



# FCC PART 15C TEST REPORT **No. I17N00063-BT**

for

**Power Idea Technology (Shenzhen) Co., Ltd.**

**TD-LTE digital mobile phone**

**Model Name: MD501**

**With**

**Hardware Version: 1.04**

**Software Version: MD501\_US\_1.003.00\_20170103**

**FCC ID: ZLE-MD501**

**IC: 11113A-MD501**

**Issued Date: 2017-04-07**

**Test Laboratory:**

**FCC 2.948 Listed: No.342690**

**IC O.A.T.S Listed: No. 21856-1**

**Note:**

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

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## **REPORT HISTORY**

<b>Report Number</b>	<b>Revision</b>	<b>Description</b>	<b>Issue Date</b>
I17N00063-BT	Rev.0	1st edition	2017-03-06
I17N00063-BT	Rev.1	2st edition	2017-03-22
I17N00063-BT	Rev.2	3st edition	2017-04-07

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## **1. Test Laboratory**

### **1.1. Testing Location**

Location: CTCL(South Branch)

Address: TCL International E city, No. 1001, Zhongshanyuan Road, Nanshan District, Shenzhen, Guangdong, China 518000

### **1.2. Testing Environment**

Normal Temperature: 15-35°C

Relative Humidity: 20-75%

### **1.3. Project data**

Testing Start Date: 2017-01-19

Testing End Date: 2017-02-28

### **1.4. Signature**

A handwritten signature in black ink, appearing to read "安然".

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(Prepared this test report)

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Tang Weisheng

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## **2. Client Information**

### **2.1. Applicant Information**

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### **2.2. Manufacturer Information**

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

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

Description	TD-LTE digital mobile phone
Model Name	MD501
Market Name	MD501
Frequency Band	2402MHz~2480MHz
Type of Modulation	GFSK/ $\pi/4$ DQPSK/8DPSK
Number of Channels	79
Antenna	Integrated
Power Supply	3.8V DC by Battery
FCC ID	ZLE-MD501
IC	11113A-MD501

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

EUT ID*	IMEI	HW Version	SW Version	Receive Date
EUT1	867453021949659	1.04	MD501_US_1.003.0 0_20170103	2017-01-19

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

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

AE ID*	Description	SN
AE1	Power Supply	/

AE1

Model	HKC0055010-2D
Manufacturer	SHENZHEN HUNTKEY ELECTRIC CO., LTD

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

## 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	Nov,2015
ANSI C63.10	American National Standard for Testing Unlicensed Wireless Devices	Jun,2013
RSS-Gen	Spectrum Management and Telecommunications Radio Standards Specification	Issue 4 Nov,2014
RSS-247	General Requirements for Compliance of Radio Apparatus Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices	Issue 1 May,2015

## **5. Test Results**

### **5.1. Summary of Test Results**

No	Test cases	Sub-clause of Part15C	Sub-clause of IC	Verdict
0	Antenna Requirement	15.203	/	P
1	Maximum Peak Output Power	15.247 (b)	RSS-247 Issue1 5.4	P
2	Band Edges Compliance	15.247 (d)	RSS-247 Issue1 5.5	P
3	Conducted Spurious Emission	15.247 (d)	RSS-247 Issue1 5.5 /RSS-Gen 6.13	P
4	Radiated Spurious Emission	15.247,15.205,15.209	RSS-247 Issue1 5.5 /RSS-Gen 6.13	P
5	Occupied 20dB bandwidth	15.247(a)	RSS-247 Issue1 5.1	P
6	Time of Occupancy(Dwell Time)	15.247(a)	RSS-247 Issue1 5.1	P
7	Number of Hopping Channel	15.247(a)	RSS-247 Issue1 5.1	P
8	Carrier Frequency Separation	15.247(a)	RSS-247 Issue1 5.1	P
9	Occupied Bandwidth	/	RSS-Gen Issue4 6.6	P
10	AC Powerline Conducted Emission	15.107,15.207	RSS-Gen Issue4 8.8	P

See **ANNEX A** and **ANNEX B** for details.

### **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. Terms used in the result table**

Terms used in Verdict column

P	Pass
NA	Not Available
F	Fail

Abbreviations

AC	Alternating Current
AFH	Adaptive Frequency Hopping
BW	Band Width
E.I.R.P.	equivalent isotropic radiated power
ISM	Industrial, Scientific and Medical
R&TTE	Radio and Telecommunications Terminal Equipment
RF	Radio Frequency
Tx	Transmitter

#### 5.4. Laboratory Environment

**Semi-anechoic chamber** did not exceed following limits along the EMC testing

Temperature	Min. = 15 °C, Max. = 30 °C
Relative humidity	Min. = 35 %, Max. = 60 %
Shielding effectiveness	0.014MHz - 1MHz, >60dB; 1MHz - 1000MHz, >90dB.
Electrical insulation	> 2 MΩ
Ground system resistance	< 4Ω
Normalised site attenuation (NSA)	< ±4dB, 3m/10m distance, from 30 to 1000 MHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 3000 MHz

**Shielded room** did not exceed following limits along the EMC testing

Temperature	Min. = 15 °C, Max. = 30 °C
Relative humidity	Min. = 35 %, Max. = 60 %
Shielding effectiveness	0.014MHz - 1MHz, >60dB; 1MHz - 1000MHz, >90dB.
Electrical insulation	> 2 MΩ
Ground system resistance	< 4 Ω

**Fully-anechoic chamber** did not exceed following limits along the EMC testing

Temperature	Min. = 15 °C, Max. = 30 °C
Relative humidity	Min. = 35 %, Max. = 60 %
Shielding effectiveness	0.014MHz - 1MHz, >60dB; 1MHz - 1000MHz, >90dB.
Electrical insulation	> 2 MΩ
Ground system resistance	< 4Ω
Voltage Standing Wave Ratio (VSWR)	≤6dB, from 1 to 18 GHz, 3m distance

## **6. Test Facilities Utilized**

### **Conducted test system**

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Due date	Calibration Period
1	Vector Signal Analyzer	FSV40	100903	Rohde & Schwarz	2017-03-21	1 year
2	Bluetooth Tester	CBT32	100584	Rohde & Schwarz	2018-01-05	1 year

### **Radiated emission test system**

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Due date	Calibration Period
1	LISN	ESH2-Z5	100196	Rohde & Schwarz	2018-01-05	1 year
2	Test Receiver	ESCI	100701	Rohde & Schwarz	2017-08-09	1 year
3	Loop Antenna	HLA6120	35779	TESEQ	2019-05-02	3 years
4	BiLog Antenna	VULB9163	9163 330	Schwarzbeck	2017-04-22	3 years
5	Horn Antenna	3117	00066585	ETS-Lindgren	2019-03-05	3 years
6	Test Receiver	ESR7	101675	Rohde & Schwarz	2017-07-21	1 year
7	Spectrum Analyzer	FSP 40	100378	Rohde & Schwarz	2017-12-15	1 year
8	Chamber	FACT5-2.0	4166	ETS-Lindgren	2018-05-13	3 years
9	Antenna	3160-09	LM4214/0011 8383	ETS-Lindgren	2018.07.14	3 years

### **Test software**

No.	Equipment	Manufacturer	Version
1	TechMgr Software	CAICT	1.9.1
2	EMC32	Rohde & Schwarz	8.53.0
3	EMC32	Rohde & Schwarz	10.01.00

Use the EUT inside MTK Engineering mode to control the transmitting signal.

The EUT was programmed to be in continuously transmitting mode.

### **Anechoic chamber**

Fully anechoic chamber by ETS-Lindgren

## **ANNEX A: MEASUREMENT RESULTS FOR RECEIVER**

### **A.0 Antenna requirement**

#### **Measurement Limit:**

<b>Standard</b>	<b>Requirement</b>
FCC CRF Part 15.203	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

**Conclusion: The Directional gains of antenna used for transmitting is 1.48dBi.**

**The RF transmitter uses an integrate antenna without connector.**

### A.1 Maximum Peak Output Power

#### Measurement Limit:

Standard	Limit (dBm)
FCC CRF Part 15.247(b)(1) & RSS-247 Issue1 5.4	< 21

#### Measurement Results:

Mode	Test Result (dBm)					
	2402MHz (Ch0)		2441MHz (Ch39)		2480 MHz (Ch78)	
GFSK	Fig.1	5.58	Fig.2	4.98	Fig.3	5.08
$\pi/4$ DQPSK	Fig.4	6.72	Fig.5	6.07	Fig.6	6.19
8DPSK	Fig.7	4.72	Fig.8	4.03	Fig.9	4.15

See ANNEX B for test graphs.

Conclusion: Pass

## A.2 Band Edges Compliance

### Measurement Limit:

Standard	Limit (dBc)
FCC 47 CFR Part 15.247 (d) & RSS-247 Issue1 5.5	> 20

### Measurement Result:

Mode	Channel	Hopping	Test Results	Conclusion
GFSK	0	ON	Fig.10	P
	78	ON	Fig.11	P
$\pi/4$ DQPSK	0	ON	Fig.12	P
	78	ON	Fig.13	P
8DPSK	0	ON	Fig.14	P
	78	ON	Fig.15	P

Mode	Channel	Hopping	Test Results	Conclusion
GFSK	0	OFF	Fig.16	P
	78	OFF	Fig.17	P
$\pi/4$ DQPSK	0	OFF	Fig.18	P
	78	OFF	Fig.19	P
8DPSK	0	OFF	Fig.20	P
	78	OFF	Fig.21	P

See ANNEX B for test graphs.

Conclusion: Pass

### A.3 Conducted Emission

#### Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247 (d) & RSS-247 Issue1 5.5	20dB below peak output power in 100 kHz bandwidth

#### Measurement Results:

MODE	Channel	Frequency Range	Test Results	Conclusion
GFSK	0	2.402 GHz	Fig.22	P
		30 MHz-1GHz	Fig.23	P
		1GHz-3GHz	Fig.24	P
		3GHz-10GHz	Fig.25	P
	39	2.441 GHz	Fig.26	P
		30 MHz-1 GHz	Fig.27	P
		1GHz-3GHz	Fig.28	P
		3GHz-10GHz	Fig.29	P
	78	2.480 GHz	Fig.30	P
		30 MHz-1GHz	Fig.31	P
		1GHz-3GHz	Fig.32	P
		3GHz-10GHz	Fig.33	P
$\pi/4$ DQPSK	0	2.402 GHz	Fig.34	P
		30 MHz-1 GHz	Fig.35	P
		1GHz-3GHz	Fig.36	P
		3GHz-10GHz	Fig.37	P
	39	2.441 GHz	Fig.38	P
		30 MHz-1GHz	Fig.39	P
		1GHz-3GHz	Fig.40	P
		3GHz-10GHz	Fig.41	P
	78	2.480 GHz	Fig.42	P
		30 MHz-1GHz	Fig.43	P
		1GHz-3GHz	Fig.44	P
		3GHz-10GHz	Fig.45	P

8DPSK	0	2.402 GHz	Fig.46	P
		30 MHz-1GHz	Fig.47	P
		1GHz-3GHz	Fig.48	P
		3GHz-10GHz	Fig.49	P
	39	2.441 GHz	Fig.50	P
		30 MHz-1GHz	Fig.51	P
		1GHz-3GHz	Fig.52	P
		3GHz-10GHz	Fig.53	P
	78	2.480 GHz	Fig.54	P
		30 MHz-1GHz	Fig.55	P
		1GHz-3GHz	Fig.56	P
		3GHz-10GHz	Fig.57	P
/	All channel	10GHz-26GHz	Fig.58	P

See ANNEX B for test graphs.

**Conclusion: Pass**

#### A.4 Radiated Emission

##### Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247, 15.205, 15.209 & RSS-247 Issue1 5.5	20dB below peak output power

In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

##### Limit in restricted band:

Frequency of emission (MHz)	Field strength(µV/m)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

##### 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	120kHz/300kHz	5
1000-4000	1MHz/3MHz	15
4000-18000	1MHz/3MHz	40
18000-26500	1MHz/3MHz	20

**Note:** According to the performance evaluation, the radiated emission margin of EUT is over 20dB in the band from 9kHz to 30MHz. Therefore, the measurement starts from 30MHz to tenth harmonic.

The measurement results include the horizontal polarization and vertical polarization measurements.

**Measurement Results:**

<b>Mode</b>	<b>Channel</b>	<b>Frequency Range</b>	<b>Test Results</b>	<b>Conclusion</b>
GFSK	39	0	1 GHz ~18 GHz	Fig.59
			9 kHz ~30 MHz	Fig.60
			30 MHz ~1 GHz	Fig.61
			1 GHz ~18 GHz	Fig.62
			18 GHz ~26.5 GHz	Fig.63
	78	1 GHz ~18 GHz	Fig.64	P
	Restricted Band(CH0)	2.38 GHz ~ 2.45 GHz	Fig.65	P
	Restricted Band (CH78)	2.45 GHz ~ 2.5 GHz	Fig.66	P
$\pi/4$ DQPS K	39	0	1 GHz ~18 GHz	Fig.67
			9 kHz ~30 MHz	Fig.68
			30 MHz ~1 GHz	Fig.69
			1 GHz ~18 GHz	Fig.70
			18 GHz ~26.5 GHz	Fig.71
	78	1 GHz ~18 GHz	Fig.72	P
	Restricted Band (CH0)	2.38 GHz ~ 2.45 GHz	Fig.73	P
	Restricted Band (CH78)	2.45 GHz ~ 2.5 GHz	Fig.74	P
8DPS K	39	0	1 GHz ~18 GHz	Fig.75
			9 kHz ~30 MHz	Fig.76
			30 MHz ~1 GHz	Fig.77
			1 GHz ~18 GHz	Fig.78
			18 GHz ~26.5 GHz	Fig.79
	78	1 GHz ~18 GHz	Fig.80	P
	Restricted Band (CH0)	2.38 GHz ~ 2.45 GHz	Fig.81	P
	Restricted Band (CH78)	2.45 GHz ~ 2.5 GHz	Fig.82	P

**GFSK CH0 (1-18GHz)**

<b>Frequency (MHz)</b>	<b>MaxPeak (dBuV/m)</b>	<b>Limit (dBuV/m)</b>	<b>Margin (dB)</b>	<b>Pol</b>	<b>Corr. (dB)</b>
13802.000000	52.75	74.00	21.25	V	11.0
14514.000000	55.18	74.00	18.82	V	11.8
15758.000000	56.85	74.00	17.15	H	12.8
16219.500000	56.66	74.00	17.34	V	13.1
16772.500000	57.08	74.00	16.92	V	13.9
17330.500000	57.25	74.00	16.75	V	14.0

<b>Frequency (MHz)</b>	<b>Average (dBuV/m)</b>	<b>Limit (dBuV/m)</b>	<b>Margin (dB)</b>	<b>Pol</b>	<b>Corr. (dB)</b>
14540.000000	43.66	54.00	10.34	V	11.9
15140.500000	43.86	54.00	10.14	V	12.1
15804.500000	45.12	54.00	8.88	H	12.8
16232.000000	45.04	54.00	8.96	V	13.1
16711.500000	45.51	54.00	8.49	V	13.8
17323.000000	45.14	54.00	8.86	V	14.0

**GFSK CH39 (1-18GHz)**

<b>Frequency (MHz)</b>	<b>MaxPeak (dBuV/m)</b>	<b>Limit (dBuV/m)</b>	<b>Margin (dB)</b>	<b>Pol</b>	<b>Corr. (dB)</b>
14125.000000	54.66	74.00	19.34	V	11.2
14803.000000	55.76	74.00	18.24	V	11.9
15677.500000	57.15	74.00	16.85	V	12.6
16191.000000	57.56	74.00	16.44	V	13.1
16772.500000	58.01	74.00	15.99	H	13.9
17454.000000	57.45	74.00	16.55	V	14.0

<b>Frequency (MHz)</b>	<b>Average (dBuV/m)</b>	<b>Limit (dBuV/m)</b>	<b>Margin (dB)</b>	<b>Pol</b>	<b>Corr. (dB)</b>
14538.500000	43.27	54.00	10.73	H	11.9
15161.000000	44.27	54.00	9.73	V	12.1
15628.000000	45.42	54.00	8.58	V	12.5
16214.000000	45.94	54.00	8.06	V	13.1
16765.500000	46.40	54.00	7.60	V	13.9
17284.500000	46.17	54.00	7.83	V	13.9

**GFSK CH78 (1-18GHz)**

Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol	Corr. (dB)
14502.000000	54.94	74.00	19.06	V	11.8
15091.000000	55.62	74.00	18.38	V	12.1
15827.000000	56.28	74.00	17.72	V	12.8
16161.500000	56.49	74.00	17.51	V	13.1
16797.000000	56.65	74.00	17.35	H	13.9
17322.000000	56.02	74.00	17.98	H	14.0

Frequency (MHz)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol	Corr. (dB)
14511.000000	43.45	54.00	10.55	H	11.8
15070.500000	43.74	54.00	10.26	H	12.1
15776.500000	44.82	54.00	9.18	H	12.8
16209.000000	44.58	54.00	9.42	H	13.1
16782.500000	44.93	54.00	9.07	H	13.9
17408.500000	44.46	54.00	9.54	H	14.0

 **$\pi/4$  DQPSK CH0 (1-18GHz)**

Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol	Corr. (dB)
13053.000000	51.83	74.00	22.17	V	11.1
14756.500000	55.66	74.00	18.34	V	11.9
15757.500000	57.18	74.00	16.82	V	12.8
16195.500000	57.55	74.00	16.45	V	13.1
16790.000000	57.91	74.00	16.09	V	13.9
17411.000000	58.11	74.00	15.89	H	14.0

Frequency (MHz)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol	Corr. (dB)
13186.500000	39.73	54.00	14.27	V	11.2
14551.500000	43.72	54.00	10.28	V	11.9
15168.000000	44.14	54.00	9.86	H	12.1
16185.500000	45.24	54.00	8.76	V	13.1
16805.000000	45.98	54.00	8.02	H	13.9
17292.000000	45.49	54.00	8.51	V	13.9

**$\pi/4$  DQPSK CH39 (1-18GHz)**

Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol	Corr. (dB)
13737.000000	52.97	74.00	21.03	V	11.1
14557.000000	55.79	74.00	18.21	H	11.9
15742.500000	56.99	74.00	17.01	H	12.8
16273.500000	57.25	74.00	16.75	H	13.2
16739.000000	57.68	74.00	16.32	V	13.9
17459.000000	56.60	74.00	17.40	H	14.0

Frequency (MHz)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol	Corr. (dB)
14534.000000	43.31	54.00	10.69	H	11.9
15151.500000	43.75	54.00	10.25	V	12.1
15758.500000	45.03	54.00	8.97	H	12.8
16198.500000	44.73	54.00	9.27	V	13.1
16825.500000	45.19	54.00	8.81	H	13.9
17338.500000	44.62	54.00	9.38	V	14.0

 **$\pi/4$  DQPSK CH78 (1-18GHz)**

Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol	Corr. (dB)
12231.500000	51.10	74.00	22.90	V	10.4
13799.500000	53.32	74.00	20.68	V	11.0
15731.500000	57.41	74.00	16.59	H	12.7
16344.500000	56.23	74.00	17.77	V	13.4
16798.000000	56.70	74.00	17.30	V	13.9
17346.000000	56.26	74.00	17.74	V	14.0

Frequency (MHz)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol	Corr. (dB)
14534.000000	43.31	54.00	10.69	H	11.9
15151.500000	43.75	54.00	10.25	V	12.1
15758.500000	45.03	54.00	8.97	H	12.8
16198.500000	44.73	54.00	9.27	V	13.1
16825.500000	45.19	54.00	8.81	H	13.9
17338.500000	44.62	54.00	9.38	V	14.0

**8DPSK CH0 (1-18GHz)**

<b>Frequency (MHz)</b>	<b>MaxPeak (dBuV/m)</b>	<b>Limit (dBuV/m)</b>	<b>Margin (dB)</b>	<b>Pol</b>	<b>Corr. (dB)</b>
12585.000000	50.91	74.00	23.09	H	10.6
13752.000000	52.88	74.00	21.12	V	11.1
14465.500000	55.19	74.00	18.81	V	11.7
15050.000000	55.83	74.00	18.17	H	12.1
16244.500000	56.00	74.00	18.00	V	13.2
16787.500000	57.65	74.00	16.35	V	13.9

<b>Frequency (MHz)</b>	<b>Average (dBuV/m)</b>	<b>Limit (dBuV/m)</b>	<b>Margin (dB)</b>	<b>Pol</b>	<b>Corr. (dB)</b>
13936.500000	41.01	54.00	12.99	H	10.8
15073.000000	43.83	54.00	10.17	V	12.1
15783.500000	45.06	54.00	8.94	H	12.8
16245.000000	44.76	54.00	9.24	V	13.2
16816.000000	45.24	54.00	8.76	V	13.9
17292.000000	44.60	54.00	9.40	H	13.9

**8DPSK CH39 (1-18GHz)**

<b>Frequency (MHz)</b>	<b>MaxPeak (dBuV/m)</b>	<b>Limit (dBuV/m)</b>	<b>Margin (dB)</b>	<b>Pol</b>	<b>Corr. (dB)</b>
14046.000000	55.08	74.00	18.92	H	10.9
15055.000000	55.21	74.00	18.79	V	12.1
15718.500000	56.86	74.00	17.14	H	12.7
16372.000000	56.16	74.00	17.84	H	13.5
16877.000000	56.79	74.00	17.21	V	14.0
17369.500000	56.70	74.00	17.30	H	14.0

<b>Frequency (MHz)</b>	<b>Average (dBuV/m)</b>	<b>Limit (dBuV/m)</b>	<b>Margin (dB)</b>	<b>Pol</b>	<b>Corr. (dB)</b>
13934.000000	40.96	54.00	13.04	V	10.8
14519.000000	43.38	54.00	10.62	V	11.8
15053.500000	43.84	54.00	10.16	V	12.1
15713.000000	45.10	54.00	8.90	V	12.7
16265.500000	44.92	54.00	9.08	V	13.2
16805.500000	45.29	54.00	8.71	V	13.9

**8DPSK CH78 (1-18GHz)**

<b>Frequency (MHz)</b>	<b>MaxPeak (dBuV/m)</b>	<b>Limit (dBuV/m)</b>	<b>Margin (dB)</b>	<b>Pol</b>	<b>Corr. (dB)</b>
12670.500000	51.49	74.00	22.51	V	10.7
14528.000000	55.18	74.00	18.82	V	11.8
15033.000000	55.52	74.00	18.48	V	12.1
15687.000000	57.26	74.00	16.74	H	12.6
16211.500000	56.79	74.00	17.21	V	13.1
16619.500000	56.88	74.00	17.12	H	13.7

<b>Frequency (MHz)</b>	<b>Average (dBuV/m)</b>	<b>Limit (dBuV/m)</b>	<b>Margin (dB)</b>	<b>Pol</b>	<b>Corr. (dB)</b>
13253.000000	39.30	54.00	14.70	V	11.1
13933.500000	41.38	54.00	12.62	V	10.8
14531.000000	43.34	54.00	10.66	V	11.8
15177.500000	43.85	54.00	10.15	V	12.2
16198.500000	45.05	54.00	8.95	V	13.1
17349.000000	45.21	54.00	8.79	V	14.0

See ANNEX B for test graphs.

**Conclusion:** Pass

**Note:**

A "reference path loss" is established and the  $A_{Rpl}$  is the attenuation of "reference path loss", and Antenna Factor, the gain of the preamplifier, the cable loss.  $P_{Mea}$  is the field strength recorded from the instrument.

The measurement results are obtained as described below:

Result=  $P_{Mea}$  +Cable Loss +Antenna Factor-Gain of the preamplifier.

### A.5 20dB Bandwidth

#### Measurement Limit:

Standard	Limit (kHz)
FCC 47 CFR Part 15.247 (a) & RSS-247 Issue1 5.1	/

#### Measurement Result:

Mode	Channel	20dB Bandwidth (MHz)		Conclusion
GFSK	0	Fig.83	1.121	/
	39	Fig.84	1.125	
	78	Fig.85	1.123	
$\pi/4$ DQPSK	0	Fig.86	1.352	/
	39	Fig.87	1.352	
	78	Fig.88	1.349	
8DPSK	0	Fig.89	1.364	/
	39	Fig.90	1.366	
	78	Fig.91	1.363	

See ANNEX B for test graphs.

Conclusion: PASS

### A.6 Time of Occupancy (Dwell Time)

#### Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247(a) & RSS-247 Issue1 5.1	< 400 ms

#### Measurement Results:

Mode	Channel	Packet	Dwell Time(ms)		Conclusion
GFSK	39	DH5	Fig.92	307	P
$\pi/4$ DQPSK	39	2-DH5	Fig.93	307	P
8DPSK	39	3-DH5	Fig.94	307	P

See ANNEX B for test graphs.

Conclusion: Pass

### A.7 Number of Hopping Channels

**Measurement Limit:**

Standard	Limit
FCC 47 CFR Part 15.247(a) & RSS-247 Issue1 5.1	At least 15 non-overlapping channels

**Measurement Results:**

Mode	Packet	Number of hopping	Test result	Conclusion
GFSK	DH5	Fig.95	Fig.96	79
$\pi/4$ DQPSK	2-DH5	Fig.97	Fig.98	79
8DPSK	3-DH5	Fig.99	Fig.100	79

See ANNEX B for test graphs.

Conclusion: Pass

### A.8 Carrier Frequency Separation

**Measurement Limit:**

Standard	Limit
FCC 47 CFR Part 15.247(a) & RSS-247 Issue1 5.1	By a minimum of 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater

**Measurement Results:**

Mode	Channel	Packet	Separation of hopping channels	Test result (MHz)	Conclusion
GFSK	39	DH5	Fig.101	1.327	P
$\pi/4$ DQPSK	39	2-DH5	Fig.102	1.019	P
8DPSK	39	3-DH5	Fig.103	1.002	P

See ANNEX B for test graphs.

Conclusion: Pass

### A.9 99%Occupied Bandwidth

#### Measurement Limit:

Standard	Limit
RSS-Gen Issue4 6.6	/

#### Measurement Results:

##### For GFSK

Channel	Occupied Bandwidth (MHz)	Conclusion
0	Fig.104	1.014
39	Fig.105	1.014
78	Fig.106	1.014

##### For π/4 DQPSK

Channel	Occupied Bandwidth (MHz)	Conclusion
0	Fig.107	0.890
39	Fig.108	0.905
78	Fig.109	0.926

##### For 8DPSK

Channel	Occupied Bandwidth (MHz)	Conclusion
0	Fig.110	1.043
39	Fig.111	1.042
78	Fig.112	1.049

See ANNEX B for test graphs.

Conclusion: PASS

## A.10 AC Power line Conducted Emission

### Test Condition:

Voltage (V)	Frequency (Hz)
120	60

### Measurement Result and limit:

BT (Quasi-peak Limit)-AE1

Frequency range (MHz)	Quasi-peak Limit (dB $\mu$ V)	Result (dB $\mu$ V)	Conclusion
		Traffic	
0.15 to 0.5	66 to 56		
0.5 to 5	56	Fig.113	P
5 to 30	60		

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

BT (Average Limit)-AE1

Frequency range (MHz)	Average-peak Limit (dB $\mu$ V)	Result (dB $\mu$ V)	Conclusion
		Traffic	
0.15 to 0.5	56 to 46		
0.5 to 5	46	Fig.113	P
5 to 30	50		

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

BT (Quasi-peak Limit)-AE1

Frequency range (MHz)	Quasi-peak Limit (dB $\mu$ V)	Result (dB $\mu$ V)	Conclusion
		Idle	
0.15 to 0.5	66 to 56		
0.5 to 5	56	Fig.114	P
5 to 30	60		

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

BT (Average Limit)-AE1

Frequency range (MHz)	Average-peak Limit (dB $\mu$ V)	Result (dB $\mu$ V)	Conclusion
		Idle	
0.15 to 0.5	56 to 46		
0.5 to 5	46	Fig.114	P
5 to 30	50		

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

**Test Condition:**

Voltage (V)	Frequency (Hz)
240	60

**Measurement Result and limit:**

BT (Quasi-peak Limit)-AE1

Frequency range (MHz)	Quasi-peak Limit (dB $\mu$ V)	Result (dB $\mu$ V)	Conclusion
		Traffic	
0.15 to 0.5	66 to 56	Fig.115	P
0.5 to 5	56		
5 to 30	60		

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

BT (Average Limit)-AE1

Frequency range (MHz)	Average-peak Limit (dB $\mu$ V)	Result (dB $\mu$ V)	Conclusion
		Traffic	
0.15 to 0.5	56 to 46	Fig.115	P
0.5 to 5	46		
5 to 30	50		

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

BT (Quasi-peak Limit)-AE1

Frequency range (MHz)	Quasi-peak Limit (dB $\mu$ V)	Result (dB $\mu$ V)	Conclusion
		Idle	
0.15 to 0.5	66 to 56	Fig.116	P
0.5 to 5	56		
5 to 30	60		

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

BT (Average Limit)-AE1

Frequency range (MHz)	Average-peak Limit (dB $\mu$ V)	Result (dB $\mu$ V)	Conclusion
		Idle	
0.15 to 0.5	56 to 46	Fig.116	P
0.5 to 5	46		
5 to 30	50		

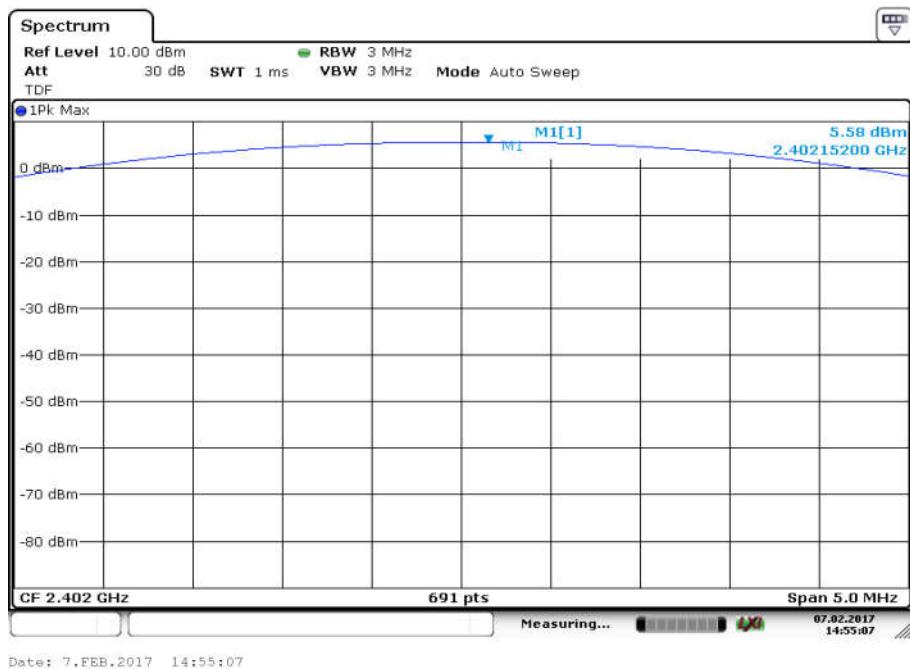
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

**Note:** The measurement results include the L1 and N measurements.

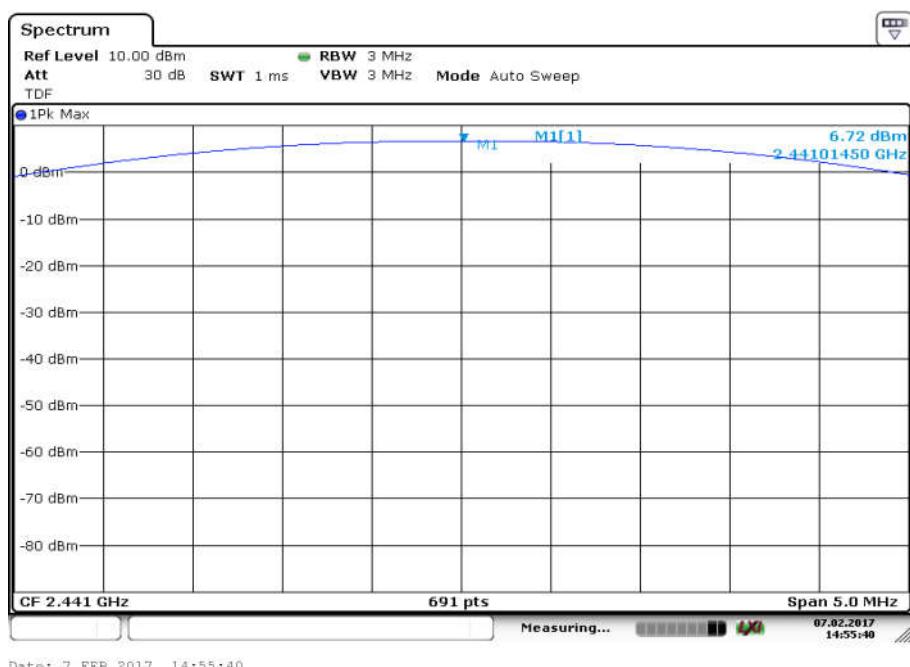
**See ANNEX B for test graphs.**

**Conclusion: Pass**

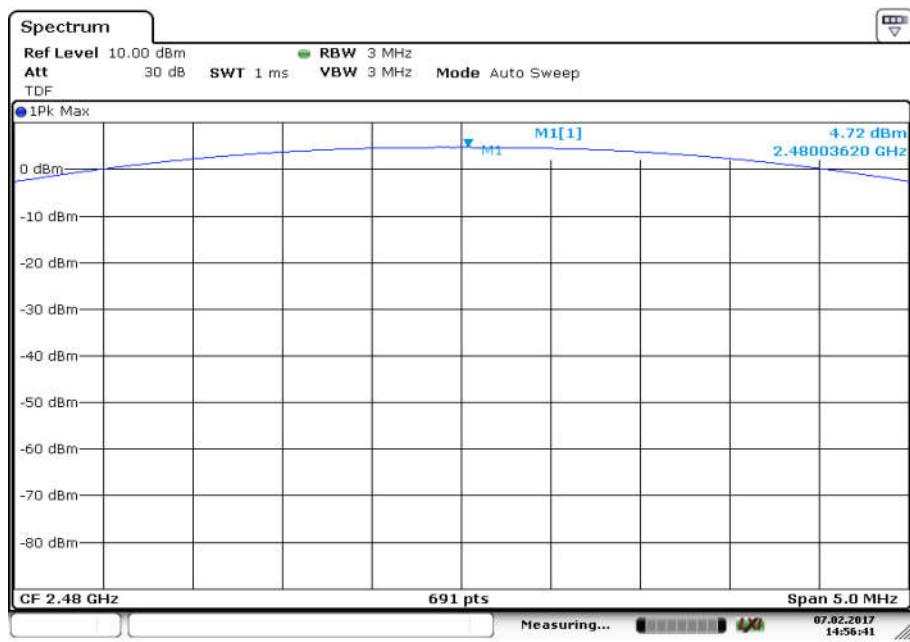
## ANNEX B: TEST FIGURE LIST



**Fig. 1 Maximum Peak Output Power(GFSK, Ch 0)**

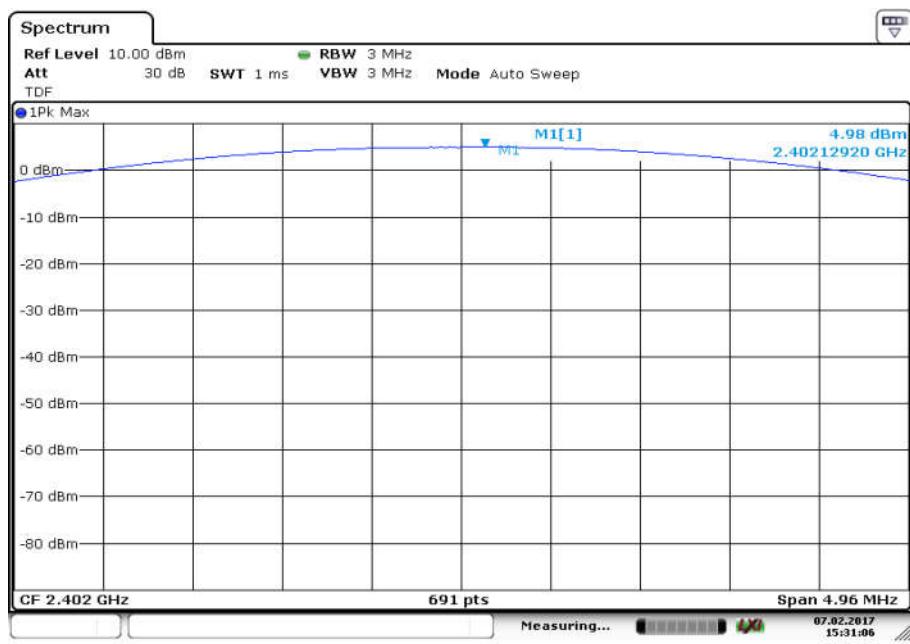


**Fig. 2 Maximum Peak Output Power(GFSK, Ch 39)**



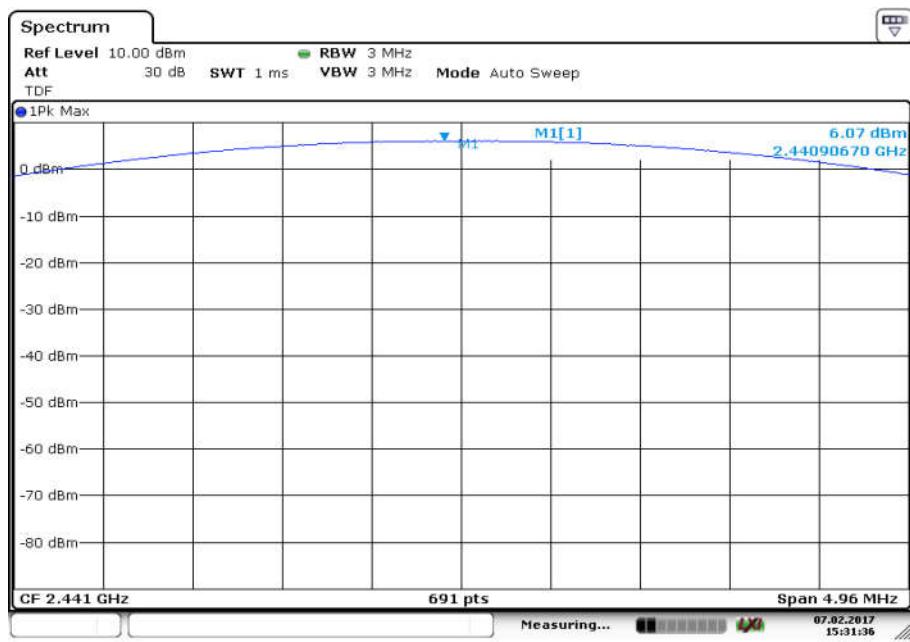
Date: 7.FEB.2017 14:56:41

**Fig. 3 Maximum Peak Output Power(GFSK, Ch 78)**

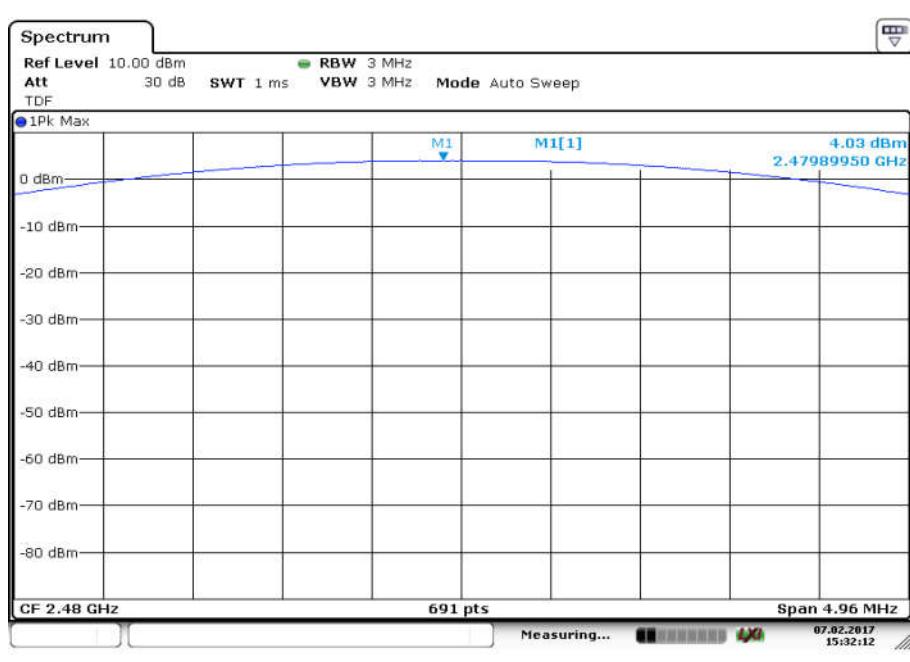


Date: 7.FEB.2017 15:31:07

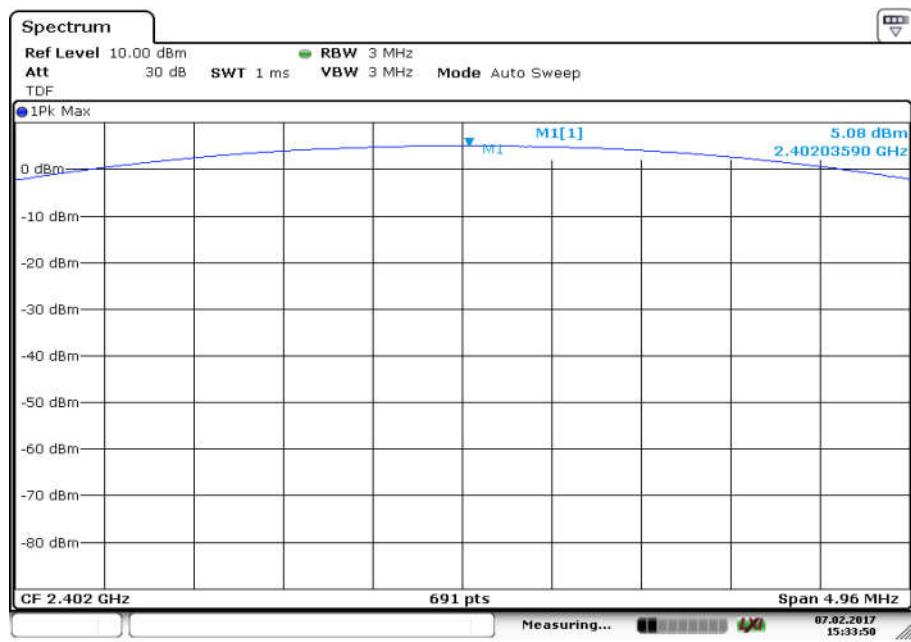
**Fig. 4 Maximum Peak Output Power( $\pi/4$  DQPSK, Ch 0)**



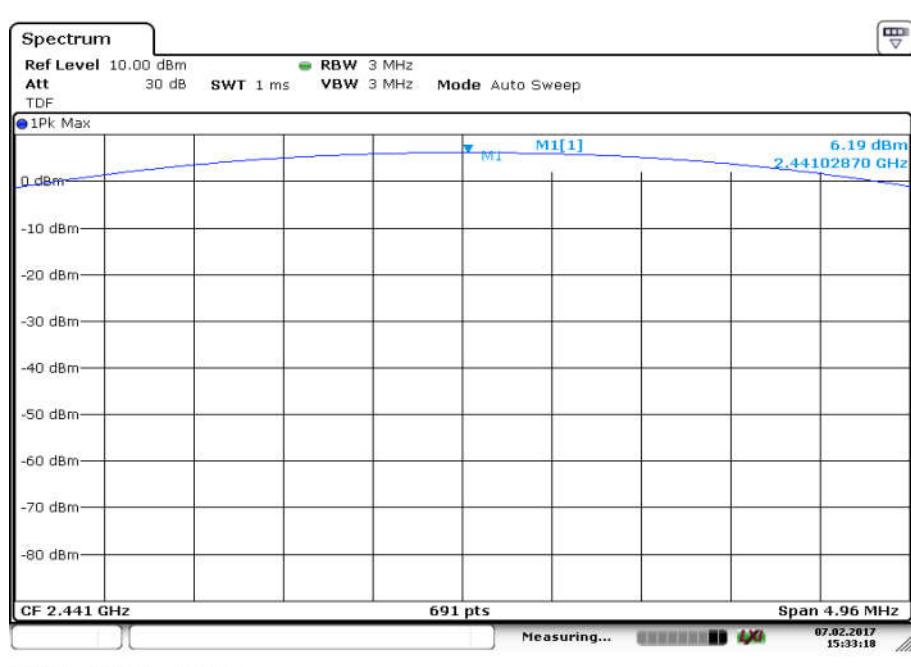
**Fig. 5 Maximum Peak Output Power(  $\pi/4$  DQPSK, Ch 39)**



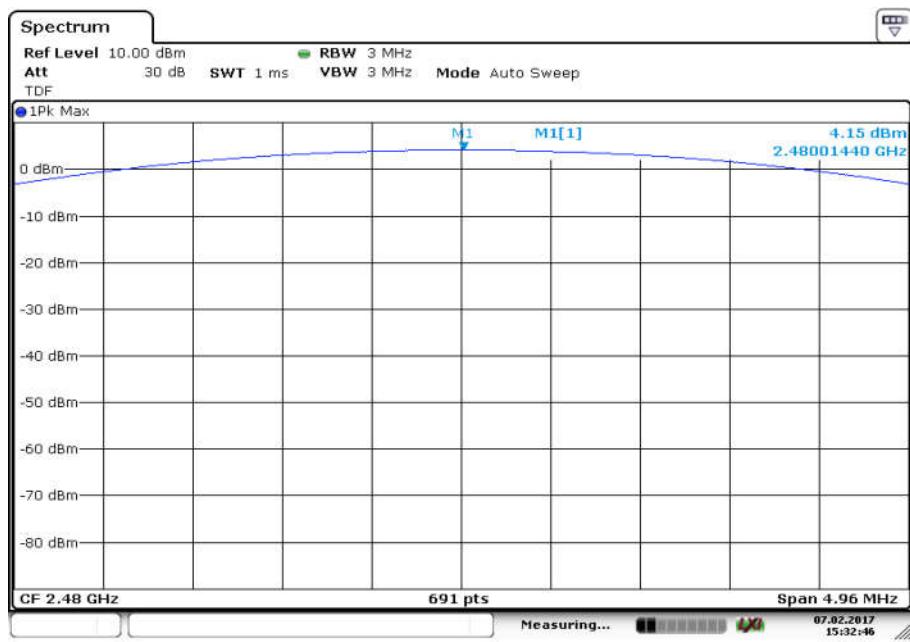
**Fig. 6 Maximum Peak Output Power(  $\pi/4$  DQPSK, Ch 78)**



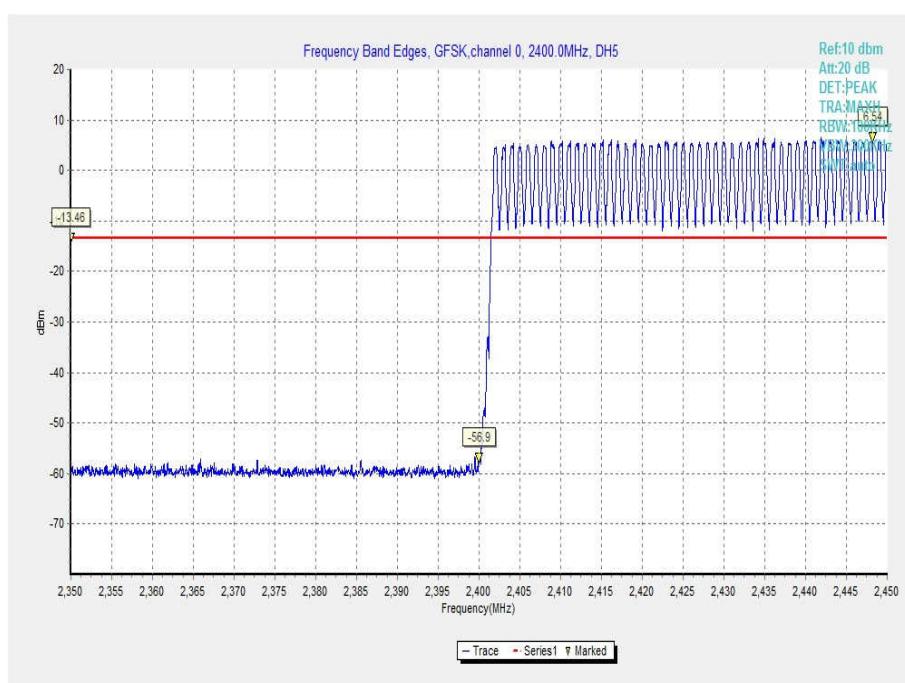
**Fig. 7 Maximum Peak Output Power(8DPSK, Ch 0)**



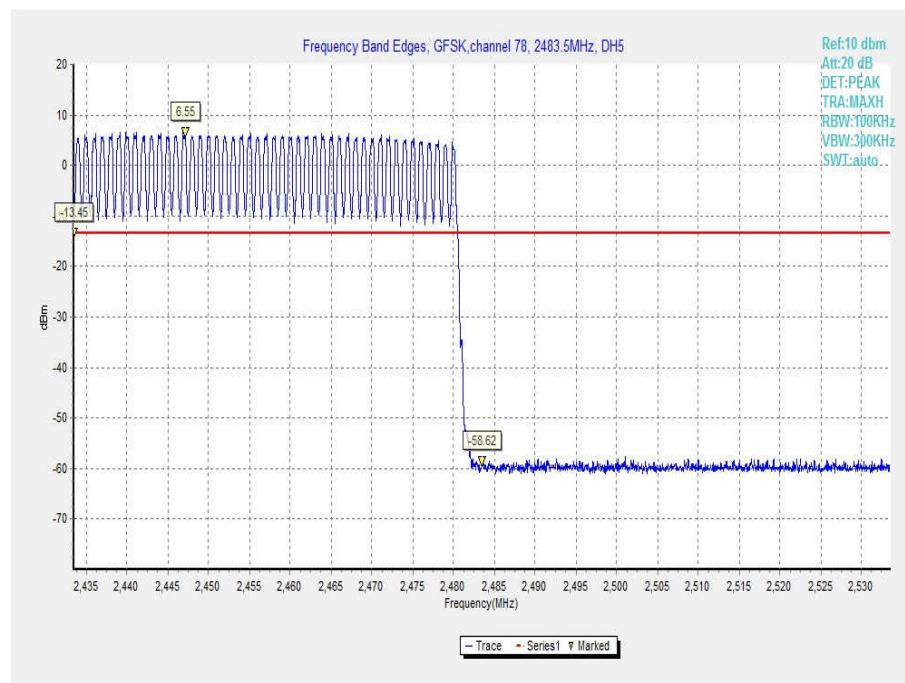
**Fig. 8 Maximum Peak Output Power(8DPSK, Ch 39)**



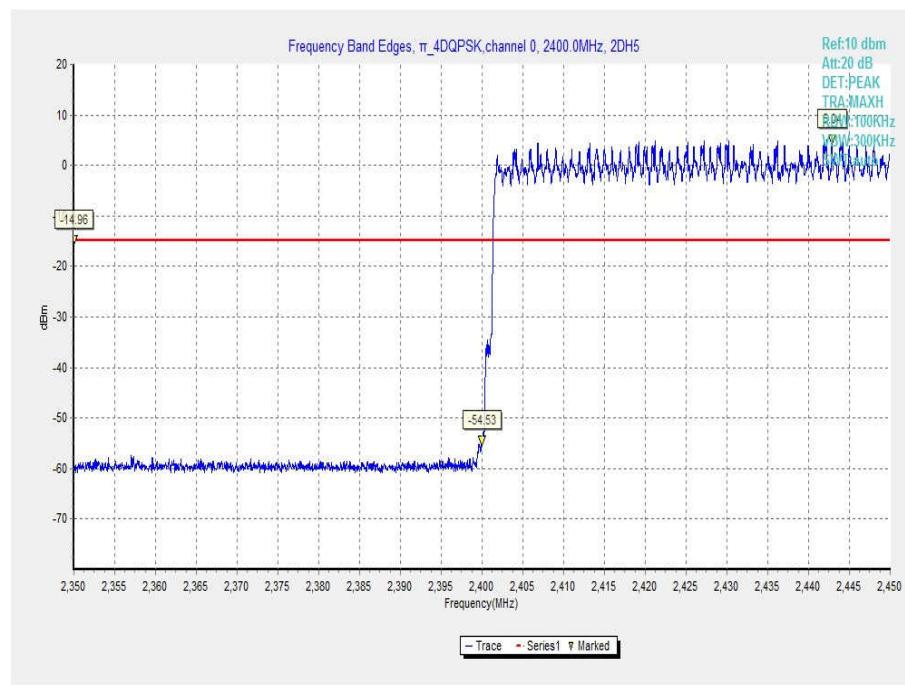
**Fig. 9 Maximum Peak Output Power(8DPSK, Ch 78)**



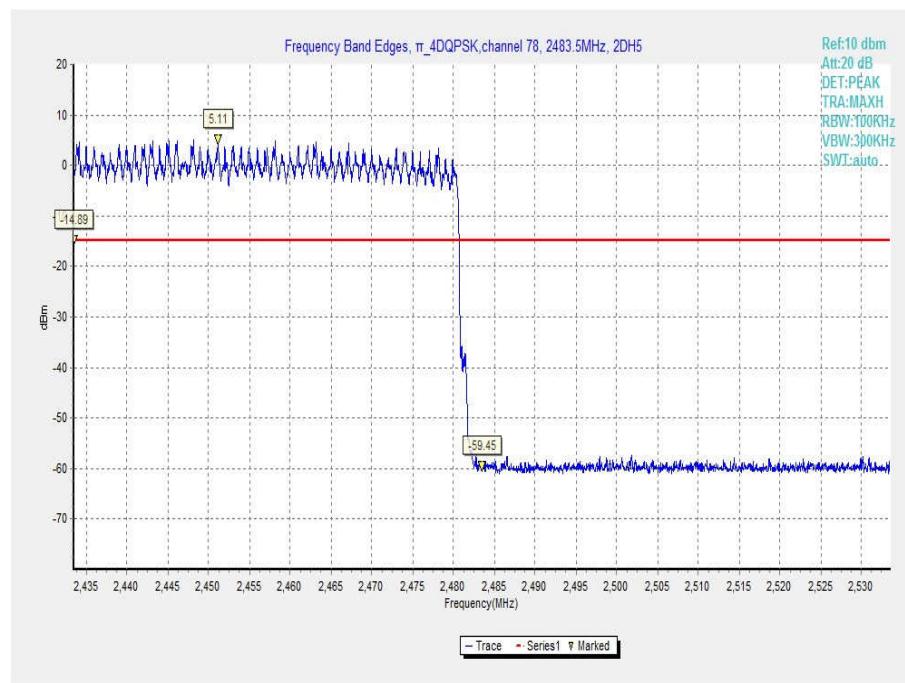
**Fig. 10 Band Edges (GFSK, Ch 0, Hopping ON)**



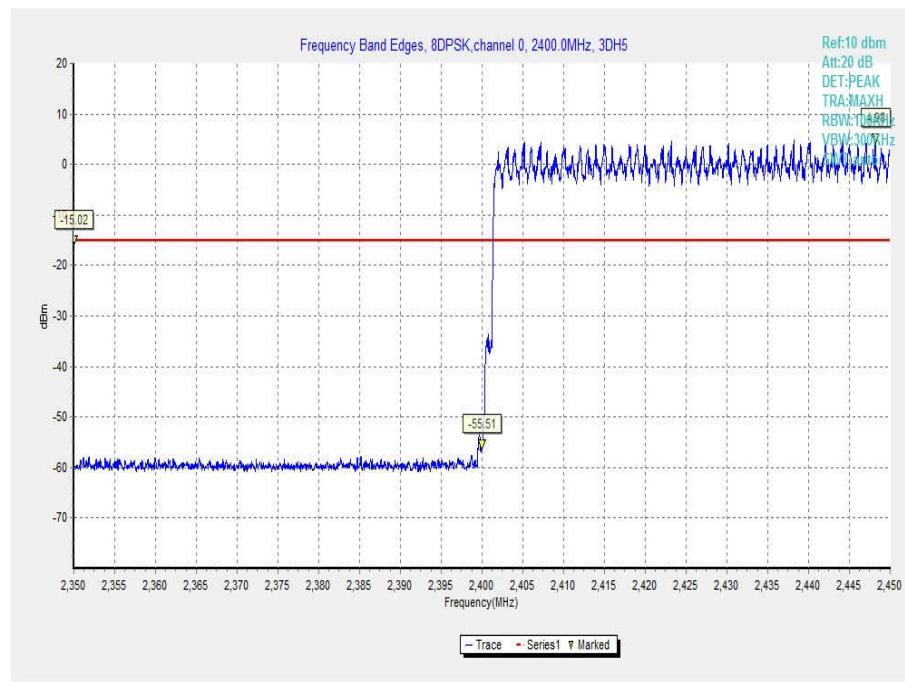
**Fig. 11 Band Edges (GFSK, Ch 78, Hopping ON)**



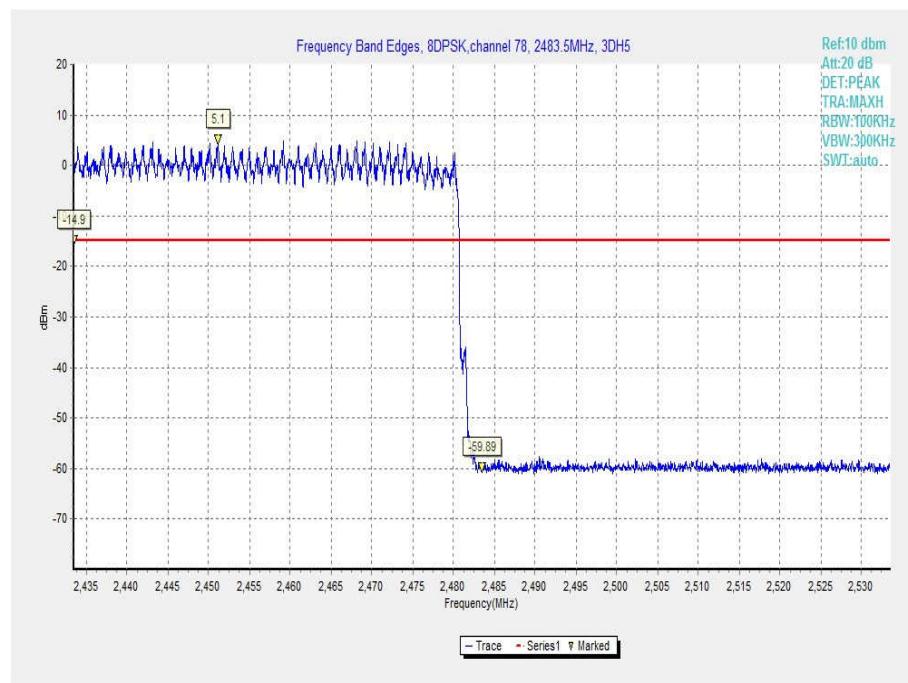
**Fig. 12 Band Edges (  $\pi/4$  DQPSK, Ch 0, Hopping ON)**



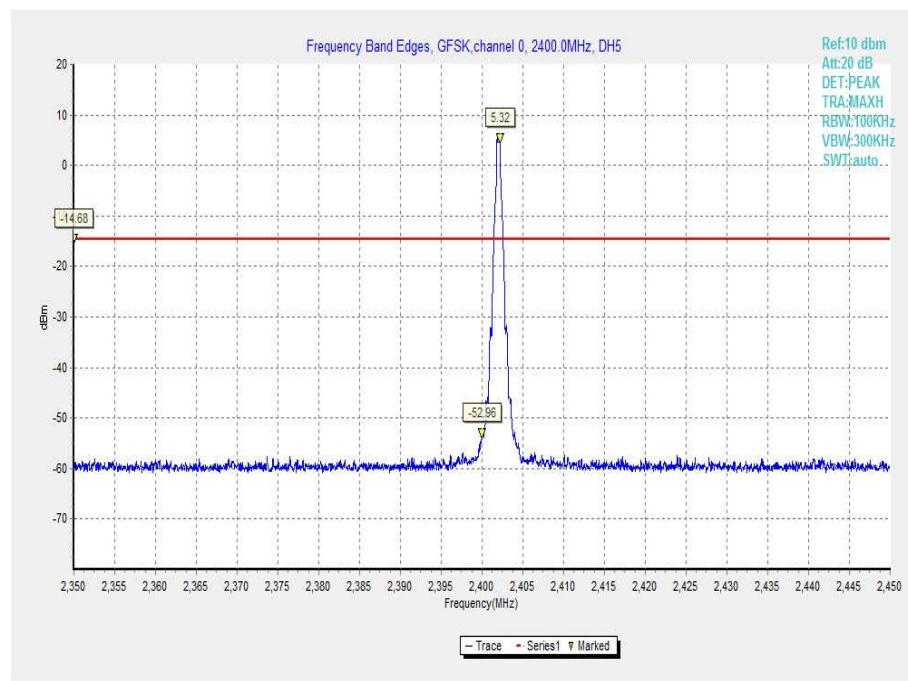
**Fig. 13 Band Edges ( $\pi/4$  DQPSK, Ch 78, Hopping ON)**



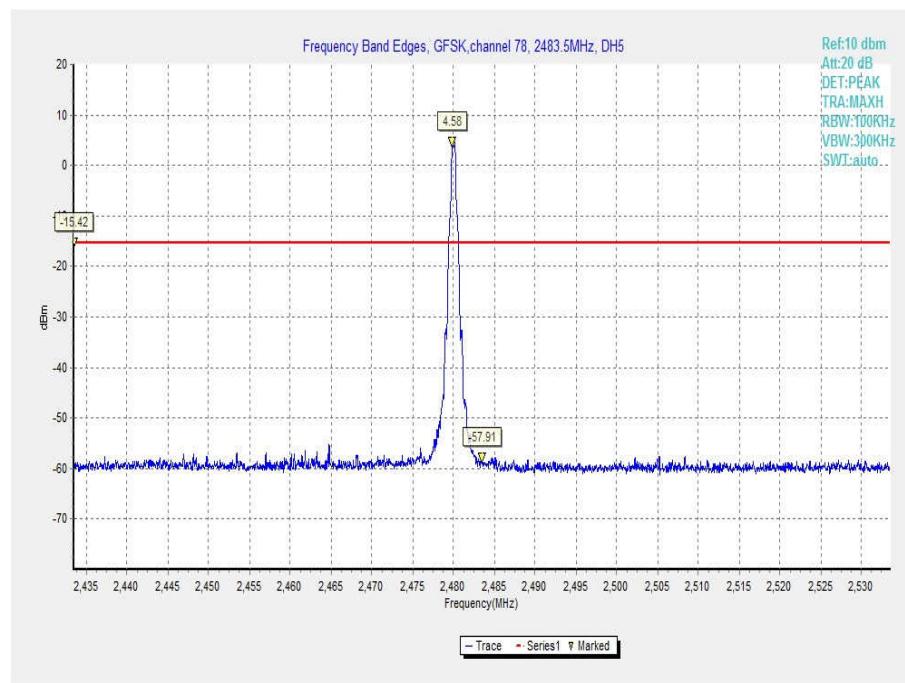
**Fig. 14 Band Edges (8DPSK, Ch 0, Hopping ON)**



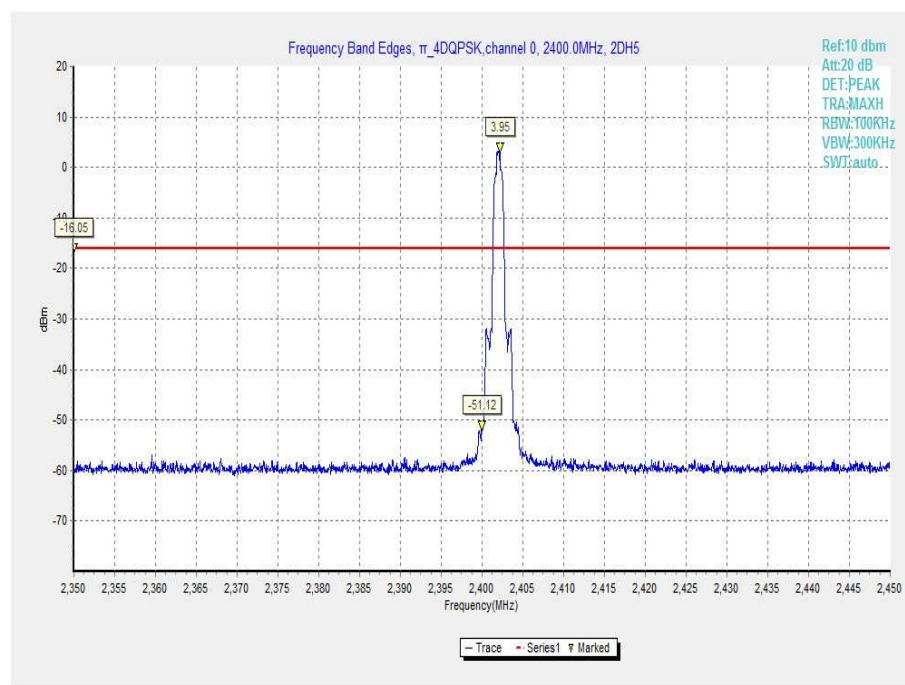
**Fig. 15 Band Edges (8DPSK, Ch 78, Hopping ON)**



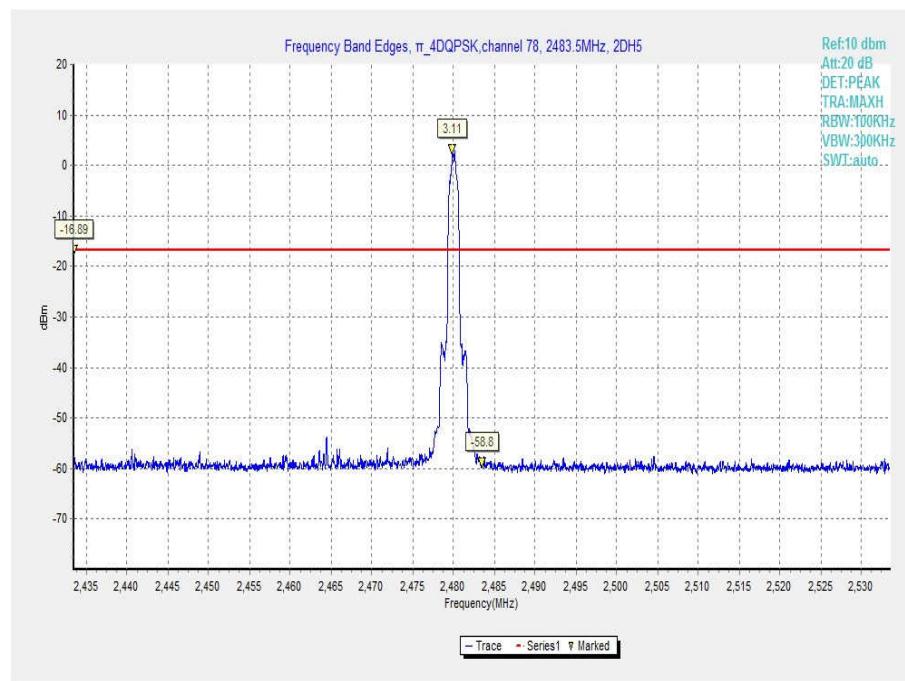
**Fig. 16 Band Edges (GFSK, Ch 0, Hopping OFF)**



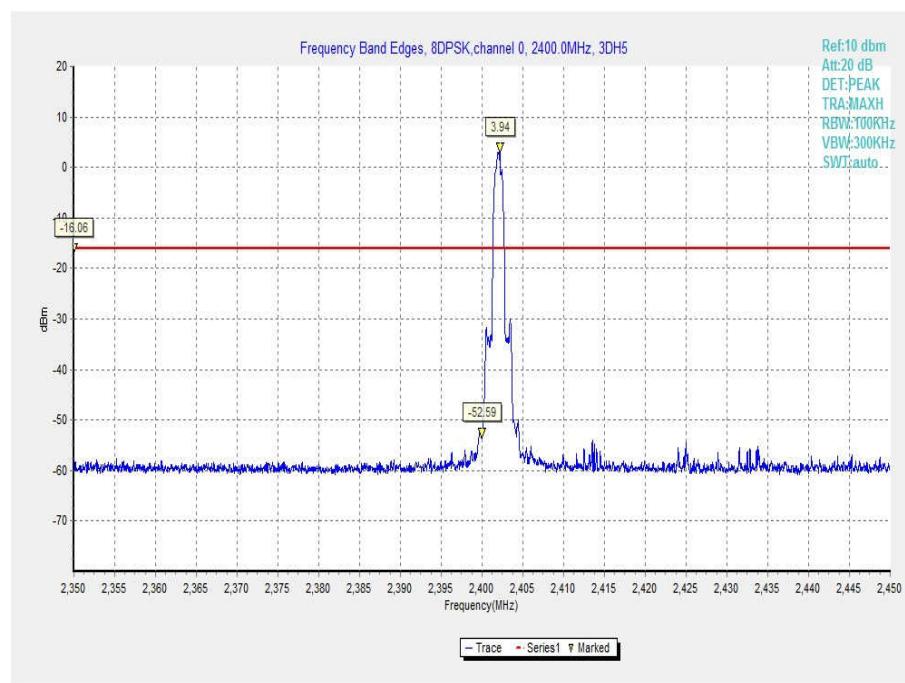
**Fig. 17 Band Edges (GFSK, Ch 78, Hopping OFF)**



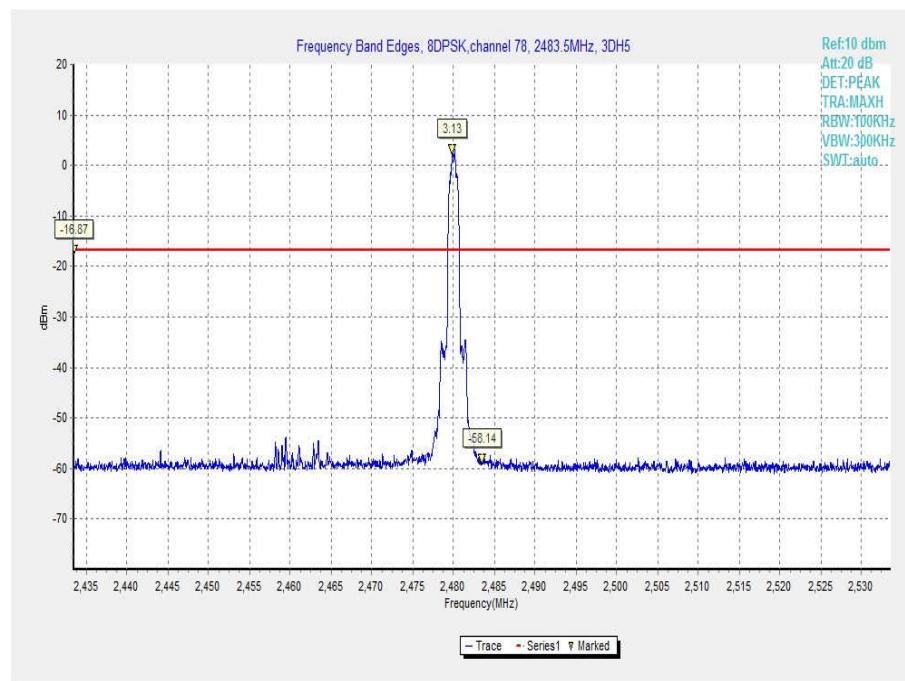
**Fig. 18 Band Edges (π/4 DQPSK, Ch 0, Hopping OFF)**



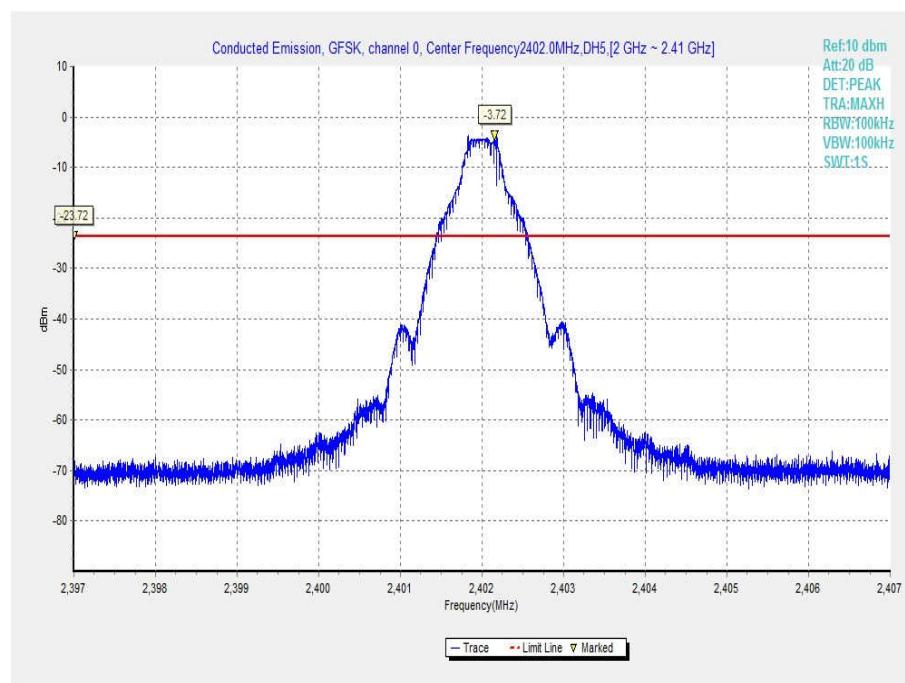
**Fig. 19 Band Edges ( $\pi$ /4 DQPSK, Ch 78, Hopping OFF)**



**Fig. 20 Band Edges (8DPSK, Ch 0, Hopping OFF)**



**Fig. 21 Band Edges (8DPSK, Ch 78, Hopping OFF)**



**Fig. 22 Conducted Spurious Emission (GFSK, Ch0, 2.402GHz)**

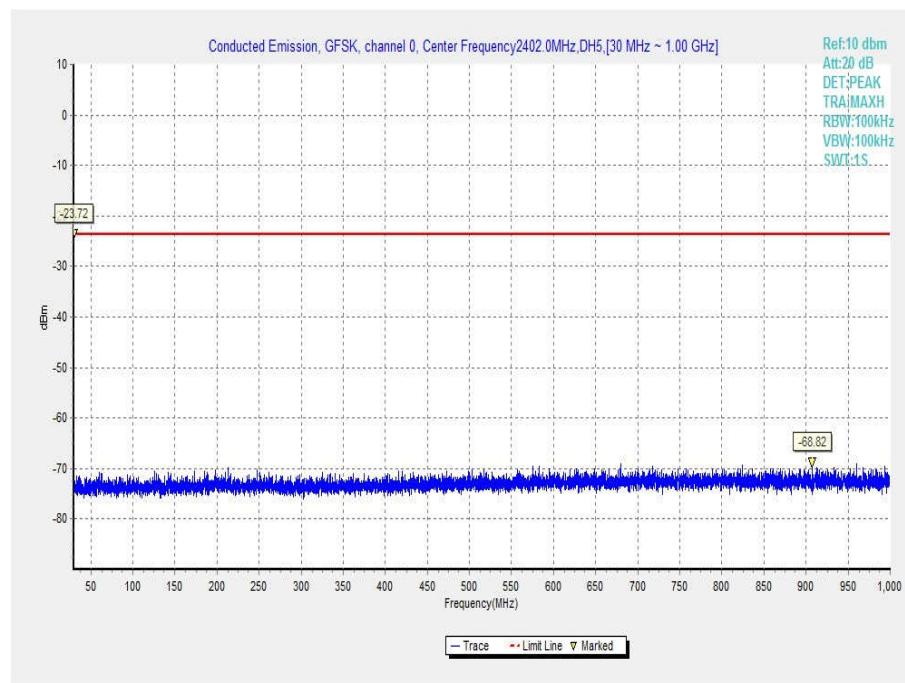


Fig. 23 Conducted Spurious Emission (GFSK, Ch0, 30 MHz-1 GHz)

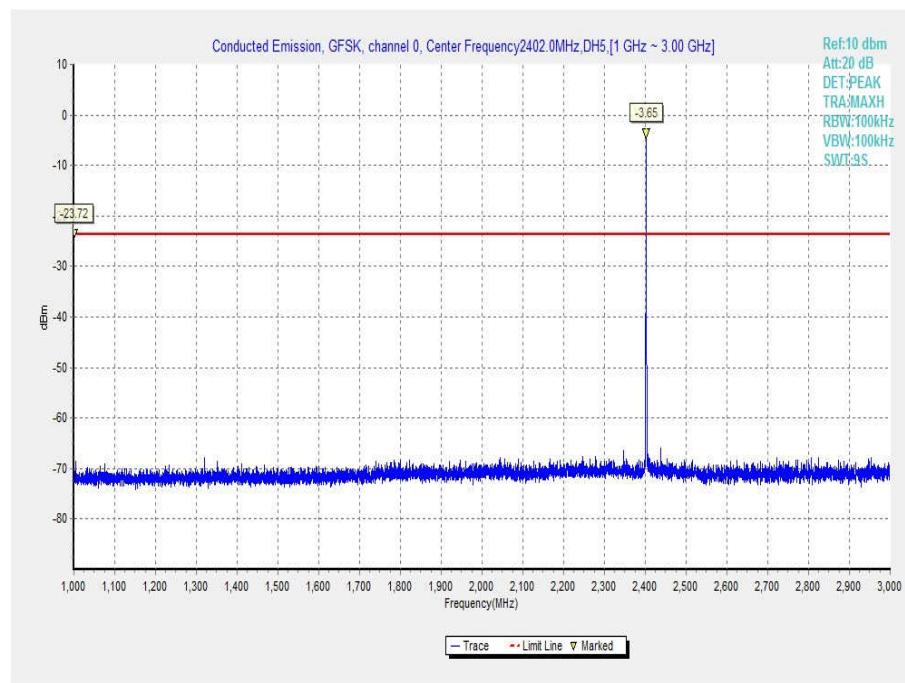
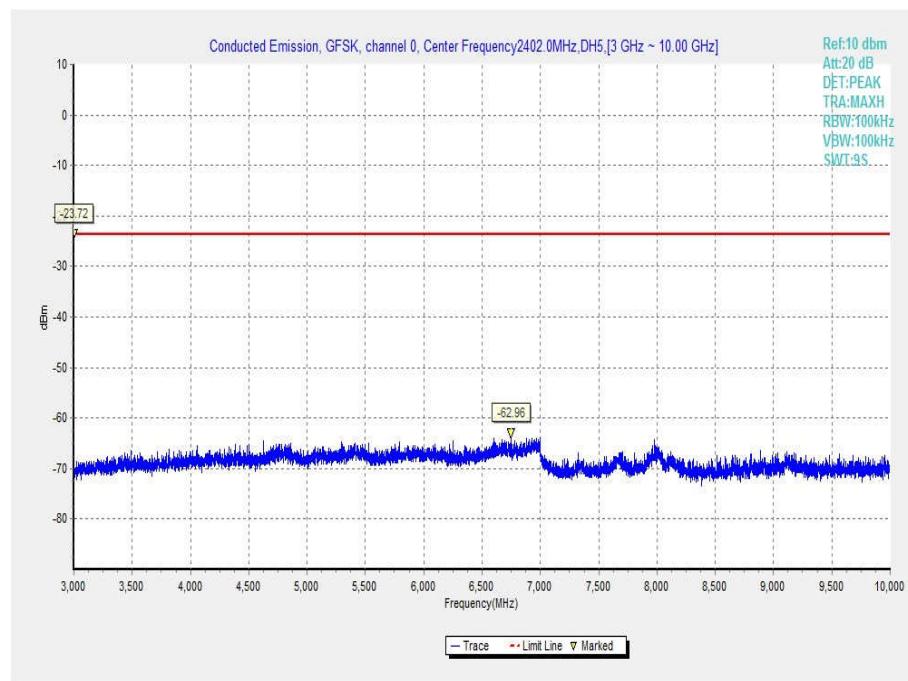
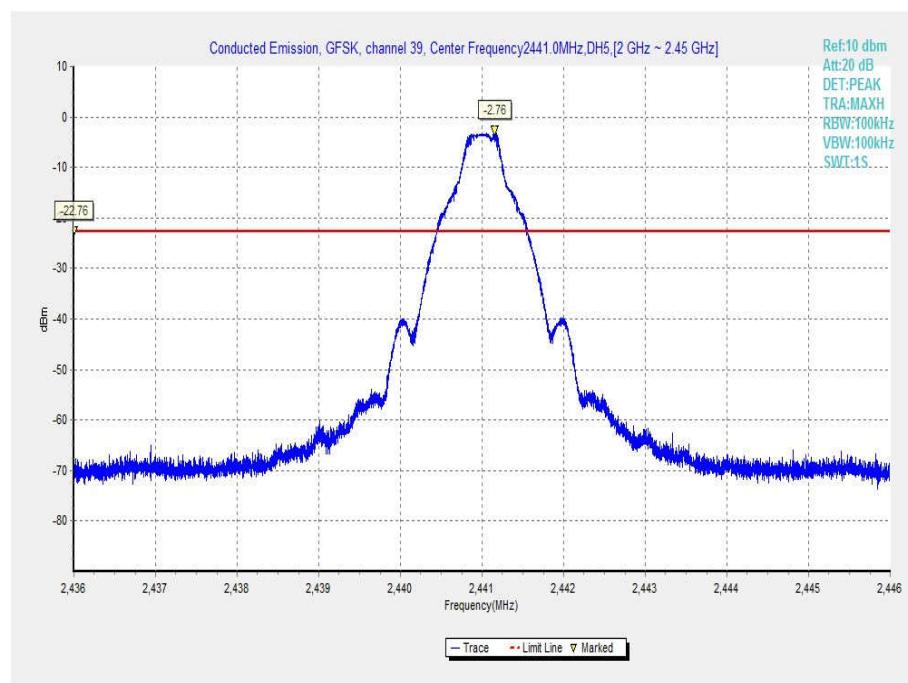


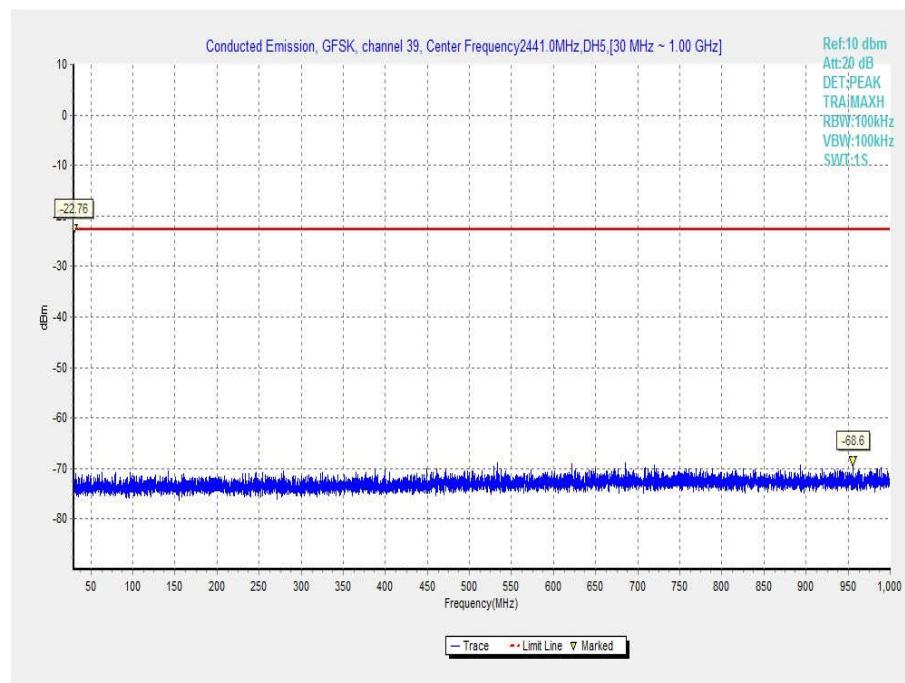
Fig. 24 Conducted Spurious Emission (GFSK, Ch0, 1 GHz-3 GHz)



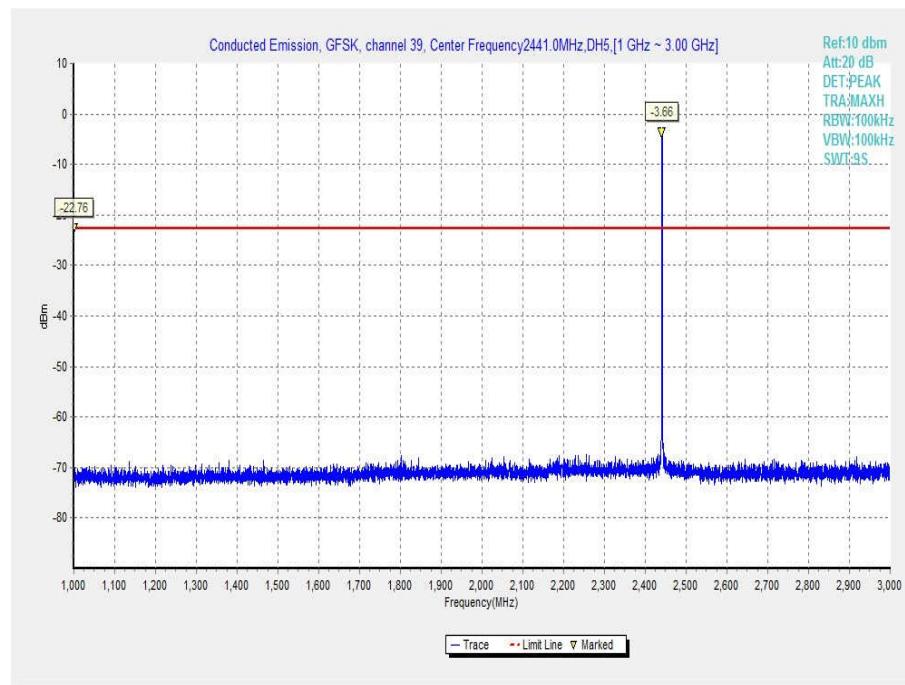
**Fig. 25 Conducted Spurious Emission (GFSK, Ch0, 3GHz-10 GHz)**



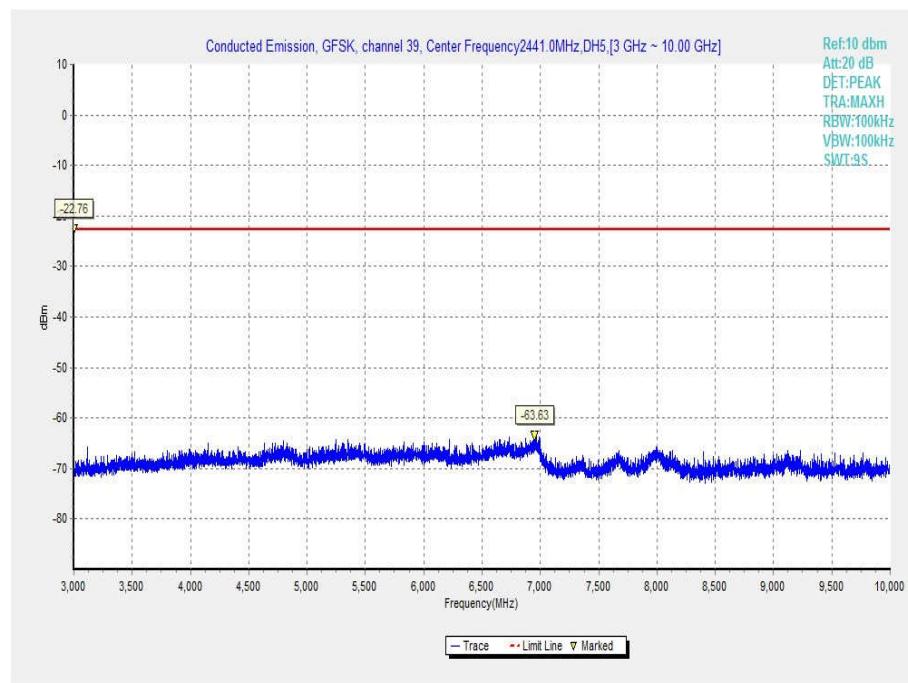
**Fig. 26 Conducted Spurious Emission (GFSK, Ch39, 2.441GHz)**



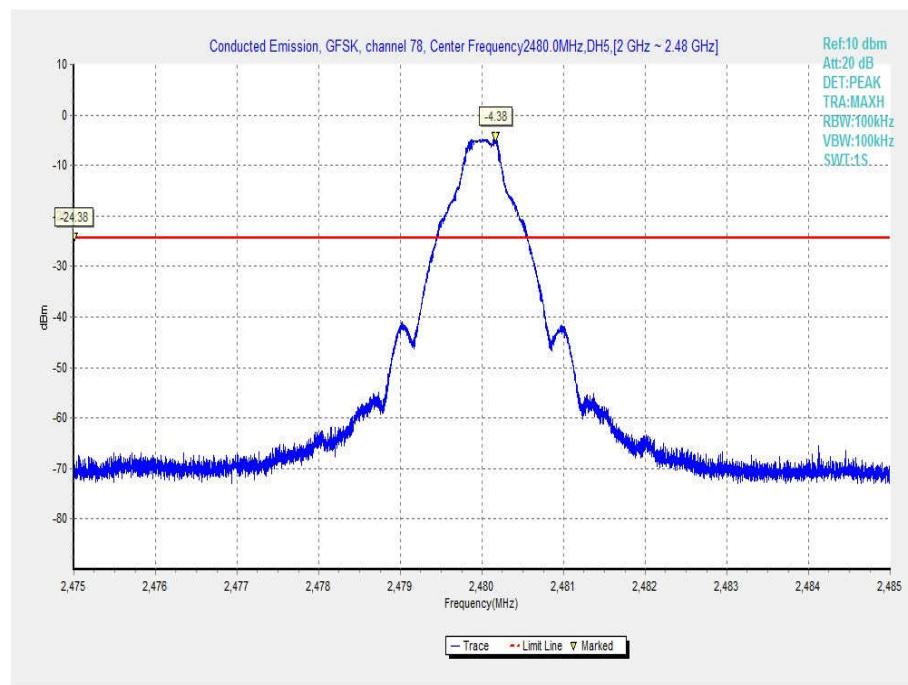
**Fig. 27 Conducted Spurious Emission (GFSK, Ch39, 30 MHz-1 GHz)**



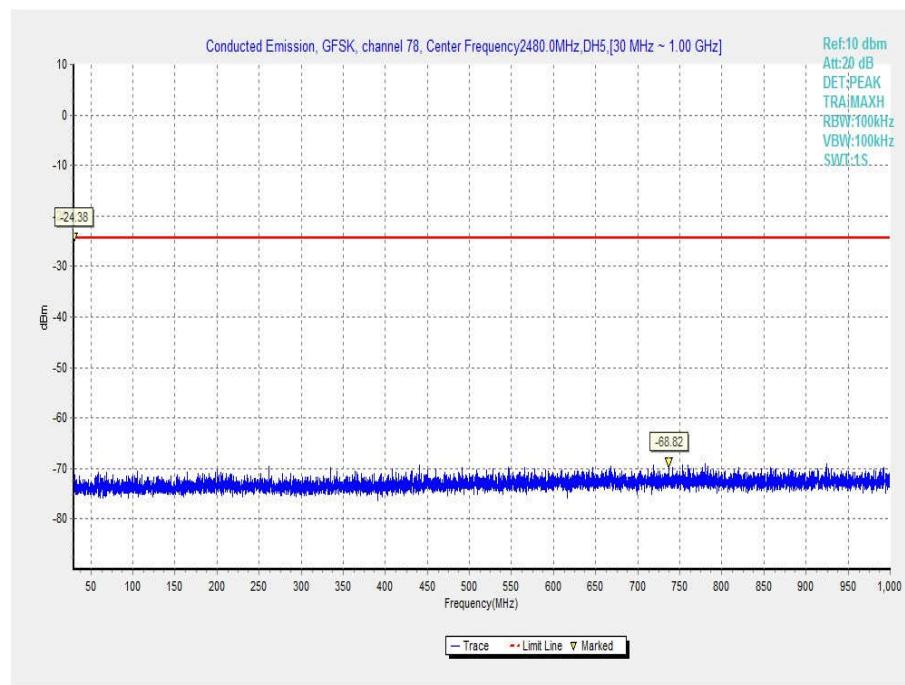
**Fig. 28 Conducted Spurious Emission (GFSK, Ch39, 1GHz-3 GHz)**



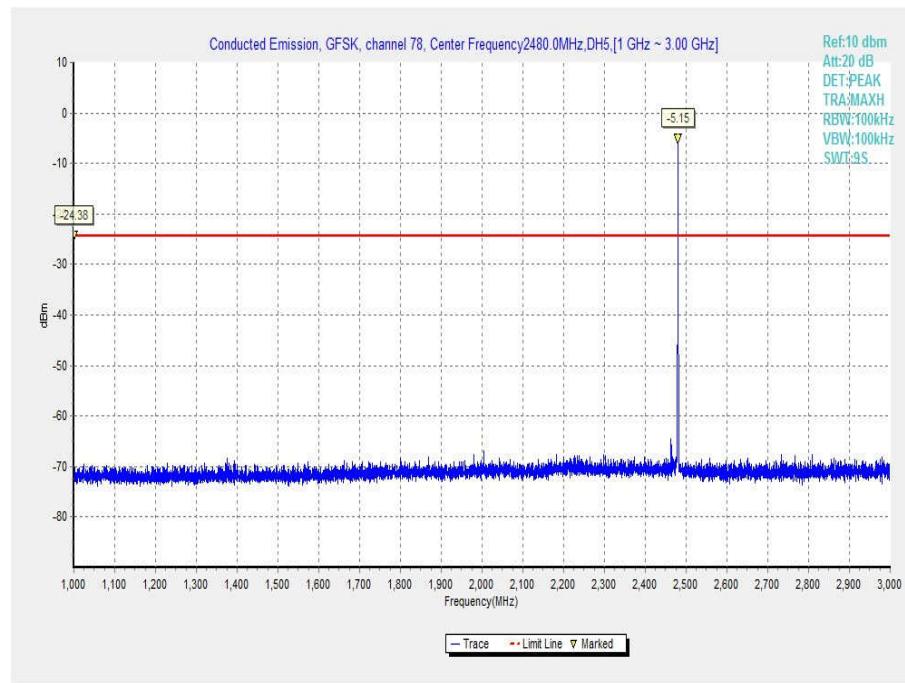
**Fig. 29 Conducted Spurious Emission (GFSK, Ch39, 3GHz-10 GHz)**



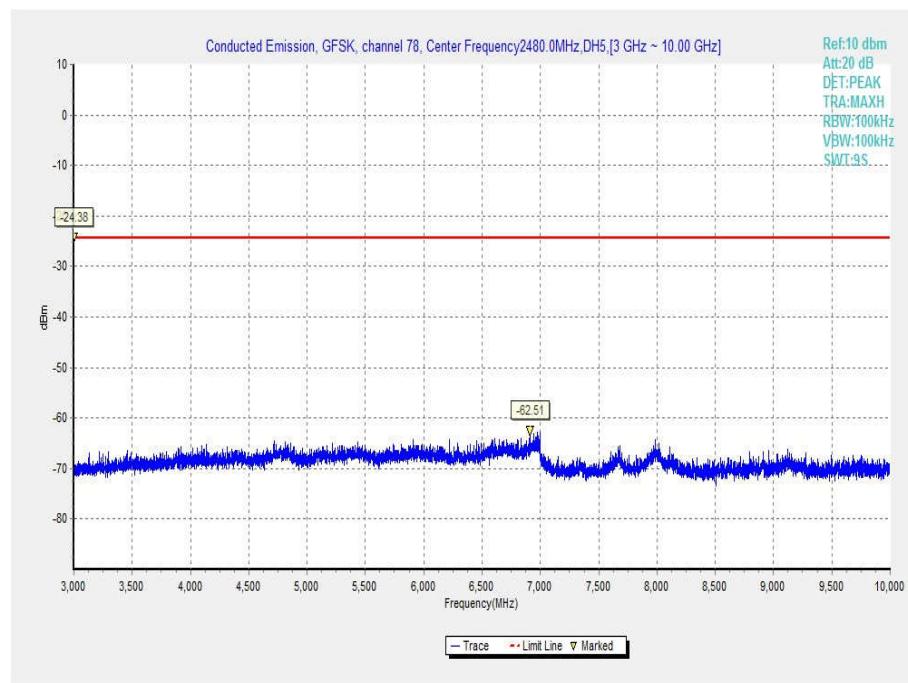
**Fig. 30 Conducted Spurious Emission (GFSK, Ch78, 2.480GHz)**



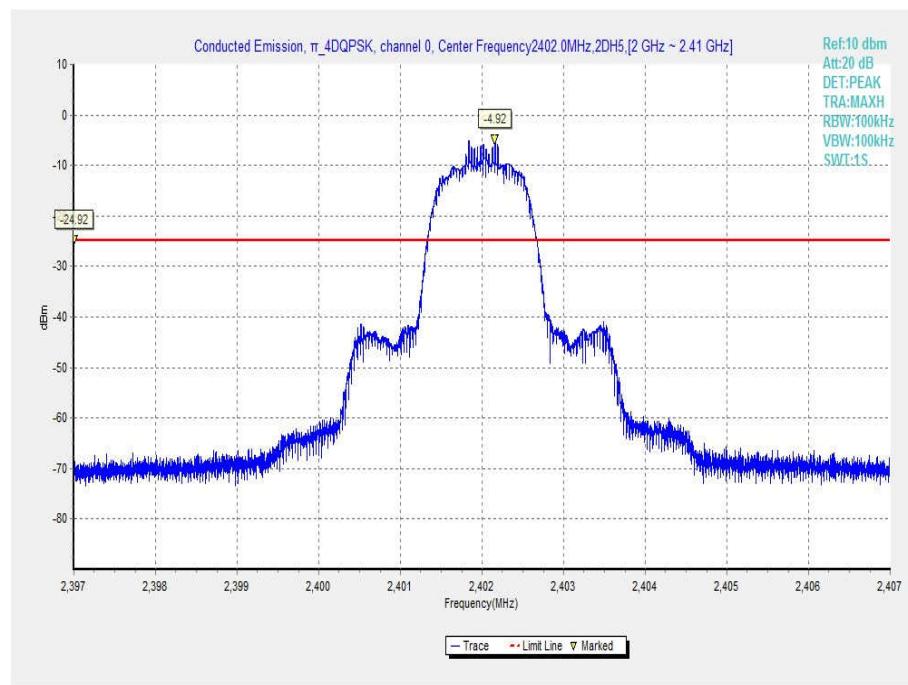
**Fig. 31 Conducted Spurious Emission (GFSK, Ch78, 30 MHz-1 GHz)**



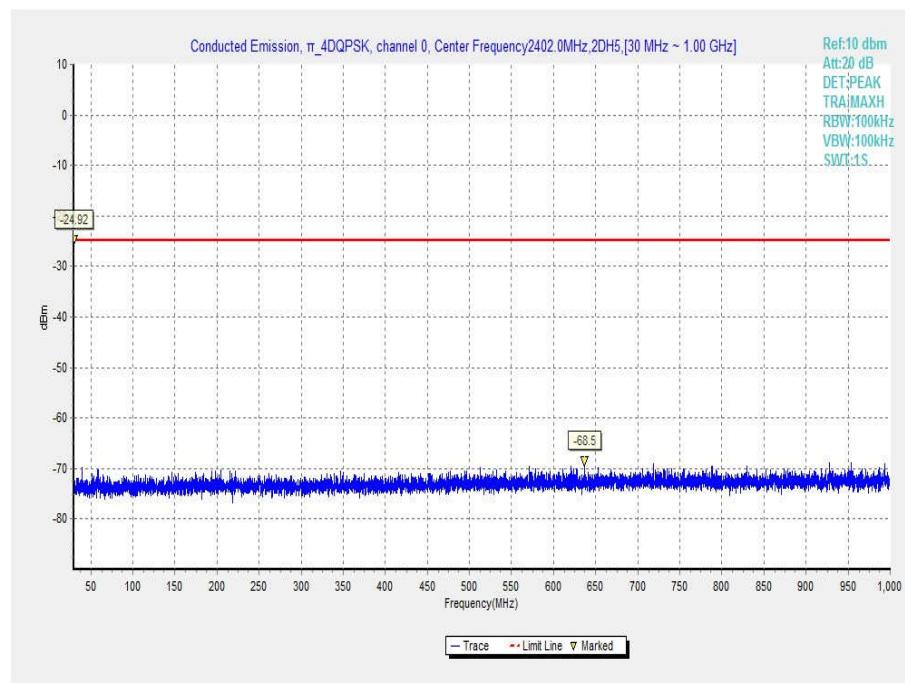
**Fig. 32 Conducted Spurious Emission (GFSK, Ch78, 1GHz-3 GHz)**



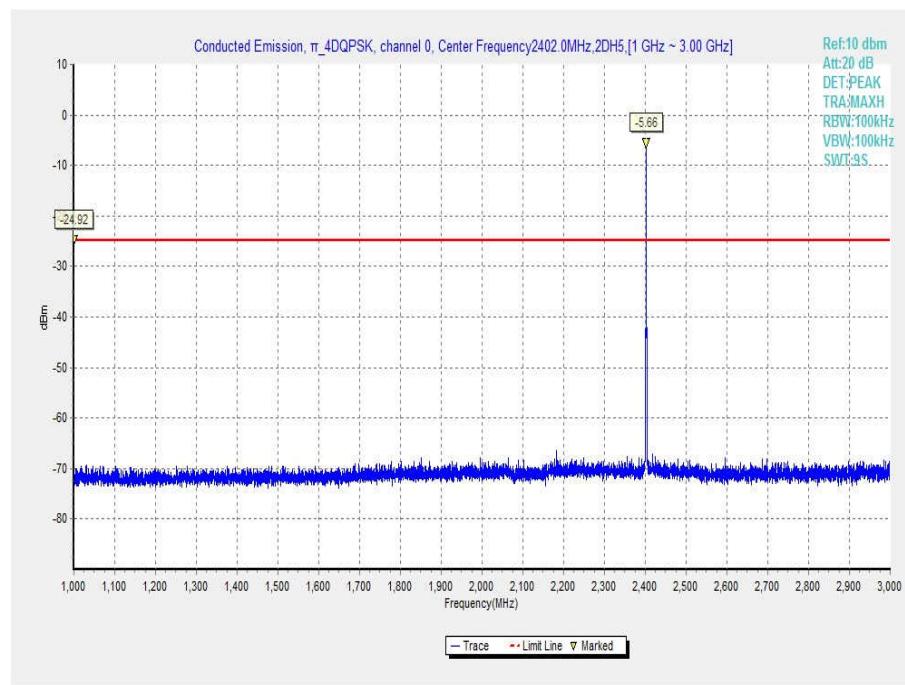
**Fig. 33 Conducted Spurious Emission (GFSK, Ch78, 3GHz-10 GHz)**



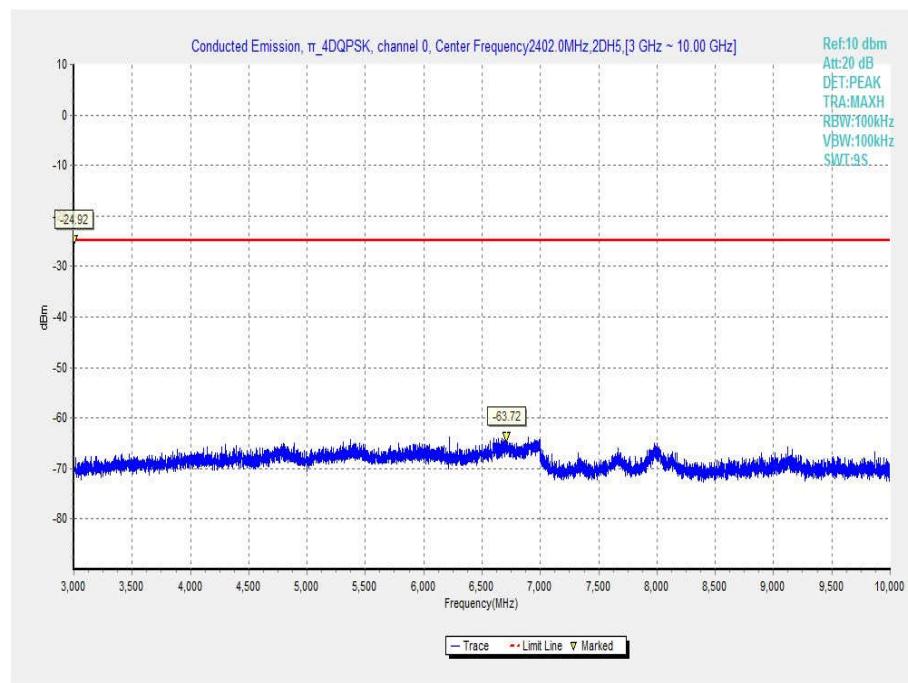
**Fig. 34 Conducted Spurious Emission (π/4 DQPSK, Ch0, 2.402GHz)**



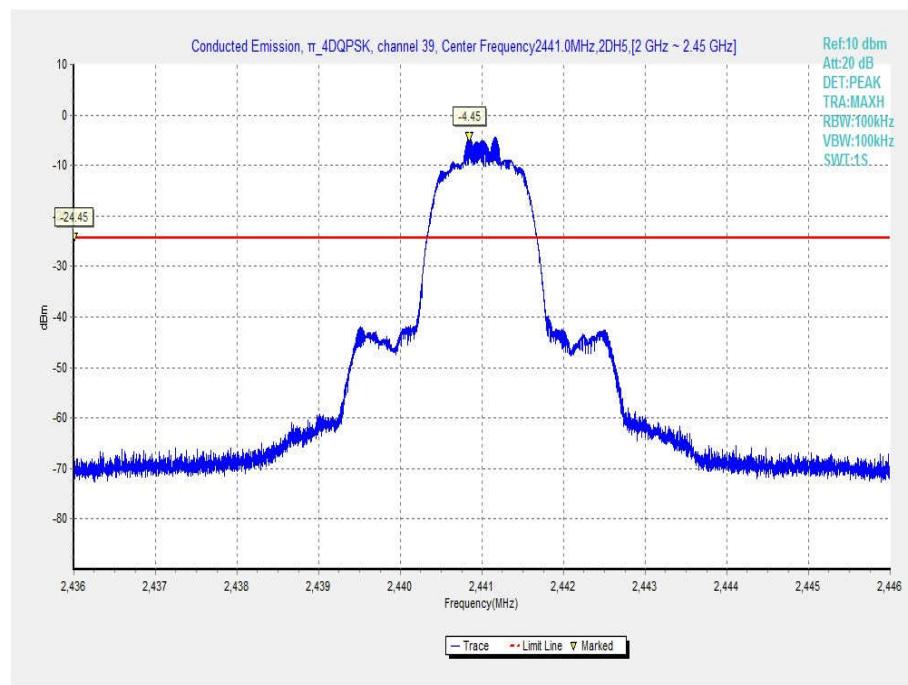
**Fig. 35 Conducted Spurious Emission ( $\pi$ /4 DQPSK, Ch0, 30 MHz-1 GHz)**



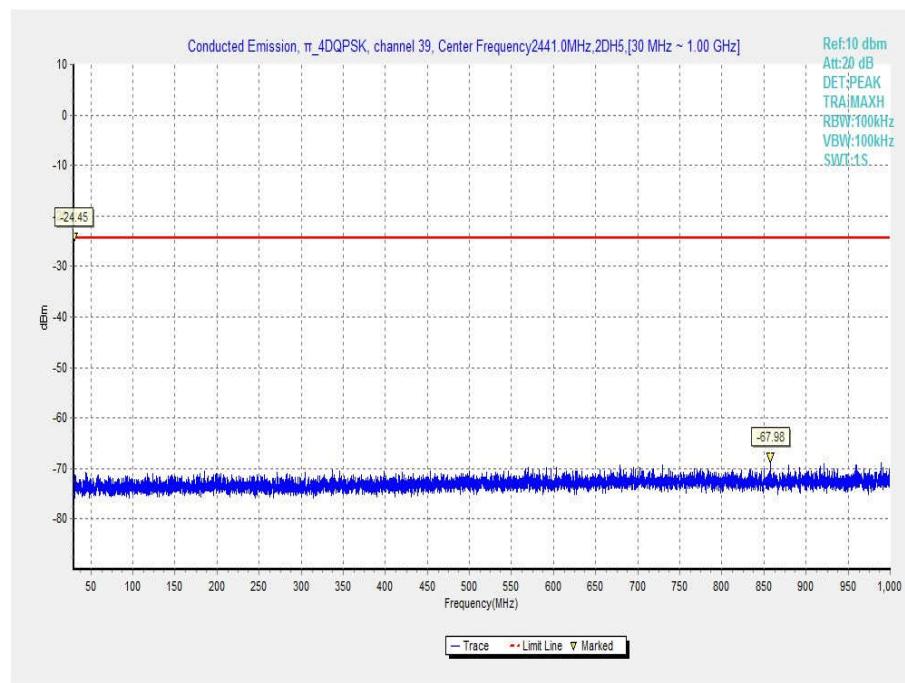
**Fig. 36 Conducted Spurious Emission ( $\pi$ /4 DQPSK, Ch0, 1GHz-3 GHz)**



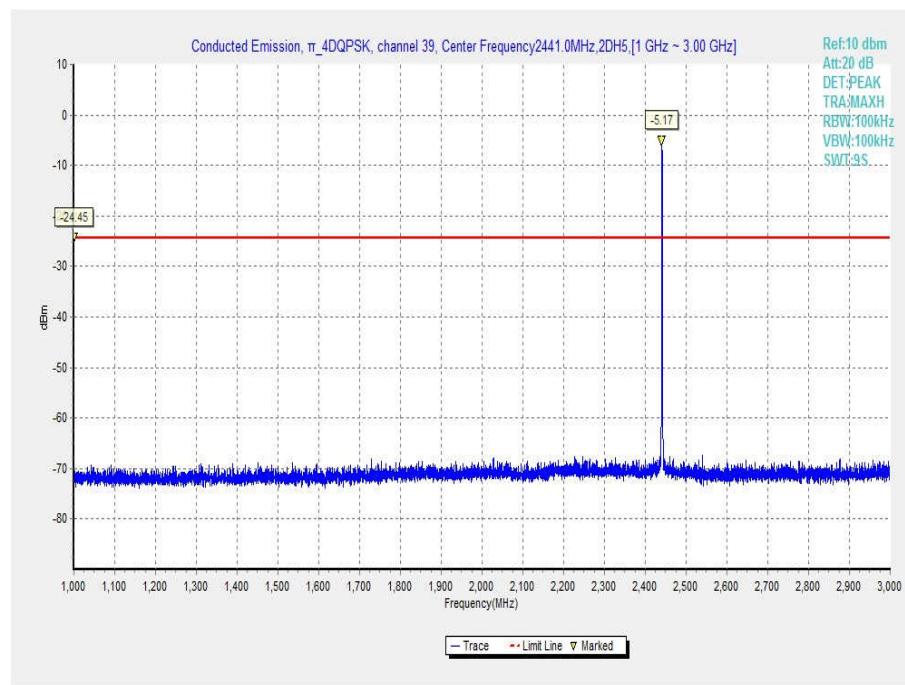
**Fig. 37 Conducted Spurious Emission ( $\pi/4$  DQPSK, Ch0, 3GHz-10 GHz)**



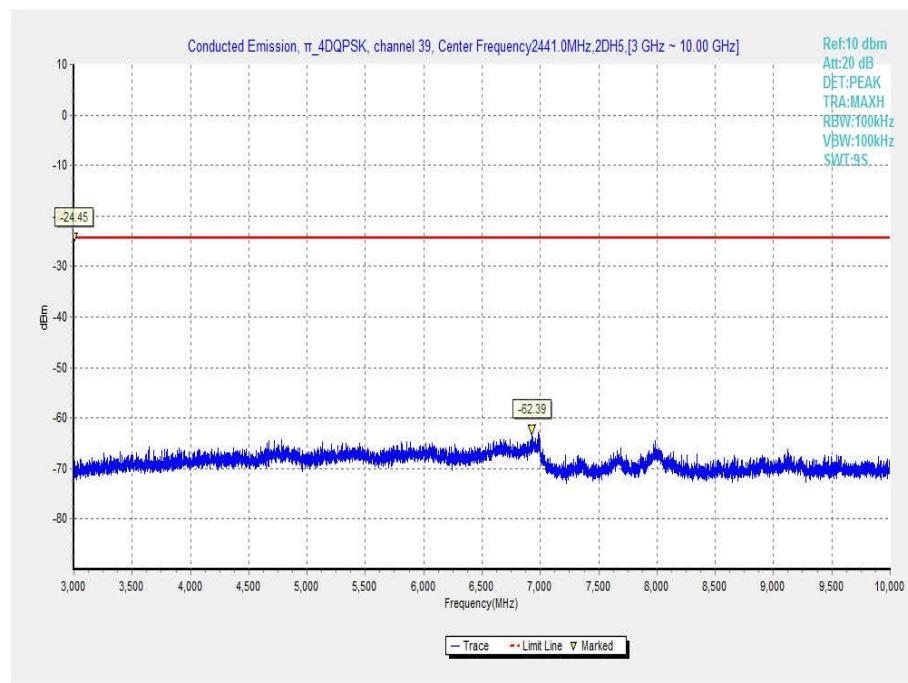
**Fig. 38 Conducted Spurious Emission ( $\pi/4$  DQPSK, Ch39, 2.441GHz)**



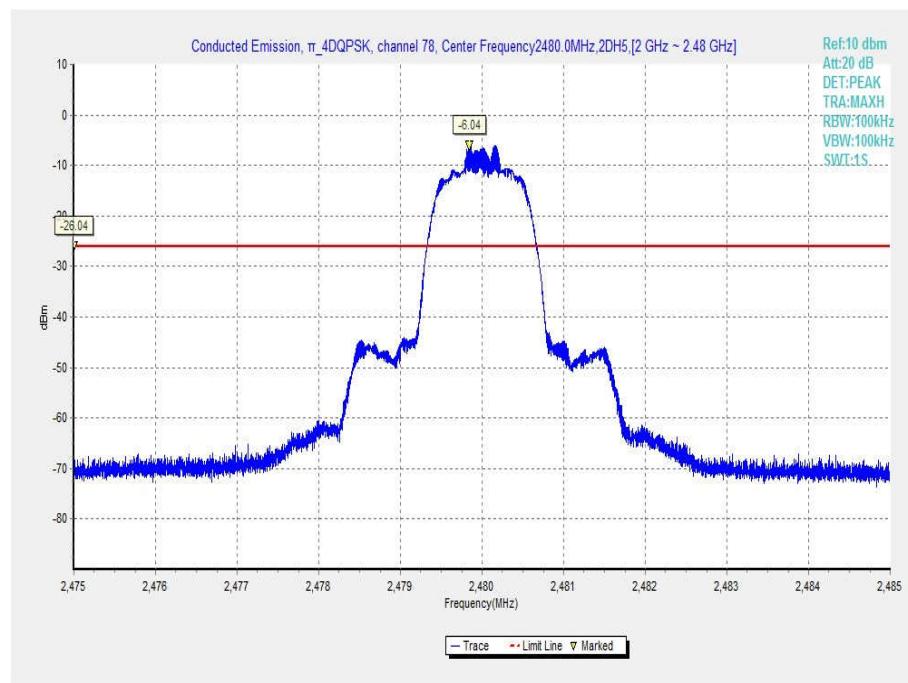
**Fig. 39 Conducted Spurious Emission ( $\pi/4$  DQPSK, Ch39, 30 MHz-1 GHz)**



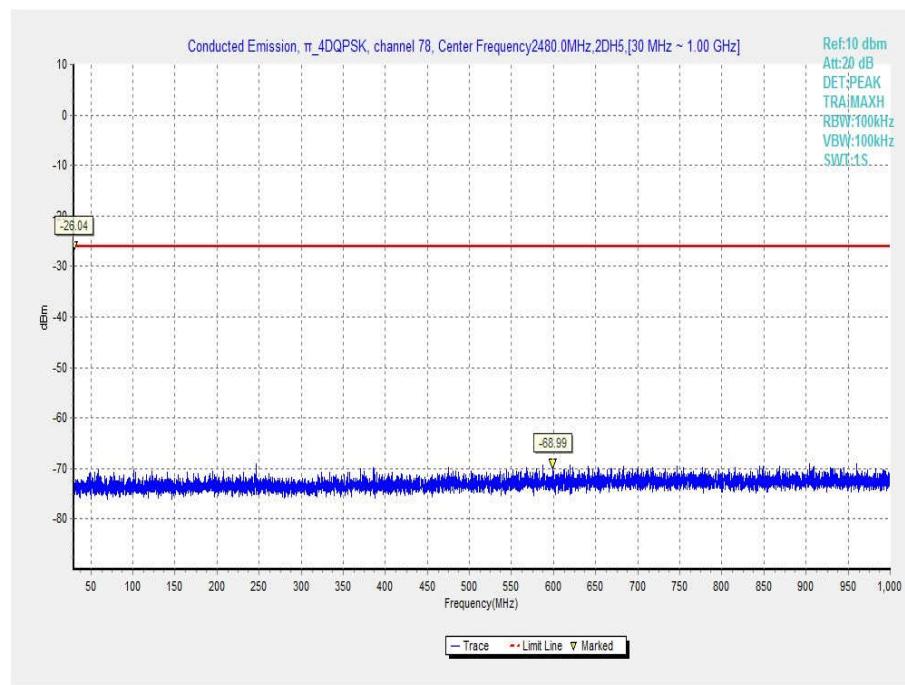
**Fig. 40 Conducted Spurious Emission ( $\pi/4$  DQPSK, Ch39, 1GHz-3 GHz)**



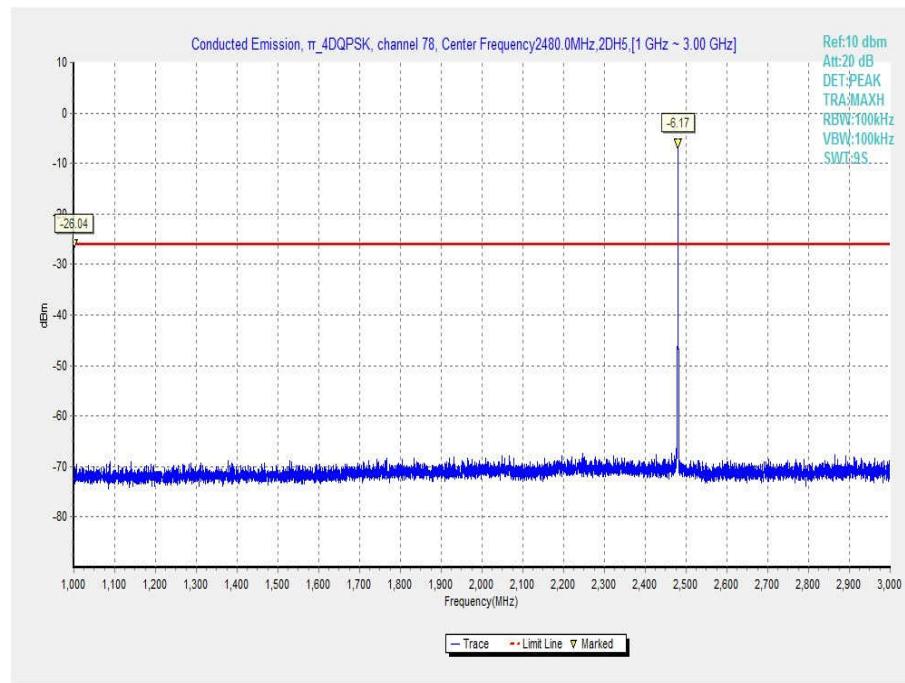
**Fig. 41 Conducted Spurious Emission (  $\pi/4$  DQPSK, Ch39, 3GHz-10 GHz)**



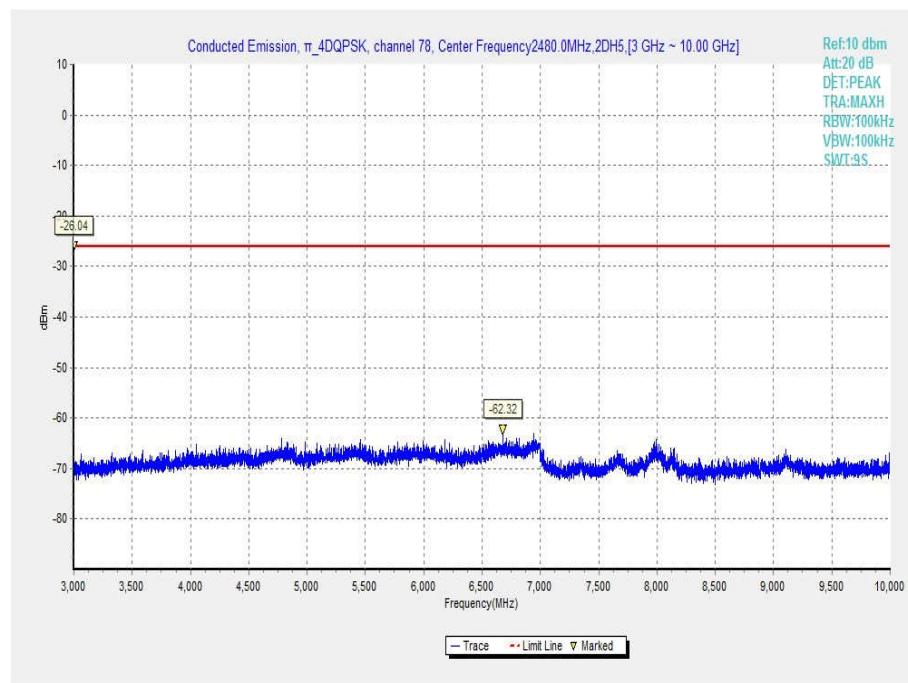
**Fig. 42 Conducted Spurious Emission (  $\pi/4$  DQPSK, Ch78, 2.480GHz)**



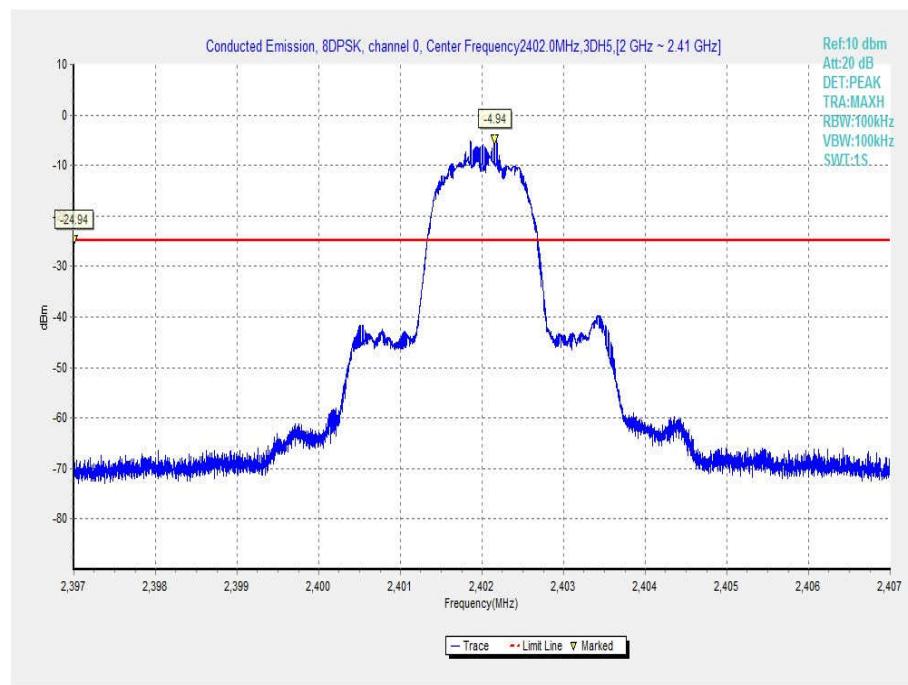
**Fig. 43 Conducted Spurious Emission (π/4 DQPSK, Ch78, 30 MHz-1 GHz)**



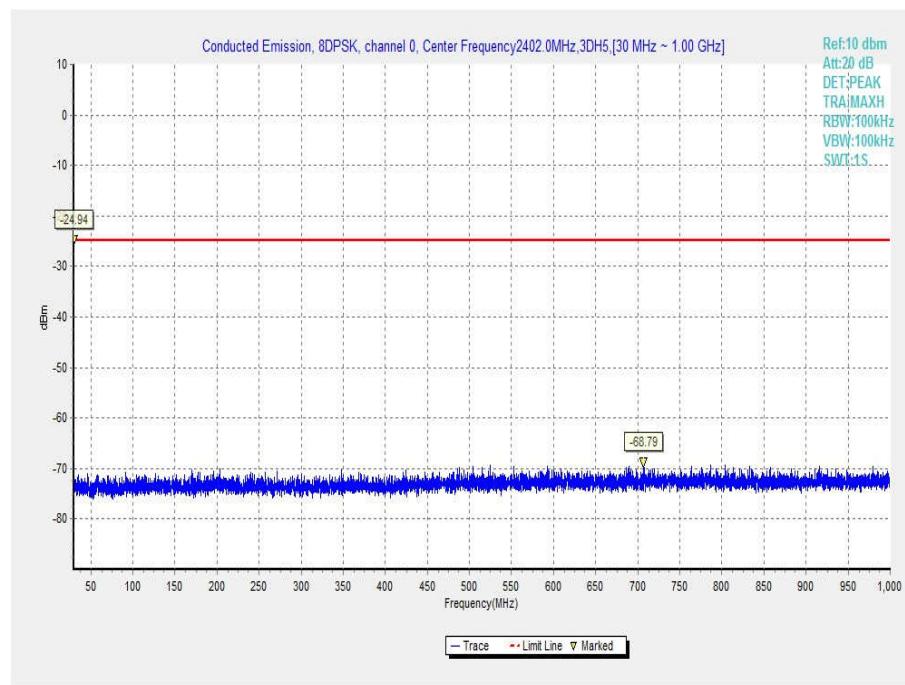
**Fig. 44 Conducted Spurious Emission (π/4 DQPSK, Ch78, 1GHz-3 GHz)**



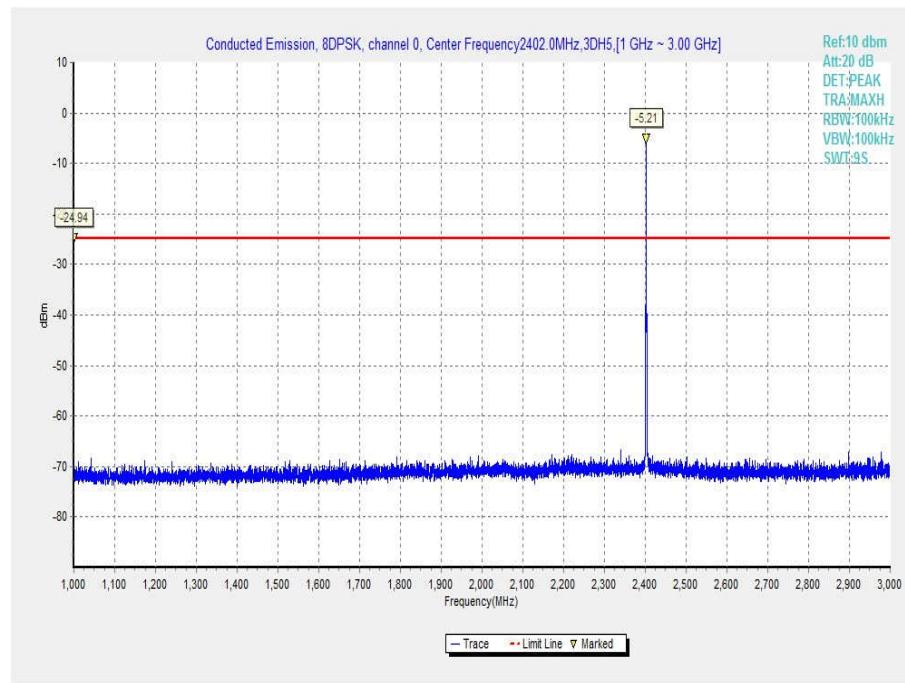
**Fig. 45 Conducted Spurious Emission ( $\pi/4$  DQPSK, Ch78, 3GHz-10 GHz)**



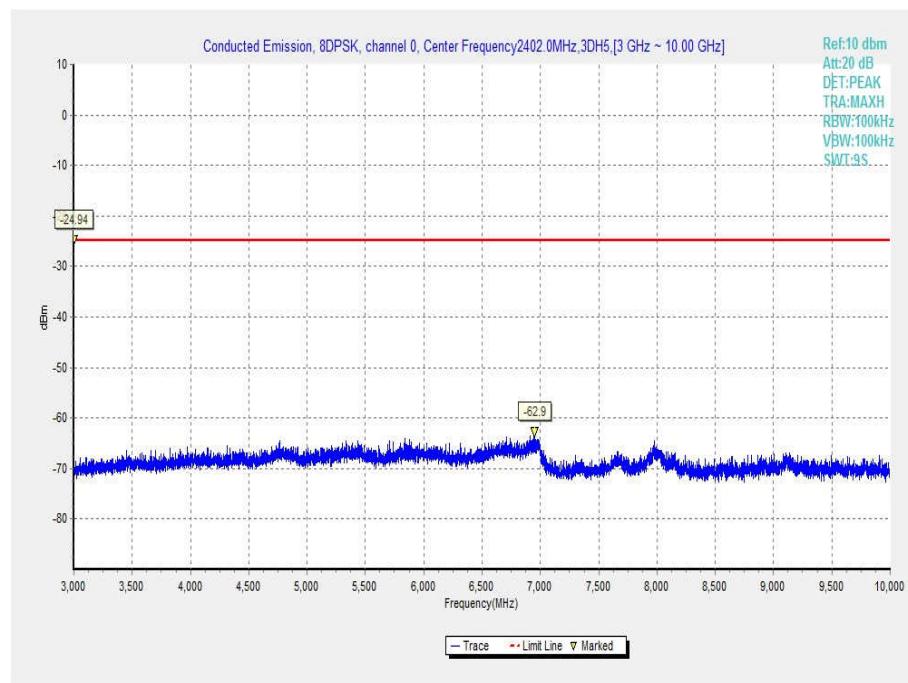
**Fig. 46 Conducted Spurious Emission (8DPSK, Ch0, 2.402GHz)**



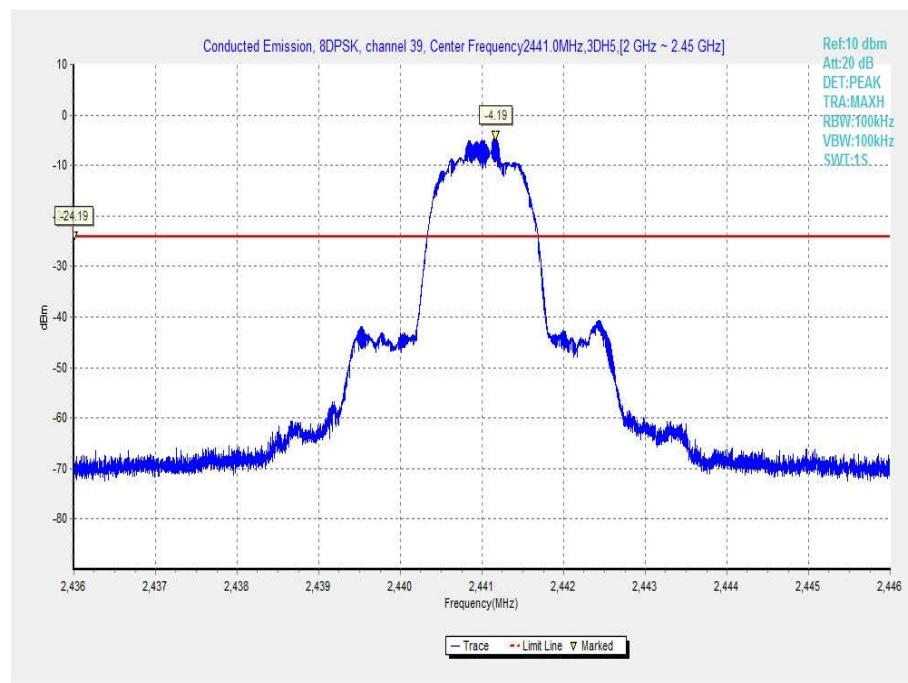
**Fig. 47 Conducted Spurious Emission (8DPSK, Ch0, 30 MHz-1 GHz)**



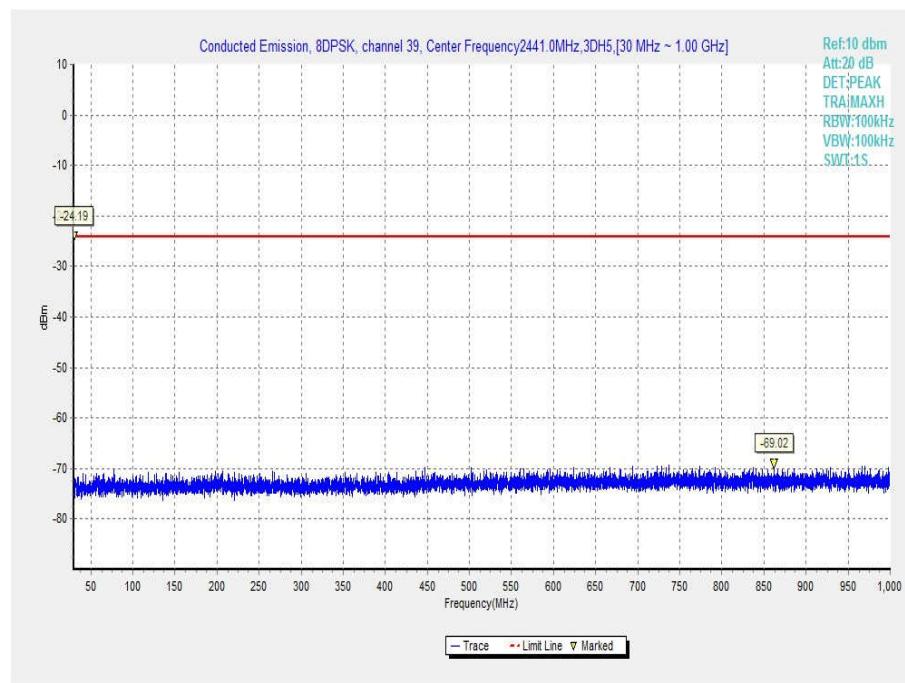
**Fig. 48 Conducted Spurious Emission (8DPSK, Ch0, 1GHz-3 GHz)**



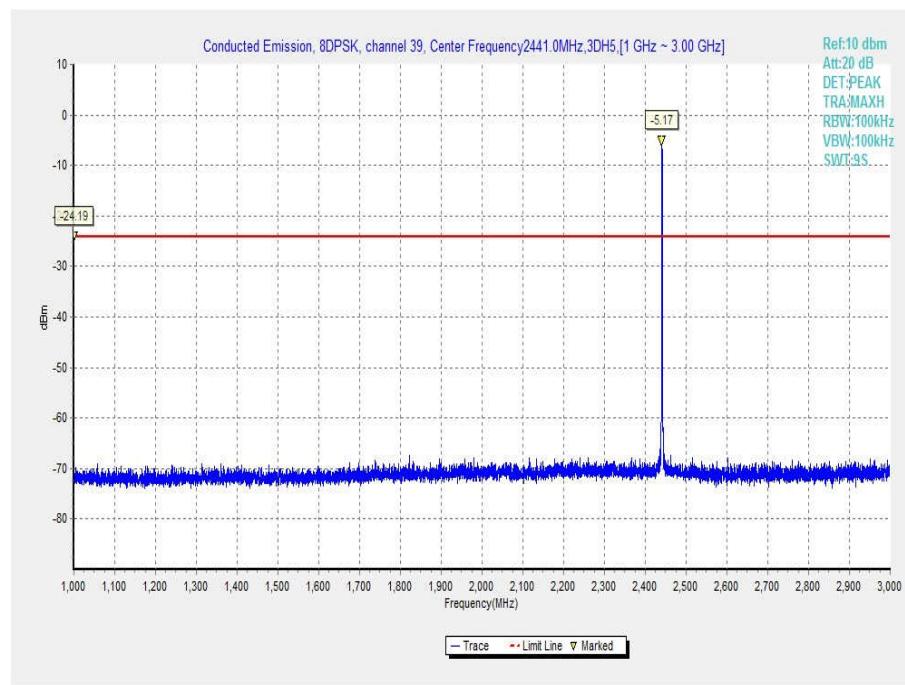
**Fig. 49 Conducted Spurious Emission (8DPSK, Ch0, 3GHz-10 GHz)**



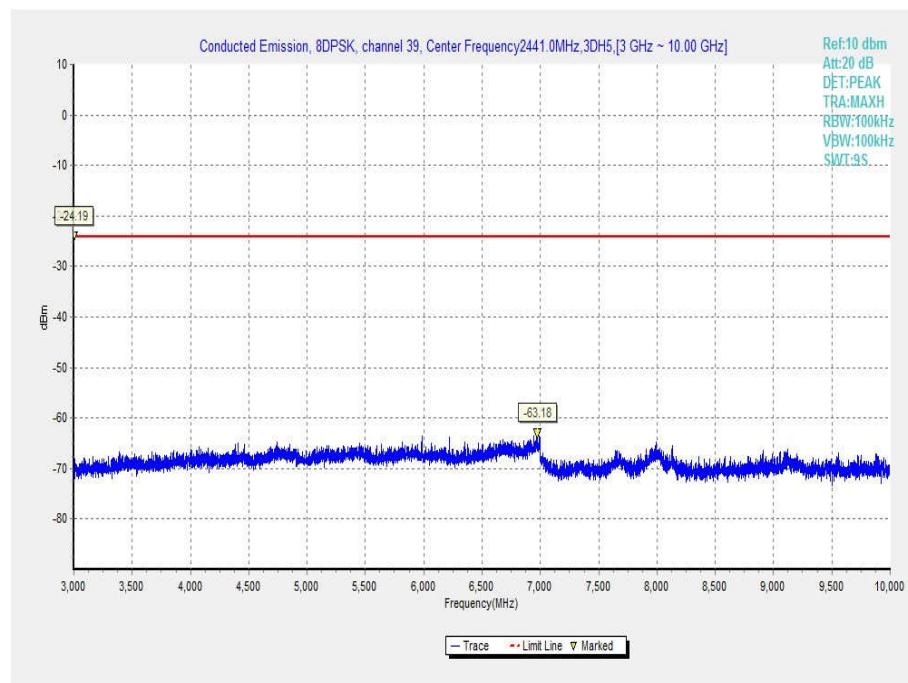
**Fig. 50 Conducted Spurious Emission (8DPSK, Ch39, 2.441GHz)**



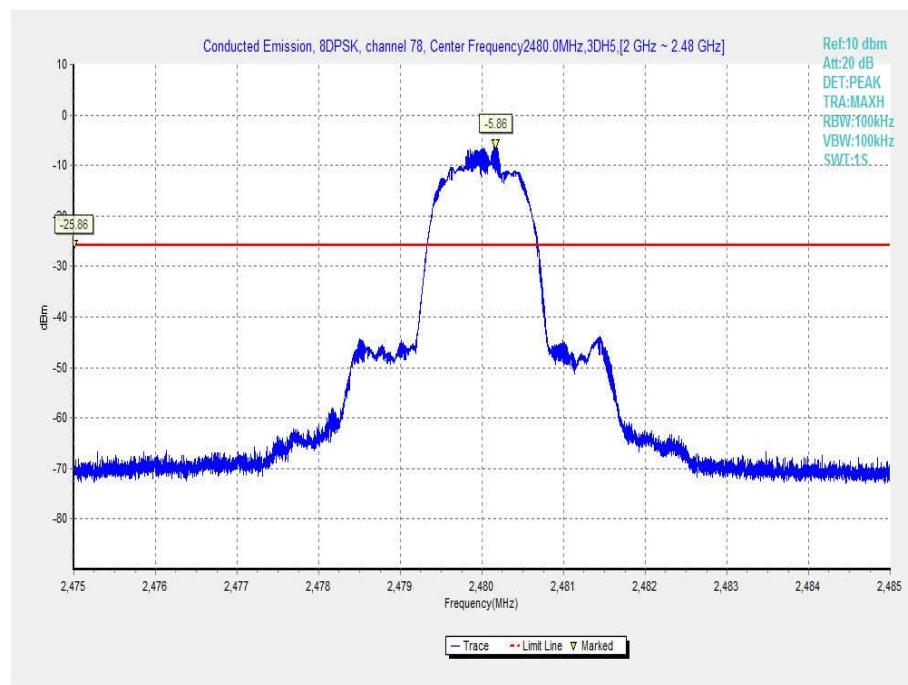
**Fig. 51 Conducted Spurious Emission (8DPSK, Ch39, 30 MHz-1 GHz)**



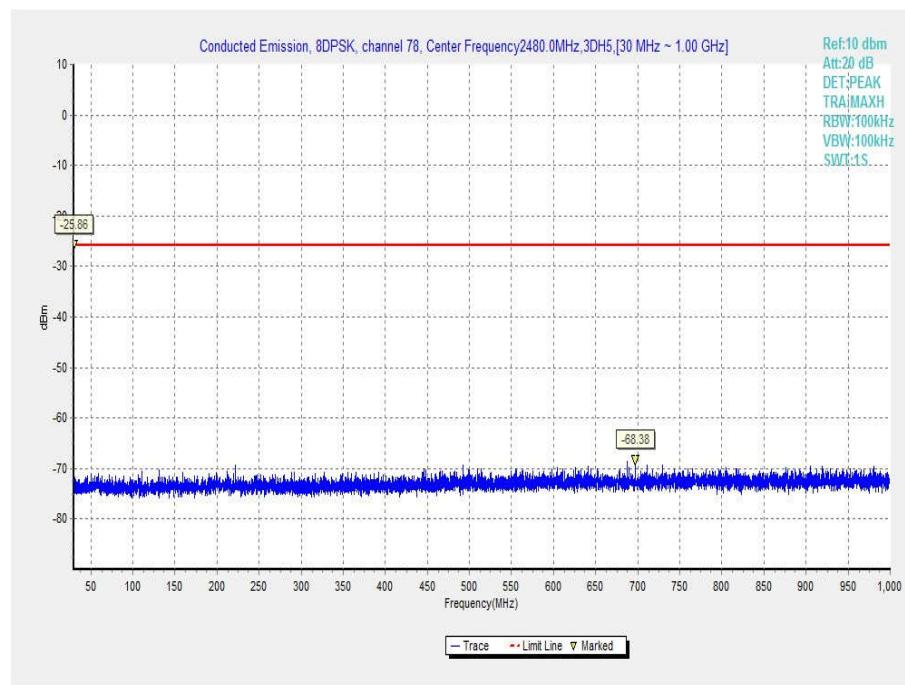
**Fig. 52 Conducted Spurious Emission (8DPSK, Ch39, 1GHz-3 GHz)**



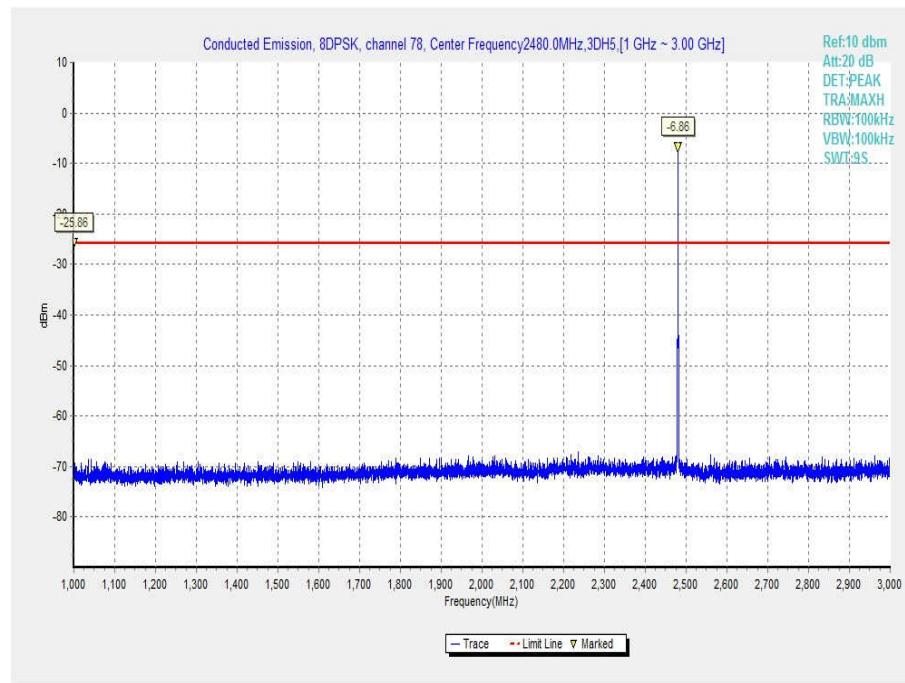
**Fig. 53 Conducted Spurious Emission (8DPSK, Ch39, 3GHz-10 GHz)**



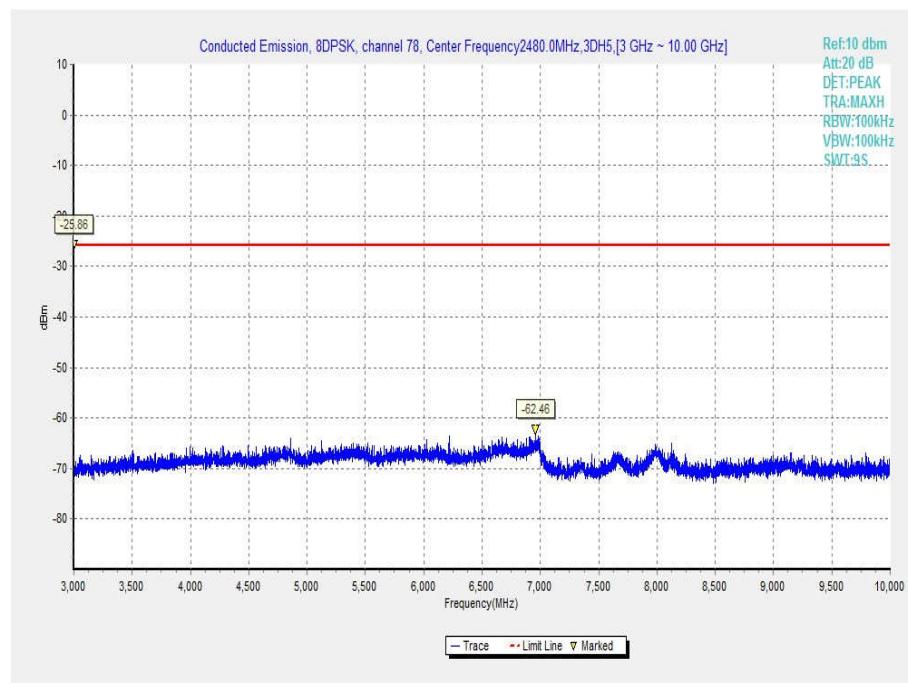
**Fig. 54 Conducted Spurious Emission (8DPSK, Ch78, 2.480GHz)**



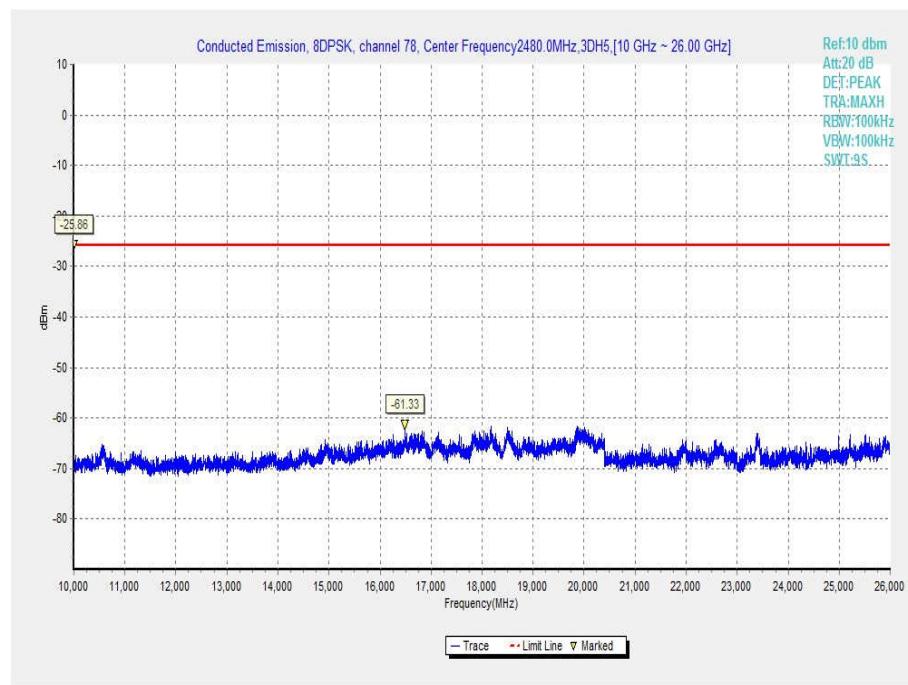
**Fig. 55 Conducted Spurious Emission (8DPSK, Ch78, 30 MHz-1 GHz)**



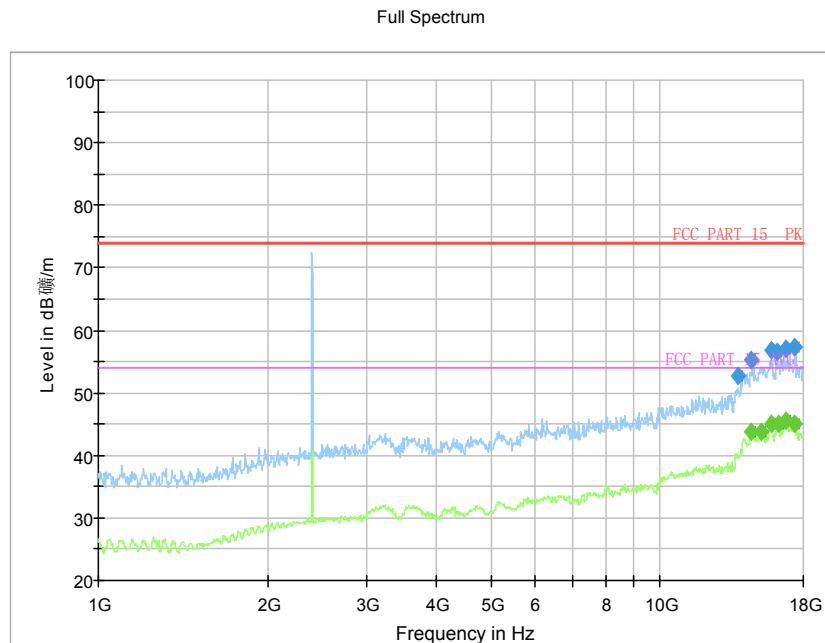
**Fig. 56 Conducted Spurious Emission (8DPSK, Ch78, 1GHz-3 GHz)**



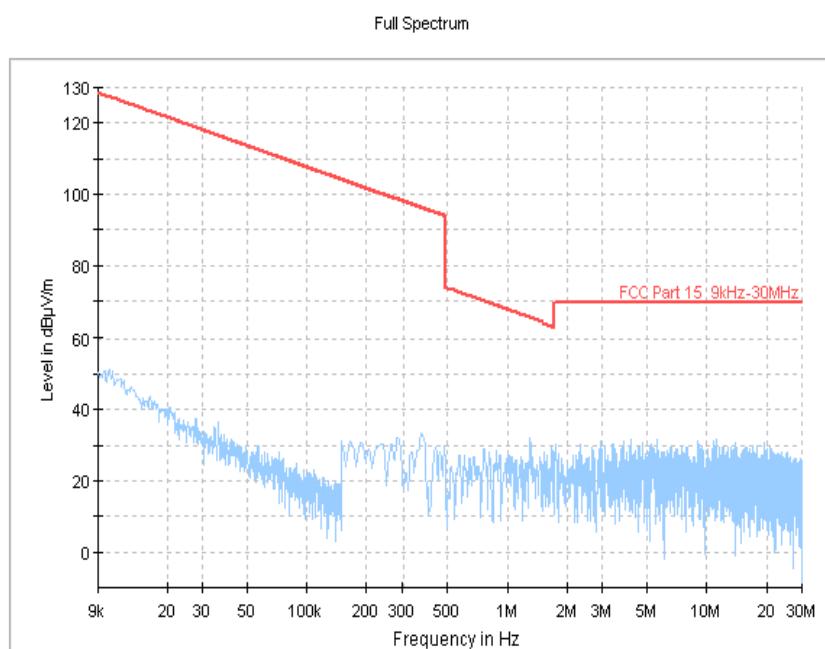
**Fig. 57 Conducted Spurious Emission (8DPSK, Ch78, 3GHz-10 GHz)**



**Fig. 58 Conducted Spurious Emission (All channel, 10 GHz-26 GHz)**



**Fig. 59 Radiated Spurious Emission (GFSK, Ch0, 1 GHz ~18 GHz)**



**Fig. 60 Radiated Spurious Emission (GFSK, Ch39, 9 kHz ~30 MHz)**