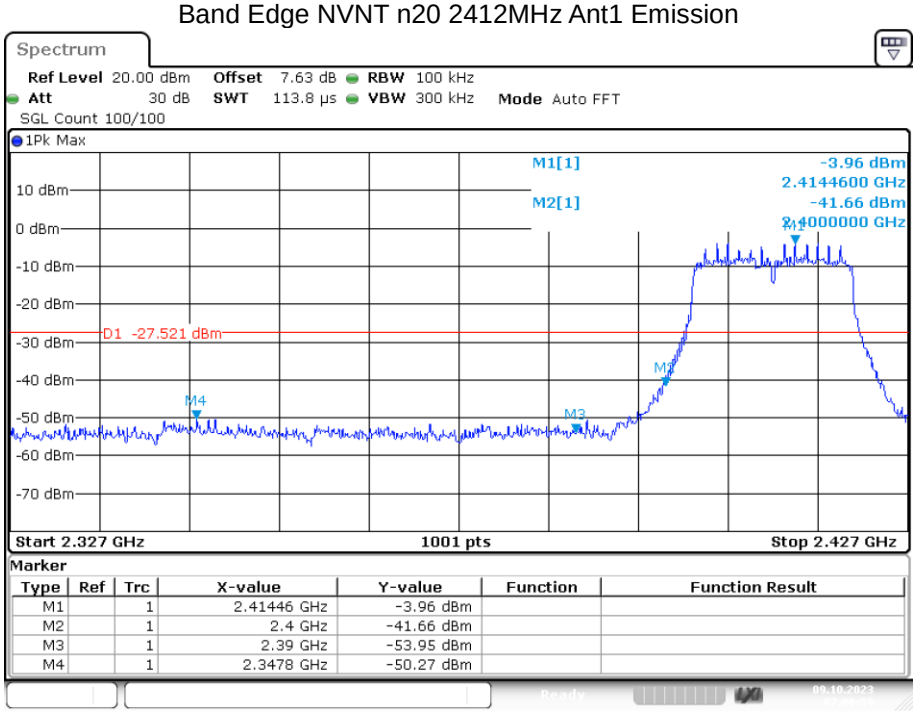
Date: 9.OCT.2023 06:57:05

Band Edge NVNT g 2462MHz Ant1 Emission



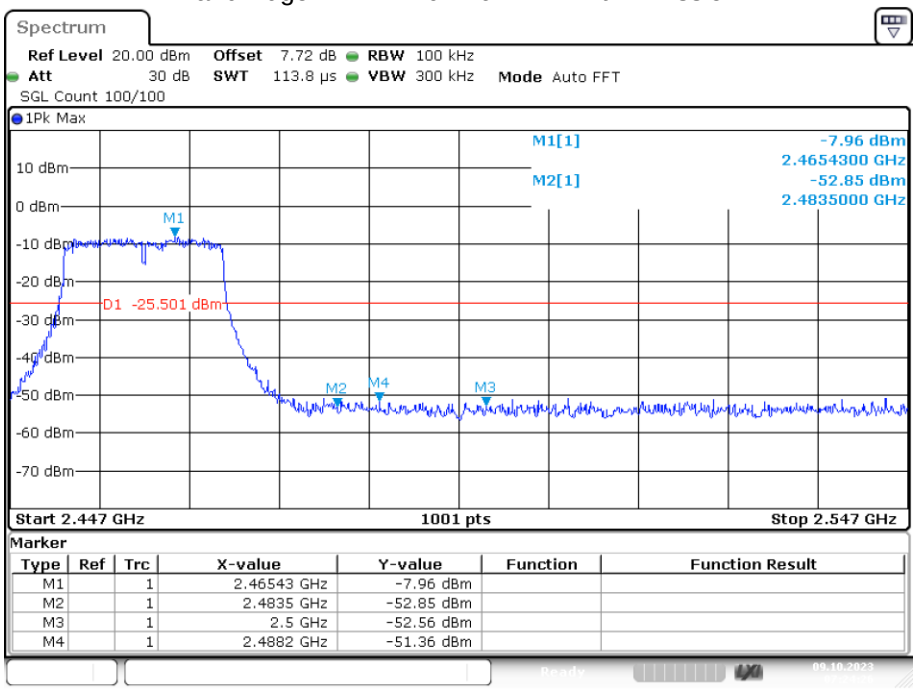
Date: 9.OCT.2023 07:03:21

Band Edge NVNT n20 2412MHz Ant1 Emission



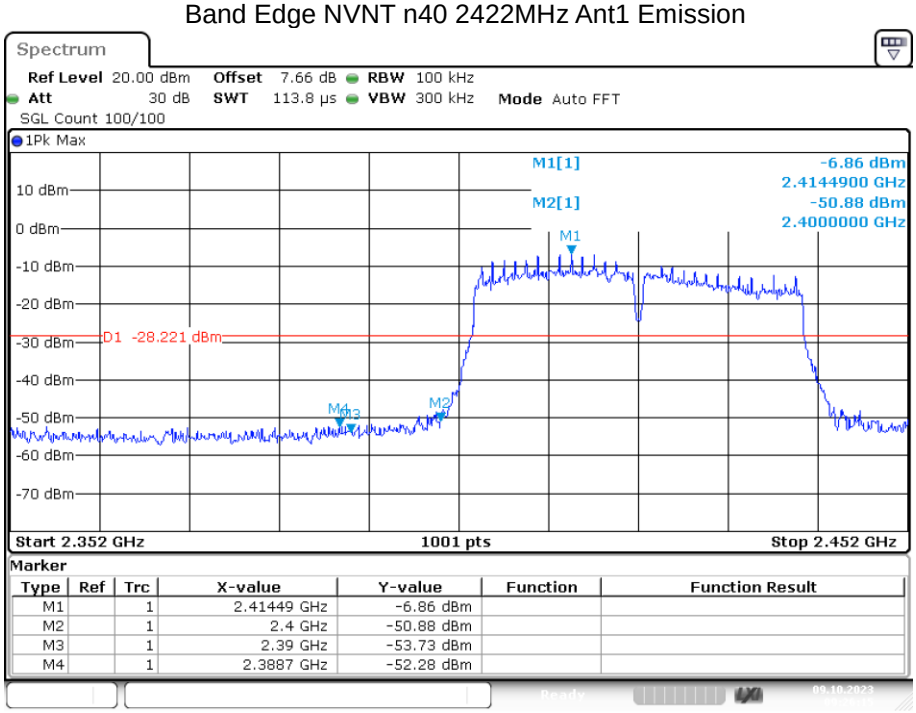
Date: 9.OCT.2023 07:06:58

Band Edge NVNT n20 2462MHz Ant1 Emission

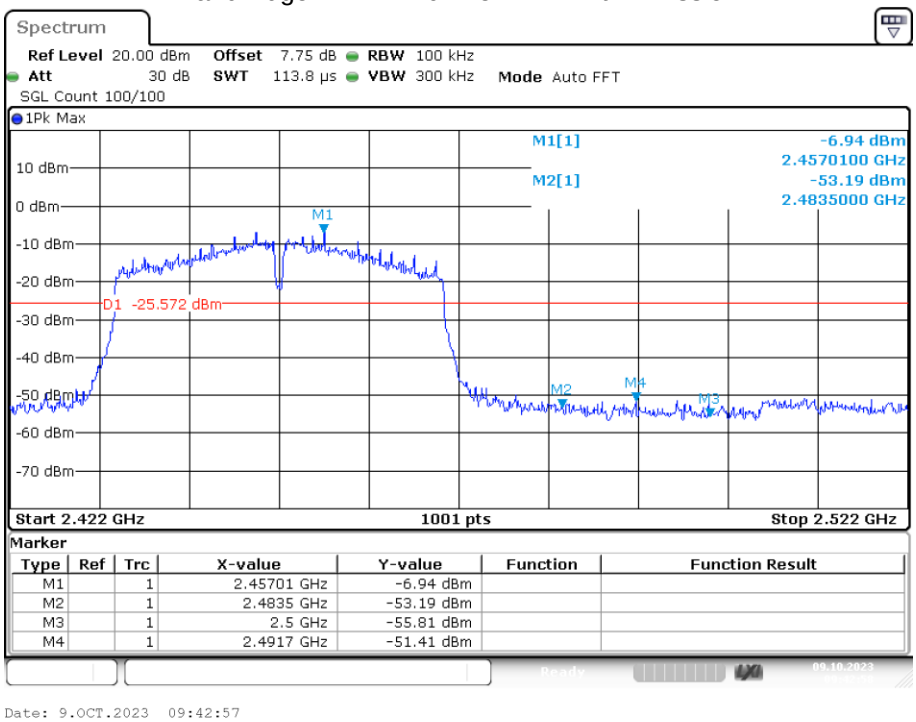


Date: 9.OCT.2023 07:24:25

Band Edge NVNT n40 2422MHz Ant1 Emission



Band Edge NVNT n40 2452MHz Ant1 Emission



Note: 1. Only the worst data of each pattern is reflected.

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

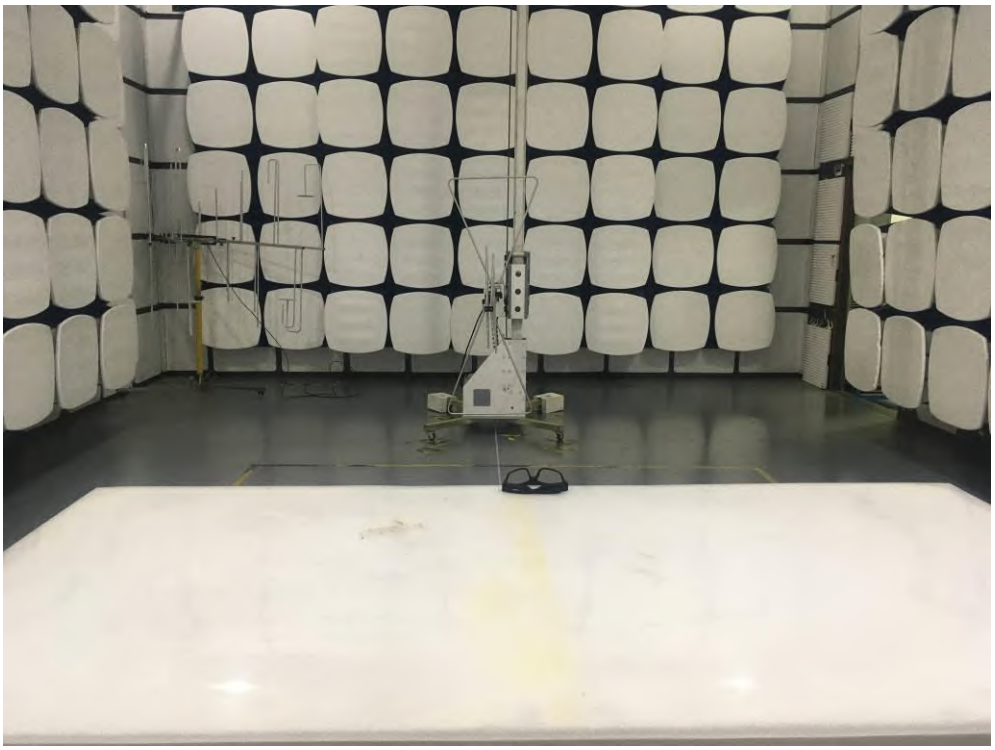
The antenna connector is unique antenna and no consideration of replacement. Please see EUT photo for details.

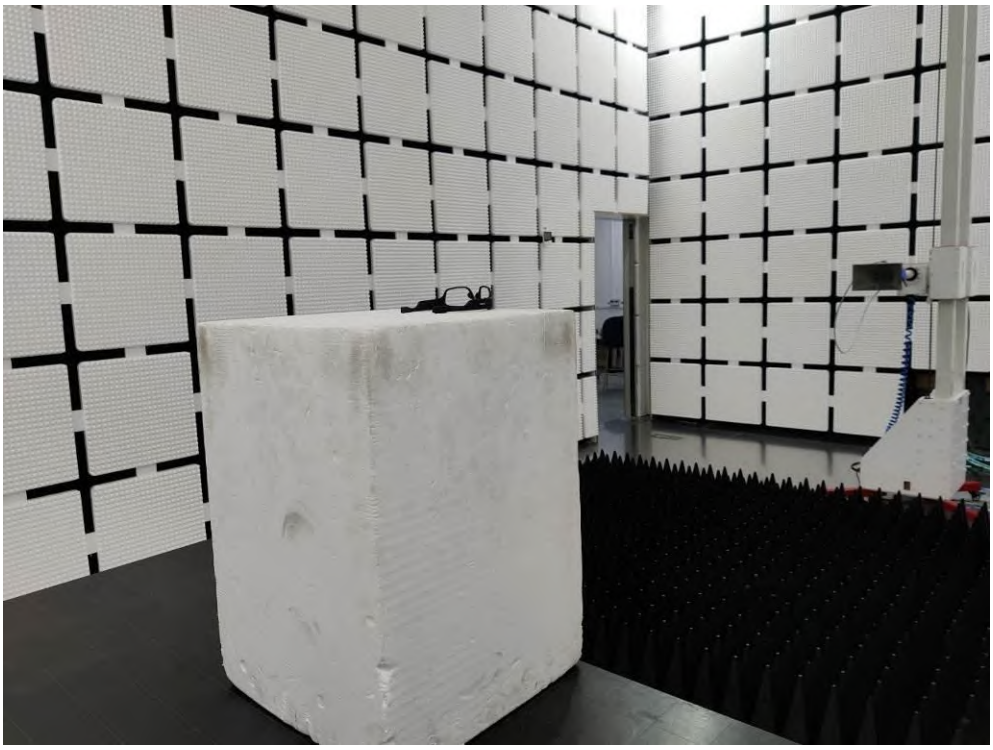
9.3. Results

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

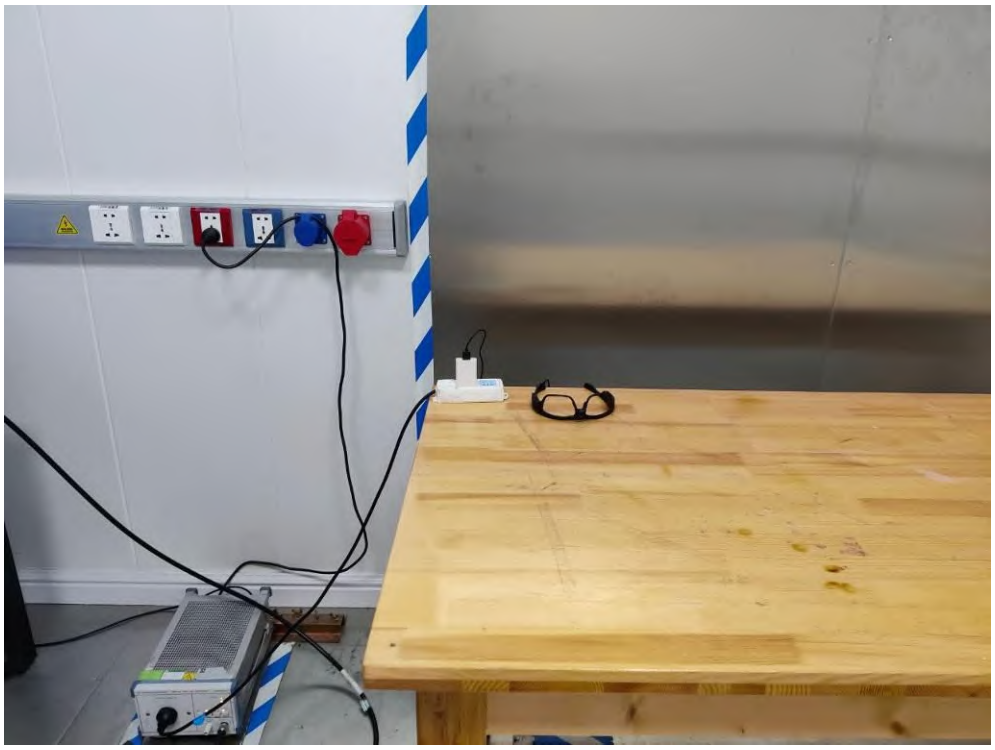
10. Photos Of Test Setup

10.1. Photos of Radiated emission





10.2.Photo of Conducted Emission test



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