FCC CERTIFICATION TEST REPORT

Report No.: DDT-B23052503-1E01

Applicant	:	Tianjin Tiandy Digital technology co., ltd.
Address	:	No.8, Haitai Huake Rd2 (Outside Ring Road),Huayuan New Technology Industrial Park, Tianjin 300384 China
Equipment under Test	:	IP Camera
Model No.	:	TC-H332N,TC-H322N,TC-H342N,TC-H352N
Trade Mark	:	Tiandy
FCC ID	:	CLF-TCH332N
Manufacturer	:	Tianjin Tiandy Digital technology co., ltd.
Address	:	No.8, Haitai Huake Rd2 (Outside Ring Road),Huayuan New Technology Industrial Park, Tianjin 300384 China

Issued By: Tianjin Dongdian Testing Service Co., Ltd.

Address: Building D-1, No. 19, Weisi Road, Microelectronics Industrial Park Development Area, Tianjin, China.

Tel: +86-22-58038033, E-mail: ddt@dgddt.com, http://www.ddttest.com

REPORT

Table of Contents

Test report declares....4
1. Summary of Test Results 6
2. General Test Information 7
2.1. Description of EUT....7
2.2. Accessories of EUT 7
2.3. Assistant equipment used for test....7
2.4. Block diagram of EUT configuration for test 8
2.5. Deviations of test standard 8
2.6. Test environment conditions....8
2.7. Test laboratory....9
2.8. Measurement uncertainty 9
3. Equipment Used During Test....10
4. 6dB Bandwidth and 99% Bandwidth....11
4.1. Block diagram of test setup 11
4.2. Limits 11
4.3. Test procedure....11
4.4. Test result....12
4.5. original test data 13
5. Maximum PK Conducted Output Power 25
5.1. Block diagram of test setup 25
5.2. Limits 25
5.3. Test procedure....25
5.4. Test result....26
6. Power Spectral Density 27
6.1. Block diagram of test setup 27
6.2. Limits 27
6.3. Test procedure....27
6.4. Test result....28
6.5. original test data 29
7. Band Edge Compliance (Conducted Method)....35
7.1. Block diagram of test setup 35
7.2. Limits 35
7.3. Test procedure....35
7.4. Test result....36
7.5. original test data 36
8. Radiated Spurious Emissions....45
8.1. Block diagram of test setup 45

8.2. Limit 46
8.3. Test procedure 47
8.4. Test result 49
9. RF Conducted Spurious Emissions 99
9.1. Block diagram of test setup 99
9.2. Limits 99
9.3. Test procedure 99
9.4. Test result 100
9.5. Original test data 100
10. Radiated Band Edge Compliance 113
10.1. Block diagram of test setup 113
10.2. Limit 113
10.3. Test procedure 113
10.4. Test result 113
11. Power Line Conducted Emission 130
11.1. Block diagram of test setup 130
11.2. Power Line Conducted Emission Limits (Class B) 130
11.3. Test procedure 130
11.4. Test result 131
12. Antenna Requirements 133
12.1. Limit 133
12.2. Result 133
13. Test Setup Photograph 134
14. Photos of the EUT 137

Test Report Declare

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Address	:	No.8, Haitai Huake Rd2 (Outside Ring Road),Huayuan New Technology Industrial Park, Tianjin 300384 China

Test Standard Used: FCC Rules and Regulations Part 15 Subpart C.

Test procedure used: ANSI C63.10:2020, KDB 558074 D01 15.247 Meas Guidance v05r02

We Declare:

The equipment described above is tested by Tianjin Dongdian Testing Service Co., Ltd and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Tianjin Dongdian Testing Service Co., Ltd is assumed of full responsibility for the accuracy and completeness of these tests.

After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC standards.

Report No:	DDT-B23052503-1E01		
Date of Receipt:	Jun. 19, 2023	**Date of Test:**	Jun. 19, 2023 ~ Jul. 10, 2023

Prepared By: ***Approved By:***

Sunny Zhang Leon Li

Sunny Zhang/Engineer ***Leon Li/RF Manager***

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Tianjin Dongdian Testing Service Co., Ltd.
The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

Revision History

Rev.	Revisions	Issue Date	Revised By
---	Initial issue	Jul. 10, 2023	

1. Summary of Test Results

The EUT have been tested according to the applicable standards as referenced below.		
Description of Test Item	**Standard**	**Verdict**
6dB Bandwidth and 99% Bandwidth	FCC 15.247 (a) (2)	Pass
Maximum Conducted Output Power	FCC 15.247 (b) (3)	Pass
Power Spectral Density	FCC 15.247 (e)	Pass
Band-edge and Spurious Emissions (Conducted)	FCC 15.247 (d)	Pass
Radiated Spurious Emissions	FCC 15.247 (d) FCC 15.209 FCC 15.205	Pass
Radiated Band Edge Compliance	FCC 15.247 (d) FCC 15.209 FCC 15.205	Pass
Power Line Conducted Emission	FCC 15.207	Pass
Antenna Requirement	FCC 15.203	Pass

2. General Test Information

2.1. Description of EUT

EUT* Name	:	IP Camera
Test Model Number	:	TC-H332N
EUT Function Description	:	Please reference user manual of this device
Power supply	:	DC 12V by ac/dc adapter
Radio Technology	:	IEEE 802.11b/g/n
Operation Frequency	:	IEEE 802.11b: 2412MHz-2462MHz IEEE 802.11g: 2412MHz-2462MHz IEEE 802.11n HT20: 2412MHz-2462MHz IEEE 802.11n HT40: 2422MHz-2452MHz
Modulation	:	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20, HT40: OFDM (64QAM, 16QAM, QPSK, BPSK)
Transmitter Rate	:	IEEE 802.11b: 1, 2, 5.5, 11 Mbps IEEE 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps IEEE 802.11n HT20, HT40: MCS0~MCS7
Antenna Type	:	PCB antenna, maximum PK gain: 2.52dBi

Note1: EUT is the ab. of equipment under test.

Channel information					
CH	Frequency (MHz)	CH	Frequency (MHz)	CH	Frequency (MHz)
1	2412	5	2432	9	2452
2	2417	6	2437	10	2457
3	2422	7	2442	11	2462
4	2427	8	2447	/	/

2.2. Accessories of EUT

Description of Accessories	Manufacturer	Model number	Description	Remark
AC/DC ADAPTER	N/A	SW-WB159D	INPUT:100-240V~50/60Hz 0.2A, OUTPUT:12V-0.5A	N/A

2.3. Assistant equipment used for test

Assistant equipment	Manufacturer	Model number	EMC Compliance	SN
Notebook	Lenovo Beijing Co. Ltd.	ThinkPad	FCC/CE	TP00067A

2.4. Block diagram of EUT configuration for test

AC Mains ——— EUT

Run the special test software “Putty.exe” provided by manufacturer to control EUT work in Continuous Tx mode, and select test channel, wireless mode and data rate.

Tested mode, channel, setting Tx power and rand data rate information				
Mode	Setting Tx Power	Data rate (Mbps) (see Note)	Channel	Frequency (MHz)
IEEE 802.11b	Default	11	LCH: CH1	2412
	Default	11	MCH: CH6	2437
	Default	11	HCH: CH11	2462
IEEE 802.11g	Default	6	LCH: CH1	2412
	Default	6	MCH: CH6	2437
	Default	6	HCH: CH11	2462
IEEE 802.11n HT20	Default	MCS 0	LCH: CH1	2412
	Default	MCS 0	MCH: CH6	2437
	Default	MCS 0	HCH: CH11	2462
IEEE 802.11n HT40	Default	MCS 0	LCH: CH3	2422
	Default	MCS 0	MCH: CH6	2437
	Default	MCS 0	HCH: CH9	2452
Note1: According exploratory test, EUT will have maximum output power in those data rate, so those data rate were used for all test.				

2.5. Deviations of test standard

No Deviation

2.6. Test environment conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature range:	21-28℃
Humidity range:	20-75%
Pressure range:	86-106kPa

2.7. Test laboratory

Tianjin Dongdian Testing Service Co., Ltd.
Address: Building D-1, No. 19, Weisi Road, Microelectronics Industrial Park Development Area, Tianjin, China.
Tel: +86-22-58038033, http://www.ddttest.com, Email: ddt@dgddt.com
NVLAP (National Voluntary Laboratory Accreditation Program) CODE: 500036-0
CNAS (China National Accreditation Service for Conformity Assessment) CODE: L13402
FCC Designation Number: CN5004; FCC Test Firm Registration Number: 368676
ISED (Innovation, Science and Economic Development Canada) Company Number: 27768
Conformity Assessment Body Identifier: CN0125
VCCI Facility Registration Number: C-20089, T-20093, R-20125, G-20122

2.8. Measurement uncertainty

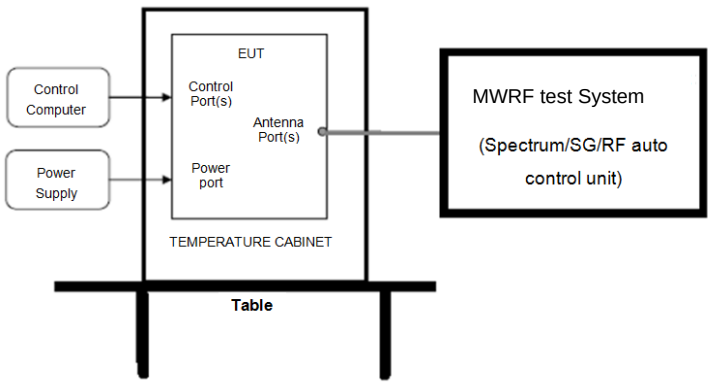
Test Item	Uncertainty
Bandwidth	0.14%
Peak Output Power (Conducted) (Spectrum Analyzer)	0.12 dB (10 MHz ≤ f < 3.6 GHz);
	0.32 dB (3.6 GHz ≤ f < 8 GHz)
Peak Output Power (Conducted) (Power Sensor)	0.51 dB
Power Spectral Density	0.12 dB (10 MHz ≤ f < 3.6 GHz);
	0.32 dB (3.6 GHz ≤ f < 8 GHz)
Frequencies Stability	6.7×10^{-8} (Antenna couple method)
	3.4×10^{-8} (Conducted method)
Conducted Spurious Emissions	0.12 dB (10 MHz ≤ f < 3.6 GHz);
	0.32 dB (3.6 GHz ≤ f < 8 GHz)
	0.52 dB (8 GHz ≤ f < 22 GHz)
Uncertainty for Radio Frequency (RBW < 20 kHz)	3×10^{-7}
Temperature	±2℃
Humidity	±1%
Uncertainty for Radiation Emission Test (30 MHz - 1 GHz)	2.72 dB (Antenna Polarize: V)
	2.72 dB (Antenna Polarize: H)
Uncertainty for Radiation Emission Test (1 GHz - 40 GHz)	2.74 dB (1 - 6 GHz)
	2.72 dB (6 GHz - 18 GHz)
	3.54 dB (18 GHz - 26 GHz)
	4.30 dB (26 GHz - 40 GHz)
Uncertainty for Power Line Conduction Emission Test	3.40 dB (150 kHz - 30 MHz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

3. Equipment Used During Test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
RF Connected Test (MWRFtest system)					
Microwave Signal Generator	R&S	SMF100A	101396	2023/05/29	1 Year
MXG Vector Signal Generator	Keysight	N5182A	MY50143288	2023/03/07	1 Year
EMI Test Receiver	R&S	ESU26	100243	2023/03/03	1 Year
Signal Analyzer	R&S	FSV	101730	2023/04/04	1 Year
Wideband Radio Communication Tester	R&S	CMW500	158800	2023/06/10	1 Year
Power Sensor	KEYSIGHT	U2021XA	MY59150007	2023/03/22	1 Year
DC Power Supply	inSTEK	PSP-2010	EN122317	2023/02/12	1 Year
Test Software	MWRFtest	MTS8310	V03	N/A	N/A
Radiated Emission -10m EMI Chamber					
Broadband Horn Antenna	TESEQ	BHA 9118	31754	2022/10/12	1 Year
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	790	2023/05/06	1 Year
Active Loop Antenna	R&S	HFH2-Z2	100269	2022/07/11	1 Year
Low noise amplifier	MITEQ	TPA0118-36	0914	2023/02/16	1 Year
EMI Test Receiver	R&S	ESCI	101024	2023/02/15	1 Year
EMI Test Receiver	R&S	ESCI	101030	2023/02/15	1 Year
EMI Test Receiver	R&S	ESU26	100244	2023/03/03	1 Year
Bilog Antenna	TESEQ	CBL6112D	29068	2022/10/10	2 Year
Bilog Antenna	TESEQ	CBL6112D	29069	2022/10/10	2 Year
Amplifier	Sonoma	310N	300913	2023/02/15	1 Year
Amplifier	Sonoma	310N	300914	2023/02/15	1 Year
Ant Mast	Innco	MA4000	N/A	N/A	N/A
Ant Mast	Innco	MA4000	N/A	N/A	N/A
Mast Controller	Innco	CO2000	N/A	N/A	N/A
Mast Controller	Innco	CO2000	N/A	N/A	N/A
RF Selector 4CH	TOYO	NS4904N	Selector1	N/A	N/A
RF Selector 4CH	TOYO	NS4904N	Selector2	N/A	N/A
Test software	TOYO	EP5/RSE	Ver 1.9.1	N/A	N/A
Test software	Audix	E3	V 6.11111b	N/A	N/A
Power Line Conducted Emissions Test					
Test Receiver	R&S	ESCI	101397	2023/02/15	1 Year
LISN	R&S	ENV216	101122	2023/02/15	1 Year
Test software	TOYO	EP5/CE	V 5.4.40	N/A	N/A

4. 6dB Bandwidth and 99% Bandwidth

4.1. Block diagram of test setup



4.2. Limits

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

4.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) 99% Bandwidth set the spectrum analyzer as follows:

RBW:	1% to 5% of the OBW
VBW:	Three times the RBW
Detector Mode:	Peak
Sweep time:	auto
Trace mode	Max hold

(3) 6dB Bandwidth set the spectrum analyzer as follows:

RBW:	100 kHz
VBW:	300 kHz
Detector Mode:	Peak
Sweep time:	auto
Trace mode	Max hold

(4) Allow the trace to stabilize, measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

4.4. Test result

Test Mode	Test Channel	Ant	6dB Bandwidth (MHz)	Limit (MHz)	Verdict
11B	2412	Ant1	7.875	≧0.5	Pass
11B	2437	Ant1	7.875	≧0.5	Pass
11B	2462	Ant1	7.872	≧0.5	Pass
11G	2412	Ant1	16.557	≧0.5	Pass
11G	2437	Ant1	16.554	≧0.5	Pass
11G	2462	Ant1	16.551	≧0.5	Pass
11N20	2412	Ant1	17.682	≧0.5	Pass
11N20	2437	Ant1	17.694	≧0.5	Pass
11N20	2462	Ant1	17.682	≧0.5	Pass
11N40	2422	Ant1	36.426	≧0.5	Pass
11N40	2437	Ant1	36.432	≧0.5	Pass
11N40	2452	Ant1	36.450	≧0.5	Pass

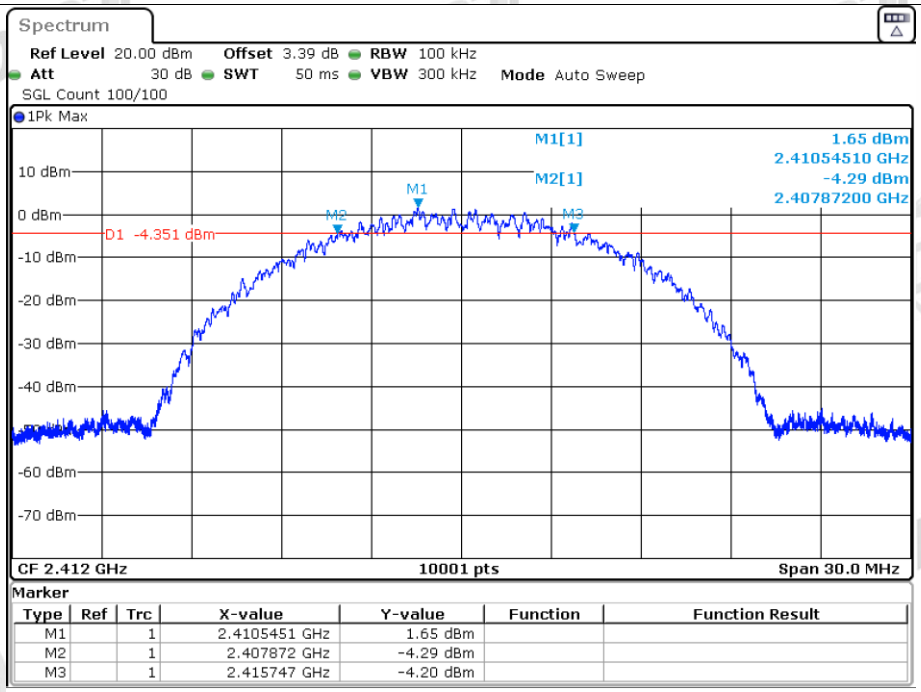
Test Mode	Test Channel	Ant	99% OBW (MHz)	Limit (MHz)	Verdict
11B	2412	Ant1	13.355	---	Pass
11B	2437	Ant1	13.316	---	Pass
11B	2462	Ant1	13.187	---	Pass
11G	2412	Ant1	16.537	---	Pass
11G	2437	Ant1	16.432	---	Pass
11G	2462	Ant1	16.591	---	Pass
11N20	2412	Ant1	17.725	---	Pass
11N20	2437	Ant1	17.677	---	Pass
11N20	2462	Ant1	17.725	---	Pass
11N40	2422	Ant1	36.206	---	Pass
11N40	2437	Ant1	36.362	---	Pass
11N40	2452	Ant1	36.194	---	Pass

4.5. original test data

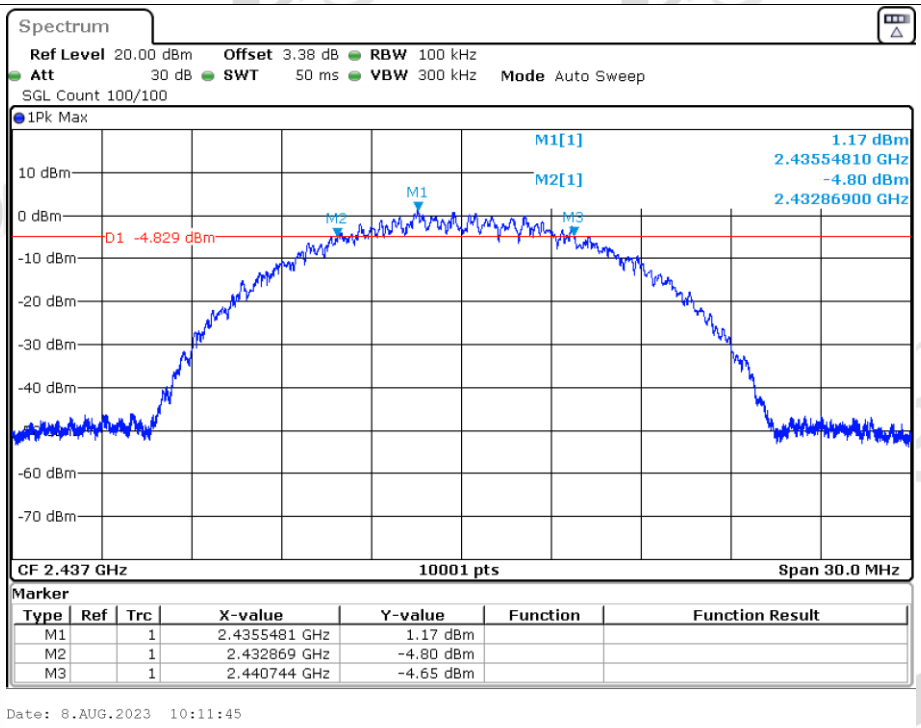
6dB Bandwidth

Test Graphs

-6dB Bandwidth NVNT b 2412MHz Ant1



-6dB Bandwidth NVNT b 2437MHz Ant1



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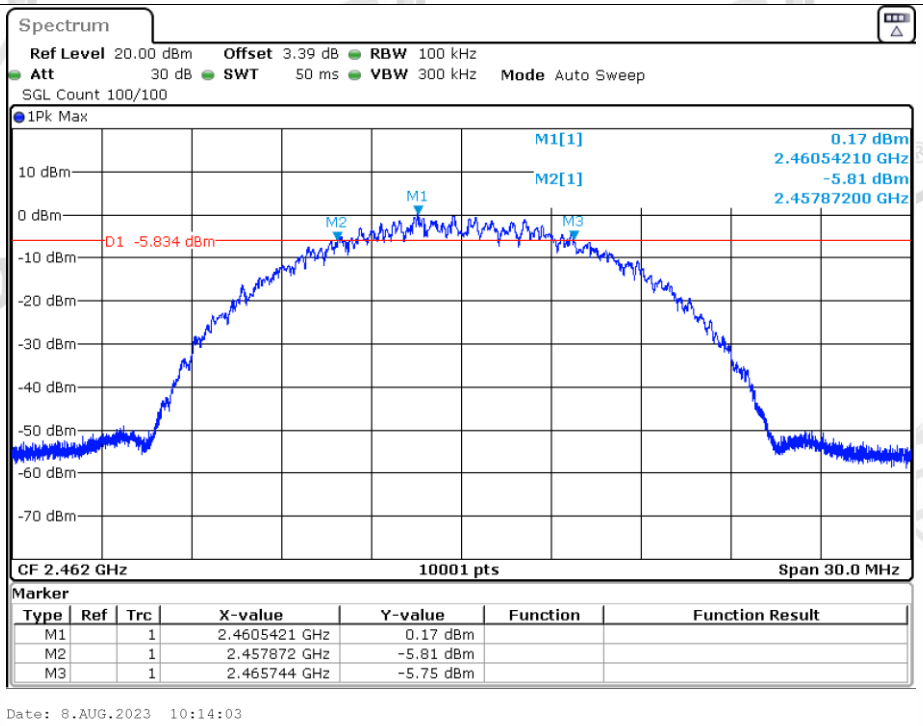

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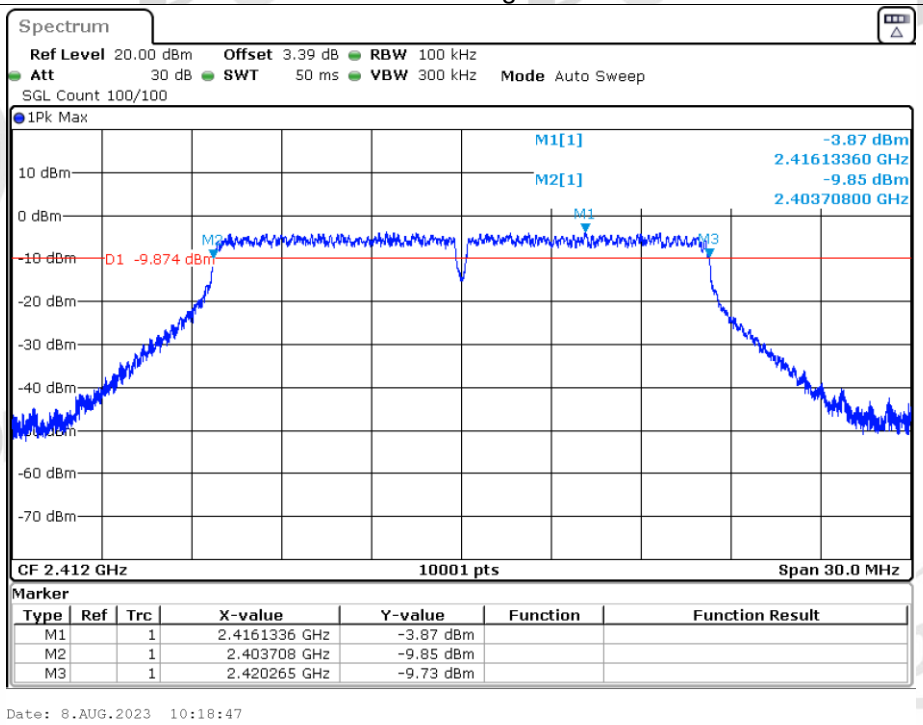

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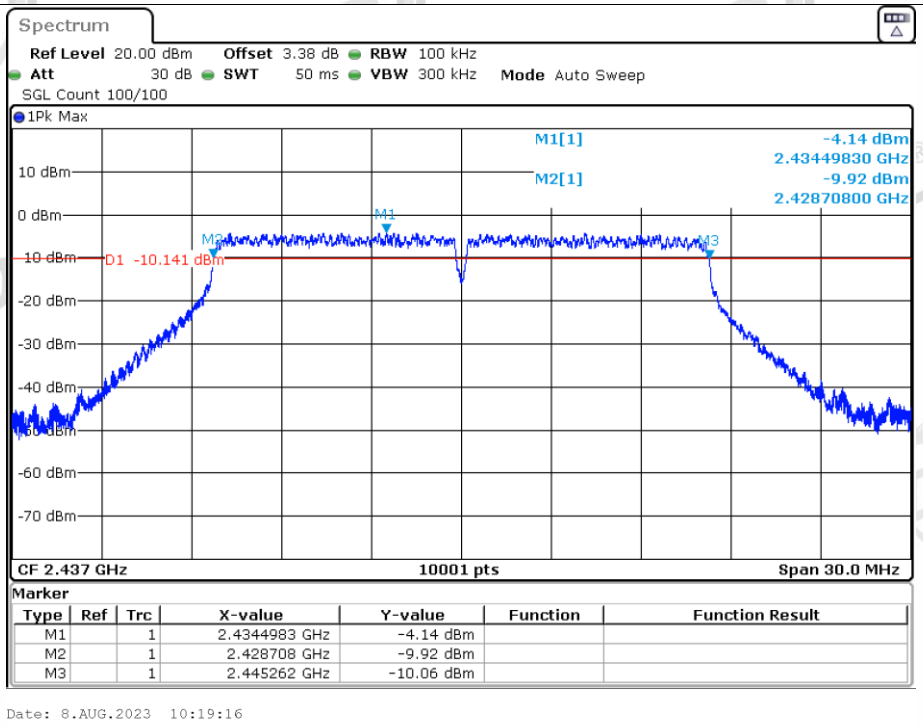

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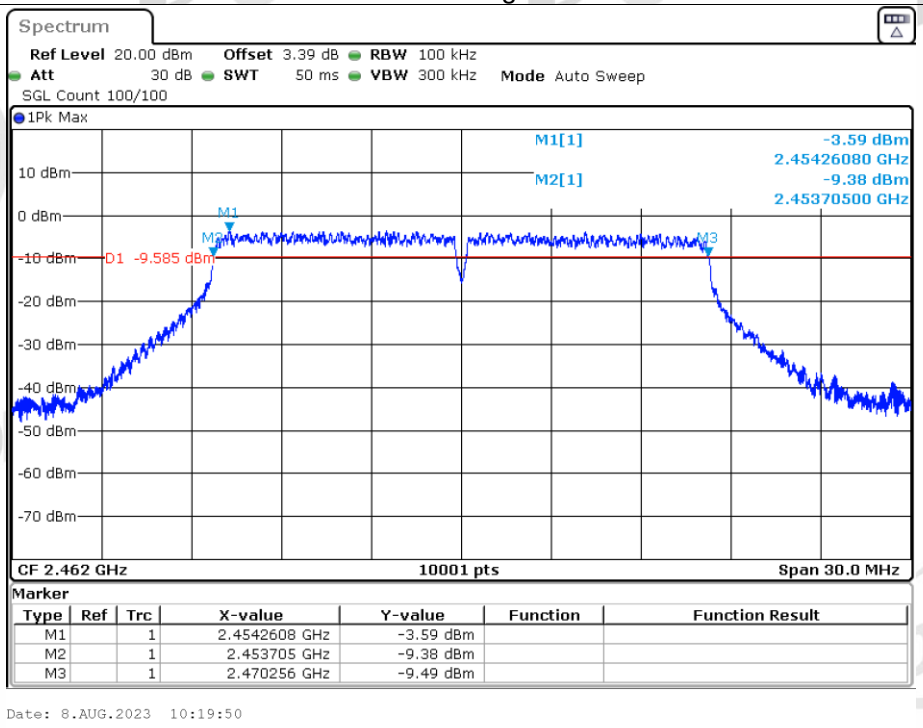
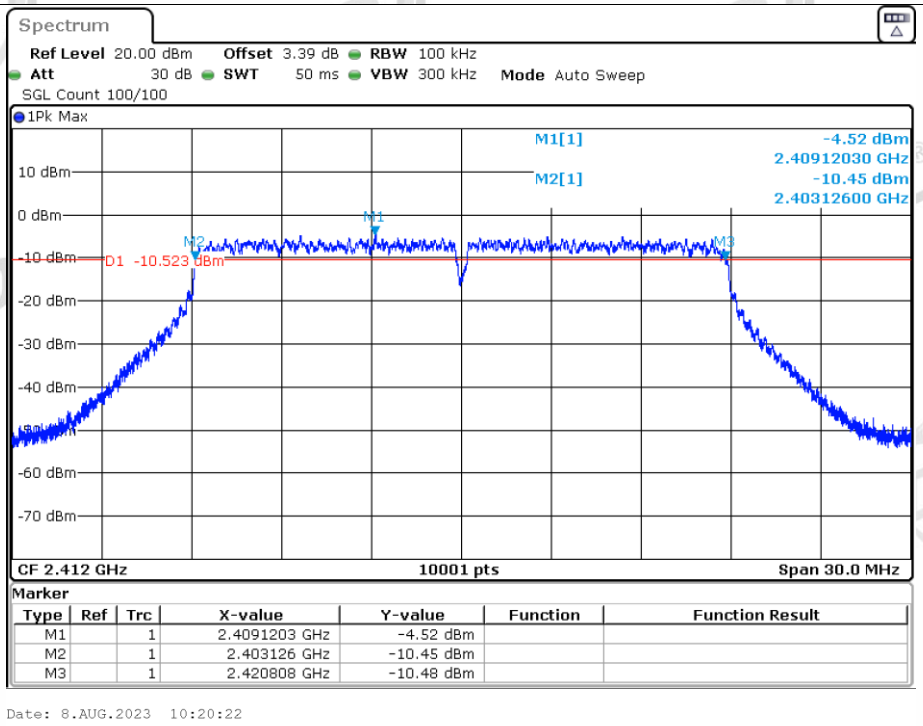
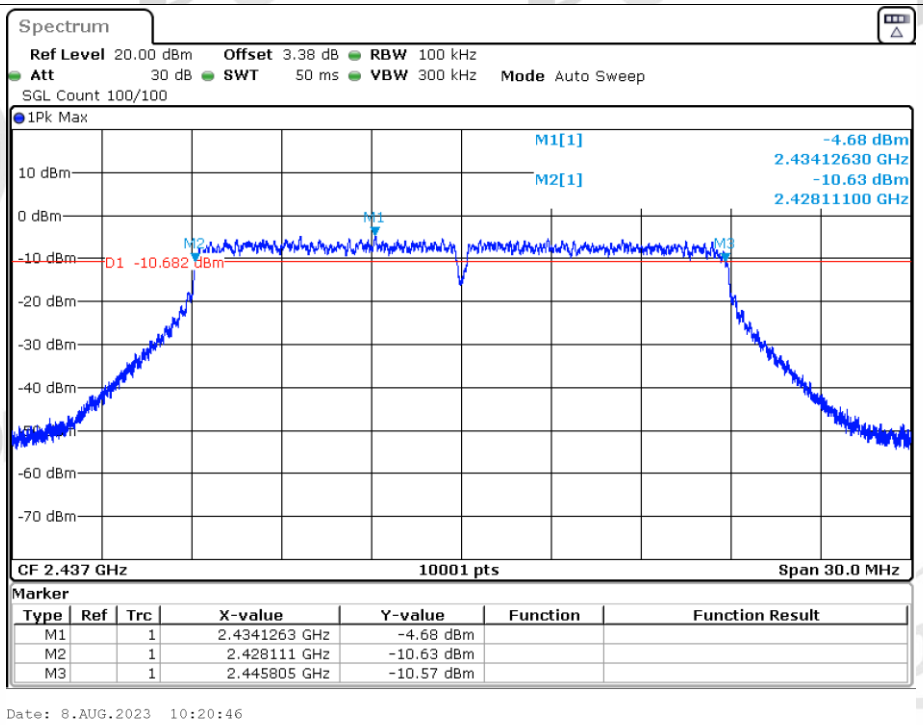


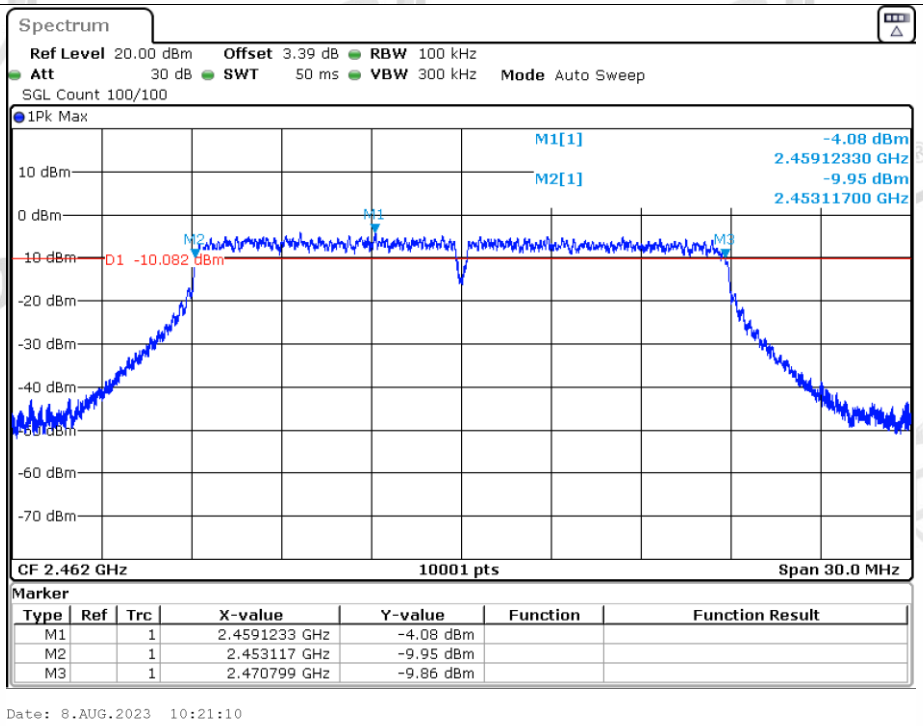
-6dB Bandwidth NVNT n20 2412MHz Ant1



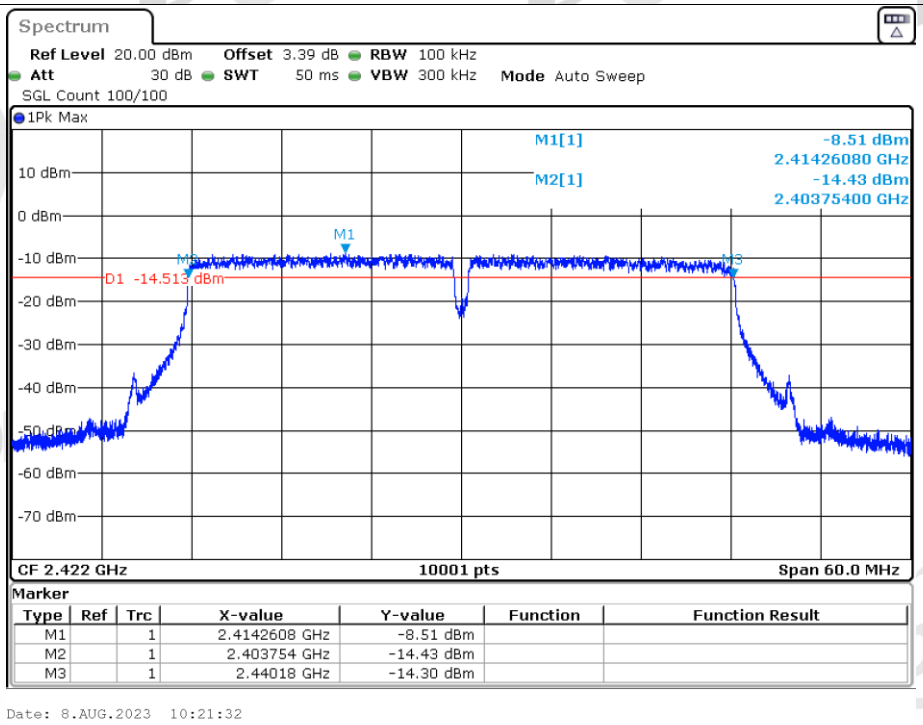
-6dB Bandwidth NVNT n20 2437MHz Ant1



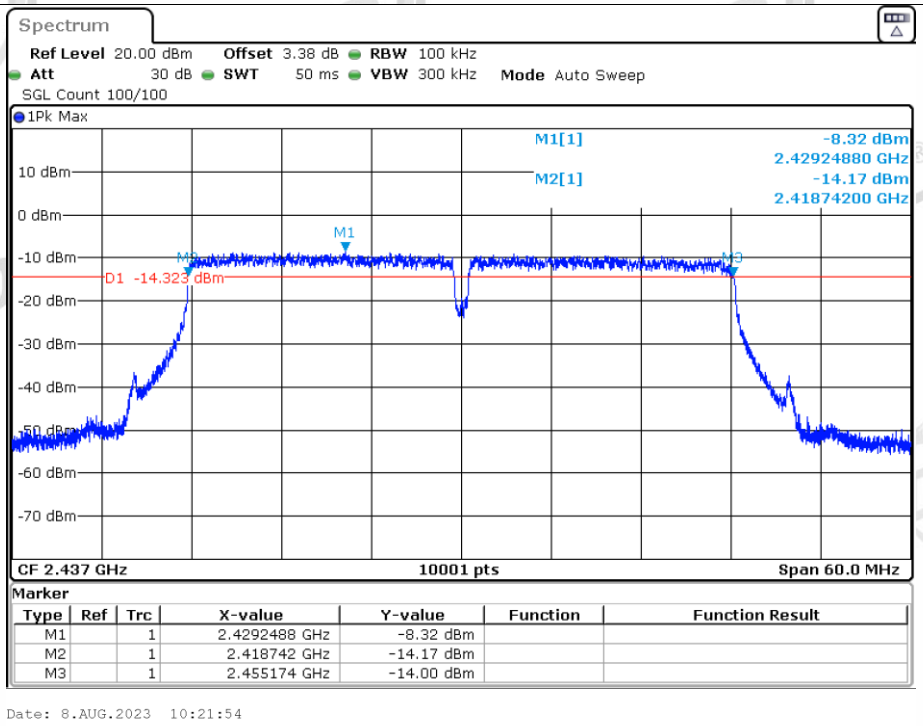
-6dB Bandwidth NVNT n20 2462MHz Ant1



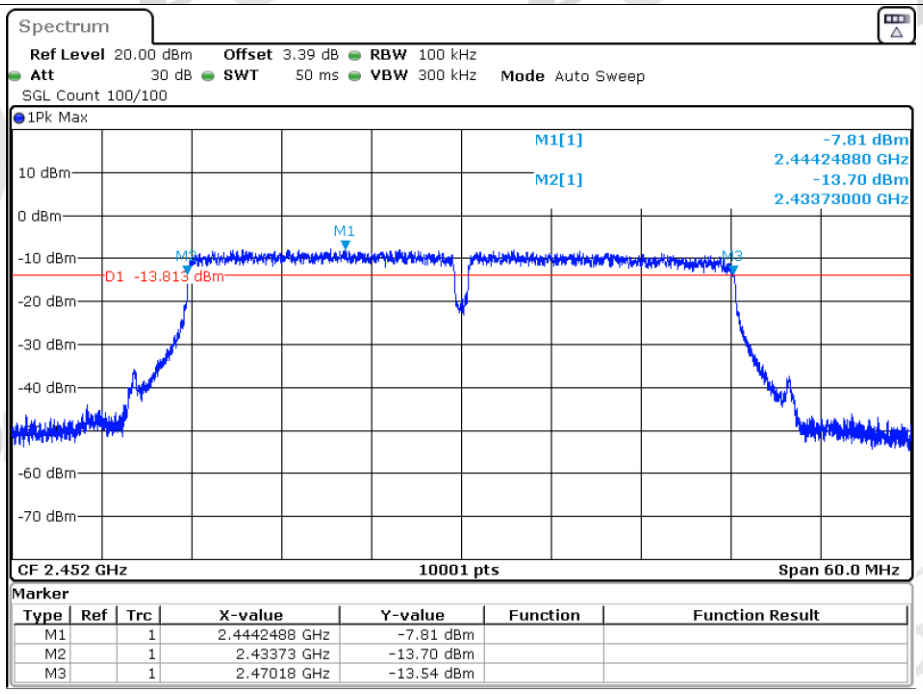
-6dB Bandwidth NVNT n40 2422MHz Ant1



-6dB Bandwidth NVNT n40 2437MHz Ant1



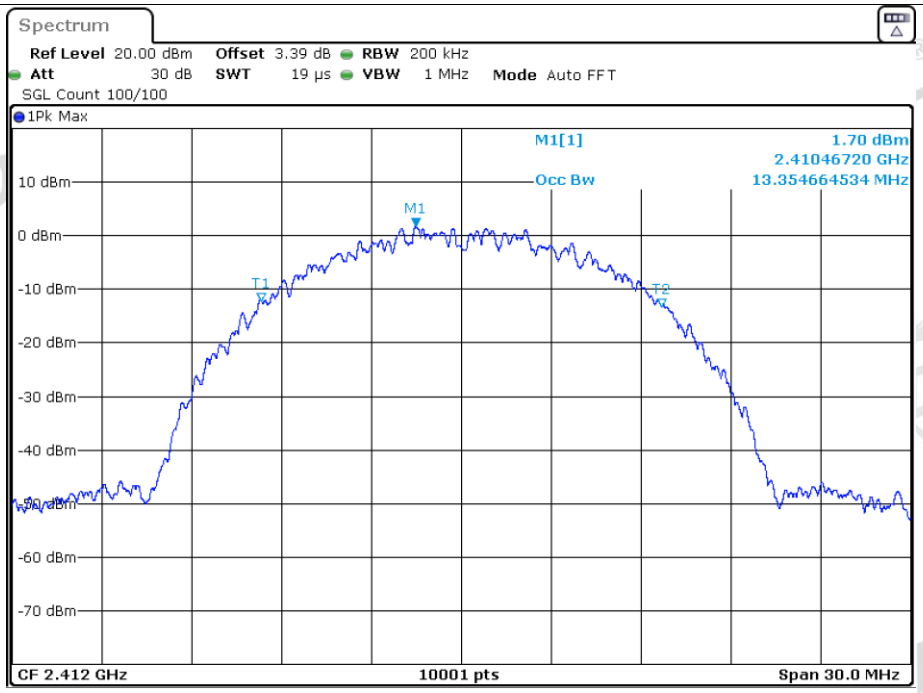
-6dB Bandwidth NVNT n40 2452MHz Ant1



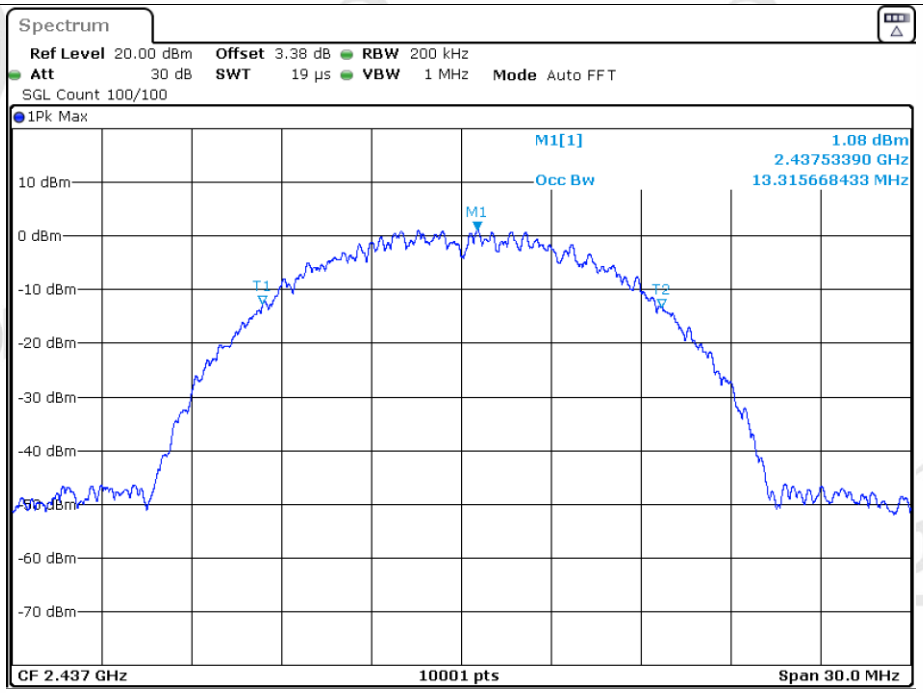
99% Bandwidth

Test Graphs

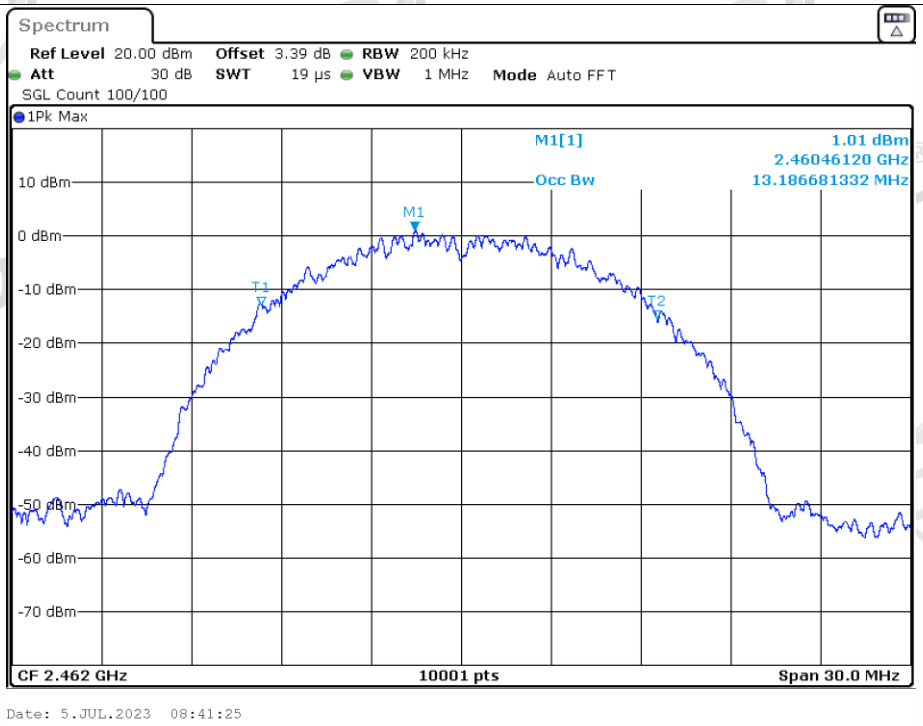
OBW NVNT b 2412MHz Ant1



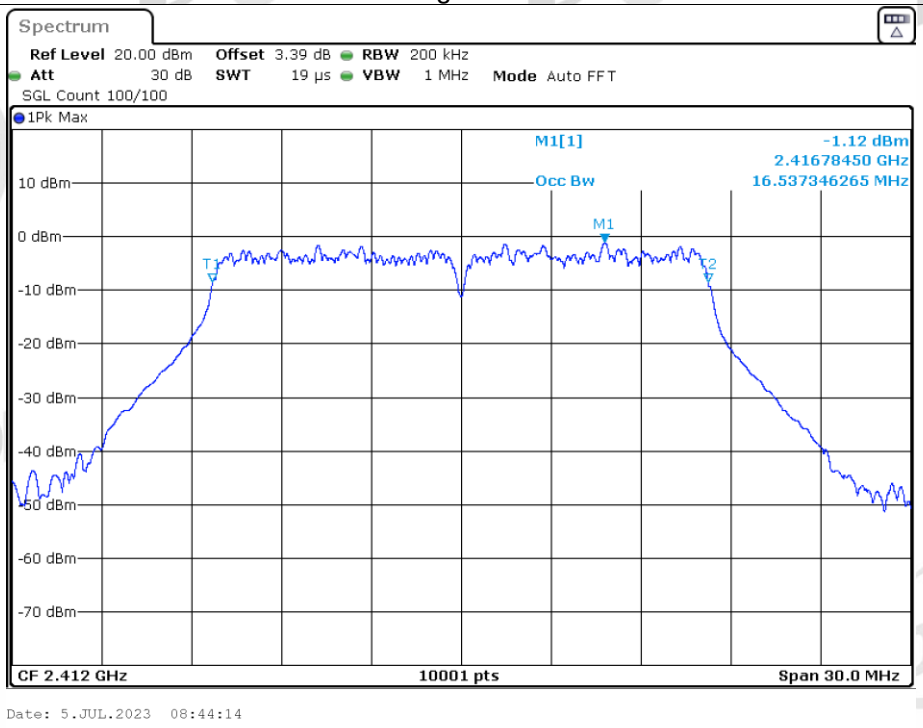
OBW NVNT b 2437MHz Ant1



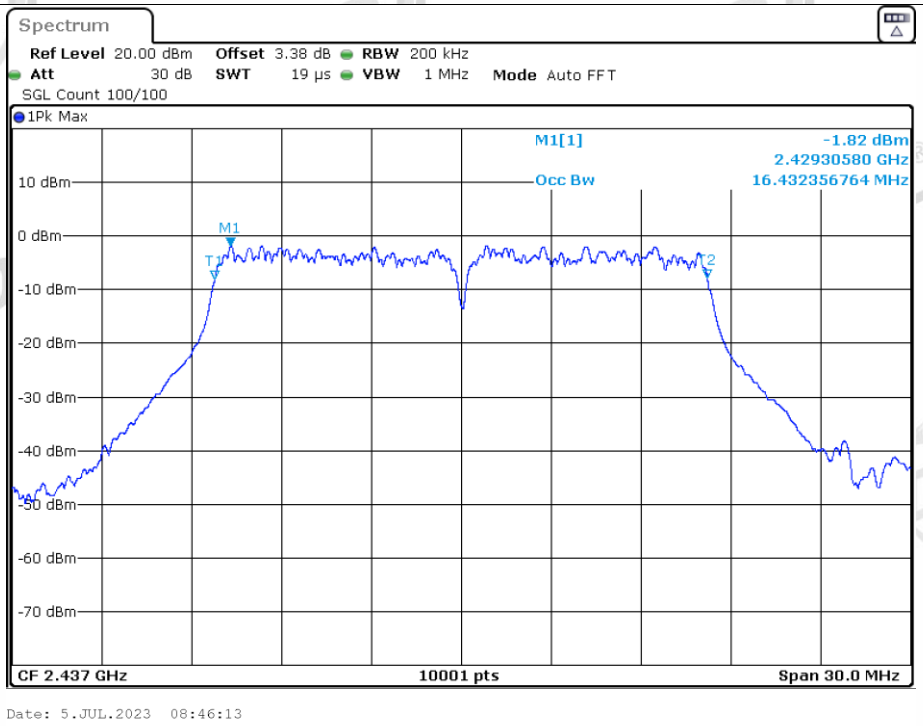
OBW NVNT b 2462MHz Ant1



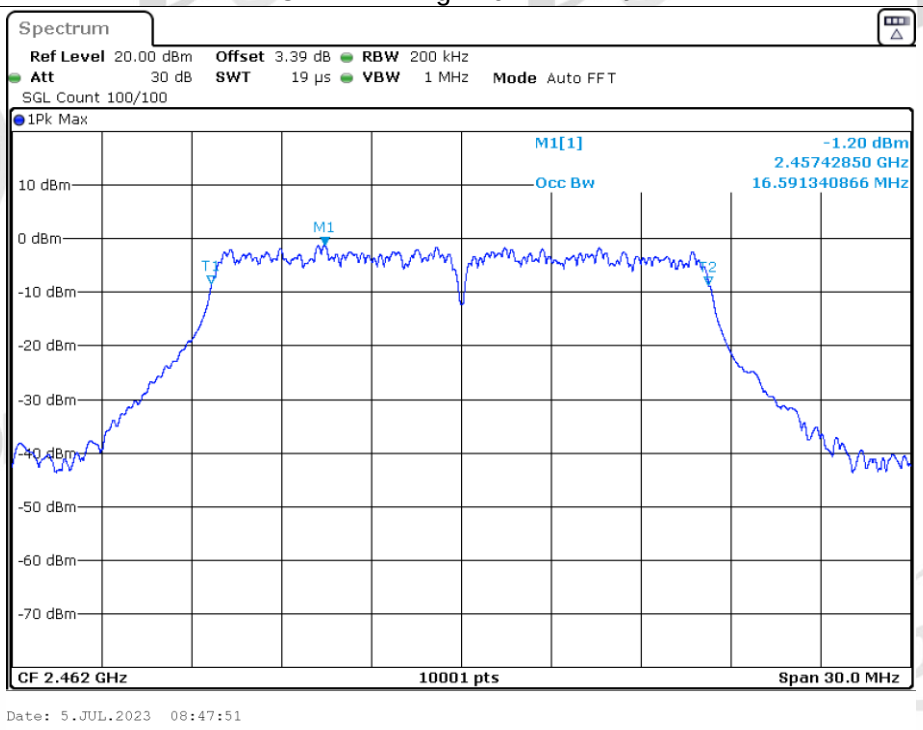
OBW NVNT g 2412MHz Ant1



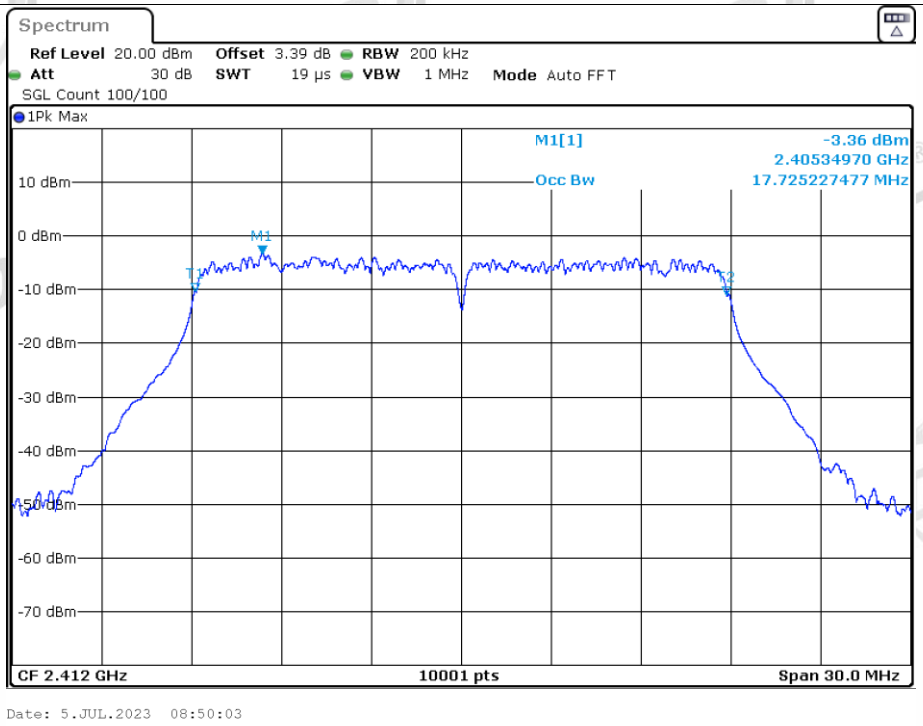
OBW NVNT g 2437MHz Ant1



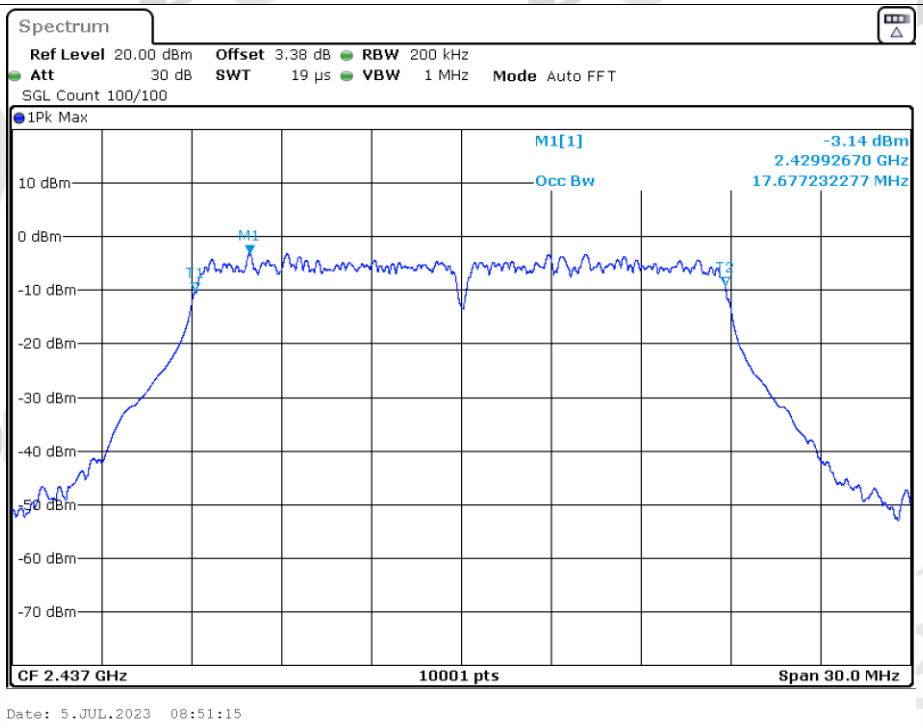
OBW NVNT g 2462MHz Ant1



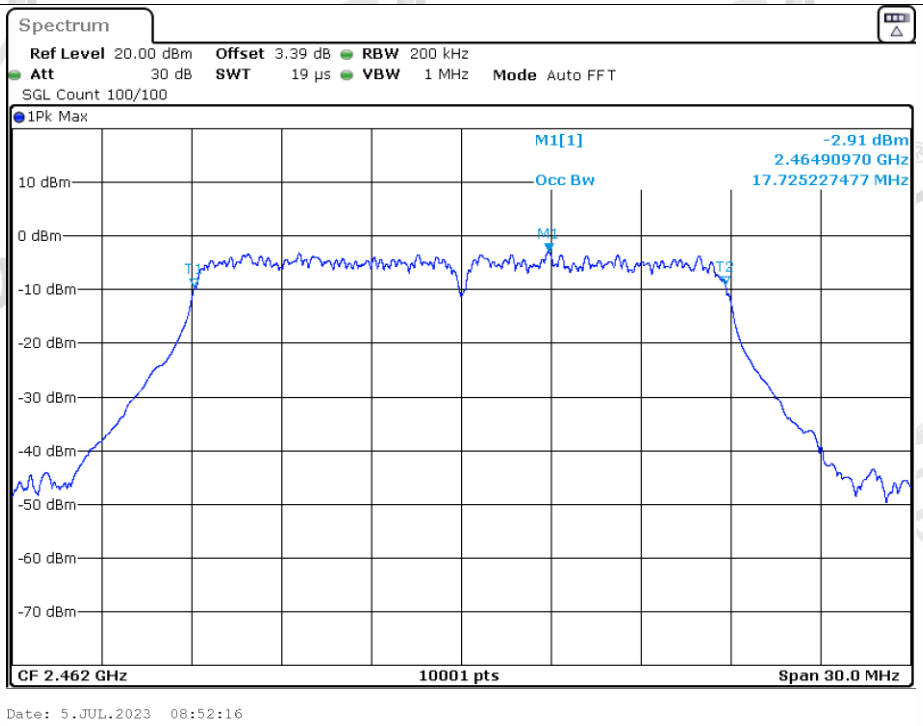
OBW NVNT n20 2412MHz Ant1



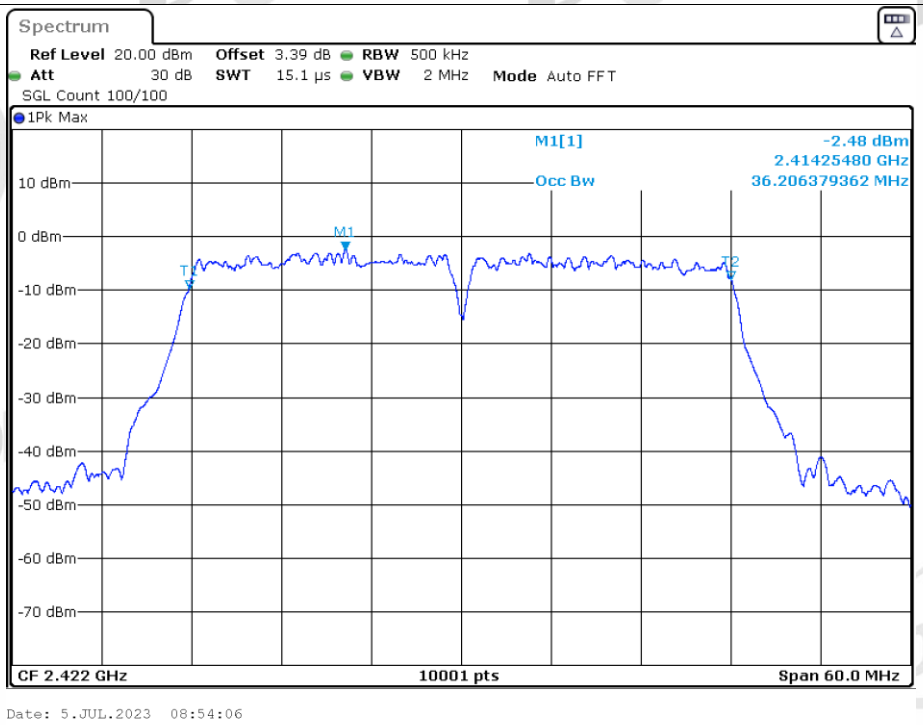
OBW NVNT n20 2437MHz Ant1



OBW NVNT n20 2462MHz Ant1



OBW NVNT n40 2422MHz Ant1



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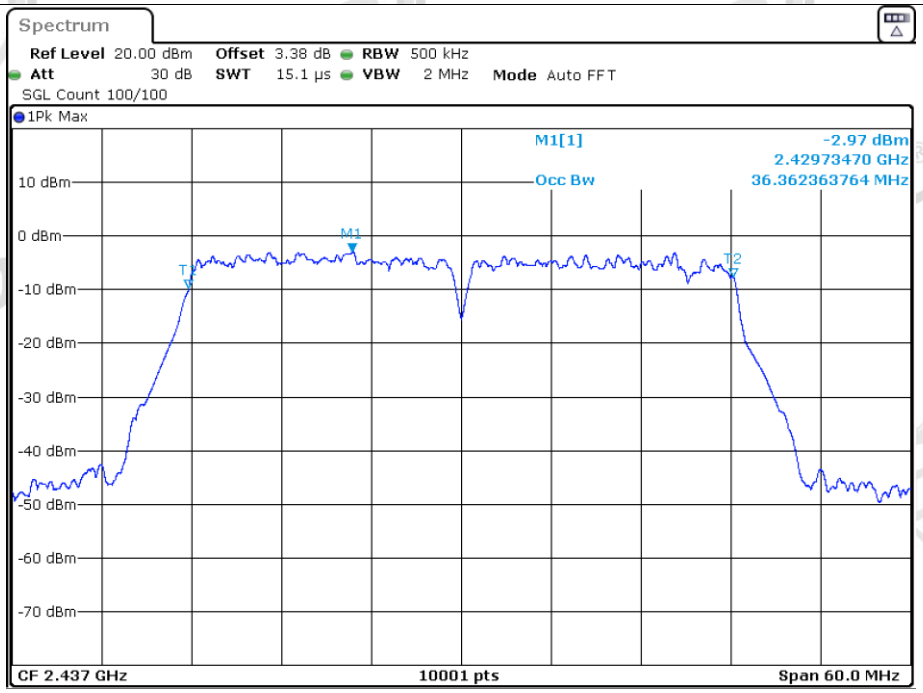
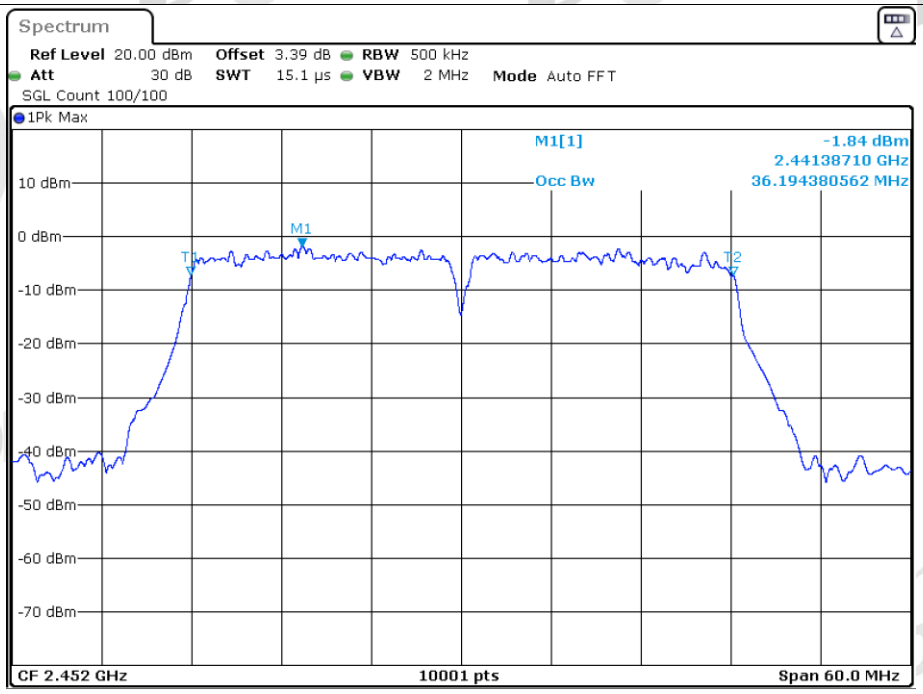


OBW NVNT n40 2452MHz Ant1



5. Maximum PK Conducted Output Power

5.1. Block diagram of test setup

Same as section 4.1

5.2. Limits

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.3. Test procedure

Connect each EUT's antenna output to power sensor by RF cable and attenuator
Measure the Maximum output power of antenna port by power sensor.

5.4. Test result

Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Limit (dBm)	Verdict
11B	2412	Ant1	15.23	30	Pass
11B	2437	Ant1	14.94	30	Pass
11B	2462	Ant1	14.18	30	Pass
11G	2412	Ant1	17.19	30	Pass
11G	2437	Ant1	16.81	30	Pass
11G	2462	Ant1	17.30	30	Pass
11N20	2412	Ant1	16.17	30	Pass
11N20	2437	Ant1	15.97	30	Pass
11N20	2462	Ant1	16.47	30	Pass
11N40	2422	Ant1	15.10	30	Pass
11N40	2437	Ant1	15.14	30	Pass
11N40	2452	Ant1	16.00	30	Pass

6. Power Spectral Density

6.1. Block diagram of test setup

Same as section 4.1

6.2. Limits

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

6.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Set the spectrum analyzer as follows:

Center frequency	DTS Channel center frequency
RBW:	3 kHz ≤ RBW ≤ 100 kHz
VBW:	≥ 3RBW
Span	1.5 times the DTS bandwidth
Detector Mode:	peak
Sweep time:	auto
Trace mode	Max hold

(3) Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.

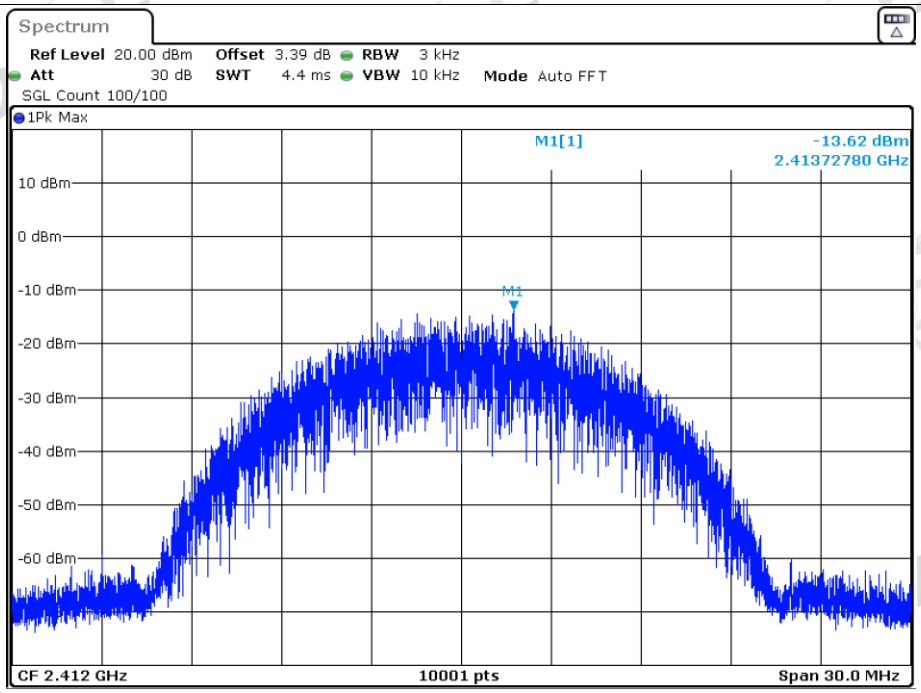
(4) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

6.4. Test result

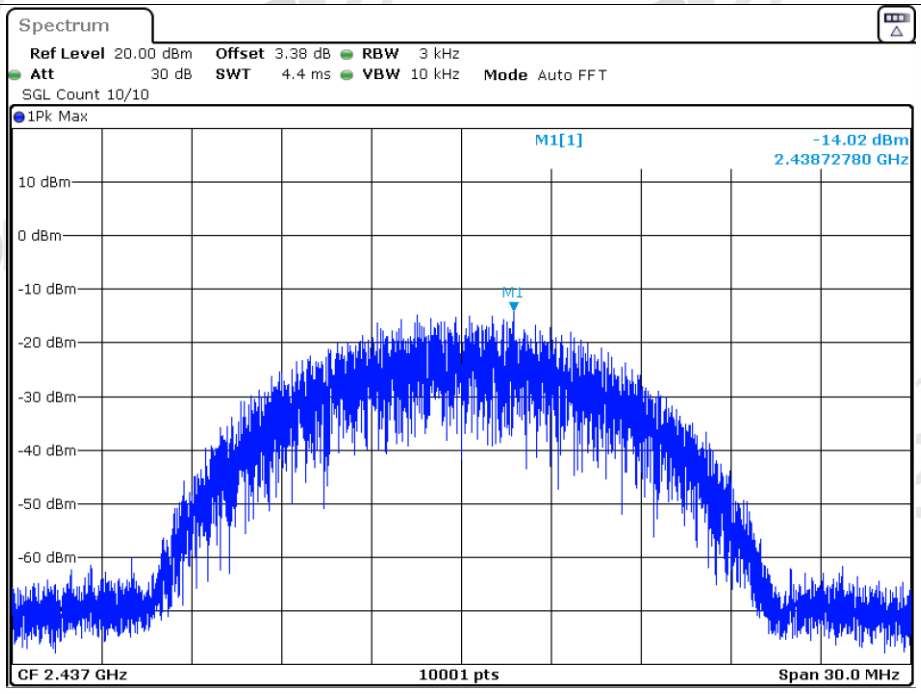
Test Mode	Test Channel	Ant	PSD (dBm/3kHz)	Limit(dBm/3kHz)	Verdict
11B	2412	Ant1	-13.62	8.00	Pass
11B	2437	Ant1	-14.02	8.00	Pass
11B	2462	Ant1	-14.81	8.00	Pass
11G	2412	Ant1	-19.13	8.00	Pass
11G	2437	Ant1	-19.13	8.00	Pass
11G	2462	Ant1	-18.70	8.00	Pass
11N20	2412	Ant1	-20.63	8.00	Pass
11N20	2437	Ant1	-19.86	8.00	Pass
11N20	2462	Ant1	-19.72	8.00	Pass
11N40	2422	Ant1	-21.47	8.00	Pass
11N40	2437	Ant1	-22.55	8.00	Pass
11N40	2452	Ant1	-21.65	8.00	Pass

6.5. original test data

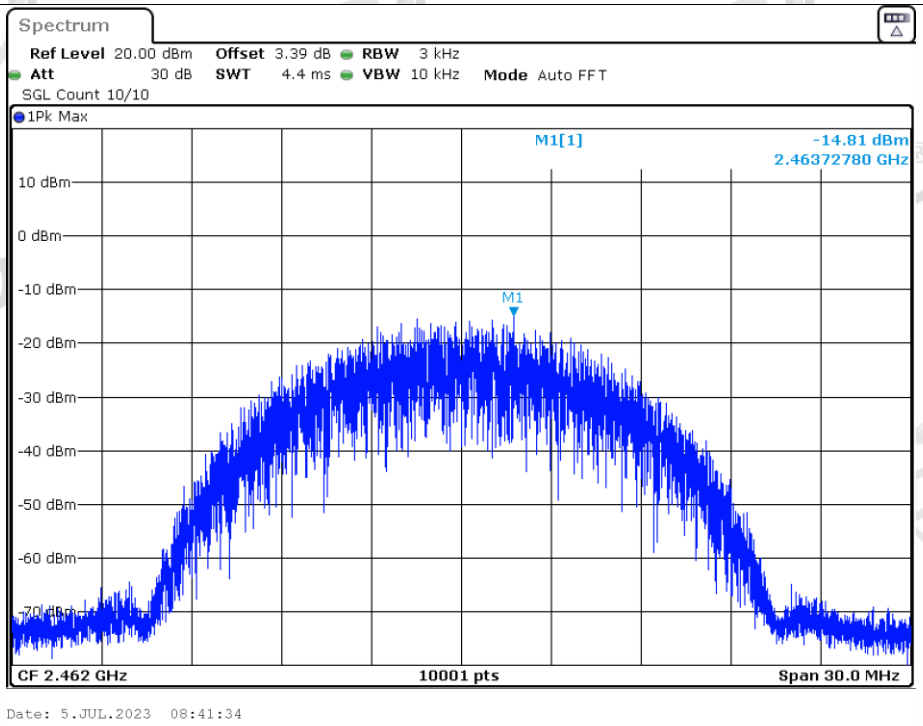
Test Graphs
PSD NVNT b 2412MHz Ant1



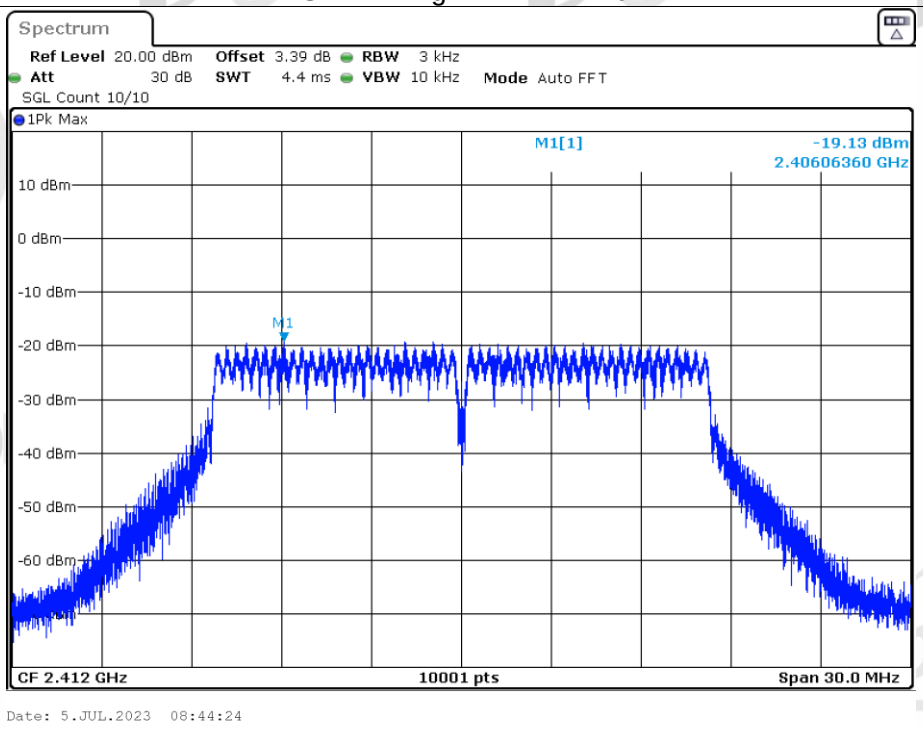
PSD NVNT b 2437MHz Ant1



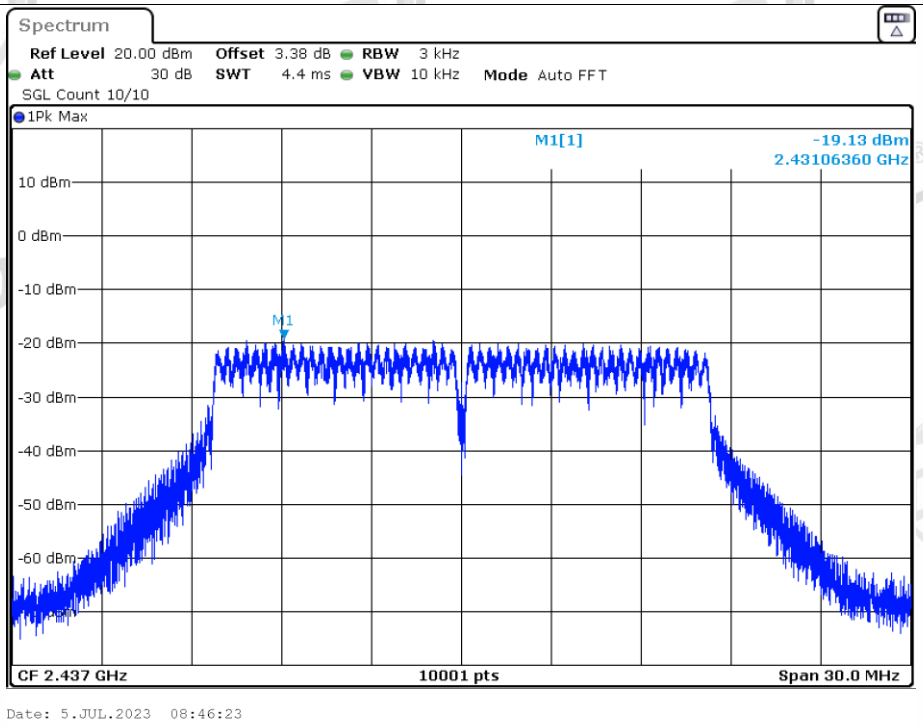
PSD NVNT b 2462MHz Ant1



PSD NVNT g 2412MHz Ant1



PSD NVNT g 2437MHz Ant1



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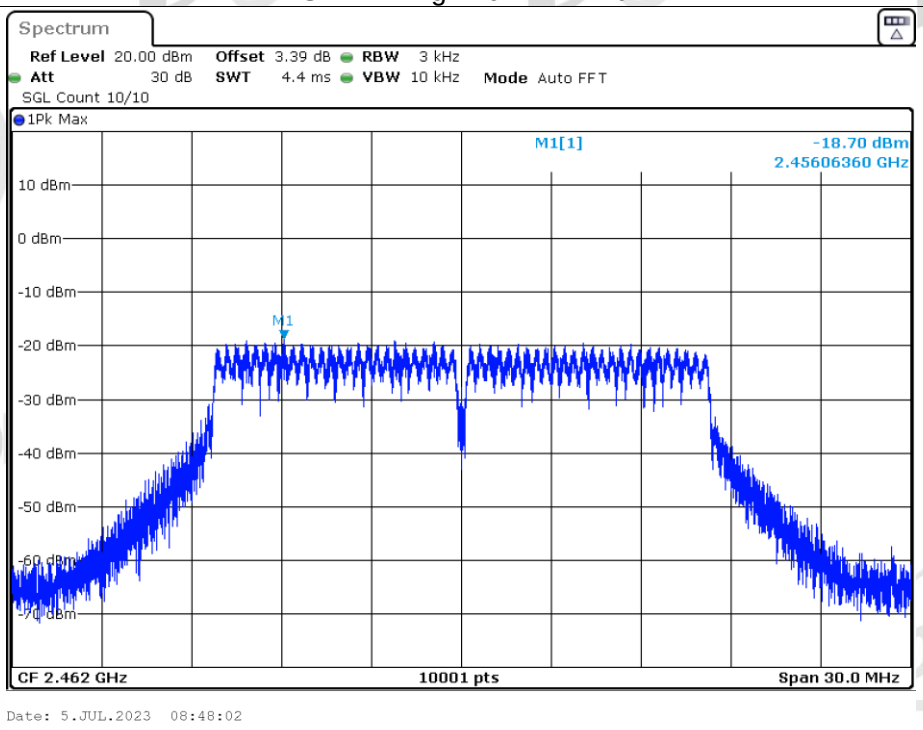
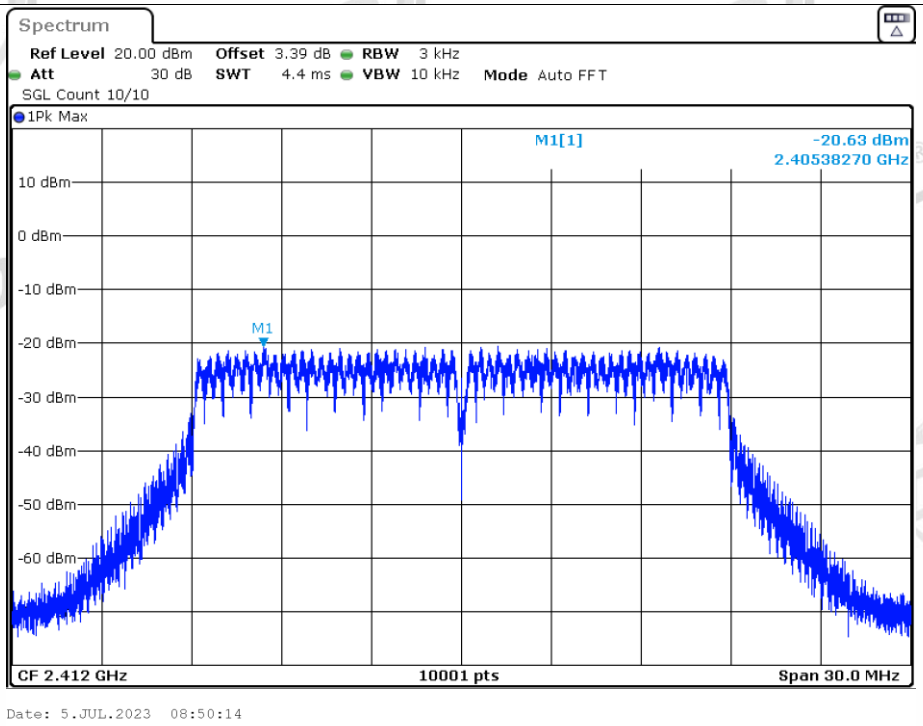
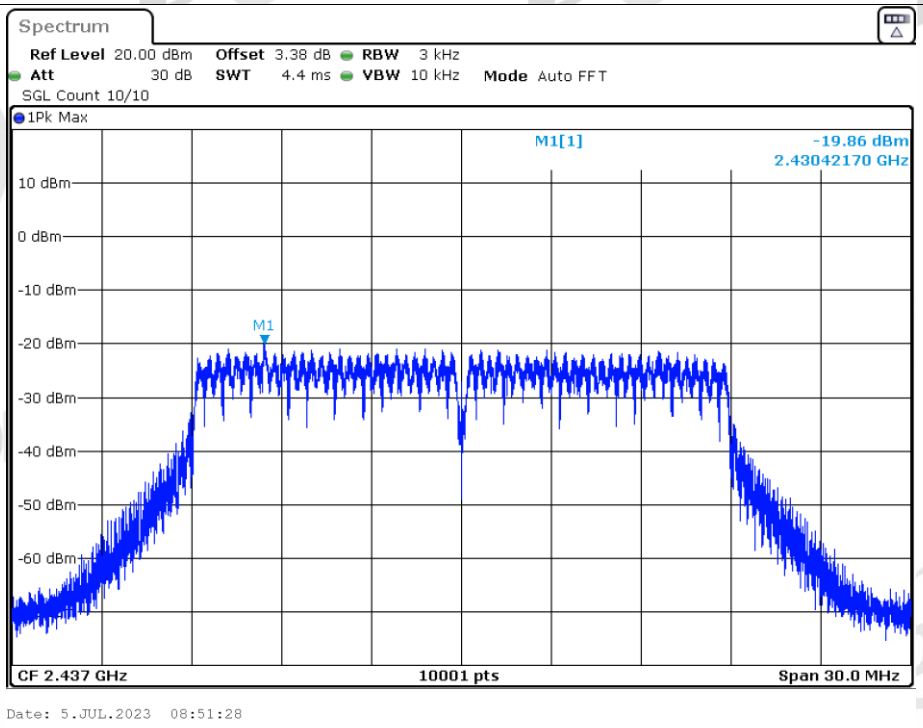


PSD NVNT n20 2412MHz Ant1



PSD NVNT n20 2437MHz Ant1



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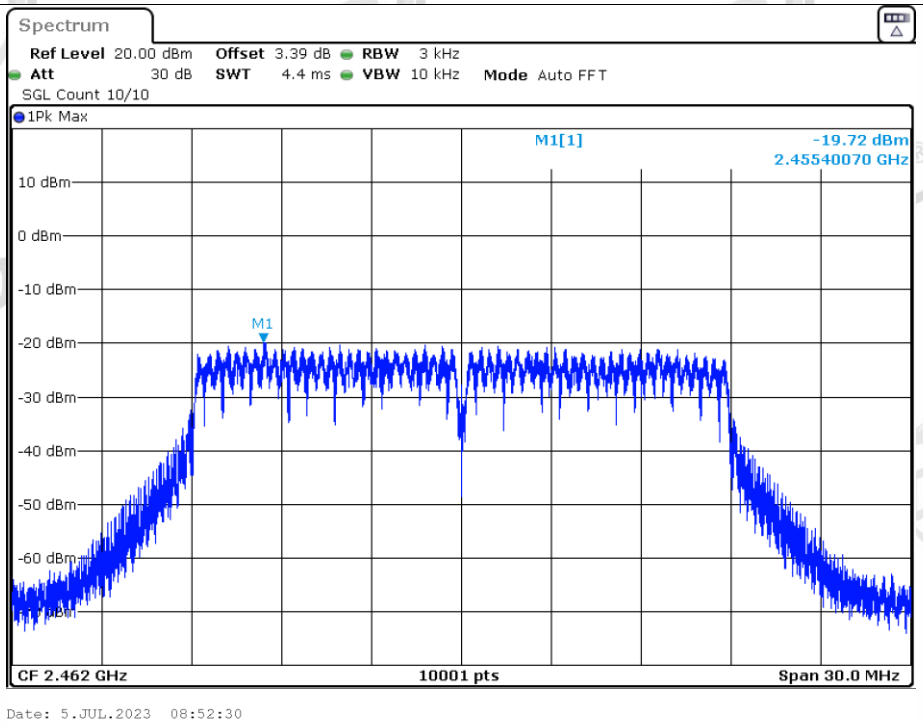
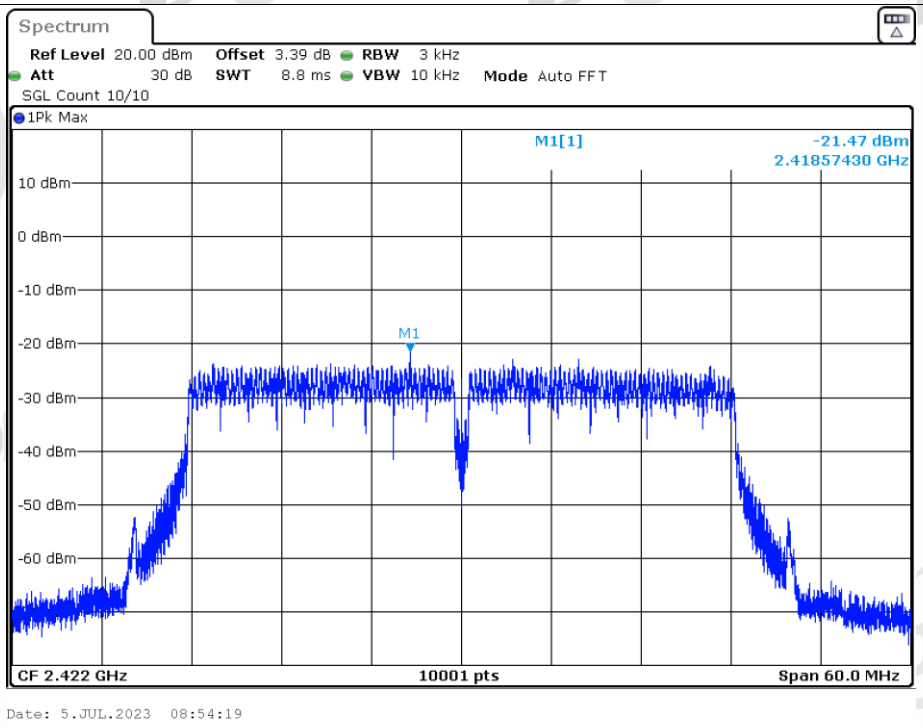


PSD NVNT n40 2422MHz Ant1



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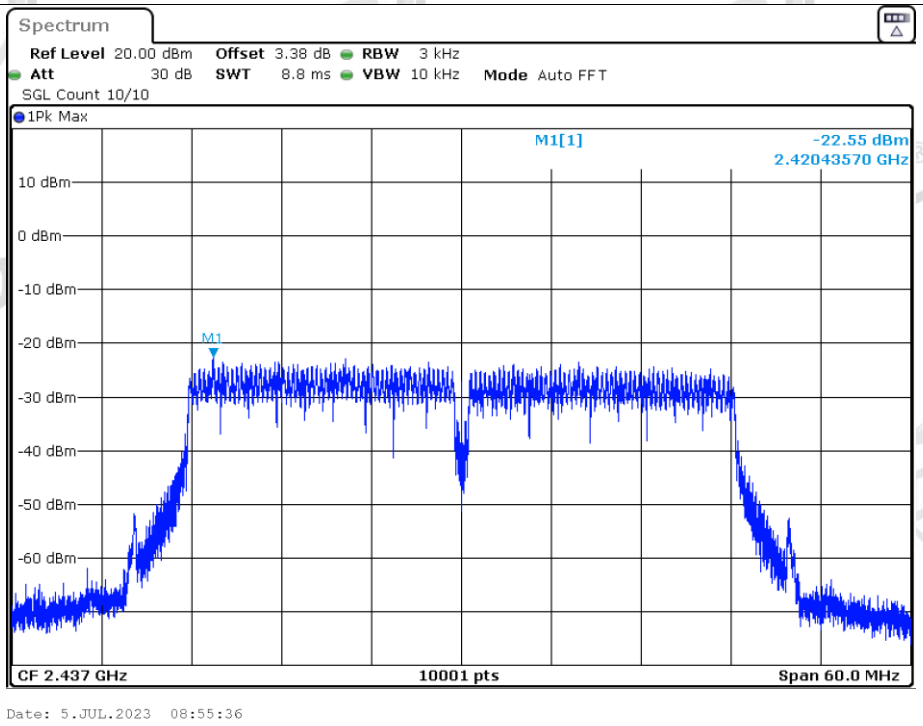
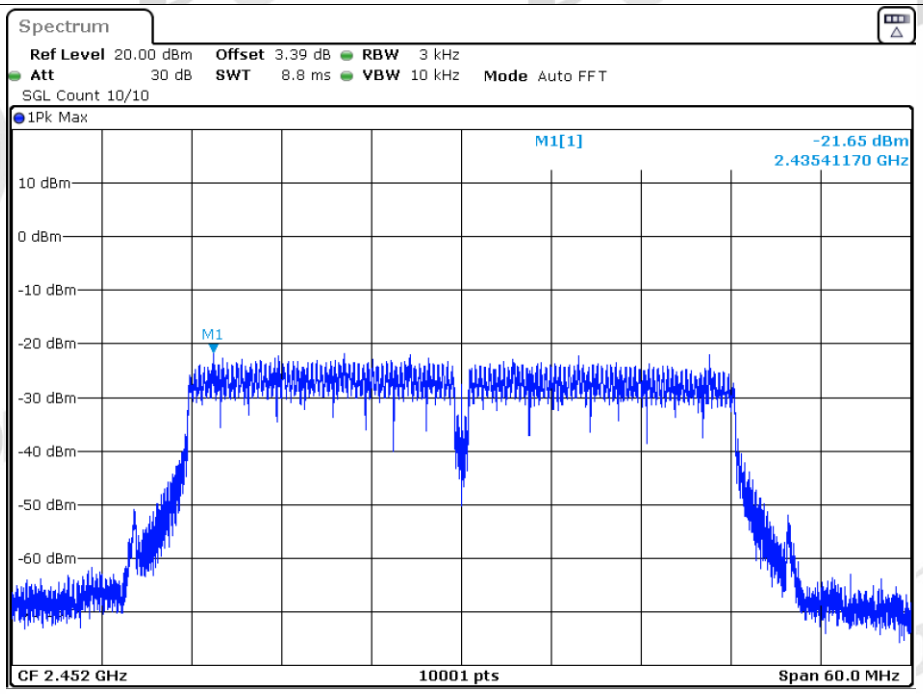


PSD NVNT n40 2452MHz Ant1



7. Band Edge Compliance (Conducted Method)

7.1. Block diagram of test setup

Same as section 4.1

7.2. Limits

In any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

7.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Establish a reference level by using the following procedure:

Center frequency	DTS Channel center frequency
RBW:	100 kHz
VBW:	300 kHz
Span	1.5 times the DTS bandwidth
Detector Mode:	Peak
Sweep time:	auto
Trace mode	Max hold

(3) Allow the trace to stabilize, use the peak marker function to determine the maximum peak power level to establish the reference level.

(4) Set the spectrum analyzer as follows:

RBW:	100 kHz
VBW:	300 kHz
Span	Encompass frequency range to be measured
Number of measurement points	≥span/RBW
Detector Mode:	Peak
Sweep time:	auto
Trace mode	Max hold

(5) Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude of all unwanted emissions outside of the authorized frequency band

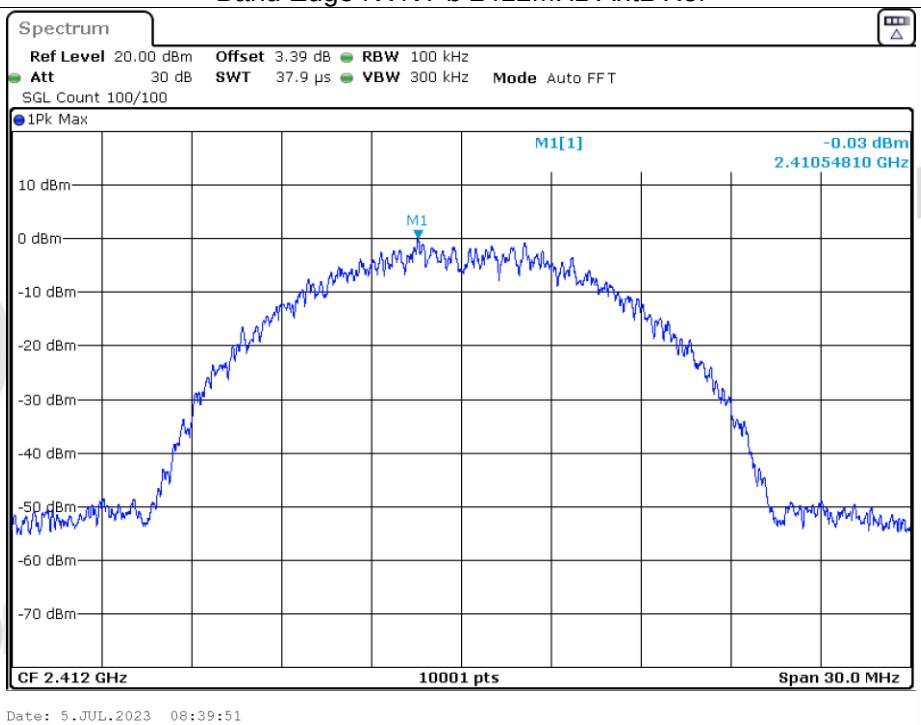
7.4. Test result

EUT Set Mode	CH or Frequency	Result	EUT Set Mode	CH or Frequency	Result
11b	CH1	Pass	11n HT 20	CH1	Pass
	CH11	Pass		CH11	Pass
11g	CH1	Pass	11n HT 40	CH3	Pass
	CH11	Pass		CH9	Pass

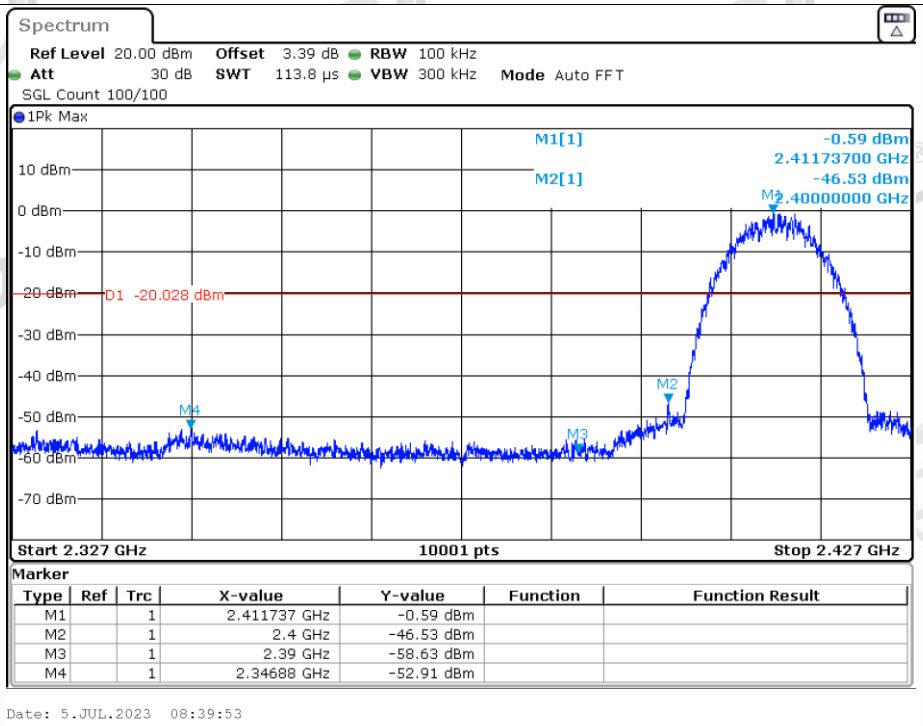
7.5. original test data

Test Graphs

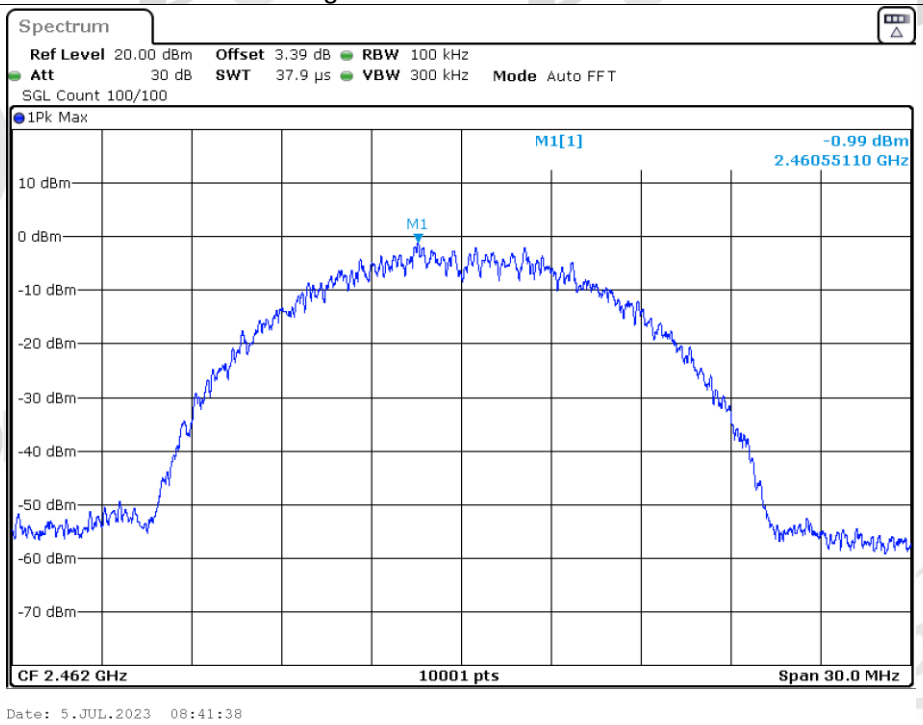
Band Edge NVNT b 2412MHz Ant1 Ref



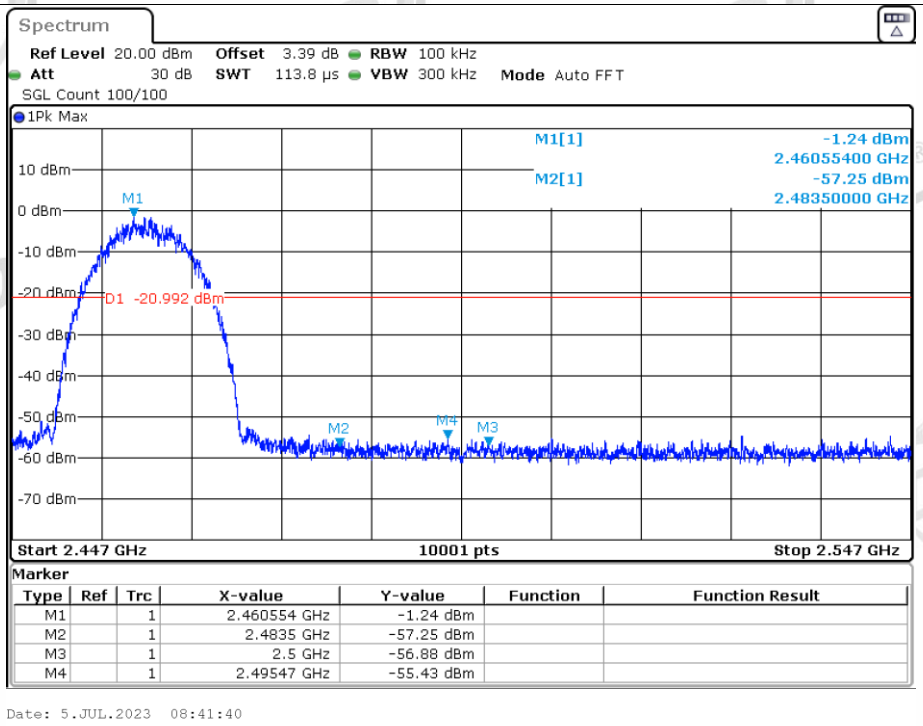
Band Edge NVNT b 2412MHz Ant1 Emission



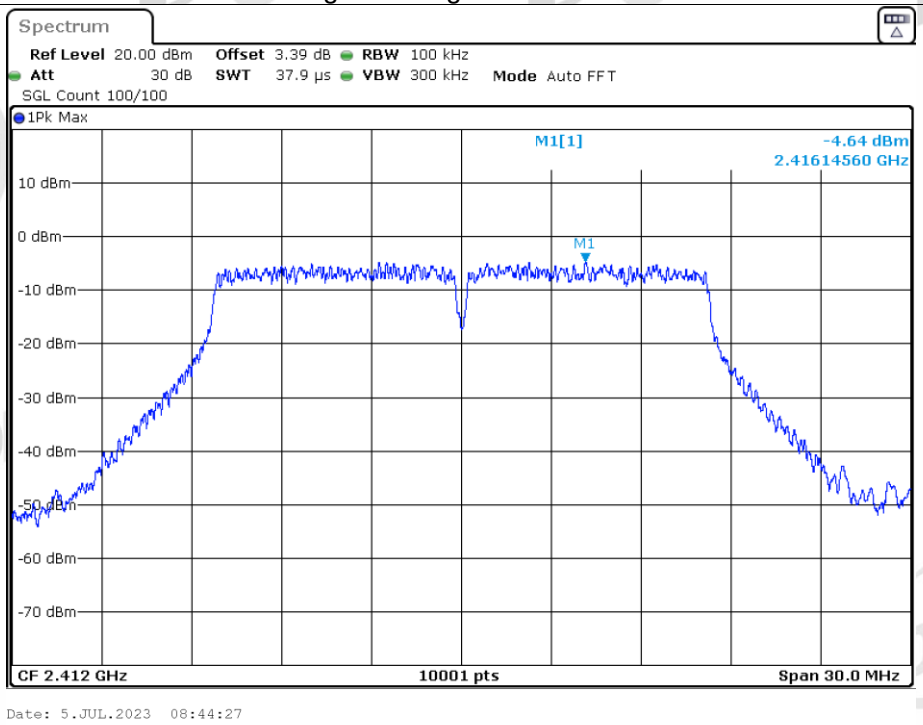
Band Edge NVNT b 2462MHz Ant1 Ref



Band Edge NVNT b 2462MHz Ant1 Emission



Band Edge NVNT g 2412MHz Ant1 Ref



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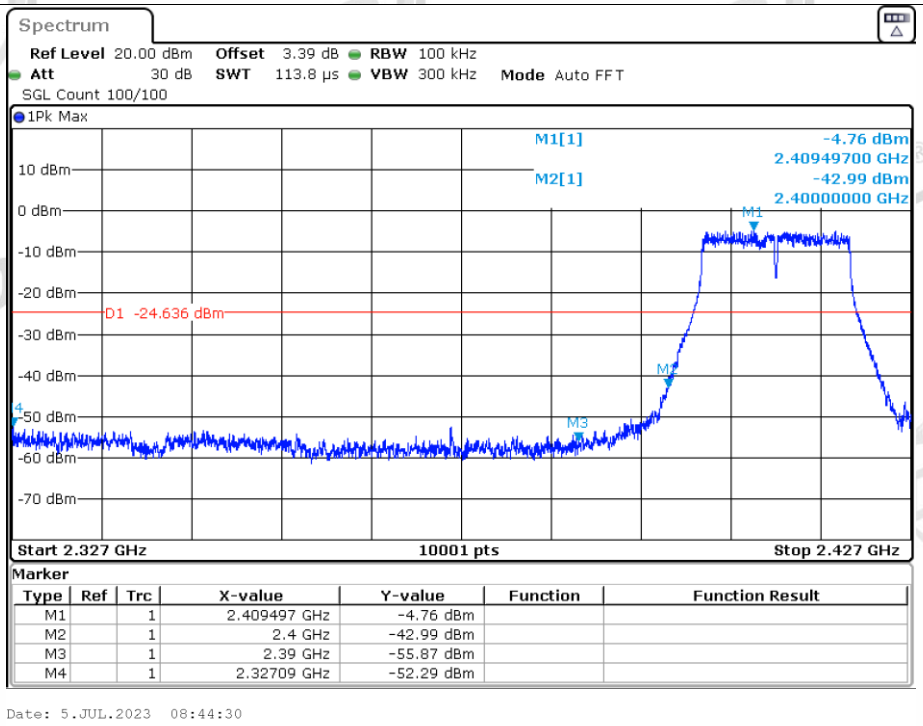

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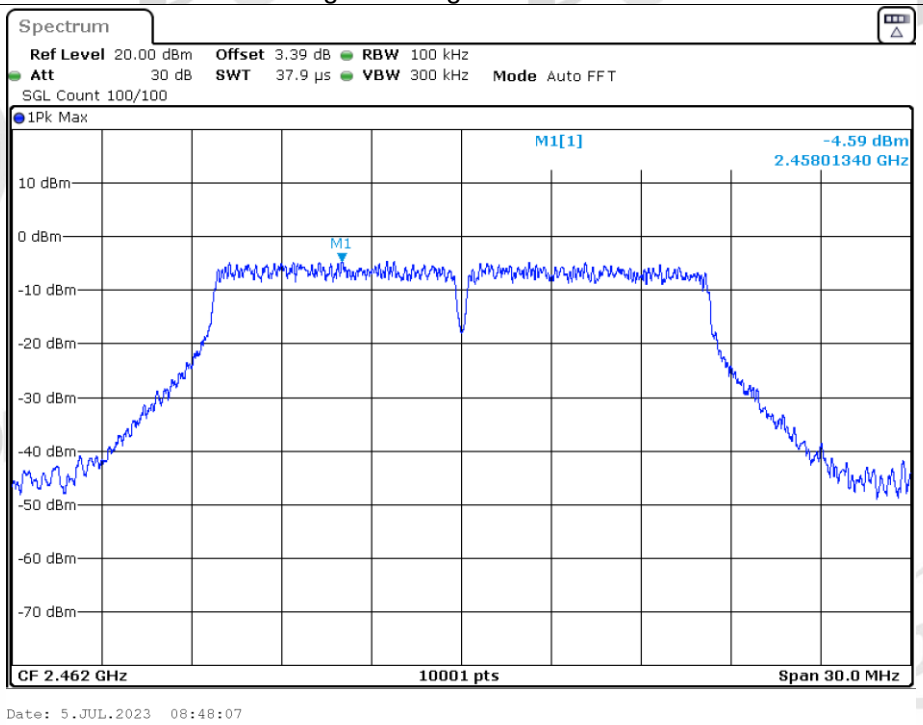
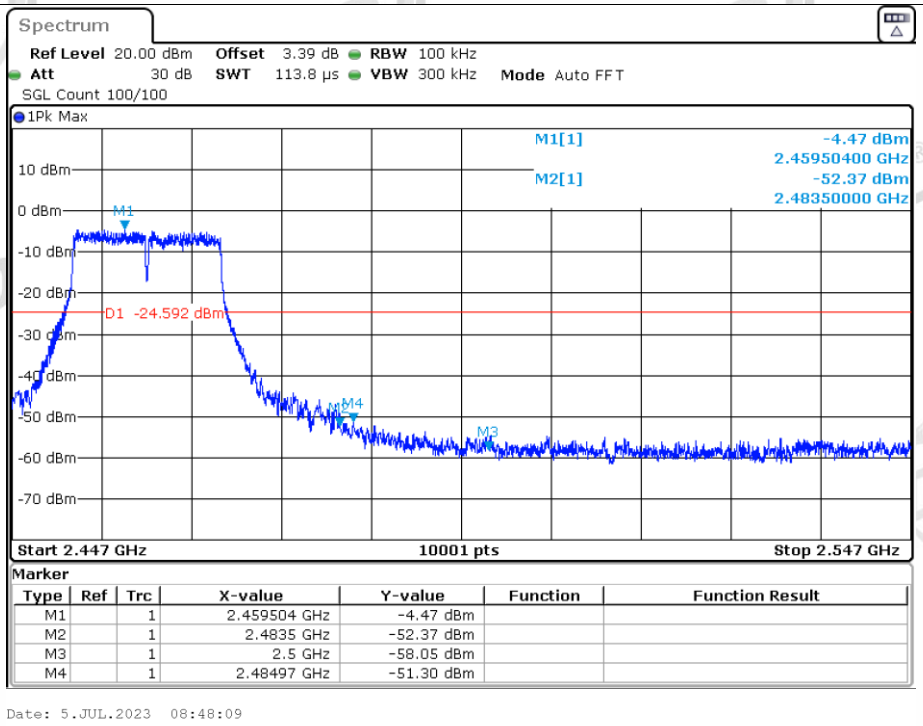
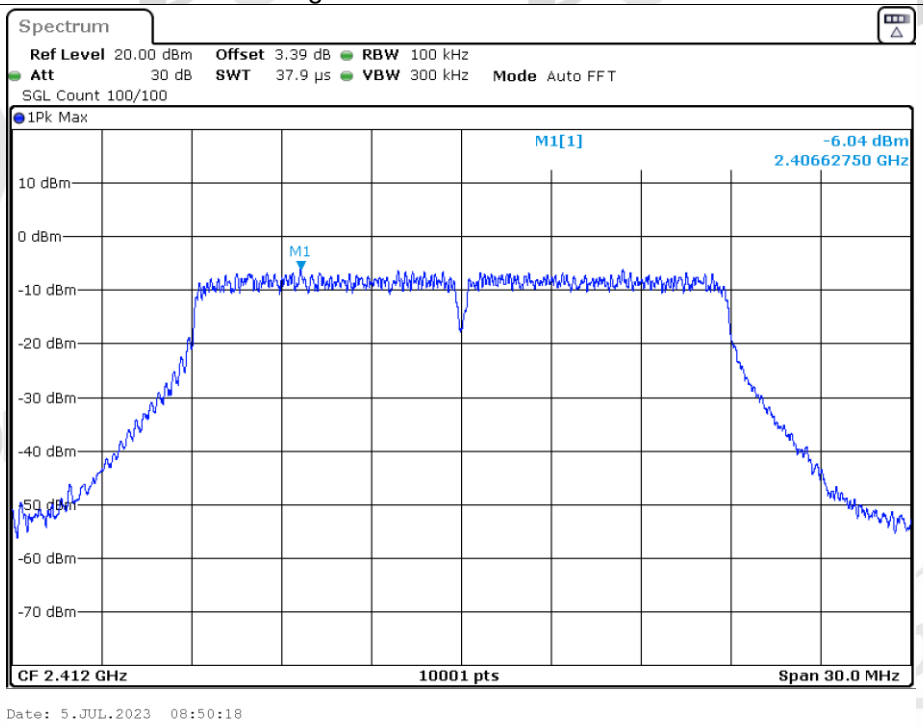


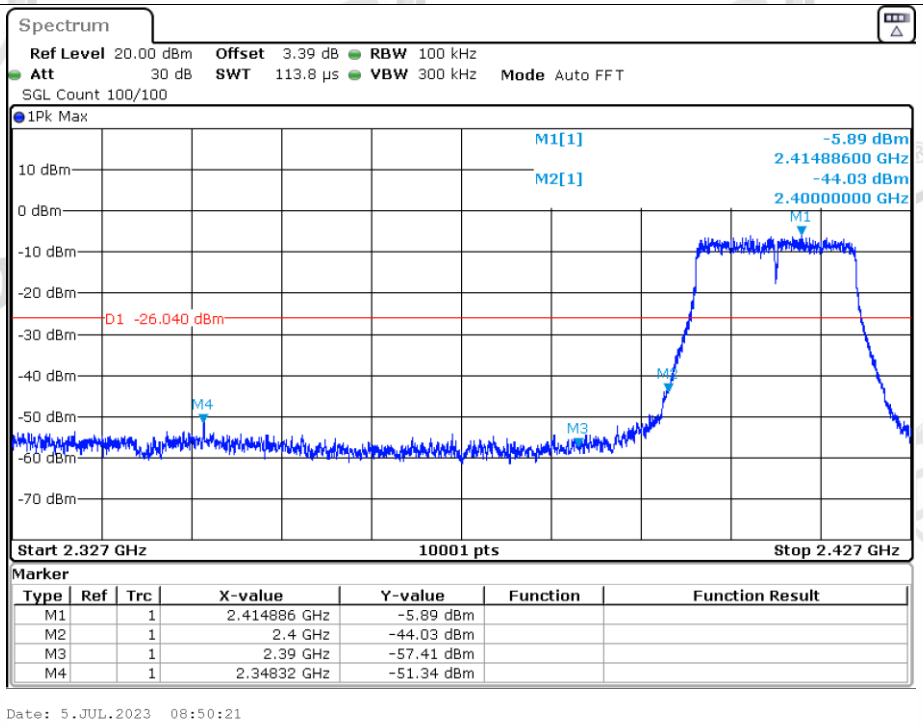
Band Edge NVNT g 2462MHz Ant1 Emission



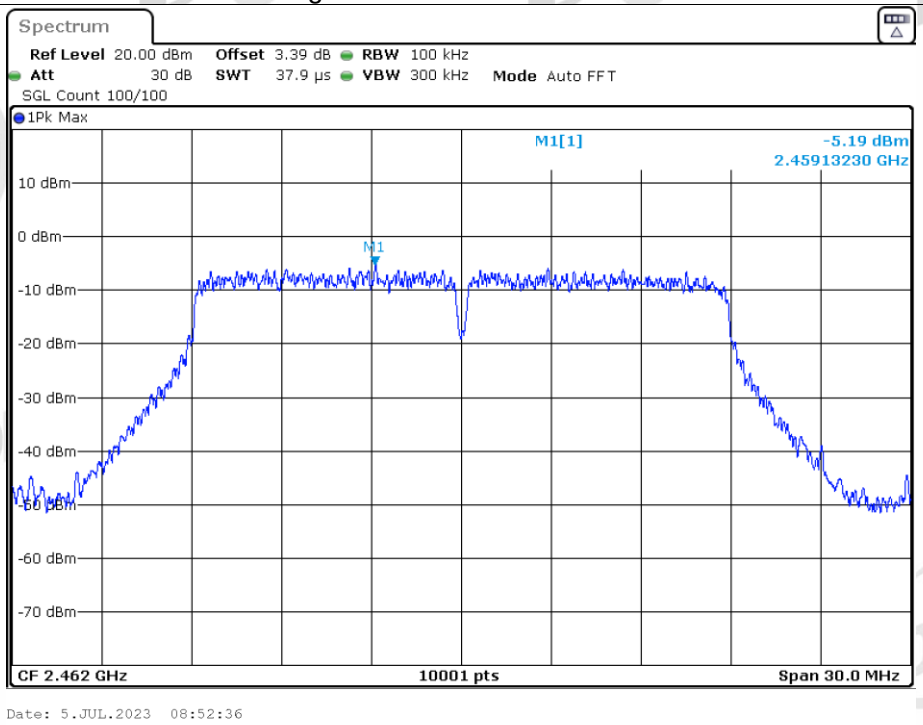
Band Edge NVNT n20 2412MHz Ant1 Ref



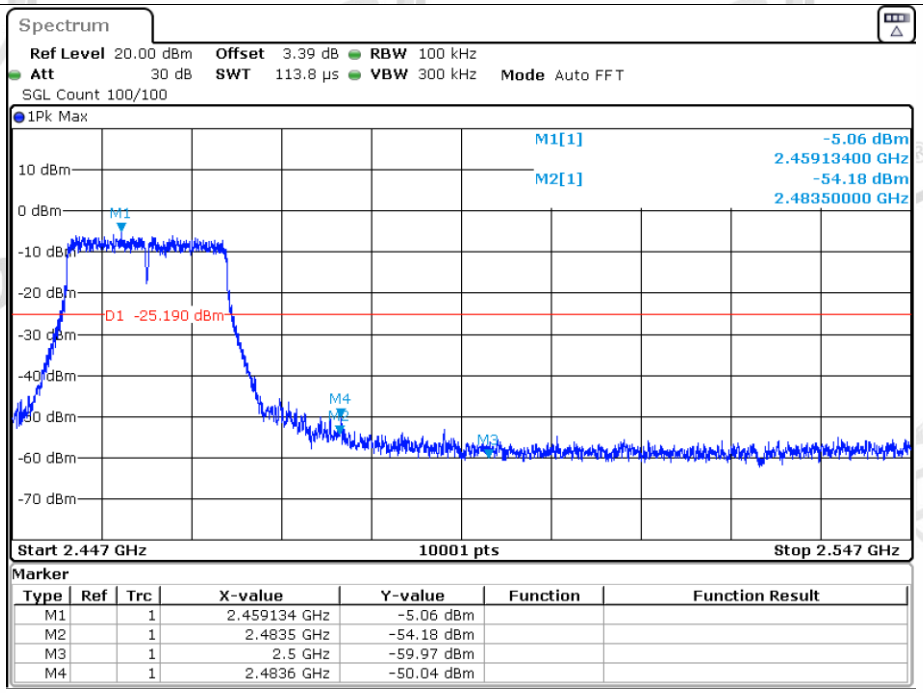
Band Edge NVNT n20 2412MHz Ant1 Emission



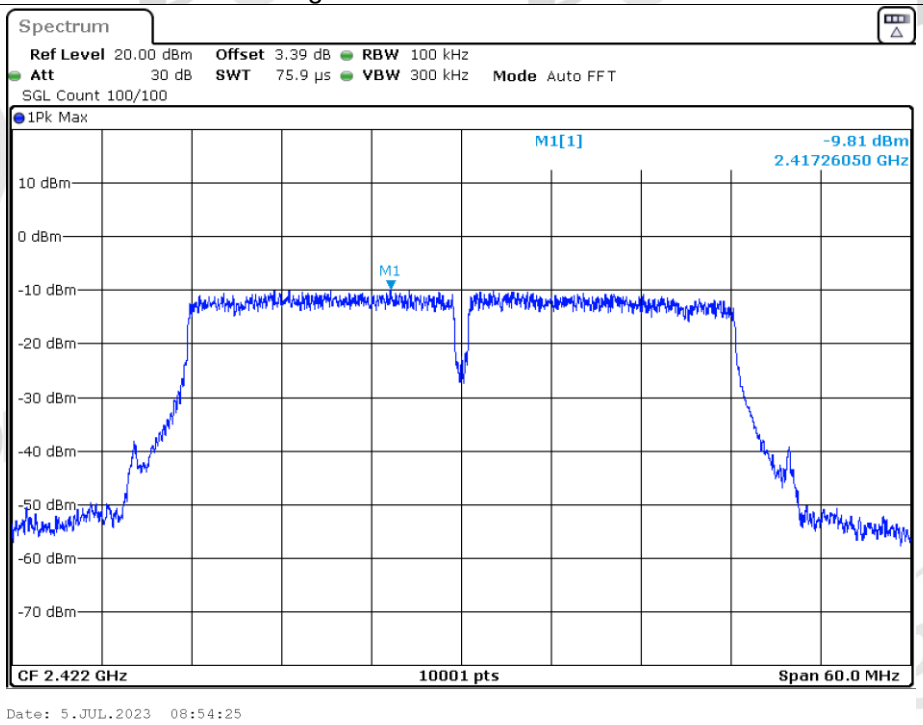
Band Edge NVNT n20 2462MHz Ant1 Ref



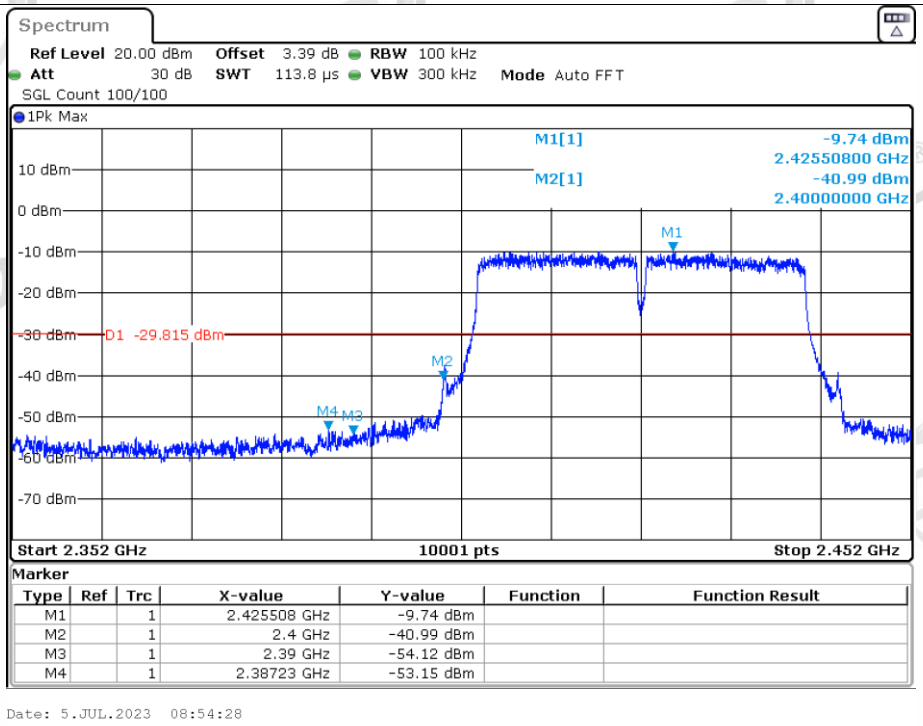
Band Edge NVNT n20 2462MHz Ant1 Emission



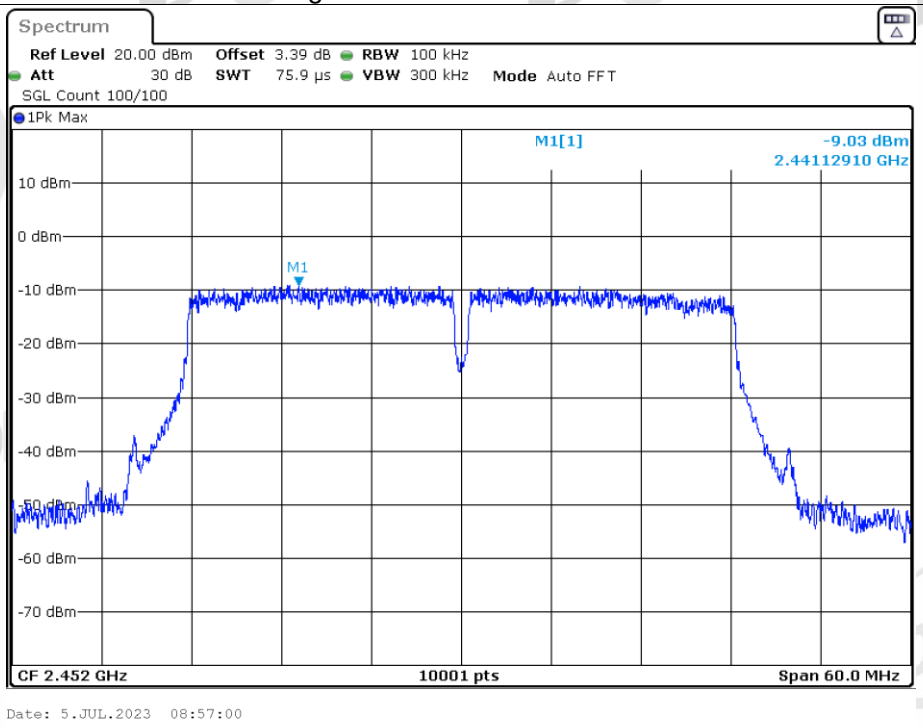
Band Edge NVNT n40 2422MHz Ant1 Ref



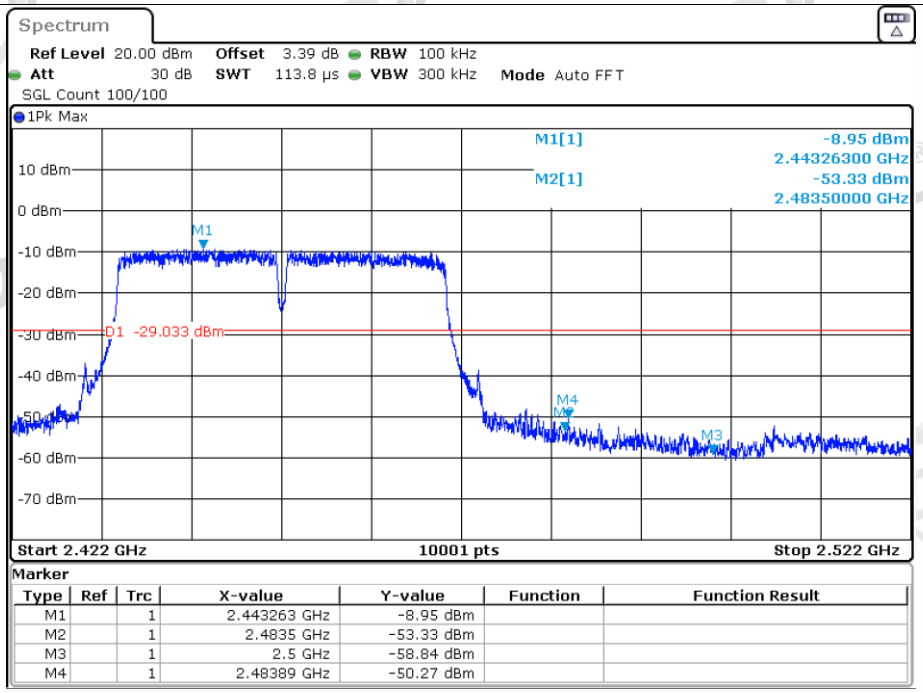
Band Edge NVNT n40 2422MHz Ant1 Emission



Band Edge NVNT n40 2452MHz Ant1 Ref



Band Edge NVNT n40 2452MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.443263 GHz	-8.95 dBm		
M2		1	2.4835 GHz	-53.33 dBm		
M3		1	2.5 GHz	-58.84 dBm		
M4		1	2.48389 GHz	-50.27 dBm		

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