FCC Part 15.247
RSS-247, ISSUE 2, February 2017
RSS-GEN, ISSUE 5, February 2021 Amendment 2
TEST REPORT

For

YEALINK(XIAMEN) NETWORK TECHNOLOGY CO.,LTD.

No.666 Hu'an Rd,Huli District Xiamen City, Fujian, P.R. China

FCC ID: T2C-T31W
IC: 10741A-T31W

Report Type:	**Product Type:**
Original Report	Classic IP Phone

Report Producer : Lynette Wen

Report Number : RXZ230630065RF02

Report Date : 2023-08-07

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Revision History

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
0.0	RXZ230630065	RXZ230630065RF02	2023-08-07	Original Report	Lynette Wen

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1 General Information

1.1 Product Description for Equipment under Test (EUT)

Applicant	YEALINK(XIAMEN) NETWORK TECHNOLOGY CO.,LTD.
	No.666 Hu'an Rd,Huli District Xiamen City, Fujian, P.R. China
Brand(Trade) Name	Yealink
Product (Equipment) / PMN	Classic IP Phone
Main Model Name	SIP-T31W
HVIN	T31W
Series Model Name	N/A
Model Discrepancy	N/A
Frequency Range	IEEE 802.11b/g / IEEE 802.11n HT20 Mode: 2412 ~ 2462 MHz IEEE 802.11n HT40 Mode: 2422 ~ 2452 MHz
Conducted Peak Output Power	IEEE 802.11b Mode: 18.60 dBm IEEE 802.11g Mode: 17.71 dBm IEEE 802.11n HT20 Mode: 17.82 dBm IEEE 802.11n HT40 Mode: 17.87 dBm
Modulation Technique	IEEE 802.11b Mode: DSSS IEEE 802.11g Mode: OFDM IEEE 802.11n HT20 Mode: OFDM IEEE 802.11n HT40 Mode: OFDM
Power Operation (Voltage Range)	☒ AC 120V/60Hz ☒ Adapter: I/P: 100-240V 50~60Hz 0.2A , O/P: 5Vdc, 0.6A ☐ By AC Power Cord ☒ PoE: I/P: 100-240V 50~60Hz 0.67A , O/P: 55Vdc, 0.6A
Received Date	2023/7/3
Date of Test	2023/7/3 ~ 2023/8/5

*All measurement and test data in this report was gathered from production sample serial number:

RXZ230630065-01 (Assigned by BACL, New Taipei Laboratory).

1.2 Objective

This report is prepared on behalf of *YEALINK(XIAMEN) NETWORK TECHNOLOGY CO.,LTD.* in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communication Commission's rules and RSS-247, Issue 2, February 2017, RSSGen, Issue 5, February 2021 Amendment 2 of the Innovation, Science and Economic Development Canada.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and KDB 558074 D01 15.247 Meas Guidance v05r02. And RSS-247, Issue 2, February 2017, RSSGen, Issue 5, February 2021 Amendment 2 of the Innovation, Science and Economic Development Canada.

1.4 Statement

Decision Rule: No, (The test results do not include MU judgment)

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
The determination of the test results does not require consideration of the uncertainty of the measurement, unless the assessment is required by customer agreement, regulation or standard document specification.
Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) is not responsible for the authenticity of the information provided by the applicant that affects the test results.

1.5 Measurement Uncertainty

Parameter		Uncertainty
AC Mains		+/- 2.53 dB
RF output power, conducted		+/- 3.74 dB
Power Spectral Density, conducted		+/- 0.58 dBm
Occupied Bandwidth		+/- 0.09 %
Unwanted Emissions, conducted		+/- 1.13 dBm
Emissions, radiated	30 MHz~1 GHz	+/- 4.99 dB
	1 GHz~18 GHz	+/- 7.56 dB
	18 GHz~40 GHz	+/- 5.06 dB
Temperature		+/- 0.401 °C
Humidity		+/- 2.6 %

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

1.6 Environmental Conditions

Test Site	Test Data	Temperature (℃)	Relative Humidity (%)	ATM Pressure (hPa)	Test Engineer
AC Line Conducted Emissions	2023/7/7~2023/8/2	24.1~25.1	45~60	1010	Jing
Radiation Spurious Emissions	2023/7/4~2023/8/5	22.4~25.6	50~66	1010	Aaron
Conducted Spurious Emissions	2023/7/3	25.1	41	1010	Jing
Emission Bandwidth	2023/7/3	25.1	41	1010	Jing
Maximum Output Power	2023/7/3	25.1	41	1010	Jing
100 kHz Bandwidth of Frequency Band Edge	2023/7/3	25.1	41	1010	Jim
Power Spectral Density	2023/7/3	25.1	41	1010	Jing

1.7 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) to collect test data is located on

☒70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 3732) and the FCC designation No.TW3732 under the Mutual Recognition Agreement (MRA) in FCC Test.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: TW3732.

2 System Test Configuration

2.1 Description of Test Configuration

For WIFI 2.4GHz mode, there are totally 11 channels.

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

For 802.11 b/g/n20 Modes were tested with channel 1, 6 and 11.

For 802.11n40 Mode were tested with channel 3, 6 and 9.

The system was configured for testing in engineering mode, which was provided by manufacturer.

2.2 Equipment Modifications

No modification was made to the EUT.

2.3 EUT Exercise Software

The test software was used "AuthenticTool_1.2.19.0"

Test Frequency		Low	Middle	High
Power Level Setting	802.11b Mode	41	41	41
	802.11g Mode	33	33	33
	802.11n HT20 Mode	35	35	35
	802.11n HT40 Mode	33	33	33

The EUT was configured for testing in an engineering mode which was provided by the manufacturer. The worst-case data rates are determined to be as follows for each mode based upon investigations by measuring the average power and PSD across all data rates bandwidths, and modulations.

802.11b: 1Mbps

802.11g: 6Mbps

802.11n HT20: MCS0

802.11n HT40: MCS0

2.4 Support Equipment List and Details

Description	Manufacturer	Model Number
Adapter	Yealink	YLPS050600E1-US
NB	DELL	E6410
AP Router	NETGEAR	R7800
POE Adapter	Cisco	SB-PWR-INJ2
Handset	Yealink	N/A
Handset	BACL	N/A

2.5 External Cable List and Details

Description	Manufacturer	Model Number
RJ-45 Cable	BACL	8m
RJ-45 Cable	BACL	8m
RJ-11 Cable	BACL	0.5m
RJ-11 Cable	BACL	0.5m

2.6 Test Mode

Pre-scan

AC Line Conducted Emissions and Radiated Spurious Emissions

Mode 1: SIP-T31W + Adapter

Mode 2: SIP-T31W + PoE

Worst case is the SIP-T31W + Adapter.

Mode 1: SIP-T31W + Adapter tested all measure item.

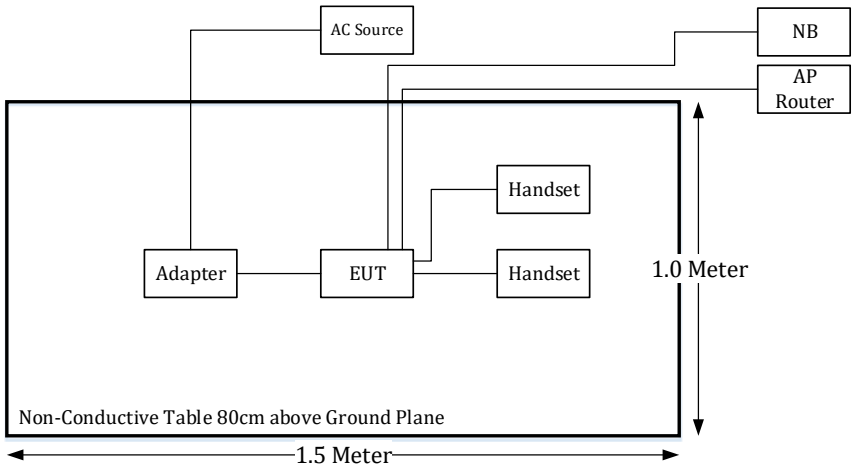
Mode 2: SIP-T31W + PoE test Below 1GHz Radiated Spurious Emissions and AC Line Conducted Emissions.

2.7 Block Diagram of Test Setup

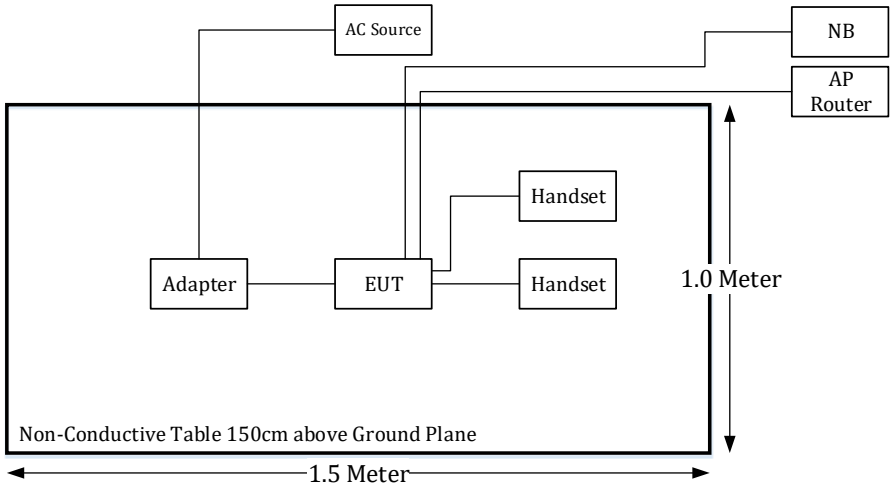
See test photographs attached in setup photos for the actual connections between EUT and support equipment.

Radiation:

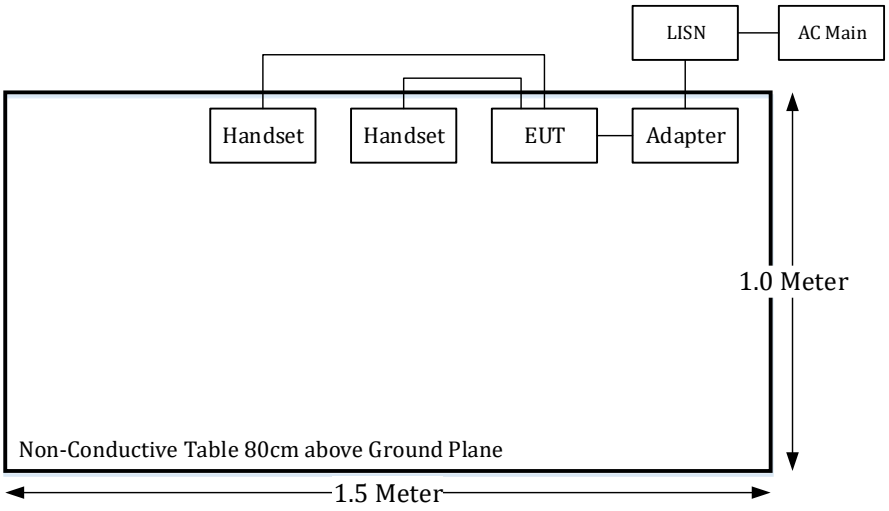
Below 1GHz:



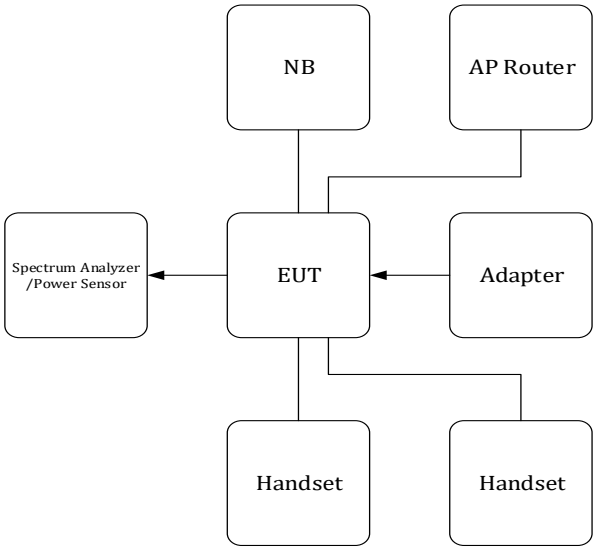
Above 1GHz:



Conduction:



Conducted:



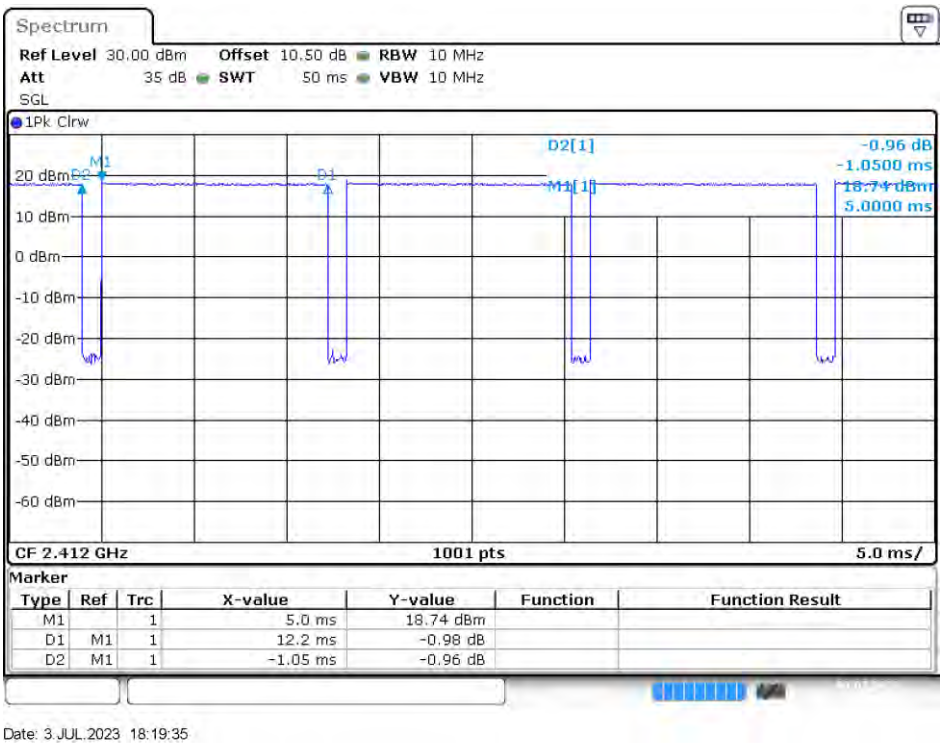
2.8 Duty Cycle

The duty cycle as below:

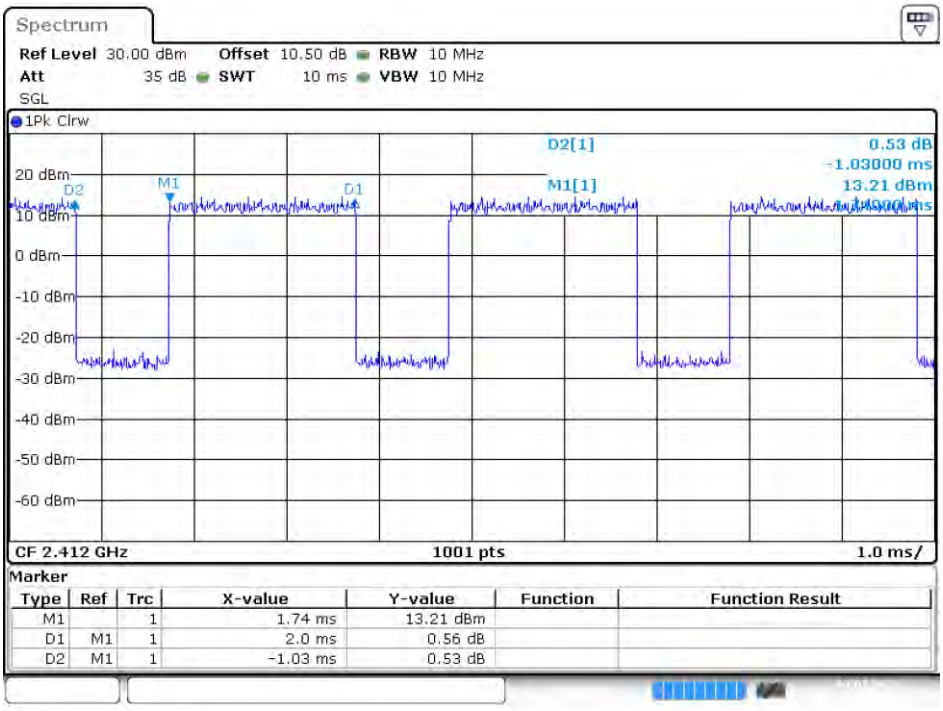
Radio Mode	On Time (ms)	Off Time (ms)	Duty Cycle (%)	1/T VBW Setting (kHz)
802.11b	12.2	1.05	92	0.08
802.11g	2.0	1.03	66	0.50
802.11n20	1.86	1.04	64	0.54
802.11n40	0.9	1.03	47	1.11

Please refer to the following plots.

B Mode

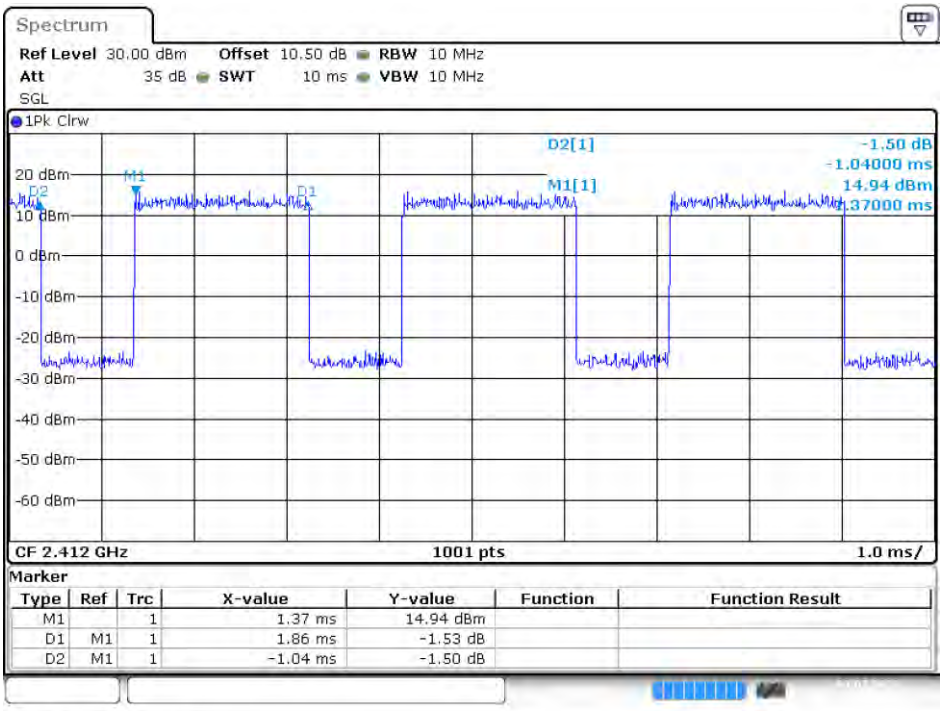


G Mode



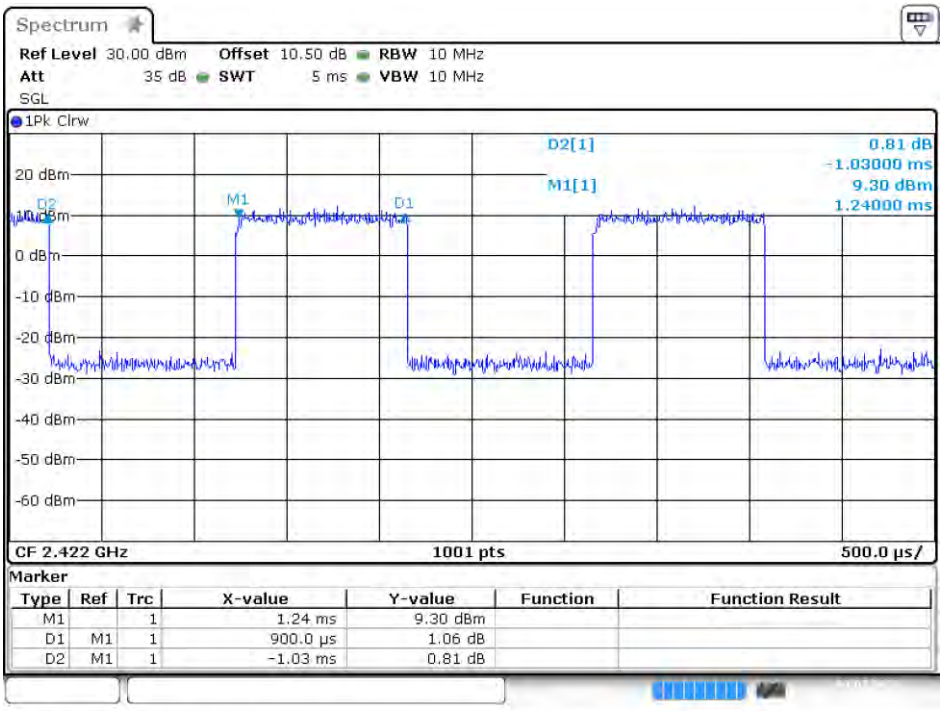
Date: 3.JUL.2023 18:21:25

N20 Mode



Date: 3.JUL.2023 18:22:27

N40 Mode



3 Summary of Test Results

Rules	Description of Test	Results
FCC §15.247(i), §1.1307(b)(3)(i)	RF Exposure	Compliance
RSS-102 §2.5.2	Exemption From Routine Evaluation Limits – RF Exposure Evaluation	Compliance
FCC §15.203 RSS-Gen §6.8	Antenna Requirement	Compliance
FCC §15.207(a) RSS-Gen §8.8	AC Line Conducted Emissions	Compliance
FCC §15.205, §15.209, §15.247(d) RSS-247 §5.5 RSS-Gen §8.9 RSS-Gen §8.10	Spurious Emissions	Compliance
FCC §15.247(a)(2) RSS-247 §5.2 a) RSS-Gen §6.7	Emission Bandwidth	Compliance
FCC §15.247(b)(3) RSS-247 §5.4 d)	Maximum Peak Output Power	Compliance
FCC §15.247(d) RSS-247 §5.5	100 kHz Bandwidth of Frequency Band Edge	Compliance
FCC §15.247(e) RSS-247 §5.2 b)	Power Spectral Density	Compliance

4 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
AC Line Conduction Room (CON-A)					
LISN	Rohde & Schwarz	ENV216	101612	2023/2/2	2024/2/1
EMI Test Receiver	Rohde & Schwarz	ESW8	100947	2023/5/22	2024/5/20
Pulse Limiter	Rohde & Schwarz	ESH3Z2	TXZEM104	2023/5/18	2024/5/16
RF Cable	EMEC	EM-CB5D	1	2023/6/6	2024/6/4
Software	AUDIX	E3	V9.150826k	N.C.R	N.C.R
Radiation 3M Room (966-A)					
Bilog Antenna with 6 dB Attenuator	SUNOL SCIENCES & MINI-CIRCUITS	JB6/UNAT-6+	A050115/15542_01	2023/2/2	2024/2/1
Horn Antenna	EMCO	SAS-571	1020	2023/5/18	2024/5/16
Horn Antenna	ETS-Lindgren	3116	62638	2022/8/18	2023/8/17
Preamplifier	Sonoma	310N	130602	2023/6/16	2024/6/14
Preamplifier	Channel	ERA-100M-18G-01D1748	EC2300051	2023/04/01	2024/03/30
Microware Preamplifier	EM Electronics Corporation	EM18G40G	60656	2023/1/6	2024/1/5
Spectrum Analyzer	Rohde & Schwarz	FSV40	101435	2023/2/1	2024/1/31
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2022/11/2	2023/11/1
Micro flex Cable	UTIFLEX	UFB197C-1-2362-70U-70U	225757-001	2023/1/24	2024/1/23
Coaxial Cable	COMMATE	PEWC	8Dr	2022/12/24	2023/12/23
Coaxial Cable	UTIFLEX	UFB311A-Q-1440-300300	220490-006	2023/1/24	2024/1/23
Coaxial Cable	JUNFLON	J12J102248-00-B-5	AUG-07-15-044	2022/12/24	2023/12/23
Cable	EMC	EMC105-SM-SM-10000	201003	2023/1/24	2024/1/23
Coaxial Cable	ROSNOL	K1K50-UP0264-K1K50-450CM	160309-1	2023/1/24	2024/1/23
Coaxial Cable	ROSNOL	K1K50-UP0264-K1K50-50CM	15120-1	2023/2/2	2024/2/1
Software	AUDIX	E3	18621a	N.C.R	N.C.R
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSV40	101140	2023/2/10	2024/2/9
Cable	UTIFLEX	UFA210A	9435	2022/10/3	2023/10/2
Power Sensor	Boonton	RTP5006	11037	2023/5/23	2024/5/21
Attenuator	MINI-CIRCUITS	BW-S10W5+	1419	2023/2/2	2024/2/1

***Statement of Traceability:** BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to the SI System of Units via the R.O.C. Center for Measurement Standards of the Electronics Testing Center, Taiwan (ETC) or to another internationally recognized National Metrology Institute (NMI), and were compliant with the current Taiwan Accreditation Foundation (TAF) requirements.

5 FCC §15.247(i), §1.1307(b)(3)(i) - RF Exposure

5.1 Applicable Standard

According to subpart 15.247(i)and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

For single RF sources (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2) of this section): A single RF source is exempt if:

(A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

(B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold Pth (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). Pth is given by:

$$P_{th}\ (\text{mW}) = \begin{cases} ERP_{20\ cm}(d/20\ \text{cm})^x & d \le 20\ \text{cm} \\ ERP_{20\ cm} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases}$$

Where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\ cm}\sqrt{f}}\right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20\ cm}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases}$$

(C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

Table 1 to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1,920 R^2.
1.34-30	3,450 R^2/f^2.
30-300	3.83 R^2.
300-1,500	0.0128 R^2f.
1,500-100,000	19.2R^2.

5.2 RF Exposure Evaluation Result

Project info

Band	Freq (MHz)	Tune-up Power (dBm)	Ant Gain (dBi)	Distances (mm)	Tune-up Power (mW)	ERP (dBm)	ERP (mW)
WIFI 2.4GHz	2412-2462	19	0.85	200	79.43	17.7	58.88
WIFI 5GHz	5180-5825	16	1.53	200	39.81	15.38	34.51

§ 1.1307(b)(3)(i)(A) methid is not applicable.

§ 1.1307(b)(3)(i)(C)

Band	λ/2π (mm)	Distances applies	ERP Limit (mW)	Result Option C
WIFI 2.4GHz	19.39	apply	768.00	exempt
WIFI 5GHz	8.16	apply	768.00	exempt

The minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates
ERP (watts) is no more than the calculated value prescribed for that frequency
R must be at least $\lambda/2\pi$
λ is the free-space operating wavelength in meters

Note: Wi-Fi 2.4G and Wi-Fi 5G can't transmit simultaneously.

Result: The device compliant the MPE-Based Exemption at 20cm distances.

6 RSS-102 §2.5.2 – EXEMPTION FROM ROUTINE EVALUATION LIMITS – RF EXPOSURE EVALUATION

6.1 Applicable Standard

According to RSS-102 2.5.2

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz[Footnote6] and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2}\ f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

6.2 RF Exposure Evaluation Result

Tune-up power = 19 dBm

EIRP Tune-up power = 19.85 dBm = 96.61 mW

Exemption from Routine Evaluation Limit is:

$1.31 \times 10^{-2}\ f^{0.6834} = 1.31 \times 10^{-2}\ 2412^{0.6834} = 2.68\text{W} > 96.61\text{mW}$

Result: The device meets the exemption requirement.

7 FCC §15.203 & RSS-GEN §6.8– Antenna Requirements

7.1 Applicable Standard

According to § 15.203,

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

According to RSS-Gen 6.8:

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:

This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type

7.2 Antenna Information

Manufacturer	Type	Antenna Gain	Impedance
YEALINK(XIAMEN) NETWORK TECHNOLOGY CO.,LTD.	PCB Antenna	0.85 dBi	50Ω

Result: Compliance

8 FCC §15.207(a) & RSS-GEN §8.8– AC Line Conducted Emissions

8.1 Applicable Standard

According to §15.207

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

According to RSS-GEN §8.8

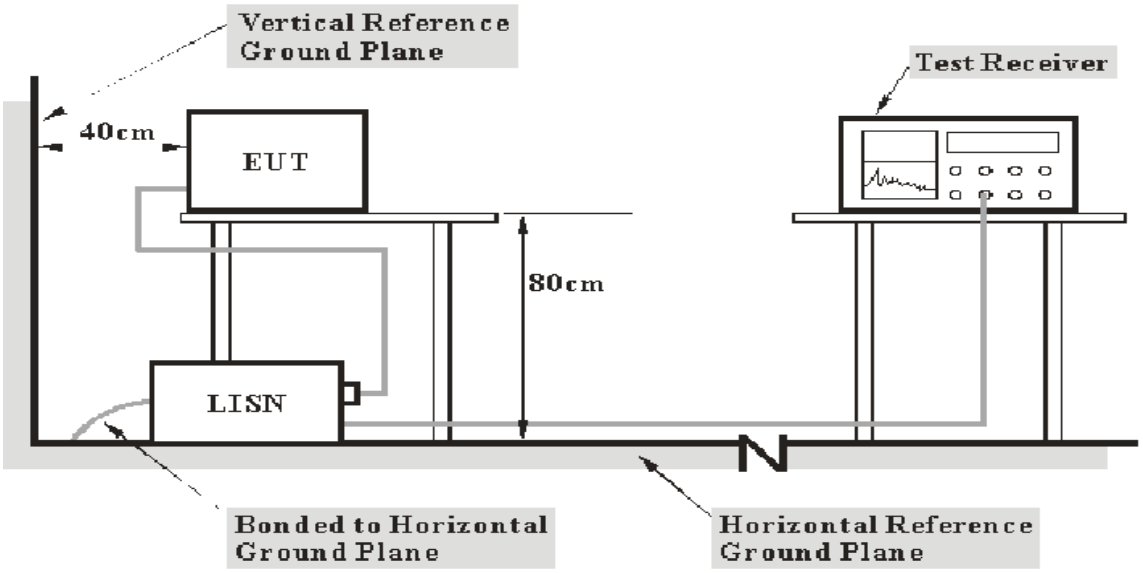
Unless stated otherwise in the applicable RSS, for radio apparatus that are designed to be connected to the public utility AC power network, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the range 150 kHz to 30 MHz shall not exceed the limits in table 4, as measured using a 50 μH / 50 Ω line impedance stabilization network. This requirement applies for the radio frequency voltage measured between each power line and the ground terminal of each AC power-line mains cable of the EUT.

For an EUT that connects to the AC power lines indirectly, through another device, the requirement for compliance with the limits in table 4 shall apply at the terminals of the AC power-line mains cable of a representative support device, while it provides power to the EUT. The lower limit applies at the boundary between the frequency ranges. The device used to power the EUT shall be representative of typical applications.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 Note 1	56 to 46 Note 1
0.5-5	56	46
5-30	60	50

Note 1: Decreases with the logarithm of the frequency.

8.2 EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 and RSS-GEN limits.

8.3 EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150kHz to 30MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations

Frequency Range	IF B/W
150kHz – 30MHz	9kHz

8.4 Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

8.5 Corrected Factor & Margin Calculation

The factor is calculated by adding LISN/ISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation

The “Over Limit” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an over limit of -7 dB means the emission is 7 dB below the limit. The equation for Over Limit calculation is as follows:

Over Limit = Result – Limit Line

8.6 Test Results

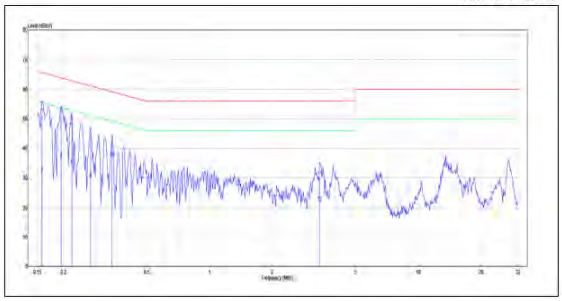
Test Mode: Transmitting

Main: AC120 V, 60 Hz **(**Worst case is 802.11b mode)

Adapter Mode:

Line

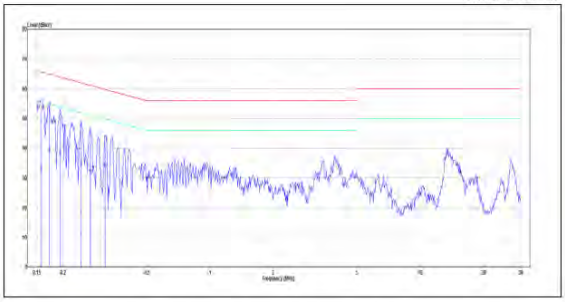
2023-07-07 15:33:01



No.	Frequency (MHz)	Reading dBuV	Correct Factor(dB)	Result dBuV	Limit dBuV	Over limit (dB)	Remark	Phase
1	0.157	32.14	19.50	51.64	65.60	-13.96	QP	Line
2	0.157	11.92	19.50	31.42	55.60	-24.18	Average	Line
3	0.194	32.22	19.49	51.71	63.84	-12.13	QP	Line
4	0.194	16.81	19.49	36.30	53.84	-17.54	Average	Line
5	0.219	29.64	19.50	49.14	62.88	-13.74	QP	Line
6	0.219	14.56	19.50	34.06	52.88	-18.82	Average	Line
7	0.269	25.55	19.52	45.07	61.16	-16.09	QP	Line
8	0.269	10.04	19.52	29.56	51.16	-21.60	Average	Line
9	0.341	22.96	19.55	42.51	59.18	-16.67	QP	Line
10	0.341	17.09	19.55	36.64	49.18	-12.54	Average	Line
11	3.364	10.30	20.11	30.41	56.00	-25.59	QP	Line
12	3.364	1.66	20.11	21.77	46.00	-24.23	Average	Line

Netural

2023-07-07 15:38:40

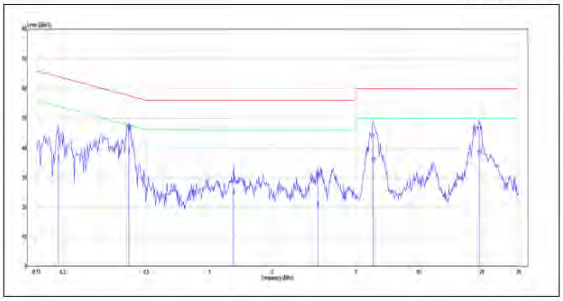


No.	Frequency (MHz)	Reading dBuV	Correct Factor(dB)	Result dBuV	Limit dBuV	Over limit (dB)	Remark	Phase
1	0.157	32.37	19.50	51.87	65.60	-13.73	QP	Neutral
2	0.157	12.41	19.50	31.91	55.60	-23.69	Average	Neutral
3	0.171	34.05	19.50	53.55	64.90	-11.35	QP	Neutral
4	0.171	18.99	19.50	38.49	54.90	-16.41	Average	Neutral
5	0.193	31.50	19.50	51.00	63.89	-12.89	QP	Neutral
6	0.193	17.79	19.50	37.29	53.89	-16.60	Average	Neutral
7	0.243	27.21	19.52	46.73	62.00	-15.27	QP	Neutral
8	0.243	14.02	19.52	33.54	52.00	-18.46	Average	Neutral
9	0.269	25.36	19.53	44.89	61.16	-16.27	QP	Neutral
10	0.269	11.45	19.53	30.98	51.16	-20.18	Average	Neutral
11	0.317	22.68	19.55	42.23	59.80	-17.57	QP	Neutral
12	0.317	13.35	19.55	32.90	49.80	-16.90	Average	Neutral

PoE Mode:

Line

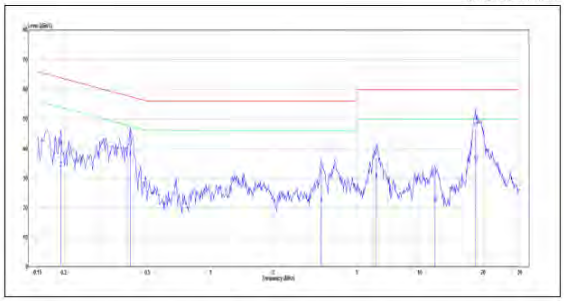
2023-08-02 12:21:57



No.	Frequency (MHz)	Reading dBuV	Correct Factor(dB)	Result dBuV	Limit dBuV	Over limit (dB)	Remark	Phase
1	0.190	22.49	19.49	41.98	64.02	-22.04	QP	Line
2	0.190	15.91	19.49	35.41	54.02	-18.61	Average	Line
3	0.413	26.56	19.58	46.14	57.59	-11.45	QP	Line
4	0.413	17.98	19.58	37.56	47.59	-10.03	Average	Line
5	1.303	9.71	19.93	29.64	56.00	-26.36	QP	Line
6	1.303	3.92	19.93	23.85	46.00	-22.15	Average	Line
7	3.293	7.44	20.10	27.55	56.00	-28.45	QP	Line
8	3.293	-0.34	20.10	19.76	46.00	-26.24	Average	Line
9	6.056	22.54	20.14	42.68	60.00	-17.32	QP	Line
10	6.056	14.61	20.14	34.75	50.00	-15.25	Average	Line
11	19.428	24.67	20.45	45.12	60.00	-14.88	QP	Line
12	19.428	16.77	20.45	37.21	50.00	-12.79	Average	Line

Netural

2023-08-02 12:32:50



No.	Frequency (MHz)	Reading dBuV	Correct Factor(dB)	Result dBuV	Limit dBuV	Over limit (dB)	Remark	Phase
1	0.193	21.16	19.50	40.66	63.89	-23.22	QP	Neutral
2	0.193	13.91	19.50	33.41	53.89	-20.47	Average	Neutral
3	0.415	25.52	19.59	45.11	57.55	-12.44	QP	Neutral
4	0.415	17.29	19.59	36.88	47.55	-10.67	Average	Neutral
5	3.381	10.39	20.11	30.51	56.00	-25.49	QP	Neutral
6	3.381	1.41	20.11	21.52	46.00	-24.48	Average	Neutral
7	6.186	16.93	20.16	37.09	60.00	-22.91	QP	Neutral
8	6.186	9.36	20.16	29.51	50.00	-20.49	Average	Neutral
9	11.807	10.12	20.21	30.33	60.00	-29.67	QP	Neutral
10	11.807	1.45	20.21	21.65	50.00	-28.35	Average	Neutral
11	18.426	26.42	20.47	46.89	60.00	-13.11	QP	Neutral
12	18.426	14.95	20.47	35.42	50.00	-14.58	Average	Neutral

Note:

Result = Read Level + Factor

Over Limit = Result – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

9 FCC §15.209, §15.205, §15.247(d) & RSS-GEN §8.9, §8.10 – Spurious Emissions

9.1 Applicable Standard

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1MHz.

As per RSS-Gen 8.10,

Restricted frequency bands, identified in table 7, are designated primarily for safety-of-life services (distress calling and certain aeronautical activities), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following conditions related to the restricted frequency bands apply:

(a)The transmit frequency, including fundamental components of modulation, of licence-exempt radio apparatus shall not fall within the restricted frequency bands listed in table 7 except for apparatus compliant with RSS-287, Emergency Position Indicating Radio Beacons (EPIRB), Emergency Locator Transmitters (ELT), Personal Locator Beacons (PLB), and Maritime Survivor Locator Devices (MSLD).

(b)Unwanted emissions that fall into restricted frequency bands listed in table 7 shall comply with the limits specified in table 5 and table 6.

(c)Unwanted emissions that do not fall within the restricted frequency bands listed in table 7 shall comply either with the limits specified in the applicable RSS or with those specified in table 5 and table 6.

As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	608 – 614	4. 5 – 5. 15
0.495 – 0.505	16.69475 – 16.69525	960 – 1240	5. 35 – 5. 46
2.1735 – 2.1905	16.80425 – 16.80475	1300 – 1427	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1435 – 1626.5	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1645.5 – 1646.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1660 – 1710	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1718.8 – 1722.2	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	2200 – 2300	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2310 – 2390	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2483.5 – 2500	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2690 – 2900	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	3260 – 3267	22.01 – 23.12
8.41425 – 8.41475	162.0125 –167.17	3.332 – 3.339	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3 3458 – 3 358	31.2 – 31.8
12.51975 – 12.52025	240 – 285	3.600 – 4.400	36.43 – 36.5
12.57675 – 12.57725	322 – 335.4		Above 38.6
13.36 – 13.41	399.9 – 410		

As per FCC §15.209(a) and RSS-GEN §8.9: Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

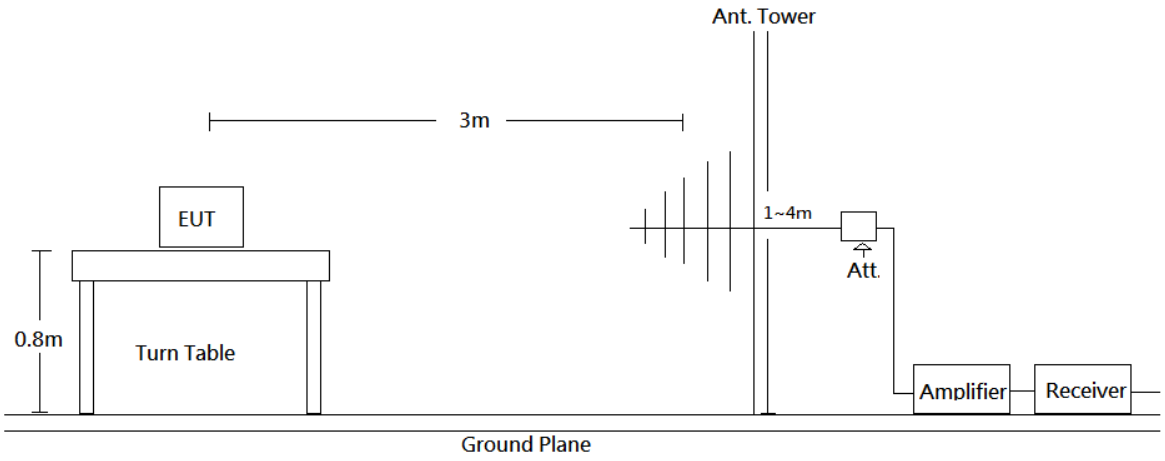
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c).

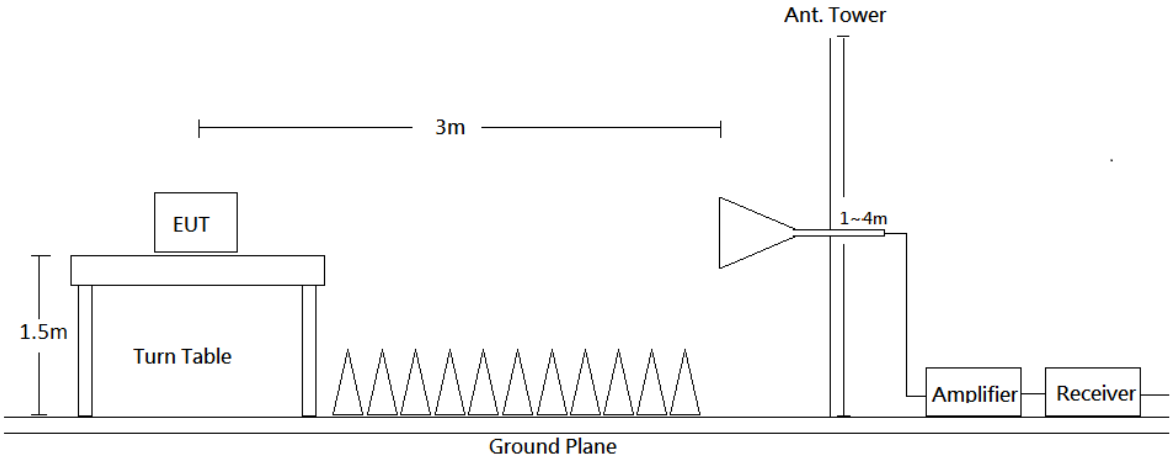
As per RSS-247 5.5,
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

9.2 EUT Setup

Below 1 GHz:



Above 1 GHz:



Radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC Part 15.209, FCC 15.247 and RSS-Gen, RSS-247 Limits.

9.3 EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 26.5 GHz. During the radiated emission test, the EMI test receiver was set with the following configurations measurement method 6.3 in ANSI C63.10.

Frequency Range	RBW	VBW	Duty cycle	Measurement method
30-1000 MHz	120 kHz	/	/	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1 MHz	10 Hz	>98%	Ave
	1 MHz	1/T	<98%	Ave

Note: T is minimum transmission duration

9.4 Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

9.5 Corrected Factor & Margin Calculation

The Correct Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

Margin = Level – Limit

9.6 Test Results

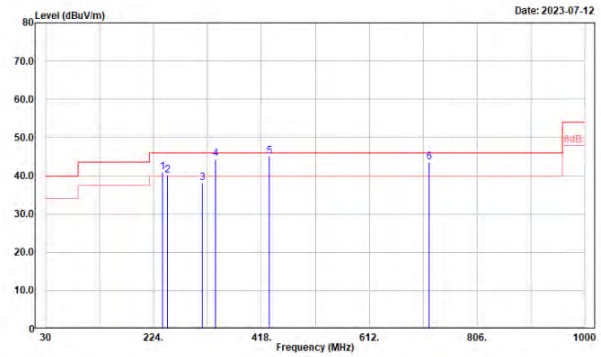
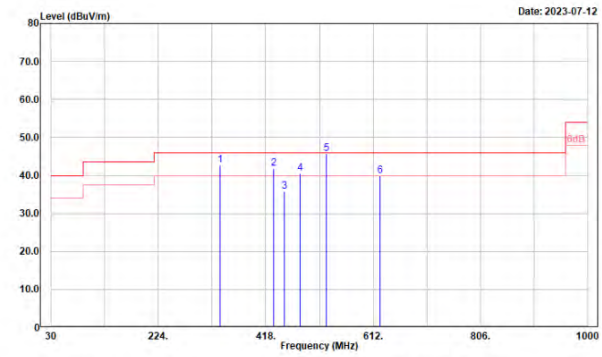
Test Mode: Transmitting

(Pre-scan with three orthogonal axis, and worse case as Y axis.)

(Worst case is 802.11b mode low channel)

30MHz-1GHz:

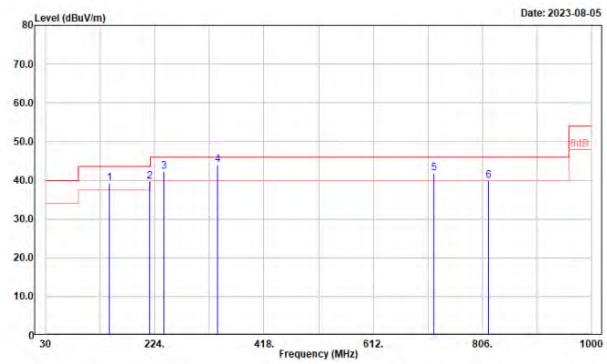
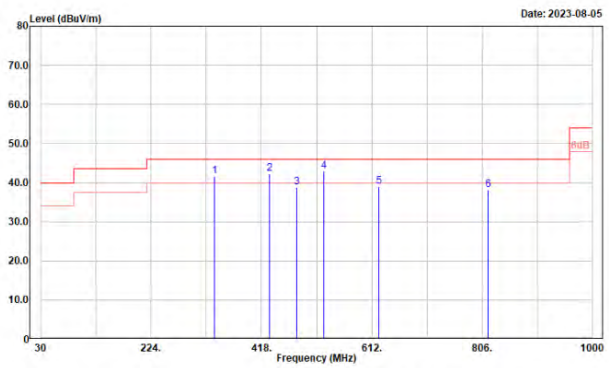
Adapter Mode:

Horizontal	Vertical
	

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
239.730	50.38	-9.39	40.99	46.00	-5.01	100	331	QP
248.469	49.47	-9.37	40.10	46.00	-5.90	100	99	QP
311.582	44.91	-6.67	38.24	46.00	-7.76	100	0	QP
335.856	50.66	-6.24	44.42	46.00	-1.58	100	18	QP
431.982	48.60	-3.45	45.15	46.00	-0.85	100	338	QP
720.360	41.65	1.99	43.64	46.00	-2.36	100	7	QP

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
335.856	48.95	-6.24	42.71	46.00	-3.29	100	49	QP
431.982	45.39	-3.45	41.94	46.00	-4.06	100	178	QP
452.372	38.66	-2.90	35.76	46.00	-10.24	100	151	QP
479.560	42.75	-2.10	40.65	46.00	-5.35	100	135	QP
528.108	47.30	-1.65	45.65	46.00	-0.35	100	360	QP
624.234	39.61	0.33	39.94	46.00	-6.06	100	64	QP

PoE Mode:

Horizontal	Vertical
	

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
143.604	48.25	-8.91	39.34	43.50	-4.16	100	288	QP
215.456	50.24	-10.66	39.58	43.50	-3.92	100	280	QP
239.730	51.58	-9.39	42.19	46.00	-3.81	100	276	QP
335.856	50.33	-6.24	44.09	46.00	-1.91	100	299	QP
720.360	39.80	1.99	41.79	46.00	-4.21	100	326	QP
816.487	35.91	3.97	39.88	46.00	-6.12	100	21	QP

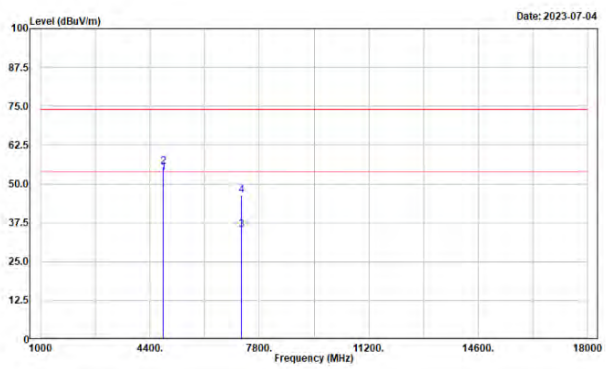
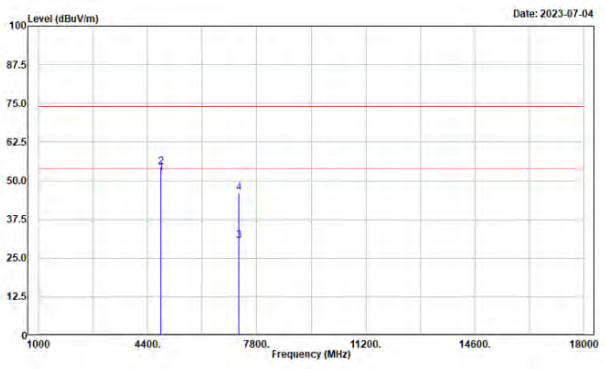
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
335.856	47.96	-6.24	41.72	46.00	-4.28	100	329	QP
431.982	45.68	-3.45	42.23	46.00	-3.77	100	88	QP
479.560	40.97	-2.10	38.87	46.00	-7.13	100	99	QP
528.108	44.67	-1.65	43.02	46.00	-2.98	100	68	QP
624.234	38.79	0.33	39.12	46.00	-6.88	100	260	QP
816.487	34.13	3.97	38.10	46.00	-7.90	100	4	QP

Level = Reading + Factor.

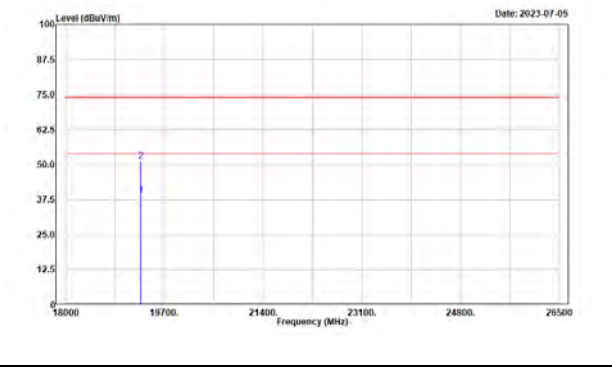
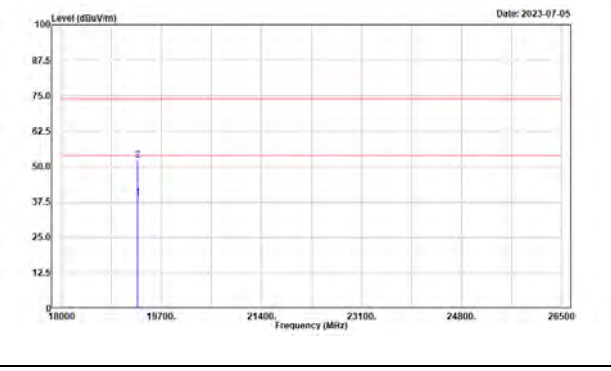
Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

1GHz-18GHz:

Horizontal	Vertical
	

18GHz-26.5GHz:

Horizontal	Vertical
	

Above 1GHz

802.11b Mode:

Low channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2389.151	52.75	-11.08	41.67	54.00	-12.33	280	360	Average
2389.151	68.87	-11.08	57.79	74.00	-16.21	280	360	Peak
2412.000	111.99	-11.02	100.97			280	360	Average
2412.000	116.80	-11.02	105.78			280	360	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4824.000	58.42	-4.81	53.61	54.00	-0.39	105	305	Average
4824.000	60.37	-4.81	55.56	74.00	-18.44	105	305	Peak
7236.000	35.06	0.08	35.14	54.00	-18.86	240	347	Average
7236.000	46.30	0.08	46.38	74.00	-27.62	240	347	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2331.413	52.25	-11.38	40.87	54.00	-13.13	108	257	Average
2331.413	66.83	-11.38	55.45	74.00	-18.55	108	257	Peak
2412.000	110.26	-11.02	99.24			108	257	Average
2412.000	115.16	-11.02	104.14			108	257	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4824.000	57.32	-4.81	52.51	54.00	-1.49	104	74	Average
4824.000	59.21	-4.81	54.40	74.00	-19.60	104	74	Peak
7236.000	30.42	0.08	30.50	54.00	-23.50	100	90	Average
7236.000	45.95	0.08	46.03	74.00	-27.97	100	90	Peak

Middle channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2437.000	111.65	-11.00	100.65			307	360	Average
2437.000	115.93	-11.00	104.93			307	360	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4874.000	54.37	-4.73	49.64	54.00	-4.36	125	309	Average
4874.000	56.66	-4.73	51.93	74.00	-22.07	125	309	Peak
7311.000	33.13	0.12	33.25	54.00	-20.75	149	177	Average
7311.000	45.91	0.12	46.03	74.00	-27.97	149	177	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2437.000	109.67	-11.00	98.67			100	278	Average
2437.000	114.43	-11.00	103.43			100	278	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4874.000	54.94	-4.73	50.21	54.00	-3.79	100	65	Average
4874.000	56.30	-4.73	51.57	74.00	-22.43	100	65	Peak
7311.000	31.40	0.12	31.52	54.00	-22.48	156	216	Average
7311.000	45.34	0.12	45.46	74.00	-28.54	156	216	Peak

High channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2462.000	110.57	-10.85	99.72			271	360	Average
2462.000	115.46	-10.85	104.61			271	360	Peak
2488.036	52.10	-10.52	41.58	54.00	-12.42	271	360	Average
2488.036	68.30	-10.52	57.78	74.00	-16.22	271	360	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4924.000	53.09	-4.54	48.55	54.00	-5.45	125	304	Average
4924.000	55.47	-4.54	50.93	74.00	-23.07	125	304	Peak
7386.000	31.22	0.21	31.43	54.00	-22.57	148	180	Average
7386.000	44.83	0.21	45.04	74.00	-28.96	148	180	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2462.000	109.60	-10.85	98.75			100	269	Average
2462.000	114.27	-10.85	103.42			100	269	Peak
2485.970	52.24	-10.54	41.70	54.00	-12.30	100	269	Average
2485.970	66.94	-10.54	56.40	74.00	-17.60	100	269	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4924.000	52.14	-4.54	47.60	54.00	-6.40	133	69	Average
4924.000	55.21	-4.54	50.67	74.00	-23.33	133	69	Peak
7386.000	30.30	0.21	30.51	54.00	-23.49	148	265	Average
7386.000	43.95	0.21	44.16	74.00	-29.84	148	265	Peak

Level = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

802.11g Mode:

Low channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2388.142	52.42	-11.09	41.33	54.00	-12.67	278	360	Average
2388.142	66.92	-11.09	55.83	74.00	-18.17	278	360	Peak
2412.000	99.47	-11.02	88.45			278	360	Average
2412.000	110.16	-11.02	99.14			278	360	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4824.000	39.14	-4.81	34.33	54.00	-19.67	103	308	Average
4824.000	53.62	-4.81	48.81	74.00	-25.19	103	308	Peak
7236.000	30.94	0.08	31.02	54.00	-22.98	147	311	Average
7236.000	42.90	0.08	42.98	74.00	-31.02	147	311	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2386.012	52.39	-11.09	41.30	54.00	-12.70	102	280	Average
2386.012	66.66	-11.09	55.57	74.00	-18.43	102	280	Peak
2412.000	97.73	-11.02	86.71			102	280	Average
2412.000	108.26	-11.02	97.24			102	280	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4824.000	38.64	-4.81	33.83	54.00	-20.17	109	66	Average
4824.000	52.68	-4.81	47.87	74.00	-26.13	109	66	Peak
7236.000	42.52	0.08	42.60	54.00	-11.40	148	282	Average
7236.000	31.03	0.08	31.11	74.00	-42.89	148	282	Peak

Middle channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2437.000	99.00	-11.00	88.00			271	360	Average
2437.000	109.56	-11.00	98.56			271	360	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4874.000	37.15	-4.73	32.42	54.00	-21.58	100	305	Average
4874.000	51.78	-4.73	47.05	74.00	-26.95	100	305	Peak
7311.000	30.99	0.12	31.11	54.00	-22.89	146	227	Average
7311.000	43.52	0.12	43.64	74.00	-30.36	146	227	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2437.000	97.28	-11.00	86.28			100	272	Average
2437.000	107.80	-11.00	96.80			100	272	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4874.000	36.96	-4.73	32.23	54.00	-21.77	100	67	Average
4874.000	51.62	-4.73	46.89	74.00	-27.11	100	67	Peak
7311.000	31.12	0.12	31.24	54.00	-22.76	149	209	Average
7311.000	42.69	0.12	42.81	74.00	-31.19	149	209	Peak

High channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2462.000	98.07	-10.85	87.22			237	360	Average
2462.000	108.55	-10.85	97.70			237	360	Peak
2486.066	52.17	-10.54	41.63	54.00	-12.37	237	360	Average
2486.066	66.48	-10.54	55.94	74.00	-18.06	237	360	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4924.000	35.06	-4.54	30.52	54.00	-23.48	148	307	Average
4924.000	49.22	-4.54	44.68	74.00	-29.32	148	307	Peak
7386.000	30.65	0.21	30.86	54.00	-23.14	146	93	Average
7386.000	42.26	0.21	42.47	74.00	-31.53	146	93	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2462.000	96.76	-10.85	85.91			100	264	Average
2462.000	107.35	-10.85	96.50			100	264	Peak
2496.685	52.20	-10.41	41.79	54.00	-12.21	100	264	Average
2496.685	65.54	-10.41	55.13	74.00	-18.87	100	264	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4924.000	35.30	-4.54	30.76	54.00	-23.24	130	71	Average
4924.000	49.23	-4.54	44.69	74.00	-29.31	130	71	Peak
7386.000	30.78	0.21	30.99	54.00	-23.01	149	221	Average
7386.000	42.75	0.21	42.96	74.00	-31.04	149	221	Peak

Level = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

802.11n HT20 Mode:

Low channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2389.936	52.87	-11.08	41.79	54.00	-12.21	212	360	Average
2389.936	66.59	-11.08	55.51	74.00	-18.49	212	360	Peak
2412.000	100.64	-11.02	89.62			212	360	Average
2412.000	111.11	-11.02	100.09			212	360	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4824.000	42.38	-4.81	37.57	54.00	-16.43	107	307	Average
4824.000	56.00	-4.81	51.19	74.00	-22.81	107	307	Peak
7236.000	31.45	0.08	31.53	54.00	-22.47	145	255	Average
7236.000	43.01	0.08	43.09	74.00	-30.91	145	255	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2389.263	52.82	-11.08	41.74	54.00	-12.26	100	278	Average
2389.263	67.18	-11.08	56.10	74.00	-17.90	100	278	Peak
2412.000	99.36	-11.02	88.34			100	278	Average
2412.000	109.75	-11.02	98.73			100	278	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4824.000	42.15	-4.81	37.34	54.00	-16.66	106	76	Average
4824.000	55.79	-4.81	50.98	74.00	-23.02	106	76	Peak
7236.000	31.26	0.08	31.34	54.00	-22.66	151	188	Average
7236.000	42.30	0.08	42.38	74.00	-31.62	151	188	Peak

Middle channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2437.000	100.42	-11.01	89.41			273	360	Average
2437.000	110.77	-11.00	99.77			273	360	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4874.000	38.75	-4.73	34.02	54.00	-19.98	168	20	Average
4874.000	52.69	-4.73	47.96	74.00	-26.04	168	20	Peak
7311.000	31.51	0.12	31.63	54.00	-22.37	148	0	Average
7311.000	43.78	0.12	43.90	74.00	-30.10	148	0	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2437.000	97.83	-11.00	86.83			100	263	Average
2437.000	108.11	-11.00	97.11			100	263	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4874.000	39.79	-4.73	35.06	54.00	-18.94	100	67	Average
4874.000	53.72	-4.73	48.99	74.00	-25.01	100	67	Peak
7311.000	31.54	0.12	31.66	54.00	-22.34	147	25	Average
7311.000	43.46	0.12	43.58	74.00	-30.42	147	25	Peak

High channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2462.000	99.60	-10.85	88.75			269	360	Average
2462.000	109.79	-10.85	98.94			269	360	Peak
2496.492	52.60	-10.41	42.19	54.00	-11.81	269	360	Average
2496.492	66.27	-10.41	55.86	74.00	-18.14	269	360	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4924.000	38.57	-4.54	34.03	54.00	-19.97	128	302	Average
4924.000	51.98	-4.54	47.44	74.00	-26.56	128	302	Peak
7386.000	31.24	0.21	31.45	54.00	-22.55	148	251	Average
7386.000	42.66	0.21	42.87	74.00	-31.13	148	251	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2462.000	98.59	-10.85	87.74			100	274	Average
2462.000	108.93	-10.85	98.08			100	274	Peak
2490.583	52.62	-10.49	42.13	54.00	-11.87	100	274	Average
2490.583	65.79	-10.49	55.30	74.00	-18.70	100	274	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4924.000	37.24	-4.54	32.70	54.00	-21.30	104	67	Average
4924.000	50.36	-4.54	45.82	74.00	-28.18	104	67	Peak
7386.000	31.14	0.21	31.35	54.00	-22.65	146	251	Average
7386.000	43.89	0.21	44.10	74.00	-29.90	146	251	Peak

Level = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

802.11n HT40 Mode:

Low channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2389.015	54.27	-11.08	43.19	54.00	-10.81	240	360	Average
2389.015	69.51	-11.08	58.43	74.00	-15.57	240	360	Peak
2422.000	97.31	-11.02	86.29			240	360	Average
2422.000	106.63	-11.02	95.61			240	360	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4844.000	38.44	-4.77	33.67	54.00	-20.33	100	310	Average
4844.000	50.14	-4.77	45.37	74.00	-28.63	100	310	Peak
7266.000	31.21	0.13	31.34	54.00	-22.66	149	303	Average
7266.000	43.36	0.13	43.49	74.00	-30.51	149	303	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2389.015	54.24	-11.08	43.16	54.00	-10.84	100	277	Average
2389.015	68.22	-11.08	57.14	74.00	-16.86	100	277	Peak
2422.000	95.78	-11.02	84.76			100	277	Average
2422.000	105.19	-11.02	94.17			100	277	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4844.000	39.00	-4.77	34.23	54.00	-19.77	100	152	Average
4844.000	50.45	-4.77	45.68	74.00	-28.32	100	152	Peak
7266.000	31.70	0.13	31.83	54.00	-22.17	148	56	Average
7266.000	43.19	0.13	43.32	74.00	-30.68	148	56	Peak

Middle channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2437.000	97.19	-11.00	86.19			275	360	Average
2437.000	106.24	-11.00	95.24			275	360	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4874.000	38.16	-4.73	33.43	54.00	-20.57	216	211	Average
4874.000	48.87	-4.73	44.14	74.00	-29.86	216	211	Peak
7311.000	32.01	0.12	32.13	54.00	-21.87	152	0	Average
7311.000	42.80	0.12	42.92	74.00	-31.08	152	0	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2437.000	95.61	-11.00	84.61			100	273	Average
2437.000	104.72	-11.00	93.72			100	273	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4874.000	38.39	-4.73	33.66	54.00	-20.34	207	80	Average
4874.000	50.95	-4.73	46.22	74.00	-27.78	207	80	Peak
7311.000	32.02	0.12	32.14	54.00	-21.86	149	190	Average
7311.000	43.46	0.12	43.58	74.00	-30.42	149	190	Peak

High channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2452.000	96.35	-10.98	85.37			210	360	Average
2452.000	105.48	-10.98	94.50			210	360	Peak
2493.738	53.01	-10.46	42.55	54.00	-11.45	210	360	Average
2493.738	65.60	-10.46	55.14	74.00	-18.86	210	360	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4904.000	38.45	-4.68	33.77	54.00	-20.23	263	338	Average
4904.000	50.35	-4.68	45.67	74.00	-28.33	263	338	Peak
7356.000	32.01	0.20	32.21	54.00	-21.79	148	31	Average
7356.000	42.45	0.20	42.65	74.00	-31.35	148	31	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2452.000	94.97	-10.98	83.99			100	271	Average
2452.000	104.31	-10.98	93.33			100	271	Peak
2499.456	53.07	-10.38	42.69	54.00	-11.31	100	271	Average
2499.456	65.79	-10.38	55.41	74.00	-18.59	100	271	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4904.000	37.25	-4.68	32.57	54.00	-21.43	208	69	Average
4904.000	49.84	-4.68	45.16	74.00	-28.84	208	69	Peak
7356.000	31.86	0.20	32.06	54.00	-21.94	148	83	Average
7356.000	43.20	0.20	43.40	74.00	-30.60	148	83	Peak

Level = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

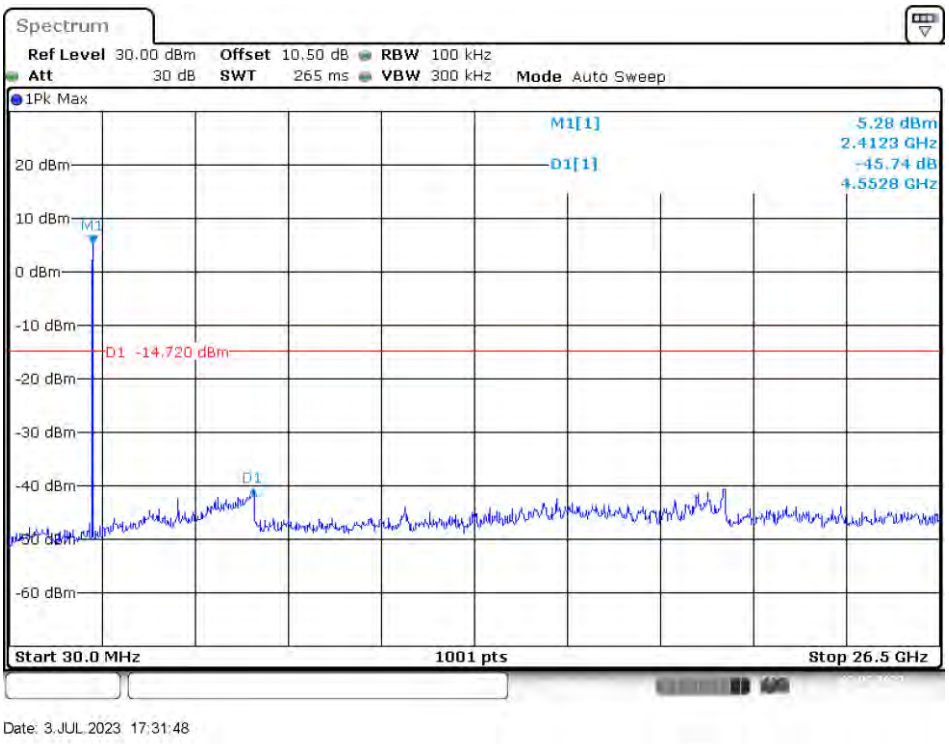
Spurious emissions more than 20 dB below the limit were not reported.

Conducted Spurious Emissions:

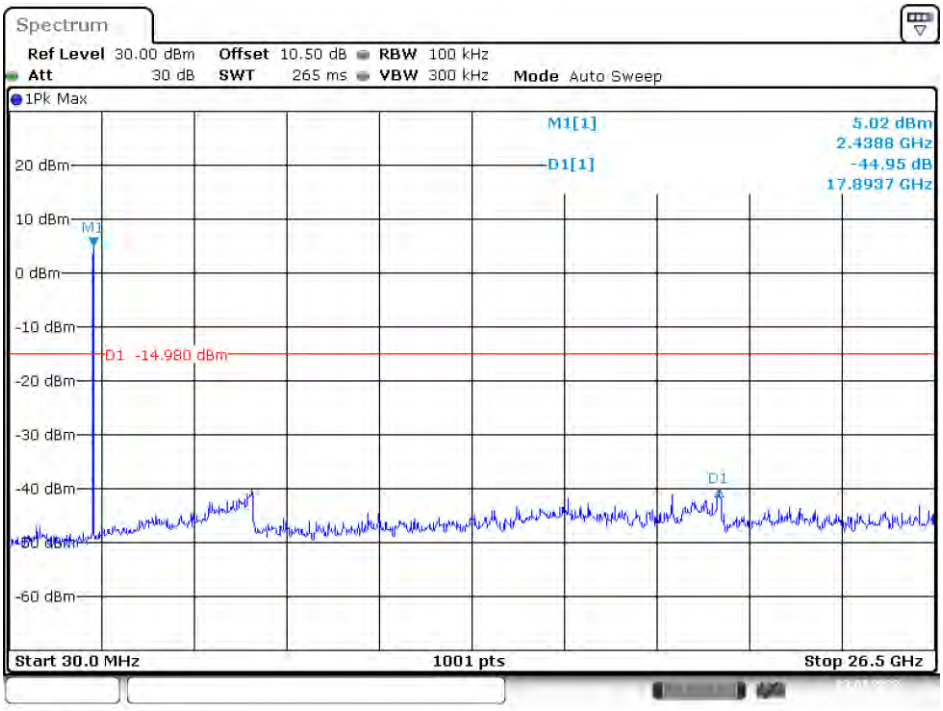
Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
B Mode				
Low	2412	45.74	≥ 20	PASS
Middle	2437	44.95	≥ 20	PASS
High	2462	45.21	≥ 20	PASS
G Mode				
Low	2412	32.53	≥ 20	PASS
Middle	2437	31.80	≥ 20	PASS
High	2462	32.48	≥ 20	PASS
N20 Mode				
Low	2412	34.31	≥ 20	PASS
Middle	2437	33.13	≥ 20	PASS
High	2462	33.89	≥ 20	PASS
N40 Mode				
Low	2422	31.04	≥ 20	PASS
Middle	2437	34.51	≥ 20	PASS
High	2452	30.20	≥ 20	PASS

B Mode

Low Channel

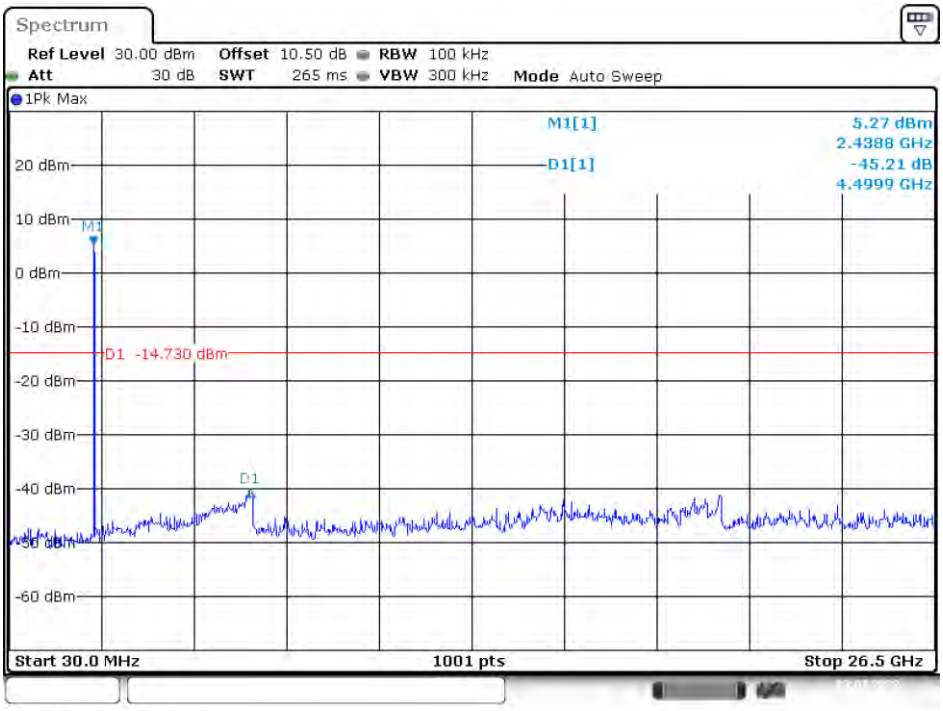


Middle Channel



Date: 3.JUL.2023 17:33:51

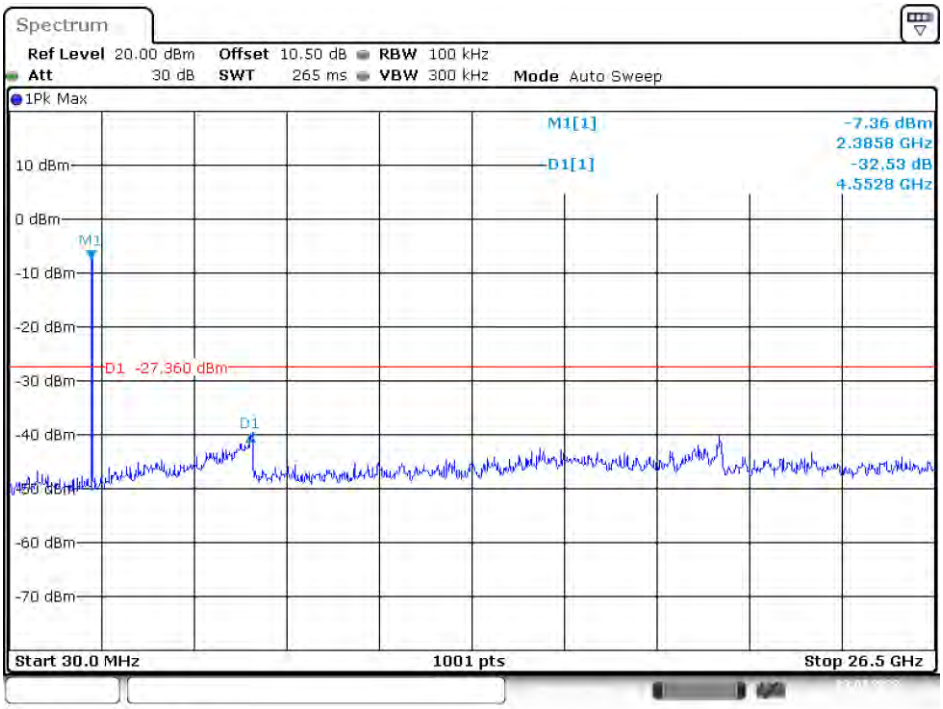
High Channel



Date: 3.JUL.2023 17:36:04

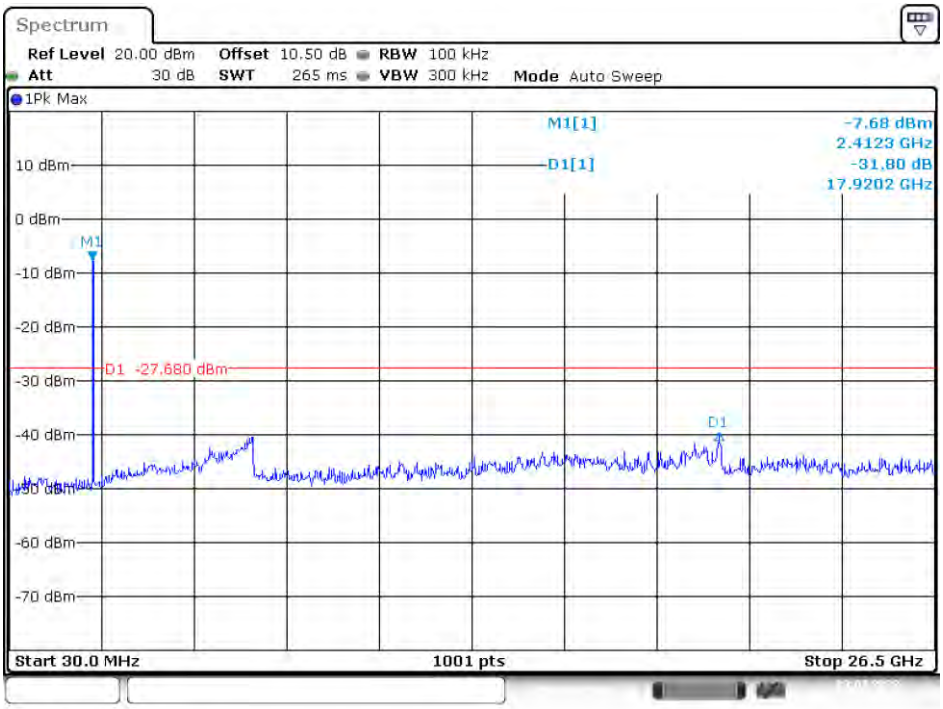
G Mode

Low Channel



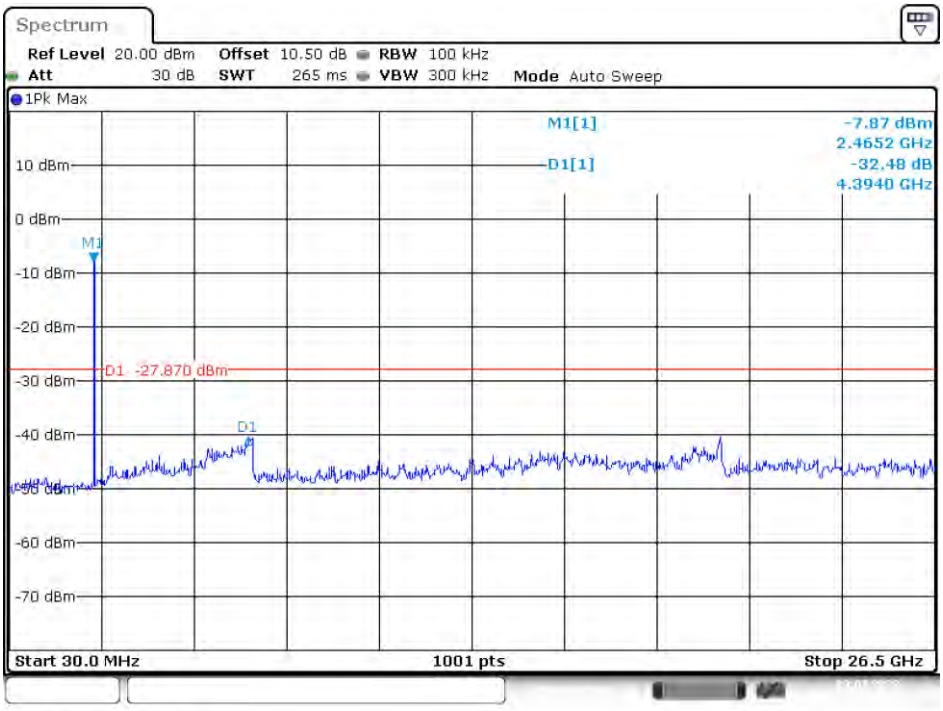
Date: 3.JUL.2023 17:38:18

Middle Channel



Date: 3.JUL.2023 17:40:24

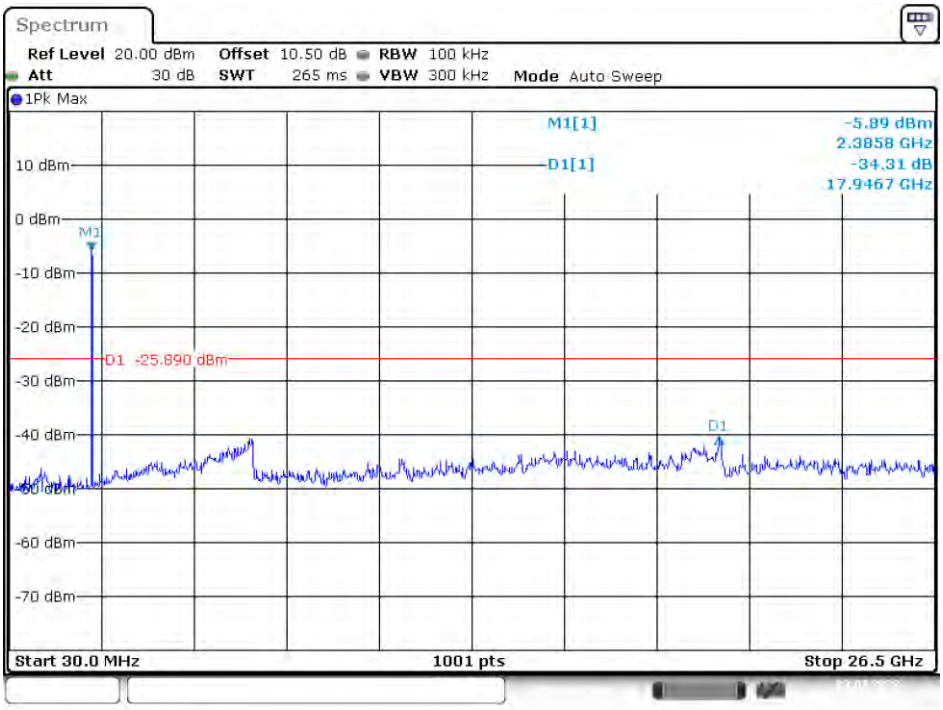
High Channel



Date: 3.JUL.2023 17:43:19

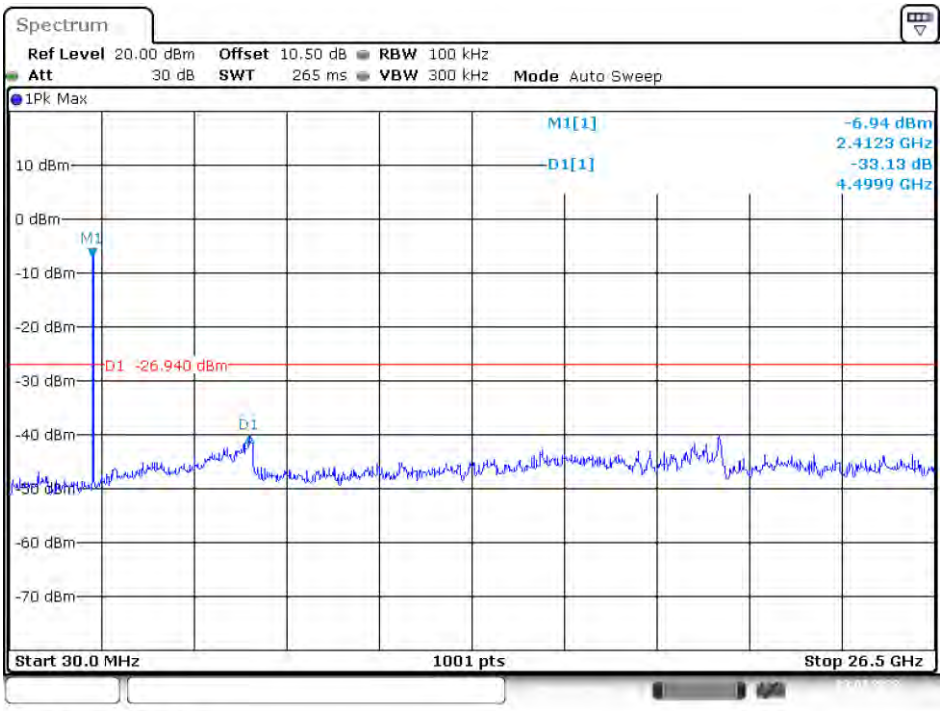
N20 Mode

Low Channel



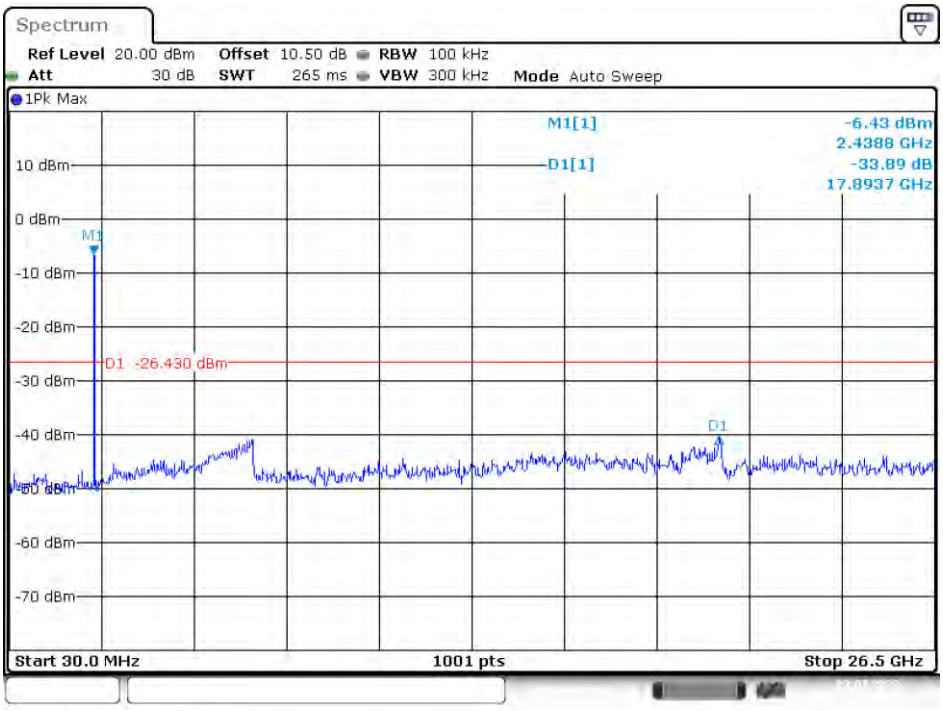
Date: 3.JUL.2023 17:47:46

Middle Channel



Date: 3.JUL.2023 17:51:59

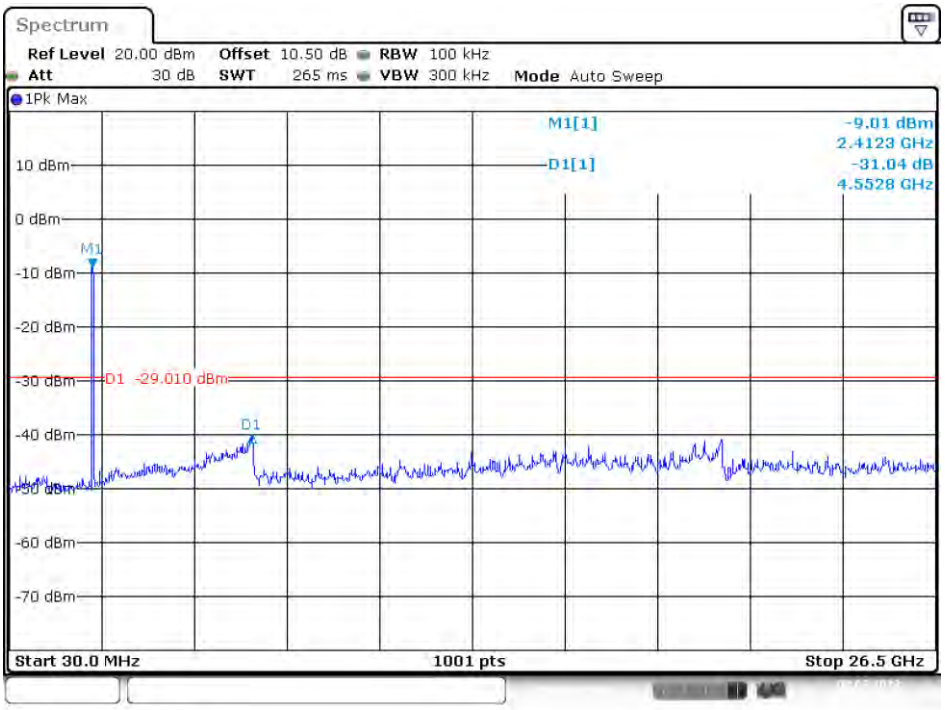
High Channel



Date: 3.JUL.2023 17:55:10

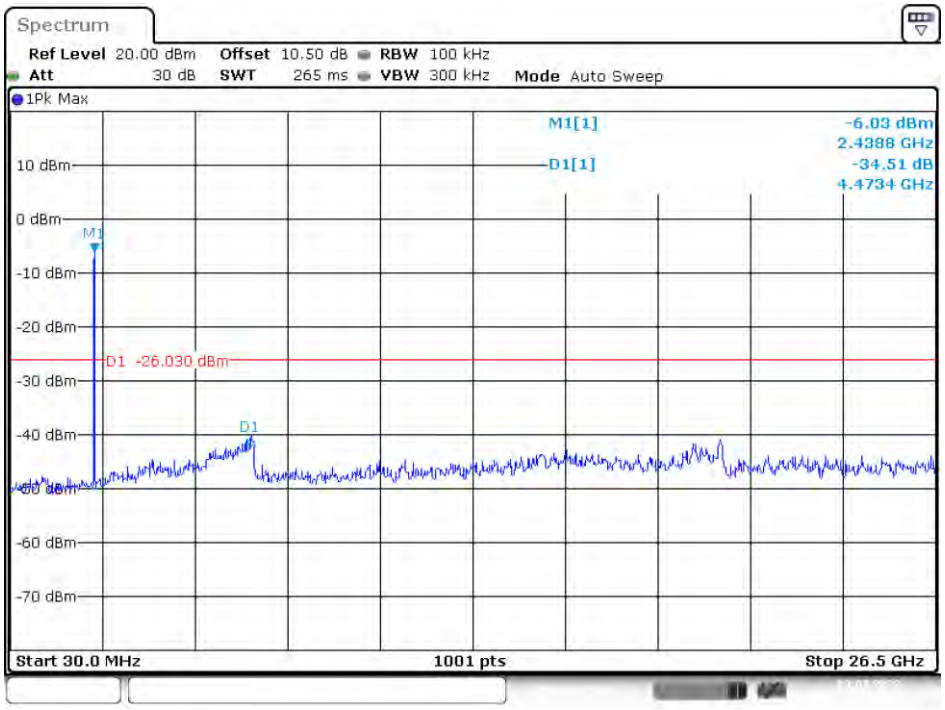
N40 Mode

Low Channel



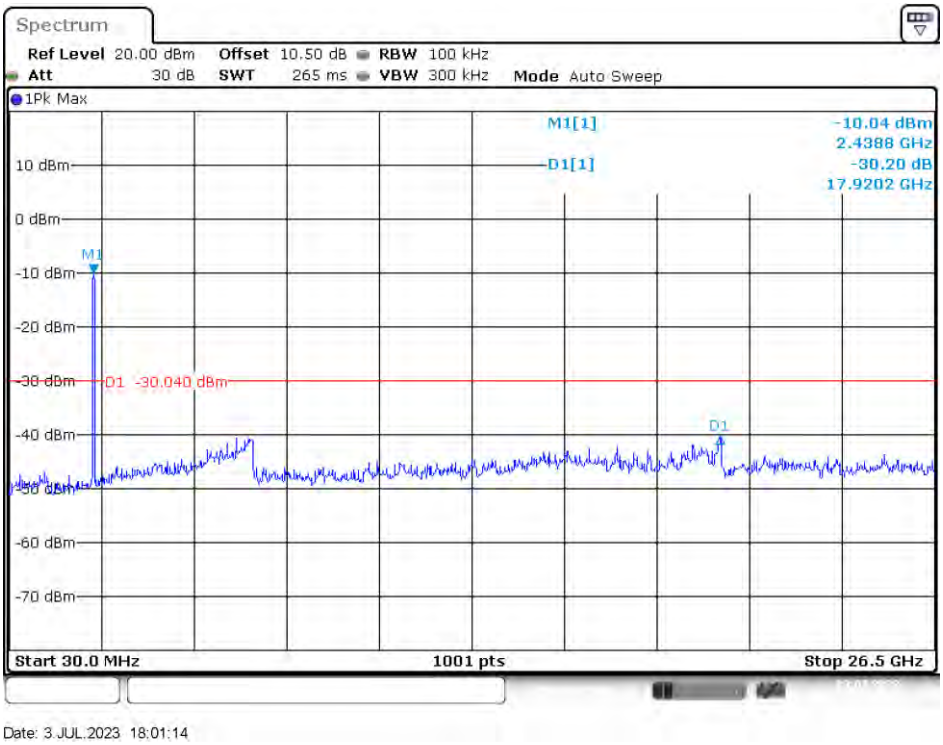
Date: 3.JUL.2023 17:57:33

Middle Channel



Date: 3.JUL.2023 17:59:24

High Channel



10 FCC §15.247(a)(2) & RSS-247 §5.2(a), RSS-GEN §6.7 – 6 dB Emission Bandwidth & Occupied Bandwidth

10.1 Applicable Standard

According to FCC §15.247(a)(2).

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

According to RSS-247 §5.2 (a)

The minimum 6 dB bandwidth shall be 500 kHz.

According to RSS-GEN §6.7

The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

10.2 Test Procedure

According to ANSI C63.10-2013, section 11.8

The steps for the first option are as follows:

a) Set RBW = 100 kHz.

b) Set the VBW ≥ [3 × RBW].

c) Detector = peak.

d) Trace mode = max hold.

e) Sweep = auto couple.

f) Allow the trace to stabilize.

g) 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.

According to ANSI C63.10-2013 Section 6.9.3

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).

10.3 Test Results

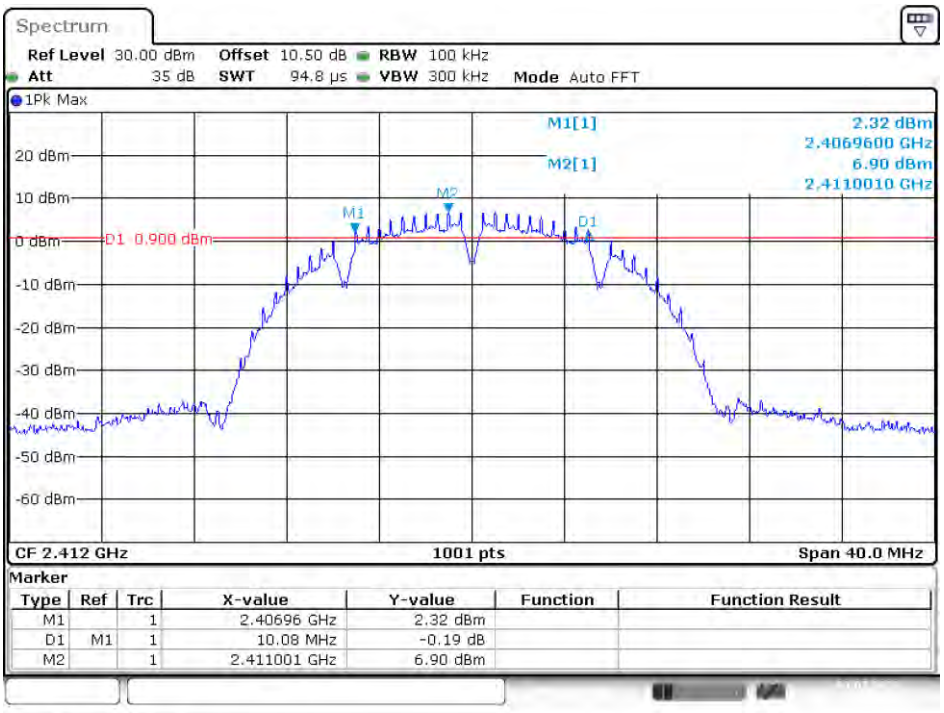
Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	99% Bandwidth (MHz)	Limit (kHz)	Result
B Mode					
Low	2412	10.08	14.99	> 500	PASS
Middle	2437	10.08	14.95	> 500	PASS
High	2462	10.08	14.95	> 500	PASS
G Mode					
Low	2412	16.32	16.62	> 500	PASS
Middle	2437	16.36	16.50	> 500	PASS
High	2462	16.32	16.58	> 500	PASS
N20 Mode					
Low	2412	17.08	17.58	> 500	PASS
Middle	2437	17.08	17.66	> 500	PASS
High	2462	17.08	17.58	> 500	PASS
N40 Mode					
Low	2422	35.68	36.28	> 500	PASS
Middle	2437	35.68	36.28	> 500	PASS
High	2452	35.68	36.28	> 500	PASS

Please refer to the following plots

6 dB Emission Bandwidth

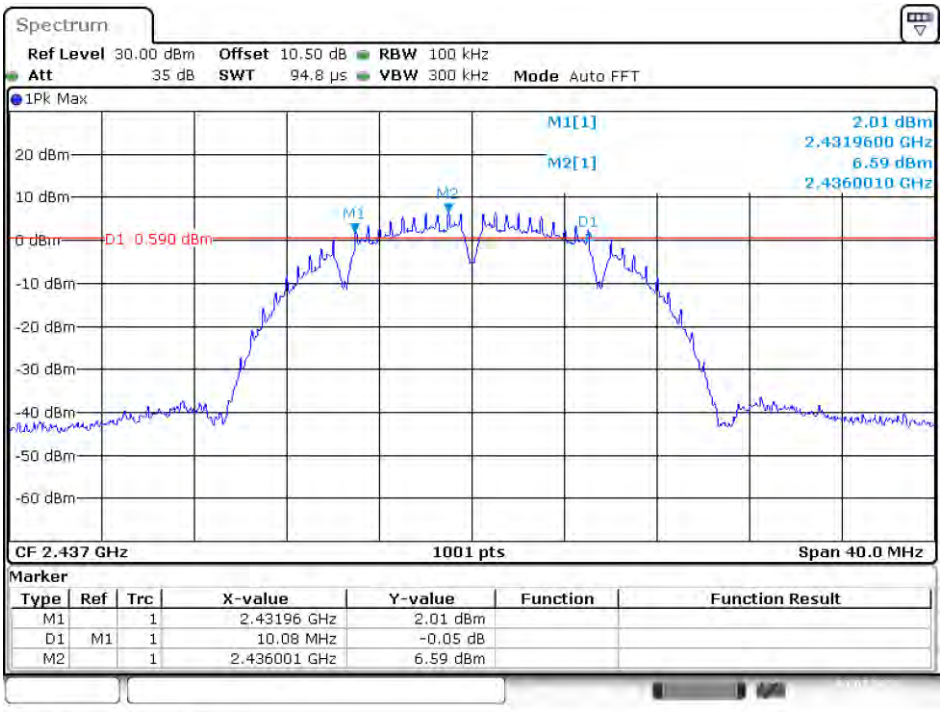
B Mode

Low Channel



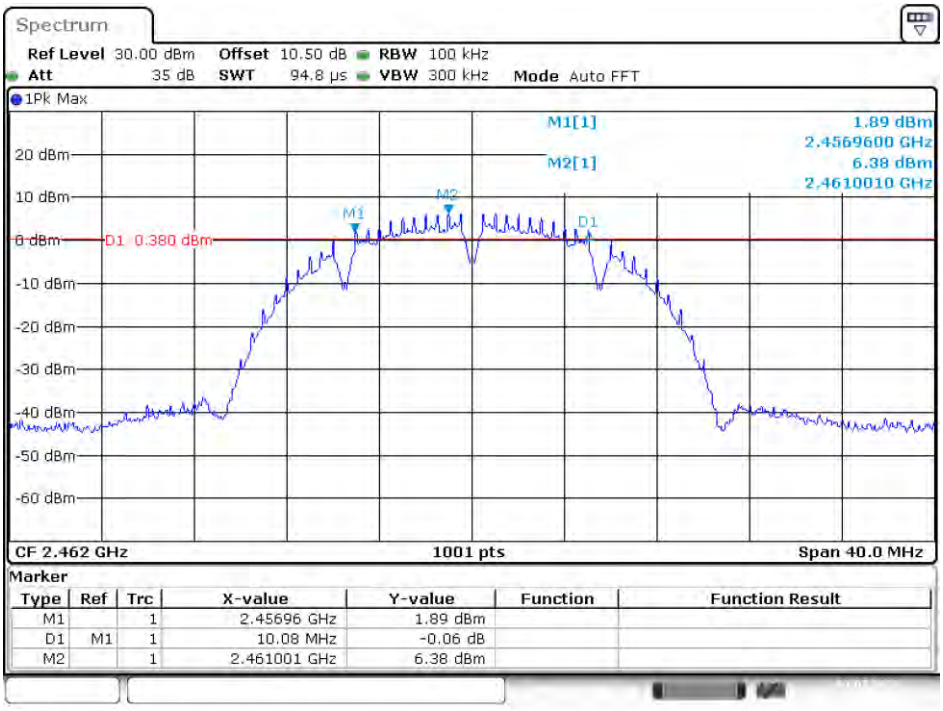
Date: 3.JUL.2023 17:31:07

Middle Channel



Date: 3.JUL.2023 17:33:26

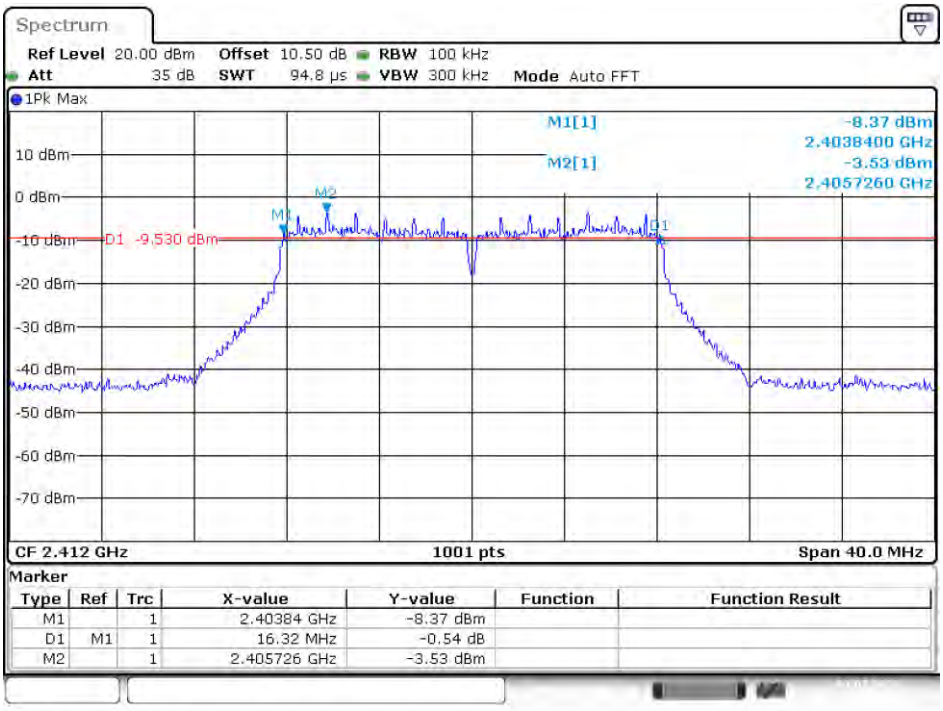
High Channel



Date: 3.JUL.2023 17:35:24

G Mode

Low Channel



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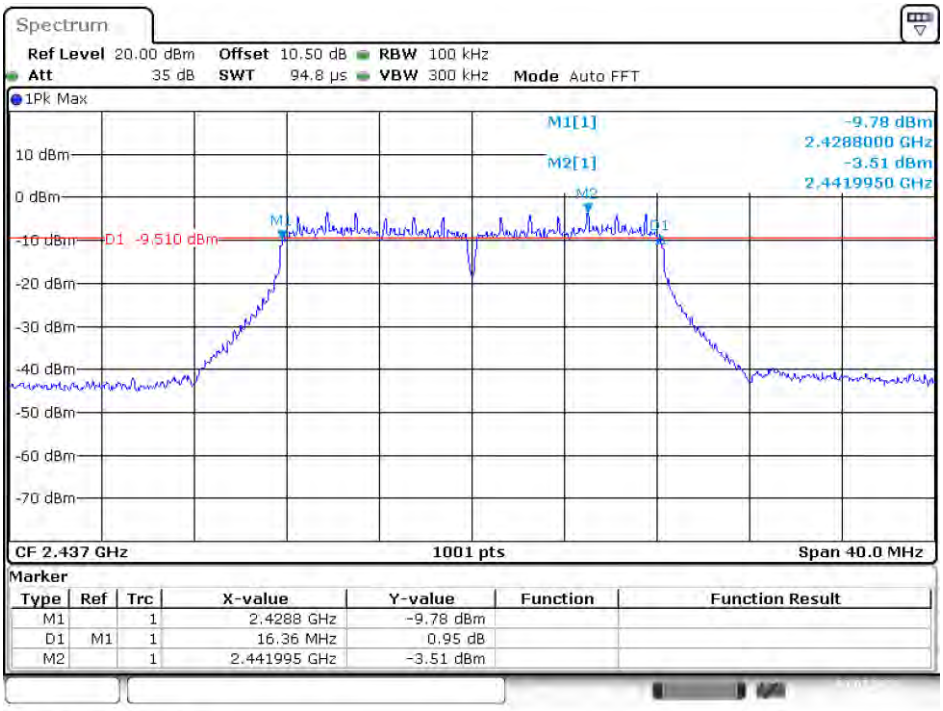
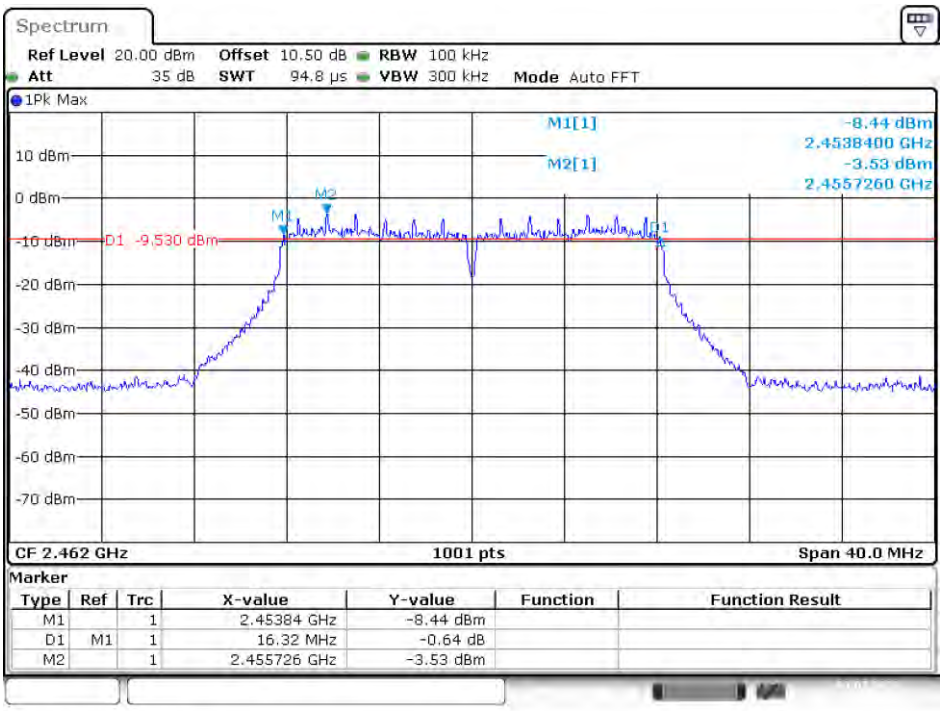
Middle Channel



Date: 3.JUL.2023 17:40:00

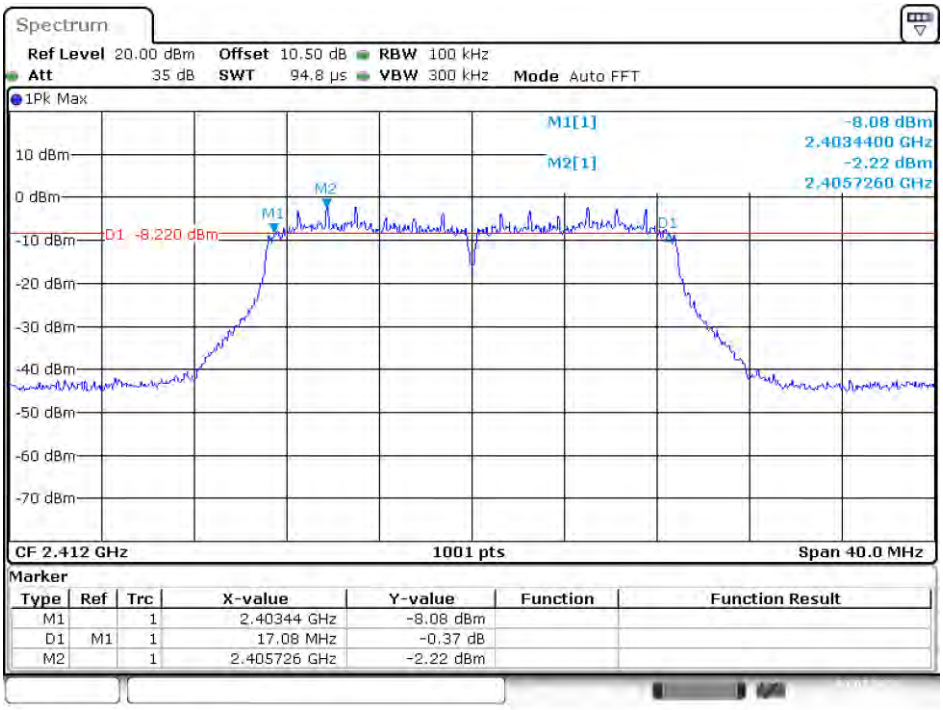
High Channel



Date: 3.JUL.2023 17:42:39

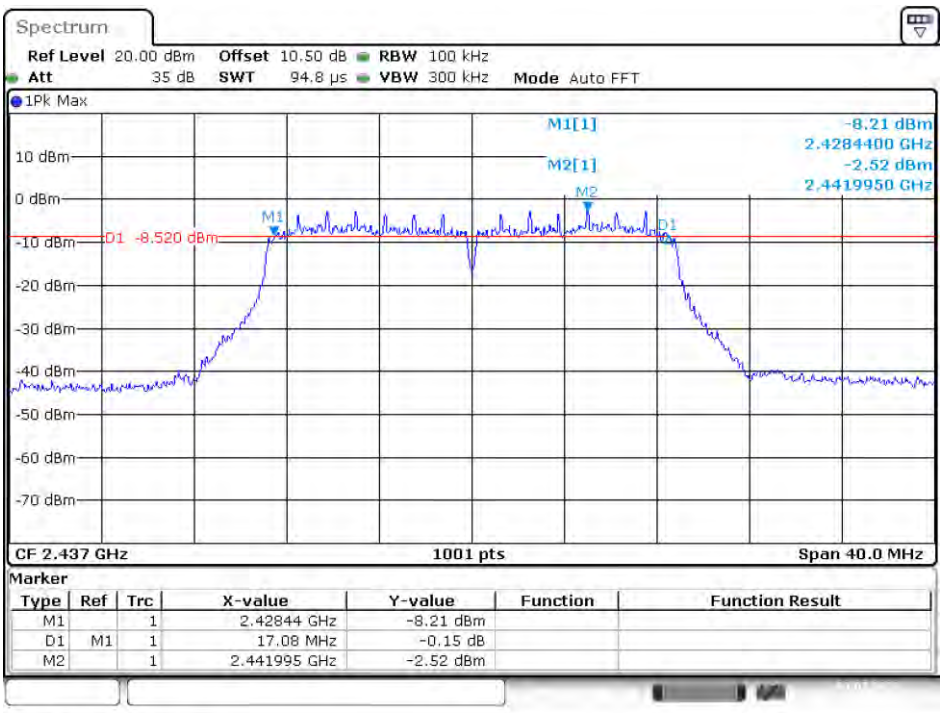
N20 Mode

Low Channel



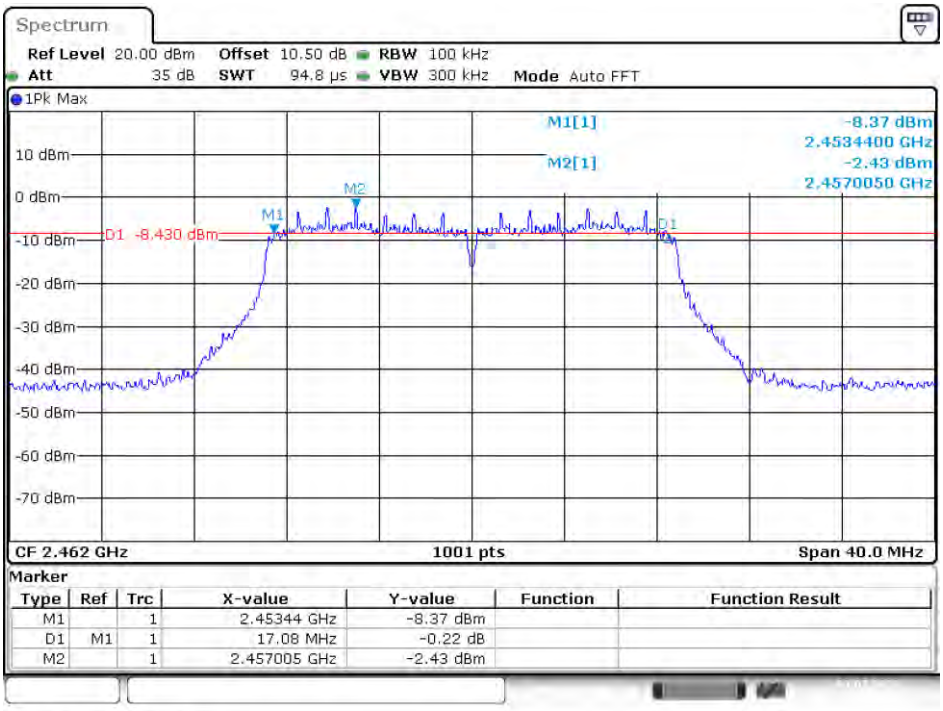
Date: 3.JUL.2023 17:47:05

Middle Channel



Date: 3.JUL.2023 17:51:34

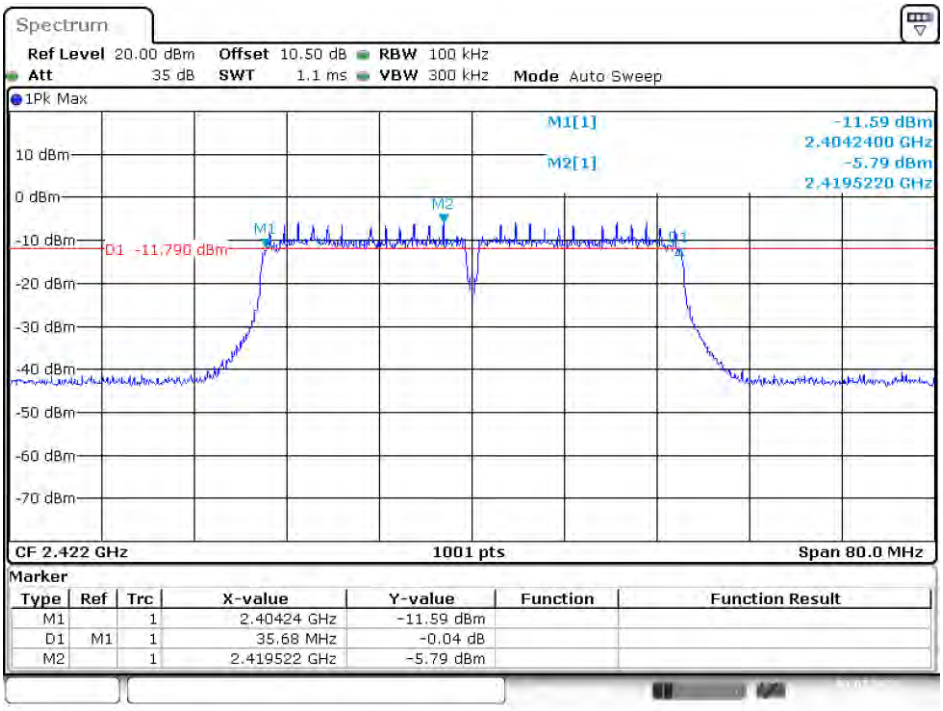
High Channel



Date: 3.JUL.2023 17:54:30

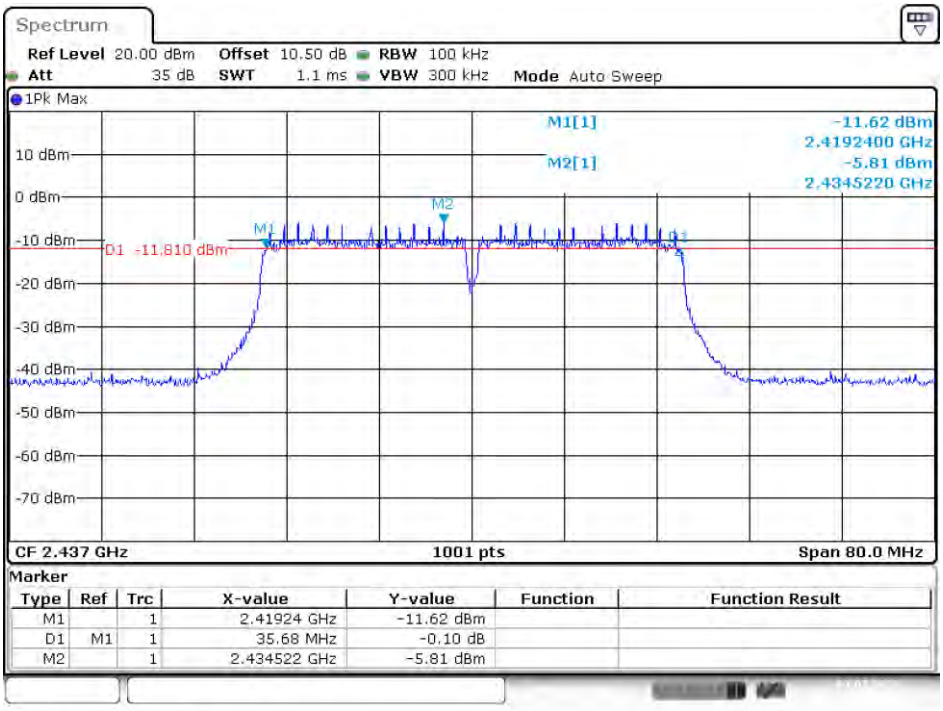
N40 Mode

Low Channel



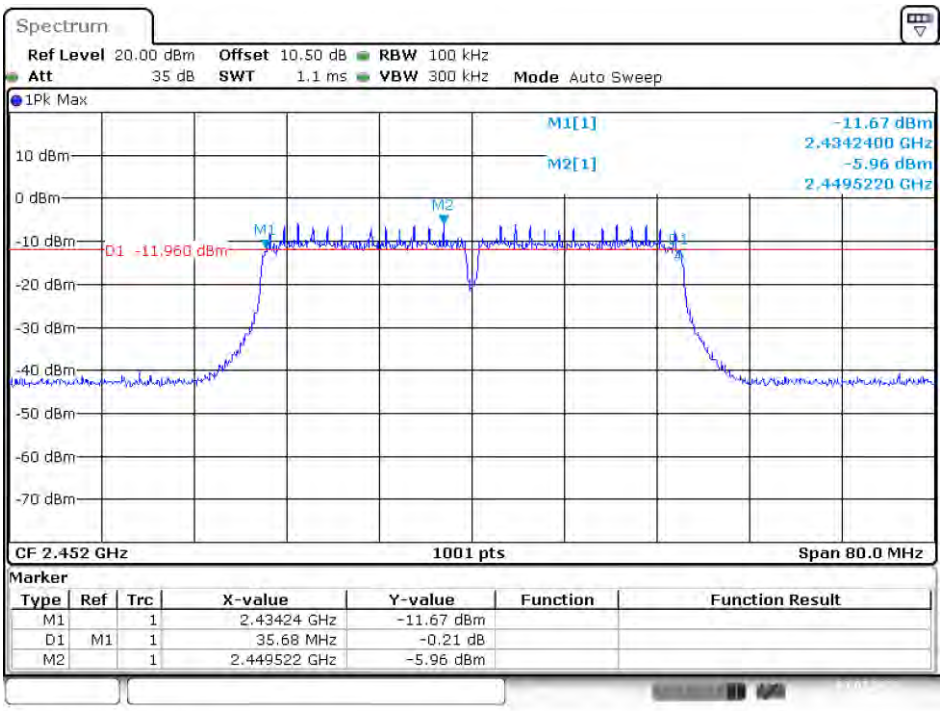
Date: 3.JUL.2023 17:56:52

Middle Channel



Date: 3.JUL.2023 17:59:00

High Channel

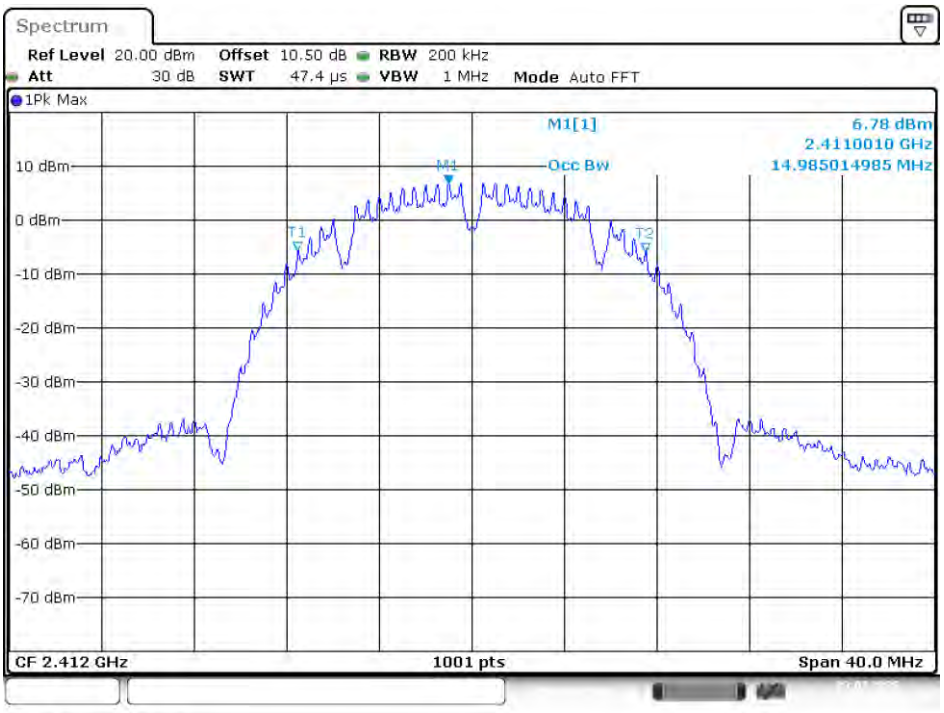


Date: 3.JUL.2023 18:00:33

99% Bandwidth

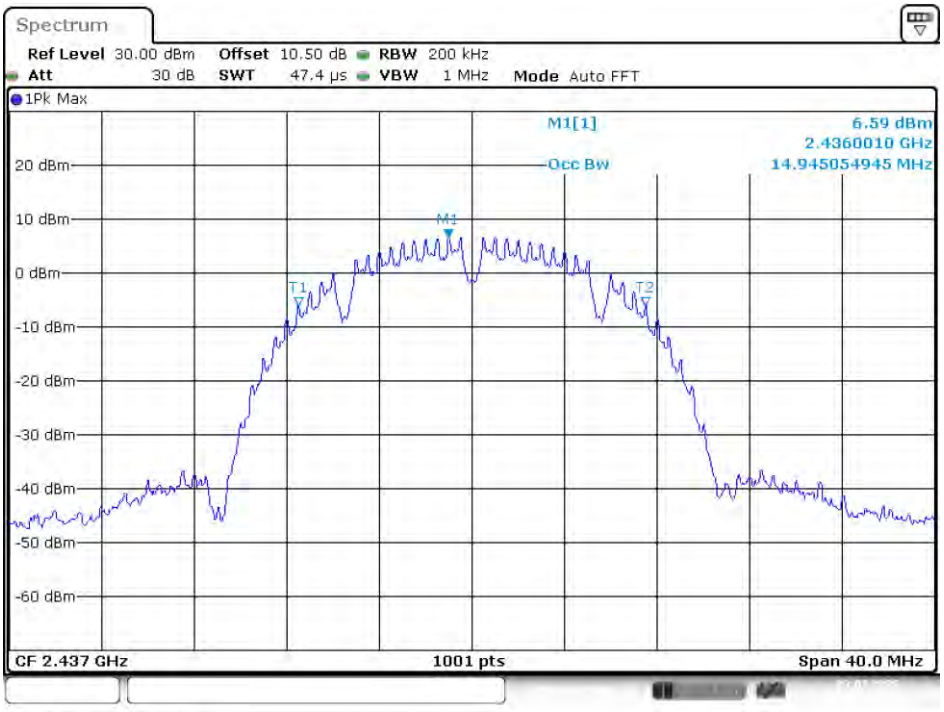
B Mode

Low Channel



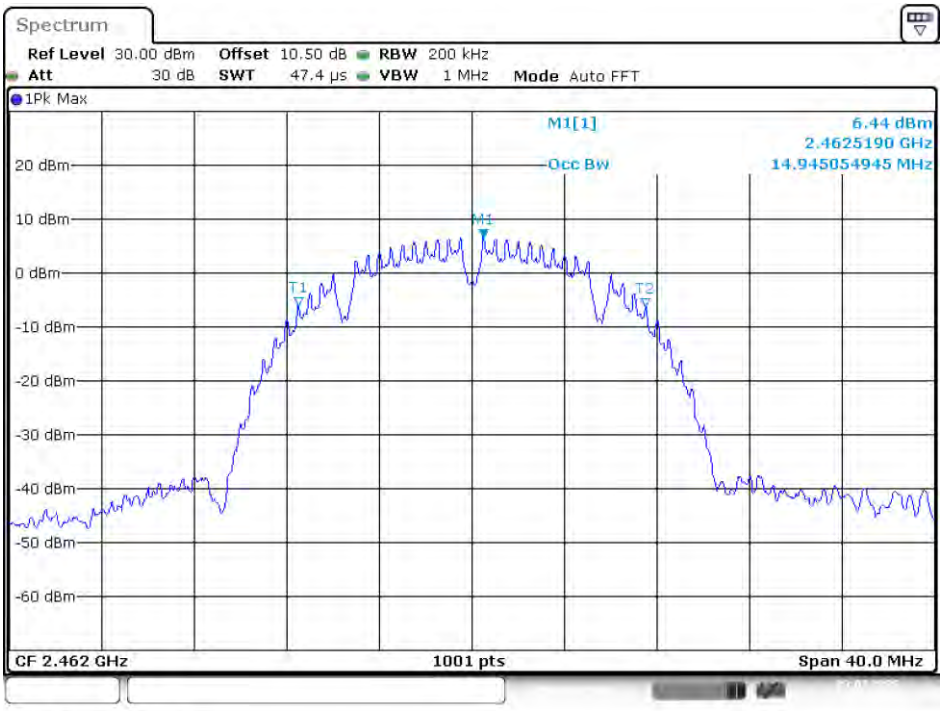
Date: 3.JUL.2023 17:32:03

Middle Channel



Date: 3.JUL.2023 17:34:06

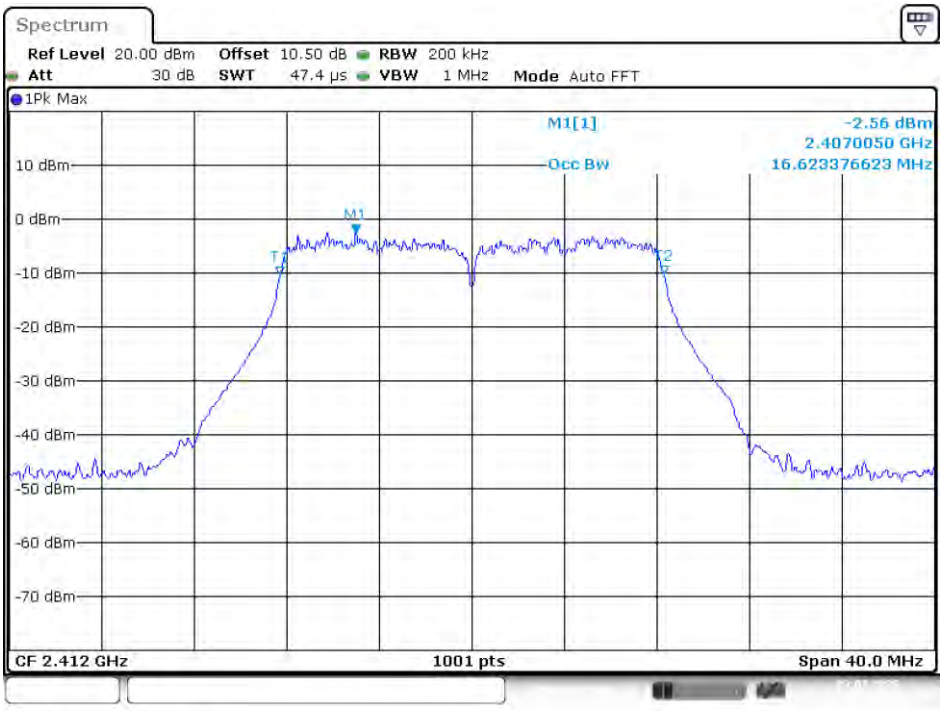
High Channel



Date: 3.JUL.2023 17:36:19

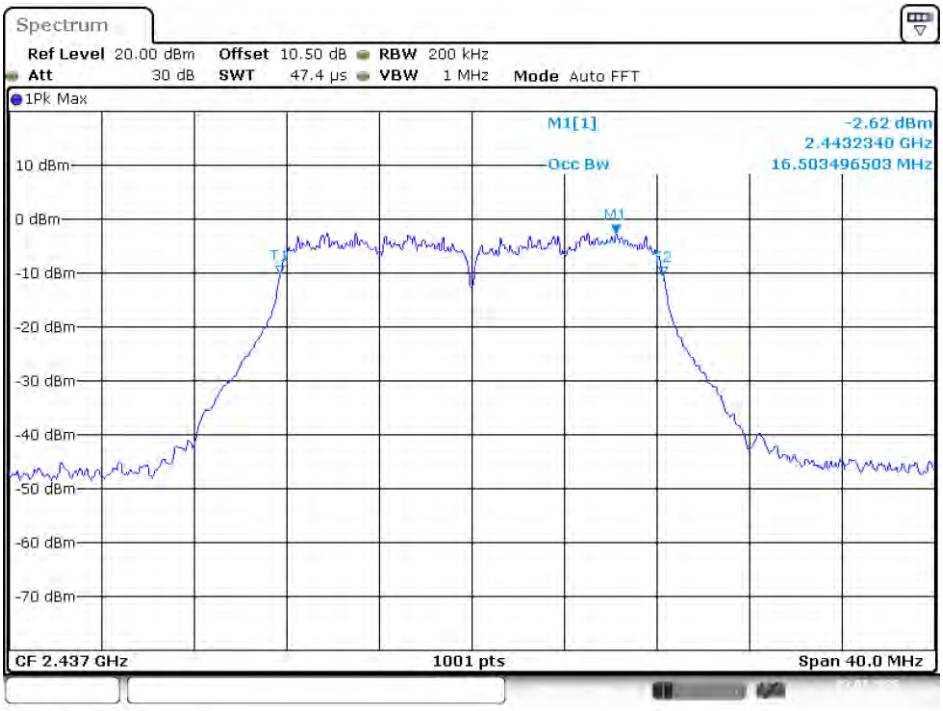
G Mode

Low Channel



Date: 3.JUL.2023 17:38:33

Middle Channel



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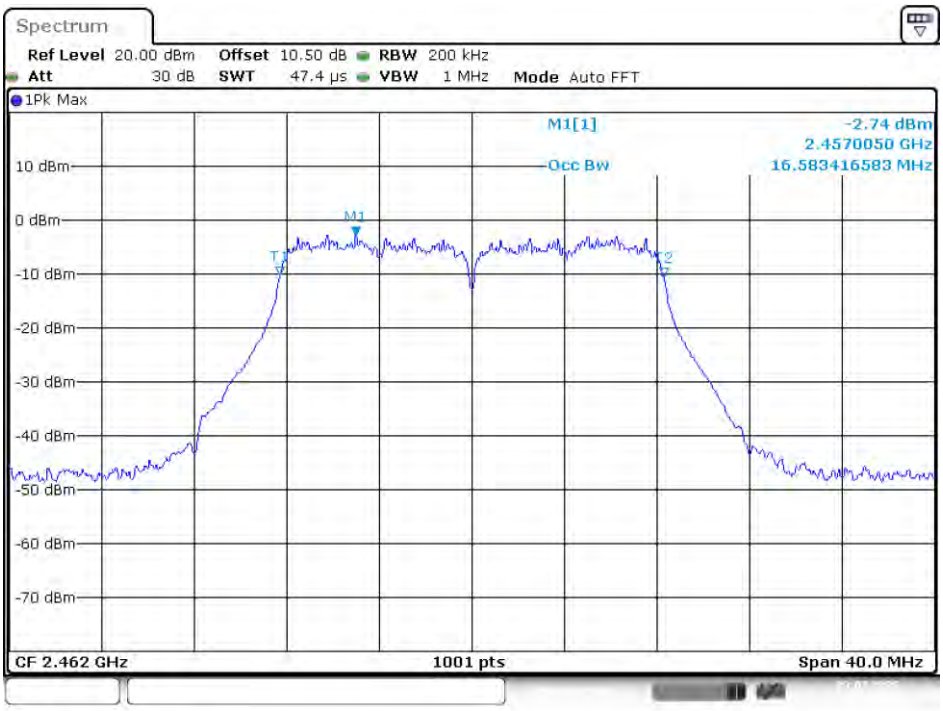
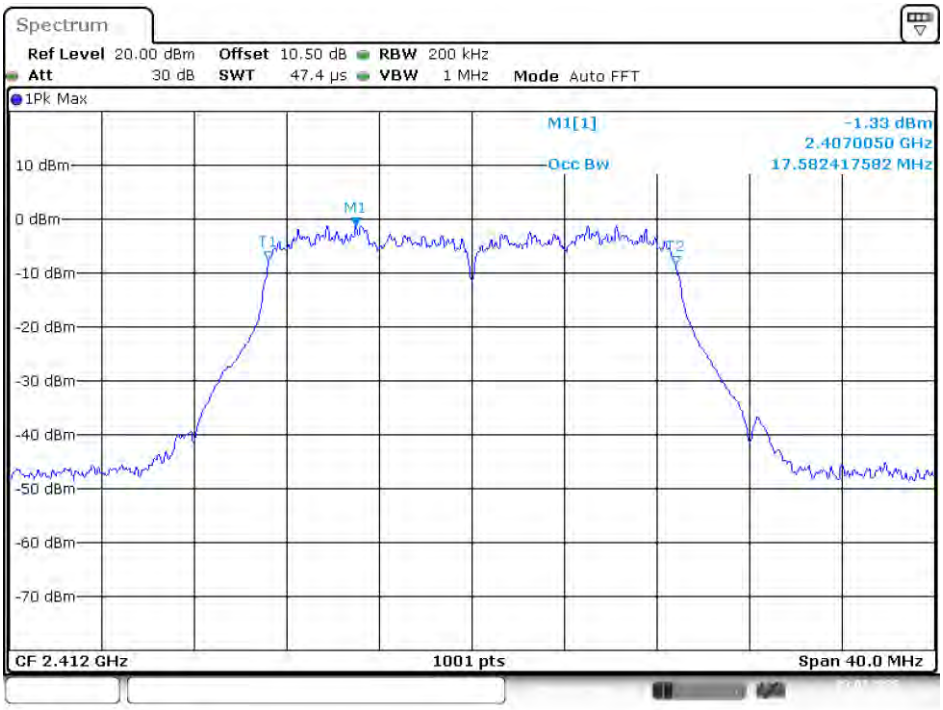
High Channel



Date: 3.JUL.2023 17:43:34

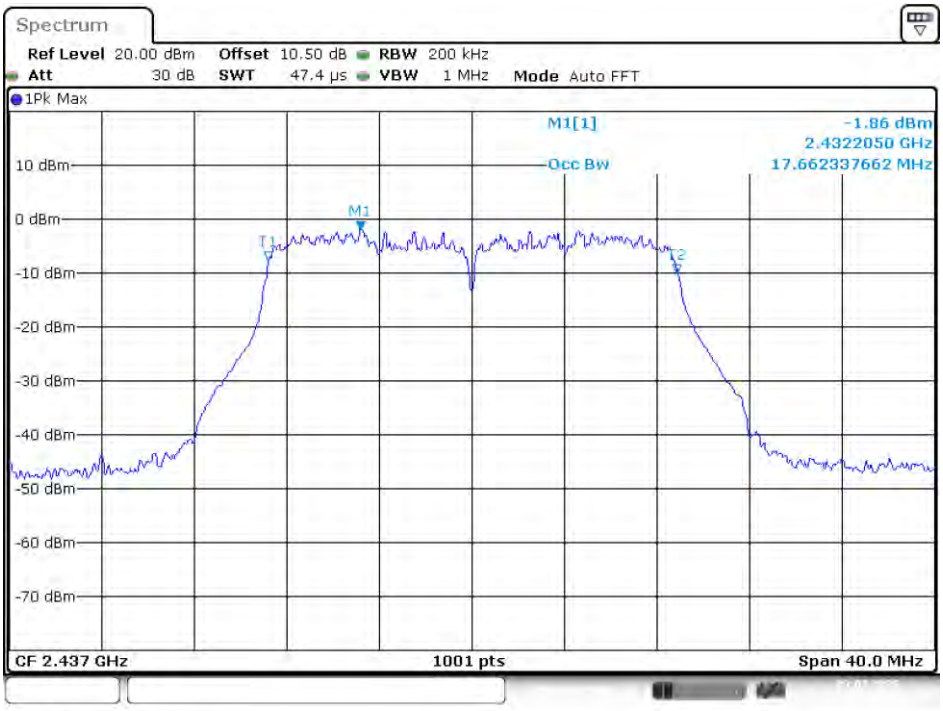
N20 Mode

Low Channel



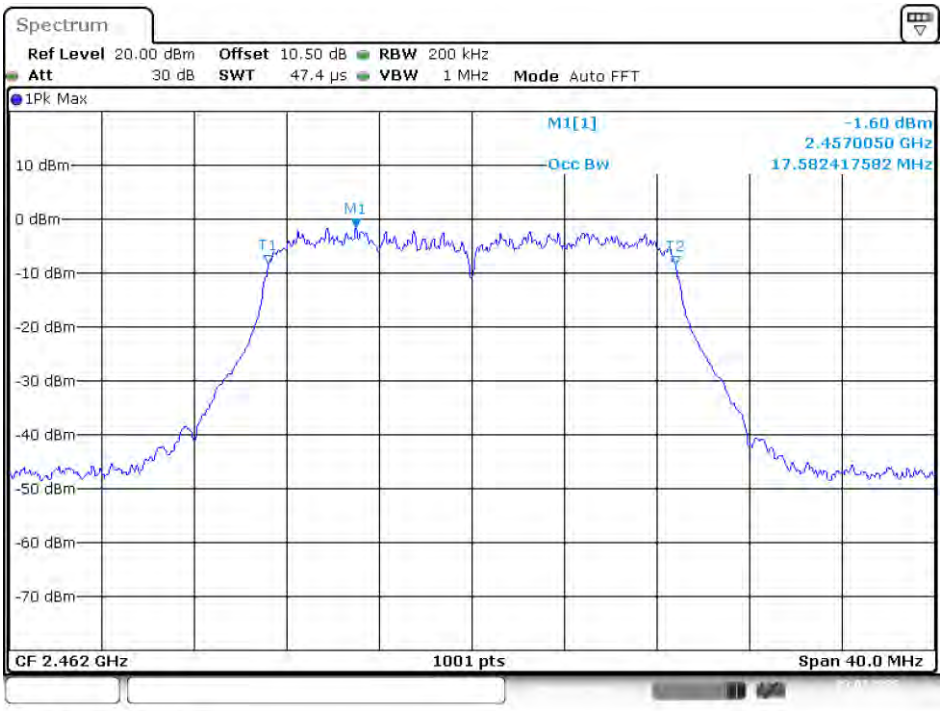
Date: 3.JUL.2023 17:48:00

Middle Channel



Date: 3.JUL.2023 17:52:14

High Channel



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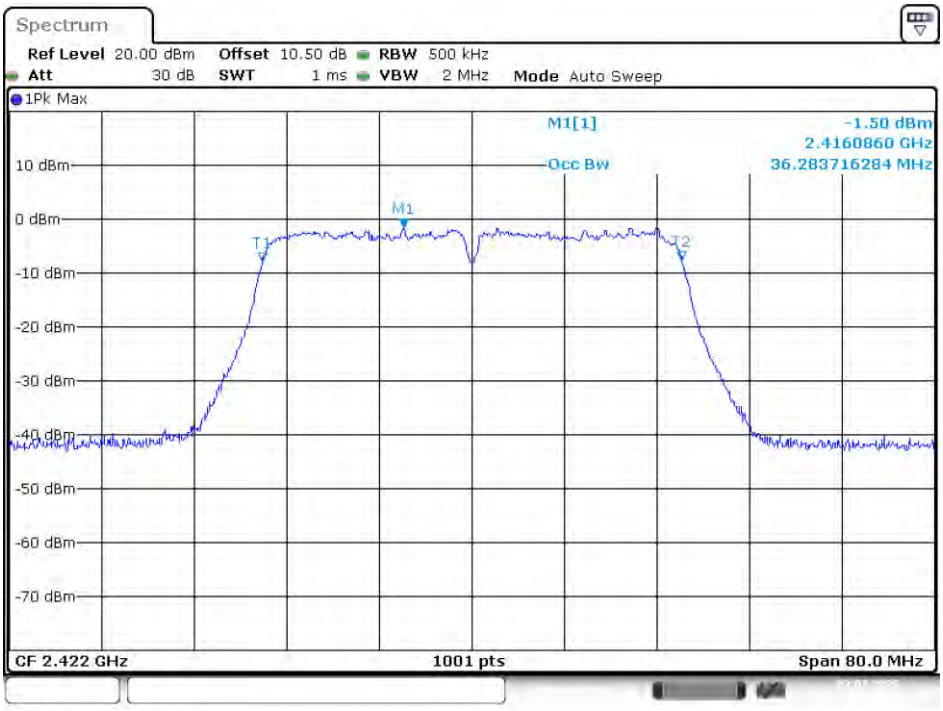
N40 Mode

Low Channel



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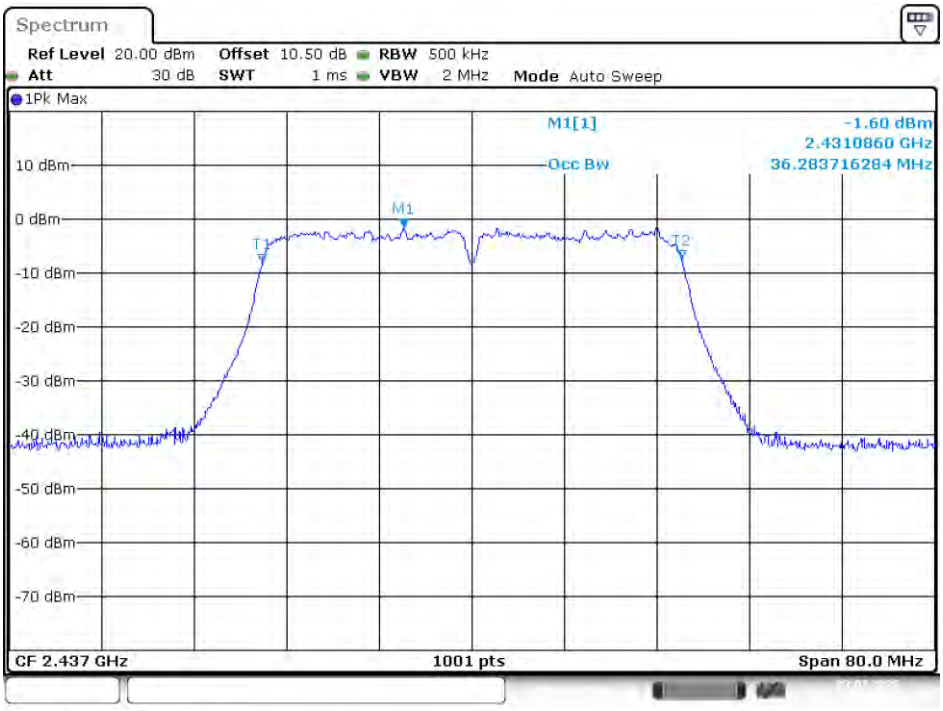
Middle Channel



Date: 3.JUL.2023 17:59:39

High Channel

Date: 3.JUL.2023 18:01:28

11 FCC §15.247(b)(3) & RSS-247 §5.4(d) – Maximum Output Power

11.1 Applicable Standard

According to FCC §15.247(b) (3).

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.

According to RSS-247 §5.4(d).

For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

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.

11.2 Test Procedure

According to ANSI C63.10-2013, section 11.9.1.3

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to measuring equipment.

11.3 Test Results

Conducted Peak Output Power

Channel	Frequency (MHz)	Conducted Peak Output Power (dBm)	Limit (dBm)	Antenna Gain (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)
802.11b Mode						
Low	2412	18.60	30	0.85	19.45	36
Middle	2437	18.37	30	0.85	19.22	36
High	2462	18.24	30	0.85	19.09	36
802.11g Mode						
Low	2412	17.71	30	0.85	18.56	36
Middle	2437	17.52	30	0.85	18.37	36
High	2462	17.36	30	0.85	18.21	36
802.11n HT20 Mode						
Low	2412	17.82	30	0.85	18.67	36
Middle	2437	17.51	30	0.85	18.36	36
High	2462	17.33	30	0.85	18.18	36
802.11n HT40 Mode						
Low	2422	17.87	30	0.85	18.72	36
Middle	2437	17.42	30	0.85	18.27	36
High	2452	17.33	30	0.85	18.18	36

12 FCC §15.247(d) & RSS-247 §5.5 – 100 kHz Bandwidth of Frequency Band Edge

12.1 Applicable Standard

According to FCC §15.247(d).

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

According to RSS-247 §5.5.

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

12.2 Test Procedure

According to ANSI C63.10-2013 Section 11.11

1. Set the center frequency and span to encompass frequency range to be measured.
2. Set the RBW = 100 kHz.
3. Set the VBW ≥ [3 × RBW].
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11. Report the three highest emissions relative to the limit.

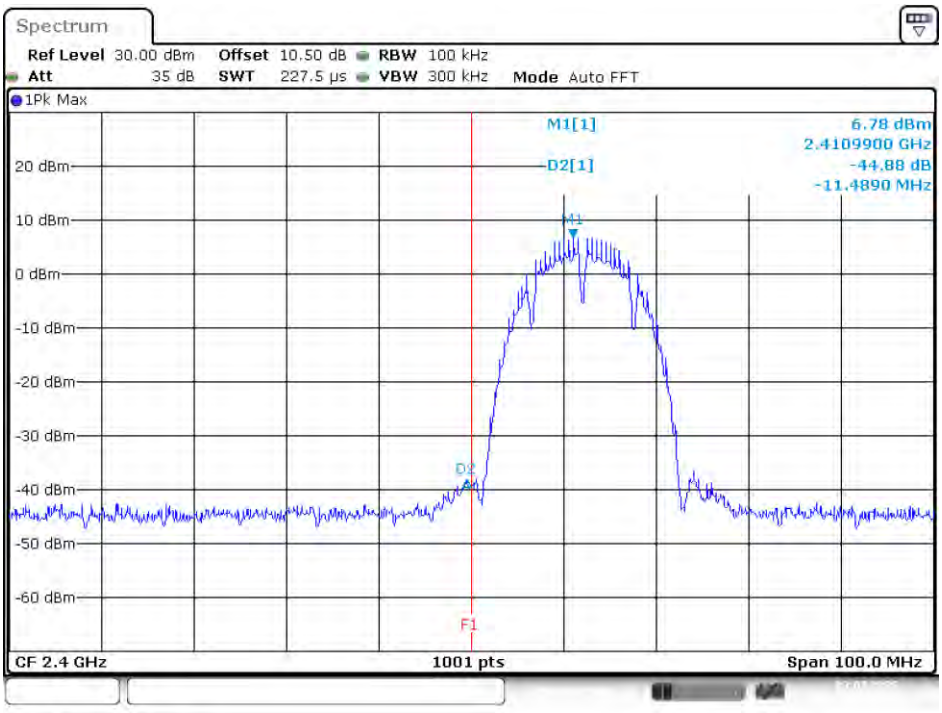
12.3 Test Results

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
B Mode				
Low	2412	44.88	≥ 20	PASS
High	2462	46.43	≥ 20	PASS
G Mode				
Low	2412	37.46	≥ 20	PASS
High	2462	34.23	≥ 20	PASS
N20 Mode				
Low	2412	39.26	≥ 20	PASS
High	2462	37.36	≥ 20	PASS
N40 Mode				
Low	2422	35.48	≥ 20	PASS
High	2452	34.73	≥ 20	PASS

Please refer to the following plots

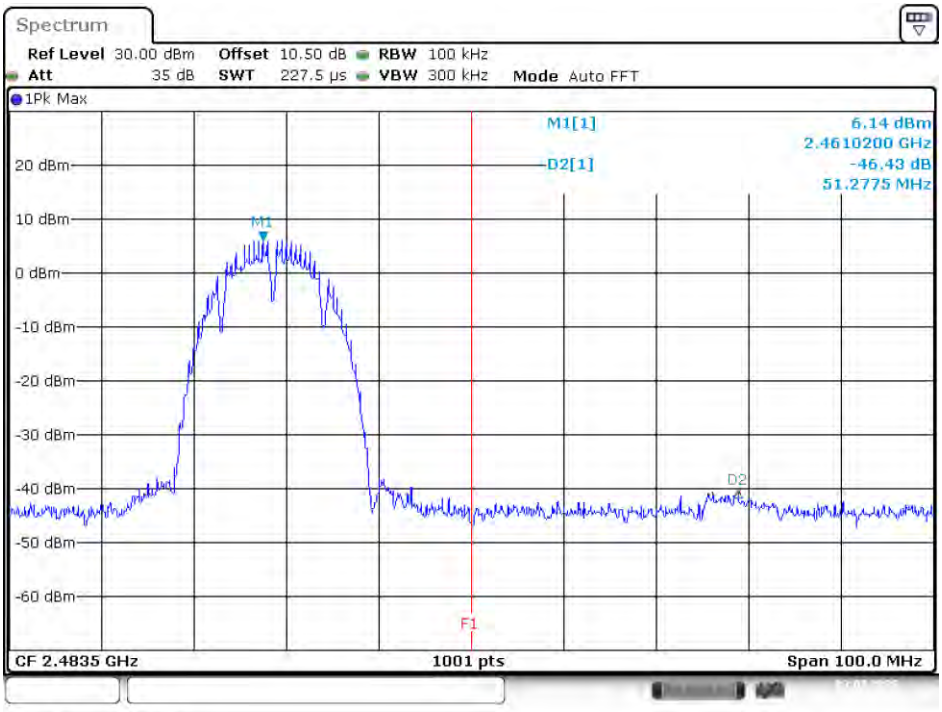
B Mode

Band Edge, Left Side



Date: 3.JUL.2023 17:31:32

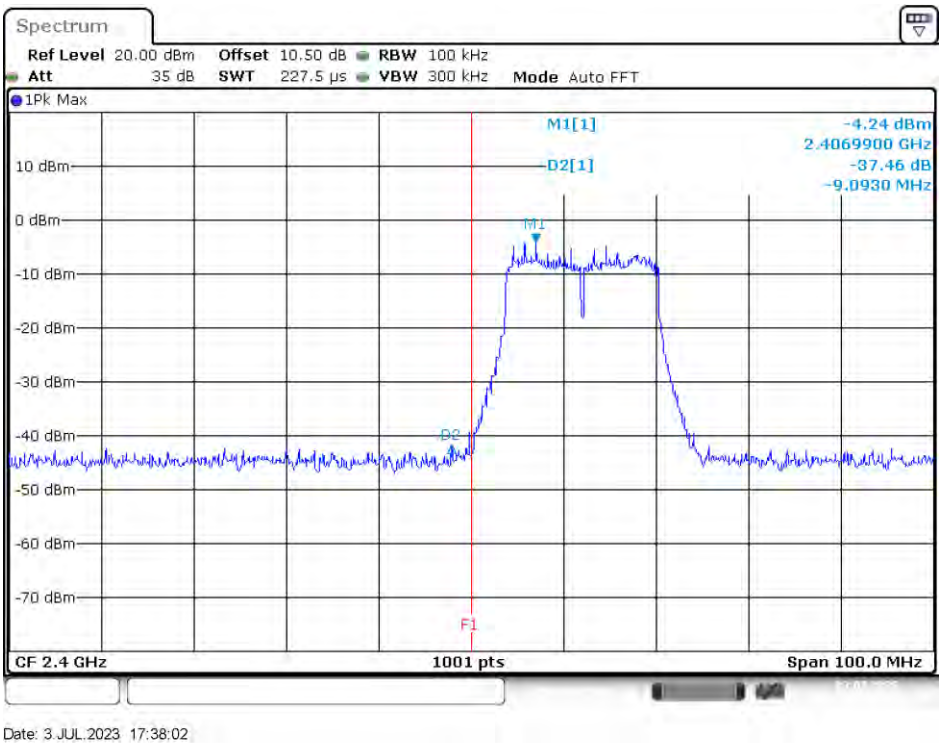
Band Edge, Right Side



Date: 3.JUL.2023 17:35:48

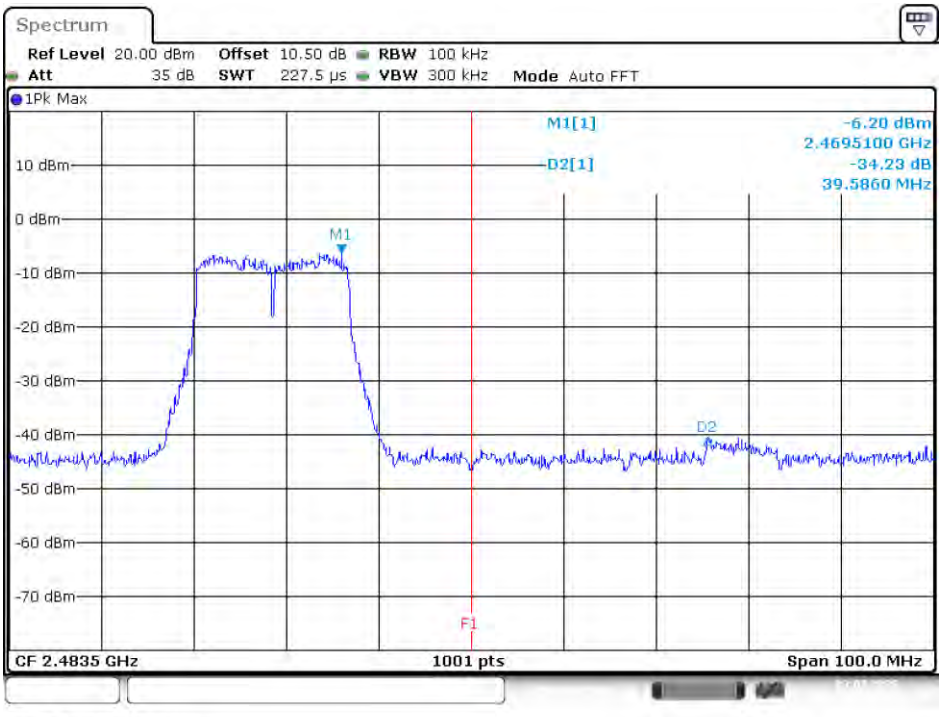
G Mode

Band Edge, Left Side



Date: 3.JUL.2023 17:38:02

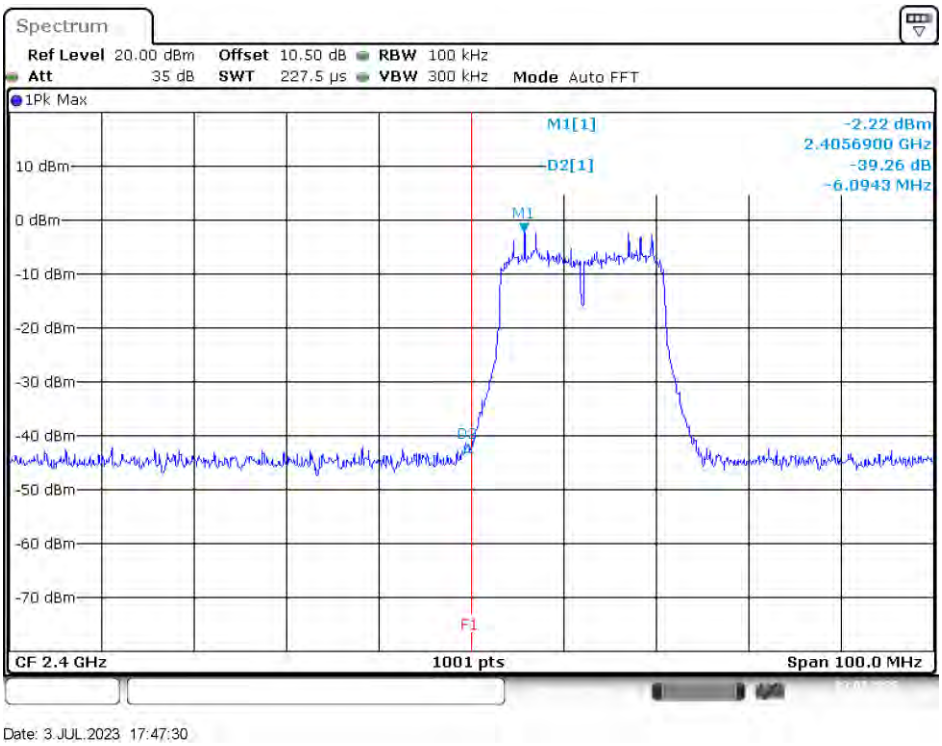
Band Edge, Right Side



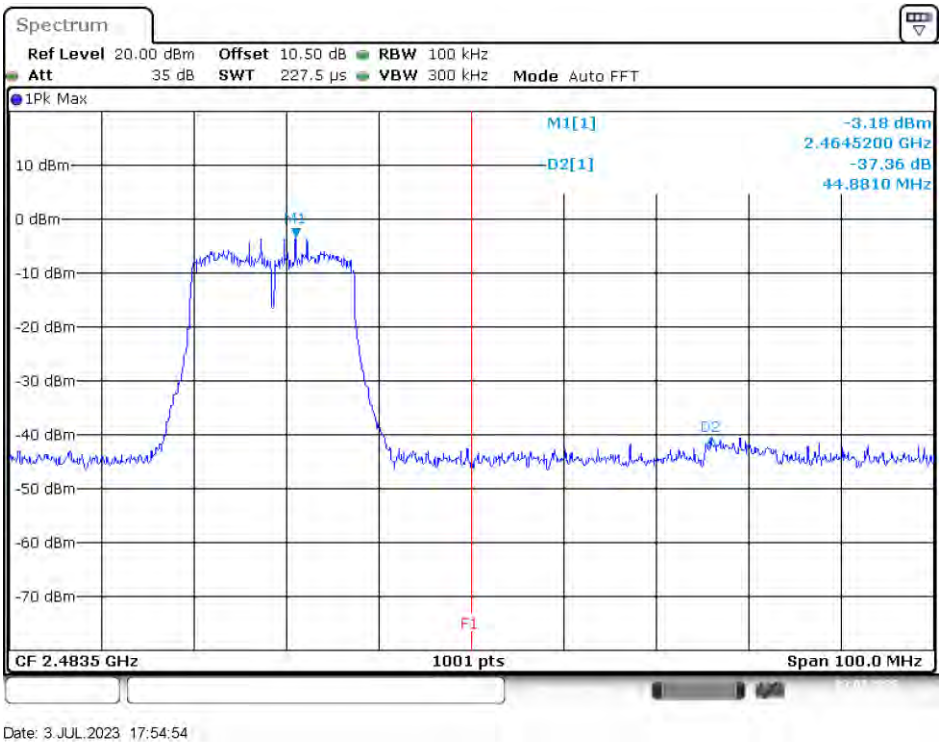
Date: 3.JUL.2023 17:43:04

N20 Mode

Band Edge, Left Side

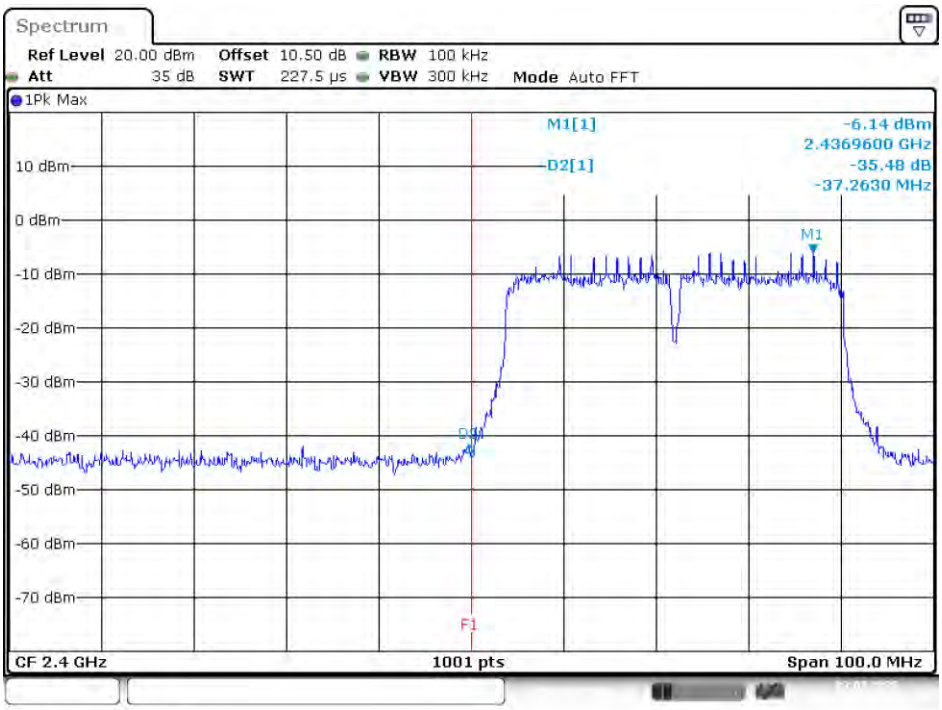


Band Edge, Right Side



N40 Mode

Band Edge, Left Side



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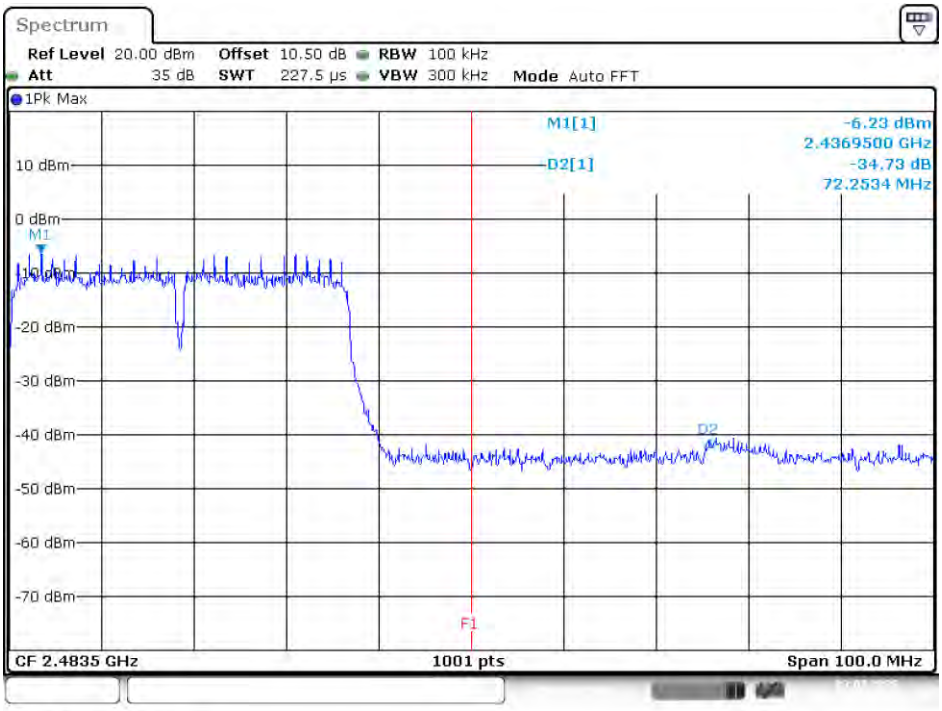
Band Edge, Right Side



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13 FCC §15.247(e) & RSS-247 §5.2(b) – Power Spectral Density

13.1 Applicable Standard

According to FCC §15.247(e).

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.

According to RSS-247 §5.2(b).

The transmitter power spectral density conducted from the transmitter 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 section 5.4(d), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

13.2 Test Procedure

According to ANSI C63.10-2013, section 11.10.2

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ [3 × RBW].
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat

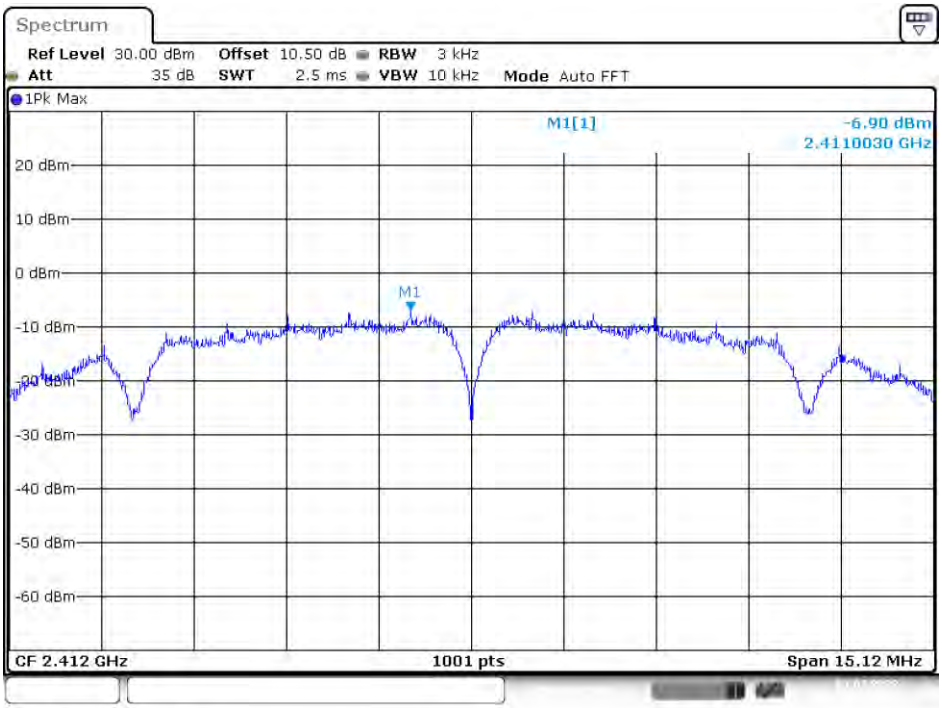
13.3 Test Results

Channel	Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
B Mode				
Low	2412	-6.90	8	PASS
Middle	2437	-7.12	8	PASS
High	2462	-7.29	8	PASS
G Mode				
Low	2412	-18.03	8	PASS
Middle	2437	-18.01	8	PASS
High	2462	-18.18	8	PASS
N20 Mode				
Low	2412	-17.89	8	PASS
Middle	2437	-17.98	8	PASS
High	2462	-18.24	8	PASS
N40 Mode				
Low	2422	-21.27	8	PASS
Middle	2437	-21.37	8	PASS
High	2452	-21.46	8	PASS

Please refer to the following plots

B Mode

Low Channel



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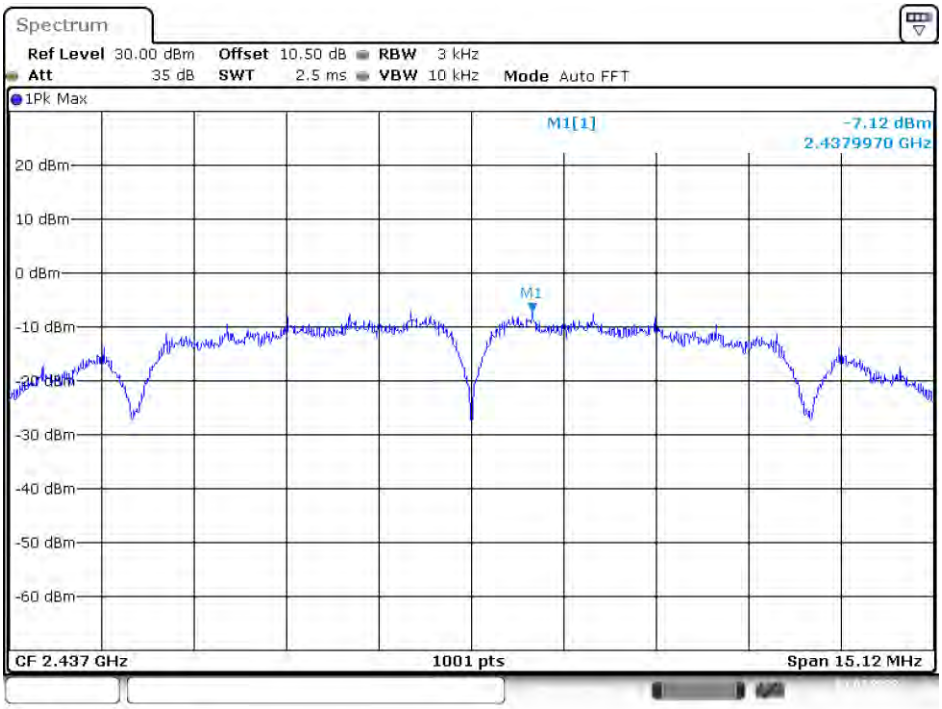
Middle Channel



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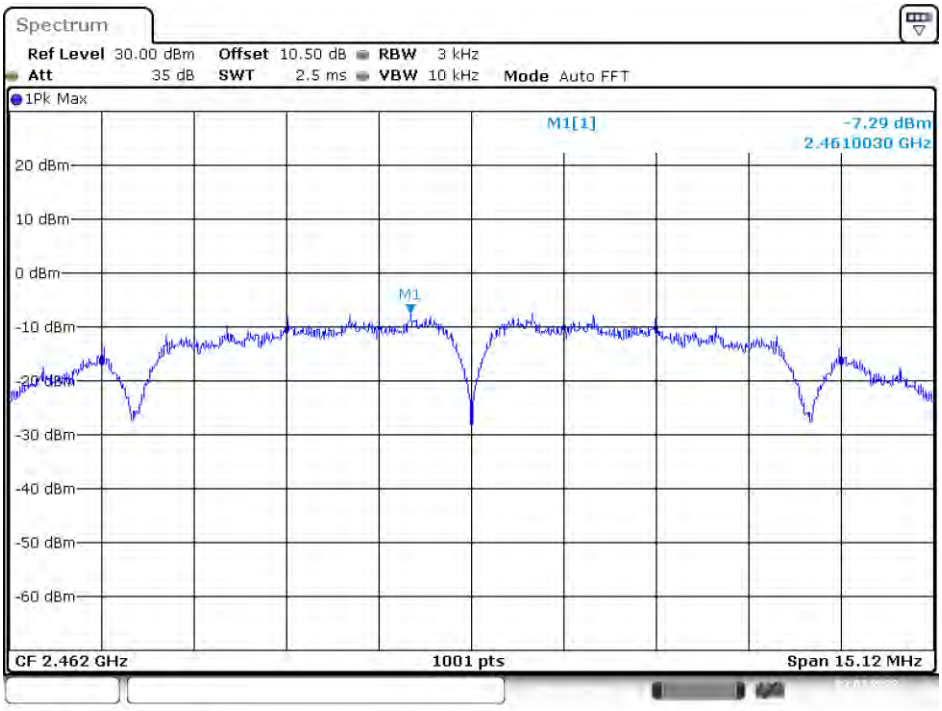
High Channel



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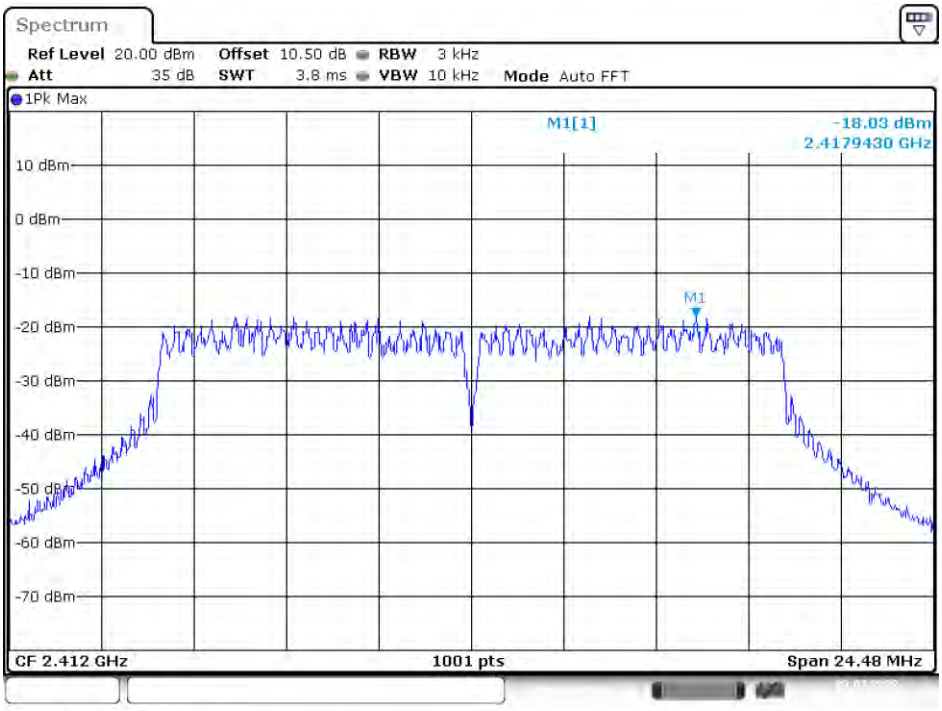
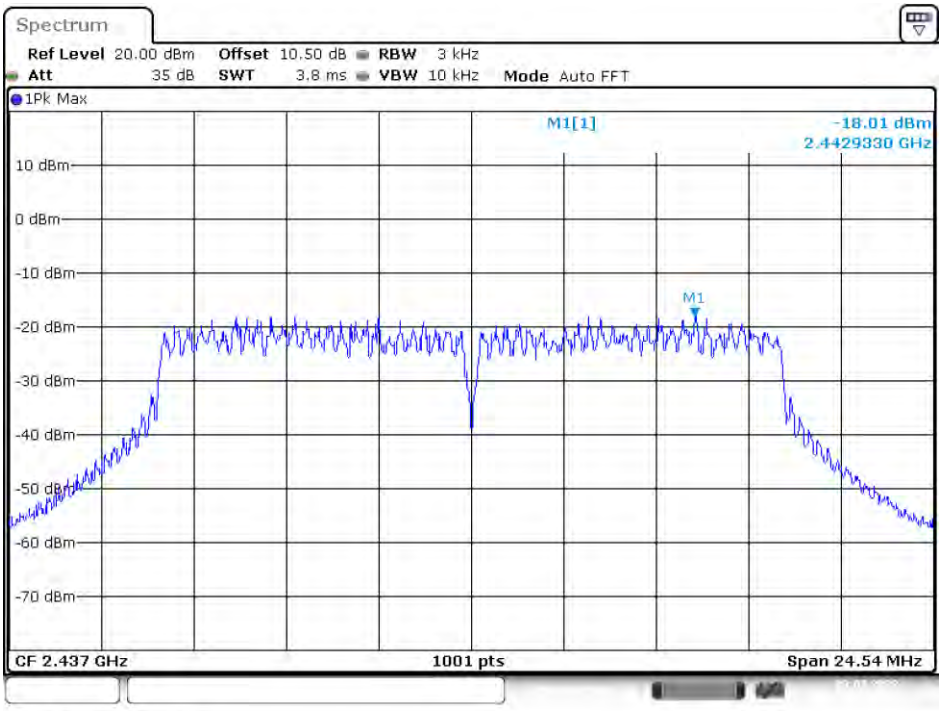
G Mode

Low Channel



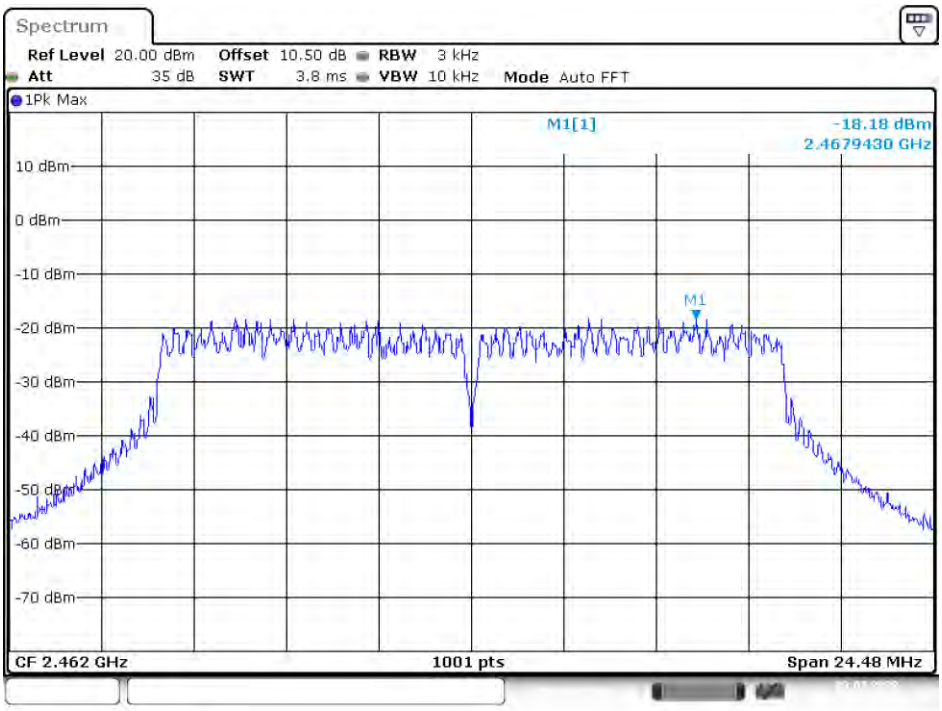
Date: 3.JUL.2023 17:37:46

Middle Channel



Date: 3.JUL.2023 17:40:09

High Channel



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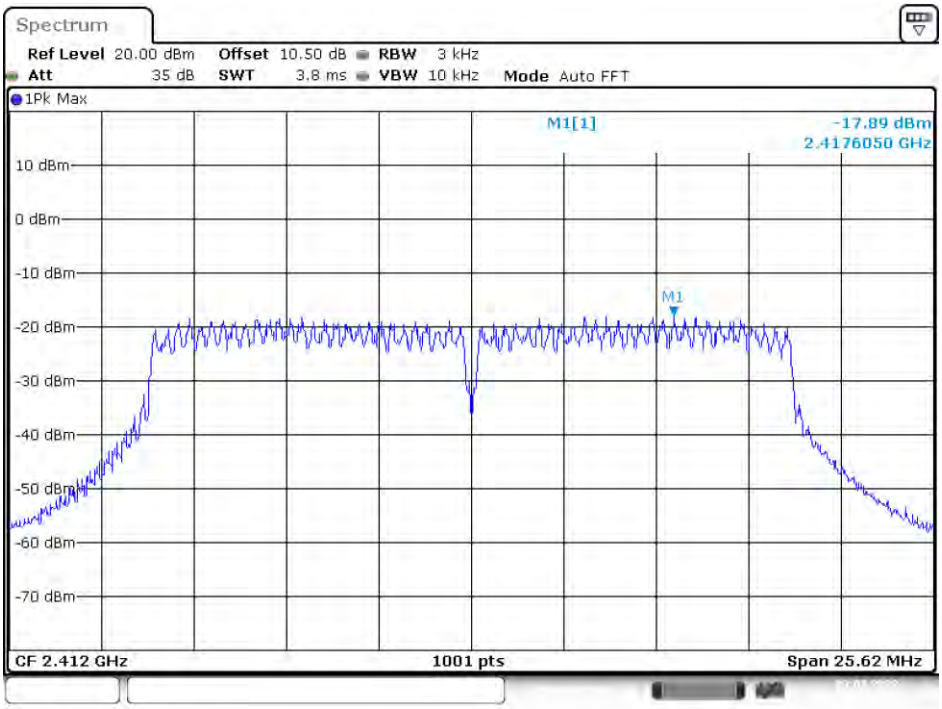
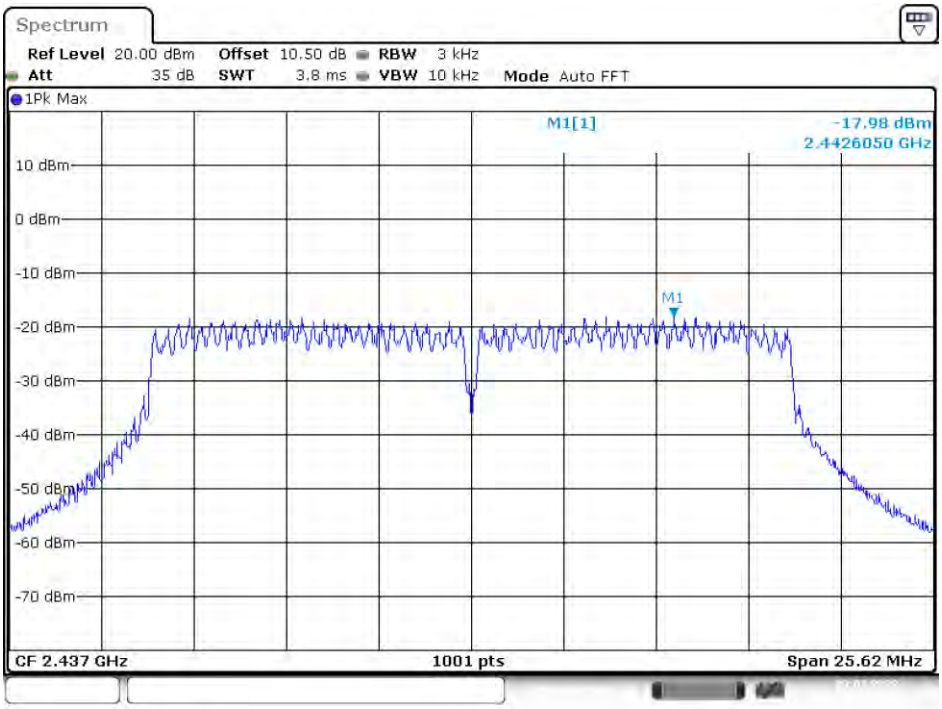
N20 Mode

Low Channel



Date: 3.JUL.2023 17:47:14

Middle Channel



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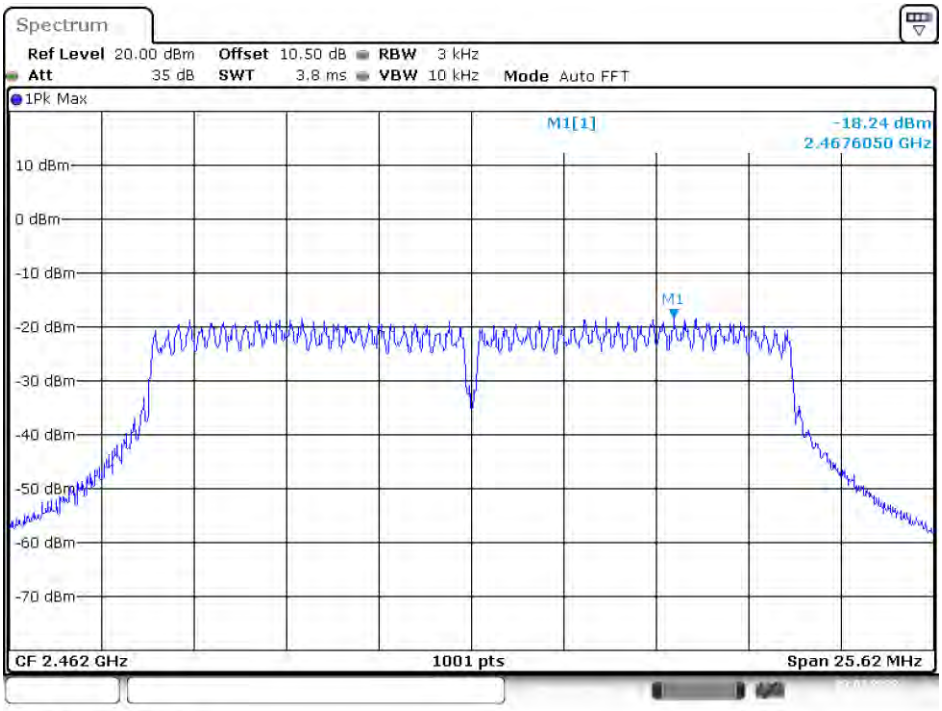
High Channel



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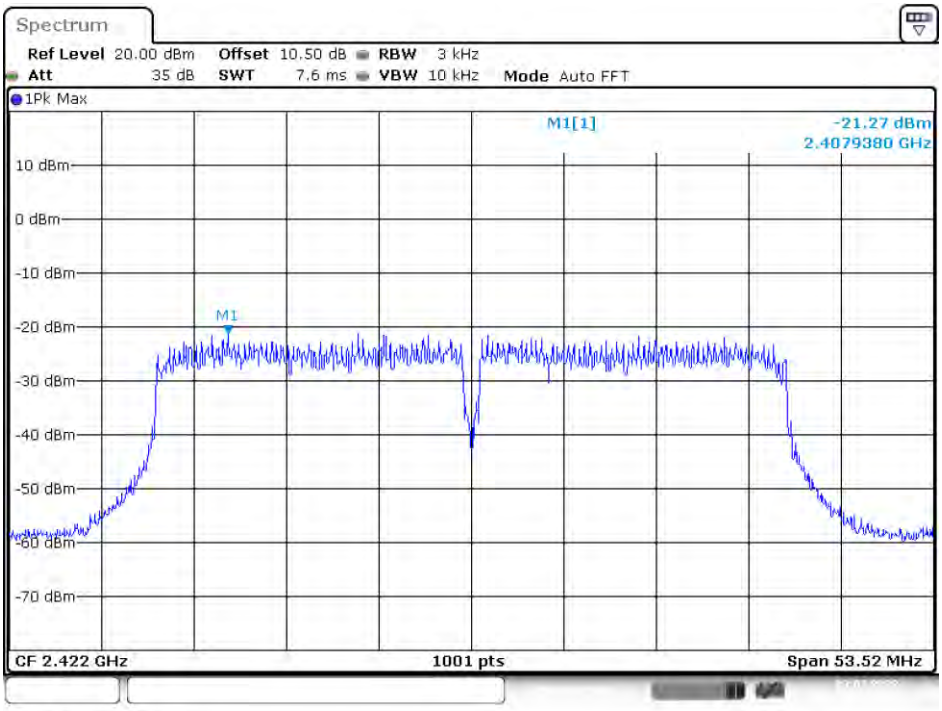
N40 Mode

Low Channel



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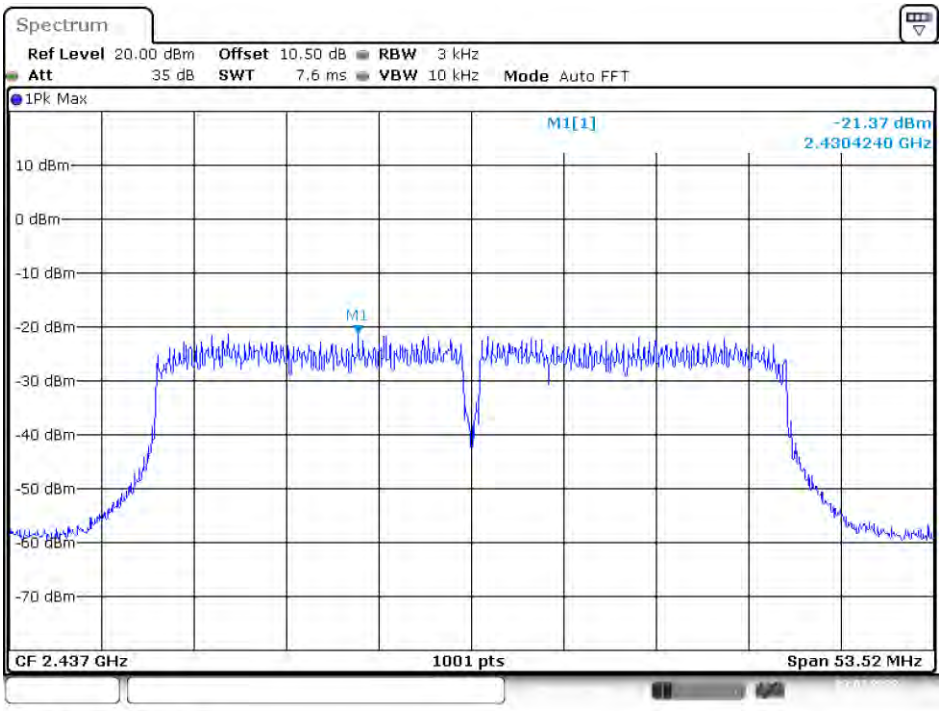
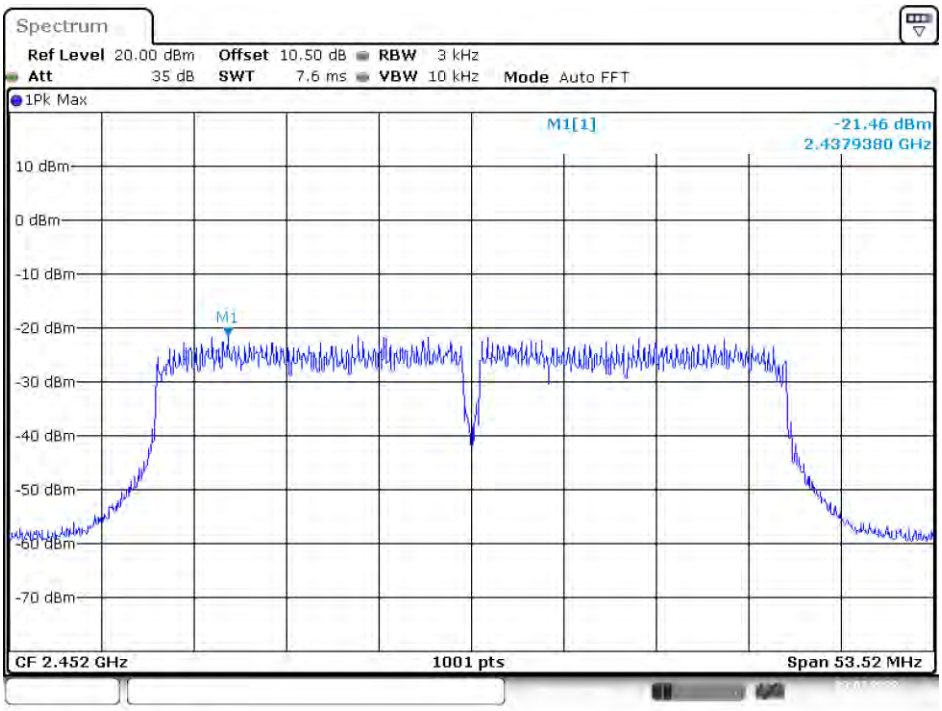
Middle Channel



Date: 3.JUL.2023 17:59:09

High Channel



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