TEST REPORT

No. I23N01197-BT

for

Shanghai Sunmi Technology Co., Ltd.

Wireless data POS System

Model Name: T5711

with

Hardware Version: Bgf6d

Software Version: SP6610A_V003_20230409_sunmi_CS

FCC ID: 2AH25V3MIX

ISED Number: 22621-V3MIX

Issued Date: 2023-08-01

Designation Number: CN1210

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of SAICT.

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I23N01197-BT	Rev.0	1st edition	2023-08-01

Note: the latest revision of the test report supersedes all previous versions.

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1. Summary of Test Report

1.1. Test Items

Description	Wireless data POS System
Model Name	T5711
Applicant's name	Shanghai Sunmi Technology Co., Ltd.
Manufacturer's Name	Shanghai Sunmi Technology Co., Ltd.

1.2. Test Standards

FCC Part15-2021; ANSI C63.10-2013; RSS-247 Issue 2; RSS-Gen Issue 5

1.3. Test Result

Pass

Please refer to 5.2 Test Results.

1.4. Testing Location

Address: Building G, Shenzhen International Innovation Center, No.1006 Shennan Road, Futian District, Shenzhen, Guangdong, P. R. China 518000

1.5. Project data

Testing Start Date:	2023-05-23
Testing End Date:	2023-06-15

1.6. Signature

Lin Kanfeng
(Prepared this test report)

An Ran
(Reviewed this test report)

Zhang Bojun
(Approved this test report)

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2. Client Information

2.1. Applicant Information

Company Name:	Shanghai Sunmi Technology Co., Ltd.
Address:	Room 505, No.388, Song Hu Road, Yang Pu District, Shanghai, China
Contact Person:	Fang Lu
E-Mail:	fang.lu@sunmi.com
Telephone:	+86 18501703215
FAX:	/

2.2. Manufacturer Information

Company Name:	Shanghai Sunmi Technology Co., Ltd.
Address:	Room 505, No.388, Song Hu Road, Yang Pu District, Shanghai, China
Contact Person:	Fang Lu
E-Mail:	fang.lu@sunmi.com
Telephone:	+86 18501703215
FAX:	/

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3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Description	Wireless data POS System
Model Name	T5711
Frequency Band	2400MHz~2483.5MHz
Equipment type	Bluetooth® BR/EDR
Type of Modulation	GFSK/ π /4 DQPSK/8DPSK
Number of Channels	79
Antenna Type	Integrated
Antenna Gain	2.0 dBi
Power Supply	7.2V DC by Battery
FCC ID	2AH25V3MIX
ISED Number	22621-V3MIX
Condition of EUT as received	No abnormality in appearance

Note: Components list, please refer to documents of the manufacturer; it is also included in the original test record of Shenzhen Academy of Information and Communications Technology.

3.2. Internal Identification of EUT

EUT ID*	SN or IMEI	HW Version	SW Version	Date of Receipt
UT01aa	868189060008663	Bgf6d	SP6610A_V003_20230409_sunmi_CS	2023-05-16
UT07aa	865506060003027	Bgf6d	SP6610A_V003_20230409_sunmi_CS	2023-05-30

*EUT ID: is used to identify the test sample in the lab internally.

*UT01aa is used for Conduction test; UT07aa is used for radiation test.

3.3. Internal Identification of AE

AE No.	Description	AE ID*
AE1	Battery	/
AE2	Charger	/
AE3	Data Cable	/

*AE ID: is used to identify the test sample in the lab internally.

3.4. General Description

The Equipment under Test (EUT) is a model of Wireless data POS System with integrated antenna and battery. It consists of normal options: Lithium Battery and Charger. Manual and specifications of the EUT were provided to fulfil the test. Samples undergoing test were selected by the client.

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4. Reference Documents

4.1. Documents supplied by applicant

EUT feature information is supplied by the applicant or manufacturer, which is the basis of testing.

4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part 15	FCC CFR 47, Part 15, Subpart C: 15.205 Restricted bands of operation; 15.209 Radiated emission limits, general requirements; 15.247 Operation within the bands 902-928MHz, 2400-2483.5 MHz, and 5725-5850 MHz	2021
ANSI C63.10	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	2013
RSS-247	Spectrum Management and Telecommunications Radio Standards Specification Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices	Issue 2 February, 2017
RSS-Gen	Spectrum Management and Telecommunications Radio Standards Specification General Requirements for Compliance of Radio Apparatus	Issue 5 A2 February, 2021

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5. Test Results

5.1. Testing Environment

Normal Temperature: 15~35°C

Relative Humidity: 20~75%

5.2. Test Results

No	Test cases	Sub-clause of Part 15C	Sub-clause of IC	Verdict
0	Antenna Requirement	15.203	/	**P**
1	Maximum Peak Output Power	15.247 (b)	RSS-247 section 5.4	**P**
2	Band Edges Compliance	15.247 (d)	RSS-247 section 5.1	**P**
3	Conducted Spurious Emission	15.247 (d)	RSS-247 section 5.5/ RSS-Gen section 6.13	**P**
4	Radiated Spurious Emission	15.247, 15.205, 15.209	RSS-247 section 5.5/ RSS-Gen section 6.13	**P**
5	Occupied 20dB bandwidth	15.247 (a)	RSS-247 section 5.1	**/**
6	Time of Occupancy (Dwell Time)	15.247 (a)	RSS-247 section 5.1	**P**
7	Number of Hopping Channel	15.247 (a)	RSS-247 section 5.1	**P**
8	Carrier Frequency Separation	15.247 (a)	RSS-247 section 5.1	**P**
9	AC Power line Conducted Emission	15.107, 15.207	RSS-Gen section 8.8	**P**
10	99% Occupied Bandwidth	/	RSS-Gen section 6.7	**/**

See **ANNEX A** for details.

5.3. Statements

SAICT has evaluated the test cases requested by the applicant/manufacturer as listed in section 5.2 of this report, for the EUT specified in section 3, according to the standards or reference documents listed in section 4.2.

Disclaimer:

A. After confirmation with the customer, the sample information provided by the customer may affect the validity of the measurement results in this report, and the impact and consequences arising therefrom shall be borne by the customer.

B. The samples in this report are provided by the customer, and the test results are only applicable to the samples received.

According to the customer's description, T5711 (I23N01197) is a variant product of T6721 (I23N00836). All results were from the initial model.

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6. Test Equipments Utilized

Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Due date	Calibration Period
1	Vector Signal Analyzer	FSV40	100903	Rohde & Schwarz	2023-12-28	1 year
2	Bluetooth Tester	CBT32	100584	Rohde & Schwarz	2023-12-28	1 year
3	Power Sensor	U2021XA	MY55430013	Keysight	2023-12-28	1 year
4	Data Acquisiton	U2531A	TW55443507	Keysight	/	/
5	Shielding Room	S81	CT000986-1344	ETS-Lindgren	2026-09-12	5 years

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Due Date	Calibration Period
1	Test Receiver	ESR7	101676	R&S	2023-11-23	1 year
2	BiLog Antenna	3142E	0224831	ETS-lindgren	2024-05-27	3 years
3	Horn Antenna	3117	00066577	ETS-lindgren	2025-04-17	1 year
4	Anechoic Chamber	FACT3-2.0	1285	ETS-Lindgren	2025-05-28	2 years
5	Spectrum Analyzer	FSV40	101192	R&S	2024-01-11	1 year
6	Loop Antenna	HLA6120	35779	TESEQ	2025-05-12	3 years
7	Horn Antenna	QSH-SL-18-26-S-20	17013	Q-par	2026-02-01	3 years
8	Test Receiver	ESCI	100702	R&S	2024-01-11	1 year
9	LISN	ENV216	102067	R&S	2024-07-13	1 year

Test software

No.	Equipment	Manufacturer	Version
1	TechMgr Software	CAICT	2.1.1
2	EMC32	Rohde & Schwarz	10.50.40

EUT is engineering software provided by the customer to control the transmitting signal.
The EUT was programmed to be in continuously transmitting mode.

Anechoic chamber

Fully anechoic chamber by ETS-Lindgren

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7. Laboratory Environment

Shielded room

Temperature	Min. = 15 ˚C, Max. = 35 ˚C
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz> 60 dB; 1MHz-18000MHz>90 dB
Electrical insulation	> 2 MΩ
Ground system resistance	< 4 Ω

Anechoic chamber

Temperature	Min. = 15 ˚C, Max. = 35 ˚C
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz> 60 dB; 1MHz-18000MHz>90 dB
Electrical insulation	> 2 MΩ
Ground system resistance	< 4 Ω
Normalised site attenuation (NSA)	< ±4 dB, 3 m distance, from 30 to 1000 MHz
Voltage Standing Wave Ratio (VSWR)	≤ 6 dB, from 1 to 18 GHz, 3 m distance
Uniformity of field strength	Between 0 and 6 dB, from 80 to 6000 MHz

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8. Measurement Uncertainty

Test Name	Uncertainty *(k=2)*	
1. RF Output Power - Conducted	1.32dB	
2. Time of Occupancy - Conducted	0.58ms	
3. Occupied channel bandwidth - Conducted	4.56kHz	
4. Transmitter Spurious Emission - Conducted	30MHz≤f<1GHz	1.41dB
	1GHz≤f<7GHz	1.92dB
	7GHz≤f<13GHz	2.31dB
	13GHz≤f≤26GHz	2.61dB
5. Transmitter Spurious Emission - Radiated	9kHz≤f<30MHz	1.70dB
	30MHz≤f<1GHz	4.80dB
	1GHz≤f<18GHz	4.62dB
	18GHz≤f≤40GHz	2.36dB
6. AC Power line Conducted Emission	150kHz≤f≤30MHz	2.62dB

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ANNEX A: Detailed Test Results

A.0 Antenna requirement

Measurement Limit:

Standard	Requirement
FCC CRF Part 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 use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Note: The Directional gains of antenna used for transmitting is 2.0 dBi. The RF transmitter uses an integrate antenna without connector.

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A.1 Maximum Peak Output Power

Method of Measurement: See ANSI C63.10-clause 7.8.5.

A peak responding power meter may be used, where the power meter and sensor system video bandwidth is greater than the occupied bandwidth of the unlicensed wireless device, rather than a spectrum analyzer.

Measurement Limit:

Standard	Limit (dBm)	E.I.R.P Limit (dBm)
FCC CRF Part 15.247 (b) & RSS-247 section 5.4	< 30	< 36

Measurement Results:

Conducted transmitter power

Mode	Peak Conducted Output Power (dBm)		
	2402MHz (Ch0)	2441MHz (Ch39)	2480MHz (Ch78)
GFSK	10.05	9.85	10.52
π /4 DQPSK	9.02	8.89	8.52
8DPSK	9.39	9.26	8.87

E.I.R.P

Mode	E.I.R.P (dBm)		
	2402MHz (Ch0)	2441MHz (Ch39)	2480MHz (Ch78)
GFSK	12.05	11.85	12.52
π /4 DQPSK	11.02	10.89	10.52
8DPSK	11.39	11.26	10.87

Note: E.I.R.P value = Conducted values (with conducted samples) + Antenna Gain.

Conclusion: Pass

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A.2 Band Edges Compliance

Measurement Limit:

Standard	Limit (dBc)
FCC 47 CFR Part 15.247 (d) & RSS-247 section 5.1	> 20

Measurement Result:

Mode	Channel	Hopping	Test Results	Conclusion
GFSK	0	ON	Fig.1	**P**
	78	ON	Fig.2	**P**
π /4 DQPSK	0	ON	Fig.3	**P**
	78	ON	Fig.4	**P**
8DPSK	0	ON	Fig.5	**P**
	78	ON	Fig.6	**P**

Mode	Channel	Hopping	Test Results	Conclusion
GFSK	0	OFF	Fig.7	**P**
	78	OFF	Fig.8	**P**
π /4 DQPSK	0	OFF	Fig.9	**P**
	78	OFF	Fig.10	**P**
8DPSK	0	OFF	Fig.11	**P**
	78	OFF	Fig.12	**P**

See below for test graphs.
Conclusion: Pass

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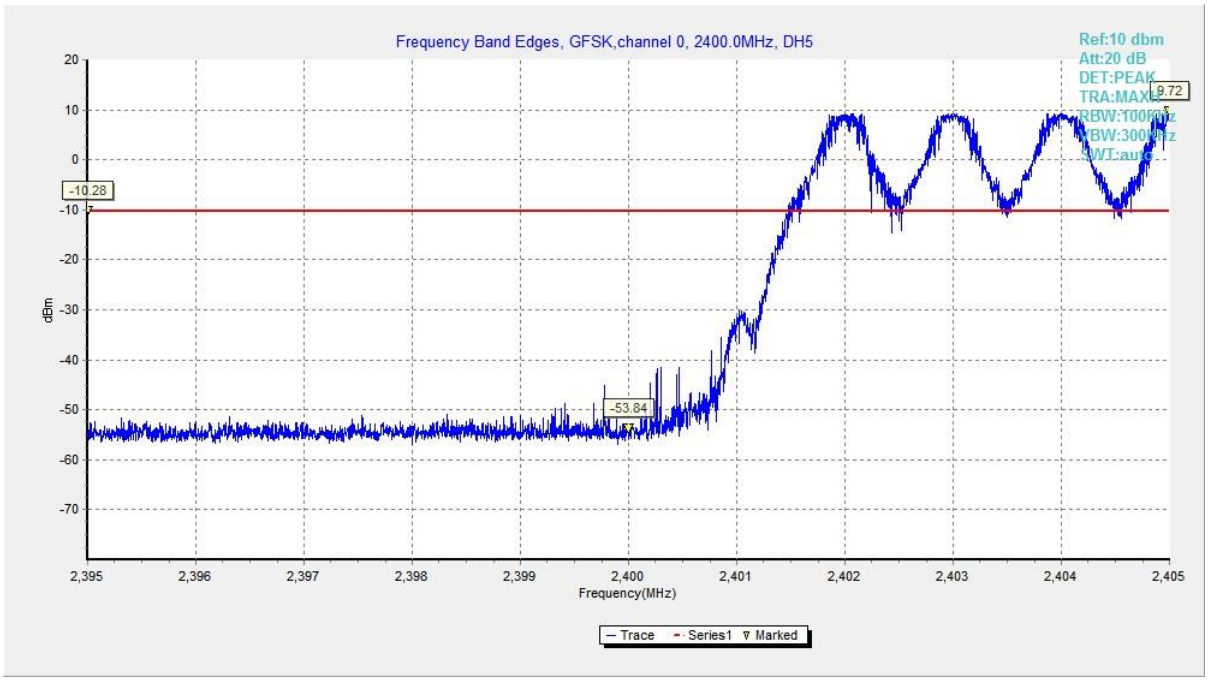

Fig. 1 Band Edges (GFSK, Ch 0, Hopping ON)

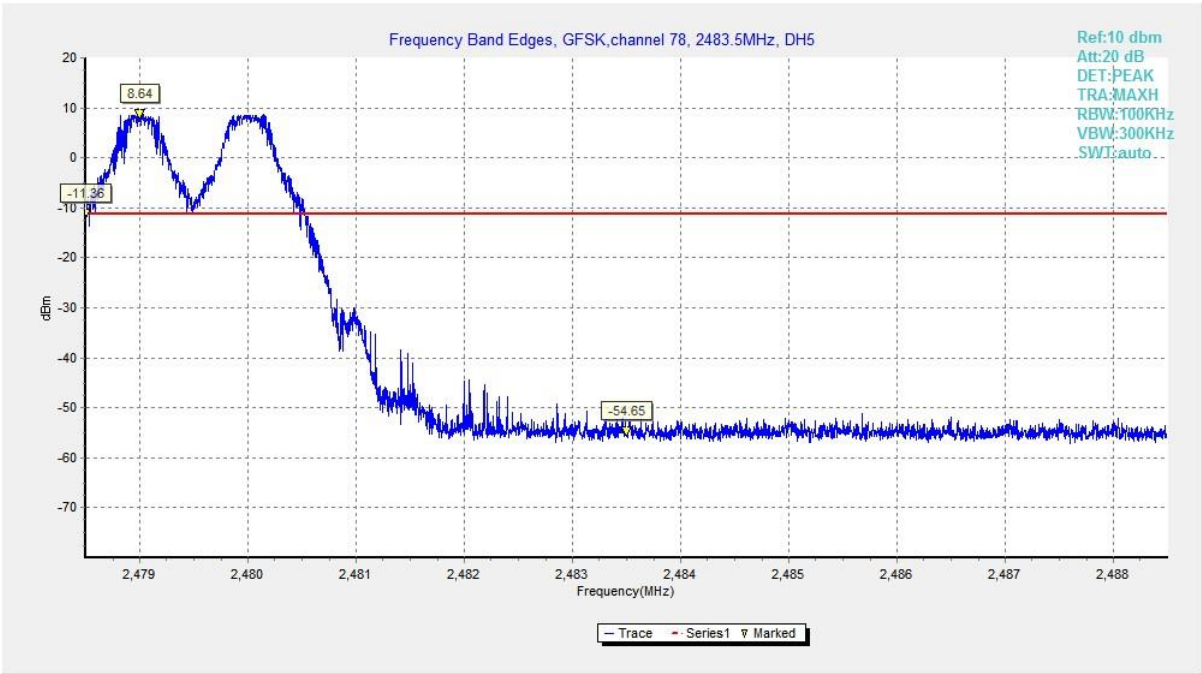

Fig. 2 Band Edges (GFSK, Ch 78, Hopping ON)

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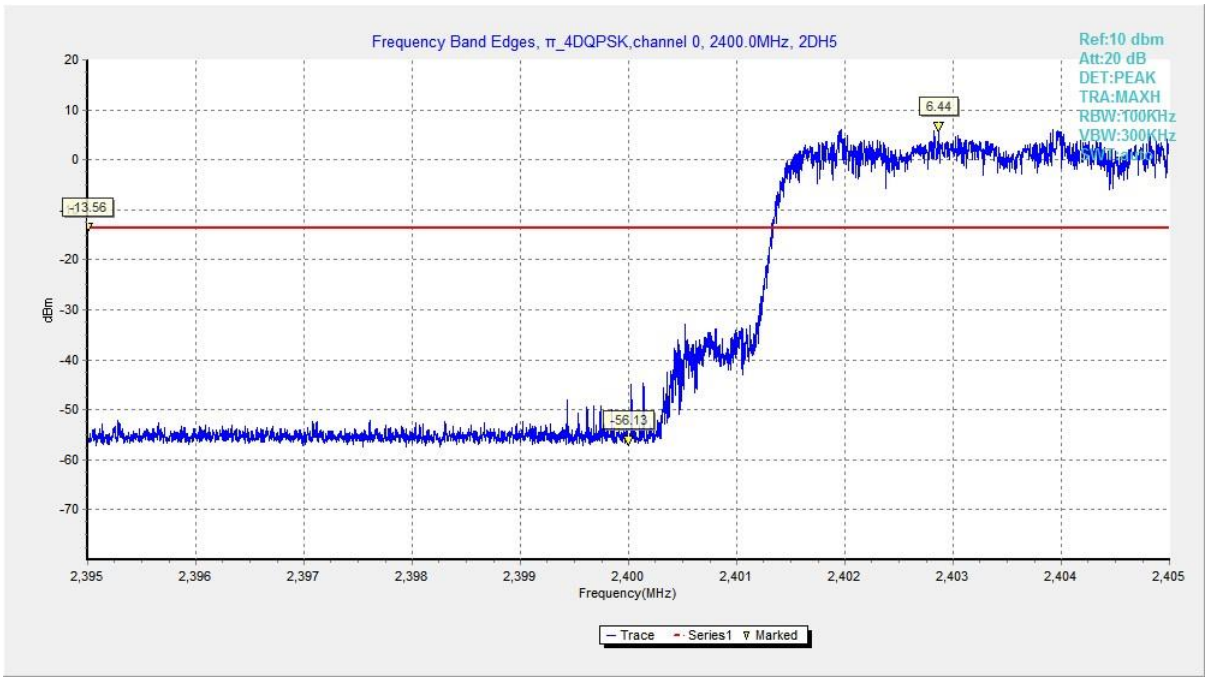

Fig. 3 Band Edges (π /4 DQPSK, Ch 0, Hopping ON)

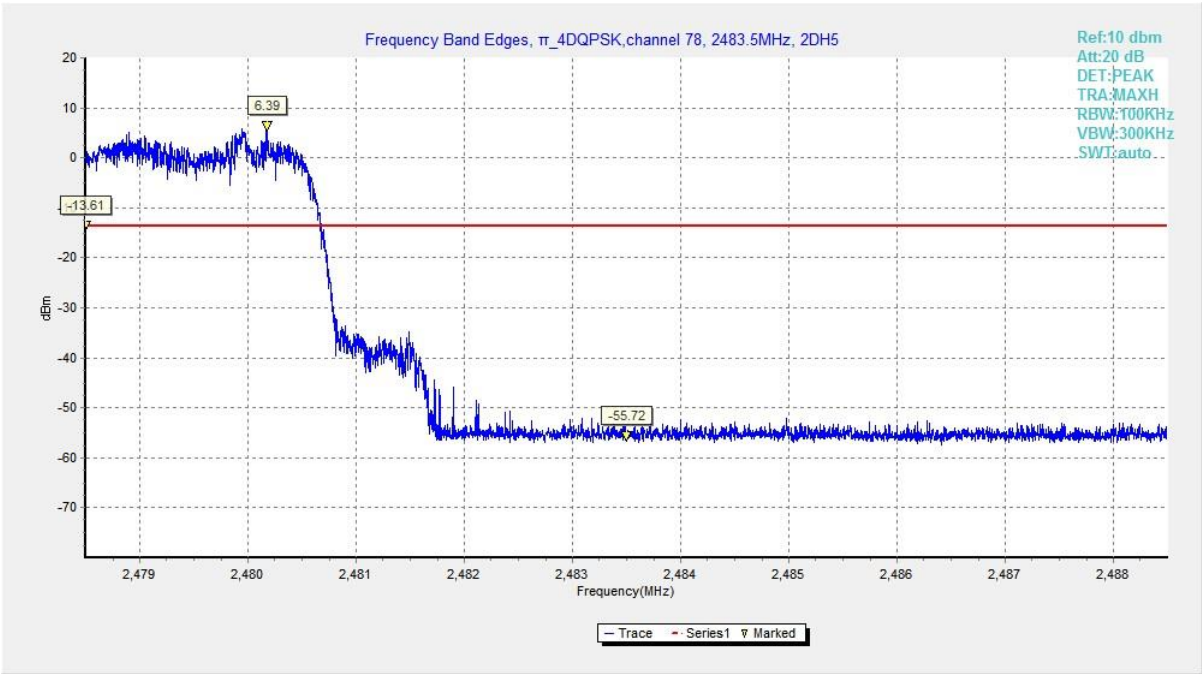

Fig. 4 Band Edges (π /4 DQPSK, Ch 78, Hopping ON)

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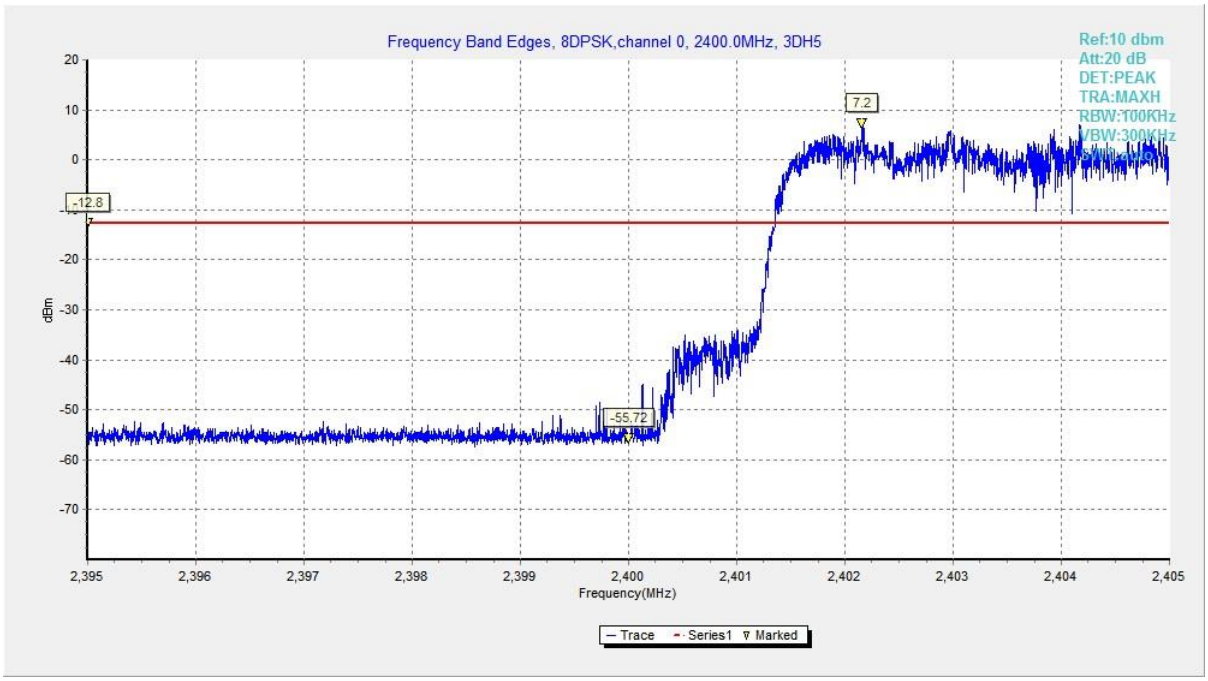

Fig. 5 Band Edges (8DPSK, Ch 0, Hopping ON)

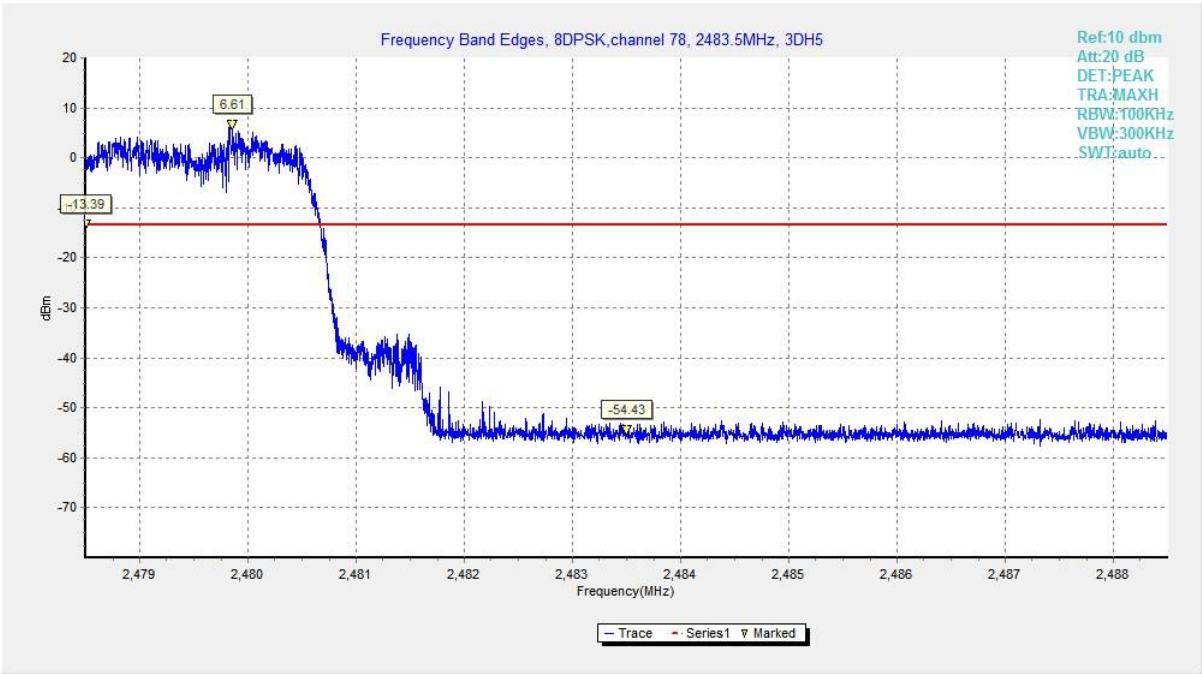

Fig. 6 Band Edges (8DPSK, Ch 78, Hopping ON)

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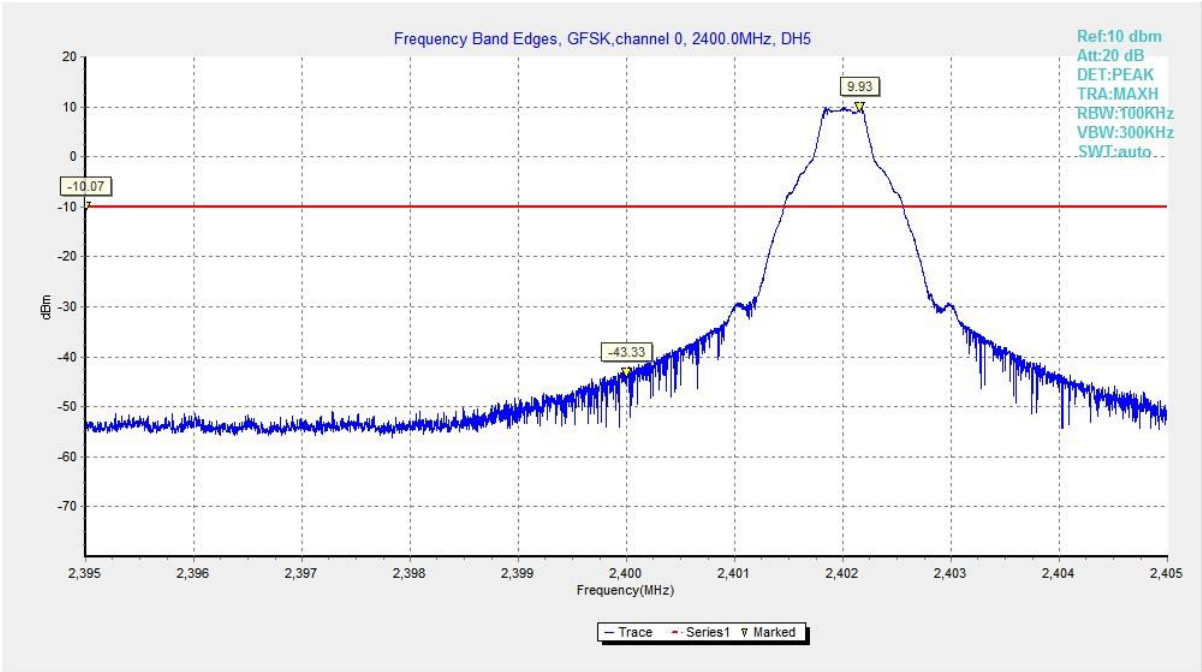

Fig. 7 Band Edges (GFSK, Ch 0, Hopping OFF)

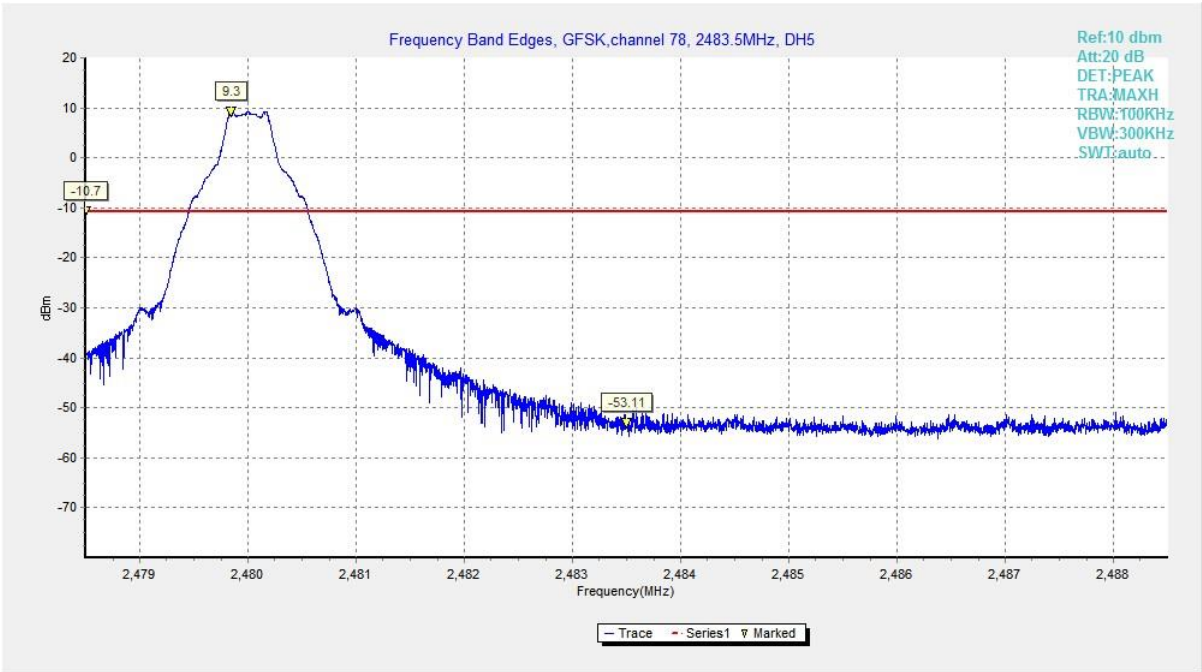

Fig. 8 Band Edges (GFSK, Ch 78, Hopping OFF)

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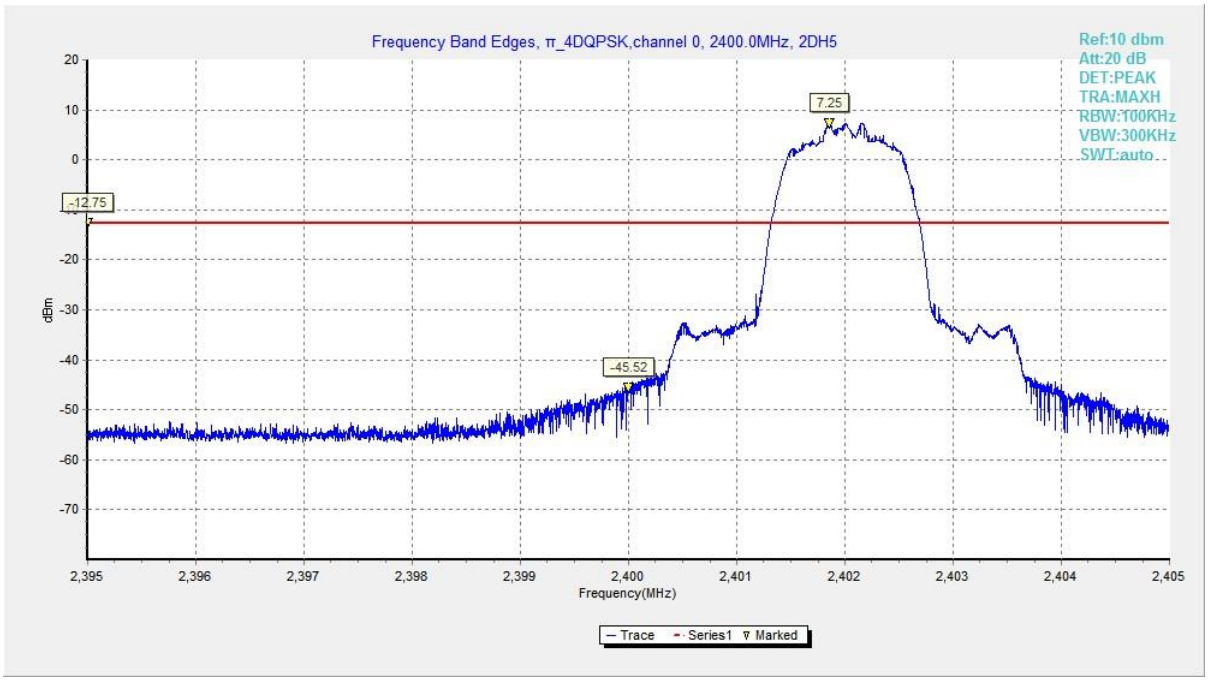

Fig. 9 Band Edges (π /4 DQPSK, Ch 0, Hopping OFF)

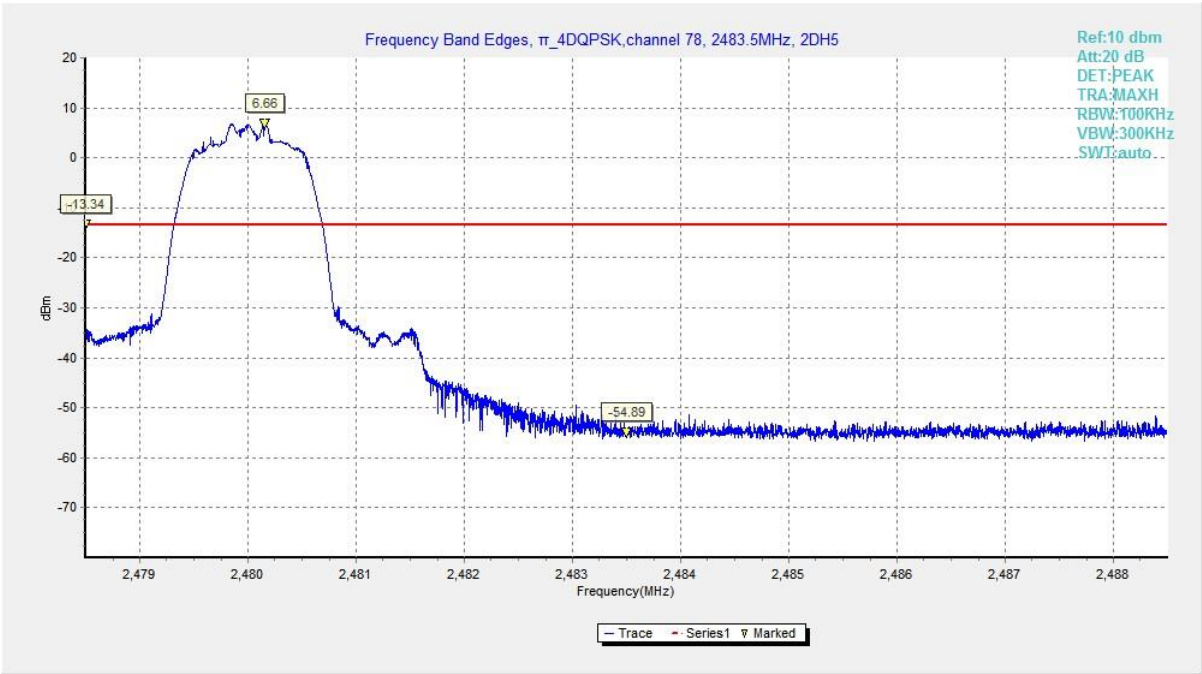

Fig. 10 Band Edges (π /4 DQPSK, Ch 78, Hopping OFF)

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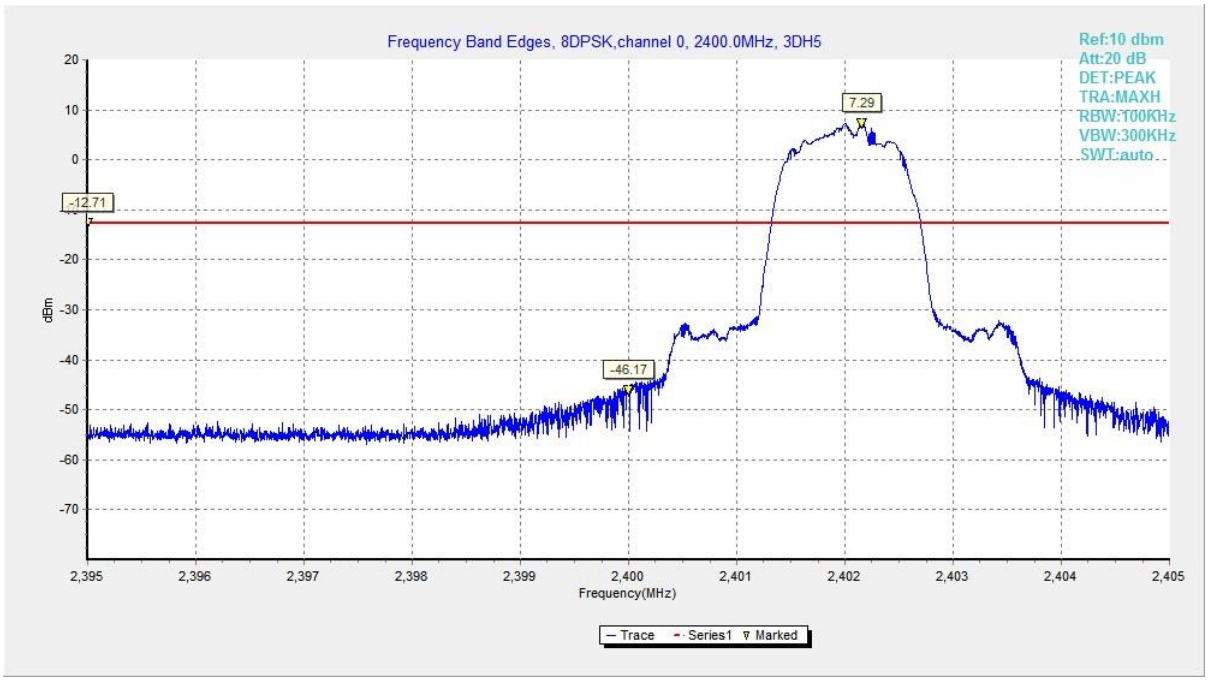

Fig. 11 Band Edges (8DPSK, Ch 0, Hopping OFF)

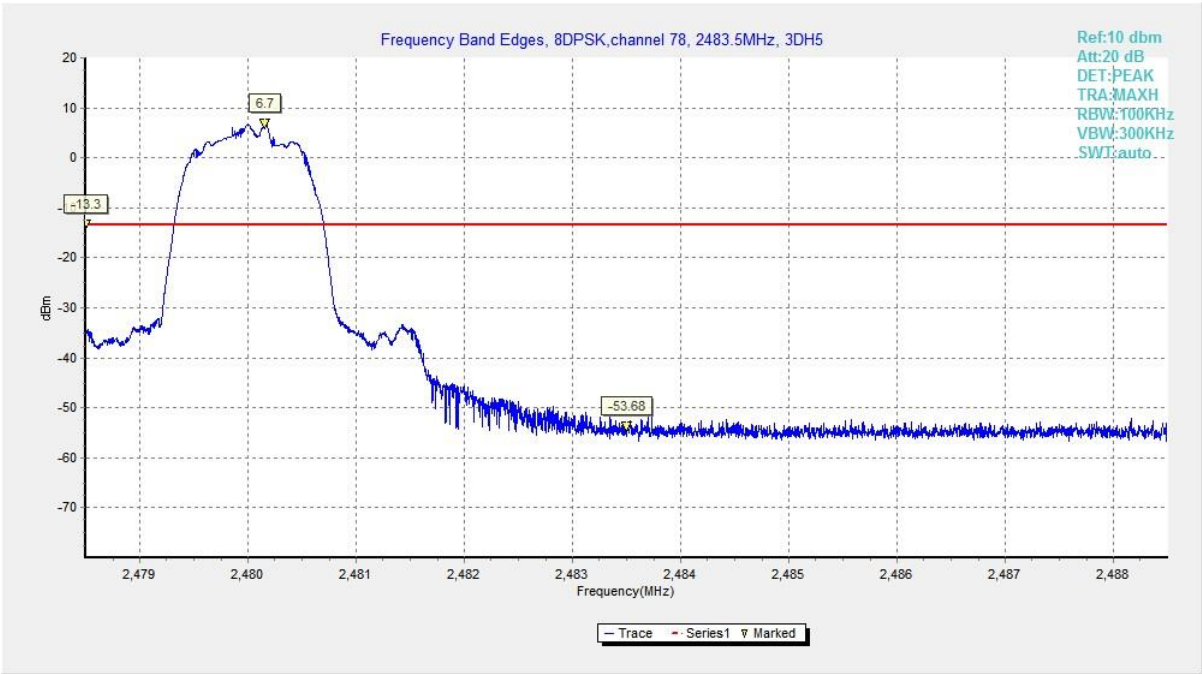

Fig. 12 Band Edges (8DPSK, Ch 78, Hopping OFF)

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A.3 Conducted Emission

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247 (d) & RSS-247 section 5.5/ RSS-Gen section 6.13	20dB below peak output power in 100 kHz bandwidth

Measurement Results:

MODE	Channel	Frequency Range	Test Results	Conclusion
GFSK	0	1GHz-3GHz	Fig.13	**P**
		3GHz-10GHz	Fig.14	**P**
	39	1GHz-3GHz	Fig.15	**P**
		3GHz-10GHz	Fig.16	**P**
	78	1GHz-3GHz	Fig.17	**P**
		3GHz-10GHz	Fig.18	**P**
π /4 DQPSK	0	1GHz-3GHz	Fig.19	**P**
		3GHz-10GHz	Fig.20	**P**
	39	1GHz-3Ghz	Fig.21	**P**
		3GHz-10GHz	Fig.22	**P**
	78	1GHz-3Ghz	Fig.23	**P**
		3GHz-10GHz	Fig.24	**P**
8DPSK	0	1GHz-3GHz	Fig.25	**P**
		3GHz-10GHz	Fig.26	**P**
	39	1GHz-3GHz	Fig.27	**P**
		3GHz-10GHz	Fig.28	**P**
	78	1GHz-3GHz	Fig.29	**P**
		3GHz-10GHz	Fig.30	**P**
/	All channels	30 MHz-1GHz	Fig.31	**P**
		10GHz-26GHz	Fig.32	**P**

See below for test graphs.

Conclusion: Pass

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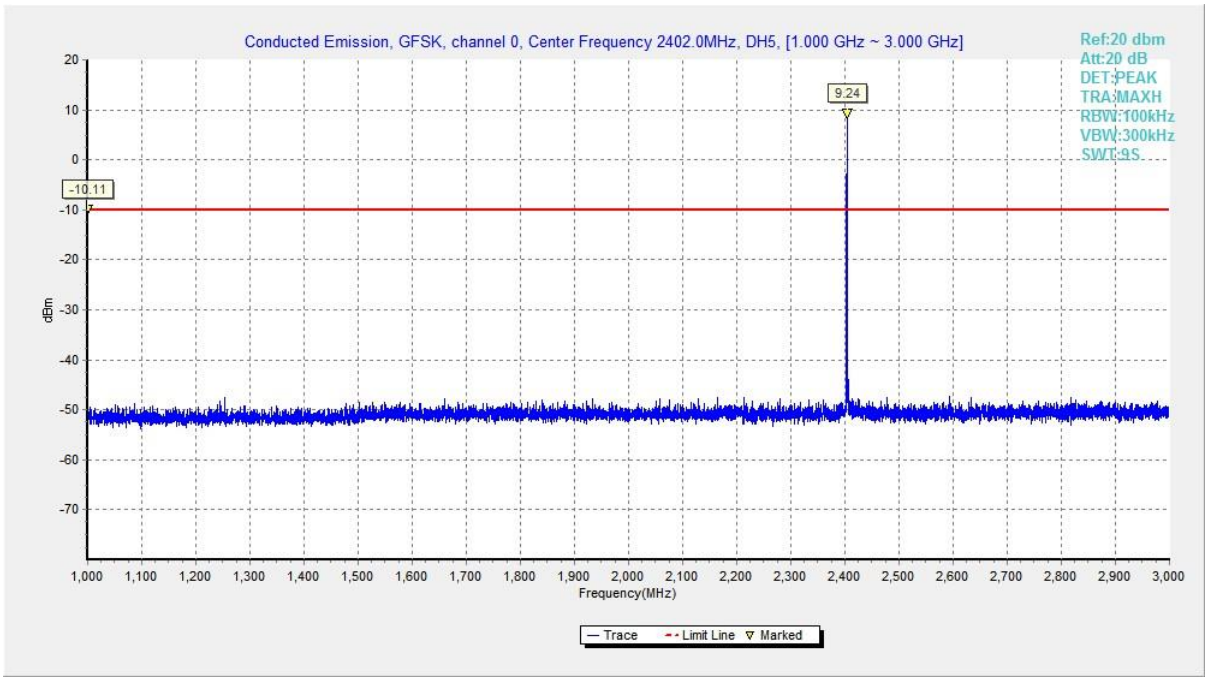

Fig. 13 Conducted Spurious Emission (GFSK, Ch0, 1GHz-3GHz)

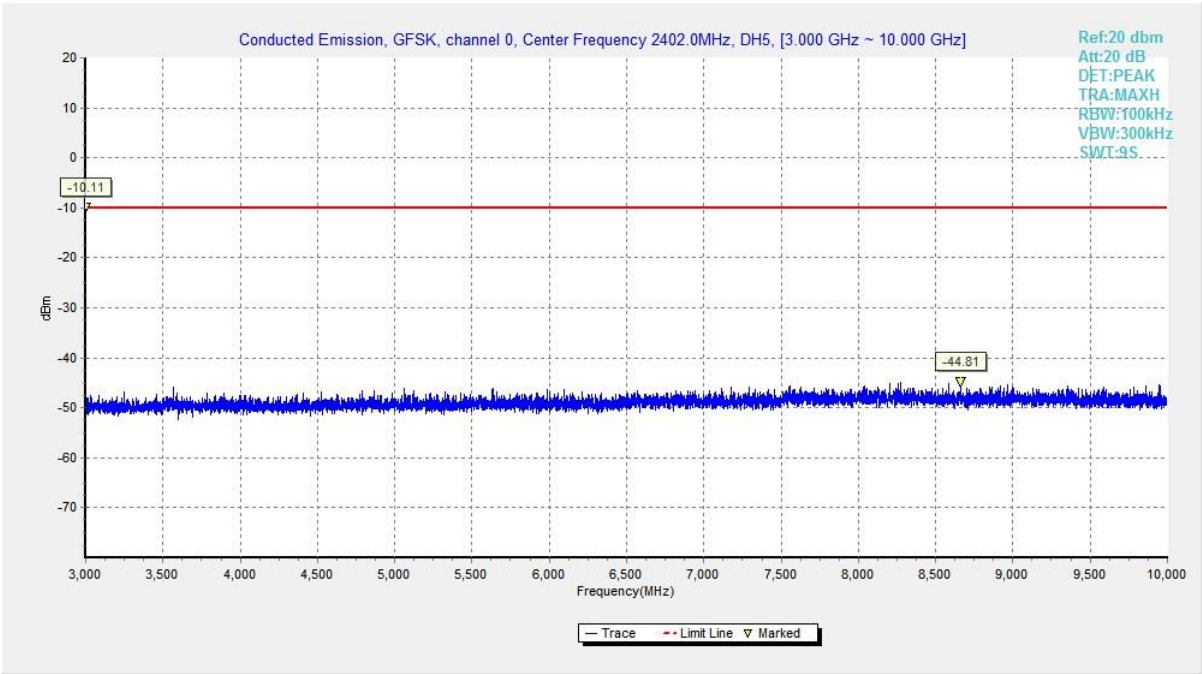

Fig. 14 Conducted Spurious Emission (GFSK, Ch0, 3GHz-10GHz)

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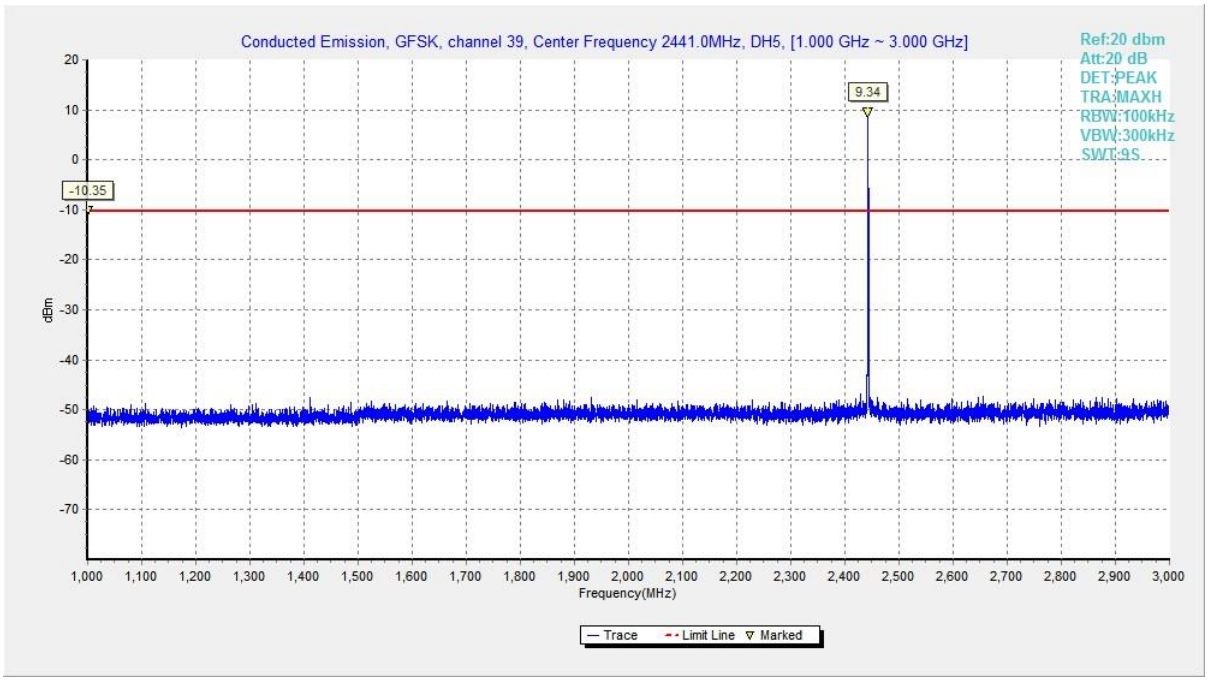

Fig. 15 Conducted Spurious Emission (GFSK, Ch39, 1GHz-3GHz)

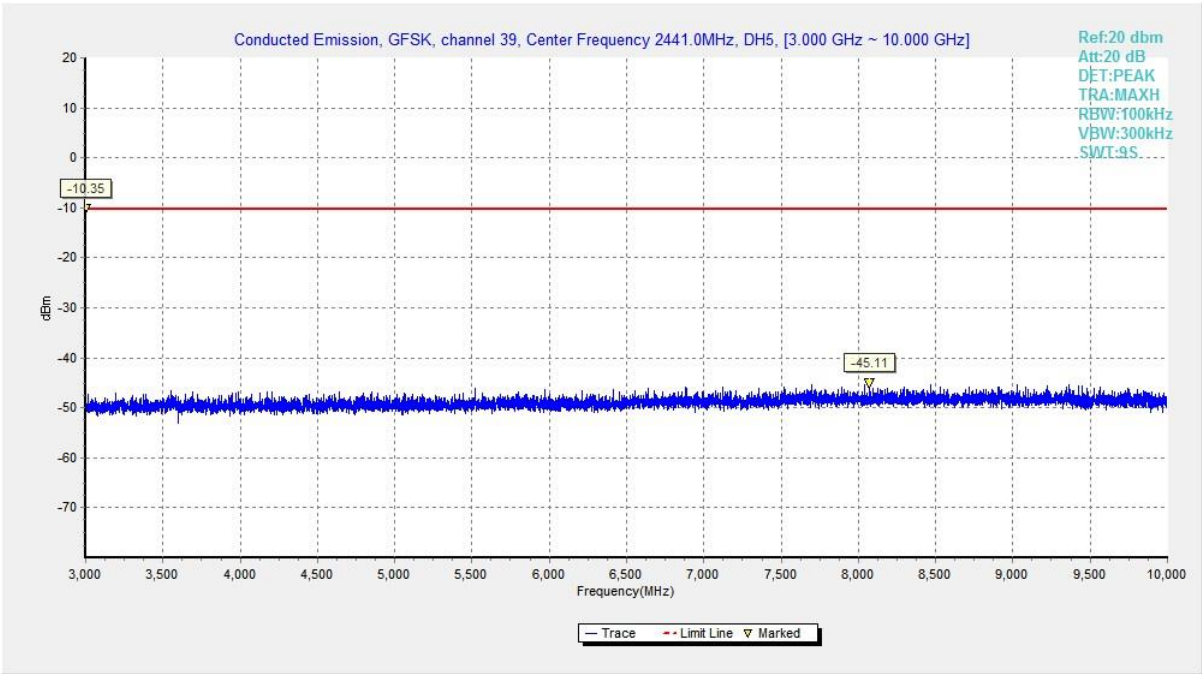

Fig. 16 Conducted Spurious Emission (GFSK, Ch39, 3GHz-10GHz)

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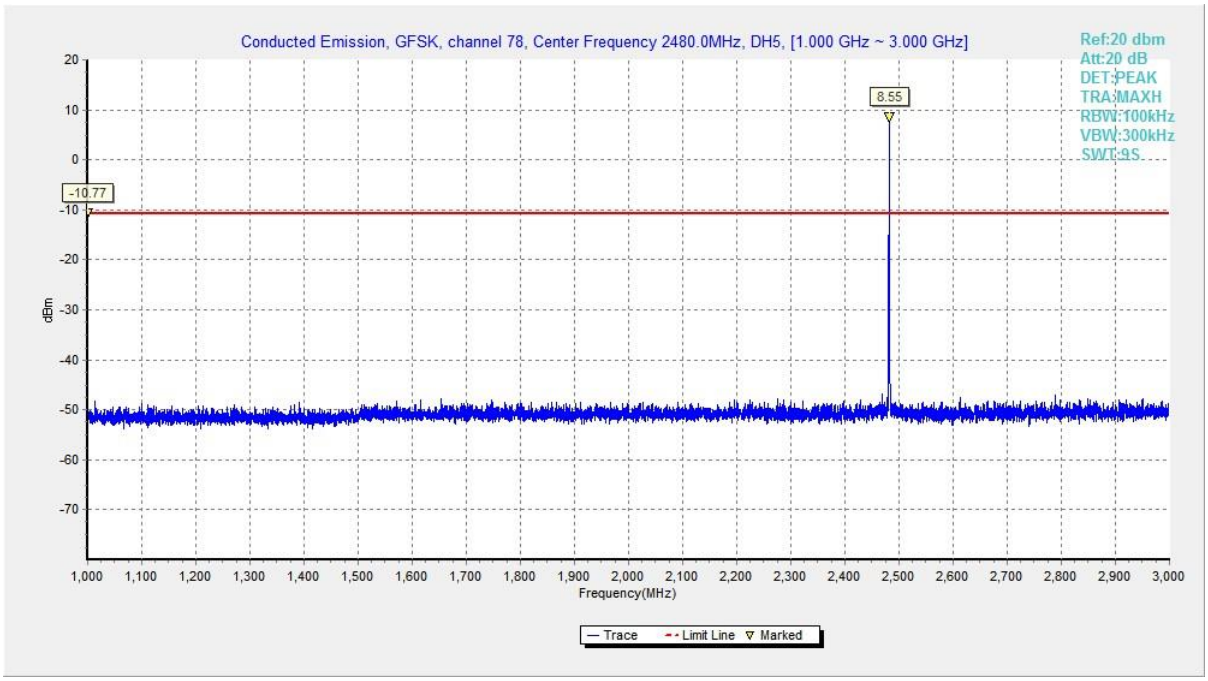

Fig. 17 Conducted Spurious Emission (GFSK, Ch78, 1GHz-3GHz)

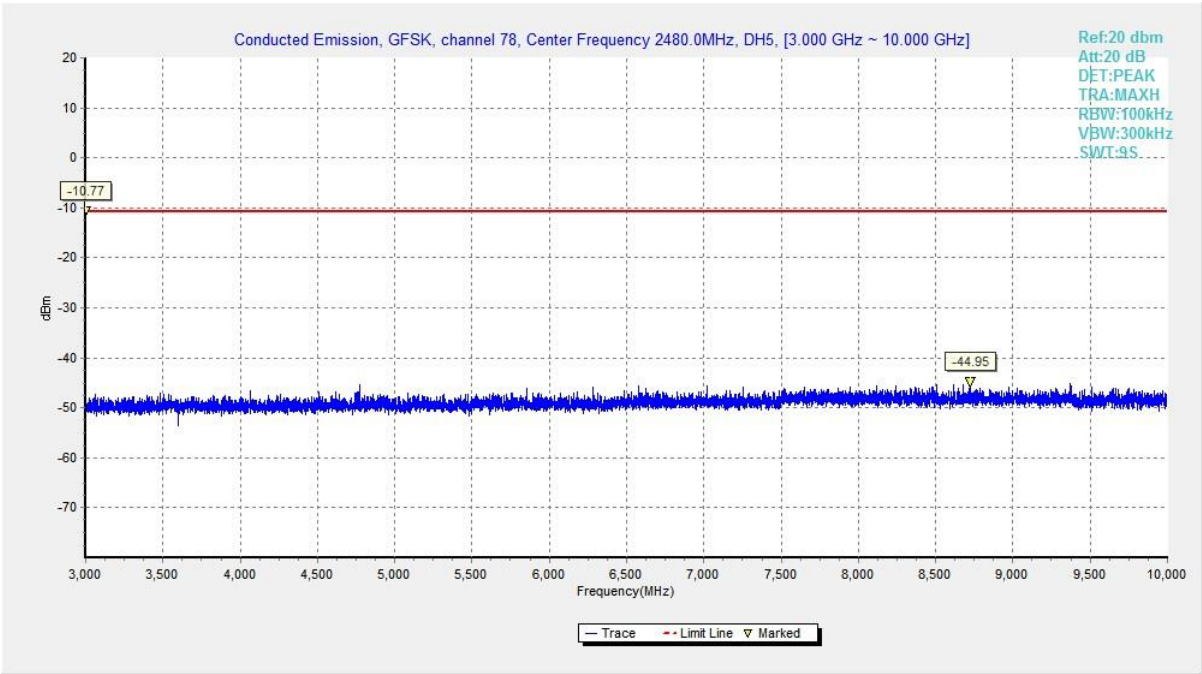

Fig. 18 Conducted Spurious Emission (GFSK, Ch78, 3GHz-10GHz)

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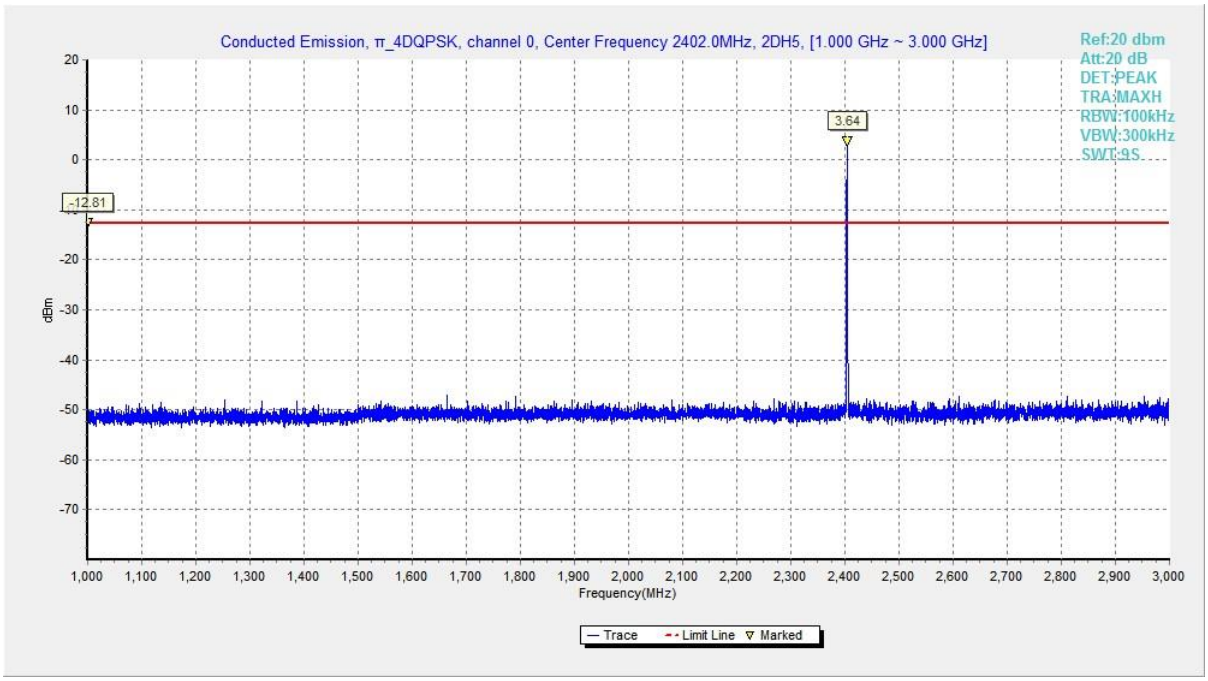

Fig. 19 Conducted Spurious Emission (π /4 DQPSK, Ch0, 1GHz-3GHz)

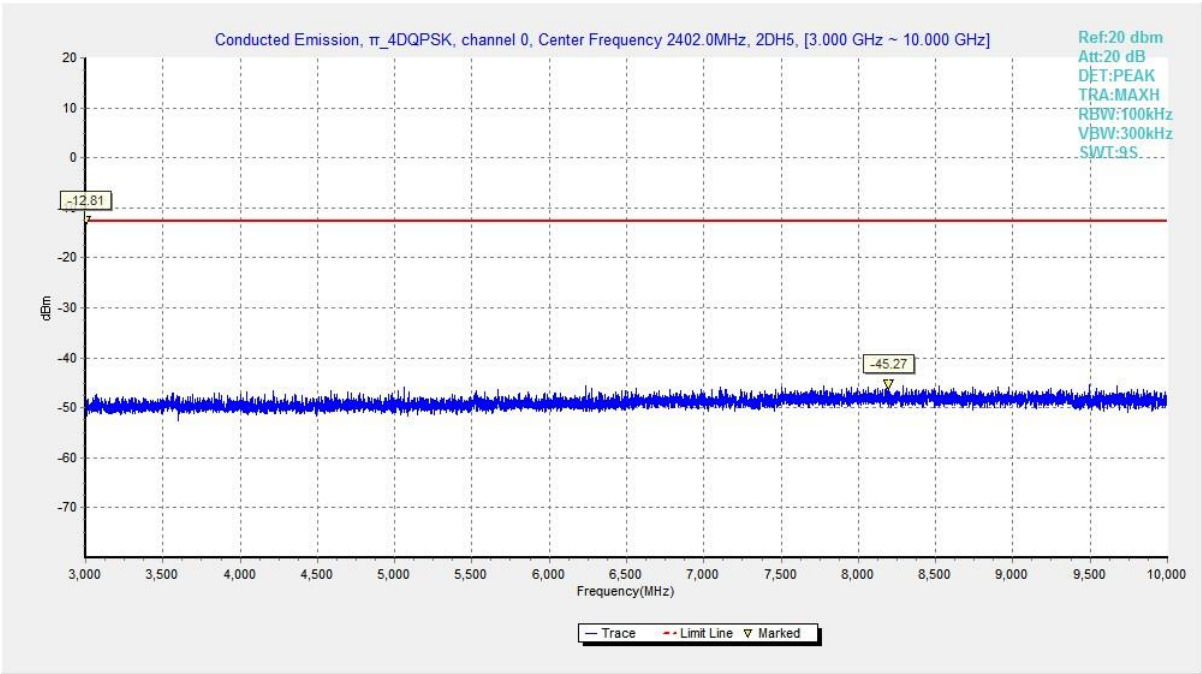

Fig. 20 Conducted Spurious Emission (π /4 DQPSK, Ch0, 3GHz-10GHz)

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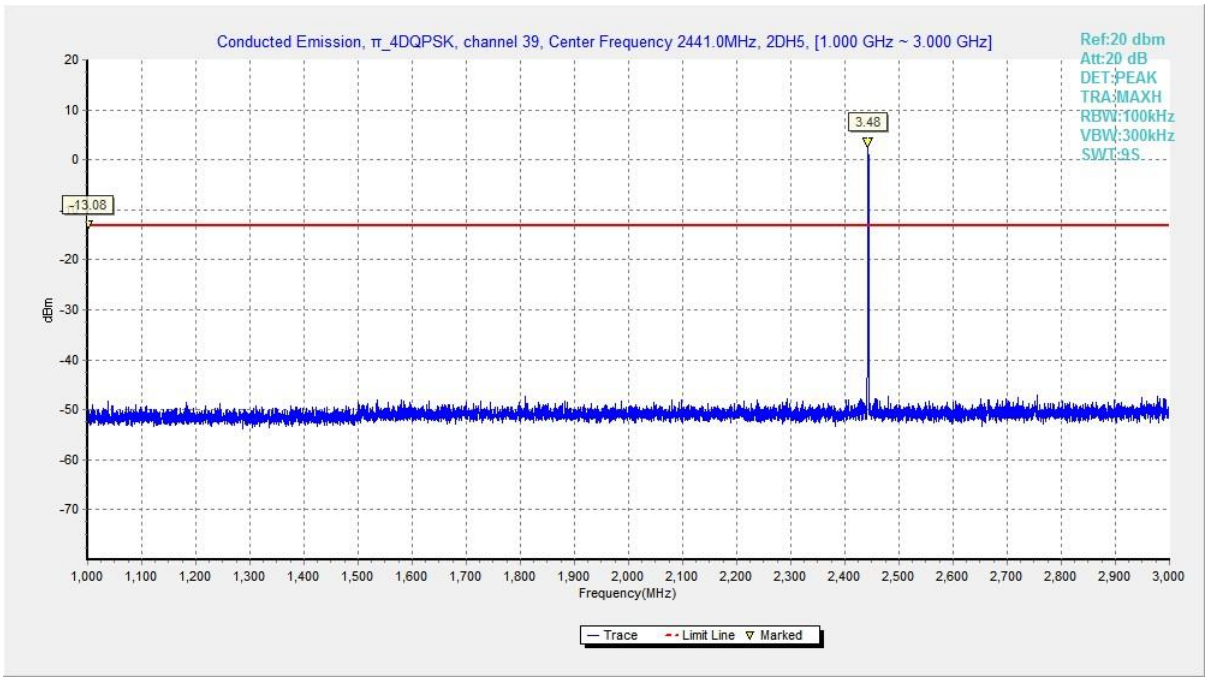

Fig. 21 Conducted Spurious Emission (π /4 DQPSK, Ch39, 1GHz-3GHz)

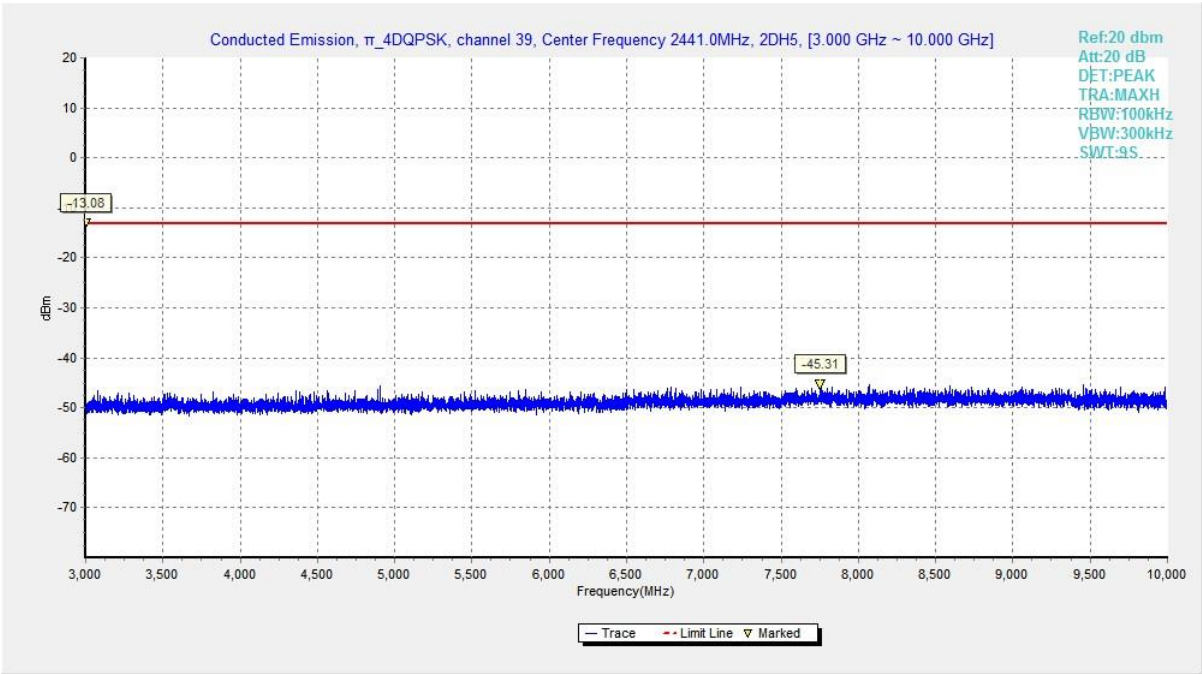

Fig. 22 Conducted Spurious Emission (π /4 DQPSK, Ch39, 3GHz-10GHz)

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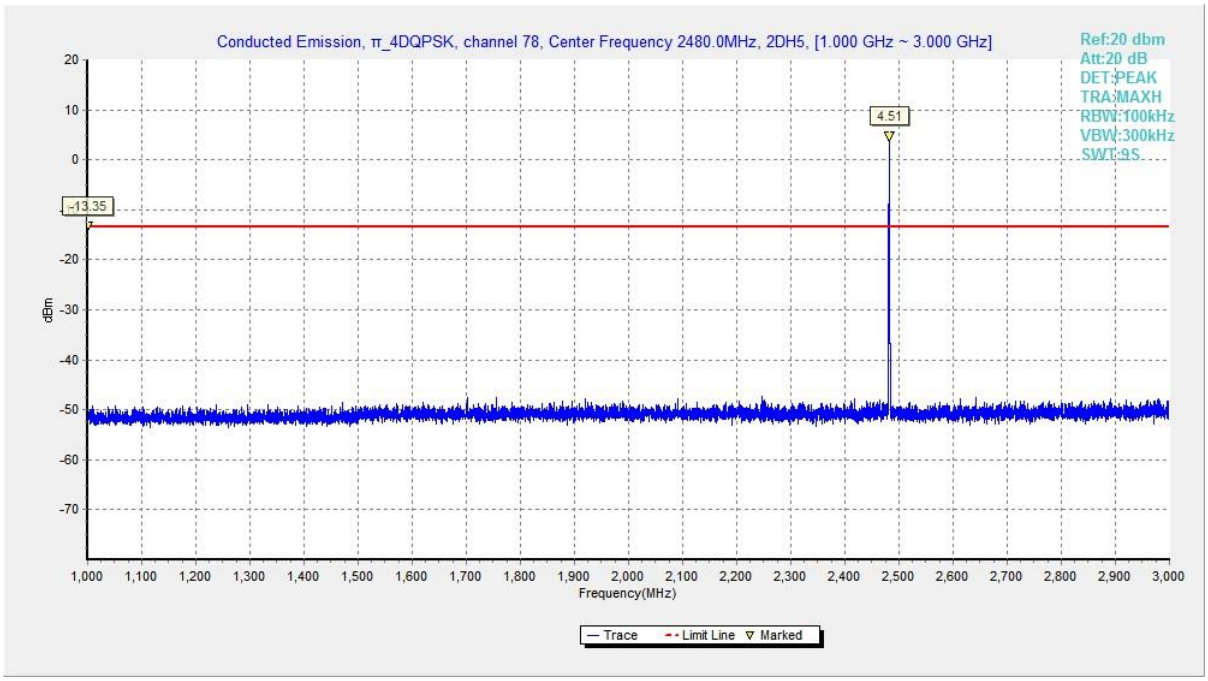

Fig. 23 Conducted Spurious Emission (π /4 DQPSK, Ch78, 1GHz-3GHz)

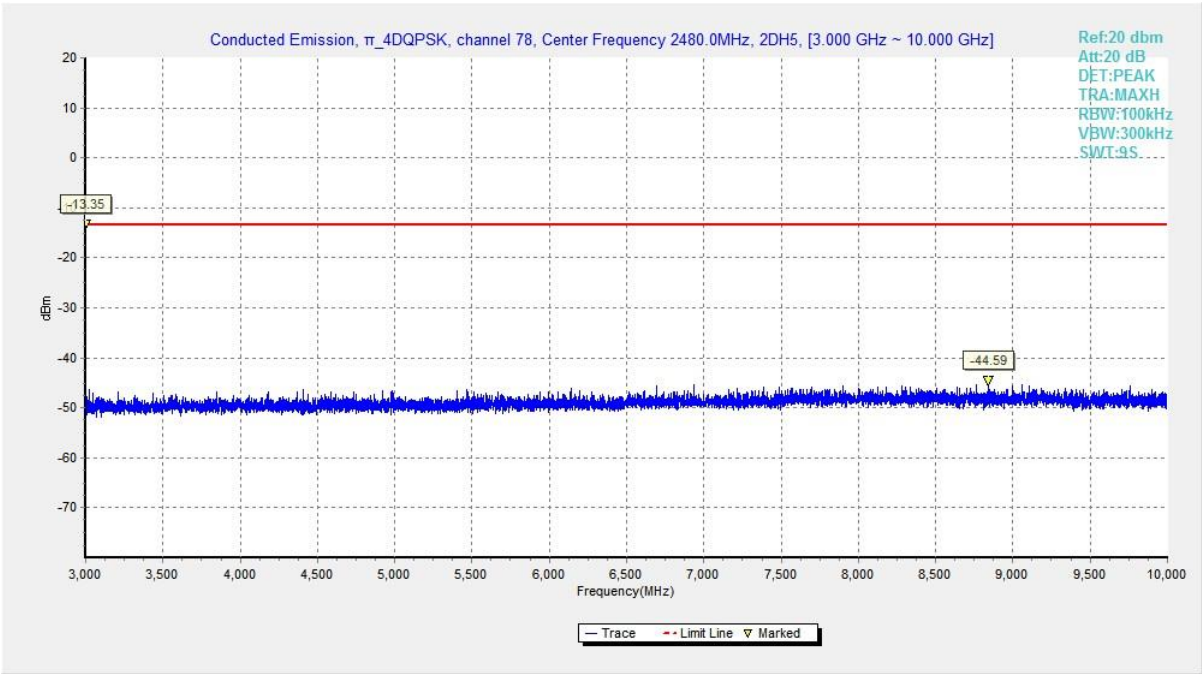

Fig. 24 Conducted Spurious Emission (π /4 DQPSK, Ch78, 3GHz-10GHz)

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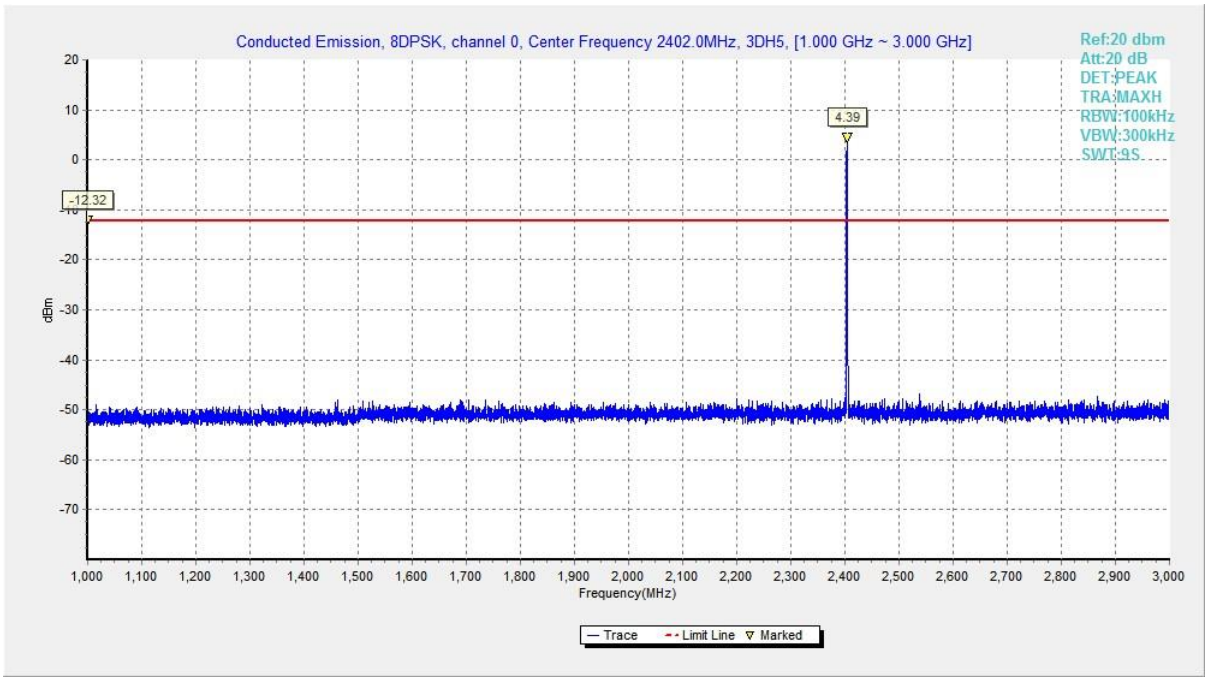

Fig. 25 Conducted Spurious Emission (8DPSK, Ch0, 1GHz-3GHz)

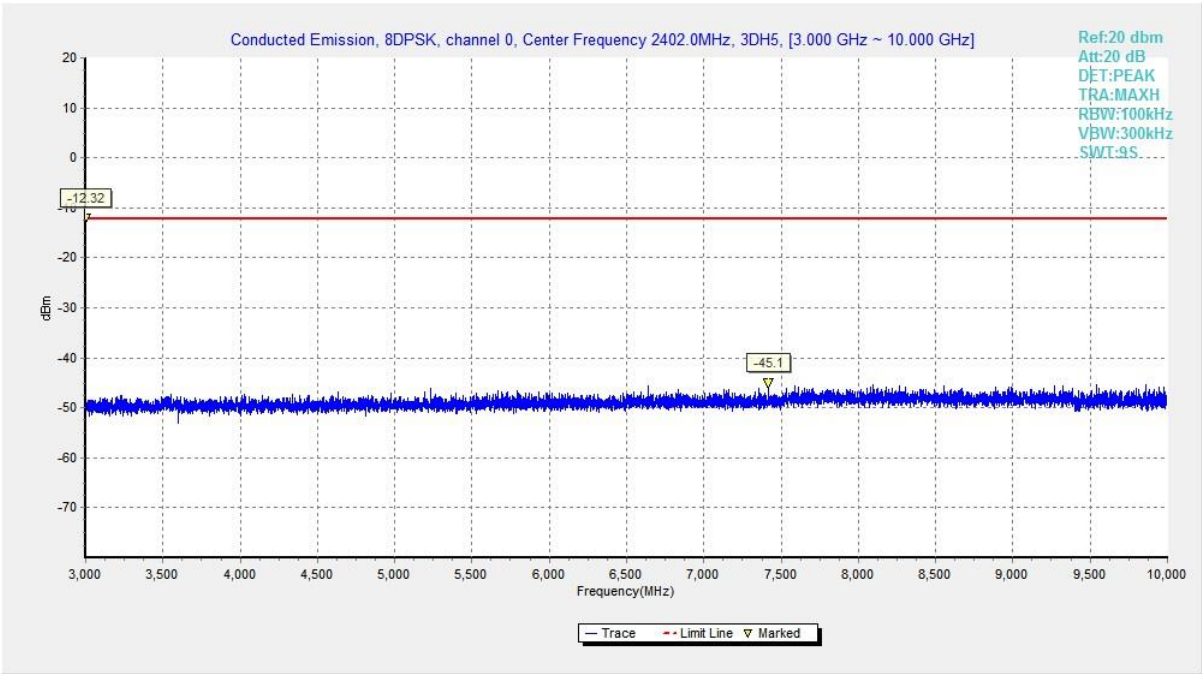

Fig. 26 Conducted Spurious Emission (8DPSK, Ch0, 3GHz-10GHz)

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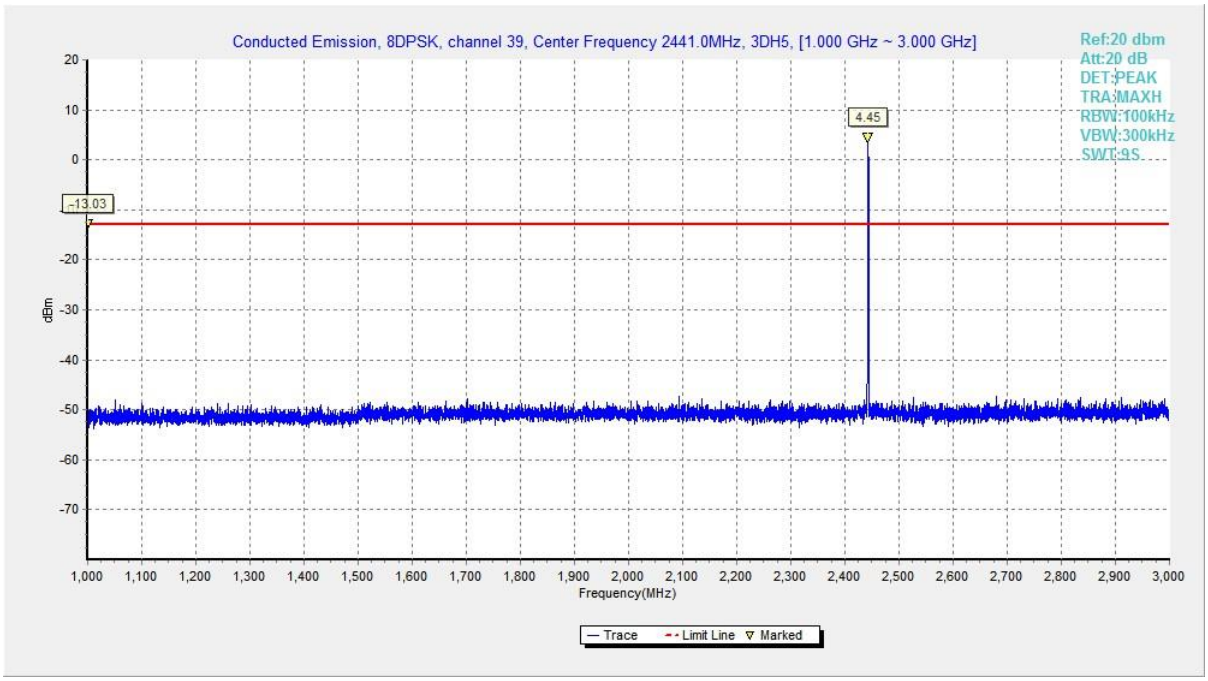

Fig. 27 Conducted Spurious Emission (8DPSK, Ch39, 1GHz-3GHz)

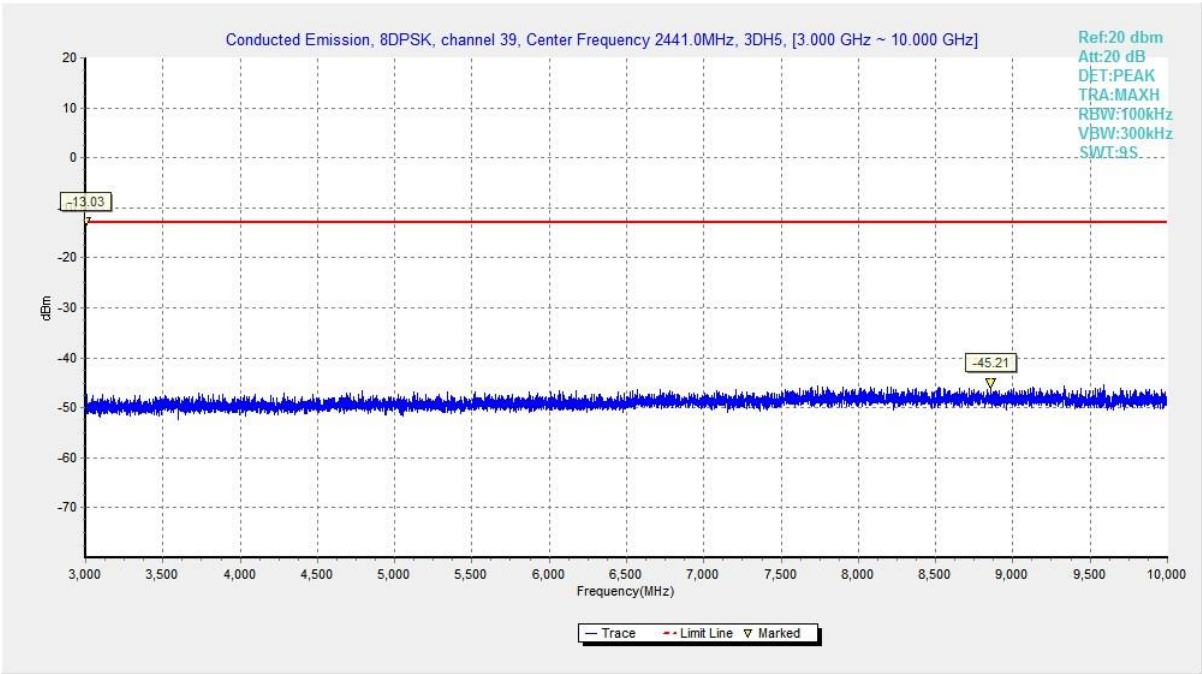

Fig. 28 Conducted Spurious Emission (8DPSK, Ch39, 3GHz-10GHz)

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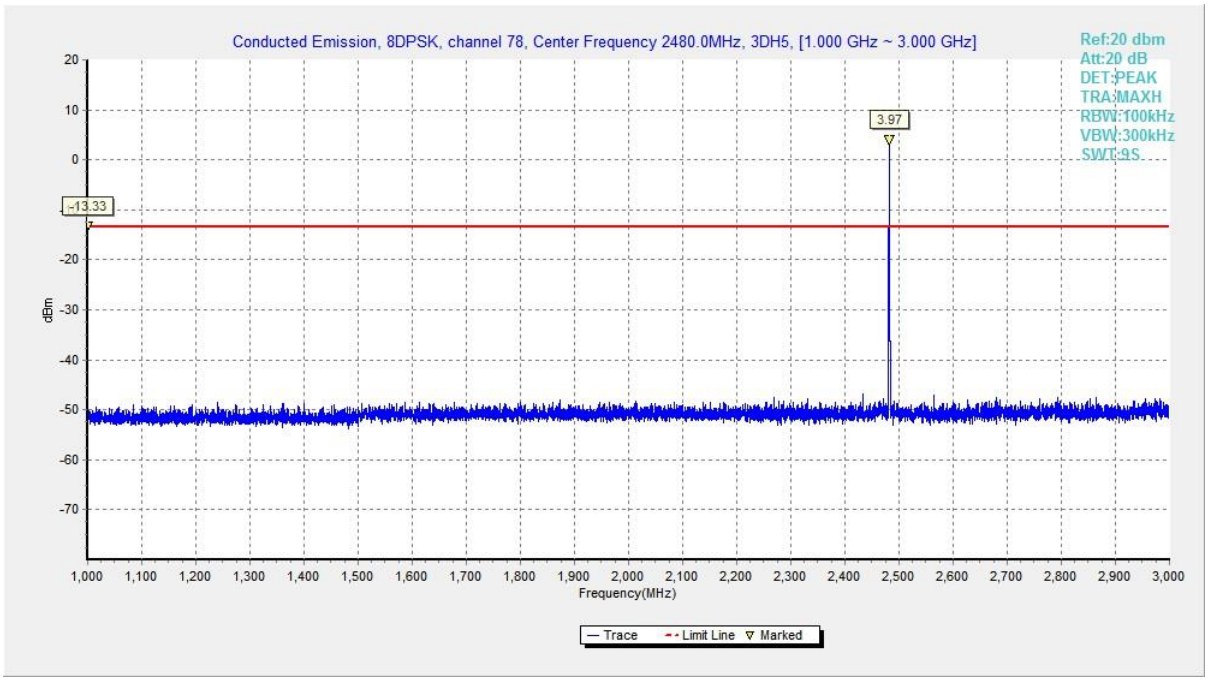

Fig. 29 Conducted Spurious Emission (8DPSK, Ch78, 1GHz-3GHz)

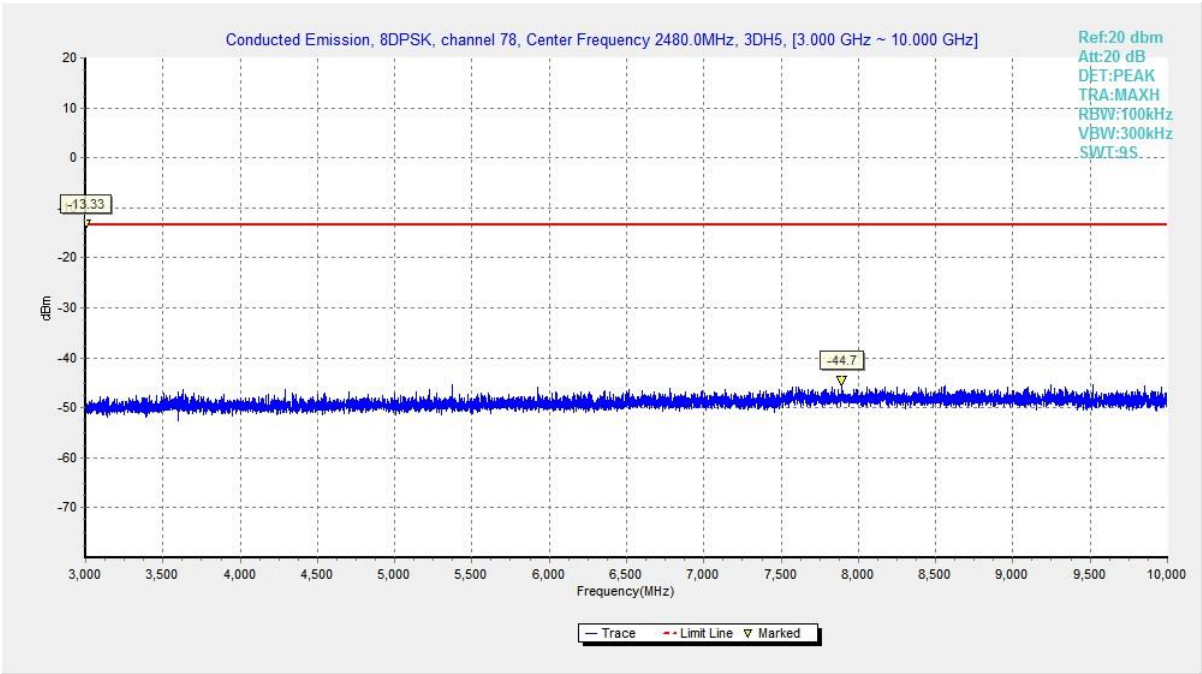

Fig. 30 Conducted Spurious Emission (8DPSK, Ch78, 3GHz-10GHz)

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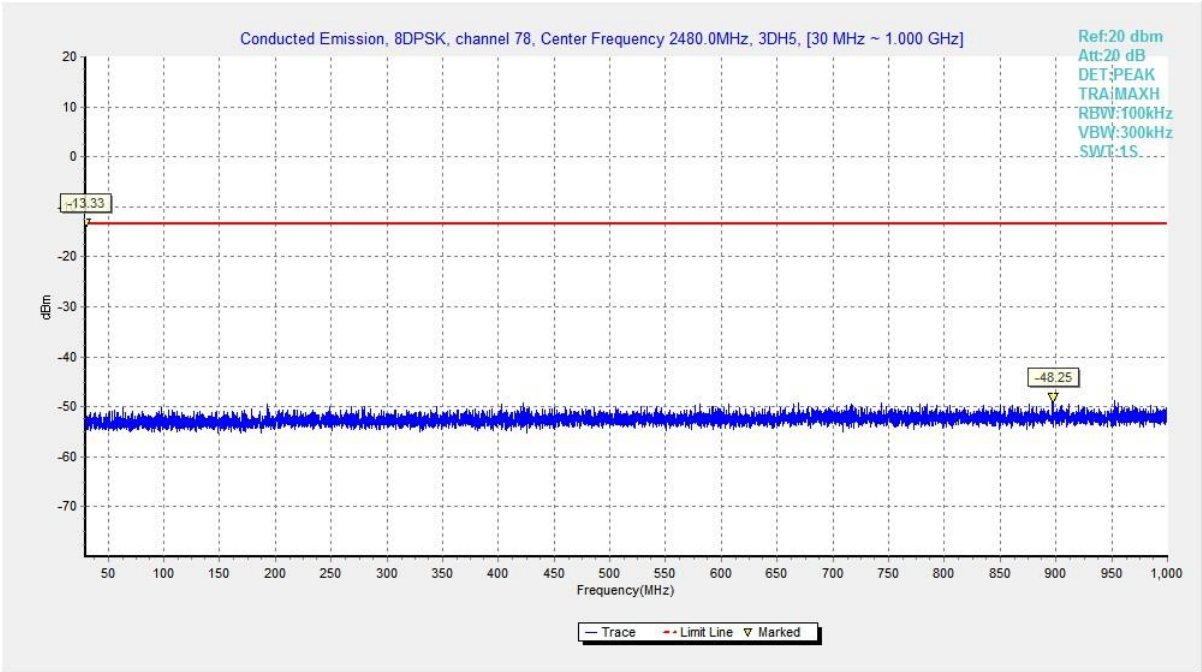

Fig. 31 Conducted Spurious Emission (All channel, 30MHz-1GHz)

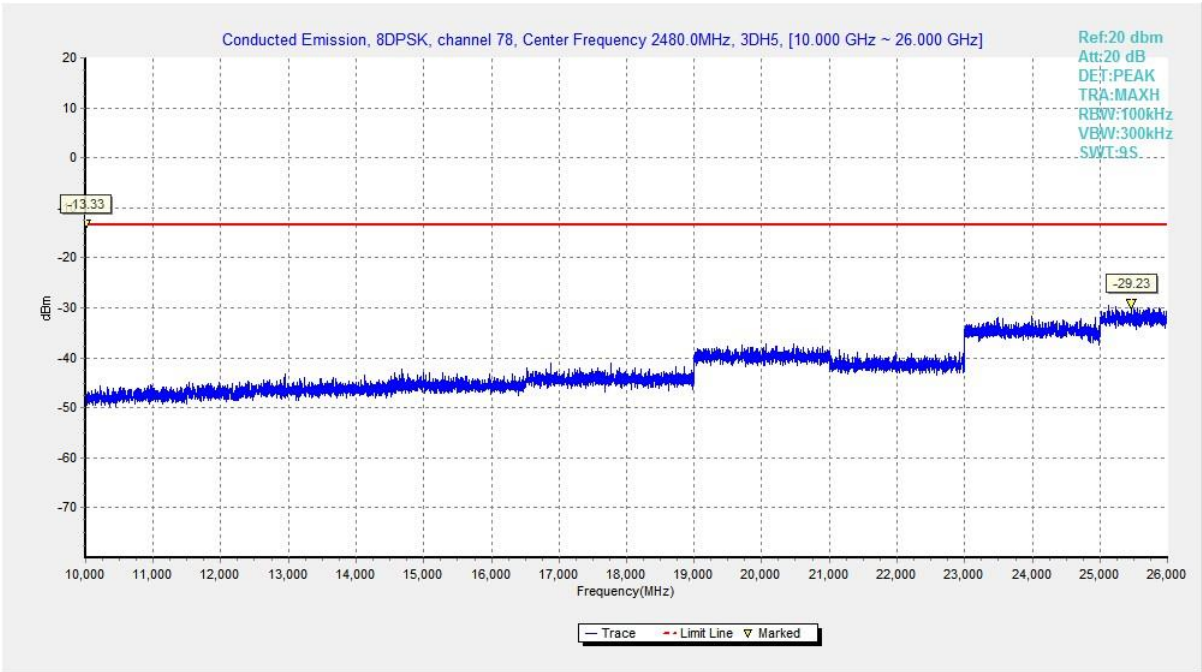

Fig. 32 Conducted Spurious Emission (All channel, 10GHz-26GHz)

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A.4 Radiated Emission

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247, 15.205, 15.209 & RSS-247 section 5.5/RSS-Gen section 6.13	20dB below peak output power

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)).

Limit in restricted band:

Frequency of emission (MHz)	Field strength (μV/m)	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

Test Condition:

The EUT was placed on a non-conductive table. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

Frequency of emission (MHz)	RBW/VBW	Sweep Time (s)
30-1000	120kHz/300kHz	5
1000-4000	1MHz/3MHz	15
4000-18000	1MHz/3MHz	40
18000-26500	1MHz/3MHz	20

Note: According to the performance evaluation, the radiated emission margin of EUT is over 20dB in the band from 9kHz to 30MHz. Therefore, the measurement starts from 30MHz to tenth harmonic.

The measurement results include the horizontal polarization and vertical polarization measurements.

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Measurement Results:

Mode	Channel	Frequency Range	Test Results	Conclusion
GFSK	0	1 GHz ~ 18 GHz	Fig.33	**P**
	39	1 GHz ~ 18 GHz	Fig.34	**P**
	78	1 GHz ~ 18 GHz	Fig.35	**P**
	Restricted Band(CH0)	2.38 GHz ~ 2.45 GHz	Fig.36	**P**
	Restricted Band (CH78)	2.45 GHz ~ 2.5 GHz	Fig.37	**P**
π /4 DQPSK	0	1 GHz ~ 18 GHz	Fig.38	**P**
	39	1 GHz ~ 18 GHz	Fig.39	**P**
	78	1 GHz ~ 18 GHz	Fig.40	**P**
	Restricted Band (CH0)	2.38 GHz ~ 2.45 GHz	Fig.41	**P**
	Restricted Band (CH78)	2.45 GHz ~ 2.5 GHz	Fig.42	**P**
8DPSK	0	1 GHz ~ 18 GHz	Fig.43	**P**
	39	1 GHz ~ 18 GHz	Fig.44	**P**
	78	1 GHz ~ 18 GHz	Fig.45	**P**
	Restricted Band (CH0)	2.38 GHz ~ 2.45 GHz	Fig.46	**P**
	Restricted Band (CH78)	2.45 GHz ~ 2.5 GHz	Fig.47	**P**
/	All channels	9 kHz ~ 30 MHz	Fig.48	**P**
		30 MHz ~ 1 GHz	Fig.49	**P**
		18 GHz ~ 26.5 GHz	Fig.50	**P**

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Worst Case Result

GFSK CH39 (1-18GHz)

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
4882.500000	51.22	74.00	22.78	H	3.7
5844.000000	47.70	74.00	26.30	H	4.7
8219.142857	44.60	74.00	29.40	V	5.9
11153.142857	46.75	74.00	27.25	V	9.7
16971.428571	54.50	74.00	19.50	V	18.3
17921.142857	54.02	74.00	19.98	H	18.9

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
4882.500000	42.95	54.00	11.05	H	3.7
5844.000000	35.33	54.00	18.67	H	4.7
8219.142857	34.48	54.00	19.52	V	5.9
11153.142857	36.73	54.00	17.27	V	9.7
16971.428571	41.79	54.00	12.21	V	18.3
17921.142857	41.94	54.00	12.06	H	18.9

π /4 DQPSK CH39 (1-18GHz)

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
4881.900000	50.15	74.00	23.85	H	3.7
5547.900000	47.38	74.00	26.62	V	3.8
7609.285714	45.13	74.00	28.87	H	5.7
11161.285714	46.79	74.00	27.21	H	9.7
17073.428571	53.38	74.00	20.62	H	18.5
17942.142857	55.42	74.00	18.58	H	19.0

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
4881.900000	40.75	54.00	13.25	H	3.7
5547.900000	35.00	54.00	19.00	V	3.8
7609.285714	34.17	54.00	19.83	H	5.7
11161.285714	36.61	54.00	17.39	H	9.7
17073.428571	41.36	54.00	12.64	H	18.5
17942.142857	42.08	54.00	11.92	H	19.0

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8DPSK CH39 (1-18GHz)

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
4881.900000	50.59	74.00	23.41	H	3.7
5910.000000	47.26	74.00	26.74	V	4.6
8230.285714	45.52	74.00	28.48	H	5.9
12224.142857	47.28	74.00	26.72	V	10.9
16938.000000	54.00	74.00	20.00	V	18.2
17953.285714	54.45	74.00	19.55	V	19.0

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Pol	Corr. (dB)
4881.900000	40.69	54.00	13.31	H	3.7
5910.000000	35.25	54.00	18.75	V	4.6
8230.285714	32.71	54.00	21.29	H	5.9
12224.142857	34.96	54.00	19.04	V	10.9
16938.000000	41.85	54.00	12.15	V	18.2
17953.285714	41.97	54.00	12.03	V	19.0

Note:

A "reference path loss" is established and the A_{Rpl} is the attenuation of “reference path loss”, and Antenna Factor, the gain of the preamplifier, the cable loss. P_{Mea} is the field strength recorded from the instrument.

The measurement results are obtained as described below:

Result = P_{Mea} + Cable Loss + Antenna Factor - Gain of the preamplifier

See below for test graphs.

Conclusion: Pass

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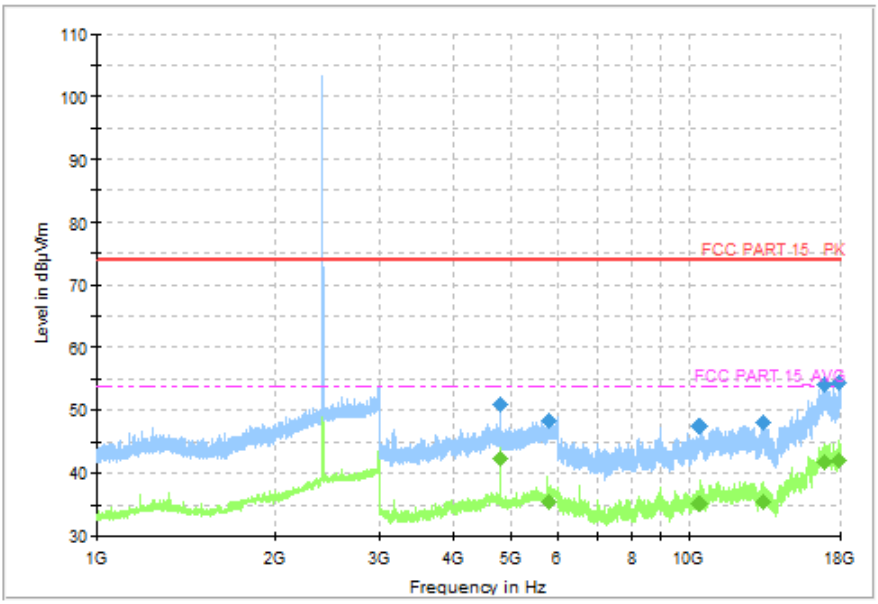

Fig. 33 Radiated Spurious Emission (GFSK, Ch0, 1GHz ~ 18GHz)

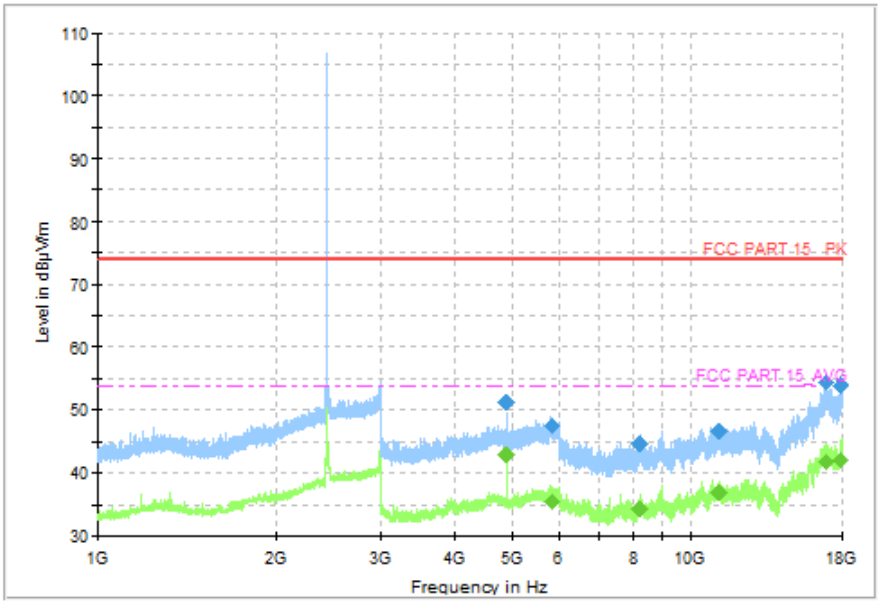

Fig. 34 Radiated Spurious Emission (GFSK, Ch39, 1GHz ~ 18GHz)

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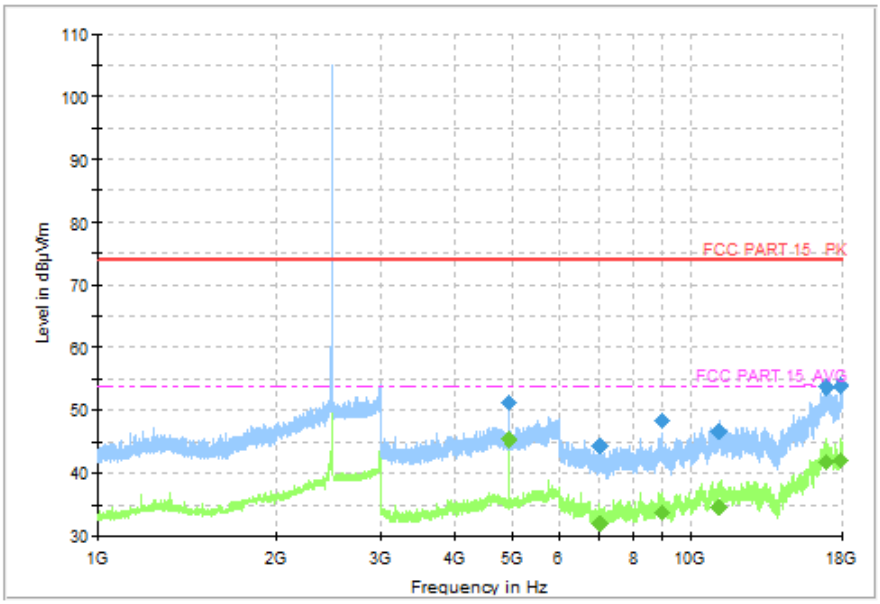

Fig. 35 Radiated Spurious Emission (GFSK, Ch78, 1GHz ~ 18GHz)

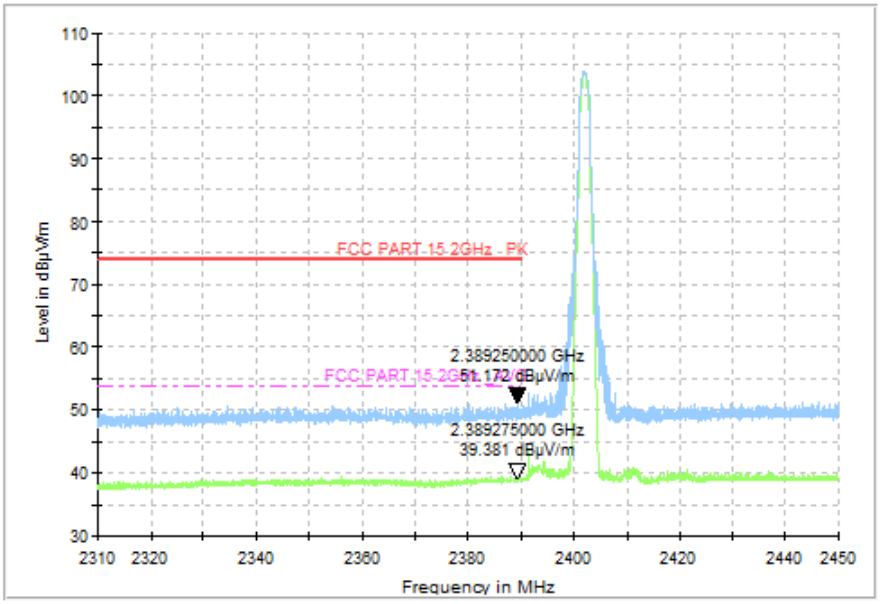

Fig. 36 Radiated Band Edges (GFSK, Ch0, 2380GHz ~ 2450GHz)

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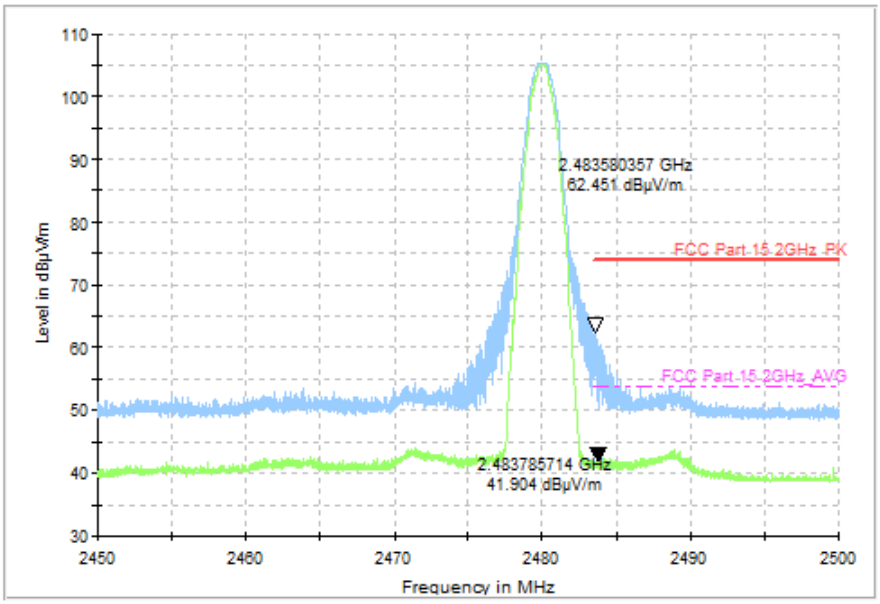

Fig. 37 Radiated Band Edges (GFSK, Ch78, 2450GHz ~ 2500GHz)

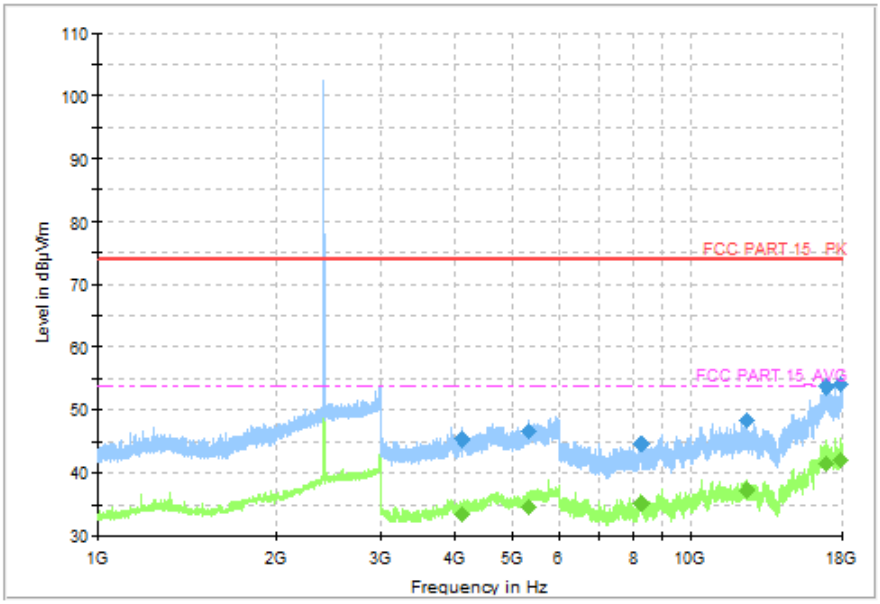

Fig. 38 Radiated Spurious Emission (π /4 DQPSK, Ch0, 1GHz ~ 18GHz)

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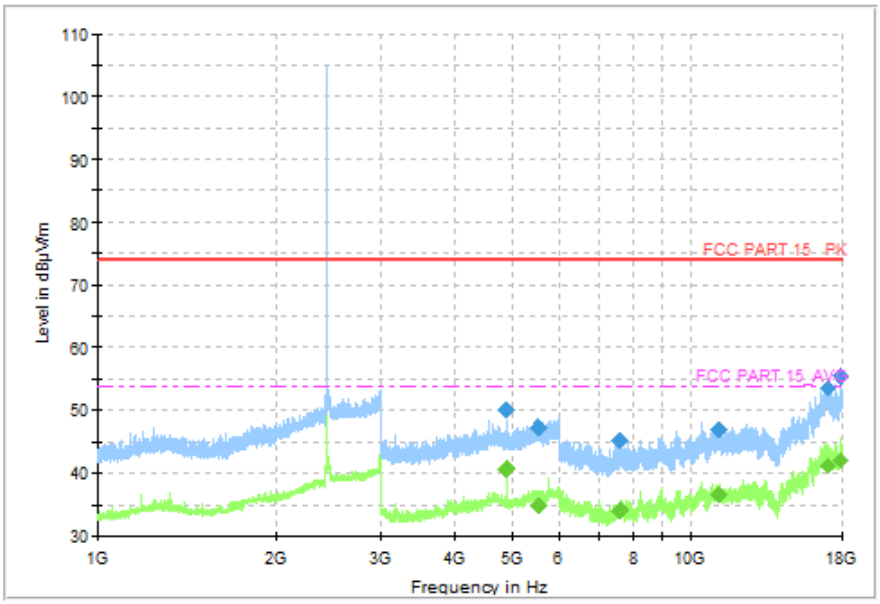

Fig. 39 Radiated Spurious Emission (π /4 DQPSK, Ch39, 1GHz ~ 18GHz)

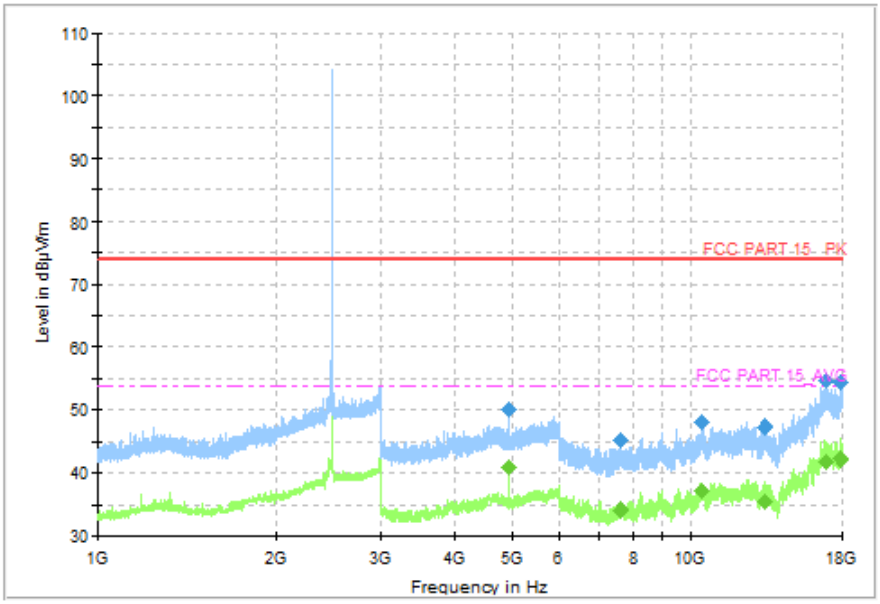

Fig. 40 Radiated Spurious Emission (π /4 DQPSK, Ch78, 1GHz ~ 18GHz)

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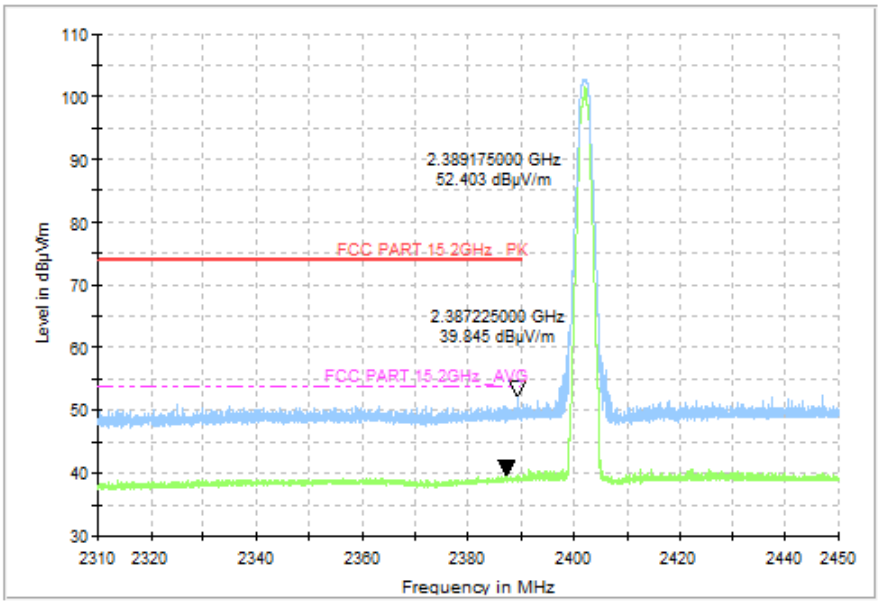

Fig. 41 Radiated Band Edges (π /4 DQPSK, Ch0, 2380GHz ~ 2450GHz)

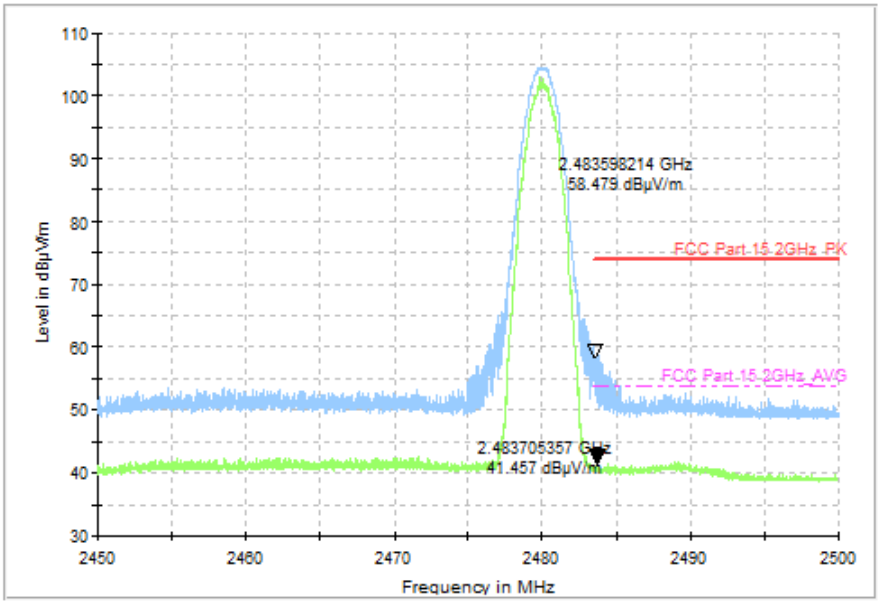

Fig. 42 Radiated Band Edges (π /4 DQPSK, Ch78, 2450GHz ~ 2500GHz)

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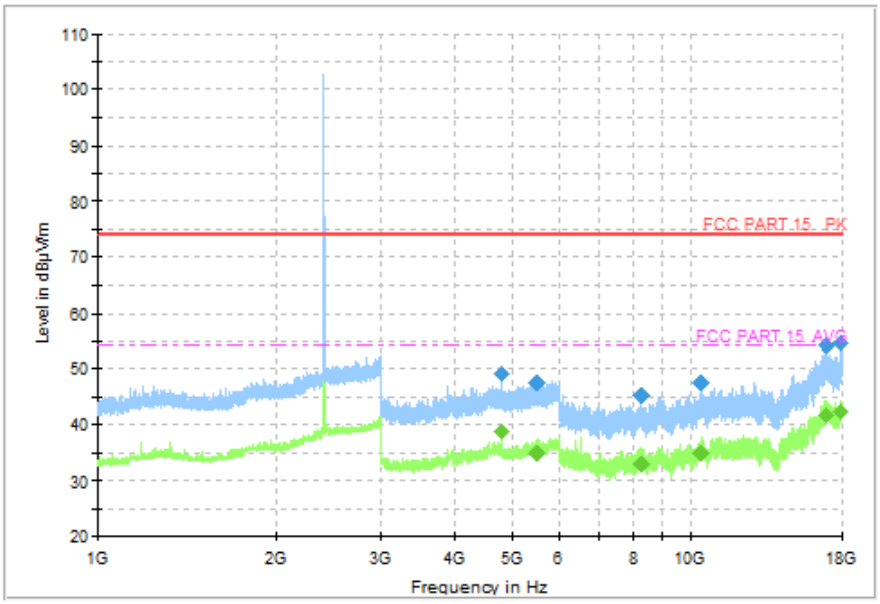

Fig. 43 Radiated Spurious Emission (8DPSK, Ch0, 1GHz ~ 18GHz)

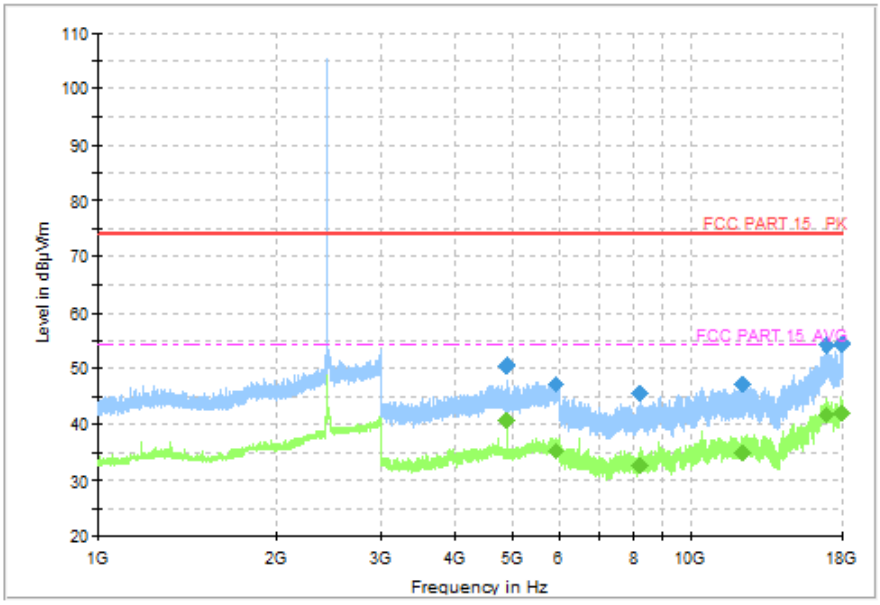

Fig. 44 Radiated Spurious Emission (8DPSK, Ch39, 1GHz ~ 18GHz)

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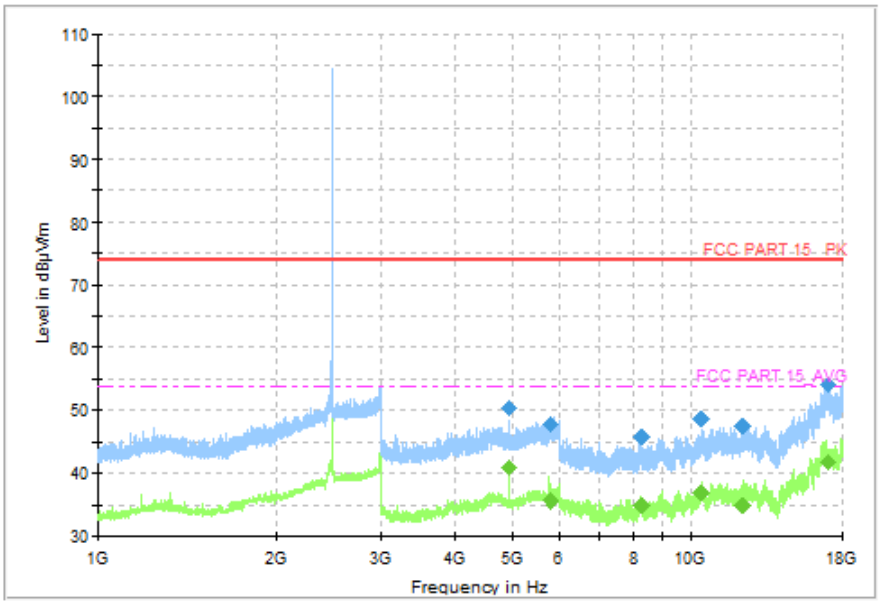

Fig. 45 Radiated Spurious Emission (8DPSK, Ch78, 1GHz ~ 18GHz)

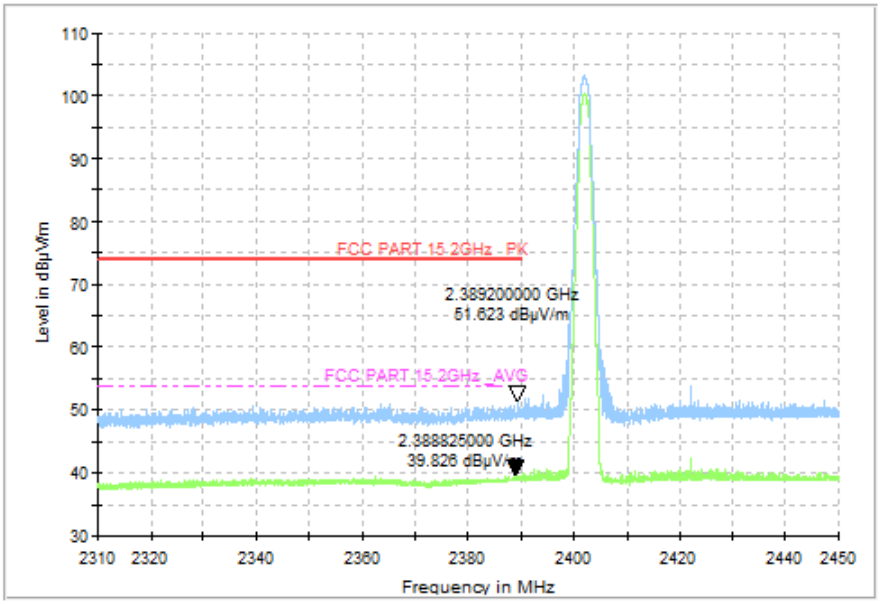

Fig. 46 Radiated Band Edges (8DPSK, Ch0, 2380GHz ~ 2450GHz)

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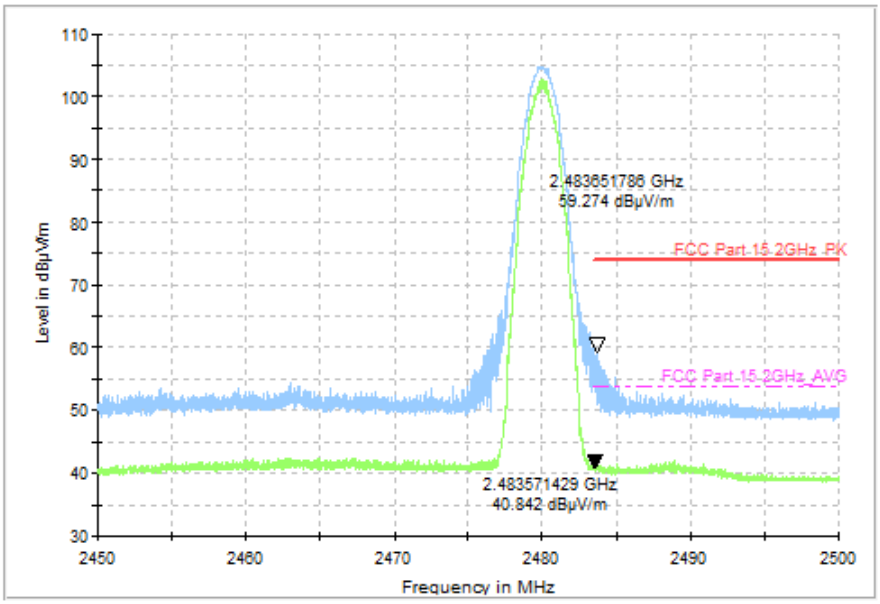

Fig. 47 Radiated Band Edges (8DPSK, Ch78, 2450GHz ~ 2500GHz)

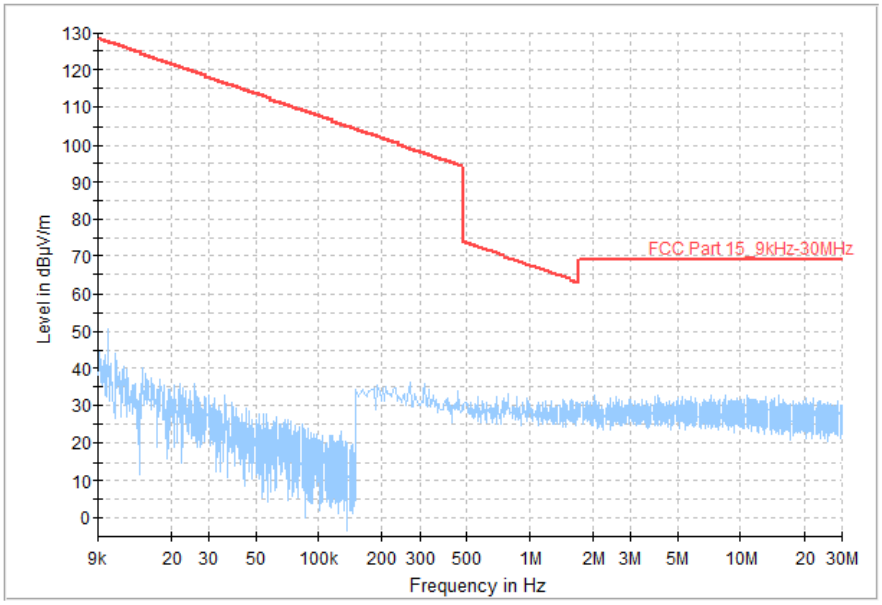

Fig. 48 Radiated Spurious Emission (All Channels, 9kHz ~ 30MHz)

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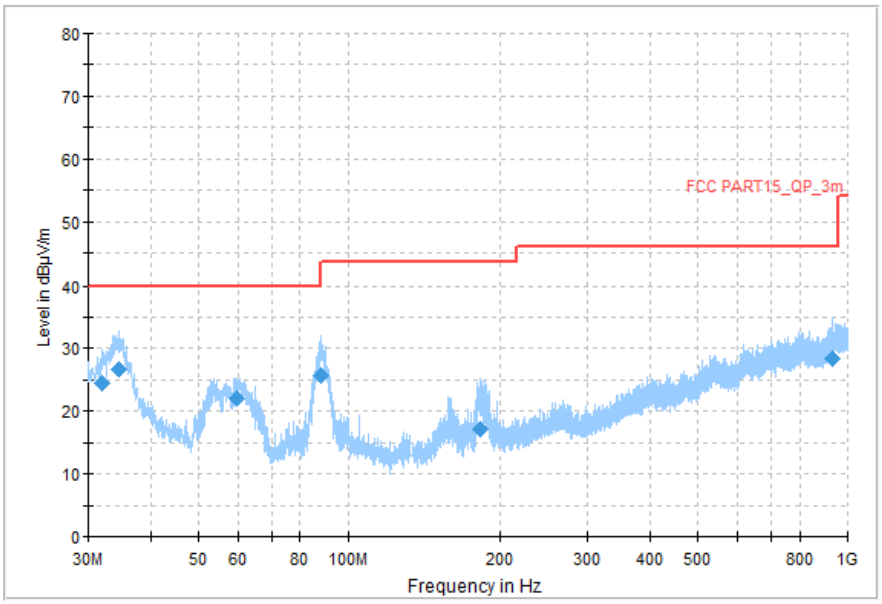

Fig. 49 Radiated Spurious Emission (All Channels, 30MHz ~ 1GHz)

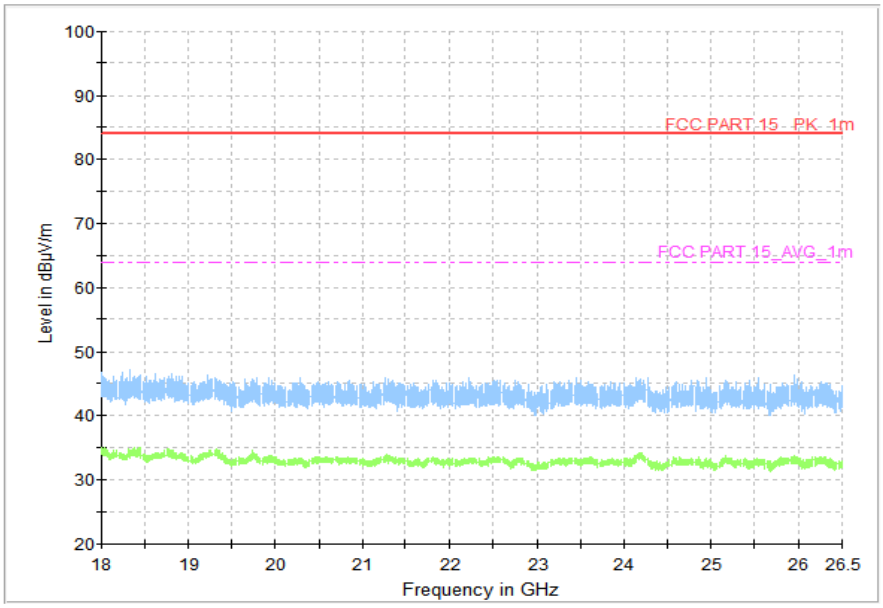

Fig. 50 Radiated Spurious Emission (All Channels, 18GHz ~ 26.5GHz)

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A.5 20dB Bandwidth

Measurement Limit:

Standard	Limit (kHz)
FCC 47 CFR Part 15.247 (a) & RSS-247 section 5.1	/

Measurement Result:

Mode	Channel	20dB Bandwidth (kHz)		conclusion
GFSK	0	Fig.51	930.00	/
	39	Fig.52	925.50	
	78	Fig.53	927.00	
π /4 DQPSK	0	Fig.54	1285.50	/
	39	Fig.55	1284.75	
	78	Fig.56	1312.50	
8DPSK	0	Fig.57	1300.50	/
	39	Fig.58	1282.50	
	78	Fig.59	1281.75	

See below for test graphs.

Conclusion: PASS

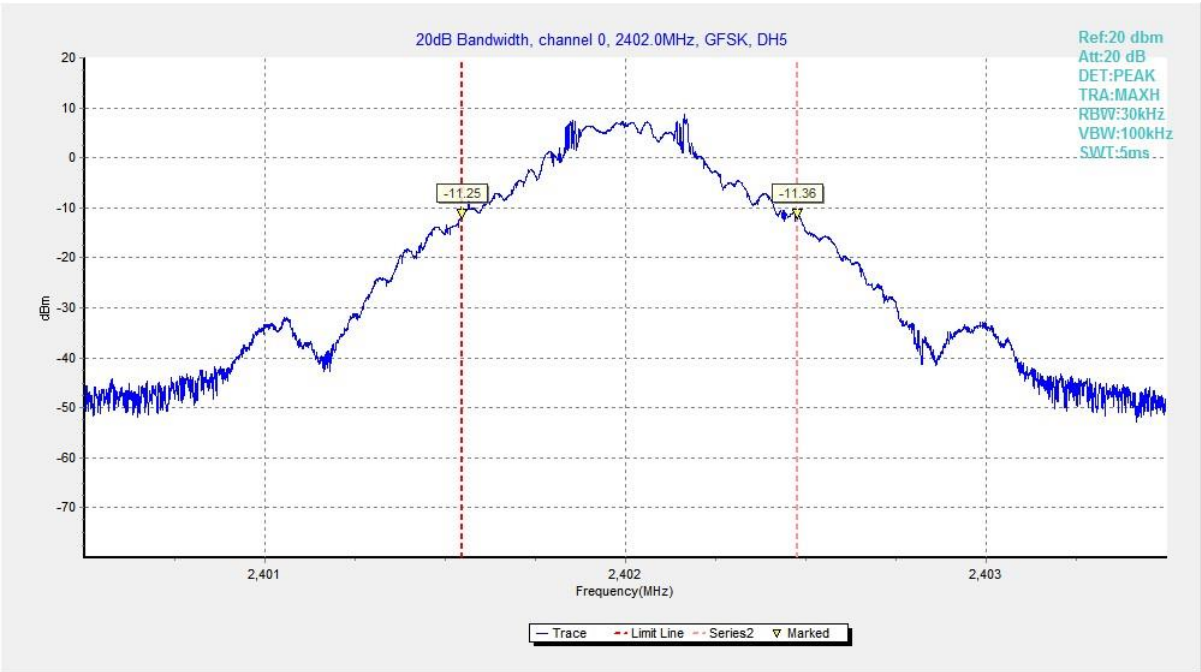

Fig. 51 20dB Bandwidth (GFSK, Ch 0)

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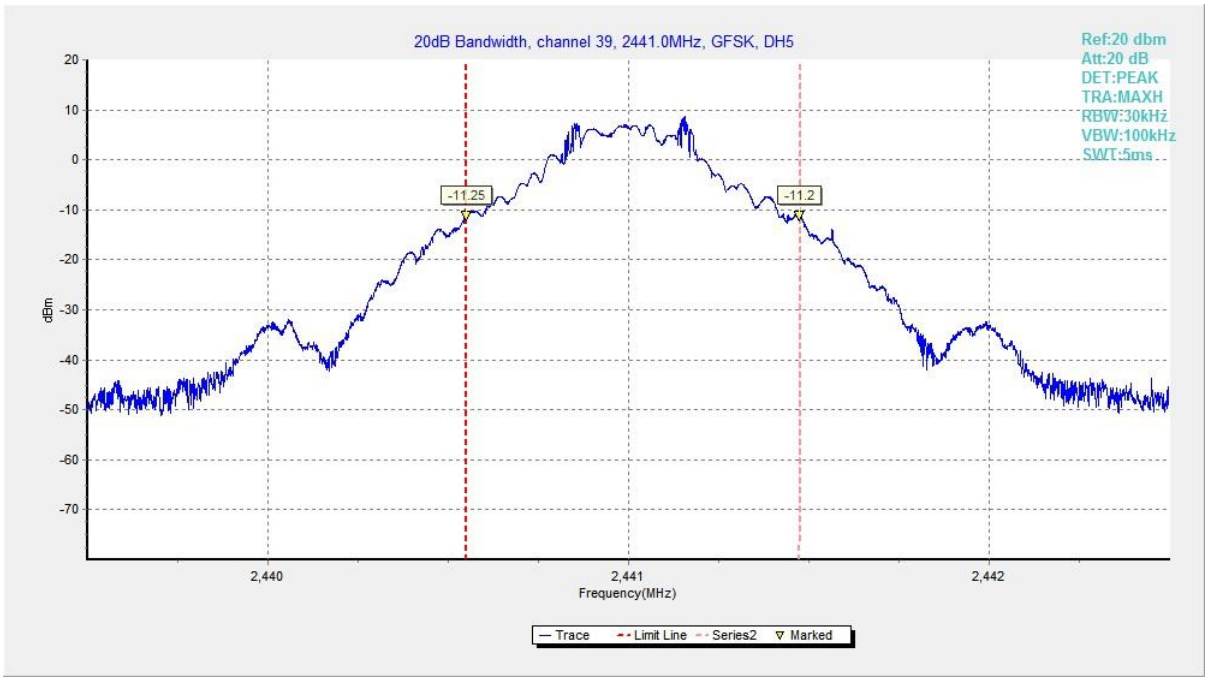

Fig. 52 20dB Bandwidth (GFSK, Ch 39)

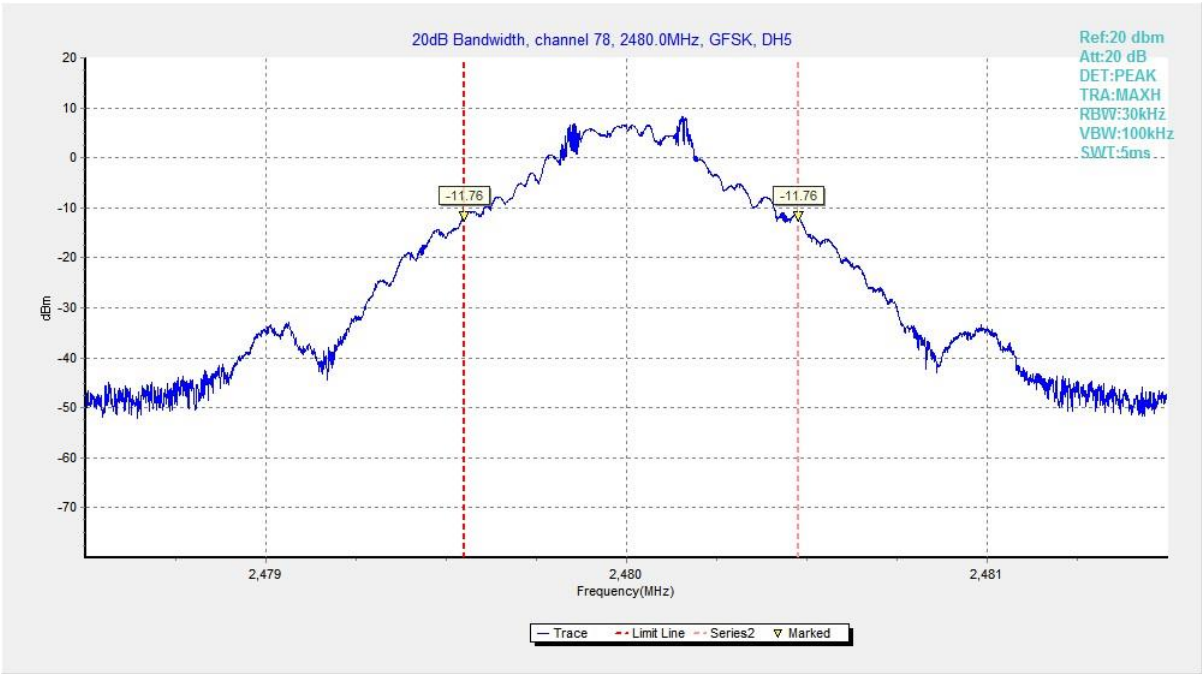

Fig. 53 20dB Bandwidth (GFSK, Ch 78)

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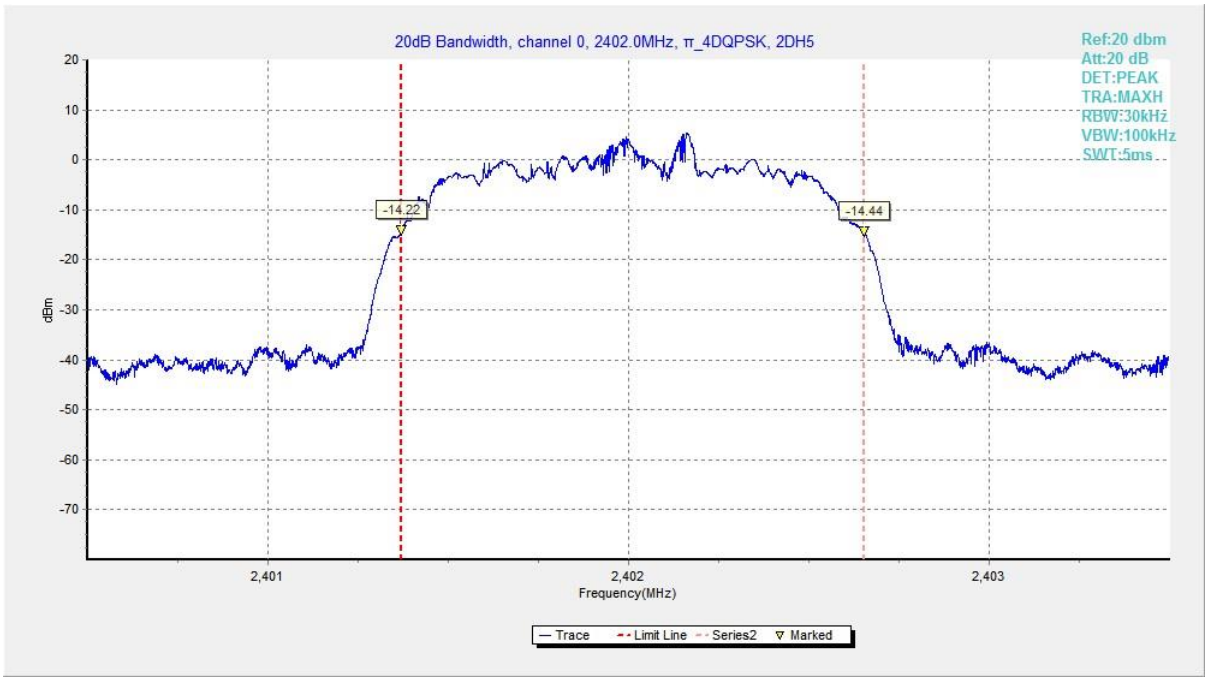

Fig. 54 20dB Bandwidth (π /4 DQPSK, Ch 0)

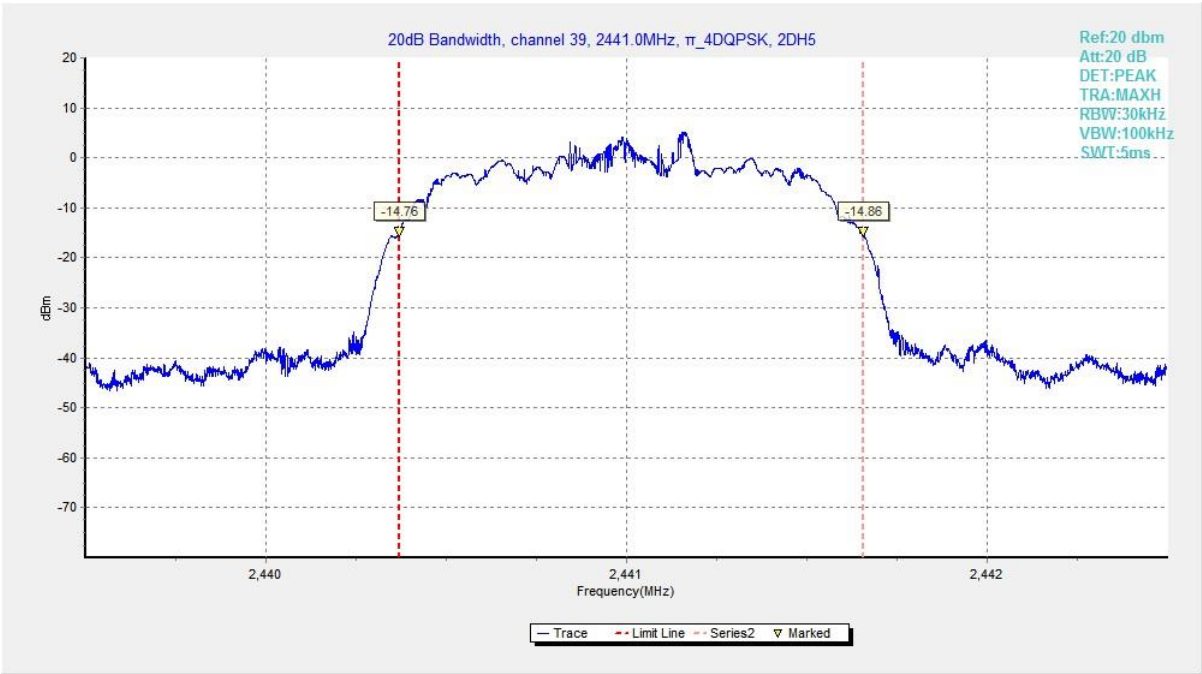

Fig. 55 20dB Bandwidth (π /4 DQPSK, Ch 39)

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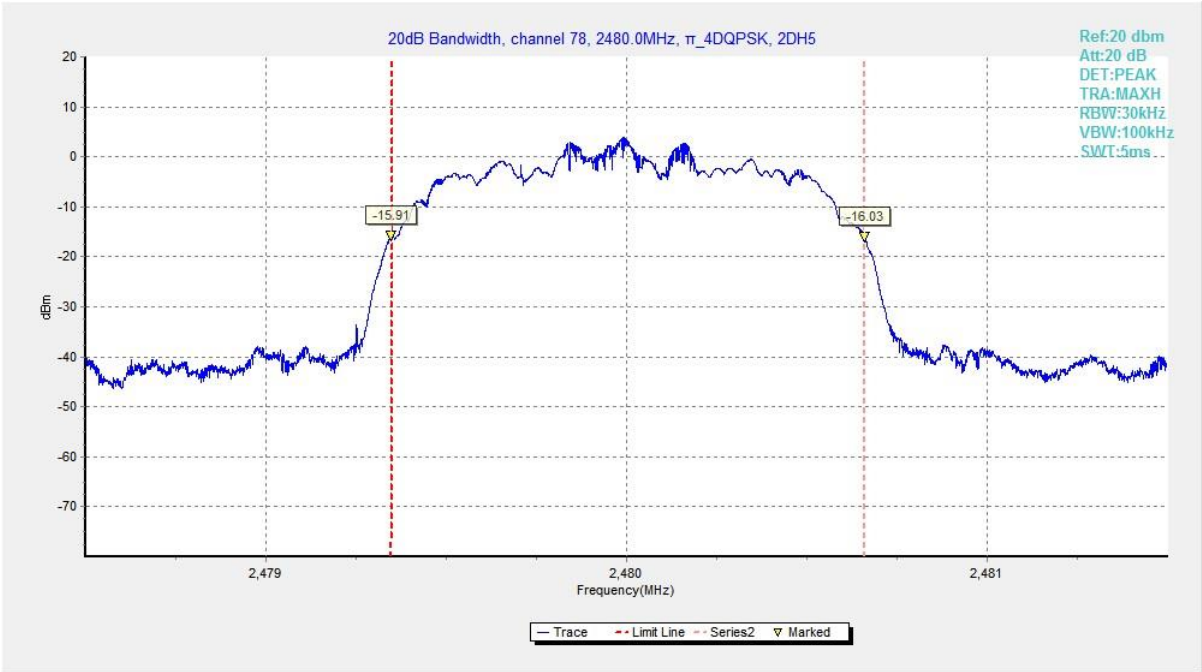

Fig. 56 20dB Bandwidth (π /4 DQPSK, Ch 78)

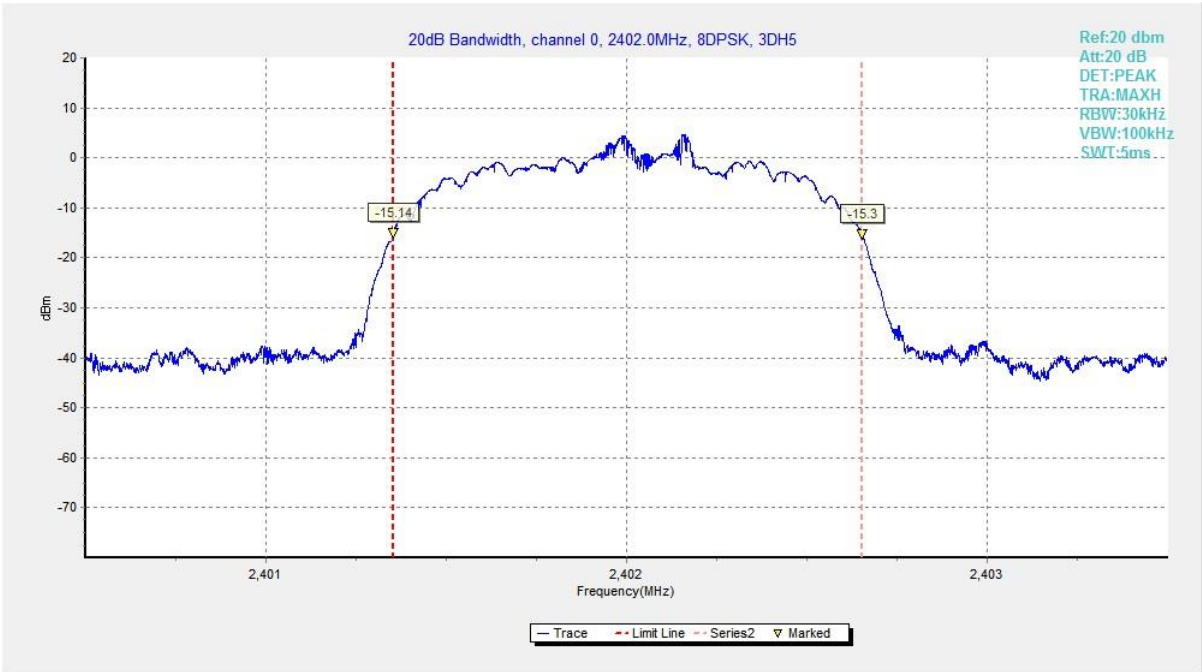

Fig. 57 20dB Bandwidth (8DPSK, Ch 0)

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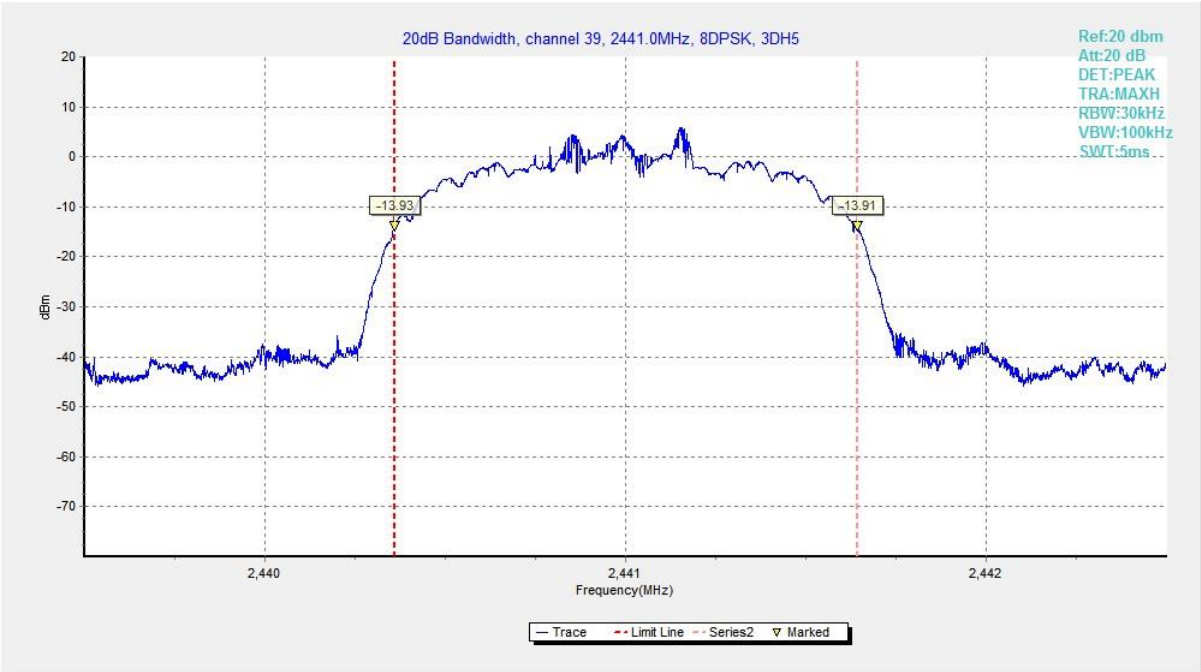

Fig. 58 20dB Bandwidth (8DPSK, Ch 39)

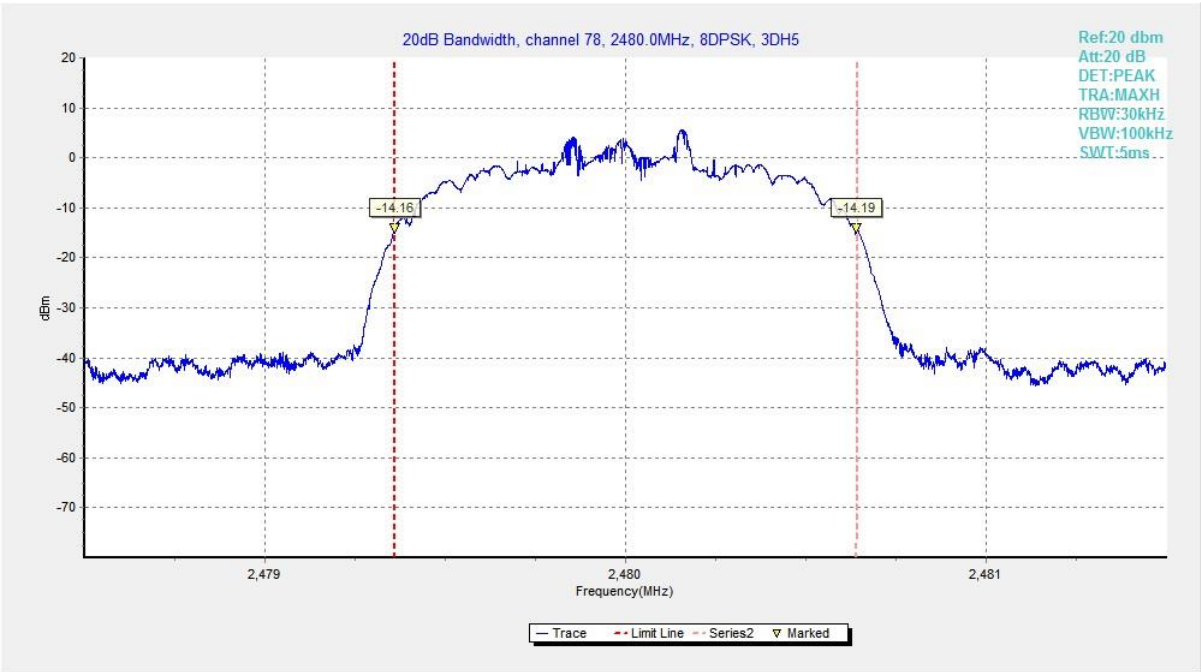

Fig. 59 20dB Bandwidth (8DPSK, Ch 78)

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A.6 Time of Occupancy (Dwell Time)

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247 (a) & RSS-247 section 5.1	< 400 ms

Measurement Results:

Mode	Channel	Packet	Dwell Time(ms)		Conclusion
GFSK	39	DH5	Fig.60	180.82	**P**
			Fig.61		
π /4 DQPSK	39	2-DH5	Fig.62	172.37	**P**
			Fig.63		
8DPSK	39	3-DH5	Fig.64	228.27	**P**
			Fig.65		

See below for test graphs.

Conclusion: Pass

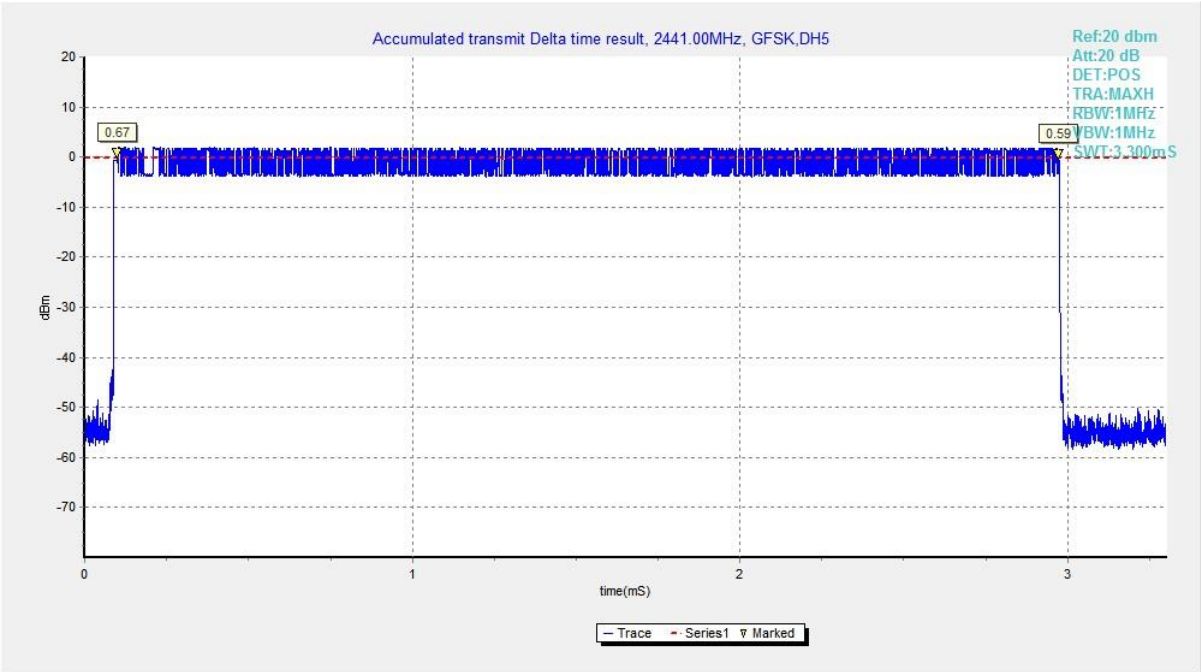

Fig. 60 Time of Occupancy(Dwell Time) (GFSK, Ch39)

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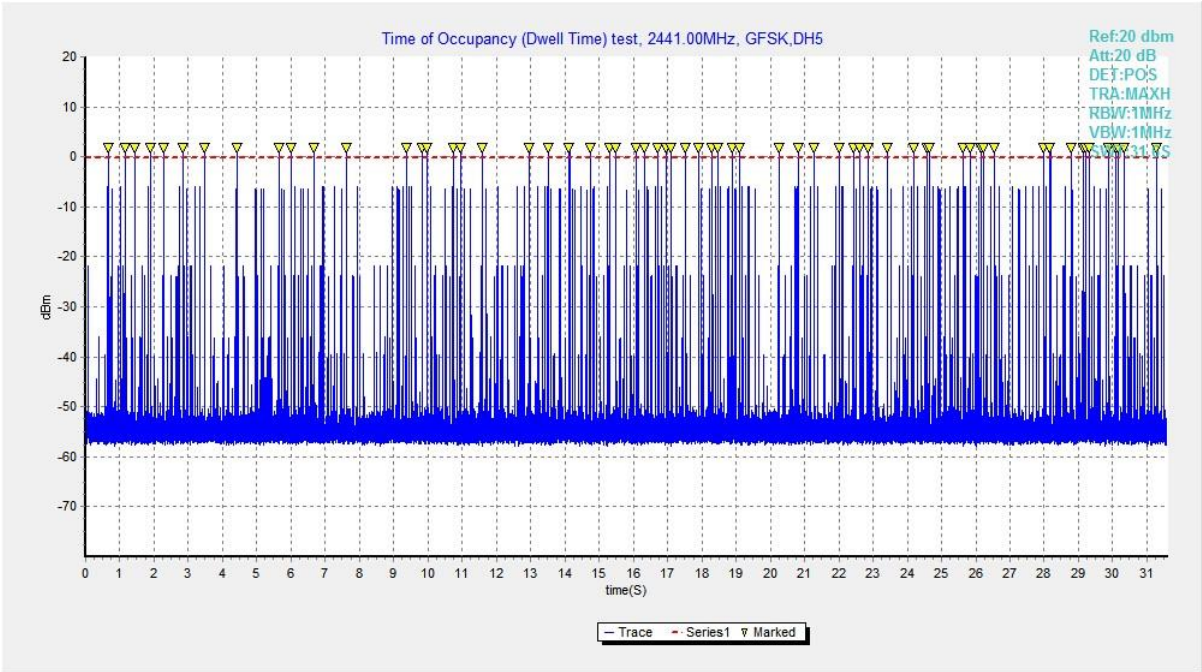

Fig. 61 Time of Occupancy(Dwell Time) (GFSK, Ch39)

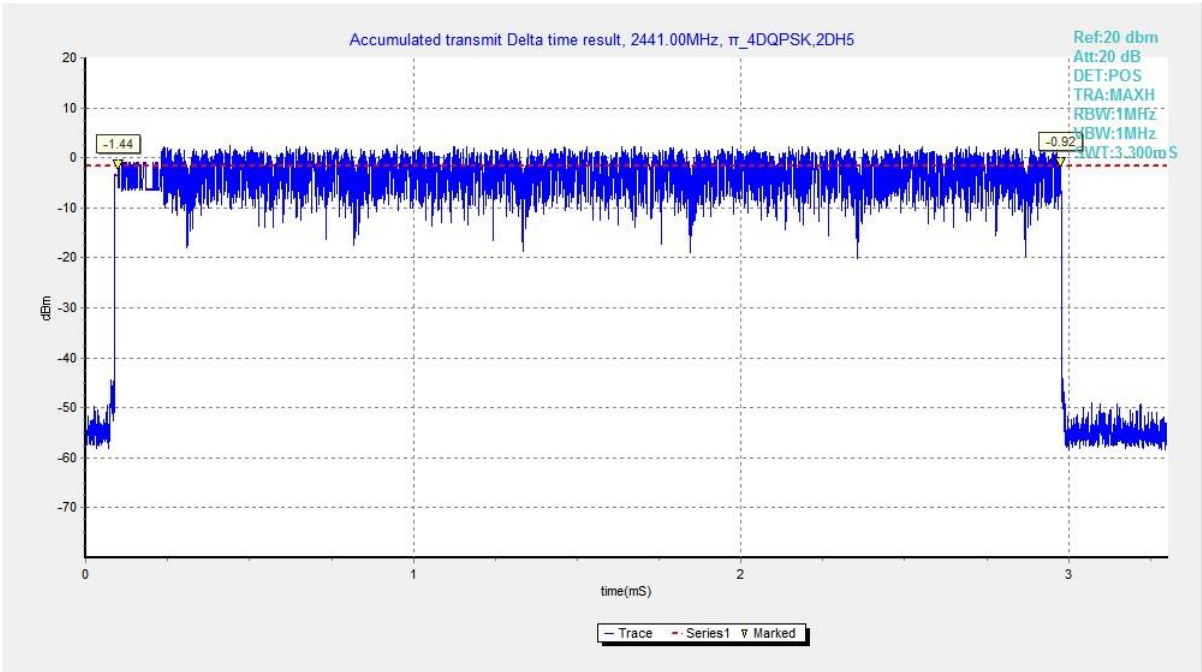

Fig. 62 Time of Occupancy(Dwell Time) (π /4 DQPSK, Ch39)

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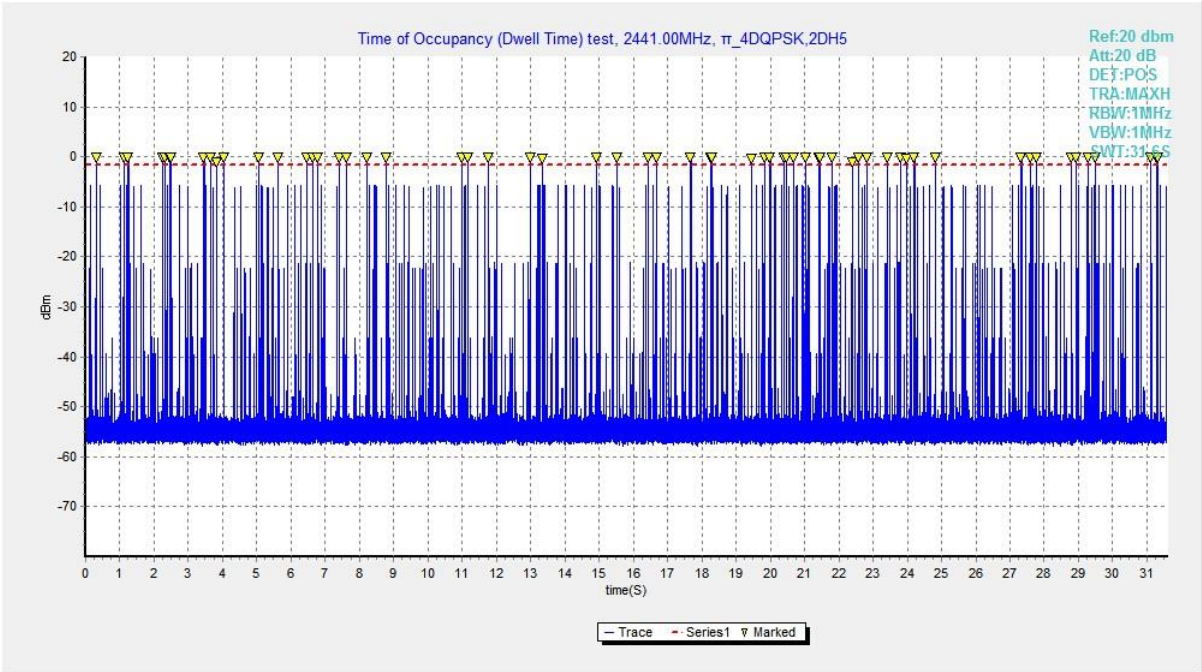

Fig. 63 Time of Occupancy(Dwell Time) (π /4 DQPSK, Ch39)

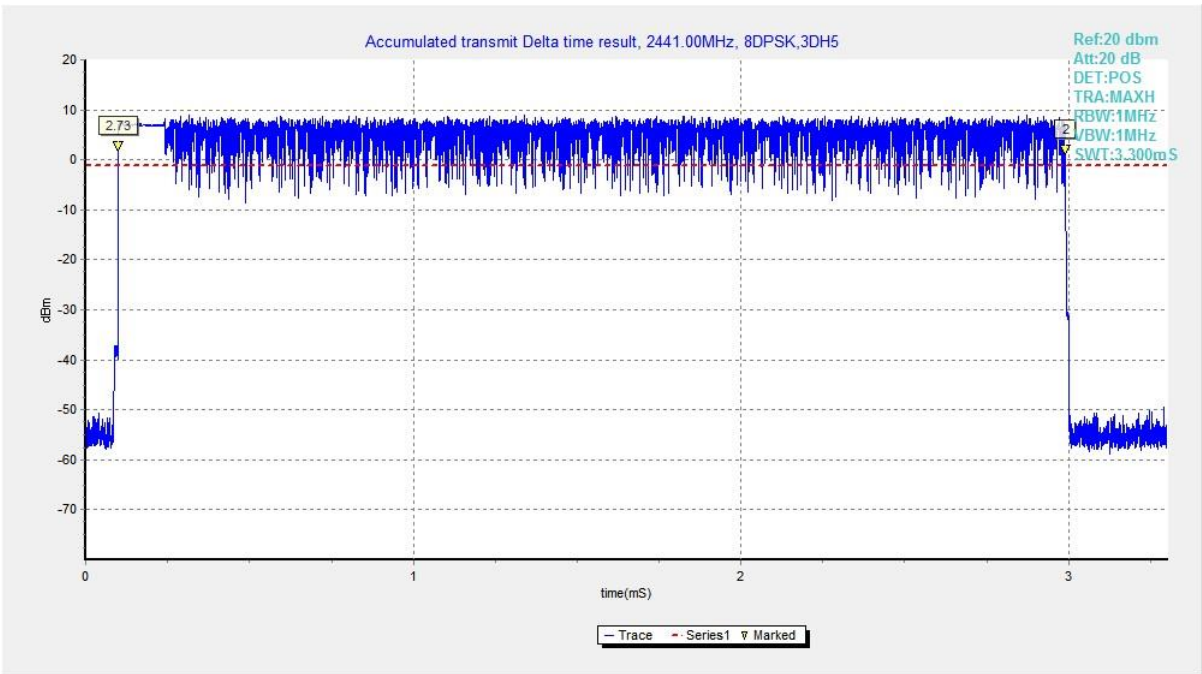

Fig. 64 Time of Occupancy(Dwell Time) (8DPSK, Ch39)

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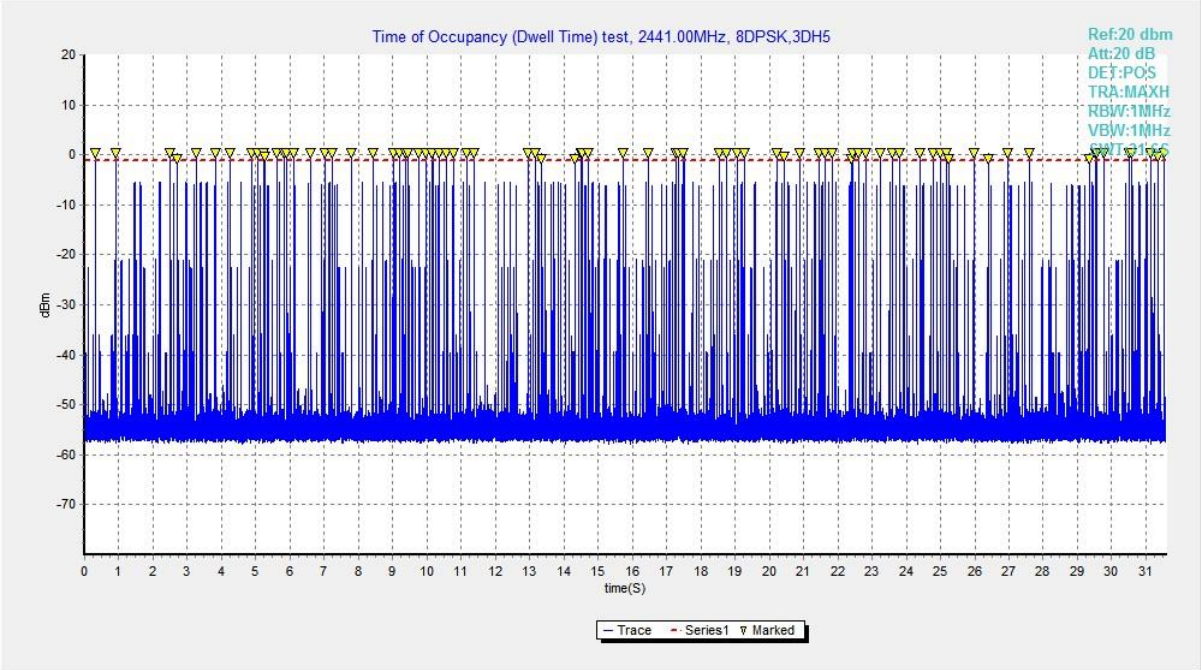

Fig. 65 Time of Occupancy(Dwell Time) (8DPSK, Ch39)

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A.7 Number of Hopping Channels

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247(a) & RSS-247 section 5.1	At least 15 non-overlapping channels

Measurement Results:

Mode	Packet	Number of hopping channels		Test result	Conclusion
GFSK	DH5	Fig.66	Fig.67	79	**P**
π /4 DQPSK	2-DH5	Fig.68	Fig.69	79	**P**
8DPSK	3-DH5	Fig.70	Fig.71	79	**P**

See below for test graphs.

Conclusion: Pass

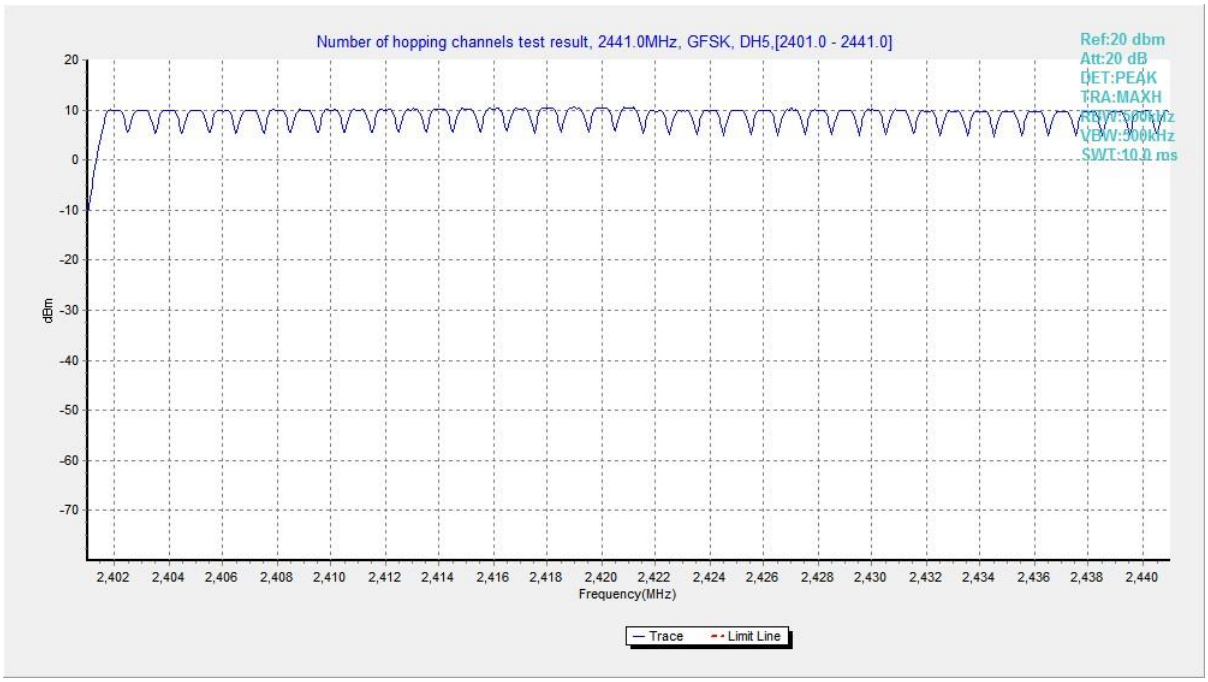

Fig. 66 Hopping channel ch0~39 (GFSK, Ch39)

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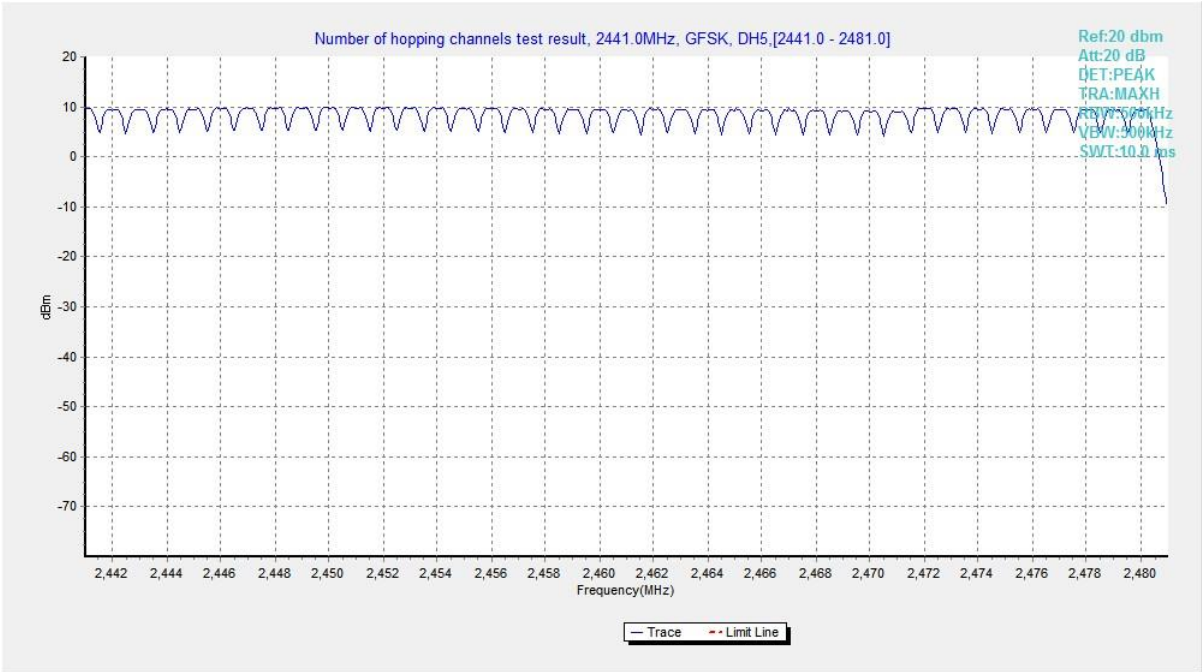

Fig. 67 Hopping channel ch40~78 (GFSK, Ch39)

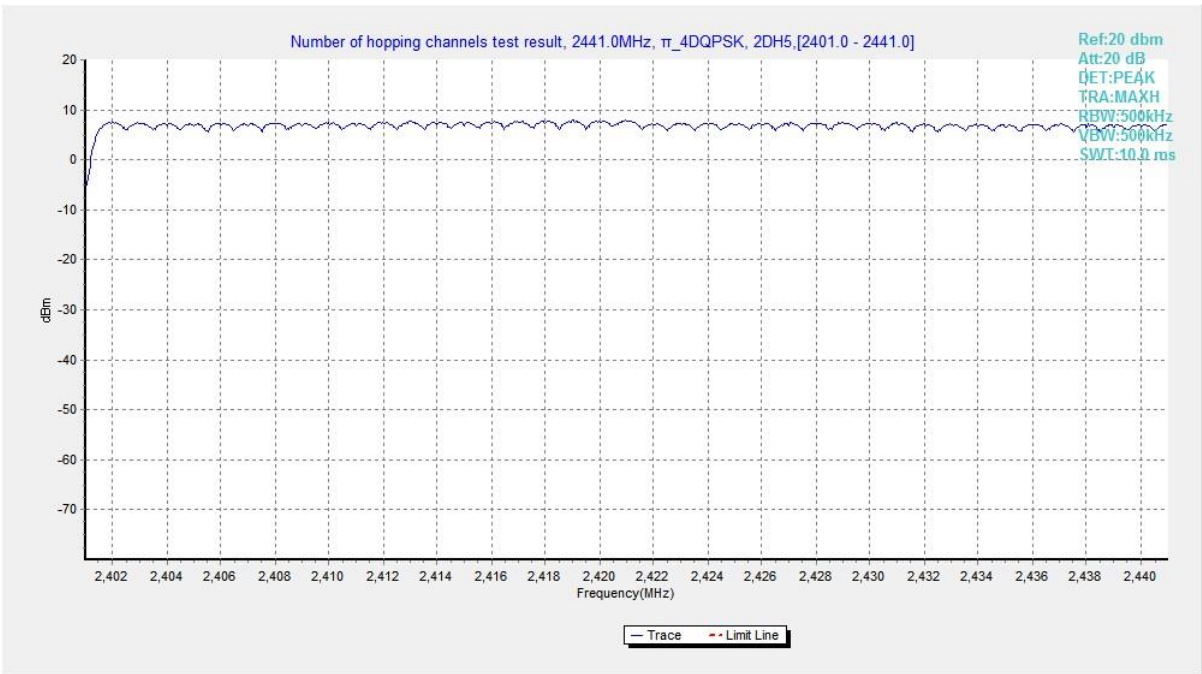

Fig. 68 Hopping channel ch0~39 (π /4 DQPSK, Ch39)

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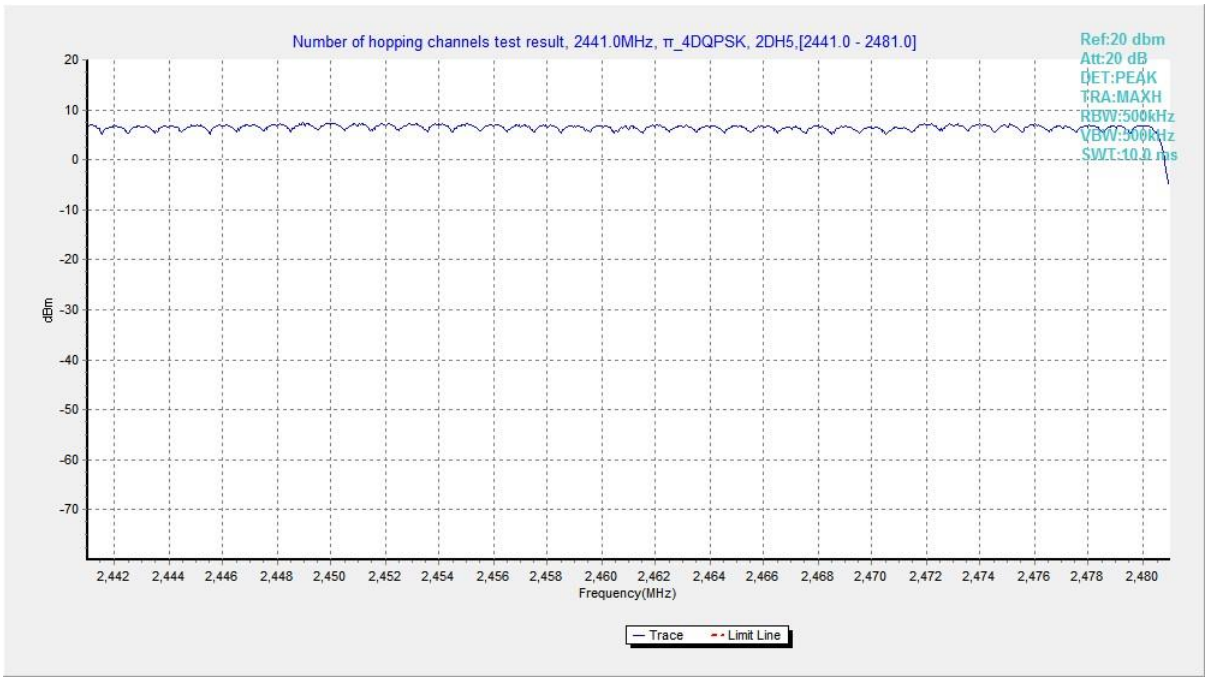

Fig. 69 Hopping channel ch40~78 (π /4 DQPSK, Ch39)

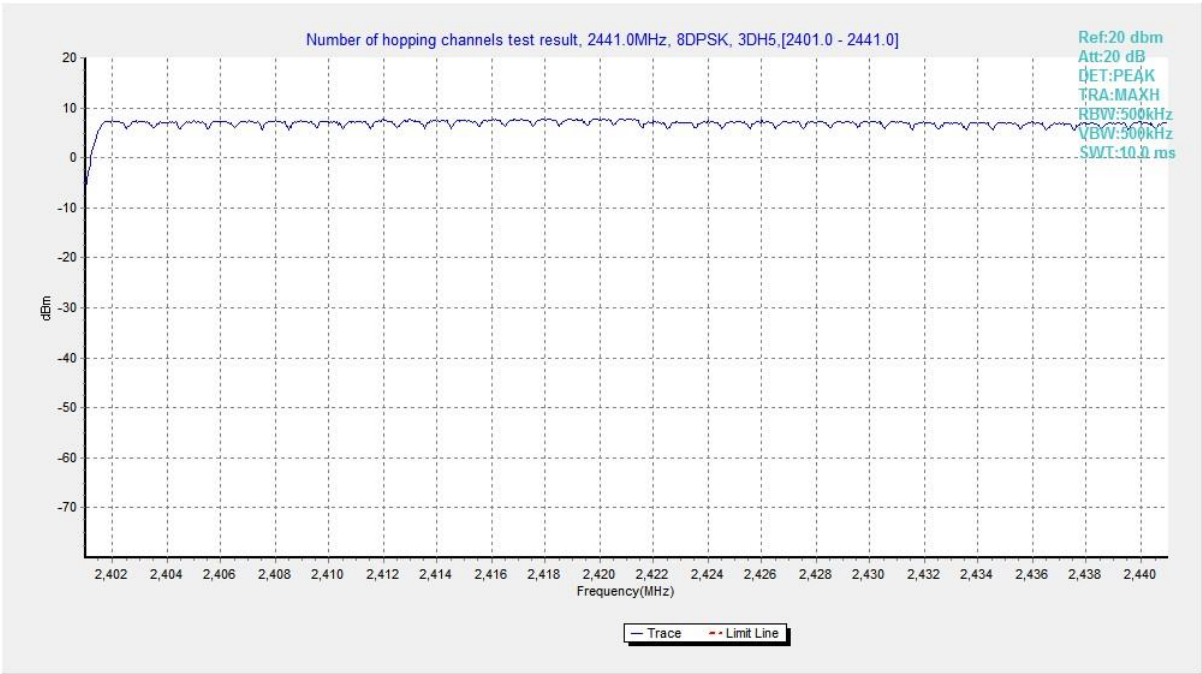

Fig. 70 Hopping channel ch0~39 (8DPSK, Ch39)

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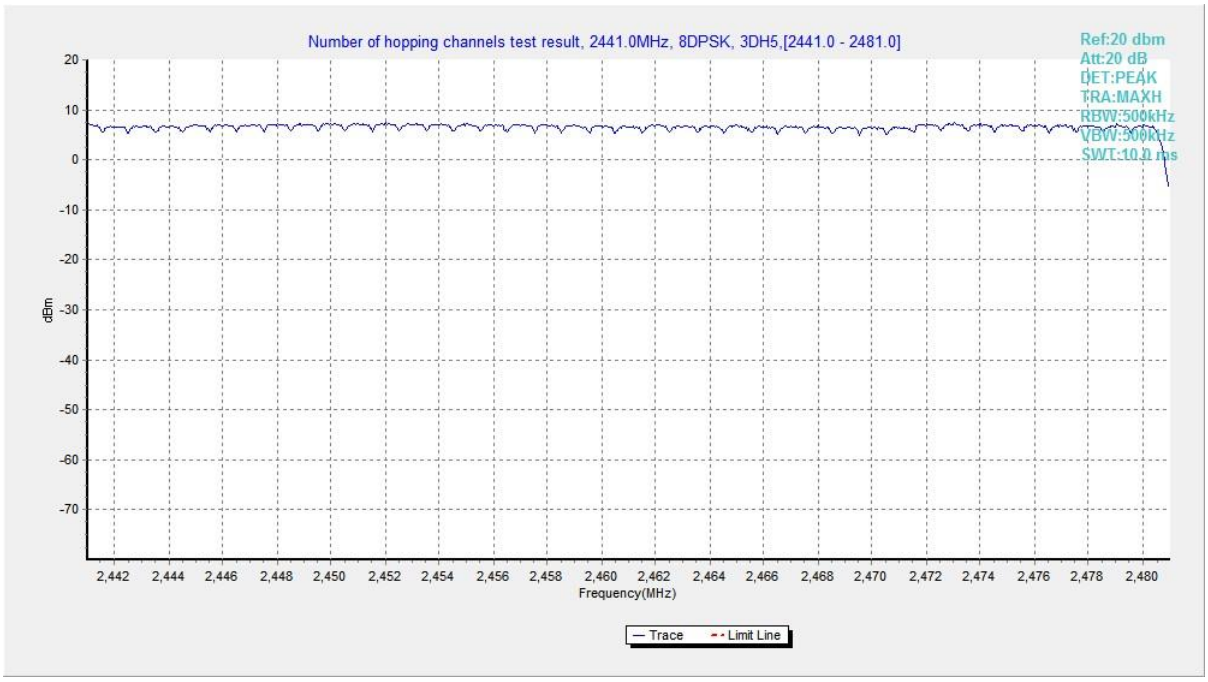

Fig. 71 Hopping channel ch40~78 (8DPSK, Ch39)

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A.8 Carrier Frequency Separation

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247(a) & RSS-247 section 5.1	By a minimum of 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater

Measurement Results:

Mode	Channel	Packet	Separation of hopping channels	Test result (MHz)	Conclusion
GFSK	39	DH5	Fig.72	1.00	**P**
π /4 DQPSK	39	2-DH5	Fig.73	1.03	**P**
8DPSK	39	3-DH5	Fig.74	1.06	**P**

See below for test graphs.

Conclusion: Pass

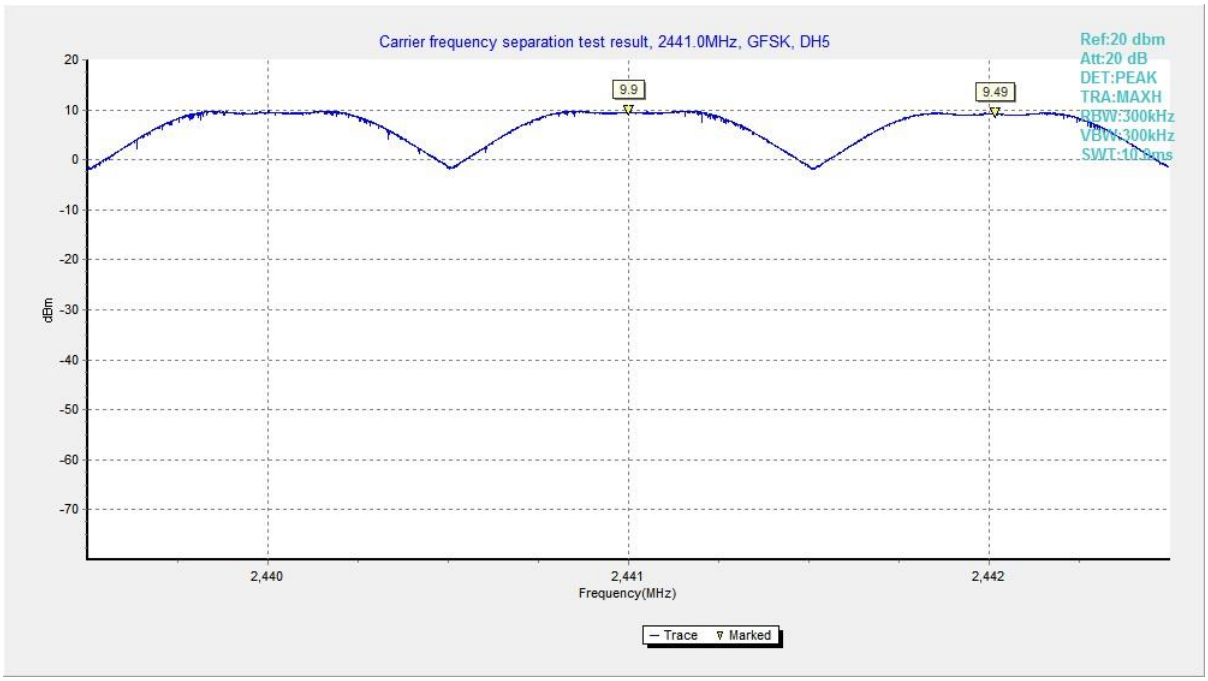

Fig. 72 Carrier Frequency Separation (GFSK, Ch39)

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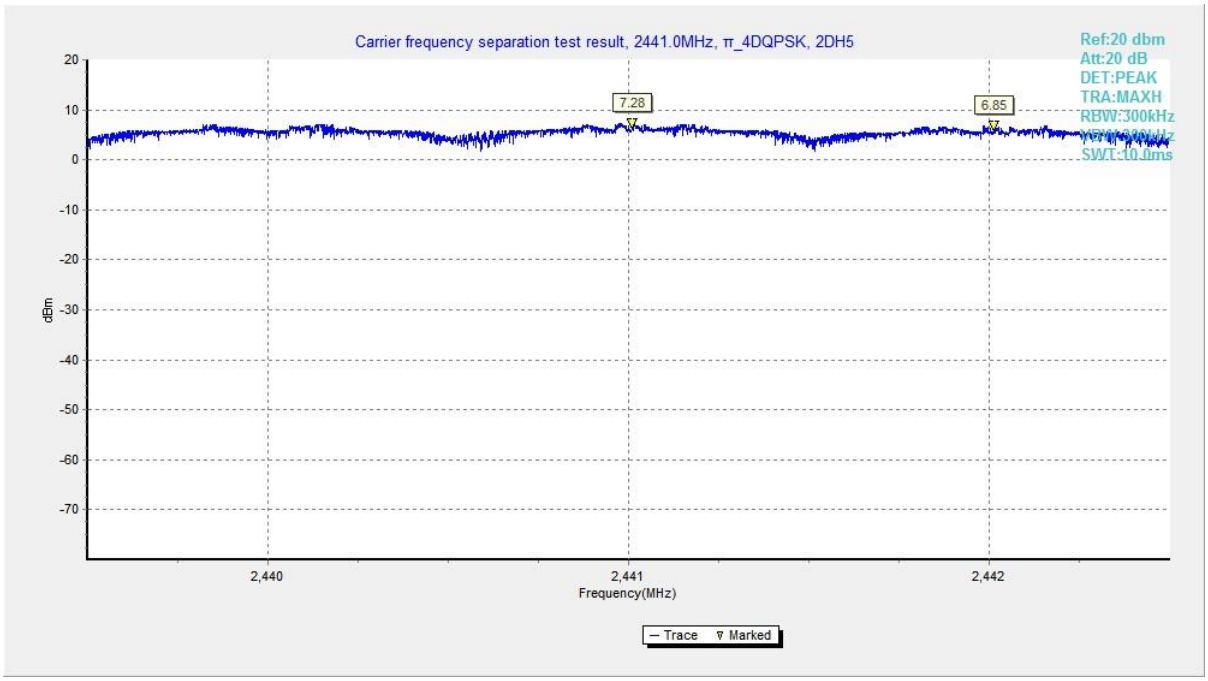

Fig. 73 Carrier Frequency Separation (π /4 DQPSK, Ch39)

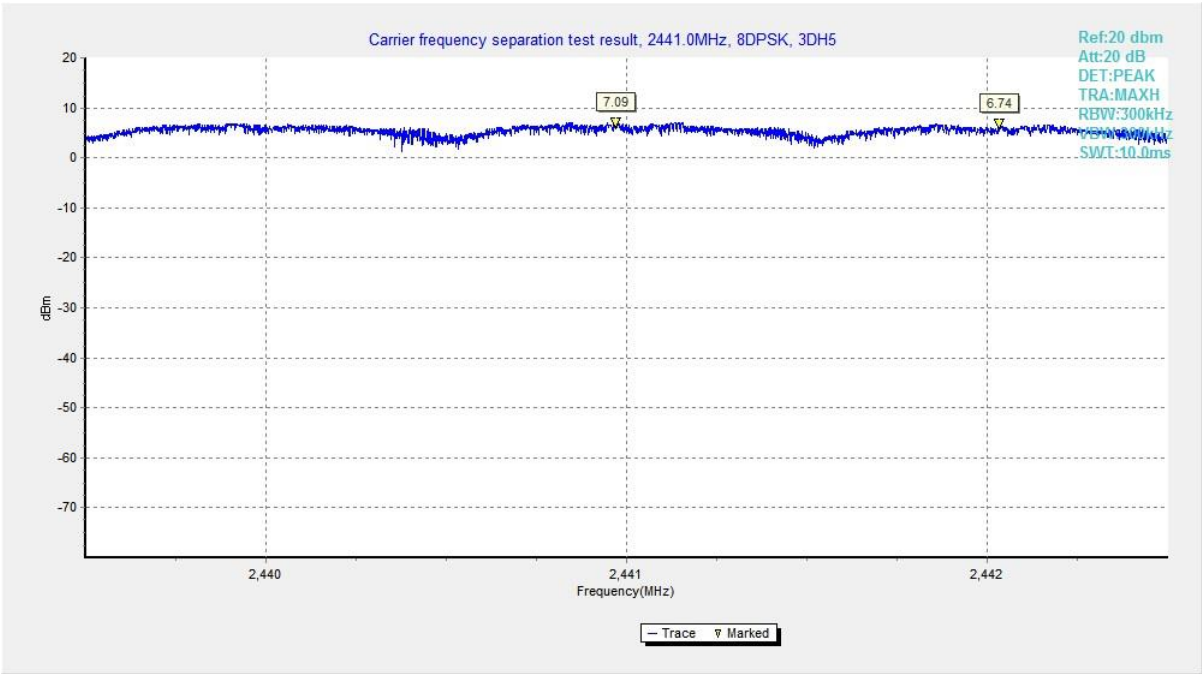

Fig. 74 Carrier Frequency Separation (8DPSK, Ch39)

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A.9 AC Power line Conducted Emission

Test Condition:

Voltage (V)	Frequency (Hz)
120	60

Measurement Result and limit:

BT (Quasi-peak Limit) - AE2

Frequency range (MHz)	Quasi-peak Limit (dBμV)	Result (dBμV)		Conclusion
		Traffic	Idle	
0.15 to 0.5	66 to 56	Fig.75	Fig.76	**P**
0.5 to 5	56			
5 to 30	60			
Note: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.				

BT (Average Limit) - AE2

Frequency range (MHz)	Average-peak Limit (dBμV)	Result (dBμV)		Conclusion
		Traffic	Idle	
0.15 to 0.5	56 to 46	Fig.75	Fig.76	**P**
0.5 to 5	46			
5 to 30	50			
Note: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.				

Note: The measurement results include the L1 and N measurements.

See below for test graphs.

Conclusion: Pass

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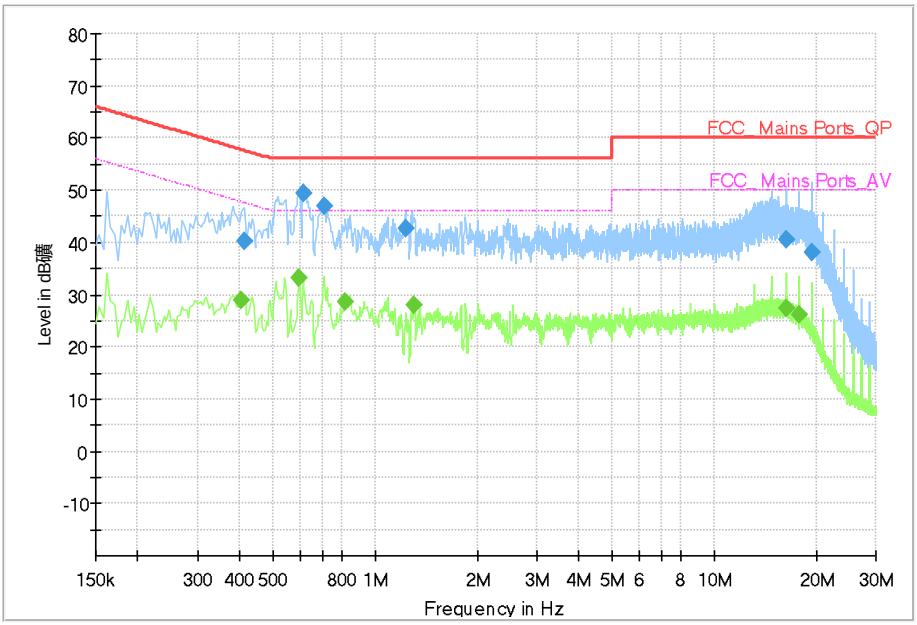

Fig. 75 AC Powerline Conducted Emission (Traffic, AE2, 120V)

Measurement Results: Quasi Peak

Frequency (MHz)	Quasi Peak (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.410000	40.36	57.65	17.29	N	ON	10
0.614000	49.52	56.00	6.48	N	ON	10
0.706000	46.85	56.00	9.15	N	ON	10
1.226000	42.57	56.00	13.43	N	ON	10
16.290000	40.48	60.00	19.52	N	ON	11
19.406000	38.24	60.00	21.76	N	ON	11

Measurement Results: Average

Frequency (MHz)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.402000	28.89	47.81	18.92	N	ON	10
0.598000	33.31	46.00	12.69	N	ON	10
0.818000	28.69	46.00	17.31	N	ON	10
1.306000	27.90	46.00	18.10	N	ON	10
16.290000	27.54	50.00	22.46	N	ON	11
17.846000	26.19	50.00	23.81	N	ON	11

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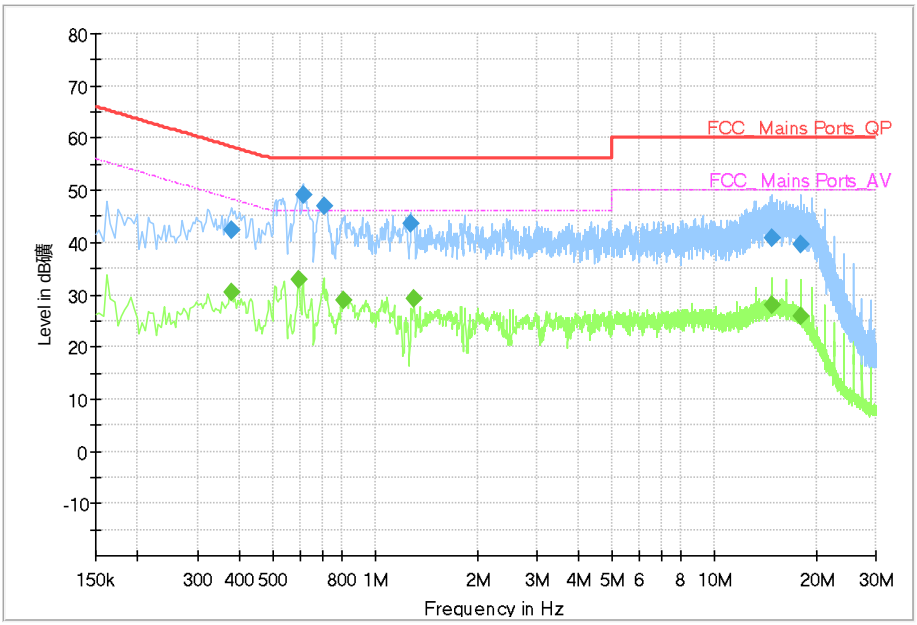

Fig. 76 AC Power line Conducted Emission (Idle, AE2, 120V)

Measurement Results: Quasi Peak

Frequency (MHz)	Quasi Peak (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.378000	42.28	58.32	16.05	N	ON	10
0.614000	49.08	56.00	6.92	N	ON	10
0.706000	47.08	56.00	8.92	N	ON	10
1.278000	43.59	56.00	12.41	N	ON	10
14.842000	40.84	60.00	19.16	N	ON	11
17.962000	39.73	60.00	20.27	N	ON	11

Measurement Results: Average

Frequency (MHz)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.378000	30.42	48.32	17.90	N	ON	10
0.598000	33.00	46.00	13.00	N	ON	10
0.810000	28.90	46.00	17.10	N	ON	10
1.302000	29.31	46.00	16.69	N	ON	10
14.838000	27.87	50.00	22.13	N	ON	11
17.962000	25.99	50.00	24.01	N	ON	11

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A.10 99% Occupied Bandwidth

Measurement Limit:

Standard	Limit
RSS-Gen section 6.7	/

Measurement Result:

Mode	Channel	Occupied Bandwidth (kHz)		Conclusion
GFSK	0	Fig.77	864.50	/
	39	Fig.78	863.50	
	78	Fig.79	865.50	
π /4 DQPSK	0	Fig.80	1183.00	/
	39	Fig.81	1183.00	
	78	Fig.82	1183.00	
8DPSK	0	Fig.83	1202.00	/
	39	Fig.84	1199.50	
	78	Fig.85	1201.00	

See below for test graphs.

Conclusion: PASS

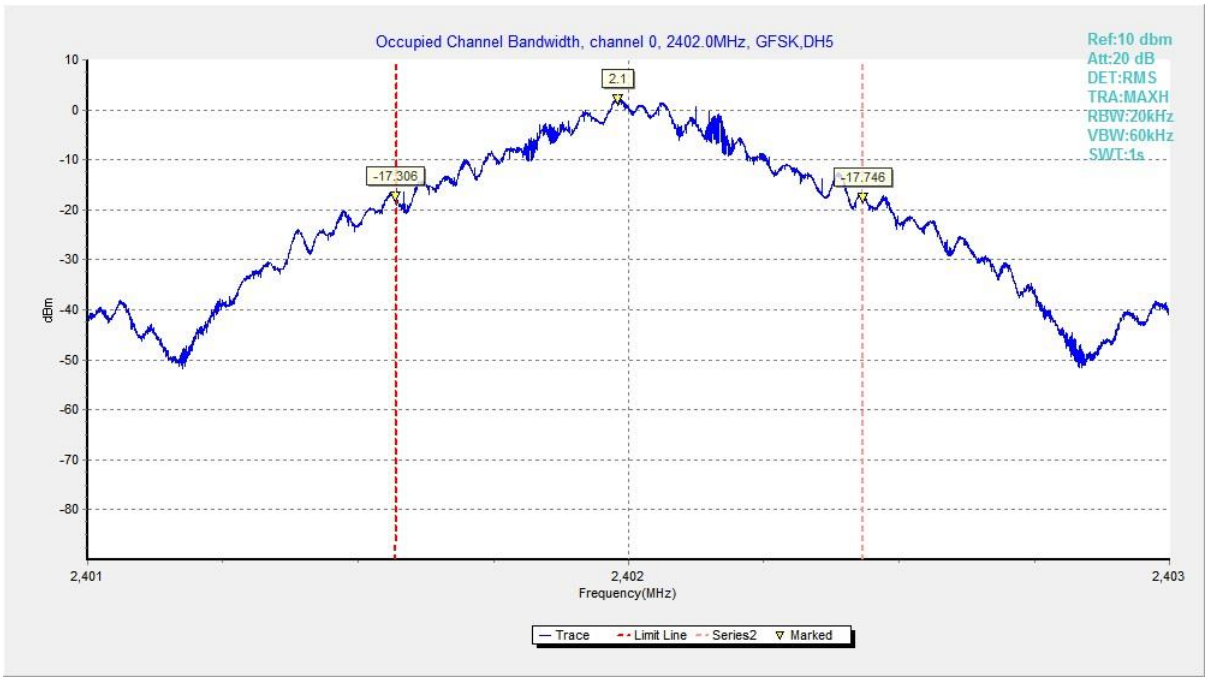

Fig. 77 99% Occupied Bandwidth (GFSK, Ch 0)

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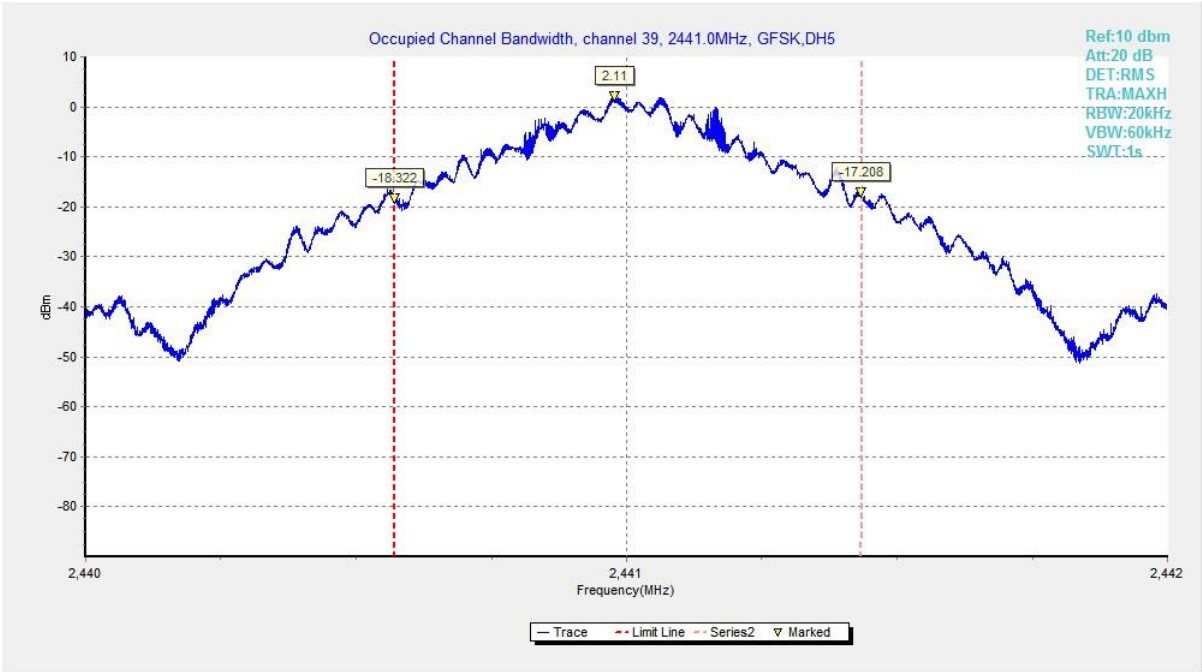

Fig. 78 99% Occupied Bandwidth (GFSK, Ch 39)

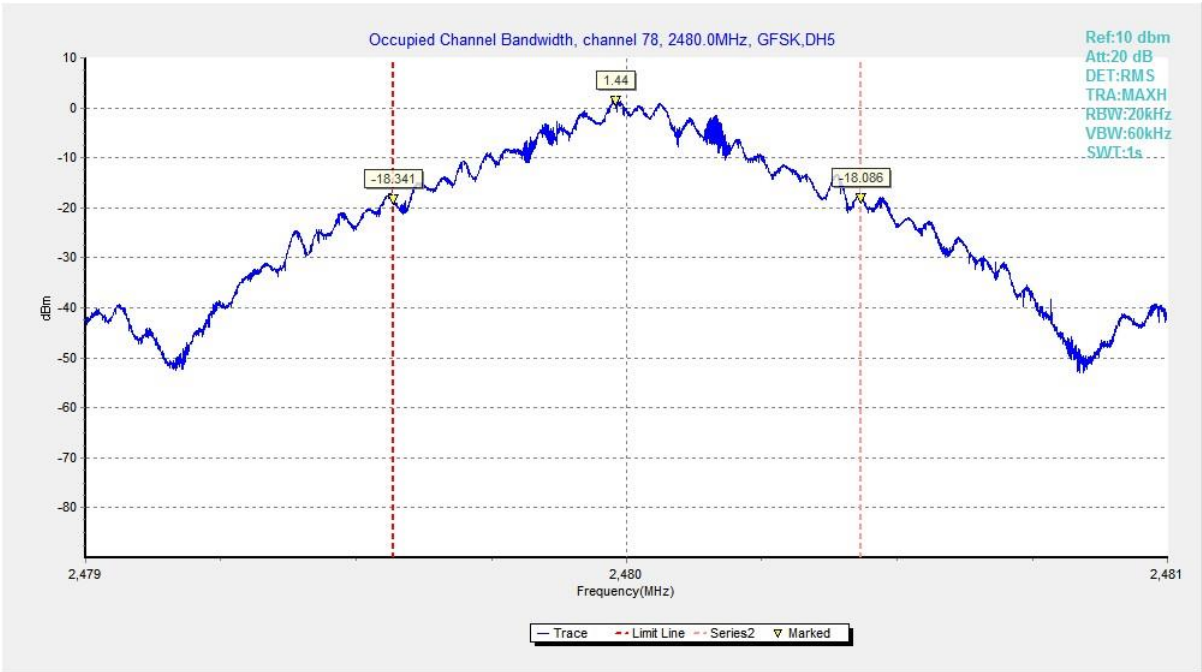

Fig. 79 99% Occupied Bandwidth (GFSK, Ch 78)

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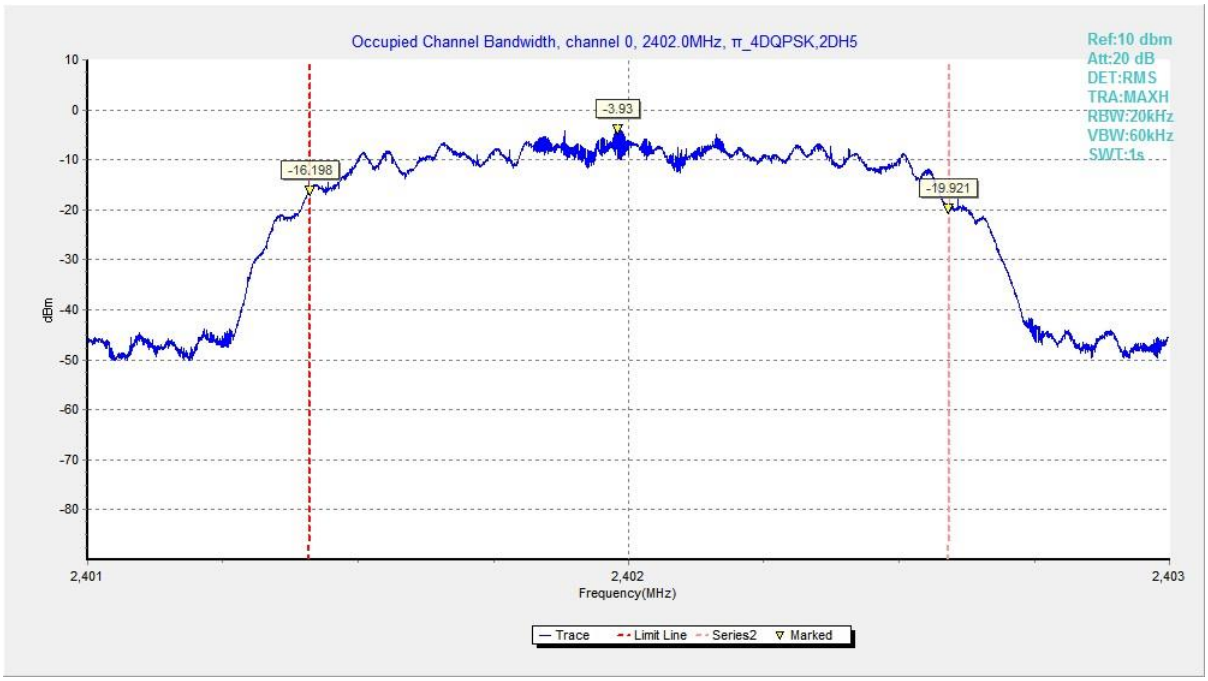

Fig. 80 99% Occupied Bandwidth (π /4 DQPSK, Ch 0)

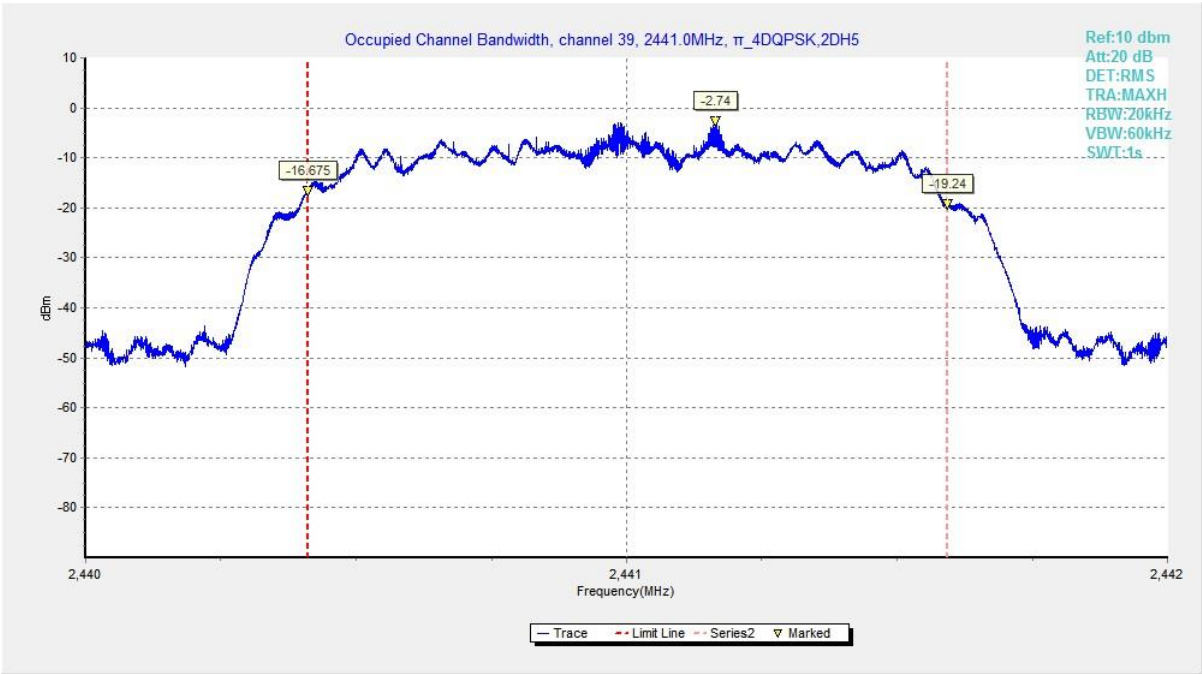

Fig. 81 99% Occupied Bandwidth (π /4 DQPSK, Ch 39)

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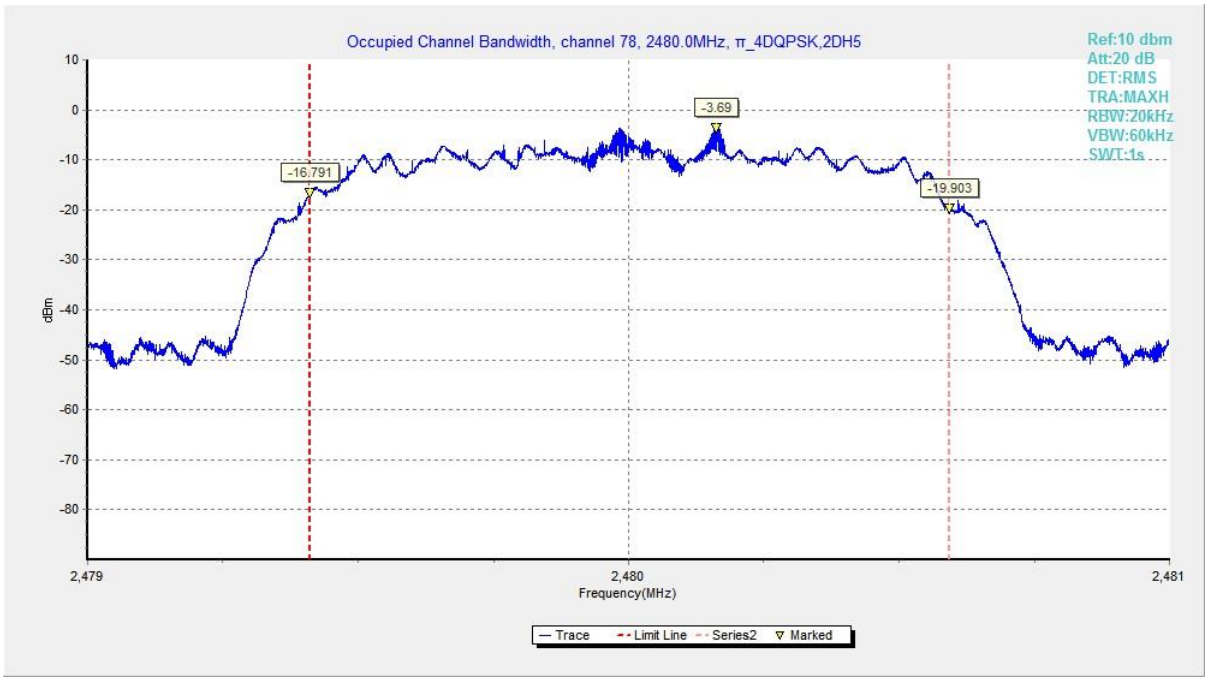

Fig. 82 99% Occupied Bandwidth (π /4 DQPSK, Ch 78)

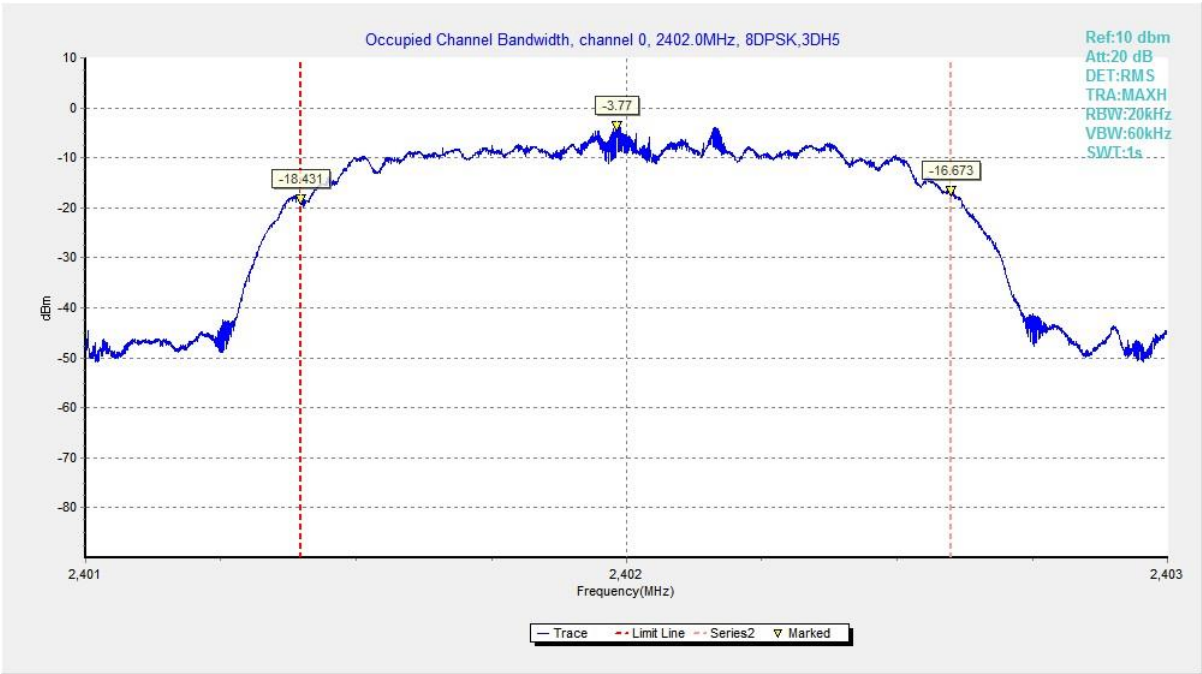

Fig. 83 99% Occupied Bandwidth (8DPSK, Ch 0)

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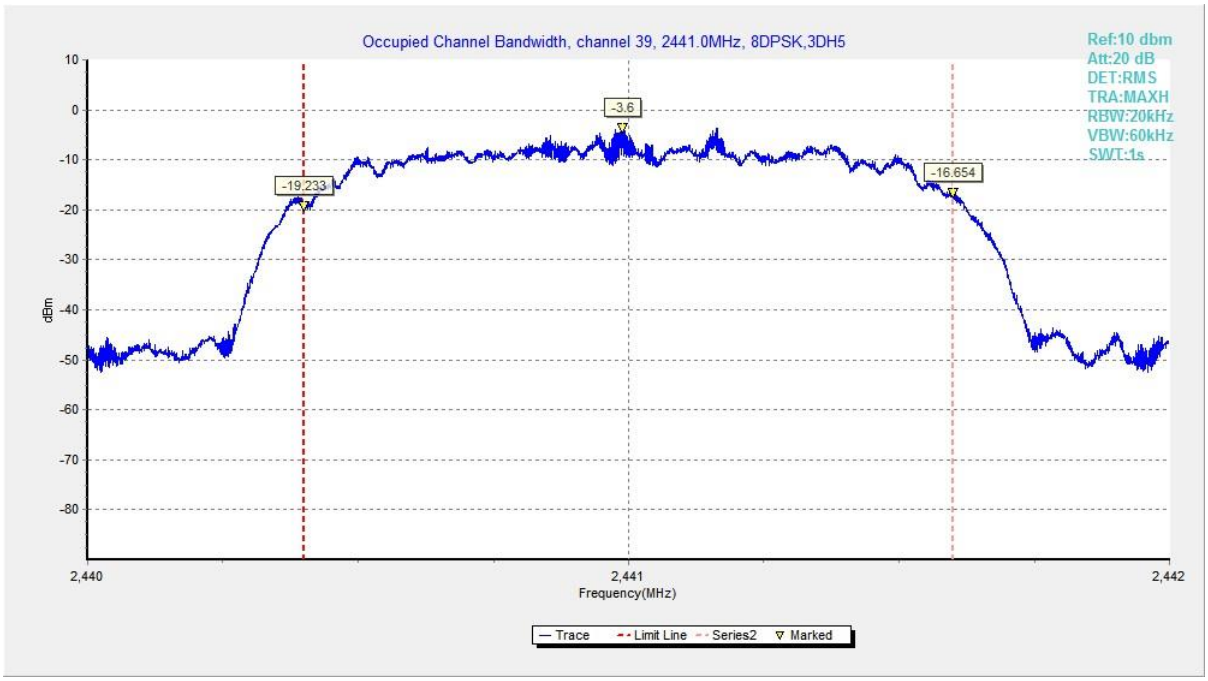

Fig. 84 99% Occupied Bandwidth (8DPSK, Ch 39)

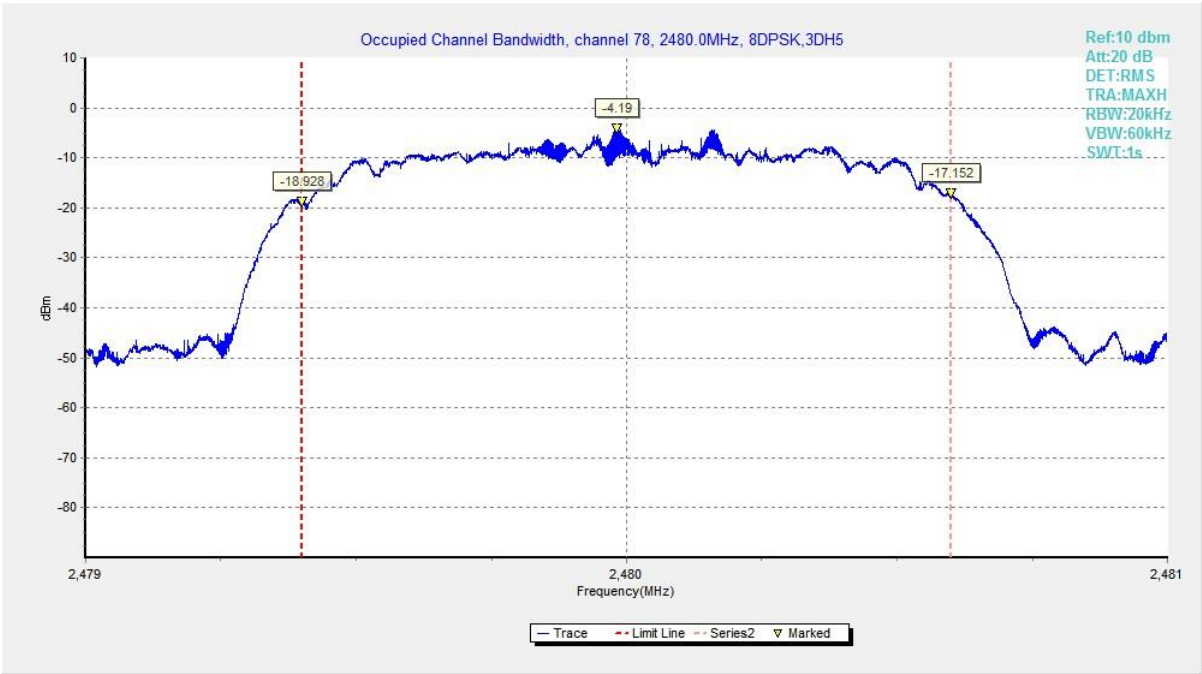

Fig. 85 99% Occupied Bandwidth (8DPSK, Ch 78)

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