FCC PART 15C
TEST REPORT

No.24T04Z101051-001

for

TCL Communication Ltd.

Tablet PC

Model Name: 9465X

FCC ID:2ACCJB223

with

Hardware Version:05

Software Version:6HS2

Issued Date: 2024-6-13

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 CTTL.

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
24T04Z101051-001	Rev.0	1st edition	2024-6-13

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

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1. Test Laboratory

1.1. Introduction &Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2017 accredited test laboratory under American Association for Laboratory Accreditation (A2LA) with lab code 7049.01, and is also an FCC accredited test laboratory (CN1349), and ISED accredited test laboratory (CAB identifier:CN0066). The detail accreditation scope can be found on A2LA website

1.2. TestingLocation

Conducted testing Location:CTTL(huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China100191

Radiated testing Location:CTTL(huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China100191

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1.3. TestingEnvironment

Normal Temperature: 20-27℃

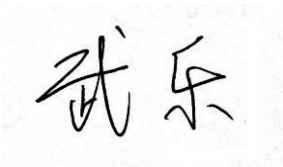
Relative Humidity: 20-50%

1.4. Project data

Testing Start Date: 2024-5-17

Testing End Date: 2024-6-13

1.5. Signature



Wu Le

(Prepared this test report)



Sun Zhenyu

(Reviewed this test report)



Hu Xiaoyu

(Approved this test report)

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2. ClientInformation

2.1. Applicant Information

Company Name:	TCL Communication Ltd.
Address/Post:	5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong
City:	/
Postal Code:	/
Country:	China
Telephone:	+86 752 2639091
Fax:	+86 755 3661 2000-81722

2.2. Manufacturer Information

Company Name:	TCL Communication Ltd.
Address/Post:	5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong
City:	/
Postal Code:	/
Country:	China
Telephone:	+86 752 2639091
Fax:	+86 755 3661 2000-81722

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3. Equipment UnderTest (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Description	Tablet PC
Model Name	9465X
FCC ID	2ACCJB223
Frequency Band	ISM 2400MHz~2483.5MHz
Type of Modulation	GFSK/π/4 DQPSK/8DPSK
Number of Channels	79
Power Supply	3.8V DC by Battery
Antenna gain	-1.6dBi

3.2. Internal Identification of EUT

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt
EUT1	W8F6B6PRT8IRNVNF	05	6HS2	2024-05-21
EUT2	4LORORFILJMVL785	05	6HS2	2024-05-17

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

3.3. Internal Identification of AE

AE ID*	Description	Note	Manufacturer
AE1	Battery	2853B7PL-2P	Gaoyuan
AE2	Charger	UT-681E-5200MY	Shenzhen Baijunda Electronic CO.,Ltd
AE3	USB cable	XB.003.1071.0003	Huizhou Besiter power technology Co., Ltd

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

3.4. Normal Accessory setting

Fully charged battery should be used during the test.

3.5. General Description

The Equipment Under Test (EUT) is a model of Tablet PCwith integrated antenna. It consists of normal options: lithium battery, charger. Manual and specifications of the EUT were provided to fulfill the test.Samples undergoing test were selected by the Client.

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4. Reference Documents

4.1. Documents supplied by applicant

EUT parameters, referring to Annex Afor detailed information, is supplied by the client 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 Part15	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.	2023
ANSI C63.10	American National Standard of Procedures for ComplianceTesting of Unlicensed Wireless Devices	June,2013

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5. Test Results

5.1. Summary of Test Results

Abbreviations used in this clause:

P Pass, The EUT complies with the essential requirements in the standard.

F Fail, The EUT does not comply with the essential requirements in the standard

NA Not Applicable,The test was not applicable

NP Not Performed,The test was not performed by CTTL

SUMMARY OF MEASUREMENT RESULTS	Sub-clause	Verdict
Peak Output Power	15.247 (b)(1)	**P**
Frequency Band Edges- Conducted	15.247 (d)	**P**
Transmitter Spurious Emission - Conducted	15.247 (d)	**P**
Radiated Unwanted Emission	15.247, 15.205, 15.209	**P**
Time of Occupancy (Dwell Time)	15.247 (a) (1)(iii)	**P**
20dB Bandwidth	15.247 (a)(1)	**NA**
Carrier Frequency Separation	15.247 (a)(1)	**P**
Number of hopping channels	15.247 (a)(iii)	**P**
AC Powerline Conducted Emission	15.107, 15.207	**P**
Antenna Requirement	15.203	**P**

Please refer to **ANNEX A** for detail.

The measurement is made according to ANSI C63.10.

5.2. Statements

CTTL has evaluated the test cases requested by the applicant /manufacturer as listed in section 5.1 of this report for the EUT specified in section 3 according to the standards or reference documents listed in section 4.2

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6. Test Facilities Utilized

Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Vector Signal Analyzer	FSQ26	100024	R&S	1 year	2025-03-09
2	Bluetooth Tester	CBT	100315	R&S	1 year	2025-03-08
3	LISN	ENV216	101200	R&S	1 Year	2025-05-17
4	Test Receiver	ESCI	100344	R&S	1 Year	2025-05-01
5	Shielding Room	S81	/	ETS-Lindgren	/	/

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Test Receiver	ESW44	103144	R&S	1 Year	2024-12-26
2	EMI Antenna	VULB9163	01223	R&S	1 Year	2024-08-18
3	EMI Antenna	3115	00167250	R&S	1 Year	2025-05-11
4	EMI Antenna	3116	2663	R&S	1 Year	2025-03-21

Test Software

Test Item	Test Software and Version	Software Vendor
Radiated Continuous Emission	EMC32 V11.50.20	R&S
Conducted Emission	EMC32 V8.53.0	R&S

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7. Measurement Uncertainty

7.1. Peak Output Power - Conducted

Measurement Uncertainty:

Measurement Uncertainty(k=2)	0.66dB

7.2. Frequency Band Edges- Conducted

Measurement Uncertainty:

Measurement Uncertainty(k=2)	0.66dB

7.3. Transmitter Spurious Emission - Conducted

Measurement Uncertainty:

FrequencyRange	Uncertainty(k=2)
30 MHz ~ 8 GHz	1.22dB
8 GHz ~ 12.75 GHz	1.51dB
12.7GHz ~ 26 GHz	1.51dB

7.4. Transmitter Spurious Emission - Radiated

Measurement Uncertainty:

FrequencyRange	Uncertainty(dBm) (k=2)
9kHz-30MHz	/
30MHz ≤ f ≤ 1GHz	4.72
1GHz ≤ f ≤18GHz	4.84
18GHz ≤ f ≤40GHz	5.12

7.5. Time of Occupancy (Dwell Time)

Measurement Uncertainty:

Measurement Uncertainty(k=2)	0.88ms

7.6. 20dB Bandwidth

Measurement Uncertainty:

Measurement Uncertainty(k=2)	61.936Hz

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7.7. Carrier Frequency Separation

Measurement Uncertainty:

Measurement Uncertainty(k=2)	61.936Hz

7.8. AC Powerline Conducted Emission

Measurement Uncertainty:

Measurement Uncertainty(k=2)	3.08dB

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ANNEX A: EUTparameters

Disclaimer: The antenna gain provided by the client may affect the validity of the measurement results in this report, and the client shall bear the impact and consequences arising therefrom.

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ANNEX B: Detailed Test Results

B.1. Measurement Method

B.1.1. Conducted Measurements

The measurement is made according to ANSI C63.10.

1). Connect the EUT to the test system correctly.

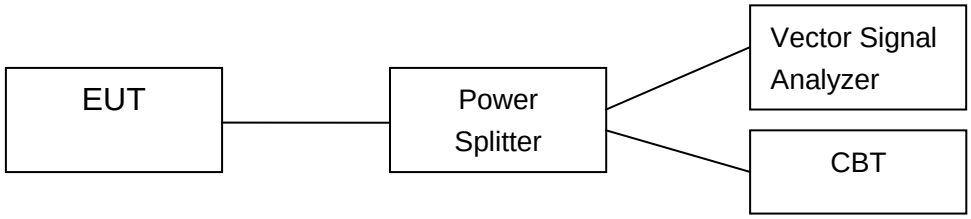
2). Set the EUT to the required work mode (Transmitter, receiver or transmitter & receiver).

3). Set the EUT to the required channel.

4). Set the EUT hopping mode (hopping or hopping off).

5). Set the spectrum analyzer to start measurement.

6). Record the values. Vector Signal Analyzer



B.1.2. Radiated Emission Measurements

The measurement is made according to ANSI C63.10

The radiated emission test is performed in semi-anechoic chamber. The EUT was placed on a non-conductive table with 80cm above the ground plane for measurement below 1GHz and 1.5m above the ground plane for measurement above 1GHz. The measurement antenna was placed at a distance of 3 meters from the EUT. The test is carried out on both vertical and horizontal polarization and only maximization result of both polarizations is kept. During the test, the turntable is rotated from 0° to 360°and the measurement antenna is moved from 1m to 4m to get the maximization result. The maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

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B.2. Peak Output Power

B.2.1. Peak Output Power – Conducted

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

a) Use the following spectrum analyzer settings:

- Span: 6MHz
- RBW: 3MHz
- VBW: 3MHz
- Sweep time: 2.5ms
- Detector function: peak
- Trace: max hold

b) Allow trace to stabilize.

c) Use the marker-to-peak function to set the marker to the peak of the emission.

d) The indicated level is the peak output power.

Measurement Limit:

Standard	Limits	
FCC Part 15.247(b)(1)	Bandwidth≤1MHz	30dBm (1W)
	Bandwidth＞1MHz	21dBm (125mW)

Measurement Results:

For GFSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	9.41	9.64	9.61	P

Forπ/4 DQPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	8.53	8.44	9.41	P

For 8DPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	8.36	8.83	9.22	P

Conclusion: PASS

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B.2.2. E.I.R.P.

The radiated E.I.R.P. is listed below:

Antenna gain =-1.6dBi

For GFSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
E.I.R.P (dBm)	7.81	8.04	8.01	P

Forπ/4 DQPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
E.I.R.P (dBm)	6.93	6.84	7.81	P

For 8DPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
E.I.R.P (dBm)	6.76	7.23	7.62	P

Note: E.I.R.P. are calculated with the antenna gain.

Conclusion: PASS

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B.3. Frequency Band Edges – Conducted

Method of Measurement: See ANSI C63.10-clause 7.8.6

Connect the spectrum analyzer to the EUT using an appropriate RF cable connected to the EUT output.Configure the spectrum analyzer settings as described below (be sure to enter all losses between theunlicensed wireless device output and the spectrum analyzer).

–Span: 10 MHz

– Resolution Bandwidth: 100 kHz

– Video Bandwidth: 300 kHz

– Sweep Time:Auto

– Detector: Peak

–Trace: max hold

Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel.

Observe the stored trace and measure the amplitude deltabetween the peak of the fundamental and the peak of the band-edge emission. This is not anabsolute field strength measurement; it is only a relative measurement to determine the amount bywhich the emission drops at the band edge relative to the highest fundamental emission level.

Measurement Limit:

Standard	Limit (dBc)
FCC 47 CFR Part 15.247 (d)	<-20

Measurement Result:

For GFSK

Channel	Hopping	Band Edge Power (dBc)		Conclusion
0	Hopping OFF	Fig.1	-61.28	P
	Hopping ON	Fig.2	-64.49	P
78	Hopping OFF	Fig.3	-66.65	P
	Hopping ON	Fig.4	-66.89	P

Forπ/4 DQPSK

Channel	Hopping	Band Edge Power (dBc)		Conclusion
0	Hopping OFF	Fig.5	-61.67	P
	Hopping ON	Fig.6	-64.99	P
78	Hopping OFF	Fig.7	-67.08	P
	Hopping ON	Fig.8	-65.52	P

For 8DPSK

Channel	Hopping	Band Edge Power (dBc)		Conclusion
0	Hopping OFF	Fig.9	-61.36	P
	Hopping ON	Fig.10	-59.38	P

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78	Hopping OFF	Fig.11	-65.98	P
	Hopping ON	Fig.12	-63.36	P

Conclusion: PASS

Test graphs as below

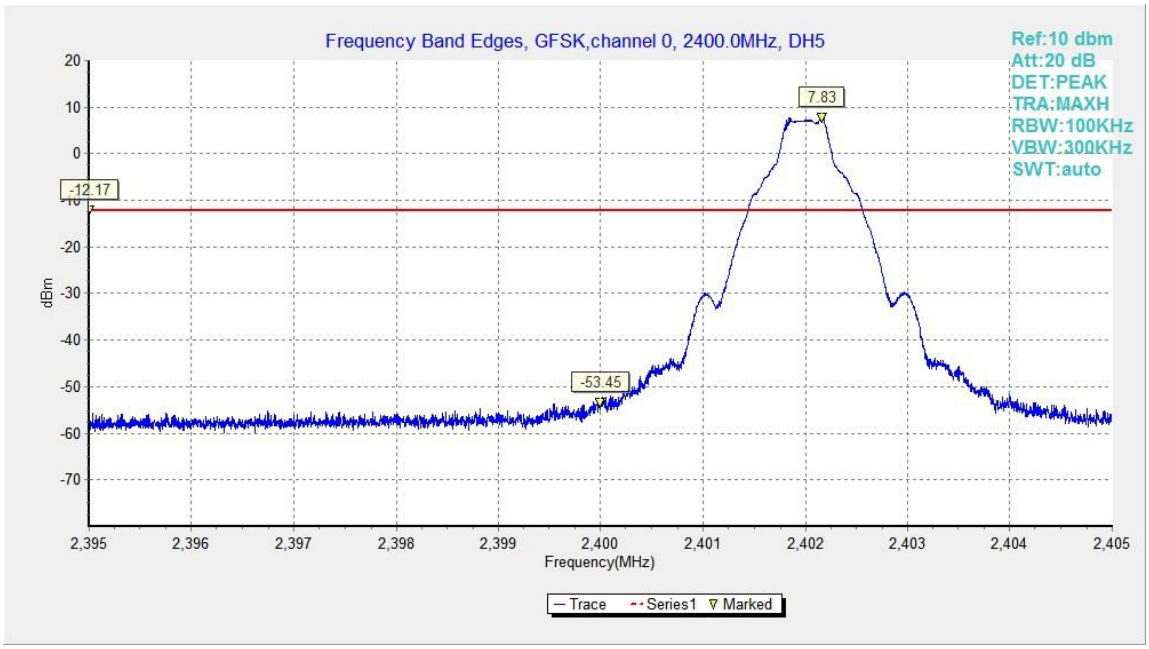


Fig.1. Frequency Band Edges: GFSK, Channel 0, Hopping Off

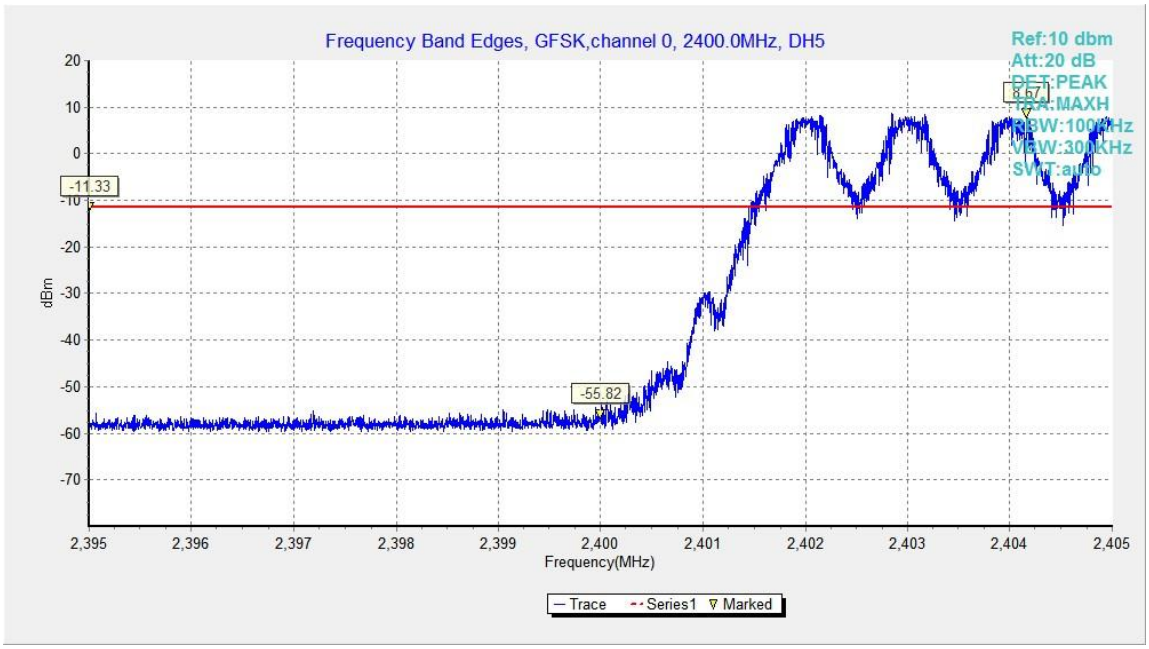


Fig.2. Frequency Band Edges: GFSK, Channel 0, Hopping On

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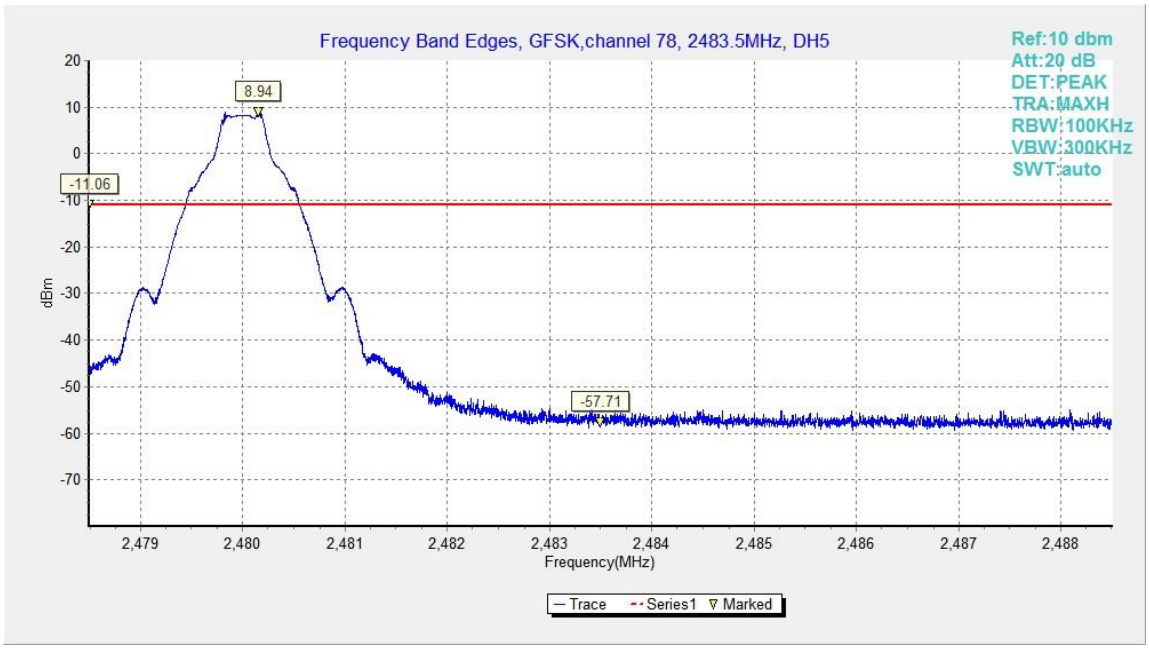


Fig.3. Frequency Band Edges: GFSK, Channel 78, Hopping Off

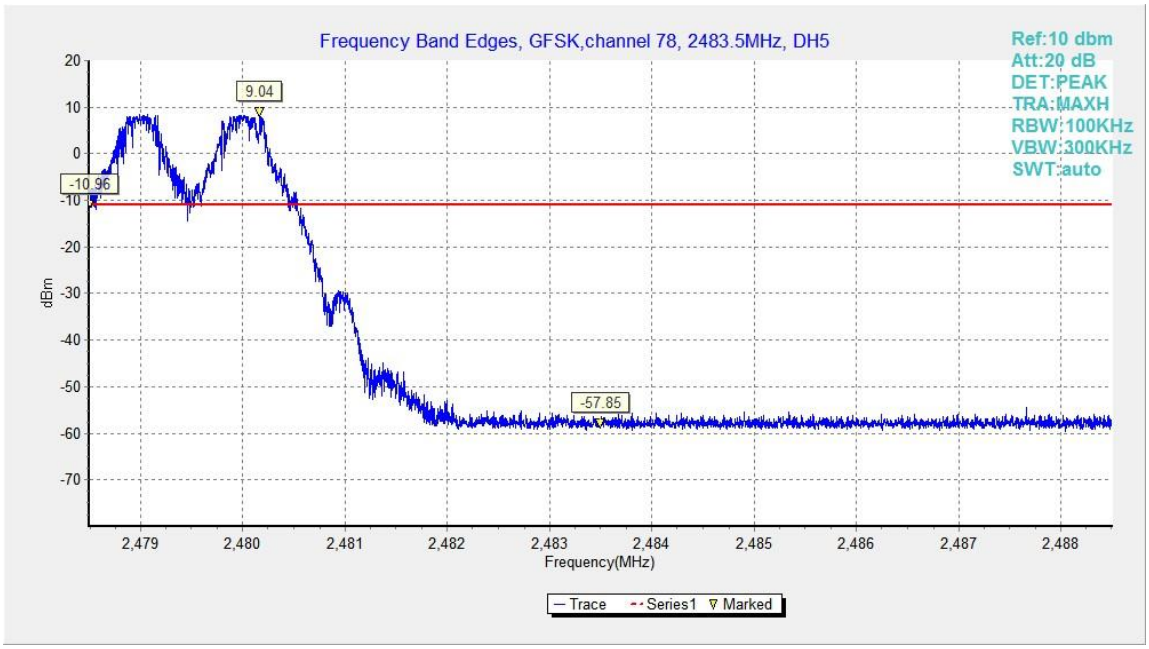


Fig.4. Frequency Band Edges: GFSK, Channel 78, Hopping On

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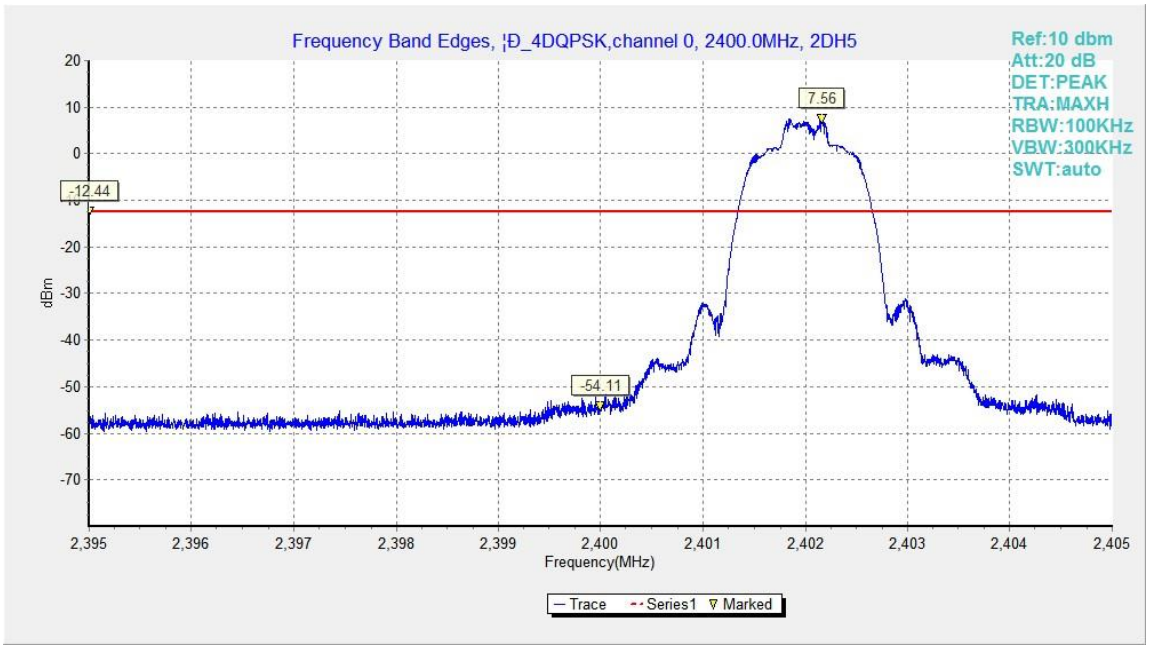


Fig.5. Frequency Band Edges: π/4 DQPSK, Channel 0, Hopping Off

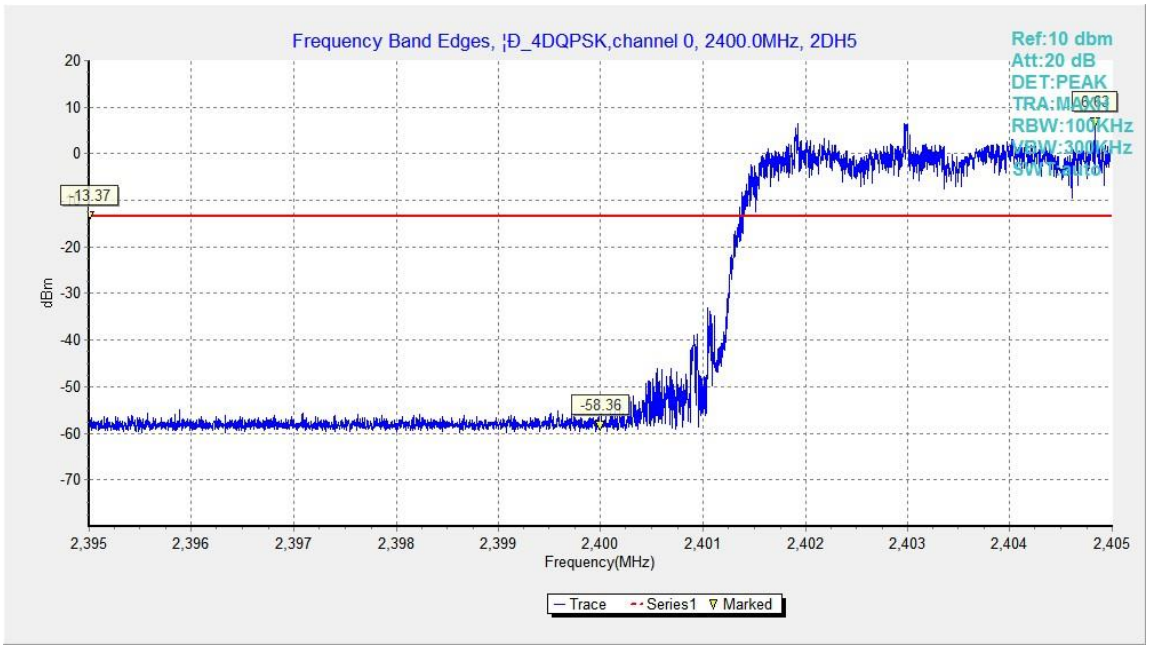


Fig.6. Frequency Band Edges: π/4 DQPSK, Channel 0, Hopping On

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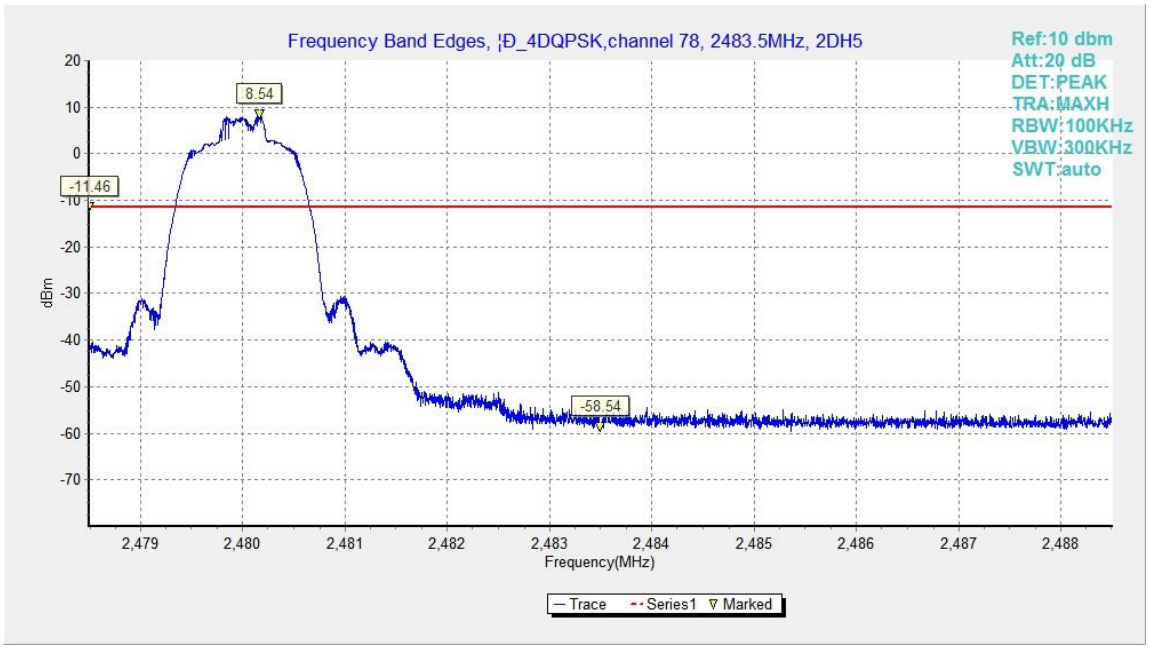


Fig.7. Frequency Band Edges: π/4 DQPSK, Channel 78, Hopping Off

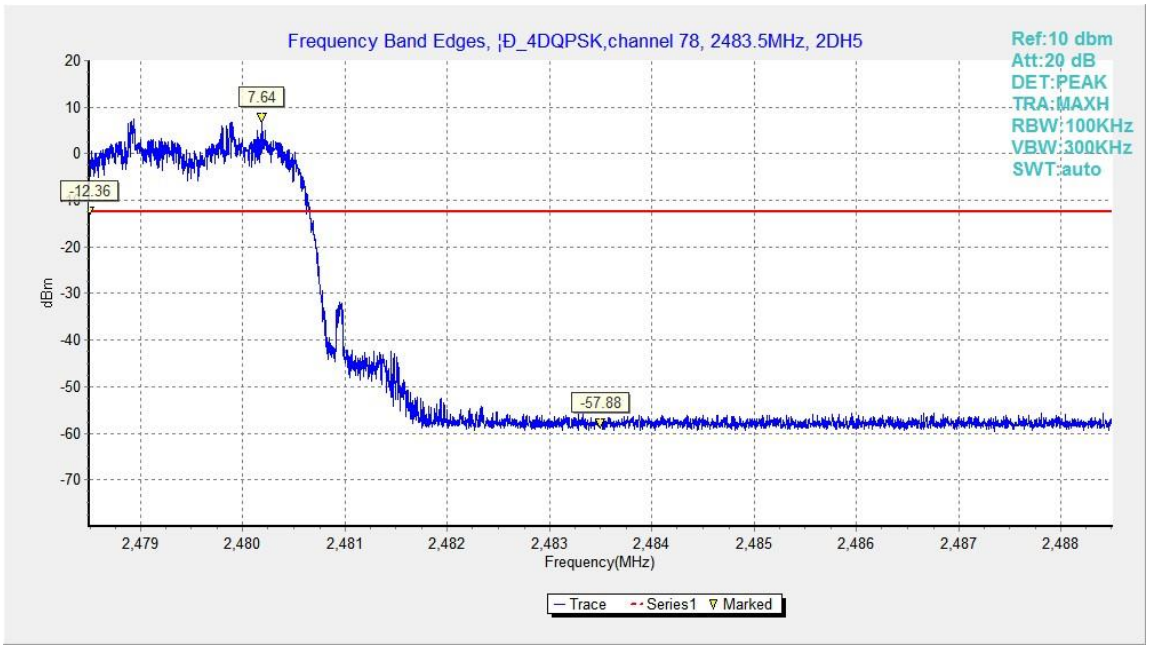


Fig.8. Frequency Band Edges: π/4 DQPSK, Channel 78, Hopping On

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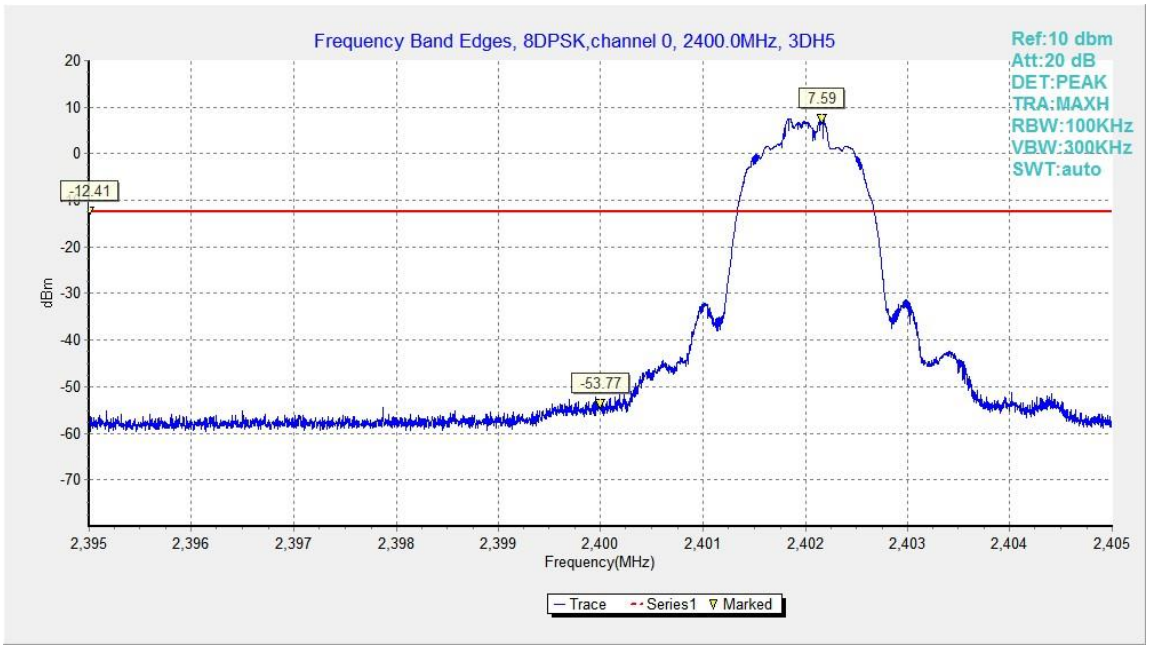


Fig.9. Frequency Band Edges: 8DPSK, Channel 0, Hopping Off

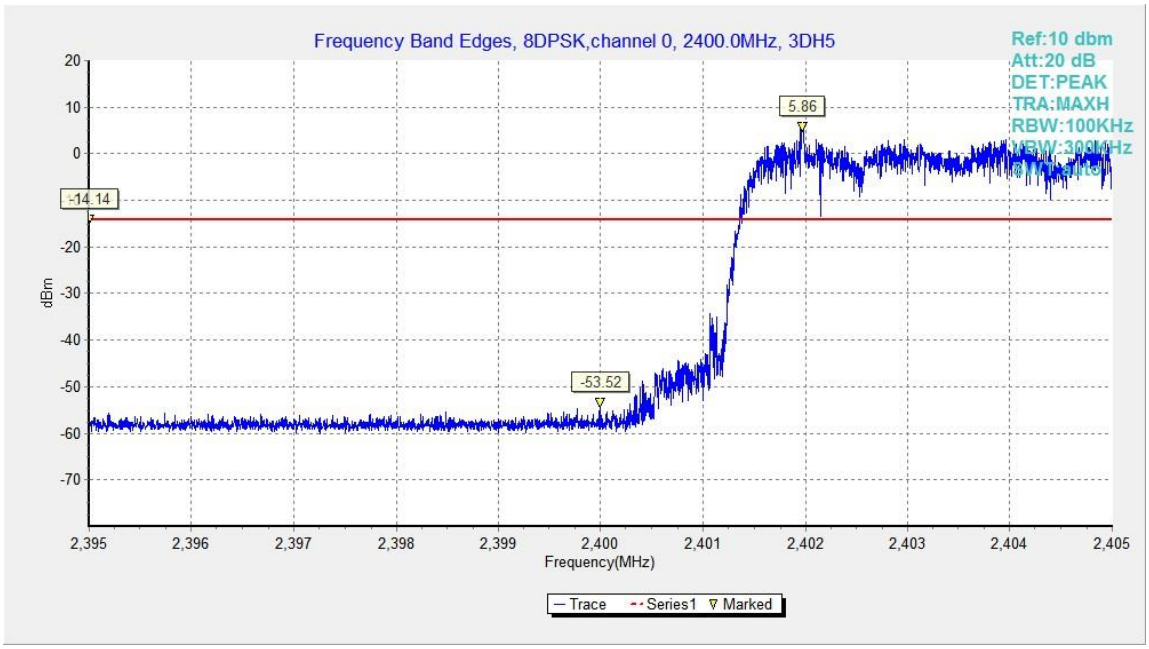


Fig.10. Frequency Band Edges: 8DPSK, Channel 0, Hopping On

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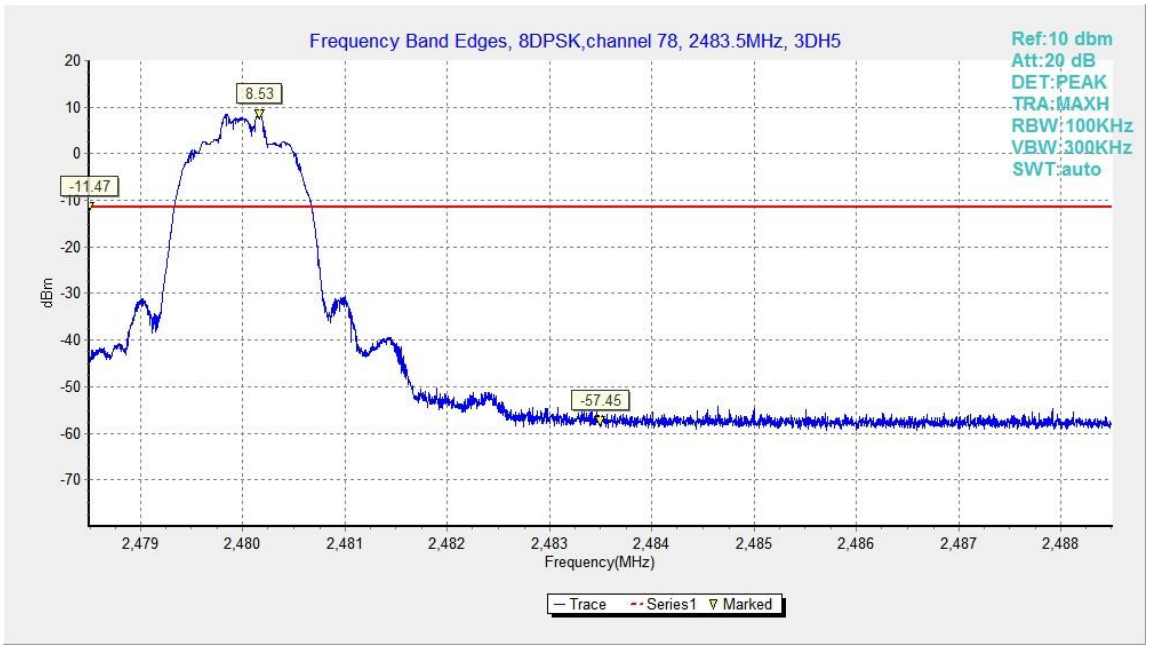


Fig.11. Frequency Band Edges: 8DPSK, Channel 78, Hopping Off

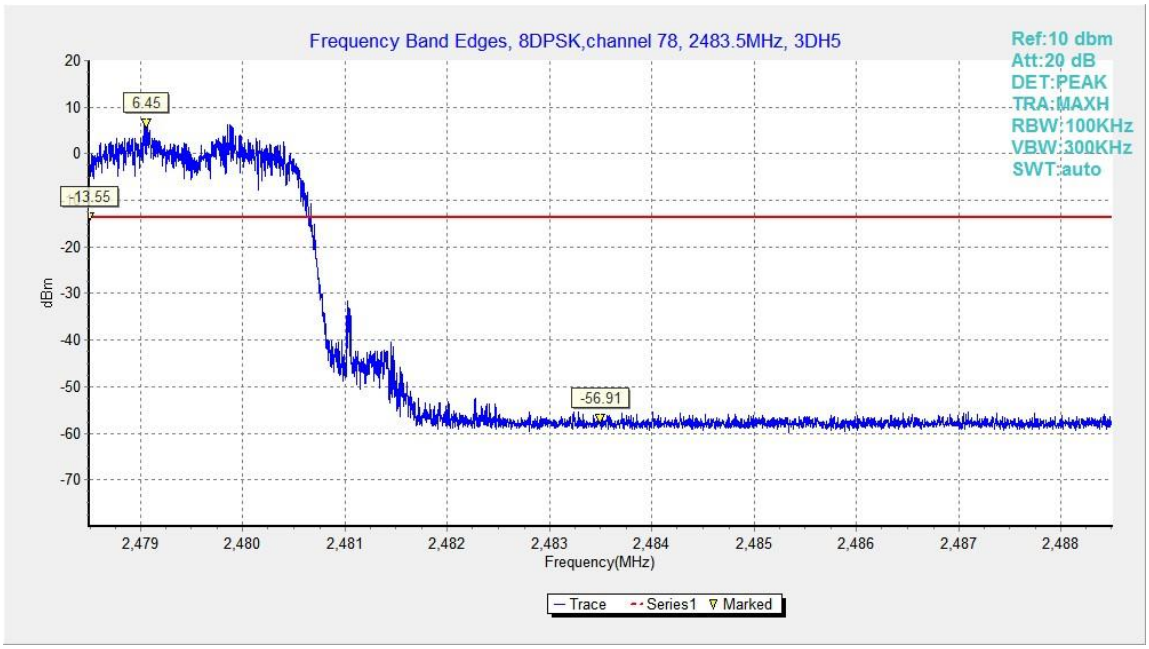


Fig.12. Frequency Band Edges: 8DPSK, Channel 78, Hopping On

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B.4. Transmitter Spurious Emission - Conducted

Method of Measurement: See ANSI C63.10-clause 7.8.8

Measurement Procedure – Reference Level

1. Set the RBW = 100 kHz.

2. Set the VBW = 300 kHz.

3. Set the span to 5-30 % greater than the EBW.

4. Detector = peak.

5. Sweep time = auto couple.

6. Trace mode = max hold.

7. Allow trace to fully stabilize.

8. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW. Next, determine the power in 100 kHz band segments outside of the authorized frequency band using the following measurement:

Measurement Procedure - Unwanted Emissions

1. Set RBW = 100 kHz.

2. Set VBW = 300 kHz.

3. Set span to encompass the spectrum to be examined.

4. Detector = peak.

5. Trace Mode = max hold.

6. Sweep = auto couple.

7. Allow the trace to stabilize (this may take some time, depending on the extent of the span).

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified above.

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247 (d)	20dB below peak output power in 100 kHz bandwidth

Measurement Results:

For GFSK

Channel	Frequency Range	Test Results	Conclusion
Ch 0	Center Frequency	Fig.13	P

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2402 MHz	30 MHz ~ 1 GHz	Fig.14	P
	1 GHz ~ 3 GHz	Fig.15	P
	3 GHz ~ 10 GHz	Fig.16	P
	10 GHz ~ 26 GHz	Fig.17	P
Ch 39 2441 MHz	Center Frequency	Fig.18	P
	30 MHz ~ 1 GHz	Fig.19	P
	1 GHz ~ 3 GHz	Fig.20	P
	3 GHz ~ 10 GHz	Fig.21	P
	10 GHz ~ 26 GHz	Fig.22	P
Ch 78 2480 MHz	Center Frequency	Fig.23	P
	30 MHz ~ 1 GHz	Fig.24	P
	1 GHz ~ 3 GHz	Fig.25	P
	3 GHz ~ 10 GHz	Fig.26	P
	10 GHz ~ 26 GHz	Fig.27	P

For π/4 DQPSK

Channel	Frequency Range	Test Results	Conclusion
Ch 0 2402 MHz	Center Frequency	Fig.28	P
	30 MHz ~ 1 GHz	Fig.29	P
	1 GHz ~ 3 GHz	Fig.30	P
	3 GHz ~ 10 GHz	Fig.31	P
	10 GHz ~ 26 GHz	Fig.32	P
Ch 39 2441 MHz	Center Frequency	Fig.33	P
	30 MHz ~ 1 GHz	Fig.34	P
	1 GHz ~ 3 GHz	Fig.35	P
	3 GHz ~ 10 GHz	Fig.36	P
	10 GHz ~ 26 GHz	Fig.37	P
Ch 78 2480 MHz	Center Frequency	Fig.38	P
	30 MHz ~ 1 GHz	Fig.39	P
	1 GHz ~ 3 GHz	Fig.40	P
	3 GHz ~ 10 GHz	Fig.41	P
	10 GHz ~ 26 GHz	Fig.42	P

For 8DPSK

Channel	Frequency Range	Test Results	Conclusion
Ch 0 2402 MHz	Center Frequency	Fig.43	P
	30 MHz ~ 1 GHz	Fig.44	P
	1 GHz ~ 3 GHz	Fig.45	P
	3 GHz ~ 10 GHz	Fig.46	P
	10 GHz ~ 26 GHz	Fig.47	P

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Ch 39 2441 MHz	Center Frequency	Fig.48	P
	30 MHz ~ 1 GHz	Fig.49	P
	1 GHz ~ 3 GHz	Fig.50	P
	3 GHz ~ 10 GHz	Fig.51	P
	10 GHz ~ 26 GHz	Fig.52	P
Ch 78 2480 MHz	Center Frequency	Fig.53	P
	30 MHz ~ 1 GHz	Fig.54	P
	1 GHz ~ 3 GHz	Fig.55	P
	3 GHz ~ 10 GHz	Fig.56	P
	10 GHz ~ 26 GHz	Fig.57	P

Conclusion: PASS

Test graphs as below

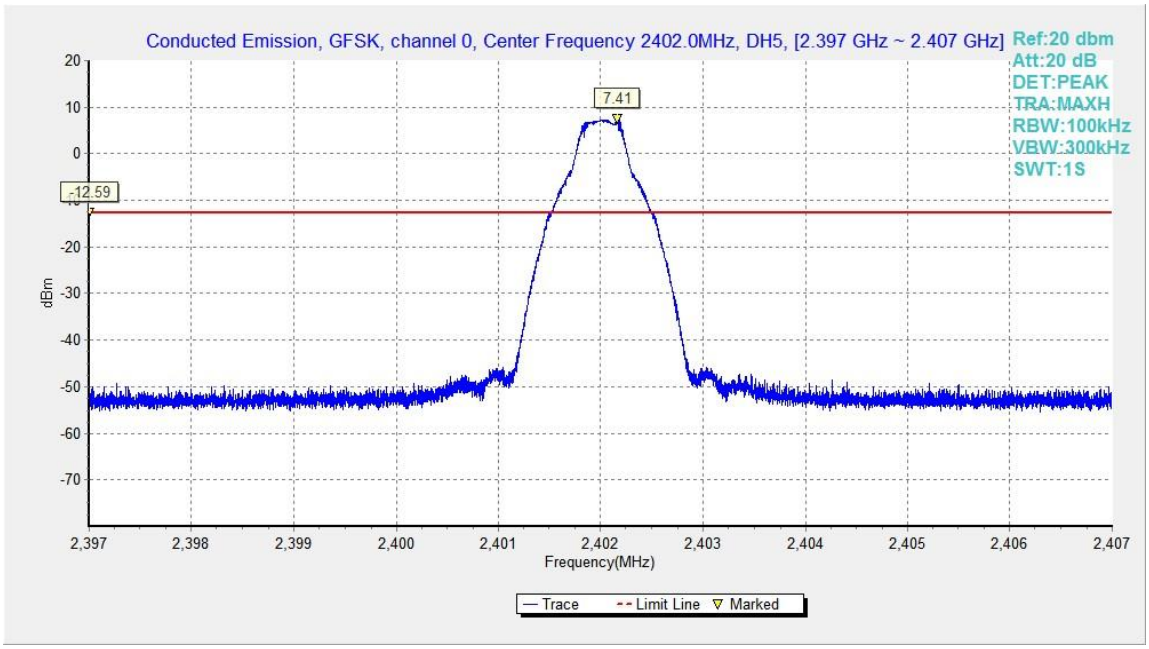


Fig.13. Conducted spurious emission: GFSK, Channel 0,2402MHz

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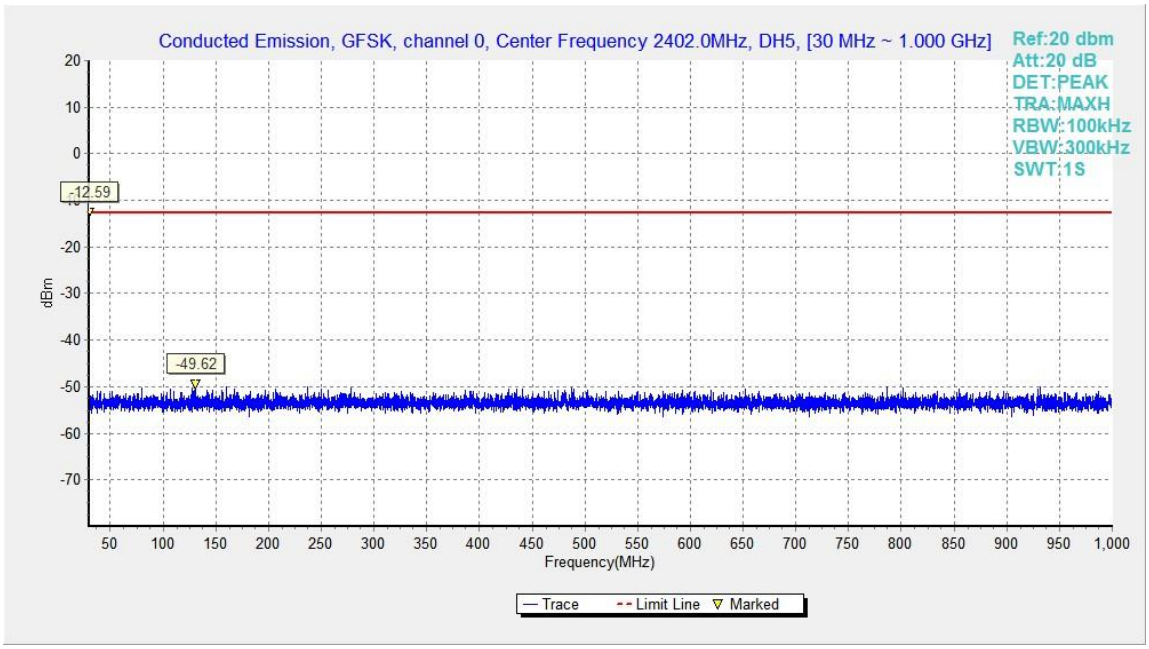


Fig.14. Conducted spurious emission: GFSK, Channel 0, 30MHz - 1GHz

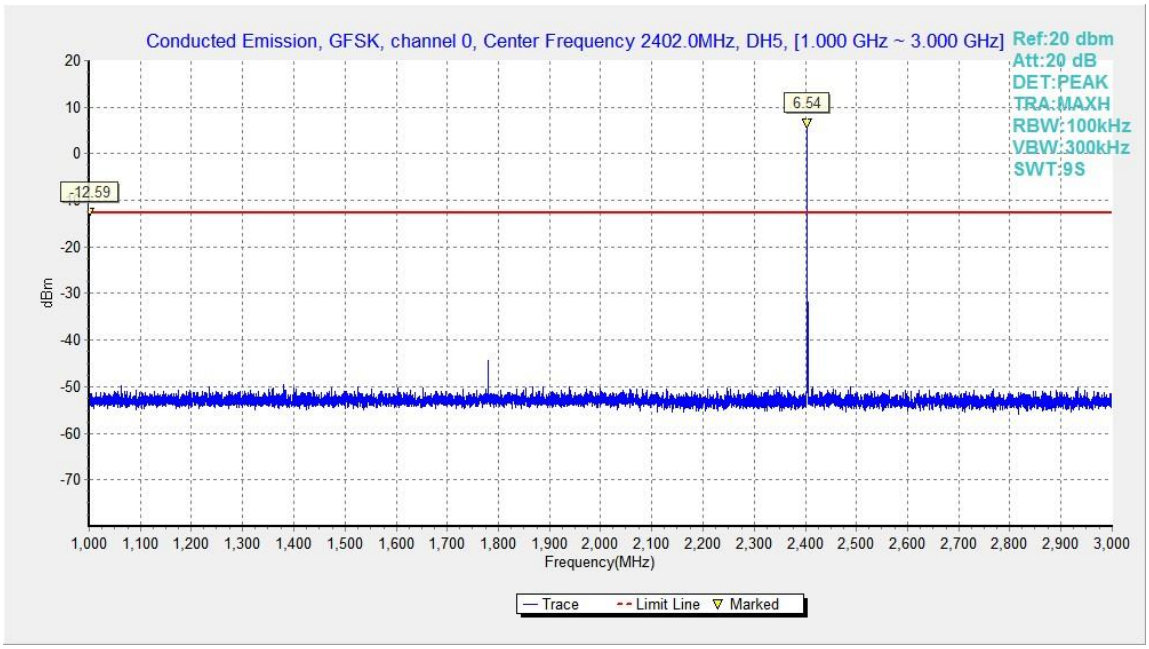


Fig.15. Conducted spurious emission: GFSK, Channel 0, 1GHz - 3GHz

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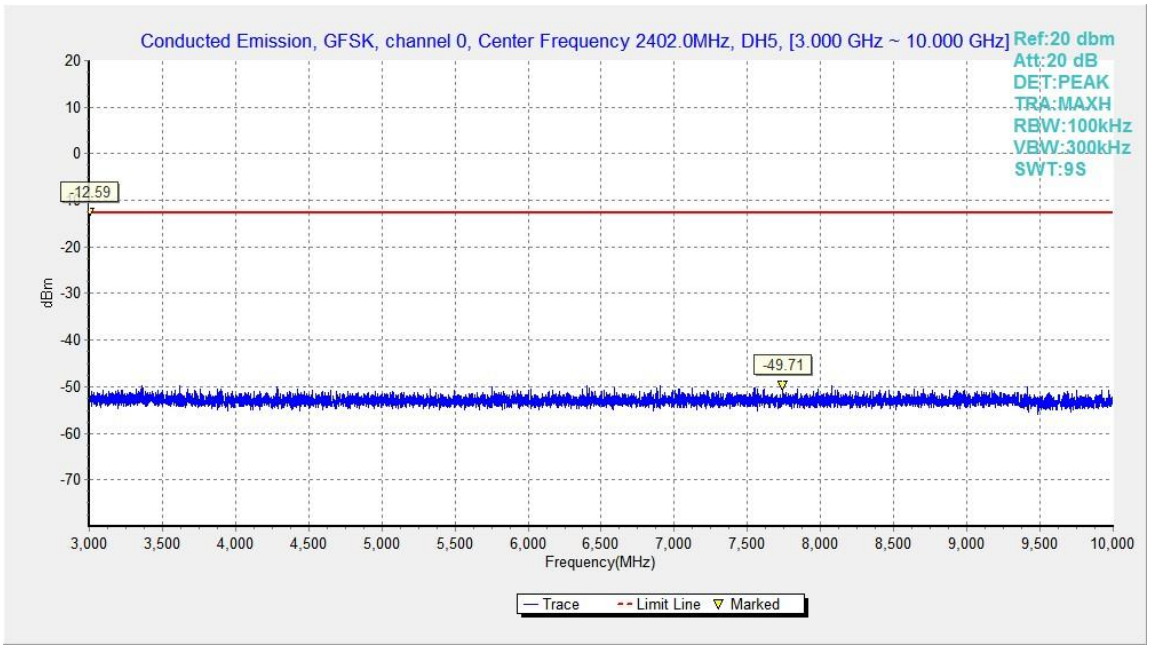


Fig.16. Conducted spurious emission: GFSK, Channel 0, 3GHz - 10GHz

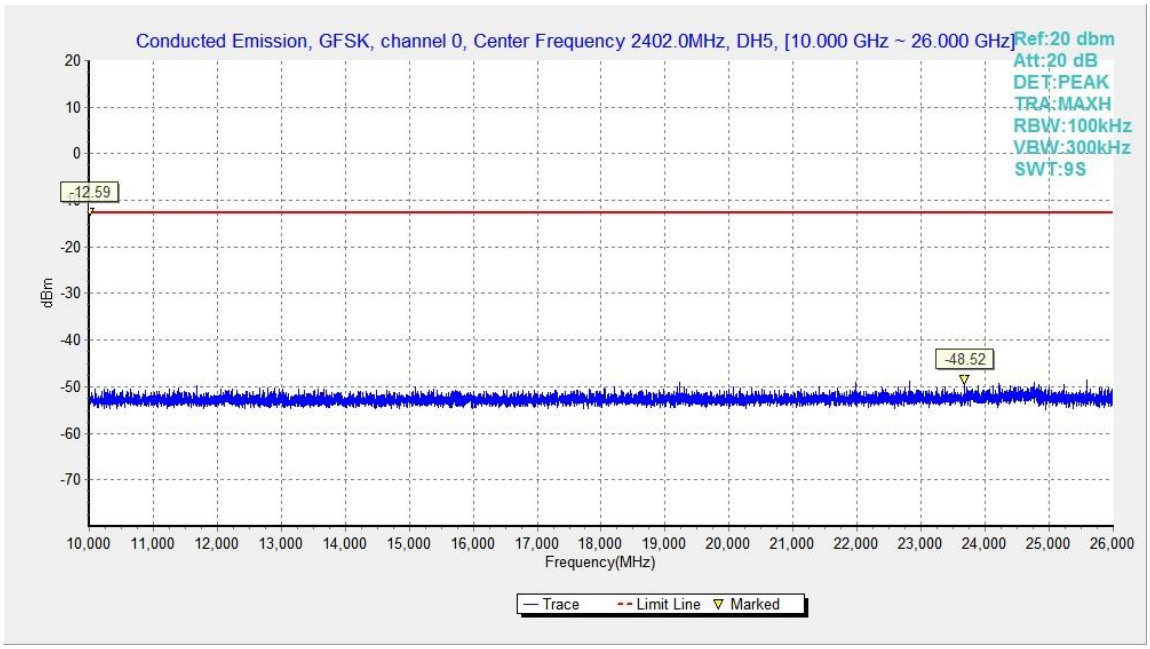


Fig.17. Conducted spurious emission: GFSK, Channel 0,10GHz - 26GHz

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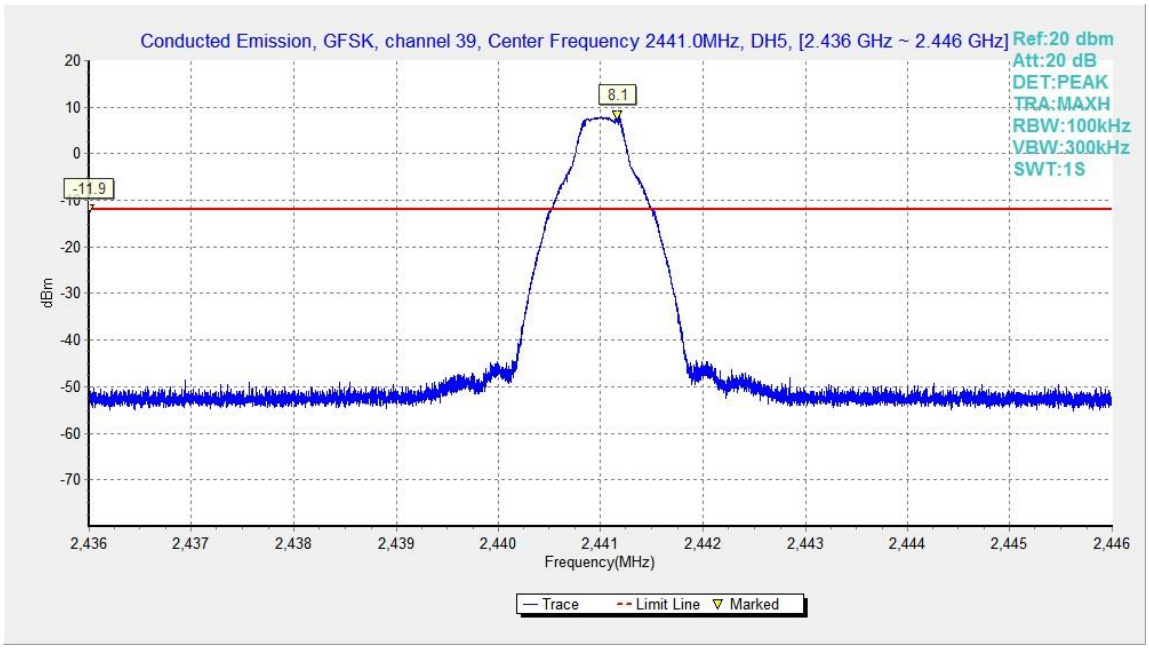


Fig.18. Conducted spurious emission: GFSK, Channel 39, 2441MHz

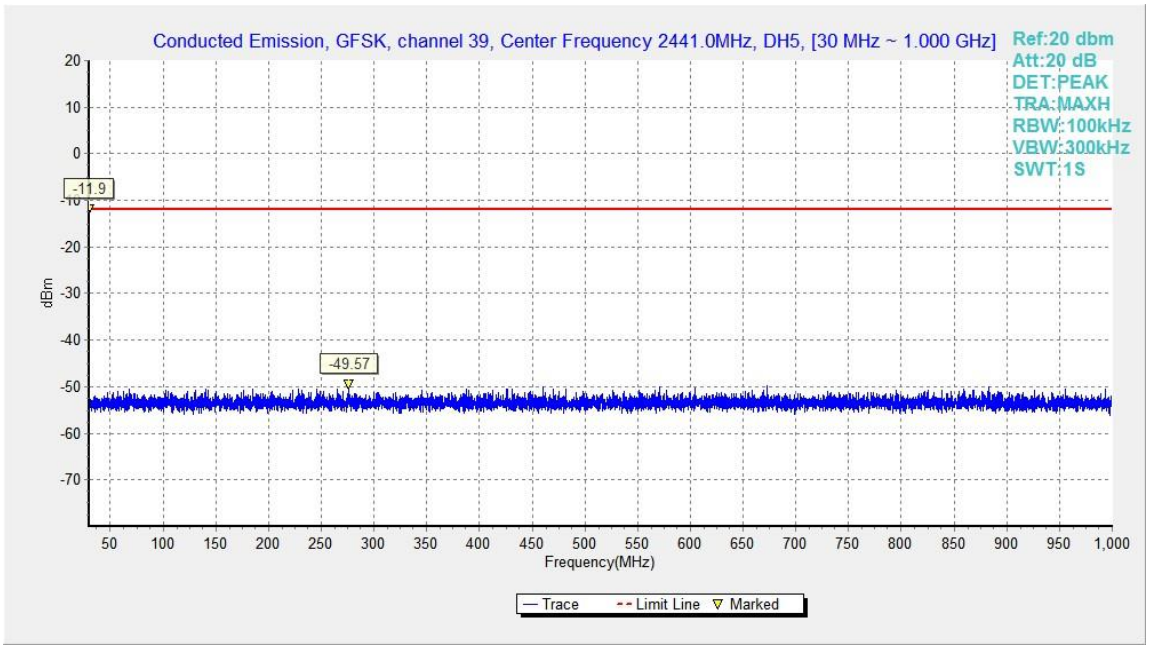


Fig.19. Conducted spurious emission: GFSK, Channel 39, 30MHz - 1GHz

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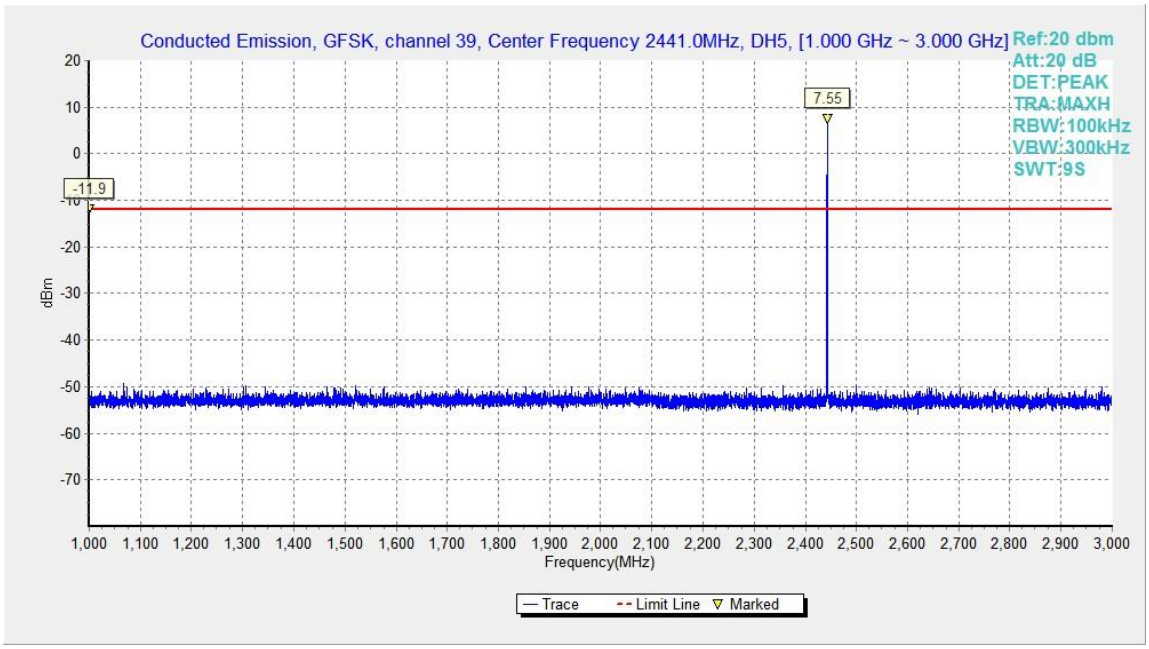


Fig.20. Conducted spurious emission: GFSK, Channel 39, 1GHz – 3GHz

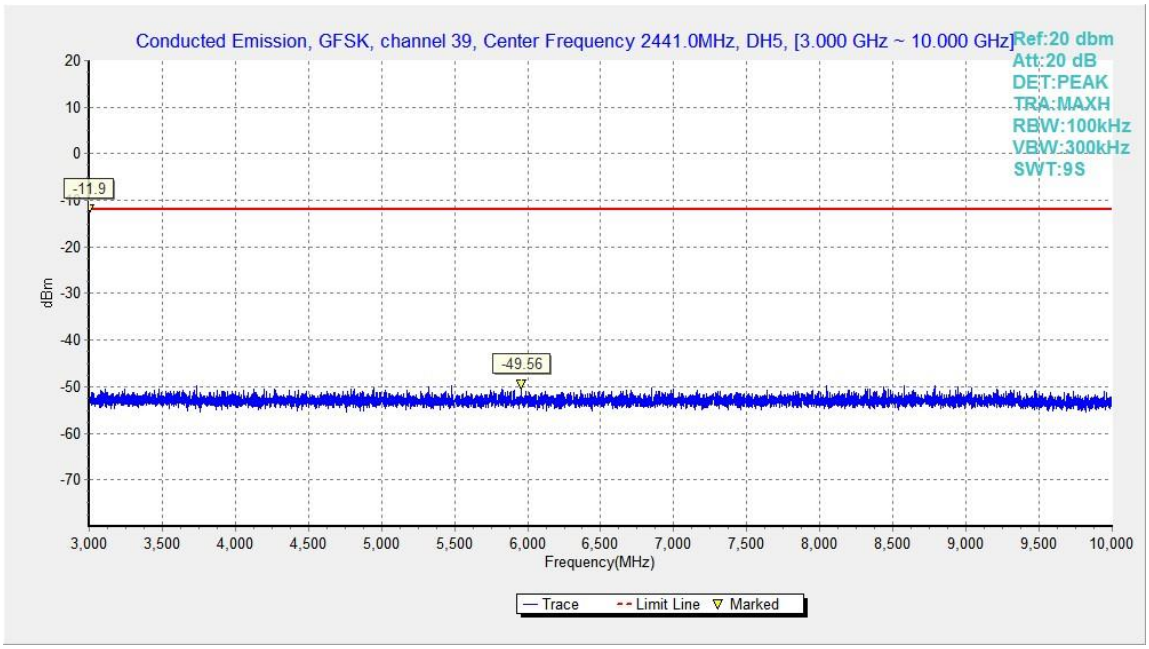


Fig.21. Conducted spurious emission: GFSK, Channel 39, 3GHz – 10GHz

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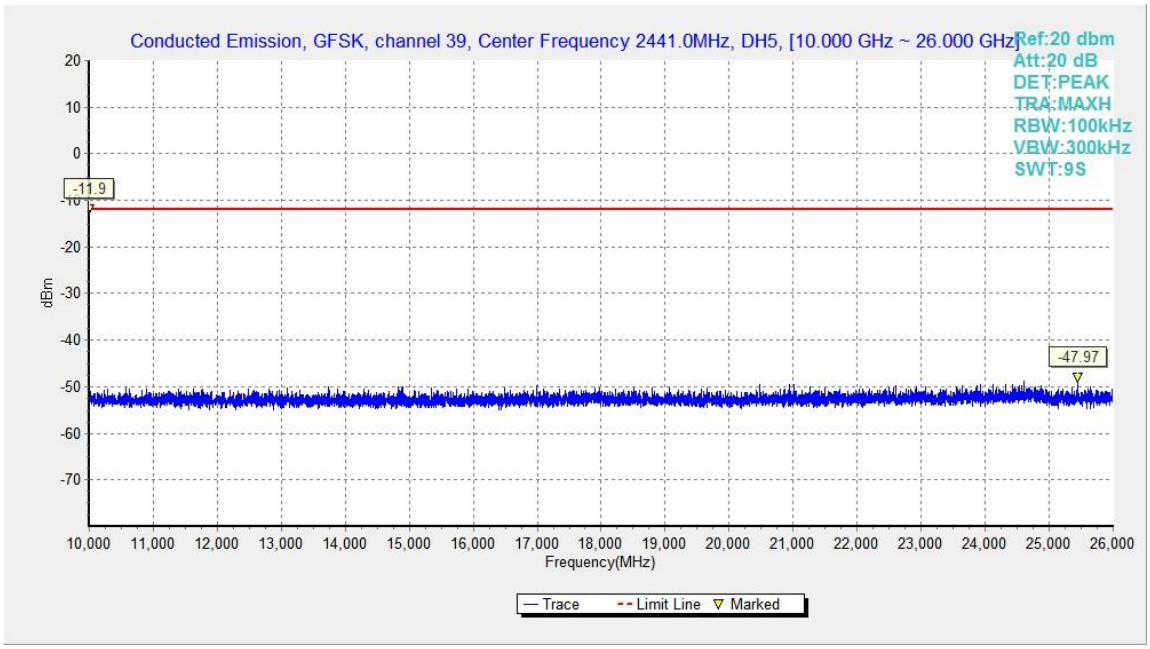


Fig.22. Conducted spurious emission: GFSK, Channel 39, 10GHz – 26GHz

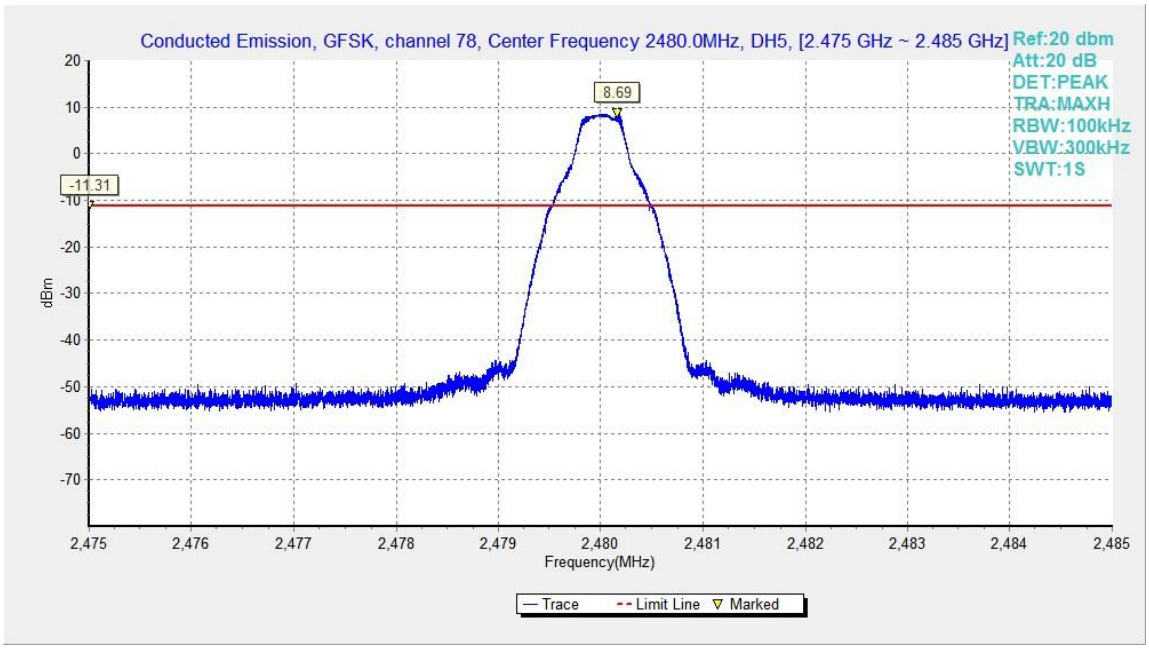


Fig.23. Conducted spurious emission: GFSK, Channel 78, 2480MHz

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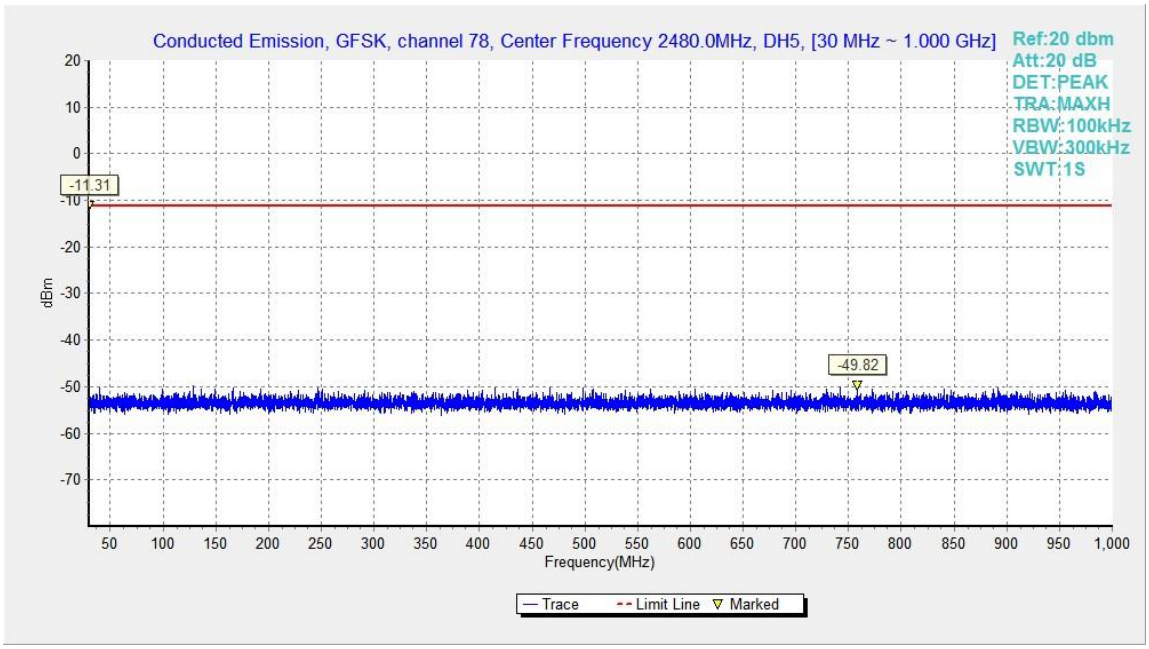


Fig.24. Conducted spurious emission: GFSK, Channel 78, 30MHz - 1GHz

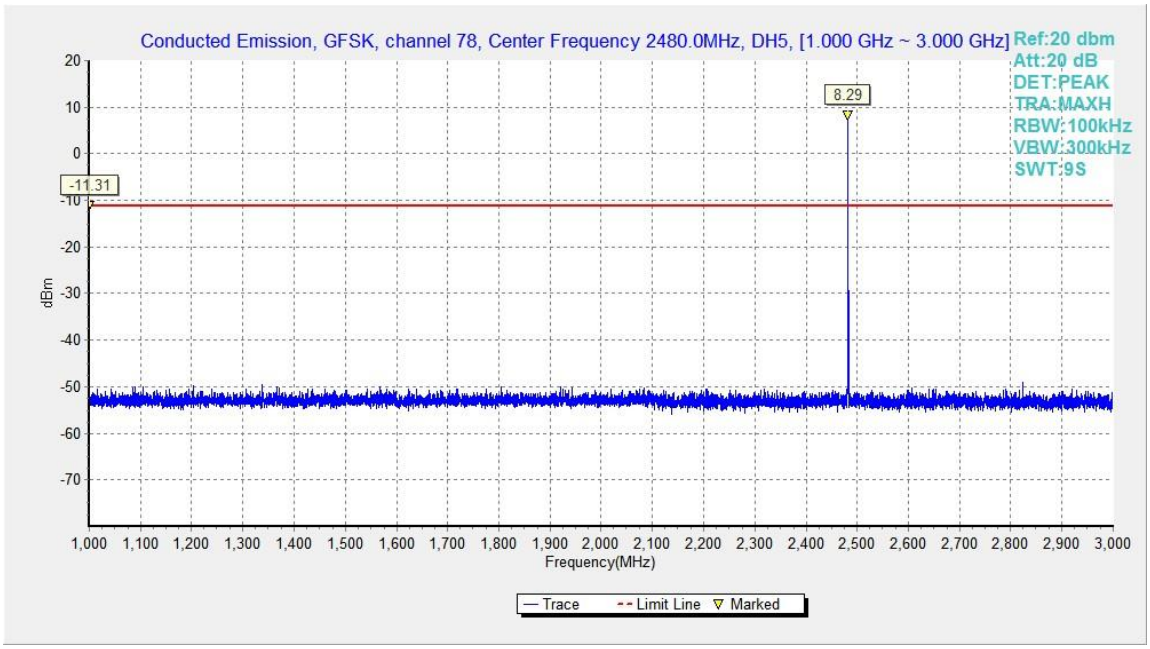


Fig.25. Conducted spurious emission: GFSK, Channel 78, 1GHz - 3GHz

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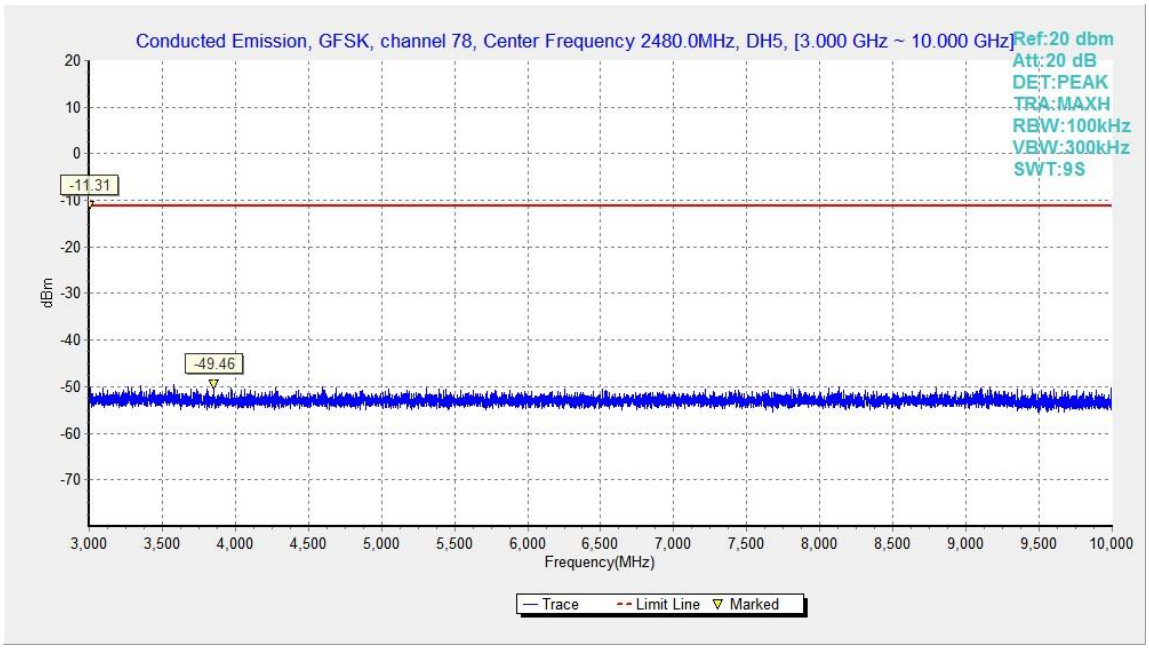


Fig.26. Conducted spurious emission: GFSK, Channel 78, 3GHz - 10GHz

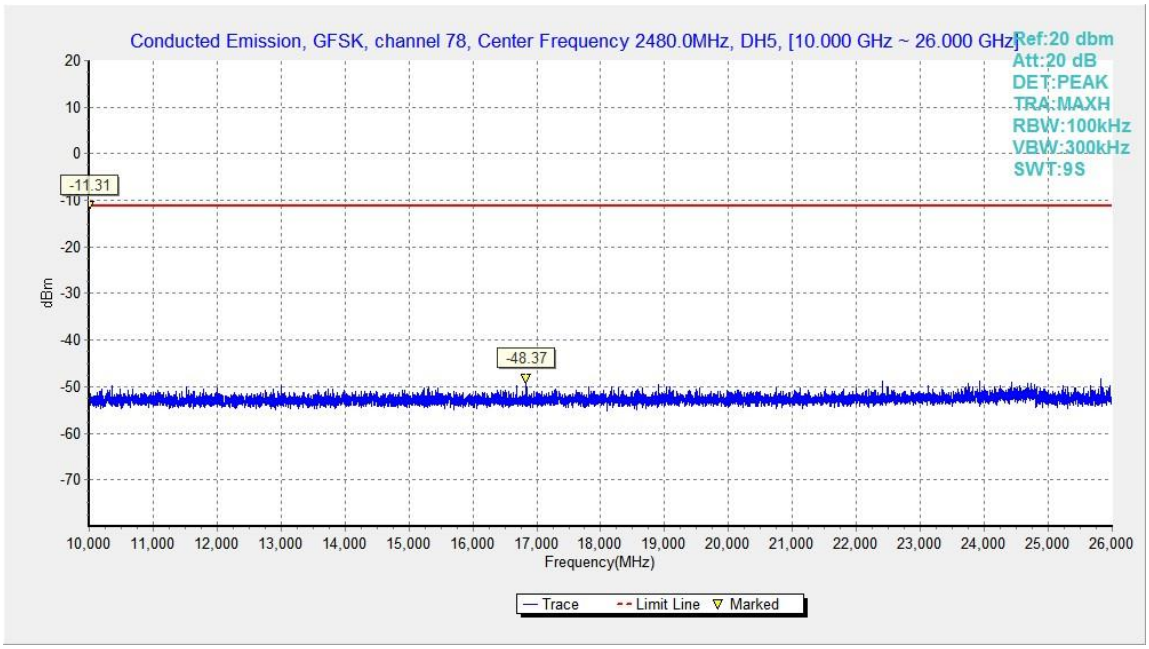


Fig.27. Conducted spurious emission: GFSK, Channel 78, 10GHz - 26GHz

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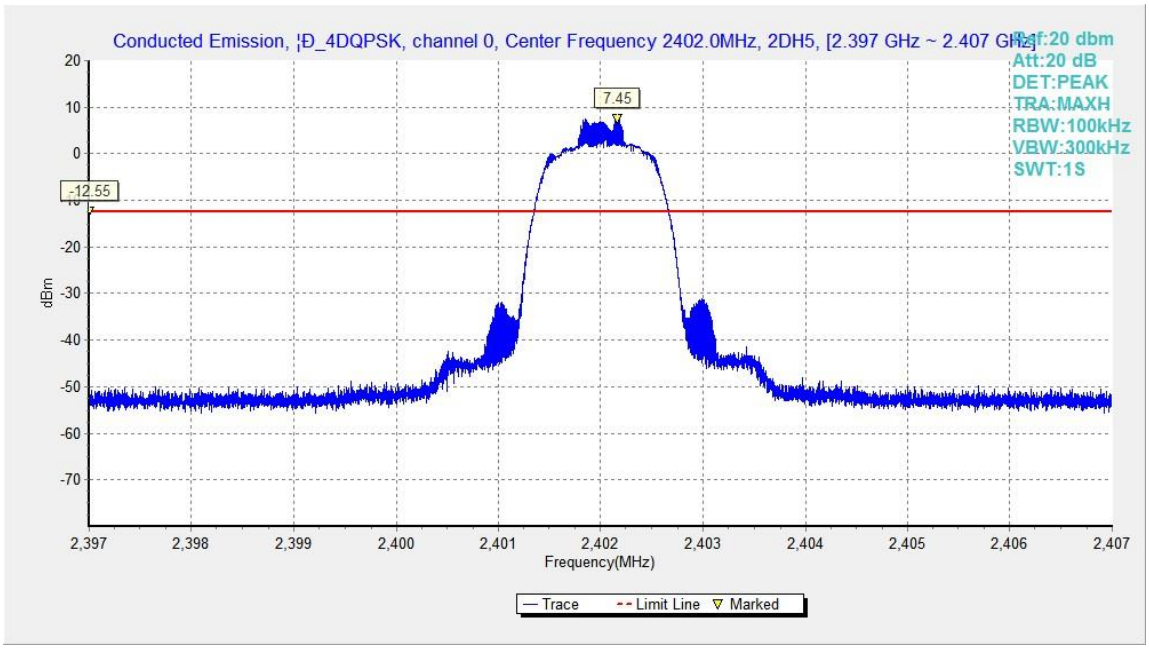


Fig.28. Conducted spurious emission: π/4 DQPSK, Channel 0,2402MHz

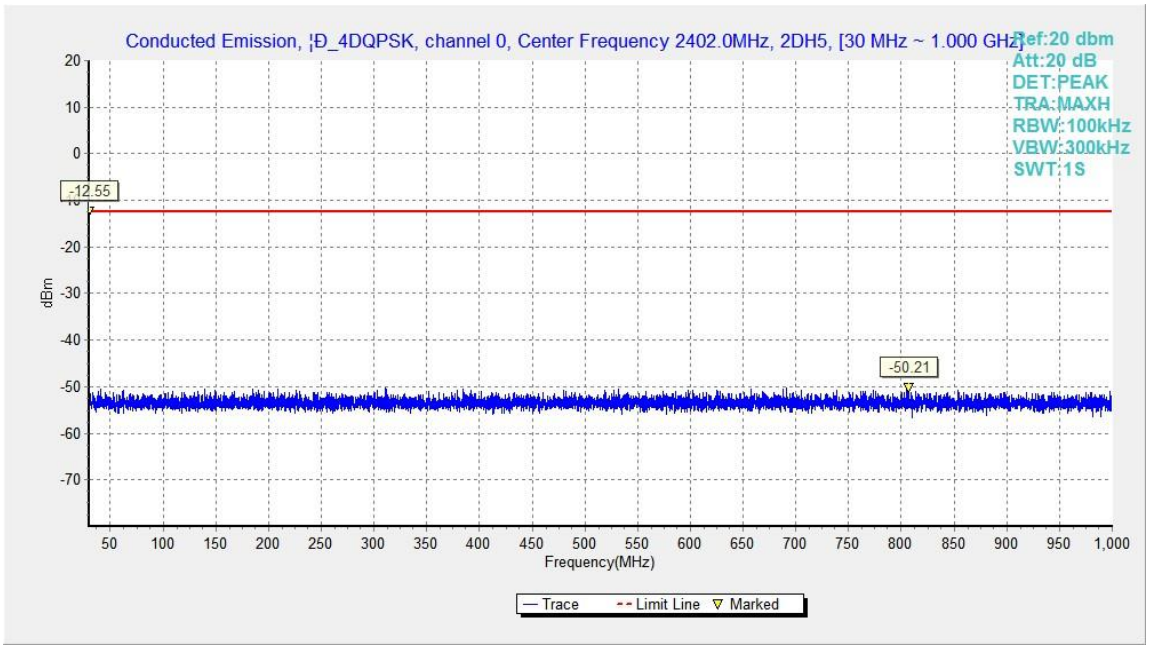


Fig.29. Conducted spurious emission: π/4 DQPSK, Channel 0, 30MHz - 1GHz

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Fig.30. Conducted spurious emission: π/4 DQPSK, Channel 0, 1GHz - 3GHz

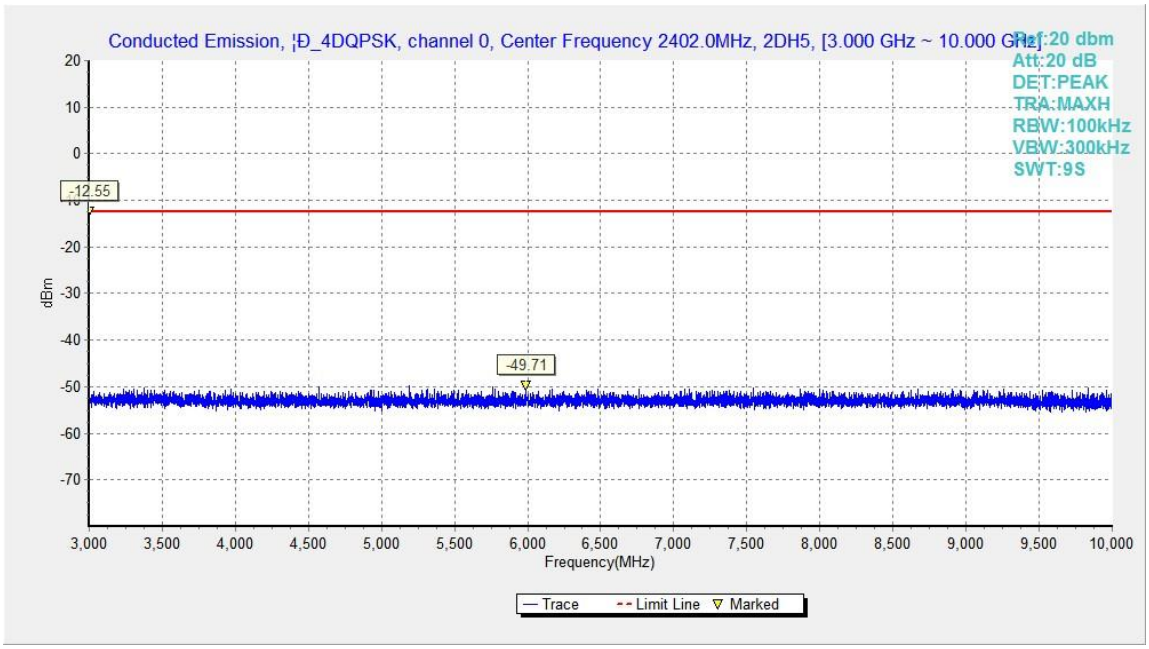


Fig.31. Conducted spurious emission: π/4 DQPSK, Channel 0, 3GHz - 10GHz

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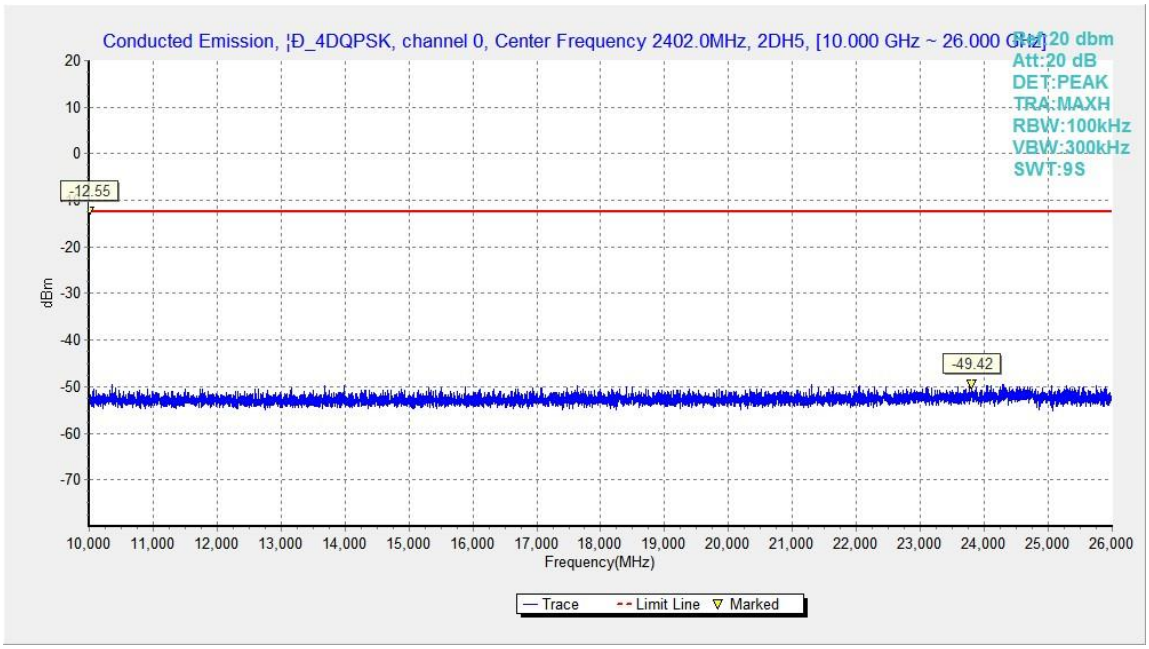


Fig.32. Conducted spurious emission: π/4 DQPSK, Channel 0,10GHz - 26GHz

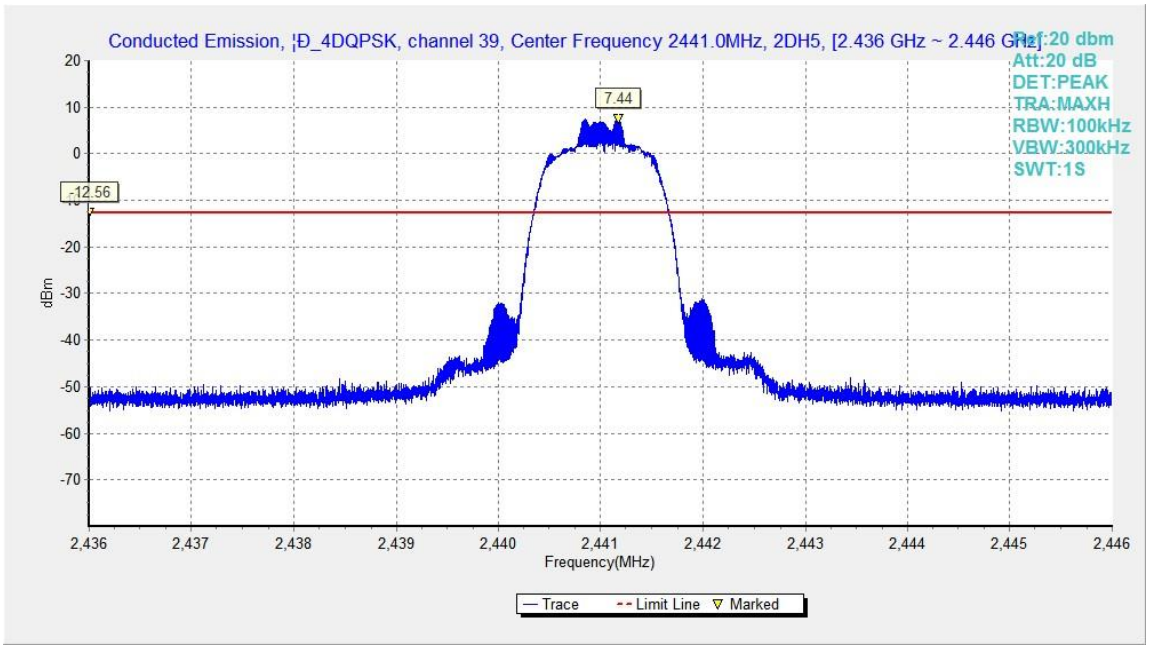


Fig.33. Conducted spurious emission: π/4 DQPSK, Channel 39, 2441MHz

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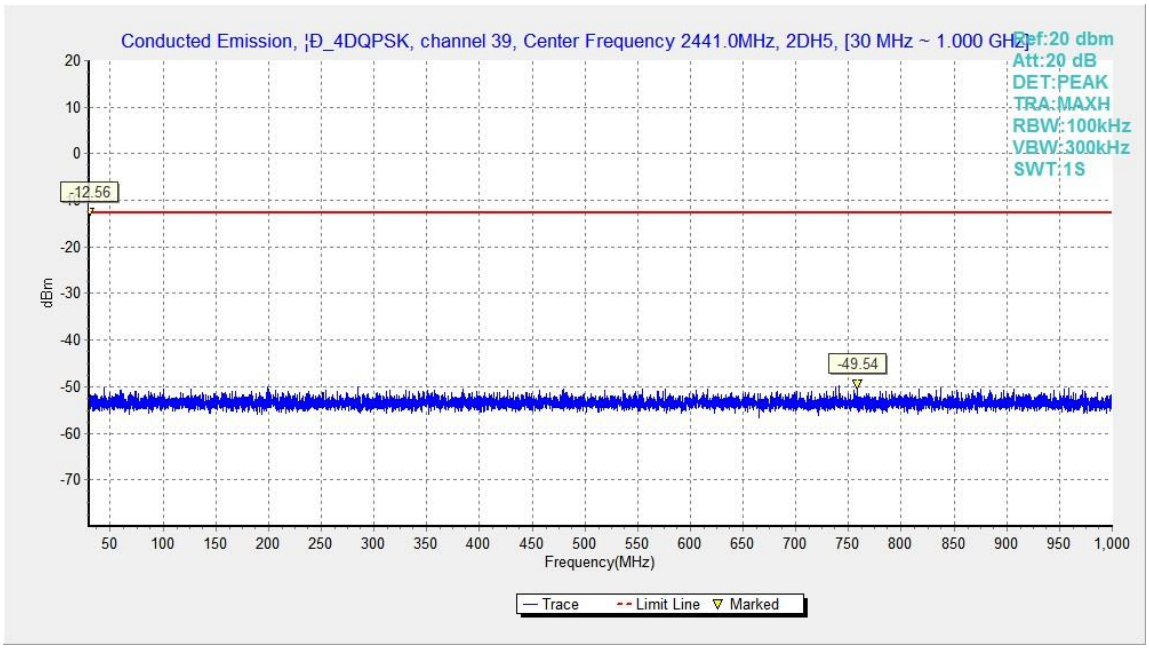


Fig.34. Conducted spurious emission: π/4 DQPSK, Channel 39, 30MHz - 1GHz

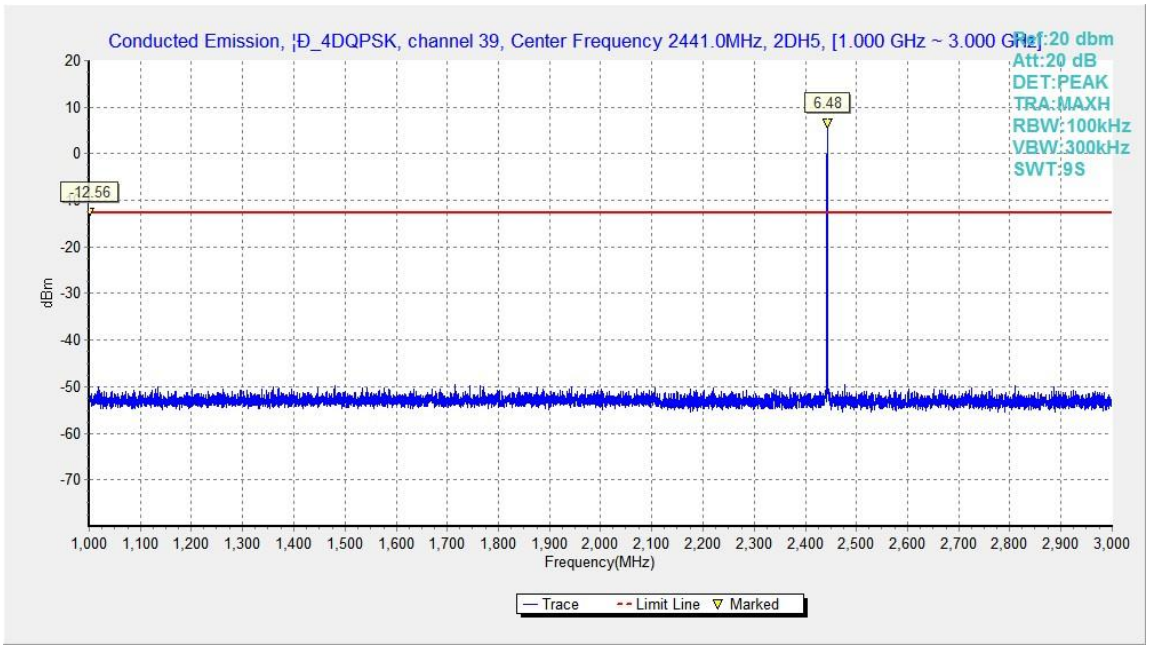


Fig.35. Conducted spurious emission: π/4 DQPSK, Channel 39, 1GHz - 3GHz

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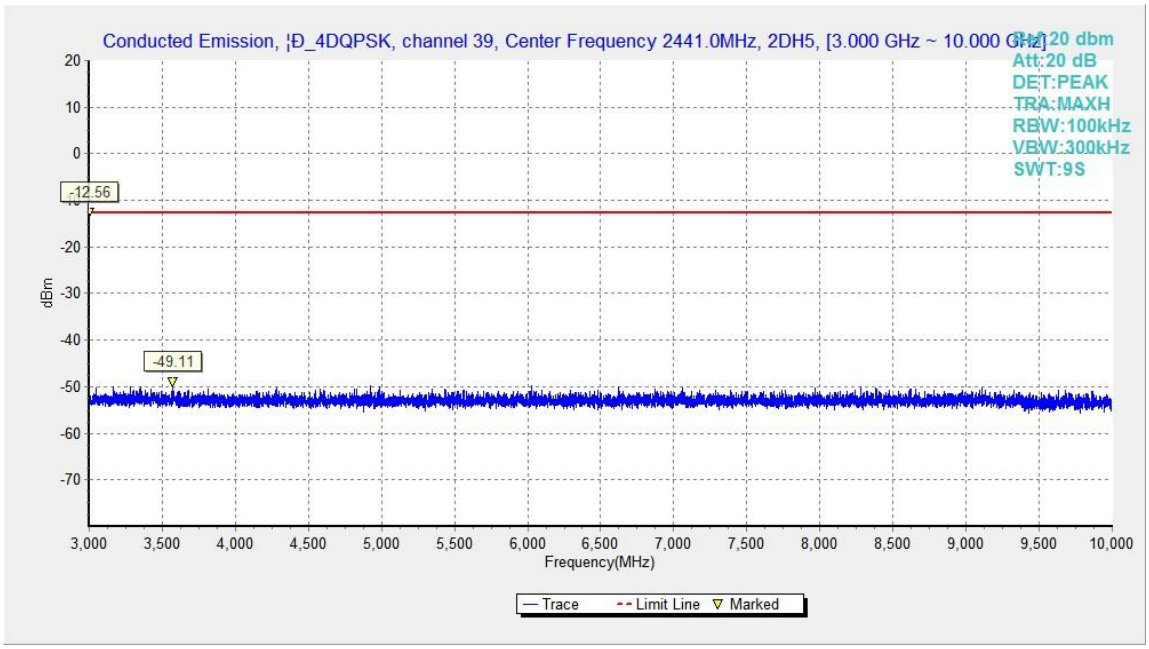


Fig.36. Conducted spurious emission: π/4 DQPSK, Channel 39, 3GHz - 10GHz

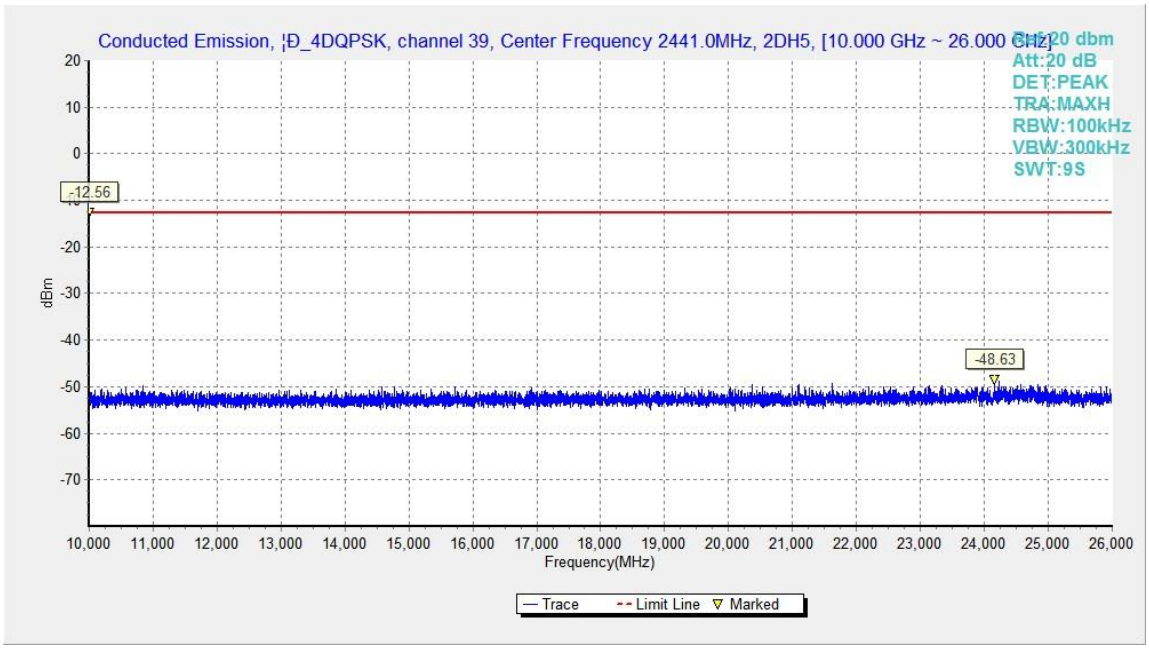


Fig.37. Conducted spurious emission: π/4 DQPSK, Channel 39, 10GHz – 26GHz

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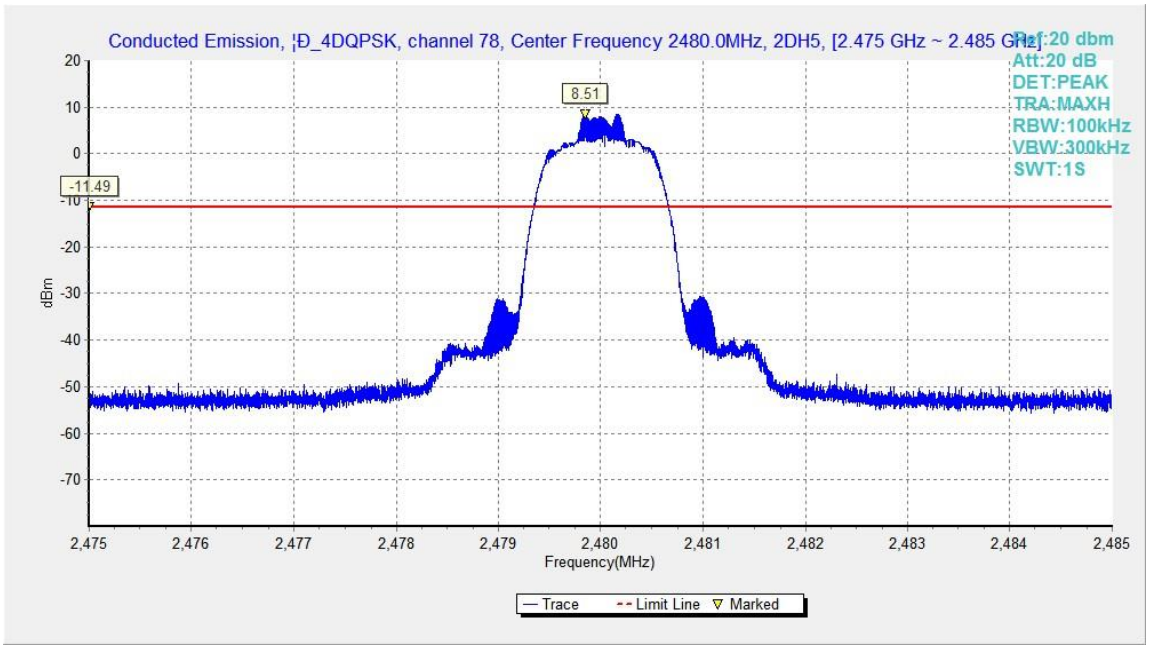


Fig.38. Conducted spurious emission: π/4 DQPSK, Channel 78, 2480MHz

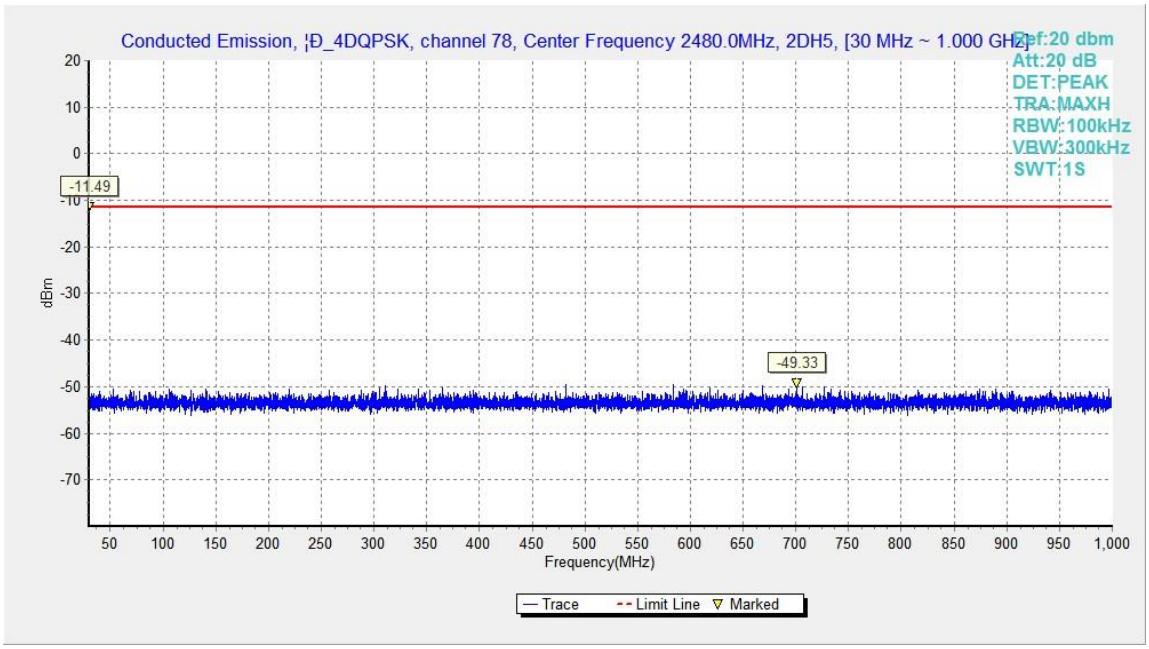


Fig.39. Conducted spurious emission: π/4 DQPSK, Channel 78, 30MHz - 1GHz

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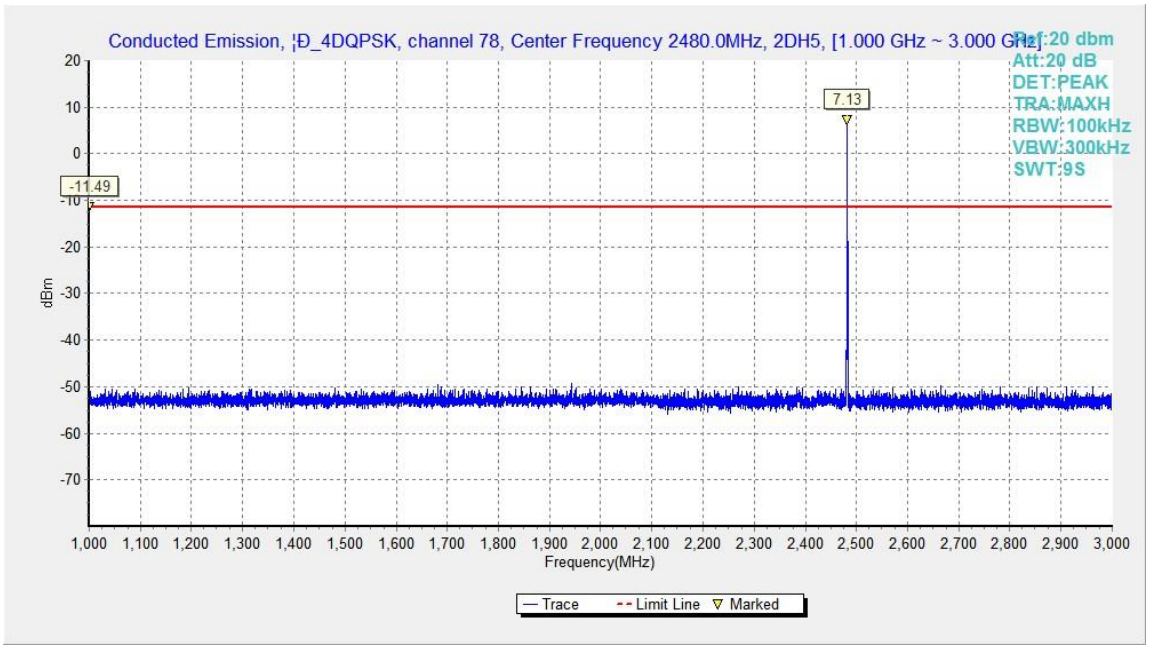


Fig.40. Conducted spurious emission: π/4 DQPSK, Channel 78, 1GHz - 3GHz

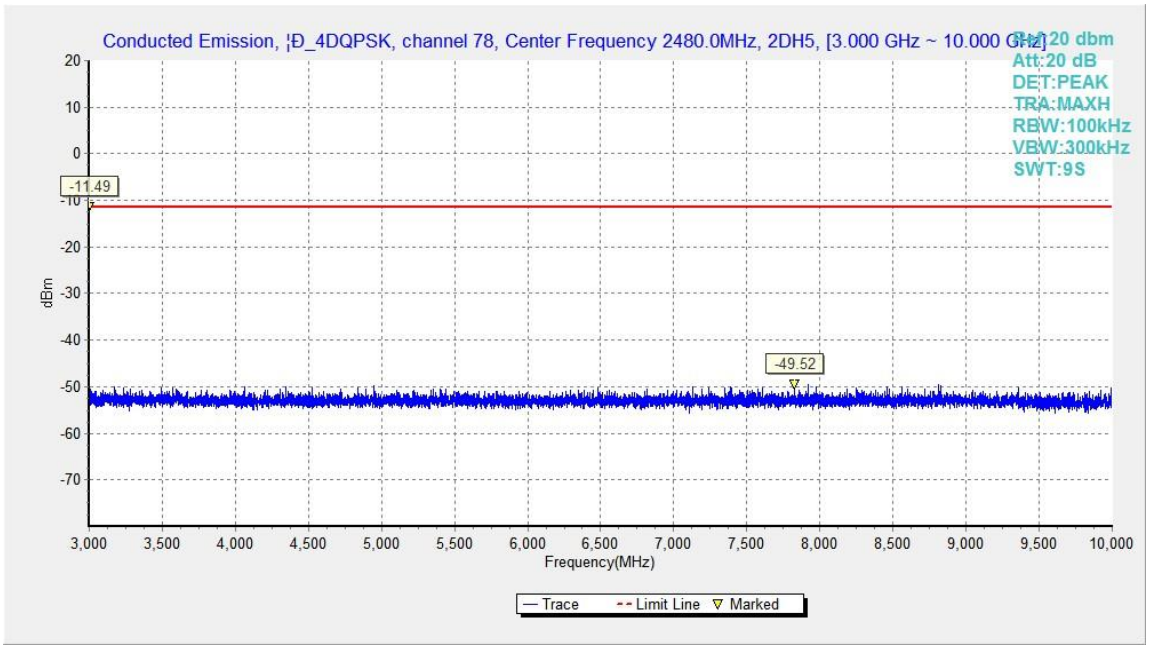


Fig.41. Conducted spurious emission: π/4 DQPSK, Channel 78, 3GHz - 10GHz

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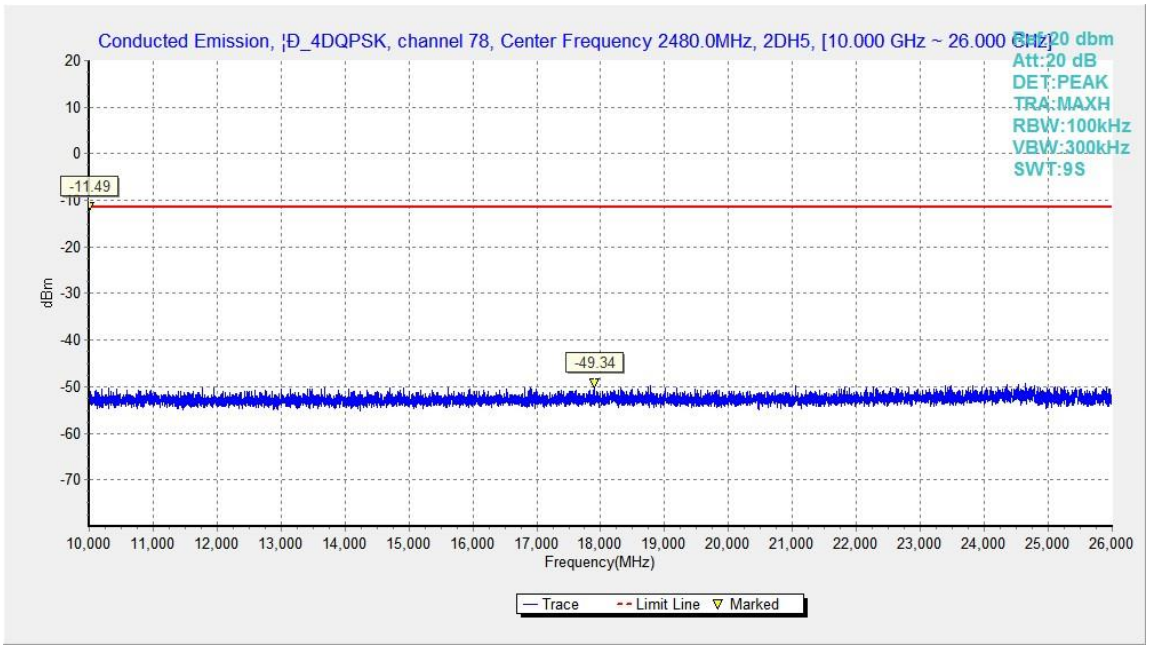


Fig.42. Conducted spurious emission: π/4 DQPSK, Channel 78, 10GHz - 26GHz

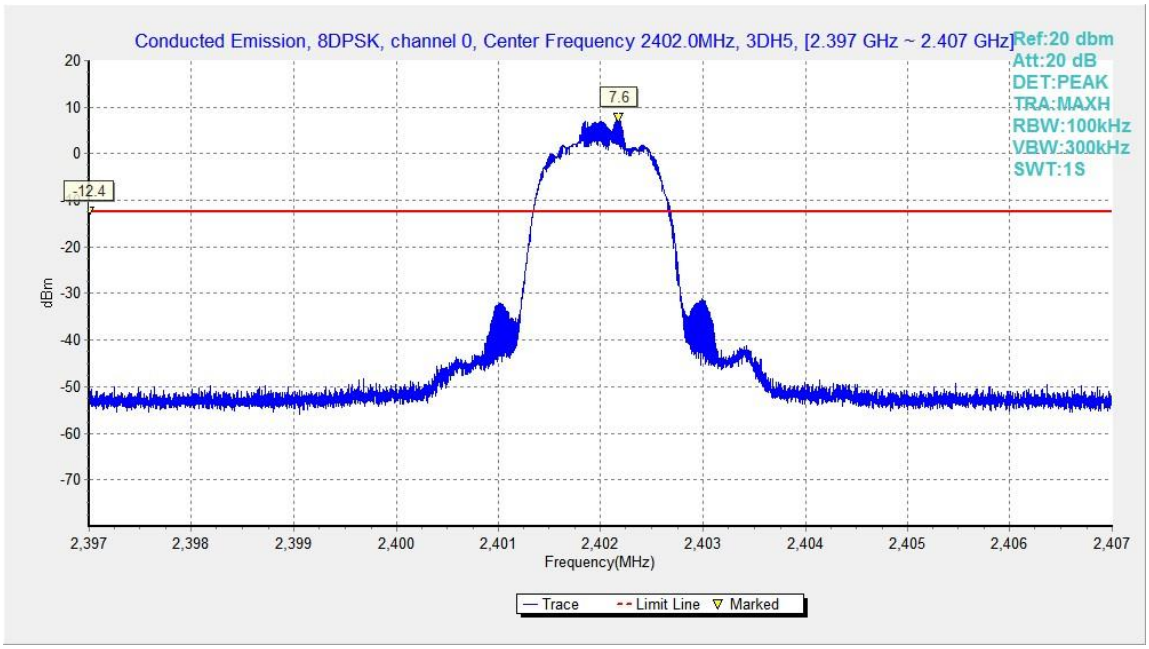


Fig.43. Conducted spurious emission: 8DPSK, Channel 0,2402MHz

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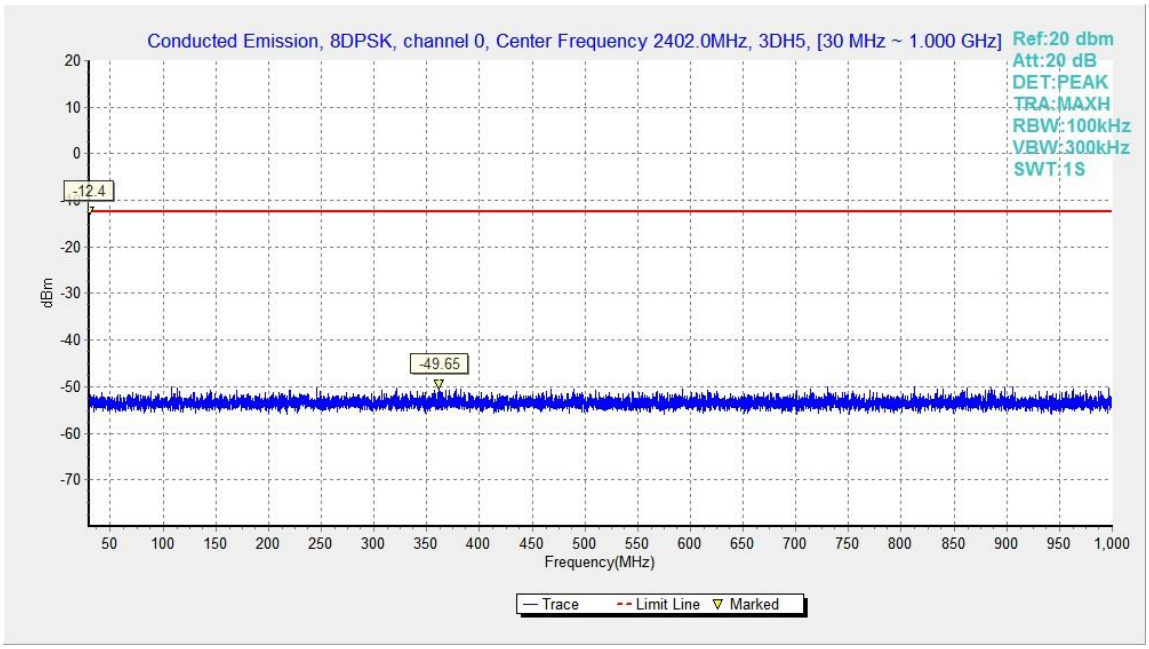


Fig.44. Conducted spurious emission: 8DPSK, Channel 0, 30MHz - 1GHz

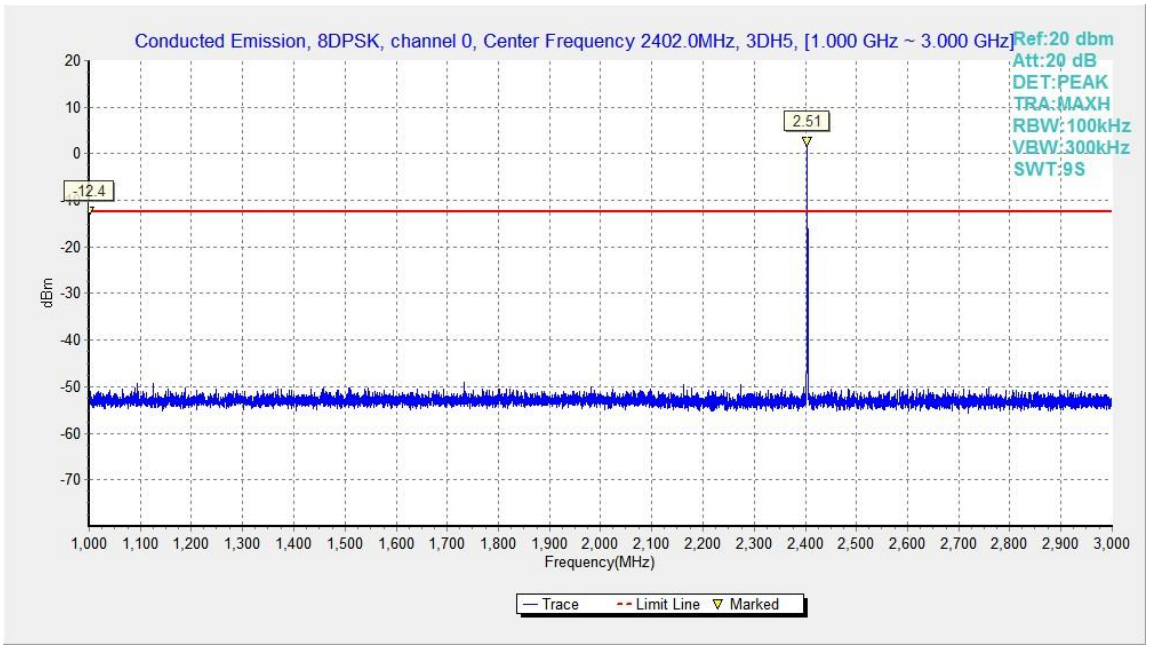


Fig.45. Conducted spurious emission: 8DPSK, Channel 0, 1GHz - 3GHz

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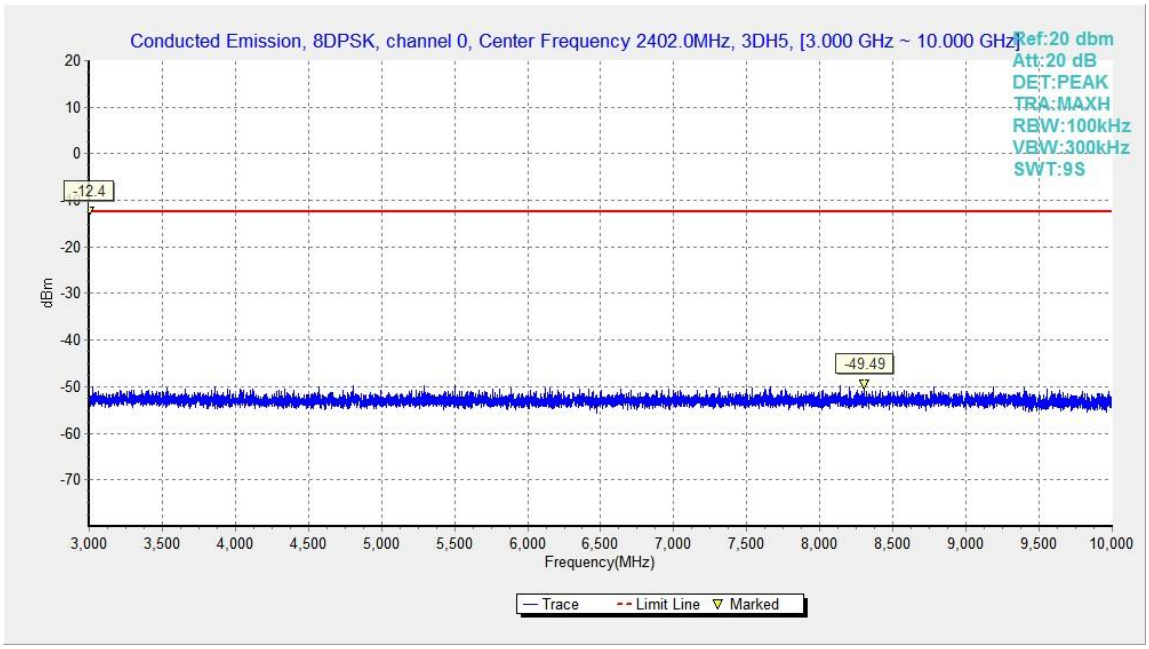


Fig.46. Conducted spurious emission: 8DPSK, Channel 0, 3GHz - 10GHz

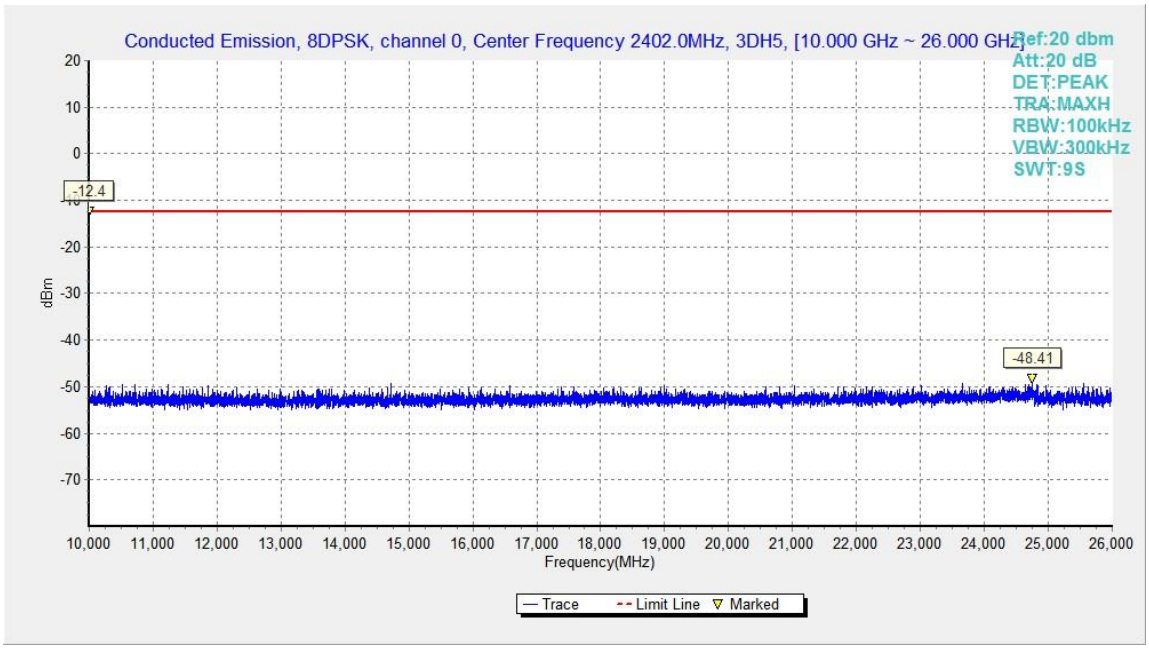


Fig.47. Conducted spurious emission: 8DPSK, Channel 0,10GHz - 26GHz

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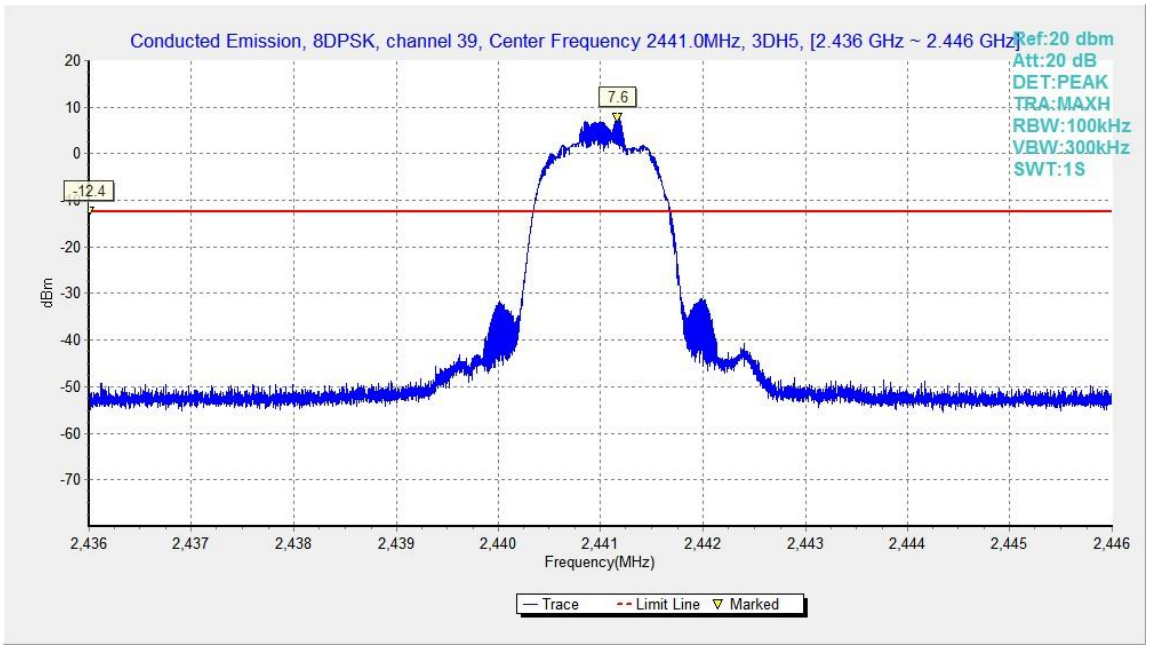


Fig.48. Conducted spurious emission: 8DPSK, Channel 39, 2441MHz

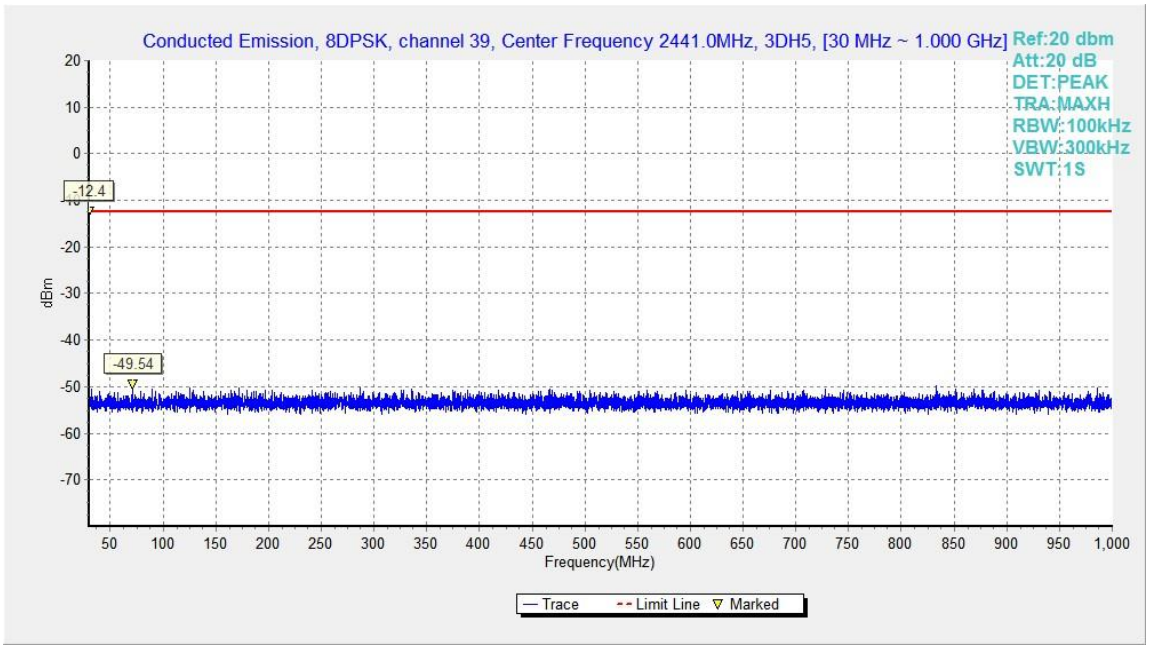


Fig.49. Conducted spurious emission: 8DPSK, Channel 39, 30MHz - 1GHz

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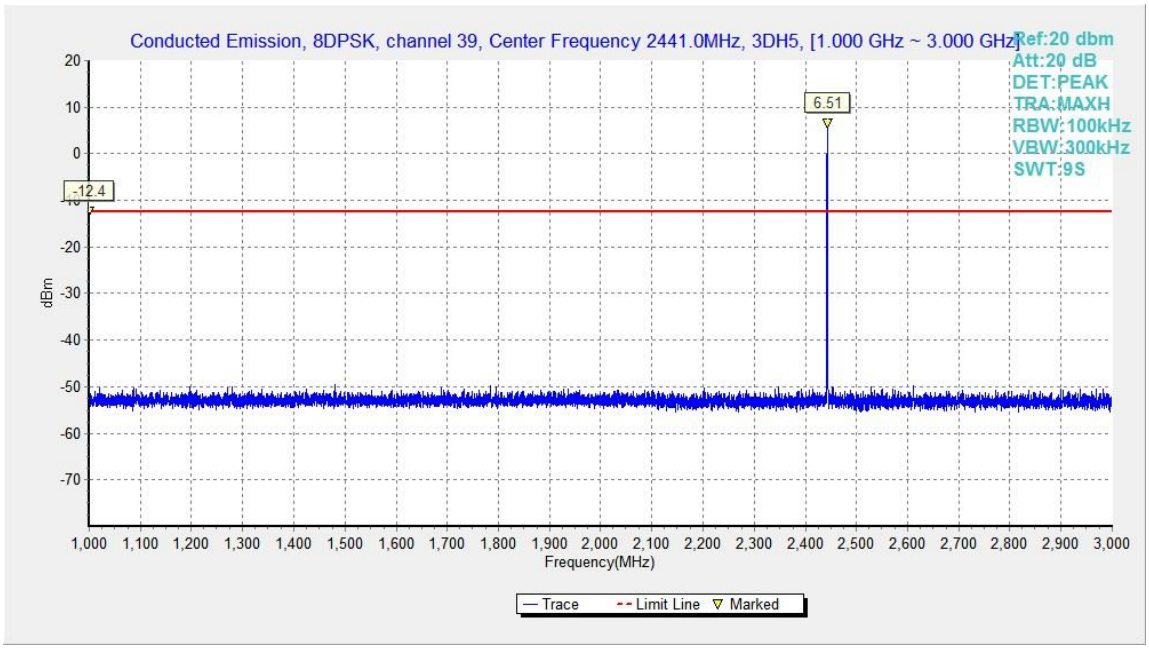


Fig.50. Conducted spurious emission: 8DPSK, Channel 39, 1GHz - 3GHz

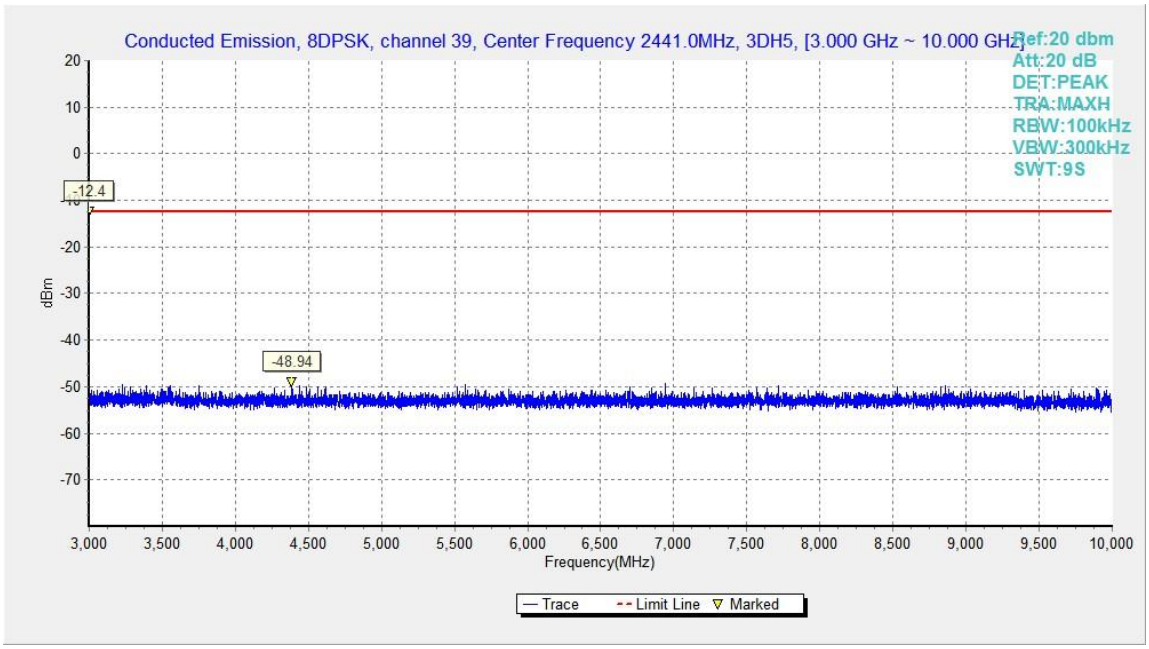


Fig.51. Conducted spurious emission: 8DPSK, Channel 39, 3GHz - 10GHz

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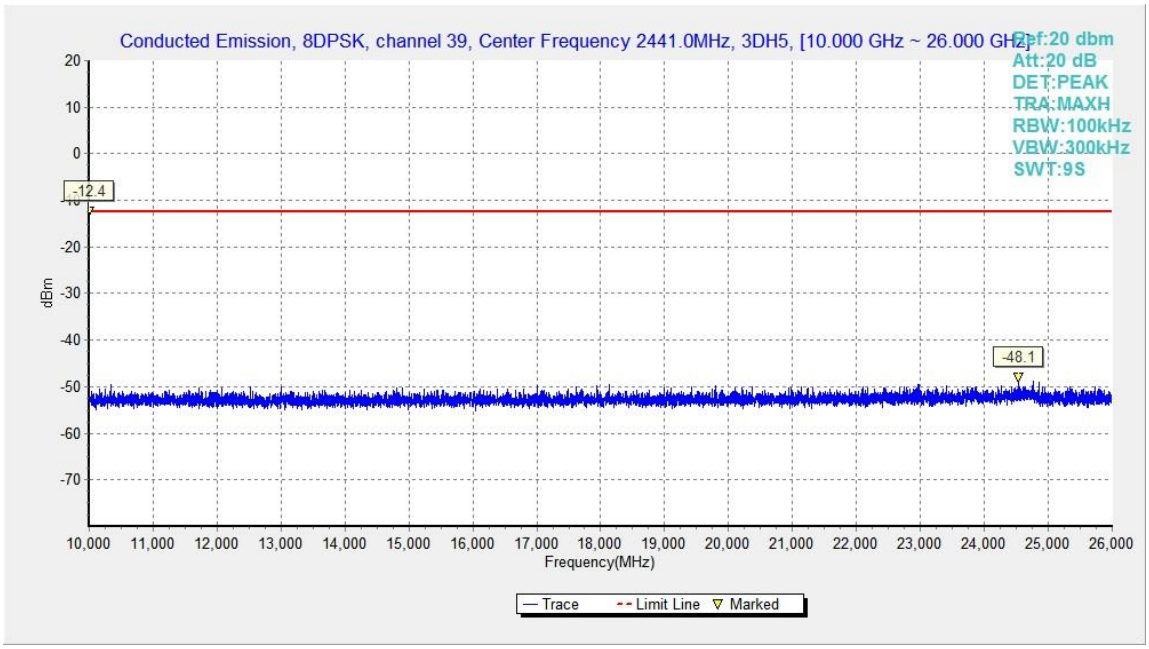


Fig.52. Conducted spurious emission: 8DPSK, Channel 39, 10GHz – 26GHz

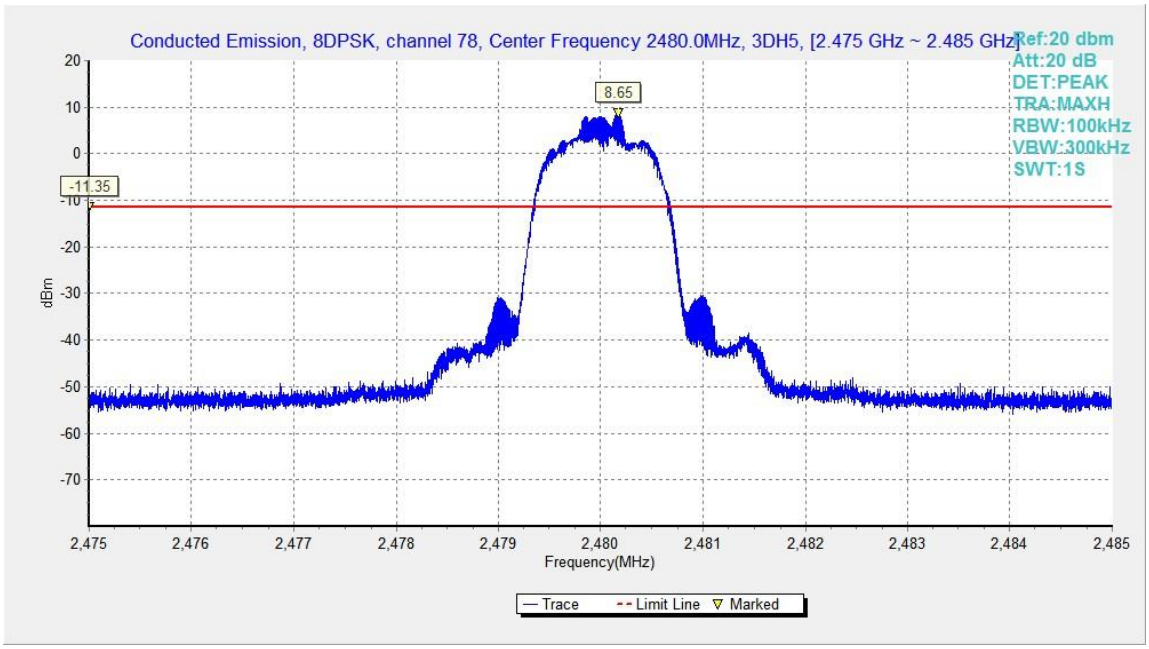


Fig.53. Conducted spurious emission: 8DPSK, Channel 78, 2480MHz

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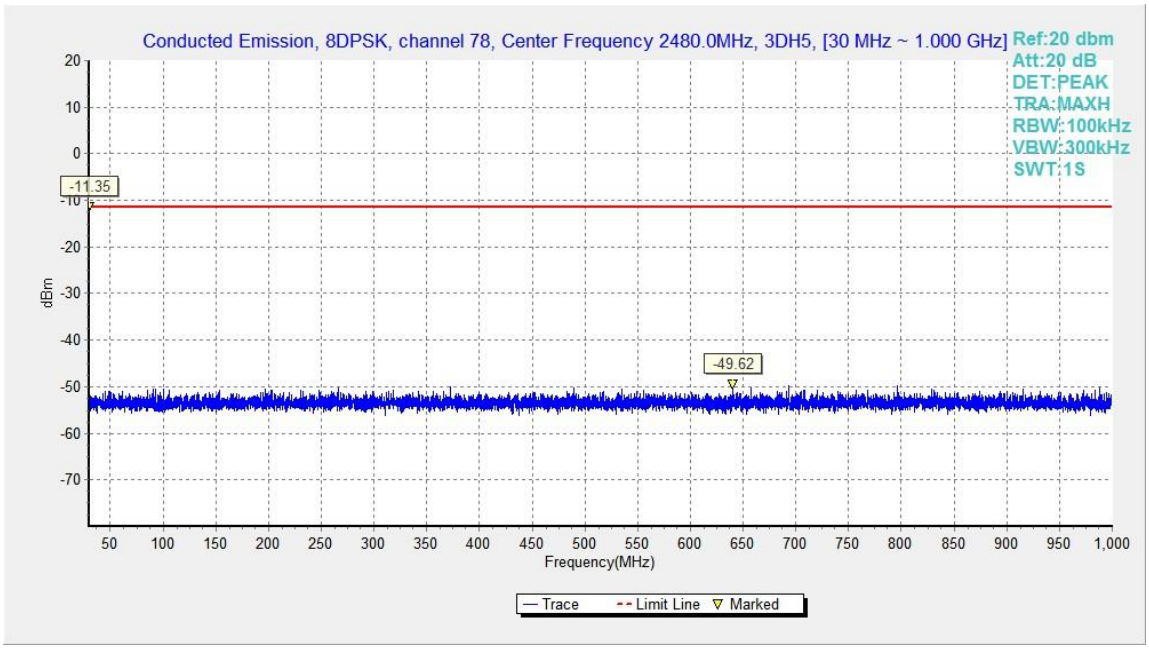


Fig.54. Conducted spurious emission: 8DPSK, Channel 78, 30MHz - 1GHz

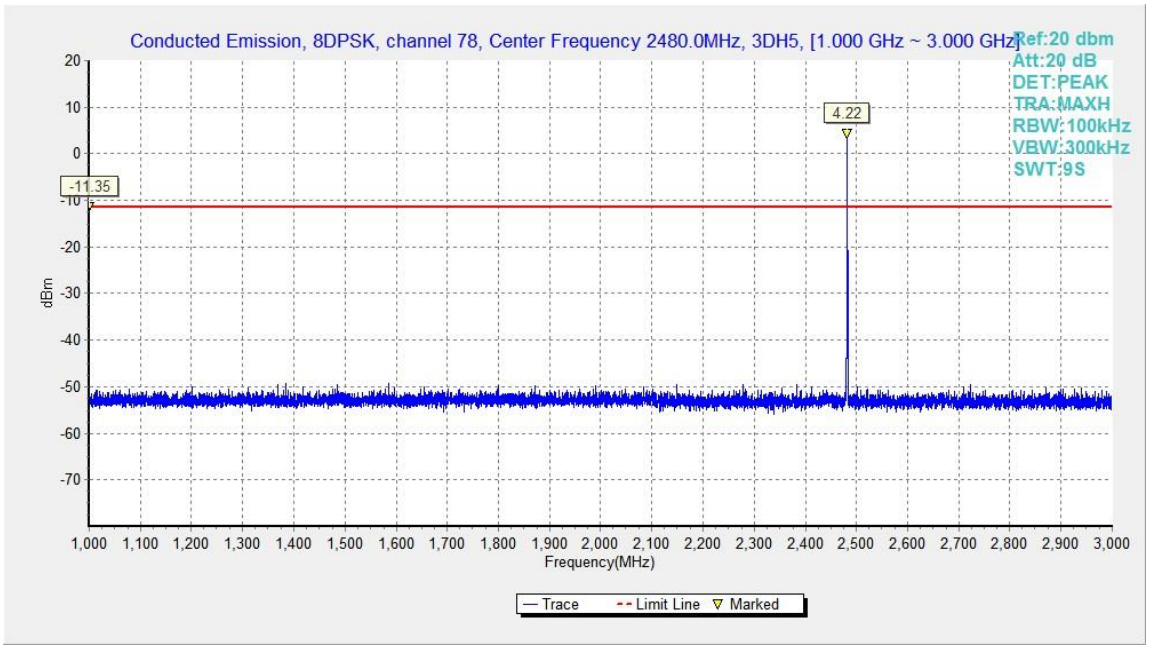


Fig.55. Conducted spurious emission: 8DPSK, Channel 78, 1GHz - 3GHz

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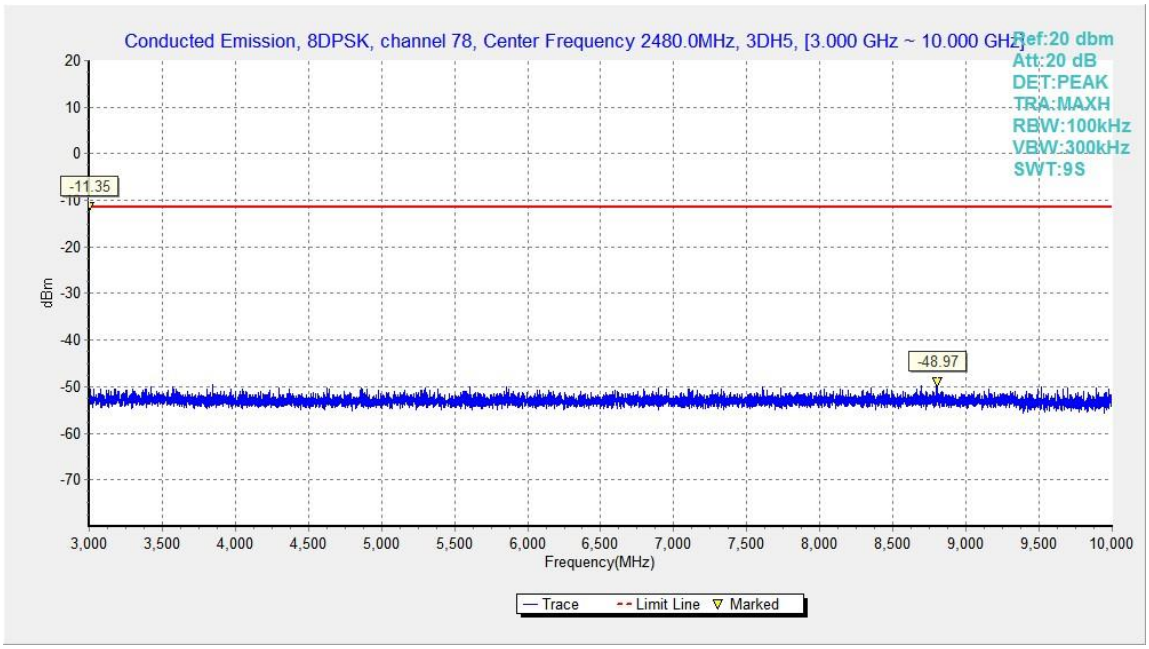


Fig.56. Conducted spurious emission: 8DPSK, Channel 78, 3GHz - 10GHz

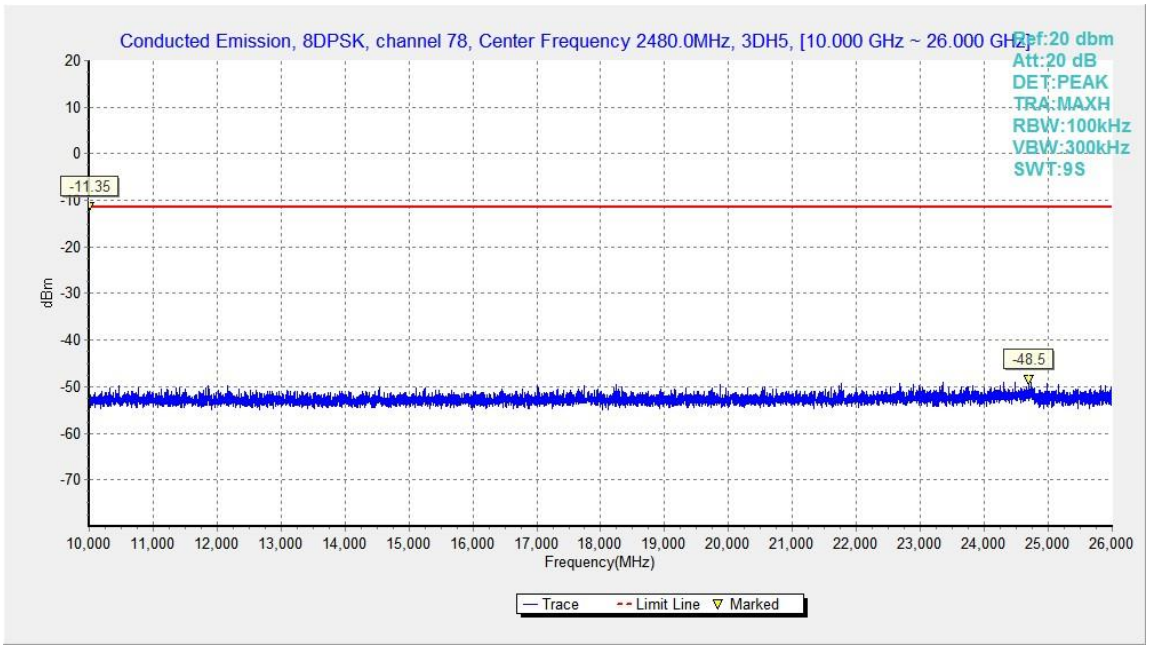


Fig.57. Conducted spurious emission: 8DPSK, Channel 78, 10GHz - 26GHz

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B.5. Radiated Unwanted Emission

Limits

Measurement Limit

Standard	Limit
FCC 47 CFR Part 15.247, 15.205, 15.209	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 (MHz)	Field strength(μV/m)	Measurement distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

Frequency of emission (MHz)	Field strength (uV/m)	Field strength (dBuV/m)	Measurement distance (m)
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Note: When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor.

Test setup

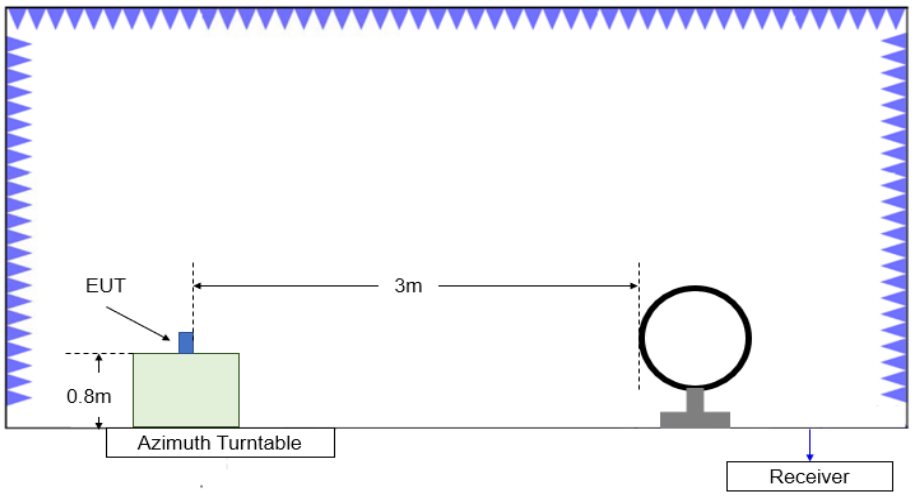


Figure B.5.1. Test Site Diagram (9kHz-30MHz)

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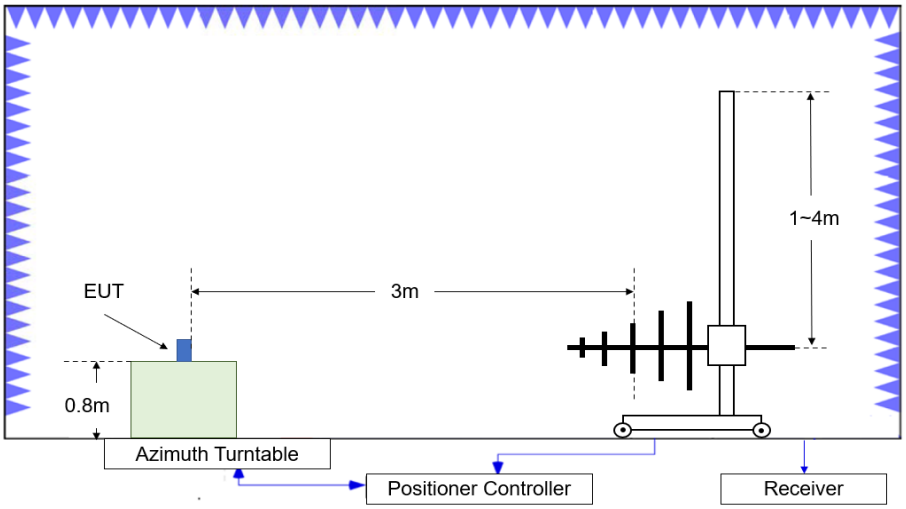


Figure B.5.2. Test Site Diagram (30MHz-1GHz)

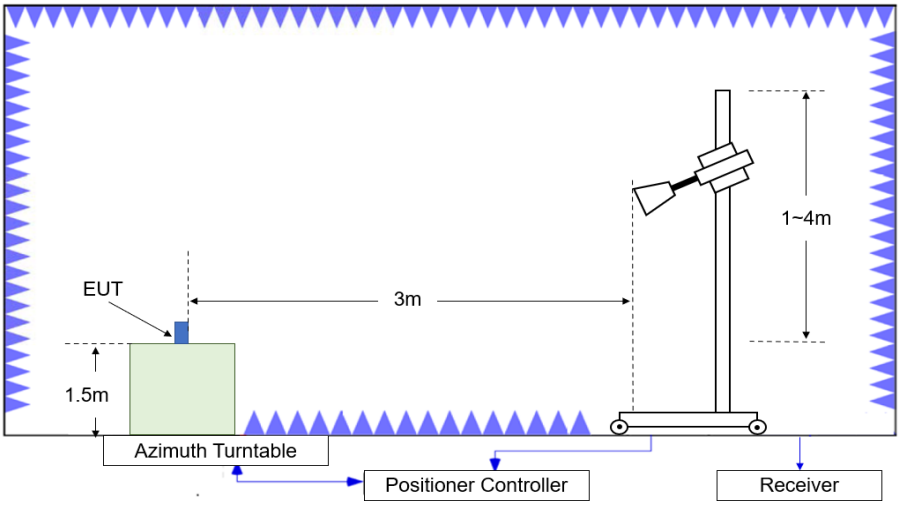


Figure B.5.3. Test Site Diagram (1GHz-40GHz)

Test Procedures

Radiated unwantedemissions from the EUT were measured according to ANSI C63.10-2013 (ANSI C63.10-2020).

Test setting

Frequency of emission (MHz)	RBW/VBW	Sweep Time(s)
30-1000	100kHz/300kHz	5
1000-3000	1MHz/3MHz	15
3000-18000	1MHz/3MHz	40
18000-26500	1MHz/3MHz	20

Sample Calculation

A "reference path loss" is established and the A_{Rpl} is the attenuation of “reference path loss”, and including the gain of receive antenna, 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:

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Result=P_{Mea}+$A_{Rpl=}P_{Mea}$+CableLoss+Antenna Factor

Test note

1. Investigation has been done on all modes and modulations/data rates. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

2. Spurious emissions for all channels were investigated and almost the same below 1GHz. According to FCC 47 CFR §15.31, emission levels are not report much lower than the limit by over 20dB

3. Measurement frequencies were performed from 9 kHzto the 10^{th} harmonic of highest fundamental frequency or 40GHz, whichever is lower.

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Test Result

EUT ID:EUT1

Radiated Spurious Emission

GFSK Ch 0

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17626.000	51.21	-29.50	45.40	35.31	74.00	22.79	V
4803.500	50.44	-37.70	33.00	55.14	74.00	23.56	V
14059.000	49.30	-31.10	41.60	38.80	74.00	24.70	H
12657.000	46.05	-31.80	39.40	38.45	74.00	27.95	H
9618.000	44.96	-34.30	37.60	41.66	74.00	29.04	H
2366.200	54.02	-19.60	28.20	45.42	74.00	19.98	H

GFSK Ch 39

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17609.000	51.65	-29.60	45.10	36.05	74.00	22.35	V
14109.000	48.73	-30.80	41.70	37.83	74.00	25.27	V
4881.500	47.71	-37.50	33.40	51.81	74.00	26.29	V
12788.500	46.46	-31.50	39.80	38.16	74.00	27.54	H
9499.000	44.81	-34.60	37.70	41.71	74.00	29.19	V
7944.000	44.19	-35.40	36.80	42.79	74.00	29.81	H

GFSK Ch 78

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17622.500	51.91	-29.60	45.10	36.31	74.00	22.09	H
4960.000	49.69	-37.40	33.60	53.49	74.00	24.31	H
13665.000	48.64	-31.00	41.00	38.64	74.00	25.36	V
10739.500	46.46	-33.70	38.40	41.76	74.00	27.54	V
8955.000	45.07	-33.90	37.70	41.27	74.00	28.93	H
2497.800	55.05	-19.70	28.20	46.55	74.00	18.95	V

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π/4 DQPSK Ch 0

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17956.500	51.59	-29.40	46.00	34.99	74.00	22.41	V
14520.000	48.47	-30.60	41.90	37.17	74.00	25.53	V
11873.500	46.29	-32.80	39.10	39.89	74.00	27.71	H
4803.500	46.26	-37.70	33.00	50.96	74.00	27.74	H
7145.000	44.72	-35.60	35.90	44.42	74.00	29.28	V
2384.200	54.39	-19.80	28.20	45.99	74.00	19.61	V

π/4 DQPSK Ch 39

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17982.000	51.45	-29.40	46.00	34.85	74.00	22.55	V
13605.000	48.77	-31.30	40.80	39.27	74.00	25.23	V
12852.500	45.99	-31.90	39.90	37.99	74.00	28.01	V
4881.500	45.64	-37.50	33.40	49.74	74.00	28.36	H
7422.000	44.93	-35.10	36.60	43.43	74.00	29.07	H
9075.000	44.62	-34.60	37.70	41.52	74.00	29.38	H

π/4 DQPSK Ch 78

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17531.000	52.20	-29.20	44.90	36.50	74.00	21.80	V
13951.500	48.83	-30.60	41.40	38.03	74.00	25.17	V
4960.000	47.49	-37.40	33.60	51.29	74.00	26.51	V
12978.000	45.89	-31.90	40.10	37.69	74.00	28.11	H
9216.500	44.96	-34.30	37.60	41.66	74.00	29.04	H
2485.400	54.79	-19.70	28.20	46.29	74.00	19.21	H

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8DPSK Ch 0

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17519.500	51.61	-29.20	44.50	36.21	74.00	22.39	V
14181.000	48.94	-30.20	41.70	37.44	74.00	25.06	V
12770.000	45.78	-31.80	39.60	37.88	74.00	28.22	V
9304.000	44.93	-34.50	37.60	41.83	74.00	29.07	V
4803.500	44.65	-37.70	33.00	49.35	74.00	29.35	H
2322.800	54.79	-19.90	28.10	46.59	74.00	19.21	V

8DPSK Ch 39

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17634.000	51.58	-29.50	45.40	35.68	74.00	22.42	H
13728.000	48.68	-31.00	41.10	38.58	74.00	25.32	V
11784.000	46.34	-32.00	39.20	39.14	74.00	27.66	H
9406.500	44.96	-33.60	37.90	40.66	74.00	29.04	V
4881.500	44.57	-37.50	33.40	48.67	74.00	29.43	H
7237.000	44.30	-35.60	36.40	43.50	74.00	29.70	H

8DPSK Ch 78

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17918.000	51.73	-29.40	46.00	35.13	74.00	22.27	H
13702.500	48.41	-31.00	41.00	38.41	74.00	25.59	V
4960.000	46.00	-37.40	33.60	49.80	74.00	28.00	V
11326.000	45.95	-32.80	38.70	40.05	74.00	28.05	V
9527.500	45.00	-33.80	37.60	41.20	74.00	29.00	H
2488.200	54.96	-19.70	28.20	46.46	74.00	19.04	H

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Average Measurement results

GFSK Ch 0

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
4803.500	48.48	-37.70	33.00	53.18	54.00	5.52	V
17980.000	41.69	-29.40	46.00	25.09	54.00	12.31	H
13726.000	39.16	-31.00	41.10	29.06	54.00	14.84	V
11402.000	36.28	-32.60	39.00	29.88	54.00	17.72	H
9498.000	34.97	-34.60	37.70	31.87	54.00	19.03	H
2358.600	42.40	-19.60	28.20	33.80	54.00	11.60	H

GFSK Ch 39

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
4881.500	46.05	-37.50	33.40	50.15	54.00	7.95	V
17944.500	41.76	-29.40	46.00	25.16	54.00	12.24	H
13715.500	38.74	-31.00	41.10	28.64	54.00	15.26	V
11901.500	36.31	-32.40	39.10	29.61	54.00	17.69	V
9509.000	34.70	-33.80	37.60	30.90	54.00	19.30	V
7432.500	34.25	-35.50	36.50	33.25	54.00	19.75	H

GFSK Ch 78

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
4959.500	48.06	-37.40	33.60	51.86	54.00	5.94	H
17603.000	41.92	-29.60	45.10	26.32	54.00	12.08	V
14085.500	39.04	-30.20	41.70	27.54	54.00	14.96	H
11871.500	36.27	-32.80	39.10	29.87	54.00	17.73	H
9737.500	35.05	-34.50	37.80	31.75	54.00	18.95	V
2498.700	42.96	-19.70	28.20	34.46	54.00	11.04	V

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π/4 DQPSK Ch 0

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
4804.000	43.53	-37.70	33.00	48.23	54.00	10.47	H
17615.500	42.19	-29.60	45.10	26.59	54.00	11.81	V
13730.000	39.31	-31.00	41.10	29.21	54.00	14.69	H
12770.500	36.33	-31.80	39.60	28.43	54.00	17.67	H
9410.500	35.23	-33.60	37.90	30.93	54.00	18.77	V
2370.500	42.54	-19.60	28.20	33.94	54.00	11.46	V

π/4 DQPSK Ch 39

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
4882.000	42.51	-37.50	33.40	46.61	54.00	11.49	H
17611.500	42.03	-29.60	45.10	26.43	54.00	11.97	V
13746.000	39.08	-31.00	41.10	28.98	54.00	14.92	V
12852.500	36.62	-31.90	39.90	28.62	54.00	17.38	V
9419.500	34.90	-33.60	37.90	30.60	54.00	19.10	H
7430.000	34.25	-35.50	36.50	33.25	54.00	19.75	H

π/4 DQPSK Ch 78

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
4960.000	44.13	-37.40	33.60	47.93	54.00	9.87	V
17600.000	41.90	-29.60	45.10	26.30	54.00	12.10	H
13707.000	39.27	-31.00	41.00	29.27	54.00	14.73	V
11777.500	36.32	-32.90	39.20	30.02	54.00	17.68	H
9097.000	34.99	-34.60	37.70	31.89	54.00	19.01	V
2499.900	43.19	-19.70	28.20	34.69	54.00	10.81	V

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8DPSK Ch 0

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17958.500	42.49	-29.40	46.00	25.89	54.00	11.51	V
4804.000	42.22	-37.70	33.00	46.92	54.00	11.78	H
13678.000	38.86	-31.00	41.00	28.86	54.00	15.14	V
11310.500	36.36	-32.80	38.70	30.46	54.00	17.64	V
9388.500	34.77	-34.10	37.90	30.97	54.00	19.23	V
2355.100	42.48	-19.60	28.20	33.88	54.00	11.52	H

8DPSK Ch 39

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17609.000	42.49	-29.60	45.10	26.89	54.00	11.51	V
4882.000	41.46	-37.50	33.40	45.56	54.00	12.54	H
13678.500	39.17	-31.00	41.00	29.17	54.00	14.83	V
12870.000	36.15	-31.90	39.90	28.15	54.00	17.85	H
9410.500	34.92	-33.60	37.90	30.62	54.00	19.08	H
7326.500	34.48	-35.40	36.60	33.28	54.00	19.52	V

8DPSK Ch 78

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
4960.000	44.23	-37.40	33.60	48.03	54.00	9.77	V
17942.000	42.13	-29.40	46.00	25.53	54.00	11.87	H
13831.000	38.99	-30.00	41.20	27.69	54.00	15.01	V
12788.000	36.52	-31.50	39.80	28.22	54.00	17.48	V
9405.500	34.97	-34.10	37.90	31.17	54.00	19.03	V
2485.100	43.00	-19.70	28.20	34.50	54.00	11.00	H

Conclusion: Pass

Note: the spurious emission above 18G is noise only and did not show on the report.

Band edge compliance

Mode	Channel	Frequency Range	Test Results	Conclusion
GFSK	0	2.31GHz ~2.43GHz	Fig.58	P
	78	2.45GHz ~2.5GHz	Fig.59	P

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Mode	Channel	Frequency Range	Test Results	Conclusion
π/4 DQPSK	0	2.31GHz ~2.43GHz	Fig.60	P
	78	2.45GHz ~2.5GHz	Fig.61	P

Mode	Channel	Frequency Range	Test Results	Conclusion
8DPSK	0	2.31GHz ~2.43GHz	Fig.62	P
	78	2.45GHz ~2.5GHz	Fig.63	P

Conclusion: PASS

Test graphs as below

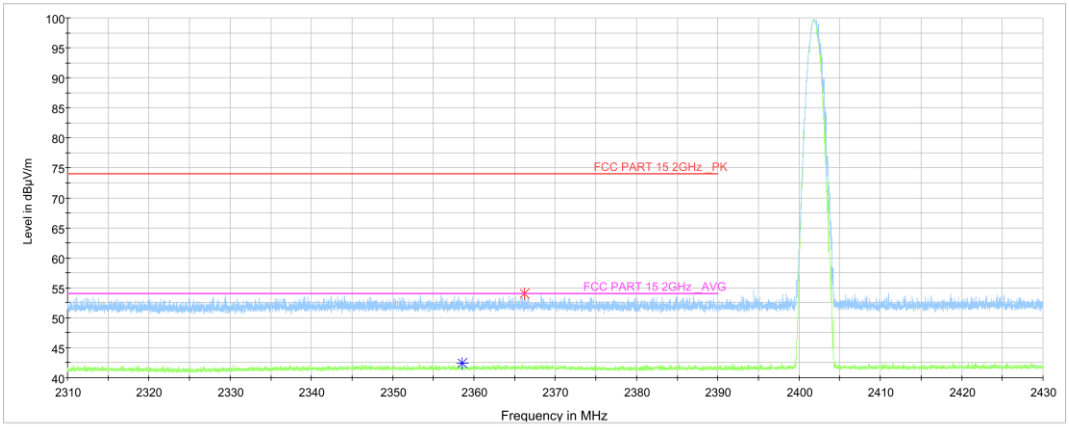


Fig.58. Frequency Band Edges: GFSK, Channel 0, Hopping Off, 2.31 GHz – 2.45GHz

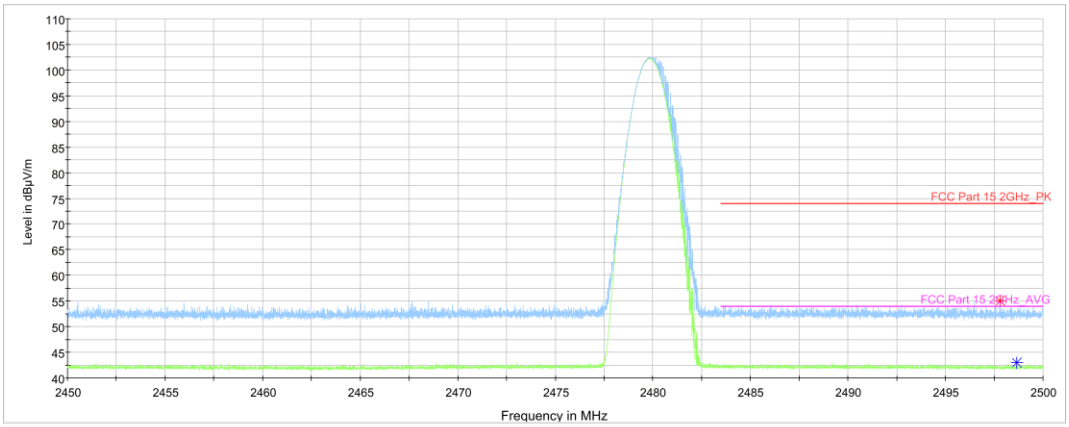


Fig.59. Frequency Band Edges: GFSK, Channel 78, Hopping Off, ch11, 2.45 GHz - 2.50GHz

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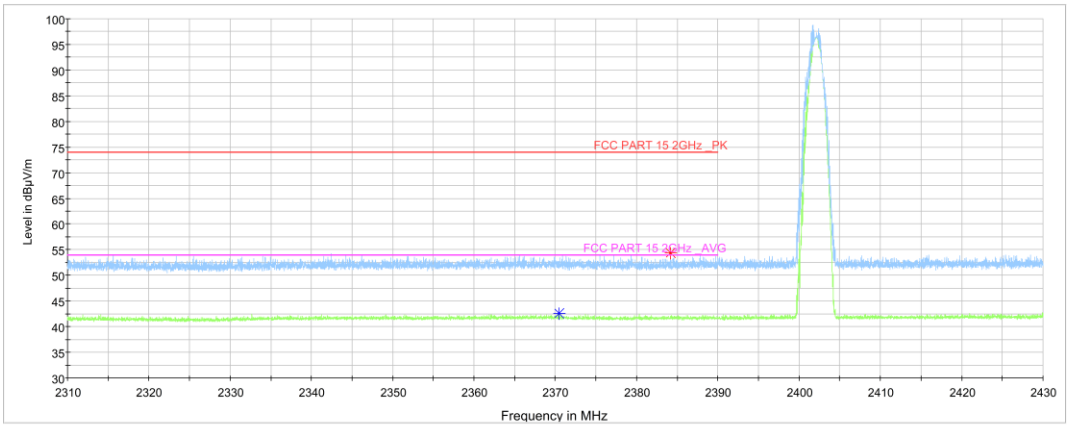


Fig.60. Frequency Band Edges: π/4 DQPSK, Channel 0, Hopping Off, 2.31 GHz - 2.45GHz

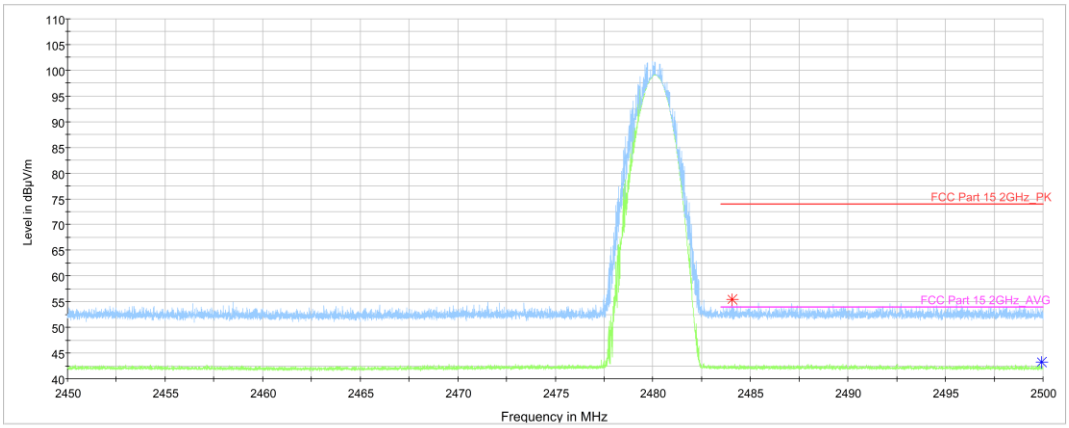


Fig.61. Frequency Band Edges: π/4 DQPSK, Channel 78, Hopping Off, 2.45 GHz - 2.50GHz

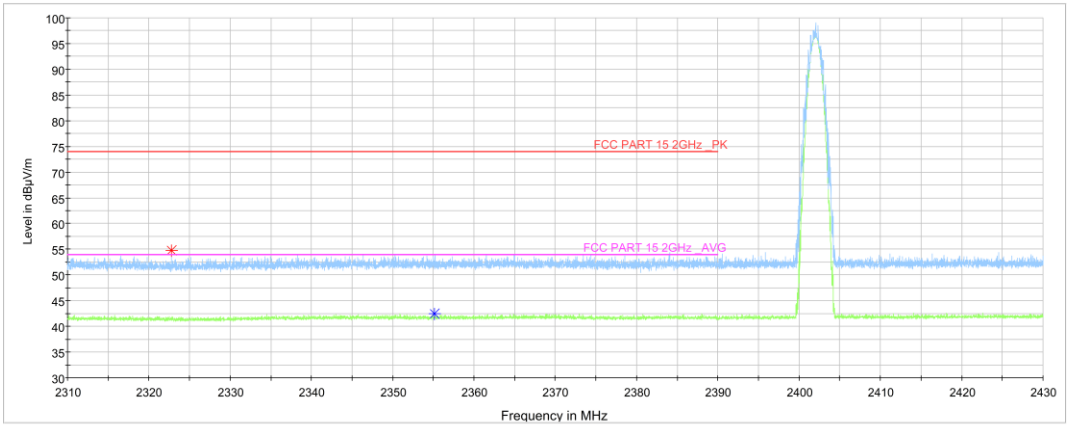


Fig.62. Frequency Band Edges: 8DPSK, Channel 0, 2.31 GHz - 2.45GHz

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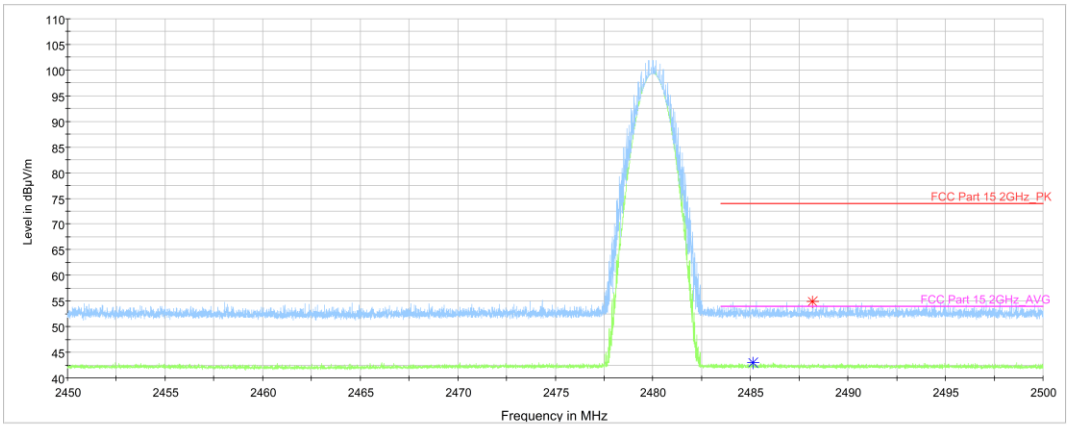


Fig.63. Frequency Band Edges: 8DPSK, Channel 78, 2.45 GHz - 2.50GHz

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B.6. Time of Occupancy (Dwell Time)

Method of Measurement: See ANSI C63.10-clause 7.8.4

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

- Span = zero span, centered on a hopping channel
- RBW = 1 MHz
- VBW ≥ RBW
- Sweep = as necessary to capture the entire dwell time per hopping channel
- Detector function = peak
- Trace = max hold

Measure a pulse time in time domain at middle frequency and then count the hopping number in 31.6s(which equals with 0.4 multiply 79) of middle frequency ,then multiply the pulse time and hopping number and record them.

Measurement Limit:

Standard	Limit (ms)
FCC 47 CFR Part 15.247(a) (1)(iii)	< 400

Measurement Result:

For GFSK

Channel	Packet	Pulse time (ms)		Number of Transmissions		Dwell Time (ms)	Conclusion
39	DH1	Fig.64	0.38	Fig.65	319	121.22	P
	DH3	Fig.66	1.63	Fig.67	111	180.93	P
	DH5	Fig.68	2.88	Fig.69	62	178.56	P

For π/4 DQPSK

Channel	Packet	Pulse time (ms)		Number of Transmissions		Dwell Time (ms)	Conclusion
39	2DH1	Fig.70	0.38	Fig.71	321	121.98	P
	2DH3	Fig.72	1.64	Fig.73	103	168.92	P
	2DH5	Fig.74	2.88	Fig.75	61	175.68	P

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For 8DPSK

Channel	Packet	Pulse time (ms)		Number of Transmissions		Dwell Time (ms)	Conclusion
39	3DH1	Fig.76	0.38	Fig.77	321	121.98	P
	3DH3	Fig.78	1.63	Fig.79	96	156.48	P
	3DH5	Fig.80	2.89	Fig.81	65	187.85	P

Conclusion: PASS

Test graphs as below:

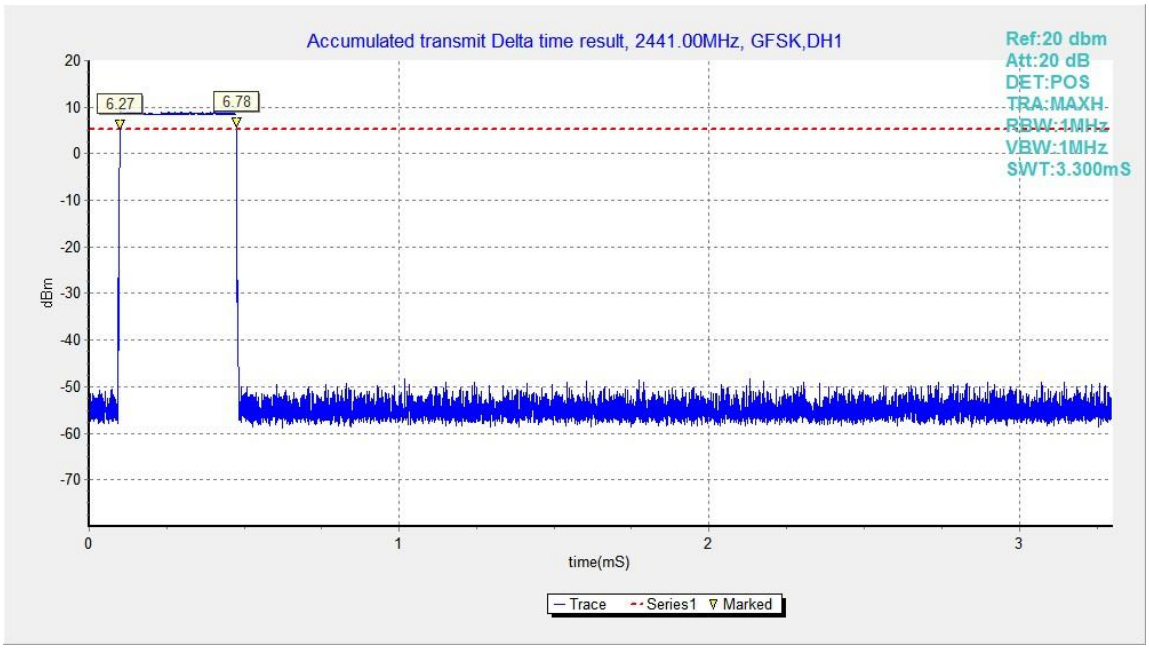


Fig.64. Time of occupancy (Dwell Time): Channel 39, Packet DH1

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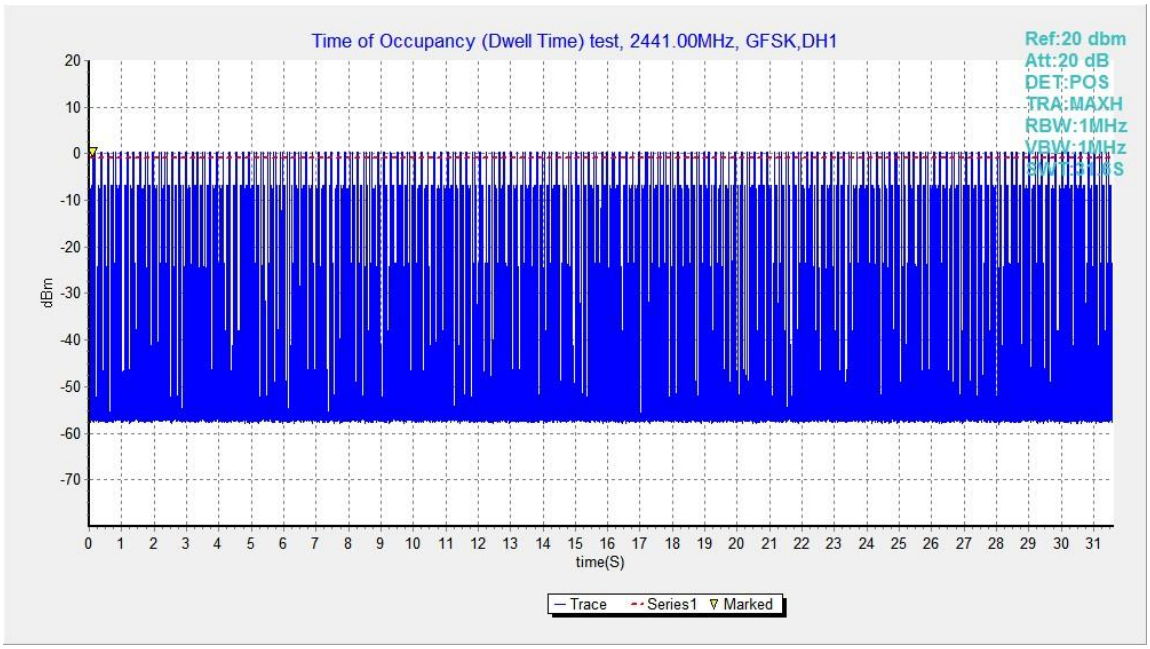


Fig.65. Number of Transmissions Measurement:Channel 39,Packet DH1

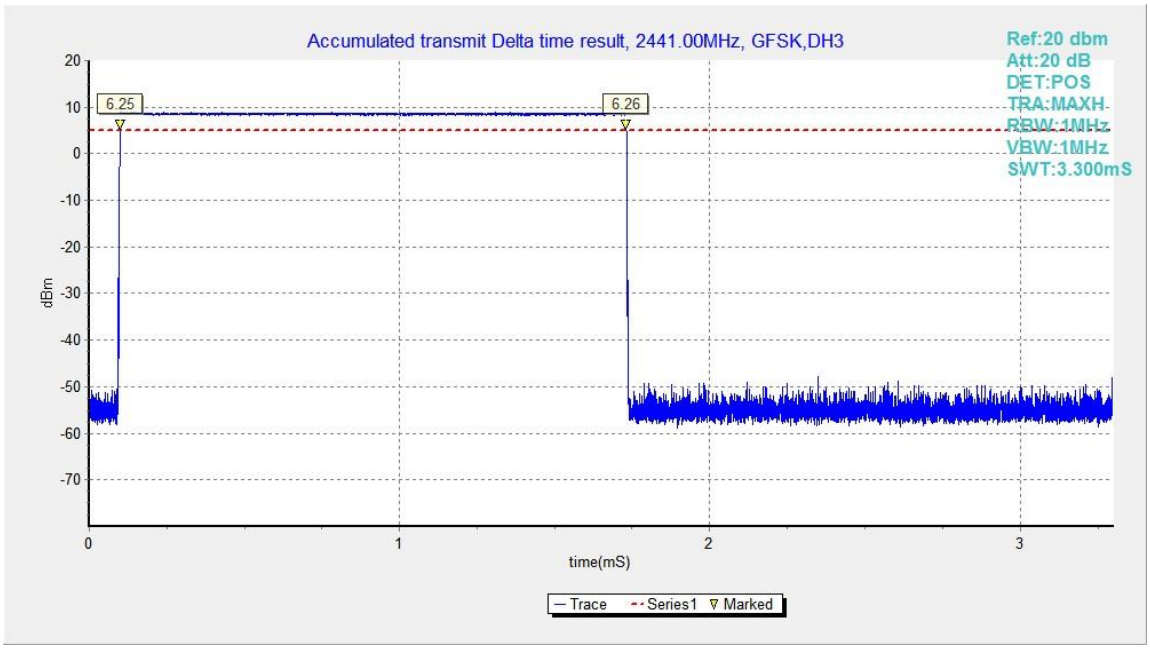


Fig.66. Time of occupancy (Dwell Time): Channel 39, Packet DH3

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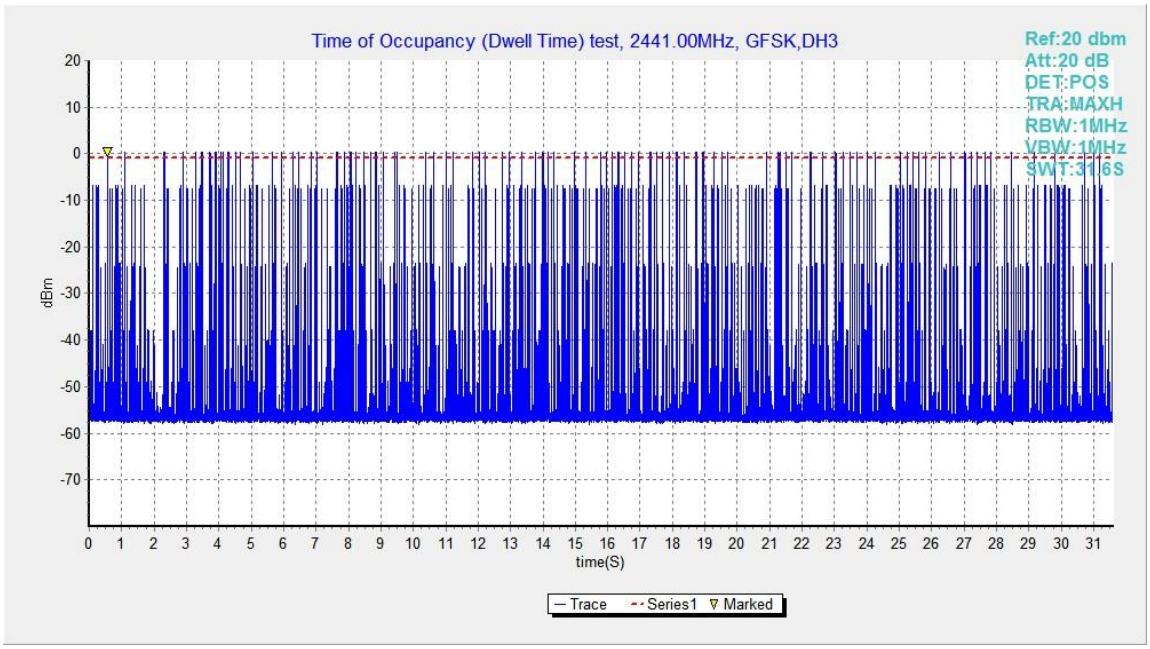


Fig.67. Number of Transmissions Measurement:Channel 39,Packet DH3

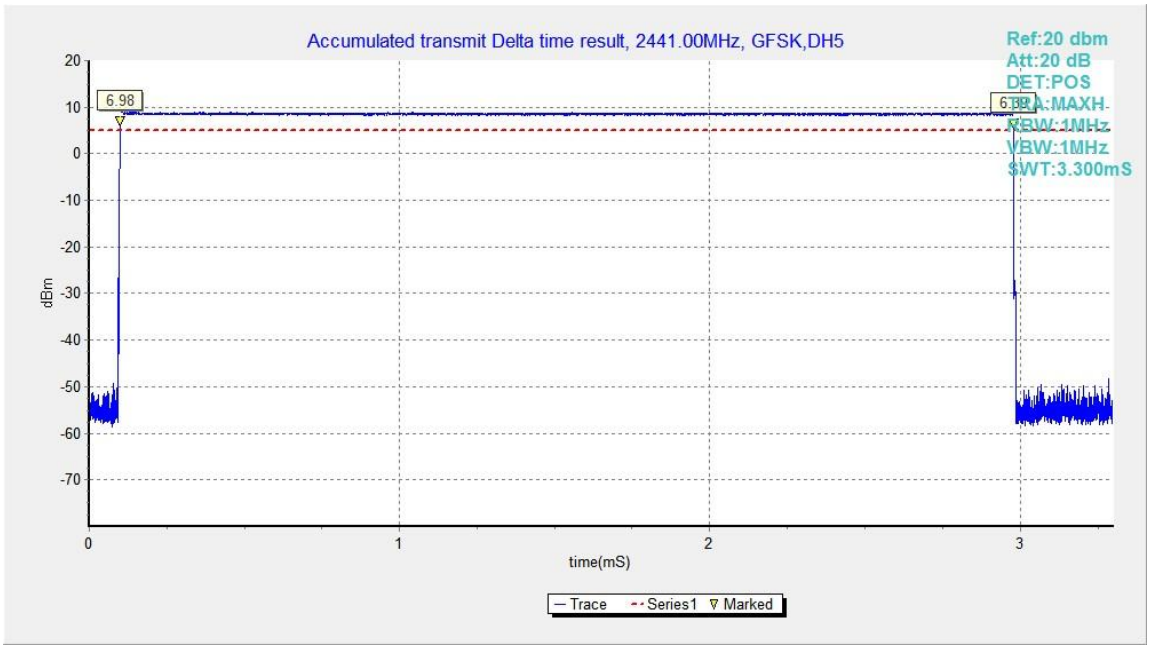


Fig.68. Time of occupancy (Dwell Time): Channel 39, Packet DH5

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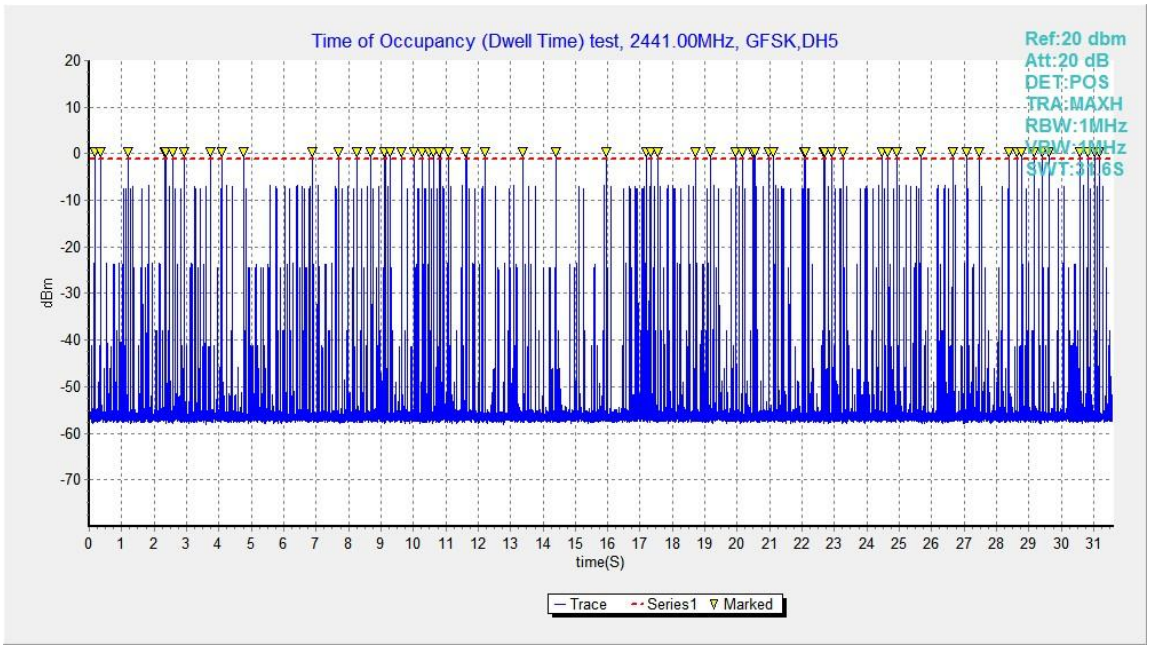


Fig.69. Number of Transmissions Measurement:Channel 39,Packet DH5

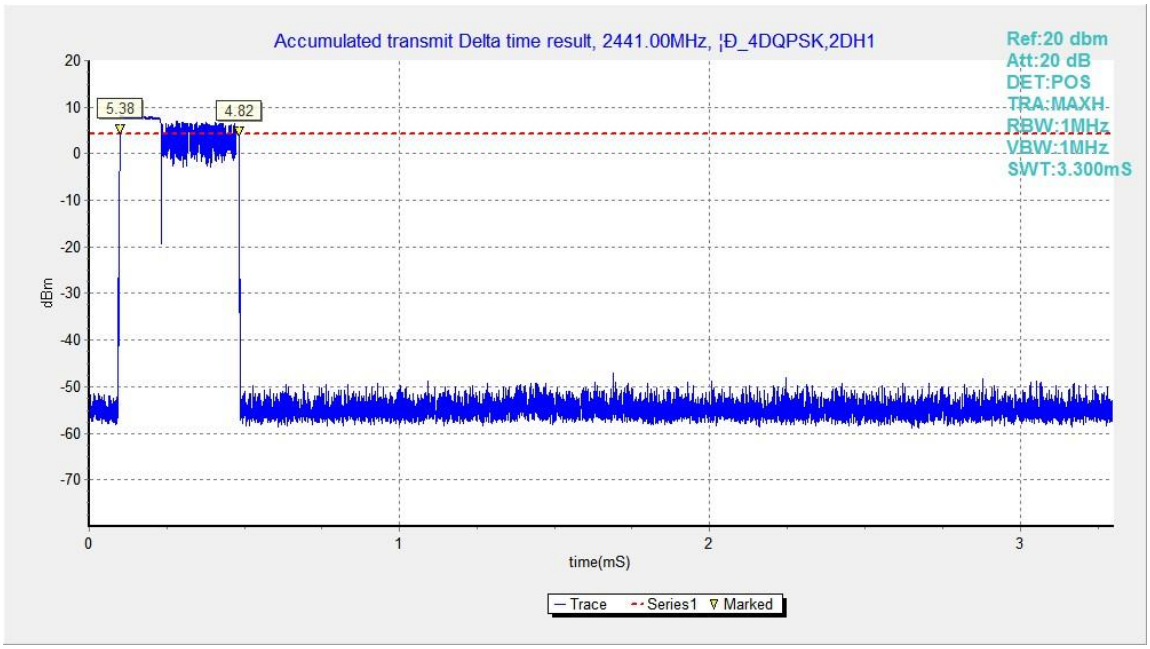


Fig.70. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH1

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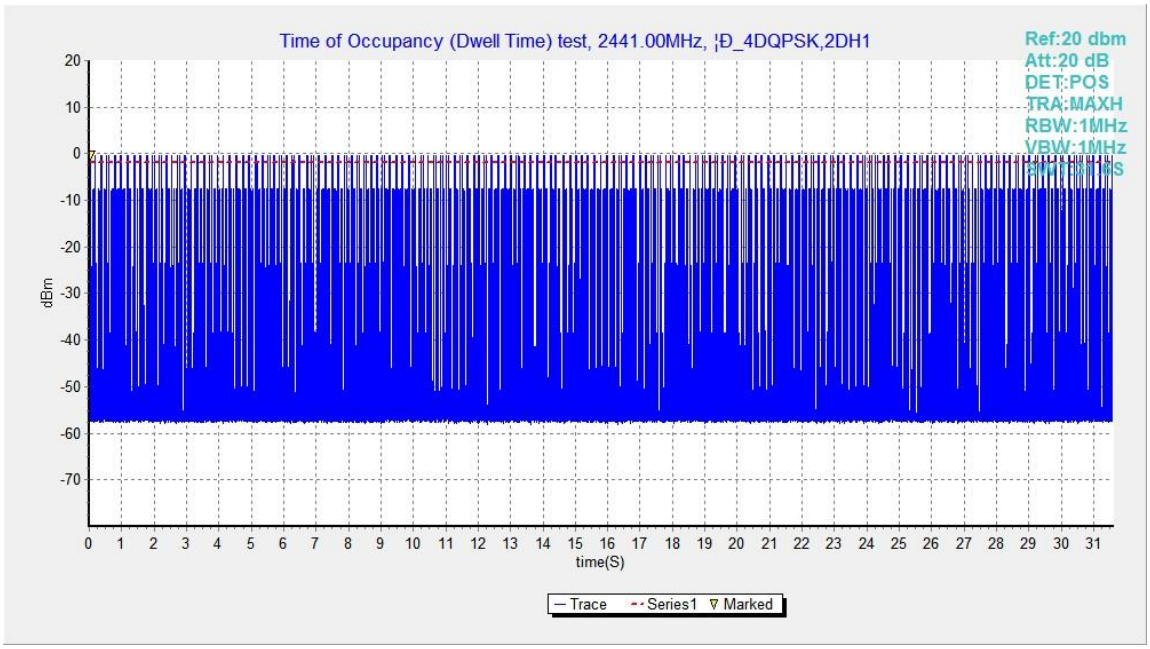


Fig.71. Number of Transmissions Measurement:Channel 39,Packet 2-DH1

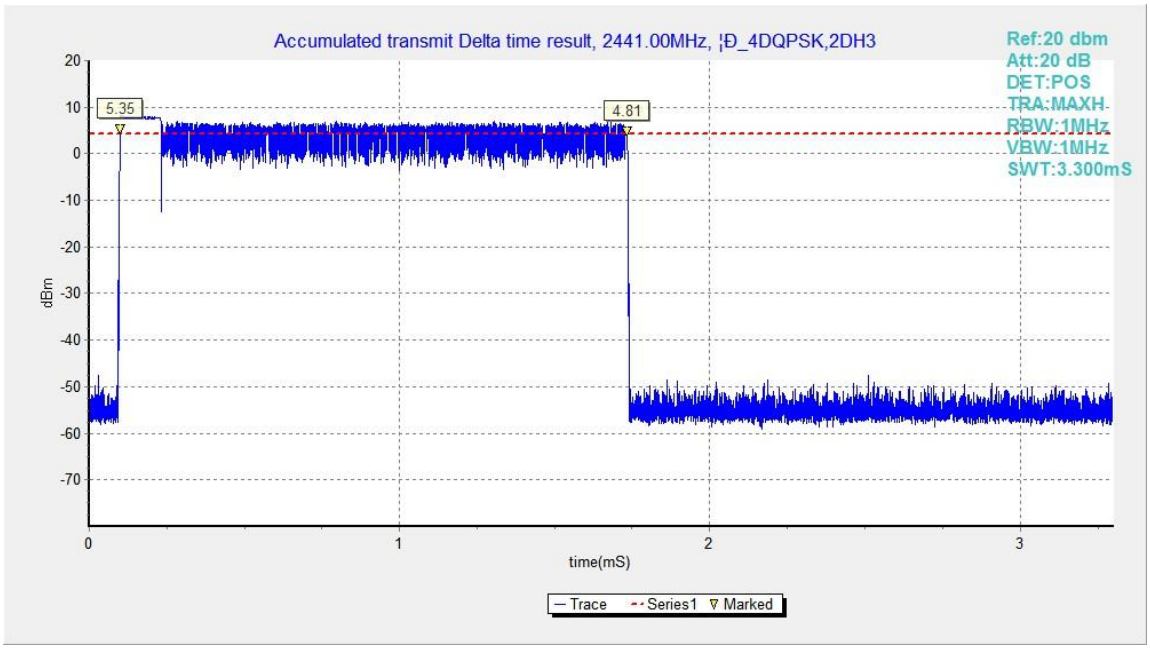


Fig.72. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH3

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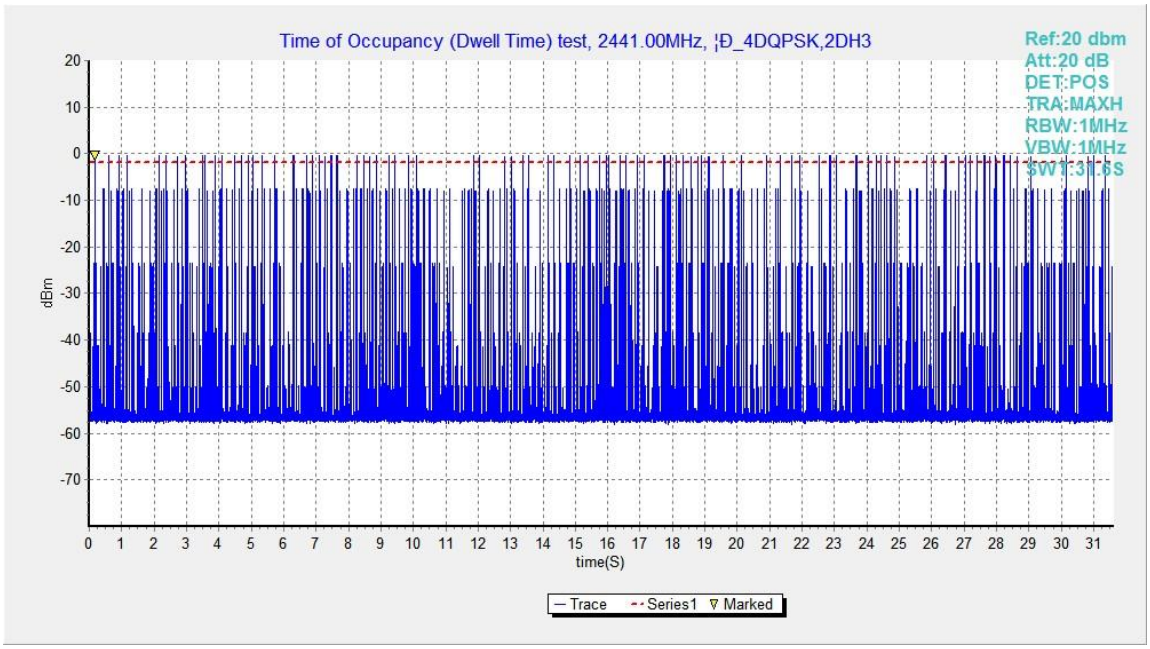


Fig.73. Number of Transmissions Measurement:Channel 39,Packet 2-DH3

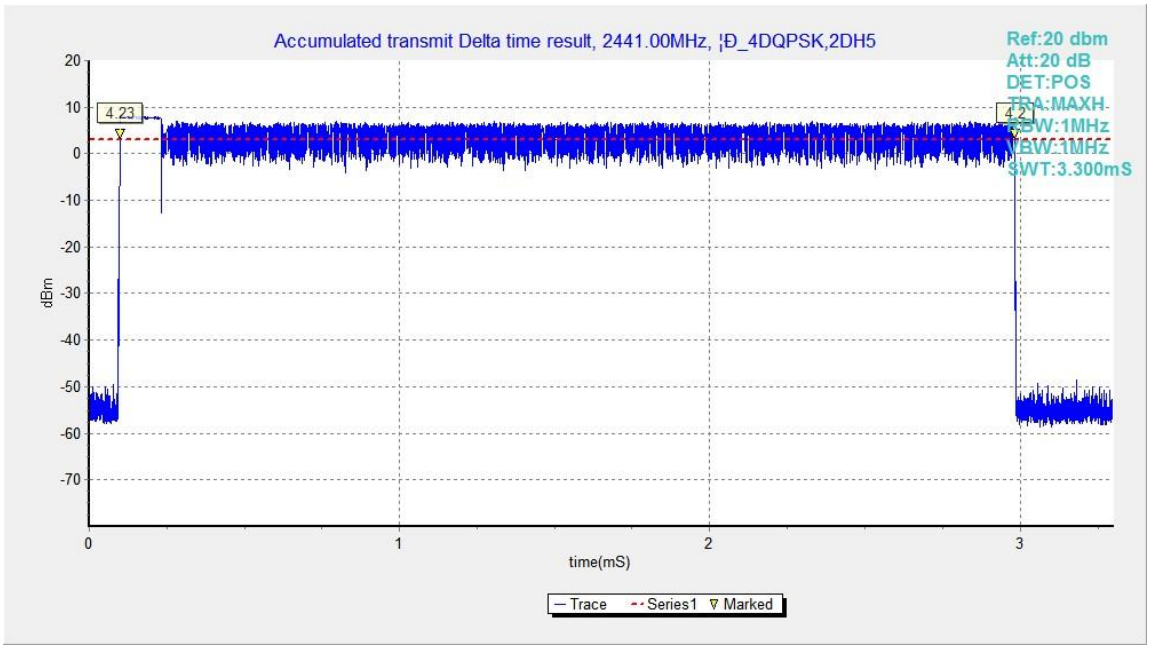


Fig.74. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH5

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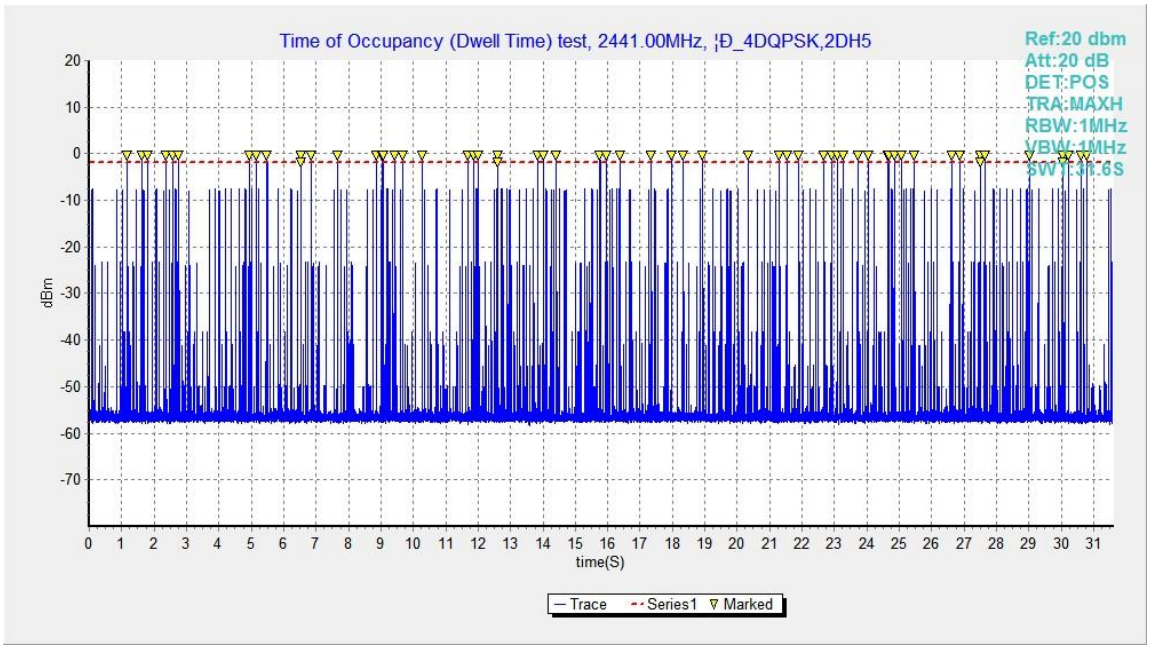


Fig.75. Number of Transmissions Measurement:Channel 39,Packet 2-DH5

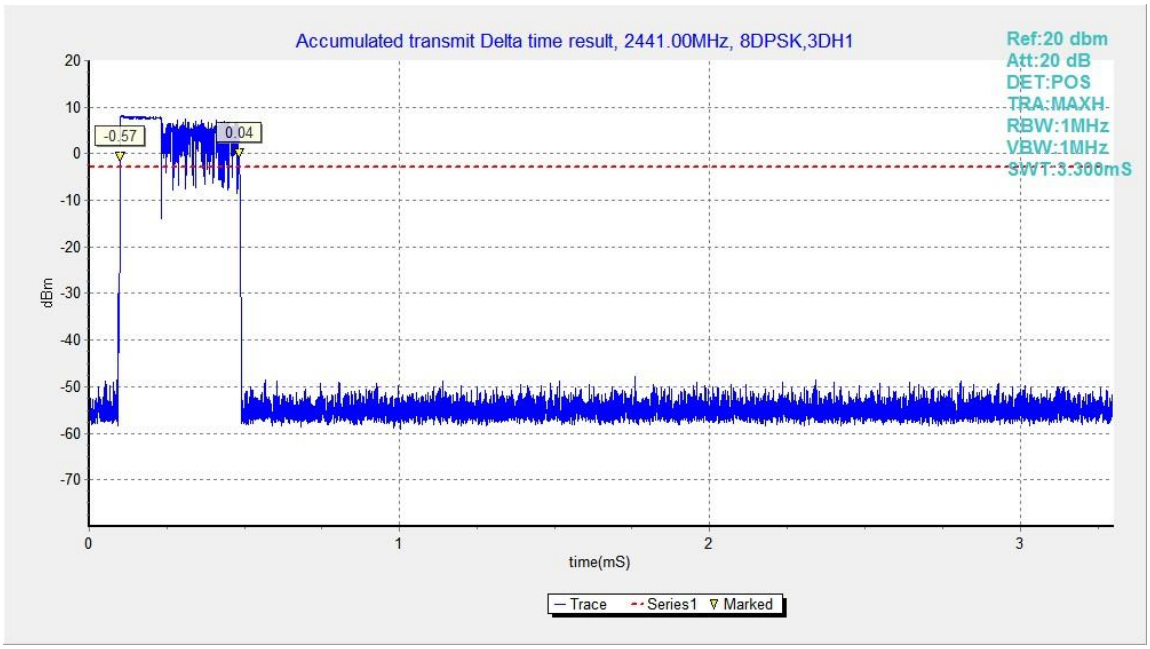


Fig.76. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH1

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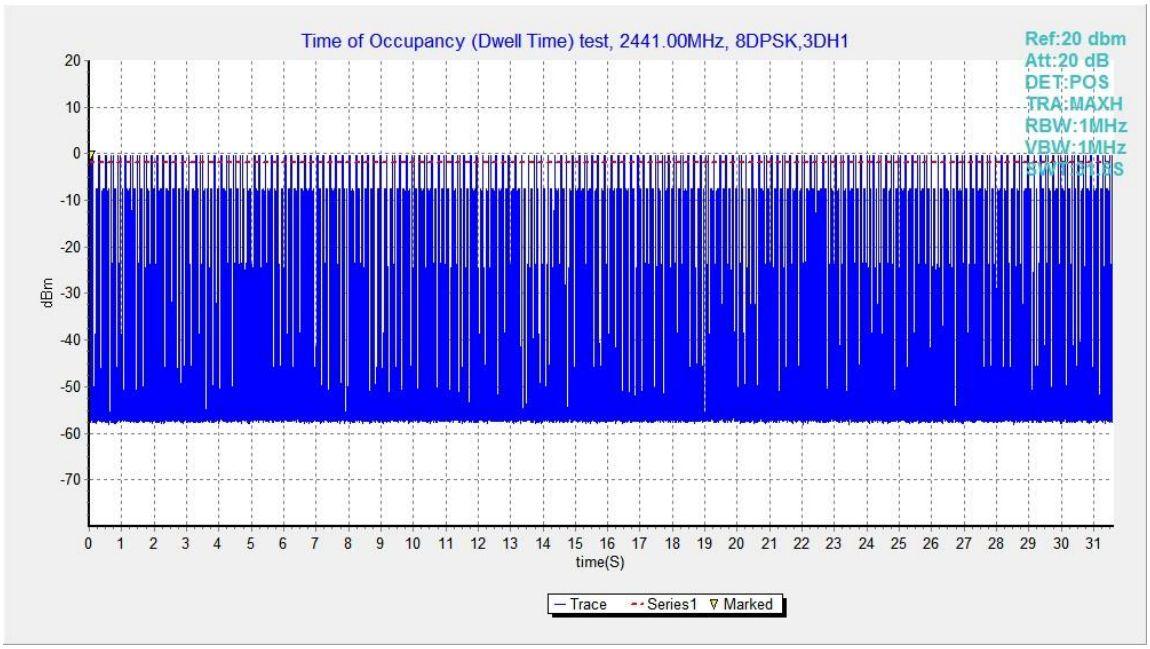


Fig.77. Number of Transmissions Measurement:Channel 39,Packet 3-DH1

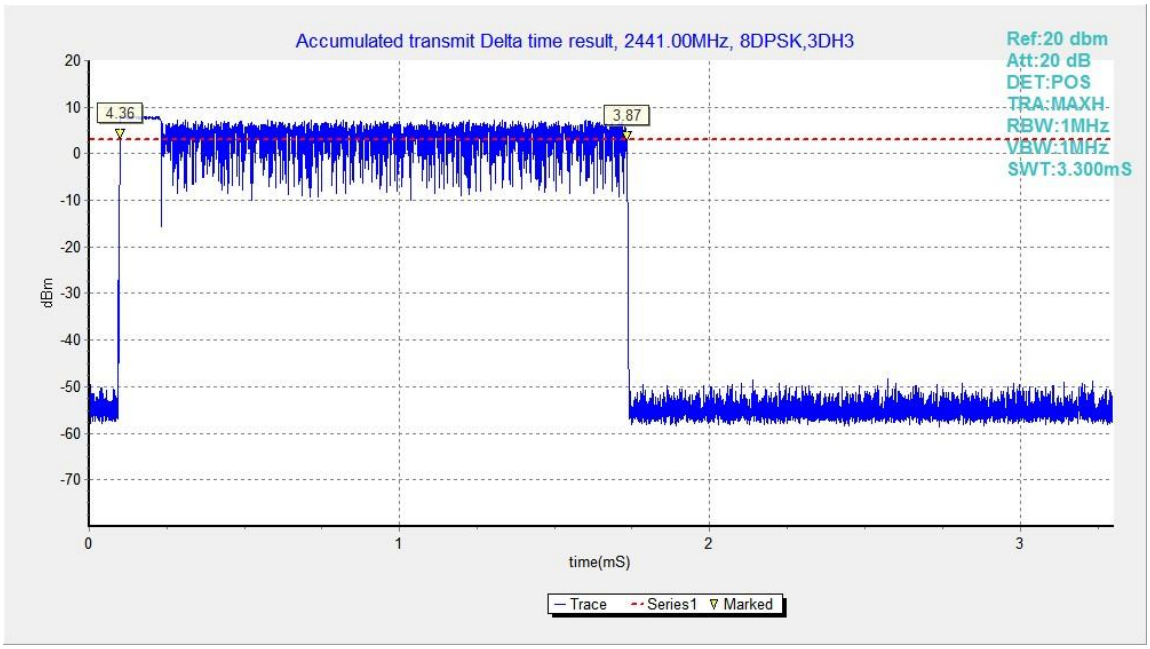


Fig.78. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH3

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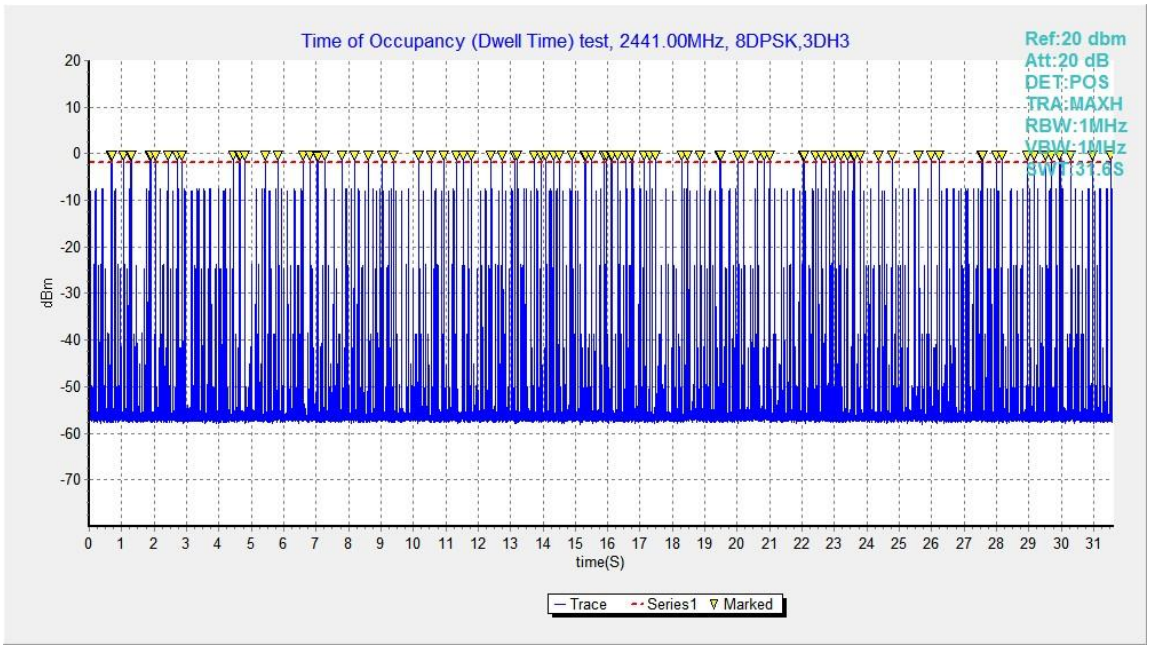


Fig.79. Number of Transmissions Measurement:Channel 39,Packet 3-DH3

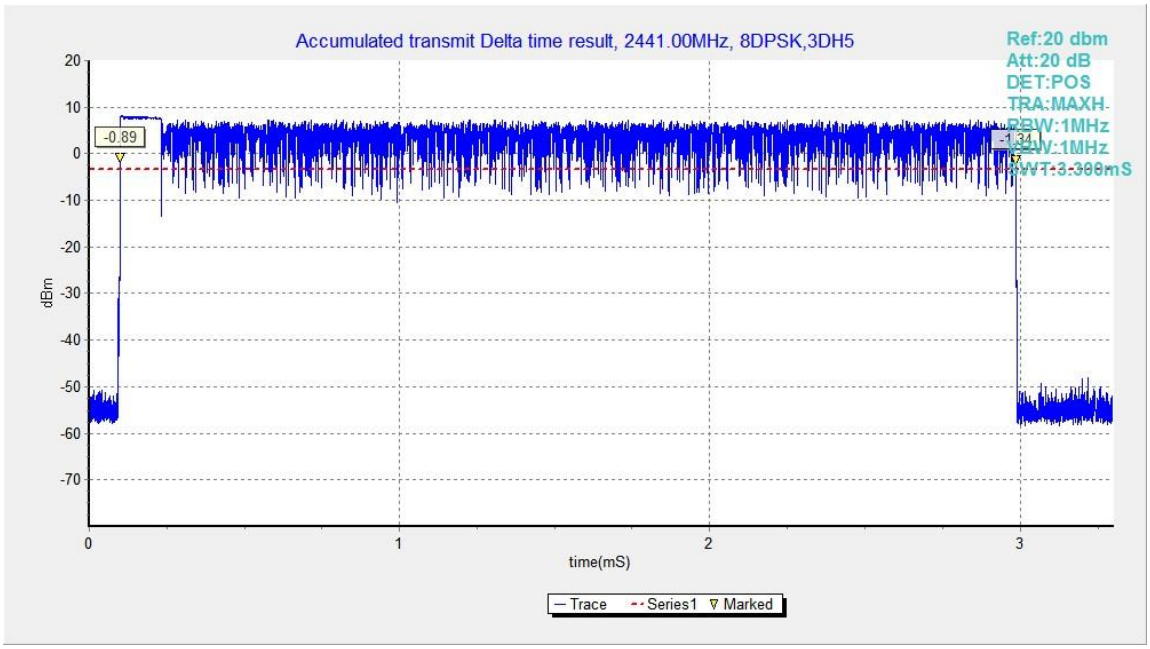


Fig.80. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH5

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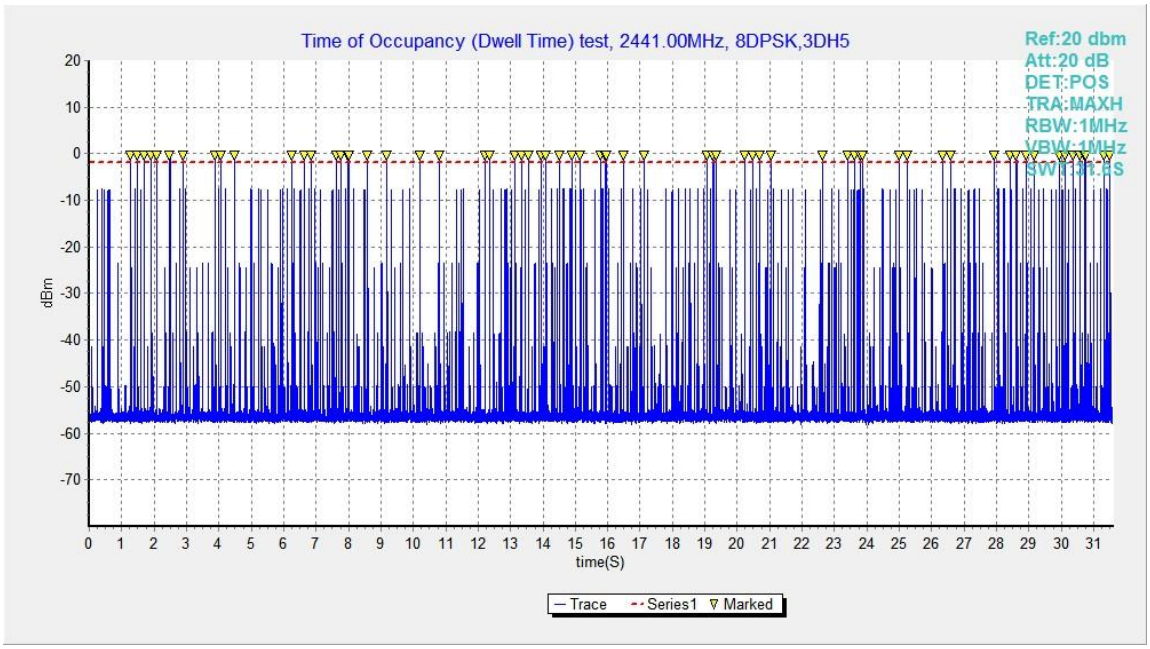


Fig.81. Number of Transmissions Measurement:Channel 39,Packet 3-DH5

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B.7. 20dB Bandwidth

Method of Measurement: See ANSI C63.10-clause 6.9.2

Measurement Procedure - Unwanted Emissions

1. Set RBW = 30kHz.

2. Set VBW = 100 kHz.

3. Set span to 3MHz

4. Detector = peak.

5. Trace Mode = max hold.

6. Sweep = auto couple.

7. Allow the trace to stabilize (this may take some time, depending on the extent of the span).

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247(a)(1)	NA *

Use NdB Down function of the SA to measure the 20dB Bandwidth

* Comment: This test case is not required according to the latest FCC 47 CFR Part 15.247. But the test results are necessary for “carrier frequency separation” test case, in Annex A.8.

Measurement Results:

For GFSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.82	941.25	NA
39	Fig.83	939.00	NA
78	Fig.84	954.75	NA

Forπ/4 DQPSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.85	1219.50	NA
39	Fig.86	1255.50	NA
78	Fig.87	1221.75	NA

For 8DPSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.88	1257.75	NA
39	Fig.89	1257.75	NA
78	Fig.90	1257.75	NA

Conclusion: NA

Test graphs as below:

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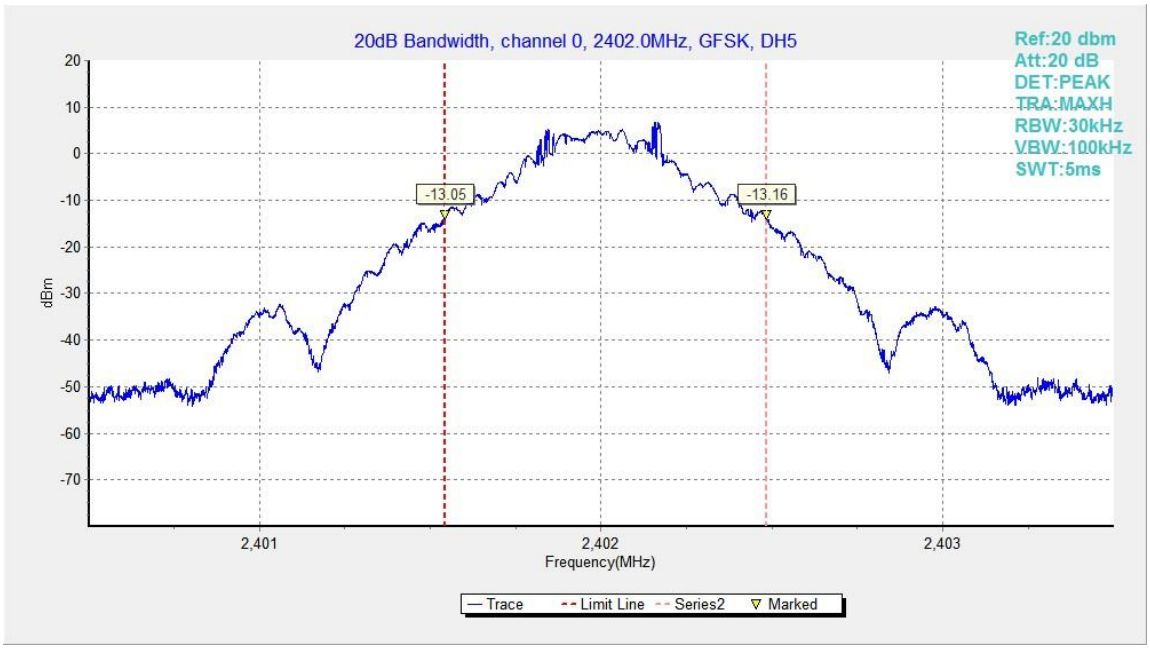


Fig.82. 20dB Bandwidth: GFSK, Channel 0

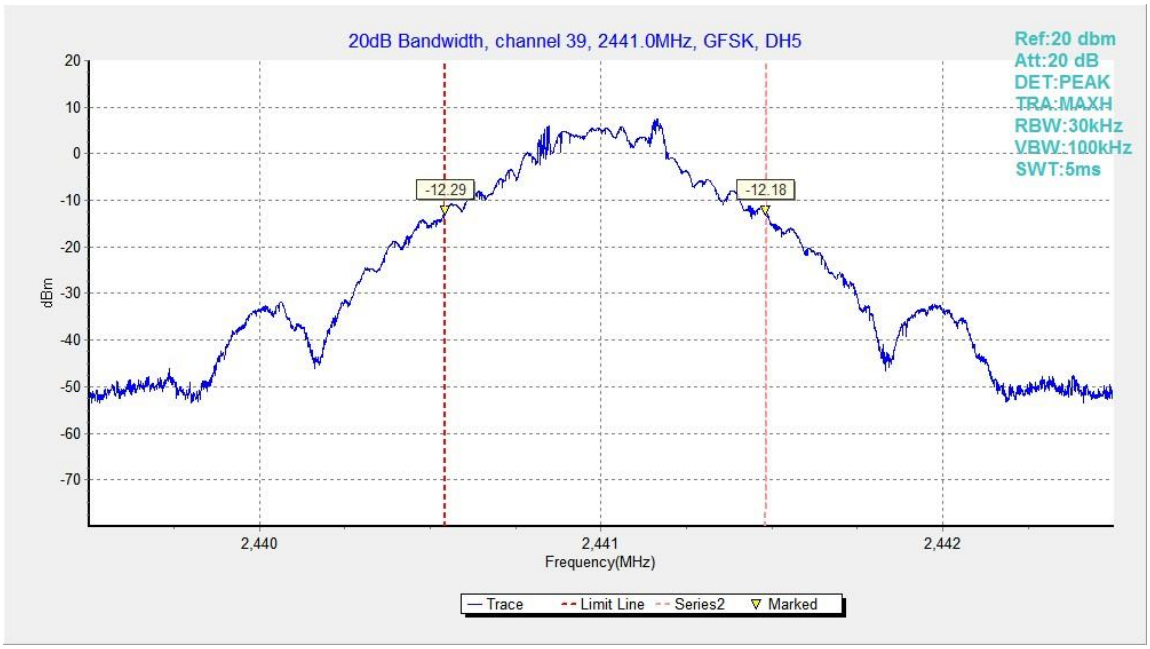


Fig.83. 20dB Bandwidth: GFSK, Channel 39

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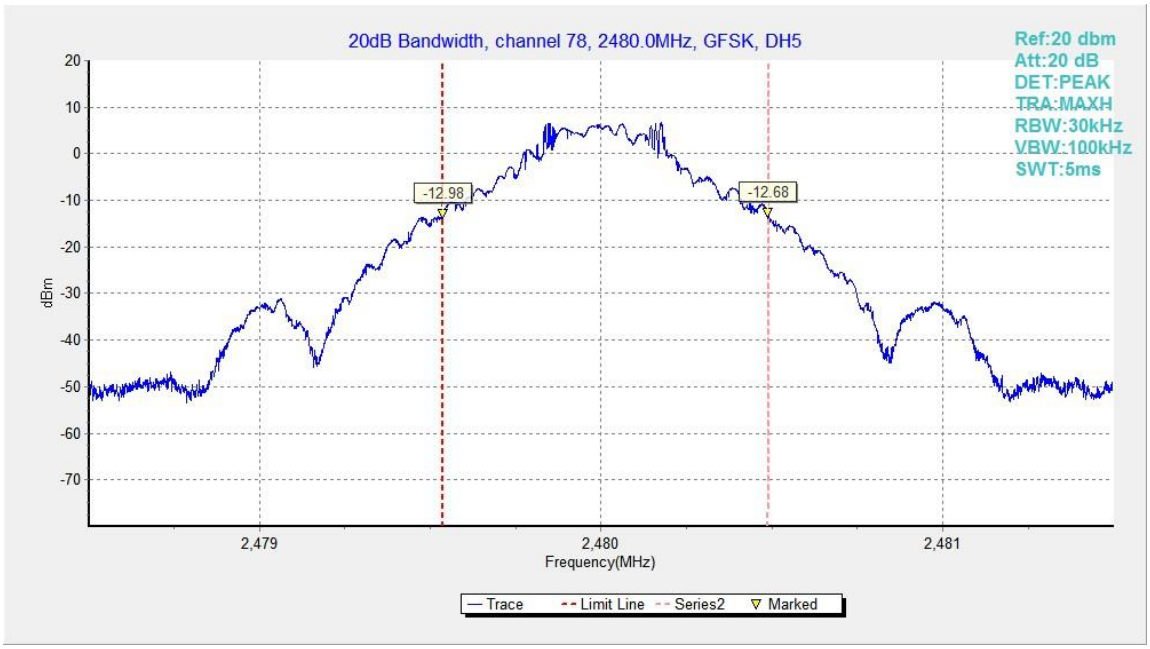


Fig.84. 20dB Bandwidth: GFSK, Channel 78

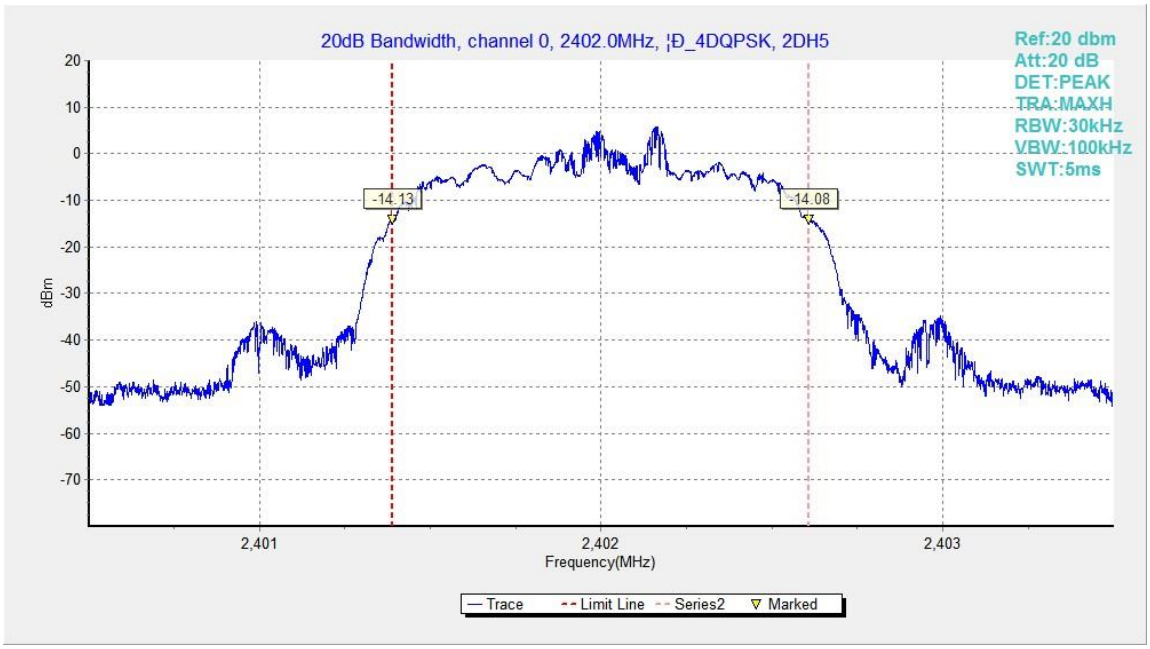


Fig.85. 20dB Bandwidth: π/4 DQPSK, Channel 0

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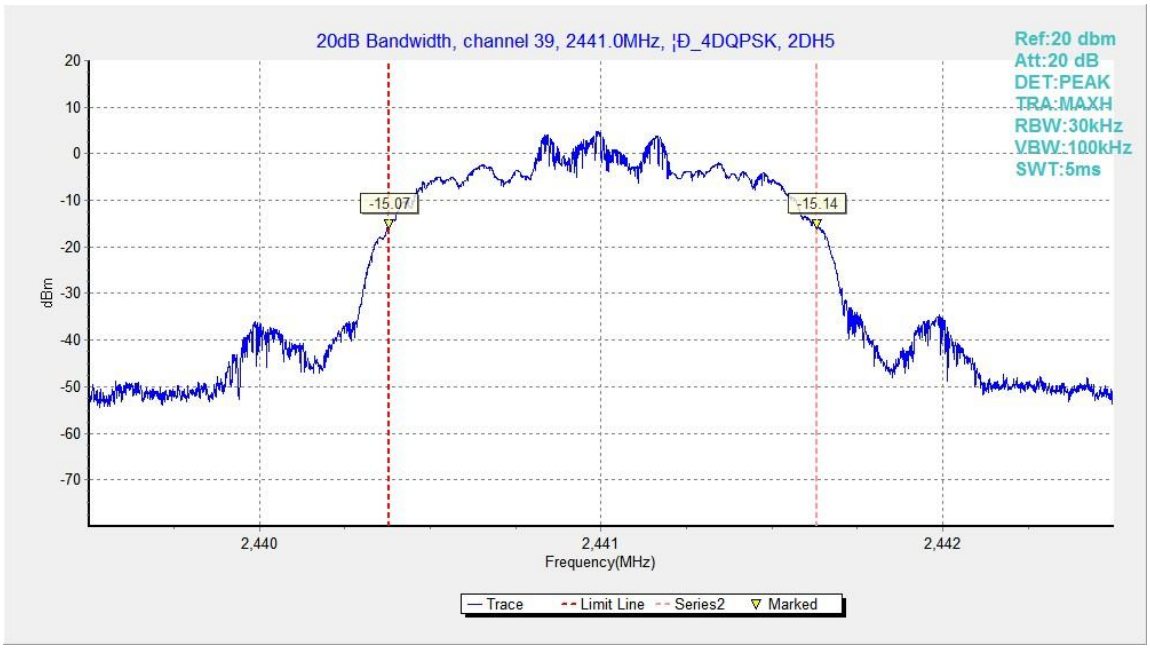


Fig.86. 20dB Bandwidth: π/4 DQPSK, Channel 39

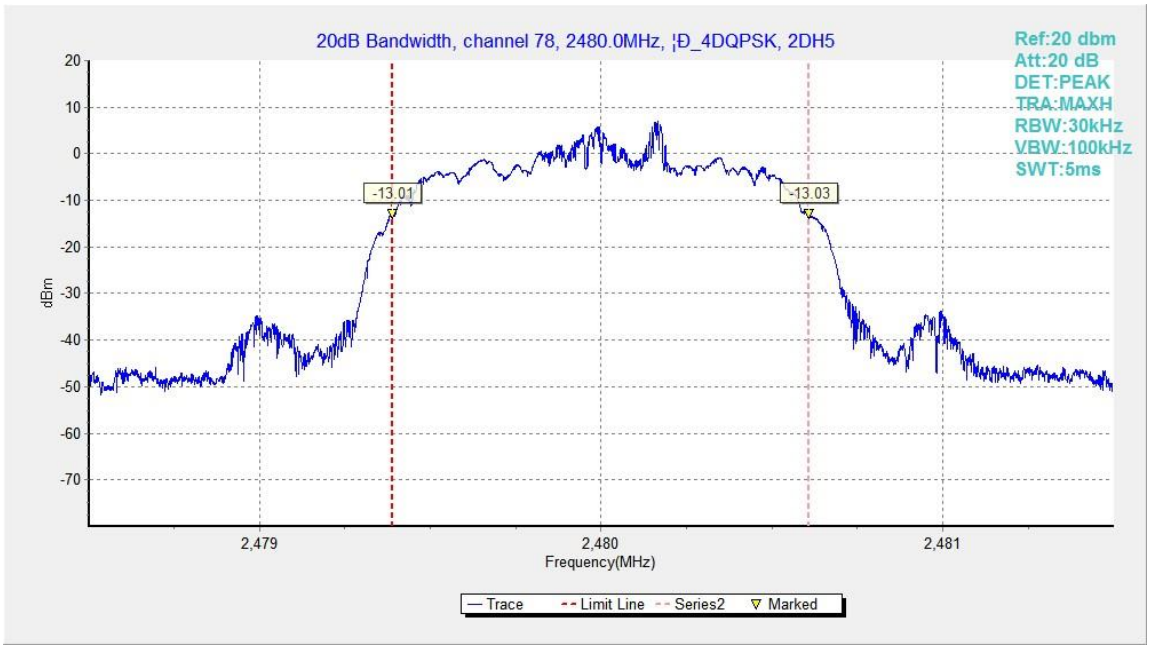


Fig.87. 20dB Bandwidth: π/4 DQPSK, Channel 78

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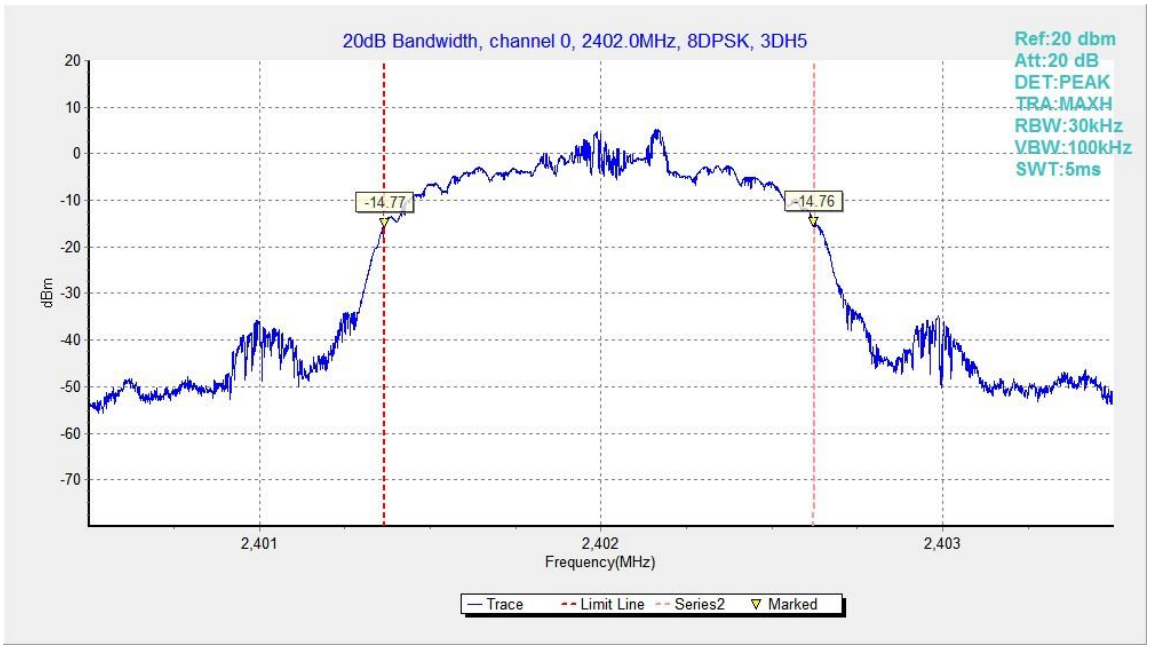


Fig.88. 20dB Bandwidth: 8DPSK, Channel 0

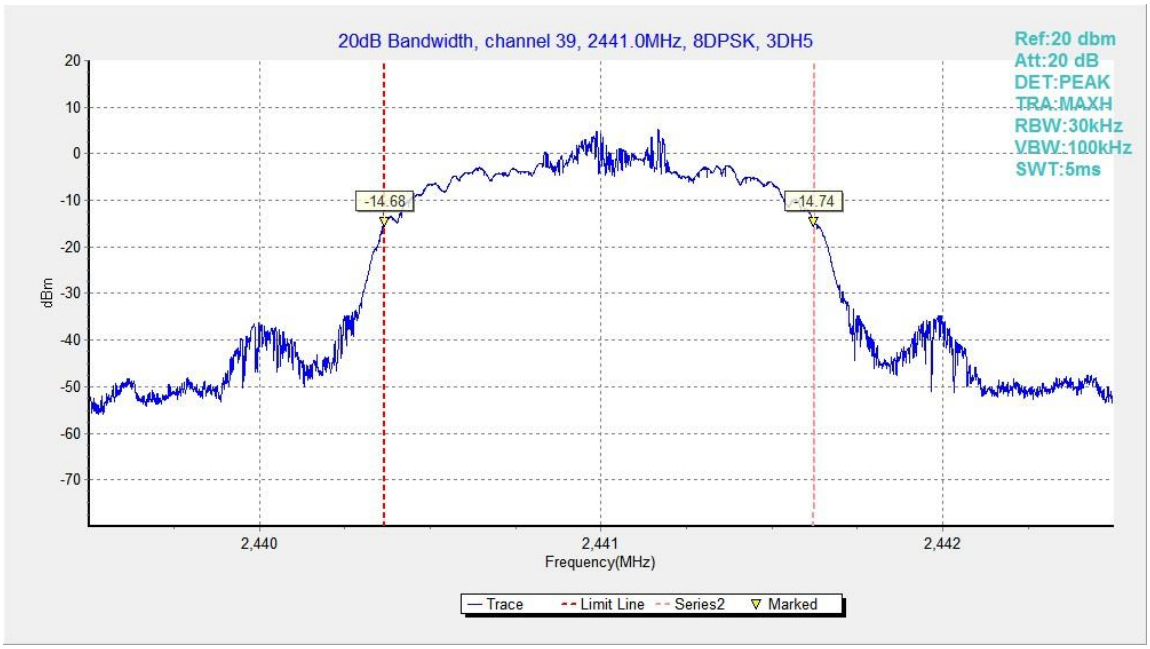


Fig.89. 20dB Bandwidth: 8DPSK, Channel 39

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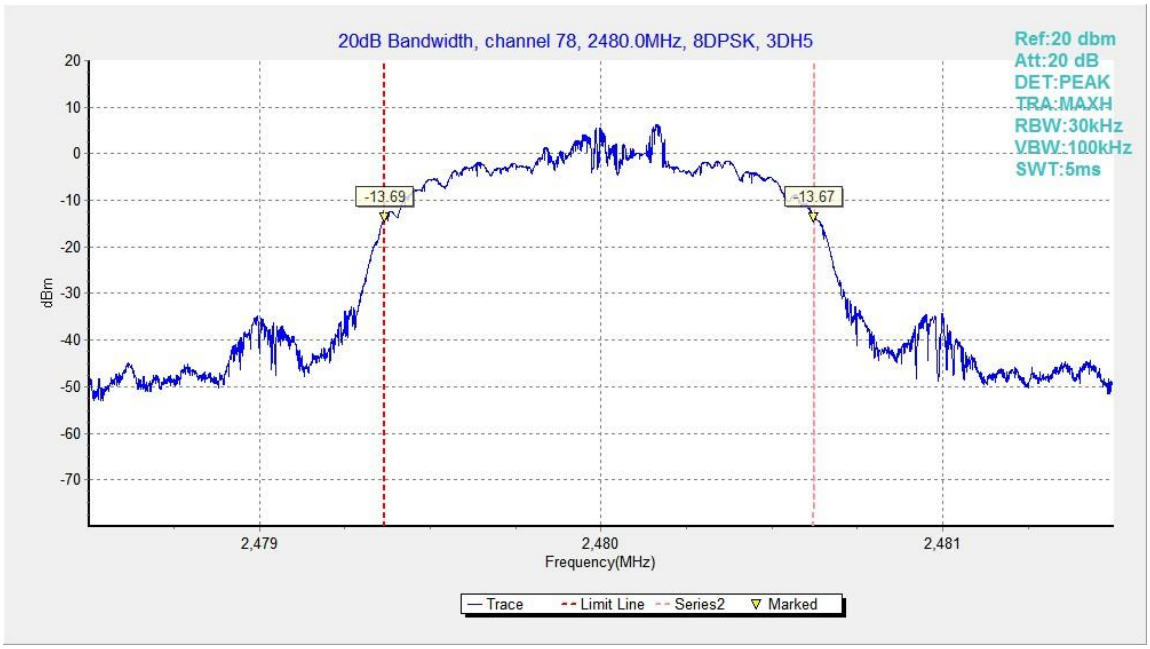


Fig.90. 20dB Bandwidth: 8DPSK, Channel 78

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B.8. Carrier Frequency Separation

Method of Measurement: See ANSI C63.10-clause 7.8.2

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

- Span = 3MHz
- RBW=300kHz
- VBW=300kHz
- Sweep = auto
- Detector function = peak
- Trace = max hold
- Allow the trace to stabilize

Search the peak marks of the middle frequency and adjacent channel, then record the separation between them.

* Comment: This limit should be over 25 kHz or (2/3) * 20dB bandwidth, whichever is greater.

Measurement Limit:

Standard	Limit(kHz)
FCC 47 CFR Part 15.247(a)(1)	over 25 kHz or (2/3) * 20dB bandwidth

Measurement Result:

For GFSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.91	1005.00	P

For π/4 DQPSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.92	1290.75	P

For 8DPSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.93	982.50	P

Conclusion: PASS

Test graphs as below:

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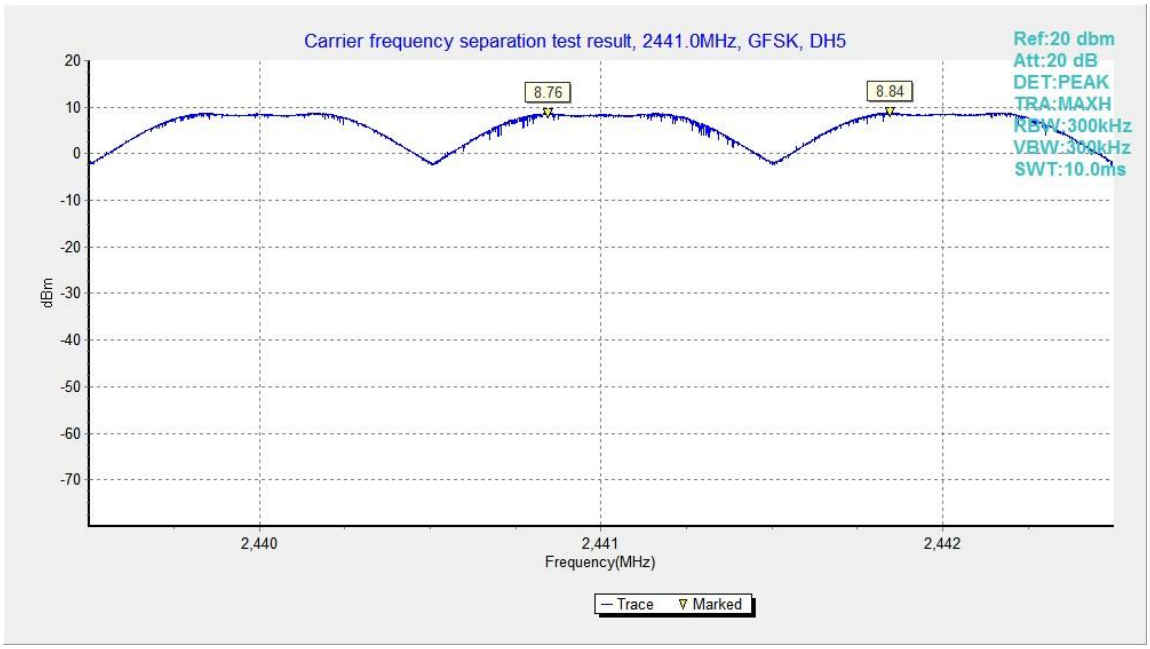


Fig.91. Carrier frequency separation measurement: GFSK, Channel 39

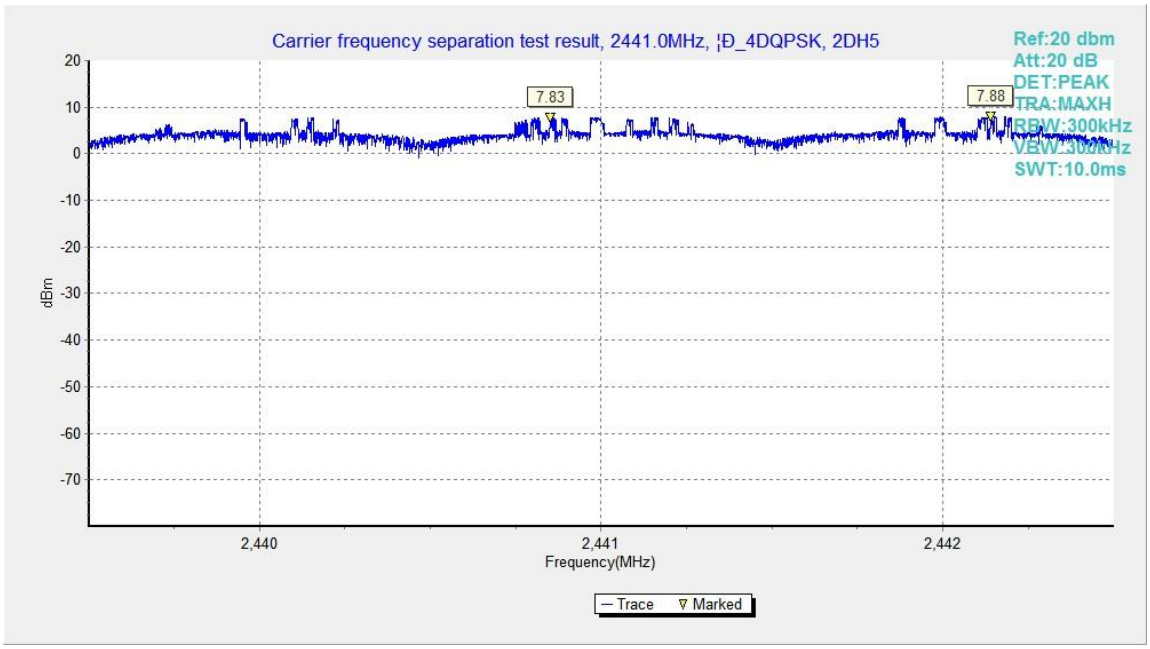


Fig.92. Carrier frequency separation measurement: π/4 DQPSK, Channel 39

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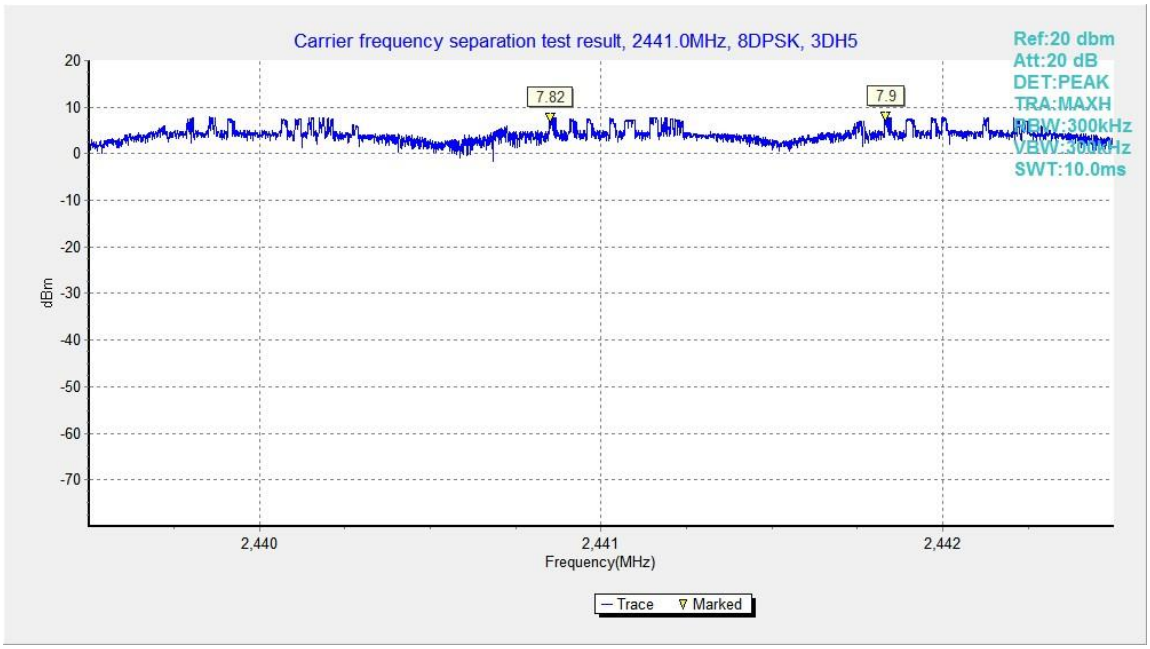


Fig.93. Carrier frequency separation measurement: 8DPSK, Channel 39

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B.9. Number of Hopping Channels

Method of Measurement: See ANSI C63.10-clause 7.8.3

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

- Span = the frequency band of operation
- RBW = 500kHz
- VBW = 500kHz
- Sweep = auto
- Detector function = peak
- Trace = max hold
- Allow the trace to stabilize

It might prove necessary to break the span up into subranges to show clearly all of the hopping frequencies. Compliance of an EUT with the appropriate regulatory limit shall be determined for the number of hopping channels. A plot of the data shall be included in the test report.

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247(a) (1)(iii)	At least 15 non-overlapping channels

Measurement Result:

For GFSK

Channel	Number of hopping channels		Conclusion
0~39	Fig.94	79	P
40~78	Fig.95		

Forπ/4 DQPSK

Channel	Number of hopping channels		Conclusion
0~39	Fig.96	79	P
40~78	Fig.97		

For 8DPSK

Channel	Number of hopping channels		Conclusion
0~39	Fig.98	79	P
40~78	Fig.99		

Conclusion: PASS

Test graphs as below:

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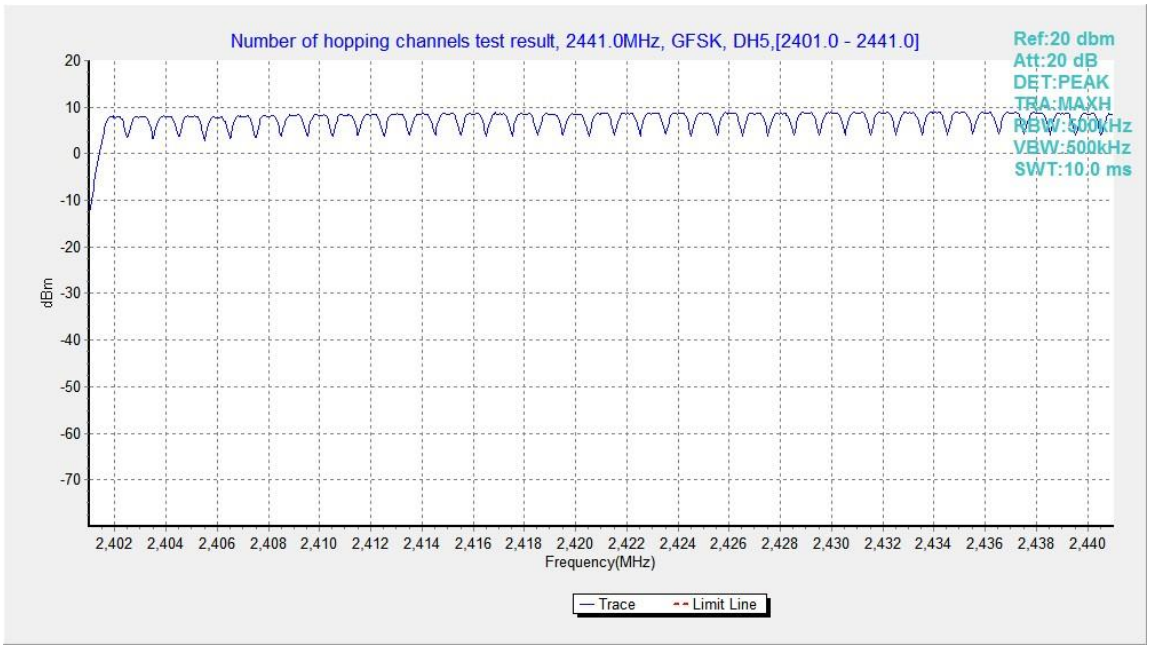


Fig.94. Number of hopping frequencies: GFSK, Channel 0 - 39

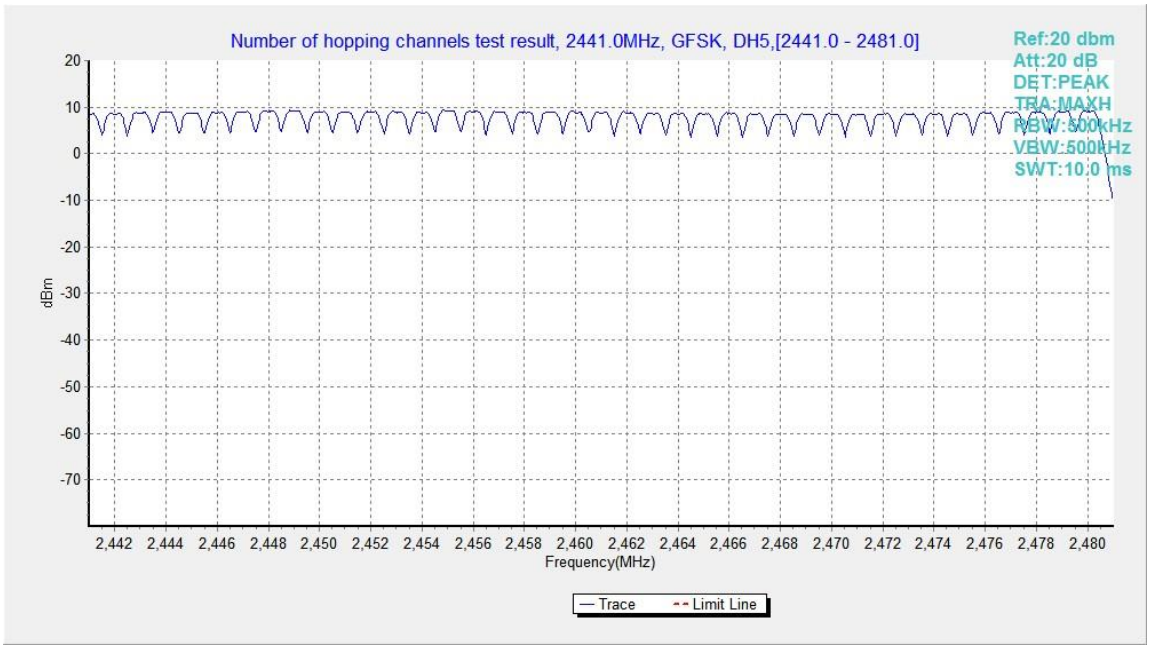


Fig.95. Number of hopping frequencies: GFSK, Channel 40 - 78

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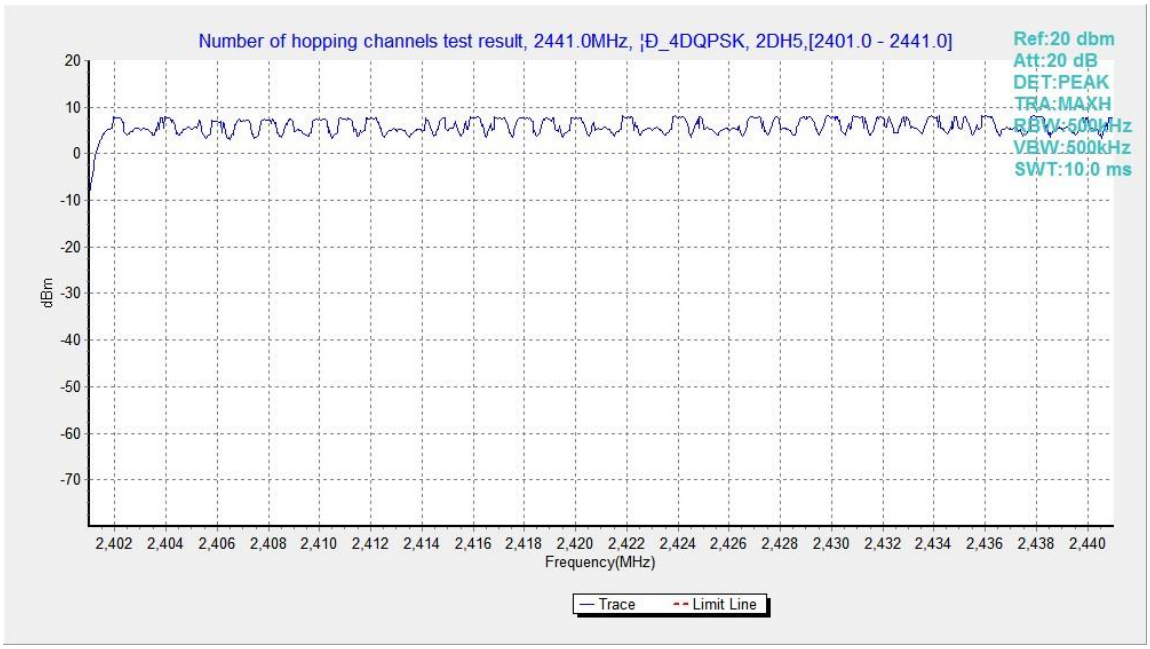


Fig.96. Number of hopping frequencies: π/4 DQPSK, Channel 0 - 39

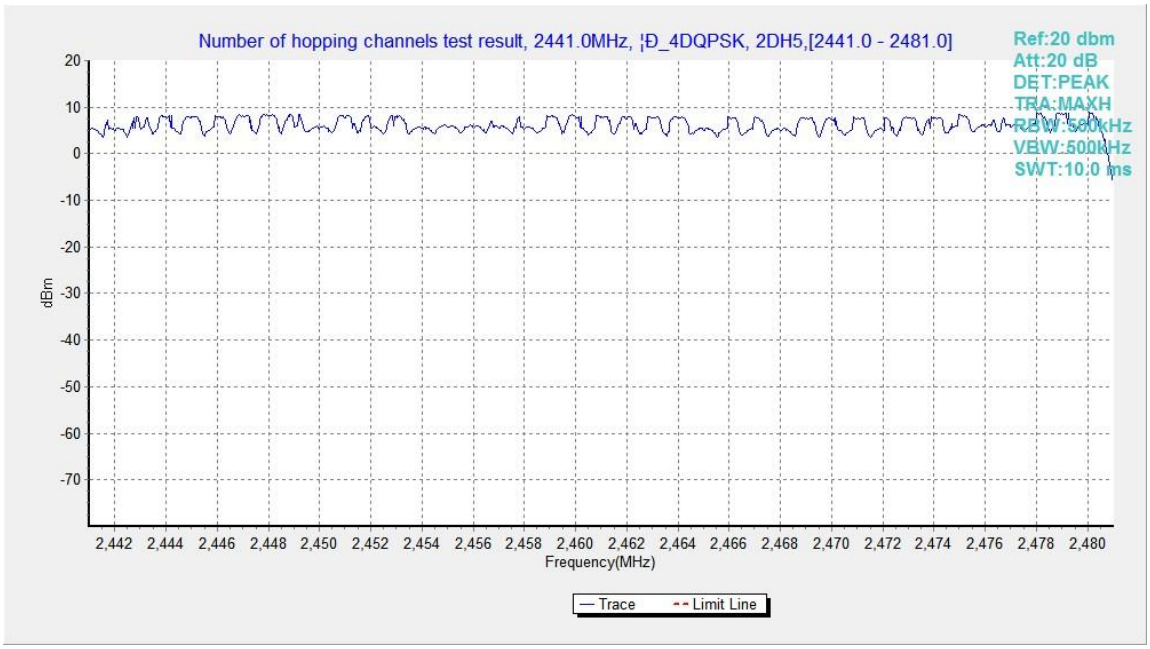


Fig.97. Number of hopping frequencies: π/4 DQPSK, Channel 40 - 78

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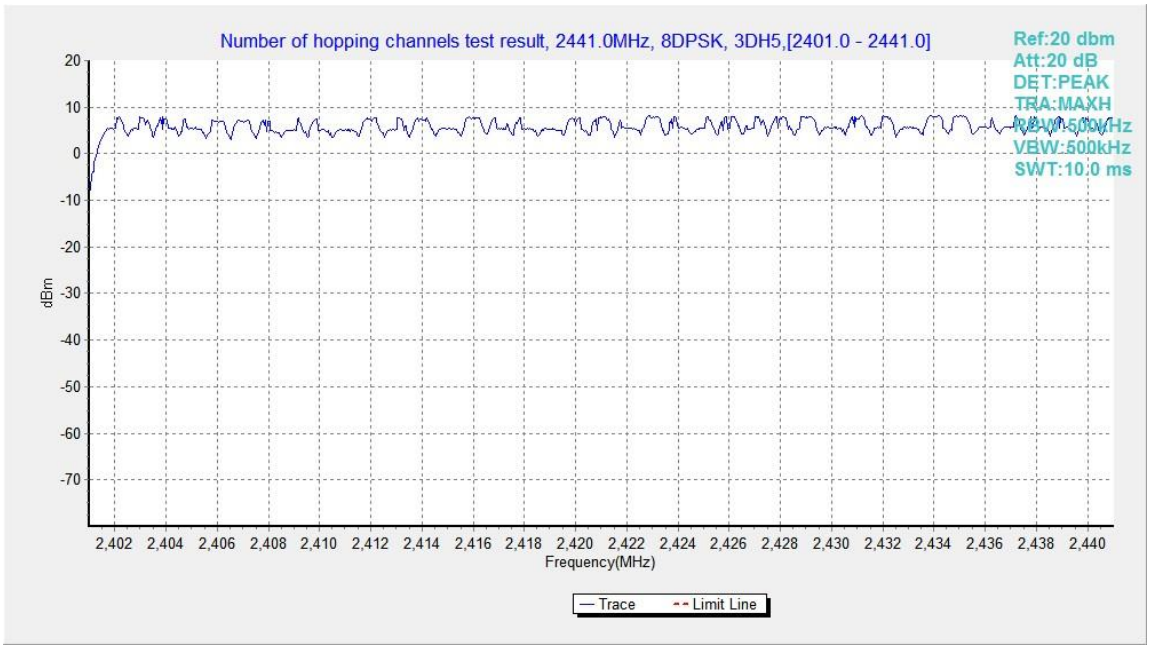


Fig.98. Number of hopping frequencies: 8DPSK, Channel 0 - 39

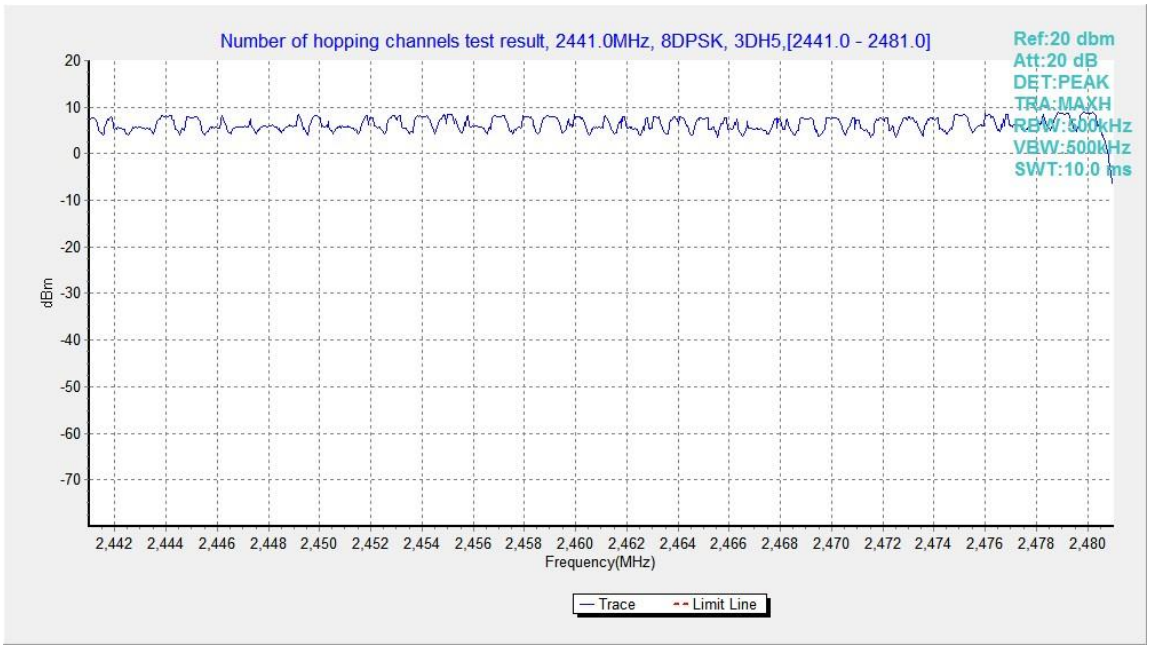


Fig.99. Number of hopping frequencies: 8DPSK, Channel 40 - 78

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B.10. AC Powerline Conducted Emission

Summary

All AC line conducted spurious emissions are measured with a receiver connected to a grounded LISN while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for conducted spurious emissions. Only the conducted emissions of the configuration that produced the worst case emissions are reported in this section

Method of Measurement:

See Clause 6.2 of ANSI C63.10 specifically.

See Clause 4 and Clause 5 of ANSI C63.10 generally.

The conducted emissions from the AC port of the EUT are measured in a shielding room. The EUT is connected to a Line Impedance Stabilization Network (LISN). An overview sweep with peak detection was performed. The measurements were performed with a quasi-peak detector and if required, an average detector.

The conducted emission measurements were made with the following detector of the test receiver:Quasi-Peak / Average Detector.

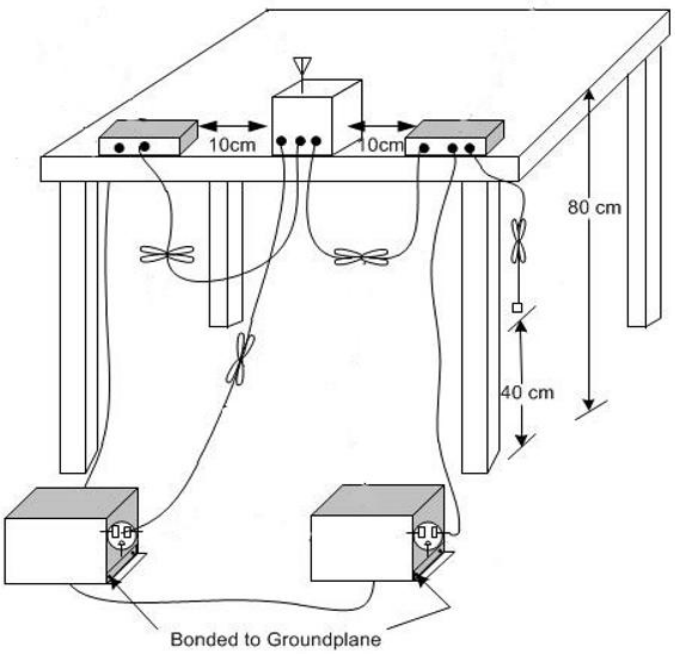
The measurement bandwidth is:

Frequency of Emission (MHz)	RBW/IF bandwidth
0.15-30	9kHz

Test Condition:

Voltage（V）	Frequency（Hz）
120	60

Test setup



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Measurement Result and limit:

Bluetooth (Quasi-peak Limit)

Frequency range (MHz)	Quasi-peak Limit (dBμV)	Result (dBμV)		Conclusion
		With charger		
		bluetooth	Idle	
0.15 to 0.5	66 to 56	Fig.B.10.1	Fig.B.10.2	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.				

Bluetooth (Average Limit)

Frequency range (MHz)	Average Limit (dBμV)	Result (dBμV)		Conclusion
		With charger		
		bluetooth	Idle	
0.15 to 0.5	56 to 46	Fig.B.10.1	Fig.B.10.2	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.				

Conclusion: Pass

Test graphs as below:

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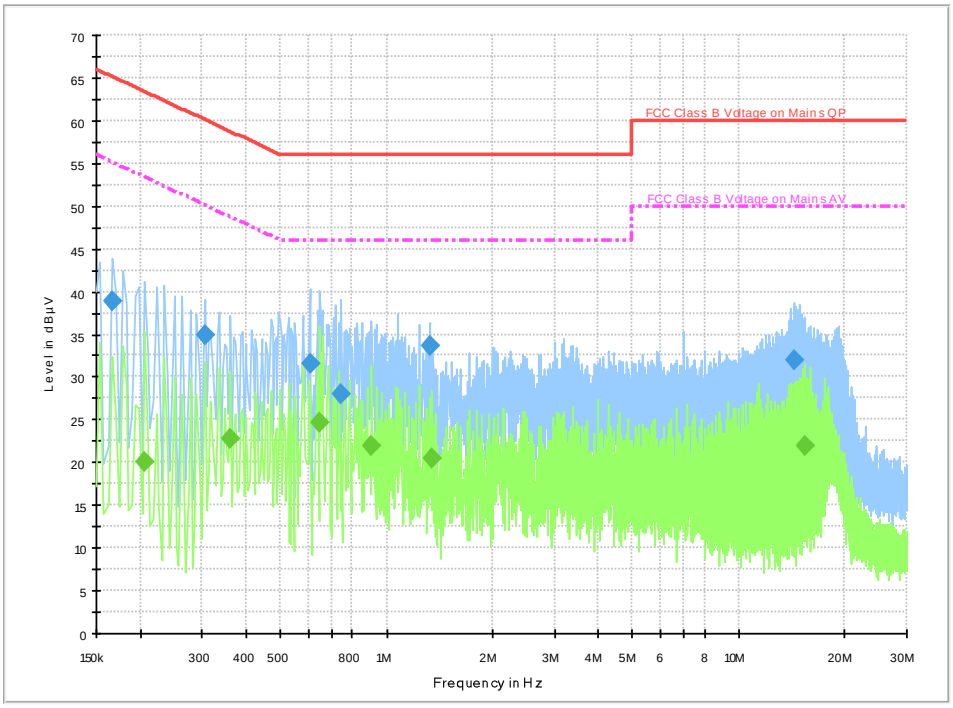


Fig.B.10.1 AC Powerline Conducted Emission-bluetooth

Note: The graphic result above is the maximum of the measurements for both phase line and neutral line.

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.166000	**39.0**	**2000.0**	**9.000**	**On**	**N**	**19.8**	**26.2**	**65.2**	
0.306000	**35.0**	**2000.0**	**9.000**	**On**	**L1**	**19.9**	**25.1**	**60.1**	
0.606000	**31.6**	**2000.0**	**9.000**	**On**	**N**	**19.9**	**24.4**	**56.0**	
0.746000	**28.0**	**2000.0**	**9.000**	**On**	**N**	**19.8**	**28.0**	**56.0**	
1.326000	**33.6**	**2000.0**	**9.000**	**On**	**L1**	**19.9**	**22.4**	**56.0**	
14.458000	**32.0**	**2000.0**	**9.000**	**On**	**N**	**19.8**	**28.0**	**60.0**	

Final Result 2

Frequency (MHz)	CAverage(dBµV)	Meas. Time	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.206000	**20.1**	**2000.0**	**9.000**	**On**	**N**	**19.8**	**33.2**	**53.4**	
0.362000	**22.7**	**2000.0**	**9.000**	**On**	**L1**	**19.9**	**25.9**	**48.7**	
0.646000	**24.6**	**2000.0**	**9.000**	**On**	**N**	**19.8**	**21.4**	**46.0**	
0.910000	**21.8**	**2000.0**	**9.000**	**On**	**L1**	**19.9**	**24.2**	**46.0**	
1.338000	**20.4**	**2000.0**	**9.000**	**On**	**L1**	**19.9**	**25.6**	**46.0**	
15.370000	**22.0**	**2000.0**	**9.000**	**On**	**L1**	**20.0**	**28.0**	**50.0**	

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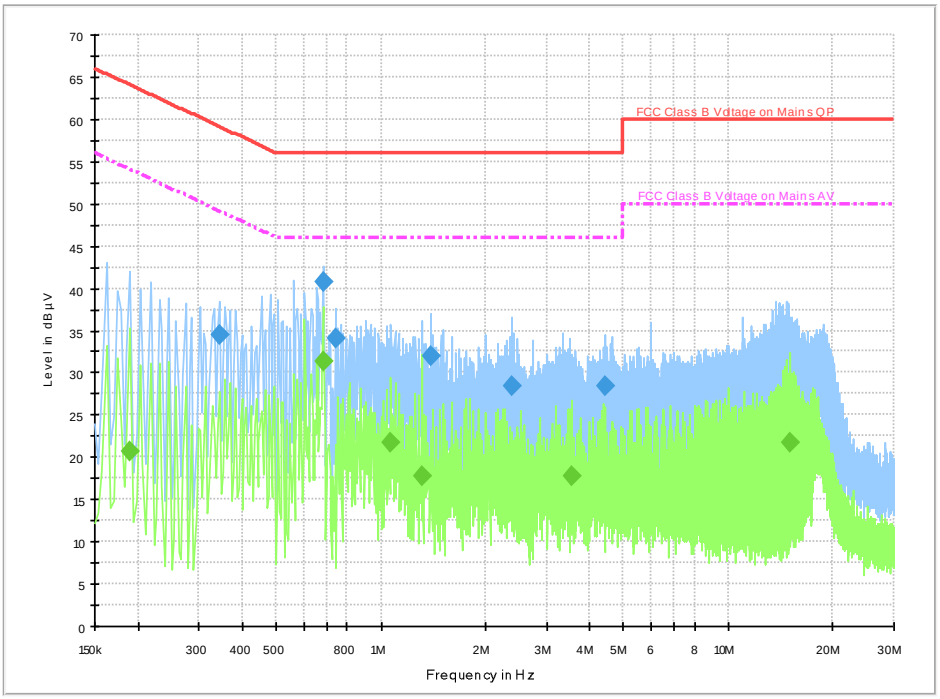


Fig.B.10.2 AC Powerline Conducted Emission-Idle

Note: The graphic result above is the maximum of the measurements for both phase line and neutral line.

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.342000	**34.5**	**2000.0**	**9.000**	**On**	**L1**	**19.9**	**24.6**	**59.2**	
0.682000	**40.8**	**2000.0**	**9.000**	**On**	**L1**	**20.0**	**15.2**	**56.0**	
0.738000	**34.1**	**2000.0**	**9.000**	**On**	**N**	**19.8**	**21.9**	**56.0**	
1.390000	**31.9**	**2000.0**	**9.000**	**On**	**L1**	**19.9**	**24.1**	**56.0**	
2.386000	**28.4**	**2000.0**	**9.000**	**On**	**L1**	**19.8**	**27.6**	**56.0**	
4.442000	**28.3**	**2000.0**	**9.000**	**On**	**L1**	**19.8**	**27.7**	**56.0**	

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.190000	**20.7**	**2000.0**	**9.000**	**On**	**L1**	**19.9**	**33.3**	**54.0**	
0.682000	**31.4**	**2000.0**	**9.000**	**On**	**L1**	**20.0**	**14.6**	**46.0**	
1.070000	**21.6**	**2000.0**	**9.000**	**On**	**L1**	**19.9**	**24.4**	**46.0**	
1.318000	**17.7**	**2000.0**	**9.000**	**On**	**L1**	**19.9**	**28.3**	**46.0**	
3.538000	**17.8**	**2000.0**	**9.000**	**On**	**L1**	**19.8**	**28.2**	**46.0**	
15.118000	**21.8**	**2000.0**	**9.000**	**On**	**L1**	**20.0**	**28.2**	**50.0**	

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B.11.Antenna Requirement

The antenna of the device is permanently attached. There are no provisions for connection to an external antenna.
The unit complies with the requirement of FCC Part 15.203.

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ANNEX C: Accreditation Certificate



Accredited Laboratory

A2LA has accredited

TELECOMMUNICATION TECHNOLOGY LABS, CAICT

Beijing, People's Republic of China

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 26th day of June 2023.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 7049.01
Valid to July 31, 2024

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

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

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