FCC PART 15C
TEST REPORT
No. I19Z61471-IOT01

for

TCL Communication Ltd.

LTE / UMTS / GSM mobile phone

Model Name: 5033Q

FCC ID: 2ACCJH110

with

Hardware Version: 05

Software Version: v7LTE

Issued Date: 2019-9-3

TESTING
NVLAP LAB CODE 600118-0

Note:

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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

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I19Z61471-IOT01	Rev.0	1st edition	2019-9-3

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(BDA)

Address: No.18A, Kangding Street, Beijing Economic-Technology Development Area, Beijing, P. R. China 100176

1.3. Testing Environment

Normal Temperature: 15-35℃

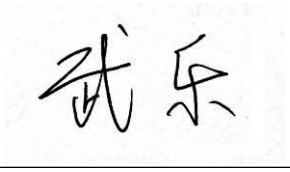
Relative Humidity: 20-75%

1.4. Project data

Testing Start Date: 2019-8-30

Testing End Date: 2019-9-3

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:	TCL Communication Ltd.
Address /Post:	7/F, Block F4, TCL Communication Technology Building, TCL International E City, Zhong Shan Yuan Road, Nanshan District, Shenzhen, Guangdong, P.R. China 518052
City:	Shenzhen
Postal Code:	518052
Country:	China
Telephone:	0086-755-36611722
Fax:	/

2.2. Manufacturer Information

Company Name:	TCL Communication Ltd.
Address /Post:	7/F, Block F4, TCL Communication Technology Building, TCL International E City, Zhong Shan Yuan Road, Nanshan District, Shenzhen, Guangdong, P.R. China 518052
City:	Shenzhen
Postal Code:	518052
Country:	China
Telephone:	0086-755-36611722
Fax:	/

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

3.1. About EUT

Description	LTE/UMTS/GSM mobile phone
Model Name	5033Q
FCC ID	2ACCJH110
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

3.2. Internal Identification of EUT

EUT ID*	SN or IMEI	HW Version	SW Version
EUT2	359598100000074	05	v7LTE
EUT3	359598100000033	05	v7LTE

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

3.3. Internal Identification of AE

AE ID*	Description	SN	Remarks
AE1	Battery	/	1860562BA001
AE2	Charger	/	16TCT-CH-1675
AE3	Charger	/	1860562CH004
AE4	Charger	/	1860562CH002
AE5	USB Cable	/	16TCT-DC-0029

AE1

Model	CAB1930000C7
Manufacturer	Ningbo Veken Battery Co.,LTD
Capacitance	2000mAh
Nominal voltage	3.85V

AE2

Model	CBA0066AGAC5
Manufacturer	HUIZHOU PUAN ELECTRONICS CO.,LTD
Length of cable	/

AE3

Model	CBA0066AGAC7
Manufacturer	JIANGSU CHENYANG ELECTRON CO.,LTD
Length of cable	/

AE4

Model	CBA3068AGAC5
Manufacturer	HUIZHOU PUAN ELECTRONICS CO.,LTD
Length of cable	/

AE5

Model	CDA3122005C1
Manufacturer	HUIZHOU JUWEI ELECTRONICS CO.,LTD
Length of cable	100cm

*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.10	EUT2+ AE1+ AE2+ AE5	BT
Set.11	EUT2+ AE1+ AE3+ AE5	BT
Set.12	EUT2+ AE1+ AE4+ AE5	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 LTE/UMTS/GSM 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 applicant or manufacturer, which is the basis of testing.

4.2. Reference Documents for testing

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

Reference	Title	Version
FCC 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	**P**
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 5033Q(FCC ID: 2ACCJH110) is a variant product of 5033A(FCC ID: 2ACCJH089), according to the declaration of changes provided by the applicant and FCC KDB publication 484596 D01, spot check measurements(Peak Output Power-Conducted and Transmitter Spurious Emission - Radiated) were performed on this device, other test results are derived from test report No. I18Z60562-IOT03. 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	2019-11-21
2	Bluetooth Tester	CBT32	100649	Rohde & Schwarz	1 year	2019-10-28
3	LISN	ENV216	101200	Rohde & Schwarz	1 year	2020-03-14
4	Test Receiver	ESCI	100344	Rohde & Schwarz	1 year	2020-02-14
5	Bluetooth Tester	CBT	101042	Rohde & Schwarz	1 year	2020-01-08
6	Shielding Room	S81	/	ETS-Lindgren	/	/

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Test Receiver	ESU26	100376	Rohde & Schwarz	1 year	2019-11-27
2	BiLog Antenna	VULB9163	514	Schwarzbeck	1 yea	2020-02-03
3	Dual-Ridge Waveguide Horn Antenna	3117	00139065	ETS-Lindgren	1 year	2019-11-05
4	Dual-Ridge Waveguide Horn Antenna	3116	2663	ETS-Lindgren	1 year	2020-05-31
5	Vector Signal Analyzer	FSV40	101047	Rohde & Schwarz	1 year	2020-06-16
6	Base Station Simulator	CMW500	159408	Rohde & Schwarz	1 year	2020-03-03

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.

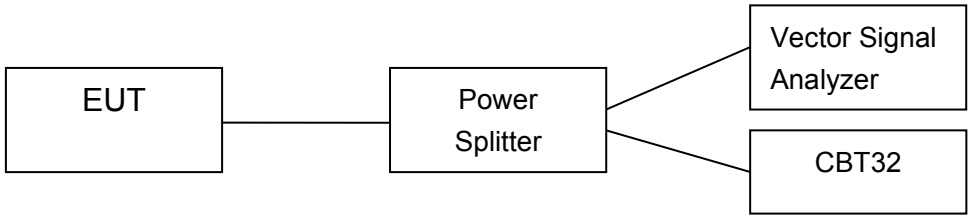
2). Set the EUT to the required work mode (Transmitter, receiver or transmitter & receiver).

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

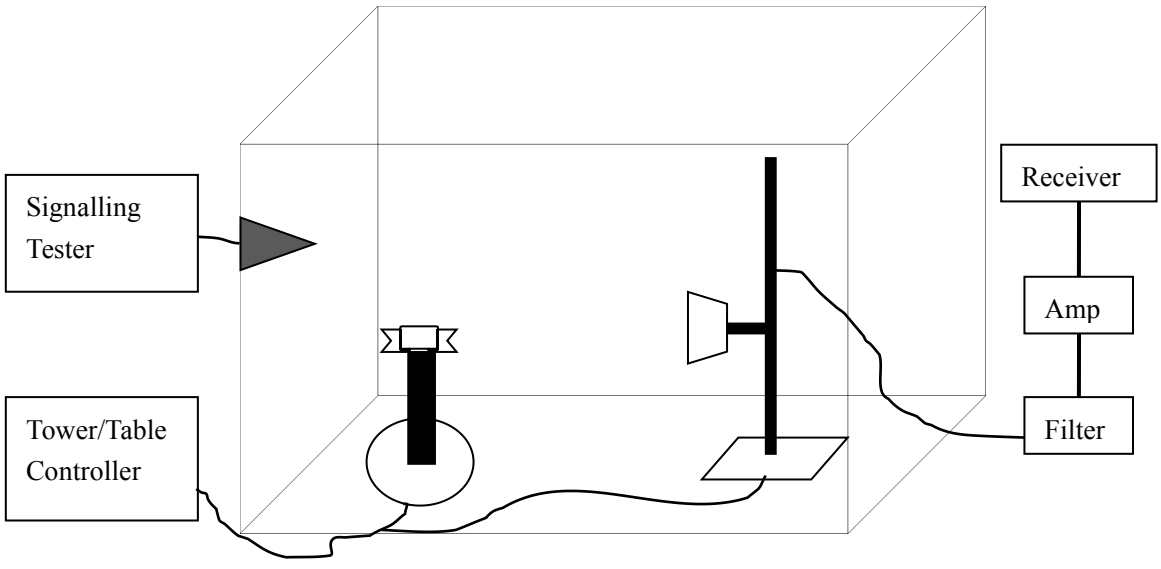
The measurement is made according to ANSI C63.10

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	Limit (dBm)
FCC Part 15.247(b)(1)	< 30

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)	4.85	5.15	5.41	P

For π/4 DQPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	3.90	4.08	4.40	P

For 8DPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	4.20	4.40	4.74	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)	4.98	4.57	5.51	P

For π/4 DQPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	3.96	3.71	4.61	P

For 8DPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	4.19	3.82	4.76	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	-59.03	P
	Hopping ON	Fig.2	-62.53	P
78	Hopping OFF	Fig.3	-62.84	P
	Hopping ON	Fig.4	-64.45	P

For π/4 DQPSK

Channel	Hopping	Band Edge Power (dBc)		Conclusion
0	Hopping OFF	Fig.5	-56.72	P
	Hopping ON	Fig.6	-62.33	P
78	Hopping OFF	Fig.7	-62.09	P
	Hopping ON	Fig.8	-63.91	P

For 8DPSK

Channel	Hopping	Band Edge Power (dBc)		Conclusion
0	Hopping OFF	Fig.9	-55.26	P
	Hopping ON	Fig.10	-60.22	P
78	Hopping OFF	Fig.11	-61.87	P
	Hopping ON	Fig.12	-64.39	P

Conclusion: PASS

Test graphs as below

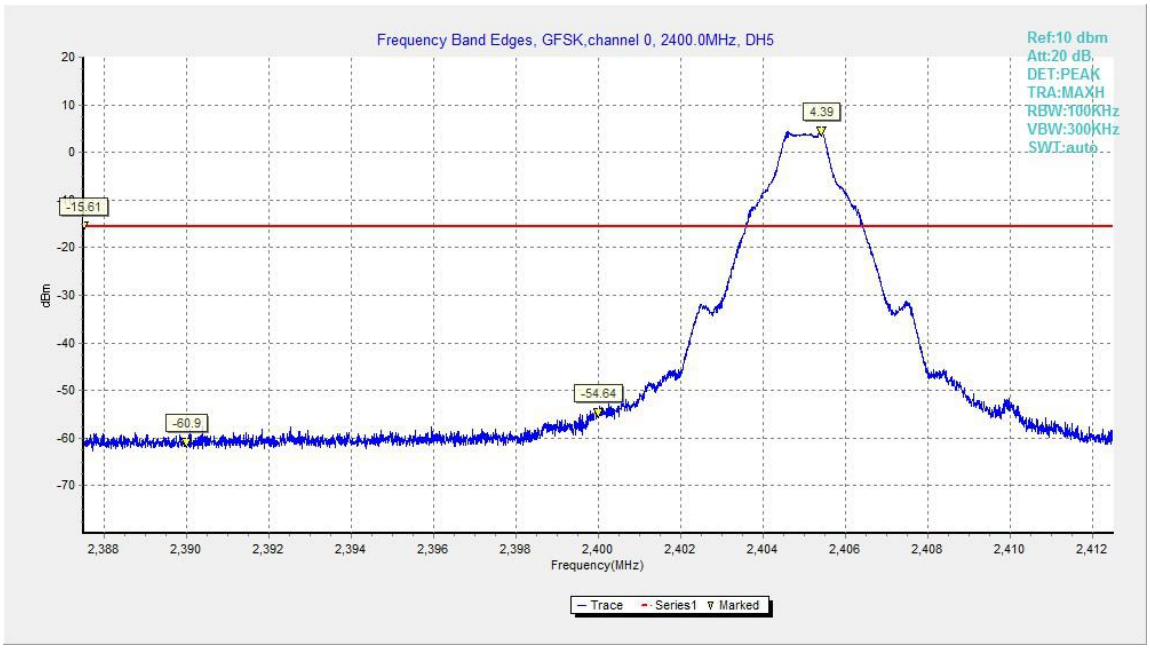


Fig.1. Frequency Band Edges: GFSK, Channel 0, Hopping Off

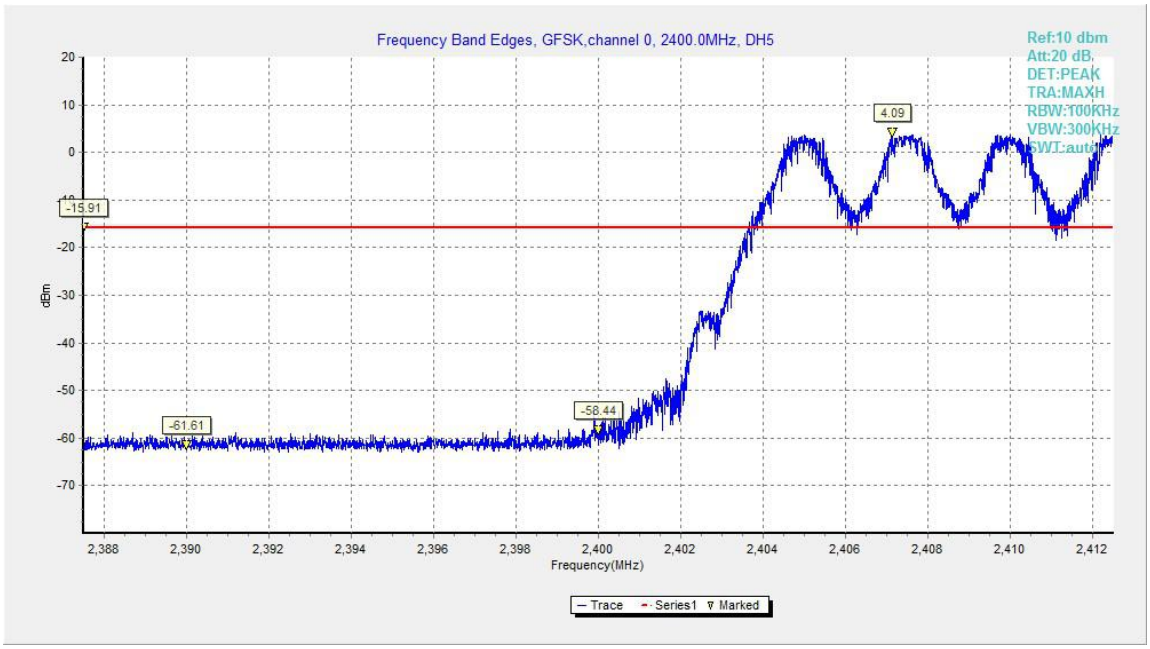


Fig.2. Frequency Band Edges: GFSK, Channel 0, Hopping On

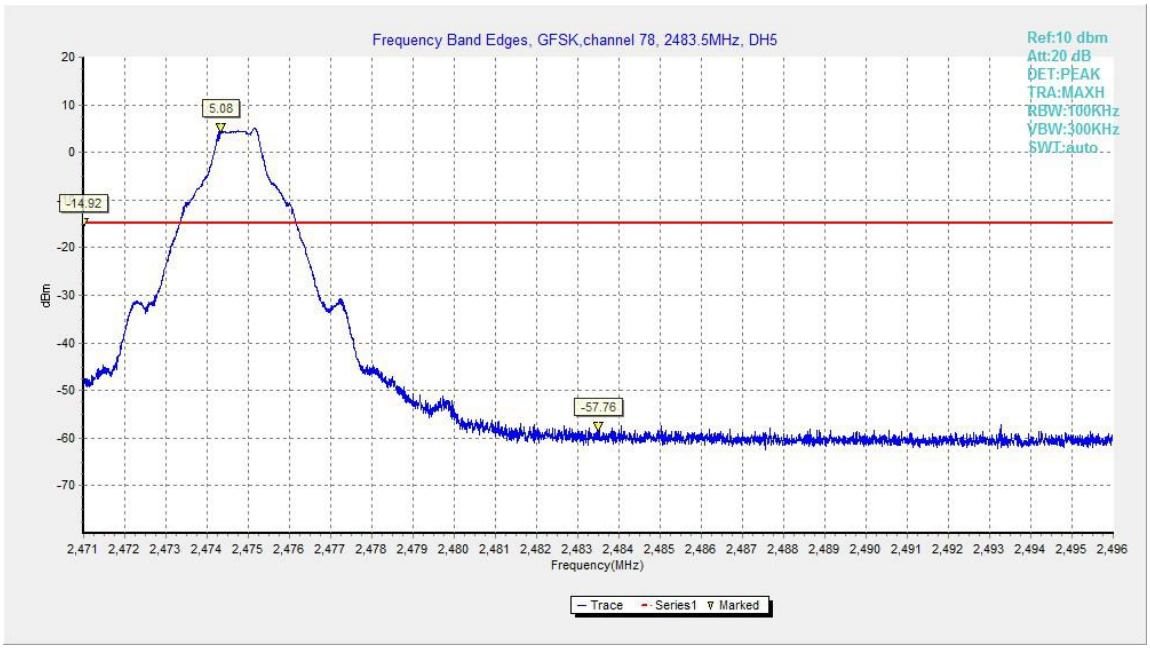


Fig.3. Frequency Band Edges: GFSK, Channel 78, Hopping Off

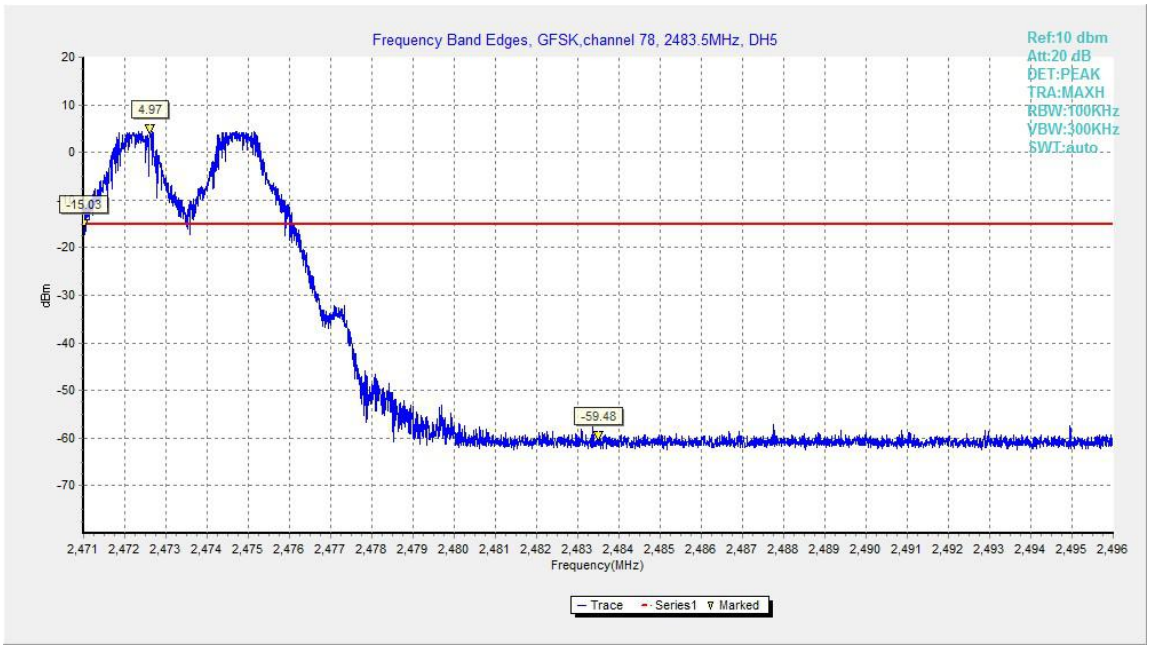


Fig.4. Frequency Band Edges: GFSK, Channel 78, Hopping On

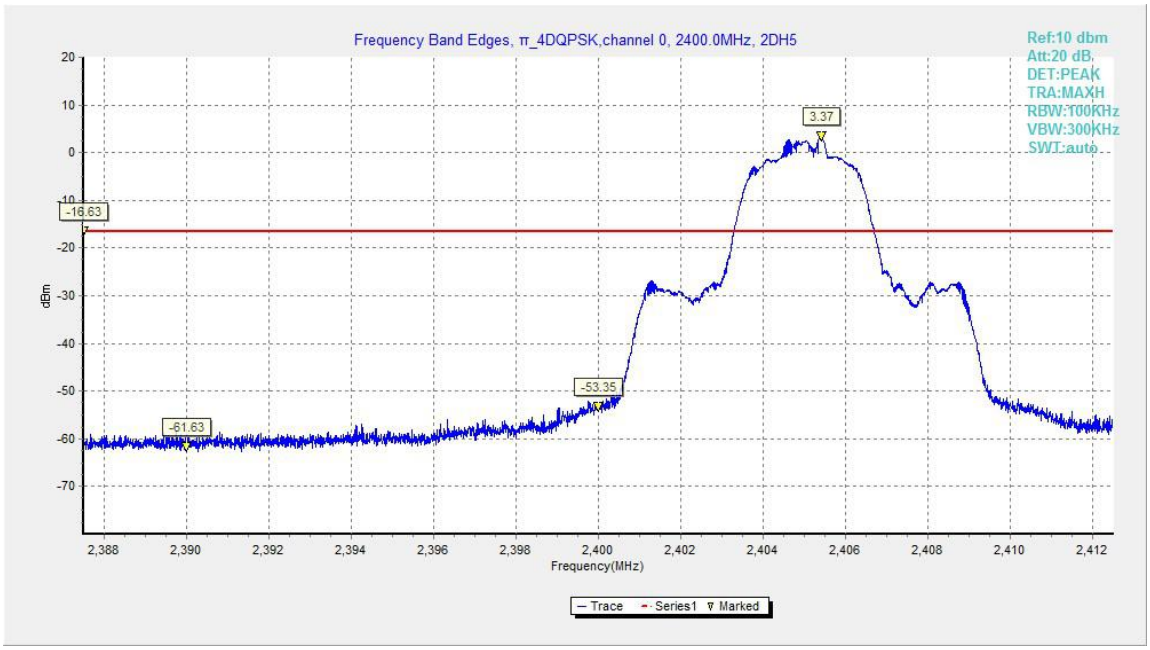


Fig.5. Frequency Band Edges: π/4 DQPSK, Channel 0, Hopping Off

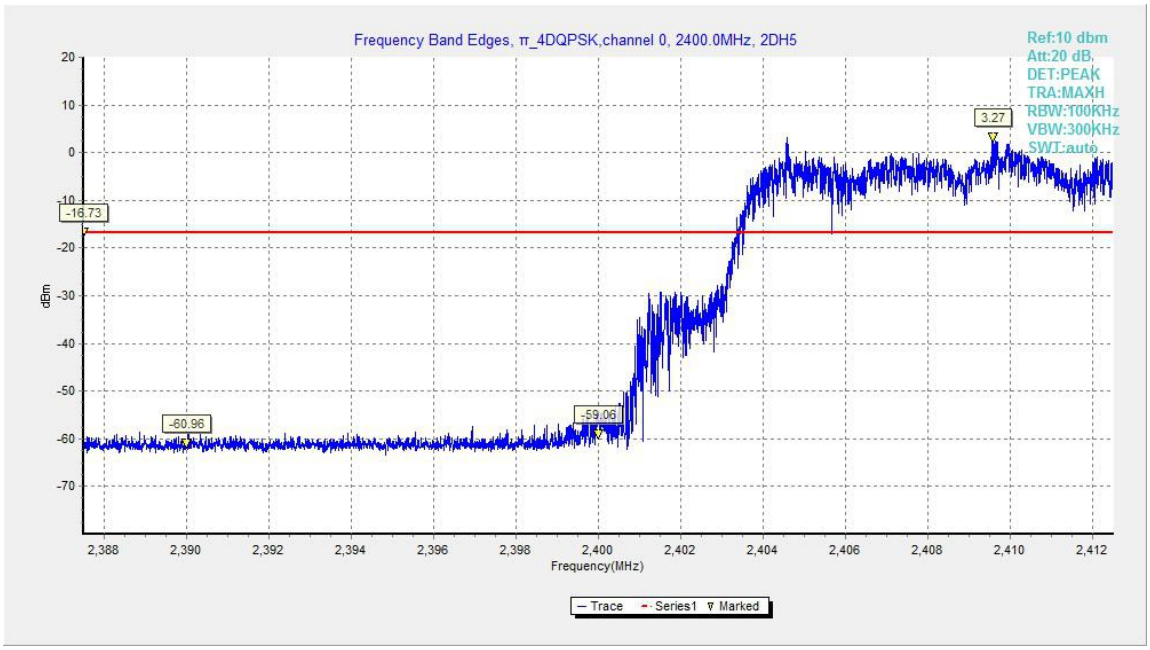


Fig.6. Frequency Band Edges: π/4 DQPSK, Channel 0, Hopping On

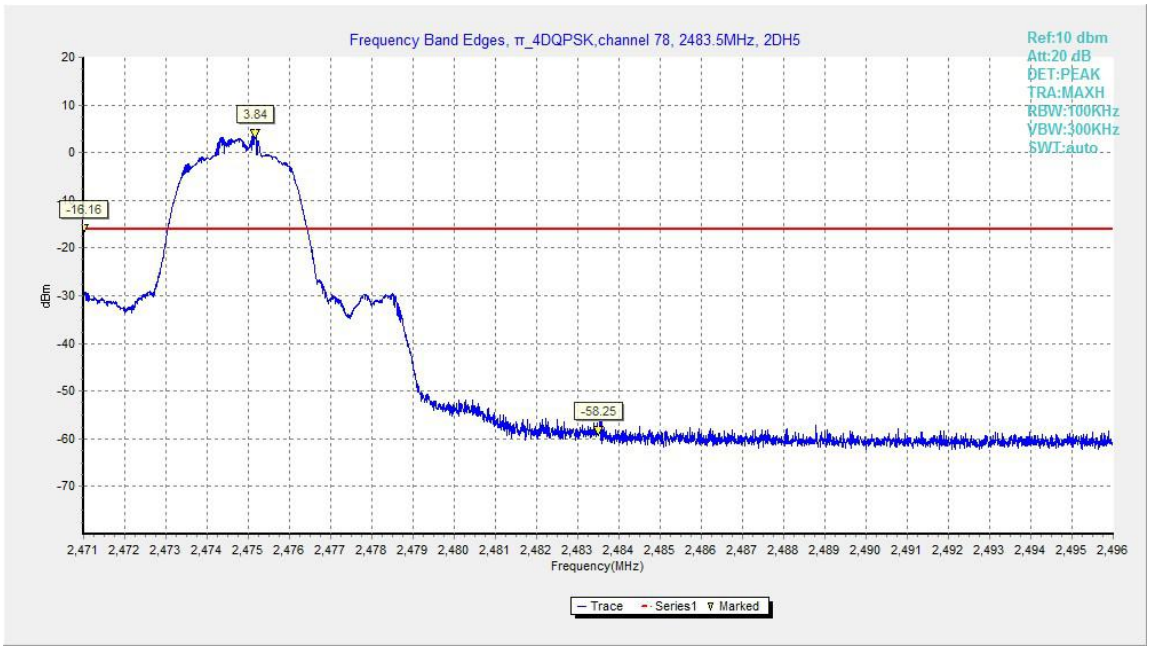


Fig.7. Frequency Band Edges: π/4 DQPSK, Channel 78, Hopping Off

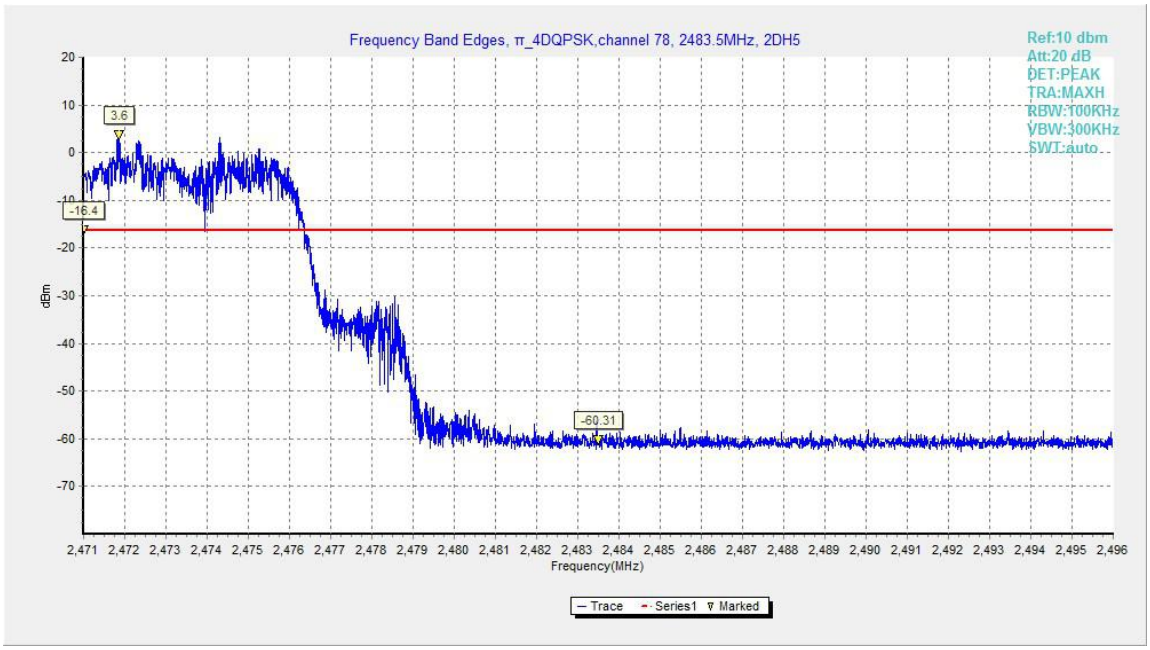


Fig.8. Frequency Band Edges: π/4 DQPSK, Channel 78, Hopping On

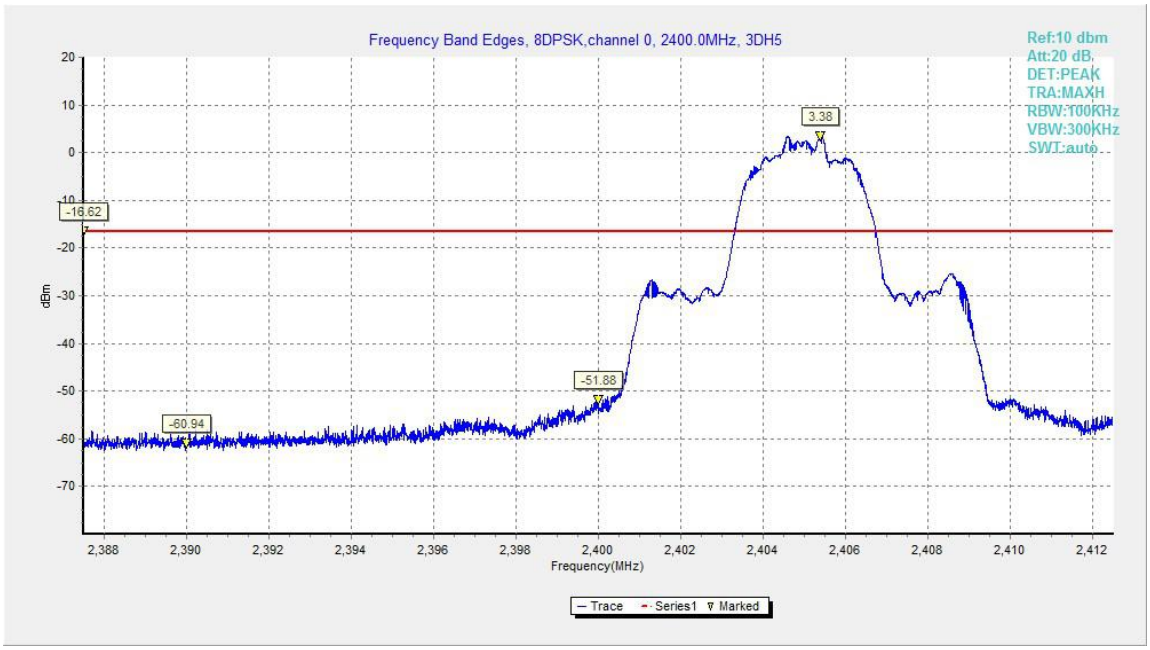


Fig.9. Frequency Band Edges: 8DPSK, Channel 0, Hopping Off

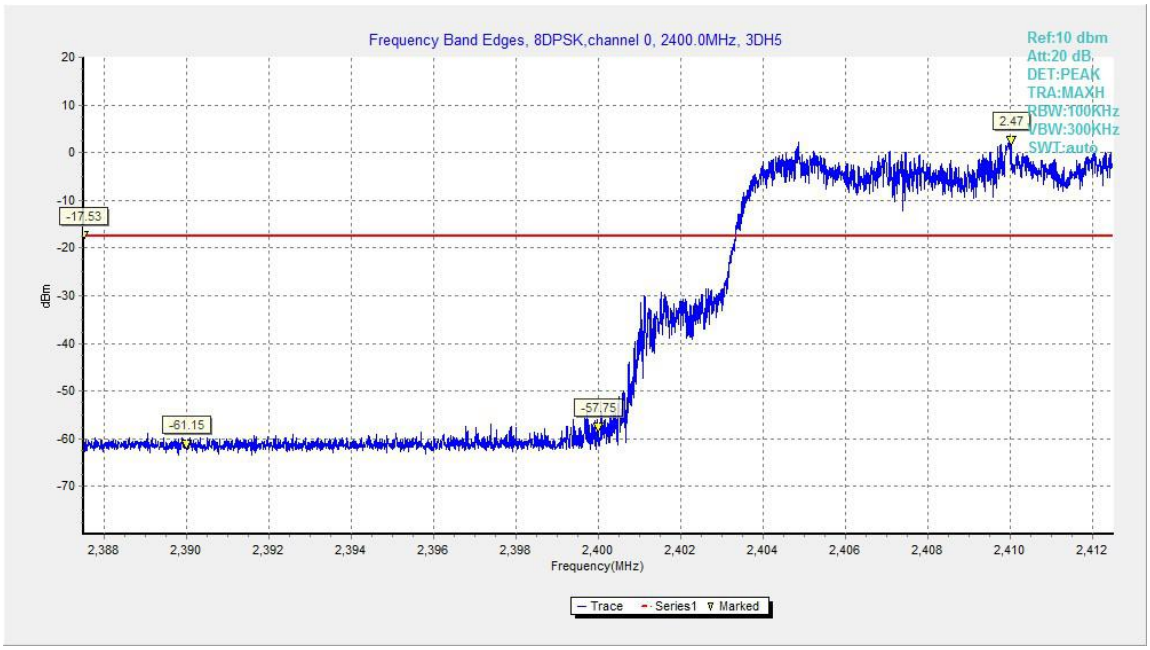


Fig.10. Frequency Band Edges: 8DPSK, Channel 0, Hopping On

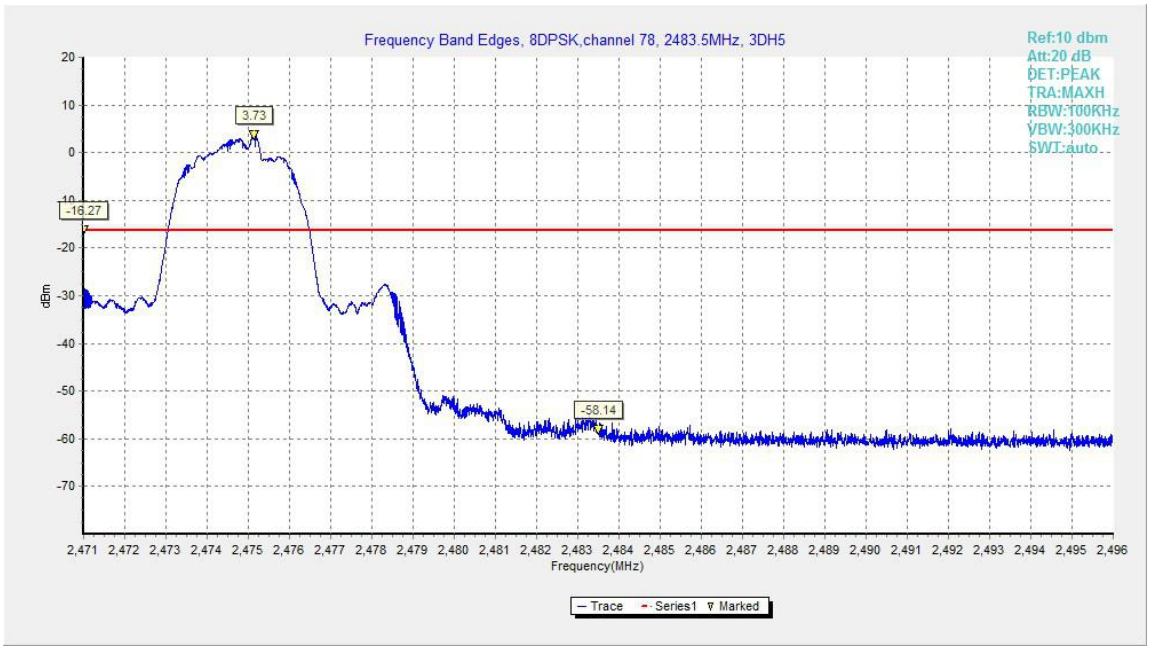


Fig.11. Frequency Band Edges: 8DPSK, Channel 78, Hopping Off

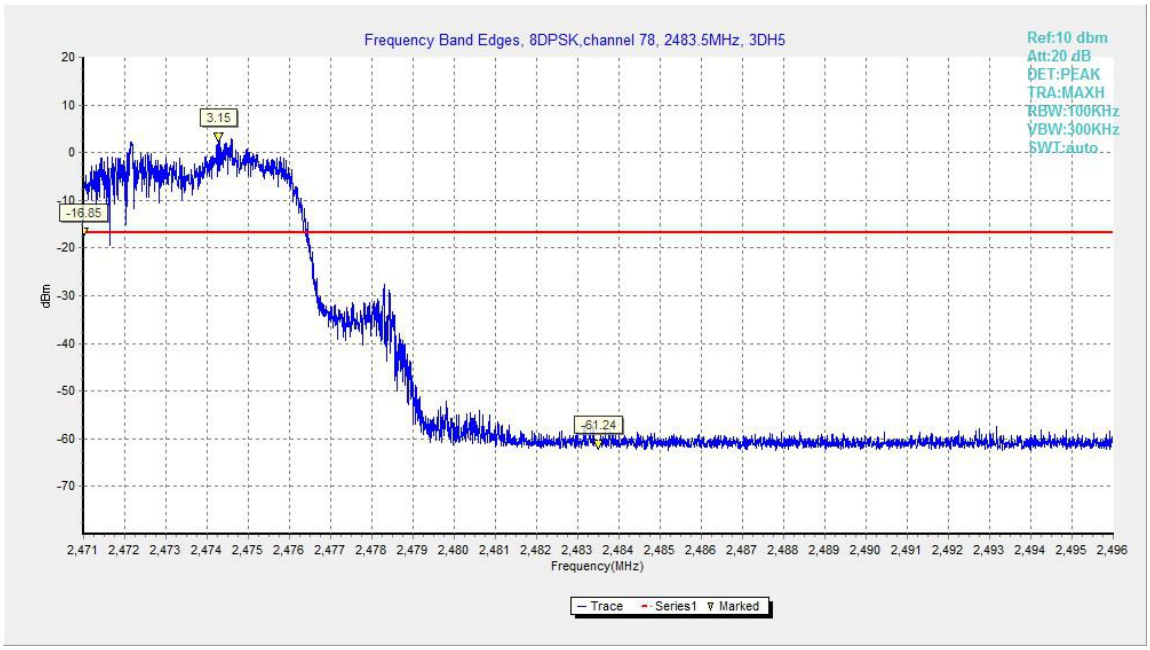


Fig.12. Frequency Band Edges: 8DPSK, Channel 78, Hopping On

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	Center Frequency	Fig.13	P

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

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

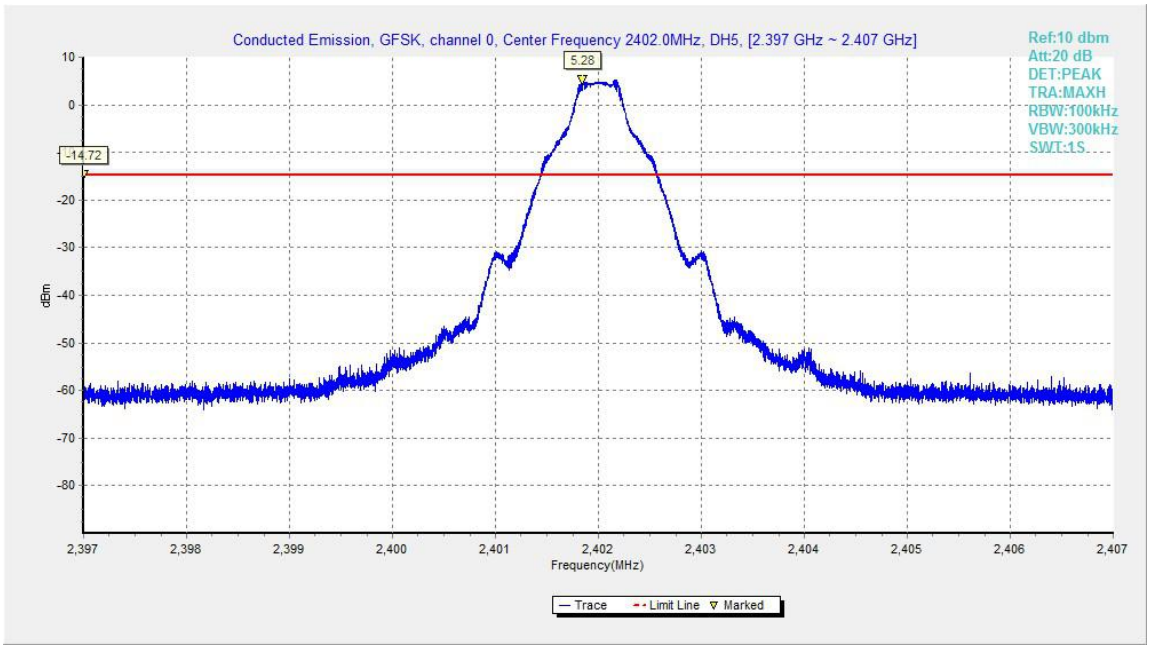


Fig.13. Conducted spurious emission: GFSK, Channel 0,2402MHz

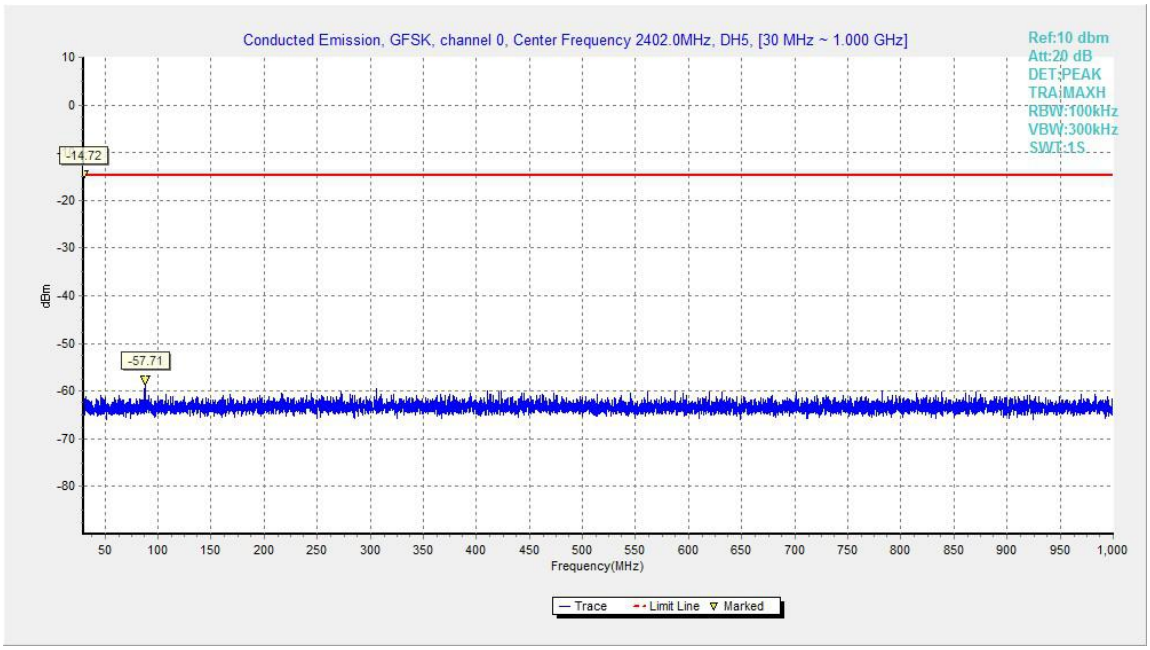


Fig.14. Conducted spurious emission: GFSK, Channel 0, 30MHz - 1GHz

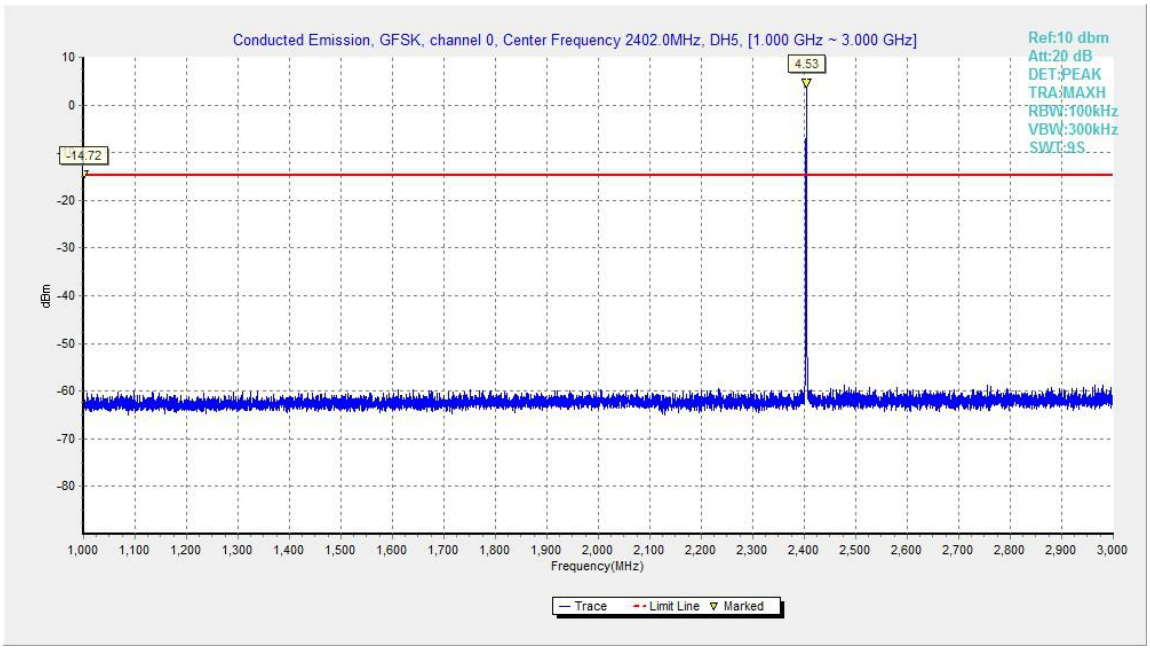


Fig.15. Conducted spurious emission: GFSK, Channel 0, 1GHz - 3GHz

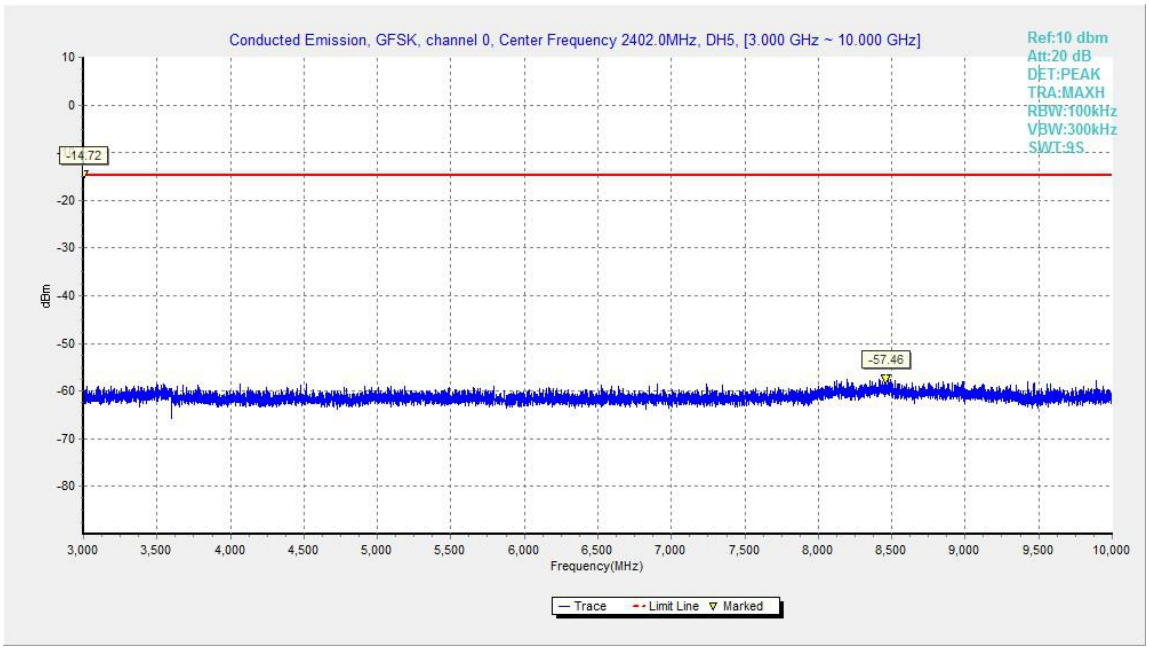


Fig.16. Conducted spurious emission: GFSK, Channel 0, 3GHz - 10GHz

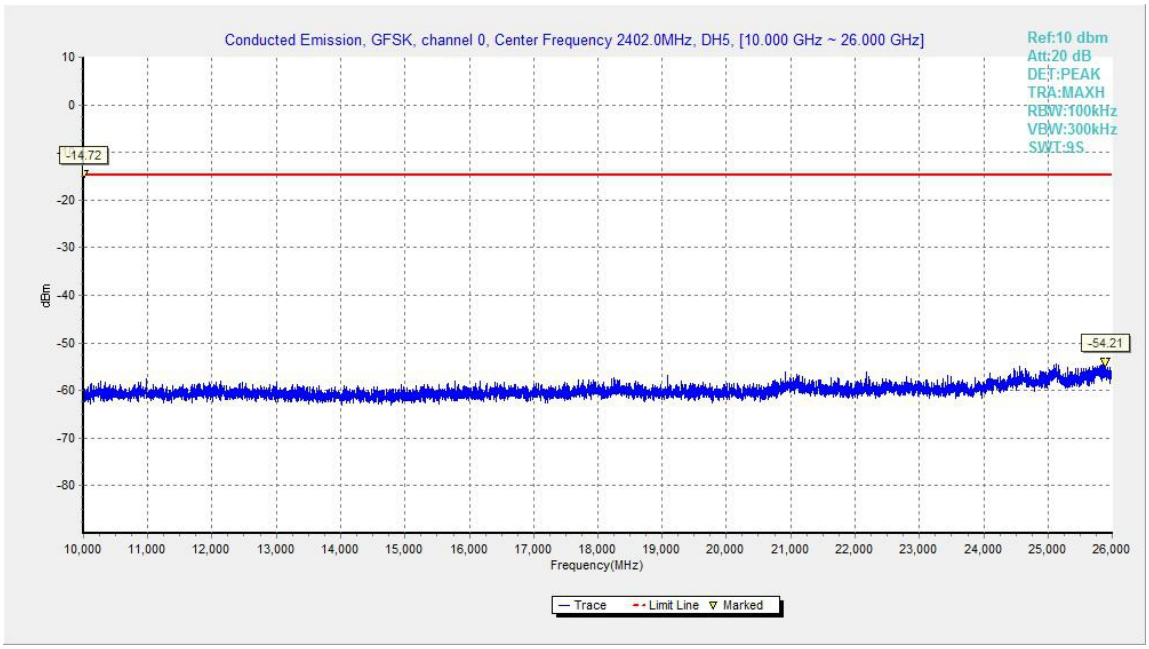


Fig.17. Conducted spurious emission: GFSK, Channel 0,10GHz - 26GHz

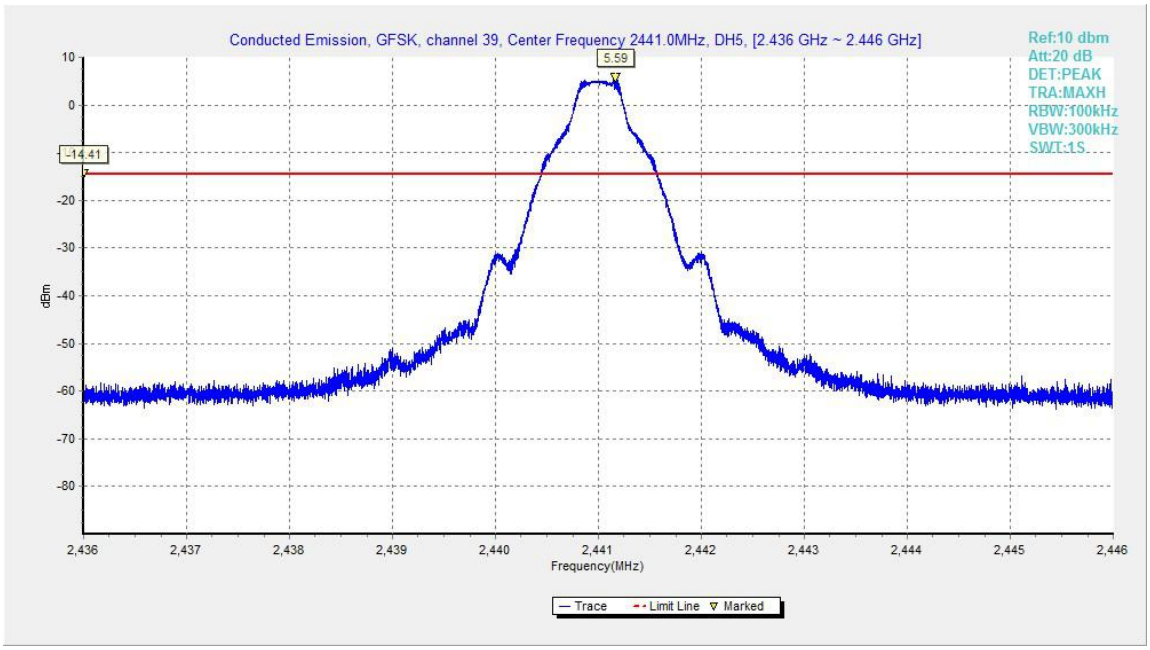


Fig.18. Conducted spurious emission: GFSK, Channel 39, 2441MHz

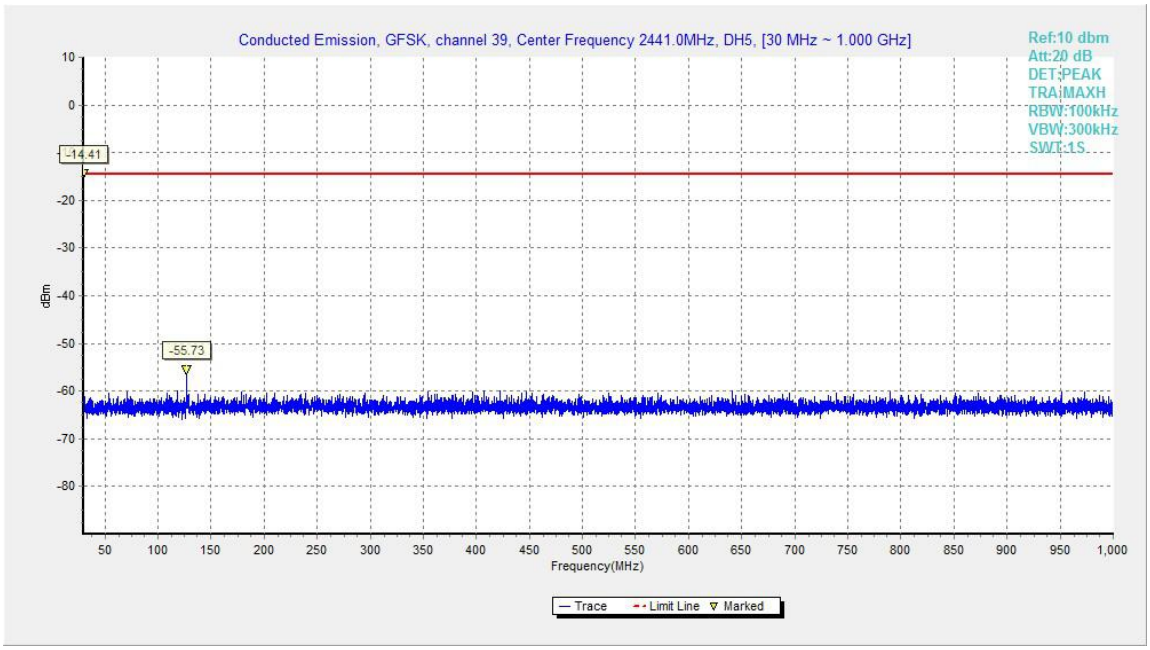


Fig.19. Conducted spurious emission: GFSK, Channel 39, 30MHz - 1GHz

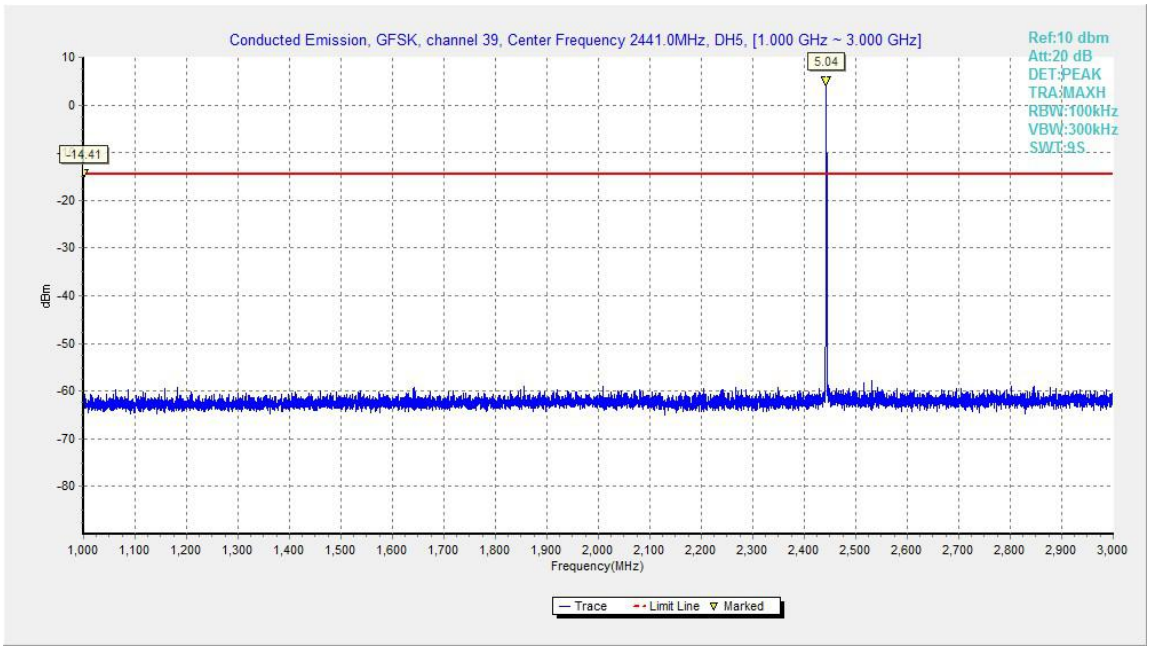


Fig.20. Conducted spurious emission: GFSK, Channel 39, 1GHz – 3GHz

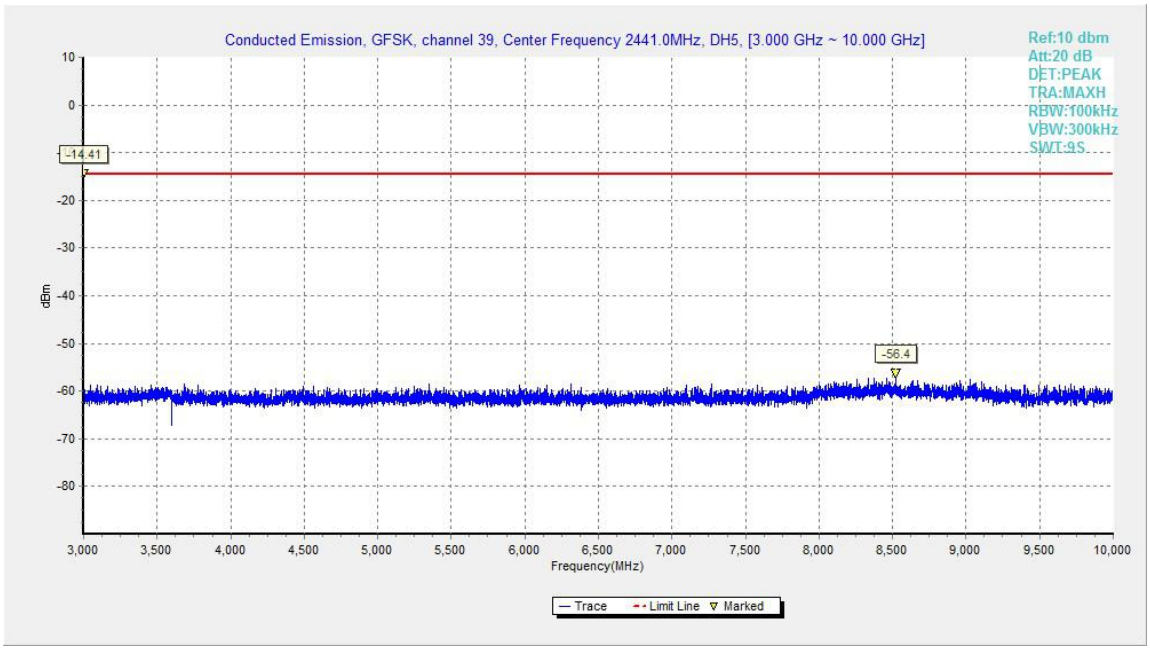


Fig.21. Conducted spurious emission: GFSK, Channel 39, 3GHz – 10GHz

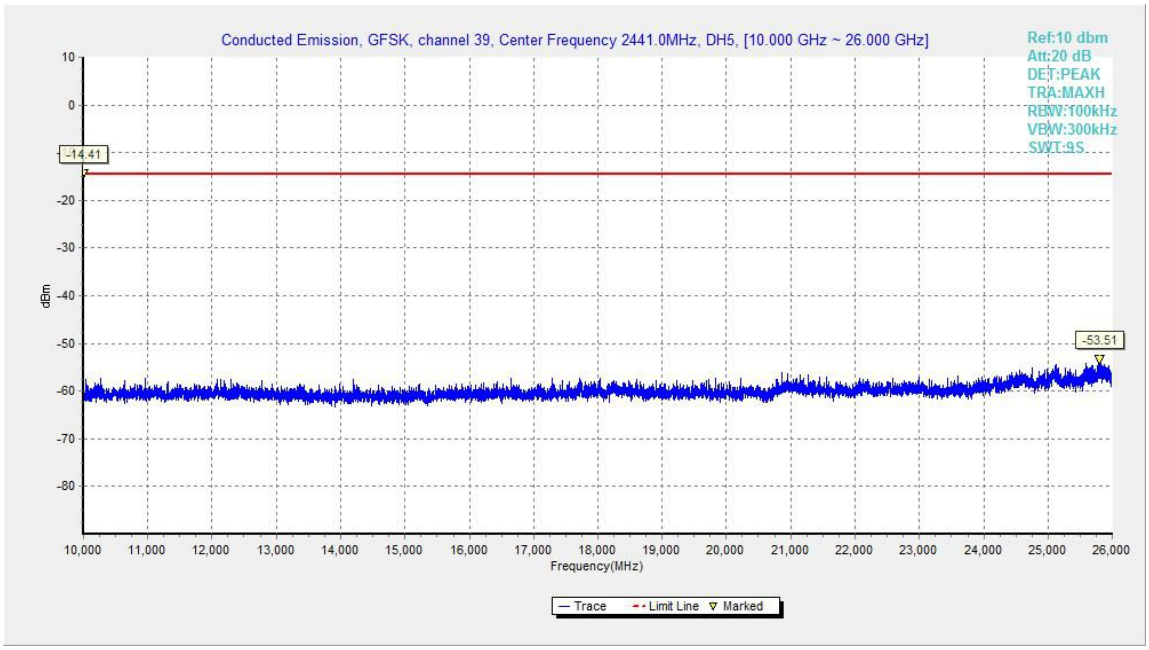


Fig.22. Conducted spurious emission: GFSK, Channel 39, 10GHz – 26GHz

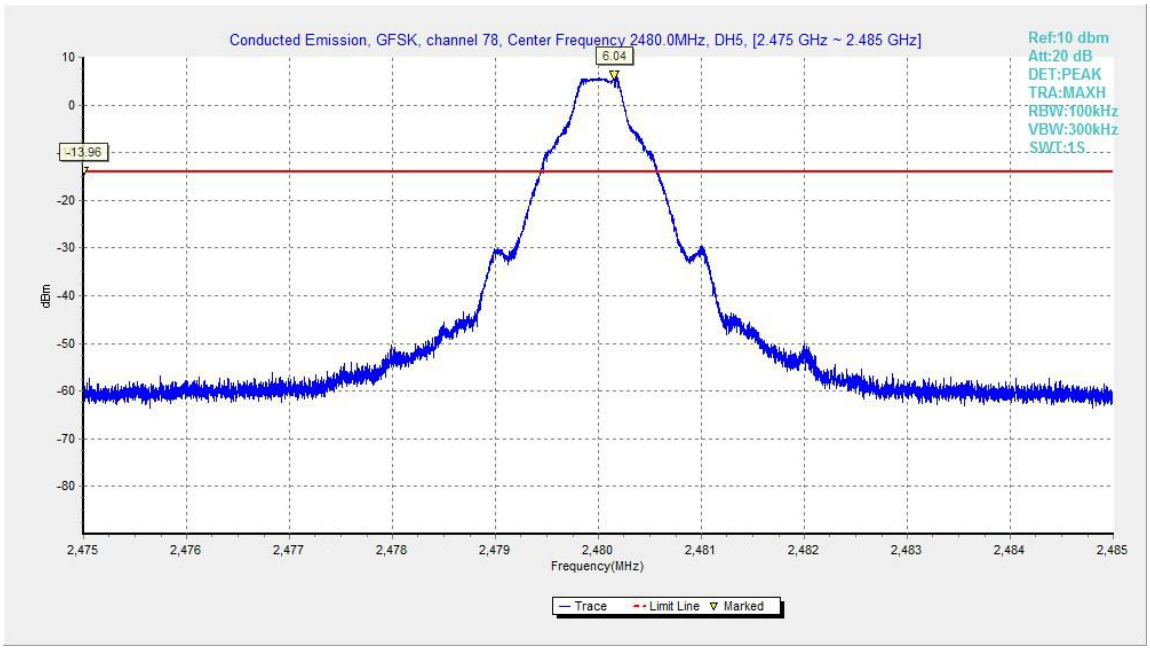


Fig.23. Conducted spurious emission: GFSK, Channel 78, 2480MHz

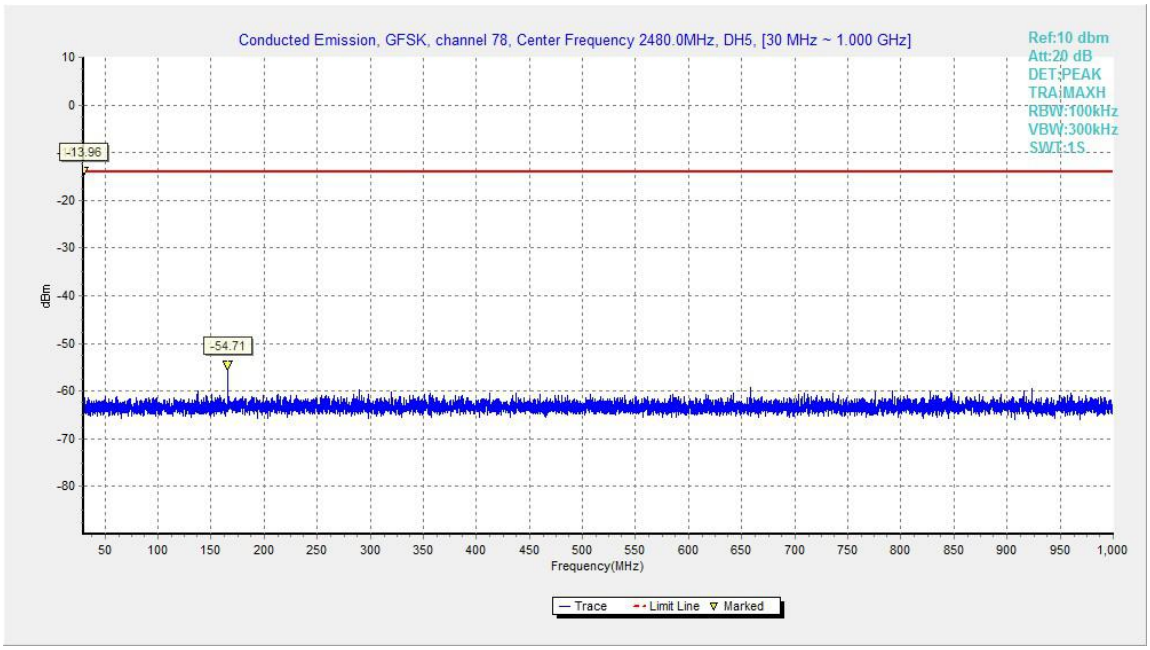


Fig.24. Conducted spurious emission: GFSK, Channel 78, 30MHz - 1GHz

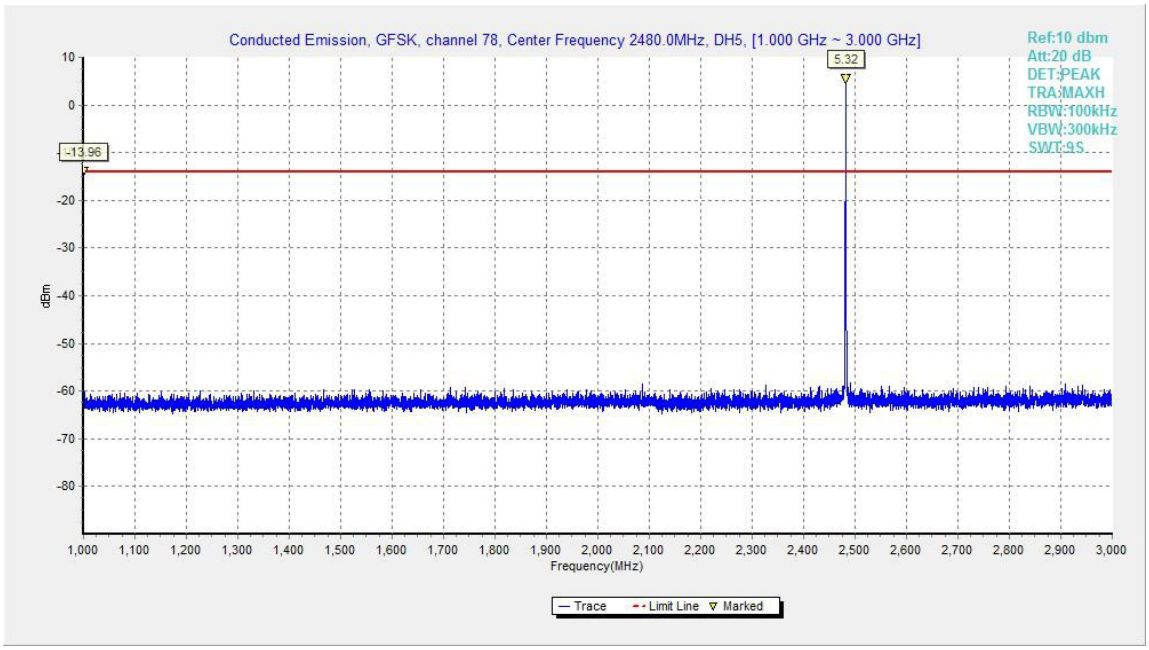


Fig.25. Conducted spurious emission: GFSK, Channel 78, 1GHz - 3GHz

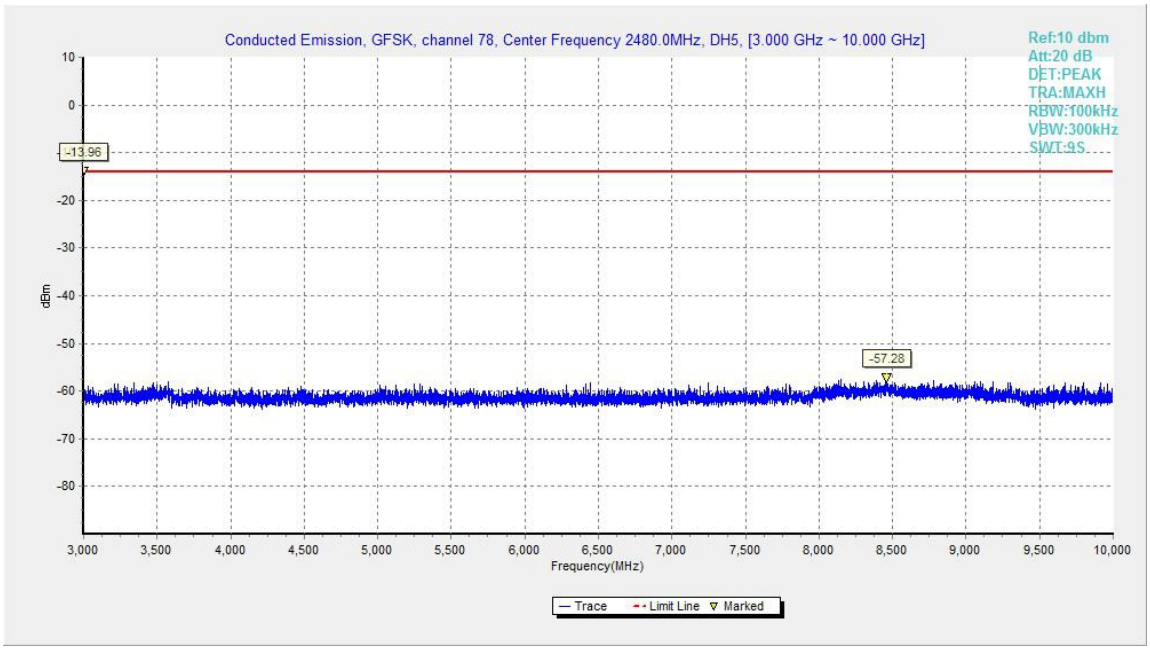


Fig.26. Conducted spurious emission: GFSK, Channel 78, 3GHz - 10GHz

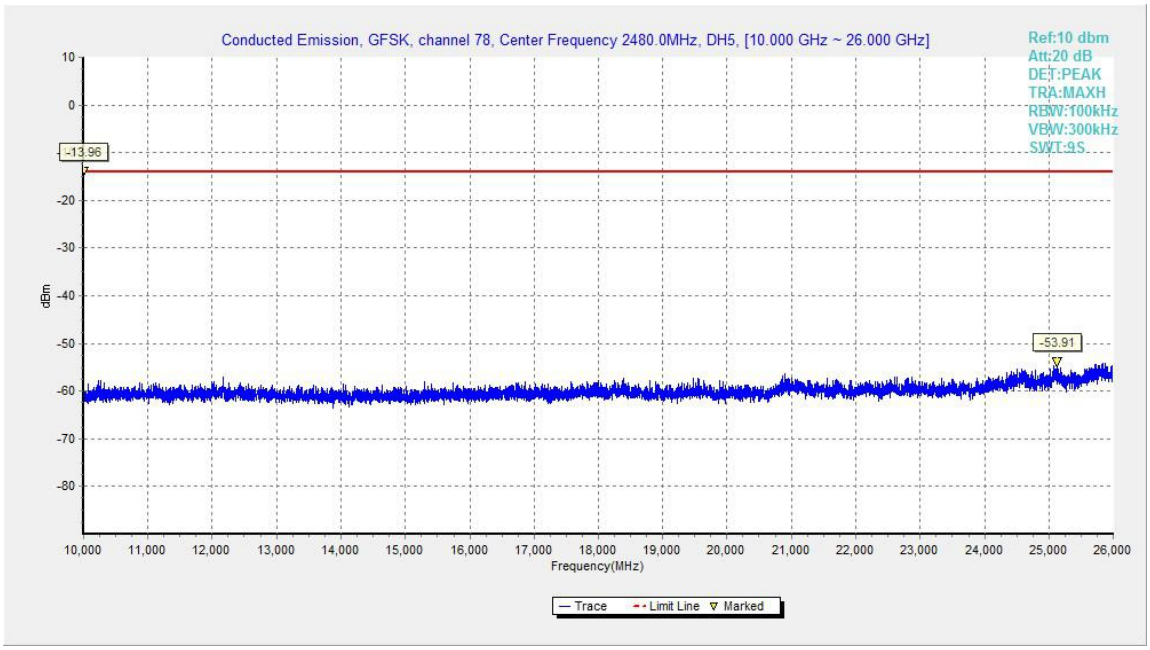


Fig.27. Conducted spurious emission: GFSK, Channel 78, 10GHz - 26GHz

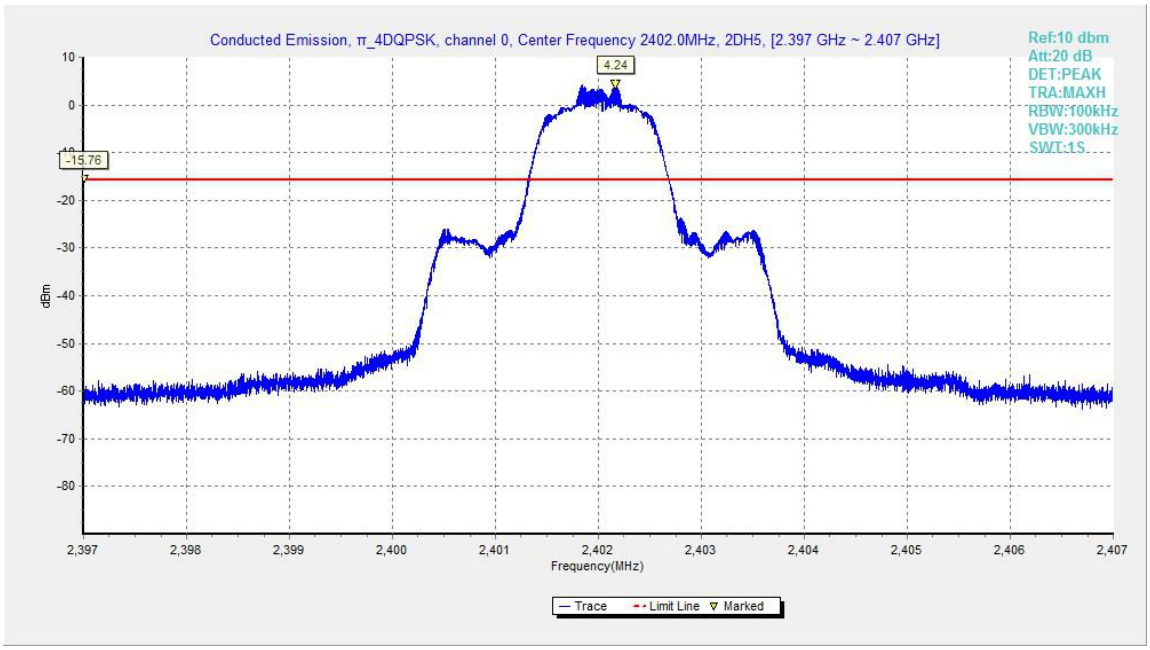


Fig.28. Conducted spurious emission: π/4 DQPSK, Channel 0,2402MHz

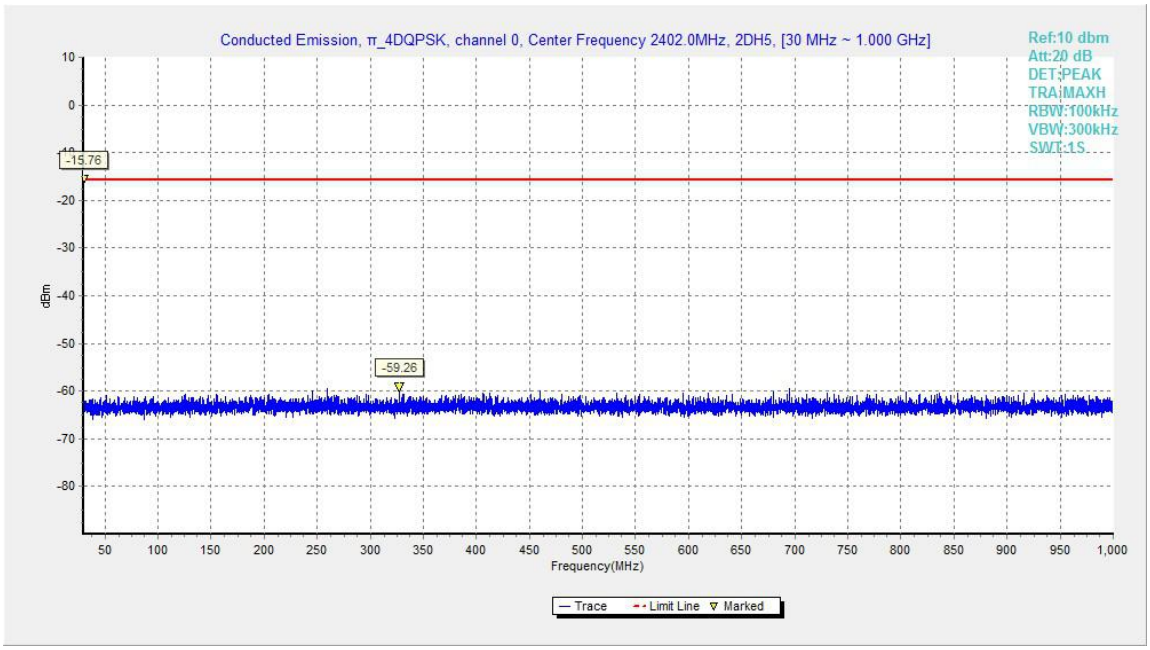


Fig.29. Conducted spurious emission: π/4 DQPSK, Channel 0, 30MHz - 1GHz

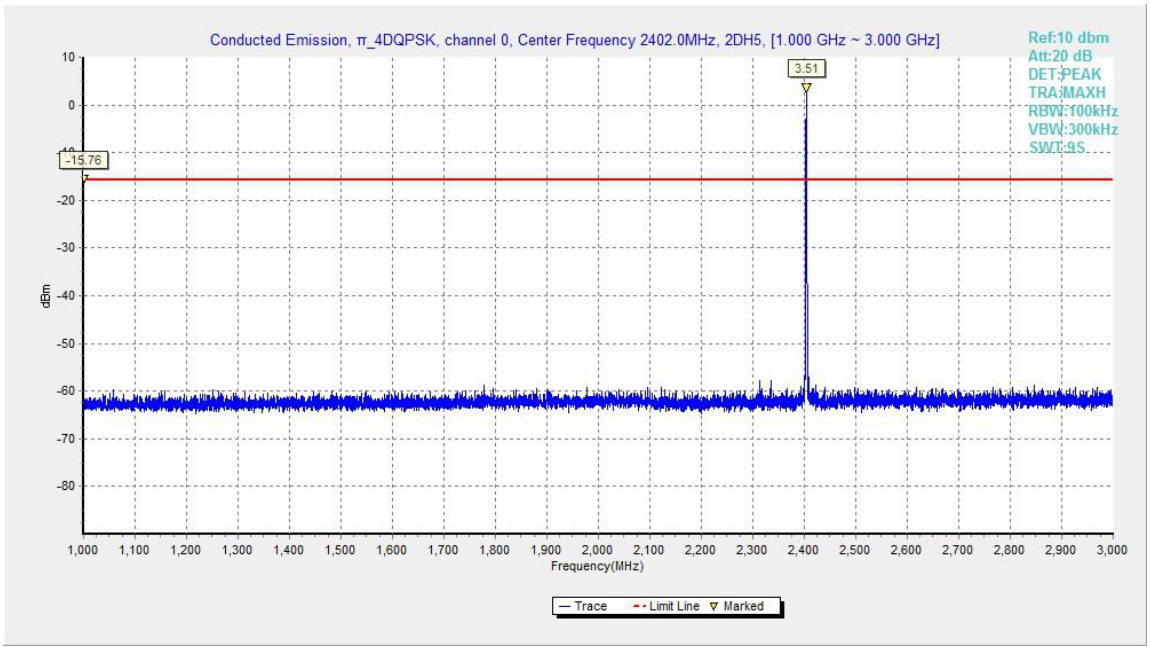


Fig.30. Conducted spurious emission: π/4 DQPSK, Channel 0, 1GHz - 3GHz

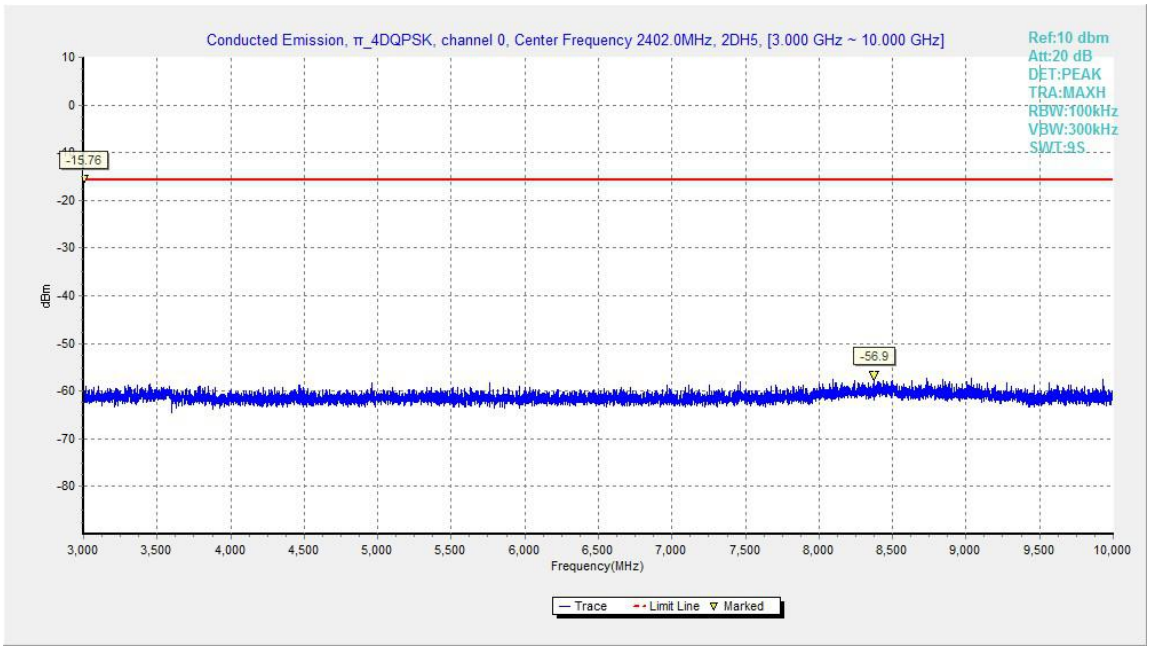


Fig.31. Conducted spurious emission: π/4 DQPSK, Channel 0, 3GHz - 10GHz

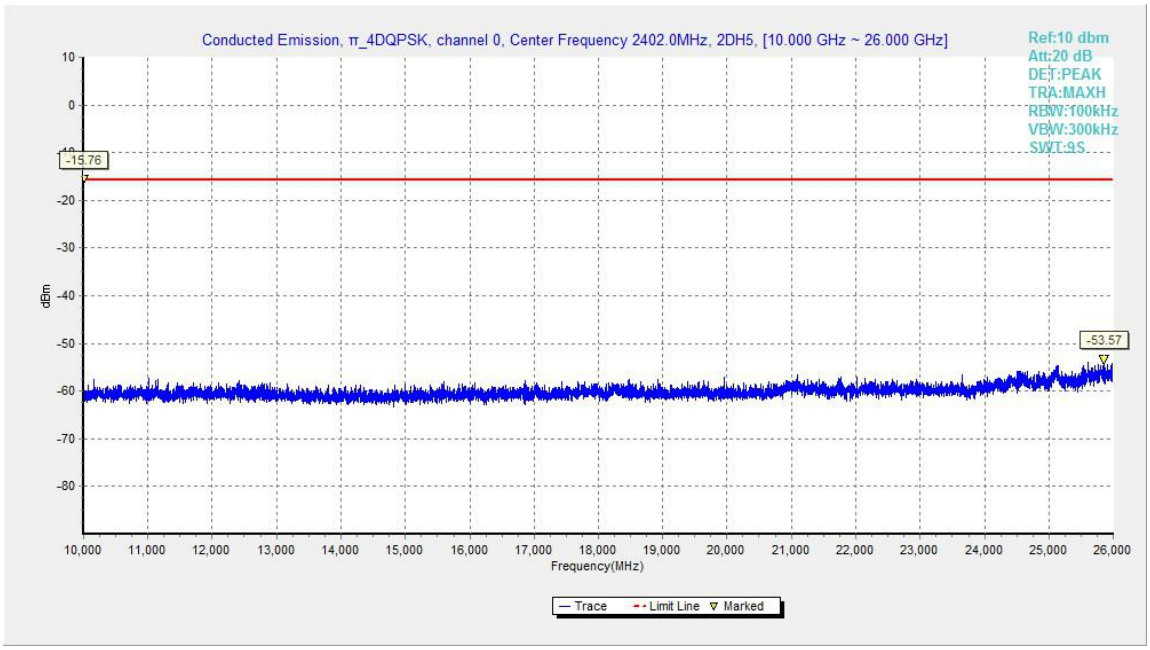


Fig.32. Conducted spurious emission: π/4 DQPSK, Channel 0,10GHz - 26GHz

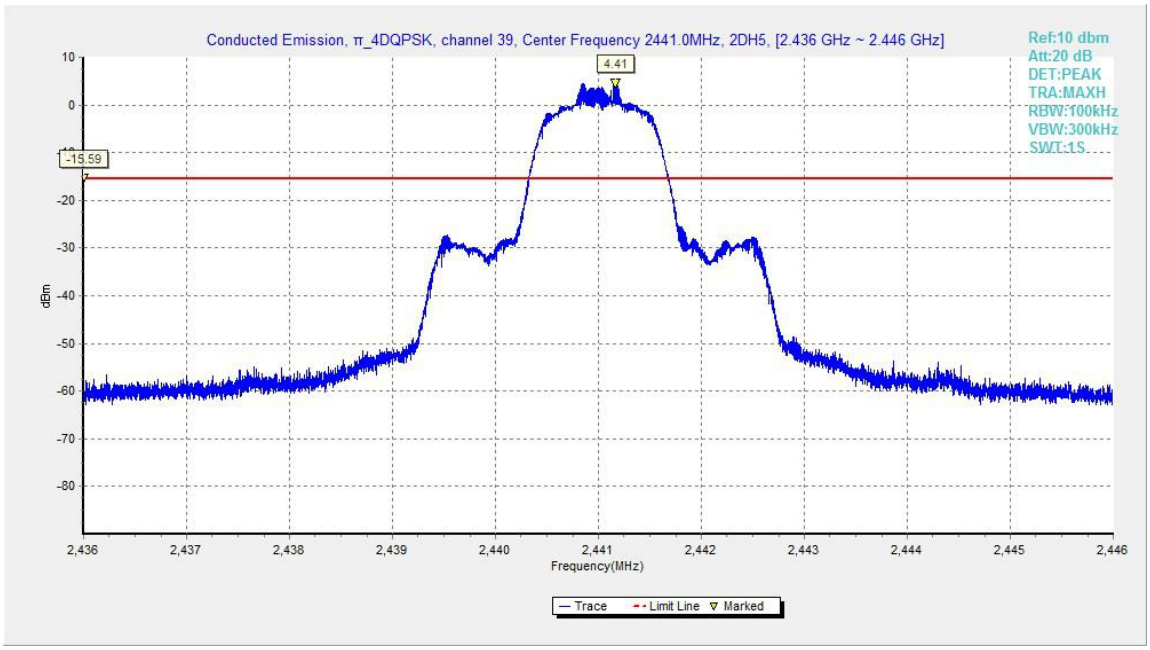


Fig.33. Conducted spurious emission: π/4 DQPSK, Channel 39, 2441MHz

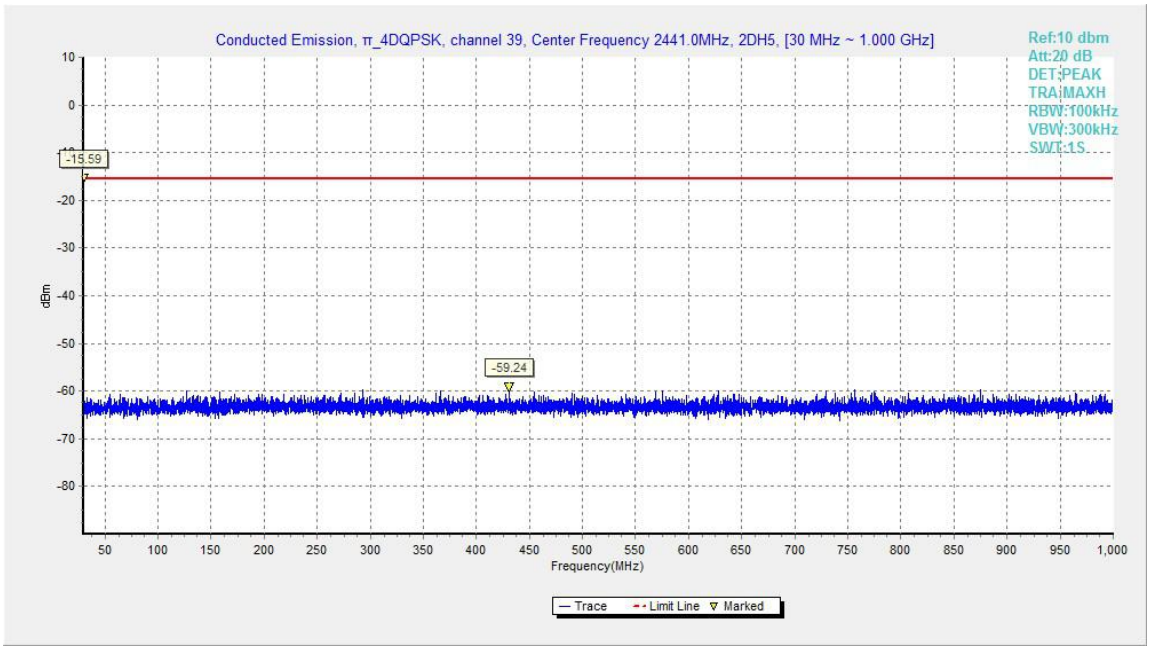


Fig.34. Conducted spurious emission: π/4 DQPSK, Channel 39, 30MHz - 1GHz

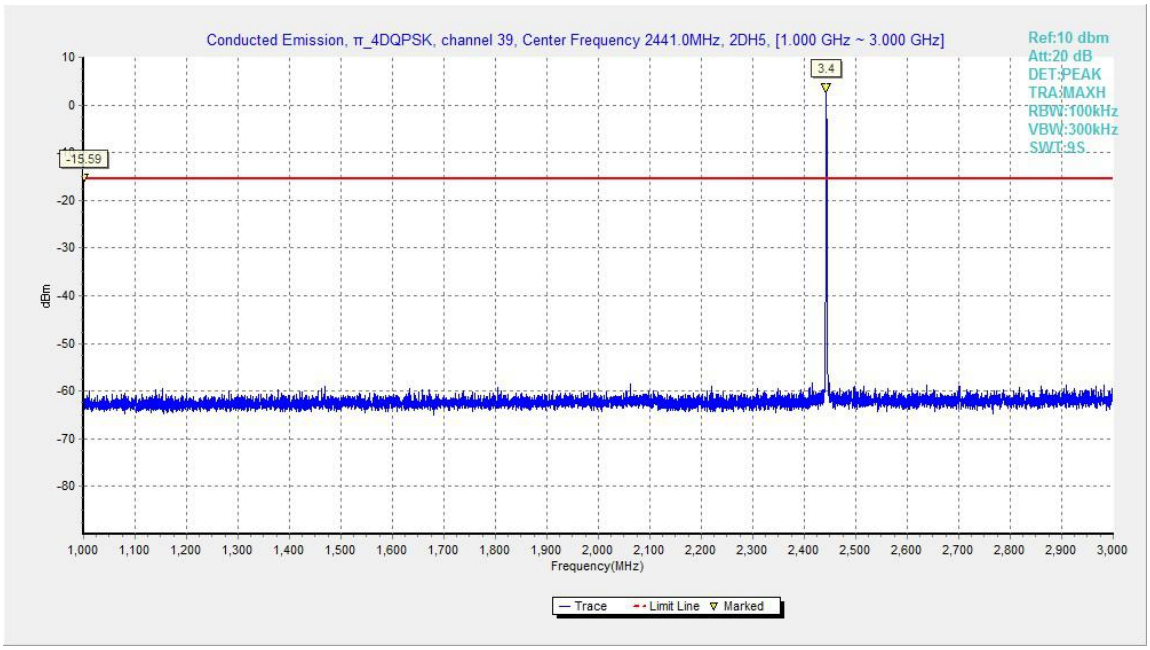


Fig.35. Conducted spurious emission: π/4 DQPSK, Channel 39, 1GHz - 3GHz

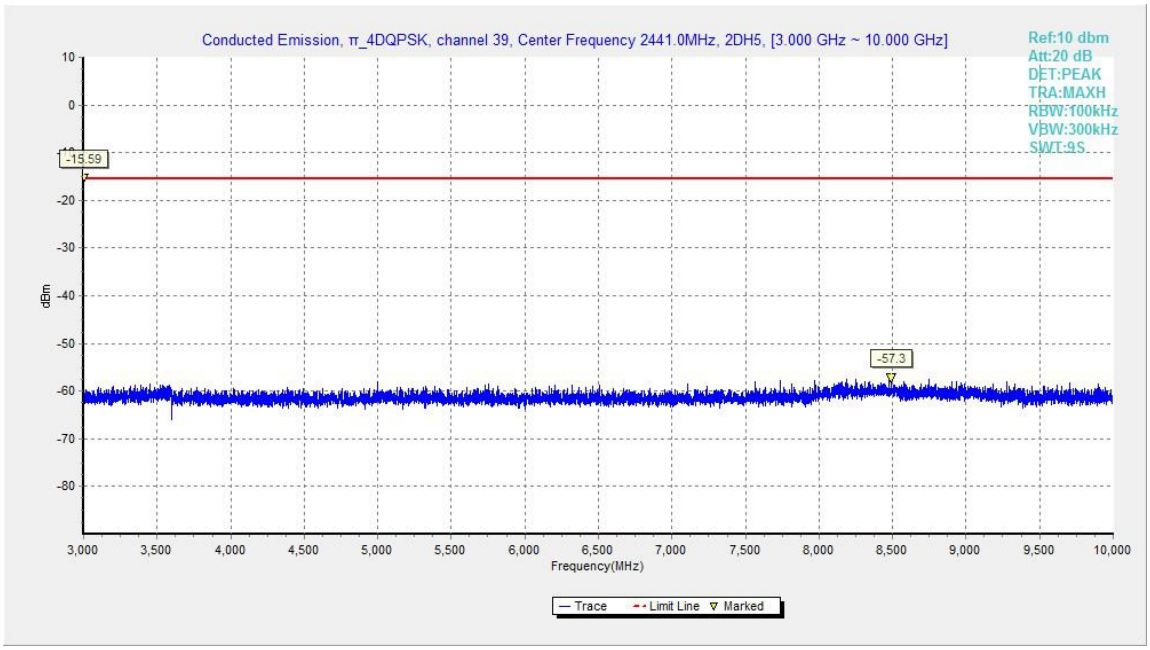


Fig.36. Conducted spurious emission: π/4 DQPSK, Channel 39, 3GHz - 10GHz

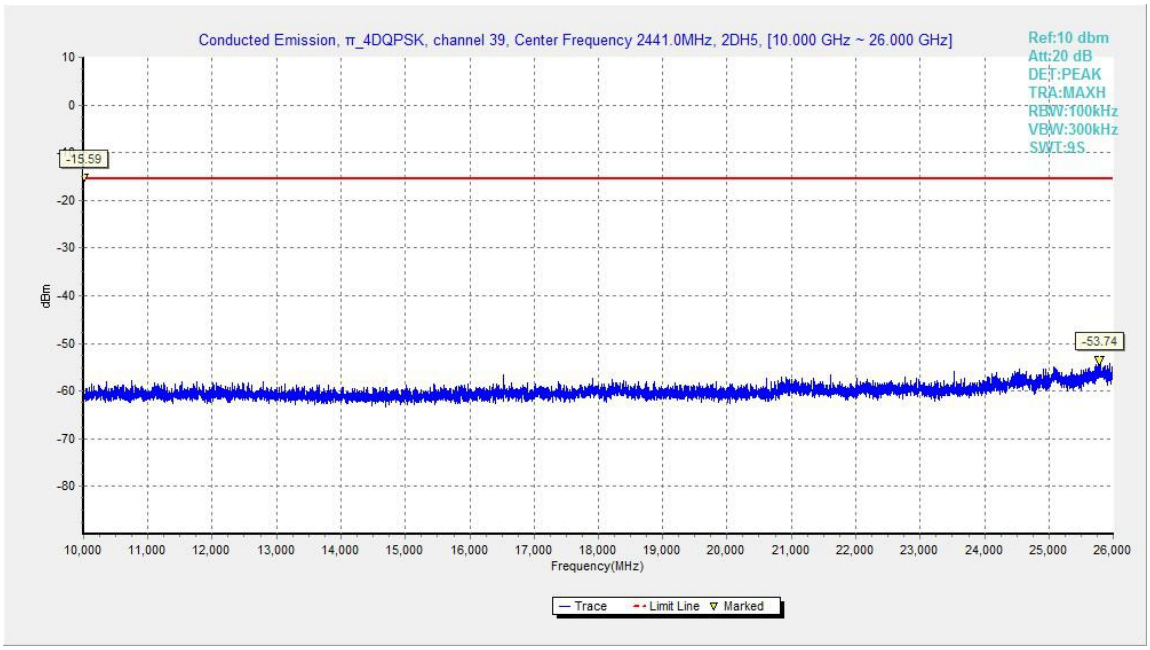


Fig.37. Conducted spurious emission: π/4 DQPSK, Channel 39, 10GHz – 26GHz

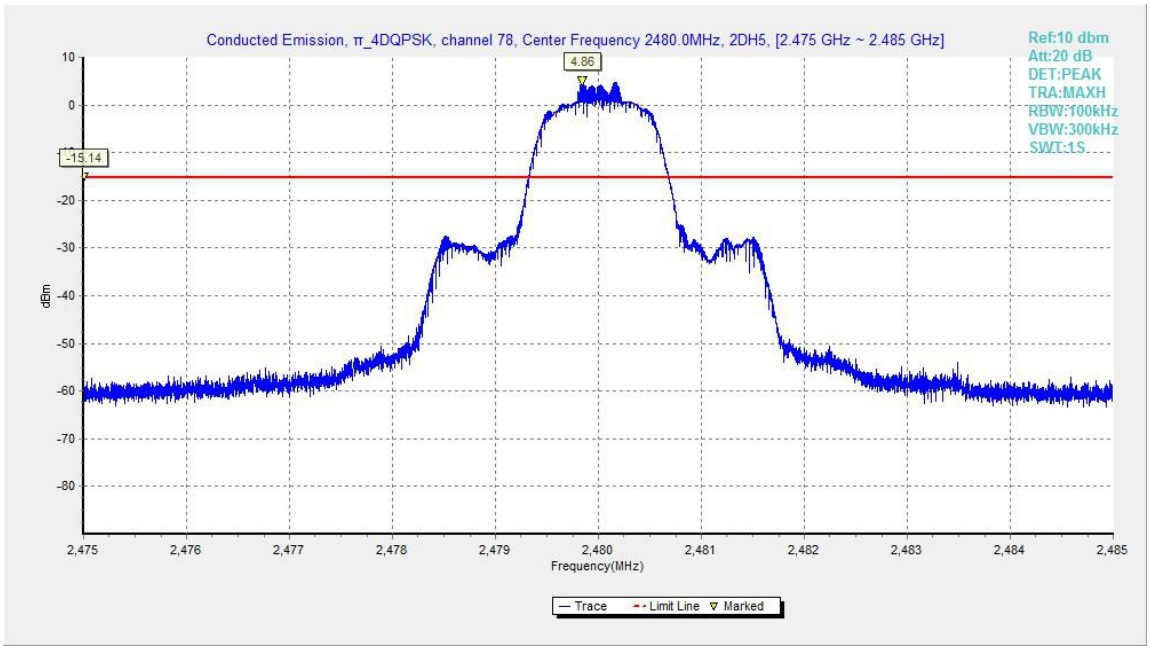


Fig.38. Conducted spurious emission: π/4 DQPSK, Channel 78, 2480MHz

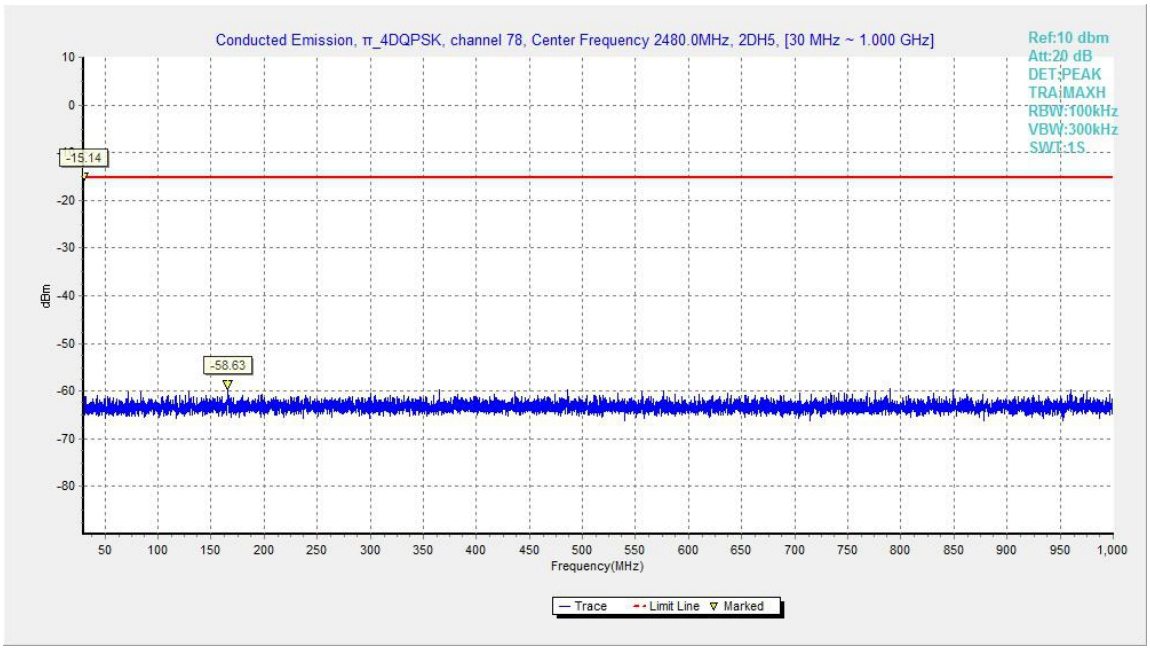


Fig.39. Conducted spurious emission: π/4 DQPSK, Channel 78, 30MHz - 1GHz

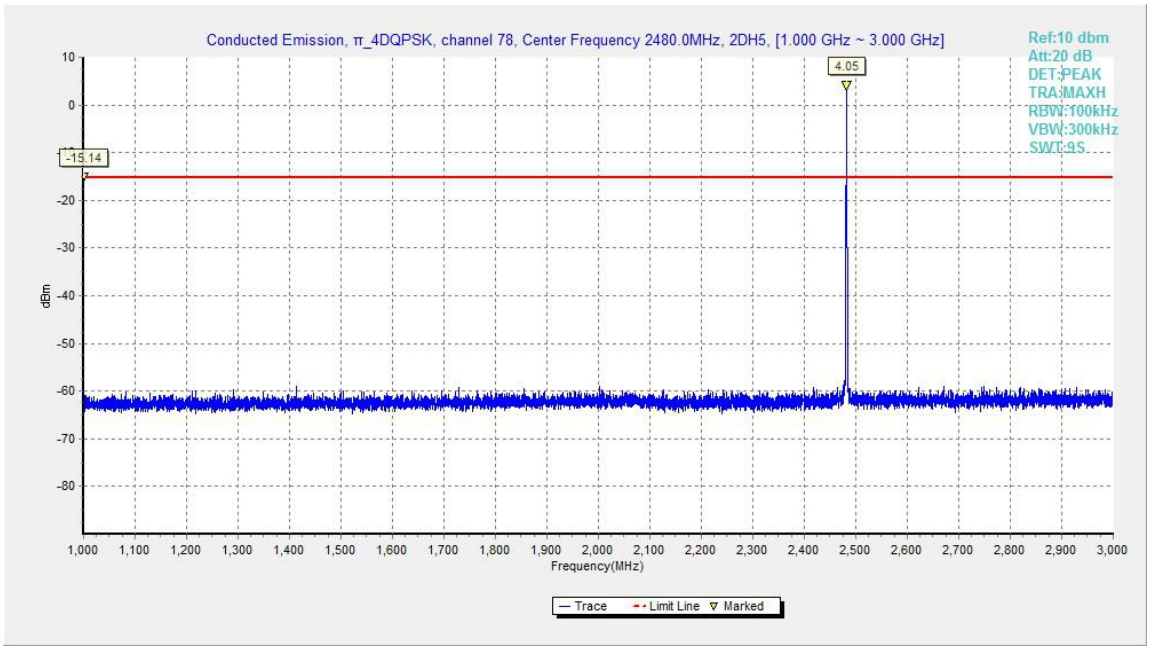


Fig.40. Conducted spurious emission: π/4 DQPSK, Channel 78, 1GHz - 3GHz

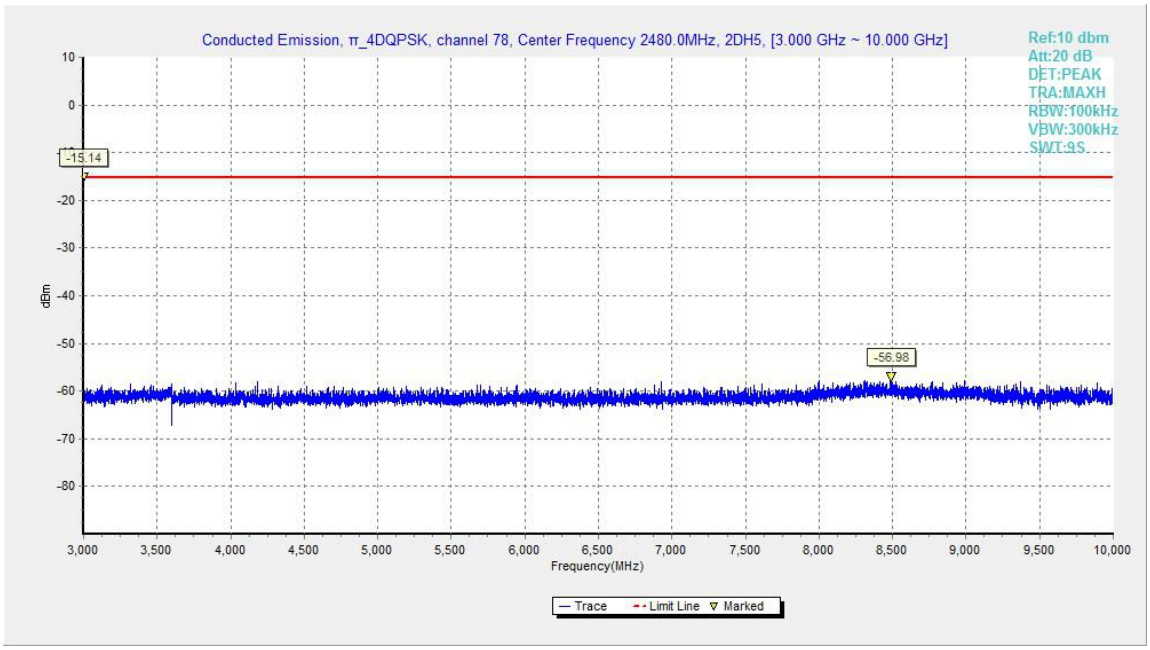


Fig.41. Conducted spurious emission: π/4 DQPSK, Channel 78, 3GHz - 10GHz

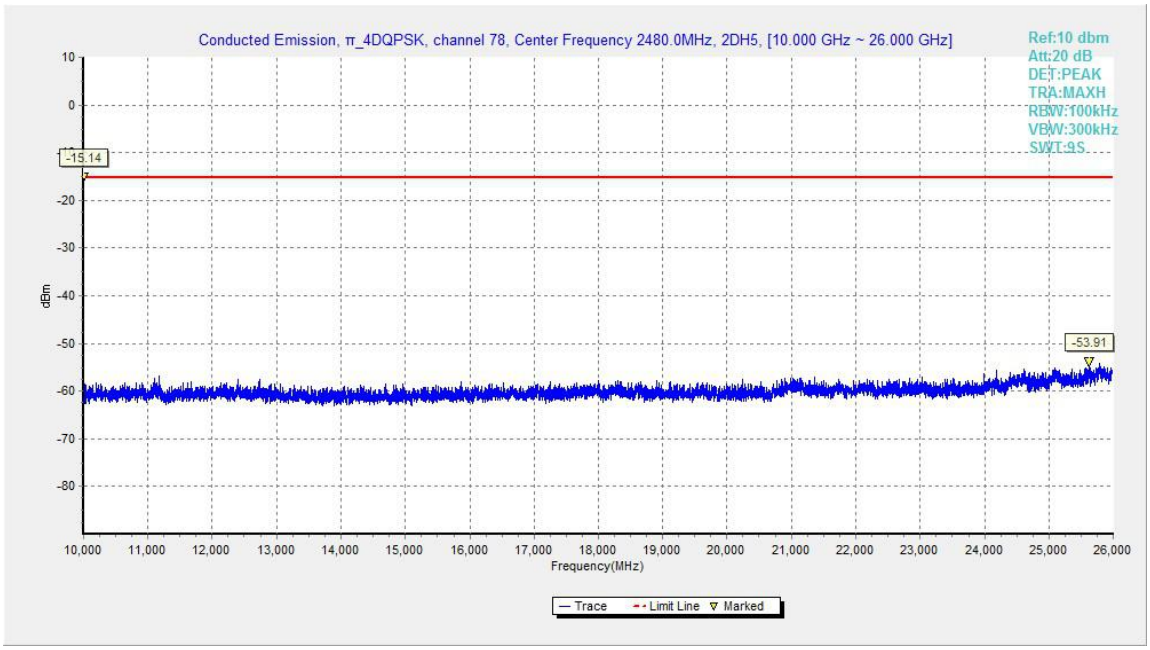


Fig.42. Conducted spurious emission: π/4 DQPSK, Channel 78, 10GHz - 26GHz

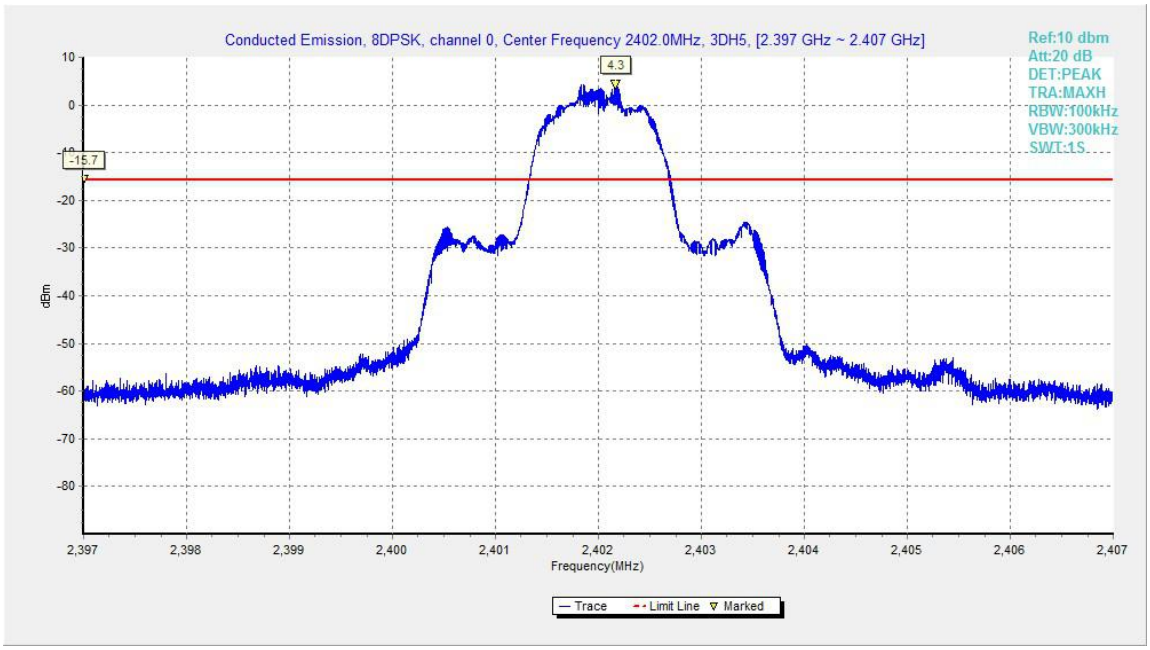


Fig.43. Conducted spurious emission: 8DPSK, Channel 0,2402MHz

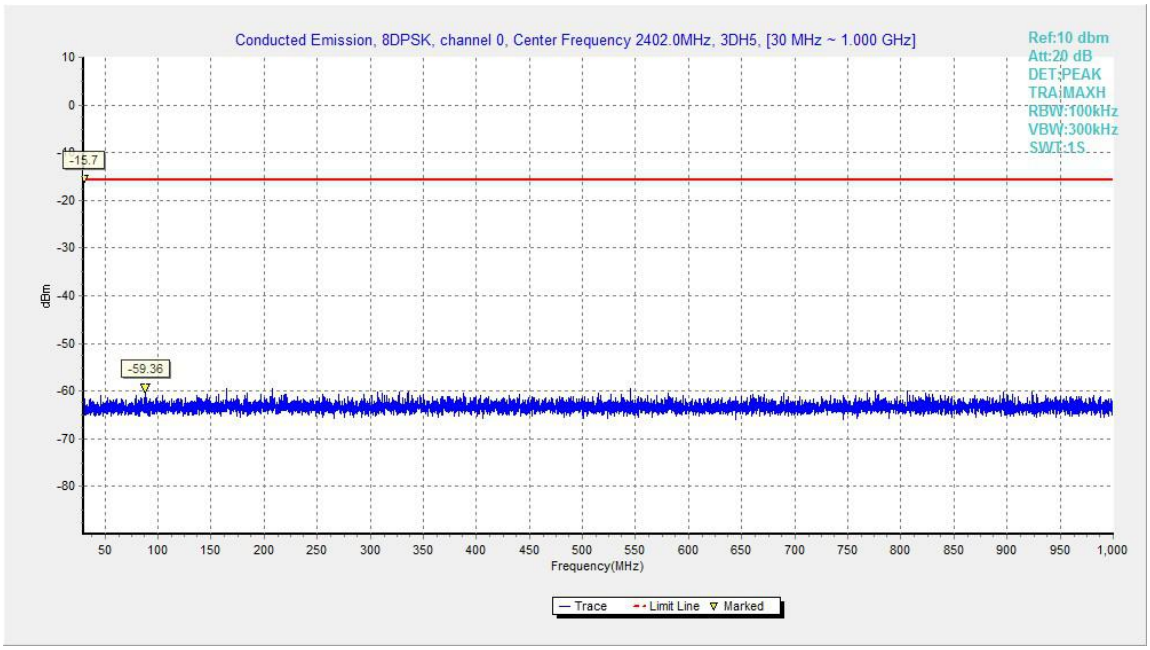


Fig.44. Conducted spurious emission: 8DPSK, Channel 0, 30MHz - 1GHz

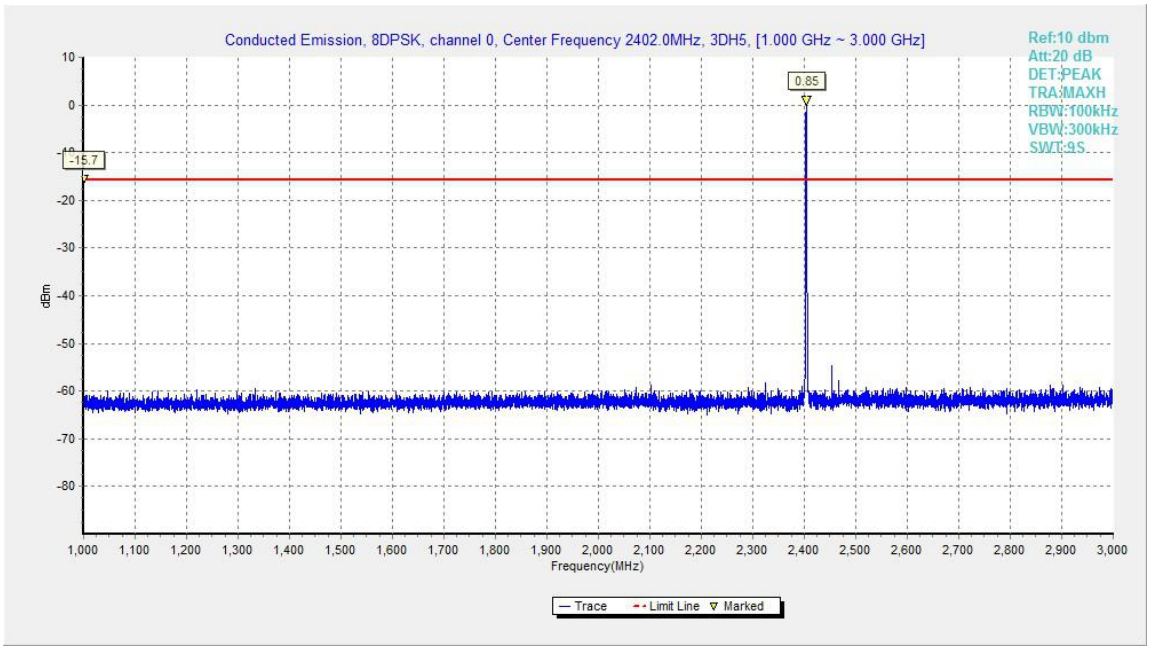


Fig.45. Conducted spurious emission: 8DPSK, Channel 0, 1GHz - 3GHz

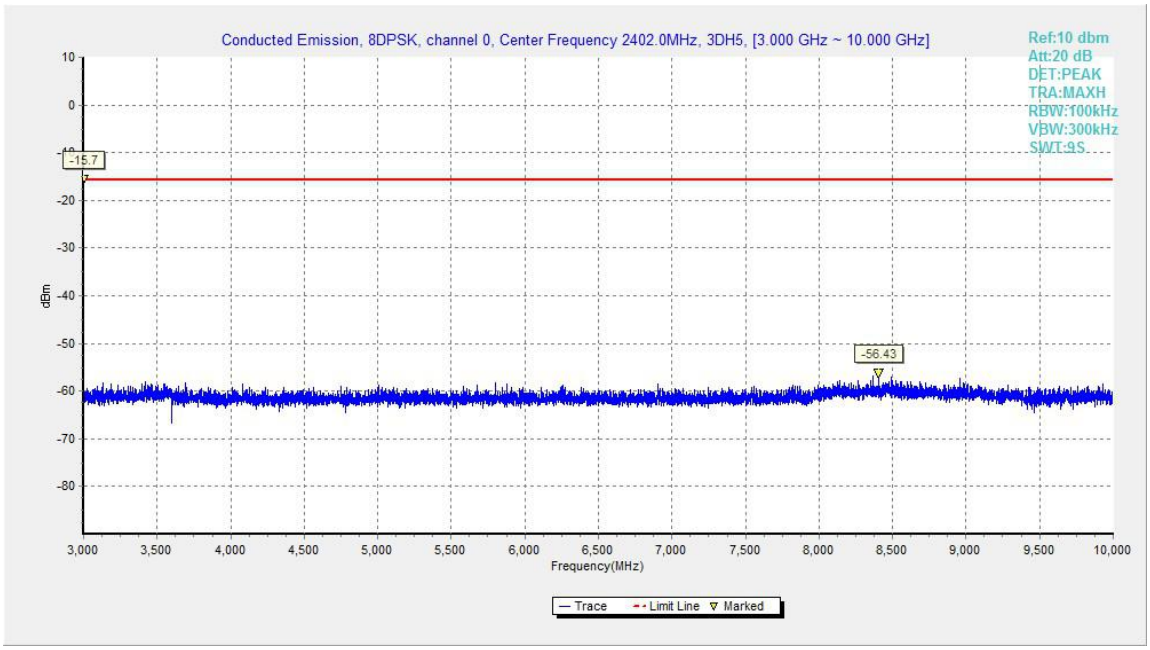


Fig.46. Conducted spurious emission: 8DPSK, Channel 0, 3GHz - 10GHz

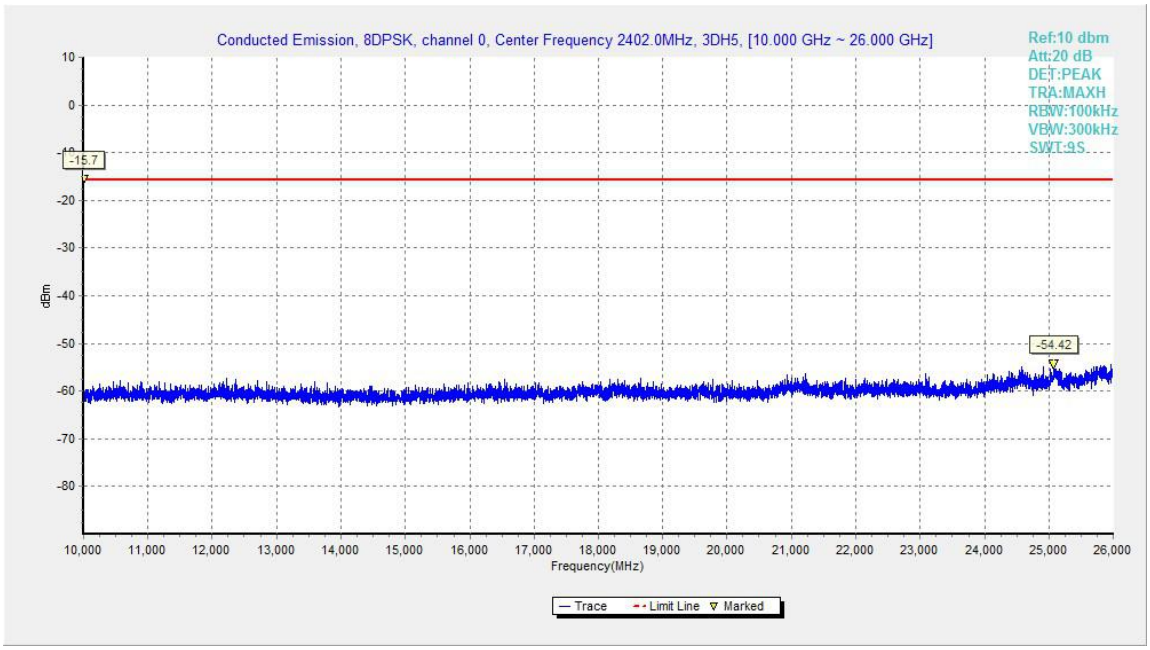


Fig.47. Conducted spurious emission: 8DPSK, Channel 0,10GHz - 26GHz

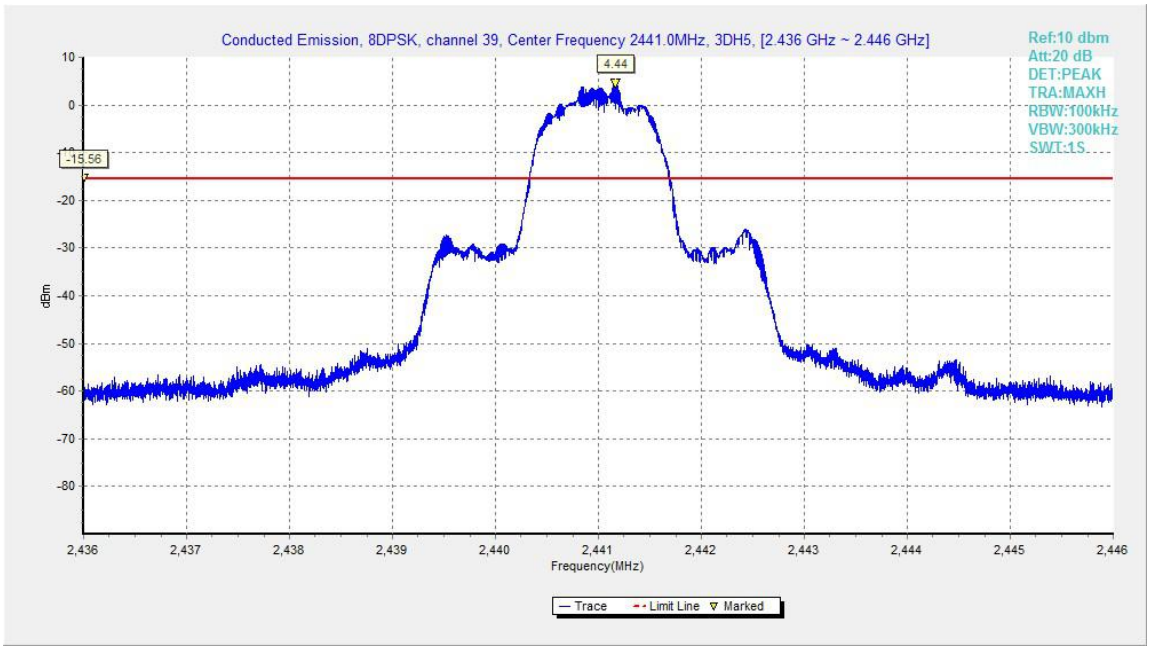


Fig.48. Conducted spurious emission: 8DPSK, Channel 39, 2441MHz

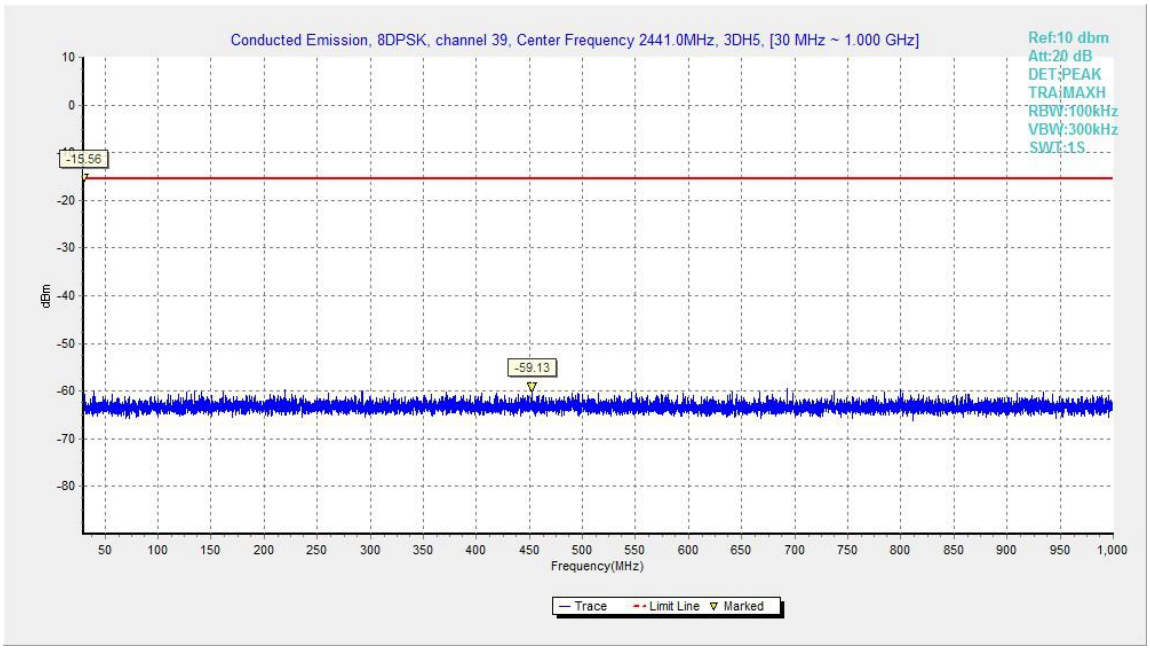


Fig.49. Conducted spurious emission: 8DPSK, Channel 39, 30MHz - 1GHz

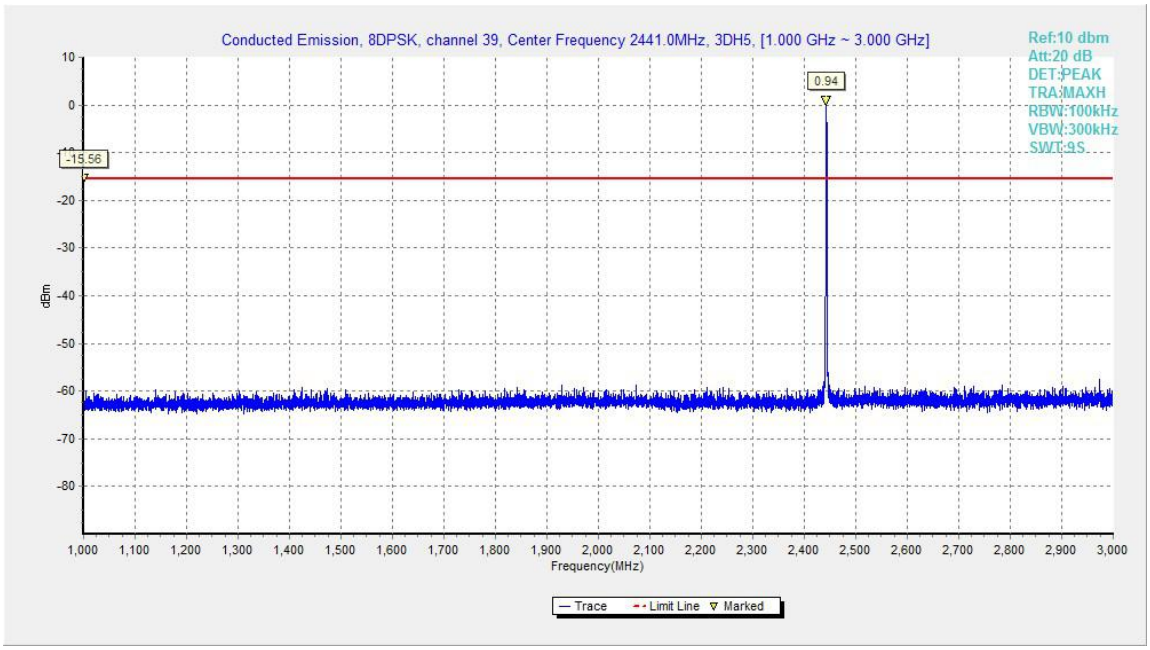


Fig.50. Conducted spurious emission: 8DPSK, Channel 39, 1GHz - 3GHz

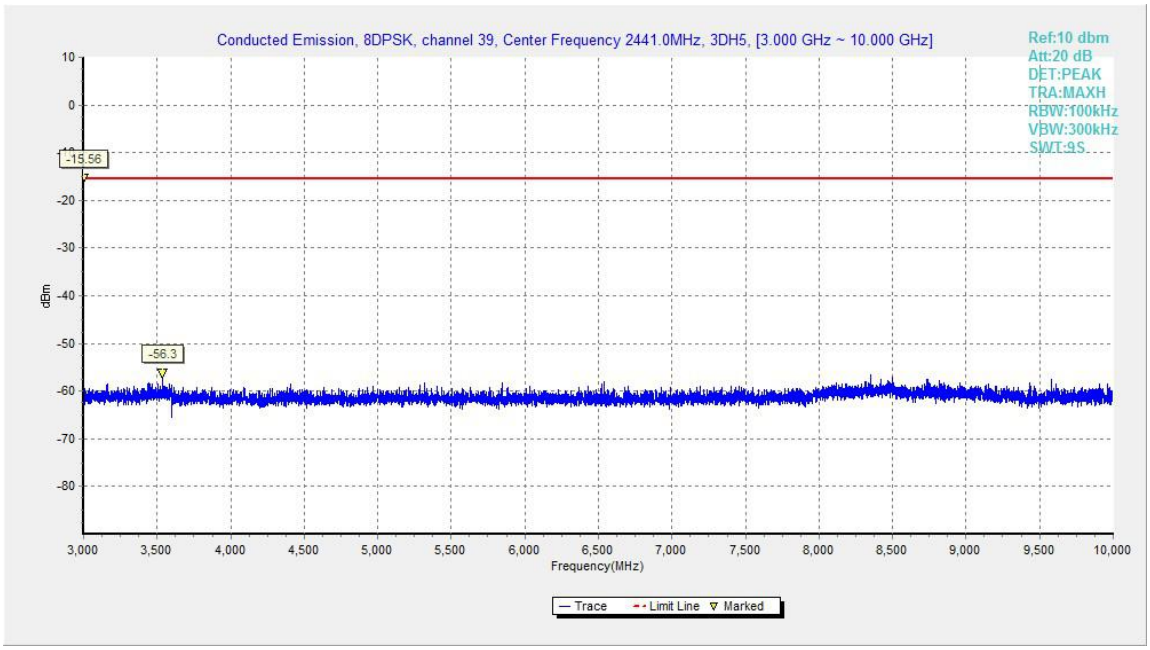


Fig.51. Conducted spurious emission: 8DPSK, Channel 39, 3GHz - 10GHz

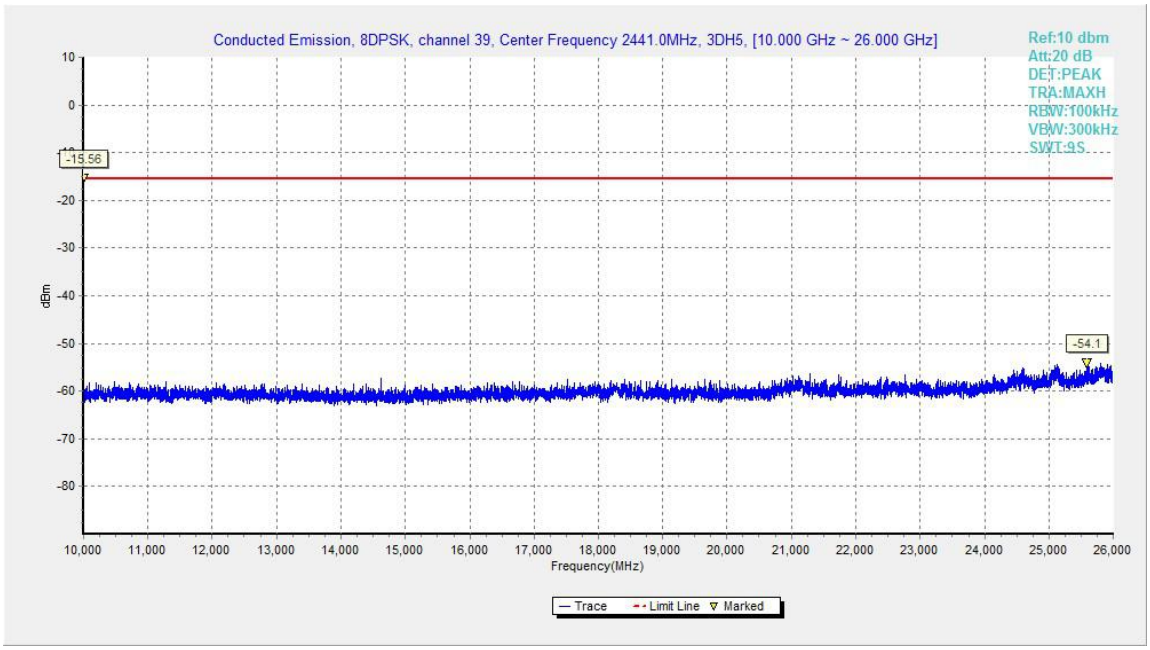


Fig.52. Conducted spurious emission: 8DPSK, Channel 39, 10GHz – 26GHz

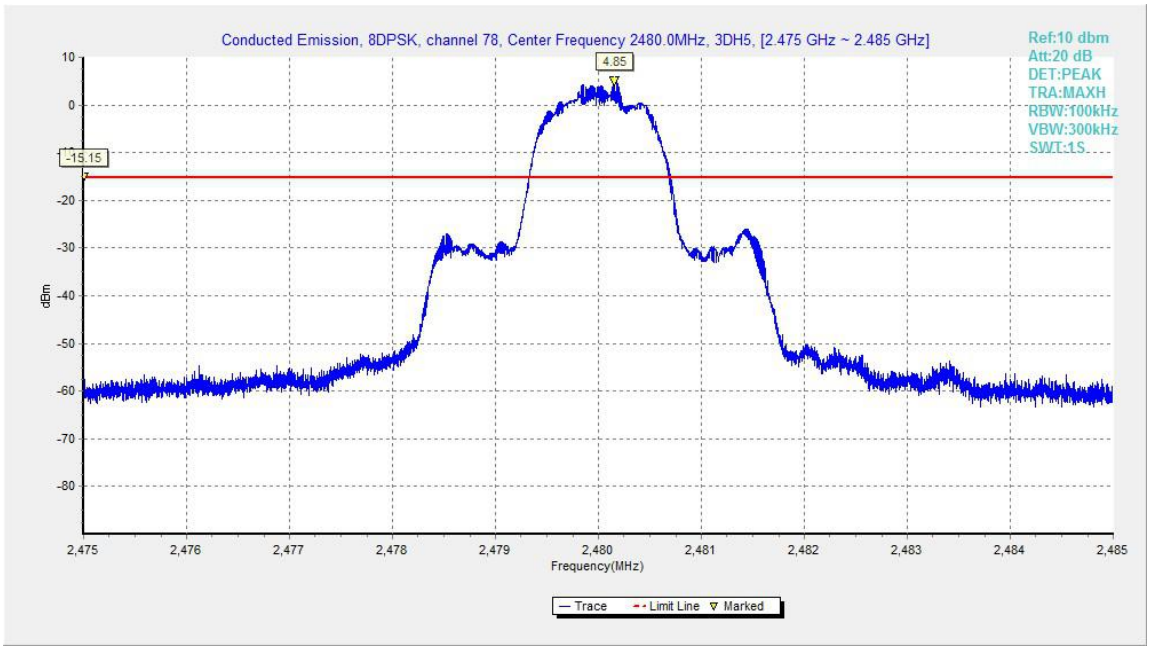


Fig.53. Conducted spurious emission: 8DPSK, Channel 78, 2480MHz

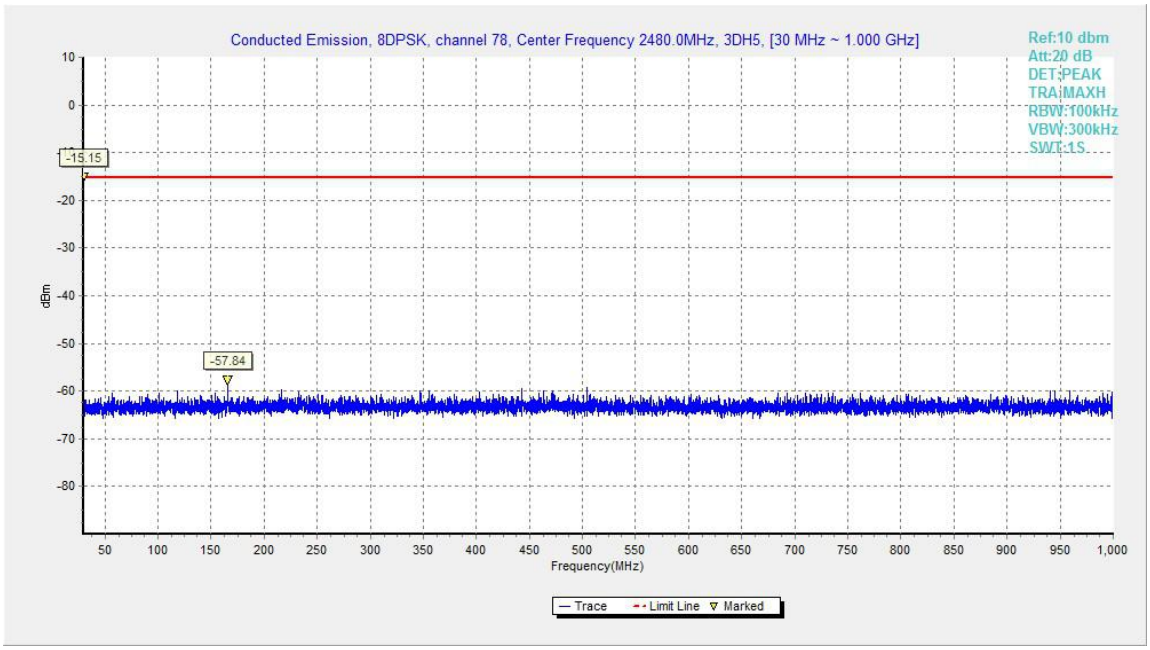


Fig.54. Conducted spurious emission: 8DPSK, Channel 78, 30MHz - 1GHz

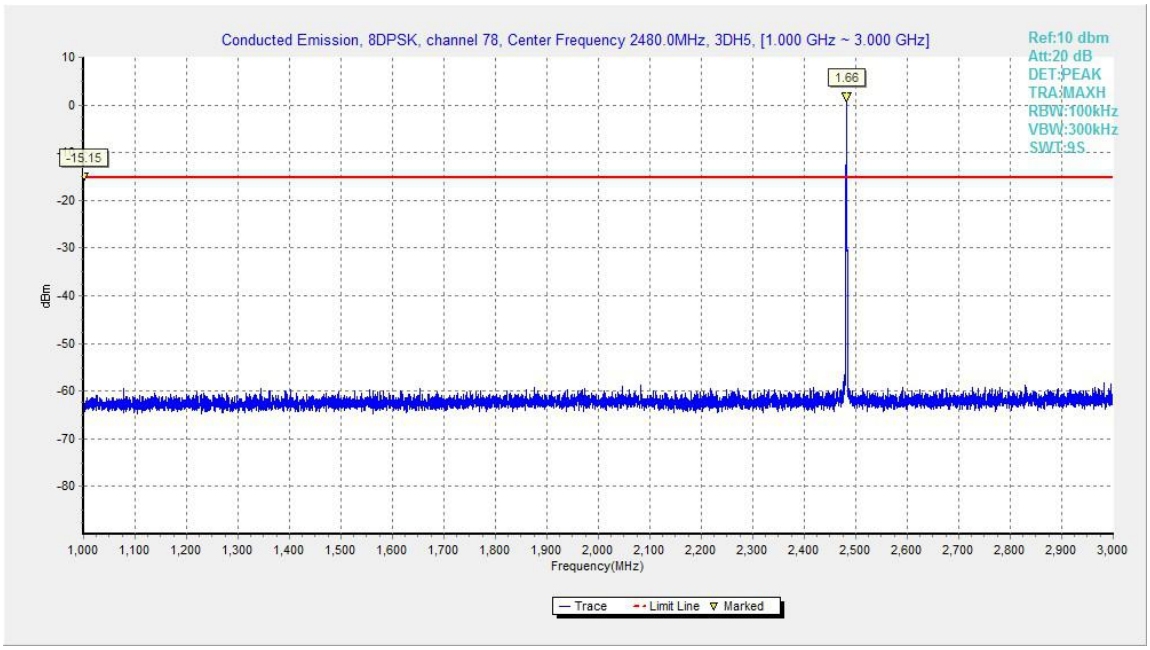


Fig.55. Conducted spurious emission: 8DPSK, Channel 78, 1GHz - 3GHz

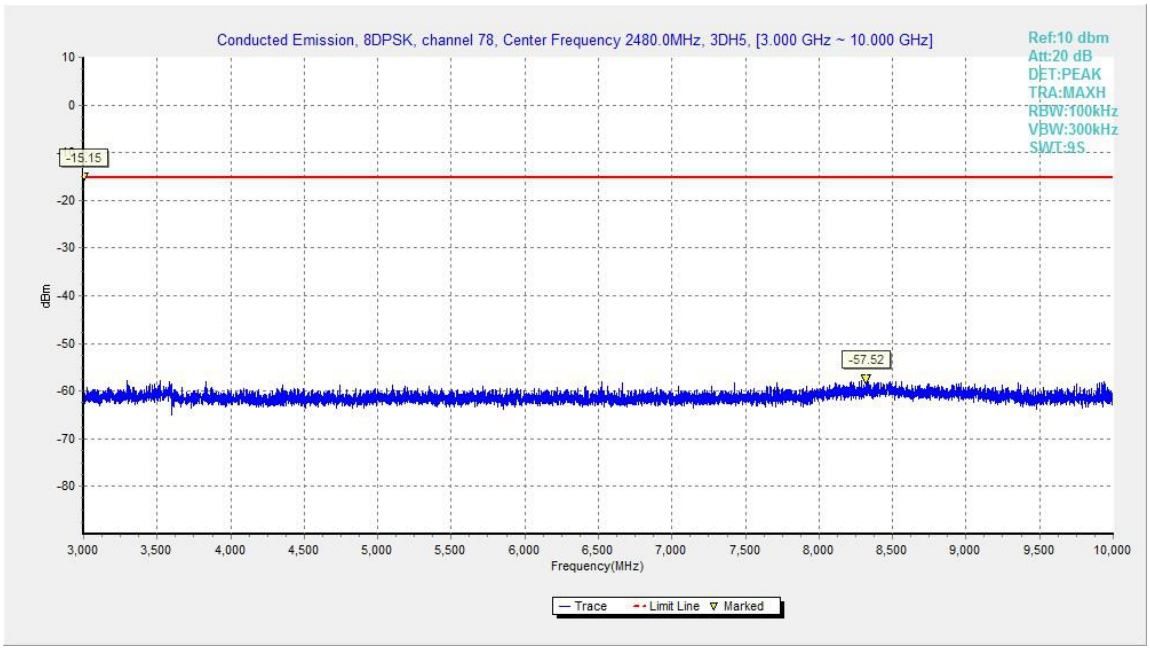


Fig.56. Conducted spurious emission: 8DPSK, Channel 78, 3GHz - 10GHz

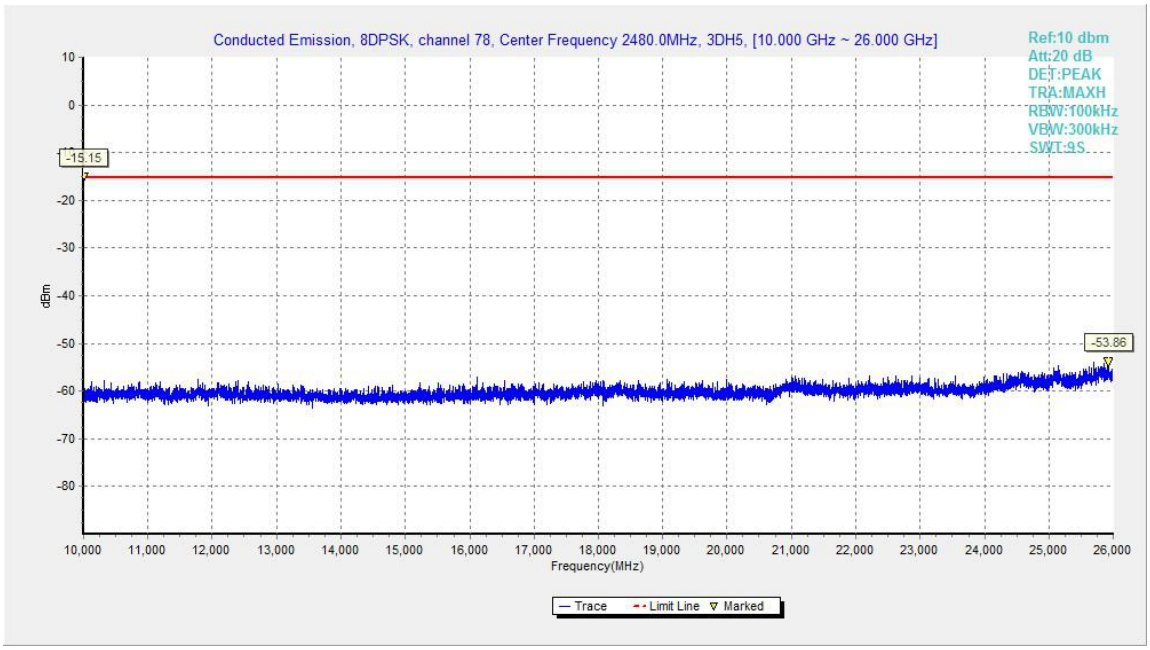


Fig.57. Conducted spurious emission: 8DPSK, Channel 78, 10GHz - 26GHz

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/1MHz	15
4000-18000	1MHz/1MHz	40
18000-26500	1MHz/1MHz	20

Measurement Results:

Result=P_{Mea}+ARPL

For GFSK

Channel	Frequency Range	Test Results	Conclusion
Power	2.38GHz~2.4GHz---L	Fig.58	P
Power	2.45GHz~2.5GHz---H	Fig.59	P

Forπ/4 DQPSK

Channel	Frequency Range	Test Results	Conclusion
Power	2.38GHz~2.4GHz---L	Fig.60	P
Power	2.45GHz~2.5GHz---H	Fig.61	P

For 8DPSK

Channel	Frequency Range	Test Results	Conclusion
Power	2.38GHz~2.4GHz---L	Fig.62	P
Power	2.45GHz~2.5GHz---H	Fig.63	P

GFSK Ch 0 - Average

Frequency (MHz)	Measurement Result (dBµV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBµV)	Limit (dBµV/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2387.000	46.40	2.9	32.0	11.57	54.0	7.6	H	155	20
2389.600	46.41	2.9	32.0	11.58	54.0	7.6	H	155	248
4804.500	33.16	-35.0	34.1	34.10	54.0	20.8	H	155	49
7206.000	37.40	-32.4	35.8	33.99	54.0	16.6	H	155	335
9607.500	40.87	-29.7	36.7	33.82	54.0	13.1	H	155	180
12010.500	42.27	-30.5	38.9	33.86	54.0	11.7	H	155	8

GFSK Ch 39 - Average

Frequency (MHz)	Measurement Result (dBµV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBµV)	Limit (dBµV/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2435.200	46.52	2.9	32.0	11.64	54.0	7.5	H	155	20
2448.700	46.49	2.9	32.0	11.60	54.0	7.5	H	155	248
4882.500	32.49	-35.5	34.1	33.94	54.0	21.5	H	155	49
7323.000	38.29	-31.3	35.8	33.80	54.0	15.7	H	155	335
9763.500	39.28	-31.4	36.9	33.76	54.0	14.7	H	155	180
12205.500	44.09	-28.9	39.0	33.96	54.0	9.9	H	155	8

GFSK Ch 78 - Average

Frequency (MHz)	Measurement Result (dBµV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBµV)	Limit (dBµV/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2483.600	47.12	2.9	32.0	12.20	54.0	6.9	H	155	4
2483.700	46.75	2.9	32.0	11.82	54.0	7.3	H	155	2
4960.500	33.34	-34.9	34.1	34.12	54.0	20.7	H	155	25
7440.000	37.47	-32.2	35.8	33.84	54.0	16.5	H	155	350
9919.500	41.20	-29.6	37.1	33.74	54.0	12.8	H	155	92
12400.500	43.35	-30.0	39.1	34.32	54.0	10.6	H	155	85

π/4 DQPSK Ch 0 - Average

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2386.000	46.34	2.9	32.0	11.52	54.0	7.7	H	155	20
2388.700	46.39	2.9	32.0	11.57	54.0	7.6	H	155	45
4804.500	33.09	-35.0	34.1	34.03	54.0	20.9	H	155	240
7206.000	39.37	-32.4	35.8	35.96	54.0	14.6	H	155	180
9607.500	40.78	-29.7	36.7	33.73	54.0	13.2	H	155	85
12010.500	42.17	-30.5	38.9	33.76	54.0	11.8	H	155	25

π/4 DQPSK Ch 39 - Average

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2435.800	46.45	2.9	32.0	11.58	54.0	7.5	H	155	170
2447.100	46.53	2.9	32.0	11.64	54.0	7.5	H	155	150
4882.500	32.65	-35.5	34.1	34.10	54.0	21.3	H	155	20
7323.000	38.28	-31.3	35.8	33.80	54.0	15.7	H	155	180
9763.500	39.15	-31.4	36.9	33.64	54.0	14.8	H	155	202
12205.500	44.05	-28.9	39.0	33.93	54.0	9.9	H	155	8

π/4 DQPSK Ch 78 - Average

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2483.500	46.66	2.9	32.0	11.73	54.0	7.3	H	155	175
2483.800	46.50	2.9	32.0	11.57	54.0	7.5	H	155	194
4960.500	33.51	-34.9	34.1	34.29	54.0	20.5	H	155	215
7440.000	37.39	-32.2	35.8	33.77	54.0	16.6	H	155	196
9919.500	41.18	-29.6	37.1	33.72	54.0	12.8	H	155	241
12400.500	43.32	-30.0	39.1	34.28	54.0	10.7	H	155	259

8DPSK Ch 0 - Average

Frequency (MHz)	Measurement Result (dBµV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBµV)	Limit (dBµV/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2386.900	46.33	2.9	32.0	11.50	54.0	7.7	H	155	25
2388.400	46.40	2.9	32.0	11.58	54.0	7.6	H	155	49
4882.000	33.24	-35.5	34.1	34.69	54.0	20.8	H	155	4
7323.000	39.44	-31.3	35.8	34.95	54.0	14.6	H	155	6
9764.000	40.85	-31.4	36.9	35.34	54.0	13.1	H	155	25
12205.000	42.33	-28.8	39.0	32.19	54.0	11.7	H	155	186

8DPSK Ch 39 - Average

Frequency (MHz)	Measurement Result (dBµV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBµV)	Limit (dBµV/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2436.300	46.51	2.9	32.0	11.64	54.0	7.5	H	155	6
2445.700	46.49	2.9	32.0	11.61	54.0	7.5	H	155	48
4882.000	32.72	-35.5	34.1	34.17	54.0	21.3	H	155	92
7323.000	38.37	-31.3	35.8	33.89	54.0	15.6	H	155	48
9764.000	39.33	-31.4	36.9	33.81	54.0	14.7	H	155	68
12205.000	44.12	-28.8	39.0	33.98	54.0	9.9	H	155	92

8DPSK Ch 78 - Average

Frequency (MHz)	Measurement Result (dBµV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBµV)	Limit (dBµV/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2483.500	47.05	2.9	32.0	12.12	54.0	7.0	H	155	135
2483.800	46.68	2.9	32.0	11.75	54.0	7.3	H	155	160
4960.000	33.49	-34.9	34.1	34.28	54.0	20.5	H	155	92
7440.000	37.46	-32.2	35.8	33.83	54.0	16.5	H	155	115
9920.000	42.04	-29.7	37.1	34.59	54.0	12.0	H	155	112
12400.000	44.00	-30.0	39.1	34.98	54.0	10.0	H	155	85

GFSK Ch 0 – Peak

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2355.570	60.32	2.8	31.9	25.5	74.0	13.7	H	155	22
2384.144	60.58	2.9	32.0	25.8	74.0	13.4	H	155	242
4804.000	41.67	-35.0	34.1	42.6	74.0	32.3	V	155	44
7206.000	43.84	-32.4	35.8	40.4	74.0	30.2	H	155	330
9608.000	47.63	-29.7	36.7	40.6	74.0	26.4	H	155	176
12010.000	47.46	-30.5	38.9	39.0	74.0	26.5	H	155	0

GFSK Ch 39 - Peak

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2365.800	48.16	-27.2	32.0	43.5	74.0	25.8	H	155	22
2508.800	48.32	-26.5	32.0	42.8	74.0	25.7	H	155	242
4882.000	39.45	-35.5	34.1	40.9	74.0	34.6	V	155	44
7323.000	45.36	-31.3	35.8	40.9	74.0	28.6	H	155	330
9764.000	44.39	-31.4	36.9	38.9	74.0	29.6	H	155	176
12205.000	47.00	-28.8	39.0	36.9	74.0	27.0	H	155	0

GFSK Ch 78 - Peak

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2489.450	60.28	2.9	32.0	25.3	74.0	13.7	H	155	0
2498.460	60.76	2.9	32.0	25.8	74.0	13.2	H	155	0
4960.000	40.25	-34.9	34.1	41.0	74.0	33.7	V	155	22
7440.000	43.44	-32.2	35.8	39.8	74.0	30.6	V	155	352
9920.000	45.48	-29.7	37.1	38.0	74.0	28.5	V	155	88
12400.000	45.95	-30.0	39.1	36.9	74.0	28.1	V	155	88

π/4 DQPSK Ch 0 - Peak

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2378.712	60.23	2.9	32.0	25.42	74.0	13.8	H	155	22
2382.198	60.33	2.9	32.0	25.51	74.0	13.7	H	155	44
4882.000	40.31	-35.5	34.1	41.75	74.0	33.7	H	155	242
7323.000	44.11	-31.3	35.8	39.62	74.0	29.9	H	155	176
9764.000	44.64	-31.4	36.9	39.13	74.0	29.4	H	155	88
12205.000	47.55	-28.8	39.0	37.42	74.0	26.4	V	155	22

π/4 DQPSK Ch 39 - Peak

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2357.400	48.06	-27.7	31.9	43.78	74.0	25.9	H	155	176
2511.600	48.41	-26.5	32.0	42.93	74.0	25.6	H	155	154
4882.000	40.03	-35.5	34.1	41.48	74.0	34.0	V	155	22
7323.000	45.86	-31.3	35.8	41.38	74.0	28.1	V	155	176
9764.000	45.75	-31.4	36.9	40.23	74.0	28.3	H	155	198
12205.000	48.90	-28.8	39.0	38.76	74.0	25.1	H	155	0

π/4 DQPSK Ch 78 - Peak

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2484.170	61.07	2.9	32.0	26.14	74.0	12.9	V	155	176
2491.980	60.88	2.9	32.0	25.95	74.0	13.1	H	155	198
4960.000	42.84	-34.9	34.1	43.63	74.0	31.2	V	155	220
7440.000	43.77	-32.2	35.8	40.15	74.0	30.2	H	155	198
9920.000	45.61	-29.7	37.1	38.17	74.0	28.4	H	155	242
12400.000	48.11	-30.0	39.1	39.08	74.0	25.9	V	155	264

8DPSK Ch 0 - Peak

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2377.004	60.58	2.9	32.0	25.77	74.0	13.4	H	155	22
2384.452	60.02	2.9	32.0	25.20	74.0	14.0	V	155	44
4882.000	42.25	-35.5	34.1	43.69	74.0	31.8	H	155	0
7323.000	45.23	-31.3	35.8	40.74	74.0	28.8	H	155	0
9764.000	46.31	-31.4	36.9	40.79	74.0	27.7	H	155	22
12205.000	46.62	-28.8	39.0	36.48	74.0	27.4	H	155	176

8DPSK Ch 39 - Peak

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2362.400	47.96	-27.4	31.9	43.45	74.0	26.0	H	155	0
2504.800	48.12	-26.4	32.0	42.48	74.0	25.9	H	155	44
4882.000	41.65	-35.5	34.1	43.09	74.0	32.4	V	155	88
7323.000	45.32	-31.3	35.8	40.84	74.0	28.7	V	155	44
9764.000	45.89	-31.4	36.9	40.38	74.0	28.1	V	155	66
12205.000	47.92	-28.8	39.0	37.78	74.0	26.1	H	155	88

8DPSK Ch 78 - Peak

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2484.560	60.23	2.9	32.0	25.30	74.0	13.8	H	155	132
2492.110	60.38	2.9	32.0	25.45	74.0	13.6	H	155	154
4960.000	41.99	-34.9	34.1	42.77	74.0	32.0	V	155	88
7440.000	44.01	-32.2	35.8	40.38	74.0	30.0	H	155	110
9920.000	46.86	-29.7	37.1	39.41	74.0	27.1	V	155	110
12400.000	47.53	-30.0	39.1	38.50	74.0	26.5	V	155	88

Conclusion: PASS

Test graphs as below for Set.10:

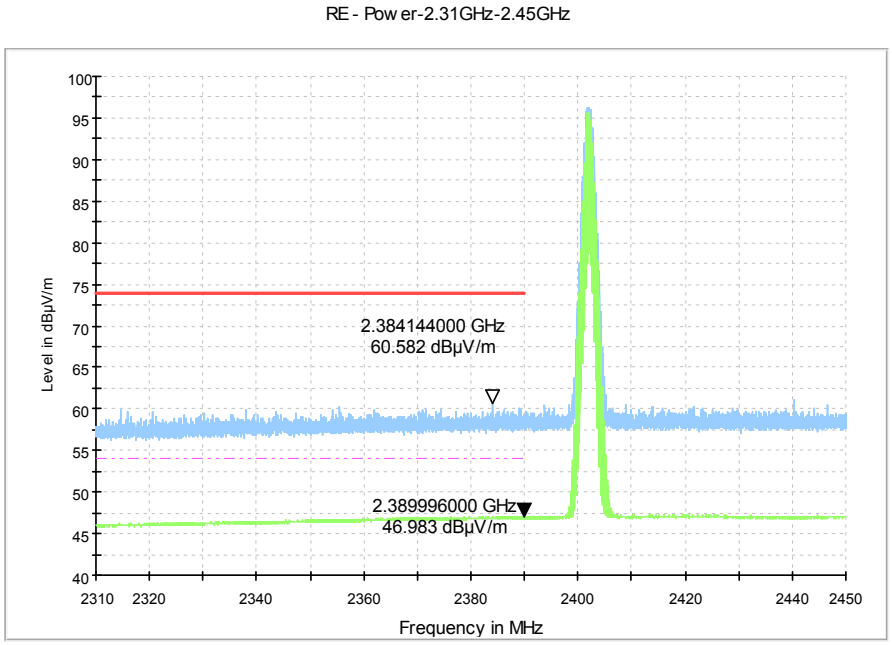


Fig.58. Radiated emission (Power): GFSK, low channel

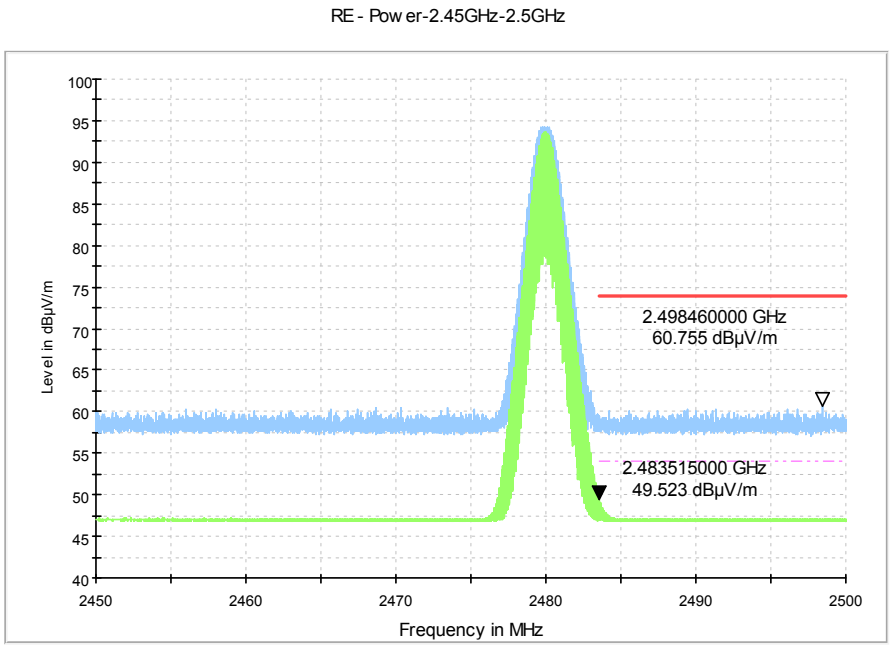


Fig.59. Radiated emission (Power) GFSK, high channel

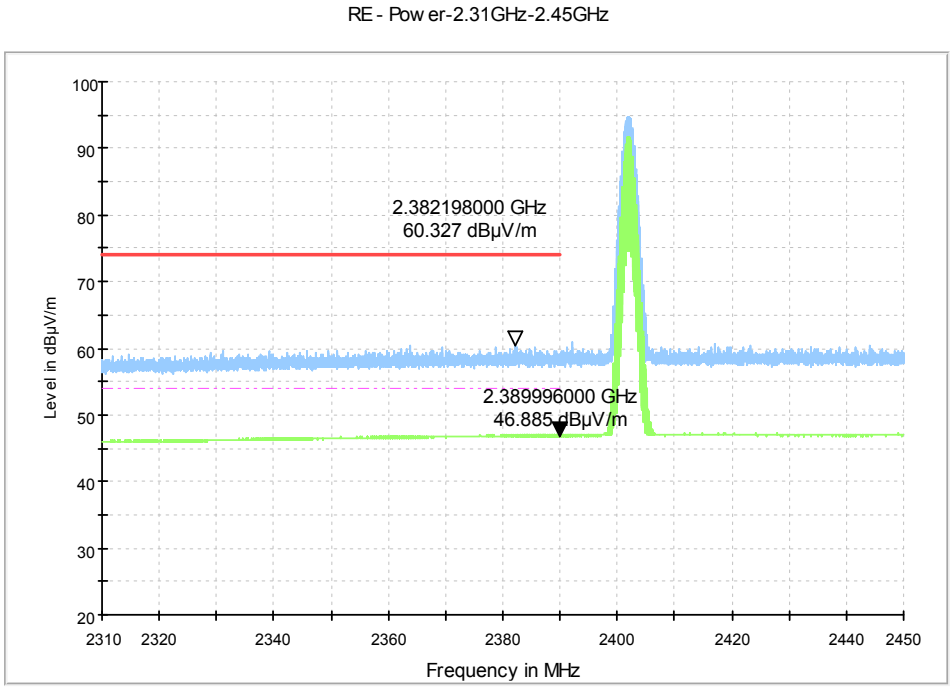


Fig.60. Radiated emission (Power): π/4 DQPSK, low channel

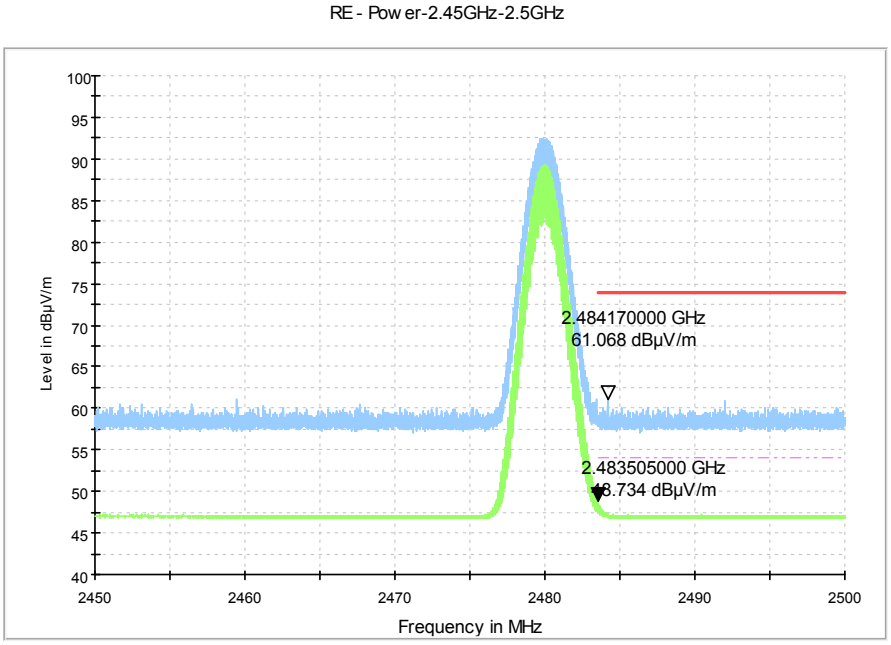


Fig.61. Radiated emission (Power): π/4 DQPSK, high channel

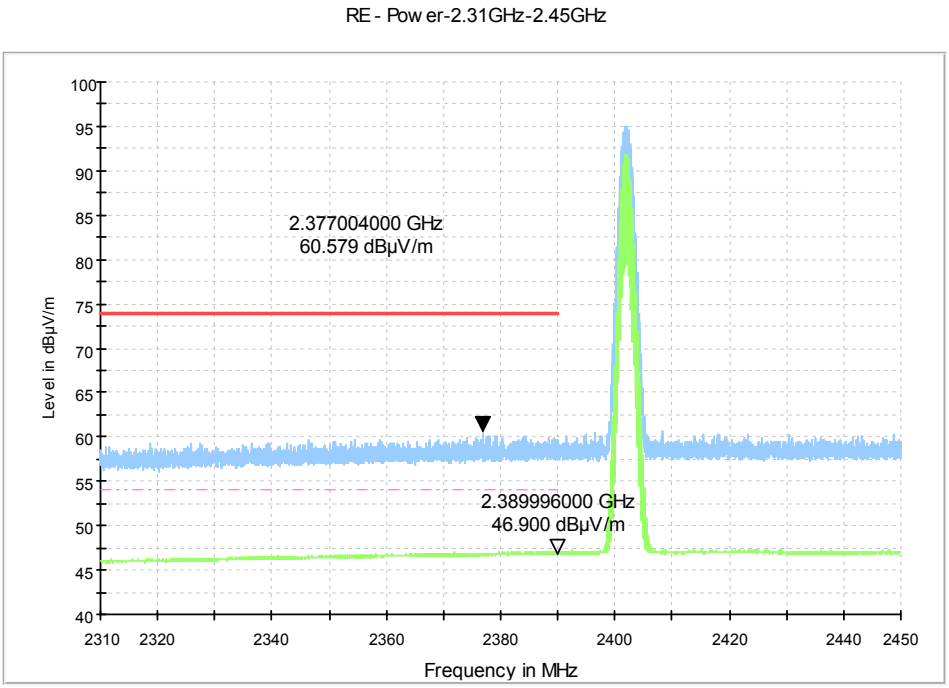


Fig.62. Radiated emission (Power): 8DPSK, low channel

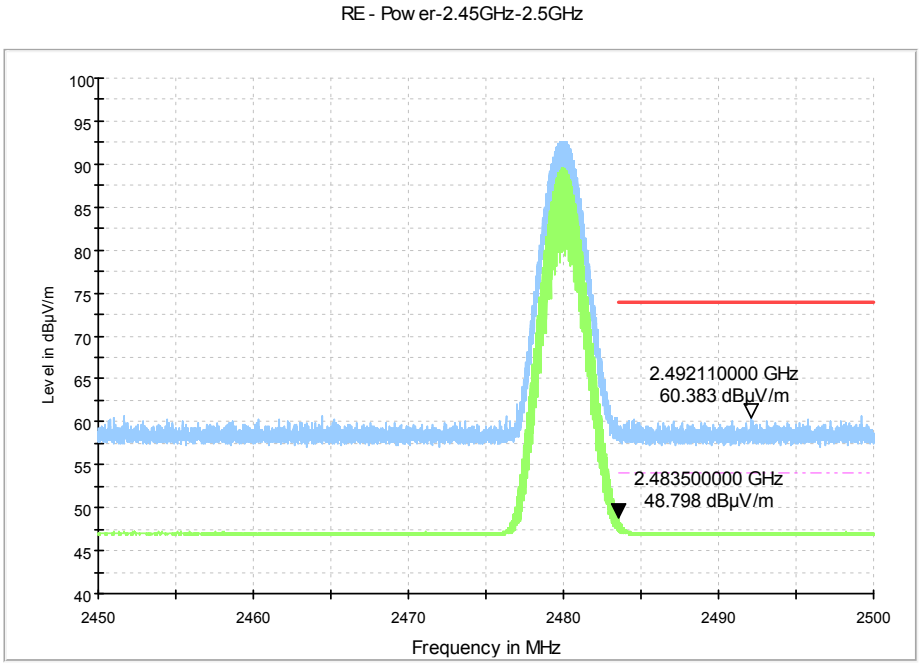


Fig.63. Radiated emission (Power): 8DPSK, high channel

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	Dwell Time (ms)		Conclusion
39	DH1	Fig.64	120.43	P
		Fig.65		
	DH3	Fig.66	158.45	P
		Fig.67		
	DH5	Fig.68	181.54	P
		Fig.69		

For π/4 DQPSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.70	122.69	P
		Fig.71		
	DH3	Fig.72	183.32	P
		Fig.73		
	DH5	Fig.74	123.41	P
		Fig.75		

For 8DPSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.76	122.62	P
		Fig.77		
	DH3	Fig.78	156.15	P
		Fig.79		