FCC Part 15.247

TEST REPORT

For

FEITIAN Technologies Co., Ltd.

Floor 17th, Tower B, Huizhi Mansion, No.9 Xueqing Road, Haidian District, Beijing, China

FCC ID: ZD3FTF20SC200RNA

Report Type:	**Product Type:**
Original Report	Android POS Terminal

Report Producer : **Jane Chen** Jane Chen

Report Number : **RXZ210922002RF04**

Report Date : **2021-11-01**

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Revision History

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
0.0	RXZ210922002	RXZ210922002RF04	2021-11-01	Original Report	Jane Chen

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1. General Information

1.1. Product Description for Equipment under Test (EUT)

Applicant	FEITIAN Technologies Co., Ltd. Floor 17th, Tower B, Huizhi Mansion, No.9 Xueqing Road, Haidian District, Beijing, China
Manufacturer	FEITIAN Technologies Co., Ltd. Floor 17th, Tower B, Huizhi Mansion, No.9 Xueqing Road, Haidian District, Beijing, China
Brand(Trade) Name	N/A
Product (Equipment)	Android POS Terminal
Main Model Name	F20 FP
Series Model Name	F20
Model Discrepancy	F20 FP with Touch Function F20 without Touch Function
Frequency Range	2402 ~ 2480 MHz
Transmit Power	BR(GFSK) Mode: 8.64 dBm EDR(π/4-DQPSK) Mode: 8.70 dBm EDR(8DPSK) Mode: 9.03 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 ☒ Adapter1 Brand Name: DEE VAN Model:DSA-10PF06-05 FUS I/P: 100-240Vac,0.3A O/P: 5Vdc, 2.0A Adapter2 Brand Name: TEKA Model:TEKA-UCA20US I/P: 100-240Vac,0.35A O/P: 5Vdc, 2.0A ☐ By AC Power Cord ☐ PoE
	☒ DC Type ☒ Battery: Rechargeable Li-ion Battery Rechargeable Li-polymer Battery Brand Name: ShenZhen Utility Power Source Co., Ltd. Model: D07 7.6V dc_2500mAh ☐ DC Power Supply ☐ External from USB Cable ☐ External DC Adapter

	☐ Host System
Received Date	Sep. 24, 2021
Date of Test	Sep 10, 2018 ~ Nov 05, 2018

*All measurement and test data in this report was gathered from production sample serial number: RXZ210922002-01 (Assigned by BACL).

1.2. Objective

This report is prepared on behalf of *FEITIAN Technologies Co*., Ltd. in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communication Commission's rules.
The tests were performed in order to determine the Bluetooth BR and EDR mode of EUT compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

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

FCC Part 15.407 NII submission with FCC ID: ZD3FTF20SC200RNA
FCC Part 15.247 DTS Submittal with FCC ID: ZD3FTF20SC200RNA
FCC Part 15.225 DXX submissions with FCC ID: ZD3FTF20SC200RNA
FCC Part 22H24E27 PCB submissions with FCC ID: ZD3FTF20SC200RNA
FCC Part 90 PCB submissions with FCC ID: ZD3FTF20SC200RNA

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 of Compliance

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

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
The determination of the test results does not require consideration of the uncertainty of the measurement, unless the assessment is required by customer agreement, regulation or standard document specification.
Bay Area Compliance Laboratories Corp. 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 Data	Temperature (℃)	Relative Humidity (%)	ATM Pressure (hPa)	Test Engineer
AC Line Conducted Emissions	2021/10/12	27.2	50.5	1010	Boris Kao
Radiation Spurious Emissions	2021/10/1~2021/10/3	24.1~26.1	56~61	1010	David Lee
Conducted Spurious Emissions	2021/9/30	25.2	50	1010	David Lee
20 dB Emission Bandwidth	2021/9/30	25.2	50	1010	David Lee
Channel Separation Test	2021/9/30	25.2	50	1010	David Lee
Time of Occupancy	2021/9/30	25.2	50	1010	David Lee
Quantity of hopping channel	2021/9/30	25.2	50	1010	David Lee
Maximum Output Power	2021/9/30	25.2	50	1010	David Lee
100 kHz Bandwidth of Frequency Band Edge	2021/9/30	25.2	50	1010	David Lee

1.8. Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. 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. 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)
1	2402	40	2441
2	2403	--	--
3	2404	--	--
4	2405	77	2478
--	--	78	2479
39	2440	79	2480

For BT Modes were tested with channel 1, 40 and 79.

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 "QRCT V3.0"

Test Frequency		2402MHz	2441MHz	2480MHz
Power Level Setting	GFSK	9	9	9
	π/4-DQPSK	9	9	9
	8DPSK	9	9	9

2.4. Test Mode

Pre-scan

AC Line Conducted Emissions and Radiated Spurious Emissions

Mode 1: F20 FP + Adapter (Model : DSA-10PF06-05 FSU).

Mode 2: F20 FP + Adapter (Model : TEKA-UCA20US).

Mode 3: F20 + Adapter (Model : DSA-10PF06-05 FSU).

Mode 4: F20 + Adapter (Model : TEKA-UCA20US).

Worst case is the F20 + Adapter (Model : DSA-10PF06-05 FSU).

Full System F20 + Adapter (Model : DSA-10PF06-05 FSU) for all test item.

2.5. Support Equipment List and Details

Description	Manufacturer	Model Number	S/N
NB	DELL	E6410	8N7PXN1
Adapter-1	DEE VAN ENTERPRISE	DSA-10PF06-05 FSU	N/A
Adapter-2	TEKA	TEKA-UCA20US	N/A
Dock	FEITIAN	F20-1	N/A

2.6. External Cable List and Details

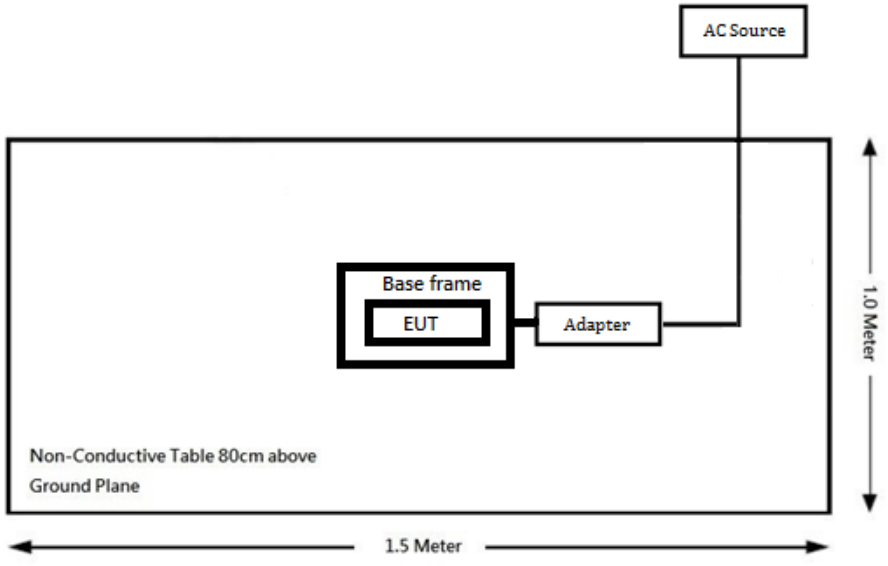
Cable Description	Length (m)	From	To
USB Cable	1.5	Adapter	EUT

2.7. Block Diagram of Test Setup

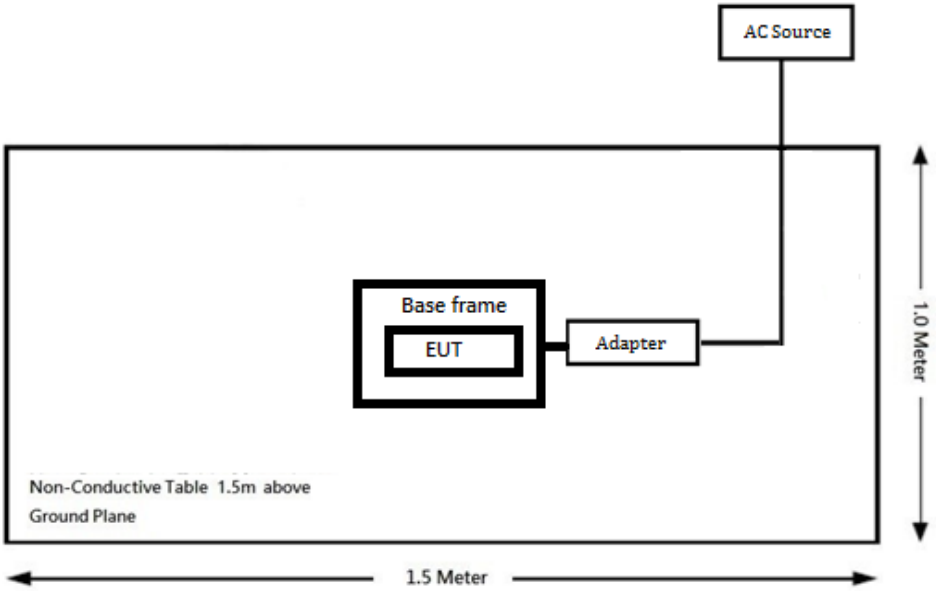
See test photographs attached in annex setup photos for the actual connections between EUT and support equipment.

Radiation:

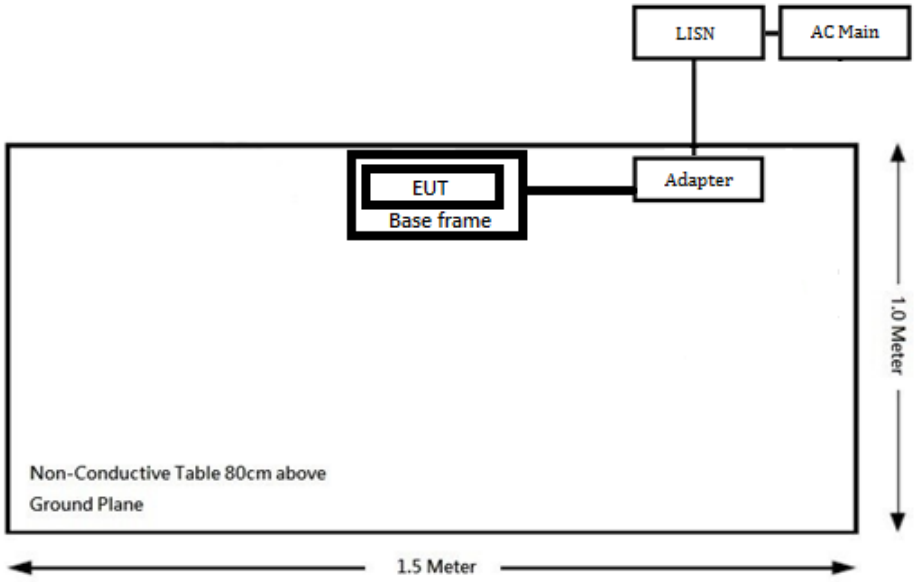
Below 1GHz:



Above 1GHz:



Conduction:



3. Summary of Test Results

FCC Rules	Description of Test	Results
§15.247(i), §1.1310,§2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247(a)(1)	20 dB Emission Bandwidth	Compliance
§15.247 (a)(1)	Channel Separation Test	Compliance
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliance
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliance
§15.247(b)(1)	Maximum Peak Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance

4. Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
AC Line Conduction Room (CON-A)					
LISN	Rohde & Schwarz	ENV216	101612	2020/12/30	2021/12/29
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2020/11/12	2021/11/11
Pulse Limiter	Rohde & Schwarz	ESH3Z2	TXZEM104	2021/7/29	2022/7/29
RF Cable	EMEC	EM-CB5D	001	2021/6/11	2022/6/11
Software	AUDIX	E3	V9.150826k	N.C.R	N.C.R
Radiated Room (966-A)					
Bilog Antenna with 6 dB Attenuator	SUNOL SCIENCES & MINI-CIRCUITS	JB6/UNAT-6+	A050115/15542_01	2021/01/19	2022/01/18
Horn Antenna	EMCO	3115	9311-4158	2021/08/26	2022/08/25
Horn Antenna	ETS-Lindgren	3116	62638	2021/08/11	2022/08/10
Preamplifier	Sonoma	310N	130602	2021/06/08	2022/06/07
Preamplifier	A.H. system Inc.	PAM-0118P	466	2020/11/5	2021/11/4
Microware Preamplifier	EM Electronics Corporation	EM18G40G	060656	2020/12/30	2021/12/29
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2020/11/12	2021/11/11
Spectrum Analyzer	Rohde & Schwarz	FSV40	101435	2021/01/07	2022/01/06
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
Turn Table	Champro	TT-2000	060772-T	N.C.R	N.C.R
Antenna Tower	Champro	AM-BS-4500-B	060772-A	N.C.R	N.C.R
Controller	Champro	EM1000	60772	N.C.R	N.C.R
Software	Farad	EZ_EMC	BACL-03A1	N.C.R	N.C.R

Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSU26	200268	2021/7/14	2022/7/13
Cable	UTIFLEX	UFA210A	9435	2020/10/08	2021/10/07
Attenuator	MCL	BW-S10W5+	1419	2021/01/28	2022/01/27
Power Sensor	KEYSIGHT	U2021XA	MY54080018	2021/01/28	2022/01/27

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

5. FCC §15.247(i), §1.1310, § 2.1093 - RF Exposure

5.1. Applicable Standard

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

According to KDB 447498 D01 General RF Exposure Guidance v06

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

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] •

[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

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

5.2. RF Exposure Evaluation Result

RF Exposure evaluation:

Mode	Frequency	Tunp-up Average Power		Evaluation Distrance	Calculated Value	Threshold	SAR Test Exclusion
	(MHz)	(dBm)	(mW)	(mm)		(1-g SAR)	
BT	2402-2480	8	6.31	5	2.008	3	Yes

Result: SAR test is exempted.

6. FCC §15.203 – Antenna Requirements

6.1. Applicable Standard

According to § 15.203,

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna does not exceed 6dBi.

6.2. Antenna Information

Manufacturer	Model	Type	Antenna Gain
AUDEN TECHNO (KUNSHAN) CO. LTD	F200	FPC Antenna	2 dBi

Result: Compliance

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

7.1. Applicable Standard

According to §15.207

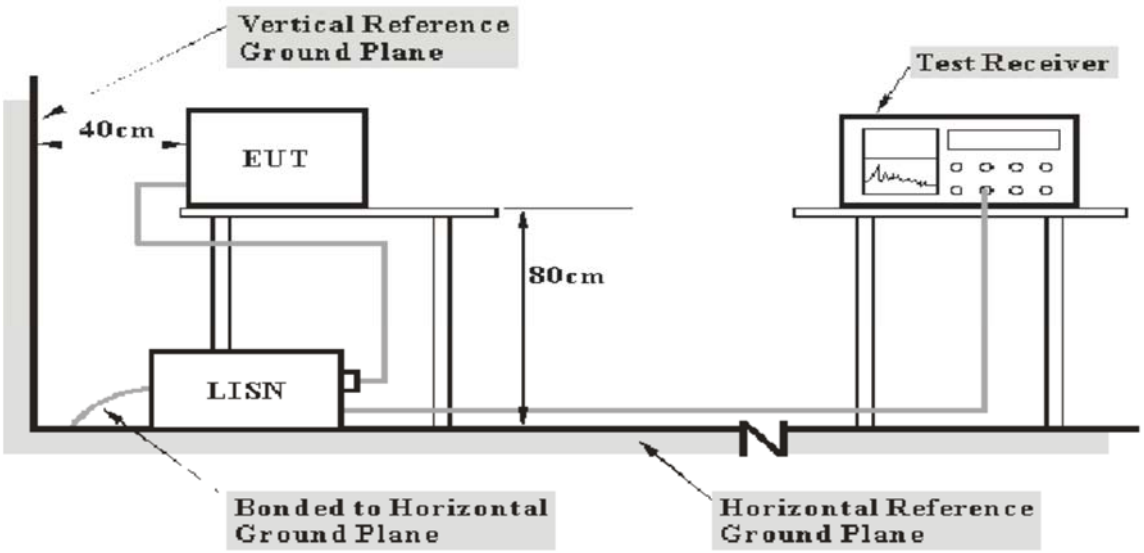
For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured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

Note 1: Decreases with the logarithm of the frequency.

Note 2: A linear average detector is required

7.2. EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

7.3. EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150kHz to 30MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations

Frequency Range	IF B/W
150kHz – 30MHz	9kHz

7.4. Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

7.5. Corrected Factor & Margin Calculation

The factor is calculated by adding LISN/ISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation

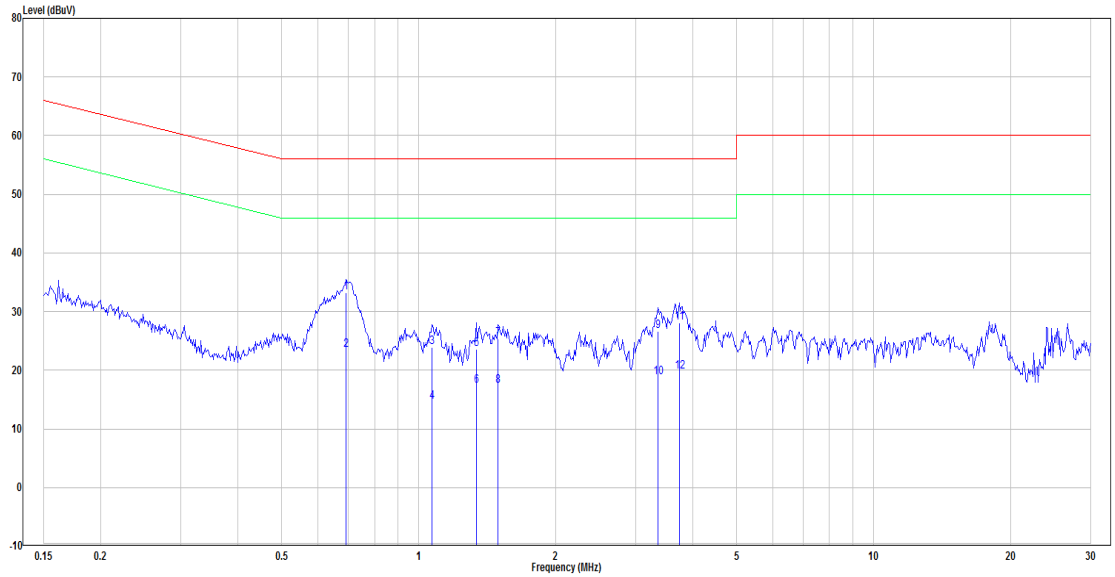
The “Over Limit” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an over limit of -7 dB means the emission is 7 dB below the limit. The equation for Over Limit calculation is as follows:

Over Limit = Level – Limit Line

7.6. Test Results

Test Mode: Transmitting

Main: AC120 V, 60 Hz, Line



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBµV)	Factor(dB)	(dBµV)	(dBµV)	(dB)	
1	0.694	13.64	19.60	33.24	56.00	-22.76	QP
2	0.694	3.83	19.60	23.43	46.00	-22.57	Average
3	1.071	4.29	19.61	23.90	56.00	-32.10	QP
4	1.071	-4.95	19.61	14.66	46.00	-31.34	Average
5	1.338	4.03	19.62	23.65	56.00	-32.35	QP
6	1.338	-2.27	19.62	17.35	46.00	-28.65	Average
7	1.495	5.74	19.62	25.36	56.00	-30.64	QP
8	1.495	-2.32	19.62	17.30	46.00	-28.70	Average
9	3.364	6.94	19.67	26.61	56.00	-29.39	QP
10	3.364	-0.90	19.67	18.77	46.00	-27.23	Average
11	3.740	8.45	19.68	28.13	56.00	-27.87	QP
12	3.740	0.02	19.68	19.70	46.00	-26.30	Average

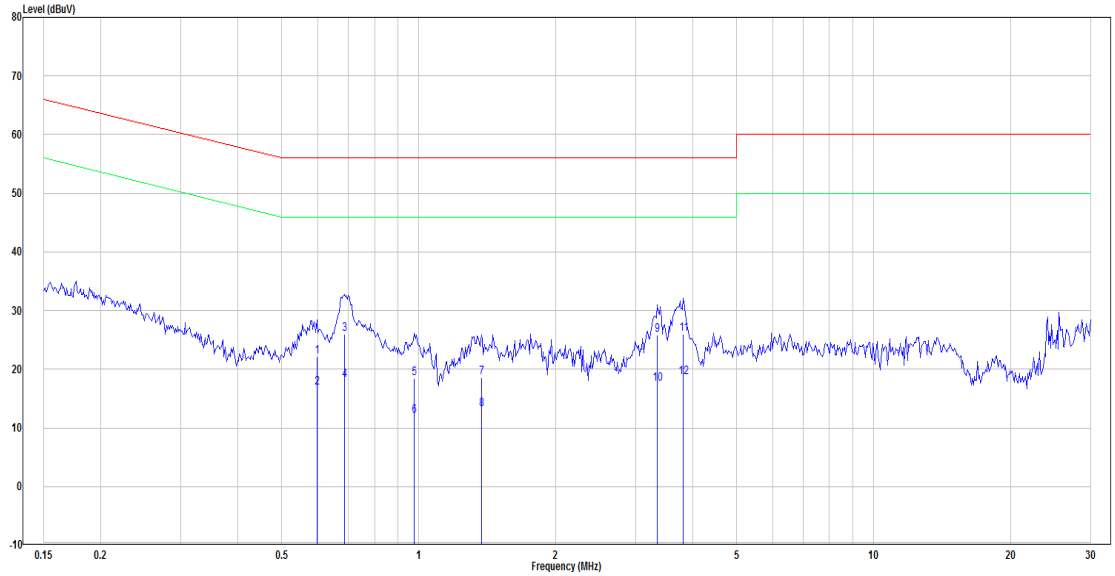
Note:

Level = Read Level + Factor

Over Limit = Level – Limit Line

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

Main: AC120 V, 60 Hz, Neutral



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBµV)	Factor(dB)	(dBµV)	(dBµV)	(dB)	
1	0.598	2.50	19.59	22.09	56.00	-33.91	QP
2	0.598	-2.71	19.59	16.88	46.00	-29.12	Average
3	0.686	6.34	19.59	25.93	56.00	-30.07	QP
4	0.686	-1.40	19.59	18.19	46.00	-27.81	Average
5	0.979	-1.10	19.60	18.50	56.00	-37.50	QP
6	0.979	-7.55	19.60	12.05	46.00	-33.95	Average
7	1.374	-1.02	19.61	18.59	56.00	-37.41	QP
8	1.374	-6.54	19.61	13.07	46.00	-32.93	Average
9	3.346	6.20	19.67	25.87	56.00	-30.13	QP
10	3.346	-2.25	19.67	17.42	46.00	-28.58	Average
11	3.820	6.36	19.69	26.05	56.00	-29.95	QP
12	3.820	-1.09	19.69	18.60	46.00	-27.40	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

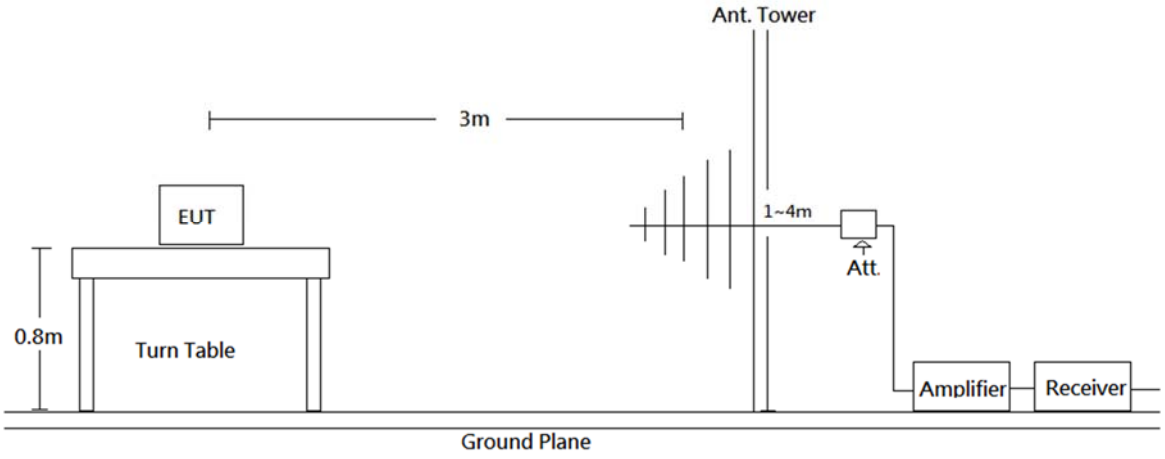
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this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

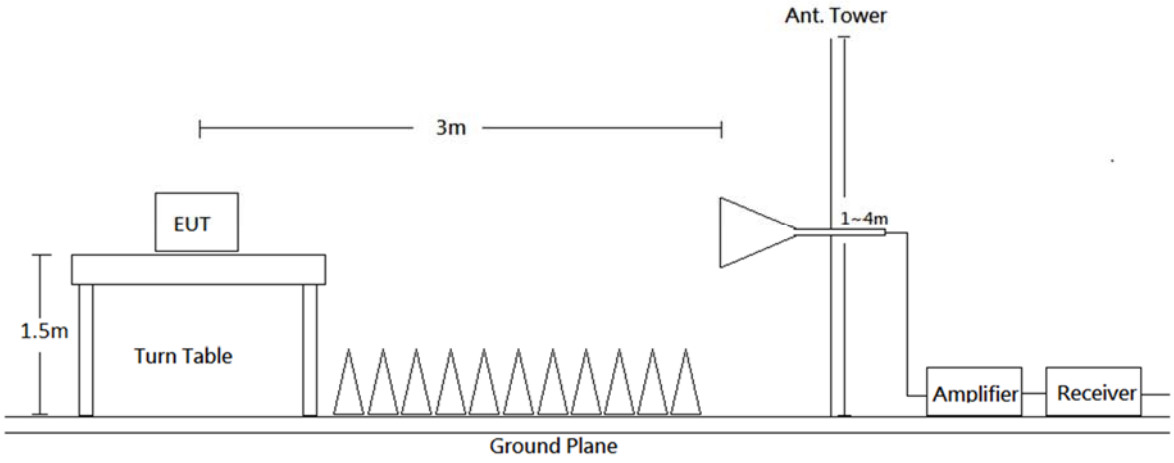
the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval,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

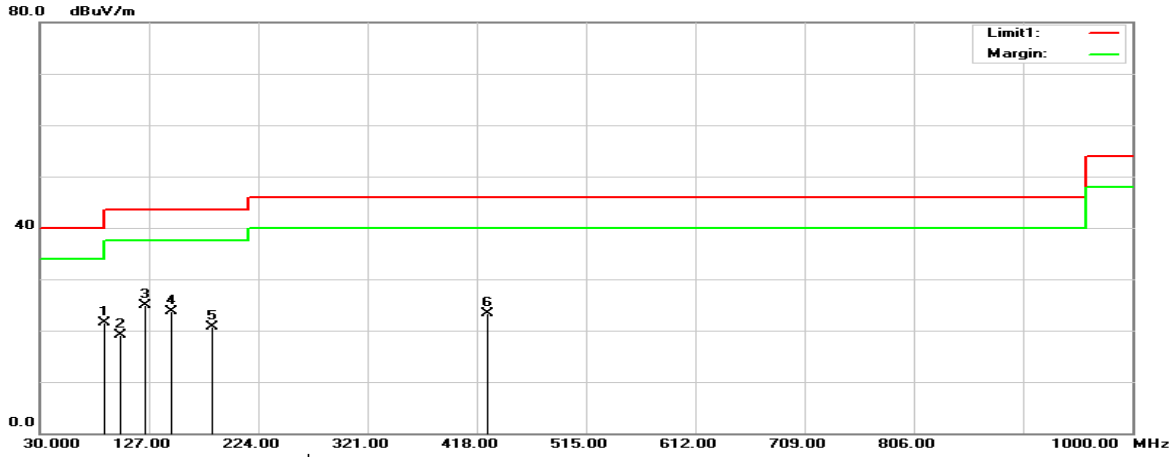
Margin = Result – Limit

8.6. Test Results

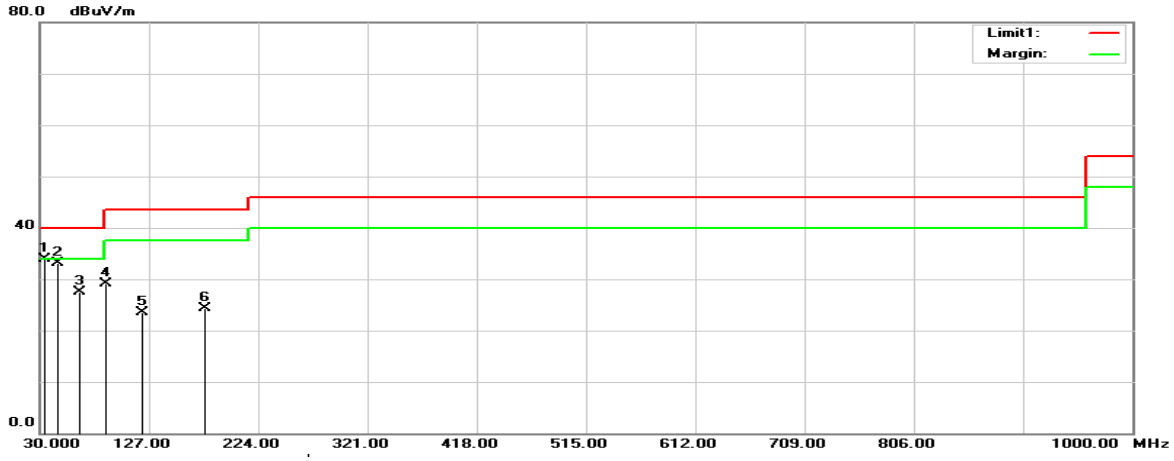
Test Mode: Transmitting (Pre-scan with three orthogonal axis, and worse case as X axis.)

30MHz-1GHz: (worst case is BR (GFSK) mode low channel)

Horizontal



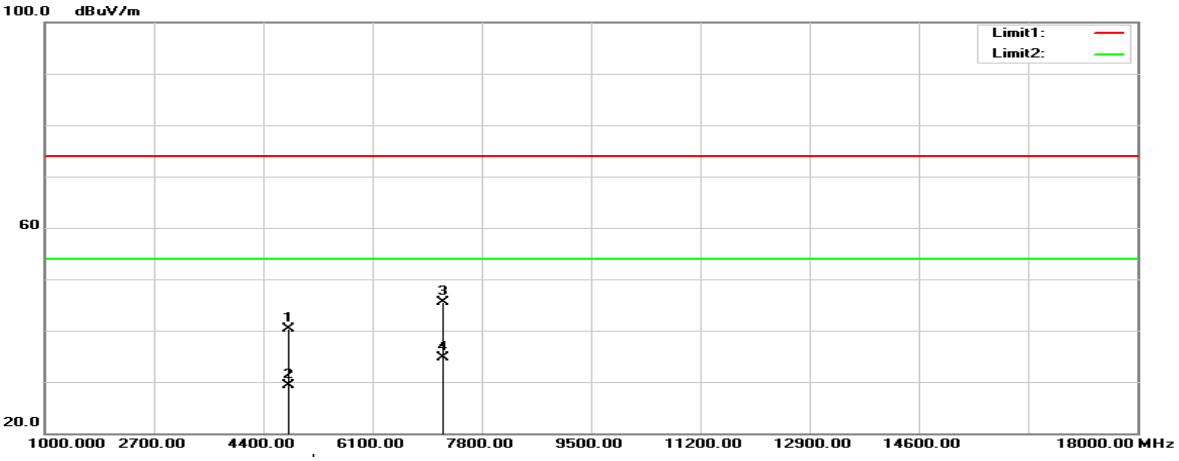
Vertical



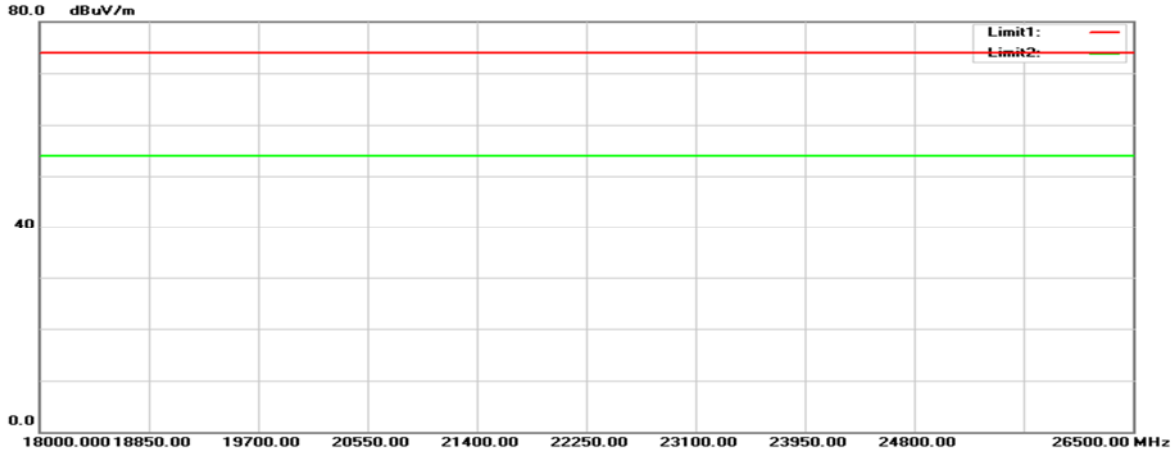
BR (GFSK) Mode

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

1GHz-18GHz:

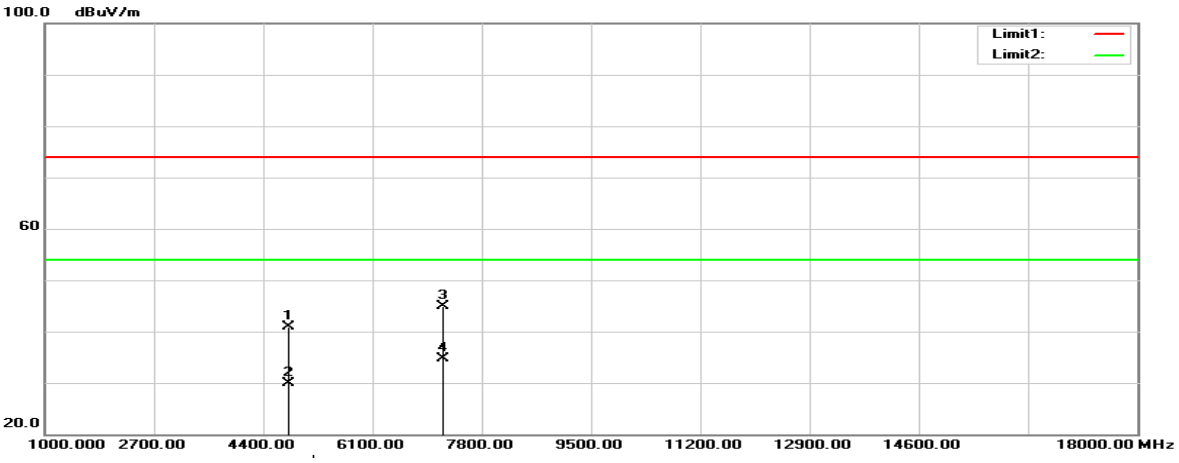


18GHz-26.5GHz:

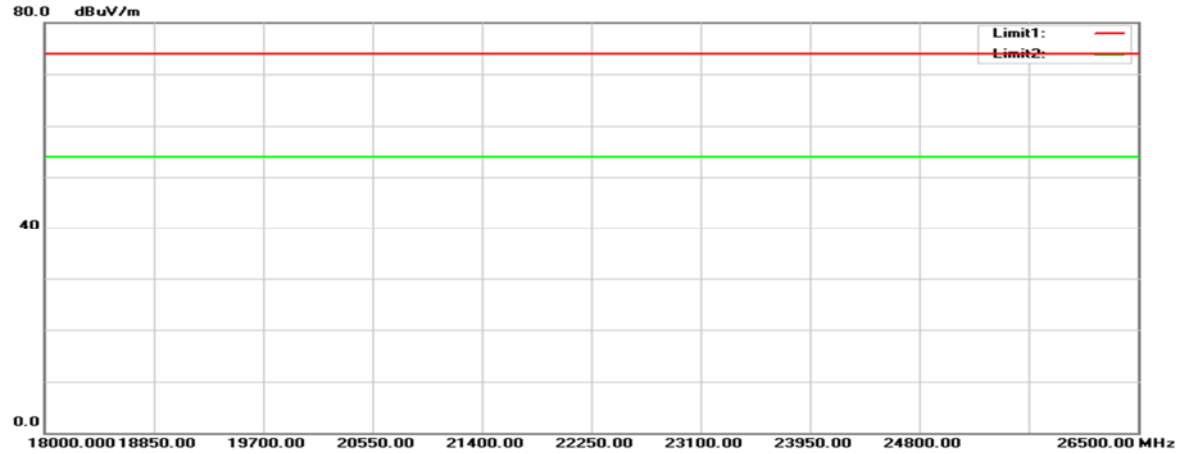


Vertical (worst case is BR (GFSK) mode low channel)

1GHz-18GHz:



18GHz-26.5GHz:



Below 1GHz

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
87.2300	38.21	-16.80	21.41	40.00	-18.59	100	200	peak
101.7800	32.74	-13.57	19.17	43.50	-24.33	100	96	peak
124.0900	35.18	-10.35	24.83	43.50	-18.67	100	48	peak
147.3700	34.52	-10.87	23.65	43.50	-19.85	100	35	peak
183.2600	33.74	-12.98	20.76	43.50	-22.74	100	22	peak
427.7000	30.39	-7.06	23.33	46.00	-22.67	100	196	peak

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
34.8500	40.51	-6.65	33.86	40.00	-6.14	100	52	peak
46.4900	47.64	-14.62	33.02	40.00	-6.98	100	185	peak
65.8900	44.27	-16.75	27.52	40.00	-12.48	100	313	peak
88.2000	45.80	-16.73	29.07	43.50	-14.43	100	28	peak
121.1800	33.73	-10.21	23.52	43.50	-19.98	100	17	peak
176.4700	36.98	-12.75	24.23	43.50	-19.27	100	123	peak

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

Above 1GHz

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
BR (GFSK), Low channel								
2360.700	56.43	-10.46	45.97	74.00	-28.03	149	168	peak
2360.700	42.12	-10.46	31.66	54.00	-22.34	149	168	AVG
2402.200	111.42	-10.13	101.29	N/A	N/A	149	168	peak
2402.200	95.96	-10.13	85.83	N/A	N/A	149	168	AVG
4804.000	43.64	-3.28	40.36	74.00	-33.64	146	225	peak
4804.000	32.53	-3.28	29.25	54.00	-24.75	146	225	AVG
7206.000	42.46	3.10	45.56	74.00	-28.44	152	328	peak
7206.000	31.66	3.10	34.76	54.00	-19.24	152	328	AVG
BR (GFSK), Middle channel								
2441.000	110.54	-9.81	100.73	N/A	N/A	145	175	peak
2441.000	95.25	-9.81	85.44	N/A	N/A	145	175	AVG
4882.000	44.65	-3.02	41.63	74.00	-32.37	138	254	peak
4882.000	33.65	-3.02	30.63	54.00	-23.37	138	254	AVG
7323.000	43.73	4.08	47.81	74.00	-26.19	155	136	peak
7323.000	32.78	4.08	36.86	54.00	-17.14	155	136	AVG
BR (GFSK), High channel								
2480.000	108.47	-9.31	99.16	N/A	N/A	155	176	peak
2480.000	93.56	-9.31	84.25	N/A	N/A	155	176	AVG
2492.058	56.94	-9.14	47.80	74.00	-26.20	155	176	peak
2492.058	44.29	-9.14	35.15	54.00	-18.85	155	176	AVG
4960.000	47.08	-2.69	44.39	74.00	-29.61	158	155	peak
4960.000	33.58	-2.69	30.89	54.00	-23.11	158	155	AVG
7440.000	43.70	4.25	47.95	74.00	-26.05	144	254	peak
7440.000	32.46	4.25	36.71	54.00	-17.29	144	254	AVG

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

Vertical

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
BR (GFSK), Low channel								
2378.900	57.27	-10.32	46.95	74.00	-27.05	100	263	peak
2378.900	42.15	-10.32	31.83	54.00	-22.17	100	263	AVG
2402.100	102.72	-10.13	92.59	N/A	N/A	100	263	peak
2402.100	89.23	-10.13	79.10	N/A	N/A	100	263	AVG
4804.000	44.24	-3.28	40.96	74.00	-33.04	156	196	peak
4804.000	33.28	-3.28	30.00	54.00	-24.00	156	196	AVG
7206.000	41.73	3.10	44.83	74.00	-29.17	146	233	peak
7206.000	31.56	3.10	34.66	54.00	-19.34	146	233	AVG
BR (GFSK), Middle channel								
2441.000	94.88	-9.81	85.07	N/A	N/A	105	247	peak
2441.000	82.79	-9.81	72.98	N/A	N/A	105	247	AVG
4882.000	43.08	-3.02	40.06	74.00	-33.94	156	233	peak
4882.000	32.55	-3.02	29.53	54.00	-24.47	156	233	AVG
7323.000	42.41	4.08	46.49	74.00	-27.51	148	328	peak
7323.000	31.86	4.08	35.94	54.00	-18.06	148	328	AVG
BR (GFSK), High channel								
2480.086	94.53	-9.31	85.22	N/A	N/A	108	234	peak
2480.086	82.54	-9.31	73.23	N/A	N/A	108	234	AVG
2485.000	57.01	-9.24	47.77	74.00	-26.23	108	234	peak
2485.000	43.22	-9.24	33.98	54.00	-20.02	108	234	AVG
4960.000	43.61	-2.69	40.92	74.00	-33.08	154	283	peak
4960.000	33.65	-2.69	30.96	54.00	-23.04	154	283	AVG
7440.000	41.89	4.25	46.14	74.00	-27.86	166	328	peak
7440.000	32.18	4.25	36.43	54.00	-17.57	166	328	AVG

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

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
EDR (π/4-DQPSK), Low channel								
2387.800	56.38	-10.25	46.13	74.00	-27.87	145	223	peak
2387.800	41.98	-10.25	31.73	54.00	-22.27	145	223	AVG
2402.200	111.28	-10.13	101.15	N/A	N/A	145	223	peak
2402.200	90.07	-10.13	79.94	N/A	N/A	145	223	AVG
4804.000	42.29	-3.28	39.01	74.00	-34.99	159	242	peak
4804.000	32.56	-3.28	29.28	54.00	-24.72	159	242	AVG
7206.000	41.52	3.10	44.62	74.00	-29.38	146	322	peak
7206.000	31.28	3.10	34.38	54.00	-19.62	146	322	AVG
EDR (π/4-DQPSK), Middle channel								
2441.000	111.04	-9.81	101.23	N/A	N/A	145	171	peak
2441.000	88.16	-9.81	78.35	N/A	N/A	145	171	AVG
4882.000	44.13	-3.02	41.11	74.00	-32.89	156	255	peak
4882.000	32.18	-3.02	29.16	54.00	-24.84	156	255	AVG
7323.000	42.10	4.08	46.18	74.00	-27.82	148	321	peak
7323.000	31.96	4.08	36.04	54.00	-17.96	148	321	AVG
EDR (π/4-DQPSK), High channel								
2480.086	109.03	-9.31	99.72	N/A	N/A	166	178	peak
2480.086	88.34	-9.31	79.03	N/A	N/A	166	178	AVG
2487.560	57.37	-9.20	48.17	74.00	-25.83	166	178	peak
2487.560	45.06	-9.20	35.86	54.00	-18.14	166	178	AVG
4960.000	43.43	-2.69	40.74	74.00	-33.26	146	248	peak
4960.000	32.58	-2.69	29.89	54.00	-24.11	146	248	AVG
7440.000	42.02	4.25	46.27	74.00	-27.73	155	196	peak
7440.000	32.01	4.25	36.26	54.00	-17.74	155	196	AVG

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

Vertical

Frequency (MHz)	Reading (dBμV)	Correct Factor(dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
EDR (π/4-DQPSK), Low channel								
2379.900	56.58	-10.31	46.27	74.00	-27.73	104	238	peak
2379.900	42.09	-10.31	31.78	54.00	-22.22	104	238	AVG
2402.200	96.34	-10.13	86.21	N/A	N/A	104	238	peak
2402.200	78.66	-10.13	68.53	N/A	N/A	104	238	AVG
4804.000	44.02	-3.28	40.74	74.00	-33.26	145	149	peak
4804.000	32.28	-3.28	29.00	54.00	-25.00	145	149	AVG
7206.000	41.98	3.10	45.08	74.00	-28.92	156	255	peak
7206.000	31.56	3.10	34.66	54.00	-19.34	156	255	AVG
EDR (π/4-DQPSK), Middle channel								
2441.000	95.28	-9.81	85.47	N/A	N/A	110	248	peak
2441.000	77.90	-9.81	68.09	N/A	N/A	110	248	AVG
4882.000	44.49	-3.02	41.47	74.00	-32.53	156	155	peak
4882.000	32.33	-3.02	29.31	54.00	-24.69	156	155	AVG
7323.000	42.75	4.08	46.83	74.00	-27.17	144	238	peak
7323.000	31.28	4.08	35.36	54.00	-18.64	144	238	AVG
EDR (π/4-DQPSK), High channel								
2479.922	95.06	-9.31	85.75	N/A	N/A	105	238	peak
2479.922	76.80	-9.31	67.49	N/A	N/A	105	238	AVG
2487.690	57.24	-9.20	48.04	74.00	-25.96	105	238	peak
2487.690	43.52	-9.20	34.32	54.00	-19.68	105	238	AVG
4960.000	45.41	-2.69	42.72	74.00	-31.28	166	238	peak
4960.000	33.66	-2.69	30.97	54.00	-23.03	166	238	AVG
7440.000	41.34	4.25	45.59	74.00	-28.41	158	135	peak
7440.000	32.18	4.25	36.43	54.00	-17.57	158	135	AVG

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

Horizontal

Frequency (MHz)	Reading (dBµV)	Correct Factor(dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
EDR (8DPSK), Low channel								
2389.800	56.27	-10.23	46.04	74.00	-27.96	155	161	peak
2389.800	42.35	-10.23	32.12	54.00	-21.88	155	161	AVG
2402.200	112.00	-10.13	101.87	N/A	N/A	155	161	peak
2402.200	82.84	-10.13	72.71	N/A	N/A	155	161	AVG
4804.000	43.20	-3.28	39.92	74.00	-34.08	156	233	peak
4804.000	32.58	-3.28	29.30	54.00	-24.70	156	233	AVG
7206.000	41.83	3.10	44.93	74.00	-29.07	148	138	peak
7206.000	31.66	3.10	34.76	54.00	-19.24	148	138	AVG
EDR (8DPSK), Middle channel								
2441.000	111.22	-9.81	101.41	N/A	N/A	145	165	peak
2441.000	82.43	-9.81	72.62	N/A	N/A	145	165	AVG
4882.000	43.72	-3.02	40.70	74.00	-33.30	155	158	peak
4882.000	32.58	-3.02	29.56	54.00	-24.44	155	158	AVG
7323.000	40.96	4.08	45.04	74.00	-28.96	146	232	peak
7323.000	31.66	4.08	35.74	54.00	-18.26	146	232	AVG
EDR (8DPSK), High channel								
2480.168	109.07	-9.31	99.76	N/A	N/A	145	238	peak
2480.168	80.86	-9.31	71.55	N/A	N/A	145	238	AVG
2489.640	57.71	-9.17	48.54	74.00	-25.46	145	238	peak
2489.640	45.34	-9.17	36.17	54.00	-17.83	145	238	AVG
4960.000	43.49	-2.69	40.80	74.00	-33.20	139	238	peak
4960.000	32.45	-2.69	29.76	54.00	-24.24	139	238	AVG
7440.000	42.96	4.25	47.21	74.00	-26.79	142	166	peak
7440.000	31.28	4.25	35.53	54.00	-18.47	142	166	AVG

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

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								
2374.500	57.08	-10.35	46.73	74.00	-27.27	108	223	peak
2374.500	42.49	-10.35	32.14	54.00	-21.86	108	223	AVG
2402.200	96.89	-10.13	86.76	N/A	N/A	108	223	peak
2402.200	73.94	-10.13	63.81	N/A	N/A	108	223	AVG
4804.000	43.23	-3.28	39.95	74.00	-34.05	165	238	peak
4804.000	32.28	-3.28	29.00	54.00	-25.00	165	238	AVG
7206.000	41.99	3.10	45.09	74.00	-28.91	144	155	peak
7206.000	31.56	3.10	34.66	54.00	-19.34	144	155	AVG
EDR (8DPSK), Middle channel								
2440.922	95.39	-9.81	85.58	N/A	N/A	102	238	peak
2440.922	71.50	-9.81	61.69	N/A	N/A	102	238	AVG
4882.000	43.66	-3.02	40.64	74.00	-33.36	146	238	peak
4882.000	32.33	-3.02	29.31	54.00	-24.69	146	238	AVG
7323.000	42.04	4.08	46.12	74.00	-27.88	155	135	peak
7323.000	31.56	4.08	35.64	54.00	-18.36	155	135	AVG
EDR (8DPSK), High channel								
2480.086	94.99	-9.31	85.68	N/A	N/A	105	288	peak
2480.086	72.82	-9.31	63.51	N/A	N/A	105	288	AVG
2485.330	57.49	-9.24	48.25	74.00	-25.75	105	288	peak
2485.330	43.75	-9.24	34.51	54.00	-19.49	105	288	AVG
4960.000	44.13	-2.69	41.44	74.00	-32.56	138	221	peak
4960.000	33.15	-2.69	30.46	54.00	-23.54	138	221	AVG
7440.000	41.34	4.25	45.59	74.00	-28.41	144	138	peak
7440.000	32.56	4.25	36.81	54.00	-17.19	144	138	AVG

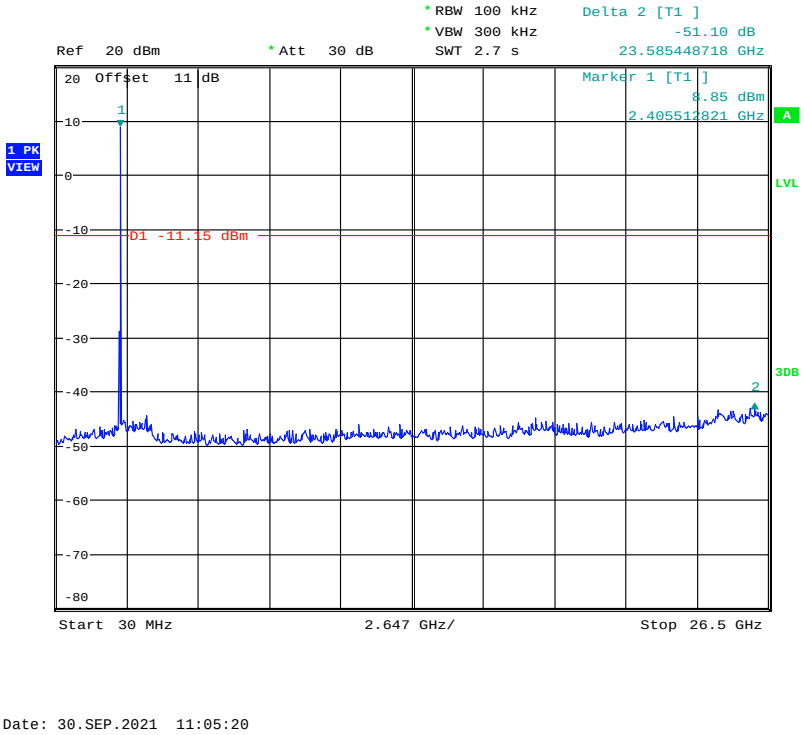
Result = Reading + Correct Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
Spurious emissions more than 20 dB below the limit were not reported.

Conducted Spurious Emissions:

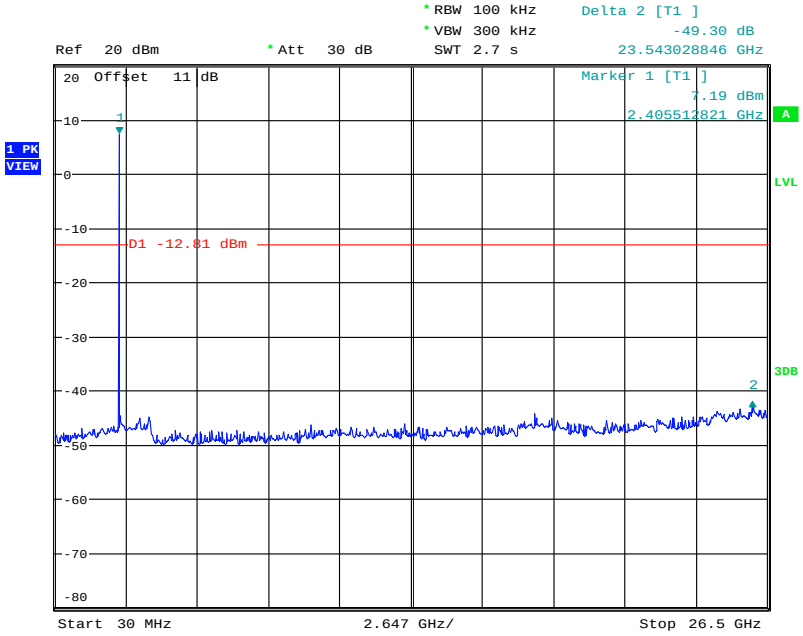
Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
BR Mode (GFSK)				
Low	2402	51.10	≥ 20	PASS
Mid	2441	49.30	≥ 20	PASS
High	2480	51.76	≥ 20	PASS
EDR Mode (π/4-DQPSK):				
Low	2402	45.08	≥ 20	PASS
Mid	2441	44.46	≥ 20	PASS
High	2480	46.67	≥ 20	PASS
EDR Mode (8DPSK):				
Low	2402	47.62	≥ 20	PASS
Mid	2441	46.86	≥ 20	PASS
High	2480	50.03	≥ 20	PASS

BR Mode (GFSK)

Low Channel



Middle Channel



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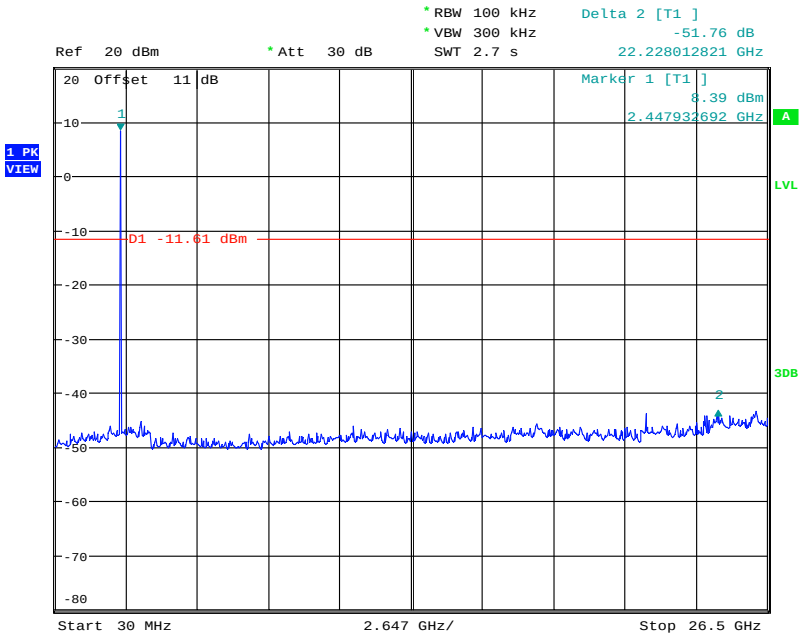
High Channel



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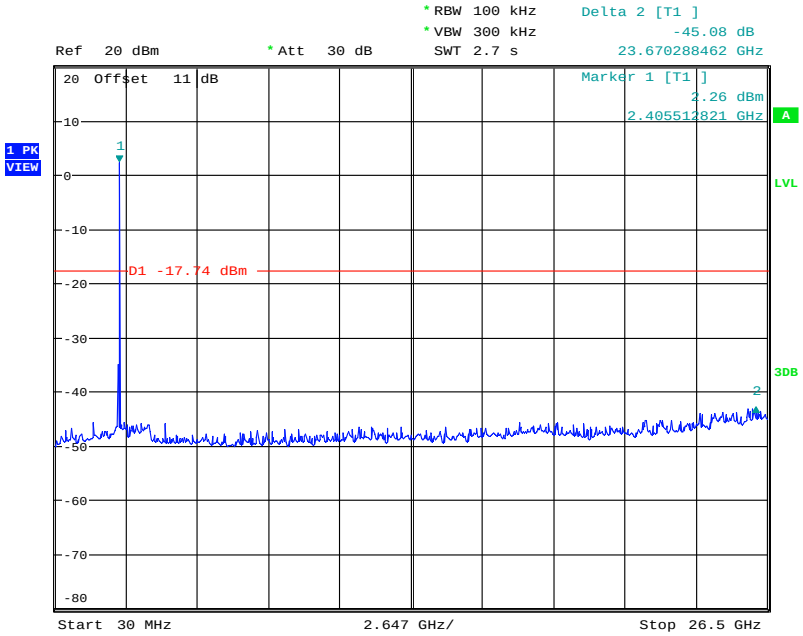
EDR Mode (π/4-DQPSK)

Low Channel



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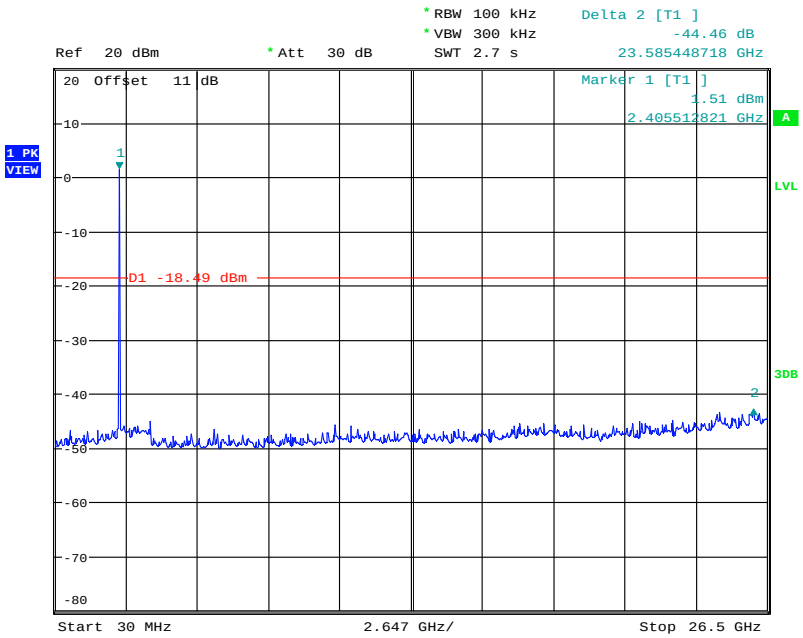
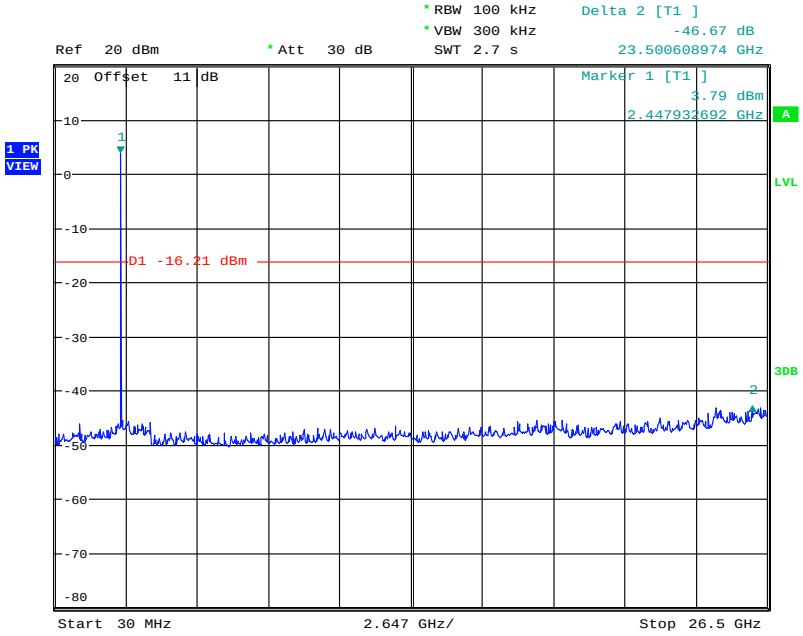
Middle Channel



Date: 30.SEP.2021 14:41:32

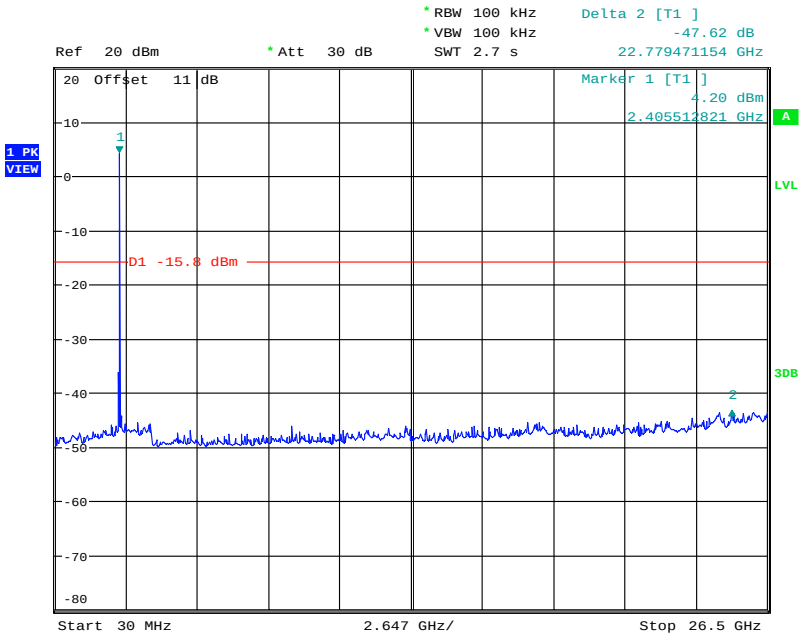
High Channel



Date: 30.SEP.2021 14:54:31

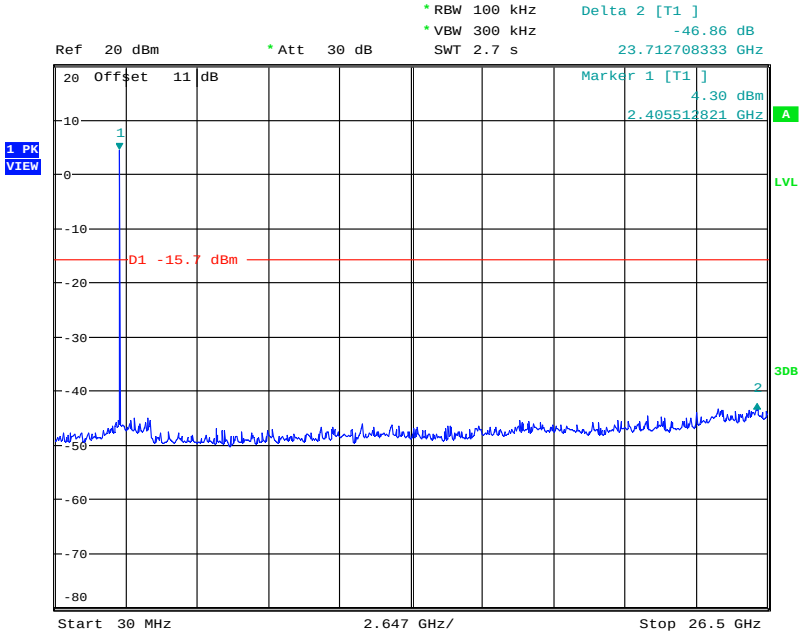
EDR Mode (8DPSK)

Low Channel



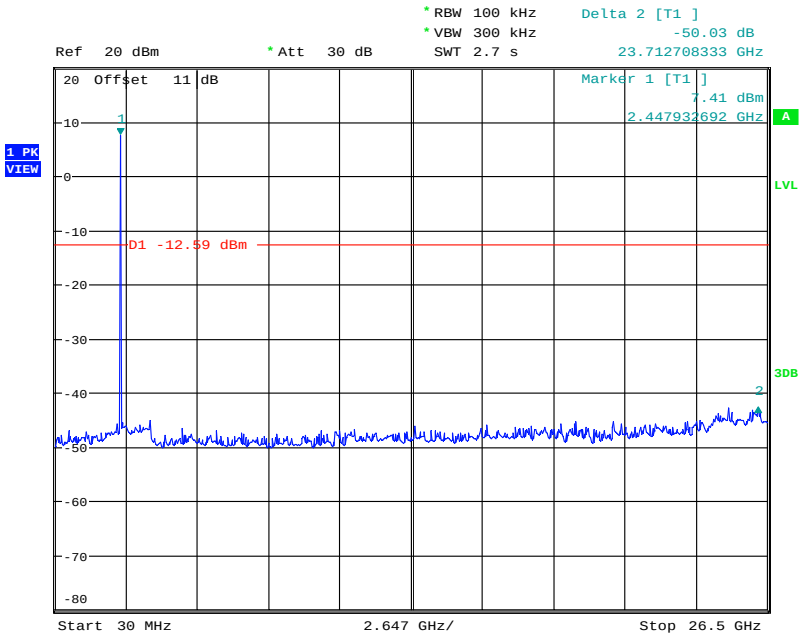
Date: 30.SEP.2021 15:42:51

Middle Channel



Date: 30.SEP.2021 15:50:55

High Channel



Date: 30.SEP.2021 15:56:01

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.

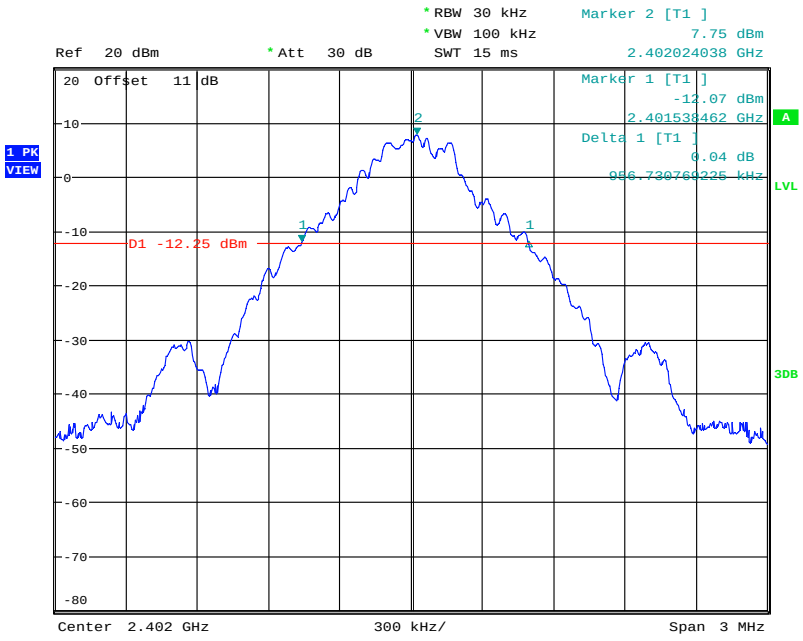
9.3. Test Results

Channel	Frequency (MHz)	20 dBc BW (MHz)
BR Mode (GFSK)		
Low	2402	0.96
Middle	2441	0.96
High	2480	0.96
EDR Mode (π/4-DQPSK)		
Low	2402	1.28
Middle	2441	1.28
High	2480	1.29
EDR Mode (8DPSK)		
Low	2402	1.29
Middle	2441	1.29
High	2480	1.29

Please refer to the following plots

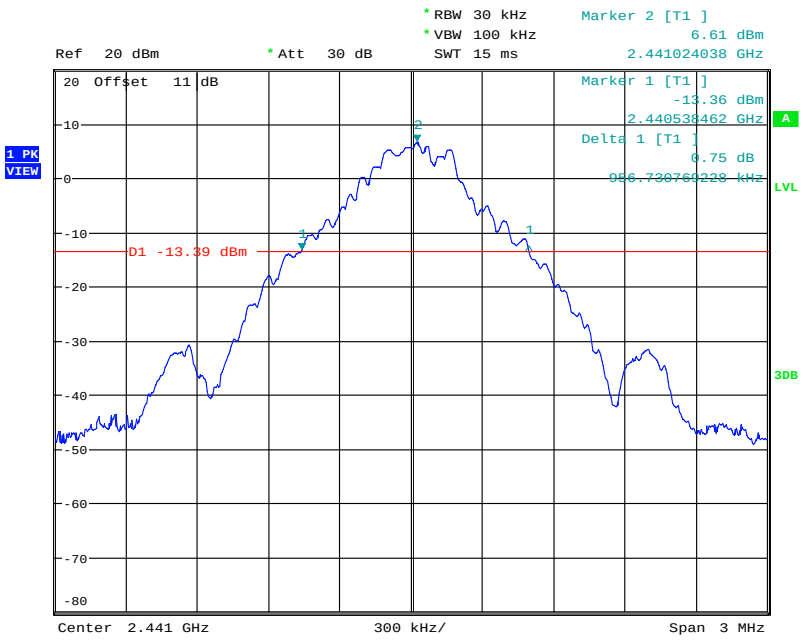
BR Mode (GFSK)

Low Channel



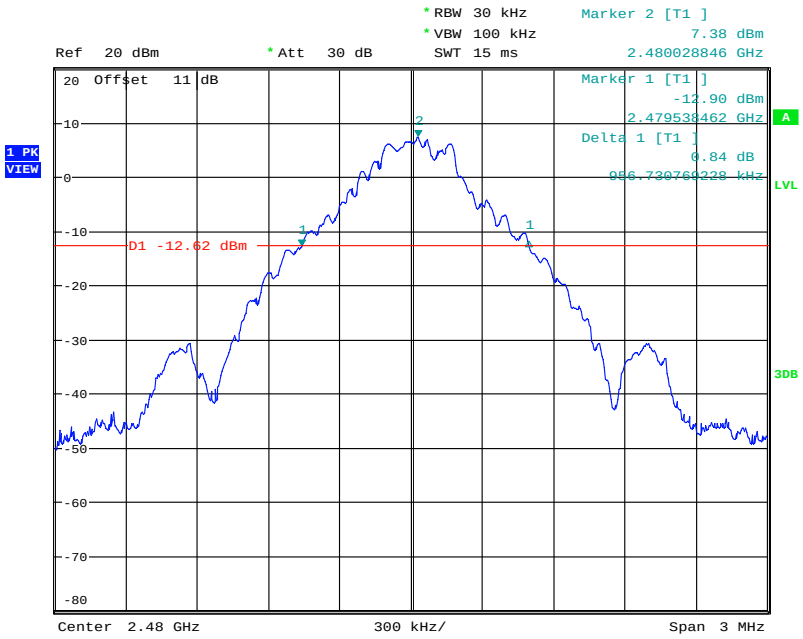
Date: 30.SEP.2021 11:00:49

Middle Channel



Date: 30.SEP.2021 12:38:19

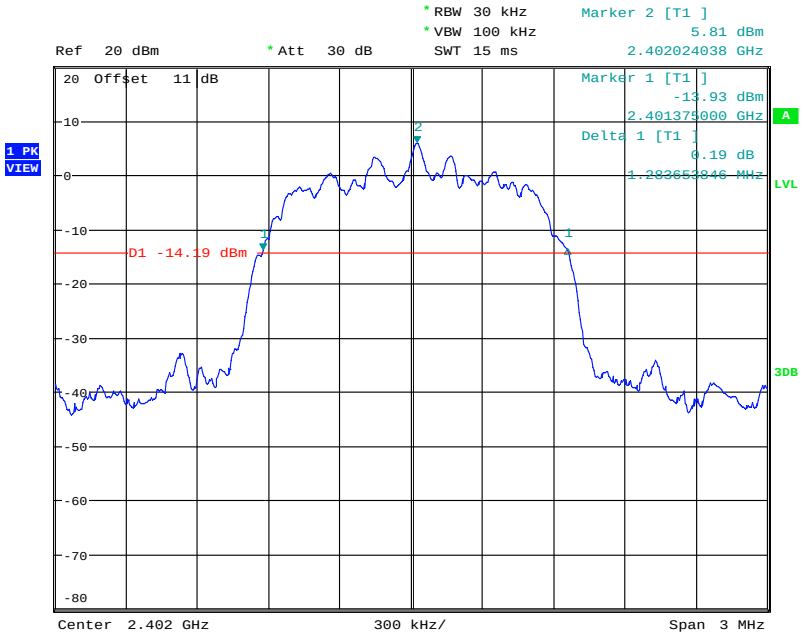
High Channel



Date: 30.SEP.2021 12:48:43

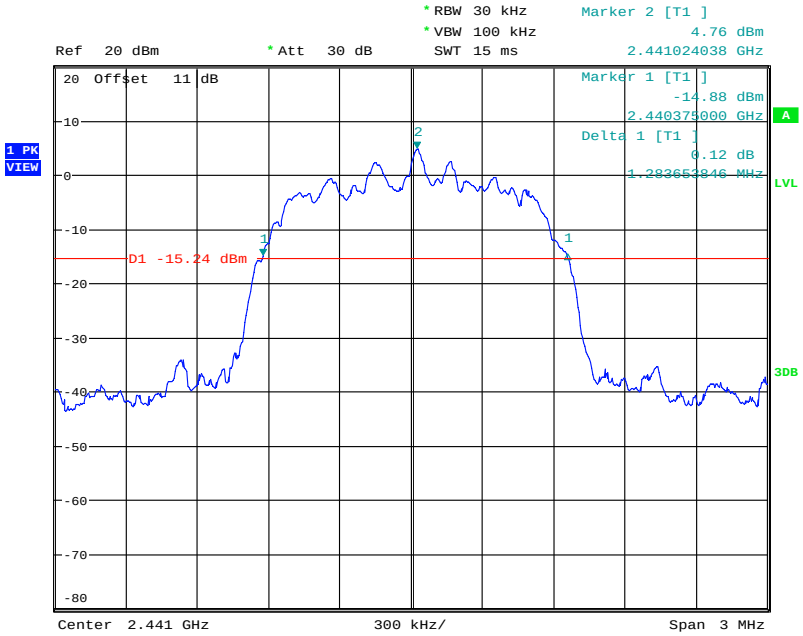
EDR Mode (π/4-DQPSK)

Low Channel



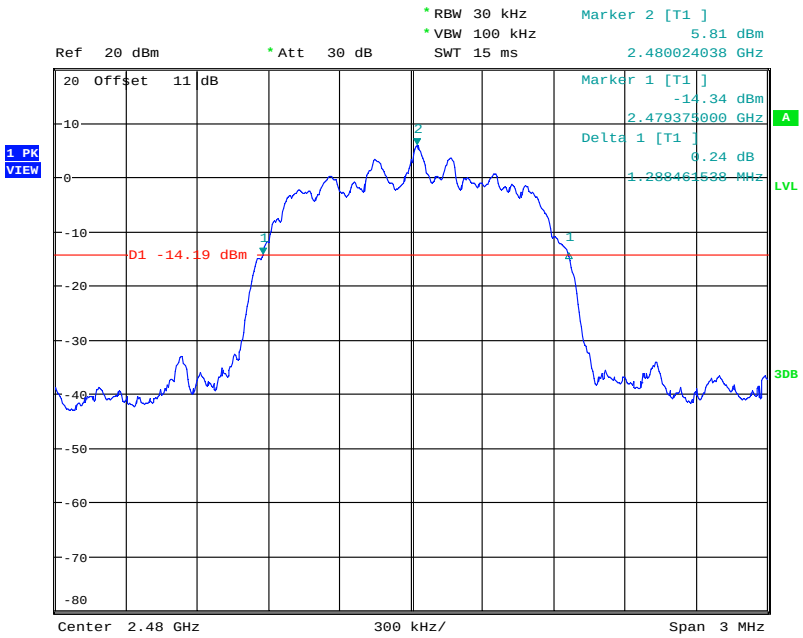
Date: 30.SEP.2021 14:23:29

Middle Channel



Date: 30.SEP.2021 14:38:49

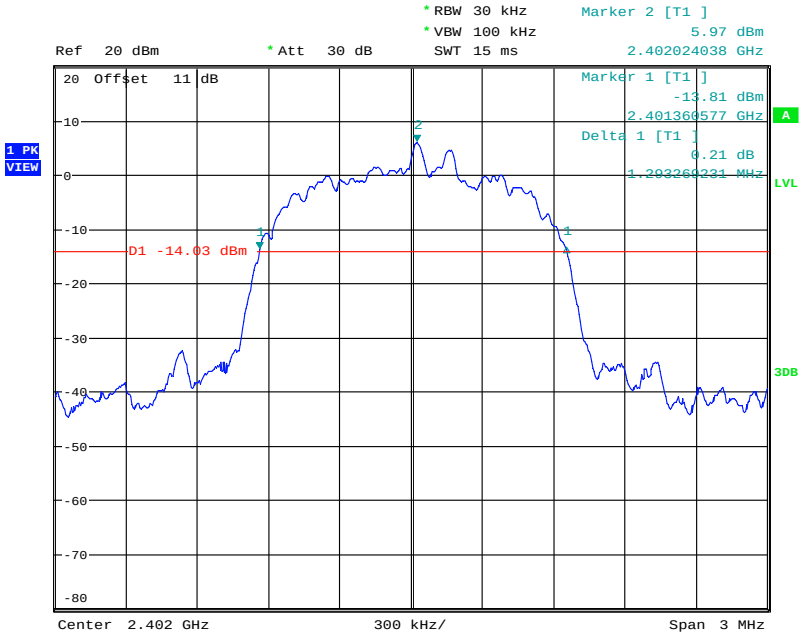
High Channel



Date: 30.SEP.2021 14:53:22

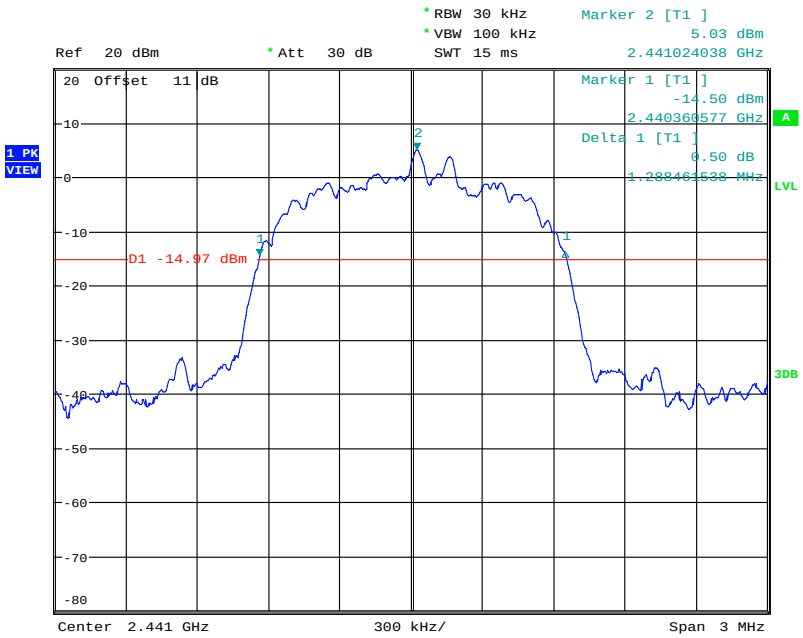
EDR Mode (8DPSK)

Low Channel



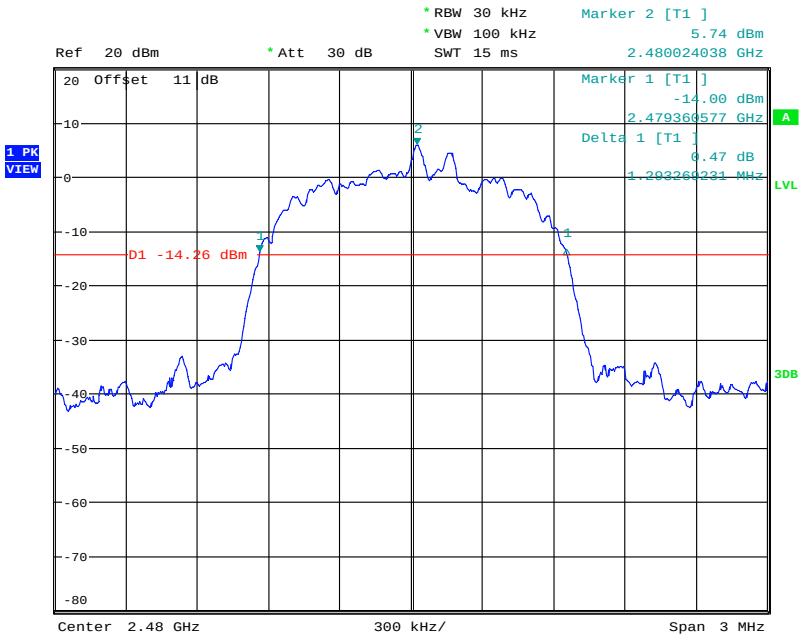
Date: 30.SEP.2021 15:41:24

Middle Channel



Date: 30.SEP.2021 15:49:47

High Channel



Date: 30.SEP.2021 15:54:35

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.

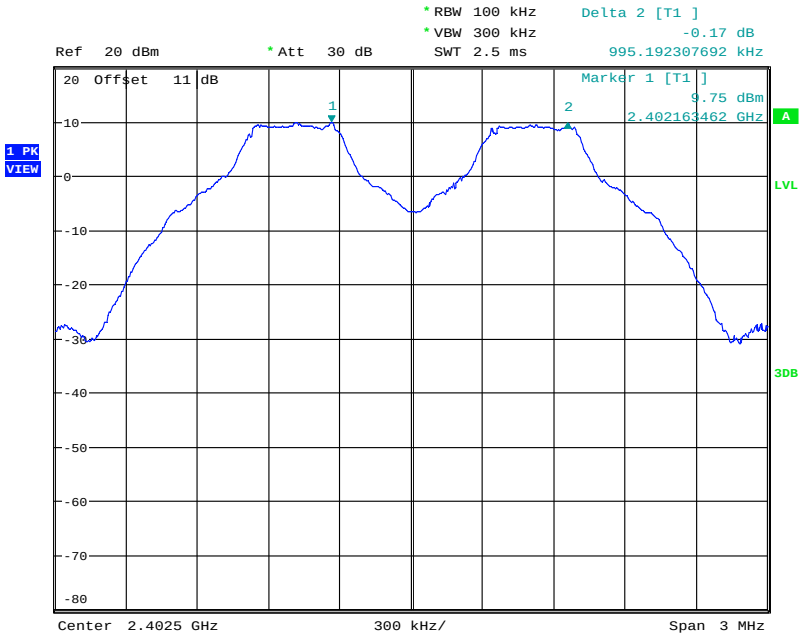
10.3. Test Results

Channel	Channel Separation (MHz)	20 dBc BW (MHz)	Two-thirds of the 20 dB bandwidth (MHz)	Channel Separation Limit	Result
BR Mode (GFSK)					
Low	0.995	0.96	0.637	>two-thirds of the 20 dB bandwidth	Compliance
Middle	0.995	0.96	0.637	>two-thirds of the 20 dB bandwidth	Compliance
High	0.990	0.96	0.637	>two-thirds of the 20 dB bandwidth	Compliance
EDR Mode (π/4-DQPSK)					
Low	1.000	1.28	0.853	>two-thirds of the 20 dB bandwidth	Compliance
Middle	1.000	1.28	0.853	>two-thirds of the 20 dB bandwidth	Compliance
High	1.000	1.29	0.860	>two-thirds of the 20 dB bandwidth	Compliance
EDR Mode (8DPSK)					
Low	1.000	1.29	0.862	>two-thirds of the 20 dB bandwidth	Compliance
Middle	1.004	1.29	0.859	>two-thirds of the 20 dB bandwidth	Compliance
High	1.000	1.29	0.862	>two-thirds of the 20 dB bandwidth	Compliance

Please refer to the following plots.

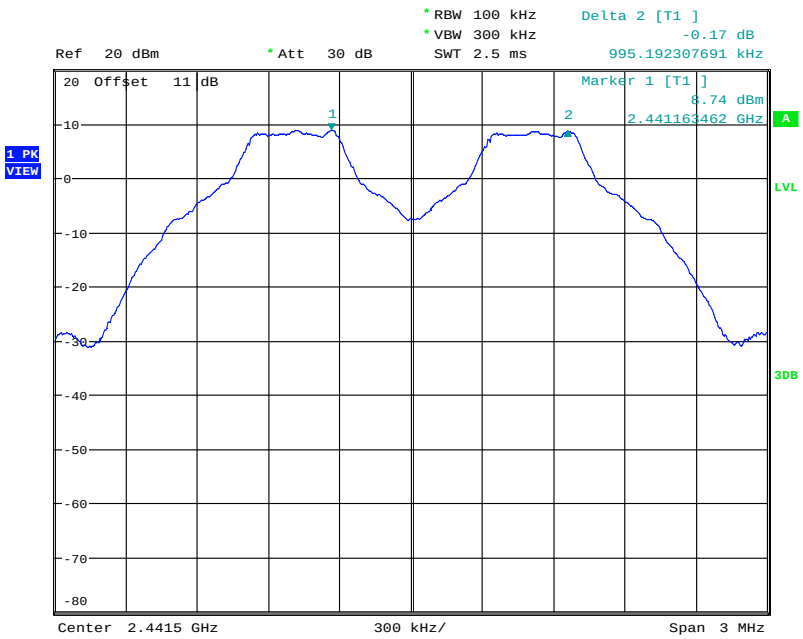
BR Mode (GFSK)

Low Channel



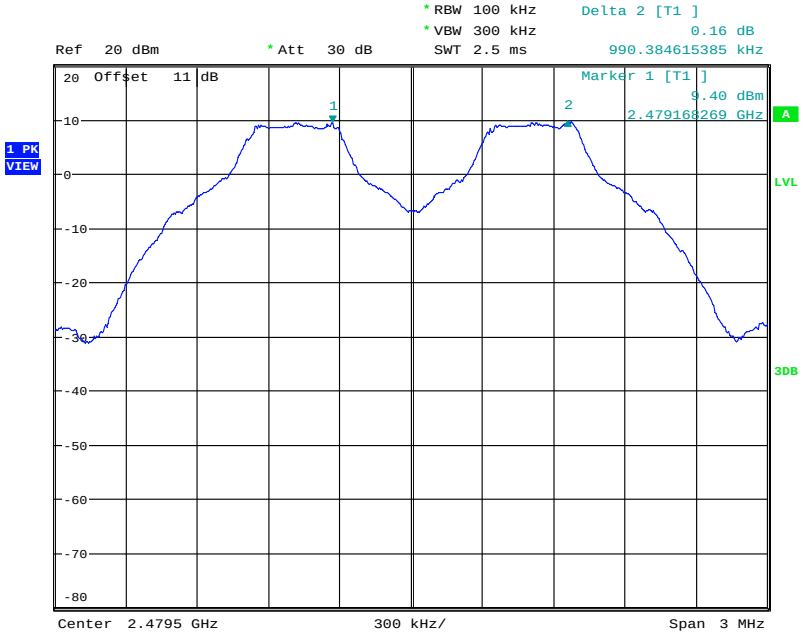
Date: 30.SEP.2021 11:22:10

Middle Channel



Date: 30.SEP.2021 13:00:57

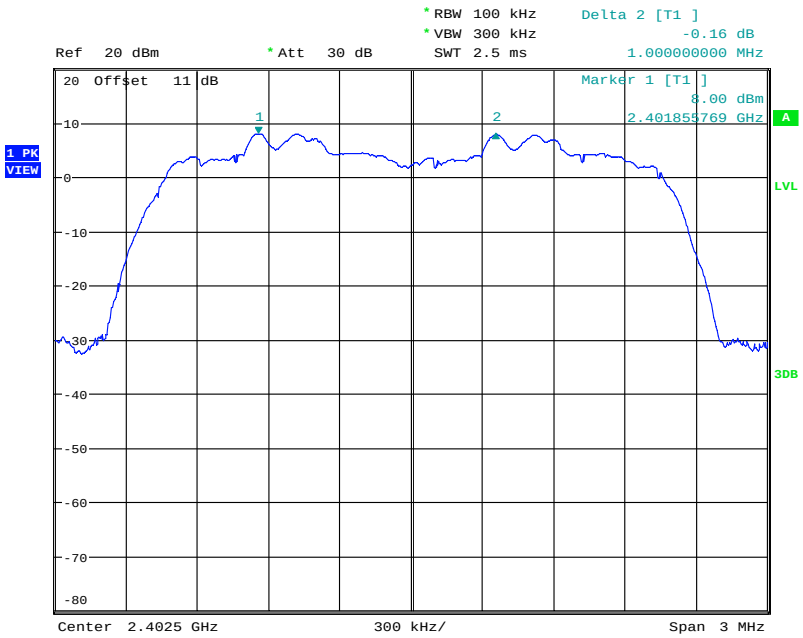
High Channel



Date: 30.SEP.2021 13:02:19

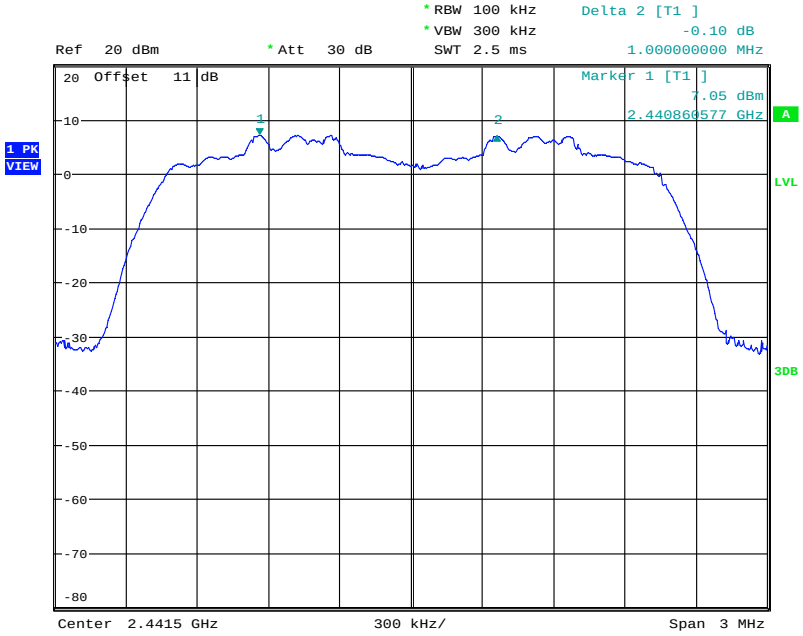
EDR Mode (π/4-DQPSK)

Low Channel



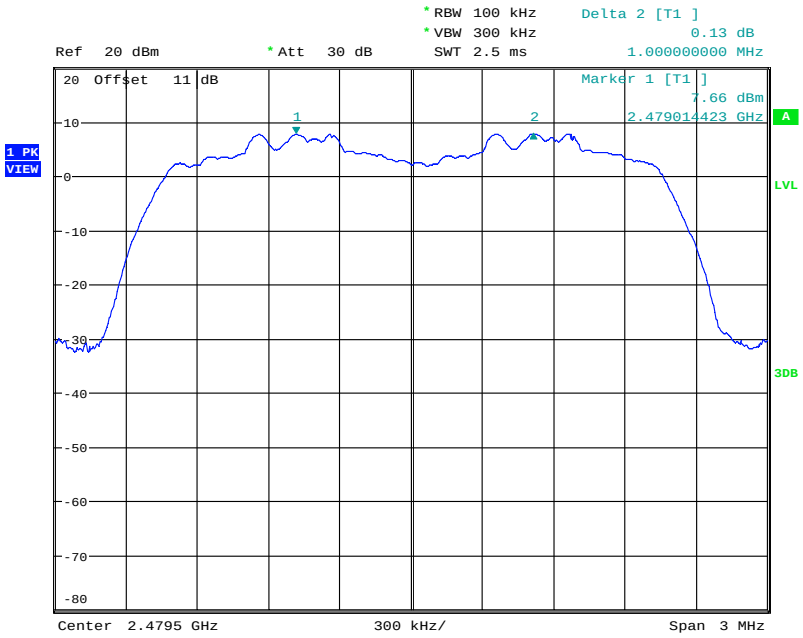
Date: 30.SEP.2021 14:33:34

Middle Channel



Date: 30.SEP.2021 14:51:57

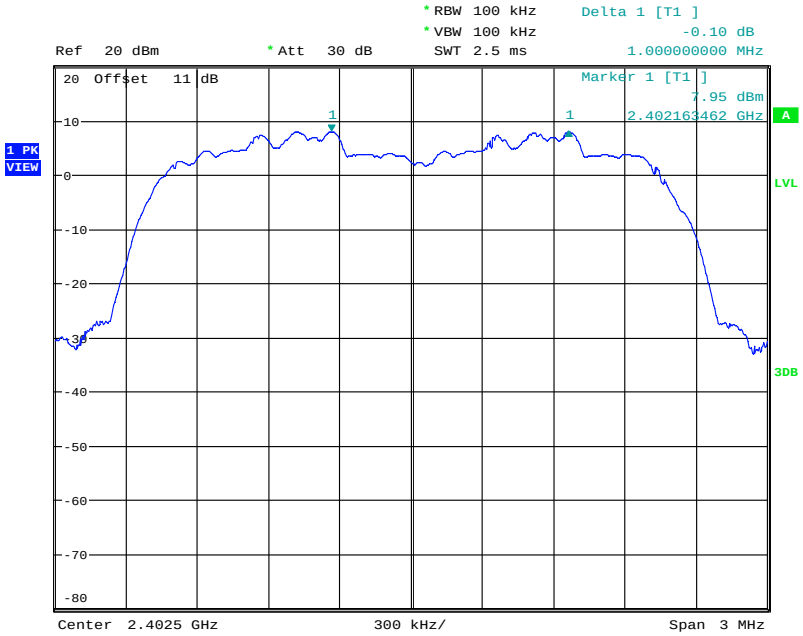
High Channel



Date: 30.SEP.2021 14:59:06

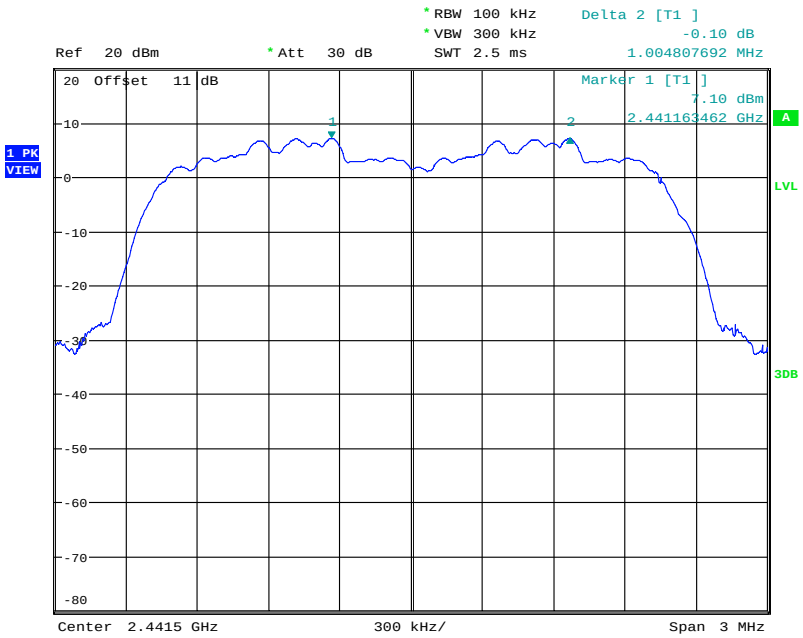
EDR Mode (8DPSK)

Low Channel



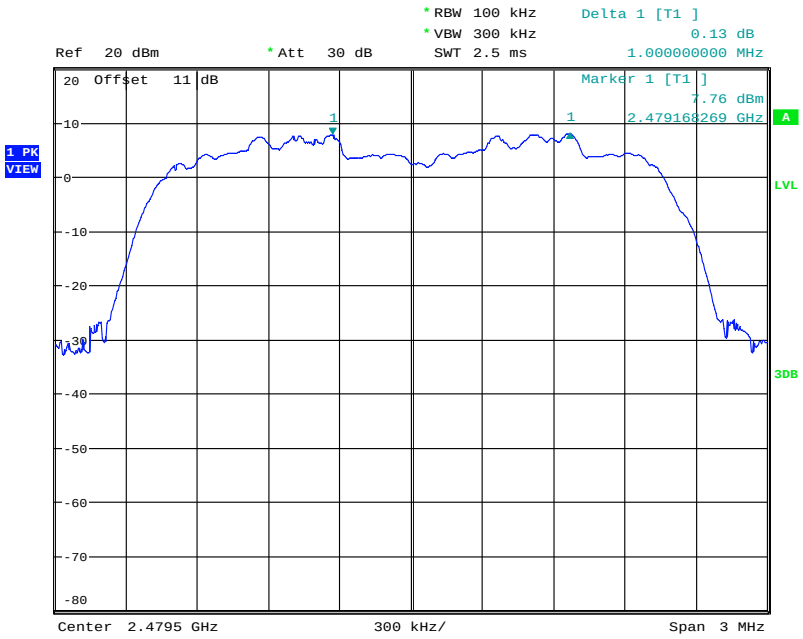
Date: 30.SEP.2021 15:45:21

Middle Channel



Date: 30.SEP.2021 15:53:09

High Channel



Date: 30.SEP.2021 16:24:13

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	0.384	320	31.6	122.88	<400	PASS
DH3	1.634	160	31.6	261.44	<400	PASS
DH5	2.884	100	31.6	288.40	<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	0.384	320	31.6	122.88	<400	PASS
2DH3	1.634	150	31.6	245.10	<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	0.384	320	31.6	122.88	<400	PASS
3DH3	1.634	150	31.6	245.10	<400	PASS
3DH5	2.884	100	31.6	288.40	<400	PASS

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

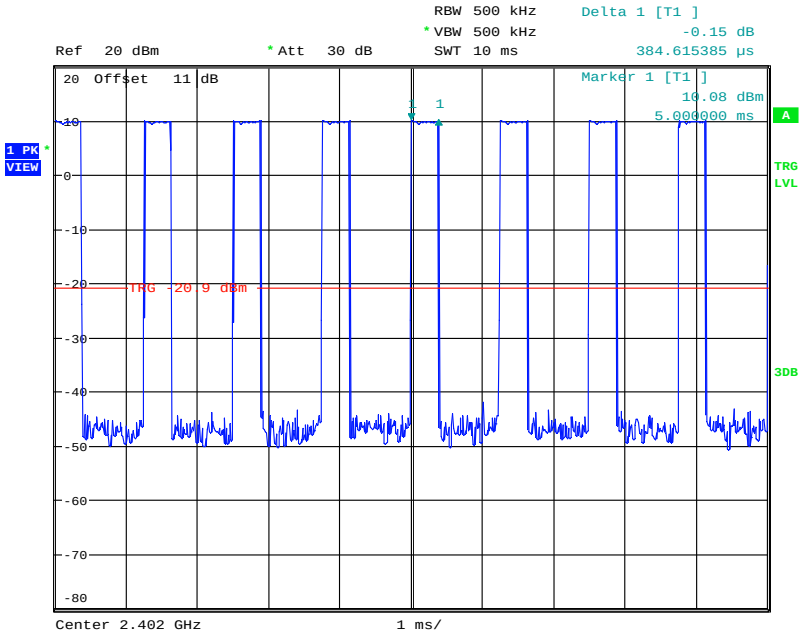
Note 2: Hopping Number = Hopping Number/10 * 10

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

Please refer to the following plots

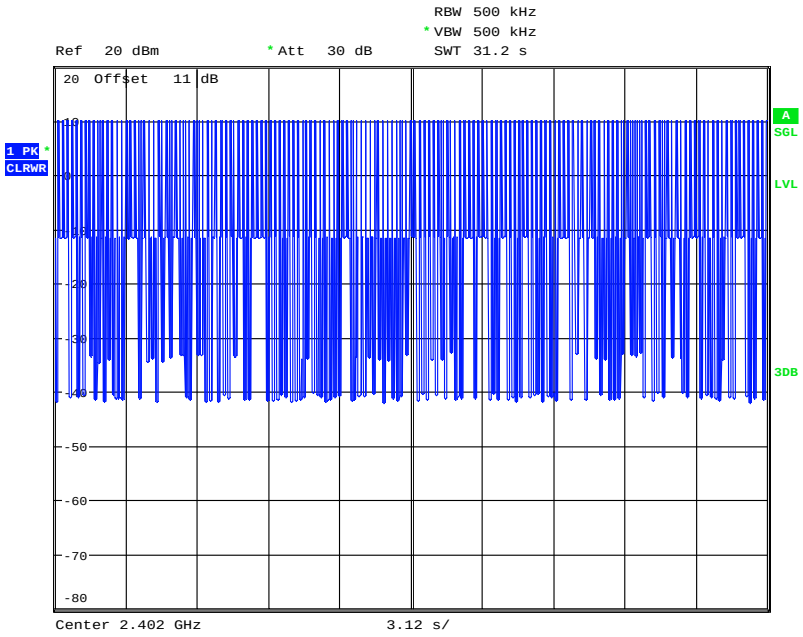
BR Mode (GFSK)

DH1: Pulse Width



Date: 30.SEP.2021 12:25:01

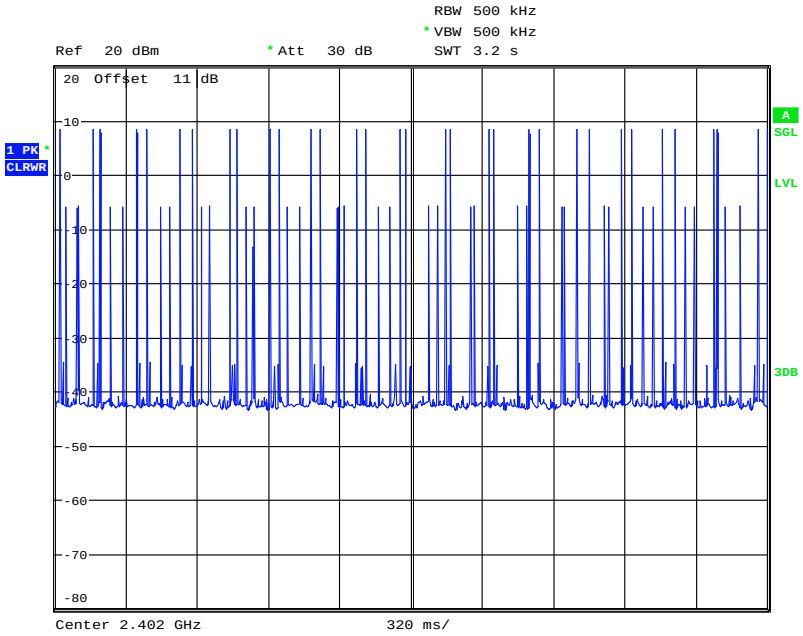
DH1: Hopping Number



Date: 30.SEP.2021 12:26:05

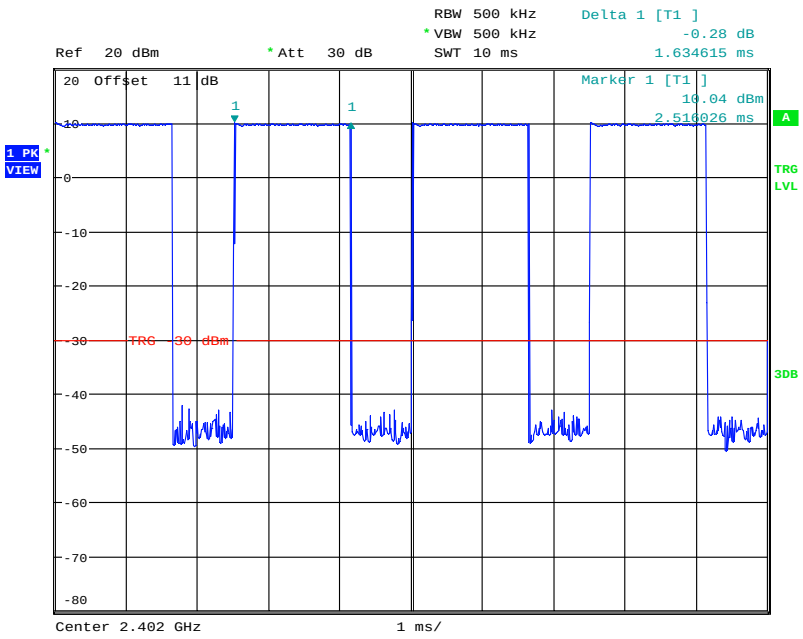
DH1: Hopping Number /10

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



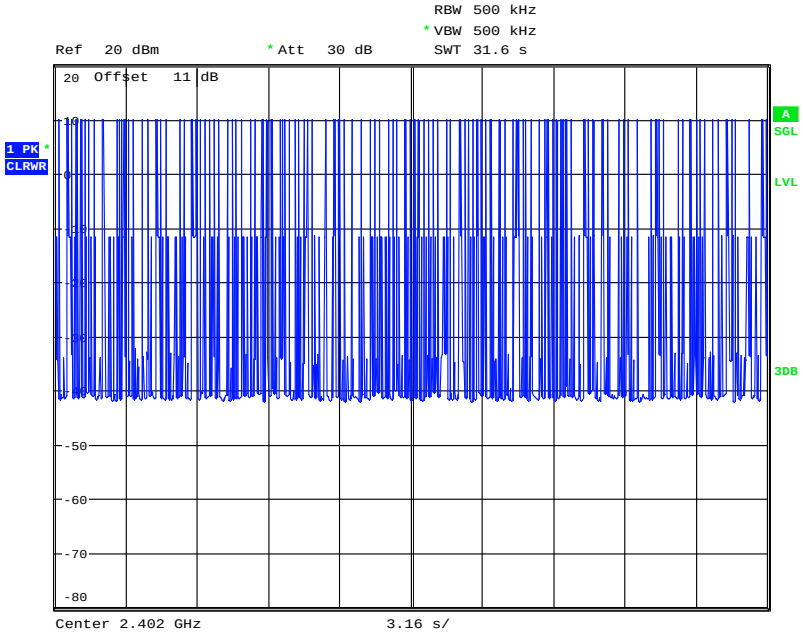
Date: 30.SEP.2021 15:36:34

DH3: Pulse Width



Date: 30.SEP.2021 12:19:10

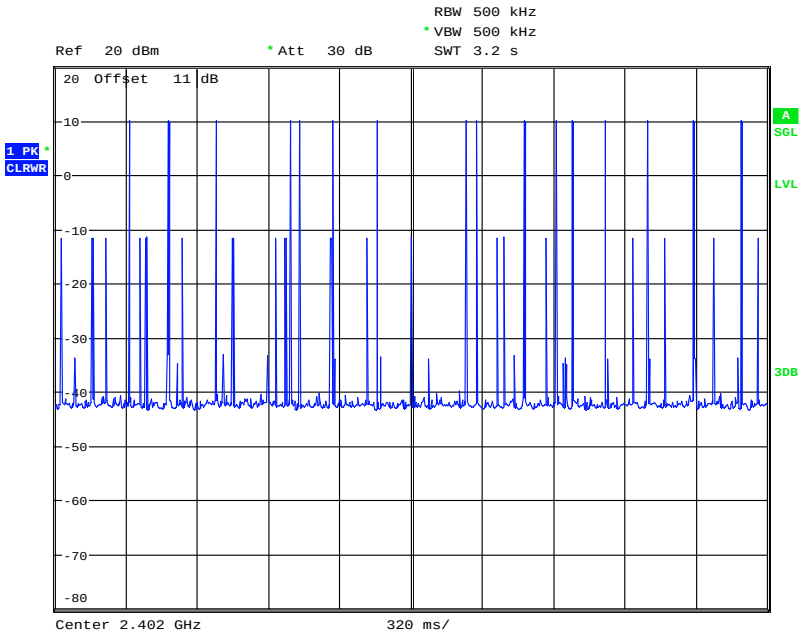
DH3: Hopping Number



Date: 30.SEP.2021 12:21:19

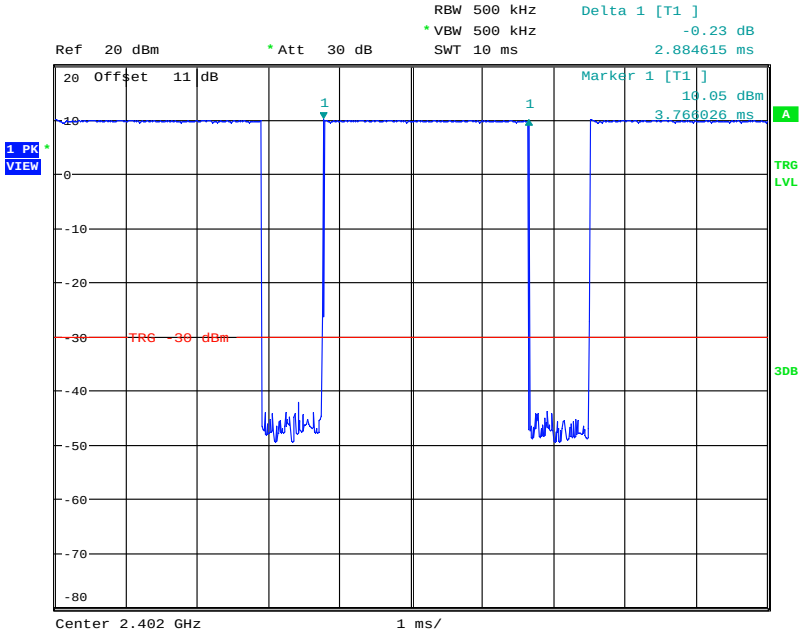
DH3: Hopping Number /10

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



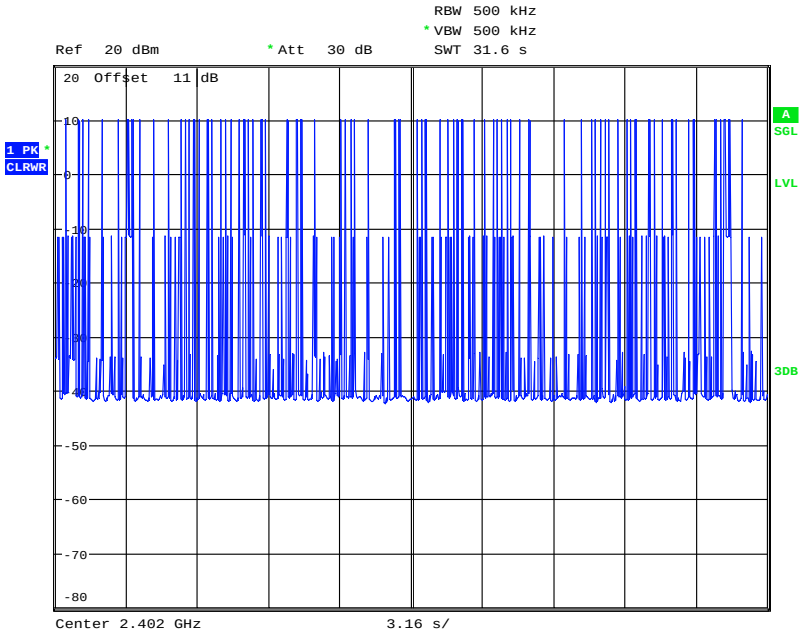
Date: 30.SEP.2021 12:21:37

DH5: Pulse Width



Date: 30.SEP.2021 11:37:22

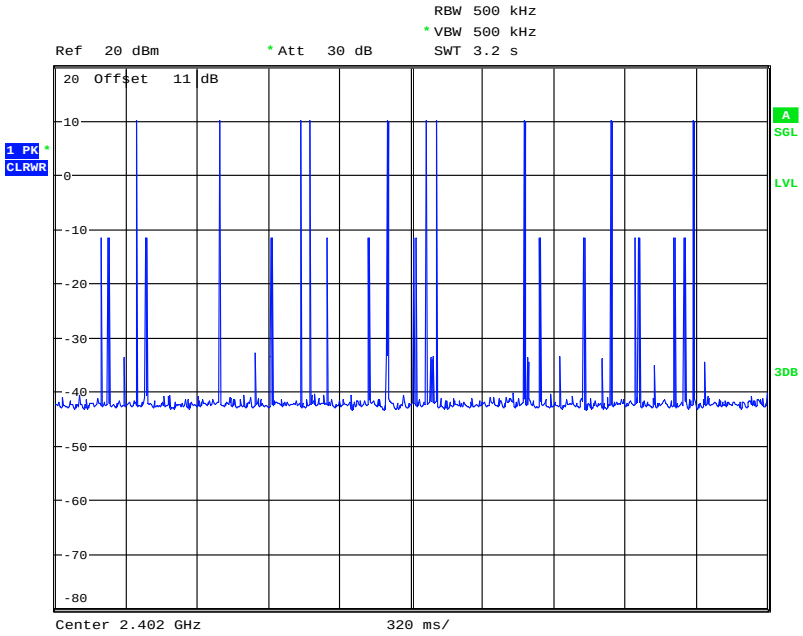
DH5: Hopping Number



Date: 30.SEP.2021 11:42:22

DH5: Hopping Number /10

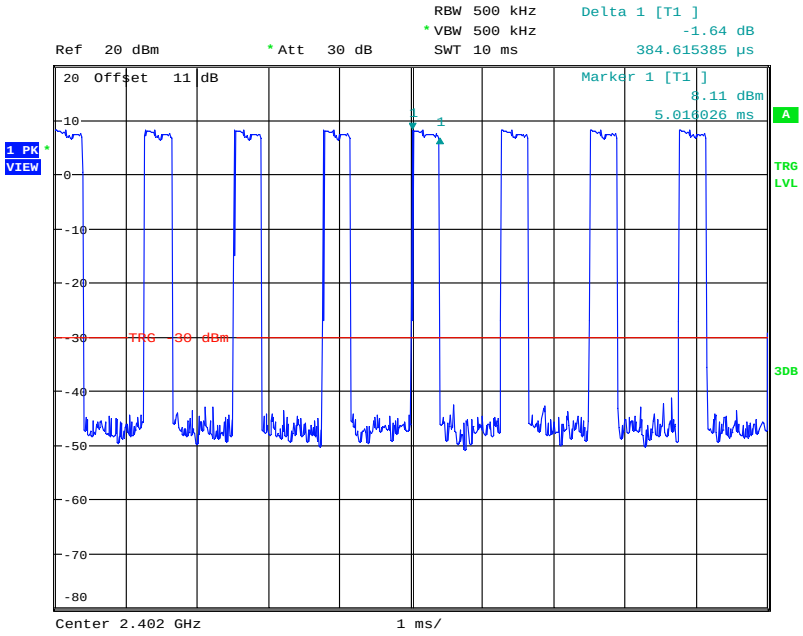
(Hopping Number = 10 in 1/10 period of highest signals, Second High signals were other channel)



Date: 30.SEP.2021 11:46:55

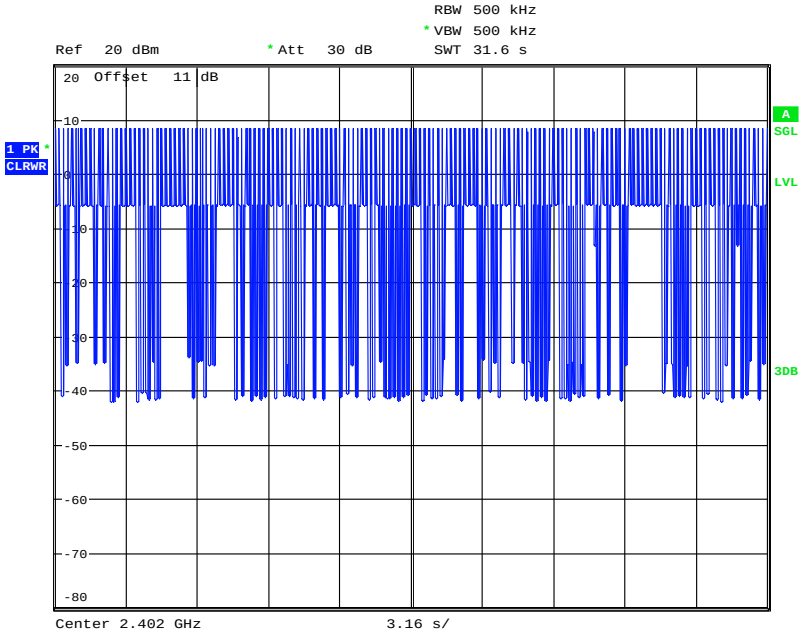
EDR Mode (π/4-DQPSK)

2DH1: Pulse Width



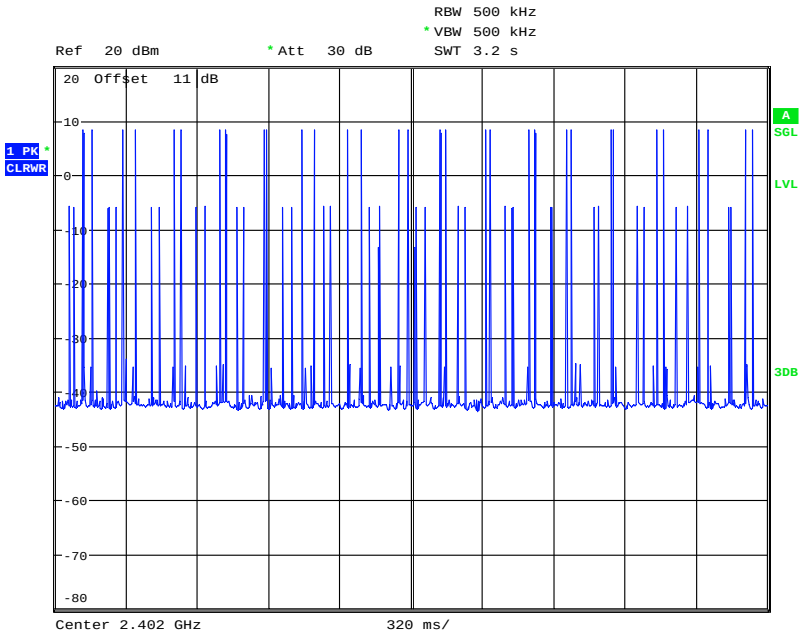
Date: 30.SEP.2021 14:31:30

2DH1: Hopping Number

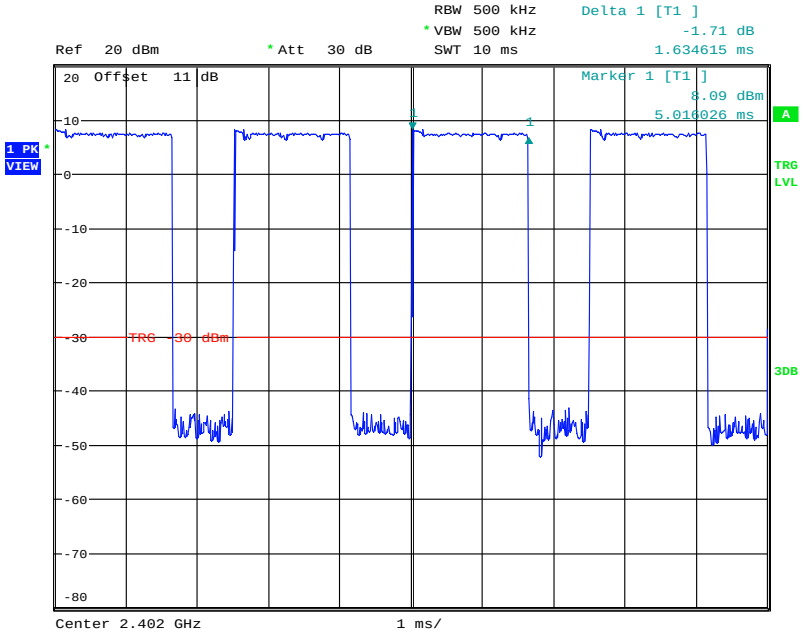


2DH1: Hopping Number /10

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

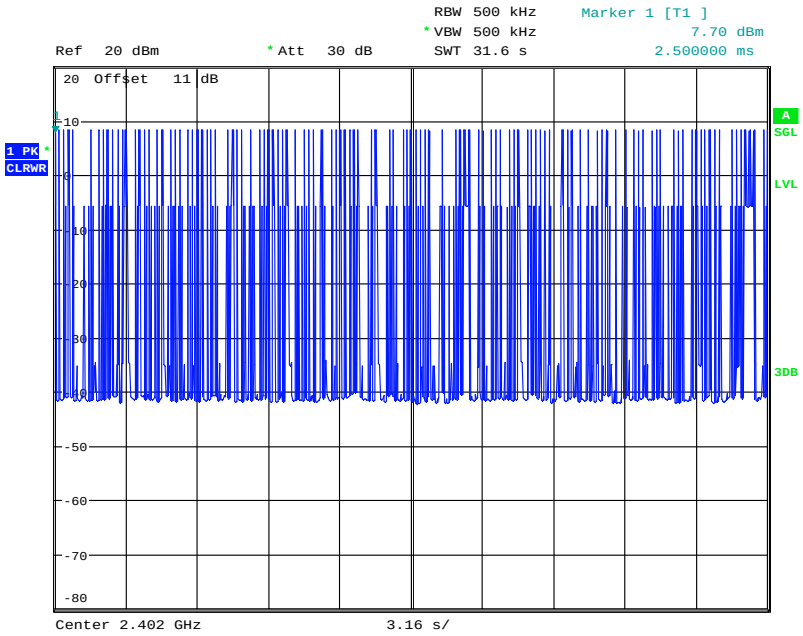


2DH3: Pulse Width



Date: 30.SEP.2021 14:30:54

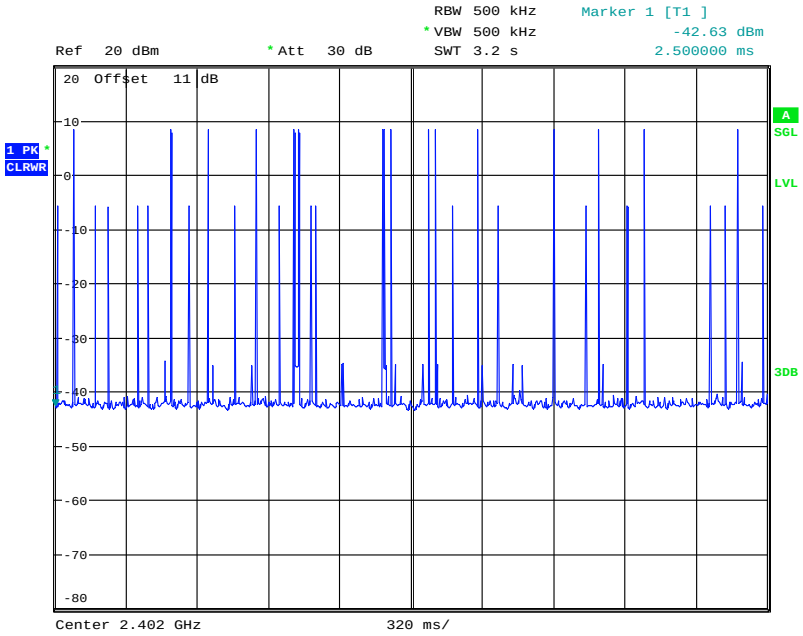
2DH3: Hopping Number



Date: 30.SEP.2021 15:10:59

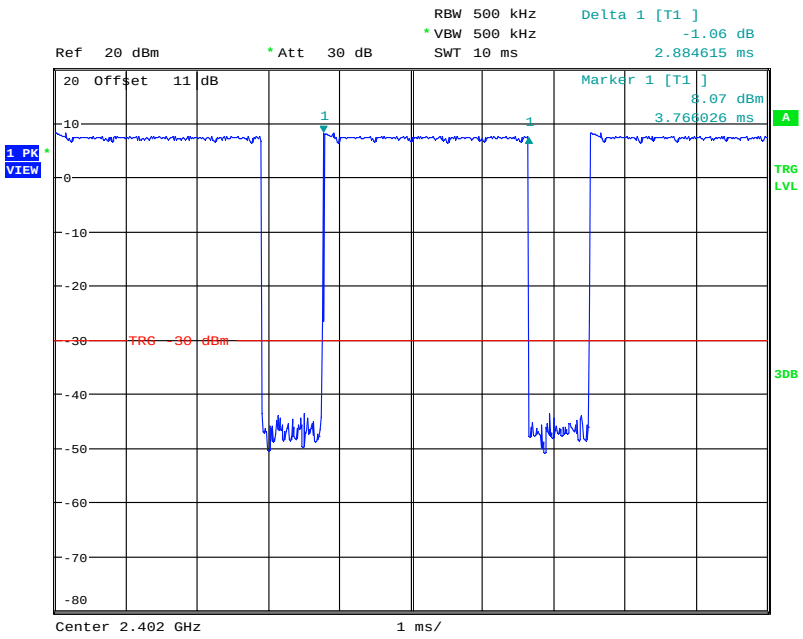
2DH3: Hopping Number /10

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



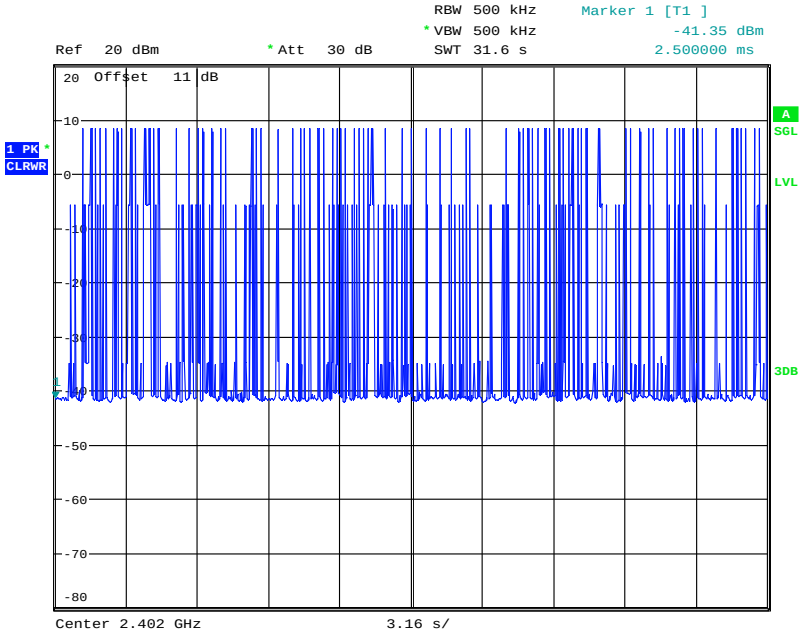
Date: 30.SEP.2021 15:14:10

2DH5: Pulse Width



Date: 30.SEP.2021 14:29:33

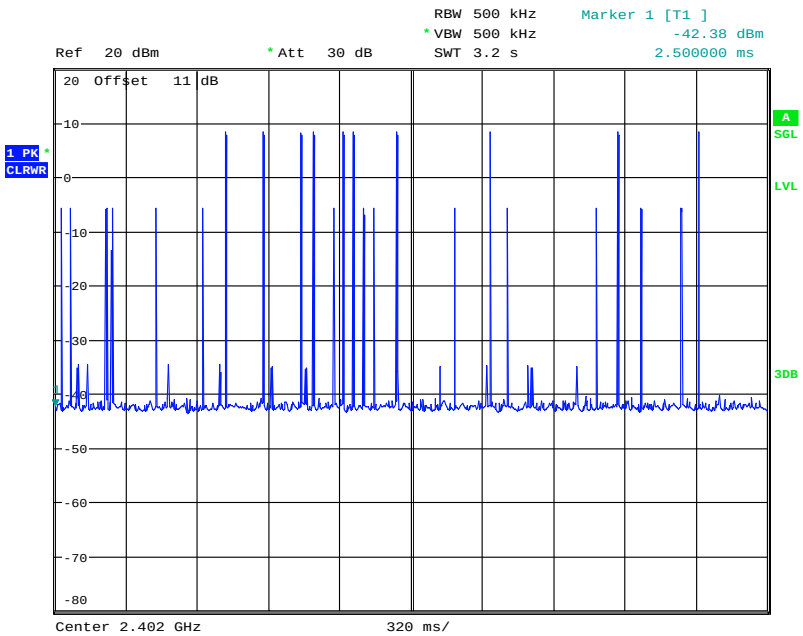
2DH5: Hopping Number



Date: 30.SEP.2021 15:09:37

2DH5: Hopping Number /10

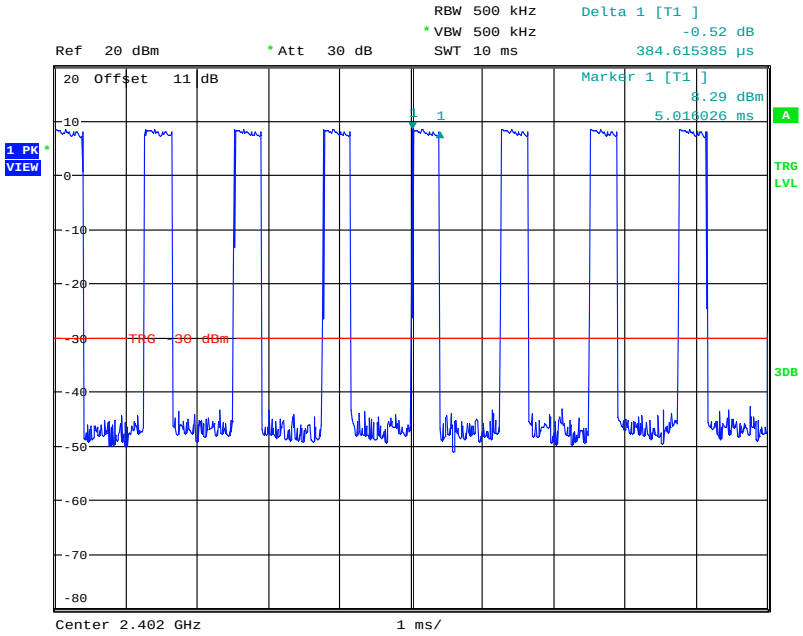
(Hopping Number = 10 in 1/10 period of highest signals, Second High signals were other channel)



Date: 30.SEP.2021 15:10:04

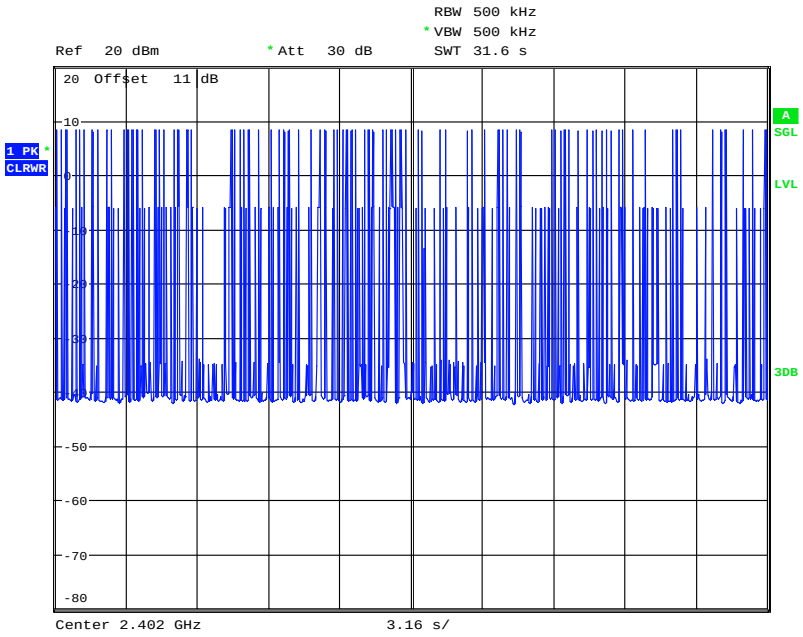
EDR Mode (8DPSK)

3DH1: Pulse Width



Date: 30.SEP.2021 15:47:44

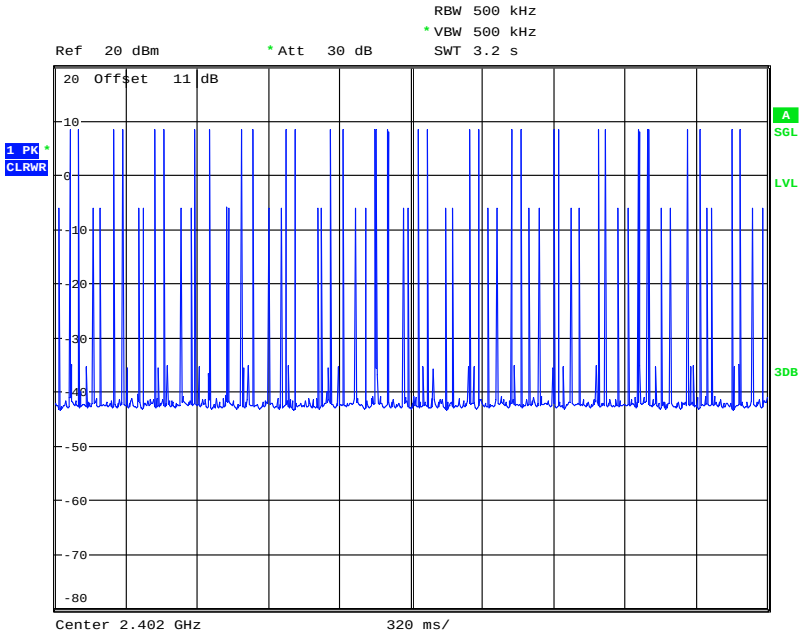
3DH1: Hopping Number



Date: 30.SEP.2021 16:00:52

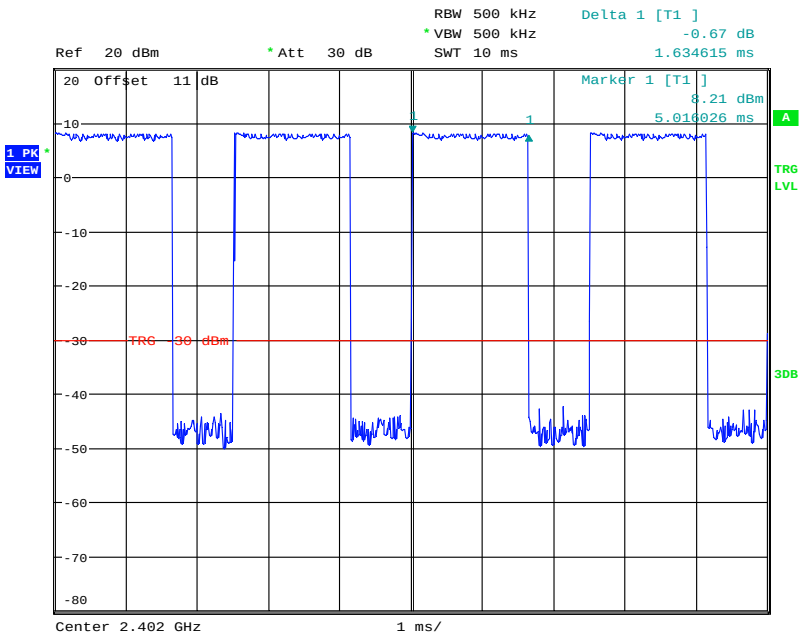
3DH1: Hopping Number /10

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



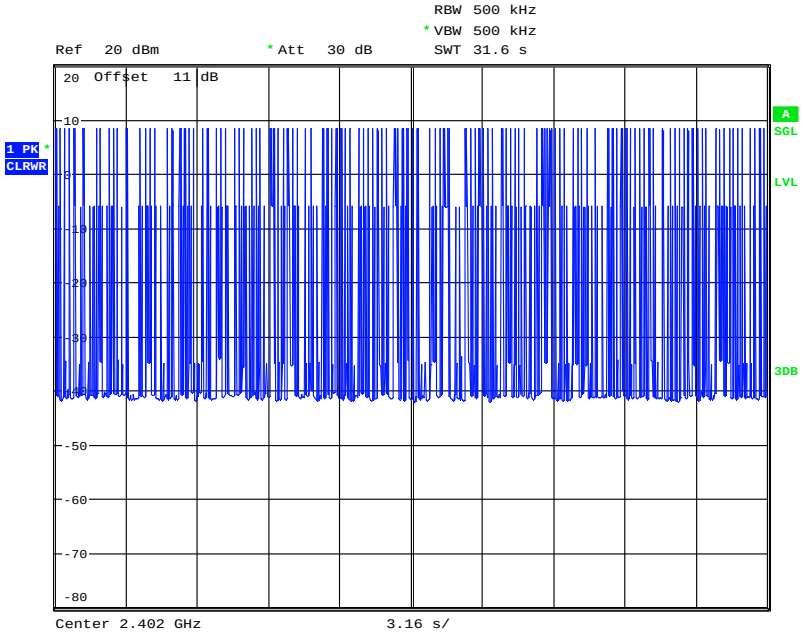
Date: 30.SEP.2021 16:04:35

3DH3: Pulse Width



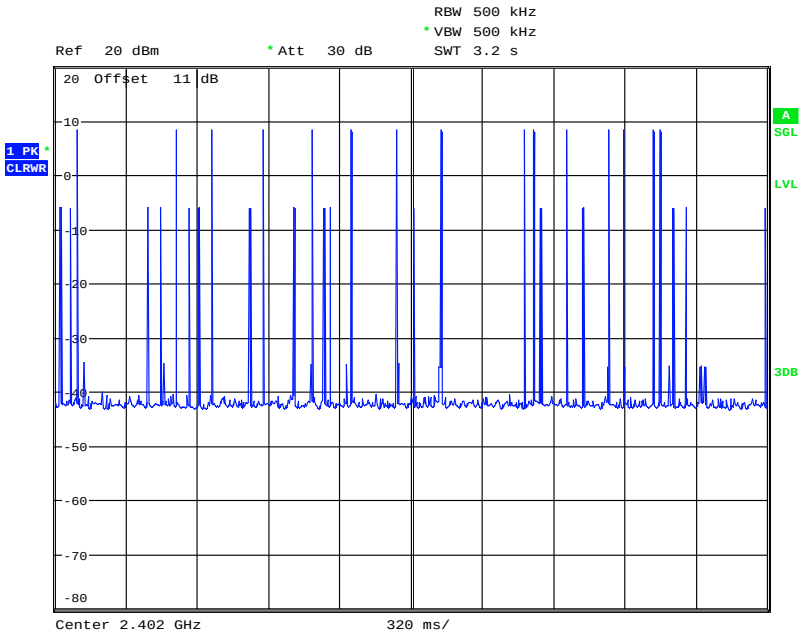
Date: 30.SEP.2021 15:47:11

3DH3: Hopping Number

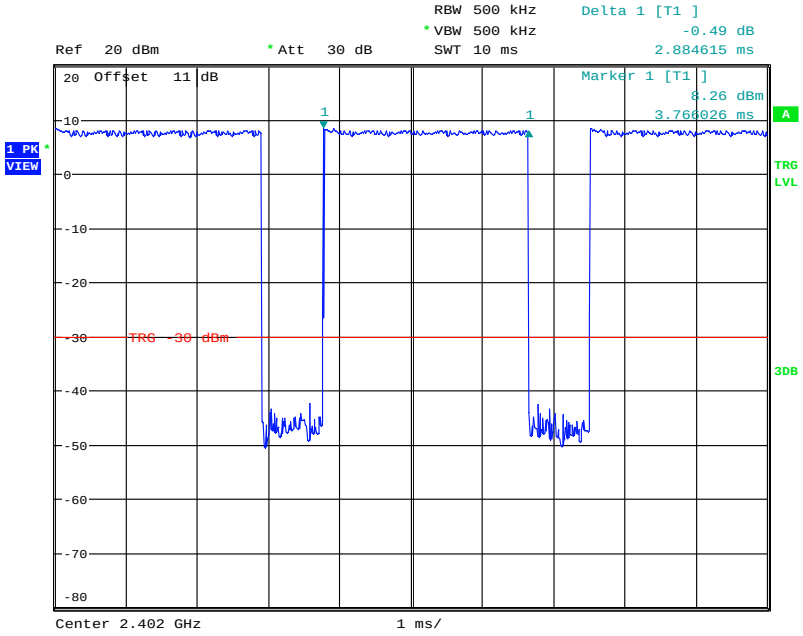


3DH3: Hopping Number /10

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

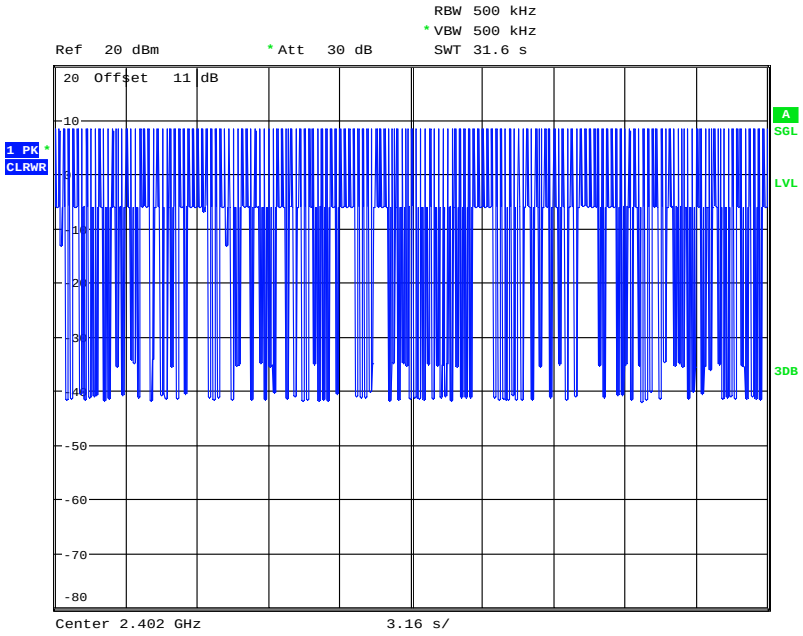


3DH5: Pulse Width



Date: 30.SEP.2021 15:46:33

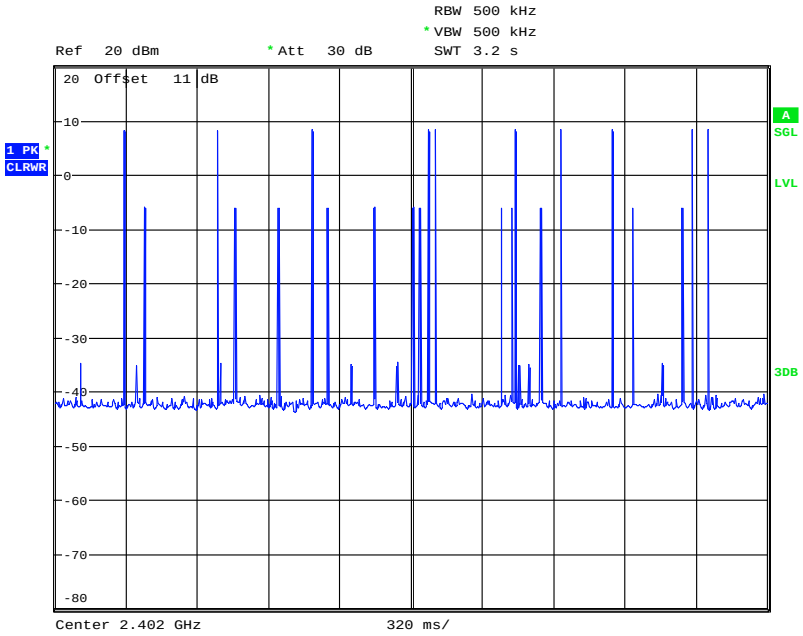
3DH5: Hopping Number



Date: 30.SEP.2021 16:04:05

3DH5: Hopping Number /10

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



Date: 30.SEP.2021 16:01:59

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

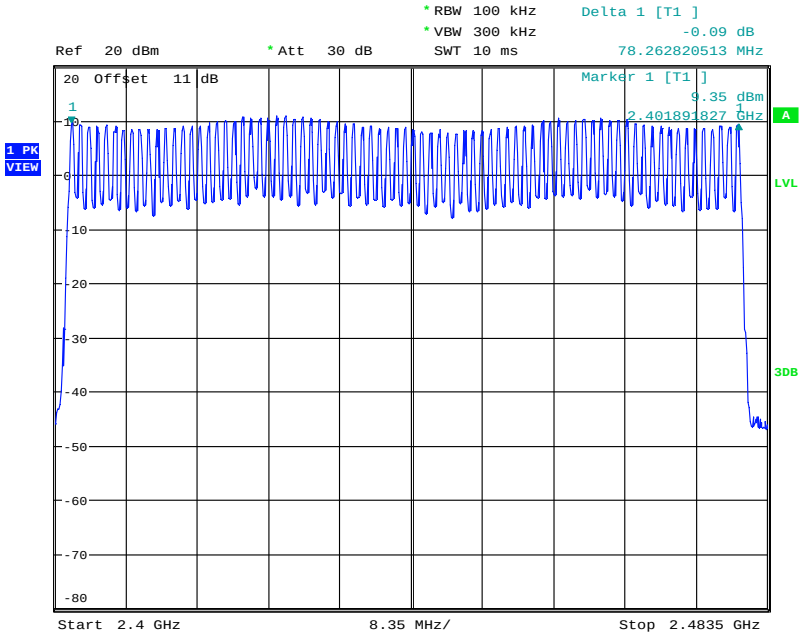
1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Set the EUT in hopping mode from first channel to last.
3. By using the Max-Hold function record the Quantity of the channel.

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

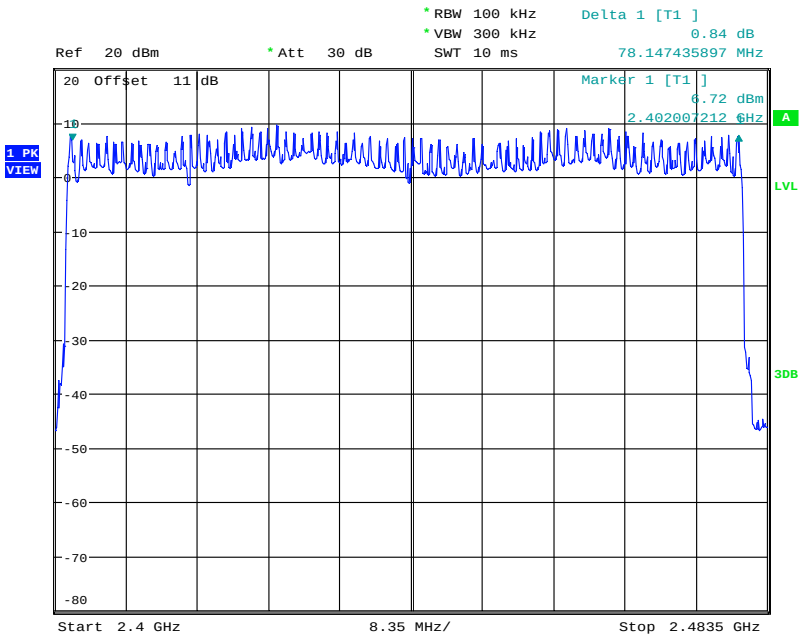
Please refer to the following plots

BR Mode (GFSK)



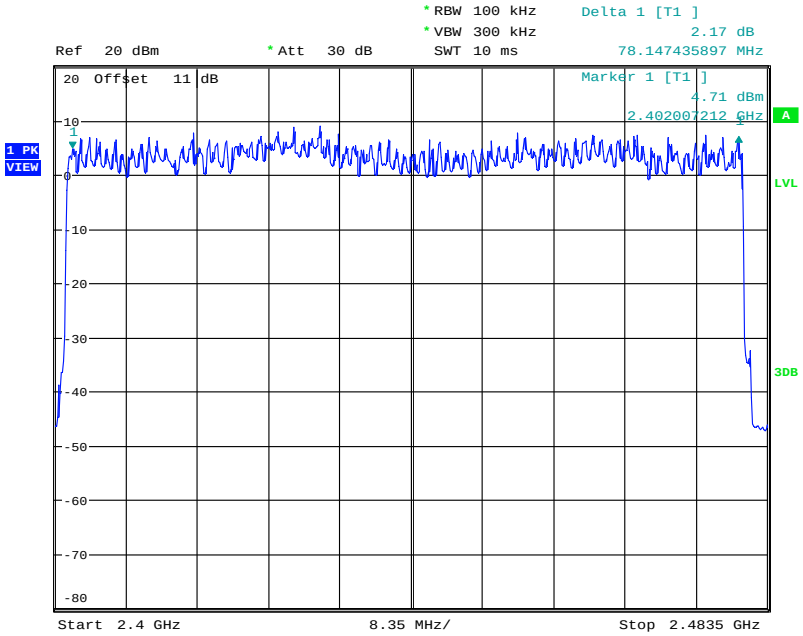
Date: 30.SEP.2021 11:58:54

EDR Mode (π/4-DQPSK)



Date: 30.SEP.2021 15:23:30

EDR Mode (8DPSK)



Date: 30.SEP.2021 16:17:43

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

13.1. Applicable Standard

According to FCC §15.247(b) (1).

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

13.2. Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.

2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to measuring equipment.

13.3. Test Results

Channel	Frequency (MHz)	Peak Conducted Output Power		Limit (W)	Result
		(dBm)	(W)		
BR Mode (GFSK)					
Low	2402	8.64	0.007	0.125	Compliance
Middle	2441	7.74	0.006	0.125	Compliance
High	2480	8.56	0.007	0.125	Compliance
EDR Mode (π/4-DQPSK)					
Low	2402	8.70	0.007	0.125	Compliance
Middle	2441	7.81	0.006	0.125	Compliance
High	2480	8.60	0.007	0.125	Compliance
EDR Mode (8DPSK)					
Low	2402	9.03	0.008	0.125	Compliance
Middle	2441	8.03	0.006	0.125	Compliance
High	2480	8.90	0.008	0.125	Compliance

Channel	Frequency (MHz)	Average Conducted Output Power		Limit (W)	Result
		(dBm)	(W)		
BR Mode (GFSK)					
Low	2402	7.54	0.006	N/A	Compliance
Middle	2441	6.66	0.005	N/A	Compliance
High	2480	7.49	0.006	N/A	Compliance
EDR Mode (π/4-DQPSK)					
Low	2402	5.62	0.004	N/A	Compliance
Middle	2441	4.77	0.003	N/A	Compliance
High	2480	5.58	0.004	N/A	Compliance
EDR Mode (8DPSK)					
Low	2402	5.61	0.004	N/A	Compliance
Middle	2441	4.73	0.003	N/A	Compliance
High	2480	5.53	0.004	N/A	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

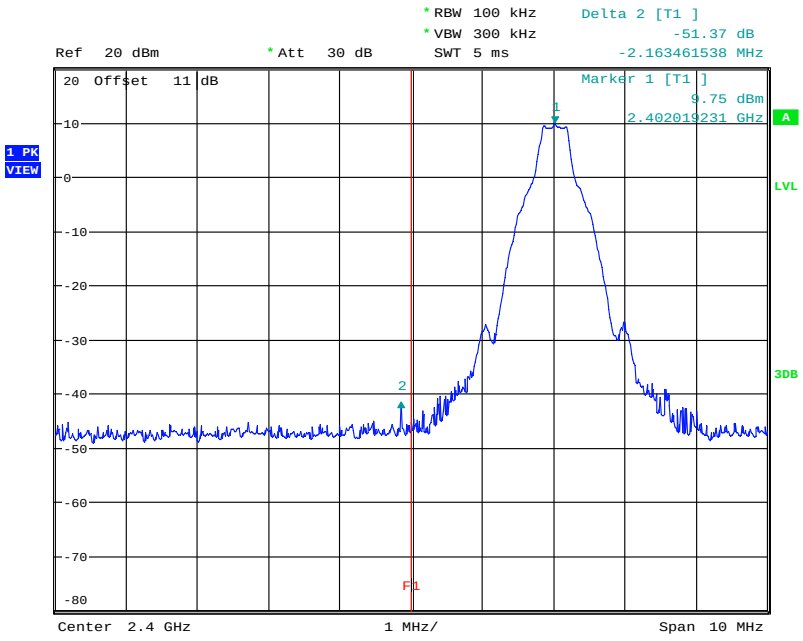
14.3. Test Results

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
BR Mode (GFSK)				
Low	2402	51.37	≥ 20	PASS
High	2480	54.52	≥ 20	PASS
BR Hopping Mode (GFSK)				
Low	2402-2480	53.49	≥ 20	PASS
High	2402-2480	53.71	≥ 20	PASS
EDR Mode (π/4-DQPSK)				
Low	2402	53.18	≥ 20	PASS
High	2480	52.89	≥ 20	PASS
EDR Hopping Mode (π/4-DQPSK)				
Low	2402-2480	52.42	≥ 20	PASS
High	2402-2480	50.13	≥ 20	PASS
EDR Mode (8DPSK)				
Low	2402	52.50	≥ 20	PASS
High	2480	52.30	≥ 20	PASS
EDR Hopping Mode (8DPSK)				
Low	2402-2480	51.57	≥ 20	PASS
High	2402-2480	51.64	≥ 20	PASS

Please refer to the following plots.

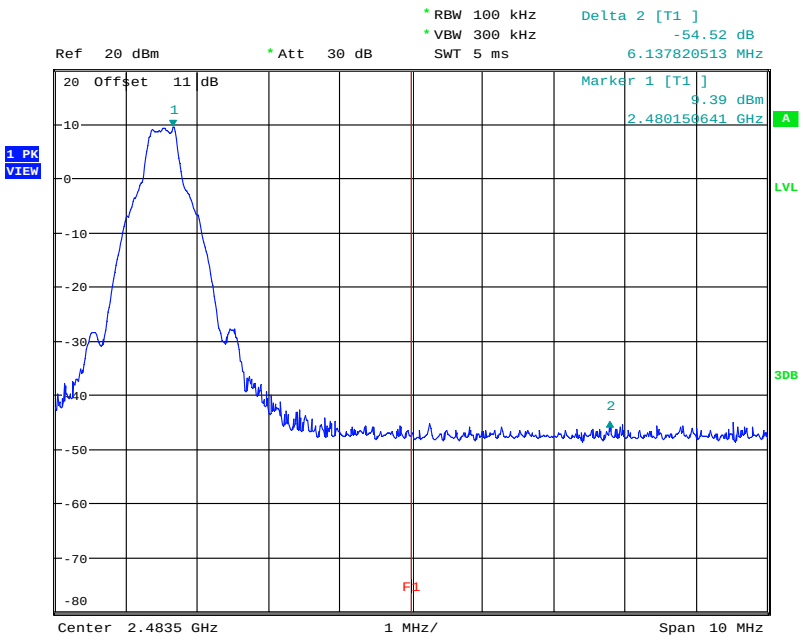
BR Mode (GFSK)

Band Edge, CH Low



Date: 30.SEP.2021 11:07:21

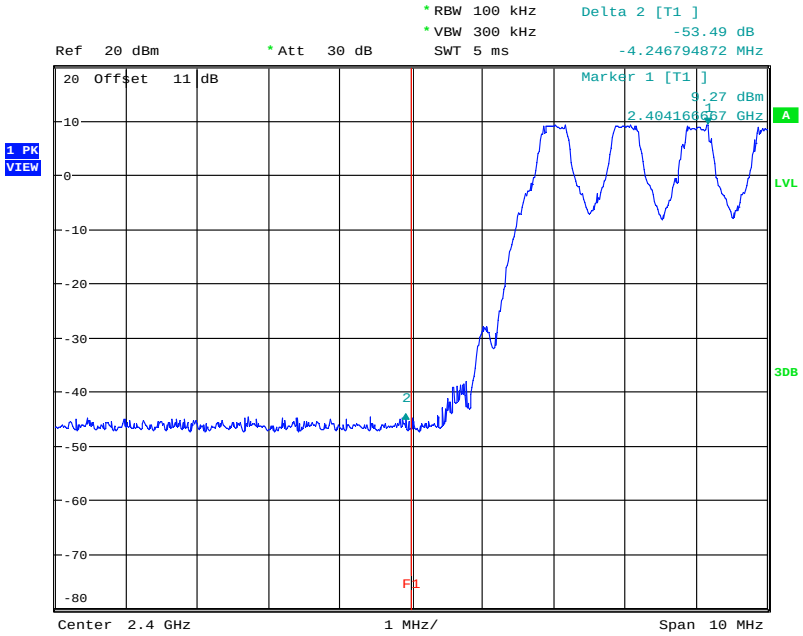
Band Edge, CH High



Date: 30.SEP.2021 14:17:54

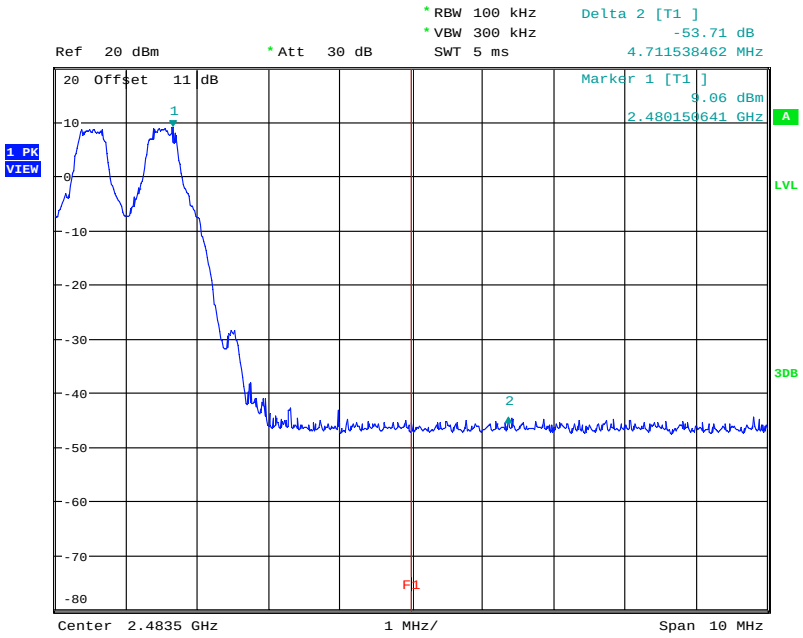
BR Hopping Mode (GFSK)

Band Edge, CH Low



Date: 30.SEP.2021 11:52:55

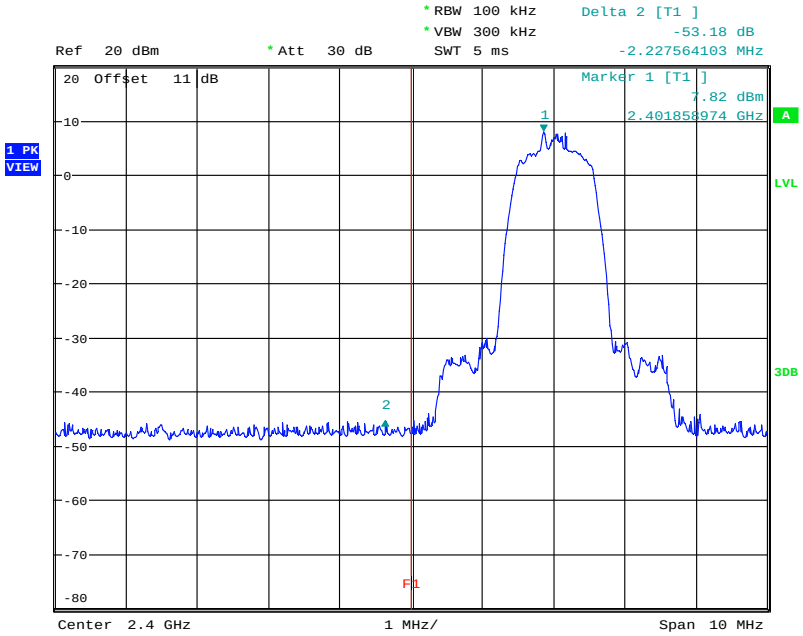
Band Edge, CH High



Date: 30.SEP.2021 14:13:41

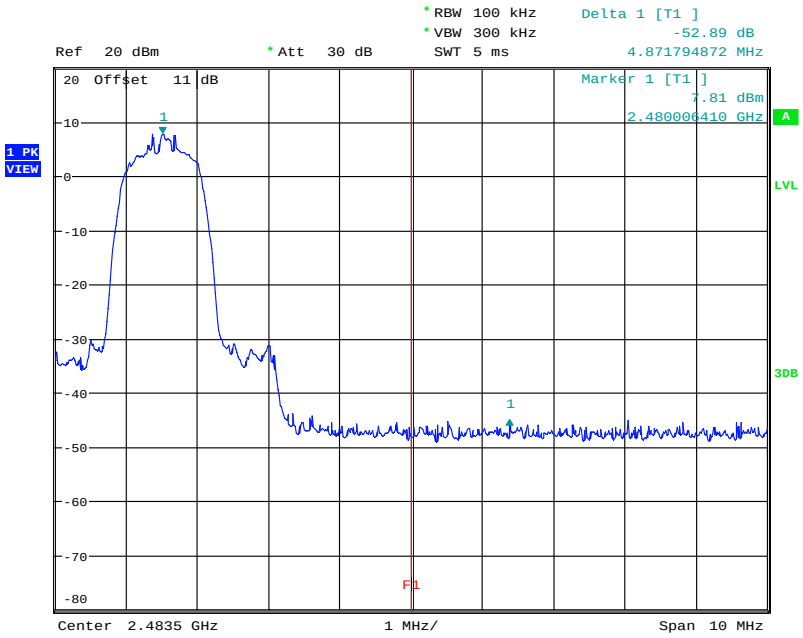
EDR Mode (π/4-DQPSK)

Band Edge, CH Low



Date: 30.SEP.2021 14:28:28

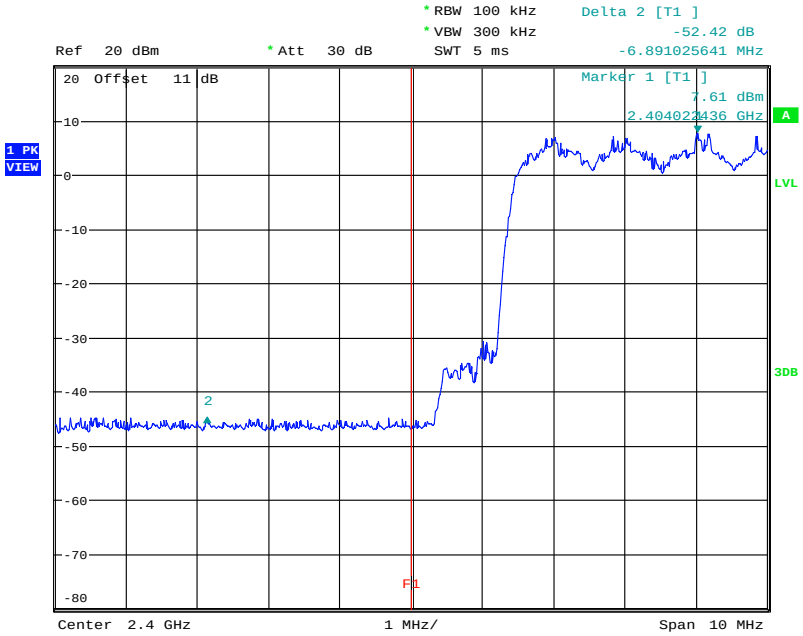
Band Edge, CH High



Date: 30.SEP.2021 14:55:16

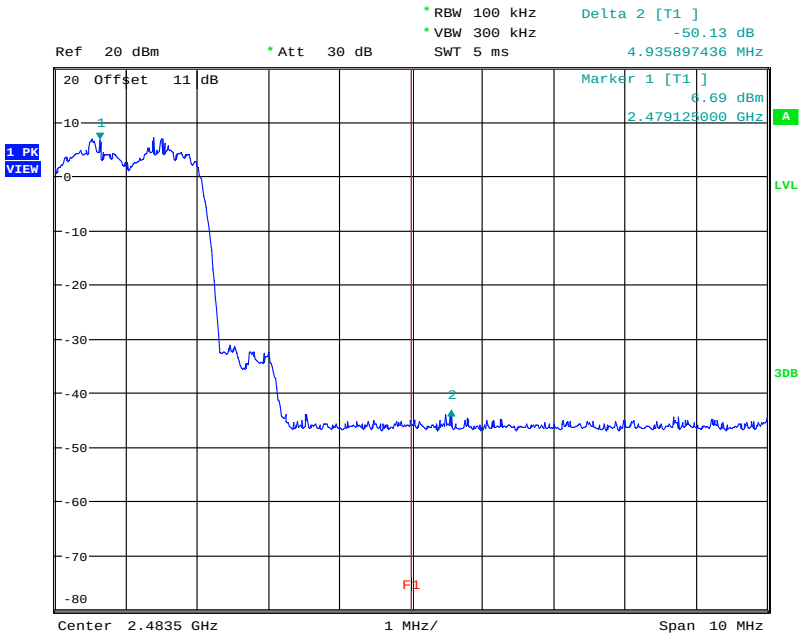
EDR Hopping Mode (π/4-DQPSK)

Band Edge, CH Low



Date: 30.SEP.2021 15:07:56

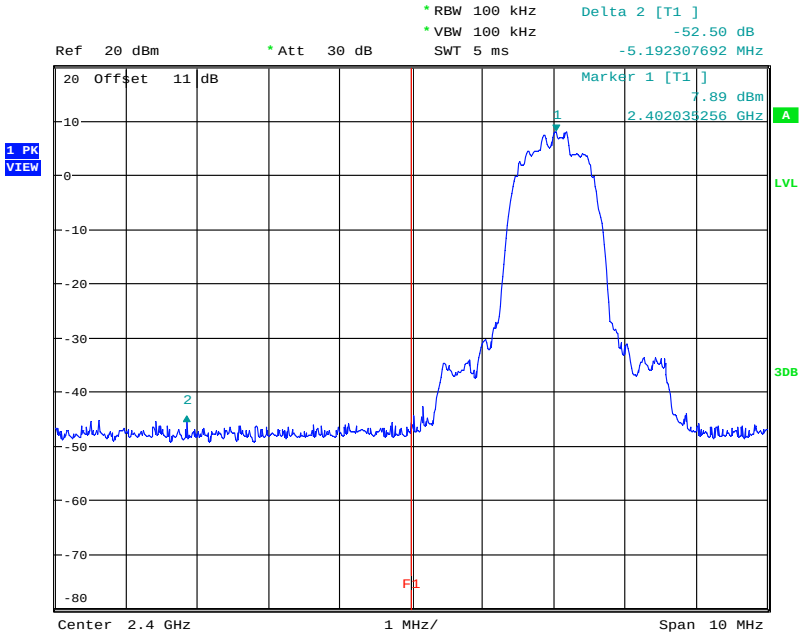
Band Edge, CH High



Date: 30.SEP.2021 15:05:28

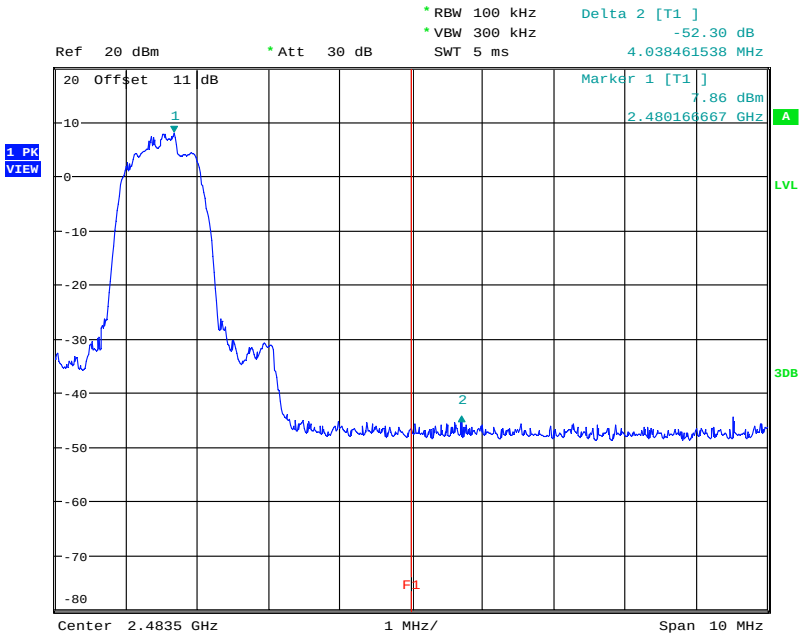
EDR Mode (8DPSK)

Band Edge, CH Low



Date: 30.SEP.2021 15:43:36

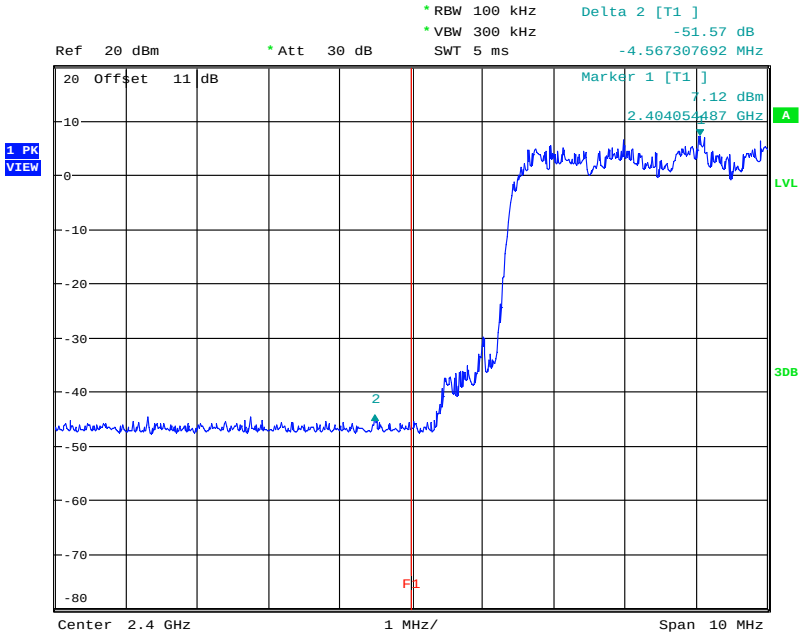
Band Edge, CH High



Date: 30.SEP.2021 15:56:45

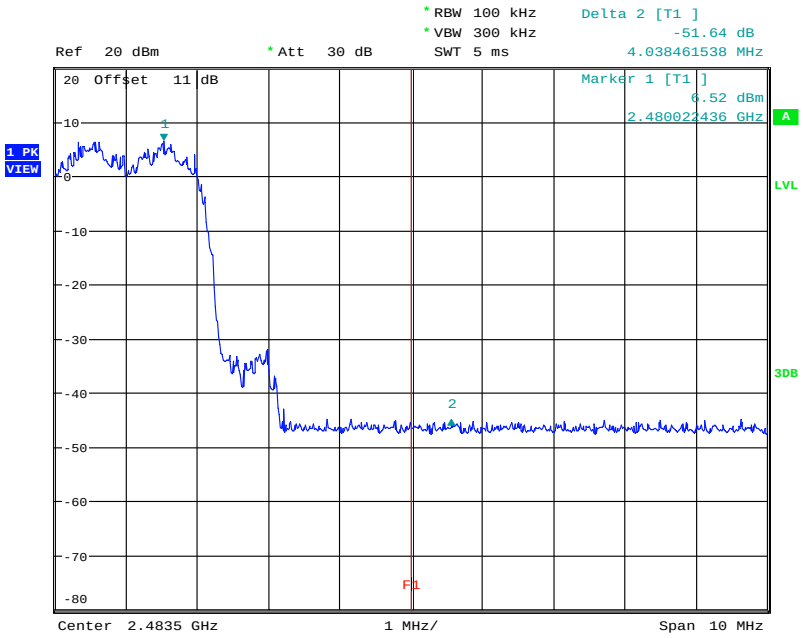
EDR Hopping Mode (8DPSK)

Band Edge, CH Low



Date: 30.SEP.2021 15:59:41

Band Edge, CH High



Date: 30.SEP.2021 15:58:30

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