FCC Part 15.247

TEST REPORT

For

Mobile Technologies International Pty Ltd

18-20 Compark Circuit, Mulgrave, Victoria, 3170, Australia

FCC ID: 2A55I-MTI8038

Report Type:	**Product Type:**
Original Report	Bluetooth Serial Adapter

Report Producer : Nana Hsu

Report Number : RXZ220516002RF01

Report Date : 2022-06-17

Reviewed By: Andy Shih

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Revision History

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
0.0	RXZ220516002	RXZ220516002RF01	2022-06-17	Original Report	Nana Hsu

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1. General Information

1.1. Product Description for Equipment under Test (EUT)

Manufacturer	Chongqing JINOU Science & Technology Development Co., Ltd. D1-802, Overseas Students Pioneer Park, No.71 Kecheng Rd, Jiulongpo District, 400039,Chongqing
Brand(Trade) Name	N/A
Product (Equipment)	Bluetooth Serial Adapter
Main Model Name	MTI8038
Frequency Range	2402 ~ 2480 MHz
Peak Conducted Output Power	BR(GFSK) Mode: 3.87 dBm EDR(π/4-DQPSK) Mode: 4.02 dBm EDR(8DPSK) Mode: 4.01 dBm
Modulation Technique	BR Mode: GFSK EDR Mode: π/4-DQPSK, 8DPSK
Transmit Data Rate	BR(GFSK) Mode: 1 Mbps EDR(π/4-DQPSK) Mode: 2 Mbps EDR(8DPSK) Mode: 3 Mbps
Power Operation (Voltage Range)	☐ AC ☐ Adapter ☐ By AC Power Cord ☐ PoE
	☒ DC7-17V(Typical:12V) ☐ Battery ☐ DC Power Supply ☒ External from Molex Connector ☐ External DC Adapter
	☐ Host System
Received Date	May 18, 2022
Date of Test	May 19, 2022 ~ Jun 16, 2022

*All measurement and test data in this report was gathered from production sample serial number: RXZ220516002-01 (Assigned by BACL, New Taipei Laboratory).

1.2. Objective

This report is prepared on behalf of *Mobile Technologies International Pty 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
Occupied Bandwidth		+/- 0.35 MHz
Unwanted Emissions, conducted		+/- 1.69 dBm
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 (°C)	Relative Humidity (%)	ATM Pressure (hPa)	Test Engineer
AC Line Conducted Emissions	2022-05-24	21.9	45	1010	Andy Cheng
Radiation Spurious Emissions	2022/05/26~2022/05/27	20.9	76	1010	Aaron Pan
Conducted Spurious Emissions	2022/05/19~2022/05/20	24.6~25.1	52~55	1010	Boris Kao
20 dB Emission Bandwidth	2022/05/19~2022/05/20	24.6~25.1	52~55	1010	Boris Kao
Channel Separation Test	2022/05/19~2022/05/20	24.6~25.1	52~55	1010	Boris Kao
Time of Occupancy	2022/05/20~202206/16	25.1~25	55~59	1010	Boris Kao
Quantity of hopping channel	2022/05/19~2022/06/16	24.6	52	1010	Boris Kao
Maximum Output Power	2022-05-19	24.6~25	52~59	1010	Boris Kao
100 kHz Bandwidth of Frequency Band Edge	2022/05/19~2022/06/16	24.6~25.1	52~59	1010	Boris Kao

1.8. Test Facility

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

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

Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) 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 "BlueTest3 v2.6.2.632"

Test Frequency		2402MHz	2441MHz	2480MHz
Power Level Setting	GFSK	63	63	63
	π/4-DQPSK	63	63	63
	8DPSK	63	63	63

2.4. Test Mode

Model : MTI 8038 for all test item.

2.5. Support Equipment List and Details

Description	Manufacturer	Model Number
NB	DELL	E6410
Fixture	CSR	N/A
Adapter	SINGOF	SINGOF-5U-1205

2.6. External Cable List and Details

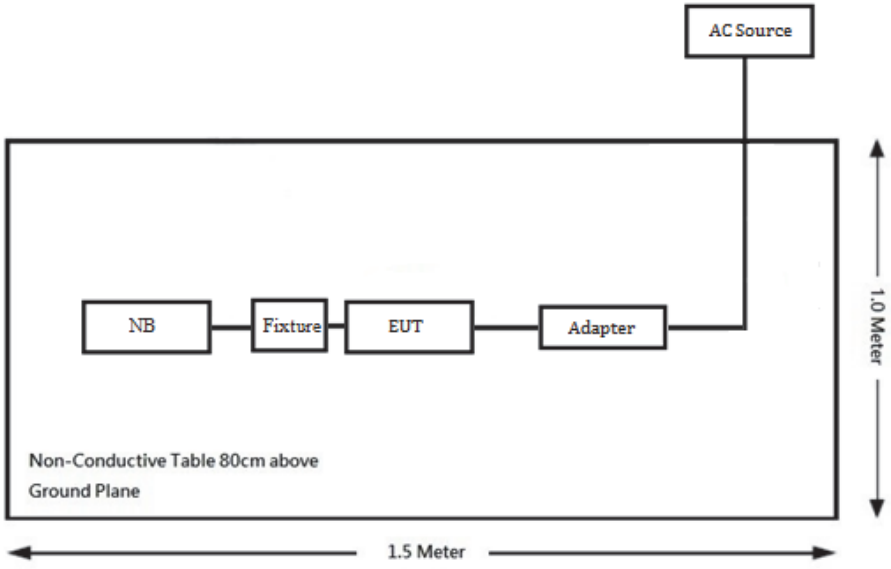
Cable Description	Length (m)	From	To
USB Cable	1	Fixture	NB

2.7. Block Diagram of Test Setup

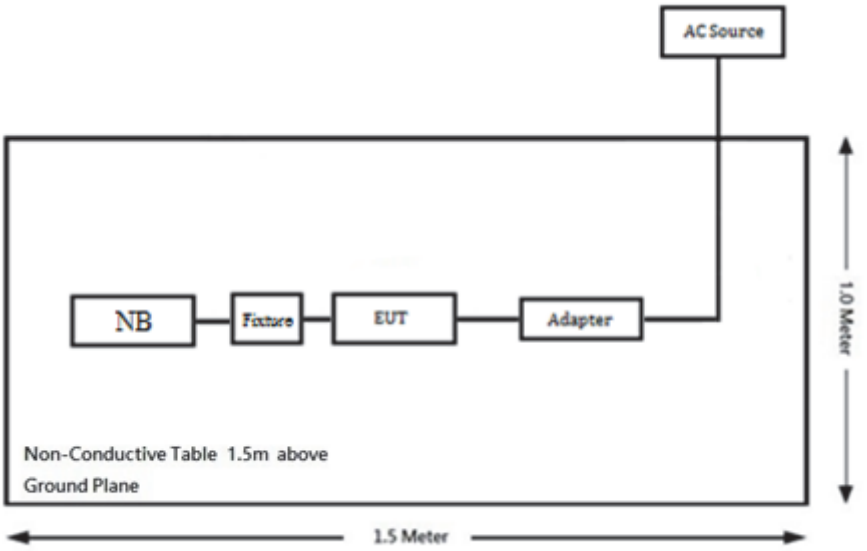
See test photographs attached in annex setup photos for the actual connections between EUT and support equipment.

Radiation:

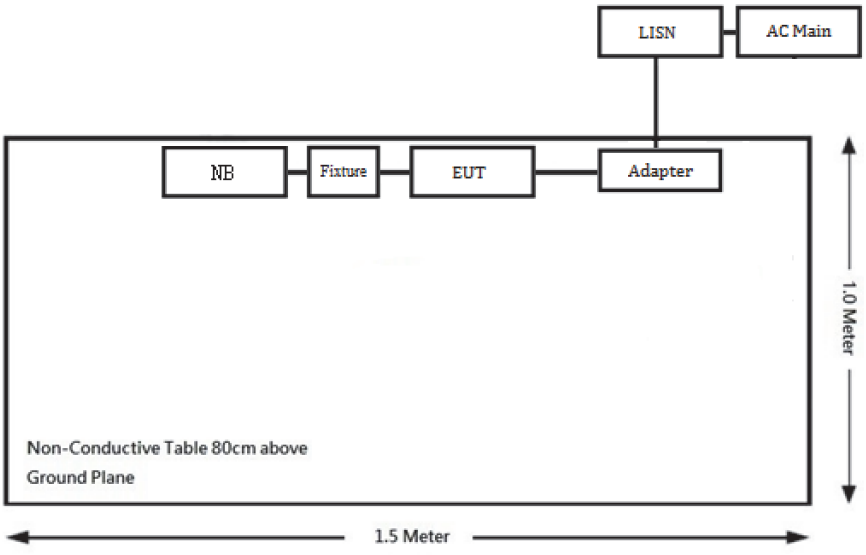
Below 1GHz:



Above 1GHz:



Conduction:



3. Summary of Test Results

FCC Rules	Description of Test	Results
§15.247(i), §1.1307(b)(3)(i)	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247(a)(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 & MINI-CIRCUITS	JB6/UNAT-6+	A050115/15542_01	2022/2/14	2023/2/13
Horn Antenna	EMCO	3115	9809-5583	2021/9/1	2022/8/31
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
Coaxial Cable	ROSNOL	K1K50-UP0264-K1K50-450CM	160309-1	2022/1/24	2023/1/23
Coaxial Cable	ROSNOL	K1K50-UP0264-K1K50-50CM	15120-1	2022/1/18	2023/1/17
Software	Audix	e3	18621a bacl	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
Power Sensor	KEYSIGHT	U2021XA	MY54080018	2022/01/24	2023/01/23

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

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

5.1. Applicable Standard

According to subpart 15.247(i) and subpart §1.1307(b)(3)(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

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

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

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

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

Where

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

and

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

5.2. RF Exposure Evaluation Result

Project info

Band	Frequency (MHz)	Tunp-up Power (dBm)	Ant Gain (dBi)	Distances (mm)	Duty (%)	Tunp-up Power (mW)	ERP (dBm)	ERP (mW)
BT	2480	4.5	2	200	100%	2.82	4.35	2.72

Option A

The available maximum time-averaged power is no more than 1 mW

Band	Frequency (MHz)	Result Option A
BT	2480	not exempt

Option B

The available maximum time-averaged power or effective radiated power (ERP), whichever is greater. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive).

Band	Frequency (MHz)	Pth (mW)	X	ERP 20cm (mW)	Ratio	Result Option B
BT	**2480**	**3060.00**	**1.905**	**3060**	**0.00**	**exempt**

Result: The device meets the exemption requirement.

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
Sunlord	SLDA52-2R450G-S1	CHIP Antenna	2 dBi

Result: Compliance

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

7.1. Applicable Standard

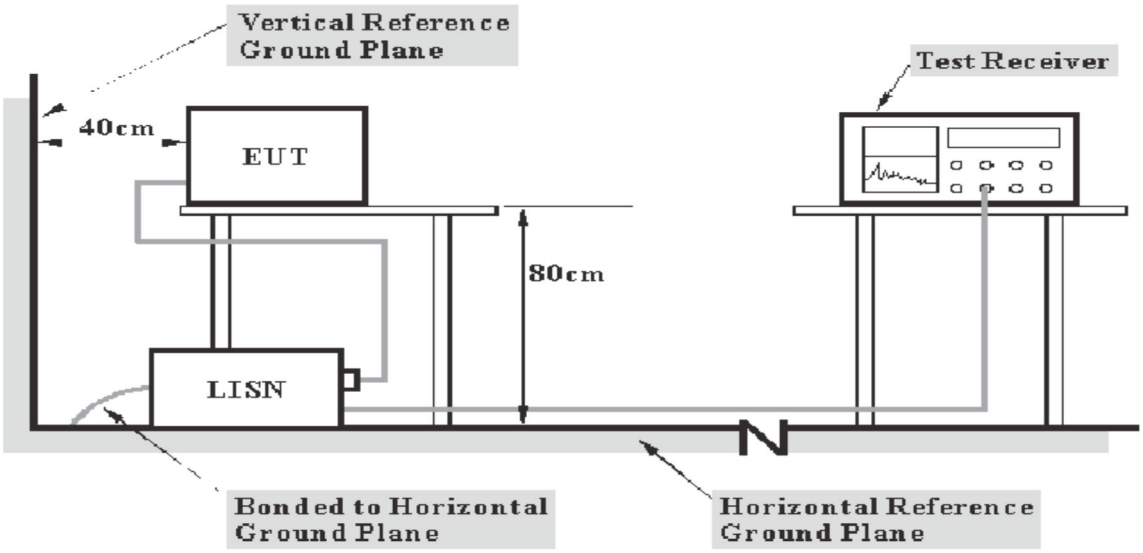
According to §15.207

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

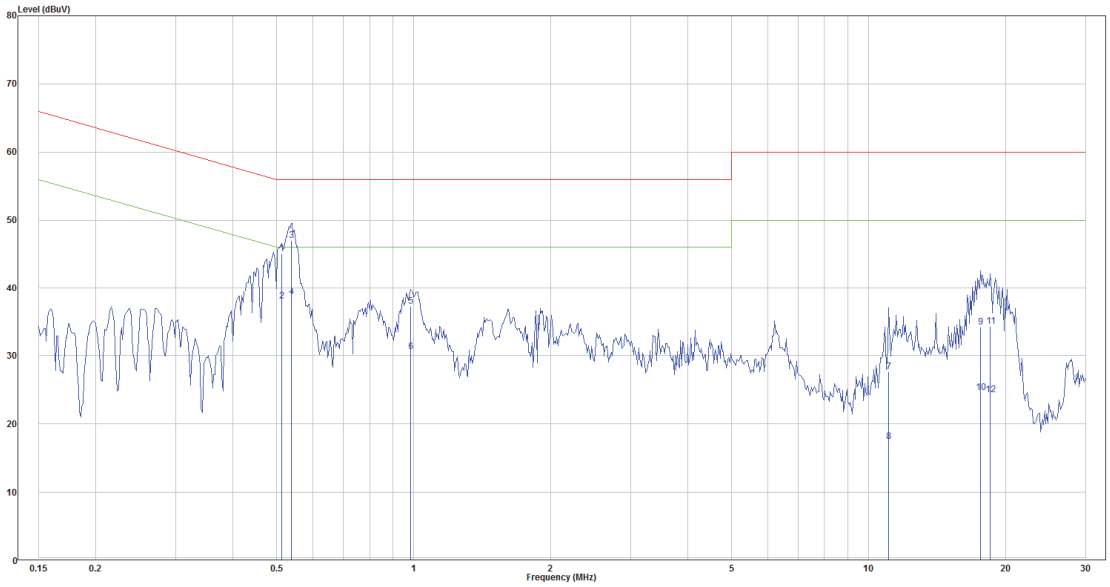
The “Over Limit” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an over limit of -7 dB means the emission is 7 dB below the limit. The equation for Over Limit calculation is as follows:

Over Limit = Level – Limit Line

7.6. Test Results

Test Mode: Transmitting

Main: AC120 V, 60 Hz, Line



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	
1	0.513	25.57	19.52	45.09	56.00	-10.91	QP
2	0.513	18.42	19.52	37.94	46.00	-8.06	Average
3	0.538	27.47	19.52	46.99	56.00	-9.01	QP
4	0.538	19.08	19.52	38.60	46.00	-7.40	Average
5	0.984	17.68	19.54	37.22	56.00	-18.78	QP
6	0.984	11.04	19.54	30.58	46.00	-15.42	Average
7	11.080	7.91	19.76	27.67	60.00	-32.33	QP
8	11.080	-2.36	19.76	17.40	50.00	-32.60	Average
9	17.661	14.32	19.81	34.13	60.00	-25.87	QP
10	17.661	4.81	19.81	24.62	50.00	-25.38	Average
11	18.524	14.50	19.81	34.31	60.00	-25.69	QP
12	18.524	4.45	19.81	24.26	50.00	-25.74	Average

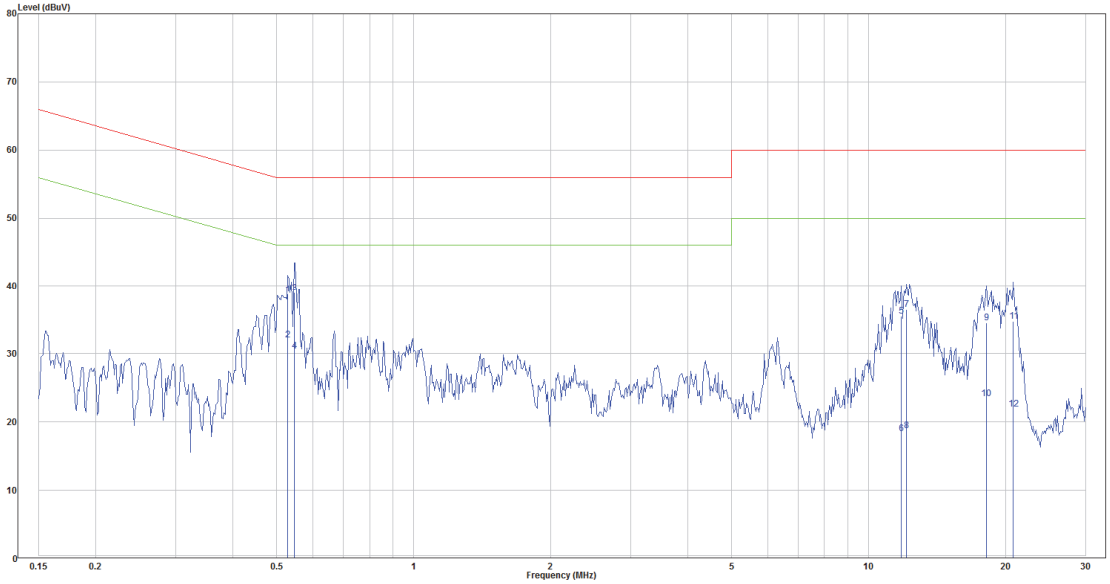
Note:

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	0.529	19.25	19.52	38.77	56.00	-17.23	QP
2	0.529	12.51	19.52	32.03	46.00	-13.97	Average
3	0.546	19.48	19.52	39.00	56.00	-17.00	QP
4	0.546	10.85	19.52	30.37	46.00	-15.63	Average
5	11.807	15.67	19.79	35.46	60.00	-24.54	QP
6	11.807	-1.54	19.79	18.25	50.00	-31.75	Average
7	12.124	16.62	19.80	36.42	60.00	-23.58	QP
8	12.124	-1.13	19.80	18.67	50.00	-31.33	Average
9	18.135	14.68	19.87	34.55	60.00	-25.45	QP
10	18.135	3.48	19.87	23.35	50.00	-26.65	Average
11	20.814	14.82	19.90	34.72	60.00	-25.28	QP
12	20.814	1.97	19.90	21.87	50.00	-28.13	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

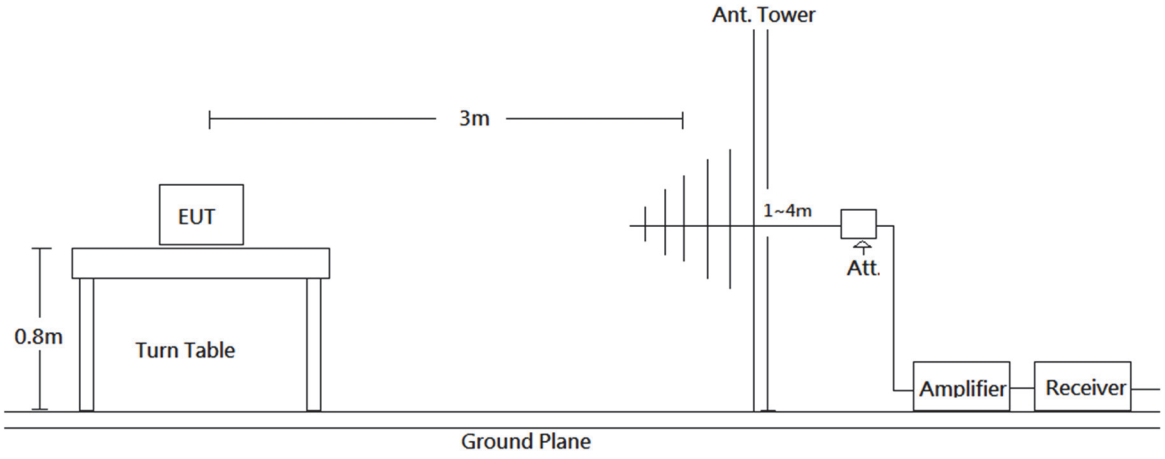
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this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

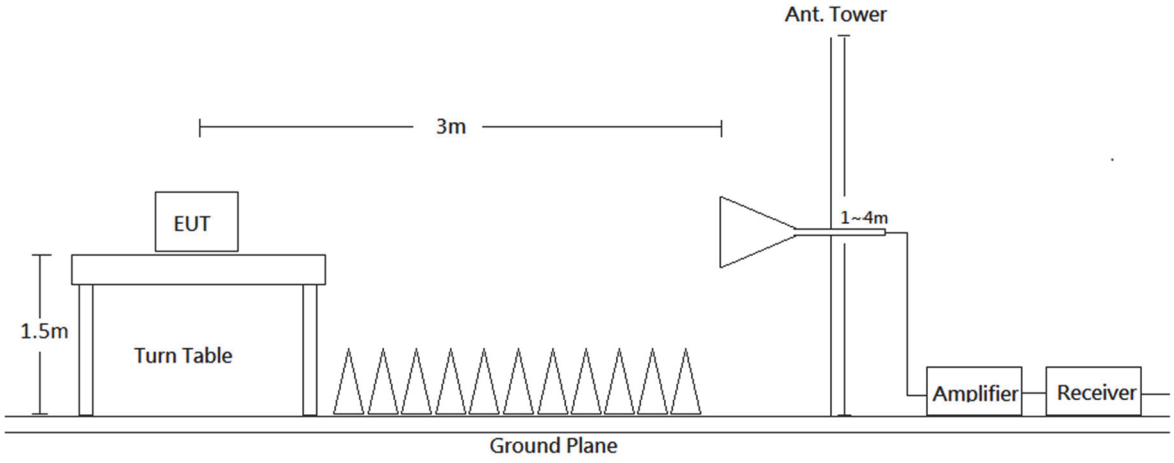
the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, 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

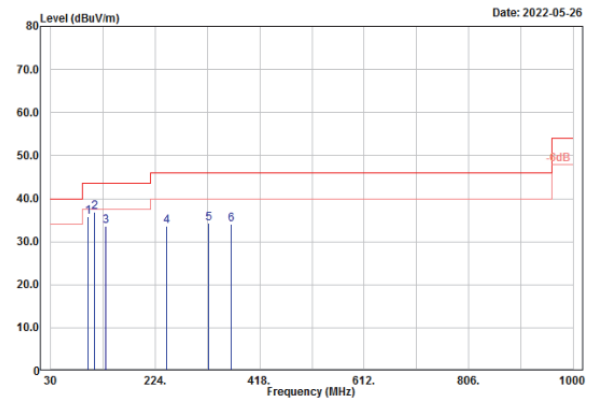
Test Mode: Transmitting

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

(Worst case is BT (GFSK) mode Middle channel)

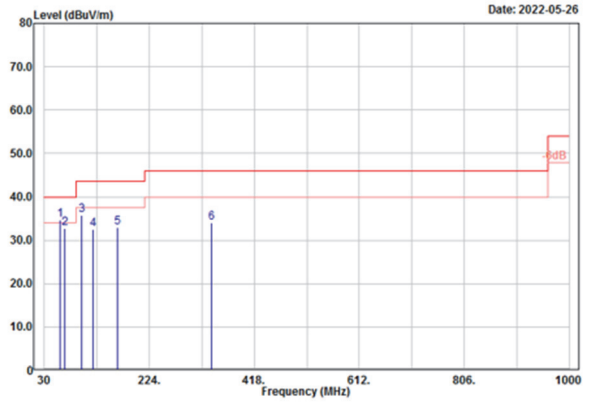
30MHz-1GHz:

Horizontal



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
99.840	47.94	-12.18	35.76	43.50	-7.74	100	102	Peak
111.480	46.46	-9.70	36.76	43.50	-6.74	100	275	Peak
131.850	41.80	-8.30	33.50	43.50	-10.00	100	123	Peak
245.340	43.33	-9.69	33.64	46.00	-12.36	100	115	Peak
323.910	41.19	-6.92	34.27	46.00	-11.73	100	227	Peak
364.650	39.81	-5.80	34.01	46.00	-11.99	100	306	Peak

Vertical



Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
59.100	50.29	-15.61	34.68	40.00	-5.32	100	193	QP
67.830	47.24	-14.54	32.70	40.00	-7.30	100	153	QP
99.840	47.93	-12.18	35.75	43.50	-7.75	100	71	Peak
119.240	41.03	-8.52	32.51	43.50	-10.99	100	39	Peak
165.800	42.92	-9.94	32.98	43.50	-10.52	100	2	Peak
339.430	40.65	-6.67	33.98	46.00	-12.02	100	31	Peak

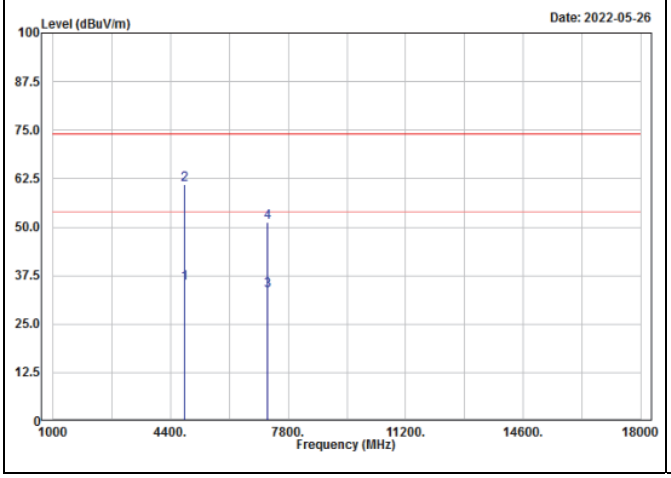
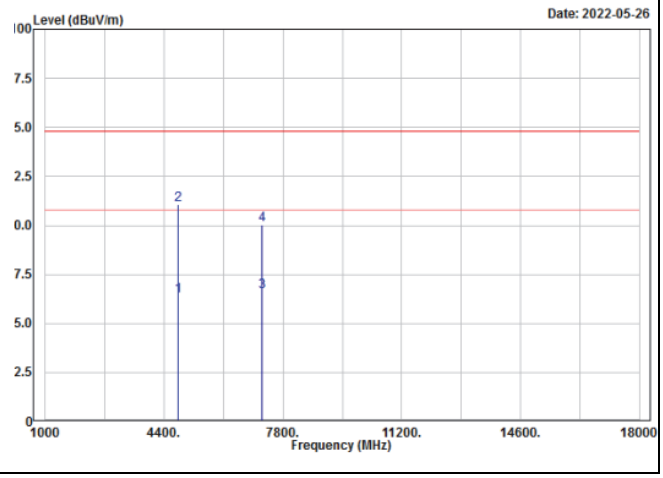
Level (Result) = Reading + Factor.

Margin = Level – Limit.

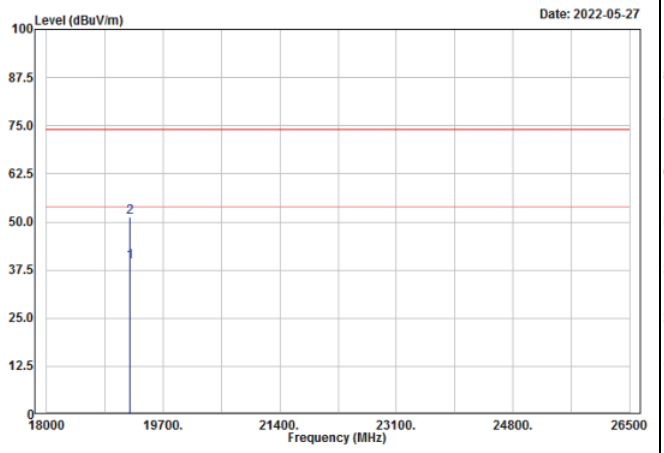
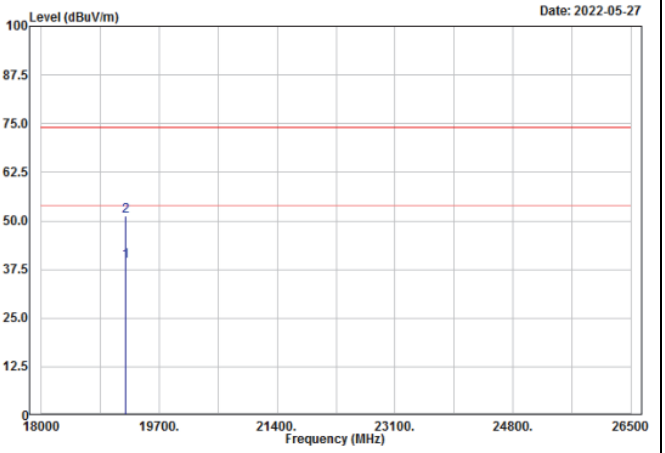
Factor = Antenna Factor + Cable Loss – Amplifier Gain.

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

1GHz-18GHz:

Horizontal	Vertical
	

18GHz-26.5GHz:

Horizontal	Vertical
	

Above 1GHz

BR (GFSK)

Horizontal

Low channel

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2370.200	41.15	-9.57	31.58	54.00	-22.42	159	244	Average
2370.200	55.15	-9.57	45.58	74.00	-28.42	159	244	Peak
2402.000	91.84	-9.54	82.30			159	244	Average
2402.000	105.93	-9.54	96.39			159	244	Peak
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4804.000	38.98	-3.47	35.51	54.00	-18.49	147	241	Average
4804.000	64.40	-3.47	60.93	74.00	-13.07	147	241	Peak
7206.000	31.69	1.83	33.52	54.00	-20.48	202	335	Average
7206.000	49.51	1.83	51.34	74.00	-22.66	202	335	Peak

Middle channel

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4882.000	39.00	-3.24	35.76	54.00	-18.24	131	248	Average
4882.000	64.11	-3.24	60.87	74.00	-13.13	131	248	Peak
7323.000	33.87	2.49	36.36	54.00	-17.64	214	331	Average
7323.000	52.68	2.49	55.17	74.00	-18.83	214	331	Peak

High channel

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2480.000	91.02	-9.29	81.73			180	253	Average
2480.000	104.94	-9.29	95.65			180	253	Peak
2483.590	51.00	-9.29	41.71	54.00	-12.29	180	253	Average
2483.590	62.82	-9.29	53.53	74.00	-20.47	180	253	Peak
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4960.000	39.19	-3.04	36.15	54.00	-17.85	129	207	Average
4960.000	63.48	-3.04	60.44	74.00	-13.56	129	207	Peak
7440.000	35.59	2.88	38.47	54.00	-15.53	214	260	Average
7440.000	54.85	2.88	57.73	74.00	-16.27	214	260	Peak

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

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

Vertical

Low channel

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2379.300	41.15	-9.57	31.58	54.00	-22.42	104	214	Average
2379.300	56.10	-9.57	46.53	74.00	-27.47	104	214	Peak
2402.000	91.28	-9.54	81.74			104	214	Average
2402.000	105.29	-9.54	95.75			104	214	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4804.000	35.56	-3.47	32.09	54.00	-21.91	120	117	Average
4804.000	58.68	-3.47	55.21	74.00	-18.79	120	117	Peak
7206.000	31.18	1.83	33.01	54.00	-20.99	215	263	Average
7206.000	48.19	1.83	50.02	74.00	-23.98	215	263	Peak

Middle channel

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4882.000	36.61	-3.24	33.37	54.00	-20.63	136	146	Average
4882.000	57.36	-3.24	54.12	74.00	-19.88	136	146	Peak
7323.000	32.13	2.49	34.62	54.00	-19.38	223	286	Average
7323.000	48.28	2.49	50.77	74.00	-23.23	223	286	Peak

High channel

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2480.000	88.73	-9.29	79.44			158	284	Average
2480.000	102.06	-9.29	92.77			158	284	Peak
2483.590	48.67	-9.29	39.38	54.00	-14.62	158	284	Average
2483.590	60.99	-9.29	51.70	74.00	-22.30	158	284	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4960.000	36.99	-3.04	33.95	54.00	-20.05	217	99	Average
4960.000	57.88	-3.04	54.84	74.00	-19.16	217	99	Peak
7440.000	35.38	2.88	38.26	54.00	-15.74	228	54	Average
7440.000	54.67	2.88	57.55	74.00	-16.45	228	54	Peak

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

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

EDR (π/4-DQPSK)

Horizontal

Low channel

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2353.700	41.72	-9.59	32.13	54.00	-21.87	155	241	Average
2353.700	55.34	-9.59	45.75	74.00	-28.25	155	241	Peak
2402.000	63.29	-9.54	53.75			155	241	Average
2402.000	105.57	-9.54	96.03			155	241	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4804.000	38.78	-3.47	35.31	54.00	-18.69	117	252	Average
4804.000	64.53	-3.47	61.06	74.00	-12.94	117	252	Peak
7206.000	31.71	1.83	33.54	54.00	-20.46	188	330	Average
7206.000	49.35	1.83	51.18	74.00	-22.82	188	330	Peak

Middle channel

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4882.000	39.10	-3.24	35.86	54.00	-18.14	127	253	Average
4882.000	63.84	-3.24	60.60	74.00	-13.40	127	253	Peak
7323.000	33.61	2.49	36.10	54.00	-17.90	200	336	Average
7323.000	52.20	2.49	54.69	74.00	-19.31	200	336	Peak

High channel

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2480.000	64.20	-9.29	54.91			122	250	Average
2480.000	104.65	-9.29	95.36			122	250	Peak
2483.710	45.12	-9.29	35.83	54.00	-18.17	122	250	Average
2483.710	64.40	-9.29	55.11	74.00	-18.89	122	250	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4960.000	39.29	-3.04	36.25	54.00	-17.75	126	241	Average
4960.000	63.79	-3.04	60.75	74.00	-13.25	126	241	Peak
7440.000	36.21	2.88	39.09	54.00	-14.91	206	327	Average
7440.000	56.21	2.88	59.09	74.00	-14.91	206	327	Peak

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

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

Vertical

Low channel

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2386.000	41.60	-9.56	32.04	54.00	-21.96	103	216	Average
2386.000	54.94	-9.56	45.38	74.00	-28.62	103	216	Peak
2402.000	63.24	-9.54	53.70			103	216	Average
2402.000	105.74	-9.54	96.20			103	216	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4804.000	35.08	-3.47	31.61	54.00	-22.39	108	268	Average
4804.000	54.35	-3.47	50.88	74.00	-23.12	108	268	Peak
7206.000	31.24	1.83	33.07	54.00	-20.93	111	249	Average
7206.000	47.67	1.83	49.50	74.00	-24.50	111	249	Peak

Middle channel

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4882.000	36.46	-3.24	33.22	54.00	-20.78	152	91	Average
4882.000	57.30	-3.24	54.06	74.00	-19.94	152	91	Peak
7323.000	32.29	2.49	34.78	54.00	-19.22	224	284	Average
7323.000	48.74	2.49	51.23	74.00	-22.77	224	284	Peak

High channel

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2480.000	63.16	-9.29	53.87			158	286	Average
2480.000	102.56	-9.29	93.27			158	286	Peak
2483.650	44.34	-9.29	35.05	54.00	-18.95	158	286	Average
2483.650	61.24	-9.29	51.95	74.00	-22.05	158	286	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4960.000	37.13	-3.04	34.09	54.00	-19.91	197	99	Average
4960.000	58.19	-3.04	55.15	74.00	-18.85	197	99	Peak
7440.000	34.68	2.88	37.56	54.00	-16.44	113	55	Average
7440.000	52.65	2.88	55.53	74.00	-18.47	113	55	Peak

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

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

EDR (8DPSK)

Horizontal

Low channel

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2382.700	41.02	-9.57	31.45	54.00	-22.55	138	247	Average
2382.700	55.91	-9.57	46.34	74.00	-27.66	138	247	Peak
2402.000	64.80	-9.54	55.26			138	247	Average
2402.000	106.53	-9.54	96.99			138	247	Peak
4804.000	38.73	-3.47	35.26	54.00	-18.74	112	241	Average
4804.000	64.03	-3.47	60.56	74.00	-13.44	112	241	Peak
7206.000	31.82	1.83	33.65	54.00	-20.35	218	139	Average
7206.000	49.49	1.83	51.32	74.00	-22.68	218	139	Peak

Middle channel

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4882.000	39.19	-3.24	35.95	54.00	-18.05	129	248	Average
4882.000	64.11	-3.24	60.87	74.00	-13.13	129	248	Peak
7323.000	33.63	2.49	36.12	54.00	-17.88	214	329	Average
7323.000	51.93	2.49	54.42	74.00	-19.58	214	329	Peak

High channel

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2480.000	63.97	-9.29	54.68			181	251	Average
2480.000	104.82	-9.29	95.53			181	251	Peak
2483.620	45.07	-9.29	35.78	54.00	-18.22	181	251	Average
2483.620	63.17	-9.29	53.88	74.00	-20.12	181	251	Peak
4960.000	39.12	-3.04	36.08	54.00	-17.92	142	245	Average
4960.000	63.43	-3.04	60.39	74.00	-13.61	142	245	Peak
7440.000	36.79	2.88	39.67	54.00	-14.33	209	337	Average
7440.000	57.76	2.88	60.64	74.00	-13.36	209	337	Peak

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

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

Vertical

Low channel

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2365.300	40.99	-9.57	31.42	54.00	-22.58	131	215	Average
2365.300	55.39	-9.57	45.82	74.00	-28.18	131	215	Peak
2402.000	63.09	-9.54	53.55			131	215	Average
2402.000	105.39	-9.54	95.85			131	215	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4804.000	35.64	-3.47	32.17	54.00	-21.83	106	77	Average
4804.000	58.84	-3.47	55.37	74.00	-18.63	106	77	Peak
7206.000	31.18	1.83	33.01	54.00	-20.99	117	269	Average
7206.000	47.71	1.83	49.54	74.00	-24.46	117	269	Peak

Middle channel

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4882.000	36.51	-3.24	33.27	54.00	-20.73	124	148	Average
4882.000	57.36	-3.24	54.12	74.00	-19.88	124	148	Peak
7323.000	32.18	2.49	34.67	54.00	-19.33	129	276	Average
7323.000	48.74	2.49	51.23	74.00	-22.77	129	276	Peak

High channel

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2480.000	63.16	-9.29	53.87	54.00	-0.13	158	287	Average
2480.000	102.49	-9.29	93.20	74.00	19.20	158	287	Peak
2483.620	44.33	-9.29	35.04	54.00	-18.96	158	287	Average
2483.620	61.50	-9.29	52.21	74.00	-21.79	158	287	Peak

Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4960.000	37.25	-3.04	34.21	54.00	-19.79	177	104	Average
4960.000	58.57	-3.04	55.53	74.00	-18.47	177	104	Peak
7440.000	35.10	2.88	37.98	54.00	-16.02	103	266	Average
7440.000	53.55	2.88	56.43	74.00	-17.57	103	266	Peak

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

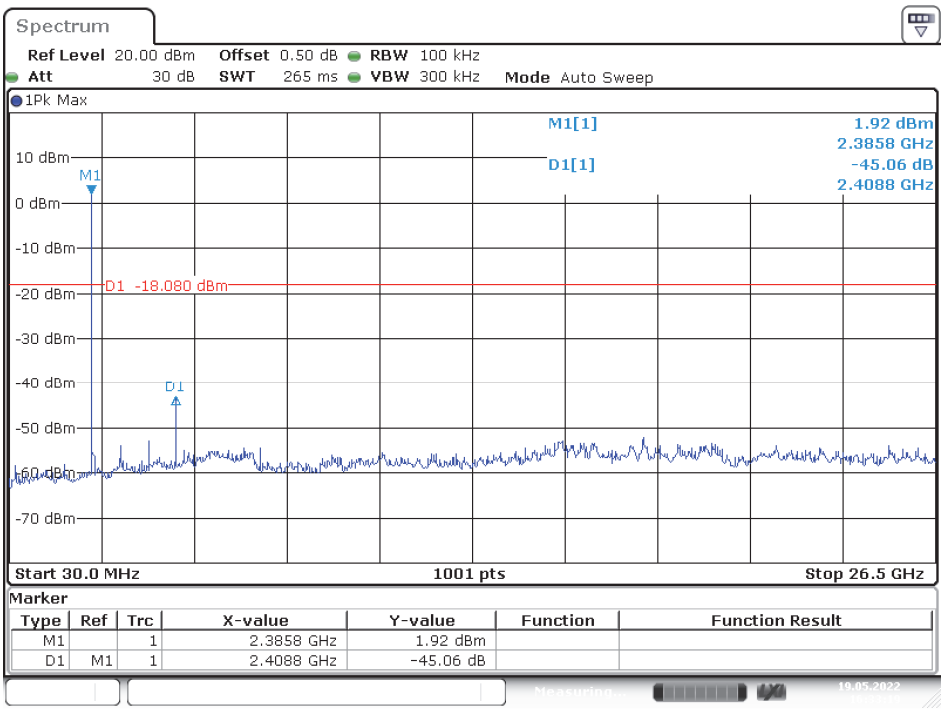
Spurious emissions more than 20 dB below the limit were not reported.

Conducted Spurious Emissions:

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
BR Mode (GFSK)				
Low	2402	45.06	≥ 20	PASS
Middle	2441	37.61	≥ 20	PASS
High	2480	44.58	≥ 20	PASS
EDR Mode (π/4-DQPSK):				
Low	2402	43.62	≥ 20	PASS
Middle	2441	43.73	≥ 20	PASS
High	2480	44.77	≥ 20	PASS
EDR Mode (8DPSK):				
Low	2402	45.63	≥ 20	PASS
Middle	2441	45.05	≥ 20	PASS
High	2480	45.23	≥ 20	PASS

BR Mode (GFSK)

Low Channel



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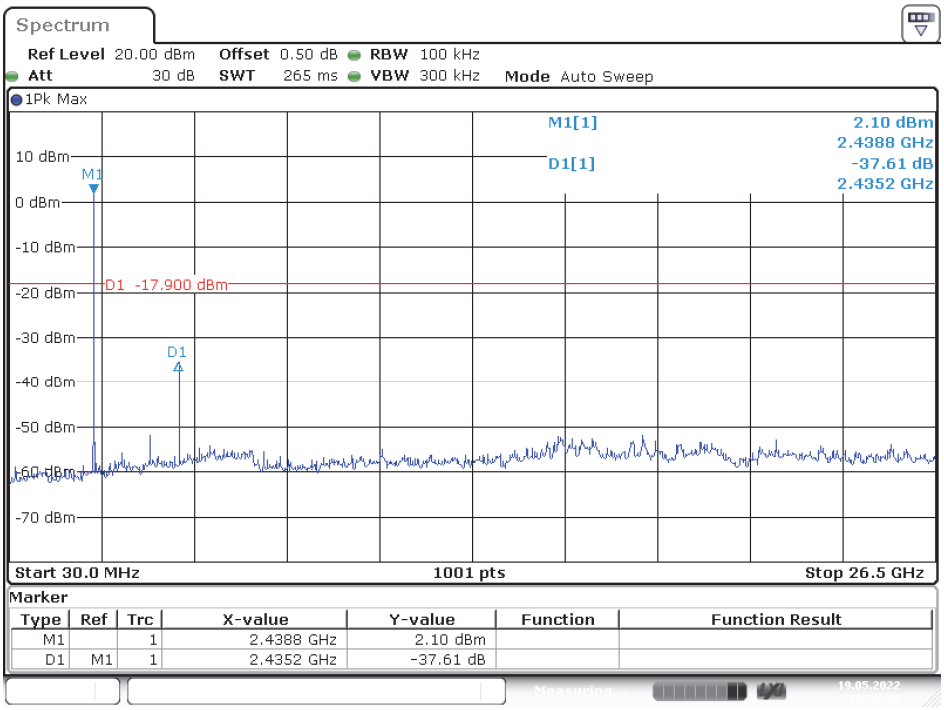
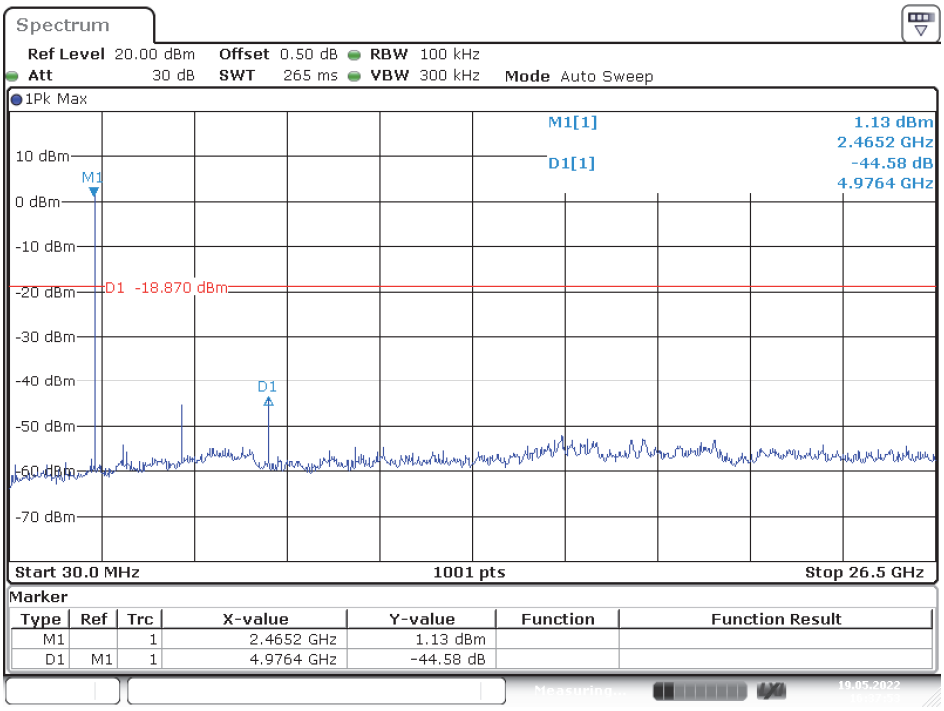
Middle Channel



Date: 19.MAY.2022 16:35:29

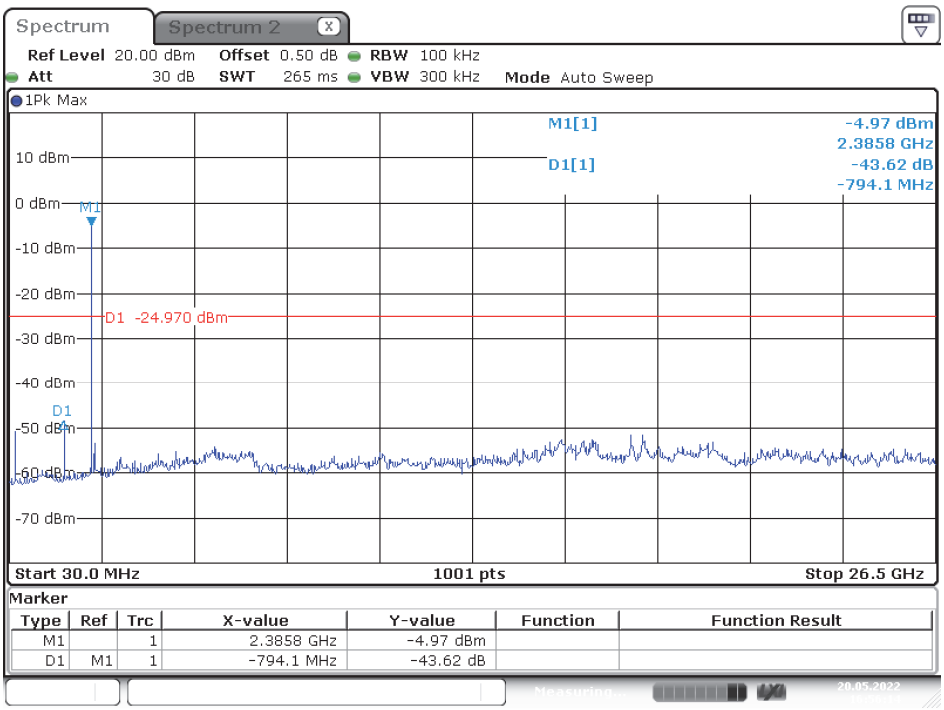
High Channel



Date: 19.MAY.2022 16:37:53

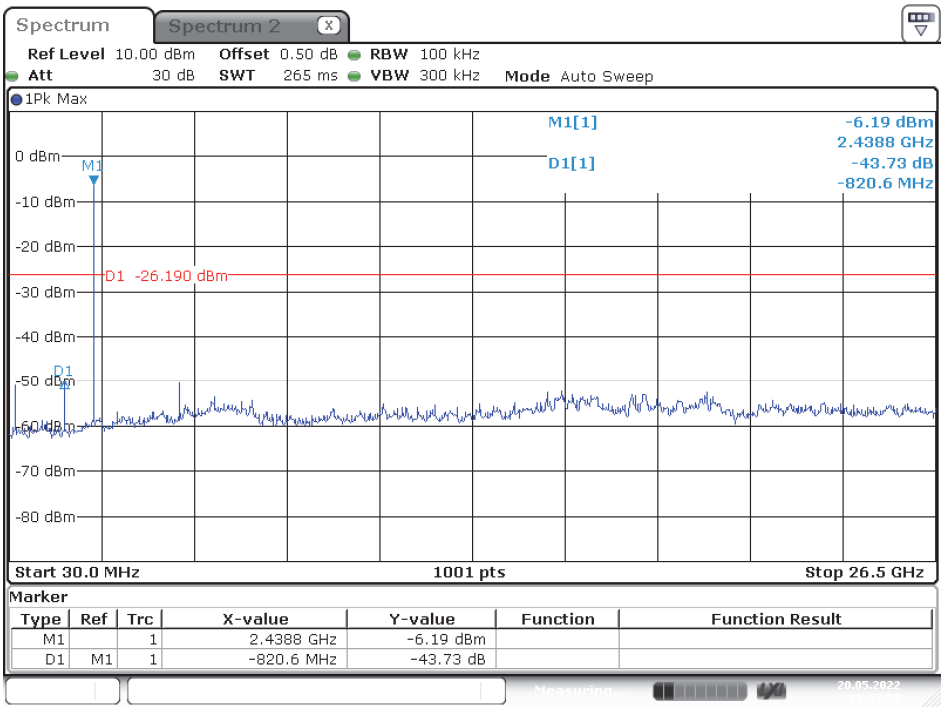
EDR Mode (π/4-DQPSK)

Low Channel



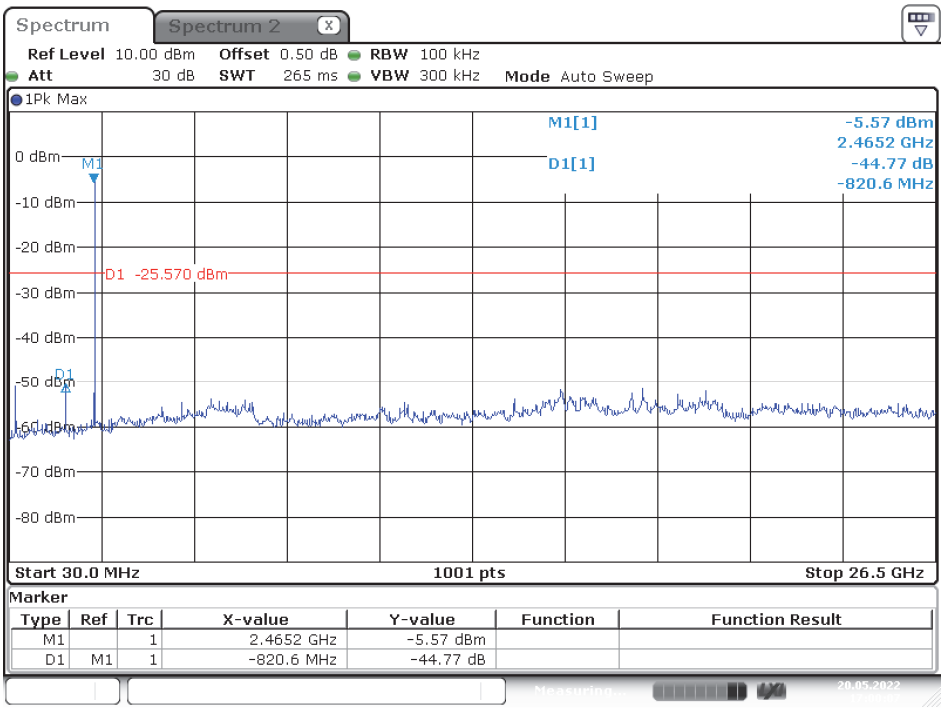
Date: 20.MAY.2022 16:56:13

Middle Channel



Date: 20.MAY.2022 16:57:50

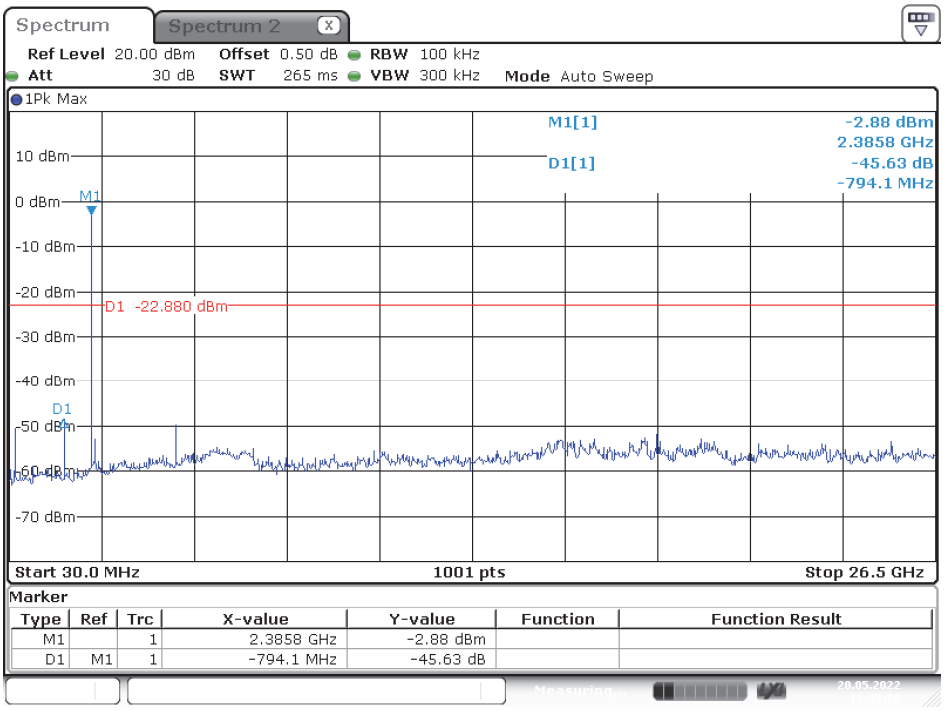
High Channel



Date: 20.MAY.2022 17:00:07

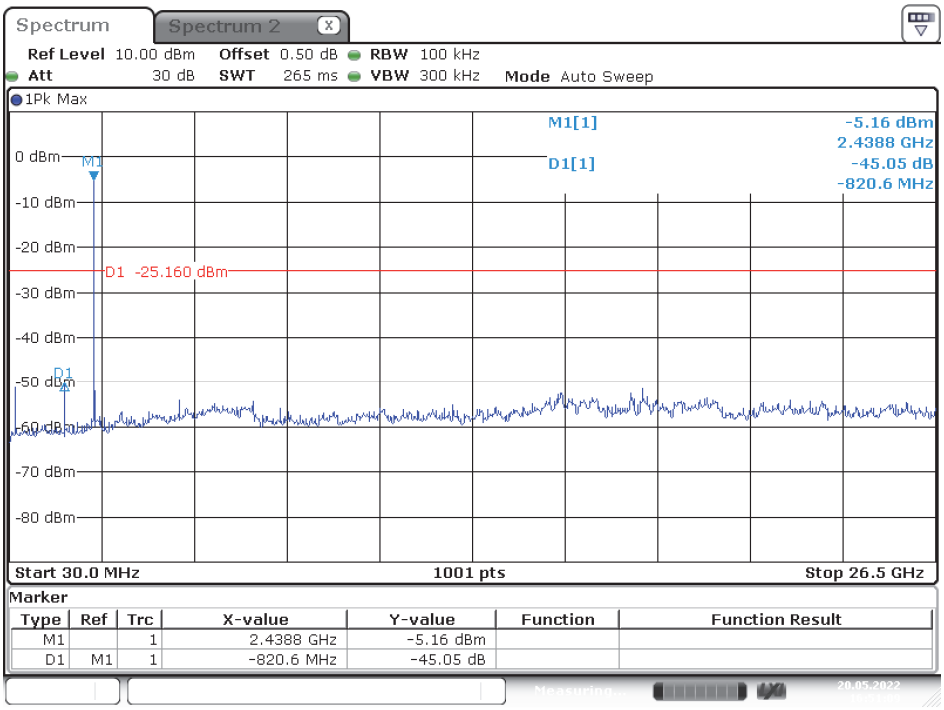
EDR Mode (8DPSK)

Low Channel



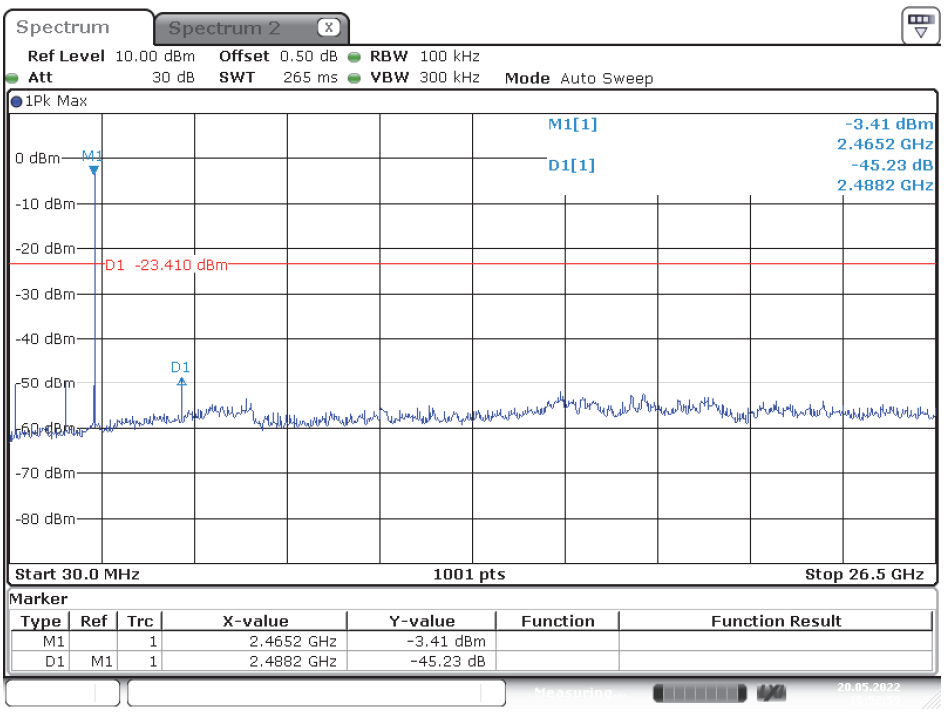
Date: 20.MAY.2022 16:49:20

Middle Channel



Date: 20.MAY.2022 16:51:09

High Channel



Date: 20.MAY.2022 16:52:59

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.

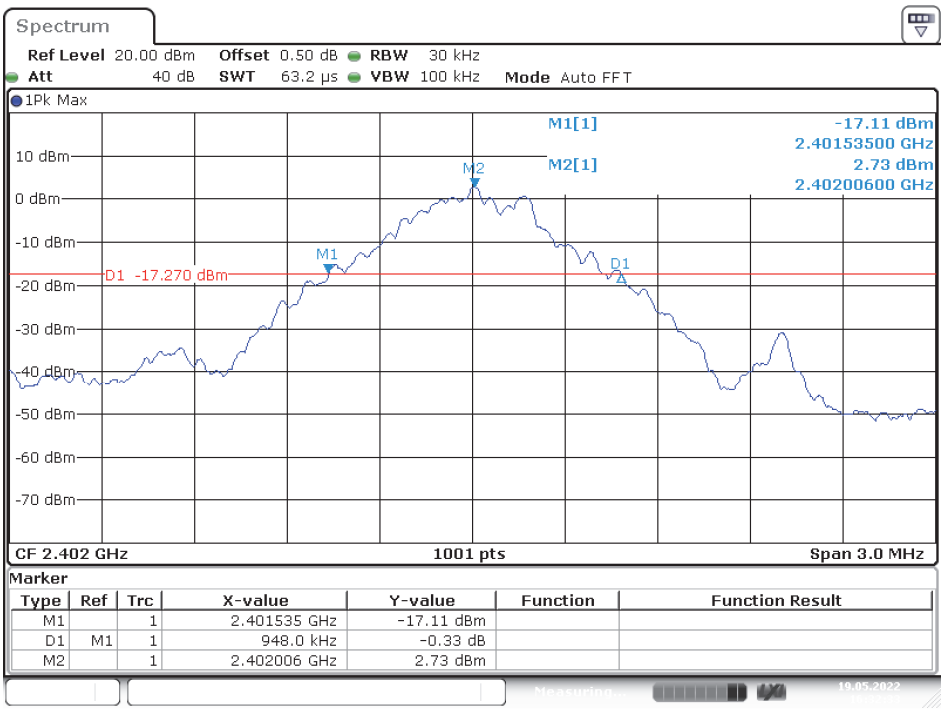
9.3. Test Results

Channel	Frequency (MHz)	20 dBc BW (MHz)
BR Mode (GFSK)		
Low	2402	0.95
Middle	2441	0.89
High	2480	0.89
EDR Mode (π/4-DQPSK)		
Low	2402	1.25
Middle	2441	1.25
High	2480	1.25
EDR Mode (8DPSK)		
Low	2402	1.26
Middle	2441	1.27
High	2480	1.27

Please refer to the following plots

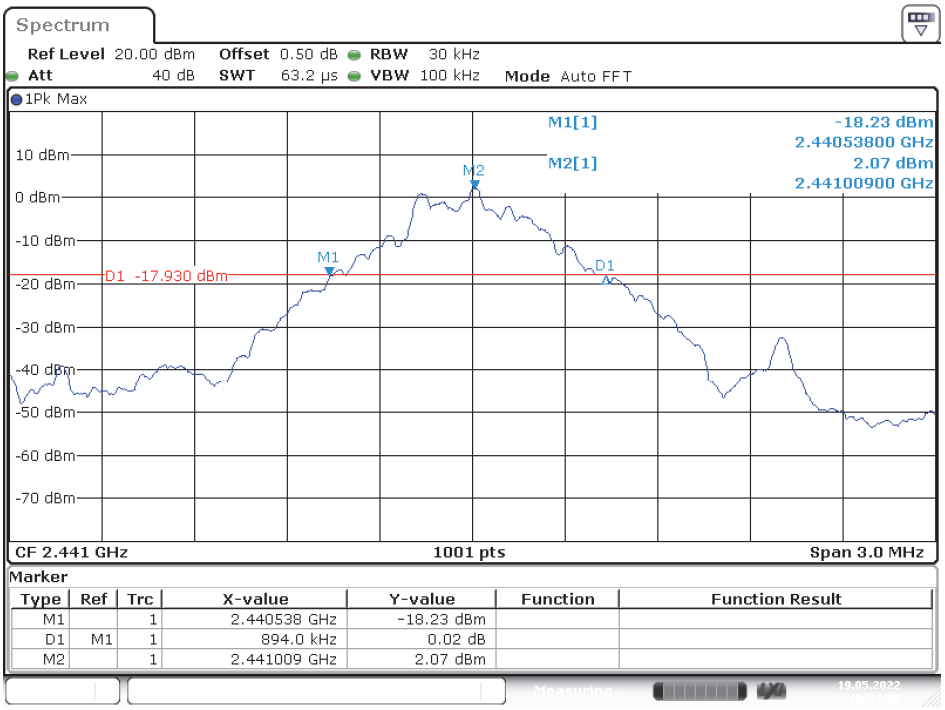
BR Mode (GFSK)

Low Channel



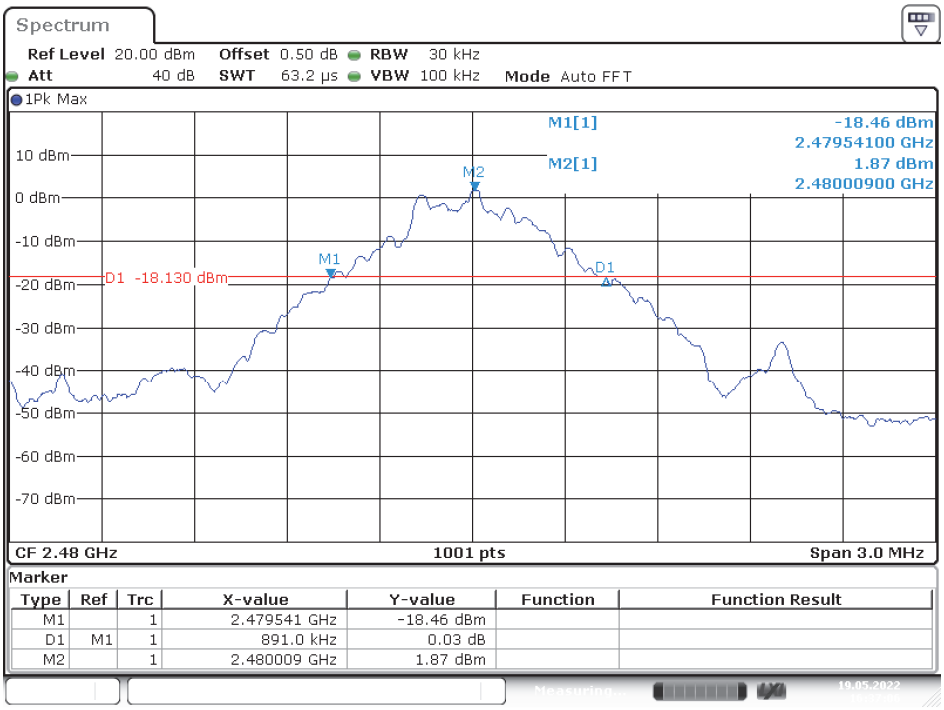
Date: 19.MAY.2022 16:32:33

Middle Channel



Date: 19.MAY.2022 16:34:58

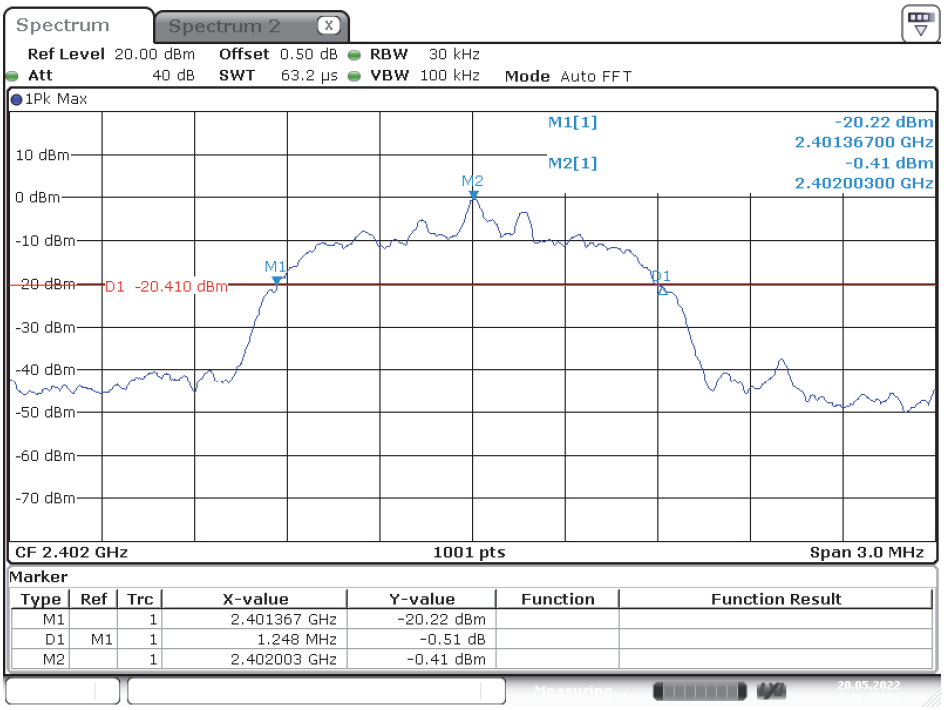
High Channel



Date: 19.MAY.2022 16:37:06

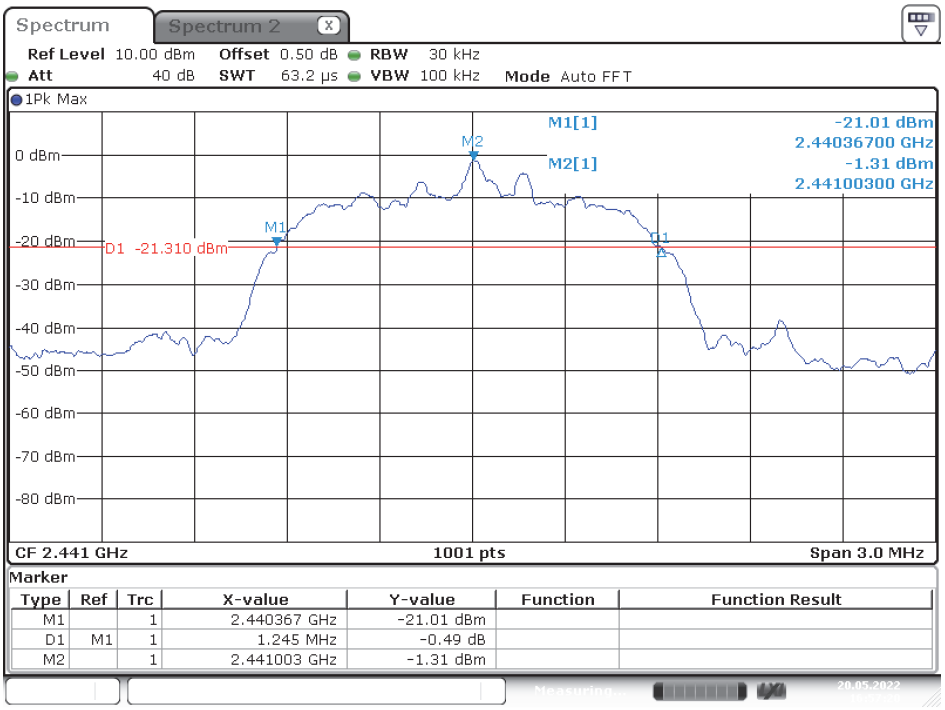
EDR Mode (π/4-DQPSK)

Low Channel



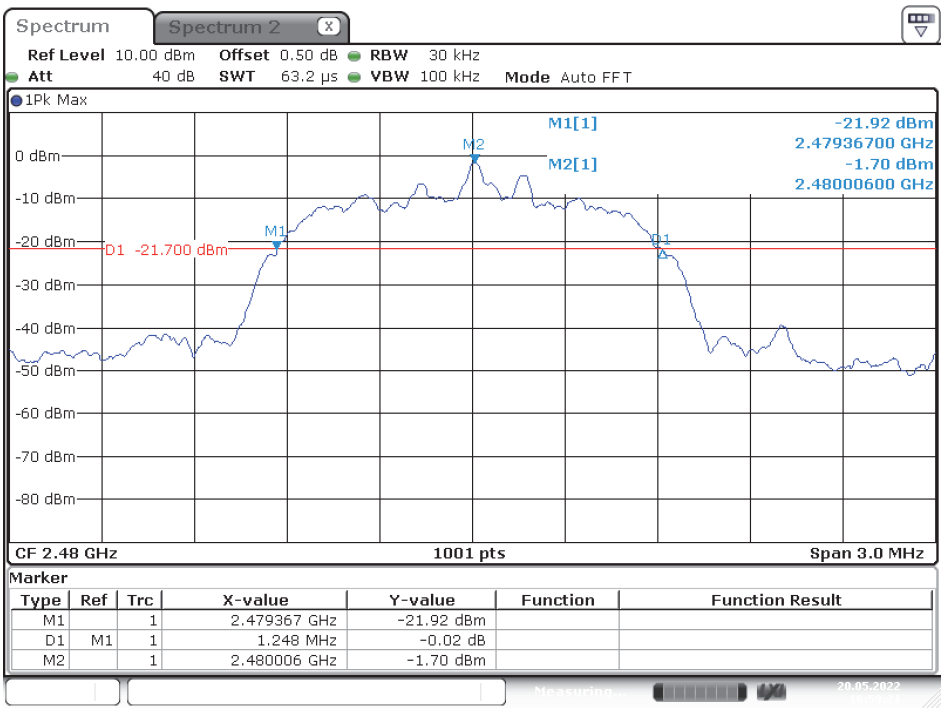
Date: 20.MAY.2022 16:55:27

Middle Channel



Date: 20.MAY.2022 16:57:19

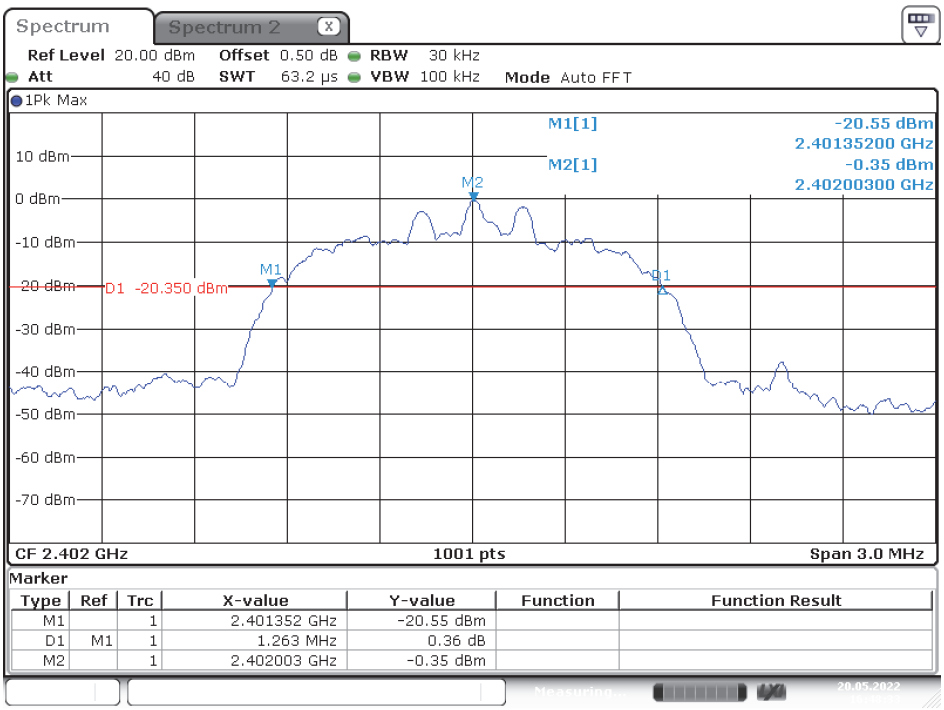
High Channel



Date: 20.MAY.2022 16:59:21

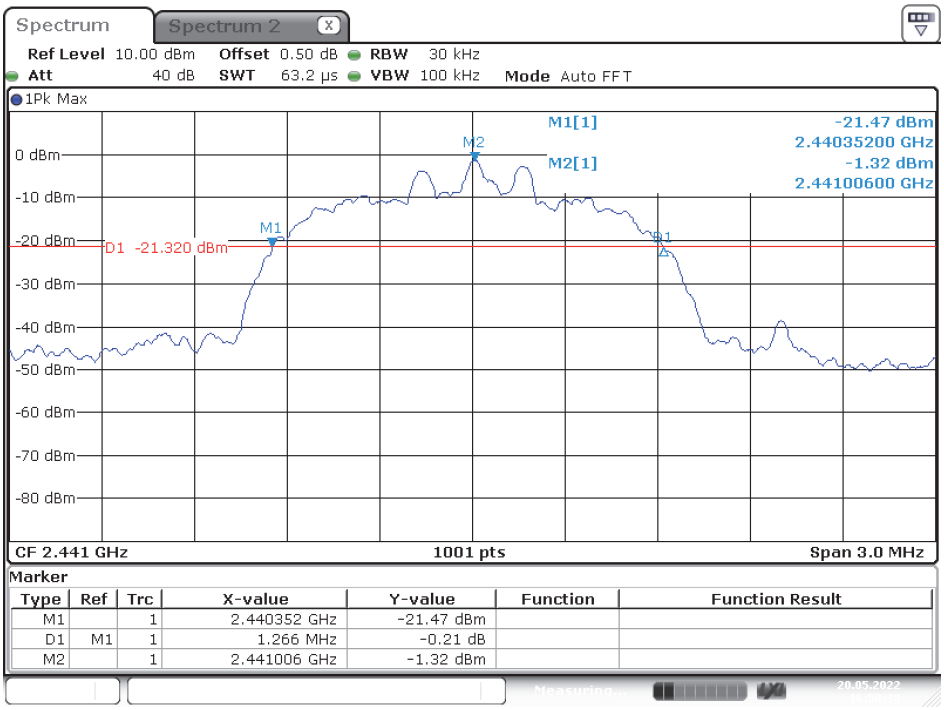
EDR Mode (8DPSK)

Low Channel



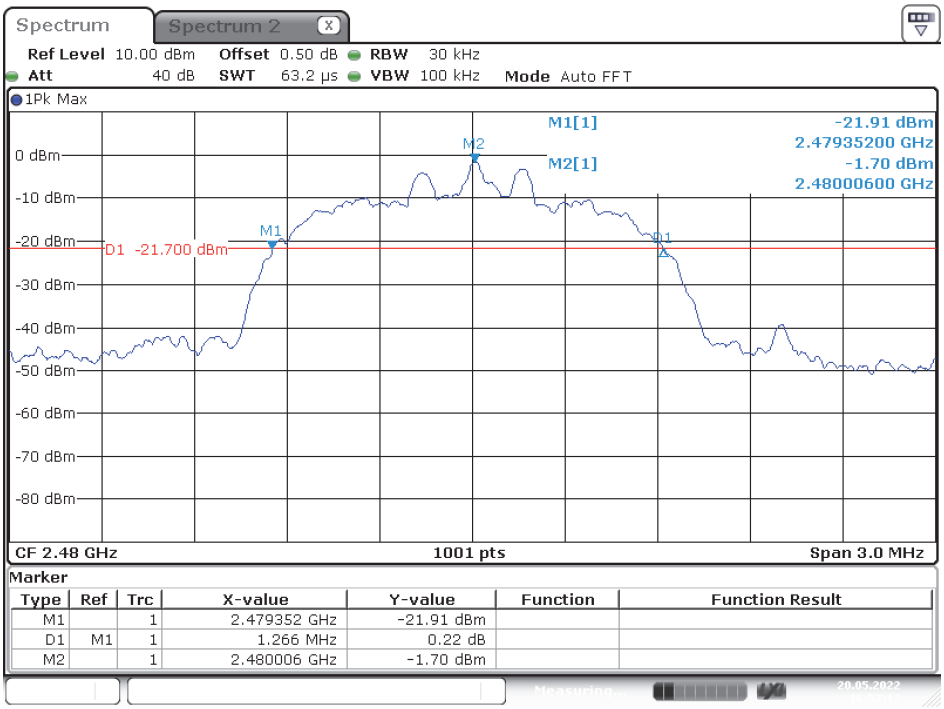
Date: 20.MAY.2022 16:48:34

Middle Channel



Date: 20.MAY.2022 16:50:38

High Channel



Date: 20.MAY.2022 16:52:12

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.

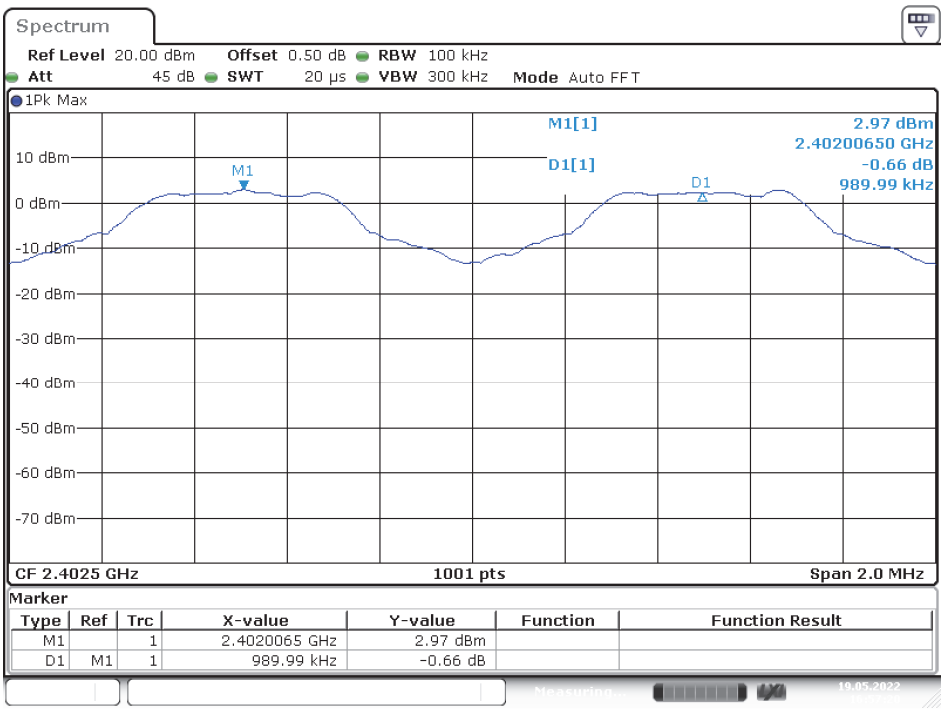
10.3. Test Results

Channel	Channel Separation (MHz)	20 dBc BW (MHz)	Two-thirds of the 20 dB bandwidth (MHz)	Channel Separation Limit	Result
BR Mode (GFSK)					
Low	0.99	0.95	0.632	>two-thirds of the 20 dB bandwidth	Compliance
Middle	1.00	0.89	0.593	>two-thirds of the 20 dB bandwidth	Compliance
High	1.01	0.89	0.593	>two-thirds of the 20 dB bandwidth	Compliance
EDR Mode (π/4-DQPSK)					
Low	1.01	1.25	0.833	>two-thirds of the 20 dB bandwidth	Compliance
Middle	1.00	1.25	0.833	>two-thirds of the 20 dB bandwidth	Compliance
High	1.01	1.25	0.833	>two-thirds of the 20 dB bandwidth	Compliance
EDR Mode (8DPSK)					
Low	0.99	1.26	0.842	>two-thirds of the 20 dB bandwidth	Compliance
Middle	1.00	1.27	0.844	>two-thirds of the 20 dB bandwidth	Compliance
High	1.01	1.27	0.844	>two-thirds of the 20 dB bandwidth	Compliance

Please refer to the following plots.

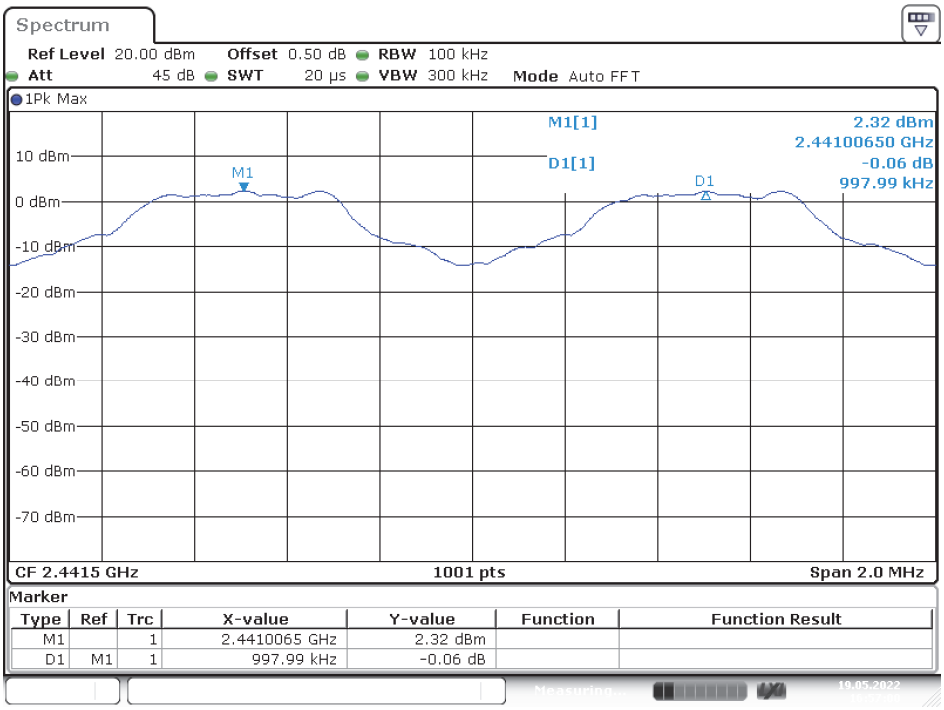
BR Mode (GFSK)

Low Channel



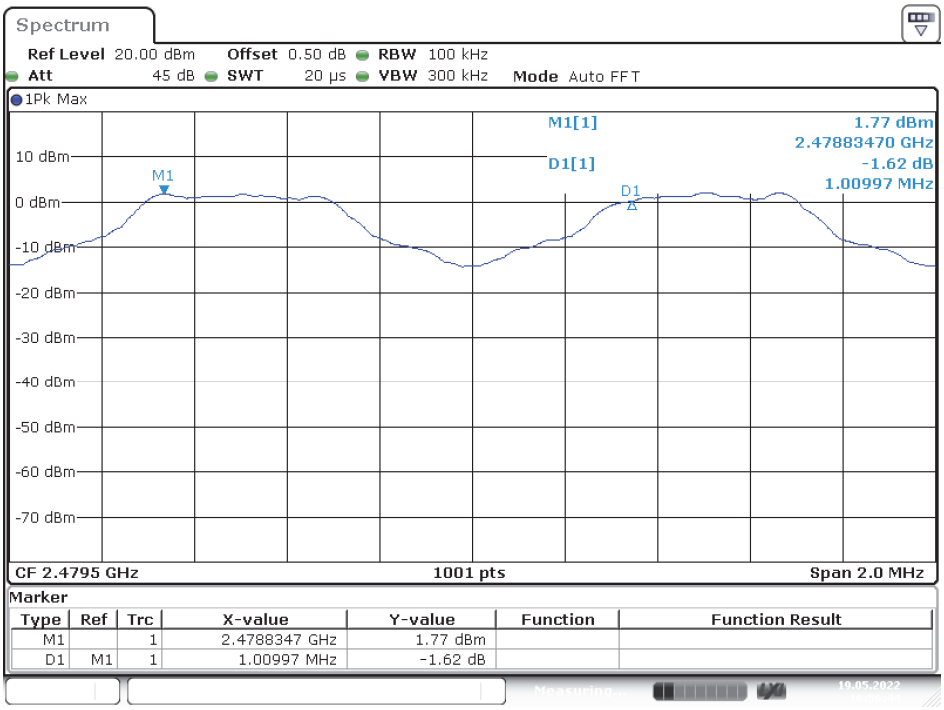
Date: 19.MAY.2022 16:57:20

Middle Channel



Date: 19.MAY.2022 16:57:01

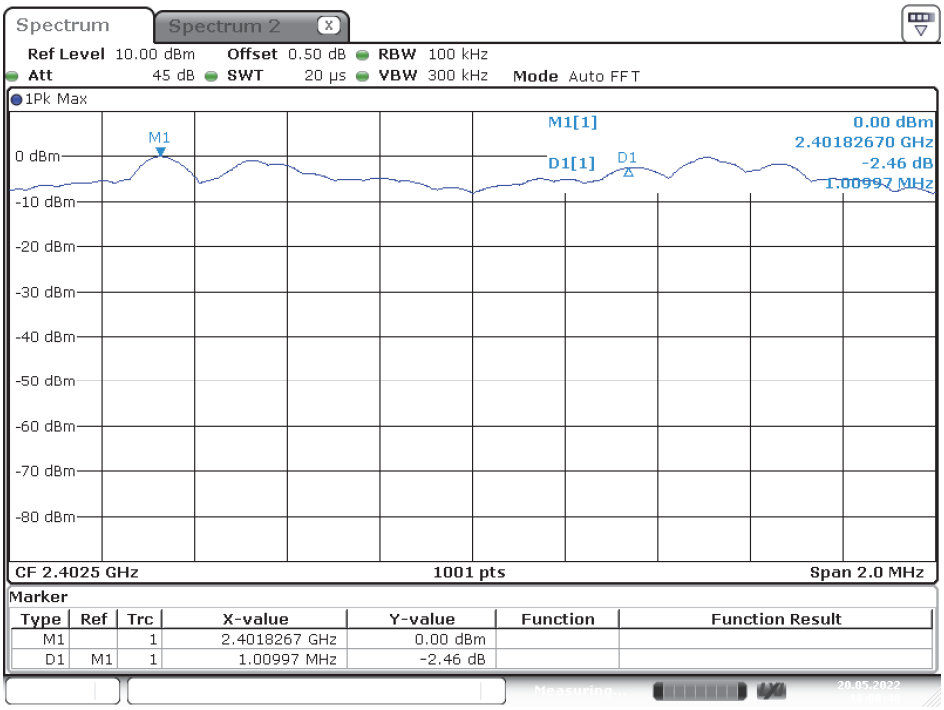
High Channel



Date: 19.MAY.2022 16:56:44

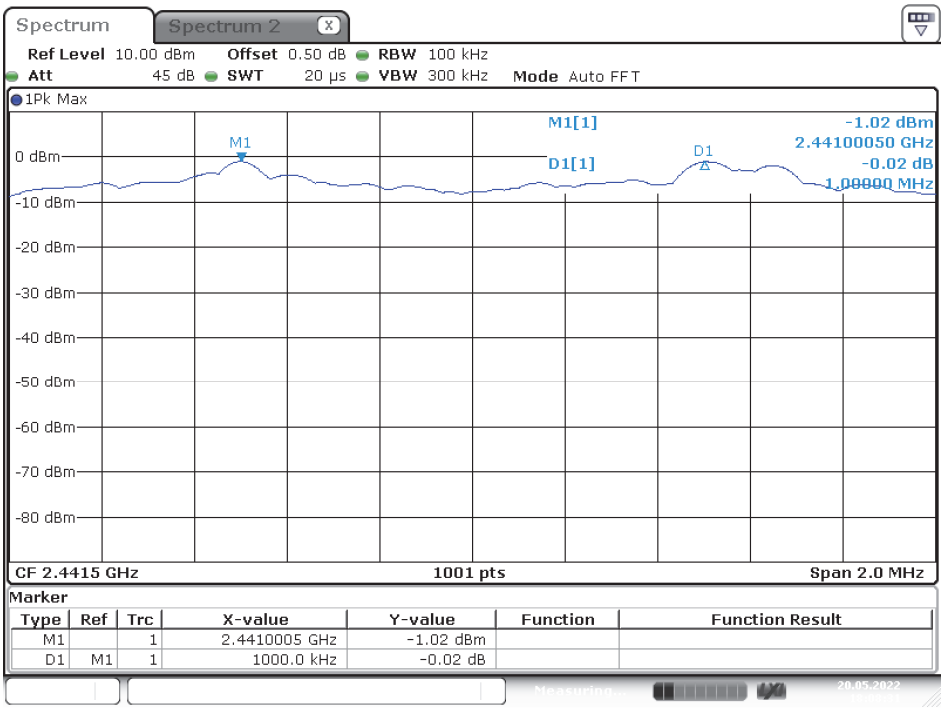
EDR Mode (π/4-DQPSK)

Low Channel



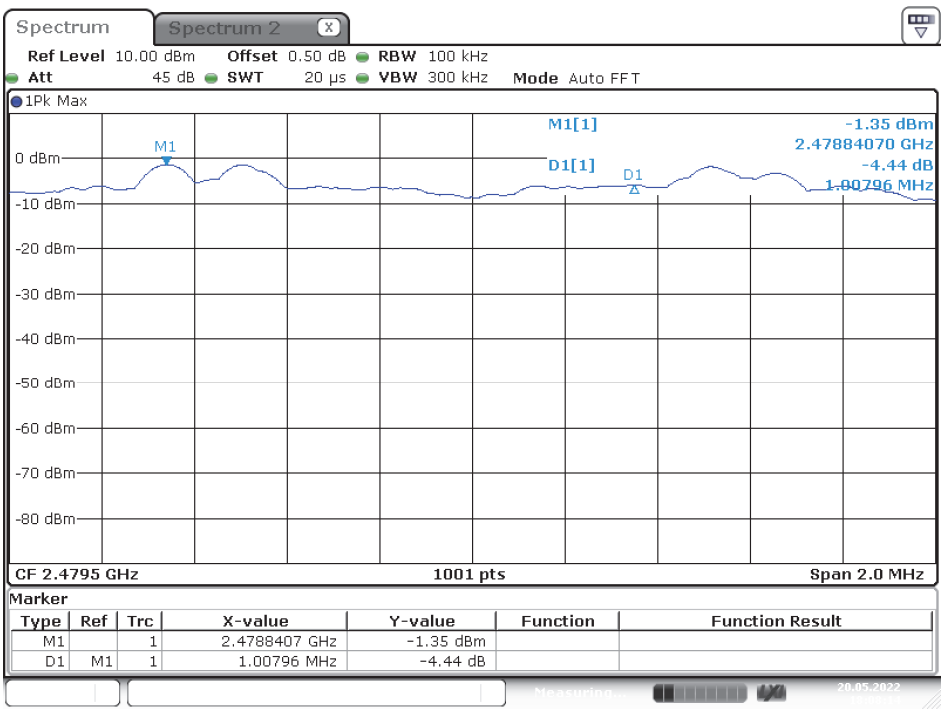
Date: 20.MAY.2022 18:08:48

Middle Channel



Date: 20.MAY.2022 18:08:31

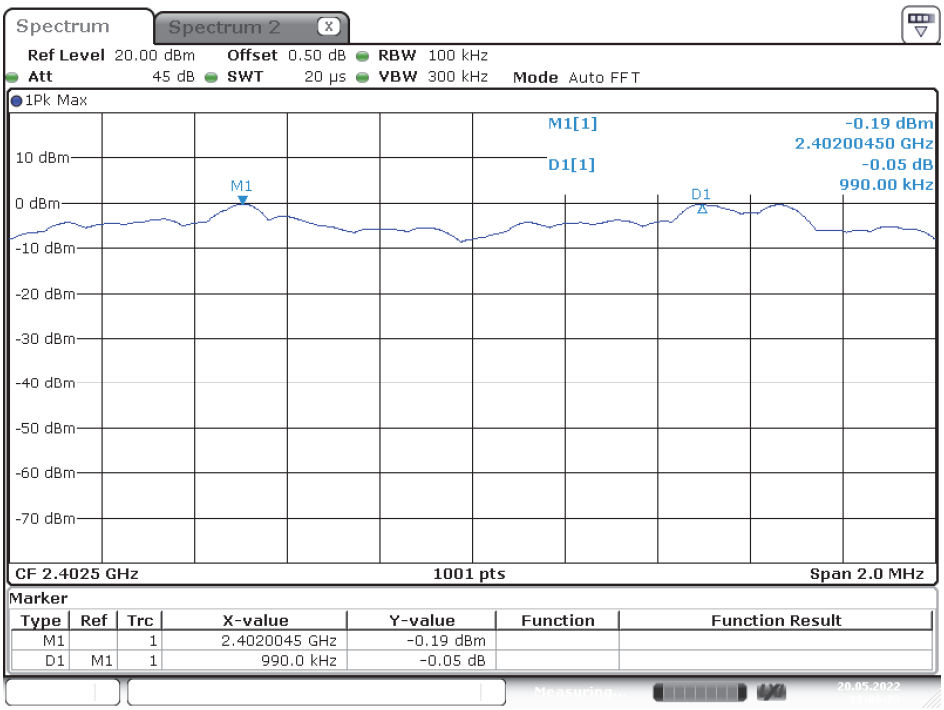
High Channel



Date: 20.MAY.2022 18:08:14

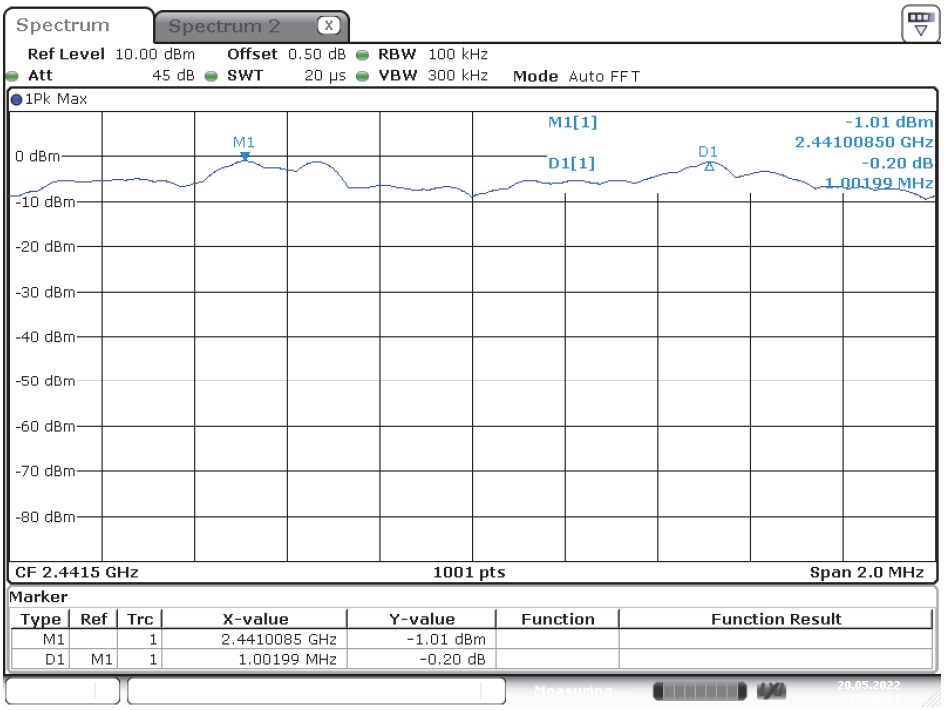
EDR Mode (8DPSK)

Low Channel



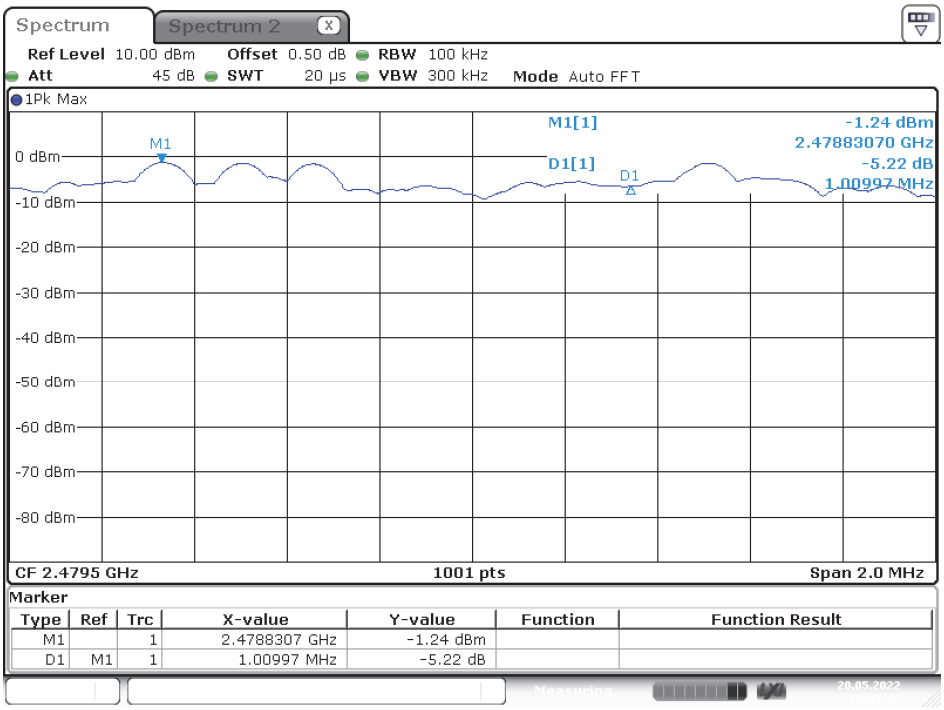
Date: 20.MAY.2022 18:06:23

Middle Channel



Date: 20.MAY.2022 18:06:01

High Channel



Date: 20.MAY.2022 18:05:44

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	0.395	320	31.6	126.40	<400	PASS
DH3	1.639	160	31.6	262.24	<400	PASS
DH5	2.894	110	31.6	318.34	<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	0.388	320	31.6	124.16	<400	PASS
2DH3	1.639	140	31.6	229.46	<400	PASS
2DH5	2.884	100	31.6	288.40	<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	1.637	130	31.6	212.81	<400	PASS
3DH5	2.884	120	31.6	346.08	<400	PASS

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

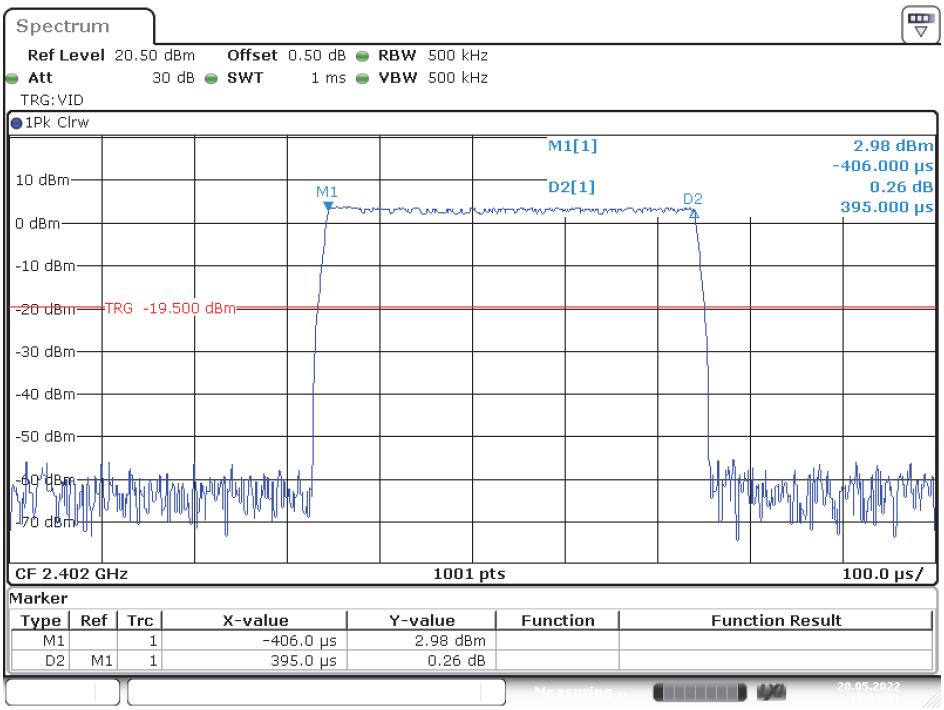
Note 2: Hopping Number = Hopping Number/10 * 10

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

Please refer to the following plots

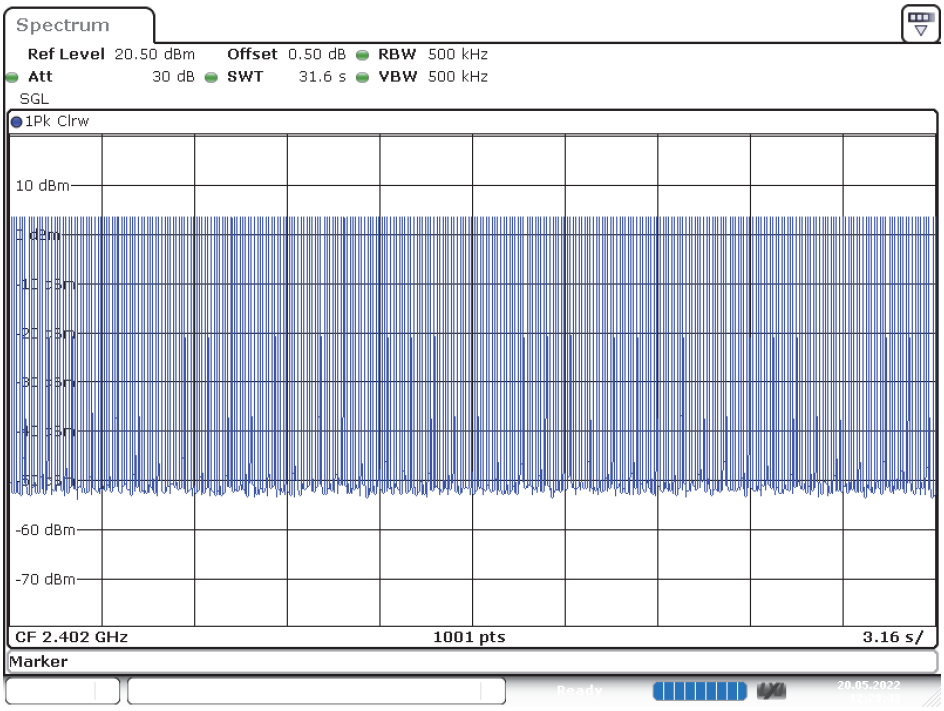
BR Mode (GFSK)

DH1: Pulse Width



Date: 20.MAY.2022 12:37:31

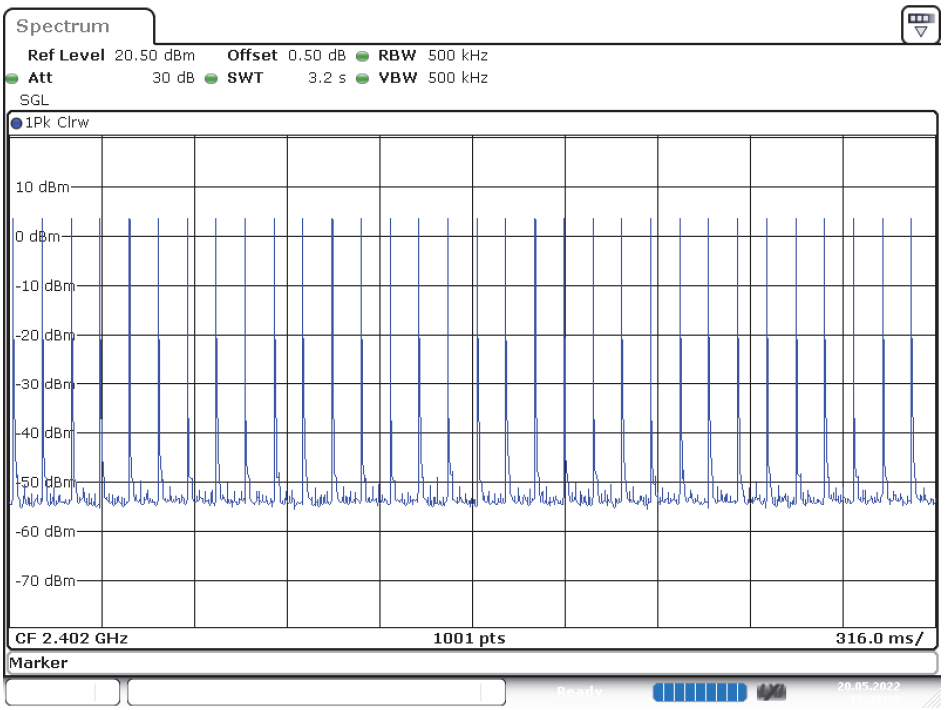
DH1: Hopping Number



Date: 20.MAY.2022 12:29:44

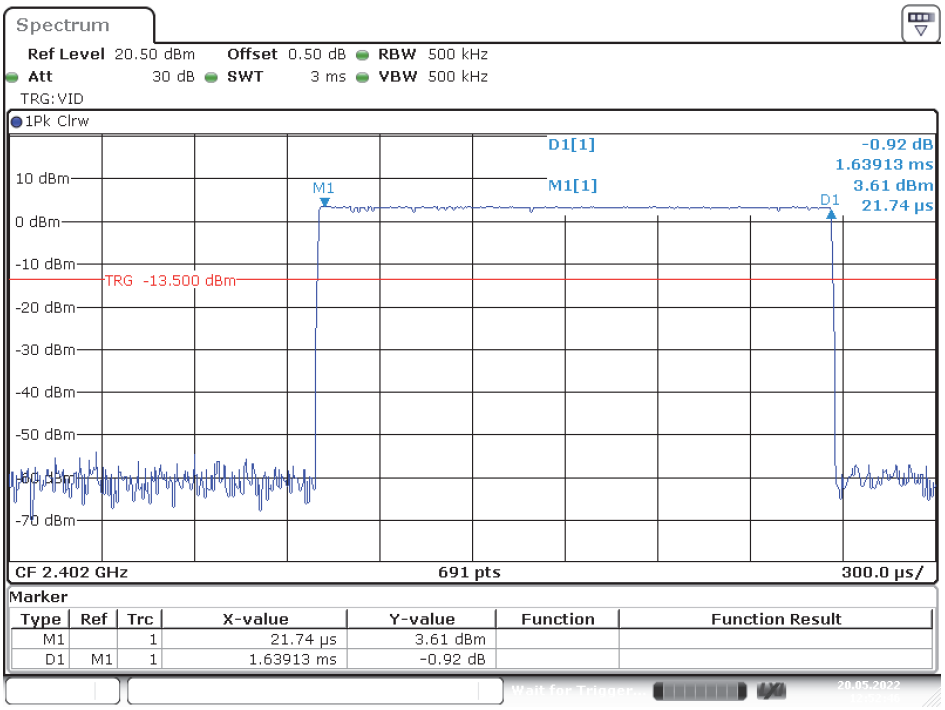
DH1: Hopping Number /10

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



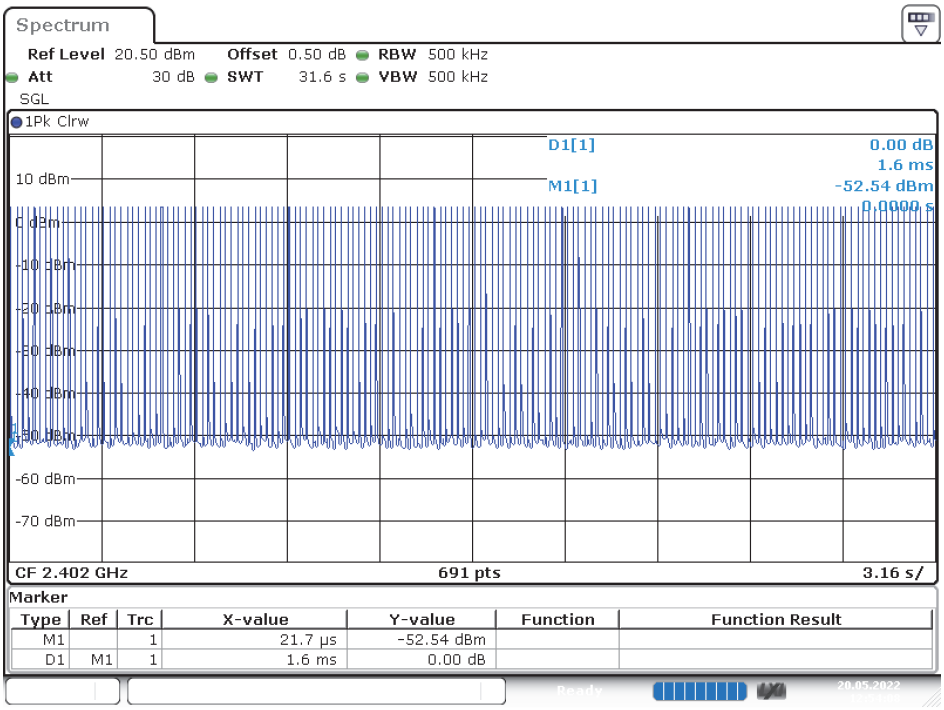
Date: 20.MAY.2022 12:30:32

DH3: Pulse Width



Date: 20.MAY.2022 12:52:47

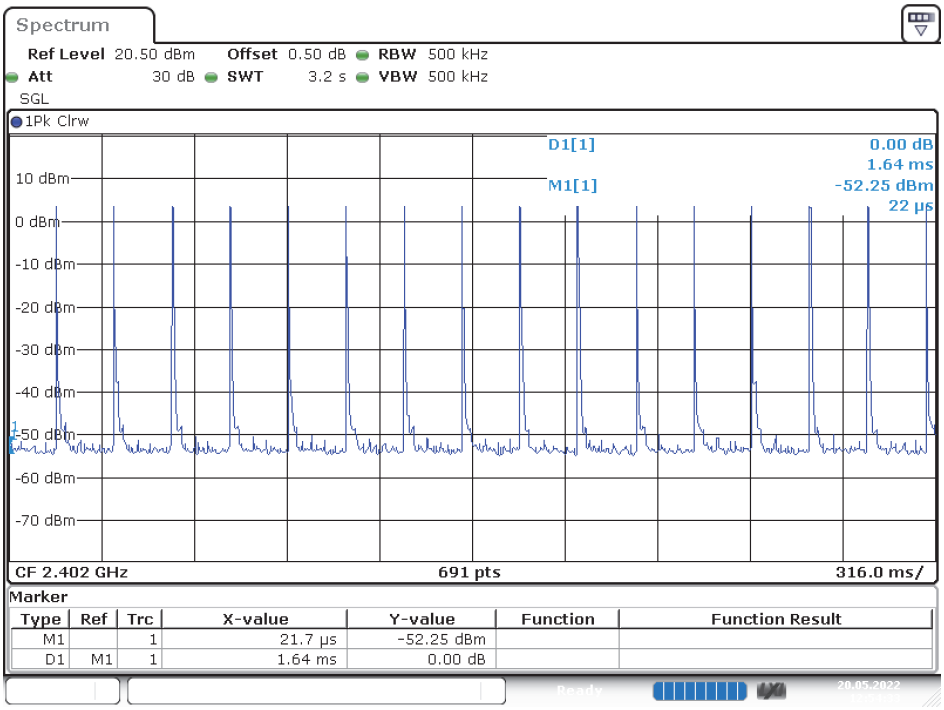
DH3: Hopping Number



Date: 20.MAY.2022 12:54:09

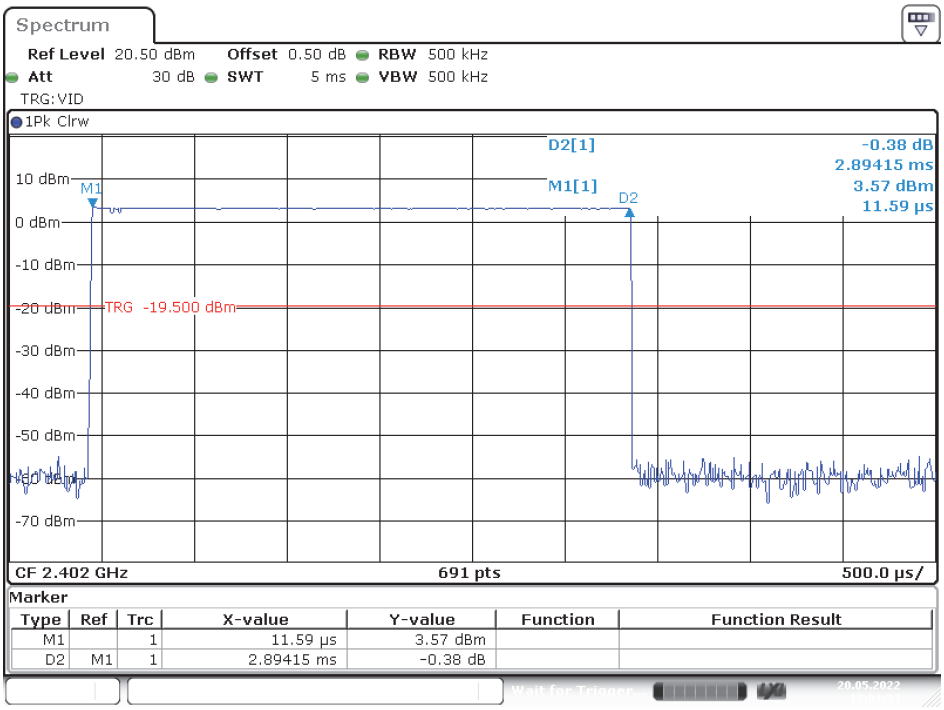
DH3: Hopping Number /10

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



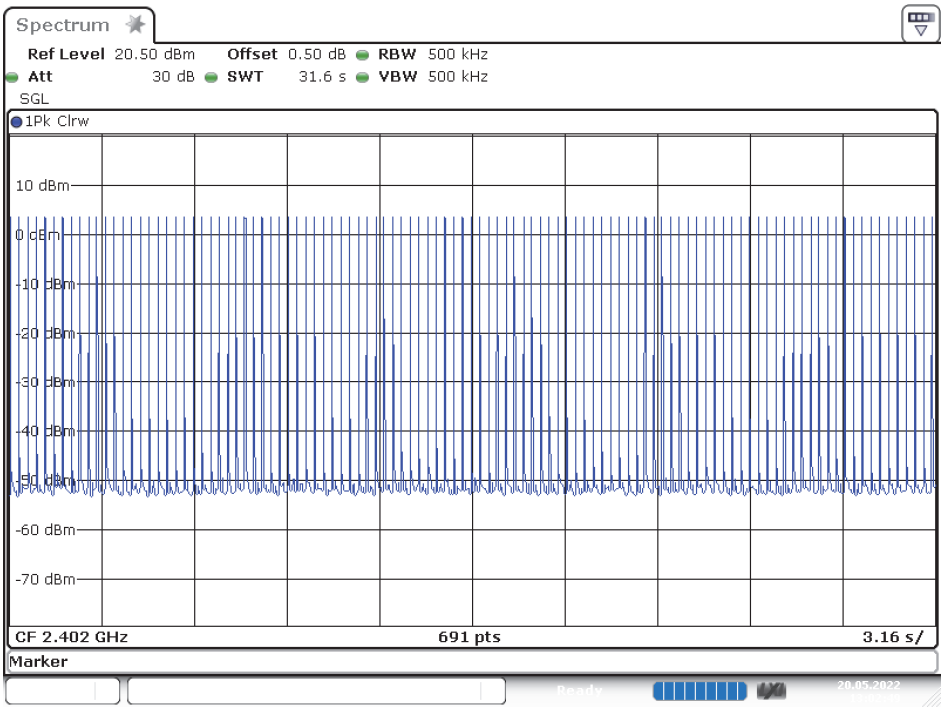
Date: 20.MAY.2022 12:54:33

DH5: Pulse Width



Date: 20.MAY.2022 13:01:34

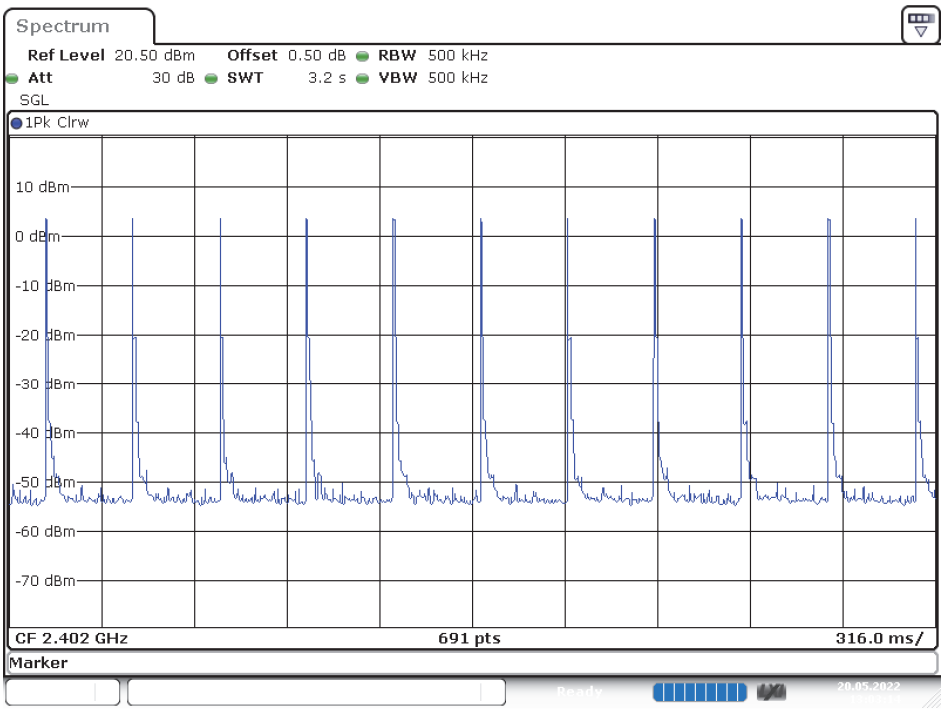
DH5: Hopping Number



Date: 20.MAY.2022 13:02:50

DH5: Hopping Number /10

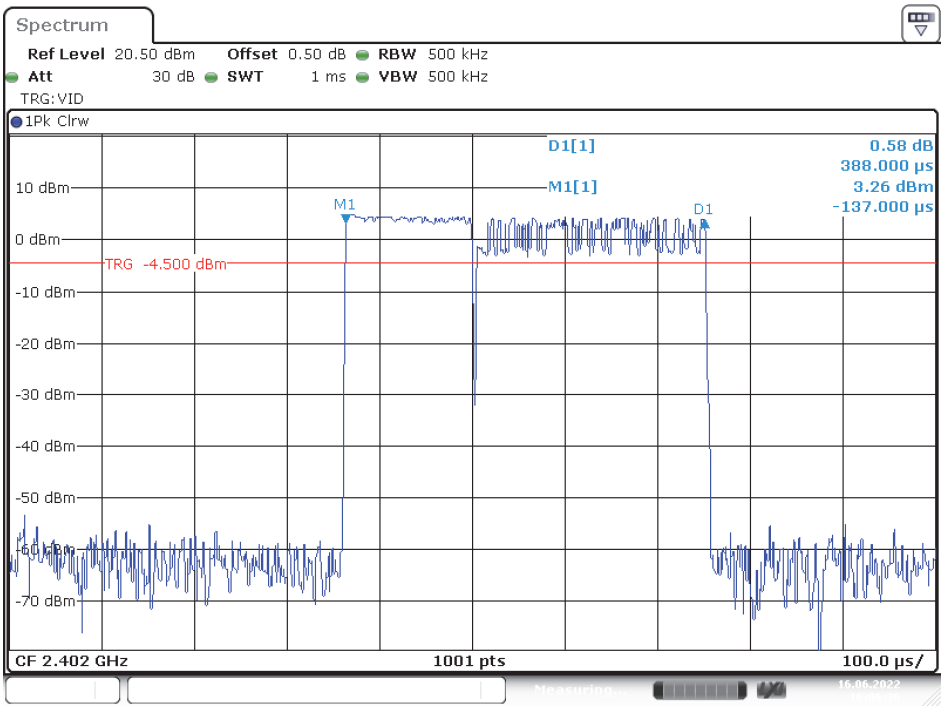
(Hopping Number = 11 in 1/10 period of highest signals, Second High signals were other channel)



Date: 20.MAY.2022 13:03:14

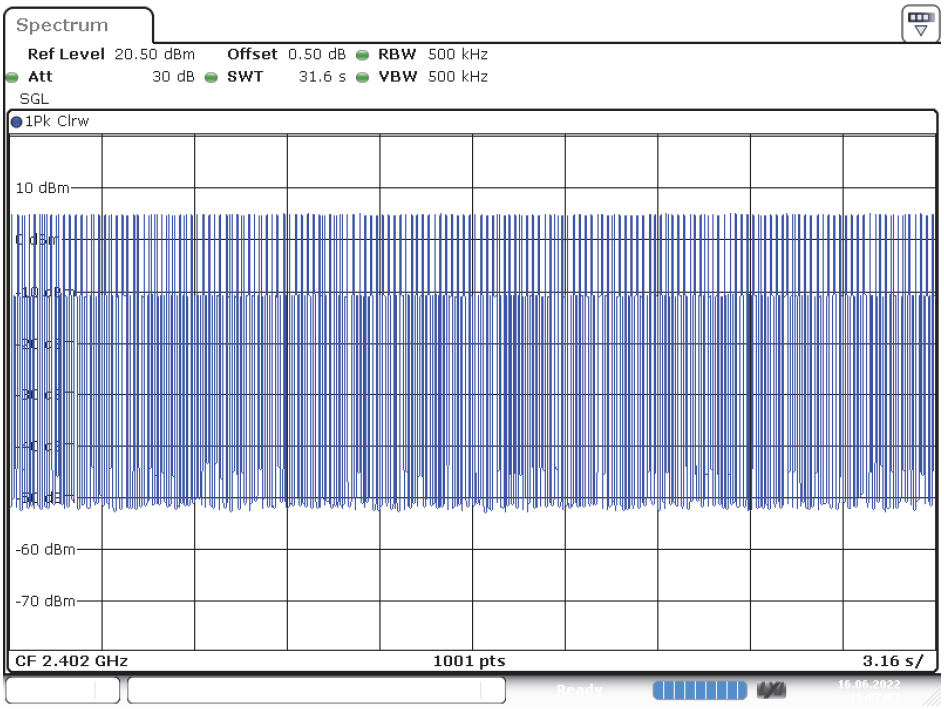
EDR Mode (π/4-DQPSK)

2DH1: Pulse Width



Date: 16.JUN.2022 16:06:36

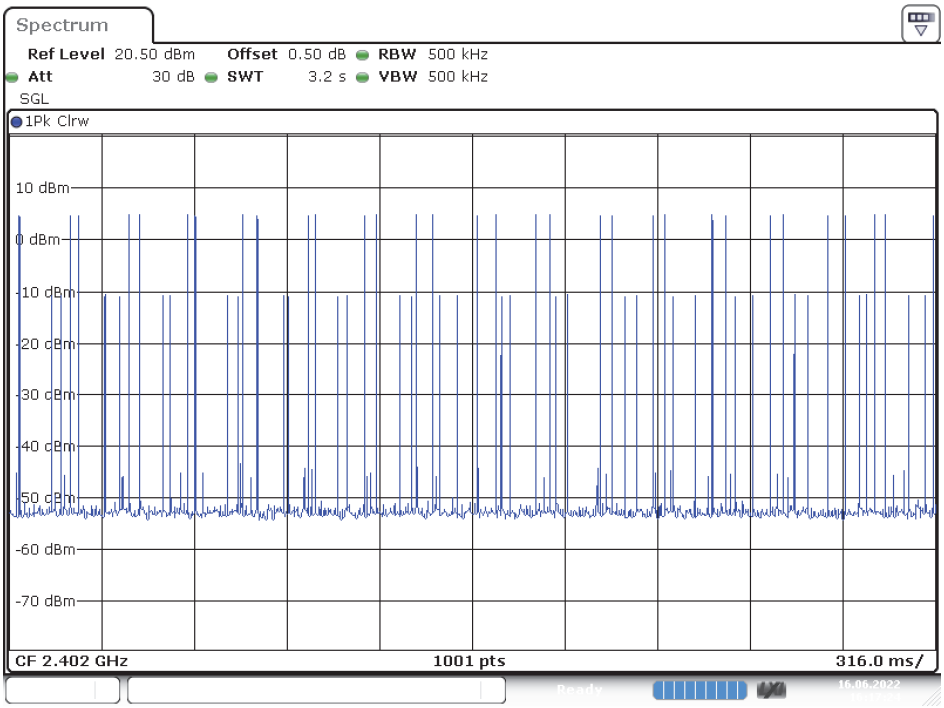
2DH1: Hopping Number



Date: 16.JUN.2022 16:07:08

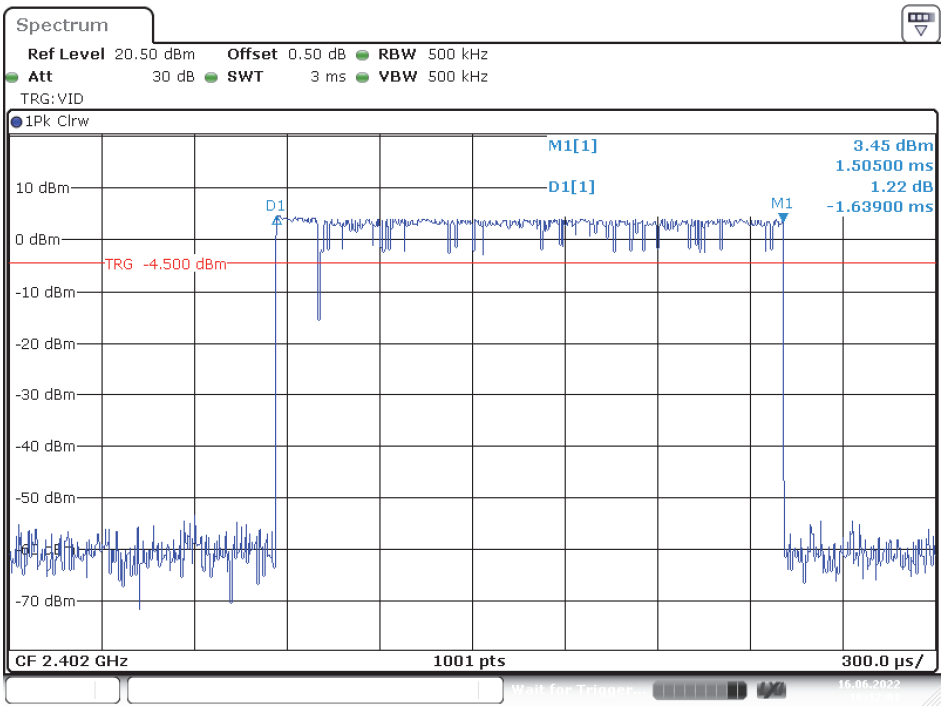
2DH1: Hopping Number /10

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



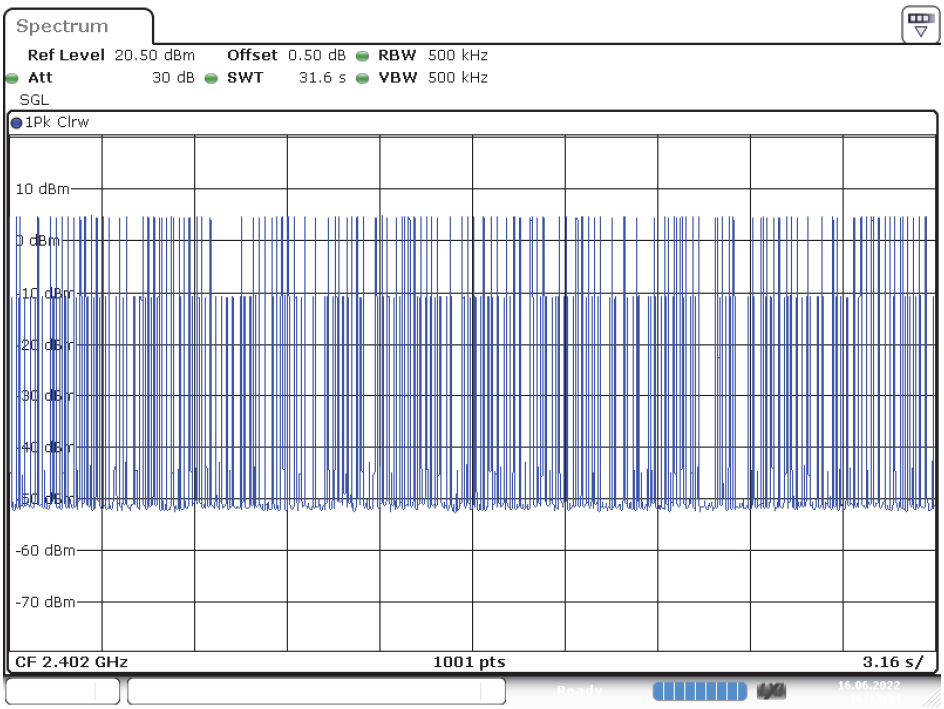
Date: 16.JUN.2022 16:17:23

2DH3: Pulse Width



Date: 16.JUN.2022 16:12:02

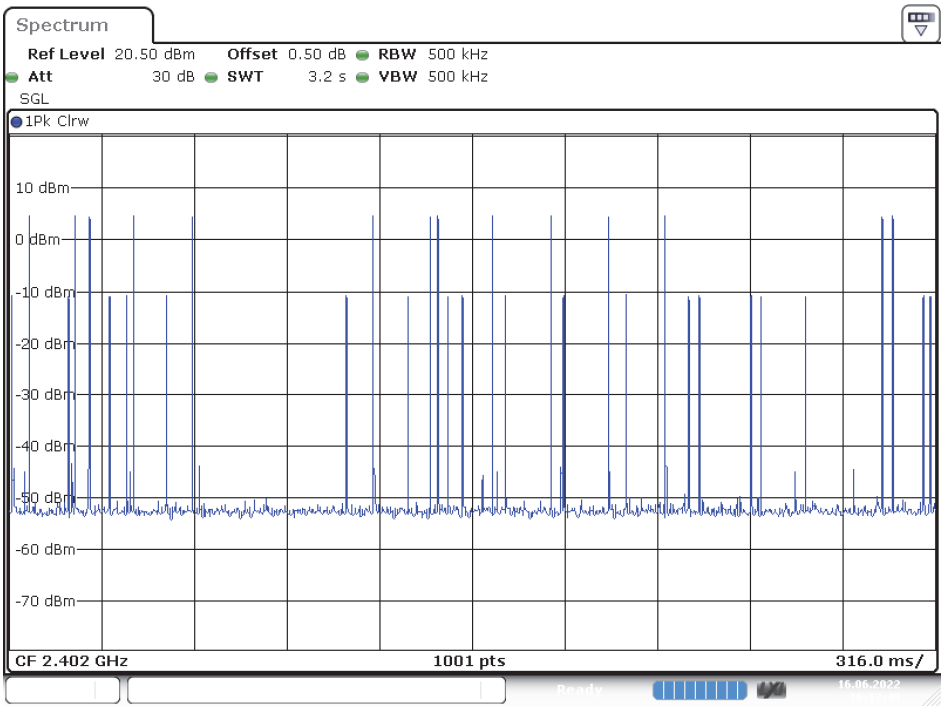
2DH3: Hopping Number



Date: 16.JUN.2022 16:12:34

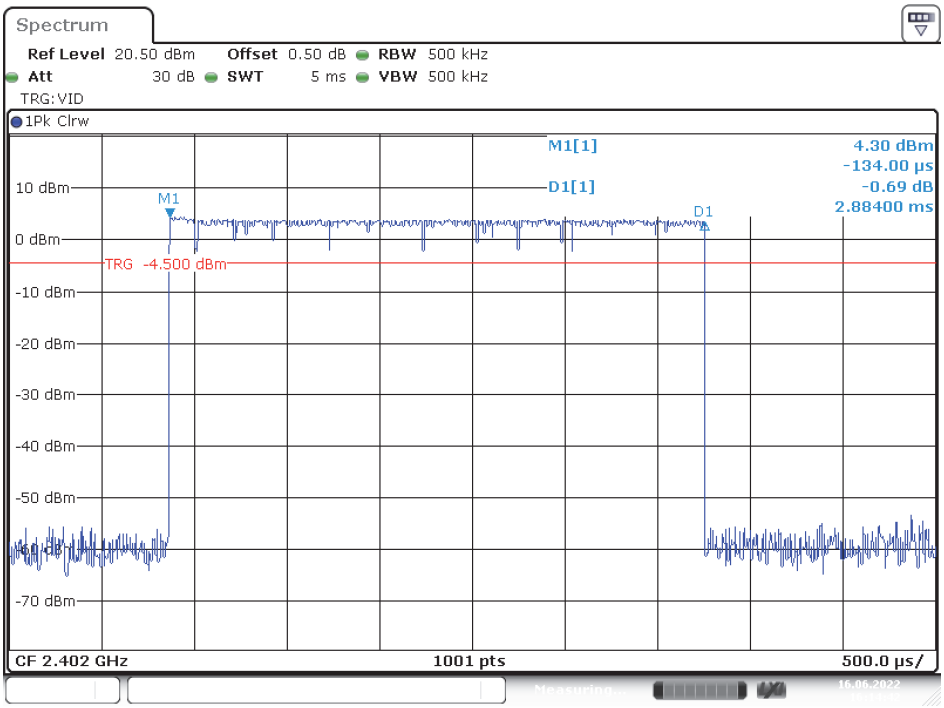
2DH3: Hopping Number /10

(Hopping Number = 14 in 1/10 period of highest signals, Second High signals were other channel)



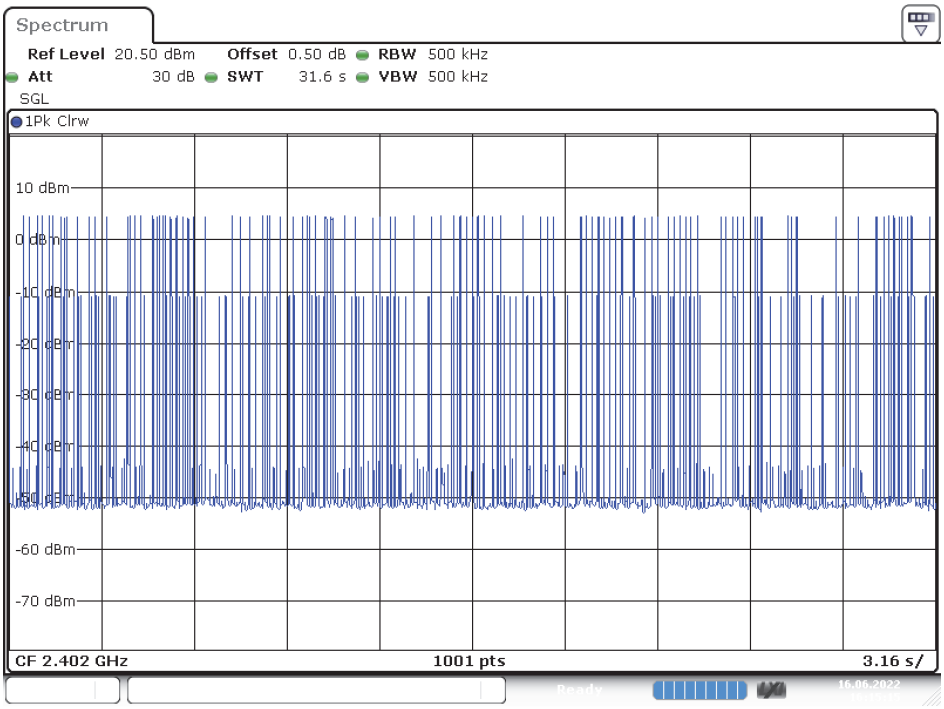
Date: 16.JUN.2022 16:12:49

2DH5: Pulse Width



Date: 16.JUN.2022 16:14:43

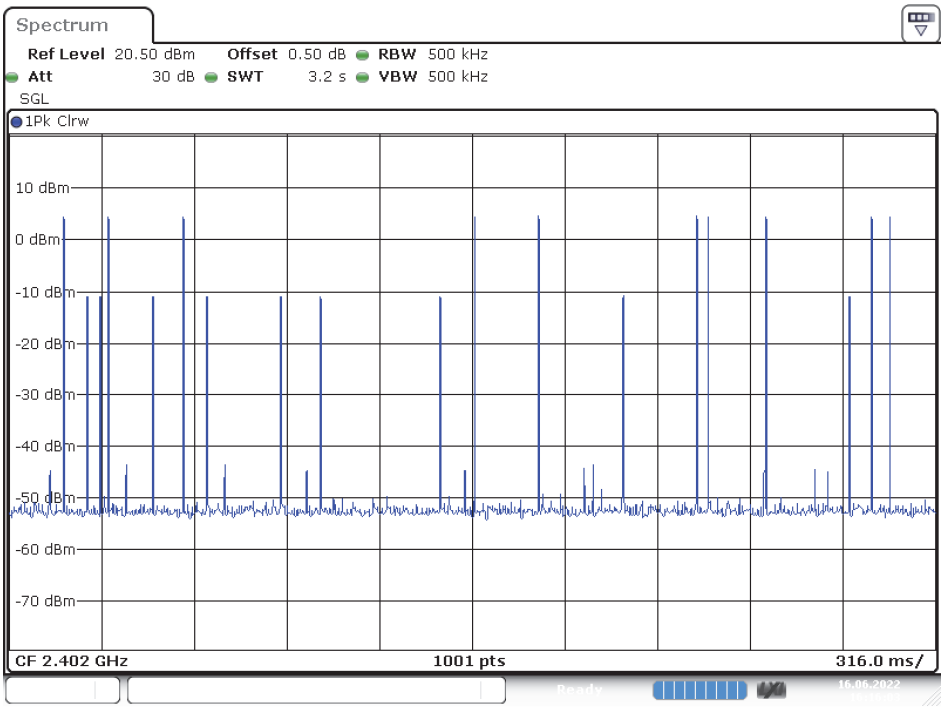
2DH5: Hopping Number



Date: 16.JUN.2022 16:15:15

2DH5: Hopping Number /10

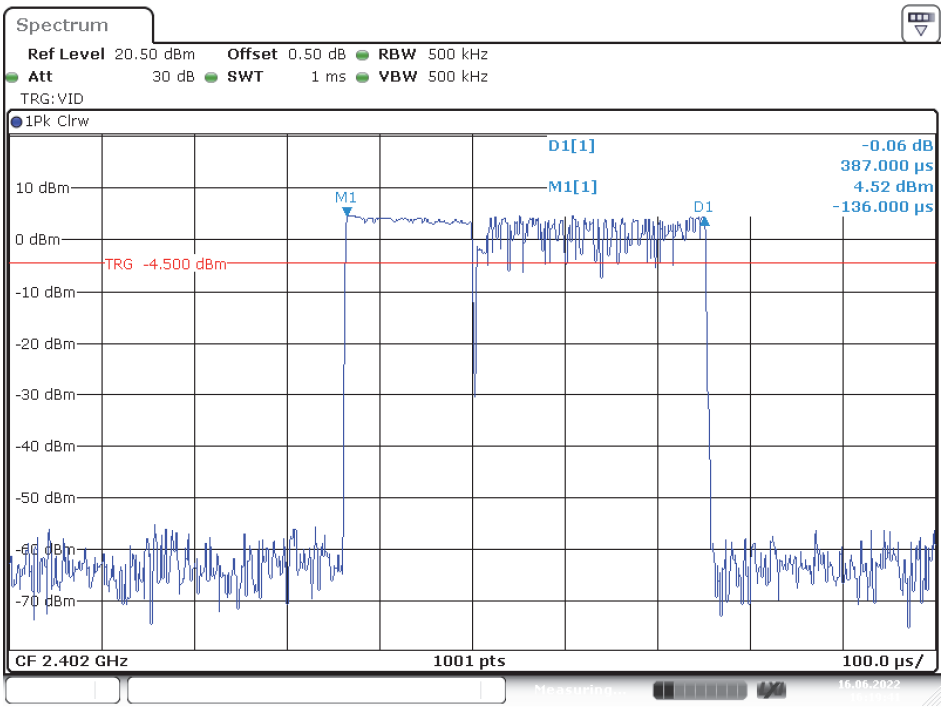
(Hopping Number = 10 in 1/10 period of highest signals, Second High signals were other channel)



Date: 16.JUN.2022 16:16:04

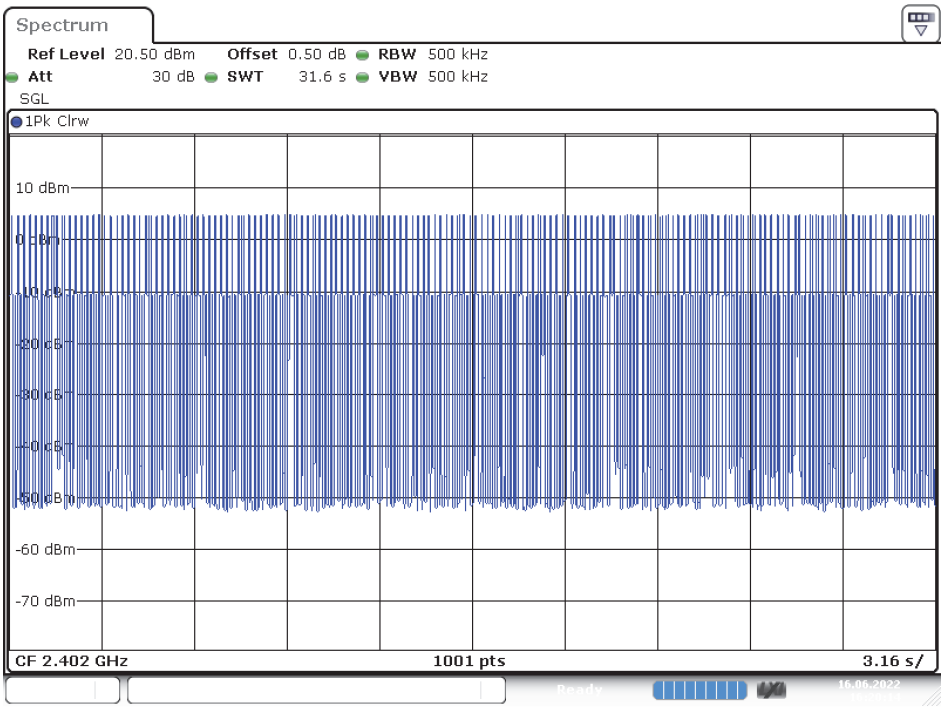
EDR Mode (8DPSK)

3DH1: Pulse Width



Date: 16.JUN.2022 16:19:42

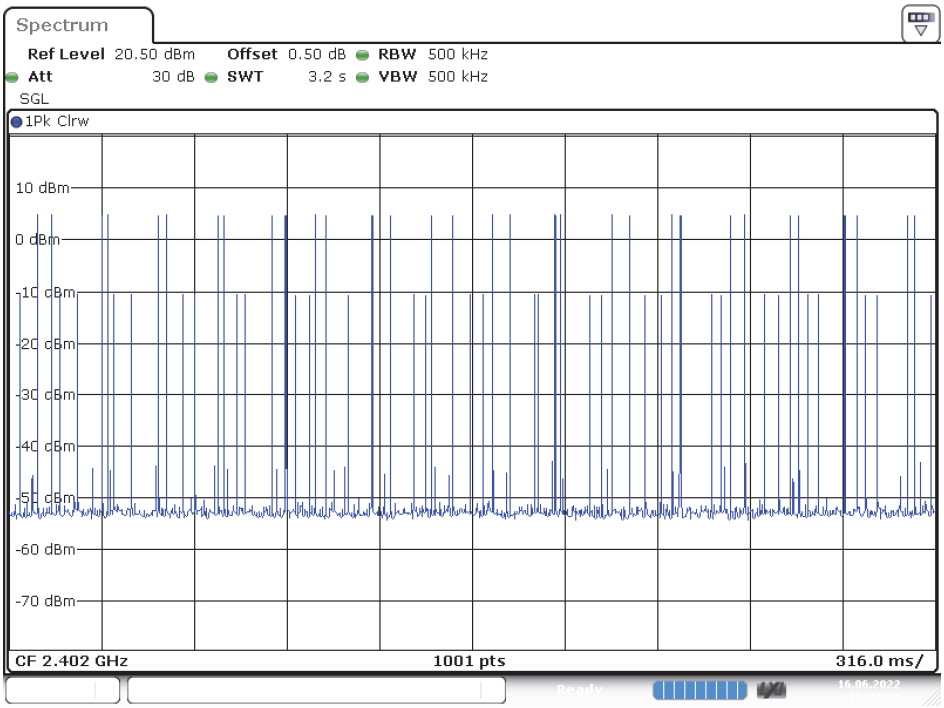
3DH1: Hopping Number



Date: 16.JUN.2022 16:20:14

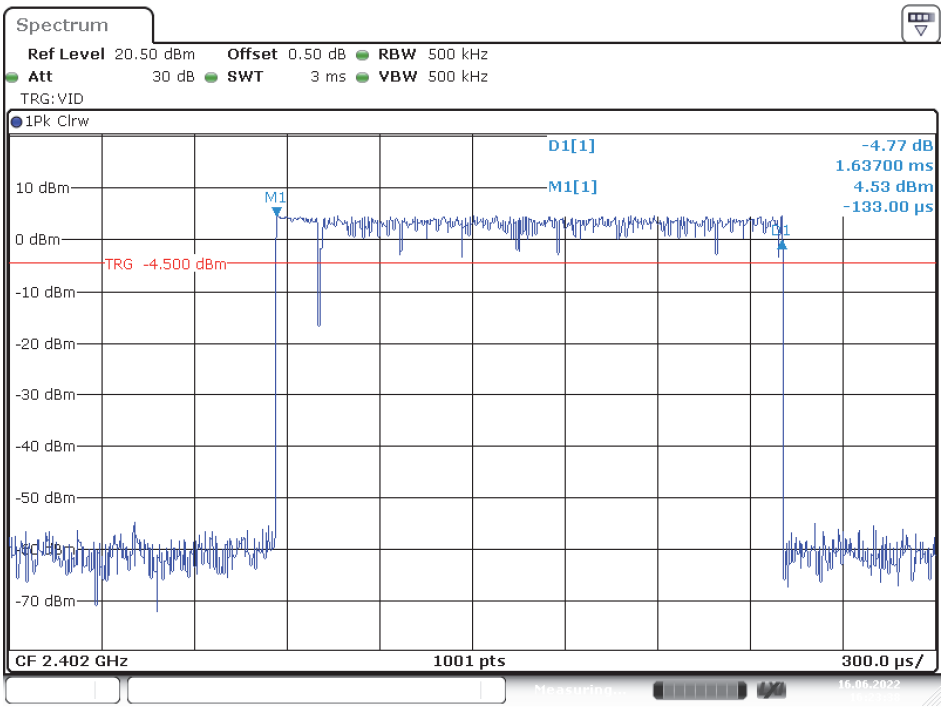
3DH1: Hopping Number /10

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



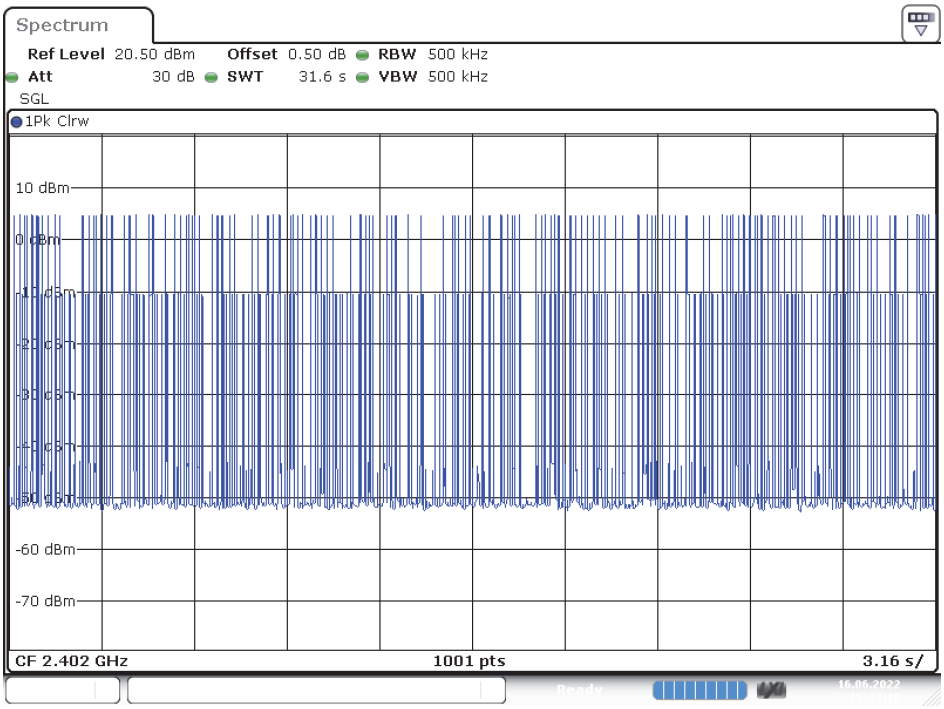
Date: 16.JUN.2022 16:20:24

3DH3: Pulse Width



Date: 16.JUN.2022 16:23:38

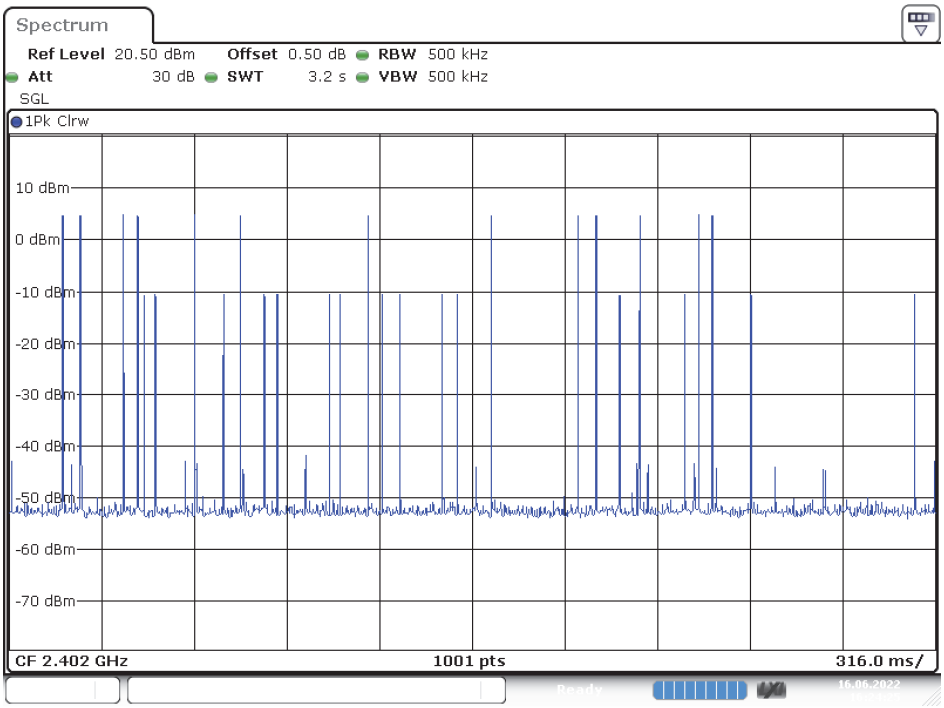
3DH3: Hopping Number



Date: 16.JUN.2022 16:24:10

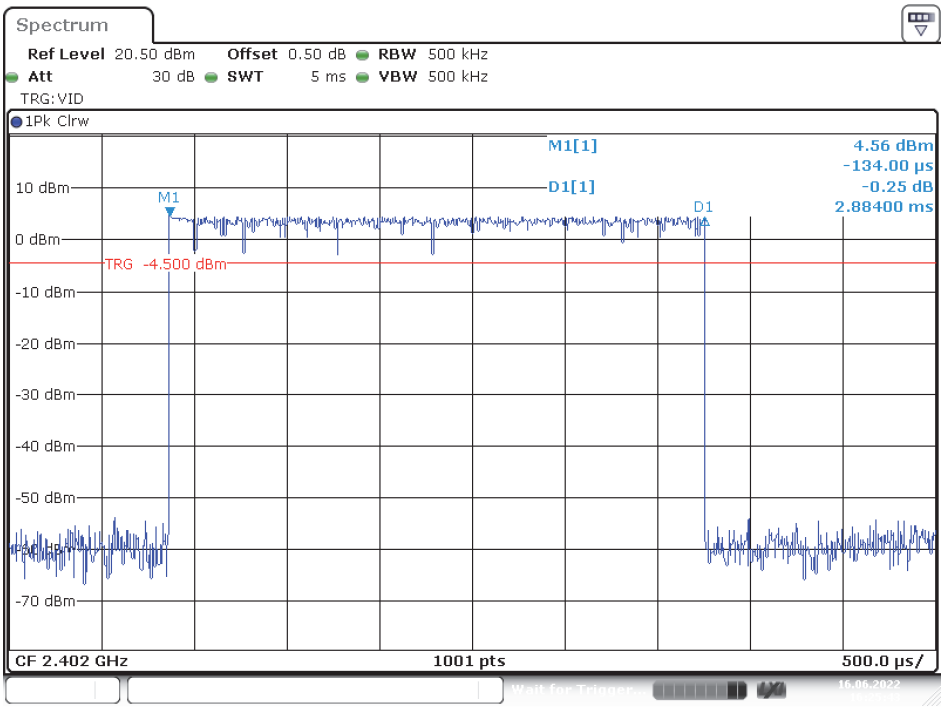
3DH3: Hopping Number /10

(Hopping Number = 13 in 1/10 period of highest signals, Second High signals were other channel)



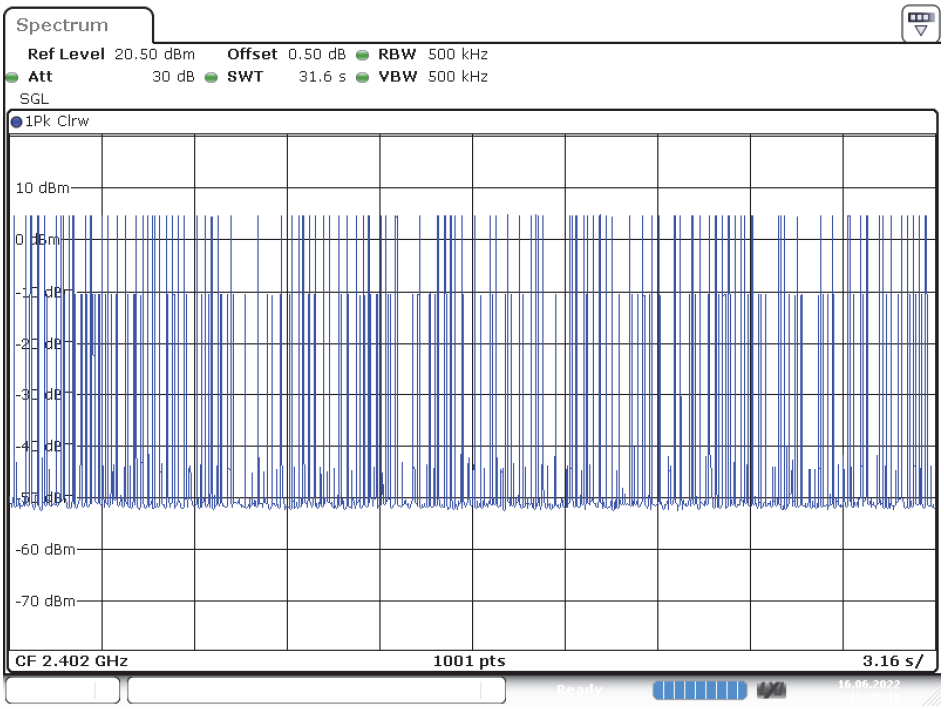
Date: 16.JUN.2022 16:24:25

3DH5: Pulse Width



Date: 16.JUN.2022 16:25:44

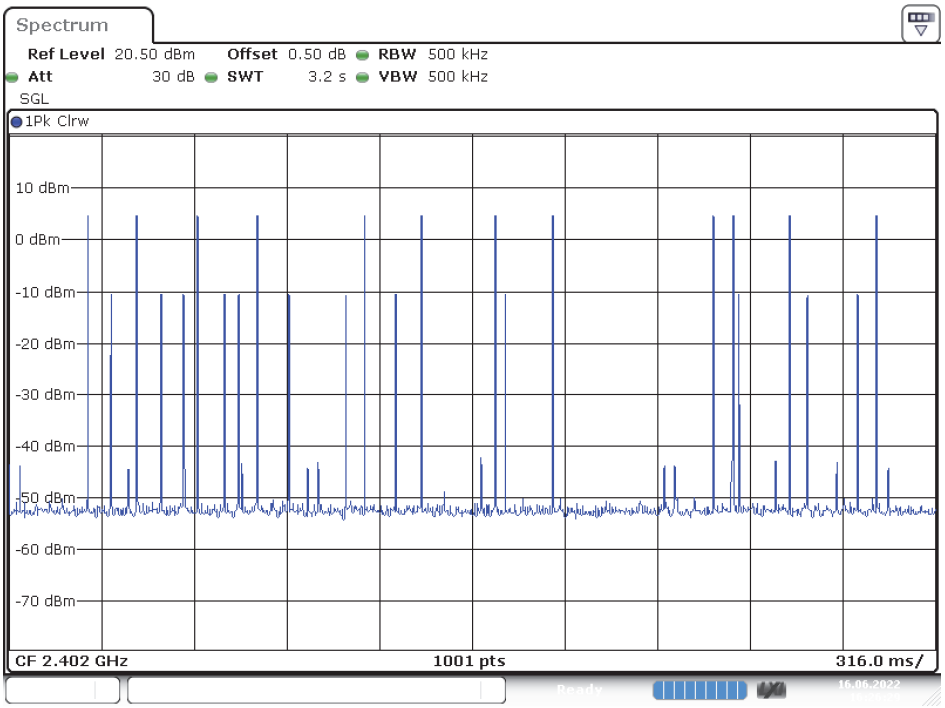
3DH5: Hopping Number



Date: 16.JUN.2022 16:26:16

3DH5: Hopping Number /10

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



Date: 16.JUN.2022 16:26:29

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

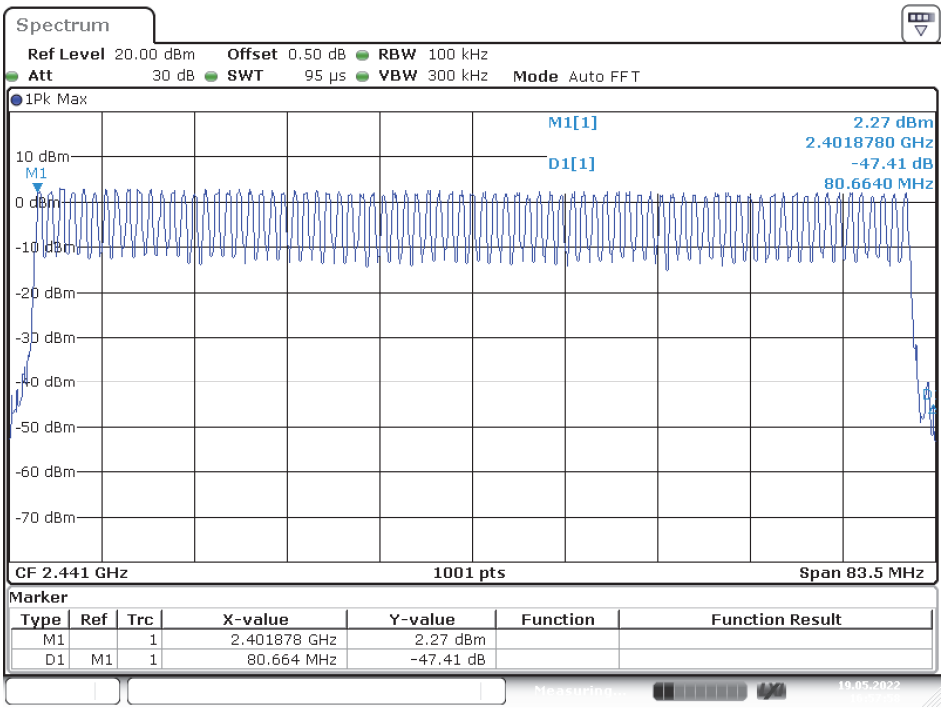
1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Set the EUT in hopping mode from first channel to last.
3. By using the Max-Hold function record the Quantity of the channel.

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

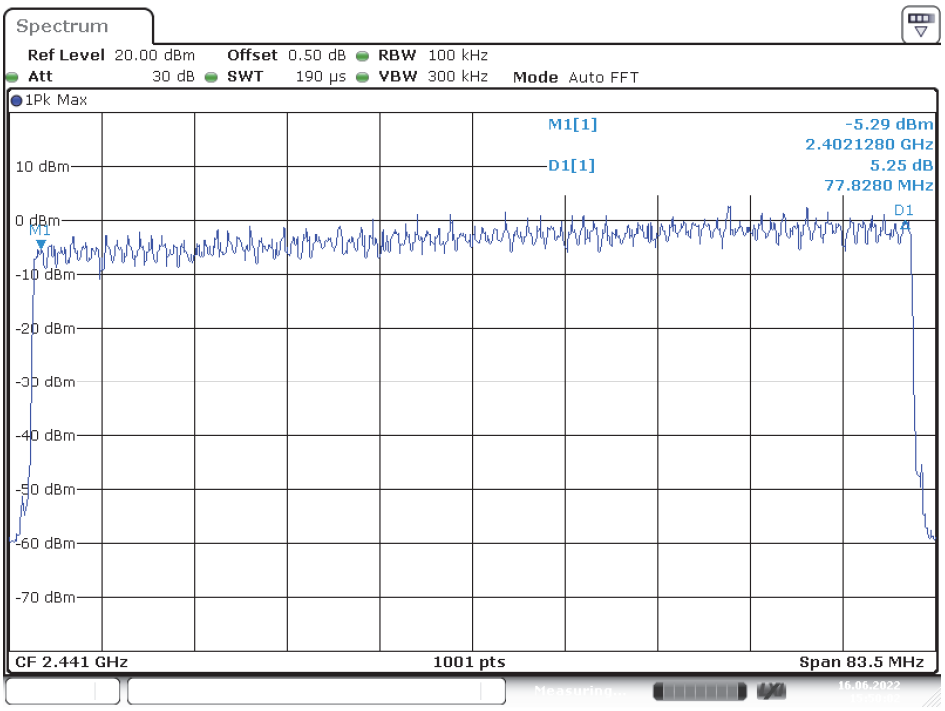
Please refer to the following plots

BR Mode (GFSK)



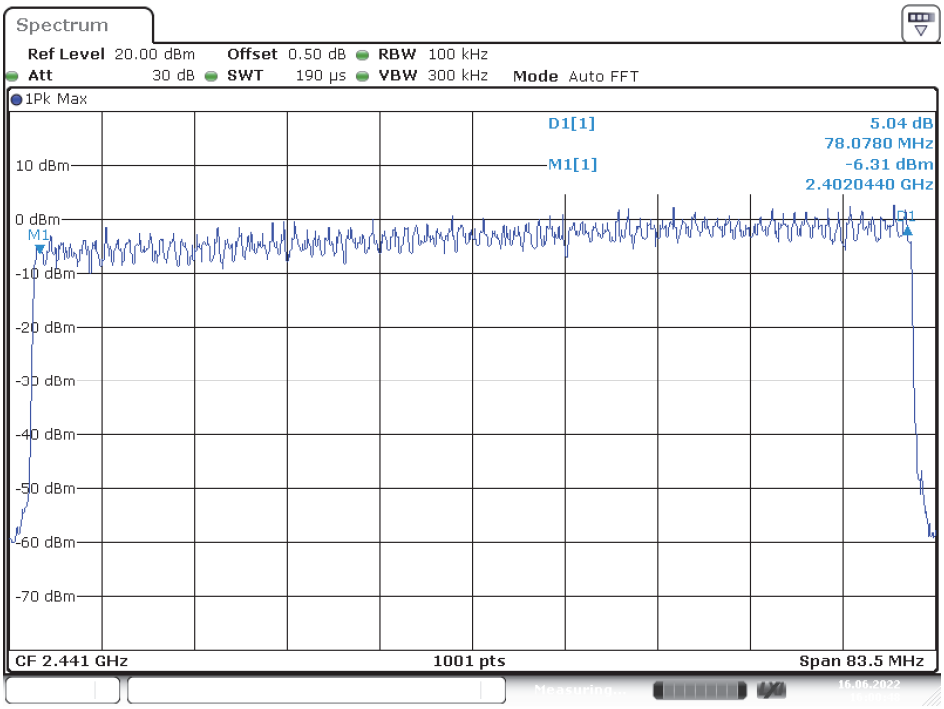
Date: 19.MAY.2022 16:57:58

EDR Mode (π/4-DQPSK)



Date: 16.JUN.2022 15:50:03

EDR Mode (8DPSK)



Date: 16.JUN.2022 16:00:48

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

Peak Conducted Output Power

Channel	Frequency (MHz)	Peak Conducted Output Power		Limit (W)	Result
		(dBm)	(W)		
BR Mode (GFSK)					
Low	2402	3.87	0.002	0.125	Compliance
Middle	2441	3.42	0.002	0.125	Compliance
High	2480	2.91	0.002	0.125	Compliance
EDR Mode (π/4-DQPSK)					
Low	2402	4.02	0.003	0.125	Compliance
Middle	2441	3.57	0.002	0.125	Compliance
High	2480	3.05	0.002	0.125	Compliance
EDR Mode (8DPSK)					
Low	2402	4.01	0.003	0.125	Compliance
Middle	2441	3.53	0.002	0.125	Compliance
High	2480	3.03	0.002	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

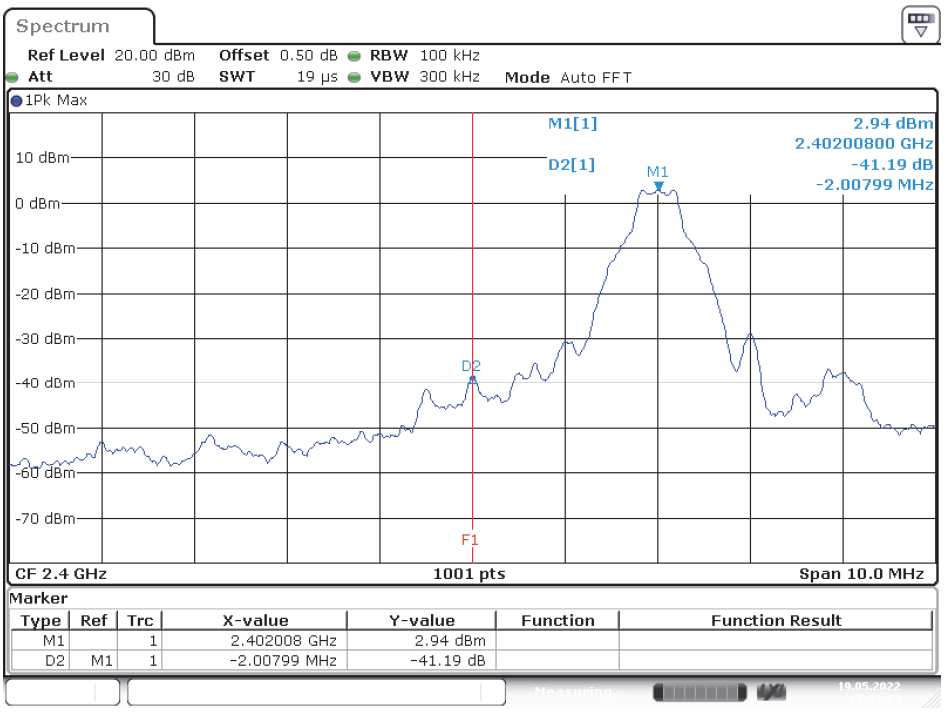
14.3. Test Results

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
BR Mode (GFSK)				
Low	2402	41.19	≥ 20	PASS
High	2480	46.62	≥ 20	PASS
BR Hopping Mode (GFSK)				
Low	2402-2480	42.64	≥ 20	PASS
High	2402-2480	47.79	≥ 20	PASS
EDR Mode (π/4-DQPSK)				
Low	2402	48.16	≥ 20	PASS
High	2480	41.75	≥ 20	PASS
EDR Hopping Mode (π/4-DQPSK)				
Low	2402-2480	57.80	≥ 20	PASS
High	2402-2480	60.61	≥ 20	PASS
EDR Mode (8DPSK)				
Low	2402	48.76	≥ 20	PASS
High	2480	43.56	≥ 20	PASS
EDR Hopping Mode (8DPSK)				
Low	2402-2480	59.33	≥ 20	PASS
High	2402-2480	59.77	≥ 20	PASS

Please refer to the following plots.

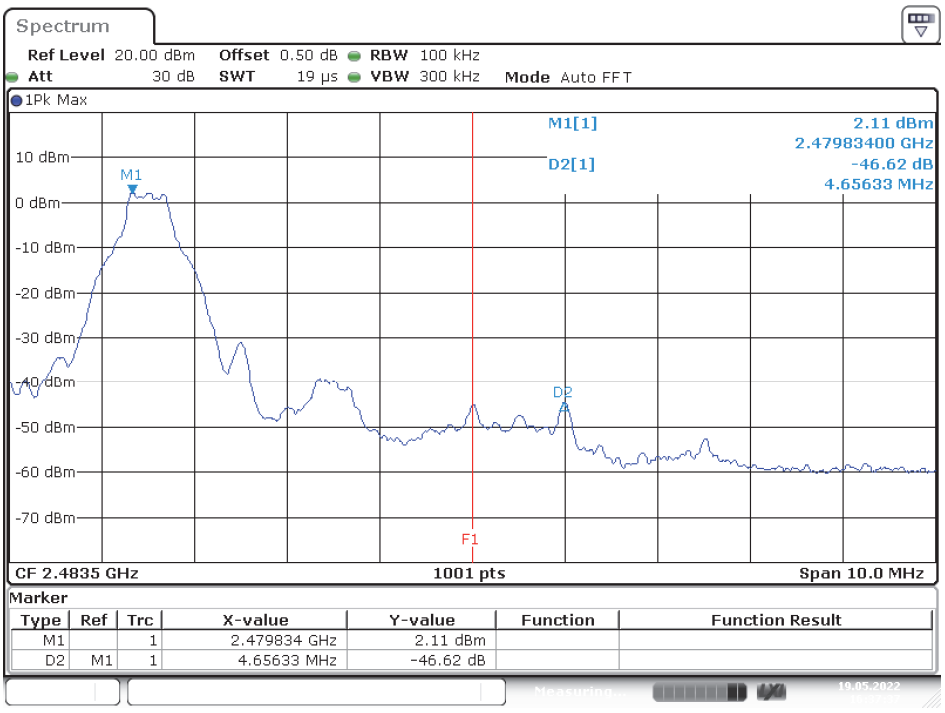
BR Mode (GFSK)

Band Edge, CH Low



Date: 19.MAY.2022 16:33:04

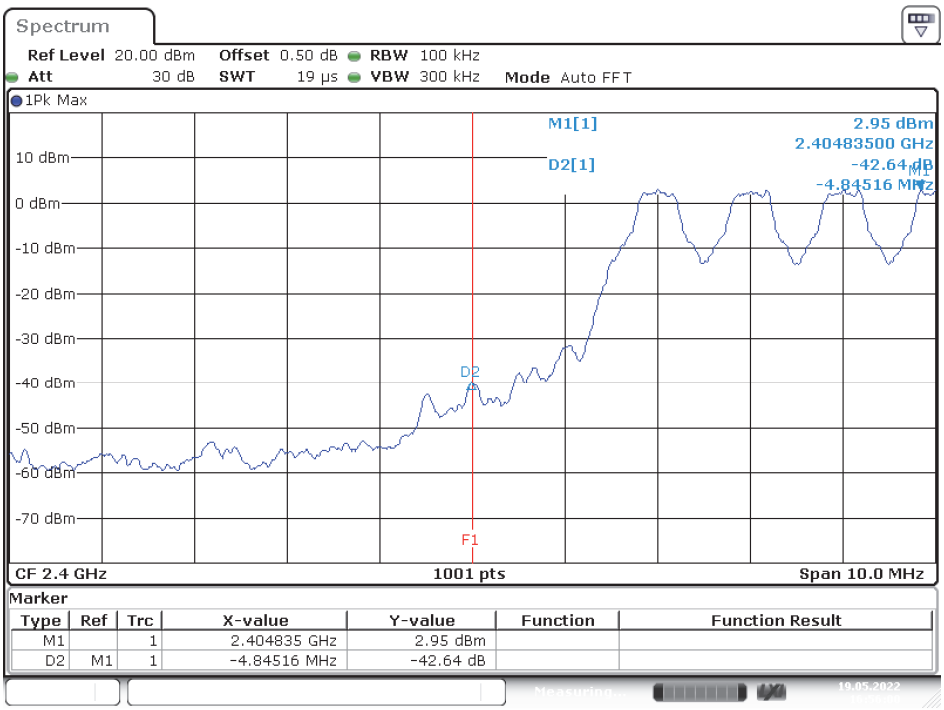
Band Edge, CH High



Date: 19.MAY.2022 16:37:37

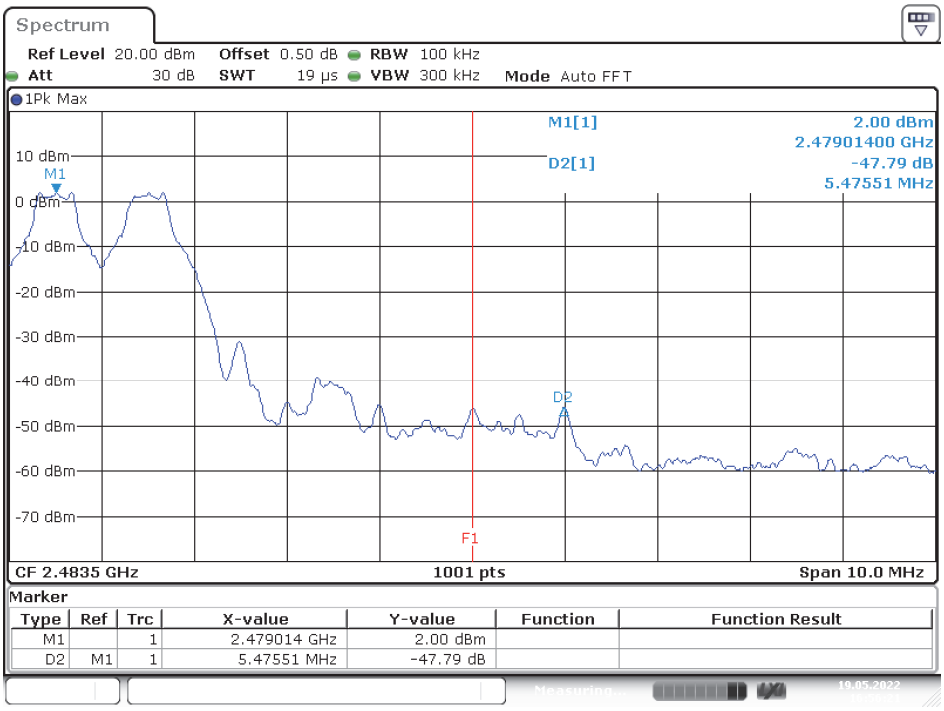
BR Hopping Mode (GFSK)

Band Edge, CH Low



Date: 19.MAY.2022 16:56:00

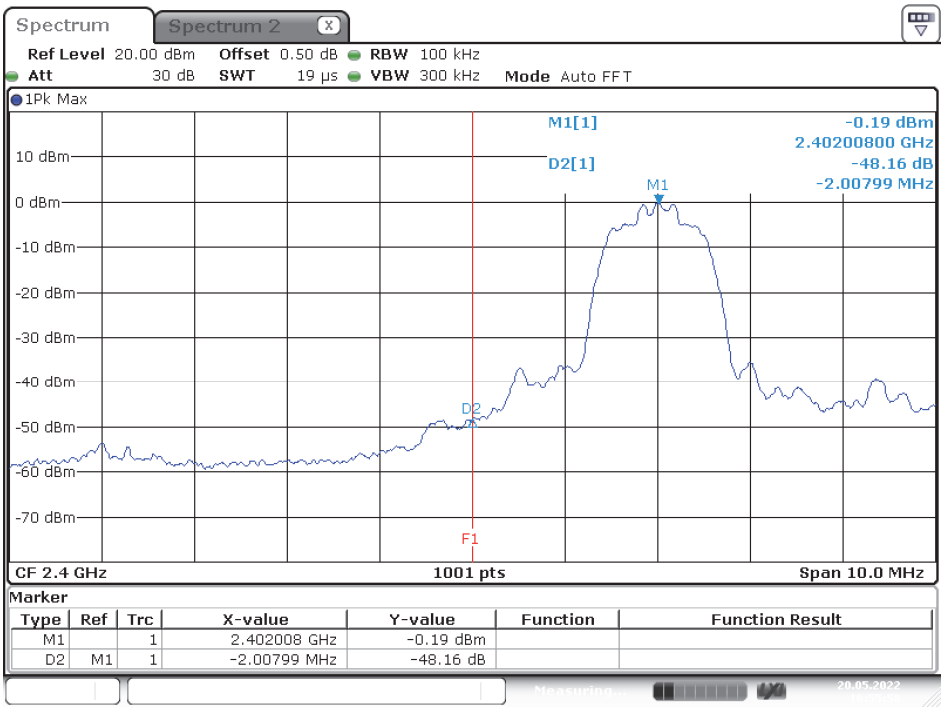
Band Edge, CH High



Date: 19.MAY.2022 16:56:21

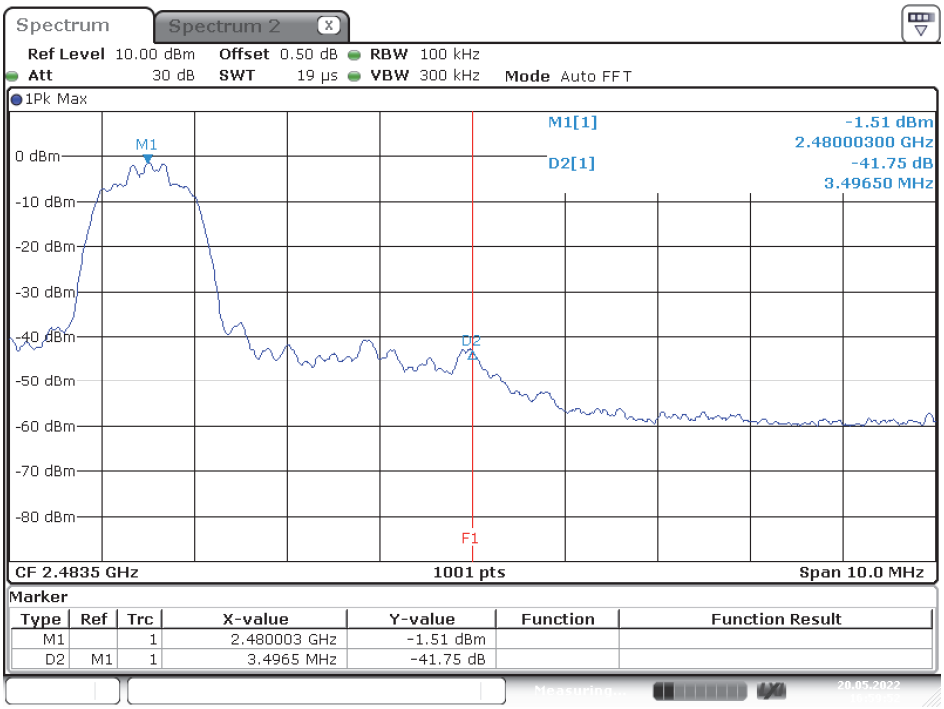
EDR Mode (π/4-DQPSK)

Band Edge, CH Low



Date: 20.MAY.2022 16:55:58

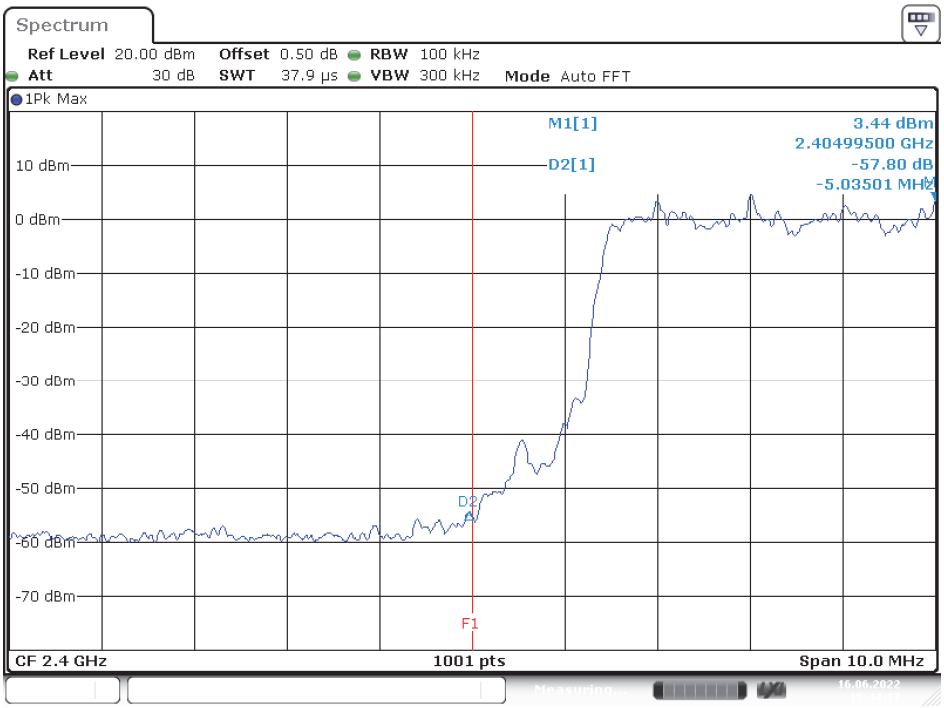
Band Edge, CH High



Date: 20.MAY.2022 16:59:52

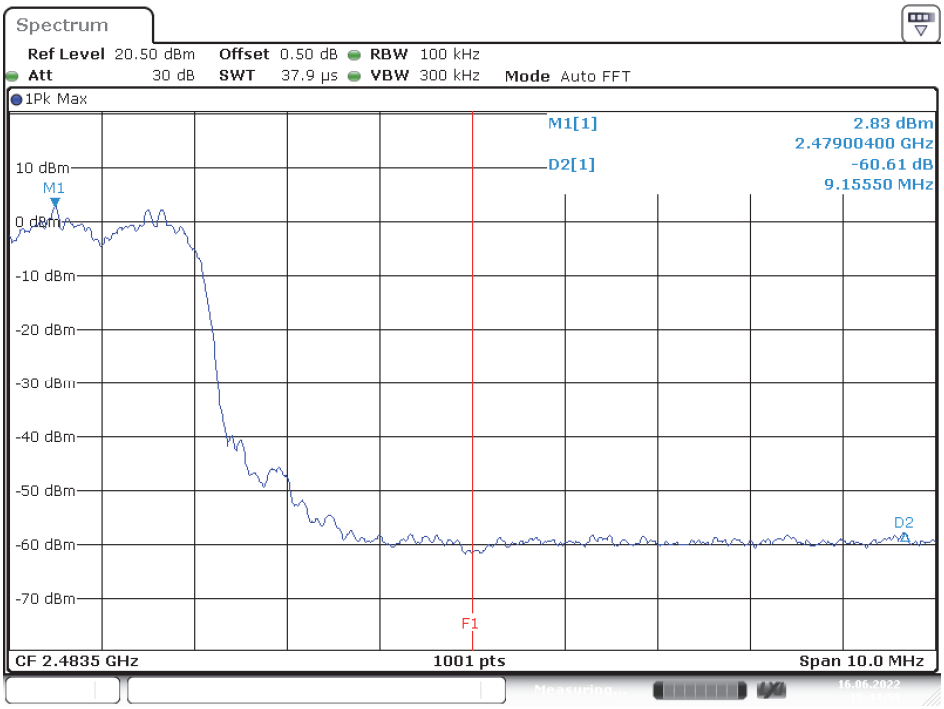
EDR Hopping Mode (π/4-DQPSK)

Band Edge, CH Low



Date: 16.JUN.2022 15:44:17

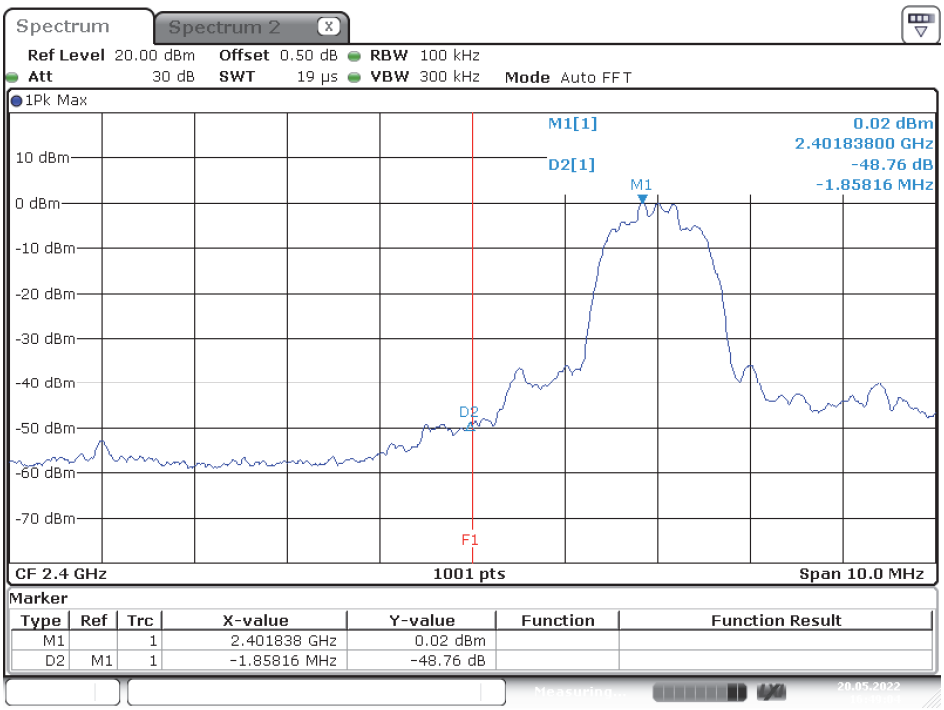
Band Edge, CH High



Date: 16.JUN.2022 15:44:59

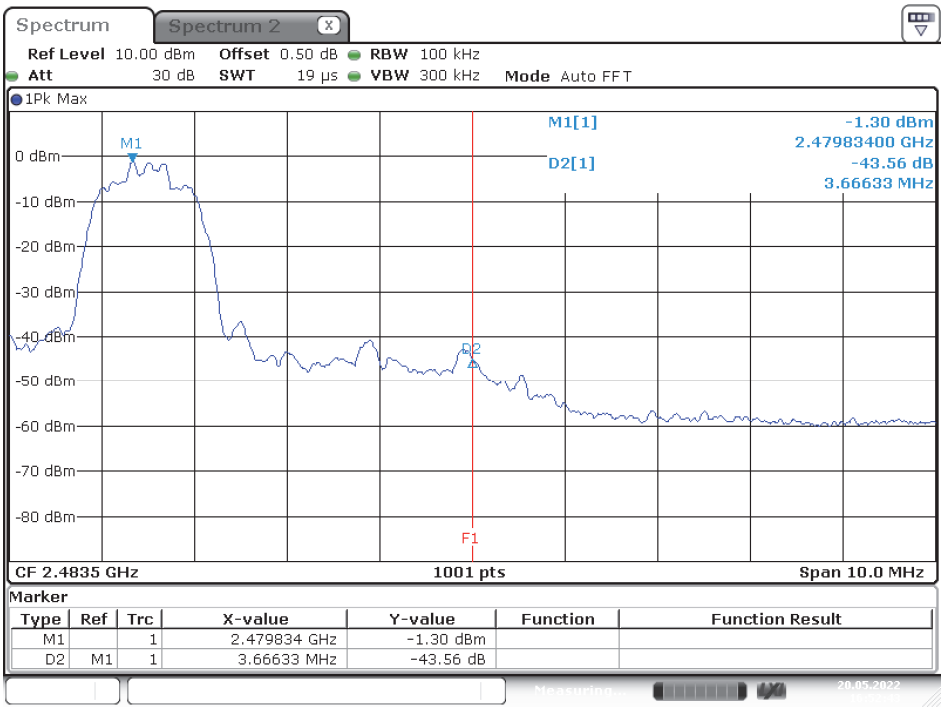
EDR Mode (8DPSK)

Band Edge, CH Low



Date: 20.MAY.2022 16:49:05

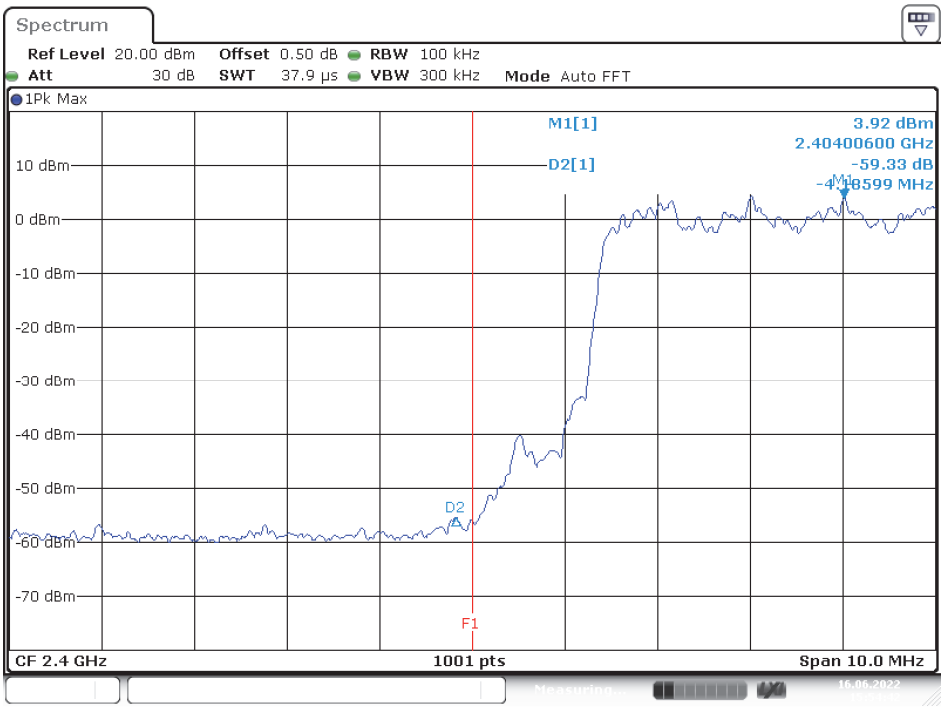
Band Edge, CH High



Date: 20.MAY.2022 16:52:43

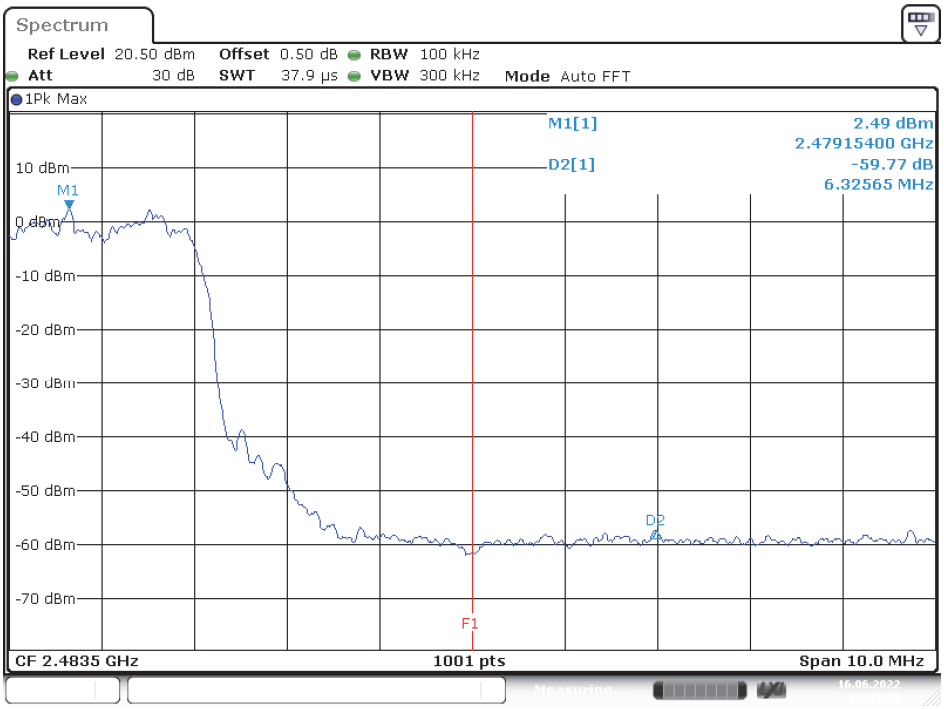
EDR Hopping Mode (8DPSK)

Band Edge, CH Low



Date: 16.JUN.2022 15:54:42

Band Edge, CH High



Date: 16.JUN.2022 15:55:56

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