



# FCC PART 15C TEST REPORT

## No.I18Z62361-IOT05

for

**HMD Global OY**

**Multi-band GSM/WCDMA/LTE phone with Bluetooth, WLAN GSM**

**850,900, 1800,1900 WCDMA : 1,2,4, 5, 8 LTE : 1,2, 3,4,**

**5,7,8,12/17,28,38,66 mobile phone, Bluetooth 4.2, WIFI 802.11 b/g/n**

**Model Name: TA-1133**

**FCC ID:2AJOTTA-1133**

**with**

**Hardware Version:89571\_1\_12**

**Software Version:00XX\_1\_XXX**

**Issued Date: 2019-01-28**



**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.

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## REPORT HISTORY

Report Number	Revision	Description	Issue Date
I18Z62361-IOT05	Rev.0	1st edition	2019-01-28

## **CONTENTS**

<b>1. TEST LABORATORY .....</b>	<b>5</b>
1.1. TESTING LOCATION .....	5
1.2. TESTING ENVIRONMENT .....	5
1.3. PROJECT DATA .....	5
1.4. SIGNATURE .....	5
<b>2. CLIENT INFORMATION.....</b>	<b>6</b>
2.1. APPLICANT INFORMATION .....	6
2.2. MANUFACTURER INFORMATION .....	6
<b>3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARY EQUIPMENT (AE) .....</b>	<b>7</b>
3.1. ABOUT EUT .....	7
3.2. INTERNAL IDENTIFICATION OF EUT .....	7
3.3. INTERNAL IDENTIFICATION OF AE .....	7
3.4. NORMAL ACCESSORY SETTING .....	8
3.5. GENERAL DESCRIPTION.....	8
<b>4. REFERENCE DOCUMENTS .....</b>	<b>9</b>
4.1. DOCUMENTS SUPPLIED BY APPLICANT .....	9
4.2. REFERENCE DOCUMENTS FOR TESTING.....	9
<b>5. TEST RESULTS .....</b>	<b>10</b>
5.1. SUMMARY OF TEST RESULTS .....	10
5.2. STATEMENTS .....	10
5.3. EXPLANATION OF RE-USE OF TEST DATA .....	10
<b>6. TEST FACILITIES UTILIZED .....</b>	<b>11</b>
<b>7. MEASUREMENT UNCERTAINTY .....</b>	<b>12</b>
7.1. PEAK OUTPUT POWER - CONDUCTED .....	12
7.2. FREQUENCY BAND EDGES .....	12
7.3. TRANSMITTER SPURIOUS EMISSION - CONDUCTED .....	12
7.4. TRANSMITTER SPURIOUS EMISSION - RADIATED .....	12
7.5. TIME OF OCCUPANCY (DWELL TIME) .....	12
7.6. 20dB BANDWIDTH .....	12
7.7. CARRIER FREQUENCY SEPARATION .....	12
7.8. AC POWERLINE CONDUCTED EMISSION .....	13
<b>ANNEX A: DETAILED TEST RESULTS .....</b>	<b>14</b>
A.1. MEASUREMENT METHOD .....	14
A.2. PEAK OUTPUT POWER – CONDUCTED .....	15
A.3. FREQUENCY BAND EDGES – CONDUCTED .....	16
A.4. TRANSMITTER SPURIOUS EMISSION - CONDUCTED .....	23
A.5. TRANSMITTER SPURIOUS EMISSION - RADIATED .....	48



A.6. TIME OF OCCUPANCY (DWELL TIME) .....	58
A.7. 20dB BANDWIDTH.....	68
A.8. CARRIER FREQUENCY SEPARATION .....	74
A.9. NUMBER OF HOPPING CHANNELS.....	77
A.10. AC POWERLINE CONDUCTED EMISSION.....	81
<b>ANNEX E: ACCREDITATION CERTIFICATE .....</b>	<b>85</b>



## 1. Test Laboratory

### 1.1. 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

### 1.2. Testing Environment

Normal Temperature: 15-35°C

Relative Humidity: 20-75%

### 1.3. Project data

Testing Start Date: 2018-12-28

Testing End Date: 2019-01-28

### 1.4. Signature

A handwritten signature in black ink, appearing to read '武乐' (Wu Le).

Wu Le

(Prepared this test report)

A handwritten signature in black ink, appearing to read '孙震宇' (Sun Zhenyu).

Sun Zhenyu

(Reviewed this test report)

A handwritten signature in black ink, appearing to read '黎卓芳' (Li Zhuofang).

Li Zhuofang

(Approved this test report)



## **2. ClientInformation**

### **2.1. Applicant Information**

Company Name: HMD Global OY  
Address/Post: Bertel Jungin aukio 9,02600 ESPOO,FINLAND  
City: /  
Postal Code: /  
Country: FINLAND  
Telephone: /  
Fax: /

### **2.2. Manufacturer Information**

Company Name: HMD Global OY  
Address/Post: Bertel Jungin aukio 9,02600 ESPOO,FINLAND  
City: /  
Postal Code: /  
Country: FINLAND  
Telephone: /  
Fax: /

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

#### **3.1. About EUT**

Description	Multi-band GSM/WCDMA/LTE phone with Bluetooth, WLAN GSM 850,900, 1800,1900 WCDMA : 1,2,4, 5, 8 LTE : 1,2, 3,4, 5,7,8,12/17,28,38,66 mobile phone, Bluetooth 4.2, WIFI 802.11 b/g/n
Model Name	TA-1133
FCC ID	2AJOTTA-1133
Frequency Band	ISM 2400MHz~2483.5MHz
Type of Modulation	GFSK/ $\pi/4$ DQPSK/8DPSK
Number of Channels	79
Power Supply	3.9V DC by Battery

#### **3.2. Internal Identification of EUT**

EUT ID*	SN or IMEI	HW Version	SW Version
EUT2	/	89571_1_12	00XX_1_XXX
EUT3	/	89571_1_12	00XX_1_XXX

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

#### **3.3. Internal Identification of AE**

AE ID*	Description
AE1	Battery / /
AE2	Battery / /
AE3	Charger / /
AE4	Charger / NO TEST
AE5	USB Cable / /
AE6	USB Cable / /
AE1	Model WT330 Manufacturer Jiade Energy Technology(Zhuhai) Co.,Ltd. Capacitance 3000mAh Nominal voltage 3.85V
AE2	Model WT330 Manufacturer Sunwoda Electronic Co.,Ltd Capacitance 3000mAh Nominal voltage 3.85V
AE3	Model CH-35U



Manufacturer	Shenzhen Tianyin Electronics Co.,Ltd
Length of cable	/
AE4	
Model	CH-35E
Manufacturer	Shenzhen Tianyin Electronics Co.,Ltd
Length of cable	/
AE5	
Model	CB-35A
Manufacturer	Leagtech Electronics Co.,Ltd
Length of cable	/
AE6	
Model	CB-35A
Manufacturer	Shenzhen BRL Technology Co.,Ltd.
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 Multi-band GSM/WCDMA/LTE phone with Bluetooth, WLAN GSM 850,900, 1800,1900 WCDMA : 1,2,4, 5, 8 LTE : 1,2, 3,4, 5,7,8,12/17,28,38,66 mobile phone, Bluetooth 4.2, WIFI 802.11 b/g/n 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.

<b>Reference</b>	<b>Title</b>	<b>Version</b>
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.	2016
ANSI C63.10	American National Standard of Procedures for ComplianceTesting 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)	<b>R</b>
Frequency Band Edges	15.247 (d)	<b>R</b>
Transmitter Spurious Emission - Conducted	15.247 (d)	<b>R</b>
Transmitter Spurious Emission - Radiated	15.247, 15.205, 15.209	<b>P</b>
Time of Occupancy (Dwell Time)	15.247 (a) (1)(iii)	<b>R</b>
20dB Bandwidth	15.247 (a)(1)	<b>R</b>
Carrier Frequency Separation	15.247 (a)(1)	<b>R</b>
Number of hopping channels	15.247 (a)(b)(iii)	<b>R</b>
AC Powerline Conducted Emission	15.107, 15.207	<b>R</b>

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

This model is a variant product which model name isTA-1157(FCC ID:2AJOTTA-1157), according to the declaration of changes provided by the applicant and FCC KDB publication 484596D01, all the test results are derived from test report No. I18Z62335-IOT09. 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	LISN	ESH3-Z5	825562/0 28	Rohde & Schwarz	1 year	2019-08-22
3	Test Receiver	ESCI	100766	Rohde & Schwarz	1 year	2019-04-16
4	Base Station Simulator	CMW500	159408	R&S	1 year	2019-04-15
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	9163-482	Schwarzbeck	1 year	2019-09-21
3	Dual-Ridge Waveguide Horn Antenna	3117	00139065	ETS-Lindgren	1 year	2019-11-15
4	Dual-Ridge Waveguide Horn Antenna	3116	2663	ETS-Lindgren	3 years	2020-05-31
5	Vector Signal Analyzer	FSV40	101047	Rohde & Schwarz	1 year	2019-07-27
6	Base Station Simulator	CMW500	159408	R&S	1 year	2019-04-15

## 7. Measurement Uncertainty

### 7.1. Peak Output Power - Conducted

**Measurement Uncertainty:**

Measurement Uncertainty(k=2)	0.66dB
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### 7.2. Frequency Band Edges

**Measurement Uncertainty:**

Measurement Uncertainty(k=2)	0.66dB
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### 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	5.40dB
> 1 GHz	4.32dB

### 7.5. Time of Occupancy (Dwell Time)

**Measurement Uncertainty:**

Measurement Uncertainty(k=2)	0.88ms
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### 7.6. 20dB Bandwidth

**Measurement Uncertainty:**

Measurement Uncertainty(k=2)	61.936Hz
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### 7.7. Carrier Frequency Separation

**Measurement Uncertainty:**



Measurement Uncertainty(k=2)	61.936Hz
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## 7.8. AC Powerline Conducted Emission

### Measurement Uncertainty:

Measurement Uncertainty(k=2)	3.10dB
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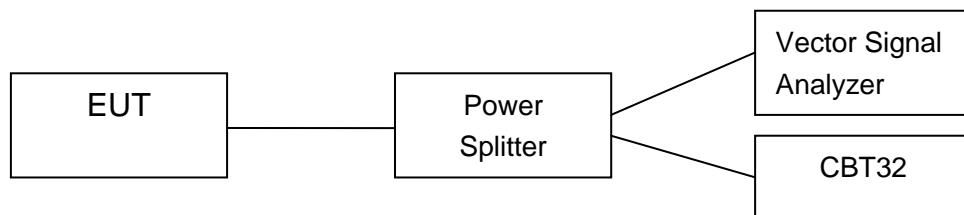
## ANNEX A: Detailed Test Results

### 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

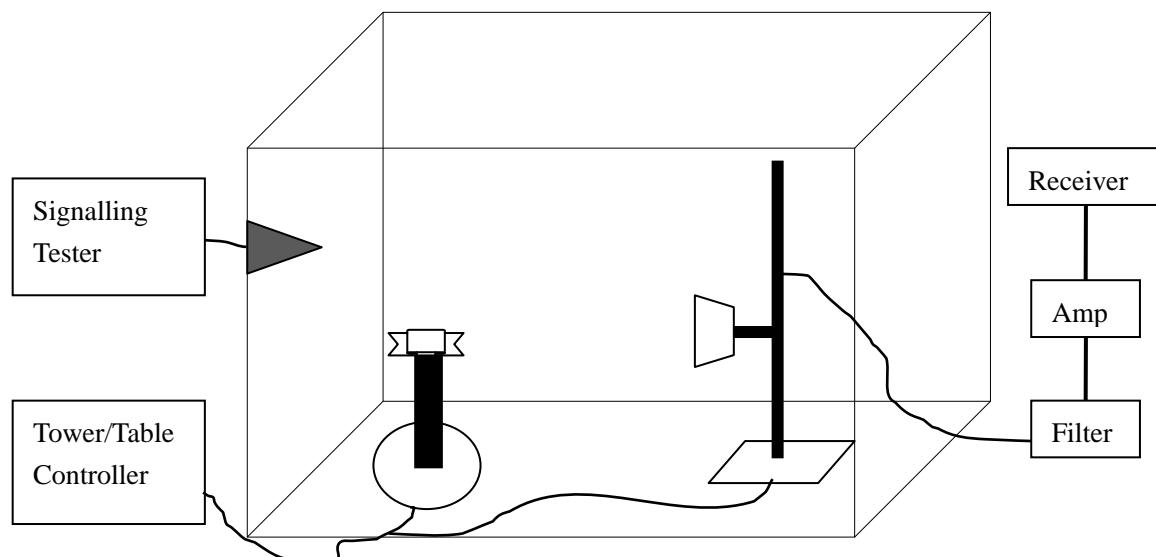
The measurement is made according to ANSI C63.10

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**

- Use the following spectrum analyzer settings:
  - Span: 6MHz
  - RBW: 3MHz
  - VBW: 3MHz
  - Sweep time: 2.5ms
  - Detector function: peak
  - Trace: max hold
- Allow trace to stabilize.
- Use the marker-to-peak function to set the marker to the peak of the emission.
- The indicated level is the peak output power.

**Measurement Limit:**

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

**Measurement Results:**

**For GFSK**

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	3.38	4.14	3.15	P

**For π/4 DQPSK**

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	4.14	4.95	3.74	P

**For 8DPSK**

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	4.37	5.10	4.02	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 difference 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	-55.26	P
	Hopping ON	Fig.2	-61.49	P
78	Hopping OFF	Fig.3	-60.79	P
	Hopping ON	Fig.4	-62.71	P

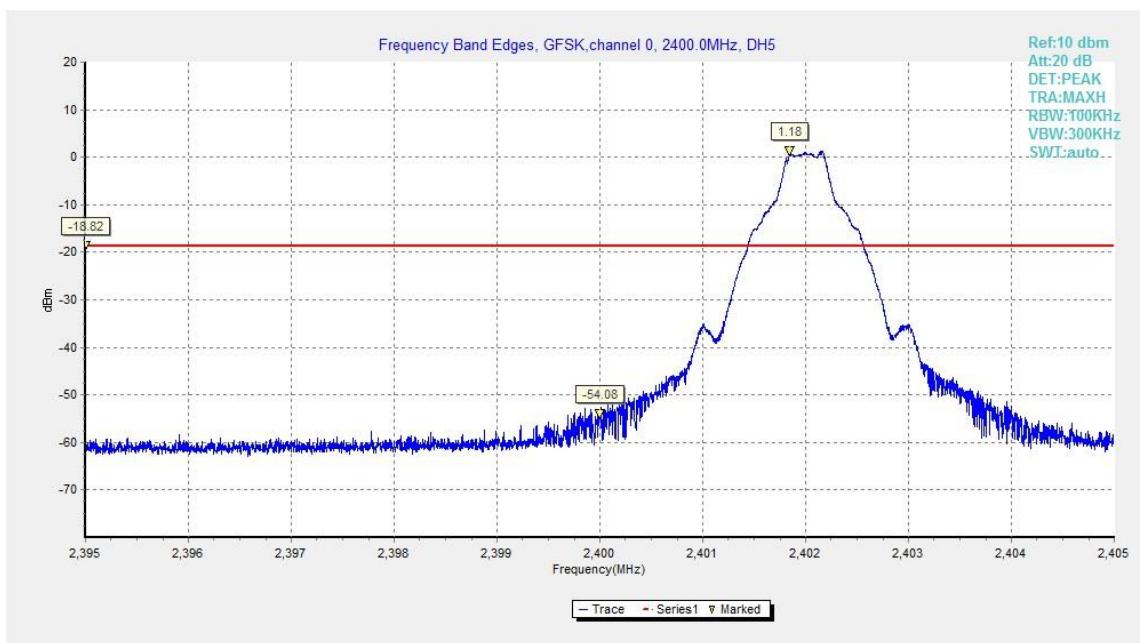
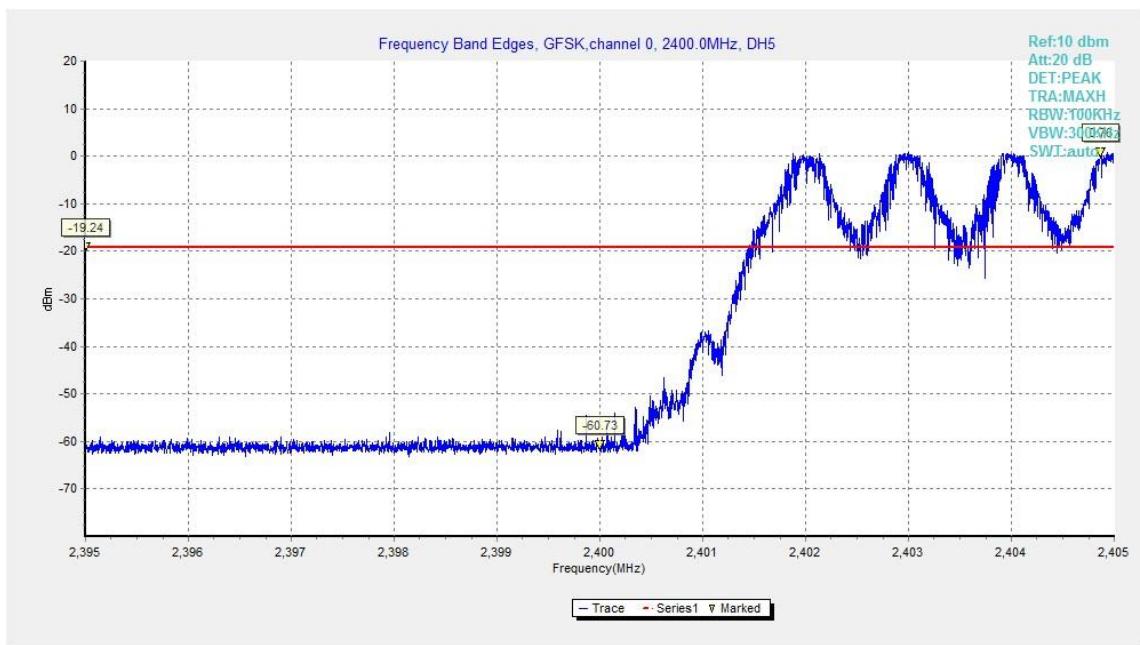
##### For 4 DQPSK

Channel	Hopping	Band Edge Power ( dBc)		Conclusion
0	Hopping OFF	Fig.5	-59.64	P
	Hopping ON	Fig.6	-61.62	P
78	Hopping OFF	Fig.7	-60.21	P
	Hopping ON	Fig.8	-60.03	P

##### For 8DPSK

Channel	Hopping	Band Edge Power ( dBc)		Conclusion
0	Hopping OFF	Fig.9	-56.49	P
	Hopping ON	Fig.10	-62.44	P
78	Hopping OFF	Fig.11	-60.53	P

	Hopping ON	Fig.12	-59.04	P
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**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**

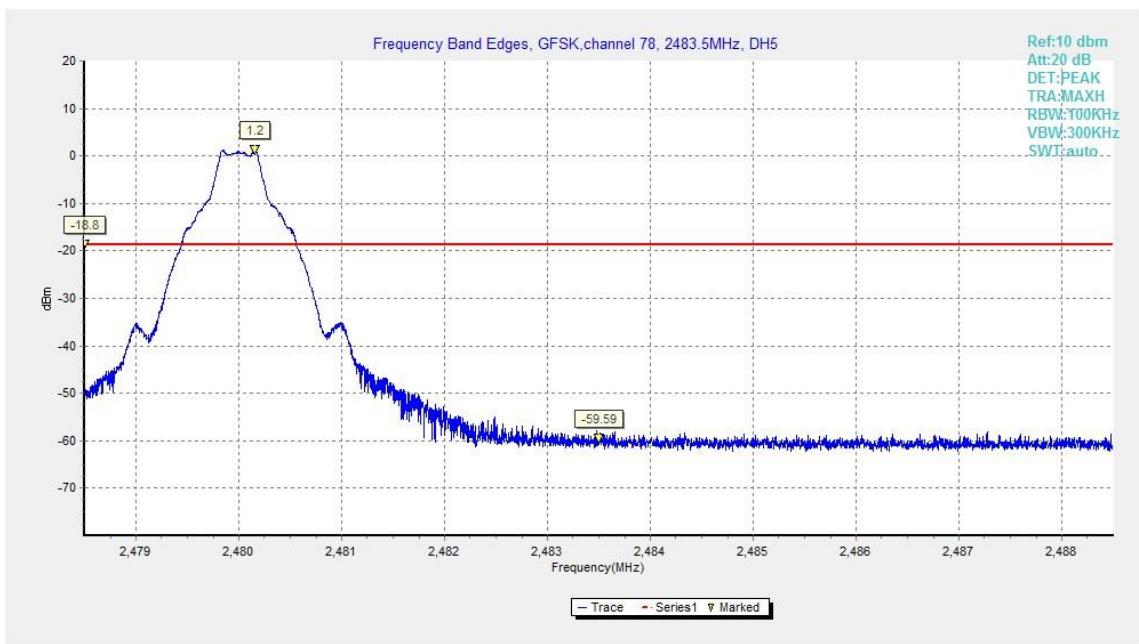


Fig.3. Frequency Band Edges: GFSK, Channel 78, Hopping Off

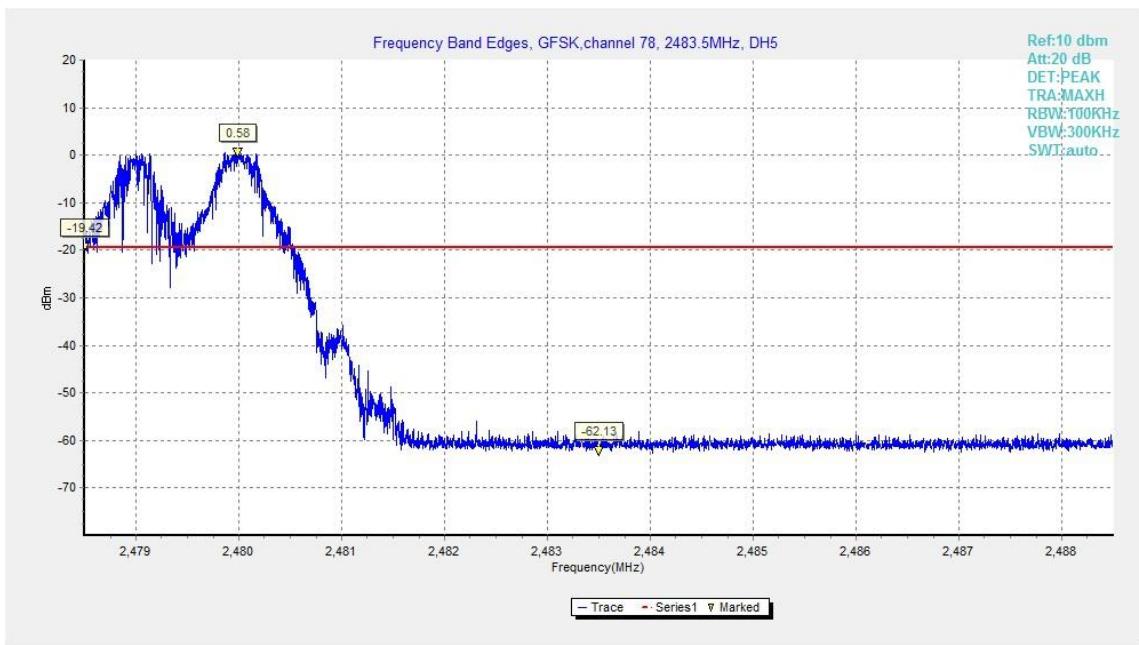


Fig.4. Frequency Band Edges: GFSK, Channel 78, Hopping On

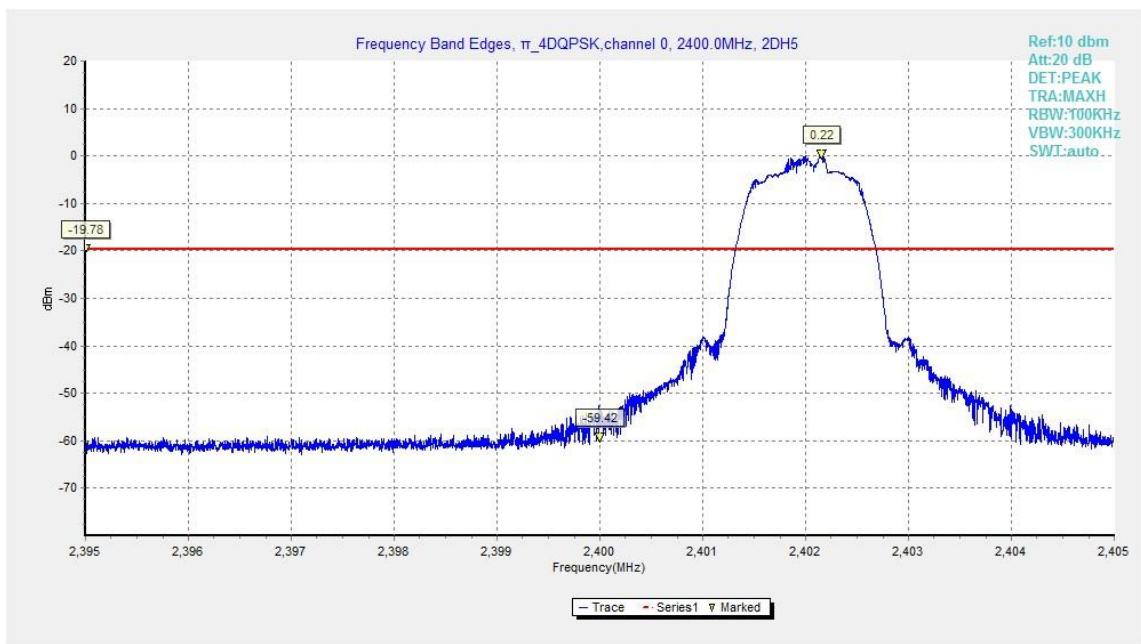


Fig.5. Frequency Band Edges:  $\pi/4$  DQPSK, Channel 0, Hopping Off

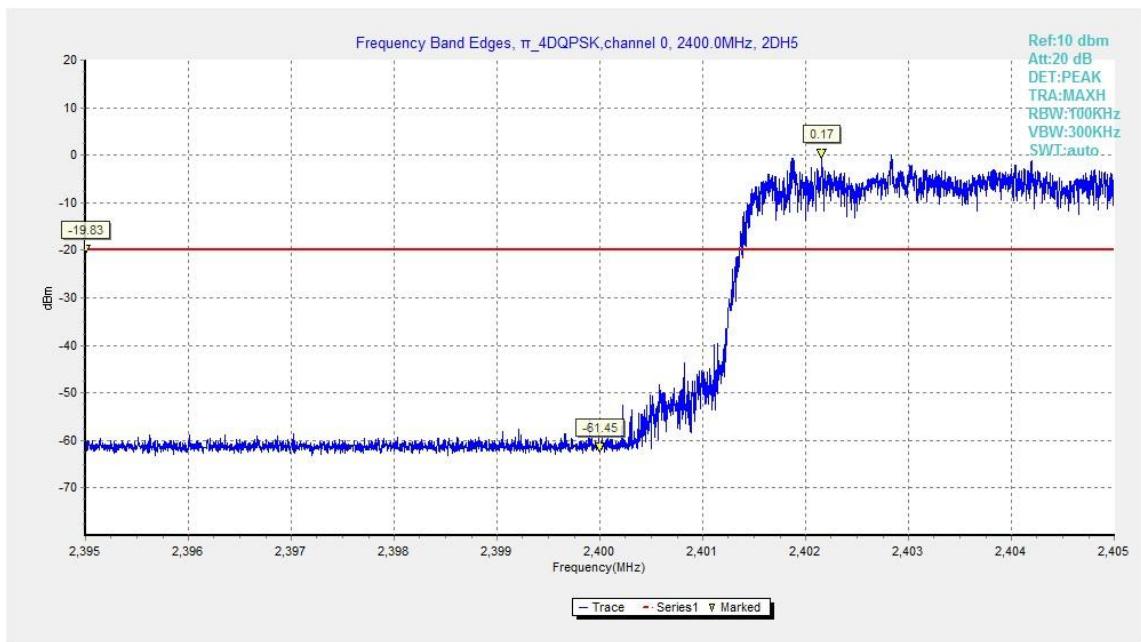


Fig.6. Frequency Band Edges:  $\pi/4$  DQPSK, Channel 0, Hopping On

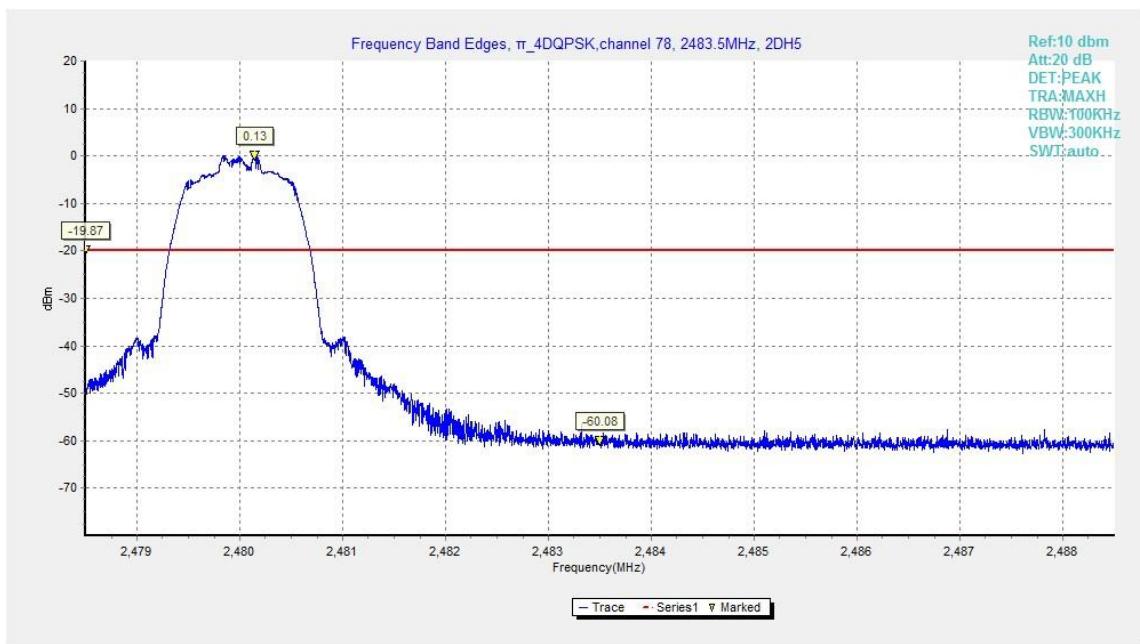


Fig.7. Frequency Band Edges:  $\pi/4$  DQPSK, Channel 78, Hopping Off

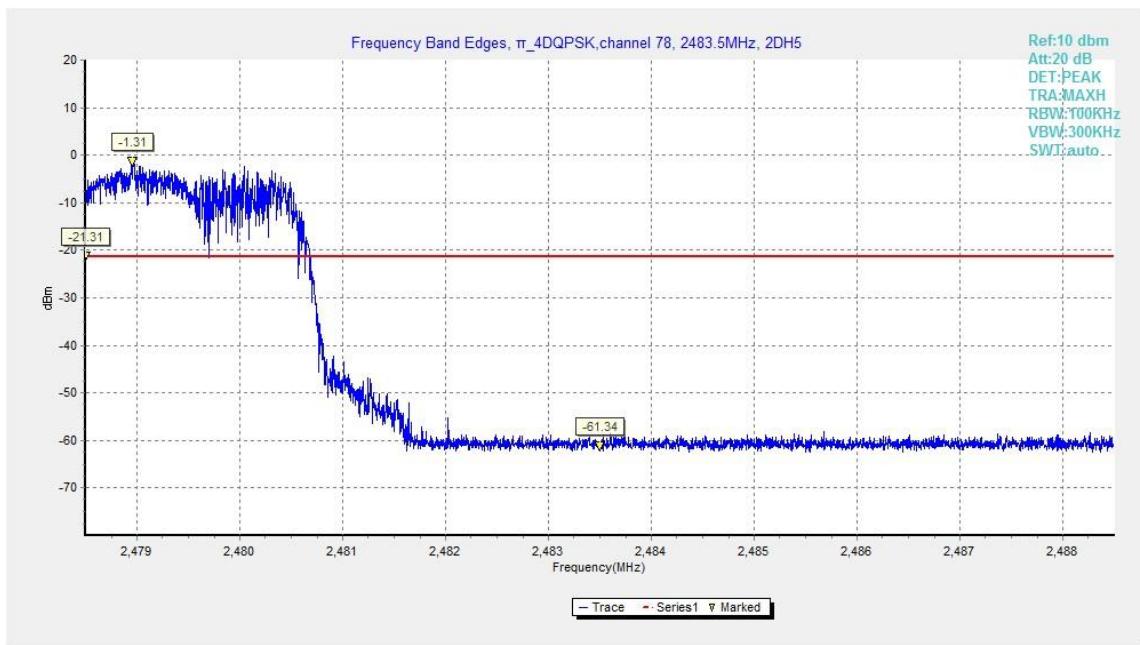


Fig.8. Frequency Band Edges:  $\pi/4$  DQPSK, Channel 78, Hopping On

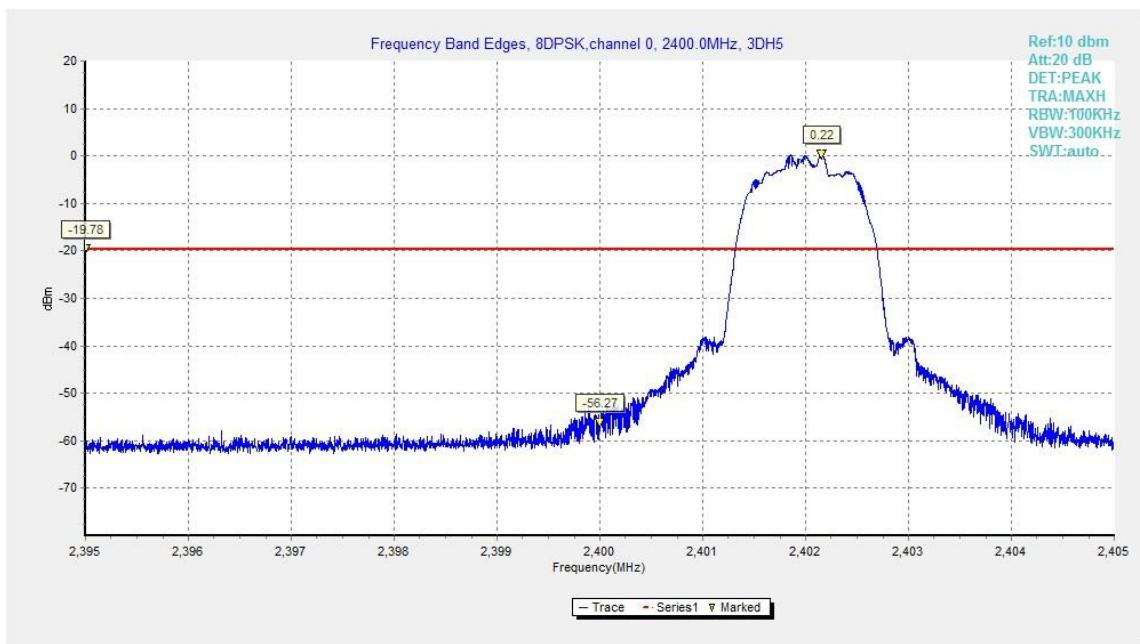


Fig.9. Frequency Band Edges: 8DPSK, Channel 0, Hopping Off

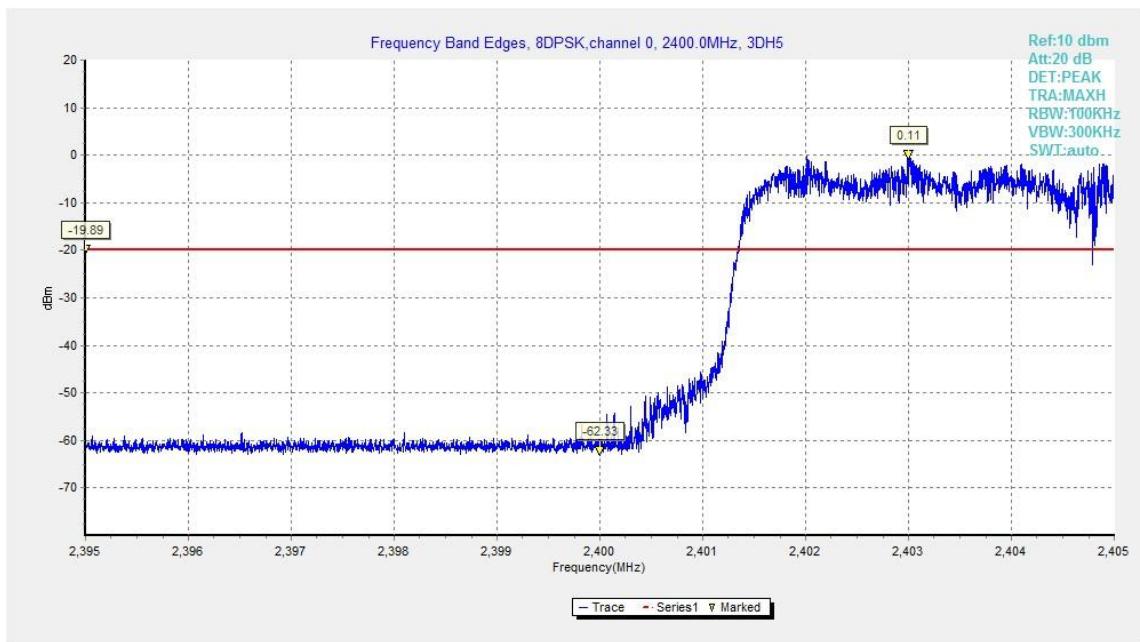


Fig.10. Frequency Band Edges: 8DPSK, Channel 0, Hopping On

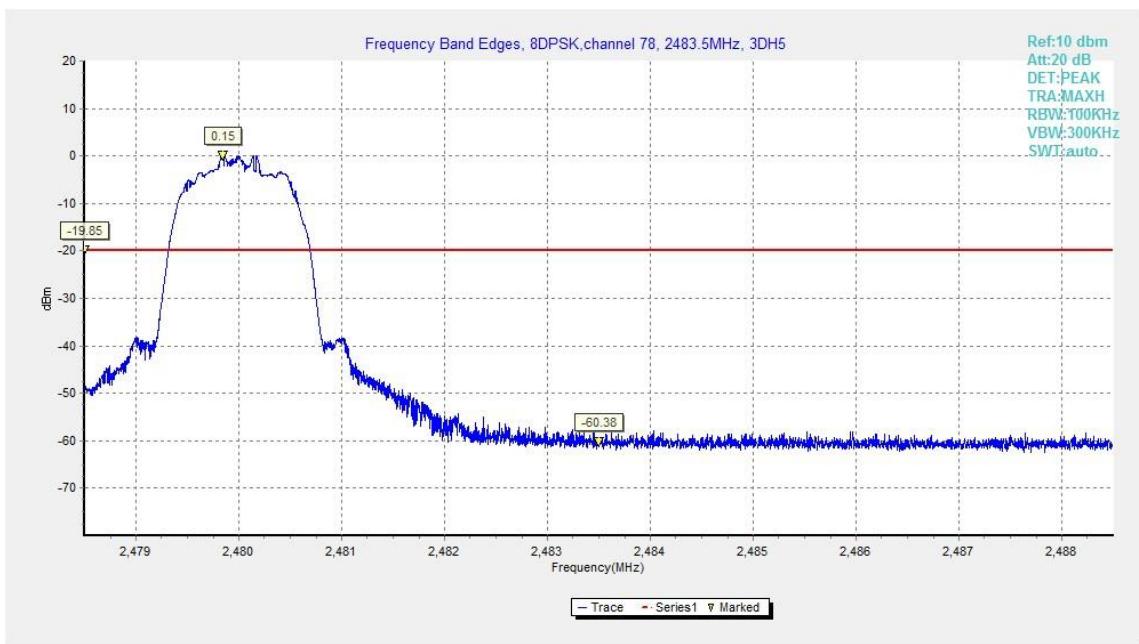


Fig.11. Frequency Band Edges: 8DPSK, Channel 78, Hopping Off

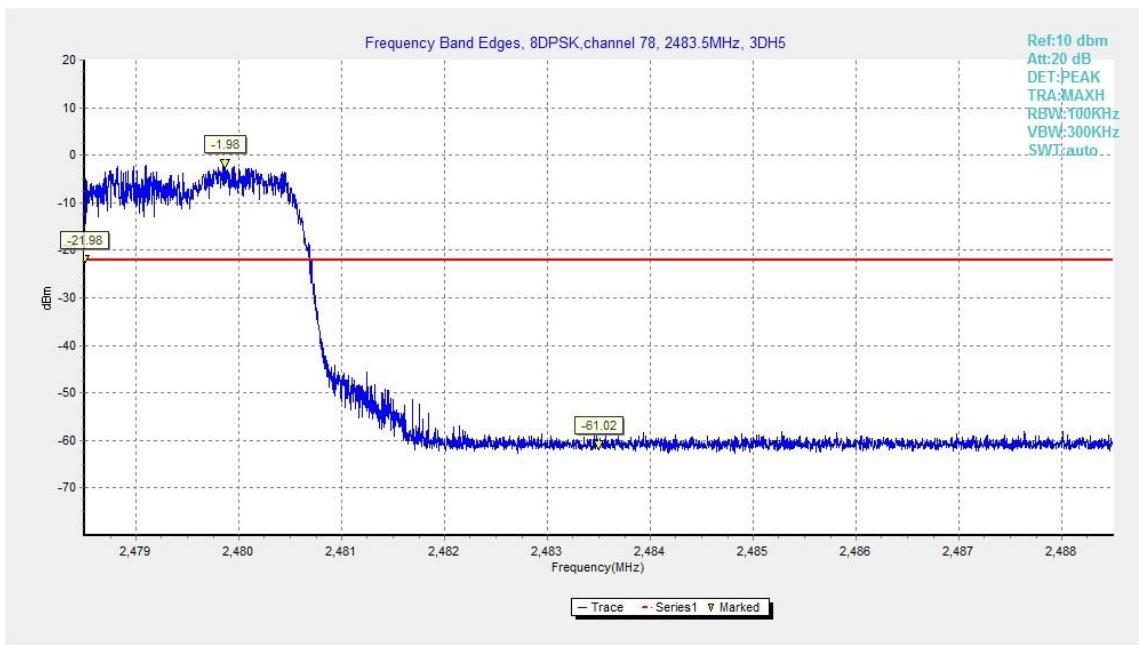


Fig.12. Frequency Band Edges: 8DPSK, Channel 78, Hopping On

#### 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	Center Frequency	Fig.48	P

2441 MHz	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**

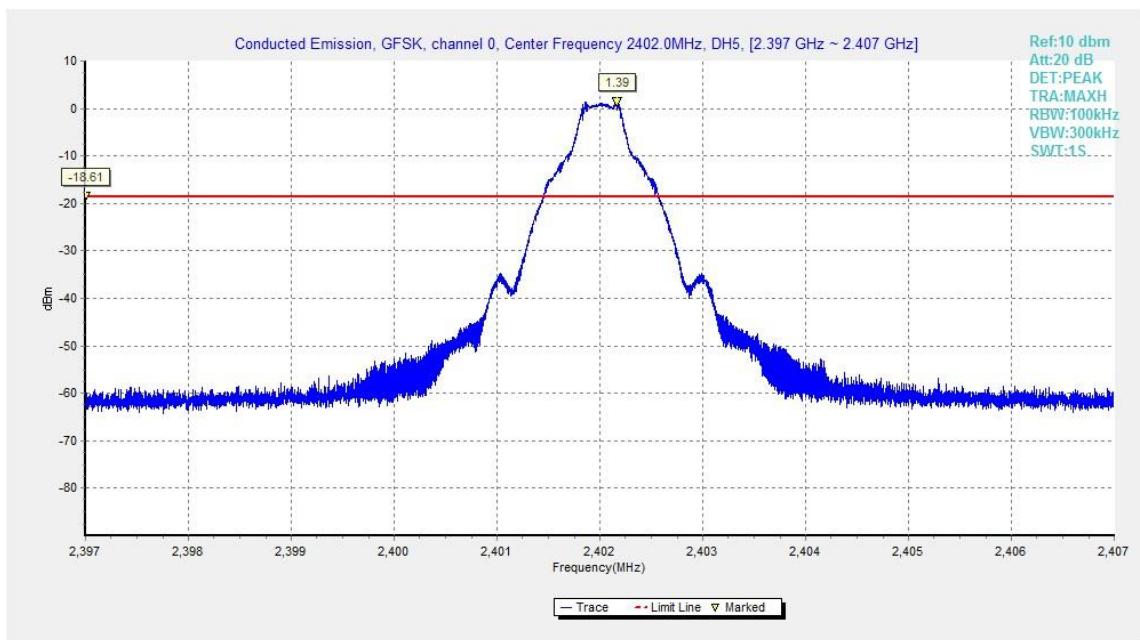


Fig.13. Conducted spurious emission: GFSK, Channel 0, 2402MHz

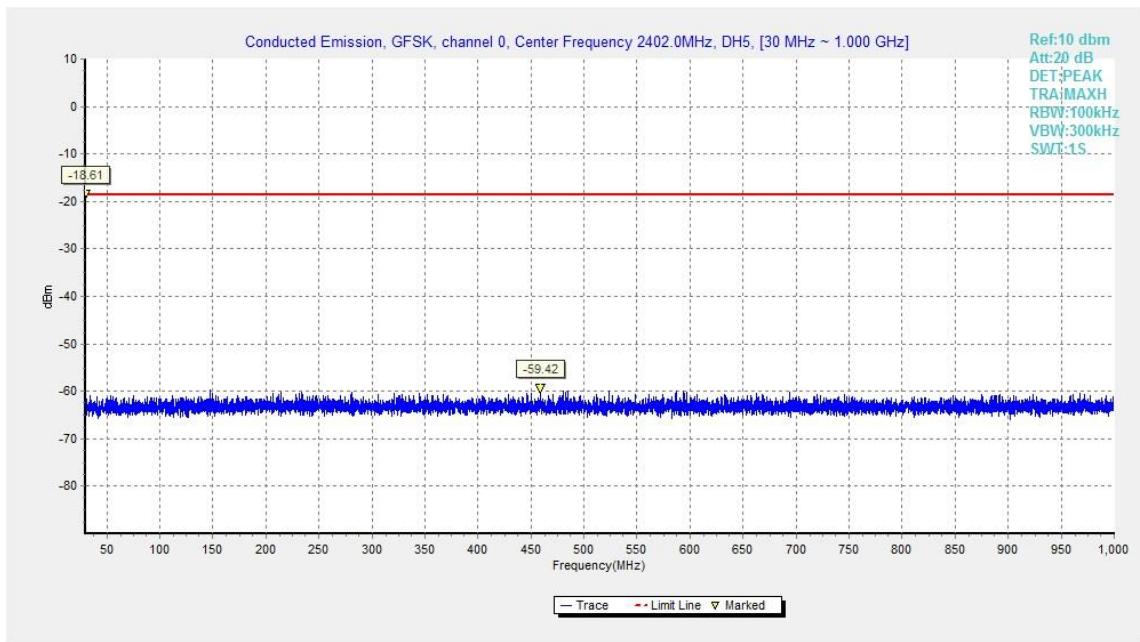


Fig.14. Conducted spurious emission: GFSK, Channel 0, 30MHz - 1GHz

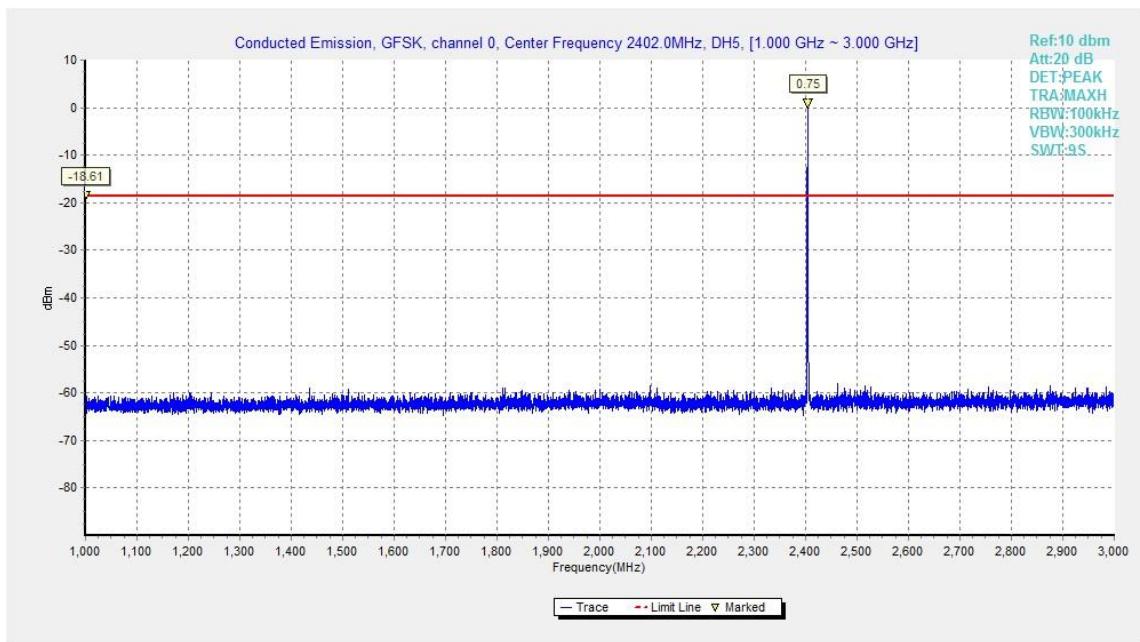


Fig.15. Conducted spurious emission: GFSK, Channel 0, 1GHz - 3GHz

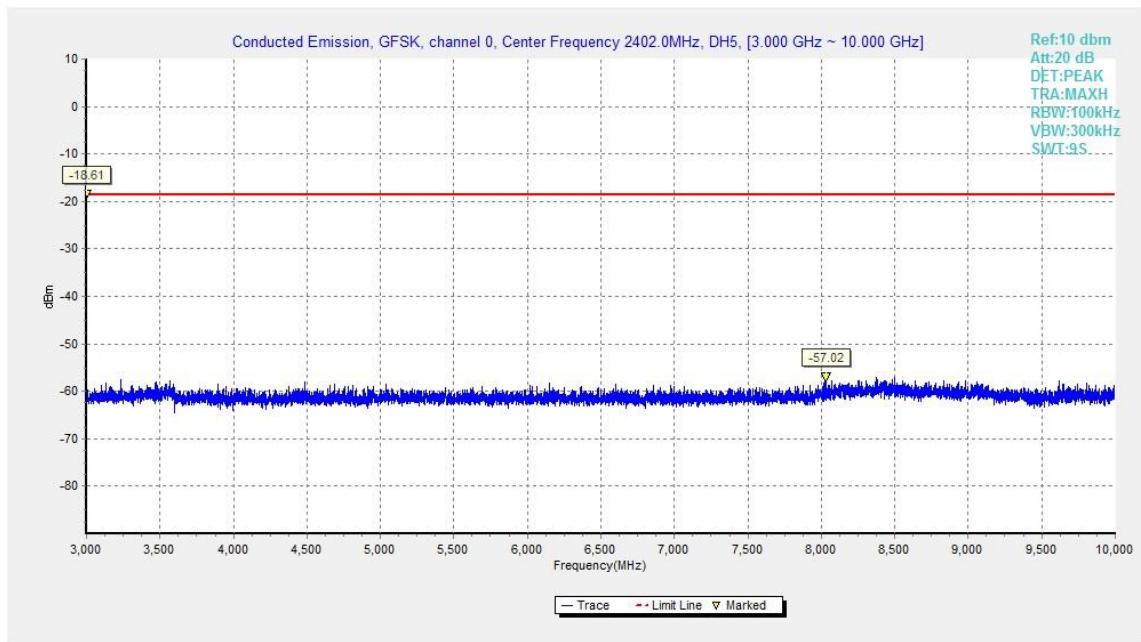


Fig.16. Conducted spurious emission: GFSK, Channel 0, 3GHz - 10GHz

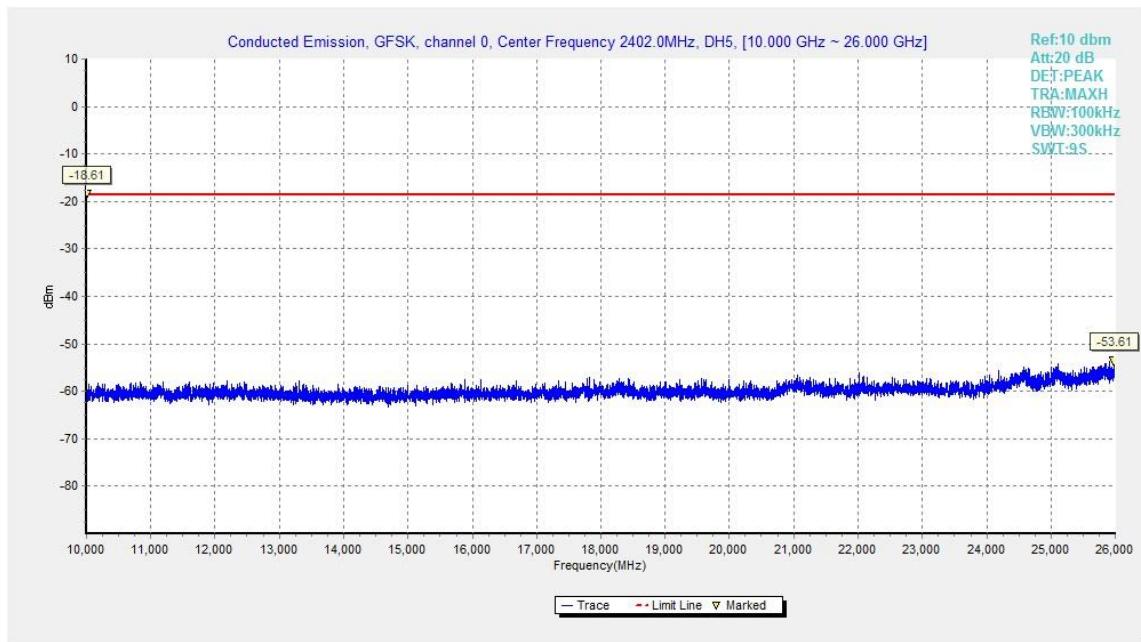


Fig.17. Conducted spurious emission: GFSK, Channel 0, 10GHz - 26GHz

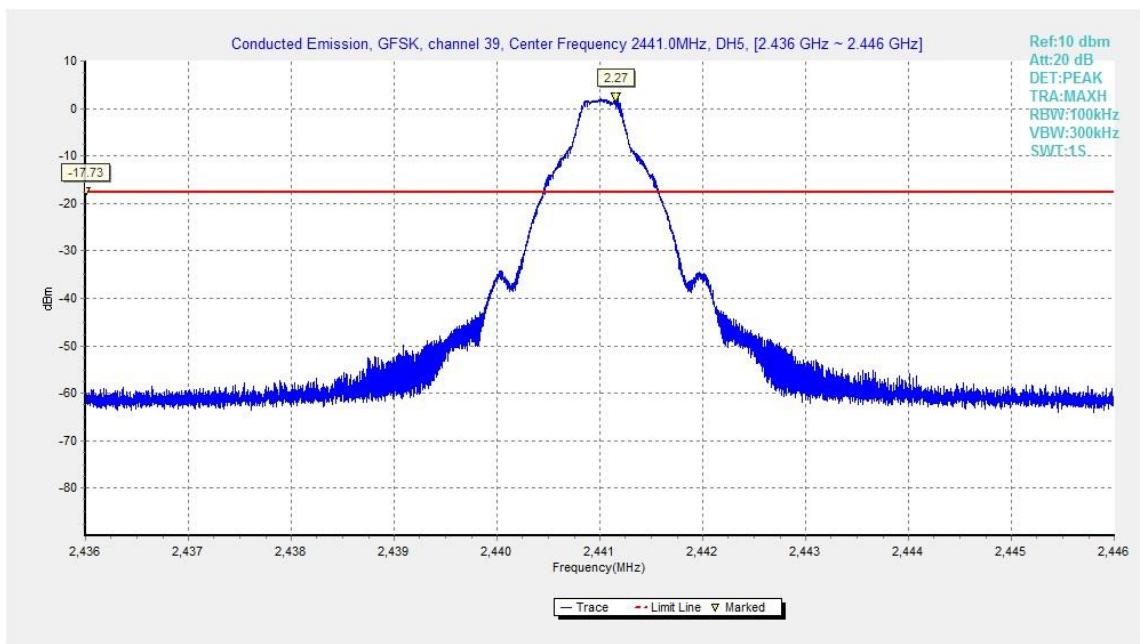


Fig.18. Conducted spurious emission: GFSK, Channel 39, 2441MHz

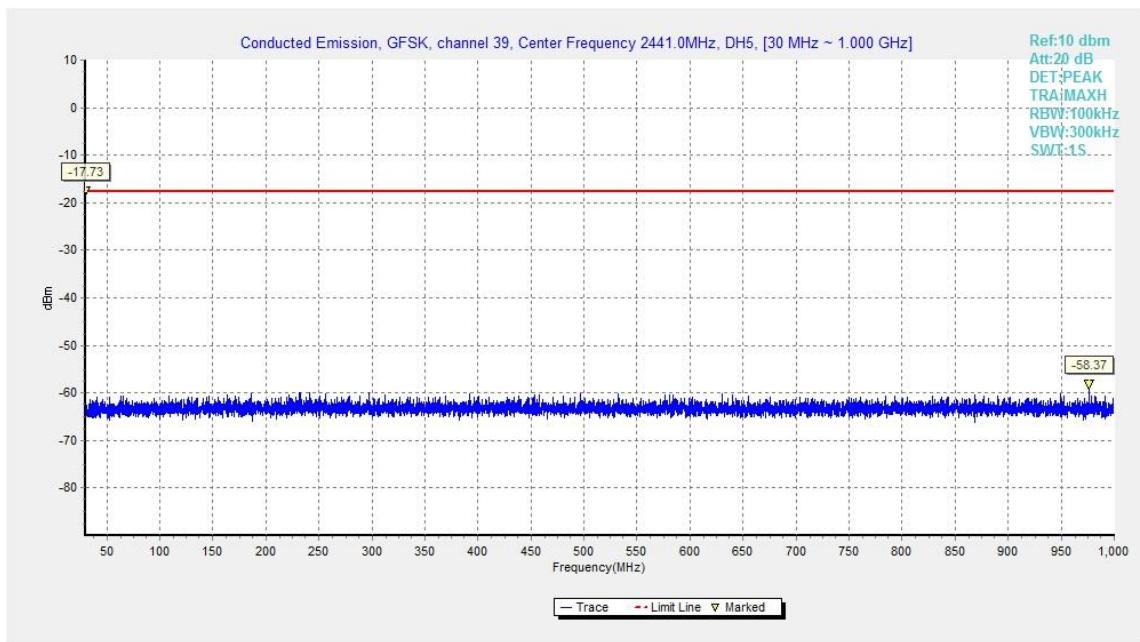


Fig.19. Conducted spurious emission: GFSK, Channel 39, 30MHz - 1GHz

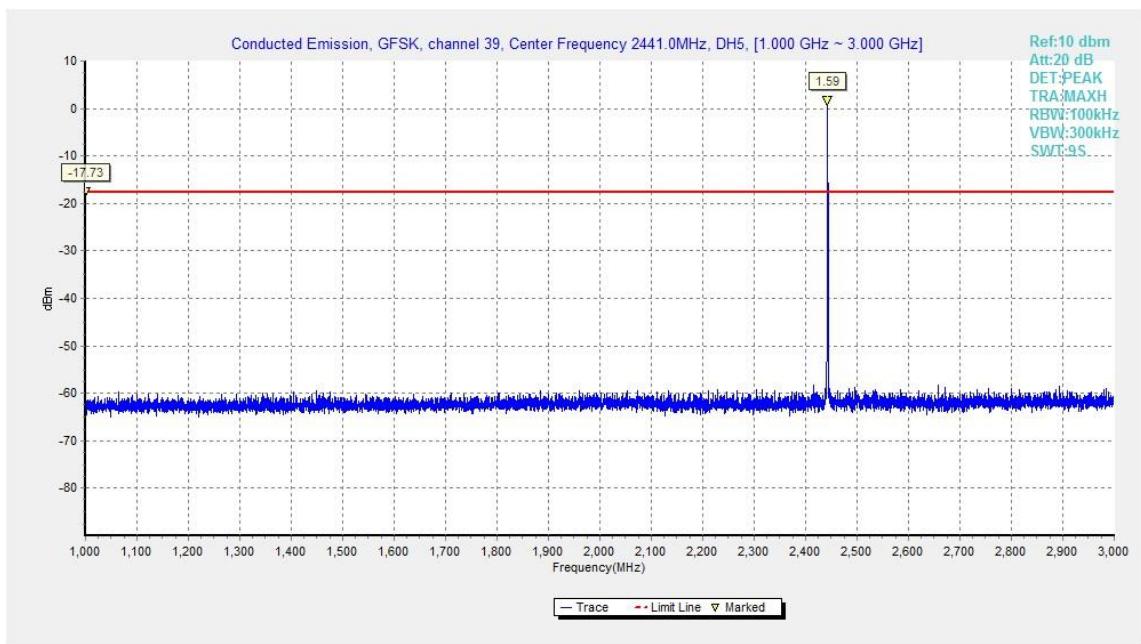


Fig.20. Conducted spurious emission: GFSK, Channel 39, 1GHz – 3GHz

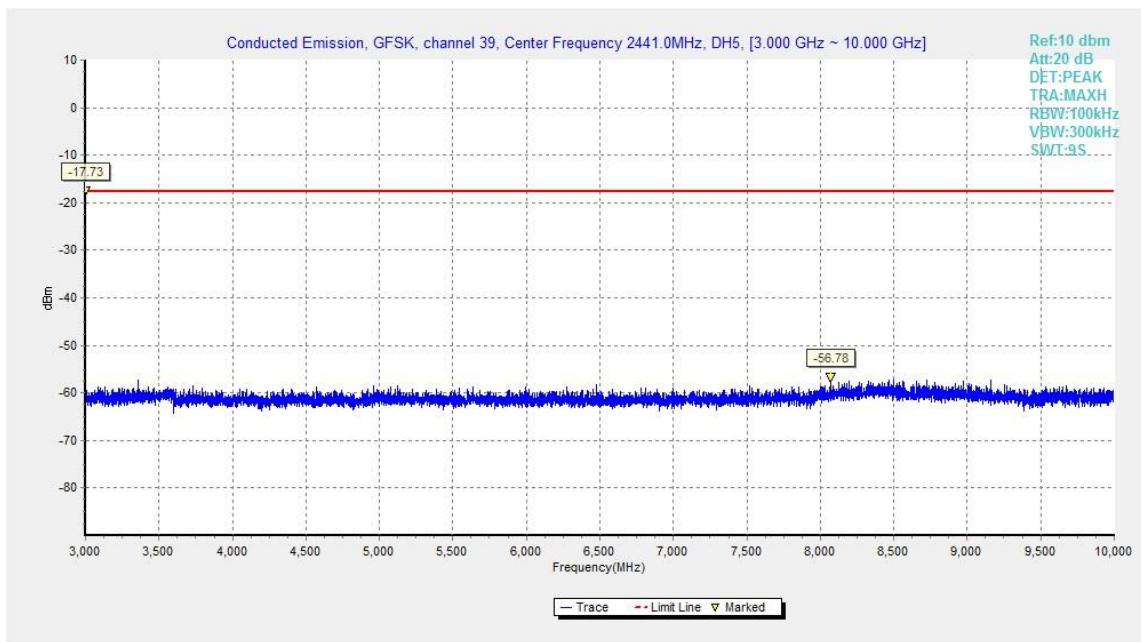


Fig.21. Conducted spurious emission: GFSK, Channel 39, 3GHz – 10GHz

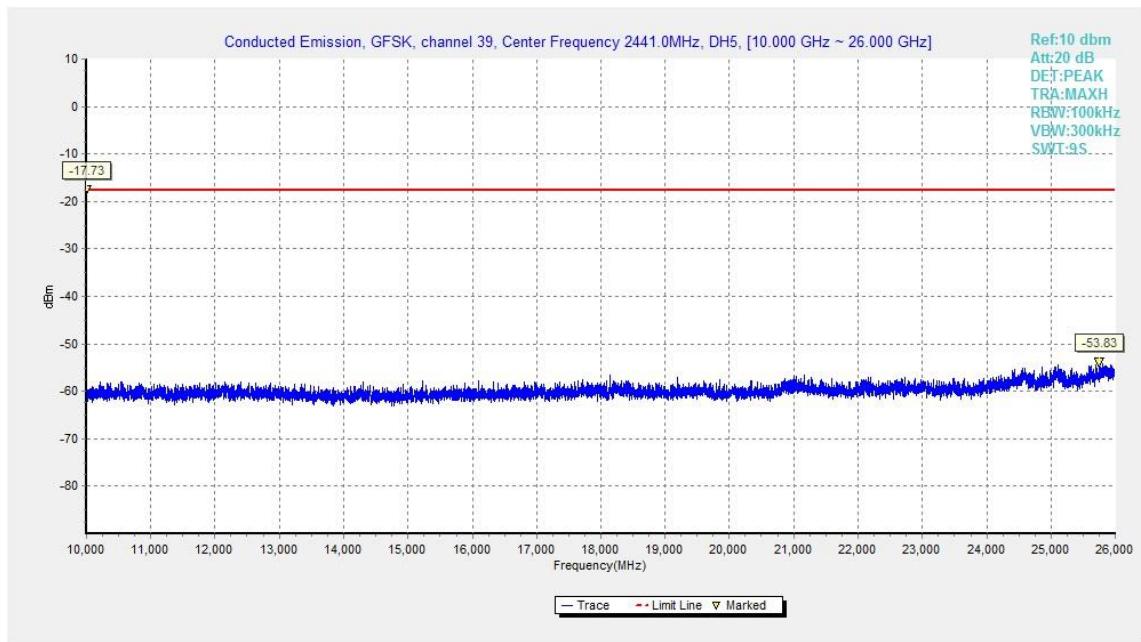


Fig.22. Conducted spurious emission: GFSK, Channel 39, 10GHz – 26GHz

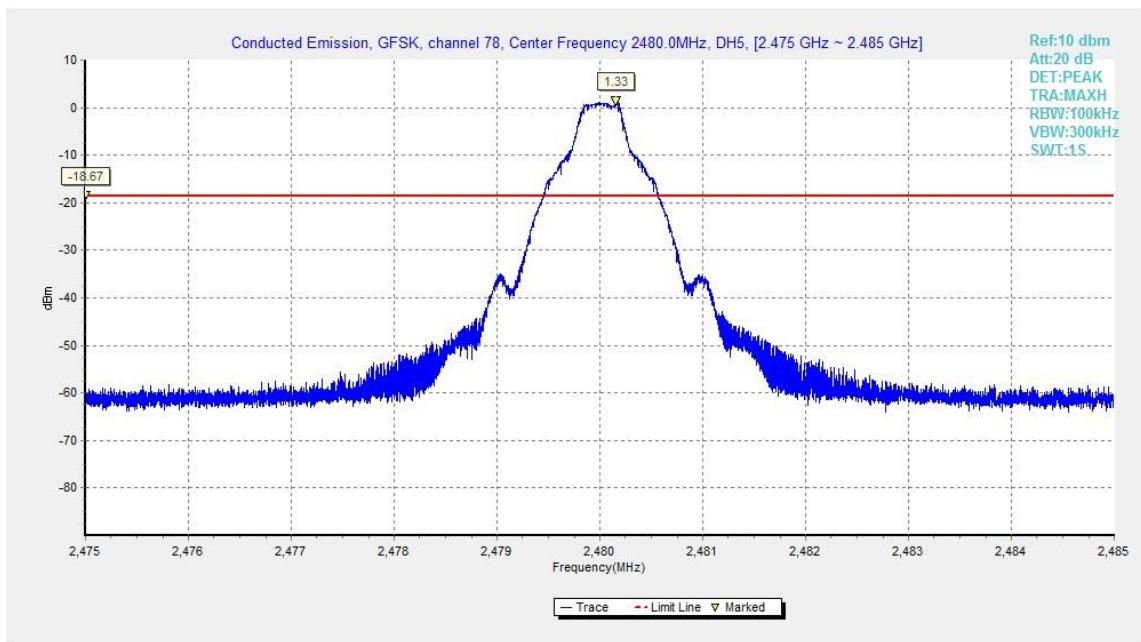


Fig.23. Conducted spurious emission: GFSK, Channel 78, 2480MHz

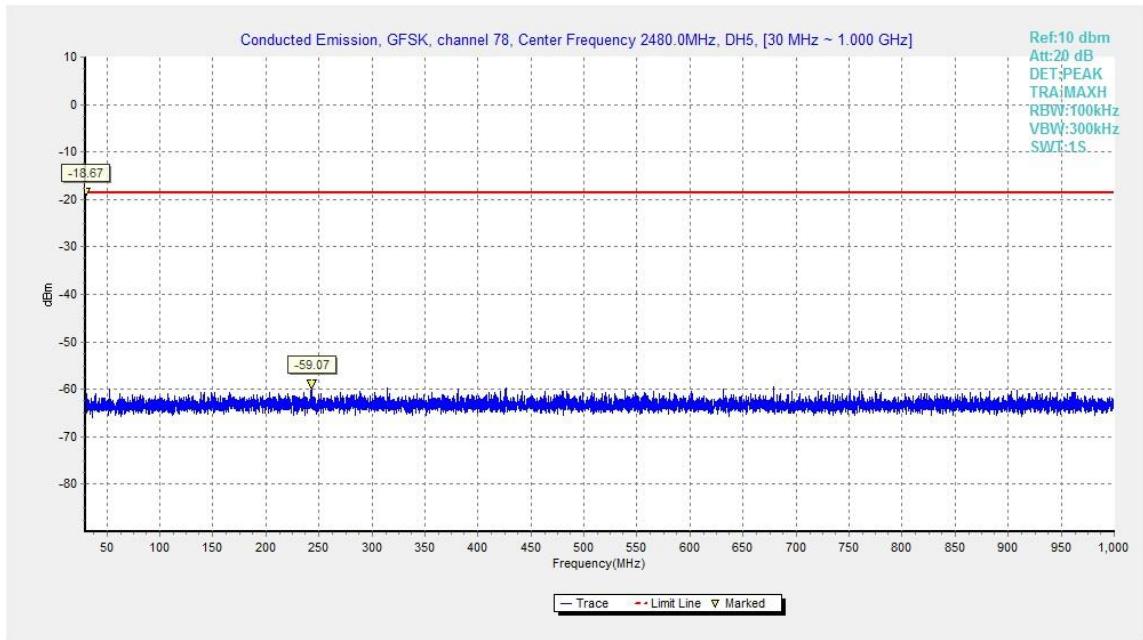


Fig.24. Conducted spurious emission: GFSK, Channel 78, 30MHz - 1GHz

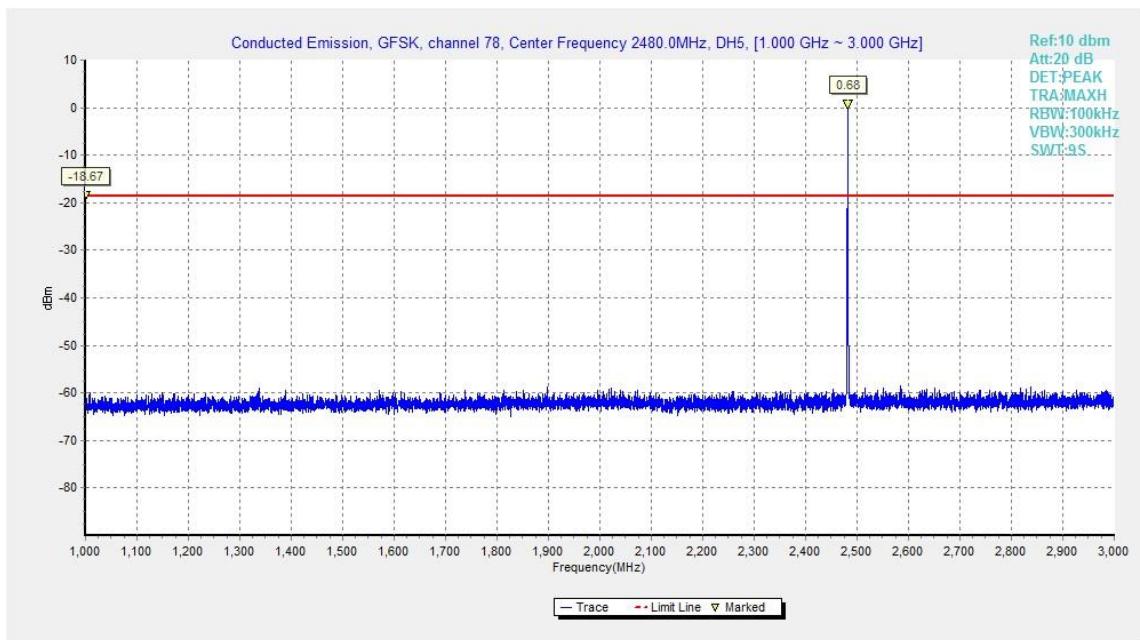


Fig.25. Conducted spurious emission: GFSK, Channel 78, 1GHz - 3GHz

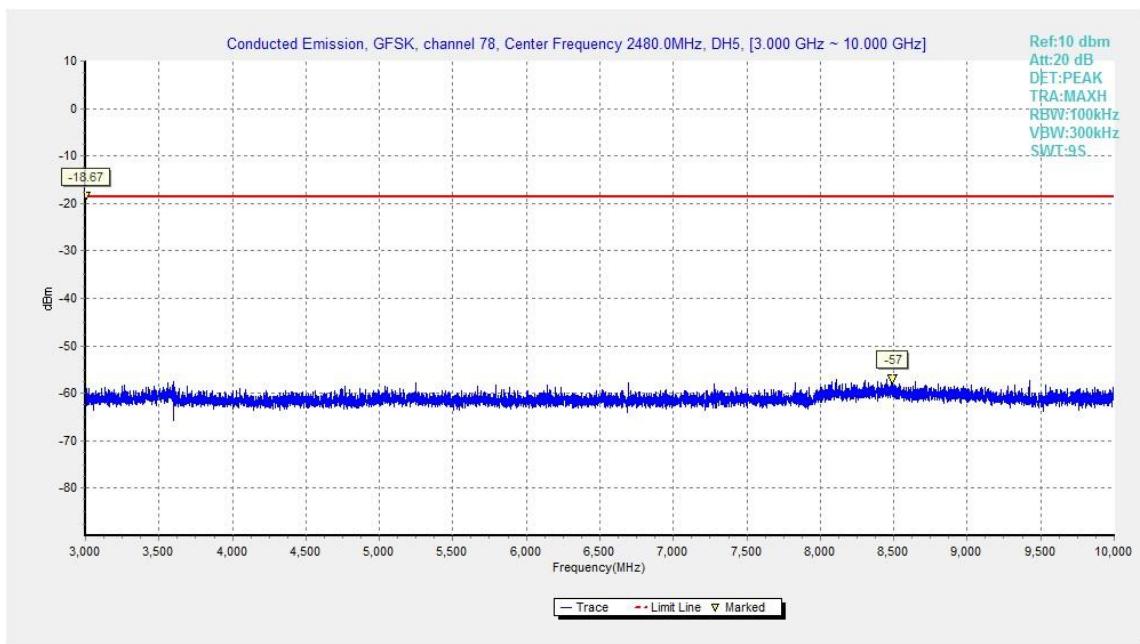


Fig.26. Conducted spurious emission: GFSK, Channel 78, 3GHz - 10GHz

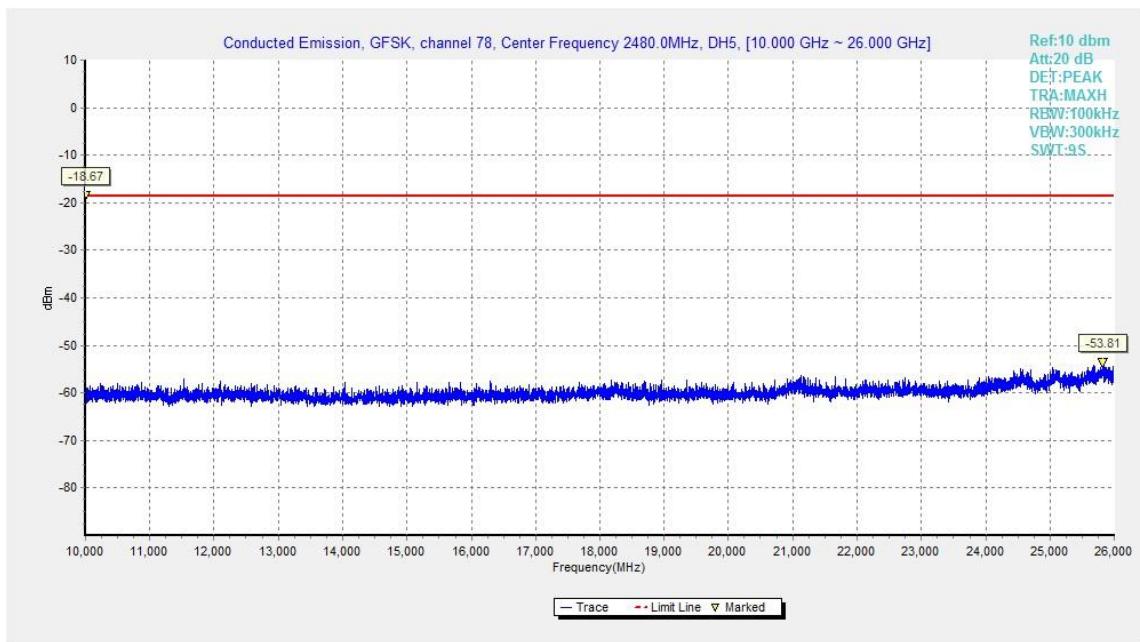


Fig.27. Conducted spurious emission: GFSK, Channel 78, 10GHz - 26GHz

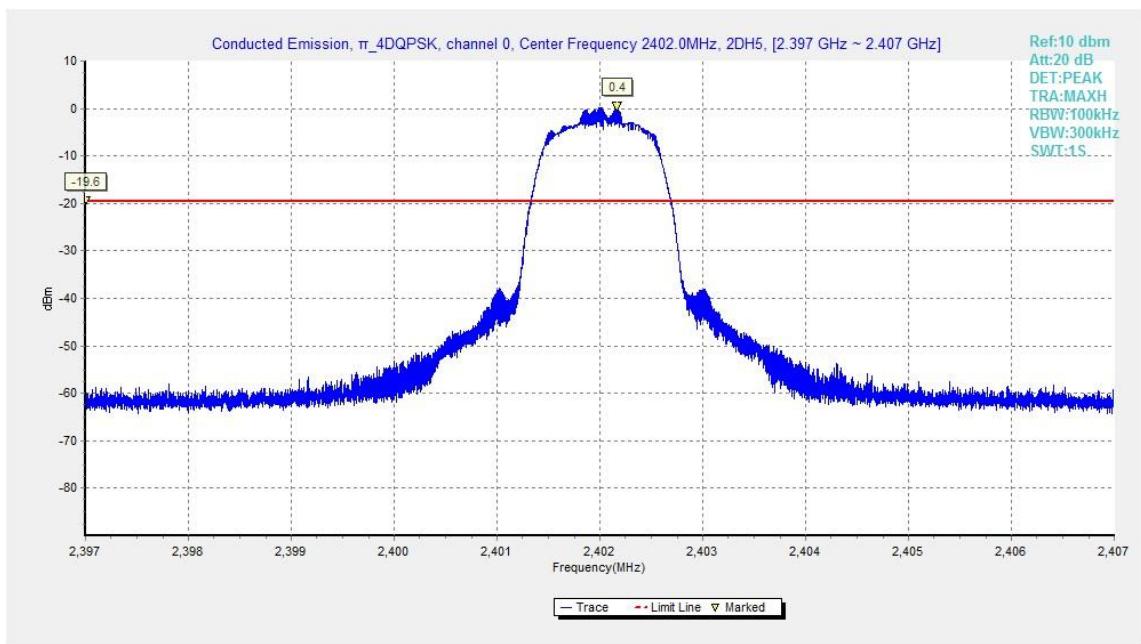


Fig.28. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 0, 2402MHz

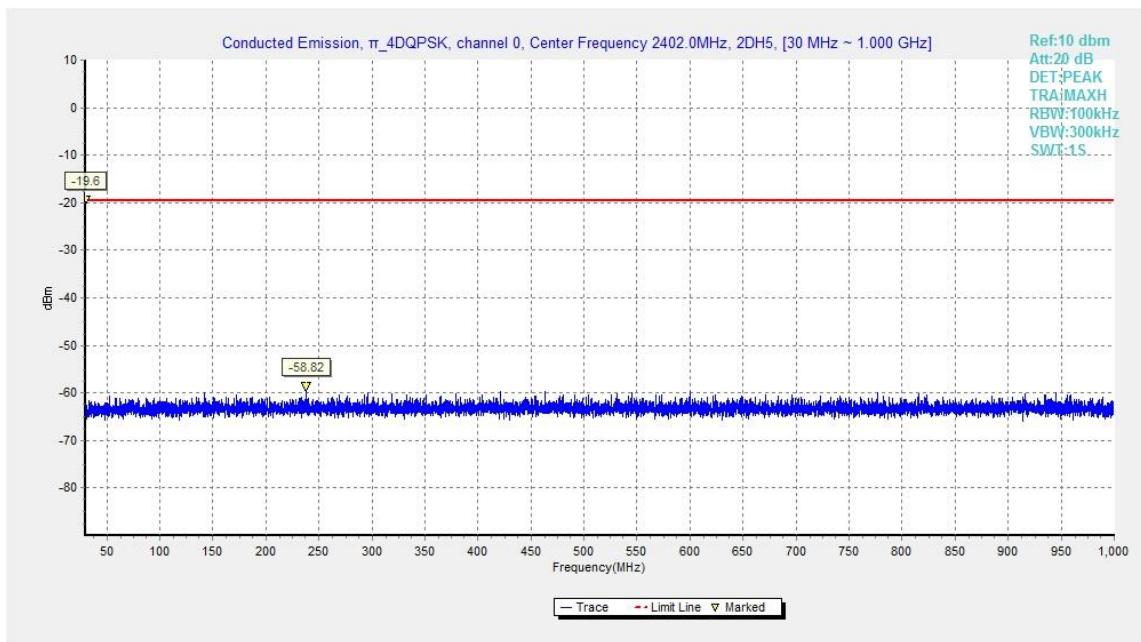


Fig.29. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 0, 30MHz - 1GHz

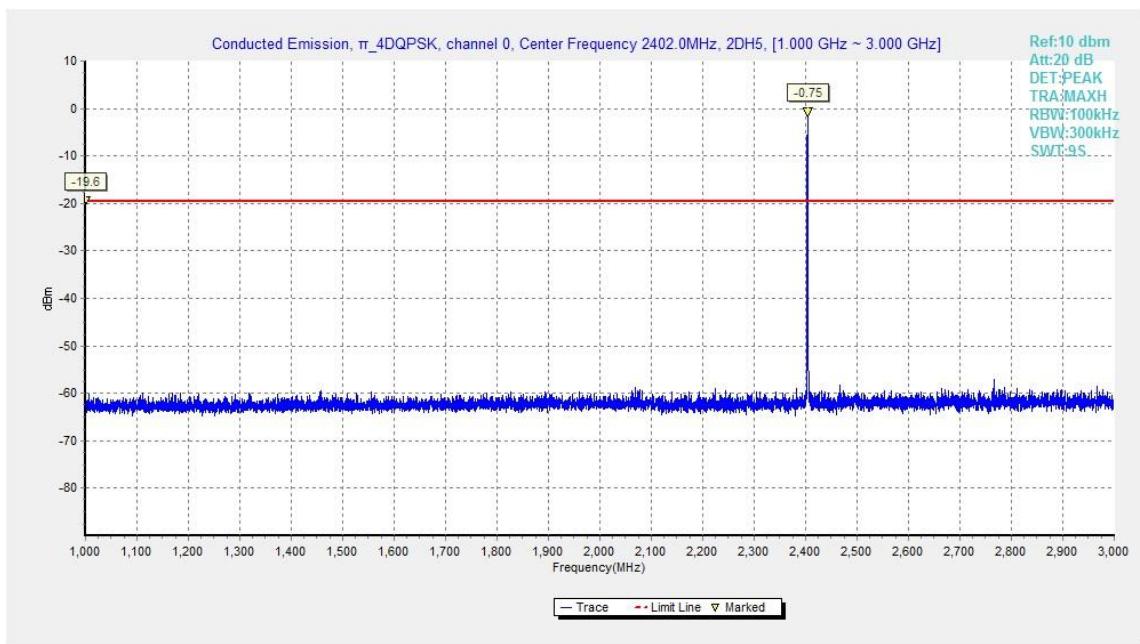


Fig.30. Conducted spurious emission: π/4 DQPSK, Channel 0, 1GHz - 3GHz

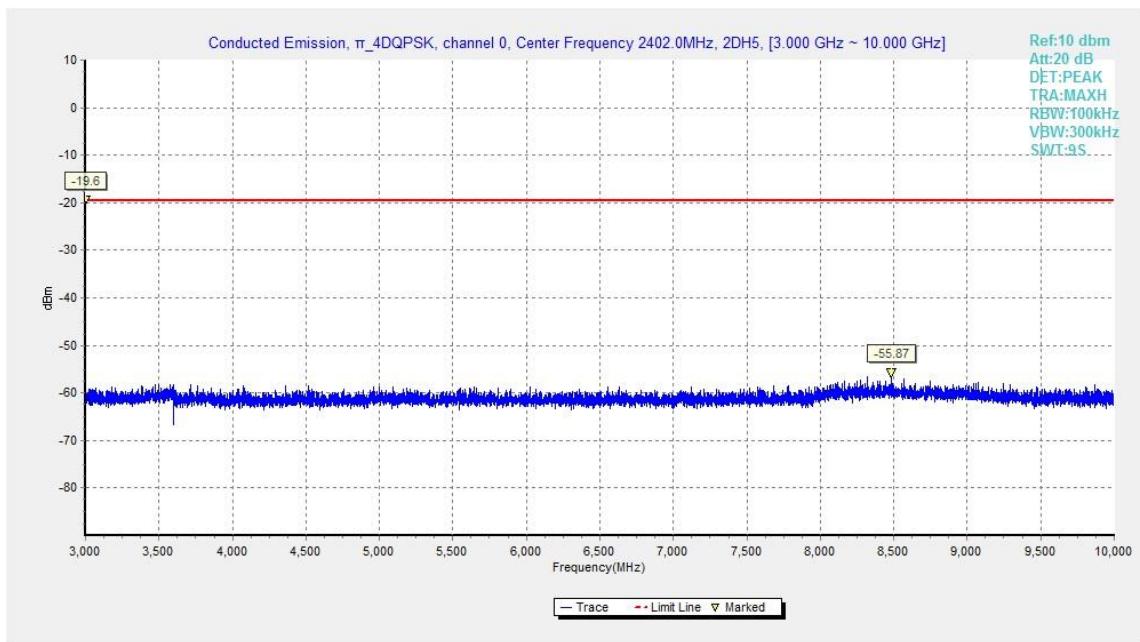


Fig.31. Conducted spurious emission: π/4 DQPSK, Channel 0, 3GHz - 10GHz

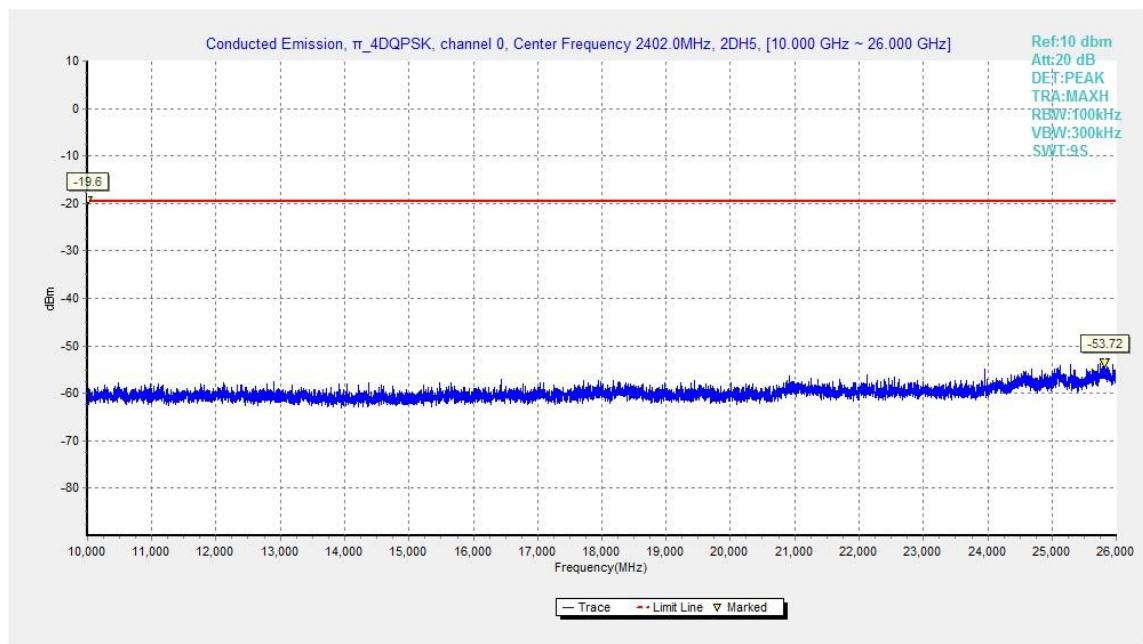


Fig.32. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 0, 10GHz - 26GHz

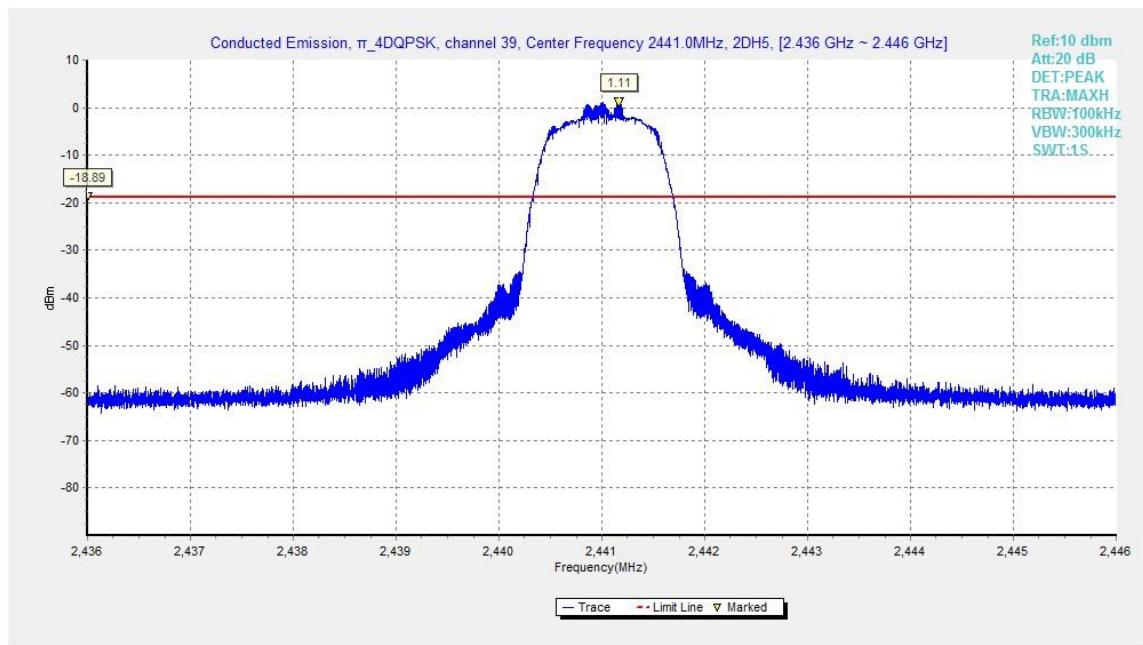


Fig.33. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 39, 2441MHz

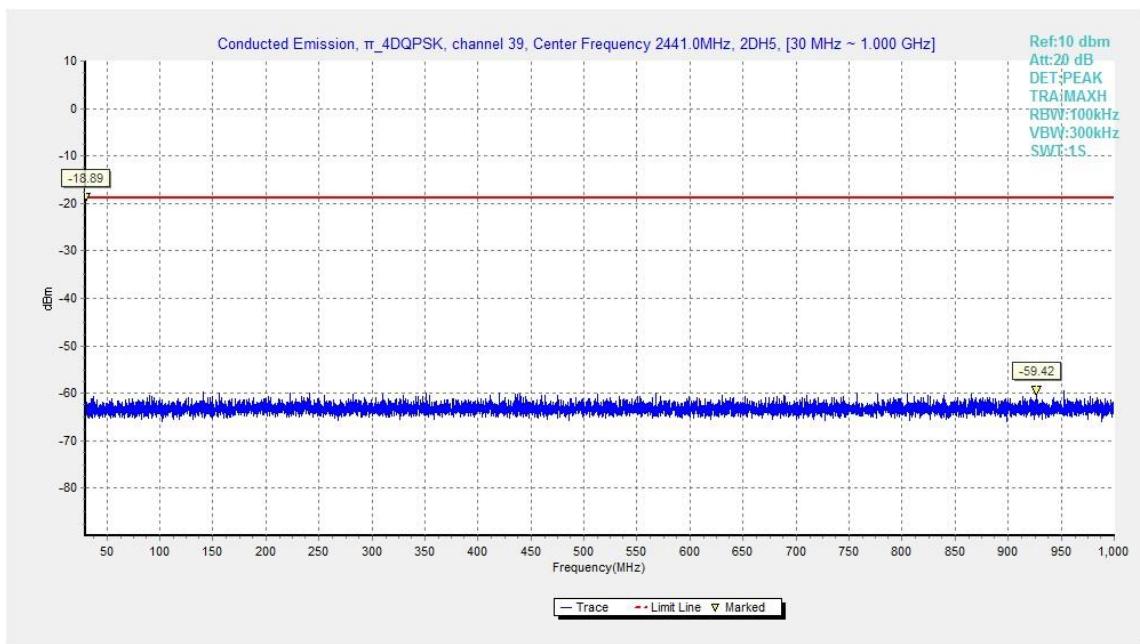


Fig.34. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 39, 30MHz - 1GHz

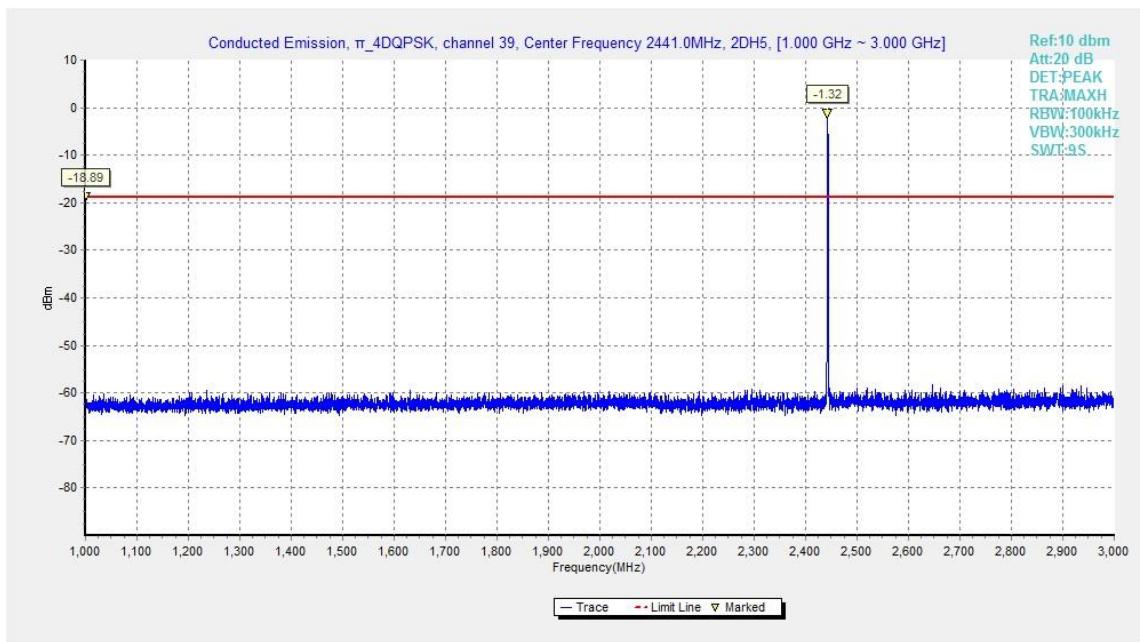


Fig.35. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 39, 1GHz - 3GHz

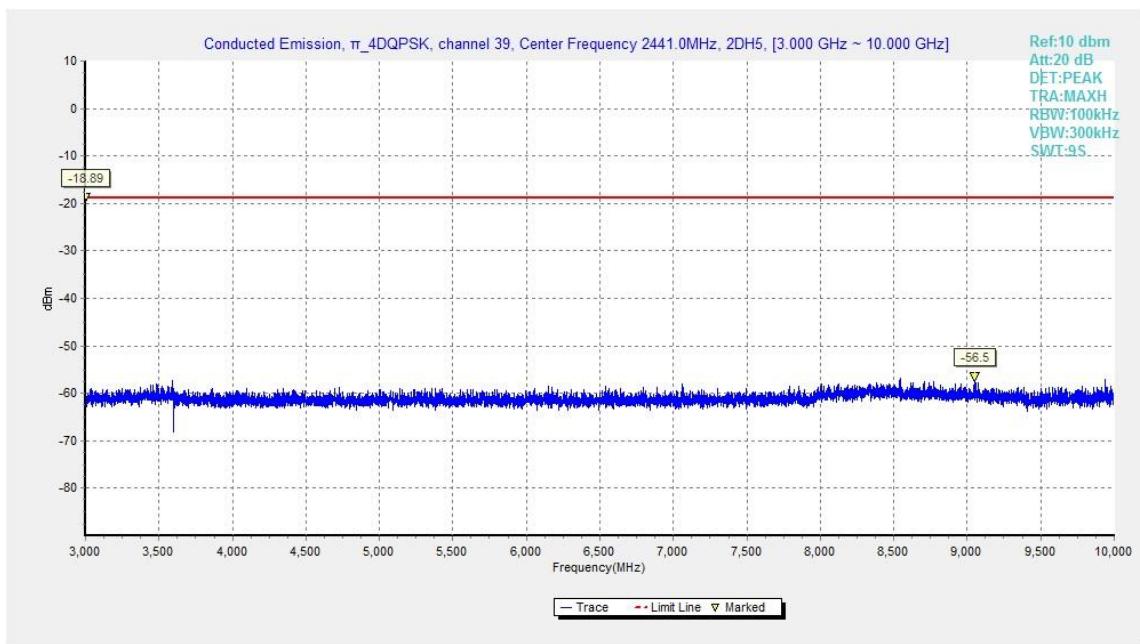


Fig.36. Conducted spurious emission: π/4 DQPSK, Channel 39, 3GHz - 10GHz

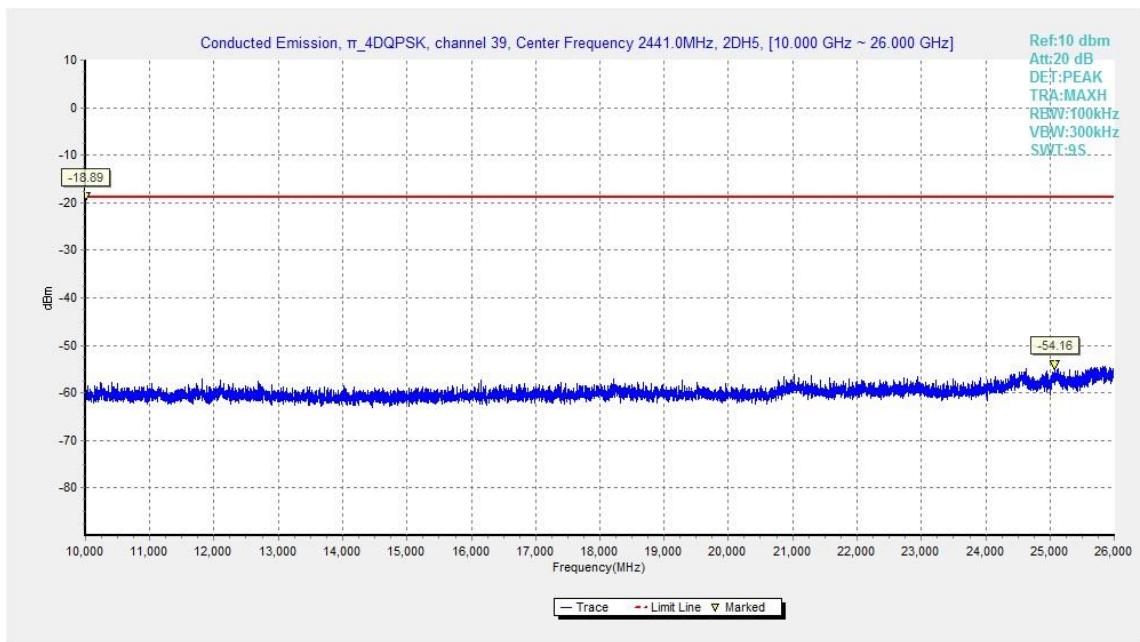


Fig.37. Conducted spurious emission: π/4 DQPSK, Channel 39, 10GHz – 26GHz

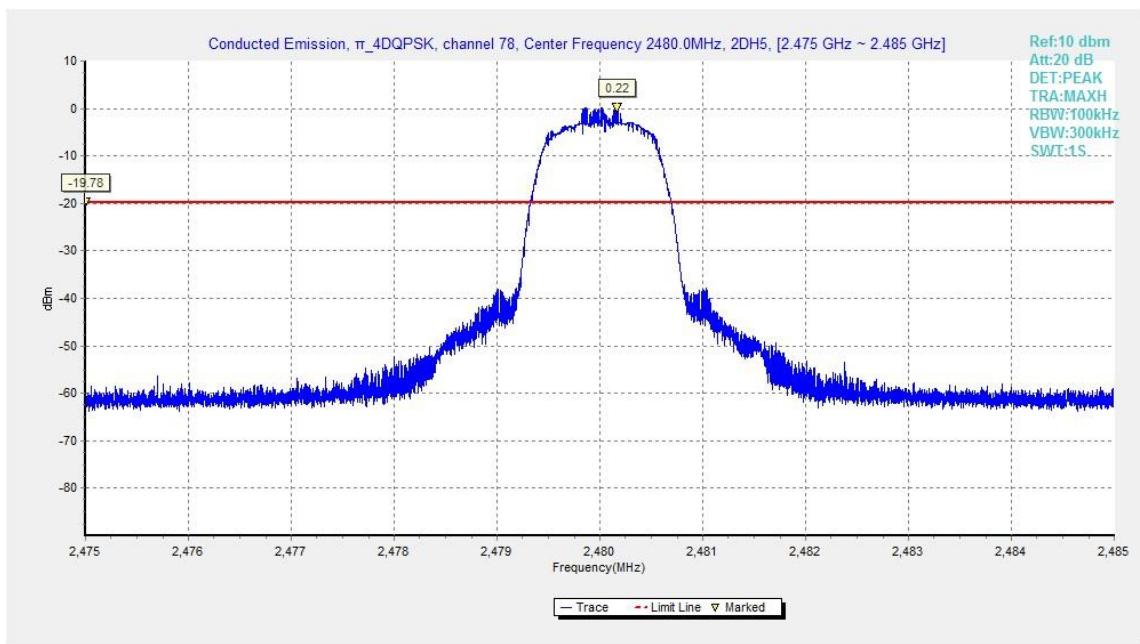


Fig.38. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 78, 2480MHz

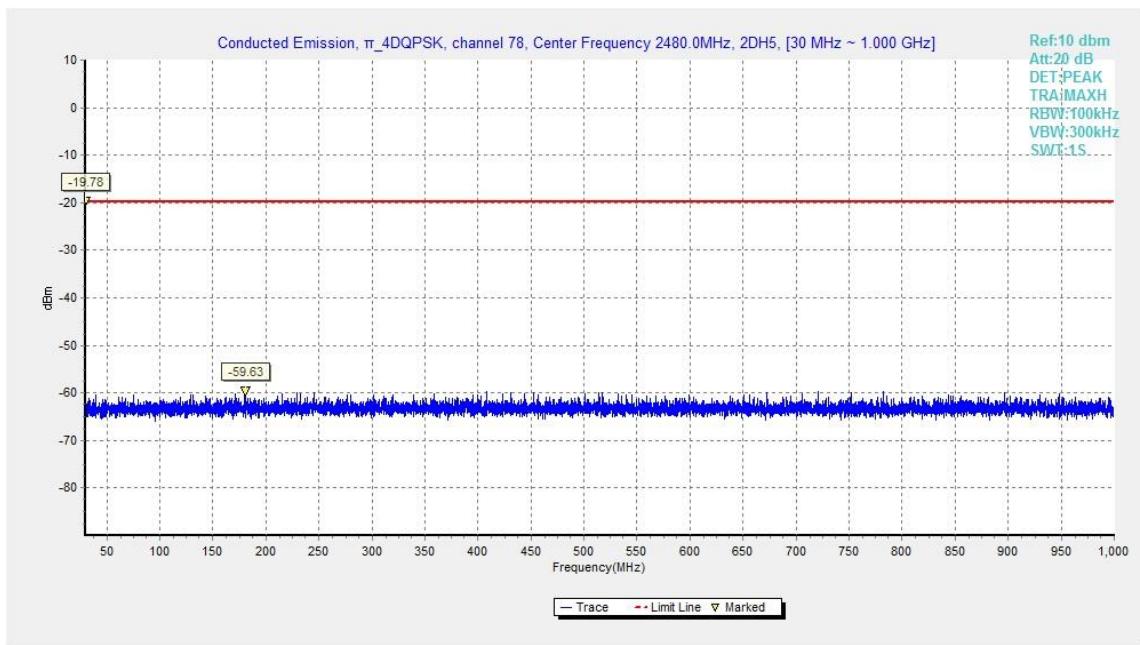


Fig.39. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 78, 30MHz - 1GHz

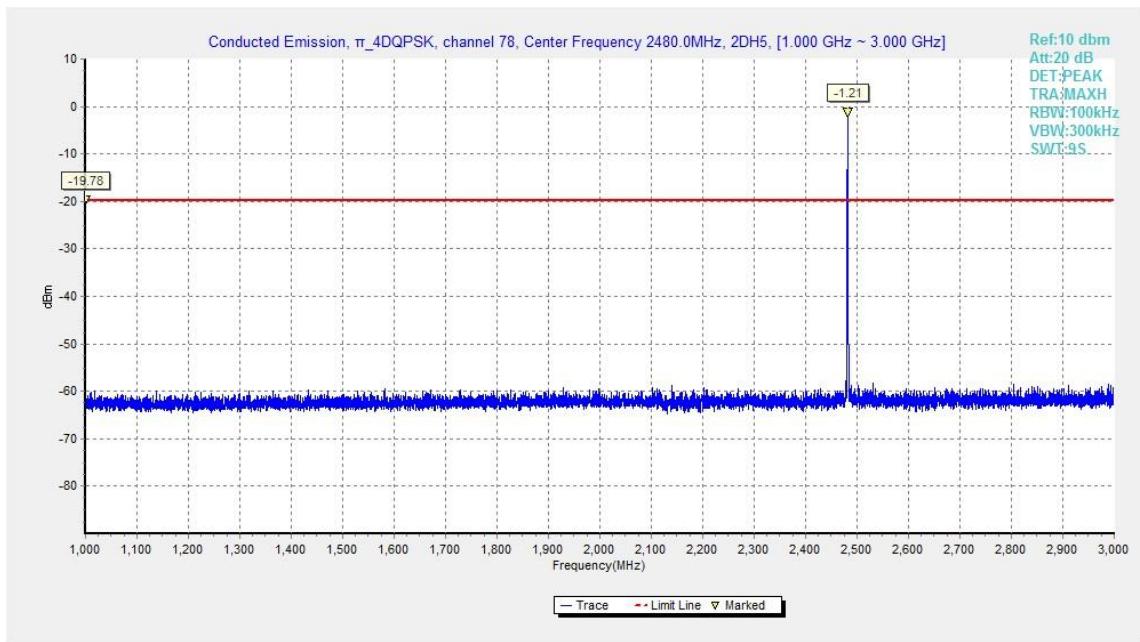


Fig.40. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 78, 1GHz - 3GHz

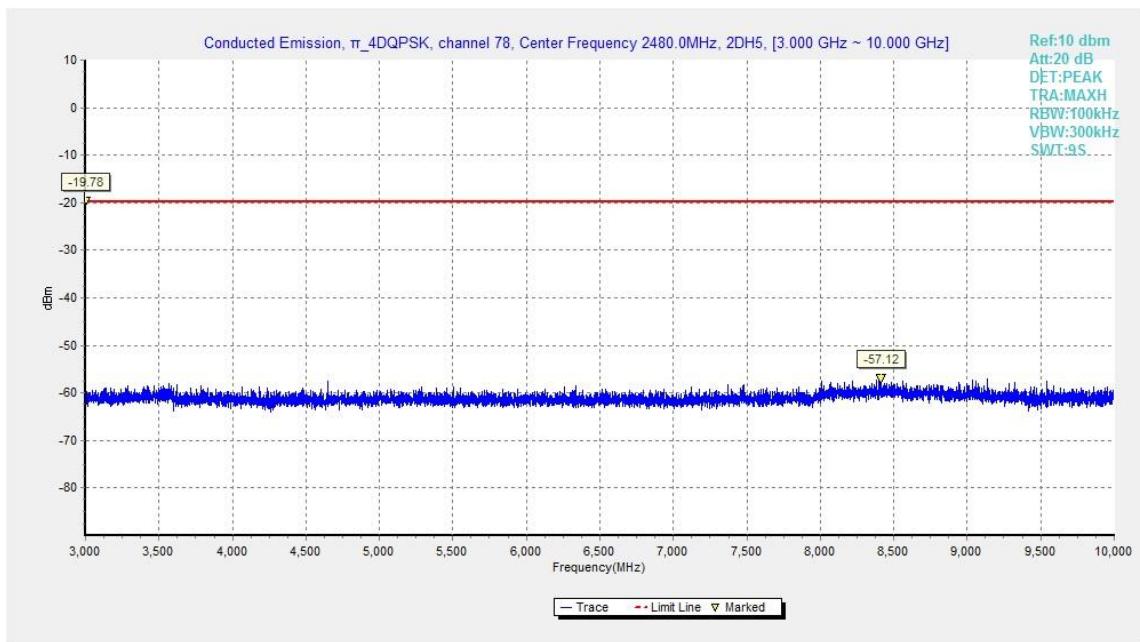


Fig.41. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 78, 3GHz - 10GHz

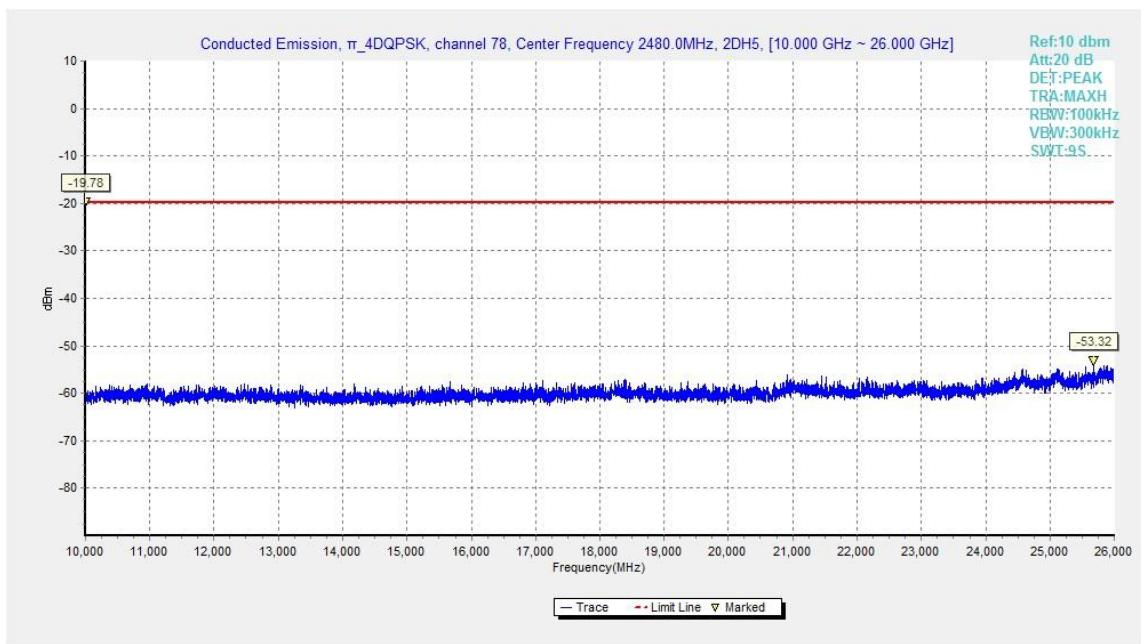


Fig.42. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 78, 10GHz - 26GHz

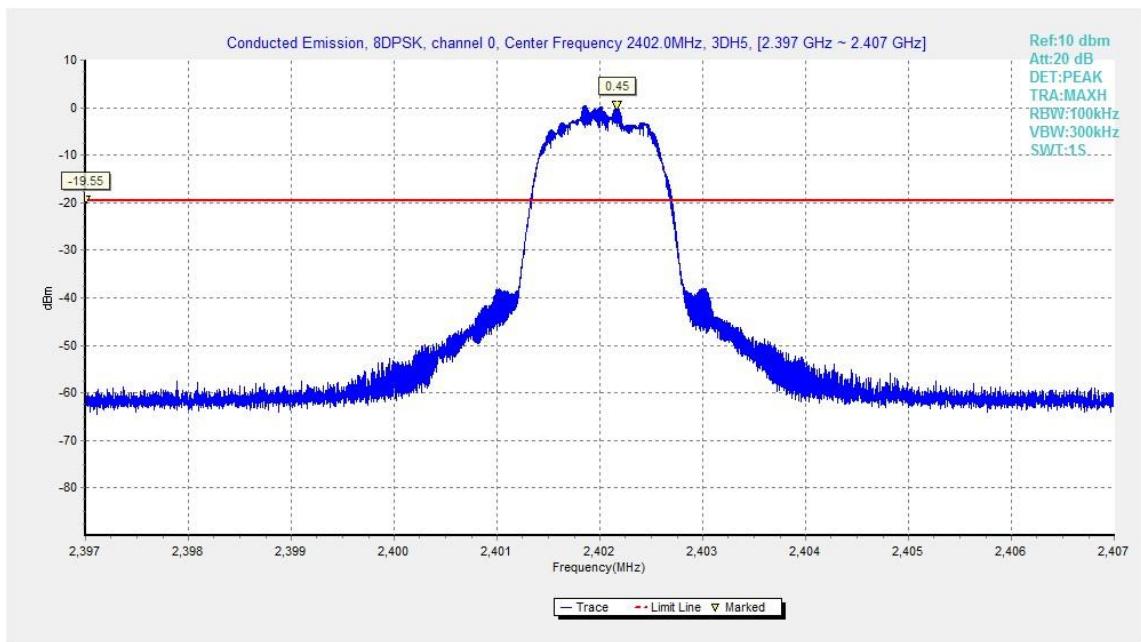


Fig.43. Conducted spurious emission: 8DPSK, Channel 0, 2402MHz

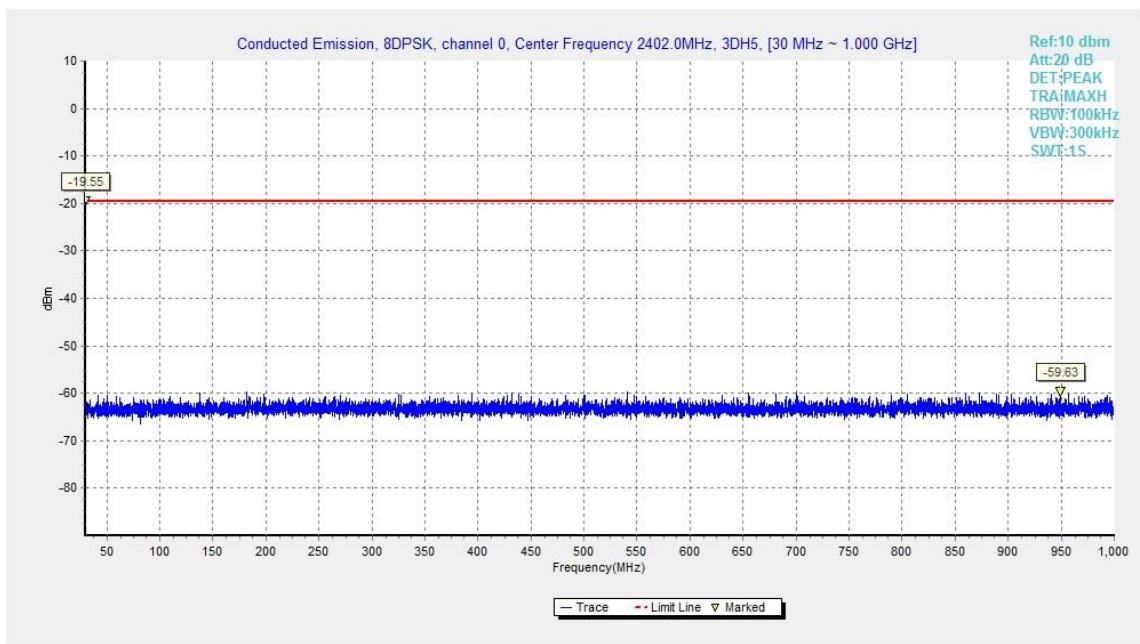


Fig.44. Conducted spurious emission: 8DPSK, Channel 0, 30MHz - 1GHz

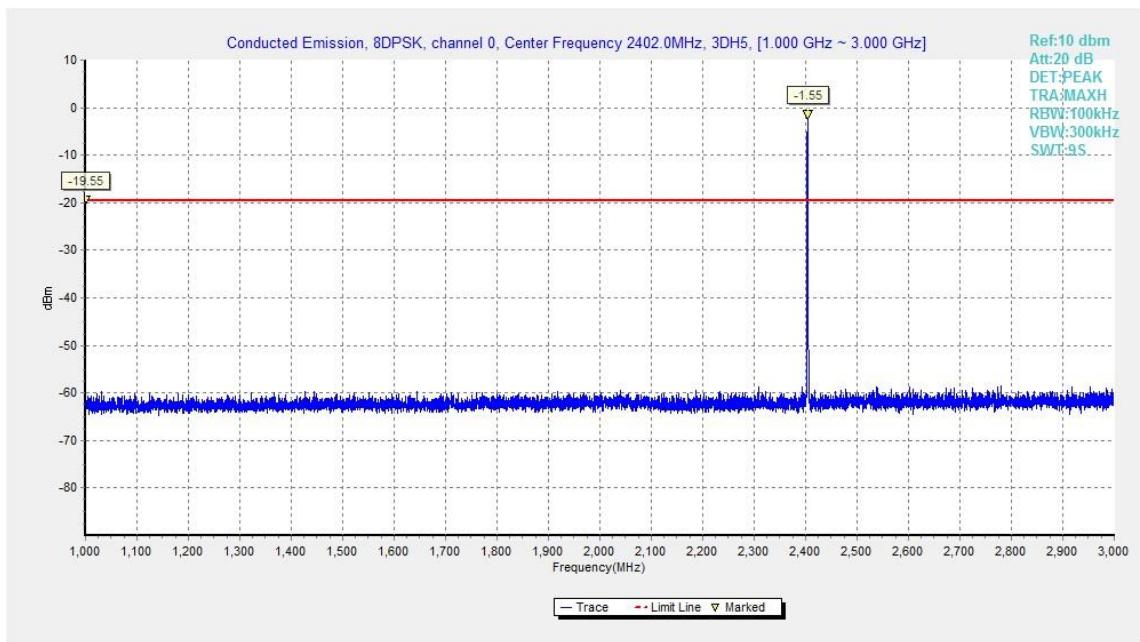


Fig.45. Conducted spurious emission: 8DPSK, Channel 0, 1GHz - 3GHz

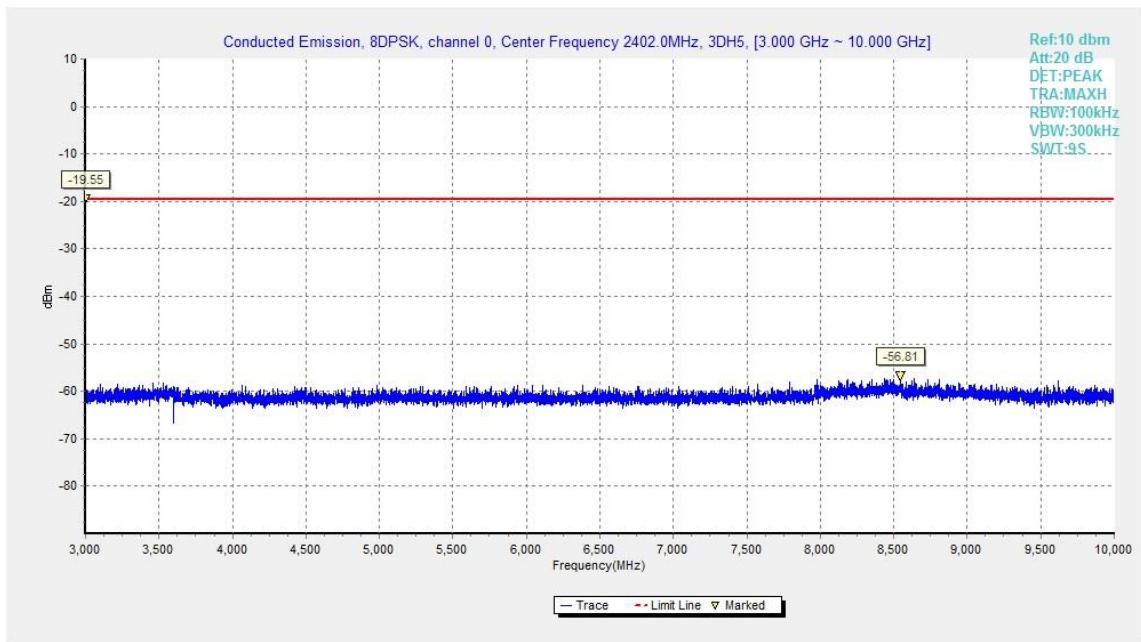


Fig.46. Conducted spurious emission: 8DPSK, Channel 0, 3GHz - 10GHz

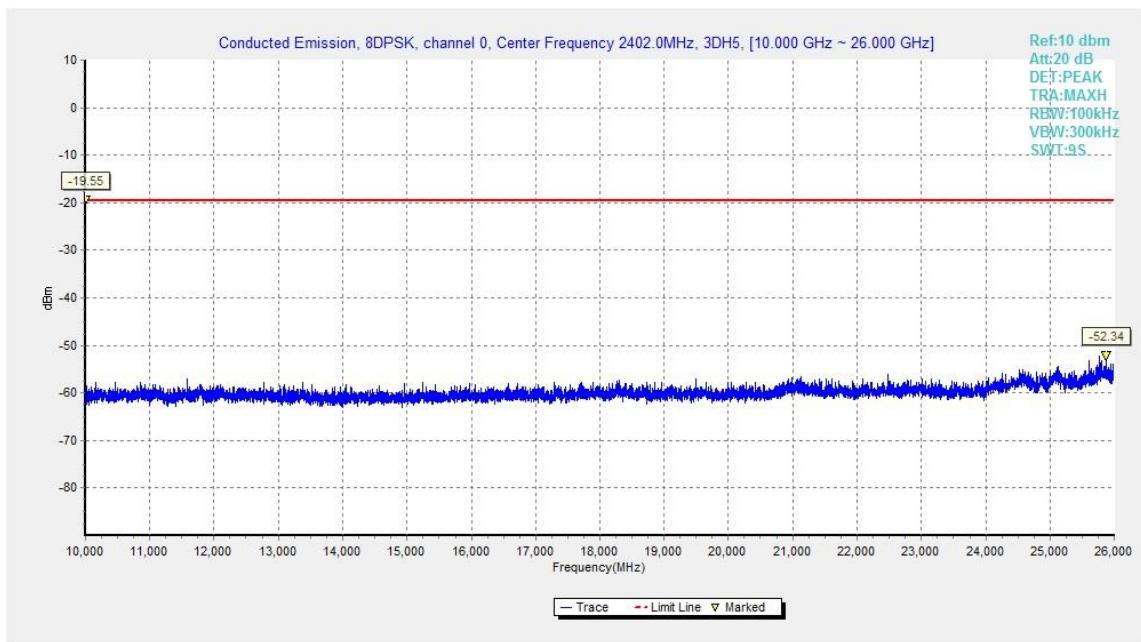


Fig.47. Conducted spurious emission: 8DPSK, Channel 0, 10GHz - 26GHz

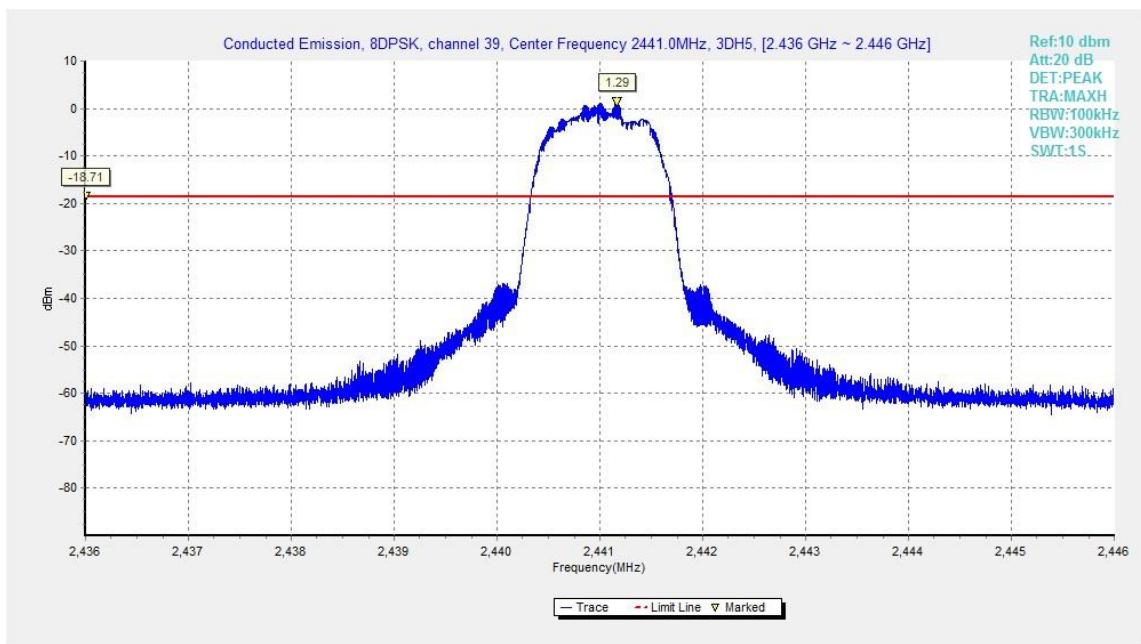


Fig.48. Conducted spurious emission: 8DPSK, Channel 39, 2441MHz

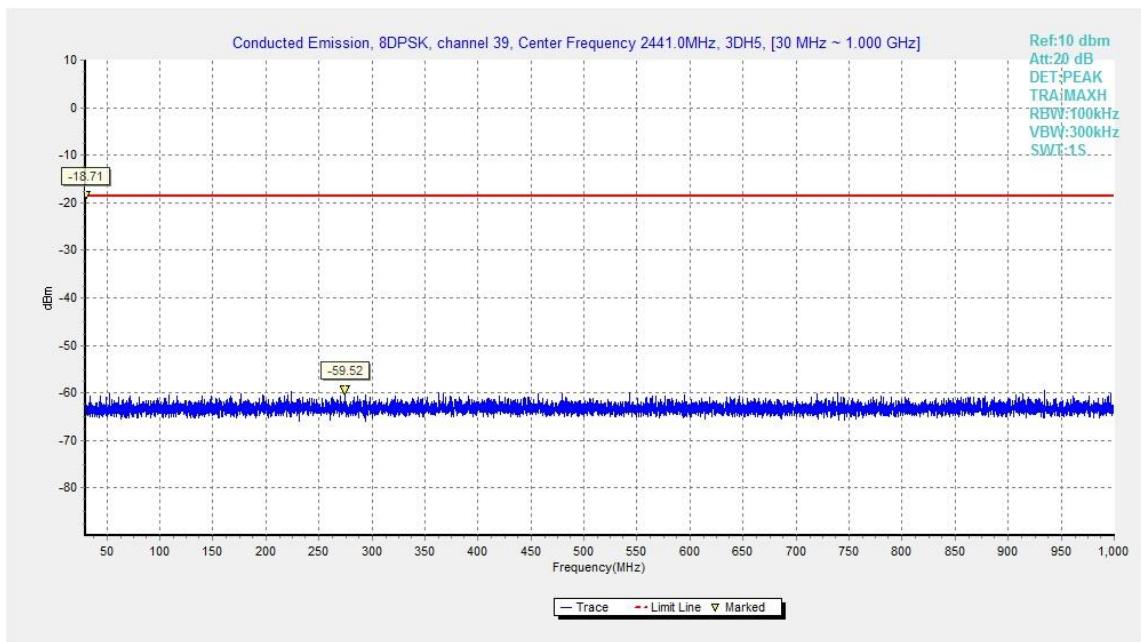


Fig.49. Conducted spurious emission: 8DPSK, Channel 39, 30MHz - 1GHz

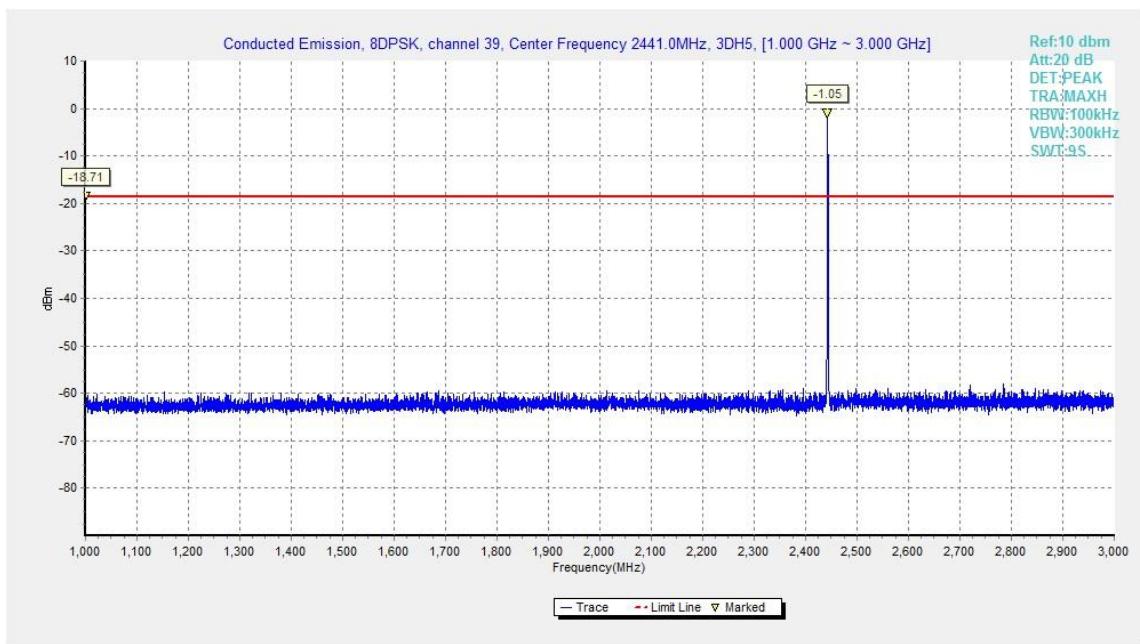


Fig.50. Conducted spurious emission: 8DPSK, Channel 39, 1GHz - 3GHz

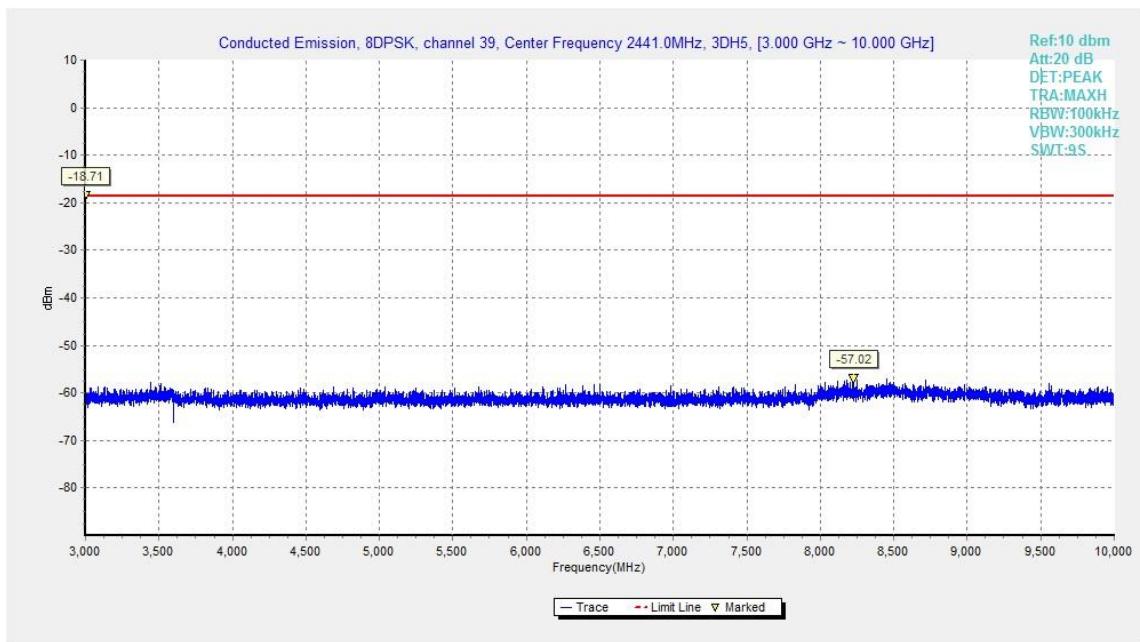


Fig.51. Conducted spurious emission: 8DPSK, Channel 39, 3GHz - 10GHz

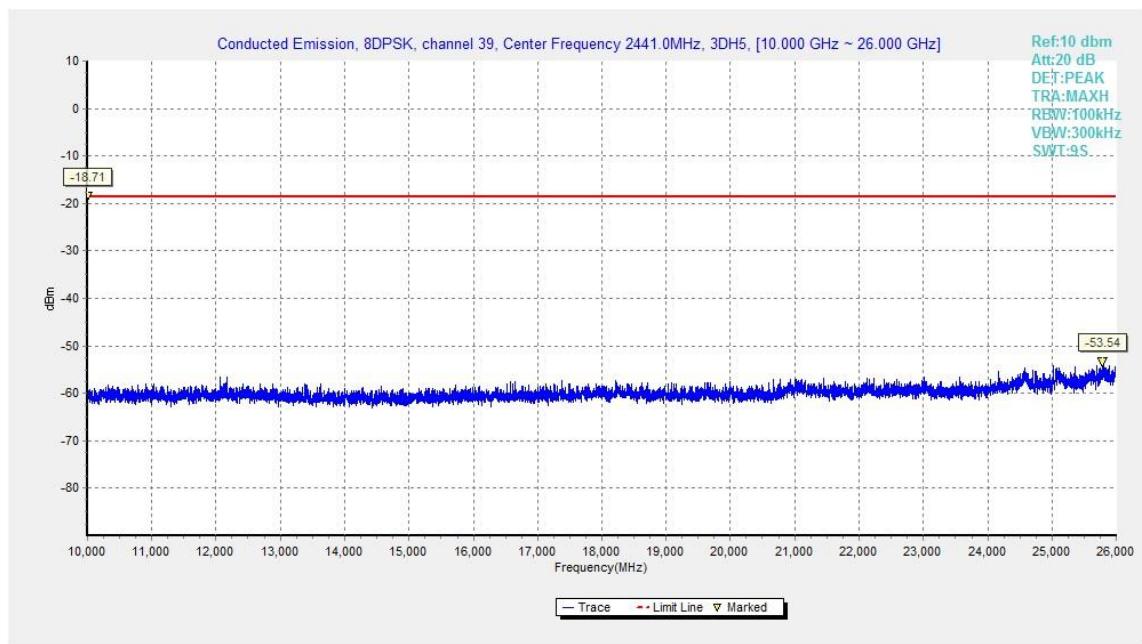


Fig.52. Conducted spurious emission: 8DPSK, Channel 39, 10GHz – 26GHz

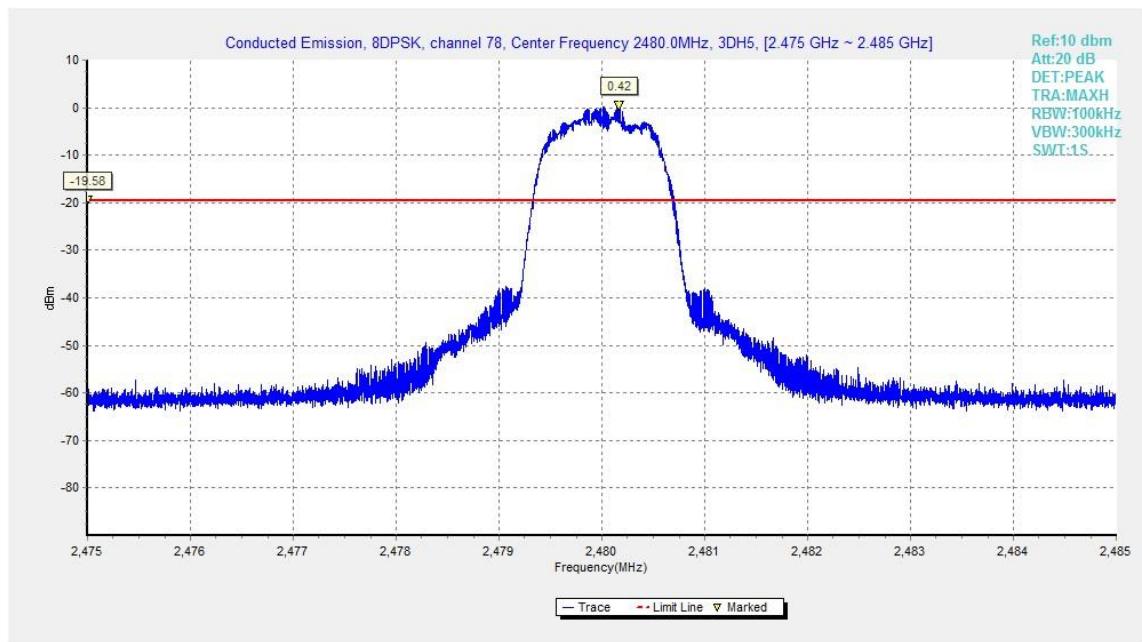


Fig.53. Conducted spurious emission: 8DPSK, Channel 78, 2480MHz

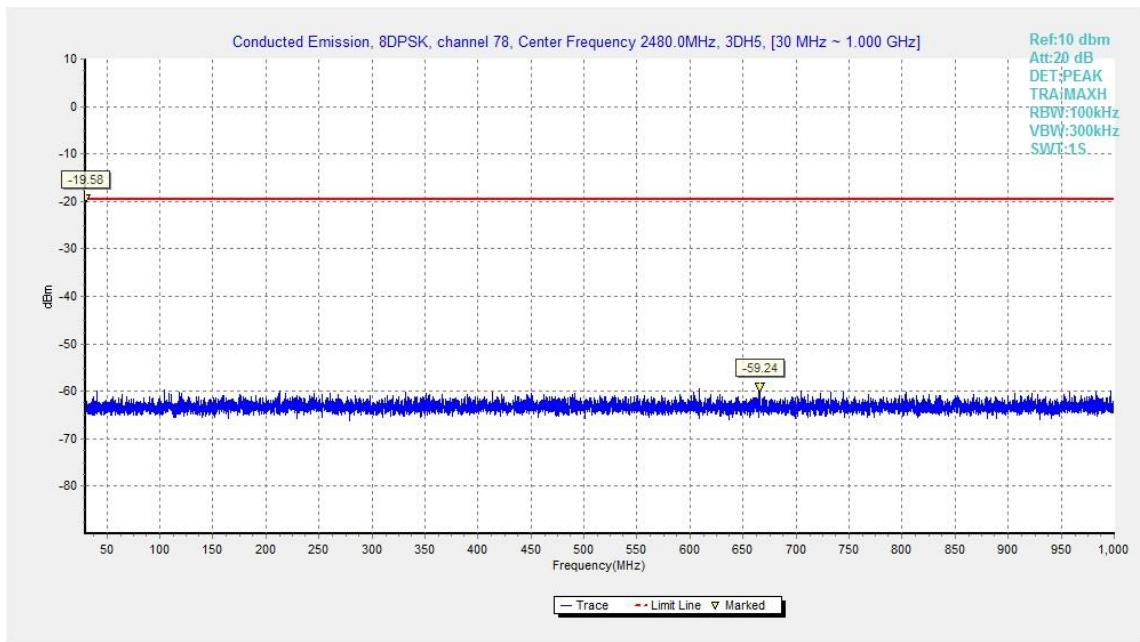


Fig.54. Conducted spurious emission: 8DPSK, Channel 78, 30MHz - 1GHz

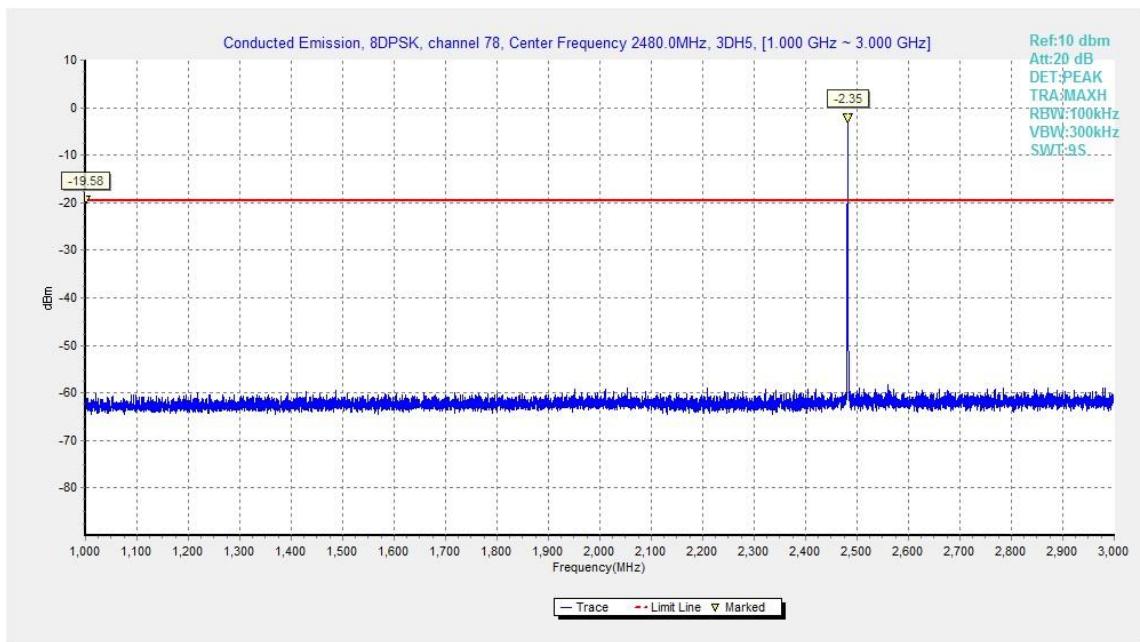


Fig.55. Conducted spurious emission: 8DPSK, Channel 78, 1GHz - 3GHz

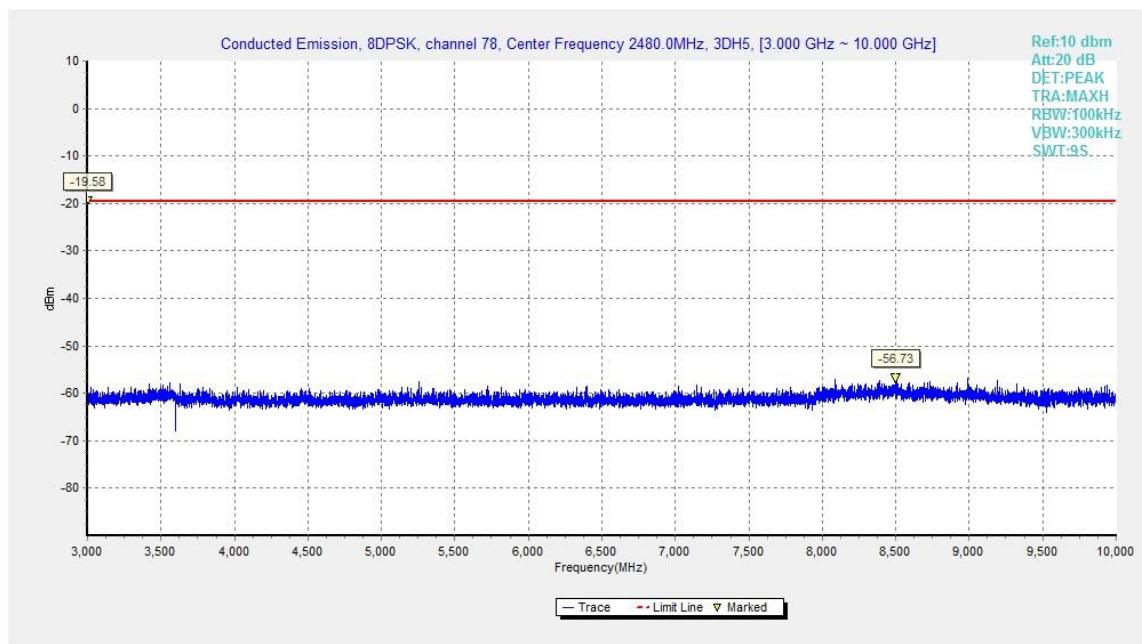


Fig.56. Conducted spurious emission: 8DPSK, Channel 78, 3GHz - 10GHz

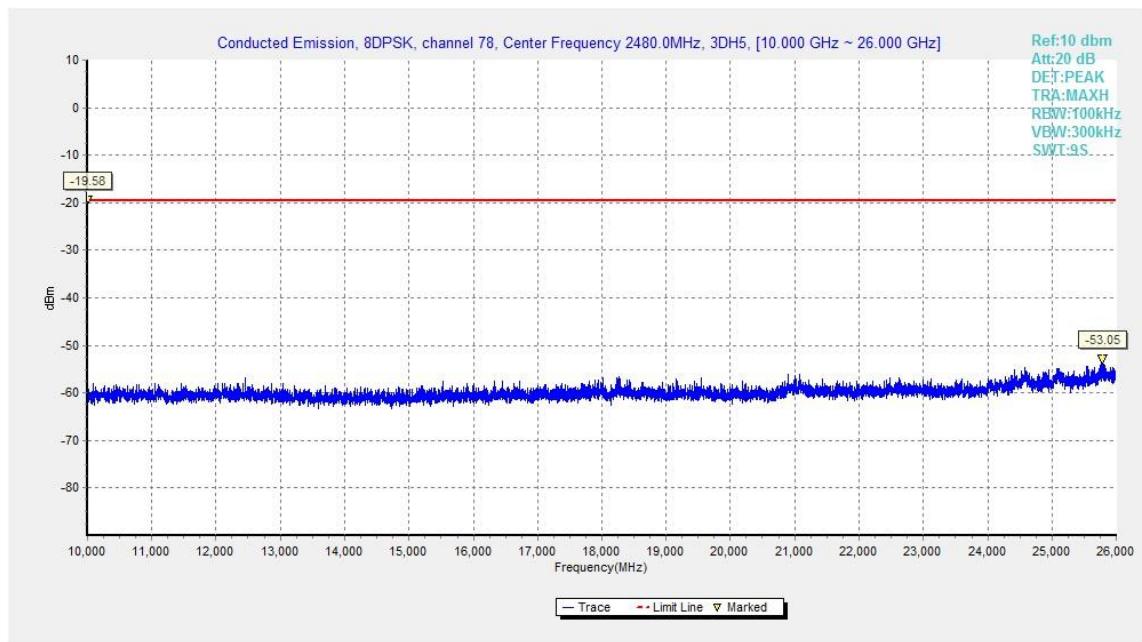


Fig.57. Conducted spurious emission: 8DPSK, Channel 78, 10GHz - 26GHz

### 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.58	P
Power	2.45GHz~2.5GHz---H	Fig.59	P

#### For 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 (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2389.200	46.26	2.9	32.0	11.41	54.0	7.7	H	155	25
2390.000	46.23	2.9	32.0	11.38	54.0	7.8	H	155	49
4803.000	34.05	-32.9	34.5	32.40	54.0	20.0	H	155	4
7206.000	37.16	-31.6	36.1	32.69	54.0	16.8	H	155	6
9607.500	41.19	-30.0	37.0	34.24	54.0	12.8	H	155	25
12010.500	42.29	-29.8	39.3	32.81	54.0	11.7	H	155	186

**GFSK Ch 39 - Average**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2384.682	46.24	2.9	32.0	11.36	54.0	7.8	H	155	5
2489.675	46.52	2.9	32.6	11.00	54.0	7.5	H	155	25
4882.000	33.20	-32.7	34.5	31.41	54.0	20.8	H	155	356
7323.000	38.32	-31.9	36.1	34.17	54.0	15.7	H	155	350
9764.000	40.02	-30.6	37.2	33.39	54.0	14.0	H	155	185
12205.000	44.17	-29.4	39.2	34.38	54.0	9.8	H	155	187

**GFSK Ch 78 - Average**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2483.500	46.33	2.9	32.8	10.64	54.0	7.7	H	155	20
2498.900	46.63	2.9	32.3	11.36	54.0	7.4	H	155	18
4960.000	33.79	-33.4	34.5	32.66	54.0	20.2	H	155	90
7440.000	37.42	-31.8	36.0	33.16	54.0	16.6	H	155	114
9920.000	41.84	-29.9	37.4	34.37	54.0	12.2	H	155	36
12400.000	43.43	-29.5	39.1	33.80	54.0	10.6	H	155	2

$\pi/4$  DQPSK Ch 0 - Average

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2386.600	46.21	2.9	32.0	11.34	54.0	7.8	H	155	4
2390.000	46.09	2.9	32.0	11.24	54.0	7.9	H	155	2
4804.000	33.43	-32.9	34.5	31.79	54.0	20.6	H	155	25
7206.000	37.12	-31.6	36.1	32.65	54.0	16.9	H	155	350
9608.000	41.05	-30.0	37.0	34.10	54.0	12.9	H	155	92
12010.000	42.29	-29.8	39.3	32.81	54.0	11.7	H	155	85

$\pi/4$  DQPSK Ch 39 - Average

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2381.950	46.22	2.9	32.0	11.32	54.0	7.8	H	155	20
2486.579	46.38	2.9	32.7	10.77	54.0	7.6	H	155	45
4882.000	33.08	-32.7	34.5	31.29	54.0	20.9	H	155	240
7323.000	38.33	-31.9	36.1	34.18	54.0	15.7	H	155	180
9764.000	39.21	-30.6	37.2	32.58	54.0	14.8	H	155	85
12205.000	44.13	-29.4	39.2	34.34	54.0	9.9	H	155	25

$\pi/4$  DQPSK Ch 78 - Average

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2483.500	46.40	2.9	32.8	10.70	54.0	7.6	H	155	268
2494.700	46.36	2.9	32.4	10.97	54.0	7.6	H	155	138
4960.000	33.77	-33.4	34.5	32.64	54.0	20.2	H	155	104
7440.000	37.47	-31.8	36.0	33.21	54.0	16.5	H	155	40
9920.000	41.75	-29.9	37.4	34.28	54.0	12.3	H	155	28
12400.000	43.49	-29.5	39.1	33.86	54.0	10.5	H	155	8

8DPSK Ch 0 - Average