FCC PART 15.247
TEST REPORT

On Behalf of

Shenzhen Growatt New Energy Co., Ltd.

4-13/F. Building A, Sino-German(Europe) Industrial Park, Hangcheng Ave, Bao' an District, Shenzhen, China

FCC ID: 2AAJ9-INFINITY2000

Model: INFINITY 2000

November 15, 2023

This Report Concerns:	Equipment Type:
☒ Original Report	Portable Power Station

Test Engineer:	Fan Yang /
Report Number:	**QCT23JR-2127E-02**
Test Date:	November 6~15, 2023
Reviewed By:	Gordon Tan/
Approved By:	Kendy Wang /
Prepared By:	**Shenzhen QC Testing Laboratory Co., Ltd.** East of 1/F., Building E, Xinghong Science Park, No.111, Shuiku Road, Fenghuanggang, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China **Tel: 0755-23008269** **Fax: 0755-23726780**

Address: East of 1/F., Building E, Xinghong Science Park, No.111, Shuiku Road, Fenghuanggang, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China
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Revision History of This Test Report

Report Number	Description	Issued Date
QCT23JR-2127E-02	Initial Issue	2023-11-15

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1. GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

EUT Description	Portable Power Station
Model No.	INFINITY 2000
Tested Model	INFINITY 2000
Serial No.:	ONAN00R23XD0000F
Hardware version:	PPSL00.0002500
Software version:	2002-02 20231110_A (LV)
Sample(s) Status	Engineer sample
Operation Frequency:	802.11b/802.11g/802.11n(HT20): 2412MHz~2462MHz 802.11n(HT40): 2422MHz~2452MHz
Channel numbers:	802.11b/802.11g /802.11n(HT20): 11 802.11n(HT40):7
Channel separation:	5MHz
Modulation type:	802.11b: Direct Sequence Spread Spectrum (DSSS) 802.11g/802.11n(HT20)/802.11n(HT40): Orthogonal Frequency Division Multiplexing (OFDM)
Antenna Type:	PCB Print Antenna
Antenna gain:	2.15dBi*1
Power supply:	Input: AC Input:100-120V~,50/60Hz, 1800W Max. Vehicle Input:12-24V ⎓ , 8A Max. Solar Input:12-60V ⎓ , 1200W Max. Battery Capacity: 2048Wh,51.2V
Trade Mark:	GROWATT
Applicant	Shenzhen Growatt New Energy Co., Ltd.
Address	4-13/F. Building A, Sino-German(Europe) Industrial Park, Hangcheng Ave, Bao' an District, Shenzhen, China
Manufacturer	Shenzhen Growatt New Energy Co., Ltd.
Address	4-13/F. Building A, Sino-German(Europe) Industrial Park, Hangcheng Ave, Bao' an District, Shenzhen, China
Sample No.	Y23J2127E01WC

Note: *1This information provided by Manufacturer, SZ QC Lab is not responsible for the accuracy of this information.

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1.2 System Test Configuration

1.2.1 Channel List

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2412MHz	4	2427MHz	7	2442MHz	10	2457MHz
2	2417MHz	5	2432MHz	8	2447MHz	11	2462MHz
3	2422MHz	6	2437MHz	9	2452MHz		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Test channel	Frequency (MHz)	
	802.11b/802.11g/802.11n(HT20)	802.11n(HT40)
Lowest channel	2412MHz	2422MHz
Middle channel	2437MHz	2437MHz
Highest channel	2462MHz	2452MHz

1.2.2 EUT Exercise Software

The device was tested with the worst case was performed as below:

Test Mode	Data Rate	Power Level
802.11b	1Mbps	15
802.11g	6Mbps	15
802.11n(HT20)	MCS0	15
802.11n(HT40)	MCS0	15

"EspRFTestTool_v2.8_Manual" exercise software was made to the EUT tested. The software and power level was provided by the applicant.

1.2.3 Support Equipment

Manufacturer	Description	Model	Serial Number
/	/	/	/

1.2.4 Test mode and voltage

Transmitting mode: Keep the EUT in continuously transmitting.

Test voltage: AC 120V/60Hz

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1.3 Test Facility

Test Firm : Shenzhen QC Testing Laboratory Co., Ltd.

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19. The testing quality system of our laboratory meets with ISO/IEC-17025 requirements. This approval result is accepted by MRA of APLAC.

Our test facility is recognized, certified, or accredited by the following organizations:

CNAS – Registration No.: L8464

The EMC Laboratory has been accredited by CNAS, and in compliance with ISO/IEC 17025:2017 General Requirements for testing Laboratories.

A2LA Certificate Number: 6759.01

The EMC Laboratory has been accredited by A2LA, and in compliance with ISO/IEC 17025:2017 General Requirements for testing Laboratories.

FCC Registration Number: 561109

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission.

IC Registration Number: 29628

CAB identifier: CN0141

The EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada.

1.4 Measurement Uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	±1.42 x10^{-4}%
RF output power, conducted	±1.06dB
Power Spectral Density, conducted	±1.06dB
Unwanted Emissions, conducted	±2.51dB
AC Power Line Conducted Emission	±1.80dB
Radiated Spurious Emission test (9kHz-30MHz)	±2.66dB
Radiated Spurious Emission test (30MHz-1000MHz)	±4.04dB
Radiated Spurious Emission test (1000MHz-18000MHz)	±4.70 dB
Radiated Spurious Emission test (18GHz-40GHz)	±4.80dB
Temperature	±0.8℃
Humidity	±3.2%
DC and low frequency voltages	±0.1%
Time	±5%
Duty cycle	±5%

Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2

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2. Summary of Test Results

Test Item	Section	Result
Antenna Requirement	FCC part 15.203/15.247 (c)	Pass
AC Power Line Conducted Emission	FCC part 15.207	Pass
Conducted Peak Output Power	FCC part 15.247 (b)(3)	Pass
Channel Bandwidth & 99% Occupied Bandwidth	FCC part 15.247 (a)(2)	Pass
Power Spectral Density	FCC part 15.247 (e)	Pass
Band Edge	FCC part 15.247(d)	Pass
Spurious Emissions	FCC part 15.205/15.209	Pass

Note: 1. Pass: The EUT complies with the essential requirements in the standard.

2.Test according to ANSI C63.10:2013

3.. All indications of Pass/Fail in this report are opinions expressed by Shenzhen QC Testing Laboratory Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.

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3. List of Test and Measurement Instruments

3.1 Conducted Emission Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due
1	EMI Test Receiver	R&S	ESIB 7	2277573376	2023.03.21	2024.03.20
2	Artificial Mains Network	SCHWARZBECK	NSLK8126	8126200	2023.03.21	2024.03.20
3	PULSE LIMITER	R&S	ESH3-Z2	100058	2023.03.21	2024.03.20
4	EMITEST RECEIVER	ROHDE & SCHWARZ	ESCS30	834115/014	2023.03.21	2024.03.20
Conducted Emission Measurement Software: TS						

3.2 Radiated Emission Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due
1.	Spectrum Analyzer	ROHDE&SCHWARZ	FSV 40	101458	2023.04.12	2024.04.11
2.	Loop Antenna	EMCO	6502	2133	2022.07.23	2024.07.22
3.	Logarithmic compound broadband Antenna	SCKWARZBECK	VULB9168	VULB9168-1-588	2023.04.01	2025.03.31
4.	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB 7	2277573376	2023.04.12	2024.04.11
5.	EMI Test Receiver	R&S	ESPI	101131	2023.03.21	2024.03.20
6.	Horn Antenna	SCHWARZBECK	BBHA9120D	02069	2023.04.01	2025.03.31
7.	Horn Antenna	COM-MW	ZLB7-18-40G -950	12221225	2023.01.12	2025.01.09
8.	Amplifier	R&S	BBV9721	9721-031	2023.03.21	2024.03.20
9.	Amplifier	HPX	BP-01G-18G	210902	2023.03.21	2024.03.20
10.	Pre-amplifier	COM-MW	DLAN-18000 -40000-02	10229104	2023.01.11	2024.01.10
11.	966 Chamber	ZhongYu Electron	9*6*6	/	2022.07.25	2025.07.24
Radiated Emission Measurement Software: EZ_EMC						

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3.3 RF Conducted test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due
1.	Wideband Radio Communication Tester	Rohde & Schwarz	CW500	151583	2023.03.21	2024.03.20
2.	Spectrum Analyzer	ROHDE& SCHWARZ	FSV 40	101458	2023.04.12	2024.04.11
3.	Signal Generator	Agilent	N5182A	MY50141563	2023.03.21	2024.03.20
4.	RF Automatic Test System	MW	MW100-RFCB/ MW100-PSB	MW2007004	2023.03.21	2024.03.20
RF Conducted Measurement Software: MTS 8310						

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4. Antenna requirement

Standard requirement: FCC Part15 C Section 15.203 /247(c)

15.203 requirement:
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(c) (1)(i) requirement:
(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

EUT Antenna: The Ant is PCB Print Antenna, the best case gain of the antenna is 2.15dBi, reference to the Internal photo for details.

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5. Conducted Emissions

5.1 Applicable Standard

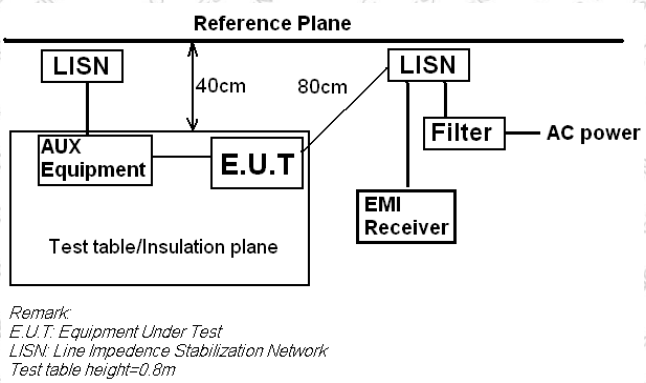
FCC Part15 C Section 15.207

5.2 Limit

Frequency range (MHz)	Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

Note *: The level decreases linearly with the logarithm of the frequency.

5.3 Test setup



Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m

5.4 EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.
RBW=9 kHz, VBW=30 kHz, Sweep time=auto

5.5 Test procedure

1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.
2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).
3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

5.6 Test Data

Temperature	23.5 ℃	Humidity	48%
ATM Pressure	101.1kPa	Antenna Gain	2.15dBi
Test by	Fan Yang	Test result	PASS

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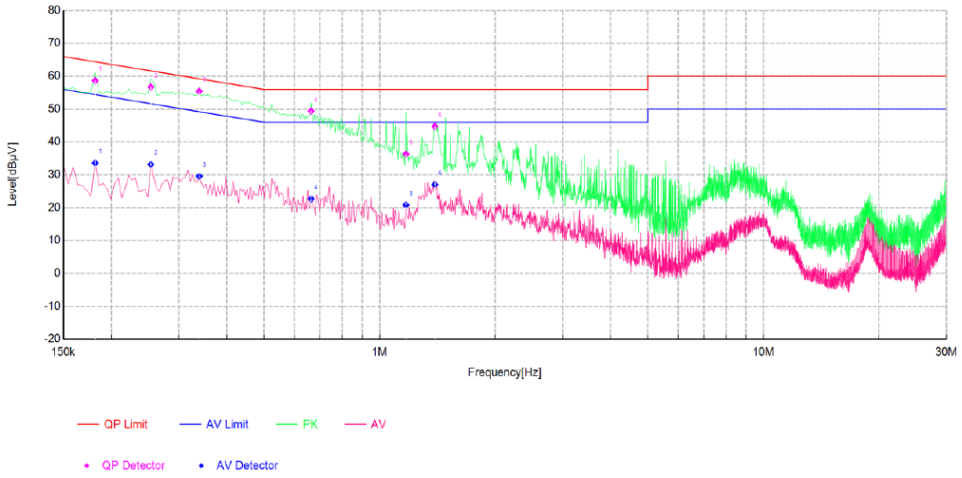
Measurement data:

Pre-scan all test modes, found worst case at 802.11b mode 2412MHz, and so only show the test result of 802.11b mode 2412MHz

Line:



Final Data List

NO.	Freq. [MHz]	Factor[dB]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Phase	Verdict
1	0.1815	10.17	58.67	64.42	5.75	33.59	54.42	20.83	L	PASS
2	0.2535	10.41	56.73	61.64	4.91	33.20	51.64	18.44	L	PASS
3	0.339	10.34	55.45	59.23	3.78	29.57	49.23	19.66	L	PASS
4	0.663	10.23	49.43	56.00	6.57	22.71	46.00	23.29	L	PASS
5	1.1715	10.04	36.31	56.00	19.69	20.82	46.00	25.18	L	PASS
6	1.392	10.07	44.76	56.00	11.24	27.02	46.00	18.98	L	PASS

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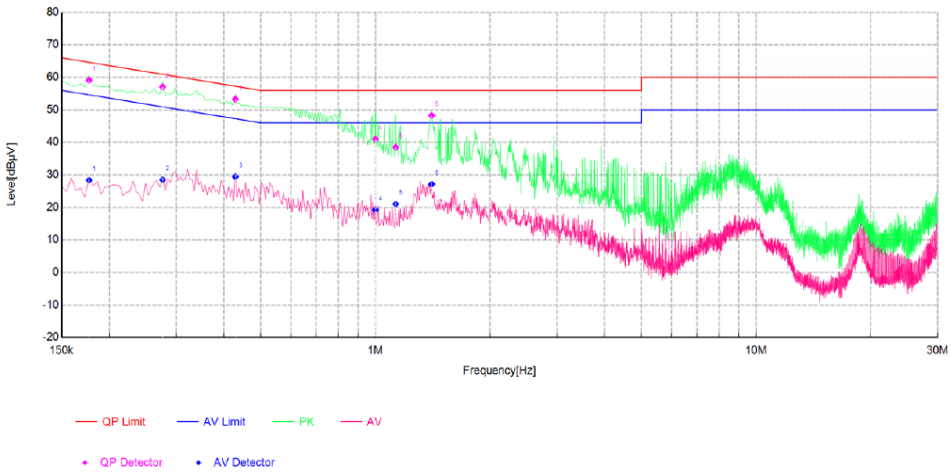
Neutral:



Final Data List										
NO.	Freq. [MHz]	Factor[dB]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Phase	Verdict
1	0.177	10.16	59.11	64.63	5.52	28.40	54.63	26.23	N	PASS
2	0.276	10.43	57.07	60.94	3.87	28.50	50.94	22.44	N	PASS
3	0.429	10.38	53.27	57.27	4.00	29.44	47.27	17.83	N	PASS
4	1.0005	9.92	41.01	56.00	14.99	19.26	46.00	26.74	N	PASS
5	1.131	9.96	38.48	56.00	17.52	21.04	46.00	24.96	N	PASS
6	1.4055	10.03	48.29	56.00	7.71	27.15	46.00	18.85	N	PASS

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.

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6. Conducted Peak Output Power

6.1 Applicable Standard

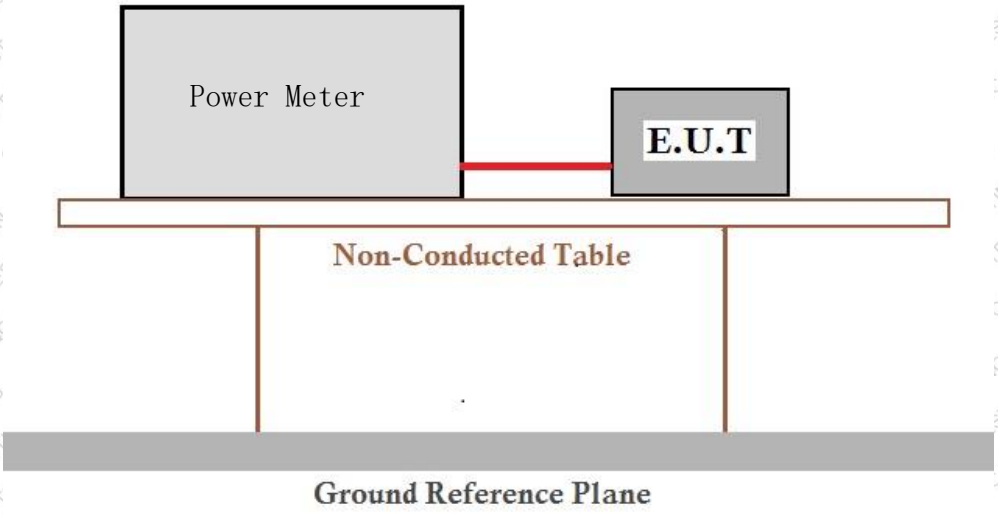
FCC Part15 C Section 15.247 (b)(3)

6.2 Limit

According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmit power delivered to all antennas and antenna elements, averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.

6.3 Test setup



6.4 Test Data

Temperature	23.5 ℃	Humidity	48%
ATM Pressure	101.1kPa	Antenna Gain	2.15dBi
Test by	Fan Yang	Test result	PASS

Please refer to following table and plots.

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Output Power:

Modulation	CH No.	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Verdict
802.11b	01	2412	16.08	≤30	PASS
	06	2437	16.18	≤30	PASS
	11	2462	17.15	≤30	PASS
802.11g	01	2412	16.36	≤30	PASS
	06	2437	16.85	≤30	PASS
	11	2462	17.55	≤30	PASS
802.11 n(HT20)	01	2412	15.56	≤30	PASS
	06	2437	15.59	≤30	PASS
	11	2462	16.5	≤30	PASS
802.11 n(HT40)	03	2422	14.76	≤30	PASS
	06	2437	14.88	≤30	PASS
	09	2452	15.33	≤30	PASS

E.I.R.P.:

Modulation	CH No.	Frequency (MHz)	Output Power (dBm)	e.i.r.p (dBm)	Limit (dBm)	Verdict
802.11b	01	2412	16.08	18.23	≤36	PASS
	06	2437	16.18	18.33	≤36	PASS
	11	2462	17.15	19.3	≤36	PASS
802.11g	01	2412	16.36	18.51	≤36	PASS
	06	2437	16.85	19	≤36	PASS
	11	2462	17.55	19.7	≤36	PASS
802.11 n(HT20)	01	2412	15.56	17.71	≤36	PASS
	06	2437	15.59	17.74	≤36	PASS
	11	2462	16.5	18.65	≤36	PASS
802.11 n(HT40)	03	2422	14.76	16.91	≤36	PASS
	06	2437	14.88	17.03	≤36	PASS
	09	2452	15.33	17.48	≤36	PASS

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7. Channel Bandwidth & 99% Occupied Bandwidth

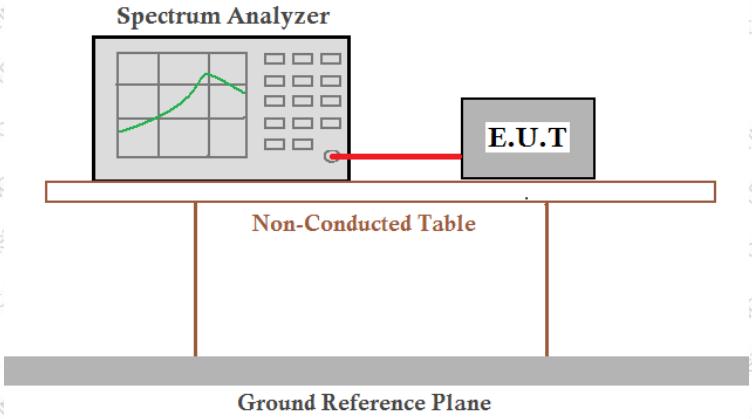
7.1 Applicable Standard

FCC Part15 C Section 15.247 (a)(2)

7.2 Limit

The minimum 6 dB bandwidth shall be 500 kHz.

7.3 Test setup



7.4 Test Procedure

The following conditions shall be observed for measuring the occupied bandwidth and x dB bandwidth:

• The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

• The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.

• The detector of the spectrum analyzer shall be set to “Sample”. However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or “Max Hold”) may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.

• The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

7.5 Test Data

Temperature	23.5 ℃	Humidity	48%
ATM Pressure	101.1kPa	Antenna Gain	2.15dBi
Test by	Fan Yang	Test result	PASS

Please refer to following table and plots.

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DTS Bandwidth:

Modulation	CH No.	Frequency (MHz)	DTS Bandwidth (MHz)	Limit (MHz)	Verdict
802.11b	01	2412	9.048	0.5	PASS
	06	2437	9.54	0.5	PASS
	11	2462	9.546	0.5	PASS
802.11g	01	2412	16.332	0.5	PASS
	06	2437	16.332	0.5	PASS
	11	2462	16.368	0.5	PASS
802.11 n(HT20)	01	2412	16.902	0.5	PASS
	06	2437	16.788	0.5	PASS
	11	2462	16.893	0.5	PASS
802.11 n(HT40)	03	2422	34.392	0.5	PASS
	06	2437	34.464	0.5	PASS
	09	2452	34.59	0.5	PASS

99% Occupied Bandwidth:

Modulation	CH No.	Frequency (MHz)	99% Bandwidth (MHz)	Limit (MHz)	Verdict
802.11b	01	2412	12.995	---	PASS
	06	2437	12.95	---	PASS
	11	2462	12.896	---	PASS
802.11g	01	2412	16.438	---	PASS
	06	2437	16.42	---	PASS
	11	2462	16.432	---	PASS
802.11 n(HT20)	01	2412	17.308	---	PASS
	06	2437	17.308	---	PASS
	11	2462	17.302	---	PASS
802.11 n(HT40)	03	2422	35.87	---	PASS
	06	2437	35.84	---	PASS
	09	2452	35.816	---	PASS

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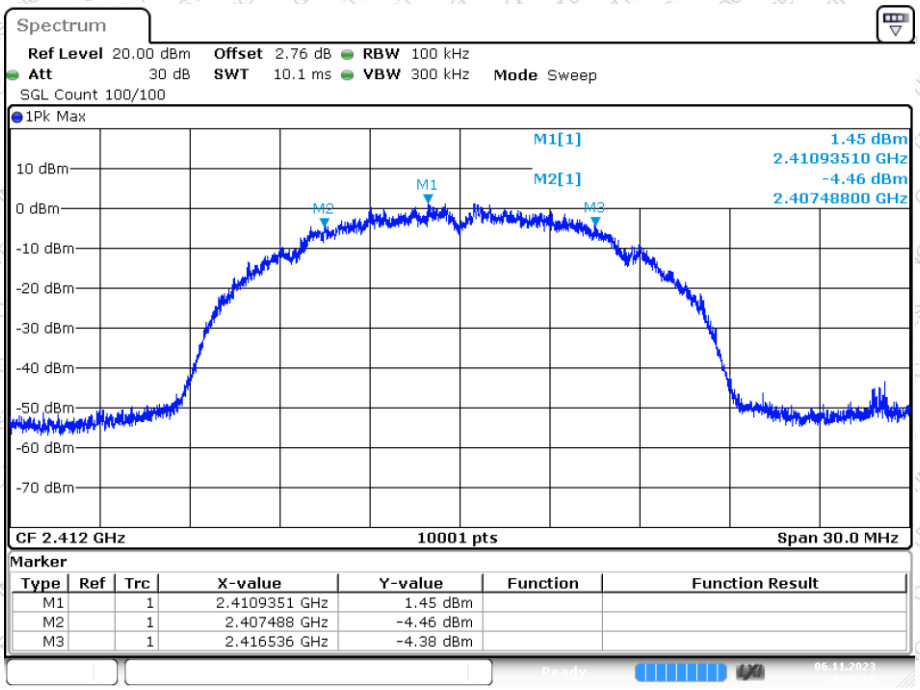
-6dB Bandwidth NVNT b 2412MHz Ant1



Date: 6.NOV.2023 10:09:19

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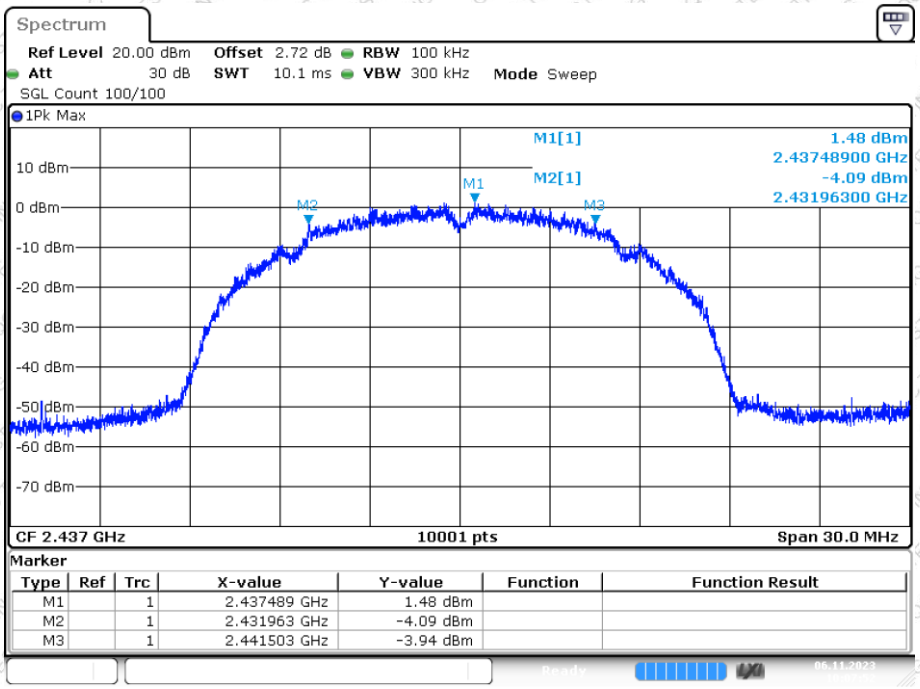

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Address: East of 1/F., Building E, Xinghong Science Park, No.111, Shuiku Road, Fenghuanggang, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China
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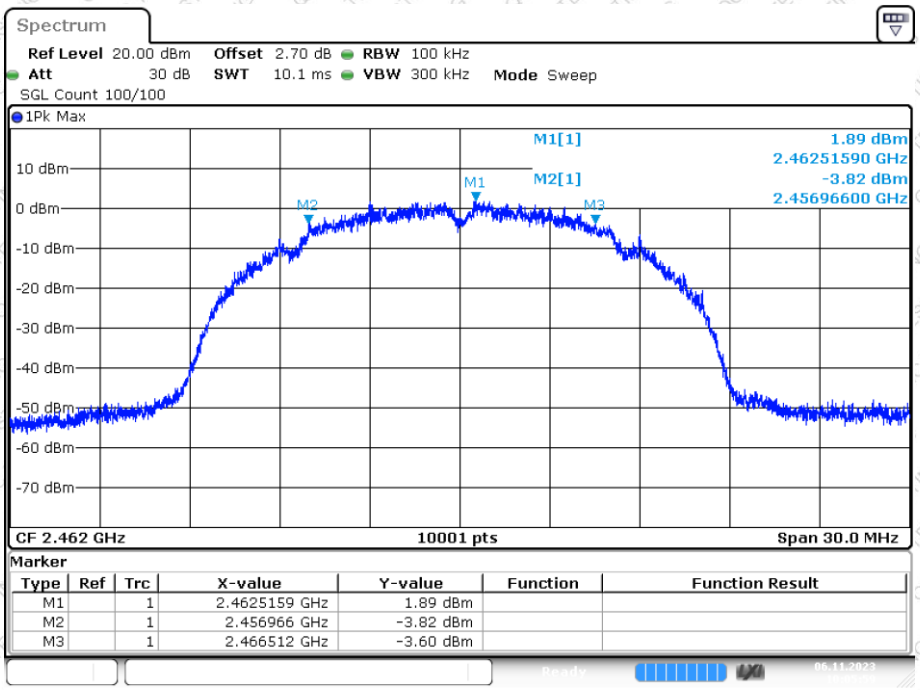
-6dB Bandwidth NVNT b 2462MHz Ant1



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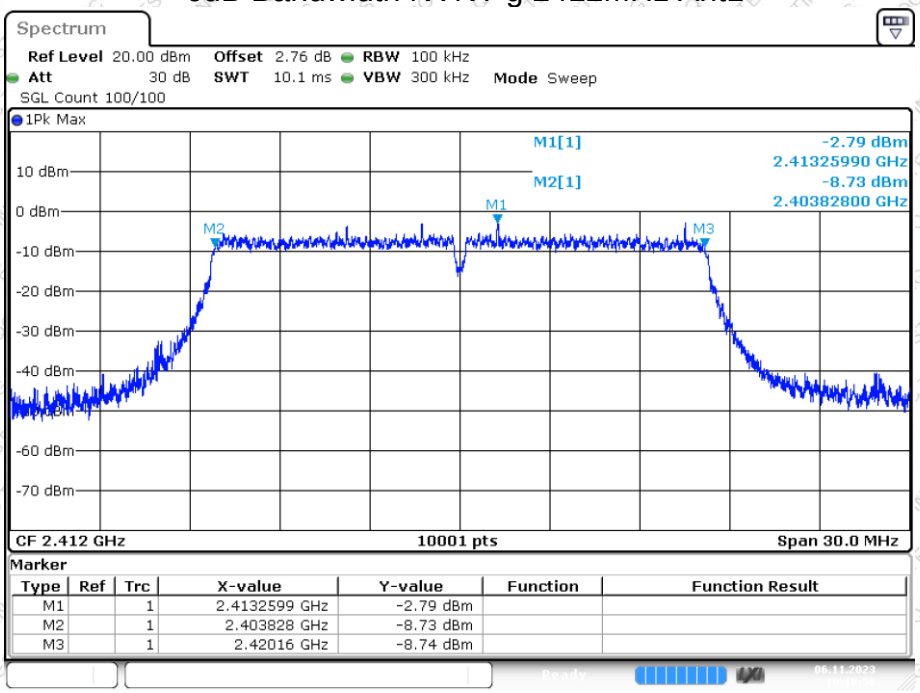
-6dB Bandwidth NVNT g 2412MHz Ant1



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Address: East of 1/F., Building E, Xinghong Science Park, No.111, Shuiku Road, Fenghuanggang, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China
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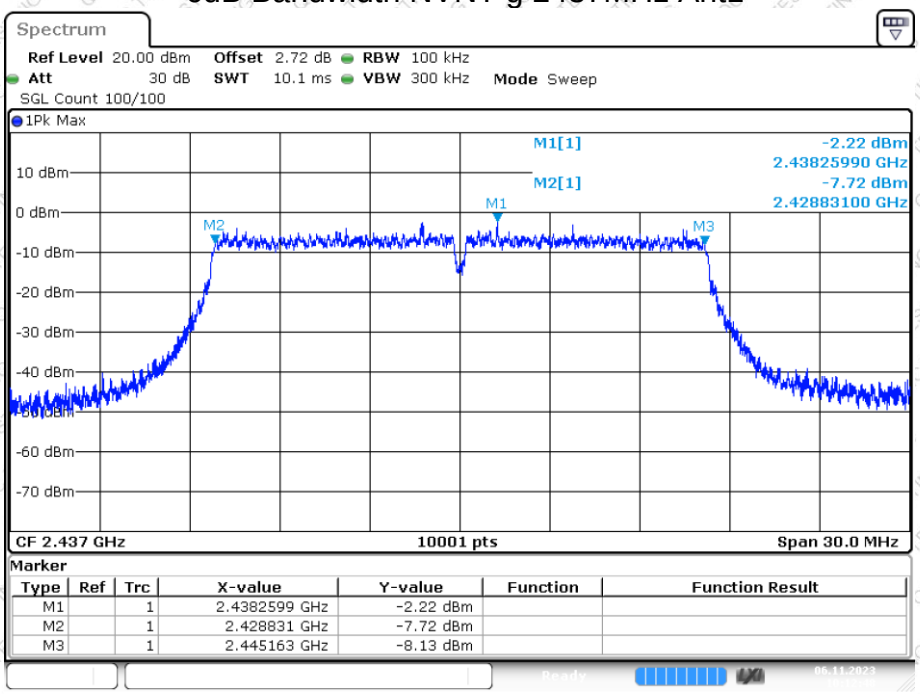
-6dB Bandwidth NVNT g 2437MHz Ant1



Date: 6.NOV.2023 10:12:49

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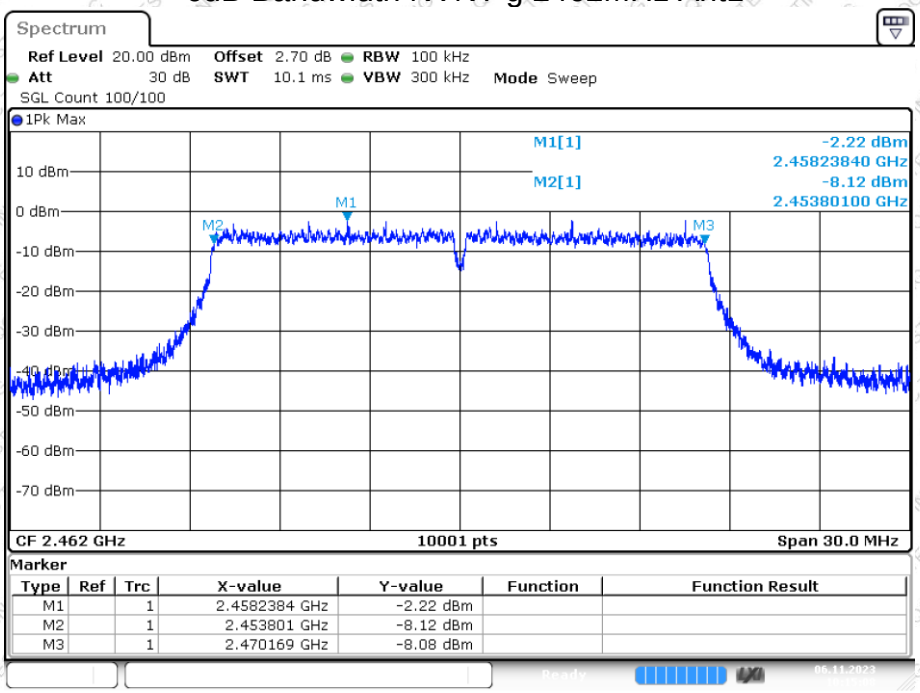

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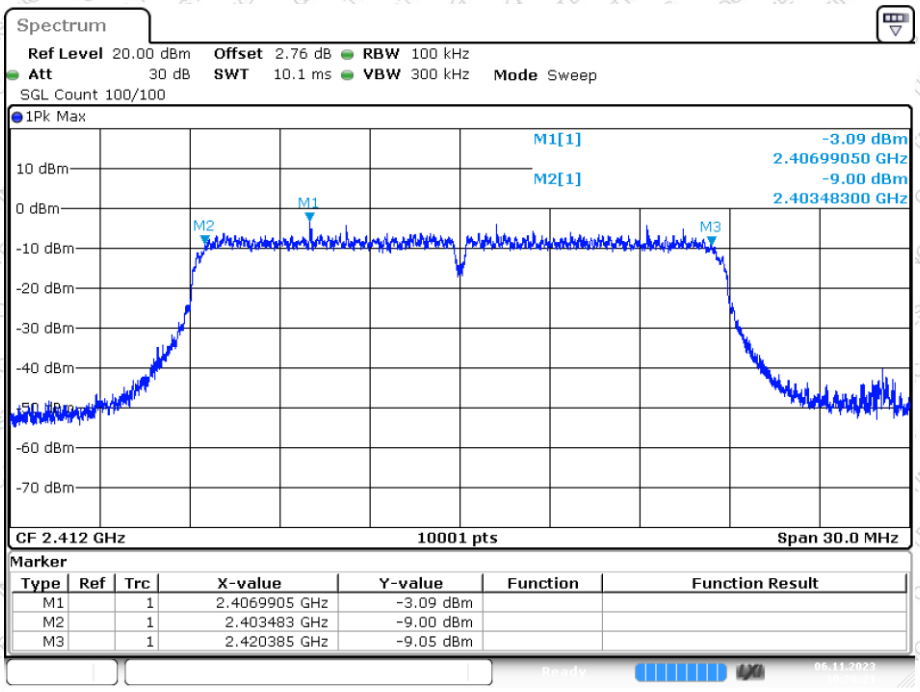
-6dB Bandwidth NVNT n20 2412MHz Ant1



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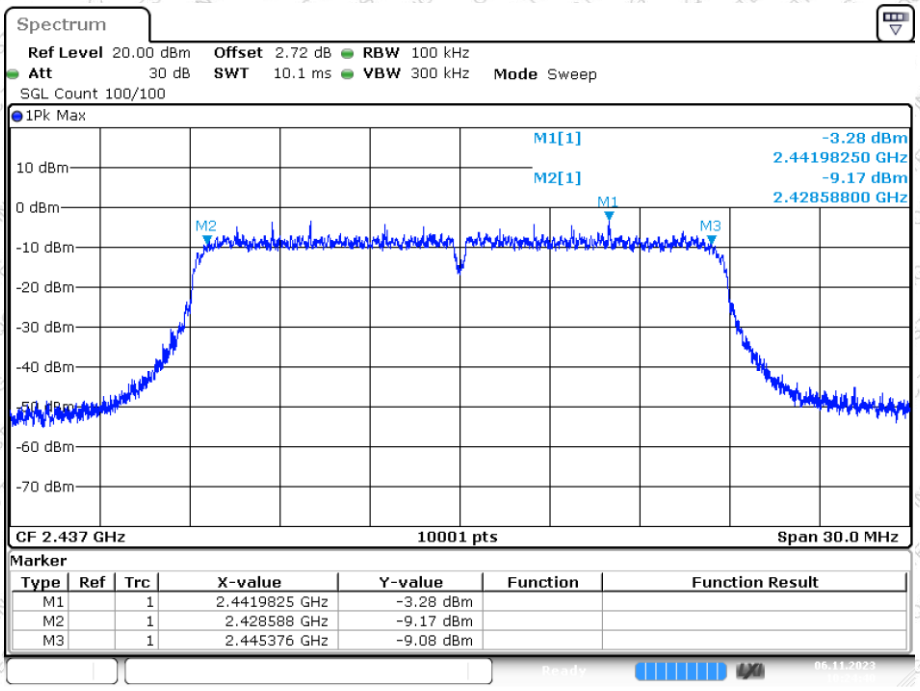

Date: 6.NOV.2023 10:24:41

Address: East of 1/F., Building E, Xinghong Science Park, No.111, Shuiku Road, Fenghuanggang, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China
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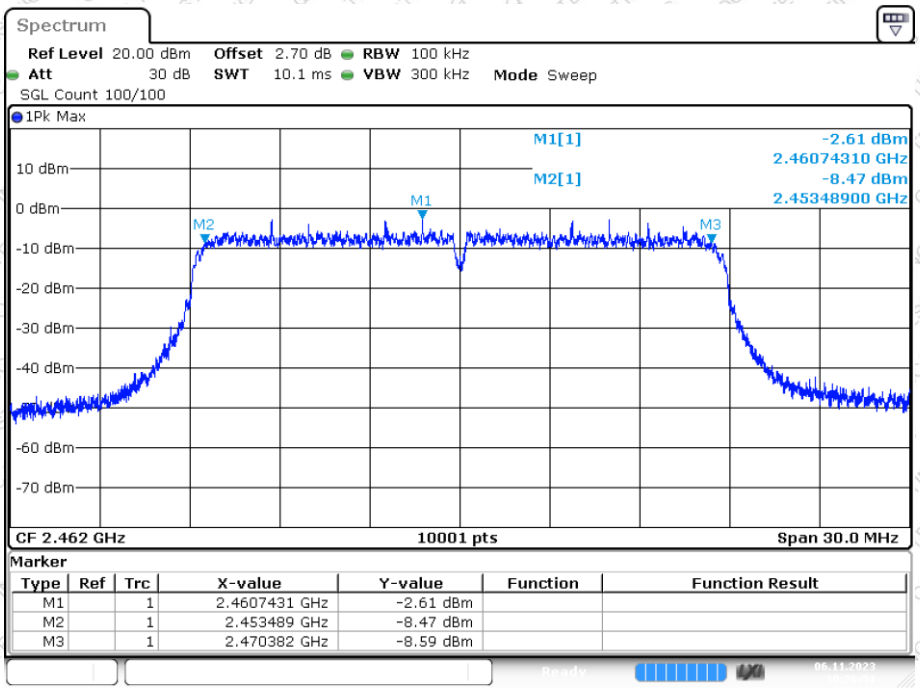
-6dB Bandwidth NVNT n20 2462MHz Ant1



Date: 6.NOV.2023 10:26:52

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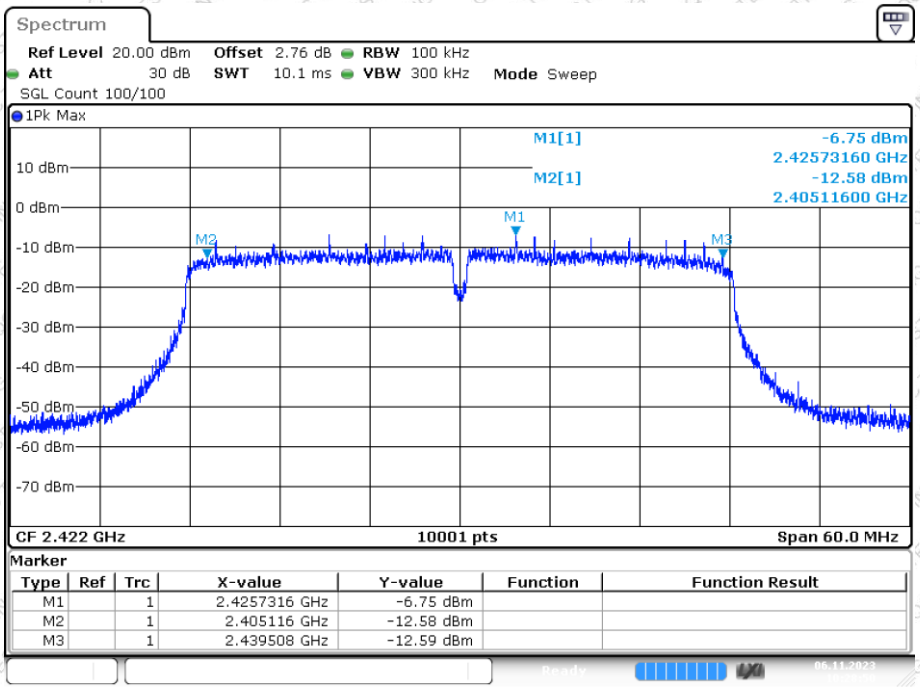

Date: 6.NOV.2023 10:28:49

Address: East of 1/F., Building E, Xinghong Science Park, No.111, Shuiku Road, Fenghuanggang, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China
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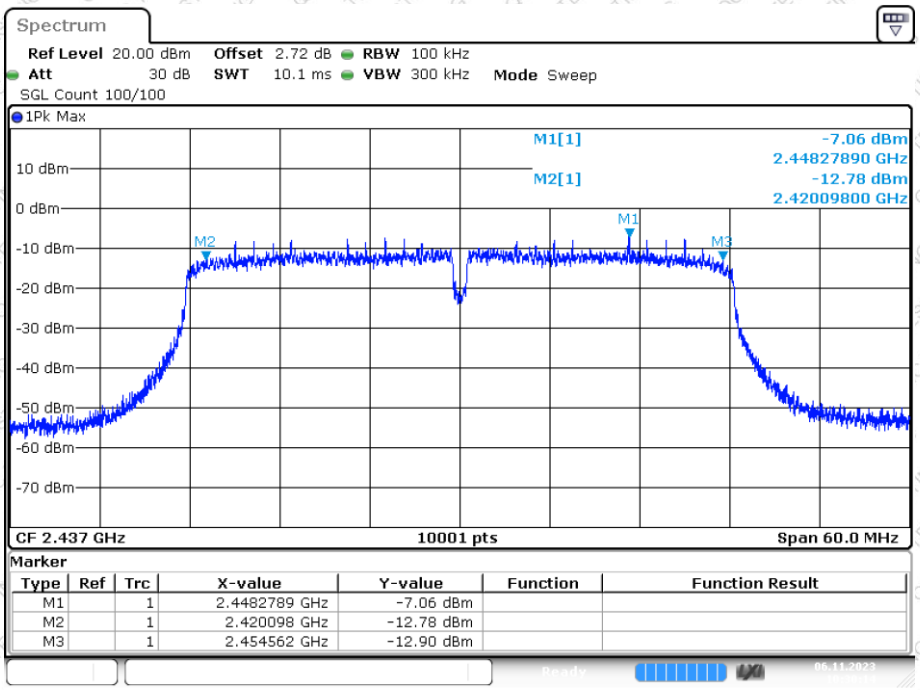
-6dB Bandwidth NVNT n40 2437MHz Ant1



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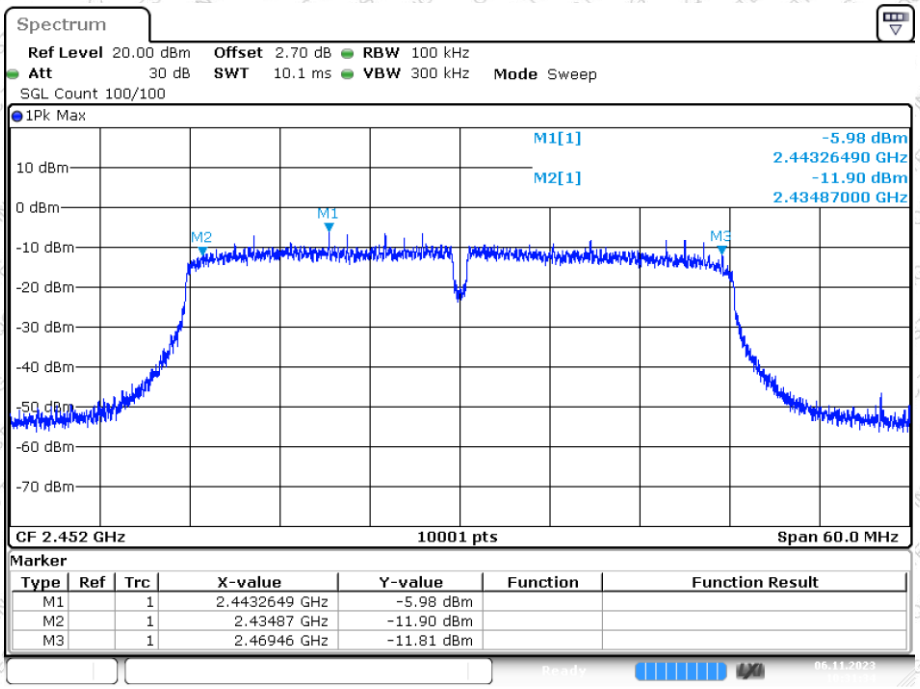

Date: 6.NOV.2023 10:31:34

Address: East of 1/F., Building E, Xinghong Science Park, No.111, Shuiku Road, Fenghuanggang, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China
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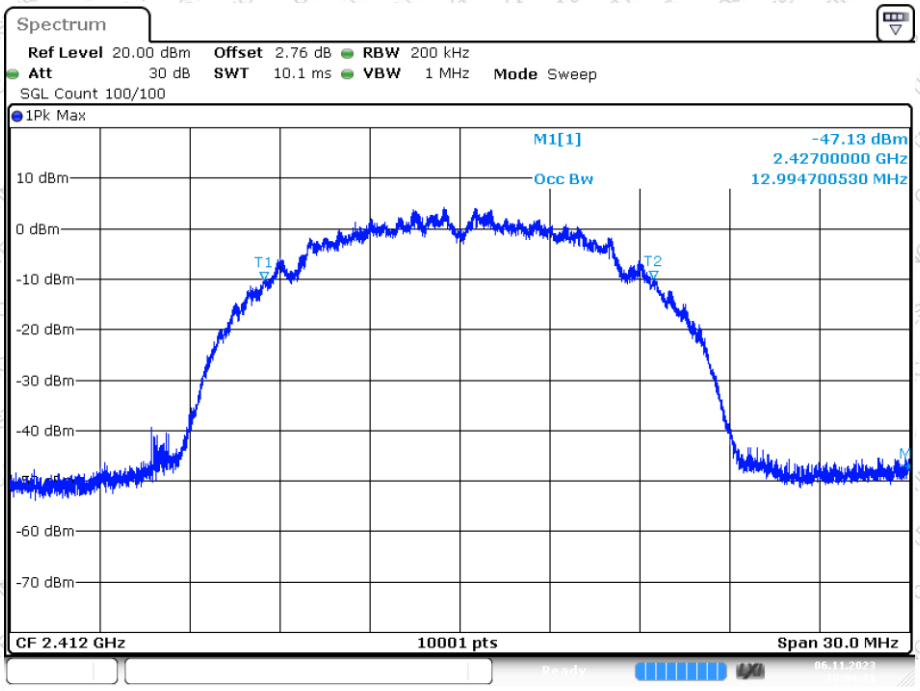
OBW NVNT b 2412MHz Ant1



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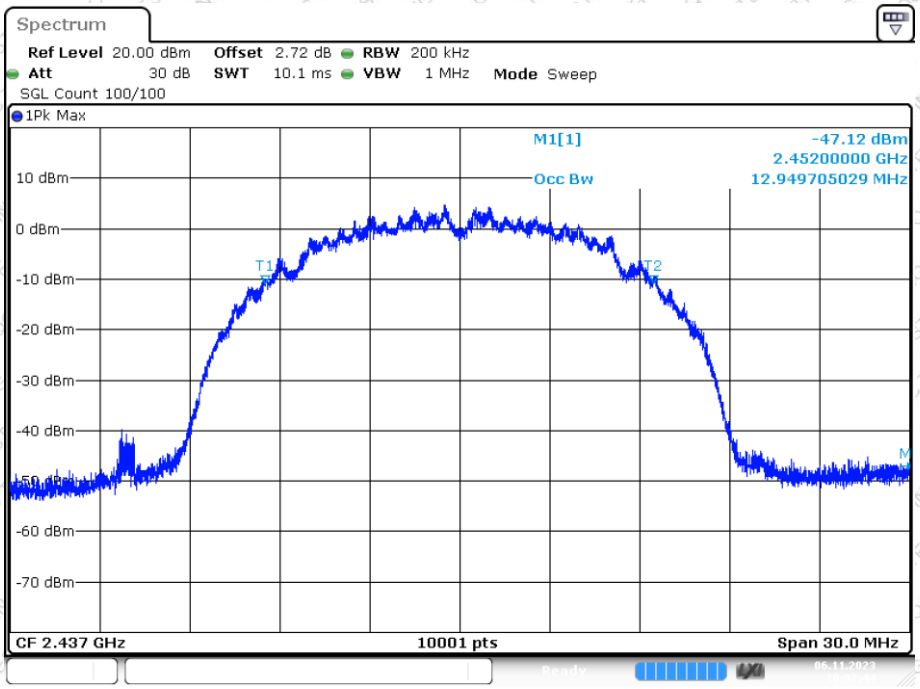

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Address: East of 1/F., Building E, Xinghong Science Park, No.111, Shuiku Road, Fenghuanggang, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China
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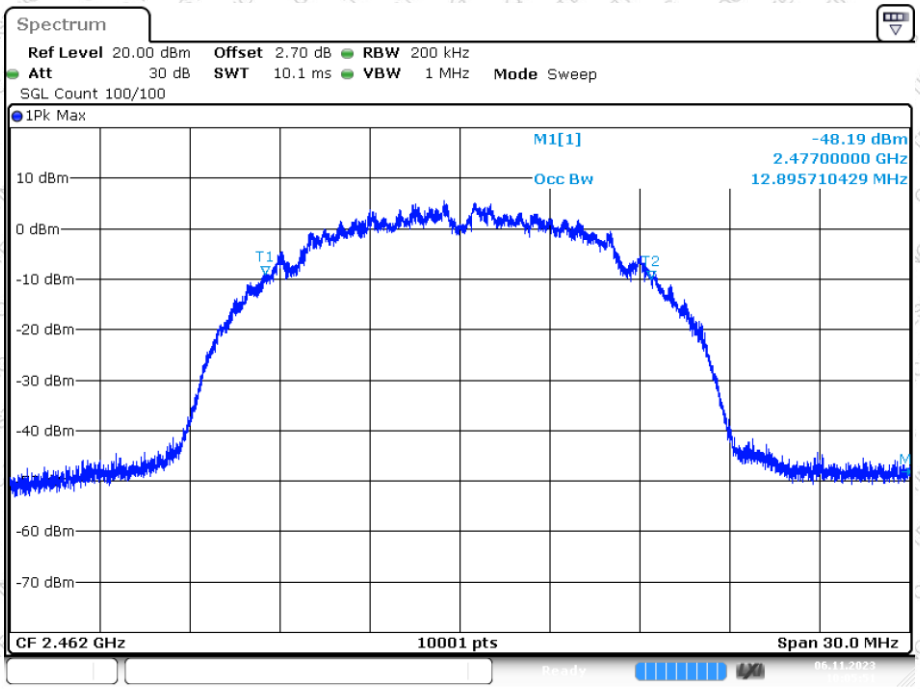
OBW NVNT b 2462MHz Ant1



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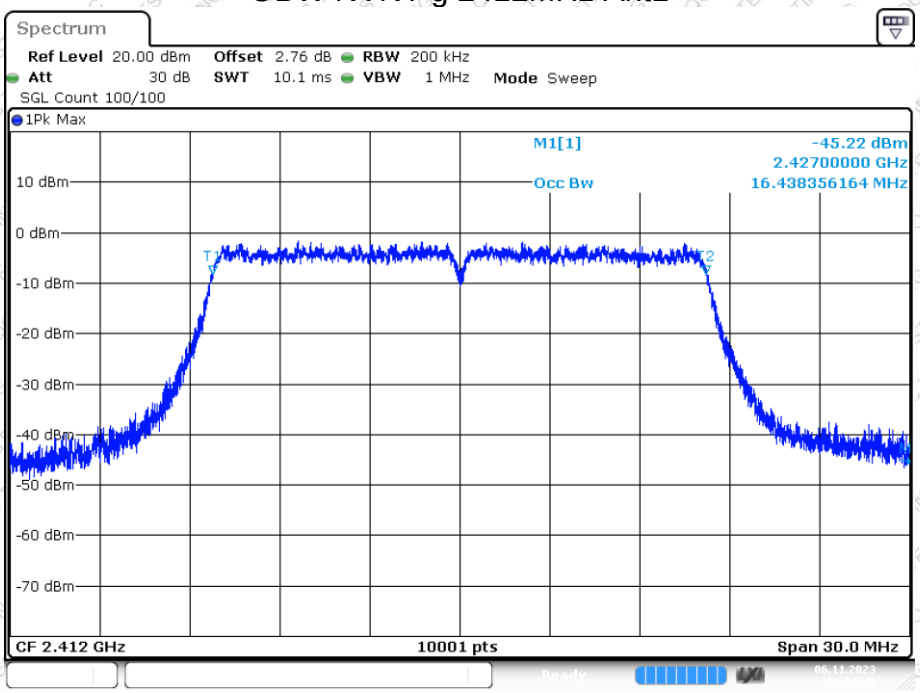
OBW NVNT g 2412MHz Ant1



Date: 6.NOV.2023 10:10:48

Address: East of 1/F., Building E, Xinghong Science Park, No.111, Shuiku Road, Fenghuanggang, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China
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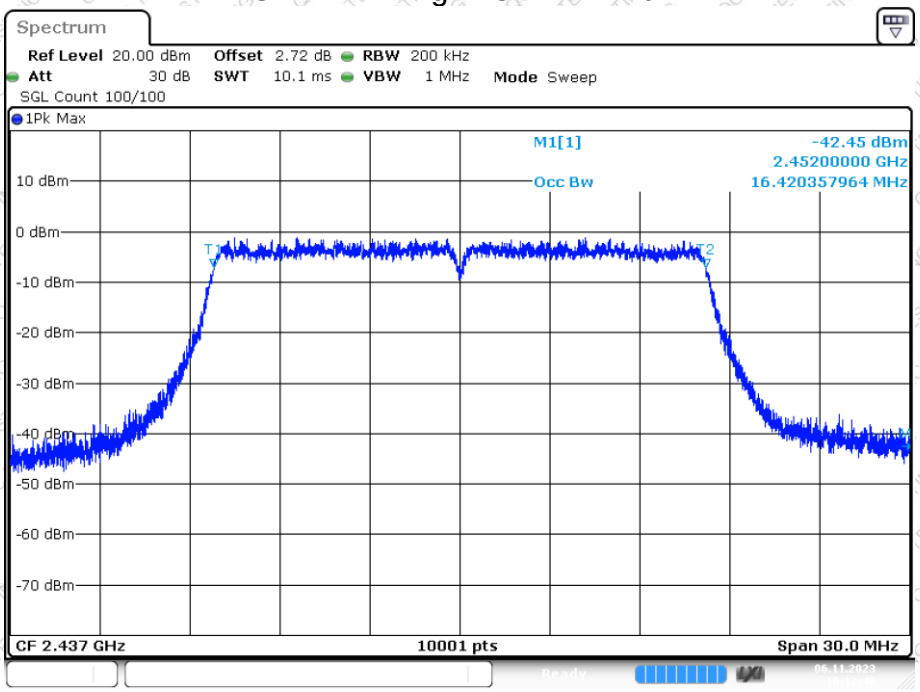
OBW NVNT g 2437MHz Ant1



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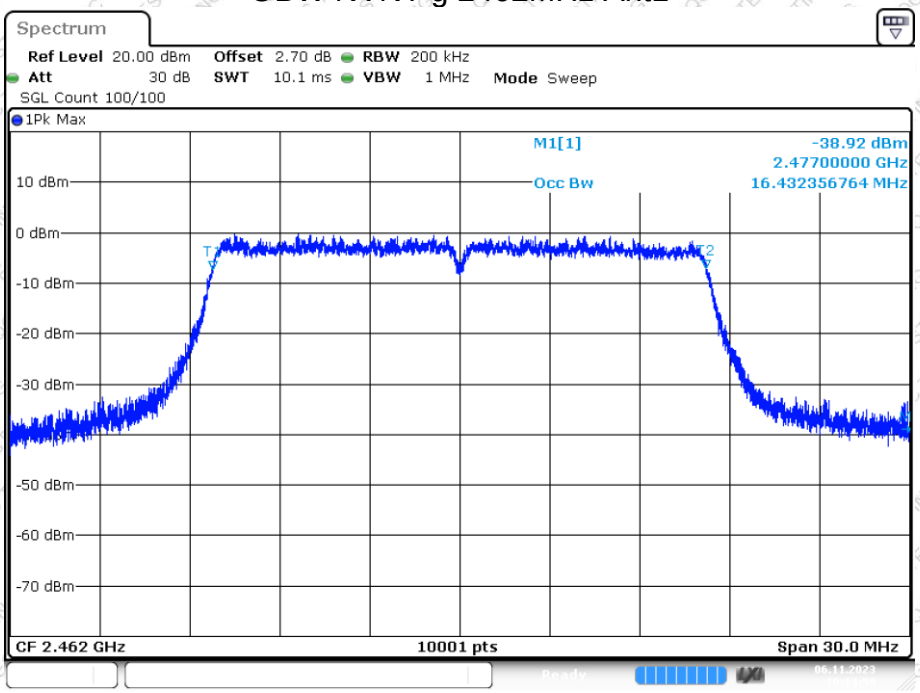

Date: 6.NOV.2023 10:15:00

Address: East of 1/F., Building E, Xinghong Science Park, No.111, Shuiku Road, Fenghuanggang, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China
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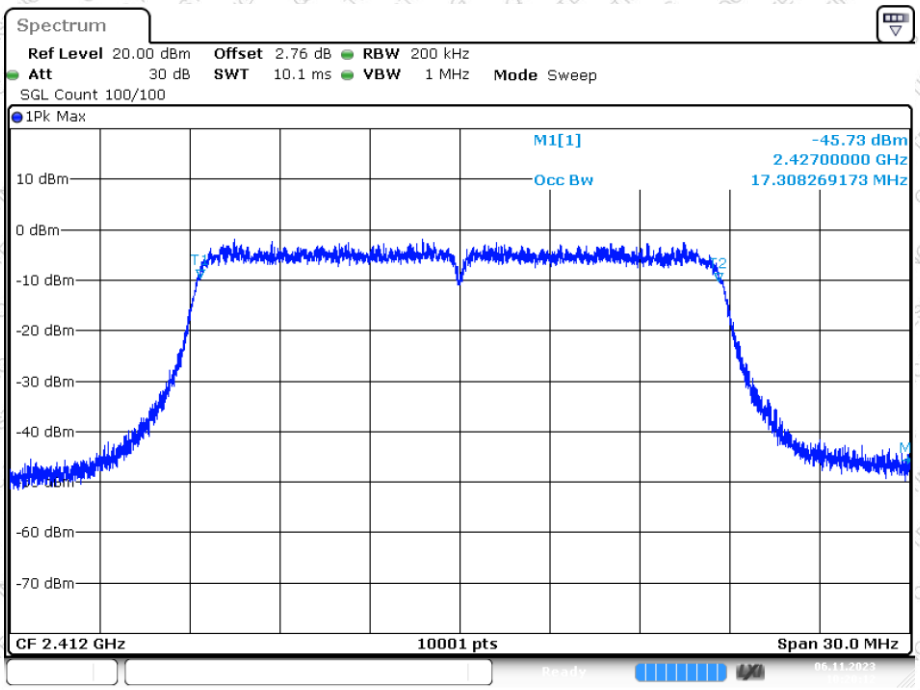
OBW NVNT n20 2412MHz Ant1



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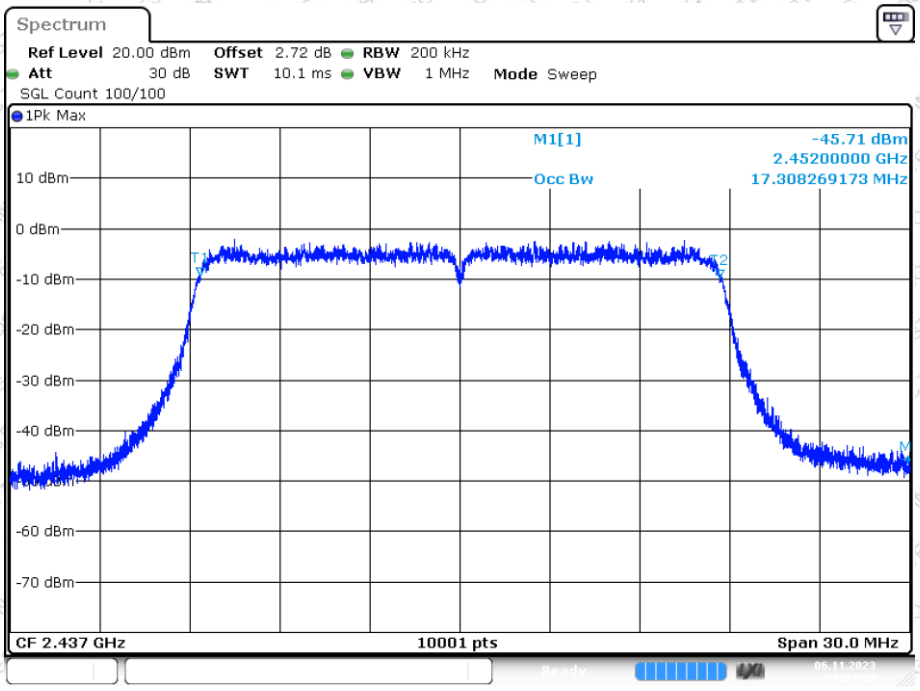

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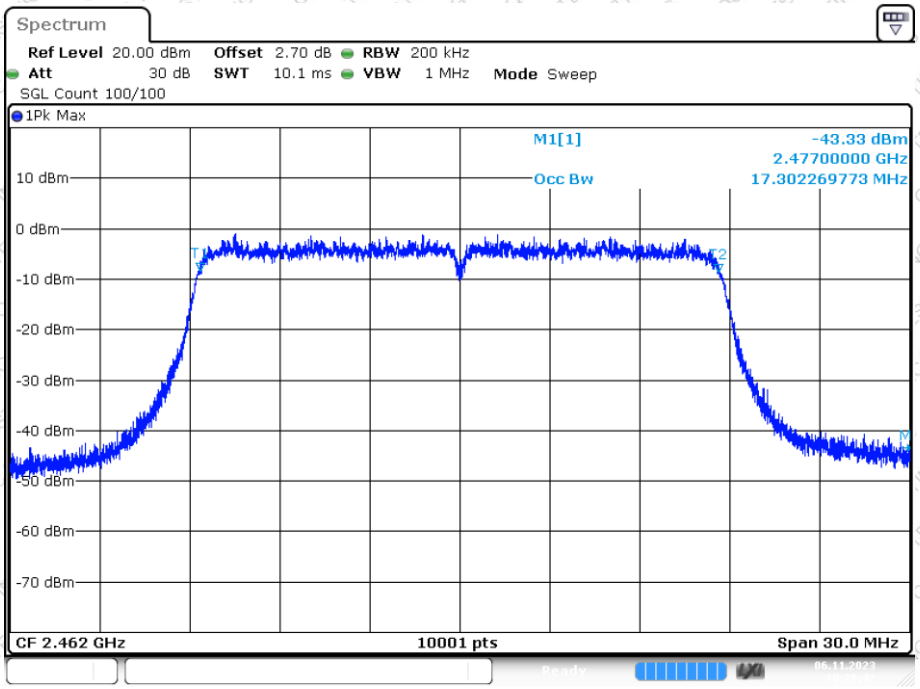

Date: 6.NOV.2023 10:26:42

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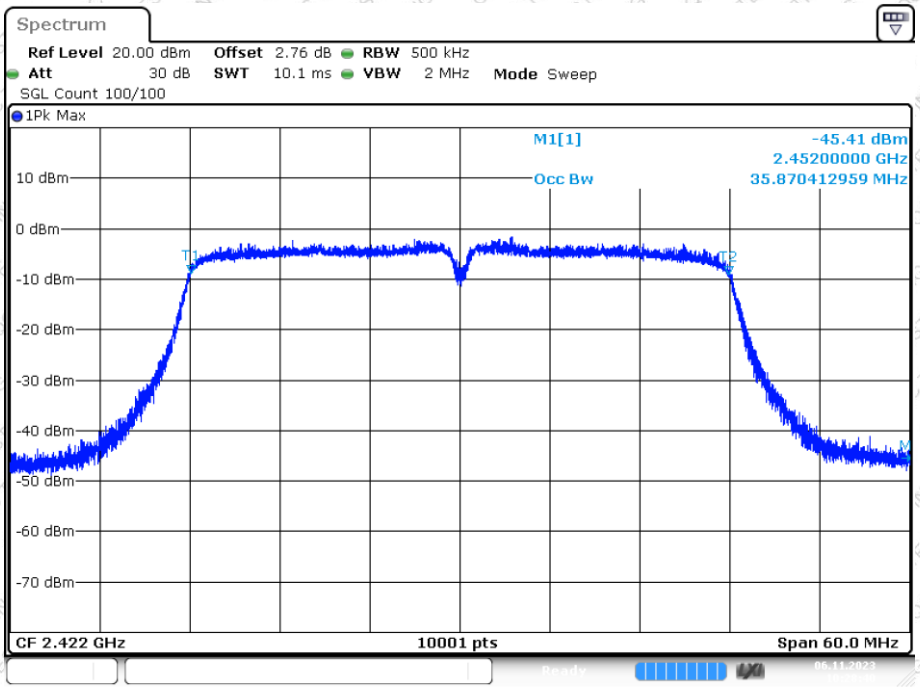

Date: 6.NOV.2023 10:28:41

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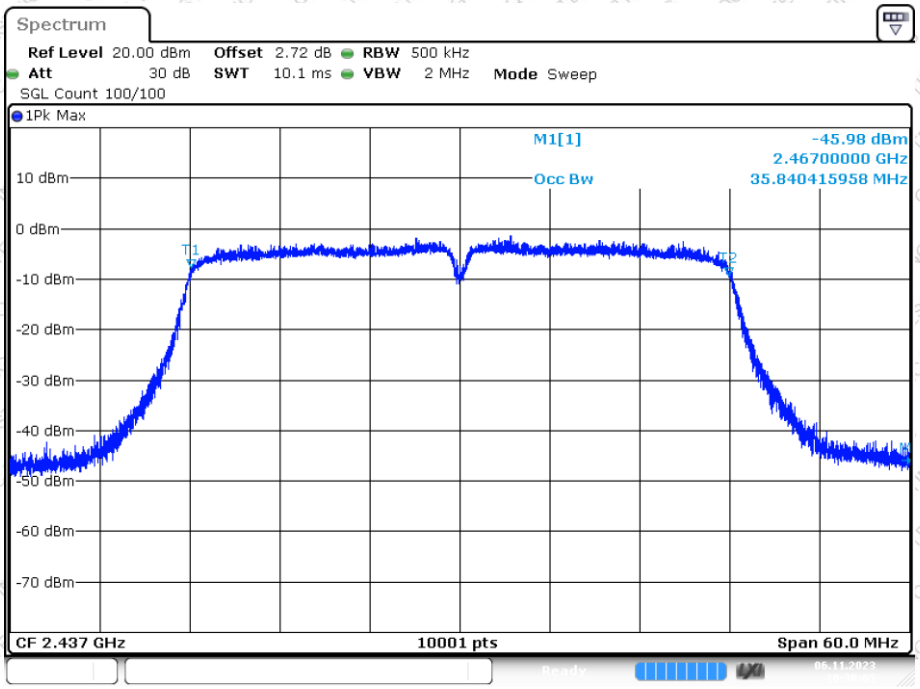
OBW NVNT n40 2437MHz Ant1



Date: 6.NOV.2023 10:30:05

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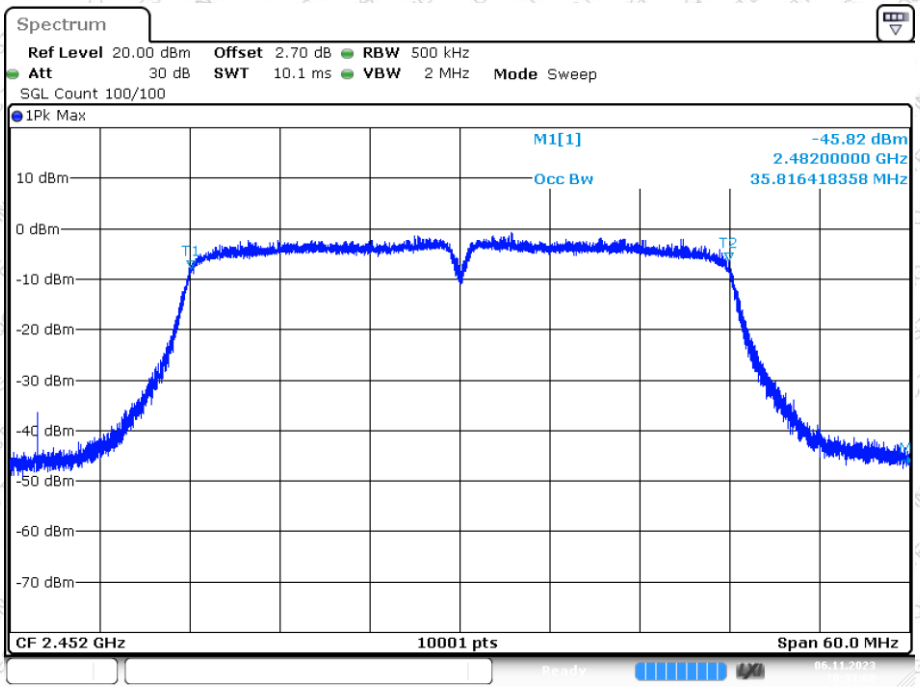

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8. Power Spectral Density

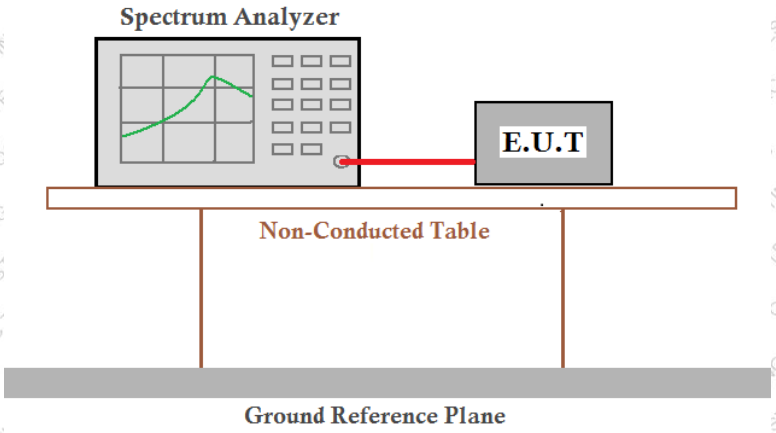
8.1 Applicable Standard

FCC Part15 C Section 15.247 (e)

8.2 Limit

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. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

8.3 Test setup



8.4 Test Procedure

Refer to KDB558074 D01 15.247 Meas Guidance v05r02

8.5 Test Data

Temperature	23.5 ℃	Humidity	48%
ATM Pressure	101.1kPa	Antenna Gain	2.15dBi
Test by	Fan Yang	Test result	PASS

Please refer to following table and plots.

Modulation	Frequency (MHz)	Max PSD (dBm)	Limit (dBm)	Modulation	Frequency (MHz)	Max PSD (dBm)	Limit (dBm)
802.11b	2412	-13.39	8	802.11 n(HT20)	2412	-16.17	8
	2437	-12.89	8		2437	-17.6	8
	2462	-12.67	8		2462	-15.47	8
802.11g	2412	-16.6	8	802.11 n(HT40)	2422	-20.41	8
	2437	-15.89	8		2437	-20.56	8
	2462	-16.1	8		2452	-20.56	8

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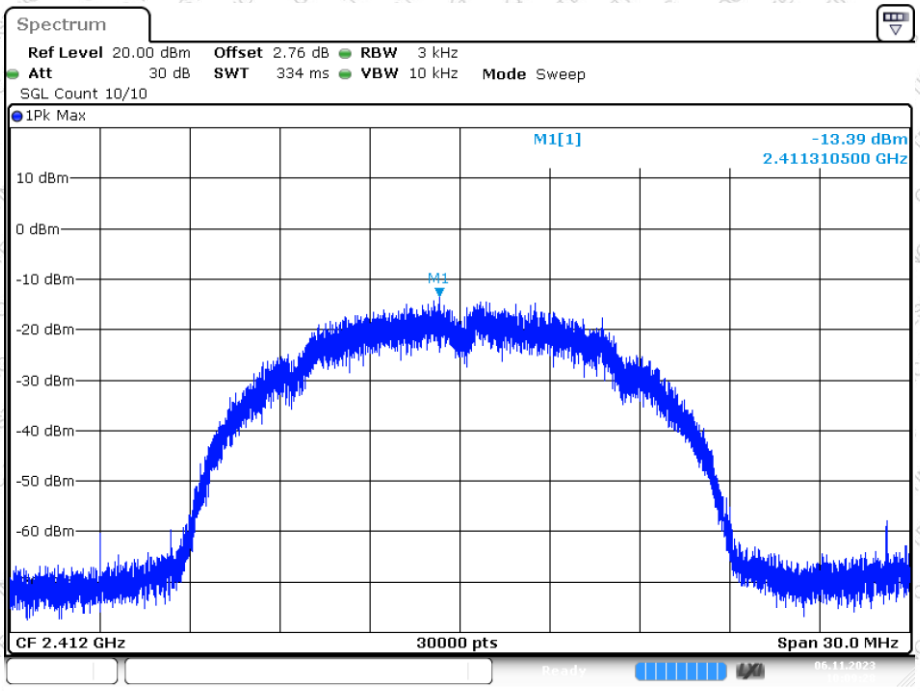
PSD NVNT b 2412MHz Ant1



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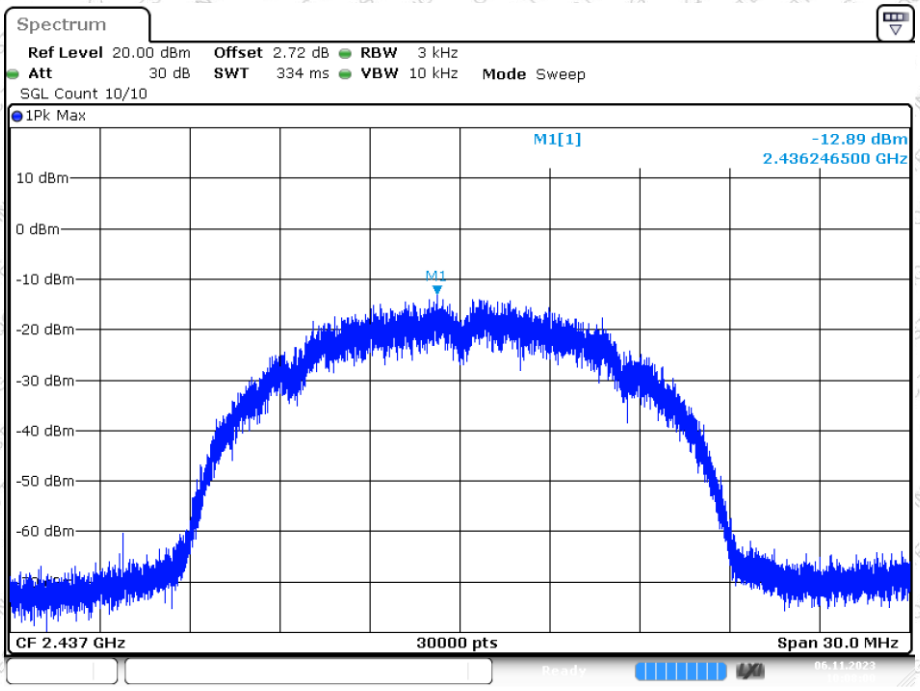
PSD NVNT b 2437MHz Ant1



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Address: East of 1/F., Building E, Xinghong Science Park, No.111, Shuiku Road, Fenghuanggang, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China
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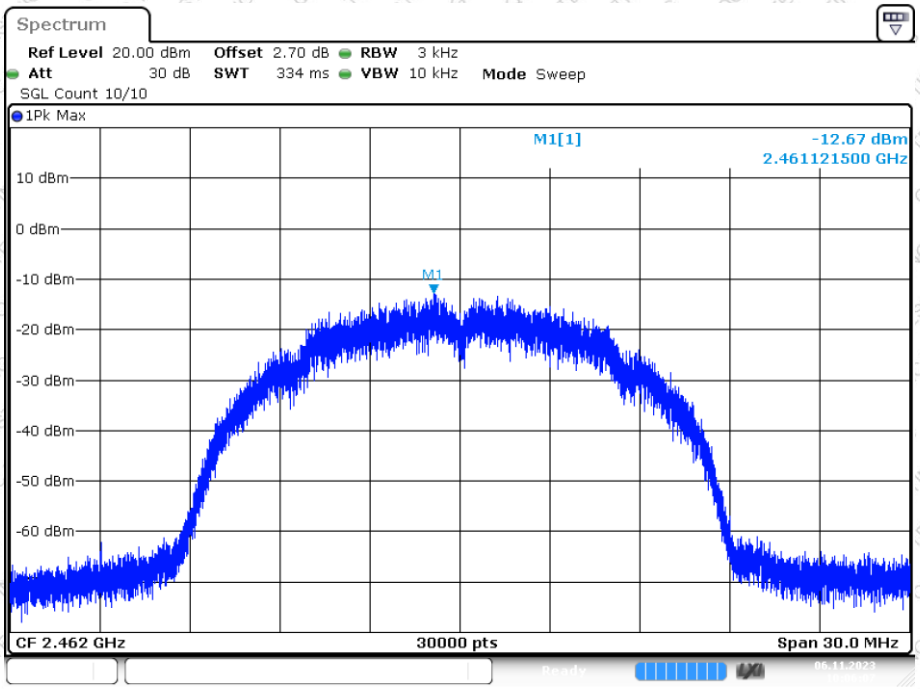
PSD NVNT b 2462MHz Ant1



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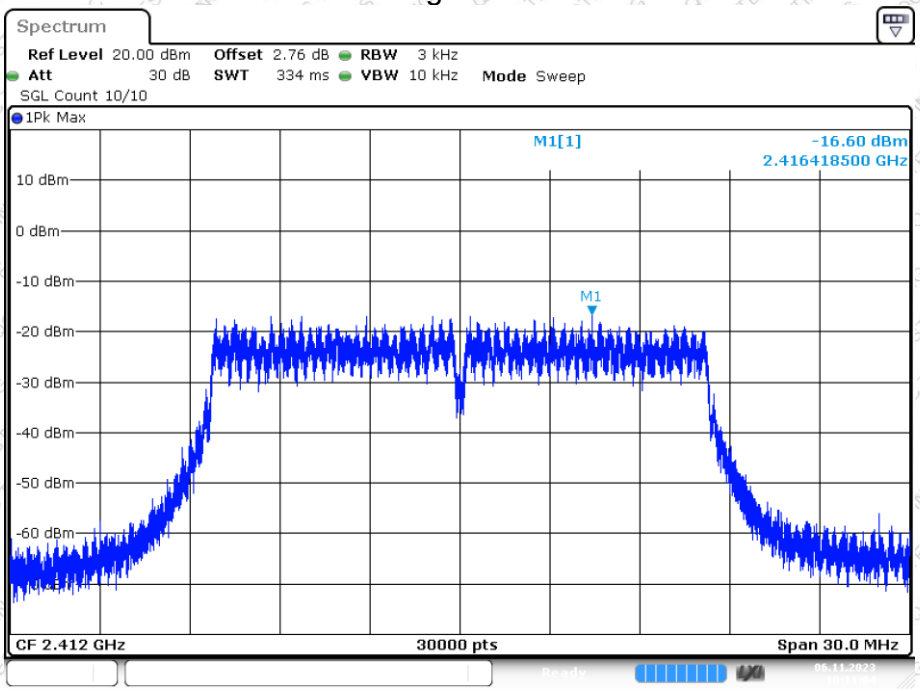

Date: 6.NOV.2023 10:11:04

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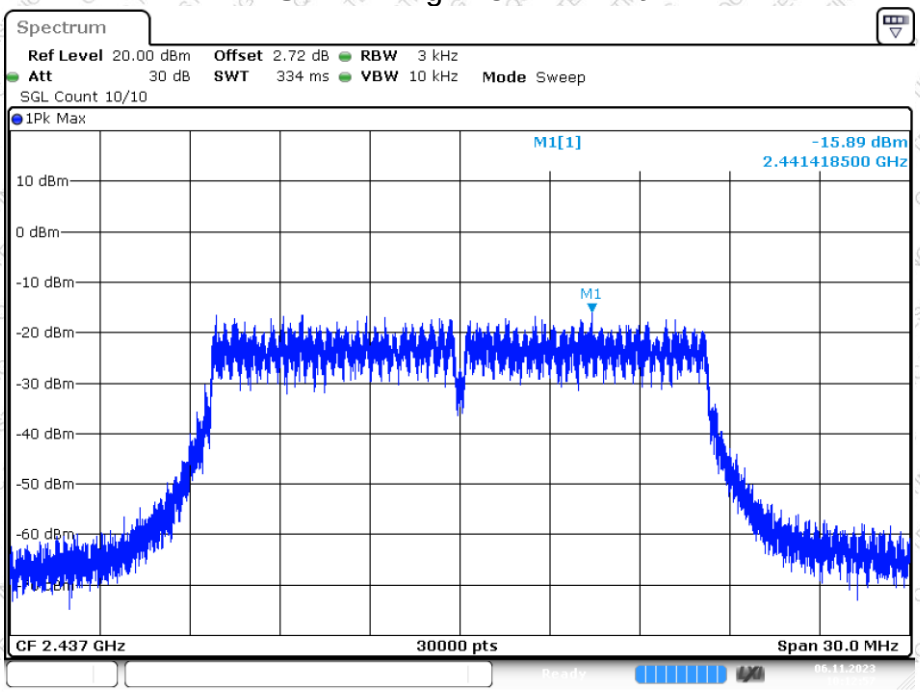
PSD NVNT g 2437MHz Ant1



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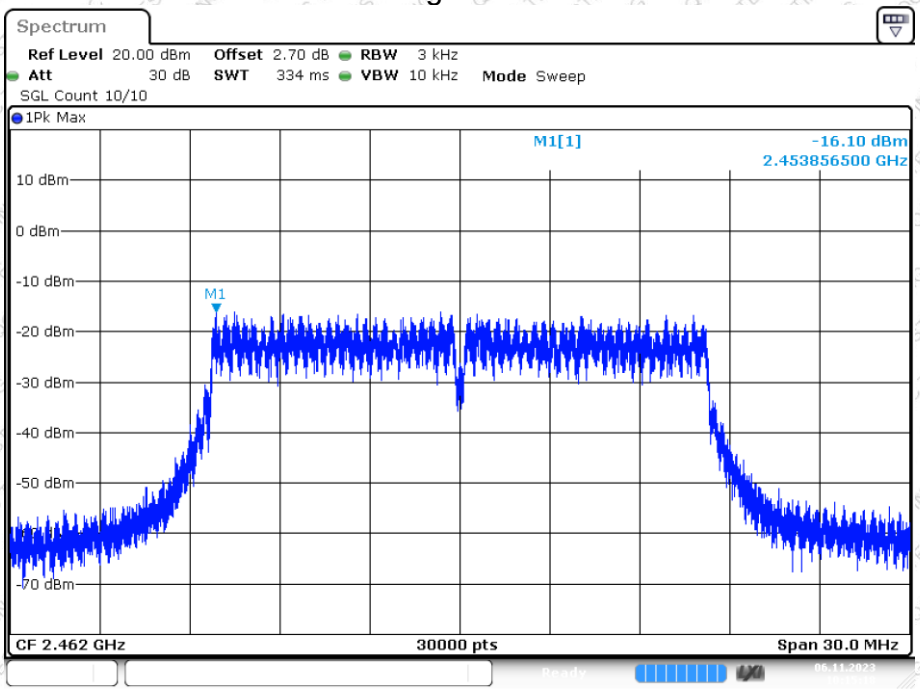

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Address: East of 1/F., Building E, Xinghong Science Park, No.111, Shuiku Road, Fenghuanggang, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China
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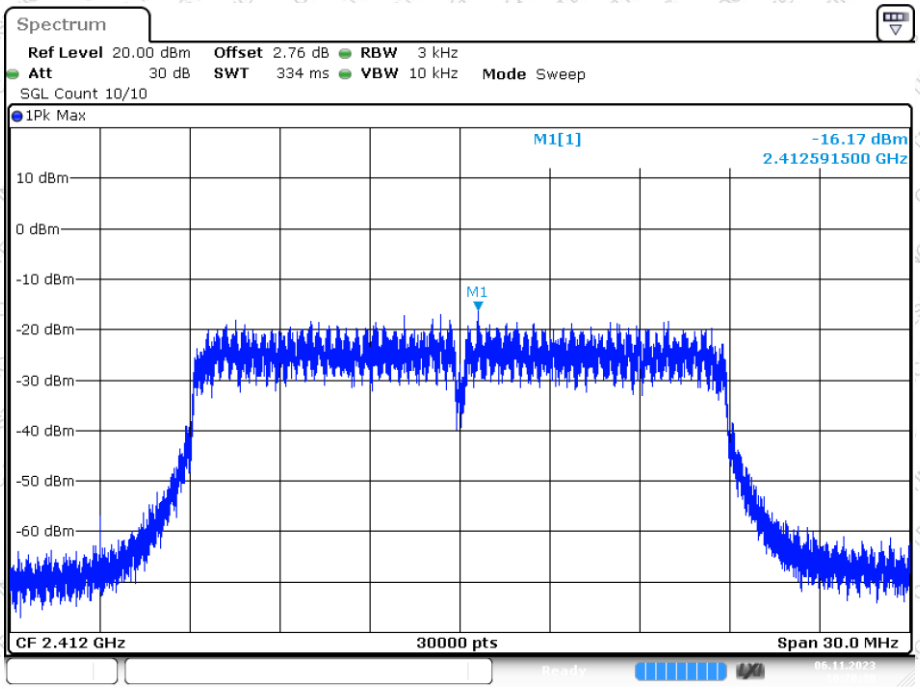
PSD NVNT n20 2412MHz Ant1



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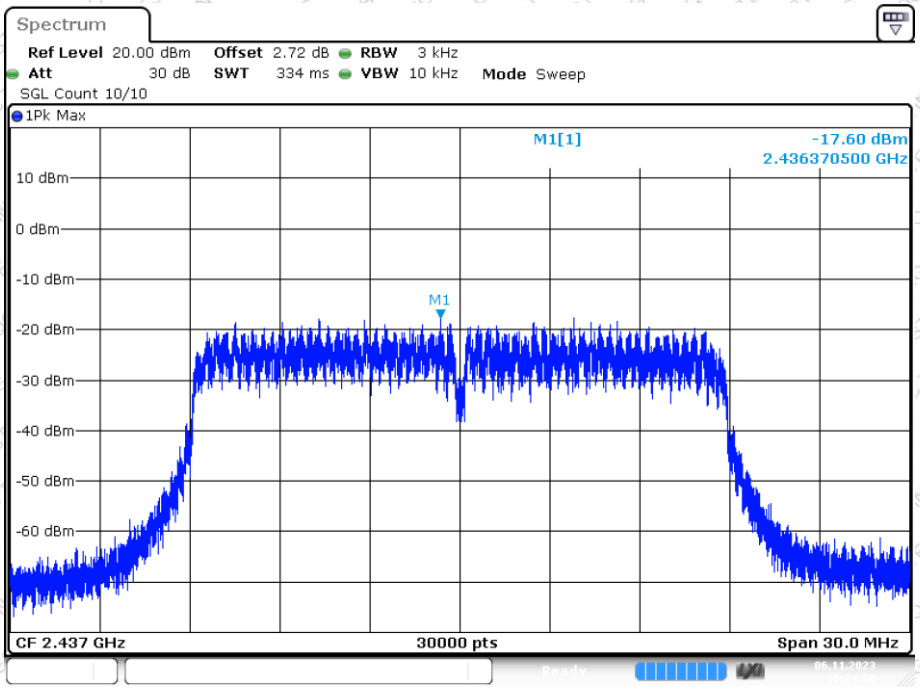

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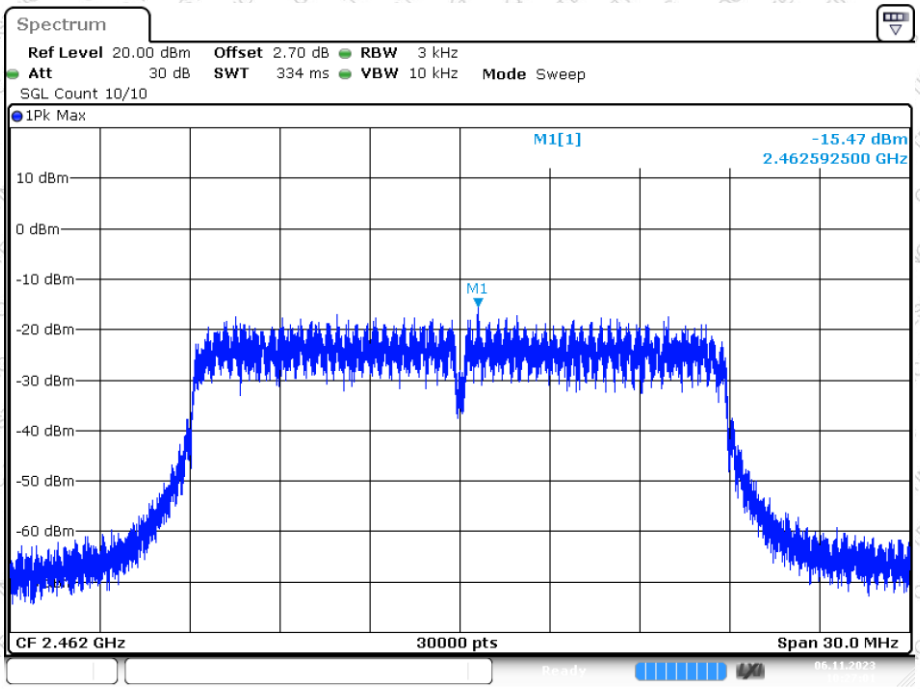
PSD NVNT n20 2462MHz Ant1



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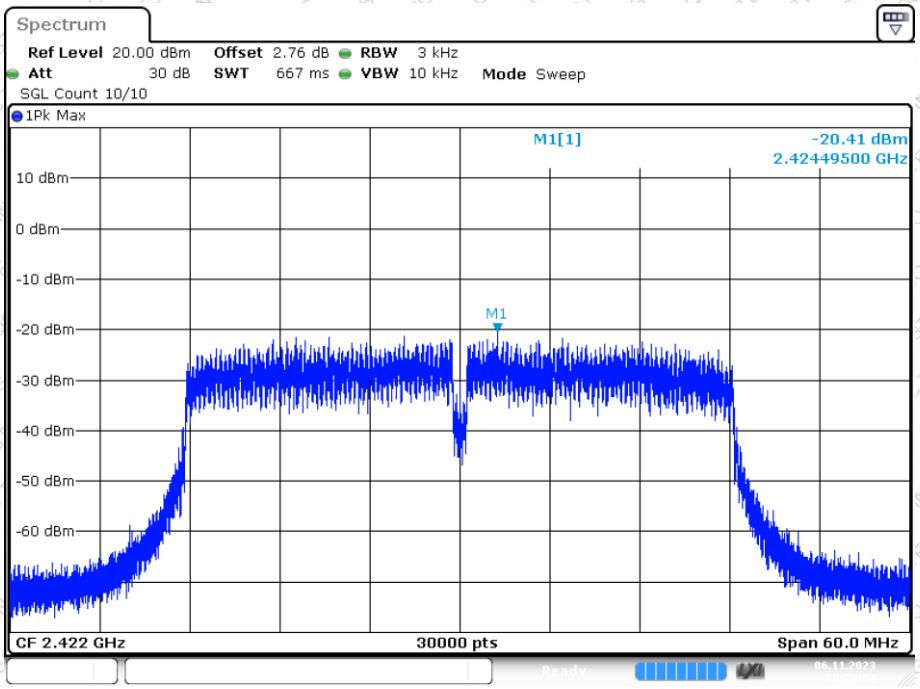

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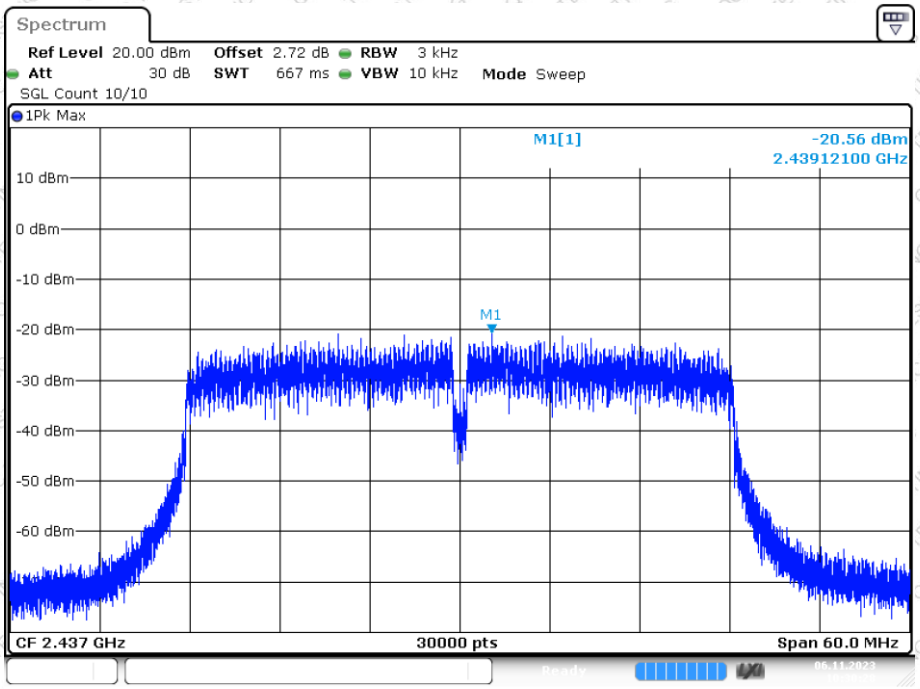
PSD NVNT n40 2437MHz Ant1



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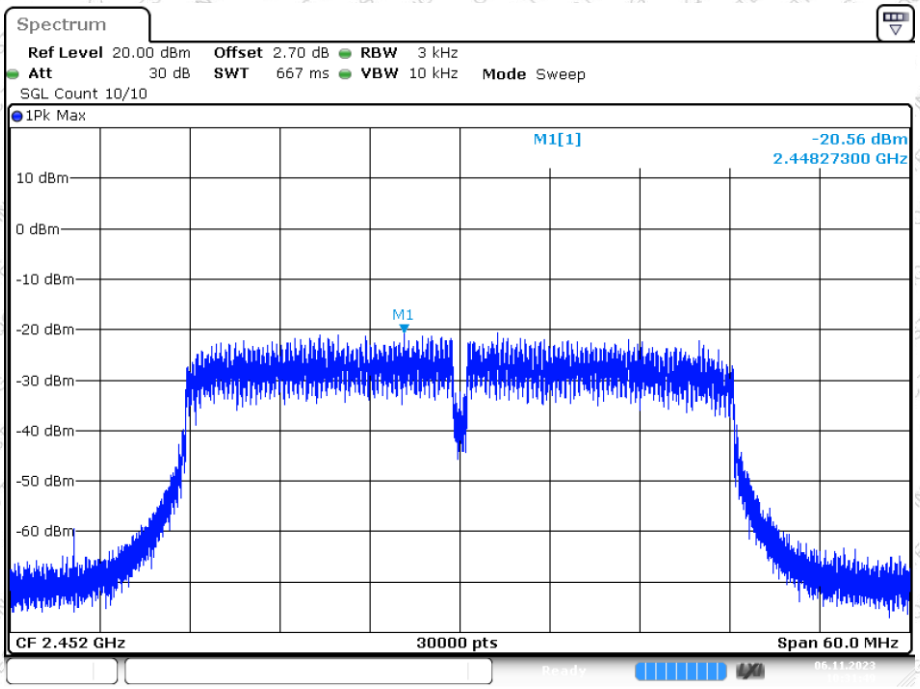

Date: 6.NOV.2023 10:31:49

Address: East of 1/F., Building E, Xinghong Science Park, No.111, Shuiku Road, Fenghuanggang, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China
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9. Spurious Emission in Non-restricted & restricted Bands

9.1 Conducted Emission Method

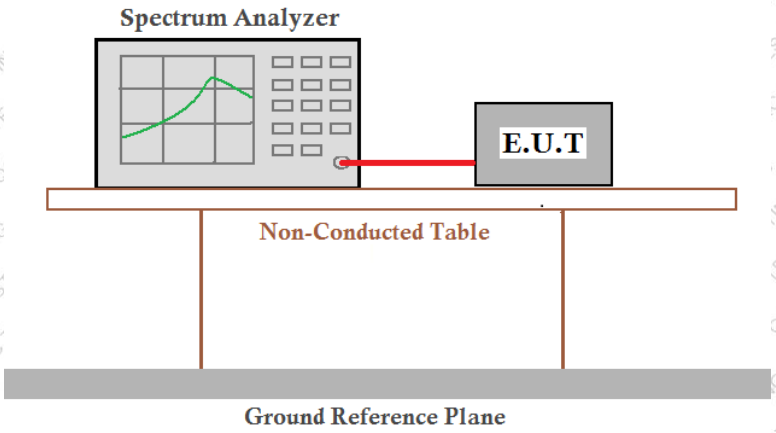
9.1.1 Applicable Standard

FCC Part15 C Section 15.247 (d)

9.1.2 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is 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, based on either an RF conducted or a radiated measurement.

9.1.3 Test setup



9.1.4 Test Procedure

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
- Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
- Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
- Repeat above procedures until all measured frequencies were complete.

9.1.5 Test Data

Temperature	23.5 ℃	Humidity	48%
ATM Pressure	101.1kPa	Antenna Gain	2.15dBi
Test by	Fan Yang	Test result	PASS

Please refer to following plots.

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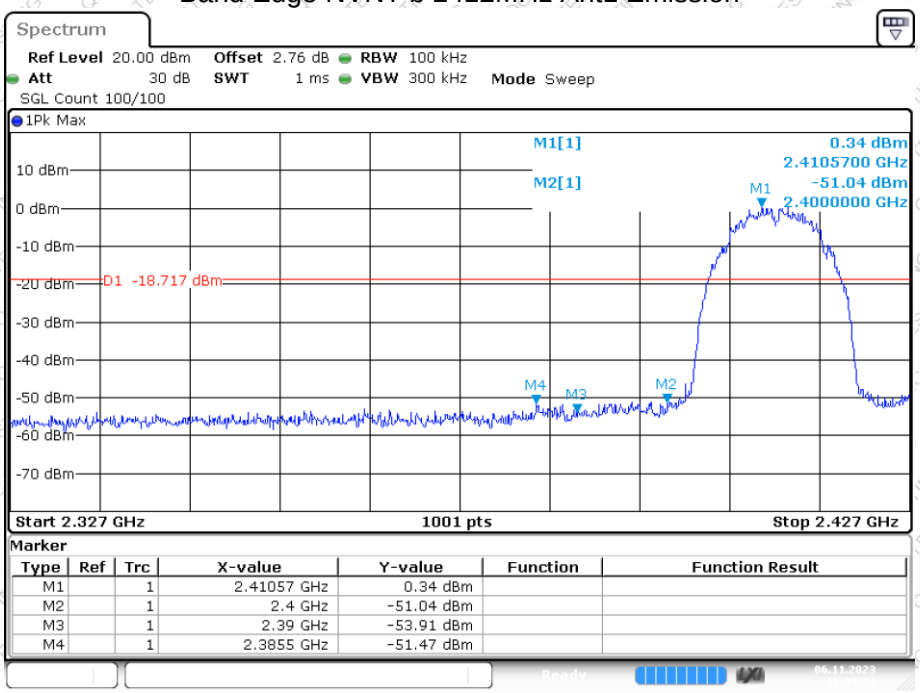
Band Edge NVNT b 2412MHz Ant1 Emission

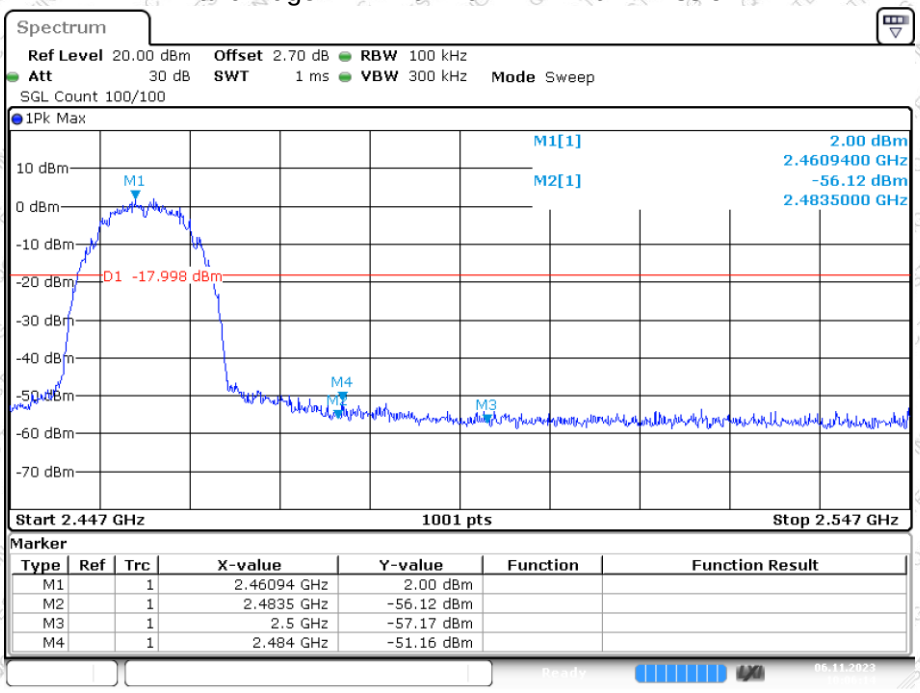


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.41057 GHz	0.34 dBm		
M2		1	2.4 GHz	-51.04 dBm		
M3		1	2.39 GHz	-53.91 dBm		
M4		1	2.3855 GHz	-51.47 dBm		

Date: 6.NOV.2023 10:09:34

Band Edge NVNT b 2462MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.46094 GHz	2.00 dBm		
M2		1	2.4835 GHz	-56.12 dBm		
M3		1	2.5 GHz	-57.17 dBm		
M4		1	2.484 GHz	-51.16 dBm		

Date: 6.NOV.2023 10:06:14

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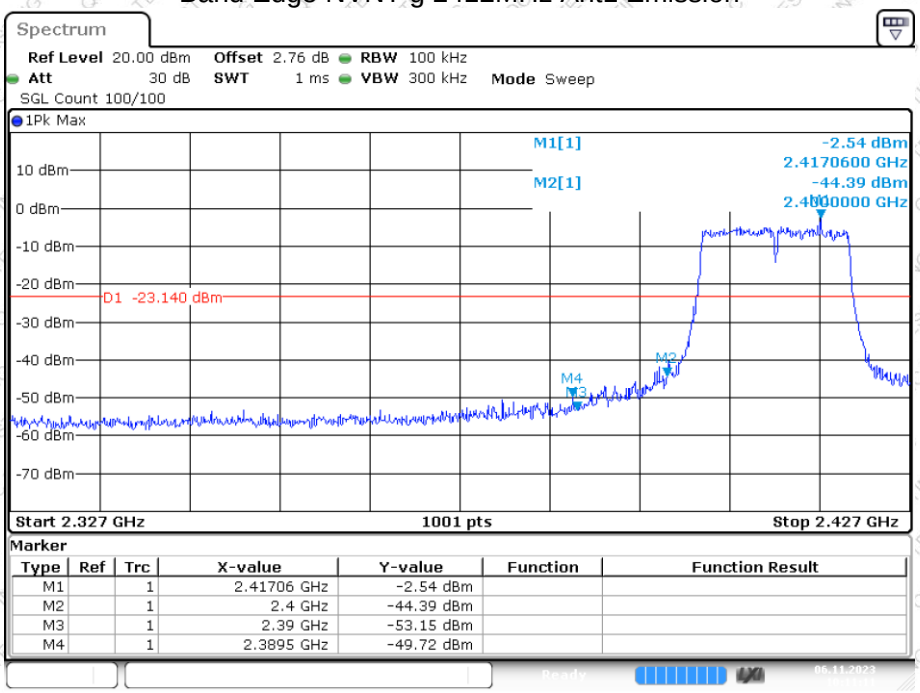
Band Edge NVNT g 2412MHz Ant1 Emission

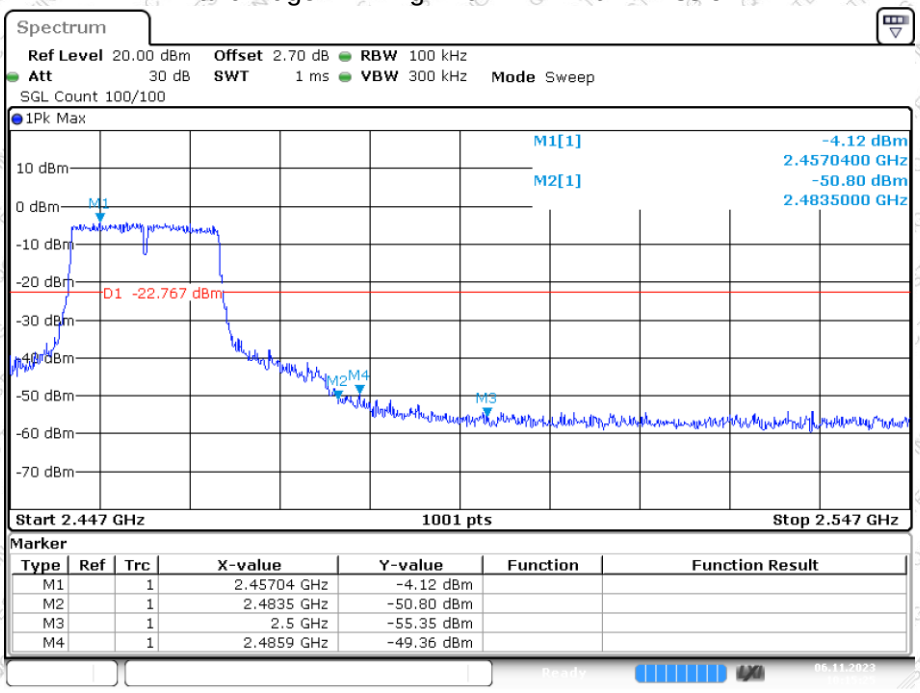


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.41706 GHz	-2.54 dBm		
M2		1	2.4 GHz	-44.39 dBm		
M3		1	2.39 GHz	-53.15 dBm		
M4		1	2.3895 GHz	-49.72 dBm		

Date: 6.NOV.2023 10:11:11

Band Edge NVNT g 2462MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45704 GHz	-4.12 dBm		
M2		1	2.4835 GHz	-50.80 dBm		
M3		1	2.5 GHz	-55.35 dBm		
M4		1	2.4859 GHz	-49.36 dBm		

Date: 6.NOV.2023 10:15:26

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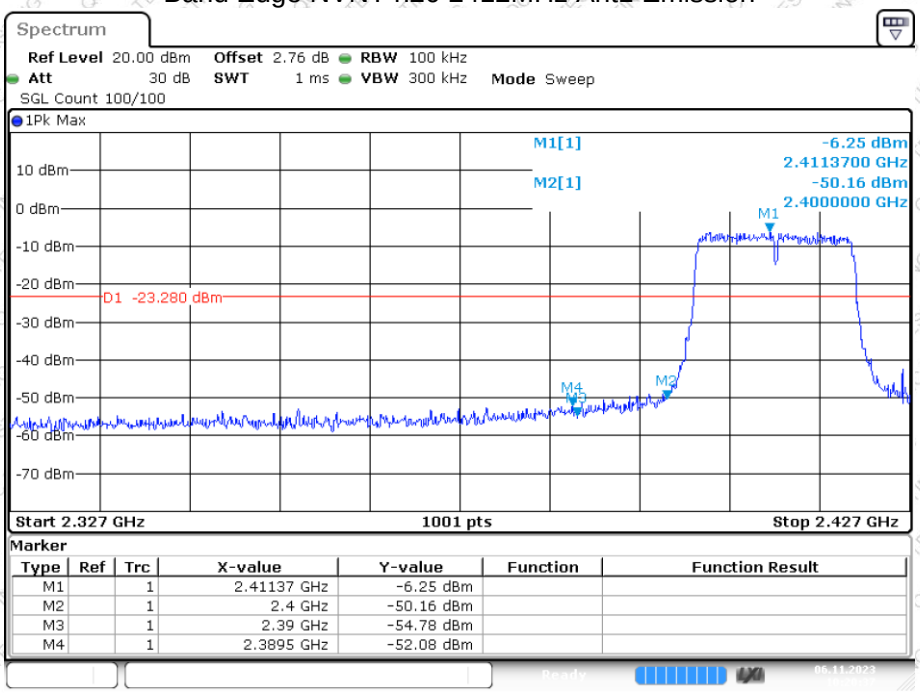
Band Edge NVNT n20 2412MHz Ant1 Emission

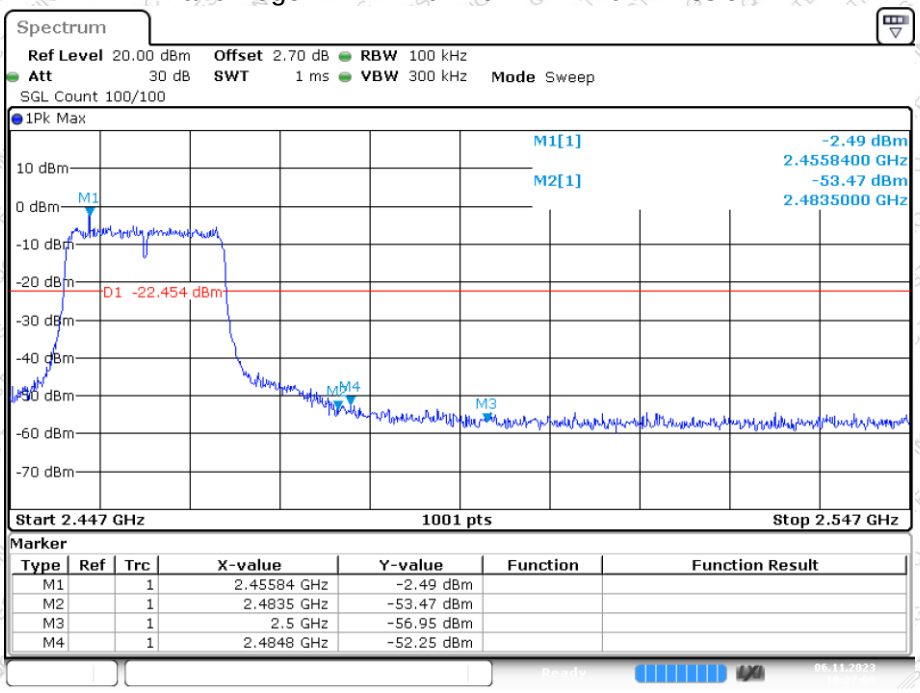


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.41137 GHz	-6.25 dBm		
M2		1	2.4 GHz	-50.16 dBm		
M3		1	2.39 GHz	-54.78 dBm		
M4		1	2.3895 GHz	-52.08 dBm		

Date: 6.NOV.2023 10:20:38

Band Edge NVNT n20 2462MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.45584 GHz	-2.49 dBm		
M2		1	2.4835 GHz	-53.47 dBm		
M3		1	2.5 GHz	-56.95 dBm		
M4		1	2.4848 GHz	-52.25 dBm		

Date: 6.NOV.2023 10:27:10

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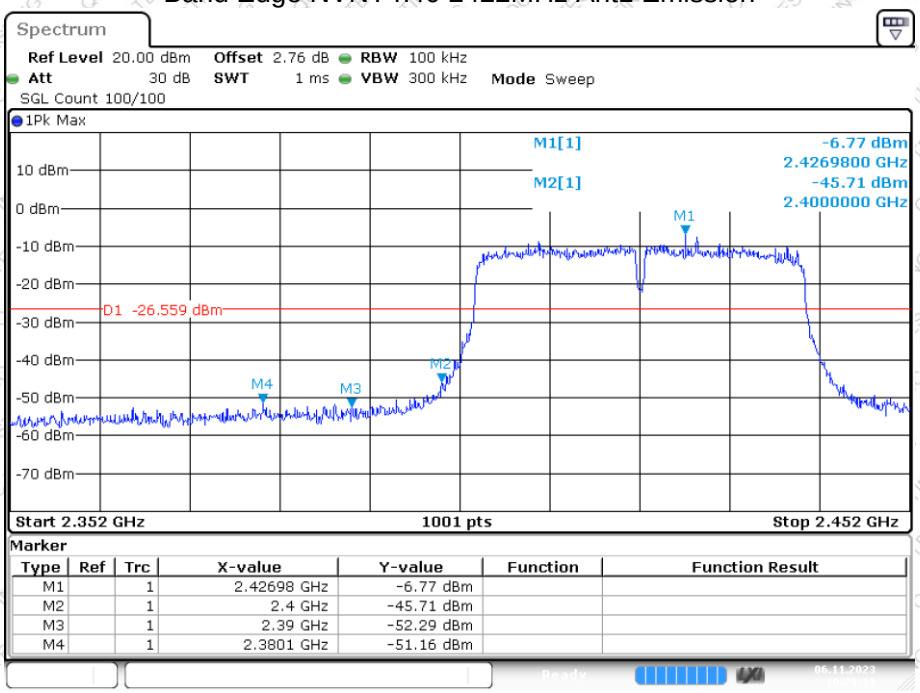
Band Edge NVNT n40 2422MHz Ant1 Emission

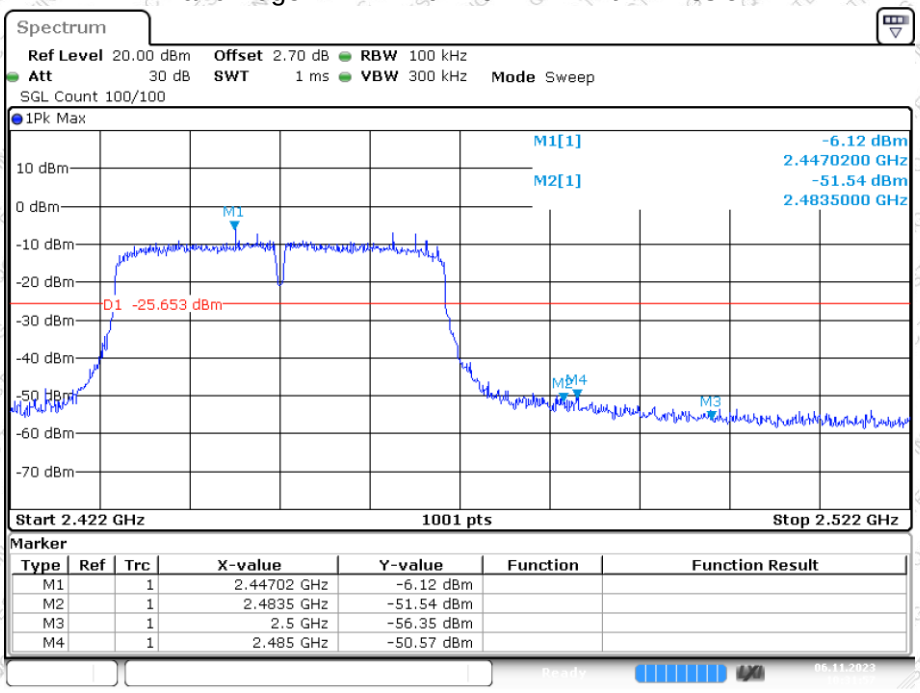


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.42698 GHz	-6.77 dBm		
M2		1	2.4 GHz	-45.71 dBm		
M3		1	2.39 GHz	-52.29 dBm		
M4		1	2.3801 GHz	-51.16 dBm		

Date: 6.NOV.2023 10:29:11

Band Edge NVNT n40 2452MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.44702 GHz	-6.12 dBm		
M2		1	2.4835 GHz	-51.54 dBm		
M3		1	2.5 GHz	-56.35 dBm		
M4		1	2.485 GHz	-50.57 dBm		

Date: 6.NOV.2023 10:31:57

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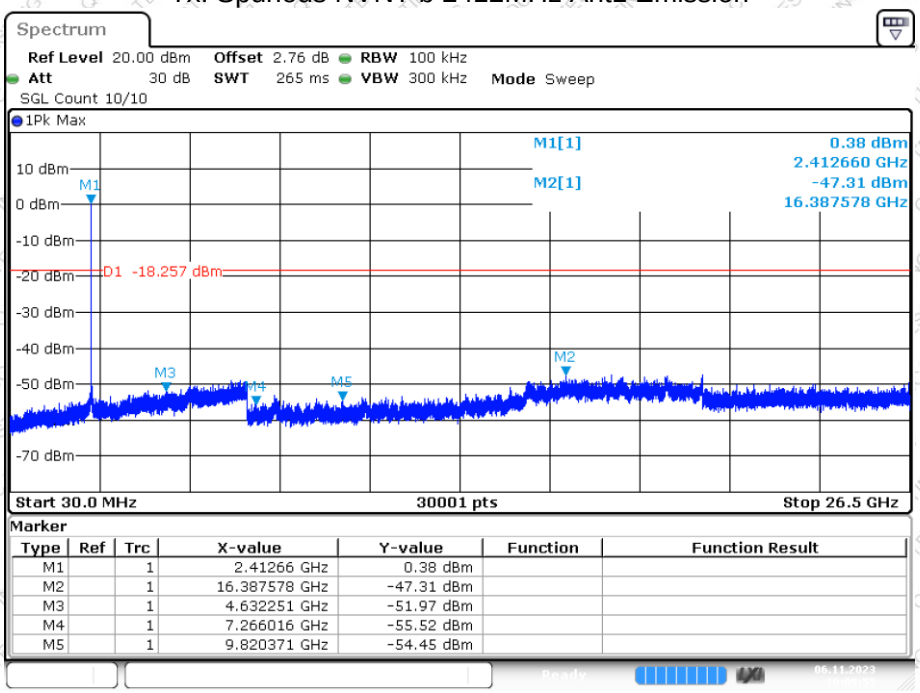
Tx. Spurious NVNT b 2412MHz Ant1 Emission

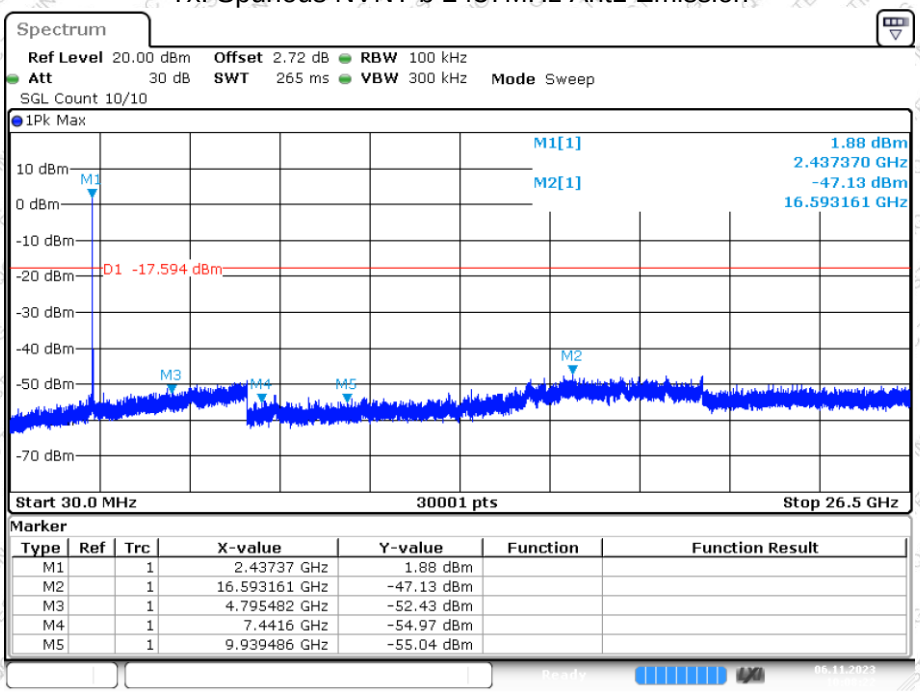


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.41266 GHz	0.38 dBm		
M2		1	16.387578 GHz	-47.31 dBm		
M3		1	4.632251 GHz	-51.97 dBm		
M4		1	7.266016 GHz	-55.52 dBm		
M5		1	9.820371 GHz	-54.45 dBm		

Date: 6.NOV.2023 10:09:55

Tx. Spurious NVNT b 2437MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.43737 GHz	1.88 dBm		
M2		1	16.593161 GHz	-47.13 dBm		
M3		1	4.795482 GHz	-52.43 dBm		
M4		1	7.4416 GHz	-54.97 dBm		
M5		1	9.939486 GHz	-55.04 dBm		

Date: 6.NOV.2023 10:08:22

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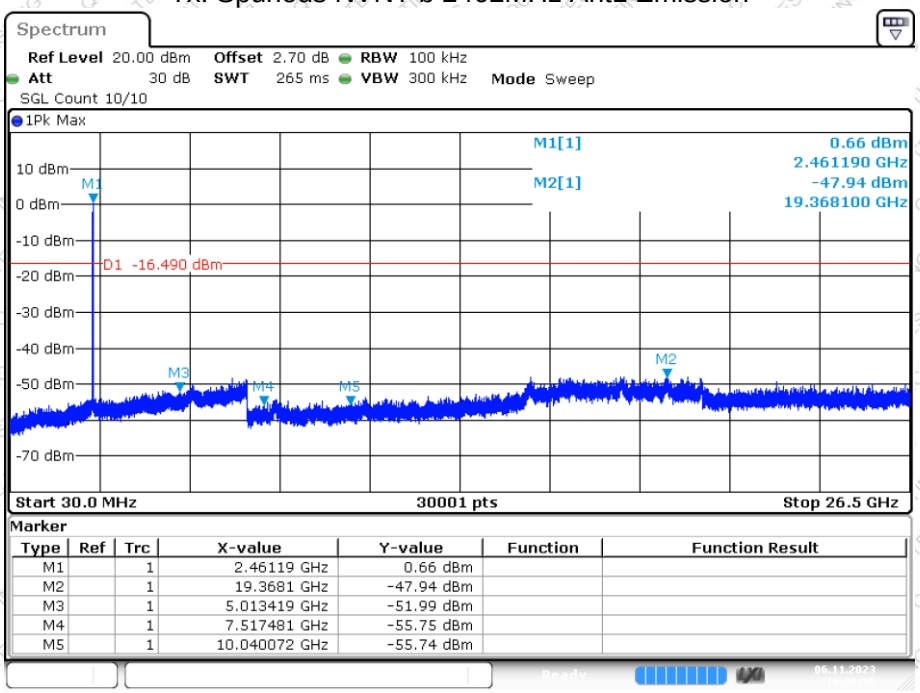
Tx. Spurious NVNT b 2462MHz Ant1 Emission

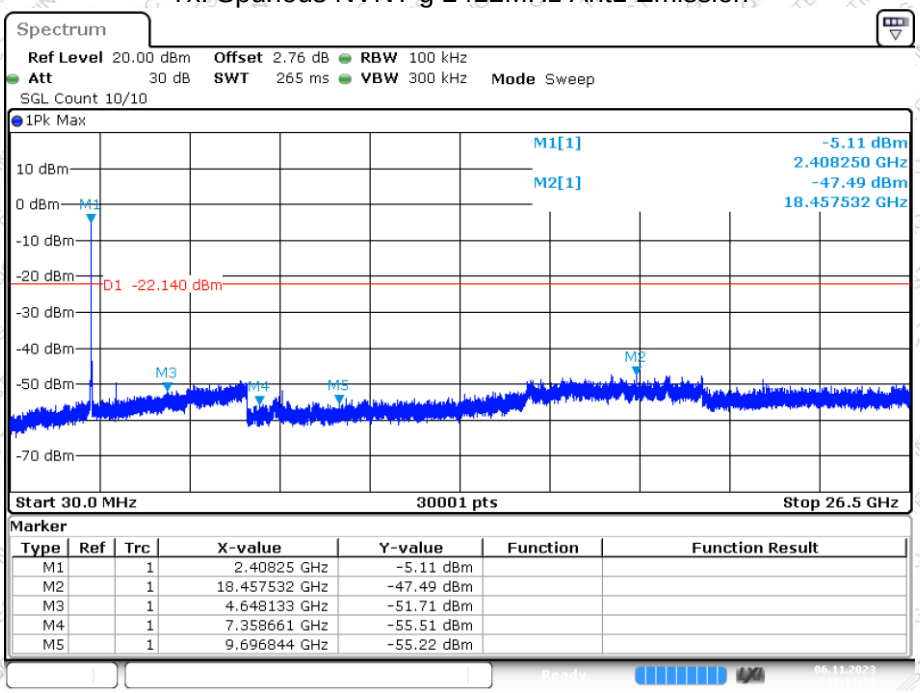


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.46119 GHz	0.66 dBm		
M2		1	19.3681 GHz	-47.94 dBm		
M3		1	5.013419 GHz	-51.99 dBm		
M4		1	7.517481 GHz	-55.75 dBm		
M5		1	10.040072 GHz	-55.74 dBm		

Date: 6.NOV.2023 10:06:36

Tx. Spurious NVNT g 2412MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40825 GHz	-5.11 dBm		
M2		1	18.457532 GHz	-47.49 dBm		
M3		1	4.648133 GHz	-51.71 dBm		
M4		1	7.358661 GHz	-55.51 dBm		
M5		1	9.696844 GHz	-55.22 dBm		

Date: 6.NOV.2023 10:11:32

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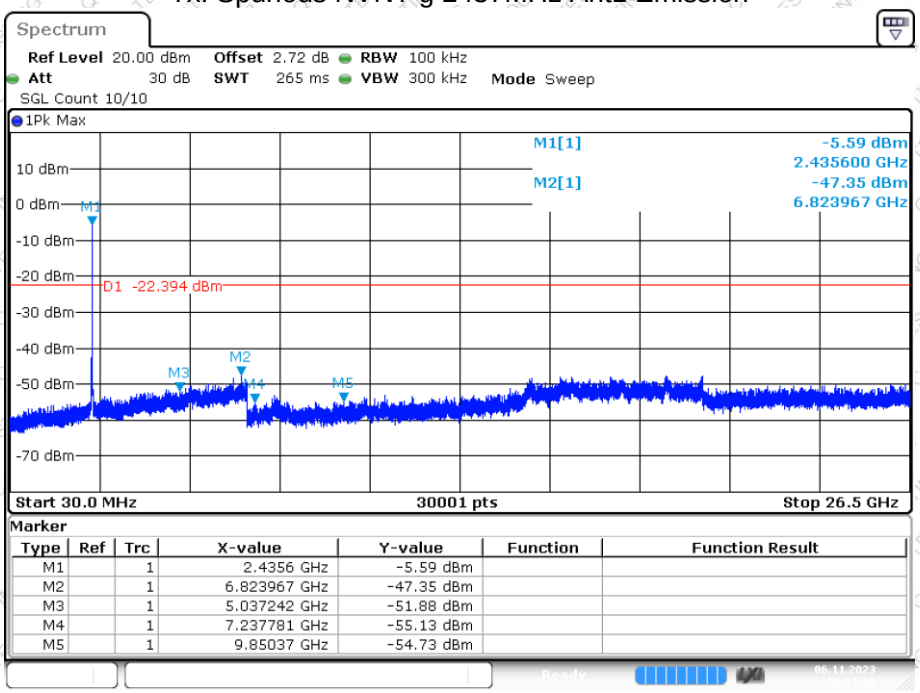
Tx. Spurious NVNT g 2437MHz Ant1 Emission

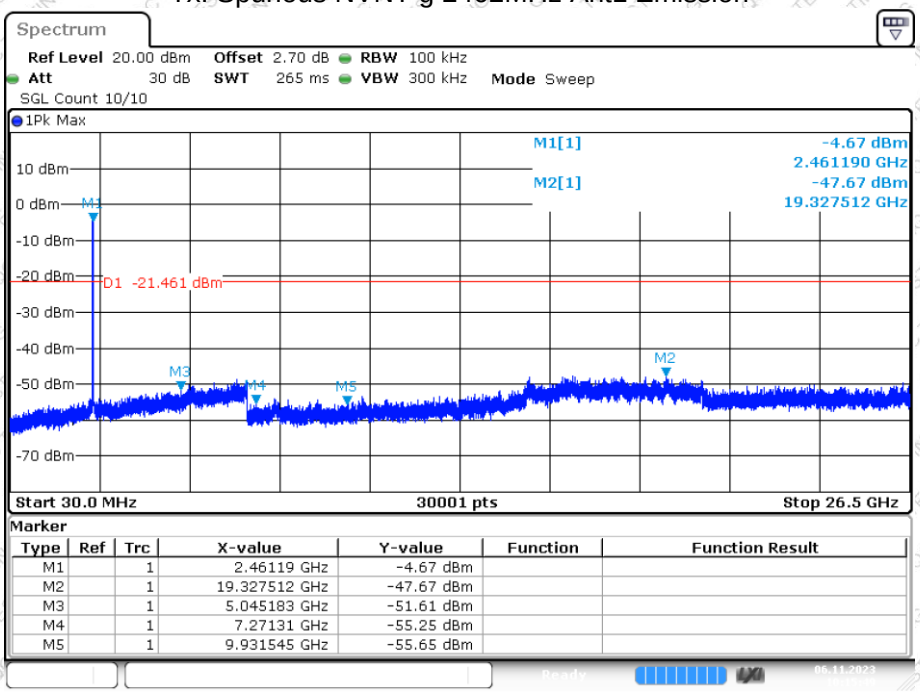


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4356 GHz	-5.59 dBm		
M2		1	6.823967 GHz	-47.35 dBm		
M3		1	5.037242 GHz	-51.88 dBm		
M4		1	7.237781 GHz	-55.13 dBm		
M5		1	9.85037 GHz	-54.73 dBm		

Date: 6.NOV.2023 10:13:20

Tx. Spurious NVNT g 2462MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.46119 GHz	-4.67 dBm		
M2		1	19.327512 GHz	-47.67 dBm		
M3		1	5.045183 GHz	-51.61 dBm		
M4		1	7.27131 GHz	-55.25 dBm		
M5		1	9.931545 GHz	-55.65 dBm		

Date: 6.NOV.2023 10:15:49

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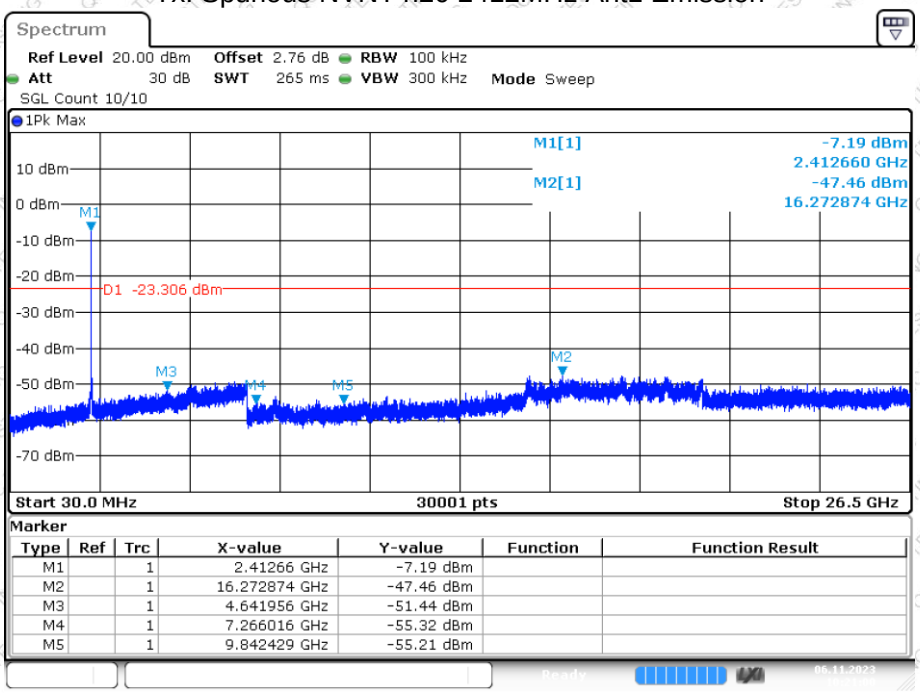
Tx. Spurious NVNT n20 2412MHz Ant1 Emission

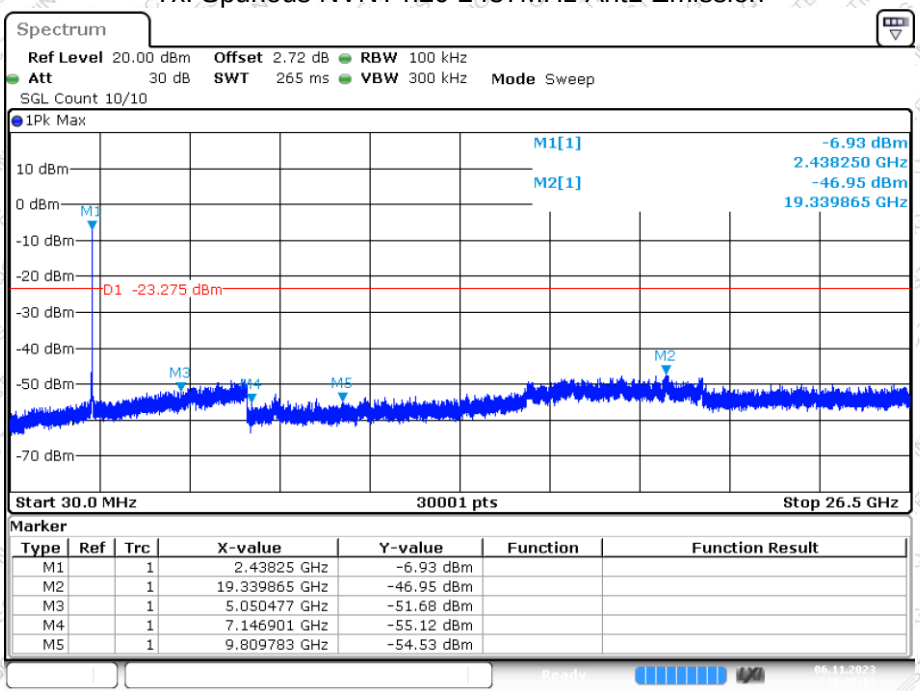


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.41266 GHz	-7.19 dBm		
M2		1	16.272874 GHz	-47.46 dBm		
M3		1	4.641956 GHz	-51.44 dBm		
M4		1	7.266016 GHz	-55.32 dBm		
M5		1	9.842429 GHz	-55.21 dBm		

Date: 6.NOV.2023 10:21:00

Tx. Spurious NVNT n20 2437MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.43825 GHz	-6.93 dBm		
M2		1	19.339865 GHz	-46.95 dBm		
M3		1	5.050477 GHz	-51.68 dBm		
M4		1	7.146901 GHz	-55.12 dBm		
M5		1	9.809783 GHz	-54.53 dBm		

Date: 6.NOV.2023 10:25:13

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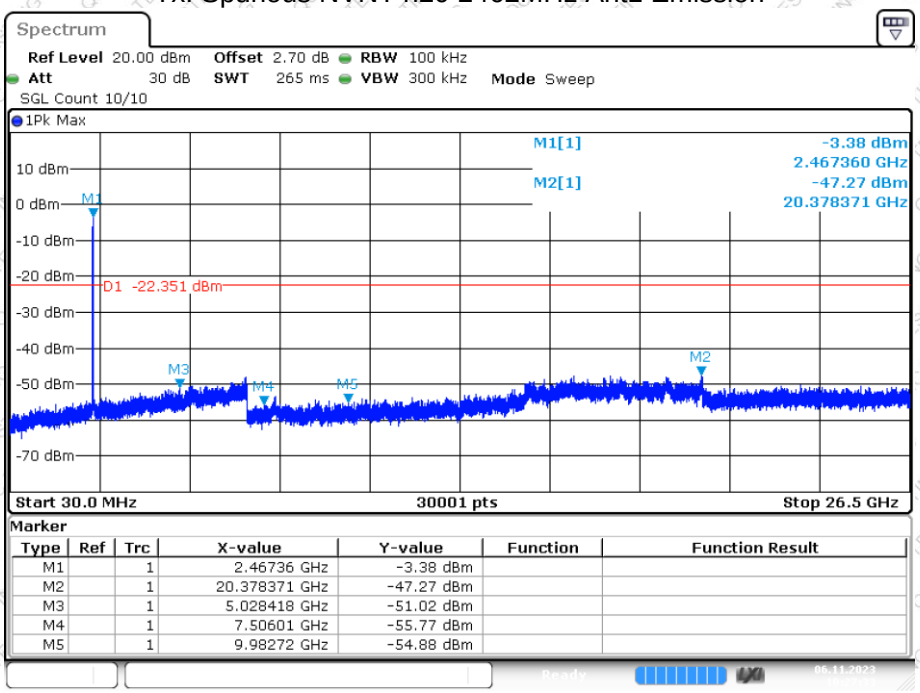
Tx. Spurious NVNT n20 2462MHz Ant1 Emission

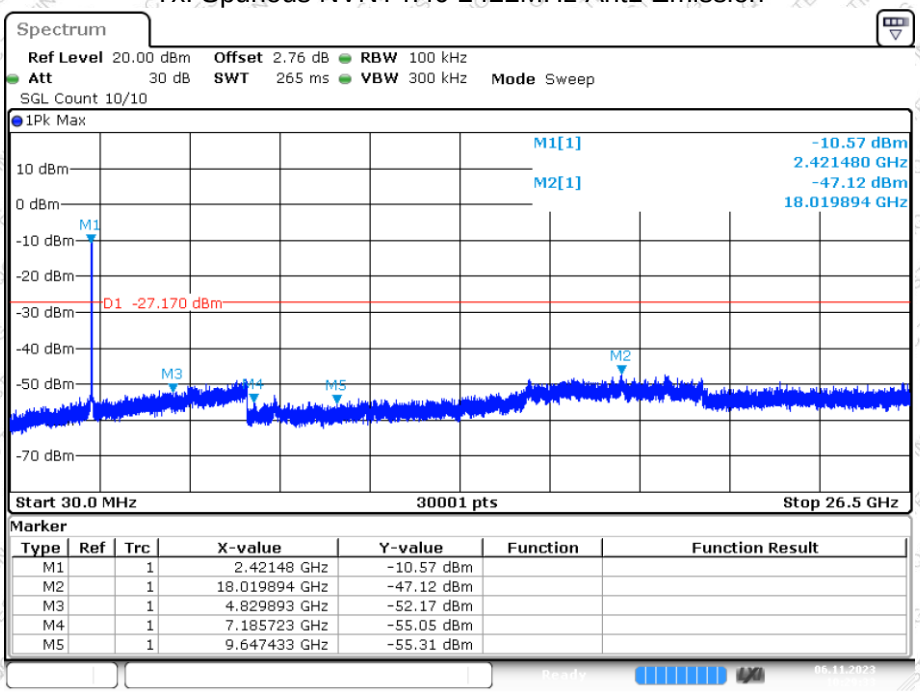


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.46736 GHz	-3.38 dBm		
M2		1	20.378371 GHz	-47.27 dBm		
M3		1	5.028418 GHz	-51.02 dBm		
M4		1	7.50601 GHz	-55.77 dBm		
M5		1	9.98272 GHz	-54.88 dBm		

Date: 6.NOV.2023 10:27:33

Tx. Spurious NVNT n40 2422MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.42148 GHz	-10.57 dBm		
M2		1	18.019894 GHz	-47.12 dBm		
M3		1	4.829893 GHz	-52.17 dBm		
M4		1	7.185723 GHz	-55.05 dBm		
M5		1	9.647433 GHz	-55.31 dBm		

Date: 6.NOV.2023 10:29:34

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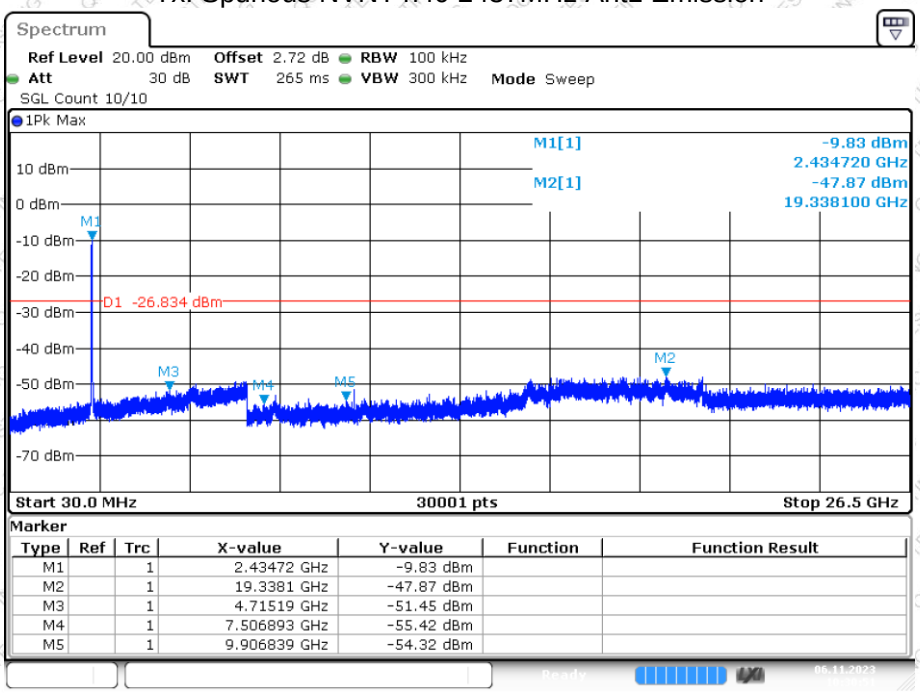
Tx. Spurious NVNT n40 2437MHz Ant1 Emission

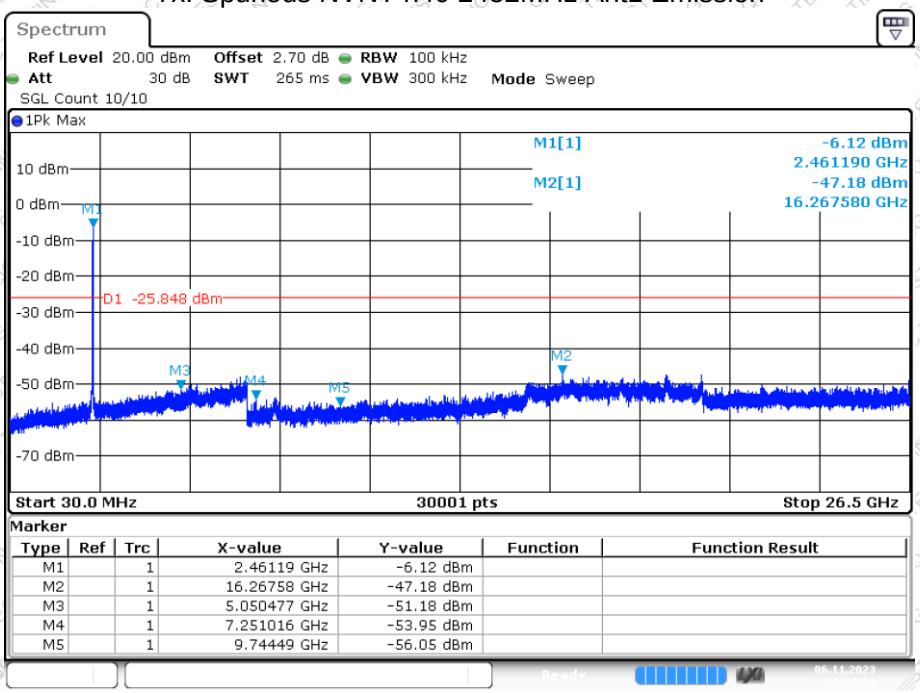


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.43472 GHz	-9.83 dBm		
M2		1	19.3381 GHz	-47.87 dBm		
M3		1	4.71519 GHz	-51.45 dBm		
M4		1	7.506893 GHz	-55.42 dBm		
M5		1	9.906839 GHz	-54.32 dBm		

Date: 6.NOV.2023 10:30:51

Tx. Spurious NVNT n40 2452MHz Ant1 Emission



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.46119 GHz	-6.12 dBm		
M2		1	16.26758 GHz	-47.18 dBm		
M3		1	5.050477 GHz	-51.18 dBm		
M4		1	7.251016 GHz	-53.95 dBm		
M5		1	9.74449 GHz	-56.05 dBm		

Date: 6.NOV.2023 10:32:21

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9.2 Radiated Emission Method

9.2.1 Applicable Standard

FCC Part15 C Section 15.209 and 15.205

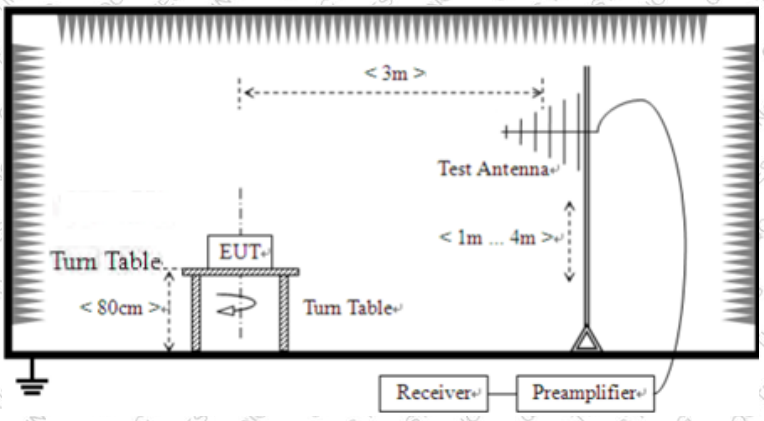
9.2.2 Limit

Frequency	Field Strengths Limits (μV/m at 3 m)	Field Strengths Limits (dBμV/m at 3 m)	Remark
30 – 88	100	40.0	Quasi-peak
88 – 216	150	43.5	Quasi-peak
216 – 960	200	46.0	Quasi-peak
Above 960	500	54.0	Quasi-peak
Above 1GHz	/	54.0	Peak
		74.0	Average

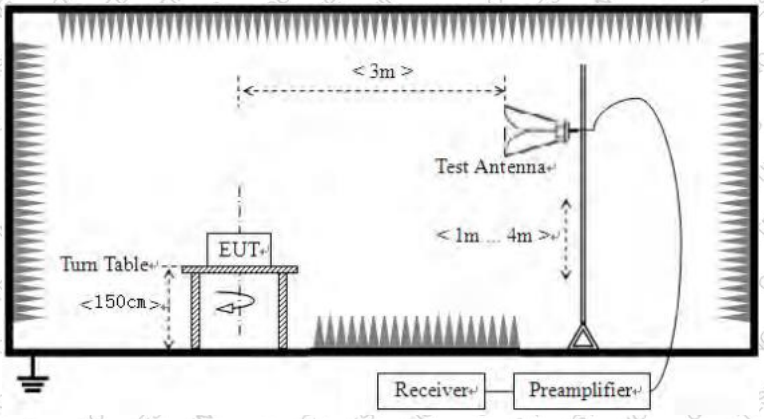
Note: dBμV/m =20log(μV/m)

9.2.3 Test setup

For radiated emissions from 30MHz to1GHz



For radiated emissions above 1GHz



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9.2.4 EMI Test Receiver Setup

Frequency	RBW	VBW	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	Peak
	1 MHz	10 Hz	/	Average

9.2.5 Test procedure

- The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

9.2.6 Test Data

Temperature	23.5 ℃	Humidity	48%
ATM Pressure	101.1kPa	Antenna Gain	2.15dBi
Test by	Fan Yang	Test result	PASS

Remarks:

1. During the test, pre-scan the all modulation, and found the 802.11b modulation which it is worse case.
2. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.
3. The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

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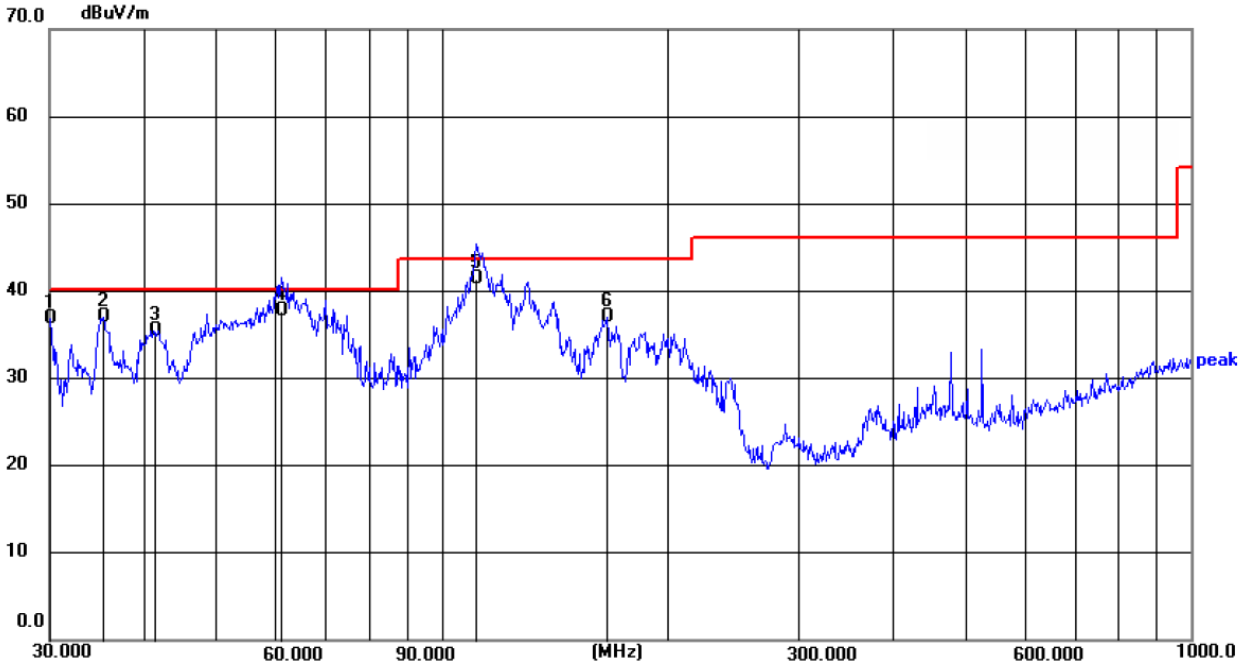
Below 1GHz

Pre-scan all test modes, found worst case at 802.11b mode 2412MHz, and so only show the test result of 802.11b mode 2412MHz

Horizontal:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	30.0000	23.88	13.04	36.92	40.00	3.08	QP
2	35.3750	23.25	13.70	36.95	40.00	3.05	QP
3	41.2765	20.69	14.77	35.46	40.00	4.54	QP
4	61.1315	23.91	13.72	37.63	40.00	2.37	QP
5 *	111.3468	28.93	12.42	41.35	43.50	2.15	QP
6	166.0680	22.92	14.02	36.94	43.50	6.56	QP

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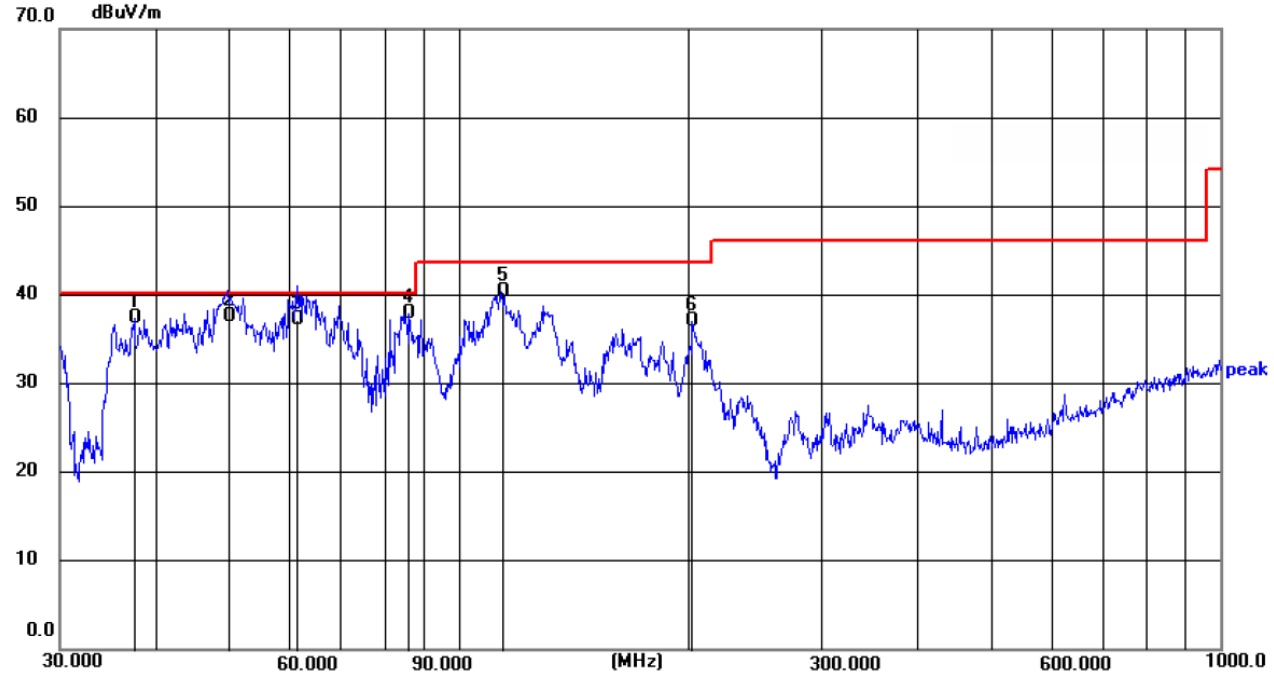
Vertical:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	37.5478	23.31	14.01	37.32	40.00	2.68	QP
2	49.8814	23.04	14.44	37.48	40.00	2.52	QP
3	61.3463	23.79	13.35	37.14	40.00	2.86	QP
4 *	86.2000	27.91	9.99	37.90	40.00	2.10	QP
5	114.1137	27.72	12.57	40.29	43.50	3.21	QP
6	202.8103	25.87	11.18	37.05	43.50	6.45	QP

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Above 1GHz

Frequency (MHz)	Read Level (dBμV)	Polarization	Factor (dB/m)	Level (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)	Detector
11b Low Channel							
2310	51.3	H	-11.14	40.16	74	33.84	peak
2310	50.87	V	-11.16	39.71	74	34.29	peak
2390	51.15	H	-10.9	40.25	74	33.75	peak
2390	51.05	V	-10.96	40.09	74	33.91	peak
4824	49.04	H	-4.29	44.75	74	29.25	peak
4824	46.43	V	-4.43	42	74	32	peak
11b Middle Channel							
4874	47.15	H	-4.12	43.03	74	30.97	peak
4874	47.22	V	-4.25	42.97	74	31.03	peak
11b High Channel							
2483.5	69.3	H	-10.61	58.69	74	15.31	peak
2483.5	57.66	H	-10.61	47.05	54	6.95	AVG
2483.5	54.89	V	-10.71	44.18	74	29.82	peak
2492.2	61.58	V	-10.68	50.9	74	23.1	peak
2500	55.69	H	-10.57	45.12	74	28.88	peak
2500	51.39	V	-10.67	40.72	74	33.28	peak
4924	47.45	H	-3.94	43.51	74	30.49	peak
4924	47.03	V	-4.06	42.97	74	31.03	peak
11g Low Channel							
2310	60.38	H	-11.14	49.24	74	24.76	peak
2310	61.55	V	-11.16	50.39	74	23.61	peak
2390	51.27	H	-10.9	40.37	74	33.63	peak
2390	51.44	V	-10.96	40.48	74	33.52	peak
4824	48.15	H	-4.29	43.86	74	30.14	peak
4824	48.37	V	-4.43	43.94	74	30.06	peak
11g Middle Channel							
4874	47.93	H	-4.12	43.81	74	30.19	peak
4874	48.73	V	-4.25	44.48	74	29.52	peak
11g High Channel							
2483.5	62.68	H	-10.61	52.07	74	21.93	peak
2483.5	67.13	V	-10.71	56.42	74	17.58	peak
2483.5	46.77	V	-10.71	36.06	54	17.94	AVG
2500	51.28	H	-10.57	40.71	74	33.29	peak
2500	50.96	V	-10.67	40.29	74	33.71	peak
4924	46.6	H	-3.94	42.66	74	31.34	peak
4924	47.68	V	-4.06	43.62	74	30.38	peak
11n20 Low Channel							
2310	62.16	H	-11.14	51.02	74	22.98	peak
2310	61.54	V	-11.16	50.38	74	23.62	peak
2390	50.88	H	-10.9	39.98	74	34.02	peak
2390	51.12	V	-10.96	40.16	74	33.84	peak
4824	46.04	H	-4.29	41.75	74	32.25	peak
4824	50.62	V	-4.43	46.19	74	27.81	peak

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11n20 Middle Channel							
4874	45.87	H	-4.12	41.75	74	32.25	peak
4874	50.44	V	-4.25	46.19	74	27.81	peak
11n20 High Channel							
2483.5	70.35	H	-10.61	59.74	74	14.26	peak
2483.5	57.56	H	-10.61	46.95	54	7.05	AVG
2483.5	61.38	V	-10.71	50.67	74	23.33	peak
2500	50.97	H	-10.57	40.4	74	33.6	peak
2500	51.86	V	-10.67	41.19	74	32.81	peak
4924	45.69	H	-3.94	41.75	74	32.25	peak
4924	50.25	V	-4.06	46.19	74	27.81	peak
11n40 Low Channel							
2310	50.9	H	-11.14	39.76	74	34.24	peak
2310	52.99	V	-11.16	41.83	74	32.17	peak
2390	61.17	H	-10.9	50.27	74	23.73	peak
2390	52.56	V	-10.96	41.6	74	32.4	peak
4844	49.31	H	-4.23	45.08	74	28.92	peak
4844	49.93	V	-4.36	45.57	74	28.43	peak
11n40 Middle Channel							
4874	49.2	H	-4.12	45.08	74	28.92	peak
4874	49.82	V	-4.25	45.57	74	28.43	peak
11n40 High Channel							
2483.5	74.41	H	-10.61	63.8	74	10.2	peak
2483.5	59.42	H	-10.61	48.81	54	5.19	AVG
2483.5	64.8	V	-10.71	54.09	74	19.91	peak
2483.5	46.76	V	-10.71	36.05	54	17.95	AVG
2500	66.48	H	-10.57	55.91	74	18.09	peak
2500	49.4	H	-10.57	38.83	54	15.17	AVG
2500	52.17	V	-10.67	41.5	74	32.5	peak
4904	49.1	H	-4.02	45.08	74	28.92	peak
4904	49.71	V	-4.14	45.57	74	28.43	peak

Remarks:

1. Level =Receiver Read level + Factor
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

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

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