FCC Part 15.247

TEST REPORT

For

IOTTECH CORPORATION

No.10-1,Shijian Rd.,Hukou,Hsinchu,Taiwan

FCC ID: 2AWP5WM1188FXC

Report Type: Original Report	**Product Type:** IEEE 802.11 b/g/n 2.4GHz 1T1R USB Wi-Fi Module

Report Producer : Coco Lin

Report Number : RXZ240711039RF02

Report Date : 2024-09-04

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Revision History

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
0.0	RXZ240711039	RXZ240711039RF02	2024-09-04	Original Report	Coco Lin

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1 General Information

1.1 Product Description for Equipment under Test (EUT)

Applicant	IOTTECH CORPORATION
	No.10-1,Shijian Rd.,Hukou,Hsinchu,Taiwan
Brand(Trade) Name	IOTTECH Corp.
Product (Equipment)	IEEE 802.11 b/g/n 2.4GHz 1T1R USB Wi-Fi Module
Main Model Name	ITM1188-F-XC
Series Model Name	N/A
Frequency Range	IEEE 802.11b/g/n HT20 Mode: 2412 ~ 2462 MHz IEEE 802.11n HT40 Mode: 2422 ~ 2452 MHz
Maximum Conducted Peak Output Power	IEEE 802.11b Mode: 15.26 dBm IEEE 802.11g Mode: 18.52 dBm IEEE 802.11n HT20 Mode: 17.46 dBm IEEE 802.11n HT40 Mode: 17.09 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)	DC 3.3Vdc
Received Date	2024/07/11
Date of Test	2024/07/12 ~ 2024/07/16

*All measurement and test data in this report was gathered from production sample serial number: RXZ240711039-1 (Assigned by BACL, New Taipei Laboratory).

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1.2 Objective

This report is prepared on behalf of IOTTECH CORPORATION in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communication Commission's rules.

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
KDB 558074 D01 15.247 Meas Guidance v05r02

1.4 Statement

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

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Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.
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		+/- 3.02 dB
RF output power, conducted		+/- 0.57 dB
Power Spectral Density, conducted		+/- 0.60 dB
Occupied Bandwidth		+/- 0.09 %
Unwanted Emissions, conducted		+/- 1.09 dB
Emissions, radiated	9 kHz~30 MHz	+/- 3.20 dB
	30 MHz~1 GHz	+/- 3.30 dB
	1 GHz~18 GHz	+/- 5.14 dB
	18 GHz~40 GHz	+/- 4.75 dB
Temperature		+/- 0.76 °C
Humidity		+/- 0.41 %

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 Date	Temperature (℃)	Relative Humidity (%)	ATM Pressure (hPa)	Test Engineer
AC Line Conducted Emissions	2024/7/15	26.6	40	1010	Jing Chang
Radiation Spurious Emissions	2024/7/12~2024/7/16	23.4~25.1	58~68	1010	Wayne Pan
Duty Cycle	2024/7/12	25.2	53	1010	Jing Chang
Conducted Spurious Emissions	2024/7/12~2024/7/15	25.2~25.4	45~53	1010	Jing Chang
6 dB Emission Bandwidth	2024/7/12~2024/7/15	25.2~25.4	45~53	1010	Jing Chang
Maximum Output Power	2024/7/12~2024/7/15	25.2~25.4	45~53	1010	Jing Chang
100 kHz Bandwidth of Frequency Band Edge	2024/7/12~2024/7/15	25.2~25.4	45~53	1010	Jing Chang
Power Spectral Density	2024/7/12~2024/7/15	25.2~25.4	45~53	1010	Jing Chang

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 221, Taiwan, R.O.C.

Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) Lab 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.

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2 System Test Configuration

2.1 Description of Test Configuration

For WIFI 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.

2.2 Equipment Modifications

No modification was made to the EUT.

2.3 EUT Exercise Software

The test software was used “MPTool v1.2.0.5”

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

Test Frequency		Low	Middle	High
Power Level Setting	802.11b Mode	42	42	36
	802.11g Mode	47	47	44
	802.11n HT20 Mode	46	46	42
	802.11n HT40 Mode	45	45	39

The worst case data rates are as follows:

802.11b: 1Mbps

802.11g: 6Mbps

802.11n HT20: MCS0

802.11n HT40: MCS0

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2.4 Test Mode

Full System (model: ITM1188-F-XC) for all test item.

2.5 Support Equipment List and Details

Description	Manufacturer	Model Number
NB	DELL	E6410
Adapter	DELL	DA90PE3-00
Bottom Layer PCB	IOTTECH Corp.	47080Z-Y25-190504

2.6 External Cable List and Details

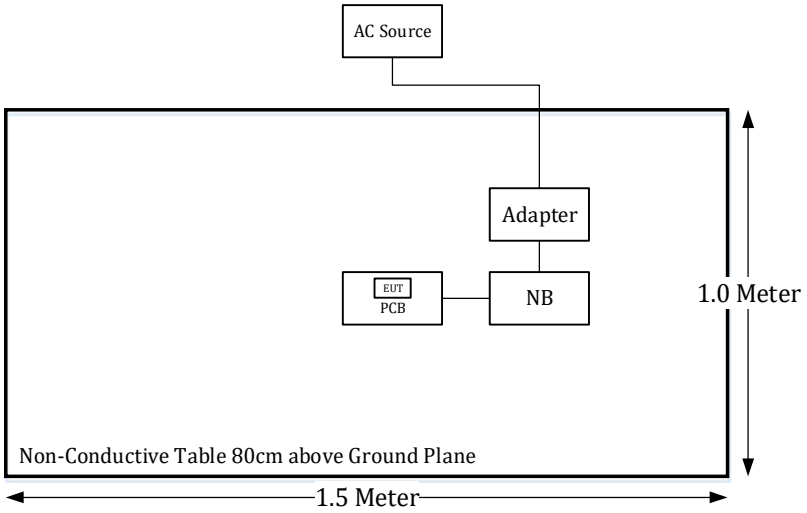
Description	Manufacturer	Length (m)
USBA to Mini USB	BACL	1

2.7 Block Diagram of Test Setup

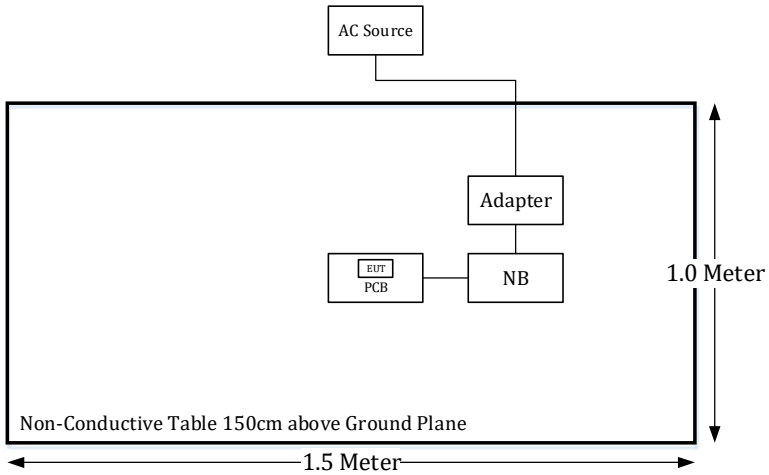
See test photographs attached in setup photos for the actual connections between EUT and support equipment.

Radiation:

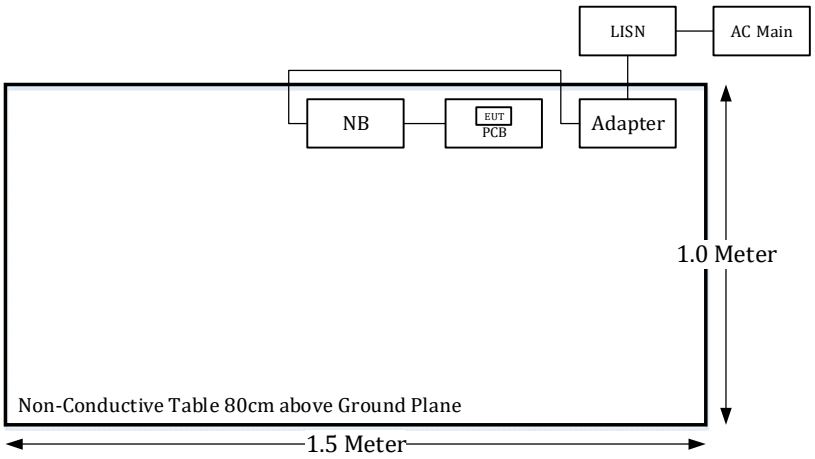
Below 1GHz:



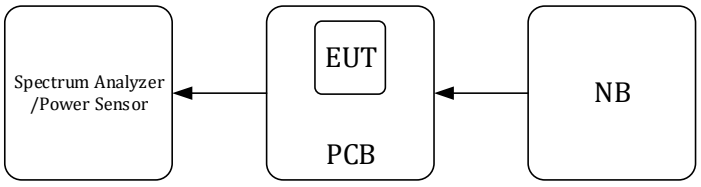
Above 1GHz:



Conduction:



Conducted:



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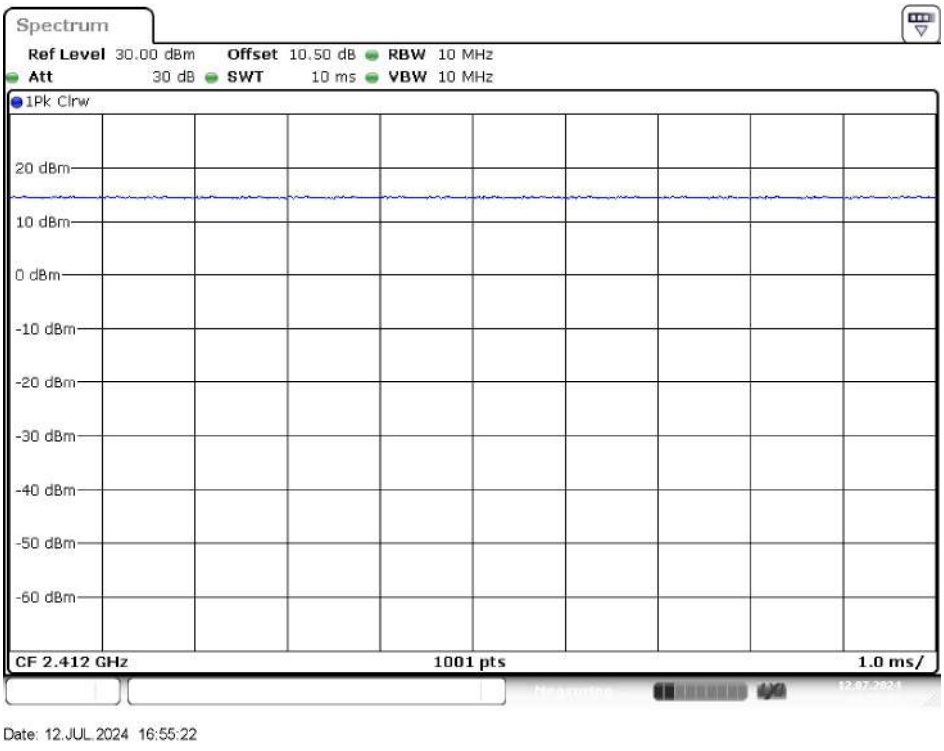
2.8 Duty Cycle

The duty cycle as below:

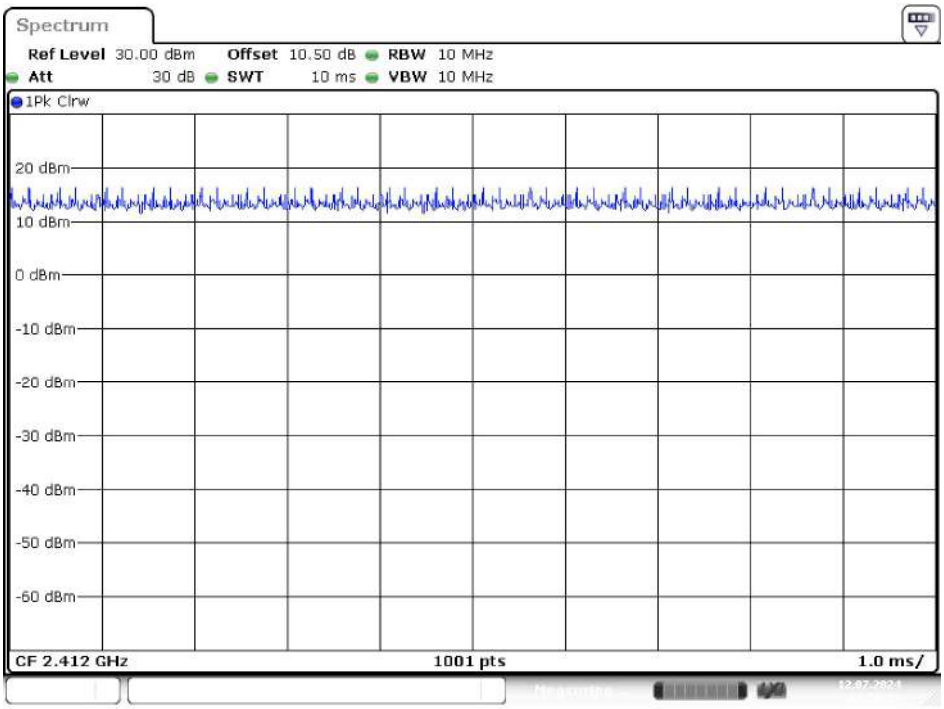
Radio Mode	Ton (ms)	Ton+Toff (ms)	Duty Cycle (%)	1/T (kHz)	1/T VBW setting (kHz)
802.11b	100	100	100	/	0.01
802.11g	100	100	100	/	0.01
802.11n HT20	100	100	100	/	0.01
802.11n HT40	100	100	100	/	0.01

Please refer to the following plots.

B Mode

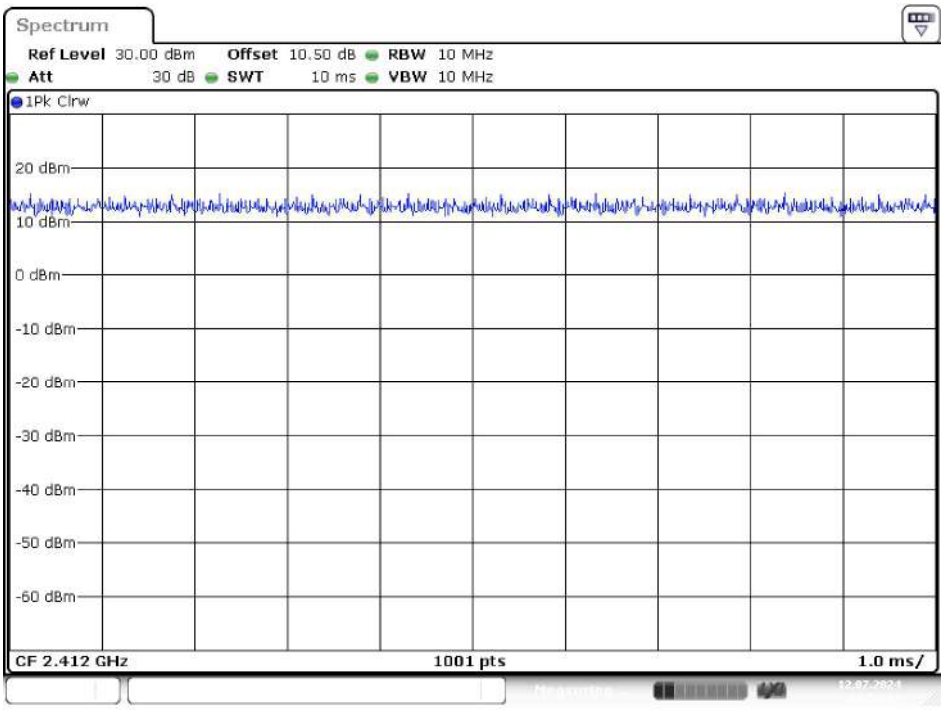


G Mode



Date: 12.JUL.2024 16:56:20

N20 Mode



Date: 12.JUL.2024 16:57:14

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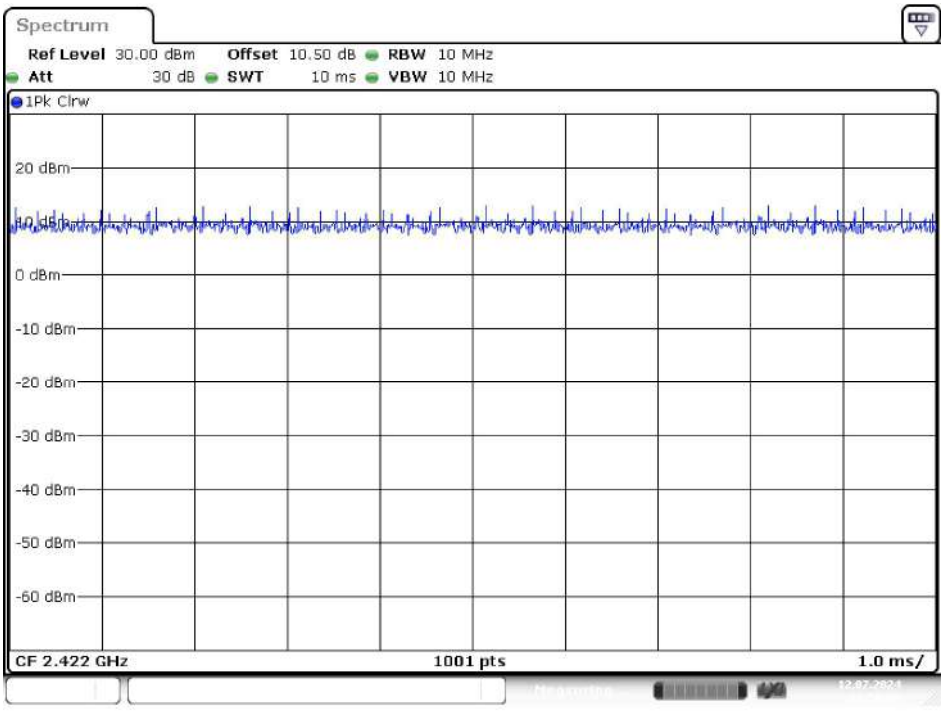
N40 Mode


Spectrum
Ref Level 30.00 dBm Offset 10.50 dB RBW 10 MHz
Att 30 dB SWT 10 ms VBW 10 MHz
1Pk Clrw
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
CF 2.422 GHz
1001 pts
1.0 ms/
Date: 12.JUL.2024 16:58:06

3 Summary of Test Results

FCC Rules	Description of Test	Results
§15.247(i), §1.1307(b)(3)(i)	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247(a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum Peak Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

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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	2024/2/16	2025/2/15
EMI Test Receiver	Rohde & Schwarz	ESW8	100947	2024/5/24	2025/5/23
RF Cable	EMEC	EM-CB5D	1	2024/6/5	2025/6/4
Software	AUDIX	E3	V9.150826k	N.C.R	N.C.R
Radiation 3M Room (966-A)					
Active Loop Antenna	ETS-Lindgren	6502	35796	2024/3/27	2025/3/26
Bilog Antenna with 6 dB Attenuator	SUNOL SCIENCES & MINI-CIRCUITS	JB6/UNAT-6+	A050115/15542_01	2024/1/19	2025/1/18
Horn Antenna	A.H. system	SAS-571	1020	2024/5/21	2025/5/20
Horn Antenna	ETS-Lindgren	3116	62638	2023/8/25	2024/8/23
Preamplifier	Sonoma	310N	130601	2024/1/29	2025/1/28
Preamplifier	Channel	ERA-100M-18G-01D1748	EC2300051	2024/3/29	2025/3/28
Microware Preamplifier	EM Electronics Corporation	EM18G40G	60656	2024/1/8	2025/1/7
EMI Test Receiver	Rohde & Schwarz	ESR3	102099	2024/6/24	2025/6/23
Spectrum Analyzer	Rohde & Schwarz	FSV40	101939	2024/3/27	2025/3/26
Microflex Cable	UTIFLEX	UFB197C-1-2362-70U-70U	225757-001	2024/1/23	2025/1/22
Coaxial Cable	UTIFLEX	UFB311A-Q-1440-300300	220490-006	2024/1/23	2025/1/22
Coaxial Cable	COMMATE	PEWC	8Dr	2023/12/23	2024/12/22
Cable	EMC	EMC105-SM-SM-10000	201003	2024/1/23	2025/1/22
Coaxial Cable	JUNFLON	J12J102248-00-B-5	AUG-07-15-044	2023/12/23	2024/12/22
Coaxial Cable	ROSNOL	K1K50-UP0264-K1K50-450CM	160309-1	2024/1/23	2025/1/22
Microflex Cable	ROSNOL	K1K50-UP0264-K1K50-80CM	160309-2	2024/1/23	2025/1/22
Band-stop filter	Woken	STI15-9831	STI15-9831-1	2023/10/20	2024/10/19
High-pass filter	XINGBOKEJI	XBLBQ-GTA54	200108-3-2	2023/10/20	2024/10/19
Software	AUDIX	E3	18621a	N.C.R	N.C.R
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz(R&S)	FSV40	101204	2024/5/30	2025/5/29
Cable	UTIFLEX	UFA210A	9435	2023/10/2	2024/10/1
Power Sensor	Boonton	RTP5006	11037	2024/5/21	2025/5/20
Attenuator	MCL	BW-S10W5+	1419	2024/2/23	2025/2/22

***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.

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

5.1 Applicable Standard

According to subpart 15.247(i) and subpart §1.1307(b)(3), 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.

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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	18.6	3.44	200	72.44	19.89	97.50

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

§ 1.1307(b)(3)(i)(C)

Band	Freq (MHz)	λ/2π (mm)	Distances applies	ERP Limit (mW)	Result Option C
WiFi 2.4GHz	2412	19.8	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: The Tune-up output power was declared by the Applicant.

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

6 FCC §15.203 – Antenna Requirements

6.1 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.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna does not exceed 6dBi.

6.2 Antenna List and Details

Manufacturer	Model	Antenna Type	Antenna Gain	Impedance
Hantech	HT870001	PCB Antenna	3.44 dBi	50Ω

The antenna is connected to the EUT using a connector that is not a standard antenna jack.

Result: Compliance

7 FCC §15.207(a) – AC Line Conducted Emissions

7.1 Applicable Standard

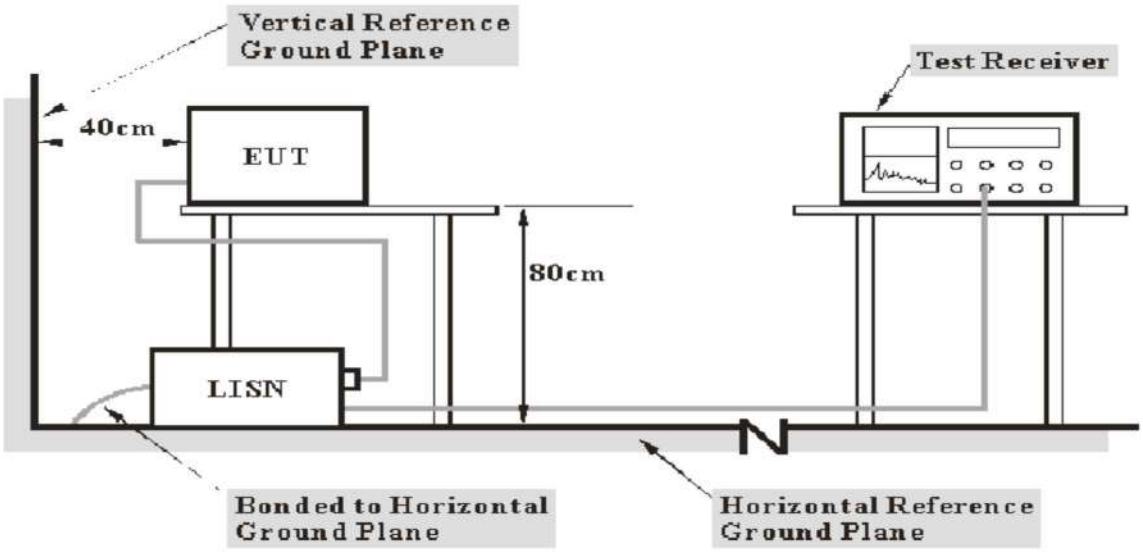
According to §15.207

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.

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

Note: Decreases with the logarithm of the frequency.

7.2 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 limits.

7.3 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

7.4 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.

7.5 Corrected Factor & Over Limit 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

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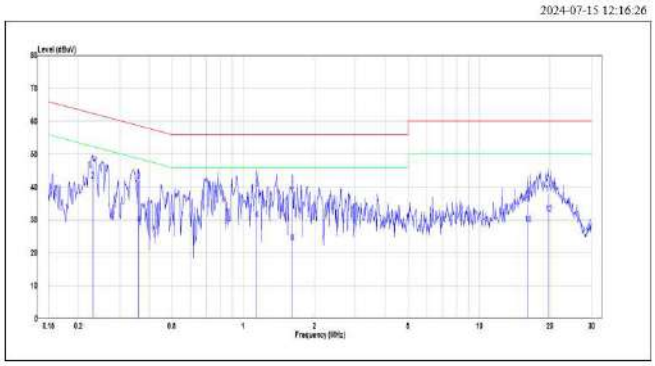
7.6 Test Results

Test Mode: Transmitting

Main: AC120 V, 60 Hz

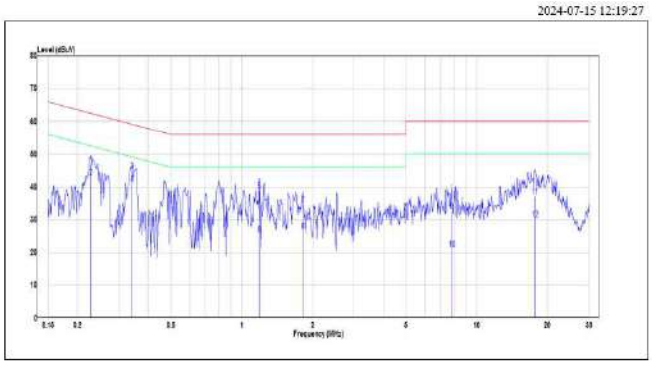
(Worst case is 802.11b mode, Middle Channel)

Line



No.	Frequency (MHz)	Reading dBuV	Correct Factor(dB)	Result dBuV	Limit dBuV	Over limit (dB)	Remark	Phase
1	0.230	37.23	10.05	47.28	62.44	-15.16	QP	Line
2	0.230	32.08	10.05	42.13	52.44	-10.31	Average	Line
3	0.360	31.84	10.15	41.99	58.74	-16.75	QP	Line
4	0.360	18.51	10.15	28.66	48.74	-20.08	Average	Line
5	1.141	29.45	10.34	39.79	56.00	-16.21	QP	Line
6	1.141	19.80	10.34	30.14	46.00	-15.86	Average	Line
7	1.610	27.09	10.34	37.43	56.00	-18.57	QP	Line
8	1.610	12.81	10.34	23.15	46.00	-22.85	Average	Line
9	16.140	24.37	10.58	34.95	60.00	-25.05	QP	Line
10	16.140	18.17	10.58	28.75	50.00	-21.25	Average	Line
11	19.740	27.59	10.61	38.20	60.00	-21.80	QP	Line
12	19.740	21.35	10.61	31.96	50.00	-18.04	Average	Line

Neutral



No.	Frequency (MHz)	Reading dBuV	Correct Factor(dB)	Result dBuV	Limit dBuV	Over limit (dB)	Remark	Phase
1	0.228	36.93	10.06	46.99	62.52	-15.53	QP	Neutral
2	0.228	32.85	10.06	42.91	52.52	-9.61	Average	Neutral
3	0.341	34.76	10.15	44.91	59.18	-14.27	QP	Neutral
4	0.341	30.91	10.15	41.06	49.18	-8.12	Average	Neutral
5	1.184	28.45	10.35	38.80	56.00	-17.20	QP	Neutral
6	1.184	15.22	10.35	25.57	46.00	-20.43	Average	Neutral
7	1.819	24.09	10.35	34.44	56.00	-21.56	QP	Neutral
8	1.819	16.18	10.35	26.53	46.00	-19.47	Average	Neutral
9	7.810	22.09	10.44	32.53	60.00	-27.47	QP	Neutral
10	7.810	10.56	10.44	21.00	50.00	-29.00	Average	Neutral
11	17.661	26.42	10.65	37.07	60.00	-22.93	QP	Neutral
12	17.661	19.43	10.65	30.08	50.00	-19.92	Average	Neutral

Note:

Result = Reading + Factor

Over Limit = Result – Limit Line

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

Note: It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)

8 FCC §15.209, §15.205 , §15.247(d) – Spurious Emissions

8.1 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 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): 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.

Note: It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)

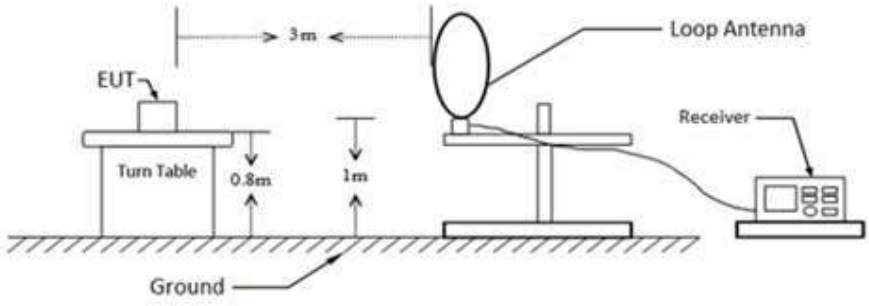
According to ANSI C63.10-2013, section 5.3.3

Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field, and the emissions to be measured can be detected by the measurement equipment (see 4.3.4). Measurements shall not be performed at a distance greater than 30 m for frequencies above 30 MHz, unless it can be further demonstrated that measurements at a distance of 30 m or less are impractical. Measurements from 18 GHz to 40 GHz are typically made at distances significantly less than 3 m from the EUT. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade of distance (inverse of linear distance for field-strength measurements or inverse of linear distance-squared for power-density measurements).

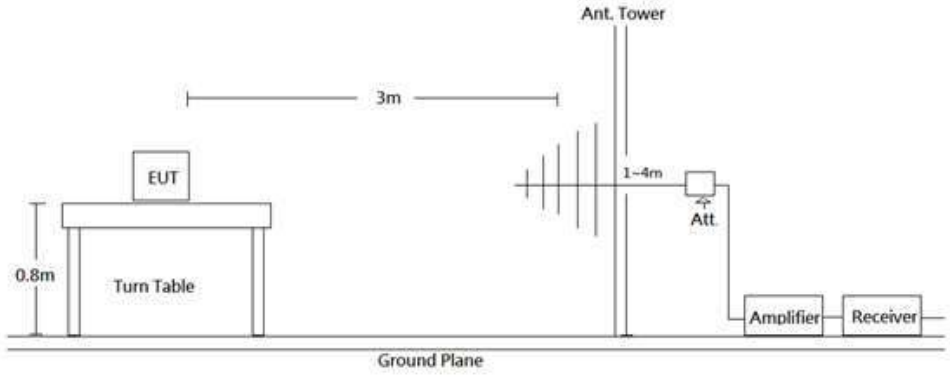
As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the 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).

8.2 EUT Setup

9kHz-30MHz:

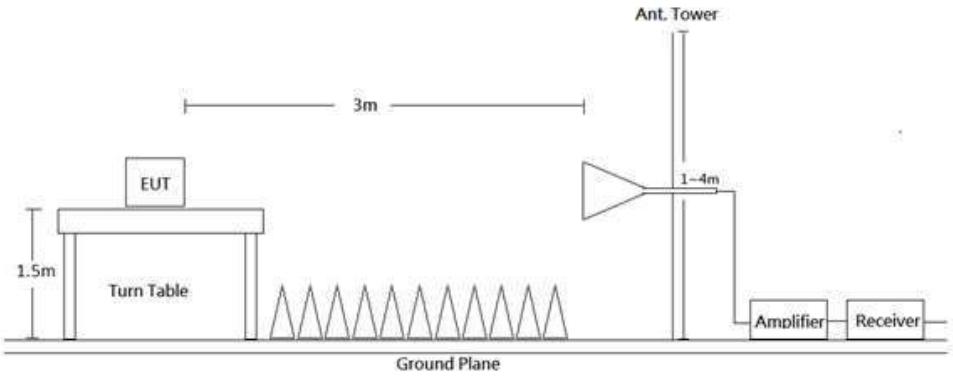


30MHz-1GHz:

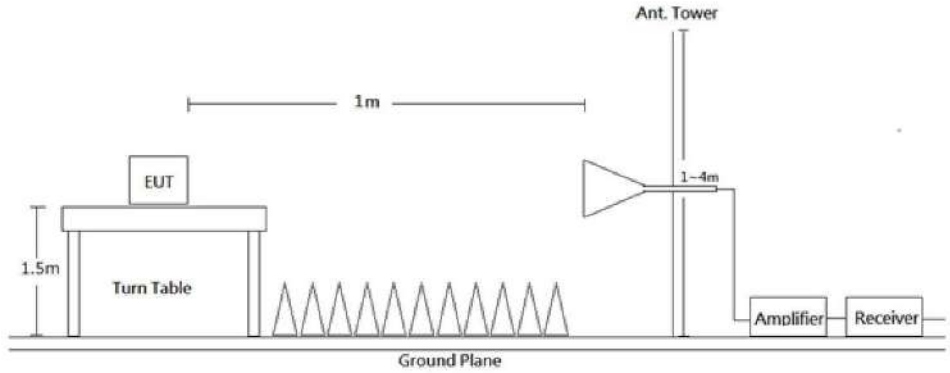


Note: It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)

1-18 GHz:



18-26.5 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 and FCC 15.247 Limits.

8.3 EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 9 kHz 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
9 kHz - 150 kHz	200 Hz/300 Hz	1 kHz	/	QP/AV
150 kHz - 30 MHz	9 kHz/10 kHz	30 kHz	/	QP/AV
30-1000 MHz	120 kHz	300 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

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

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8.4 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 Quasi-peak and average detector mode from 9 kHz to 30 MHz, Quasi-peak detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

8.5 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

Note: It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)

8.6 Test Results

Test Mode: Transmitting

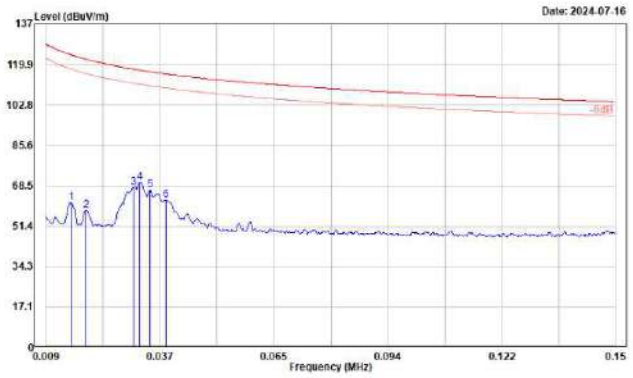
(Pre-scan with three orthogonal axis, and worse case as X axis.)

9kHz-30MHz:

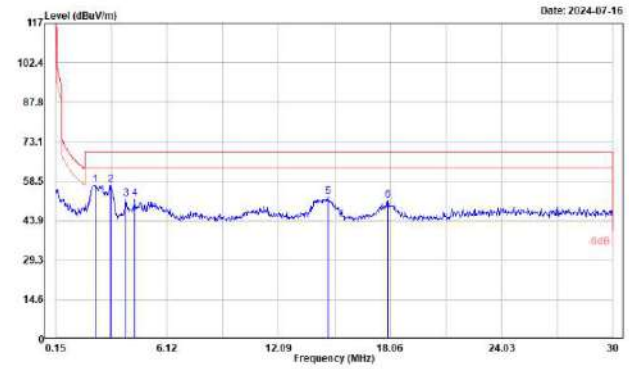
(Worst case is 802.11b mode, middle channel)

(Pre-scan using three directional polarities, worst case as parallel.)

9kHz-150kHz	150kHz-30MHz



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
0.015	45.77	15.64	61.41	123.97	-62.56	100	360	Average
0.019	42.80	15.22	58.02	122.03	-64.01	100	360	Average
0.031	54.02	13.66	67.68	117.90	-50.22	100	360	Average
0.032	56.43	13.53	69.96	117.43	-47.47	100	360	Average
0.035	53.11	13.33	66.44	116.77	-50.33	100	360	Average
0.039	49.45	13.03	62.48	115.87	-53.39	100	360	Average

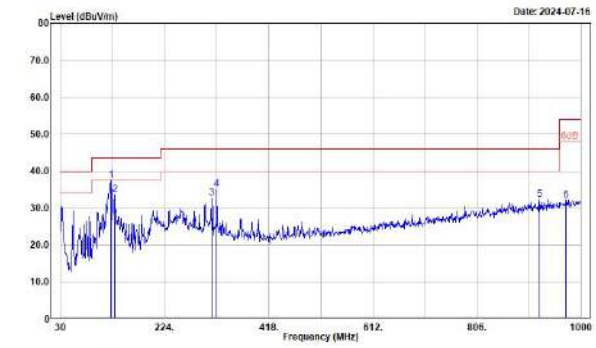


Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2.269	46.37	10.67	57.04	69.54	-12.50	100	0	QP
3.075	46.62	10.47	57.09	69.54	-12.45	100	0	QP
3.911	41.51	10.57	52.08	69.54	-17.46	100	0	QP
4.389	41.26	10.63	51.89	69.54	-17.65	100	0	QP
14.717	40.91	11.58	52.49	69.54	-17.05	100	0	QP
17.941	39.85	11.65	51.50	69.54	-18.04	100	0	QP

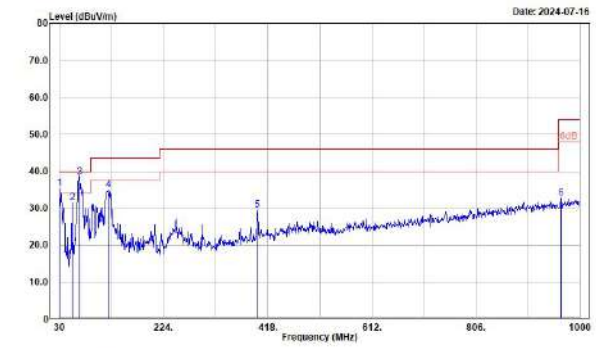
30MHz-1GHz:

(worst case is 802.11b mode)

Low channel	
Horizontal	**Vertical**



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
124.090	46.85	-9.25	37.60	43.50	-5.90	100	62	QP
130.880	42.68	-9.11	33.57	43.50	-9.93	100	85	QP
311.300	41.52	-8.69	32.83	46.00	-13.17	100	131	QP
321.000	43.68	-8.52	35.16	46.00	-10.84	100	36	QP
922.400	29.47	2.85	32.32	46.00	-13.68	100	170	QP
971.870	28.46	3.67	32.13	54.00	-21.87	100	51	QP

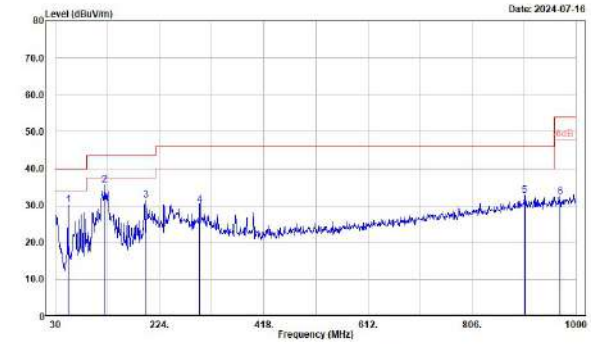


Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
30.000	37.95	-2.53	35.42	40.00	-4.58	100	91	QP
53.280	47.16	-15.70	31.46	40.00	-8.54	100	278	QP
67.830	53.52	-15.07	38.45	40.00	-1.55	100	0	QP
120.210	44.23	-9.38	34.85	43.50	-8.65	100	209	QP
398.600	36.15	-6.77	29.38	46.00	-16.62	100	16	QP
964.110	29.19	3.45	32.64	54.00	-21.36	100	290	QP

Note: It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)

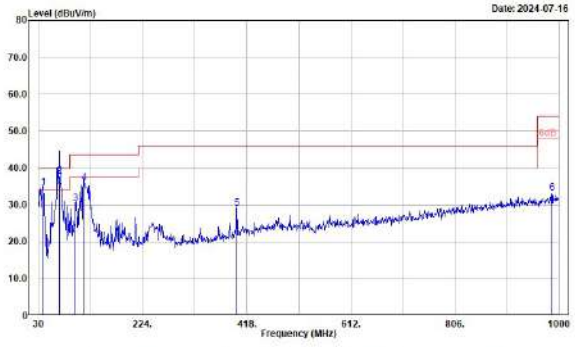
Middle channel

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
53.280	45.85	-15.70	30.15	40.00	-9.85	100	24	QP
121.180	44.91	-9.35	35.56	43.50	-7.94	100	97	QP
198.780	41.32	-9.98	31.34	43.50	-12.16	100	112	QP
298.690	38.93	-8.80	30.13	46.00	-15.87	100	59	QP
903.970	30.09	2.72	32.81	46.00	-13.19	100	245	QP
970.900	28.58	3.66	32.24	54.00	-21.76	100	82	QP

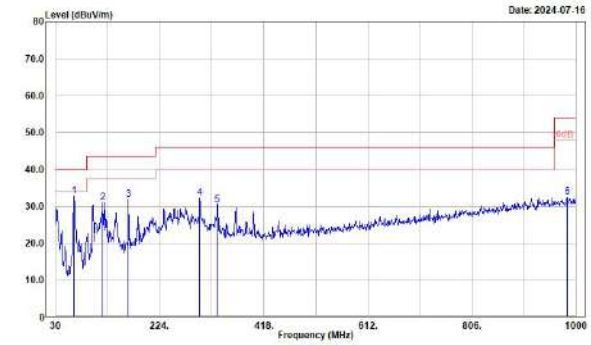
Vertical



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
38.730	43.63	-8.85	34.78	40.00	-5.22	100	86	QP
68.800	52.99	-15.27	37.72	40.00	-2.28	100	137	QP
98.870	43.61	-13.36	30.25	43.50	-13.25	100	67	QP
114.390	46.13	-10.06	36.07	43.50	-7.43	100	347	QP
399.570	35.87	-6.77	29.10	46.00	-16.90	100	9	QP
986.420	29.13	4.06	33.19	54.00	-20.81	100	229	QP

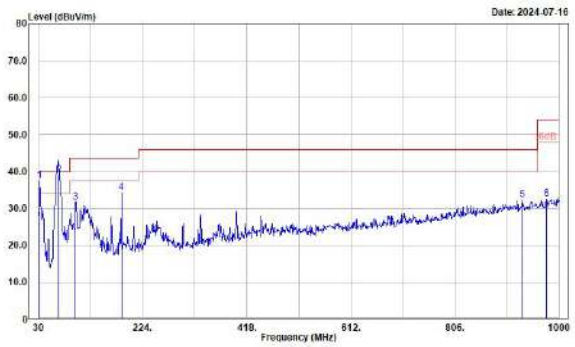
High channel

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
64.920	48.24	-15.48	32.76	40.00	-7.24	100	107	QP
118.270	40.53	-9.60	30.93	43.50	-12.57	100	24	QP
165.800	42.52	-10.70	31.82	43.50	-11.68	100	99	QP
298.690	41.06	-8.80	32.26	46.00	-13.74	100	35	QP
331.670	38.59	-8.23	30.36	46.00	-15.64	100	244	QP
983.510	28.65	3.96	32.61	54.00	-21.39	100	155	QP

Vertical



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
31.940	41.52	-3.95	37.57	40.00	-2.43	100	356	QP
67.830	54.03	-15.07	38.96	40.00	-1.04	100	107	QP
98.870	44.96	-13.36	31.60	43.50	-11.90	100	57	QP
184.230	46.15	-11.83	34.32	43.50	-9.18	100	237	QP
931.130	29.17	3.09	32.26	46.00	-13.74	100	138	QP
976.720	28.82	3.78	32.60	54.00	-21.40	100	290	QP

Level = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

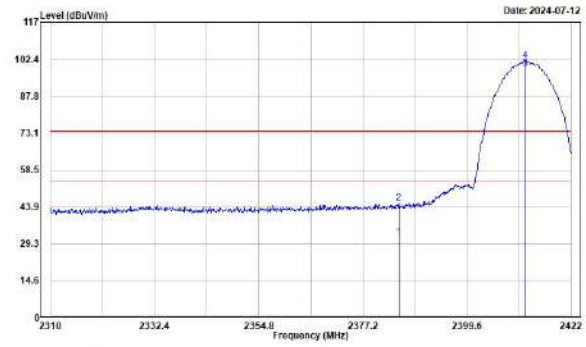
Note: It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)

Band-Edge:

802.11b Mode

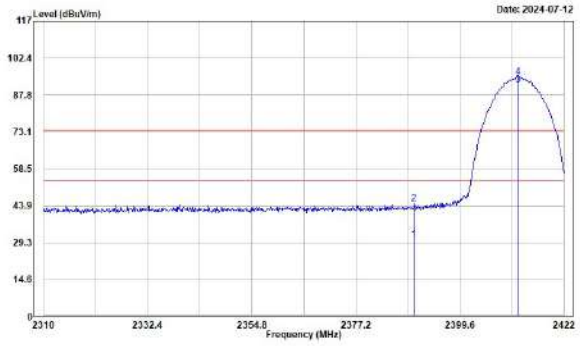
Low channel

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2384.928	42.95	-11.13	31.82	54.00	-22.18	141	311	Average
2384.928	56.60	-11.13	45.47	74.00	-28.53	141	311	Peak
2412.000	109.65	-11.02	98.63			141	311	Average
2412.000	112.70	-11.02	101.68			141	311	Peak

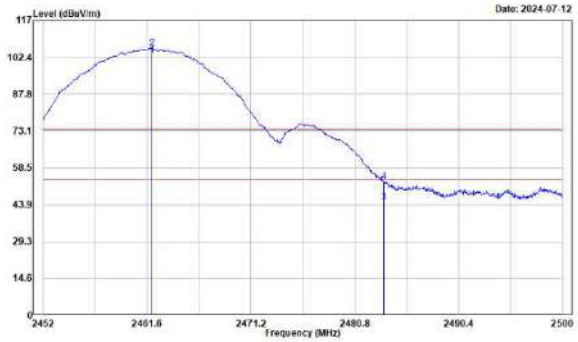
Vertical



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2389.744	41.49	-11.09	30.40	54.00	-23.60	151	337	Average
2389.744	55.70	-11.09	44.61	74.00	-29.39	151	337	Peak
2412.000	102.79	-11.02	91.77			151	337	Average
2412.000	105.94	-11.02	94.92			151	337	Peak

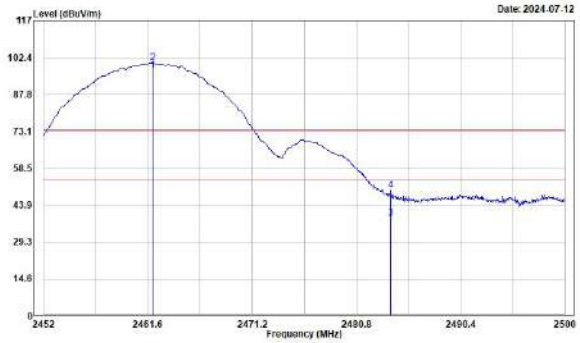
High channel

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2462.000	113.91	-10.88	103.03			135	310	Average
2462.000	116.68	-10.88	105.80			135	310	Peak
2483.500	55.47	-10.61	44.86	54.00	-9.14	135	310	Average
2483.500	63.71	-10.61	53.10	74.00	-20.90	135	310	Peak

Vertical



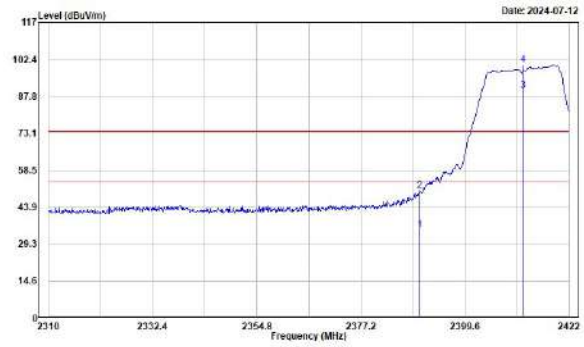
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2462.000	108.18	-10.88	97.30			190	3	Average
2462.000	111.03	-10.88	100.15			190	3	Peak
2483.920	49.14	-10.60	38.54	54.00	-15.46	190	3	Average
2483.920	60.42	-10.60	49.82	74.00	-24.18	190	3	Peak

Note: It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)

802.11g mode

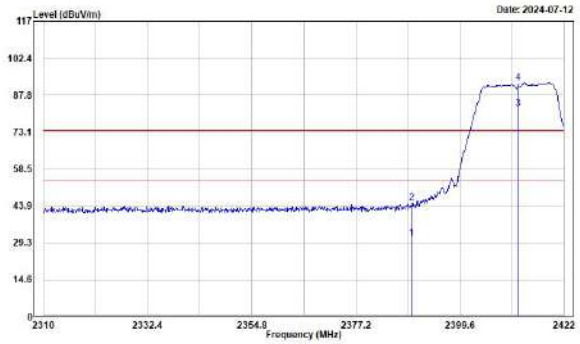
Low channel

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2389.856	46.03	-11.09	34.94	54.00	-19.06	140	310	Average
2389.856	61.36	-11.09	50.27	74.00	-23.73	140	310	Peak
2412.000	101.09	-11.02	90.07			140	310	Average
2412.000	111.11	-11.02	100.09			140	310	Peak

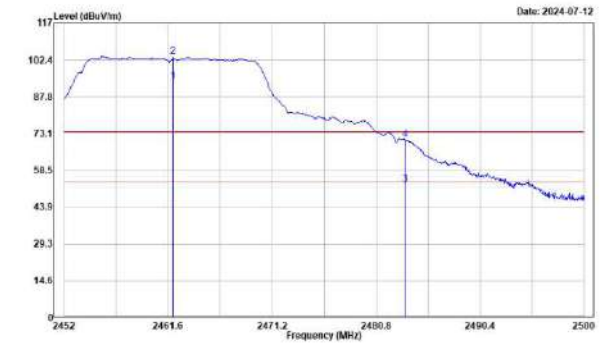
Vertical



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2389.072	42.07	-11.10	30.97	54.00	-23.03	152	336	Average
2389.072	56.24	-11.10	45.14	74.00	-28.86	152	336	Peak
2412.000	93.61	-11.02	82.59			152	336	Average
2412.000	103.62	-11.02	92.60			152	336	Peak

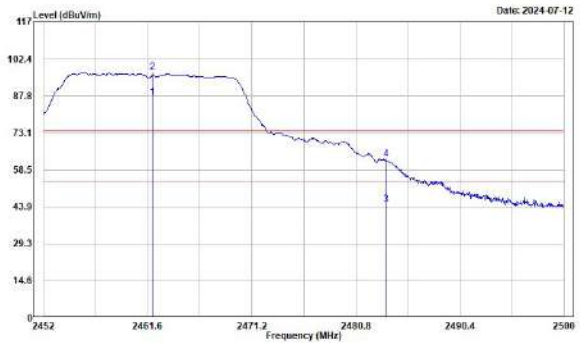
High channel

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2462.000	104.81	-10.88	93.93			138	310	Average
2462.000	114.62	-10.88	103.74			138	310	Peak
2483.500	63.70	-10.61	53.09	54.00	-0.91	138	310	Average
2483.500	81.38	-10.61	70.77	74.00	-3.23	138	310	Peak

Vertical



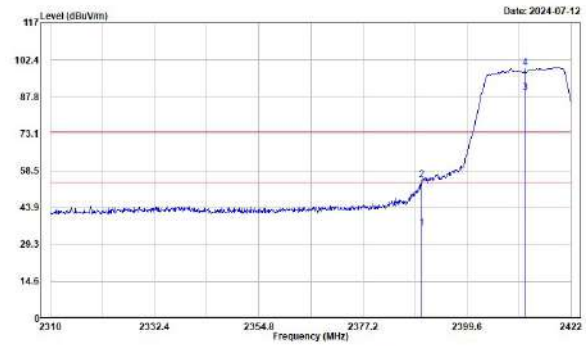
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2462.000	97.97	-10.88	87.09			178	339	Average
2462.000	107.88	-10.88	97.00			178	339	Peak
2483.584	55.38	-10.61	44.77	54.00	-9.23	178	339	Average
2483.584	73.23	-10.61	62.62	74.00	-11.38	178	339	Peak

Note: It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)

802.11n HT20 Mode

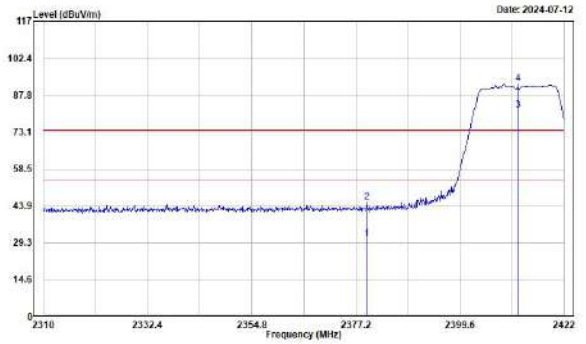
Low channel

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2389.856	47.04	-11.09	35.95	54.00	-18.05	143	314	Average
2389.856	65.98	-11.09	54.89	74.00	-19.11	143	314	Peak
2412.000	100.48	-11.02	89.46			143	314	Average
2412.000	110.33	-11.02	99.31			143	314	Peak

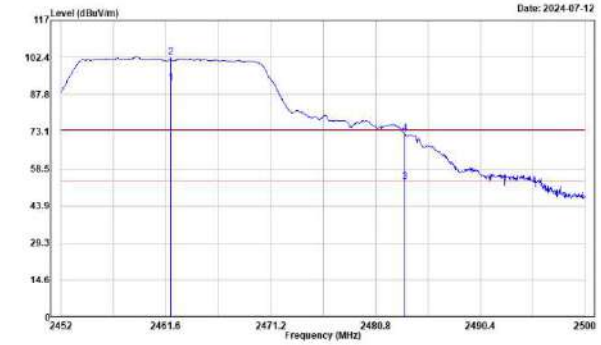
Vertical



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2379.552	41.94	-11.17	30.77	54.00	-23.23	152	336	Average
2379.552	56.56	-11.17	45.39	74.00	-28.61	152	336	Peak
2412.000	92.67	-11.02	81.65			152	336	Average
2412.000	103.16	-11.02	92.14			152	336	Peak

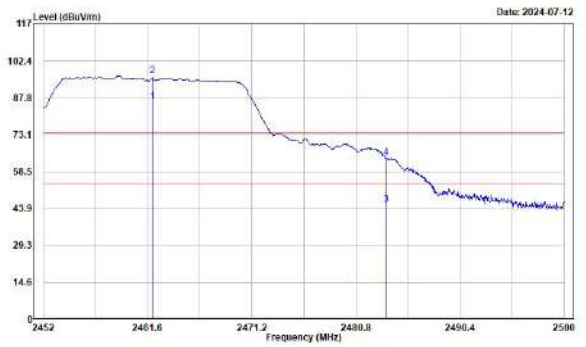
High channel

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2462.000	103.02	-10.88	92.14			135	310	Average
2462.000	113.40	-10.88	102.52			135	310	Peak
2483.500	63.97	-10.61	53.36	54.00	-0.64	135	310	Average
2483.500	83.05	-10.61	72.44	74.00	-1.56	135	310	Peak

Vertical



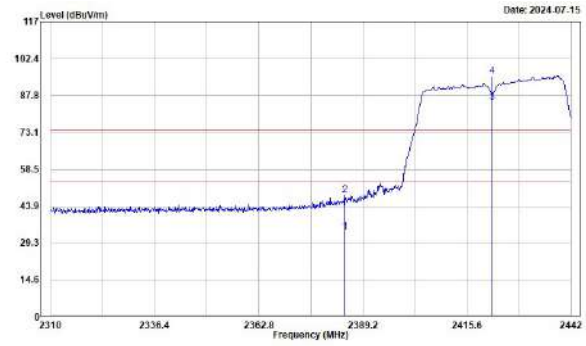
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2462.000	97.11	-10.88	86.23			177	338	Average
2462.000	107.33	-10.88	96.45			177	338	Peak
2483.536	56.07	-10.61	45.46	54.00	-8.54	177	338	Average
2483.536	74.52	-10.61	63.91	74.00	-10.09	177	338	Peak

Note: It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)

802.11n HT40 Mode

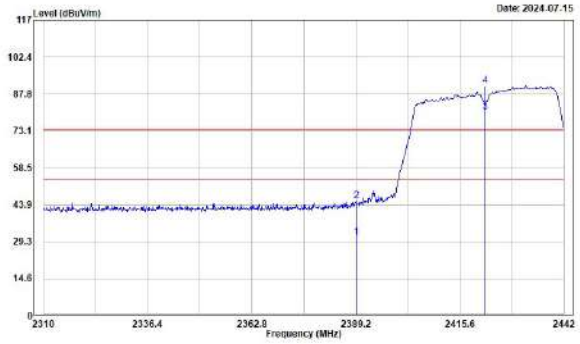
Low channel

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2384.580	44.78	-11.13	33.65	54.00	-20.35	142	231	Average
2384.580	59.29	-11.13	48.16	74.00	-25.84	142	231	Peak
2422.000	96.11	-11.01	85.10			142	231	Average
2422.000	106.54	-11.01	95.53			142	231	Peak

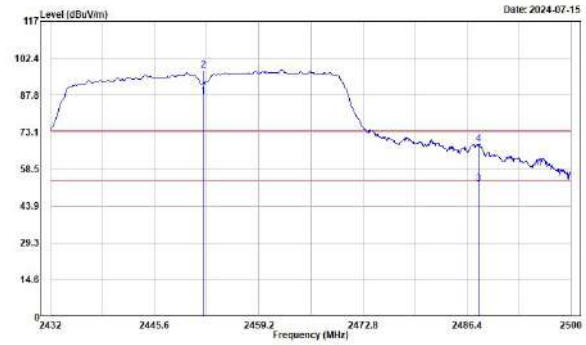
Vertical



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2389.200	42.21	-11.09	31.12	54.00	-22.88	147	327	Average
2389.200	56.50	-11.09	45.41	74.00	-28.59	147	327	Peak
2422.000	91.39	-11.01	80.38			147	327	Average
2422.000	102.01	-11.01	91.00			147	327	Peak

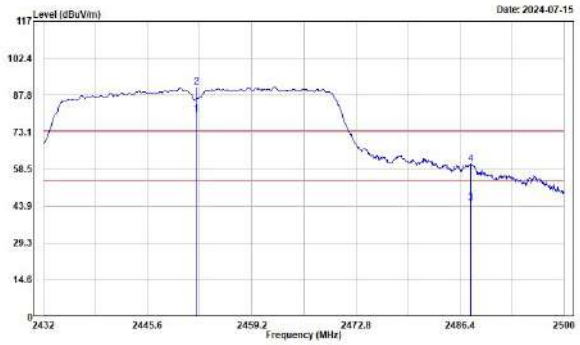
High channel

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2452.000	98.07	-10.99	87.08			141	196	Average
2452.000	108.78	-10.99	97.79			141	196	Peak
2487.896	63.20	-10.57	52.63	54.00	-1.37	141	196	Average
2487.896	79.13	-10.57	68.56	74.00	-5.44	141	196	Peak

Vertical

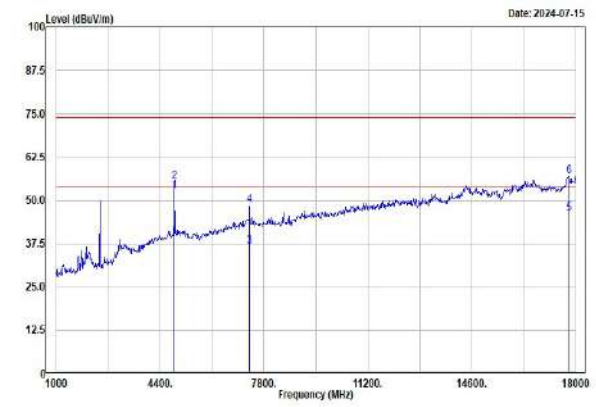
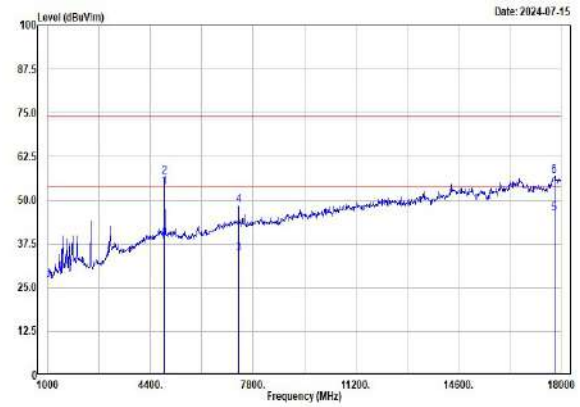


Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2452.000	91.30	-10.99	80.31			142	348	Average
2452.000	102.00	-10.99	91.01			142	348	Peak
2487.828	55.57	-10.57	45.00	54.00	-9.00	142	348	Average
2487.828	71.15	-10.57	60.58	74.00	-13.42	142	348	Peak

Note: It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)

(worst case is 802.11b mode, middle channel)

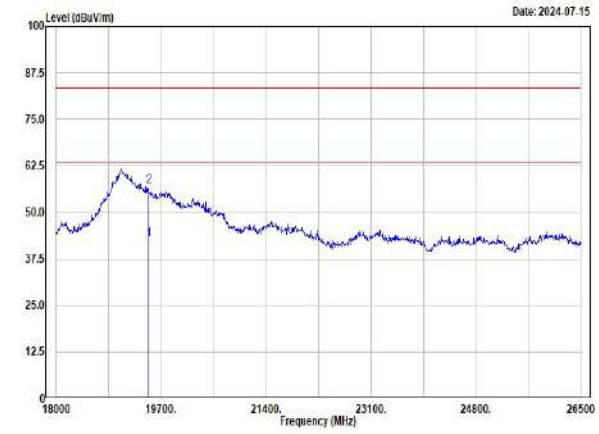
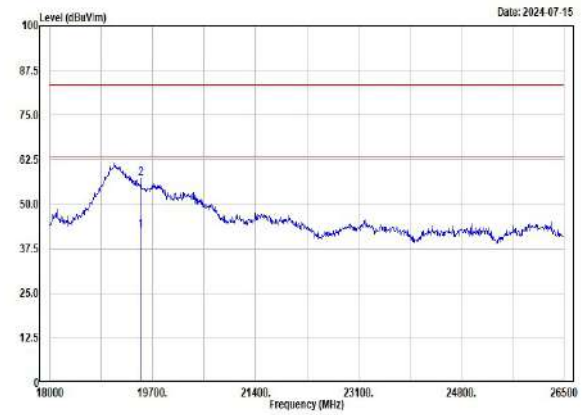
1GHz-18GHz:

Horizontal	Vertical
	

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4874.000	56.18	-3.59	52.59	54.00	-1.41	128	36	Average
4874.000	58.97	-3.59	55.38	74.00	-18.62	128	36	Peak
7311.000	36.06	0.56	36.62	54.00	-17.38	126	225	Average
7311.000	47.86	0.56	48.42	74.00	-25.58	126	225	Peak
17796.000	33.20	12.88	46.08	54.00	-7.92	150	289	Average
17796.000	44.10	12.88	56.98	74.00	-17.02	150	289	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4874.000	57.33	-3.59	53.74	54.00	-0.26	142	210	Average
4874.000	60.12	-3.59	56.53	74.00	-17.47	142	210	Peak
7311.000	34.11	0.56	34.67	54.00	-19.33	133	231	Average
7311.000	48.01	0.56	48.57	74.00	-25.43	133	231	Peak
17779.000	33.34	12.85	46.19	54.00	-7.81	150	356	Average
17779.000	44.01	12.85	56.86	74.00	-17.14	150	356	Peak

18GHz-26.5GHz:

Horizontal	Vertical
	

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
19496.000	29.33	13.27	42.60	63.50	-20.90	150	171	Average
19496.000	43.54	13.27	56.81	83.50	-26.69	150	171	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
19496.000	29.30	13.27	42.57	63.50	-20.93	150	266	Average
19496.000	43.85	13.27	57.12	83.50	-26.38	150	266	Peak

Level = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

For 18-26.5GHz Convert the test distance limit of 3 meters to a limit of 1 meter:

Conversion factor = 20 log (1m/3m) = 9.5 dB , Average Limit = 54+9.5 = 63.50 dBuV/m @ 1m

Note: It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)

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)	(°)	
4824.000	53.36	-3.96	49.40	54.00	-4.60	115	42	Average
4824.000	56.15	-3.96	52.19	74.00	-21.81	115	42	Peak
7236.000	30.31	0.55	30.86	54.00	-23.14	150	179	Average
7236.000	46.09	0.55	46.64	74.00	-27.36	150	179	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4824.000	54.76	-3.96	50.80	54.00	-3.20	155	332	Average
4824.000	57.50	-3.96	53.54	74.00	-20.46	155	332	Peak
7236.000	30.53	0.55	31.08	54.00	-22.92	150	328	Average
7236.000	45.41	0.55	45.96	74.00	-28.04	150	328	Peak

Middle channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4874.000	56.18	-3.59	52.59	54.00	-1.41	128	36	Average
4874.000	58.97	-3.59	55.38	74.00	-18.62	128	36	Peak
7311.000	36.06	0.56	36.62	54.00	-17.38	126	225	Average
7311.000	47.86	0.56	48.42	74.00	-25.58	126	225	Peak
17796.000	33.20	12.88	46.08	54.00	-7.92	150	289	Average
17796.000	44.10	12.88	56.98	74.00	-17.02	150	289	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4874.000	57.33	-3.59	53.74	54.00	-0.26	142	210	Average
4874.000	60.12	-3.59	56.53	74.00	-17.47	142	210	Peak
7311.000	34.11	0.56	34.67	54.00	-19.33	133	231	Average
7311.000	48.01	0.56	48.57	74.00	-25.43	133	231	Peak
17779.000	33.34	12.85	46.19	54.00	-7.81	150	356	Average
17779.000	44.01	12.85	56.86	74.00	-17.14	150	356	Peak

High channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4924.000	55.24	-3.51	51.73	54.00	-2.27	126	37	Average
4924.000	58.05	-3.51	54.54	74.00	-19.46	126	37	Peak
7386.000	39.81	0.22	40.03	54.00	-13.97	134	221	Average
7386.000	49.08	0.22	49.30	74.00	-24.70	134	221	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4924.000	56.08	-3.51	52.57	54.00	-1.43	125	35	Average
4924.000	58.89	-3.51	55.38	74.00	-18.62	125	35	Peak
7386.000	37.03	0.22	37.25	54.00	-16.75	135	227	Average
7386.000	47.87	0.22	48.09	74.00	-25.91	135	227	Peak

Note:

Level = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

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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)	(°)	
4824.000	37.18	-3.96	33.22	54.00	-20.78	114	41	Average
4824.000	51.44	-3.96	47.48	74.00	-26.52	114	41	Peak
7236.000	30.33	0.55	30.88	54.00	-23.12	150	43	Average
7236.000	46.02	0.55	46.57	74.00	-27.43	150	43	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4824.000	40.31	-3.96	36.35	54.00	-17.65	201	100	Average
4824.000	54.15	-3.96	50.19	74.00	-23.81	201	100	Peak
7236.000	30.39	0.55	30.94	54.00	-23.06	150	360	Average
7236.000	46.38	0.55	46.93	74.00	-27.07	150	360	Peak

Middle channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4874.000	37.84	-3.59	34.25	54.00	-19.75	127	202	Average
4874.000	54.07	-3.59	50.48	74.00	-23.52	127	202	Peak
7311.000	30.96	0.56	31.52	54.00	-22.48	183	216	Average
7311.000	48.57	0.56	49.13	74.00	-24.87	183	216	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4874.000	38.94	-3.59	35.35	54.00	-18.65	149	351	Average
4874.000	54.69	-3.59	51.10	74.00	-22.90	149	351	Peak
7311.000	30.64	0.56	31.20	54.00	-22.80	151	201	Average
7311.000	46.13	0.56	46.69	74.00	-27.31	151	201	Peak

High channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4924.000	39.23	-3.51	35.72	54.00	-18.28	126	40	Average
4924.000	54.74	-3.51	51.23	74.00	-22.77	126	40	Peak
7386.000	32.24	0.22	32.46	54.00	-21.54	120	220	Average
7386.000	48.76	0.22	48.98	74.00	-25.02	120	220	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4924.000	39.42	-3.51	35.91	54.00	-18.09	143	36	Average
4924.000	55.21	-3.51	51.70	74.00	-22.30	143	36	Peak
7386.000	31.66	0.22	31.88	54.00	-22.12	116	226	Average
7386.000	47.46	0.22	47.68	74.00	-26.32	116	226	Peak

Note:

Level = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Note: It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)

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)	(°)	
4824.000	36.47	-3.96	32.51	54.00	-21.49	115	43	Average
4824.000	51.31	-3.96	47.35	74.00	-26.65	115	43	Peak
7236.000	30.35	0.55	30.90	54.00	-23.10	150	342	Average
7236.000	45.93	0.55	46.48	74.00	-27.52	150	342	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4824.000	36.81	-3.96	32.85	54.00	-21.15	161	329	Average
4824.000	52.17	-3.96	48.21	74.00	-25.79	161	329	Peak
7236.000	30.40	0.55	30.95	54.00	-23.05	150	232	Average
7236.000	45.55	0.55	46.10	74.00	-27.90	150	232	Peak

Middle channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4874.000	36.06	-3.59	32.47	54.00	-21.53	137	36	Average
4874.000	53.40	-3.59	49.81	74.00	-24.19	137	36	Peak
7311.000	30.59	0.56	31.15	54.00	-22.85	150	330	Average
7311.000	45.60	0.56	46.16	74.00	-27.84	150	330	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4874.000	37.56	-3.59	33.97	54.00	-20.03	128	43	Average
4874.000	54.36	-3.59	50.77	74.00	-23.23	128	43	Peak
7311.000	30.60	0.56	31.16	54.00	-22.84	150	359	Average
7311.000	45.85	0.56	46.41	74.00	-27.59	150	359	Peak

High channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4924.000	36.60	-3.51	33.09	54.00	-20.91	142	36	Average
4924.000	53.87	-3.51	50.36	74.00	-23.64	142	36	Peak
7386.000	30.36	0.22	30.58	54.00	-23.42	150	348	Average
7386.000	46.06	0.22	46.28	74.00	-27.72	150	348	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4924.000	38.26	-3.51	34.75	54.00	-19.25	135	13	Average
4924.000	55.73	-3.51	52.22	74.00	-21.78	135	13	Peak
7386.000	30.37	0.22	30.59	54.00	-23.41	150	291	Average
7386.000	46.16	0.22	46.38	74.00	-27.62	150	291	Peak

Note:

Level = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

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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)	(°)	
4844.000	31.28	-3.83	27.45	54.00	-26.55	150	0	Average
4844.000	46.52	-3.83	42.69	74.00	-31.31	150	0	Peak
7266.000	30.50	0.60	31.10	54.00	-22.90	150	209	Average
7266.000	45.62	0.60	46.22	74.00	-27.78	150	209	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4844.000	31.28	-3.83	27.45	54.00	-26.55	150	121	Average
4844.000	46.75	-3.83	42.92	74.00	-31.08	150	121	Peak
7266.000	30.49	0.60	31.09	54.00	-22.91	150	360	Average
7266.000	45.74	0.60	46.34	74.00	-27.66	150	360	Peak

Middle channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4874.000	32.09	-3.59	28.50	54.00	-25.50	137	358	Average
4874.000	47.05	-3.59	43.46	74.00	-30.54	137	358	Peak
7311.000	30.48	0.56	31.04	54.00	-22.96	150	322	Average
7311.000	46.06	0.56	46.62	74.00	-27.38	150	322	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4874.000	35.99	-3.59	32.40	54.00	-21.60	127	43	Average
4874.000	51.67	-3.59	48.08	74.00	-25.92	127	43	Peak
7311.000	30.49	0.56	31.05	54.00	-22.95	150	212	Average
7311.000	45.44	0.56	46.00	74.00	-28.00	150	212	Peak

High channel

Horizontal

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4904.000	33.21	-3.48	29.81	54.00	-24.19	132	39	Average
4904.000	48.68	-3.48	45.20	74.00	-28.80	132	39	Peak
7356.000	30.53	0.39	30.92	54.00	-23.08	150	355	Average
7356.000	46.54	0.39	46.93	74.00	-27.07	150	355	Peak

Vertical

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4904.000	33.32	-3.48	29.92	54.00	-24.08	150	138	Average
4904.000	48.46	-3.48	45.06	74.00	-28.94	150	138	Peak
7356.000	30.52	0.39	30.91	54.00	-23.09	150	182	Average
7356.000	45.89	0.39	46.28	74.00	-27.72	150	182	Peak

Note:

Level = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

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Conducted Spurious Emissions:

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
B Mode				
Low	2412	41.49	≥ 20	PASS
Mid	2437	42.63	≥ 20	PASS
High	2462	39.56	≥ 20	PASS
G Mode				
Low	2412	34.78	≥ 20	PASS
Mid	2437	33.58	≥ 20	PASS
High	2462	32.19	≥ 20	PASS
N20 Mode				
Low	2412	33.19	≥ 20	PASS
Mid	2437	34.48	≥ 20	PASS
High	2462	31.46	≥ 20	PASS
N40 Mode				
Low	2422	29.72	≥ 20	PASS
Mid	2437	29.93	≥ 20	PASS
High	2452	27.31	≥ 20	PASS

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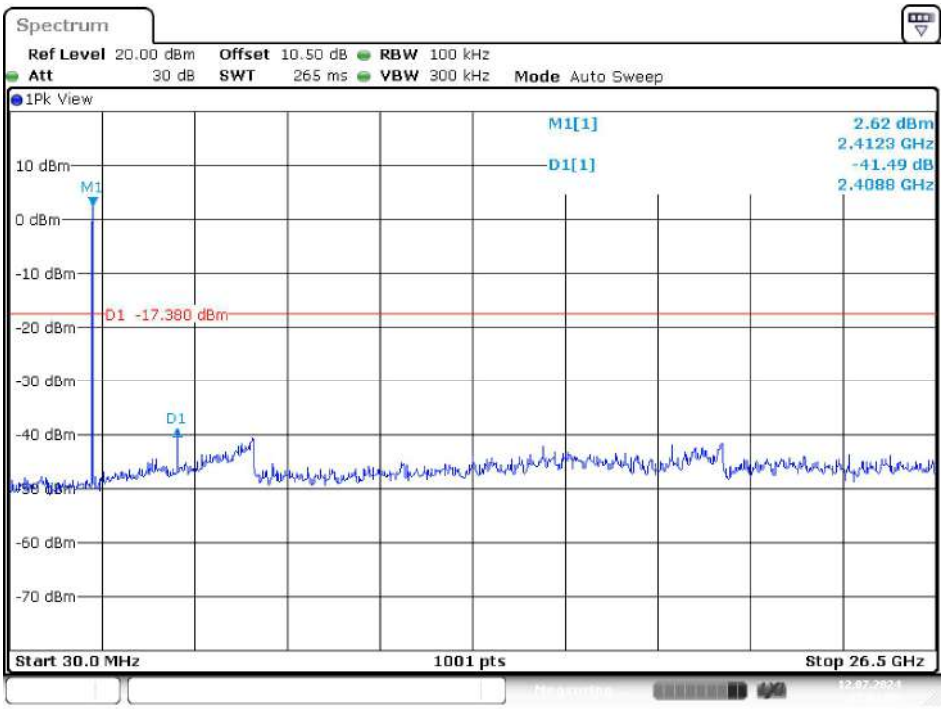
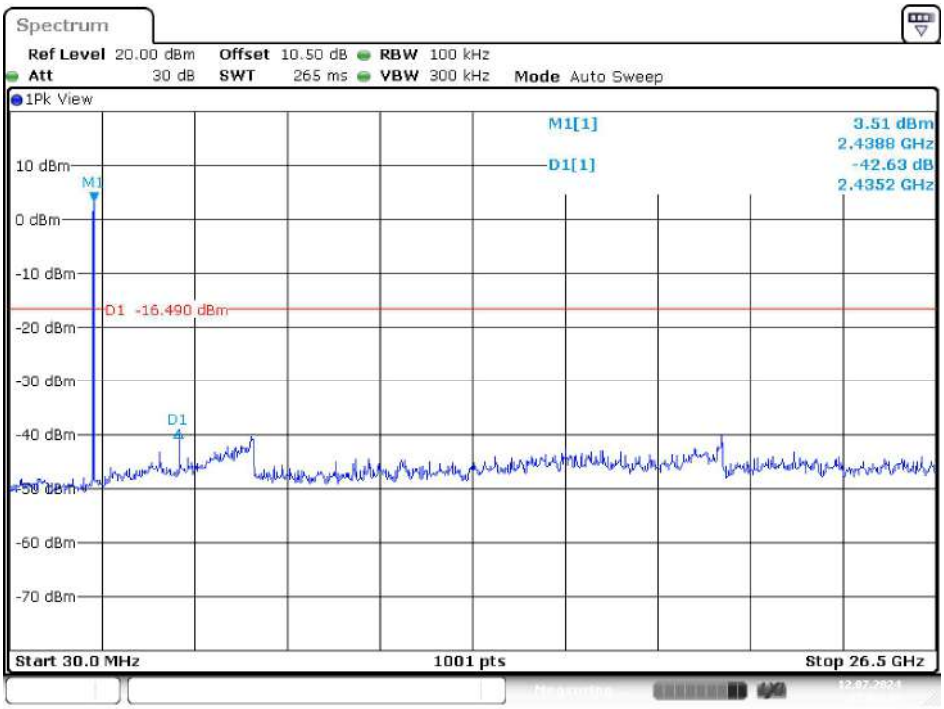
B Mode

Low Channel



Date: 12.JUL.2024 17:01:21

Middle Channel



Date: 12.JUL.2024 17:04:11

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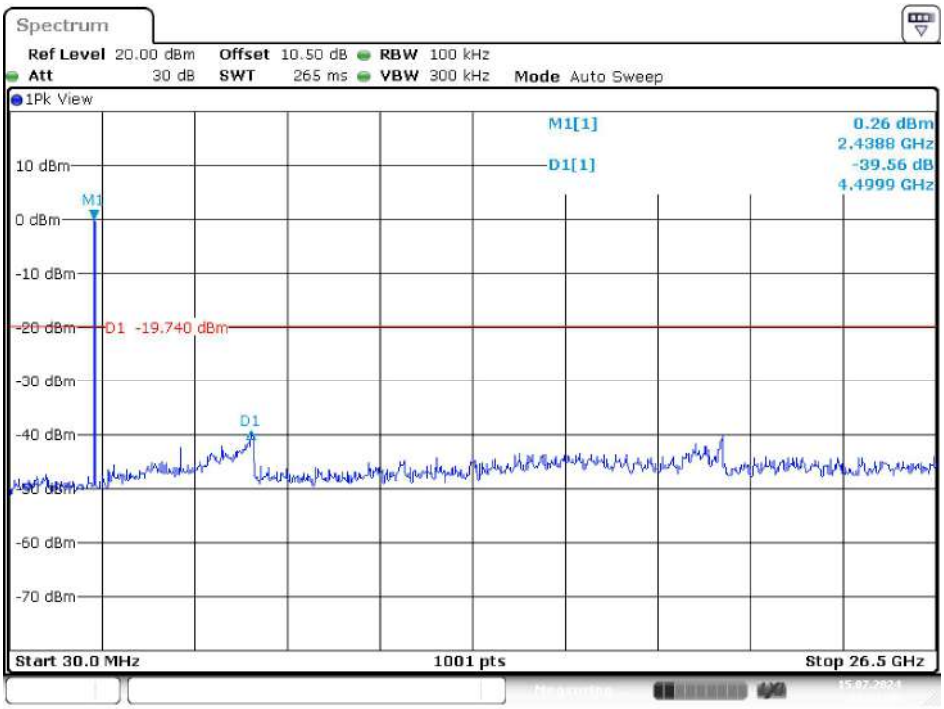
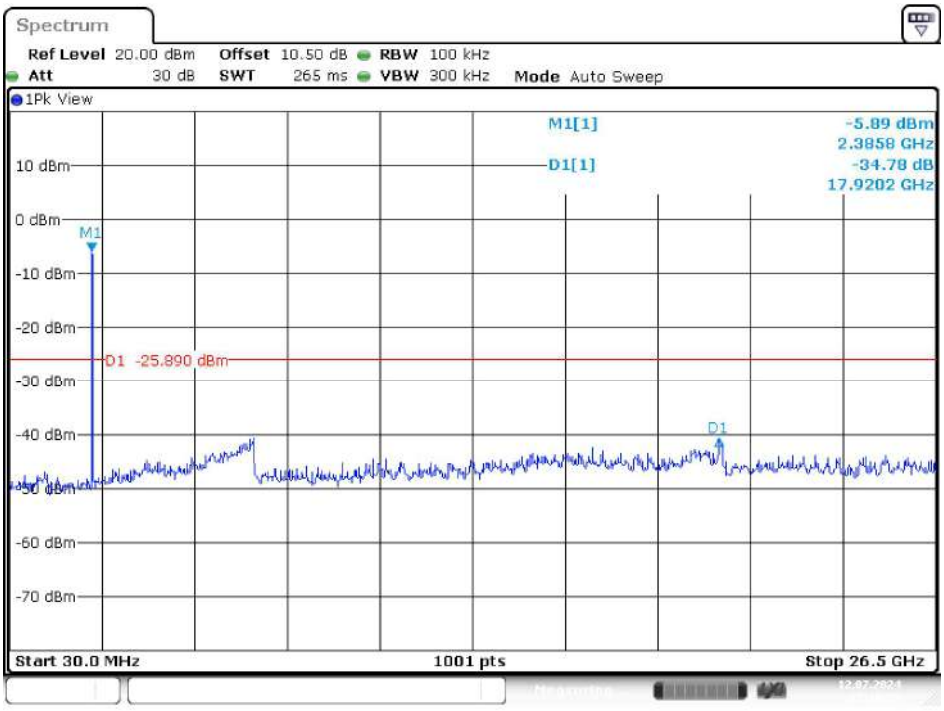
High Channel



Date: 15.JUL.2024 14:41:48

G Mode

Low Channel



Date: 12.JUL.2024 17:10:30

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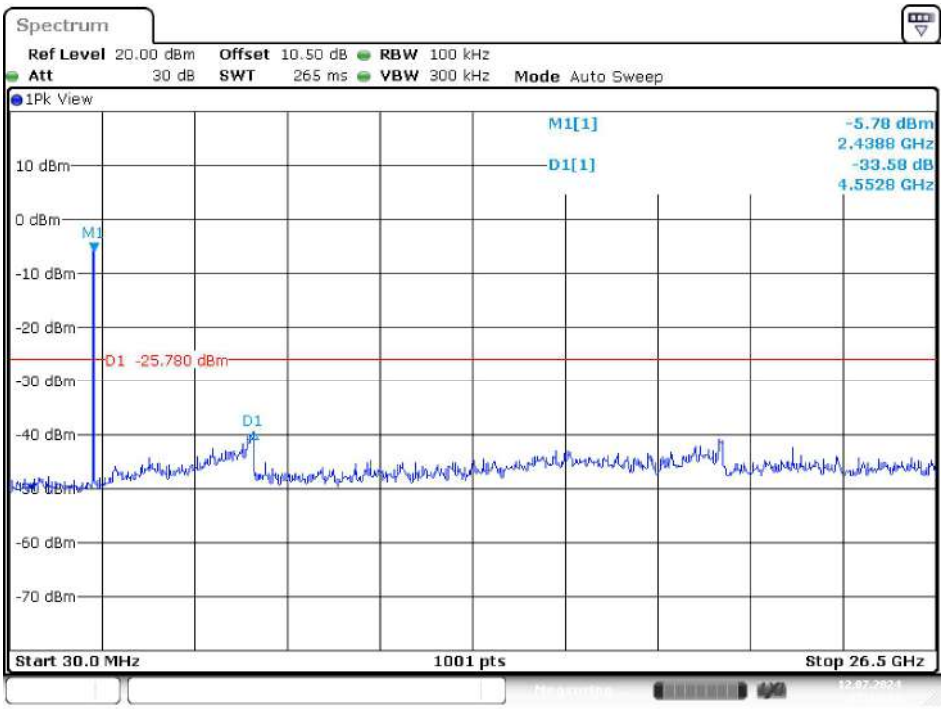
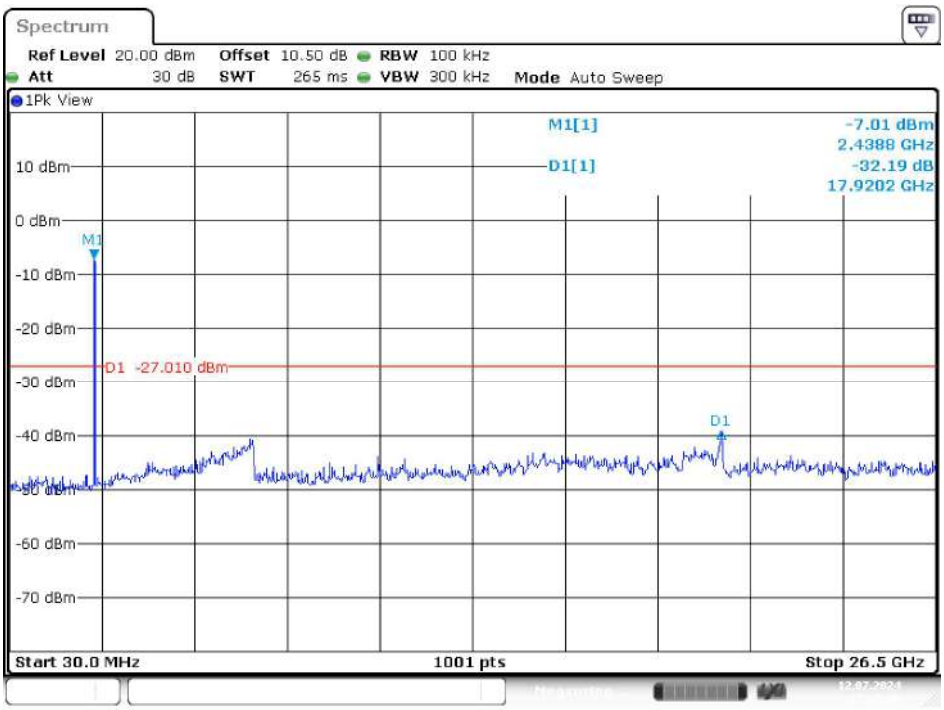
Middle Channel



Date: 12.JUL.2024 17:13:41

High Channel



Date: 12.JUL.2024 17:45:47

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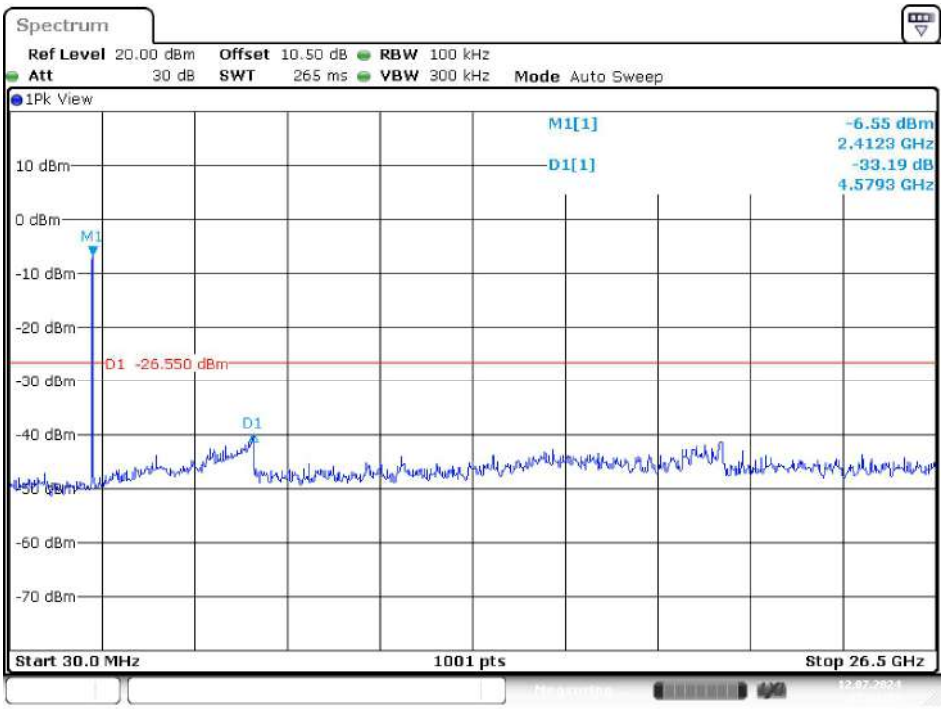
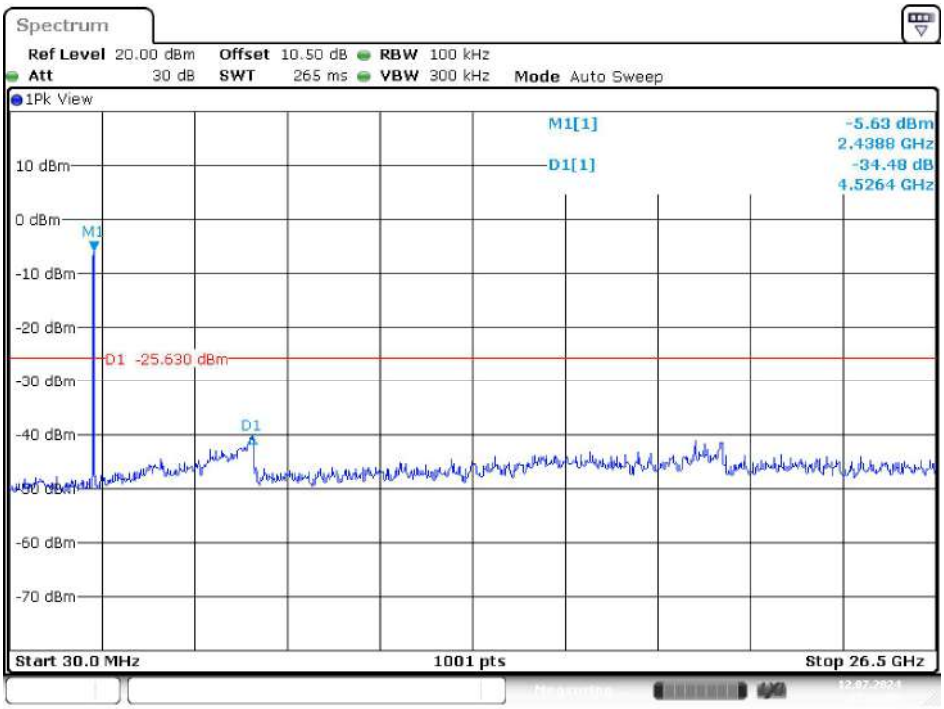
N20 Mode

Low Channel



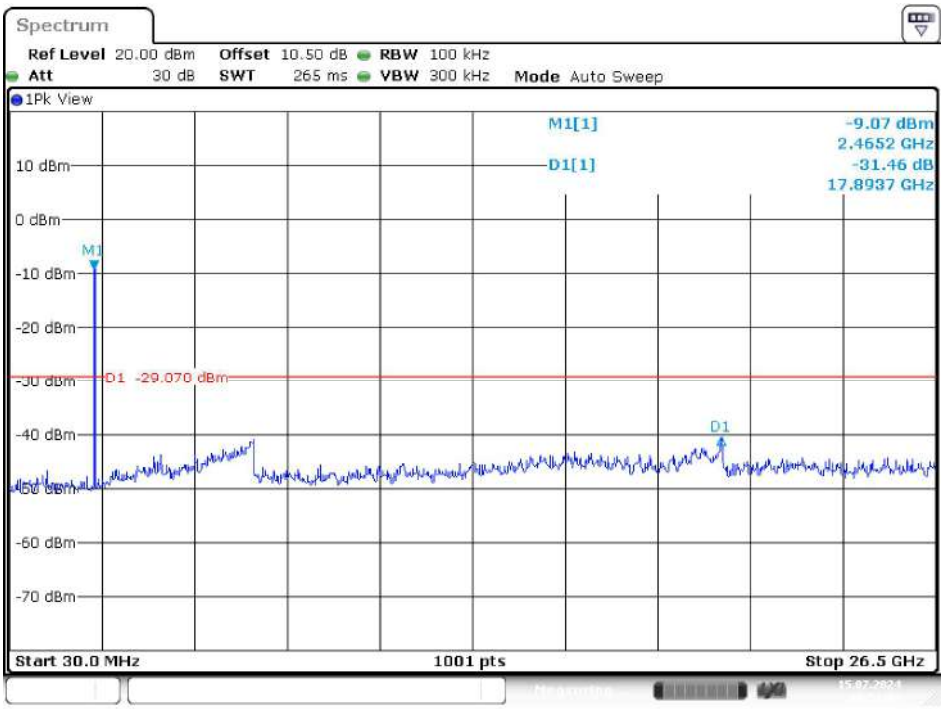
Date: 12.JUL.2024 17:21:15

Middle Channel



Date: 12.JUL.2024 17:23:01

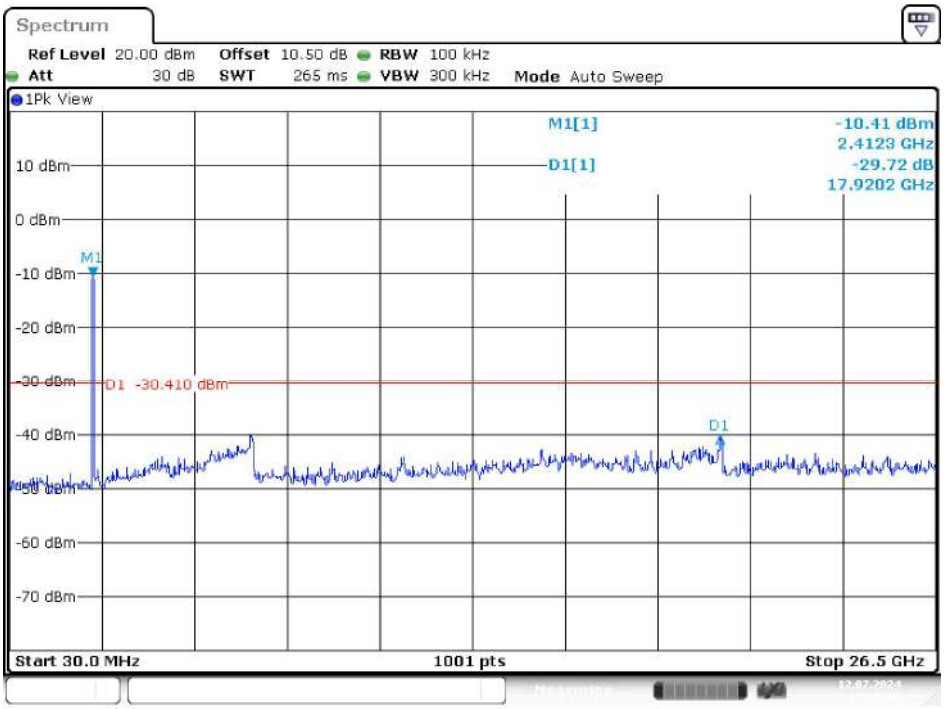
High Channel



Date: 15.JUL.2024 09:51:04

N40 Mode

Low Channel



Date: 12.JUL.2024 17:26:40

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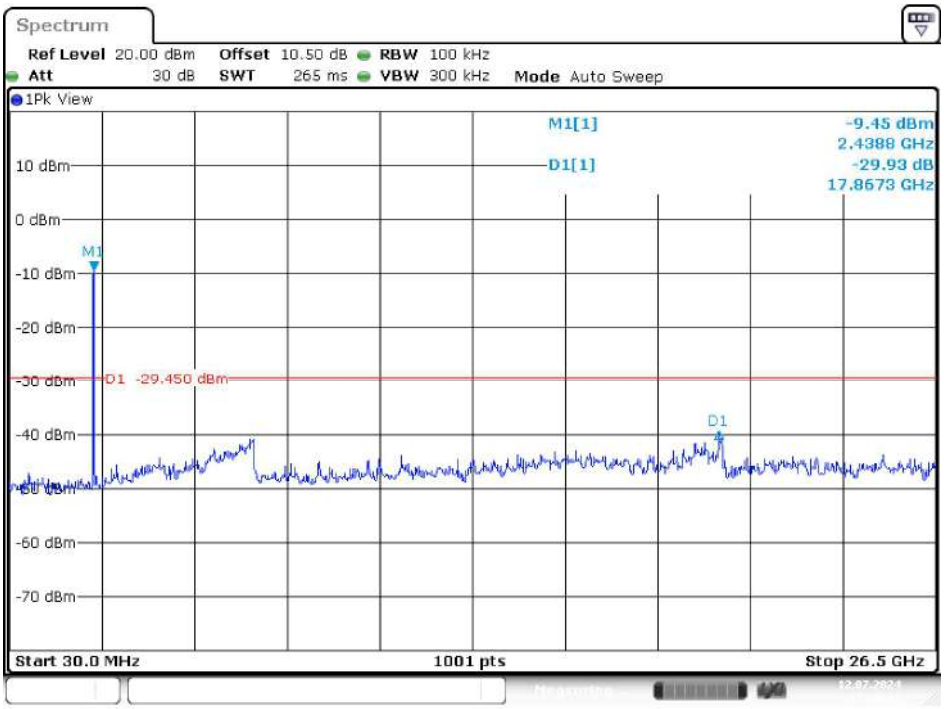
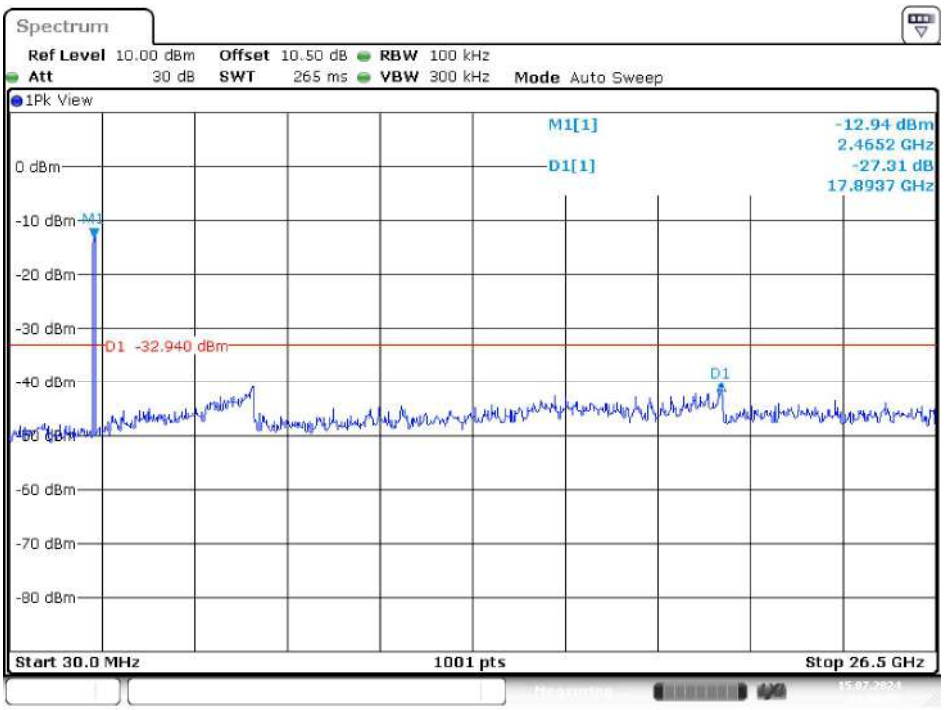
Middle Channel



Date: 12.JUL.2024 17:30:43

High Channel



Date: 15.JUL.2024 11:09:10

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9 FCC §15.247(a)(2) – 6 dB Emission Bandwidth

9.1 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.

9.2 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.

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9.3 Test Results

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (kHz)	Result
B Mode				
Low	2412	9.08	> 500	PASS
Middle	2437	9.12	> 500	PASS
High	2462	9.08	> 500	PASS
G Mode				
Low	2412	16.56	> 500	PASS
Middle	2437	16.56	> 500	PASS
High	2462	16.60	> 500	PASS
N20 Mode				
Low	2412	17.80	> 500	PASS
Middle	2437	17.80	> 500	PASS
High	2462	17.84	> 500	PASS
N40 Mode				
Low	2422	36.40	> 500	PASS
Middle	2437	36.56	> 500	PASS
High	2452	36.56	> 500	PASS

Please refer to the following plots

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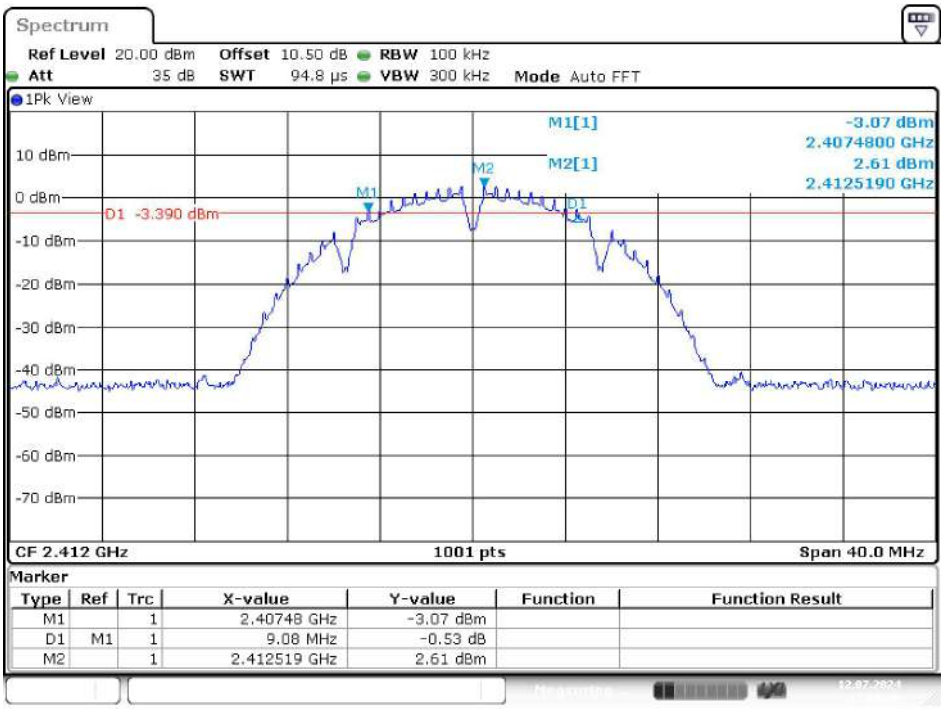
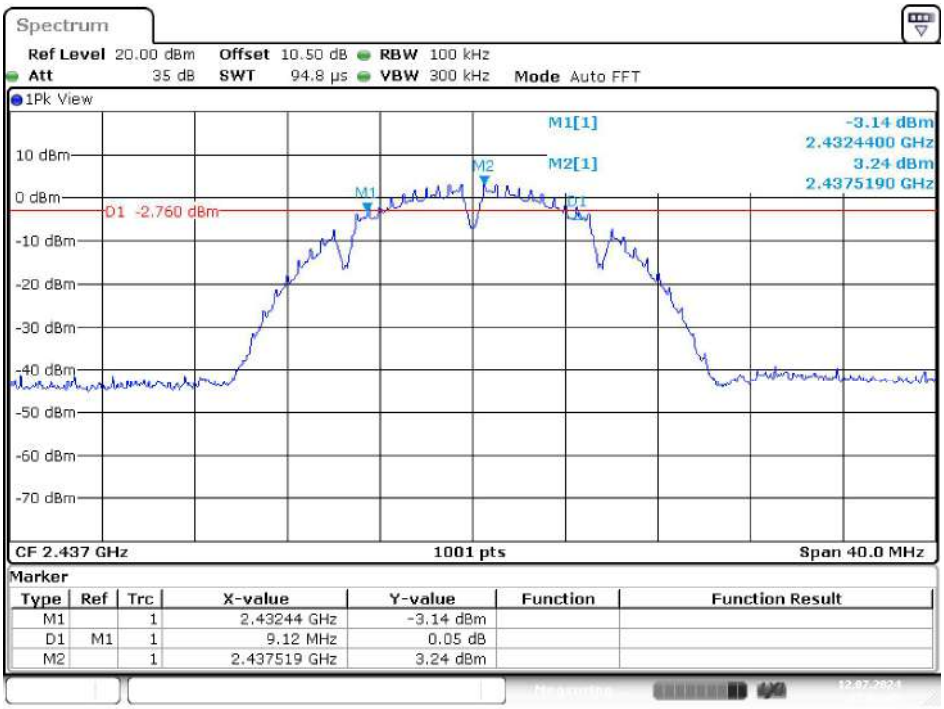
B Mode

Low Channel



Date: 12.JUL.2024 17:00:40

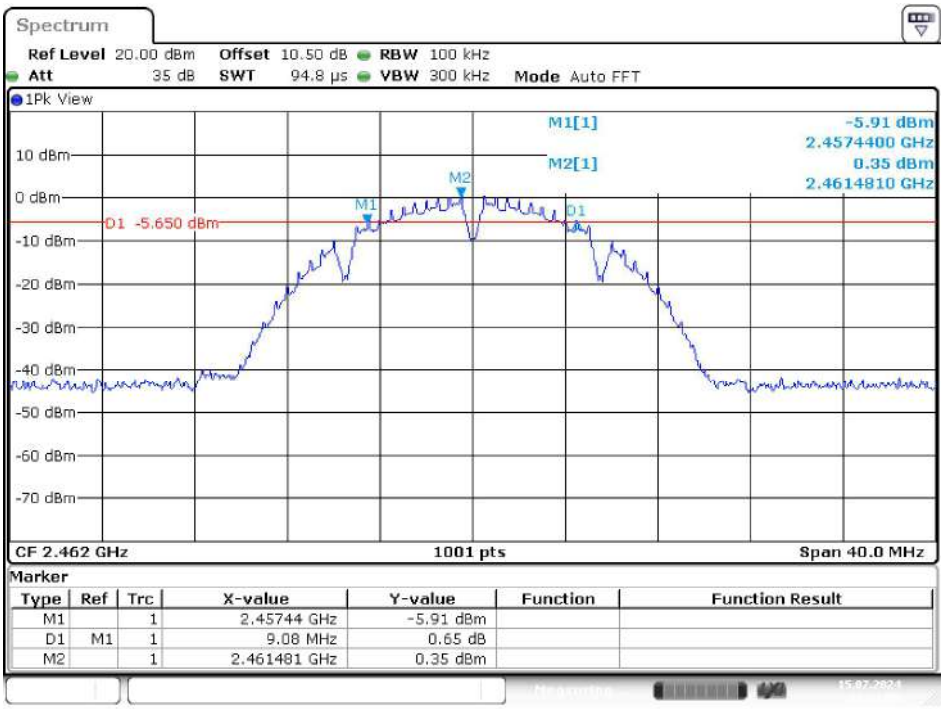
Middle Channel



Date: 12.JUL.2024 17:03:46

Note: It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)

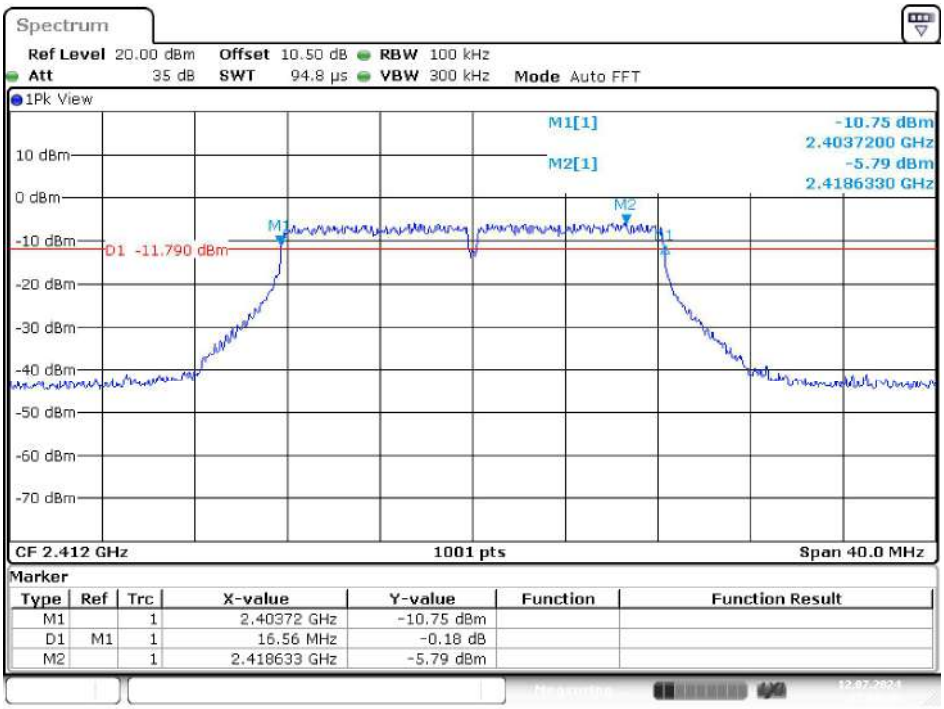
High Channel



Date: 15.JUL.2024 14:41:08

G Mode

Low Channel



Date: 12.JUL.2024 17:09:49

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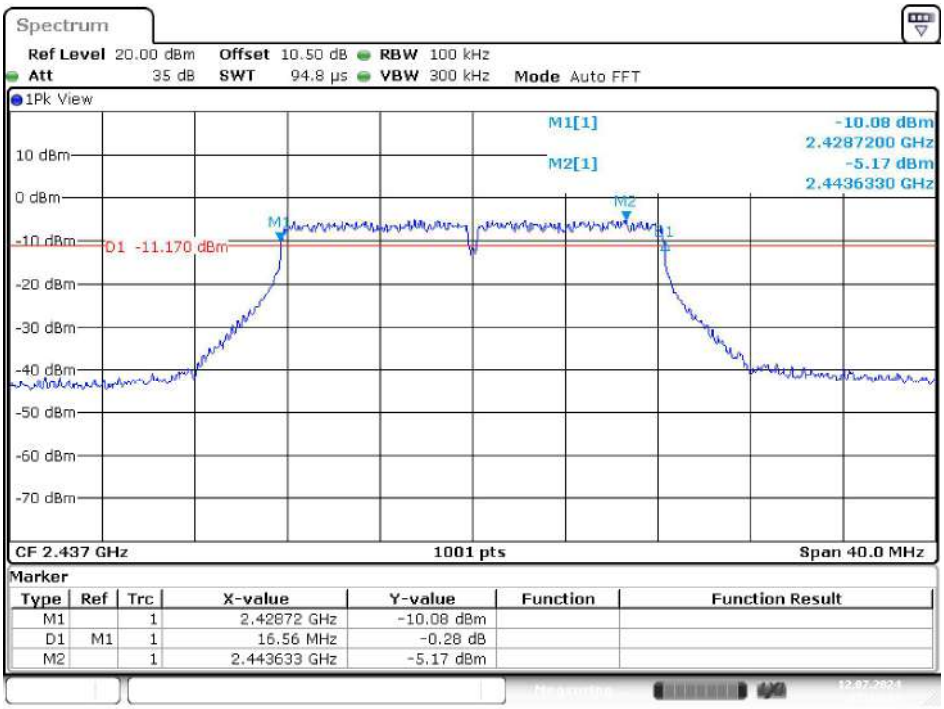
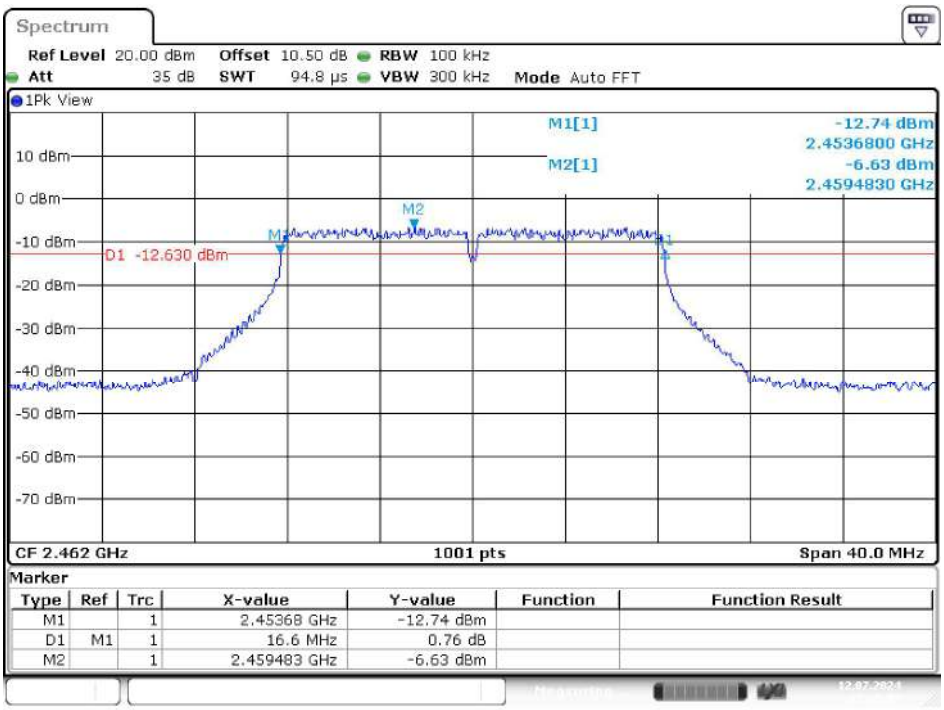
Middle Channel



Date: 12.JUL.2024 17:13:17

High Channel

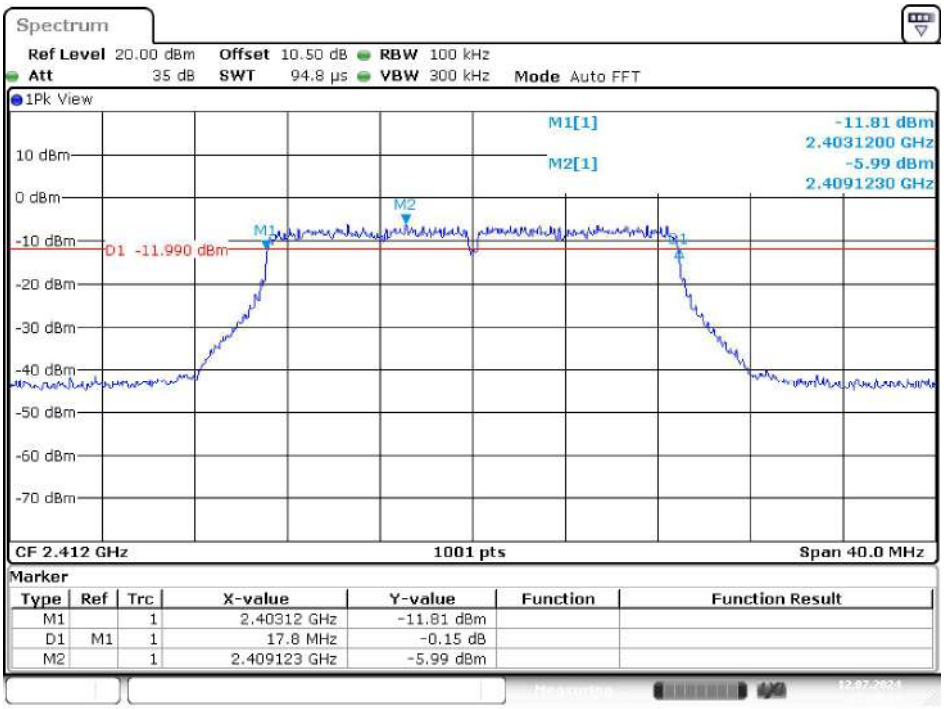


Date: 12.JUL.2024 17:45:07

Note: It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)

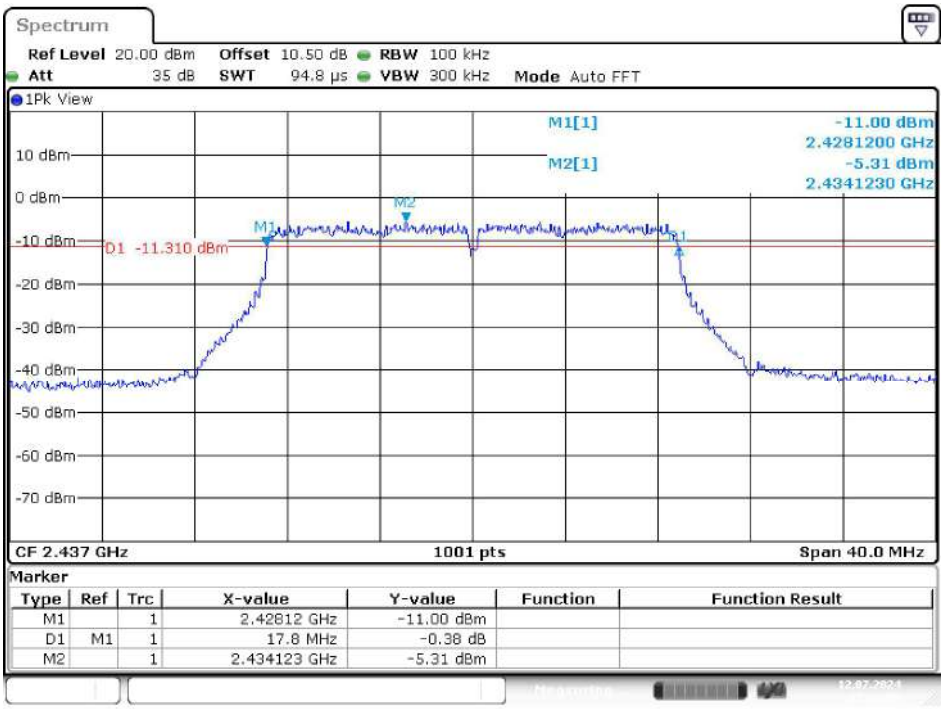
N20 Mode

Low Channel



Date: 12.JUL.2024 17:20:35

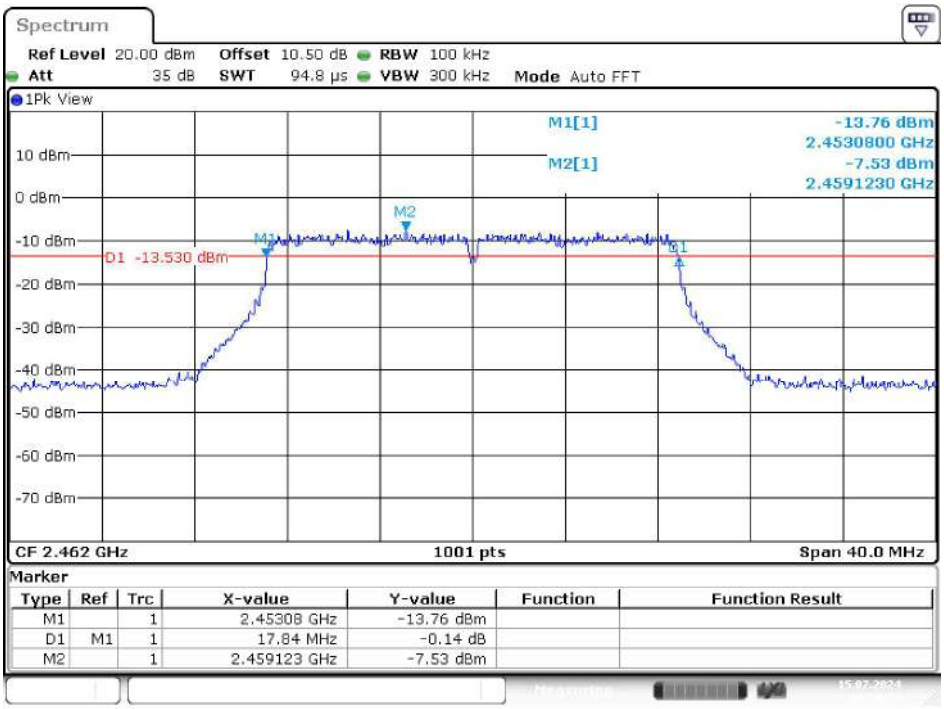
Middle Channel



Date: 12.JUL.2024 17:22:37

Note: It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)

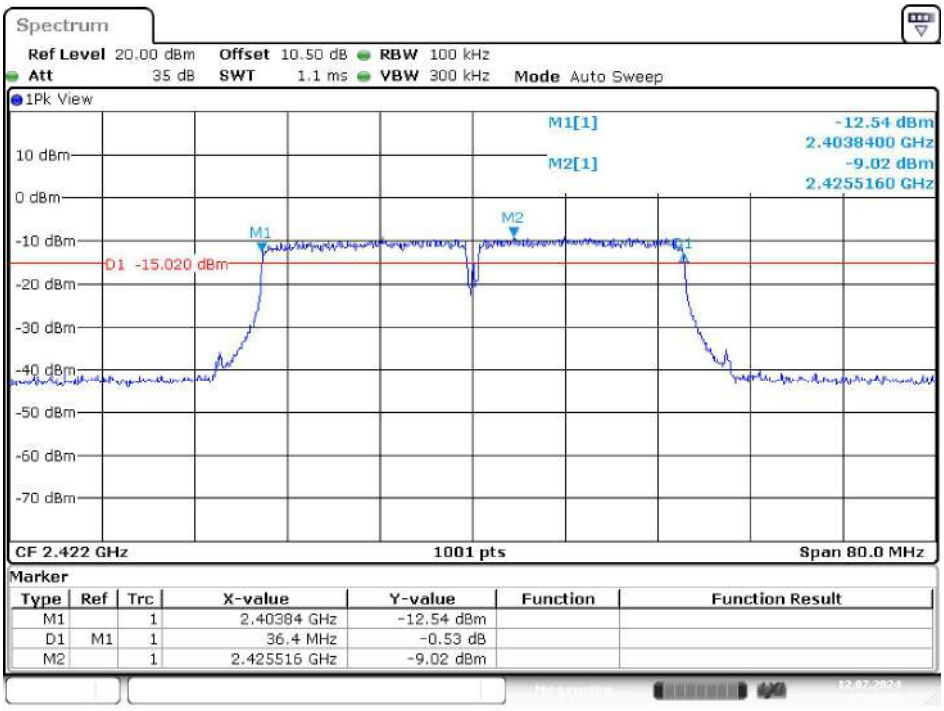
High Channel



Date: 15.JUL.2024 09:50:24

N40 Mode

Low Channel



Date: 12.JUL.2024 17:26:00

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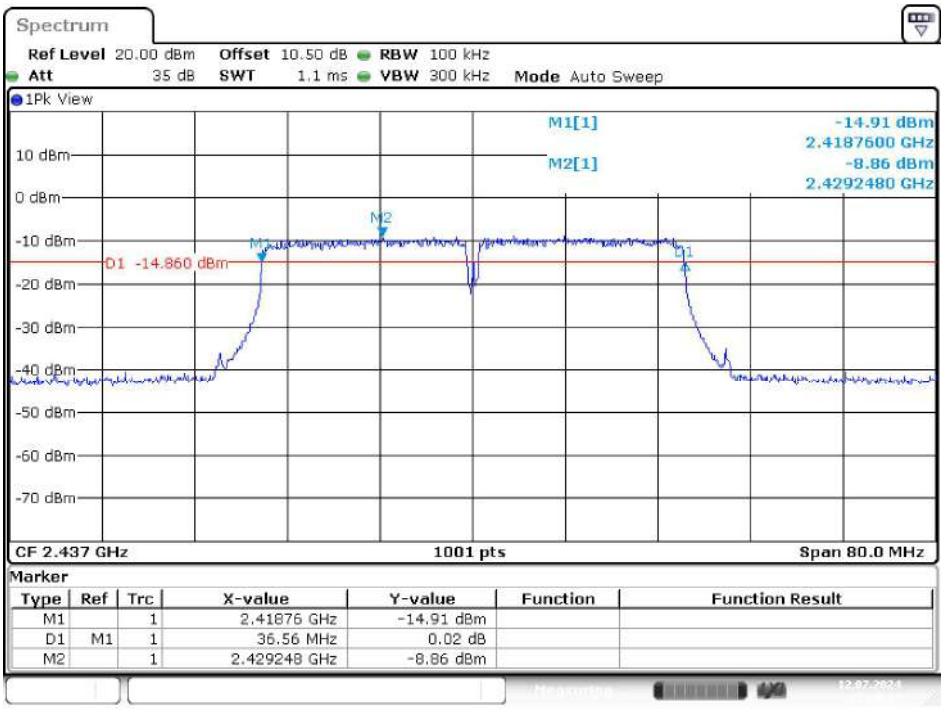
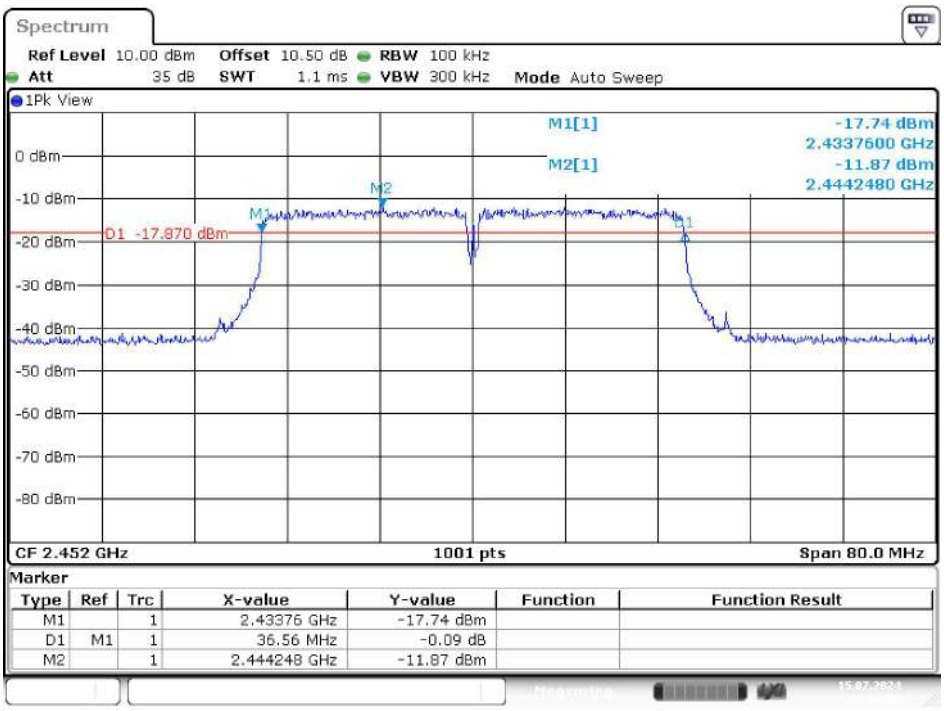
Middle Channel



Date: 12.JUL.2024 17:30:18

High Channel



Date: 15.JUL.2024 11:08:30

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10 FCC §15.247(b)(3) – Maximum Peak Output Power

10.1 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.

10.2 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.

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10.3 Test Results

Conducted Peak Output Power

Channel	Frequency (MHz)	Conducted Peak Output Power (dBm)	Power (W)	Limit (W)	Result
802.11b Mode					
Low	2412	14.77	0.030	1	PASS
Middle	2437	15.26	0.034	1	PASS
High	2462	13.32	0.021	1	PASS
802.11g Mode					
Low	2412	18.12	0.065	1	PASS
Middle	2437	18.52	0.071	1	PASS
High	2462	17.43	0.055	1	PASS
802.11n HT20 Mode					
Low	2412	16.73	0.047	1	PASS
Middle	2437	17.46	0.056	1	PASS
High	2462	15.84	0.038	1	PASS
802.11n HT40 Mode					
Low	2422	16.98	0.050	1	PASS
Middle	2437	17.09	0.051	1	PASS
High	2452	15.12	0.033	1	PASS

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11 FCC§15.247(d) – 100 kHz Bandwidth of Frequency Band Edge

11.1 Applicable Standard

According to FCC §15.247(d).

In any 100kHz 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 20dB below that in the 100kHz 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 30dB instead of 20dB. 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)).

11.2 Test Procedure

According to ANSI C63.10-2013 Section 11.11

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

2. 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.

3. 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.

4. 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.

5. Repeat above procedures until all measured frequencies were complete.

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11.3 Test Results

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
B Mode				
Low	2412	44.29	≥ 20	PASS
High	2462	40.51	≥ 20	PASS
G Mode				
Low	2412	35.69	≥ 20	PASS
High	2462	33.05	≥ 20	PASS
N20 Mode				
Low	2412	33.83	≥ 20	PASS
High	2462	32.73	≥ 20	PASS
N40 Mode				
Low	2422	31.40	≥ 20	PASS
High	2452	28.72	≥ 20	PASS

Please refer to the following plots.

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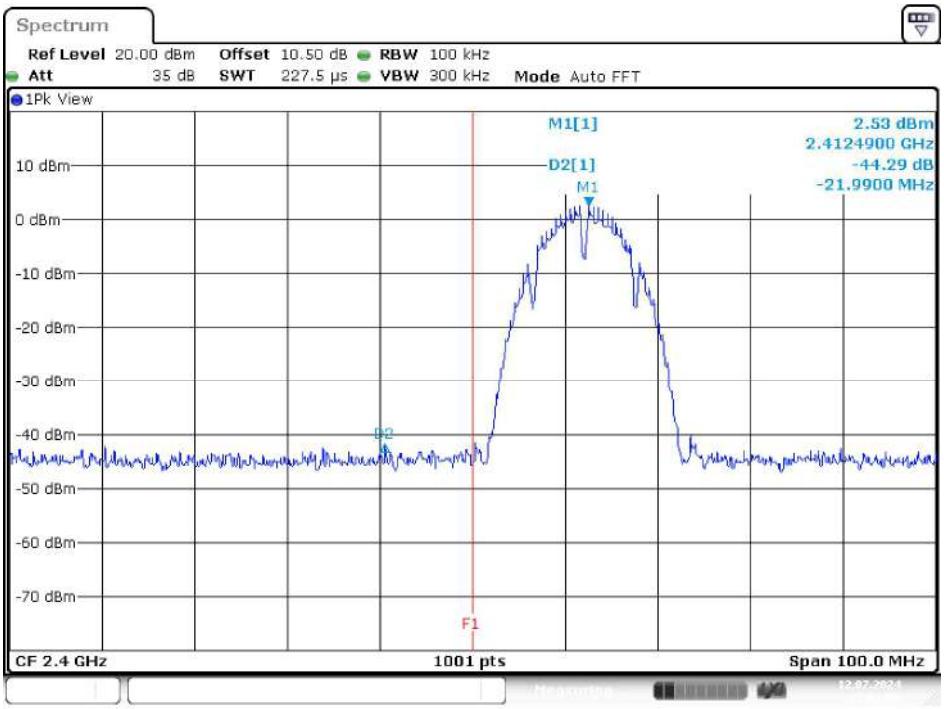
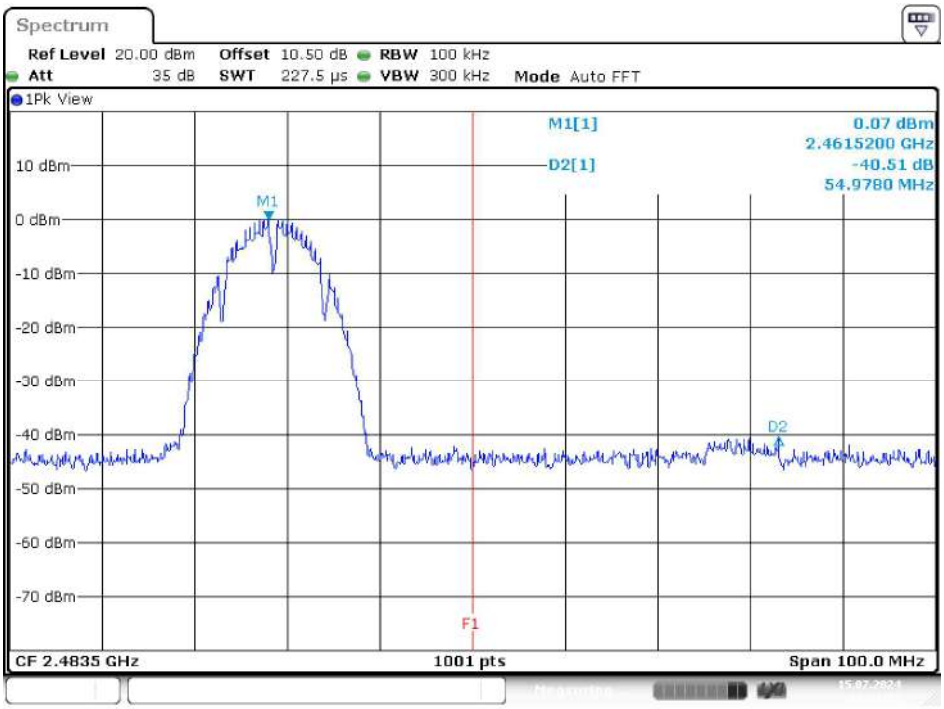
B Mode

Band Edge, Left Side



Date: 12.JUL.2024 17:01:05

Band Edge, Right Side



Date: 15.JUL.2024 14:41:33

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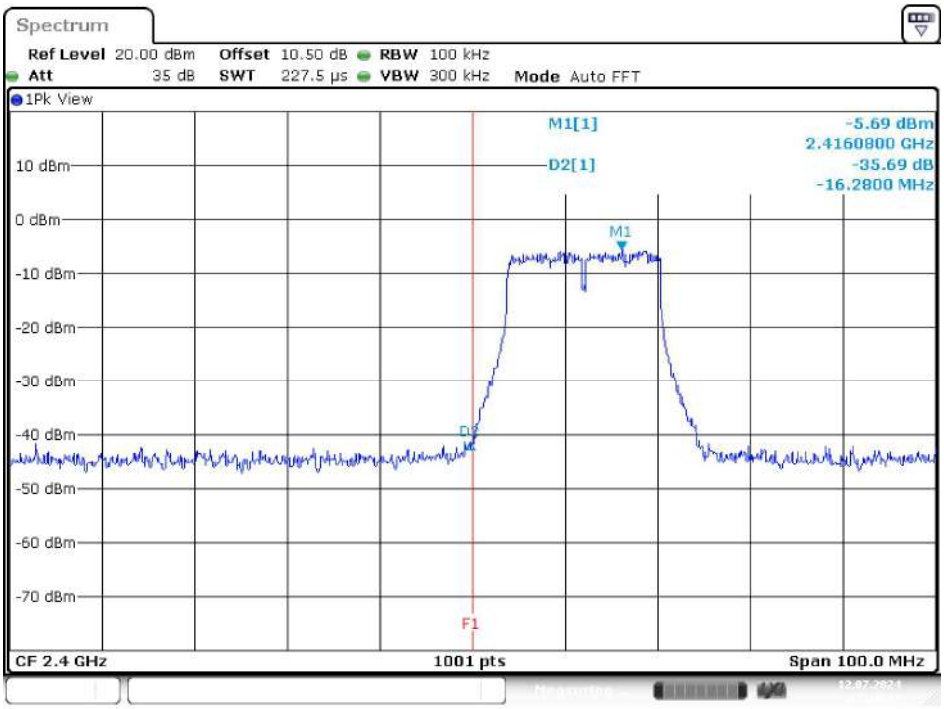
G Mode

Band Edge, Left Side



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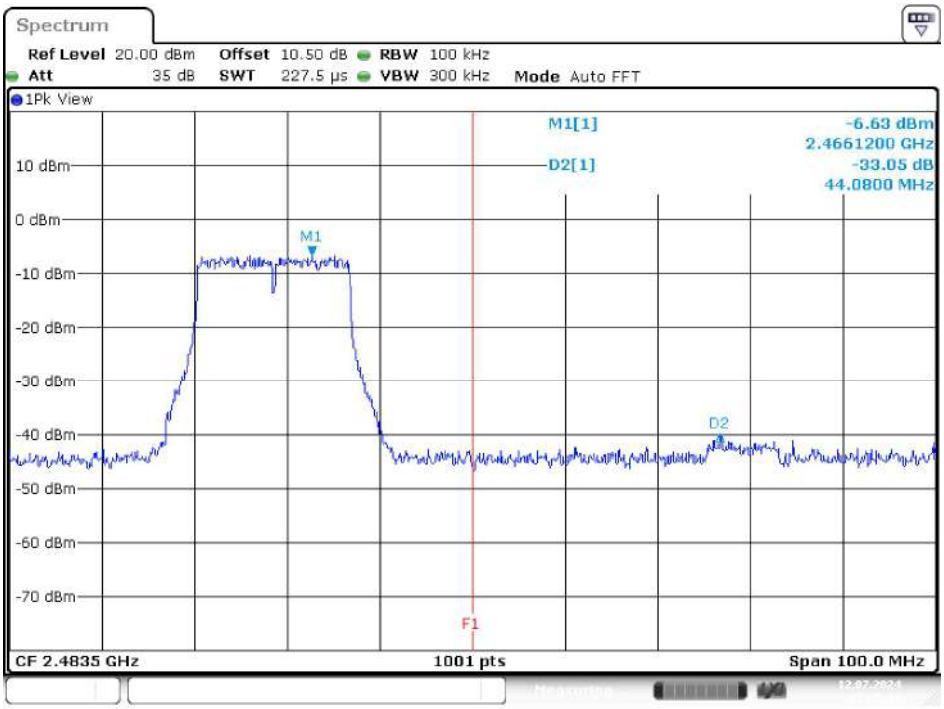
Band Edge, Right Side



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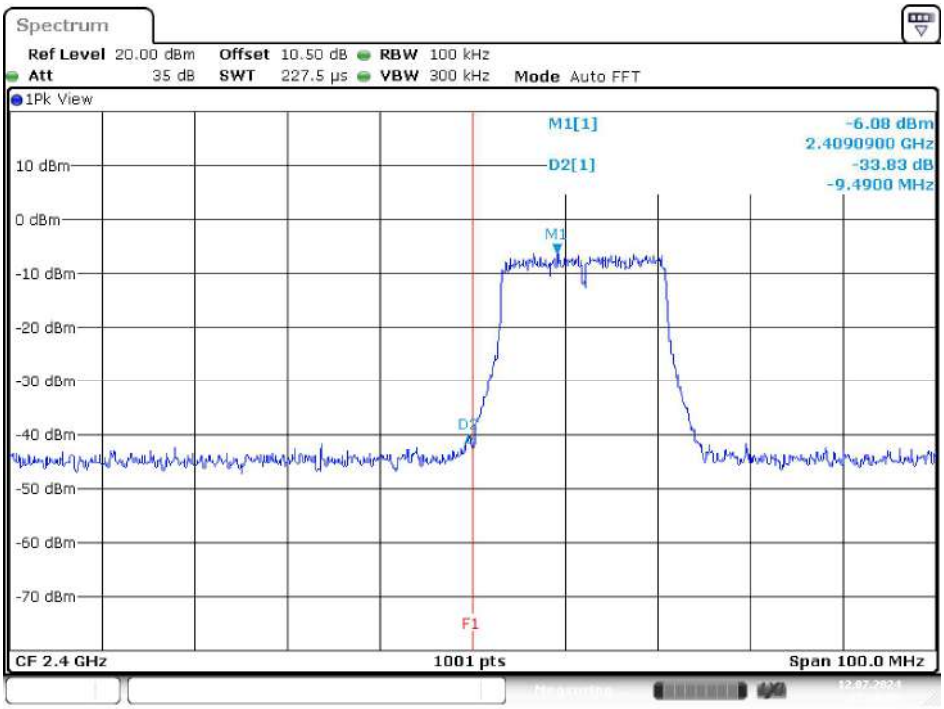
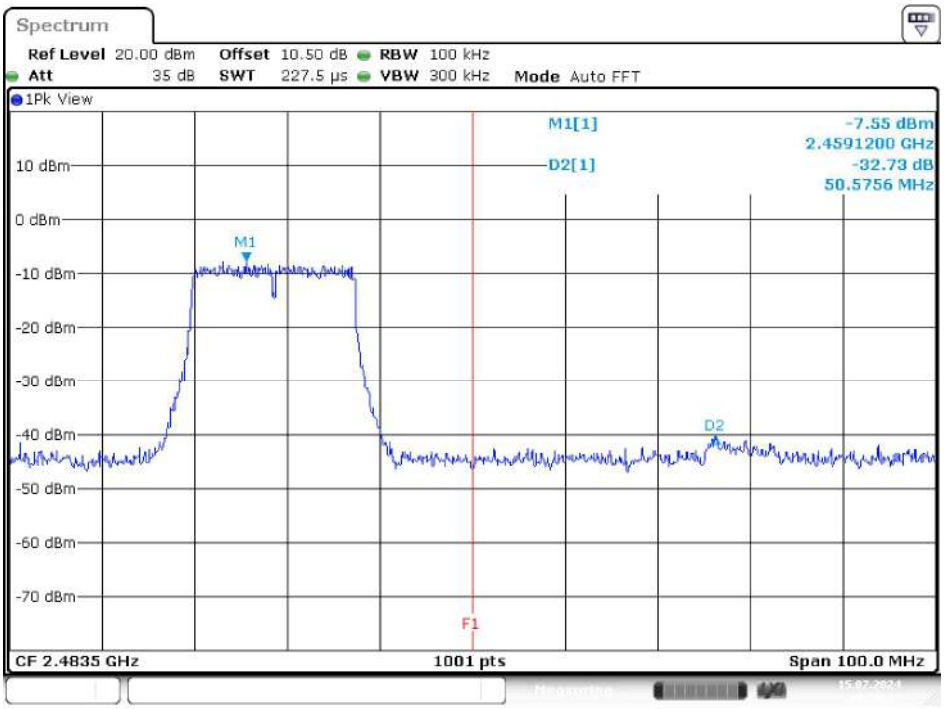
N20 Mode

Band Edge, Left Side



Date: 12.JUL.2024 17:20:59

Band Edge, Right Side



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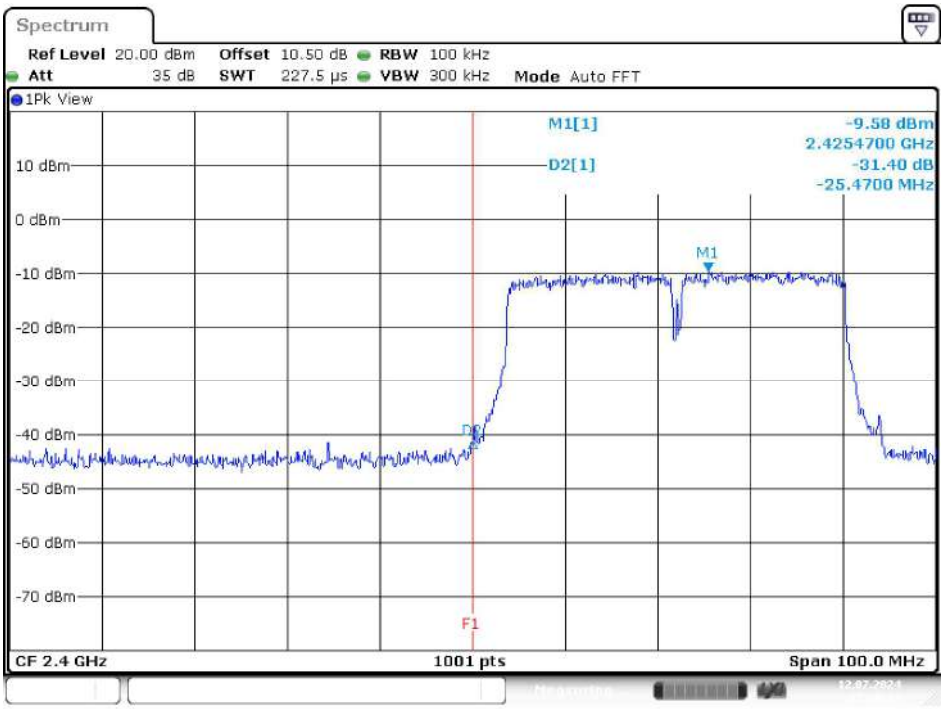
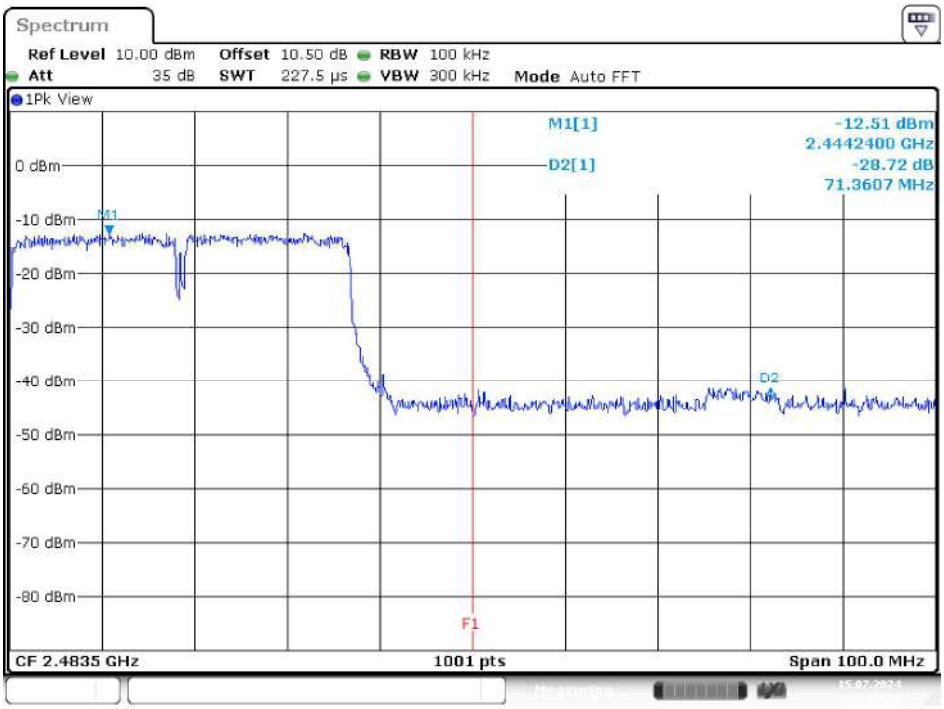
N40 Mode

Band Edge, Left Side



Date: 12.JUL.2024 17:26:24

Band Edge, Right Side



Date: 15.JUL.2024 11:08:55

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12 FCC §15.247(e) – Power Spectral Density

12.1 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.

12.2 Test Procedure

According to ANSI C63.10-2013, section 11.10.2

a) Set analyzer center frequency to DTS channel center frequency.

b) Set the span to 1.5 times the DTS bandwidth.

c) Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.

d) Set the VBW ≥ [3 × RBW].

e) Detector = peak.

f) Sweep time = auto couple.

g) Trace mode = max hold.

h) Allow trace to fully stabilize.

i) Use the peak marker function to determine the maximum amplitude level within the RBW.

j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat

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12.3 Test Results

Channel	Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
B Mode				
Low	2412	-16.07	8	PASS
Middle	2437	-16.42	8	PASS
High	2462	-18.58	8	PASS
G Mode				
Low	2412	-17.37	8	PASS
Middle	2437	-16.69	8	PASS
High	2462	-18.54	8	PASS
N20 Mode				
Low	2412	-16.10	8	PASS
Middle	2437	-16.71	8	PASS
High	2462	-18.84	8	PASS
N40 Mode				
Low	2422	-16.92	8	PASS
Middle	2437	-16.60	8	PASS
High	2452	-17.83	8	PASS

Please refer to the following plots

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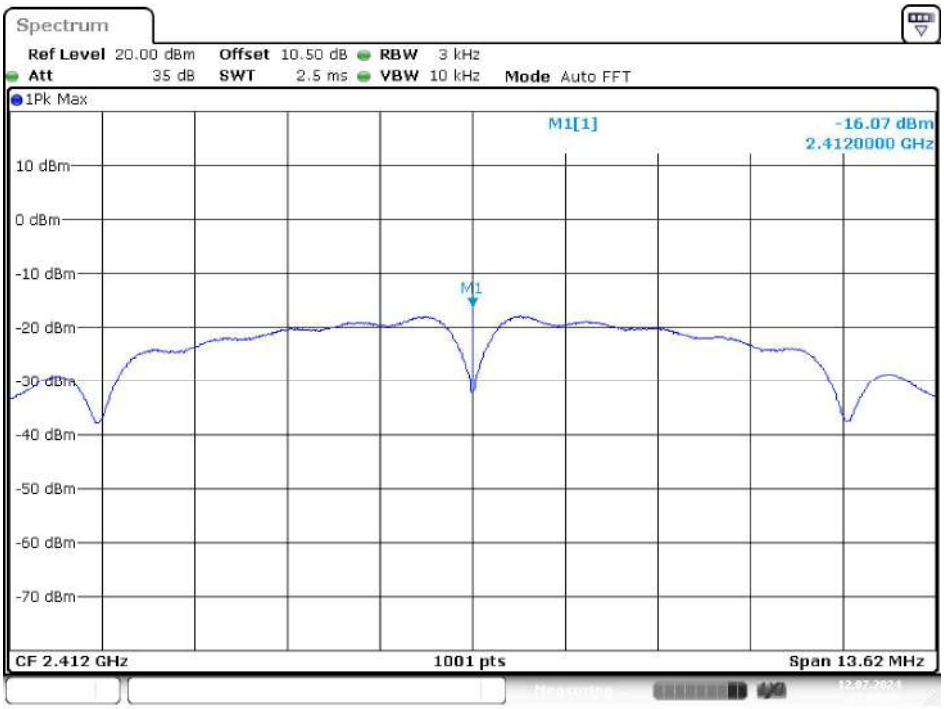
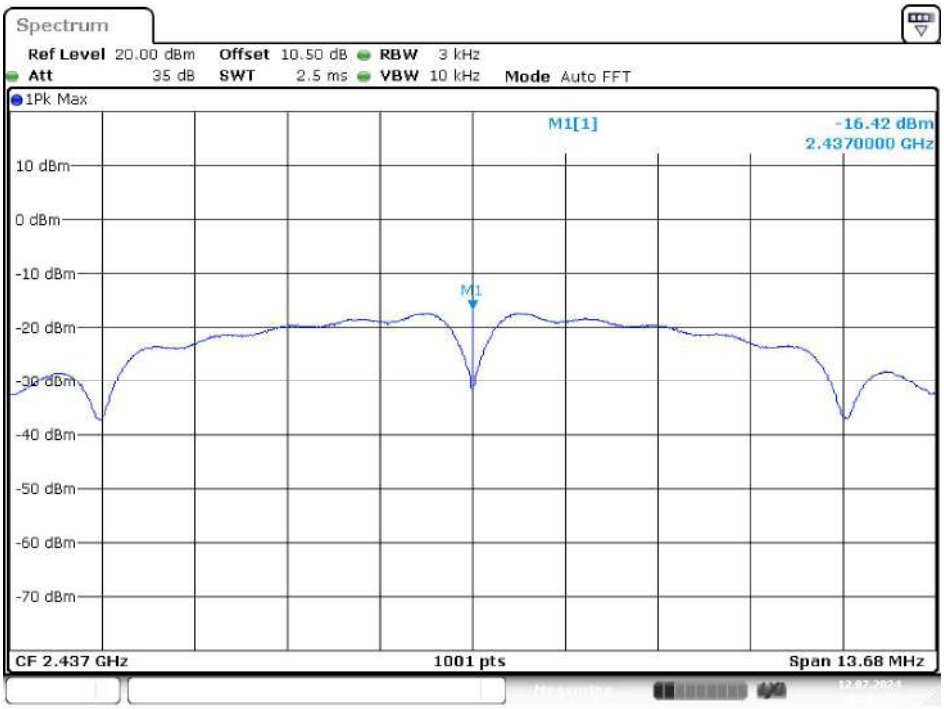
B Mode

Low Channel



Date: 12.JUL.2024 17:00:49

Middle Channel



Date: 12.JUL.2024 17:03:55

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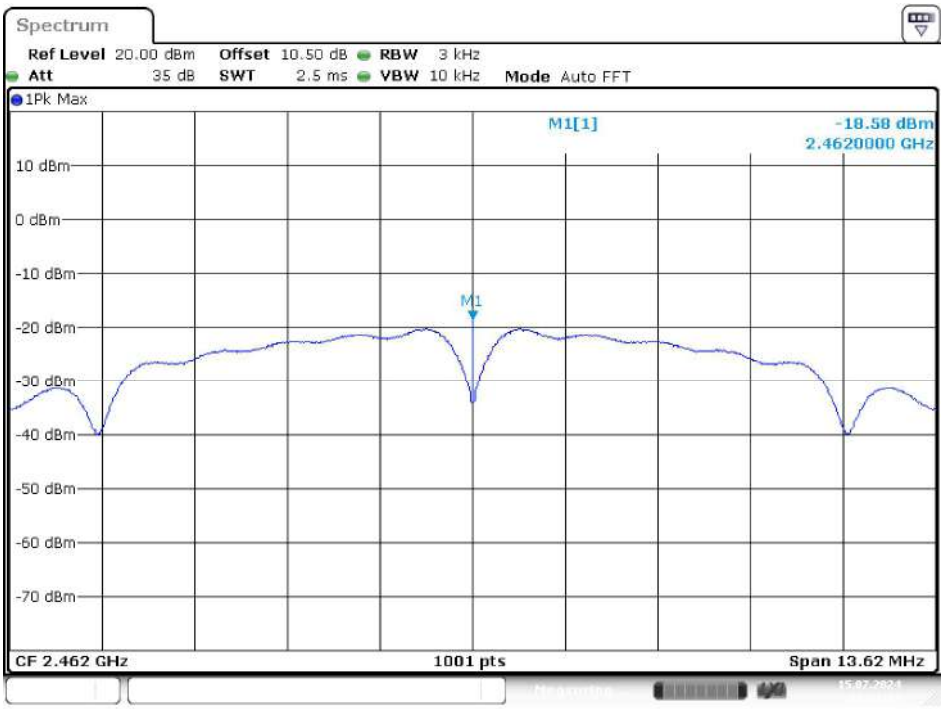
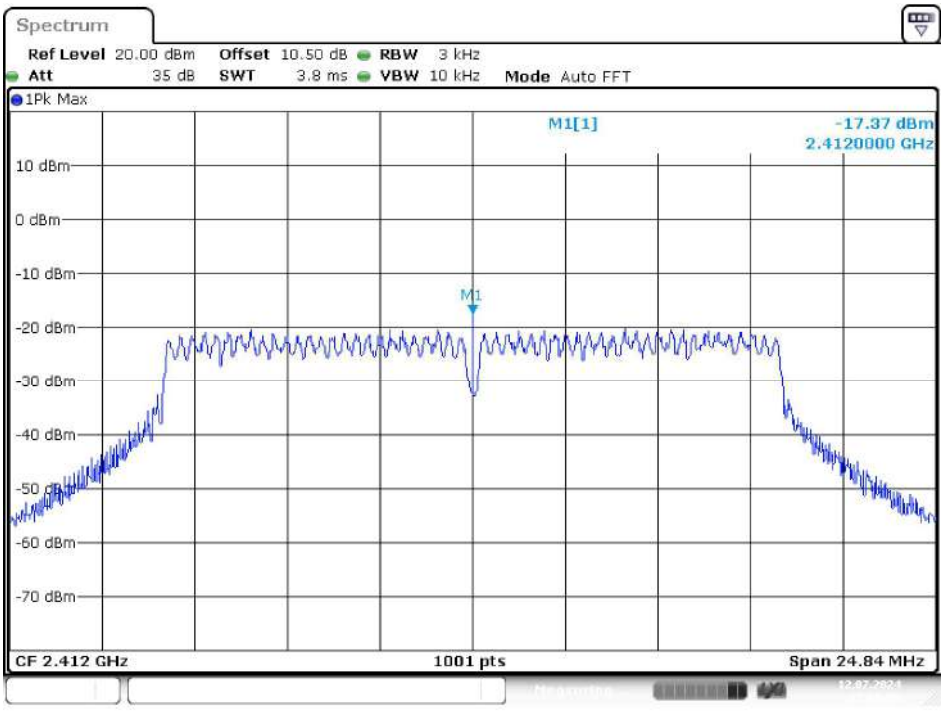
High Channel



Date: 15.JUL.2024 14:41:17

G Mode

Low Channel



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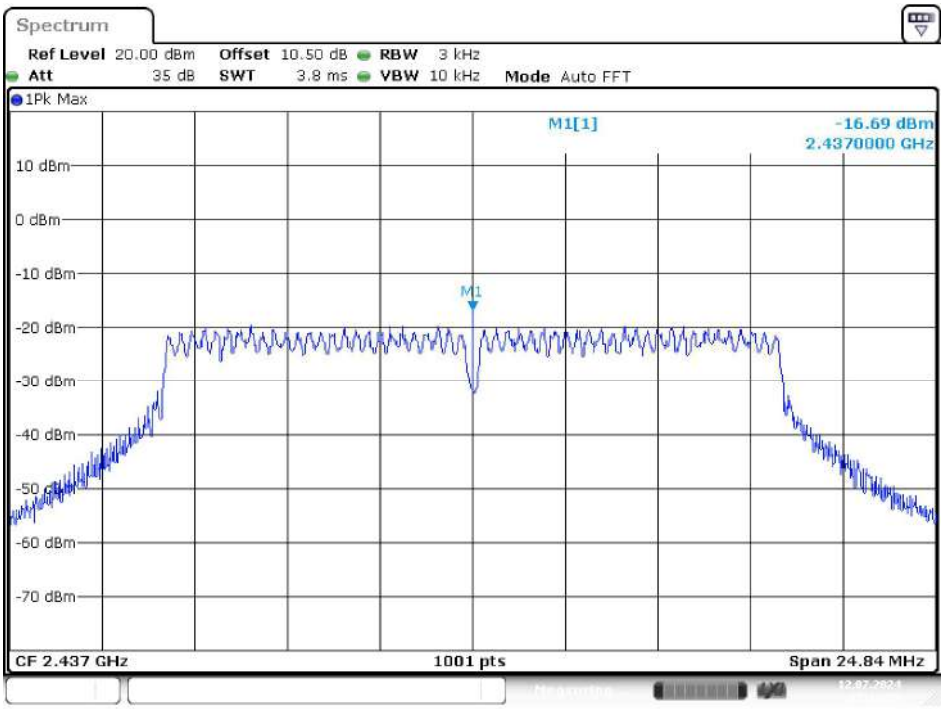
Middle Channel



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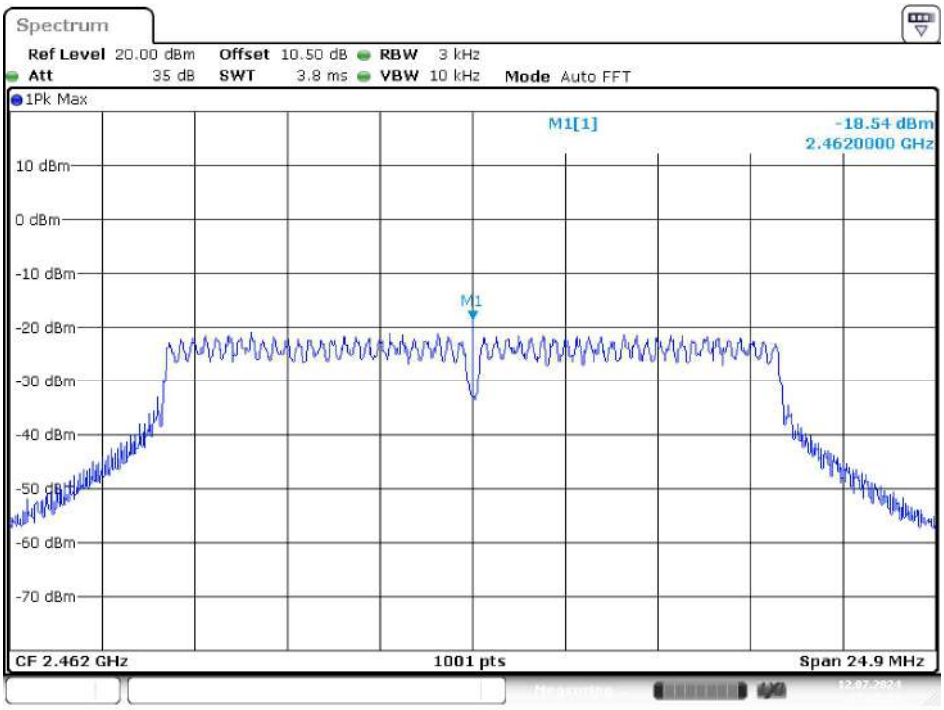
High Channel



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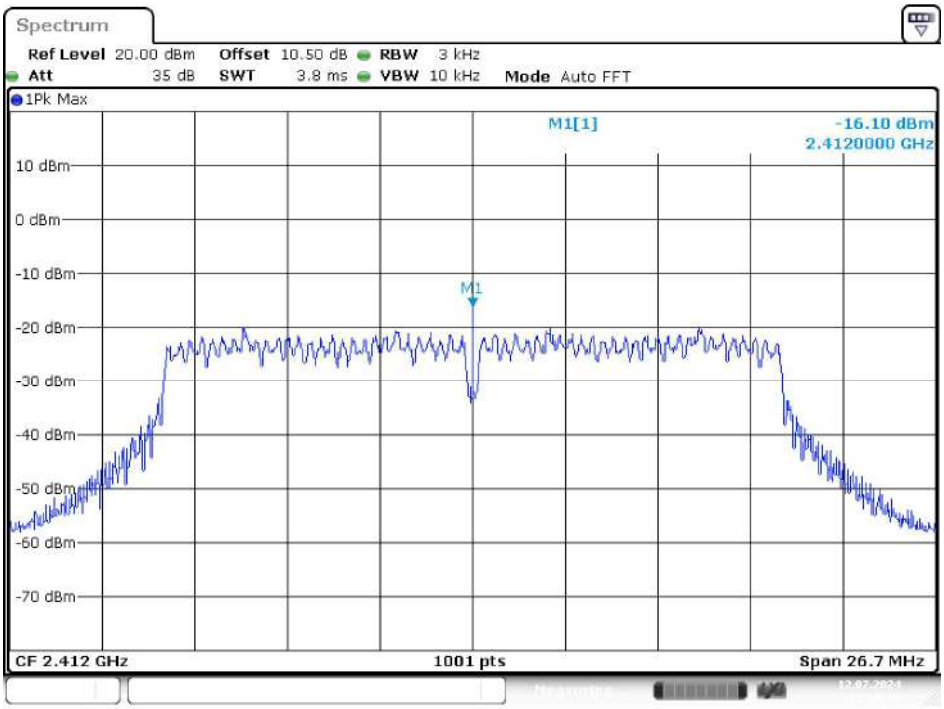
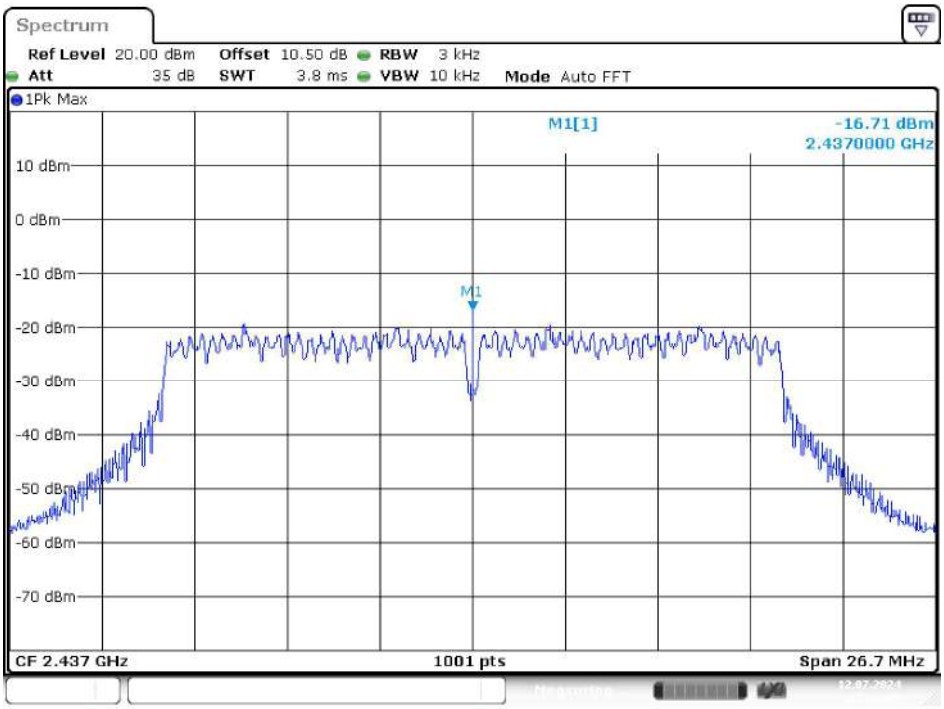
N20 Mode

Low Channel



Date: 12.JUL.2024 17:20:44

Middle Channel



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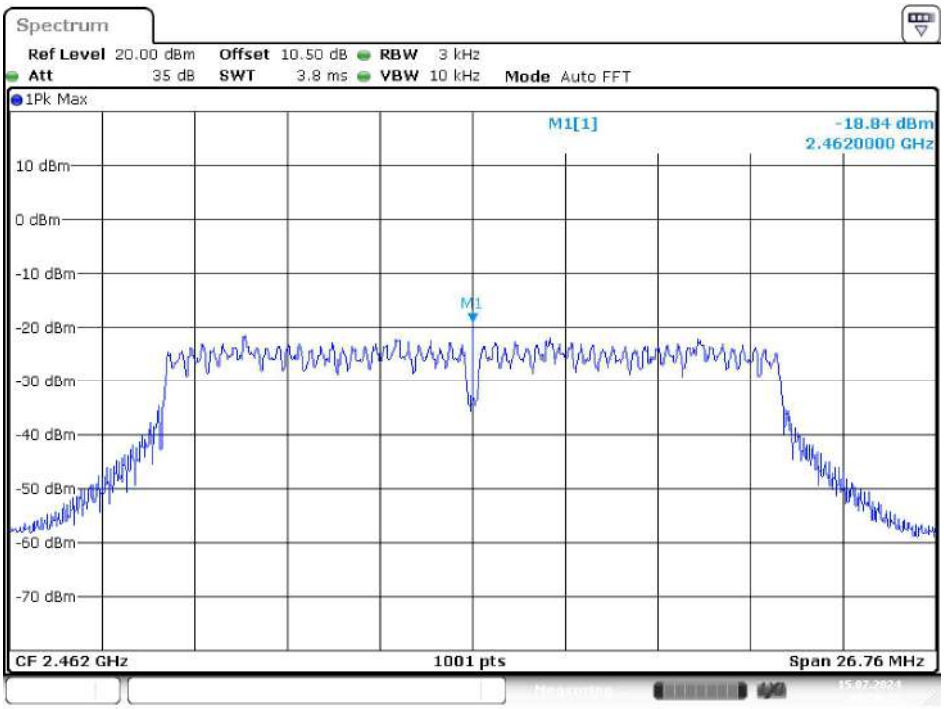
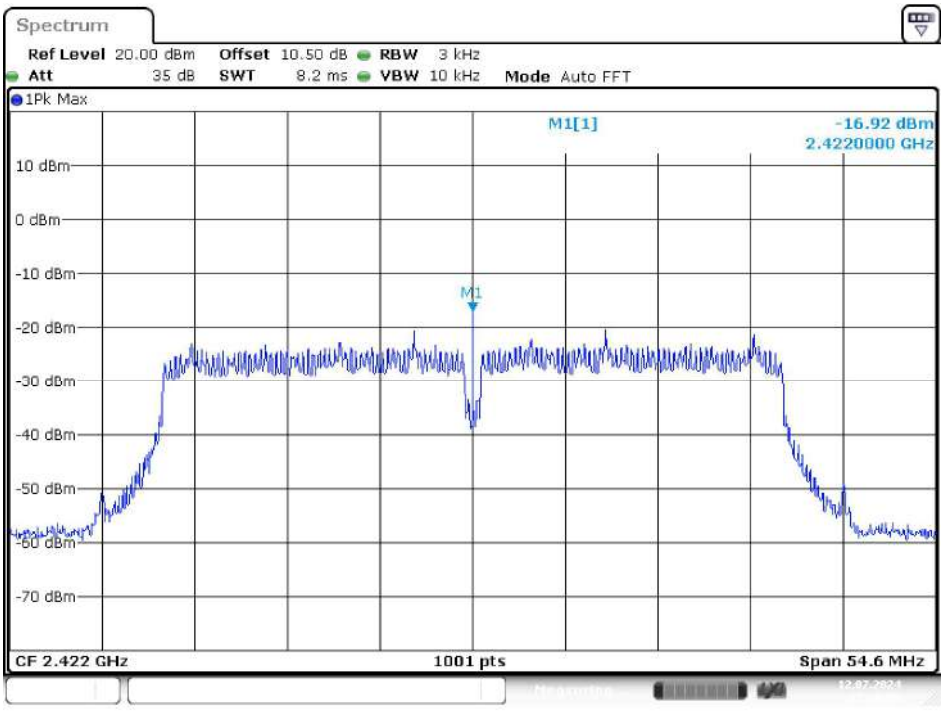
High Channel



Date: 15.JUL.2024 09:50:33

N40 Mode

Low Channel



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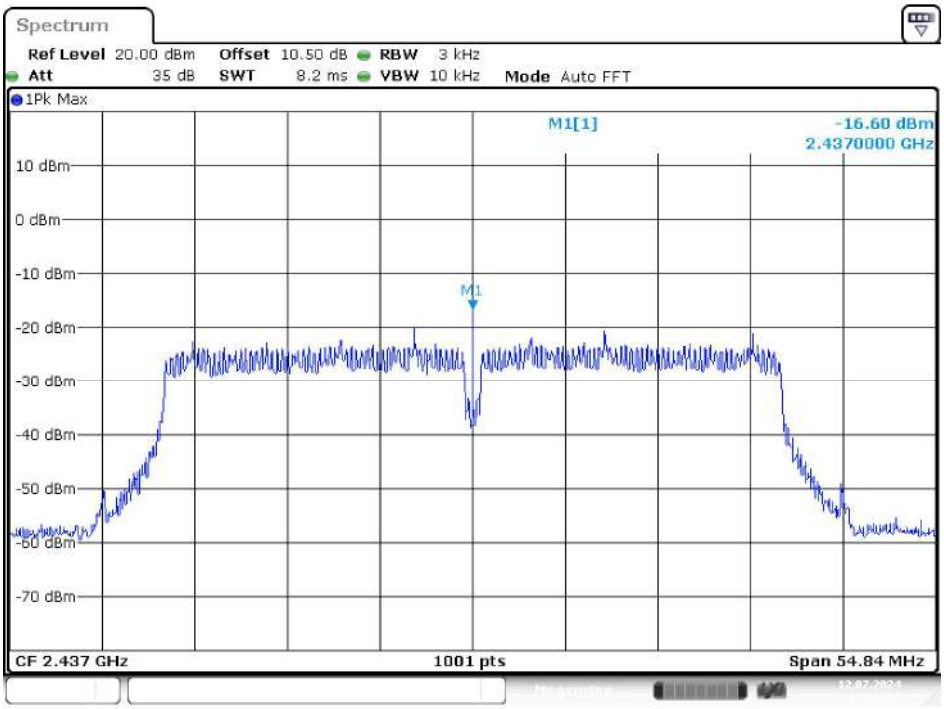
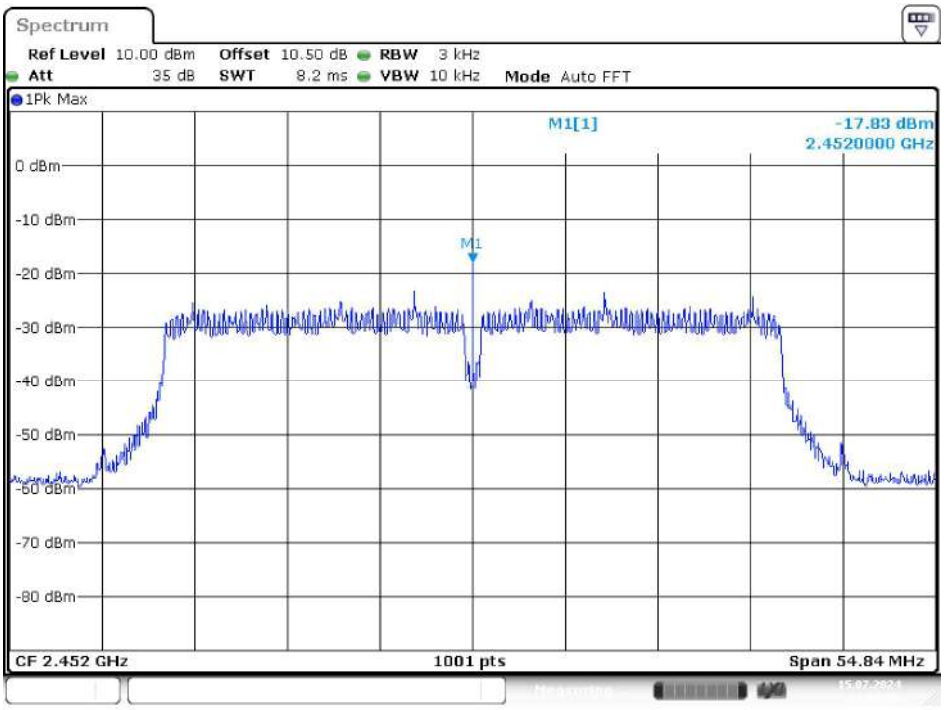
Middle Channel



Date: 12.JUL.2024 17:30:27

High Channel



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