FCC TEST REPORT

FCC ID: 2BAK5-CEK8902

On Behalf of

SHENZHEN CECPORT TECHNOLOGIES CO., LTD.

CEK8902 SBC

Model No.: CEK8902-S905D3

Prepared for	:	SHENZHEN CECPORT TECHNOLOGIES CO., LTD.
Address	:	20th Floor, block A, phase 1, China Merchants Qianhai Economic and Trade Center, No.151, Nanshan street, Nanshan District, Shenzhen City, Guangdong Province, China

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

Report Number	:	A2301110-C01-R11
Date of Receipt	:	February 14, 2023
Date of Test	:	February 14, 2023-March 10, 2023
Date of Report	:	March 15, 2023
Version Number	:	V0

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TEST REPORT DECLARATION

Applicant	:	SHENZHEN CECPORT TECHNOLOGIES CO., LTD.
Address	:	20th Floor, block A, phase 1, China Merchants Qianhai Economic and Trade Center, No.151, Nanshan street, Nanshan District, Shenzhen City, Guangdong Province, China
Manufacturer	:	Shenzhen Komkia Precision Products Co., Ltd.
Address	:	Building D, Area 0A-04, Fenghuang Third Industrial Park Fuyong Subdistrict, Bao'an District, Shenzhen, P.R. China, 518100
EUT Description	:	CEK8902 SBC
	(A) Model No.	: CEK8902-S905D3
	(B) Trademark	: 萤火工场 Firefly Workshop

Measurement Standard Used:

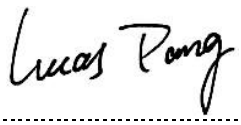
FCC Rules and Regulations Part 15 Subpart C Section 15.247

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).....:	Lucas Pang Project Engineer	
Approved by (name + signature).....:	Reak Yang Project Manager	
Date of issue.....:	March 15, 2023	

Revision History

Revision	Issue Date	Revisions	Revised By
V0	March 15, 2023	Initial released Issue	Lucas Pang

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 ANSI C63.10	P
6dB Bandwidth	FCC PART 15:15.247(a)(2) ANSI C63.10	P
Output Power	FCC Part 15: 15.247(b)(3) ANSI C63.10	P
Radiated Spurious Emission	FCC Part 15: 15.209 FCC Part 15: 15.247(d) ANSI C63.10	P
Conducted Spurious & Band Edge Emission	FCC Part 15: 15.247(d) ANSI C63.10	P
Power Spectral Density	FCC PART 15:15.247(e) ANSI C63.10	P
Radiated Band Edge Emission	FCC Part 15: 15.247(d) ANSI C63.10	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)

EUT Name	:	CEK8902 SBC
Model No.	:	CEK8902-S905D3
DIFF.	:	N/A
Power supply	:	DC 5V from adapter
2.4G WIFI	:	
Operation frequency	:	2412MHz-2462MHz for IEEE 802.11 b, g. n/HT20 2422MHz~2452MHz for IEEE802.11n/HT40
Channel No.	:	802.11b/802.11g /802.11n(HT20): 11CH 802.11(HT40): 7CH
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)
Antenna Type	:	Ceramic antenna, max gain 4.0dBi (Antenna information is provided by applicant.) Note: The product also has a spare antenna, and their antenna gain is the same.
Software version	:	Linux Kernel 4.9
Hardware version	:	CEK8902-S905D3
Intend use environment	:	Residential, commercial and light industrial environment
Note	:	/

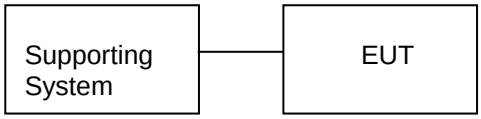
2.2. Accessories of Device (EUT)

Accessories	:	Adapter
Manufacturer	:	Shenzhen Keyu Power Supply Co., Ltd.
Model	:	KA1801A-0503000US
Ratings	:	Input: 100-240V~ 50/60Hz 0.55A Output: 5V⎓3.0A

2.3. Tested Supporting System Details

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

2.4. Block Diagram of connection between EUT and simulators



2.5. Test Mode Description

Duty cycle :100% Keeping TX			
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, n/HT20					
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		
For IEEE 802.11 n/HT40					
Channel	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**
CH1	2422	CH5	2442		
CH2	2427	CH6	2447		
CH3	2432	CH7	2452		
CH4	2437				

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 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	2022.08.22	1Year
Spectrum analyzer	Agilent	N9020A	A.14.16	MY499100060	2022.08.22	1Year
Receiver	ROHDE&SCHWARZ	ESR	2.28 SP1	1316.3003K03-102082-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	2022.08.22	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

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])

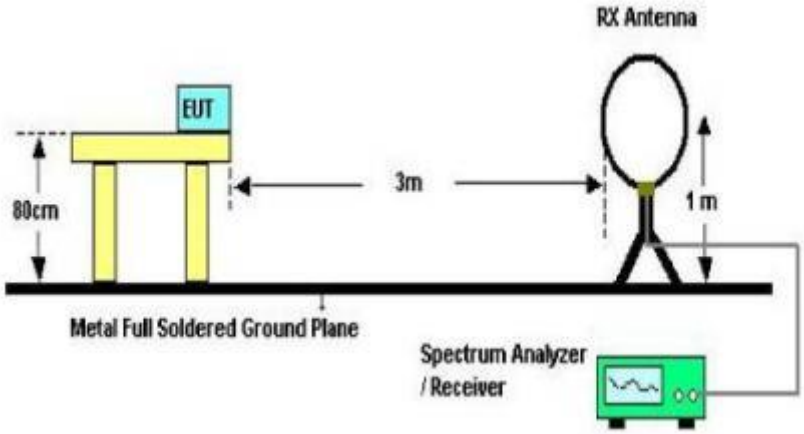
15.209 Limit

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			

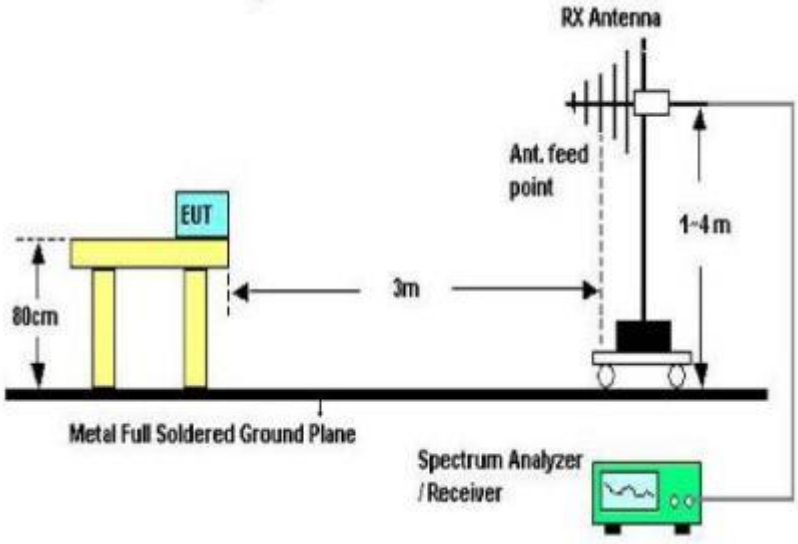
3.2. Test Procedure

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.

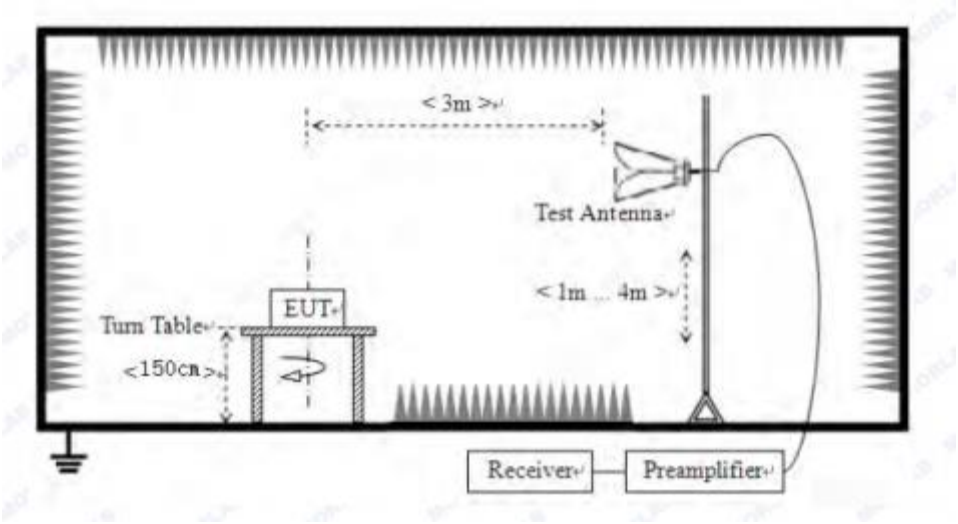
3.3. Test Setup



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

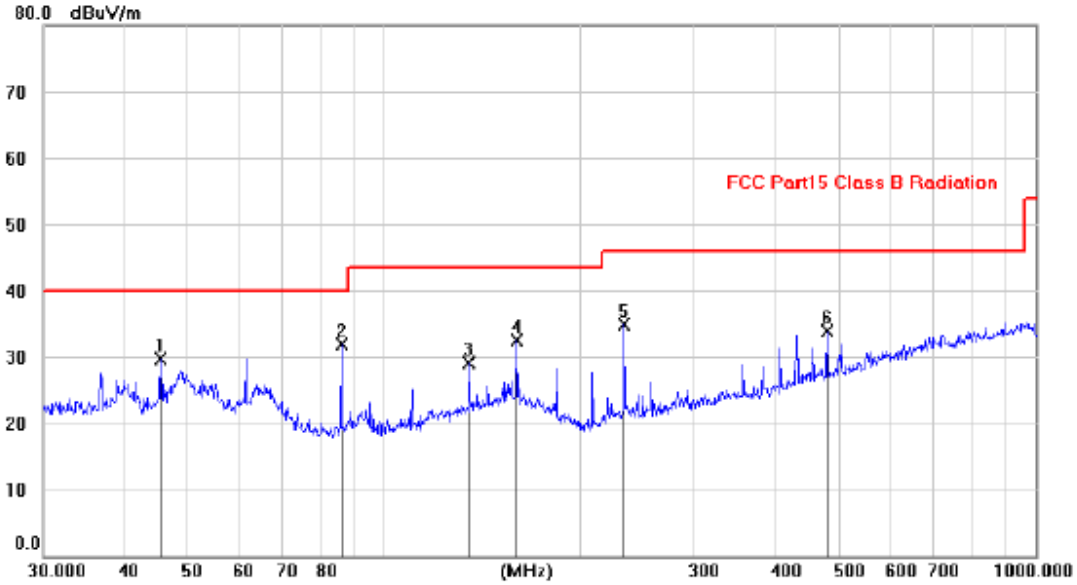
Note: 1.The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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

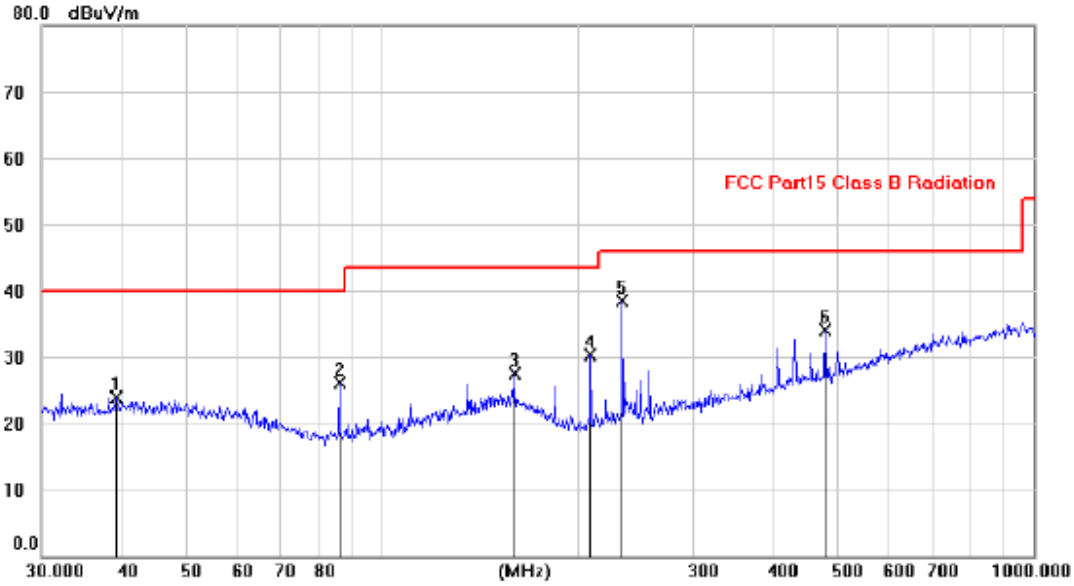
Vertical:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		45.3914	15.64	14.10	29.74	40.00	-10.26	peak			
2	*	86.0089	21.85	9.98	31.83	40.00	-8.17	peak			
3		135.1740	15.13	13.96	29.09	43.50	-14.41	peak			
4		159.7471	17.48	15.04	32.52	43.50	-10.98	peak			
5		233.4851	22.57	12.39	34.96	46.00	-11.04	peak			
6		479.2375	16.06	17.93	33.99	46.00	-12.01	peak			

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

Horizontal:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		39.1433	9.45	14.46	23.91	40.00	-16.09	peak			
2		86.0290	16.13	9.98	26.11	40.00	-13.89	peak			
3		159.7471	12.49	15.04	27.53	43.50	-15.97	peak			
4		208.8974	19.16	11.05	30.21	43.50	-13.29	peak			
5	*	233.4851	26.14	12.39	38.53	46.00	-7.47	peak			
6		479.2375	16.24	17.93	34.17	46.00	-11.83	peak			

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

Remark: All modes have been tested, and only worst data of b mode, Channel 2412MHz 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	48.11	V	33.93	10.18	34.26	57.96	74	-16.04	PK
4824	36.03	V	33.93	10.18	34.26	45.88	54	-8.12	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
4824	47.14	H	33.93	10.18	34.26	56.99	74	-17.01	PK
4824	35.12	H	33.93	10.18	34.26	44.97	54	-9.03	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11b TX Mid									
4874	49.40	V	33.95	10.20	34.26	59.29	74	-14.71	PK
4874	35.99	V	33.95	10.20	34.26	45.88	54	-8.12	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
4874	48.53	H	33.95	10.20	34.26	58.42	74	-15.58	PK
4874	34.34	H	33.95	10.20	34.26	44.23	54	-9.77	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11b TX High									
4924	47.68	V	33.98	10.22	34.25	57.63	74	-16.37	PK
4924	33.01	V	33.98	10.22	34.25	42.96	54	-11.04	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/
4924	46.55	H	33.98	10.22	34.25	56.50	74	-17.50	PK
4924	32.74	H	33.98	10.22	34.25	42.69	54	-11.31	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	48.49	V	33.93	10.18	34.26	58.34	74	-15.66	PK
4824	36.12	V	33.93	10.18	34.26	45.97	54	-8.03	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
4824	47.81	H	33.93	10.18	34.26	57.66	74	-16.34	PK
4824	35.98	H	33.93	10.18	34.26	45.83	54	-8.17	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11g TX Mid									
4874	49.14	V	33.95	10.20	34.26	59.03	74	-14.97	PK
4874	35.68	V	33.95	10.20	34.26	45.57	54	-8.43	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
4874	48.84	H	33.95	10.20	34.26	58.73	74	-15.27	PK
4874	34.65	H	33.95	10.20	34.26	44.54	54	-9.46	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11g TX High									
4924	47.07	V	33.98	10.22	34.25	57.02	74	-16.98	PK
4924	33.11	V	33.98	10.22	34.25	43.06	54	-10.94	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/
4924	46.73	H	33.98	10.22	34.25	56.68	74	-17.32	PK
4924	32.35	H	33.98	10.22	34.25	42.30	54	-11.70	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	48.96	V	33.93	10.18	34.26	58.81	74	-15.19	PK
4824	36.18	V	33.93	10.18	34.26	46.03	54	-7.97	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
4824	47.38	H	33.93	10.18	34.26	57.23	74	-16.77	PK
4824	35.69	H	33.93	10.18	34.26	45.54	54	-8.46	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11n HT20 TX Mid									
4874	49.84	V	33.95	10.20	34.26	59.73	74	-14.27	PK
4874	35.48	V	33.95	10.20	34.26	45.37	54	-8.63	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
4874	48.76	H	33.95	10.20	34.26	58.65	74	-15.35	PK
4874	34.23	H	33.95	10.20	34.26	44.12	54	-9.88	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11n HT20 TX High									
4924	47.47	V	33.98	10.22	34.25	57.42	74	-16.58	PK
4924	33.91	V	33.98	10.22	34.25	43.86	54	-10.14	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/
4924	46.55	H	33.98	10.22	34.25	56.50	74	-17.50	PK
4924	32.21	H	33.98	10.22	34.25	42.16	54	-11.84	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 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	48.92	V	33.93	10.18	34.26	58.77	74	-15.23	PK
4844	36.47	V	33.93	10.18	34.26	46.32	54	-7.68	AV
7266	/	/	/	/	/	/	/	/	/
9688	/	/	/	/	/	/	/	/	/
4844	47.92	H	33.93	10.18	34.26	57.77	74	-16.23	PK
4844	35.93	H	33.93	10.18	34.26	45.78	54	-8.22	AV
7266	/	/	/	/	/	/	/	/	/
9688	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11n HT40 TX Mid									
4874	49.36	V	33.95	10.20	34.26	59.25	74	-14.75	PK
4874	35.88	V	33.95	10.20	34.26	45.77	54	-8.23	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
4874	48.34	H	33.95	10.20	34.26	58.23	74	-15.77	PK
4874	34.73	H	33.95	10.20	34.26	44.62	54	-9.38	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11n HT40 TX High									
4904	47.84	V	33.98	10.22	34.25	57.79	74	-16.21	PK
4904	33.90	V	33.98	10.22	34.25	43.85	54	-10.15	AV
7356	/	/	/	/	/	/	/	/	/
9808	/	/	/	/	/	/	/	/	/
4904	46.99	H	33.98	10.22	34.25	56.94	74	-17.06	PK
4904	32.79	H	33.98	10.22	34.25	42.74	54	-11.26	AV
7356	/	/	/	/	/	/	/	/	/
9808	/	/	/	/	/	/	/	/	/

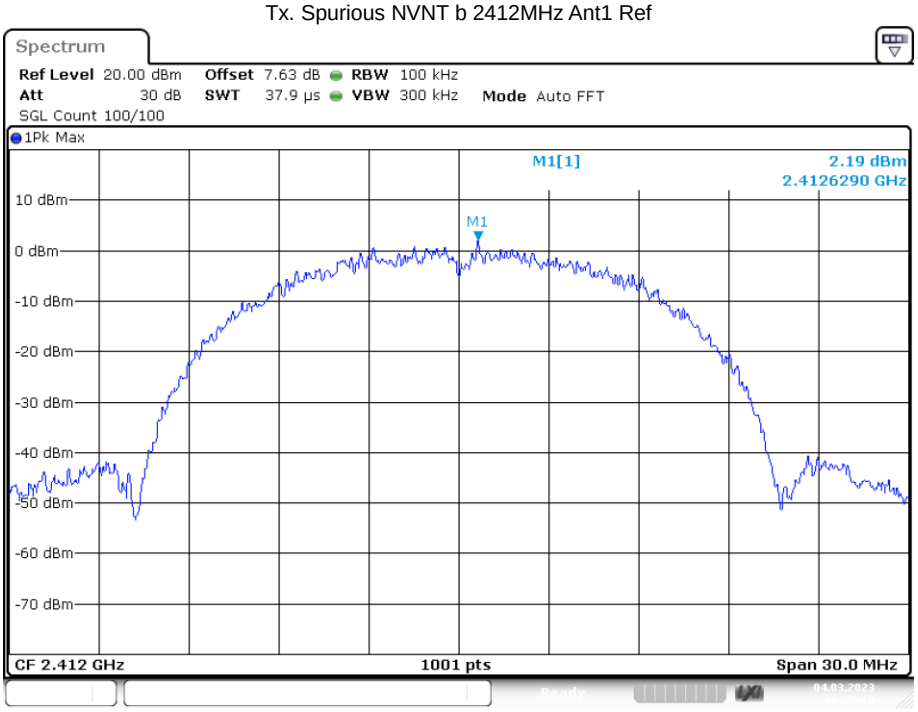
Note:

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.

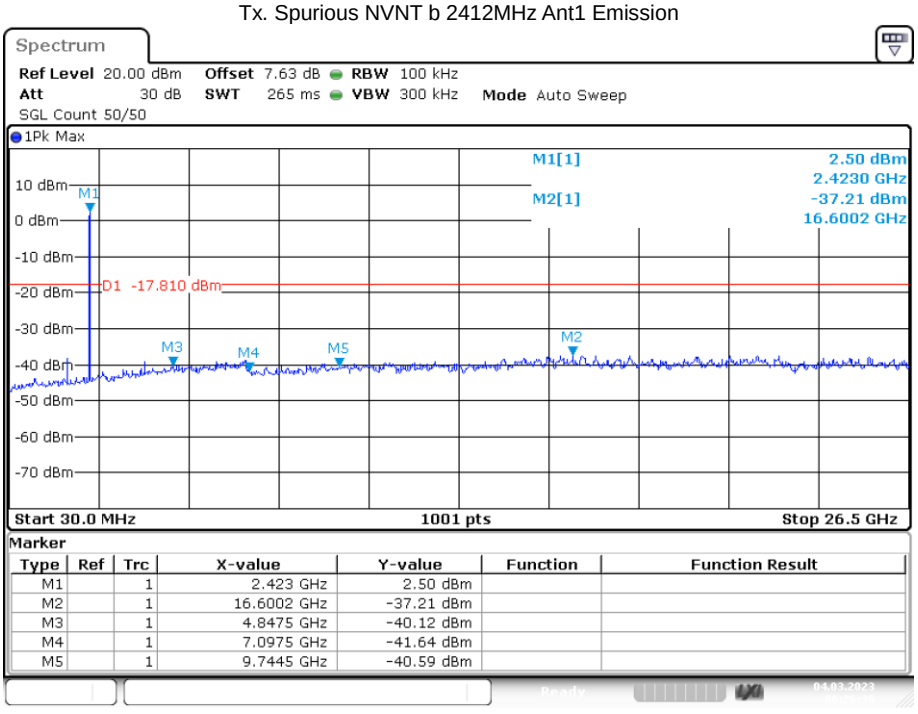
Conducted RF Spurious Emission

Tx. Spurious NVNT b 2412MHz Ant1 Ref



Date: 4.MAR.2023 06:25:18

Tx. Spurious NVNT b 2412MHz Ant1 Emission

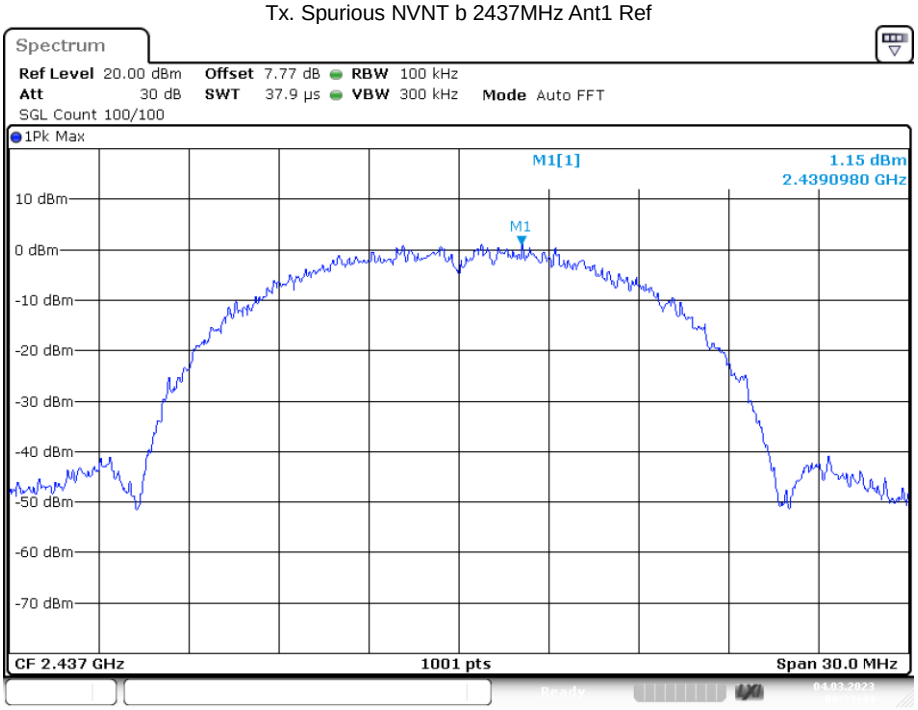


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.423 GHz	2.50 dBm		
M2		1	16.6002 GHz	-37.21 dBm		
M3		1	4.8475 GHz	-40.12 dBm		
M4		1	7.0975 GHz	-41.64 dBm		
M5		1	9.7445 GHz	-40.59 dBm		

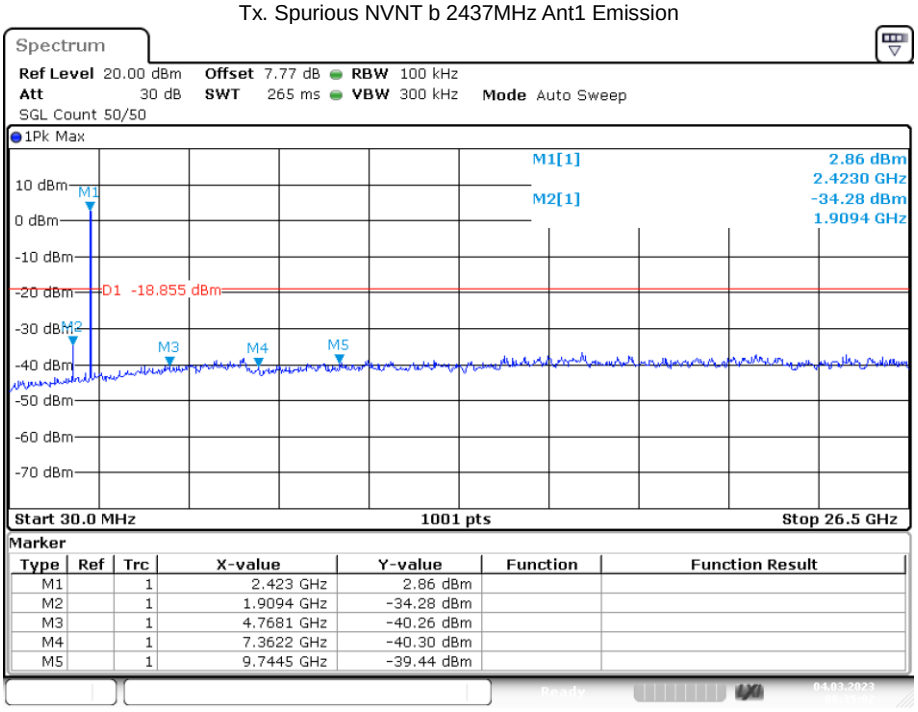
Date: 4.MAR.2023 06:26:35

Tx. Spurious NVNT b 2437MHz Ant1 Ref



Date: 4.MAR.2023 08:33:44

Tx. Spurious NVNT b 2437MHz Ant1 Emission

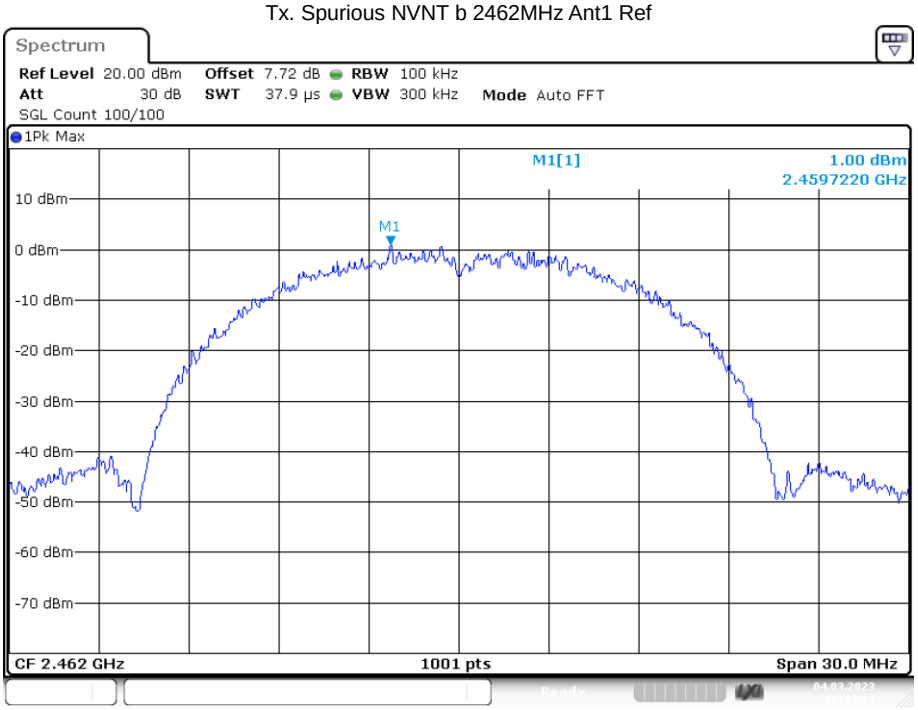


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.423 GHz	2.86 dBm		
M2		1	1.9094 GHz	-34.28 dBm		
M3		1	4.7681 GHz	-40.26 dBm		
M4		1	7.3622 GHz	-40.30 dBm		
M5		1	9.7445 GHz	-39.44 dBm		

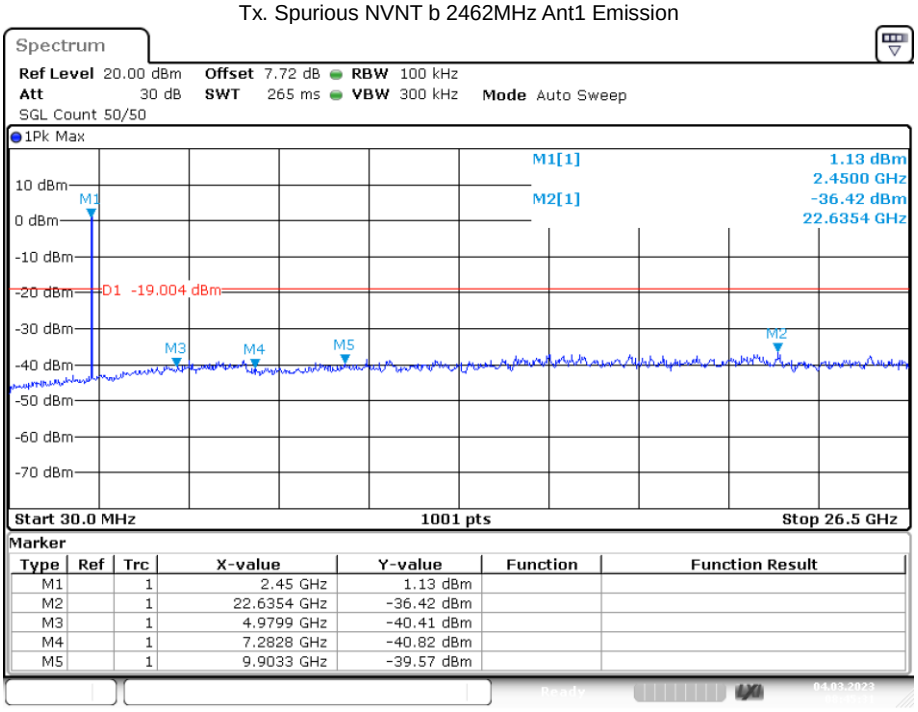
Date: 4.MAR.2023 08:35:01

Tx. Spurious NVNT b 2462MHz Ant1 Ref



Date: 4.MAR.2023 08:44:14

Tx. Spurious NVNT b 2462MHz Ant1 Emission

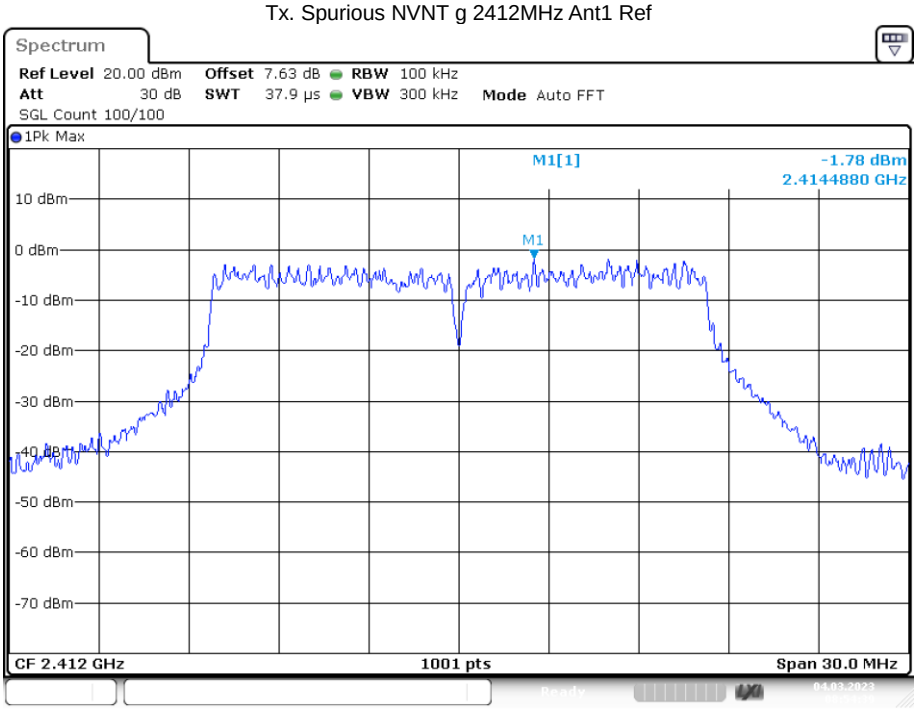


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45 GHz	1.13 dBm		
M2		1	22.6354 GHz	-36.42 dBm		
M3		1	4.9799 GHz	-40.41 dBm		
M4		1	7.2828 GHz	-40.82 dBm		
M5		1	9.9033 GHz	-39.57 dBm		

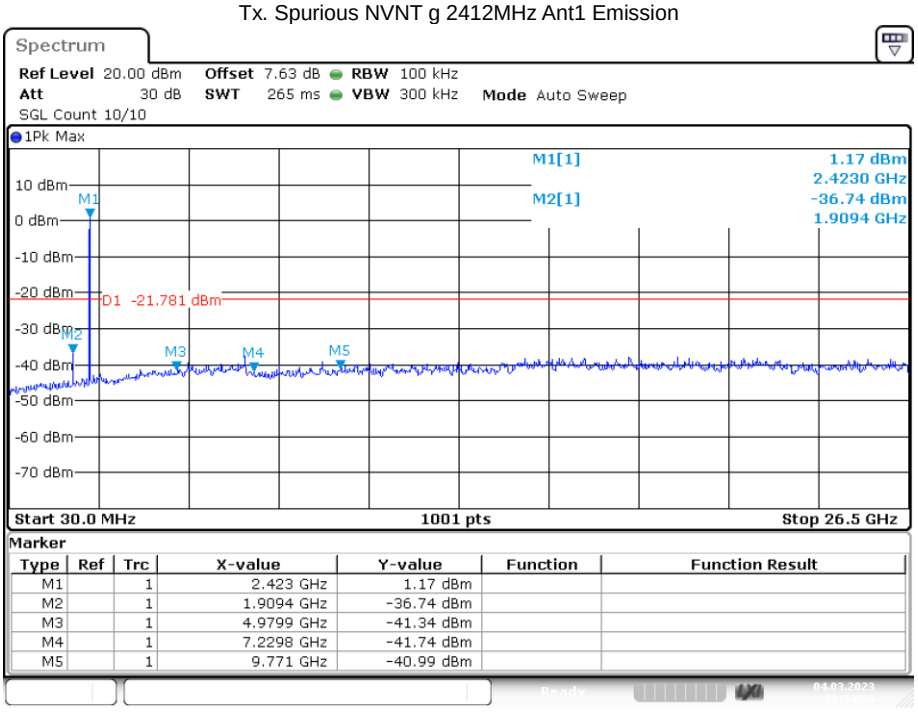
Date: 4.MAR.2023 08:45:31

Tx. Spurious NVNT g 2412MHz Ant1 Ref



Date: 4.MAR.2023 08:54:38

Tx. Spurious NVNT g 2412MHz Ant1 Emission

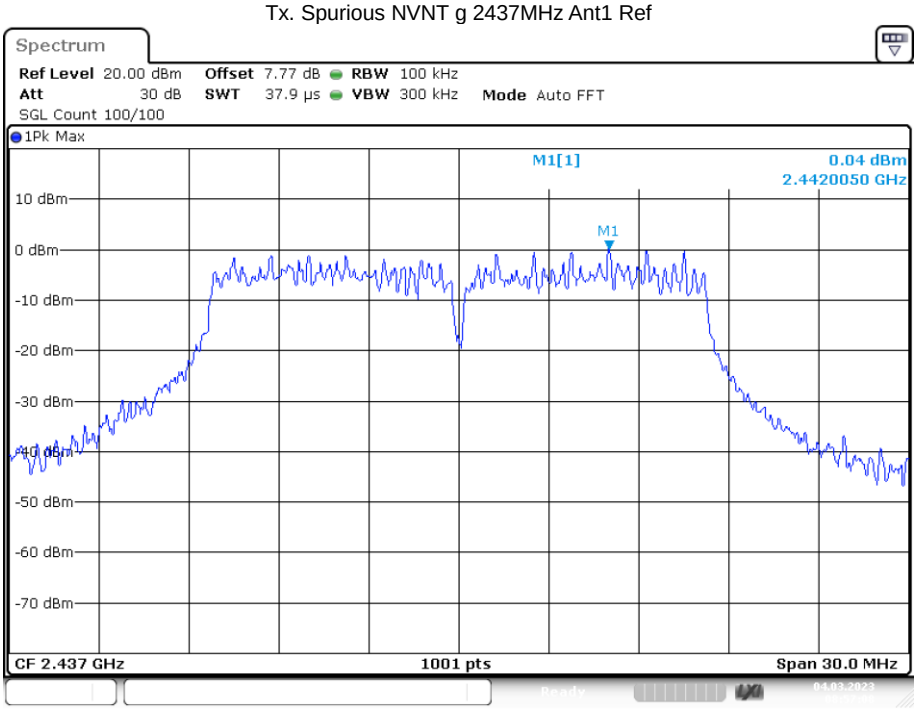


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.423 GHz	1.17 dBm		
M2		1	1.9094 GHz	-36.74 dBm		
M3		1	4.9799 GHz	-41.34 dBm		
M4		1	7.2298 GHz	-41.74 dBm		
M5		1	9.771 GHz	-40.99 dBm		

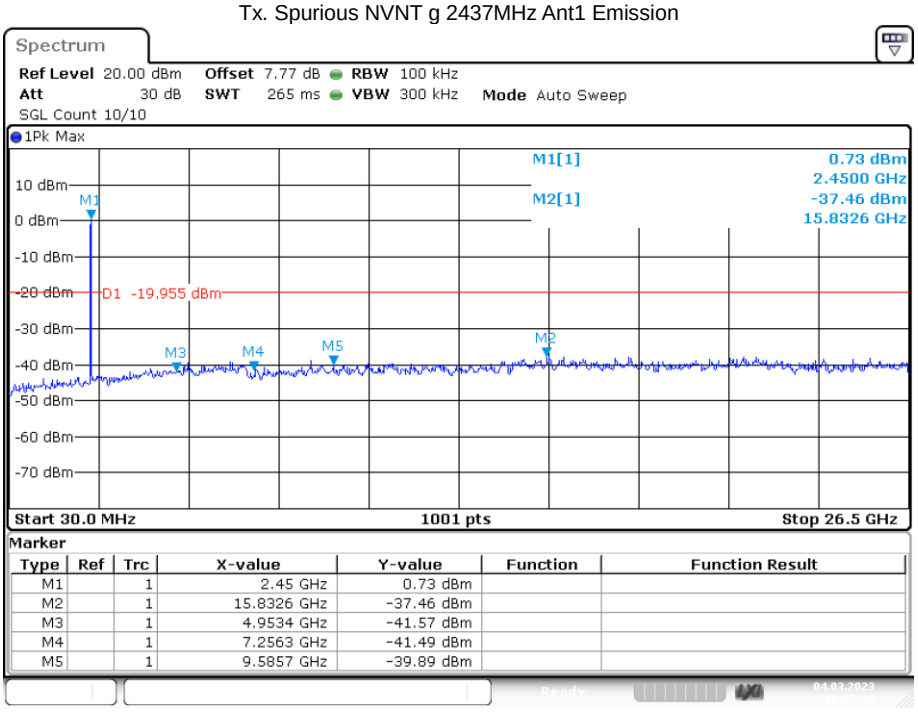
Date: 4.MAR.2023 08:54:56

Tx. Spurious NVNT g 2437MHz Ant1 Ref



Date: 4.MAR.2023 08:57:07

Tx. Spurious NVNT g 2437MHz Ant1 Emission

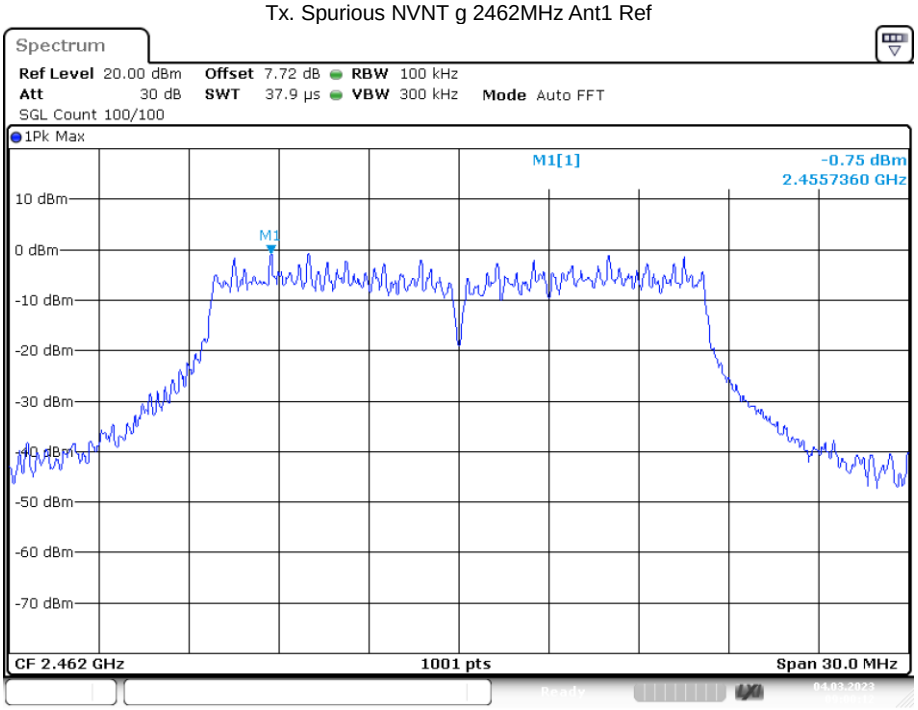


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45 GHz	0.73 dBm		
M2		1	15.8326 GHz	-37.46 dBm		
M3		1	4.9534 GHz	-41.57 dBm		
M4		1	7.2563 GHz	-41.49 dBm		
M5		1	9.5857 GHz	-39.89 dBm		

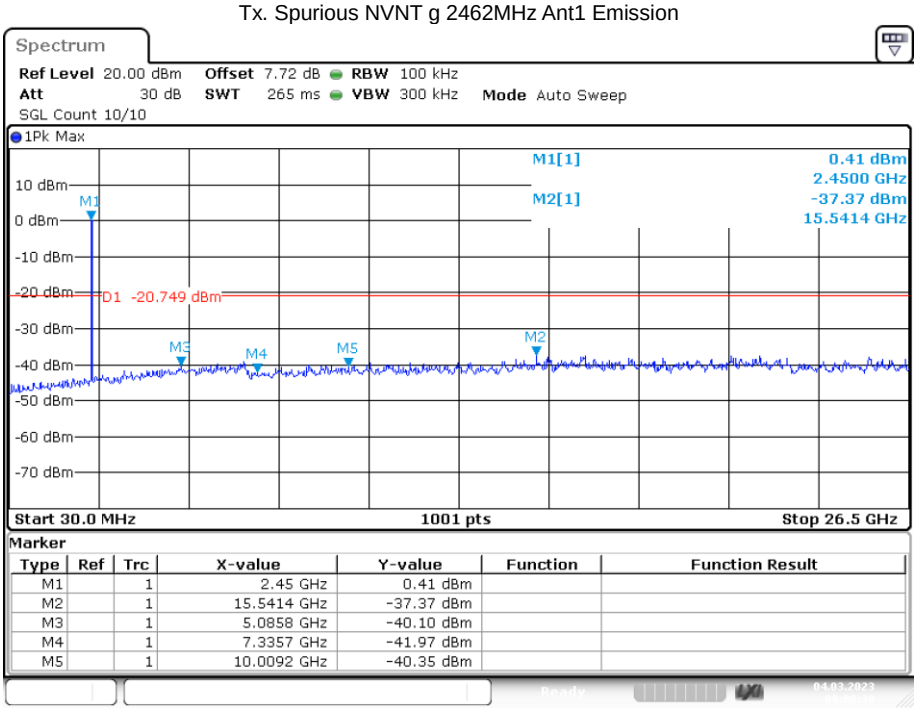
Date: 4.MAR.2023 08:57:25

Tx. Spurious NVNT g 2462MHz Ant1 Ref



Date: 4.MAR.2023 09:00:12

Tx. Spurious NVNT g 2462MHz Ant1 Emission

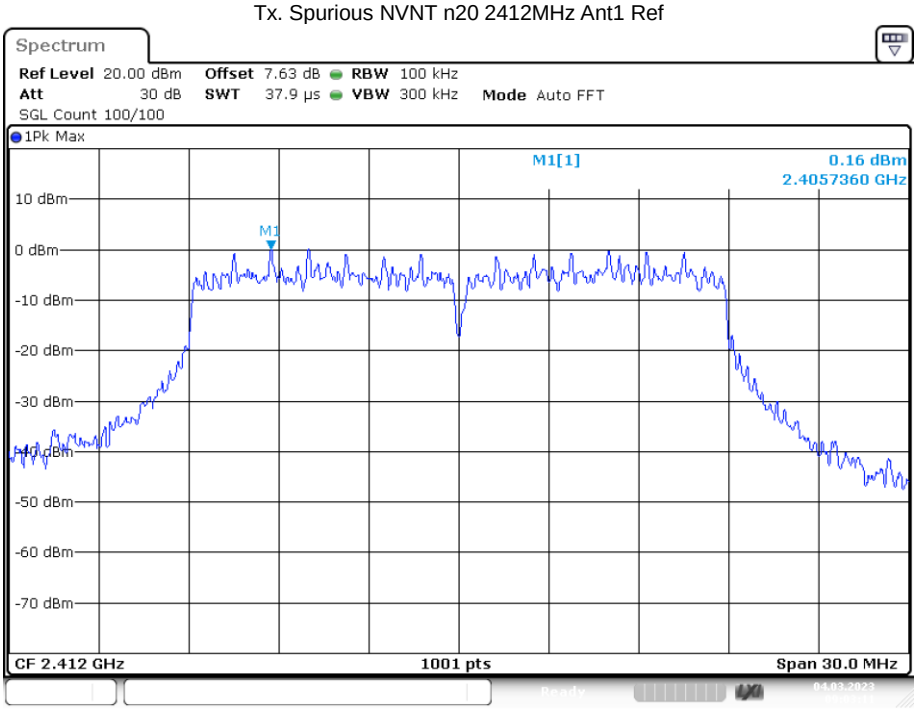


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45 GHz	0.41 dBm		
M2		1	15.5414 GHz	-37.37 dBm		
M3		1	5.0858 GHz	-40.10 dBm		
M4		1	7.3357 GHz	-41.97 dBm		
M5		1	10.0092 GHz	-40.35 dBm		

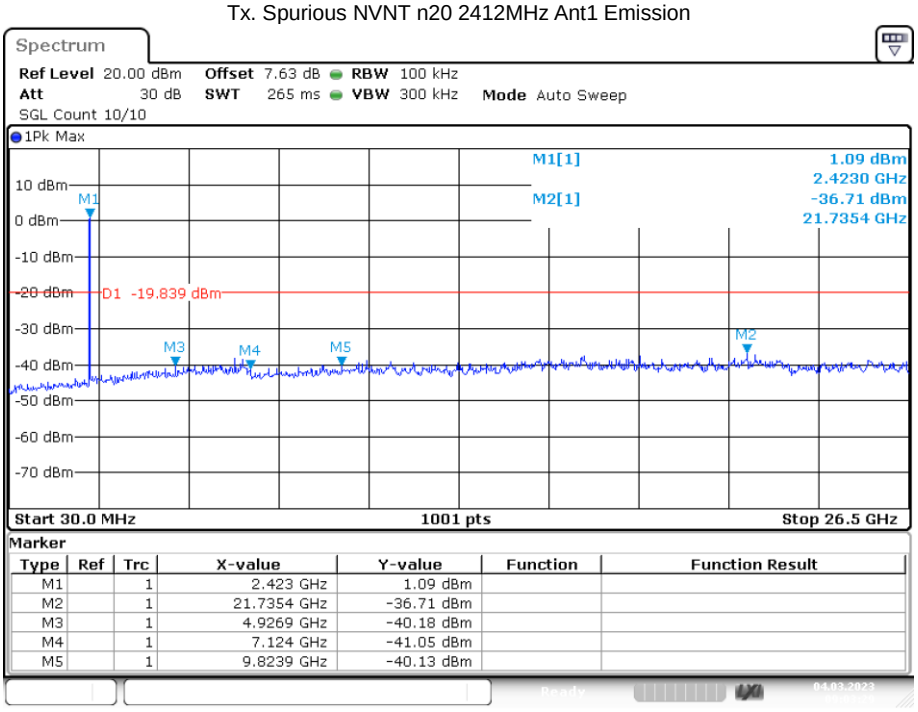
Date: 4.MAR.2023 09:00:29

Tx. Spurious NVNT n20 2412MHz Ant1 Ref



Date: 4.MAR.2023 09:03:11

Tx. Spurious NVNT n20 2412MHz Ant1 Emission

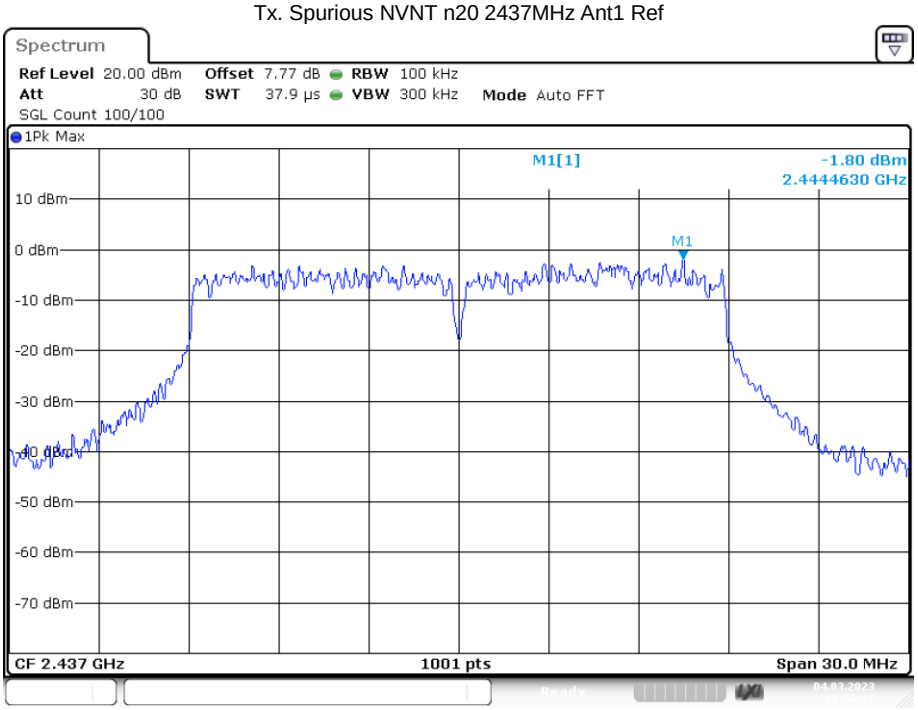


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.423 GHz	1.09 dBm		
M2		1	21.7354 GHz	-36.71 dBm		
M3		1	4.9269 GHz	-40.18 dBm		
M4		1	7.124 GHz	-41.05 dBm		
M5		1	9.8239 GHz	-40.13 dBm		

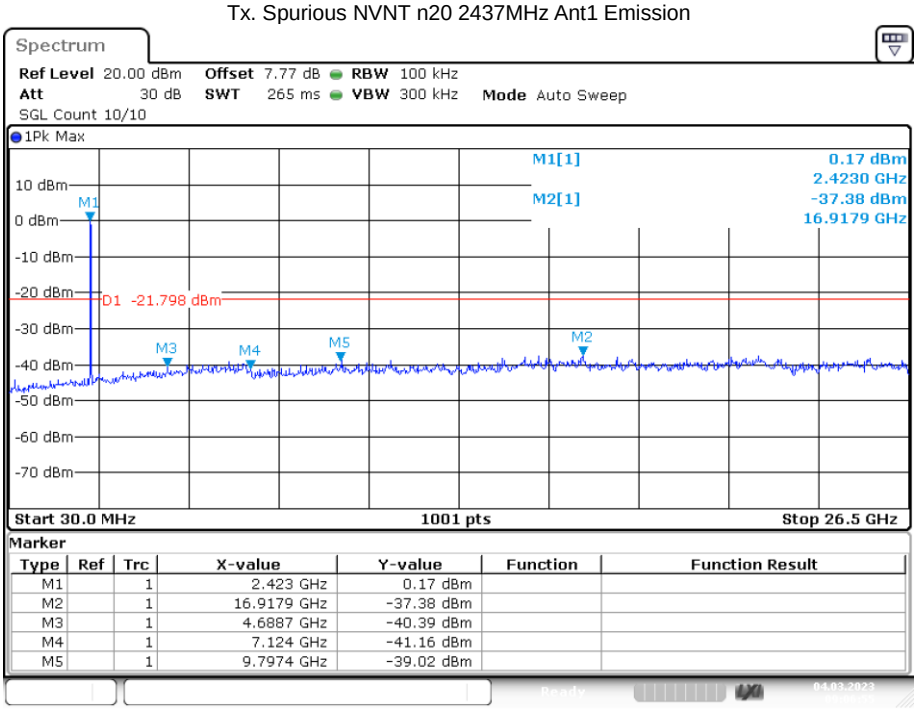
Date: 4.MAR.2023 09:03:29

Tx. Spurious NVNT n20 2437MHz Ant1 Ref



Date: 4.MAR.2023 09:06:36

Tx. Spurious NVNT n20 2437MHz Ant1 Emission

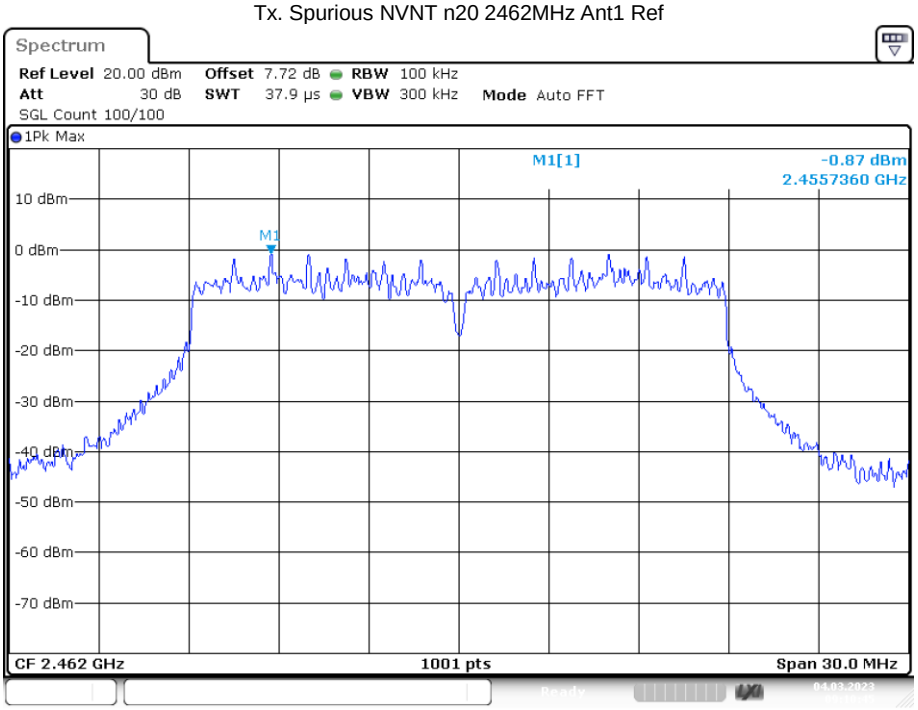


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.423 GHz	0.17 dBm		
M2		1	16.9179 GHz	-37.38 dBm		
M3		1	4.6887 GHz	-40.39 dBm		
M4		1	7.124 GHz	-41.16 dBm		
M5		1	9.7974 GHz	-39.02 dBm		

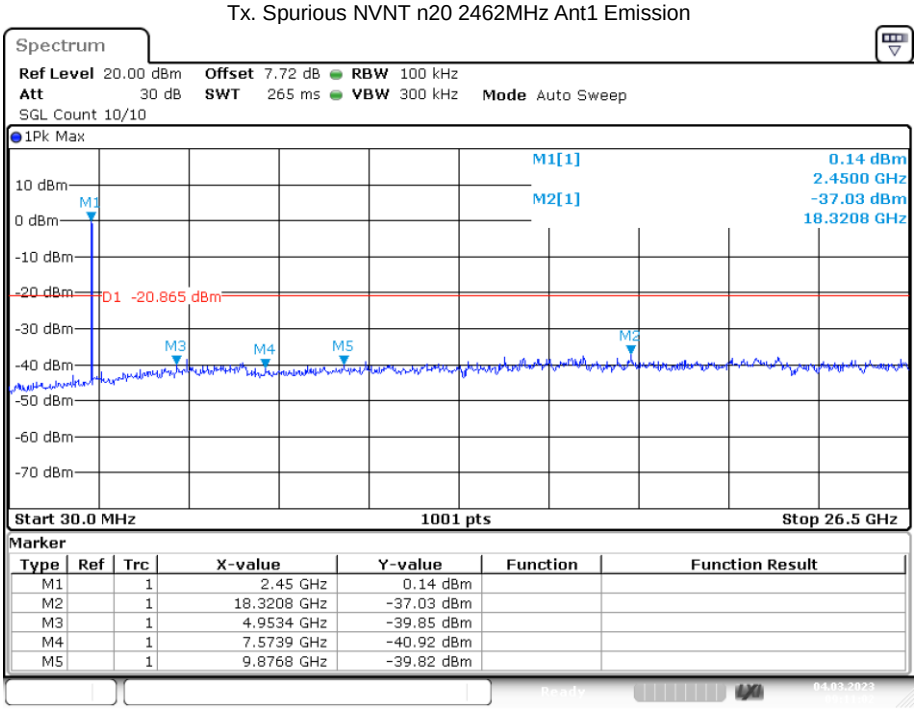
Date: 4.MAR.2023 09:06:54

Tx. Spurious NVNT n20 2462MHz Ant1 Ref



Date: 4.MAR.2023 09:10:45

Tx. Spurious NVNT n20 2462MHz Ant1 Emission

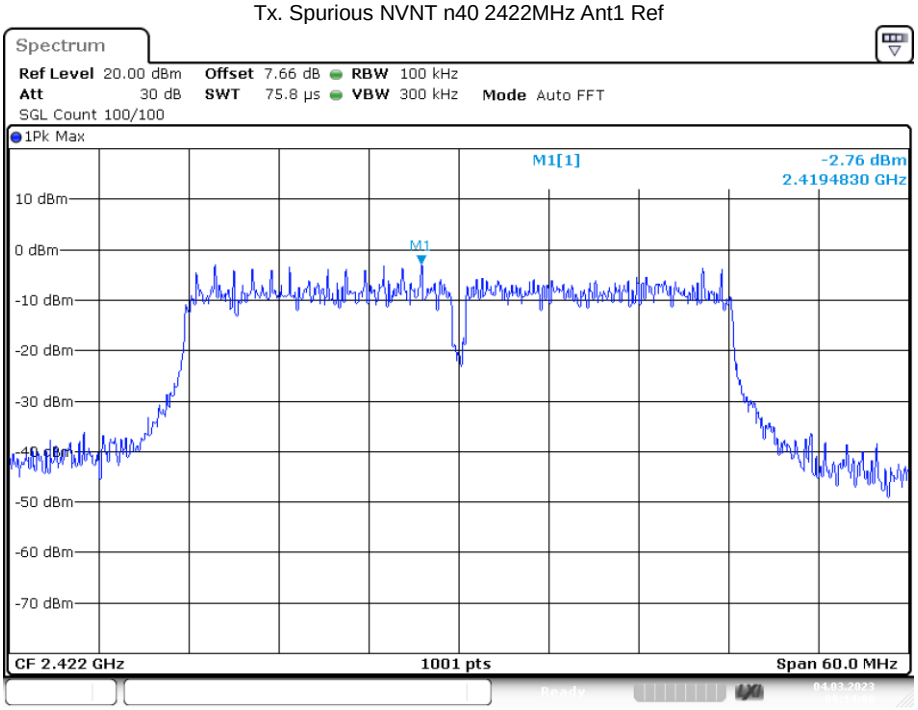


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45 GHz	0.14 dBm		
M2		1	18.3208 GHz	-37.03 dBm		
M3		1	4.9534 GHz	-39.85 dBm		
M4		1	7.5739 GHz	-40.92 dBm		
M5		1	9.8768 GHz	-39.82 dBm		

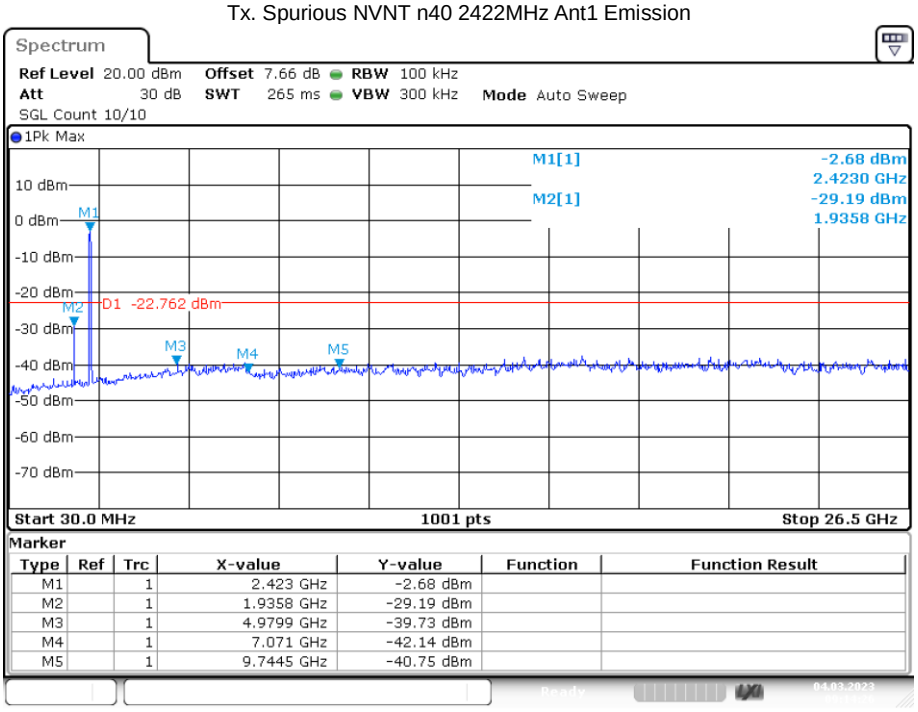
Date: 4.MAR.2023 09:11:02

Tx. Spurious NVNT n40 2422MHz Ant1 Ref



Date: 4.MAR.2023 09:14:09

Tx. Spurious NVNT n40 2422MHz Ant1 Emission

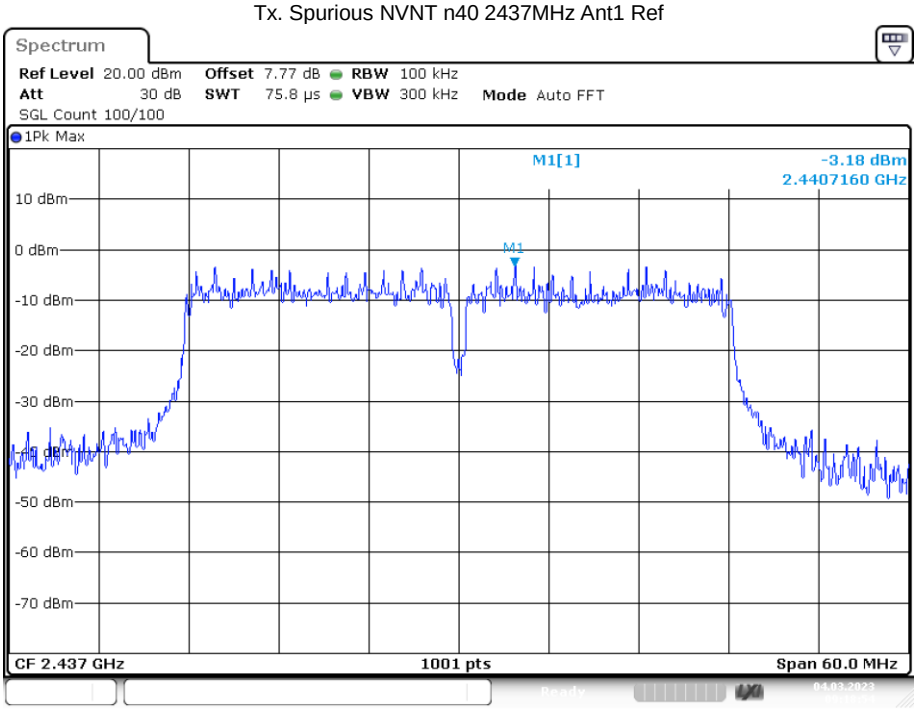


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.423 GHz	-2.68 dBm		
M2		1	1.9358 GHz	-29.19 dBm		
M3		1	4.9799 GHz	-39.73 dBm		
M4		1	7.071 GHz	-42.14 dBm		
M5		1	9.7445 GHz	-40.75 dBm		

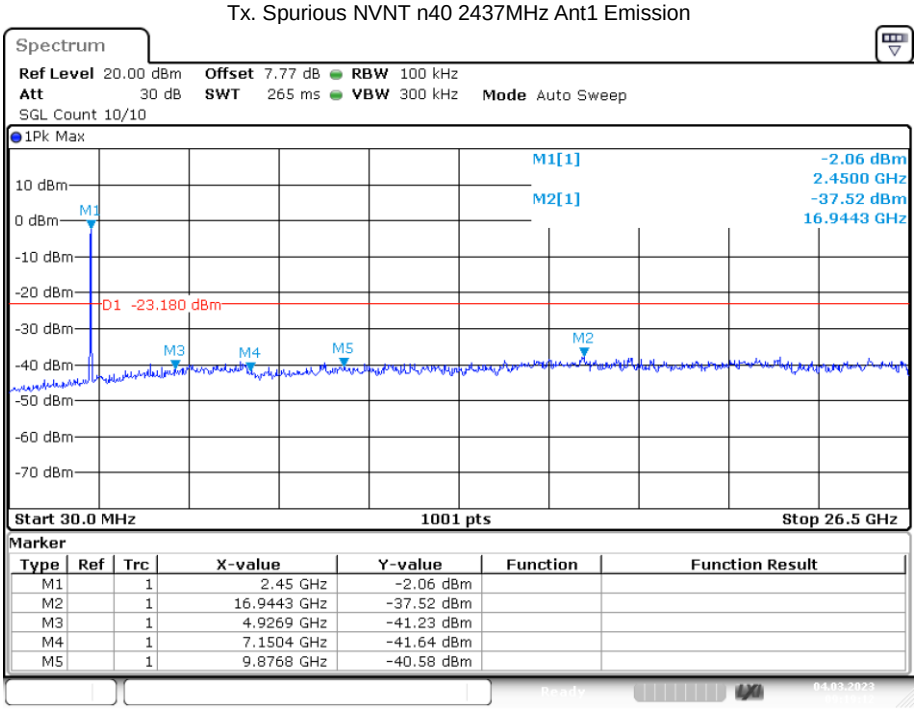
Date: 4.MAR.2023 09:14:27

Tx. Spurious NVNT n40 2437MHz Ant1 Ref



Date: 4.MAR.2023 09:18:54

Tx. Spurious NVNT n40 2437MHz Ant1 Emission

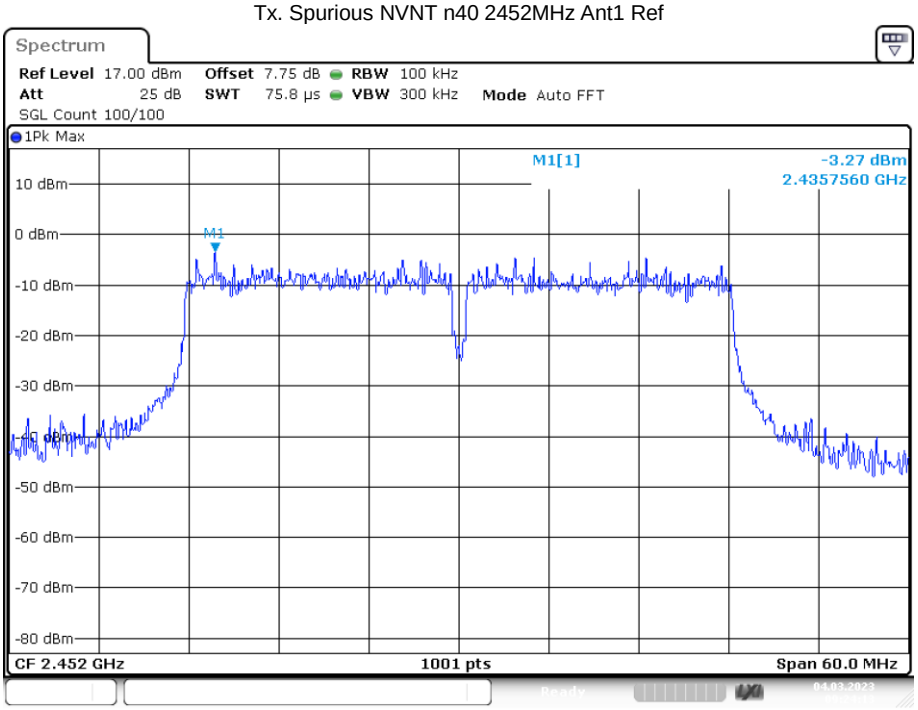


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45 GHz	-2.06 dBm		
M2		1	16.9443 GHz	-37.52 dBm		
M3		1	4.9269 GHz	-41.23 dBm		
M4		1	7.1504 GHz	-41.64 dBm		
M5		1	9.8768 GHz	-40.58 dBm		

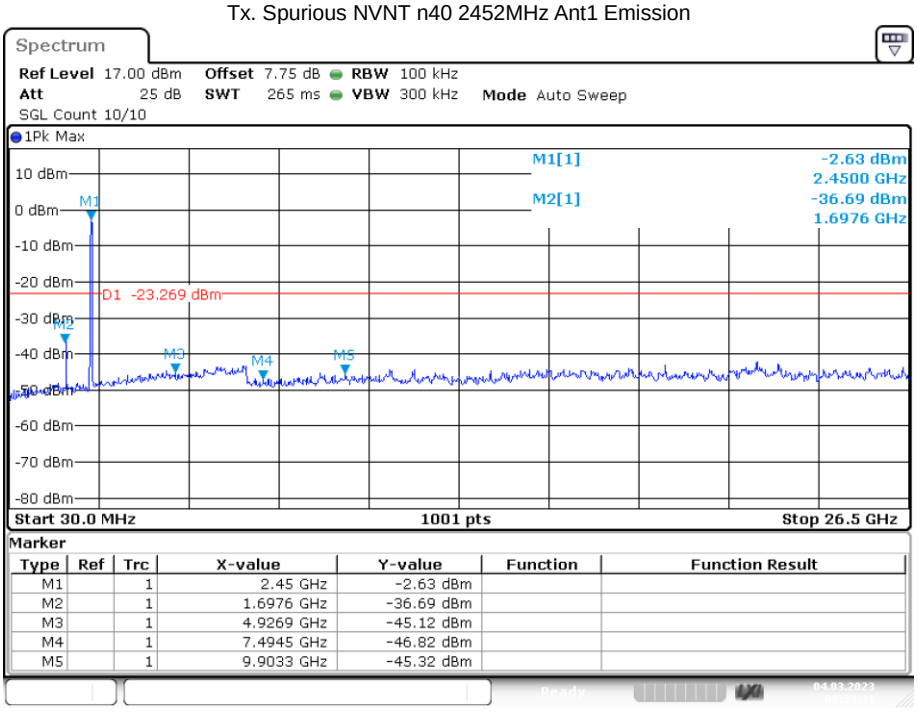
Date: 4.MAR.2023 09:19:12

Tx. Spurious NVNT n40 2452MHz Ant1 Ref



Date: 4.MAR.2023 09:24:13

Tx. Spurious NVNT n40 2452MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45 GHz	-2.63 dBm		
M2		1	1.6976 GHz	-36.69 dBm		
M3		1	4.9269 GHz	-45.12 dBm		
M4		1	7.4945 GHz	-46.82 dBm		
M5		1	9.9033 GHz	-45.32 dBm		

Date: 4.MAR.2023 09:24:31

4. POWER LINE CONDUCTED EMISSION

4.1. Test Limits

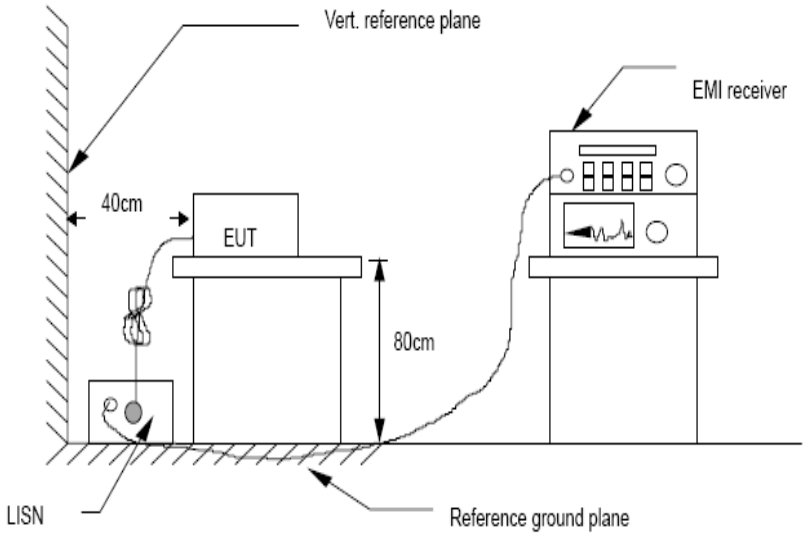
Frequency	Limits dB(μV)	
MHz	Quasi-peak Level	Average Level
0.15 -0.50	66 -56*	56 - 46*
0.50 -5.00	56	46
5.00 -30.00	60	50

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.

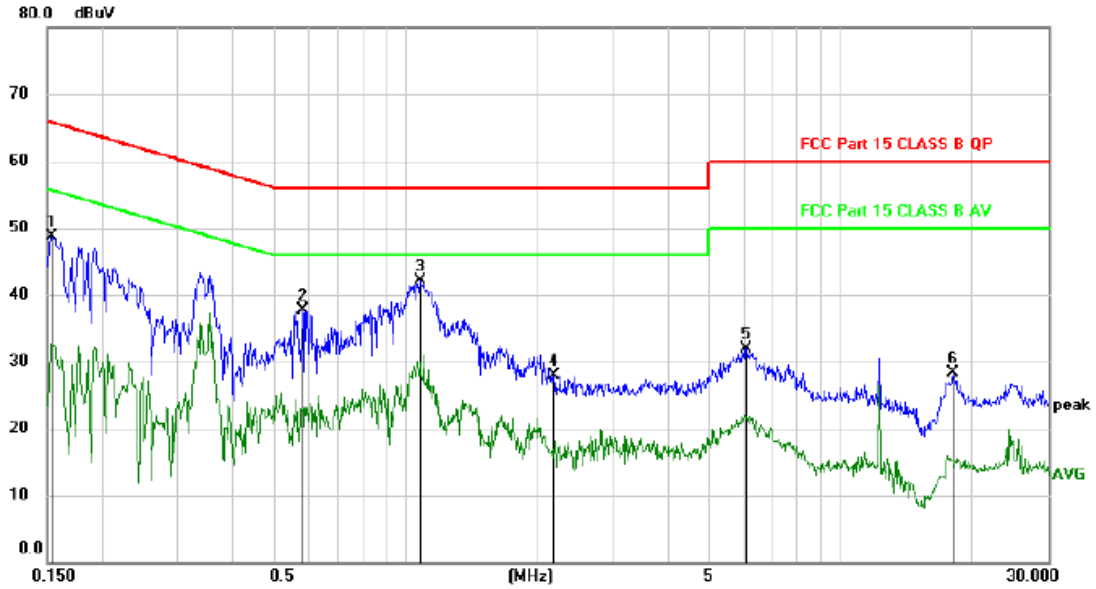
4.3. Test Setup



4.4. Test Results

PASS. (See below detailed test data)
Note: If peak Result comply with AV limit, QP and AV Result is deemed to comply with AV limit

Line:

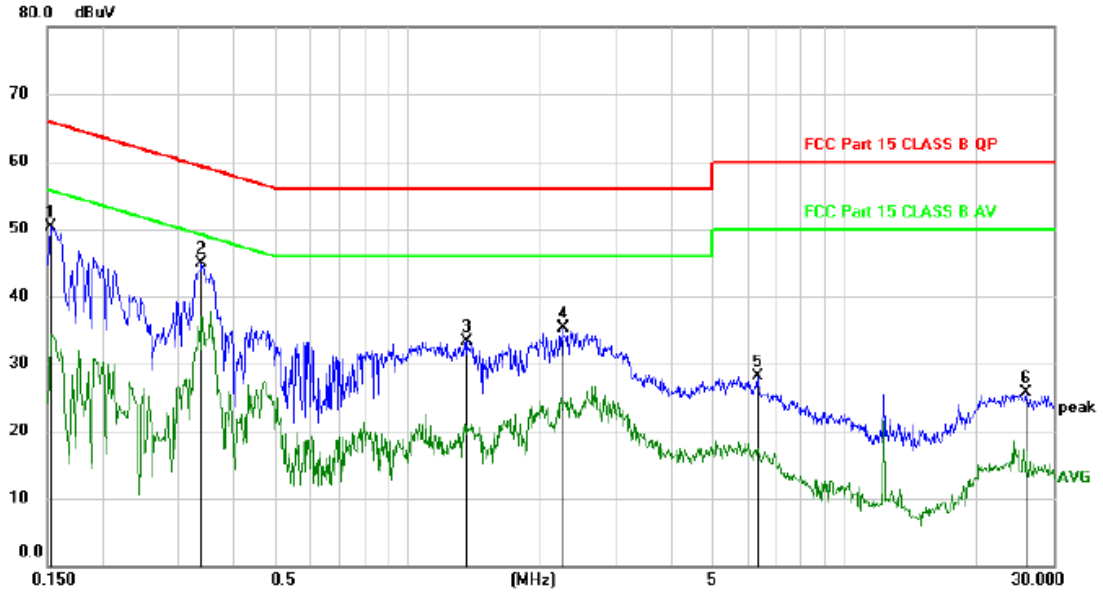


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1539	38.67	9.94	48.61	65.79	-17.18	peak	
2		0.5816	27.71	9.93	37.64	56.00	-18.36	peak	
3	*	1.0766	32.23	9.91	42.14	56.00	-13.86	peak	
4		2.1900	18.07	9.89	27.96	56.00	-28.04	peak	
5		6.0868	21.73	10.08	31.81	60.00	-28.19	peak	
6		18.1230	17.82	10.42	28.24	60.00	-31.76	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

Neutral:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1529	40.29	9.94	50.23	65.84	-15.61	peak	
2	*	0.3390	34.90	9.94	44.84	59.23	-14.39	peak	
3		1.3649	23.35	9.89	33.24	56.00	-22.76	peak	
4		2.2618	25.41	9.90	35.31	56.00	-20.69	peak	
5		6.3360	17.97	10.09	28.06	60.00	-31.94	peak	
6		25.8779	15.32	10.48	25.80	60.00	-34.20	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 B mode 2412MHz mode with the worst data is listed.

5. CONDUCTED MAXIMUM 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.

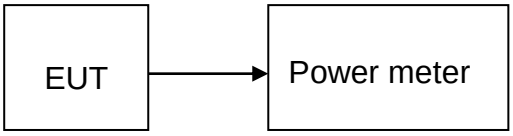
5.2.3 Measure out each mode and each bands peak output power of EUT.

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

5.2.4 The measure-and-sum technique shall be used for measuring in-band transmit power of a device. Total power is the sum of the conducted power levels measured at the various output ports.

(First measure the power (mW) of each antenna separately, and the total power is equal to $Ant1^{mW}$ + $Ant2^{mW+....}$)

5.3. Test Setup



5.4. Test Results

Mode	Frequency (MHz)	Antenna	Total Power (dBm)	Limit (dBm)	Verdict
b	2412	Ant1	18.068	30	Pass
b	2437	Ant1	18.763	30	Pass
b	2462	Ant1	17.688	30	Pass
g	2412	Ant1	18.733	30	Pass
g	2437	Ant1	18.840	30	Pass
g	2462	Ant1	18.041	30	Pass
n20	2412	Ant1	18.656	30	Pass
n20	2437	Ant1	18.655	30	Pass
n20	2462	Ant1	17.845	30	Pass
n40	2422	Ant1	19.513	30	Pass
n40	2437	Ant1	**19.521**	30	Pass
n40	2452	Ant1	18.982	30	Pass

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.

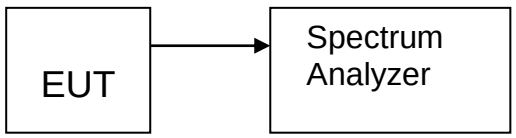
6.2.2 Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

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

6.2.4 Record the max reading.

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

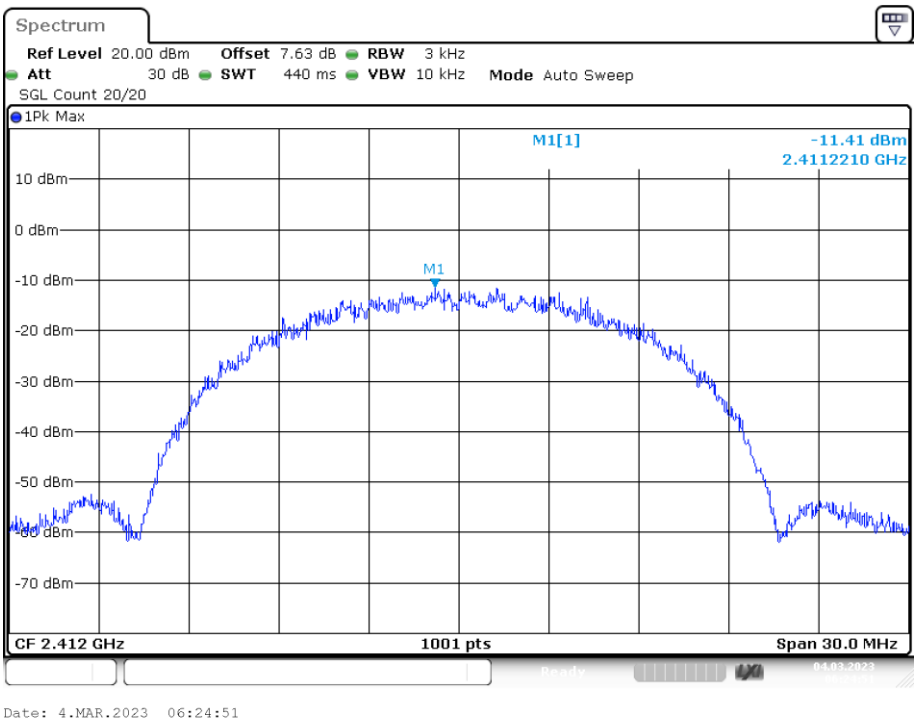
6.3. Test Setup



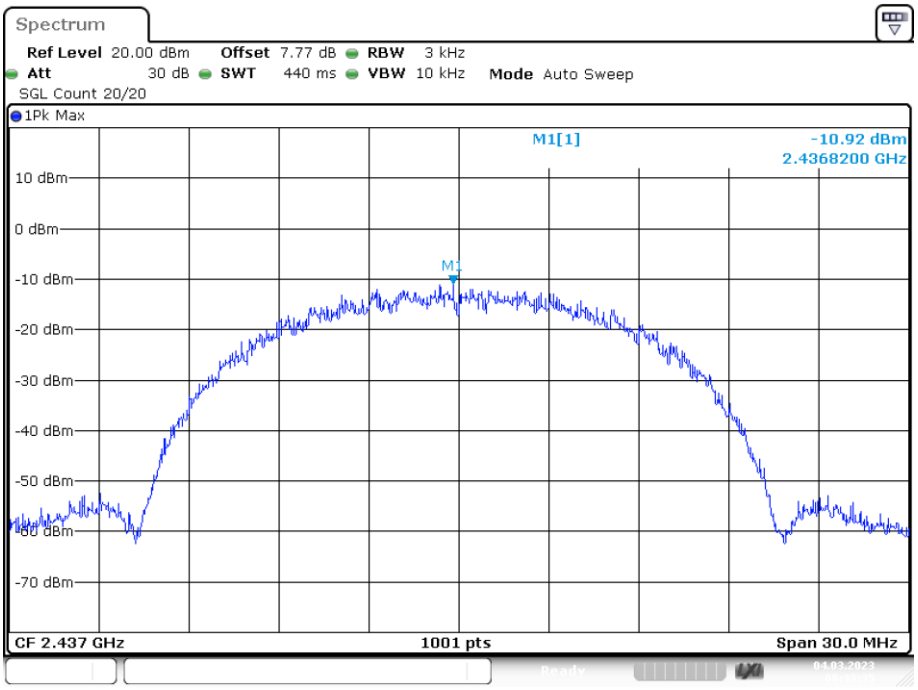
6.4. Test Results

Condition	Mode	Frequency (MHz)	Antenna	Max PSD (dBm)	Limit (dBm)	Verdict
NVNT	b	2412	Ant1	-11.407	8	Pass
NVNT	b	2437	Ant1	-10.923	8	Pass
NVNT	b	2462	Ant1	-11.363	8	Pass
NVNT	g	2412	Ant1	-14.581	8	Pass
NVNT	g	2437	Ant1	-12.619	8	Pass
NVNT	g	2462	Ant1	-15.025	8	Pass
NVNT	n20	2412	Ant1	-14.264	8	Pass
NVNT	n20	2437	Ant1	-14.655	8	Pass
NVNT	n20	2462	Ant1	-15.764	8	Pass
NVNT	n40	2422	Ant1	-15.5	8	Pass
NVNT	n40	2437	Ant1	-16.28	8	Pass
NVNT	n40	2452	Ant1	-16.488	8	Pass

PSD NVNT b 2412MHz Ant1



PSD NVNT b 2437MHz Ant1



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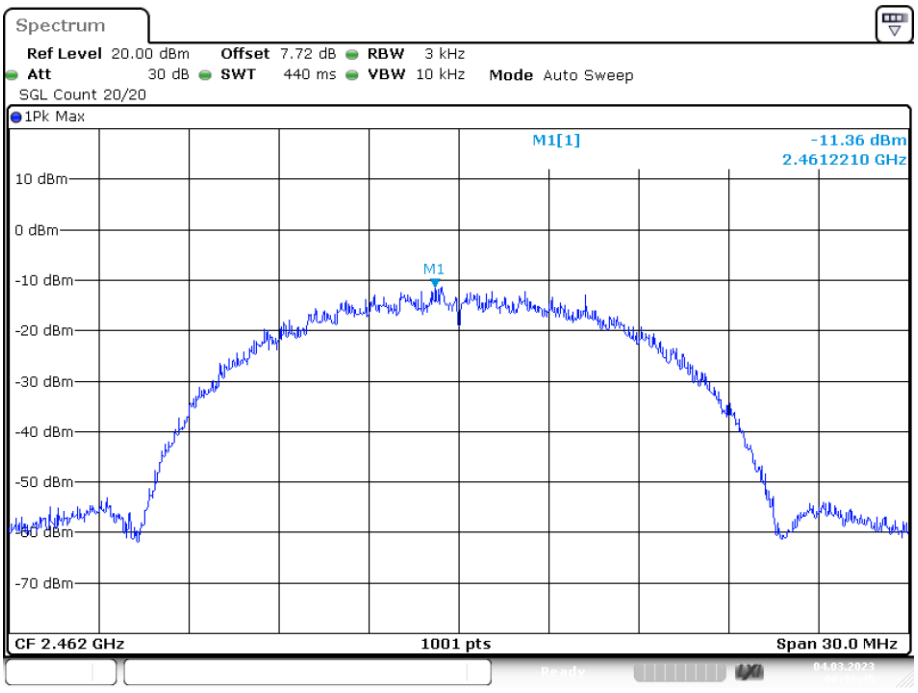
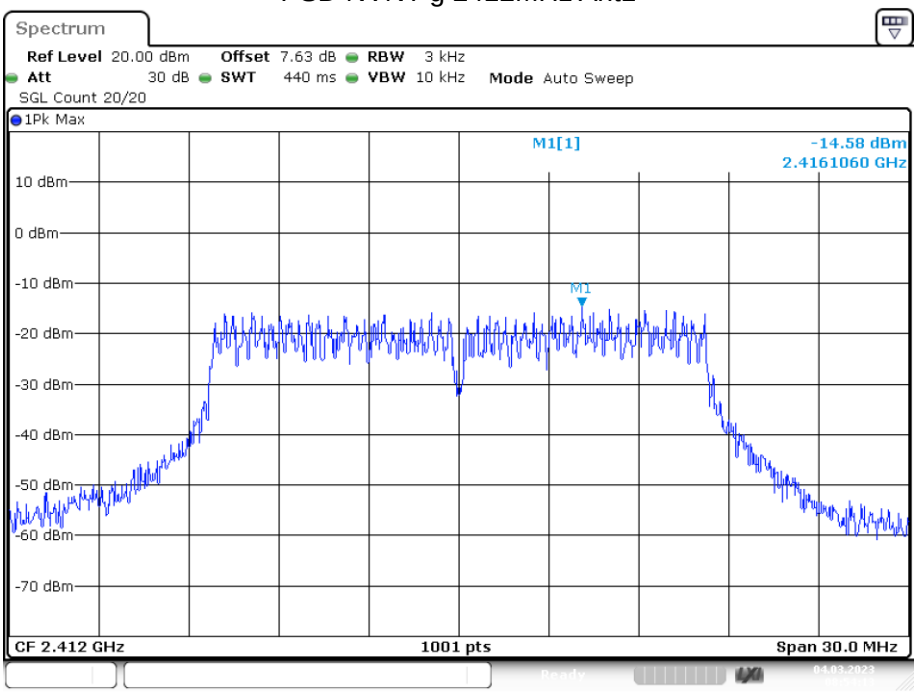
PSD NVNT b 2462MHz Ant1



Date: 4.MAR.2023 08:43:45

PSD NVNT g 2412MHz Ant1



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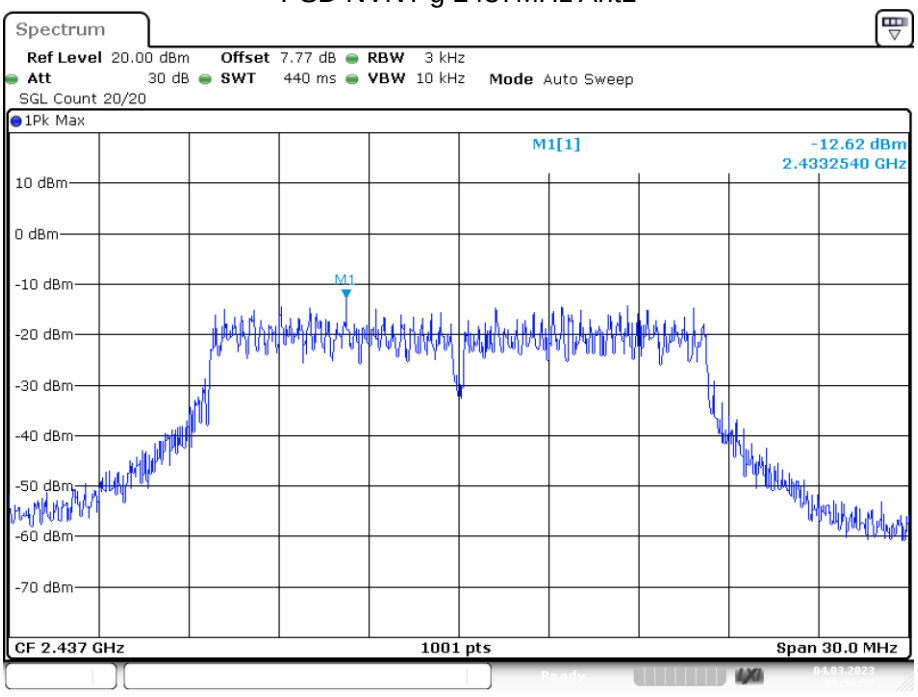
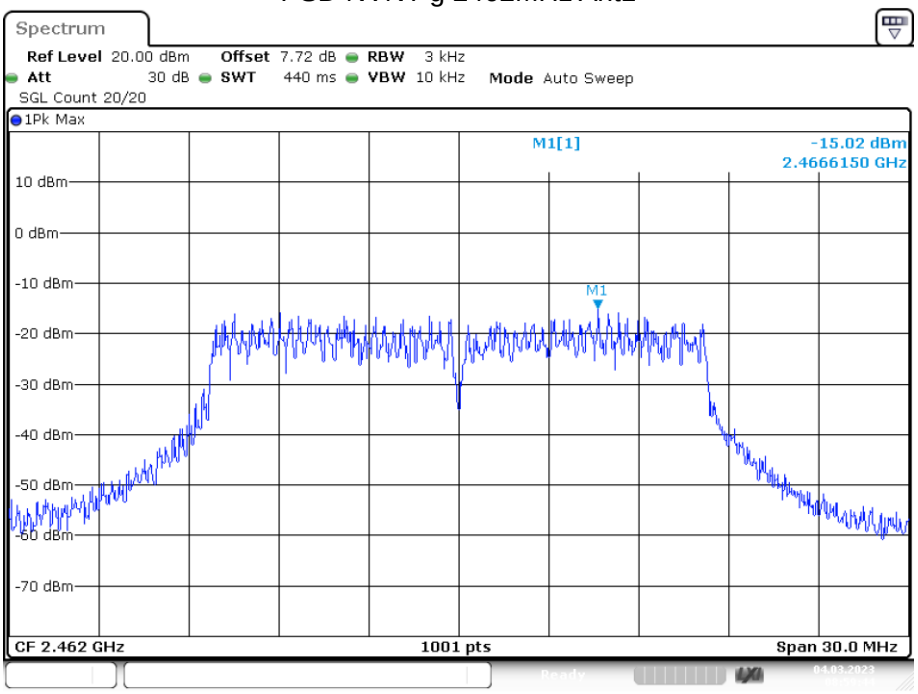
PSD NVNT g 2437MHz Ant1



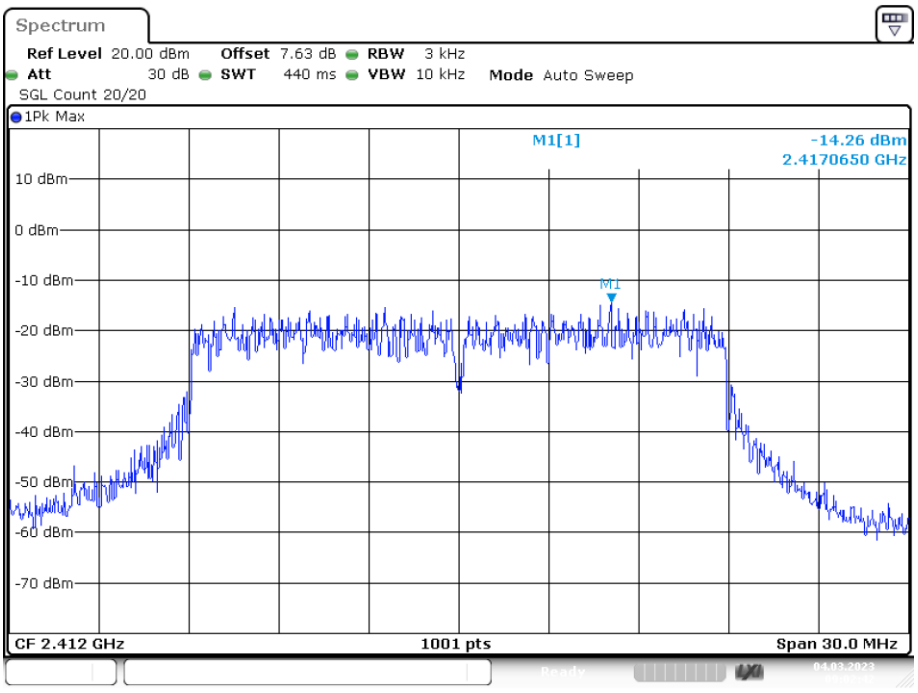
Date: 4.MAR.2023 08:56:57

PSD NVNT g 2462MHz Ant1



Date: 4.MAR.2023 08:59:44

PSD NVNT n20 2412MHz Ant1



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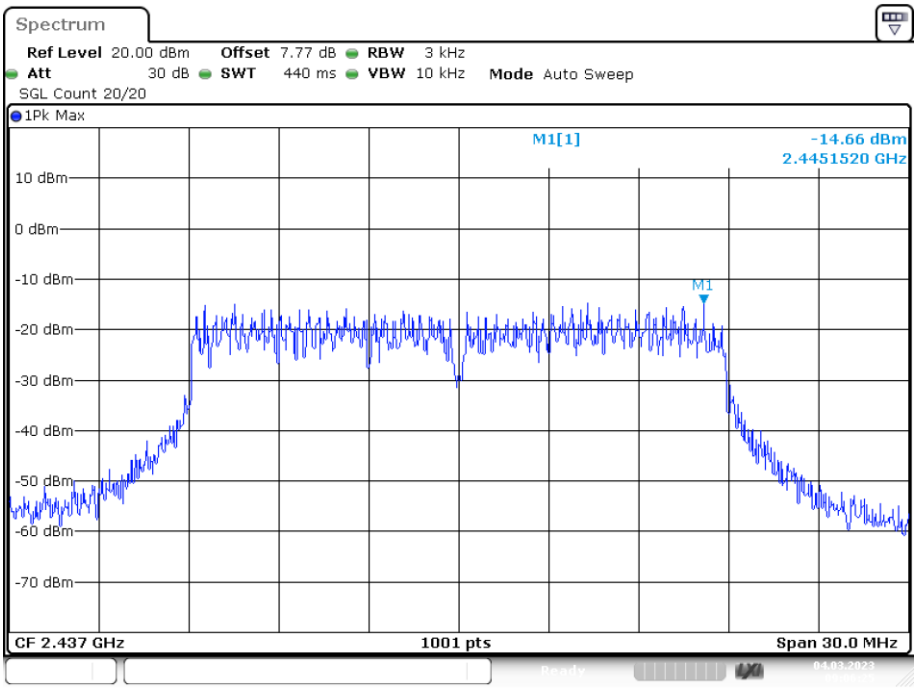
PSD NVNT n20 2437MHz Ant1



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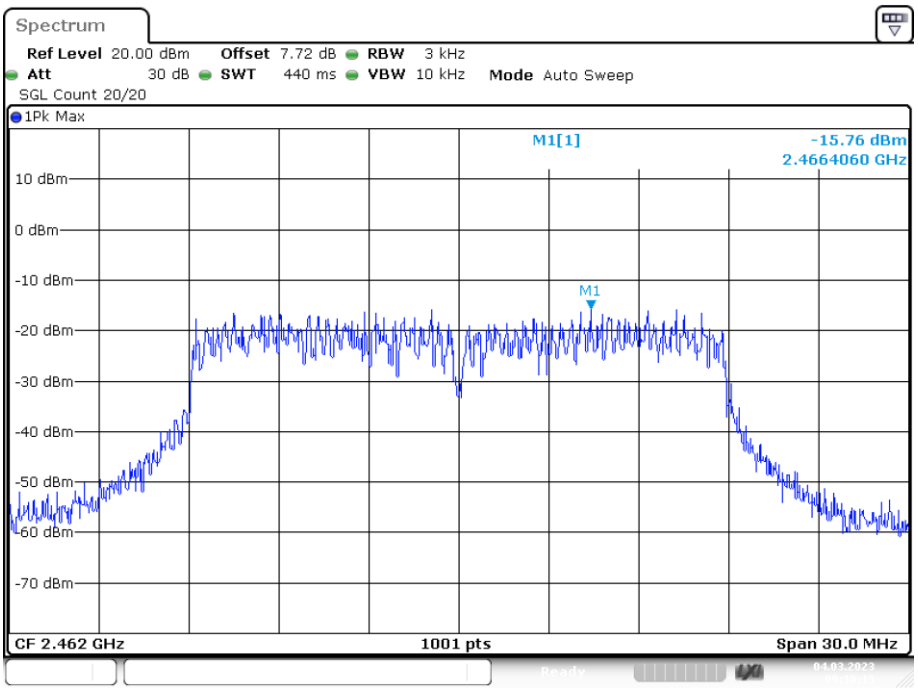
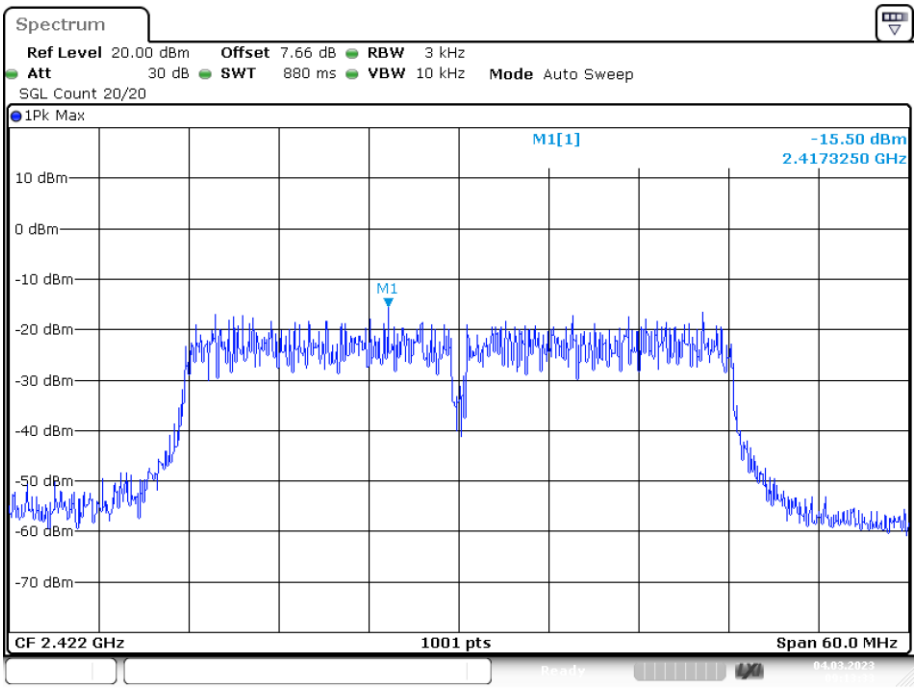


Date: 4.MAR.2023 09:10:13

PSD NVNT n40 2422MHz Ant1



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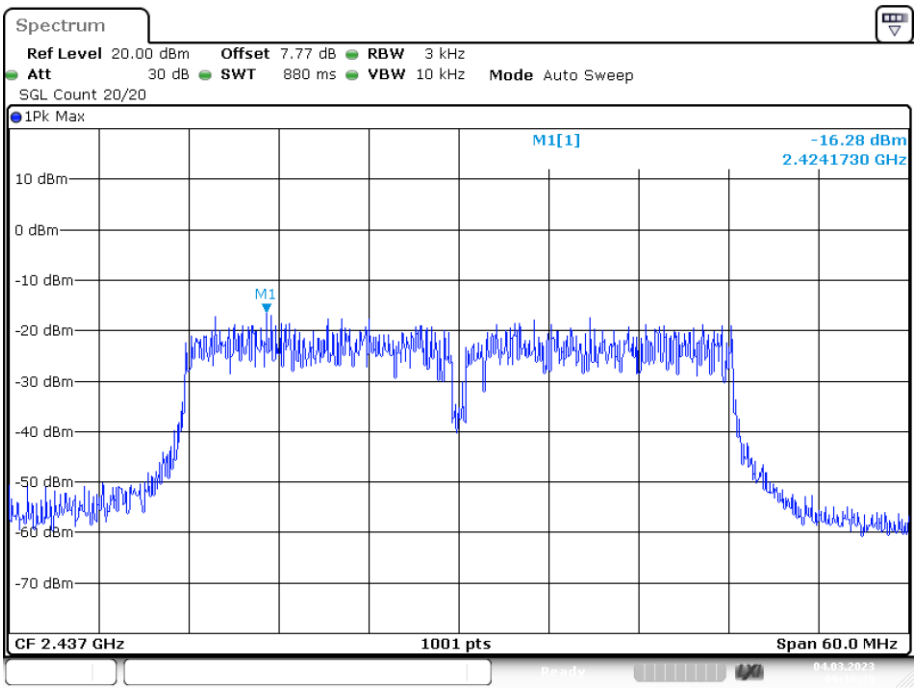
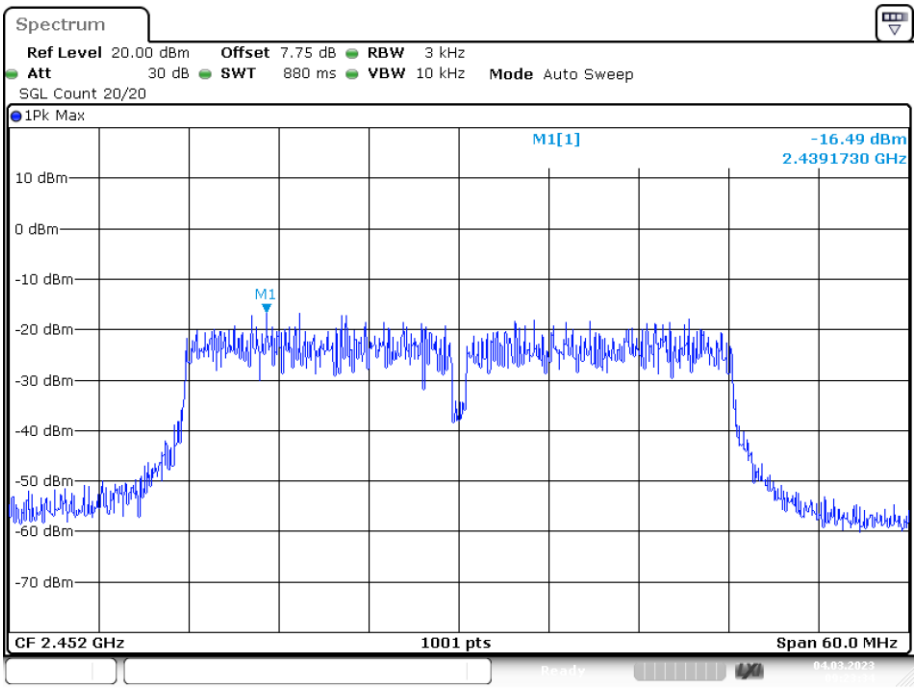
PSD NVNT n40 2437MHz Ant1



Date: 4.MAR.2023 09:18:39

PSD NVNT n40 2452MHz Ant1



7. BANDWIDTH

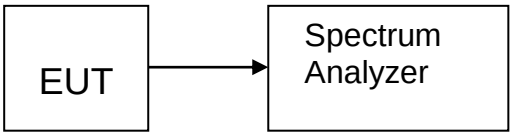
7.1. Test limits

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

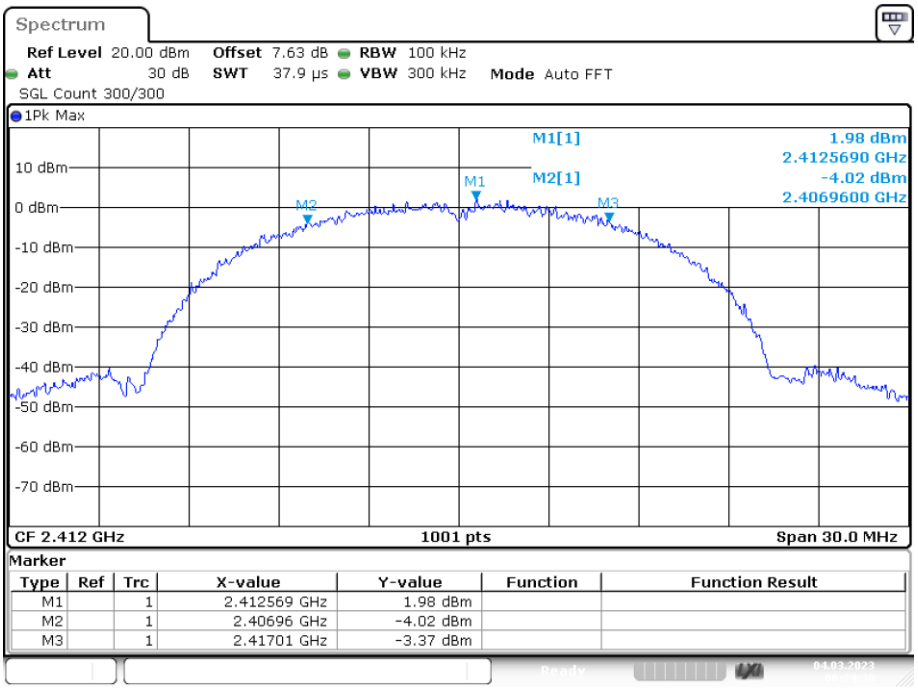


7.4. Test Results

-6dB Bandwidth

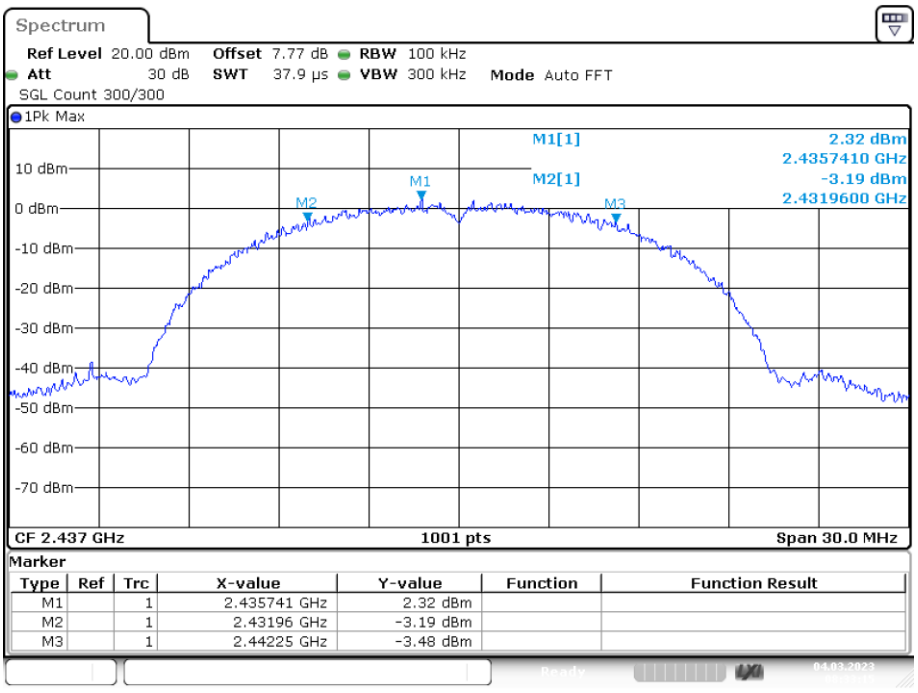
Condition	Mode	Frequency (MHz)	Antenna	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	b	2412	Ant1	10.05	0.5	Pass
NVNT	b	2437	Ant1	10.29	0.5	Pass
NVNT	b	2462	Ant1	10.38	0.5	Pass
NVNT	g	2412	Ant1	16.41	0.5	Pass
NVNT	g	2437	Ant1	16.41	0.5	Pass
NVNT	g	2462	Ant1	16.44	0.5	Pass
NVNT	n20	2412	Ant1	17.22	0.5	Pass
NVNT	n20	2437	Ant1	17.37	0.5	Pass
NVNT	n20	2462	Ant1	17.58	0.5	Pass
NVNT	n40	2422	Ant1	35.16	0.5	Pass
NVNT	n40	2437	Ant1	35.46	0.5	Pass
NVNT	n40	2452	Ant1	35.4	0.5	Pass

-6dB Bandwidth NVNT b 2412MHz Ant1



Date: 4.MAR.2023 06:24:30

-6dB Bandwidth NVNT b 2437MHz Ant1



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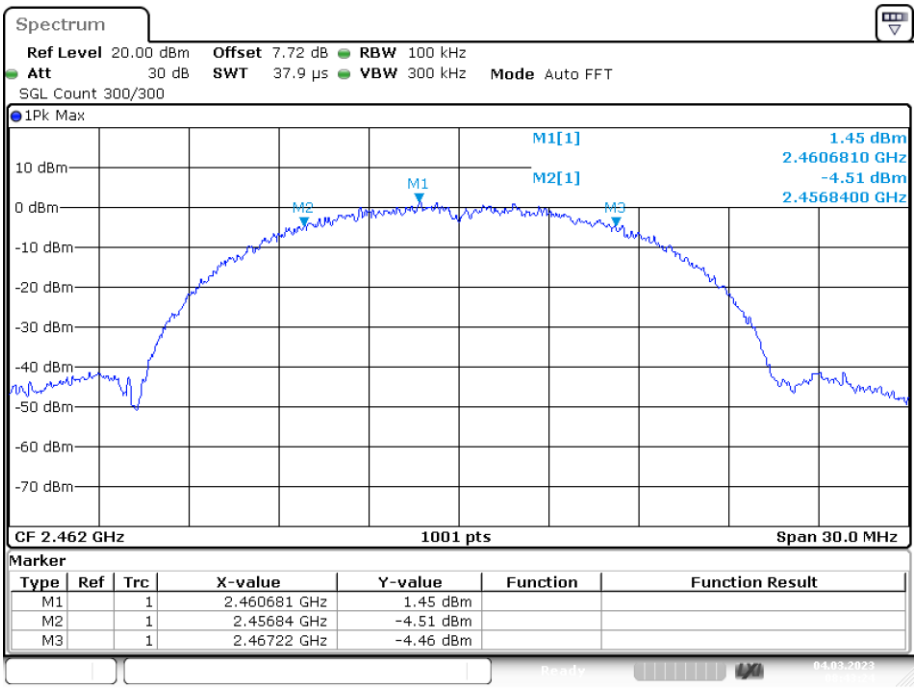
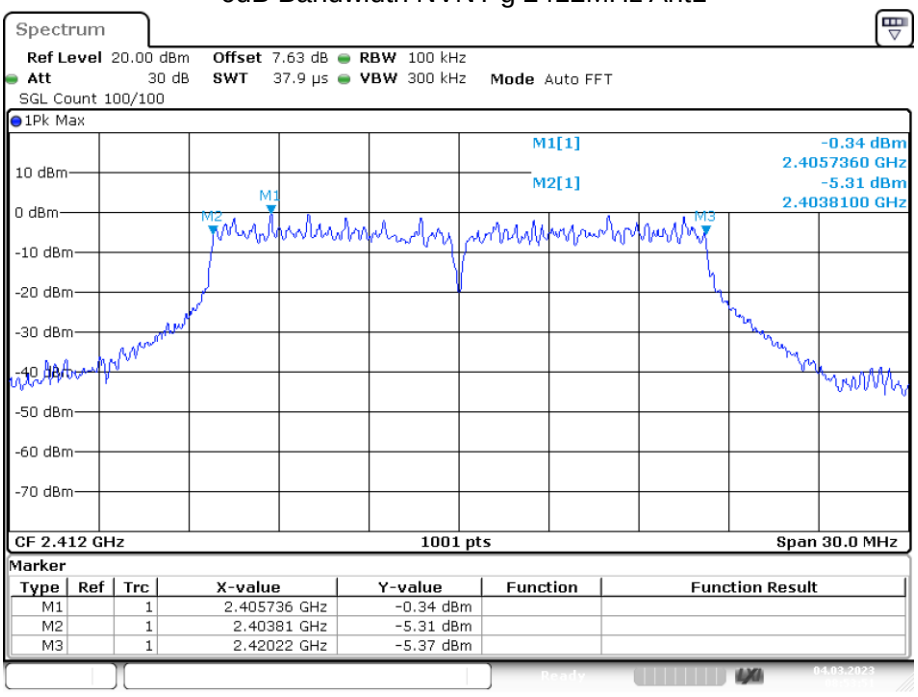
-6dB Bandwidth NVNT b 2462MHz Ant1



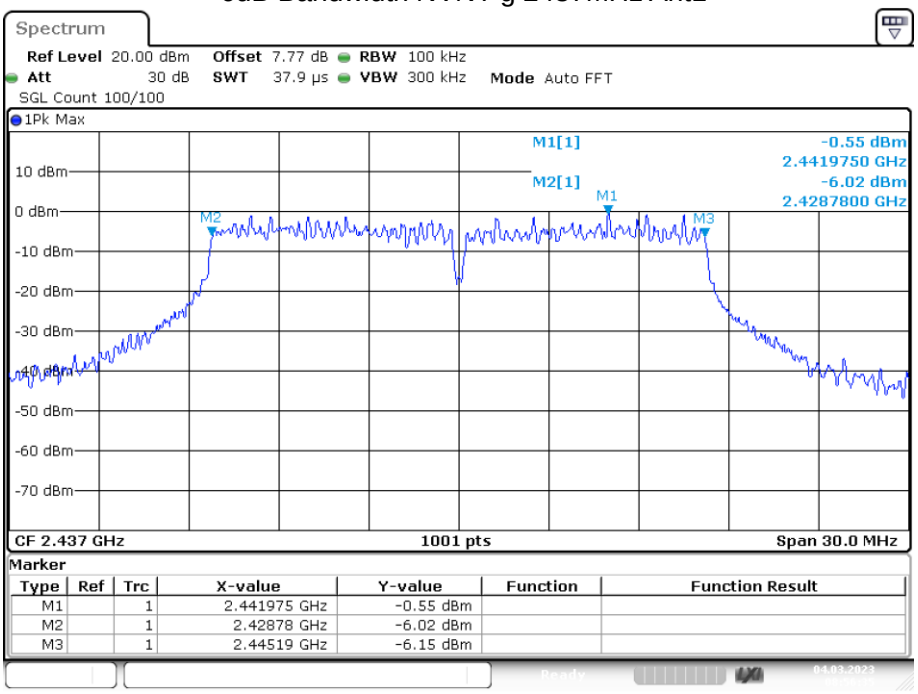
Date: 4.MAR.2023 08:43:23

-6dB Bandwidth NVNT g 2412MHz Ant1



Date: 4.MAR.2023 08:53:51

-6dB Bandwidth NVNT g 2437MHz Ant1



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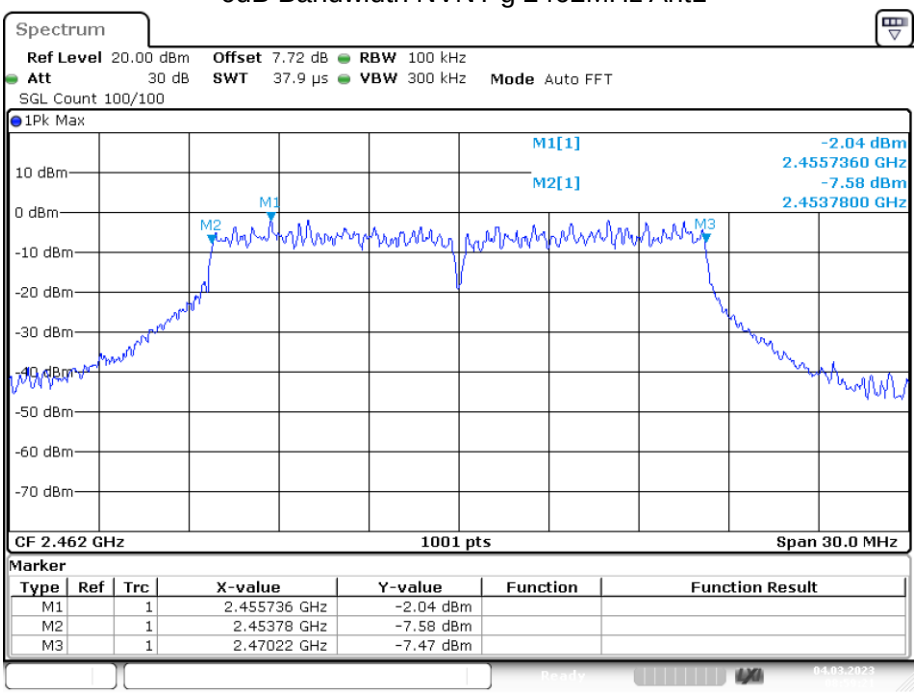
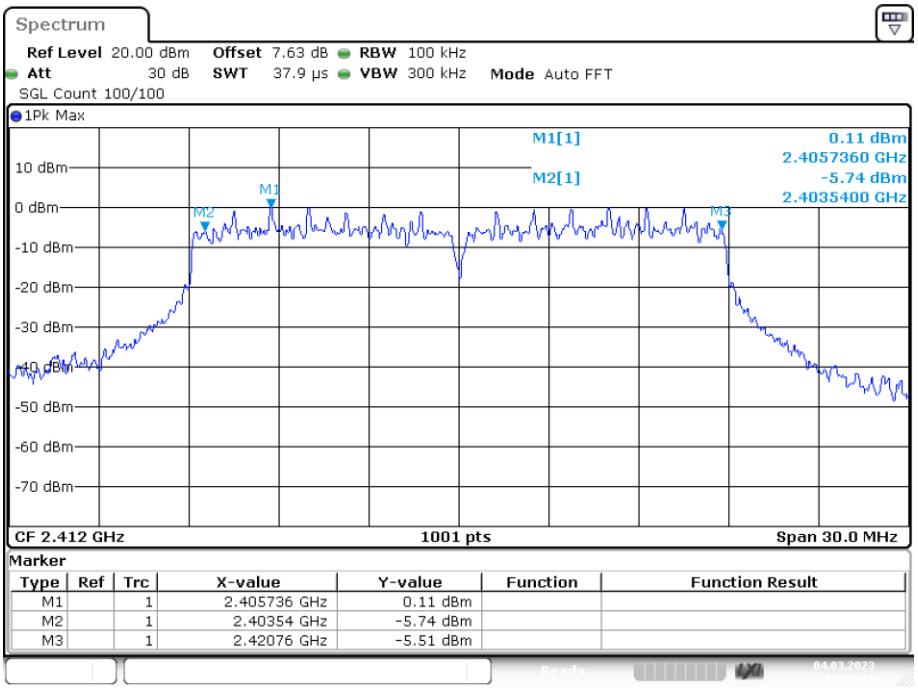
-6dB Bandwidth NVNT g 2462MHz Ant1



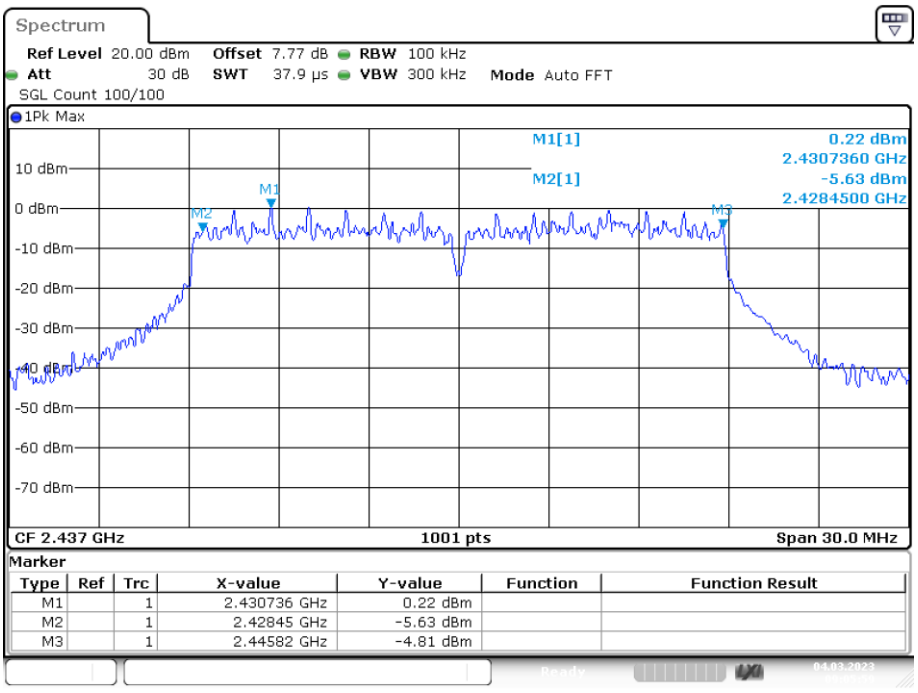
Date: 4.MAR.2023 08:59:21

-6dB Bandwidth NVNT n20 2412MHz Ant1



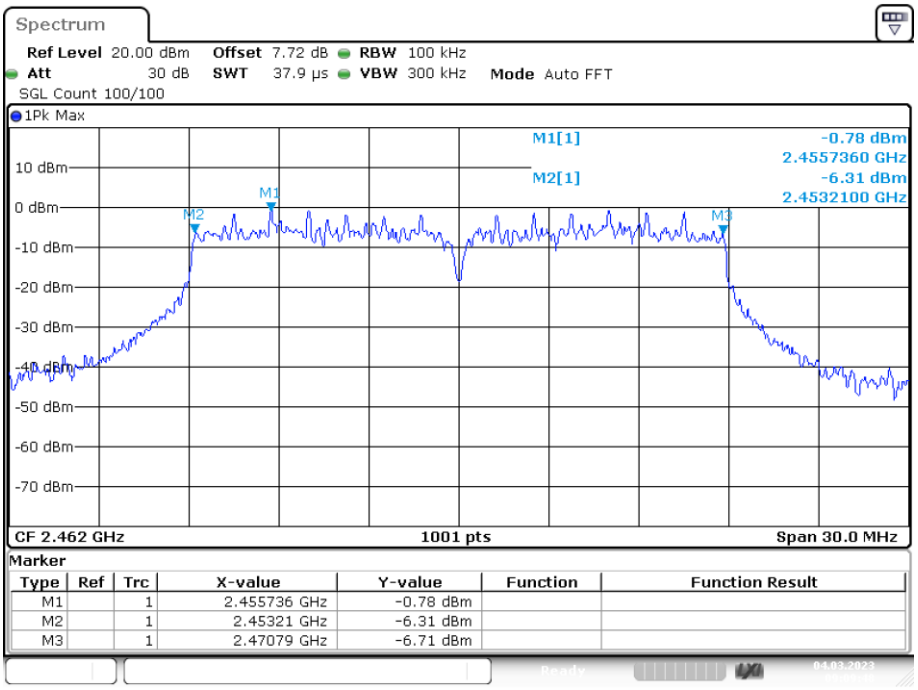
Date: 4.MAR.2023 09:02:18

-6dB Bandwidth NVNT n20 2437MHz Ant1



Date: 4.MAR.2023 09:06:00

-6dB Bandwidth NVNT n20 2462MHz Ant1



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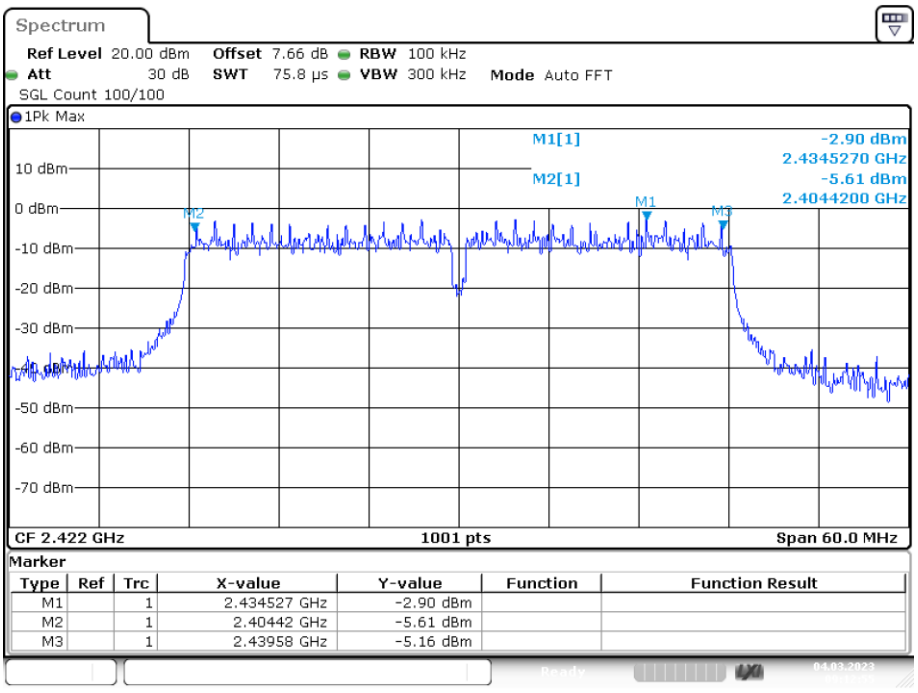
-6dB Bandwidth NVNT n40 2422MHz Ant1



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