FCC PART 15C
TEST REPORT
No. I19Z70327-IOT01

for

Samsung Electronics. Co., Ltd.

Mobile phone

Model Name: SM-A015T1

FCC ID: ZCASMA015T1

with

Hardware Version: REV3.0

Software Version: A015T1.001 (A015T1UVE0ASJ6)

Issued Date: 2020-1-13

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.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S.Government.

Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

No.52, HuayuanNorth Road, Haidian District, Beijing, P. R. China 100191.

Tel:+86(0)10-62304633-2512,Fax:+86(0)10-62304633-2504

Email:cttl_terminals@caict.ac.cn, website: www.chinattl.com

REPORT HISTORY

Report Number	Revision	Description	Issue Date
I19Z70327-IOT01	Rev.0	1st edition	2020-1-13

CONTENTS

1. Test Laboratory

1.1. Introduction &Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2005accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP)with lab code600118-0, and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (CN0066). The detail accreditation scope can be found on NVLAP website.

1.2. Testing Location

Conducted testing Location: CTTL(huayuan North Road)

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

Radiated testing Location: CTTL(Shouxiang)

Address: No. 51 Shouxiang Science Building, Xueyuan Road, Haidian District, Beijing, P. R. China100191

1.3. Testing Environment

Normal Temperature: 15-35℃

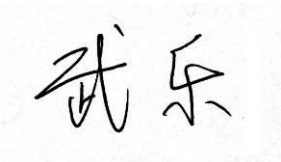
Relative Humidity: 20-75%

1.4. Project data

Testing Start Date: 2019-10-21

Testing End Date: 2020-1-7

1.5. Signature



Wu Le

(Prepared this test report)

Sun Zhenyu

(Reviewed this test report)

Li Zhuofang

(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name:	Samsung Electronics. Co., Ltd.
Address /Post:	Samsung R5, Maetan dong 129, Samsung ro Youngtong gu, Suwon city 443 742, Korea
City:	/
Postal Code:	/
Country:	Korea
Telephone:	+82-10-4376-0326
Fax:	/

2.2. Manufacturer Information

Company Name:	Samsung Electronics. Co., Ltd.
Address /Post:	Samsung R5, Maetan dong 129, Samsung ro Youngtong gu, Suwon city 443 742, Korea
City:	/
Postal Code:	/
Country:	Korea
Telephone:	+82-10-4376-0326
Fax:	/

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

3.1. About EUT

Description	Mobile phone
Model Name	SM-A015T1
FCC ID	ZCASMA015T1
Frequency Band	ISM 2400MHz~2483.5MHz
Type of Modulation	GFSK/π/4 DQPSK/8DPSK
Number of Channels	79
Power Supply	3.85V DC by Battery

3.2. Internal Identification of EUT

EUT ID*	SN or IMEI	HW Version	SW Version
EUT3	/	REV3.0	A015T1.001 (A015T1UVE0ASJ6)
EUT5	351767110000030	REV3.0	A015T1.001 (A015T1UVE0ASJ6)

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

3.3. Internal Identification of AE

AE ID*	Description		
AE1	Battery	/	Inbuilt
AE3	Charger		/
AE6	USB Cable		/

AE1

Model	QL1695
Manufacturer	Ningde Amperex Technology Limited
Capacitance	/
Nominal voltage	3.85 V

AE3

Model	EP-TA50JWE
Manufacturer	DongYang E&P Inc.
Length of cable	/

AE6

Model	ECB-DU68WE
Manufacturer	SHENGHUA
Length of cable	/

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

3.4. EUT set-ups

EUT set-up No.	Combination of EUT and AE	Remarks
Set.11	EUT3+ AE1+ AE3+ AE6	WIFI&BT

3.5. Normal Accessory setting

Fully charged battery should be used during the test.

3.6. General Description

The Equipment Under Test (EUT) is a model of Mobile phone with 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.

4. Reference Documents

4.1. Documents supplied by applicant

EUT feature 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.	2018
ANSI C63.10	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	June,2013

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

R Re-use test data from basic model report.

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

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

5.3. Explanation of re-use of test data

The Equipment Under Test (EUT) model SM-A015T1(FCC ID: ZCASMA015T1) is a variant product of SM-A015V(FCC ID: ZCASMA015V), according to the declaration of changes provided by the applicant and FCC KDB publication 484596 D01, spot check measurements(Peak Output Power-Conducted) were performed on this device, other test results are derived from test report No. I19Z70303-IOT11. Please refer Annex A for detail spot check verification data and reference data. the spot check test results are consistent with basic model.

For detail differences between two models please refer the Declaration of Changes document.

6. Test Facilities Utilized

Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Vector Signal Analyzer	FSQ26	200136	Rohde & Schwarz	1 year	2020-11-29
2	Bluetooth Tester	CBT32	101042	Rohde & Schwarz	1 year	2020-11-29
3	LISN	ENV216	101200	Rohde & Schwarz	1 year	2020-03-14
4	Test Receiver	ESCI	100344	Rohde & Schwarz	1 year	2020-02-14
5	Shielding Room	S81	/	ETS-Lindgren	/	/

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Test Receiver	ESU26	100235	Rohde & Schwarz	1 year	2020-03-01
2	BiLog Antenna	VULB9163	1222	Schwarzbeck	1 year	2020-03-14
3	Dual-Ridge Waveguide Horn Antenna	3115	6914	ETS-Lindgren	1 year	2021-01-03
4	Bluetooth Tester	CBT	101042	Rohde & Schwarz	1 year	2020-02-08

7. Measurement Uncertainty

7.1. Peak Output Power - Conducted

Measurement Uncertainty:

Measurement Uncertainty (k=2)	0.66dB

7.2. Frequency Band Edges

Measurement Uncertainty:

Measurement Uncertainty (k=2)	0.66dB

7.3. Transmitter Spurious Emission - Conducted

Measurement Uncertainty:

Frequency Range	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:

Frequency Range	Uncertainty (k=2)
＜ 1 GHz	4.86dB
＞ 1 GHz	5.26dB

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

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)	3.38dB

ANNEX A: Detailed Test Results

A.1. Measurement Method

A.1.1. Conducted Measurements

The measurement is made according to ANSI C63.10.

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

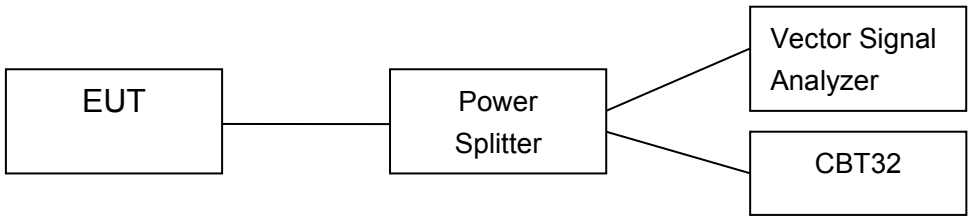
2). Set the EUT to the required work mode (Transmitter, receiver or transmitter & receiver).

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



A.1.2. Radiated Emission Measurements

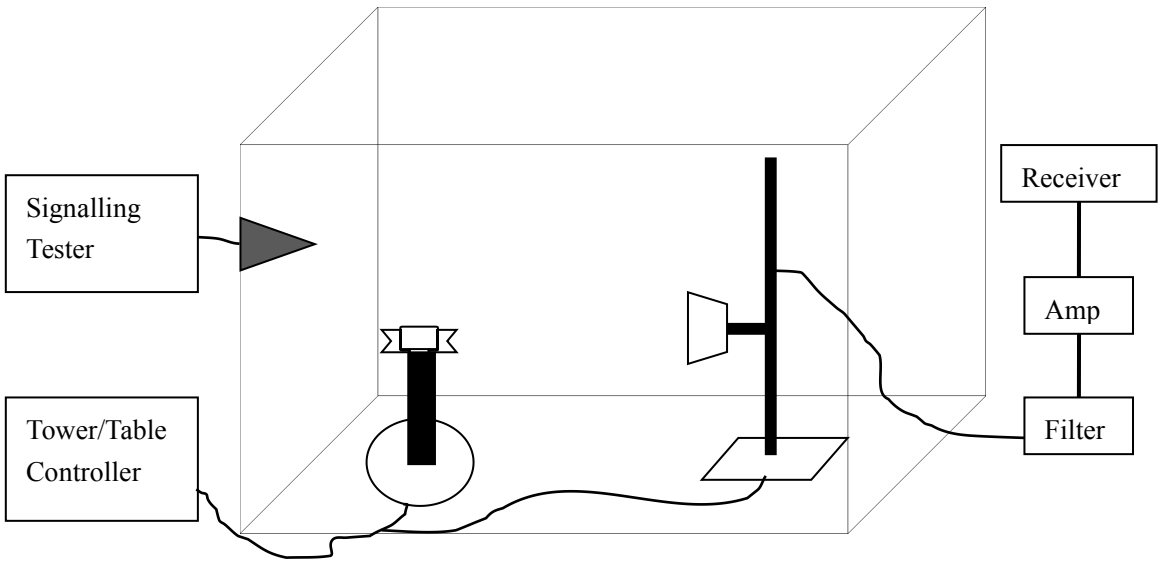
The measurement is made according to ANSI C63.10

The radiated emission test is performed in semi-anechoic chamber. The distance from the EUT to the reference point of measurement antenna is 3m. 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 360° and the measurement antenna is moved from 1m to 4m to get the maximization result.

In the case of radiated emission, the used settings are as follows,

Sweep frequency from 30 MHz to 1GHz, RBW = 100 kHz, VBW = 300 kHz;

Sweep frequency from 1 GHz to 26GHz, RBW = 1MHz, VBW = 1MHz;



A.2. 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)

Spot check Measurement Results:

For GFSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	7.70	8.90	8.24	P

For π/4 DQPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	7.70	8.91	8.19	P

For 8DPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	8.00	9.24	8.59	P

Conclusion: PASS

Reference Measurement Results from basic model:

For GFSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	7.01	7.95	7.57	P

For π/4 DQPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	6.93	7.85	7.59	P

For 8DPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	7.16	8.26	7.91	P

Conclusion: PASS

A.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 the unlicensed 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 delta between the peak of the fundamental and the peak of the band-edge emission. This is not an absolute field strength measurement; it is only a relative measurement to determine the amount by which 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	-58.06	P
	Hopping ON	Fig.2	-65.55	P
78	Hopping OFF	Fig.3	-65.87	P
	Hopping ON	Fig.4	-65.92	P

For π/4 DQPSK

Channel	Hopping	Band Edge Power (dBc)		Conclusion
0	Hopping OFF	Fig.5	-58.46	P
	Hopping ON	Fig.6	-63.28	P
78	Hopping OFF	Fig.7	-64.42	P
	Hopping ON	Fig.8	-64.77	P

For 8DPSK

Channel	Hopping	Band Edge Power (dBc)		Conclusion
0	Hopping OFF	Fig.9	-57.18	P
	Hopping ON	Fig.10	-65.30	P

78	Hopping OFF	Fig.11	-64.22	P
	Hopping ON	Fig.12	-64.91	P

Conclusion: PASS

Test graphs as below

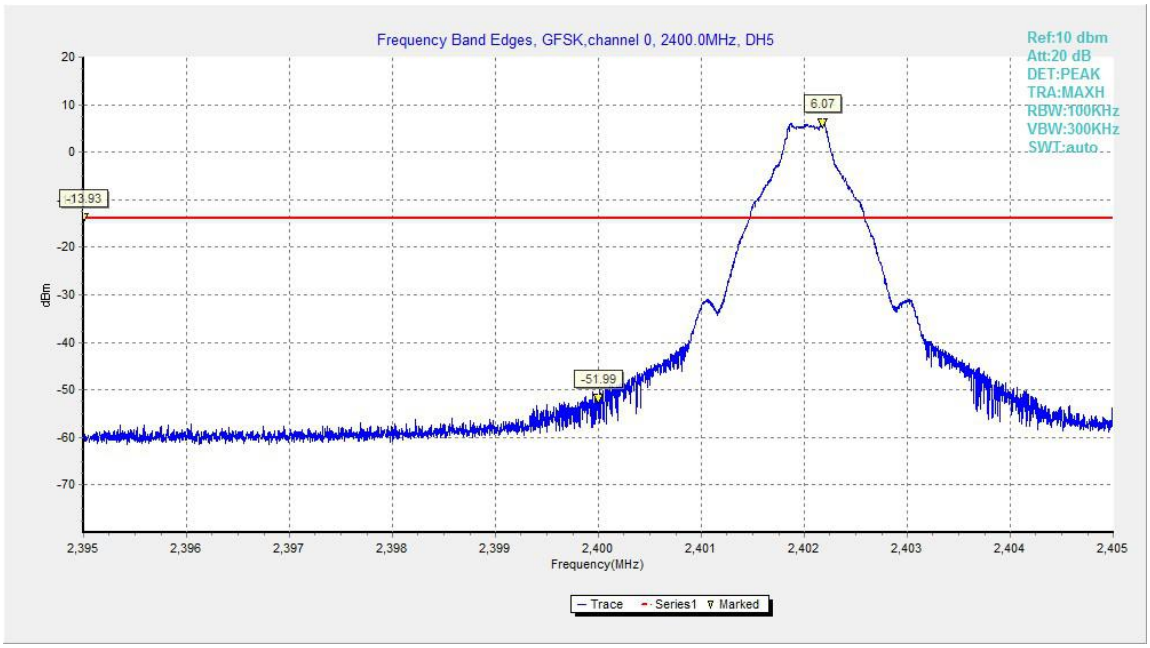


Fig.1. Frequency Band Edges: GFSK, Channel 0, Hopping Off

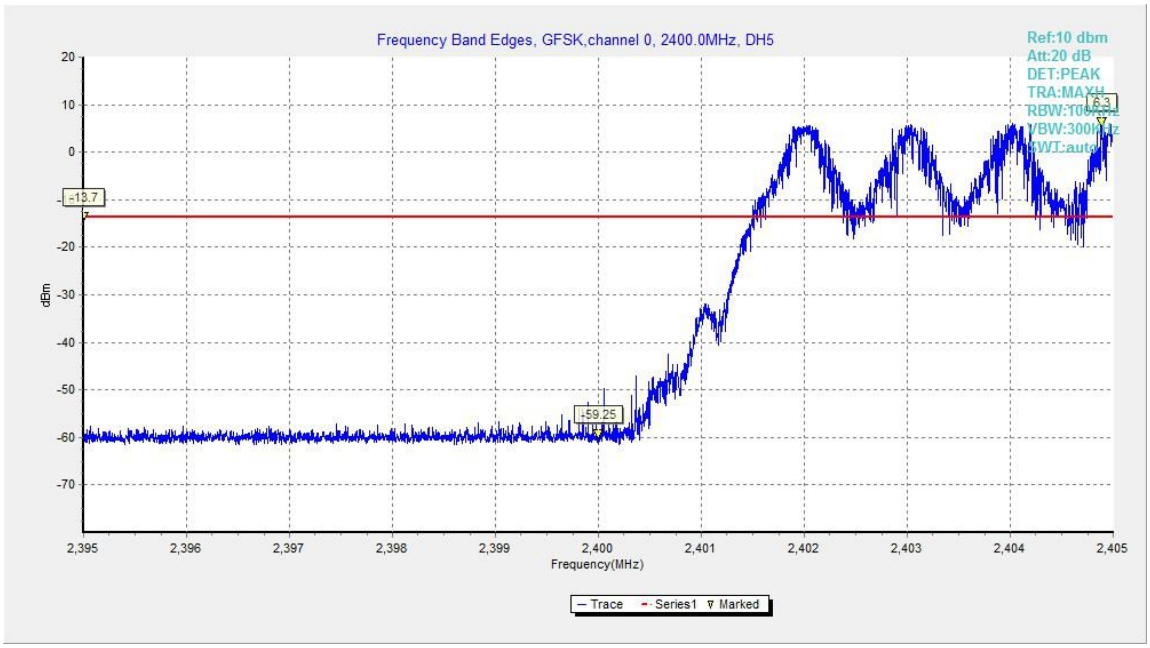


Fig.2. Frequency Band Edges: GFSK, Channel 0, Hopping On

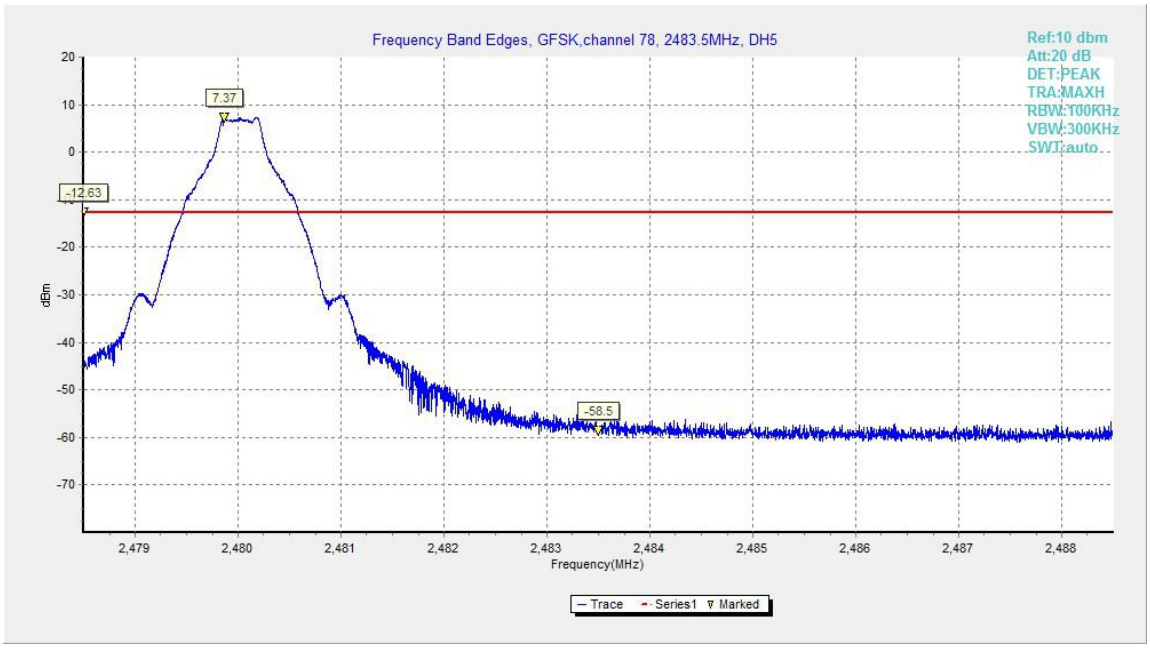


Fig.3. Frequency Band Edges: GFSK, Channel 78, Hopping Off

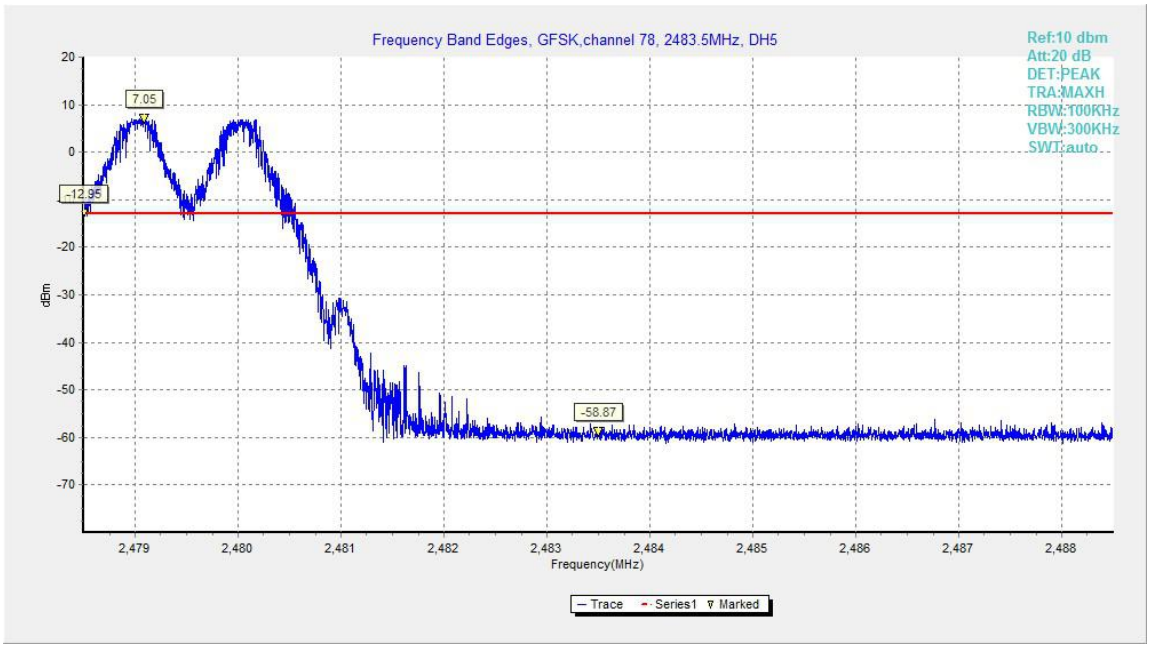


Fig.4. Frequency Band Edges: GFSK, Channel 78, Hopping On

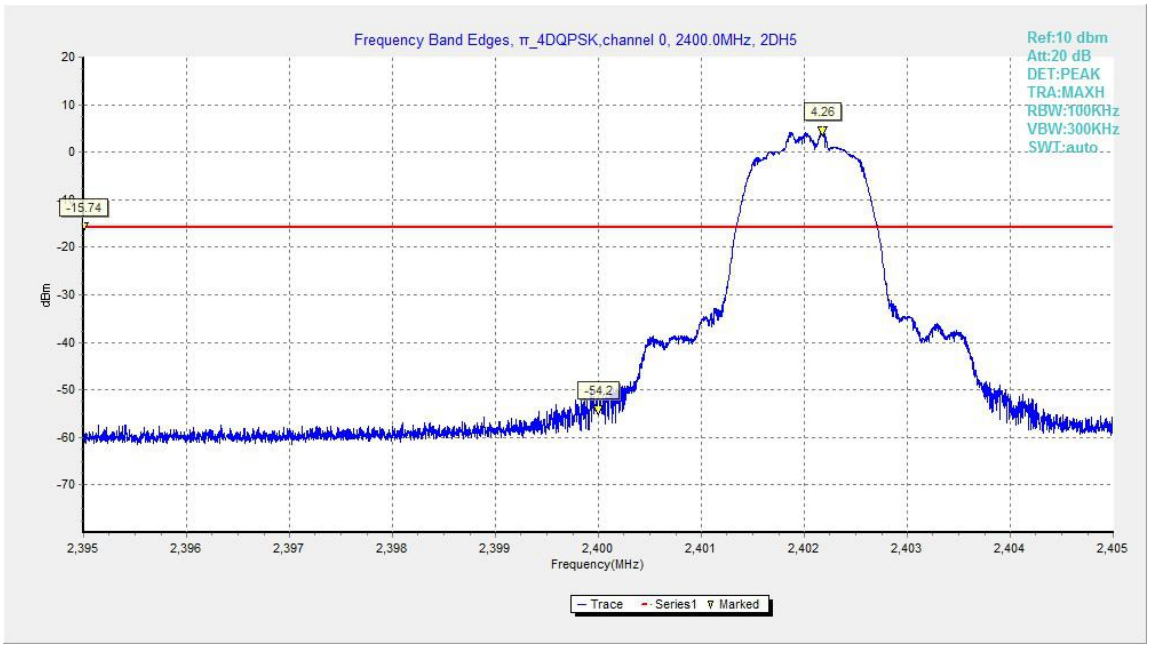


Fig.5. Frequency Band Edges: π/4 DQPSK, Channel 0, Hopping Off

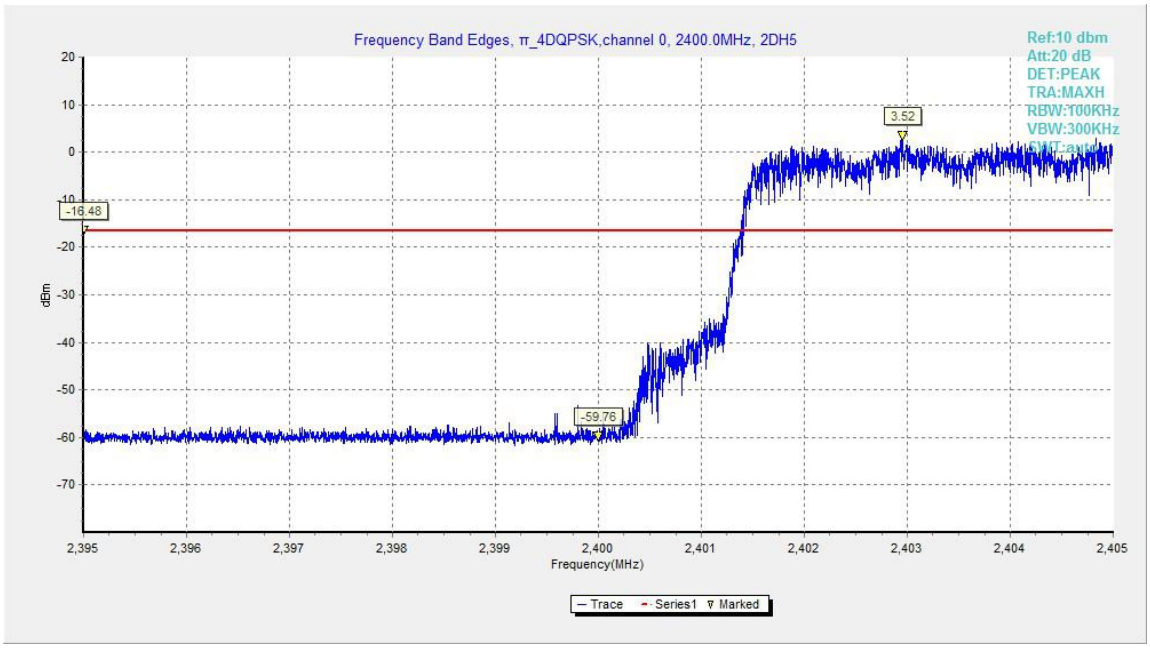


Fig.6. Frequency Band Edges: π/4 DQPSK, Channel 0, Hopping On

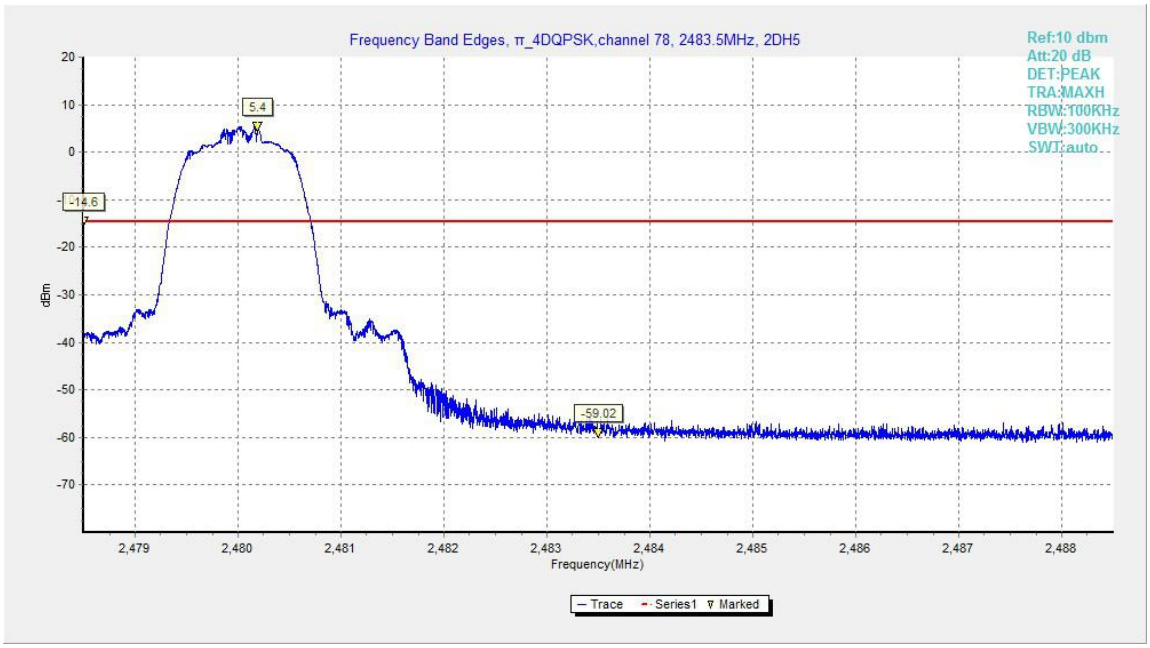


Fig.7. Frequency Band Edges: π/4 DQPSK, Channel 78, Hopping Off

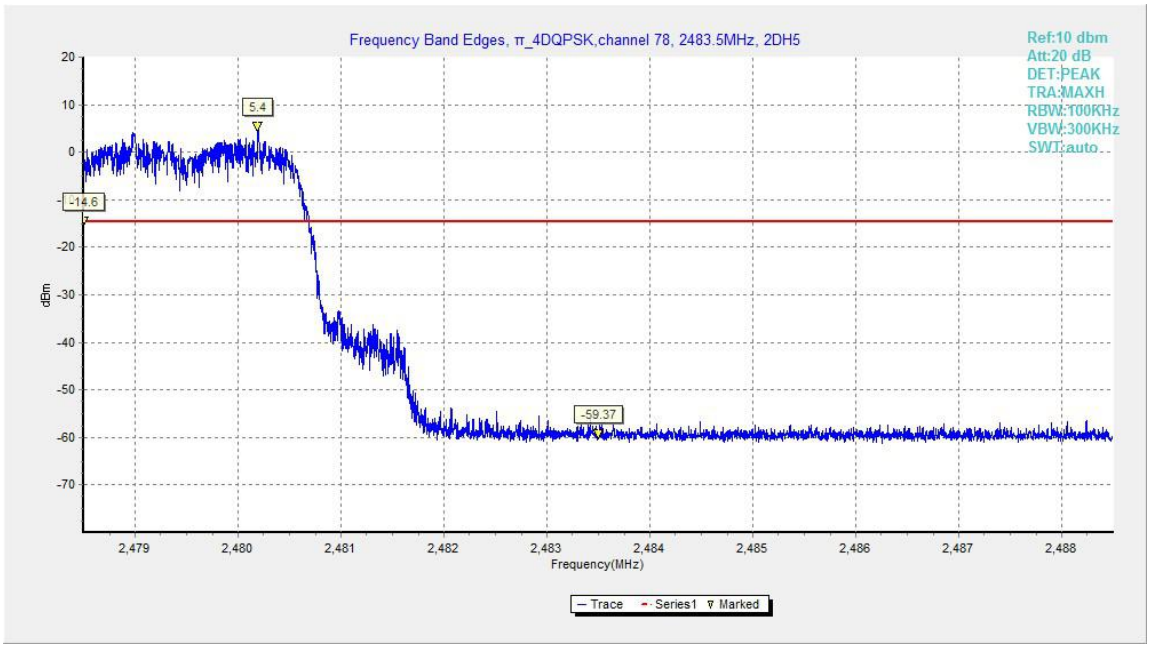


Fig.8. Frequency Band Edges: π/4 DQPSK, Channel 78, Hopping On

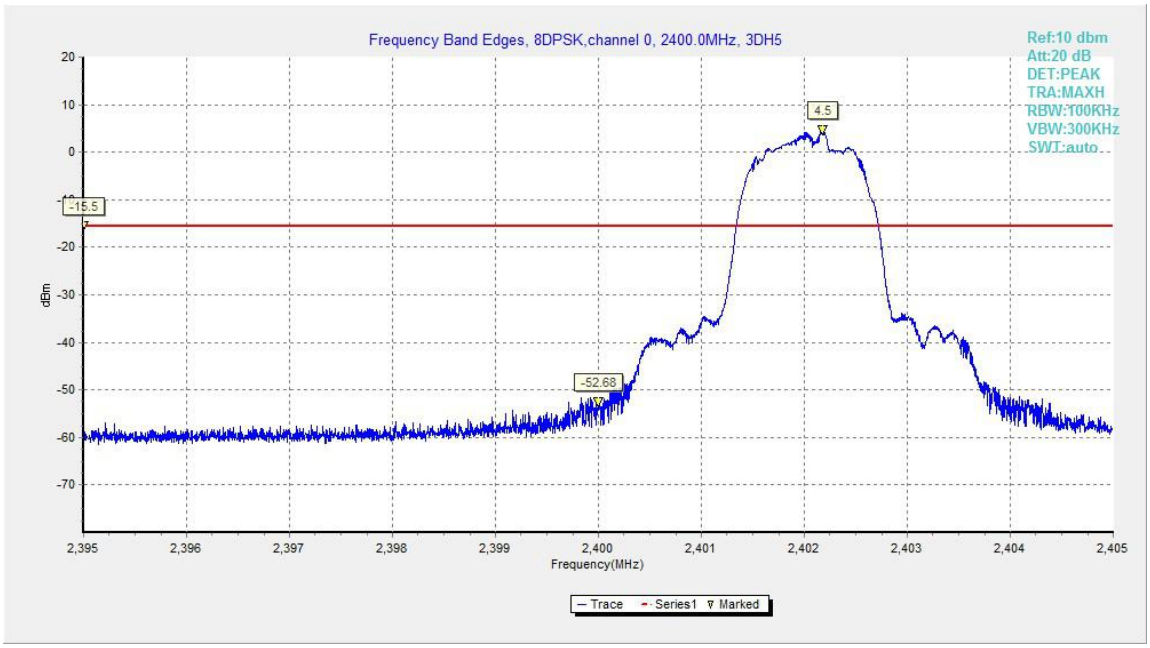


Fig.9. Frequency Band Edges: 8DPSK, Channel 0, Hopping Off

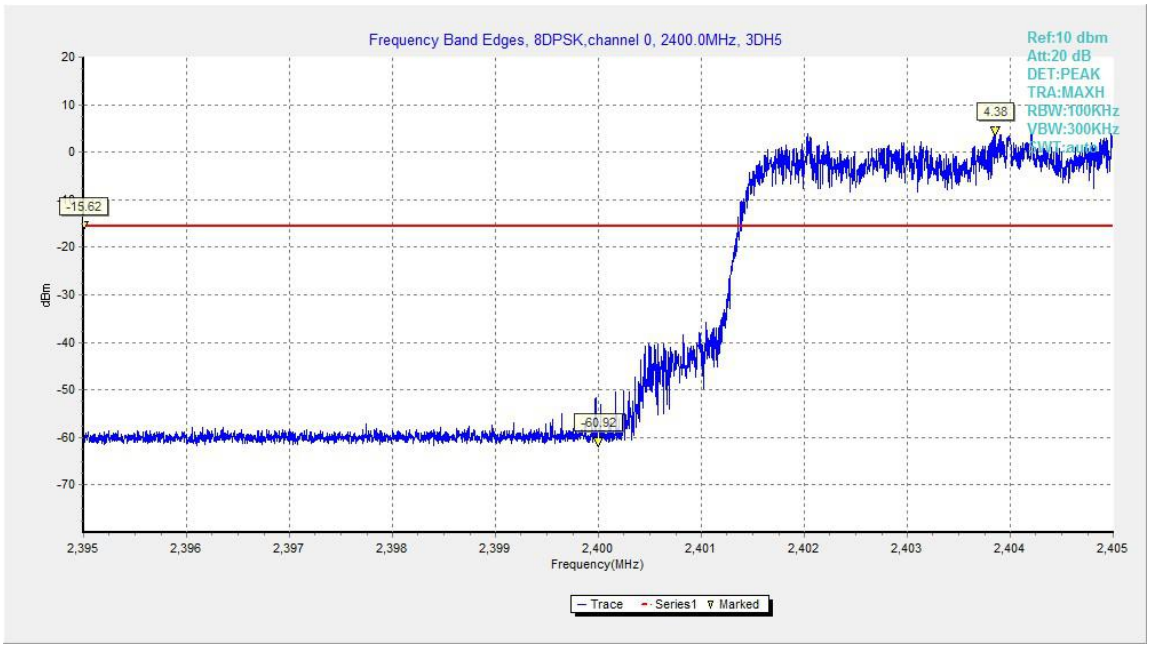


Fig.10. Frequency Band Edges: 8DPSK, Channel 0, Hopping On

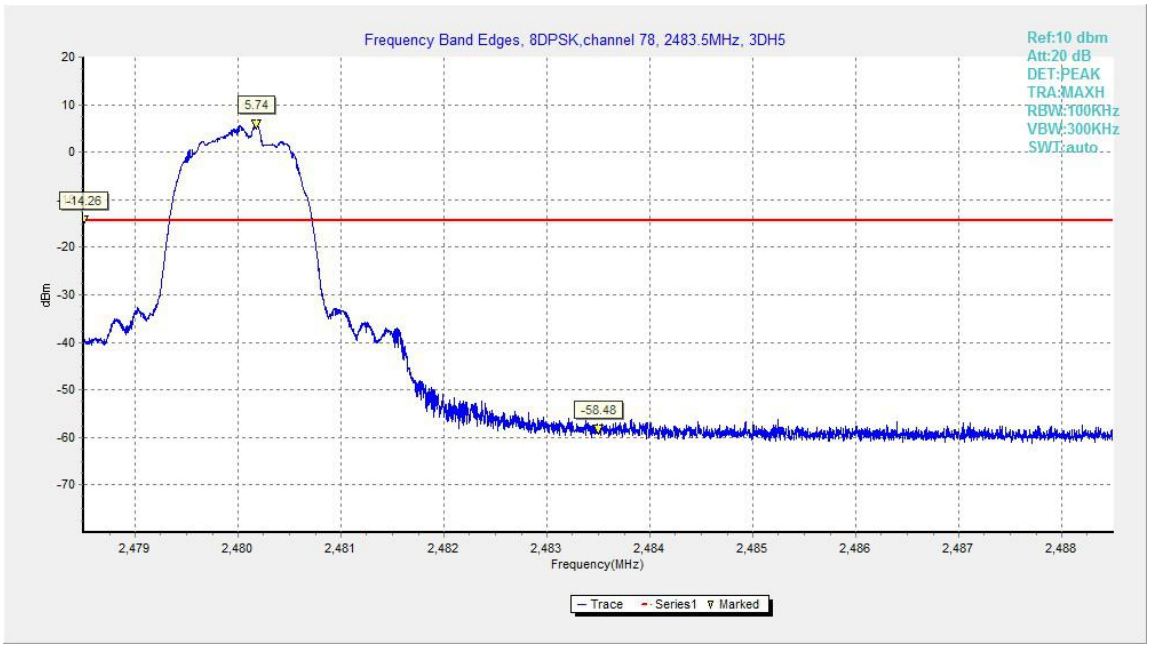


Fig.11. Frequency Band Edges: 8DPSK, Channel 78, Hopping Off

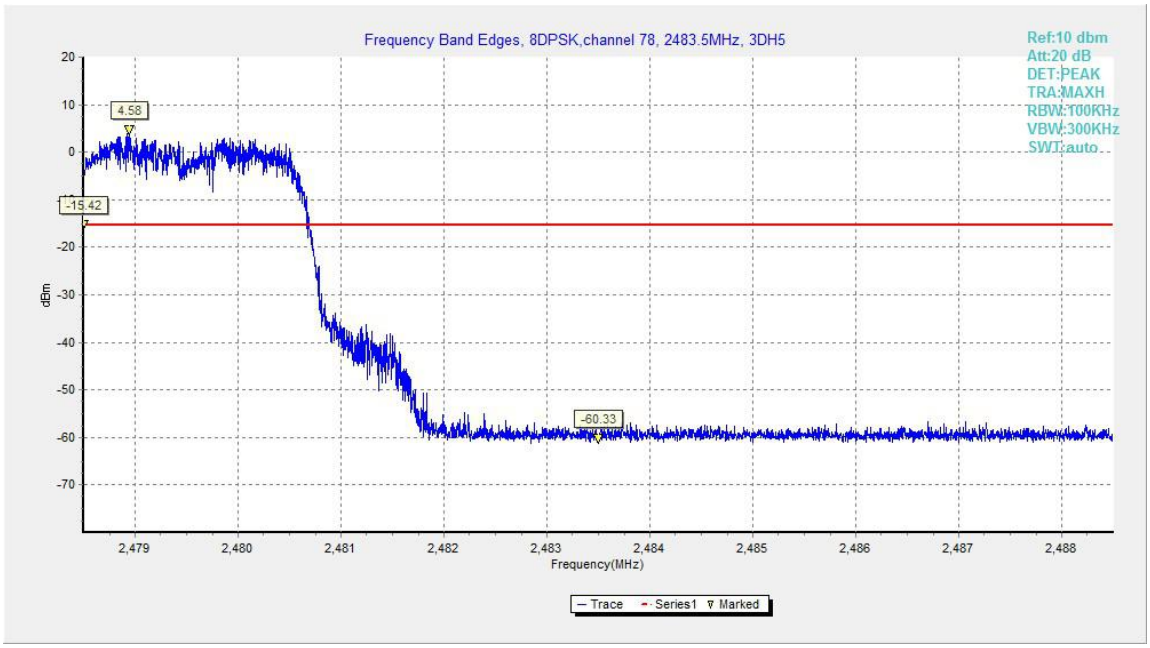


Fig.12. Frequency Band Edges: 8DPSK, Channel 78, Hopping On

A.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 2402 MHz	Center Frequency	Fig.13	P
	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
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

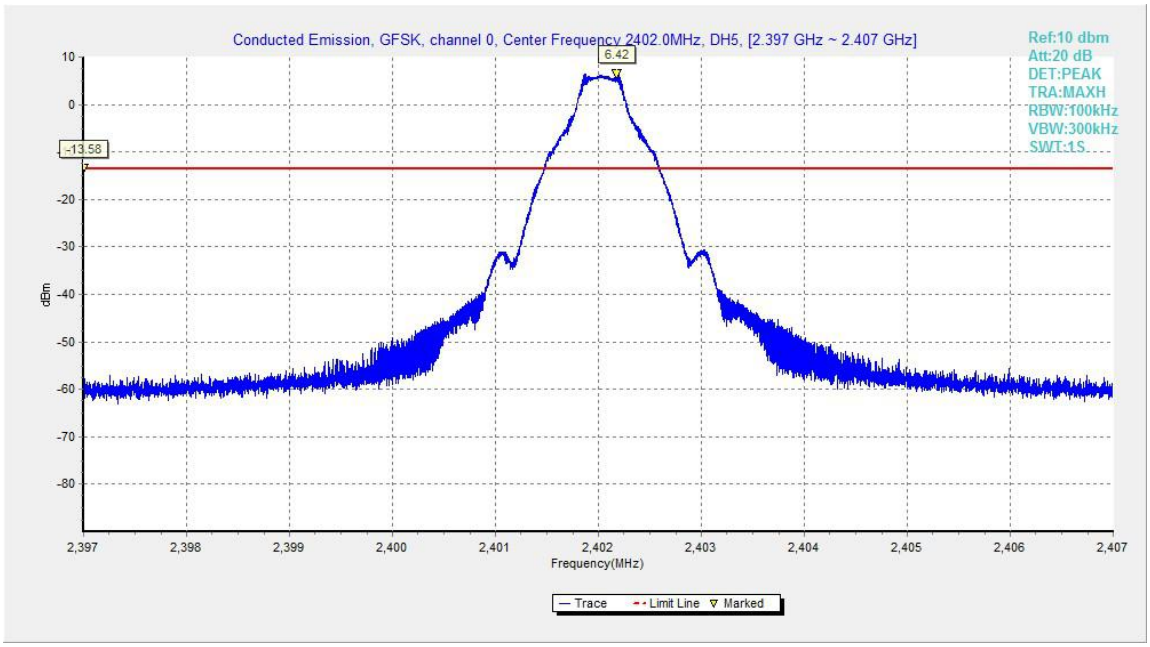


Fig.13. Conducted spurious emission: GFSK, Channel 0,2402MHz

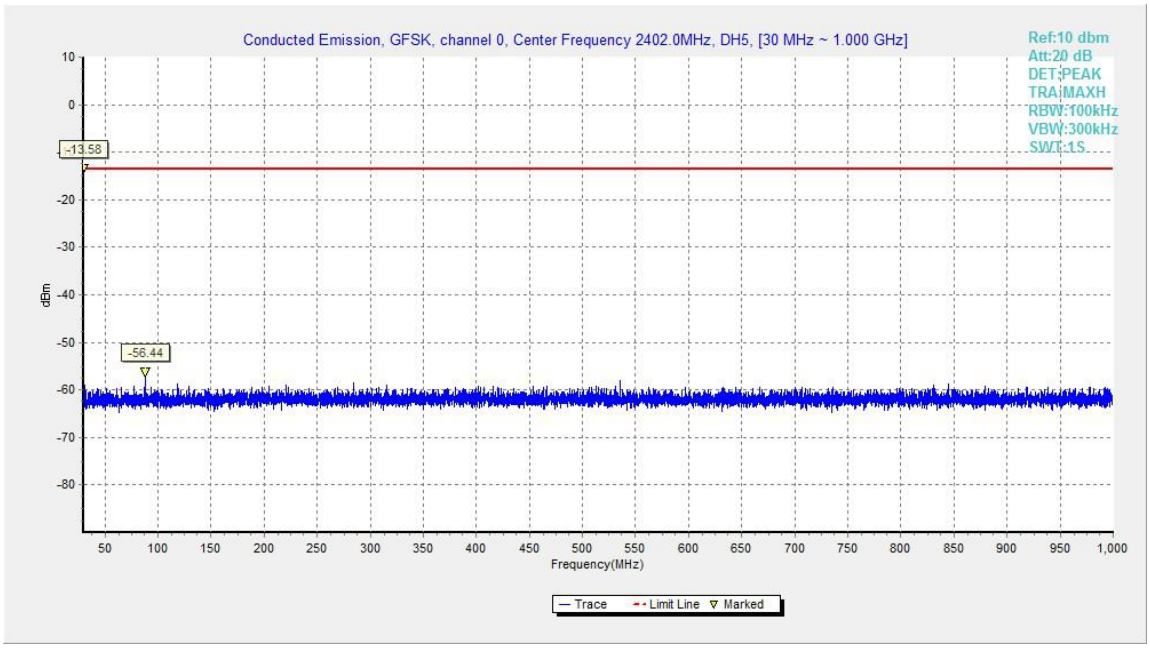


Fig.14. Conducted spurious emission: GFSK, Channel 0, 30MHz - 1GHz

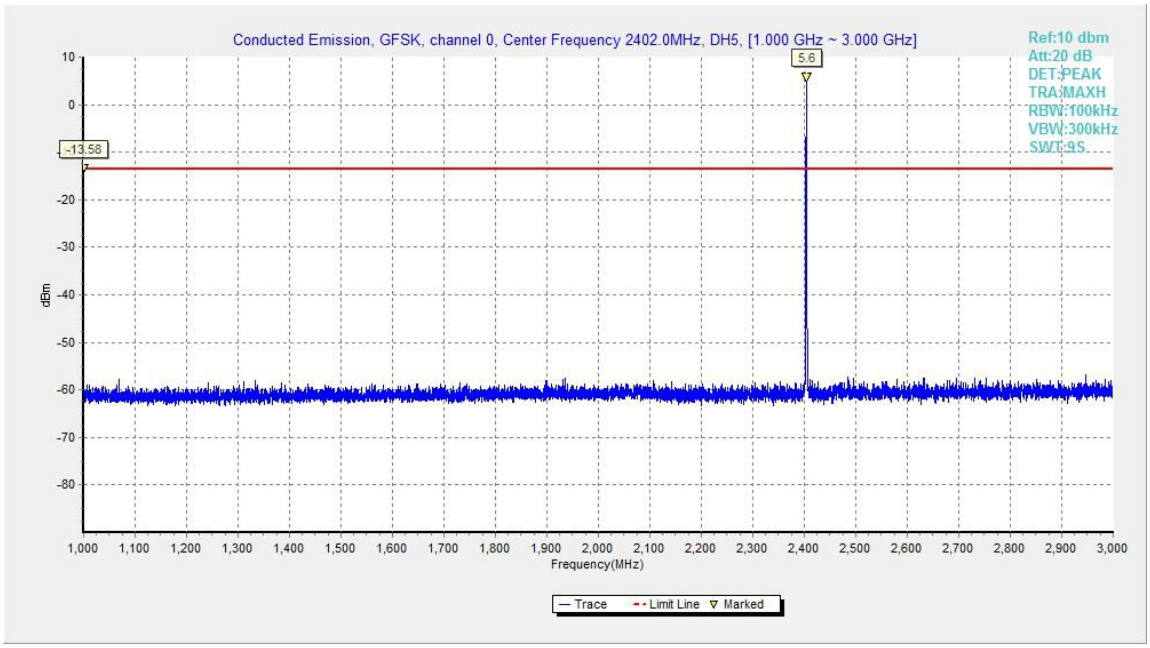


Fig.15. Conducted spurious emission: GFSK, Channel 0, 1GHz - 3GHz

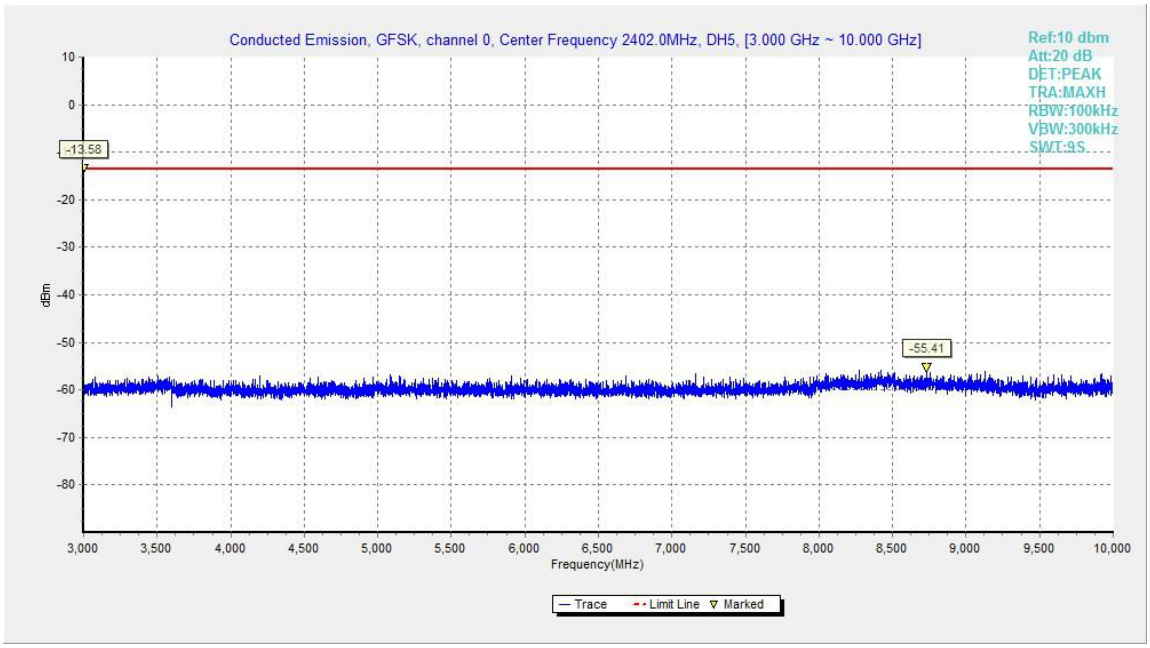


Fig.16. Conducted spurious emission: GFSK, Channel 0, 3GHz - 10GHz

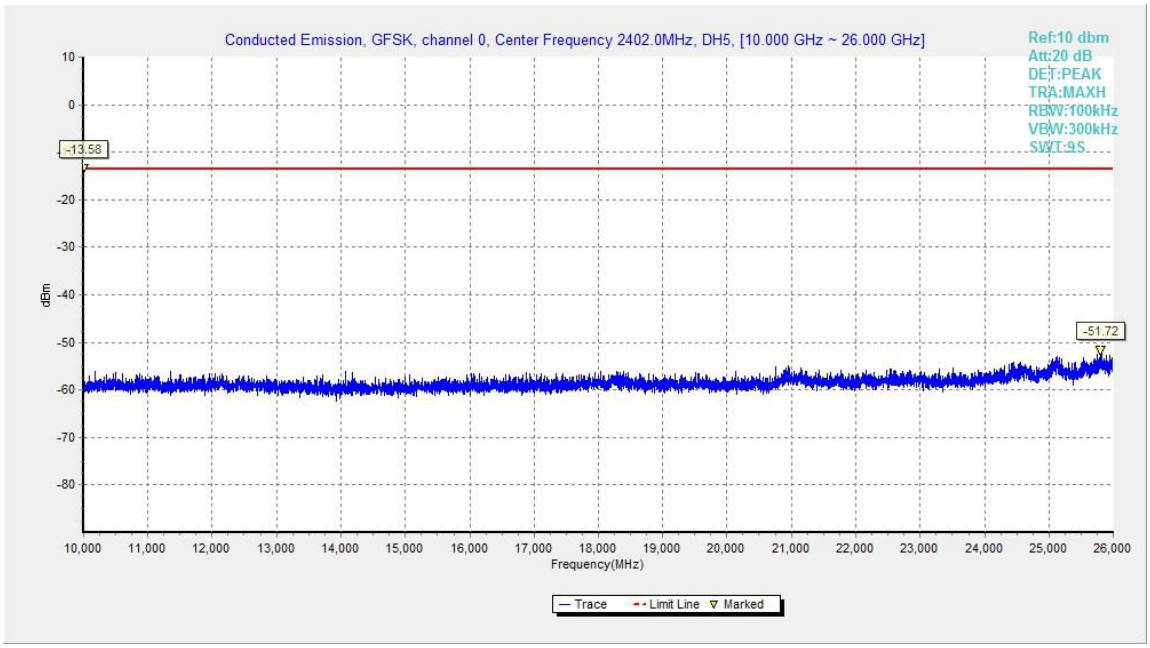


Fig.17. Conducted spurious emission: GFSK, Channel 0,10GHz - 26GHz

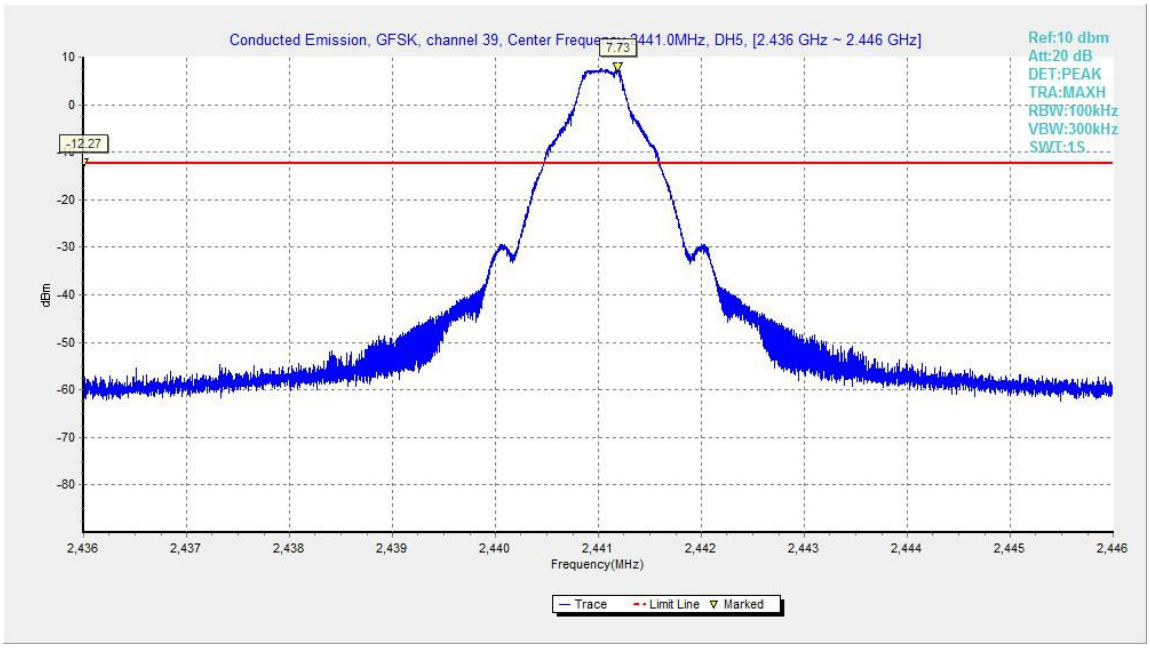


Fig.18. Conducted spurious emission: GFSK, Channel 39, 2441MHz

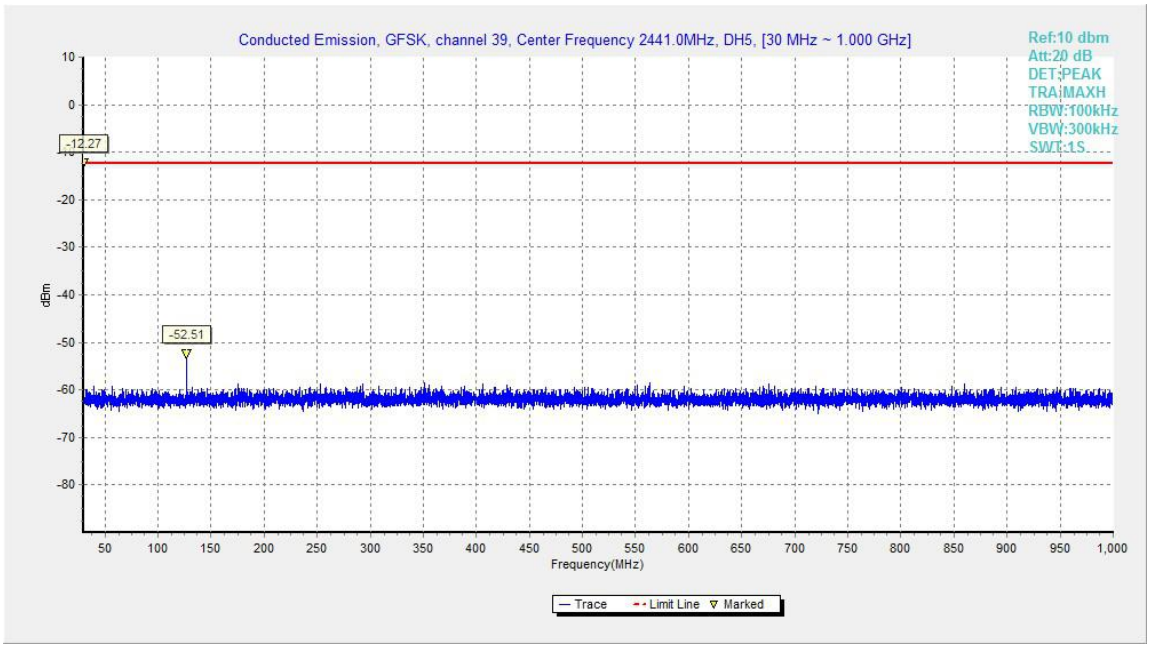


Fig.19. Conducted spurious emission: GFSK, Channel 39, 30MHz - 1GHz

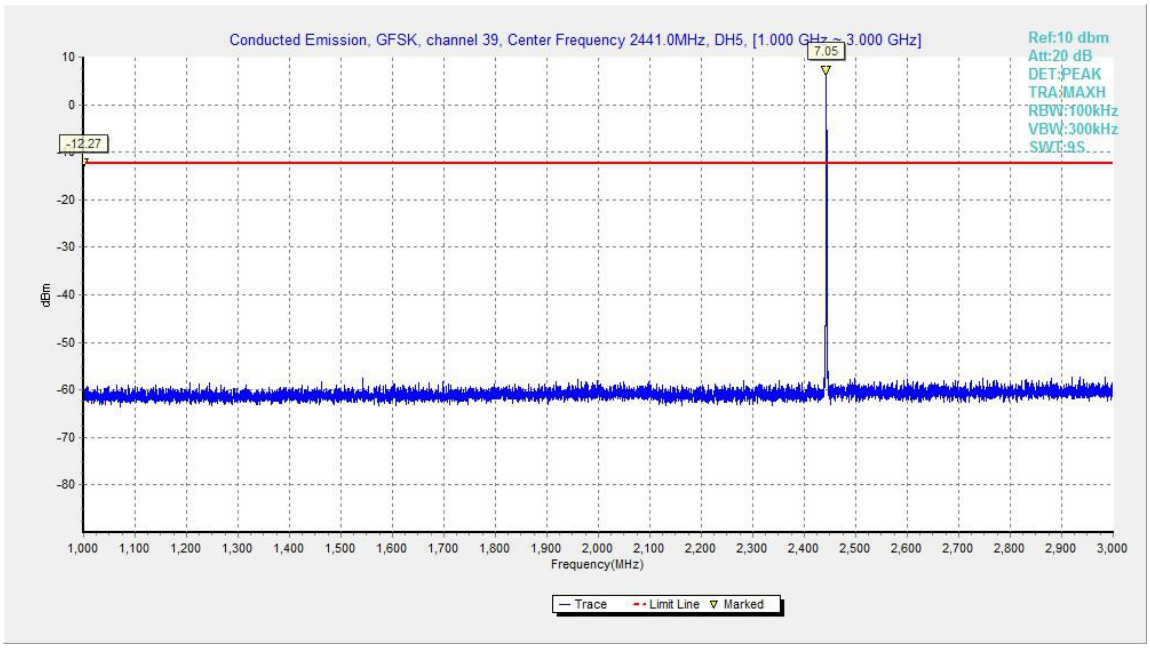


Fig.20. Conducted spurious emission: GFSK, Channel 39, 1GHz – 3GHz

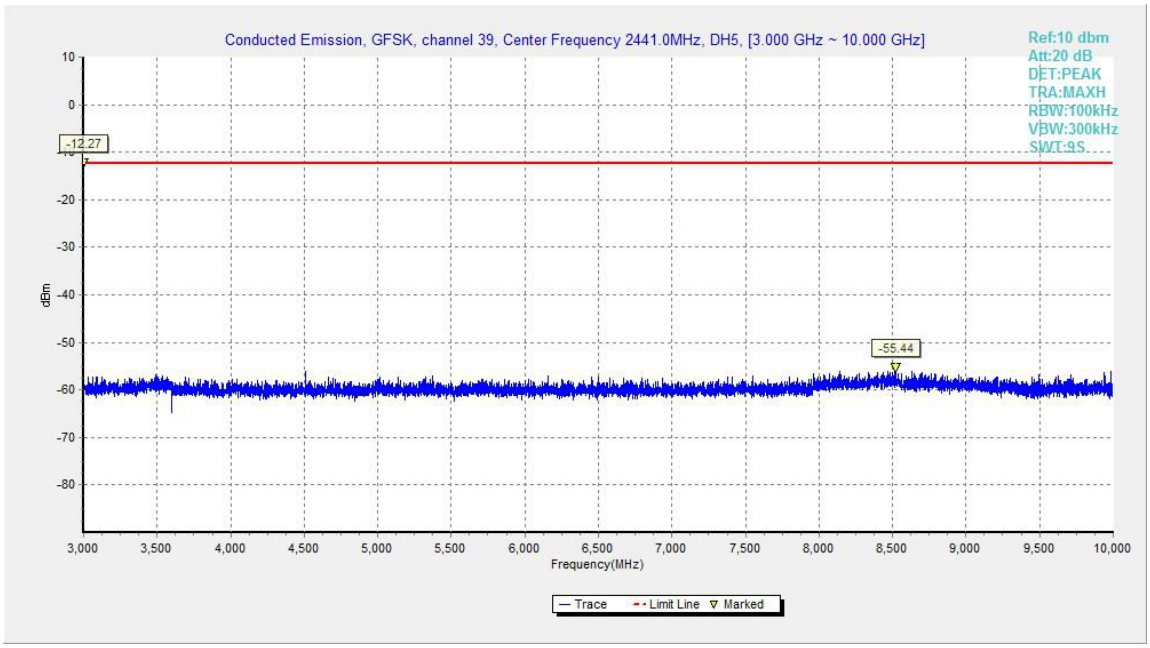


Fig.21. Conducted spurious emission: GFSK, Channel 39, 3GHz – 10GHz

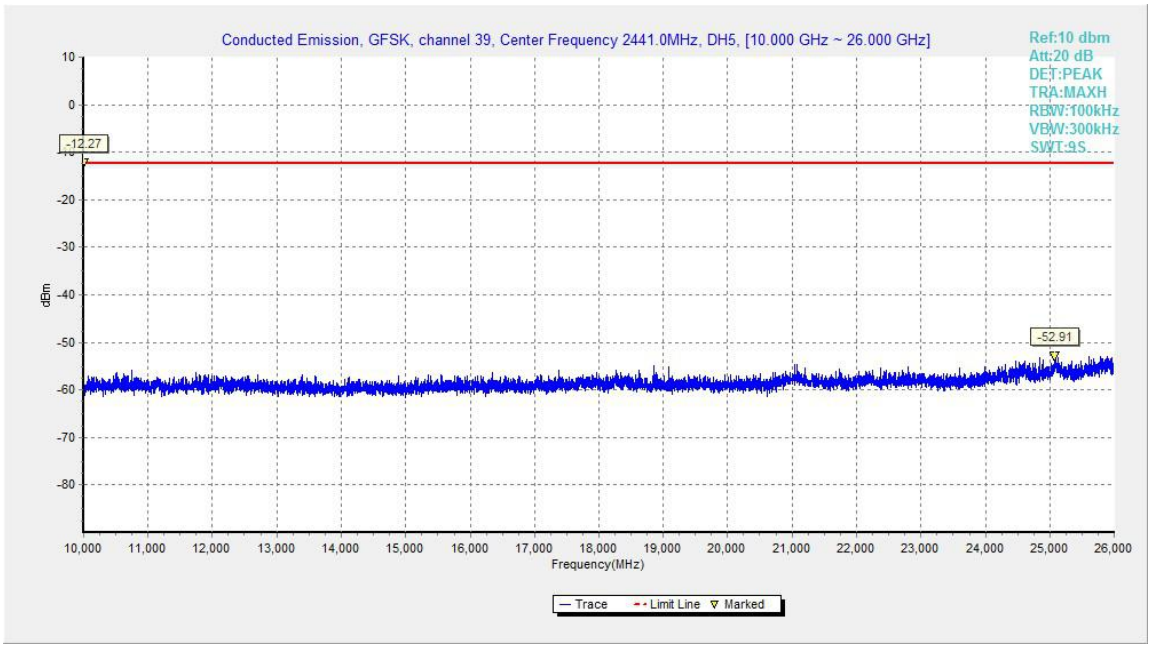


Fig.22. Conducted spurious emission: GFSK, Channel 39, 10GHz – 26GHz

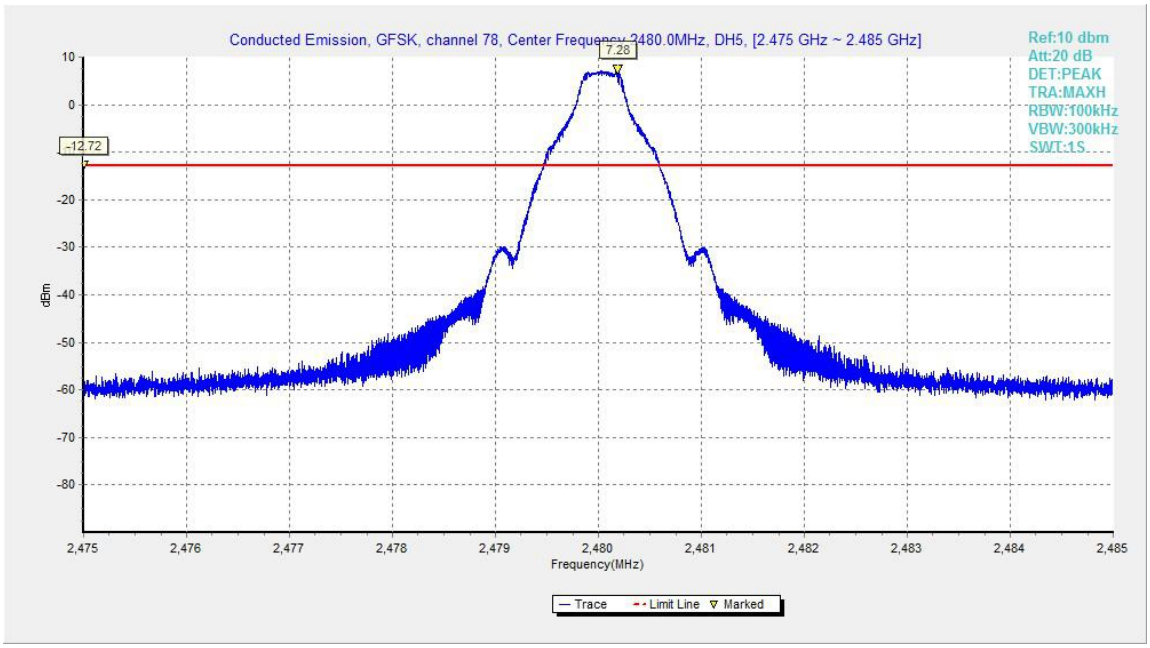


Fig.23. Conducted spurious emission: GFSK, Channel 78, 2480MHz

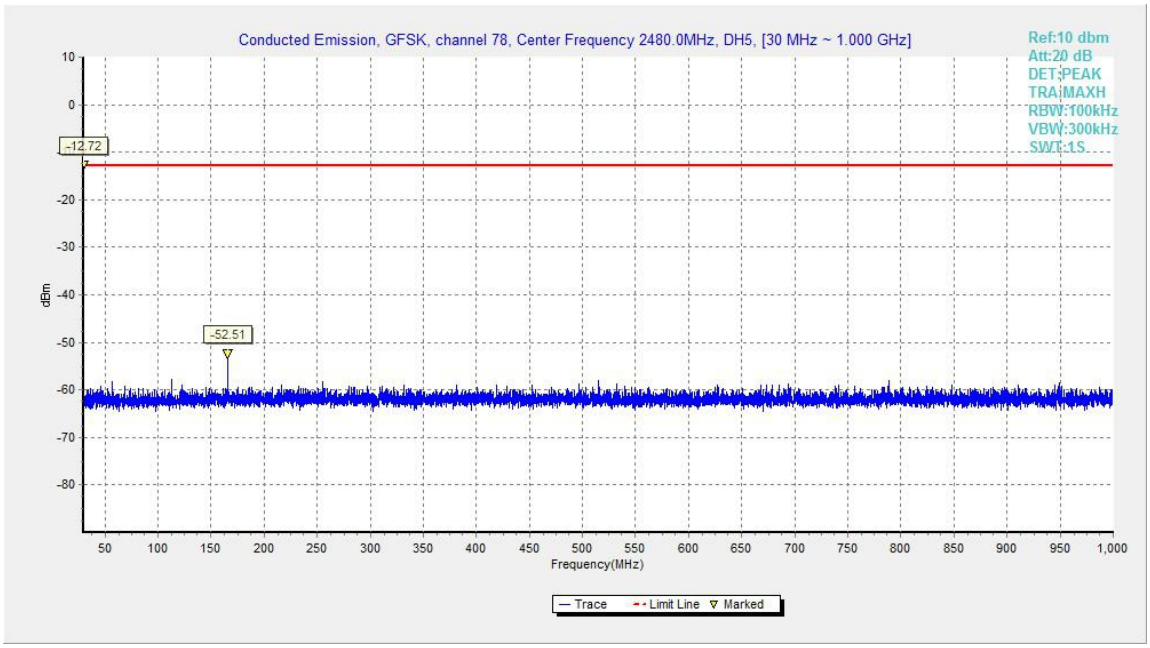


Fig.24. Conducted spurious emission: GFSK, Channel 78, 30MHz - 1GHz

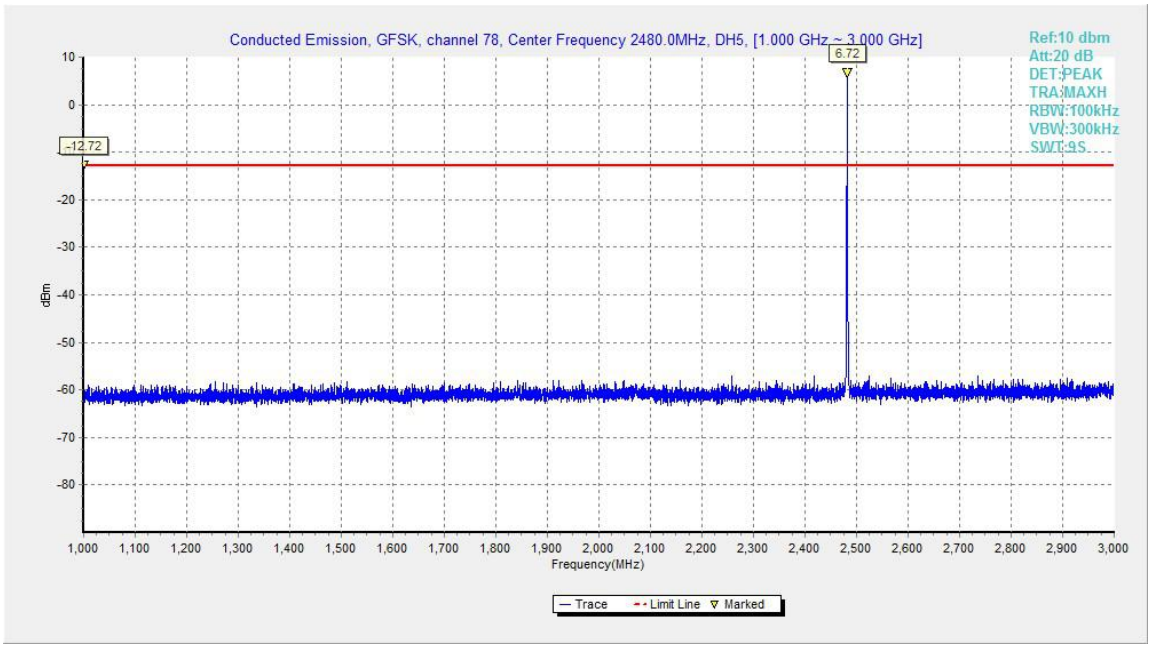


Fig.25. Conducted spurious emission: GFSK, Channel 78, 1GHz - 3GHz

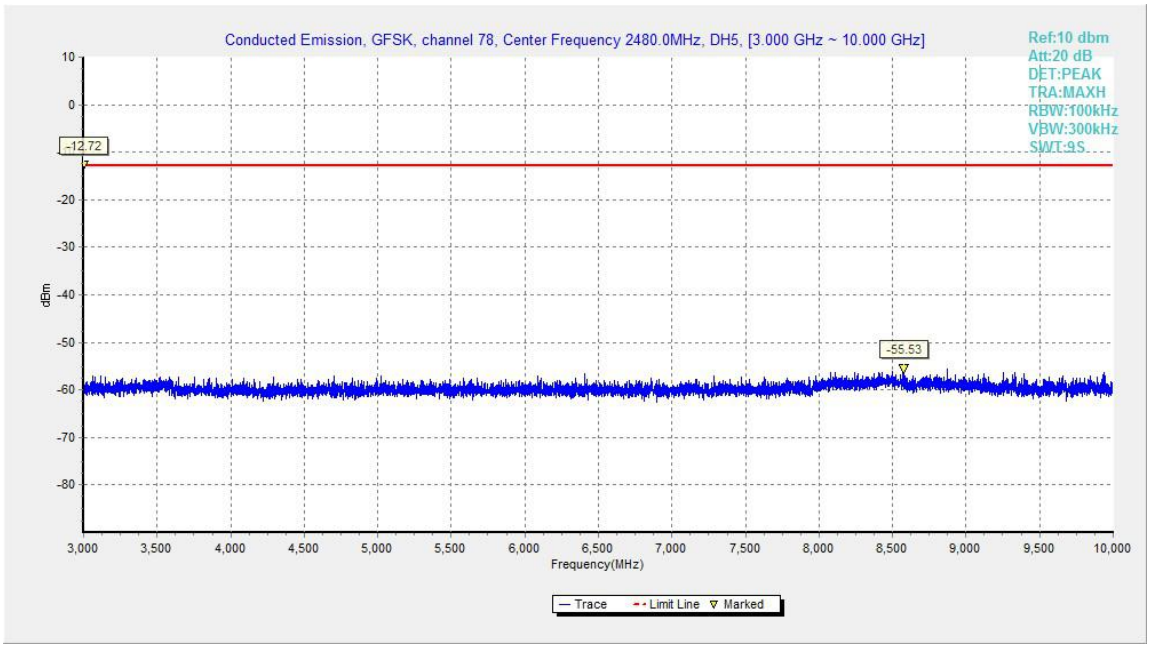


Fig.26. Conducted spurious emission: GFSK, Channel 78, 3GHz - 10GHz

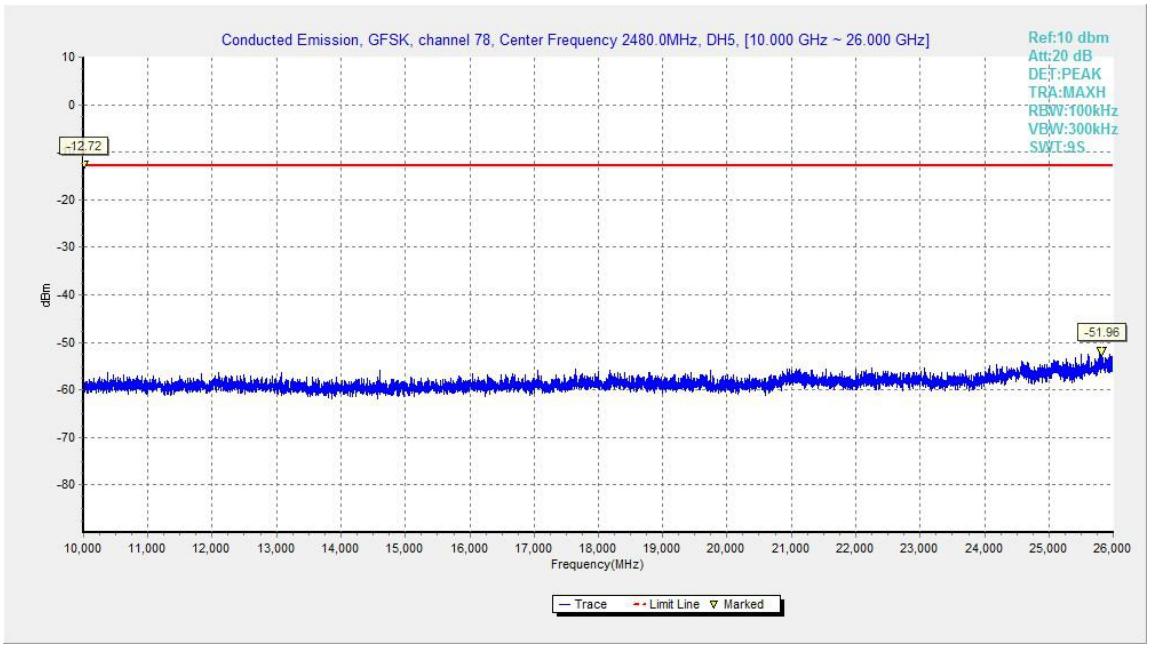


Fig.27. Conducted spurious emission: GFSK, Channel 78, 10GHz - 26GHz

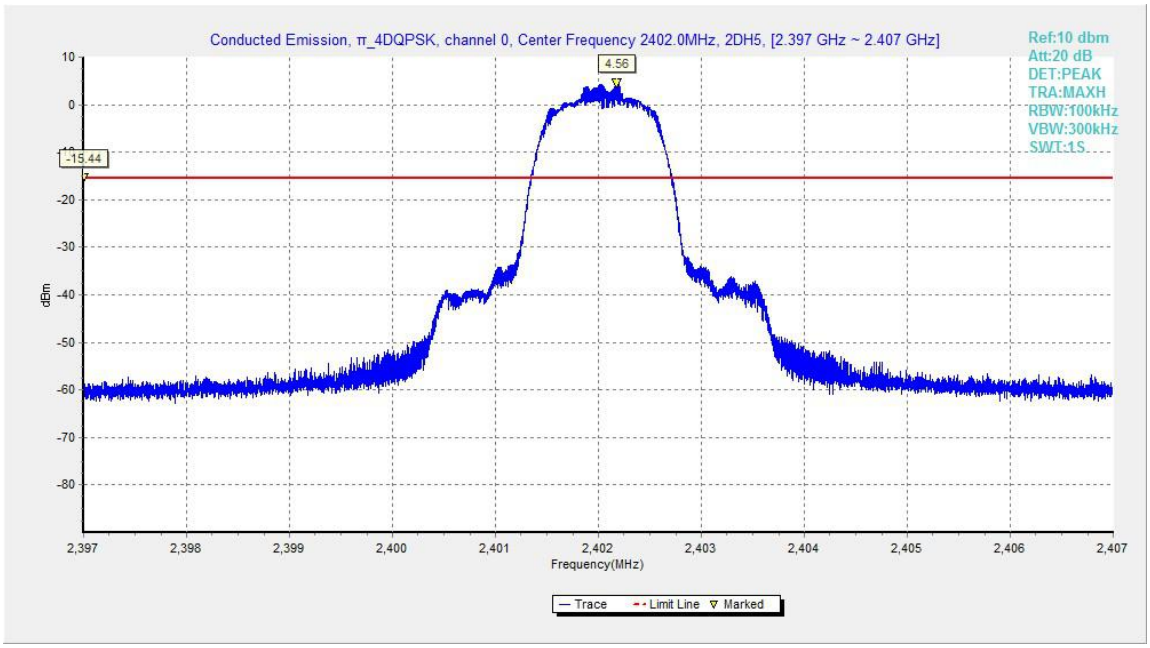


Fig.28. Conducted spurious emission: π/4 DQPSK, Channel 0,2402MHz

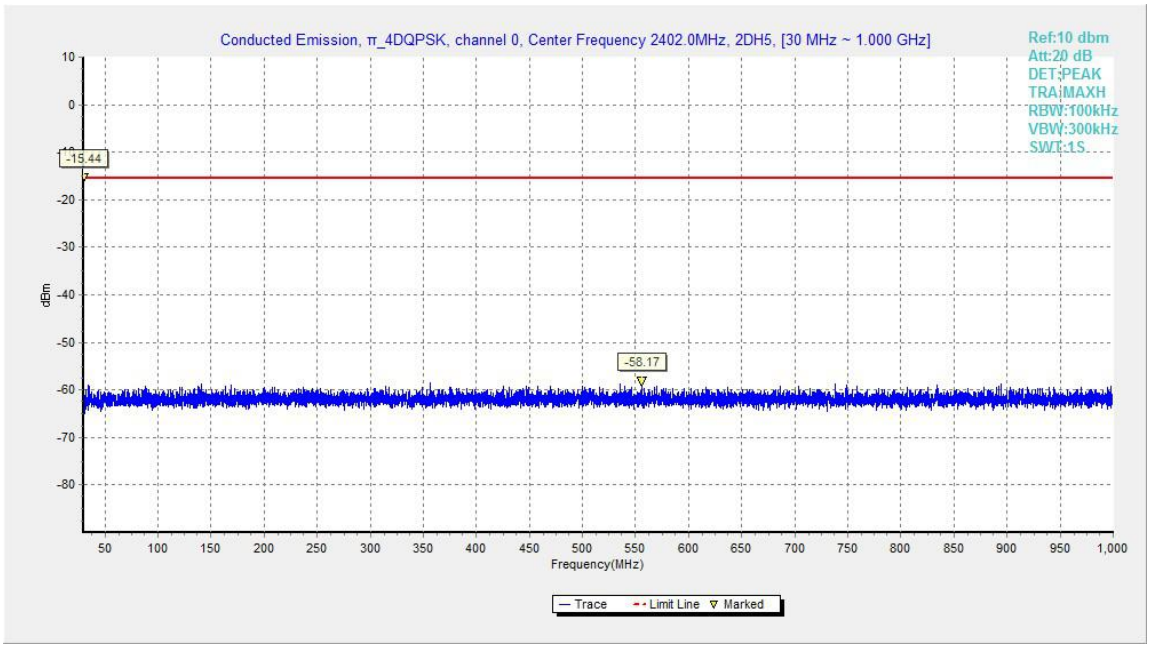


Fig.29. Conducted spurious emission: π/4 DQPSK, Channel 0, 30MHz - 1GHz

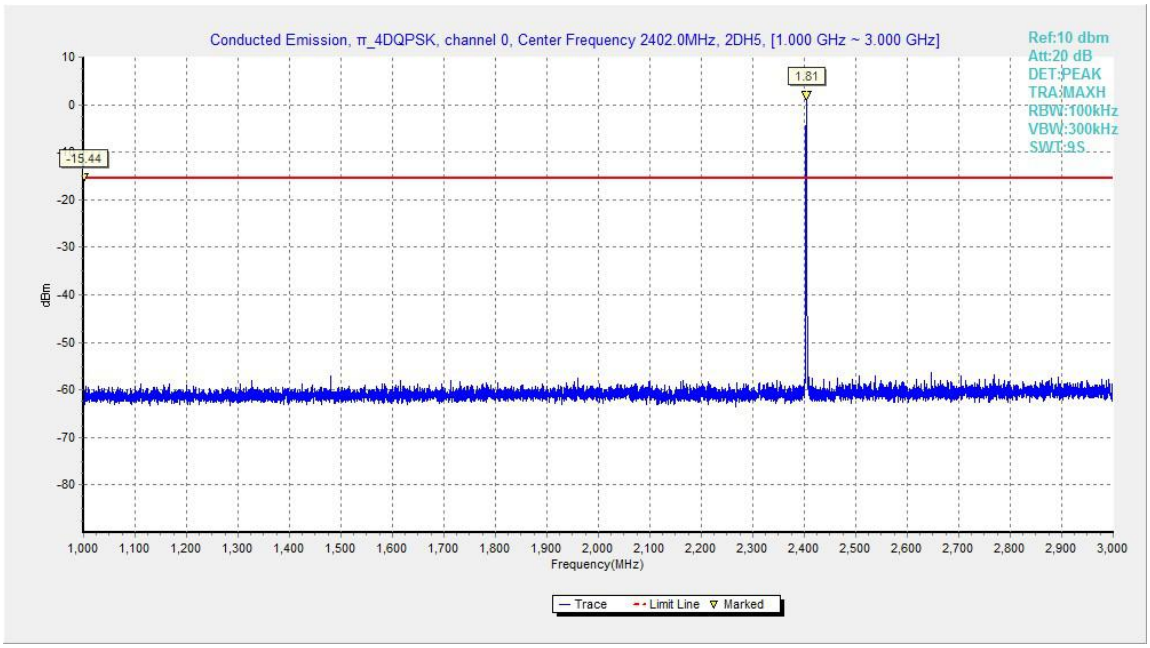


Fig.30. Conducted spurious emission: π/4 DQPSK, Channel 0, 1GHz - 3GHz

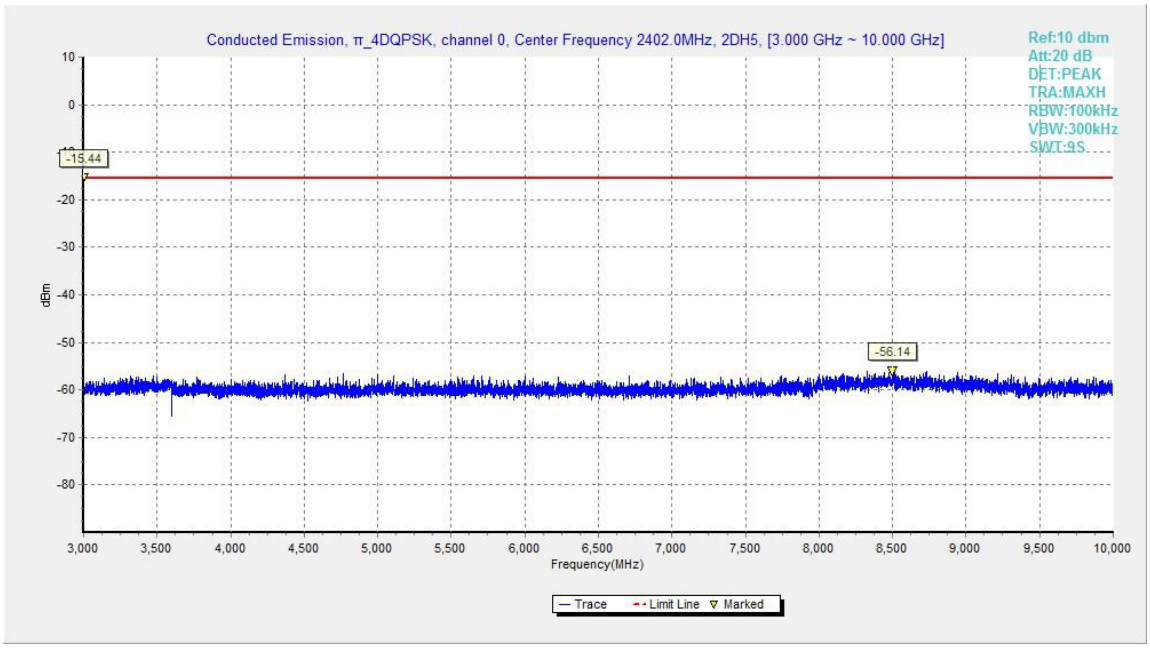


Fig.31. Conducted spurious emission: π/4 DQPSK, Channel 0, 3GHz - 10GHz

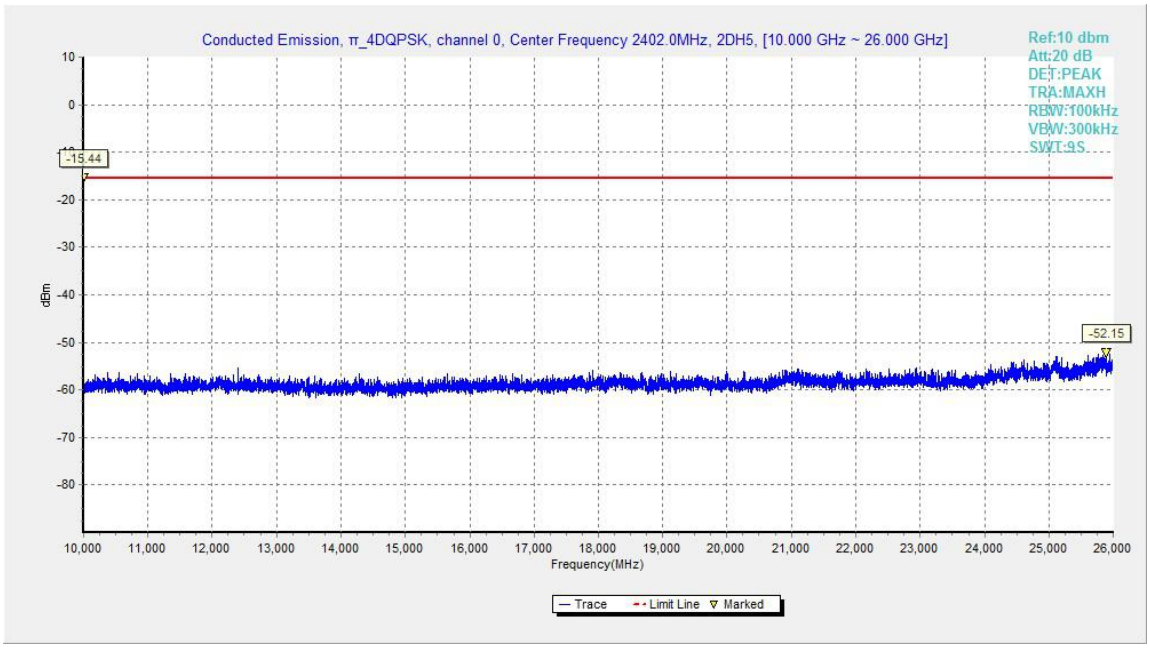


Fig.32. Conducted spurious emission: π/4 DQPSK, Channel 0,10GHz - 26GHz

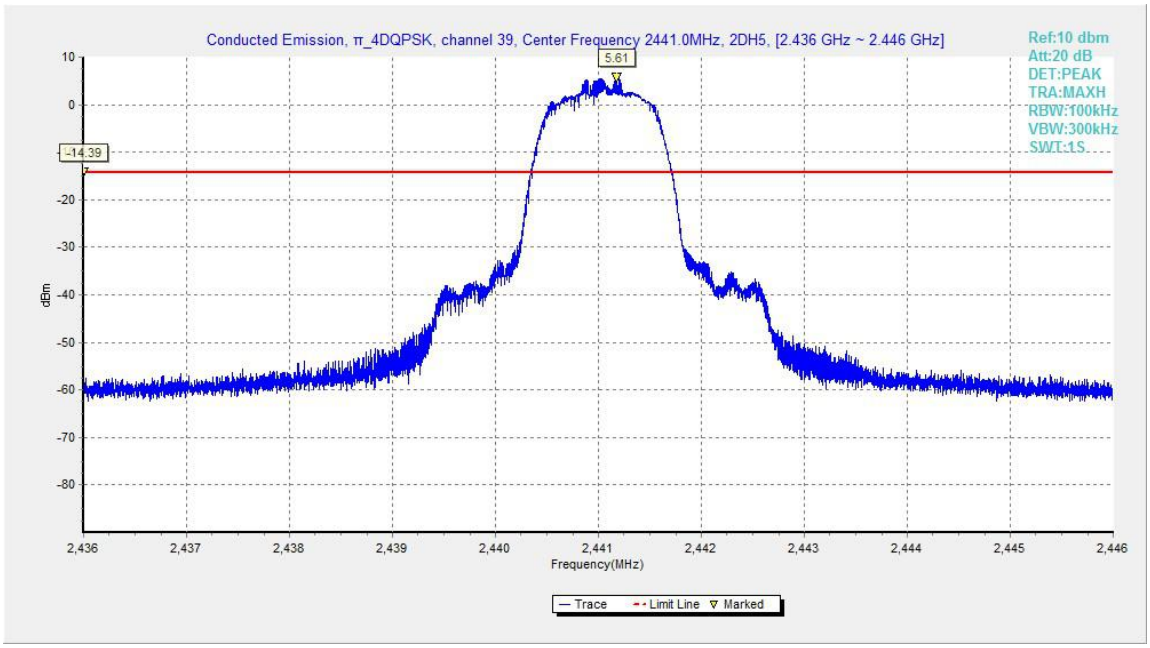


Fig.33. Conducted spurious emission: π/4 DQPSK, Channel 39, 2441MHz

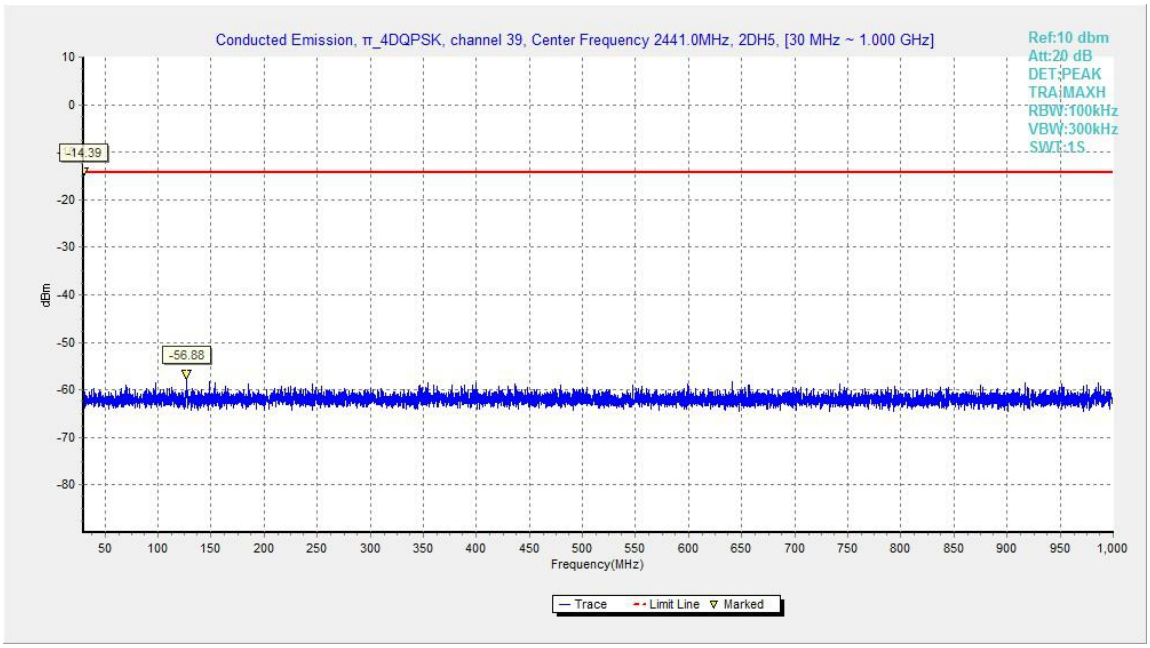


Fig.34. Conducted spurious emission: π/4 DQPSK, Channel 39, 30MHz - 1GHz

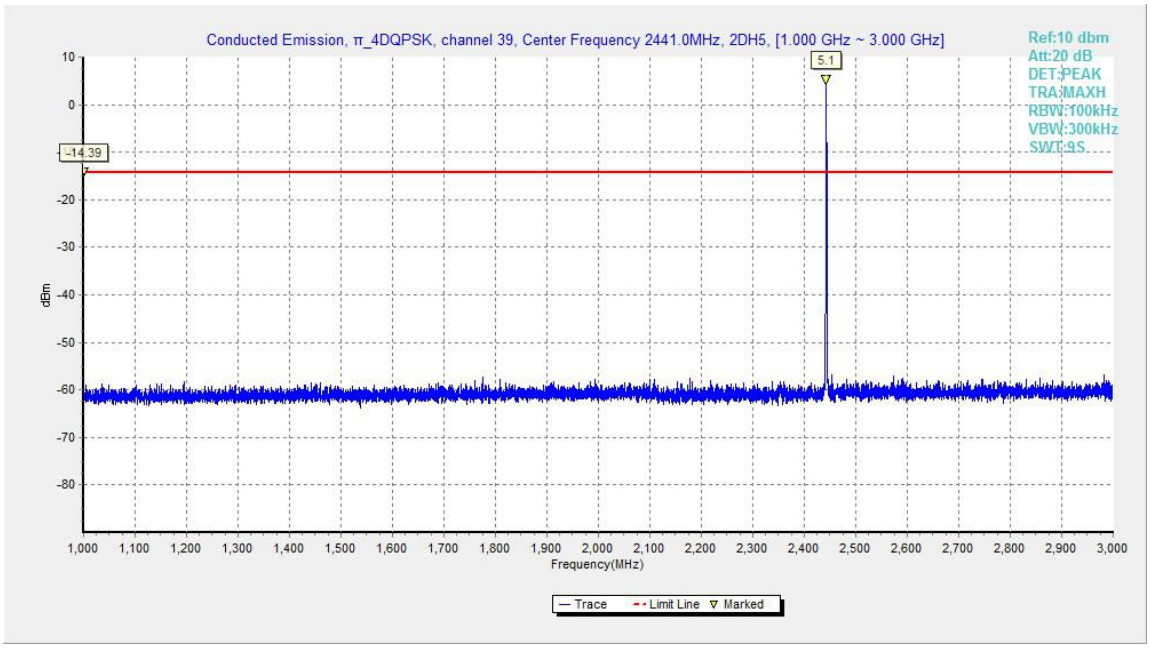


Fig.35. Conducted spurious emission: π/4 DQPSK, Channel 39, 1GHz - 3GHz

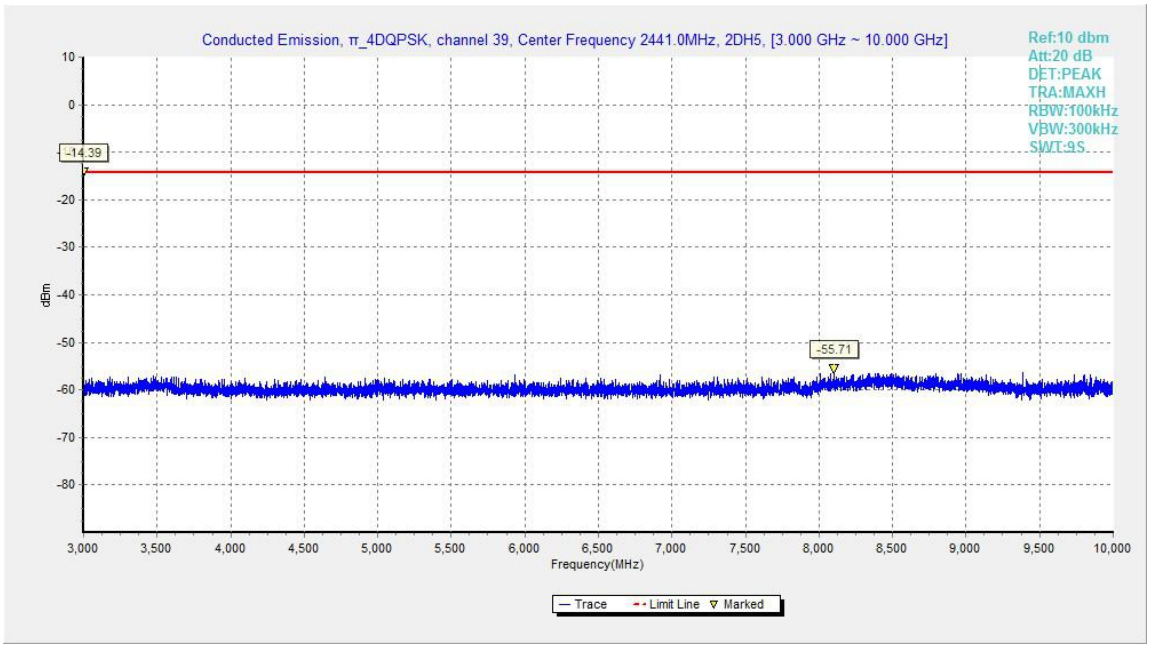


Fig.36. Conducted spurious emission: π/4 DQPSK, Channel 39, 3GHz - 10GHz

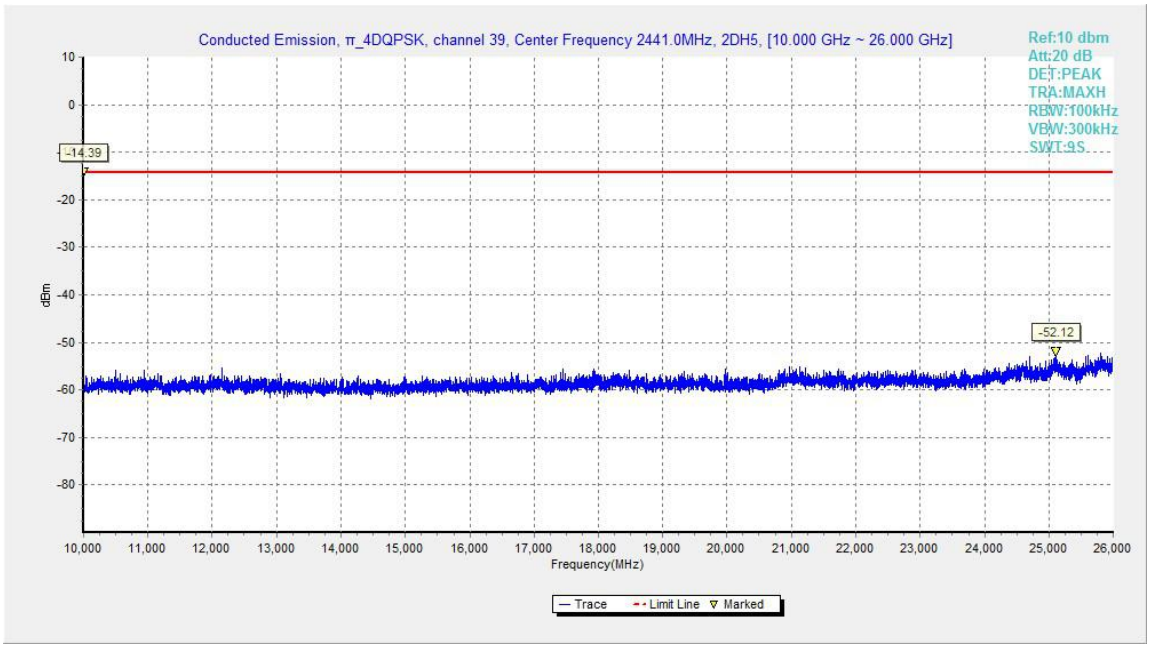


Fig.37. Conducted spurious emission: π/4 DQPSK, Channel 39, 10GHz – 26GHz

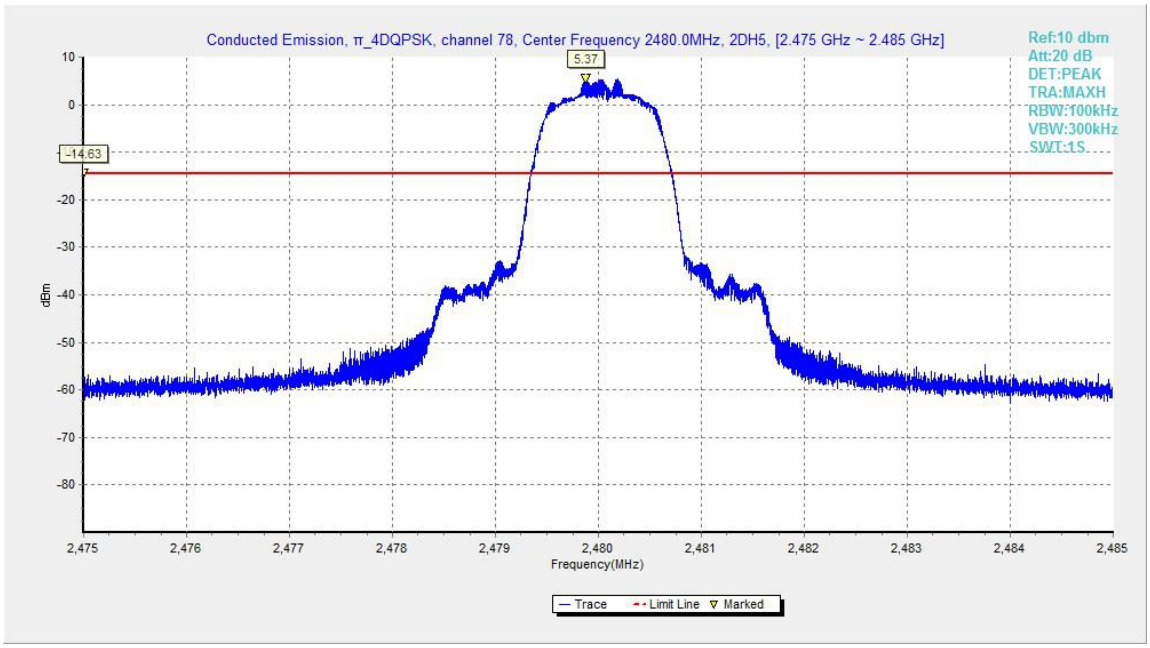


Fig.38. Conducted spurious emission: π/4 DQPSK, Channel 78, 2480MHz

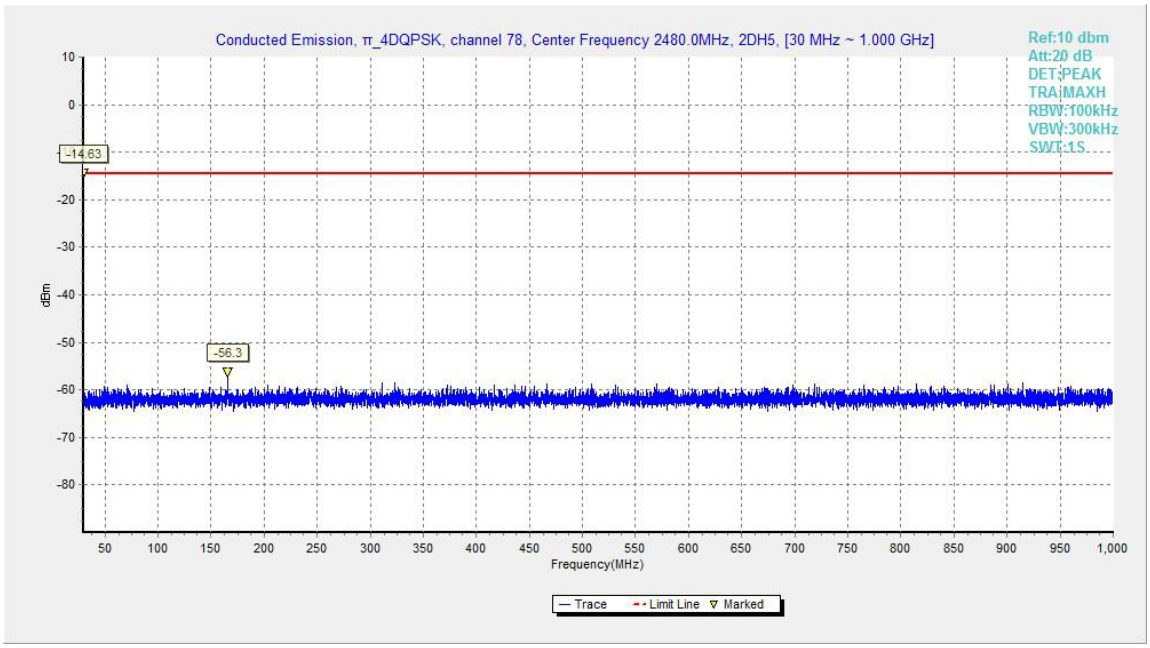


Fig.39. Conducted spurious emission: π/4 DQPSK, Channel 78, 30MHz - 1GHz

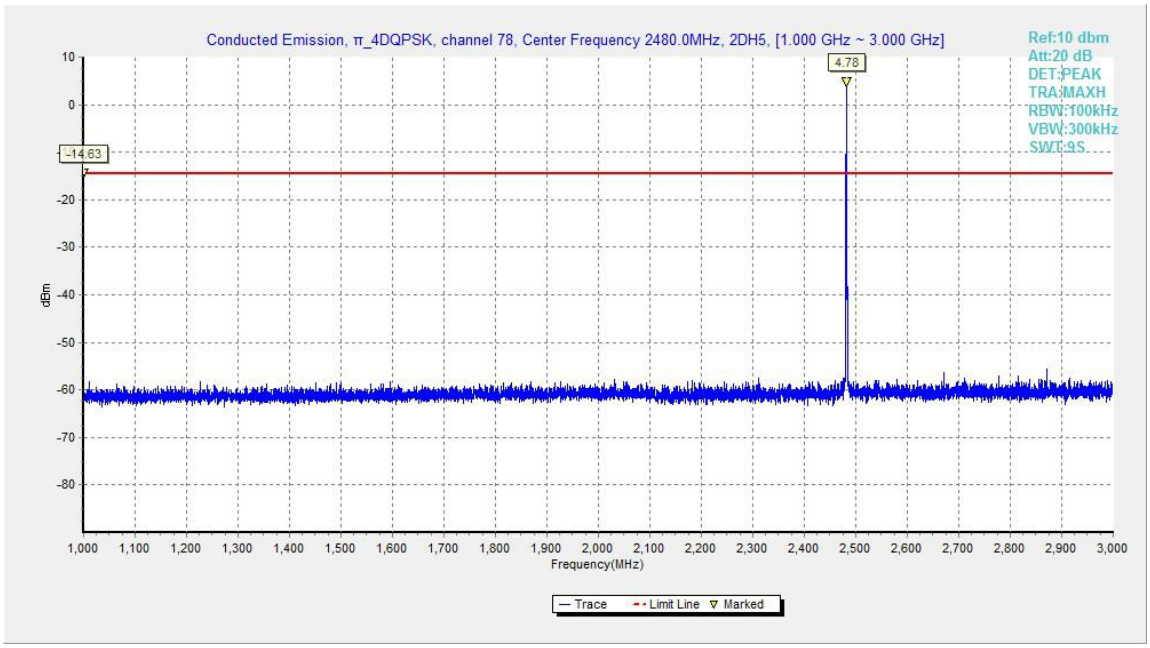


Fig.40. Conducted spurious emission: π/4 DQPSK, Channel 78, 1GHz - 3GHz

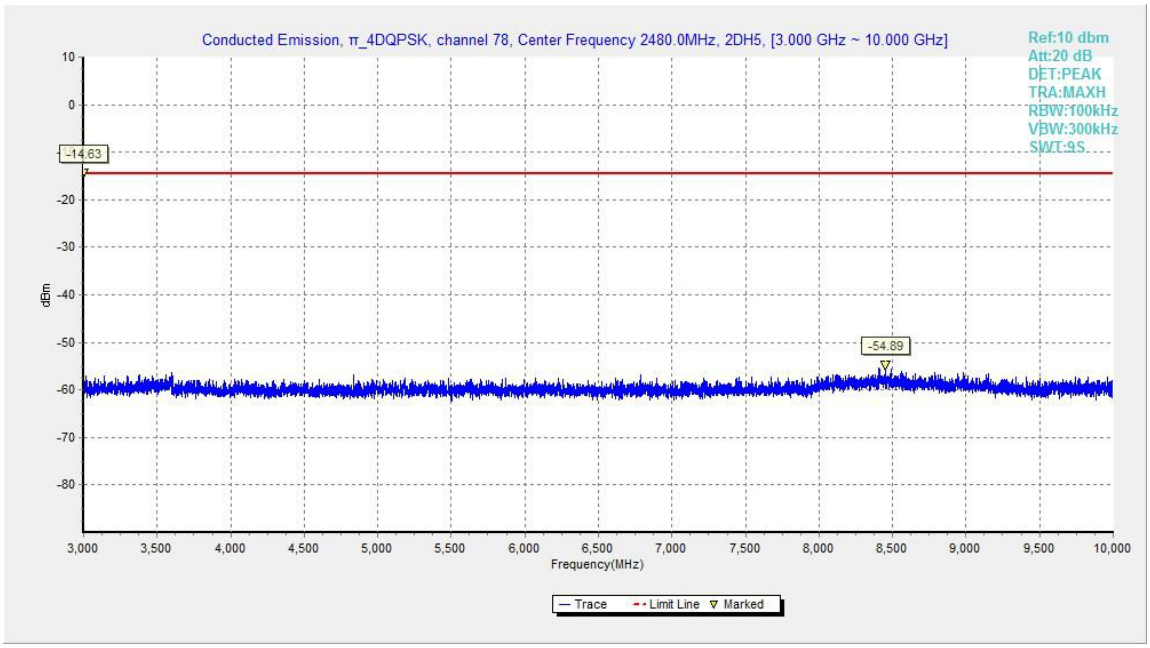


Fig.41. Conducted spurious emission: π/4 DQPSK, Channel 78, 3GHz - 10GHz

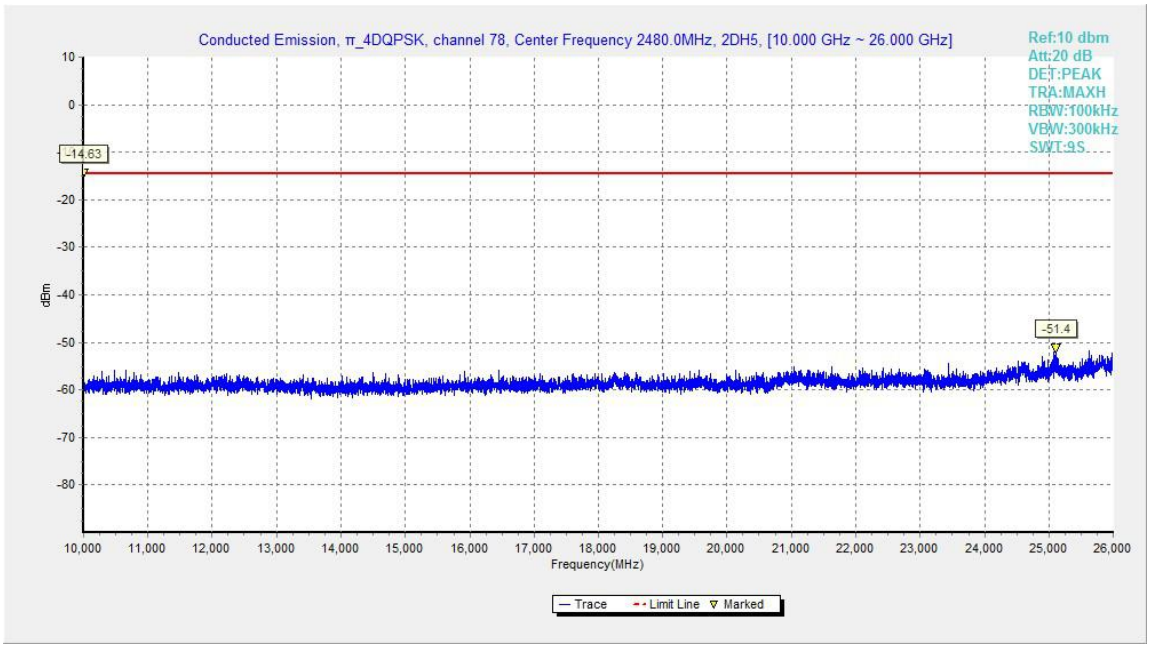


Fig.42. Conducted spurious emission: π/4 DQPSK, Channel 78, 10GHz - 26GHz

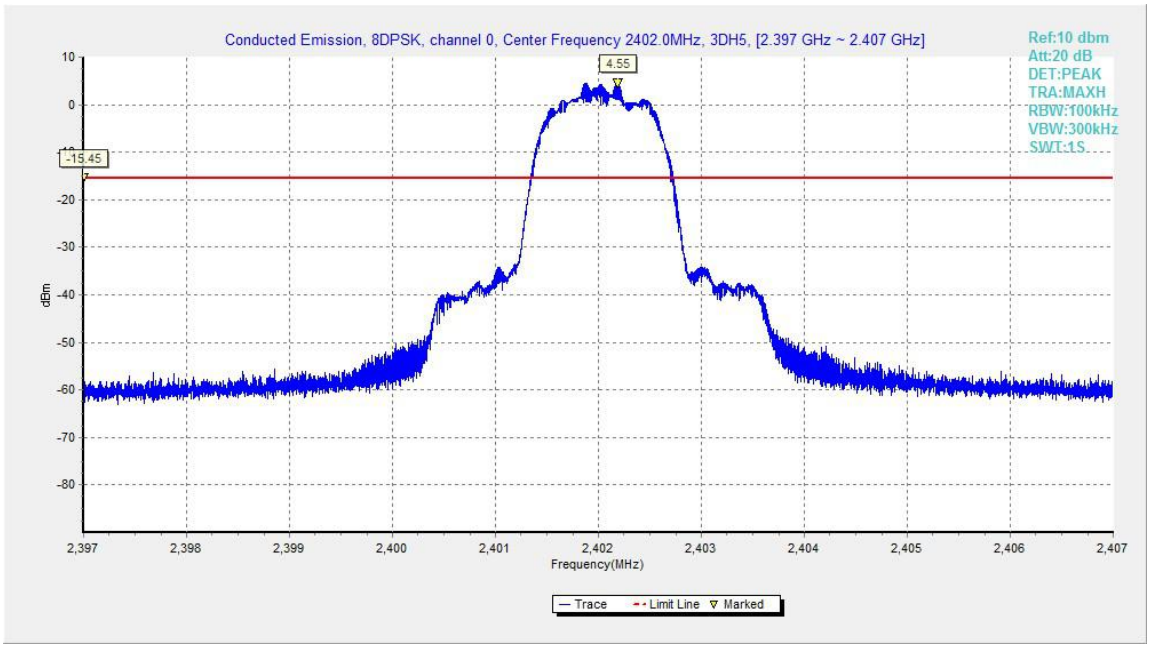


Fig.43. Conducted spurious emission: 8DPSK, Channel 0,2402MHz

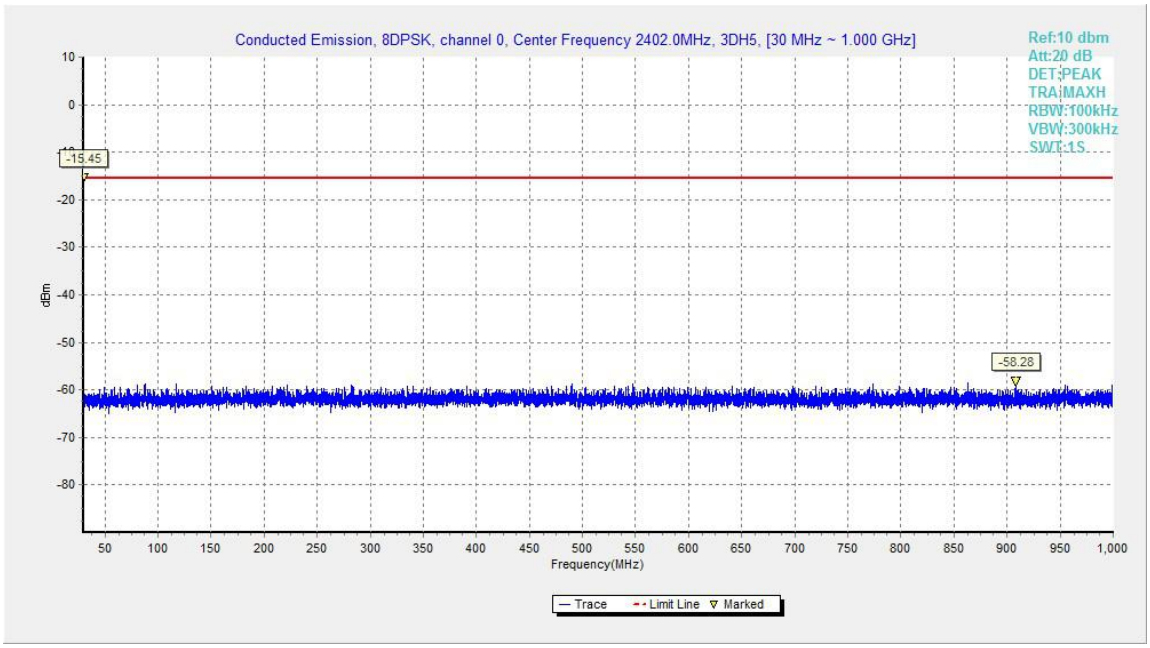


Fig.44. Conducted spurious emission: 8DPSK, Channel 0, 30MHz - 1GHz

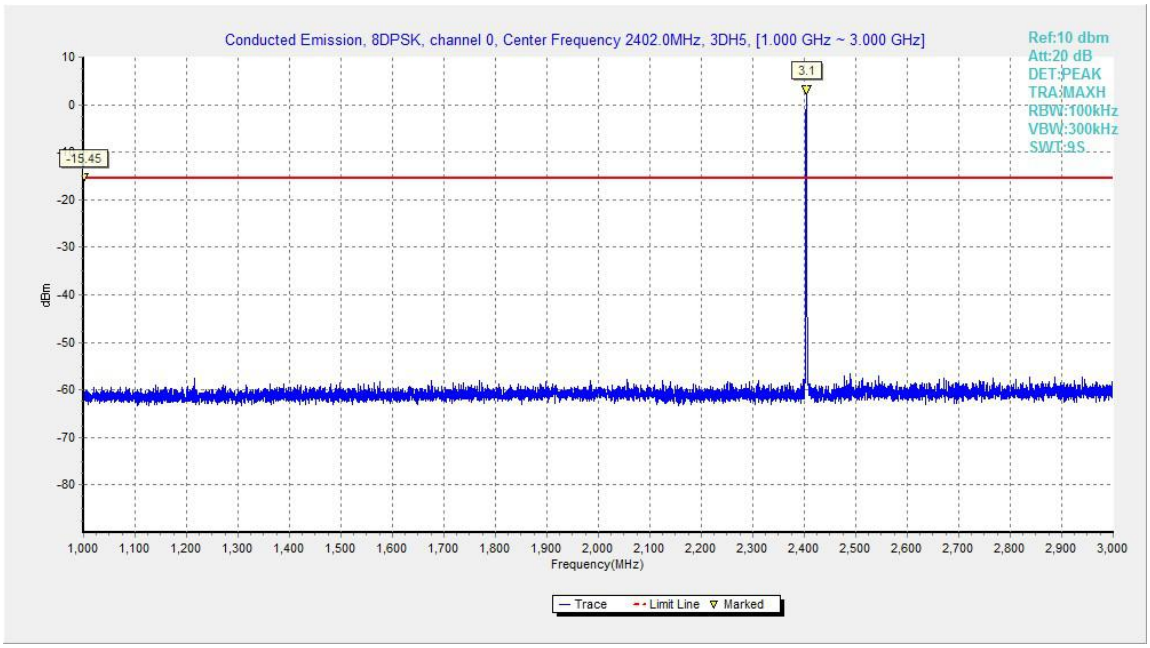


Fig.45. Conducted spurious emission: 8DPSK, Channel 0, 1GHz - 3GHz

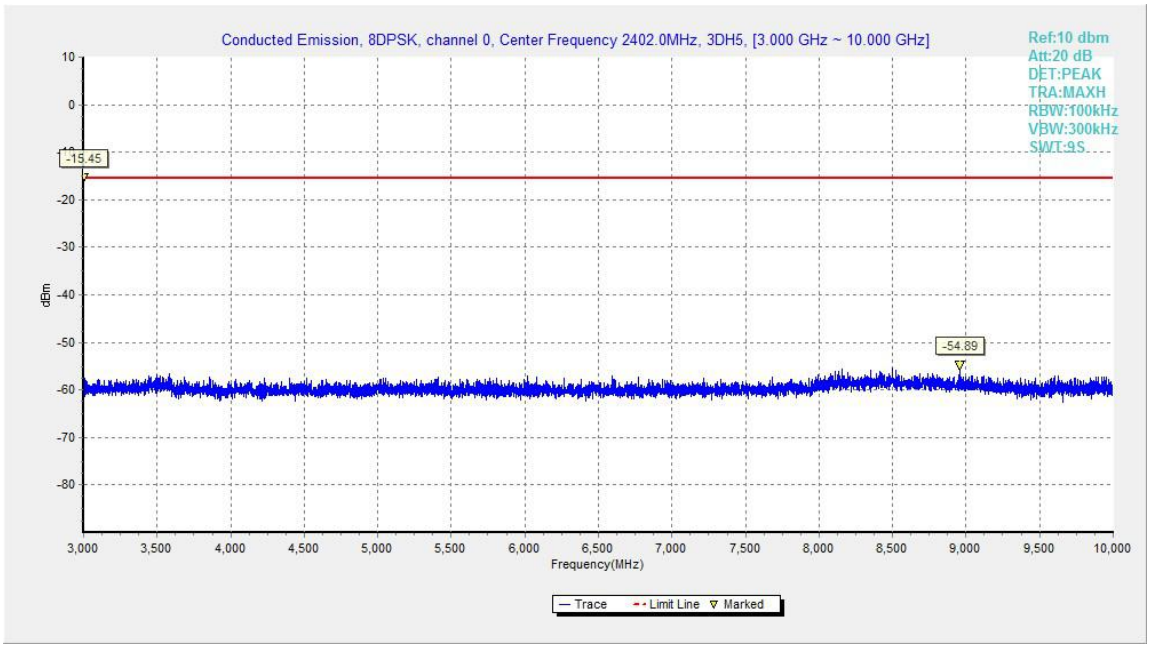


Fig.46. Conducted spurious emission: 8DPSK, Channel 0, 3GHz - 10GHz

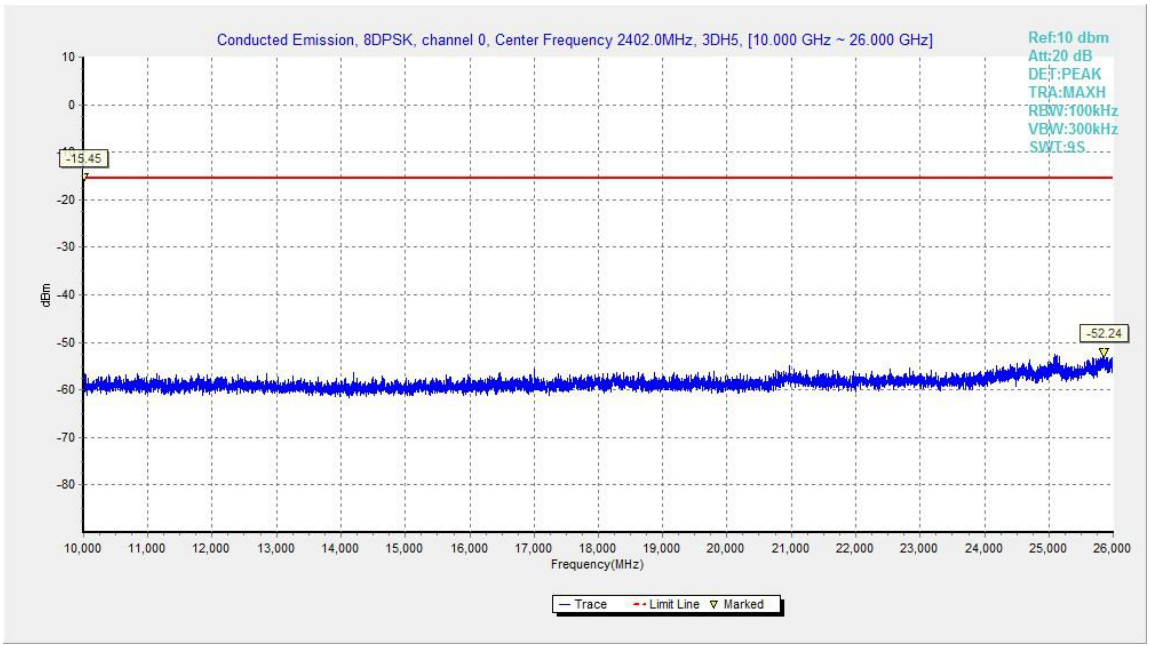


Fig.47. Conducted spurious emission: 8DPSK, Channel 0,10GHz - 26GHz

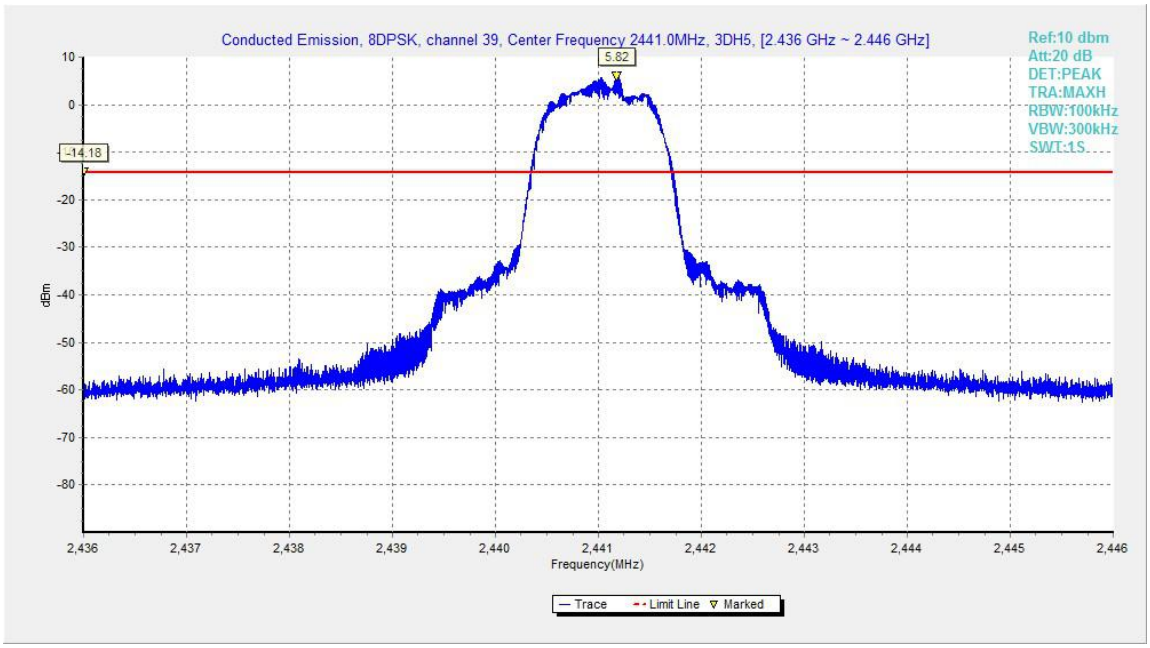


Fig.48. Conducted spurious emission: 8DPSK, Channel 39, 2441MHz

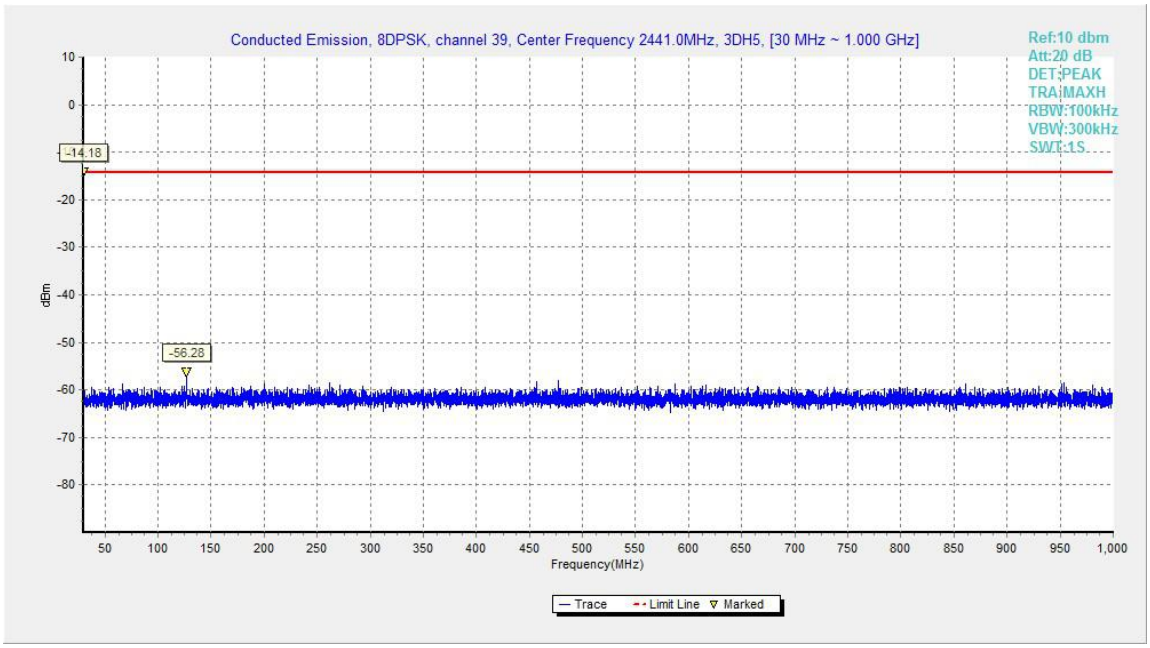


Fig.49. Conducted spurious emission: 8DPSK, Channel 39, 30MHz - 1GHz

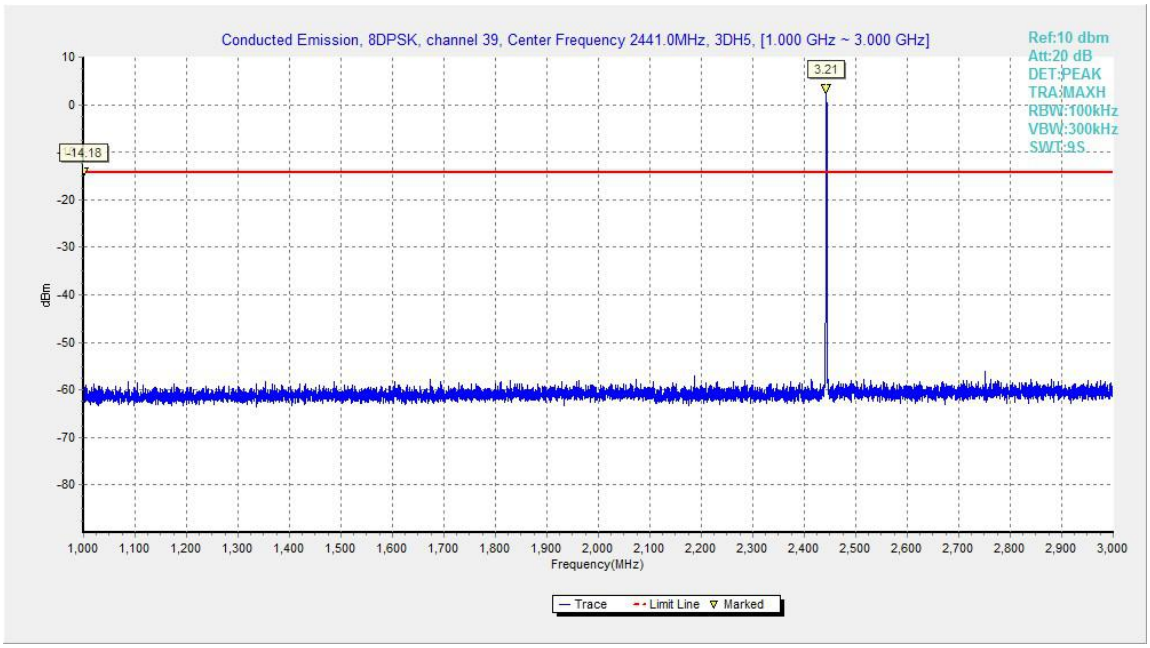


Fig.50. Conducted spurious emission: 8DPSK, Channel 39, 1GHz - 3GHz

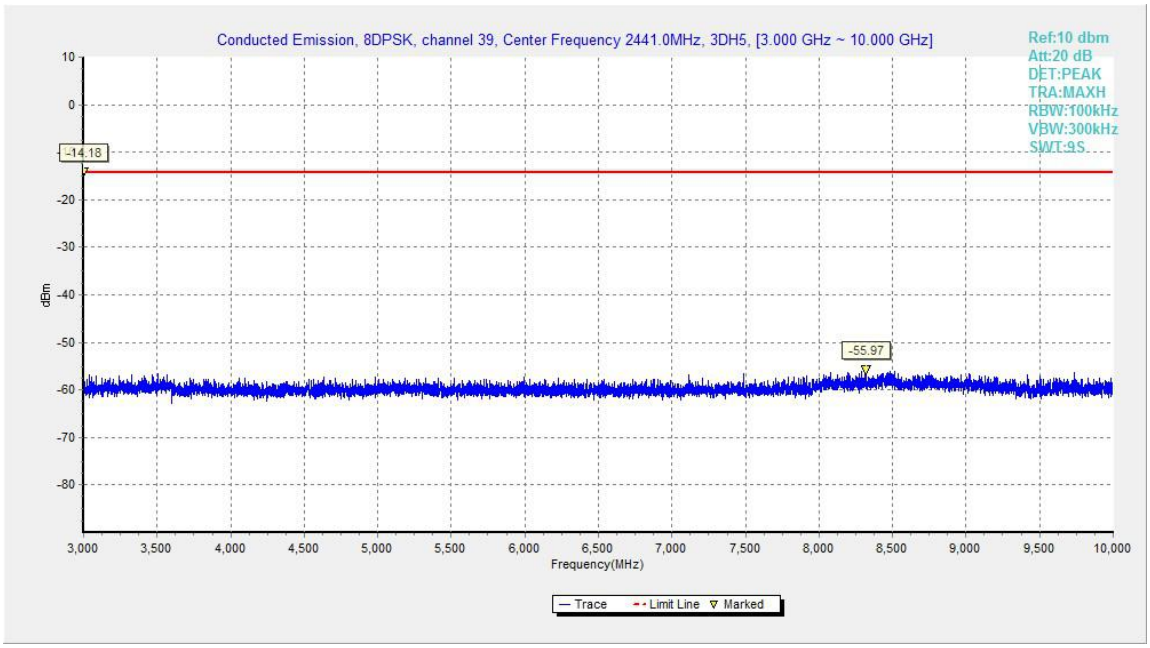


Fig.51. Conducted spurious emission: 8DPSK, Channel 39, 3GHz - 10GHz

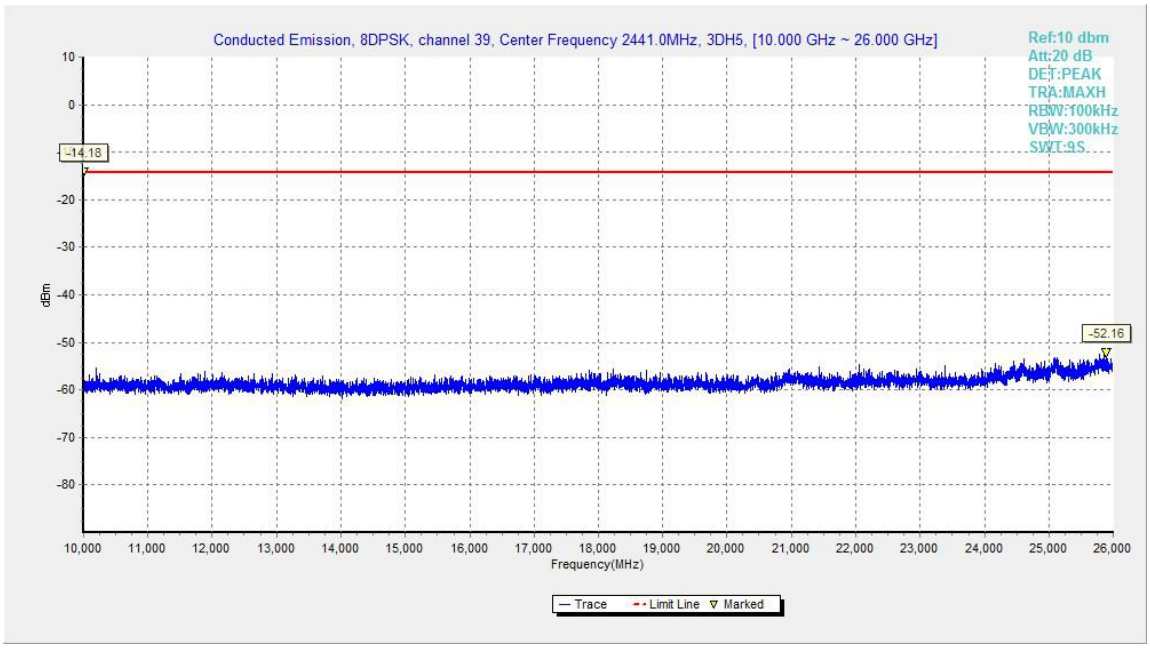


Fig.52. Conducted spurious emission: 8DPSK, Channel 39, 10GHz – 26GHz

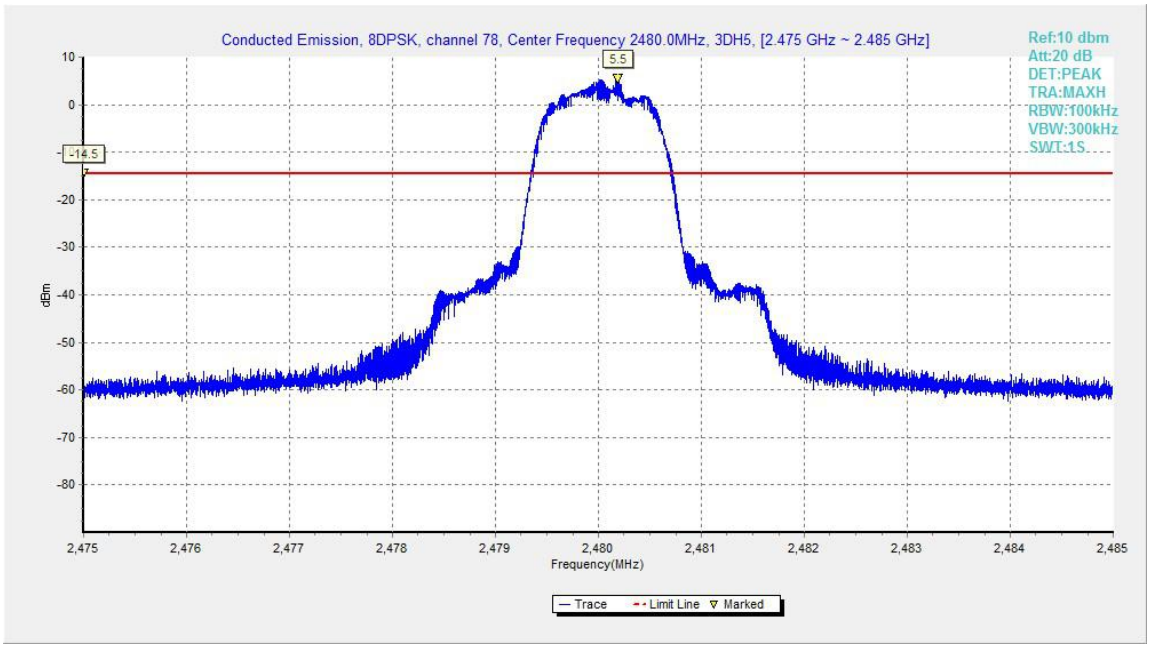


Fig.53. Conducted spurious emission: 8DPSK, Channel 78, 2480MHz

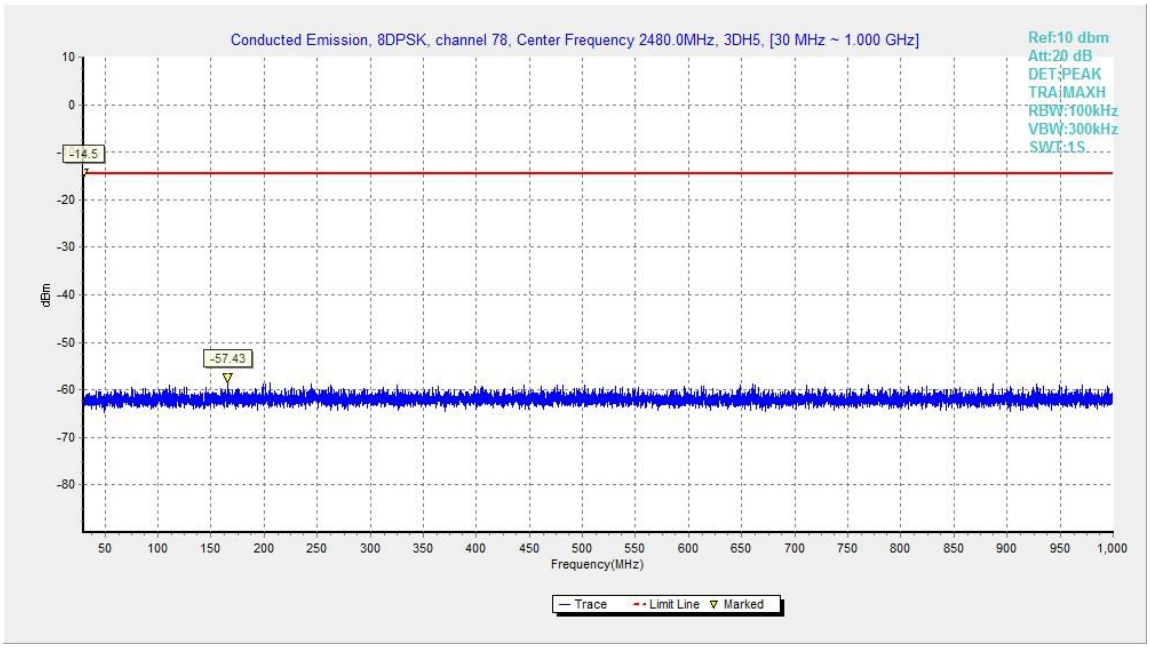


Fig.54. Conducted spurious emission: 8DPSK, Channel 78, 30MHz - 1GHz

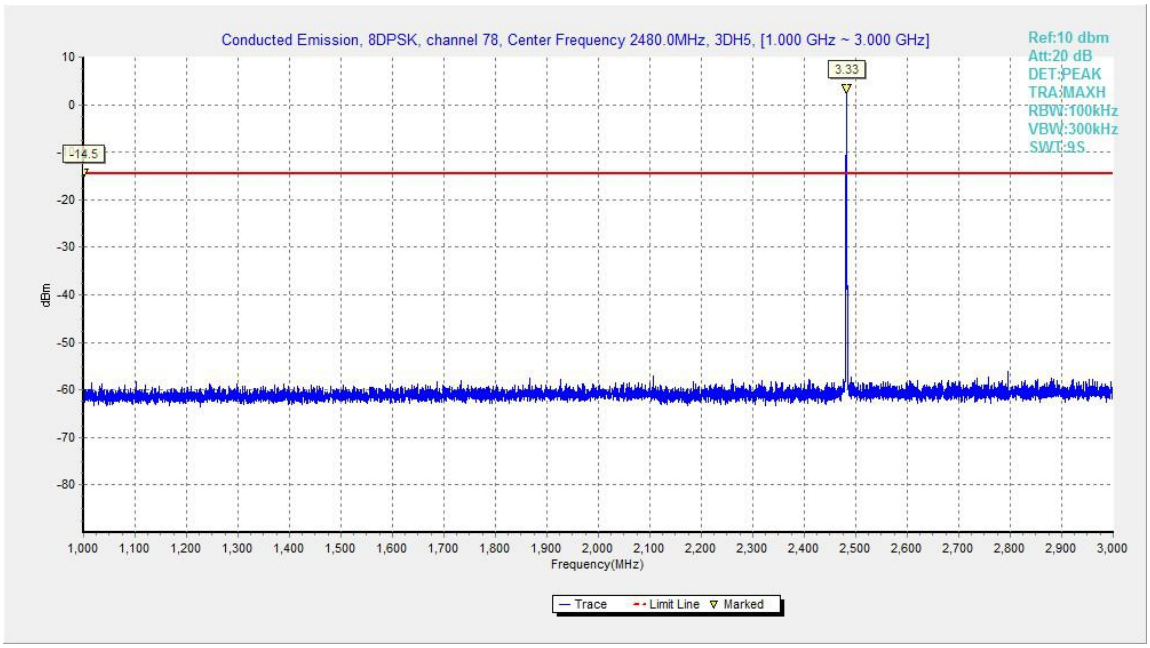


Fig.55. Conducted spurious emission: 8DPSK, Channel 78, 1GHz - 3GHz

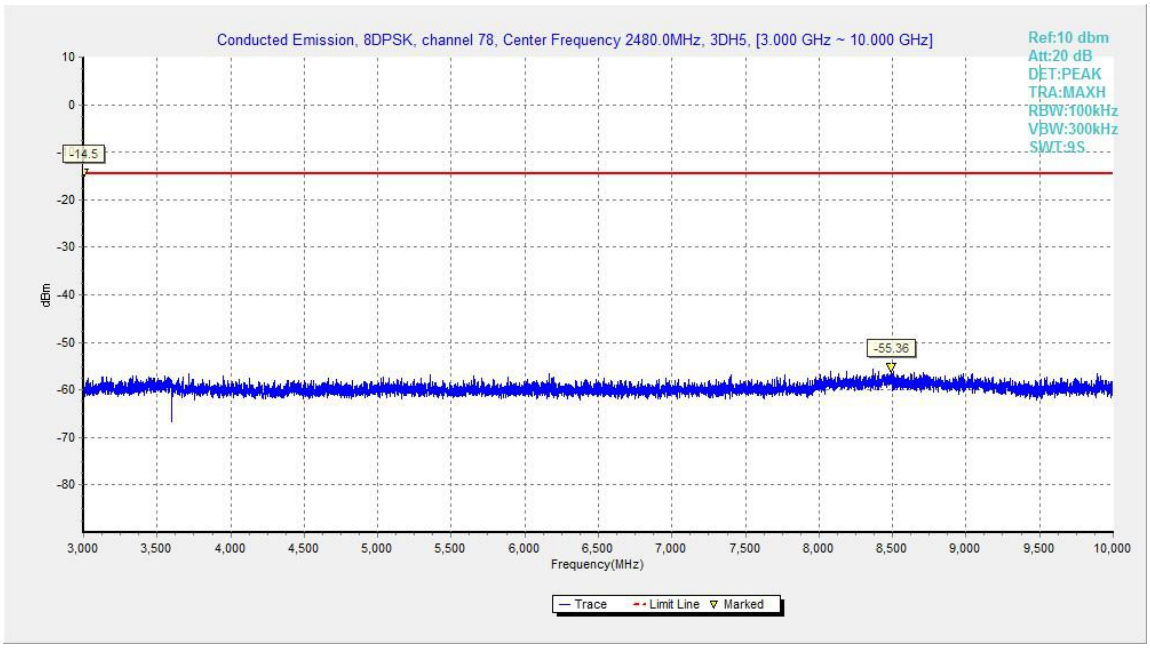


Fig.56. Conducted spurious emission: 8DPSK, Channel 78, 3GHz - 10GHz

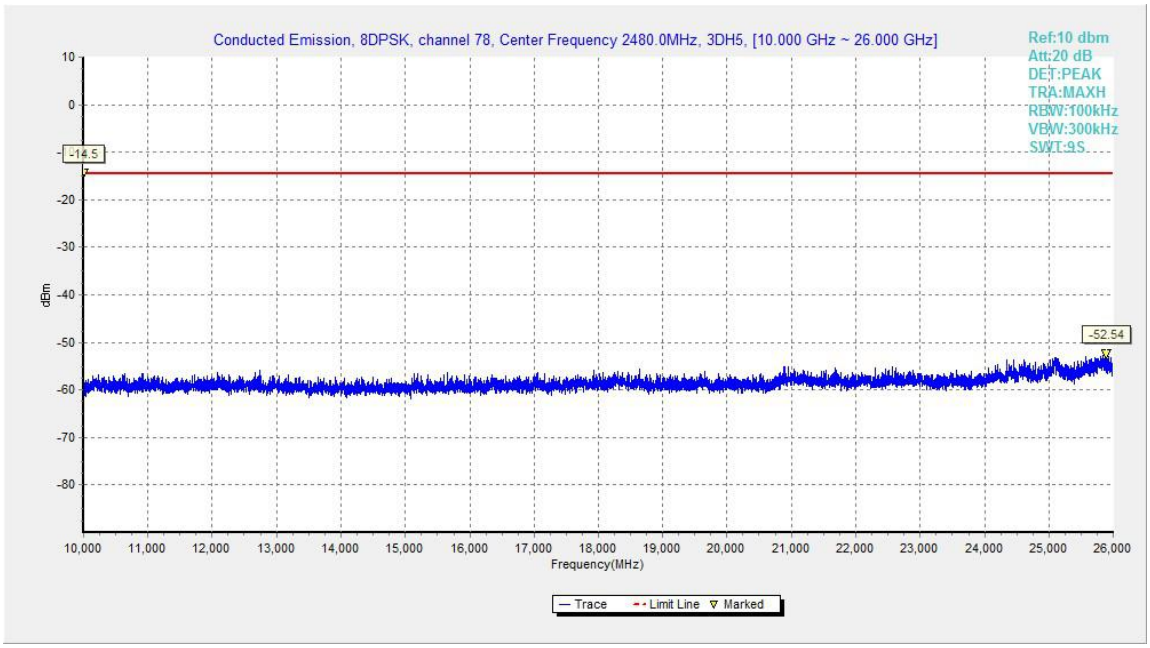


Fig.57. Conducted spurious emission: 8DPSK, Channel 78, 10GHz - 26GHz

A.5. Transmitter Spurious Emission - Radiated

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)).

The measurement is made according to ANSI C63.10

Limit in restricted band:

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

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	100KHz/300KHz	5
1000-4000	1MHz/3MHz	15
4000-18000	1MHz/3MHz	40
18000-26500	1MHz/3MHz	20

Measurement Results for Set.11:

Result=P_{Mea}+ARPL

For GFSK

Channel	Frequency Range	Test Results	Conclusion
Power	2.31GHz~2.43GHz---L	Fig.58	P
Power	2.45GHz~2.50GHz---H	Fig.59	P

Forπ/4 DQPSK

Channel	Frequency Range	Test Results	Conclusion
Power	2.31GHz~2.43GHz---L	Fig.60	P
Power	2.45GHz~2.50GHz---H	Fig.61	P

For 8DPSK

Channel	Frequency Range	Test Results	Conclusion
Power	2.31GHz~2.43GHz---L	Fig.62	P
Power	2.45GHz~2.50GHz---H	Fig.63	P

GFSK Ch 0 - Average

Frequency (MHz)	Measurement Result (dBµV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBµV)	Antenna Pol. (H/V)
17976.0	36.5	-25.5	43.4	18.6	V
17961.0	36.4	-25.5	43.4	18.5	V
17992.5	36.4	-25.5	43.4	18.5	V
17892.0	36.3	-25.5	43.4	18.4	V
17902.5	36.3	-25.5	43.4	18.4	V
2381.7	39.6	-14.2	27.2	26.6	V

GFSK Ch 39 - Average

Frequency (MHz)	Measurement Result (dBµV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBµV)	Antenna Pol. (H/V)
17970.0	36.2	-25.5	43.4	18.3	H
17979.0	36.2	-25.5	43.4	18.3	V
17965.5	36.1	-25.5	43.4	18.2	H
17995.5	36.1	-25.5	43.4	18.2	H
17886.0	36.0	-25.5	43.4	18.1	H
17890.5	36.0	-25.5	43.4	18.1	V

GFSK Ch 78 - Average

Frequency (MHz)	Measurement Result (dBµV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBµV)	Antenna Pol. (H/V)
17956.5	36.5	-25.5	43.4	18.6	V
17994.0	36.5	-25.5	43.4	18.6	V
17776.5	36.4	-25.5	43.4	18.5	V
17872.5	36.4	-25.5	43.4	18.5	V
17979.0	36.4	-25.5	43.4	18.5	V
2485.6	39.5	-14.2	27.2	26.5	V

π/4 DQPSK Ch 0 - Average

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Antenna Pol. (H/V)
17991.0	36.8	-25.5	43.4	18.9	V
17889.0	36.7	-25.5	43.4	18.8	V
17982.0	36.7	-25.5	43.4	18.8	V
17986.5	36.7	-25.5	43.4	18.8	V
17898.0	36.6	-25.5	43.4	18.7	V
2383.0	39.5	-14.2	27.2	26.5	H

π/4 DQPSK Ch 39 - Average

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Antenna Pol. (H/V)
17889.0	36.6	-25.5	43.4	18.7	V
17910.0	36.6	-25.5	43.4	18.7	V
17959.5	36.6	-25.5	43.4	18.7	V
17970.0	36.6	-25.5	43.4	18.7	H
17983.5	36.6	-25.5	43.4	18.7	V
17989.5	36.6	-25.5	43.4	18.7	V

π/4 DQPSK Ch 78 - Average

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Antenna Pol. (H/V)
17962.5	36.6	-25.5	43.4	18.7	V
17992.5	36.6	-25.5	43.4	18.7	V
17797.5	36.5	-25.5	43.4	18.6	V
17893.5	36.5	-25.5	43.4	18.6	V
17904.0	36.5	-25.5	43.4	18.6	V
2486.2	39.8	-14.2	27.2	26.8	V

8DPSK Ch 0 - Average

Frequency (MHz)	Measurement Result (dBµV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBµV)	Antenna Pol. (H/V)
17898.0	36.7	-25.5	43.4	18.8	V
17986.5	36.7	-25.5	43.4	18.8	V
17994.0	36.7	-25.5	43.4	18.8	V
17809.5	36.6	-25.5	43.4	18.7	H
17812.5	36.6	-25.5	43.4	18.7	V
2381.4	39.6	-14.2	27.2	26.6	V

8DPSK Ch 39 - Average

Frequency (MHz)	Measurement Result (dBµV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBµV)	Antenna Pol. (H/V)
17994.0	36.9	-25.5	43.4	19.0	V
17988.0	36.8	-25.5	43.4	18.9	V
17992.5	36.8	-25.5	43.4	18.9	V
17893.5	36.7	-25.5	43.4	18.8	V
17976.0	36.7	-25.5	43.4	18.8	V
17995.5	36.7	-25.5	43.4	18.8	V

8DPSK Ch 78 - Average

Frequency (MHz)	Measurement Result (dBµV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBµV)	Antenna Pol. (H/V)
17985.0	36.7	-25.5	43.4	18.8	V
17989.5	36.7	-25.5	43.4	18.8	V
17991.0	36.7	-25.5	43.4	18.8	V
17980.5	36.6	-25.5	43.4	18.7	V
17982.0	36.6	-25.5	43.4	18.7	V
2485.5	39.5	-14.2	27.2	26.5	H

GFSK Ch 0 – Peak

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Antenna Pol. (H/V)
17961.0	49.3	-25.5	43.4	31.4	V
17772.0	49.0	-25.5	43.4	31.1	V
17875.5	48.9	-25.5	43.4	31.0	V
17878.5	48.6	-25.5	43.4	30.7	V
17808.0	48.5	-25.5	43.4	30.6	H
2380.9	53.5	-14.2	27.2	40.5	H

GFSK Ch 39 - Peak

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Antenna Pol. (H/V)
17890.5	48.4	-25.5	43.4	30.5	V
17883.0	48.3	-25.5	43.4	30.4	V
17896.5	48.3	-25.5	43.4	30.4	V
17919.0	48.3	-25.5	43.4	30.4	V
17415.0	48.2	-26.9	43.4	31.7	H
17731.5	48.2	-25.7	43.4	30.5	H

GFSK Ch 78 - Peak

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Antenna Pol. (H/V)
17442.0	48.8	-26.9	43.4	32.3	V
17712.0	48.8	-25.7	43.4	31.1	V
17922.0	48.5	-25.5	43.4	30.6	V
17997.0	48.5	-25.5	43.4	30.6	H
17898.0	48.4	-25.5	43.4	30.5	V
2490.7	52.5	-14.2	27.2	39.5	V

π/4 DQPSK Ch 0 - Peak

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Antenna Pol. (H/V)
17889.0	50.4	-25.5	43.4	32.5	V
17955.0	49.4	-25.5	43.4	31.5	H
17791.5	49.1	-25.5	43.4	31.2	V
17824.5	48.9	-25.5	43.4	31.0	H
17965.5	48.9	-25.5	43.4	31.0	V
2383.4	52.7	-14.2	27.2	39.7	H

π/4 DQPSK Ch 39 - Peak

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Antenna Pol. (H/V)
17905.5	48.9	-25.5	43.4	31.0	H
17913.0	48.9	-25.5	43.4	31.0	H
17983.5	48.8	-25.5	43.4	30.9	V
17824.5	48.7	-25.5	43.4	30.8	V
17830.5	48.7	-25.5	43.4	30.8	V
17862.0	48.7	-25.5	43.4	30.8	V

π/4 DQPSK Ch 78 - Peak

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Antenna Pol. (H/V)
17901.0	48.6	-25.5	43.4	30.7	V
17604.0	48.5	-25.7	43.4	30.8	H
17868.0	48.5	-25.5	43.4	30.6	H
17460.0	48.4	-26.9	43.4	31.9	V
17647.5	48.4	-25.7	43.4	30.7	V
2499.1	52.8	-13.9	28.4	38.3	V

8DPSK Ch 0 - Peak

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Antenna Pol. (H/V)
17871.0	49.4	-25.5	43.4	31.5	H
17568.0	49.2	-25.7	43.4	31.5	V
17898.0	49.0	-25.5	43.4	31.1	V
17812.5	48.8	-25.5	43.4	30.9	V
17976.0	48.8	-25.5	43.4	30.9	V
2389.4	52.6	-14.2	27.2	39.6	H

8DPSK Ch 39 - Peak

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Antenna Pol. (H/V)
17733.0	49.4	-25.7	43.4	31.7	V
17643.0	49.2	-25.7	43.4	31.5	V
17811.0	49.1	-25.5	43.4	31.2	V
17832.0	49.0	-25.5	43.4	31.1	V
17895.0	48.9	-25.5	43.4	31.0	V
17608.5	48.8	-25.7	43.4	31.1	V

8DPSK Ch 78 - Peak

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Antenna Pol. (H/V)
17994.0	49.5	-25.5	43.4	31.6	H
17982.0	49.0	-25.5	43.4	31.1	V
17892.0	48.9	-25.5	43.4	31.0	H
17895.0	48.9	-25.5	43.4	31.0	V
17784.0	48.8	-25.5	43.4	30.9	V
2485.3	53.4	-14.2	27.2	40.4	H

Conclusion: PASS

Test graphs as below:

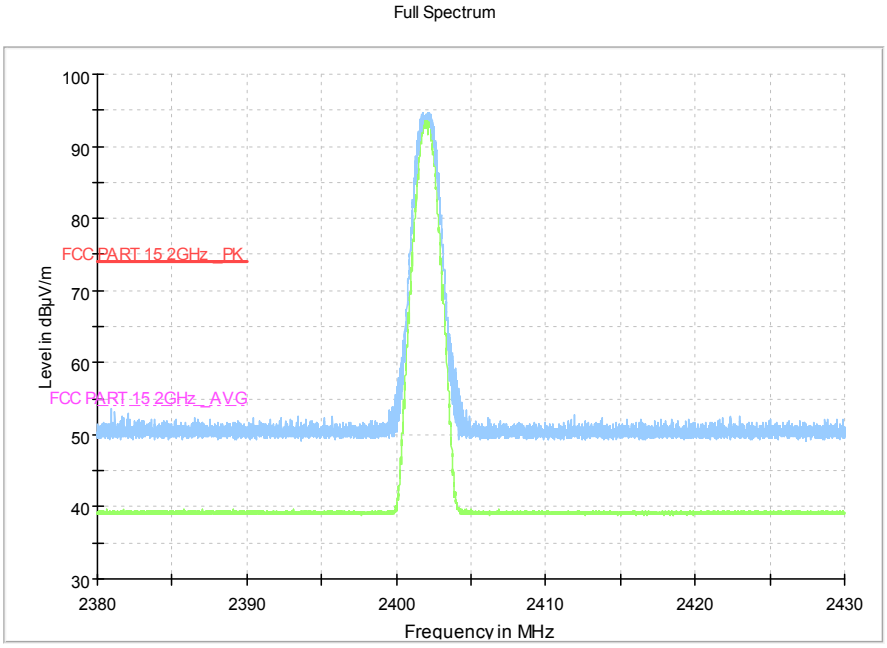


Fig.58. Radiated emission (Power): GFSK, low channel

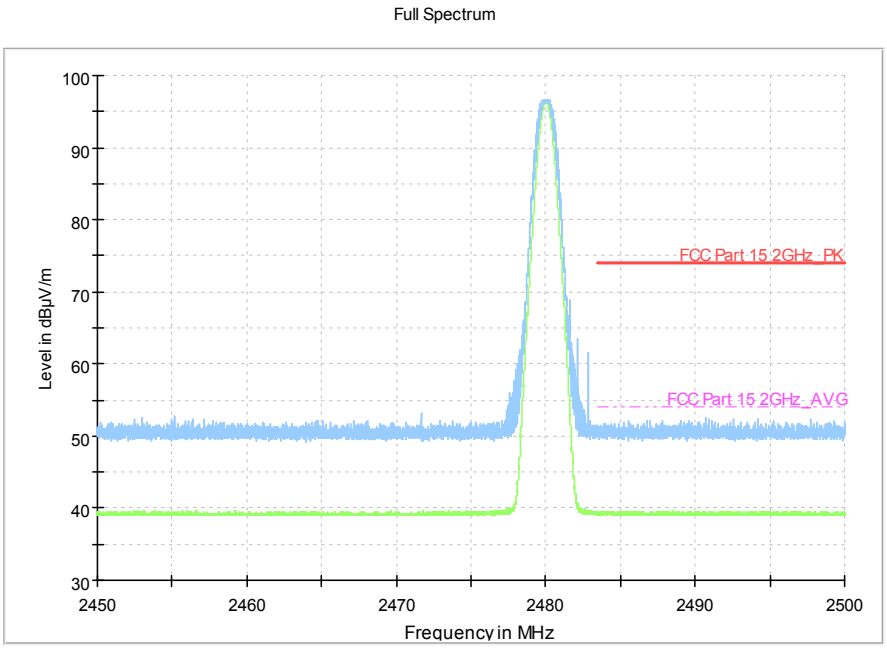


Fig.59. Radiated emission (Power) GFSK, high channel

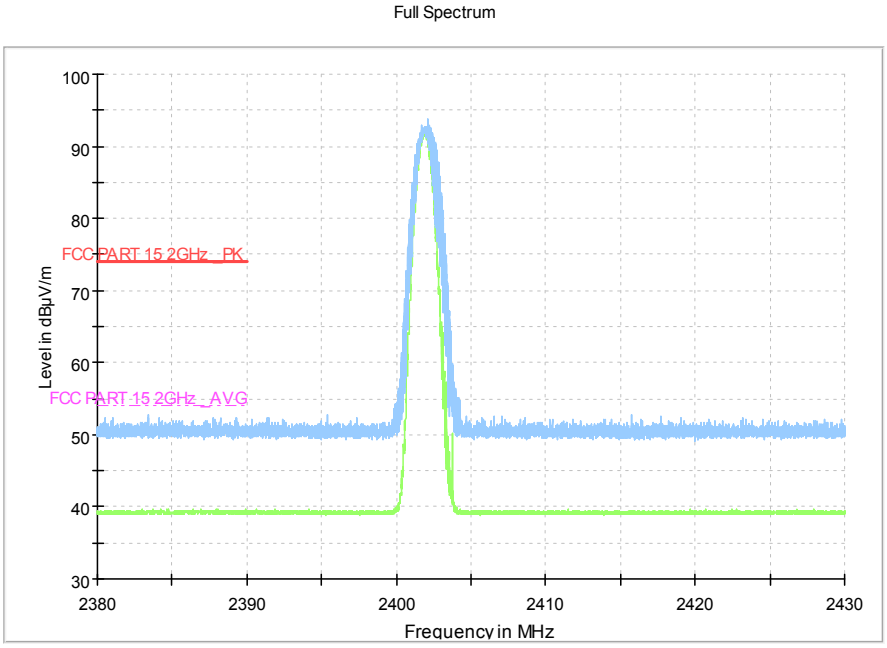


Fig.60. Radiated emission (Power): π/4 DQPSK, low channel

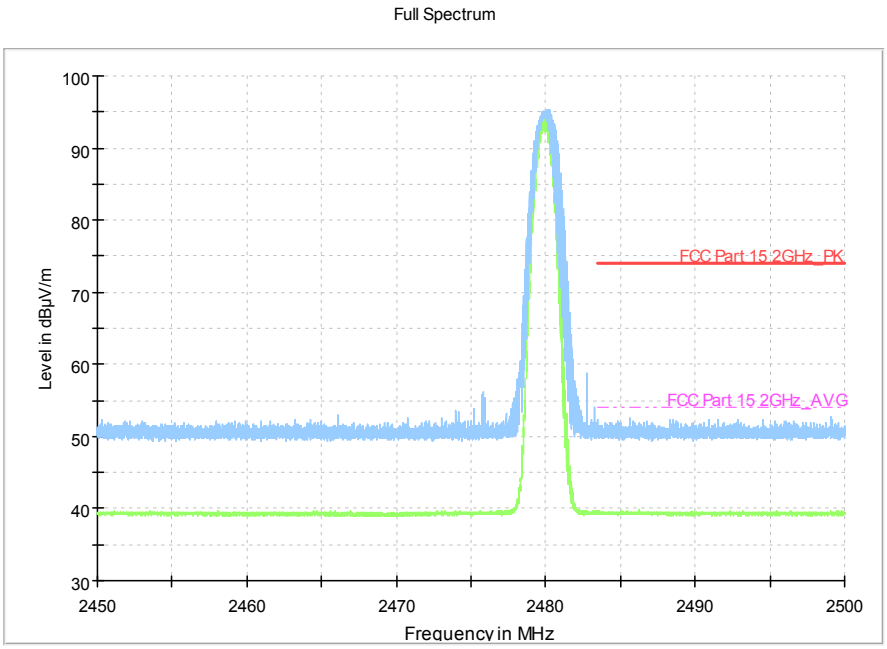


Fig.61. Radiated emission (Power): π/4 DQPSK, high channel

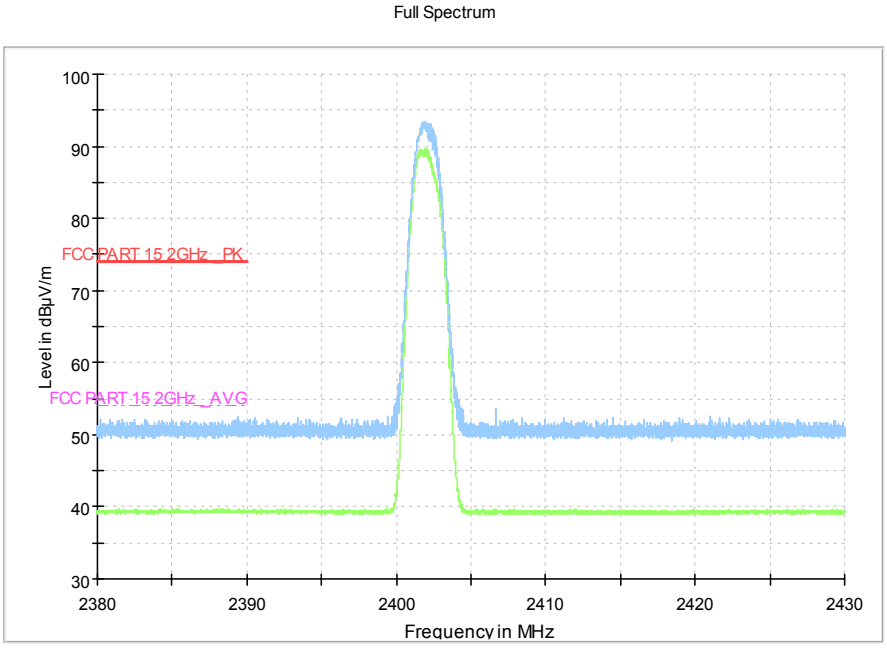


Fig.62. Radiated emission (Power): 8DPSK, low channel

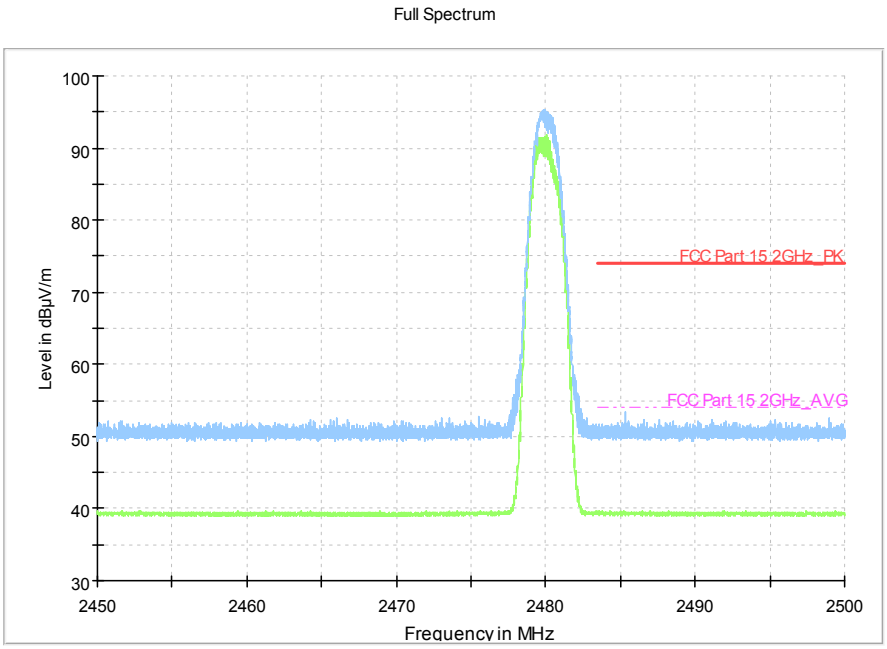


Fig.63. Radiated emission (Power): 8DPSK, high channel

A.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	321	121.98	P
	DH3	Fig.66	1.64	Fig.67	106	173.84	P
	DH5	Fig.68	2.89	Fig.69	62	179.18	P

For π/4 DQPSK

Channel	Packet	Pulse time (ms)		Number of Transmissions		Dwell Time (ms)	Conclusion
39	2DH1	Fig.70	0.39	Fig.71	320	124.80	P
	2DH3	Fig.72	1.64	Fig.73	114	186.96	P
	2DH5	Fig.74	2.89	Fig.75	73	210.97	P

For 8DPSK

Channel	Packet	Pulse time (ms)		Number of Transmissions		Dwell Time (ms)	Conclusion
39	3DH1	Fig.76	0.39	Fig.77	320	124.80	P
	3DH3	Fig.78	1.64	Fig.79	121	198.44	P
	3DH5	Fig.80	2.89	Fig.81	53	153.17	P

Conclusion: PASS

Test graphs as below:

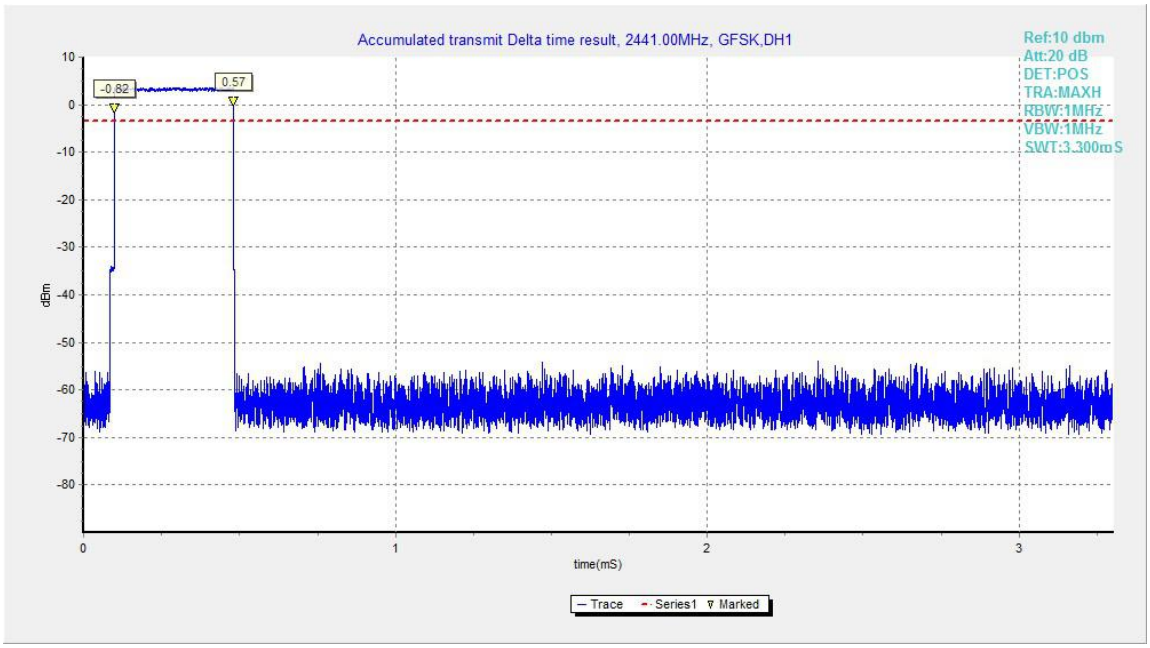


Fig.64. Time of occupancy (Dwell Time): Channel 39, Packet DH1