FCC Part 15.247

TEST REPORT

For

UConnect International Co.,Ltd.

8F., No. 200-3, Jianxing Rd., Zhongli Dist., Taoyuan City, Taiwan (R.O.C.)

FCC ID: XJ8S2XXCOMXVN

Report Type:	**Product Type:**
Original Report	Bluetooth RS-232 adapter

Report Producer : Coco Lin

Report Number : RXZ220117002RF01

Report Date : 2022-04-20

Reviewed By: David Hsu David.Hsu

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Revision History

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
0.0	RXZ220117002	RXZ220117002RF01	2022-04-20	Original Report	Coco Lin

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1. General Information

1.1. Product Description for Equipment under Test (EUT)

<table>
<tr><td rowspan="2">Applicant</td><td>UConnect International Co.,Ltd.</td></tr>
<tr><td>8F., No. 200-3, Jianxing Rd., Zhongli Dist.,
Taoyuan City, Taiwan (R.O.C.)</td></tr>
<tr><td rowspan="2">Manufacturer</td><td>UConnect International Co.,Ltd.</td></tr>
<tr><td>8F., No. 200-3, Jianxing Rd., Zhongli Dist.,
Taoyuan City, Taiwan (R.O.C.)</td></tr>
<tr><td>Brand(Trade) Name</td><td>N/A</td></tr>
<tr><td>Product (Equipment)</td><td>Bluetooth RS-232 adapter</td></tr>
<tr><td>Main Model Name</td><td>S2B2232FIV2</td></tr>
<tr><td>Series Model Name</td><td>S2B2232IV2, S2DB232FIV2, S2DB232IV2, S2W232IV2, S2W232I-ESP32, S2B2232FEV2, S2B2232EV2, S2DB232FEV2, S2DB232EV2, S2W232EV2, S2W232E-ESP32</td></tr>
<tr><td>Model Discrepancy</td><td>The major electrical and mechanical constructions of series models are identical to the basic model, except different antenna type. The model, S2B2232FIV2 is the testing sample, and the final test data are shown on this test report.
<table>
<tr><td>Model</td><td>Antenna type</td></tr>
<tr><td>S2B2232FIV2</td><td>Chip</td></tr>
<tr><td>S2B2232IV2</td><td>Chip</td></tr>
<tr><td>S2DB232FIV2</td><td>Chip</td></tr>
<tr><td>S2DB232IV2</td><td>Chip</td></tr>
<tr><td>S2W232IV2</td><td>Chip</td></tr>
<tr><td>S2W232I-ESP32</td><td>Chip</td></tr>
<tr><td>S2B2232FEV2</td><td>Dipole</td></tr>
<tr><td>S2B2232EV2</td><td>Dipole</td></tr>
<tr><td>S2DB232FEV2</td><td>Dipole</td></tr>
<tr><td>S2DB232EV2</td><td>Dipole</td></tr>
<tr><td>S2W232EV2</td><td>Dipole</td></tr>
<tr><td>S2W232E-ESP32</td><td>Dipole</td></tr>
</table></td></tr>
<tr><td>Frequency Range</td><td>2402 ~ 2480 MHz</td></tr>
<tr><td>Transmit Power</td><td>BR(GFSK) Mode: -2.45 dBm
EDR(π/4-DQPSK) Mode: -0.86 dBm
EDR(8DPSK) Mode: -0.90 dBm</td></tr>
<tr><td>Modulation Technique</td><td>BR Mode: GFSK
EDR Mode: π/4-DQPSK, 8DPSK</td></tr>
<tr><td>Transmit Data Rate</td><td>BR(GFSK) Mode: 1 Mbps
EDR(π/4-DQPSK) Mode: 2 Mbps
EDR(8DPSK) Mode: 3 Mbps</td></tr>
<tr><td>Power Operation
(Voltage Range)</td><td>5~28 VDC form Mini USB, 2P Terminal Block (Blue) and pin9 of DB9</td></tr>
</table>

Received Date	Jan. 11, 2022
Date of Test	Feb. 11, 2022 ~ Mar. 17, 2022

*All measurement and test data in this report was gathered from production sample serial number: RXZ220117002-02/03 (Assigned by BACL, New Taipei Laboratory).

1.2. Objective

This report is prepared on behalf of UConnect International 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)

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.

1.5. Statement

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

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

1.6. Measurement Uncertainty

Parameter		Uncertainty
AC Mains		+/- 2.36 dB
RF output power, conducted		+/- 0.93 dB
Power Spectral Density, conducted		+/- 0.93 dB
Occupied Bandwidth		+/- 0.35 MHz
Unwanted Emissions, conducted		+/- 1.69 dB
Emissions, radiated	30 MHz~1GHz	+/- 5.22 dB
	1 GHz~18 GHz	+/- 6.12 dB
	18 GHz~40 GHz	+/- 4.99 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	2022/3/17	22.1	69	1010	Boris Kao
Radiation Spurious Emissions	2022/2/11-14	19.8	69	1010	Boris Kao
Conducted Spurious Emissions	2022/2/16	22.5	58	1010	Aaron Pan
20 dB Emission Bandwidth	2022/2/16	22.5	58	1010	Aaron Pan
Channel Separation Test	2022/2/16-17	21.3-22.5	57-58	1010	Aaron Pan
Time of Occupancy	2022/2/16-17	21.3-22.5	57-58	1010	Aaron Pan
Quantity of hopping channel	2022/2/16	22.5	58	1010	Aaron Pan
Maximum Output Power	2022/2/16	22.5	58	1010	Aaron Pan
100 kHz Bandwidth of Frequency Band Edge	2022/2/16-17	21.3-22.5	57-58	1010	Aaron Pan

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) 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 BT mode, 79 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	40	2442
1	2403	--	--
2	2404	76	2478
3	2405	77	2479
--	--	78	2480
39	2441	/	/

For BT Modes were tested with channel 0, 39 and 78.

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 "EspRFTestTool_v2.8"

Test Frequency		2402MHz	2441MHz	2480MHz
Power Level Setting	GFSK	6	6	6
	π/4-DQPSK	6	6	6
	8DPSK	6	6	6

2.4. Test Mode

Pre-scan

AC Line Conducted Emissions and Radiated Spurious Emissions

	Test Model No.	Test Mode	Sample Serial No.
Mode 1	S2B2232FIV2	Chip Antenna Power from USB	RXZ220117002-2
Mode 2	S2B2232FIV2	Chip Antenna Power from DC (Radiated Spurious Emissions)	RXZ220117002-2
Mode 3	S2B2232FIV2	Chip Antenna Power from DB9	RXZ220117002-2
Mode 4	S2B2232FEV2	Dipole Antenna Power from USB	RXZ220117002-3
Mode 5	S2B2232FEV2	Dipole Antenna Power from DC (Radiated Spurious Emissions)	RXZ220117002-3
Mode 6	S2B2232FEV2	Dipole Antenna Power from DB9	RXZ220117002-3

Worst case is the Model 1/Mode 4.

	Test Model No.	Test Mode	Sample Serial No.
Mode 1	S2B2232FIV2	Chip Antenna Power from USB	RXZ220117002-2
Mode 4	S2B2232FEV2	Dipole Antenna Power from USB	RXZ220117002-3

2.5. Support Equipment List and Details

Description	Manufacturer	Model Number	S/N
NB	DELL	E6410	8N7PXN1

2.6. External Cable List and Details

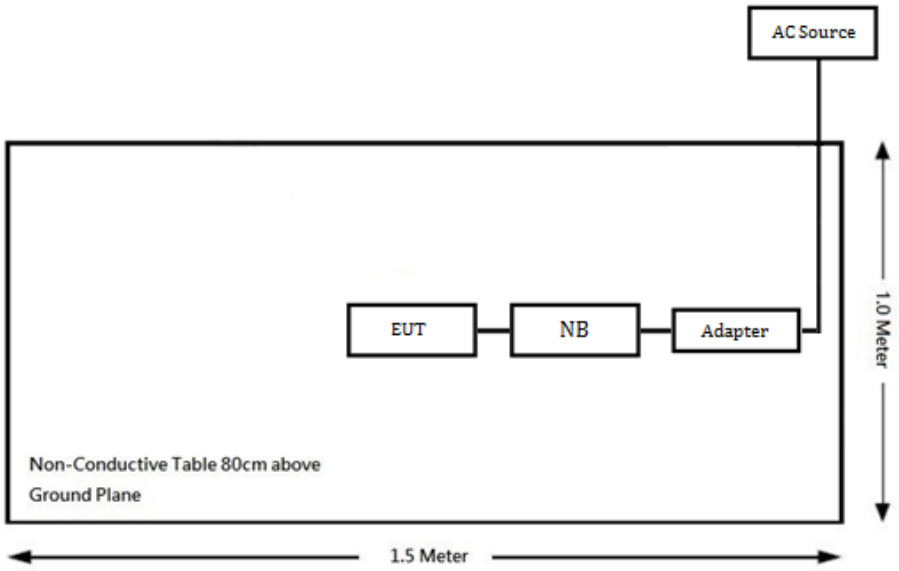
Cable Description	Length (m)	From	To
Mini USB Cable	1.5	EUT	NB
RS-232 to USB Cable	0.6	EUT	NB

2.7. Block Diagram of Test Setup

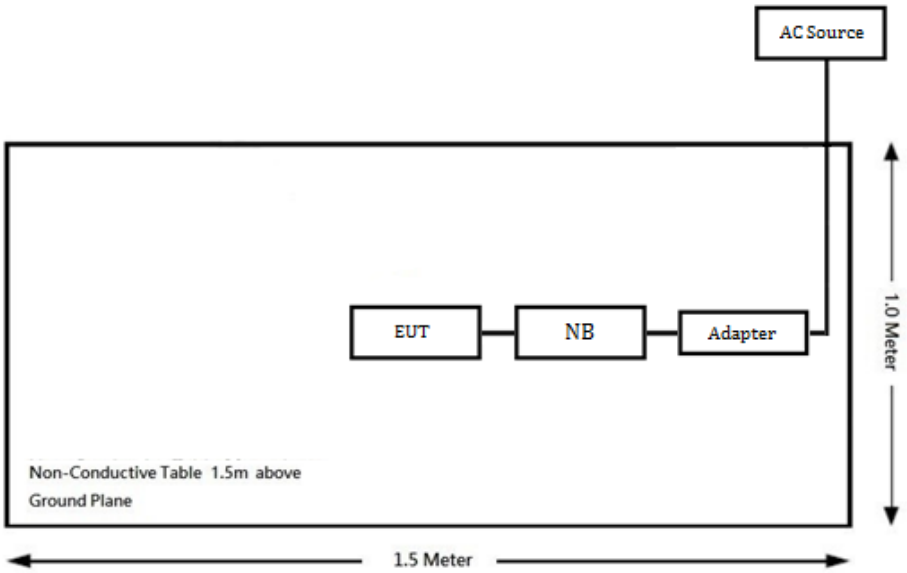
See test photographs attached in annex setup photos for the actual connections between EUT and support equipment.

Radiation:

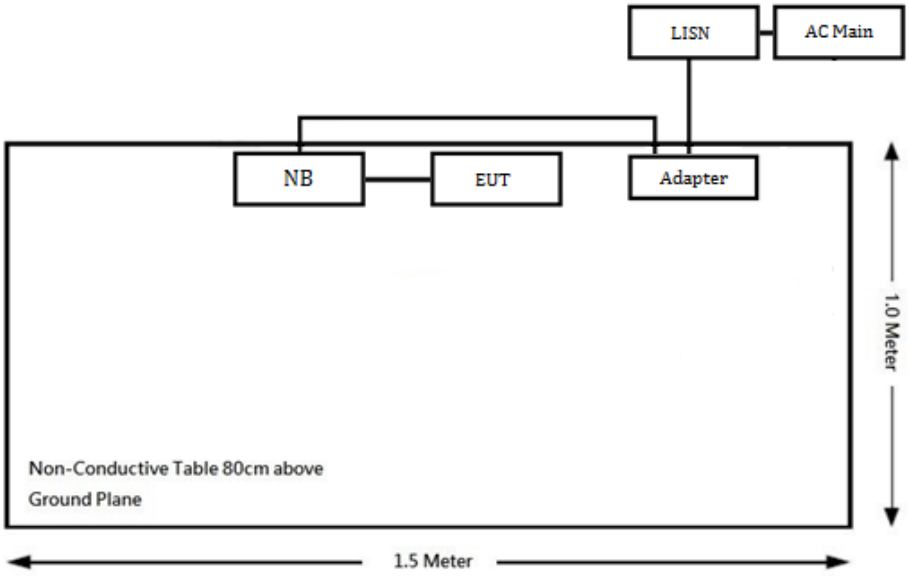
Below 1GHz:



Above 1GHz:



Conduction:



3. Summary of Test Results

FCC Rules	Description of Test	Results
§15.247(i), §1.1310,§2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247(a)(1)	20 dB Emission Bandwidth	Compliance
§15.247 (a)(1)	Channel Separation Test	Compliance
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliance
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliance
§15.247(b)(1)	Maximum Peak Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	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	2022/1/14	2023/1/13
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	2022/1/26	2023/1/25
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	466	2021/11/4	2022/11/3
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
Software	Farad	EZ_EMC	BACL-03A1	N.C.R	N.C.R
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSV40	101140	2022/2/18	2023/2/17
Cable	UTIFLEX	UFA210A	9435	2021/10/5	2022/10/4
Attenuator	MINI-CIRCUITS	BW-S10W5+	1419	2022/2/11	2023/2/10

***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, § 2.1093 – RF Exposure

5.1. Applicable Standard

According to §2.1093 and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D01 General RF Exposure Guidance v06

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

1. f(GHz) is the RF channel transmit frequency in GHz.
2. Power and distance are rounded to the nearest mW and mm before calculation.
3. The result is rounded to one decimal place for comparison.
4. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion.

5.2. RF Exposure Evaluation Result

RF Exposure evaluation:

Mode	Frequency Range (MHz)	Tunp-up Power		Evaluation Distance (mm)	Calculated Value	Threshold	SAR Test Exclusion
		(dBm)	(mW)			(1-g SAR)	
BT	2402-2480	-0.5	0.891	5	0.2	3	Yes

Result: SAR test is exempted.

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 Information

Manufacturer	Model	Type	Antenna Gain
TopGain	CH2G4-6022-000D1-01	Chip Antenna	2.3 dBi
Cortec	AN2400-3901BRS	Dipole Antenna	2.0 dBi

Result: Compliance

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

7.1. Applicable Standard

According to §15.207

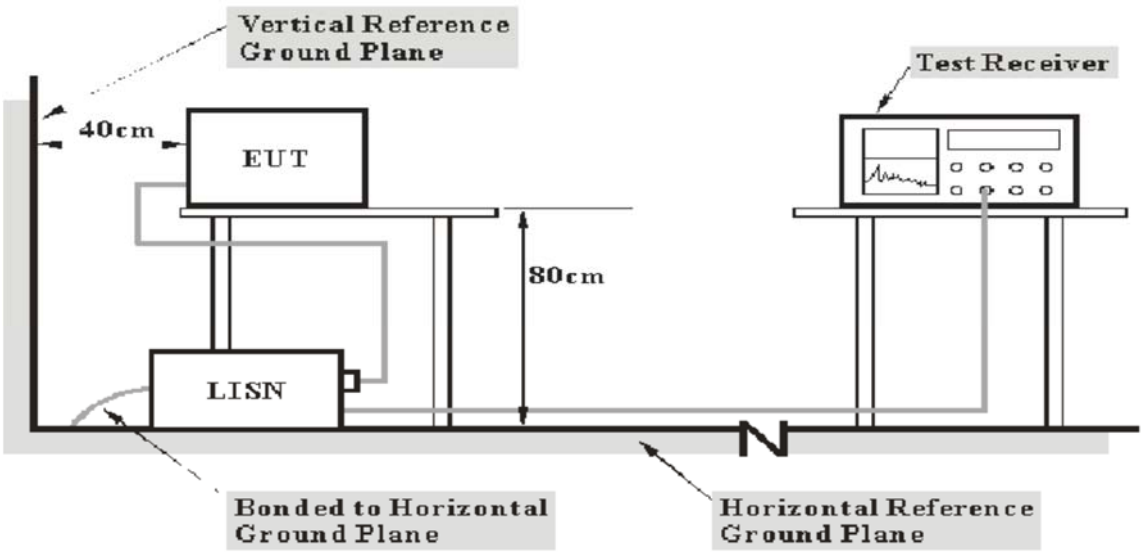
For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured 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 2
0.5-5	56	46
5-30	60	50

Note 1: Decreases with the logarithm of the frequency.

Note 2: A linear average detector is required

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

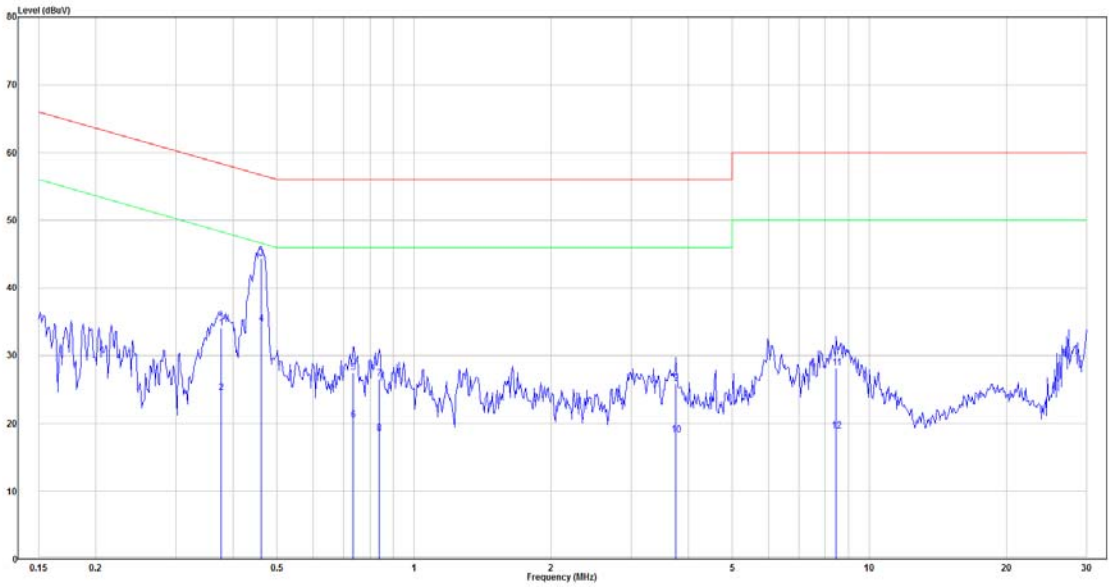
The “Over Limit” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an over limit of -7 dB means the emission is 7 dB below the limit. The equation for Over Limit calculation is as follows:

Over Limit = Level – Limit Line

7.6. Test Results

Test Mode: Transmitting

Main: Mode 1, AC120 V, 60 Hz, Line



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBµV)	Factor(dB)	(dBµV)	(dBµV)	(dB)	
1	0.377	14.55	19.51	34.06	58.34	-24.28	QP
2	0.377	5.03	19.51	24.54	48.34	-23.80	Average
3	0.461	24.93	19.52	44.45	56.67	-12.22	QP
4	0.461	15.06	19.52	34.58	46.67	-12.09	Average
5	0.735	7.93	19.53	27.46	56.00	-28.54	QP
6	0.735	0.97	19.53	20.50	46.00	-25.50	Average
7	0.839	6.98	19.53	26.52	56.00	-29.48	QP
8	0.839	-1.04	19.53	18.50	46.00	-27.50	Average
9	3.759	6.29	19.62	25.92	56.00	-30.08	QP
10	3.759	-1.32	19.62	18.31	46.00	-27.69	Average
11	8.456	8.42	19.72	28.14	60.00	-31.86	QP
12	8.456	-0.82	19.72	18.90	50.00	-31.10	Average

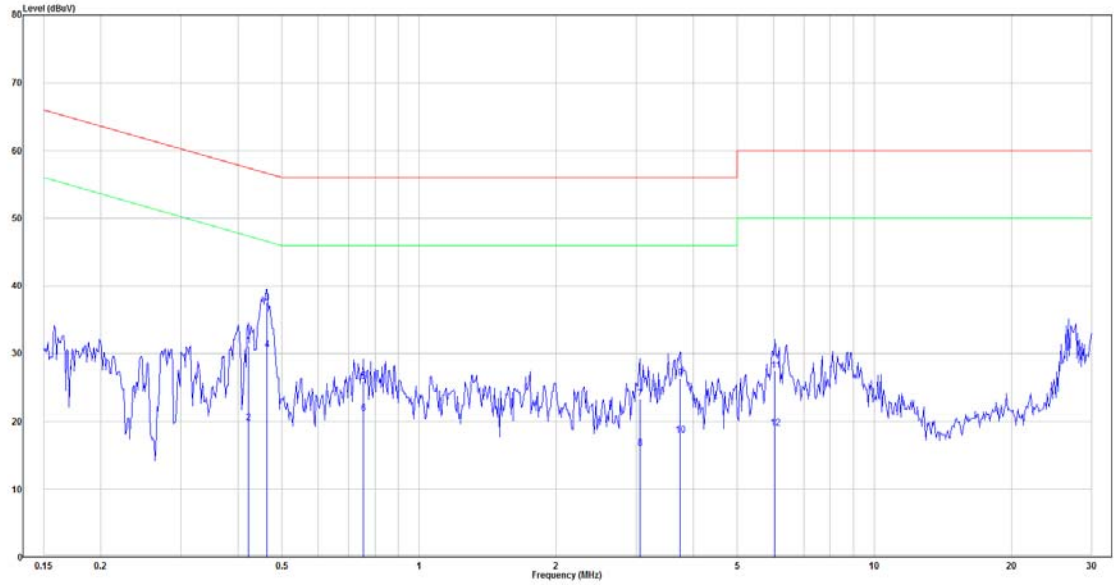
Note:

Level = Read Level + Factor

Over Limit = Level – Limit Line

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

Main: Mode 1, AC120 V, 60 Hz, Neutral



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBµV)	Factor(dB)	(dBµV)	(dBµV)	(dB)	
1	0.421	11.57	19.51	31.09	57.42	-26.33	QP
2	0.421	0.23	19.51	19.74	47.42	-27.68	Average
3	0.464	17.91	19.52	37.43	56.63	-19.20	QP
4	0.464	10.95	19.52	30.47	46.63	-16.15	Average
5	0.755	6.32	19.53	25.84	56.00	-30.16	QP
6	0.755	1.61	19.53	21.14	46.00	-24.86	Average
7	3.058	3.63	19.60	23.23	56.00	-32.77	QP
8	3.058	-3.51	19.60	16.09	46.00	-29.91	Average
9	3.740	6.66	19.62	26.29	56.00	-29.71	QP
10	3.740	-1.65	19.62	17.97	46.00	-28.03	Average
11	6.056	7.74	19.68	27.42	60.00	-32.58	QP
12	6.056	-0.75	19.68	18.94	50.00	-31.06	Average

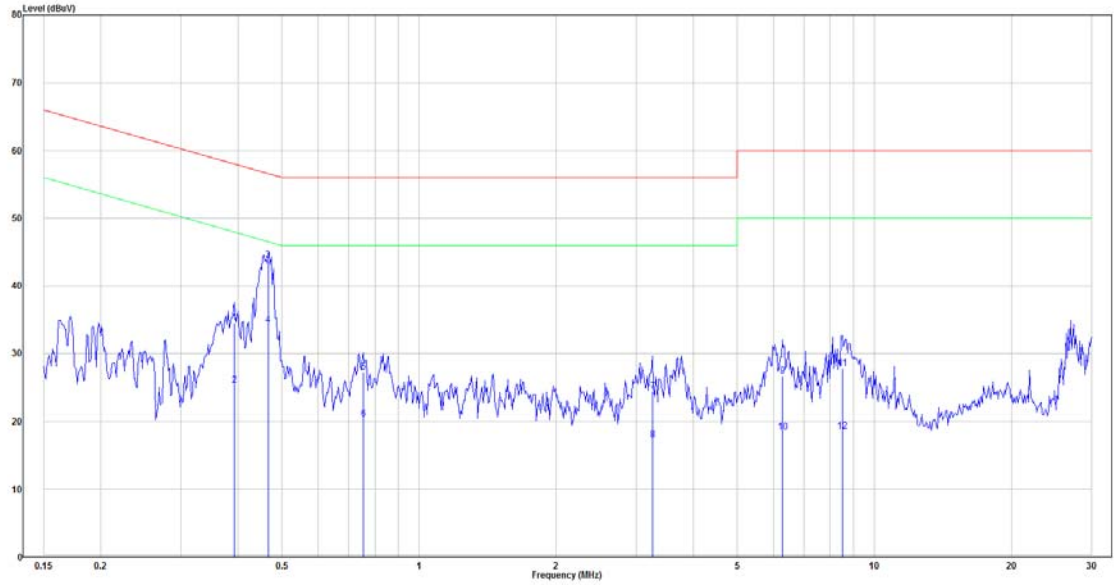
Note:

Level = Read Level + Factor

Over Limit = Level – Limit Line

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

Main: Mode 4, AC120 V, 60 Hz, Line



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBµV)	Factor(dB)	(dBµV)	(dBµV)	(dB)	
1	0.393	15.00	19.51	34.51	57.99	-23.48	QP
2	0.393	5.79	19.51	25.31	47.99	-22.69	Average
3	0.466	24.33	19.52	43.85	56.58	-12.74	QP
4	0.466	14.63	19.52	34.15	46.58	-12.43	Average
5	0.755	7.72	19.53	27.25	56.00	-28.75	QP
6	0.755	0.85	19.53	20.38	46.00	-25.62	Average
7	3.258	4.85	19.61	24.46	56.00	-31.54	QP
8	3.258	-2.38	19.61	17.24	46.00	-28.76	Average
9	6.285	7.02	19.68	26.70	60.00	-33.30	QP
10	6.285	-1.23	19.68	18.45	50.00	-31.55	Average
11	8.501	8.13	19.72	27.85	60.00	-32.15	QP
12	8.501	-1.14	19.72	18.58	50.00	-31.42	Average

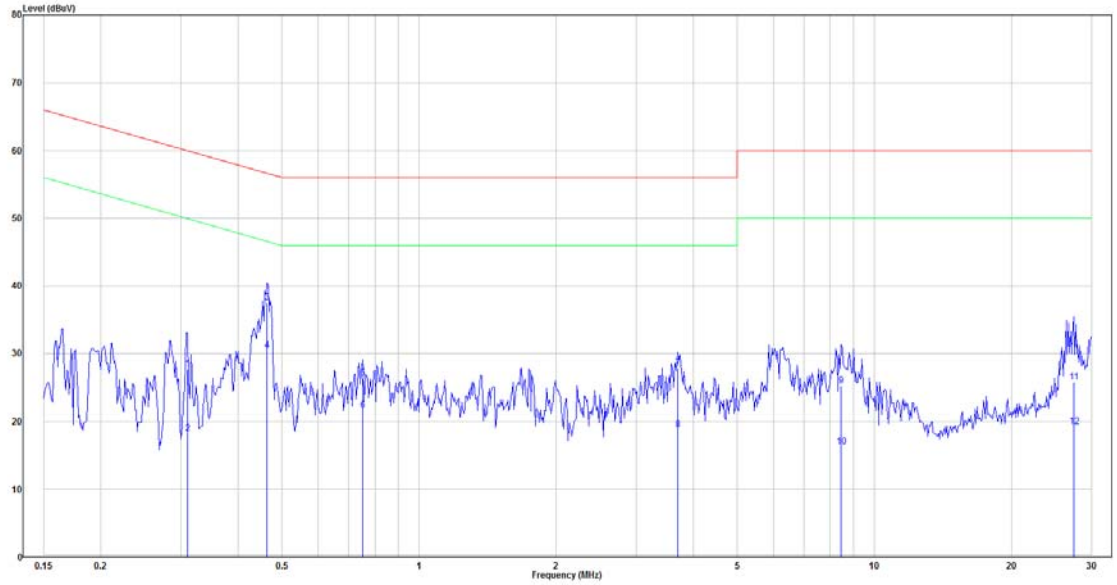
Note:

Level = Read Level + Factor

Over Limit = Level – Limit Line

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

Main: Mode 4, AC120 V, 60 Hz, Neutral



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBµV)	Factor(dB)	(dBµV)	(dBµV)	(dB)	
1	0.310	8.16	19.50	27.66	59.97	-32.31	QP
2	0.310	-1.26	19.50	18.24	49.97	-31.73	Average
3	0.464	17.92	19.52	37.44	56.63	-19.19	QP
4	0.464	10.88	19.52	30.40	46.63	-16.23	Average
5	0.751	6.76	19.53	26.28	56.00	-29.72	QP
6	0.751	2.06	19.53	21.58	46.00	-24.42	Average
7	3.700	8.18	19.62	27.80	56.00	-28.20	QP
8	3.700	-0.89	19.62	18.73	46.00	-27.27	Average
9	8.456	5.46	19.73	25.19	60.00	-34.81	QP
10	8.456	-3.44	19.73	16.30	50.00	-33.70	Average
11	27.416	5.74	20.00	25.74	60.00	-34.26	QP
12	27.416	-0.81	20.00	19.19	50.00	-30.81	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

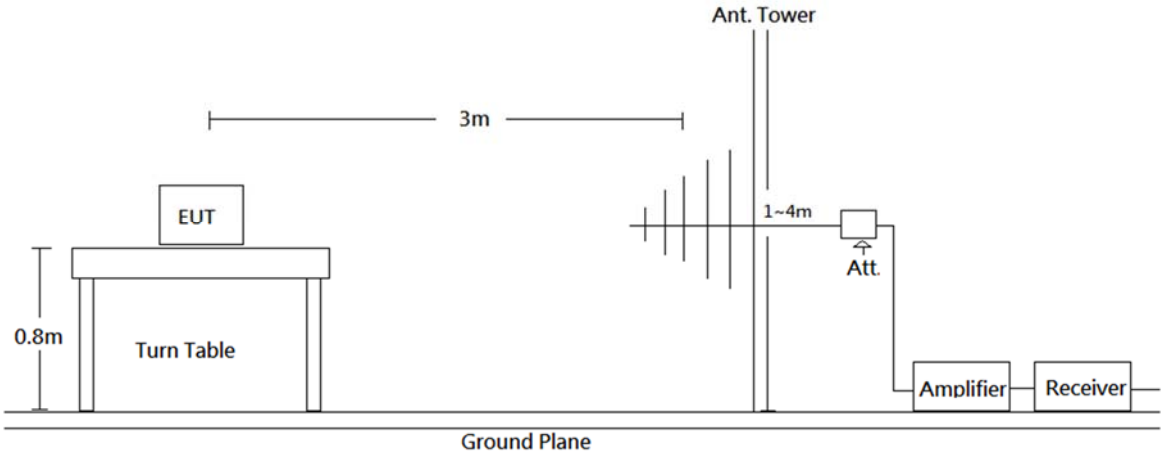
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this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

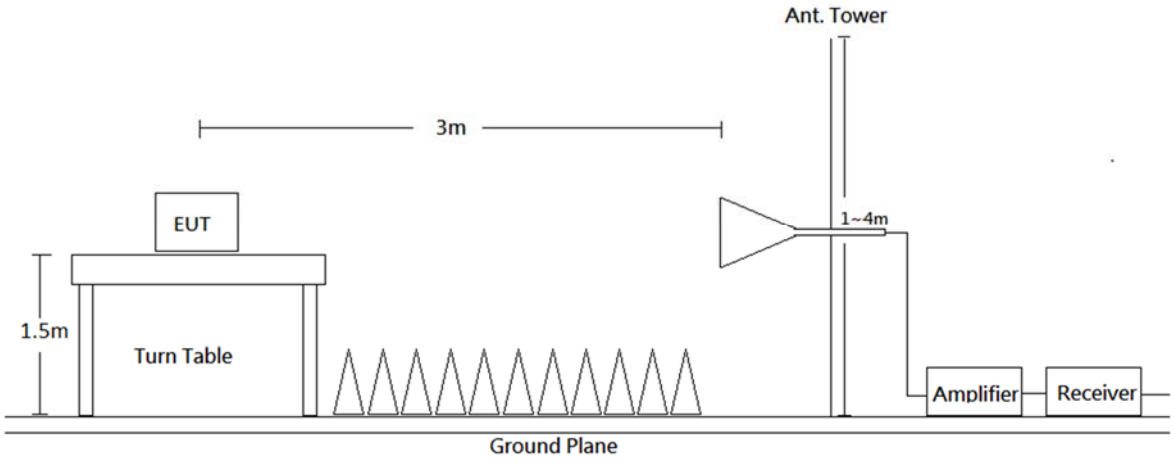
the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, 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	Measurement method
30-1000 MHz	120 kHz	/	QP
Above 1 GHz	1 MHz	3 MHz	PK
	1 MHz	10 Hz	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:

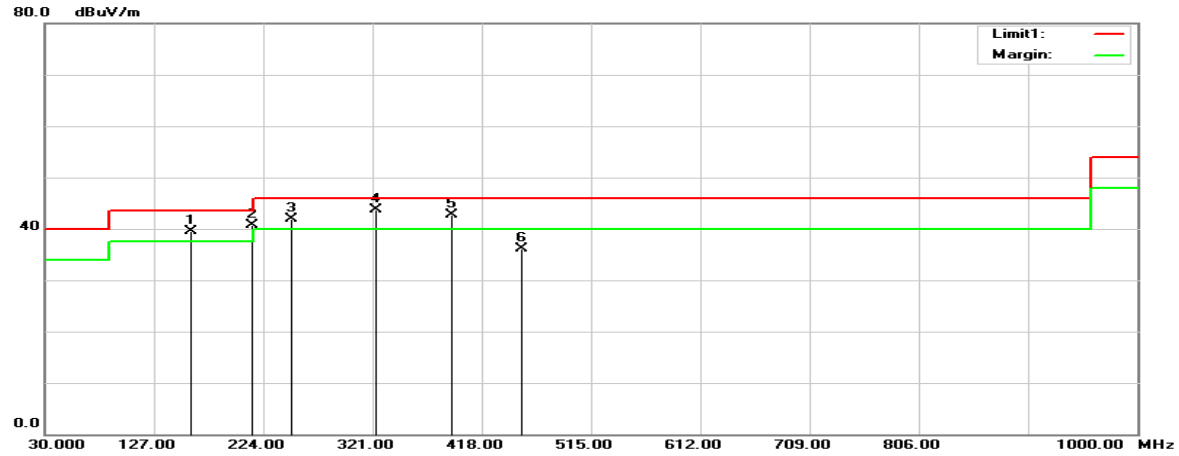
Margin = Result – Limit

8.6. Test Results

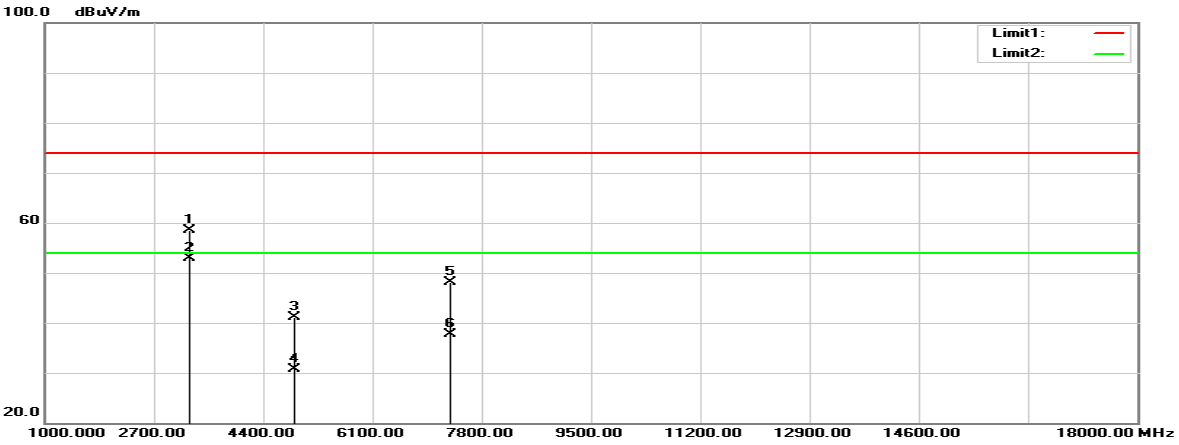
Test Mode: Mode 1 Transmitting (Pre-scan with three orthogonal axis, and worse case as X axis.)

Horizontal (worst case is 8DPSK mode middle channel)

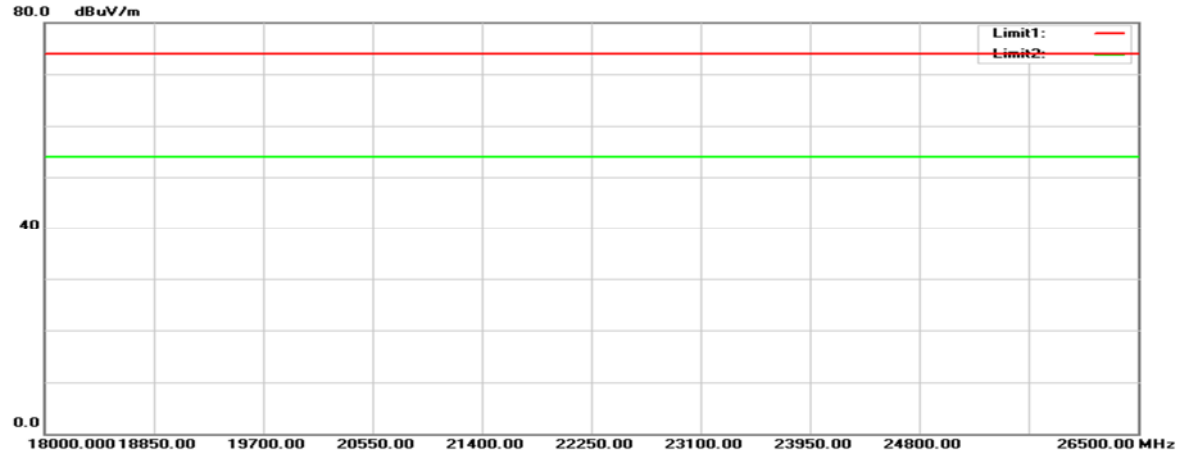
30MHz-1GHz:



1GHz-18GHz:

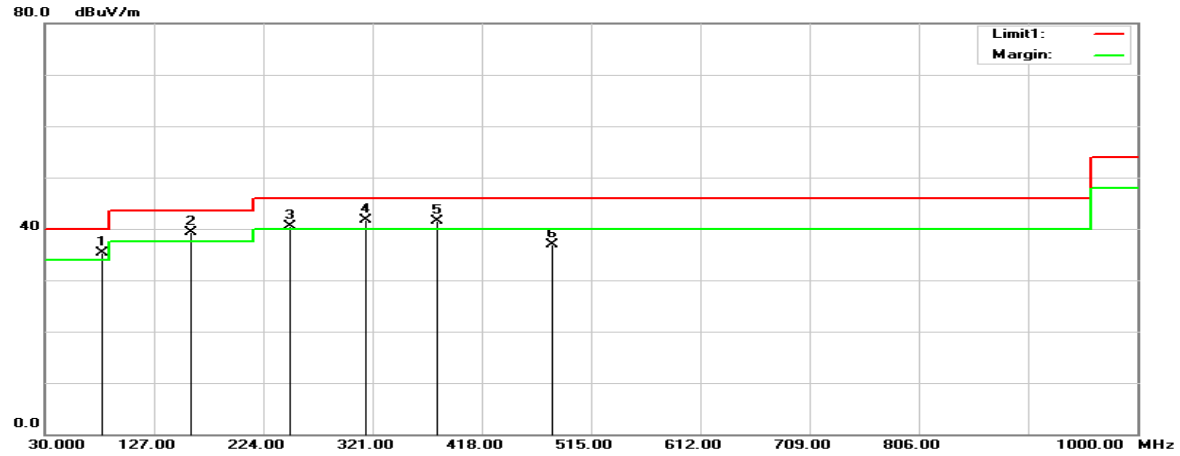


18GHz-26.5GHz:

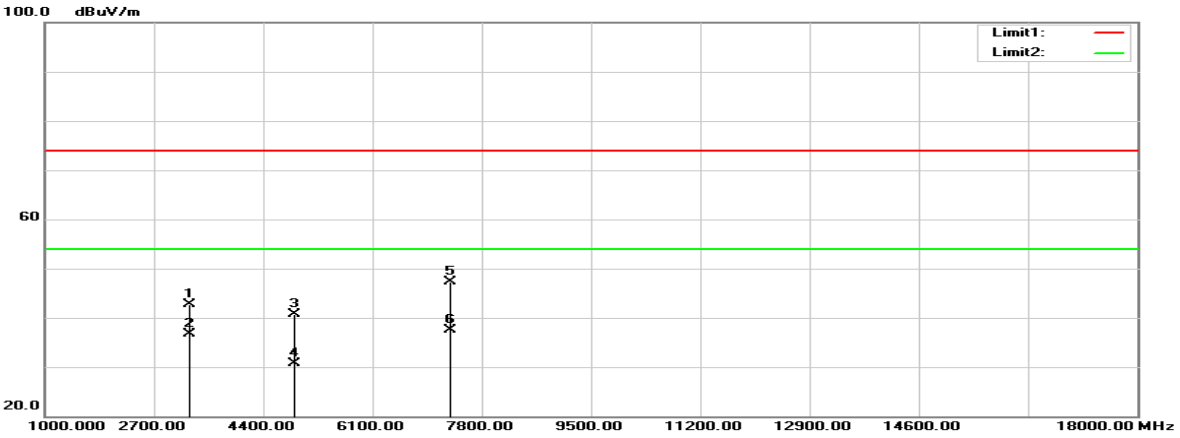


Vertical (worst case is 8DPSK mode middle channel)

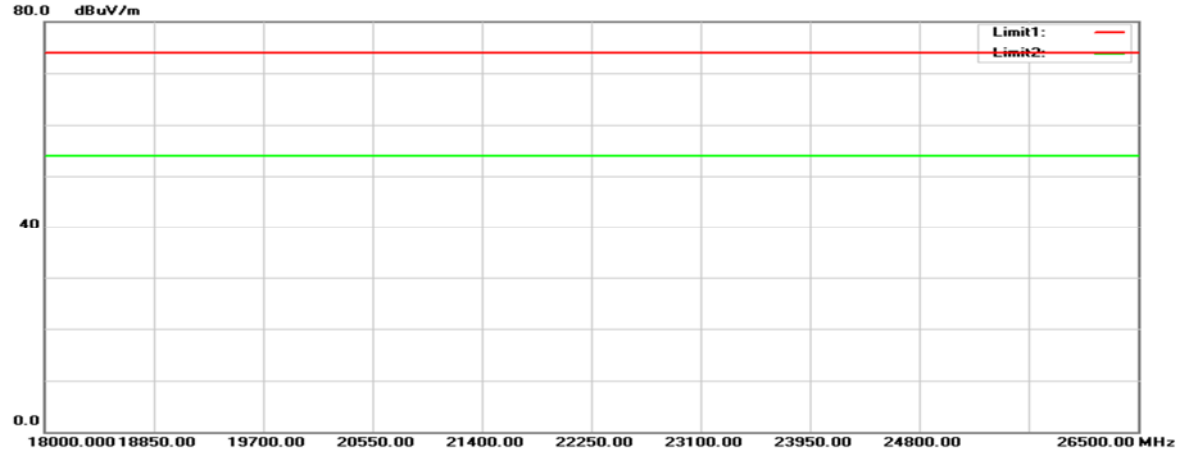
30MHz-1GHz:



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
159.9800	50.67	-11.14	39.53	43.50	-3.97	100	320	QP
214.3000	53.91	-13.21	40.70	43.50	-2.80	100	66	QP
249.2200	54.18	-12.31	41.87	46.00	-4.13	100	4	QP
323.9100	53.31	-9.56	43.75	46.00	-2.25	100	23	QP
390.8400	50.78	-8.00	42.78	46.00	-3.22	100	26	QP
452.9200	42.52	-6.43	36.09	46.00	-9.91	100	51	QP

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
81.4100	51.97	-16.62	35.35	40.00	-4.65	100	301	QP
159.9800	50.52	-11.14	39.38	43.50	-4.12	100	301	QP
247.2800	52.69	-12.28	40.41	46.00	-5.59	100	135	QP
315.1800	51.43	-9.71	41.72	46.00	-4.28	100	154	QP
378.2300	50.02	-8.48	41.54	46.00	-4.46	100	159	QP
481.0500	42.81	-5.98	36.83	46.00	-9.17	100	147	QP

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
BR (GFSK), Low channel								
2389.600	58.90	-9.46	49.44	74.00	-24.56	145	68	peak
2389.600	45.34	-9.46	35.88	54.00	-18.12	145	68	AVG
3193.000	63.49	-5.56	57.93	74.00	-16.07	144	267	peak
3193.000	57.63	-5.56	52.07	54.00	-1.93	144	267	AVG
4804.000	45.03	-2.17	42.86	74.00	-31.14	155	245	peak
4804.000	35.08	-2.17	32.91	54.00	-21.09	155	245	AVG
7206.000	42.92	4.18	47.10	74.00	-26.90	163	168	peak
7206.000	32.58	4.18	36.76	54.00	-17.24	163	168	AVG
BR (GFSK), Middle channel								
3244.000	63.99	-5.42	58.57	74.00	-15.43	157	258	peak
3244.000	57.72	-5.42	52.30	54.00	-1.70	157	258	AVG
4882.000	43.13	-1.86	41.27	74.00	-32.73	148	169	peak
4882.000	33.16	-1.86	31.30	54.00	-22.70	148	169	AVG
7323.000	42.52	5.11	47.63	74.00	-26.37	153	85	peak
7323.000	32.43	5.11	37.54	54.00	-16.46	153	85	AVG
BR (GFSK), High channel								
2483.770	64.06	-8.44	55.62	74.00	-18.38	134	55	peak
2483.770	47.34	-8.44	38.90	54.00	-15.10	134	55	AVG
3295.000	63.50	-5.59	57.91	74.00	-16.09	156	276	peak
3295.000	57.98	-5.59	52.39	54.00	-1.61	156	276	AVG
4960.000	44.28	-1.49	42.79	74.00	-31.21	152	141	peak
4960.000	34.57	-1.49	33.08	54.00	-20.92	152	141	AVG
7440.000	40.82	5.23	46.05	74.00	-27.95	163	323	peak
7440.000	30.55	5.23	35.78	54.00	-18.22	163	323	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
BR (GFSK), Low channel								
2357.300	56.65	-9.73	46.92	74.00	-27.08	197	303	peak
2357.300	42.98	-9.73	33.25	54.00	-20.75	197	303	AVG
3193.000	49.97	-5.56	44.41	74.00	-29.59	156	278	peak
3193.000	43.14	-5.56	37.58	54.00	-16.42	156	278	AVG
4804.000	44.15	-2.17	41.98	74.00	-32.02	149	135	peak
4804.000	34.64	-2.17	32.47	54.00	-21.53	149	135	AVG
7206.000	42.76	4.18	46.94	74.00	-27.06	161	311	peak
7206.000	32.59	4.18	36.77	54.00	-17.23	161	311	AVG
BR (GFSK), Middle channel								
3244.000	48.77	-5.42	43.35	74.00	-30.65	162	143	peak
3244.000	42.56	-5.42	37.14	54.00	-16.86	162	143	AVG
4882.000	44.10	-1.86	42.24	74.00	-31.76	155	258	peak
4882.000	34.28	-1.86	32.42	54.00	-21.58	155	258	AVG
7323.000	43.50	5.11	48.61	74.00	-25.39	146	243	peak
7323.000	33.67	5.11	38.78	54.00	-15.22	146	243	AVG
BR (GFSK), High channel								
2483.500	59.94	-8.45	51.49	74.00	-22.51	214	309	peak
2483.500	44.33	-8.45	35.88	54.00	-18.12	214	309	AVG
3295.000	47.37	-5.59	41.78	74.00	-32.22	156	244	peak
3295.000	41.45	-5.59	35.86	54.00	-18.14	156	244	AVG
4960.000	43.65	-1.49	42.16	74.00	-31.84	163	218	peak
4960.000	33.54	-1.49	32.05	54.00	-21.95	163	218	AVG
7440.000	42.32	5.23	47.55	74.00	-26.45	145	166	peak
7440.000	32.49	5.23	37.72	54.00	-16.28	145	166	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
EDR (π/4-DQPSK), Low channel								
2354.700	59.73	-9.75	49.98	74.00	-24.02	121	63	peak
2354.700	45.25	-9.75	35.50	54.00	-18.50	121	63	AVG
3193.000	64.92	-5.56	59.36	74.00	-14.64	158	217	peak
3193.000	57.65	-5.56	52.09	54.00	-1.91	158	217	AVG
4804.000	43.28	-2.17	41.11	74.00	-32.89	163	142	peak
4804.000	33.45	-2.17	31.28	54.00	-22.72	163	142	AVG
7206.000	41.29	4.18	45.47	74.00	-28.53	148	256	peak
7206.000	31.67	4.18	35.85	54.00	-18.15	148	256	AVG
EDR (π/4-DQPSK), Middle channel								
3244.000	63.87	-5.42	58.45	74.00	-15.55	155	238	peak
3244.000	58.31	-5.42	52.89	54.00	-1.11	155	238	AVG
4882.000	42.57	-1.86	40.71	74.00	-33.29	161	313	peak
4882.000	32.48	-1.86	30.62	54.00	-23.38	161	313	AVG
7323.000	42.33	5.11	47.44	74.00	-26.56	152	95	peak
7323.000	32.56	5.11	37.67	54.00	-16.33	152	95	AVG
EDR (π/4-DQPSK), High channel								
2483.500	62.56	-8.45	54.11	74.00	-19.89	127	96	peak
2483.500	46.54	-8.45	38.09	54.00	-15.91	127	96	AVG
3295.000	63.82	-5.59	58.23	74.00	-15.77	148	211	peak
3295.000	58.22	-5.59	52.63	54.00	-1.37	148	211	AVG
4960.000	43.87	-1.49	42.38	74.00	-31.62	166	84	peak
4960.000	33.56	-1.49	32.07	54.00	-21.93	166	84	AVG
7440.000	39.94	5.23	45.17	74.00	-28.83	154	193	peak
7440.000	30.58	5.23	35.81	54.00	-18.19	154	193	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
EDR (π/4-DQPSK), Low channel								
2383.300	57.38	-9.51	47.87	74.00	-26.13	213	305	peak
2383.300	43.04	-9.51	33.53	54.00	-20.47	213	305	AVG
3193.000	49.44	-5.56	43.88	74.00	-30.12	161	223	peak
3193.000	43.63	-5.56	38.07	54.00	-15.93	161	223	AVG
4804.000	43.21	-2.17	41.04	74.00	-32.96	154	118	peak
4804.000	33.27	-2.17	31.10	54.00	-22.90	154	118	AVG
7206.000	42.09	4.18	46.27	74.00	-27.73	146	74	peak
7206.000	32.54	4.18	36.72	54.00	-17.28	146	74	AVG
EDR (π/4-DQPSK), Middle channel								
3244.000	48.22	-5.42	42.80	74.00	-31.20	163	227	peak
3244.000	42.55	-5.42	37.13	54.00	-16.87	163	227	AVG
4882.000	43.65	-1.86	41.79	74.00	-32.21	148	135	peak
4882.000	33.54	-1.86	31.68	54.00	-22.32	148	135	AVG
7323.000	41.63	5.11	46.74	74.00	-27.26	155	86	peak
7323.000	31.51	5.11	36.62	54.00	-17.38	155	86	AVG
EDR (π/4-DQPSK), High channel								
2483.530	61.60	-8.45	53.15	74.00	-20.85	210	305	peak
2483.530	44.39	-8.45	35.94	54.00	-18.06	210	305	AVG
3295.000	48.21	-5.59	42.62	74.00	-31.38	158	149	peak
3295.000	42.58	-5.59	36.99	54.00	-17.01	158	149	AVG
4960.000	42.94	-1.49	41.45	74.00	-32.55	161	311	peak
4960.000	32.56	-1.49	31.07	54.00	-22.93	161	311	AVG
7440.000	41.47	5.23	46.70	74.00	-27.30	144	238	peak
7440.000	31.57	5.23	36.80	54.00	-17.20	144	238	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
EDR (8DPSK), Low channel								
2374.300	58.61	-9.59	49.02	74.00	-24.98	127	91	peak
2374.300	44.99	-9.59	35.40	54.00	-18.60	127	91	AVG
3193.000	64.99	-5.56	59.43	74.00	-14.57	161	196	peak
3193.000	58.45	-5.56	52.89	54.00	-1.11	161	196	AVG
4804.000	42.39	-2.17	40.22	74.00	-33.78	145	86	peak
4804.000	32.55	-2.17	30.38	54.00	-23.62	145	86	AVG
7206.000	40.91	4.18	45.09	74.00	-28.91	158	231	peak
7206.000	30.56	4.18	34.74	54.00	-19.26	158	231	AVG
EDR (8DPSK), Middle channel								
3244.000	63.86	-5.42	58.44	74.00	-15.56	161	232	peak
3244.000	58.33	-5.42	52.91	54.00	-1.09	161	232	AVG
4882.000	42.92	-1.86	41.06	74.00	-32.94	155	166	peak
4882.000	32.55	-1.86	30.69	54.00	-23.31	155	166	AVG
7323.000	42.99	5.11	48.10	74.00	-25.90	148	138	peak
7323.000	32.68	5.11	37.79	54.00	-16.21	148	138	AVG
EDR (8DPSK), High channel								
2483.500	63.28	-8.45	54.83	74.00	-19.17	130	61	peak
2483.500	47.01	-8.45	38.56	54.00	-15.44	130	61	AVG
3295.000	63.57	-5.59	57.98	74.00	-16.02	155	223	peak
3295.000	58.31	-5.59	52.72	54.00	-1.28	155	223	AVG
4960.000	43.64	-1.49	42.15	74.00	-31.85	161	86	peak
4960.000	33.49	-1.49	32.00	54.00	-22.00	161	86	AVG
7440.000	39.85	5.23	45.08	74.00	-28.92	153	158	peak
7440.000	30.61	5.23	35.84	54.00	-18.16	153	158	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

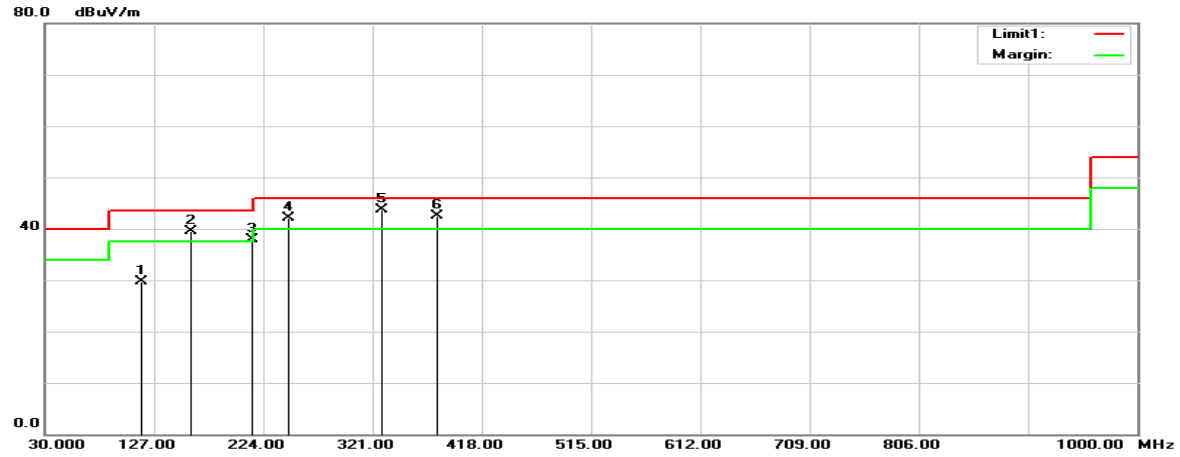
Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
EDR (8DPSK), Low channel								
2385.700	56.35	-9.49	46.86	74.00	-27.14	213	303	peak
2385.700	42.90	-9.49	33.41	54.00	-20.59	213	303	AVG
3193.000	49.07	-5.56	43.51	74.00	-30.49	163	218	peak
3193.000	43.21	-5.56	37.65	54.00	-16.35	163	218	AVG
4804.000	42.28	-2.17	40.11	74.00	-33.89	145	86	peak
4804.000	32.66	-2.17	30.49	54.00	-23.51	145	86	AVG
7206.000	40.65	4.18	44.83	74.00	-29.17	158	134	peak
7206.000	30.48	4.18	34.66	54.00	-19.34	158	134	AVG
EDR (8DPSK), Middle channel								
3244.000	48.17	-5.42	42.75	74.00	-31.25	156	138	peak
3244.000	42.22	-5.42	36.80	54.00	-17.20	156	138	AVG
4882.000	42.58	-1.86	40.72	74.00	-33.28	161	256	peak
4882.000	32.57	-1.86	30.71	54.00	-23.29	161	256	AVG
7323.000	42.16	5.11	47.27	74.00	-26.73	149	77	peak
7323.000	32.33	5.11	37.44	54.00	-16.56	149	77	AVG
EDR (8DPSK), High channel								
2483.500	60.11	-8.45	51.66	74.00	-22.34	207	309	peak
2483.500	44.72	-8.45	36.27	54.00	-17.73	207	309	AVG
3295.000	48.33	-5.59	42.74	74.00	-31.26	165	168	peak
3295.000	42.62	-5.59	37.03	54.00	-16.97	165	168	AVG
4960.000	42.58	-1.49	41.09	74.00	-32.91	158	332	peak
4960.000	32.47	-1.49	30.98	54.00	-23.02	158	332	AVG
7440.000	41.66	5.23	46.89	74.00	-27.11	149	223	peak
7440.000	31.61	5.23	36.84	54.00	-17.16	149	223	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.

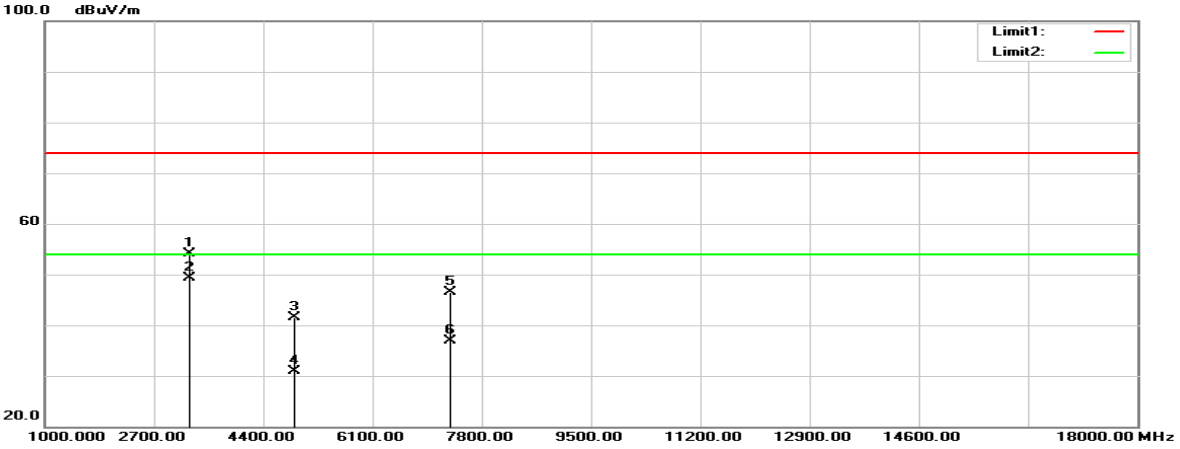
Test Mode: Mode 4 Transmitting (Pre-scan with three orthogonal axis, and worse case as Z axis.)

Horizontal (worst case is π/4-DQPSK mode middle channel)

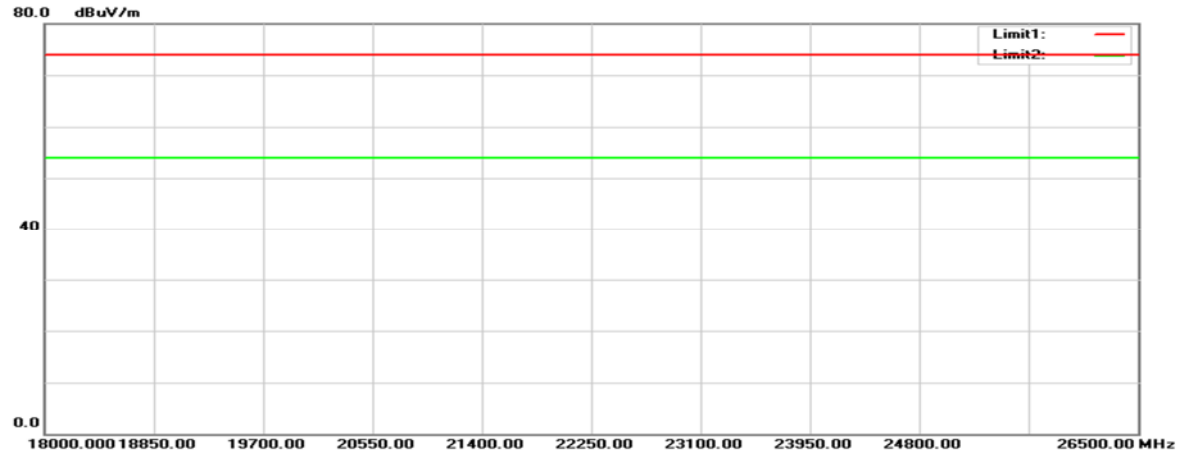
30MHz-1GHz:



1GHz-18GHz:

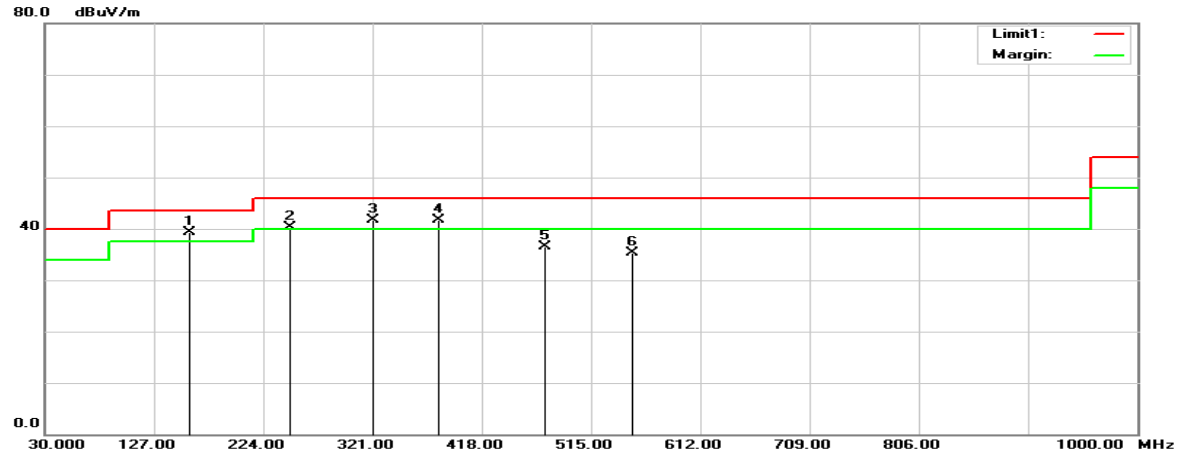


18GHz-26.5GHz:

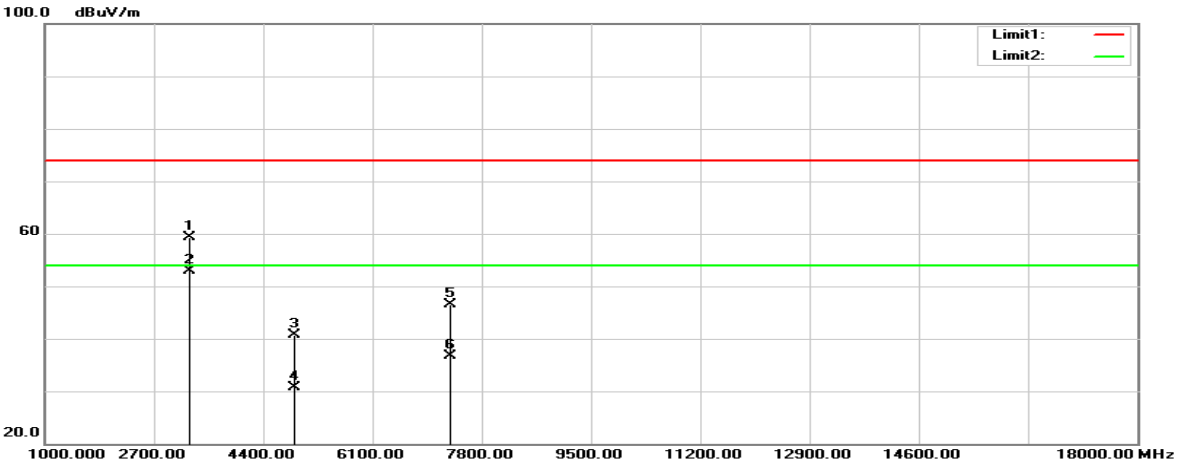


Vertical (worst case is π/4-DQPSK mode middle channel)

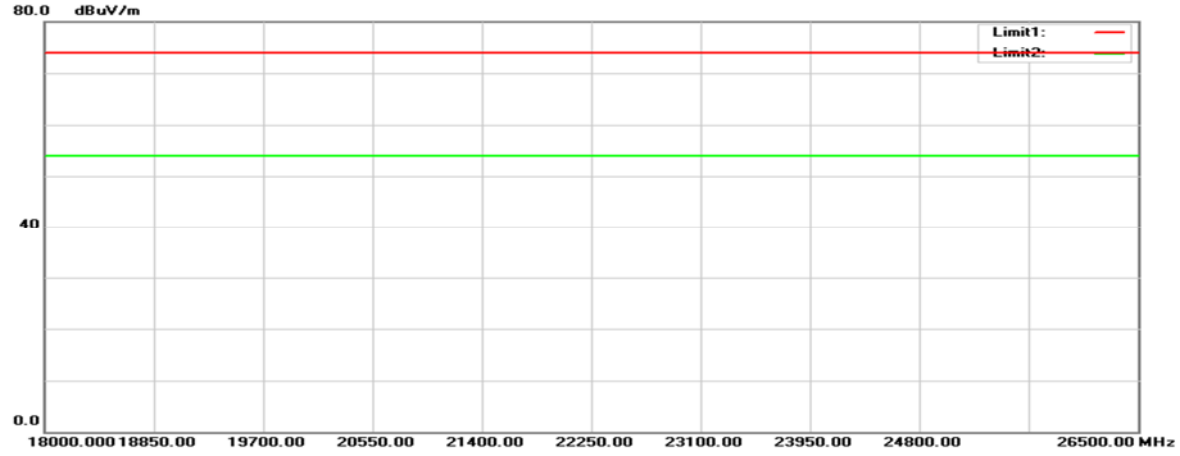
30MHz-1GHz:



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
116.3300	40.58	-10.92	29.66	43.50	-13.84	100	70	QP
159.9800	50.58	-11.14	39.44	43.50	-4.06	100	319	QP
214.3000	51.07	-13.21	37.86	43.50	-5.64	100	353	QP
246.3100	54.32	-12.26	42.06	46.00	-3.94	100	2	QP
328.7600	53.12	-9.46	43.66	46.00	-2.34	100	35	QP
378.2300	51.01	-8.48	42.53	46.00	-3.47	100	32	QP

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
159.0100	50.48	-11.24	39.24	43.50	-4.26	100	303	QP
247.2800	52.57	-12.28	40.29	46.00	-5.71	100	116	QP
321.0000	51.28	-9.62	41.66	46.00	-4.34	100	136	QP
380.1700	50.13	-8.45	41.68	46.00	-4.32	100	151	QP
474.2600	42.67	-6.21	36.46	46.00	-9.54	100	173	QP
551.8600	40.81	-5.59	35.22	46.00	-10.78	100	286	QP

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
BR (GFSK), Low channel								
2387.900	57.71	-9.48	48.23	74.00	-25.77	214	306	peak
2387.900	44.10	-9.48	34.62	54.00	-19.38	214	306	AVG
3193.000	59.35	-5.56	53.79	74.00	-20.21	133	161	peak
3193.000	54.28	-5.56	48.72	54.00	-5.28	133	161	AVG
4804.000	43.32	-2.17	41.15	74.00	-32.85	162	248	peak
4804.000	33.24	-2.17	31.07	54.00	-22.93	162	248	AVG
7206.000	42.34	4.18	46.52	74.00	-27.48	155	352	peak
7206.000	32.58	4.18	36.76	54.00	-17.24	155	352	AVG
BR (GFSK), Middle channel								
3244.000	59.23	-5.42	53.81	74.00	-20.19	131	345	peak
3244.000	55.45	-5.42	50.03	54.00	-3.97	131	345	AVG
4882.000	41.64	-1.86	39.78	74.00	-34.22	161	214	peak
4882.000	31.55	-1.86	29.69	54.00	-24.31	161	214	AVG
7323.000	41.48	5.11	46.59	74.00	-27.41	158	325	peak
7323.000	31.27	5.11	36.38	54.00	-17.62	158	325	AVG
BR (GFSK), High channel								
2483.500	62.45	-8.45	54.00	74.00	-20.00	217	308	peak
2483.500	45.52	-8.45	37.07	54.00	-16.93	217	308	AVG
3295.000	59.82	-5.59	54.23	74.00	-19.77	133	248	peak
3295.000	54.66	-5.59	49.07	54.00	-4.93	133	248	AVG
4960.000	42.28	-1.49	40.79	74.00	-33.21	163	158	peak
4960.000	32.55	-1.49	31.06	54.00	-22.94	163	158	AVG
7440.000	41.00	5.23	46.23	74.00	-27.77	155	332	peak
7440.000	31.45	5.23	36.68	54.00	-17.32	155	332	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
BR (GFSK), Low channel								
2383.700	62.21	-9.51	52.70	74.00	-21.30	153	308	peak
2383.700	48.71	-9.51	39.20	54.00	-14.80	153	308	AVG
3193.000	64.52	-5.56	58.96	74.00	-15.04	122	307	peak
3193.000	58.26	-5.56	52.70	54.00	-1.30	122	307	AVG
4804.000	42.45	-2.17	40.28	74.00	-33.72	145	245	peak
4804.000	32.48	-2.17	30.31	54.00	-23.69	145	245	AVG
7206.000	41.34	4.18	45.52	74.00	-28.48	156	133	peak
7206.000	31.28	4.18	35.46	54.00	-18.54	156	133	AVG
BR (GFSK), Middle channel								
3244.000	63.96	-5.42	58.54	74.00	-15.46	133	288	peak
3244.000	57.45	-5.42	52.03	54.00	-1.97	133	288	AVG
4882.000	42.30	-1.86	40.44	74.00	-33.56	156	142	peak
4882.000	32.45	-1.86	30.59	54.00	-23.41	156	142	AVG
7323.000	41.25	5.11	46.36	74.00	-27.64	162	315	peak
7323.000	31.87	5.11	36.98	54.00	-17.02	162	315	AVG
BR (GFSK), High channel								
2483.500	70.04	-8.45	61.59	74.00	-12.41	135	306	peak
2483.500	49.95	-8.45	41.50	54.00	-12.50	135	306	AVG
3295.000	64.72	-5.59	59.13	74.00	-14.87	125	352	peak
3295.000	58.15	-5.59	52.56	54.00	-1.44	125	352	AVG
4960.000	42.22	-1.49	40.73	74.00	-33.27	151	138	peak
4960.000	32.55	-1.49	31.06	54.00	-22.94	151	138	AVG
7440.000	42.13	5.23	47.36	74.00	-26.64	162	258	peak
7440.000	32.28	5.23	37.51	54.00	-16.49	162	258	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
EDR (π/4-DQPSK), Low channel								
2354.200	59.11	-9.76	49.35	74.00	-24.65	210	303	peak
2354.200	43.53	-9.76	33.77	54.00	-20.23	210	303	AVG
3193.000	59.58	-5.56	54.02	74.00	-19.98	133	258	peak
3193.000	54.68	-5.56	49.12	54.00	-4.88	133	258	AVG
4804.000	43.39	-2.17	41.22	74.00	-32.78	166	137	peak
4804.000	33.45	-2.17	31.28	54.00	-22.72	166	137	AVG
7206.000	41.98	4.18	46.16	74.00	-27.84	158	235	peak
7206.000	31.58	4.18	35.76	54.00	-18.24	158	235	AVG
EDR (π/4-DQPSK), Middle channel								
3244.000	59.57	-5.42	54.15	74.00	-19.85	133	254	peak
3244.000	54.66	-5.42	49.24	54.00	-4.76	133	254	AVG
4882.000	43.46	-1.86	41.60	74.00	-32.40	165	246	peak
4882.000	32.76	-1.86	30.90	54.00	-23.10	165	246	AVG
7323.000	41.35	5.11	46.46	74.00	-27.54	158	223	peak
7323.000	31.89	5.11	37.00	54.00	-17.00	158	223	AVG
EDR (π/4-DQPSK), High channel								
2483.500	61.17	-8.45	52.72	74.00	-21.28	216	301	peak
2483.500	44.57	-8.45	36.12	54.00	-17.88	216	301	AVG
3295.000	59.87	-5.59	54.28	74.00	-19.72	134	257	peak
3295.000	54.33	-5.59	48.74	54.00	-5.26	134	257	AVG
4960.000	42.05	-1.49	40.56	74.00	-33.44	165	214	peak
4960.000	32.54	-1.49	31.05	54.00	-22.95	165	214	AVG
7440.000	42.04	5.23	47.27	74.00	-26.73	158	168	peak
7440.000	32.18	5.23	37.41	54.00	-16.59	158	168	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
EDR (π/4-DQPSK), Low channel								
2389.500	62.28	-9.46	52.82	74.00	-21.18	153	310	peak
2389.500	48.35	-9.46	38.89	54.00	-15.11	153	310	AVG
3193.000	64.56	-5.56	59.00	74.00	-15.00	178	229	peak
3193.000	57.86	-5.56	52.30	54.00	-1.70	178	229	AVG
4804.000	42.52	-2.17	40.35	74.00	-33.65	156	312	peak
4804.000	32.55	-2.17	30.38	54.00	-23.62	156	312	AVG
7206.000	41.75	4.18	45.93	74.00	-28.07	172	288	peak
7206.000	31.68	4.18	35.86	54.00	-18.14	172	288	AVG
EDR (π/4-DQPSK), Middle channel								
3244.000	64.65	-5.42	59.23	74.00	-14.77	138	167	peak
3244.000	58.40	-5.42	52.98	54.00	-1.02	138	167	AVG
4882.000	42.60	-1.86	40.74	74.00	-33.26	152	275	peak
4882.000	32.56	-1.86	30.70	54.00	-23.30	152	275	AVG
7323.000	41.39	5.11	46.50	74.00	-27.50	161	238	peak
7323.000	31.68	5.11	36.79	54.00	-17.21	161	238	AVG
EDR (π/4-DQPSK), High channel								
2483.500	69.97	-8.45	61.52	74.00	-12.48	174	289	peak
2483.500	49.89	-8.45	41.44	54.00	-12.56	174	289	AVG
3295.000	64.26	-5.59	58.67	74.00	-15.33	145	312	peak
3295.000	58.36	-5.59	52.77	54.00	-1.23	145	312	AVG
4960.000	42.95	-1.49	41.46	74.00	-32.54	157	158	peak
4960.000	32.55	-1.49	31.06	54.00	-22.94	157	158	AVG
7440.000	41.46	5.23	46.69	74.00	-27.31	163	228	peak
7440.000	31.61	5.23	36.84	54.00	-17.16	163	228	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
EDR (8DPSK), Low channel								
2369.200	56.88	-9.63	47.25	74.00	-26.75	210	308	peak
2369.200	43.47	-9.63	33.84	54.00	-20.16	210	308	AVG
3193.000	59.45	-5.56	53.89	74.00	-20.11	134	168	peak
3193.000	54.68	-5.56	49.12	54.00	-4.88	134	168	AVG
4804.000	42.50	-2.17	40.33	74.00	-33.67	166	328	peak
4804.000	32.45	-2.17	30.28	54.00	-23.72	166	328	AVG
7206.000	41.36	4.18	45.54	74.00	-28.46	152	193	peak
7206.000	31.68	4.18	35.86	54.00	-18.14	152	193	AVG
EDR (8DPSK), Middle channel								
3244.000	59.45	-5.42	54.03	74.00	-19.97	143	162	peak
3244.000	55.33	-5.42	49.91	54.00	-4.09	143	162	AVG
4882.000	42.35	-1.86	40.49	74.00	-33.51	155	218	peak
4882.000	32.45	-1.86	30.59	54.00	-23.41	155	218	AVG
7323.000	42.13	5.11	47.24	74.00	-26.76	161	314	peak
7323.000	32.66	5.11	37.77	54.00	-16.23	161	314	AVG
EDR (8DPSK), High channel								
2483.500	61.29	-8.45	52.84	74.00	-21.16	180	305	peak
2483.500	44.66	-8.45	36.21	54.00	-17.79	180	305	AVG
3295.000	59.55	-5.59	53.96	74.00	-20.04	161	158	peak
3295.000	56.12	-5.59	50.53	54.00	-3.47	161	158	AVG
4960.000	42.46	-1.49	40.97	74.00	-33.03	151	324	peak
4960.000	32.55	-1.49	31.06	54.00	-22.94	151	324	AVG
7440.000	42.13	5.23	47.36	74.00	-26.64	163	215	peak
7440.000	32.67	5.23	37.90	54.00	-16.10	163	215	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
EDR (8DPSK), Low channel								
2361.600	62.00	-9.69	52.31	74.00	-21.69	153	308	peak
2361.600	48.34	-9.69	38.65	54.00	-15.35	153	308	AVG
3193.000	65.48	-5.56	59.92	74.00	-14.08	133	189	peak
3193.000	58.42	-5.56	52.86	54.00	-1.14	133	189	AVG
4804.000	43.46	-2.17	41.29	74.00	-32.71	155	218	peak
4804.000	33.67	-2.17	31.50	54.00	-22.50	155	218	AVG
7206.000	42.32	4.18	46.50	74.00	-27.50	163	335	peak
7206.000	32.48	4.18	36.66	54.00	-17.34	163	335	AVG
EDR (8DPSK), Middle channel								
3244.000	65.13	-5.42	59.71	74.00	-14.29	141	225	peak
3244.000	58.22	-5.42	52.80	54.00	-1.20	141	225	AVG
4882.000	42.50	-1.86	40.64	74.00	-33.36	156	317	peak
4882.000	32.56	-1.86	30.70	54.00	-23.30	156	317	AVG
7323.000	41.69	5.11	46.80	74.00	-27.20	163	156	peak
7323.000	31.48	5.11	36.59	54.00	-17.41	163	156	AVG
EDR (8DPSK), High channel								
2483.500	67.82	-8.45	59.37	74.00	-14.63	142	307	peak
2483.500	49.57	-8.45	41.12	54.00	-12.88	142	307	AVG
3295.000	63.83	-5.59	58.24	74.00	-15.76	132	166	peak
3295.000	58.33	-5.59	52.74	54.00	-1.26	132	166	AVG
4960.000	42.77	-1.49	41.28	74.00	-32.72	155	322	peak
4960.000	32.45	-1.49	30.96	54.00	-23.04	155	322	AVG
7440.000	42.62	5.23	47.85	74.00	-26.15	149	168	peak
7440.000	32.68	5.23	37.91	54.00	-16.09	149	168	AVG

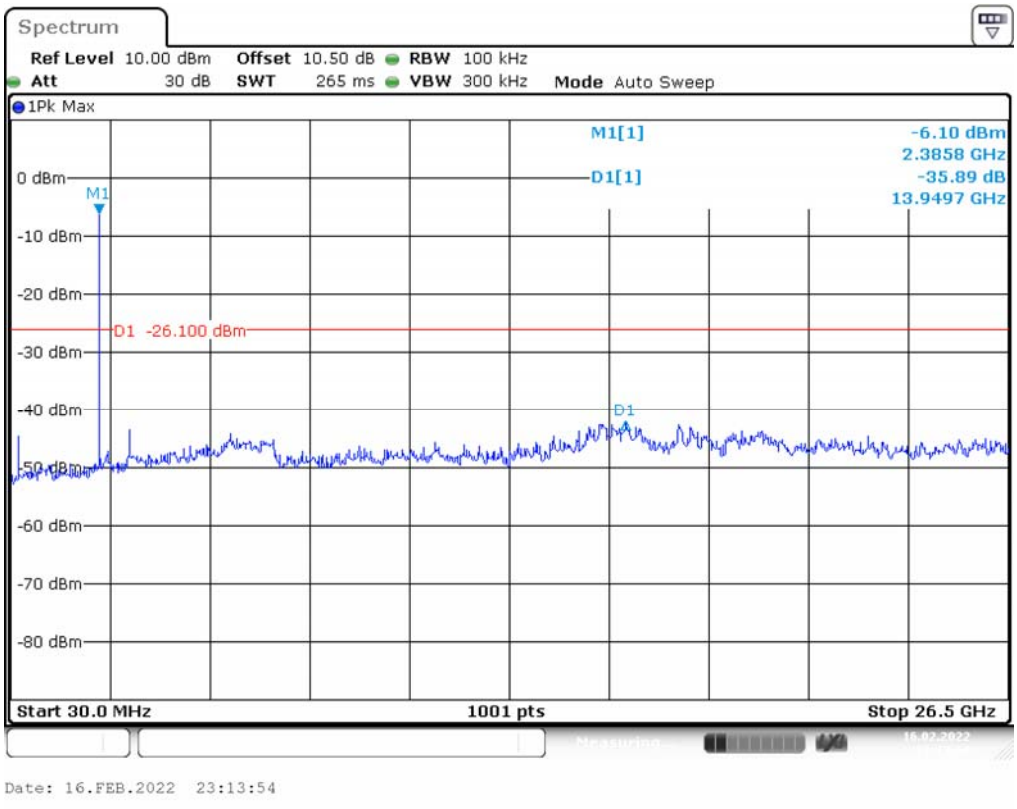
Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Conducted Spurious Emissions:

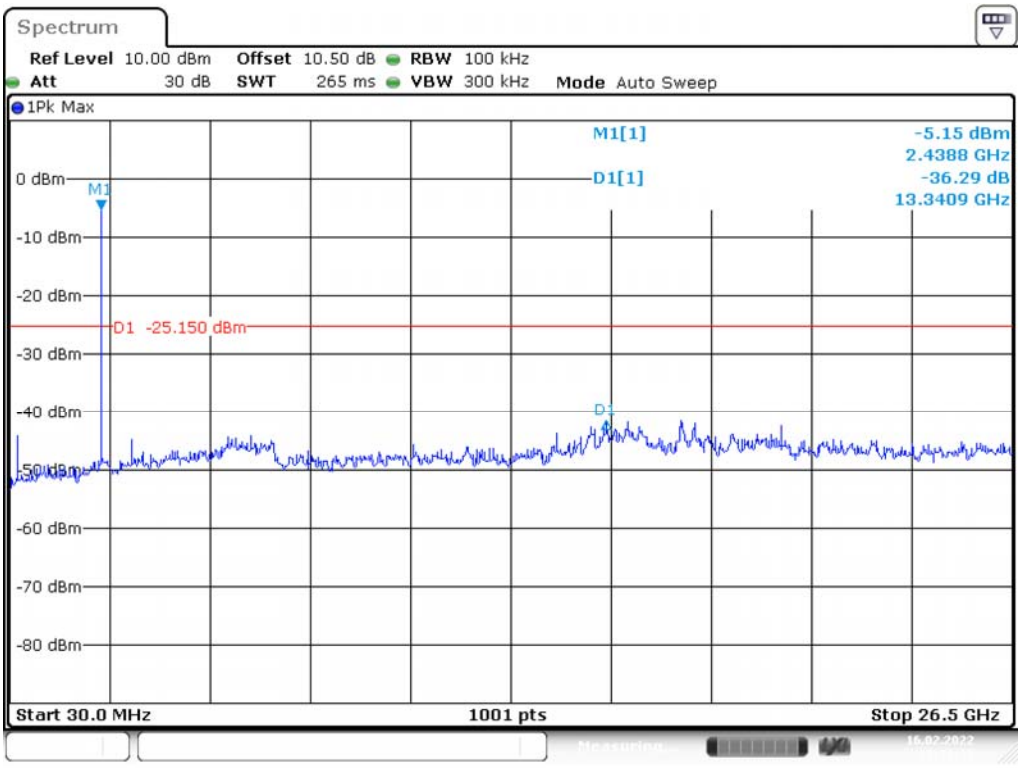
Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
BR Mode (GFSK)				
Low	2402	35.89	≥ 20	PASS
Mid	2441	36.29	≥ 20	PASS
High	2480	35.22	≥ 20	PASS
EDR Mode (π/4-DQPSK):				
Low	2402	32.79	≥ 20	PASS
Mid	2441	31.78	≥ 20	PASS
High	2480	35.84	≥ 20	PASS
EDR Mode (8DPSK):				
Low	2402	31.64	≥ 20	PASS
Mid	2441	35.33	≥ 20	PASS
High	2480	36.18	≥ 20	PASS

BR Mode (GFSK)

Low Channel

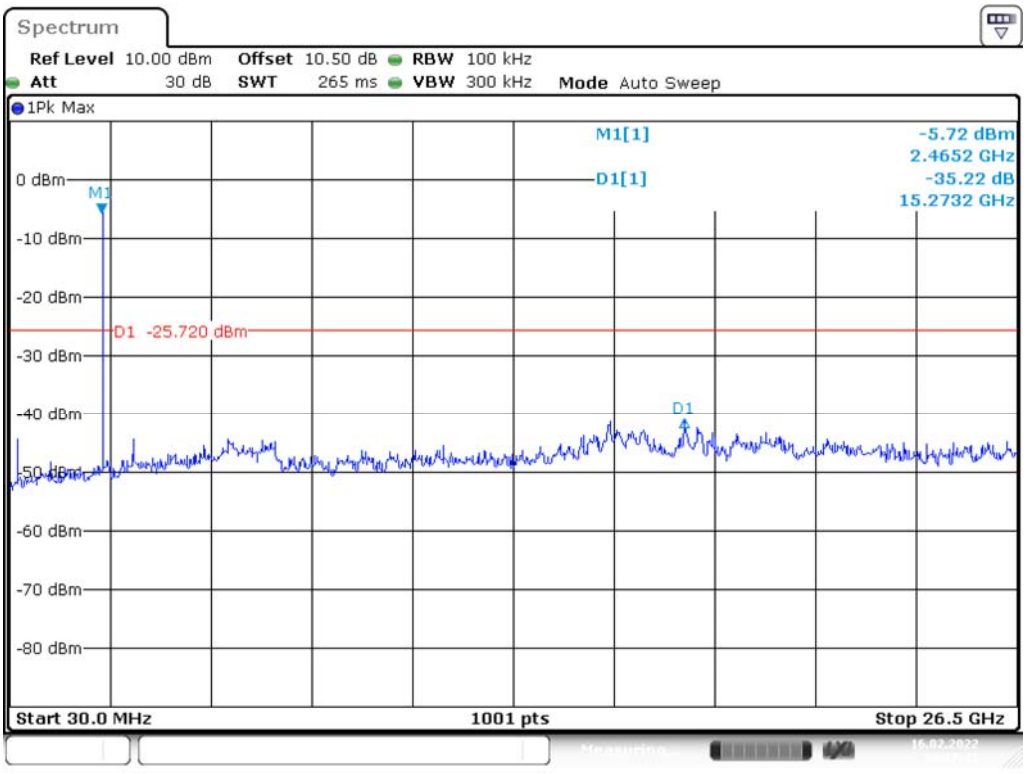


Middle Channel



Date: 16.FEB.2022 23:19:38

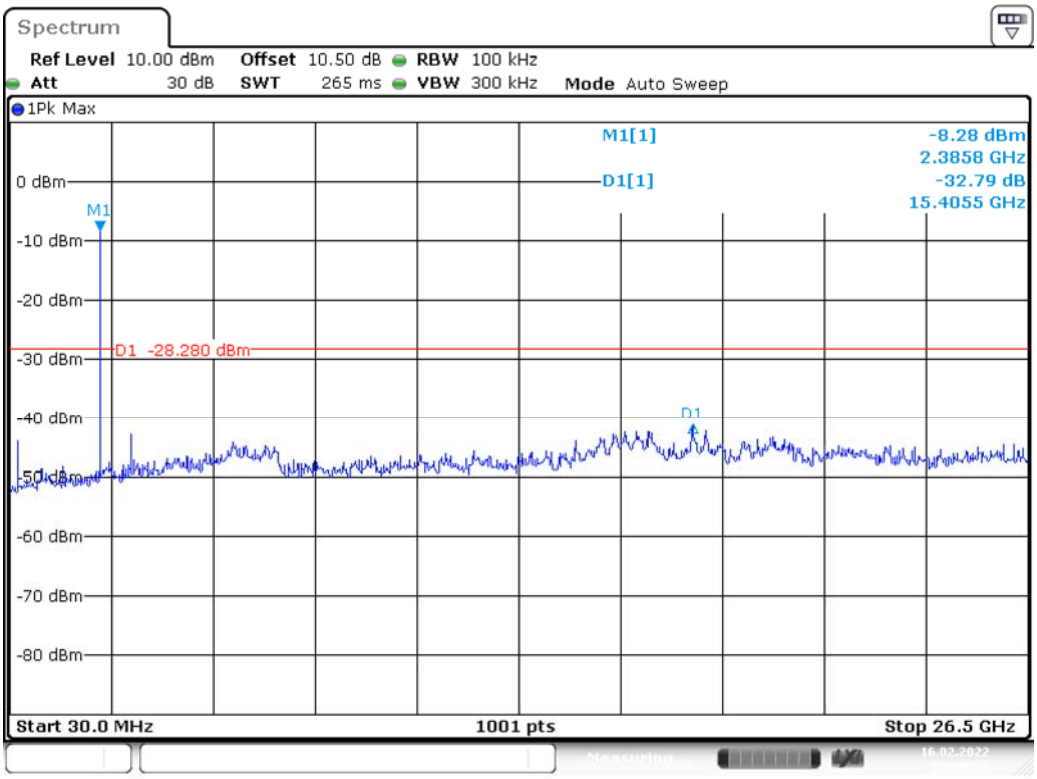
High Channel



Date: 16.FEB.2022 23:17:13

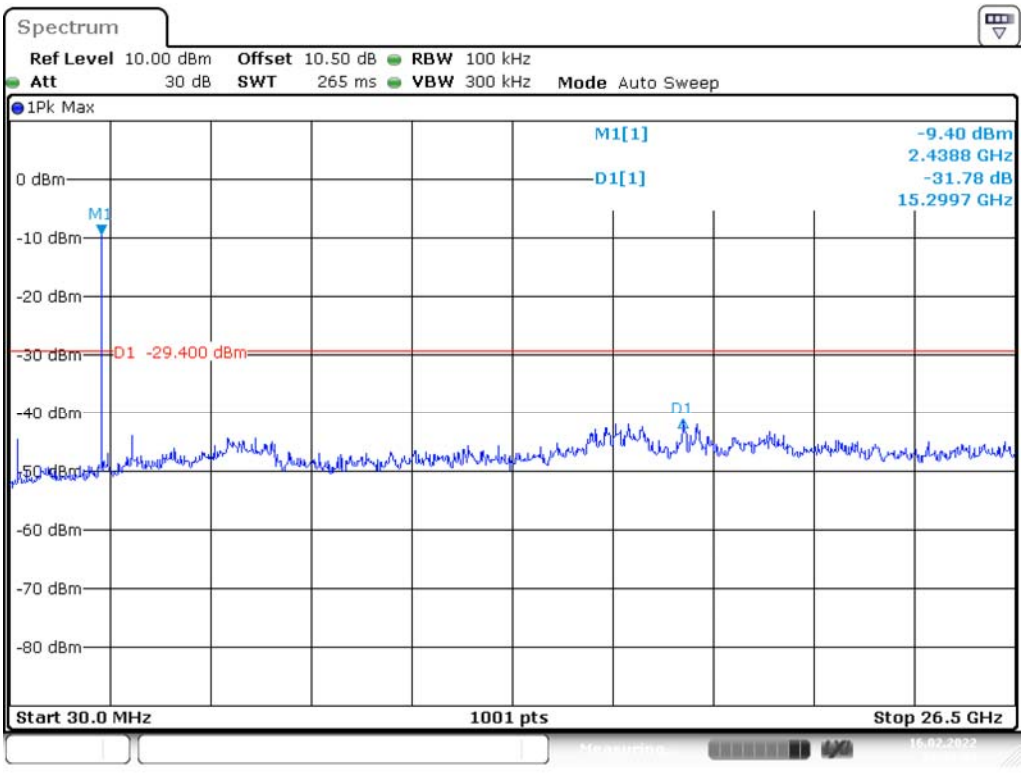
EDR Mode (π/4-DQPSK)

Low Channel



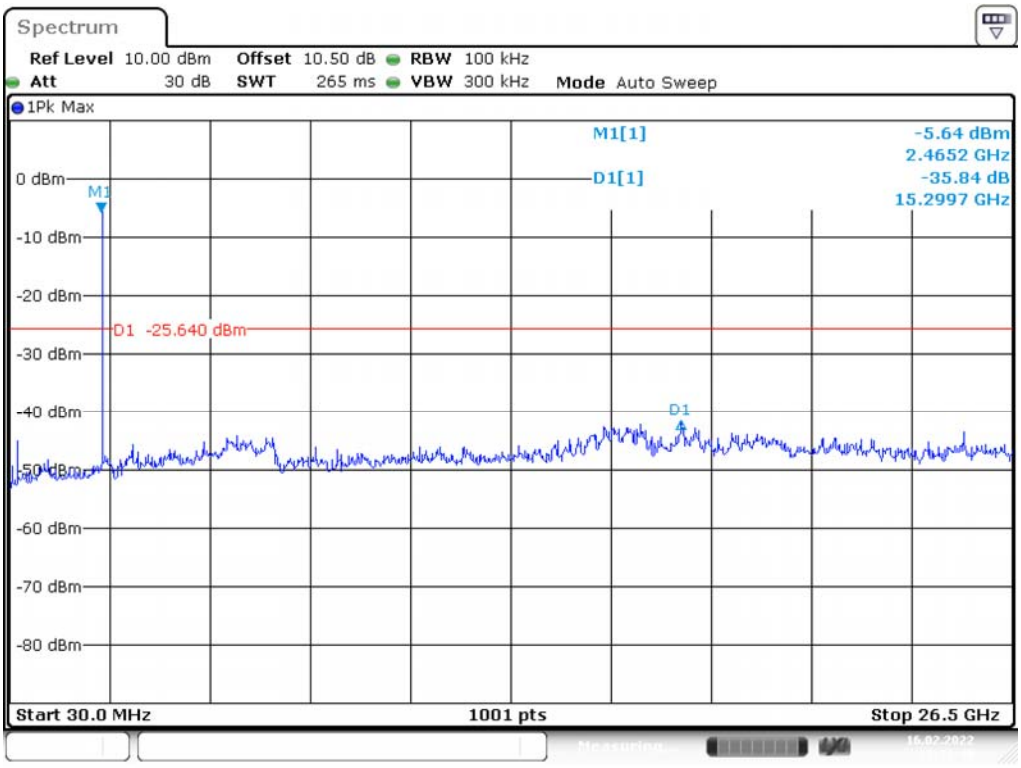
Date: 16.FEB.2022 23:48:17

Middle Channel



Date: 16.FEB.2022 23:32:09

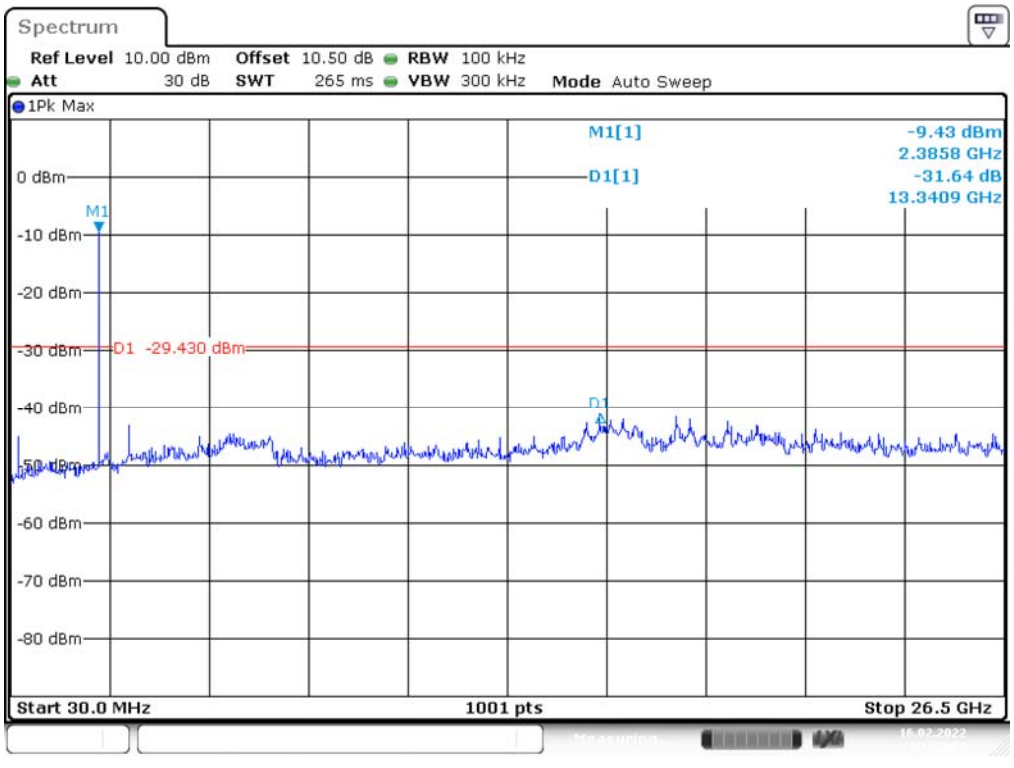
High Channel



Date: 16.FEB.2022 23:33:40

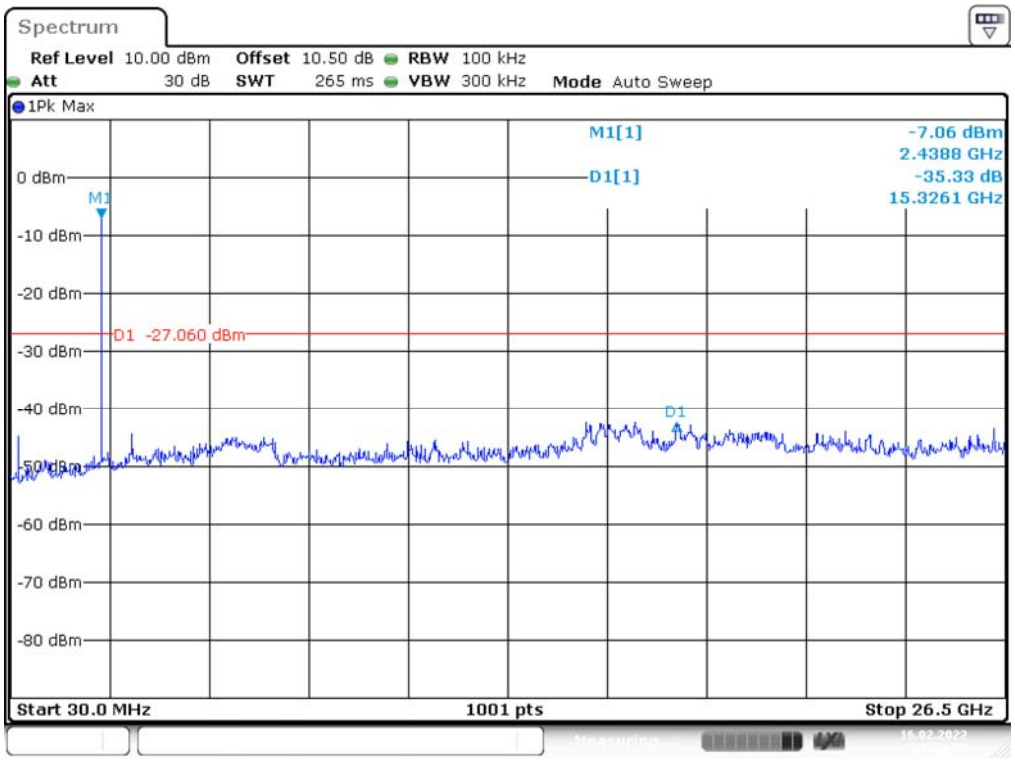
EDR Mode (8DPSK)

Low Channel



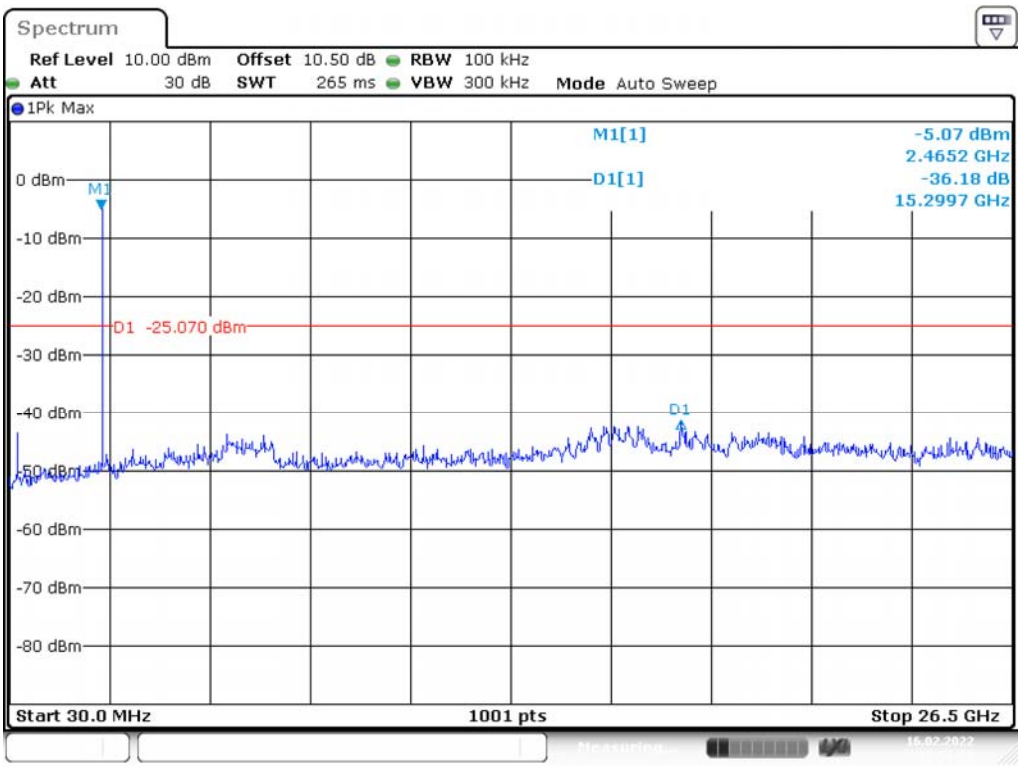
Date: 16.FEB.2022 23:52:02

Middle Channel



Date: 16.FEB.2022 23:53:51

High Channel



Date: 16.FEB.2022 23:56:28

9. FCC §15.247(a)(1) – 20 dB Emission Bandwidth

9.1. Applicable Standard

According to FCC §15.247(a) (1) the maximum 20 dB bandwidth of the hopping channel shall be presented.

9.2. 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 it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
(3) Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
(4) Repeat above procedures until all frequencies measured were complete.

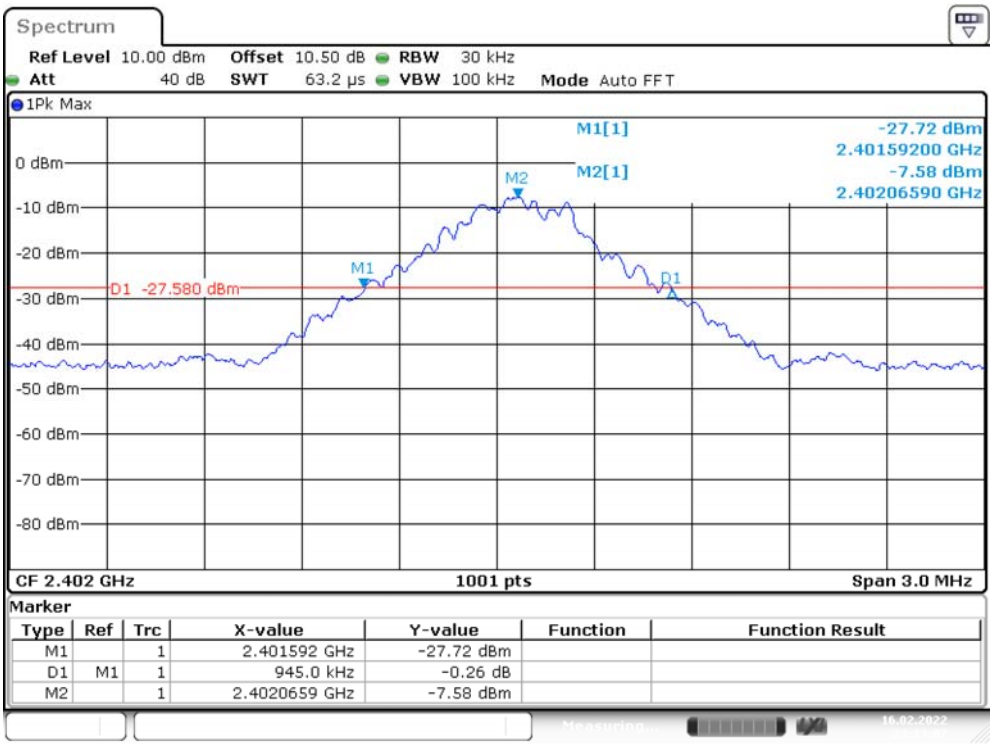
9.3. Test Results

Channel	Frequency (MHz)	20 dBc BW (MHz)
BR Mode (GFSK)		
Low	2402	0.95
Middle	2441	0.94
High	2480	0.94
EDR Mode (π/4-DQPSK)		
Low	2402	1.32
Middle	2441	1.32
High	2480	1.31
EDR Mode (8DPSK)		
Low	2402	1.31
Middle	2441	1.30
High	2480	1.30

Please refer to the following plots

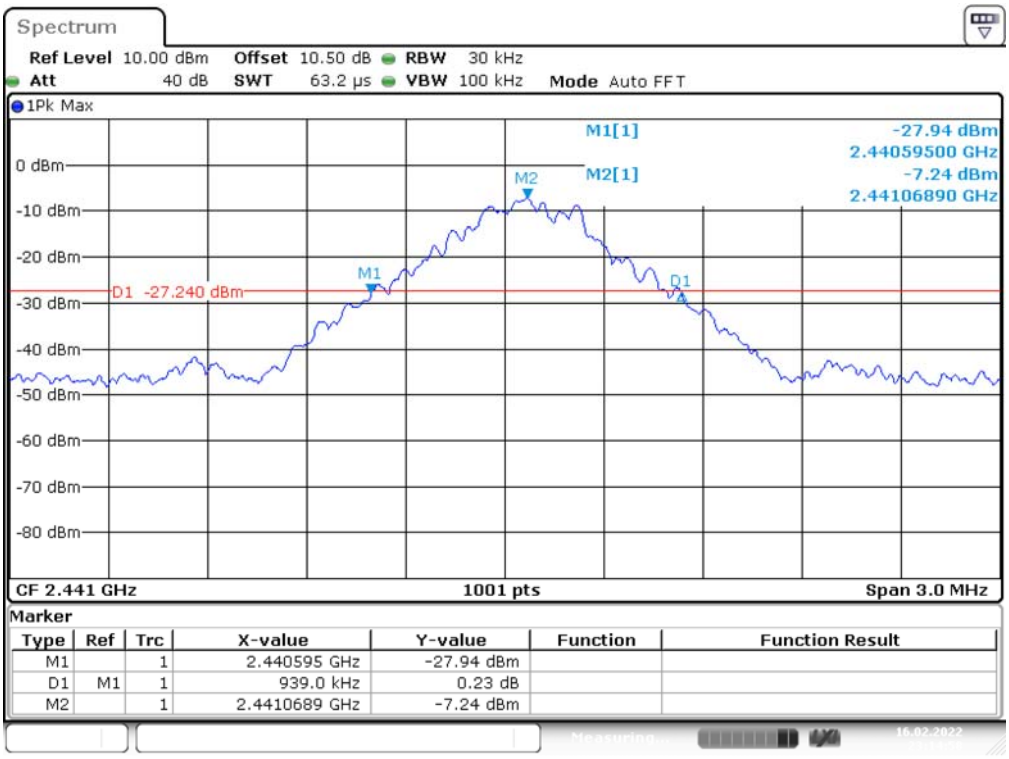
BR Mode (GFSK)

Low Channel



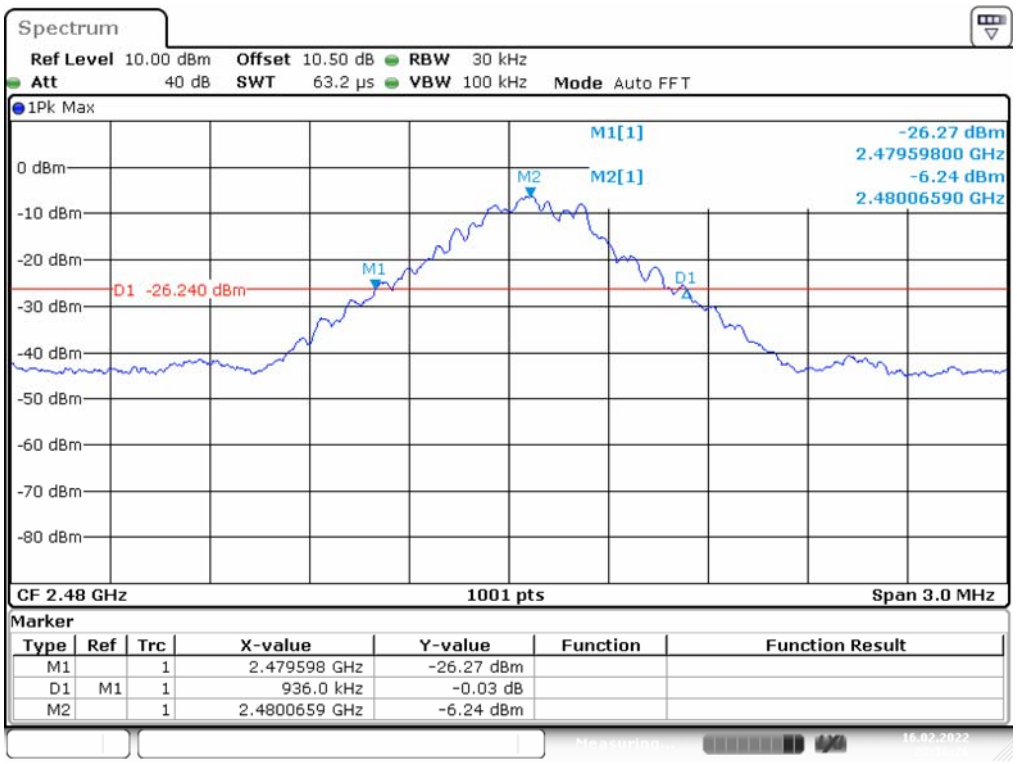
Date: 16.FEB.2022 23:13:07

Middle Channel



Date: 16.FEB.2022 23:14:59

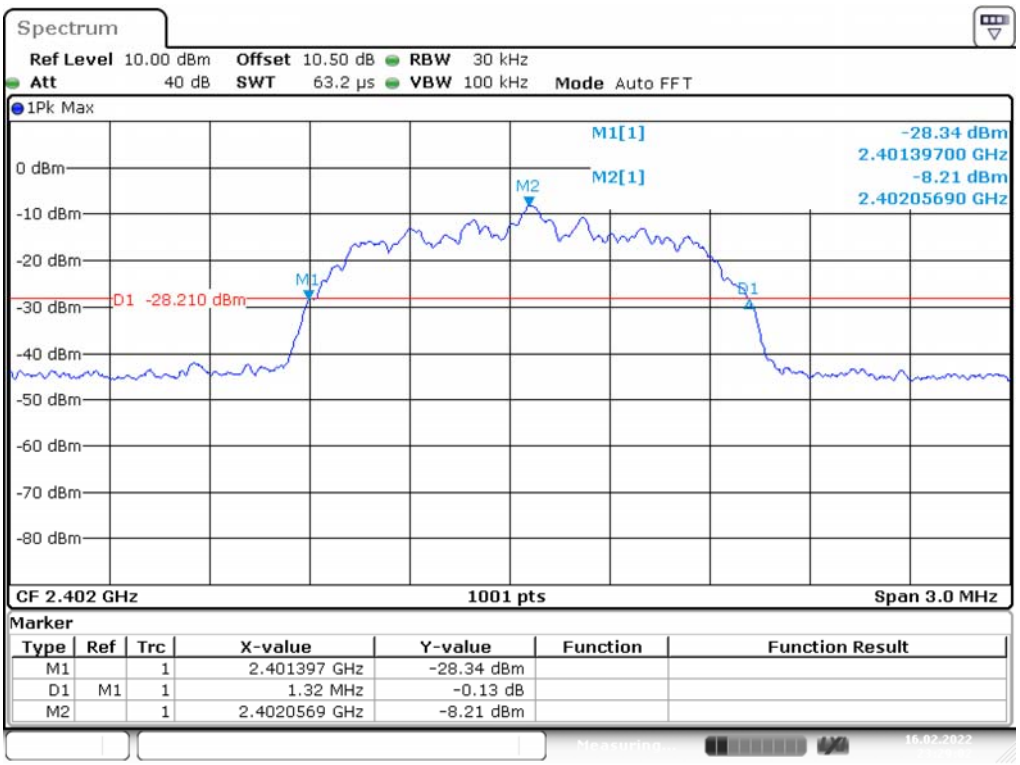
High Channel



Date: 16.FEB.2022 23:16:26

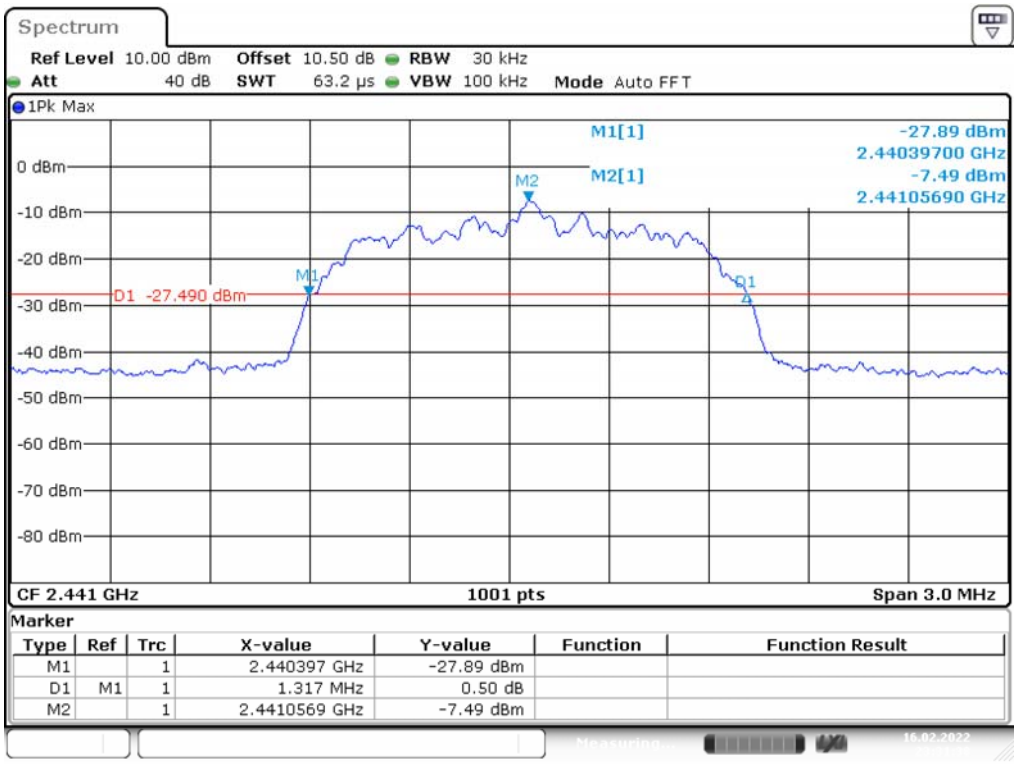
EDR Mode (π/4-DQPSK)

Low Channel

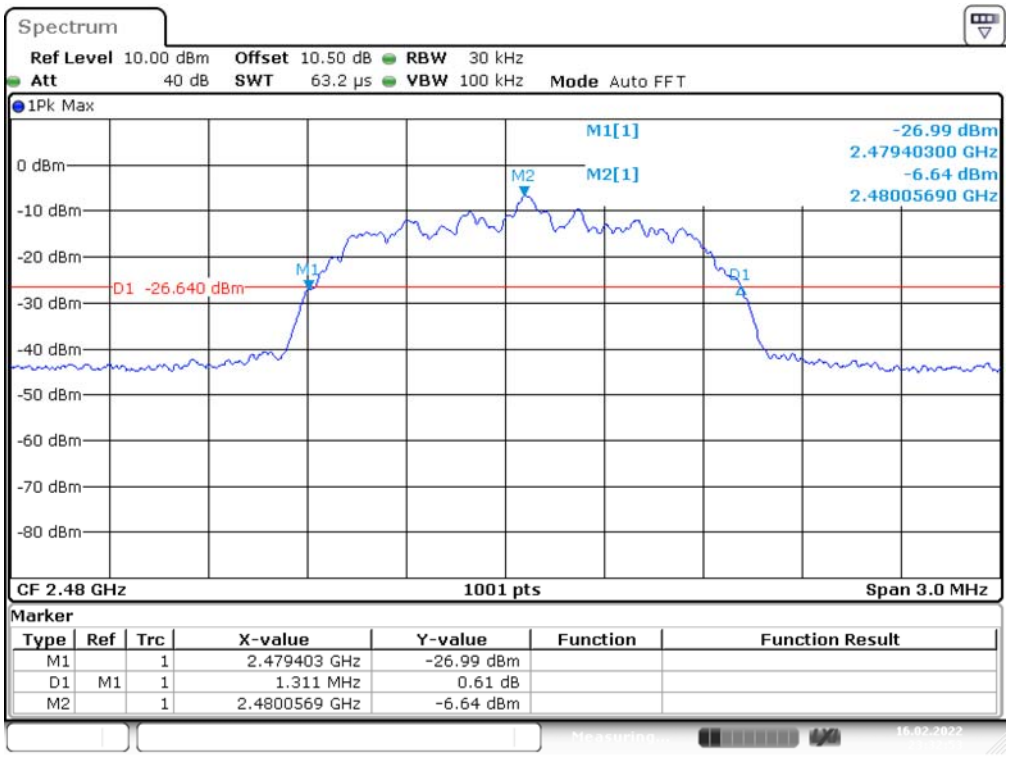


Date: 16.FEB.2022 23:29:02

Middle Channel

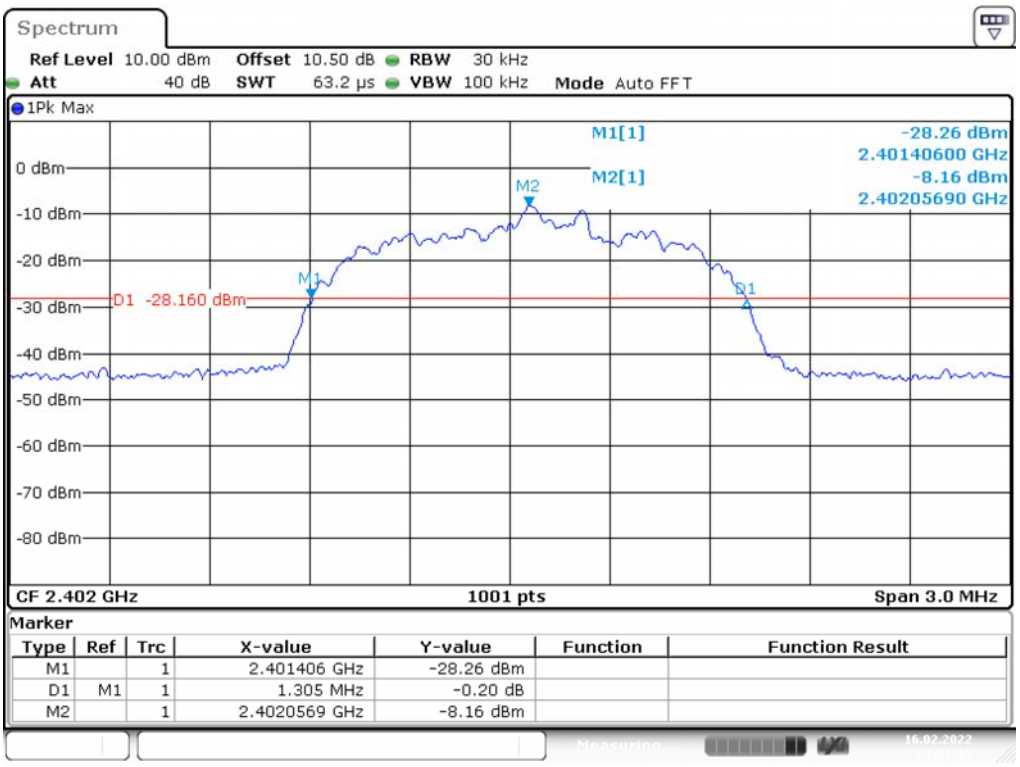


High Channel



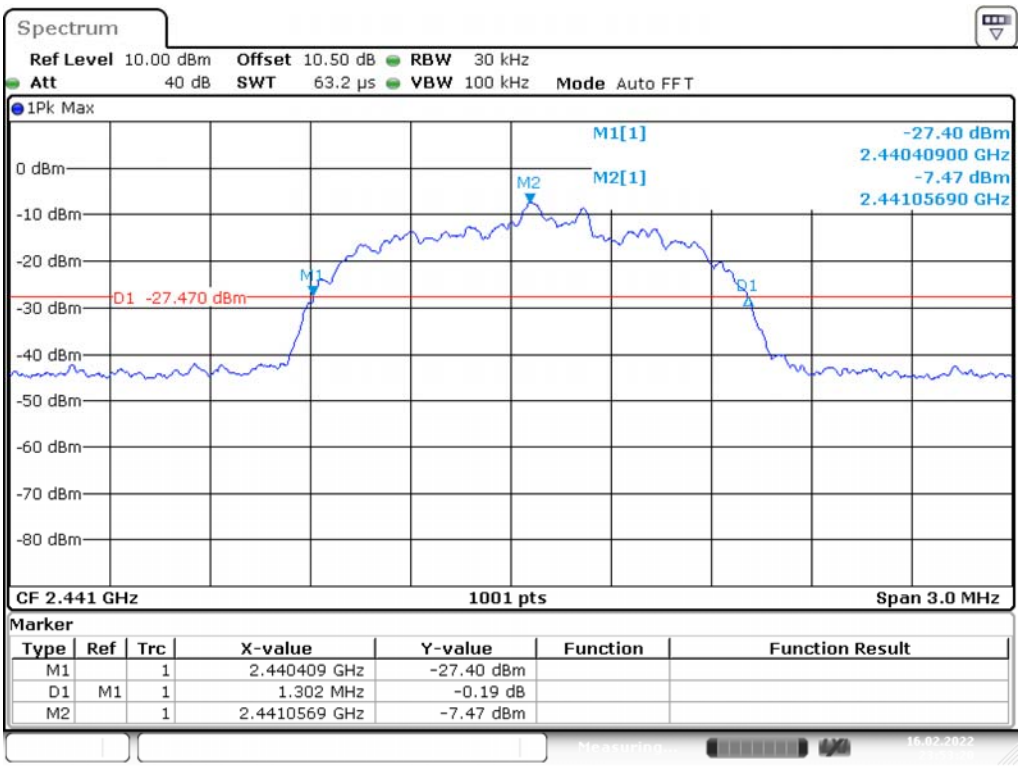
EDR Mode (8DPSK)

Low Channel



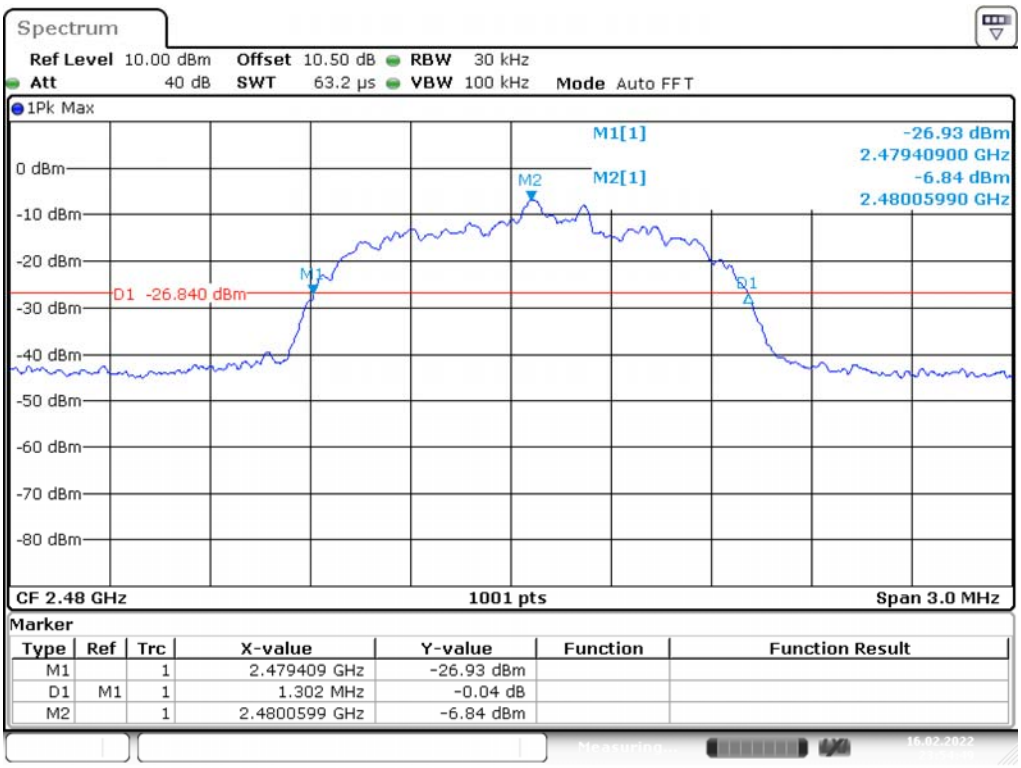
Date: 16.FEB.2022 23:51:15

Middle Channel



Date: 16.FEB.2022 23:53:20

High Channel



10. FCC §15.247(a)(1) – Channel Separation Test

10.1. Applicable Standard

According to FCC §15.247(a) (1): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

10.2. Test Procedure

1. Set the EUT in transmitting mode, max hold the channel.
2. Set the adjacent channel of the EUT and max hold another trace.
3. Measure the channel separation.

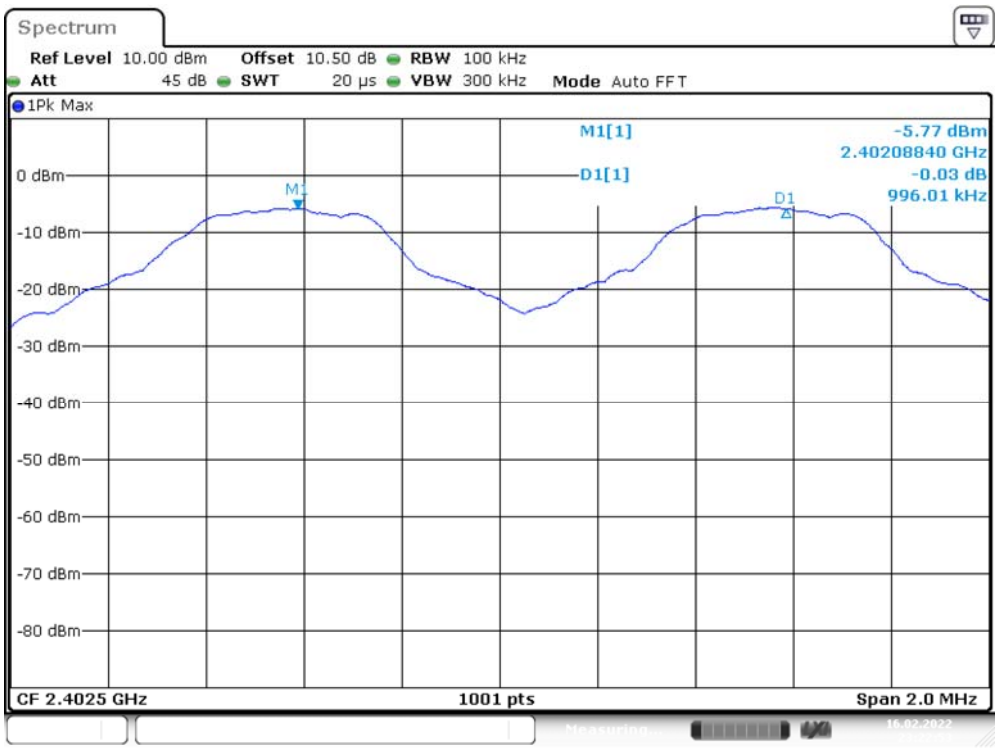
10.3. Test Results

Channel	Channel Separation (MHz)	20 dBc BW (MHz)	Two-thirds of the 20 dB bandwidth (MHz)	Channel Separation Limit	Result
BR Mode (GFSK)					
Low	1	0.95	0.630	>two-thirds of the 20 dB bandwidth	Compliance
Middle	1	0.94	0.626	>two-thirds of the 20 dB bandwidth	Compliance
High	1	0.94	0.624	>two-thirds of the 20 dB bandwidth	Compliance
EDR Mode (π/4-DQPSK)					
Low	1	1.32	0.880	>two-thirds of the 20 dB bandwidth	Compliance
Middle	1	1.32	0.878	>two-thirds of the 20 dB bandwidth	Compliance
High	1	1.31	0.874	>two-thirds of the 20 dB bandwidth	Compliance
EDR Mode (8DPSK)					
Low	1	1.31	0.870	>two-thirds of the 20 dB bandwidth	Compliance
Middle	1	1.30	0.868	>two-thirds of the 20 dB bandwidth	Compliance
High	1	1.30	0.868	>two-thirds of the 20 dB bandwidth	Compliance

Please refer to the following plots.

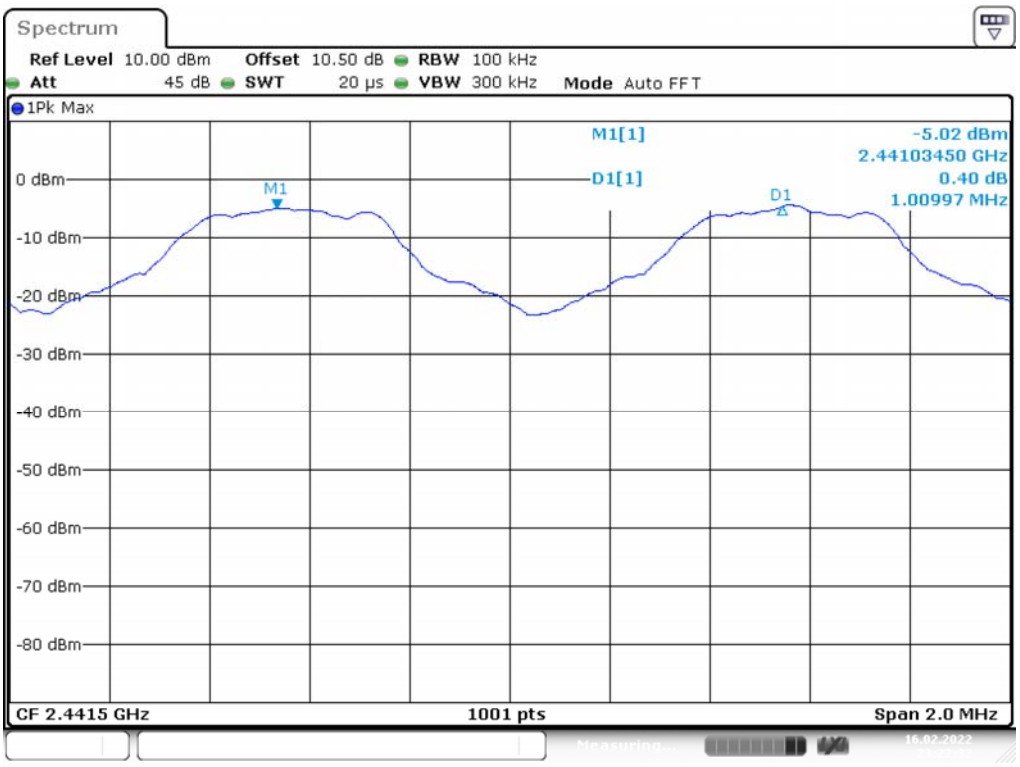
BR Mode (GFSK)

Low Channel



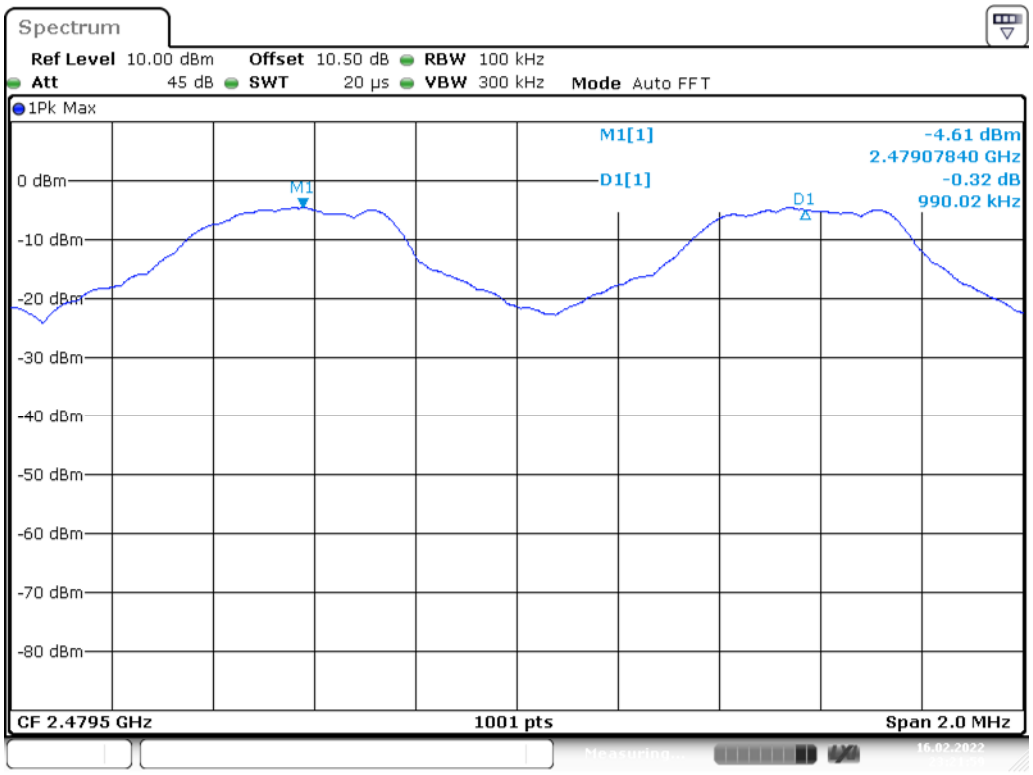
Date: 16.FEB.2022 23:22:53

Middle Channel



Date: 16.FEB.2022 23:22:32

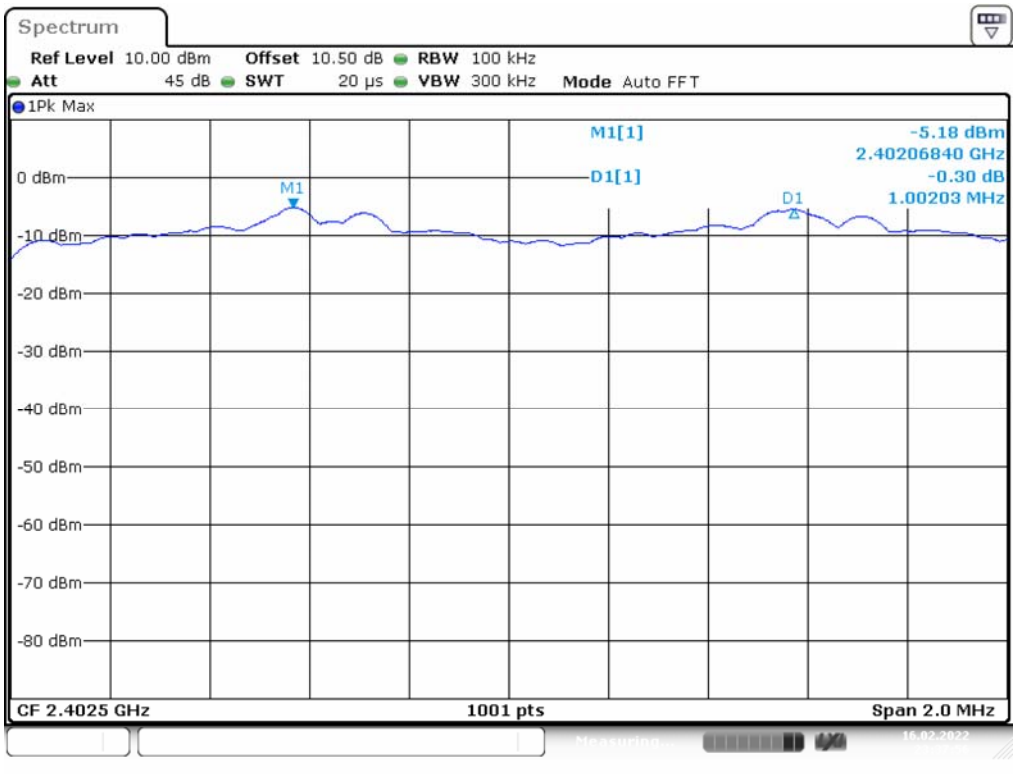
High Channel



Date: 16.FEB.2022 23:21:59

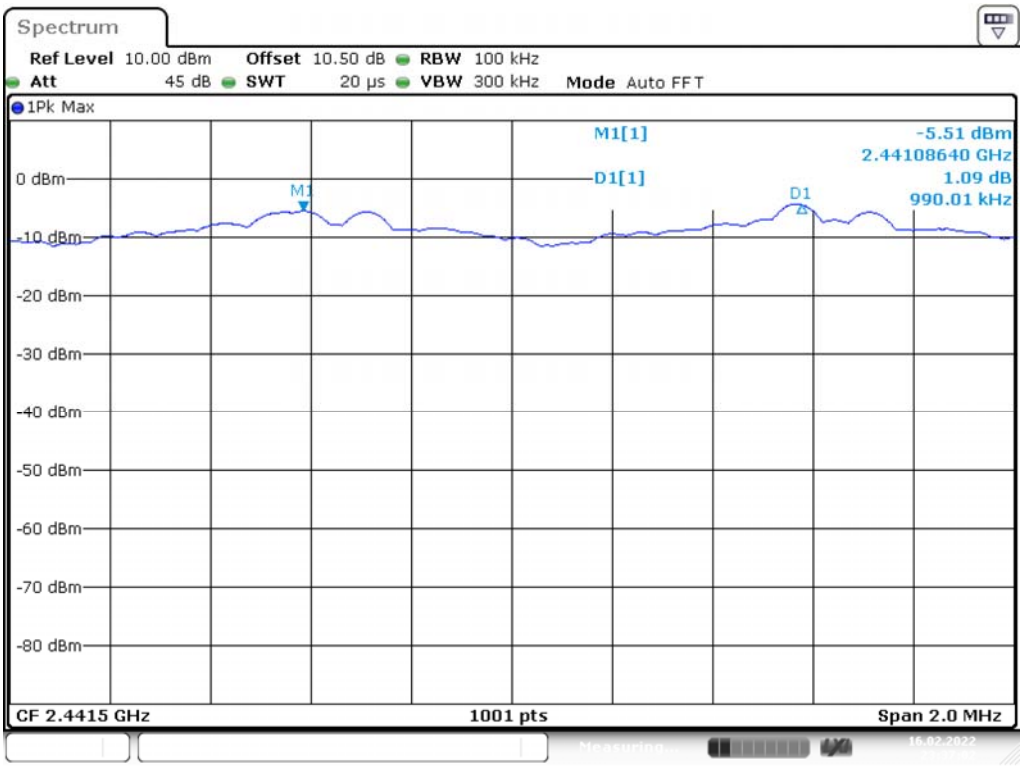
EDR Mode (π/4-DQPSK)

Low Channel



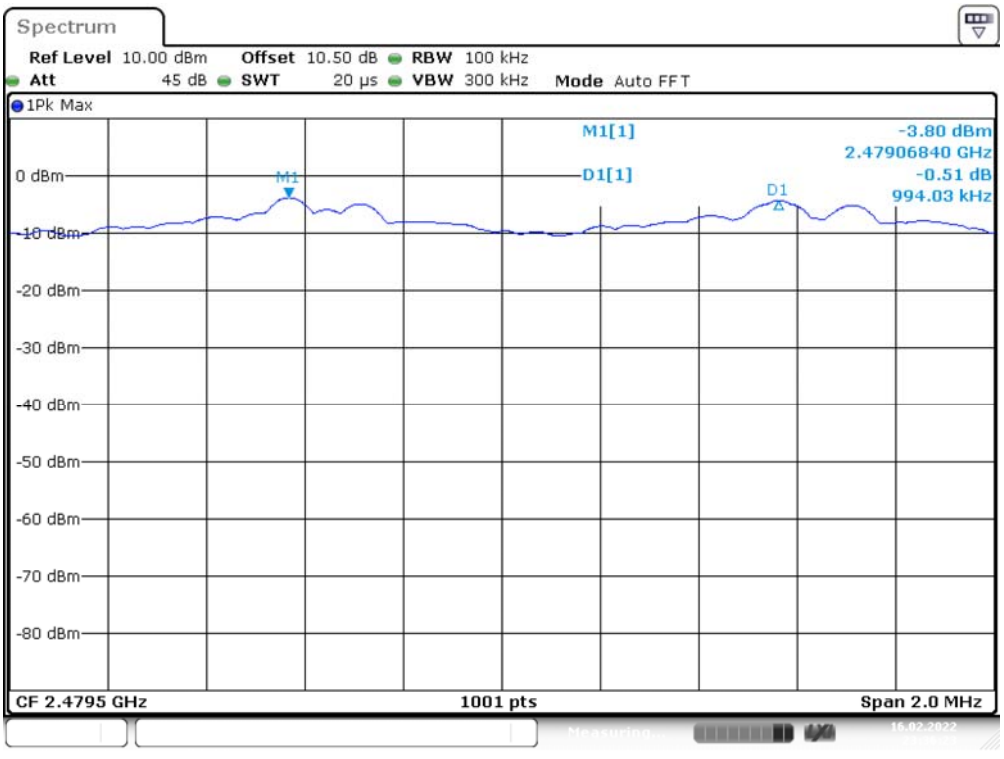
Date: 16.FEB.2022 23:37:56

Middle Channel



Date: 16.FEB.2022 23:37:02

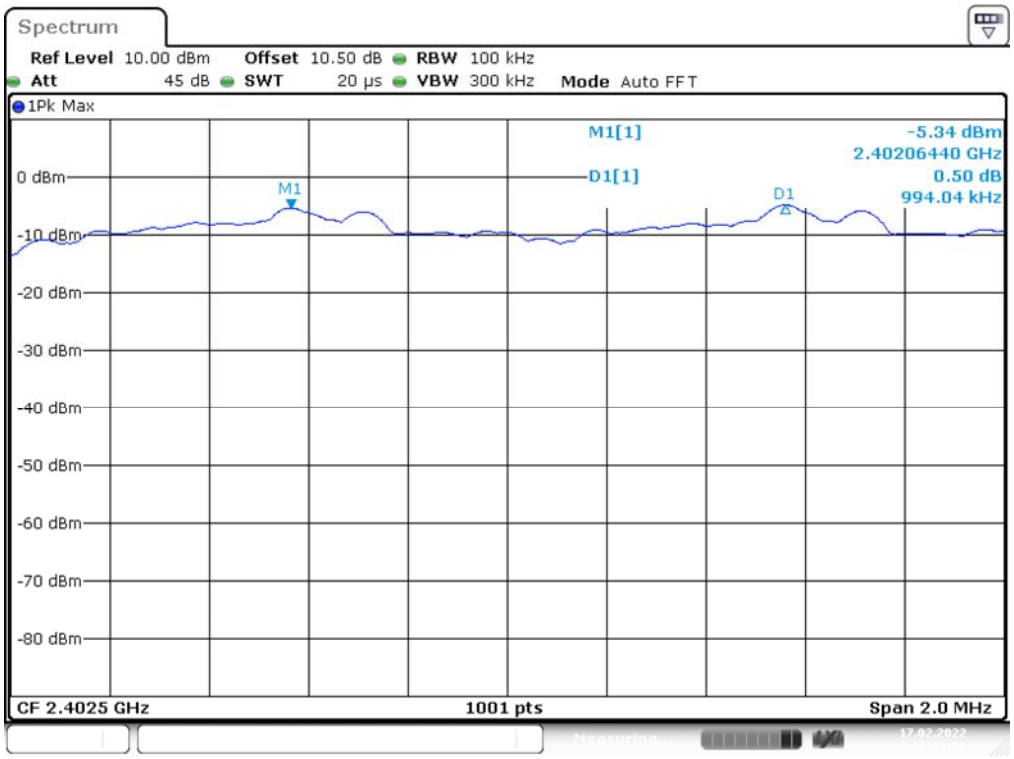
High Channel



Date: 16.FEB.2022 23:36:24

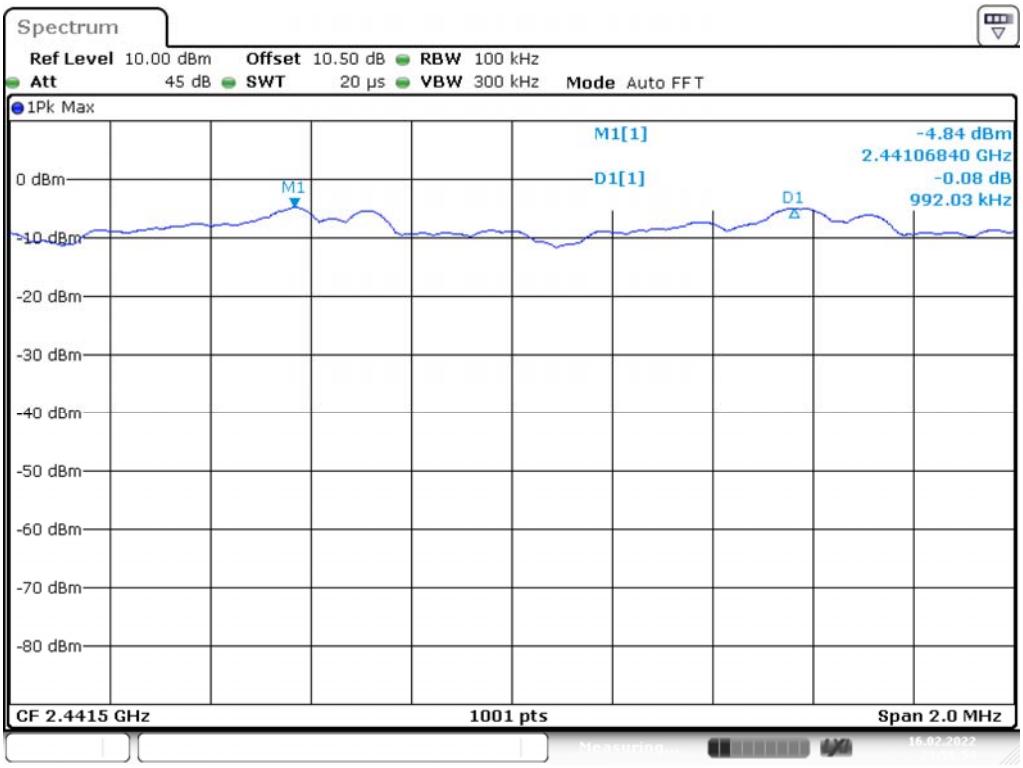
EDR Mode (8DPSK)

Low Channel



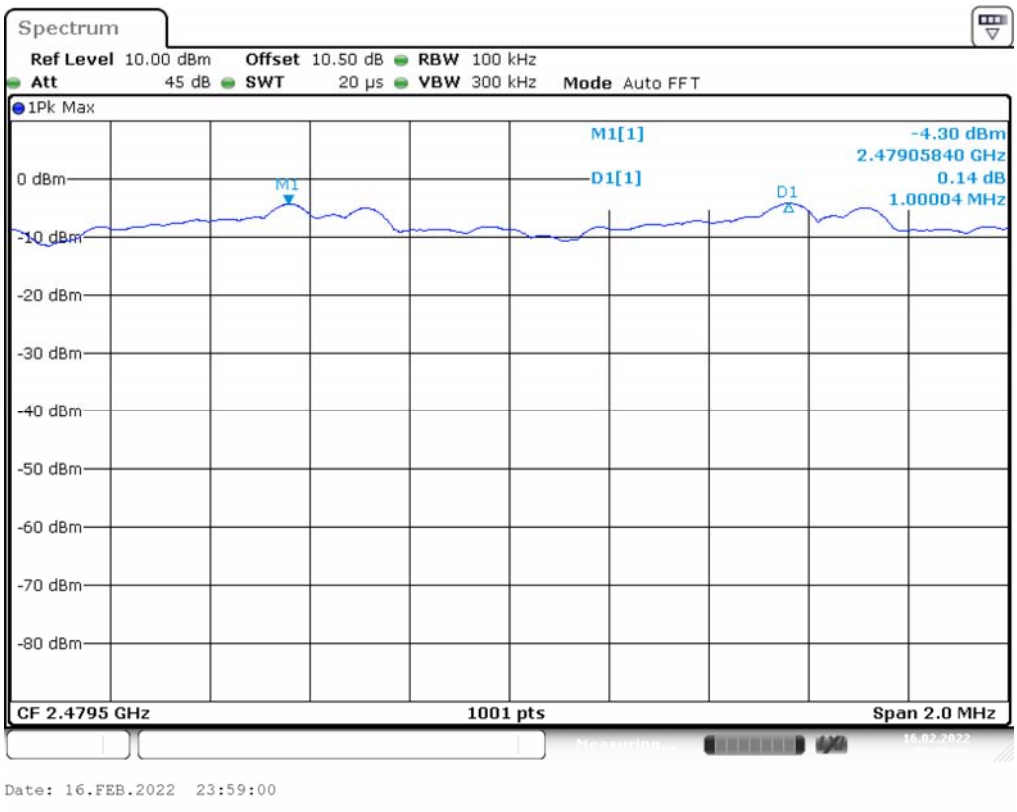
Date: 17.FEB.2022 00:01:02

Middle Channel



Date: 16.FEB.2022 23:59:54

High Channel



11. FCC§15.247(a)(1)(iii) –Time of Occupancy (Dwell Time)

11.1. Applicable Standard

According to FCC §15.247(a) (1) (iii).

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

11.2. Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel RBW ≤ channel spacing and where possible RBW should be set >> 1/T, where T is the expected dwell time per channel Sweep = as necessary to capture the entire dwell time per hopping channel Detector function = peak Trace = max hold

Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.

Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements.

Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:

(Number of hops in the period specified in the requirements) = (number of hops on spectrum analyzer) x (period specified in the requirements / analyzer sweep time)

The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified. If the number of hops in a specific time varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation.

11.3. Test Results

Test mode: BR mode / 2402 ~ 2480MHz (GFSK)						
Mode	**Pulse Time (ms)**	**Hopping Number**	**Period Time (s)**	**Total of Dwell (ms)**	**Limit (ms)**	**Result**
DH1	0.373	320	31.6	119.36	<400	PASS
DH3	1.633	170	31.6	277.61	<400	PASS
DH5	2.878	100	31.6	287.80	<400	PASS
Test mode: EDR mode / 2402 ~ 2480MHz (π/4-DQPSK)						
Mode	**Pulse Time (ms)**	**Hopping Number**	**Period Time (s)**	**Total of Dwell (ms)**	**Limit (ms)**	**Result**
2DH1	0.3885	310	31.6	120.44	<400	PASS
2DH3	1.6395	170	31.6	278.72	<400	PASS
2DH5	2.8895	70	31.6	202.27	<400	PASS
Test mode: EDR mode / 2402 ~ 2480MHz (8DPSK)						
Mode	**Pulse Time (ms)**	**Hopping Number**	**Period Time (s)**	**Total of Dwell (ms)**	**Limit (ms)**	**Result**
3DH1	0.387	320	31.6	123.84	<400	PASS
3DH3	1.6415	160	31.6	262.64	<400	PASS
3DH5	2.8865	120	31.6	346.38	<400	PASS

Note 1: A period time = 0.4*79 = 31.6 (s), Total of Dwell=Pulse Time * Hopping Number

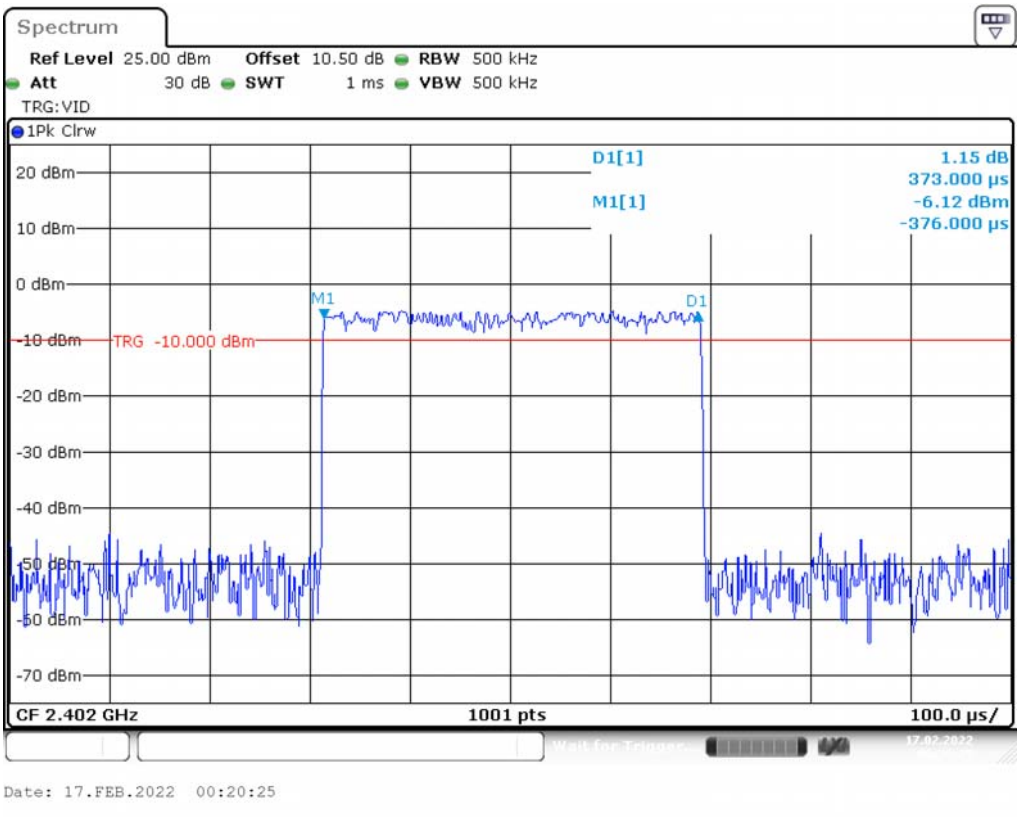
Note 2: Hopping Number = Hopping Number/10 * 10

Note 3: Hopping Number/10 = Total of highest signals in 3.16s. (Second high signals were other channel)

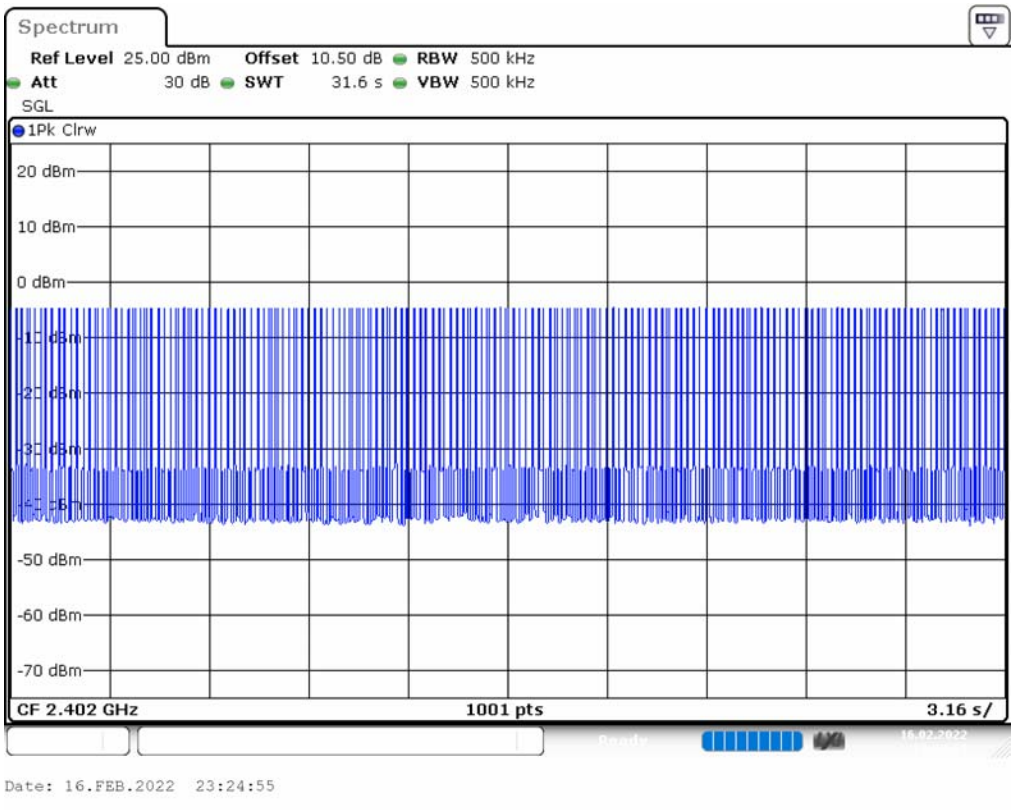
Please refer to the following plots

BR Mode (GFSK)

DH1: Pulse Width

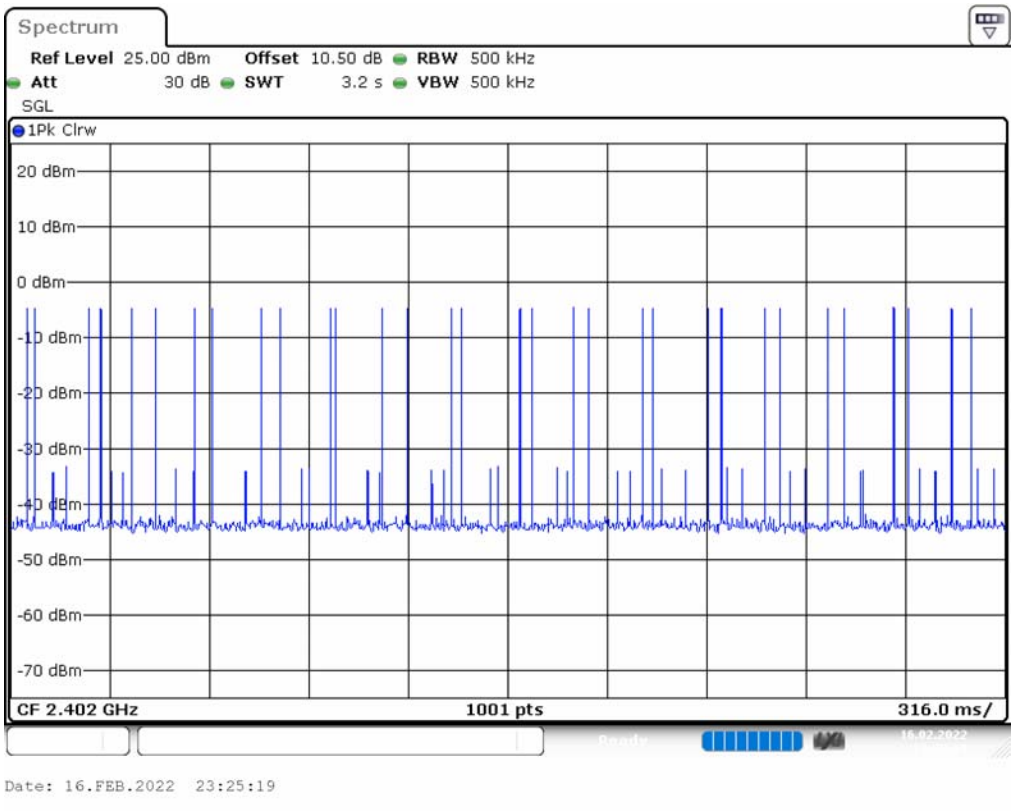


DH1: Hopping Number

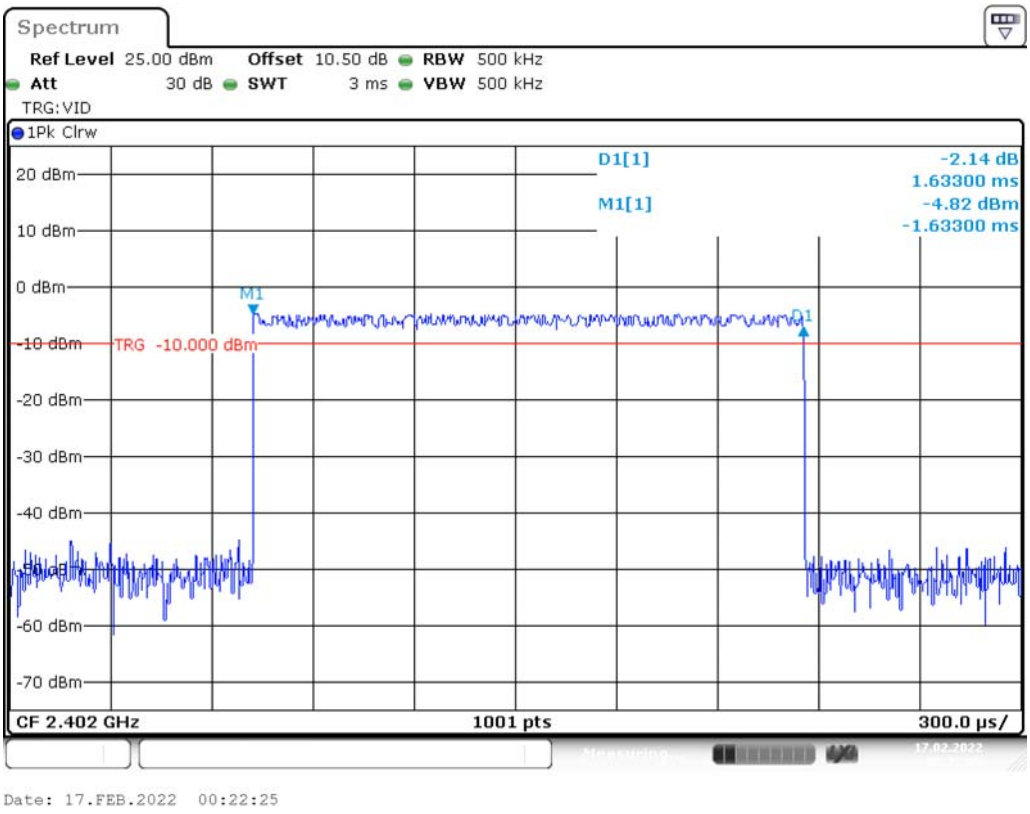


DH1: Hopping Number /10

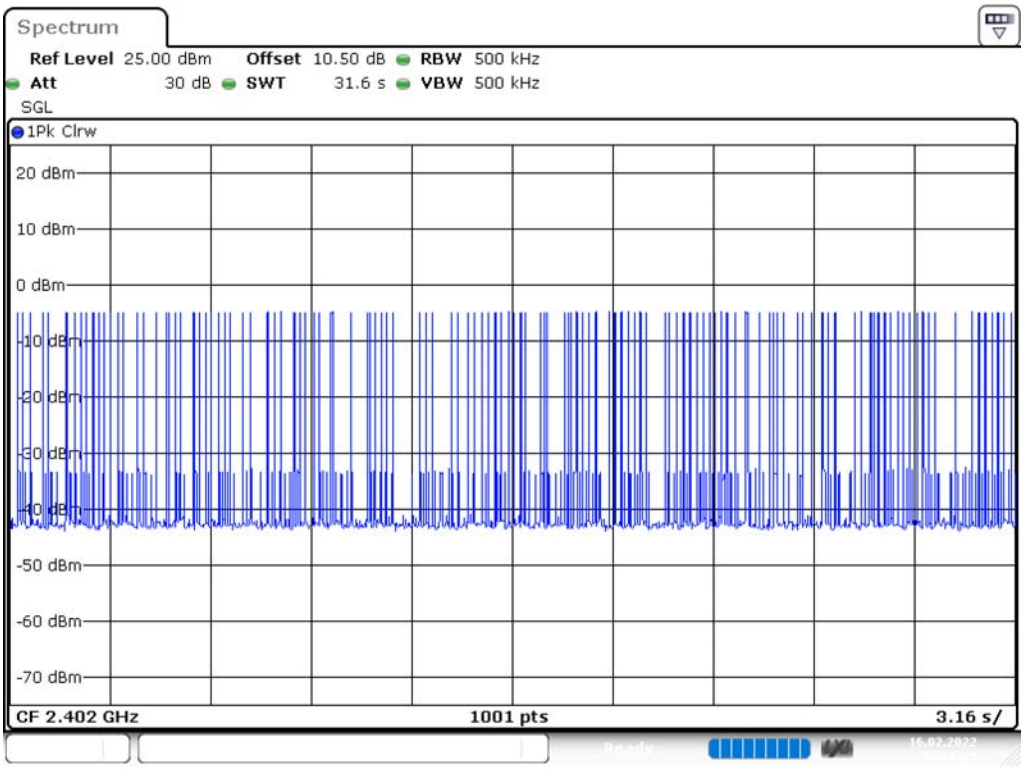
(Hopping Number = 32 in 1/10 period of highest signals, Second High signals were other channel)



DH3: Pulse Width

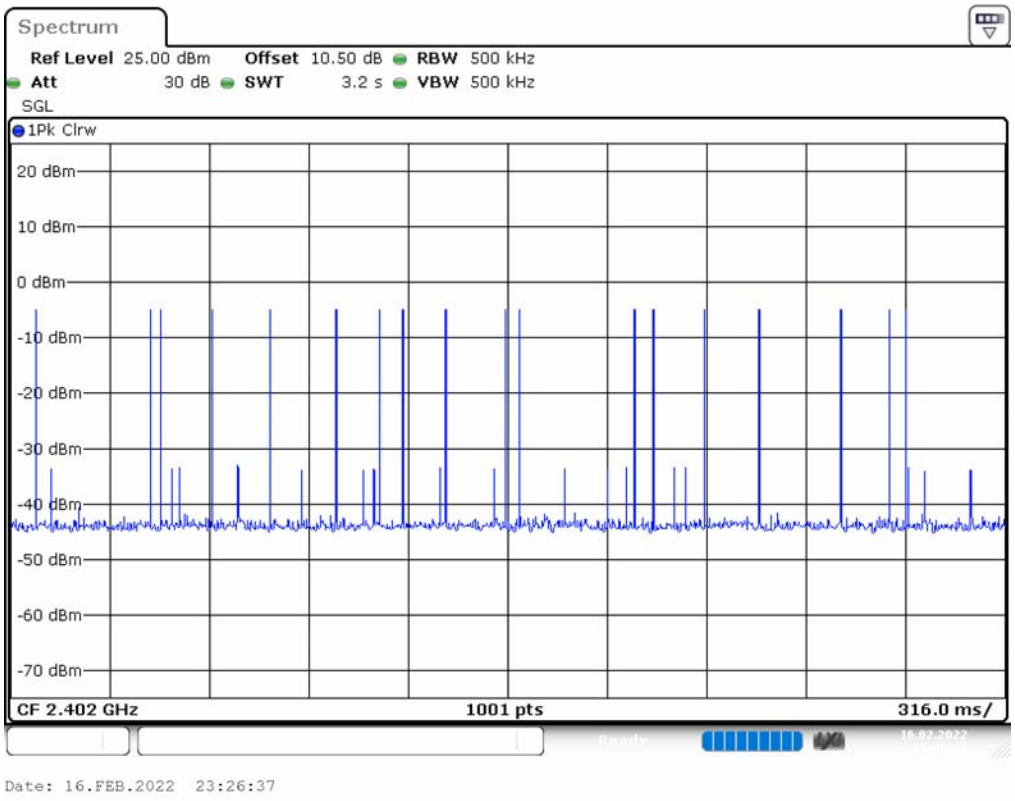


DH3: Hopping Number

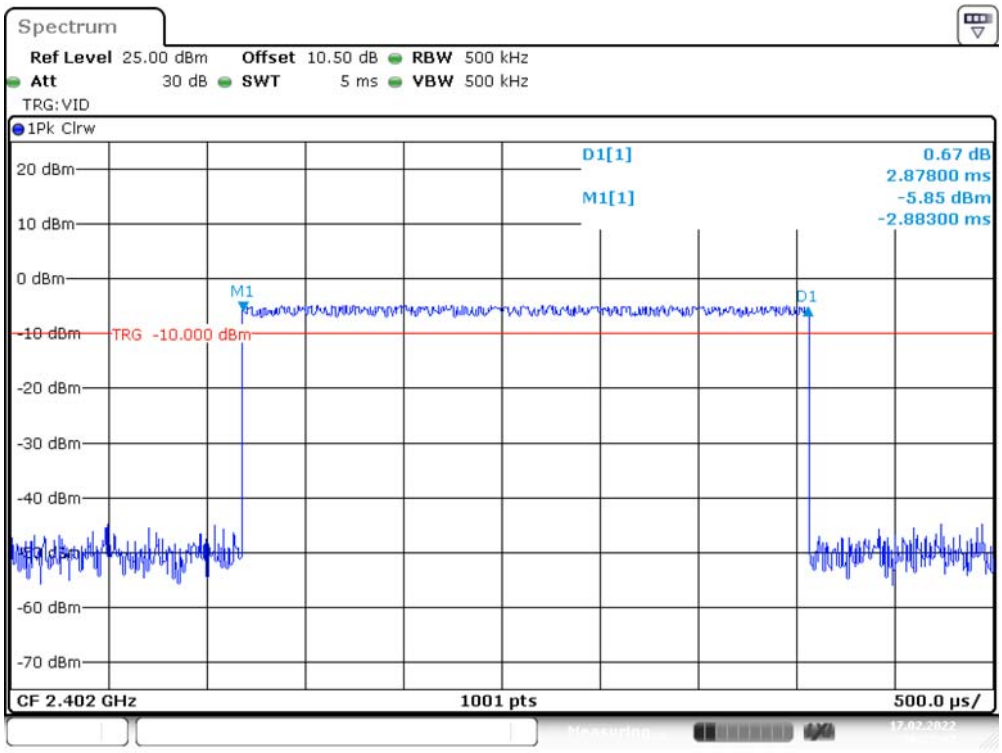


DH3: Hopping Number /10

(Hopping Number = 17 in 1/10 period of highest signals, Second High signals were other channel)

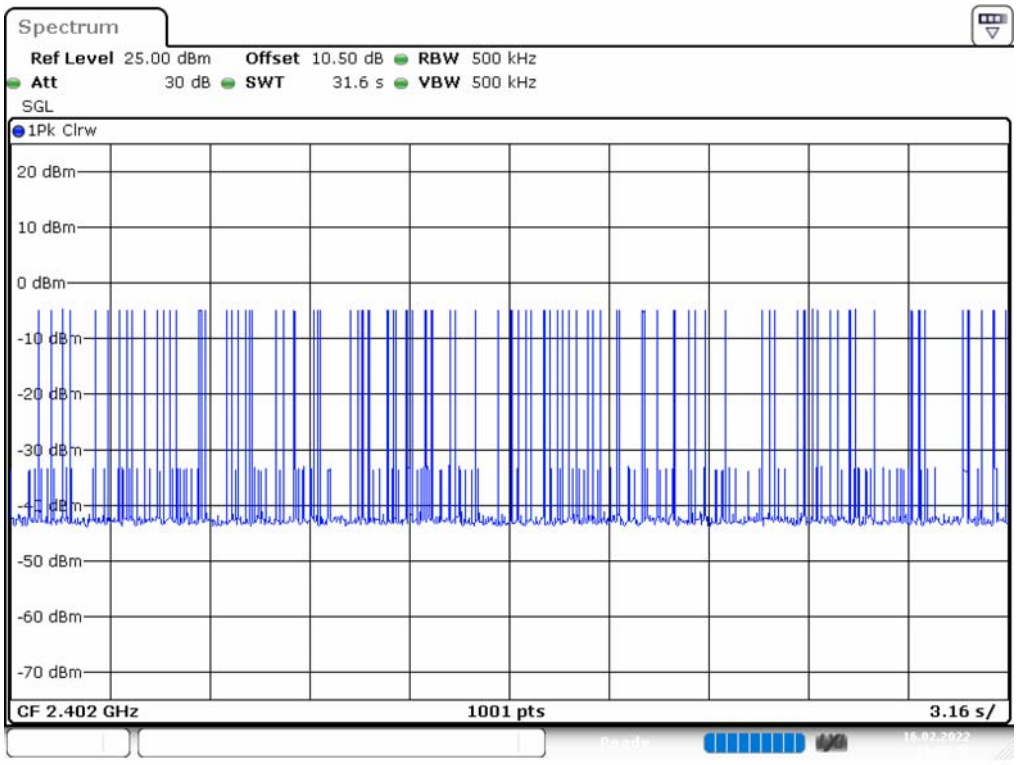


DH5: Pulse Width



Date: 17.FEB.2022 00:23:47

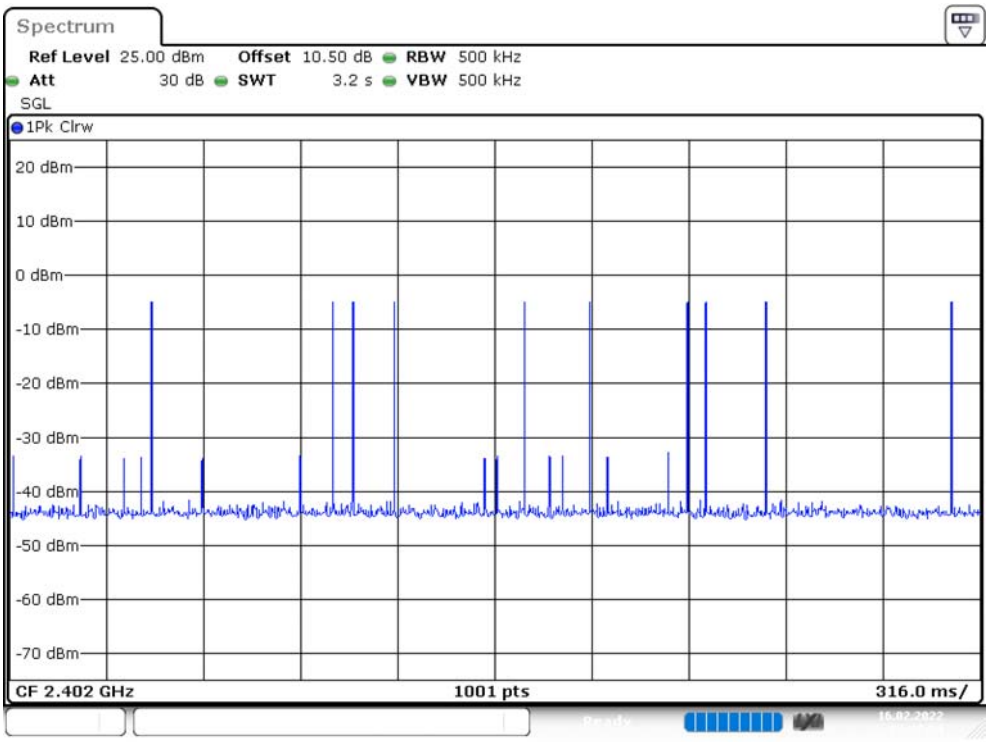
DH5: Hopping Number



Date: 16.FEB.2022 23:27:47

DH5: Hopping Number /10

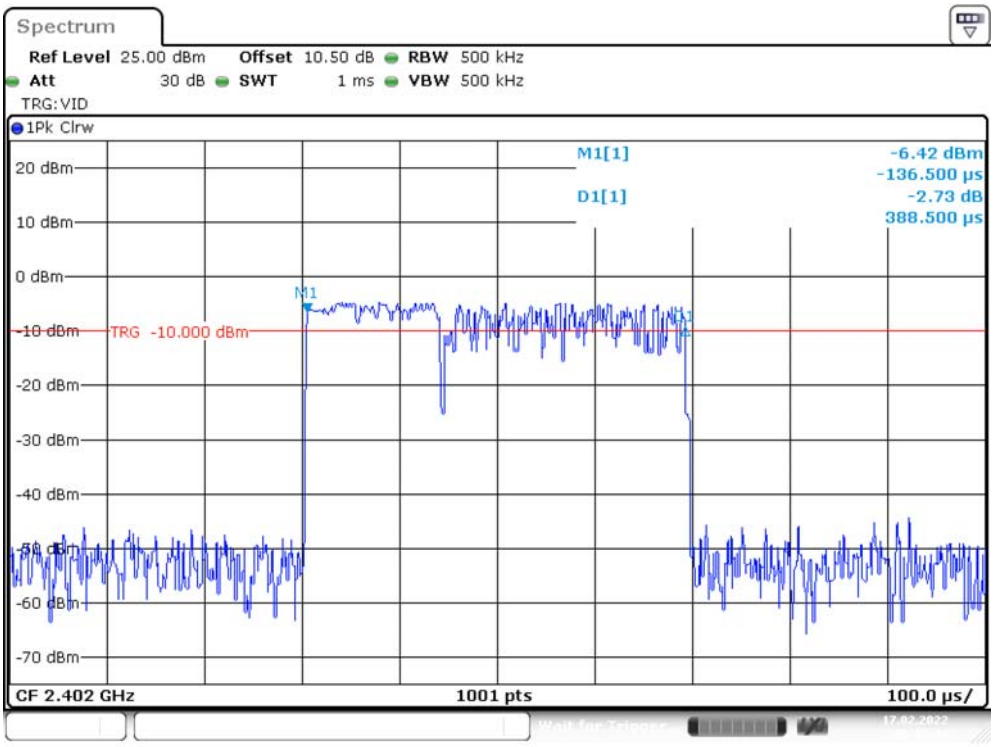
(Hopping Number = 10 in 1/10 period of highest signals, Second High signals were other channel)



Date: 16.FEB.2022 23:27:54

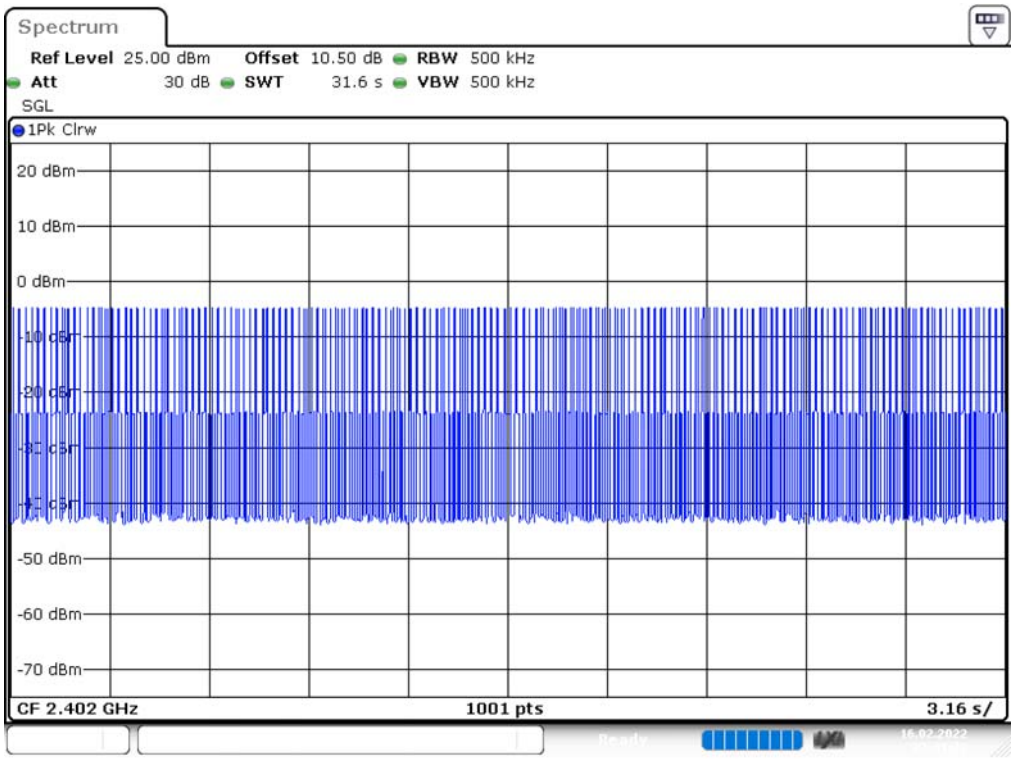
EDR Mode (π/4-DQPSK)

2DH1: Pulse Width



Date: 17.FEB.2022 00:25:44

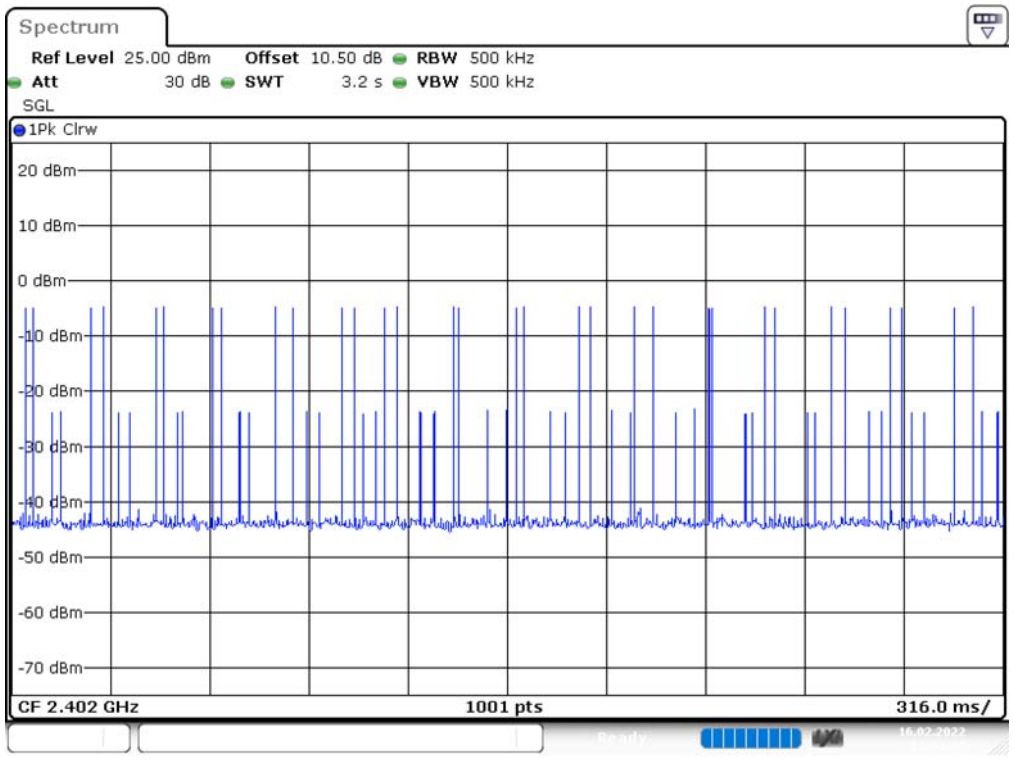
2DH1: Hopping Number



Date: 16.FEB.2022 23:41:20

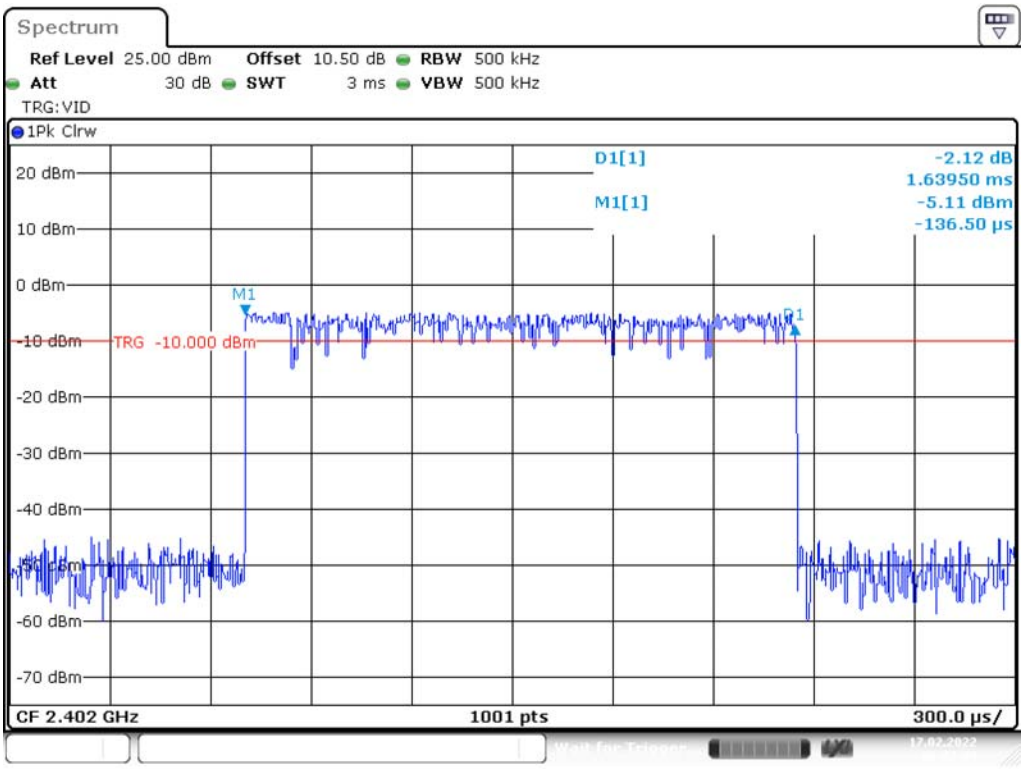
2DH1: Hopping Number /10

(Hopping Number = 31 in 1/10 period of highest signals, Second High signals were other channel)



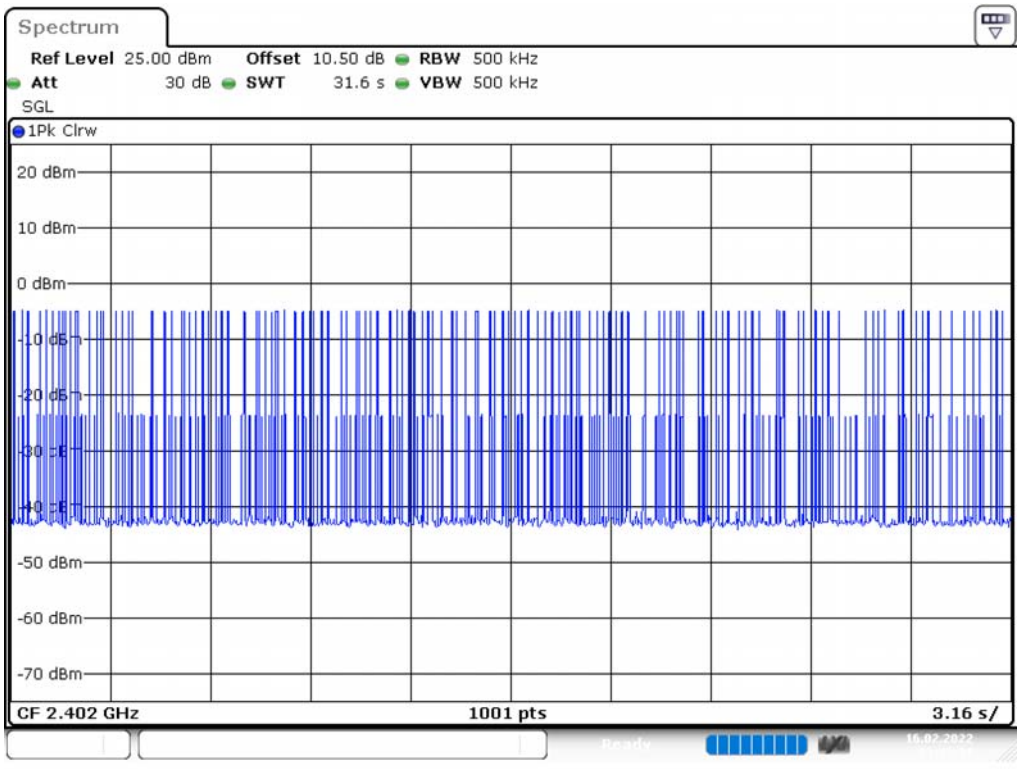
Date: 16.FEB.2022 23:42:03

2DH3: Pulse Width



Date: 17.FEB.2022 00:27:05

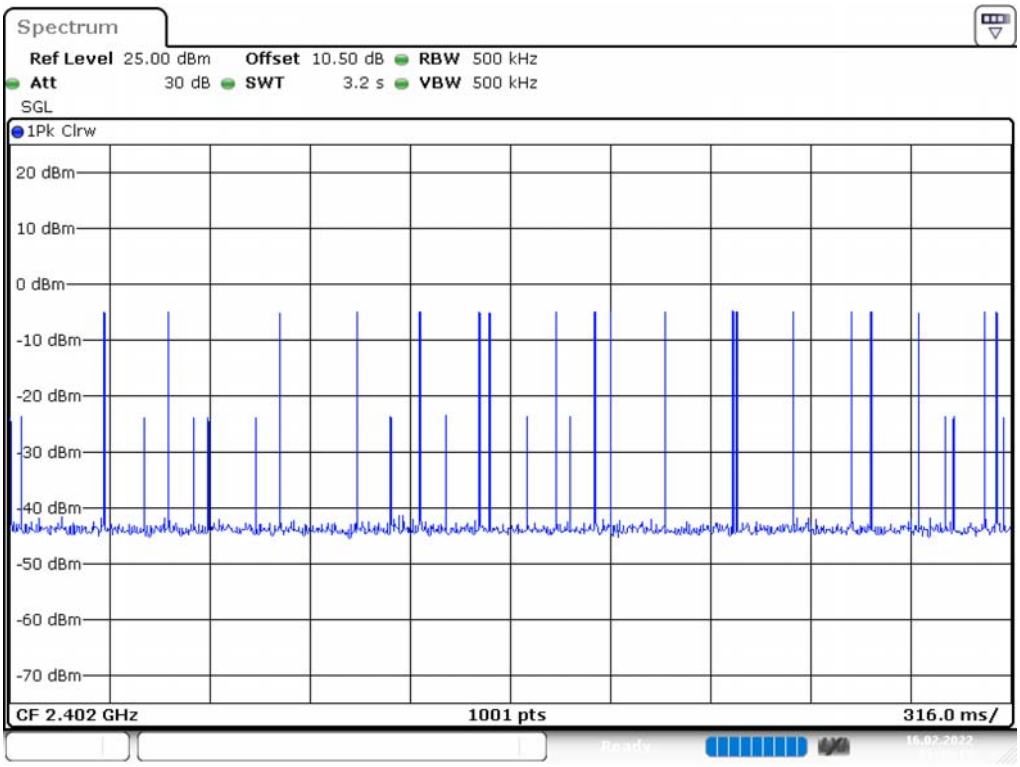
2DH3: Hopping Number



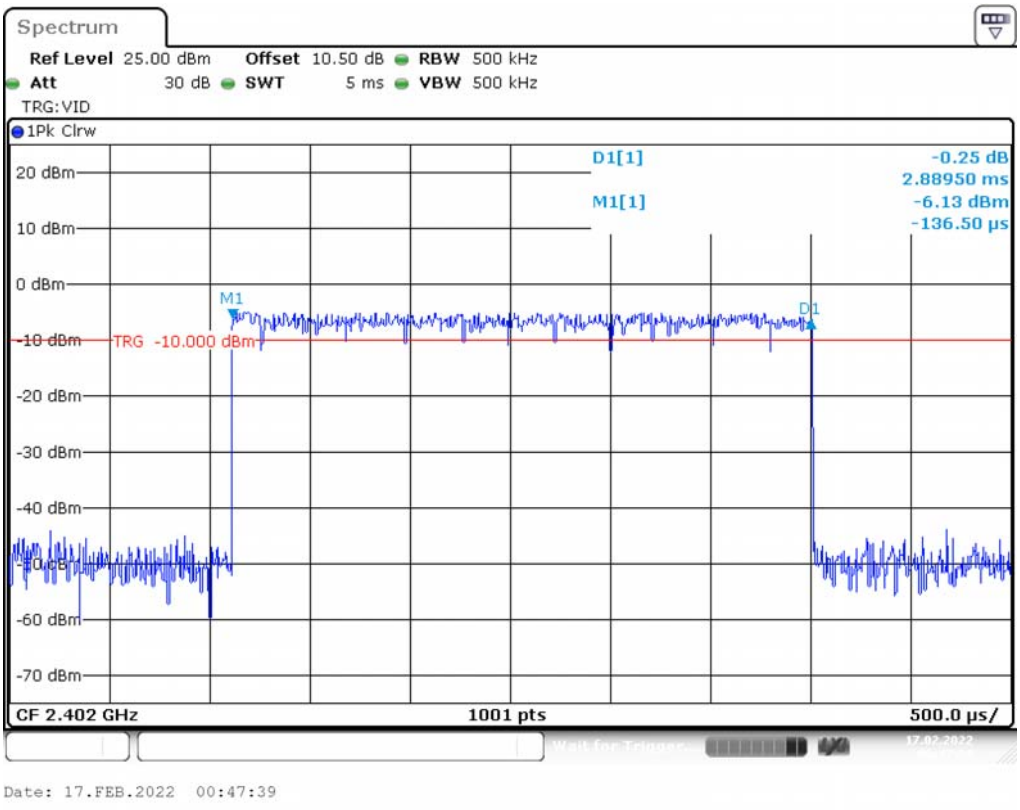
Date: 16.FEB.2022 23:43:12

2DH3: Hopping Number /10

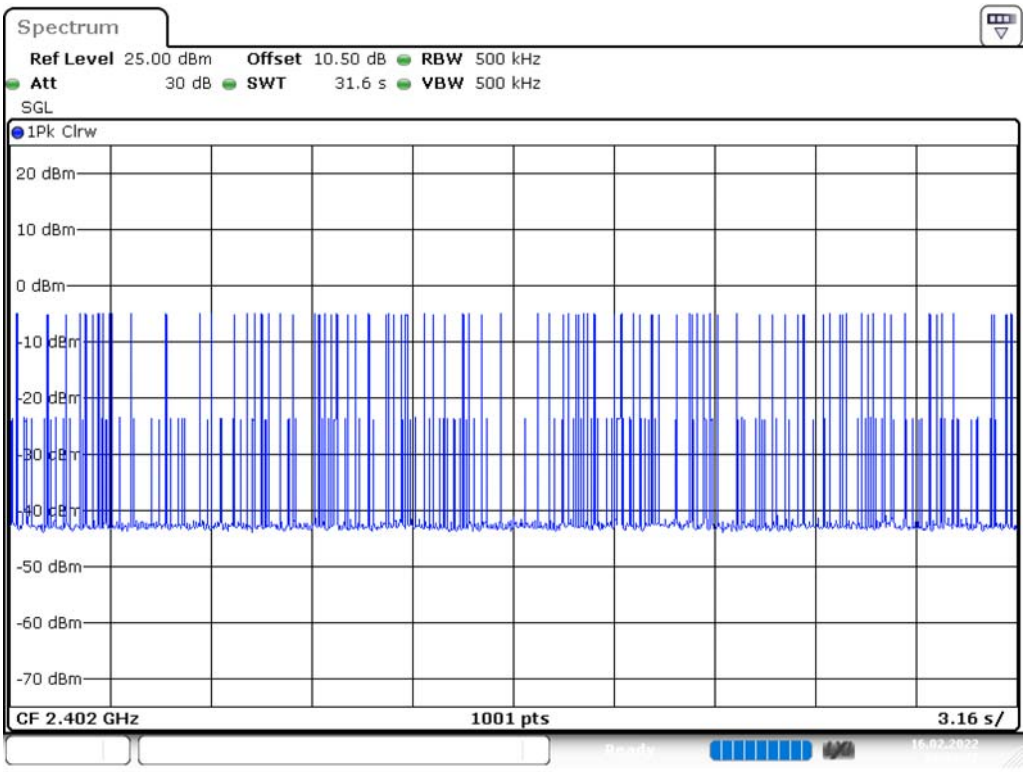
(Hopping Number = 17 in 1/10 period of highest signals, Second High signals were other channel)



2DH5: Pulse Width

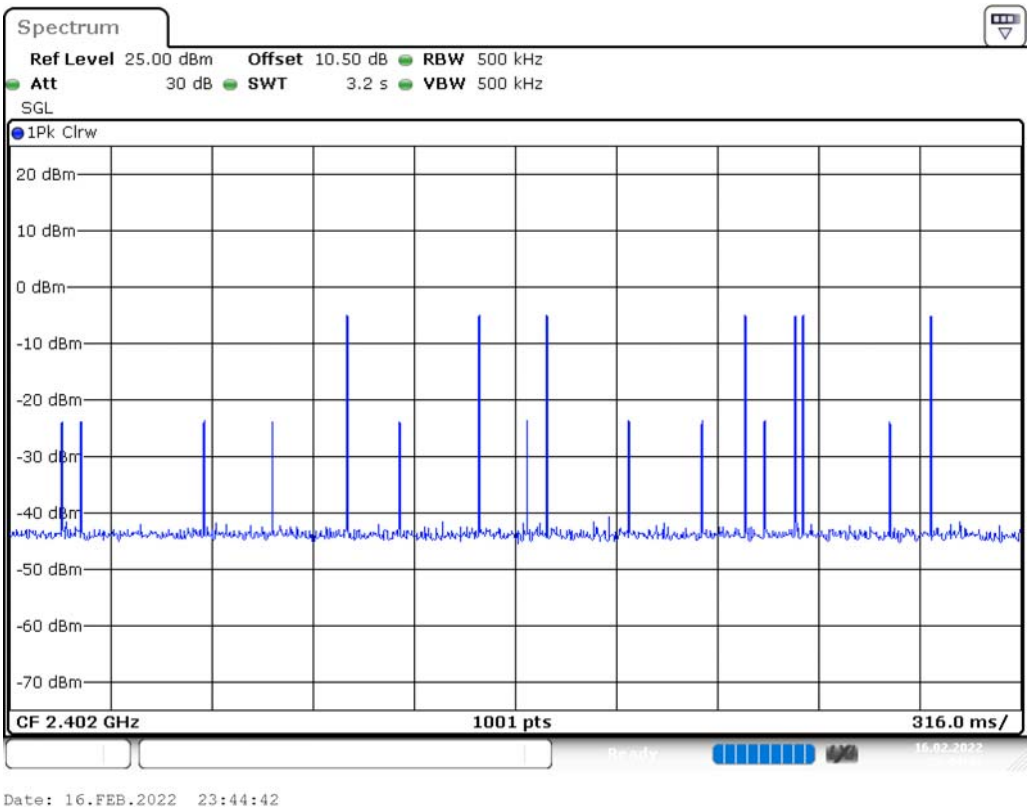


2DH5: Hopping Number



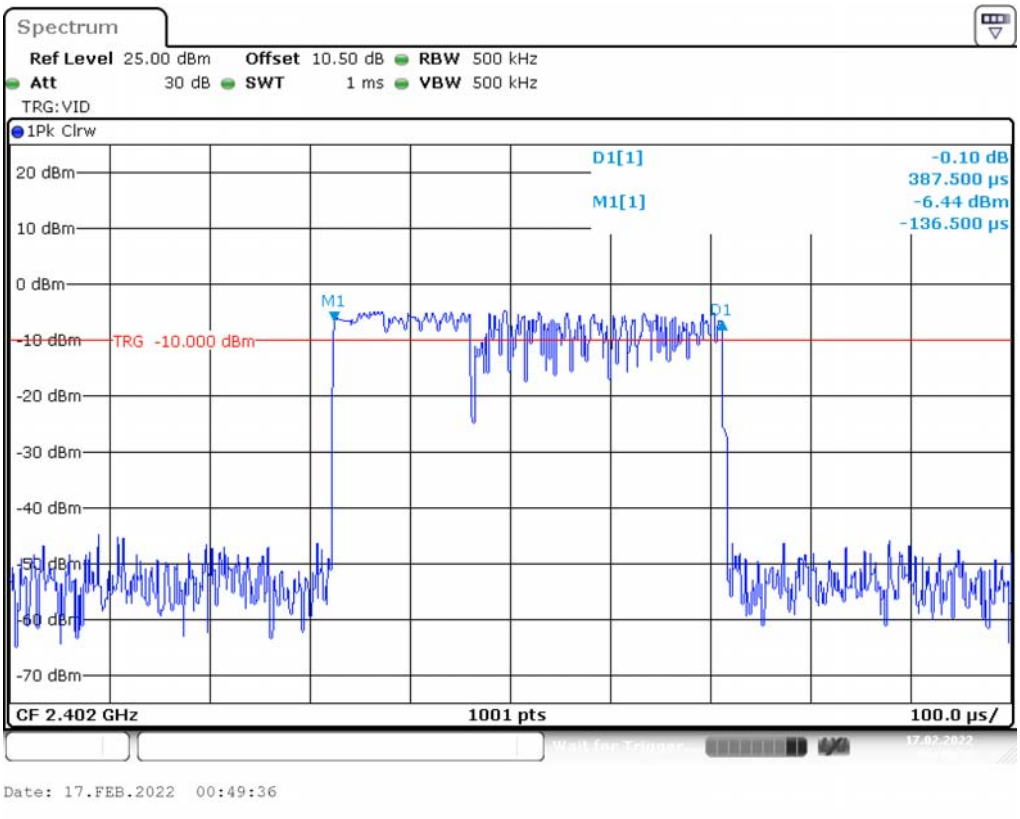
2DH5: Hopping Number /10

(Hopping Number = 7 in 1/10 period of highest signals, Second High signals were other channel)

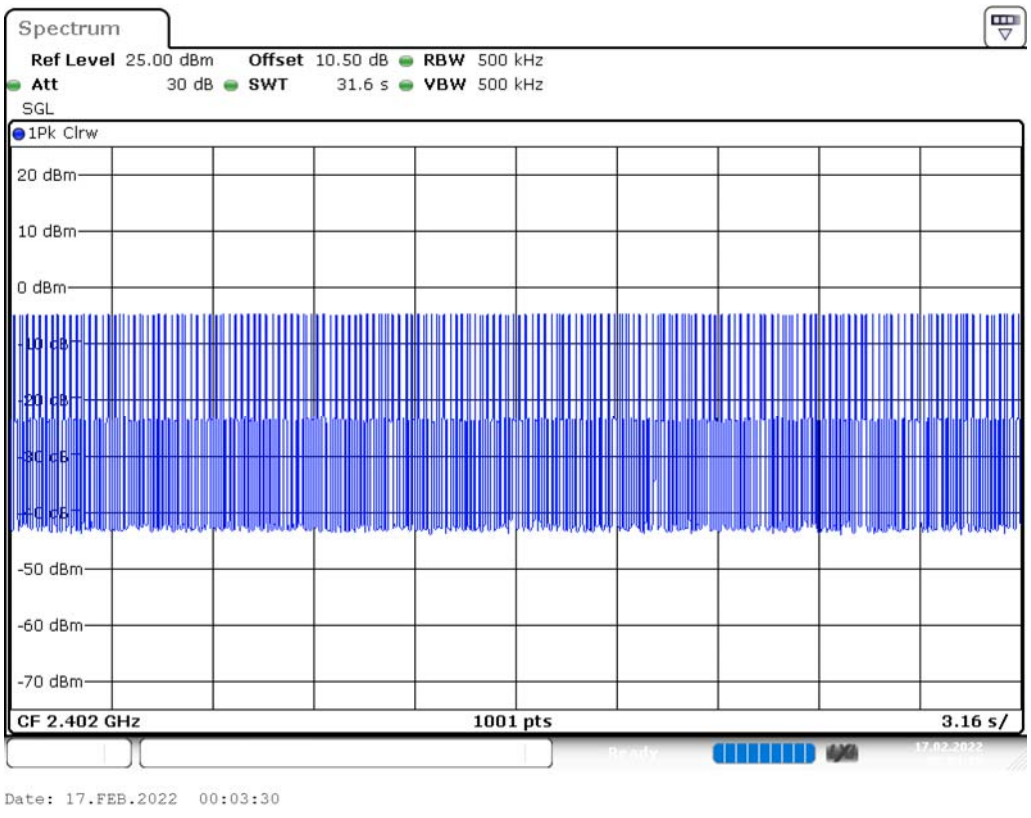


EDR Mode (8DPSK)

3DH1: Pulse Width

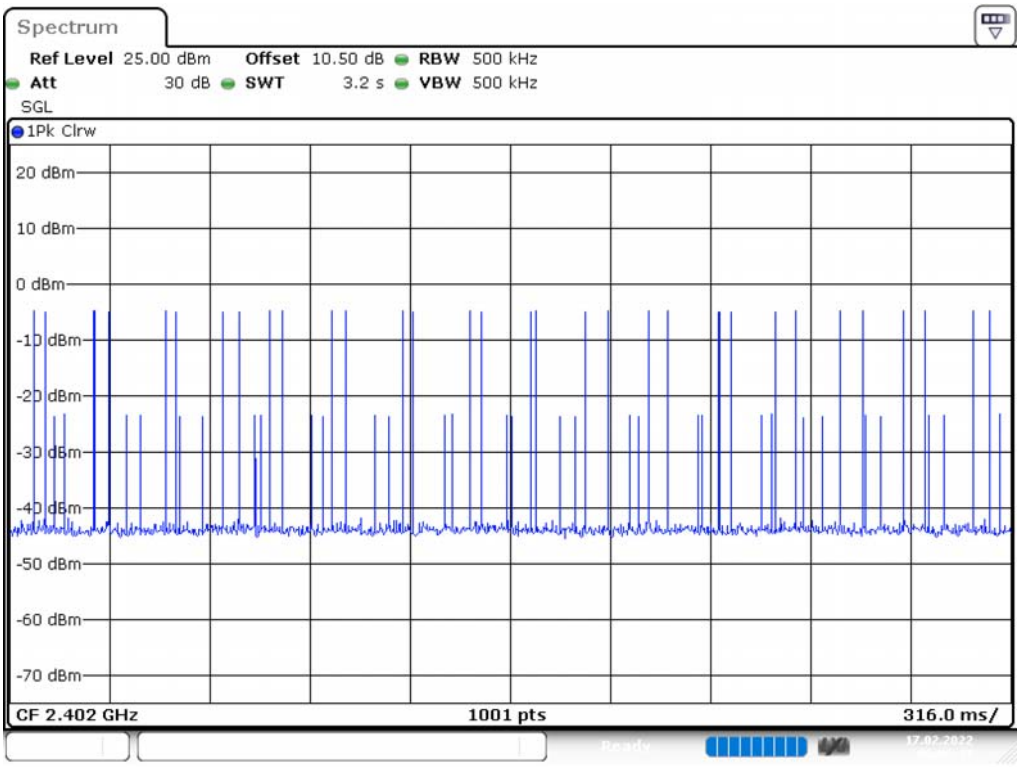


3DH1: Hopping Number

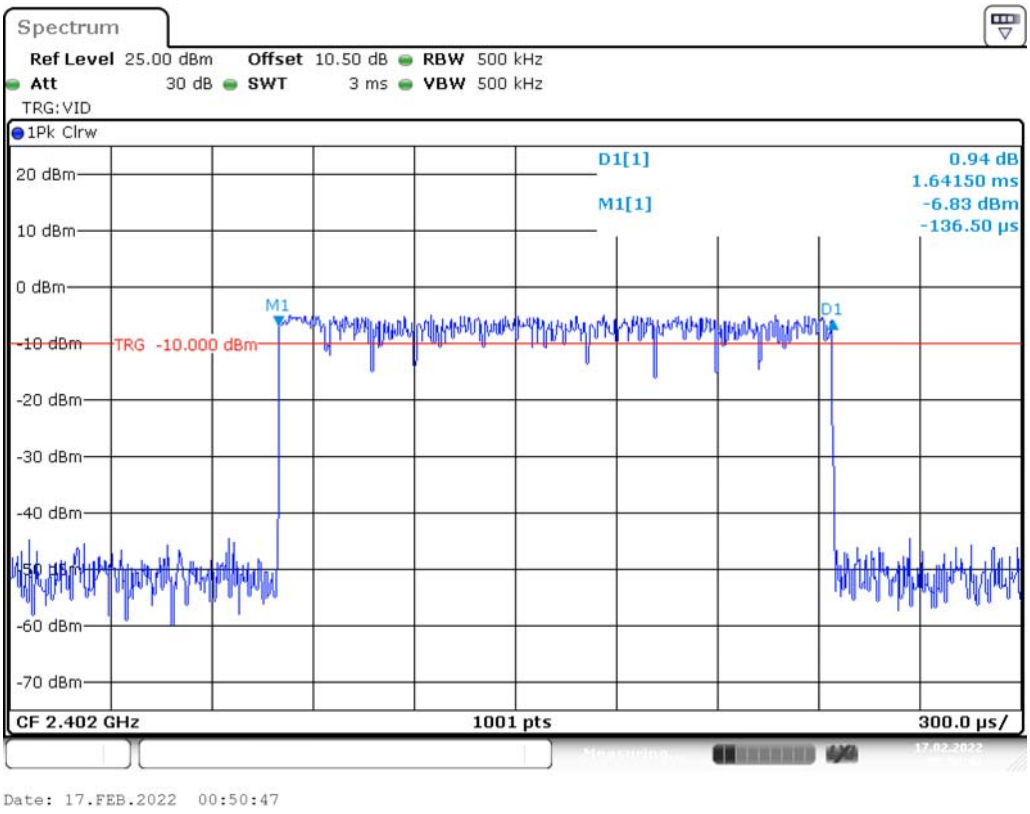


3DH1: Hopping Number /10

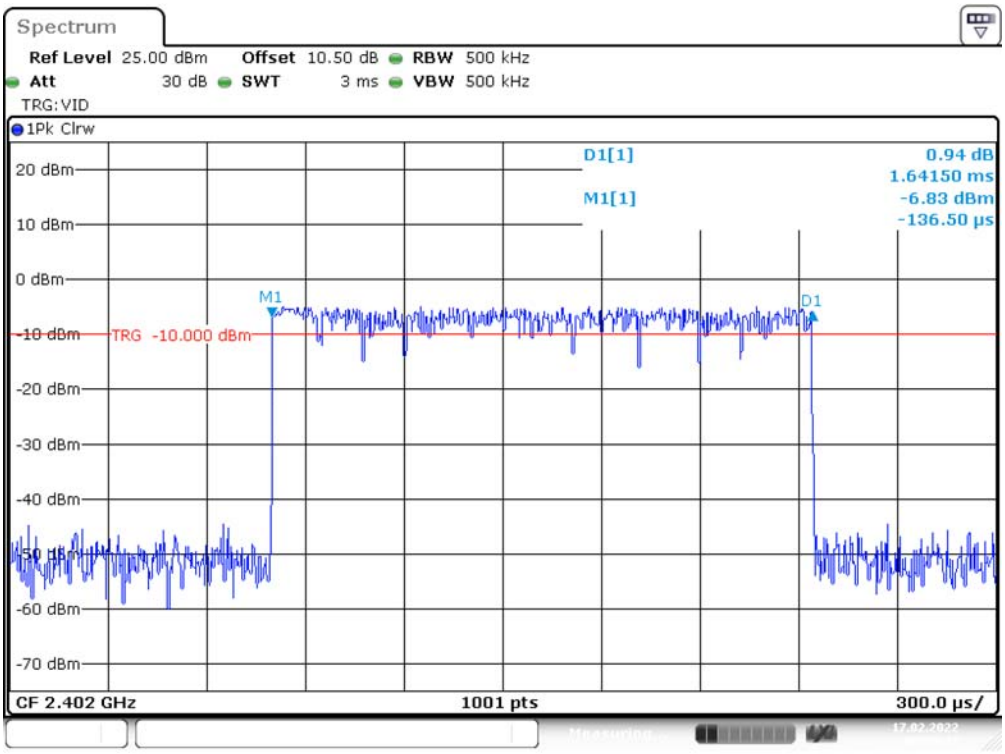
(Hopping Number = 32 in 1/10 period of highest signals, Second High signals were other channel)



3DH3: Pulse Width



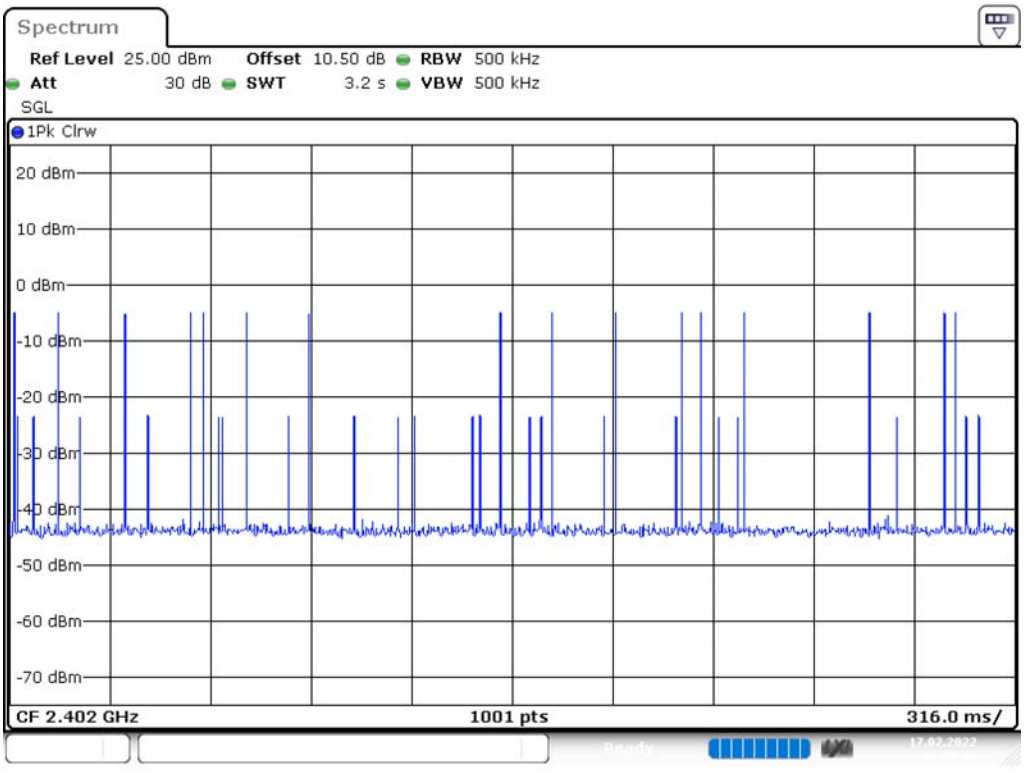
3DH3: Hopping Number



Date: 17.FEB.2022 00:50:47

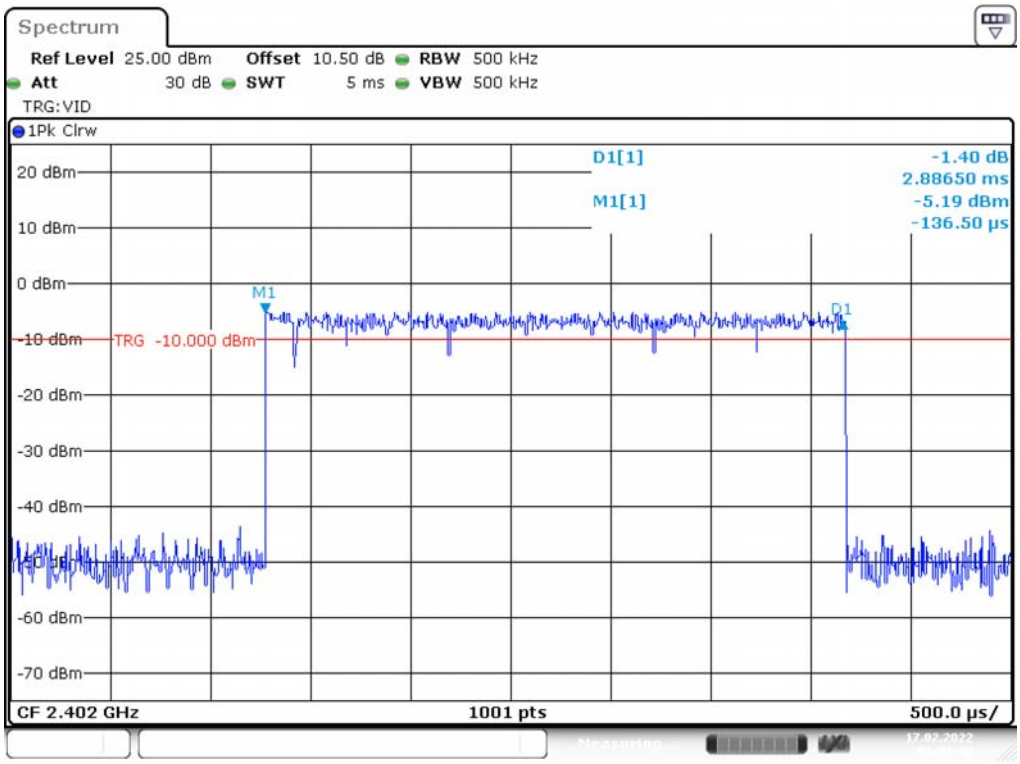
3DH3: Hopping Number /10

(Hopping Number = 16 in 1/10 period of highest signals, Second High signals were other channel)



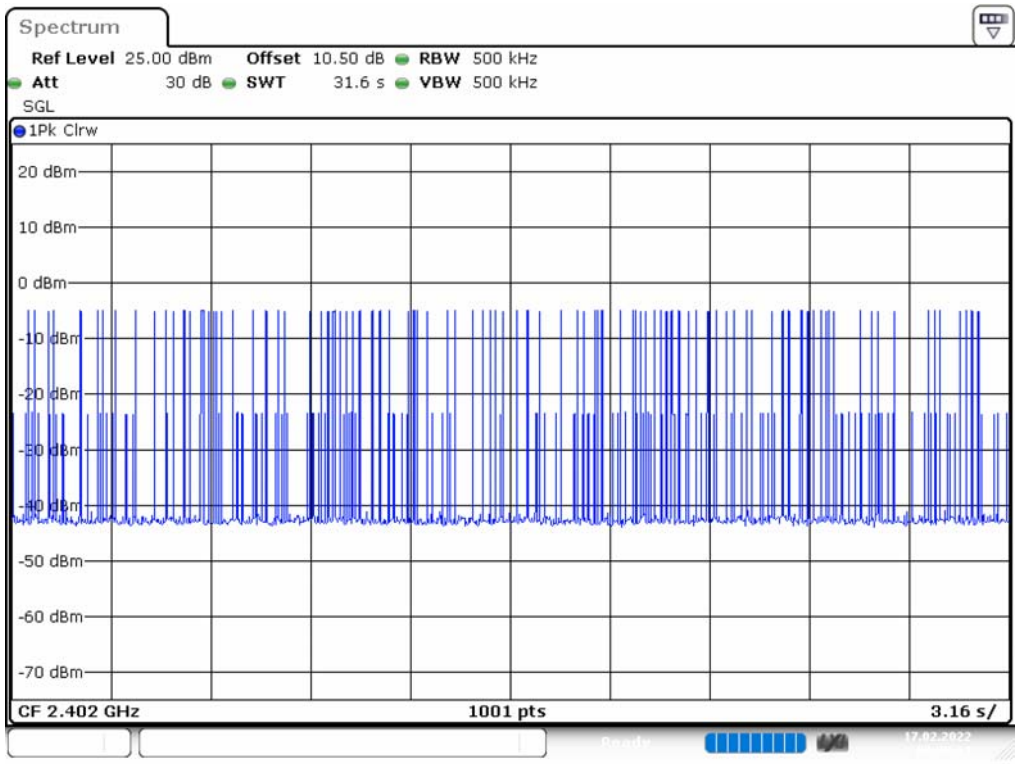
Date: 17.FEB.2022 00:05:02

3DH5: Pulse Width



Date: 17.FEB.2022 00:51:41

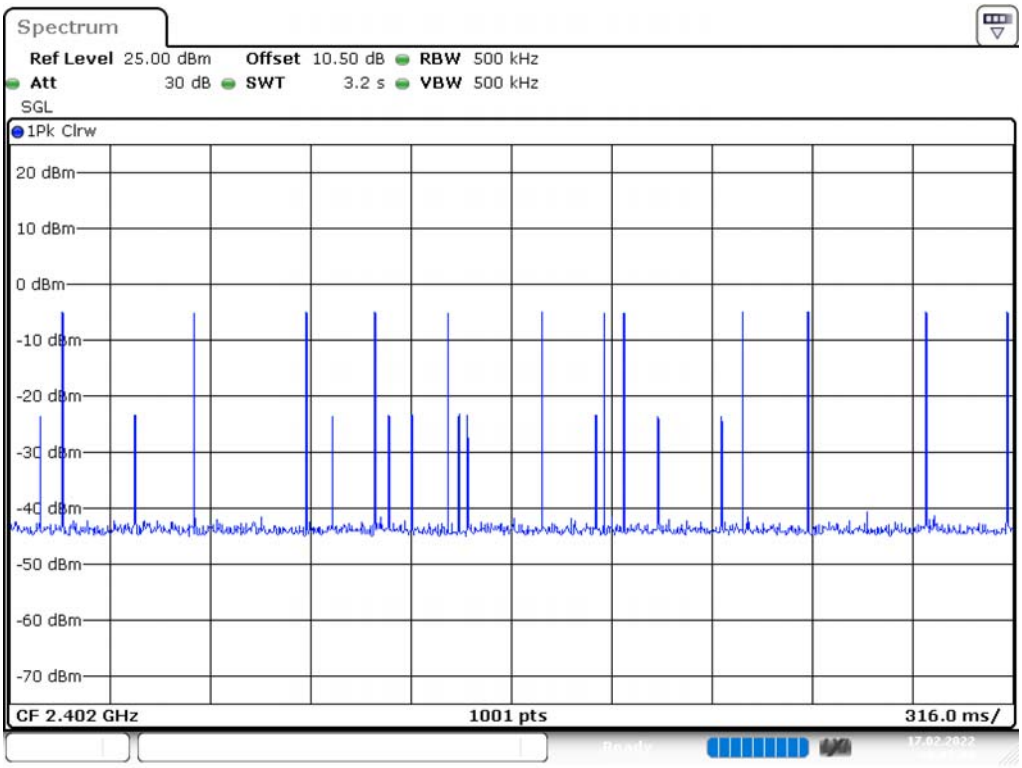
3DH5: Hopping Number



Date: 17.FEB.2022 00:06:11

3DH5: Hopping Number /10

(Hopping Number = 12 in 1/10 period of highest signals, Second High signals were other channel)



12. FCC §15.247(a)(1)(iii) –Quantity of hopping channel Test

12.1. Applicable Standard

According to FCC §15.247(a) (1) (iii).

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

12.2. Test Procedure

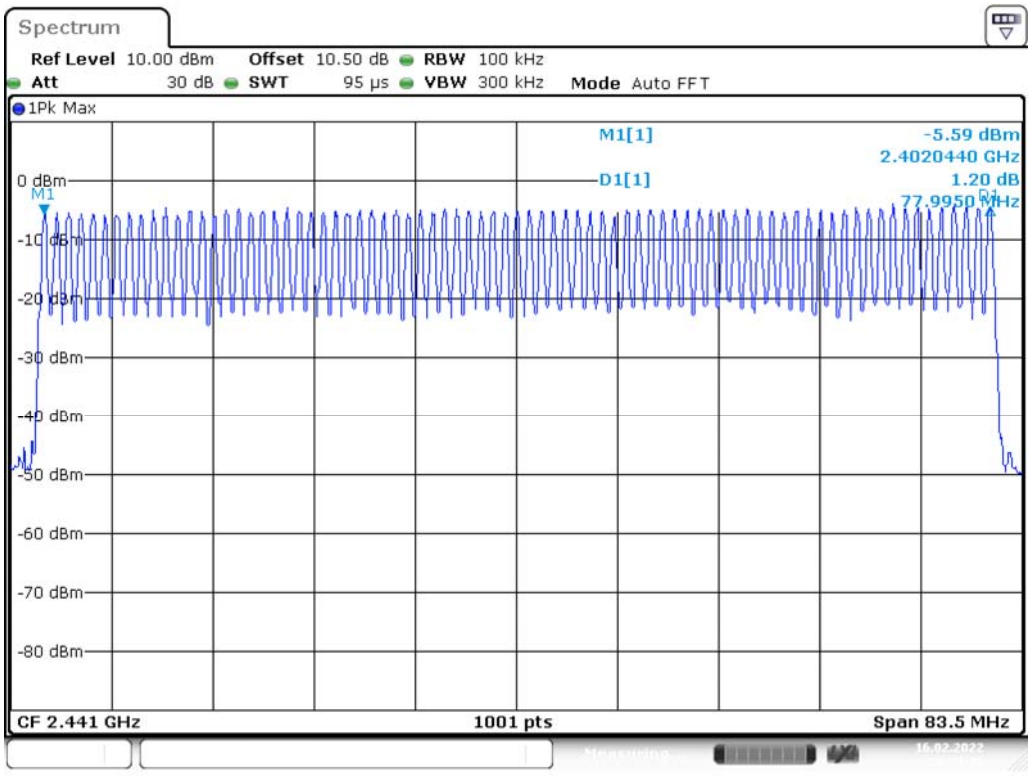
1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Set the EUT in hopping mode from first channel to last.
3. By using the Max-Hold function record the Quantity of the channel.

12.3. Test Results

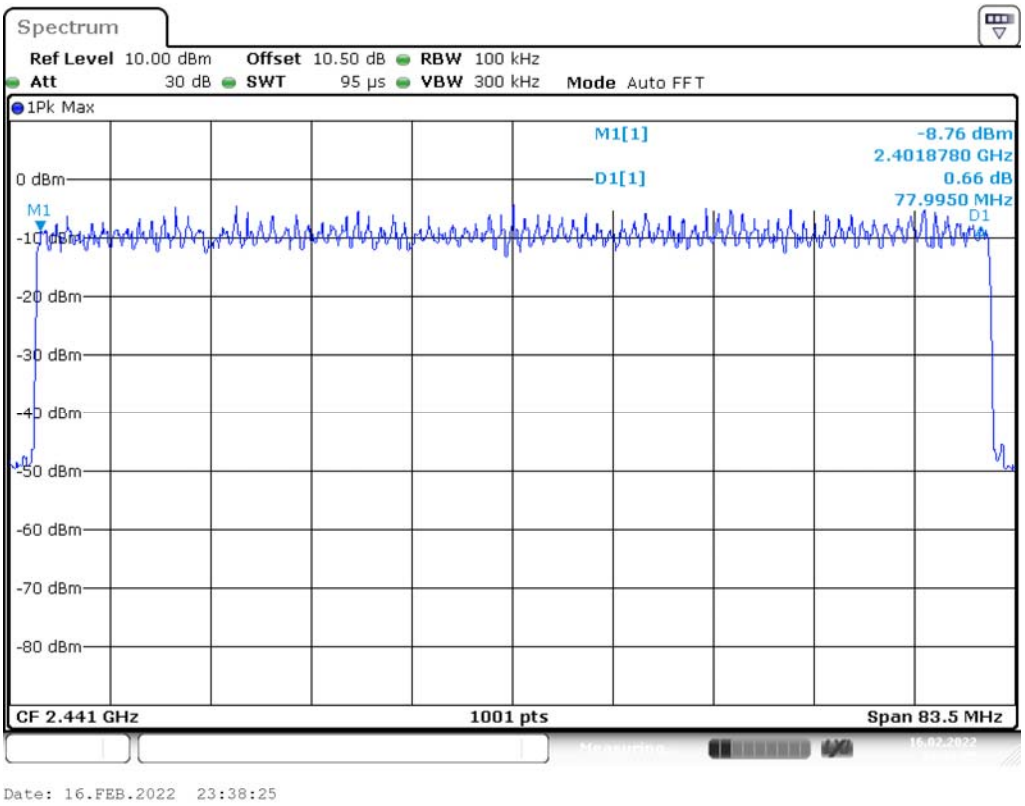
Mode	Frequency Range (MHz)	Number of Hopping Channel (CH)	Limit (CH)	Result
GFSK	2402-2480	79	>15	Compliance
π/4-DQPSK	2402-2480	79	>15	Compliance
8DPSK	2402-2480	79	>15	Compliance

Please refer to the following plots

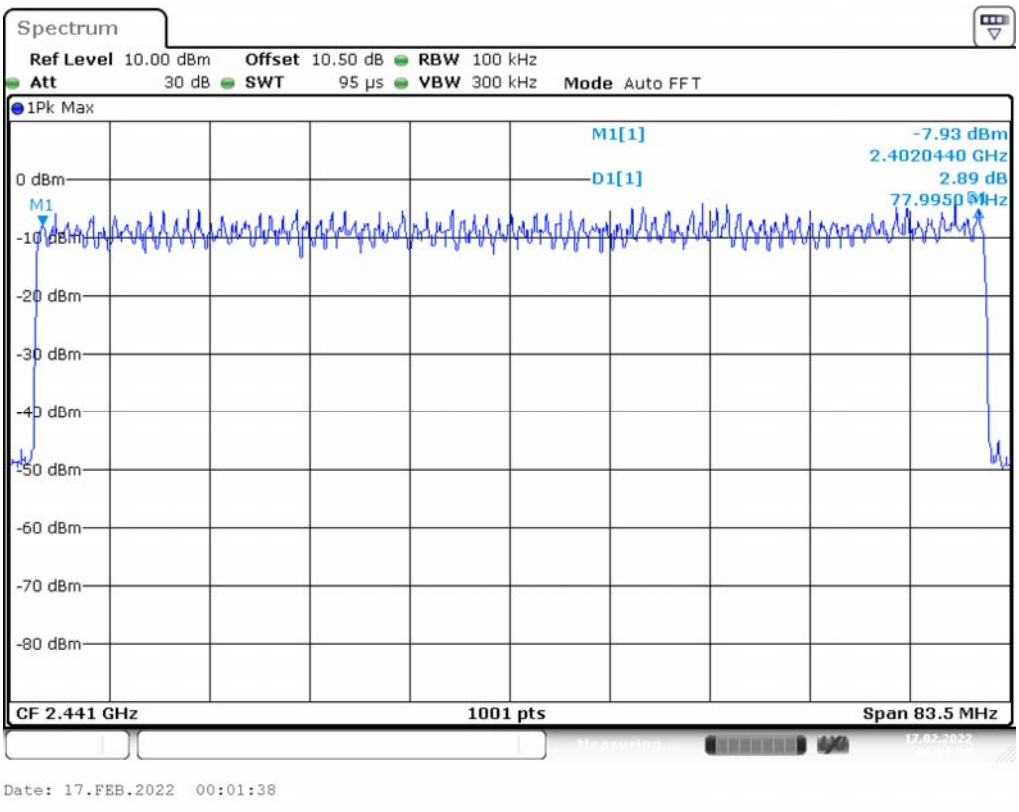
BR Mode (GFSK)



EDR Mode (π/4-DQPSK)



EDR Mode (8DPSK)



13. FCC §15.247(b)(1) – Maximum Output Power

13.1. Applicable Standard

According to FCC §15.247(b) (1).

Frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725- 5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

13.2. 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.

13.3. Test Results

Channel	Frequency (MHz)	Peak Conducted Output Power		Limit (W)	Result
		(dBm)	(W)		
BR Mode (GFSK)					
Low	2402	-4.50	0.0004	0.125	Compliance
Middle	2441	-3.78	0.0004	0.125	Compliance
High	2480	-2.45	0.0006	0.125	Compliance
EDR Mode (π/4-DQPSK)					
Low	2402	-2.20	0.0006	0.125	Compliance
Middle	2441	-1.90	0.0006	0.125	Compliance
High	2480	-0.86	0.0008	0.125	Compliance
EDR Mode (8DPSK)					
Low	2402	-2.39	0.0006	0.125	Compliance
Middle	2441	-1.65	0.0007	0.125	Compliance
High	2480	-0.90	0.0008	0.125	Compliance

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

14.1. Applicable Standard

According to FCC §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emissions limits specified in §15.209(a) see §15.205(c).

14.2. Test Procedure

Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation.

RBW = 100 kHz VBW = 300 kHz

Sweep = coupled

Detector function = peak Trace = max hold

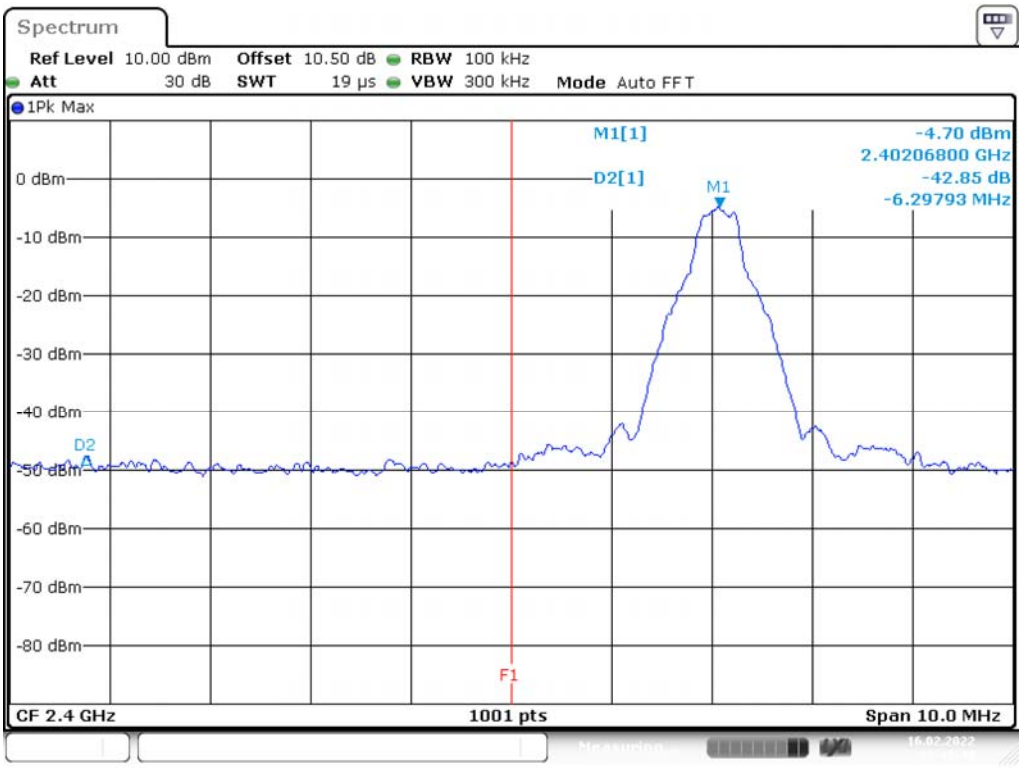
14.3. Test Results

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
BR Mode (GFSK)				
Low	2402	42.85	≥ 20	PASS
High	2480	44.02	≥ 20	PASS
BR Hopping Mode (GFSK)				
Low	2402-2480	43.38	≥ 20	PASS
High	2402-2480	43.97	≥ 20	PASS
EDR Mode (π/4-DQPSK)				
Low	2402	43.16	≥ 20	PASS
High	2480	44.25	≥ 20	PASS
EDR Hopping Mode (π/4-DQPSK)				
Low	2402-2480	41.99	≥ 20	PASS
High	2402-2480	44.20	≥ 20	PASS
EDR Mode (8DPSK)				
Low	2402	42.81	≥ 20	PASS
High	2480	43.78	≥ 20	PASS
EDR Hopping Mode (8DPSK)				
Low	2402-2480	42.37	≥ 20	PASS
High	2402-2480	42.35	≥ 20	PASS

Please refer to the following plots.

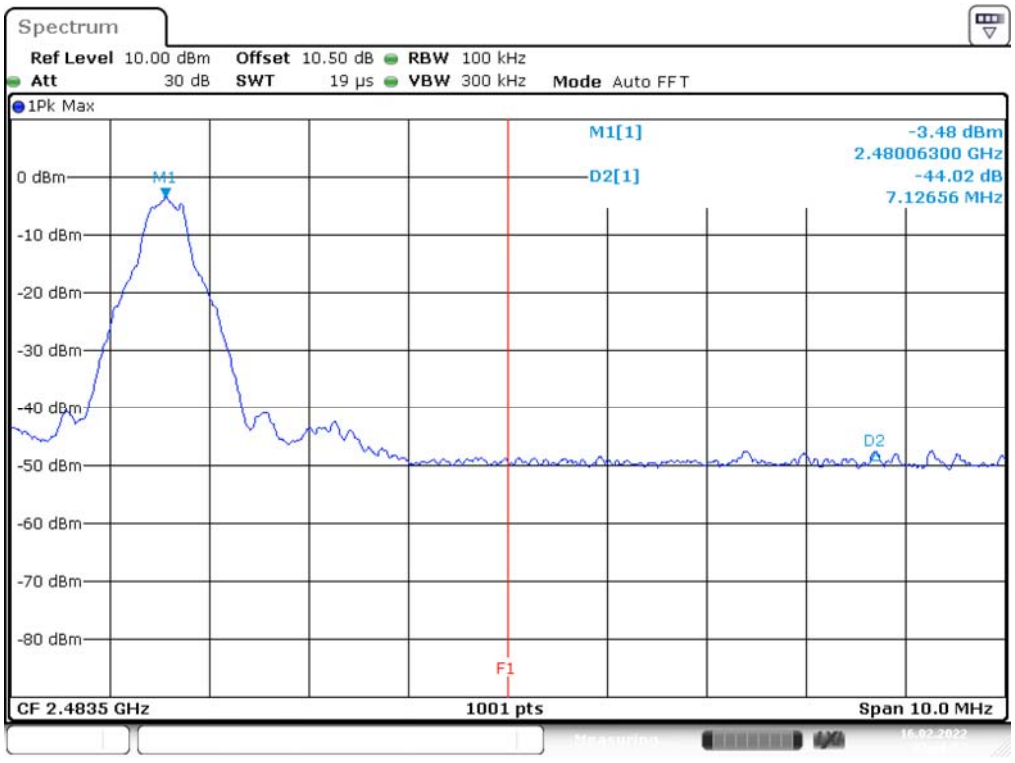
BR Mode (GFSK)

Band Edge, CH Low



Date: 16.FEB.2022 23:13:39

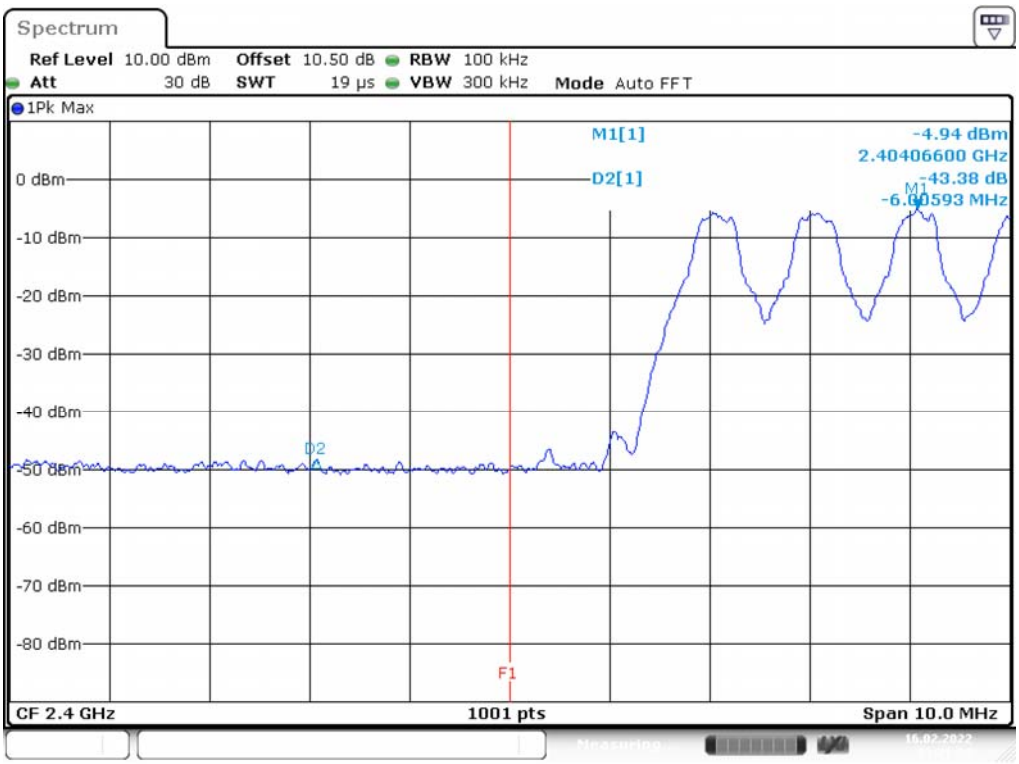
Band Edge, CH High



Date: 16.FEB.2022 23:16:57

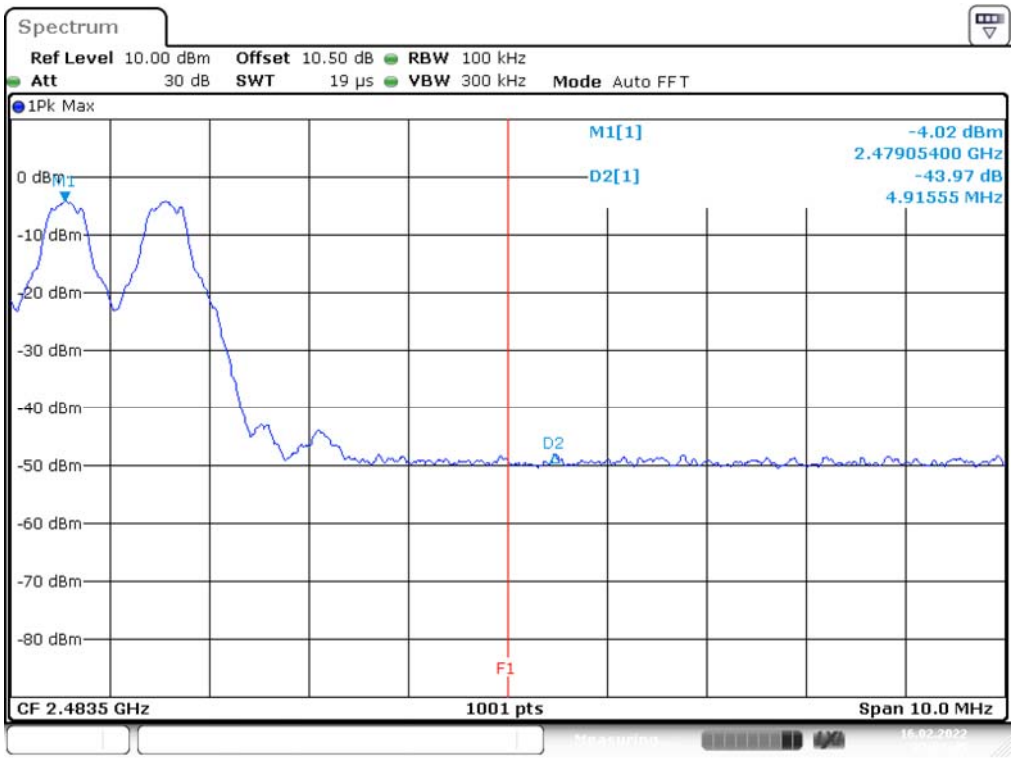
BR Hopping Mode (GFSK)

Band Edge, CH Low



Date: 16.FEB.2022 23:21:23

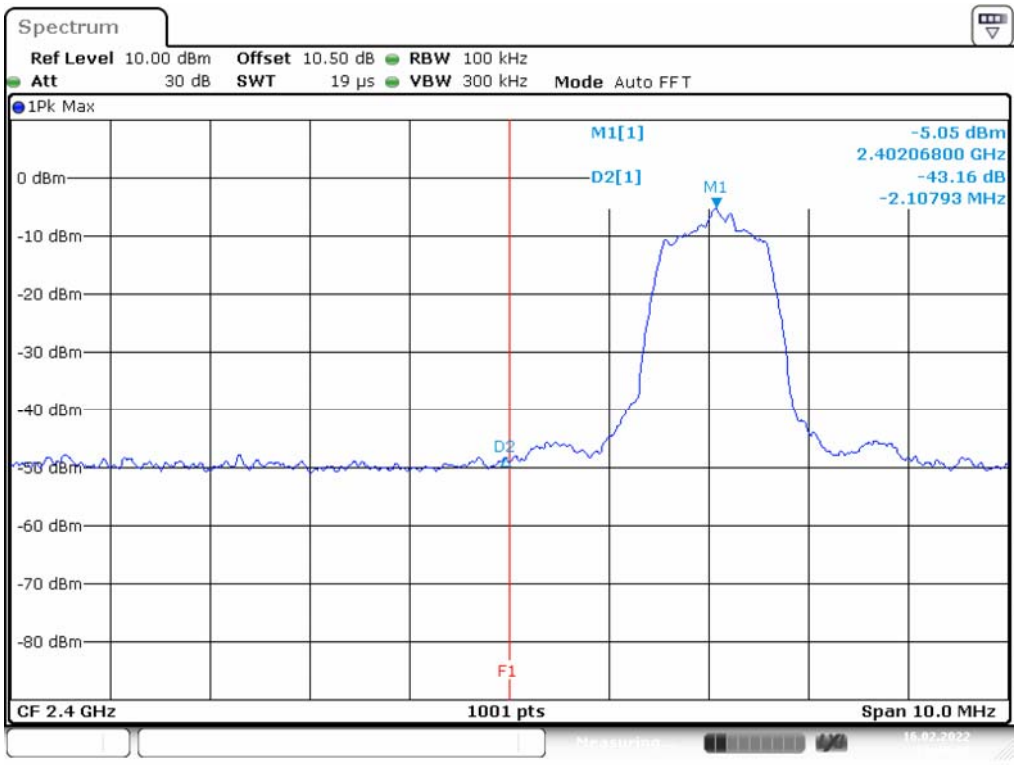
Band Edge, CH High



Date: 16.FEB.2022 23:21:45

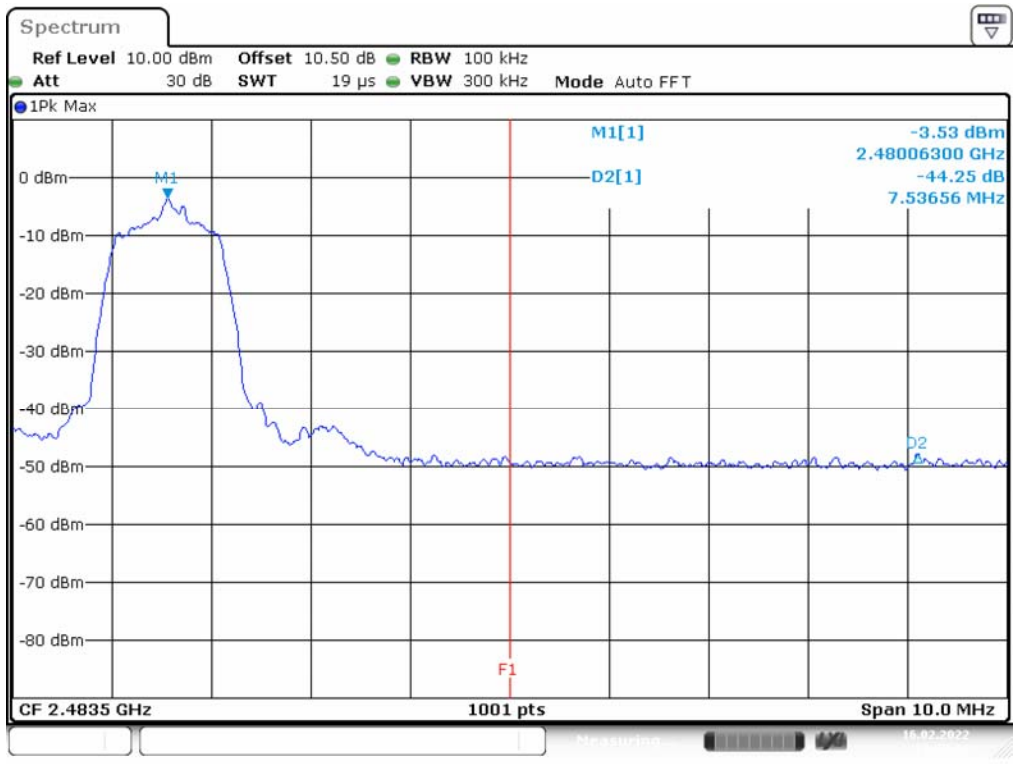
EDR Mode (π/4-DQPSK)

Band Edge, CH Low



Date: 16.FEB.2022 23:49:32

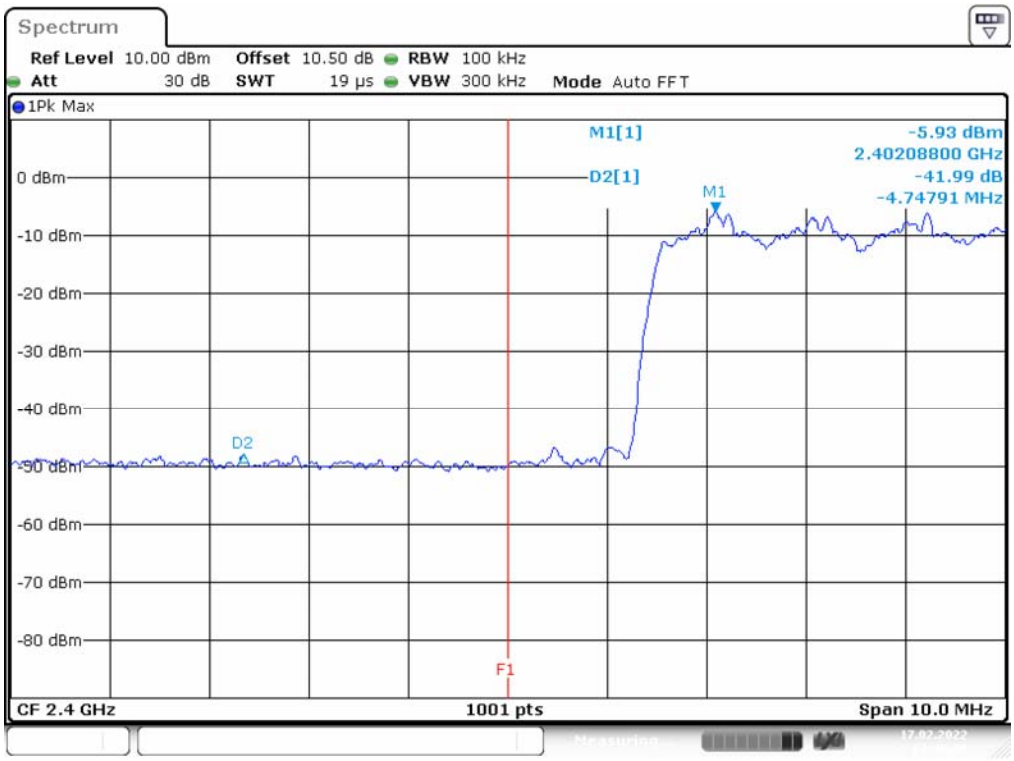
Band Edge, CH High



Date: 16.FEB.2022 23:33:24

EDR Hopping Mode (π/4-DQPSK)

Band Edge, CH Low



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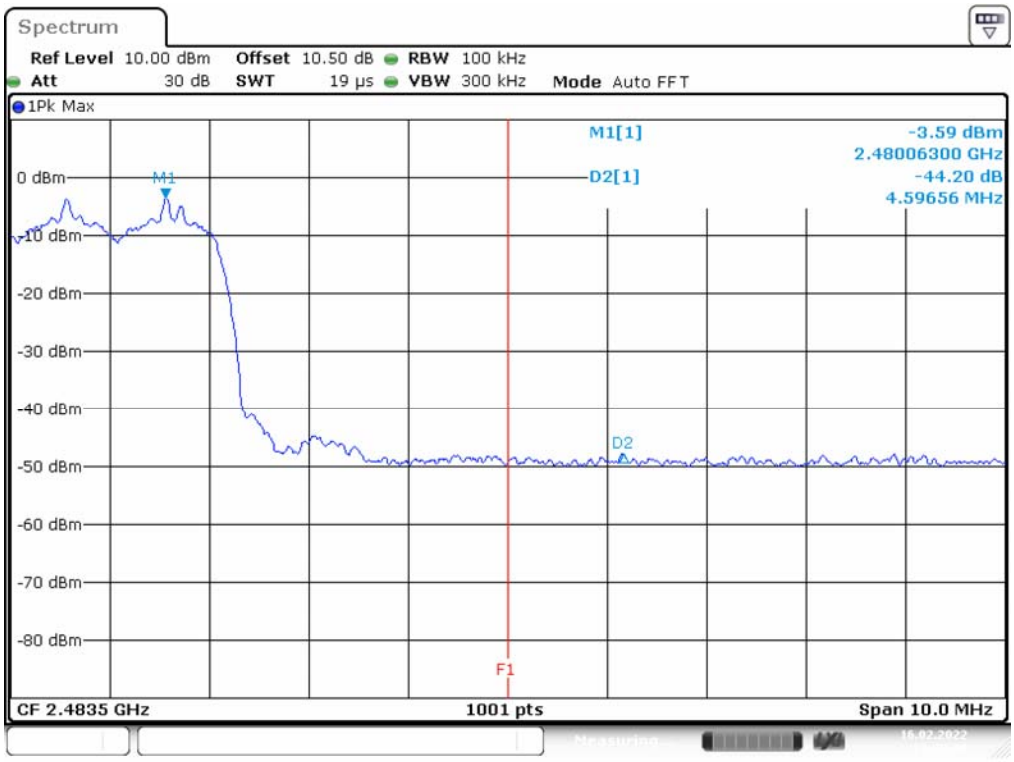
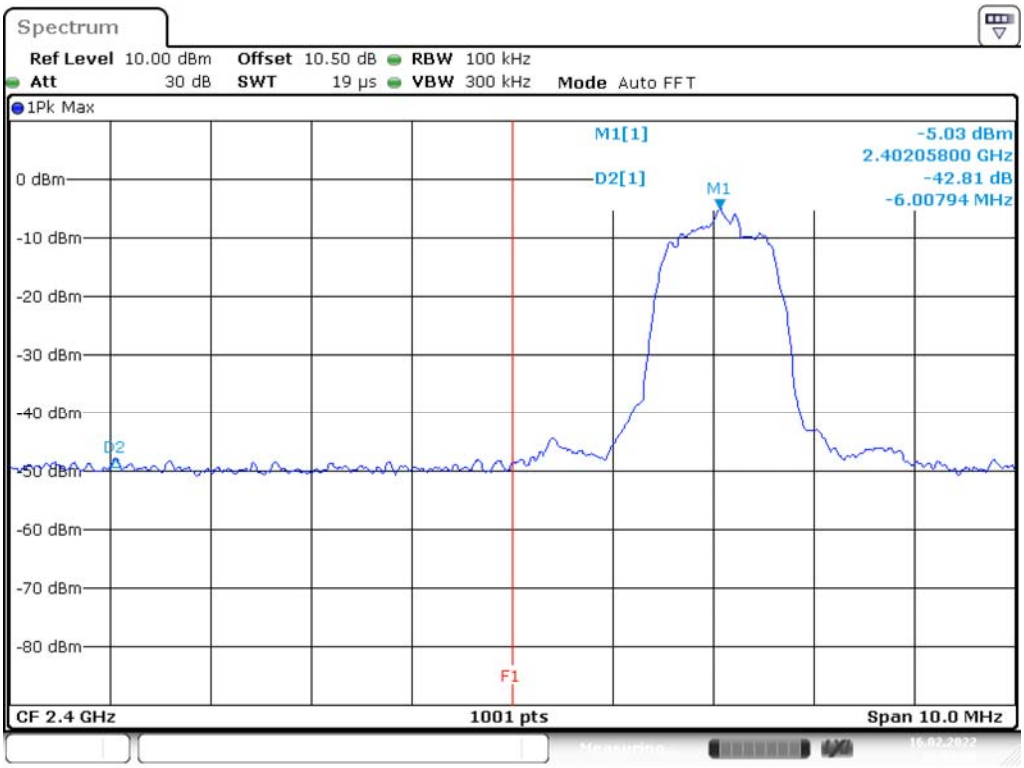
Band Edge, CH High



Date: 16.FEB.2022 23:35:38

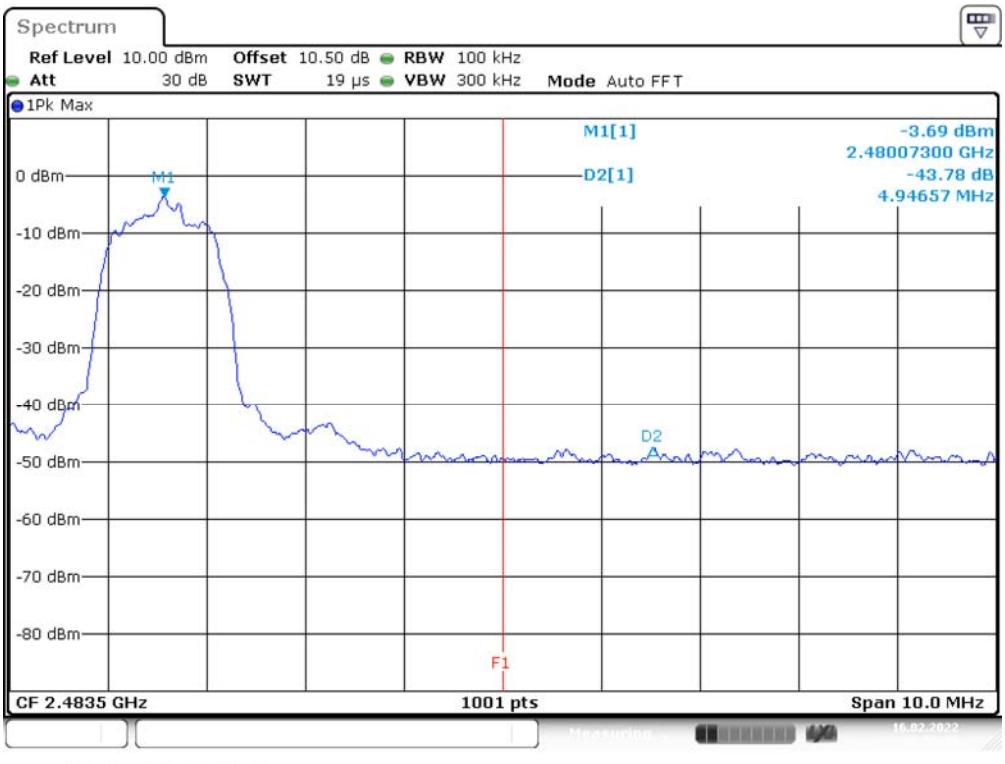
EDR Mode (8DPSK)

Band Edge, CH Low



Date: 16.FEB.2022 23:51:46

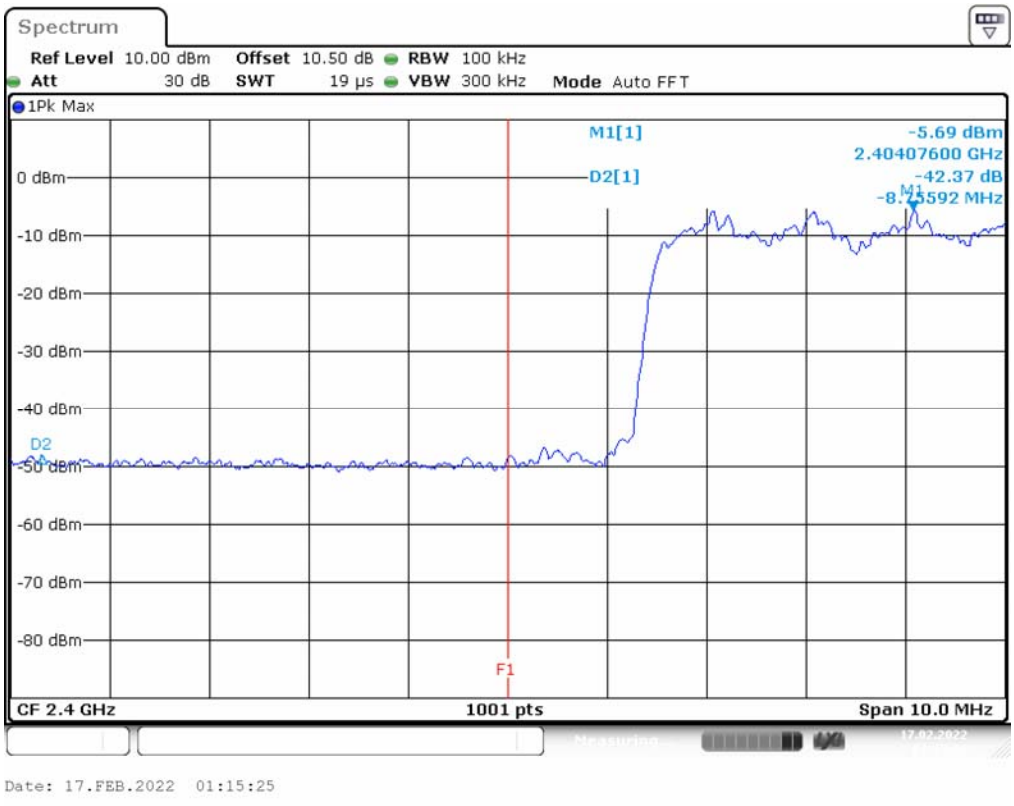
Band Edge, CH High



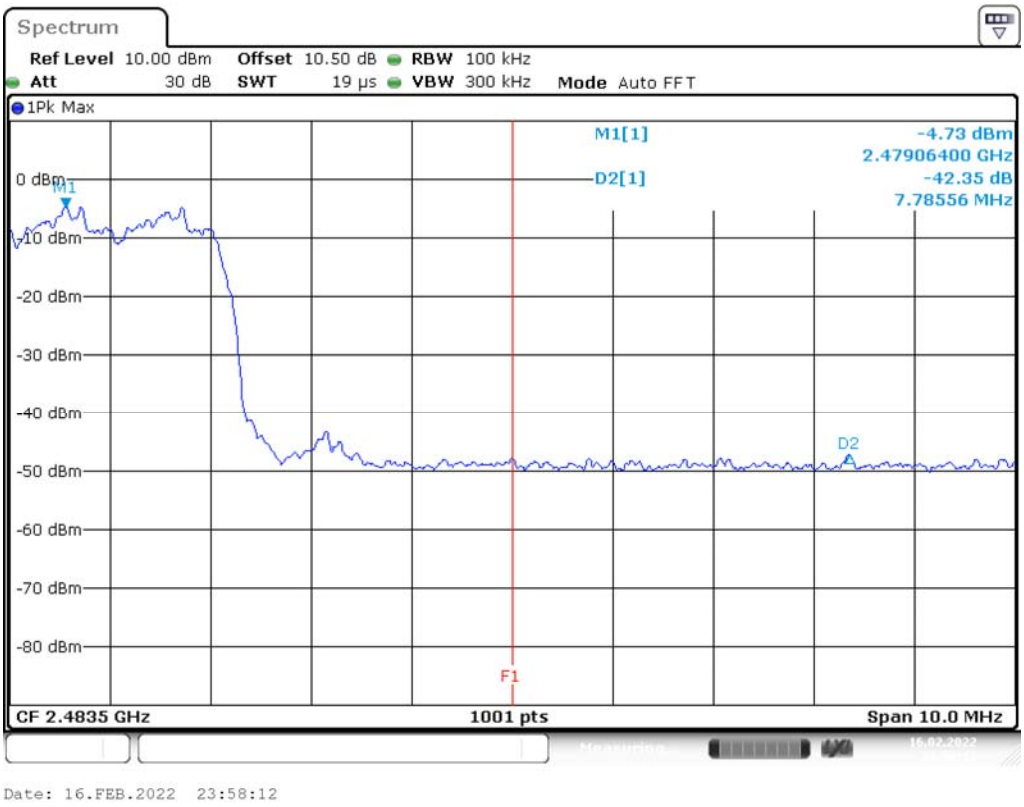
Date: 16.FEB.2022 23:55:20

EDR Hopping Mode (8DPSK)

Band Edge, CH Low



Band Edge, CH High



******* END OF REPORT *******