FCC Part 15.247

TEST REPORT

For

Waylens Inc.

2711 Centerville Road - Suite 400, Wilmington, Delaware, United States, 19808

FCC ID: 2AKAF-TW06V1C

Report Type:	**Product Type:**
Original Report	Secure 4K

Report Producer : Jojo Lu

Report Number : RXZ211109004RF02

Report Date : 2022-02-18

Reviewed By: Andy Shih Andy. Shih

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Revision History

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
0.0	RXZ211109004	RXZ211109004RF02	2022-02-18	Original Report	Jojo Lu

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1. General Information

1.1. Product Description for Equipment under Test (EUT)

Applicant	Waylens Inc.
	2711 Centerville Road - Suite 400, Wilmington, Delaware, United States, 19808
Manufacturer	Waylens Inc.
	2711 Centerville Road - Suite 400, Wilmington, Delaware, United States, 19808
Brand(Trade) Name	N/A
Product (Equipment)	Secure 4K
Main Model Name	TW06V1C
Frequency Range	2402 ~ 2480 MHz
Peak Conducted Output Power	BR(GFSK) Mode: 6.37 dBm EDR(π/4-DQPSK) Mode: 7.45 dBm EDR(8DPSK) Mode: 7.77 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 120V/60Hz ☐ Adapter ☐ By AC Power Cord ☐ PoE
	☒ DC Type ☒ Battery 12V ☐ DC Power Supply ☐ External from USB Cable ☐ External DC Adapter
	☐ Host System
Received Date	Nov 09, 2021
Date of Test	Dec 07, 2021 ~ Dec 28, 2021

*All measurement and test data in this report was gathered from production sample serial number: RXZ211109004 (Assigned by BACL, New Taipei Laboratory)

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1.2. Objective

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

1.3. Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS submissions with FCC ID: 2AKAF-TW06V1C

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.
FCC 558074 D01 15.247 Meas Guidance v05r02.

1.5. Statement of Compliance

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

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Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.
Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
The determination of the test results does not require consideration of the uncertainty of the measurement, unless the assessment is required by customer agreement, regulation or standard document specification.
Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) is not responsible for the authenticity of the information provided by the applicant that affects the test results.

1.6. Measurement Uncertainty

Parameter		Uncertainty
RF output power, conducted		+/- 0.93 dB
Occupied Bandwidth		+/- 0.35 MHz
Unwanted Emissions, conducted		+/- 1.69 dBm
Radiated Emissions	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 Data	Temperature (℃)	Relative Humidity (%)	ATM Pressure (hPa)	Test Engineer
Radiation Spurious Emissions	2021/12/7~2021/12/10	20.4~22.2	63~70	1010	Aaron Pan
Conducted Spurious Emissions	2021/12/8~2021/12/28	22.2~23.2	45~48	1010	Howard Ho
20 dB Emission Bandwidth	2021/12/8	23.2	48	1010	Howard Ho
Channel Separation Test	2021/12/9	23.8	50	1010	Howard Ho
Time of Occupancy	2021/12/9	23.8	50	1010	Howard Ho
Quantity of hopping channel	2021/12/9~2021/12/27	22.1~23.8	47~50	1010	Howard Ho
Maximum Output Power	2021/12/8	23.2	48	1010	Howard Ho
100 kHz Bandwidth of Frequency Band Edge	2021/12/8~2021/12/27	22.1~23.2	47~48	1010	Howard Ho

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.

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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 "SecureCRTSecureFX_HH_x64_7.0.0.326"

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

2.4. Test Mode

Full System (model: TW06V1C) for all test item.

2.5. Support Equipment List and Details

Description	Manufacturer	Model Number	S/N
NB	DELL	E6410	8N7PXN1
ADAPTER	FUJIA	FJ-SW266B50502000U	N/A
fixture	Ambarella	AB023-202-V10	N/A

2.6. External Cable List and Details

Description	Length(m)	From	To
RS-232 to USB Cable	3	EUT	NB
Micro USB Cable	1	Adapter	EUT

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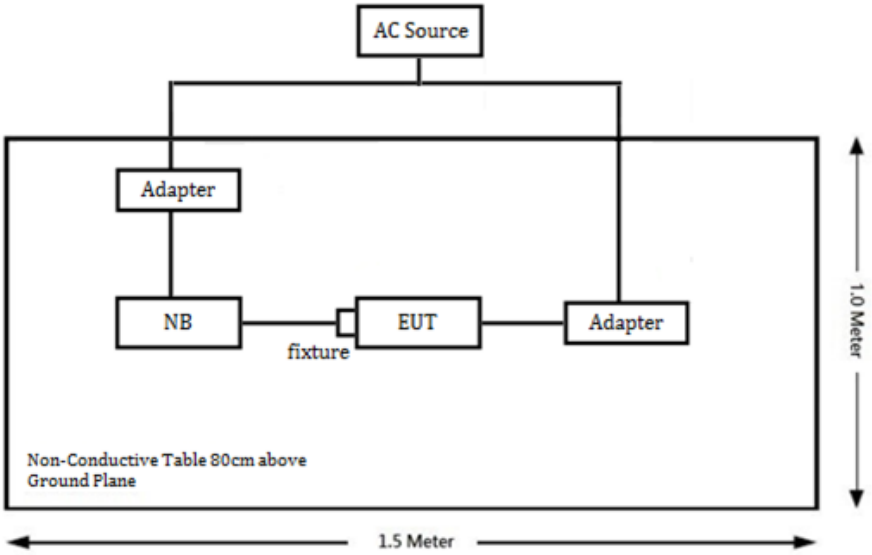
2.7. Block Diagram of Test Setup

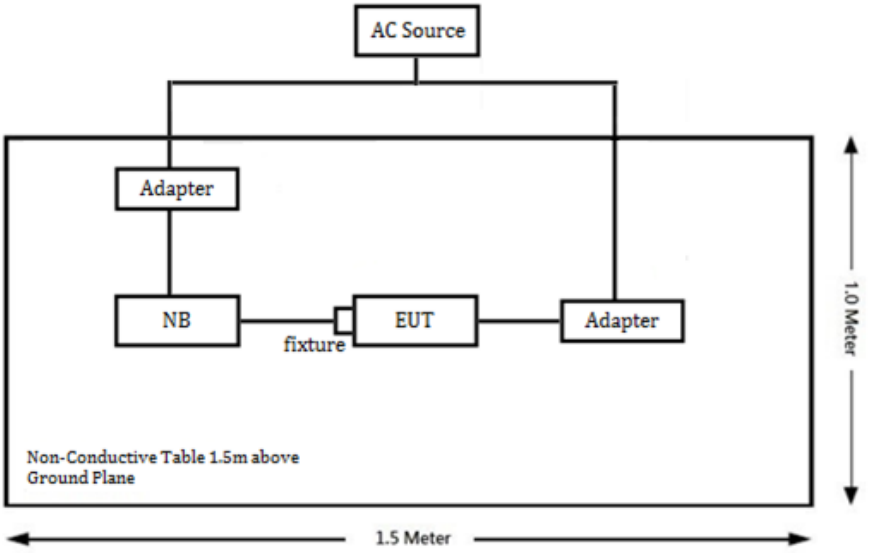
See test photographs attached in annex setup photos for the actual connections between EUT and support equipment.

Radiation:

Below 1GHz:



Above 1GHz:



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3. Summary of Test Results

FCC Rules	Description of Test	Results
§15.247(i), §1.1310,§2.1091	Maximum Permissible Exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Not Applicable
§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

Not Applicable: The device will only be used in the car and will be powered by the onboard DC.

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4. Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Room (966-A)					
Bilog Antenna with 6 dB Attenuator	SUNOL SCIENCES & MINI-CIRCUITS	JB6/UNAT-6+	A050115/15542_01	2021/1/19	2022/1/18
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2021/11/9	2022/11/8
Horn Antenna	EMCO	SAS-571	1020	2021/4/23	2022/4/22
Horn Antenna	ETS-Lindgren	3116	62638	2021/8/11	2022/8/10
Preamplifier	Sonoma	310N	130602	2021/6/8	2022/6/7
Preamplifier	A.H. system Inc.	PAM-0118P	470	2021/3/15	2022/3/14
Microware Preamplifier	EM Electronics Corporation	EM18G40G	60656	2020/12/30	2021/12/29
Spectrum Analyzer	Rohde & Schwarz	FSV40	101435	2021/1/7	2022/1/6
Micro flex Cable	UTIFLEX	UFB197C-1-2362-70U-70U	225757-001	2021/2/1	2022/1/31
Coaxial Cable	COMMATE	PEWC	8Dr	2020/12/25	2021/12/24
Coaxial Cable	UTIFLEX	UFB311A-Q-1440-300300	220490-006	2021/2/1	2022/1/31
Coaxial Cable	JUNFLON	J12J102248-00-B-5	AUG-07-15-044	2020/12/25	2021/12/24
Cable	EMC	EMC105-SM-SM-10000	201003	2021/2/3	2022/2/2
Coaxial Cable	ROSNOL	K1K50-UP0264-K1K50-450CM	160309-1	2021/2/1	2022/1/31
Coaxial Cable	ROSNOL	K1K50-UP0264-K1K50-50CM	15120-1	2021/1/28	2022/1/27
Software	Farad	EZ_EMC	BACL-03A1	N.C.R	N.C.R
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSV40	101140	2021/1/7	2022/1/6
Cable	UTIFLEX	UFA210A	9435	2021/10/5	2022/10/4
Power Sensor	KEYSIGHT	U2021XA	MY54080018	2021/1/28	2022/1/27
Attenuator	MINI-CIRCUITS	BW-S10W5+	1419	2021/1/28	2022/1/27

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

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

5.1. Applicable Standard

According to subpart 15.247(i)and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

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

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

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

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

Calculated Formulary:

Predication of MPE limit at a given distance

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

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

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

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

5.2. RF Exposure Evaluation Result

MPE evaluation:

Mode	Frequency Range (MHz)	Antenna Gain		Target Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
WI-FI 2.4G	2412-2462	1.5	1.413	21	125.893	20	0.0354	1
BT	2402-2480	1.5	1.413	8	6.310	20	0.0018	1
BLE	2402-2480	1.5	1.413	6.5	4.467	20	0.0013	1

Note: Wi-Fi 2.4G and BT/BLE can't transmit simultaneously.

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

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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

Model	Type	Antenna Gain
N/A	PCB	1.5 dBi

Result: Compliance

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

7.1. 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

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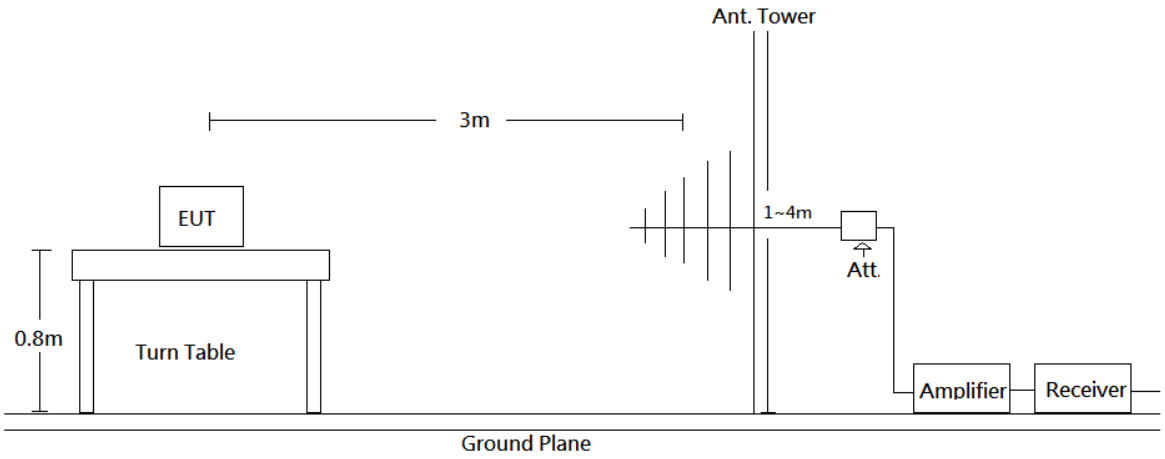
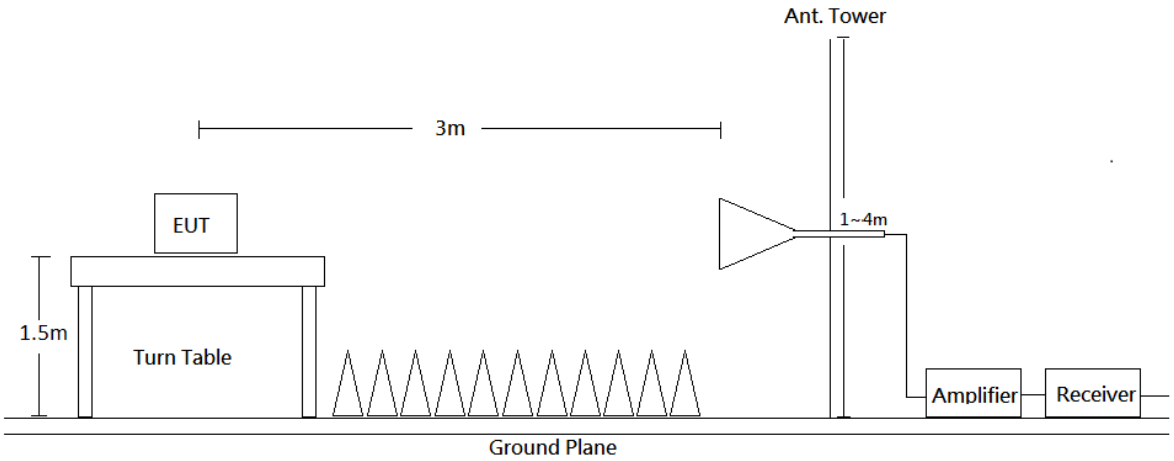
intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the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

7.2. 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.

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7.3. 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

7.4. 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.

7.5. 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

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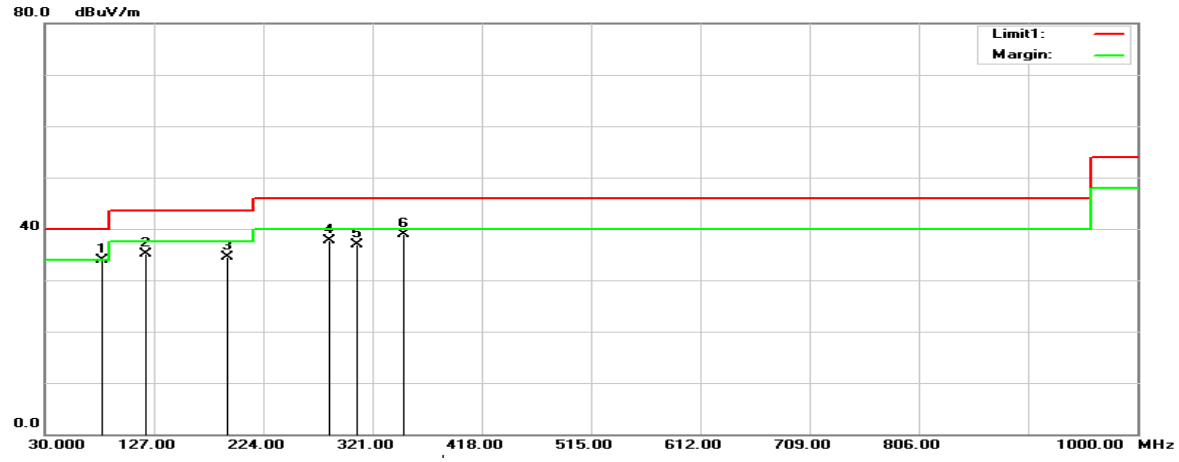
7.6. Test Results

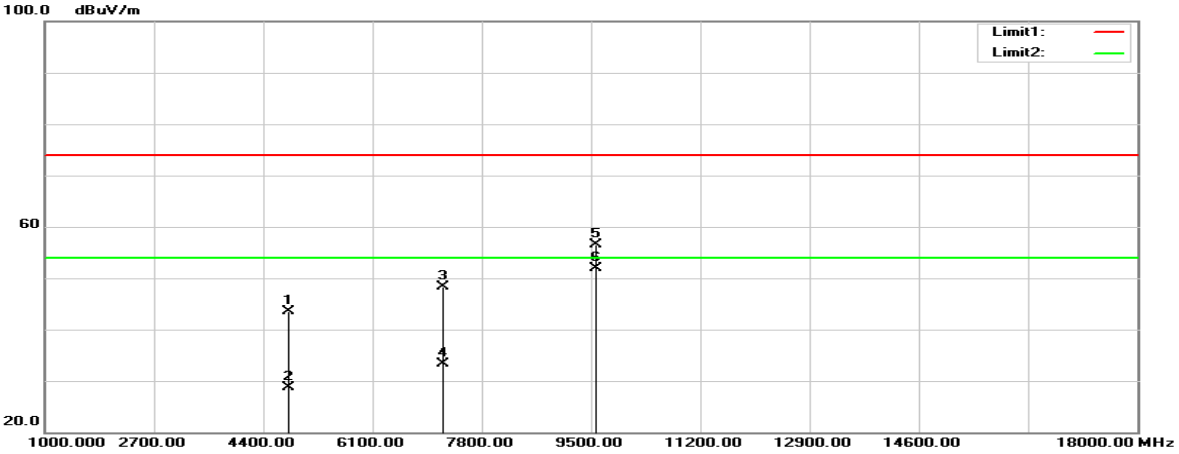
Test Mode: Transmitting

Horizontal (worst case is BR (GFSK) mode Low channel)

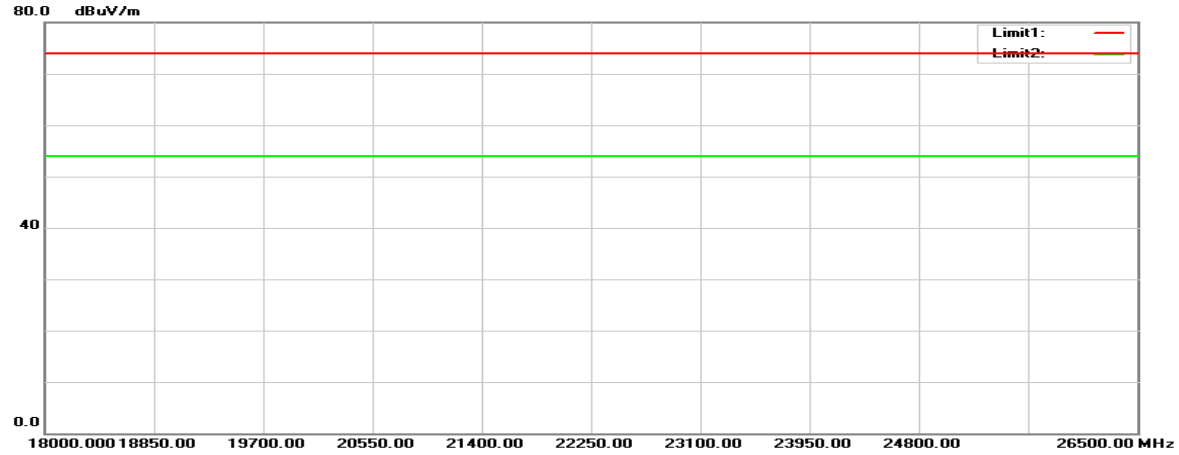
30MHz-1GHz:



1GHz-18GHz:



18GHz-26.5GHz:



Note: Test 18GHz-26.5GHz, no product signal is detected, it is background noise, so there is no punctuation.

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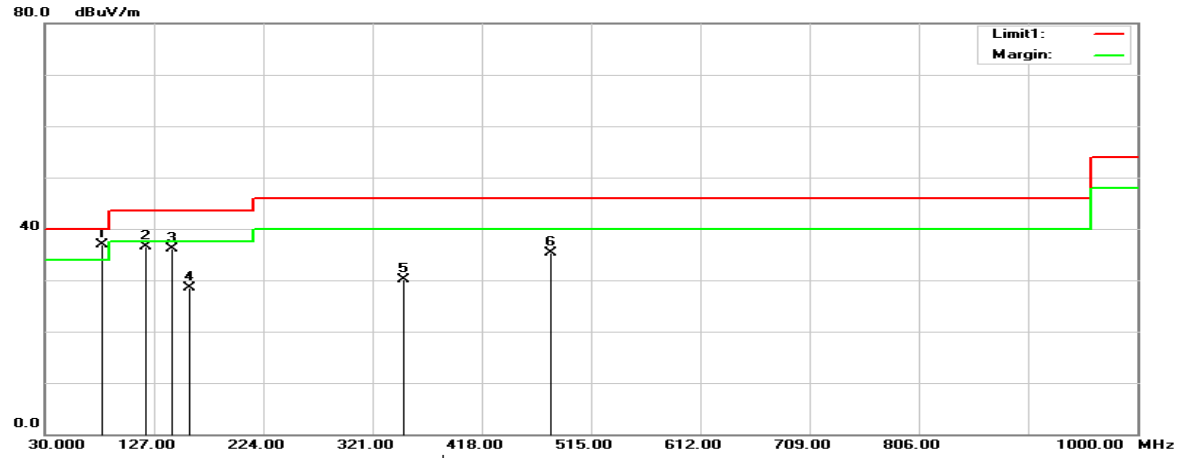
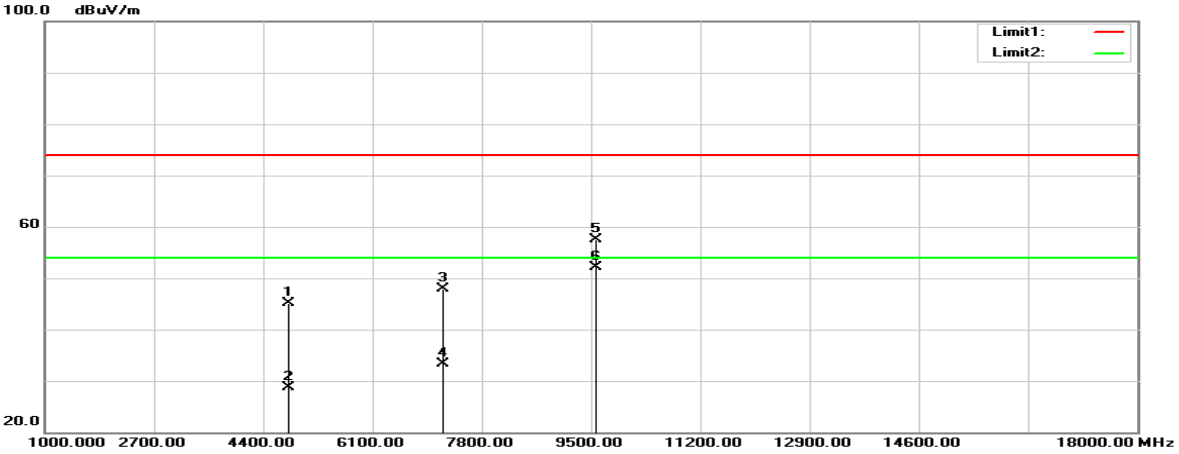
Vertical (worst case is BR (GFSK) mode Low channel)

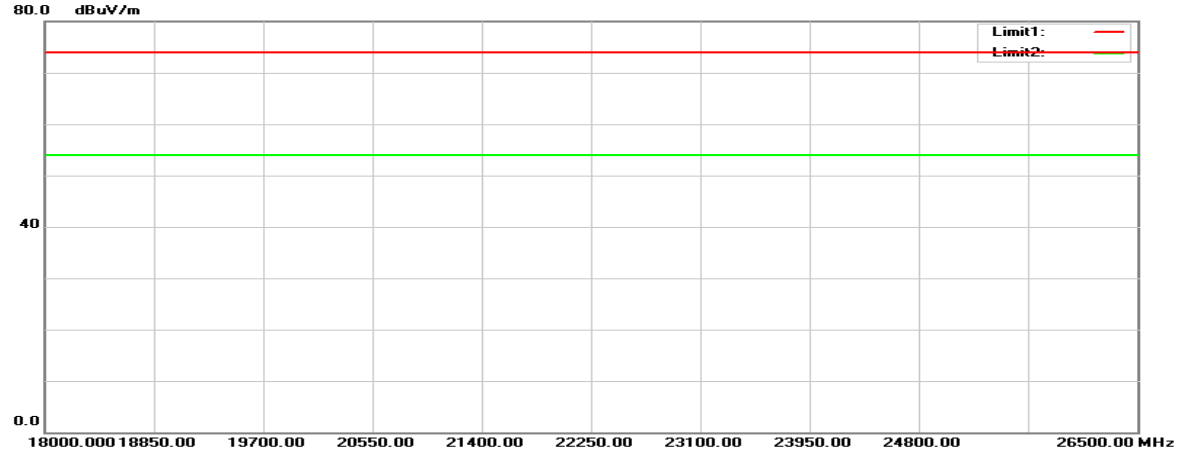
30MHz-1GHz:



1GHz-18GHz:



18GHz-26.5GHz:



Note: Test 18GHz-26.5GHz, no product signal is detected, it is background noise, so there is no punctuation.

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Below 1GHz

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
81.4100	50.59	-16.62	33.97	40.00	-6.03	100	92	peak
119.2400	45.59	-10.54	35.05	43.50	-8.45	100	147	peak
191.9900	47.00	-12.48	34.52	43.50	-8.98	100	39	peak
282.2000	47.91	-10.23	37.68	46.00	-8.32	100	156	peak
307.4200	46.76	-9.93	36.83	46.00	-9.17	100	148	peak
349.1300	48.27	-9.31	38.96	46.00	-7.04	100	232	peak

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
81.4100	53.60	-16.62	36.98	40.00	-3.02	100	94	QP
119.2400	47.14	-10.54	36.60	43.50	-6.90	100	41	peak
143.4900	46.94	-10.85	36.09	43.50	-7.41	100	258	peak
159.0100	39.79	-11.24	28.55	43.50	-14.95	100	214	peak
348.1600	39.50	-9.33	30.17	46.00	-15.83	100	159	peak
479.1100	41.29	-6.04	35.25	46.00	-10.75	100	146	peak

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

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

Above 1GHz

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								
2388.100	56.11	-9.48	46.63	74.00	-27.37	148	141	peak
2388.100	41.91	-9.48	32.43	54.00	-21.57	148	141	AVG
4804.000	45.71	-2.17	43.54	74.00	-30.46	141	296	peak
4804.000	30.94	-2.17	28.77	54.00	-25.23	141	296	AVG
7206.000	44.15	4.18	48.33	74.00	-25.67	157	351	peak
7206.000	29.20	4.18	33.38	54.00	-20.62	157	351	AVG
9568.000	49.72	6.88	56.60	74.00	-17.40	224	0	peak
9568.000	44.96	6.88	51.84	54.00	-2.16	224	0	AVG
BR (GFSK), Middle channel								
4882.000	46.77	-1.86	44.91	74.00	-29.09	148	132	peak
4882.000	30.97	-1.86	29.11	54.00	-24.89	148	132	AVG
7323.000	44.72	5.11	49.83	74.00	-24.17	152	336	peak
7323.000	29.69	5.11	34.80	54.00	-19.20	152	336	AVG
9568.000	50.11	6.88	56.99	74.00	-17.01	222	0	peak
9568.000	44.09	6.88	50.97	54.00	-3.03	222	0	AVG
BR (GFSK), High channel								
2484.370	56.25	-8.44	47.81	74.00	-26.19	158	138	peak
2484.370	41.93	-8.44	33.49	54.00	-20.51	158	138	AVG
4960.000	46.04	-1.49	44.55	74.00	-29.45	152	21	peak
4960.000	31.27	-1.49	29.78	54.00	-24.22	152	21	AVG
7440.000	43.81	5.23	49.04	74.00	-24.96	155	323	peak
7440.000	28.94	5.23	34.17	54.00	-19.83	155	323	AVG
9568.000	50.06	6.88	56.94	74.00	-17.06	223	0	peak
9568.000	44.78	6.88	51.66	54.00	-2.34	223	0	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.

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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								
2375.500	56.42	-9.58	46.84	74.00	-27.16	108	45	peak
2375.500	42.52	-9.58	32.94	54.00	-21.06	108	45	AVG
4804.000	47.20	-2.17	45.03	74.00	-28.97	139	219	peak
4804.000	30.94	-2.17	28.77	54.00	-25.23	139	219	AVG
7206.000	43.78	4.18	47.96	74.00	-26.04	154	114	peak
7206.000	29.05	4.18	33.23	54.00	-20.77	154	114	AVG
9568.000	50.59	6.88	57.47	74.00	-16.53	227	360	peak
9568.000	45.28	6.88	52.16	54.00	-1.84	227	360	AVG
BR (GFSK), Middle channel								
4882.000	45.33	-1.86	43.47	74.00	-30.53	148	128	peak
4882.000	30.97	-1.86	29.11	54.00	-24.89	148	128	AVG
7323.000	43.88	5.11	48.99	74.00	-25.01	141	229	peak
7323.000	29.19	5.11	34.30	54.00	-19.70	141	229	AVG
9568.000	50.18	6.88	57.06	74.00	-16.94	228	0	peak
9568.000	45.45	6.88	52.33	54.00	-1.67	228	0	AVG
BR (GFSK), High channel								
2490.670	56.37	-8.34	48.03	74.00	-25.97	123	38	peak
2490.670	42.62	-8.34	34.28	54.00	-19.72	123	38	AVG
4960.000	45.49	-1.49	44.00	74.00	-30.00	144	127	peak
4960.000	31.12	-1.49	29.63	54.00	-24.37	144	127	AVG
7440.000	43.83	5.23	49.06	74.00	-24.94	159	259	peak
7440.000	28.93	5.23	34.16	54.00	-19.84	159	259	AVG
9568.000	50.37	6.88	57.25	74.00	-16.75	228	360	peak
9568.000	45.26	6.88	52.14	54.00	-1.86	228	360	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.

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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								
2389.400	56.14	-9.46	46.68	74.00	-27.32	150	140	peak
2389.400	41.91	-9.46	32.45	54.00	-21.55	150	140	AVG
4804.000	45.55	-2.17	43.38	74.00	-30.62	149	177	peak
4804.000	30.81	-2.17	28.64	54.00	-25.36	149	177	AVG
7206.000	43.76	4.18	47.94	74.00	-26.06	152	67	peak
7206.000	28.98	4.18	33.16	54.00	-20.84	152	67	AVG
9568.000	50.25	6.88	57.13	74.00	-16.87	223	0	peak
9568.000	44.70	6.88	51.58	54.00	-2.42	223	0	AVG
EDR (π/4-DQPSK), Middle channel								
4882.000	45.81	-1.86	43.95	74.00	-30.05	146	158	peak
4882.000	30.94	-1.86	29.08	54.00	-24.92	146	158	AVG
7323.000	44.04	5.11	49.15	74.00	-24.85	154	332	peak
7323.000	29.76	5.11	34.87	54.00	-19.13	154	332	AVG
9568.000	50.10	6.88	56.98	74.00	-17.02	222	0	peak
9568.000	44.99	6.88	51.87	54.00	-2.13	222	0	AVG
EDR (π/4-DQPSK), High channel								
2490.640	56.24	-8.34	47.90	74.00	-26.10	156	142	peak
2490.640	41.84	-8.34	33.50	54.00	-20.50	156	142	AVG
4960.000	45.83	-1.49	44.34	74.00	-29.66	132	84	peak
4960.000	31.05	-1.49	29.56	54.00	-24.44	132	84	AVG
7440.000	44.75	5.23	49.98	74.00	-24.02	146	233	peak
7440.000	28.90	5.23	34.13	54.00	-19.87	146	233	AVG
9568.000	50.18	6.88	57.06	74.00	-16.94	115	0	peak
9568.000	44.75	6.88	51.63	54.00	-2.37	115	0	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.

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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								
2355.900	56.38	-9.74	46.64	74.00	-27.36	115	36	peak
2355.900	42.50	-9.74	32.76	54.00	-21.24	115	36	AVG
4804.000	45.27	-2.17	43.10	74.00	-30.90	147	253	peak
4804.000	31.01	-2.17	28.84	54.00	-25.16	147	253	AVG
7206.000	44.17	4.18	48.35	74.00	-25.65	159	248	peak
7206.000	29.04	4.18	33.22	54.00	-20.78	159	248	AVG
9568.000	50.53	6.88	57.41	74.00	-16.59	228	360	peak
9568.000	45.44	6.88	52.32	54.00	-1.68	228	360	AVG
EDR (π/4-DQPSK), Middle channel								
4882.000	46.17	-1.86	44.31	74.00	-29.69	147	296	peak
4882.000	30.95	-1.86	29.09	54.00	-24.91	147	296	AVG
7323.000	44.47	5.11	49.58	74.00	-24.42	152	338	peak
7323.000	29.66	5.11	34.77	54.00	-19.23	152	338	AVG
9568.000	50.06	6.88	56.94	74.00	-17.06	228	360	peak
9568.000	45.20	6.88	52.08	54.00	-1.92	228	360	AVG
EDR (π/4-DQPSK), High channel								
2484.070	56.98	-8.44	48.54	74.00	-25.46	100	49	peak
2484.070	42.62	-8.44	34.18	54.00	-19.82	100	49	AVG
4960.000	46.52	-1.49	45.03	74.00	-28.97	156	114	peak
4960.000	31.07	-1.49	29.58	54.00	-24.42	156	114	AVG
7440.000	44.12	5.23	49.35	74.00	-24.65	148	342	peak
7440.000	28.95	5.23	34.18	54.00	-19.82	148	342	AVG
9568.000	51.15	6.88	58.03	74.00	-15.97	228	10	peak
9568.000	45.58	6.88	52.46	54.00	-1.54	228	10	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.

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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								
2371.700	55.85	-9.61	46.24	74.00	-27.76	152	141	peak
2371.700	41.90	-9.61	32.29	54.00	-21.71	152	141	AVG
4804.000	45.30	-2.17	43.13	74.00	-30.87	143	122	peak
4804.000	30.86	-2.17	28.69	54.00	-25.31	143	122	AVG
7206.000	44.80	4.18	48.98	74.00	-25.02	151	39	peak
7206.000	29.01	4.18	33.19	54.00	-20.81	151	39	AVG
9568.000	49.88	6.88	56.76	74.00	-17.24	223	0	peak
9568.000	44.82	6.88	51.70	54.00	-2.30	223	0	AVG
EDR (8DPSK), Middle channel								
4882.000	45.91	-1.86	44.05	74.00	-29.95	151	249	peak
4882.000	30.95	-1.86	29.09	54.00	-24.91	151	249	AVG
7323.000	43.71	5.11	48.82	74.00	-25.18	156	197	peak
7323.000	29.64	5.11	34.75	54.00	-19.25	156	197	AVG
9568.000	50.45	6.88	57.33	74.00	-16.67	204	0	peak
9568.000	44.69	6.88	51.57	54.00	-2.43	204	0	AVG
EDR (8DPSK), High channel								
2495.530	56.18	-8.27	47.91	74.00	-26.09	154	142	peak
2495.530	41.86	-8.27	33.59	54.00	-20.41	154	142	AVG
4960.000	45.96	-1.49	44.47	74.00	-29.53	155	24	peak
4960.000	31.11	-1.49	29.62	54.00	-24.38	155	24	AVG
7440.000	44.14	5.23	49.37	74.00	-24.63	148	176	peak
7440.000	28.94	5.23	34.17	54.00	-19.83	148	176	AVG
9568.000	50.17	6.88	57.05	74.00	-16.95	223	0	peak
9568.000	45.12	6.88	52.00	54.00	-2.00	223	0	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.

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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								
2378.100	56.49	-9.56	46.93	74.00	-27.07	113	35	peak
2378.100	42.48	-9.56	32.92	54.00	-21.08	113	35	AVG
4804.000	47.19	-2.17	45.02	74.00	-28.98	144	159	peak
4804.000	30.94	-2.17	28.77	54.00	-25.23	144	159	AVG
7206.000	44.10	4.18	48.28	74.00	-25.72	129	77	peak
7206.000	29.00	4.18	33.18	54.00	-20.82	129	77	AVG
9568.000	51.39	6.88	58.27	74.00	-15.73	222	360	peak
9568.000	45.09	6.88	51.97	54.00	-2.03	222	360	AVG
EDR (8DPSK), Middle channel								
4882.000	45.14	-1.86	43.28	74.00	-30.72	142	329	peak
4882.000	31.23	-1.86	29.37	54.00	-24.63	142	329	AVG
7323.000	44.51	5.11	49.62	74.00	-24.38	154	11	peak
7323.000	29.65	5.11	34.76	54.00	-19.24	154	11	AVG
9568.000	50.17	6.88	57.05	74.00	-16.95	228	359	peak
9568.000	45.09	6.88	51.97	54.00	-2.03	228	359	AVG
EDR (8DPSK), High channel								
2489.020	56.70	-8.37	48.33	74.00	-25.67	123	35	peak
2489.020	42.58	-8.37	34.21	54.00	-19.79	123	35	AVG
4960.000	45.76	-1.49	44.27	74.00	-29.73	159	243	peak
4960.000	30.94	-1.49	29.45	54.00	-24.55	159	243	AVG
7440.000	44.10	5.23	49.33	74.00	-24.67	154	341	peak
7440.000	28.87	5.23	34.10	54.00	-19.90	154	341	AVG
9568.000	50.22	6.88	57.10	74.00	-16.90	227	360	peak
9568.000	45.21	6.88	52.09	54.00	-1.91	227	360	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.

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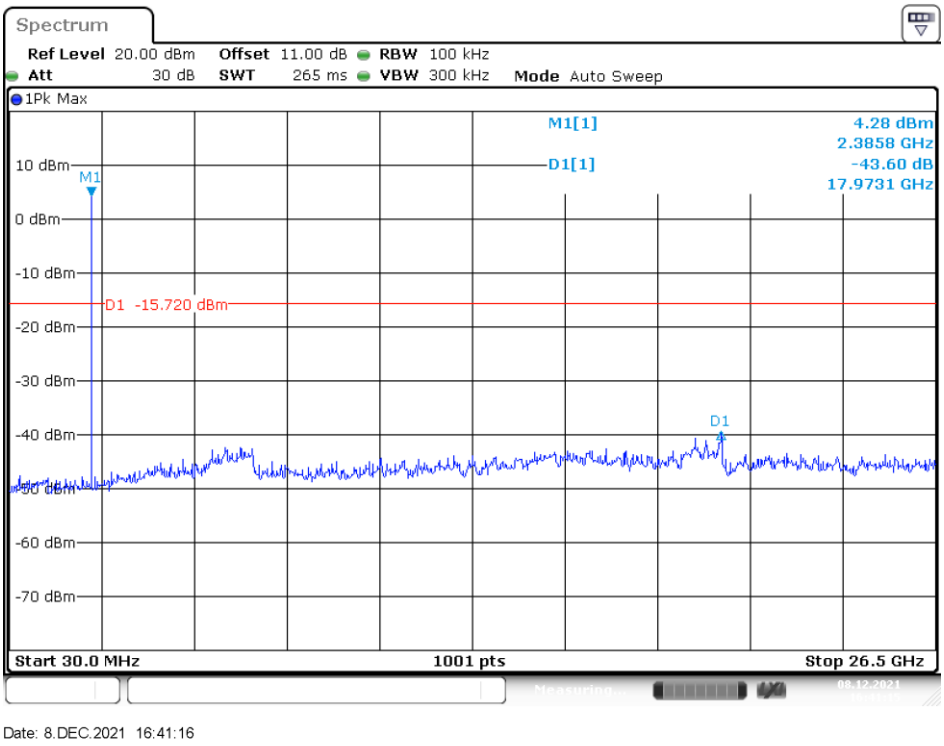
Conducted Spurious Emissions:

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
BR Mode (GFSK)				
Low	2402	43.60	≥ 20	PASS
Middle	2441	44.31	≥ 20	PASS
High	2480	42.23	≥ 20	PASS
EDR Mode (π/4-DQPSK):				
Low	2402	41.31	≥ 20	PASS
Middle	2441	41.10	≥ 20	PASS
High	2480	41.57	≥ 20	PASS
EDR Mode (8DPSK):				
Low	2402	41.65	≥ 20	PASS
Middle	2441	40.38	≥ 20	PASS
High	2480	40.56	≥ 20	PASS

BR Mode (GFSK)

Low Channel



Date: 8.DEC.2021 16:41:16

Middle Channel

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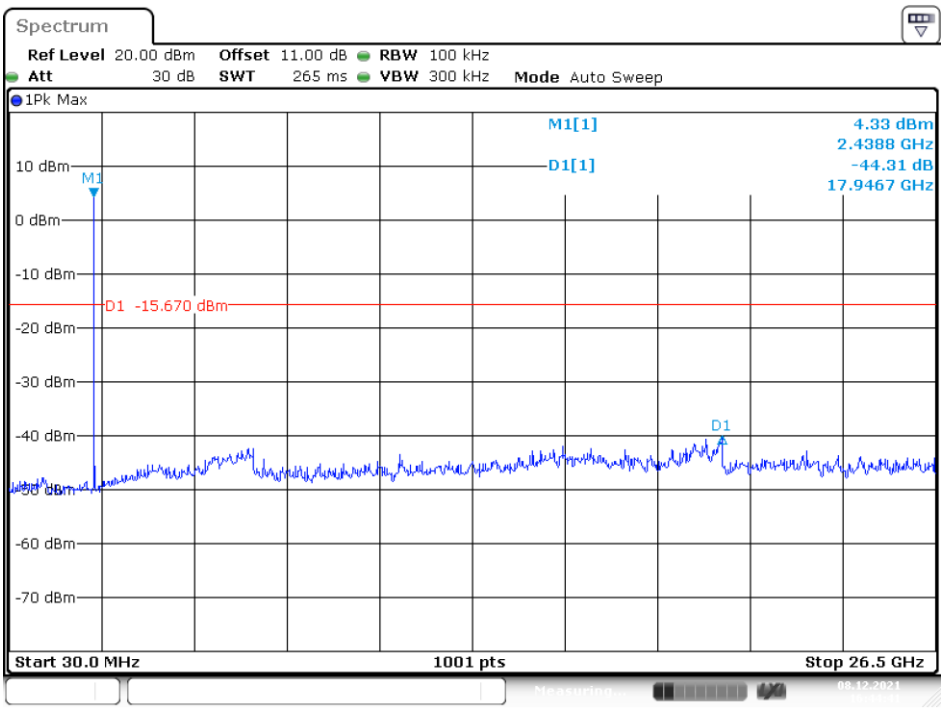
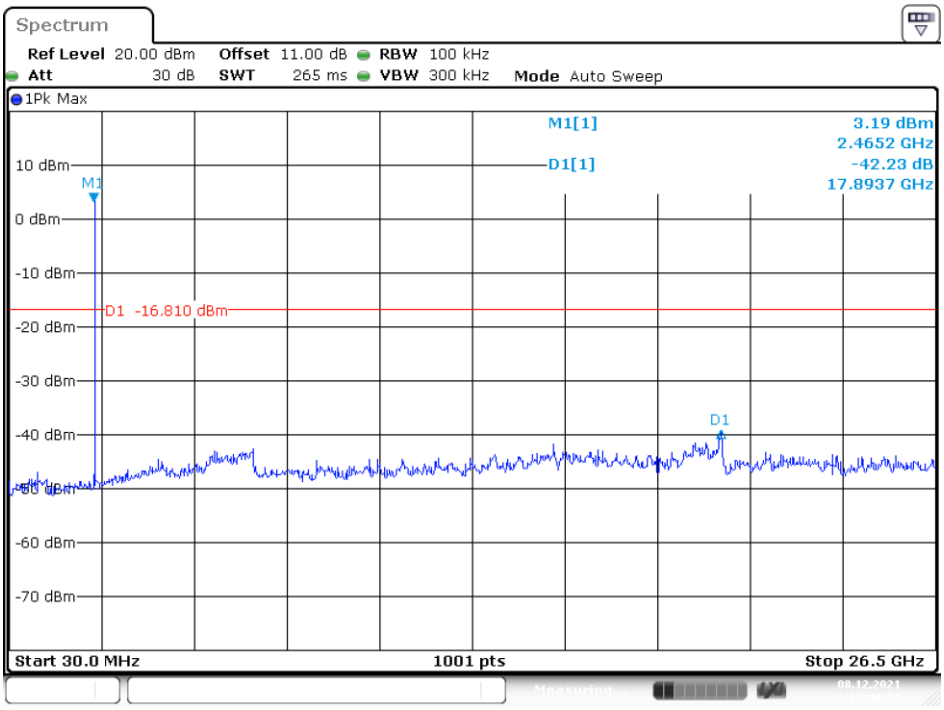


Date: 8.DEC.2021 16:44:41

High Channel



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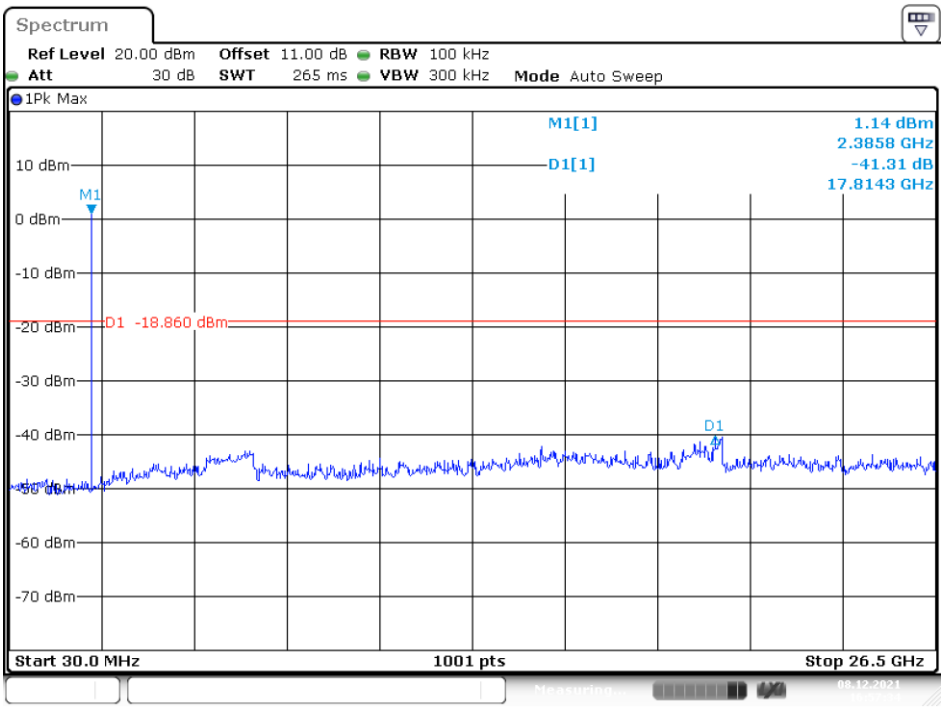
EDR Mode (π/4-DQPSK)

Low Channel



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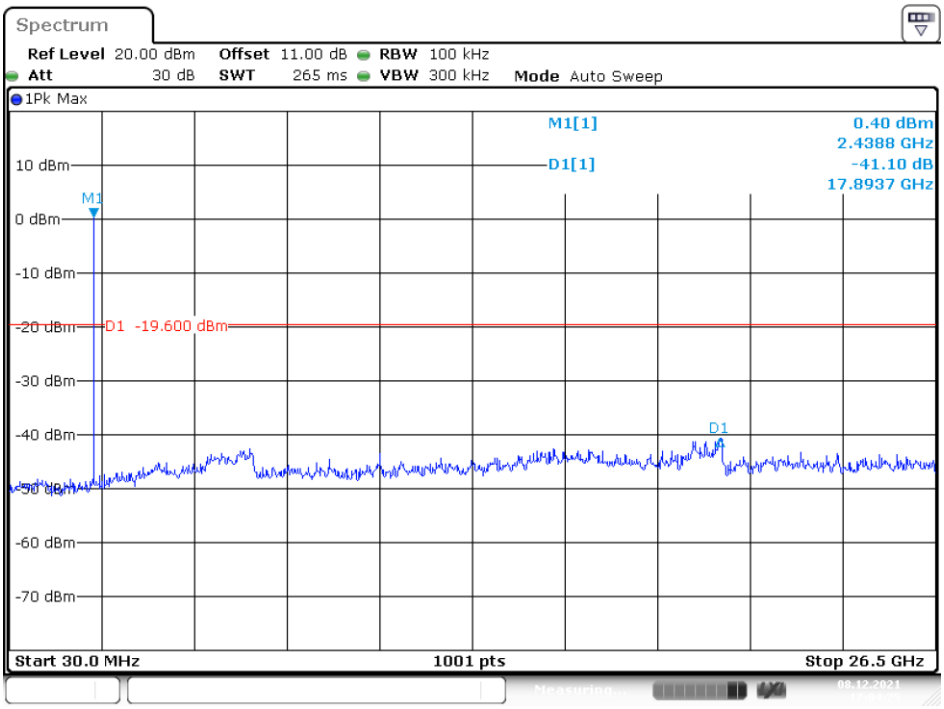
Middle Channel



Date: 8.DEC.2021 17:04:26

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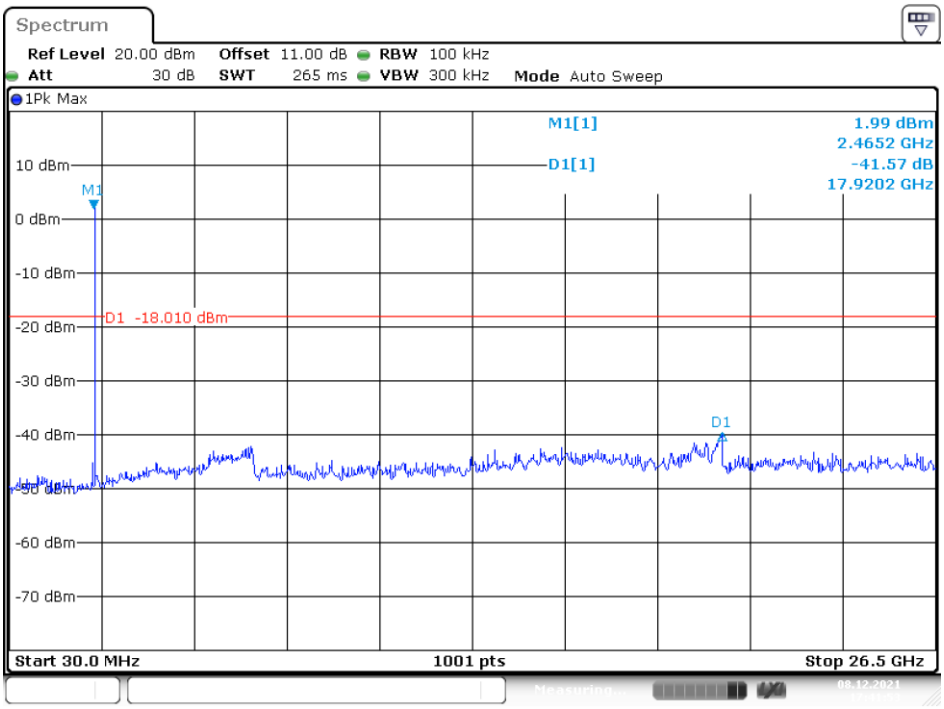
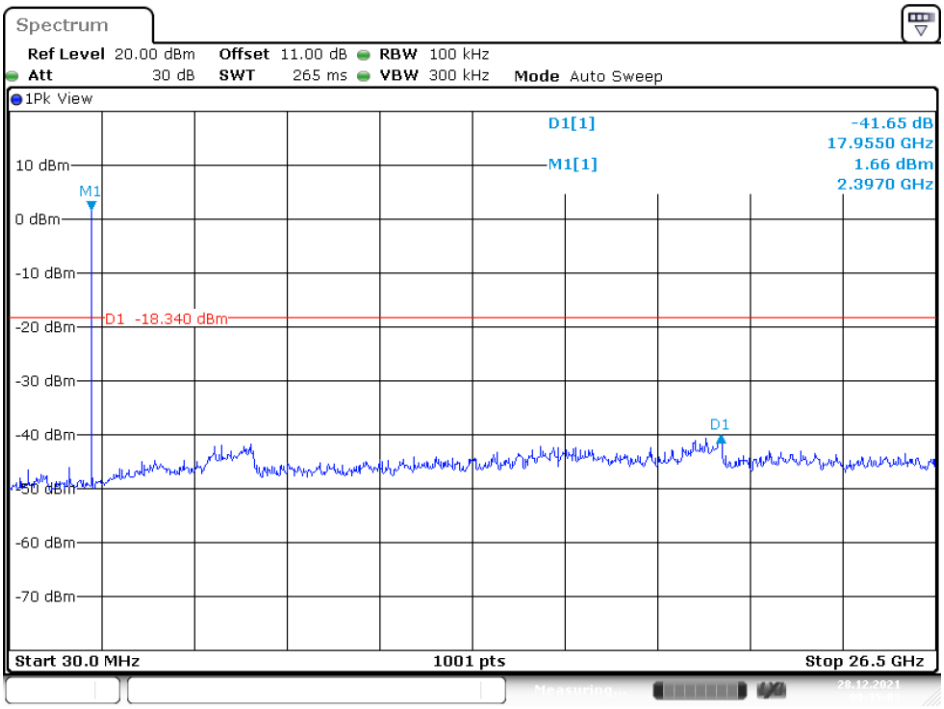
High Channel



Date: 8.DEC.2021 17:41:53

EDR Mode (8DPSK)

Low Channel



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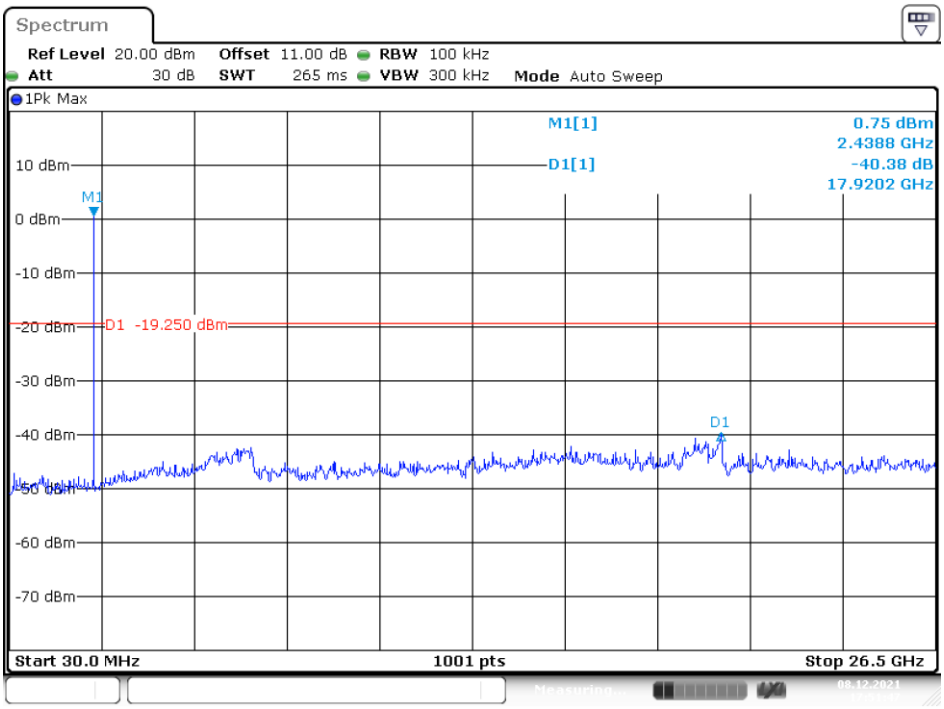
Middle Channel



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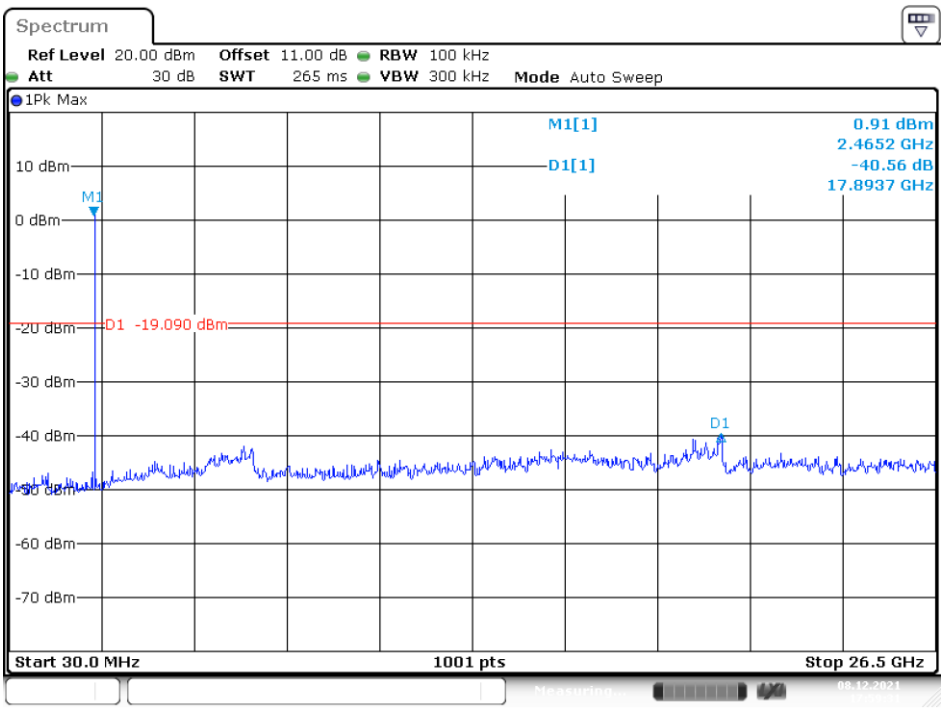
High Channel



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

8.1. Applicable Standard

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

8.2. 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.

8.3. Test Results

Channel	Frequency (MHz)	20 dBc BW (MHz)
BR Mode (GFSK)		
Low	2402	0.98
Middle	2441	0.98
High	2480	0.98
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	1.26
High	2480	1.26

Please refer to the following plots

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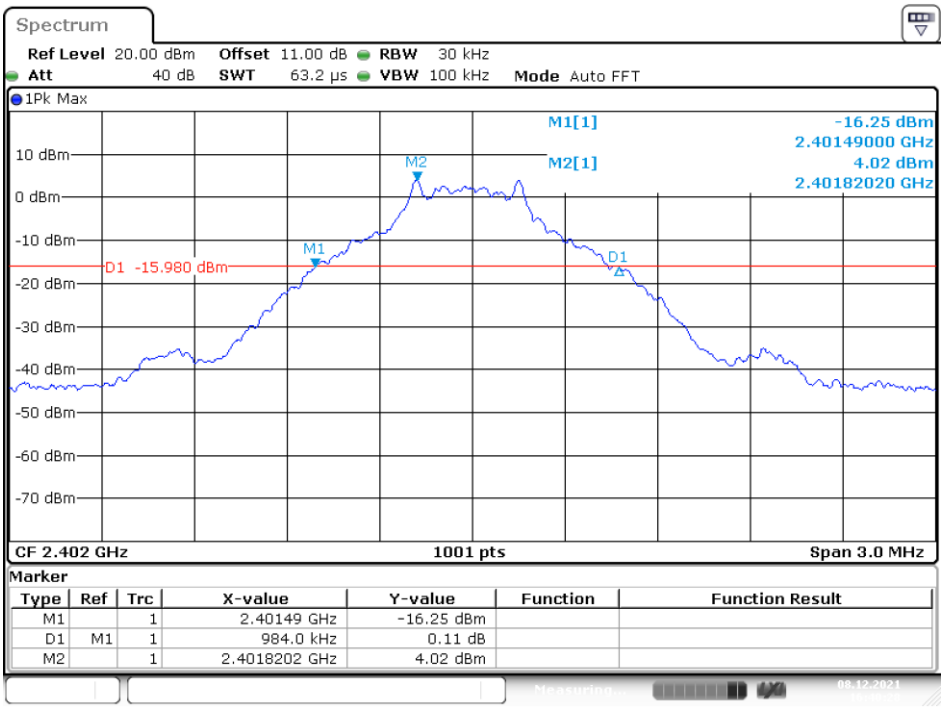
BR Mode (GFSK)

Low Channel



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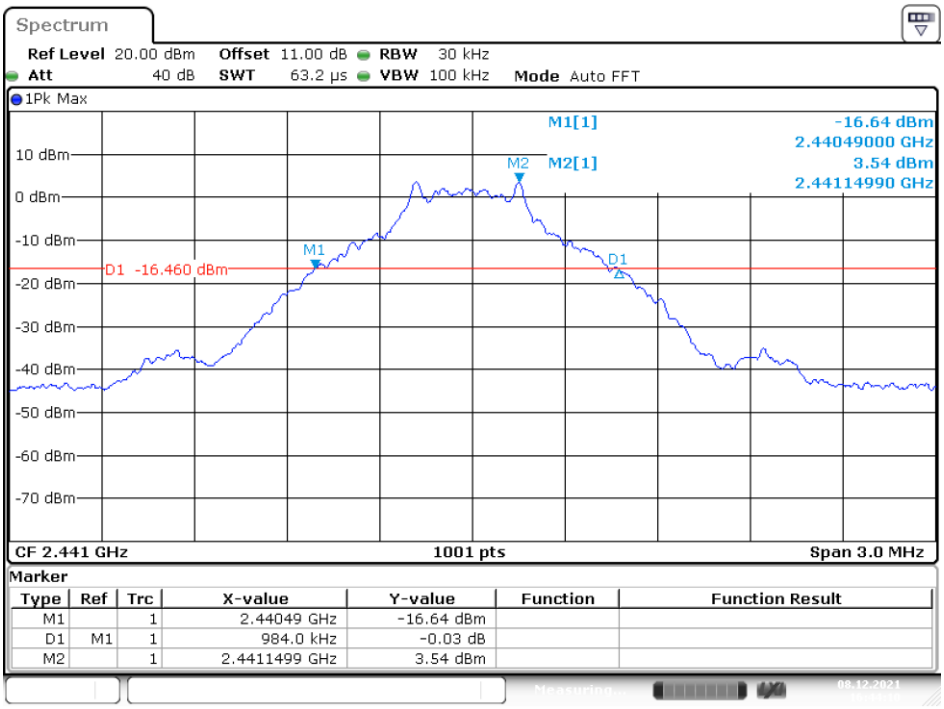
Middle Channel



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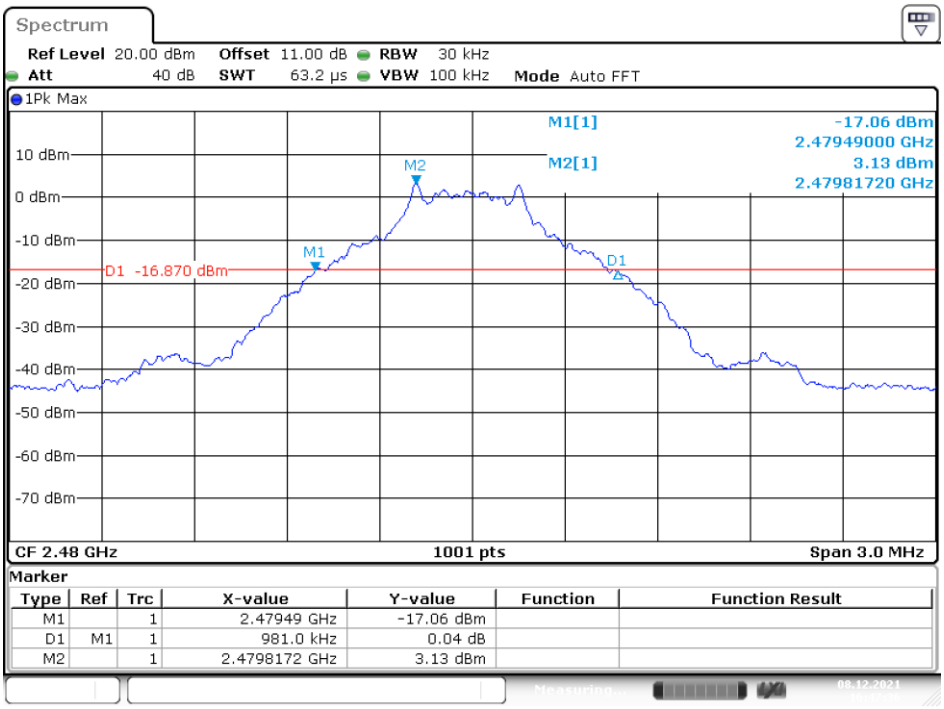
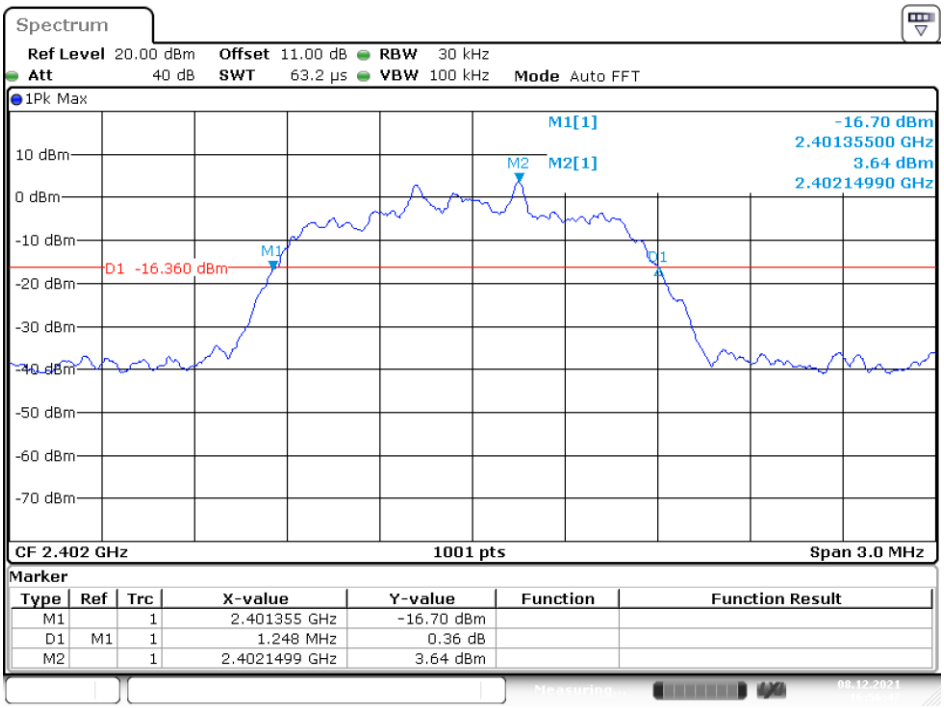
High Channel



Date: 8.DEC.2021 16:47:37

EDR Mode (π/4-DQPSK)

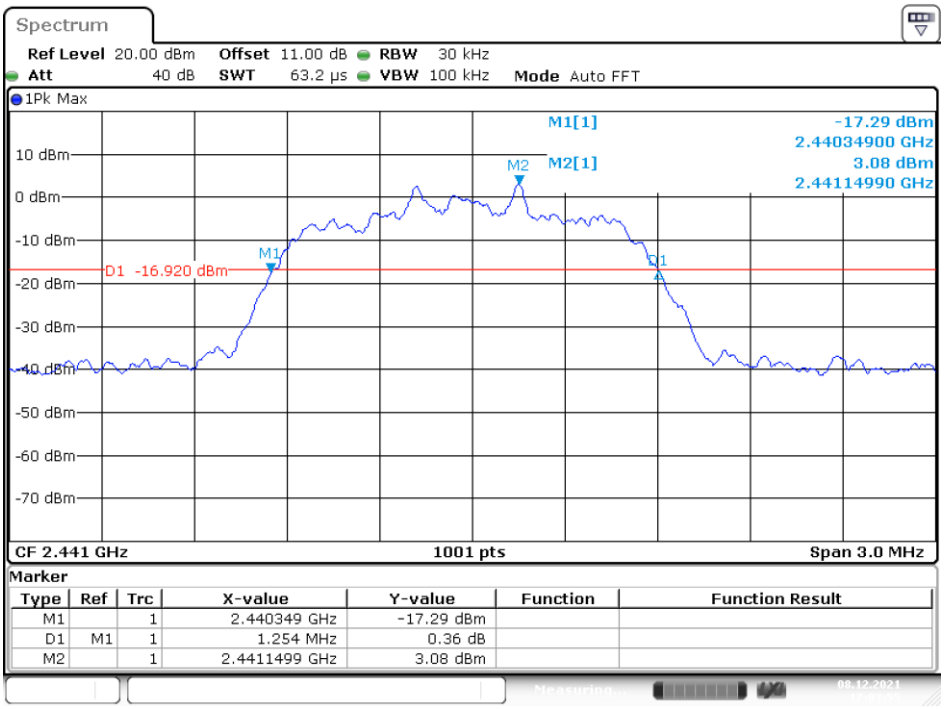
Low Channel



Date: 8.DEC.2021 16:56:48

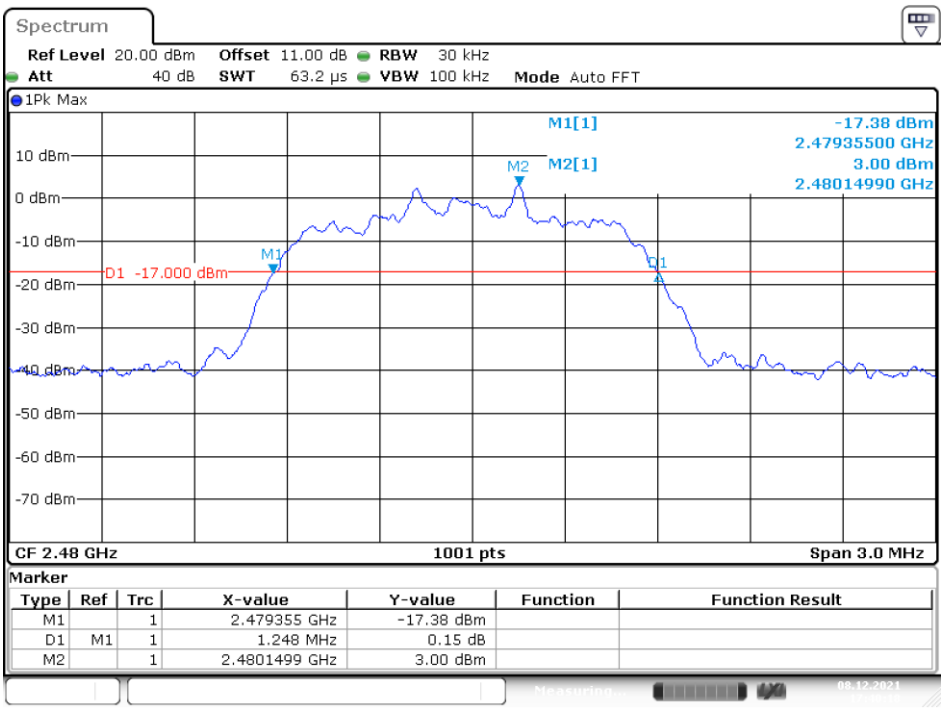
Note: It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)

Middle Channel



Date: 8.DEC.2021 17:03:55

High Channel

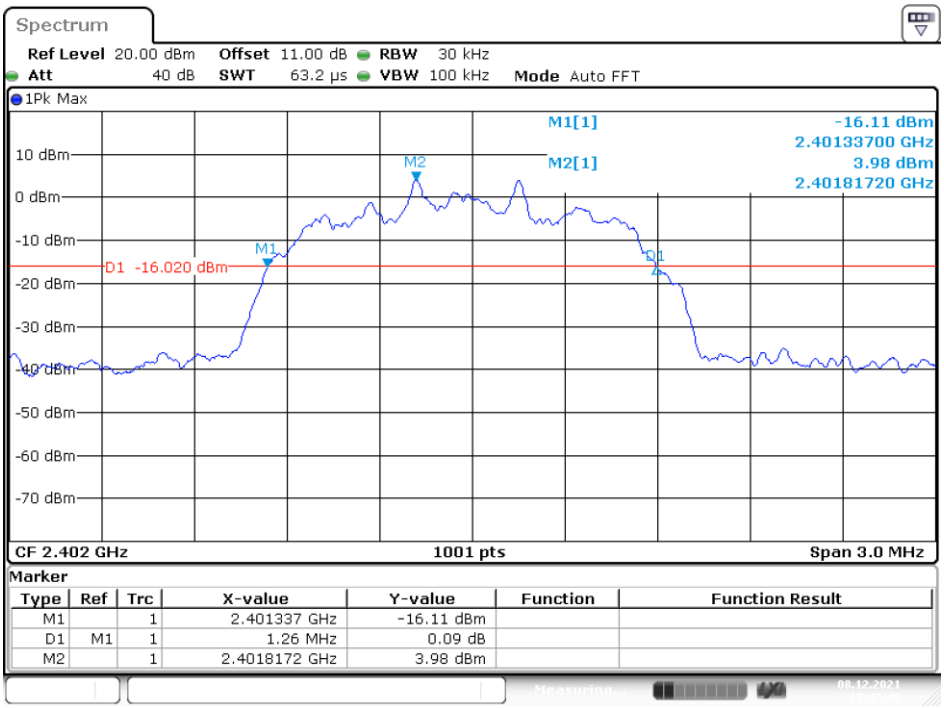


Date: 8.DEC.2021 17:40:19

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

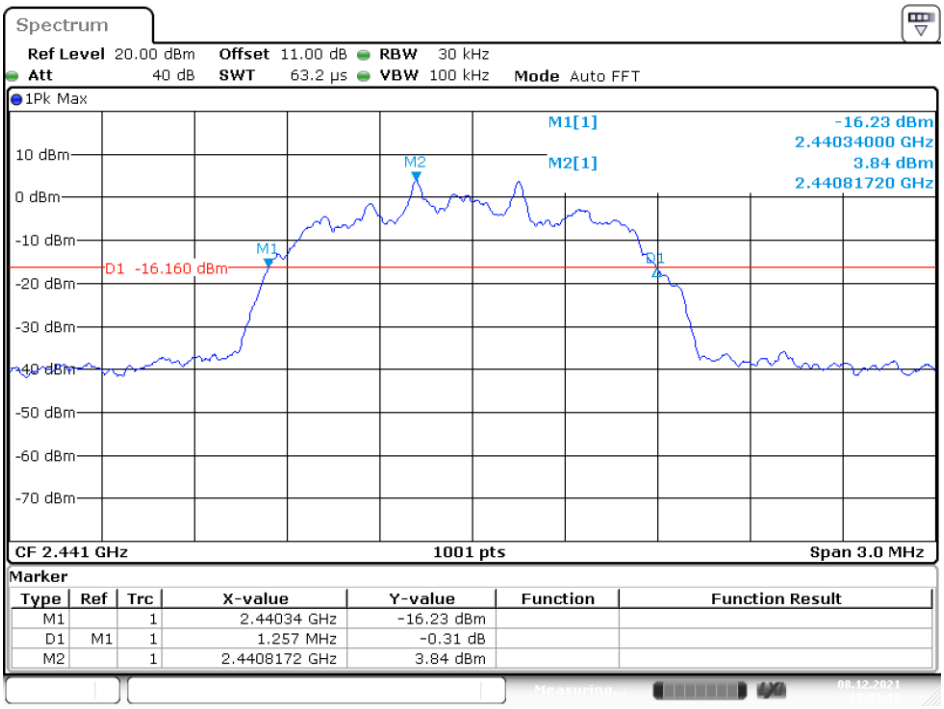
EDR Mode (8DPSK)

Low Channel



Date: 8.DEC.2021 17:47:40

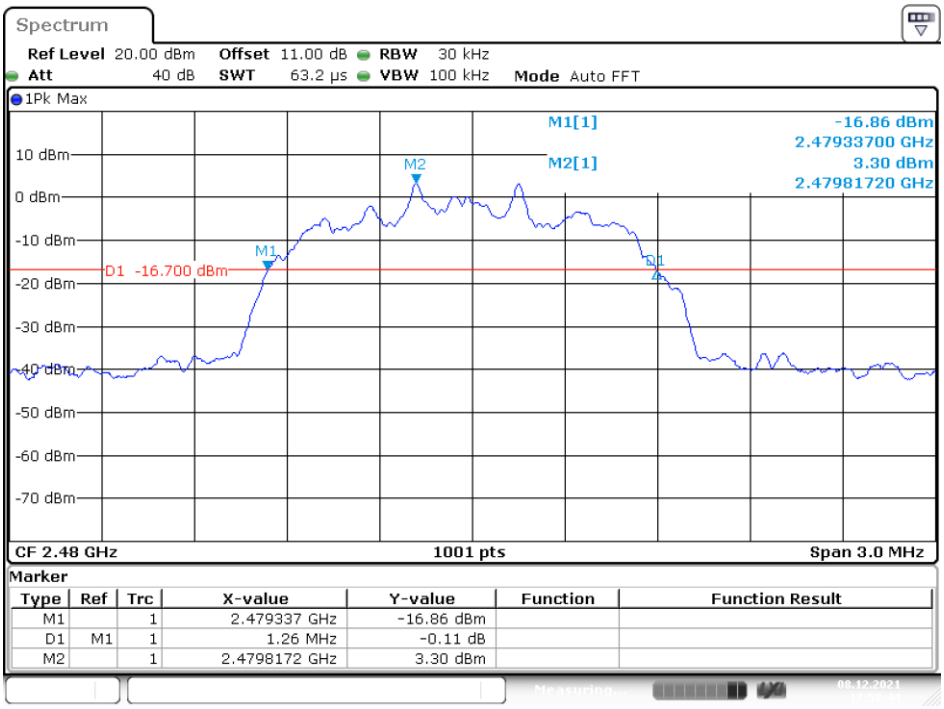
Middle Channel



Date: 8.DEC.2021 17:51:16

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

High Channel



Date: 8.DEC.2021 17:58:45

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

9.1. 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.

9.2. 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.

9.3. 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	1.00	0.98	0.653	>two-thirds of the 20 dB bandwidth	Compliance
Middle	1.00	0.98	0.653	>two-thirds of the 20 dB bandwidth	Compliance
High	1.00	0.98	0.653	>two-thirds of the 20 dB bandwidth	Compliance
EDR Mode (π/4-DQPSK)					
Low	1.00	1.25	0.833	>two-thirds of the 20 dB bandwidth	Compliance
Middle	0.99	1.25	0.833	>two-thirds of the 20 dB bandwidth	Compliance
High	1.00	1.25	0.833	>two-thirds of the 20 dB bandwidth	Compliance
EDR Mode (8DPSK)					
Low	1.00	1.26	0.840	>two-thirds of the 20 dB bandwidth	Compliance
Middle	1.00	1.26	0.840	>two-thirds of the 20 dB bandwidth	Compliance
High	1.00	1.26	0.840	>two-thirds of the 20 dB bandwidth	Compliance

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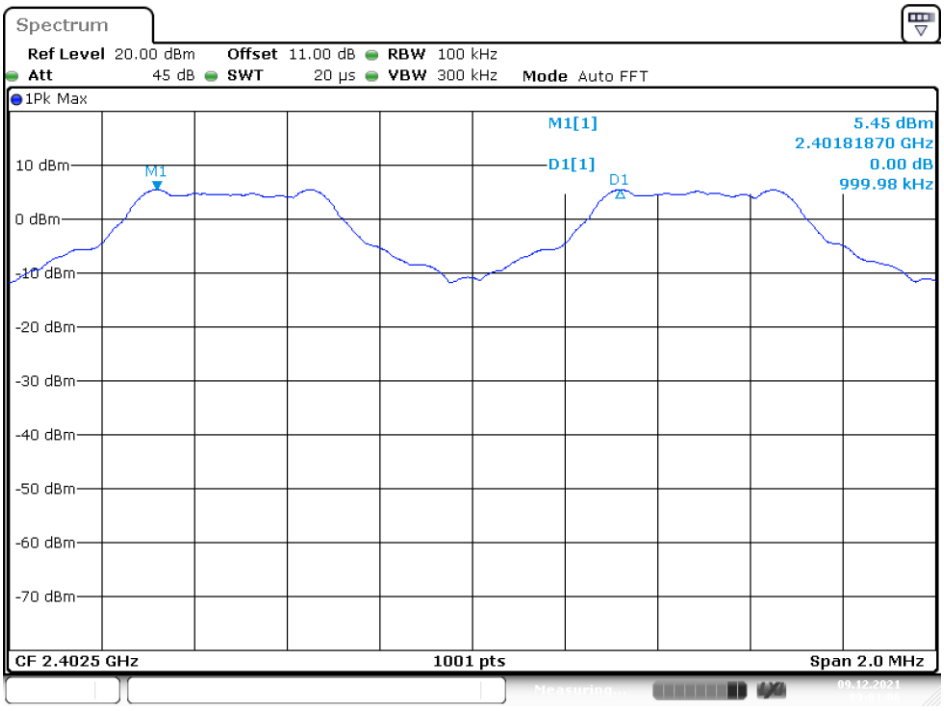
Please refer to the following plots.

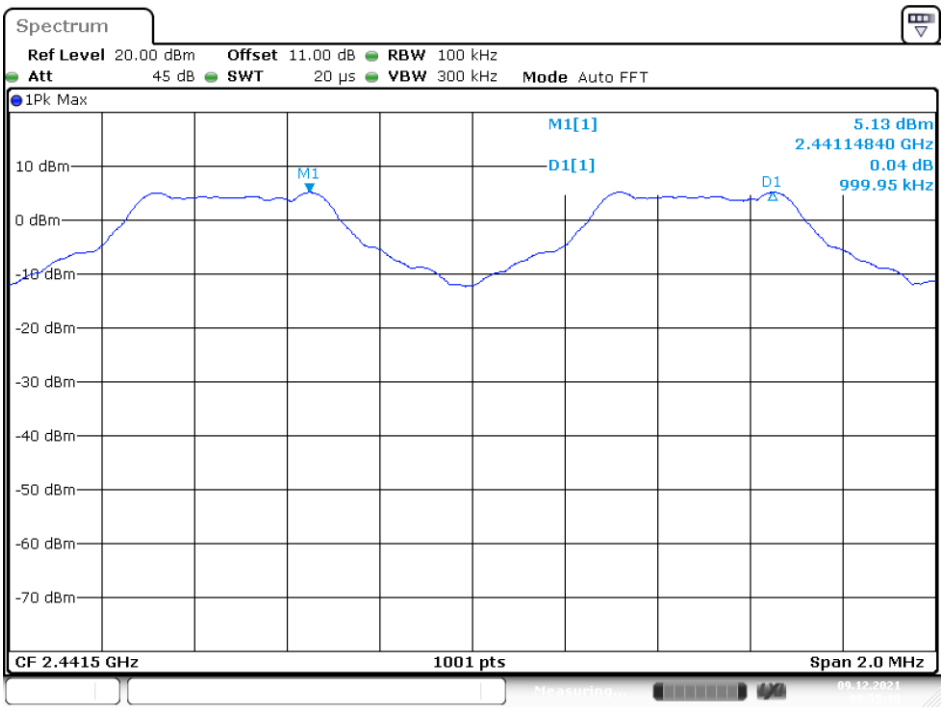
BR Mode (GFSK)

Low Channel



Date: 9.DEC.2021 09:01:06

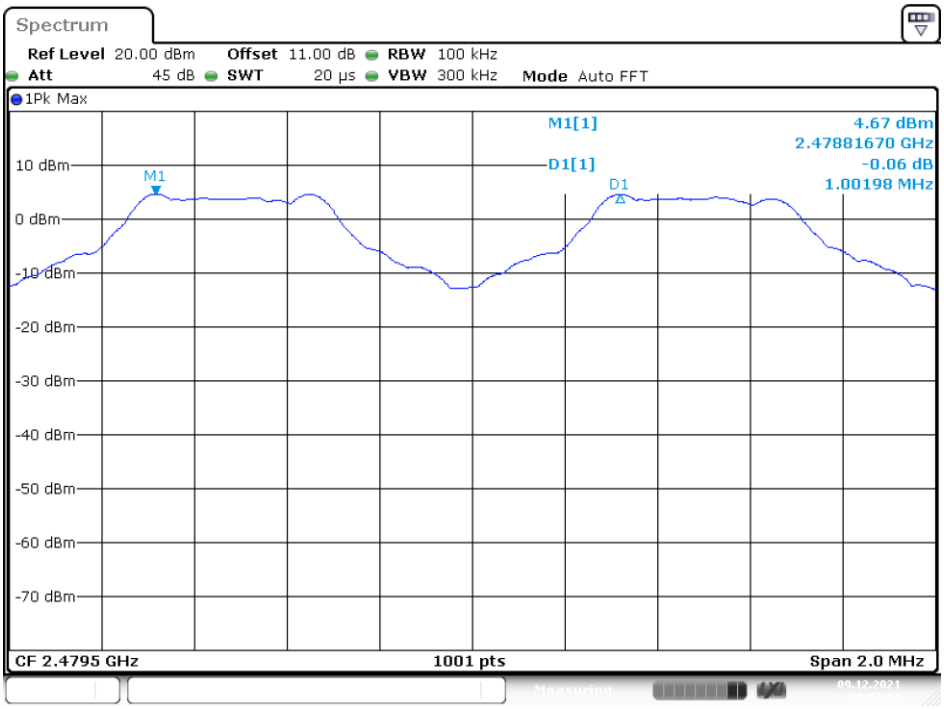
Middle Channel



Date: 9.DEC.2021 08:59:19

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

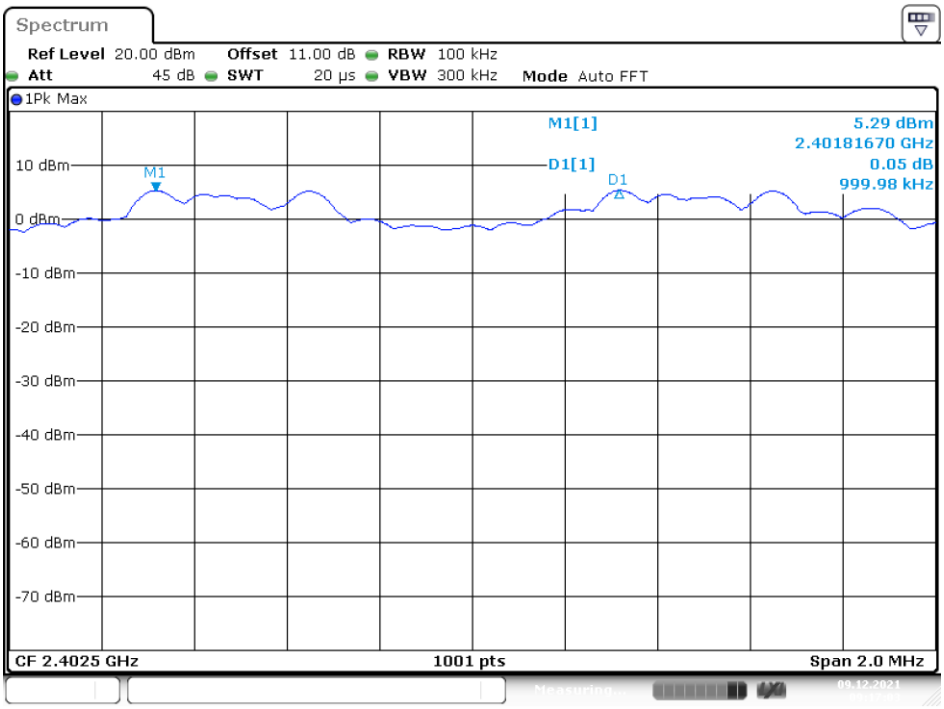
High Channel



Date: 9.DEC.2021 08:57:14

EDR Mode (π/4-DQPSK)

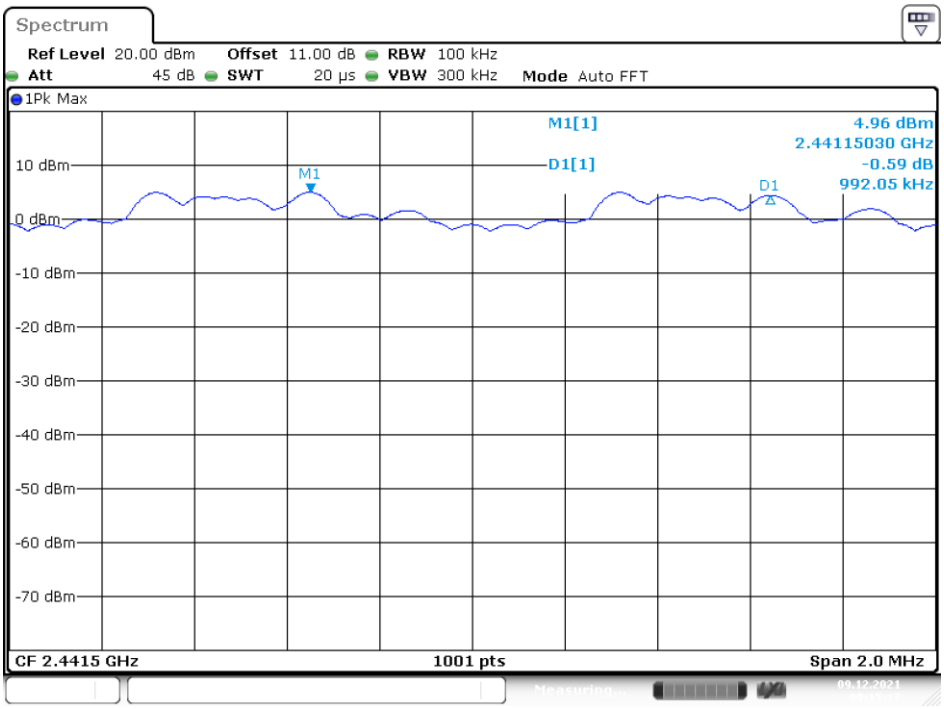
Low Channel



Date: 9.DEC.2021 09:17:03

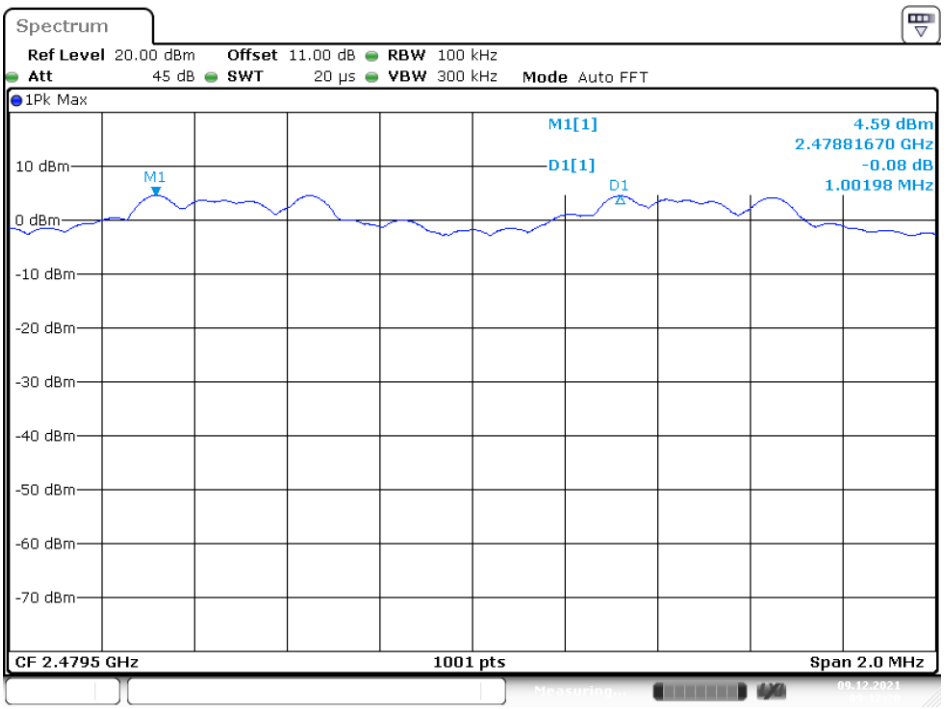
Note: It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)

Middle Channel



Date: 9.DEC.2021 09:15:17

High Channel

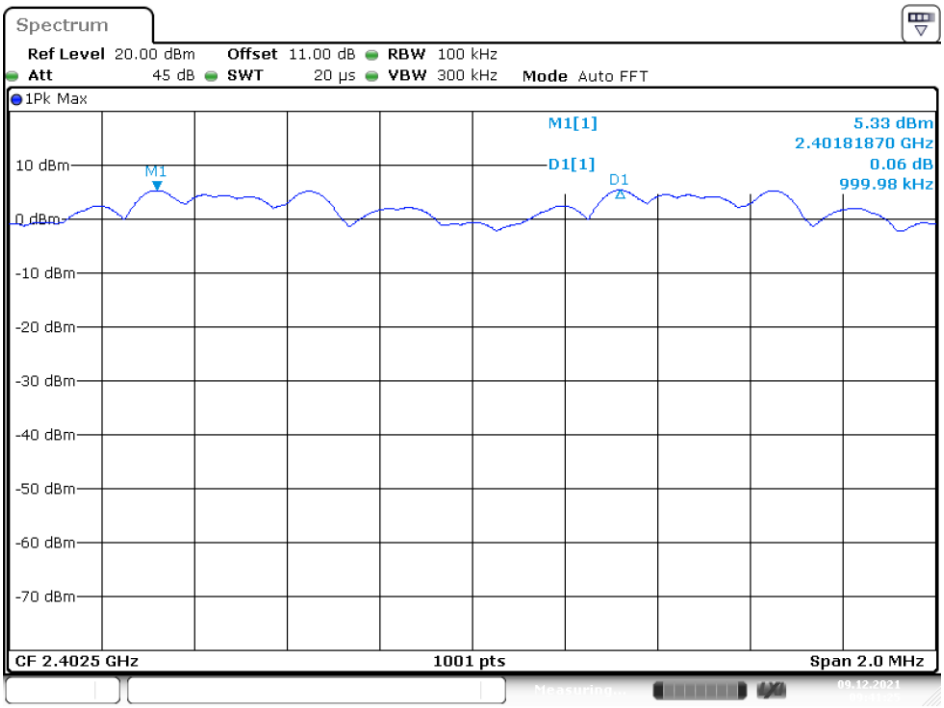


Date: 9.DEC.2021 09:12:21

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

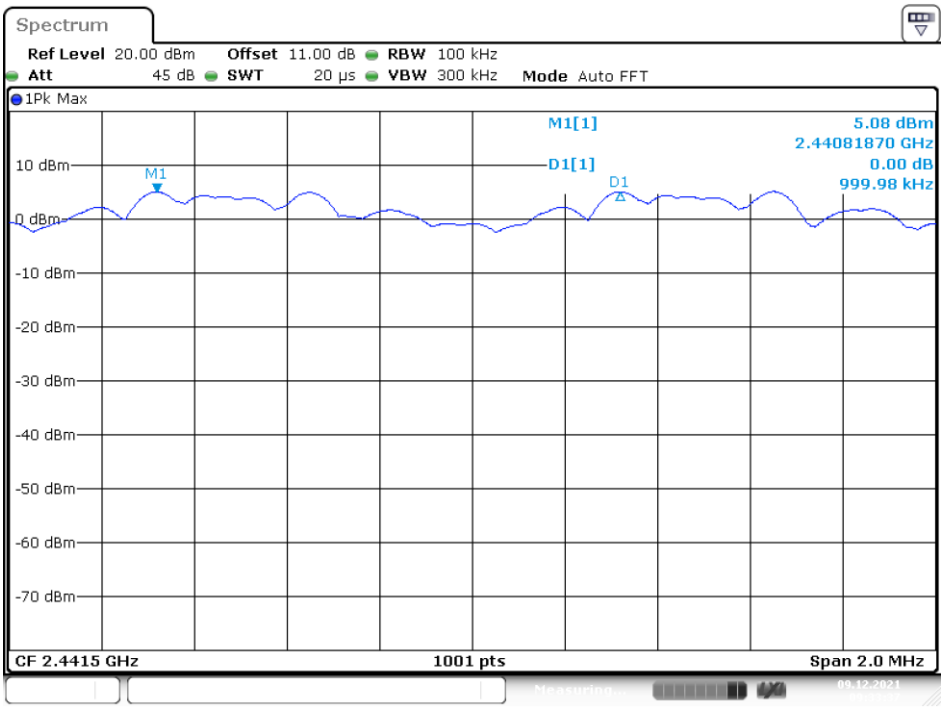
EDR Mode (8DPSK)

Low Channel



Date: 9.DEC.2021 09:41:26

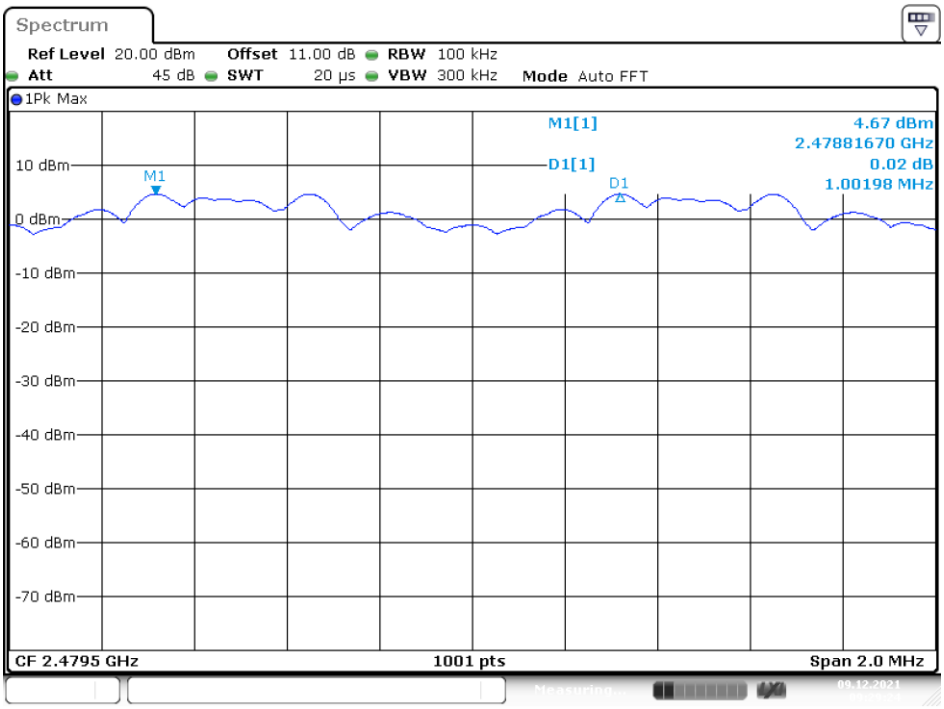
Middle Channel



Date: 9.DEC.2021 09:33:37

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

High Channel



Date: 9.DEC.2021 09:29:25

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

10.1. 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.

10.2. 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.

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

10.3. 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	0.382	320	31.6	122.24	<400	PASS
DH3	1.640	170	31.6	278.80	<400	PASS
DH5	2.885	130	31.6	375.05	<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	0.390	320	31.6	124.80	<400	PASS
2DH3	1.642	160	31.6	262.72	<400	PASS
2DH5	2.888	100	31.6	288.80	<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	0.391	310	31.6	121.21	<400	PASS
3DH3	1.643	150	31.6	246.45	<400	PASS
3DH5	2.893	110	31.6	318.23	<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

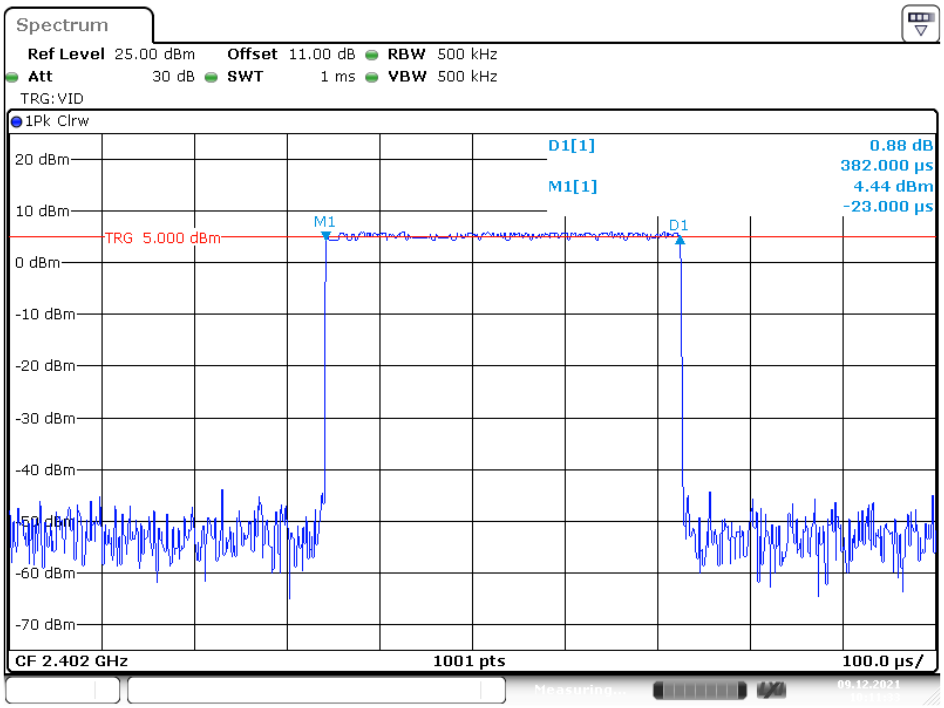
Note 3: Hopping Number/10 = Total of highest signals in 3.16s. (Second high signals were other channel)

Please refer to the following plots

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

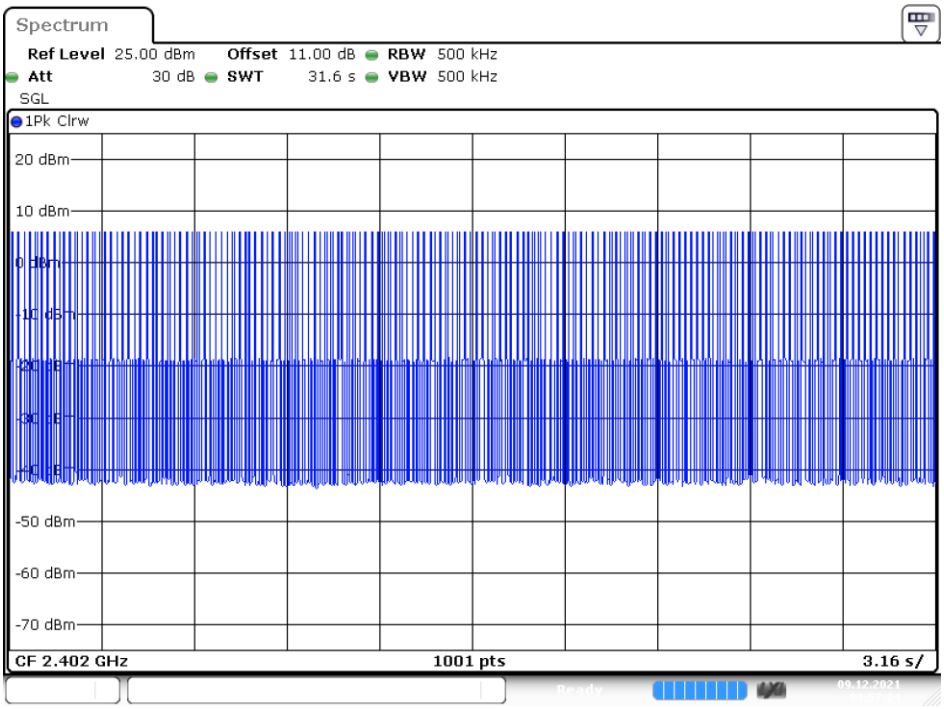
BR Mode (GFSK)

DH1: Pulse Width



Date: 9.DEC.2021 10:11:33

DH1: Hopping Number



Date: 9.DEC.2021 09:57:24

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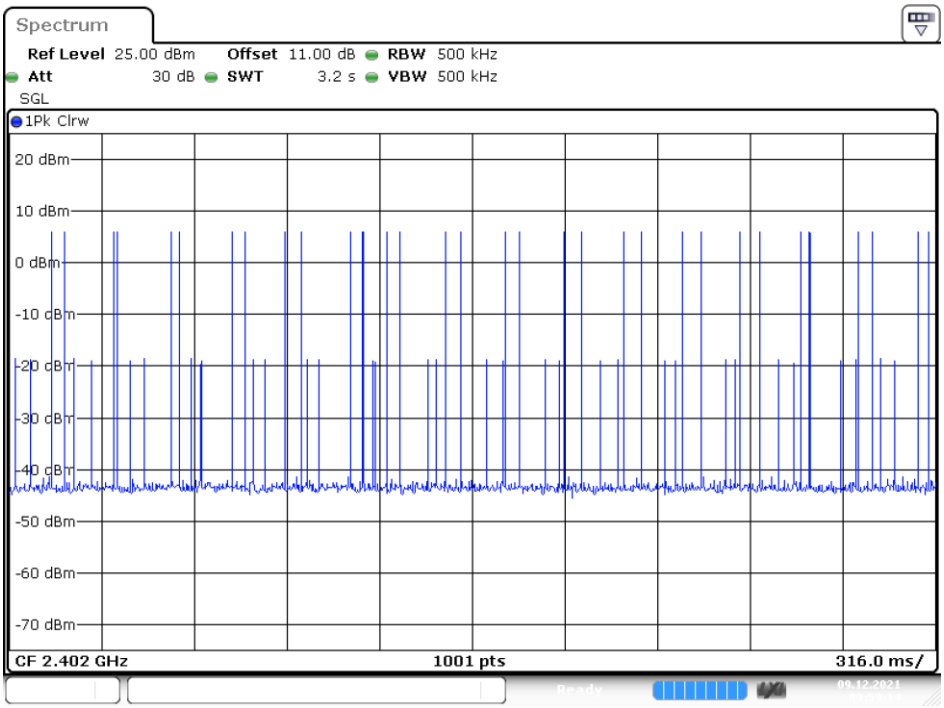
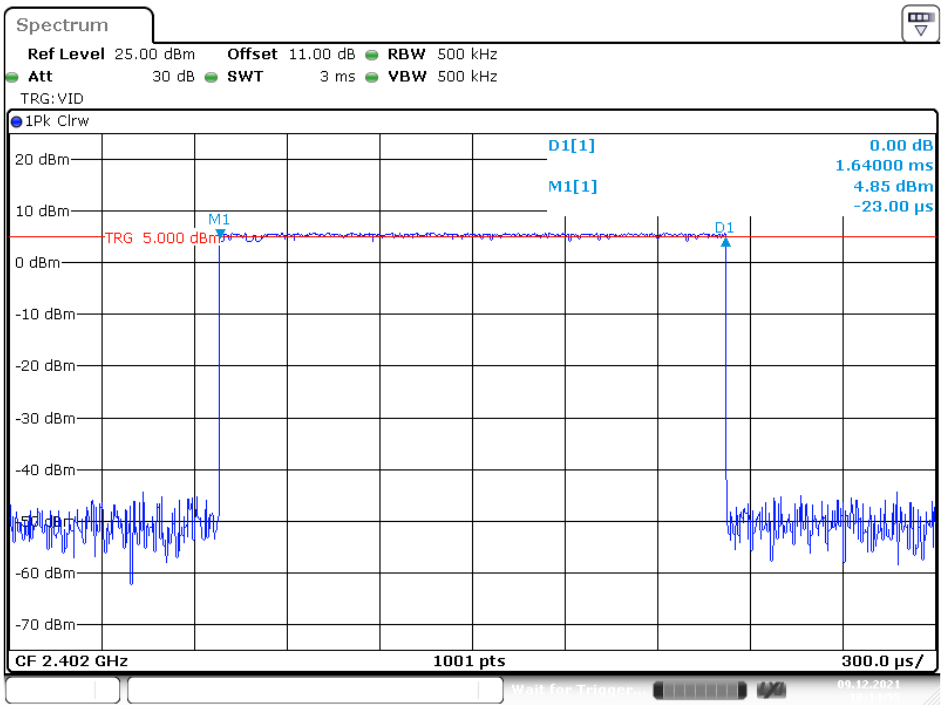
DH1: Hopping Number /10

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



Date: 9.DEC.2021 09:59:15

DH3: Pulse Width



Date: 9.DEC.2021 10:14:55

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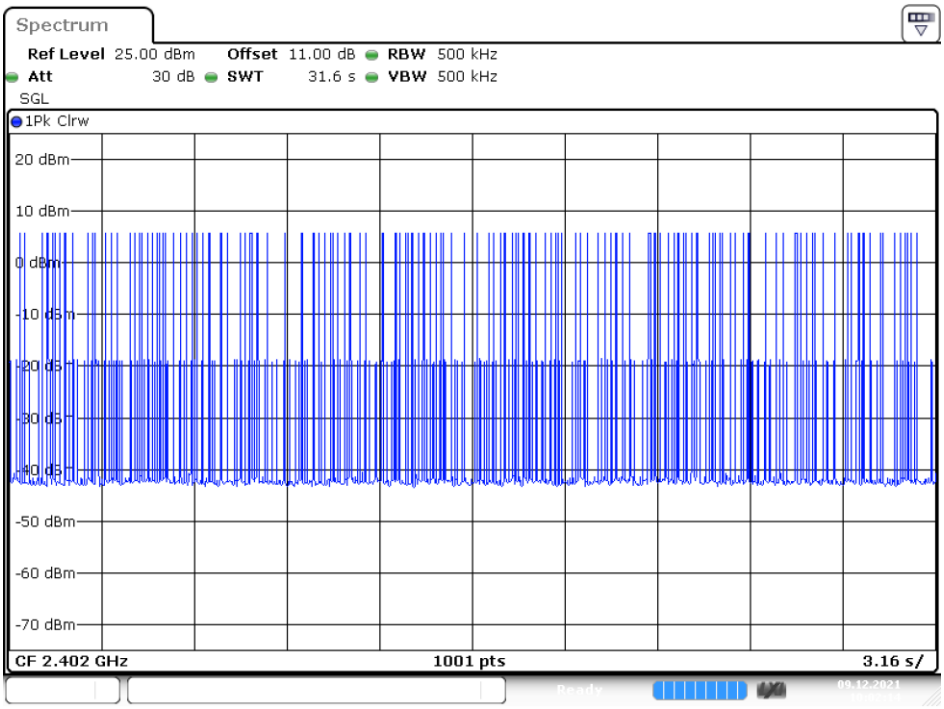
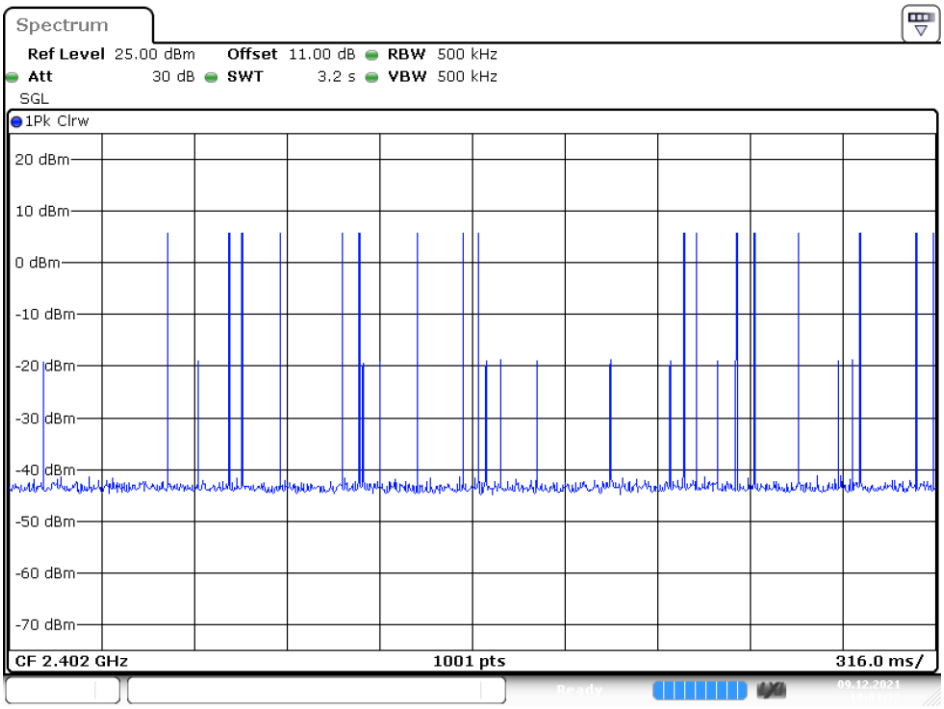
DH3: Hopping Number



Date: 9.DEC.2021 10:02:14

DH3: Hopping Number /10

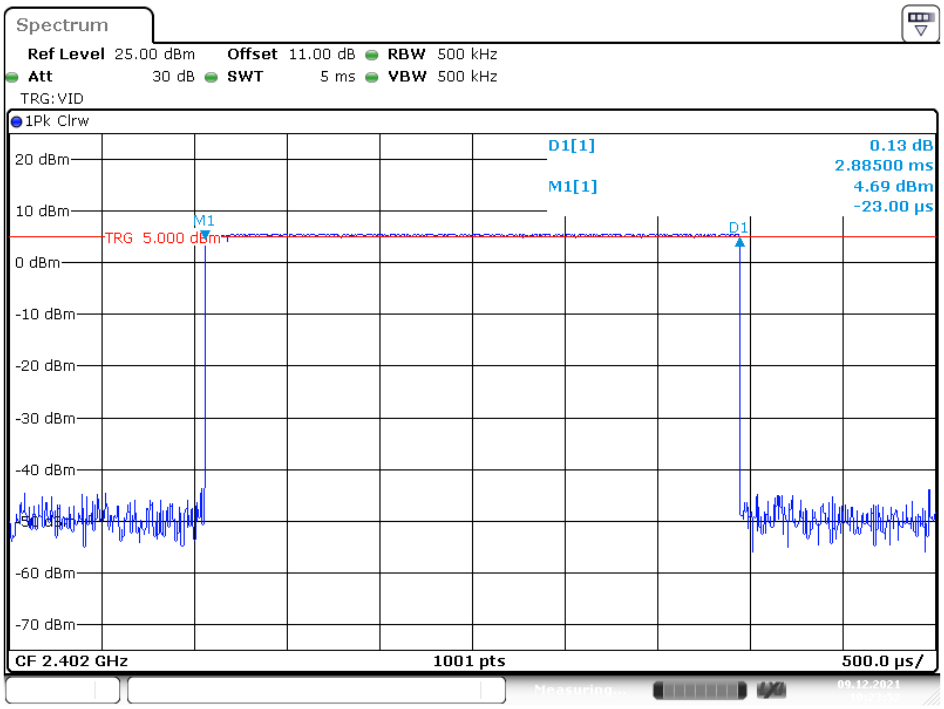
(Hopping Number = 17 in 1/10 period of highest signals, Second High signals were other channel)



Date: 9.DEC.2021 10:03:32

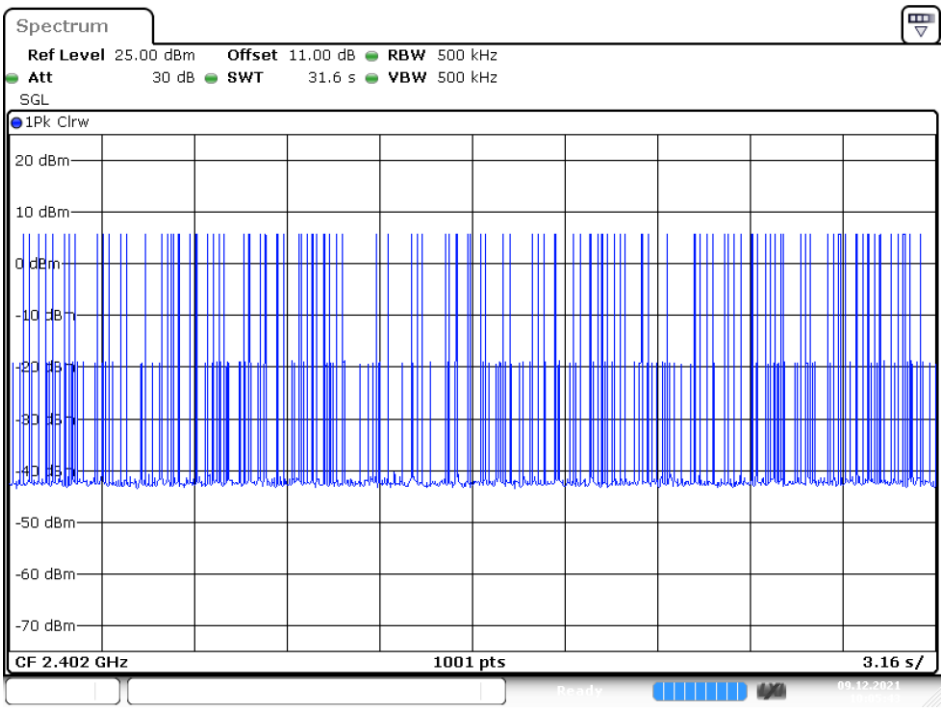
Note: It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)

DH5: Pulse Width



Date: 9.DEC.2021 10:23:52

DH5: Hopping Number



Date: 9.DEC.2021 10:05:43

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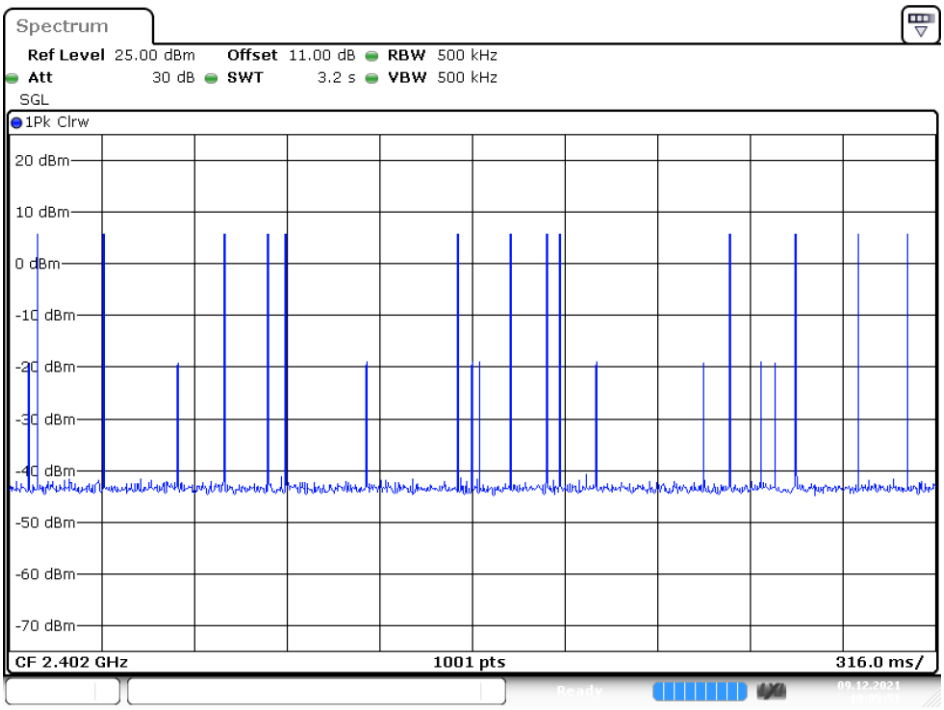
DH5: Hopping Number /10

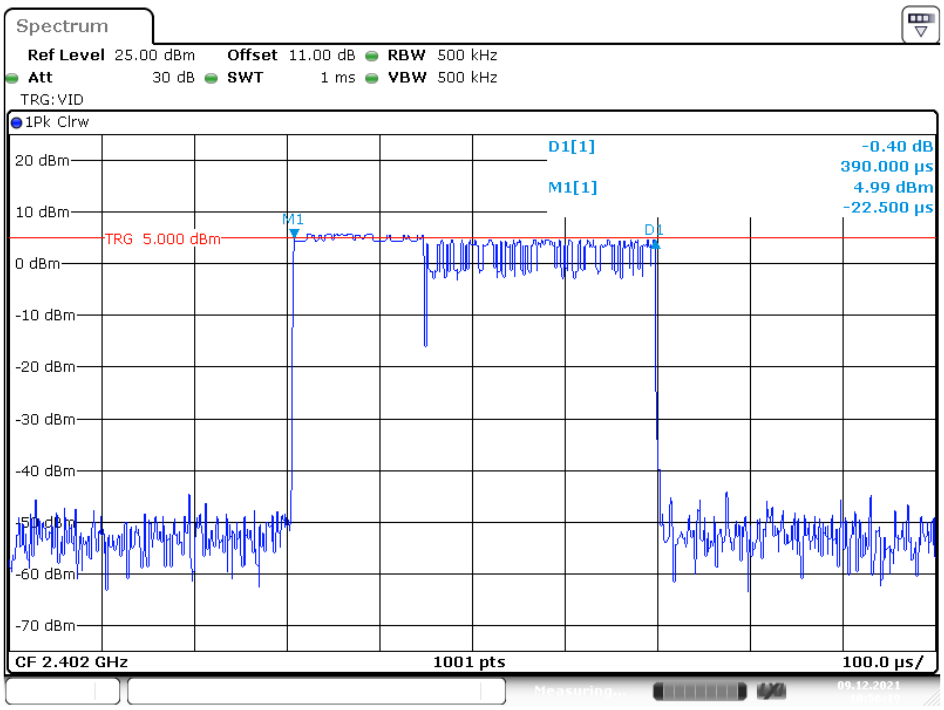
(Hopping Number = 13 in 1/10 period of highest signals, Second High signals were other channel)



Date: 9.DEC.2021 10:05:51

EDR Mode (π/4-DQPSK)

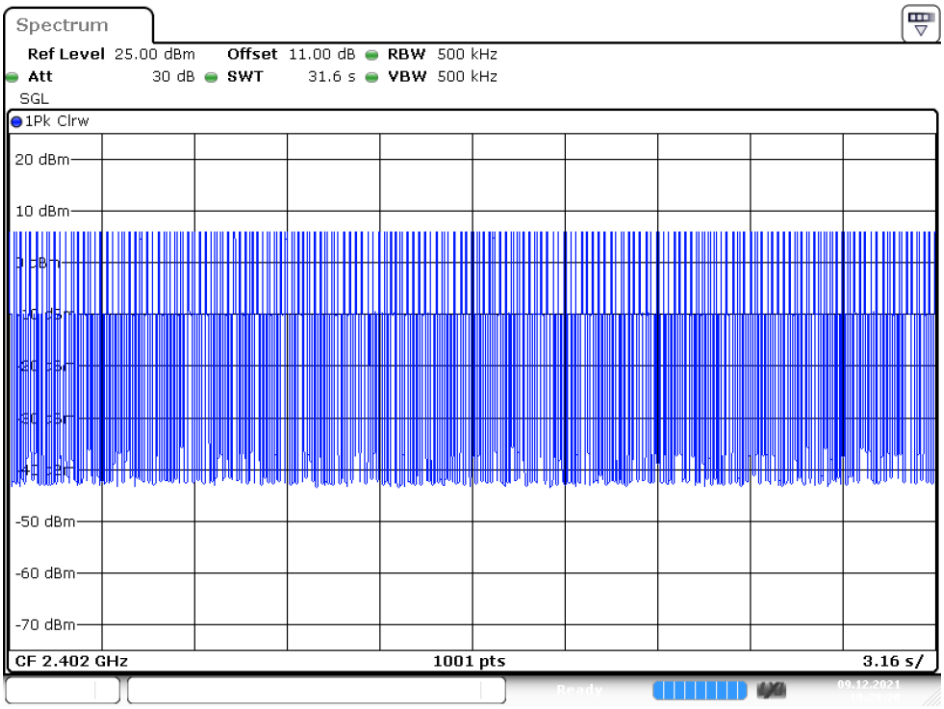
2DH1: Pulse Width



Date: 9.DEC.2021 10:56:19

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

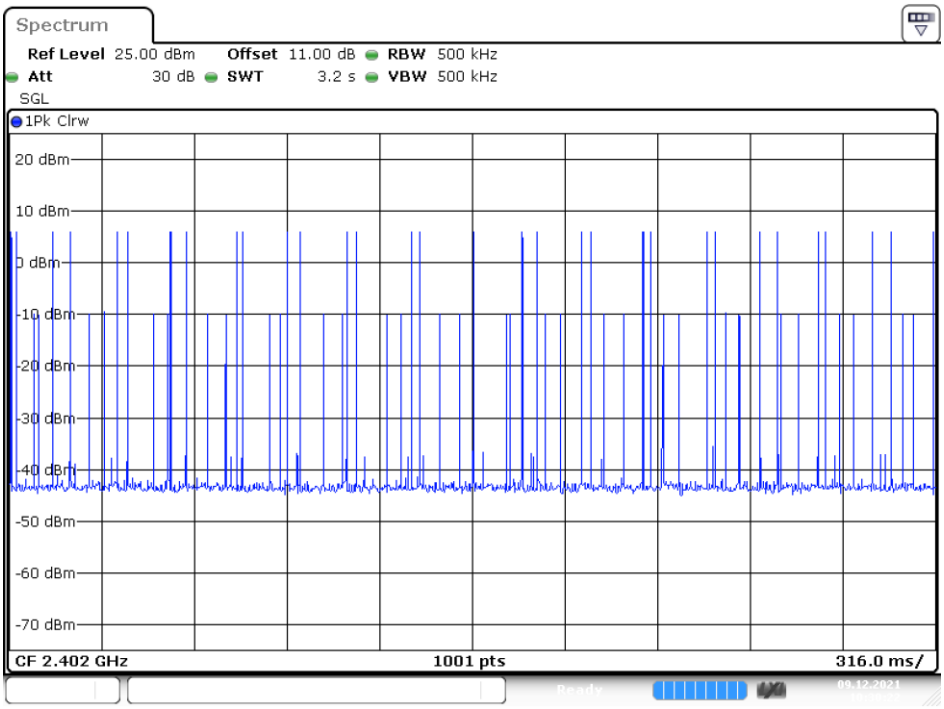
2DH1: Hopping Number



Date: 9.DEC.2021 10:29:20

2DH1: Hopping Number /10

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



Date: 9.DEC.2021 10:30:22

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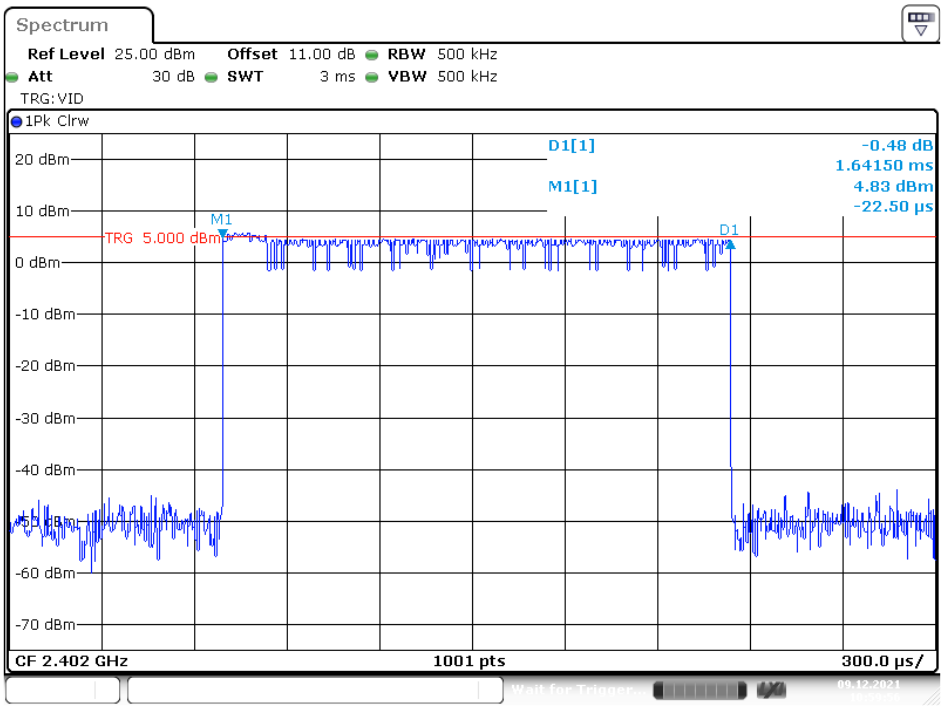
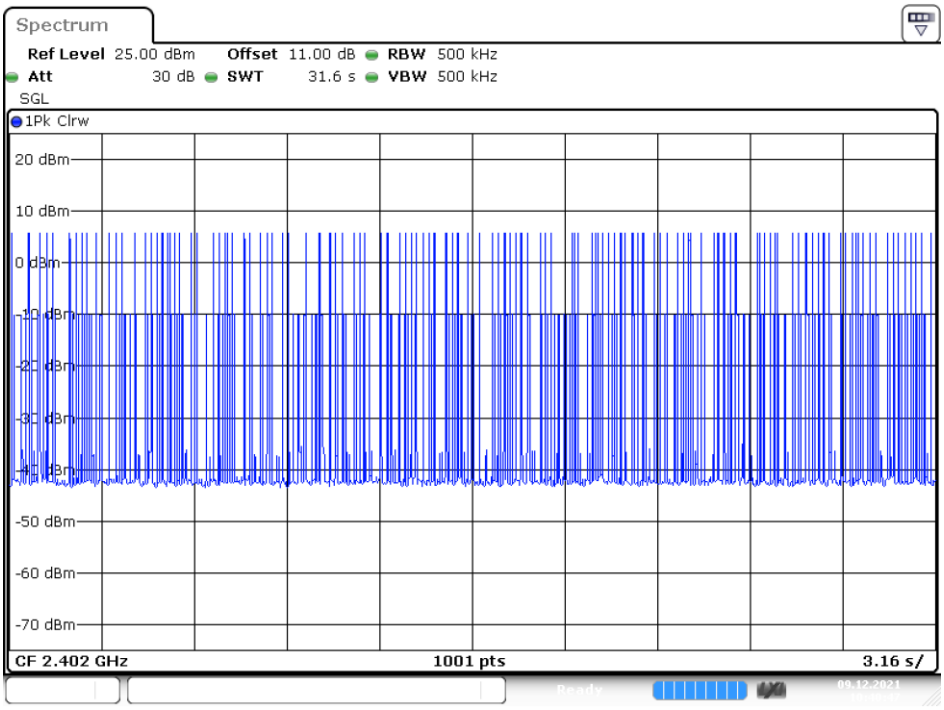
2DH3: Pulse Width



Date: 9.DEC.2021 10:59:56

2DH3: Hopping Number



Date: 9.DEC.2021 10:40:47

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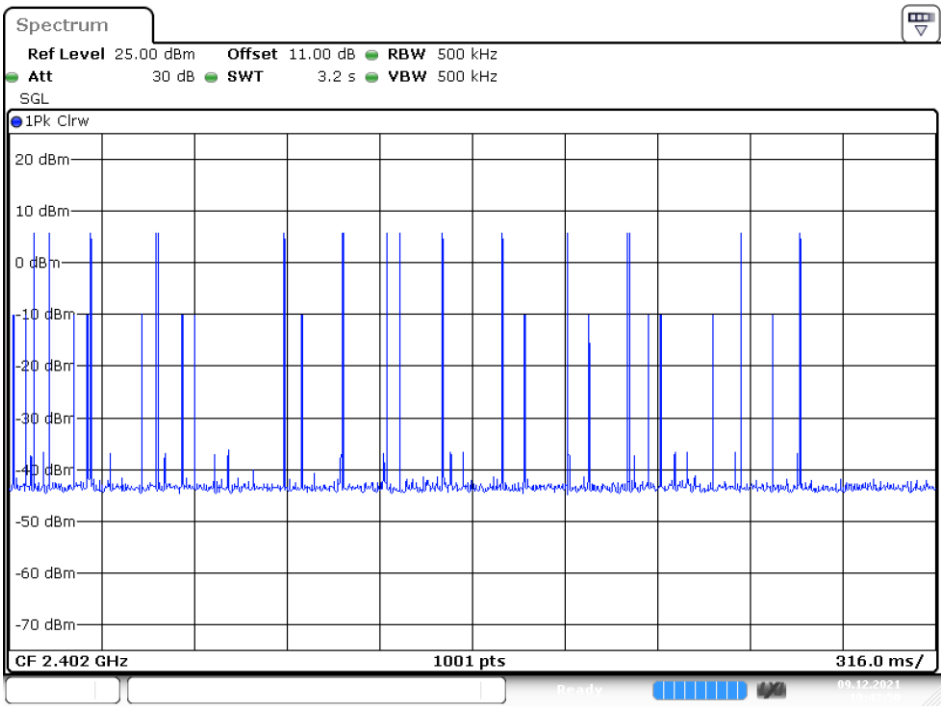
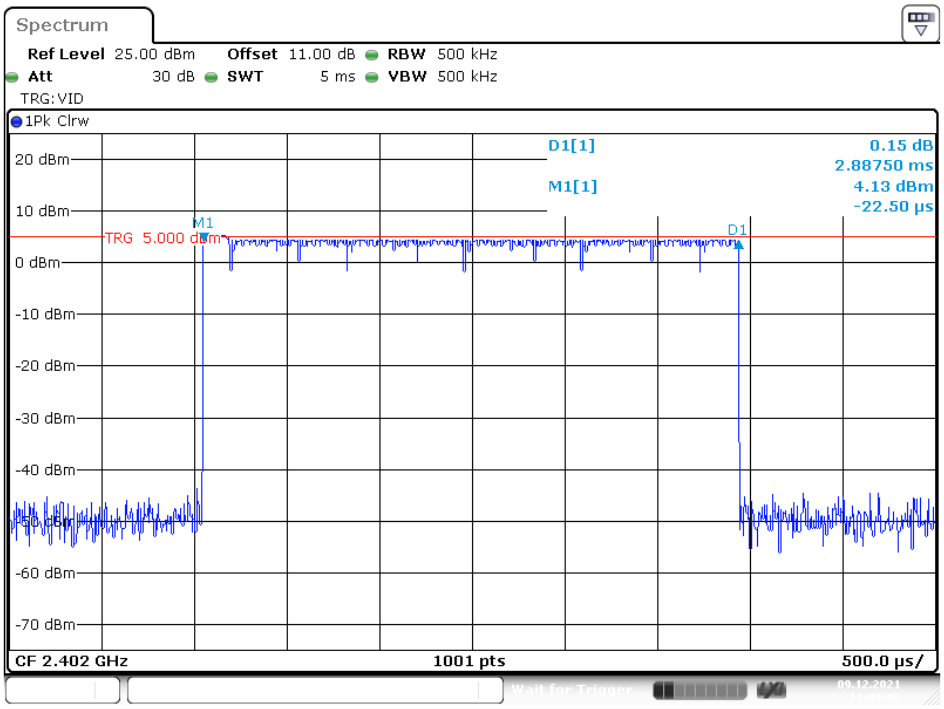
2DH3: Hopping Number /10

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



Date: 9.DEC.2021 10:43:51

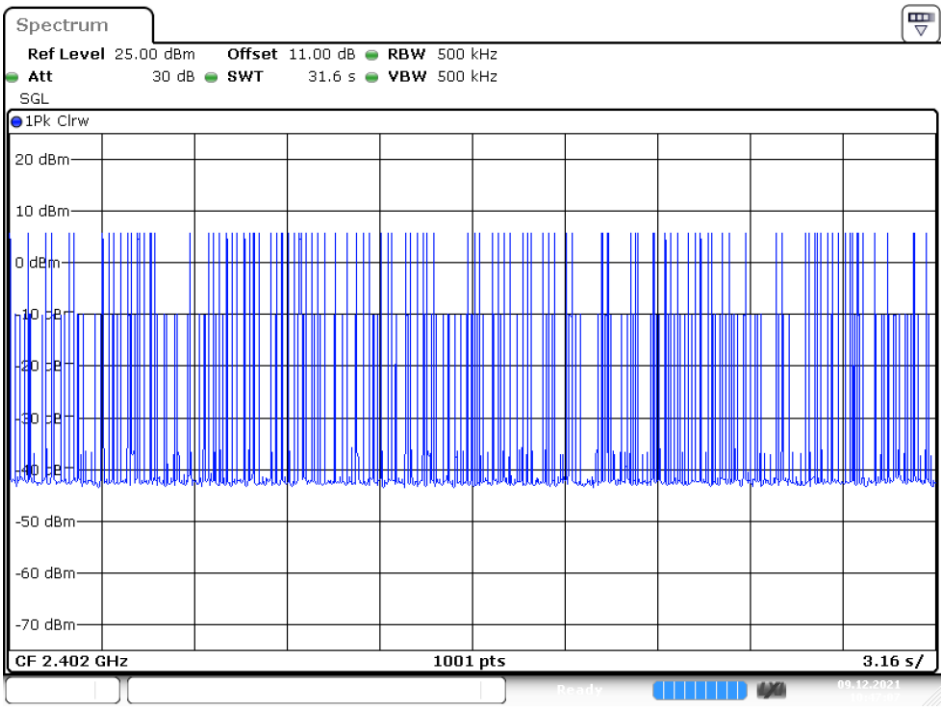
2DH5: Pulse Width



Date: 9.DEC.2021 11:08:06

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

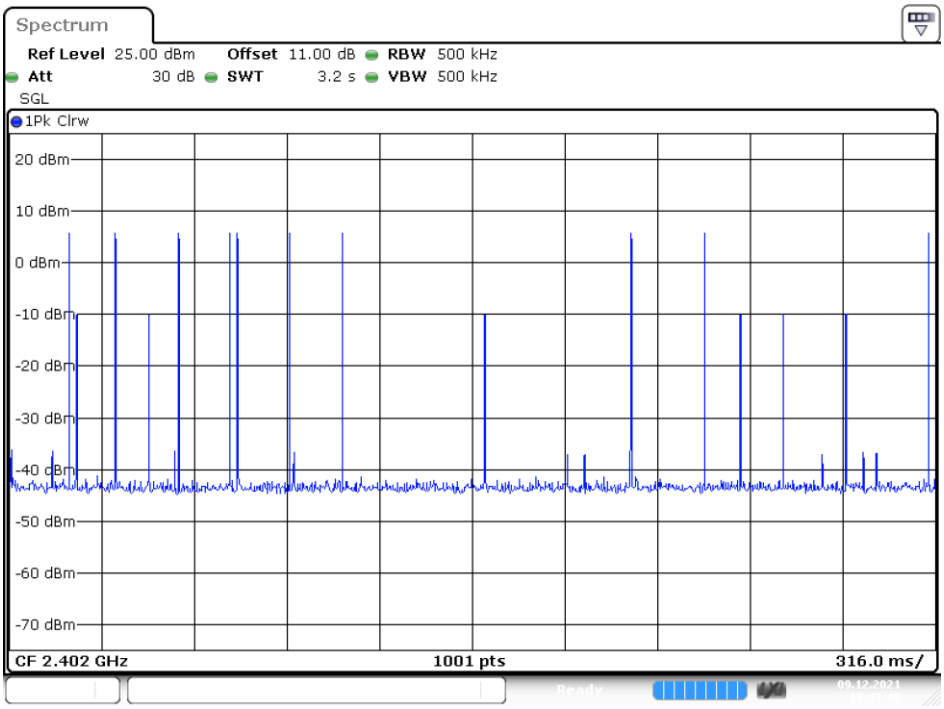
2DH5: Hopping Number



Date: 9.DEC.2021 10:47:07

2DH5: Hopping Number /10

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

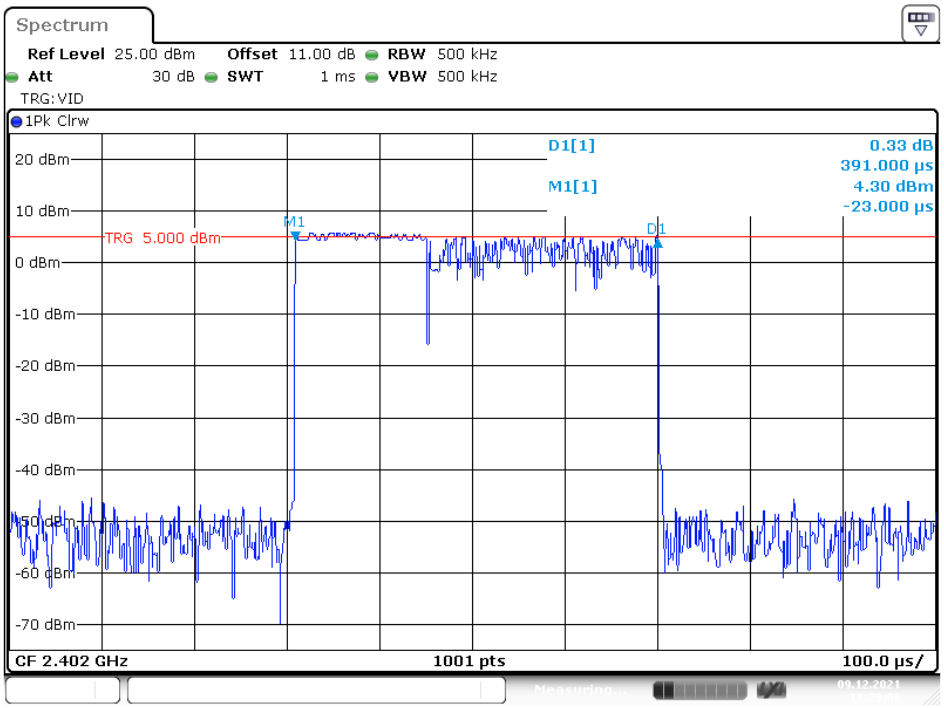


Date: 9.DEC.2021 10:48:41

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

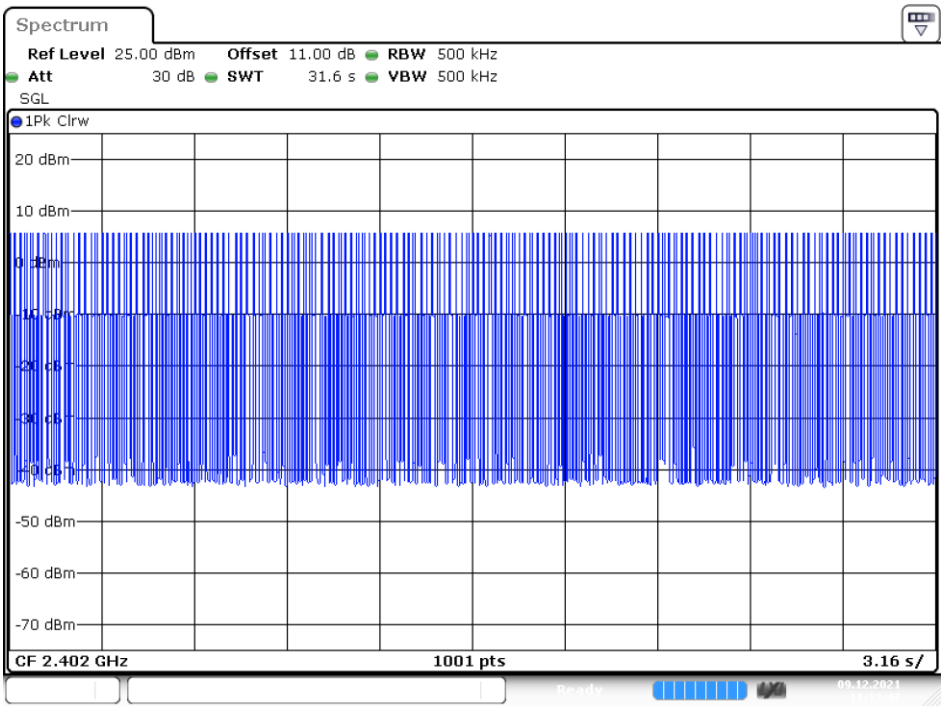
EDR Mode (8DPSK)

3DH1: Pulse Width



Date: 9.DEC.2021 11:29:07

3DH1: Hopping Number



Date: 9.DEC.2021 11:13:48

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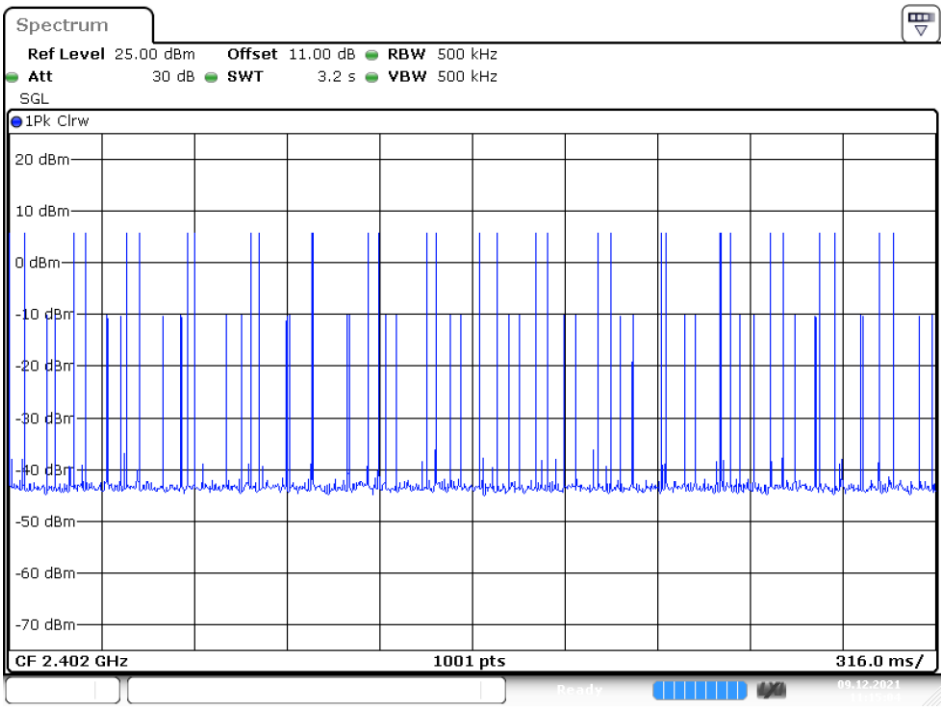
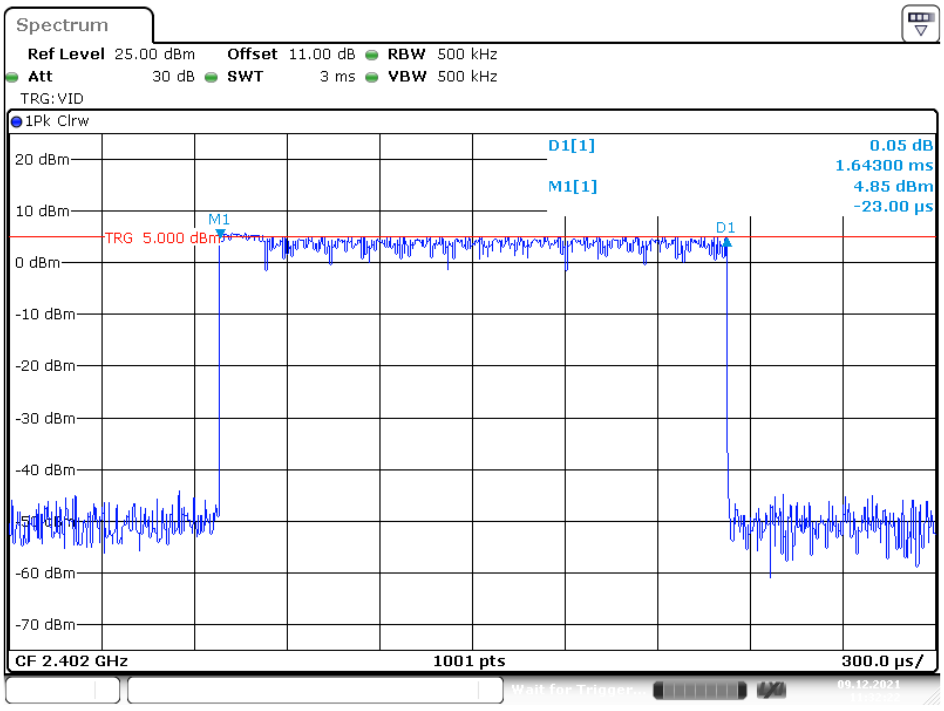
3DH1: Hopping Number /10

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



Date: 9.DEC.2021 11:15:04

3DH3: Pulse Width



Date: 9.DEC.2021 11:32:23

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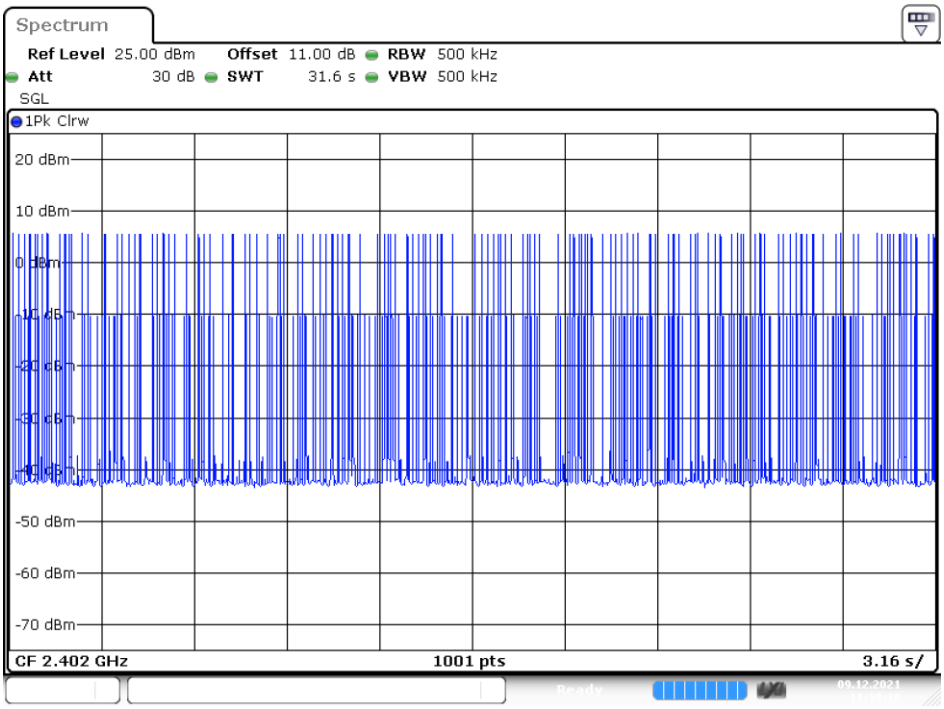
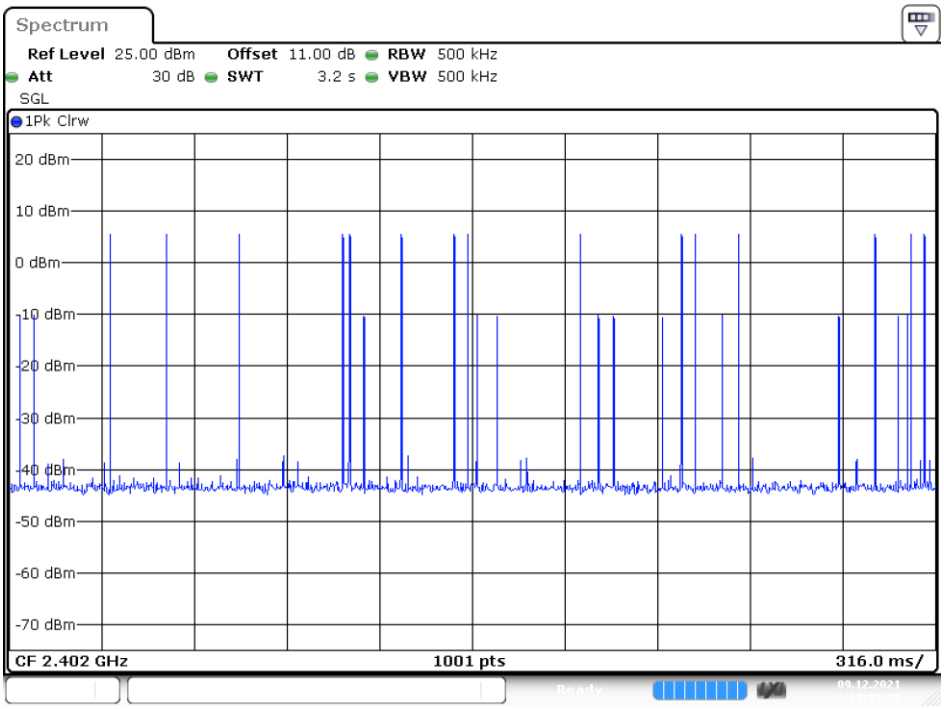
3DH3: Hopping Number



Date: 9.DEC.2021 11:19:18

3DH3: Hopping Number /10

(Hopping Number = 15 in 1/10 period of highest signals, Second High signals were other channel)



Date: 9.DEC.2021 11:19:29

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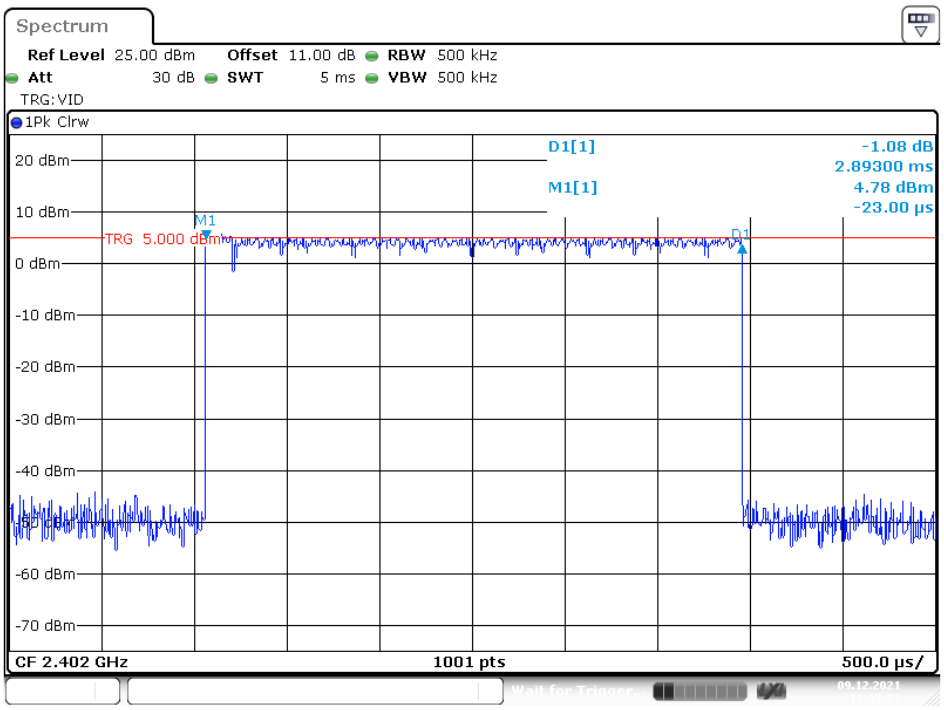
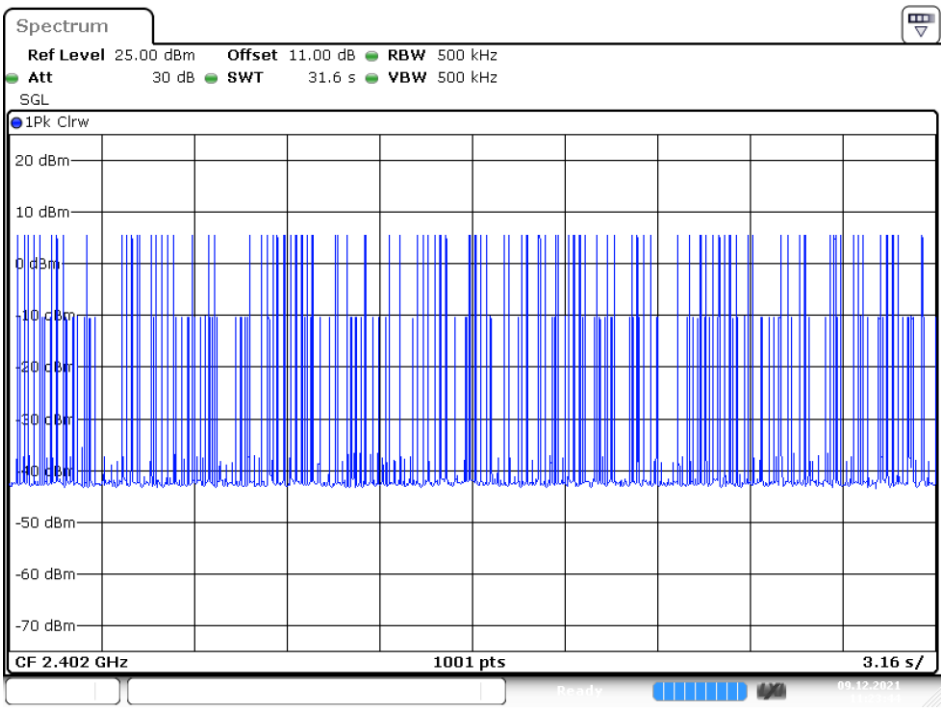
3DH5: Pulse Width



Date: 9.DEC.2021 11:35:01

3DH5: Hopping Number



Date: 9.DEC.2021 11:23:45

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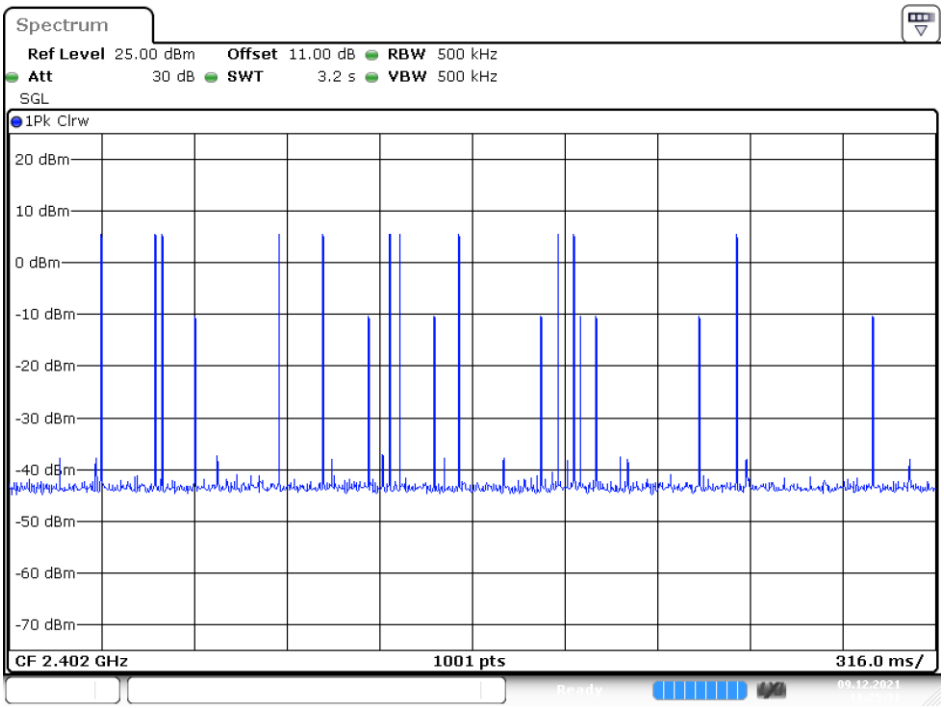
3DH5: Hopping Number /10

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



Date: 9.DEC.2021 11:25:31

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

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

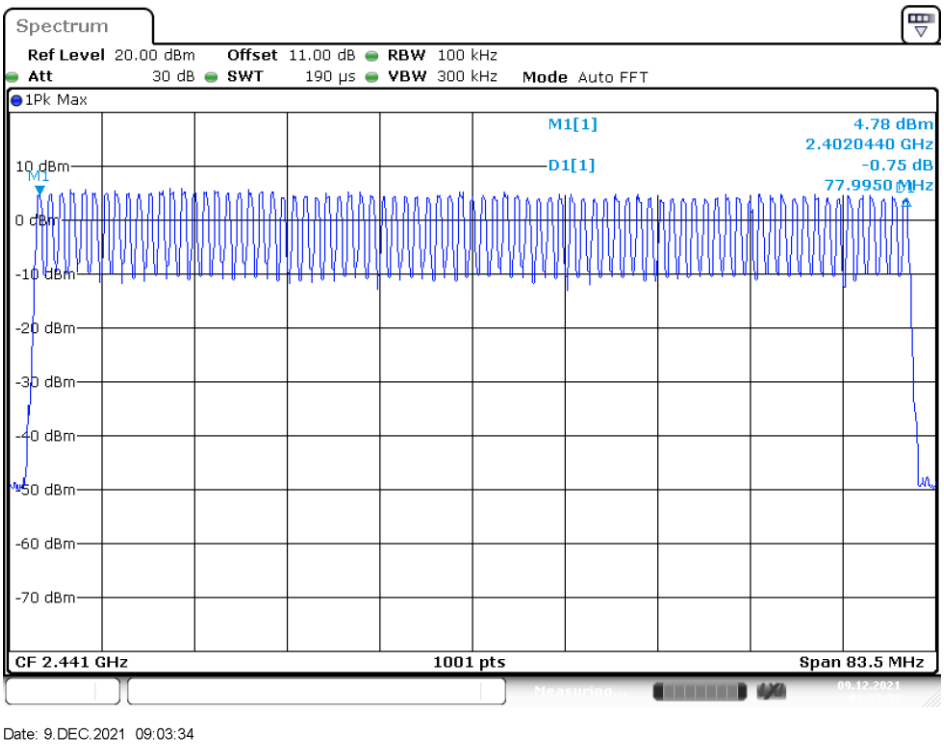
1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Set the EUT in hopping mode from first channel to last.
3. By using the Max-Hold function record the Quantity of the channel.

11.3. Test Results

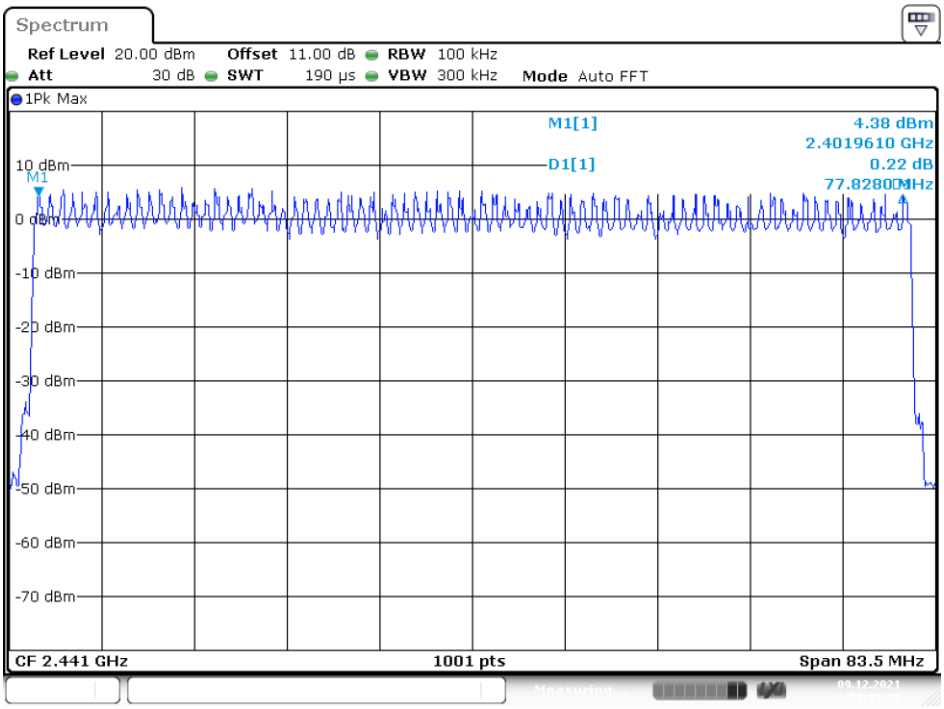
Mode	Frequency Range (MHz)	Number of Hopping Channel (CH)	Limit (CH)	Result
GFSK	2402-2480	79	>15	Compliance
π/4-DQPSK	2402-2480	79	>15	Compliance
8DPSK	2402-2480	79	>15	Compliance

Please refer to the following plots

BR Mode (GFSK)

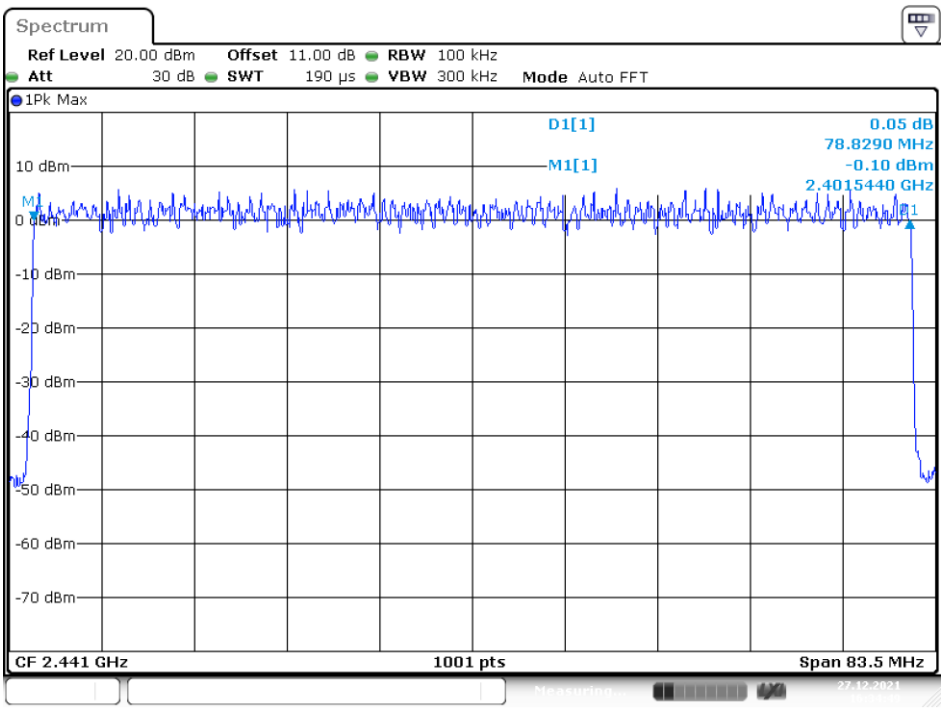


EDR Mode (π/4-DQPSK)



Date: 9.DEC.2021 09:19:30

EDR Mode (8DPSK)



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

12.1. 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.

12.2. 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.

12.3. Test Results

Channel	Frequency (MHz)	Peak Conducted Output Power		Limit (W)	Result
		(dBm)	(W)		
BR Mode (GFSK)					
Low	2402	6.37	0.004	0.125	Compliance
Middle	2441	6.01	0.004	0.125	Compliance
High	2480	5.35	0.003	0.125	Compliance
EDR Mode (π/4-DQPSK)					
Low	2402	7.45	0.006	0.125	Compliance
Middle	2441	7.11	0.005	0.125	Compliance
High	2480	6.57	0.005	0.125	Compliance
EDR Mode (8DPSK)					
Low	2402	7.77	0.006	0.125	Compliance
Middle	2441	7.45	0.006	0.125	Compliance
High	2480	7.05	0.005	0.125	Compliance

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

13.1. 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).

13.2. 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

13.3. Test Results

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
BR Mode (GFSK)				
Low	2402	55.12	≥ 20	PASS
High	2480	52.67	≥ 20	PASS
BR Hopping Mode (GFSK)				
Low	2402-2480	53.97	≥ 20	PASS
High	2402-2480	52.81	≥ 20	PASS
EDR Mode (π/4-DQPSK)				
Low	2402	52.69	≥ 20	PASS
High	2480	52.57	≥ 20	PASS
EDR Hopping Mode (π/4-DQPSK)				
Low	2402-2480	51.33	≥ 20	PASS
High	2402-2480	51.93	≥ 20	PASS
EDR Mode (8DPSK)				
Low	2402	53.47	≥ 20	PASS
High	2480	48.71	≥ 20	PASS
EDR Hopping Mode (8DPSK)				
Low	2402-2480	51.10	≥ 20	PASS
High	2402-2480	50.47	≥ 20	PASS

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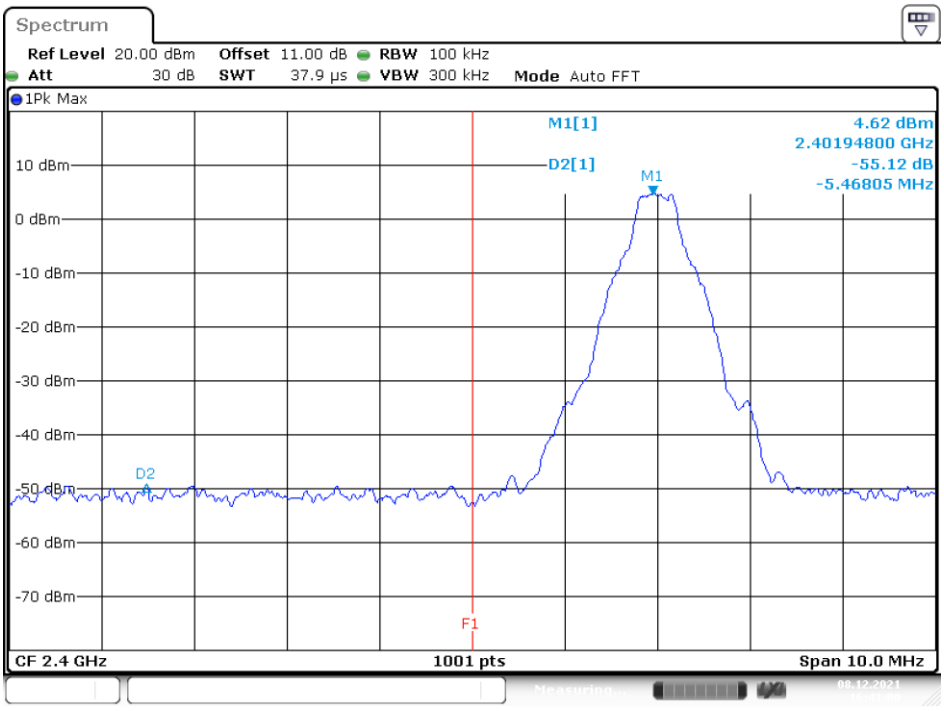
Please refer to the following plots.

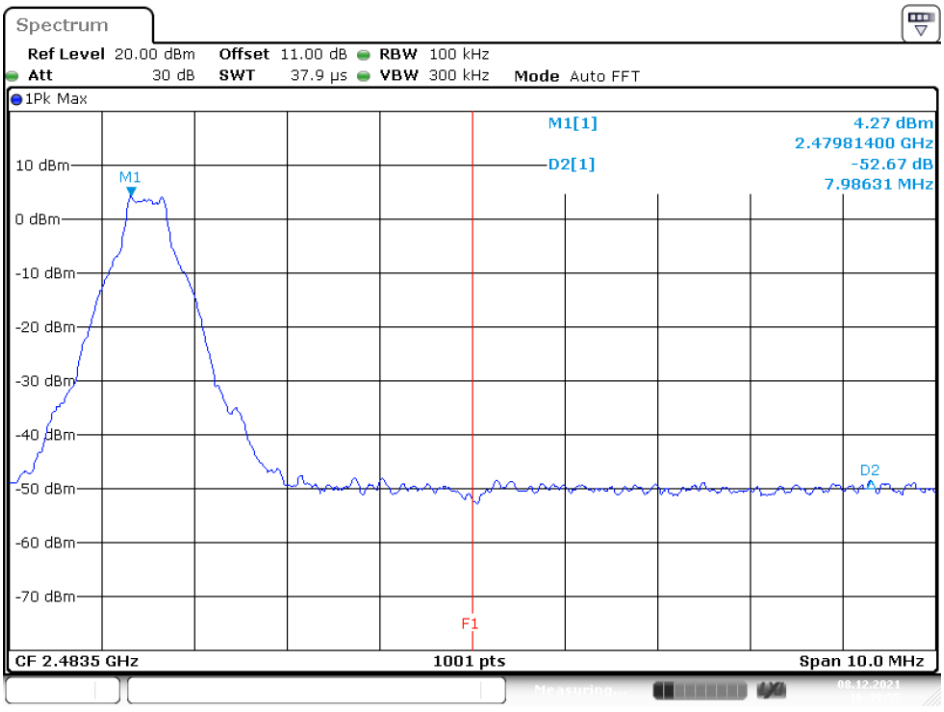
BR Mode (GFSK)

Band Edge, CH Low



Date: 8.DEC.2021 16:41:00

Band Edge, CH High



Date: 8.DEC.2021 16:49:56

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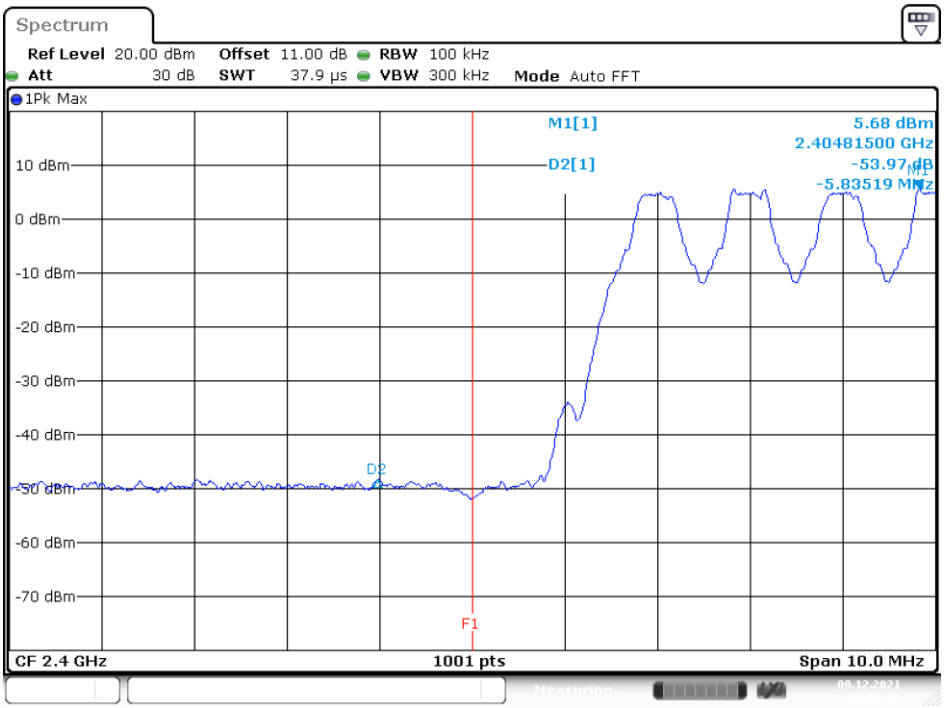
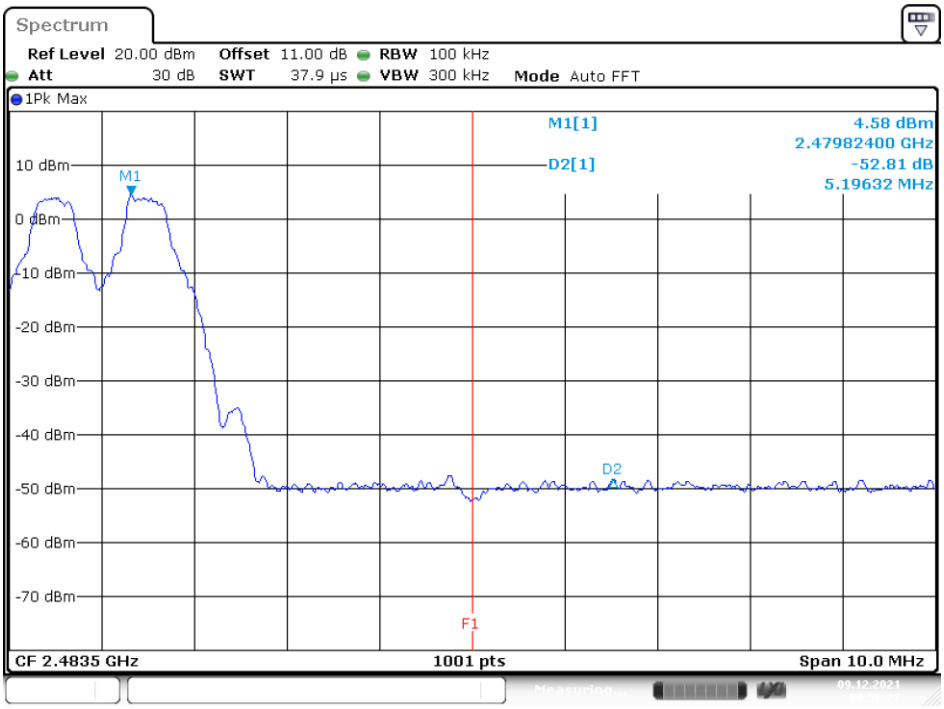
BR Hopping Mode (GFSK)

Band Edge, CH Low



Date: 9.DEC.2021 08:53:26

Band Edge, CH High



Date: 9.DEC.2021 08:56:28

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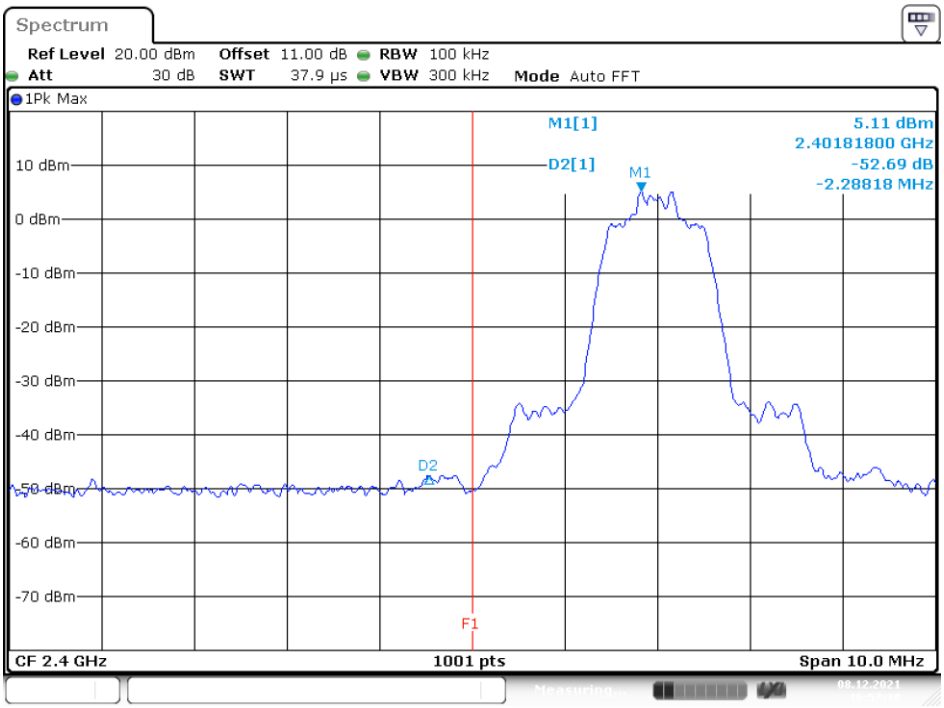
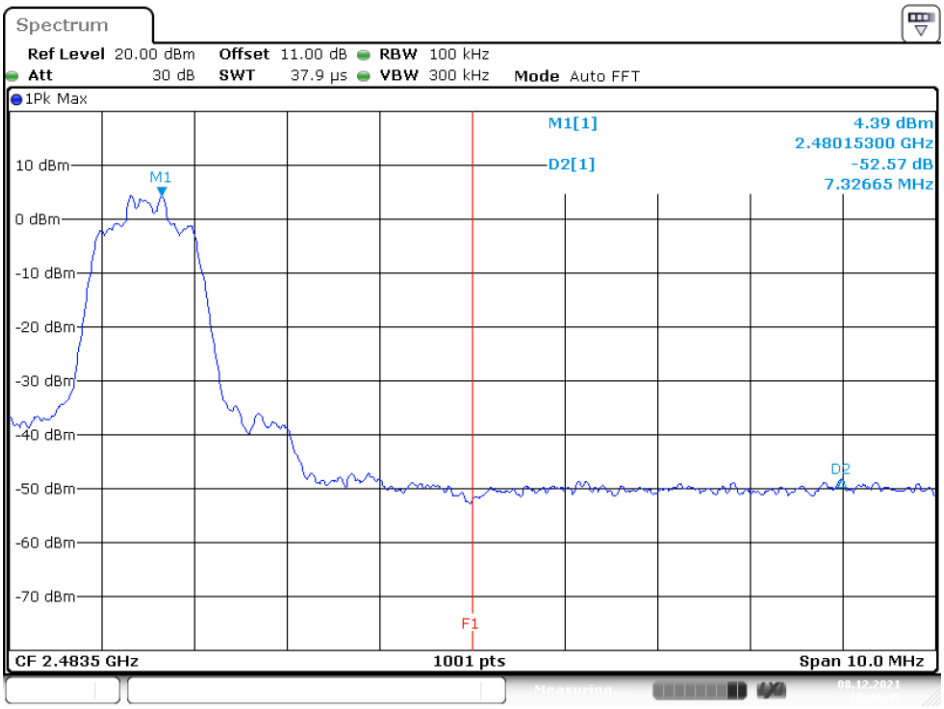
EDR Mode (π/4-DQPSK)

Band Edge, CH Low



Date: 8.DEC.2021 16:57:19

Band Edge, CH High



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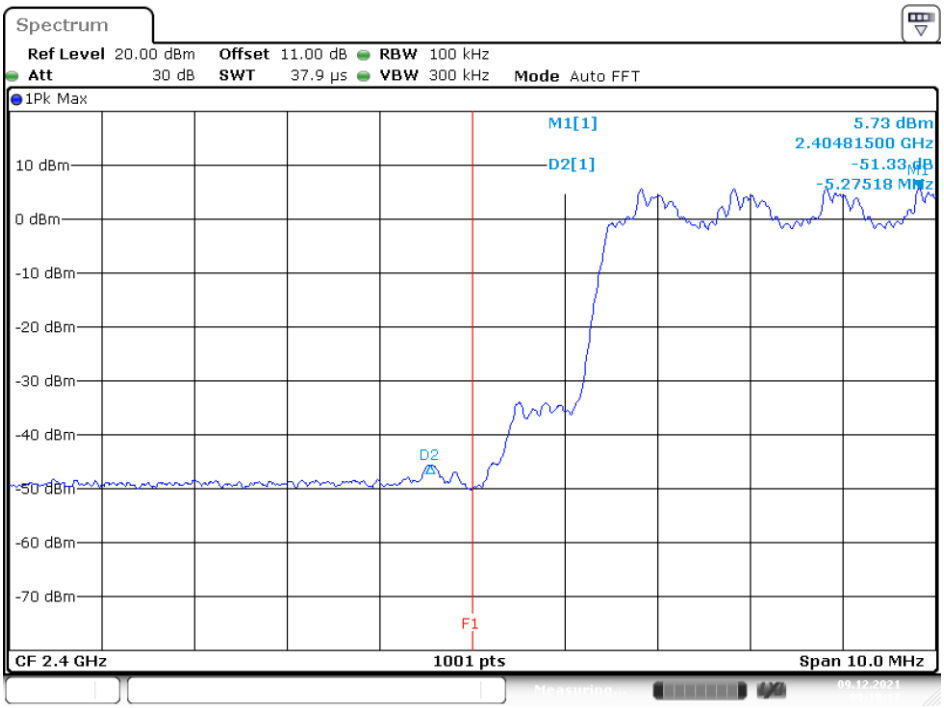
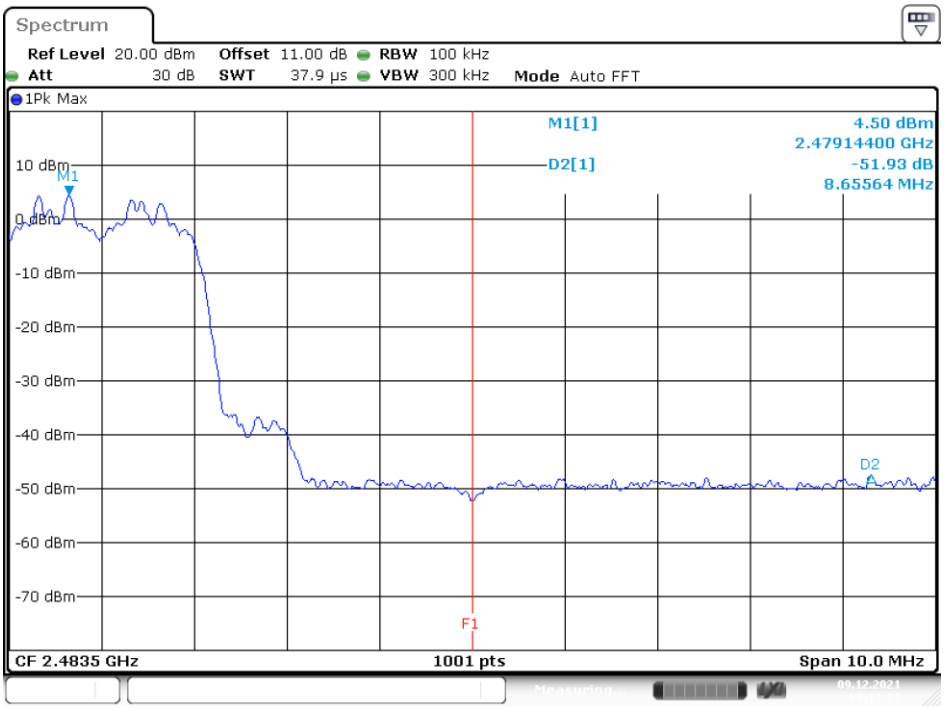
EDR Hopping Mode (π/4-DQPSK)

Band Edge, CH Low



Date: 9.DEC.2021 09:10:17

Band Edge, CH High



Date: 9.DEC.2021 09:11:23

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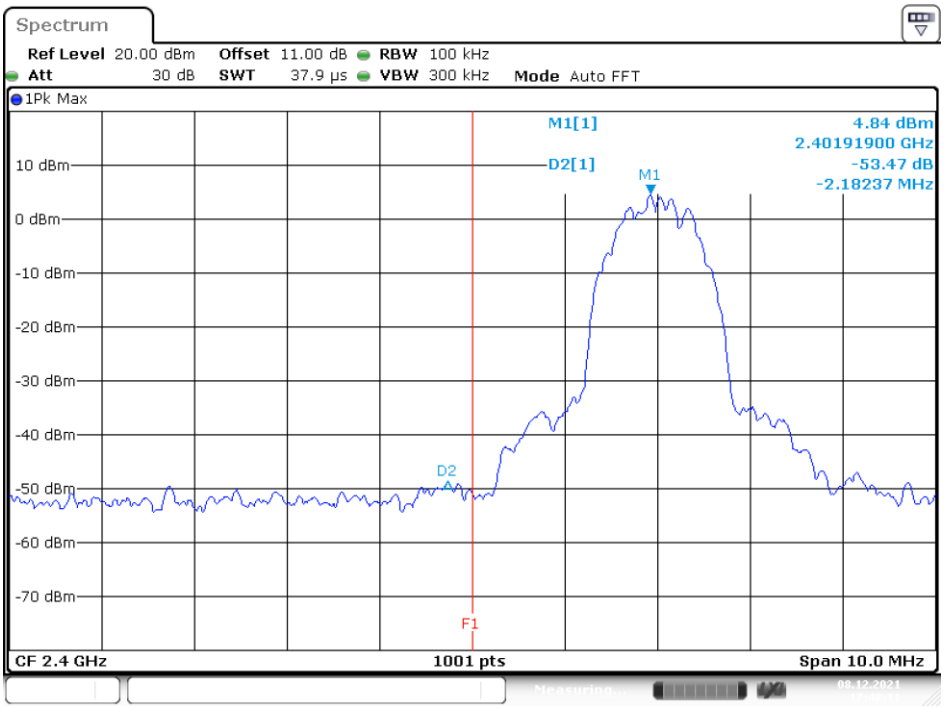
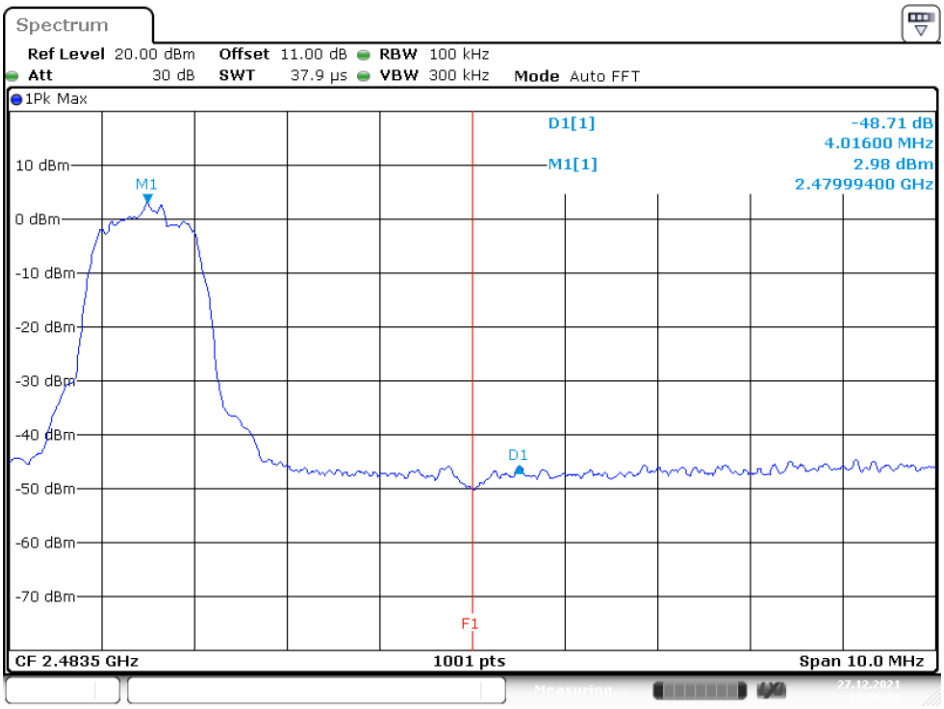
EDR Mode (8DPSK)

Band Edge, CH Low



Date: 8.DEC.2021 17:48:11

Band Edge, CH High



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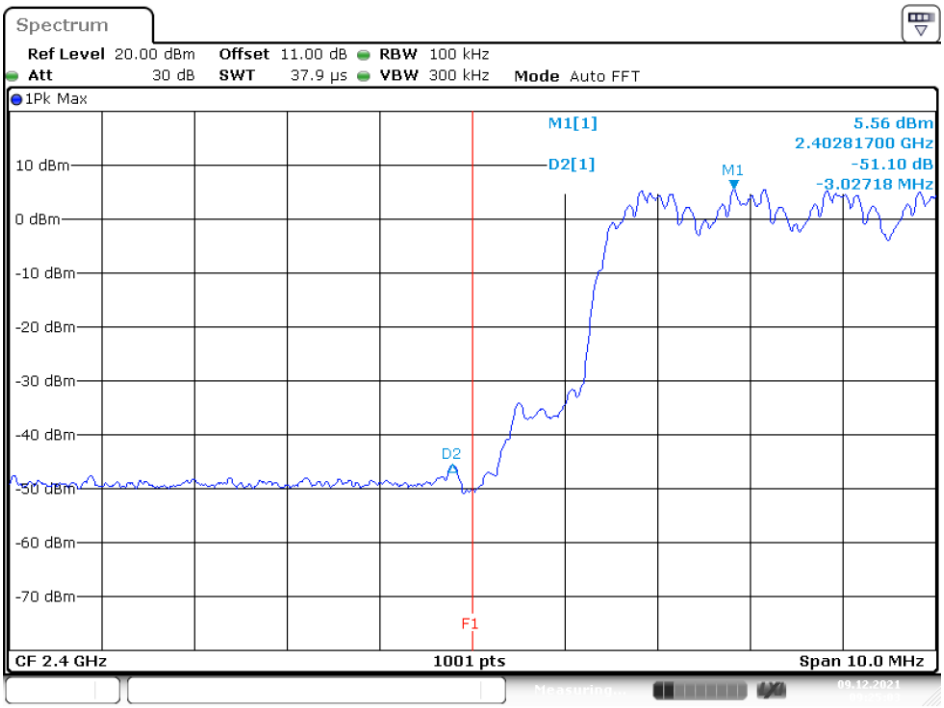
EDR Hopping Mode (8DPSK)

Band Edge, CH Low



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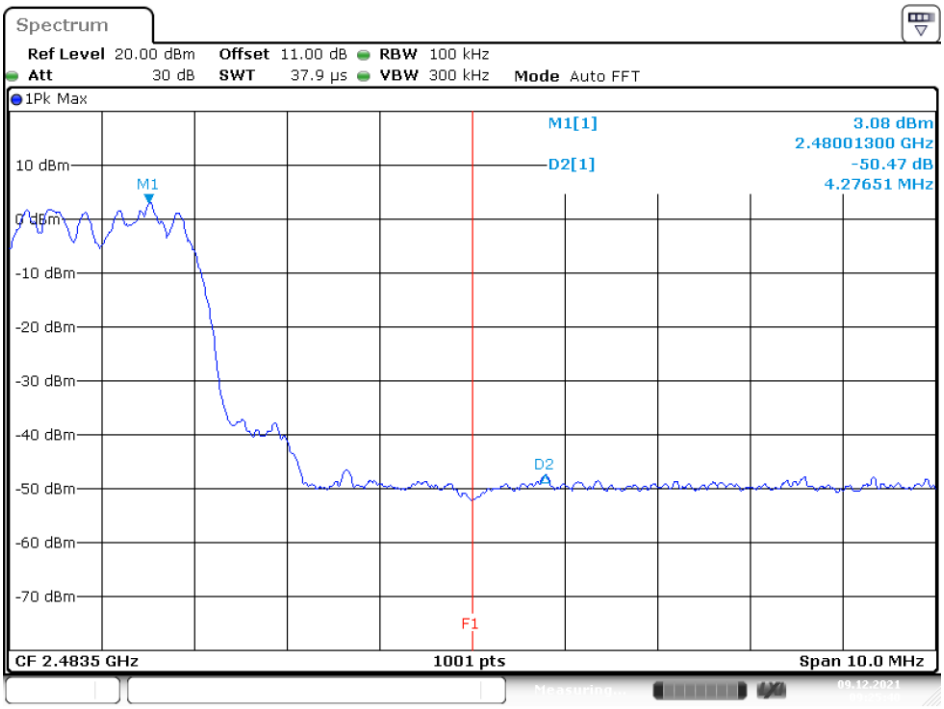
Band Edge, CH High



Date: 9.DEC.2021 09:25:41

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