



FCC PART 15C TEST REPORT

No. I19Z61572-IOT01

for
TCL Communication Ltd.

UMTS/GSM mobile phone

Model Name: 3078A

FCC ID: 2ACCJH108

with

Hardware Version: PIO

Software Version: V1.0

Issued Date: 2019-9-11



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.caict.ac.cn



REPORT HISTORY

Report Number	Revision	Description	Issue Date
I19Z61572-IOT01	Rev.0	1st edition	2019-9-11

CONTENTS

1. TEST LABORATORY.....	5
1.1. INTRODUCTION & ACCREDITATION.....	5
1.2. TESTING LOCATION.....	5
1.3. TESTING ENVIRONMENT.....	6
1.4. PROJECT DATA.....	6
1.5. SIGNATURE.....	6
2. CLIENT INFORMATION.....	7
2.1. APPLICANT INFORMATION.....	7
2.2. MANUFACTURER INFORMATION.....	7
3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARY EQUIPMENT (AE).....	8
3.1. ABOUT EUT.....	8
3.2. INTERNAL IDENTIFICATION OF EUT.....	8
3.3. INTERNAL IDENTIFICATION OF AE.....	8
3.4. NORMAL ACCESSORY SETTING.....	8
3.5. GENERAL DESCRIPTION.....	9
3.6. EUT SET-UPS.....	9
4. REFERENCE DOCUMENTS.....	10
4.1. DOCUMENTS SUPPLIED BY APPLICANT.....	10
4.2. REFERENCE DOCUMENTS FOR TESTING.....	10
5. TEST RESULTS.....	11
5.1. SUMMARY OF TEST RESULTS.....	11
5.2. STATEMENTS.....	11
5.3. EXPLANATION OF RE-USE OF TEST DATA.....	11
6. TEST FACILITIES UTILIZED.....	12
7. MEASUREMENT UNCERTAINTY.....	13
7.1. PEAK OUTPUT POWER - CONDUCTED.....	13
7.2. FREQUENCY BAND EDGES.....	13
7.3. TRANSMITTER SPURIOUS EMISSION - CONDUCTED.....	13
7.4. TRANSMITTER SPURIOUS EMISSION - RADIATED.....	13
7.5. TIME OF OCCUPANCY (DWELL TIME).....	13
7.6. 20dB BANDWIDTH.....	13
7.7. CARRIER FREQUENCY SEPARATION.....	14
7.8. AC POWERLINE CONDUCTED EMISSION.....	14
ANNEX A: DETAILED TEST RESULTS.....	15
A.1. MEASUREMENT METHOD.....	15
A.2. PEAK OUTPUT POWER – CONDUCTED.....	16



A.3. FREQUENCY BAND EDGES – CONDUCTED.....	18
A.4. TRANSMITTER SPURIOUS EMISSION - CONDUCTED.....	25
A.5. TRANSMITTER SPURIOUS EMISSION - RADIATED.....	50
A.6. TIME OF OCCUPANCY (DWELL TIME).....	60
A.7. 20dB BANDWIDTH.....	70
A.8. CARRIER FREQUENCY SEPARATION.....	76
A.9. NUMBER OF HOPPING CHANNELS.....	79
A.10. AC POWERLINE CONDUCTED EMISSION.....	83
ANNEX E: ACCREDITATION CERTIFICATE.....	88



1. Test Laboratory

1.1. Introduction &Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2005 accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code 600118-0, 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. China 100191

Radiated testing Location: CTTL(BDA)

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

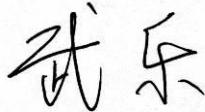
1.3. Testing Environment

Normal Temperature: 15-35°C
Relative Humidity: 20-75%

1.4. Project data

Testing Start Date: 2019-8-1
Testing End Date: 2019-9-5

1.5. Signature



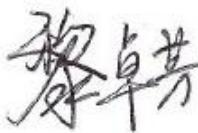
Wu Le

(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: 0086-755-36612000-81722

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: 0086-755-36612000-81722

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

3.1. About EUT

Description	UMTS/GSM mobile phone
Model Name	3078A
FCC ID	2ACCJH108
Frequency Band	ISM 2400MHz~2483.5MHz
Type of Modulation	GFSK/ $\pi/4$ 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	/	PIO	V1.0
EUT3	358937100000356	PIO	V1.0

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

3.3. Internal Identification of AE

AE ID*	Description	Note
AE1	Battery	inbuilt
AE3	Charger	CH004
AE4	Charger	CH001
AE1		
Model	CAB1000012CA	
Manufacturer	TIANMAO	
Capacitance	1000mAh	
Nominal voltage	4.2V	
AE3		
Model	CBA0066AGAC5	
Manufacturer	PUAN	
Length of cable	/	
AE4		
Model	CBA0066AGAC7	
Manufacturer	CHENYANG	
Length of cable	/	

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

3.4. Normal Accessory setting

Fully charged battery should be used during the test.

3.5. General Description

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

3.6. EUT set-ups

EUT set-up No.	Combination of EUT and AE	Remarks
Set.3	EUT2+ AE1+ AE3	Charger
Set.4	EUT2+ AE1+ AE4	Charger

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 3078A(FCC ID: 2ACCJH108) is a variant product of 3078G(FCC ID: 2ACCJH109), 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. I19Z61432-IOT01. 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	101459	Rohde & Schwarz	1 year	2020-04-10
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	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
-------------------------------	--------

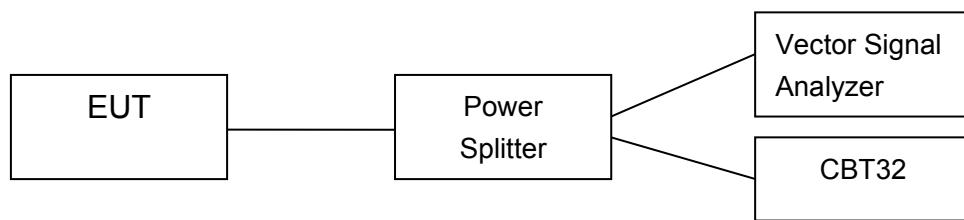
ANNEX A: Detailed Test Results

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

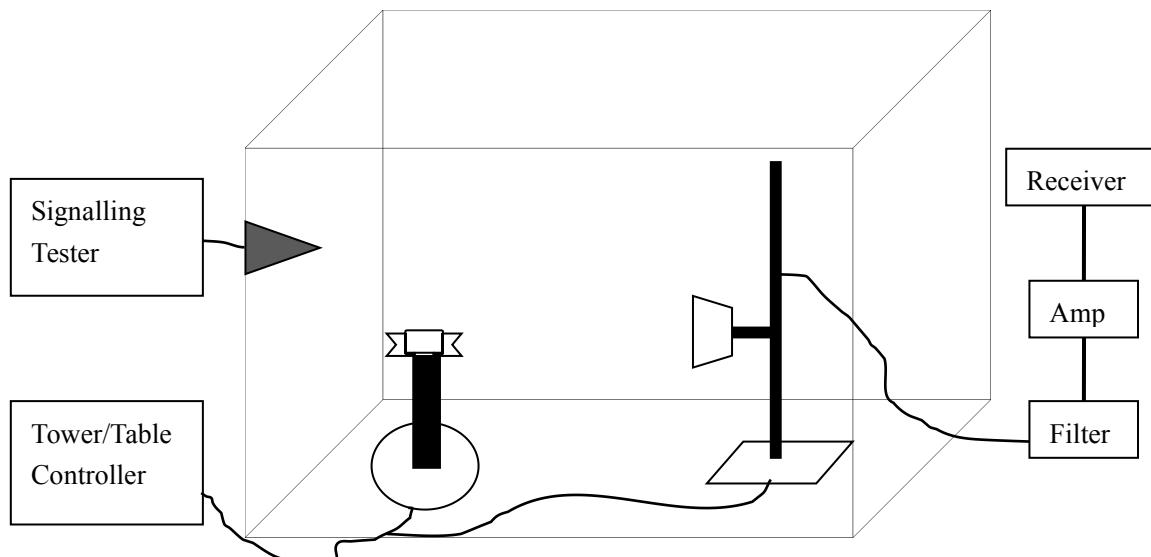
The measurement is made according to ANSI C63.10

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)	2.53	3.30	3.19	P

For $\pi/4$ DQPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	2.70	3.16	3.03	P

For 8DPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	2.52	3.03	2.90	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)	4.27	5.01	5.16	P

For $\pi/4$ DQPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	3.85	4.49	4.68	P

For 8DPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	4.07	4.65	4.78	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	-57.90	P
	Hopping ON	Fig.2	-63.21	P
78	Hopping OFF	Fig.3	-62.38	P
	Hopping ON	Fig.4	-63.80	P

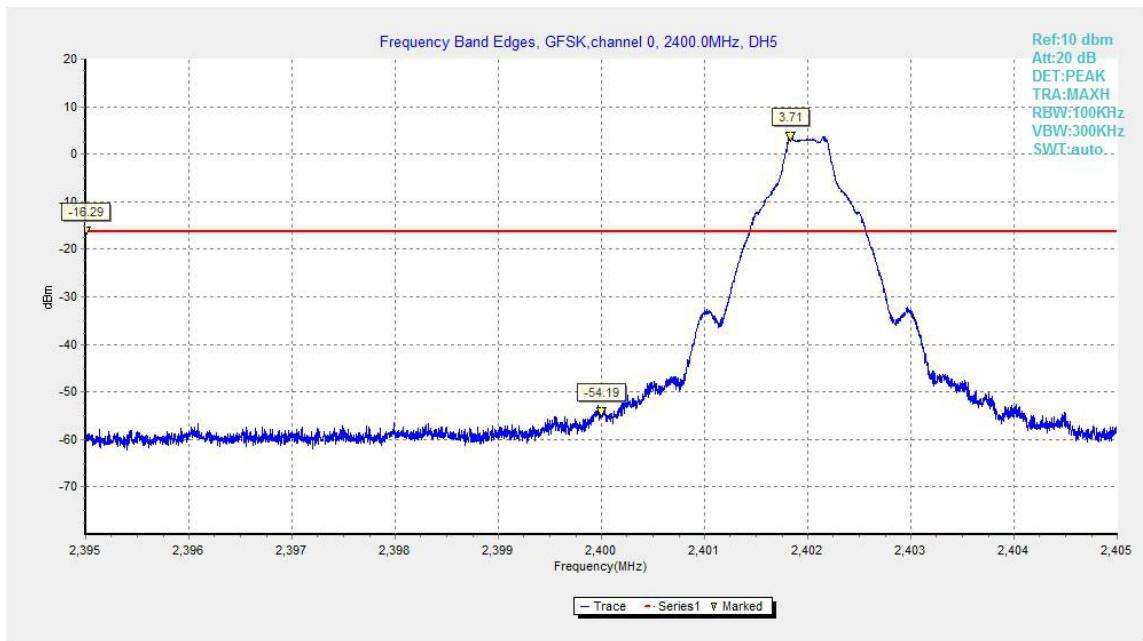
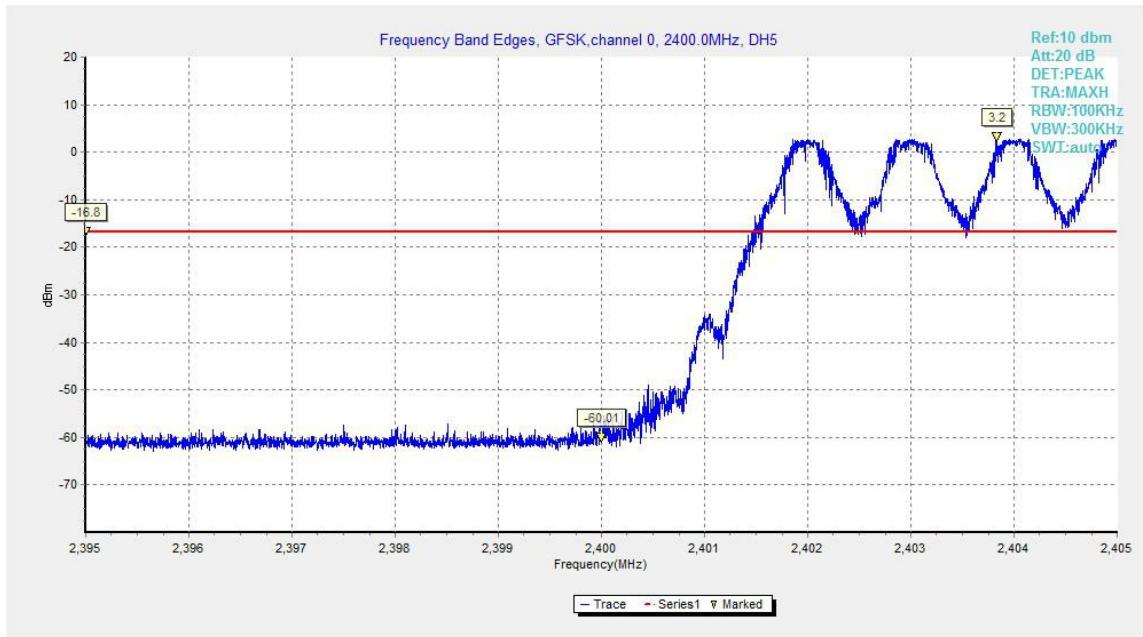
For $\pi/4$ DQPSK

Channel	Hopping	Band Edge Power (dBc)		Conclusion
0	Hopping OFF	Fig.5	-55.10	P
	Hopping ON	Fig.6	-57.03	P
78	Hopping OFF	Fig.7	-60.92	P
	Hopping ON	Fig.8	-60.09	P

For 8DPSK

Channel	Hopping	Band Edge Power (dBc)		Conclusion
0	Hopping OFF	Fig.9	-56.17	P
	Hopping ON	Fig.10	-60.47	P

78	Hopping OFF	Fig.11	-61.14	P
	Hopping ON	Fig.12	-61.31	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

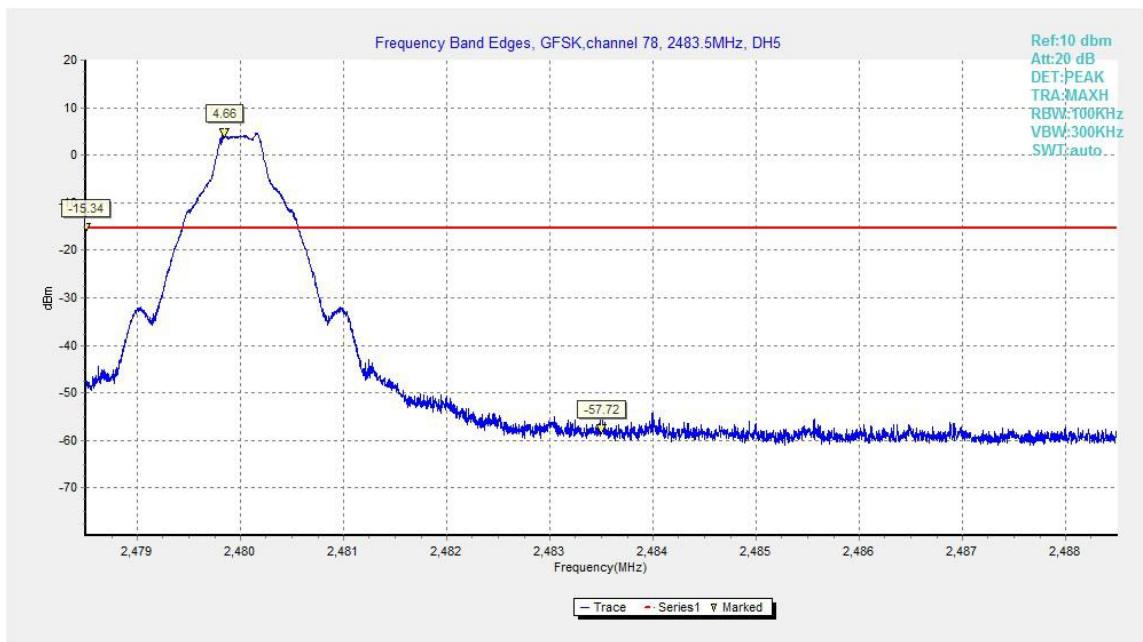


Fig.3. Frequency Band Edges: GFSK, Channel 78, Hopping Off

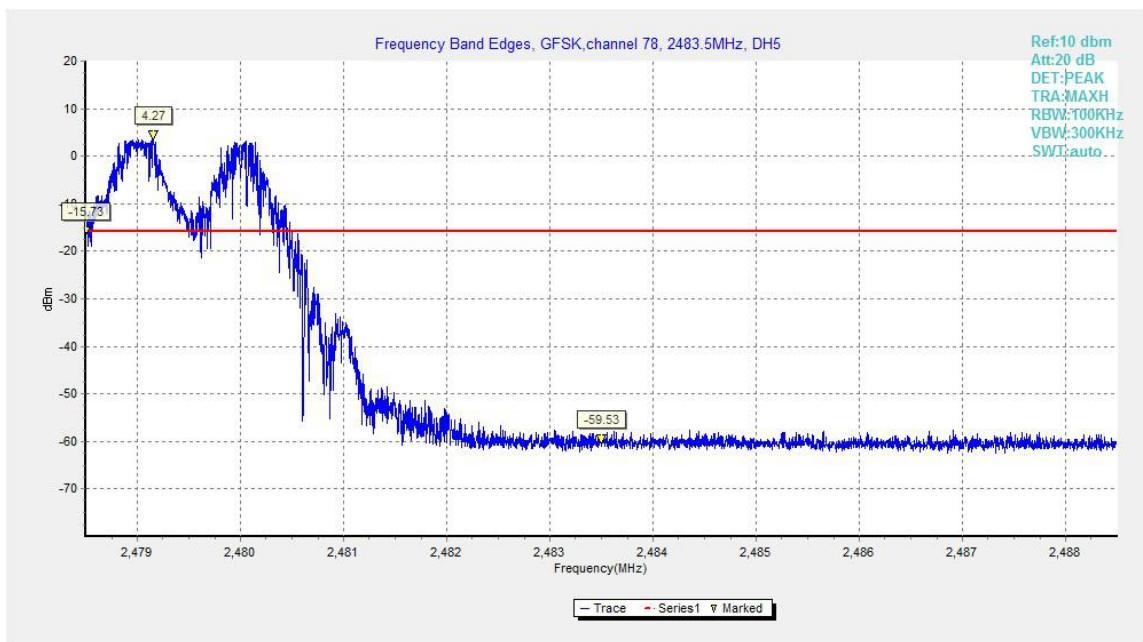


Fig.4. Frequency Band Edges: GFSK, Channel 78, Hopping On

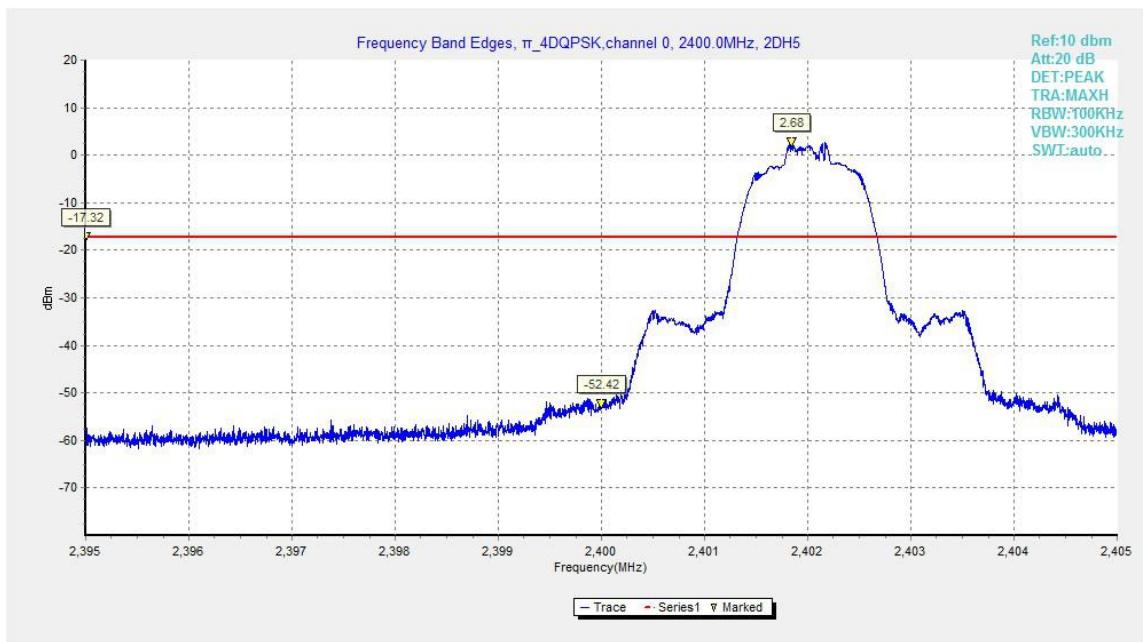


Fig.5. Frequency Band Edges: $\pi/4$ DQPSK, Channel 0, Hopping Off

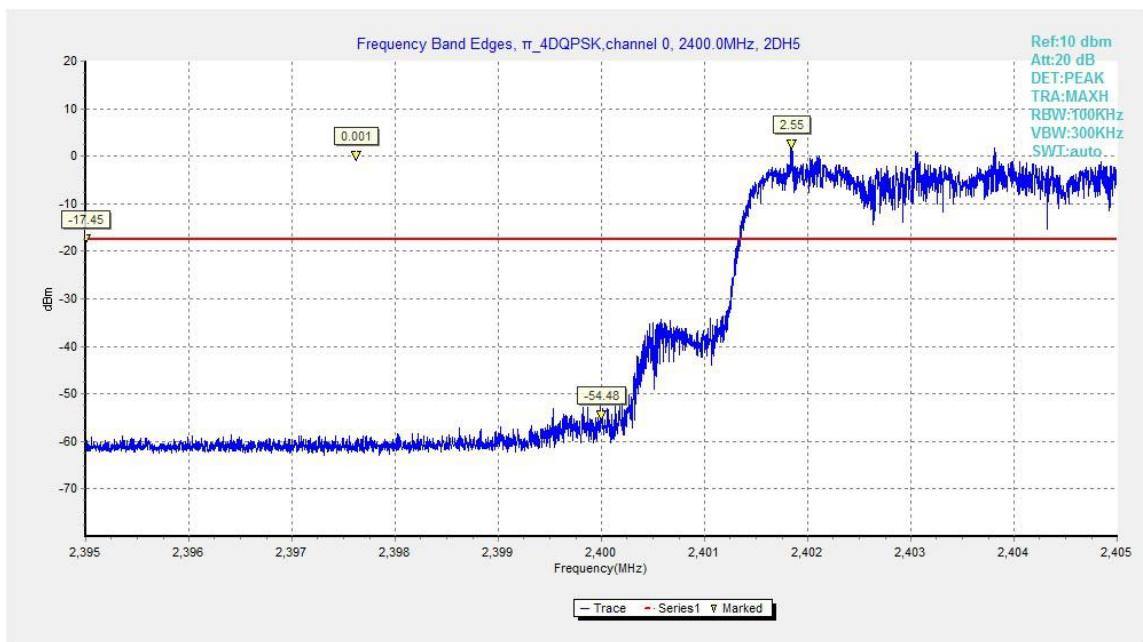


Fig.6. Frequency Band Edges: $\pi/4$ DQPSK, Channel 0, Hopping On

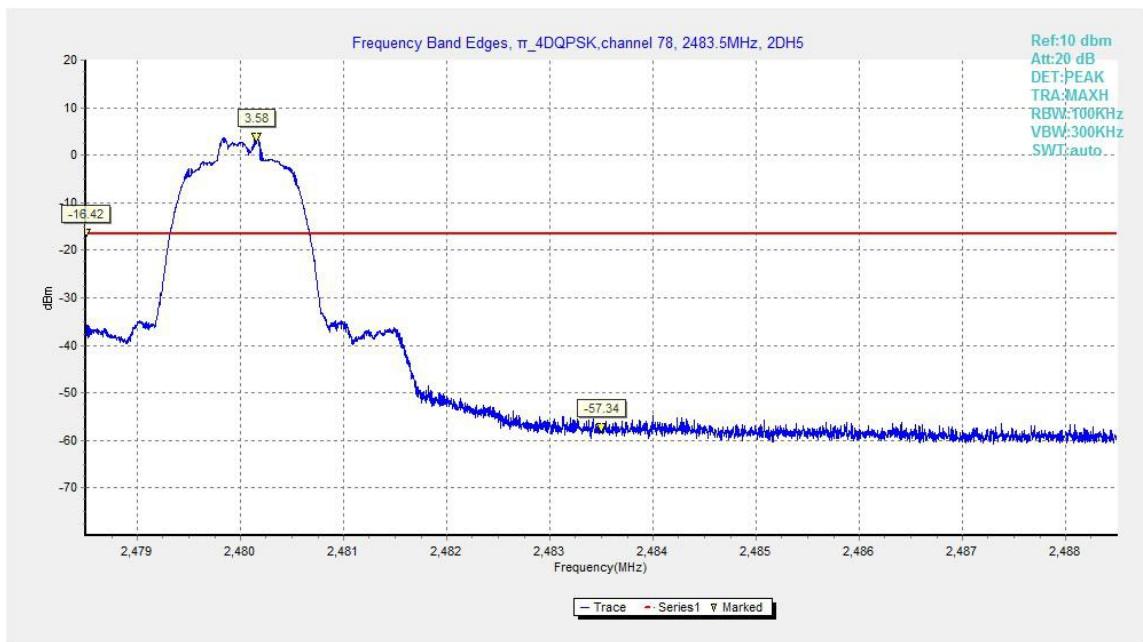


Fig.7. Frequency Band Edges: $\pi/4$ DQPSK, Channel 78, Hopping Off

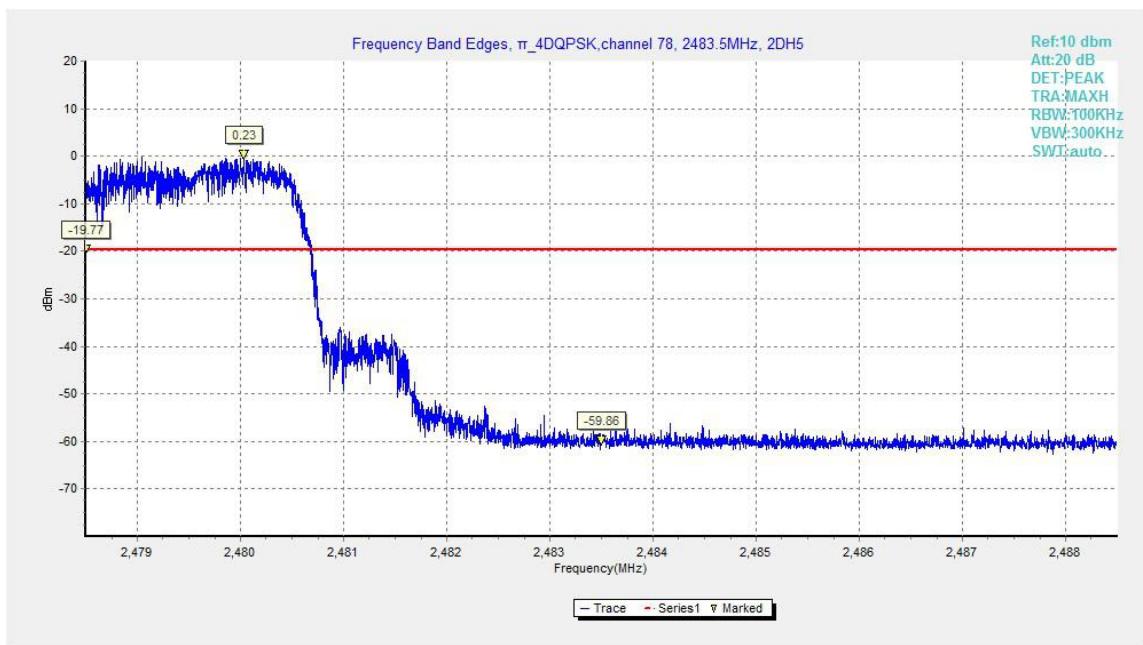


Fig.8. Frequency Band Edges: $\pi/4$ DQPSK, Channel 78, Hopping On

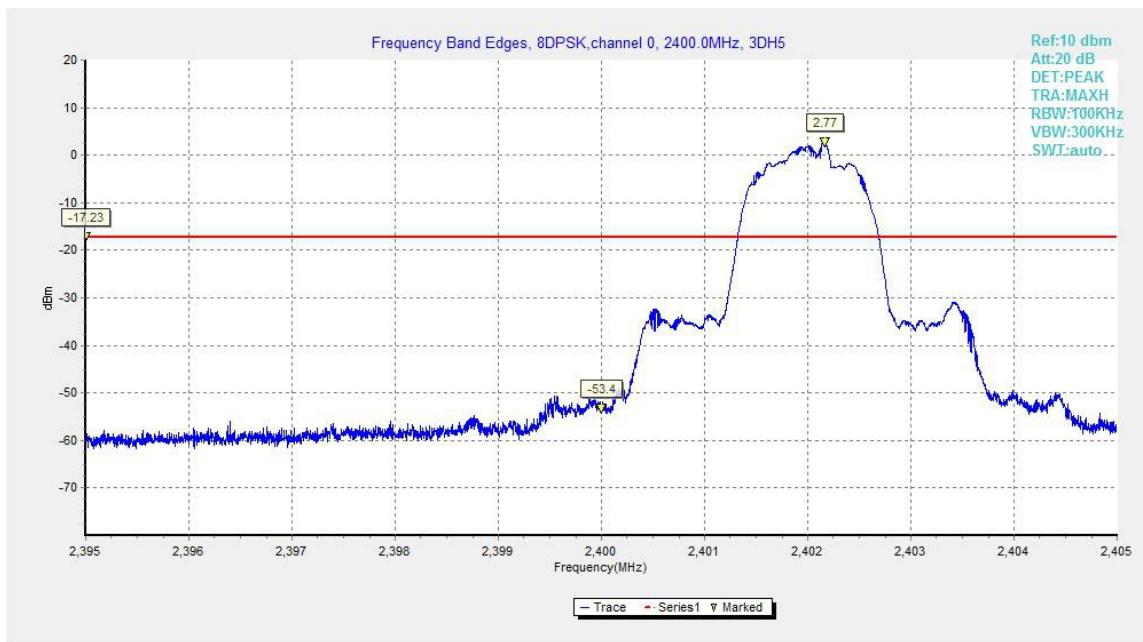


Fig.9. Frequency Band Edges: 8DPSK, Channel 0, Hopping Off

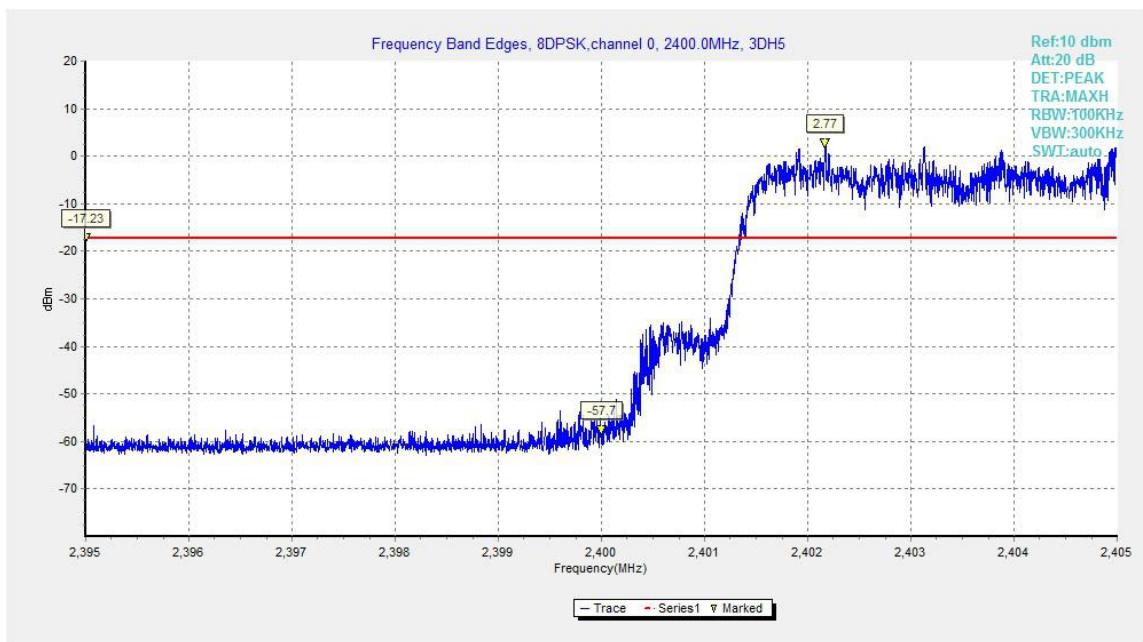


Fig.10. Frequency Band Edges: 8DPSK, Channel 0, Hopping On

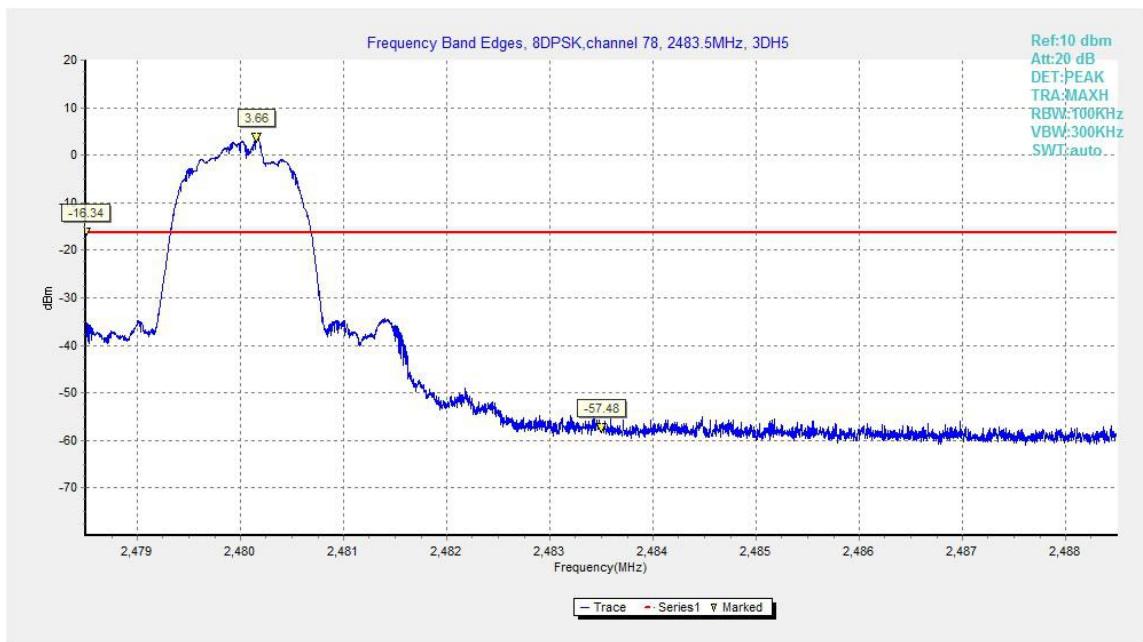


Fig.11. Frequency Band Edges: 8DPSK, Channel 78, Hopping Off

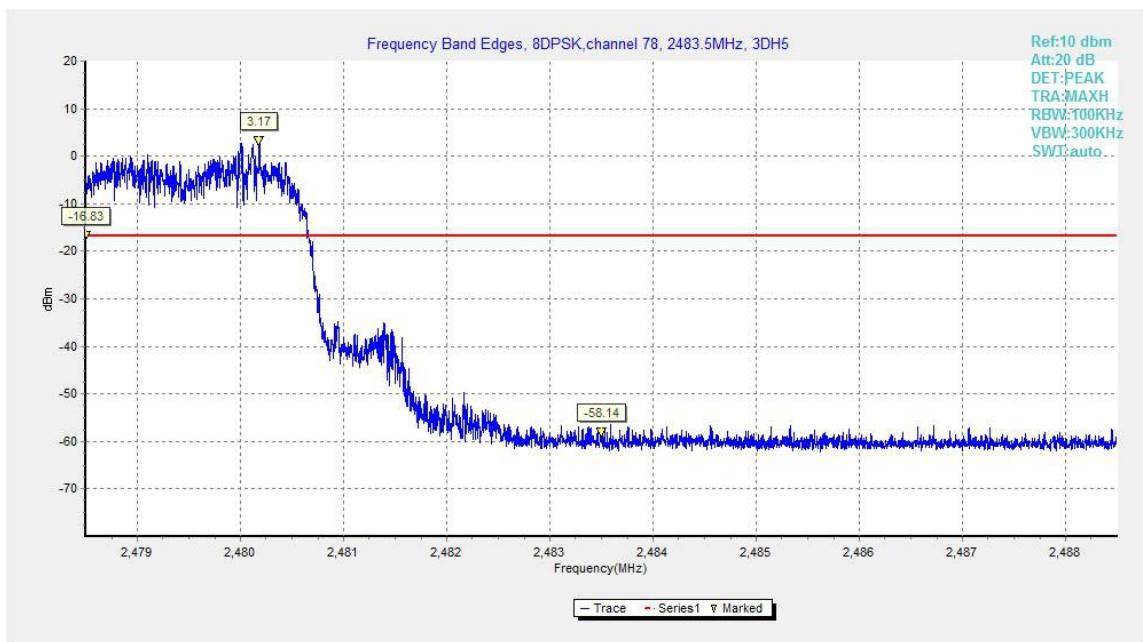


Fig.12. Frequency Band Edges: 8DPSK, Channel 78, Hopping On

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

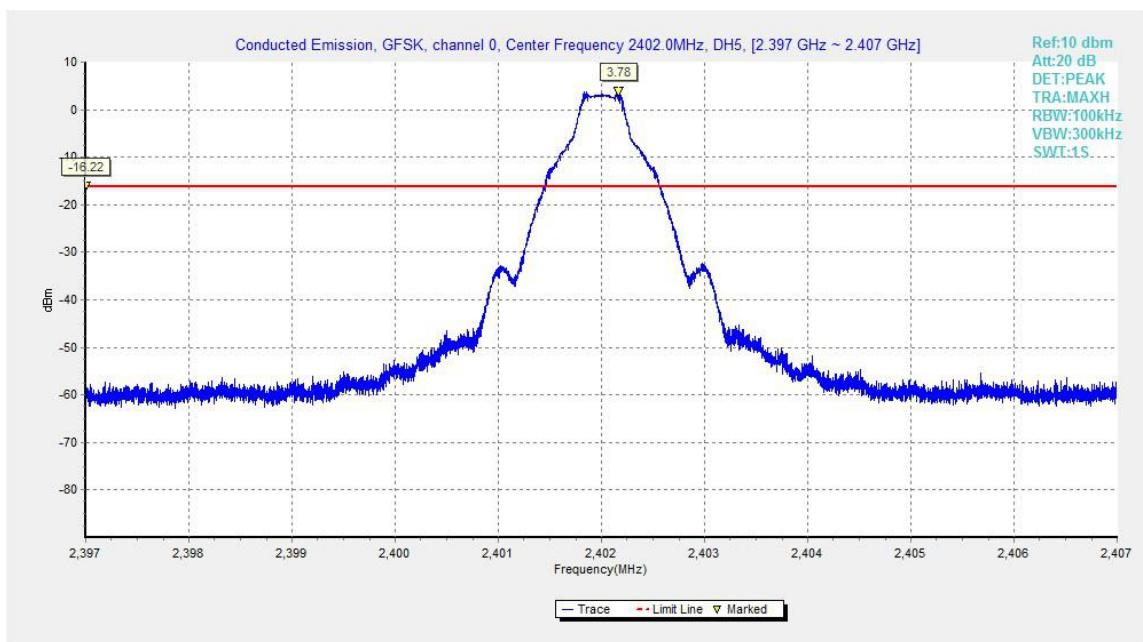


Fig.13. Conducted spurious emission: GFSK, Channel 0,2402MHz

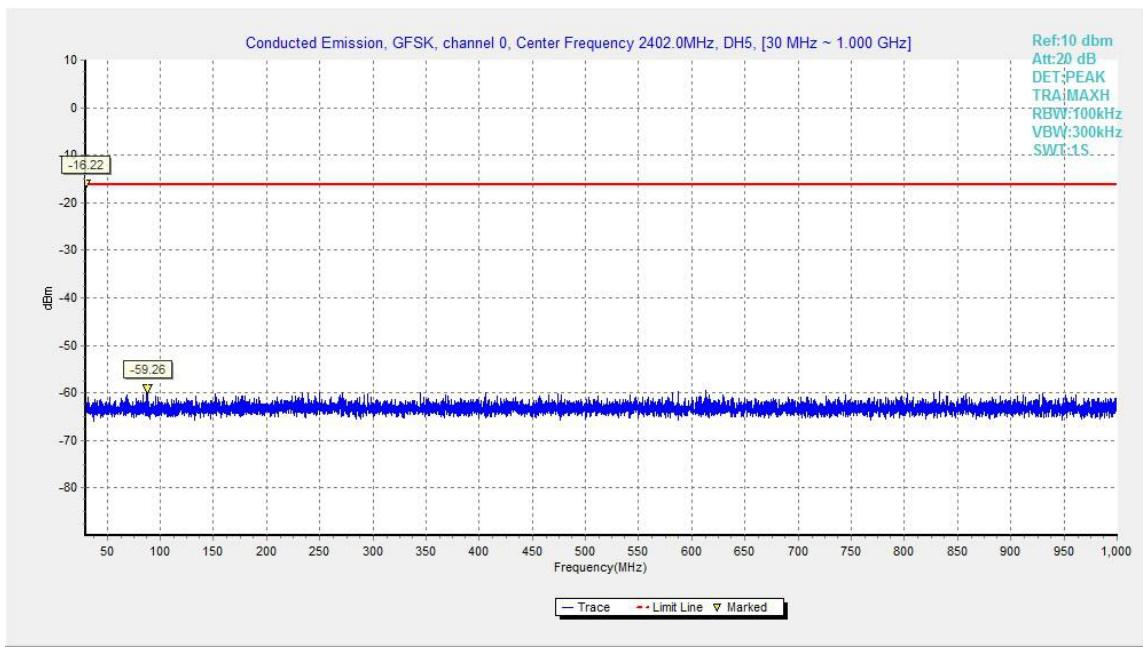


Fig.14. Conducted spurious emission: GFSK, Channel 0, 30MHz - 1GHz

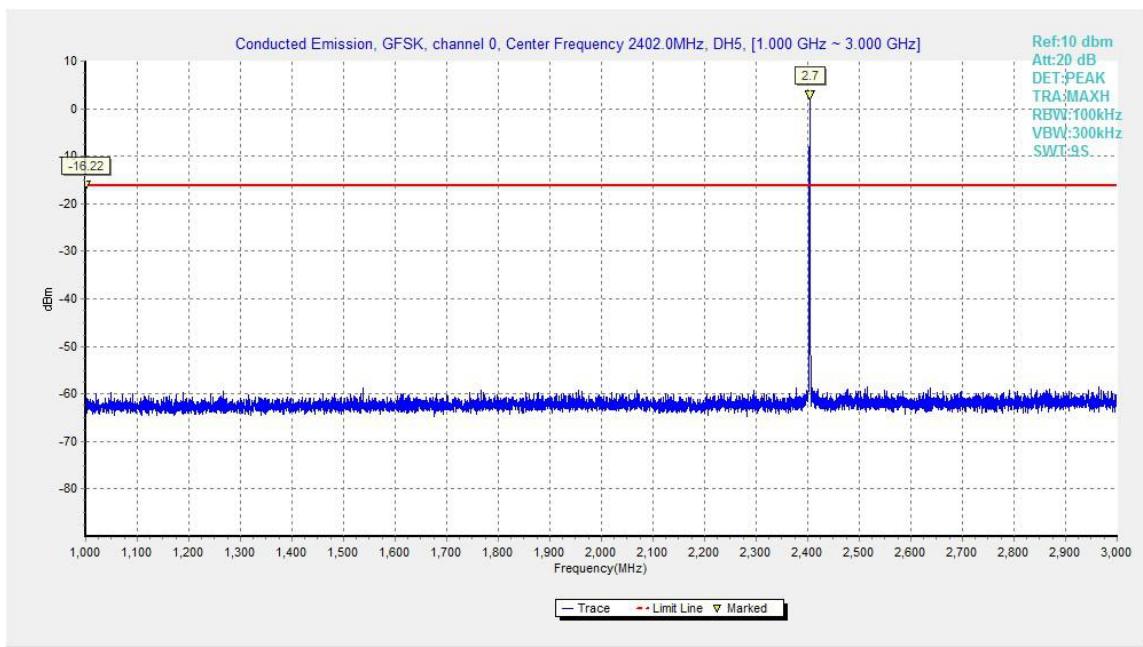


Fig.15. Conducted spurious emission: GFSK, Channel 0, 1GHz - 3GHz

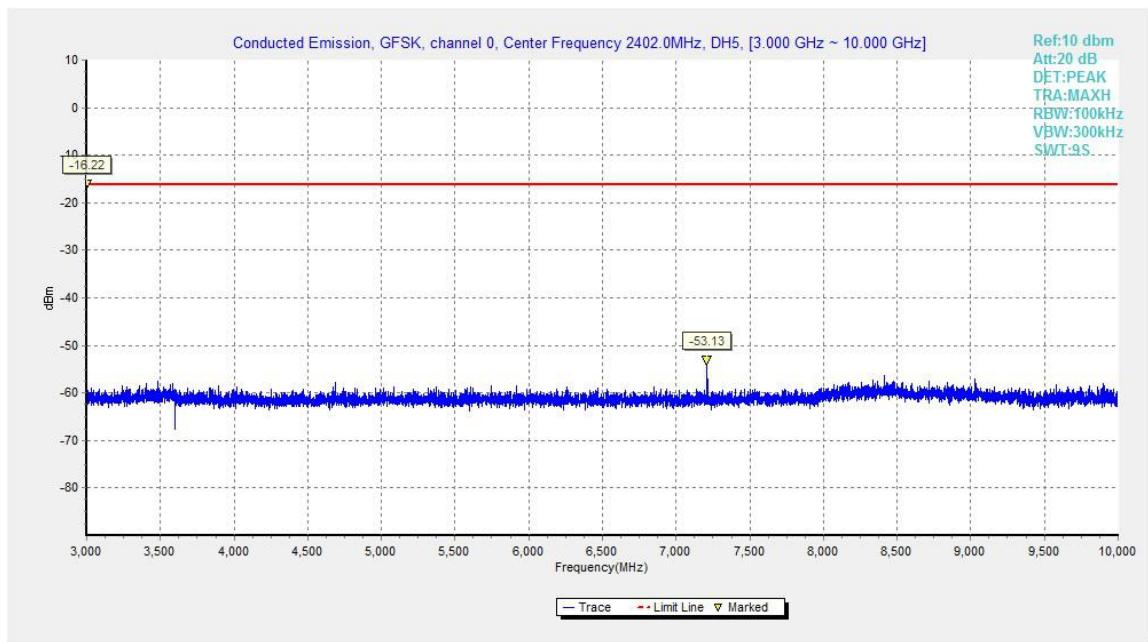


Fig.16. Conducted spurious emission: GFSK, Channel 0, 3GHz - 10GHz

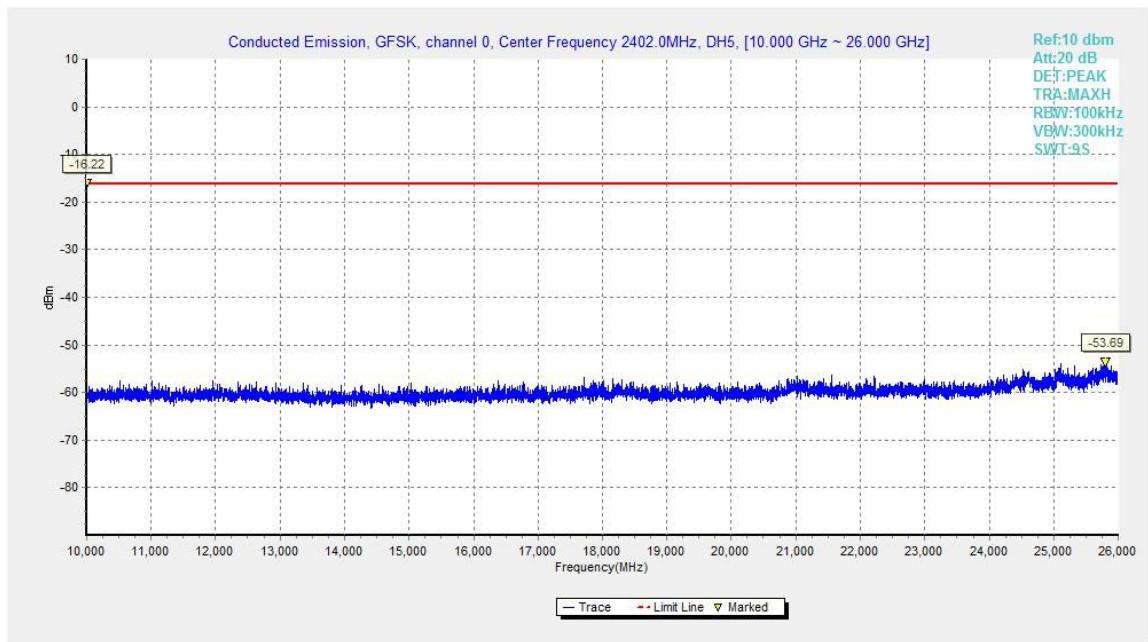


Fig.17. Conducted spurious emission: GFSK, Channel 0, 10GHz - 26GHz

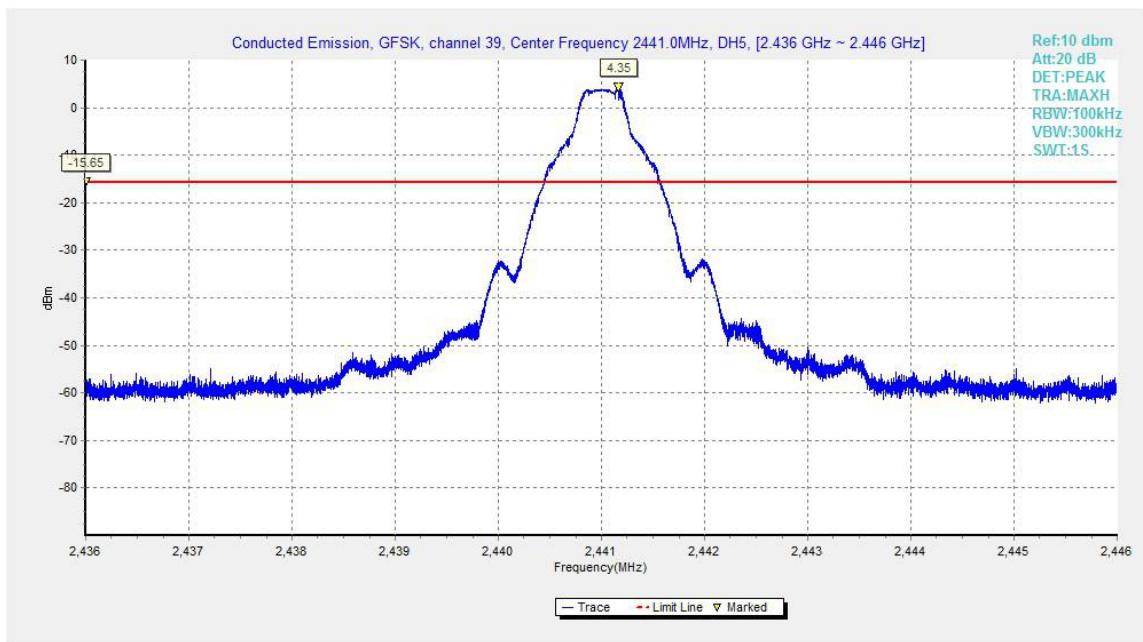


Fig.18. Conducted spurious emission: GFSK, Channel 39, 2441MHz

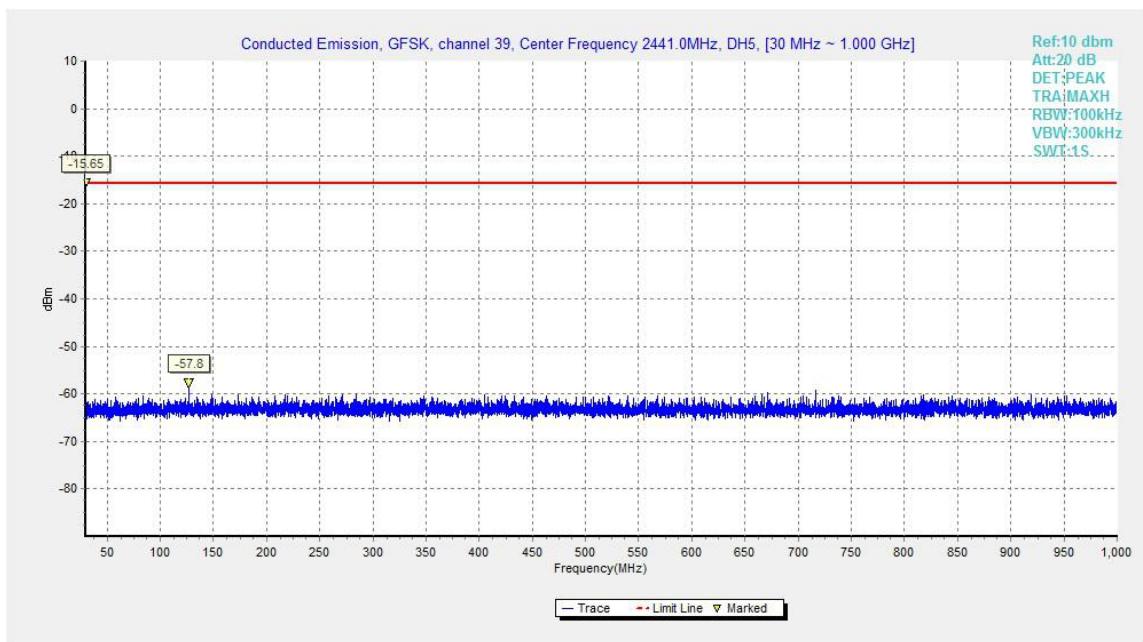


Fig.19. Conducted spurious emission: GFSK, Channel 39, 30MHz - 1GHz

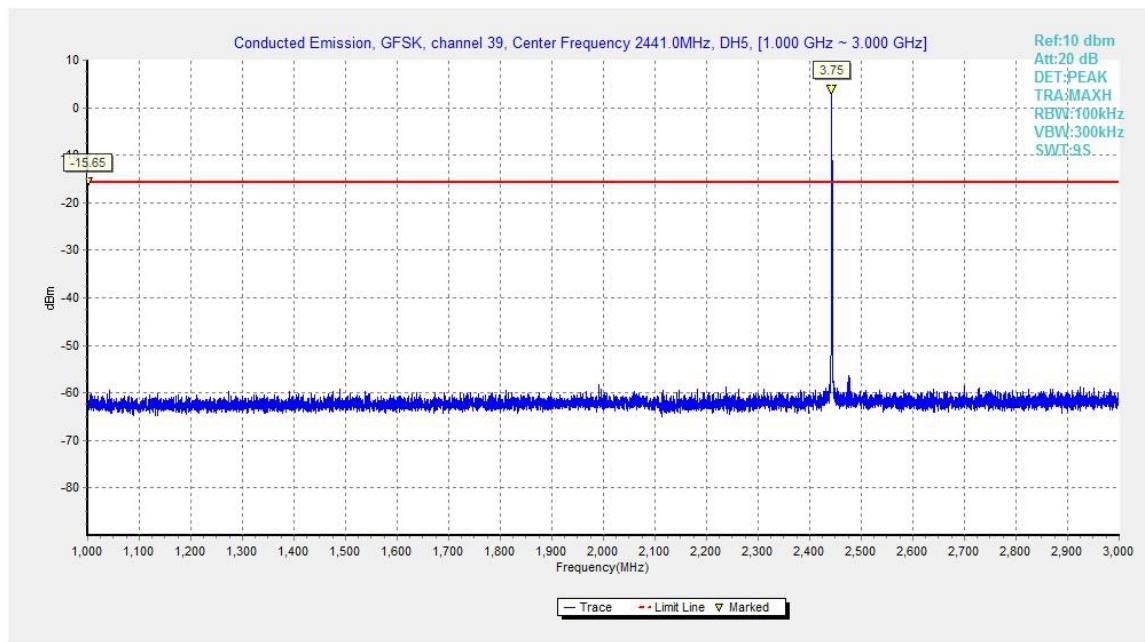


Fig.20. Conducted spurious emission: GFSK, Channel 39, 1GHz – 3GHz

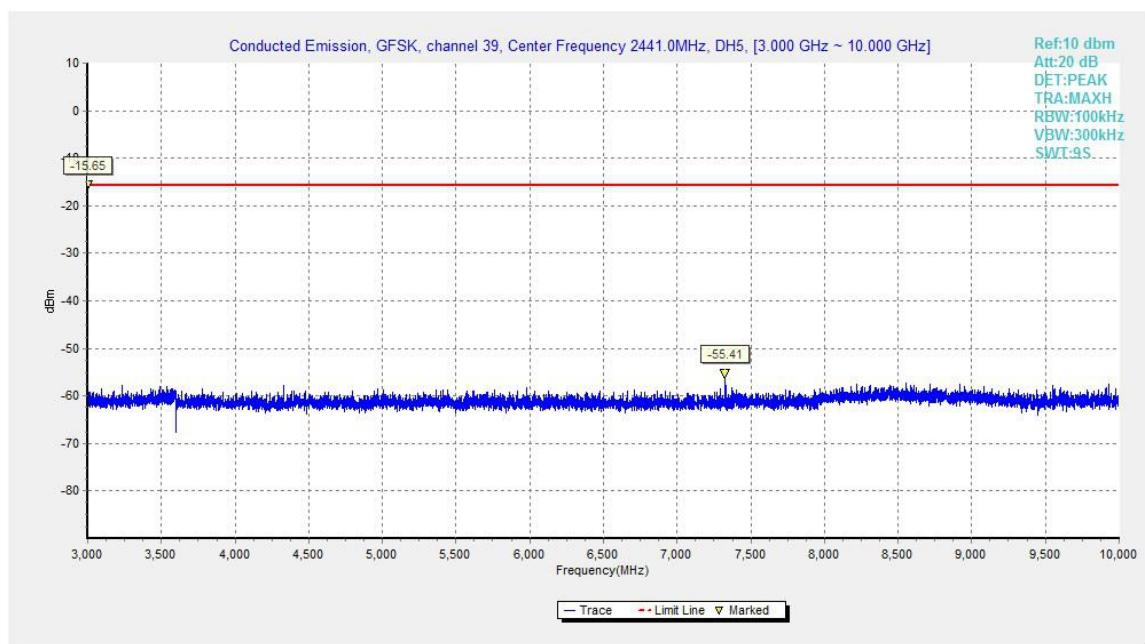


Fig.21. Conducted spurious emission: GFSK, Channel 39, 3GHz – 10GHz

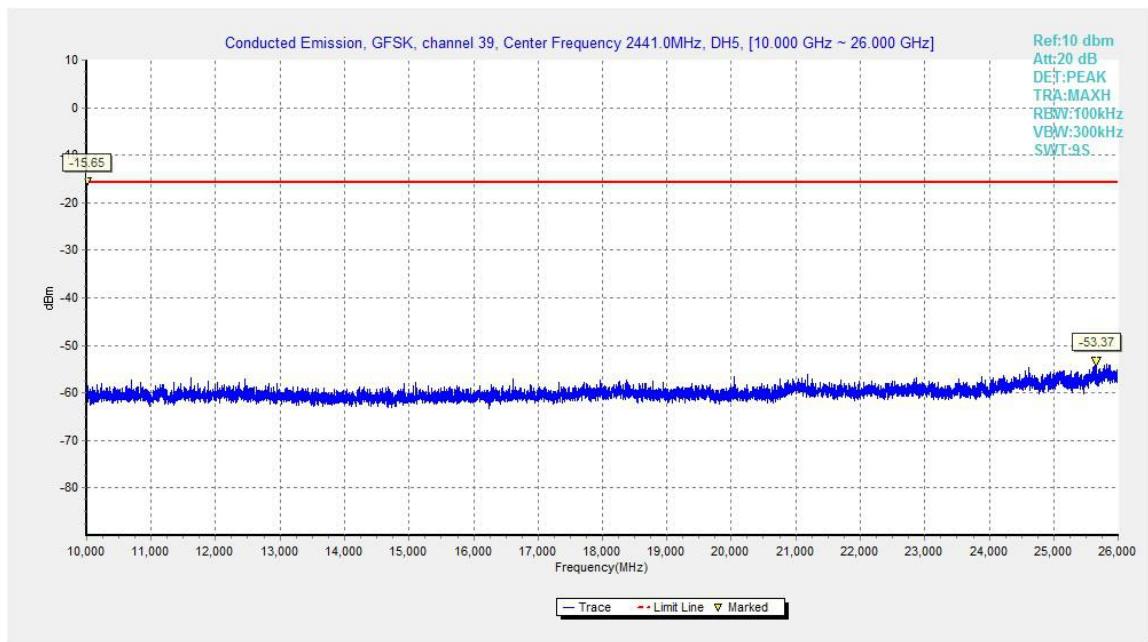


Fig.22. Conducted spurious emission: GFSK, Channel 39, 10GHz – 26GHz

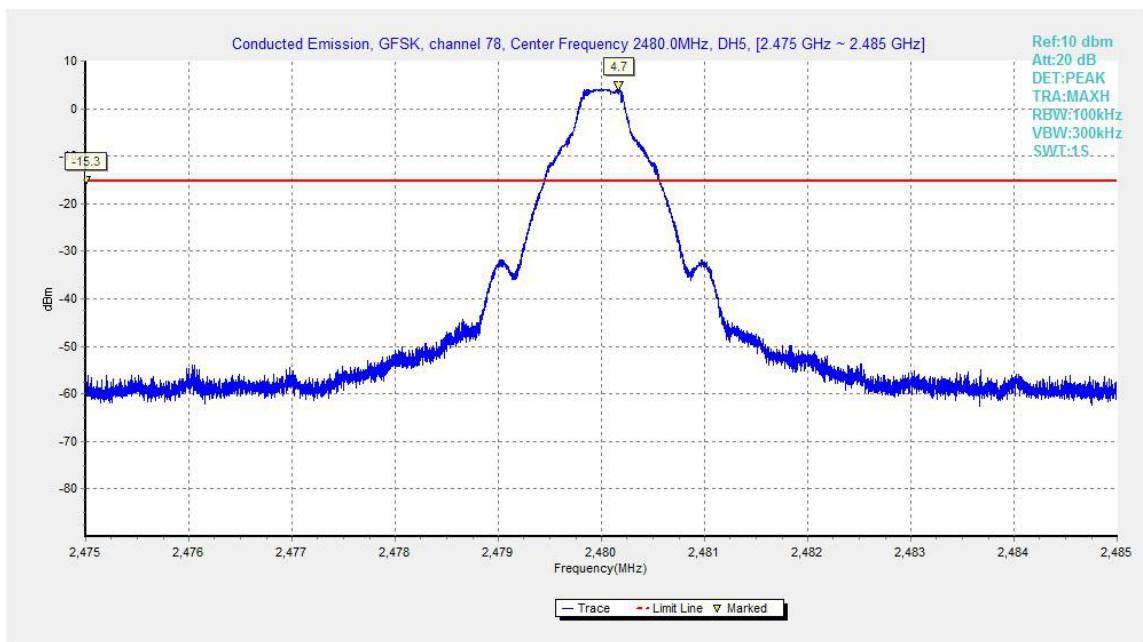


Fig.23. Conducted spurious emission: GFSK, Channel 78, 2480MHz

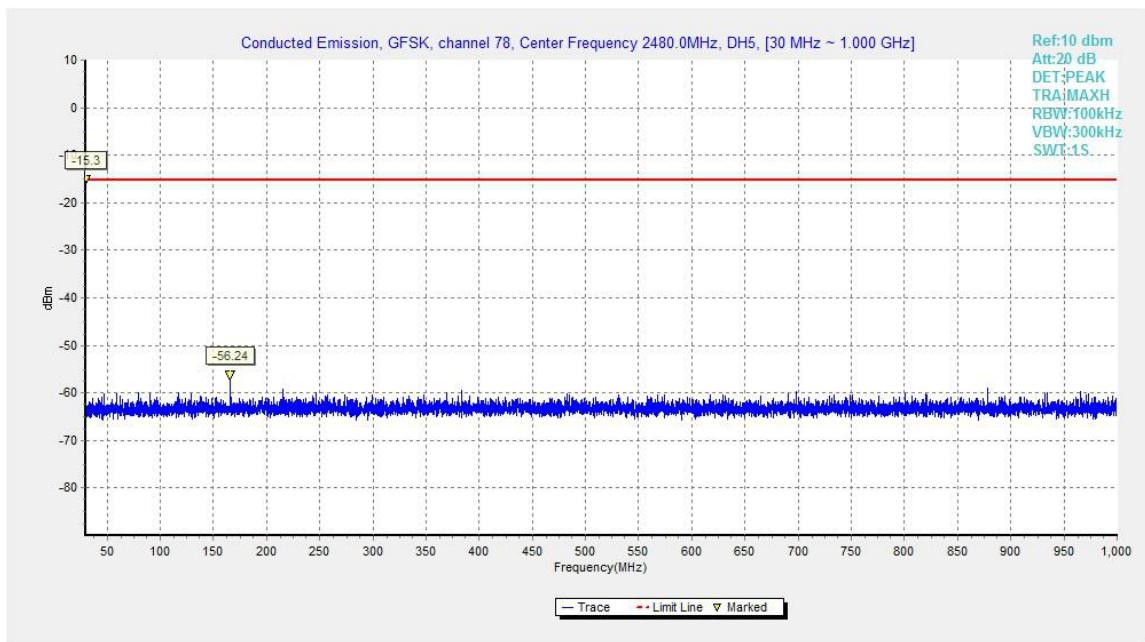


Fig.24. Conducted spurious emission: GFSK, Channel 78, 30MHz - 1GHz

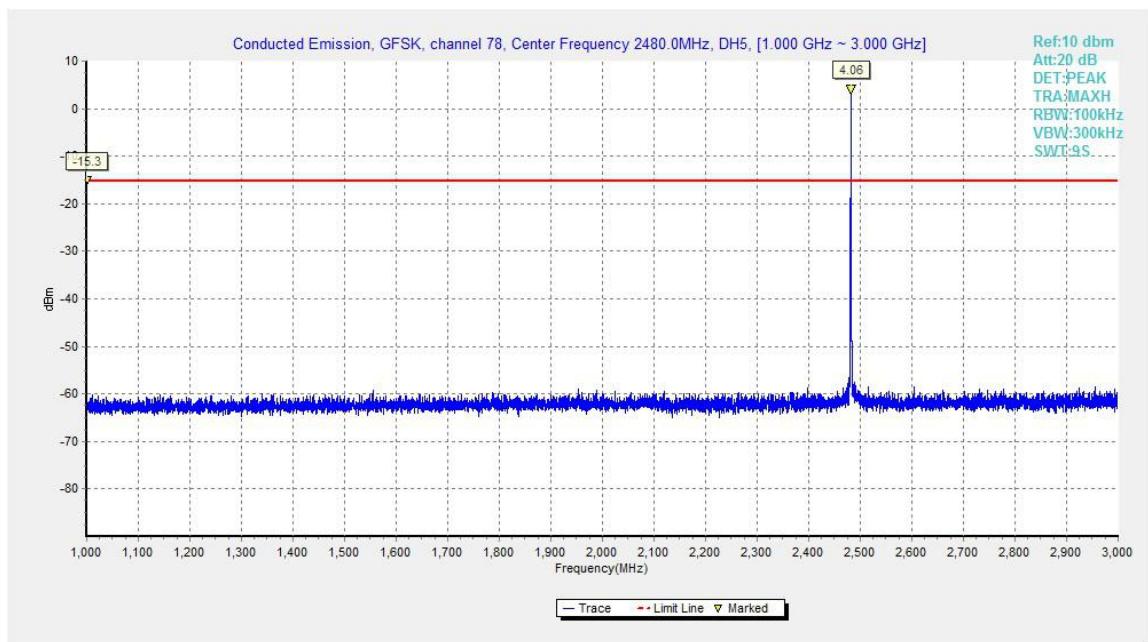


Fig.25. Conducted spurious emission: GFSK, Channel 78, 1GHz - 3GHz

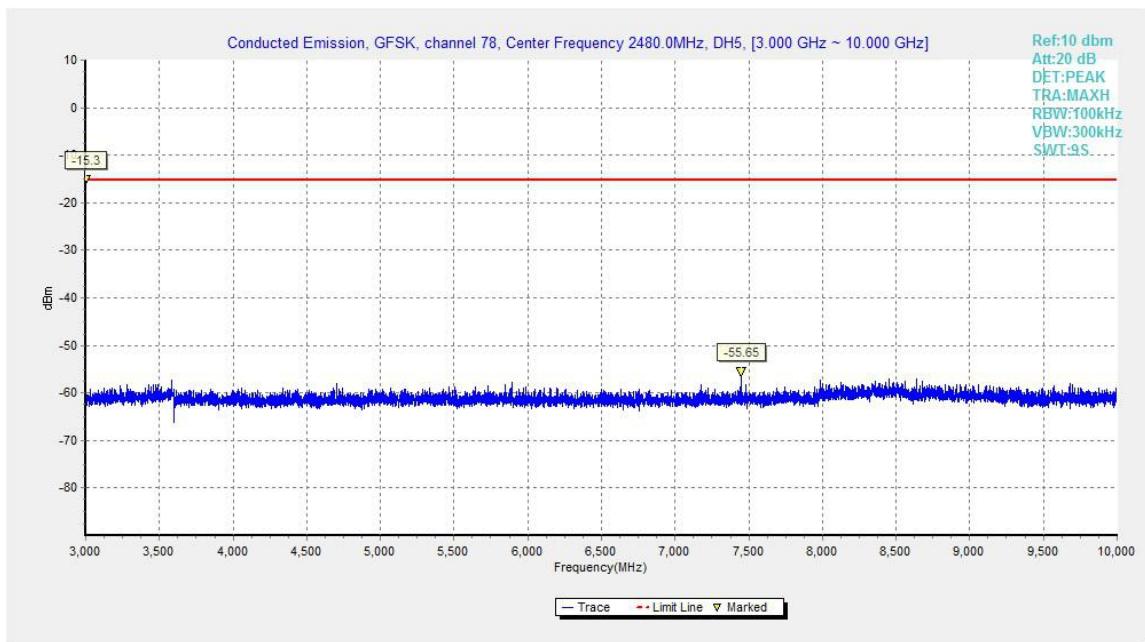


Fig.26. Conducted spurious emission: GFSK, Channel 78, 3GHz - 10GHz

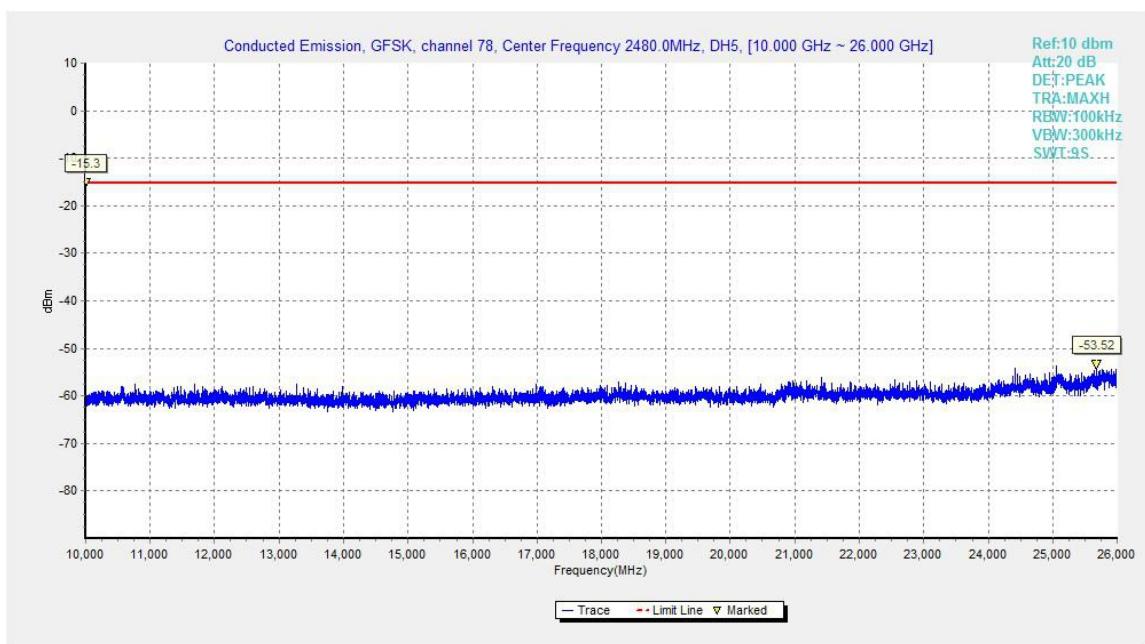


Fig.27. Conducted spurious emission: GFSK, Channel 78, 10GHz - 26GHz

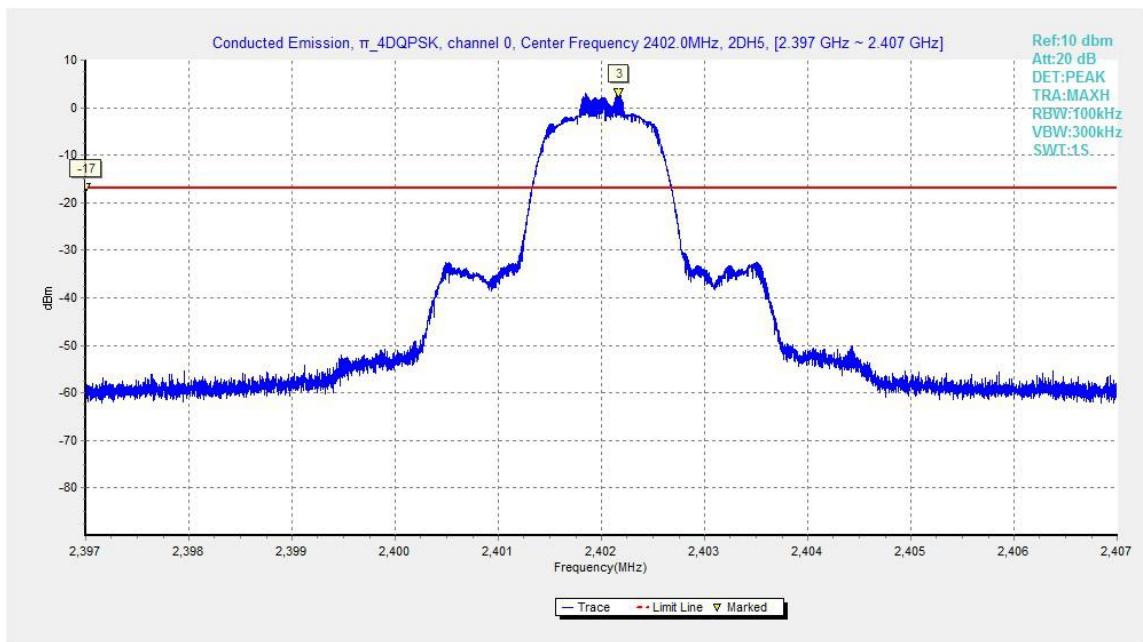


Fig.28. Conducted spurious emission: $\pi/4$ DQPSK, Channel 0, 2402MHz

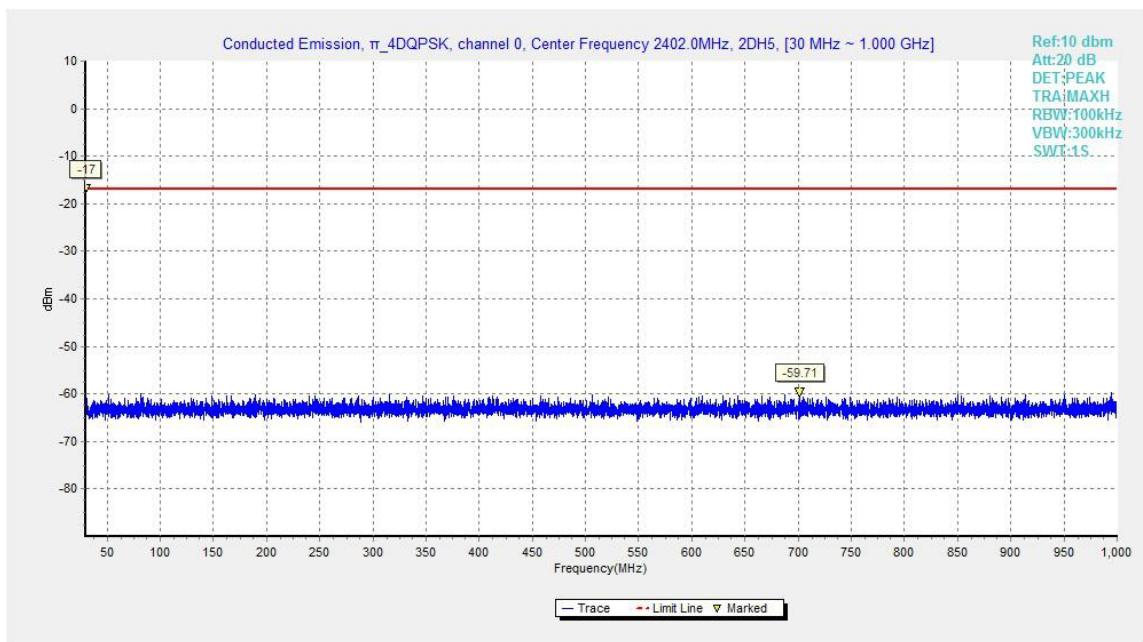


Fig.29. Conducted spurious emission: $\pi/4$ DQPSK, Channel 0, 30MHz - 1GHz

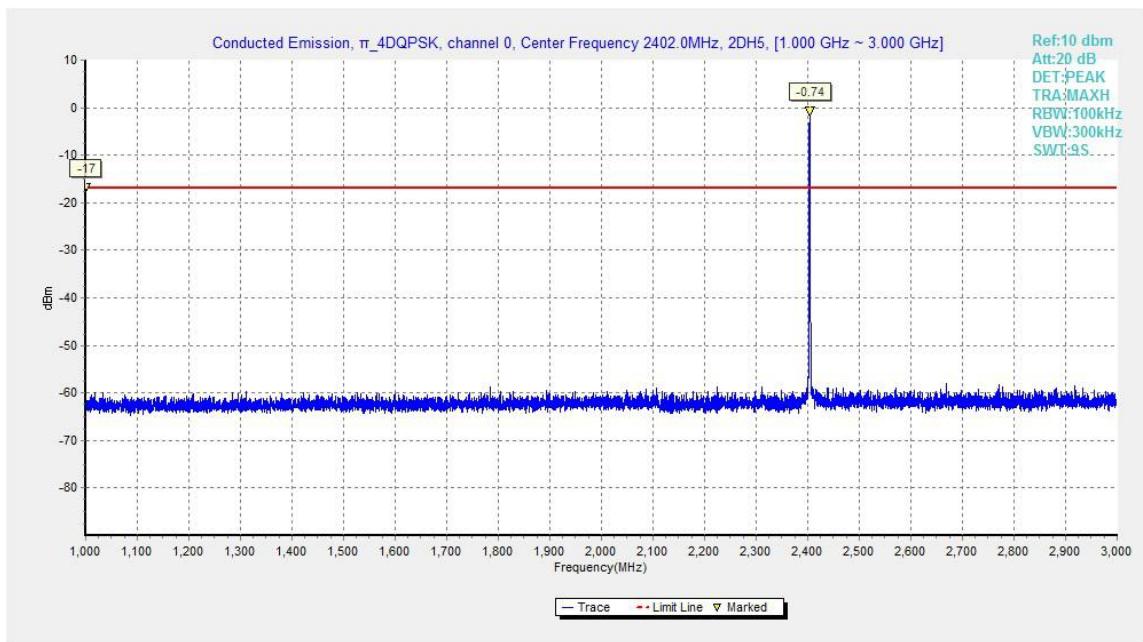


Fig.30. Conducted spurious emission: π/4 DQPSK, Channel 0, 1GHz - 3GHz

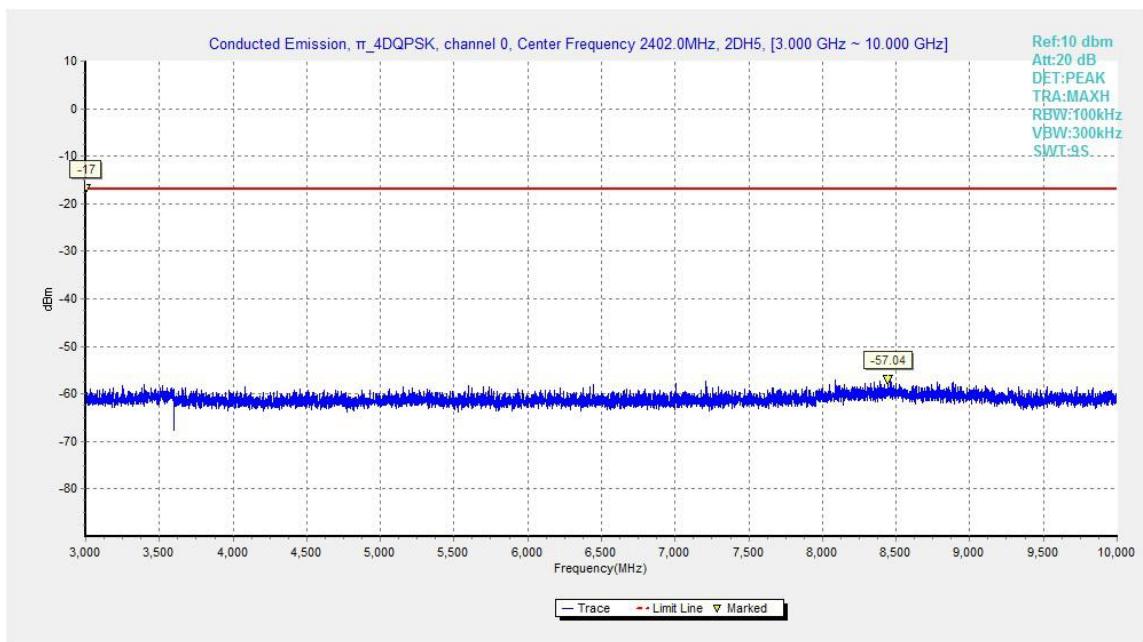


Fig.31. Conducted spurious emission: π/4 DQPSK, Channel 0, 3GHz - 10GHz

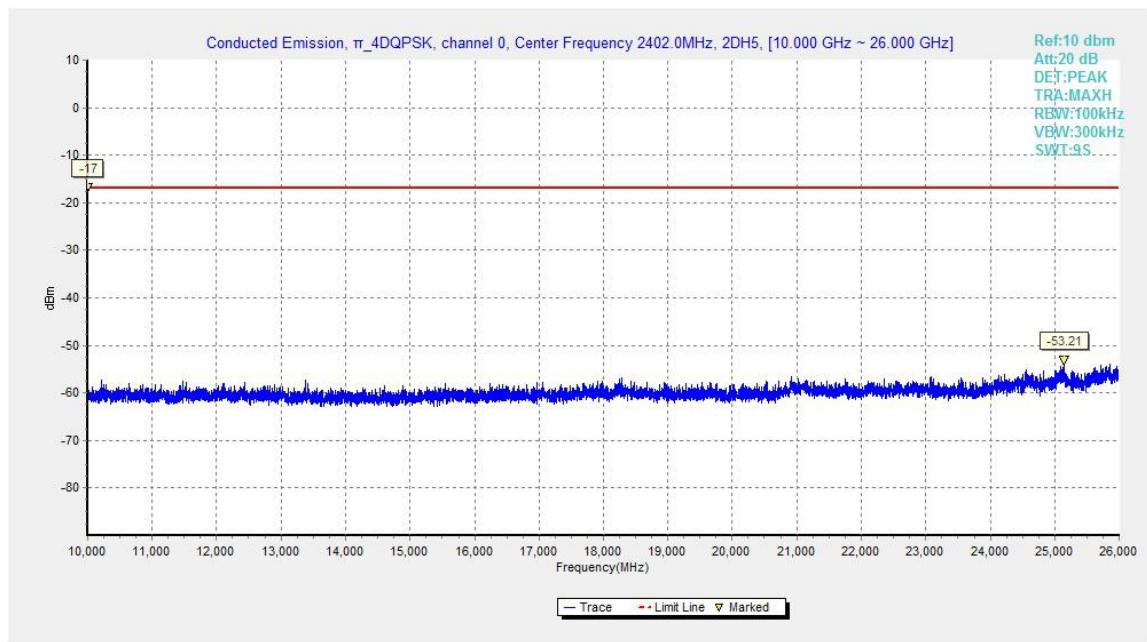


Fig.32. Conducted spurious emission: $\pi/4$ DQPSK, Channel 0, 10GHz - 26GHz

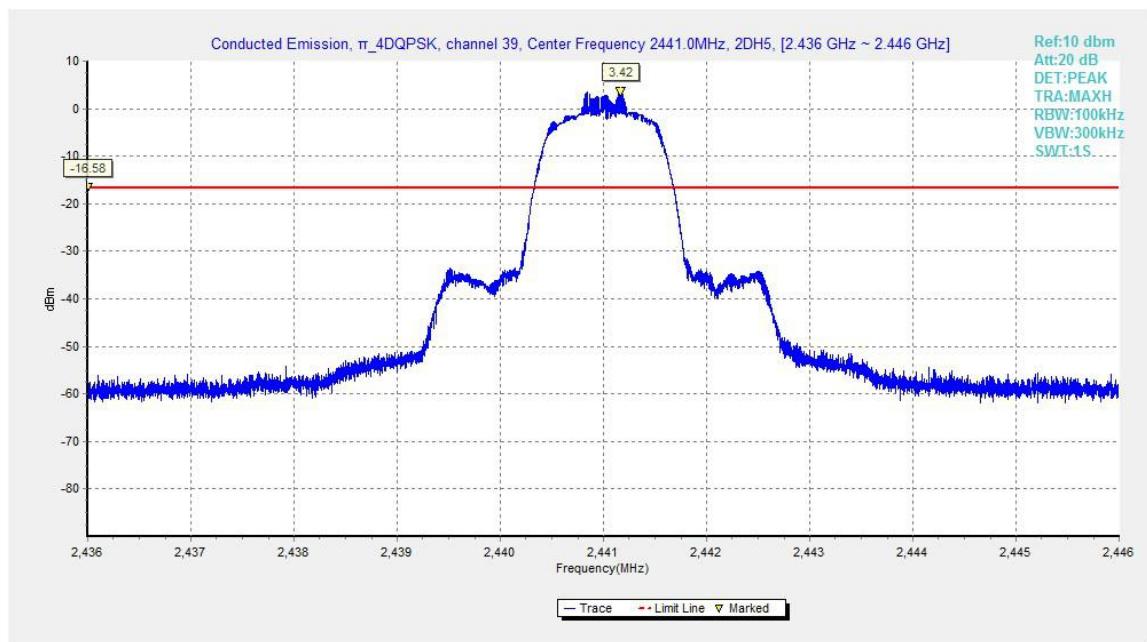


Fig.33. Conducted spurious emission: $\pi/4$ DQPSK, Channel 39, 2441MHz

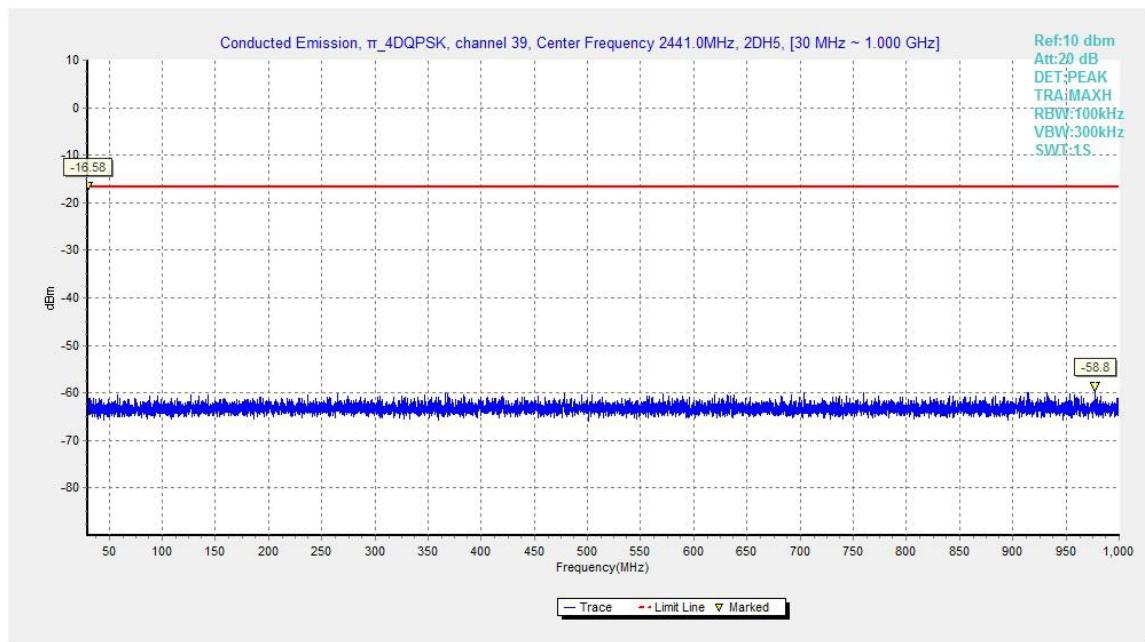


Fig.34. Conducted spurious emission: π/4 DQPSK, Channel 39, 30MHz - 1GHz

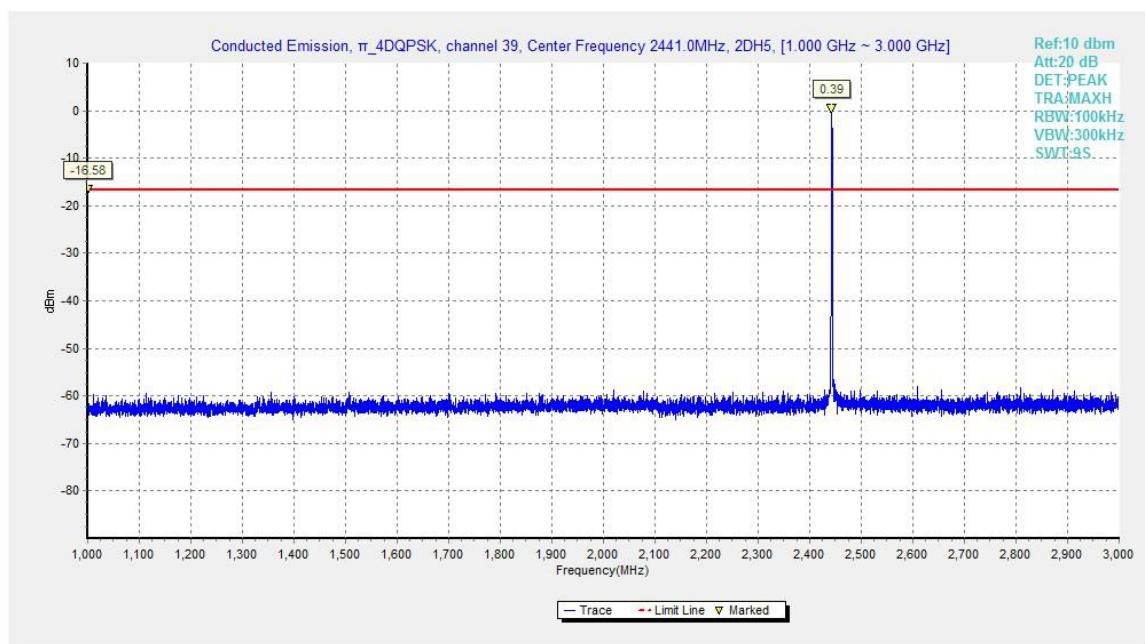


Fig.35. Conducted spurious emission: π/4 DQPSK, Channel 39, 1GHz - 3GHz

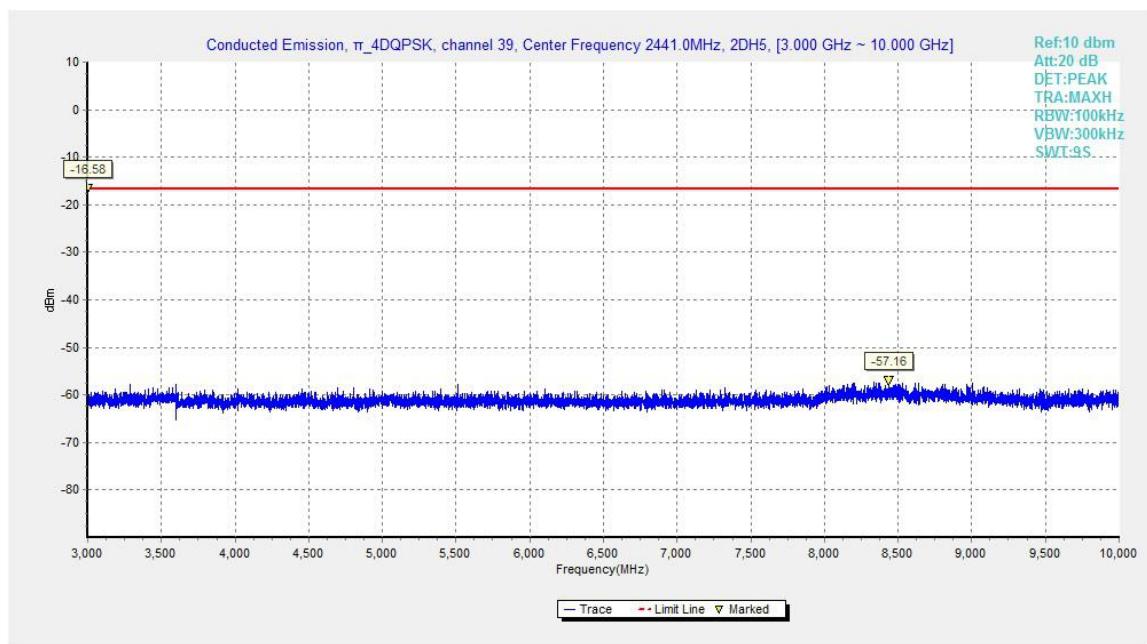


Fig.36. Conducted spurious emission: π/4 DQPSK, Channel 39, 3GHz - 10GHz

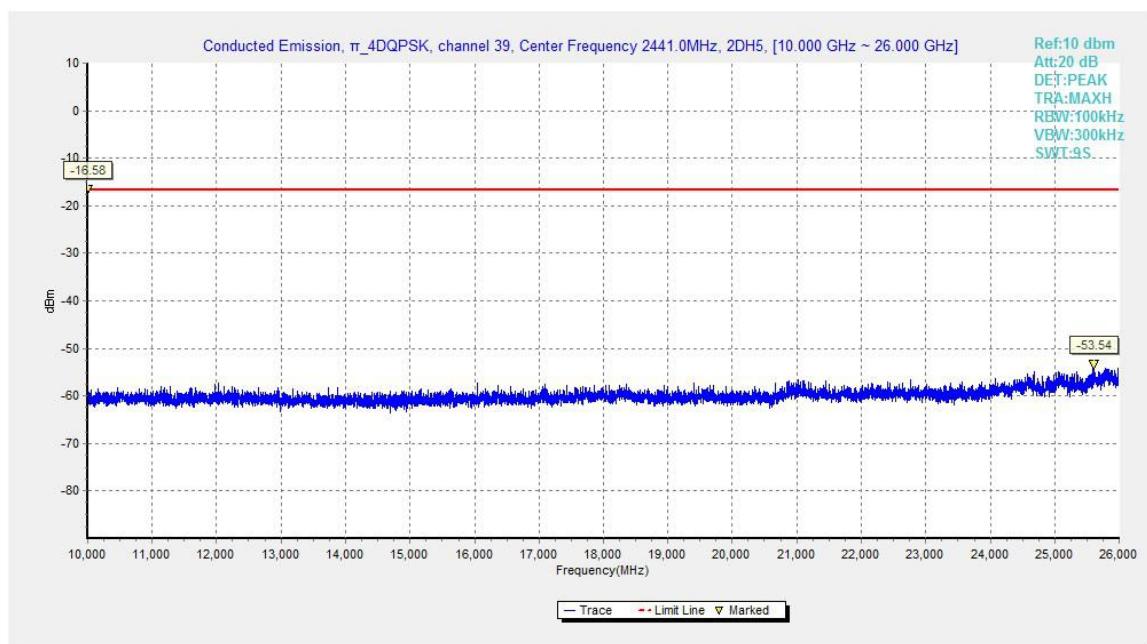


Fig.37. Conducted spurious emission: π/4 DQPSK, Channel 39, 10GHz – 26GHz

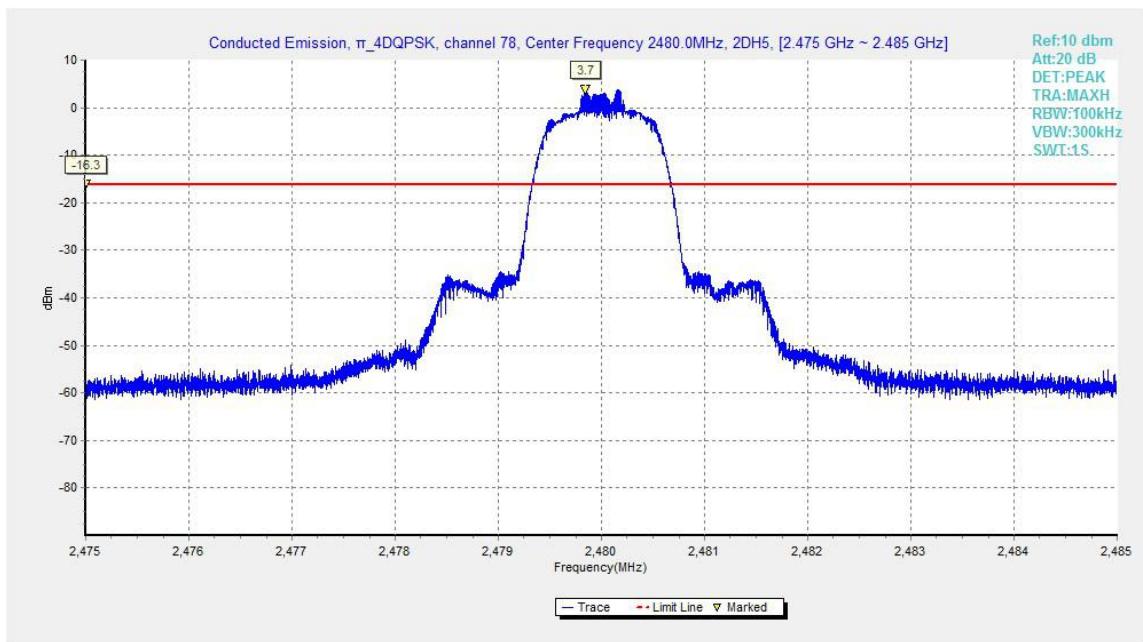


Fig.38. Conducted spurious emission: $\pi/4$ DQPSK, Channel 78, 2480MHz

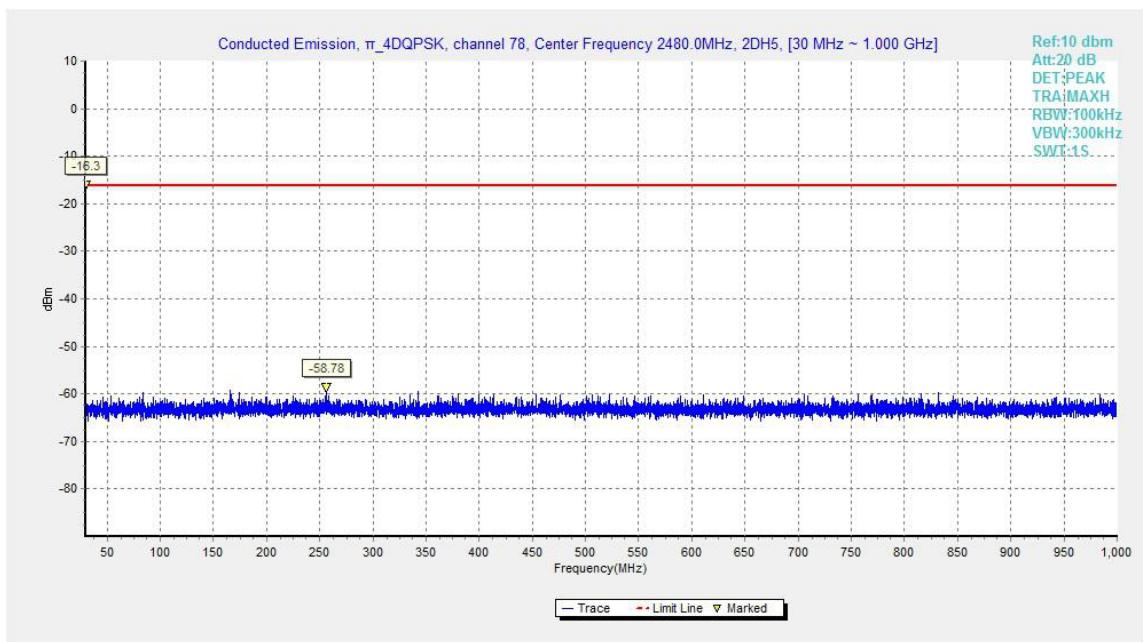


Fig.39. Conducted spurious emission: $\pi/4$ DQPSK, Channel 78, 30MHz - 1GHz

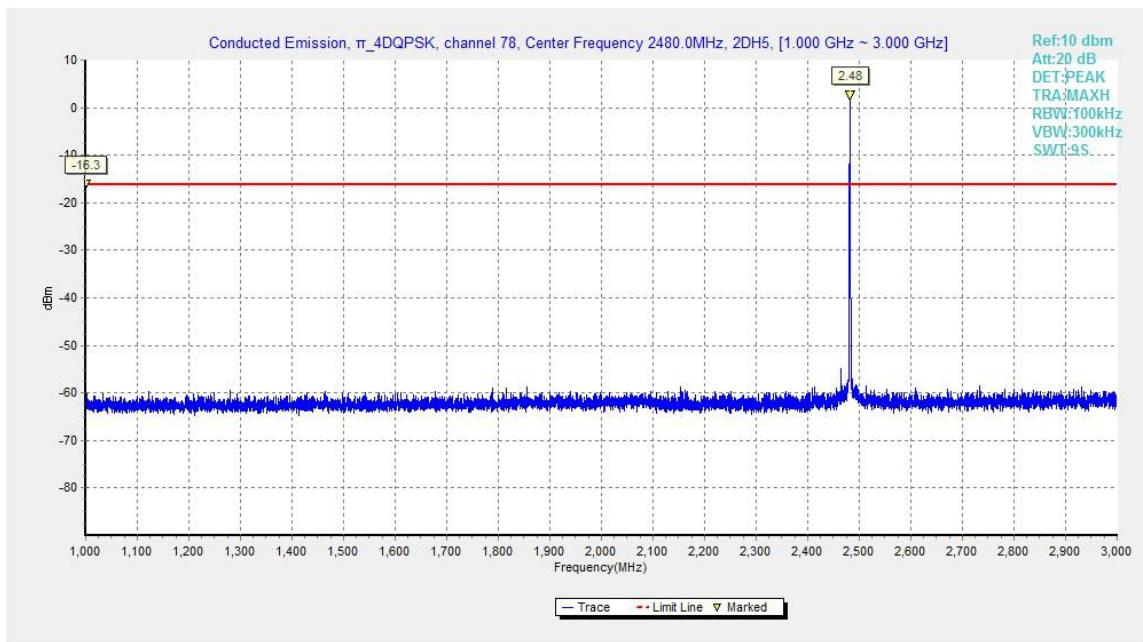


Fig.40. Conducted spurious emission: $\pi/4$ DQPSK, Channel 78, 1GHz - 3GHz

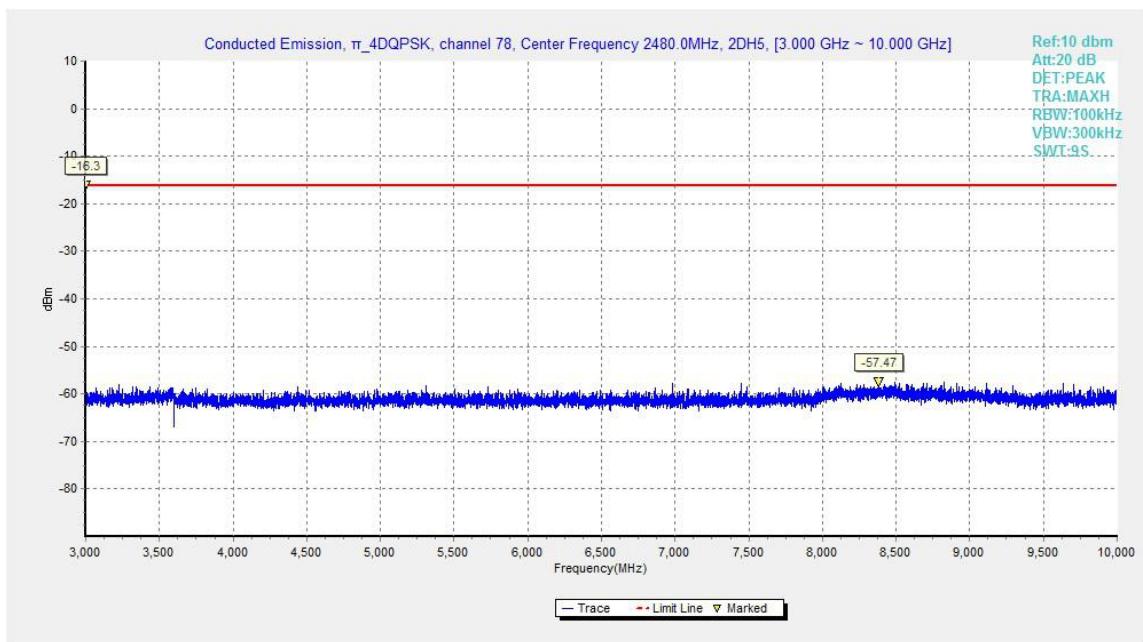


Fig.41. Conducted spurious emission: $\pi/4$ DQPSK, Channel 78, 3GHz - 10GHz

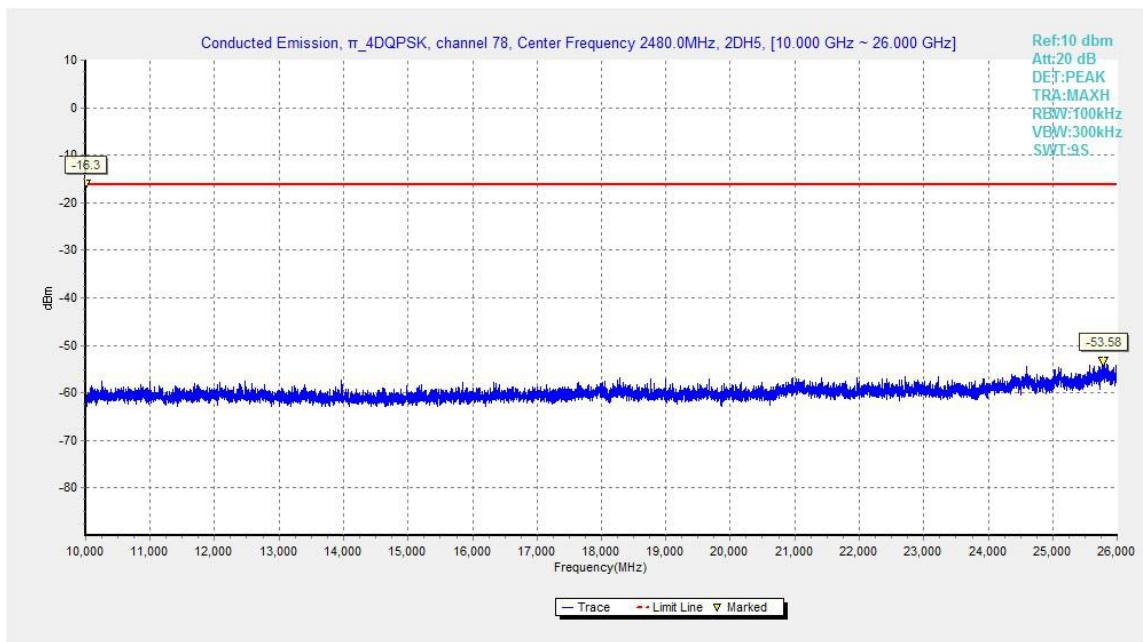


Fig.42. Conducted spurious emission: $\pi/4$ DQPSK, Channel 78, 10GHz - 26GHz

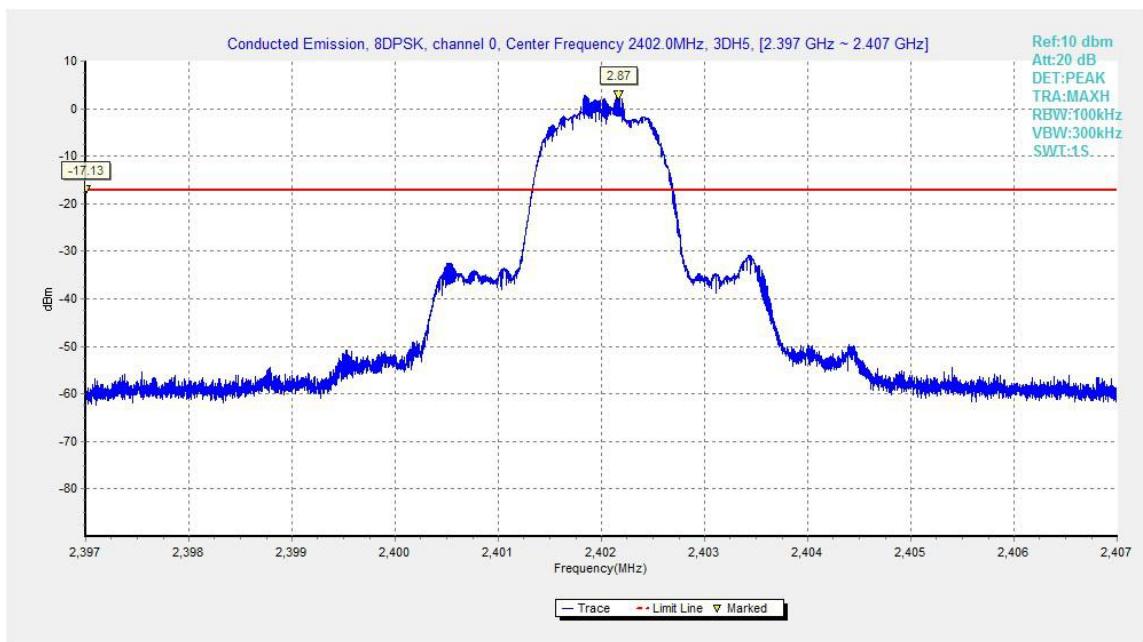


Fig.43. Conducted spurious emission: 8DPSK, Channel 0, 2402MHz

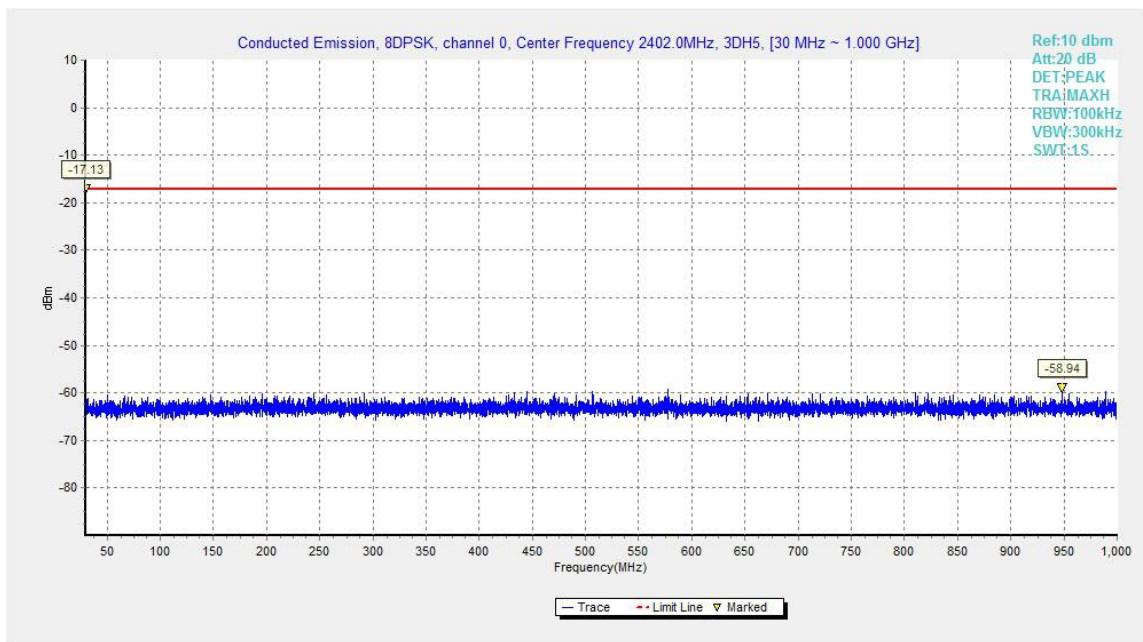


Fig.44. Conducted spurious emission: 8DPSK, Channel 0, 30MHz - 1GHz

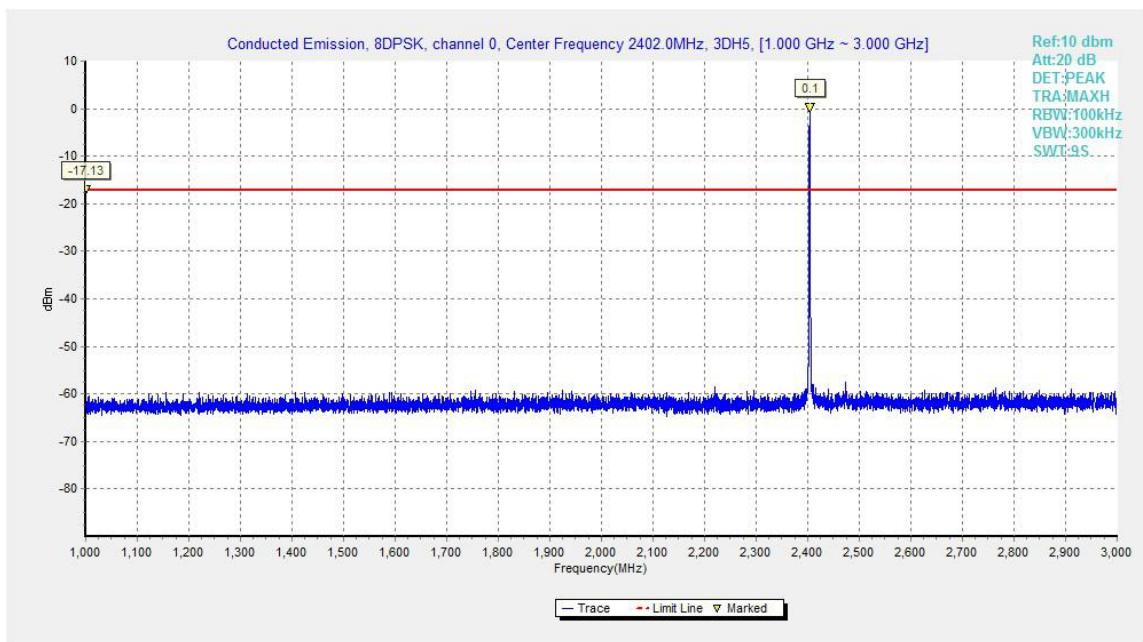


Fig.45. Conducted spurious emission: 8DPSK, Channel 0, 1GHz - 3GHz

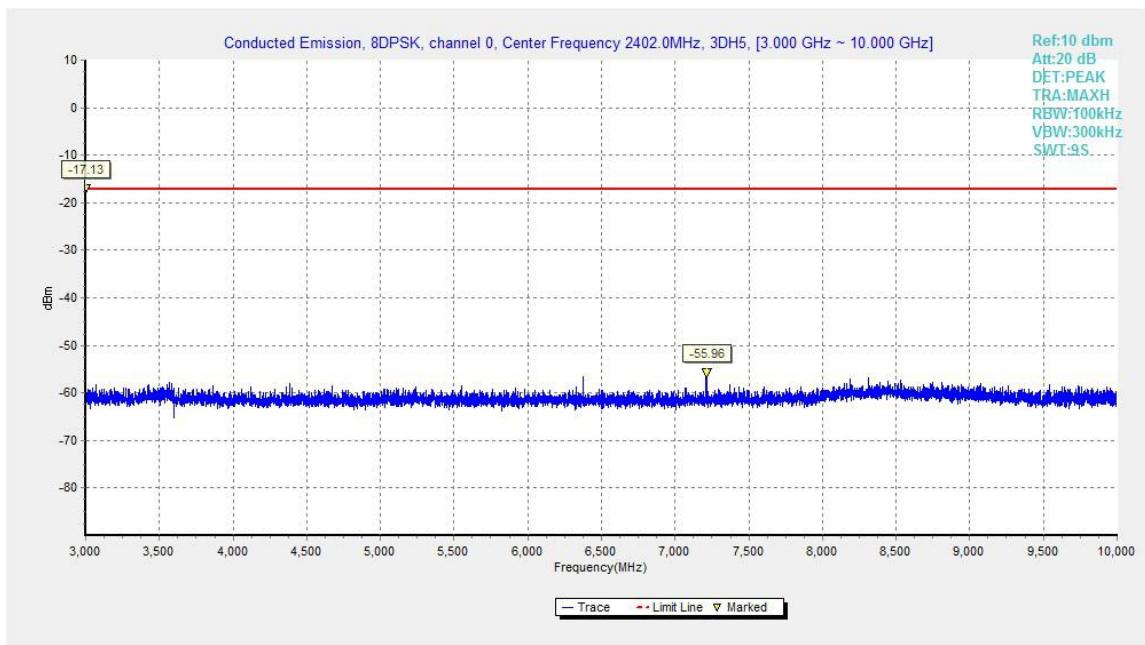


Fig.46. Conducted spurious emission: 8DPSK, Channel 0, 3GHz - 10GHz

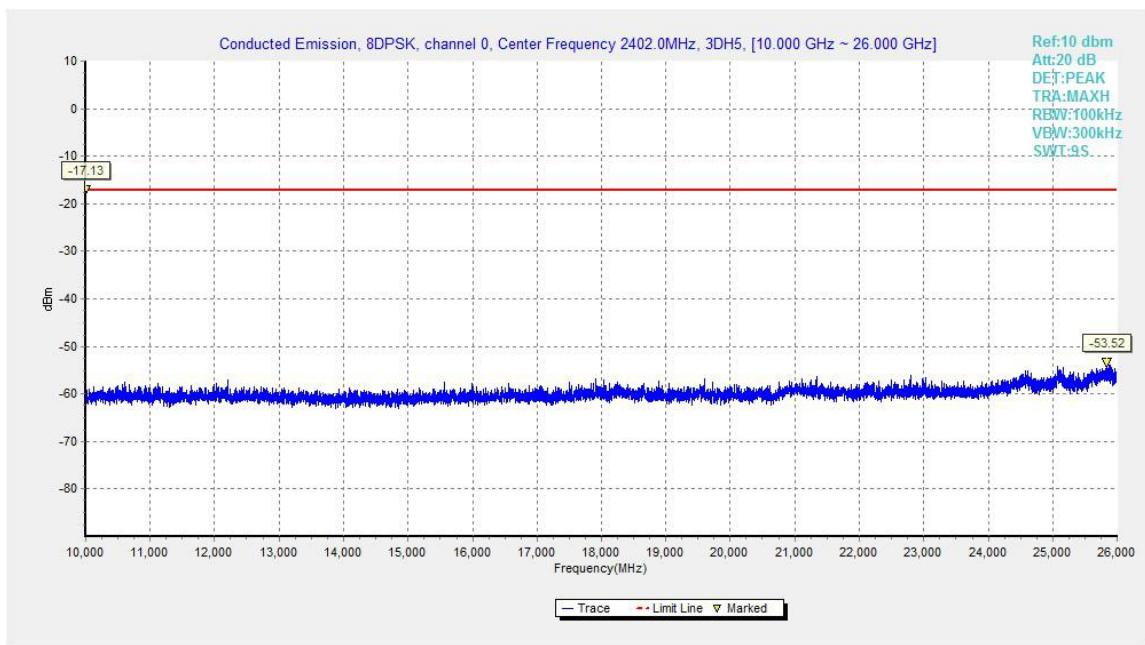


Fig.47. Conducted spurious emission: 8DPSK, Channel 0, 10GHz - 26GHz

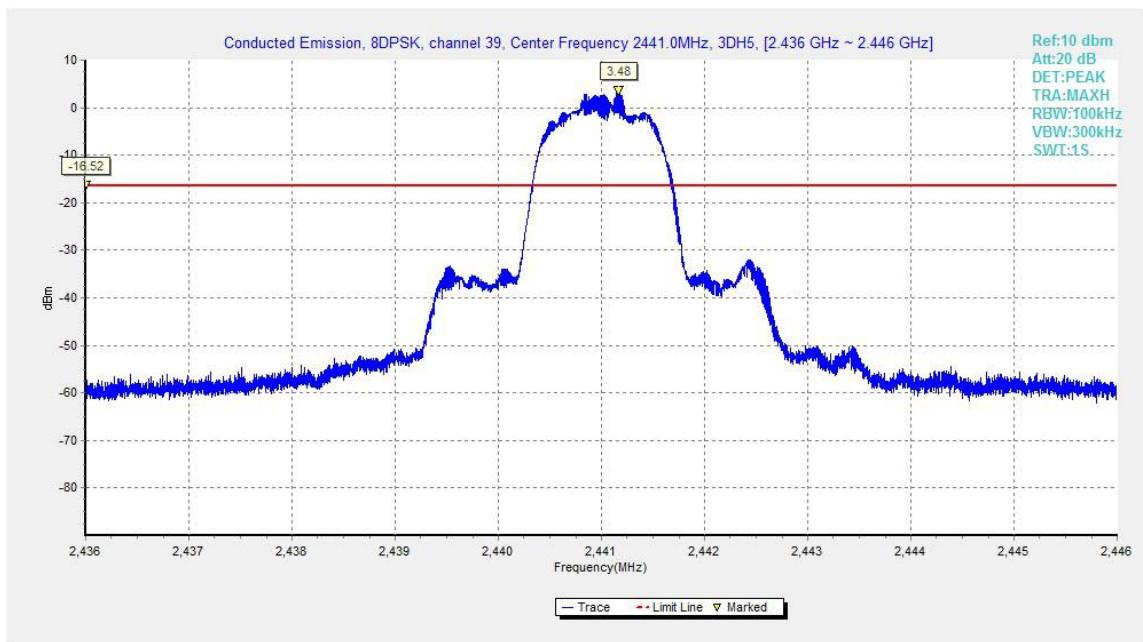


Fig.48. Conducted spurious emission: 8DPSK, Channel 39, 2441MHz

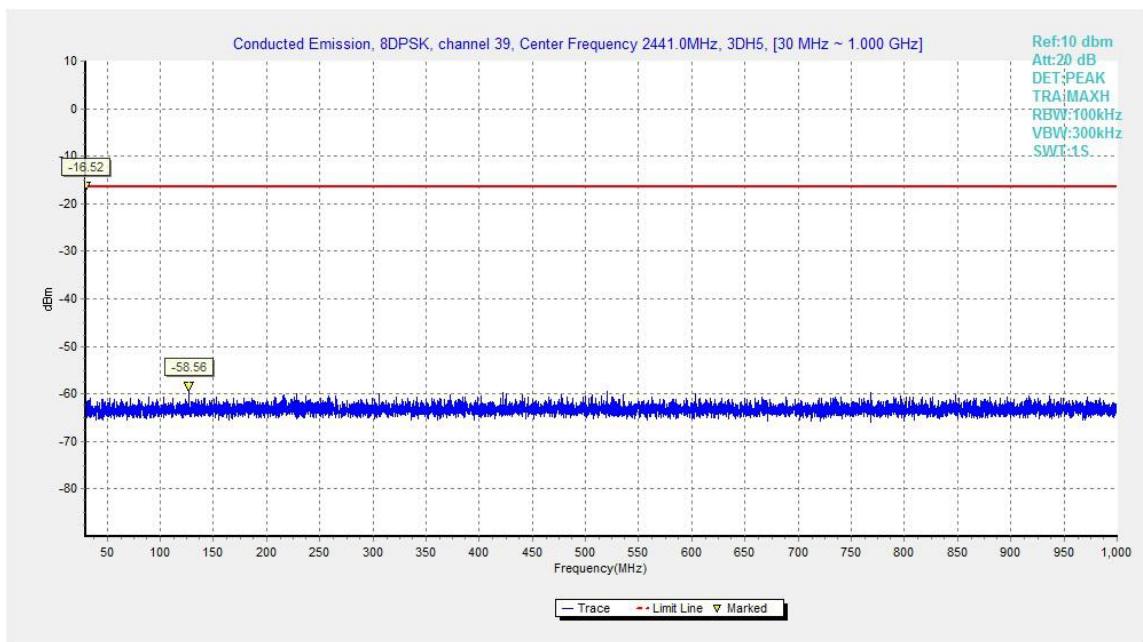


Fig.49. Conducted spurious emission: 8DPSK, Channel 39, 30MHz - 1GHz

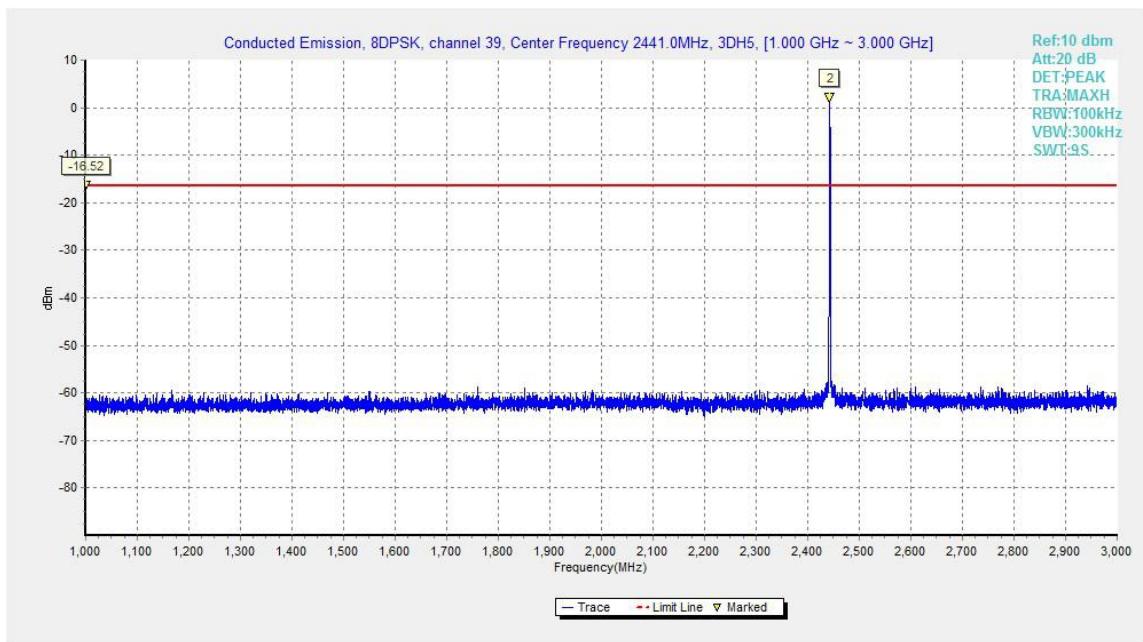


Fig.50. Conducted spurious emission: 8DPSK, Channel 39, 1GHz - 3GHz

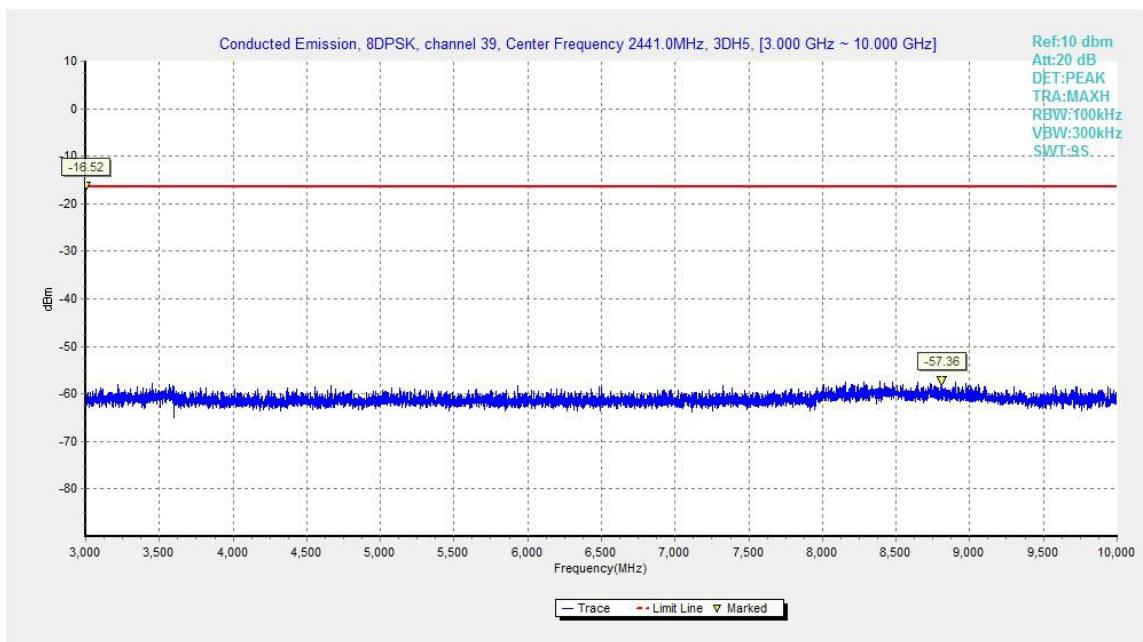


Fig.51. Conducted spurious emission: 8DPSK, Channel 39, 3GHz - 10GHz

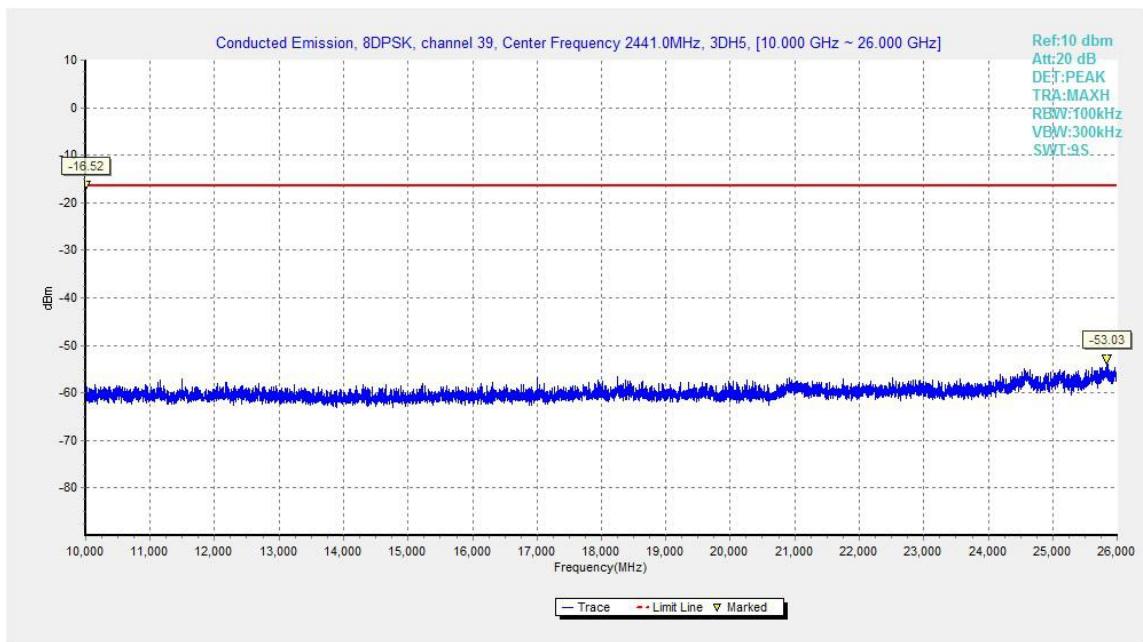


Fig.52. Conducted spurious emission: 8DPSK, Channel 39, 10GHz – 26GHz

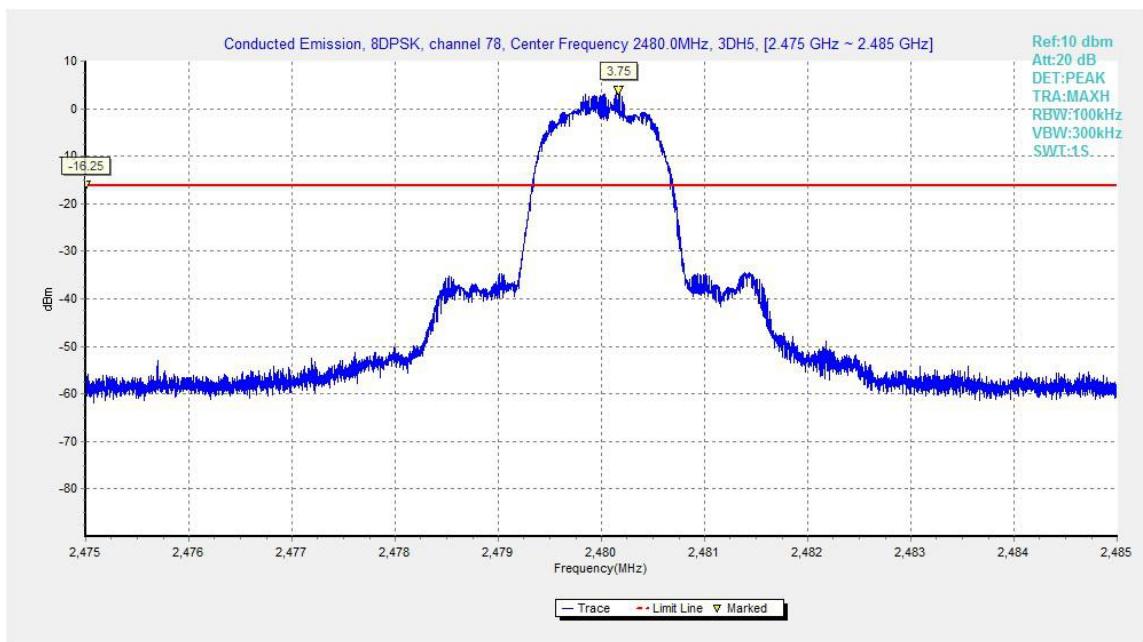


Fig.53. Conducted spurious emission: 8DPSK, Channel 78, 2480MHz

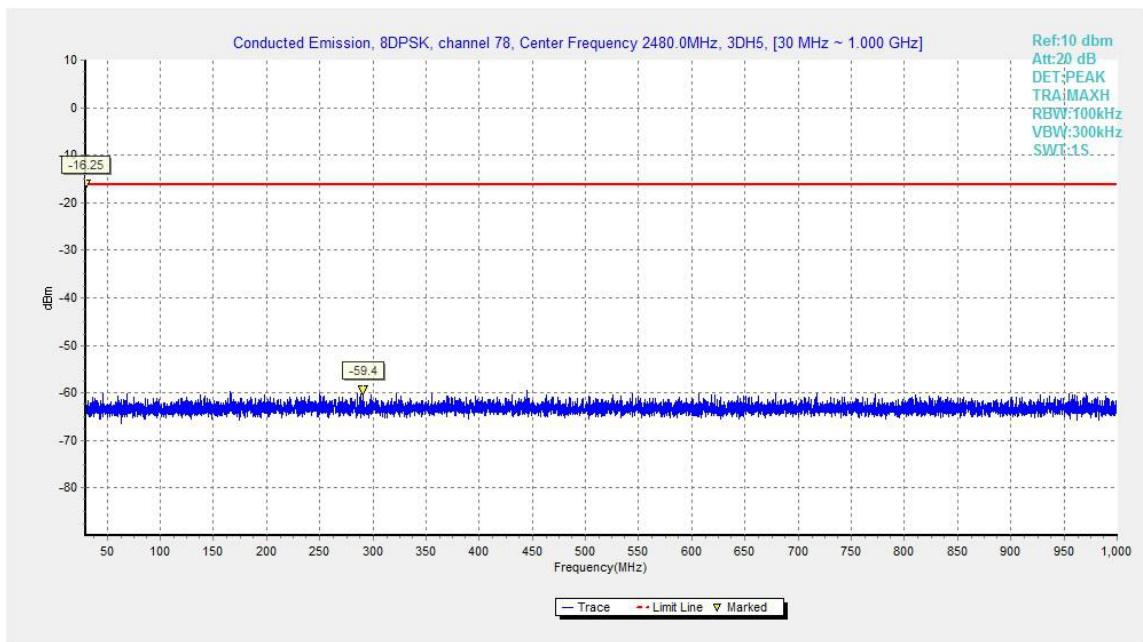


Fig.54. Conducted spurious emission: 8DPSK, Channel 78, 30MHz - 1GHz

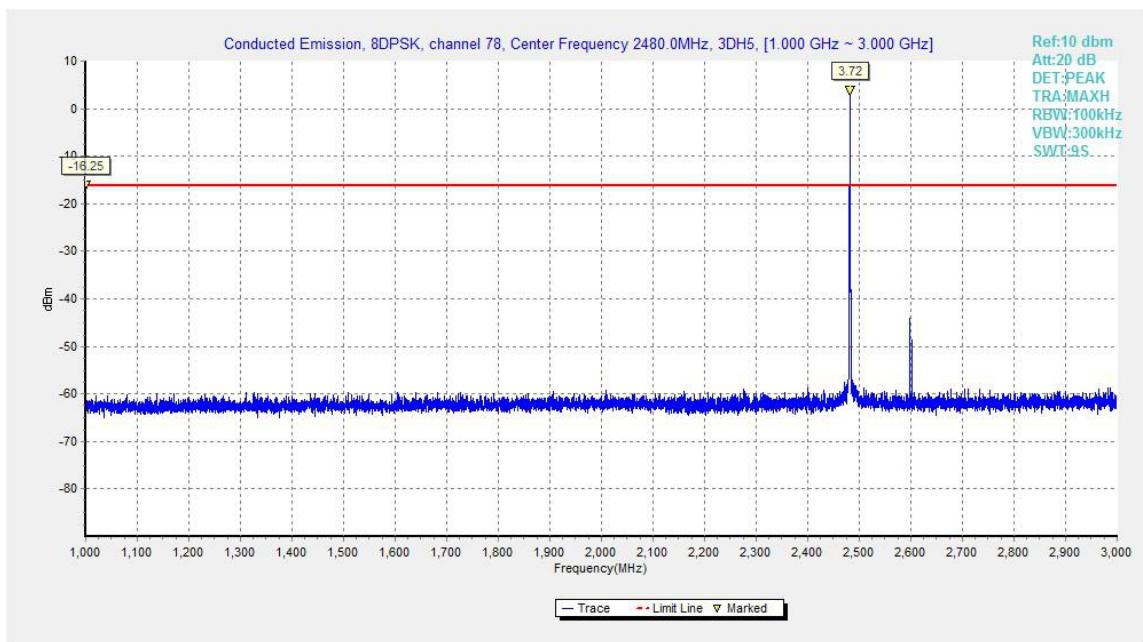


Fig.55. Conducted spurious emission: 8DPSK, Channel 78, 1GHz - 3GHz

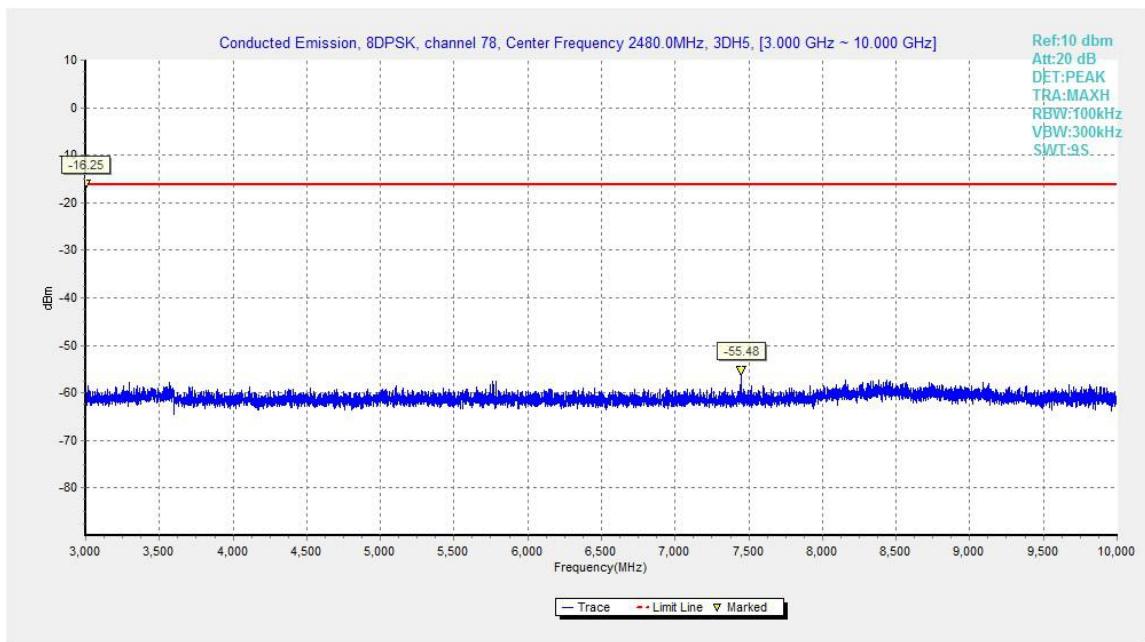


Fig.56. Conducted spurious emission: 8DPSK, Channel 78, 3GHz - 10GHz

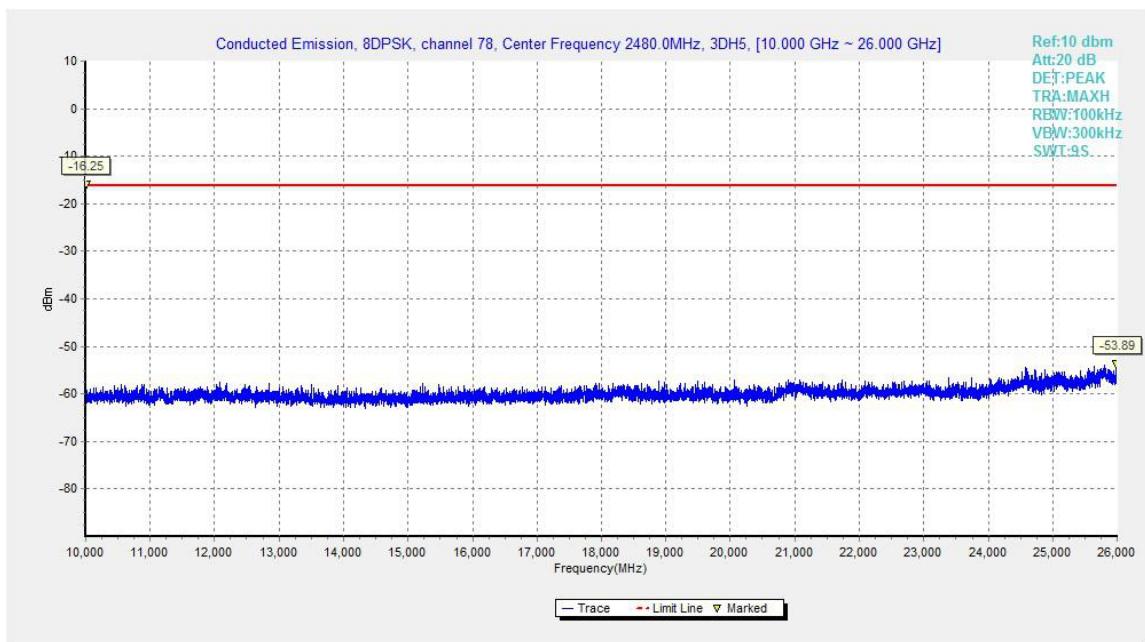


Fig.57. Conducted spurious emission: 8DPSK, Channel 78, 10GHz - 26GHz

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:

$$\text{Result} = P_{\text{Mea}} + \text{ARPL}$$

For GFSK

Channel	Frequency Range	Test Results	Conclusion
Power	2.38GHz~2.4GHz---L	Fig.1	P
Power	2.45GHz~2.5GHz---H	Fig.2	P

For π/4 DQPSK

Channel	Frequency Range	Test Results	Conclusion
Power	2.38GHz~2.4GHz---L	Fig.3	P
Power	2.45GHz~2.5GHz---H	Fig.4	P

For 8DPSK

Channel	Frequency Range	Test Results	Conclusion
Power	2.38GHz~2.4GHz---L	Fig.5	P
Power	2.45GHz~2.5GHz---H	Fig.6	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)
2387.824	46.44	2.9	32.0	11.62	54.0	7.6	H	155	132
2389.657	46.52	2.9	32.0	11.69	54.0	7.5	H	155	28
4804.500	33.42	-35.0	34.1	34.36	54.0	20.6	H	155	38
7206.000	37.27	-32.4	35.8	33.86	54.0	16.7	H	155	65
9607.500	40.84	-29.7	36.7	33.79	54.0	13.2	H	155	4
12010.500	42.16	-30.5	38.9	33.75	54.0	11.8	H	155	24

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)
2386.578	46.39	2.9	32.0	11.57	54.0	7.6	H	155	8
2478.635	47.87	2.9	32.0	12.94	54.0	6.1	H	155	56
4882.500	32.91	-35.5	34.1	34.36	54.0	21.1	H	155	139
7323.000	38.31	-31.3	35.8	33.82	54.0	15.7	H	155	108
9763.500	39.18	-31.4	36.9	33.66	54.0	14.8	H	155	78
12205.500	44.06	-28.9	39.0	33.93	54.0	9.9	H	155	36

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)
2483.654	47.99	2.9	32.0	13.06	54.0	6.0	H	155	268
2483.760	47.69	2.9	32.0	12.77	54.0	6.3	H	155	138
4960.500	33.50	-34.9	34.1	34.29	54.0	20.5	H	155	104
7440.000	37.31	-32.2	35.8	33.68	54.0	16.7	H	155	40
9919.500	41.16	-29.6	37.1	33.70	54.0	12.8	H	155	28
12400.500	43.36	-30.0	39.1	34.32	54.0	10.6	H	155	8

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)
2386.896	46.51	2.9	32.0	11.69	54.0	7.5	H	155	16
2389.347	46.50	2.9	32.0	11.67	54.0	7.5	H	155	48
4804.500	33.44	-35.0	34.1	34.39	54.0	20.6	H	155	80
7206.000	37.33	-32.4	35.8	33.92	54.0	16.7	H	155	8
9607.500	40.93	-29.7	36.7	33.87	54.0	13.1	H	155	102
12010.500	42.18	-30.5	38.9	33.78	54.0	11.8	H	155	118

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)
2384.752	46.42	2.9	32.0	11.60	54.0	7.6	H	155	28
2486.593	47.68	2.9	32.0	12.75	54.0	6.3	H	155	46
4882.500	32.89	-35.5	34.1	34.34	54.0	21.1	H	155	8
7323.000	38.23	-31.3	35.8	33.74	54.0	15.8	H	155	6
9763.500	39.25	-31.4	36.9	33.73	54.0	14.8	H	155	24
12205.500	44.09	-28.9	39.0	33.96	54.0	9.9	H	155	185

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)
2485.670	47.57	2.9	32.0	12.64	54.0	6.4	H	155	28
2486.384	47.66	2.9	32.0	12.74	54.0	6.3	H	155	248
4960.500	33.53	-34.9	34.1	34.31	54.0	20.5	H	155	38
7440.000	37.40	-32.2	35.8	33.77	54.0	16.6	H	155	98
9919.500	41.26	-29.6	37.1	33.80	54.0	12.7	H	155	183
12400.500	43.39	-30.0	39.1	34.36	54.0	10.6	H	155	356

8DPSK Ch 0 - Average

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2381.600	46.46	2.9	32.0	11.64	54.0	7.5	H	155	354
2386.500	46.48	2.9	32.0	11.66	54.0	7.5	H	155	28
4804.500	33.43	-35.0	34.1	34.37	54.0	20.6	H	155	348
7206.000	37.28	-32.4	35.8	33.87	54.0	16.7	H	155	345
9607.500	40.95	-29.7	36.7	33.90	54.0	13.0	H	155	184
12010.500	42.21	-30.5	38.9	33.80	54.0	11.8	H	155	182

8DPSK Ch 39 - Average

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2386.325	46.41	2.9	32.0	11.59	54.0	7.6	H	155	142
2487.658	47.64	2.9	32.0	12.70	54.0	6.4	H	155	168
4882.500	32.88	-35.5	34.1	34.33	54.0	21.1	H	155	90
7323.000	38.25	-31.3	35.8	33.76	54.0	15.8	H	155	102
9763.500	39.22	-31.4	36.9	33.70	54.0	14.8	H	155	118
12205.500	44.06	-28.9	39.0	33.94	54.0	9.9	H	155	94

8DPSK Ch 78 - Average

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2483.500	50.24	2.9	32.0	15.31	54.0	3.8	H	155	92
2548.600	49.71	3.0	32.1	14.66	54.0	4.3	H	155	68
4960.500	33.48	-34.9	34.1	34.26	54.0	20.5	H	155	118
7440.000	37.40	-32.2	35.8	33.78	54.0	16.6	H	155	354
9919.500	41.20	-29.6	37.1	33.75	54.0	12.8	H	155	18
12400.500	43.32	-30.0	39.1	34.29	54.0	10.7	H	155	38

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)
2376.023	59.96	2.9	32.0	25.15	74.0	14.0	H	155	22
2384.136	60.22	2.9	32.0	25.40	74.0	13.8	H	155	44
4804.000	40.60	-35.0	34.1	41.54	74.0	33.4	V	155	66
7206.000	42.97	-32.4	35.8	39.57	74.0	31.0	V	155	22
9608.000	45.97	-29.7	36.7	38.90	74.0	28.0	V	155	0
12010.000	45.31	-30.5	38.9	36.90	74.0	28.7	V	155	88

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)
2374.000	48.21	2.9	32.0	42.98	74.0	25.8	H	155	110
2512.200	49.10	3.0	32.0	43.63	74.0	24.9	H	155	22
4882.000	39.48	-35.5	34.1	40.92	74.0	34.5	V	155	44
7323.000	43.88	-31.3	35.8	39.39	74.0	30.1	V	155	66
9764.000	43.80	-31.4	36.9	38.29	74.0	30.2	V	155	0
12205.000	46.40	-28.8	39.0	36.26	74.0	27.6	H	155	22

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)
2487.785	60.41	2.9	32.0	25.48	74.0	13.6	H	155	0
2490.956	60.96	2.9	32.0	26.03	74.0	13.0	H	155	44
4960.000	38.92	-34.9	34.1	39.71	74.0	35.1	H	155	132
7440.000	43.57	-32.2	35.8	39.94	74.0	30.4	V	155	110
9920.000	47.36	-29.7	37.1	39.92	74.0	26.6	H	155	88
12400.000	47.03	-30.0	39.1	38.01	74.0	27.0	H	155	44

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)
2368.295	60.20	2.9	32.0	25.40	74.0	13.8	H	155	264
2380.336	60.64	2.9	32.0	25.82	74.0	13.4	H	155	132
4804.000	39.43	-35.0	34.1	40.37	74.0	34.6	H	155	110
7206.000	43.50	-32.4	35.8	40.09	74.0	30.5	H	155	44
9608.000	45.00	-29.7	36.7	37.93	74.0	29.0	H	155	22
12010.000	46.65	-30.5	38.9	38.24	74.0	27.4	V	155	0

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)
2376.000	47.67	2.9	32.0	42.30	74.0	26.3	H	155	22
2502.600	48.61	2.9	32.0	42.93	74.0	25.4	H	155	44
4882.000	39.05	-35.5	34.1	40.50	74.0	34.9	V	155	88
7323.000	43.30	-31.3	35.8	38.81	74.0	30.7	V	155	0
9764.000	43.59	-31.4	36.9	38.07	74.0	30.4	H	155	110
12205.000	50.37	-28.8	39.0	40.23	74.0	23.6	H	155	132

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)
2484.045	60.63	2.9	32.0	25.71	74.0	13.4	H	155	22
2493.225	60.73	2.9	32.0	25.79	74.0	13.3	H	155	44
4960.000	40.04	-34.9	34.1	40.83	74.0	34.0	V	155	0
7440.000	41.01	-32.2	35.8	37.38	74.0	33.0	H	155	0
9920.000	47.30	-29.7	37.1	39.85	74.0	26.7	V	155	22
12400.000	46.55	-30.0	39.1	37.53	74.0	27.4	H	155	176

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)
2354.212	60.69	2.8	31.9	25.90	74.0	13.3	H	155	22
2386.608	60.30	2.9	32.0	25.48	74.0	13.7	H	155	242
4804.000	40.01	-35.0	34.1	40.95	74.0	34.0	V	155	44
7323.000	42.64	-31.3	35.8	38.15	74.0	31.4	H	155	88
9764.000	44.81	-31.4	36.9	39.29	74.0	29.2	V	155	176
12010.000	45.27	-30.5	38.9	36.86	74.0	28.7	H	155	0

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)
2377.600	47.82	2.9	32.0	42.34	74.0	26.2	H	155	0
2500.000	49.13	2.9	32.0	43.40	74.0	24.9	H	155	22
4882.000	38.91	-35.5	34.1	40.36	74.0	35.1	V	155	352
7323.000	44.03	-31.3	35.8	39.54	74.0	30.0	V	155	352
9764.000	43.59	-31.4	36.9	38.07	74.0	30.4	V	155	176
12205.000	47.13	-28.8	39.0	36.99	74.0	26.9	V	155	176

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)
2486.545	60.37	2.9	32.0	25.44	74.0	13.6	H	155	132
2489.425	60.12	2.9	32.0	25.19	74.0	13.9	V	155	154
4960.000	39.70	-34.9	34.1	40.49	74.0	34.3	H	155	88
7440.000	41.22	-32.2	35.8	37.59	74.0	32.8	V	155	110
9920.000	46.28	-29.7	37.1	38.83	74.0	27.7	V	155	110
12400.000	45.73	-30.0	39.1	36.70	74.0	28.3	V	155	88

Conclusion: PASS
Test graphs as below: