FCC Part 15.247

TEST REPORT

For

Hangzhou Arenti Technology Co., Ltd.

Room 1010, 10th Floor, Building 1, No.768 Jianghong Road, Changhe Street, Binjiang District, Hangzhou

FCC ID: 2A2MQ-BULLET9T

Report Type:	**Product Type:**
Original Report	IP CAMERA

Report Producer : Coco Lin

Report Number : RXZ211229005RF01

Report Date : 2022-03-11

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Revision History

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
0.0	RXZ211229005	RXZ211229005RF01	2022-03-11	Original Report	Coco Lin

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1 General Information

1.1 Product Description for Equipment under Test (EUT)

Applicant	Hangzhou Arenti Technology Co., Ltd. Room 1010, 10th Floor, Building 1, No.768 Jianghong Road, Changhe Street, Binjiang District, Hangzhou
Manufacturer	Hangzhou Arenti Technology Co., Ltd. Room 1010, 10th Floor, Building 1, No.768 Jianghong Road, Changhe Street, Binjiang District, Hangzhou
Brand(Trade) Name	N/A
Product (Equipment)	IP CAMERA
Main Model Name	OUTDOOR1
Series Model Name	Bullet 9S; Bullet 9T; Bullet 9Q
Model Discrepancy	The major electrical and mechanical constructions of series models are identical to the basic model, except different Market segmentation. The model, OUTDOOR1 is the testing sample, and the final test data are shown on this test report.
Frequency Range	IEEE 802.11b/g / IEEE 802.11n HT20 Mode: 2412 ~ 2462 MHz IEEE 802.11n HT40 Mode: 2422 ~ 2452 MHz
Transmit Power	IEEE 802.11b Mode: 18.36 dBm IEEE 802.11g Mode: 24.28 dBm IEEE 802.11n HT20 Mode: 24.26 dBm IEEE 802.11n HT40 Mode: 23.15 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 ☐ By AC Power Cord ☐ PoE
	☒ DC 12V ☐ Battery ☒ DC Power Supply Adapter I/P: 100-240Vac, 50/60Hz, 0.3A Max; O/P: 12Vdc, 1.0A ☐ External from USB Cable ☐ External DC Adapter
	☐ Host System
Received Date	Jan. 06, 2022
Date of Test	Jan. 24, 2022 ~ Feb. 16, 2022

*All measurement and test data in this report was gathered from production sample serial number: RXZ211229005-01 (Assigned by BACL, New Taipei Laboratory).

1.2 Objective

This report is prepared on behalf of *Hangzhou Arenti Technology Co., Ltd.* in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communication Commission's rules.

1.3 Related Submittal(s)/Grant(s)

FCC Part 15.407 UNII submission with FCC ID: 2A2MQ-BULLET9T

1.4 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

1.5 Statement of Compliance

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.

1.6 Measurement Uncertainty

Parameter		Uncertainty
AC Mains		+/- 2.36 dB
RF output power, conducted		+/- 0.93 dB
Power Spectral Density, conducted		+/- 0.93 dBm
Occupied Bandwidth		+/- 0.35 MHz
Unwanted Emissions, conducted		+/- 1.69 dBm
Emissions, radiated	30 MHz~1GHz	+/- 5.46 dB
	1 GHz~18 GHz	+/- 5.24 dB
	18 GHz~40 GHz	+/- 5.86 dB
Temperature		+/- 1.27 °C
Humidity		+/- 3 %

1.7 Environmental Conditions

Test Site	Test Date	Temperature (℃)	Relative Humidity (%)	ATM Pressure (hPa)	Test Engineer
AC Line Conducted Emissions	2022/2/16	19.2	70	1010	Boris Kao
Radiation Spurious Emissions	2022/1/24~2022/1/27	20.9~23.4	69~81	1010	Howard Ho
Conducted Spurious Emissions	2022/2/10	21	56	1010	Boris Kao
6 dB Emission Bandwidth	2022/2/10	21	56	1010	Boris Kao
Maximum Output Power	2022/2/10	21	56	1010	Boris Kao
100 kHz Bandwidth of Frequency Band Edge	2022/2/10	21	56	1010	Boris Kao
Power Spectral Density	2022/2/10	21	56	1010	Boris Kao

1.8 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) 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.

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.

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 “Release_v34”.

Test Frequency		Low	Mid	High
Power Level Setting	802.11b Mode	-2	-2	-2
	802.11g Mode	-3	0	-3
	802.11n HT20 Mode	-5	0	-5
	802.11n HT40 Mode	-8	-4	-8

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 peak 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 Test Mode

Full System (model: OUTDOOR1) for all test item.

2.5 Support Equipment List and Details

Description	Manufacturer	Model Number	S/N
SD Card	SanDisk	16G	N/A
NB	DELL	E6410	8N7PXN1

2.6 External Cable List and Details

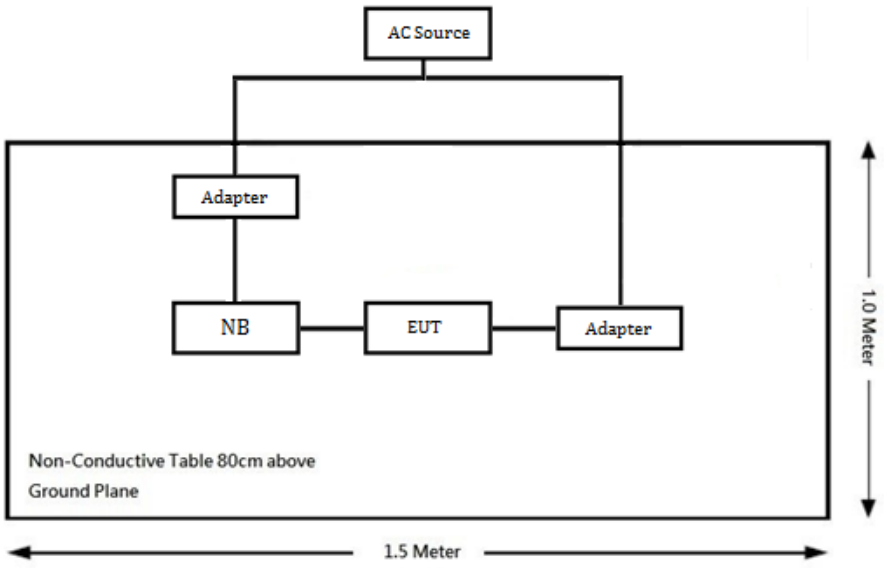
N/A

2.7 Block Diagram of Test Setup

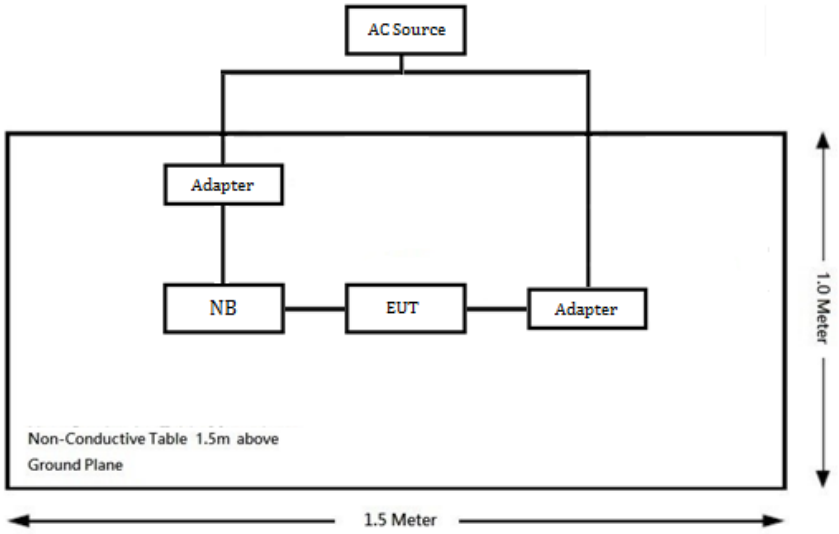
See test photographs attached in setup photos for the actual connections between EUT and support equipment.

Radiation:

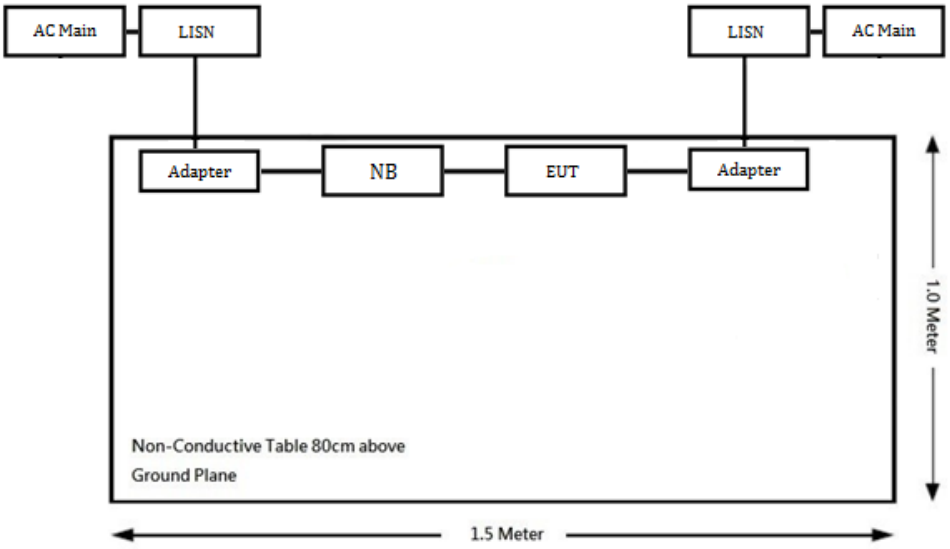
Below 1GHz:



Above 1GHz:



Conduction:



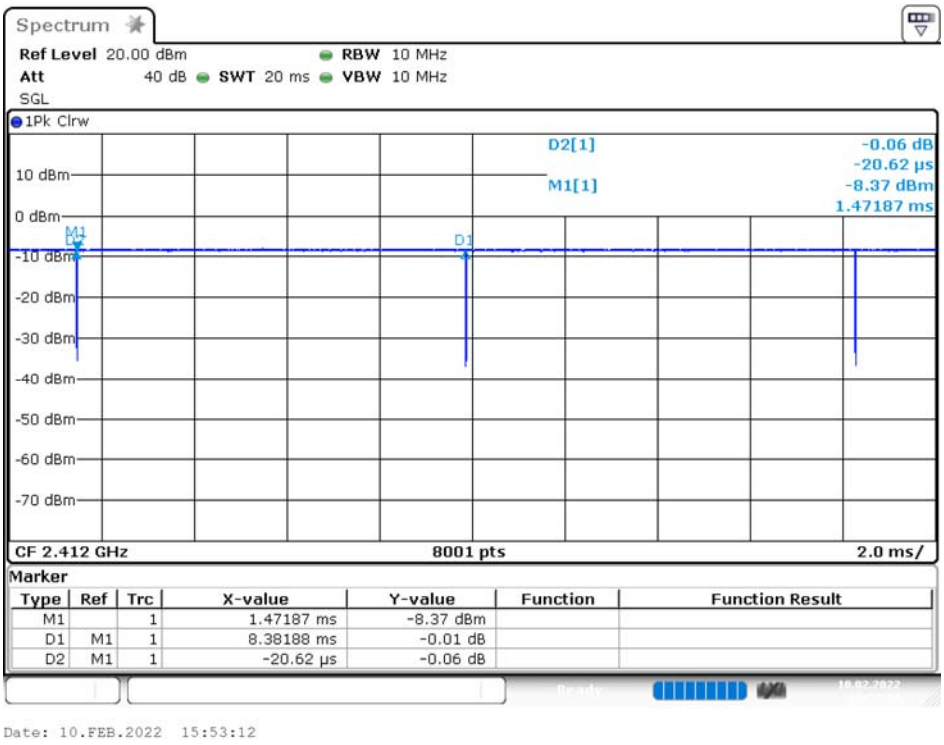
2.8 Duty Cycle

The duty cycle as below:

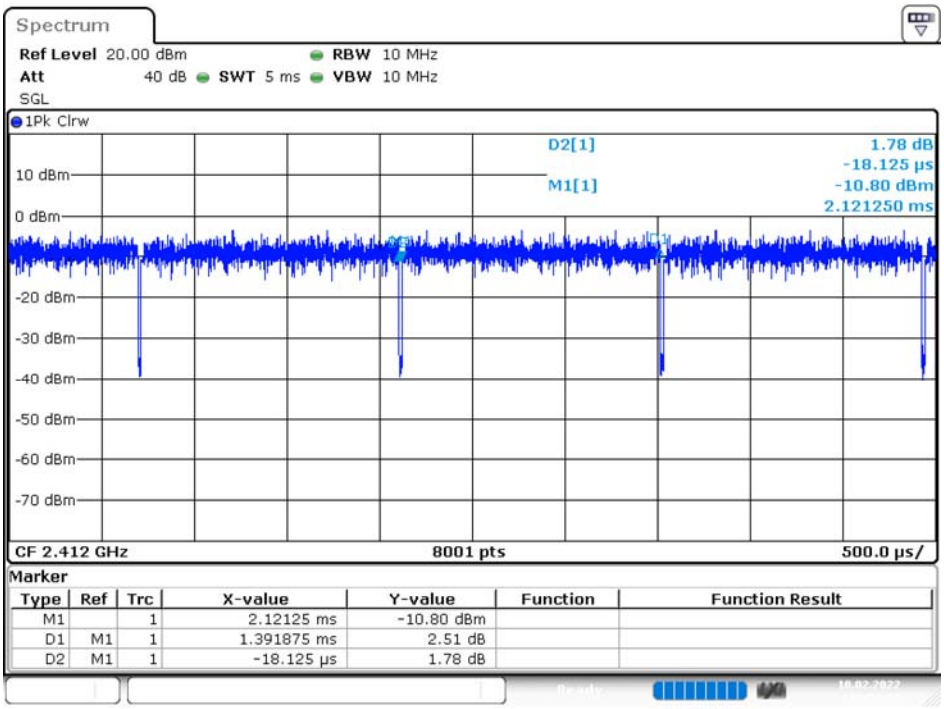
Radio Mode	T_{on} (ms)	$T_{on}+T_{off}$ (ms)	Duty Cycle (%)
802.11b	8.38	8.40	100
802.11g	1.39	1.41	99
802.11n20	5.08	5.10	100
802.11n40	2.47	2.49	99

Please refer to the following plots.

B Mode

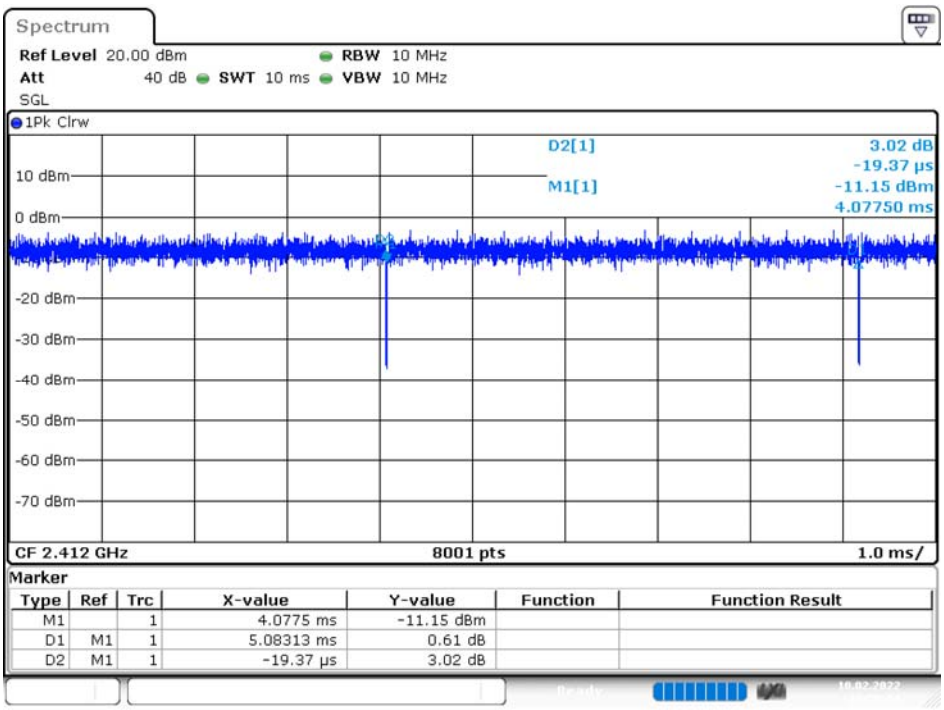


G Mode



Date: 10.FEB.2022 15:54:53

N20 Mode



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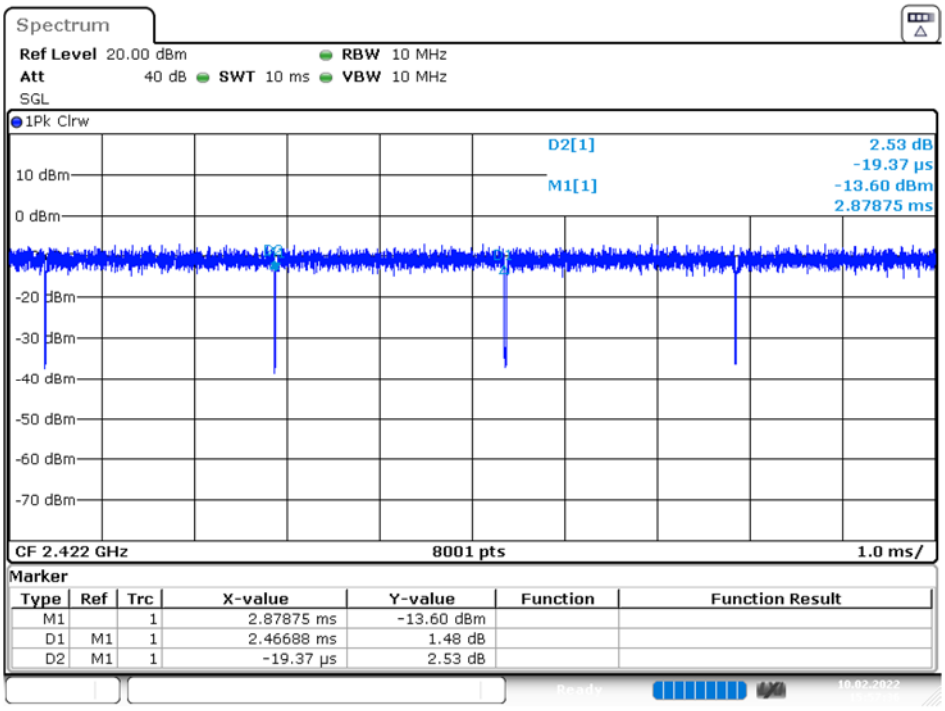
N40 Mode



Date: 10.FEB.2022 15:57:37

3 Summary of Test Results

FCC Rules	Description of Test	Results
§15.247(i), §1.1310, §2.1091	Maximum Permissible Exposure (MPE)	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

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	2022/1/10	2023/1/09
LISN	Rohde & Schwarz	ENV216	101248	2021/6/8	2022/6/7
EMI Test Receiver	Rohde & Schwarz	ESW8	100947	2021/7/23	2022/7/22
Pulse Limiter	Rohde & Schwarz	ESH3Z2	TXZEM104	2021/7/29	2022/7/28
RF Cable	EMEC	EM-CB5D	1	2021/6/11	2022/6/10
Software	AUDIX	E3	V9.150826k	N.C.R	N.C.R
Radiated Room (966-A)					
Bilog Antenna with 6 dB Attenuator	SUNOL SCIENCES & EMEC	JB3 &EM-ATT6000-6-NN	A090816-2&ATT-09-003	2022/1/20	2023/1/19
Horn Antenna	EMCO	SAS-571	1020	2021/4/23	2022/4/22
Horn Antenna	ETS-Lindgren	3116	62638	2021/8/11	2022/8/10
Preamplifier	Sonoma	310N	130602	2021/6/8	2022/6/7
Preamplifier	A.H. system Inc.	PAM-0118P	470	2021/3/15	2022/3/14
Microware Preamplifier	EM Electronics Corporation	EM18G40G	60656	2021/12/27	2022/12/26
Spectrum Analyzer	Rohde & Schwarz	FSV40	101435	2022/1/13	2023/1/12
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2021/11/9	2022/11/8
Micro flex Cable	UTIFLEX	UFB197C-1-2362-70U-70U	225757-001	2022/1/24	2023/1/23
Coaxial Cable	COMMATE	PEWC	8Dr	2021/12/24	2022/12/23
Coaxial Cable	UTIFLEX	UFB311A-Q-1440-300300	220490-006	2022/1/24	2023/1/23
Coaxial Cable	JUNFLON	J12J102248-00-B-5	AUG-07-15-044	2021/12/24	2022/12/23
Cable	EMC	EMC105-SM-SM-10000	201003	2022/1/24	2023/1/23

Coaxial Cable	ROSNOL	K1K50-UP0264-K1K50-450CM	160309-1	2022/1/24	2023/1/23
Coaxial Cable	ROSNOL	K1K50-UP0264-K1K50-50CM	15120-1	2022/1/18	2023/1/17
Software	Farad	EZ_EMC	BACL-03A1	N.C.R	N.C.R
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSV40	101204	2021/6/10	2022/6/9
Cable	UTIFLEX	UFA210A	9435	2021/10/5	2022/10/4
Power Sensor	KEYSIGHT	U2021XA	MY54080018	2022/1/24	2023/1/23
Attenuator	MCL	BW-S20W5+	1430	2021/6/23	2022/6/22

***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

5 FCC §15.247(i), §1.1310, § 2.1091 - Maximum Permissible Exposure (MPE)

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.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

5.2 RF Exposure Evaluation Result

MPE evaluation:

Mode	Frequency Range (MHz)	Antenna Gain		Target Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
2.4G WIFI	2412-2462	2.99	1.991	24.5	281.838	20	0.112	1
5G WIFI B1	5150-5250	2.78	1.897	13.5	22.387	20	0.008	1
5G WIFI B4	5725-5850	2.87	1.936	14.5	28.184	20	0.011	1

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

Result: MPE evaluation meets the requirements of the **20cm** standard.

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
Hangzhou Arenti Technology Co., Ltd.	YJC-6N120-B33	PFC Antenna	2.99 dBi

Result: Compliance

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

7.1 Applicable Standard

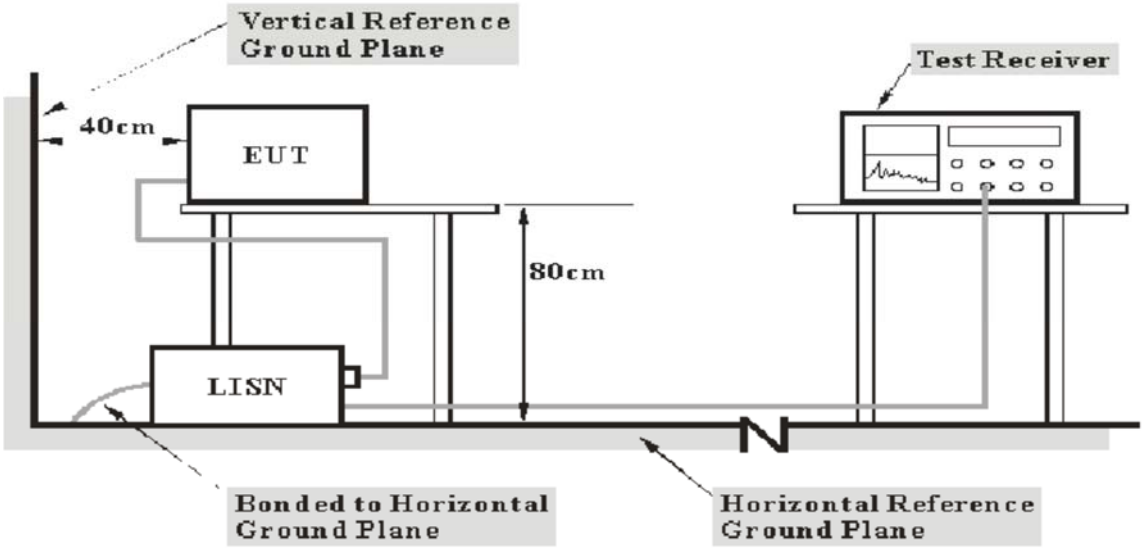
According to §15.207

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 & 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:

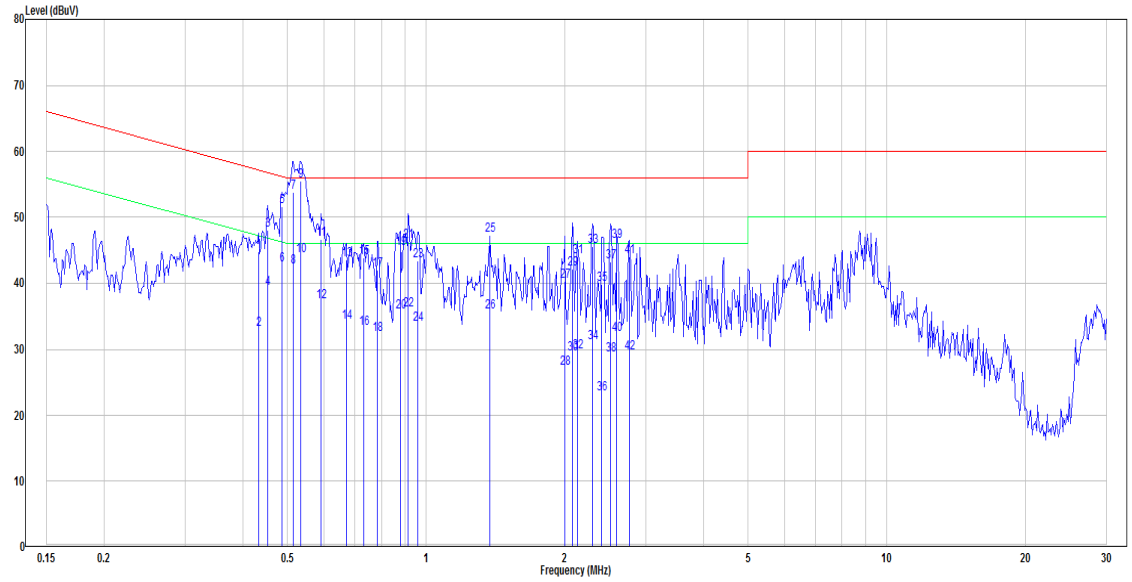
Over Limit = Level – Limit Line

7.6 Test Results

Test Mode: Transmitting

(Worst case is 802.11g mode, Middle Channel)

Main: AC120 V, 60 Hz, Line



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBµV)	Factor(dB)	(dBµV)	(dBµV)	(dB)	
1	0.433	25.25	19.52	44.77	57.20	-12.43	QP
2	0.433	13.49	19.52	33.01	47.20	-14.19	Average
3	0.454	28.60	19.52	48.12	56.80	-8.68	QP
4	0.454	19.64	19.52	39.16	46.80	-7.64	Average
5	0.486	32.04	19.52	51.56	56.23	-4.67	QP
6	0.486	23.32	19.52	42.84	46.23	-3.39	Average
7	0.516	34.25	19.52	53.77	56.00	-2.23	QP
8	0.516	22.88	19.52	42.40	46.00	-3.60	Average
9	0.535	35.98	19.52	55.50	56.00	-0.50	QP
10	0.535	24.68	19.52	44.20	46.00	-1.80	Average
11	0.592	27.09	19.53	46.62	56.00	-9.38	QP
12	0.592	17.61	19.53	37.14	46.00	-8.86	Average
13	0.672	24.03	19.53	43.56	56.00	-12.44	QP
14	0.672	14.60	19.53	34.13	46.00	-11.87	Average
15	0.731	24.41	19.53	43.94	56.00	-12.06	QP
16	0.731	13.72	19.53	33.25	46.00	-12.75	Average
17	0.783	22.44	19.53	41.97	56.00	-14.03	QP
18	0.783	12.78	19.53	32.31	46.00	-13.69	Average

19	0.880	25.78	19.54	45.32	56.00	-10.68	QP
20	0.880	16.14	19.54	35.68	46.00	-10.32	Average
21	0.914	26.89	19.54	46.43	56.00	-9.57	QP
22	0.914	16.46	19.54	36.00	46.00	-10.00	Average
23	0.958	23.92	19.54	43.46	56.00	-12.54	QP
24	0.958	14.26	19.54	33.80	46.00	-12.20	Average
25	1.374	27.74	19.55	47.29	56.00	-8.71	QP
26	1.374	16.08	19.55	35.63	46.00	-10.37	Average
27	2.001	20.69	19.58	40.27	56.00	-15.73	QP
28	2.001	7.50	19.58	27.08	46.00	-18.92	Average
29	2.077	22.66	19.58	42.24	56.00	-13.76	QP
30	2.077	9.71	19.58	29.29	46.00	-16.71	Average
31	2.133	24.42	19.58	44.00	56.00	-12.00	QP
32	2.133	10.00	19.58	29.58	46.00	-16.42	Average
33	2.297	25.94	19.59	45.53	56.00	-10.47	QP
34	2.297	11.44	19.59	31.03	46.00	-14.97	Average
35	2.409	20.33	19.59	39.92	56.00	-16.08	QP
36	2.409	3.65	19.59	23.24	46.00	-22.76	Average
37	2.513	23.72	19.59	43.31	56.00	-12.69	QP
38	2.513	9.54	19.59	29.13	46.00	-16.87	Average
39	2.594	26.74	19.59	46.33	56.00	-9.67	QP
40	2.594	12.58	19.59	32.17	46.00	-13.83	Average
41	2.765	24.46	19.60	44.06	56.00	-11.94	QP
42	2.765	9.88	19.60	29.48	46.00	-16.52	Average

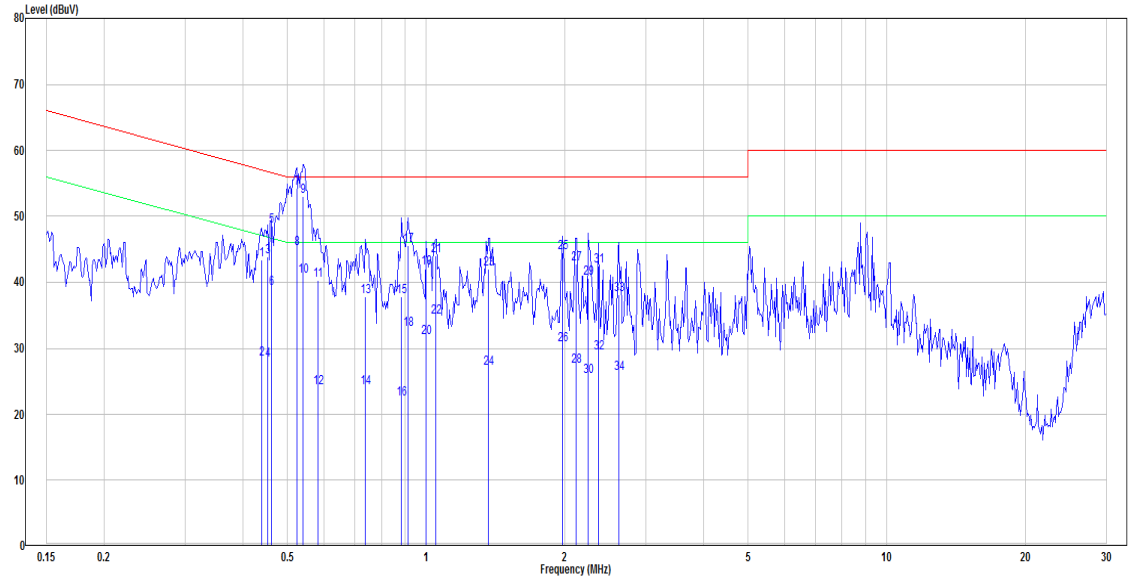
Note:

Level = Read Level + Factor

Over Limit = Level – Limit Line

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

Main: AC120 V, 60 Hz, Neutral



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBµV)	Factor(dB)	(dBµV)	(dBµV)	(dB)	
1	0.440	23.86	19.52	43.38	57.07	-13.69	QP
2	0.440	8.82	19.52	28.34	47.07	-18.73	Average
3	0.454	24.37	19.52	43.89	56.80	-12.91	QP
4	0.454	8.66	19.52	28.18	46.80	-18.62	Average
5	0.461	29.01	19.52	48.53	56.67	-8.14	QP
6	0.461	19.62	19.52	39.14	46.67	-7.53	Average
7	0.524	34.68	19.52	54.20	56.00	-1.80	QP
8	0.524	25.64	19.52	45.16	46.00	-0.84	Average
9	0.541	33.53	19.52	53.05	56.00	-2.95	QP
10	0.541	21.35	19.52	40.87	46.00	-5.13	Average
11	0.582	20.85	19.52	40.37	56.00	-15.63	QP
12	0.582	4.44	19.52	23.96	46.00	-22.04	Average
13	0.739	18.33	19.52	37.85	56.00	-18.15	QP
14	0.739	4.52	19.52	24.04	46.00	-21.96	Average
15	0.885	18.24	19.53	37.77	56.00	-18.23	QP
16	0.885	2.75	19.53	22.28	46.00	-23.72	Average
17	0.914	26.13	19.53	45.66	56.00	-10.34	QP
18	0.914	13.41	19.53	32.94	46.00	-13.06	Average
19	1.000	22.60	19.53	42.13	56.00	-13.87	QP
20	1.000	12.09	19.53	31.62	46.00	-14.38	Average
21	1.049	24.55	19.53	44.08	56.00	-11.92	QP
22	1.049	15.27	19.53	34.80	46.00	-11.20	Average

23	1.367	22.42	19.54	41.96	56.00	-14.04	QP
24	1.367	7.47	19.54	27.01	46.00	-18.99	Average
25	1.980	24.99	19.57	44.56	56.00	-11.44	QP
26	1.980	10.95	19.57	30.52	46.00	-15.48	Average
27	2.121	23.23	19.57	42.80	56.00	-13.20	QP
28	2.121	7.77	19.57	27.34	46.00	-18.66	Average
29	2.249	21.12	19.58	40.70	56.00	-15.30	QP
30	2.249	6.19	19.58	25.77	46.00	-20.23	Average
31	2.371	22.90	19.58	42.48	56.00	-13.52	QP
32	2.371	9.80	19.58	29.38	46.00	-16.62	Average
33	2.622	18.51	19.59	38.10	56.00	-17.90	QP
34	2.622	6.62	19.59	26.21	46.00	-19.79	Average

Note:

Level = Read Level + Factor

Over Limit = Level – Limit Line

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

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

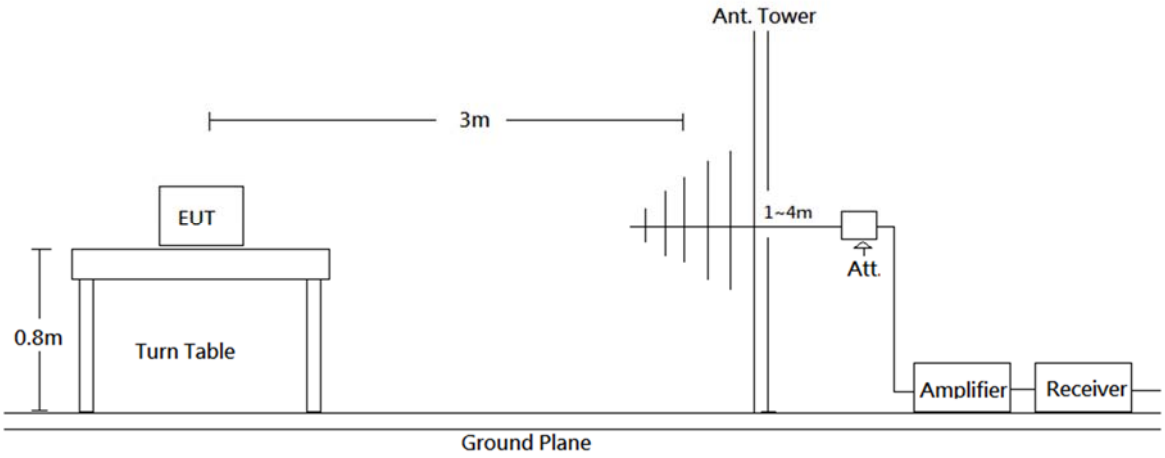
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this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

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

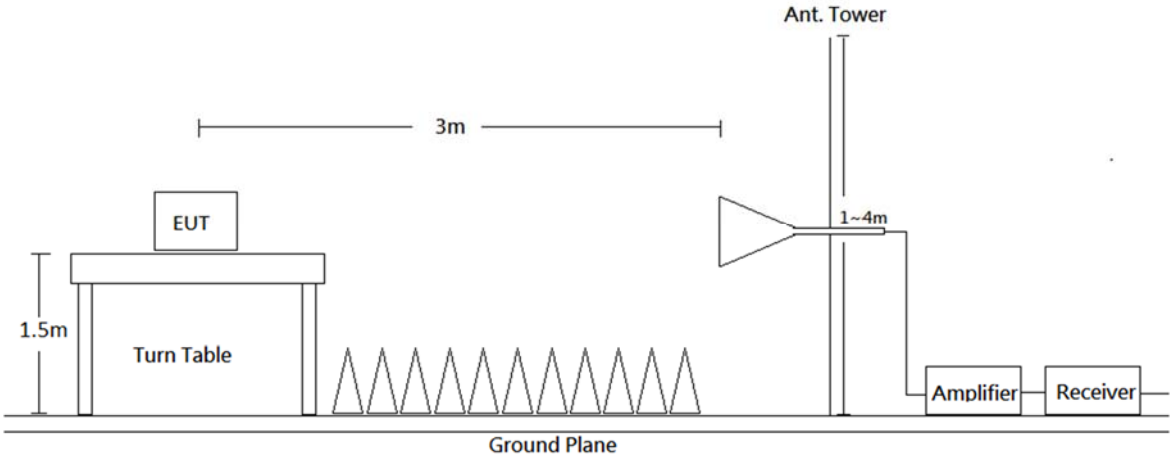
intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the 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

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 and FCC 15.247 Limits.

8.3 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

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 the 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 = Result – Limit

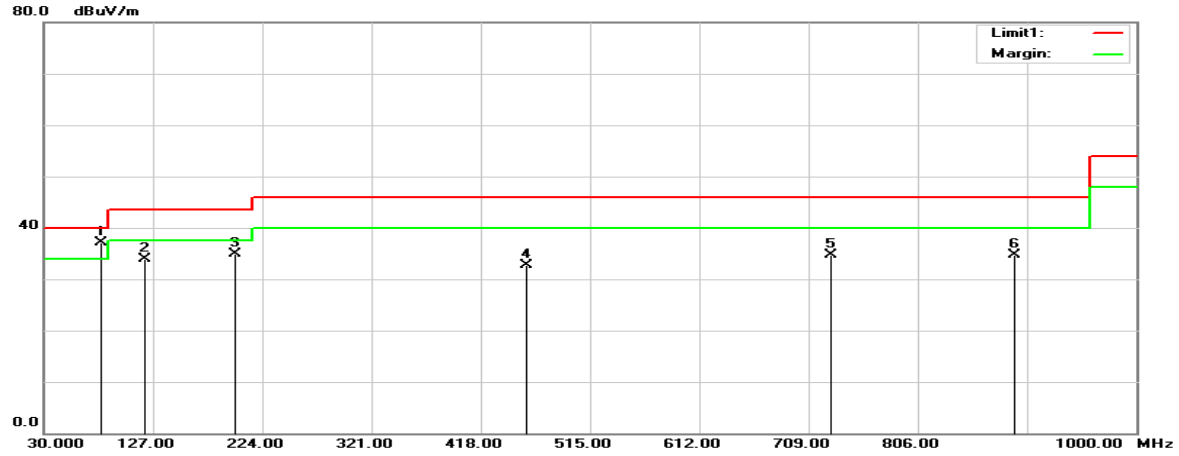
8.6 Test Results

Test Mode: Transmitting

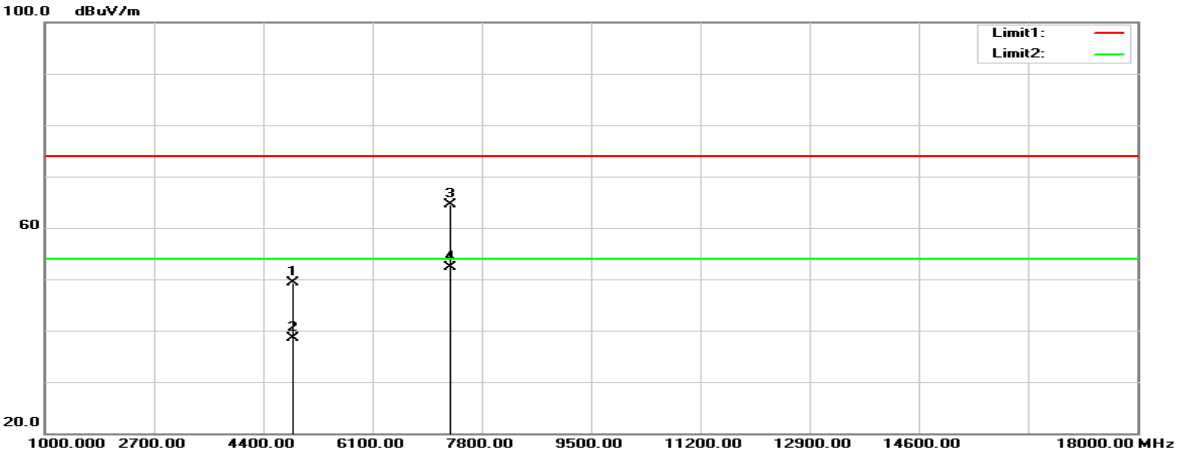
(Pre-scan with three orthogonal axis, and worse case as X axis.)

Horizontal (worst case is 802.11g mode middle channel)

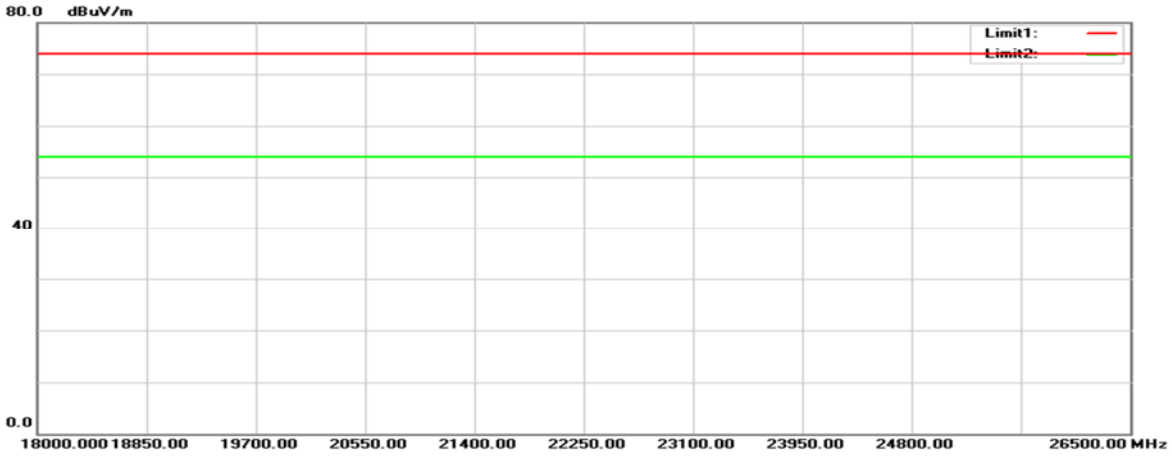
30MHz-1GHz:



1GHz-18GHz:

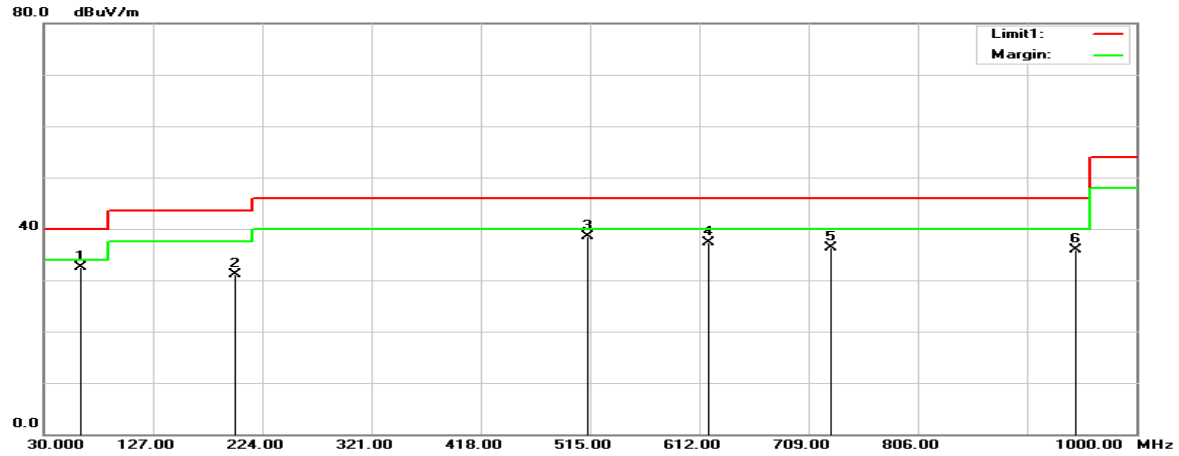


18GHz-26.5GHz:

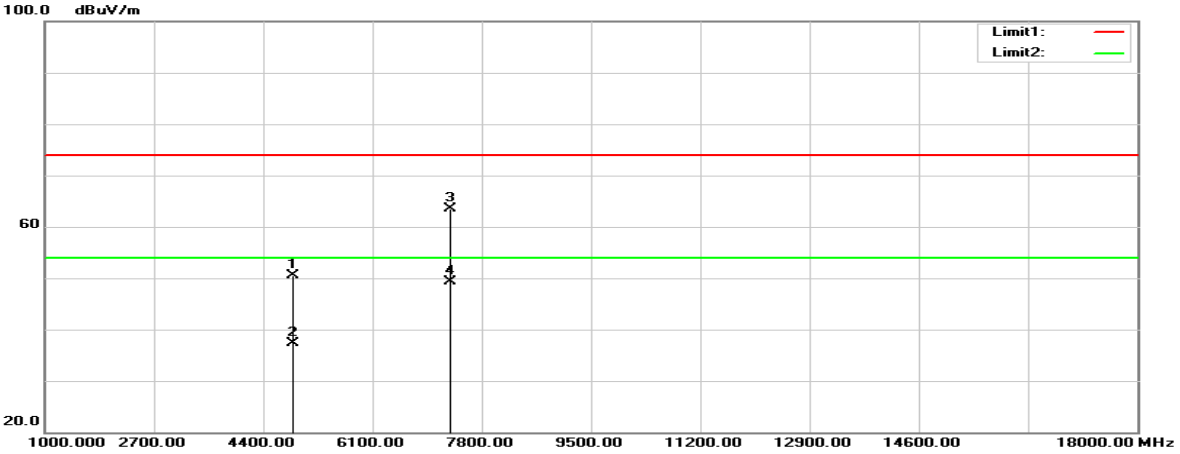


Vertical (worst case is 802.11g mode middle channel)

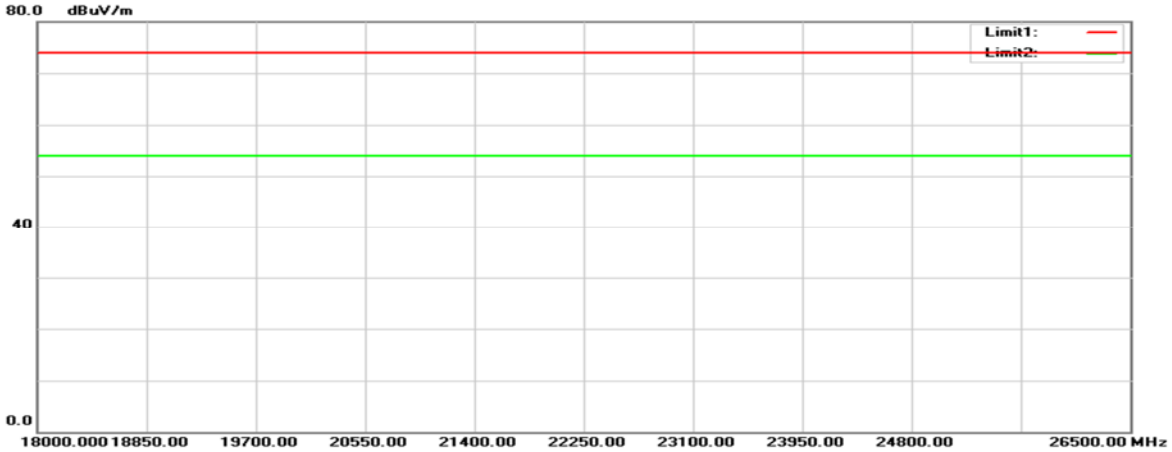
30MHz-1GHz:



1GHz-18GHz:



18GHz-26.5GHz:



Below 1GHz

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
81.4100	53.69	-16.62	37.07	40.00	-2.93	100	52	QP
120.2100	44.16	-10.27	33.89	43.50	-9.61	100	86	peak
199.7500	45.85	-10.99	34.86	43.50	-8.64	100	299	peak
458.7400	39.26	-6.46	32.80	46.00	-13.20	100	74	peak
729.3700	37.05	-2.35	34.70	46.00	-11.30	100	78	peak
891.3600	34.08	0.62	34.70	46.00	-11.30	100	86	peak

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
62.9800	49.40	-16.98	32.42	40.00	-7.58	100	132	peak
199.7500	42.12	-10.99	31.13	43.50	-12.37	100	1	peak
513.0600	44.14	-5.71	38.43	46.00	-7.57	100	274	peak
620.7300	42.11	-4.87	37.24	46.00	-8.76	100	50	peak
729.3700	38.66	-2.35	36.31	46.00	-9.69	100	191	peak
945.6800	33.87	2.13	36.00	46.00	-10.00	100	177	peak

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Above 1GHz

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
B Mode, Low channel								
2386.608	66.94	-9.49	57.45	74.00	-16.55	138	23	peak
2386.608	58.85	-9.49	49.36	54.00	-4.64	138	23	AVG
4824.000	55.13	-2.15	52.98	74.00	-21.02	150	5	peak
4824.000	51.94	-2.15	49.79	54.00	-4.21	150	5	AVG
7236.000	55.15	4.55	59.70	74.00	-14.30	187	175	peak
7236.000	48.33	4.55	52.88	54.00	-1.12	187	175	AVG
B Mode, Middle channel								
4874.000	55.23	-1.92	53.31	74.00	-20.69	152	21	peak
4874.000	51.64	-1.92	49.72	54.00	-4.28	152	21	AVG
7311.000	55.28	5.08	60.36	74.00	-13.64	178	166	peak
7311.000	47.65	5.08	52.73	54.00	-1.27	178	166	AVG
B Mode, High channel								
2483.500	64.26	-8.45	55.81	74.00	-18.19	126	25	peak
2483.500	56.13	-8.45	47.68	54.00	-6.32	126	25	AVG
4924.000	55.13	-1.63	53.50	74.00	-20.50	158	32	peak
4924.000	51.47	-1.63	49.84	54.00	-4.16	158	32	AVG
7386.000	55.31	5.20	60.51	74.00	-13.49	146	155	peak
7386.000	47.54	5.20	52.74	54.00	-1.26	146	155	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
B Mode, Low channel								
2386.048	67.62	-9.49	58.13	74.00	-15.87	128	30	peak
2386.048	59.88	-9.49	50.39	54.00	-3.61	128	30	AVG
4824.000	54.38	-2.15	52.23	74.00	-21.77	151	36	peak
4824.000	51.06	-2.15	48.91	54.00	-5.09	151	36	AVG
7236.000	54.60	4.55	59.15	74.00	-14.85	212	76	peak
7236.000	47.88	4.55	52.43	54.00	-1.57	212	76	AVG
B Mode, Middle channel								
4874.000	54.45	-1.92	52.53	74.00	-21.47	153	39	peak
4874.000	51.22	-1.92	49.30	54.00	-4.70	153	39	AVG
7311.000	54.68	5.08	59.76	74.00	-14.24	168	78	peak
7311.000	47.25	5.08	52.33	54.00	-1.67	168	78	AVG
B Mode, High channel								
2483.500	65.24	-8.45	56.79	74.00	-17.21	117	32	peak
2483.500	56.78	-8.45	48.33	54.00	-5.67	117	32	AVG
4924.000	54.32	-1.63	52.69	74.00	-21.31	159	49	peak
4924.000	51.47	-1.63	49.84	54.00	-4.16	159	49	AVG
7386.000	54.61	5.20	59.81	74.00	-14.19	164	77	peak
7386.000	47.38	5.20	52.58	54.00	-1.42	164	77	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
G Mode, Low channel								
2390.000	79.96	-9.46	70.50	74.00	-3.50	136	28	peak
2390.000	62.10	-9.46	52.64	54.00	-1.36	136	28	AVG
4824.000	51.45	-2.15	49.30	74.00	-24.70	132	6	peak
4824.000	40.24	-2.15	38.09	54.00	-15.91	132	6	AVG
7236.000	59.52	4.55	64.07	74.00	-9.93	100	42	peak
7236.000	47.16	4.55	51.71	54.00	-2.29	100	42	AVG
G Mode, Middle channel								
4874.000	51.28	-1.92	49.36	74.00	-24.64	133	31	peak
4874.000	40.36	-1.92	38.44	54.00	-15.56	133	31	AVG
7311.000	59.48	5.08	64.56	74.00	-9.44	105	48	peak
7311.000	47.26	5.08	52.34	54.00	-1.66	105	48	AVG
G Mode, High channel								
2484.256	74.82	-8.44	66.38	74.00	-7.62	172	49	peak
2484.256	61.14	-8.44	52.70	54.00	-1.30	172	49	AVG
4924.000	51.47	-1.63	49.84	74.00	-24.16	142	47	peak
4924.000	40.21	-1.63	38.58	54.00	-15.42	142	47	AVG
7386.000	59.66	5.20	64.86	74.00	-9.14	118	95	peak
7386.000	47.58	5.20	52.78	54.00	-1.22	118	95	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
G Mode, Low channel								
2390.000	78.22	-9.46	68.76	74.00	-5.24	132	33	peak
2390.000	61.10	-9.46	51.64	54.00	-2.36	132	33	AVG
4824.000	52.76	-2.15	50.61	74.00	-23.39	113	50	peak
4824.000	39.54	-2.15	37.39	54.00	-16.61	113	50	AVG
7236.000	58.40	4.55	62.95	74.00	-11.05	213	69	peak
7236.000	44.60	4.55	49.15	54.00	-4.85	213	69	AVG
G Mode, Middle channel								
4874.000	52.45	-1.92	50.53	74.00	-23.47	123	54	peak
4874.000	39.28	-1.92	37.36	54.00	-16.64	123	54	AVG
7311.000	58.41	5.08	63.49	74.00	-10.51	225	61	peak
7311.000	44.26	5.08	49.34	54.00	-4.66	225	61	AVG
G Mode, High channel								
2483.500	76.75	-8.45	68.30	74.00	-5.70	123	30	peak
2483.500	61.34	-8.45	52.89	54.00	-1.11	123	30	AVG
4924.000	52.33	-1.63	50.70	74.00	-23.30	133	38	peak
4924.000	38.13	-1.63	36.50	54.00	-17.50	133	38	AVG
7386.000	58.28	5.20	63.48	74.00	-10.52	244	65	peak
7386.000	44.87	5.20	50.07	54.00	-3.93	244	65	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
N20 Mode, Low channel								
2390.000	81.25	-9.46	71.79	74.00	-2.21	138	28	peak
2390.000	62.37	-9.46	52.91	54.00	-1.09	138	28	AVG
4824.000	51.48	-2.15	49.33	74.00	-24.67	156	12	peak
4824.000	40.33	-2.15	38.18	54.00	-15.82	156	12	AVG
7236.000	59.45	4.55	64.00	74.00	-10.00	106	60	peak
7236.000	47.28	4.55	51.83	54.00	-2.17	106	60	AVG
N20 Mode, Middle channel								
4874.000	51.36	-1.92	49.44	74.00	-24.56	141	37	peak
4874.000	40.28	-1.92	38.36	54.00	-15.64	141	37	AVG
7311.000	59.44	5.08	64.52	74.00	-9.48	106	29	peak
7311.000	47.33	5.08	52.41	54.00	-1.59	106	29	AVG
N20 Mode, High channel								
2485.696	77.16	-8.42	68.74	74.00	-5.26	151	16	peak
2485.696	58.13	-8.42	49.71	54.00	-4.29	151	16	AVG
4924.000	51.38	-1.63	49.75	74.00	-24.25	155	64	peak
4924.000	40.45	-1.63	38.82	54.00	-15.18	155	64	AVG
7386.000	59.16	5.20	64.36	74.00	-9.64	131	87	peak
7386.000	47.28	5.20	52.48	54.00	-1.52	131	87	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
N20 Mode, Low channel								
2390.000	80.77	-9.46	71.31	74.00	-2.69	131	32	peak
2390.000	62.22	-9.46	52.76	54.00	-1.24	131	32	AVG
4824.000	52.45	-2.15	50.30	74.00	-23.70	128	39	peak
4824.000	38.22	-2.15	36.07	54.00	-17.93	128	39	AVG
7236.000	58.45	4.55	63.00	74.00	-11.00	205	64	peak
7236.000	44.67	4.55	49.22	54.00	-4.78	205	64	AVG
N20 Mode, Middle channel								
4874.000	52.33	-1.92	50.41	74.00	-23.59	133	78	peak
4874.000	39.87	-1.92	37.95	54.00	-16.05	133	78	AVG
7311.000	58.65	5.08	63.73	74.00	-10.27	195	66	peak
7311.000	44.37	5.08	49.45	54.00	-4.55	195	66	AVG
N20 Mode, High channel								
2485.408	78.53	-8.43	70.10	74.00	-3.90	109	38	peak
2485.408	58.09	-8.43	49.66	54.00	-4.34	109	38	AVG
4924.000	52.47	-1.63	50.84	74.00	-23.16	145	32	peak
4924.000	38.45	-1.63	36.82	54.00	-17.18	145	32	AVG
7386.000	58.24	5.20	63.44	74.00	-10.56	207	44	peak
7386.000	44.58	5.20	49.78	54.00	-4.22	207	44	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
N40 Mode, Low channel								
2387.748	81.75	-9.48	72.27	74.00	-1.73	136	39	peak
2387.748	58.47	-9.48	48.99	54.00	-5.01	136	39	AVG
4844.000	51.45	-2.11	49.34	74.00	-24.66	166	68	peak
4844.000	40.42	-2.11	38.31	54.00	-15.69	166	68	AVG
7266.000	59.45	4.83	64.28	74.00	-9.72	154	54	peak
7266.000	47.51	4.83	52.34	54.00	-1.66	154	54	AVG
N40 Mode, Middle channel								
4874.000	51.66	-1.92	49.74	74.00	-24.26	165	64	peak
4874.000	40.28	-1.92	38.36	54.00	-15.64	165	64	AVG
7311.000	59.58	5.08	64.66	74.00	-9.34	158	59	peak
7311.000	47.45	5.08	52.53	54.00	-1.47	158	59	AVG
N40 Mode, High channel								
2483.500	78.04	-8.45	69.59	74.00	-4.41	118	42	peak
2483.500	52.02	-8.45	43.57	54.00	-10.43	118	42	AVG
4904.000	51.45	-1.71	49.74	74.00	-24.26	164	48	peak
4904.000	40.27	-1.71	38.56	54.00	-15.44	164	48	AVG
7356.000	59.66	5.18	64.84	74.00	-9.16	151	57	peak
7356.000	47.81	5.18	52.99	54.00	-1.01	151	57	AVG

Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
N40 Mode, Low channel								
2387.880	81.47	-9.48	71.99	74.00	-2.01	110	45	peak
2387.880	57.23	-9.48	47.75	54.00	-6.25	110	45	AVG
4844.000	52.46	-2.11	50.35	74.00	-23.65	155	67	peak
4844.000	38.28	-2.11	36.17	54.00	-17.83	155	67	AVG
7266.000	58.33	4.83	63.16	74.00	-10.84	206	88	peak
7266.000	44.45	4.83	49.28	54.00	-4.72	206	88	AVG
N40 Mode, Middle channel								
4874.000	52.38	-1.92	50.46	74.00	-23.54	161	78	peak
4874.000	38.46	-1.92	36.54	54.00	-17.46	161	78	AVG
7311.000	58.15	5.08	63.23	74.00	-10.77	207	89	peak
7311.000	44.28	5.08	49.36	54.00	-4.64	207	89	AVG
N40 Mode, High channel								
2485.720	78.36	-8.42	69.94	74.00	-4.06	110	46	peak
2485.720	52.52	-8.42	44.10	54.00	-9.90	110	46	AVG
4904.000	52.47	-1.71	50.76	74.00	-23.24	165	80	peak
4904.000	38.33	-1.71	36.62	54.00	-17.38	165	80	AVG
7356.000	58.23	5.18	63.41	74.00	-10.59	208	59	peak
7356.000	44.66	5.18	49.84	54.00	-4.16	208	59	AVG

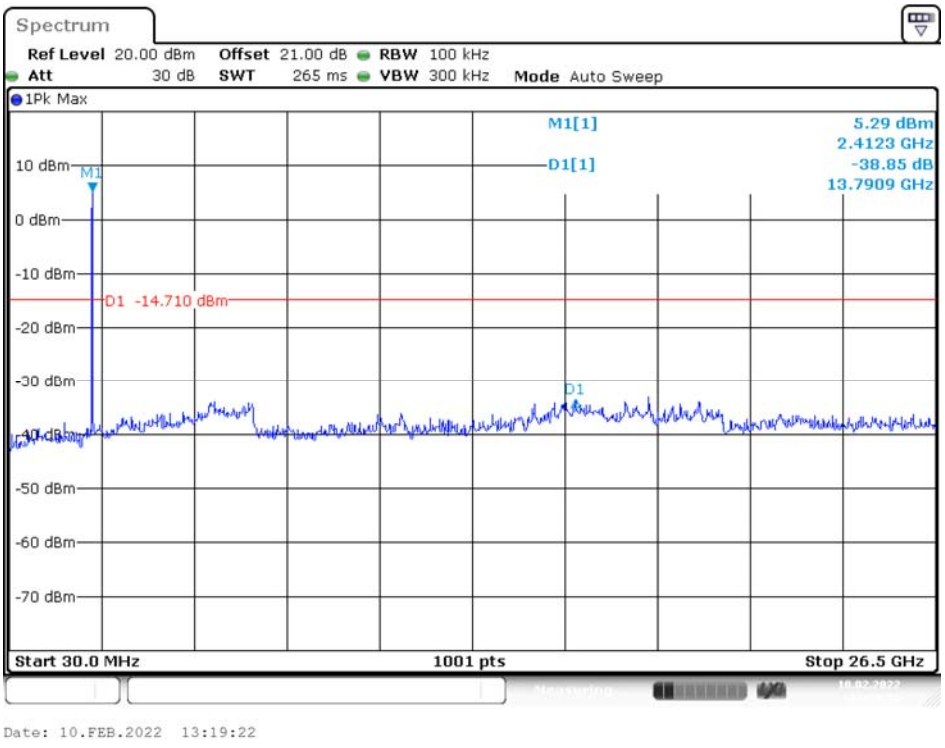
Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Conducted Spurious Emissions:

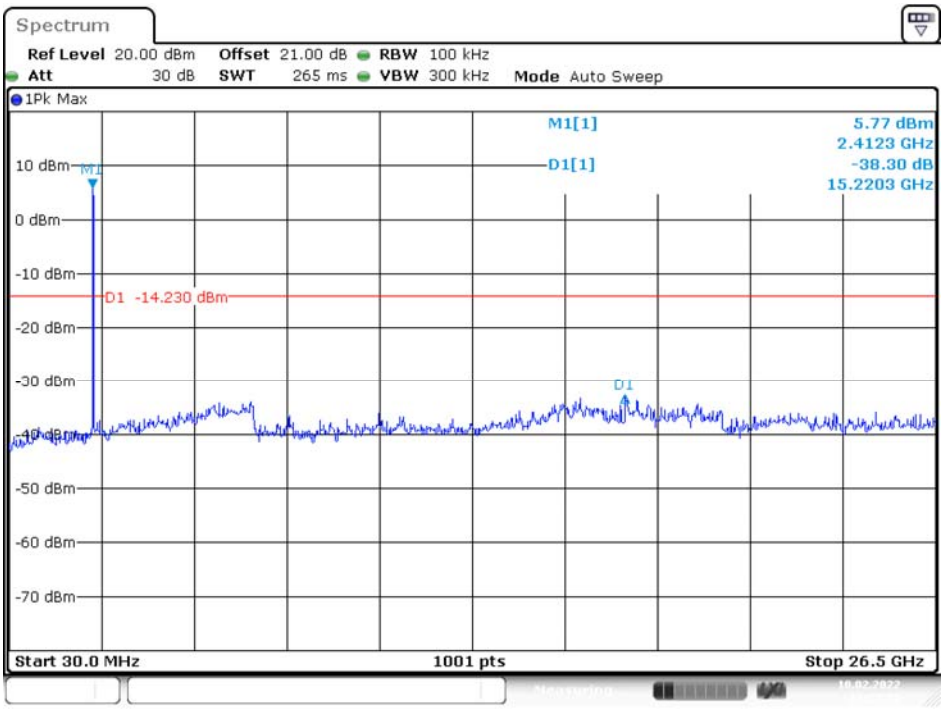
Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
B Mode				
Low	2412	38.85	≥ 20	PASS
Middle	2437	38.30	≥ 20	PASS
High	2462	37.60	≥ 20	PASS
G Mode				
Low	2412	32.05	≥ 20	PASS
Middle	2437	34.98	≥ 20	PASS
High	2462	32.22	≥ 20	PASS
N20 Mode				
Low	2412	29.24	≥ 20	PASS
Middle	2437	35.38	≥ 20	PASS
High	2462	30.56	≥ 20	PASS
N40 Mode				
Low	2422	28.83	≥ 20	PASS
Middle	2437	29.08	≥ 20	PASS
High	2452	25.56	≥ 20	PASS

B Mode

Low Channel

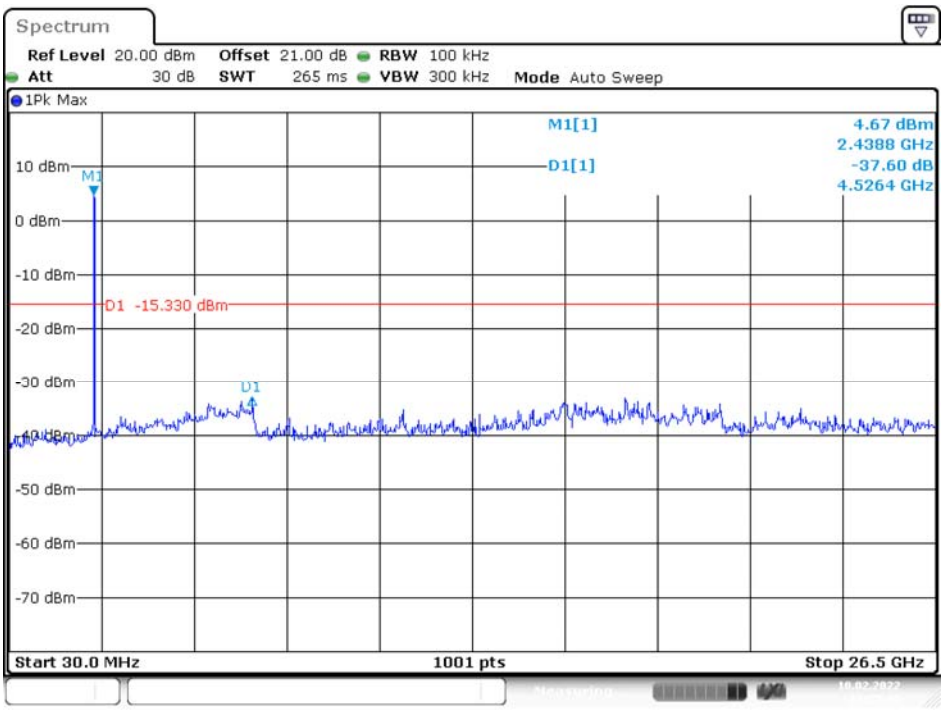


Middle Channel



Date: 10.FEB.2022 13:22:20

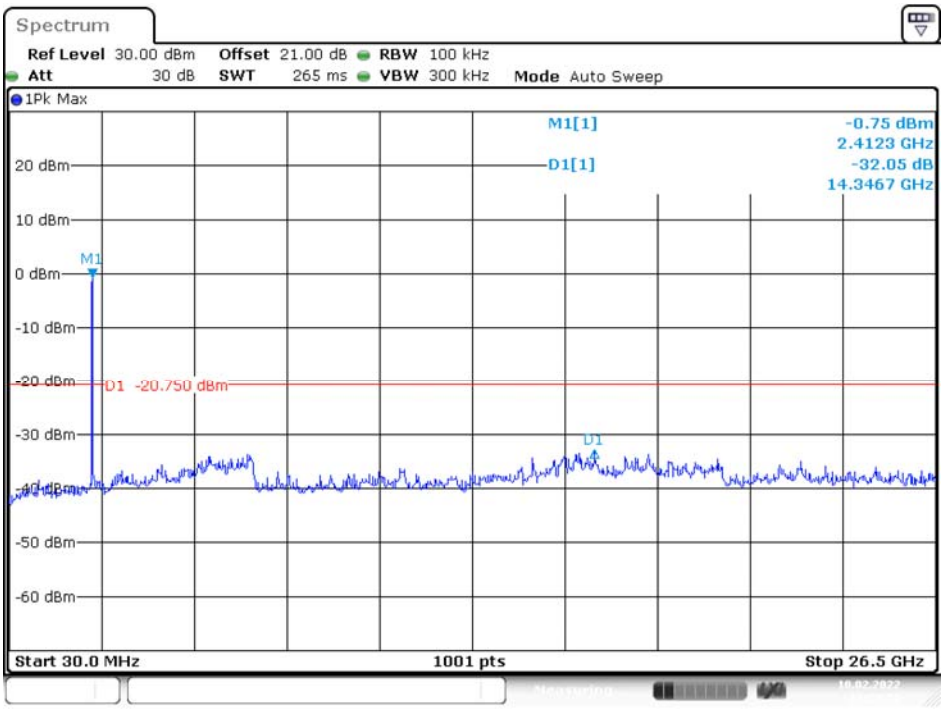
High Channel



Date: 10.FEB.2022 13:25:49

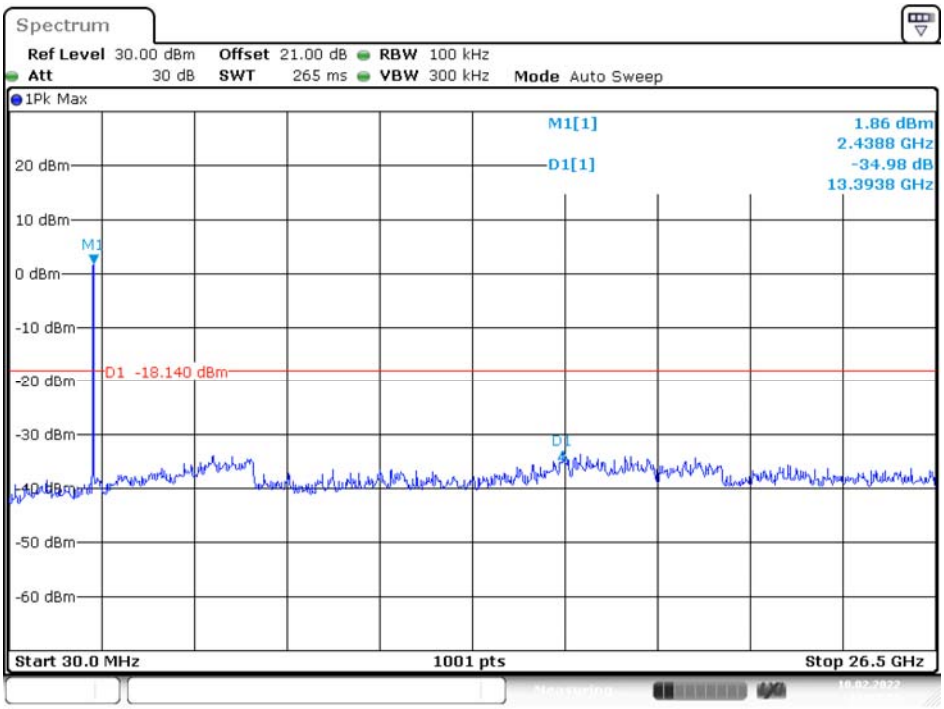
G Mode

Low Channel



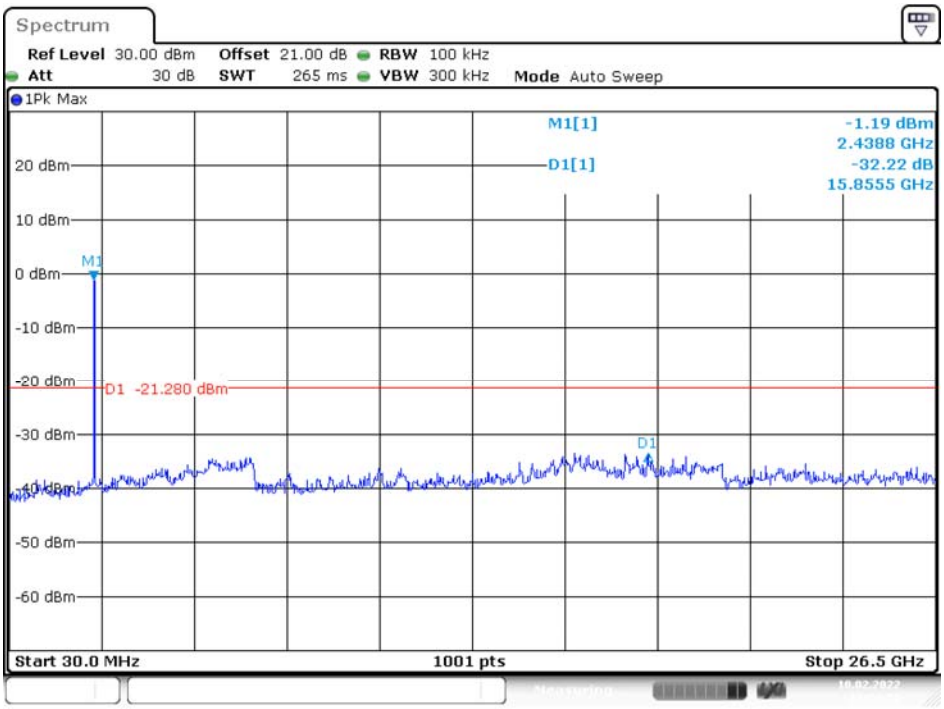
Date: 10.FEB.2022 13:28:58

Middle Channel



Date: 10.FEB.2022 13:31:57

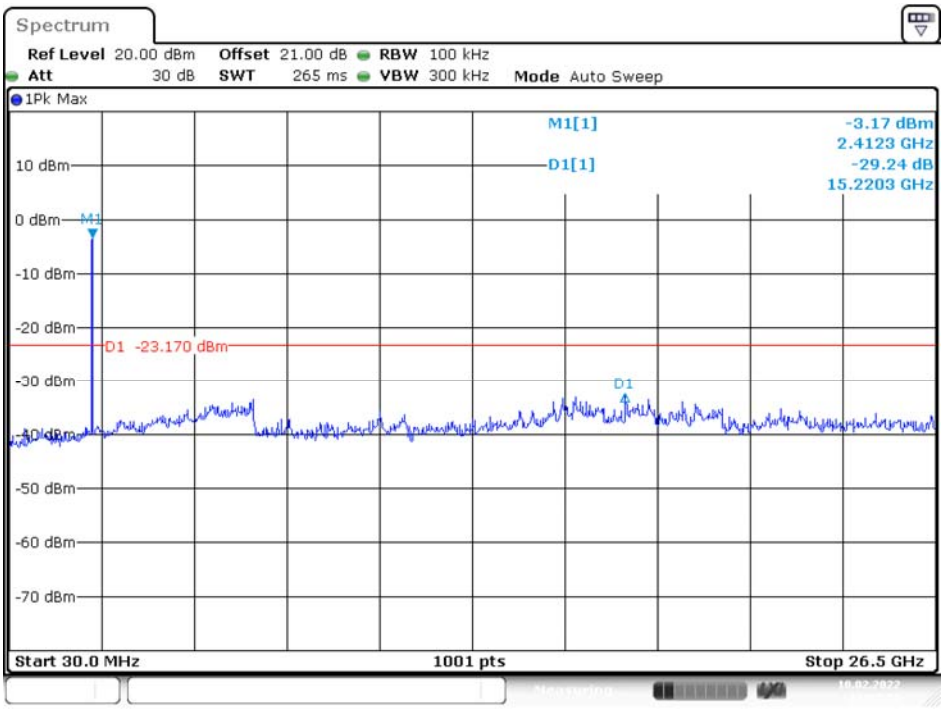
High Channel



Date: 10.FEB.2022 13:34:50

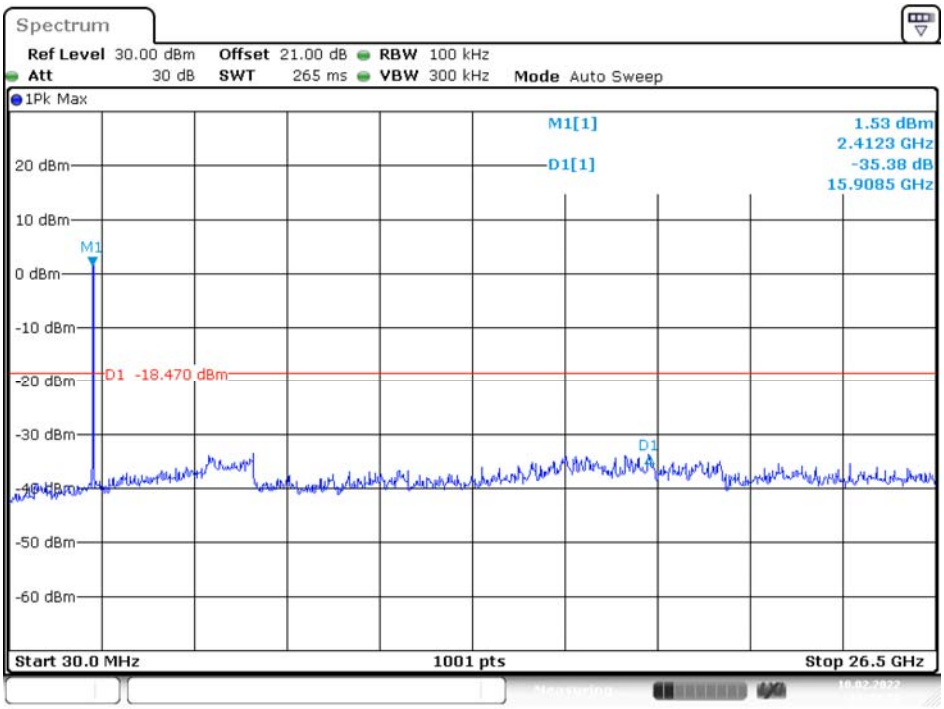
N20 Mode

Low Channel



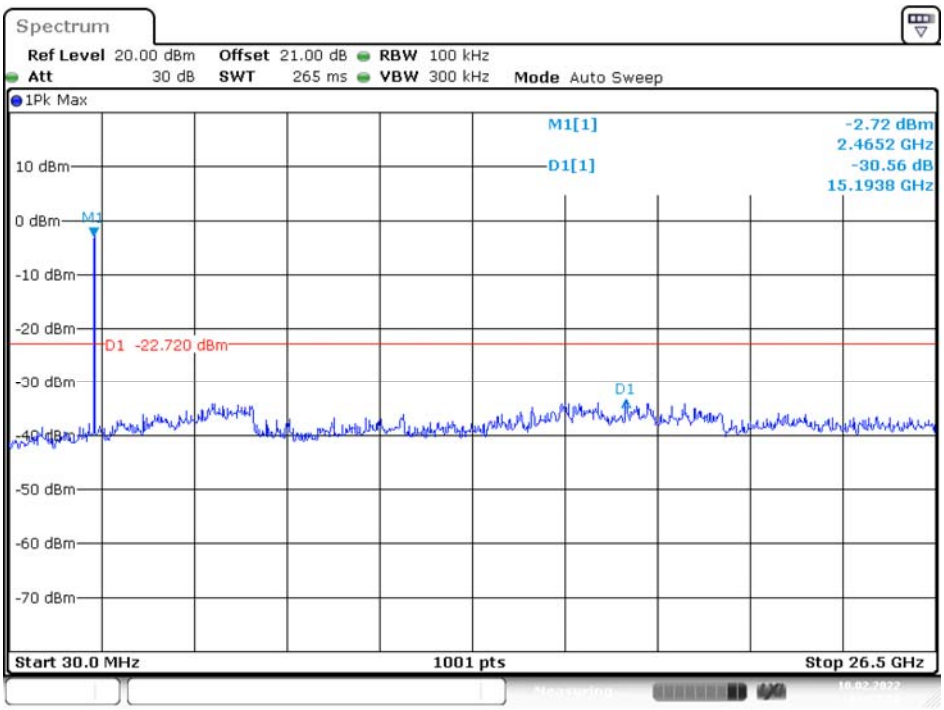
Date: 10.FEB.2022 13:37:59

Middle Channel



Date: 10.FEB.2022 13:41:56

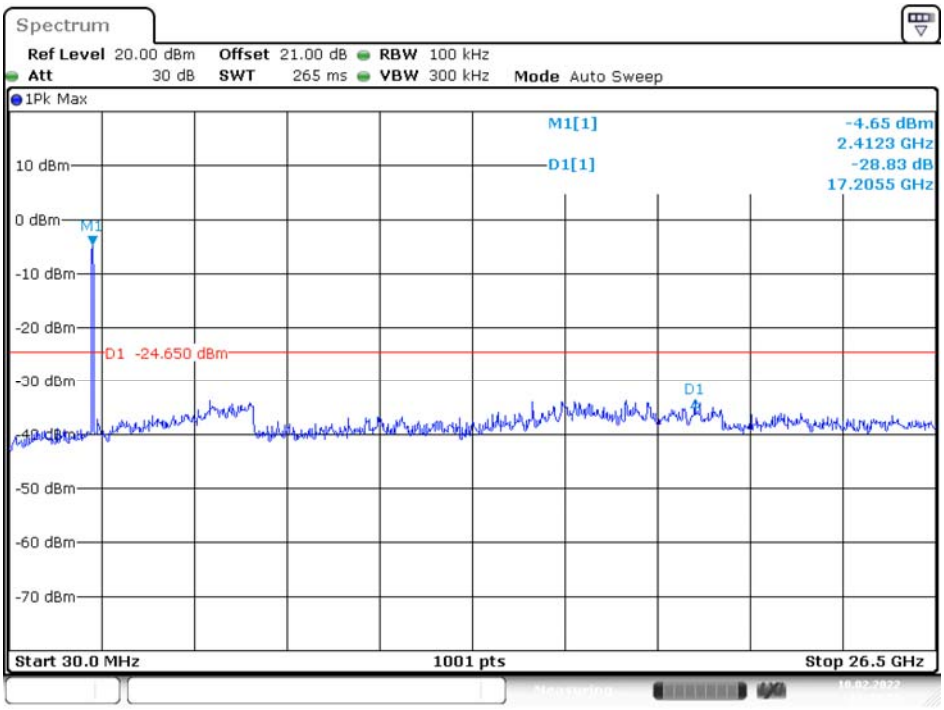
High Channel



Date: 10.FEB.2022 13:45:02

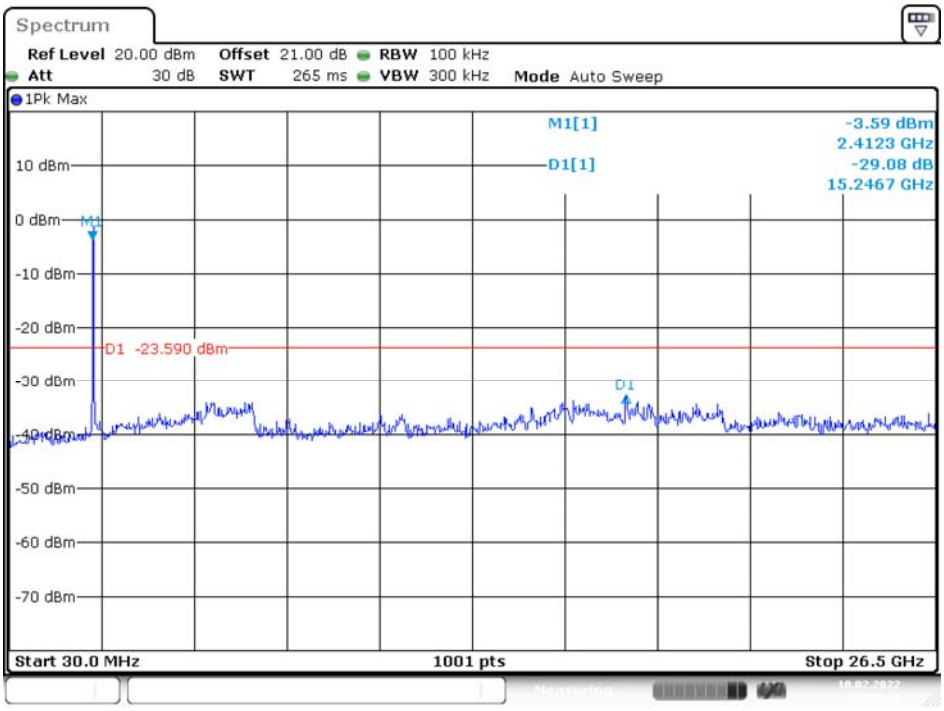
N40 Mode

Low Channel



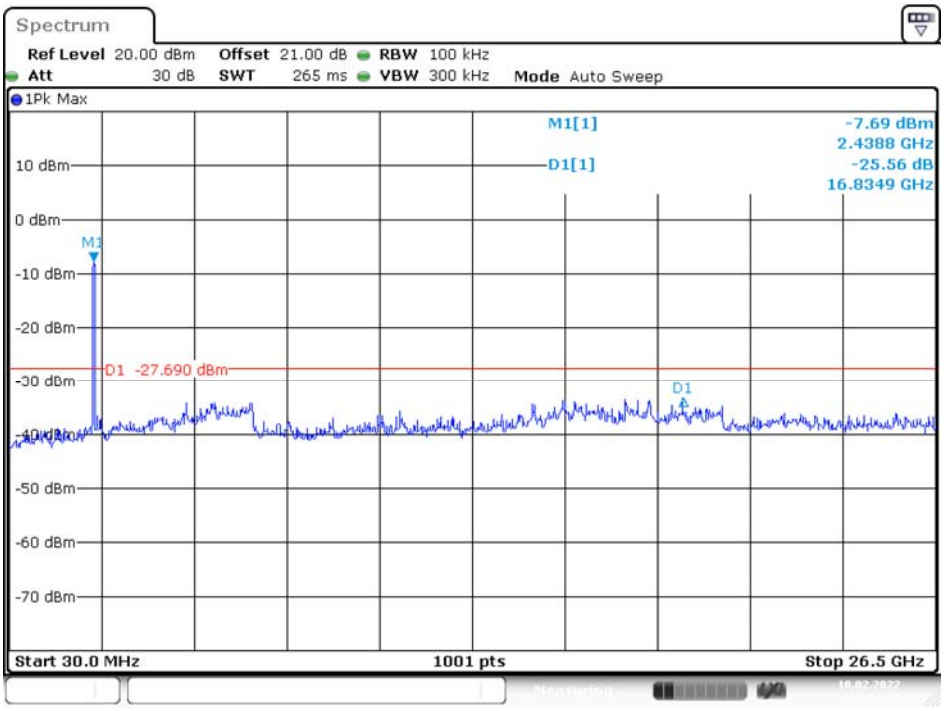
Date: 10.FEB.2022 13:48:53

Middle Channel



Date: 10.FEB.2022 13:51:40

High Channel



Date: 10.FEB.2022 13:54:47

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

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.

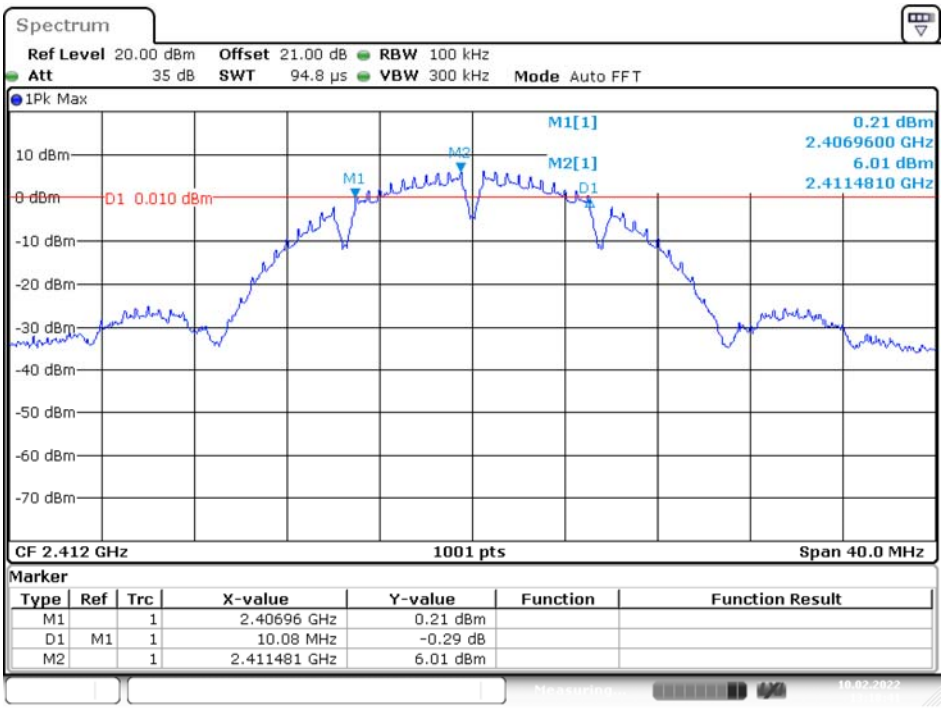
9.3 Test Results

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (kHz)	Result
B Mode				
Low	2412	10.08	> 500	PASS
Middle	2437	10.08	> 500	PASS
High	2462	10.08	> 500	PASS
G Mode				
Low	2412	16.36	> 500	PASS
Middle	2437	16.36	> 500	PASS
High	2462	16.36	> 500	PASS
N20 Mode				
Low	2412	17.60	> 500	PASS
Middle	2437	17.60	> 500	PASS
High	2462	17.60	> 500	PASS
N40 Mode				
Low	2422	36.40	> 500	PASS
Middle	2437	36.40	> 500	PASS
High	2452	36.32	> 500	PASS

Please refer to the following plots

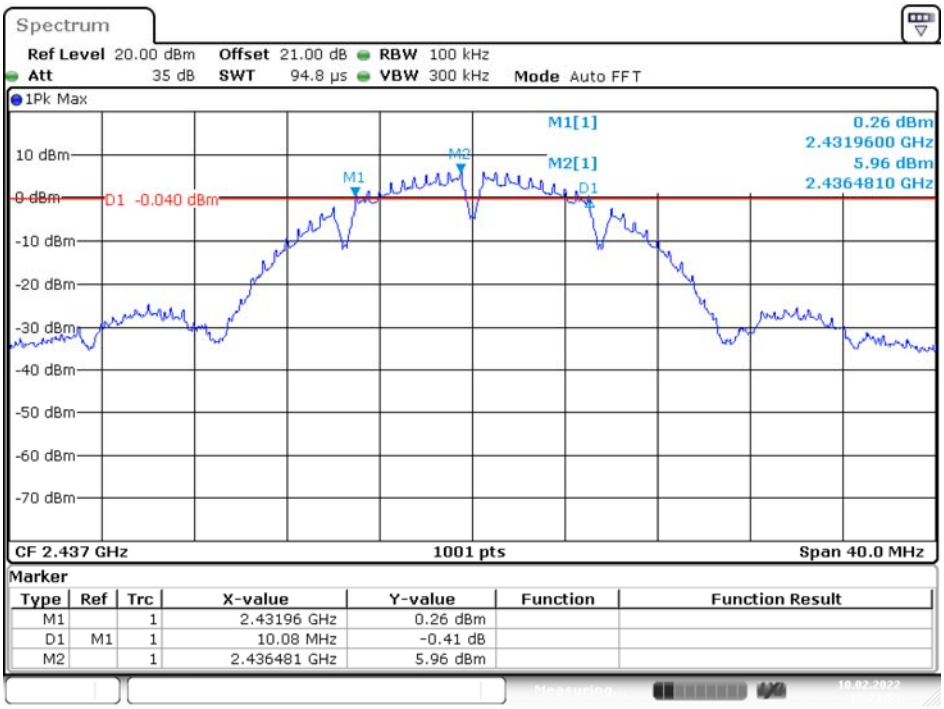
B Mode

Low Channel



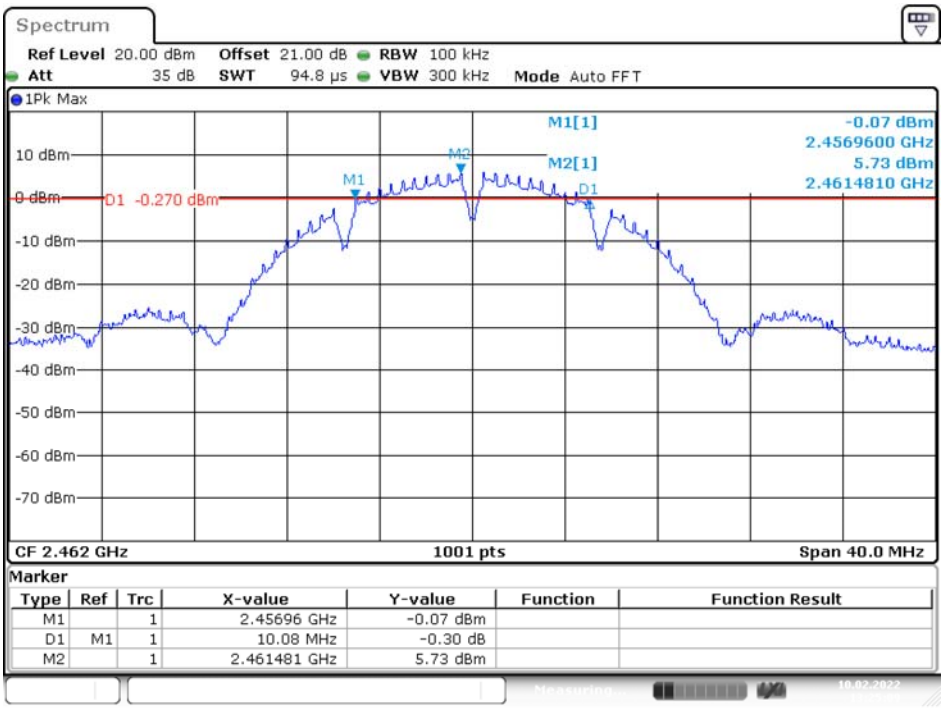
Date: 10.FEB.2022 13:18:41

Middle Channel



Date: 10.FEB.2022 13:21:55

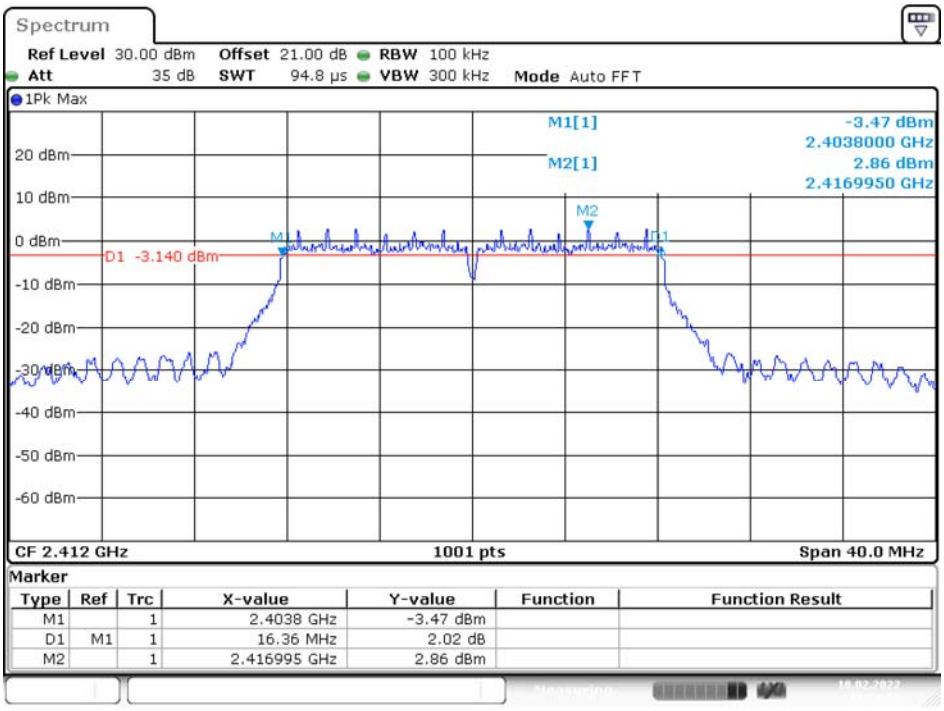
High Channel



Date: 10.FEB.2022 13:25:09

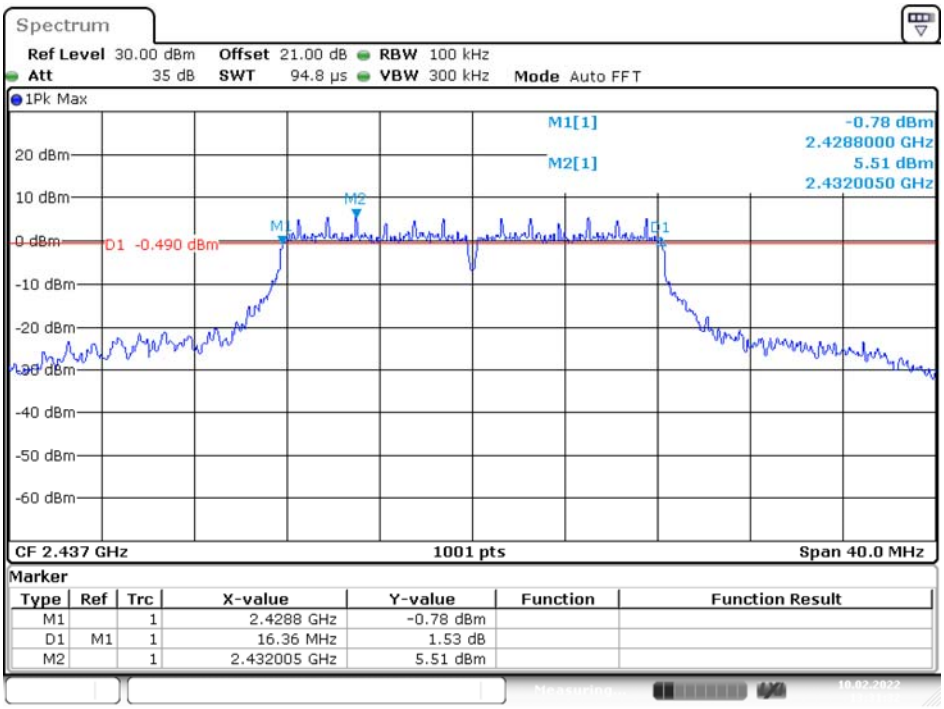
G Mode

Low Channel



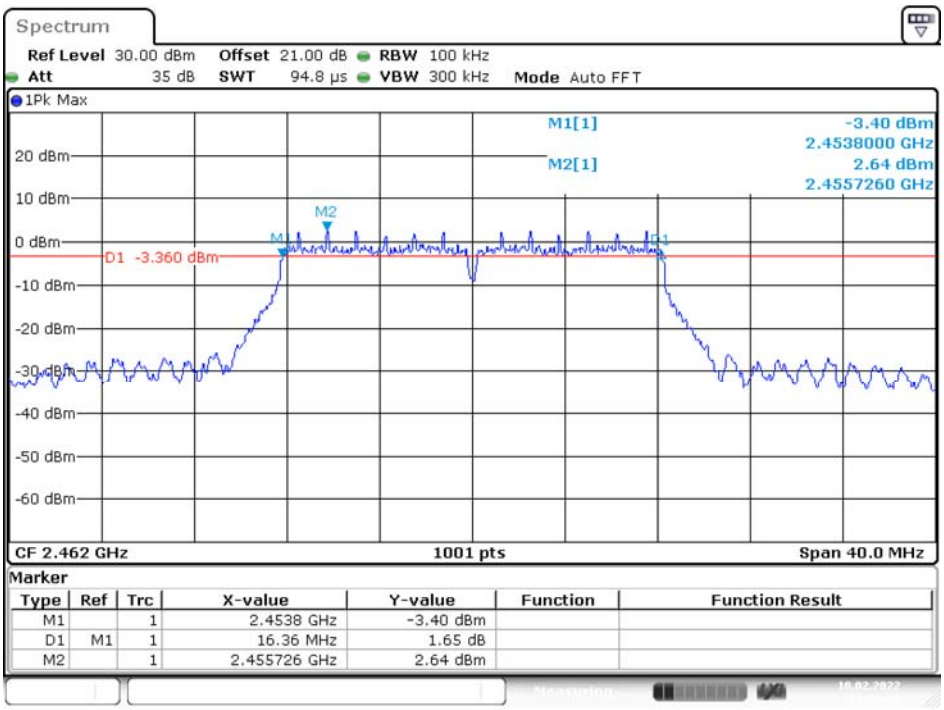
Date: 10.FEB.2022 13:28:18

Middle Channel



Date: 10.FEB.2022 13:31:32

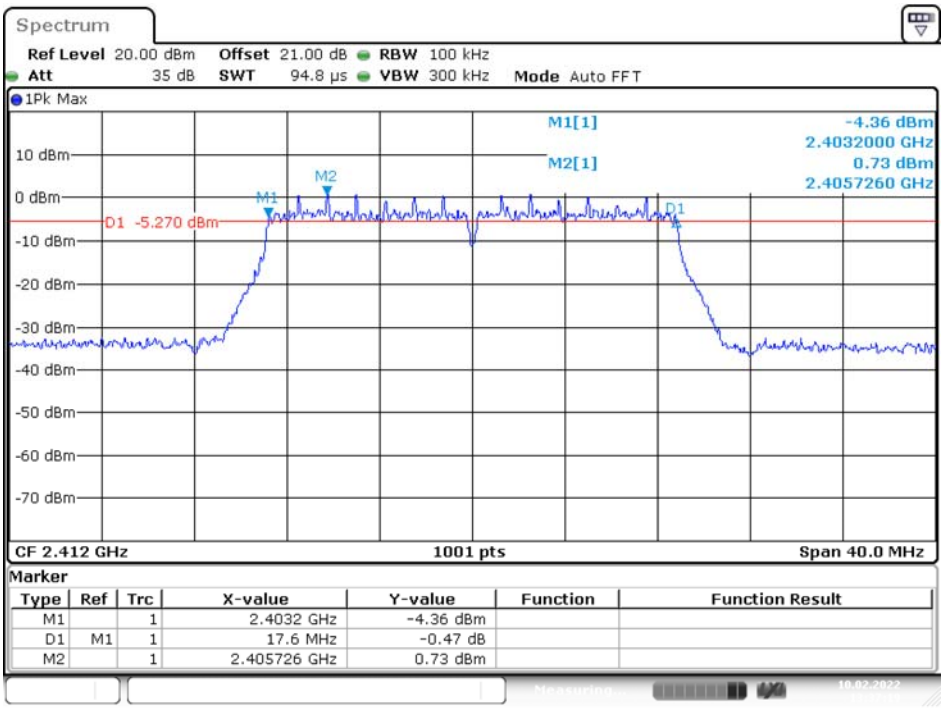
High Channel



Date: 10.FEB.2022 13:34:10

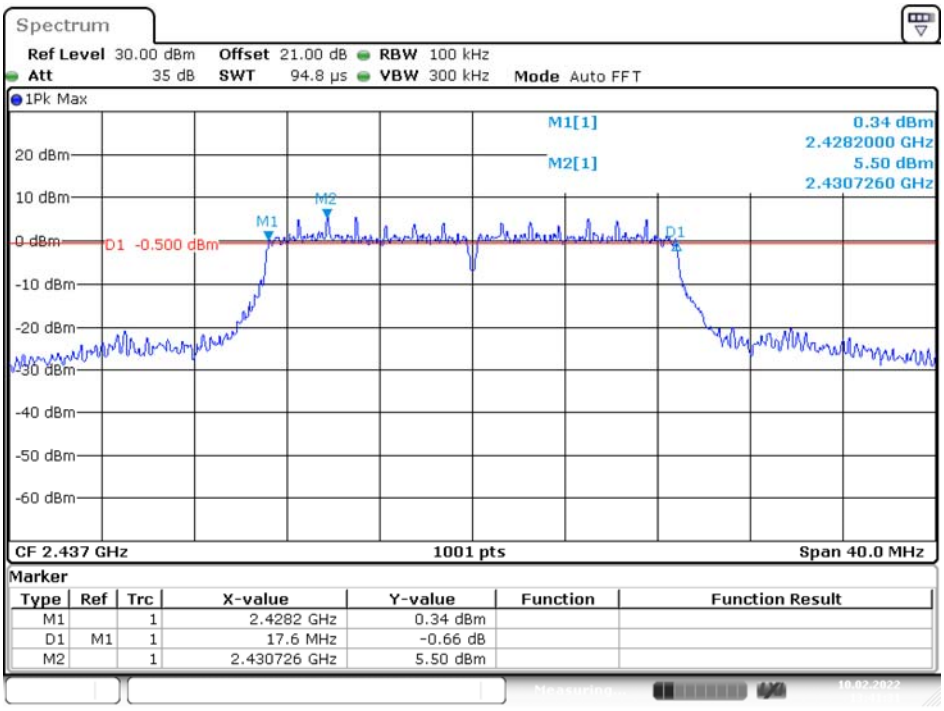
N20 Mode

Low Channel



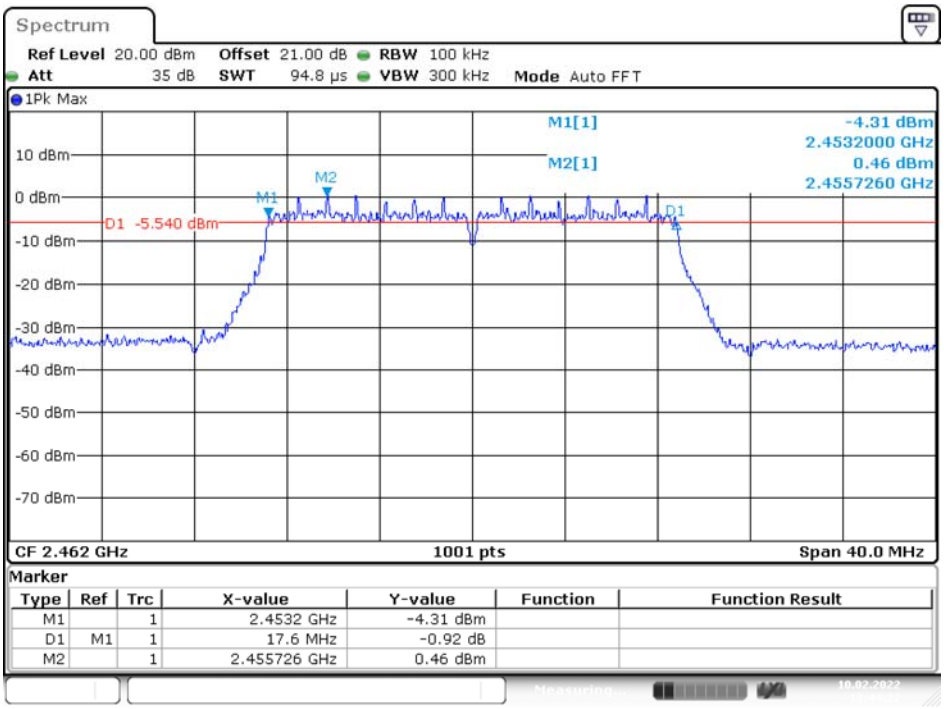
Date: 10.FEB.2022 13:37:19

Middle Channel



Date: 10.FEB.2022 13:41:31

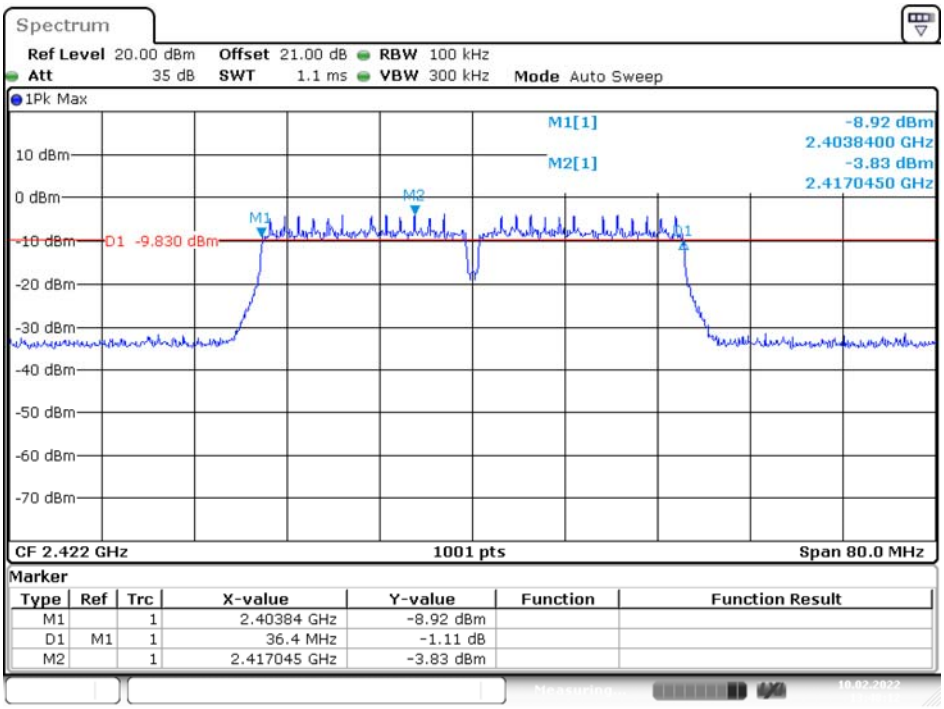
High Channel



Date: 10.FEB.2022 13:44:22

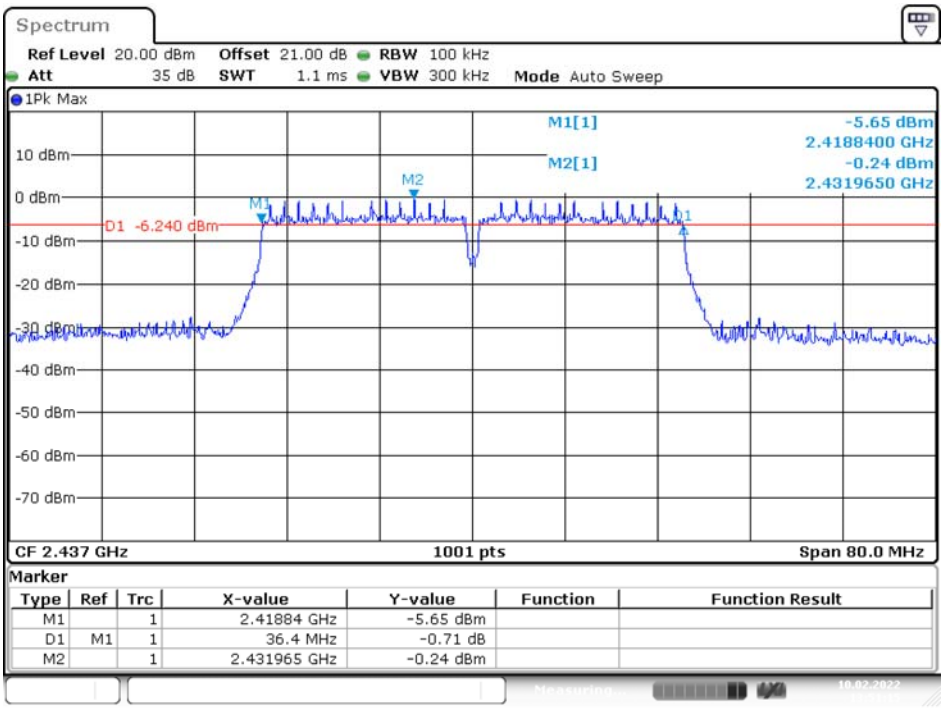
N40 Mode

Low Channel



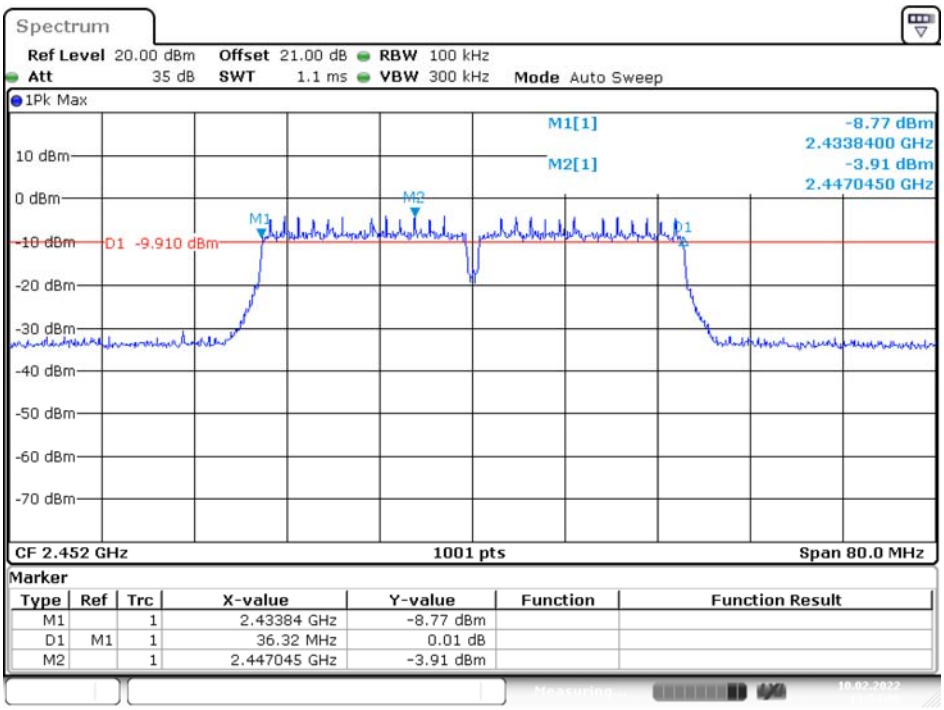
Date: 10.FEB.2022 13:48:12

Middle Channel



Date: 10.FEB.2022 13:51:15

High Channel



Date: 10.FEB.2022 13:54:06

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

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.

10.3 Test Results

Conducted Peak Output Power

Channel	Frequency (MHz)	Power (dBm)	Power (W)	Limit (W)	Result
802.11b Mode					
Low	2412	18.36	0.069	1	PASS
Middle	2437	18.25	0.067	1	PASS
High	2462	18.08	0.064	1	PASS
802.11g Mode					
Low	2412	23.75	0.237	1	PASS
Middle	2437	24.28	0.268	1	PASS
High	2462	23.65	0.232	1	PASS
802.11n HT20 Mode					
Low	2412	23.01	0.200	1	PASS
Middle	2437	24.26	0.267	1	PASS
High	2462	22.85	0.193	1	PASS
802.11n HT40 Mode					
Low	2422	21.04	0.127	1	PASS
Middle	2437	23.15	0.207	1	PASS
High	2452	21.09	0.129	1	PASS

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

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.

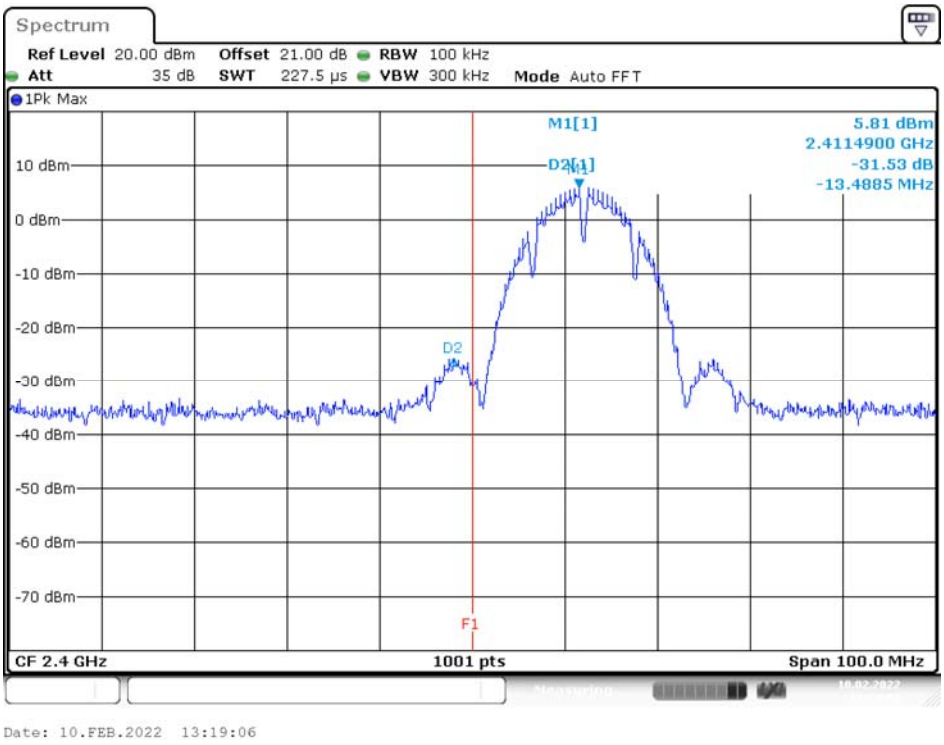
11.3 Test Results

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
B Mode				
Low	2412	31.53	≥ 20	PASS
High	2462	38.47	≥ 20	PASS
G Mode				
Low	2412	29.78	≥ 20	PASS
High	2462	35.28	≥ 20	PASS
N20 Mode				
Low	2412	33.98	≥ 20	PASS
High	2462	33.26	≥ 20	PASS
N40 Mode				
Low	2422	28.94	≥ 20	PASS
High	2452	29.02	≥ 20	PASS

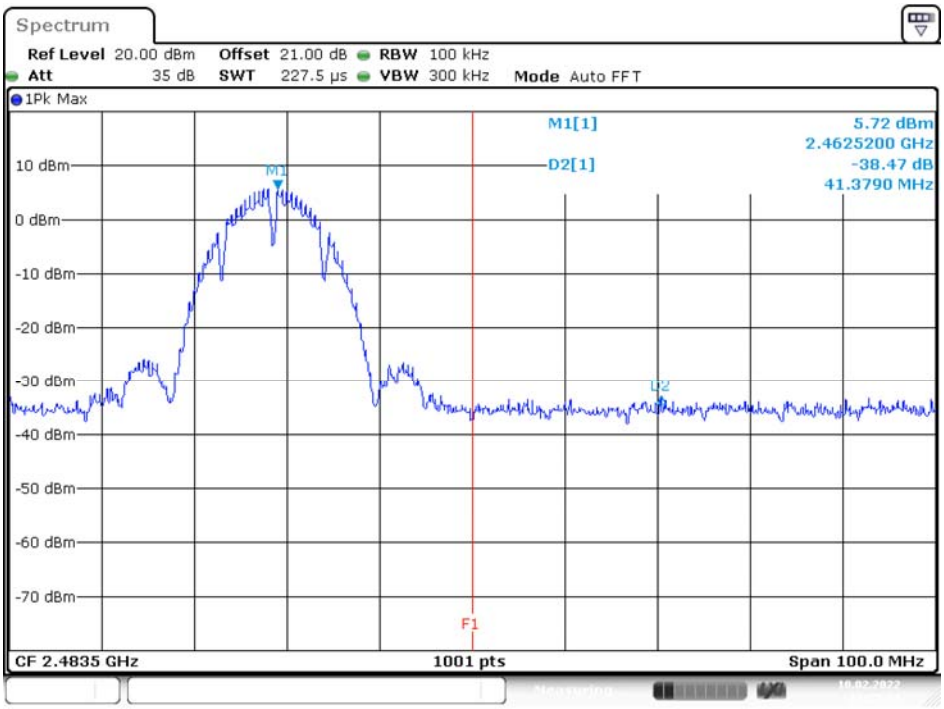
Please refer to the following plots.

B Mode

Band Edge, Left Side



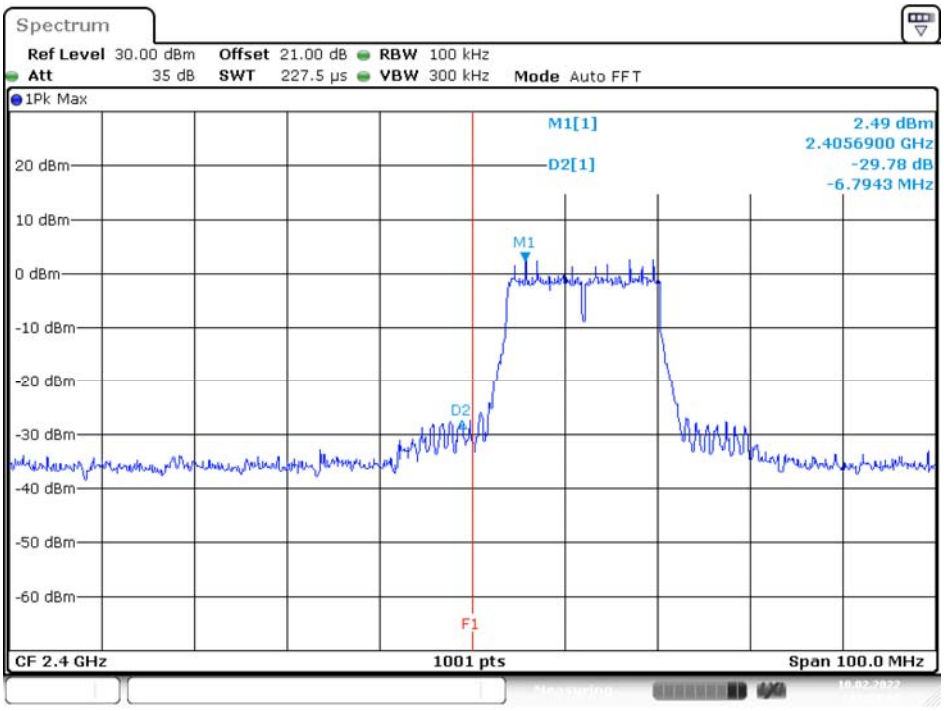
Band Edge, Right Side



Date: 10.FEB.2022 13:25:34

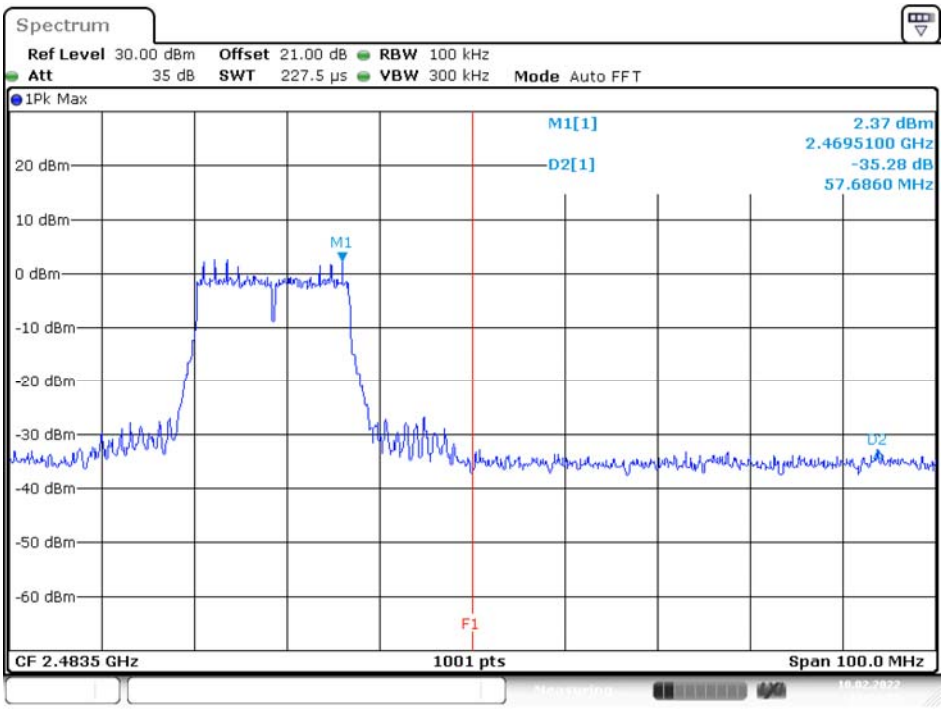
G Mode

Band Edge, Left Side



Date: 10.FEB.2022 13:28:42

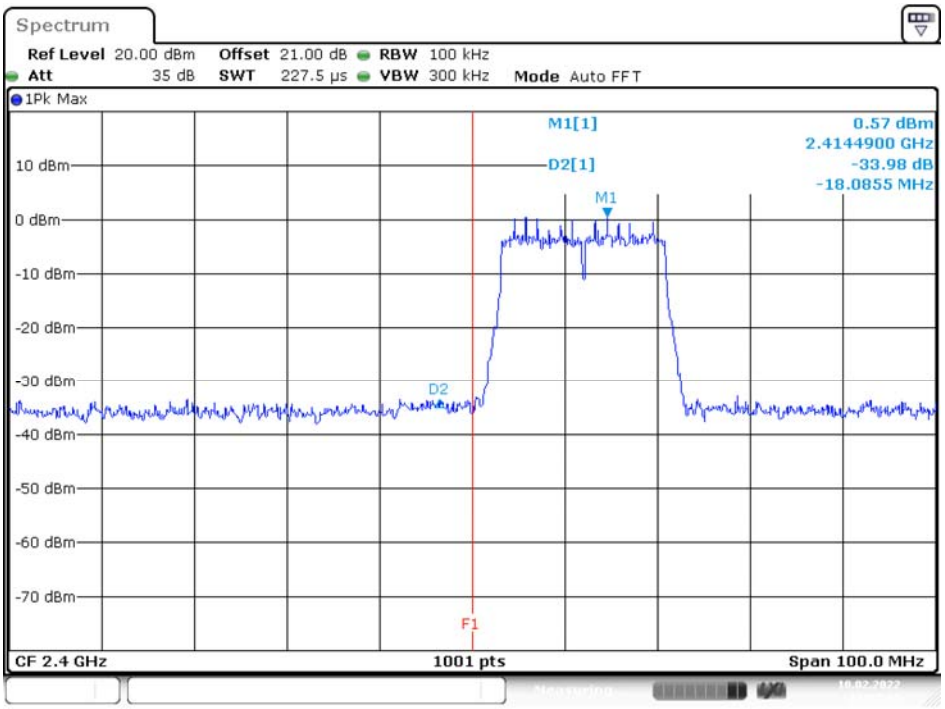
Band Edge, Right Side



Date: 10.FEB.2022 13:34:35

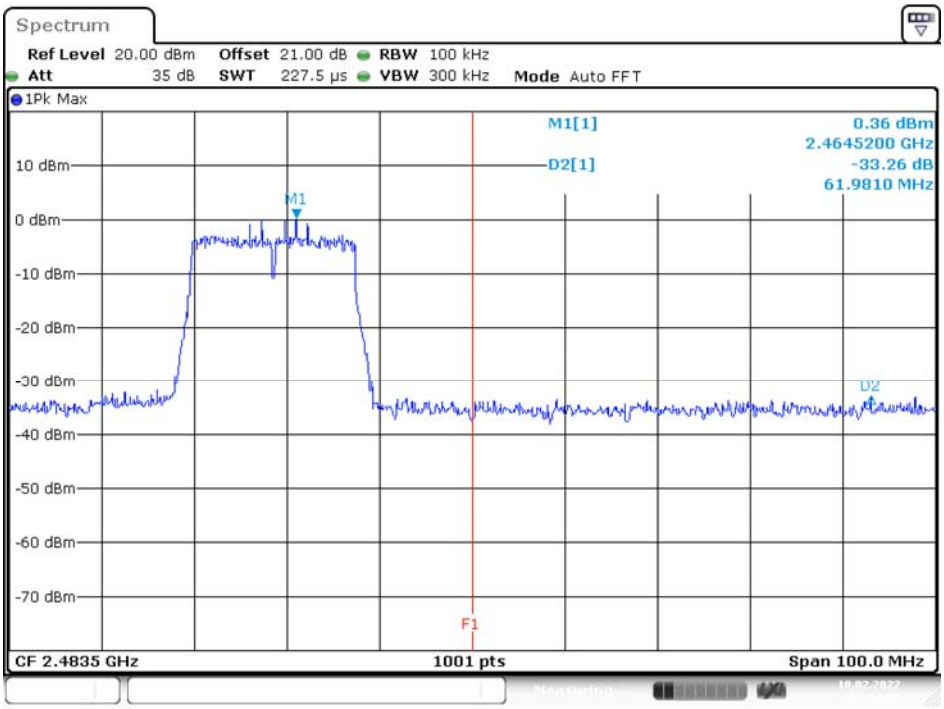
N20 Mode

Band Edge, Left Side



Date: 10.FEB.2022 13:37:43

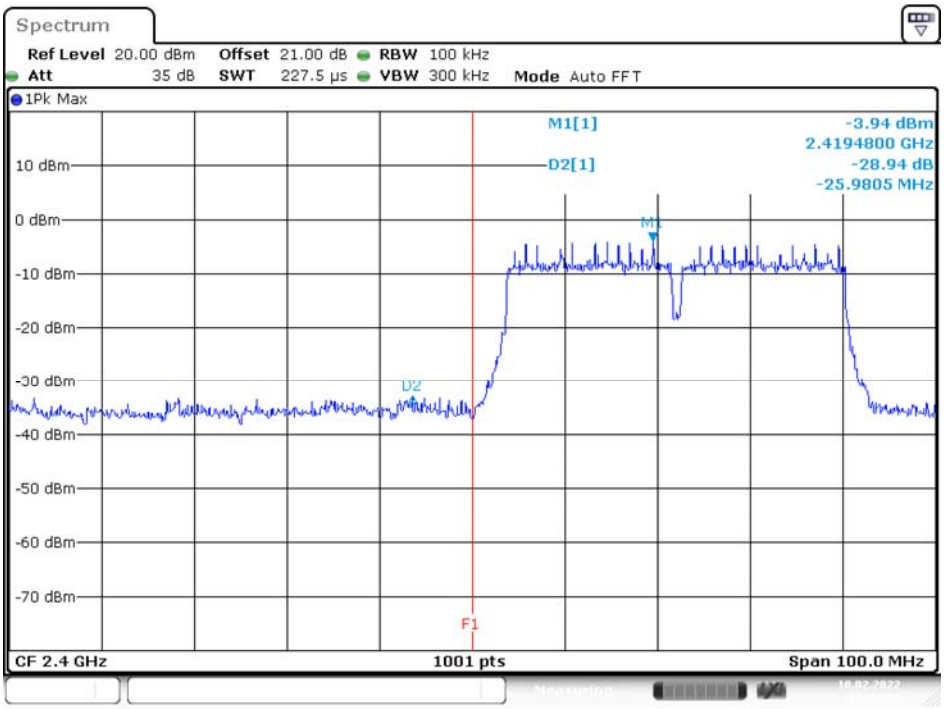
Band Edge, Right Side



Date: 10.FEB.2022 13:44:47

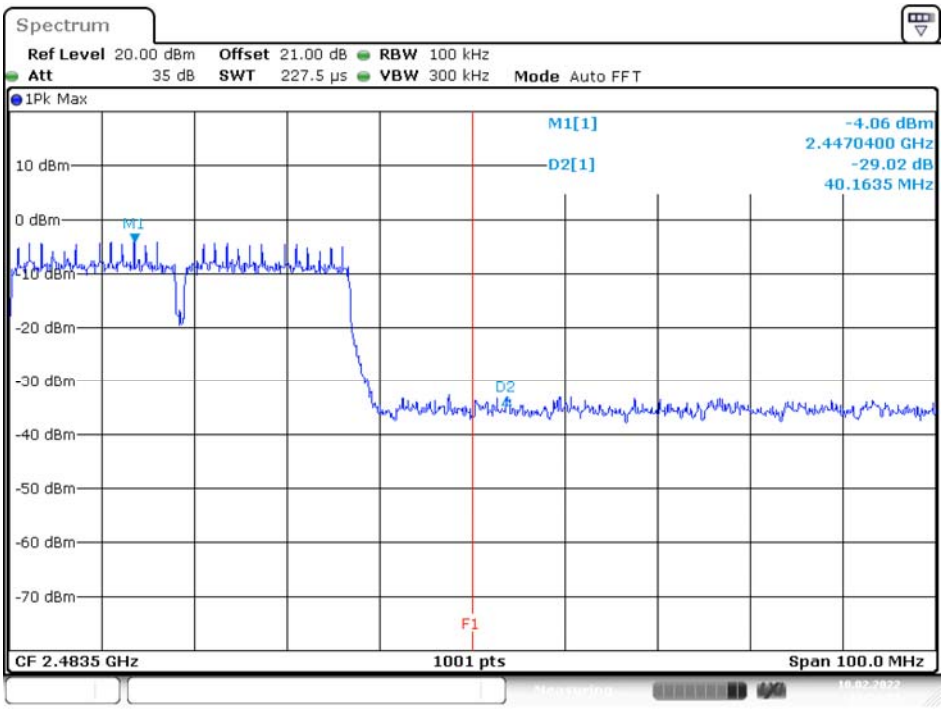
N40 Mode

Band Edge, Left Side



Date: 10.FEB.2022 13:48:37

Band Edge, Right Side



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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

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

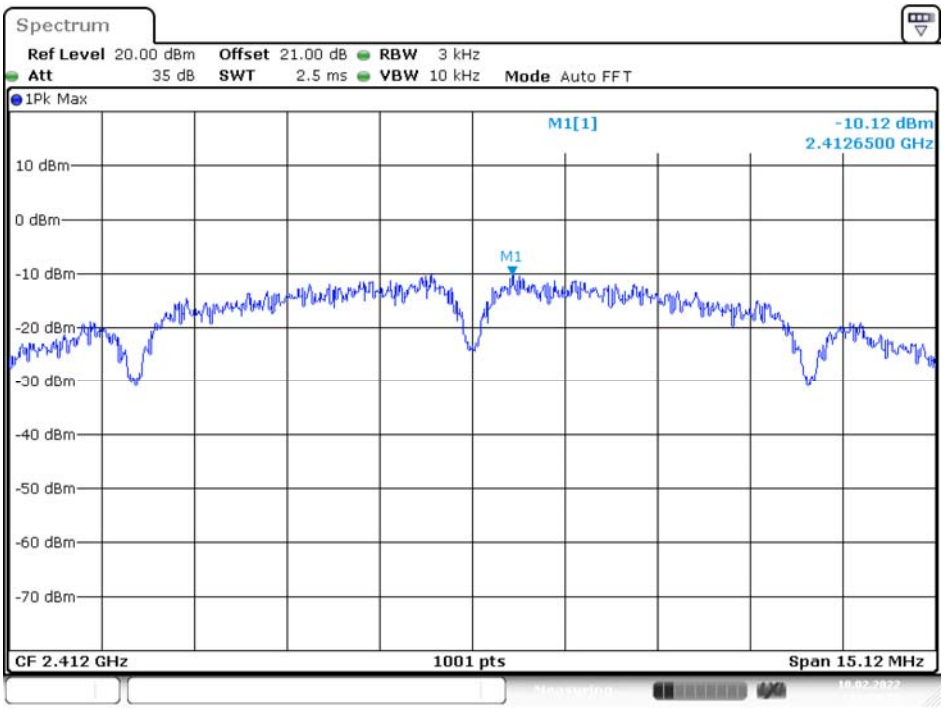
12.3 Test Results

Channel	Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
B Mode				
Low	2412	-10.12	8	PASS
Middle	2437	-10.16	8	PASS
High	2462	-10.39	8	PASS
G Mode				
Low	2412	-11.50	8	PASS
Middle	2437	-9.43	8	PASS
High	2462	-11.70	8	PASS
N20 Mode				
Low	2412	-13.26	8	PASS
Middle	2437	-9.57	8	PASS
High	2462	-14.33	8	PASS
N40 Mode				
Low	2422	-18.80	8	PASS
Middle	2437	-15.19	8	PASS
High	2452	-18.96	8	PASS

Please refer to the following plots

B Mode

Low Channel



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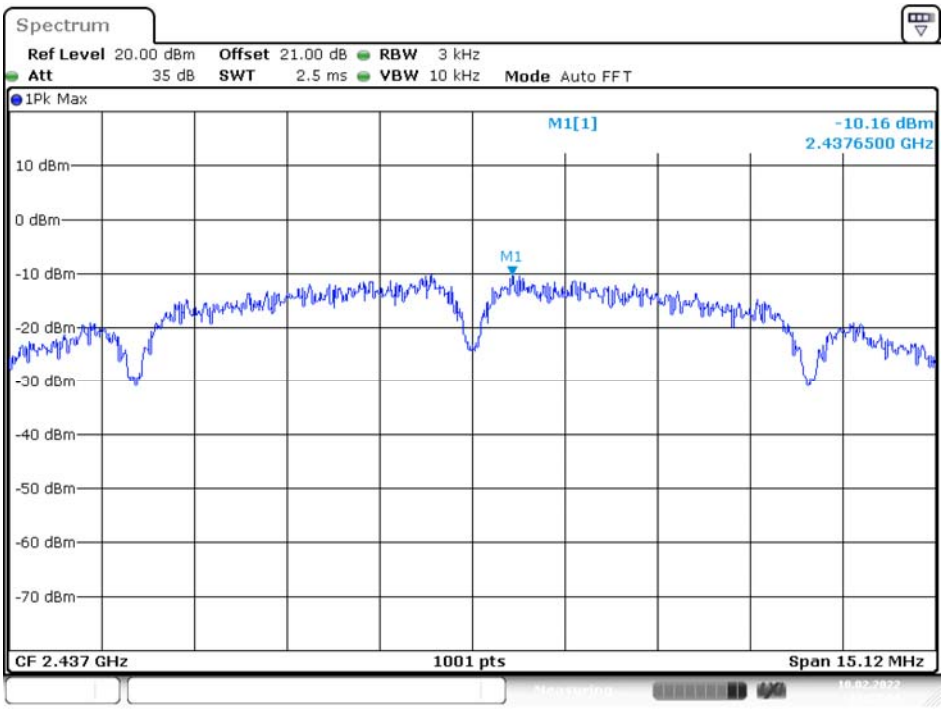
Middle Channel



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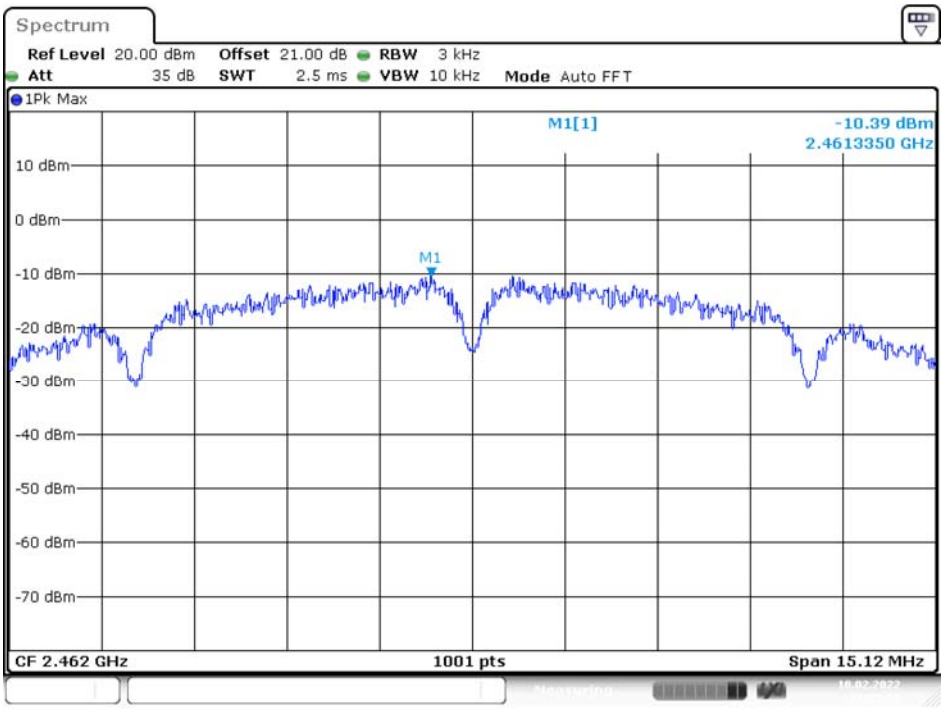
High Channel



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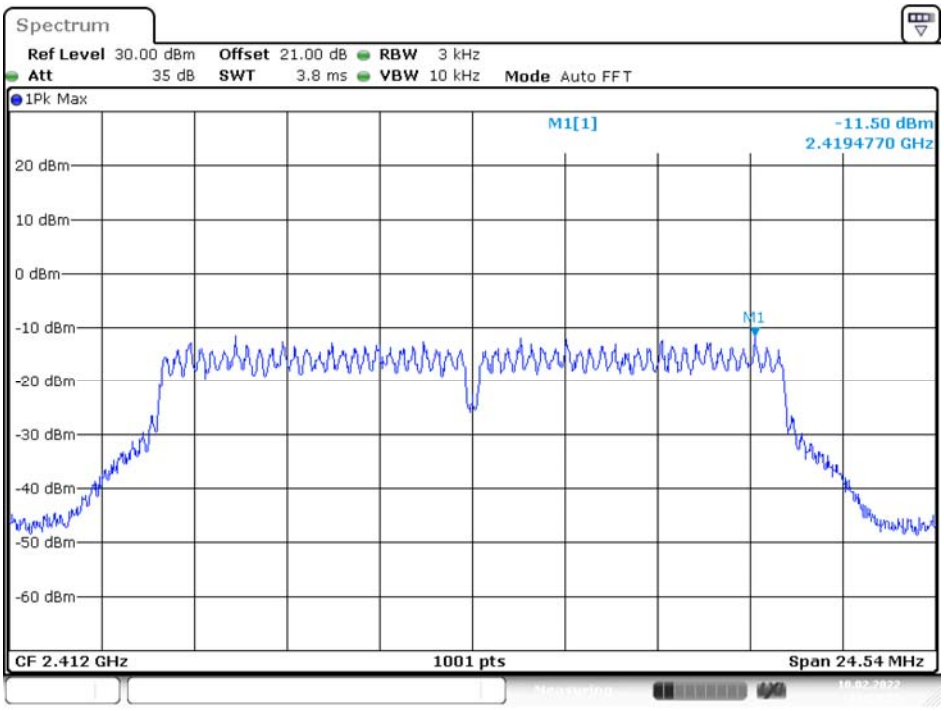
G Mode

Low Channel



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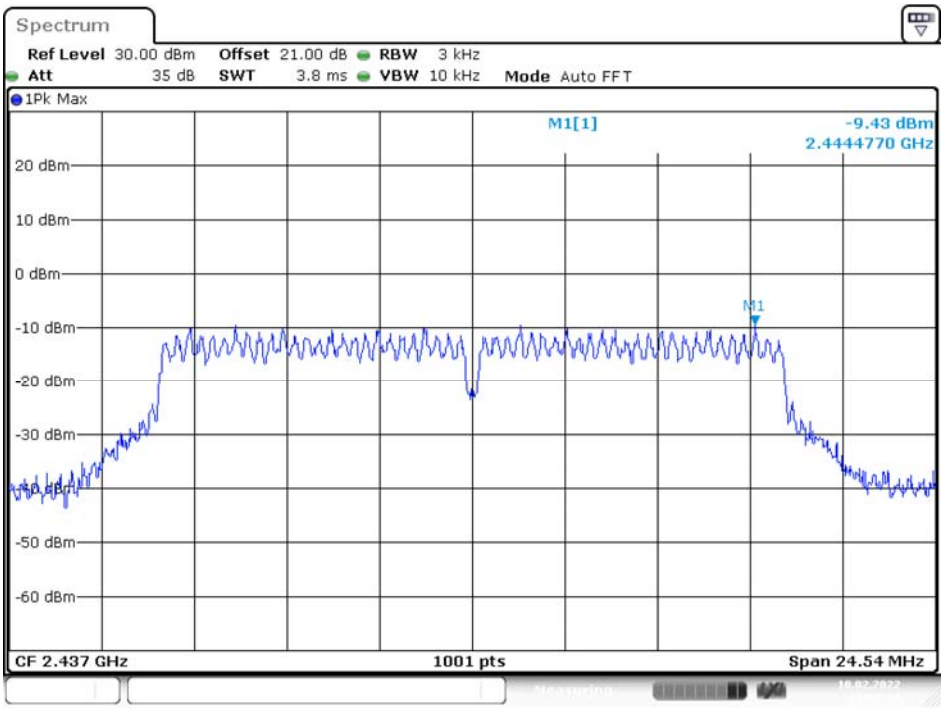
Middle Channel



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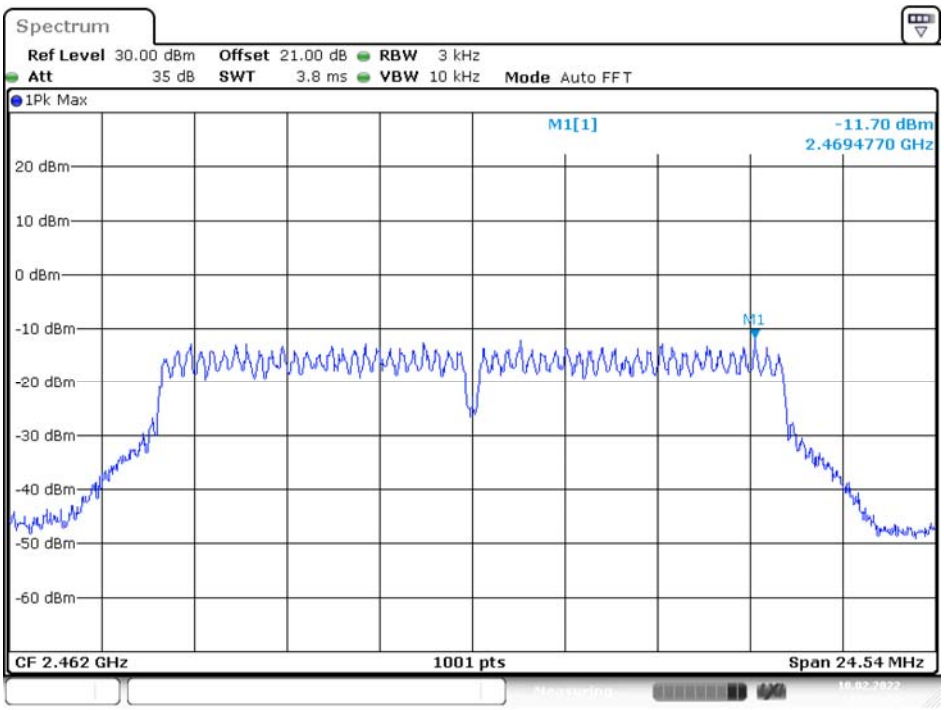
High Channel



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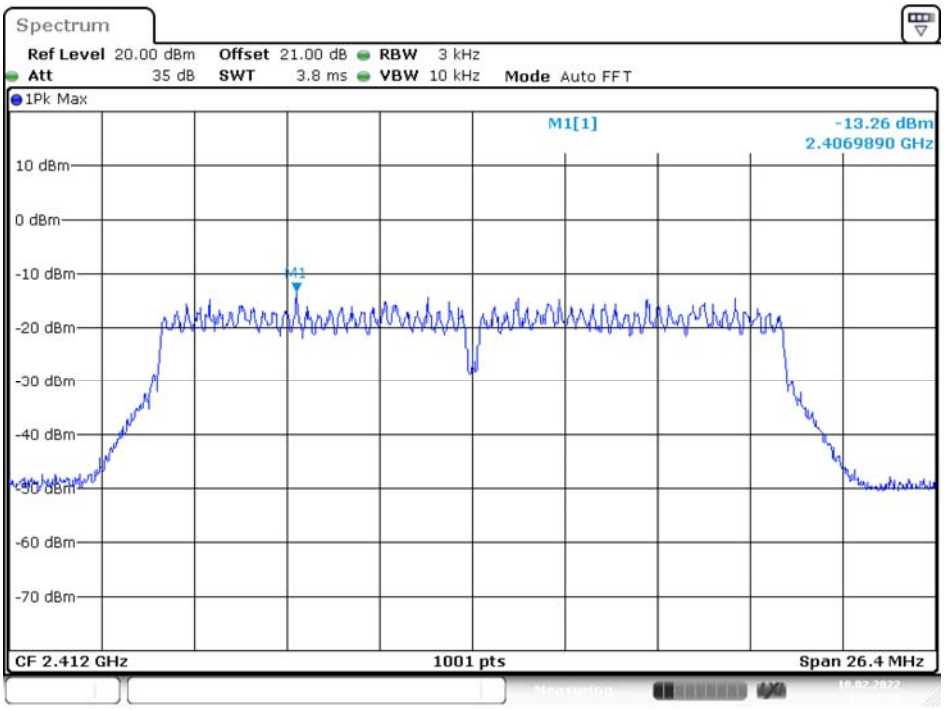
N20 Mode

Low Channel



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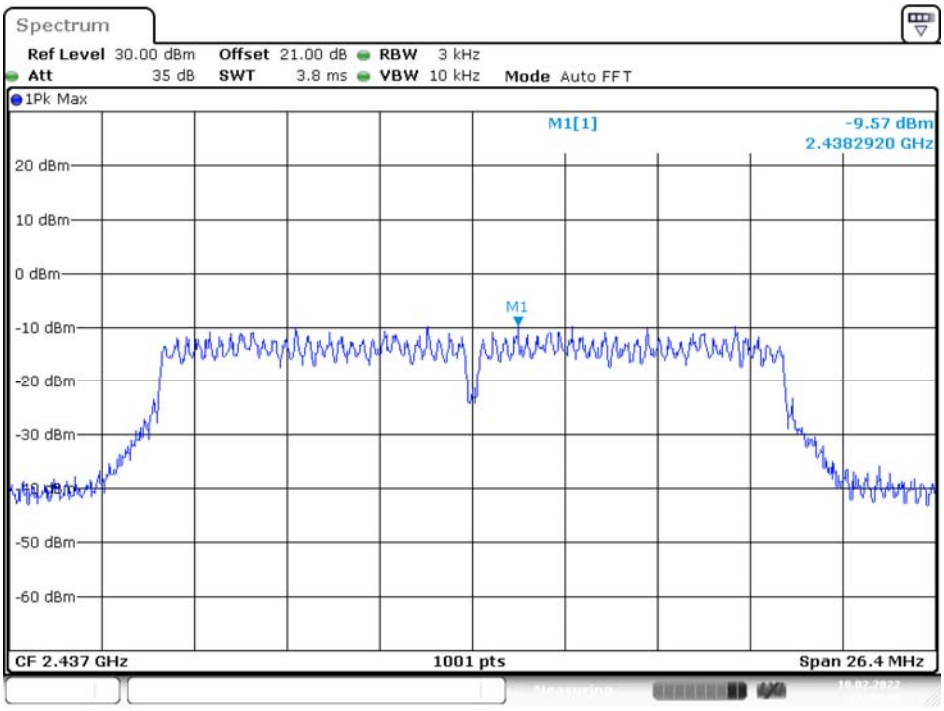
Middle Channel



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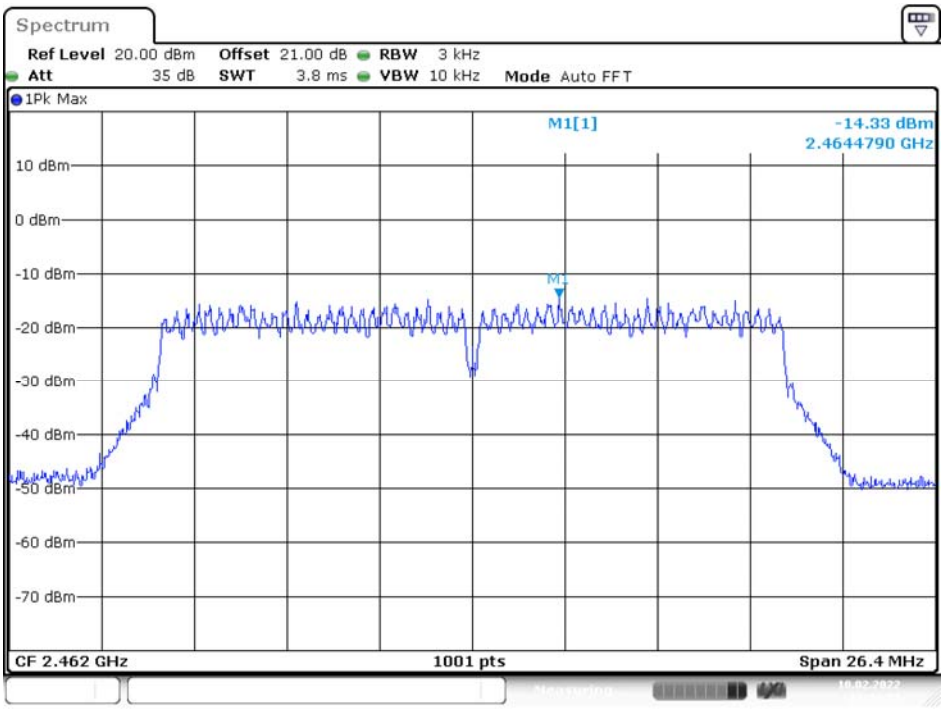
High Channel



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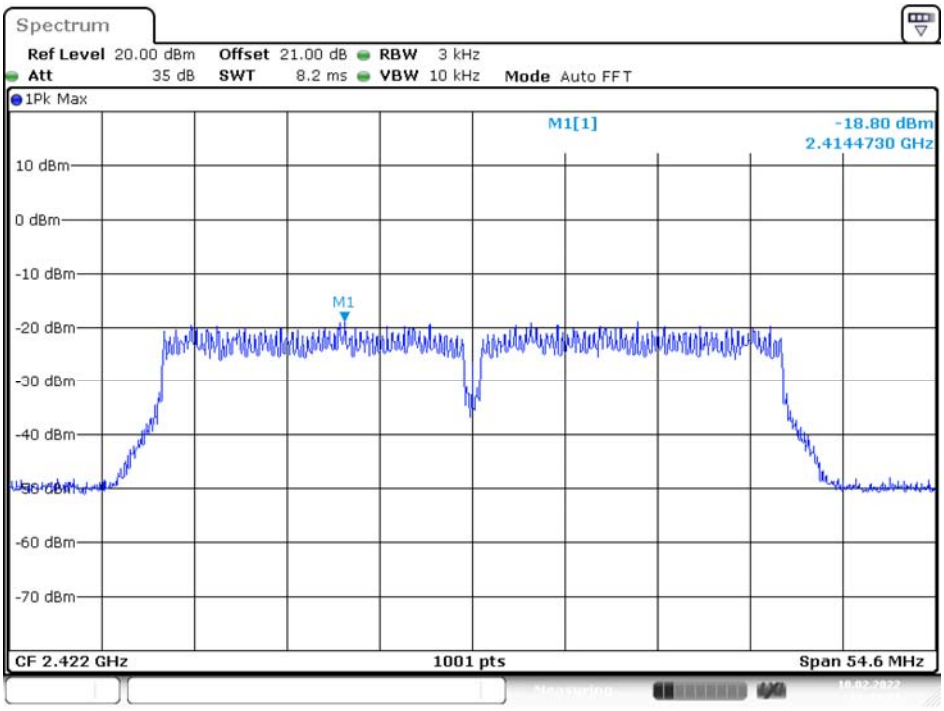
N40 Mode

Low Channel



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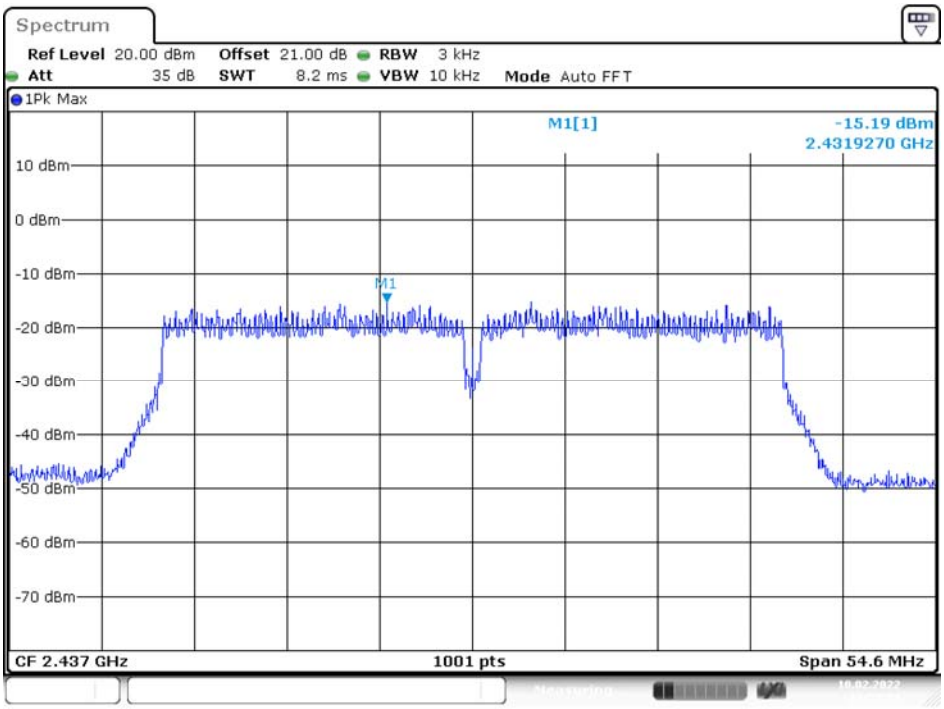
Middle Channel



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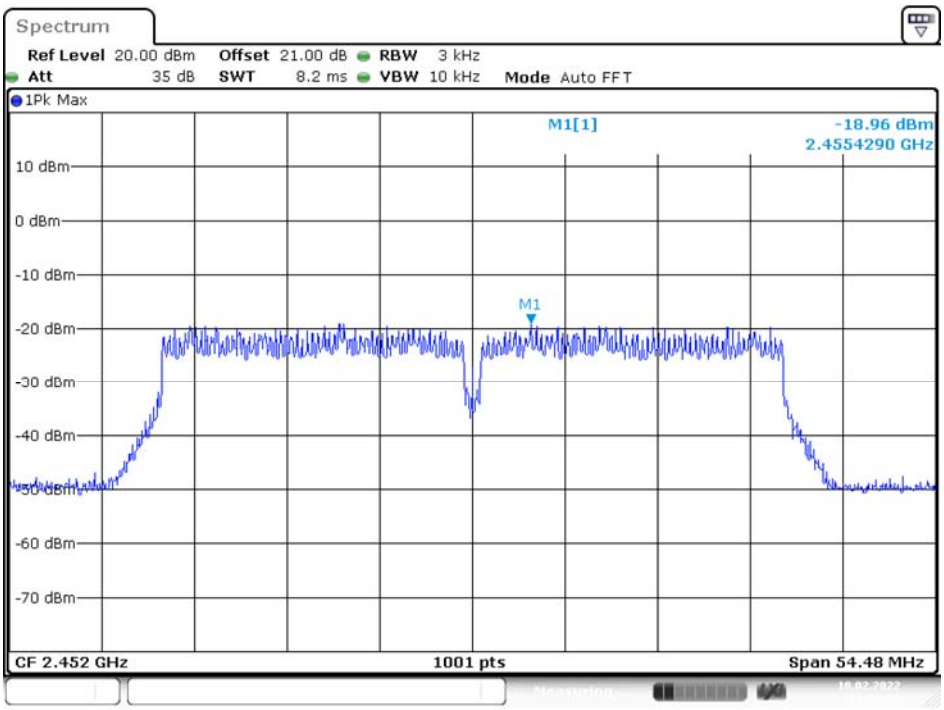
High Channel



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