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TEST REPORT

Report No.: CQASZ20201201480E-01
Applicant: Ocean Digital Technology Ltd.
Address of Applicant: Flat 12B, Yeung Yiu Chung (No.8) Ind. Bldg., 20 Wang Hoi Road, Kowloon Bay
Equipment Under Test (EUT):
EUT Name: Internet Radio
Model No.: MA-336D, MA-336N, WR-336N, WR-336D, WR-336
Test Model No.: MA-336D
Brand Name: N/A
FCC ID: 2ABD3-MA336N
Standards: 47 CFR Part 15, Subpart C
Date of Receipt: 2020-12-15
Date of Test: 2020-12-15 to 2020-12-22
Date of Issue: 2020-12-22
Test Result: **PASS***

*In the configuration tested, the EUT complied with the standards specified above

Tested By:

Martin Lee

(Martin Lee)

Reviewed By:

Ares Liu

(Ares Liu)

Approved By:

Sheek, Luo

(Sheek Luo)



1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20201201480E-01	Rev.01	Initial report	2020-12-22

2 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203/15.247 (c)	ANSI C63.10 (2013)	PASS
AC Power Line Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10 (2013)	PASS
Conducted Peak Output Power	47 CFR Part 15, Subpart C Section 15.247 (b)(1)	ANSI C63.10 (2013)	PASS
20dB Occupied Bandwidth	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10 (2013)	PASS
Carrier Frequencies Separation	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10 (2013)	PASS
Hopping Channel Number	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10 (2013)	PASS
Dwell Time	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10 (2013)	PASS
Pseudorandom Frequency Hopping Sequence	47 CFR Part 15, Subpart C Section 15.247(b)(4)&TCB Exclusion List (7 July 2002)	ANSI C63.10 (2013)	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10 (2013)	PASS
RF Conducted Spurious Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10 (2013)	PASS
Radiated Spurious emissions	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 (2013)	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 (2013)	PASS

Note:

Model No.: MA-336D, MA-336N, WR-336N, WR-336D, WR-336

Only the model MA-336D was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, with difference being color of appearance and model name.

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4 General Information

4.1 Client Information

Applicant:	Ocean Digital Technology Ltd.
Address of Applicant:	Flat 12B, Yeung Yiu Chung (No.8) Ind. Bldg., 20 Wang Hoi Road, Kowloon Bay
Manufacturer:	Ocean Digital Technology Ltd.
Address of Manufacturer:	Flat 12B, Yeung Yiu Chung (No.8) Ind. Bldg., 20 Wang Hoi Road, Kowloon Bay
Factory:	Ocean Digital Technology Ltd.
Address of Factory:	Flat 12B, Yeung Yiu Chung (No.8) Ind. Bldg., 20 Wang Hoi Road, Kowloon Bay

4.2 General Description of EUT

Product Name:	Internet Radio
Model No.:	MA-336D, MA-336N, WR-336N, WR-336D, WR-336
Test Model No.:	MA-336D
Trade Mark:	N/A
Hardware version:	V2.0
Software version:	(APP:20200304.1159)
Test sample No:	CQASZ20201201480E#1
EUT Supports Radios application:	Bluetooth: 2402-2480MHz 2.4G Wi-Fi: 802.11b/g/n(HT20): 2412MHz~2462 MHz
Power Supply:	lithium battery: DC3.7V, 2000mAh, Charge by DC5V

4.3 Product Specification subjective to this standard

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	V4.2
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	GFSK, $\pi/4$ DQPSK, 8DPSK
Transfer Rate:	1Mbps/2Mbps/3Mbps
Number of Channel:	79
Hopping Channel Type:	Adaptive Frequency Hopping systems
Product Type:	<input type="checkbox"/> Mobile <input checked="" type="checkbox"/> Portable <input type="checkbox"/> Fix Location
Test Software of EUT:	EspRFtestTool (manufacturer declare)
Antenna Type:	PCB antenna
Antenna Gain:	0dBi

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2402MHz	20	2422MHz	40	2442MHz	60	2462MHz
1	2403MHz	21	2423MHz	41	2443MHz	61	2463MHz
2	2404MHz	22	2424MHz	42	2444MHz	62	2464MHz
3	2405MHz	23	2425MHz	43	2445MHz	63	2465MHz
4	2406MHz	24	2426MHz	44	2446MHz	64	2466MHz
5	2407MHz	25	2427MHz	45	2447MHz	65	2467MHz
6	2408MHz	26	2428MHz	46	2448MHz	66	2468MHz
7	2409MHz	27	2429MHz	47	2449MHz	67	2469MHz
8	2410MHz	28	2430MHz	48	2450MHz	68	2470MHz
9	2411MHz	29	2431MHz	49	2451MHz	69	2471MHz
10	2412MHz	30	2432MHz	50	2452MHz	70	2472MHz
11	2413MHz	31	2433MHz	51	2453MHz	71	2473MHz
12	2414MHz	32	2434MHz	52	2454MHz	72	2474MHz
13	2415MHz	33	2435MHz	53	2455MHz	73	2475MHz
14	2416MHz	34	2436MHz	54	2456MHz	74	2476MHz
15	2417MHz	35	2437MHz	55	2457MHz	75	2477MHz
16	2418MHz	36	2438MHz	56	2458MHz	76	2478MHz
17	2419MHz	37	2439MHz	57	2459MHz	77	2479MHz
18	2420MHz	38	2440MHz	58	2460MHz	78	2480MHz
19	2421MHz	39	2441MHz	59	2461MHz		

Note:

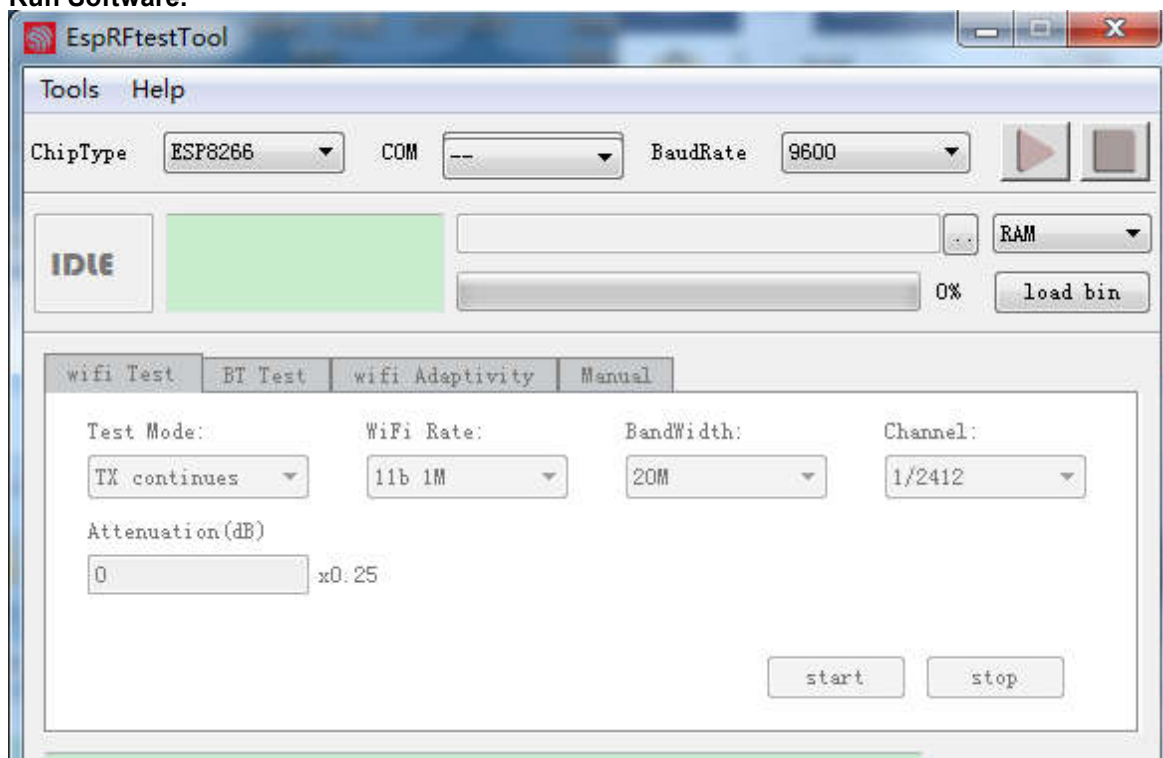
In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The Lowest channel	2402MHz
The Middle channel	2441MHz
The Highest channel	2480MHz

4.4 Additional Instructions

EUT Test Software Settings:		
Mode:	<input checked="" type="checkbox"/> Special software is used. <input type="checkbox"/> Through engineering command into the engineering mode. engineering command: *##3646633##*	
EUT Power level:	Class2 (Power level is built-in set parameters and cannot be changed and selected)	
Use test software to set the lowest frequency, the middle frequency and the highest frequency keep transmitting of the EUT.		
Mode	Channel	Frequency(MHz)
DH1/DH3/DH5	CH0	2402
	CH39	2441
	CH78	2480
2DH1/2DH3/2DH5	CH0	2402
	CH39	2441
	CH78	2480
3DH1/3DH3/3DH5	CH0	2402
	CH39	2441
	CH78	2480

Run Software:



4.5 Test Environment

Operating Environment:	
Radiated Emissions:	
Temperature:	25.3 °C
Humidity:	55 % RH
Atmospheric Pressure:	1009 mbar
Conducted Emissions:	
Temperature:	22.3 °C
Humidity:	47 % RH
Atmospheric Pressure:	1009 mbar
Radio conducted item test (RF Conducted test room):	
Temperature:	25.3 °C
Humidity:	51 % RH
Atmospheric Pressure:	1009 mbar
Test mode:	
Test Mode:	Use test software to set the lowest frequency, the middle frequency and the highest frequency keep transmitting of the EUT.

4.6 Description of Support Units

The EUT has been tested with associated equipment below.

1) Support equipment

Description	Manufacturer	Model No.	Certification	Supplied by
PC	Lenovo	ThinkPad E450c	FCC ID	CQA
Adapter	HUAWEI	LPL-C010050200Z	DOC	CQA

2) Cable

Cable No.	Description	Manufacturer	Cable Type/Length	Supplied by
/	/	/	/	/

4.7 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate.

The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities.

The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the **Shenzhen Huaxia Testing Technology Co., Ltd.** quality system acc. to DIN EN ISO/IEC 17025.

Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CQA laboratory is reported:

No.	Item	Uncertainty	Notes
1	Radiated Emission (Below 1GHz)	5.12dB	(1)
2	Radiated Emission (Above 1GHz)	4.60dB	(1)
3	Conducted Disturbance (0.15~30MHz)	3.34dB	(1)
4	Radio Frequency	3×10^{-8}	(1)
5	Duty cycle	0.6 %.	(1)
6	Occupied Bandwidth	1.1%	(1)
7	RF conducted power	0.86dB	(1)
8	RF power density	0.74	(1)
9	Conducted Spurious emissions	0.86dB	(1)
10	Temperature test	0.8°C	(1)
11	Humidity test	2.0%	(1)
12	Supply voltages	0.5 %.	(1)
13	Frequency Error	5.5 Hz	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

4.8 Test Location

All tests were performed at:

Shenzhen Huaxia Testing Technology Co., Ltd.,

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua New District, Shenzhen, Guangdong, China

4.9 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **A2LA (Certificate No. 4742.01)**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4742.01.

- **FCC Registration No.: 522263**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No.:522263

4.10 Abnormalities from Standard Conditions

None.

4.11 Other Information Requested by the Customer

None.

4.12 Equipment List

Test Equipment	Manufacturer	Model No.	Instrument No.	Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESR7	CQA-005	2020/10/25	2021/10/24
Spectrum analyzer	R&S	FSU26	CQA-038	2020/10/25	2021/10/24
Preamplifier	MITEQ	AFS4-00010300-18-10P-4	CQA-035	2020/10/25	2021/10/24
Preamplifier	MITEQ	AMF-6D-02001800-29-20P	CQA-036	2020/10/25	2021/10/24
Preamplifier	EMCI	EMC184055SE	CQA-089	2020/9/25	2021/9/24
Loop antenna	Schwarzbeck	FMZB1516	CQA-060	2020/10/21	2021/10/20
Bilog Antenna	R&S	HL562	CQA-011	2020/9/26	2021/9/25
Horn Antenna	R&S	HF906	CQA-012	2020/9/26	2021/9/25
Horn Antenna	Schwarzbeck	BBHA 9170	CQA-088	2020/9/25	2021/9/24
Coaxial Cable (Above 1GHz)	CQA	N/A	C007	2020/9/26	2021/9/25
Coaxial Cable (Below 1GHz)	CQA	N/A	C013	2020/9/26	2021/9/25
Antenna Connector	CQA	RFC-01	CQA-080	2020/9/26	2021/9/25
RF cable(9KHz~40GHz)	CQA	RF-01	CQA-079	2020/9/26	2021/9/25
N1918A Power Analysis Manager Power Panel	Agilent	N1918A	CQA-074	2020/9/26	2021/9/25
Power meter	R&S	NRVD	CQA-029	2020/9/26	2021/9/25
Power divider	MIDWEST	PWD-2533-02-SMA-79	CQA-067	2020/9/26	2021/9/25
EMI Test Receiver	R&S	ESR7	CQA-005	2020/10/25	2021/10/24
LISN	R&S	ENV216	CQA-003	2020/10/23	2021/10/22
Coaxial cable	CQA	N/A	CQA-C009	2020/9/26	2021/9/25
DC power	KEYSIGHT	E3631A	CQA-028	2020/9/26	2021/9/25

Test software:

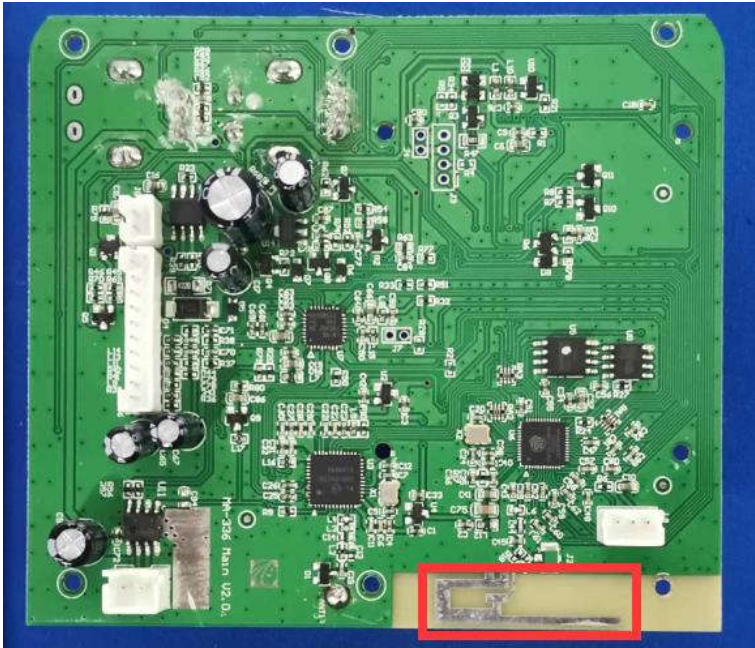
	Manufacturer	Software brand
Radiated Emissions test software	Tonscend	JS1120-3
Conducted Emissions test software	Audix	e3
RF Conducted test software	Audix	e3

Note:

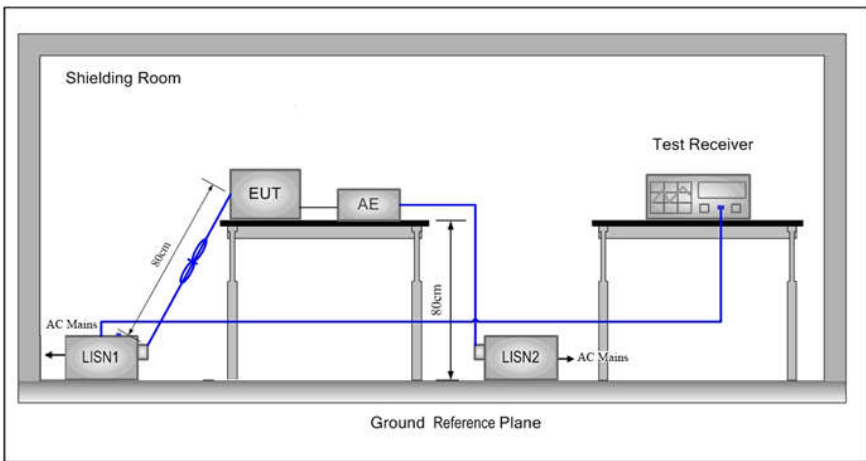
The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

5 Test results and Measurement Data

5.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C Section 15.203 /247(c)
<p>15.203 requirement: 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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p> <p>15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.</p>	
EUT Antenna:	
The antenna is PCB antenna. The best case gain of the antenna is 0dBi.	

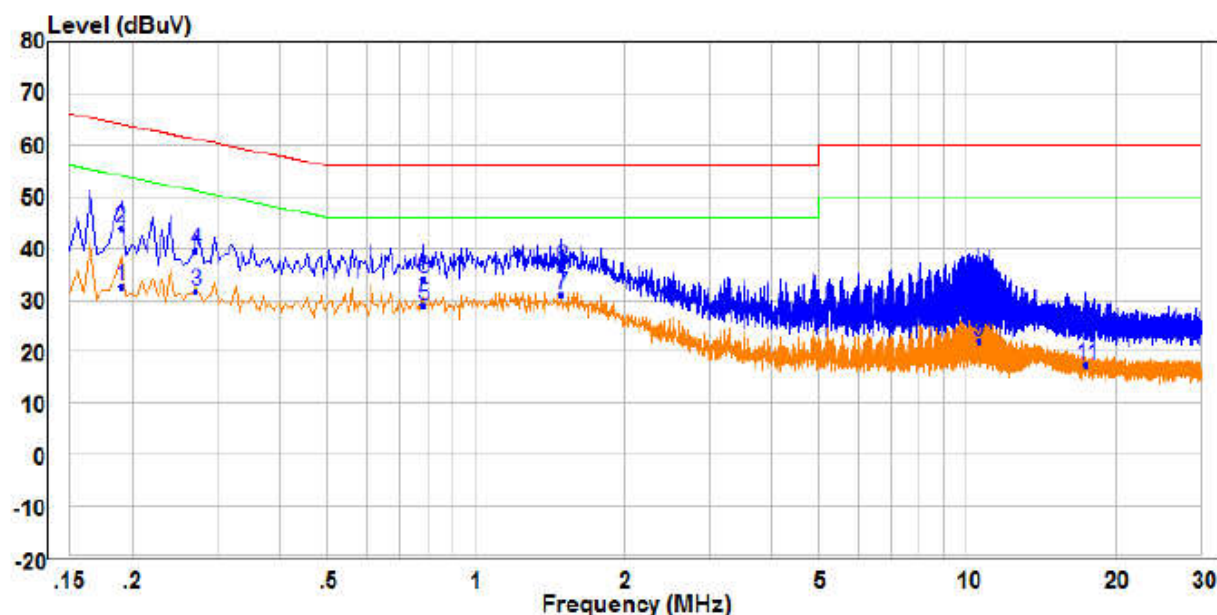
5.2 Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207		
Test Method:	ANSI C63.10: 2013		
Test Frequency Range:	150kHz to 30MHz		
Limit:	Frequency range (MHz)	Limit (dBuV)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
* Decreases with the logarithm of the frequency.			
Test Procedure:	<ol style="list-style-type: none"> 1) The mains terminal disturbance voltage test was conducted in a shielded room. 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded. 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2. 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement. 		
Test Setup:			

Exploratory Test Mode:	Non-hopping transmitting mode with all kind of modulation and all kind of data type at the lowest, middle, high channel.
Final Test Mode:	Through Pre-scan, find the 3DH5 of data type and 8DPSK modulation at the highest channel is the worst case. Only the worst case is recorded in the report.
Test Voltage:	AC 120V/60Hz
Test Results:	Pass

Measurement Data

Live line:

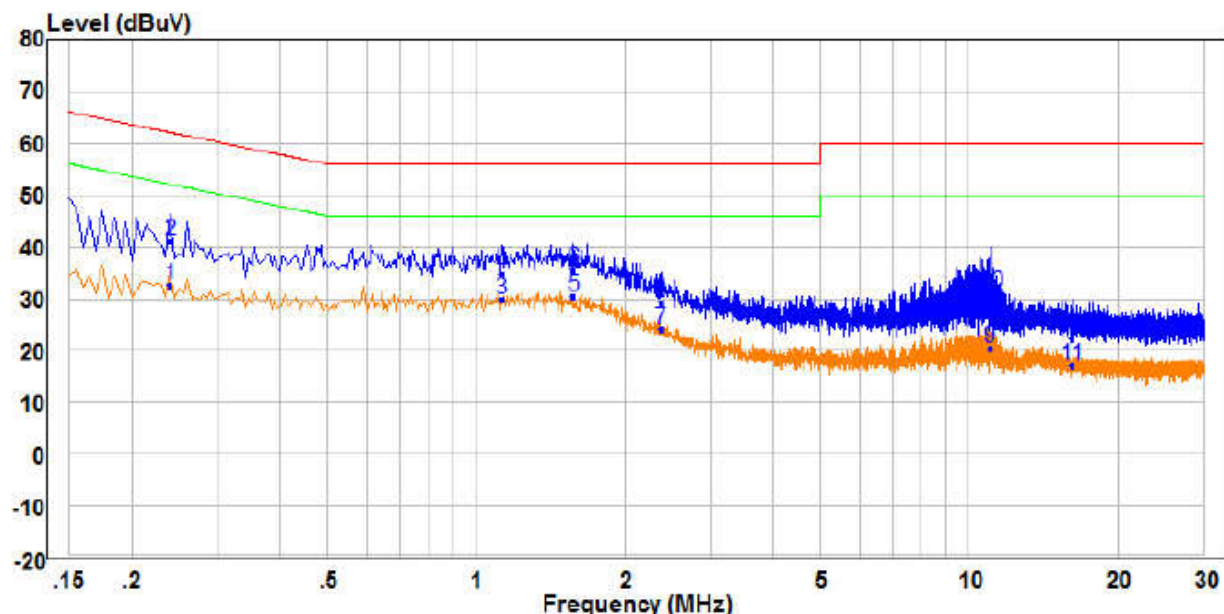


		Read		Limit	Over		
	Freq	Level	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	Pol/Phase
1	0.190	22.96	9.49	32.45	54.04	-21.59	Average
2	0.190	34.24	9.49	43.73	64.04	-20.31	QP
3	0.270	22.07	9.49	31.56	51.12	-19.56	Average
4	0.270	30.11	9.49	39.60	61.12	-21.52	QP
5	0.785	19.28	9.77	29.05	46.00	-16.95	Average
6	0.785	24.30	9.77	34.07	56.00	-21.93	QP
7 PP	1.500	21.54	9.52	31.06	46.00	-14.94	Average
8 QP	1.500	26.73	9.52	36.25	56.00	-19.75	QP
9	10.550	12.24	9.82	22.06	50.00	-27.94	Average
10	10.550	23.69	9.82	33.51	60.00	-26.49	QP
11	17.515	7.44	10.00	17.44	50.00	-32.56	Average
12	17.515	13.01	10.00	23.01	60.00	-36.99	QP

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

Neutral line:

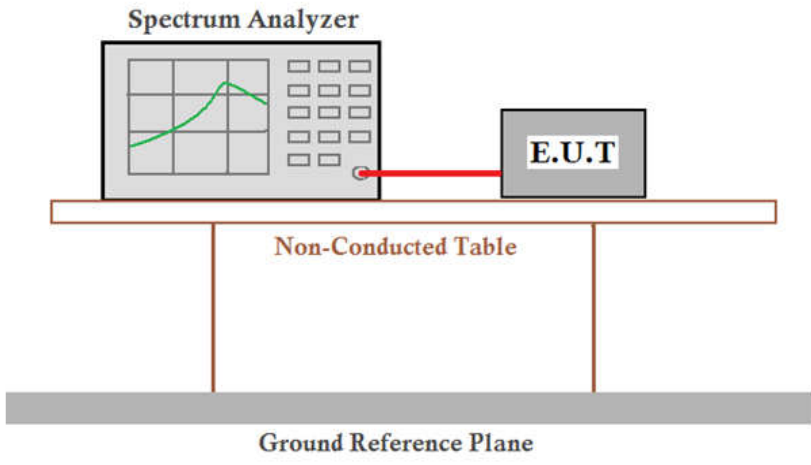


	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB		
1	0.240	22.98	9.48	32.46	52.10	-19.64	Average	Neutral
2	0.240	31.63	9.48	41.11	62.10	-20.99	QP	Neutral
3	1.130	20.03	9.72	29.75	46.00	-16.25	Average	Neutral
4	1.130	24.99	9.72	34.71	56.00	-21.29	QP	Neutral
5 PP	1.580	20.83	9.72	30.55	46.00	-15.45	Average	Neutral
6 QP	1.580	25.95	9.72	35.67	56.00	-20.33	QP	Neutral
7	2.375	14.22	9.73	23.95	46.00	-22.05	Average	Neutral
8	2.375	19.46	9.73	29.19	56.00	-26.81	QP	Neutral
9	11.025	10.58	9.95	20.53	50.00	-29.47	Average	Neutral
10	11.025	21.01	9.95	30.96	60.00	-29.04	QP	Neutral
11	16.155	7.10	9.96	17.06	50.00	-32.94	Average	Neutral
12	16.155	12.25	9.96	22.21	60.00	-37.79	QP	Neutral

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level = Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

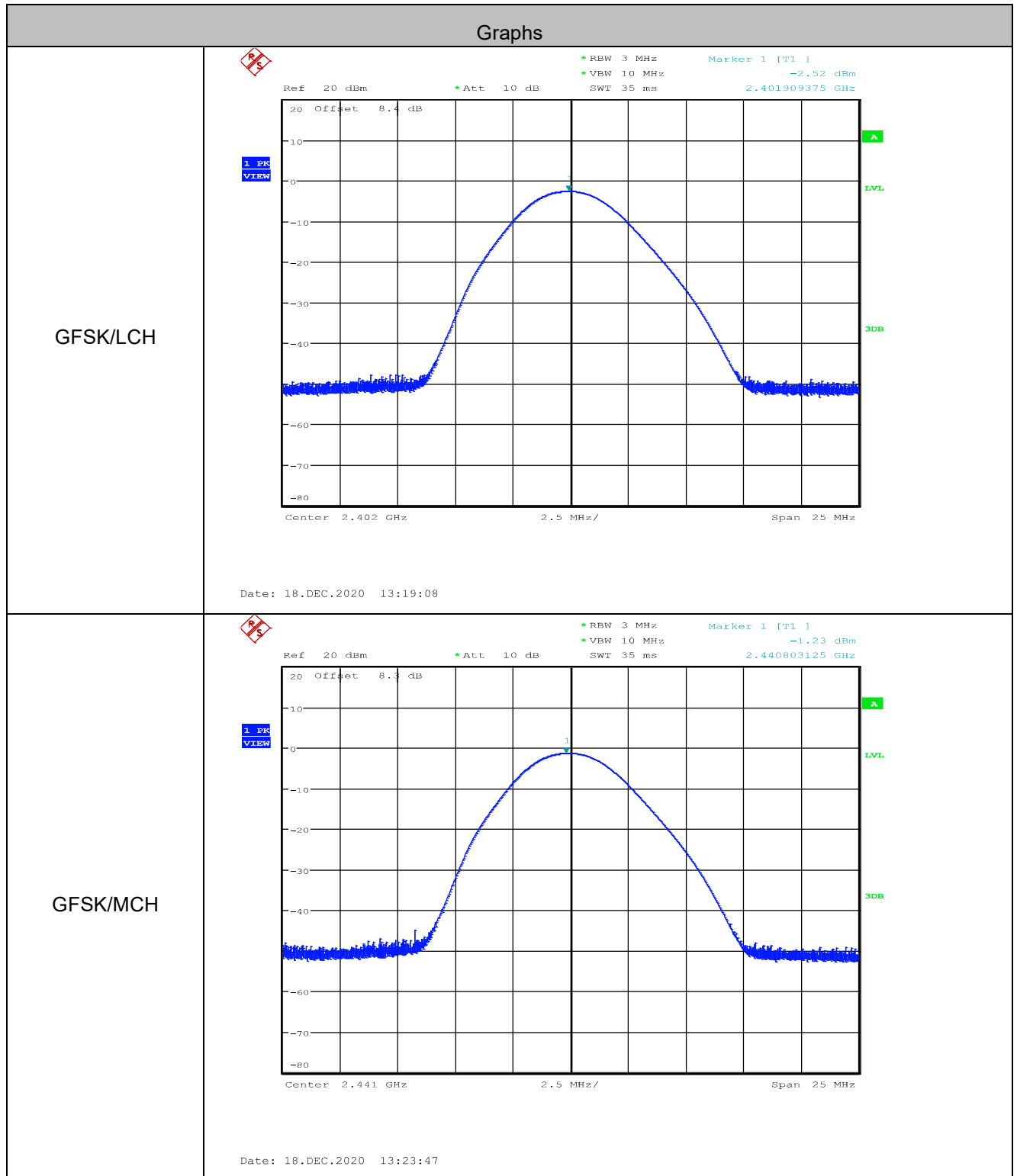
5.3 Conducted Peak Output Power

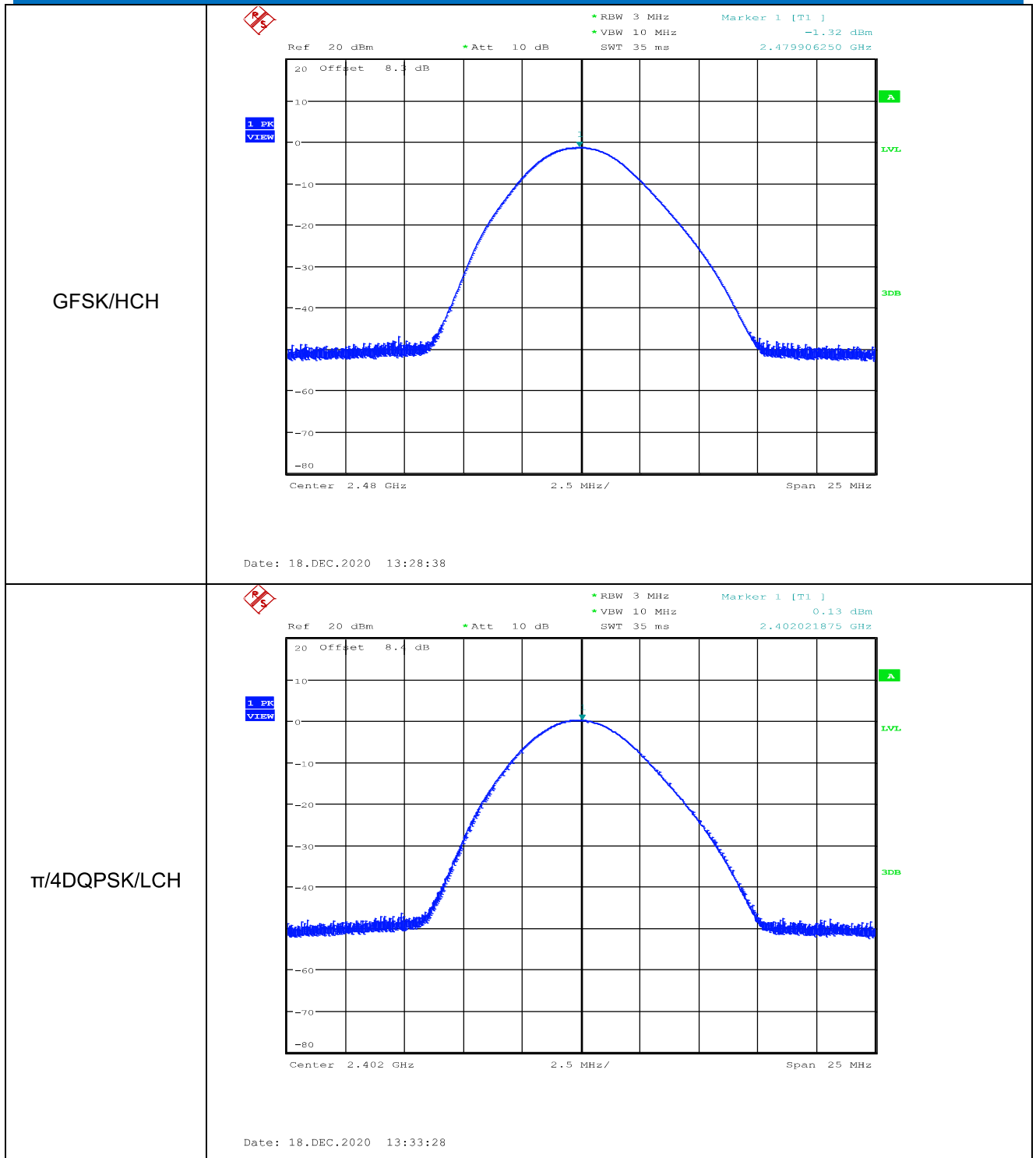
Test Requirement:	47 CFR Part 15C Section 15.247 (b)(1)
Test Method:	ANSI C63.10:2013
Test Setup:	 <p><i>Remark: Offset=Cable loss+ attenuation factor.</i></p>
Limit:	21dBm
Exploratory Test Mode:	Non-hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of $\pi/4$ DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type. Only the worst case is recorded in the report.
Test Results:	Pass

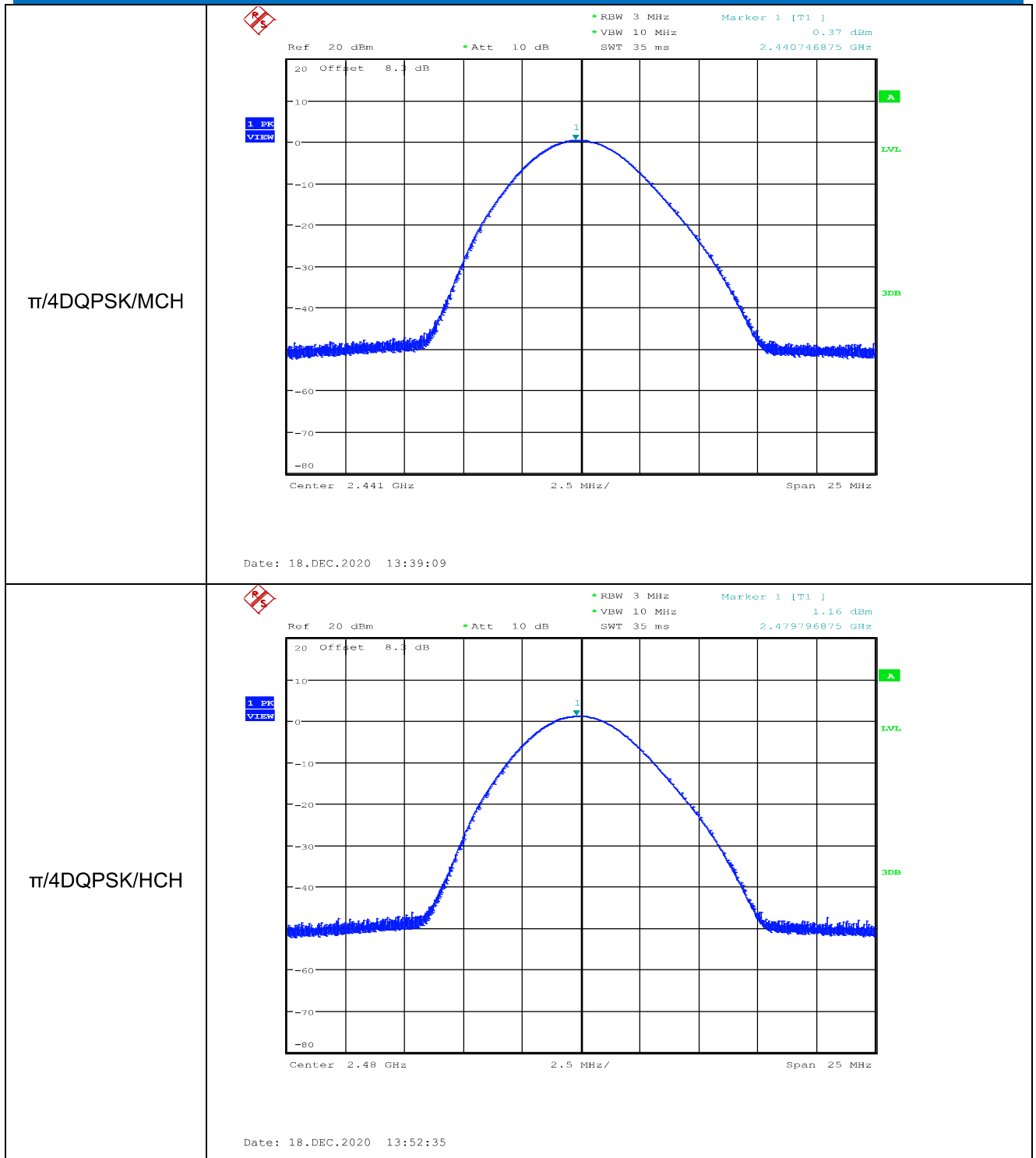
Measurement Data

GFSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	-2.520	21.00	Pass
Middle	-1.230	21.00	Pass
Highest	-1.320	21.00	Pass
$\pi/4$ DQPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	0.130	21.00	Pass
Middle	0.370	21.00	Pass
Highest	1.160	21.00	Pass
8DPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	1.490	21.00	Pass
Middle	2.010	21.00	Pass
Highest	2.580	21.00	Pass

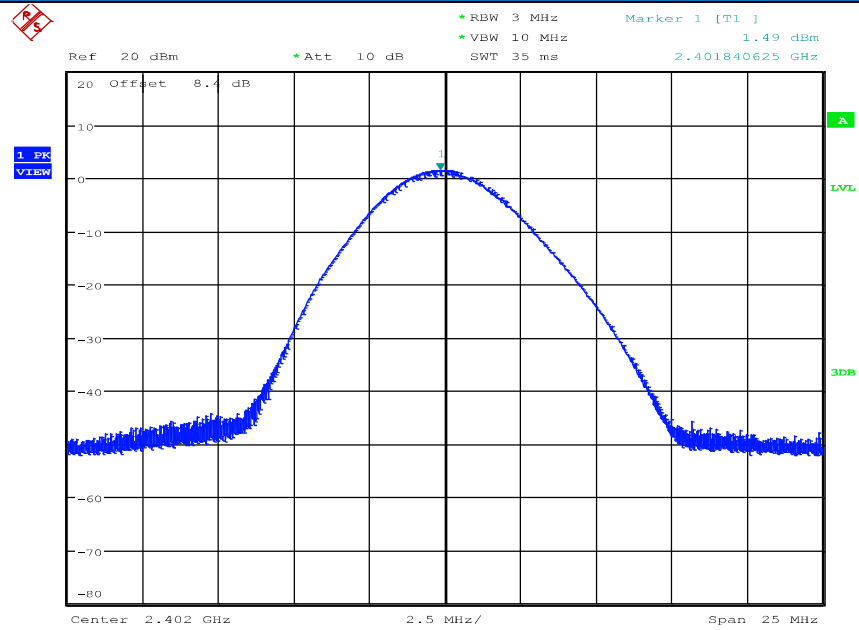
Test plot as follows:





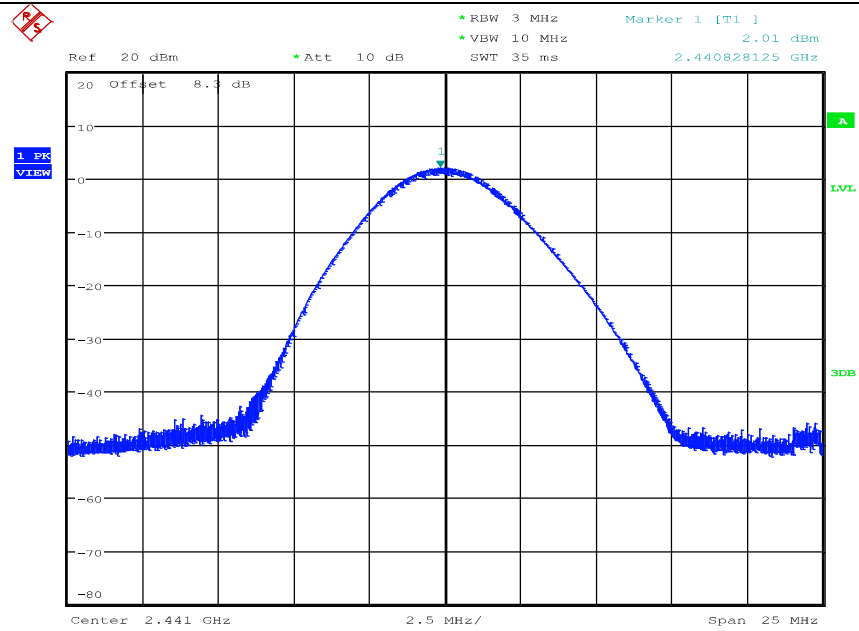


8DPSK/LCH



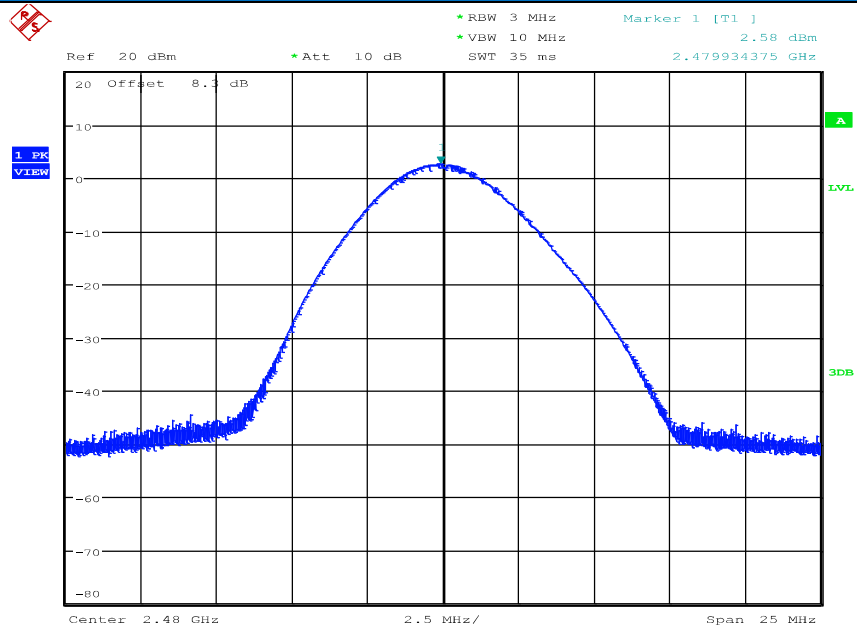
Date: 18.DEC.2020 14:19:04

8DPSK/MCH



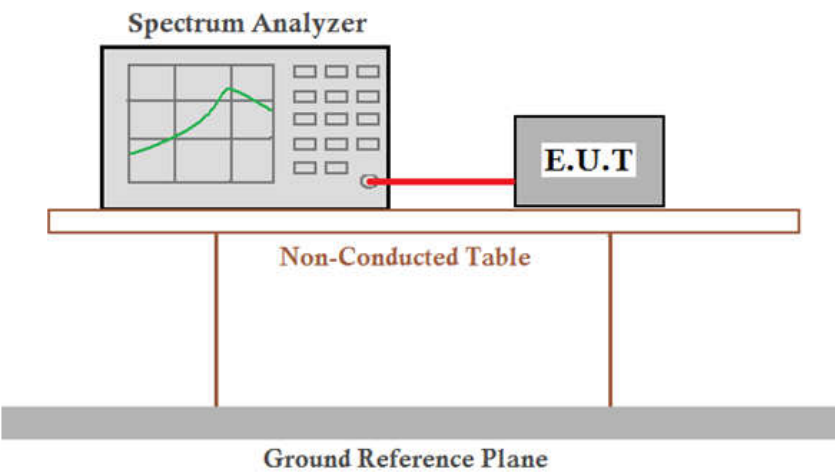
Date: 18.DEC.2020 14:27:08

8DPSK/HCH



Date: 18.DEC.2020 14:32:18

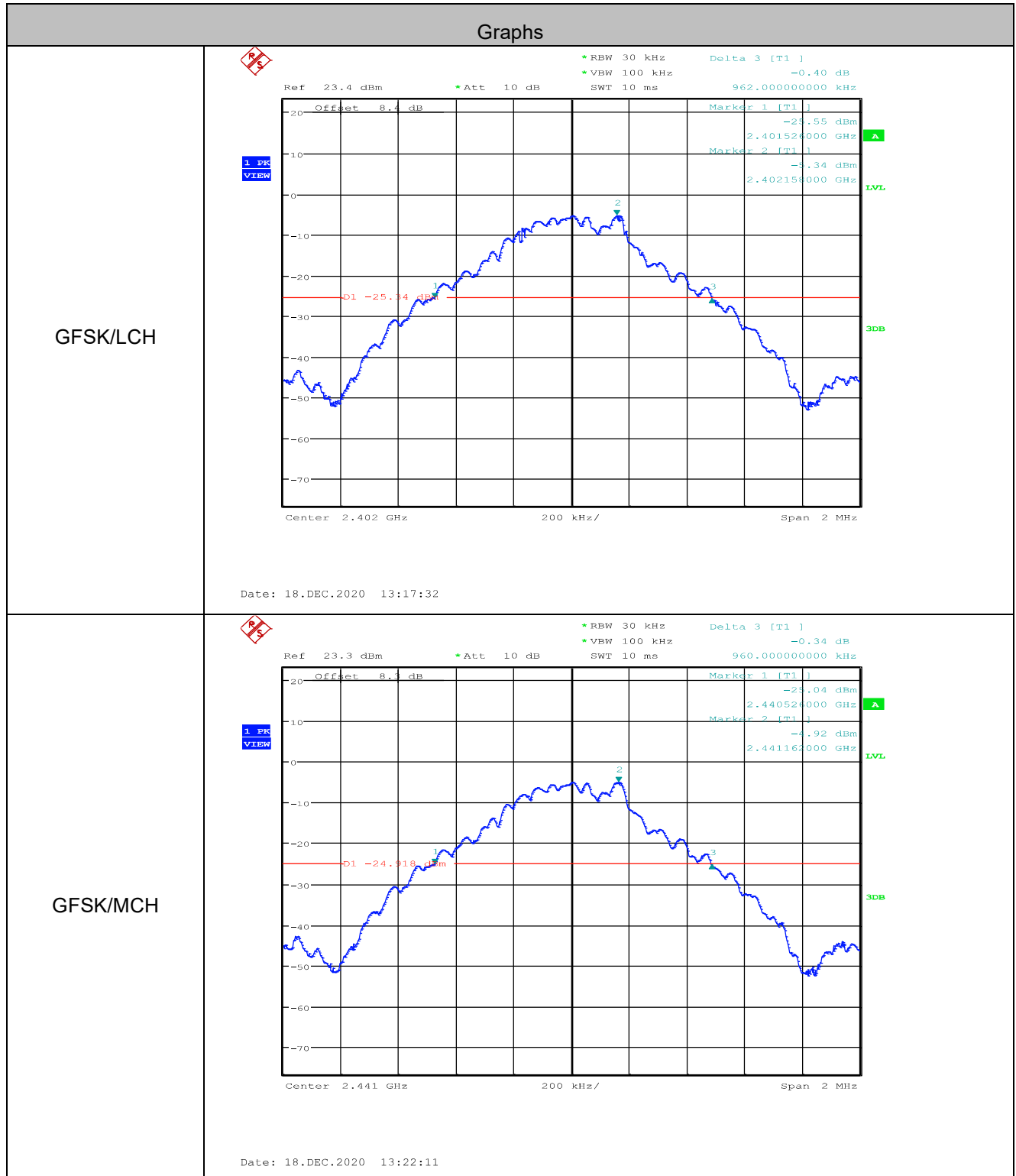
5.4 20dB Occupy Bandwidth

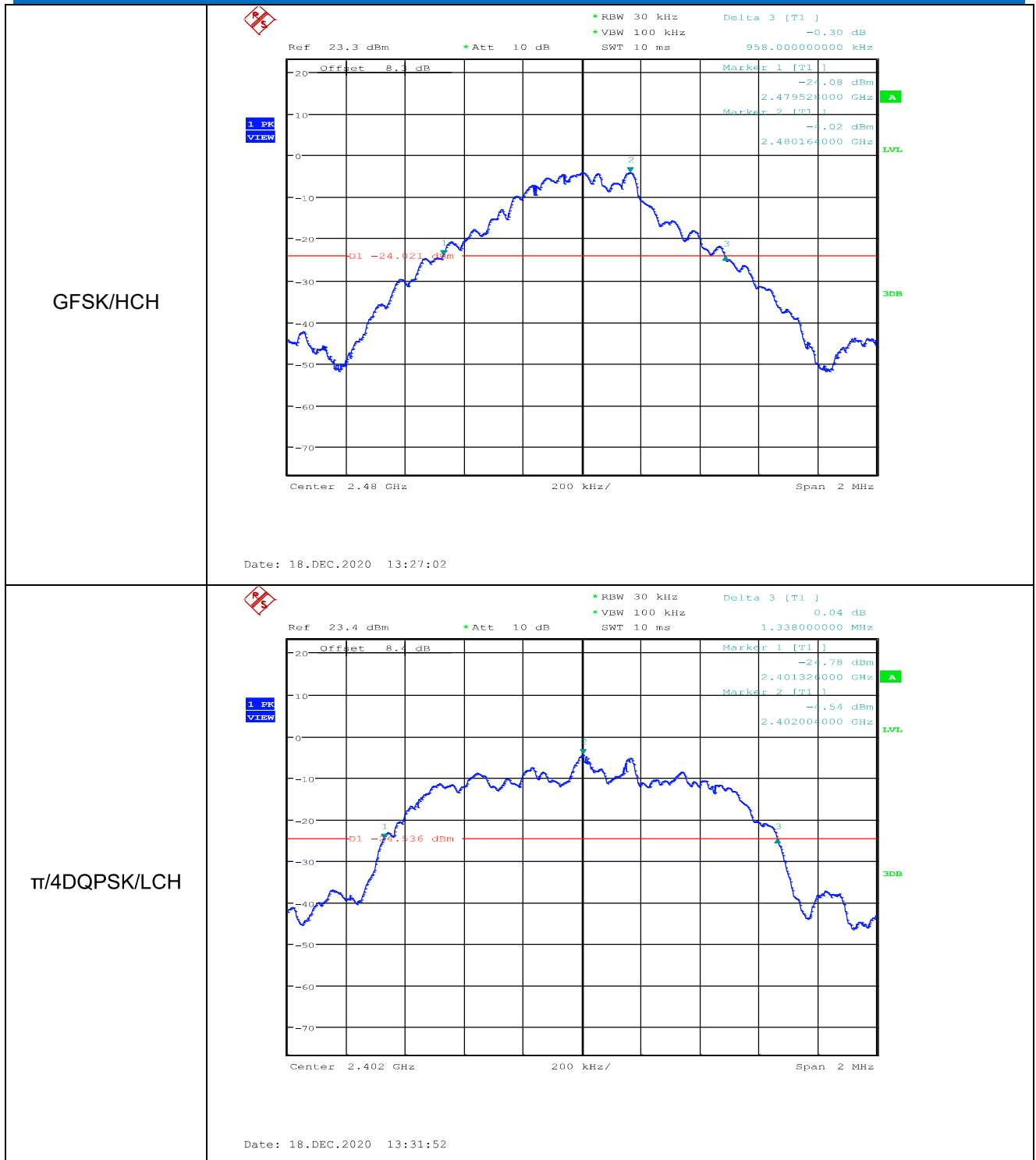
Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Test Setup:	 <p>Remark: Offset=Cable loss+ attenuation factor.</p>
Limit:	NA
Exploratory Test Mode:	Non-hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of $\pi/4$ DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type. Only the worst case is recorded in the report.
Test Results:	Pass

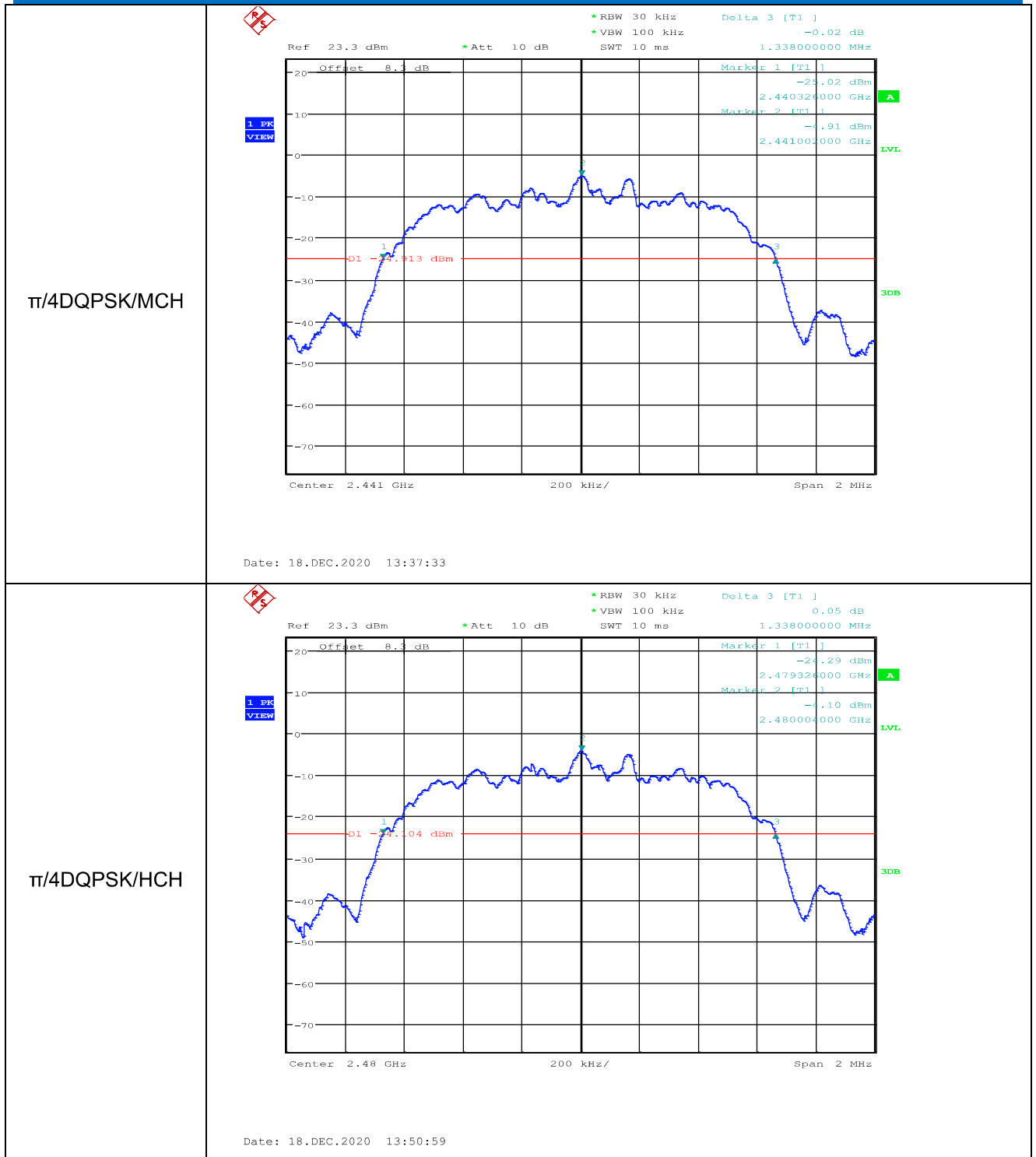
Measurement Data

Test channel	20dB Occupy Bandwidth (MHz)		
	GFSK	$\pi/4$ DQPSK	8DPSK
Lowest	0.962	1.338	1.306
Middle	0.960	1.338	1.304
Highest	0.958	1.338	1.304

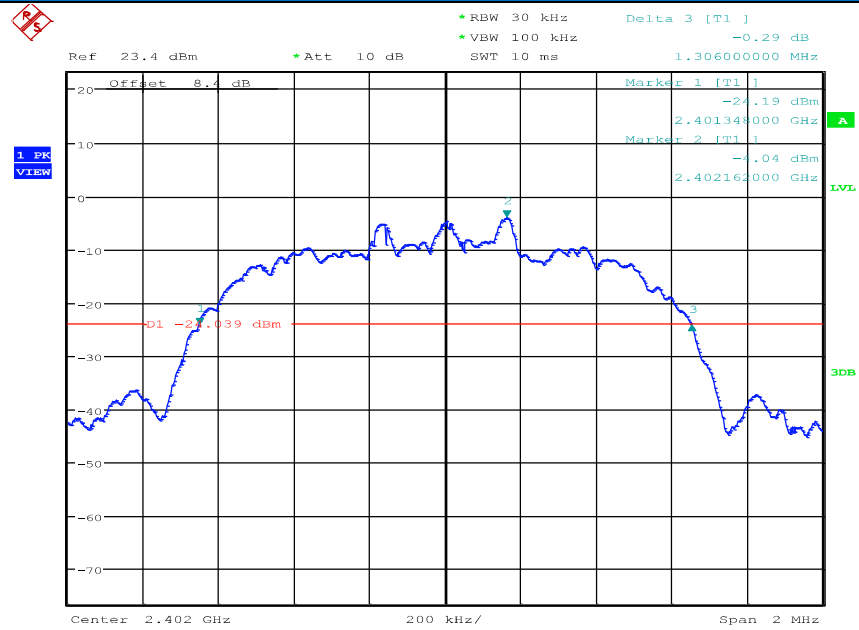
Test plot as follows:





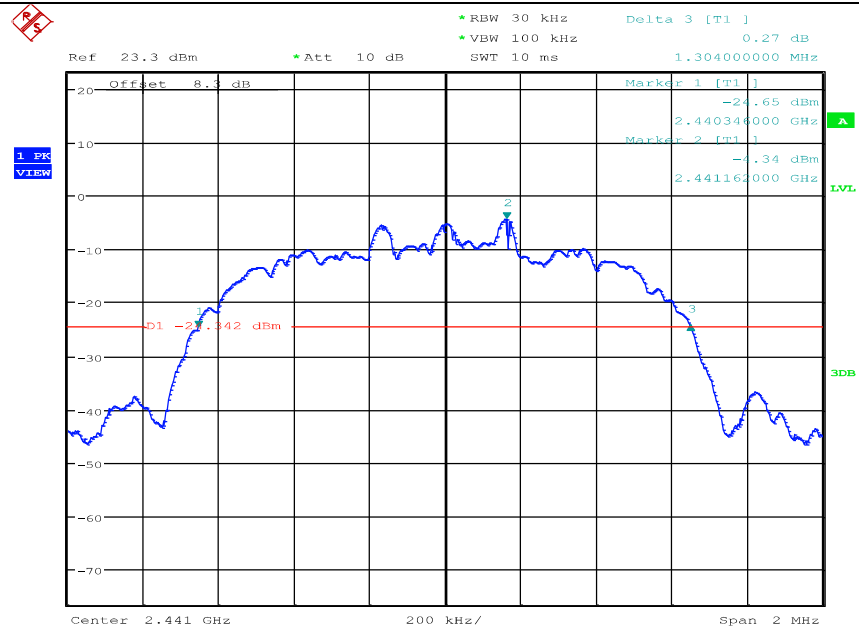


8DPSK/LCH



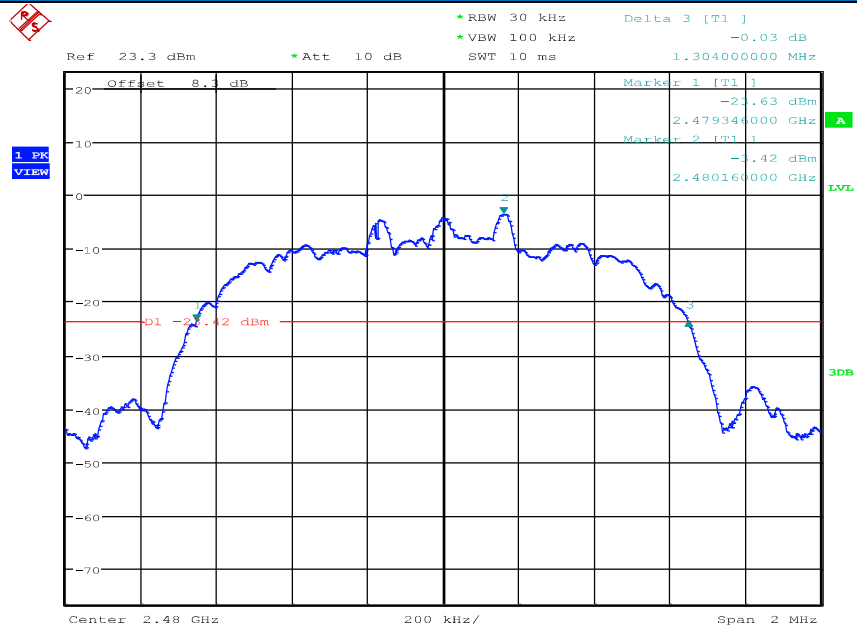
Date: 18.DEC.2020 14:17:27

8DPSK/MCH



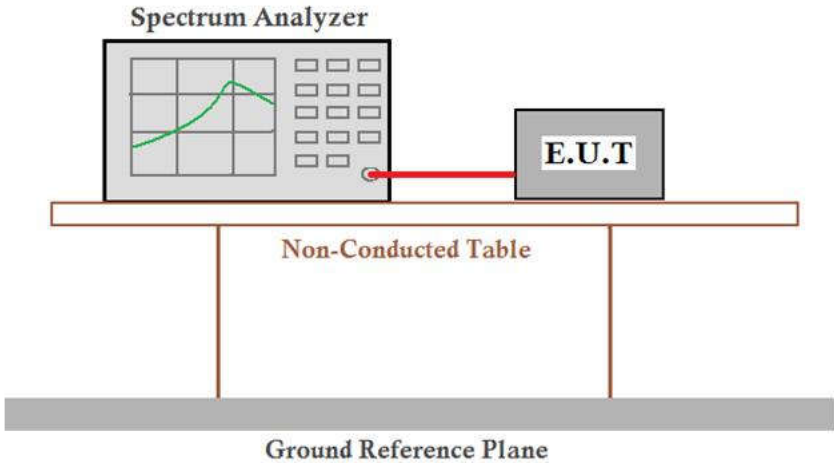
Date: 18.DEC.2020 14:25:32

8DPSK/HCH



Date: 18.DEC.2020 14:30:42

5.5 Carrier Frequencies Separation

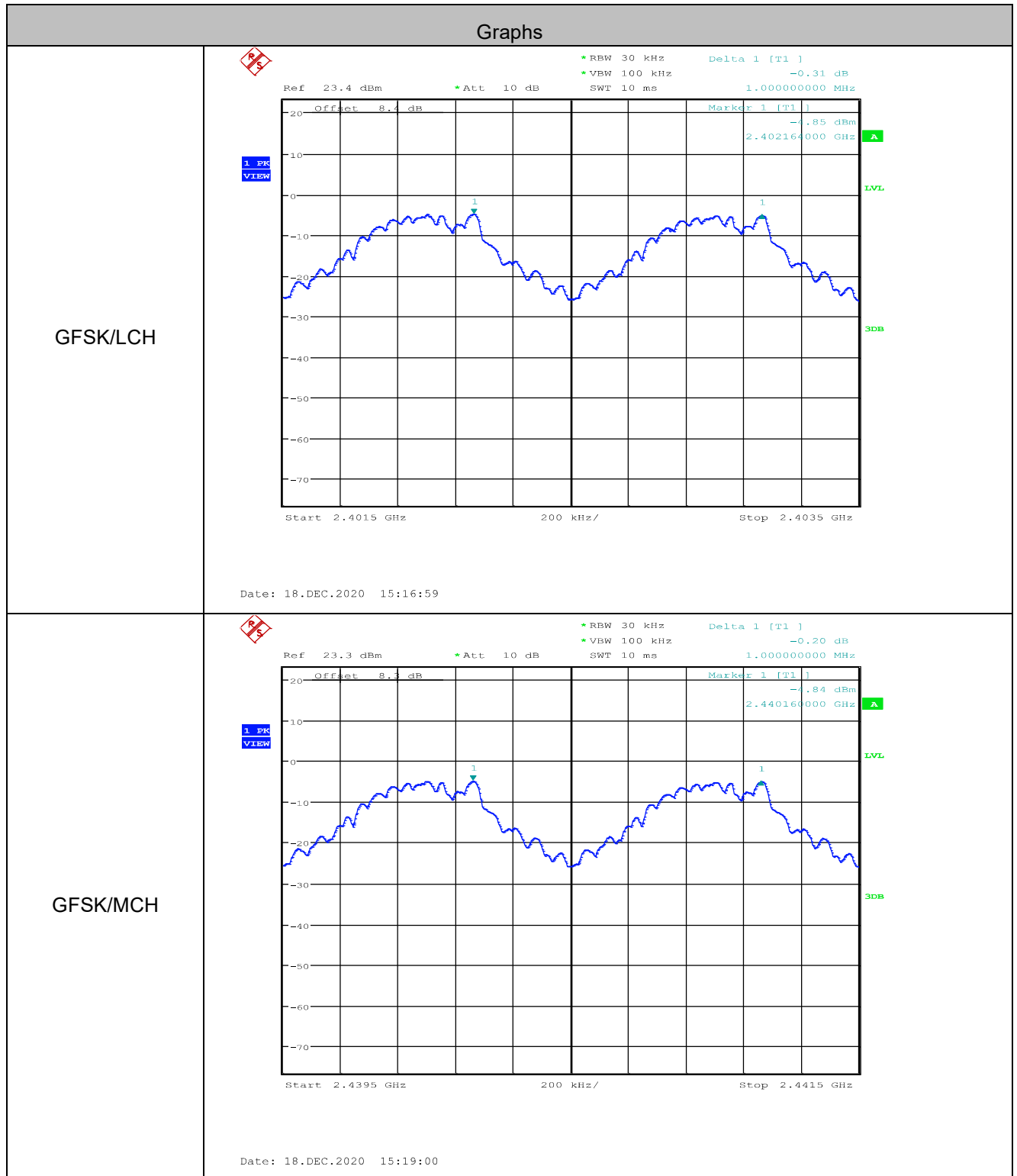
Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Test Setup:	 <p>Remark: Offset=Cable loss+ attenuation factor.</p>
Limit:	2/3 of the 20dB bandwidth
	Remark: the transmission power is less than 0.125W.
Exploratory Test Mode:	Hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of $\pi/4$ DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type. Only the worst case is recorded in the report.
Test Results:	Pass

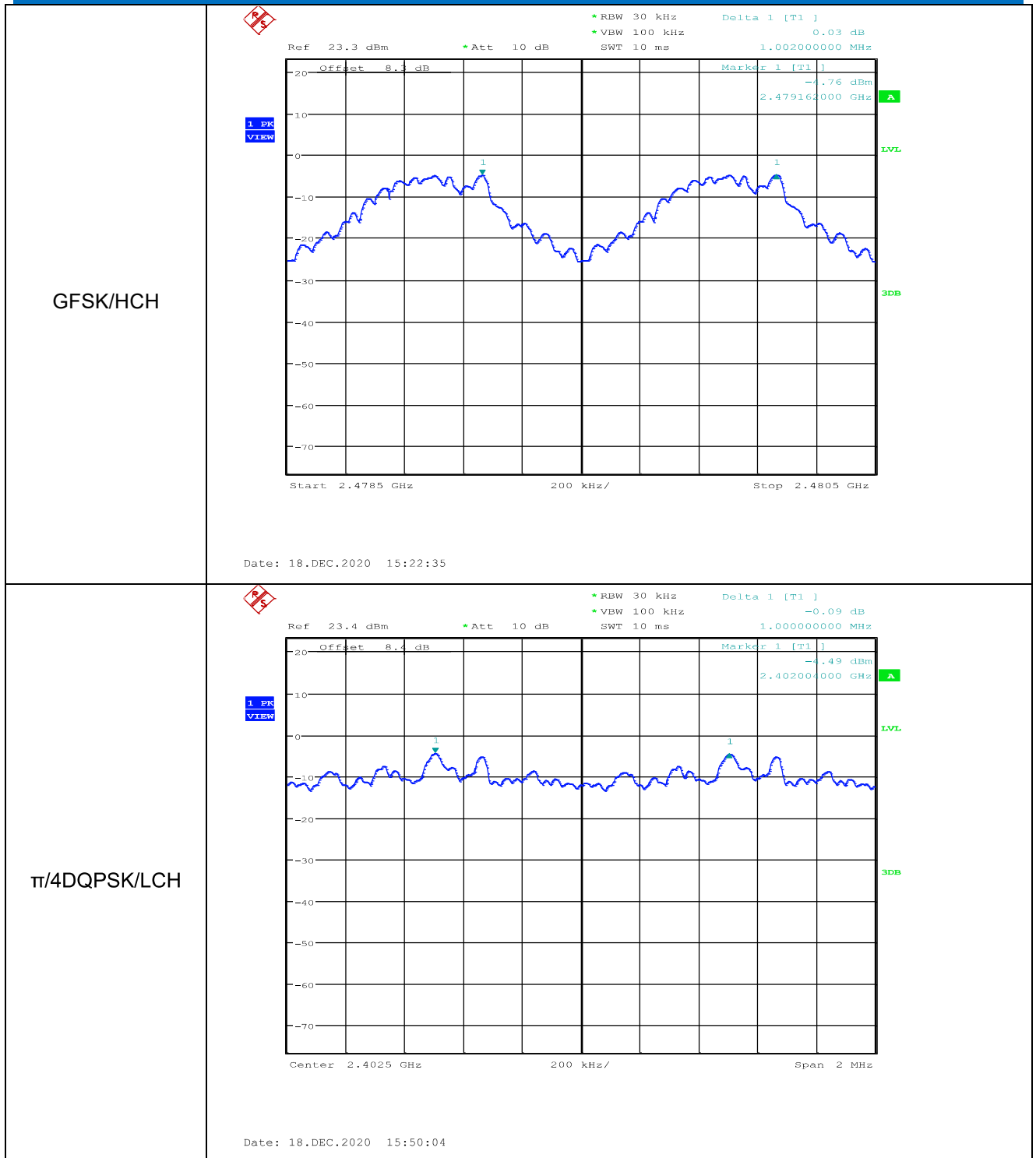
Measurement Data

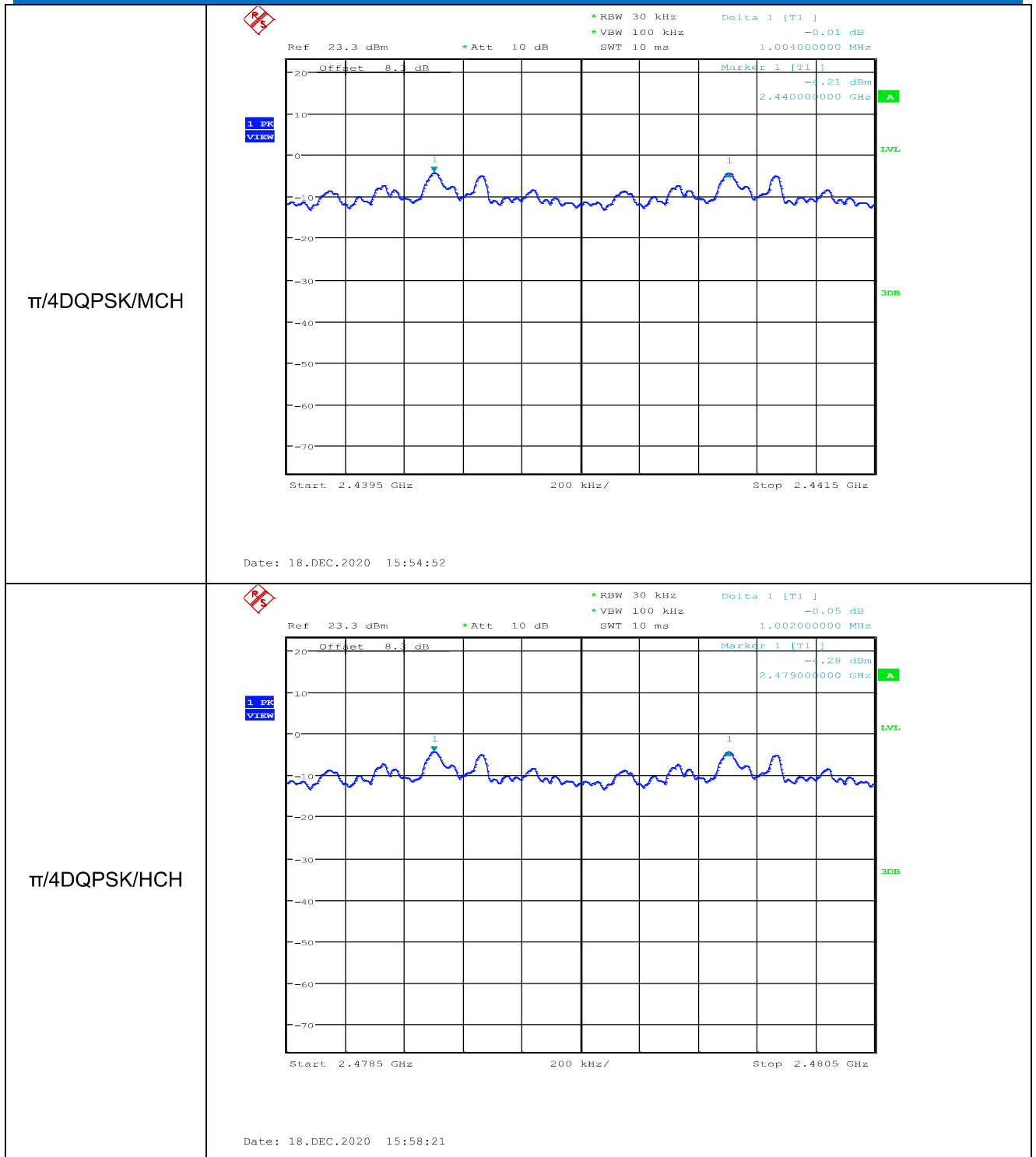
GFSK mode			
Test channel	Carrier Frequencies Separation (MHz)	Limit (MHz)	Result
Lowest	1.000	≥ 0.641	Pass
Middle	1.000	≥ 0.641	Pass
Highest	1.002	≥ 0.641	Pass
$\pi/4$ DQPSK mode			
Test channel	Carrier Frequencies Separation (MHz)	Limit (MHz)	Result
Lowest	1.000	≥ 0.892	Pass
Middle	1.004	≥ 0.892	Pass
Highest	1.002	≥ 0.892	Pass
8DPSK mode			
Test channel	Carrier Frequencies Separation (MHz)	Limit (MHz)	Result
Lowest	1.000	≥ 0.871	Pass
Middle	1.002	≥ 0.871	Pass
Highest	1.000	≥ 0.871	Pass

Mode	20dB bandwidth (MHz) (worse case)	Limit (MHz) (Carrier Frequencies Separation)
GFSK	0.962	0.641
$\pi/4$ DQPSK	1.338	0.892
8DPSK	1.306	0.871

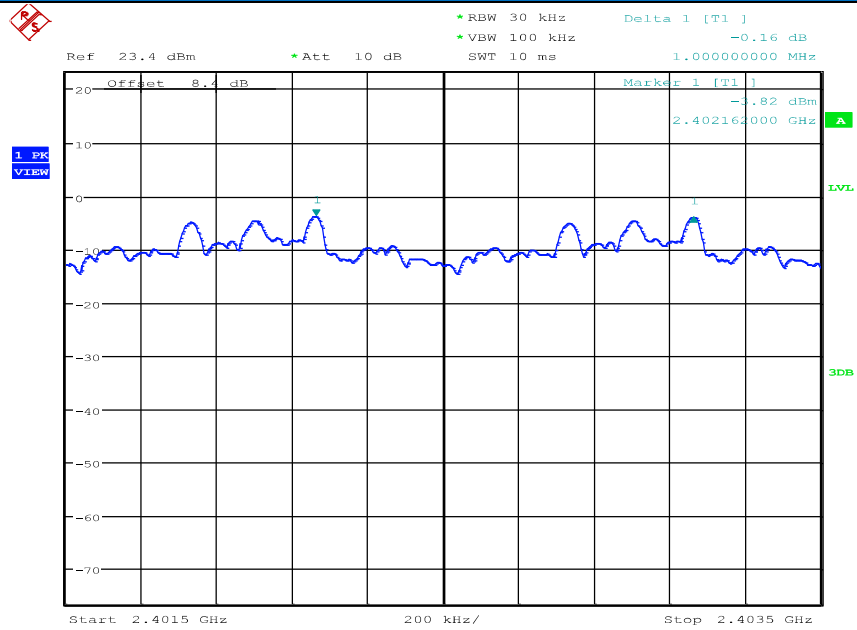
Test plot as follows:





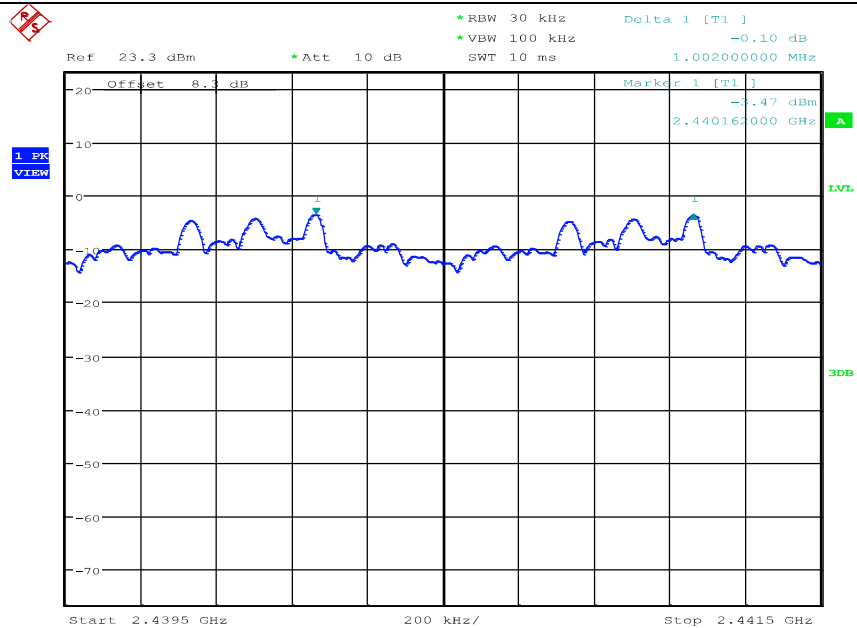


8DPSK/LCH



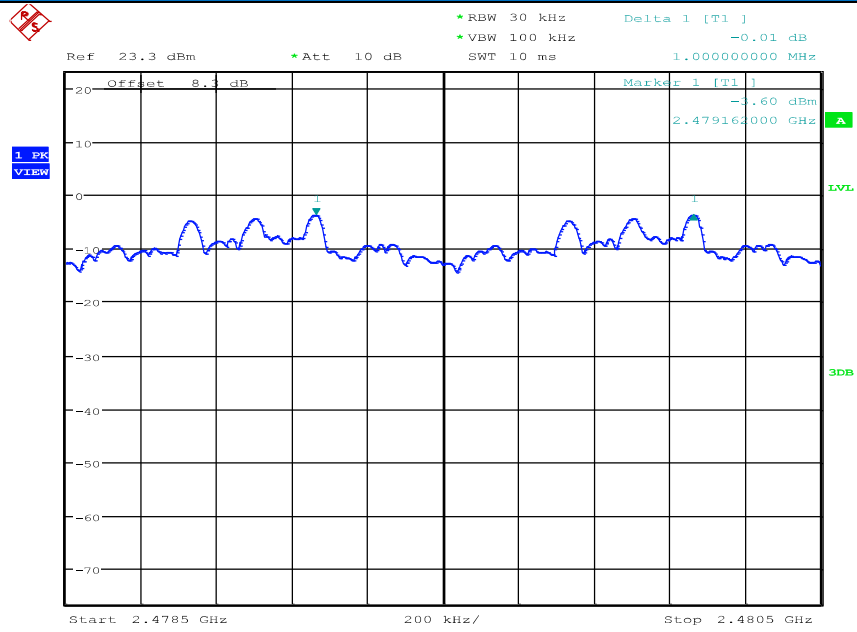
Date: 18.DEC.2020 16:43:08

8DPSK/MCH



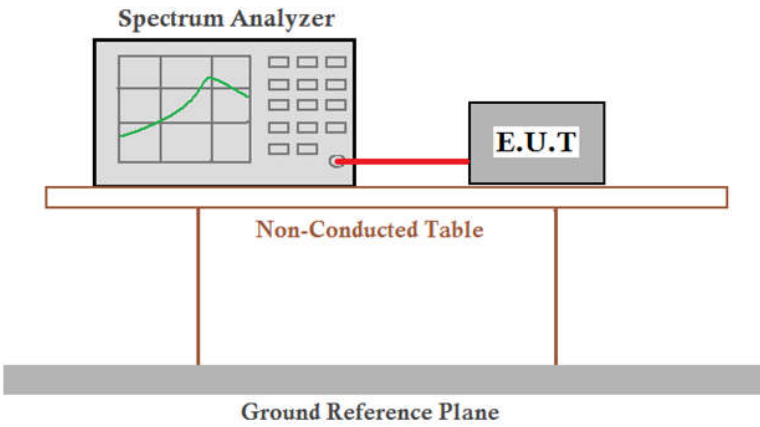
Date: 18.DEC.2020 16:47:31

8DPSK/HCH



Date: 18.DEC.2020 16:49:19

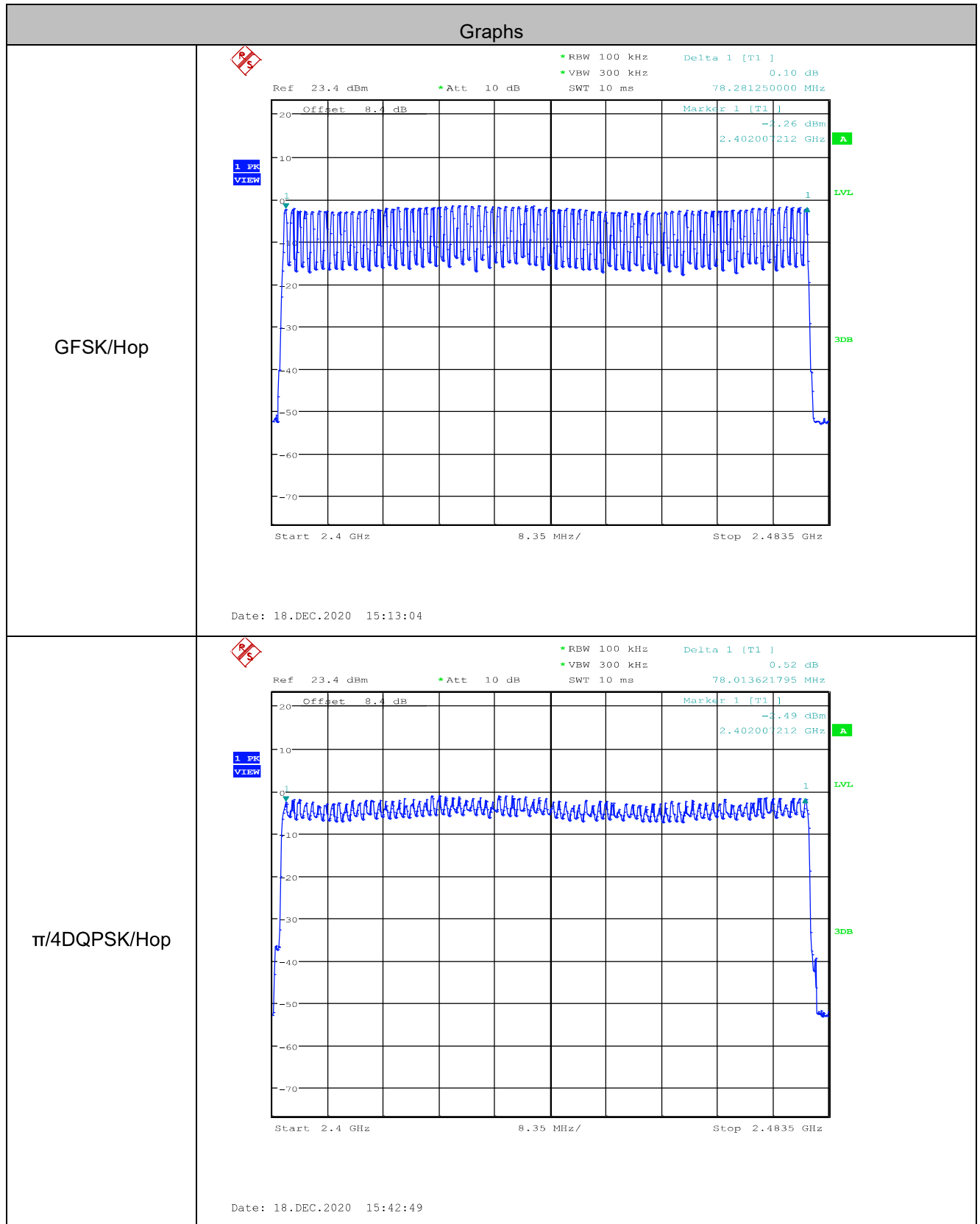
5.6 Hopping Channel Number

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Test Setup:	 <p>Remark: Offset=Cable loss+ attenuation factor.</p>
Limit:	At least 15 channels
Exploratory Test Mode:	hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of $\pi/4$ DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type. Only the worst case is recorded in the report.
Test Results:	Pass

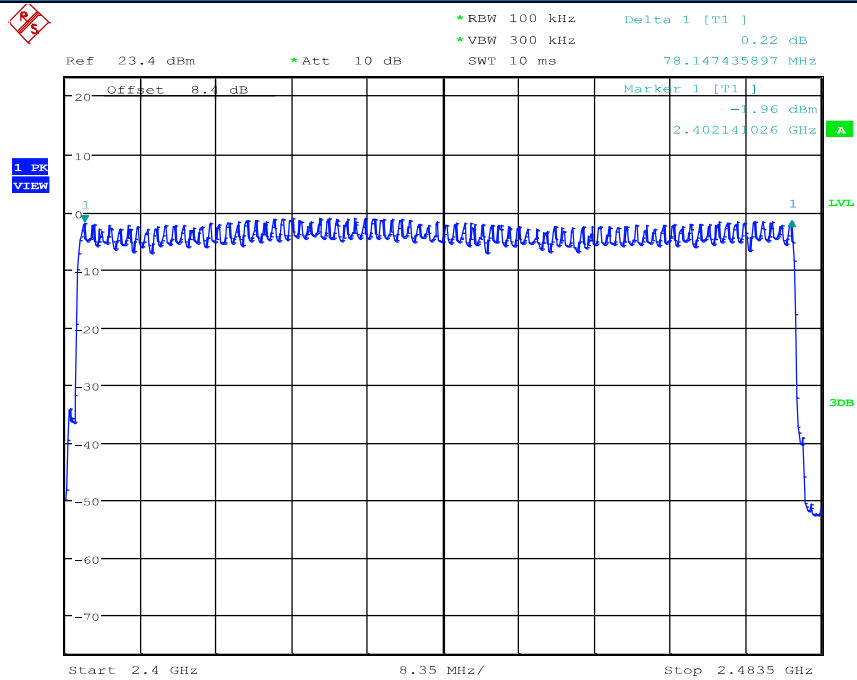
Measurement Data

Mode	Hopping channel numbers	Limit
GFSK	79	≥ 15
$\pi/4$ DQPSK	79	≥ 15
8DPSK	79	≥ 15

Test plot as follows:

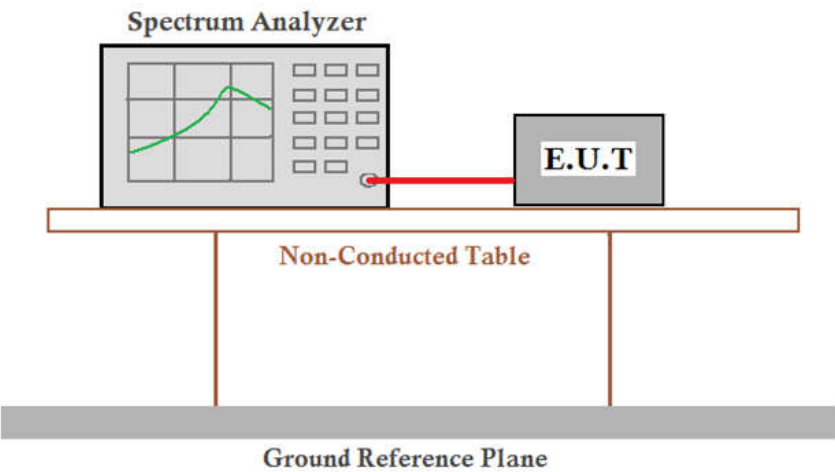


8DPSK/Hop



Date: 18.DEC.2020 16:35:47

5.7 Dwell Time

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Test Setup:	 <p>Remark: $\text{Offset} = \text{Cable loss} + \text{attenuation factor}$.</p>
Test Mode:	Hopping transmitting with all kind of modulation and all kind of data type.
Limit:	0.4 Second
Test Results:	Pass

Measurement Data

Mode	Packet	Channel	Burst Width [ms/hop/ch]	Dwell Time[s]	Limit (second)
GFSK	DH1	LCH	0.38	0.122	≤0.4
GFSK	DH1	MCH	0.38	0.122	≤0.4
GFSK	DH1	HCH	0.39	0.125	≤0.4
π/4DQPSK	2DH1	LCH	0.4	0.128	≤0.4
π/4DQPSK	2DH1	MCH	0.4	0.128	≤0.4
π/4DQPSK	2DH1	HCH	0.4	0.128	≤0.4
8DPSK	3DH1	LCH	0.4	0.128	≤0.4
8DPSK	3DH1	MCH	0.39	0.125	≤0.4
8DPSK	3DH1	HCH	0.4	0.128	≤0.4
GFSK	DH3	LCH	1.64	0.262	≤0.4
GFSK	DH3	MCH	1.64	0.262	≤0.4
GFSK	DH3	HCH	1.64	0.262	≤0.4
π/4DQPSK	2DH3	LCH	1.65	0.264	≤0.4
π/4DQPSK	2DH3	MCH	1.65	0.264	≤0.4
π/4DQPSK	2DH3	HCH	1.65	0.264	≤0.4
8DPSK	3DH3	LCH	1.64	0.262	≤0.4
8DPSK	3DH3	MCH	1.64	0.262	≤0.4
8DPSK	3DH3	HCH	1.65	0.264	≤0.4
GFSK	DH5	LCH	2.89	0.308	≤0.4
GFSK	DH5	MCH	2.89	0.308	≤0.4
GFSK	DH5	HCH	2.89	0.308	≤0.4
π/4DQPSK	2DH5	LCH	2.9	0.309	≤0.4
π/4DQPSK	2DH5	MCH	2.89	0.308	≤0.4
π/4DQPSK	2DH5	HCH	2.89	0.308	≤0.4
8DPSK	3DH5	LCH	2.9	0.309	≤0.4
8DPSK	3DH5	MCH	2.9	0.309	≤0.4
8DPSK	3DH5	HCH	2.9	0.309	≤0.4

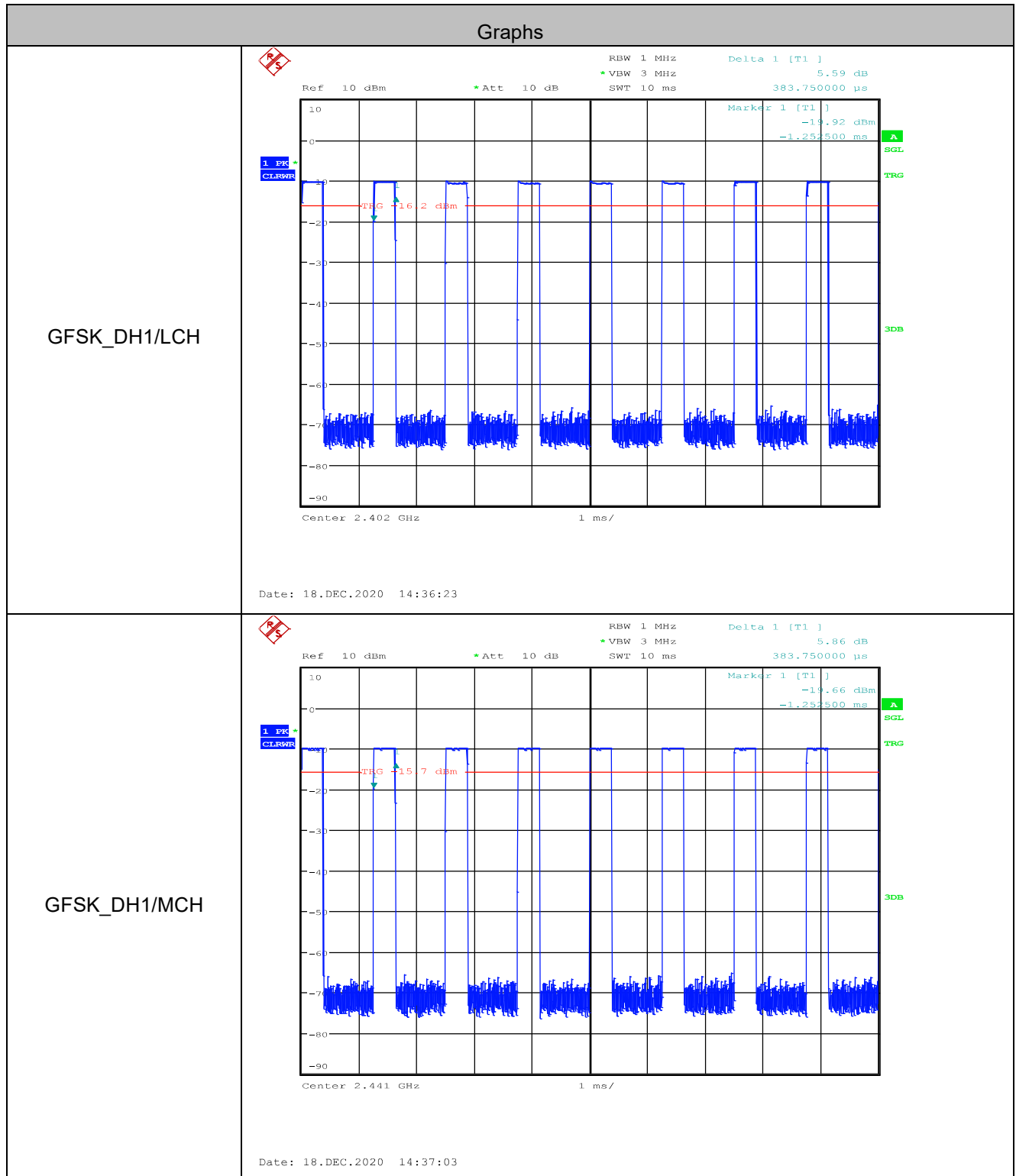
Remark:

The test period: $T = 0.4 \text{ Second/Channel} \times 79 \text{ Channel} = 31.6 \text{ s}$

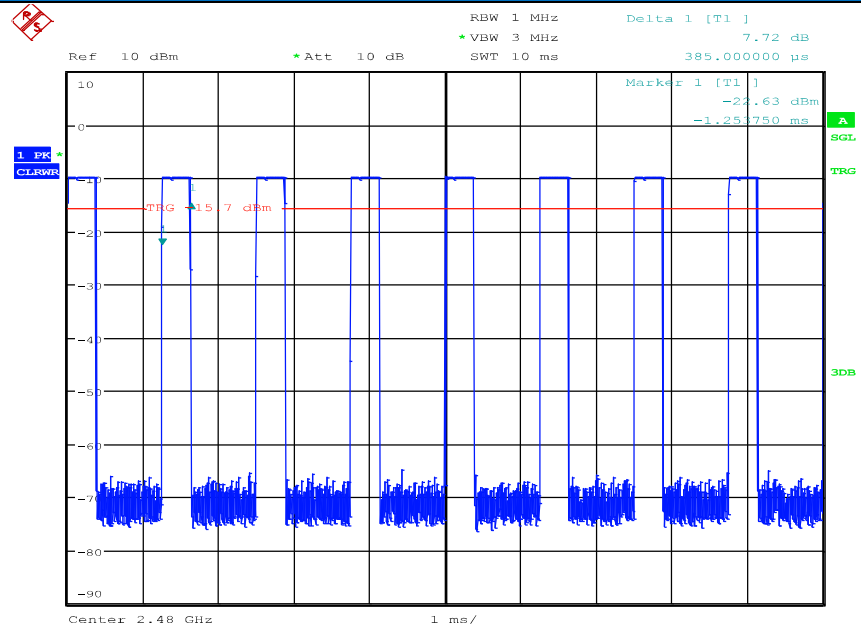
DH1/2DH1/3DH1 Dwell time = Burst Width(ms)*(1600/ (2*79))*31.6

DH3/2DH3/3DH3 Dwell time = Burst Width (ms)*(1600/ (4*79))*31.6

DH5/2DH5/3DH5 Dwell time = Burst Width (ms)*(1600/ (6*79))*31.6

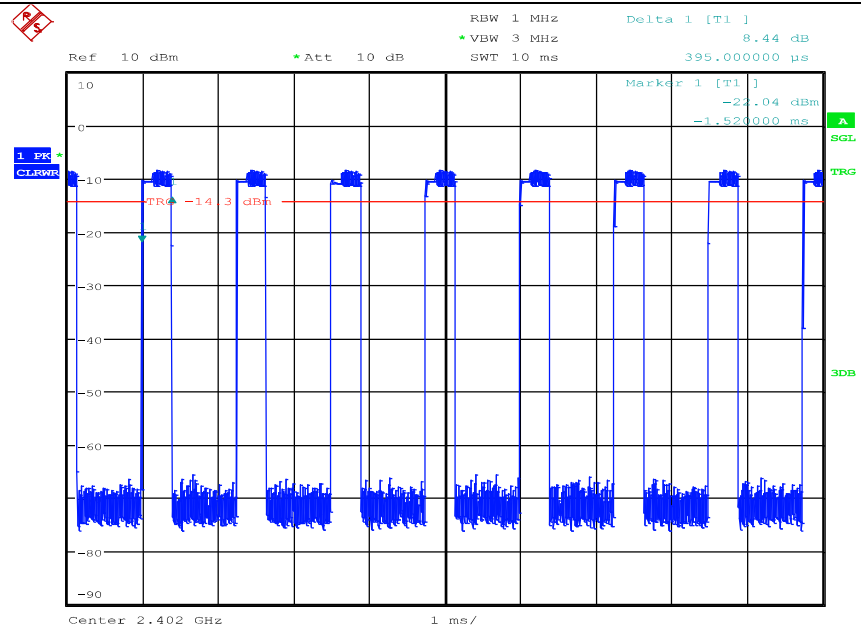


GFSK_DH1/HCH



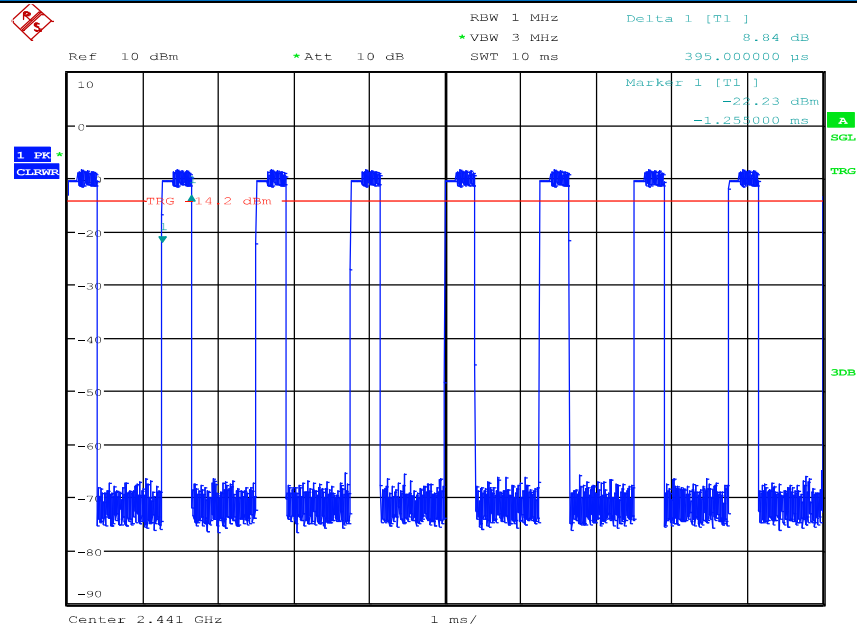
Date: 18.DEC.2020 14:37:37

$\pi/4$ DQPSK
_2DH1/LCH



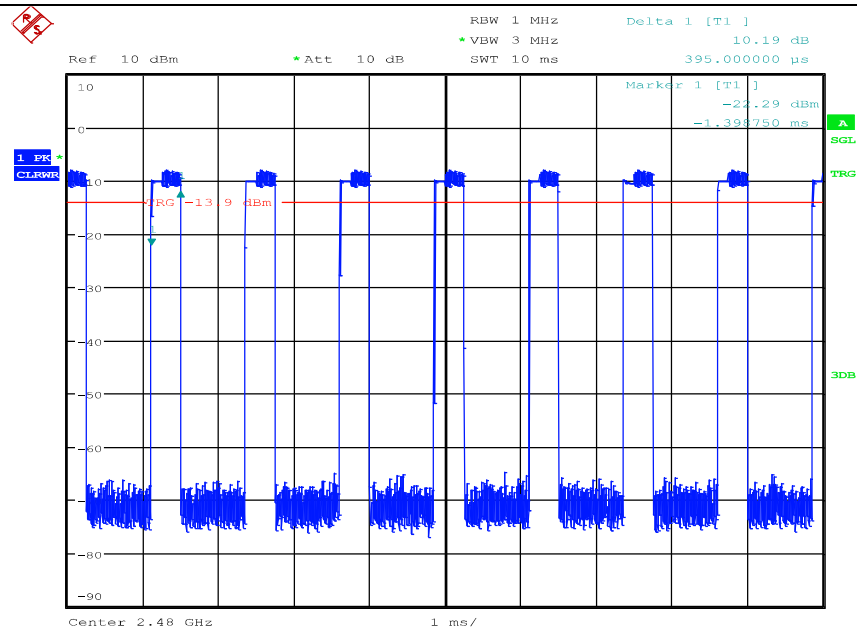
Date: 18.DEC.2020 14:43:09

$\pi/4$ DQPSK
_2DH1/MCH



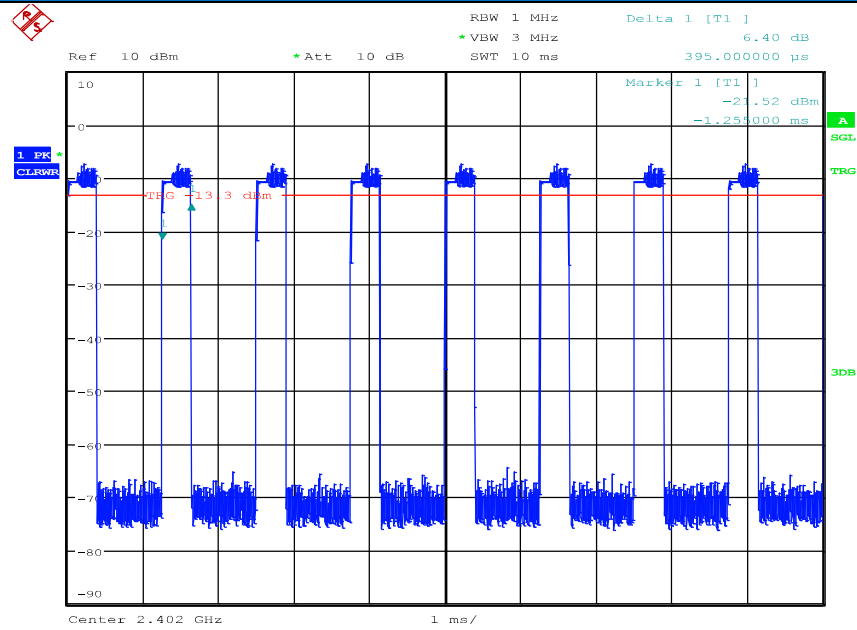
Date: 18.DEC.2020 14:44:05

$\pi/4$ DQPSK
_2DH1/HCH



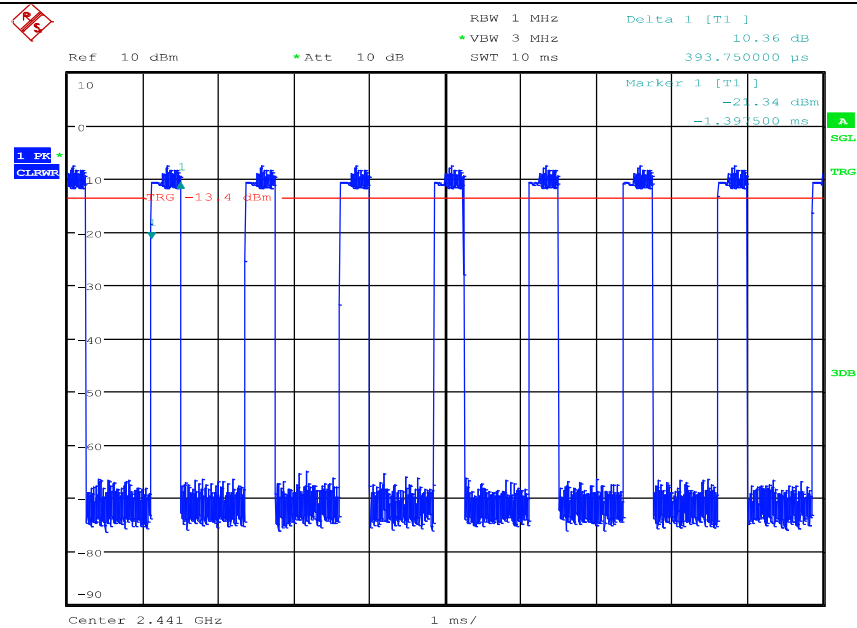
Date: 18.DEC.2020 14:44:41

8DPSK_3DH1/LCH



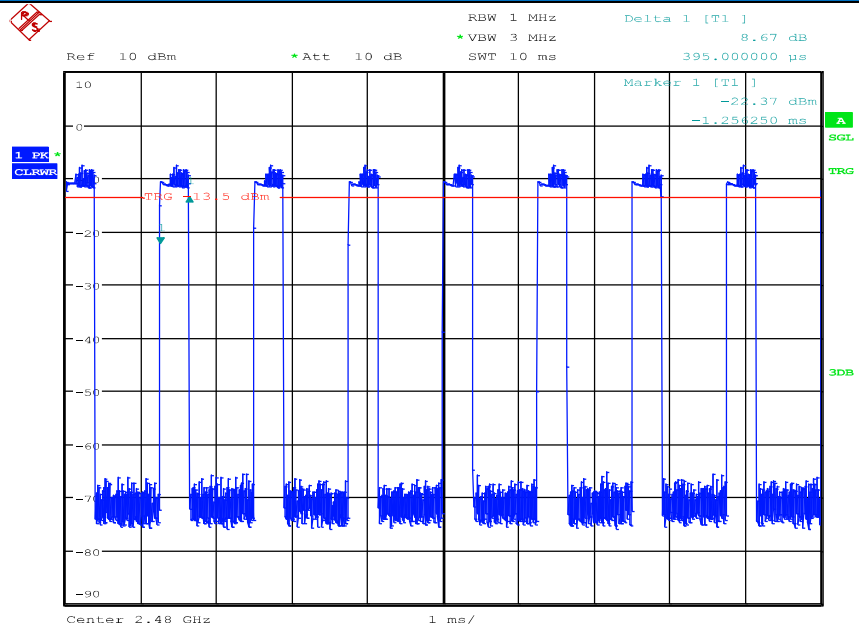
Date: 18.DEC.2020 14:47:18

8DPSK_3DH1/MCH



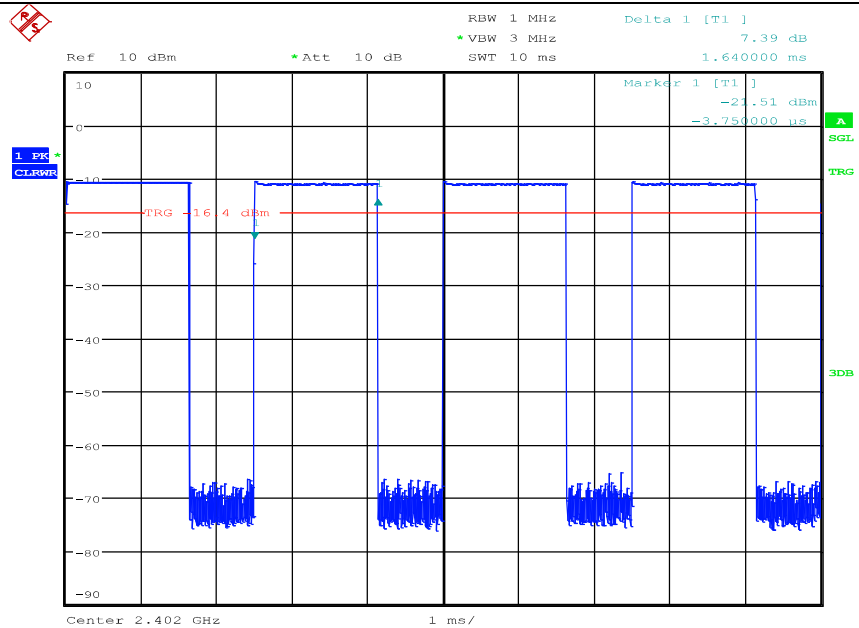
Date: 18.DEC.2020 14:48:16

8DPSK_3DH1/HCH



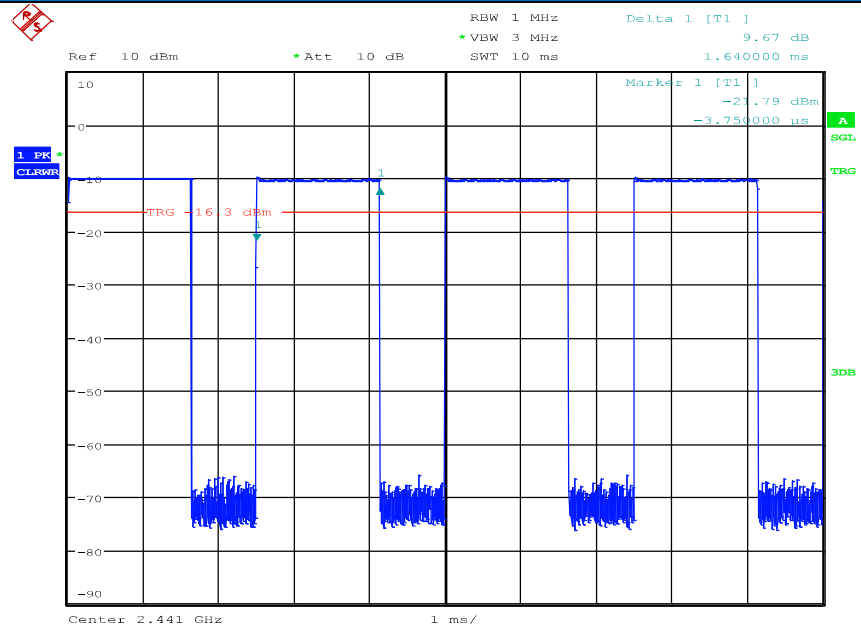
Date: 18.DEC.2020 14:49:01

GFSK_DH3/LCH



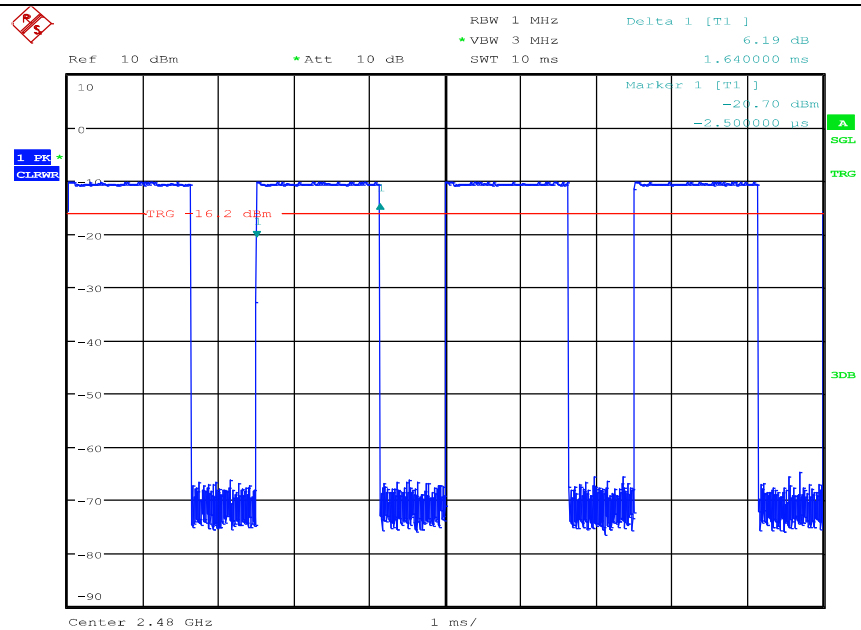
Date: 18.DEC.2020 14:38:43

GFSK_DH3/MCH



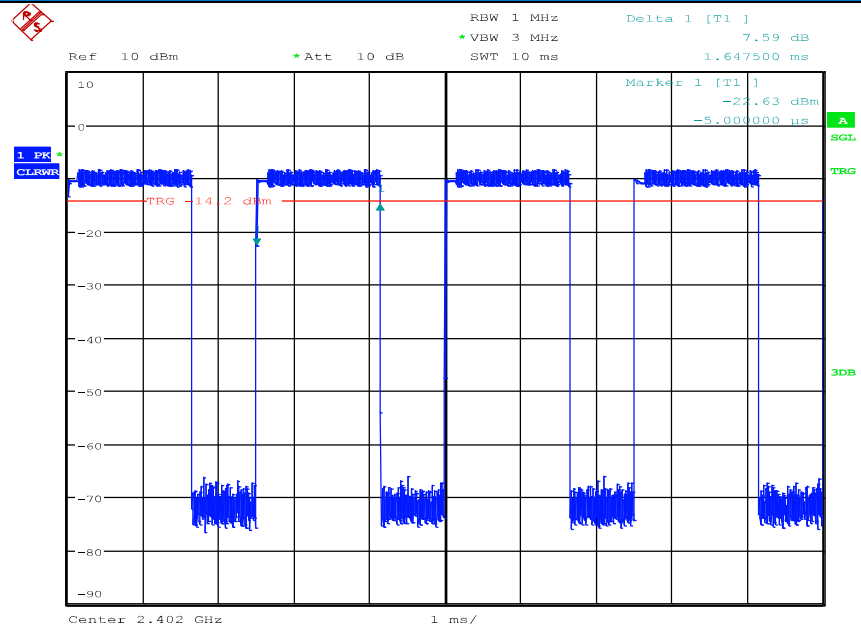
Date: 18.DEC.2020 14:39:35

GFSK_DH3/HCH



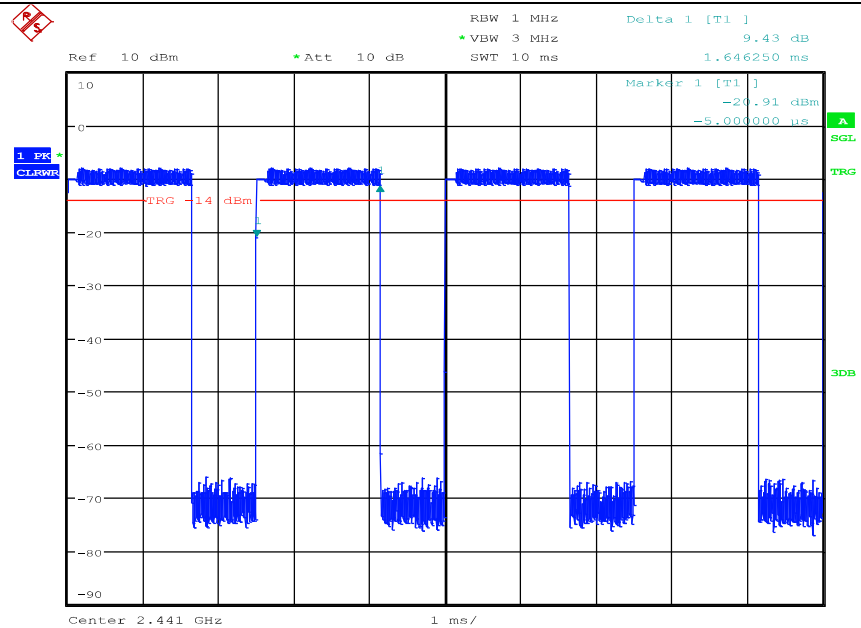
Date: 18.DEC.2020 14:42:24

$\pi/4$ DQPSK
 _2DH3/LCH



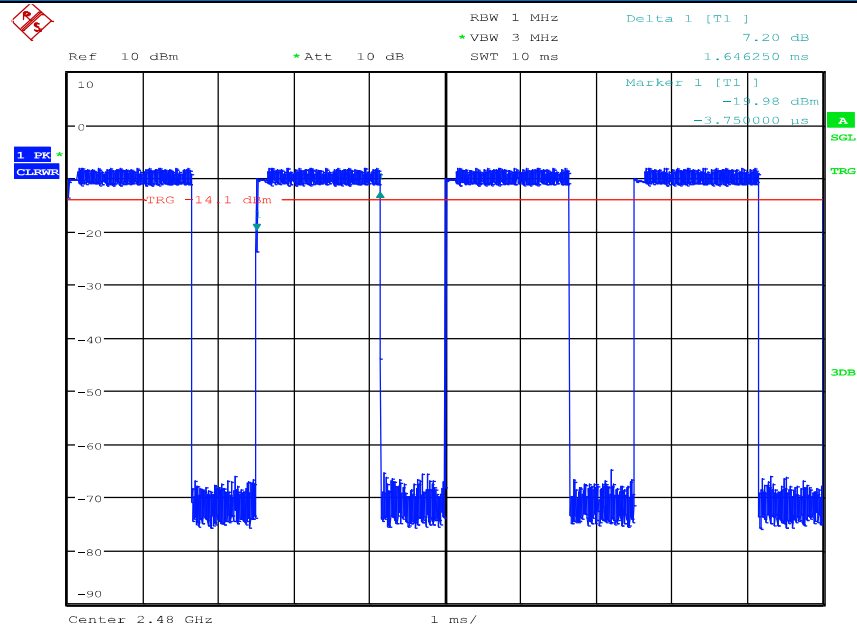
Date: 18.DEC.2020 14:45:16

$\pi/4$ DQPSK
 _2DH3/MCH



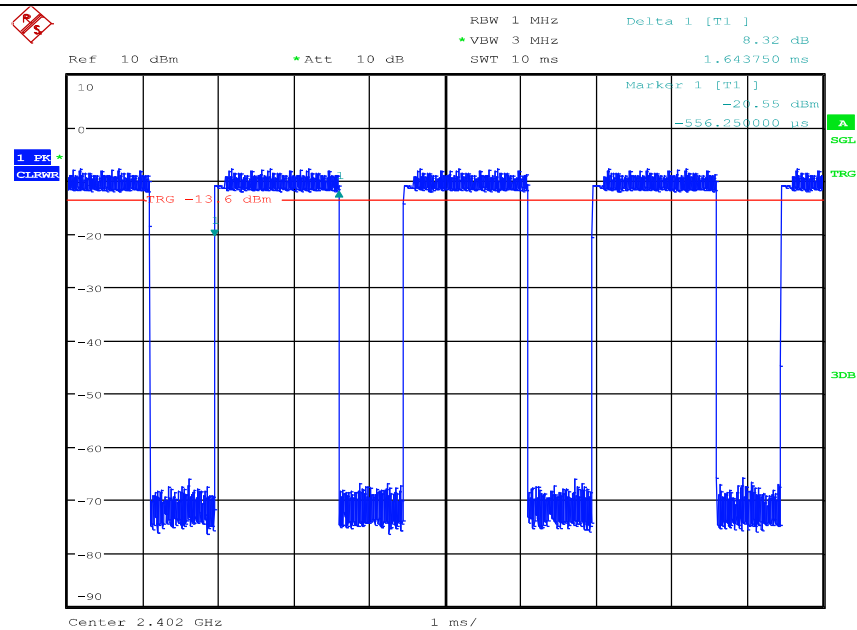
Date: 18.DEC.2020 14:45:51

$\pi/4$ DQPSK
_2DH3/HCH



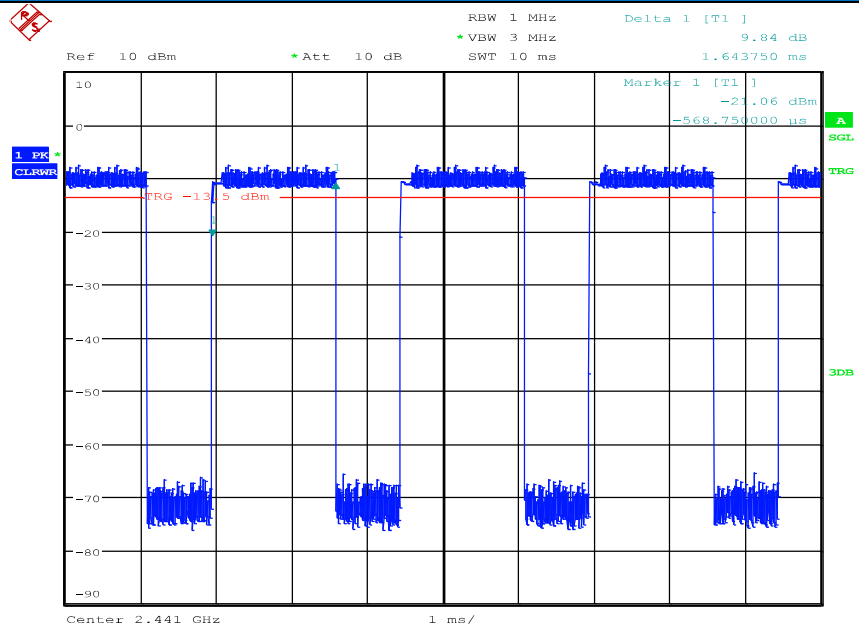
Date: 18.DEC.2020 14:46:24

8DPSK_3DH3/LCH



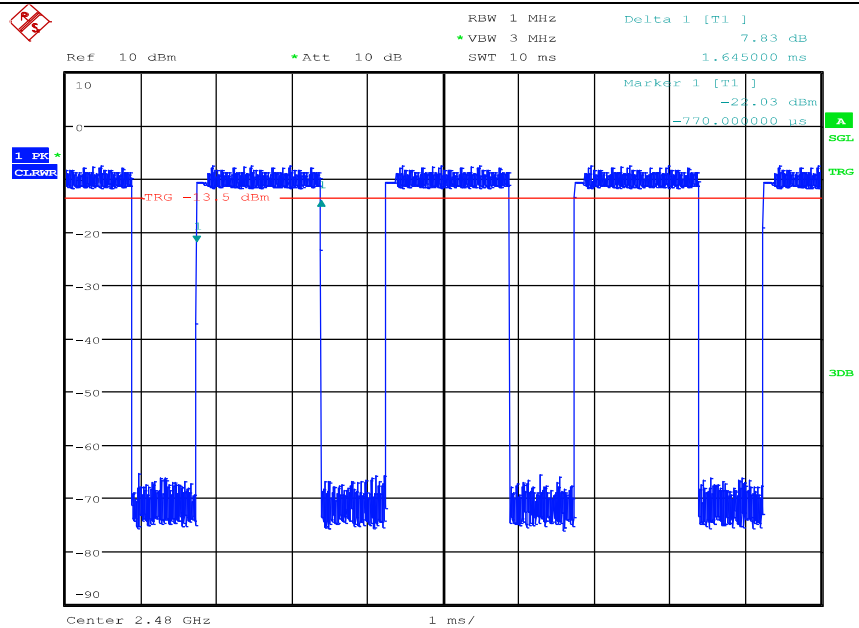
Date: 18.DEC.2020 14:49:47

8DPSK_3DH3/MCH



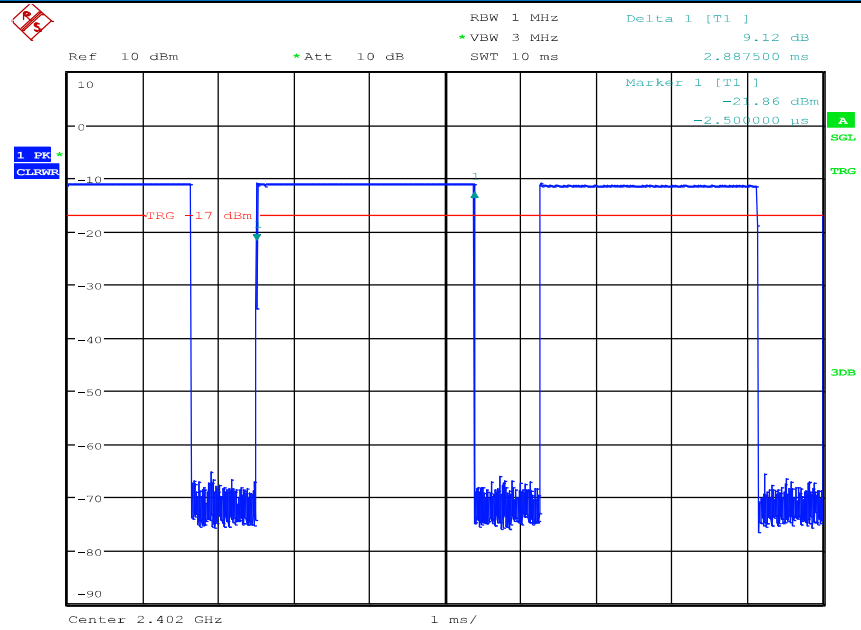
Date: 18.DEC.2020 14:50:26

8DPSK_3DH3/HCH



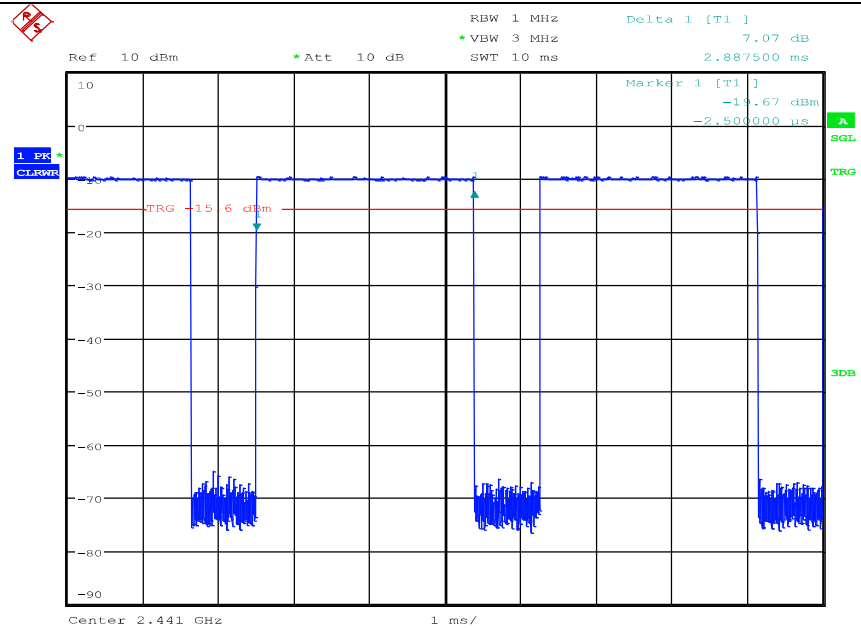
Date: 18.DEC.2020 14:51:10

GFSK_DH5/LCH



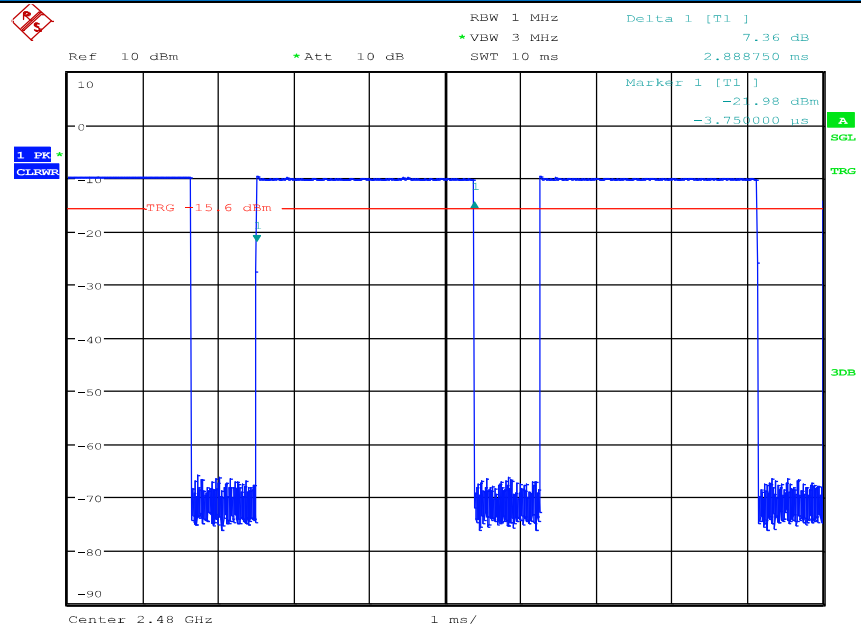
Date: 18.DEC.2020 13:18:34

GFSK_DH5/MCH



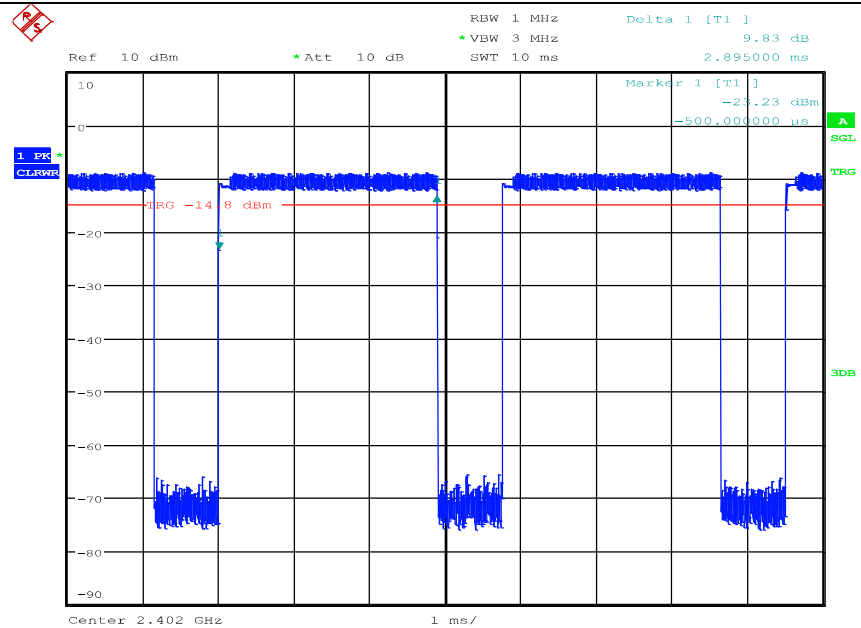
Date: 18.DEC.2020 13:23:13

GFSK_DH5/HCH



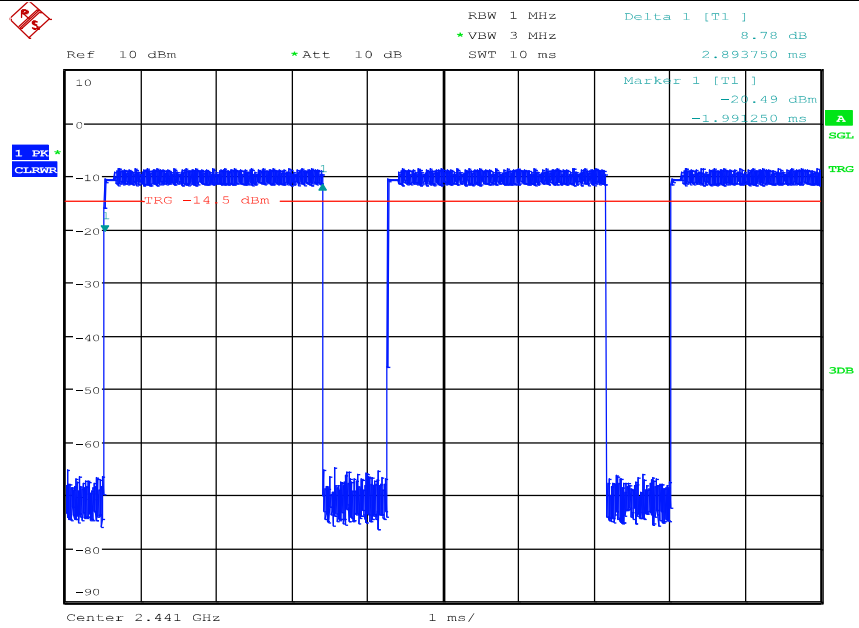
Date: 18.DEC.2020 13:28:04

$\pi/4$ DQPSK
_2DH5/LCH



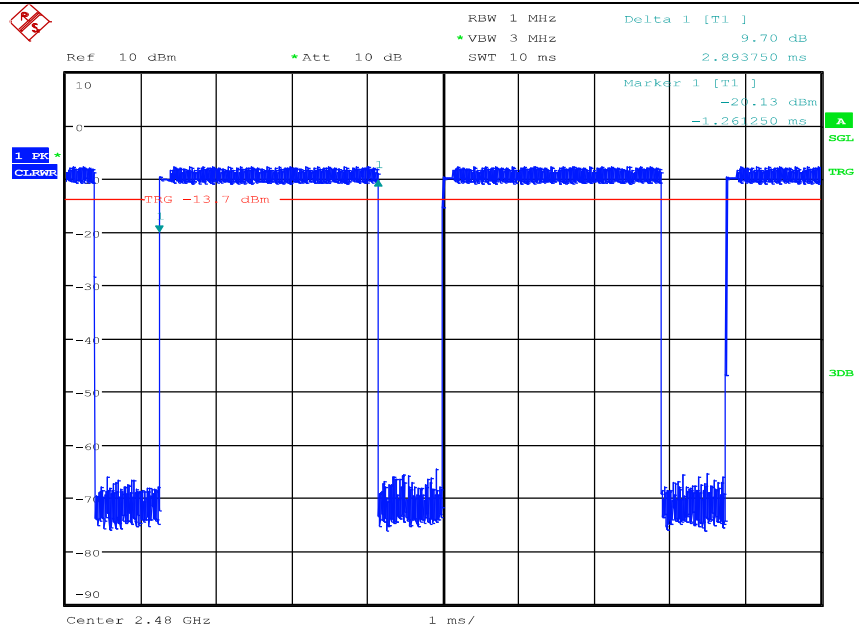
Date: 18.DEC.2020 13:32:54

$\pi/4$ DQPSK
_2DH5/MCH



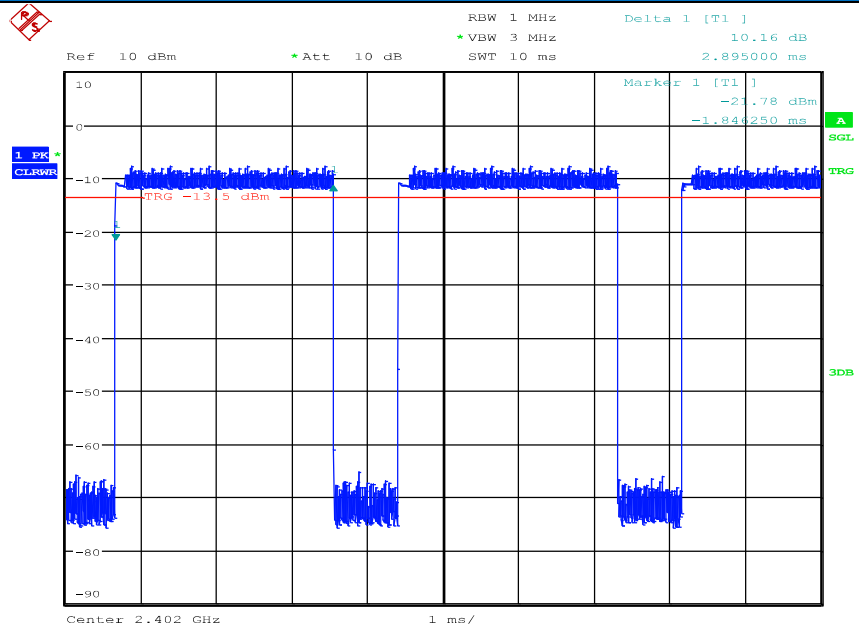
Date: 18.DEC.2020 13:38:35

$\pi/4$ DQPSK
_2DH5/HCH



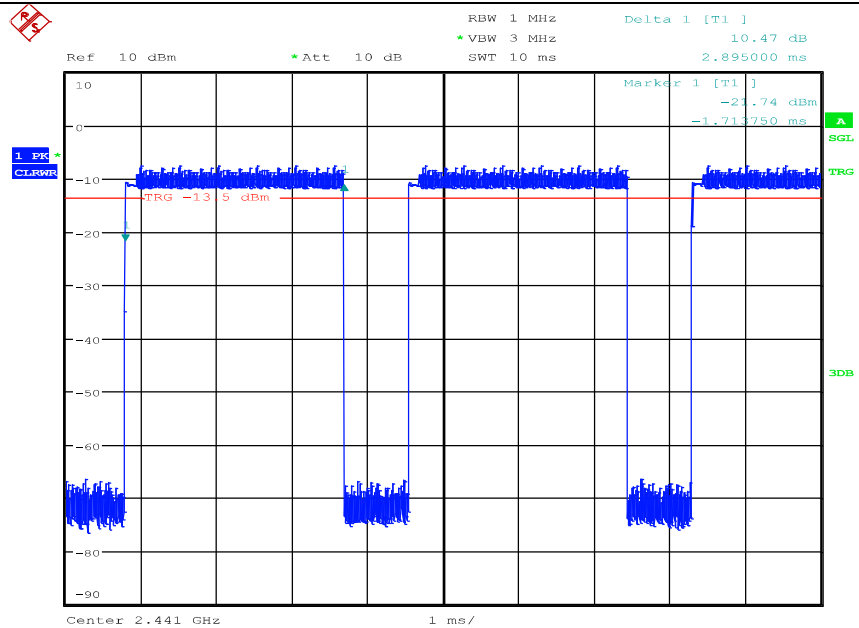
Date: 18.DEC.2020 13:52:01

8DPSK_3DH5/LCH



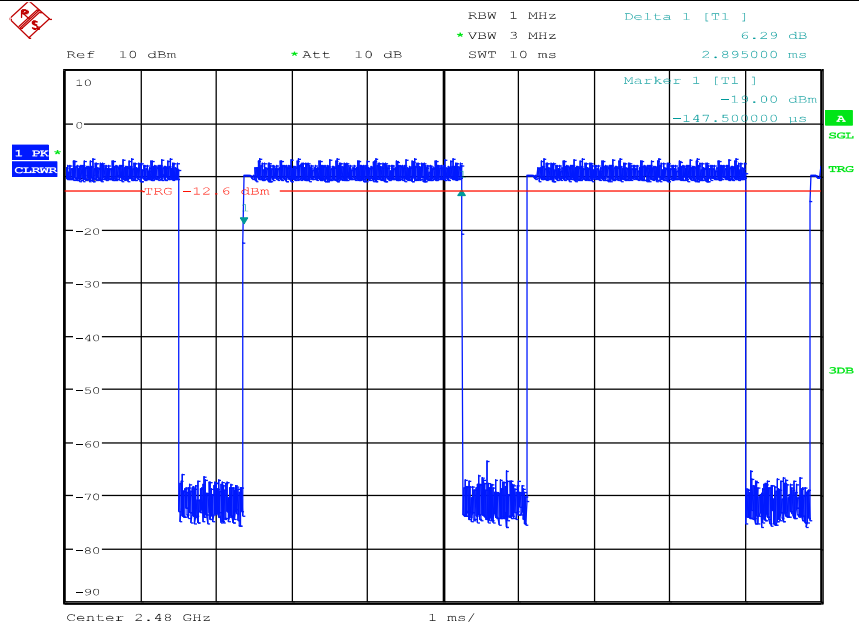
Date: 18.DEC.2020 14:18:31

8DPSK_3DH5/MCH



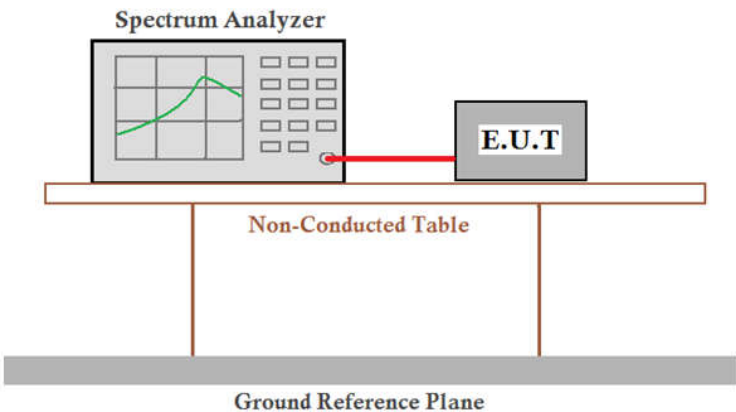
Date: 18.DEC.2020 14:26:34

8DPSK_3DH5/HCH



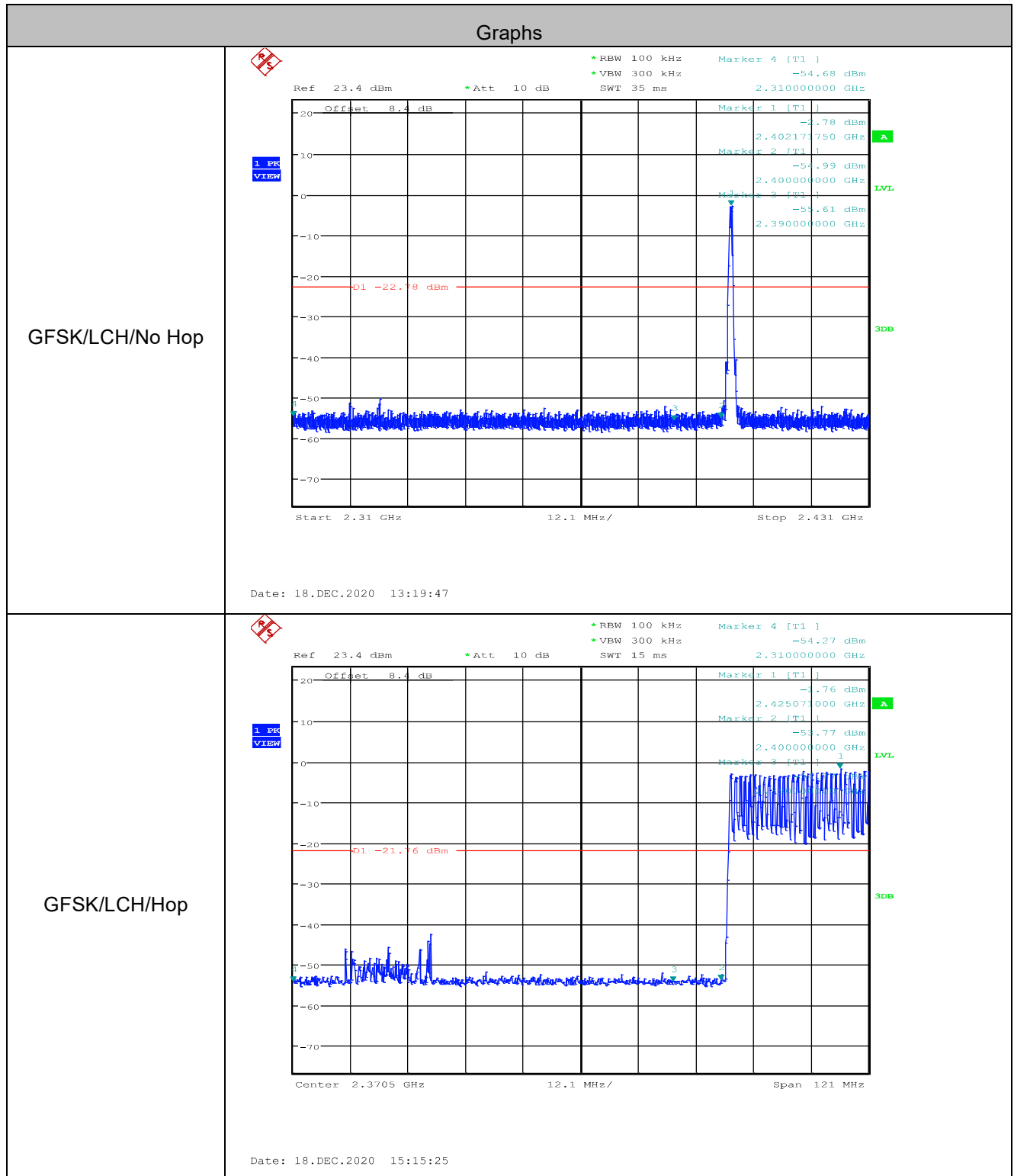
Date: 18.DEC.2020 14:31:44

5.8 Band-edge for RF Conducted Emissions

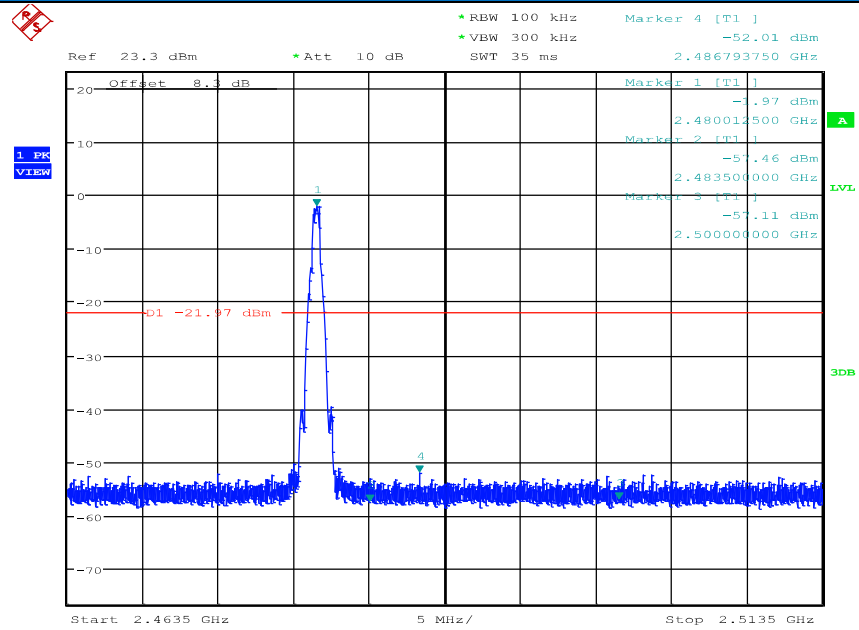
Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10:2013
Test Setup:	 <p><i>Remark: Offset=cable loss+ attenuation factor.</i></p>
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power 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.
Exploratory Test Mode:	Hopping and Non-hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of $\pi/4$ DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type. Only the worst case is recorded in the report.
Test Results:	Pass

Mode	Test Channel	Frequency [MHz]	Frequency Hopping	Emission Level [dBm]	Limit [dBm]	Result
GFSK	LCH	2400	Off	-54.990	-22.78	PASS
			On	-53.770	-21.76	PASS
GFSK	HCH	2483.5	Off	-57.460	-21.97	PASS
			On	-53.660	-21.82	PASS
$\pi/4$ DQPSK	LCH	2400	Off	-55.440	-22.88	PASS
			On	-54.000	-21.43	PASS
$\pi/4$ DQPSK	HCH	2483.5	Off	-54.590	-22.23	PASS
			On	-53.050	-22.46	PASS
8DPSK	LCH	2400	Off	-53.430	-22.78	PASS
			On	-51.070	-21.81	PASS
8DPSK	HCH	2483.5	Off	-54.060	-21.6	PASS
			On	-53.190	-21.94	PASS

Test plot as follows:

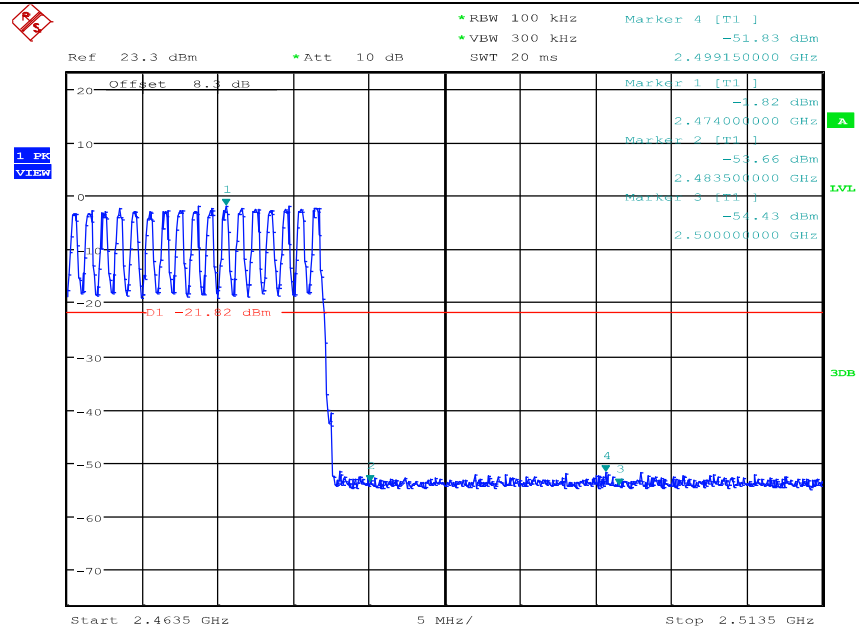


GFSK/HCH/No Hop



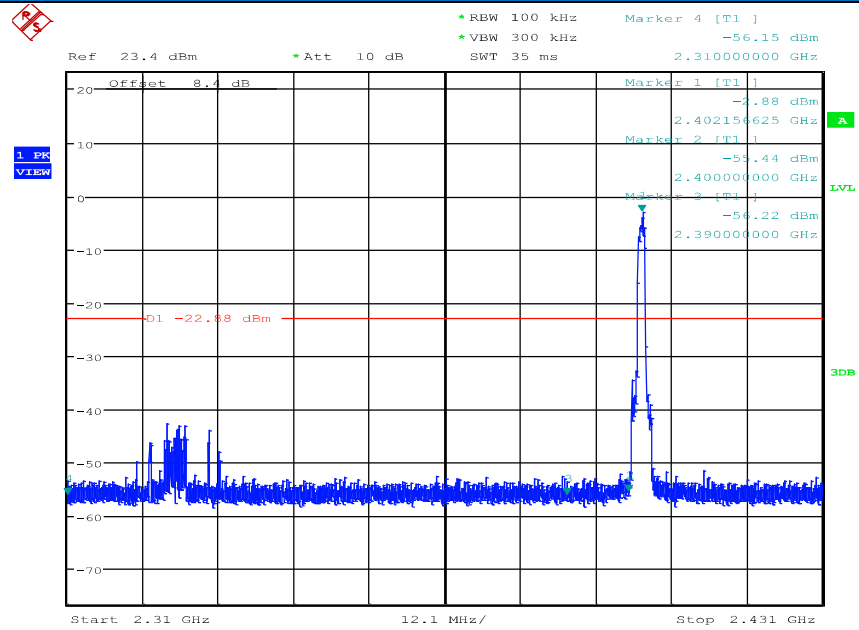
Date: 18.DEC.2020 13:29:13

GFSK/HCH/Hop



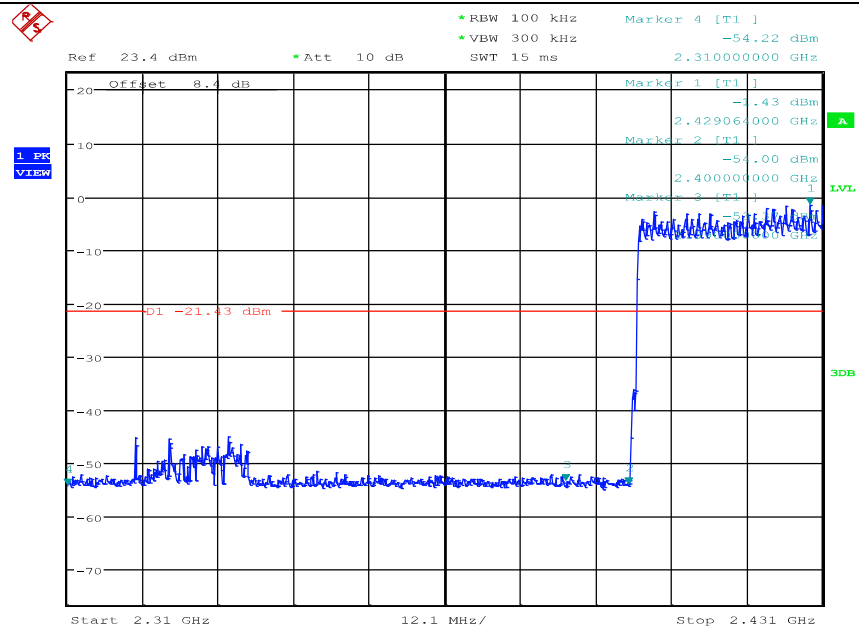
Date: 18.DEC.2020 15:25:16

$\pi/4$ DQPSK/LCH/No
Hop



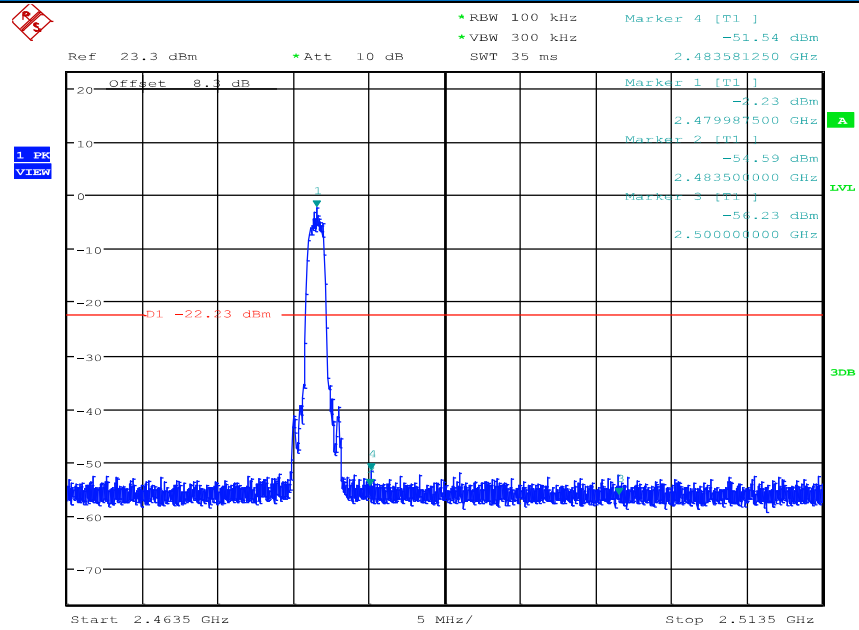
Date: 18.DEC.2020 13:34:07

$\pi/4$ DQPSK/LCH/Hop



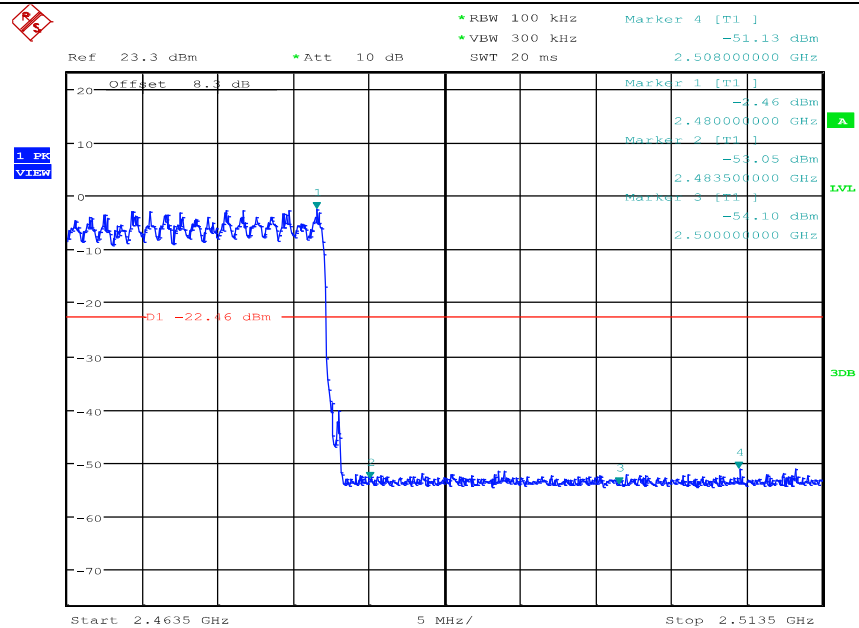
Date: 18.DEC.2020 15:45:25

$\pi/4$ DQPSK/HCH/No
Hop



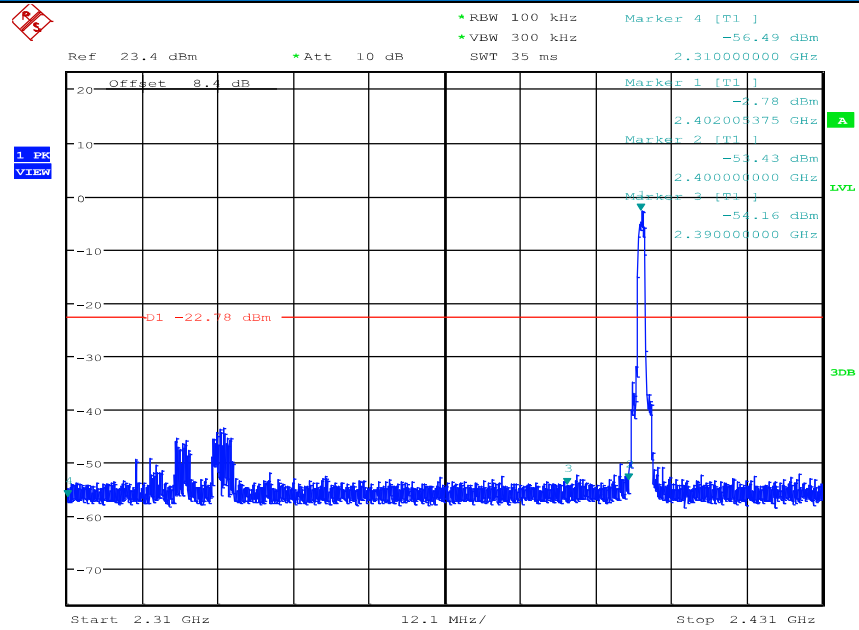
Date: 18.DEC.2020 13:53:11

$\pi/4$ DQPSK/HCH/Hop

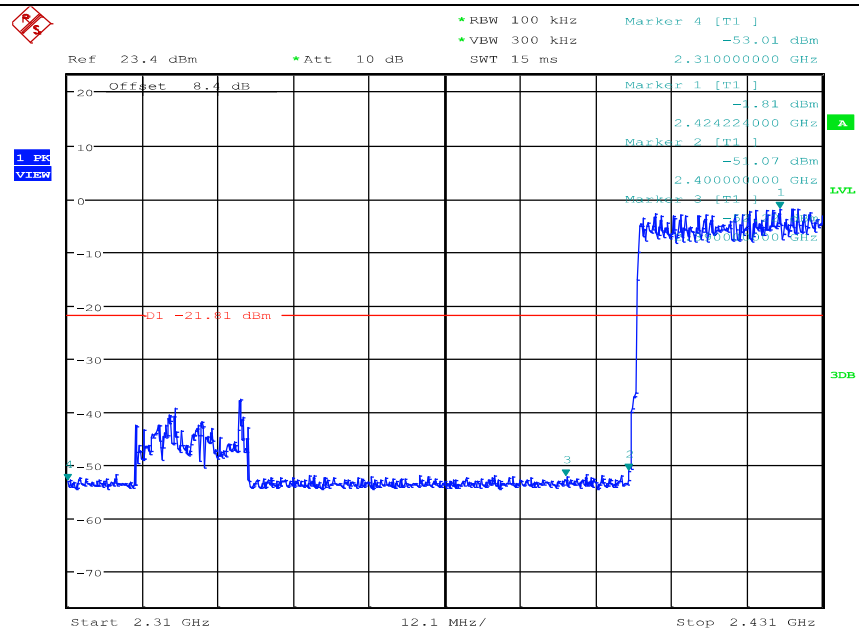


Date: 18.DEC.2020 16:03:05

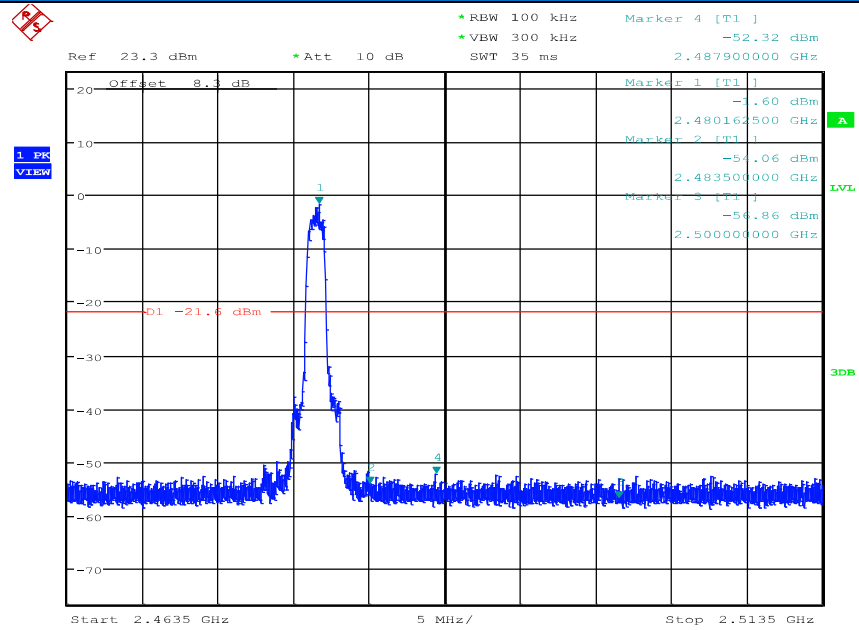
8DPSK/LCH/No Hop



8DPSK/LCH/Hop

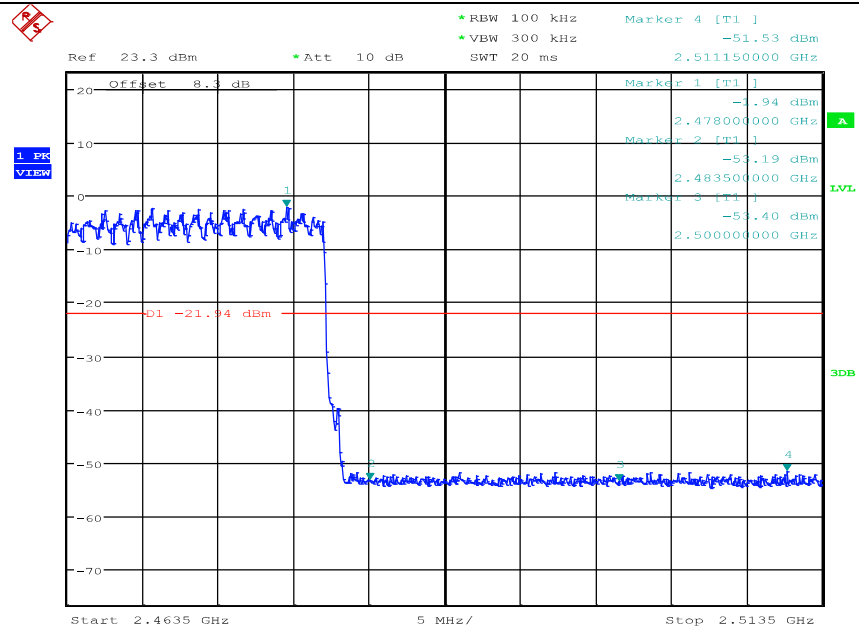


8DPSK/HCH/No Hop



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8DPSK/HCH/Hop



Date: 18.DEC.2020 16:54:37