FCC TEST REPORT

FCC ID: 2AZFE-AAO-YG

On Behalf of

Shenzhen Shadow Crown Technology Co., Ltd.

LED Projector

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

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

Prepared By	:	Shenzhen Alpha Product Testing Co., Ltd.
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Report Number	:	A2307263-C01-R04
Date of Receipt	:	July 27, 2023
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TEST REPORT DECLARATION

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

Measurement Standard Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.247

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…… ……..:	August 16, 2023	

Revision History

Revision	Issue Date	Revisions	Revised By
V0	August 16, 2023	Initial released Issue	Yannis Wen

1. Summary Of Standards And Results

1.1. Description of Standards and Results

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

Test Item	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	:	LED Projector
Model Number	:	YG691 Movin, W1K, YG691, YG561, YG531, YG491, YG471, PJ30
Diff.	:	There is no difference except the name of the model. All tests are made with the YG691 Movin model.
Test Voltage	:	AC 120V/60Hz
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 1, max gain 4.73dBi Internal antenna 2, max gain 4.73dBi The antenna MIMO combining gain is 7.73dBi. (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.

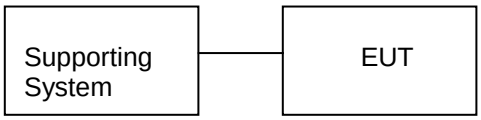
2.2. Accessories of Device (EUT)

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	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	Teelong	WHTH-1000-40-880	/	TL-20191205-01	2022.07.28	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	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

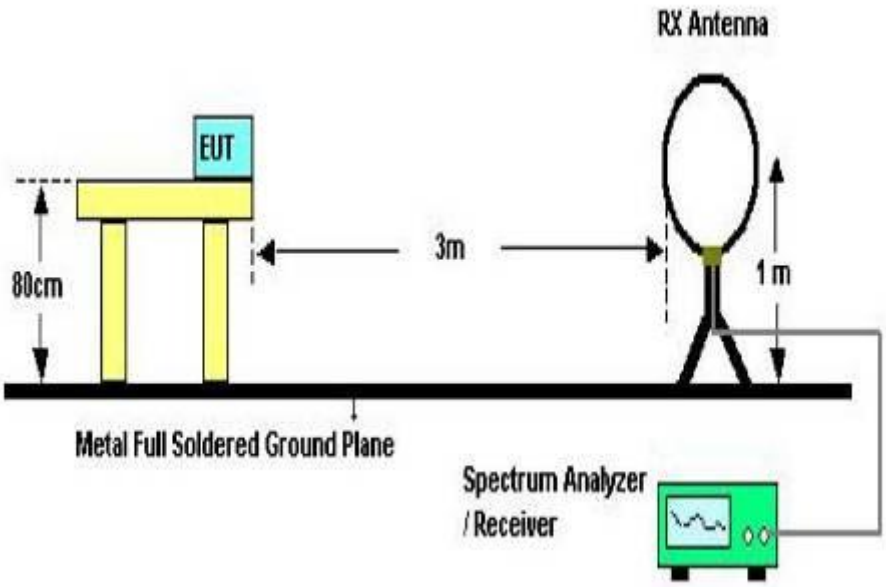
Table 6 – General field strength limits at frequencies below 30 MHz		
Frequency	**Magnetic field strength (H-Field) (μA/m)**	**Measurement distance (m)**
9 - 490 kHz[Note 1]	6.37/F (F in kHz)	300
490 - 1705 kHz	63.7/F (F in kHz)	30
1.705 - 30 MHz	0.08	30

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

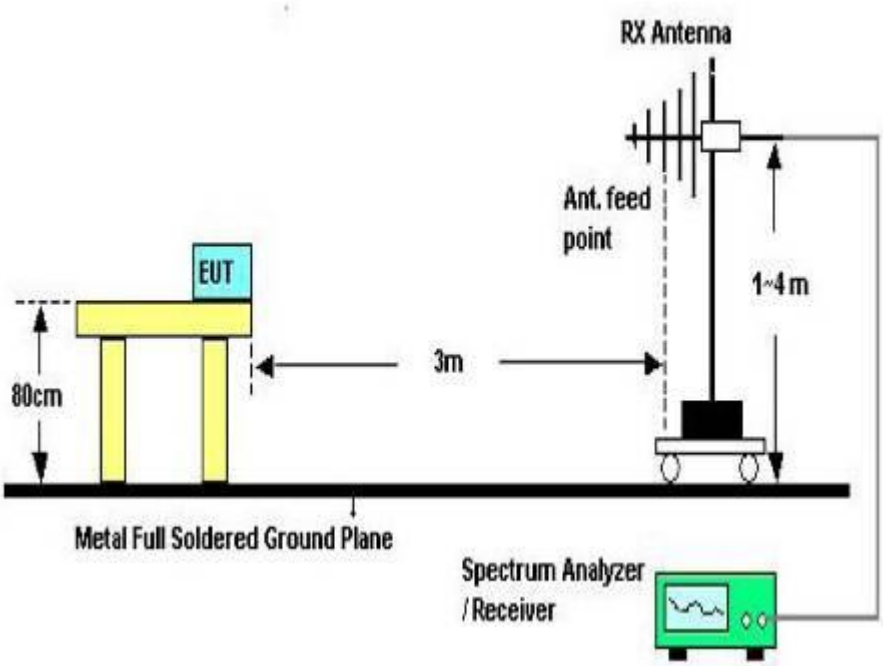
3.2. Test Procedure

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.

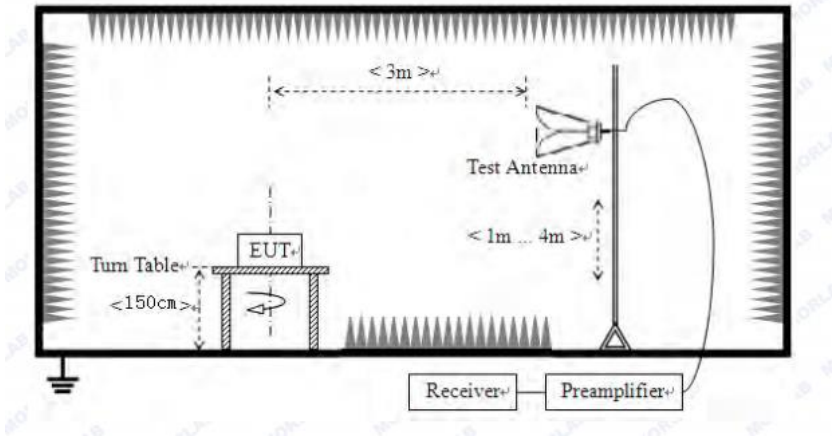
3.3. Test Setup



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.

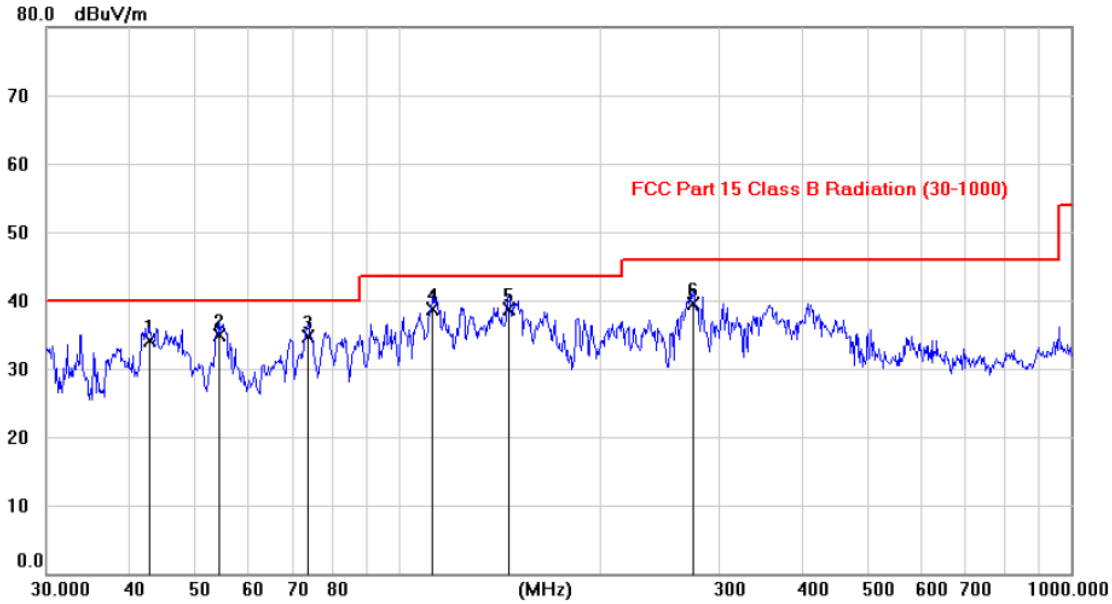
From 9KHz to 30MHz: Conclusion: PASS

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

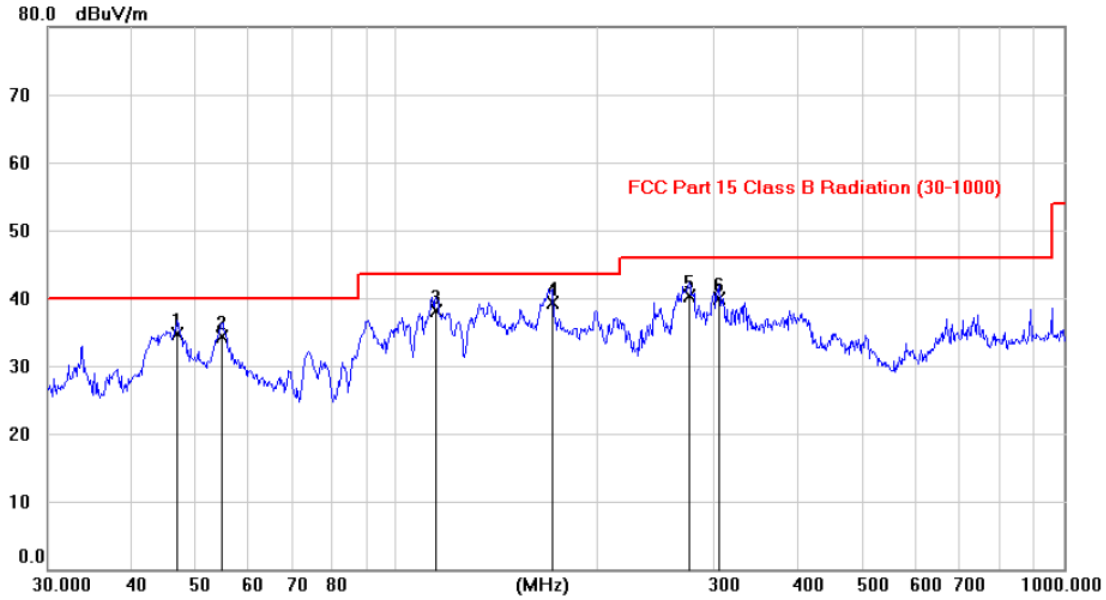
From 30MHz to 1000MHz: Conclusion: PASS
Vertical:



No.	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		42.7246	19.76	14.26	34.02	40.00	-5.98	QP			
2		54.2419	21.13	13.68	34.81	40.00	-5.19	QP			
3		73.6084	23.82	10.81	34.63	40.00	-5.37	QP			
4		112.8932	26.49	12.18	38.67	43.50	-4.83	QP			
5	*	146.0317	23.92	14.76	38.68	43.50	-4.82	QP			
6		274.8034	26.15	13.42	39.57	46.00	-6.43	QP			

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		46.8356	20.57	14.08	34.65	40.00	-5.35	QP			
2		54.7707	20.77	13.60	34.37	40.00	-5.63	QP			
3		114.8900	25.63	12.42	38.05	43.50	-5.45	QP			
4	*	170.8325	25.38	13.96	39.34	43.50	-4.16	QP			
5		274.9641	26.86	13.43	40.29	46.00	-5.71	QP			
6		304.3608	25.77	14.20	39.97	46.00	-6.03	QP			

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 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	45.92	V	33.95	10.18	34.26	55.79	74	-18.21	PK
4824	35.06	V	33.95	10.18	34.26	44.93	54	-9.07	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
4824	47.66	H	33.95	10.18	34.26	57.53	74	-16.47	PK
4824	33.36	H	33.95	10.18	34.26	43.23	54	-10.77	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11b TX Mid									
4874	43.30	V	33.93	10.2	34.29	53.14	74	-20.86	PK
4874	34.10	V	33.93	10.2	34.29	43.94	54	-10.06	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
4874	47.92	H	33.93	10.2	34.29	57.76	74	-16.24	PK
4874	34.75	H	33.93	10.2	34.29	44.59	54	-9.41	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11b TX High									
4924	48.13	V	33.98	10.22	34.25	58.08	74	-15.92	PK
4924	36.93	V	33.98	10.22	34.25	46.88	54	-7.12	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/
4924	45.82	H	33.98	10.22	34.25	55.77	74	-18.23	PK
4924	34.24	H	33.98	10.22	34.25	44.19	54	-9.81	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	44.56	V	33.95	10.18	34.26	54.43	74	-19.57	PK
4824	35.03	V	33.95	10.18	34.26	44.90	54	-9.10	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
4824	50.55	H	33.95	10.18	34.26	60.42	74	-13.58	PK
4824	35.33	H	33.95	10.18	34.26	45.20	54	-8.80	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11g TX Mid									
4874	45.30	V	33.93	10.2	34.29	55.14	74	-18.86	PK
4874	32.18	V	33.93	10.2	34.29	42.02	54	-11.98	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
4874	45.86	H	33.93	10.2	34.29	55.70	74	-18.30	PK
4874	32.20	H	33.93	10.2	34.29	42.04	54	-11.96	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11g TX High									
4924	46.41	V	33.98	10.22	34.25	56.36	74	-17.64	PK
4924	34.23	V	33.98	10.22	34.25	44.18	54	-9.82	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/
4924	47.58	H	33.98	10.22	34.25	57.53	74	-16.47	PK
4924	34.95	H	33.98	10.22	34.25	44.90	54	-9.10	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 ModeIEEE 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	44.74	V	33.95	10.18	34.26	54.61	74	-19.39	PK
4824	34.81	V	33.95	10.18	34.26	44.68	54	-9.32	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
4824	47.30	H	33.95	10.18	34.26	57.17	74	-16.83	PK
4824	35.47	H	33.95	10.18	34.26	45.34	54	-8.66	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
Test Mode:IEEE 802.11n HT20 TX Mid									
4874	45.11	V	33.93	10.2	34.29	54.95	74	-19.05	PK
4874	31.55	V	33.93	10.2	34.29	41.39	54	-12.61	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
4874	46.70	H	33.93	10.2	34.29	56.54	74	-17.46	PK
4874	32.95	H	33.93	10.2	34.29	42.79	54	-11.21	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
Test Mode:IEEE 802.11n HT20 TX High									
4924	46.01	V	33.98	10.22	34.25	55.96	74	-18.04	PK
4924	35.68	V	33.98	10.22	34.25	45.63	54	-8.37	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/
4924	48.45	H	33.98	10.22	34.25	58.40	74	-15.60	PK
4924	36.10	H	33.98	10.22	34.25	46.05	54	-7.95	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 ModeIEEE 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	46.13	V	33.95	10.18	34.26	56.00	74	-18.00	PK
4844	36.66	V	33.95	10.18	34.26	46.53	54	-7.47	AV
7266	/	/	/	/	/	/	/	/	/
9688	/	/	/	/	/	/	/	/	/
4844	47.42	H	33.95	10.18	34.26	57.29	74	-16.71	PK
4844	35.93	H	33.95	10.18	34.26	45.80	54	-8.20	AV
7266	/	/	/	/	/	/	/	/	/
9688	/	/	/	/	/	/	/	/	/
Test Mode:IEEE 802.11n40 HT40 TX Mid									
4884	44.68	V	33.93	10.2	34.29	54.52	74	-19.48	PK
4884	32.29	V	33.93	10.2	34.29	42.13	54	-11.87	AV
7326	/	/	/	/	/	/	/	/	/
9768	/	/	/	/	/	/	/	/	/
4884	47.93	H	33.93	10.2	34.29	57.77	74	-16.23	PK
4884	32.93	H	33.93	10.2	34.29	42.77	54	-11.23	AV
7326	/	/	/	/	/	/	/	/	/
9768	/	/	/	/	/	/	/	/	/
Test Mode:IEEE 802.11n40 HT40 TX High									
4924	48.20	V	33.98	10.22	34.25	58.15	74	-15.85	PK
4924	35.71	V	33.98	10.22	34.25	45.66	54	-8.34	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/
4924	46.39	H	33.98	10.22	34.25	56.34	74	-17.66	PK
4924	33.58	H	33.98	10.22	34.25	43.53	54	-10.47	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/

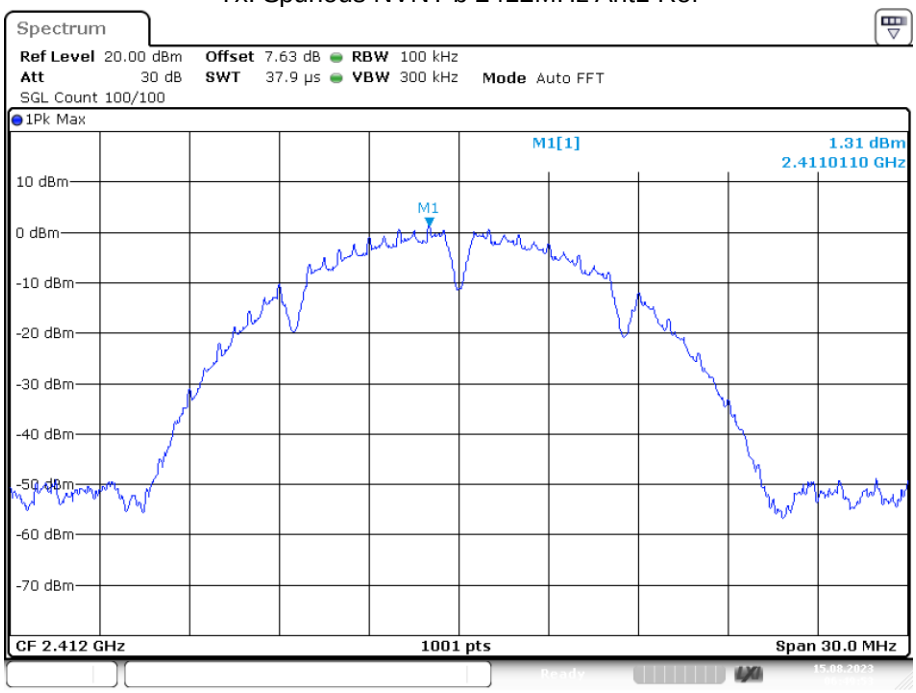
Note:

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.

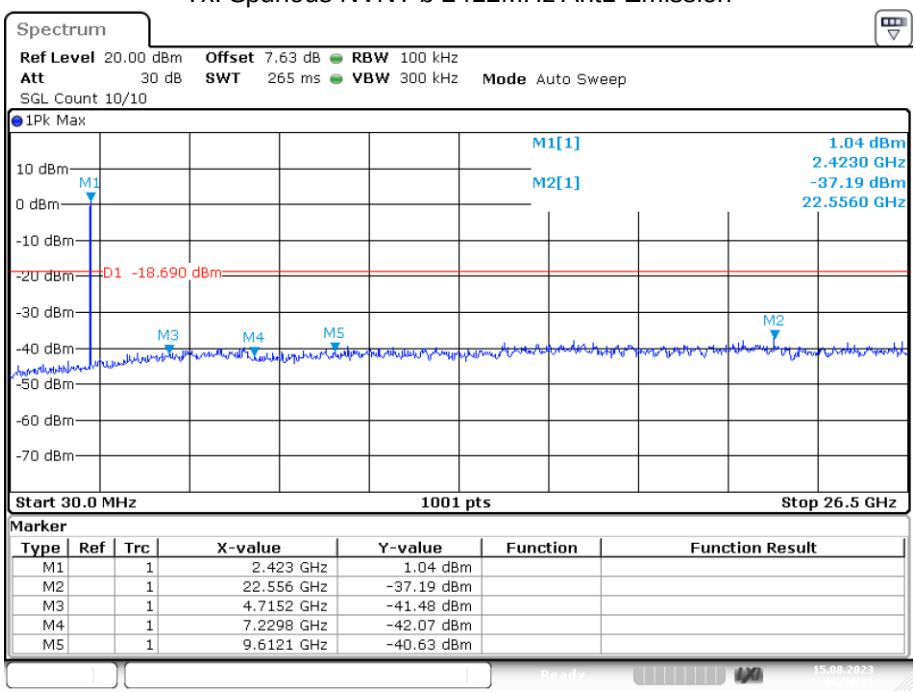
Conducted RF Spurious Emission

Tx. Spurious NVNT b 2412MHz Ant1 Ref



Date: 15.AUG.2023 06:49:52

Tx. Spurious NVNT b 2412MHz Ant1 Emission

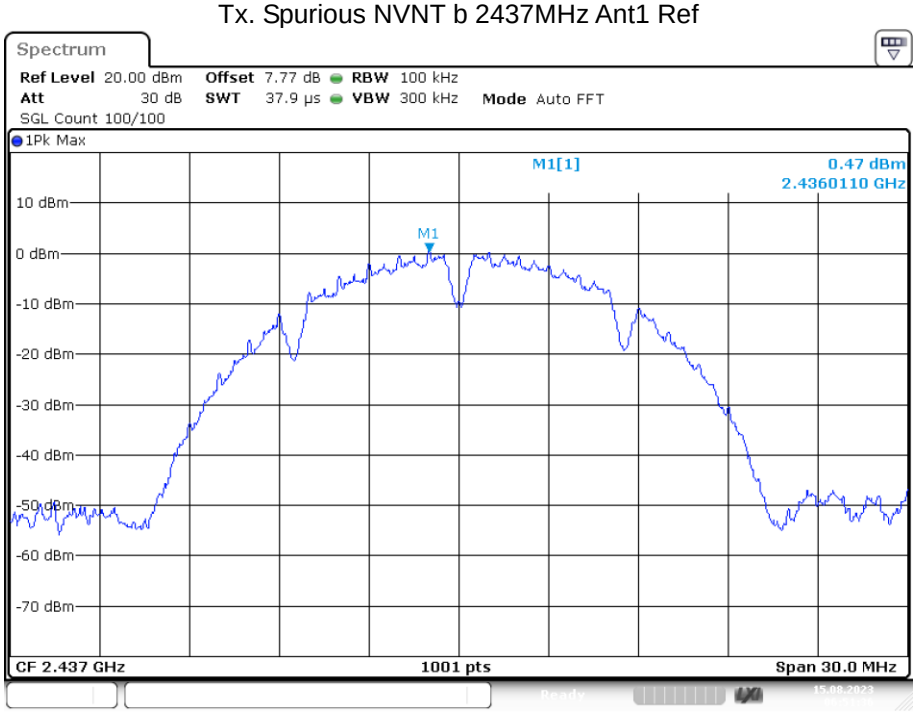


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.423 GHz	1.04 dBm		
M2		1	22.556 GHz	-37.19 dBm		
M3		1	4.7152 GHz	-41.48 dBm		
M4		1	7.2298 GHz	-42.07 dBm		
M5		1	9.6121 GHz	-40.63 dBm		

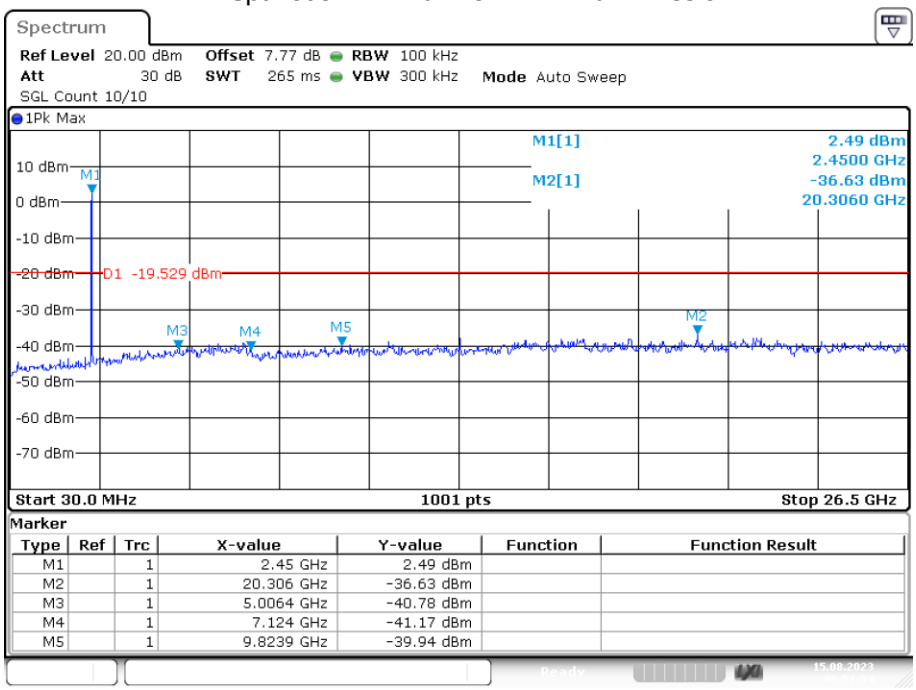
Date: 15.AUG.2023 06:50:10

Tx. Spurious NVNT b 2437MHz Ant1 Ref



Date: 15.AUG.2023 06:51:36

Tx. Spurious NVNT b 2437MHz Ant1 Emission

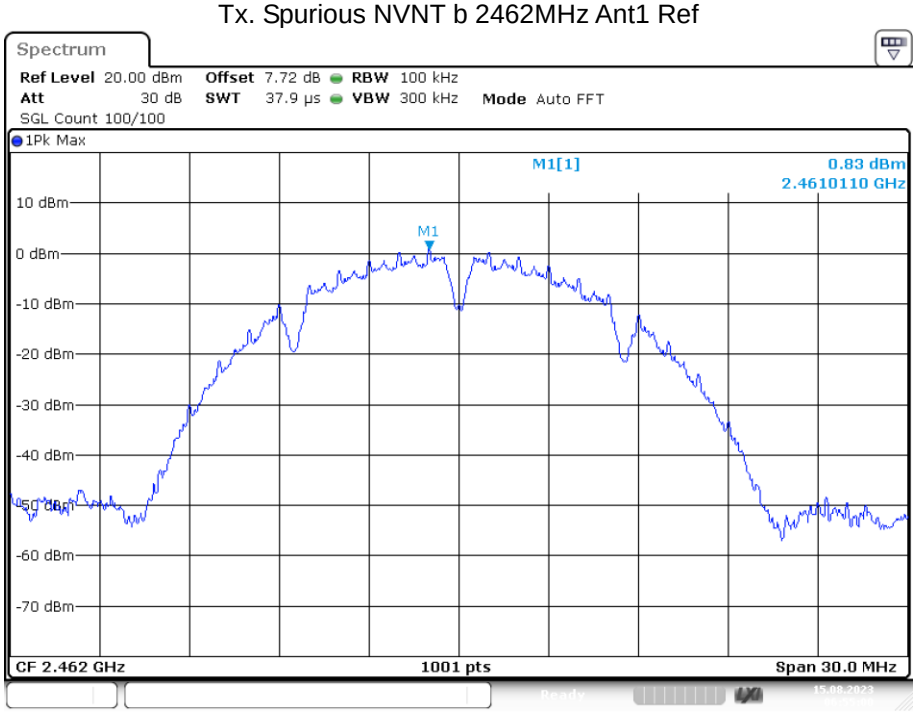


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45 GHz	2.49 dBm		
M2		1	20.306 GHz	-36.63 dBm		
M3		1	5.0064 GHz	-40.78 dBm		
M4		1	7.124 GHz	-41.17 dBm		
M5		1	9.8239 GHz	-39.94 dBm		

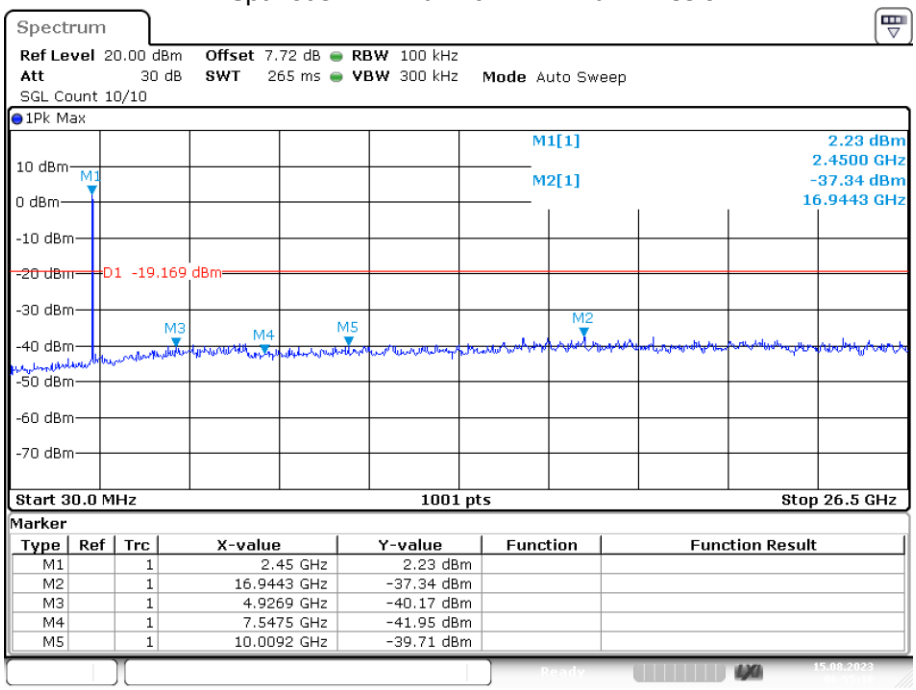
Date: 15.AUG.2023 06:51:54

Tx. Spurious NVNT b 2462MHz Ant1 Ref



Date: 15.AUG.2023 06:54:59

Tx. Spurious NVNT b 2462MHz Ant1 Emission

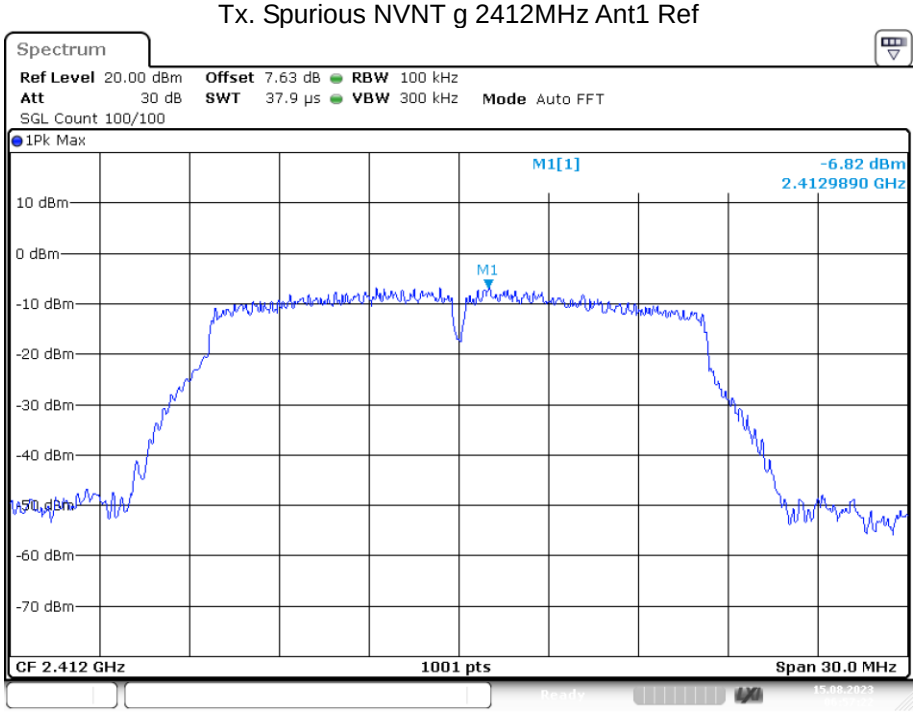


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45 GHz	2.23 dBm		
M2		1	16.9443 GHz	-37.34 dBm		
M3		1	4.9269 GHz	-40.17 dBm		
M4		1	7.5475 GHz	-41.95 dBm		
M5		1	10.0092 GHz	-39.71 dBm		

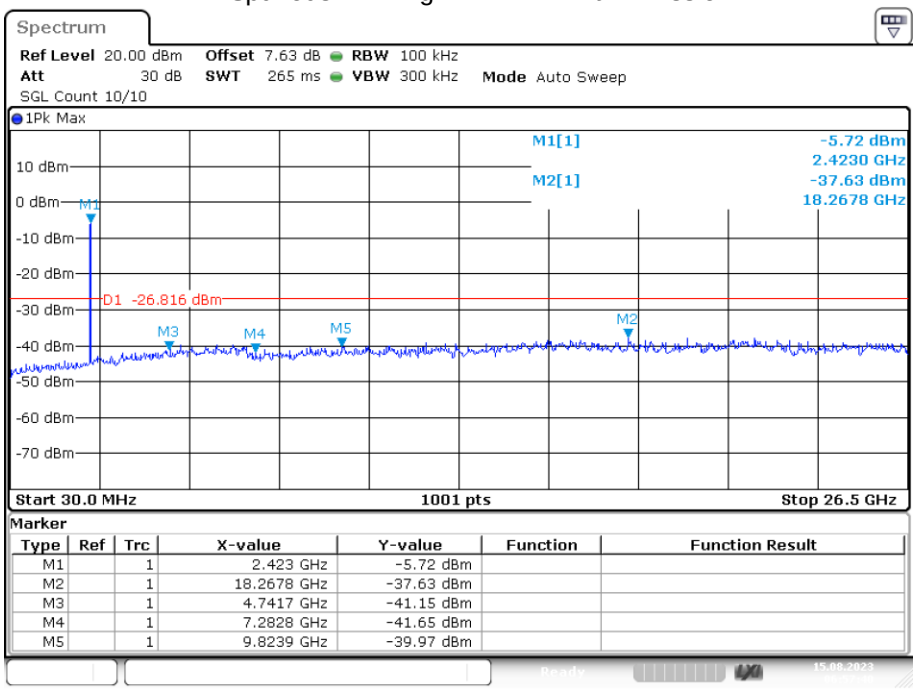
Date: 15.AUG.2023 06:55:17

Tx. Spurious NVNT g 2412MHz Ant1 Ref



Date: 15.AUG.2023 06:57:22

Tx. Spurious NVNT g 2412MHz Ant1 Emission

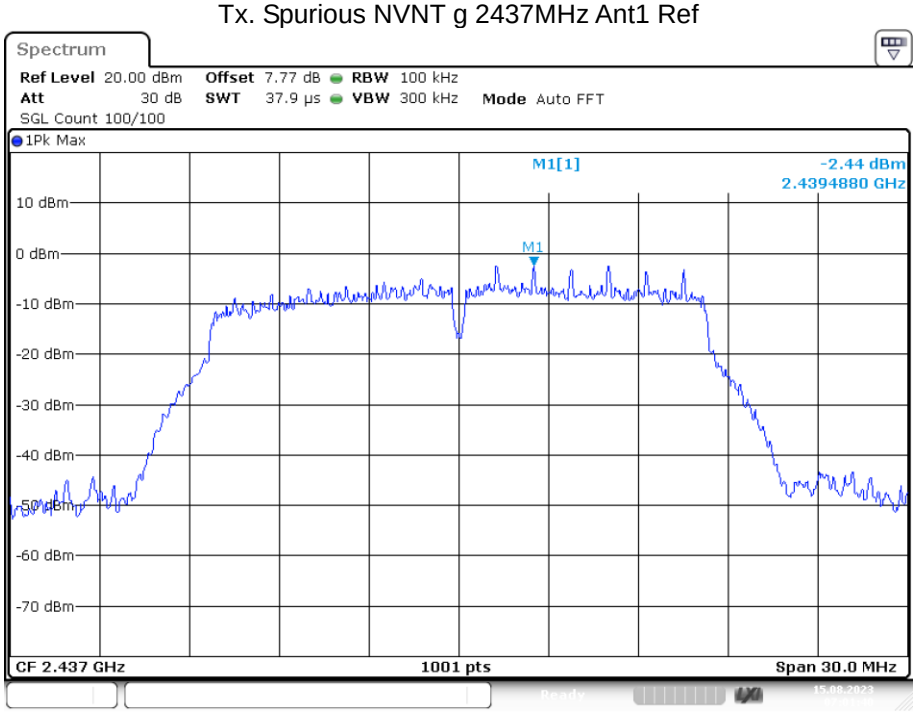


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.423 GHz	-5.72 dBm		
M2		1	18.2678 GHz	-37.63 dBm		
M3		1	4.7417 GHz	-41.15 dBm		
M4		1	7.2828 GHz	-41.65 dBm		
M5		1	9.8239 GHz	-39.97 dBm		

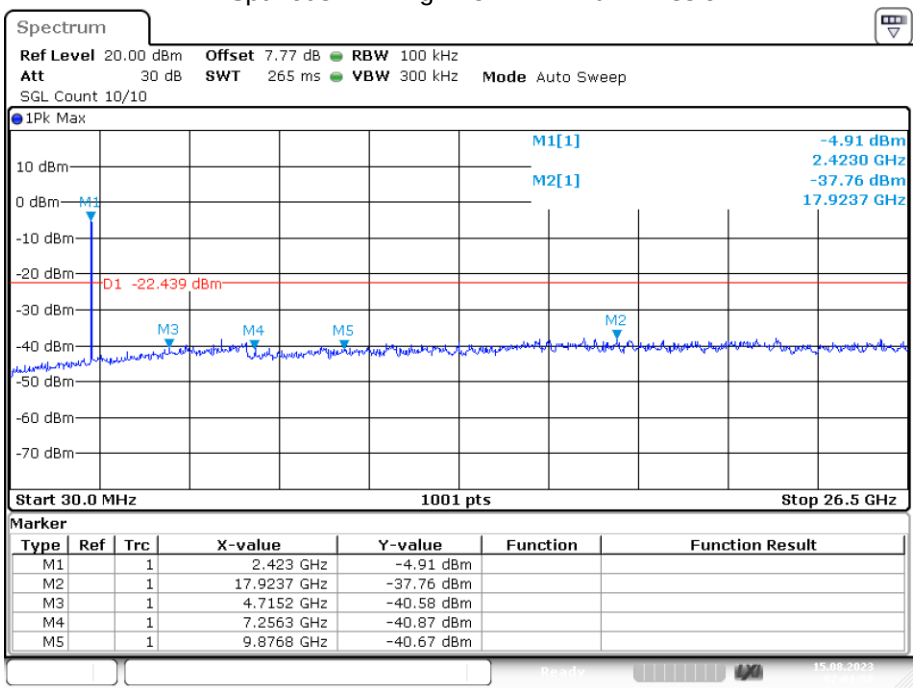
Date: 15.AUG.2023 06:57:40

Tx. Spurious NVNT g 2437MHz Ant1 Ref



Date: 15.AUG.2023 07:01:40

Tx. Spurious NVNT g 2437MHz Ant1 Emission

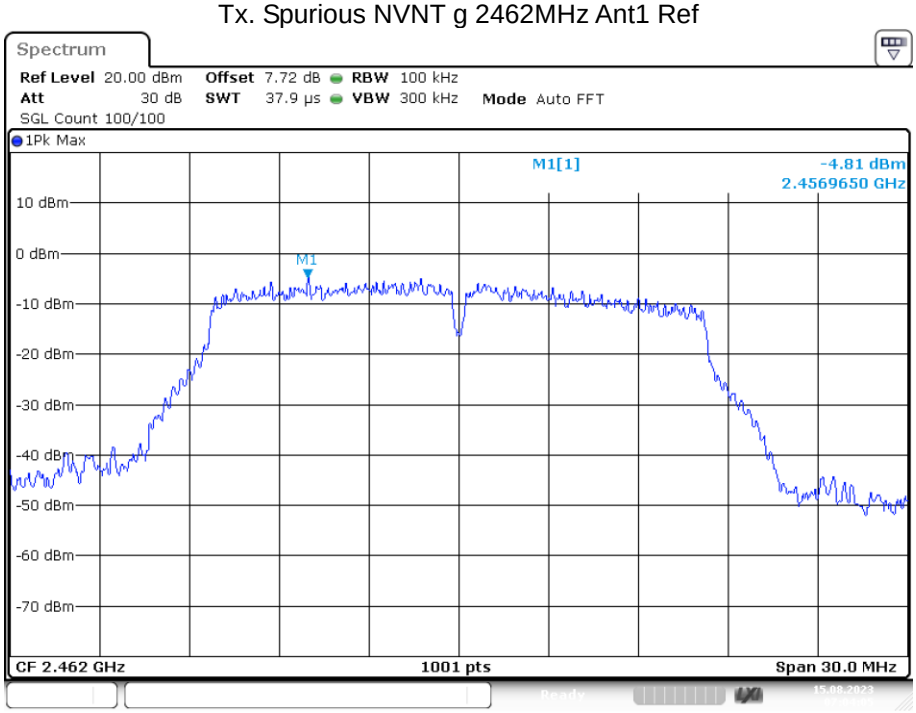


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.423 GHz	-4.91 dBm		
M2		1	17.9237 GHz	-37.76 dBm		
M3		1	4.7152 GHz	-40.58 dBm		
M4		1	7.2563 GHz	-40.87 dBm		
M5		1	9.8768 GHz	-40.67 dBm		

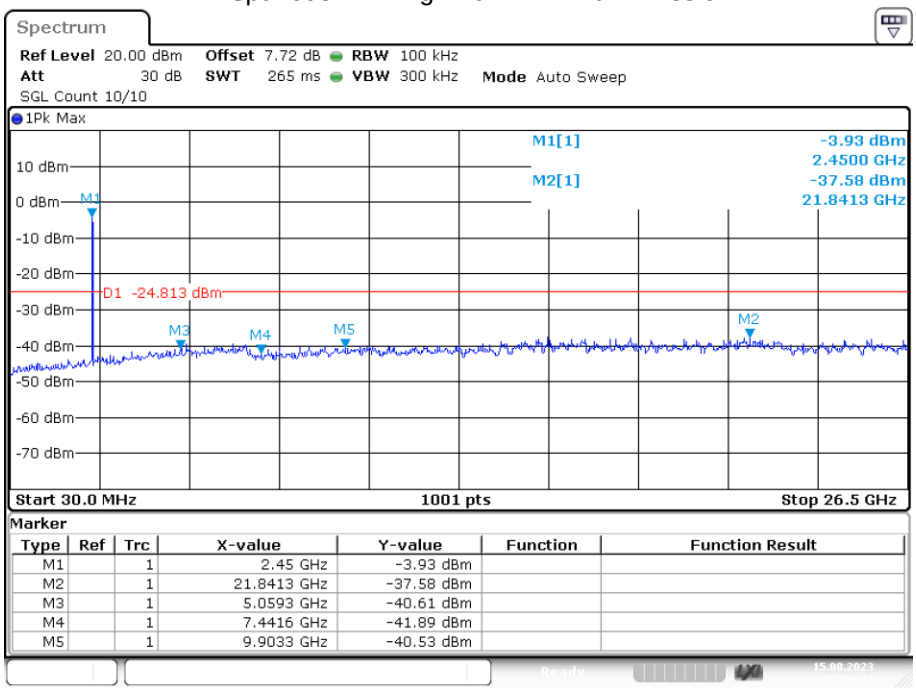
Date: 15.AUG.2023 07:01:58

Tx. Spurious NVNT g 2462MHz Ant1 Ref



Date: 15.AUG.2023 07:04:05

Tx. Spurious NVNT g 2462MHz Ant1 Emission

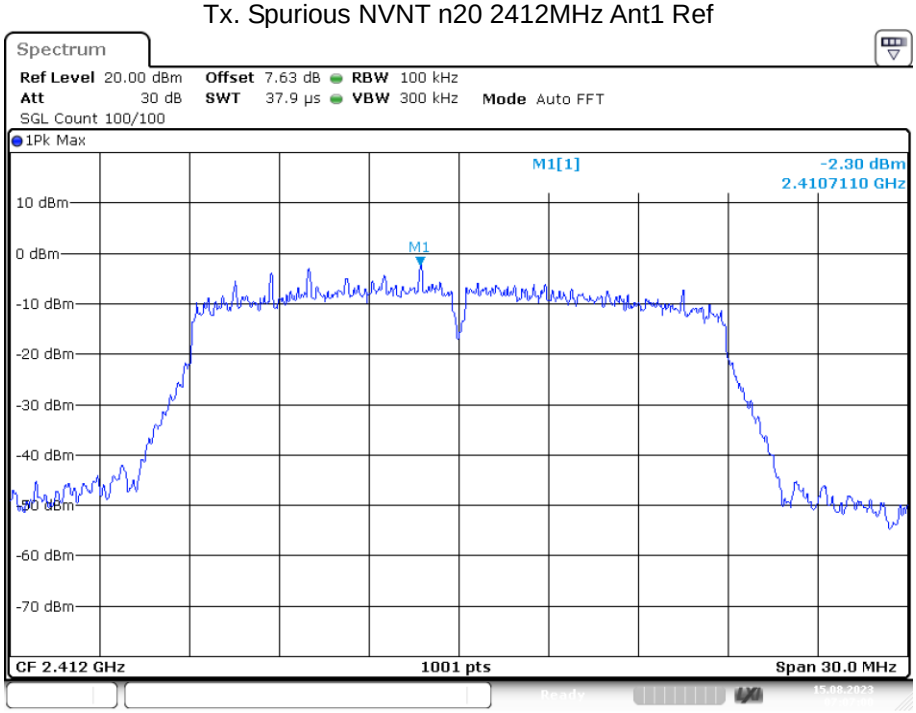


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45 GHz	-3.93 dBm		
M2		1	21.8413 GHz	-37.58 dBm		
M3		1	5.0593 GHz	-40.61 dBm		
M4		1	7.4416 GHz	-41.89 dBm		
M5		1	9.9033 GHz	-40.53 dBm		

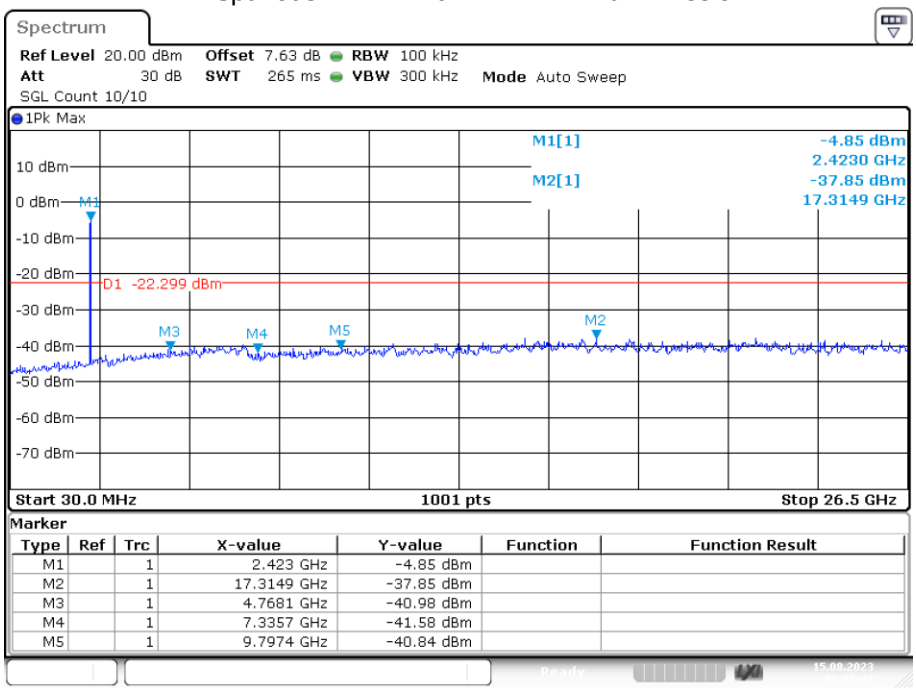
Date: 15.AUG.2023 07:04:23

Tx. Spurious NVNT n20 2412MHz Ant1 Ref



Date: 15.AUG.2023 07:06:59

Tx. Spurious NVNT n20 2412MHz Ant1 Emission

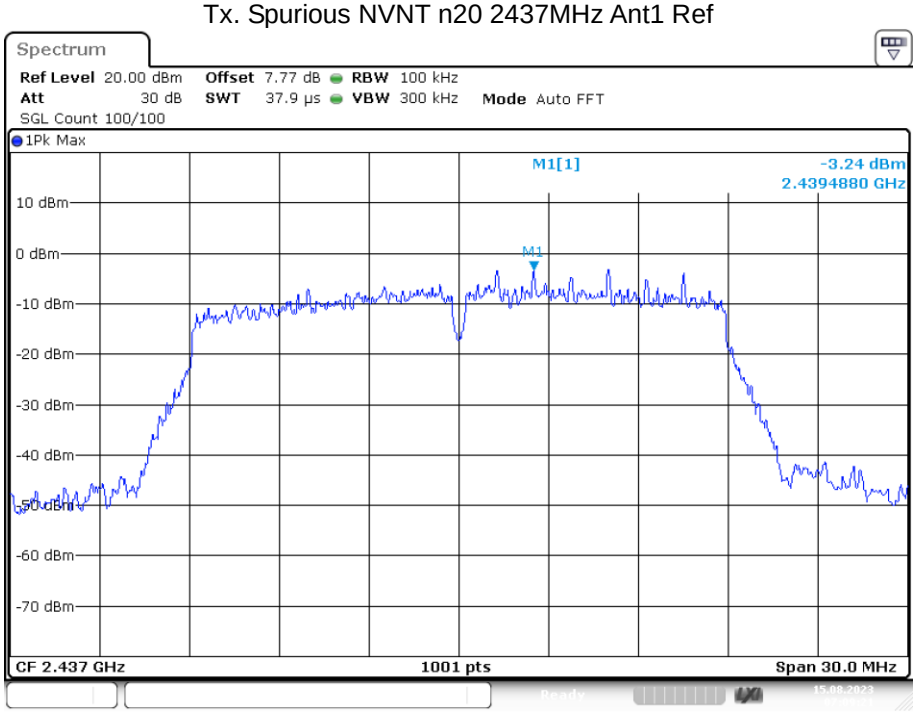


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.423 GHz	-4.85 dBm		
M2		1	17.3149 GHz	-37.85 dBm		
M3		1	4.7681 GHz	-40.98 dBm		
M4		1	7.3357 GHz	-41.58 dBm		
M5		1	9.7974 GHz	-40.84 dBm		

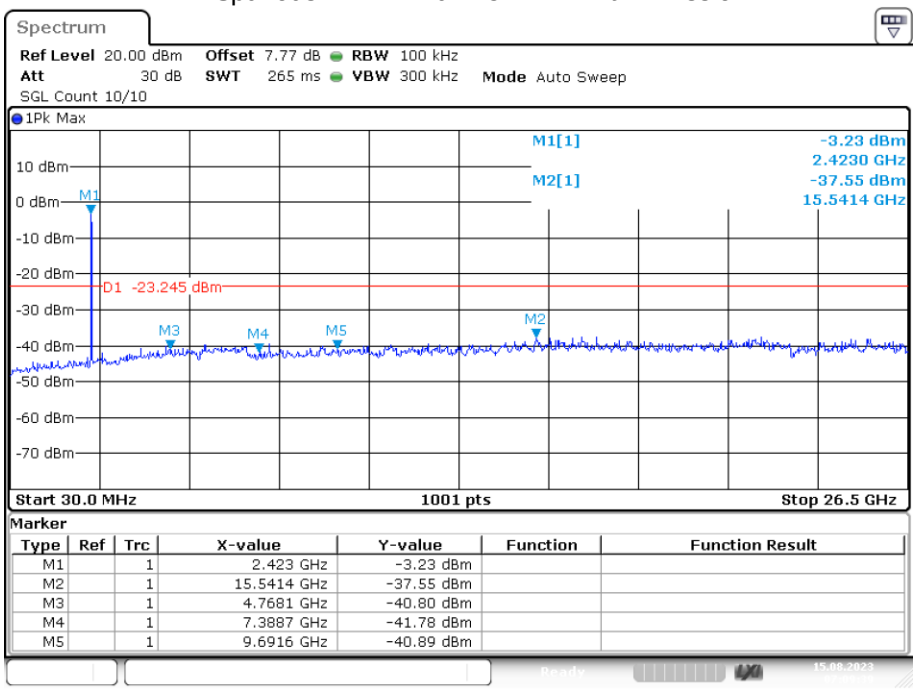
Date: 15.AUG.2023 07:07:17

Tx. Spurious NVNT n20 2437MHz Ant1 Ref



Date: 15.AUG.2023 07:09:21

Tx. Spurious NVNT n20 2437MHz Ant1 Emission

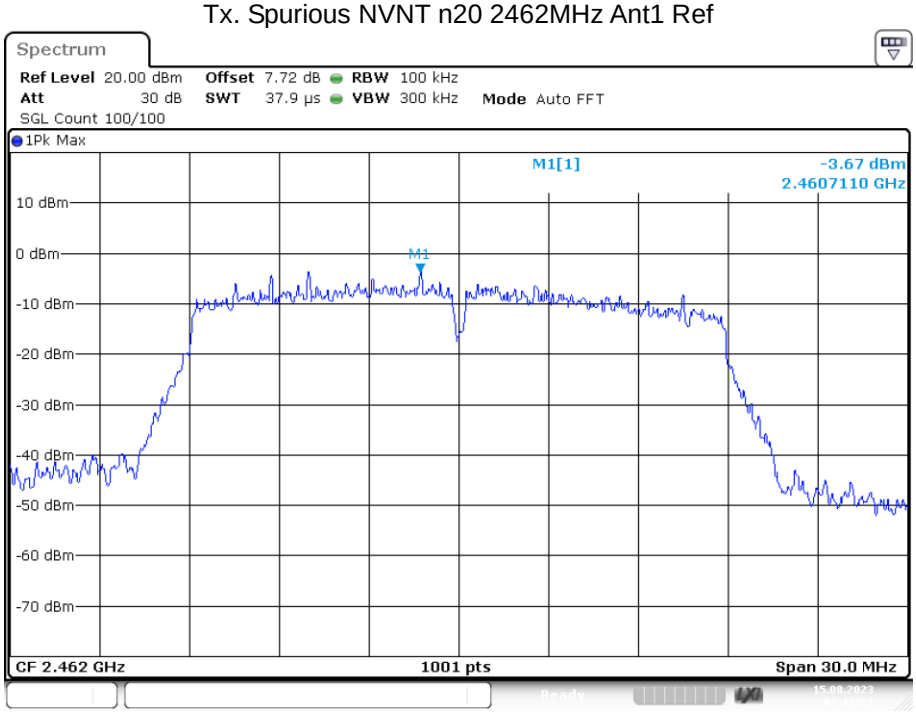


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.423 GHz	-3.23 dBm		
M2		1	15.5414 GHz	-37.55 dBm		
M3		1	4.7681 GHz	-40.80 dBm		
M4		1	7.3887 GHz	-41.78 dBm		
M5		1	9.6916 GHz	-40.89 dBm		

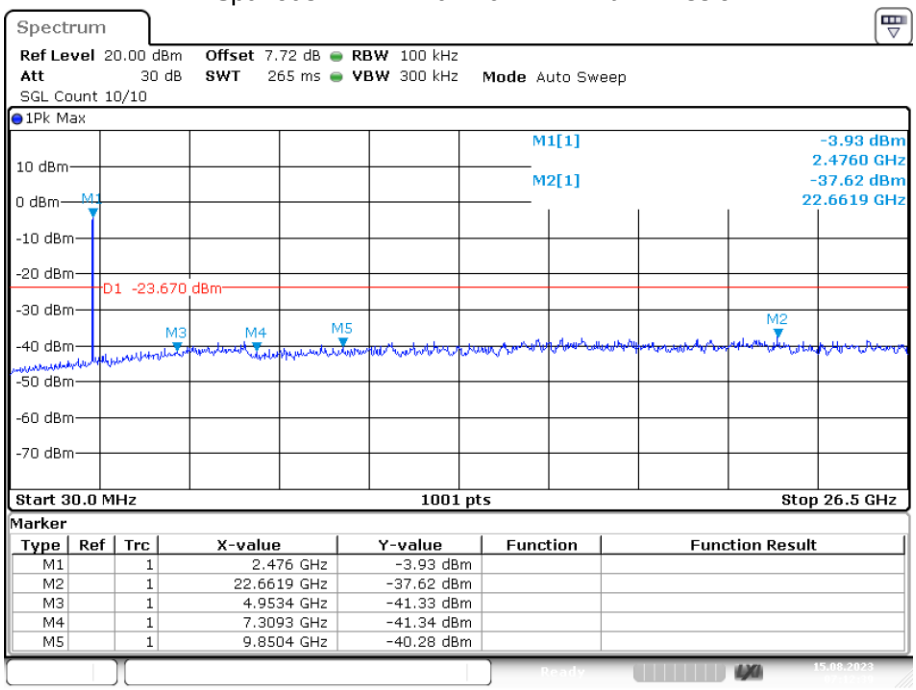
Date: 15.AUG.2023 07:09:39

Tx. Spurious NVNT n20 2462MHz Ant1 Ref



Date: 15.AUG.2023 07:12:20

Tx. Spurious NVNT n20 2462MHz Ant1 Emission

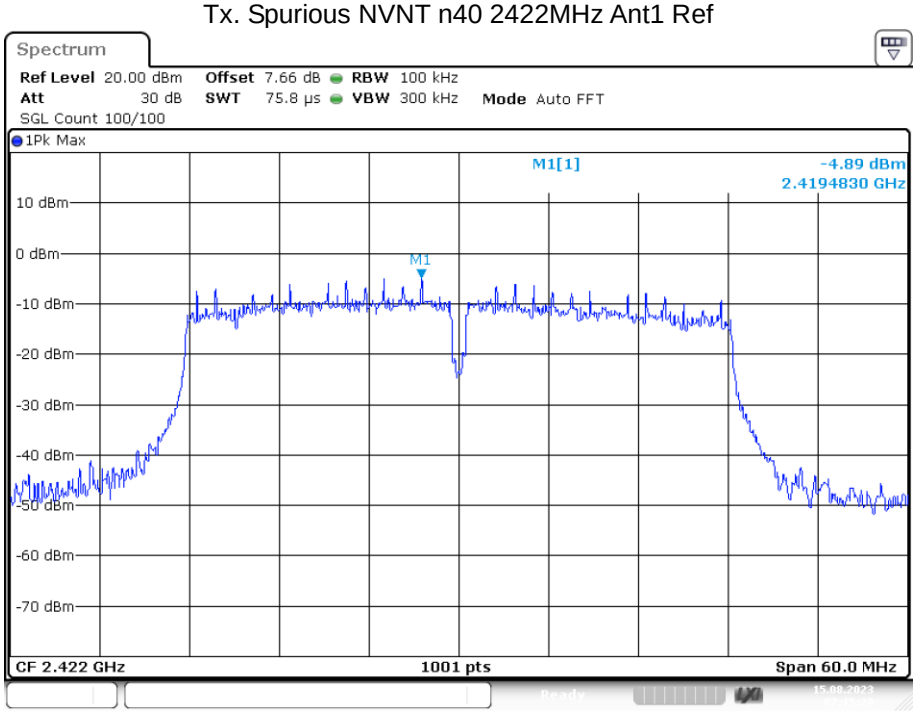


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.476 GHz	-3.93 dBm		
M2		1	22.6619 GHz	-37.62 dBm		
M3		1	4.9534 GHz	-41.33 dBm		
M4		1	7.3093 GHz	-41.34 dBm		
M5		1	9.8504 GHz	-40.28 dBm		

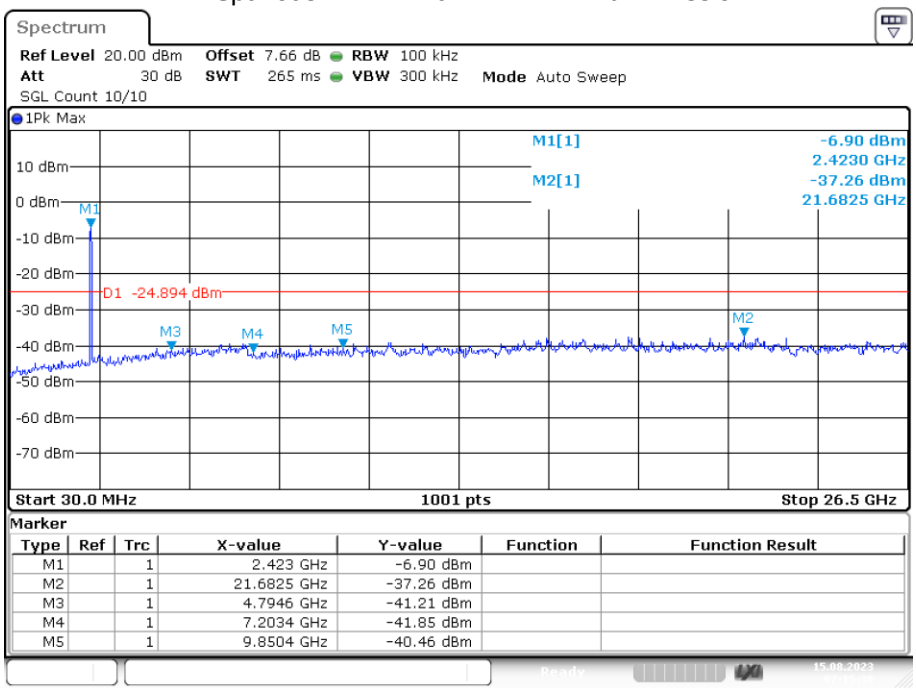
Date: 15.AUG.2023 07:12:38

Tx. Spurious NVNT n40 2422MHz Ant1 Ref



Date: 15.AUG.2023 07:15:20

Tx. Spurious NVNT n40 2422MHz Ant1 Emission

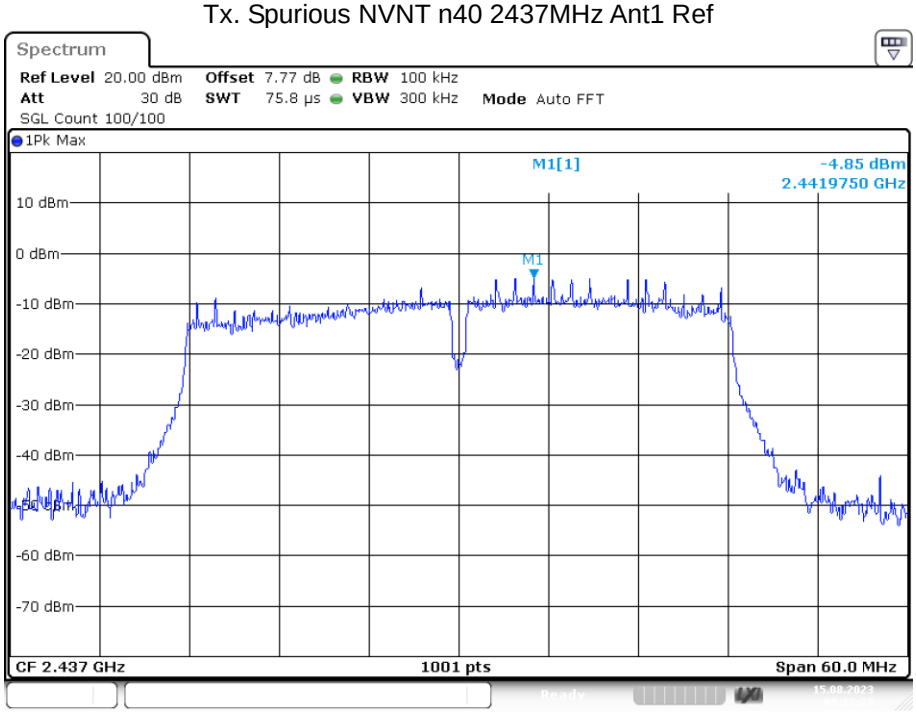


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.423 GHz	-6.90 dBm		
M2		1	21.6825 GHz	-37.26 dBm		
M3		1	4.7946 GHz	-41.21 dBm		
M4		1	7.2034 GHz	-41.85 dBm		
M5		1	9.8504 GHz	-40.46 dBm		

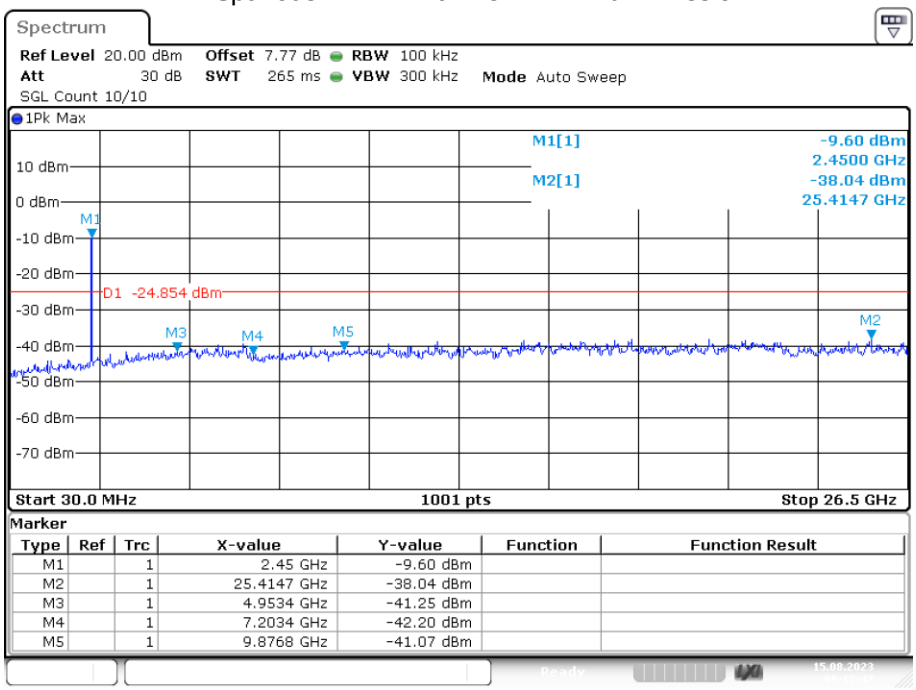
Date: 15.AUG.2023 07:15:37

Tx. Spurious NVNT n40 2437MHz Ant1 Ref



Date: 15.AUG.2023 09:12:28

Tx. Spurious NVNT n40 2437MHz Ant1 Emission

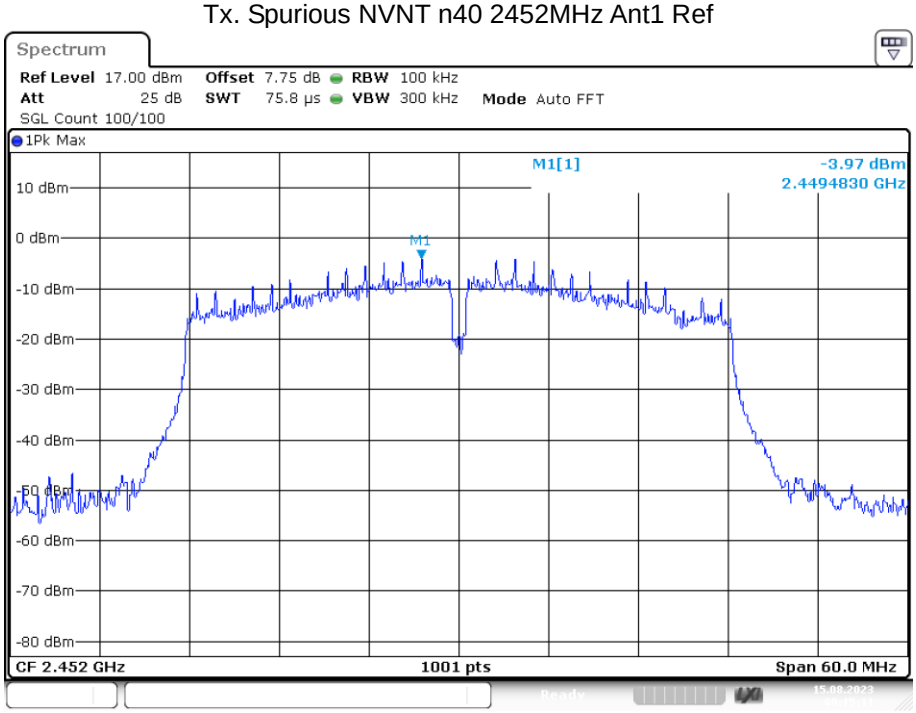


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45 GHz	-9.60 dBm		
M2		1	25.4147 GHz	-38.04 dBm		
M3		1	4.9534 GHz	-41.25 dBm		
M4		1	7.2034 GHz	-42.20 dBm		
M5		1	9.8768 GHz	-41.07 dBm		

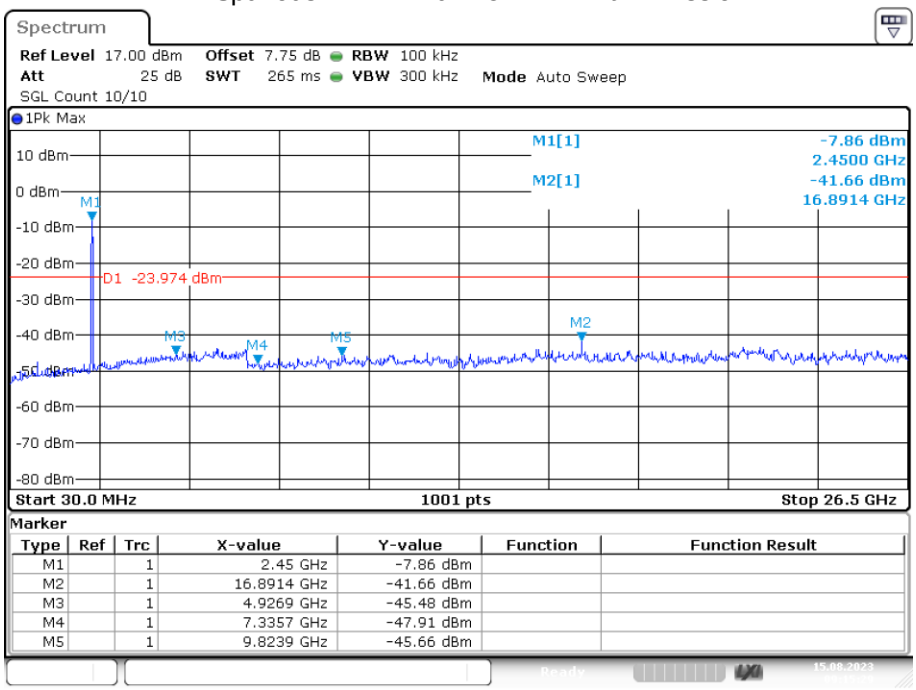
Date: 15.AUG.2023 09:12:46

Tx. Spurious NVNT n40 2452MHz Ant1 Ref



Date: 15.AUG.2023 09:15:11

Tx. Spurious NVNT n40 2452MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45 GHz	-7.86 dBm		
M2		1	16.8914 GHz	-41.66 dBm		
M3		1	4.9269 GHz	-45.48 dBm		
M4		1	7.3357 GHz	-47.91 dBm		
M5		1	9.8239 GHz	-45.66 dBm		

Date: 15.AUG.2023 09:15:29

4. Power Line Conducted Emission

4.1. Test Limits

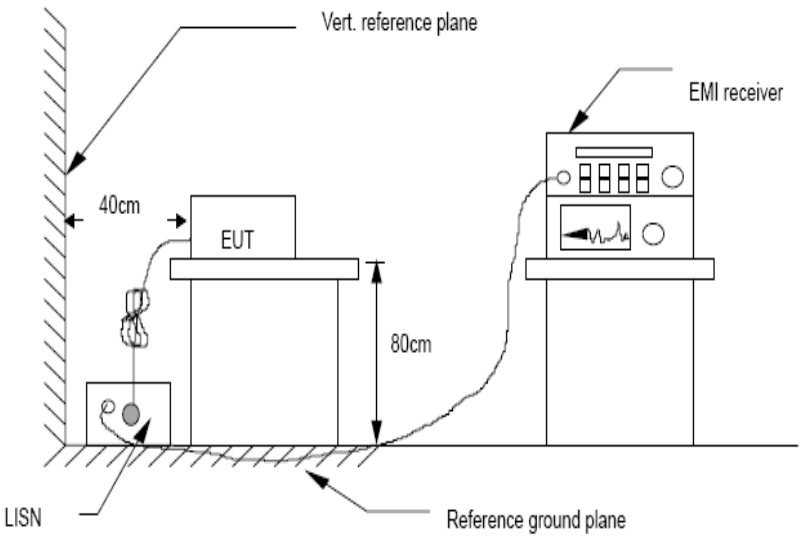
Frequency	Limits dB(μV)	
MHz	Quasi-peak Level	Average Level
0.15 -0.50	66 -56*	56 - 46*
0.50 -5.00	56	46
5.00 -30.00	60	50

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

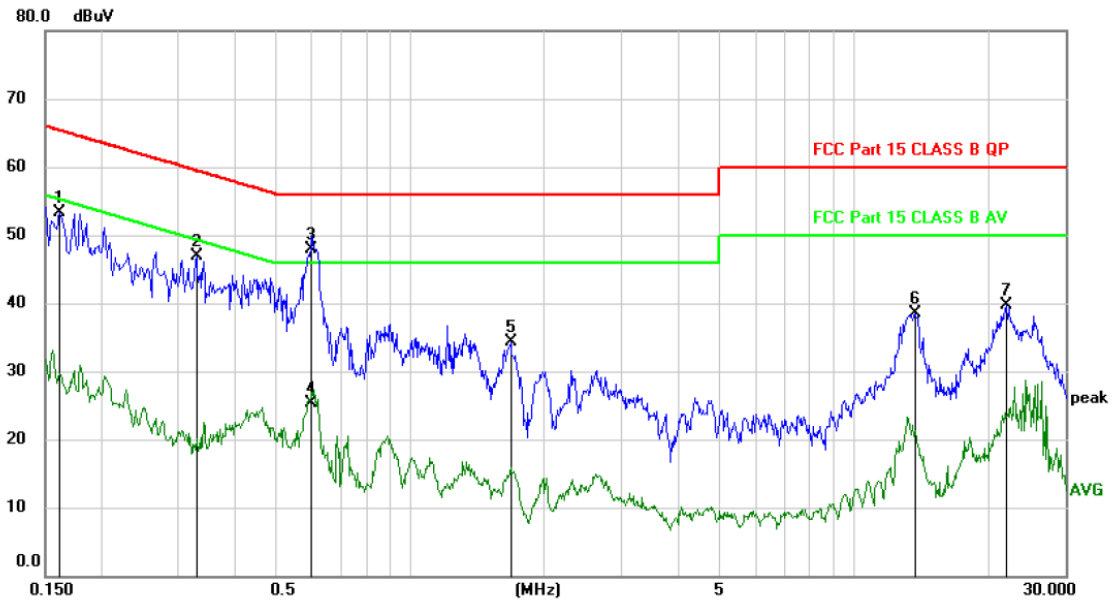
Polarity: L

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1830	44.66	9.93	54.59	64.35	-9.76	peak	
2		0.2819	40.82	9.94	50.76	60.76	-10.00	peak	
3	*	0.6090	39.93	9.92	49.85	56.00	-6.15	QP	
4		0.6090	16.82	9.92	26.74	46.00	-19.26	AVG	
5		0.8760	30.07	9.96	40.03	56.00	-15.97	peak	
6		13.7490	31.02	10.30	41.32	60.00	-18.68	peak	
7		21.6630	26.86	10.46	37.32	60.00	-22.68	peak	

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

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

Polarity: N



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1620	43.36	9.93	53.29	65.36	-12.07	peak	
2		0.3300	37.00	9.94	46.94	59.45	-12.51	peak	
3	*	0.6000	38.04	9.92	47.96	56.00	-8.04	QP	
4		0.6000	15.35	9.92	25.27	46.00	-20.73	AVG	
5		1.6890	24.46	9.89	34.35	56.00	-21.65	peak	
6		13.7310	28.21	10.30	38.51	60.00	-21.49	peak	
7		22.1669	29.19	10.46	39.65	60.00	-20.35	peak	

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

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

Note: All modes and channels have been tested and only the BLE 2402MHz(1Mbps) mode with the worst data is listed.

5. Conducted Maximum Peak Output Power

5.1. Test limits

Please refer 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

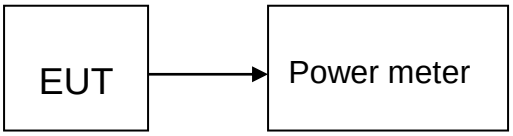
5.2.1 Place the EUT on the table and set it in transmitting mode.

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)	Total Power (dBm)	Limit (dBm)	Verdict
NVNT	b	2412	Ant1	14.533	14.533	30	Pass
NVNT	b	2437	Ant1	14.53	14.53	30	Pass
NVNT	b	2462	Ant1	14.218	14.218	30	Pass
NVNT	g	2412	Ant1	15.193	15.193	30	Pass
NVNT	g	2437	Ant1	16.096	16.096	30	Pass
NVNT	g	2462	Ant1	15.903	15.903	30	Pass
NVNT	n20	2412	Ant1	16.407	16.407	30	Pass
NVNT	n20	2437	Ant1	16.341	16.341	30	Pass
NVNT	n20	2462	Ant1	16.245	16.245	30	Pass
NVNT	n40	2422	Ant1	17.121	17.121	30	Pass
NVNT	n40	2437	Ant1	14.544	14.544	30	Pass
NVNT	n40	2452	Ant1	14.348	14.348	30	Pass

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Total Power (dBm)	Limit (dBm)	Verdict
NVNT	b	2412	Ant2	14.746	14.746	30	Pass
NVNT	b	2437	Ant2	14.330	14.330	30	Pass
NVNT	b	2462	Ant2	14.655	14.655	30	Pass
NVNT	g	2412	Ant2	14.901	14.901	30	Pass
NVNT	g	2437	Ant2	15.960	15.960	30	Pass
NVNT	g	2462	Ant2	16.156	16.156	30	Pass
NVNT	n20	2412	Ant2	16.851	16.851	30	Pass
NVNT	n20	2437	Ant2	15.859	15.859	30	Pass
NVNT	n20	2462	Ant2	16.263	16.263	30	Pass
NVNT	n40	2422	Ant2	17.612	17.612	30	Pass
NVNT	n40	2437	Ant2	14.713	14.713	30	Pass
NVNT	n40	2452	Ant2	14.061	14.061	30	Pass

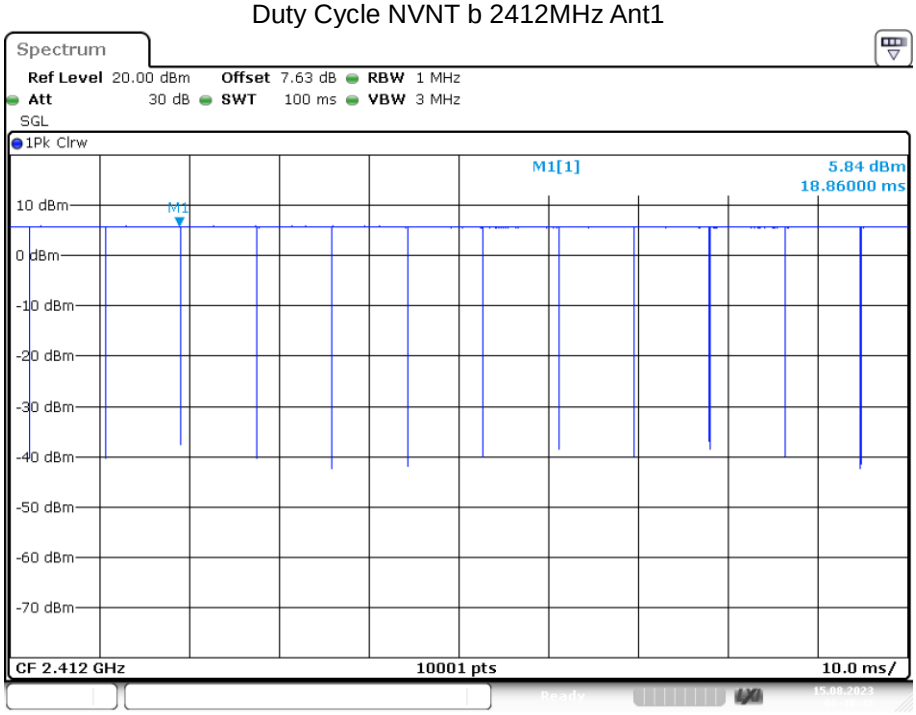
Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Total Power (dBm)	Limit (dBm)	Verdict
NVNT	n20	2412	MIMO	19.645	19.645	28.27	Pass
NVNT	n20	2437	MIMO	19.117	19.117	28.27	Pass
NVNT	n20	2462	MIMO	19.264	19.264	28.27	Pass
NVNT	n40	2422	MIMO	20.384	20.384	28.27	Pass
NVNT	n40	2437	MIMO	17.640	17.640	28.27	Pass
NVNT	n40	2452	MIMO	17.217	17.217	28.27	Pass

Note: 1. Directional gain=7.73dBi, so the Conducted Power Limit need to reduce 1.73.

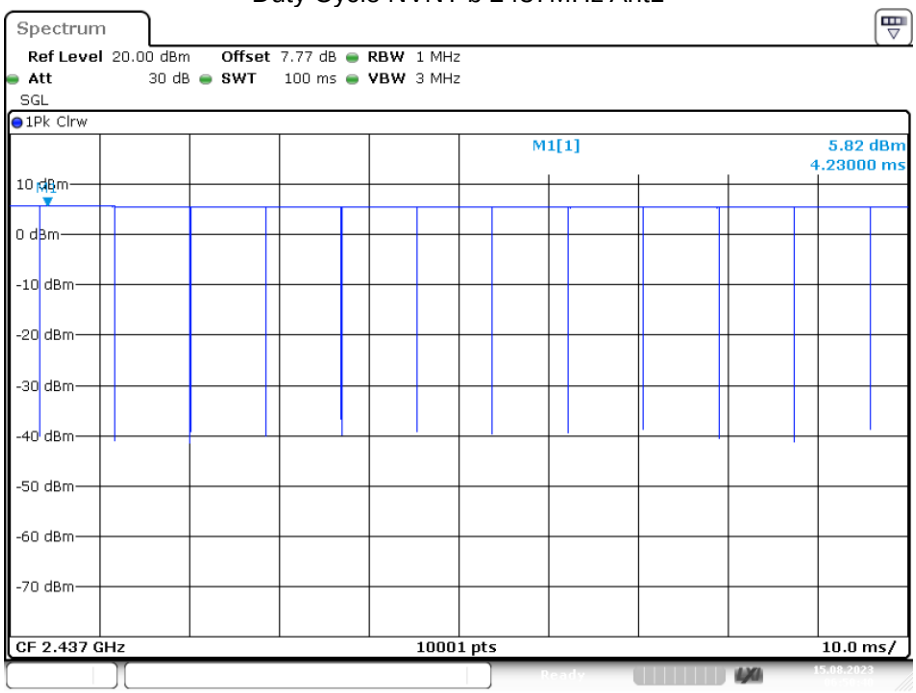
Duty Cycle

Condition	Mode	Frequency (MHz)	Antenna	Duty Cycle (%)
NVNT	b	2412	Ant1	99.92
NVNT	b	2437	Ant1	99.94
NVNT	b	2462	Ant1	99.93
NVNT	g	2412	Ant1	99.53
NVNT	g	2437	Ant1	99.61
NVNT	g	2462	Ant1	99.73
NVNT	n20	2412	Ant1	99.44
NVNT	n20	2437	Ant1	99.58
NVNT	n20	2462	Ant1	99.53
NVNT	n40	2422	Ant1	99.01
NVNT	n40	2437	Ant1	99.07
NVNT	n40	2452	Ant1	99.03

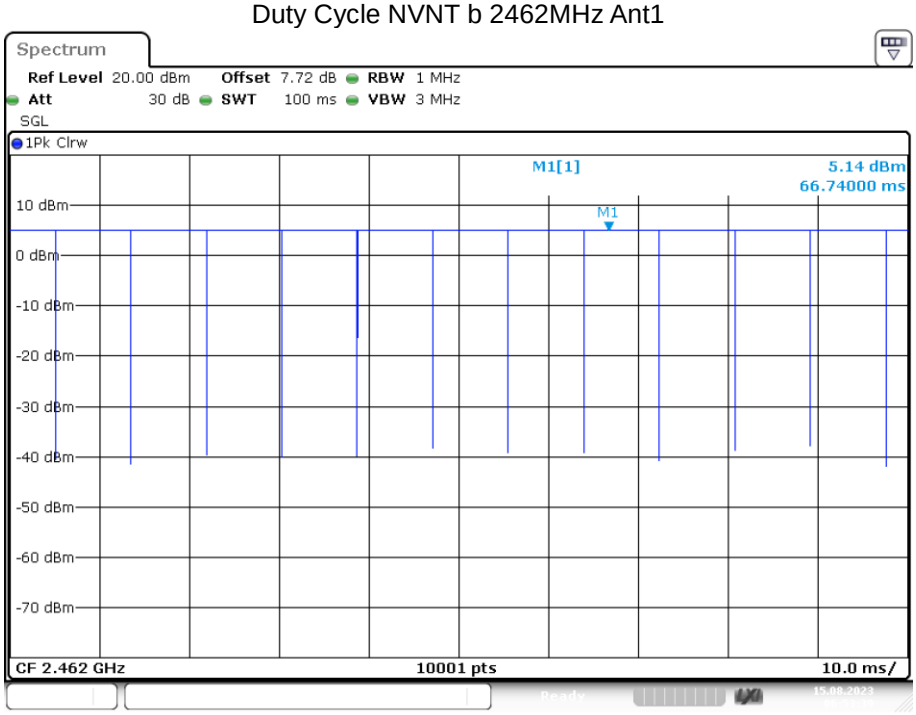
Duty Cycle NVNT b 2412MHz Ant1



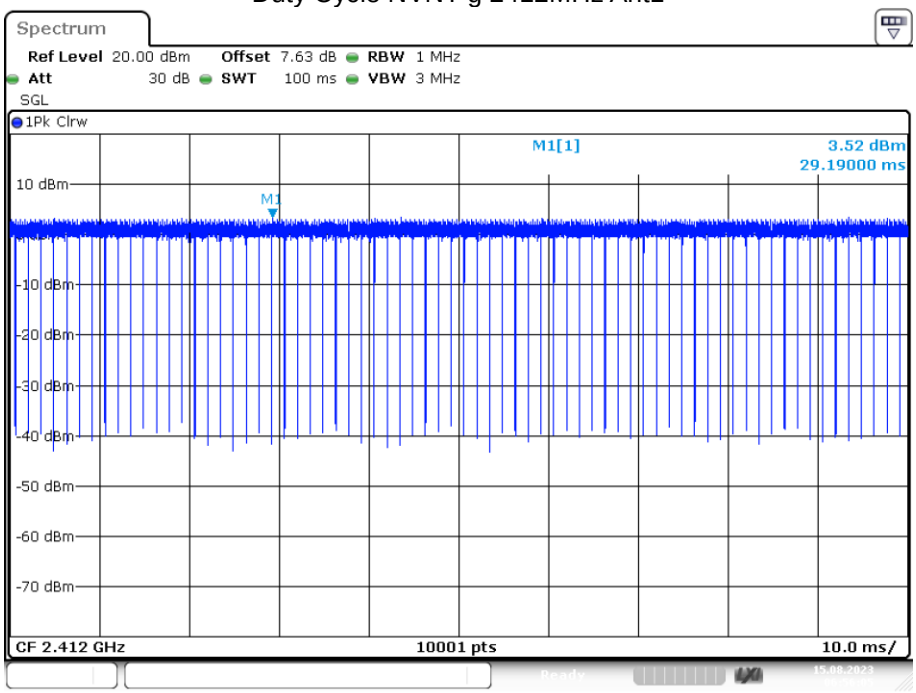
Duty Cycle NVNT b 2437MHz Ant1



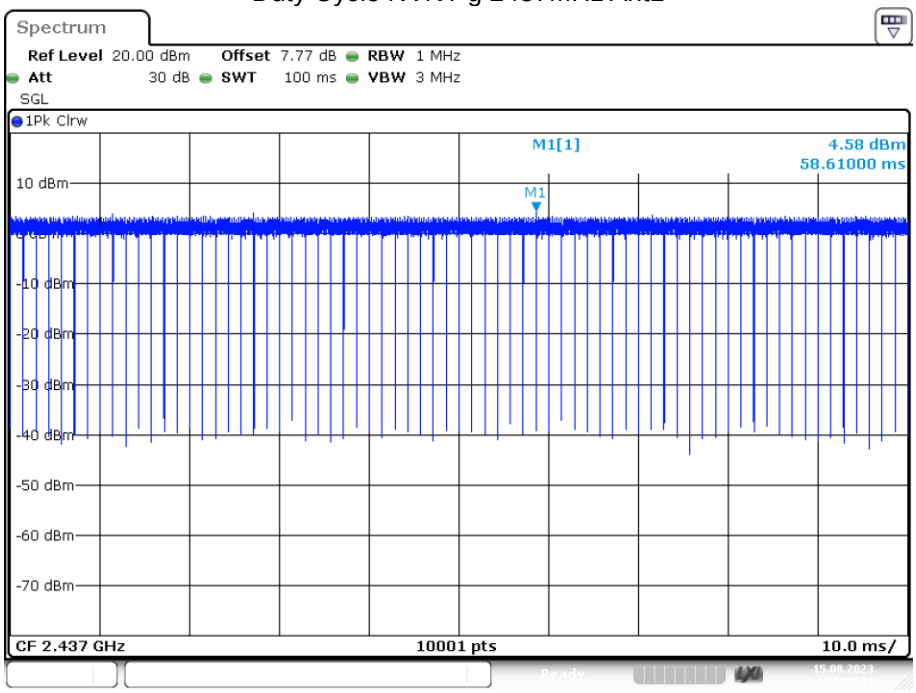
Duty Cycle NVNT b 2462MHz Ant1



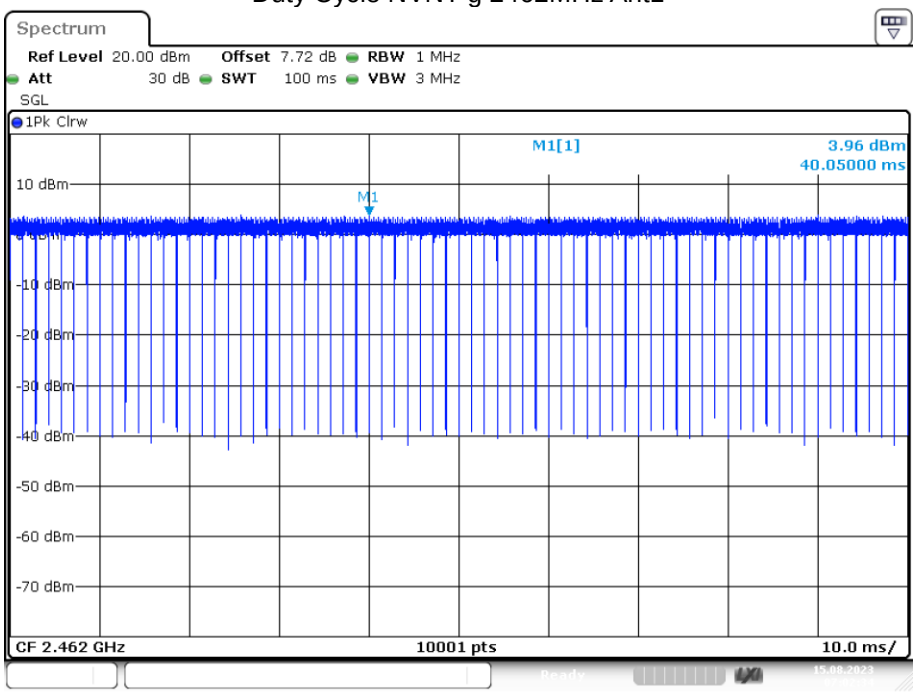
Duty Cycle NVNT g 2412MHz Ant1



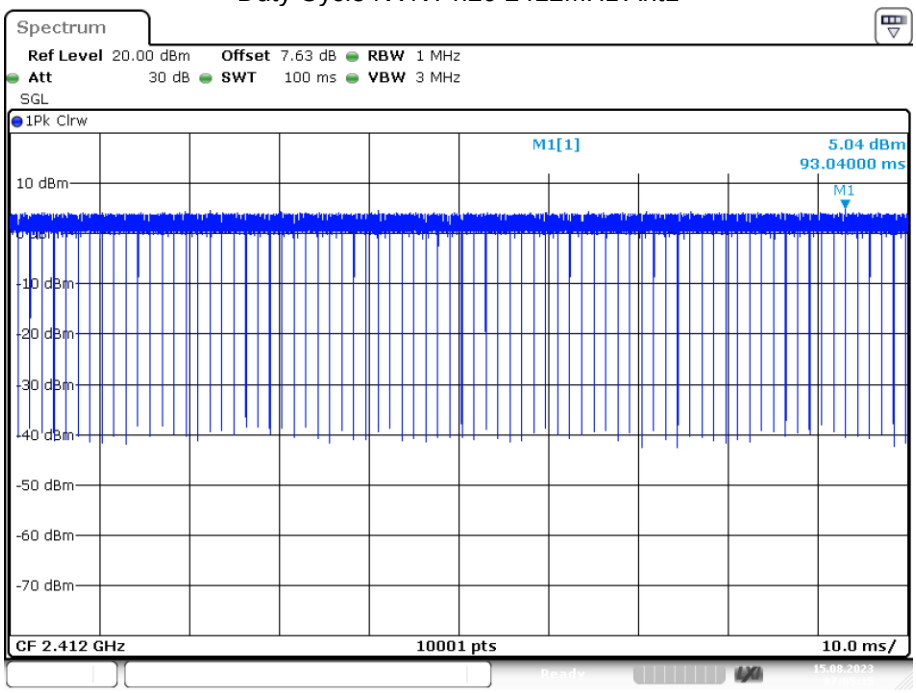
Duty Cycle NVNT g 2437MHz Ant1



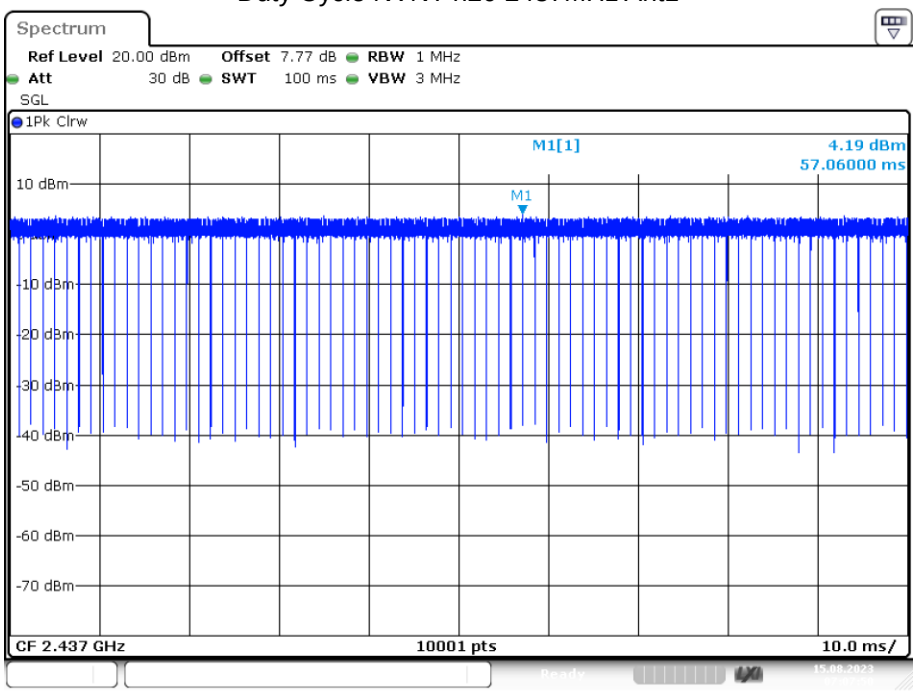
Duty Cycle NVNT g 2462MHz Ant1



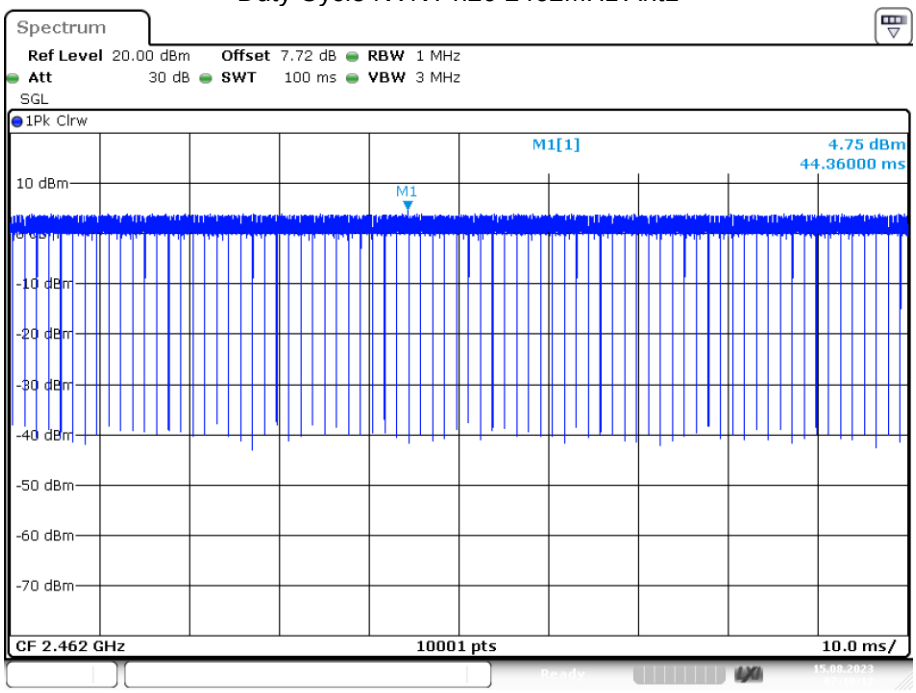
Duty Cycle NVNT n20 2412MHz Ant1



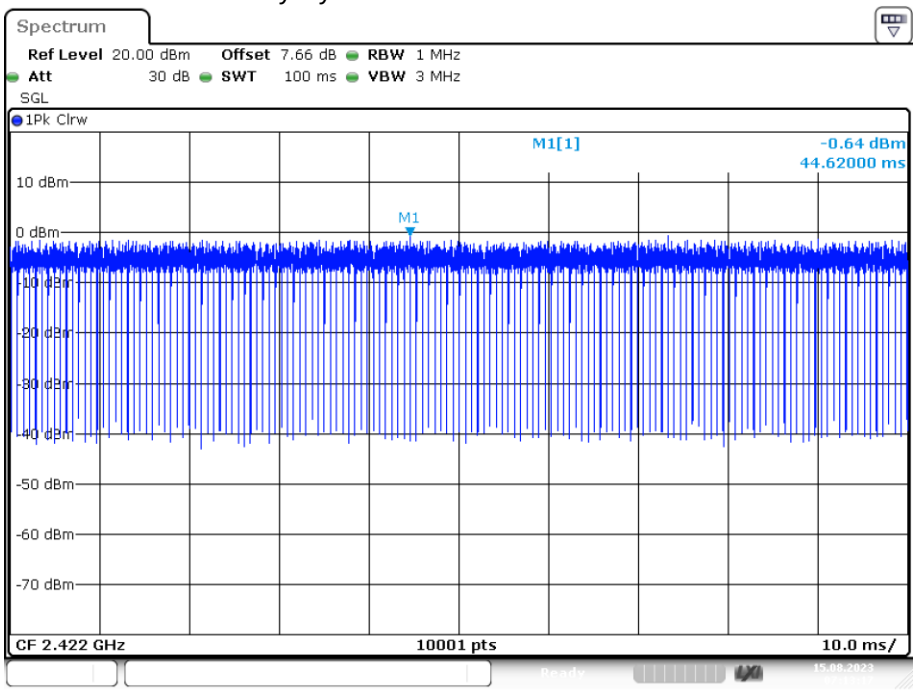
Duty Cycle NVNT n20 2437MHz Ant1



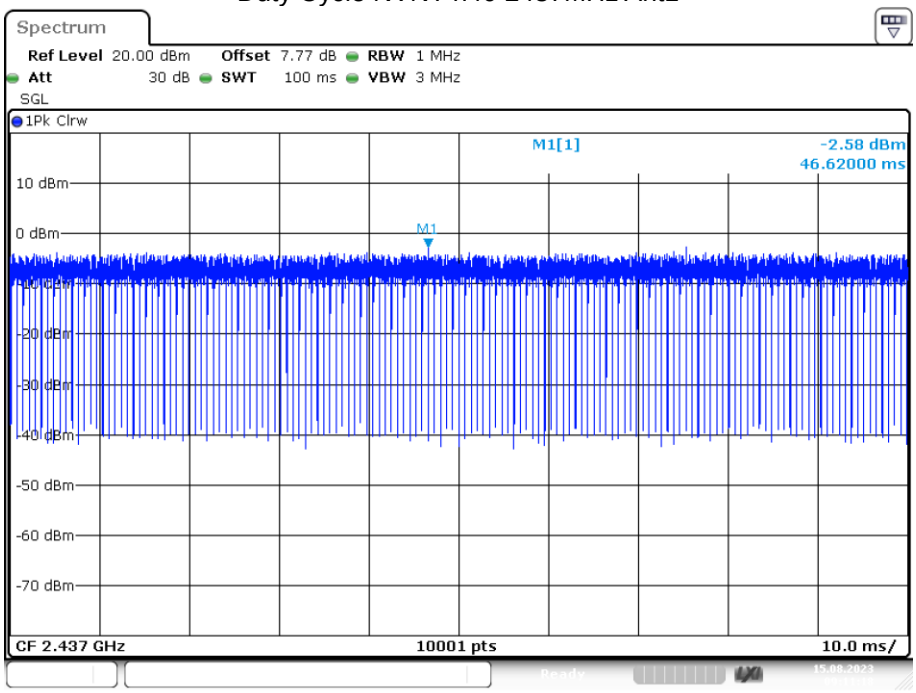
Duty Cycle NVNT n20 2462MHz Ant1



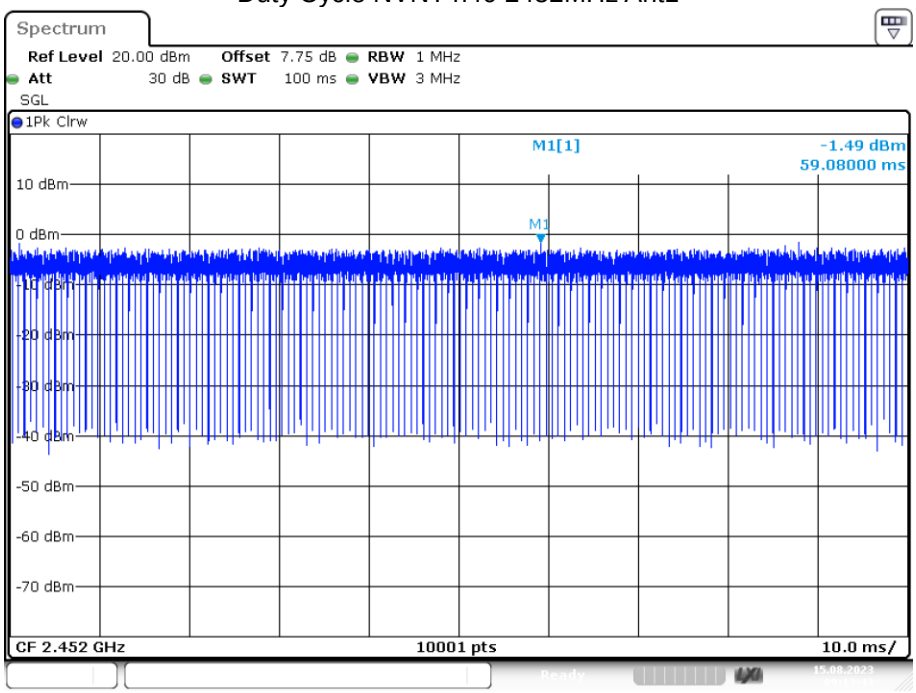
Duty Cycle NVNT n40 2422MHz Ant1



Duty Cycle NVNT n40 2437MHz Ant1



Duty Cycle NVNT n40 2452MHz Ant1



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.

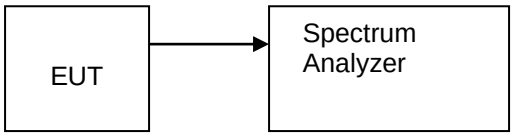
6.2.2 Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

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

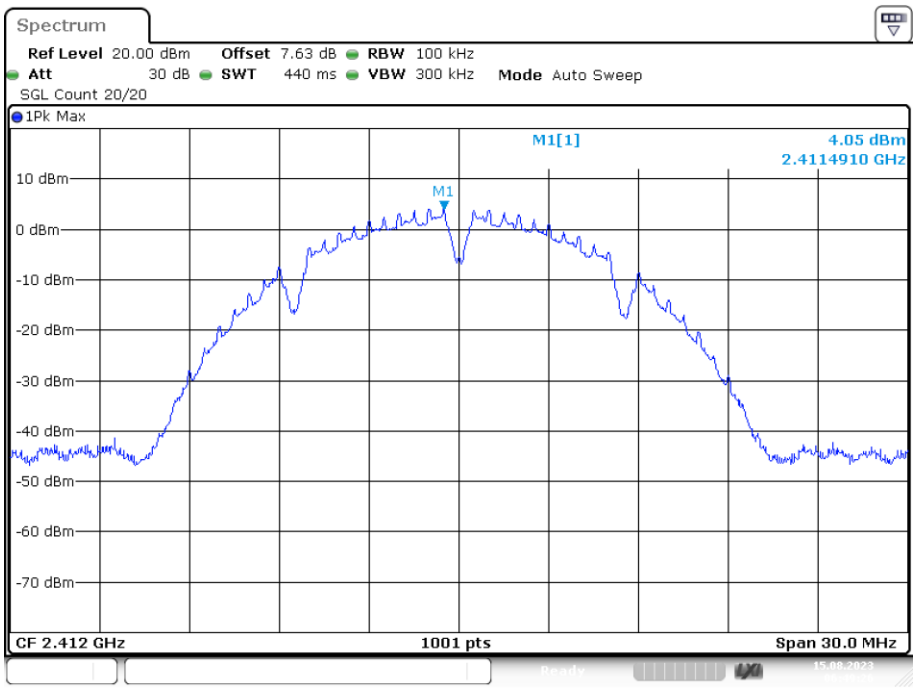
Condition	Mode	Frequency (MHz)	Antenna	Max PSD (dBm)	Limit (dBm)	Verdict
NVNT	b	2412	Ant1	4.047	8	Pass
NVNT	b	2437	Ant1	3.986	8	Pass
NVNT	b	2462	Ant1	3.629	8	Pass
NVNT	g	2412	Ant1	-0.484	8	Pass
NVNT	g	2437	Ant1	0.431	8	Pass
NVNT	g	2462	Ant1	0.963	8	Pass
NVNT	n20	2412	Ant1	1.117	8	Pass
NVNT	n20	2437	Ant1	0.093	8	Pass
NVNT	n20	2462	Ant1	0.58	8	Pass
NVNT	n40	2422	Ant1	-3.817	8	Pass
NVNT	n40	2437	Ant1	-6.555	8	Pass
NVNT	n40	2452	Ant1	-5.595	8	Pass

Condition	Mode	Frequency (MHz)	Antenna	Max PSD (dBm)	Limit (dBm)	Verdict
NVNT	b	2412	Ant2	3.537	8	Pass
NVNT	b	2437	Ant2	3.62	8	Pass
NVNT	b	2462	Ant2	3.435	8	Pass
NVNT	g	2412	Ant2	0.593	8	Pass
NVNT	g	2437	Ant2	0.583	8	Pass
NVNT	g	2462	Ant2	0.416	8	Pass
NVNT	n20	2412	Ant2	0.645	8	Pass
NVNT	n20	2437	Ant2	0.416	8	Pass
NVNT	n20	2462	Ant2	0.356	8	Pass
NVNT	n40	2422	Ant2	-4.252	8	Pass
NVNT	n40	2437	Ant2	-4.27	8	Pass
NVNT	n40	2452	Ant2	-4.786	8	Pass

Condition	Mode	Frequency (MHz)	Antenna	Max PSD (dBm)	Limit (dBm)	Verdict
NVNT	n20	2412	MIMO	3.898	6.27	Pass
NVNT	n20	2437	MIMO	3.268	6.27	Pass
NVNT	n20	2462	MIMO	3.480	6.27	Pass
NVNT	n40	2422	MIMO	-1.019	6.27	Pass
NVNT	n40	2437	MIMO	-2.254	6.27	Pass
NVNT	n40	2452	MIMO	-2.161	6.27	Pass

Note: 1. Directional gain=7.73dBi, so the Conducted Power Limit need to reduce 1.73.

PSD NVNT b 2412MHz Ant1



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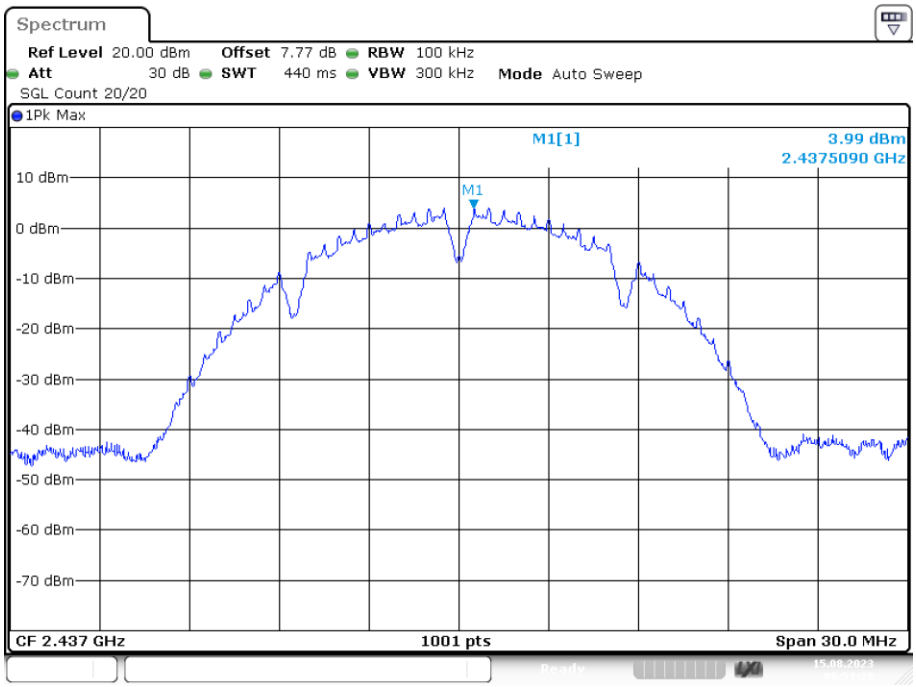
PSD NVNT b 2437MHz Ant1



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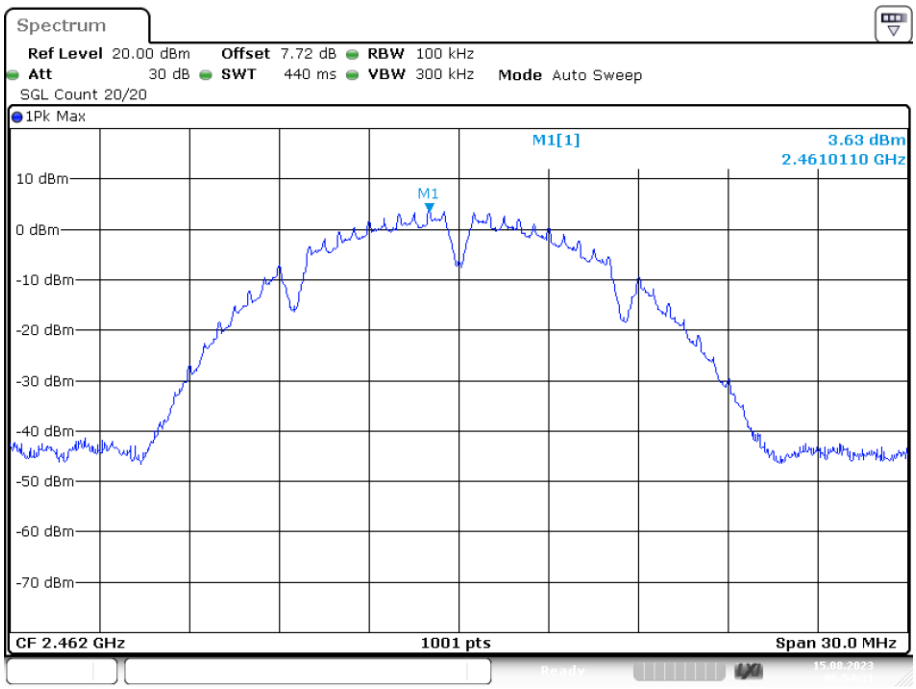
PSD NVNT b 2462MHz Ant1



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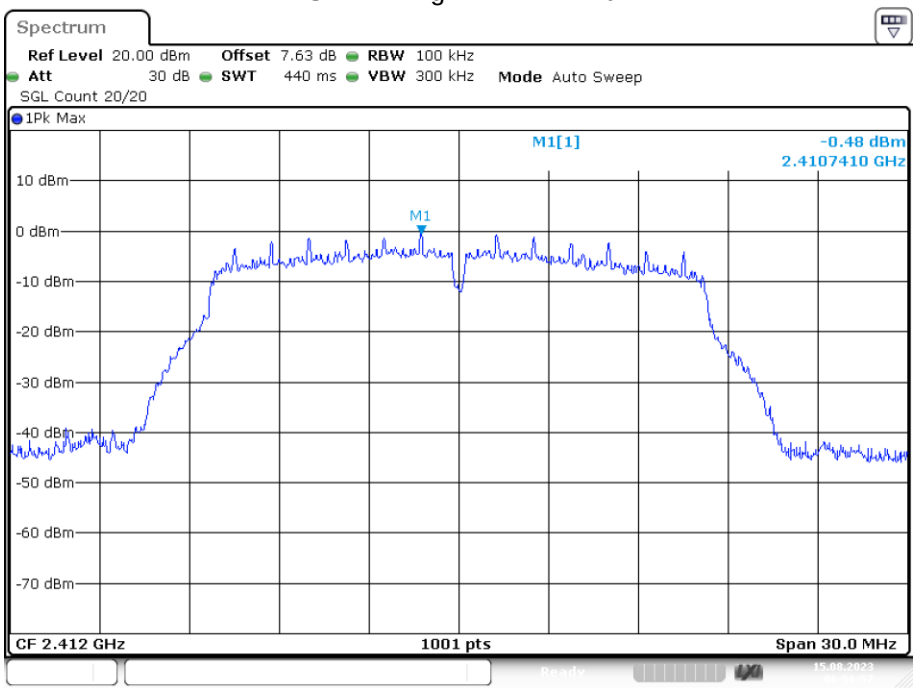
PSD NVNT g 2412MHz Ant1



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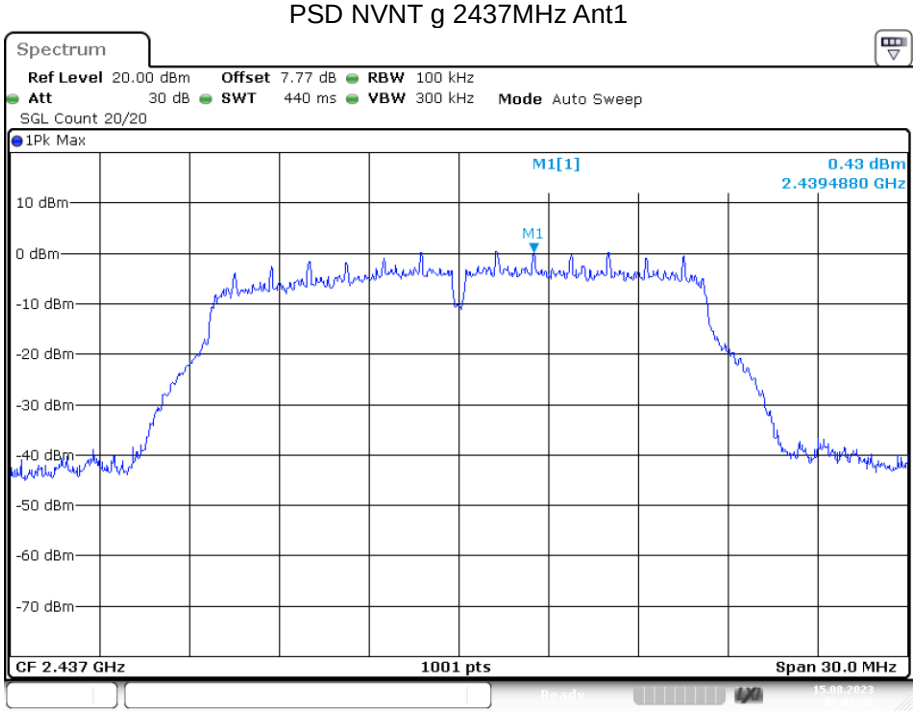
PSD NVNT g 2437MHz Ant1



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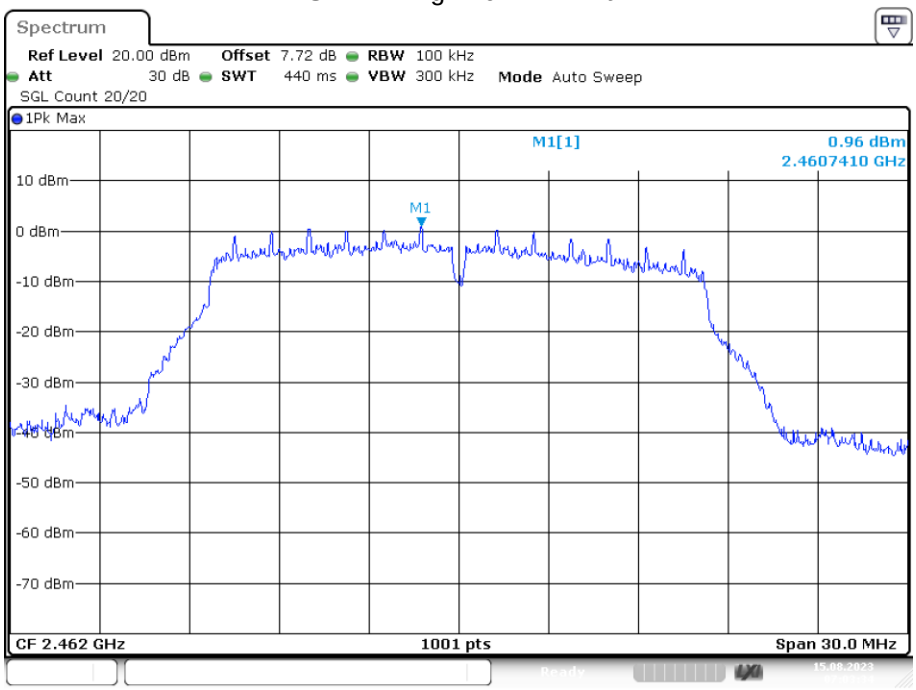
PSD NVNT g 2462MHz Ant1



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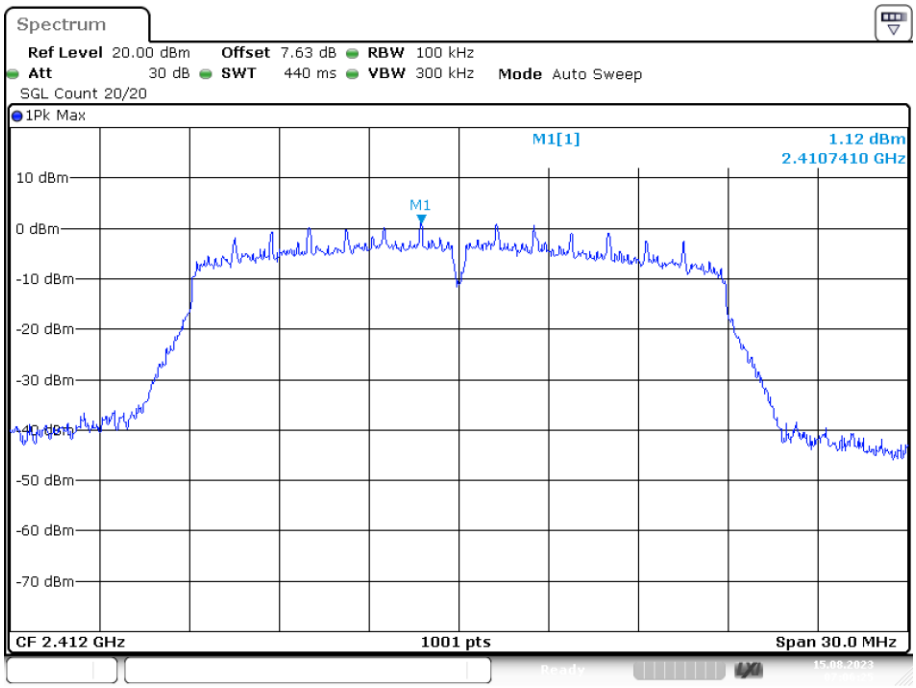
PSD NVNT n20 2412MHz Ant1



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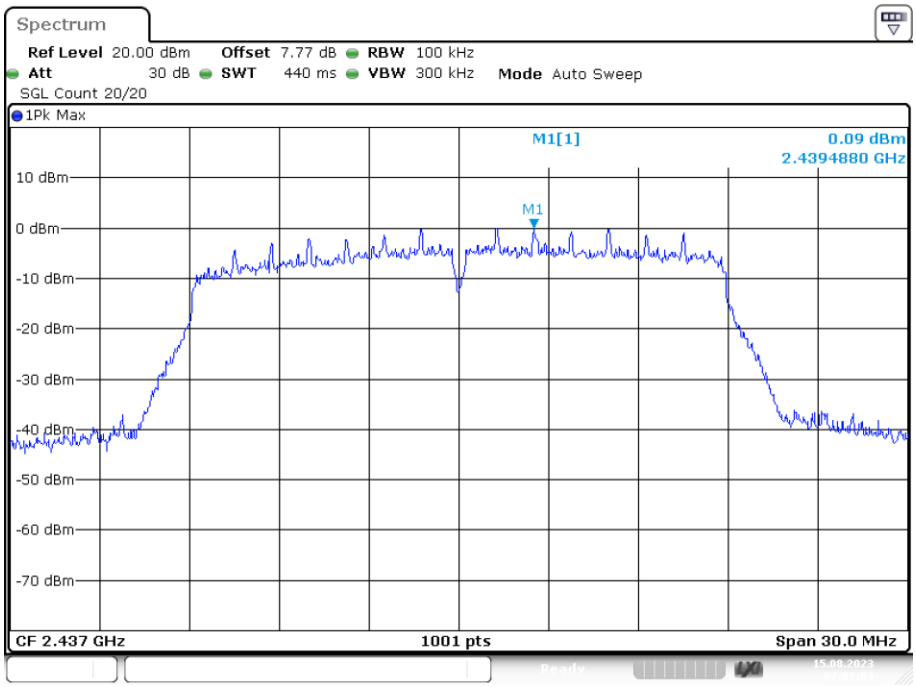
PSD NVNT n20 2437MHz Ant1



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