FCC Part 15.247

TEST REPORT

For

Ten Tronics Co., Ltd

No. 33, Lane 347, Chung-San S.Road Young-Kang District,Tainan, 710 Taiwan

FCC ID: 2ACIA-TTBT012

Report Type:	**Product Type:**
Original Report	WIFI Audio Streaming Amplifier

Report Producer : Nana Hsu

Report Number : RXZ211028002RF02

Report Date : 2022-01-10

Reviewed By: Andy Shih

Prepared By: Bay Area Compliance Laboratories Corp.
(New Taipei Laboratory)
70, Lane 169, Sec. 2, Datong Road, Xizhi Dist.,
New Taipei City 22183, Taiwan, R.O.C.
Tel: +886 (2) 2647 6898
Fax: +886 (2) 2647 6895
www.bacl.com.tw

Revision History

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
0.0	RXZ211028002	RXZ211028002RF02	2022-01-10	Original Report	Nana Hsu

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1 General Information

1.1 Product Description for Equipment under Test (EUT)

<table>
<tr><td rowspan="2">Applicant</td><td>Ten Tronics Co., Ltd</td></tr>
<tr><td>No. 33, Lane 347, Chung-San S.Road Young-Kang District,Tainan, 710 Taiwan</td></tr>
<tr><td rowspan="2">Manufacturer</td><td>Ten Tronics Co., Ltd</td></tr>
<tr><td>No. 33, Lane 347, Chung-San S.Road Young-Kang District,Tainan, 710 Taiwan</td></tr>
<tr><td>Brand(Trade) Name</td><td>Ten-Tronics</td></tr>
<tr><td>Product (Equipment)</td><td>WIFI Audio Streaming Amplifier</td></tr>
<tr><td>Main Model Name</td><td>A-1462WP</td></tr>
<tr><td>Series Model Name</td><td>A-1461WP, A-1461WPA, A-1462WPA</td></tr>
<tr><td>Model Discrepancy</td><td>The difference is explained in the table The model, A-1462WP is the testing sample, and the final test data are shown on this test report.
<table>
<tr><th>Model</th><th>Difference</th></tr>
<tr><td>A-1462WP (Main)</td><td>45W, with IR receiver</td></tr>
<tr><td>A-1461WP</td><td>25W, with IR receiver</td></tr>
<tr><td>A-1461WPA</td><td>25W, w/o IR receiver</td></tr>
<tr><td>A-1462WPA</td><td>45W, w/o IR receiver</td></tr>
</table></td></tr>
<tr><td>Frequency Range</td><td>IEEE 802.11b/g / IEEE 802.11n HT20 Mode: 2412 ~ 2462 MHz
IEEE 802.11n HT40 Mode: 2422 ~ 2452 MHz</td></tr>
<tr><td>Transmit Power</td><td>IEEE 802.11b Mode: 20.85 dBm
IEEE 802.11g Mode: 23.66 dBm
IEEE 802.11n HT20 Mode: 23.94 dBm
IEEE 802.11n HT40 Mode: 19.68 dBm</td></tr>
<tr><td>Modulation Technique</td><td>IEEE 802.11b Mode: DSSS
IEEE 802.11g Mode: OFDM
IEEE 802.11n HT20 Mode: OFDM
IEEE 802.11n HT40 Mode: OFDM</td></tr>
<tr><td rowspan="3">Power Operation
(Voltage Range)</td><td>☐ AC 120V/60Hz
☐ Adapter
☐ By AC Power Cord
☐ PoE</td></tr>
<tr><td>☒ DC Type
☐ Battery
☐ DC Power Supply
☐ External from USB Cable
☒ External DC Adapter 24V</td></tr>
<tr><td>☐ Host System</td></tr>
<tr><td>Received Date</td><td>Nov 01, 2021</td></tr>
<tr><td>Date of Test</td><td>Nov 05, 2021 ~ Jan 8, 2022</td></tr>
</table>

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

RXZ211028002-01 ~ RXZ211028002-04 (Assigned by BACL (New Taipei Laboratory))

1.2 Objective

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

The objective is to determine compliance with FCC Part 15.247 rules for Output Power, Antenna Requirements, 6 dB Bandwidth, Power Spectral Density, 100 kHz Bandwidth of Band Edges Measurement, Conducted and Radiated Spurious Emissions.

1.3 Related Submittal(s)/Grant(s)

N/A.

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	+/- 5.22 dB	+/- 5.46 dB
	+/- 6.12 dB	+/- 5.24 dB
	+/- 4.99 dB	+/- 5.86 dB
Temperature		+/- 1.27 °C
Humidity		+/- 3 %

1.7 Environmental Conditions

Test Site	Test Data	Temperature (℃)	Relative Humidity (%)	ATM Pressure (hPa)	Test Engineer
AC Line Conducted Emissions	2021/12/08	20.3	54	1010	Howard Ho
Radiation Spurious Emissions	2021/11/05~2022/1/8	22	72	1010	Howard Ho
Conducted Spurious Emissions	2021/11/08	25	60	1010	Ken Yu
6 dB Emission Bandwidth	2021/11/08	25	60	1010	Ken Yu
Maximum Output Power	2021/11/08	25	60	1010	Ken Yu
100 kHz Bandwidth of Frequency Band Edge	2021/11/08	25	60	1010	Ken Yu
Power Spectral Density	2021/11/08	25	60	1010	Ken Yu

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

Used “MT7628 QA 0.0.0.96” software.

Test Frequency		Low	Mid	High
Power Level Setting	B Mode	25	25	20
	G Mode	1E	24	19
	N20 Mode	1B	25	17
	N40 Mode	17	1C	12

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

802.11b: 1Mbps

802.11g: 6Mbps

802.11n HT20: MCS0

802.11n HT40: MCS0

2.4 Test Mode

Pre-scan

AC Line Conducted Emissions and Radiated Spurious Emissions

Model 1: A-1462WP (Sample serial number: RXZ211028002-01)

Model 2: A-1461WP (Sample serial number: RXZ211028002-02)

Model 3: A-1461WPA (Sample serial number: RXZ211028002-03)

Model 4: A-1462WPA (Sample serial number: RXZ211028002-04)

Worst case is the Model 1: A-1462WP

Full System (Model 1: A-1462WP) for all test item.

2.5 Support Equipment List and Details

Description	Manufacturer	Model Number	S/N
NB	DELL	E6410	8N7PXN1
ADAPTER	ADAPTER TECH	AT060T-W240U	N/A
Speaker	EDIFIER	R1850DB	N/A
IPod	Apple	A1320	YM0211EY71Y
Mobile Phone	LG	K11+	804WIAE0000680
Fixture (RJ-45 Port)	Ten Tronics Co., Ltd	N/A	N/A

2.6 External Cable List and Details

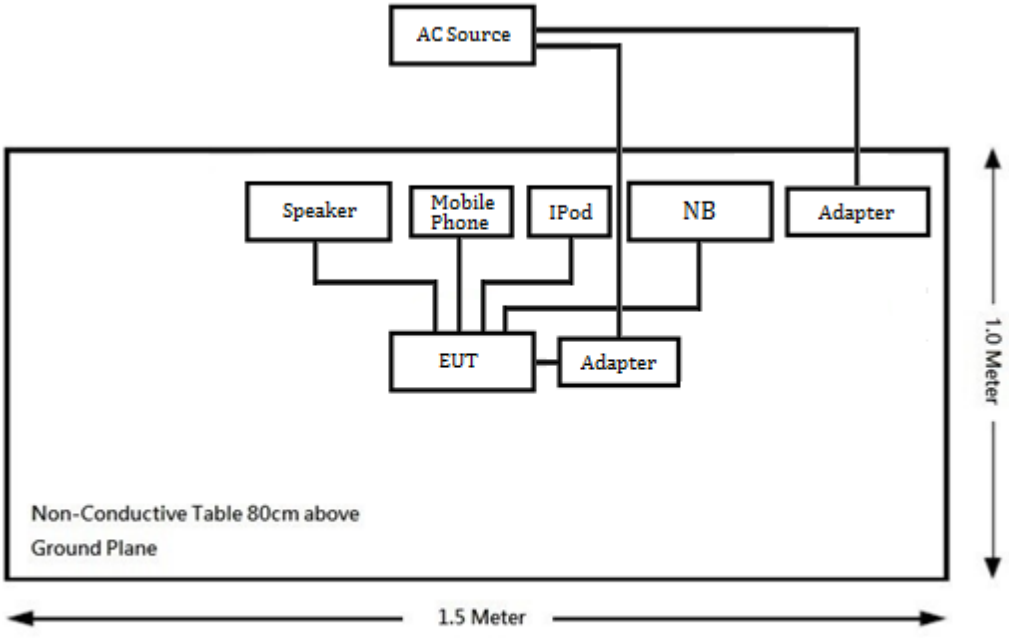
Cable Description	Length (m)	From	To
RJ-45 Cable	1	Fixture (RJ-45 Port)	NB
3.5mm Audio Cable	1	EUT	IPod
3.5mm Audio Cable	1	EUT	Mobile Phone
RCA Audio Cable	1.6m	EUT	Speaker

2.7 Block Diagram of Test Setup

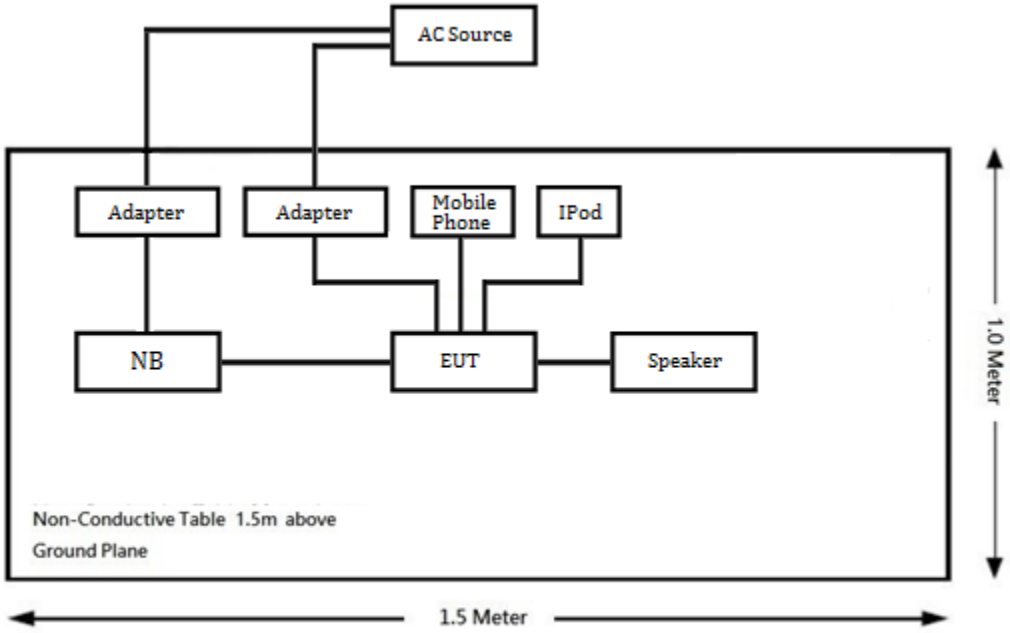
See test photographs attached in setup photos for the actual connections between EUT and support equipment.

Radiation:

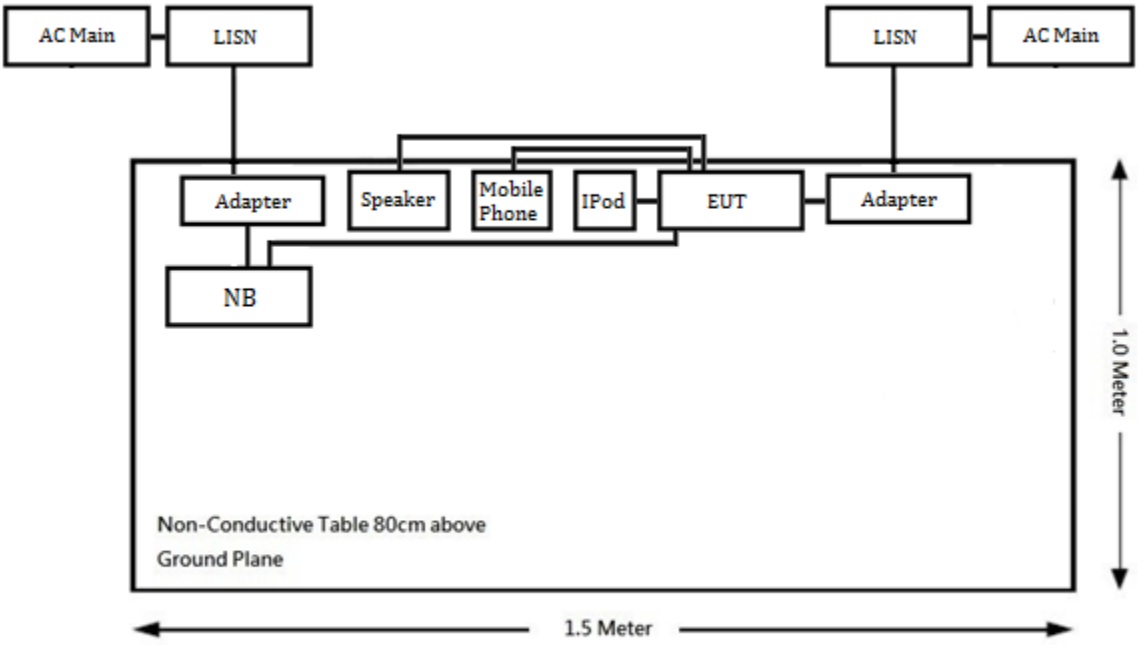
Below 1GHz:



Above 1GHz:



Conduction:



2.8 Duty Cycle

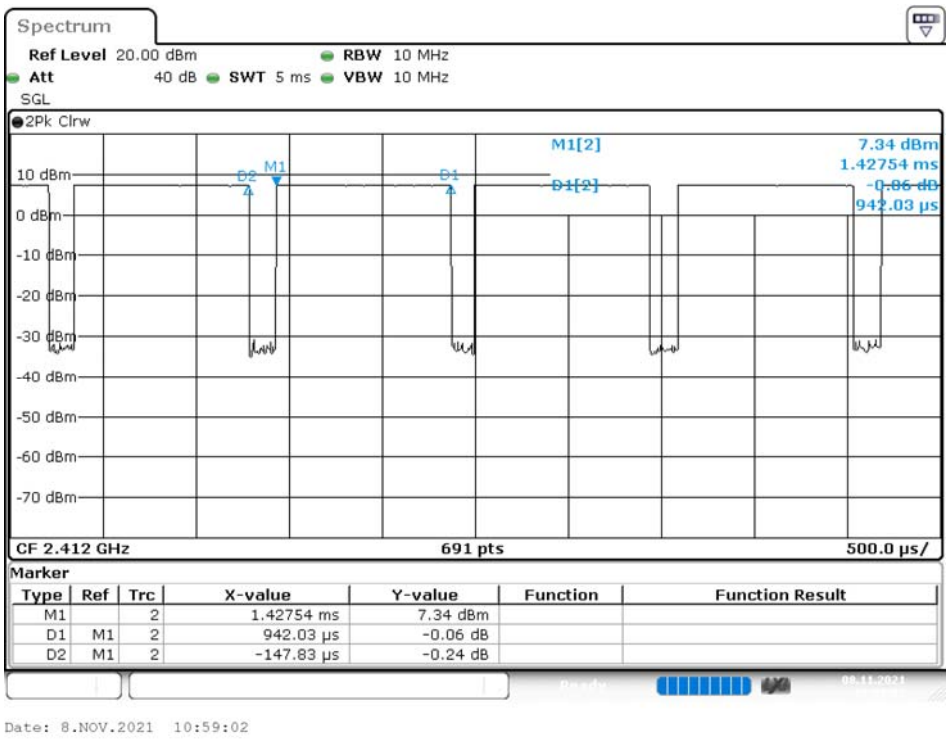
The duty cycle as below:

Radio Mode	On Time (ms)	Off Time (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
802.11b	0.942	0.147	87	0.60
802.11g	1.401	0.079	95	0.22
802.11n HT20	1.311	0.065	95	0.22
802.11n HT40	0.649	0.06	92	0.36

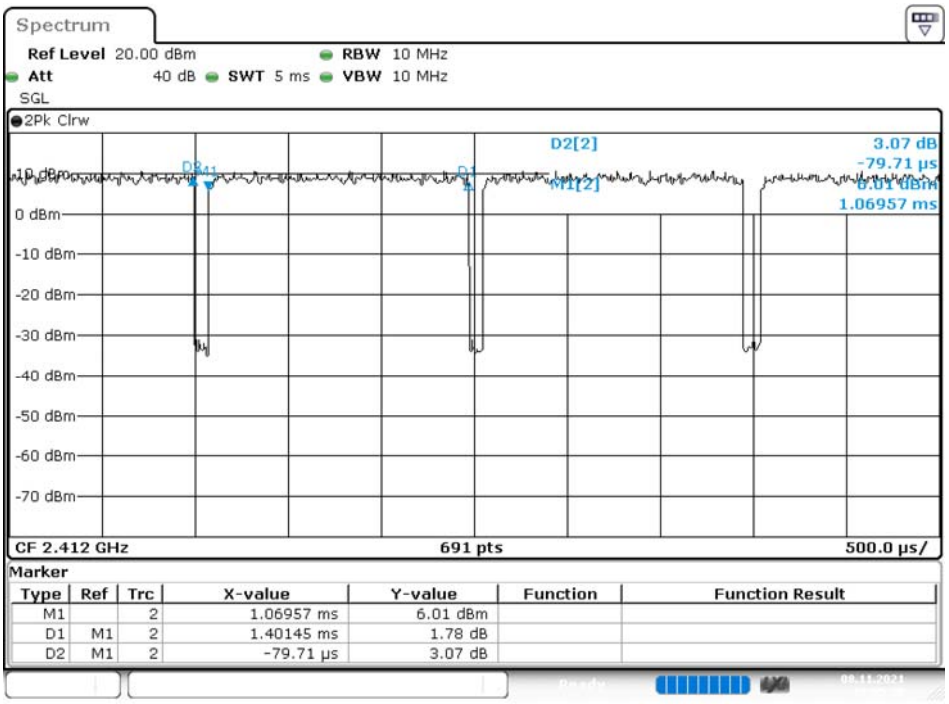
Note: Duty Cycle Correction Factor = 10*log(1/duty cycle)

Please refer to the following plots.

B Mode



G Mode



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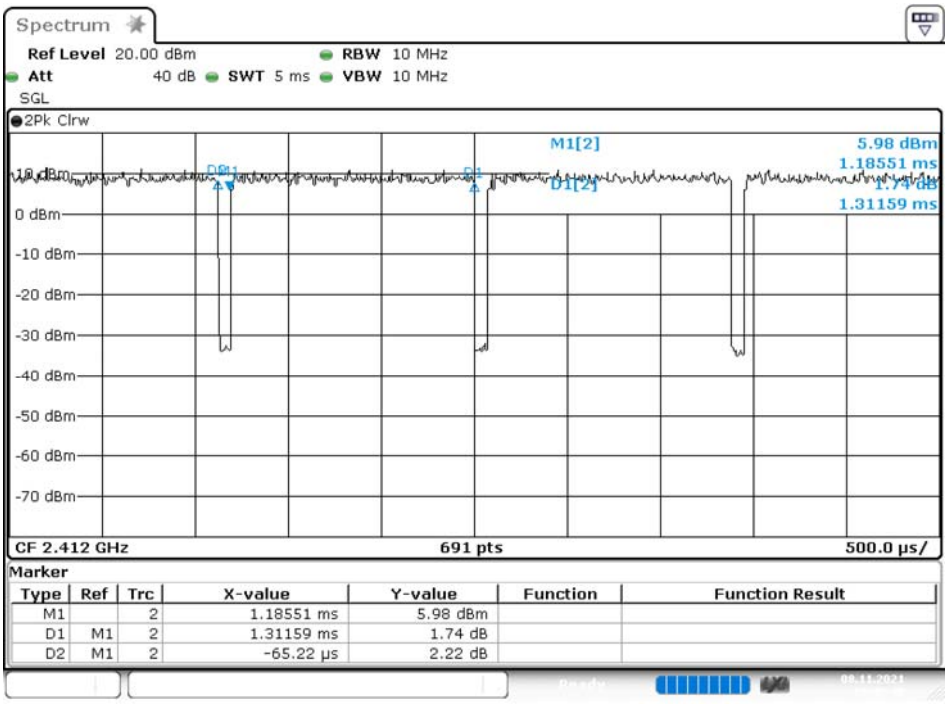
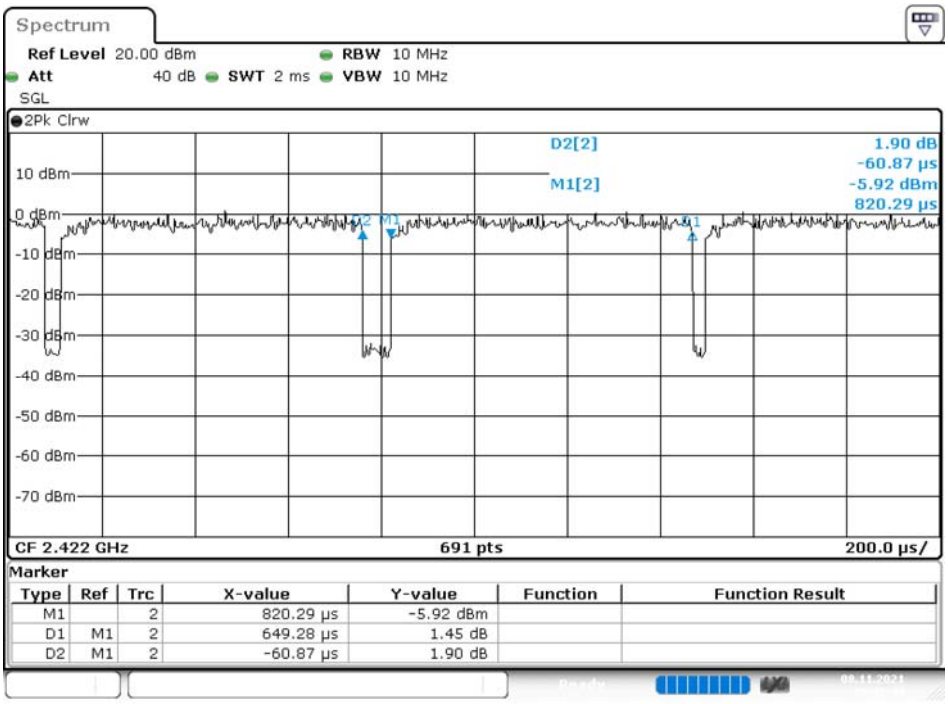
N20 Mode



Date: 8.NOV.2021 10:45:49

N40 Mode



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	2020/12/30	2021/12/29
LISN	COM-POWER	LI-550A	211726	2020/12/30	2021/12/29
EMI Test Receiver	Rohde & Schwarz	ESR3	102099	2021/06/02	2022/06/01
Pulse Limiter	Rohde & Schwarz	ESH3Z2	TXZEM104	2021/07/29	2022/07/28
RF Cable	EMEC	EM-CB5D	1	2021/06/11	2022/06/11
Software	AUDIX	E3	V9.150826k	N.C.R	N.C.R
Radiated Room (966-A)					
Bilog Antenna with 6 dB Attenuator	SUNOL SCIENCES & MINI-CIRCUITS	JB6/UNAT-6+	A050115/15542_01	2021/1/19	2022/1/18
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2020/11/12	2021/11/11
				2021/11/09	2022/11/08
Horn Antenna	EMCO	SAS-571	1020	2021/4/23	2022/4/22
Horn Antenna	ETS-Lindgren	3116	62638	2021/08/11	2022/08/10
Preamplifier	Sonoma	310N	130602	2021/6/8	2022/6/7
Preamplifier	A.H.	PAM-0118P	470	2021/03/15	2022/03/14
Microware Preamplifier	EM Electronics Corporation	EM18G40G	60656	2020/12/30	2021/12/29
Spectrum Analyzer	Rohde & Schwarz	FSV40	101435	2021/1/7	2022/1/6
Micro flex Cable	UTIFLEX	UFB197C-1-2362-70U-70U	225757-001	2021/2/1	2022/1/31
Coaxial Cable	COMMATE	PEWC	8Dr	2020/12/25	2021/12/24
Coaxial Cable	UTIFLEX	UFB311A-Q-1440-300300	220490-006	2021/2/1	2022/1/31
Coaxial Cable	JUNFLON	J12J102248-00-B-5	AUG-07-15-044	2020/12/25	2021/12/24
Cable	EMC	EMC105-SM-SM-10000	201003	2021/2/3	2022/2/2
Software	Farad	EZ_EMC	BACL-03A1	N.C.R	N.C.R
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSV40	101140	2021/1/7	2022/1/6

Cable	WOKEN	SFL402	S02-160323-07	2021/1/28	2022/1/28
Power Sensor	KEYSIGHT	U2021XA	MY54080018	2021/1/28	2022/1/28
Attenuator	MCL	BW-S10W5+	1419	2021/01/28	2022/01/27

***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)			
WIFI	2412-2462	2.6	1.820	24	251.189	20	0.0909	1

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
KINSUN	6672113031-110	PCB Antenna	2.6 dBi

Result: Compliance

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

7.1 Applicable Standard

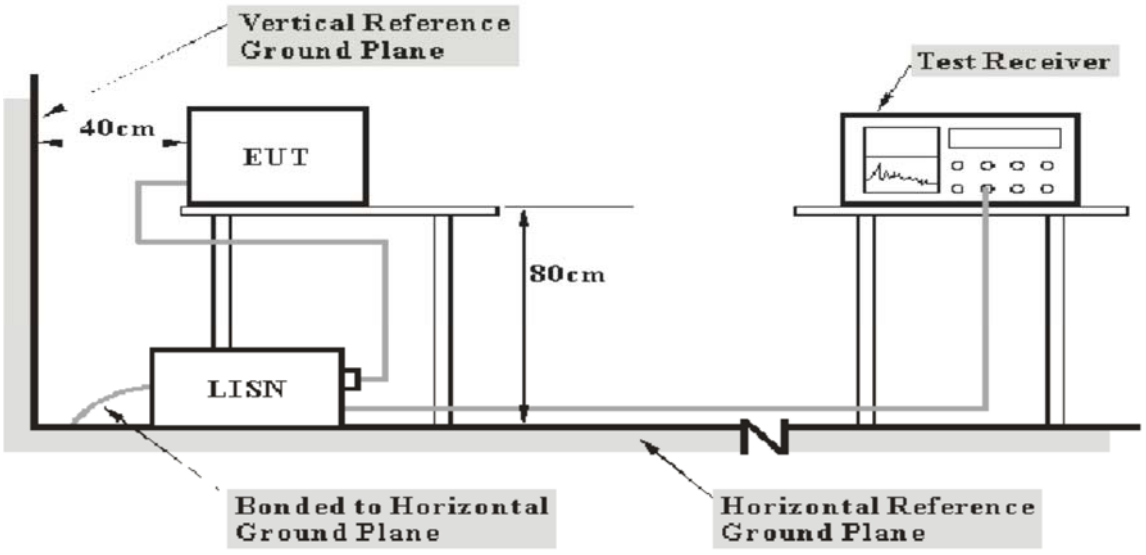
According to §15.207

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 1)	56 to 46 (Note 1)
0.5-5	56	46
5-30	60	50

Note 1: 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:

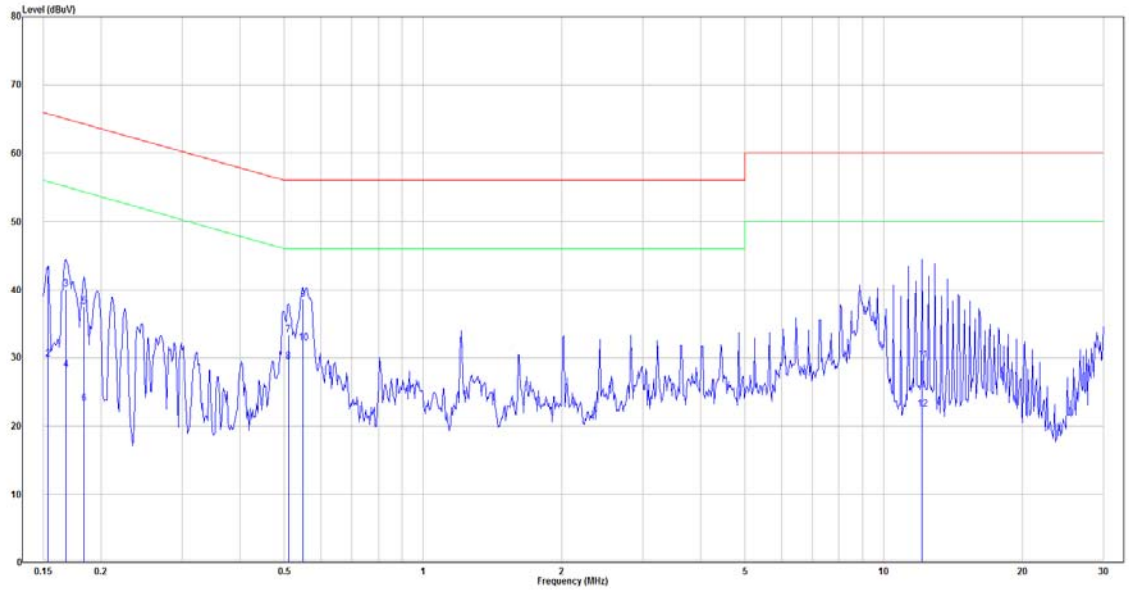
Over Limit = Level – Limit Line

7.6 Test Results

Test Mode: Transmitting

Worst case is 802.11n HT20 mode, Middle Channel

Main: AC120 V, 60 Hz, Line



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	
1	0.180	23.20	19.59	42.79	64.50	-21.71	QP
2	0.180	6.82	19.59	26.41	54.50	-28.09	Average
3	0.197	19.90	19.58	39.48	63.76	-24.28	QP
4	0.197	5.46	19.58	25.04	53.76	-28.72	Average
5	0.223	18.08	19.58	37.66	62.70	-25.04	QP
6	0.223	6.88	19.58	26.46	52.70	-26.24	Average
7	0.315	19.15	19.58	38.73	59.84	-21.11	QP
8	0.315	16.07	19.58	35.65	49.84	-14.19	Average
9	0.339	23.03	19.58	42.61	59.22	-16.61	QP
10	0.339	21.63	19.58	41.21	49.22	-8.01	Average
11	8.869	22.39	19.79	42.18	60.00	-17.82	QP
12	8.869	20.83	19.79	40.62	50.00	-9.38	Average

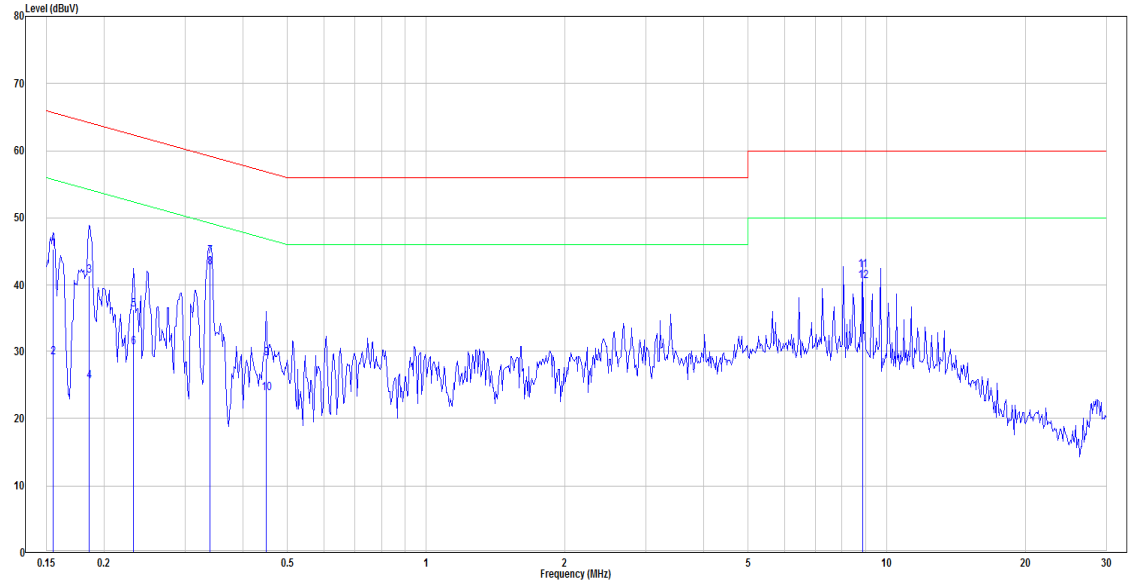
Note:

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)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	
1	0.155	25.73	19.59	45.32	65.74	-20.42	QP
2	0.155	9.47	19.59	29.06	55.74	-26.68	Average
3	0.185	21.72	19.58	41.30	64.24	-22.94	QP
4	0.185	5.89	19.58	25.47	54.24	-28.77	Average
5	0.232	16.57	19.58	36.15	62.39	-26.24	QP
6	0.232	11.04	19.58	30.62	52.39	-21.77	Average
7	0.339	24.72	19.58	44.30	59.22	-14.92	QP
8	0.339	23.02	19.58	42.60	49.22	-6.62	Average
9	0.449	9.41	19.59	29.00	56.89	-27.89	QP
10	0.449	4.12	19.59	23.71	46.89	-23.18	Average
11	8.869	22.44	19.79	42.23	60.00	-17.77	QP
12	8.869	20.73	19.79	40.52	50.00	-9.48	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

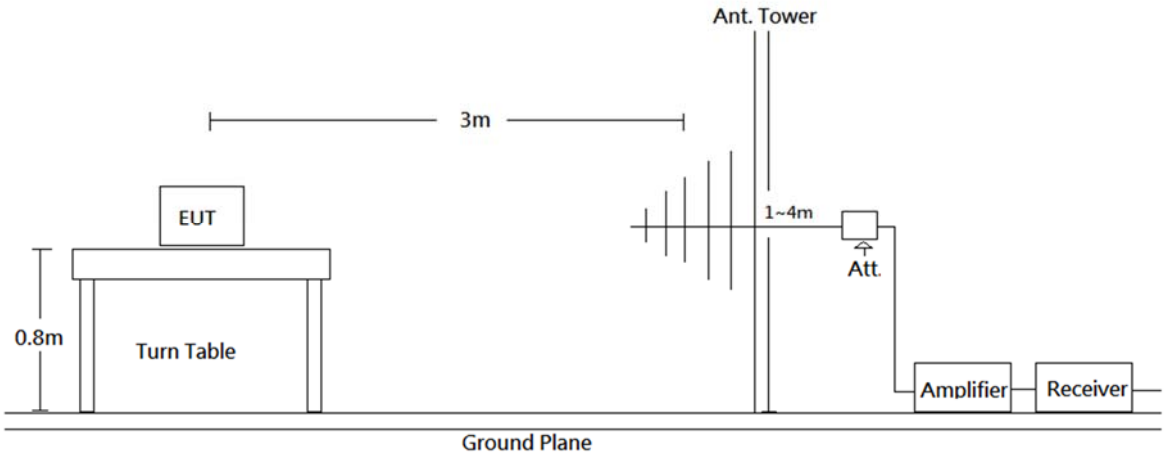
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this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

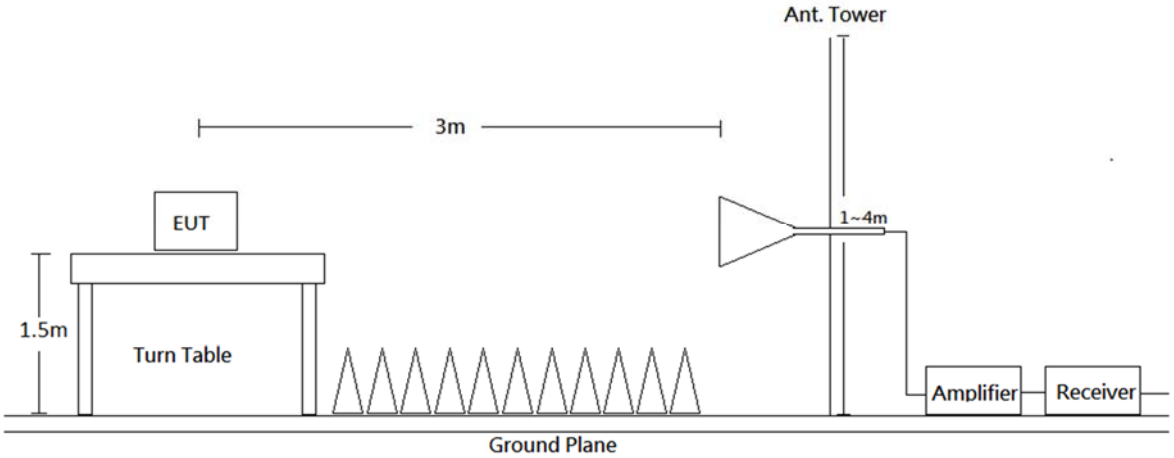
intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the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

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

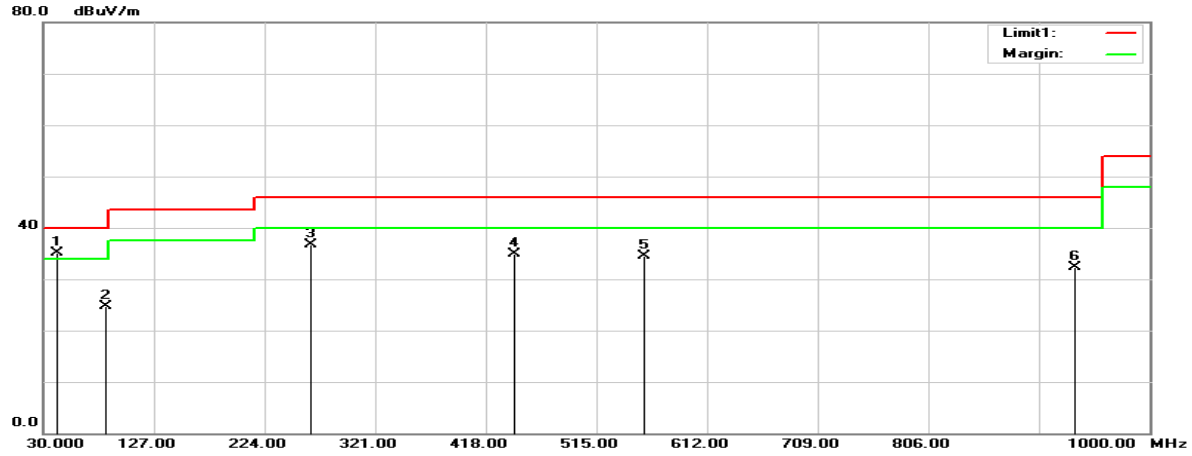
8.6 Test Results

Test Mode: Transmitting

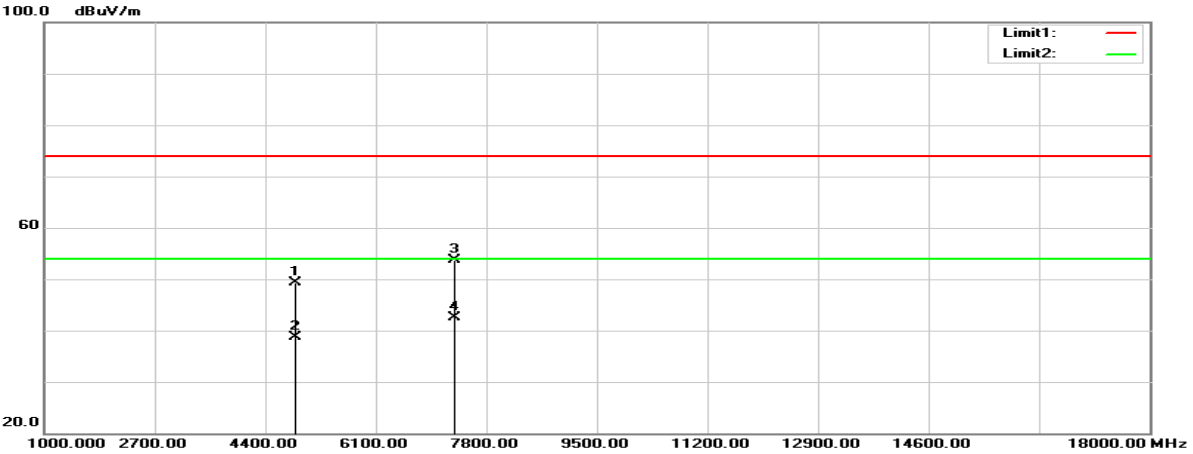
(Pre-scan with three orthogonal axis, and worse case as Z axis.)

Horizontal (worst case is 802.11n20 mode, Middle channel)

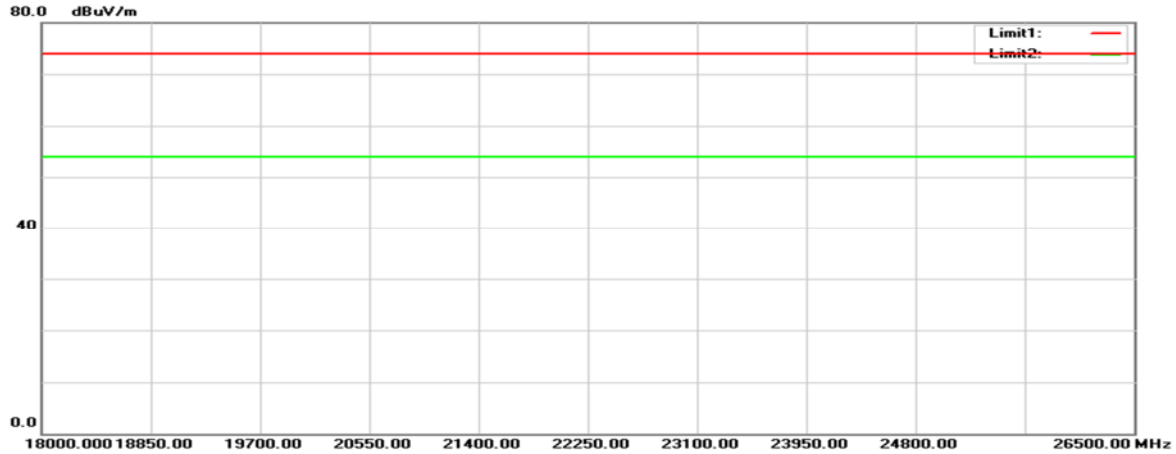
30MHz-1GHz:



1GHz-18GHz:

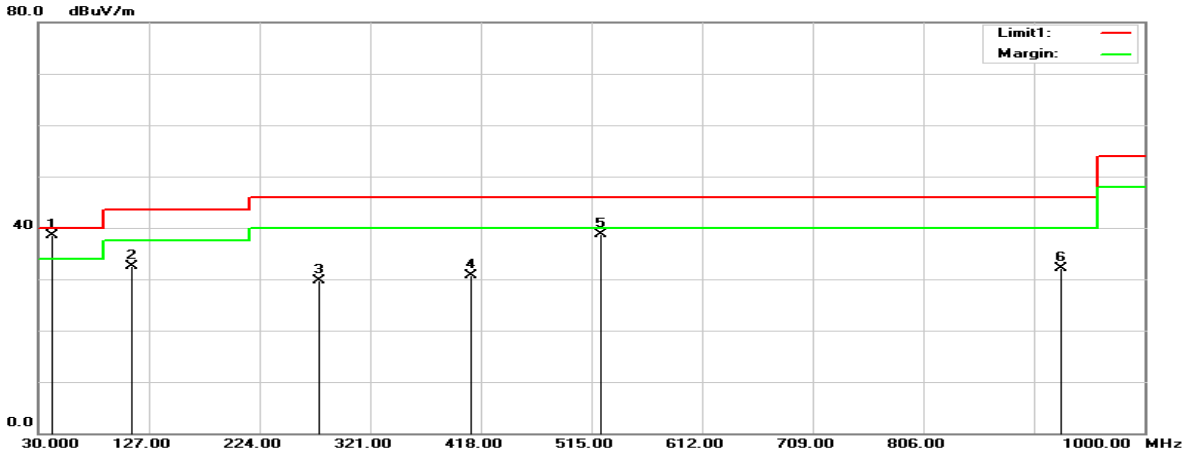


18GHz-26.5GHz:

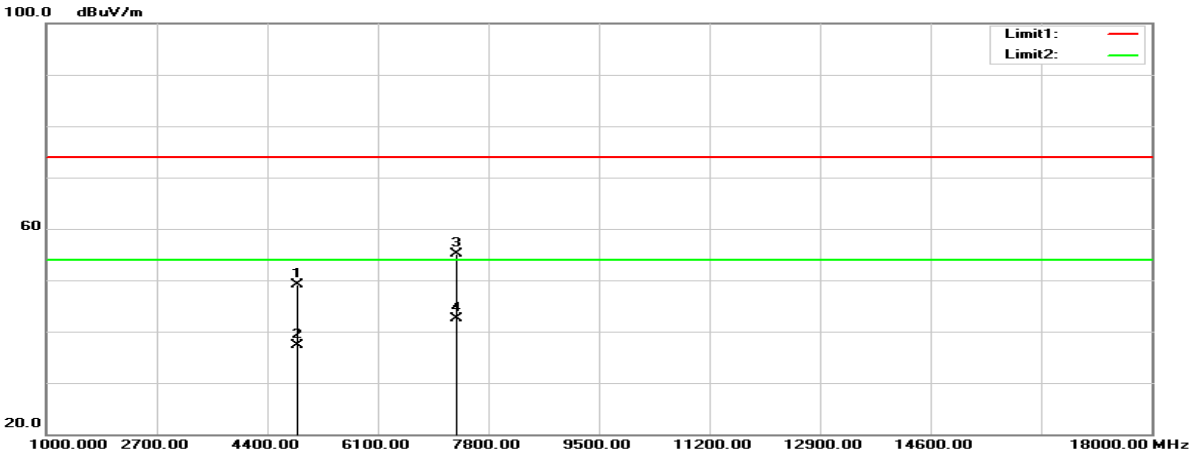


Vertical (worst case is 802.11n20 mode, Middle channel)

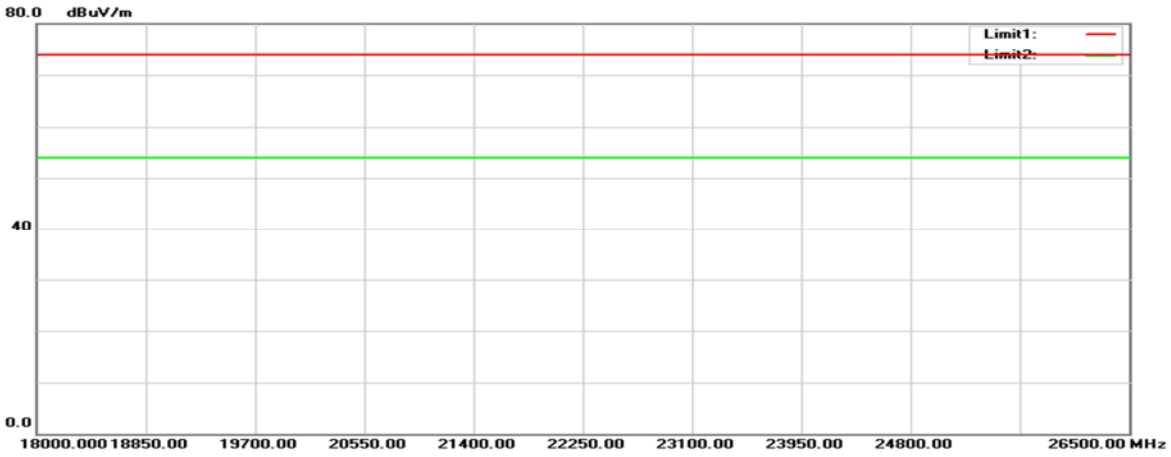
30MHz-1GHz:



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
41.6400	46.87	-11.75	35.12	40.00	-4.88	100	174	QP
84.3200	41.68	-17.04	24.64	40.00	-15.36	100	214	peak
264.7400	48.00	-11.22	36.78	46.00	-9.22	100	156	peak
443.2200	41.97	-6.99	34.98	46.00	-11.02	100	345	peak
556.7100	40.43	-6.02	34.41	46.00	-11.59	100	156	peak
934.0400	30.96	1.35	32.31	46.00	-13.69	100	247	peak

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
41.6400	50.30	-11.75	38.55	40.00	-1.45	100	145	QP
112.4500	44.25	-11.69	32.56	43.50	-10.94	100	247	peak
276.3800	40.27	-10.65	29.62	46.00	-16.38	100	174	peak
409.2700	38.73	-8.09	30.64	46.00	-15.36	100	246	peak
522.7600	44.79	-6.09	38.70	46.00	-7.30	100	255	peak
926.2800	30.97	1.23	32.20	46.00	-13.80	100	345	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								
2386.048	64.91	-9.49	55.42	74.00	-18.58	150	133	peak
2386.048	55.41	-9.49	45.92	54.00	-8.08	150	133	AVG
2412.000	114.48	-9.28	105.20	N/A	N/A	150	133	peak
2412.000	110.69	-9.28	101.41	N/A	N/A	150	133	AVG
4824.000	58.89	-2.15	56.74	74.00	-17.26	100	118	peak
4824.000	54.00	-2.15	51.85	54.00	-2.15	100	118	AVG
7236.000	49.82	4.55	54.37	74.00	-19.63	143	258	peak
7236.000	37.34	4.55	41.89	54.00	-12.11	143	258	AVG
B Mode, Middle channel								
2437.000	115.31	-9.06	106.25	N/A	N/A	124	136	peak
2437.000	111.53	-9.06	102.47	N/A	N/A	124	136	AVG
4874.000	60.11	-1.92	58.19	74.00	-15.81	100	116	peak
4874.000	55.35	-1.92	53.43	54.00	-0.57	100	116	AVG
7311.000	49.12	5.08	54.20	74.00	-19.80	152	314	peak
7311.000	37.01	5.08	42.09	54.00	-11.91	152	314	AVG
B Mode, High channel								
2462.000	113.36	-8.77	104.59	N/A	N/A	146	135	peak
2462.000	109.50	-8.77	100.73	N/A	N/A	146	135	AVG
2488.048	62.97	-8.38	54.59	74.00	-19.41	146	135	peak
2488.048	52.64	-8.38	44.26	54.00	-9.74	146	135	AVG
4924.000	56.05	-1.63	54.42	74.00	-19.58	121	360	peak
4924.000	51.26	-1.63	49.63	54.00	-4.37	121	360	AVG
7386.000	50.31	5.20	55.51	74.00	-18.49	154	244	peak
7386.000	38.03	5.20	43.23	54.00	-10.77	154	244	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								
2386.272	68.72	-9.49	59.23	74.00	-14.77	159	0	peak
2386.272	61.92	-9.49	52.43	54.00	-1.57	159	0	AVG
2412.000	120.33	-9.28	111.05	N/A	N/A	159	0	peak
2412.000	116.51	-9.28	107.23	N/A	N/A	159	0	AVG
4824.000	55.53	-2.15	53.38	74.00	-20.62	149	360	peak
4824.000	50.49	-2.15	48.34	54.00	-5.66	149	360	AVG
7236.000	54.20	4.55	58.75	74.00	-15.25	157	244	peak
7236.000	41.97	4.55	46.52	54.00	-7.48	157	244	AVG
B Mode, Middle channel								
2437.000	120.68	-9.06	111.62	N/A	N/A	174	0	peak
2437.000	116.82	-9.06	107.76	N/A	N/A	174	0	AVG
4874.000	56.35	-1.92	54.43	74.00	-19.57	133	123	peak
4874.000	51.49	-1.92	49.57	54.00	-4.43	133	123	AVG
7311.000	59.09	5.08	64.17	74.00	-9.83	149	58	peak
7311.000	46.77	5.08	51.85	54.00	-2.15	149	58	AVG
B Mode, High channel								
2462.000	119.18	-8.77	110.41	N/A	N/A	160	0	peak
2462.000	115.38	-8.77	106.61	N/A	N/A	160	0	AVG
2487.904	68.83	-8.39	60.44	74.00	-13.56	160	0	peak
2487.904	61.23	-8.39	52.84	54.00	-1.16	160	0	AVG
4924.000	56.01	-1.63	54.38	74.00	-19.62	140	137	peak
4924.000	51.07	-1.63	49.44	54.00	-4.56	140	137	AVG
7386.000	56.17	5.20	61.37	74.00	-12.63	152	63	peak
7386.000	44.14	5.20	49.34	54.00	-4.66	152	63	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	67.03	-9.46	57.57	74.00	-16.43	149	134	peak
2390.000	53.36	-9.46	43.90	54.00	-10.10	149	134	AVG
2412.000	113.09	-9.28	103.81	N/A	N/A	149	134	peak
2412.000	103.18	-9.28	93.90	N/A	N/A	149	134	AVG
4824.000	51.91	-2.15	49.76	74.00	-24.24	149	216	peak
4824.000	38.90	-2.15	36.75	54.00	-17.25	149	216	AVG
7236.000	48.36	4.55	52.91	74.00	-21.09	154	78	peak
7236.000	37.26	4.55	41.81	54.00	-12.19	154	78	AVG
G Mode, Middle channel								
2437.000	114.81	-9.06	105.75	N/A	N/A	159	132	peak
2437.000	104.93	-9.06	95.87	N/A	N/A	159	132	AVG
4874.000	51.60	-1.92	49.68	74.00	-24.32	149	213	peak
4874.000	40.57	-1.92	38.65	54.00	-15.35	149	213	AVG
7311.000	49.26	5.08	54.34	74.00	-19.66	161	247	peak
7311.000	37.33	5.08	42.41	54.00	-11.59	161	247	AVG
G Mode, High channel								
2462.000	110.60	-8.77	101.83	N/A	N/A	147	132	peak
2462.000	100.81	-8.77	92.04	N/A	N/A	147	132	AVG
2483.500	66.19	-8.45	57.74	74.00	-16.26	147	132	peak
2483.500	50.98	-8.45	42.53	54.00	-11.47	147	132	AVG
4924.000	49.96	-1.63	48.33	74.00	-25.67	143	254	peak
4924.000	39.18	-1.63	37.55	54.00	-16.45	143	254	AVG
7386.000	50.29	5.20	55.49	74.00	-18.51	155	318	peak
7386.000	37.59	5.20	42.79	54.00	-11.21	155	318	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	77.95	-9.46	68.49	74.00	-5.51	158	0	peak
2390.000	62.31	-9.46	52.85	54.00	-1.15	158	0	AVG
2412.000	120.03	-9.28	110.75	N/A	N/A	158	0	peak
2412.000	110.19	-9.28	100.91	N/A	N/A	158	0	AVG
4824.000	49.85	-2.15	47.70	74.00	-26.30	145	218	peak
4824.000	38.62	-2.15	36.47	54.00	-17.53	145	218	AVG
7236.000	49.14	4.55	53.69	74.00	-20.31	150	312	peak
7236.000	37.04	4.55	41.59	54.00	-12.41	150	312	AVG
G Mode, Middle channel								
2437.000	121.85	-9.06	112.79	N/A	N/A	147	0	peak
2437.000	111.95	-9.06	102.89	N/A	N/A	147	0	AVG
4874.000	50.62	-1.92	48.70	74.00	-25.30	153	96	peak
4874.000	40.47	-1.92	38.55	54.00	-15.45	153	96	AVG
7311.000	50.60	5.08	55.68	74.00	-18.32	142	157	peak
7311.000	37.58	5.08	42.66	54.00	-11.34	142	157	AVG
G Mode, High channel								
2462.000	118.69	-8.77	109.92	N/A	N/A	154	0	peak
2462.000	108.72	-8.77	99.95	N/A	N/A	154	0	AVG
2484.256	79.03	-8.44	70.59	74.00	-3.41	154	0	peak
2484.256	60.66	-8.44	52.22	54.00	-1.78	154	0	AVG
4924.000	50.67	-1.63	49.04	74.00	-24.96	146	291	peak
4924.000	38.62	-1.63	36.99	54.00	-17.01	146	291	AVG
7386.000	49.49	5.20	54.69	74.00	-19.31	154	268	peak
7386.000	37.64	5.20	42.84	54.00	-11.16	154	268	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	68.16	-9.46	58.70	74.00	-15.30	145	134	peak
2390.000	53.30	-9.46	43.84	54.00	-10.16	145	134	AVG
2412.000	111.52	-9.28	102.24	N/A	N/A	145	134	peak
2412.000	101.68	-9.28	92.40	N/A	N/A	145	134	AVG
4824.000	50.46	-2.15	48.31	74.00	-25.69	149	317	peak
4824.000	38.41	-2.15	36.26	54.00	-17.74	149	317	AVG
7236.000	49.06	4.55	53.61	74.00	-20.39	154	255	peak
7236.000	37.16	4.55	41.71	54.00	-12.29	154	255	AVG
N20 Mode, Middle channel								
2437.000	115.70	-9.06	106.64	N/A	N/A	124	136	peak
2437.000	105.70	-9.06	96.64	N/A	N/A	124	136	AVG
4874.000	51.20	-1.92	49.28	74.00	-24.72	153	0	peak
4874.000	40.64	-1.92	38.72	54.00	-15.28	153	0	AVG
7311.000	48.60	5.08	53.68	74.00	-20.32	158	137	peak
7311.000	37.39	5.08	42.47	54.00	-11.53	158	137	AVG
N20 Mode, High channel								
2462.000	110.31	-8.77	101.54	N/A	N/A	145	132	peak
2462.000	100.32	-8.77	91.55	N/A	N/A	145	132	AVG
2483.500	68.19	-8.45	59.74	74.00	-14.26	145	132	peak
2483.500	51.38	-8.45	42.93	54.00	-11.07	145	132	AVG
4924.000	50.54	-1.63	48.91	74.00	-25.09	145	243	peak
4924.000	39.74	-1.63	38.11	54.00	-15.89	145	243	AVG
7386.000	49.07	5.20	54.27	74.00	-19.73	154	69	peak
7386.000	37.80	5.20	43.00	54.00	-11.00	154	69	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	78.17	-9.46	68.71	74.00	-5.29	159	0	peak
2390.000	61.03	-9.46	51.57	54.00	-2.43	159	0	AVG
2412.000	118.30	-9.28	109.02	N/A	N/A	159	0	peak
2412.000	108.47	-9.28	99.19	N/A	N/A	159	0	AVG
4824.000	49.94	-2.15	47.79	74.00	-26.21	146	296	peak
4824.000	38.59	-2.15	36.44	54.00	-17.56	146	296	AVG
7236.000	48.19	4.55	52.74	74.00	-21.26	153	247	peak
7236.000	37.29	4.55	41.84	54.00	-12.16	153	247	AVG
N20 Mode, Middle channel								
2437.000	122.28	-9.06	113.22	N/A	N/A	168	0	peak
2437.000	111.83	-9.06	102.77	N/A	N/A	168	0	AVG
4874.000	51.07	-1.92	49.15	74.00	-24.85	150	358	peak
4874.000	39.12	-1.92	37.20	54.00	-16.80	150	358	AVG
7311.000	50.02	5.08	55.10	74.00	-18.90	147	249	peak
7311.000	37.39	5.08	42.47	54.00	-11.53	147	249	AVG
N20 Mode, High channel								
2462.000	117.00	-8.77	108.23	N/A	N/A	157	0	peak
2462.000	107.03	-8.77	98.26	N/A	N/A	157	0	AVG
2483.824	78.70	-8.44	70.26	74.00	-3.74	157	0	peak
2483.824	60.54	-8.44	52.10	54.00	-1.90	157	0	AVG
4924.000	50.66	-1.63	49.03	74.00	-24.97	146	266	peak
4924.000	39.07	-1.63	37.44	54.00	-16.56	146	266	AVG
7386.000	49.92	5.20	55.12	74.00	-18.88	146	293	peak
7386.000	37.62	5.20	42.82	54.00	-11.18	146	293	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								
2390.000	65.53	-9.46	56.07	74.00	-17.93	163	135	peak
2390.000	51.83	-9.46	42.37	54.00	-11.63	163	135	AVG
2422.000	106.18	-9.18	97.00	N/A	N/A	163	135	peak
2422.000	95.86	-9.18	86.68	N/A	N/A	163	135	AVG
4844.000	49.67	-2.11	47.56	74.00	-26.44	150	179	peak
4844.000	38.54	-2.11	36.43	54.00	-17.57	150	179	AVG
7266.000	49.39	4.83	54.22	74.00	-19.78	146	285	peak
7266.000	37.14	4.83	41.97	54.00	-12.03	146	286	AVG
N40 Mode, Middle channel								
2390.000	70.34	-9.46	60.88	74.00	-13.12	122	134	peak
2390.000	53.02	-9.46	43.56	54.00	-10.44	122	134	AVG
2437.000	110.83	-9.06	101.77	N/A	N/A	122	134	peak
2437.000	100.75	-9.06	91.69	N/A	N/A	122	134	AVG
2483.500	64.34	-8.45	55.89	74.00	-18.11	122	134	peak
2483.500	50.53	-8.45	42.08	54.00	-11.92	122	134	AVG
4874.000	50.33	-1.92	48.41	74.00	-25.59	154	219	peak
4874.000	39.89	-1.92	37.97	54.00	-16.03	154	219	AVG
7311.000	49.88	5.08	54.96	74.00	-19.04	144	134	peak
7311.000	37.34	5.08	42.42	54.00	-11.58	144	134	AVG
N40 Mode, High channel								
2452.000	107.63	-8.92	98.71	N/A	N/A	143	132	peak
2452.000	97.46	-8.92	88.54	N/A	N/A	143	132	AVG
2483.500	70.30	-8.45	61.85	74.00	-12.15	143	132	peak
2483.500	53.08	-8.45	44.63	54.00	-9.37	143	132	AVG
4904.000	49.56	-1.71	47.85	74.00	-26.15	157	238	peak
4904.000	38.64	-1.71	36.93	54.00	-17.07	157	238	AVG
7356.000	49.71	5.18	54.89	74.00	-19.11	149	164	peak
7356.000	37.43	5.18	42.61	54.00	-11.39	149	164	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								
2390.000	78.73	-9.46	69.27	74.00	-4.73	148	0	peak
2390.000	62.26	-9.46	52.80	54.00	-1.20	148	0	AVG
2422.000	112.88	-9.18	103.70	N/A	N/A	148	0	peak
2422.000	103.37	-9.18	94.19	N/A	N/A	148	0	AVG
4844.000	50.06	-2.11	47.95	74.00	-26.05	145	238	peak
4844.000	38.45	-2.11	36.34	54.00	-17.66	145	238	AVG
7266.000	48.55	4.83	53.38	74.00	-20.62	156	149	peak
7266.000	37.15	4.83	41.98	54.00	-12.02	156	149	AVG
N40 Mode, Middle channel								
2390.000	77.82	-9.46	68.36	74.00	-5.64	140	0	peak
2390.000	61.69	-9.46	52.23	54.00	-1.77	140	0	AVG
2437.000	116.83	-9.06	107.77	N/A	N/A	140	0	peak
2437.000	107.25	-9.06	98.19	N/A	N/A	140	0	AVG
2483.500	77.92	-8.45	69.47	74.00	-4.53	140	0	peak
2483.500	61.31	-8.45	52.86	54.00	-1.14	140	0	AVG
4874.000	50.47	-1.92	48.55	74.00	-25.45	162	154	peak
4874.000	39.13	-1.92	37.21	54.00	-16.79	162	154	AVG
7311.000	48.68	5.08	53.76	74.00	-20.24	143	277	peak
7311.000	37.56	5.08	42.64	54.00	-11.36	143	277	AVG
N40 Mode, High channel								
2452.000	112.30	-8.92	103.38	N/A	N/A	142	4	peak
2452.000	101.88	-8.92	92.96	N/A	N/A	142	4	AVG
2483.500	74.99	-8.45	66.54	74.00	-7.46	142	4	peak
2483.500	60.56	-8.45	52.11	54.00	-1.89	142	4	AVG
4904.000	50.01	-1.71	48.30	74.00	-25.70	151	135	peak
4904.000	38.35	-1.71	36.64	54.00	-17.36	151	135	AVG
7356.000	48.75	5.18	53.93	74.00	-20.07	148	236	peak
7356.000	37.48	5.18	42.66	54.00	-11.34	148	236	AVG

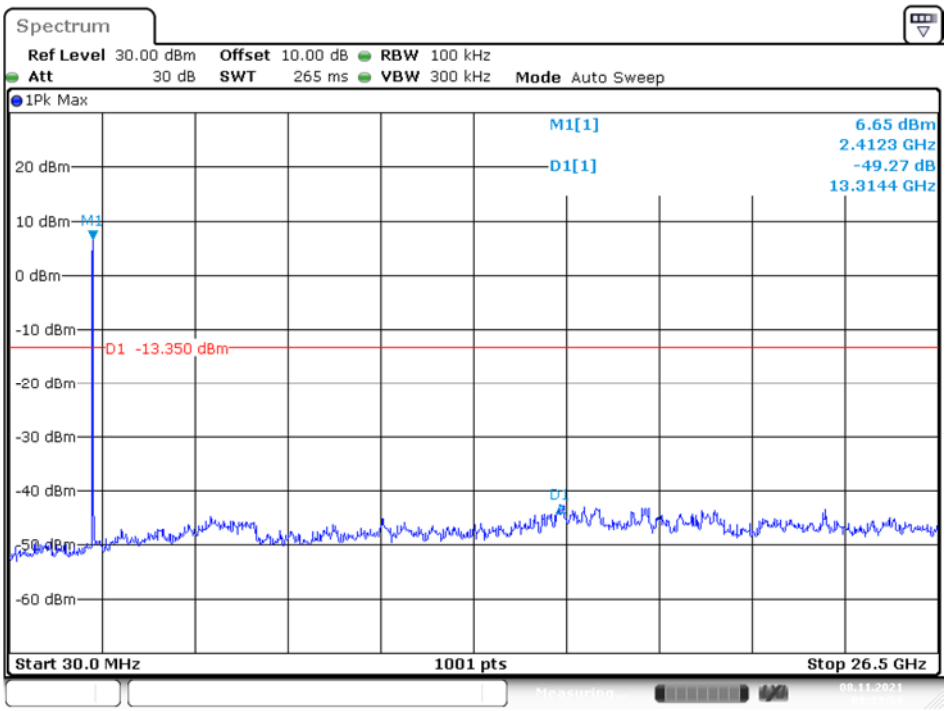
Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Conducted Spurious Emissions:

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
B Mode				
Low	2412	49.27	≥ 20	PASS
Middle	2437	51.58	≥ 20	PASS
High	2462	49.78	≥ 20	PASS
G Mode				
Low	2412	43.11	≥ 20	PASS
Middle	2437	48.63	≥ 20	PASS
High	2462	41.26	≥ 20	PASS
N20 Mode				
Low	2412	41.12	≥ 20	PASS
Middle	2437	45.67	≥ 20	PASS
High	2462	43.55	≥ 20	PASS
N40 Mode				
Low	2422	35.03	≥ 20	PASS
Middle	2437	37.46	≥ 20	PASS
High	2452	32.36	≥ 20	PASS

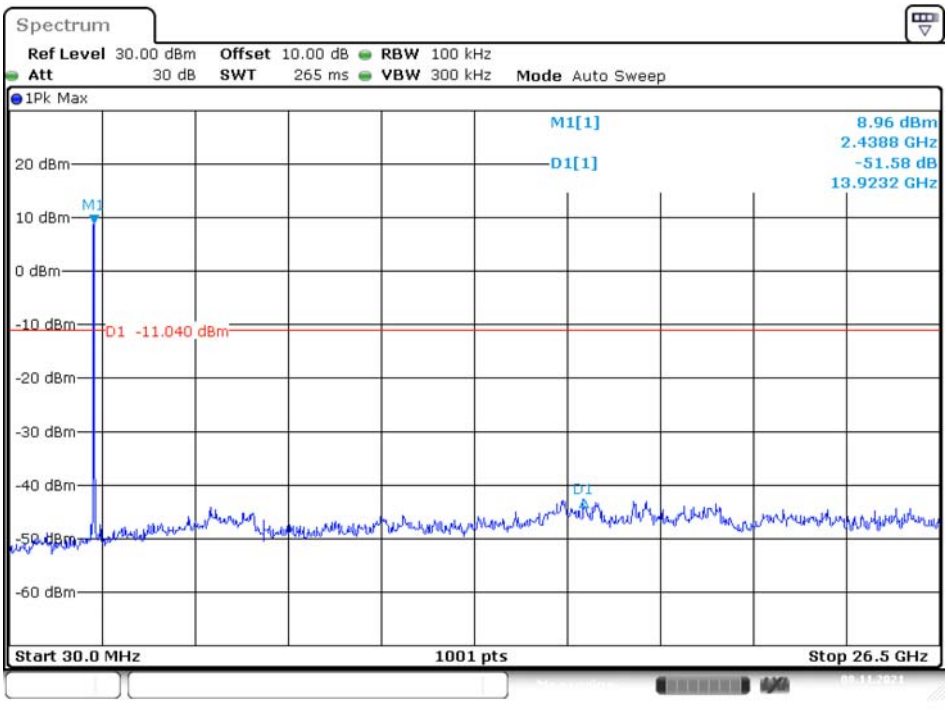
B Mode

Low Channel



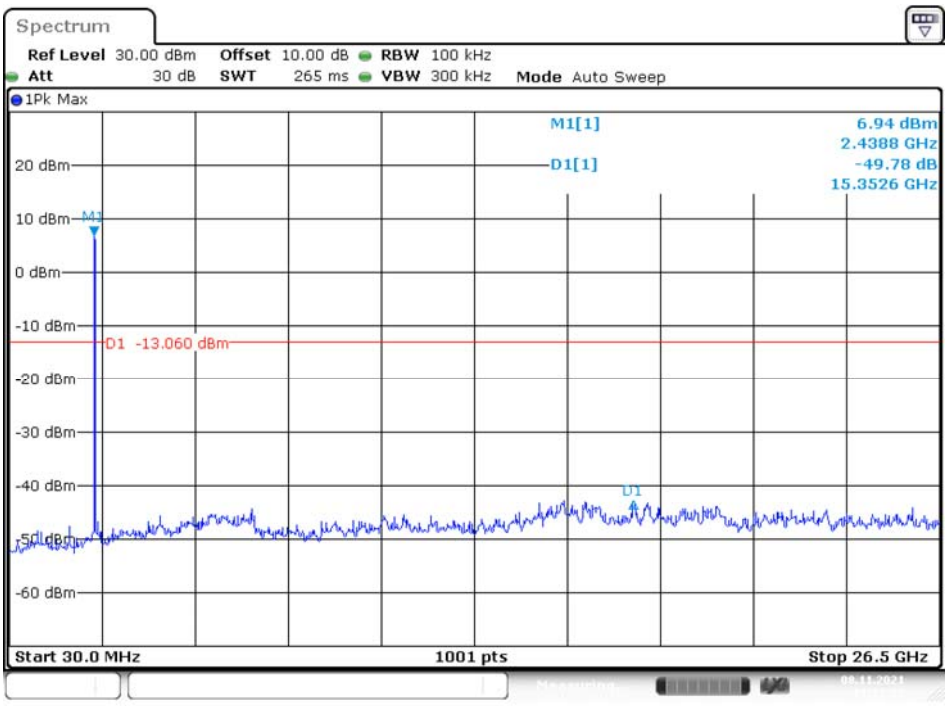
Date: 8.NOV.2021 09:23:50

Middle Channel



Date: 8.NOV.2021 09:28:04

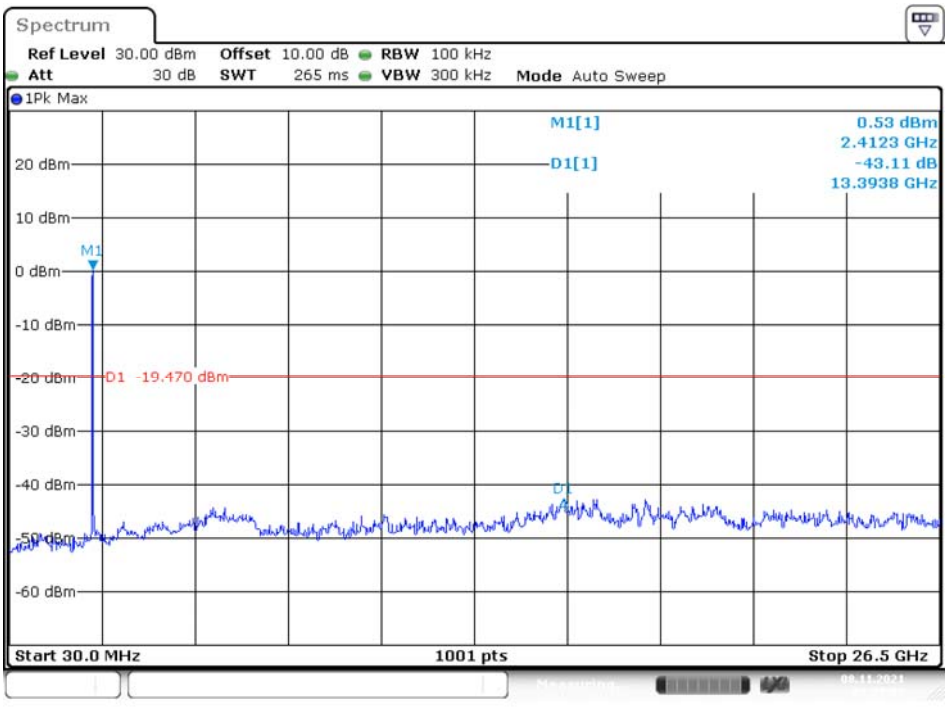
High Channel



Date: 8.NOV.2021 11:11:27

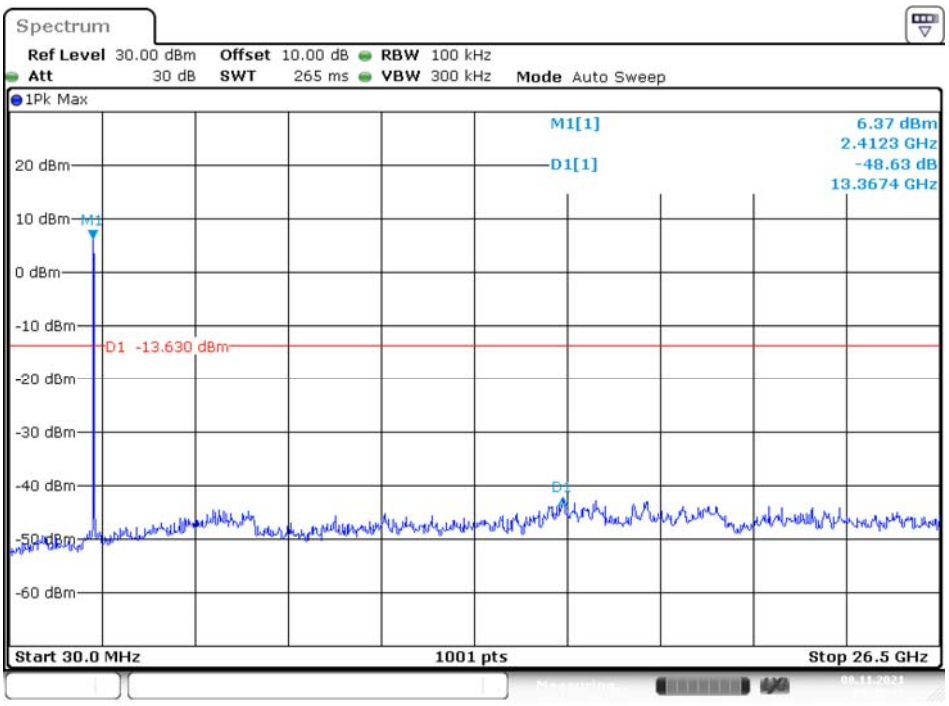
G Mode

Low Channel



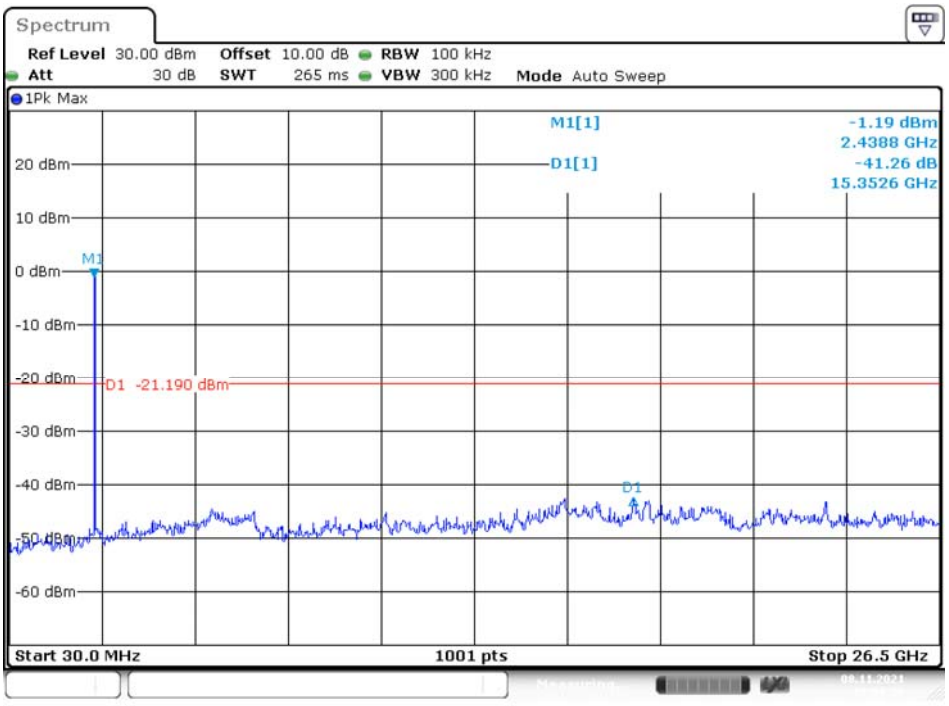
Date: 8.NOV.2021 09:37:05

Middle Channel



Date: 8.NOV.2021 09:45:41

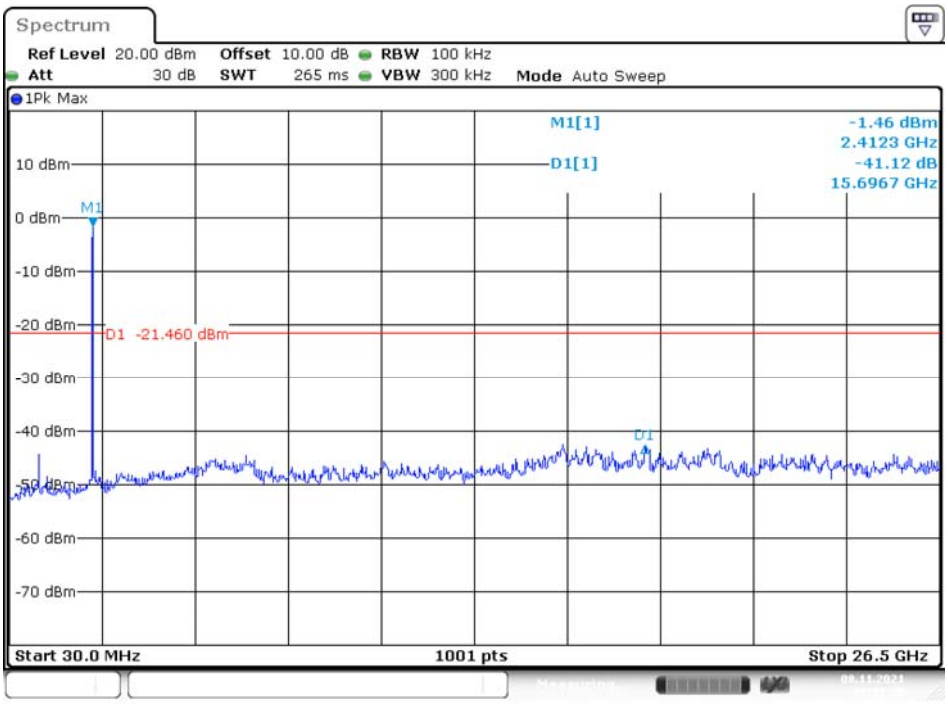
High Channel



Date: 8.NOV.2021 10:06:26

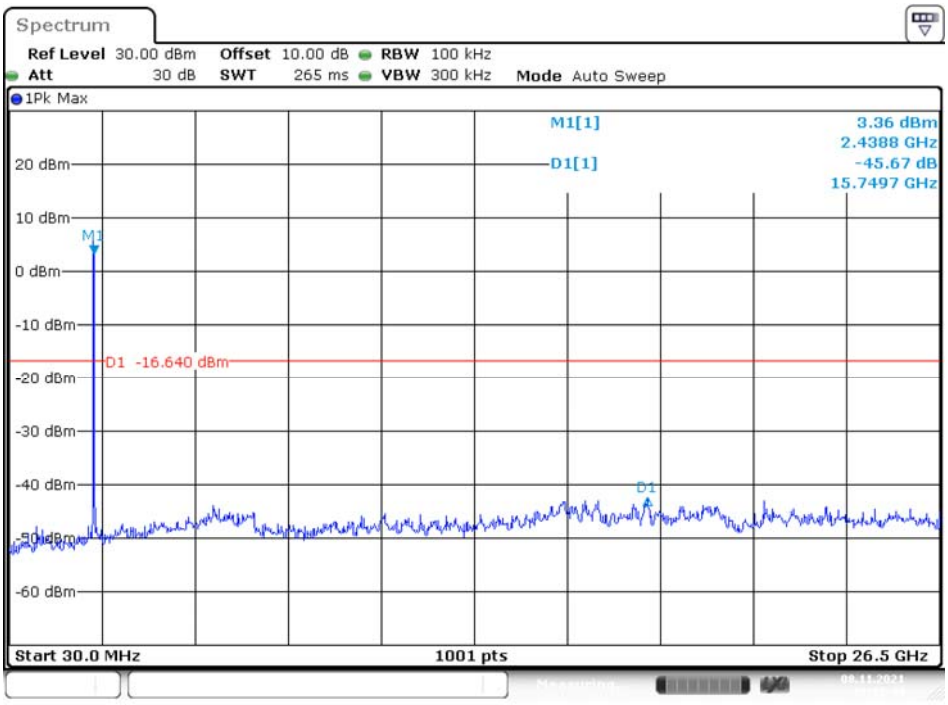
N20 Mode

Low Channel



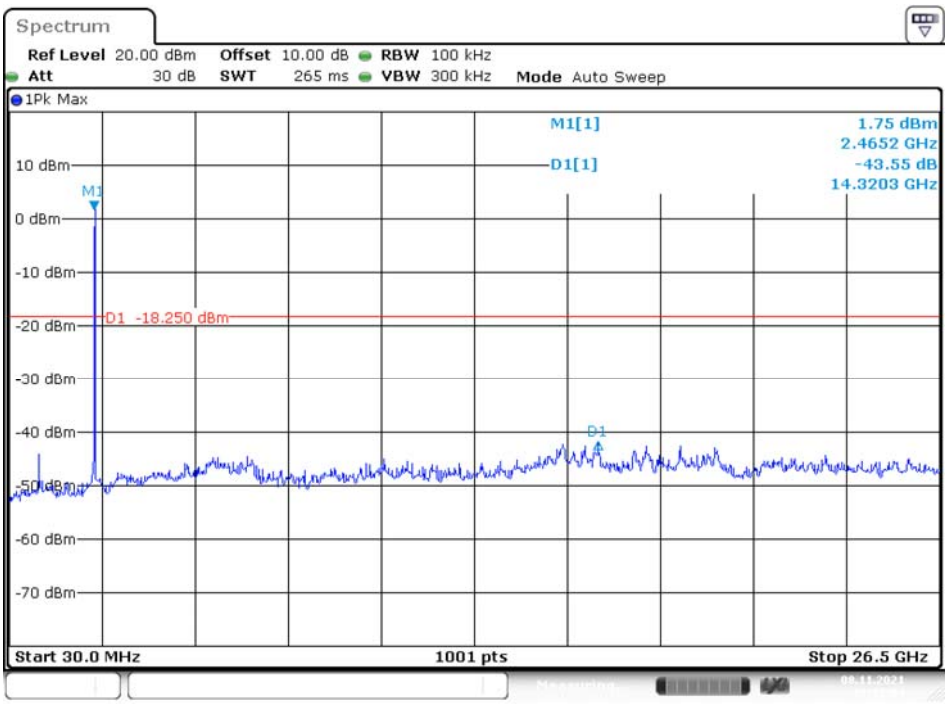
Date: 8.NOV.2021 10:10:29

Middle Channel



Date: 8.NOV.2021 10:12:44

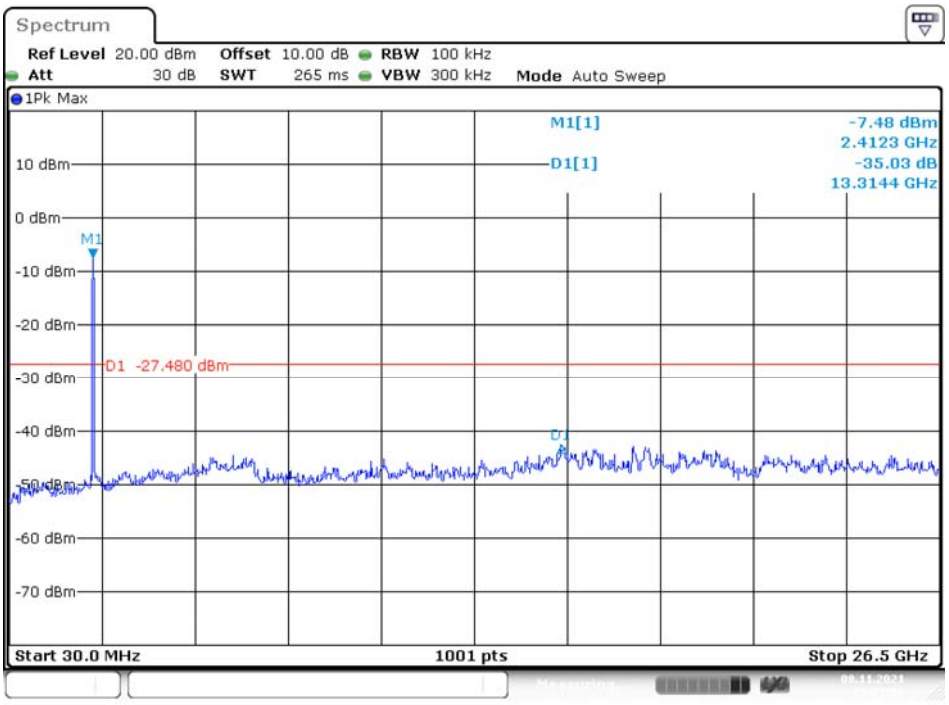
High Channel



Date: 8.NOV.2021 10:15:04

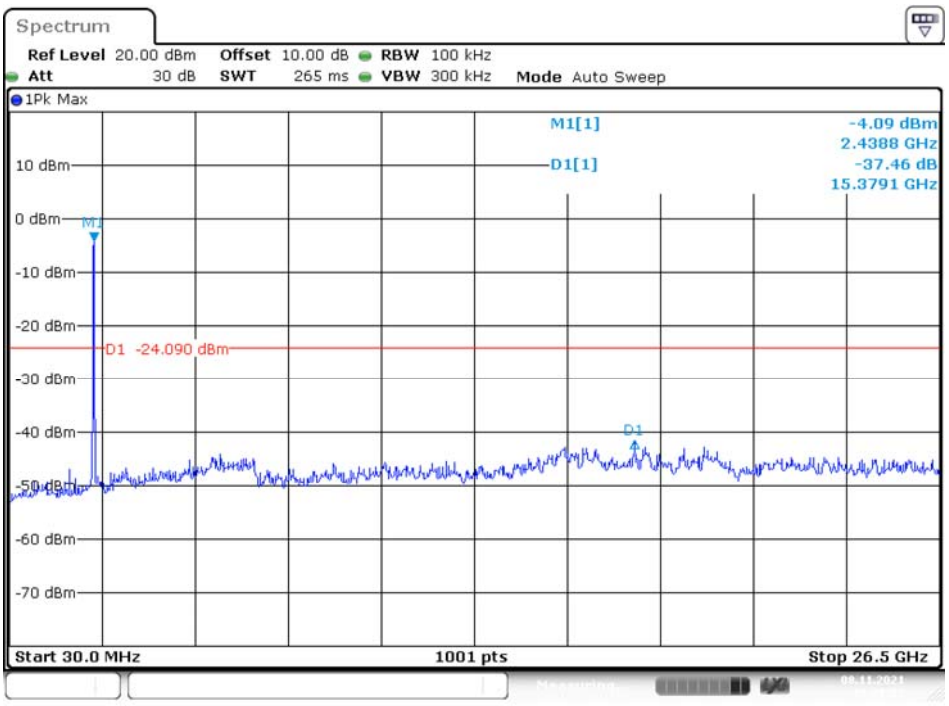
N40 Mode

Low Channel



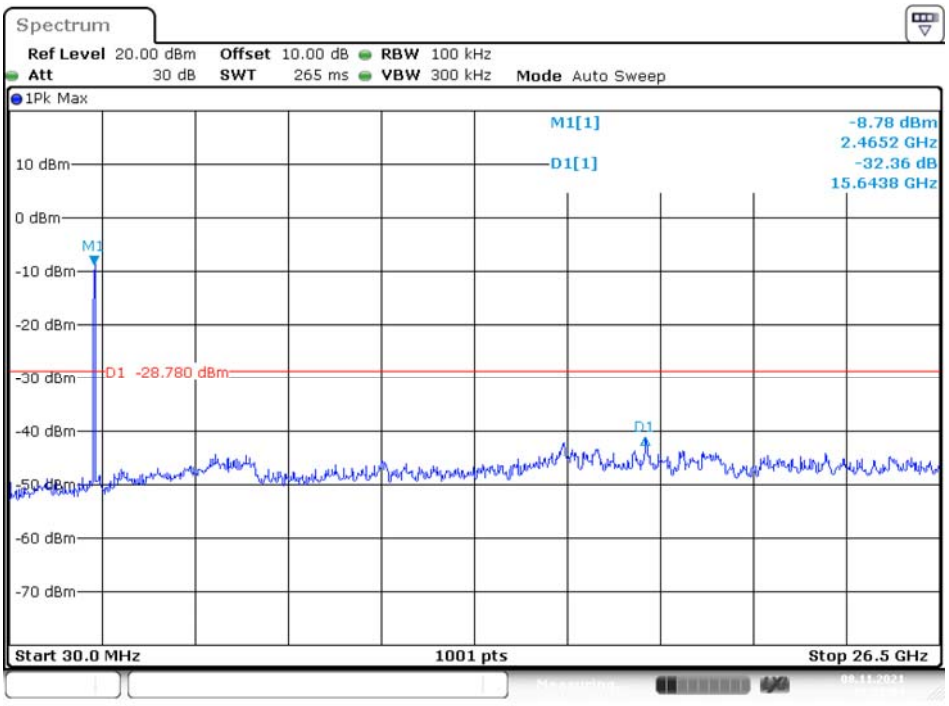
Date: 8.NOV.2021 10:27:05

Middle Channel



Date: 8.NOV.2021 10:28:51

High Channel



Date: 8.NOV.2021 10:32:04

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.

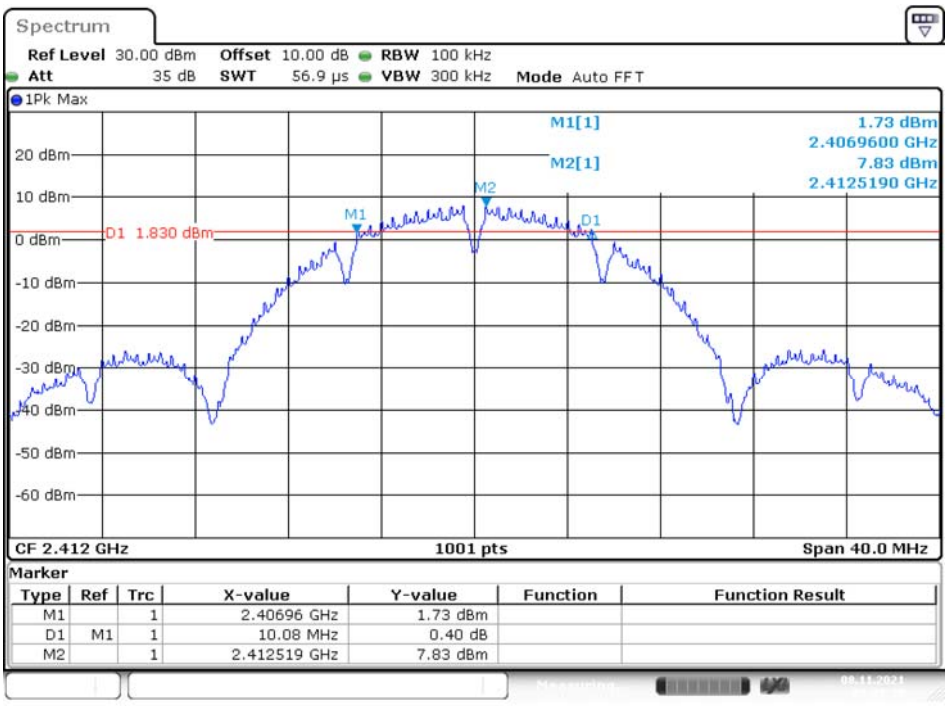
9.3 Test Results

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (kHz)	Result
B Mode				
Low	2412	10.08	> 500	PASS
Middle	2437	10.04	> 500	PASS
High	2462	10.08	> 500	PASS
G Mode				
Low	2412	15.12	> 500	PASS
Middle	2437	15.12	> 500	PASS
High	2462	15.12	> 500	PASS
N20 Mode				
Low	2412	15.12	> 500	PASS
Middle	2437	15.12	> 500	PASS
High	2462	15.12	> 500	PASS
N40 Mode				
Low	2422	35.12	> 500	PASS
Middle	2437	35.12	> 500	PASS
High	2452	35.12	> 500	PASS

Please refer to the following plots

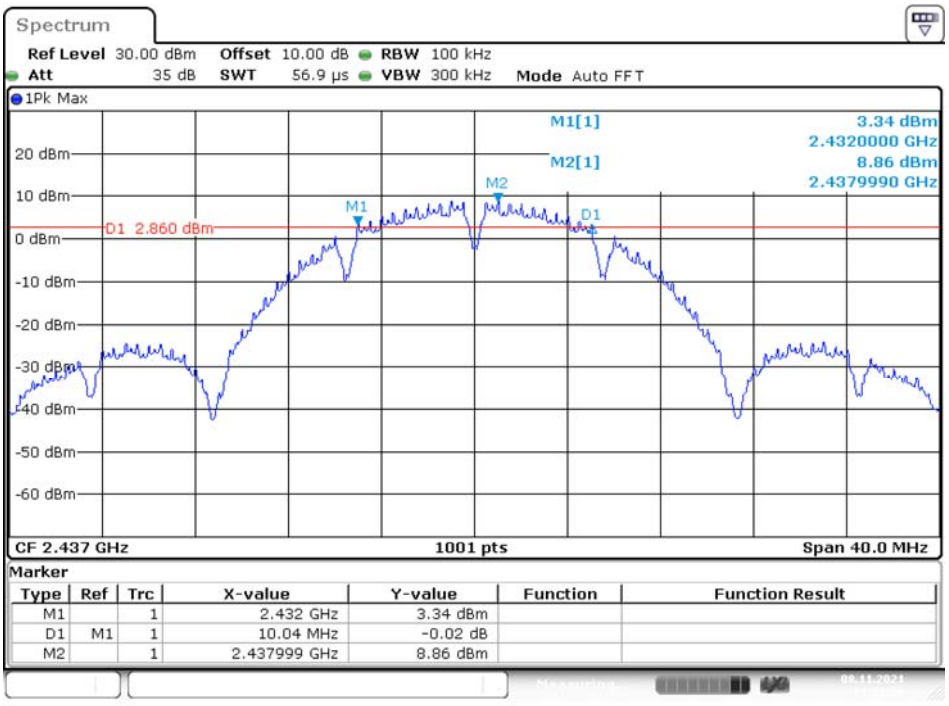
B Mode

Low Channel



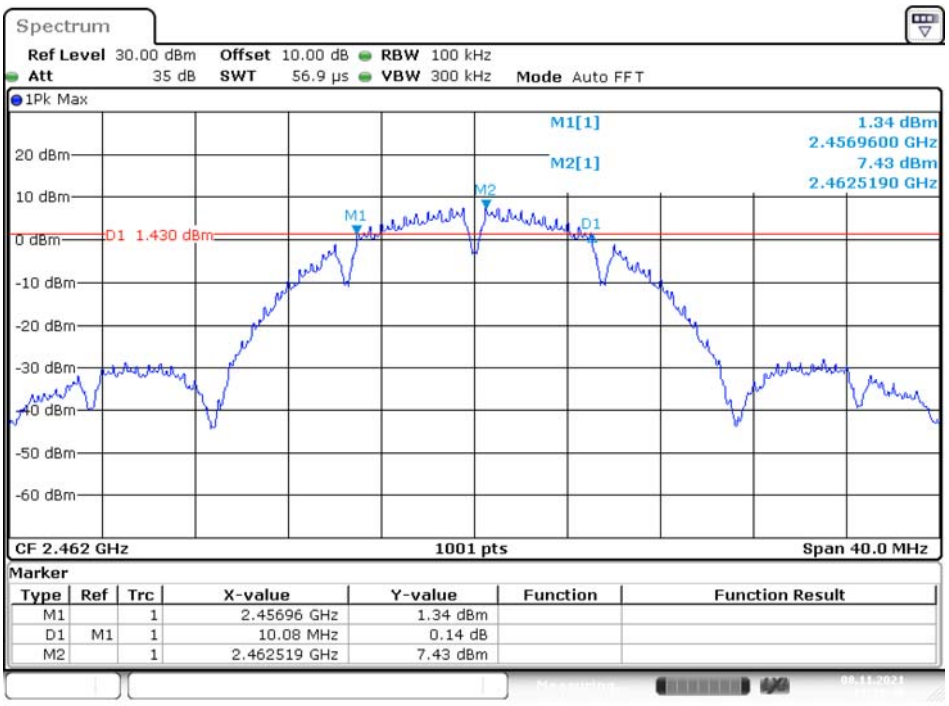
Date: 8.NOV.2021 09:23:10

Middle Channel



Date: 8.NOV.2021 11:22:35

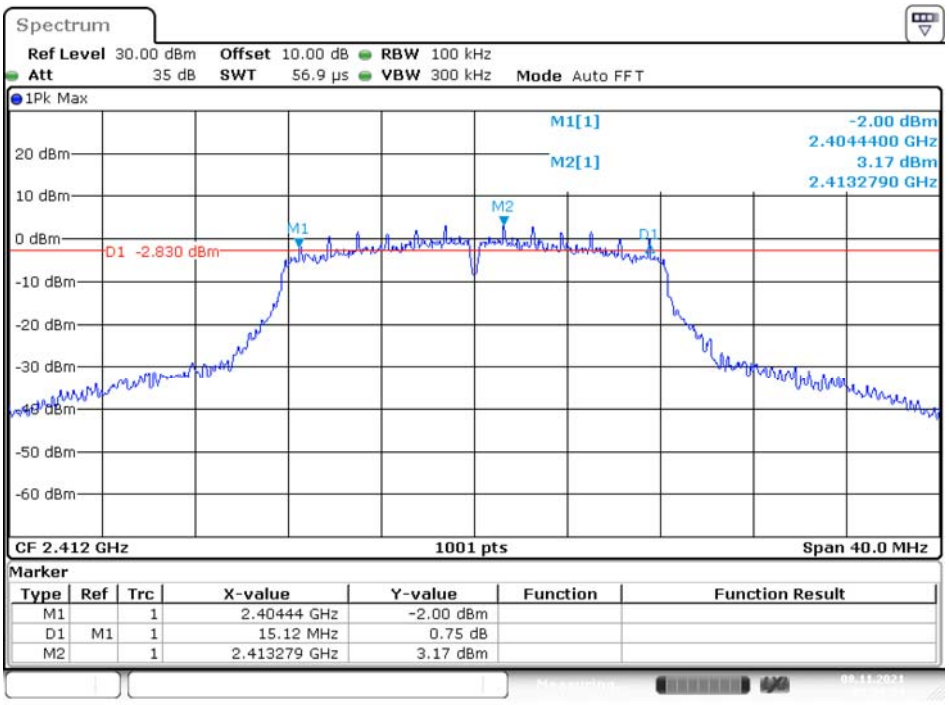
High Channel



Date: 8.NOV.2021 11:10:46

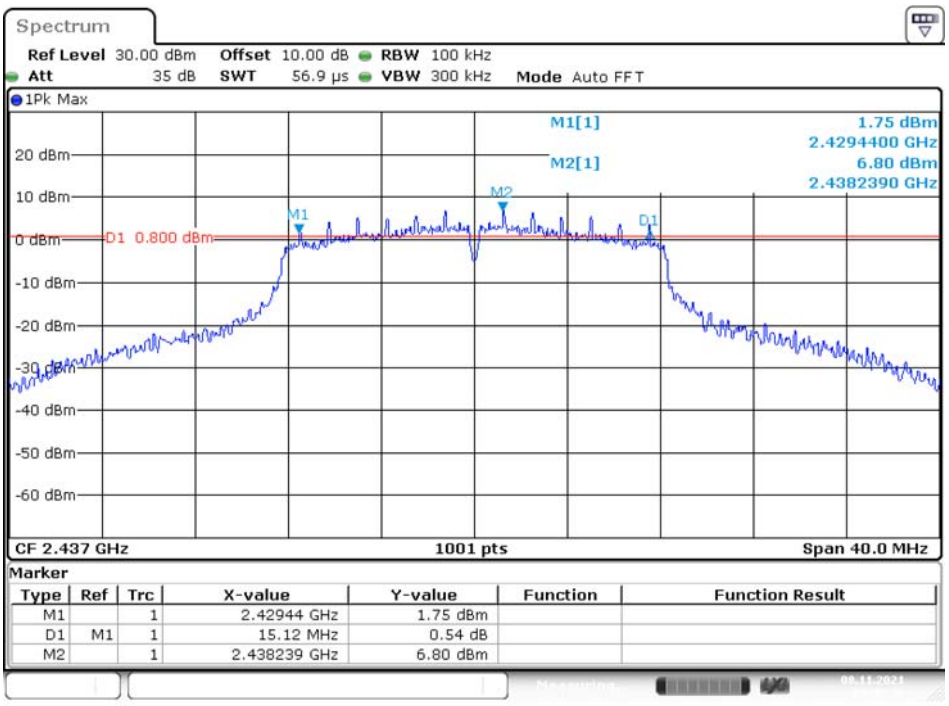
G Mode

Low Channel



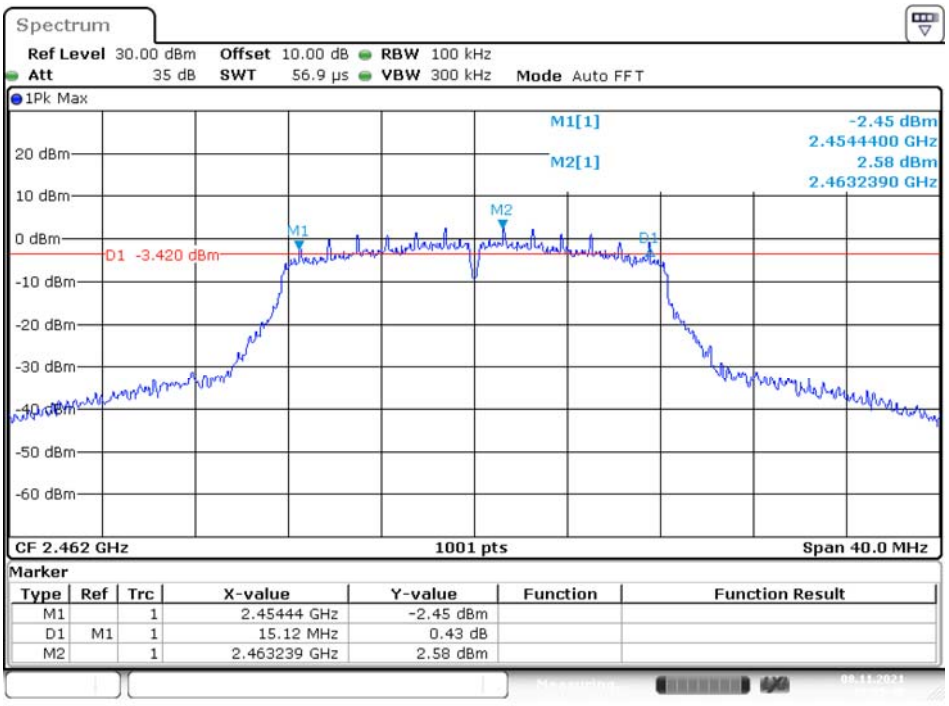
Date: 8.NOV.2021 09:36:24

Middle Channel



Date: 8.NOV.2021 09:45:16

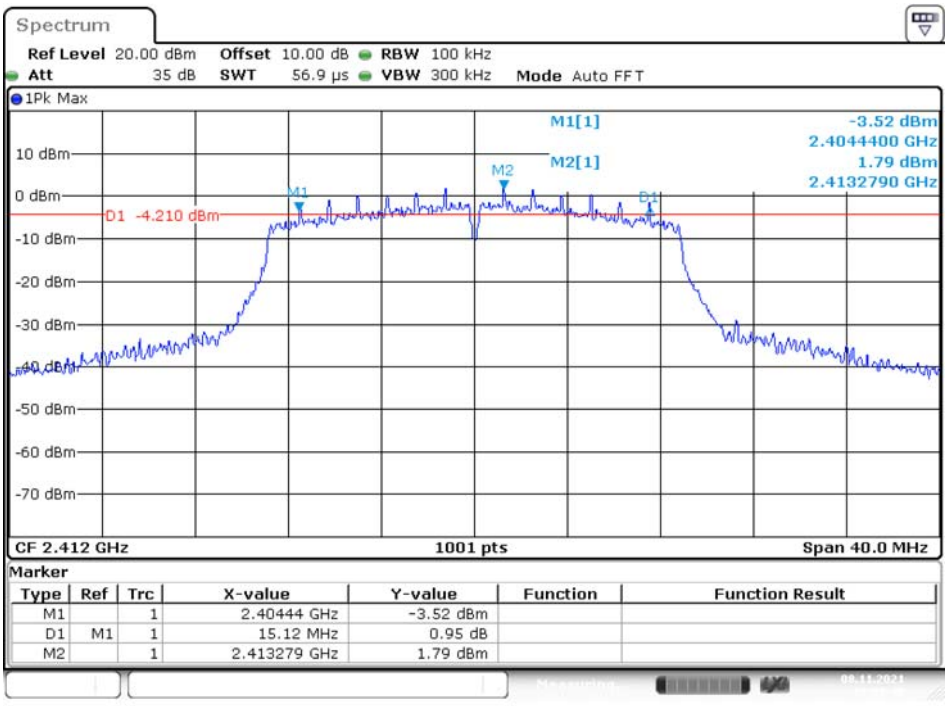
High Channel



Date: 8.NOV.2021 10:05:45

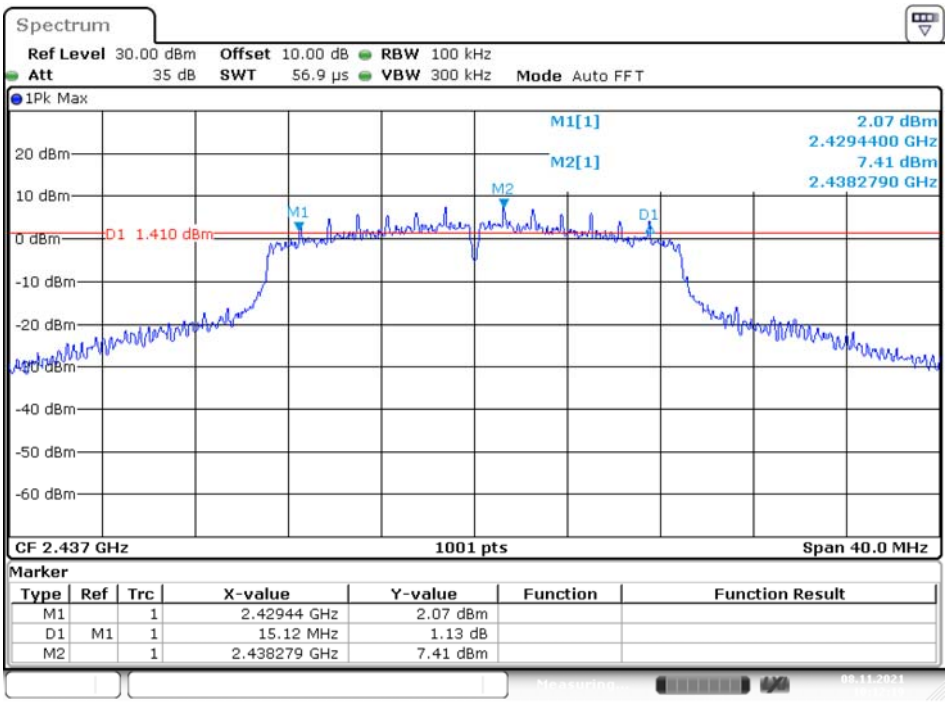
N20 Mode

Low Channel



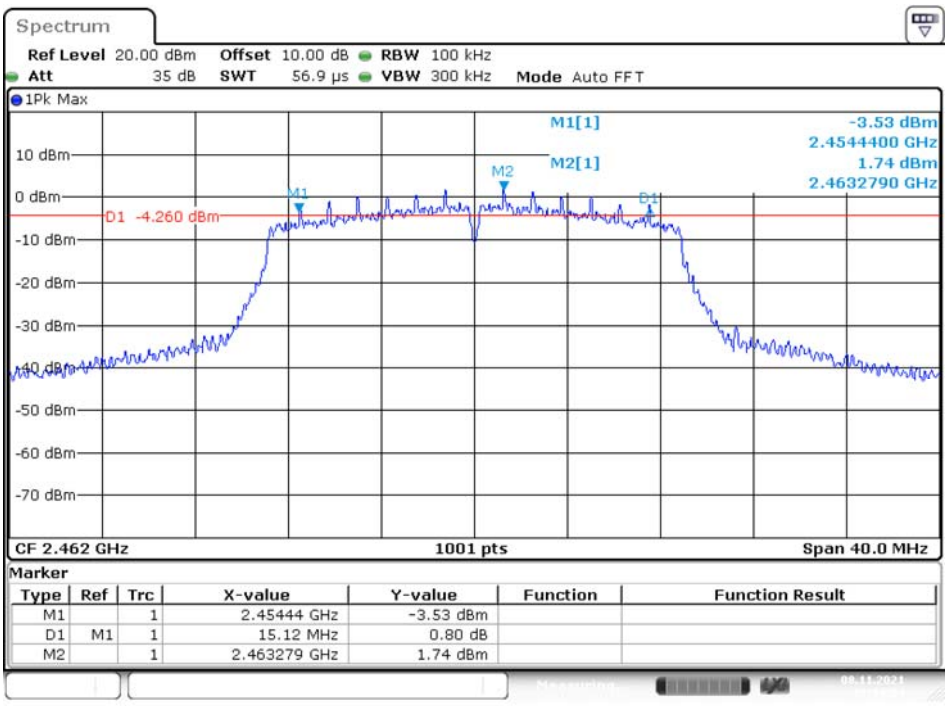
Date: 8.NOV.2021 10:09:49

Middle Channel



Date: 8.NOV.2021 10:12:19

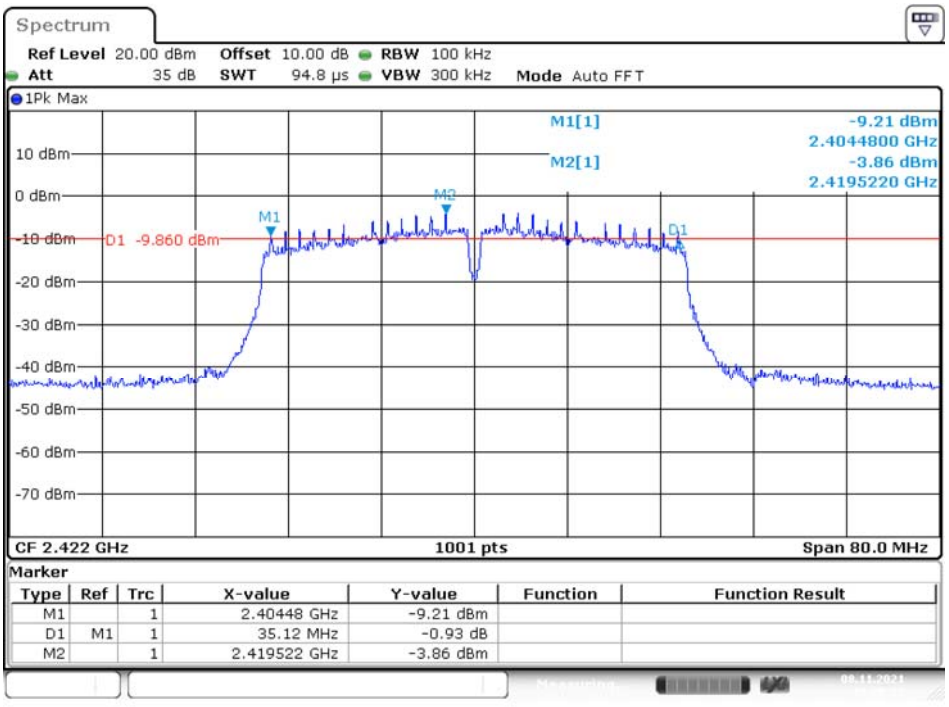
High Channel



Date: 8.NOV.2021 10:14:23

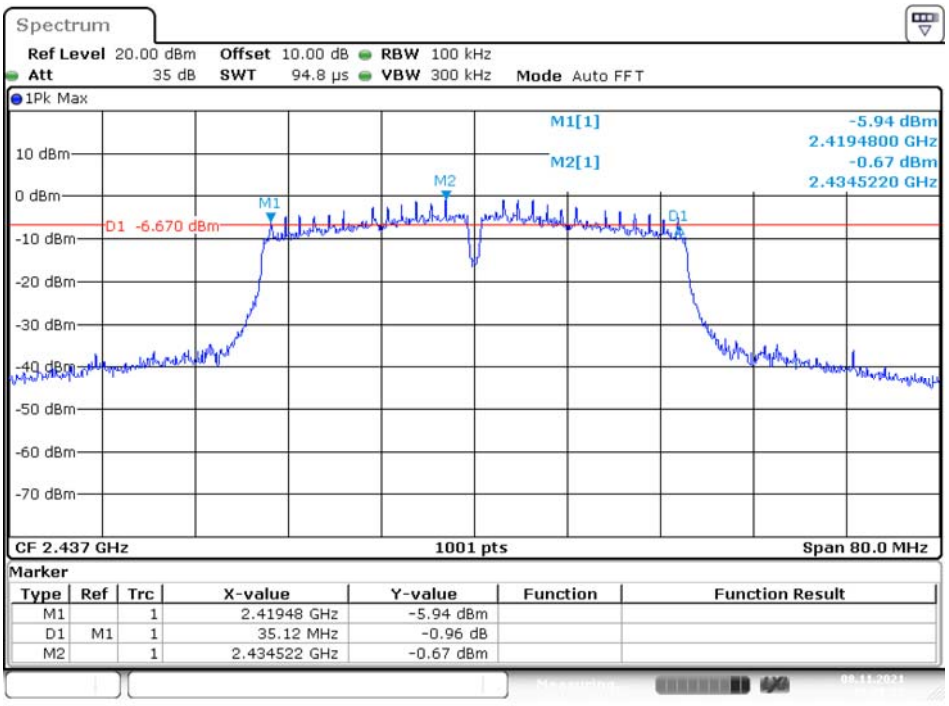
N40 Mode

Low Channel



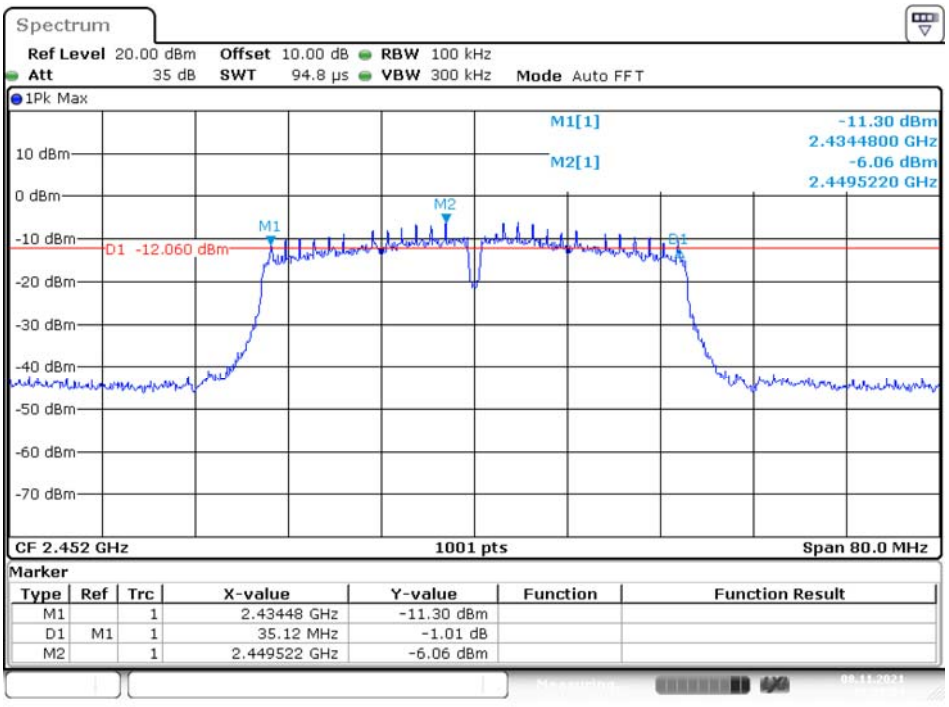
Date: 8.NOV.2021 10:26:25

Middle Channel



Date: 8.NOV.2021 10:28:27

High Channel



Date: 8.NOV.2021 10:31:24

10 FCC §15.247(b)(3) – Maximum 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	20.57	0.114	1	PASS
Middle	2437	20.85	0.122	1	PASS
High	2462	19.84	0.096	1	PASS
802.11g Mode					
Low	2412	23.22	0.210	1	PASS
Middle	2437	23.66	0.232	1	PASS
High	2462	21.84	0.153	1	PASS
802.11n HT20 Mode					
Low	2412	21.25	0.133	1	PASS
Middle	2437	23.94	0.248	1	PASS
High	2462	21.31	0.135	1	PASS
802.11n HT40 Mode					
Low	2422	17.11	0.051	1	PASS
Middle	2437	19.68	0.093	1	PASS
High	2452	15.01	0.032	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.

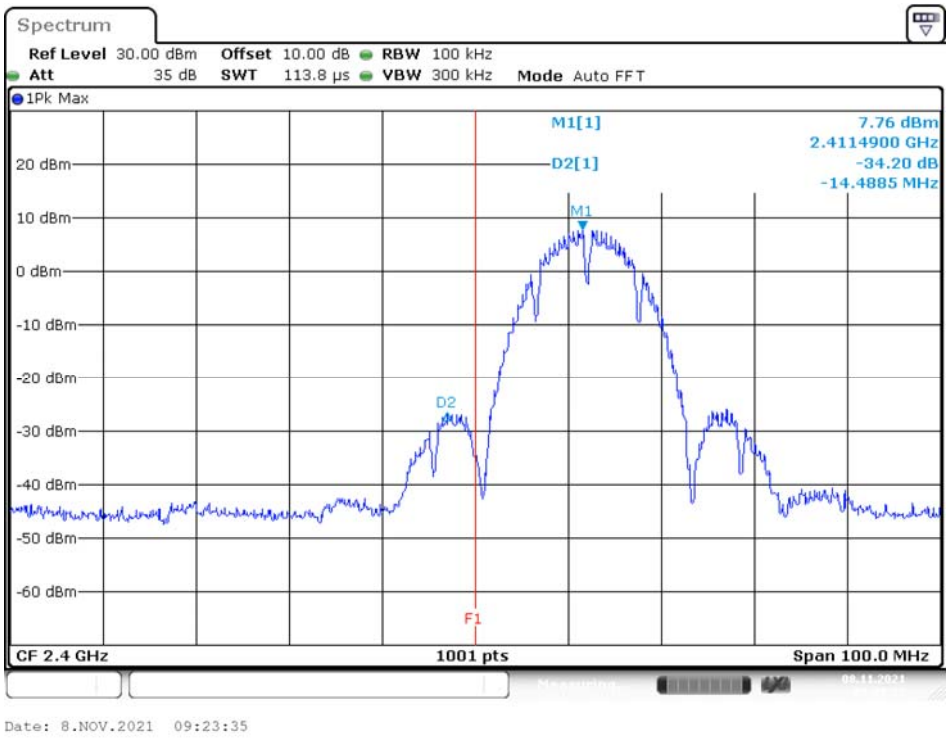
11.3 Test Results

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
B Mode				
Low	2412	34.20	≥ 20	PASS
High	2462	49.36	≥ 20	PASS
G Mode				
Low	2412	34.13	≥ 20	PASS
High	2462	44.23	≥ 20	PASS
N20 Mode				
Low	2412	35.85	≥ 20	PASS
High	2462	43.38	≥ 20	PASS
N40 Mode				
Low	2422	36.34	≥ 20	PASS
High	2452	36.33	≥ 20	PASS

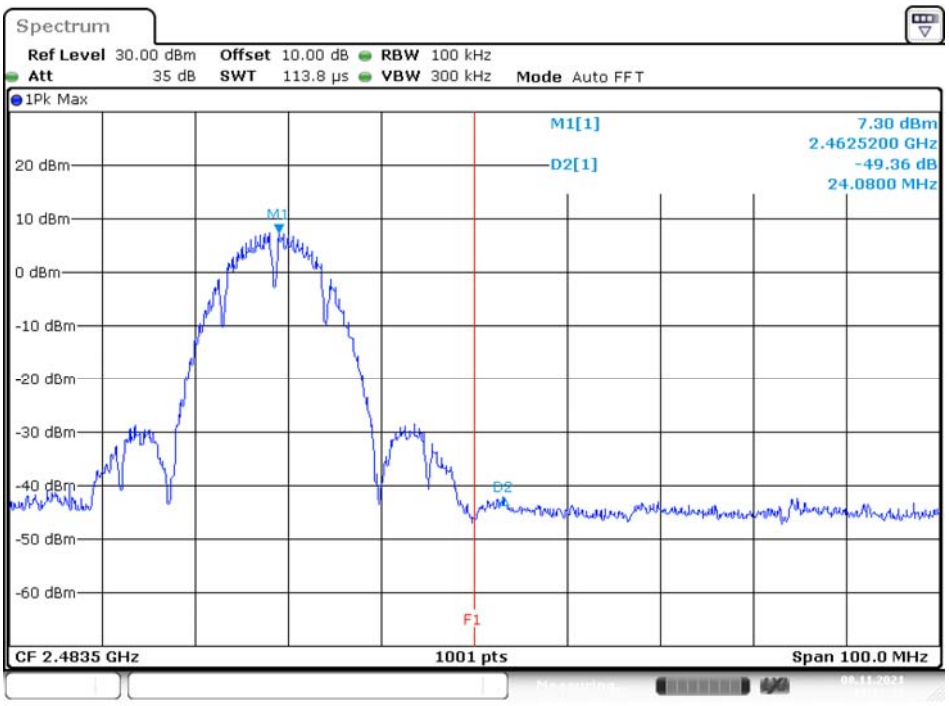
Please refer to the following plots.

B Mode

Band Edge, Left Side



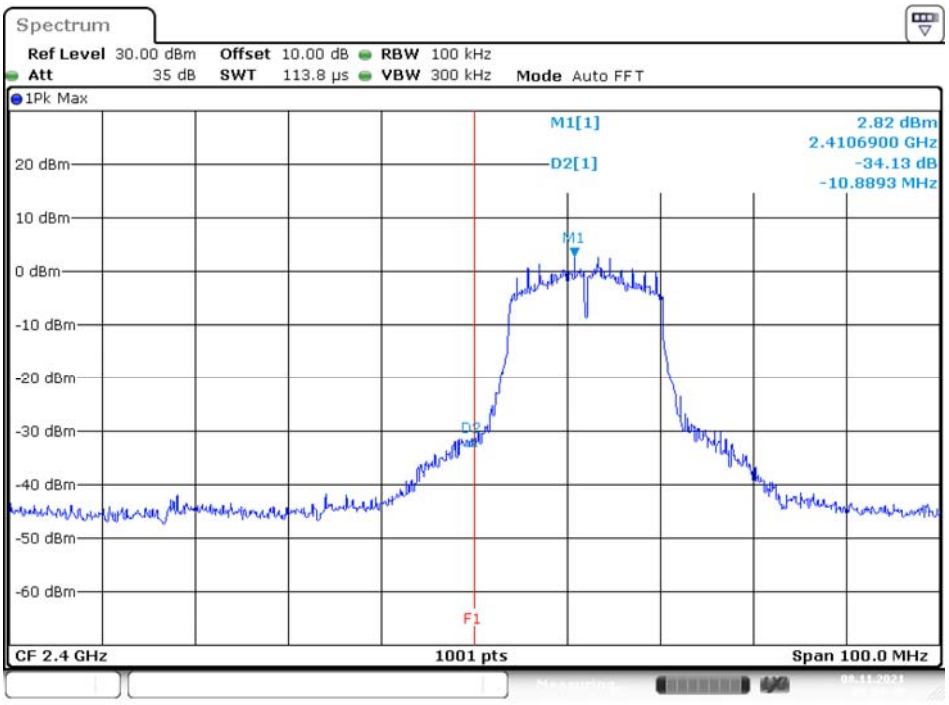
Band Edge, Right Side



Date: 8.NOV.2021 11:11:11

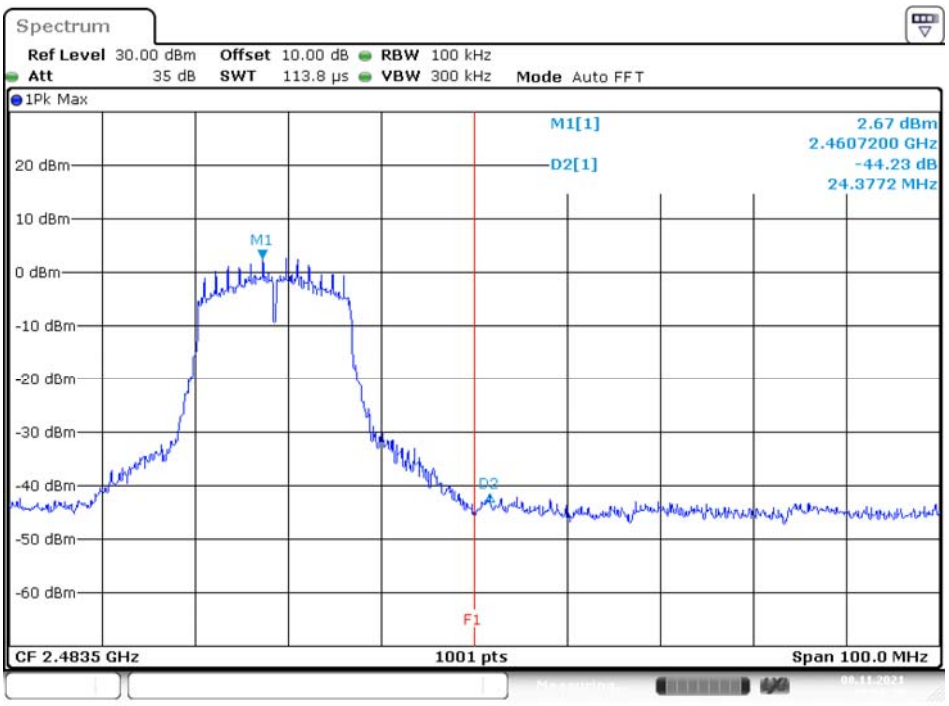
G Mode

Band Edge, Left Side



Date: 8.NOV.2021 09:36:49

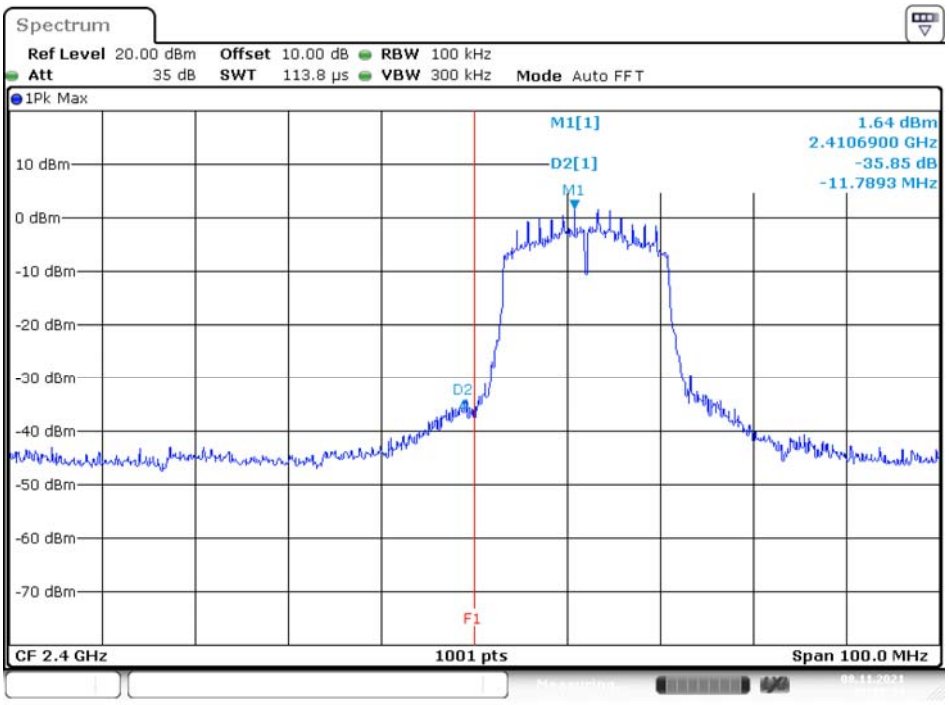
Band Edge, Right Side



Date: 8.NOV.2021 10:06:10

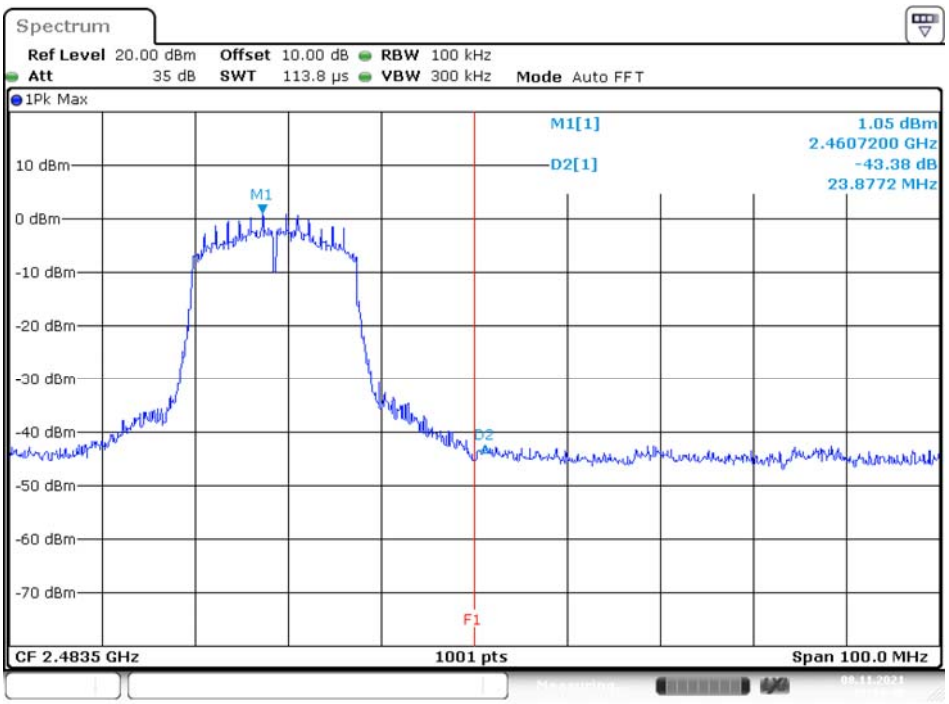
N20 Mode

Band Edge, Left Side



Date: 8.NOV.2021 10:10:14

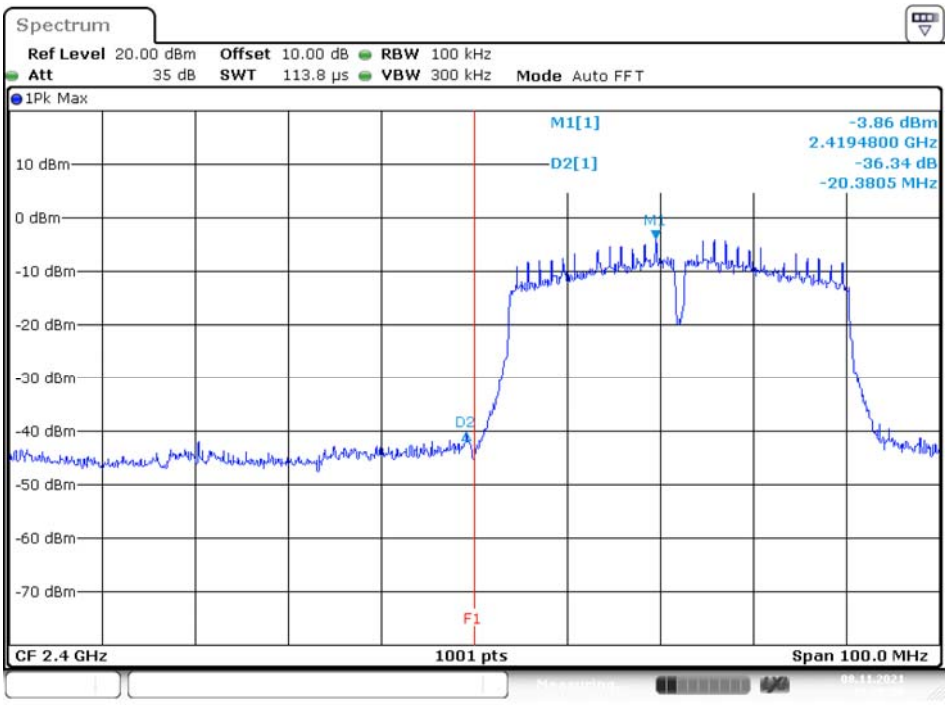
Band Edge, Right Side



Date: 8.NOV.2021 10:14:48

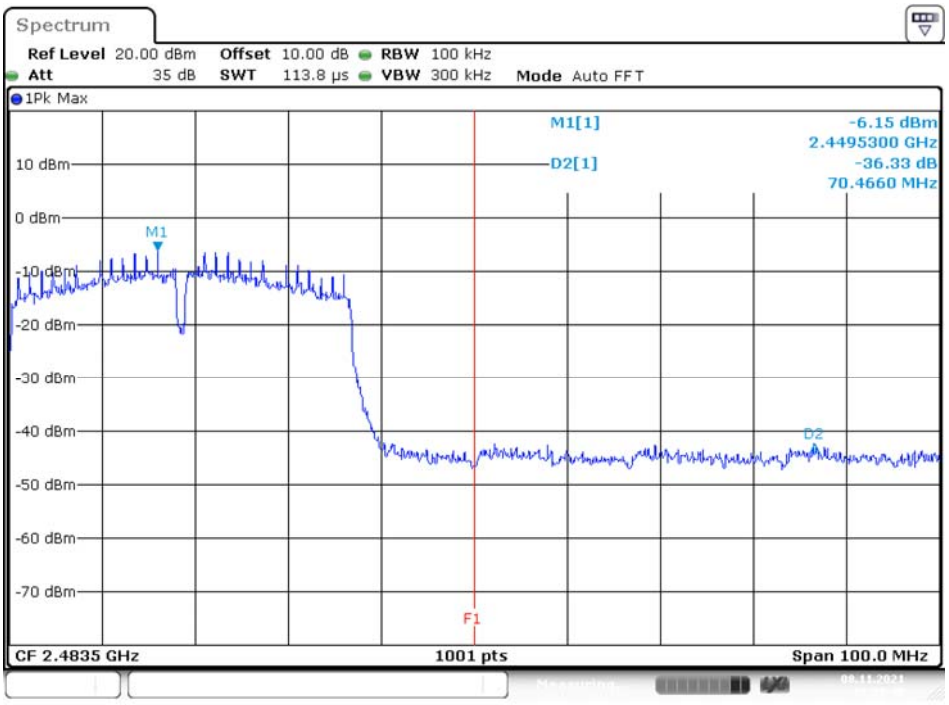
N40 Mode

Band Edge, Left Side



Date: 8.NOV.2021 10:26:50

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

According to ANSI C63.10-2013

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

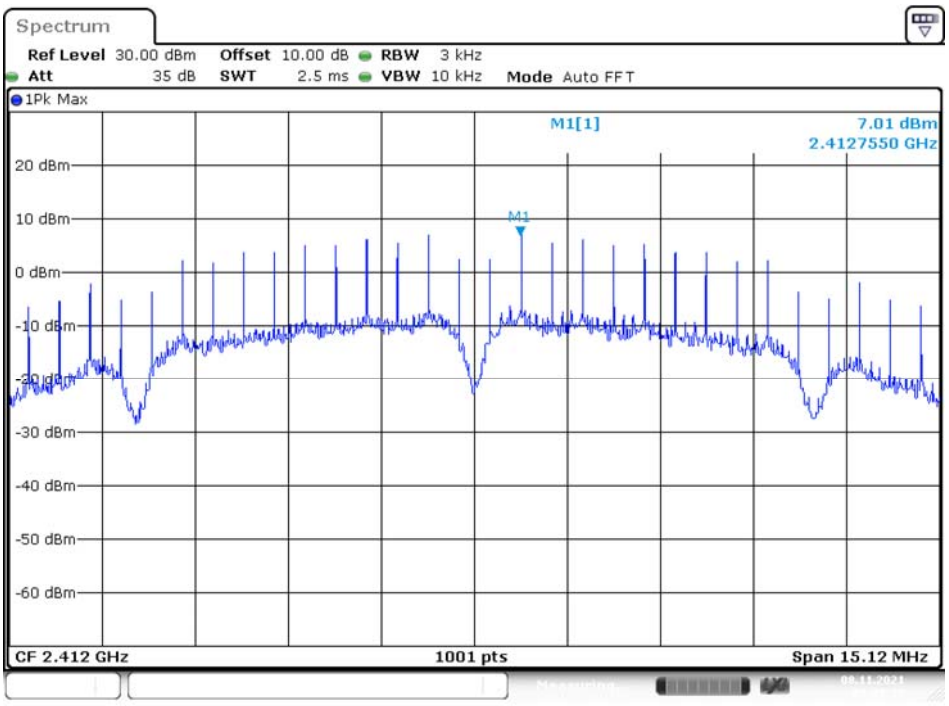
12.3 Test Results

Channel	Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
B Mode				
Low	2412	7.01	8	PASS
Middle	2437	7.77	8	PASS
High	2462	6.59	8	PASS
G Mode				
Low	2412	-12.12	8	PASS
Middle	2437	-7.86	8	PASS
High	2462	-11.96	8	PASS
N20 Mode				
Low	2412	-12.01	8	PASS
Middle	2437	-7.34	8	PASS
High	2462	-12.66	8	PASS
N40 Mode				
Low	2422	-18.75	8	PASS
Middle	2437	-15.71	8	PASS
High	2452	-21.21	8	PASS

Please refer to the following plots

B Mode

Low Channel



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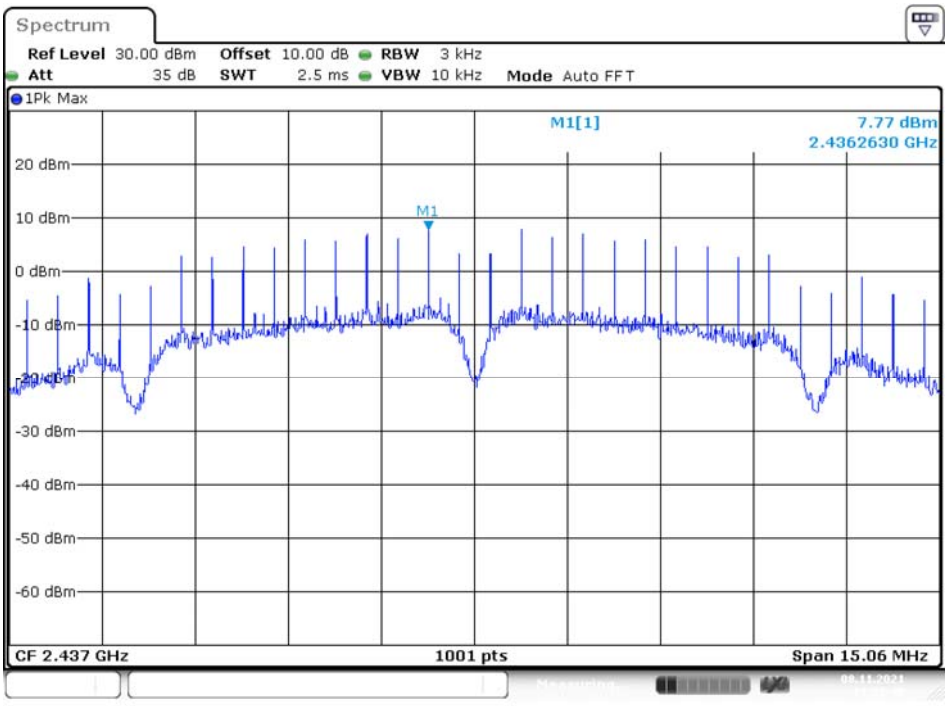
Middle Channel



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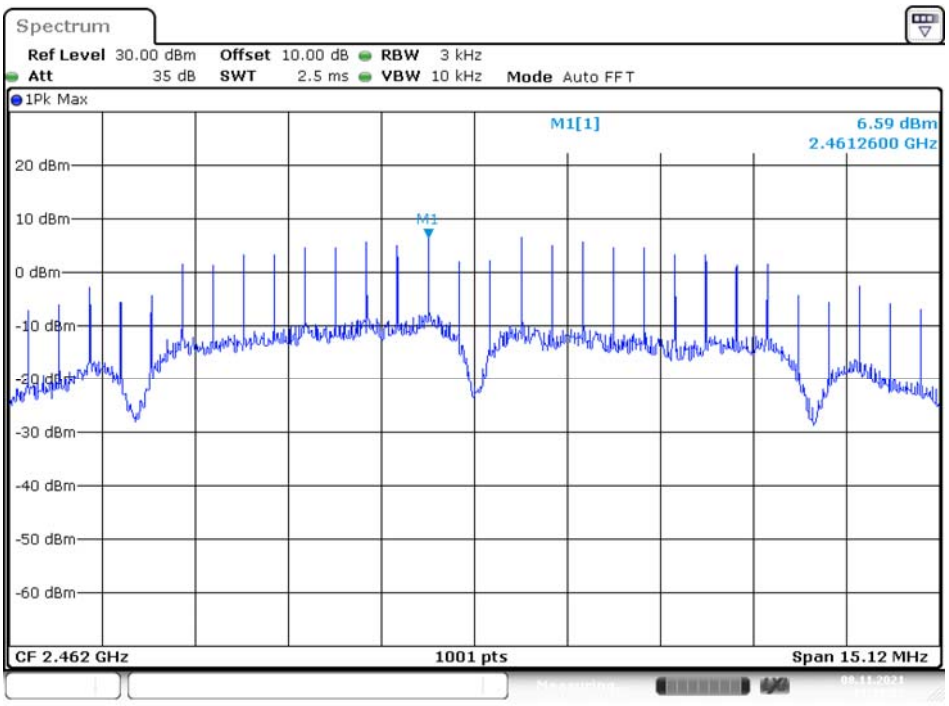
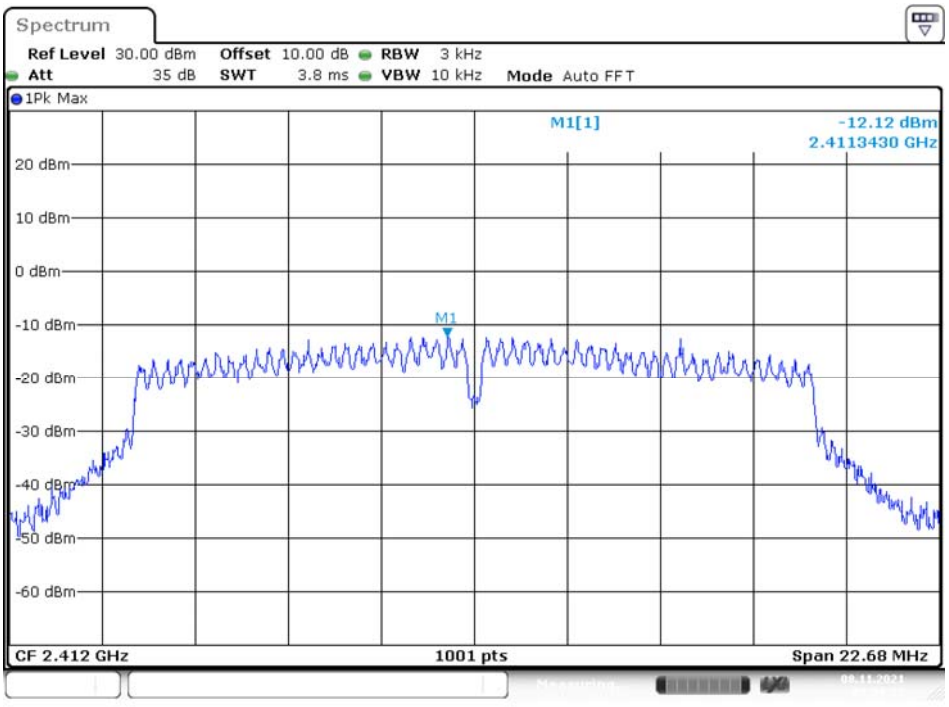
High Channel

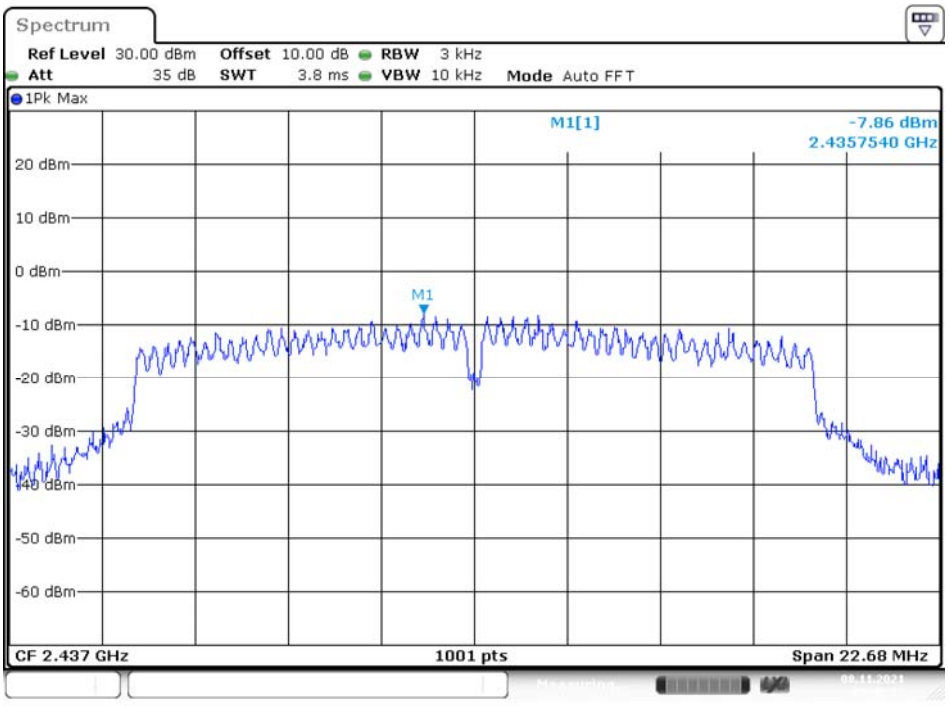


G Mode

Low Channel

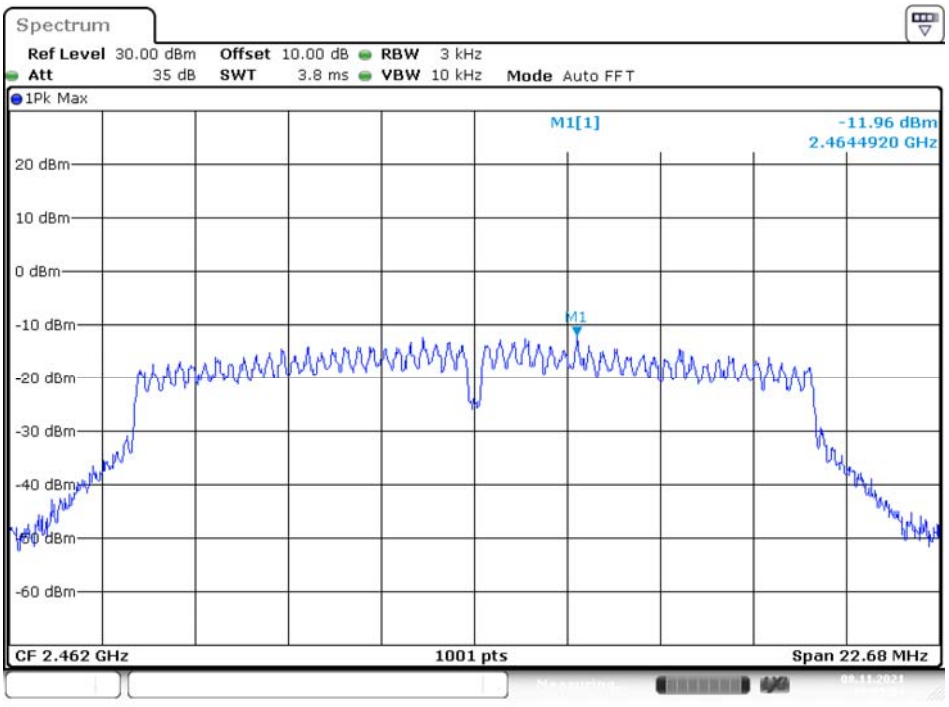


Middle Channel



Date: 8.NOV.2021 09:45:25

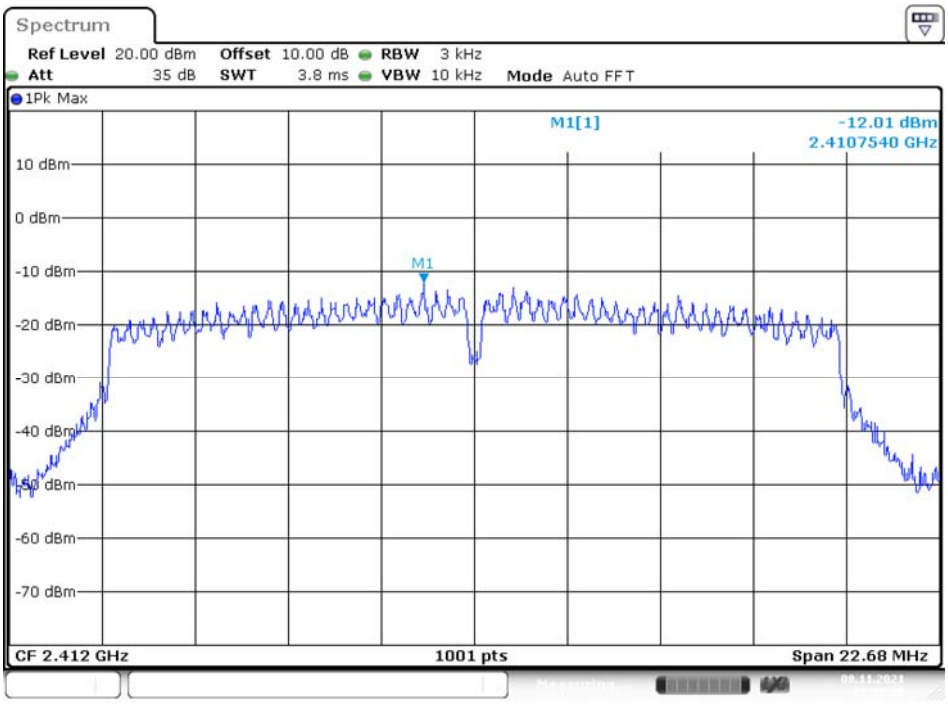
High Channel



Date: 8.NOV.2021 10:05:54

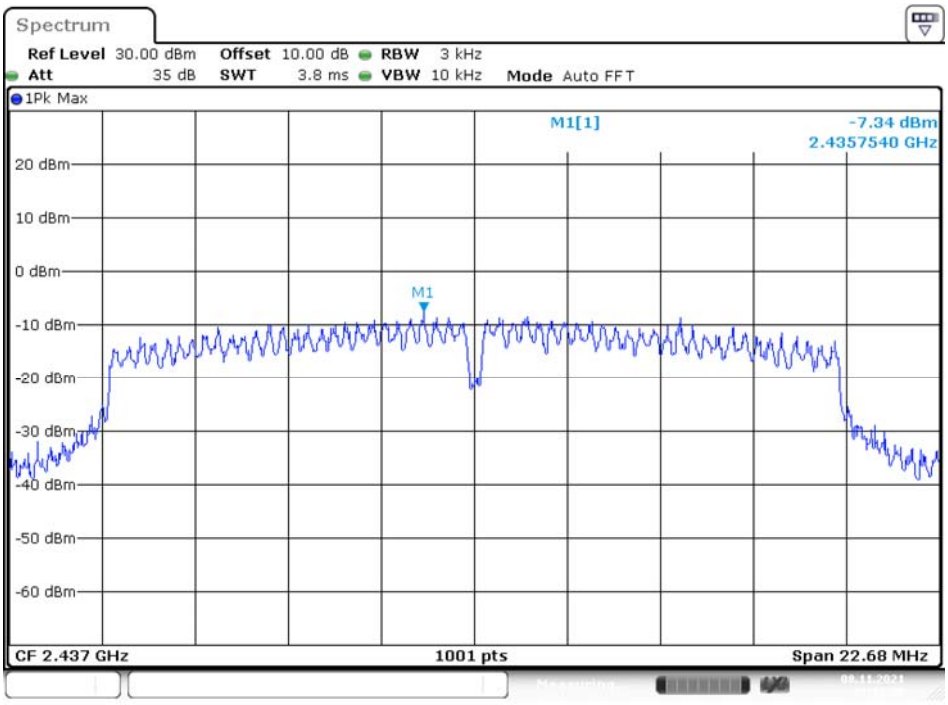
N20 Mode

Low Channel



Date: 8.NOV.2021 10:09:58

Middle Channel



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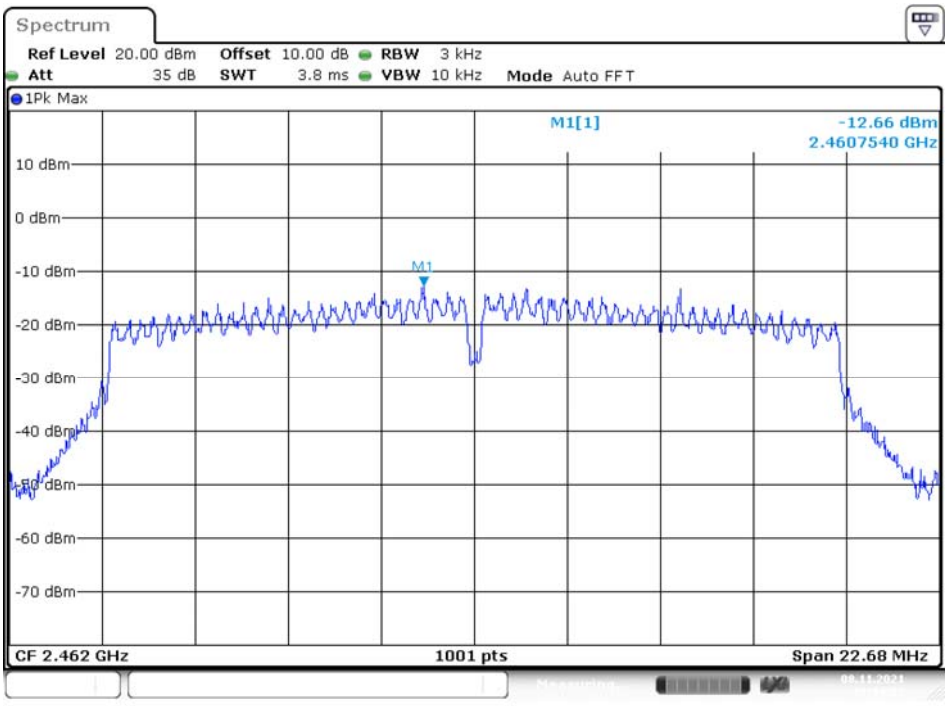
High Channel



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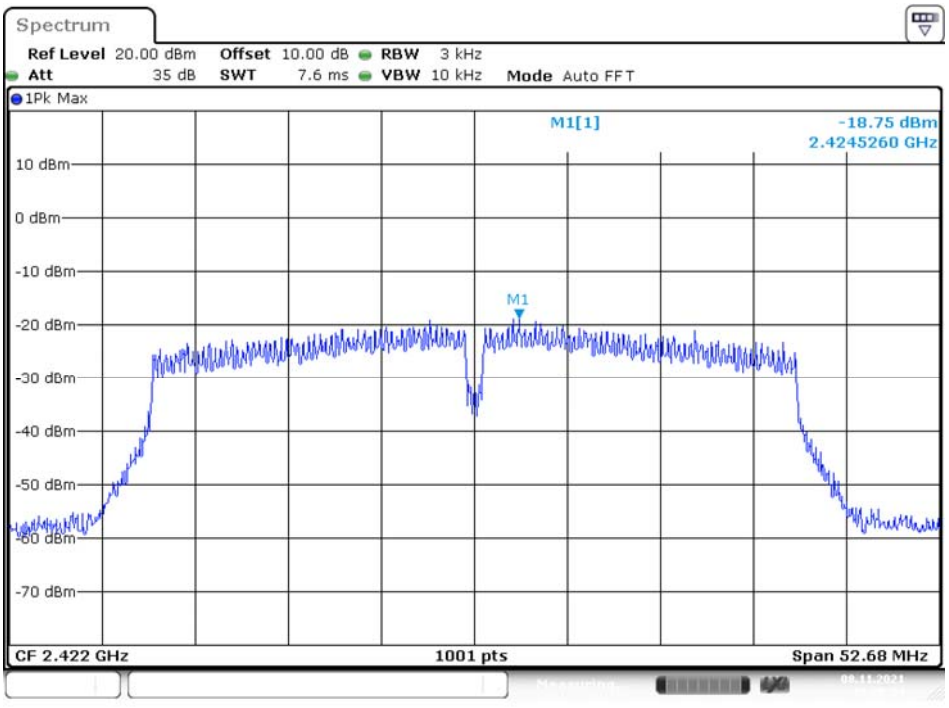
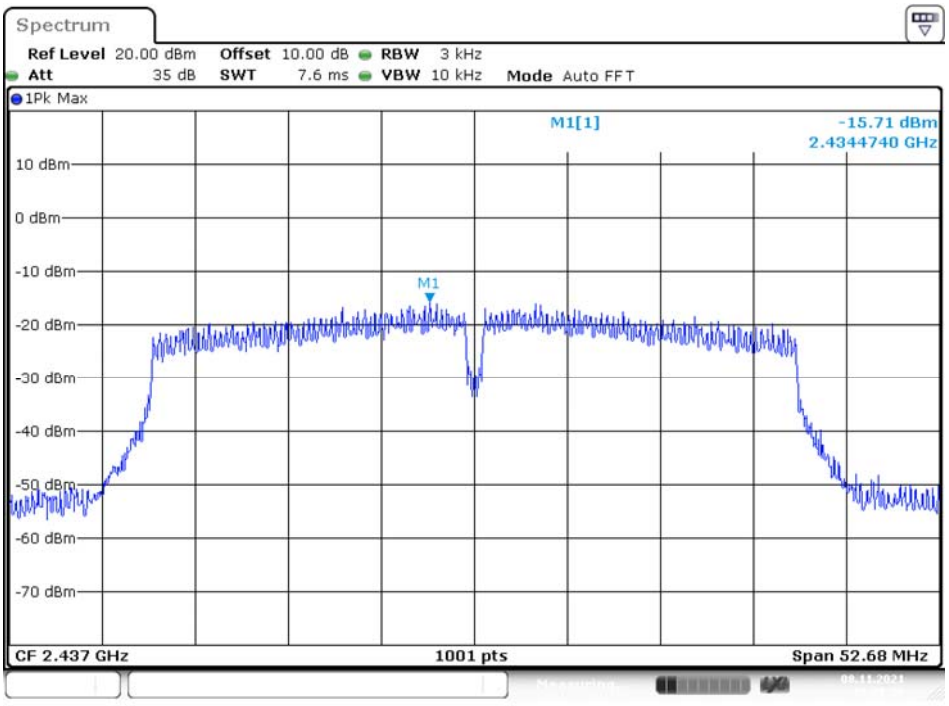
N40 Mode

Low Channel



Date: 8.NOV.2021 10:26:34

Middle Channel



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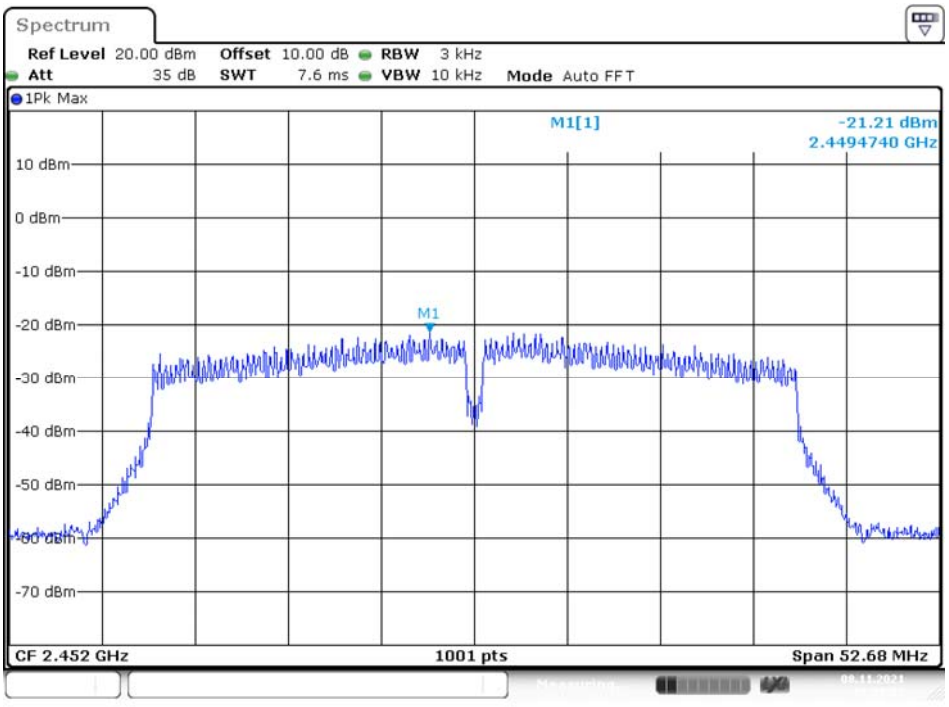
High Channel



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