



# FCC PART 15C TEST REPORT

## No. I15Z43162-SRD07

for

**Reliance Communications, LLC**

**GSM quad band and wcdma and LTE mobile Phone**

**Model Name: RC501L**

**With**

**Hardware Version: WMDGa**

**Software Version: Orbic-RC501L\_v1.0.9**

**FCC ID: 2ABGH-RC501L**

**Issued Date: Jan 25<sup>th</sup>, 2016**



**Test Laboratory:**

**FCC 2.948 Listed: No.342690**

**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>
I15Z43162-SRD07	Rev.0	1st edition	2016-01-25

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## **1. Test Laboratory**

### **1.1. Testing Location**

Location 1: CTTL(huayuan North Road)

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

Location 2: CTTL(Shouxiang)

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

### **1.2. Testing Environment**

Normal Temperature: 15-35°C

Extreme Temperature: -20/+55°C

Relative Humidity: 20-75%

### **1.3. Project data**

Testing Start Date: 2015-12-11

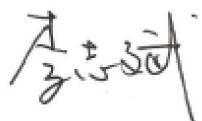
Testing End Date: 2016-01-07

### **1.4. Signature**



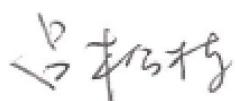
Xu Zhongfei

(Prepared this test report)



Li Zhibin

(Reviewed this test report)



Lv Songdong

(Approved this test report)



## **2. Client Information**

### **2.1. Applicant Information**

Company Name: Reliance Communications, LLC  
Address: 555 Wireless Blvd, Hauppauge, NY 11788, United States  
City: Shenzhen  
Postal Code: /  
Country: United States  
Telephone: 631-240-8396  
Fax: /

### **2.2. Manufacturer Information**

Company Name: Reliance Communications, LLC  
Address: 555 Wireless Blvd, Hauppauge, NY 11788, United States  
City: Shenzhen  
Postal Code: /  
Country: United States  
Telephone: 631-240-8396  
Fax: /

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

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

Description	GSM quad band and wcdma and LTE mobile Phone
Model Name	RC501L
Market Name	/
Frequency Band	2402MHz~2480MHz
Type of Modulation	GFSK/ $\pi$ /4 DQPSK/8DPSK
Number of Channels	79
FCC ID	2ABGH-RC501L
IC number	20994-RC501L

\*Note: Photographs of EUT are shown in ANNEX A of this test report.

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

EUT ID*	IMEI	HW Version	SW Version
EUT1	/	WMDGa	Orbic-RC501L_v1.0.9

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

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

AE ID*	Description	Type	SN
AE1	Charger	TL6D-0501000	/

\*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.	Oct, 2014
ANSI C63.10	American National Standard for Testing Unlicensed Jun,2013 Wireless Devices	

## **5. Test Results**

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

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

See **ANNEX B** and **ANNEX C** 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 isotropical 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 (23 meters×17 meters×10 meters) did not exceed following limits:

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 15 %, Max. = 75 %
Shielding effectiveness	0.014MHz - 1MHz, >60dB; 1MHz - 1000MHz, >90dB.
Electrical insulation	> 2 M
Ground system resistance	< 4
Normalised site attenuation (NSA)	< ± 4 dB, 3m/10m distance, from 30 to 1000 MHz
Site voltage standing-wave ratio ( $S_{VSWR}$ )	Between 0 and 6 dB, from 1GHz to 18GHz
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. = 35 °C
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	0.014MHz - 1MHz, >60dB; 1MHz - 1000MHz, >90dB.
Electrical insulation	> 2 M
Ground system resistance	< 4

## **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	2016-01-06
2	Bluetooth Tester	CBT32	100649	Rohde & Schwarz	1 year	2016-02-09
3	Shielding Room	S81	/	ETS-Lindgren	/	/
4	LISN	ENV216	101200	Rohde & Schwarz	1 year	2016-07-07
5	Test Receiver	ESCI	100344	Rohde & Schwarz	1 year	2016-03-03

### **Radiated emission test system**

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Test Receiver	ESCI 7	100948	Rohde & Schwarz	1 year	2016-07-16
2	Loop antenna	HFH2-Z2	829324/00 7	Rohde & Schwarz	3 year	2017-12-16
3	BiLog Antenna	VULB9163	234	Schwarzbeck	3 year	2016-09-15
4	Dual-Ridge Waveguide Horn Antenna	3115	6914	EMCO	3 year	2017-12-15
5	Dual-Ridge Waveguide Horn Antenna	3116	2661	ETS-Lindgren	3 year	2017-06-30
6	Vector Signal Analyzer	FSV	101047	Rohde & Schwarz	1 year	2016-07-03
7	Semi-anechoic chamber	/	CT000332 -1074	Frankonia German	/	/
8	Bluetooth Tester	CBT	100153	Rohde & Schwarz	1 year	2016-09-18

### **Anechoic chamber**

Fully anechoic chamber by ETS-Lindgren.

## 7. Measurement Uncertainty

Test Name	Uncertainty	
1. Maximum Peak Output Power	$\pm 1.32\text{dB}$	
2. Band Edges Compliance	$\pm 66\text{Hz}$	
3. Conducted Spurious Emission	$30\text{MHz} \leq f \leq 1\text{GHz}$	$\pm 1.41\text{dB}$
	$1\text{GHz} \leq f \leq 18\text{GHz}$	$\pm 1.92\text{dB}$
	$18\text{GHz} \leq f \leq 26\text{GHz}$	$\pm 2.31\text{dB}$
4. Radiated Spurious Emission	$9\text{kHz} \leq f \leq 30\text{MHz}$	$\pm 4.00\text{dB}$
	$30\text{MHz} \leq f \leq 1\text{GHz}$	$\pm 5.08\text{dB}$
	$1\text{GHz} \leq f \leq 18\text{GHz}$	$\pm 4.56\text{dB}$
	$18\text{GHz} \leq f \leq 26\text{GHz}$	$\pm 4.56\text{dB}$
5. Occupied 20dB bandwidth	$\pm 66\text{Hz}$	
6. Time of Occupancy(Dwell Time)	$\pm 0.6\text{ms}$	
7. Number of Hopping Channel	$\pm 66\text{Hz}$	
8. Carrier Frequency Separation	$\pm 0.6\text{ms}$	
9. AC Powerline Conducted Emission	$\pm 2.7\text{dB}$	
10. Occupied Bandwidth	$\pm 66\text{Hz}$	

## **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 1.7 dBi.**

**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)	< 30

### Measurement Results:

Mode	Test Result (dBm)					
	2402MHz (Ch0)		2441MHz (Ch39)		2480 MHz (Ch78)	
GFSK	Fig.1	7.21	Fig.2	7.55	Fig.3	7.27
$\pi/4$ DQPSK	Fig.4	6.36	Fig.5	6.73	Fig.6	6.32
8DPSK	Fig.7	6.53	Fig.8	6.97	Fig.9	6.62

**Conclusion: Pass**

## A.2 Band Edges Compliance

### Measurement Limit:

Standard	Limit (dBc)
FCC 47 CFR Part 15.247 (d)	> 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 C for test graphs.

Conclusion: Pass

### A.3 Conducted Emission

#### Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247 (d)	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-3GHz	Fig.23	P
		3GHz-18GHz	Fig.24	P
	39	2.441 GHz	Fig.25	P
		30 MHz-3 GHz	Fig.26	P
		3GHz-18GHz	Fig.27	P
	78	2.480 GHz	Fig.28	P
		30 MHz-3GHz	Fig.29	P
		3GHz-18GHz	Fig.30	P
$\pi/4$ DQPSK	0	2.402 GHz	Fig.31	P
		30 MHz-3 GHz	Fig.32	P
		3GHz-18GHz	Fig.33	P
	39	2.441 GHz	Fig.34	P
		30 MHz-3GHz	Fig.35	P
		3GHz-18GHz	Fig.36	P
	78	2.480 GHz	Fig.37	P
		30 MHz-3GHz	Fig.38	P
		3GHz-18GHz	Fig.39	P
8DPSK	0	2.402 GHz	Fig.40	P
		30 MHz-3GHz	Fig.41	P
		3GHz-18GHz	Fig.42	P
	39	2.441 GHz	Fig.43	P
		30 MHz-3GHz	Fig.44	P
		3GHz-18GHz	Fig.45	P
	78	2.480 GHz	Fig.46	P
		30 MHz-3GHz	Fig.47	P
		3GHz-18GHz	Fig.48	P
/	All channel	18GHz-26GHz	Fig.49	P

See ANNEX C for test graphs.

Conclusion: Pass

#### A.4 Radiated Emission

##### 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)).

##### 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:**
**GFSK mode**

Mode	Channel	Frequency Range	Test Results	Conclusion
GFSK	0	1 GHz ~ 18 GHz	Fig.50	P
	39	9 kHz ~30 MHz	Fig.51	P
		30 MHz ~1 GHz	Fig.52	P
		1 GHz ~ 18 GHz	Fig.53	P
		18 GHz~ 26.5 GHz	Fig.54	P
	78	1 GHz ~ 18 GHz	Fig.55	P
	Power(CH0)	2.38 GHz ~ 2.45 GHz	Fig.56	P
	Power(CH78)	2.45 GHz ~ 2.5 GHz	Fig.57	P
$\pi/4$ DQPSK	0	1 GHz ~ 18 GHz	Fig.58	P
	39	30 MHz ~1 GHz	Fig.59	P
		1 GHz ~ 18 GHz	Fig.60	P
		18 GHz~ 26.5 GHz	Fig.61	P
	78	1 GHz ~ 18 GHz	Fig.62	P
	Power(CH0)	2.38 GHz ~ 2.45 GHz	Fig.63	P
	Power(CH78)	2.45 GHz ~ 2.5 GHz	Fig.64	P
8DPSK	0	1 GHz ~ 18 GHz	Fig.65	P
	39	30 MHz ~1 GHz	Fig.66	P
		1 GHz ~ 18 GHz	Fig.67	P
		18 GHz~ 26.5 GHz	Fig.68	P
	78	1 GHz ~ 18 GHz	Fig.69	P
	Power(CH0)	2.38 GHz ~ 2.45 GHz	Fig.70	P
	Power(CH78)	2.45 GHz ~ 2.5 GHz	Fig.71	P

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

Frequency (MHz)	MaxPeak-ClearWrite (dB $\mu$ V/m)	Polarization	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
14443.000000	55.7	V	11.6	18.3	74.0
15118.000000	56.4	V	12.1	17.6	74.0
15781.000000	58.1	H	13.0	15.9	74.0
16226.000000	58.0	H	13.3	16.0	74.0
16727.000000	60.1	H	13.9	13.9	74.0
17488.000000	58.3	V	14.3	15.7	74.0

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

Frequency (MHz)	Average-ClearWrite (dB $\mu$ V/m)	Polarization	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
14518.000000	43.7	V	11.7	10.3	54.0
15129.000000	44.6	V	12.1	9.4	54.0
15757.000000	46.1	V	12.9	7.9	54.0
16205.000000	46.2	V	13.3	7.8	54.0
16826.000000	46.8	V	14.0	7.2	54.0
17359.000000	46.4	V	14.2	7.6	54.0

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

Frequency (MHz)	MaxPeak-ClearWrite (dB $\mu$ V/m)	Polarization	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
13971.000000	56.8	H	10.9	17.2	74.0
15144.000000	57.2	H	12.1	16.8	74.0
15760.000000	58.6	H	12.9	15.4	74.0
16234.000000	59.1	V	13.3	14.9	74.0
16695.000000	59.5	V	13.9	14.5	74.0
17897.000000	59.5	V	14.4	14.5	74.0

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

Frequency (MHz)	Average-ClearWrite (dB $\mu$ V/m)	Polarization	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
14534.000000	44.3	H	11.8	9.7	54.0
15169.000000	45.0	V	12.1	9.0	54.0
15677.000000	46.5	V	12.8	7.5	54.0
16213.000000	47.1	H	13.3	6.9	54.0
16767.000000	47.6	V	14.0	6.4	54.0
17318.000000	47.2	V	14.2	6.8	54.0

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

Frequency (MHz)	MaxPeak-ClearWrite (dB $\mu$ V/m)	Polarization	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
14537.000000	56.1	V	11.8	17.9	74.0
14697.000000	56.5	V	11.8	17.5	74.0
15745.000000	58.6	H	12.9	15.4	74.0
16242.000000	58.5	V	13.3	15.5	74.0
16783.000000	59.1	H	14.0	14.9	74.0
17412.000000	58.4	H	14.3	15.6	74.0

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

Frequency (MHz)	Average-ClearWrite (dB $\mu$ V/m)	Polarization	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
14518.000000	44.1	V	11.7	9.9	54.0
15165.000000	44.7	V	12.1	9.3	54.0
15780.000000	46.2	V	13.0	7.8	54.0
16218.000000	46.2	V	13.3	7.8	54.0
16816.000000	46.7	V	14.0	7.3	54.0
17395.000000	46.8	V	14.3	7.2	54.0

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

Frequency (MHz)	MaxPeak-ClearWrite (dB $\mu$ V/m)	Polarization	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
14171.000000	55.4	H	11.3	18.6	74.0
15033.000000	56.5	H	12.0	17.5	74.0
15738.000000	58.2	V	12.9	15.8	74.0
16201.000000	58.0	H	13.3	16.0	74.0
16822.000000	59.0	H	14.0	15.0	74.0
17759.000000	57.8	V	14.4	16.2	74.0

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

Frequency (MHz)	Average-ClearWrite (dB $\mu$ V/m)	Polarization	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
14526.000000	43.4	H	11.7	10.6	54.0
15123.000000	44.3	V	12.1	9.7	54.0
15755.000000	46.0	V	12.9	8.0	54.0
16231.000000	45.7	V	13.3	8.3	54.0
16730.000000	46.1	V	13.9	7.9	54.0
17441.000000	45.9	V	14.3	8.1	54.0

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

Frequency (MHz)	MaxPeak-ClearWrite (dB $\mu$ V/m)	Polarization	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
14095.000000	55.1	H	11.2	18.9	74.0
15056.000000	57.1	V	12.0	16.9	74.0
15780.000000	58.2	V	13.0	15.8	74.0
16195.000000	58.0	V	13.3	16.0	74.0
16870.000000	58.9	H	14.1	15.1	74.0
17365.000000	58.7	V	14.3	15.3	74.0

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

Frequency (MHz)	Average-ClearWrite (dB $\mu$ V/m)	Polarization	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
14484.000000	43.5	V	11.7	10.5	54.0
15149.000000	44.5	V	12.1	9.5	54.0
15777.000000	46.0	V	12.9	8.0	54.0
16205.000000	45.9	V	13.3	8.1	54.0
16826.000000	46.2	V	14.0	7.8	54.0
17444.000000	46.1	V	14.3	7.9	54.0

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

Frequency (MHz)	MaxPeak-ClearWrite (dB $\mu$ V/m)	Polarization	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
14036.000000	55.9	V	11.0	18.1	74.0
15160.000000	56.8	V	12.1	17.2	74.0
15626.000000	58.5	H	12.7	15.5	74.0
16242.000000	59.0	V	13.3	15.0	74.0
16791.000000	59.4	V	14.0	14.6	74.0
17318.000000	59.6	V	14.2	14.4	74.0

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

Frequency (MHz)	Average-ClearWrite (dB $\mu$ V/m)	Polarization	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
14525.000000	44.1	V	11.7	9.9	54.0
15157.000000	44.8	V	12.1	9.2	54.0
15671.000000	46.5	V	12.8	7.5	54.0
16200.000000	47.0	V	13.3	7.0	54.0
16743.000000	47.4	V	14.0	6.6	54.0
17352.000000	47.2	V	14.2	6.8	54.0

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

Frequency (MHz)	MaxPeak-ClearWrite (dB $\mu$ V/m)	Polarization	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
14545.000000	56.2	V	11.8	17.8	74.0
15143.000000	56.7	V	12.1	17.3	74.0
15722.000000	59.2	V	12.9	14.8	74.0
16271.000000	58.6	V	13.4	15.4	74.0
16730.000000	59.8	V	13.9	14.2	74.0
17777.000000	58.9	V	14.4	15.1	74.0

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

Frequency (MHz)	Average-ClearWrite (dB $\mu$ V/m)	Polarization	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
14530.000000	44.2	V	11.7	9.8	54.0
15135.000000	44.9	V	12.1	9.1	54.0
15678.000000	46.5	V	12.8	7.5	54.0
16216.000000	46.8	V	13.3	7.2	54.0
16751.000000	47.2	V	14.0	6.8	54.0
17385.000000	47.0	V	14.3	7.0	54.0

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

Frequency (MHz)	MaxPeak-ClearWrite (dB $\mu$ V/m)	Polarization	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
14534.000000	55.9	V	11.8	18.1	74.0
15109.000000	56.9	V	12.1	17.1	74.0
15761.000000	58.1	H	12.9	15.9	74.0
16211.000000	58.3	V	13.3	15.7	74.0
16883.000000	58.8	V	14.1	15.2	74.0
17773.000000	59.0	V	14.4	15.0	74.0

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

Frequency (MHz)	Average-ClearWrite (dB $\mu$ V/m)	Polarization	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
14545.000000	44.0	V	11.8	10.0	54.0
15147.000000	44.8	V	12.1	9.2	54.0
15761.000000	46.3	V	12.9	7.7	54.0
16195.000000	46.7	V	13.3	7.3	54.0
16740.000000	47.2	V	14.0	6.8	54.0
17274.000000	46.8	V	14.1	7.2	54.0

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

Frequency (MHz)	MaxPeak-ClearWrite (dB $\mu$ V/m)	Polarization	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
14171.000000	55.5	H	11.3	18.5	74.0
15069.000000	56.7	H	12.0	17.3	74.0
15763.000000	57.6	H	12.9	16.4	74.0
16231.000000	57.7	H	13.3	16.3	74.0
16880.000000	58.3	V	14.1	15.7	74.0
17390.000000	57.7	H	14.3	16.3	74.0

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

Frequency (MHz)	Average-ClearWrite (dB $\mu$ V/m)	Polarization	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
14518.000000	43.2	V	11.7	10.8	54.0
15131.000000	44.1	V	12.1	9.9	54.0
15775.000000	45.8	V	12.9	8.2	54.0
16205.000000	45.5	V	13.3	8.5	54.0
16798.000000	46.1	H	14.0	7.9	54.0
17349.000000	45.7	H	14.2	8.3	54.0

See ANNEX C for test graphs.

**Conclusion: Pass**

### A.5 Occupied 20dB Bandwidth

**Measurement Limit:**

Standard	Limit (kHz)
FCC 47 CFR Part 15.247 (a)	/

**Measurement Result:**

Mode	Channel	Occupied 20dB Bandwidth ( MHz)		Conclusion
GFSK	0	Fig.72	1.136	/
	39	Fig.73	1.136	
	78	Fig.74	1.136	
$\pi/4$ DQPSK	0	Fig.75	1.360	/
	39	Fig.76	1.360	
	78	Fig.77	1.360	
8DPSK	0	Fig.78	1.375	/
	39	Fig.79	1.375	
	78	Fig.80	1.375	

See ANNEX C for test graphs.

**Conclusion: PASS**

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

**Measurement Limit:**

Standard	Limit
FCC 47 CFR Part 15.247(a)	< 400 ms

**Measurement Results:**

Mode	Channel	Packet	Dwell Time(ms)		Conclusion
GFSK	39	DH5	Fig.81	169.4	P
			Fig.82		
$\pi/4$ DQPSK	39	2-DH5	Fig.83	173.1	P
			Fig.84		
8DPSK	39	3-DH5	Fig.85	183.5	P
			Fig.86		

See ANNEX C for test graphs.

**Conclusion: Pass**

### A.7 Number of Hopping Channels

**Measurement Limit:**

Standard	Limit
FCC 47 CFR Part 15.247(a)	At least 15 non-overlapping channels

**Measurement Results:**

Mode	Channel	Packet	Number of hopping channels	Test result	Conclusion
GFSK	39	DH5	Fig.87	Fig.88	79
$\pi/4$ DQPSK	39	2-DH5	Fig.89	Fig.90	79
8DPSK	39	3-DH5	Fig.91	Fig.92	79

See ANNEX C for test graphs.

**Conclusion:** Pass

### A.8 Carrier Frequency Separation

**Measurement Limit:**

Standard	Limit
FCC 47 CFR Part 15.247(a)	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.93	1.006	P
$\pi/4$ DQPSK	39	2-DH5	Fig.94	1.006	P
8DPSK	39	3-DH5	Fig.95	1.006	P

See ANNEX C for test graphs.

**Conclusion:** Pass

## A.9 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	Fig.96	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.96	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.97	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.97	P
0.5 to 5	46		
5 to 30	50		

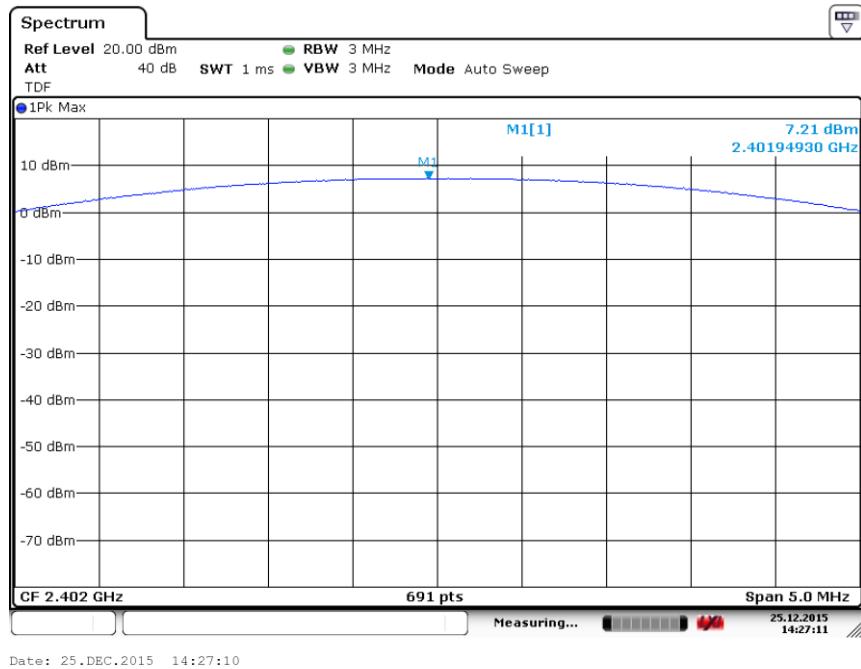
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

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

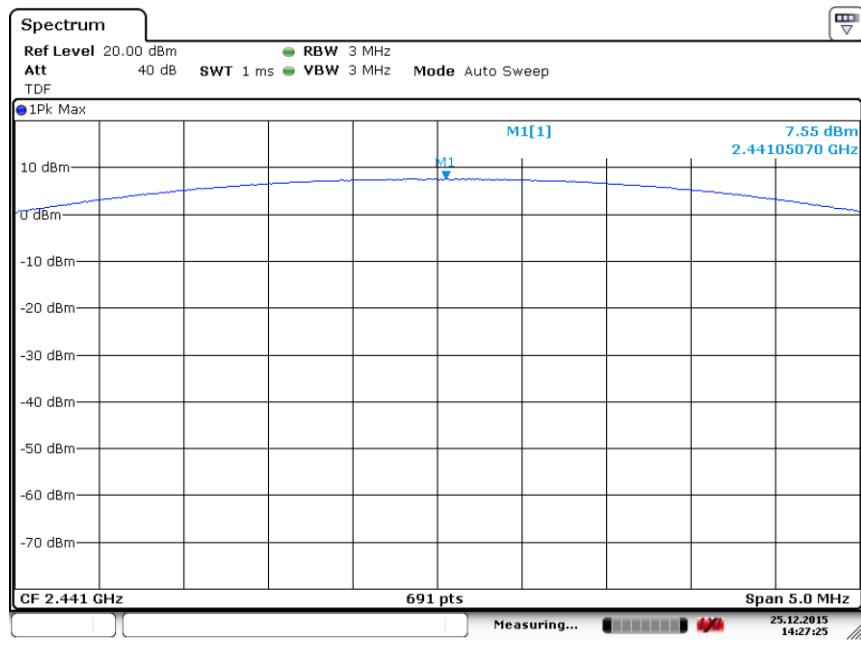
See ANNEX C for test graphs.

Conclusion: Pass

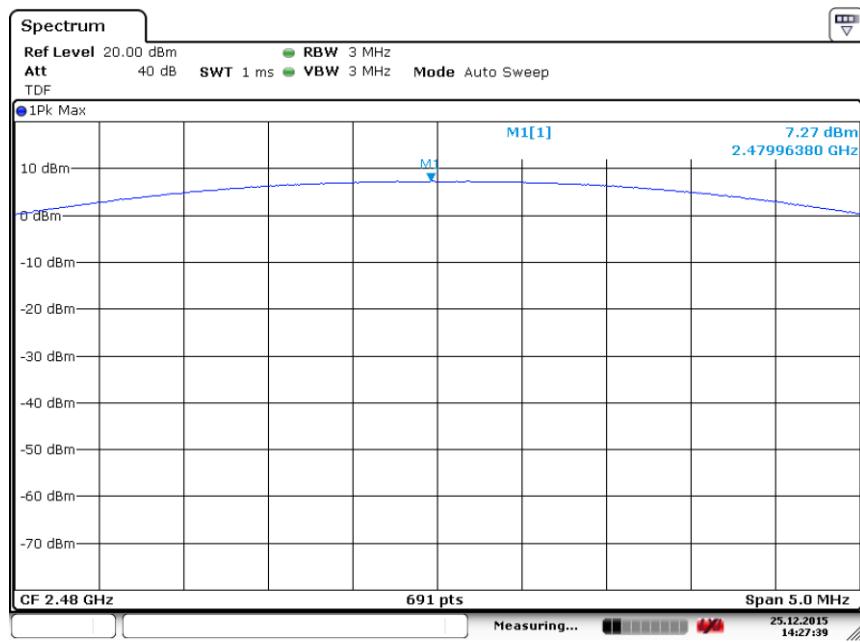
## ANNEX B: TEST FIGURE LIST



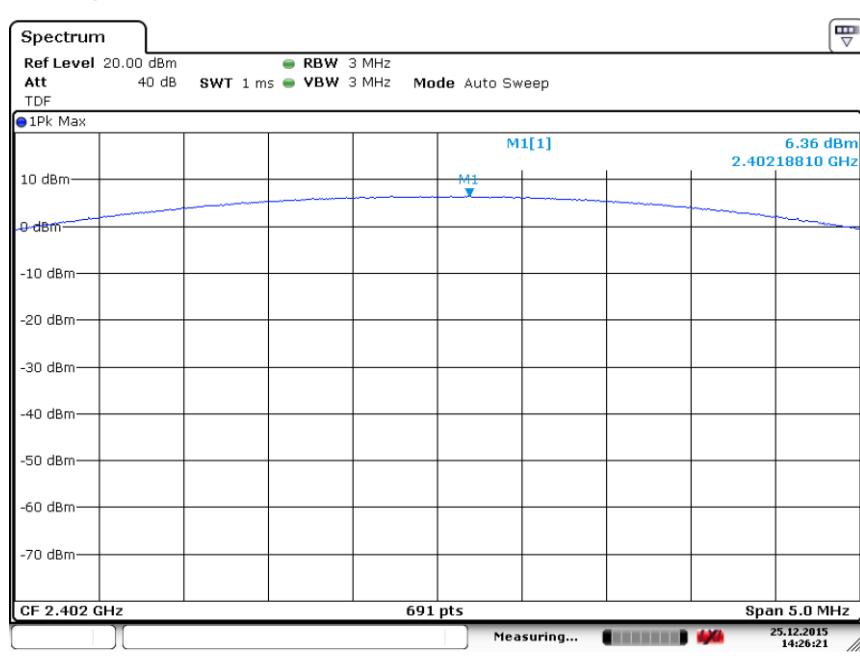
**Fig. 1 Maximum Peak Output Power(GFSK, Ch 0)**



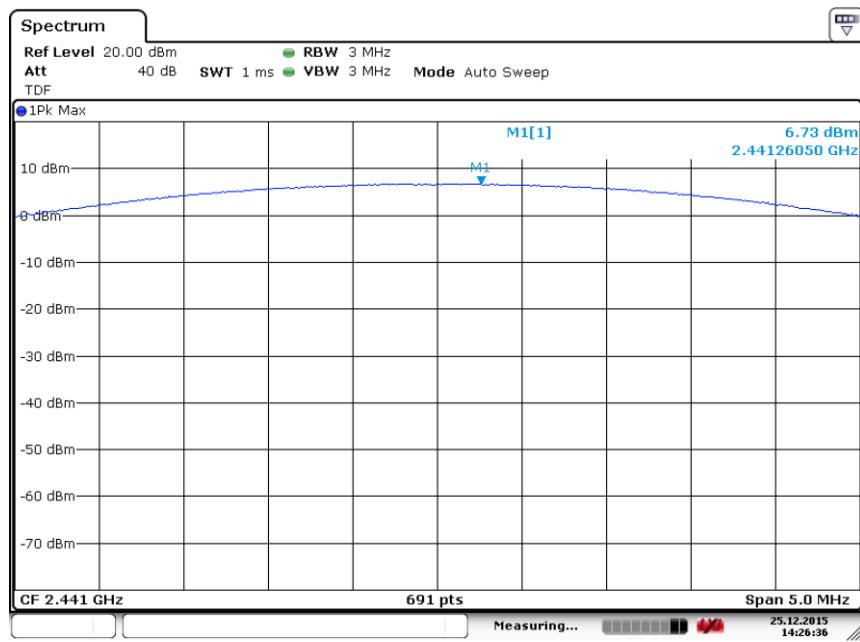
**Fig. 2 Maximum Peak Output Power(GFSK, Ch 39)**



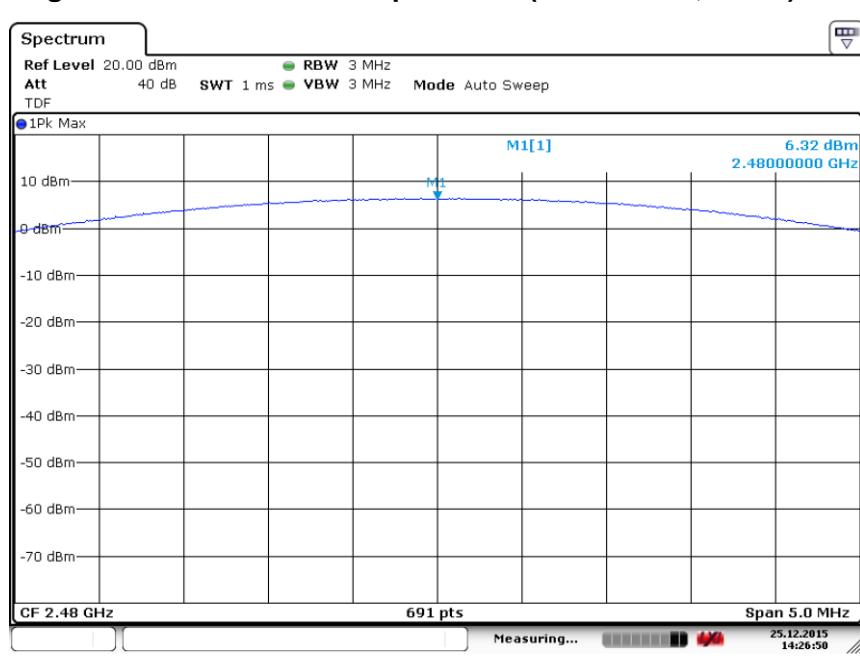
**Fig. 3 Maximum Peak Output Power(GFSK, Ch 78)**



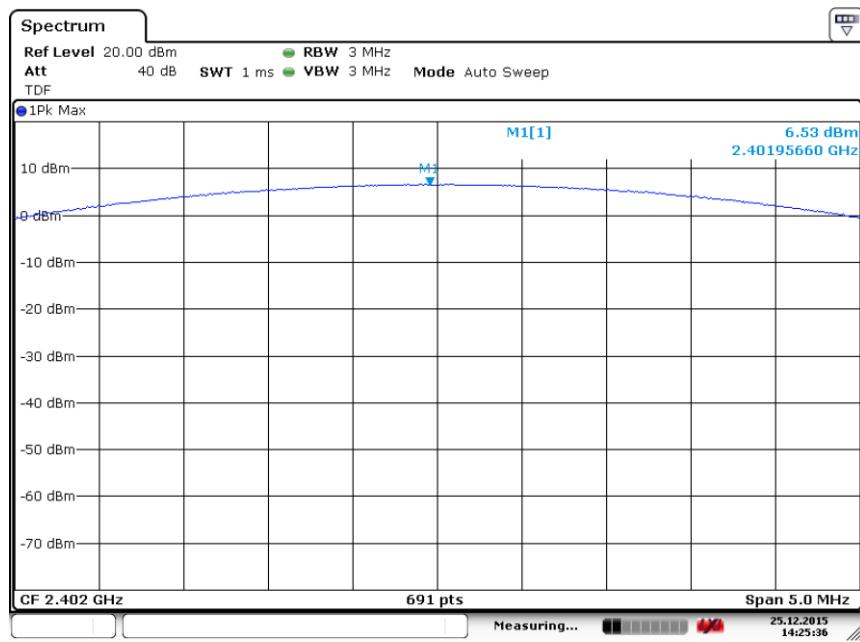
**Fig. 4 Maximum Peak Output Power( $\pi/4$  DQPSK, Ch 0)**



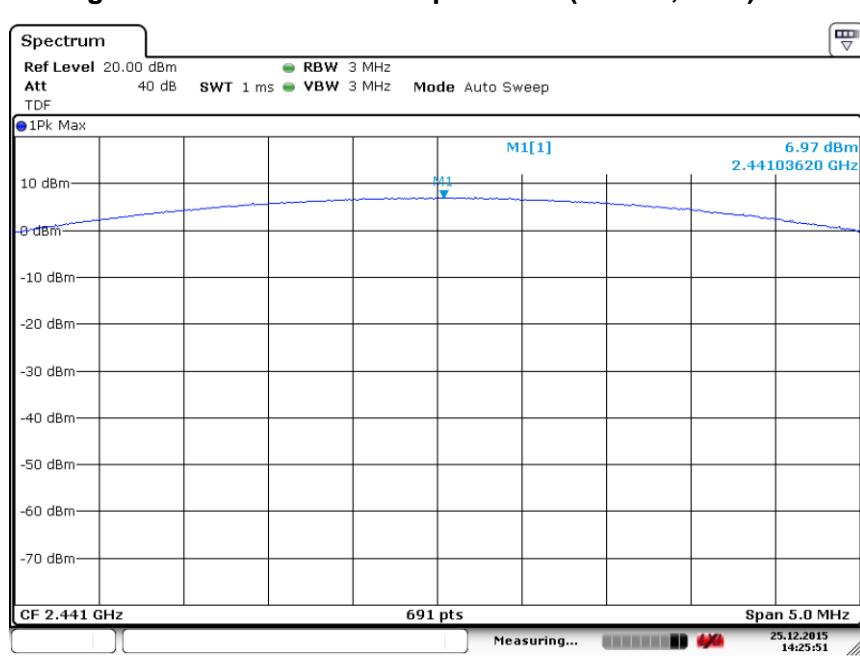
**Fig. 5 Maximum Peak Output Power( $\pi/4$  DQPSK, Ch 39)**



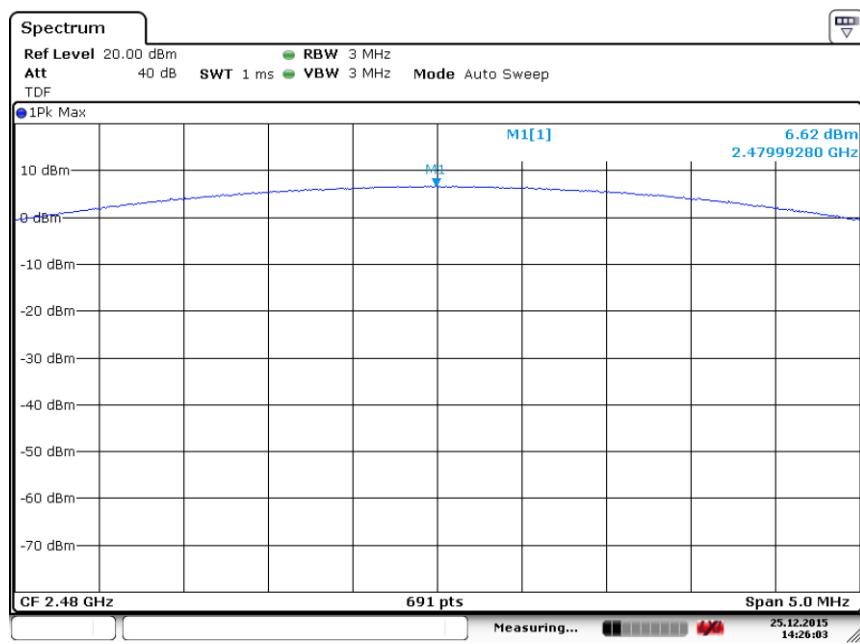
**Fig. 6 Maximum Peak Output Power( $\pi/4$  DQPSK, Ch 78)**



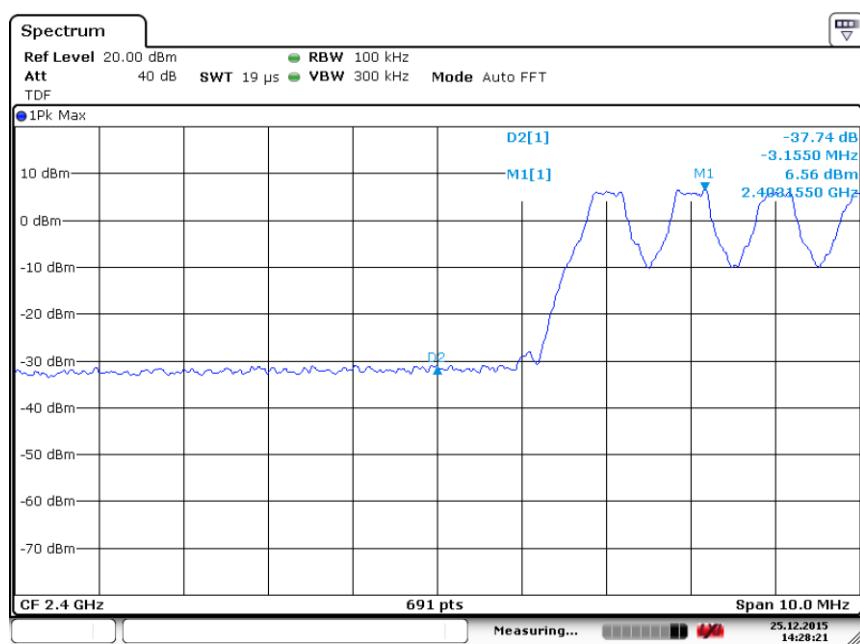
**Fig. 7 Maximum Peak Output Power(8DPSK, Ch 0)**



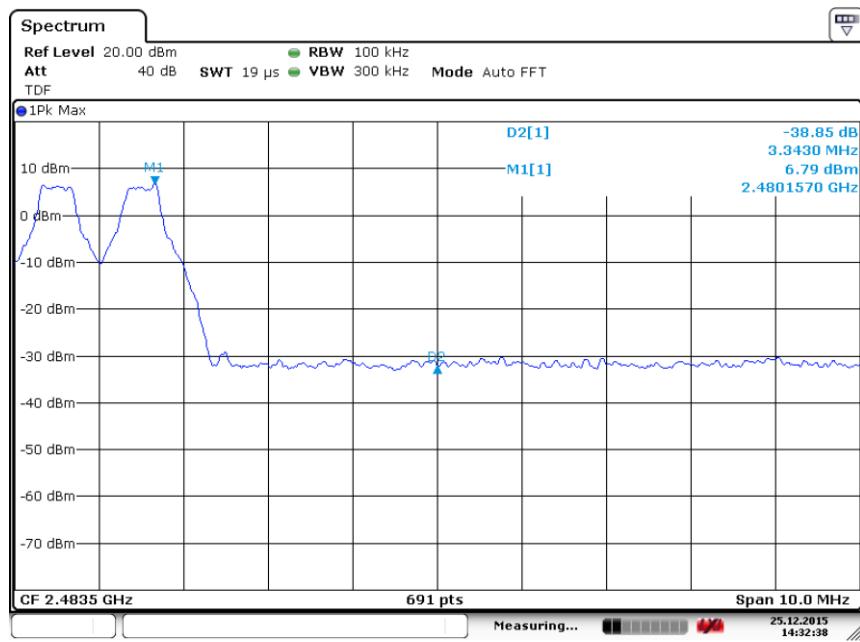
**Fig. 8 Maximum Peak Output Power(8DPSK, Ch 39)**



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

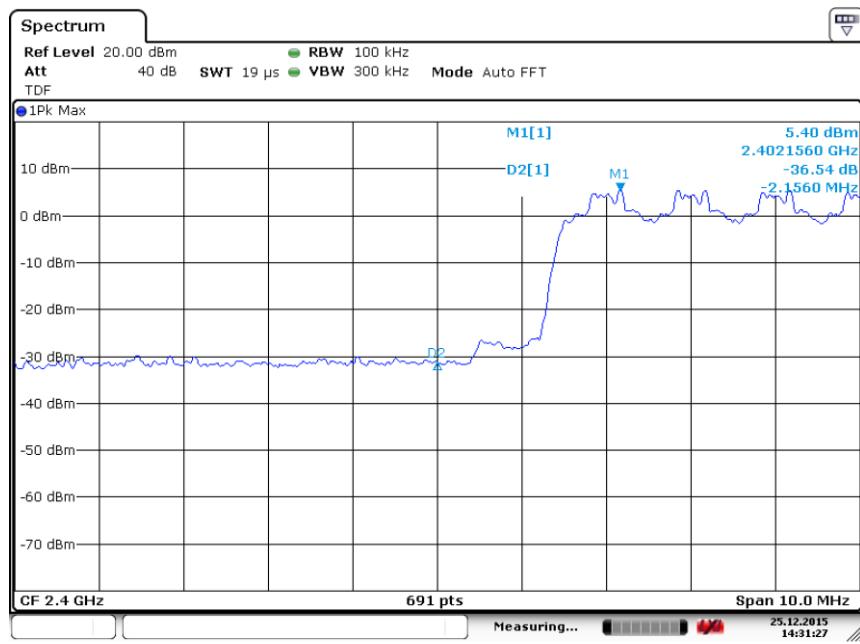


**Fig. 10 Band Edges (GFSK, Ch 0, Hopping ON)**



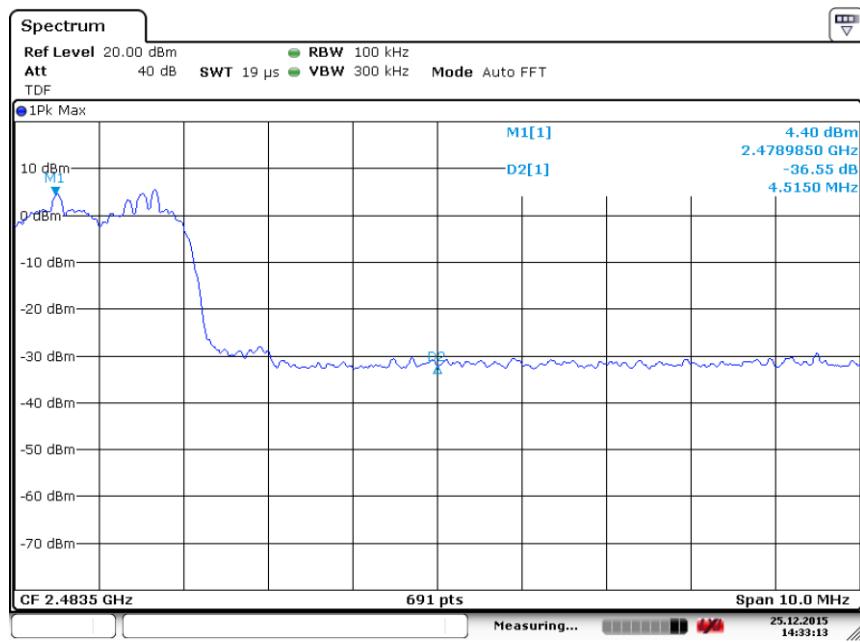
Date: 25.DEC.2015 14:32:38

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

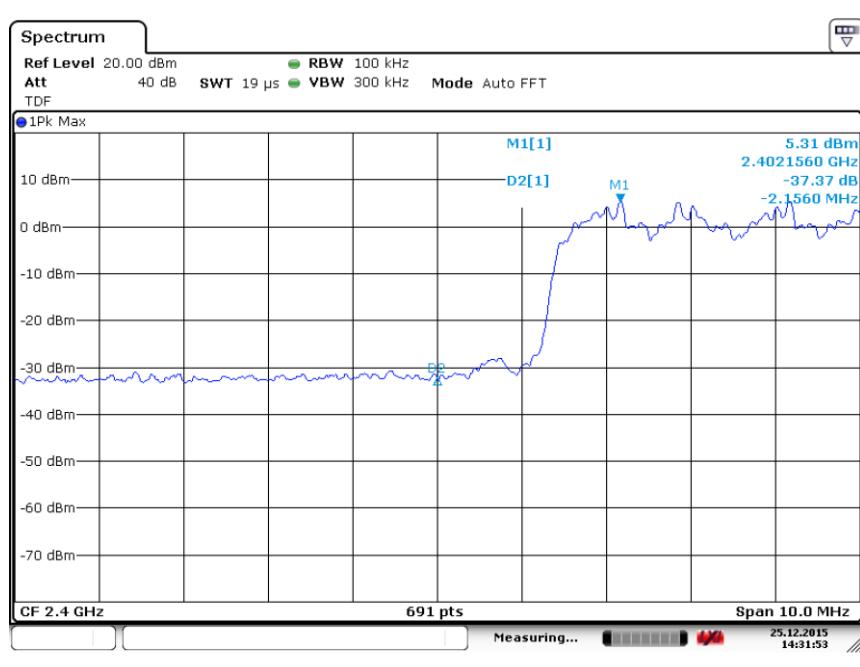


Date: 25.DEC.2015 14:31:27

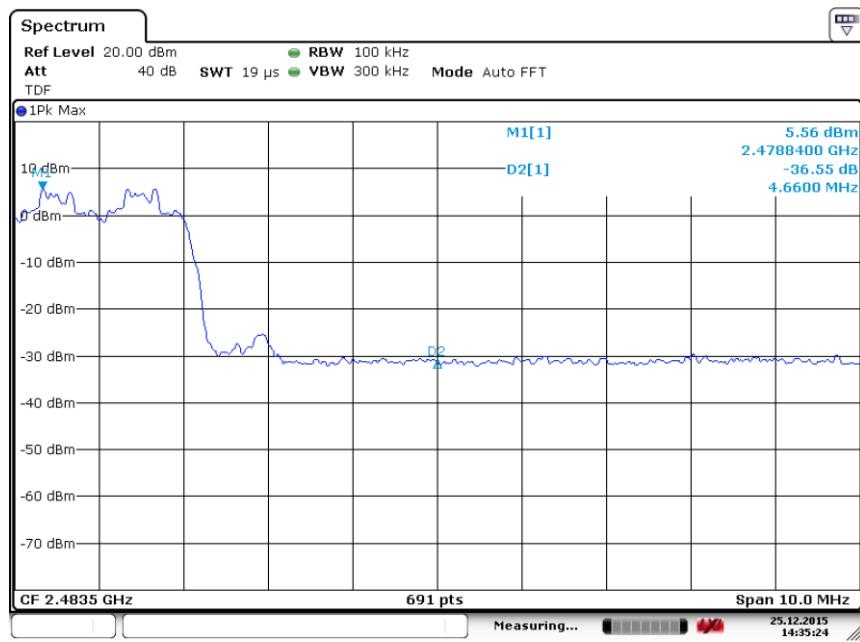
**Fig. 12 Band Edges (π/4 DQPSK, Ch 0, Hopping ON)**



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

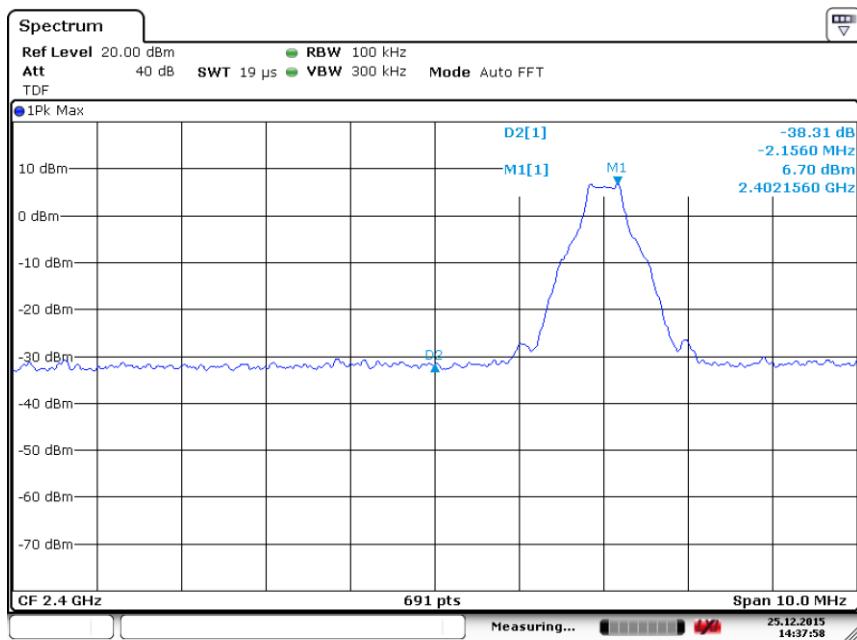


**Fig. 14 Band Edges (8DPSK, Ch 0, Hopping ON)**



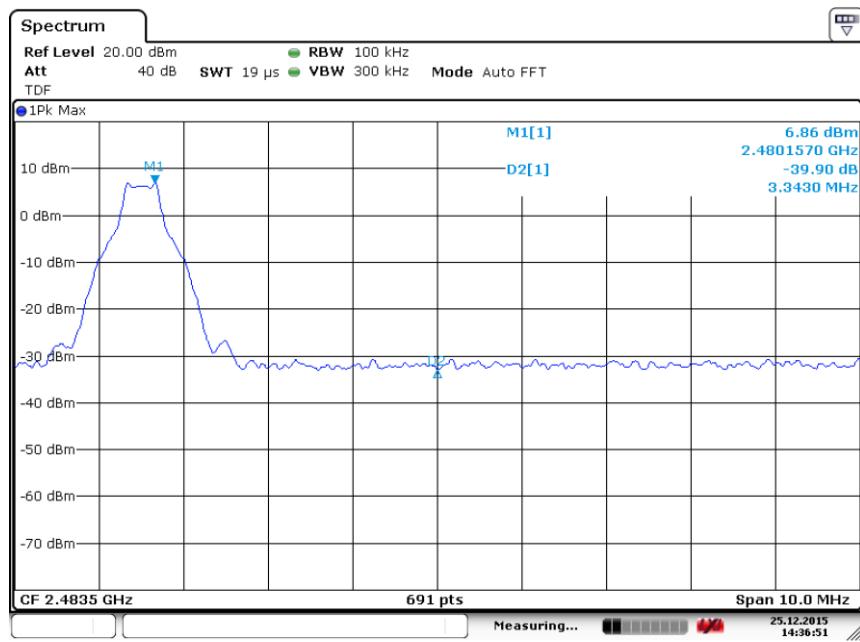
Date: 25.DEC.2015 14:35:24

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

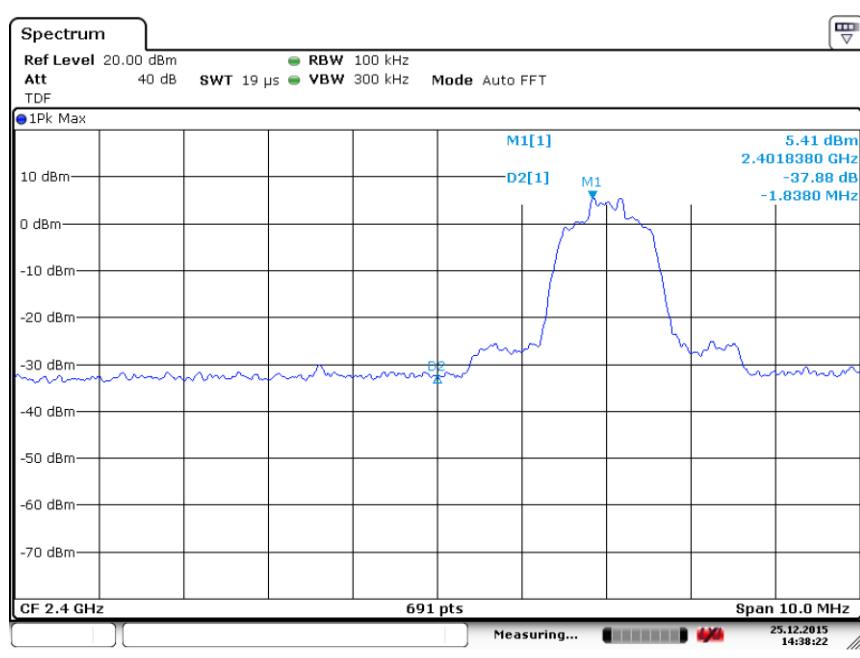


Date: 25.DEC.2015 14:37:58

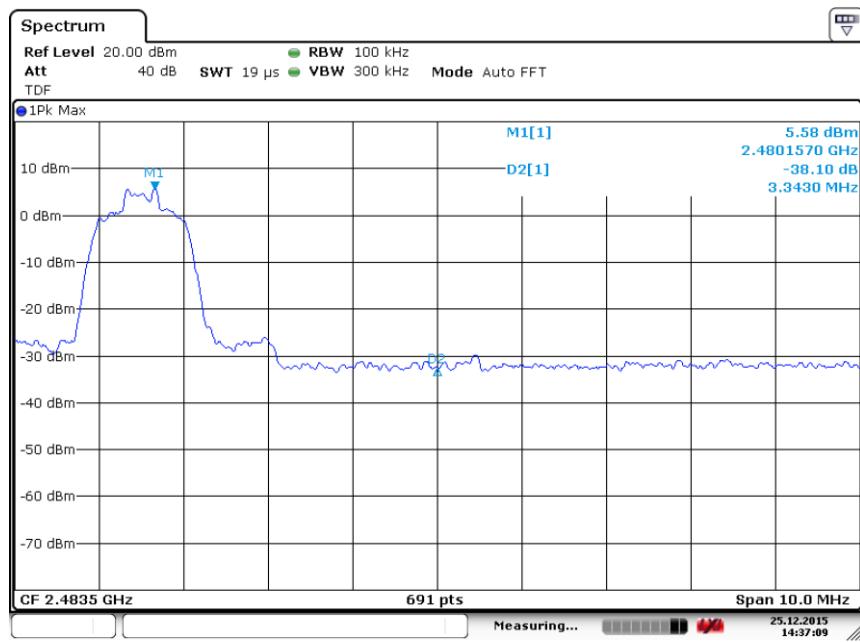
**Fig. 16 Band Edges (GFSK, Ch 0, Hopping OFF)**



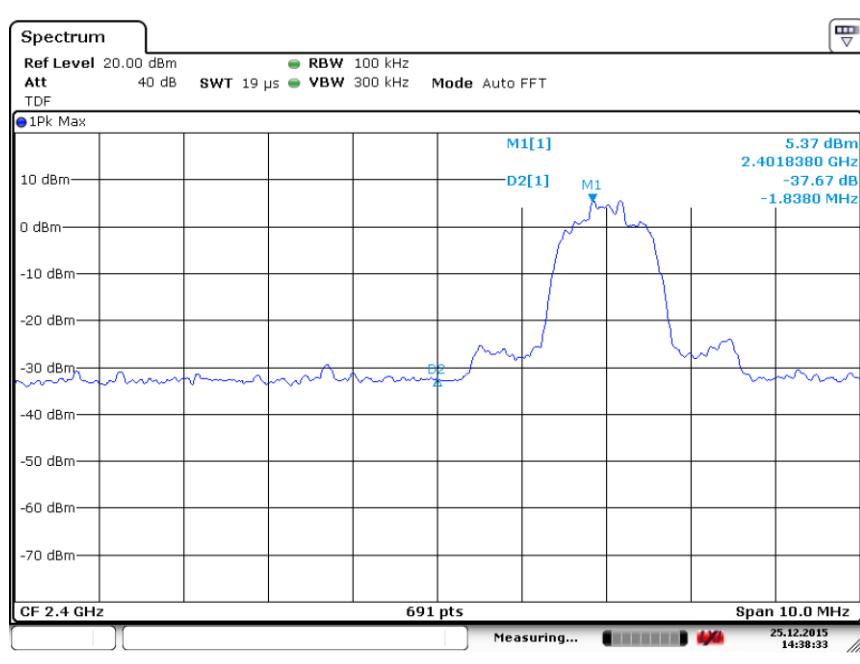
**Fig. 17 Band Edges (GFSK, Ch 78, Hopping OFF)**



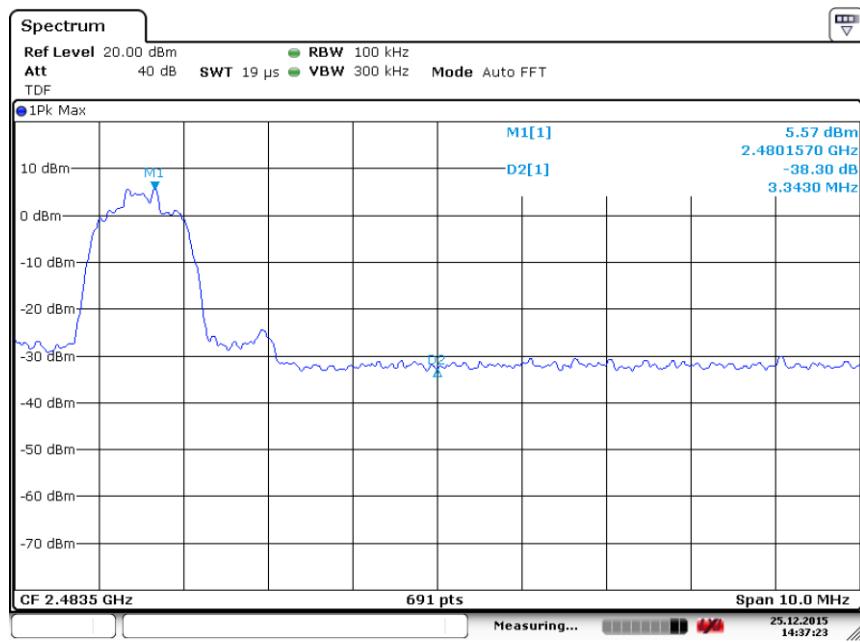
**Fig. 18 Band Edges (π /4 DQPSK, Ch 0, Hopping OFF)**



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

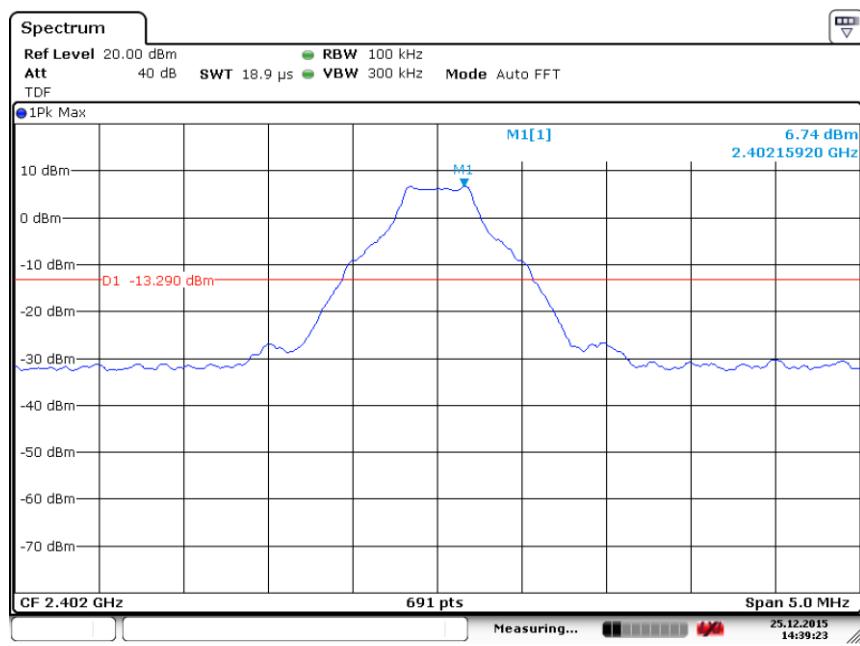


**Fig. 20 Band Edges (8DPSK, Ch 0, Hopping OFF)**



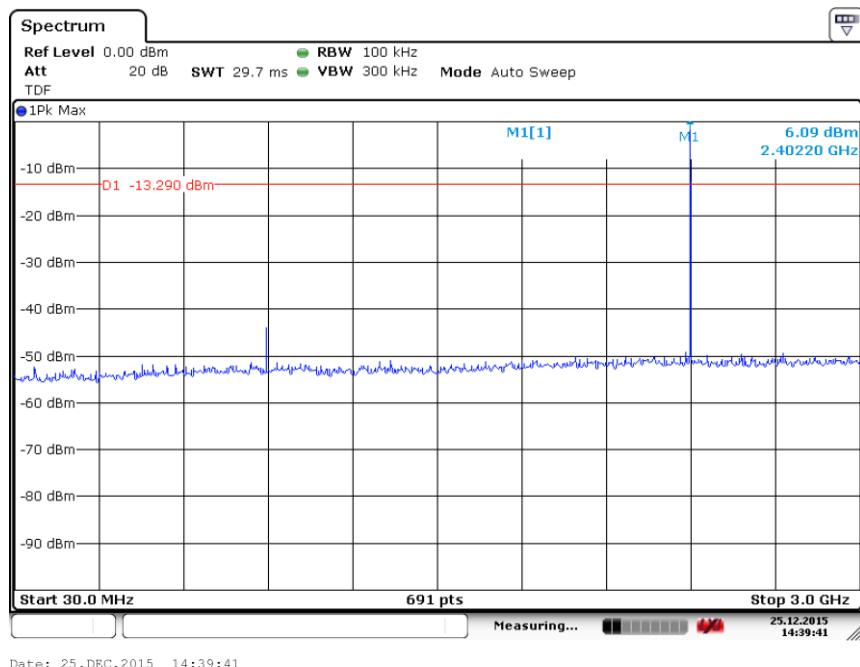
Date: 25.DEC.2015 14:37:23

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

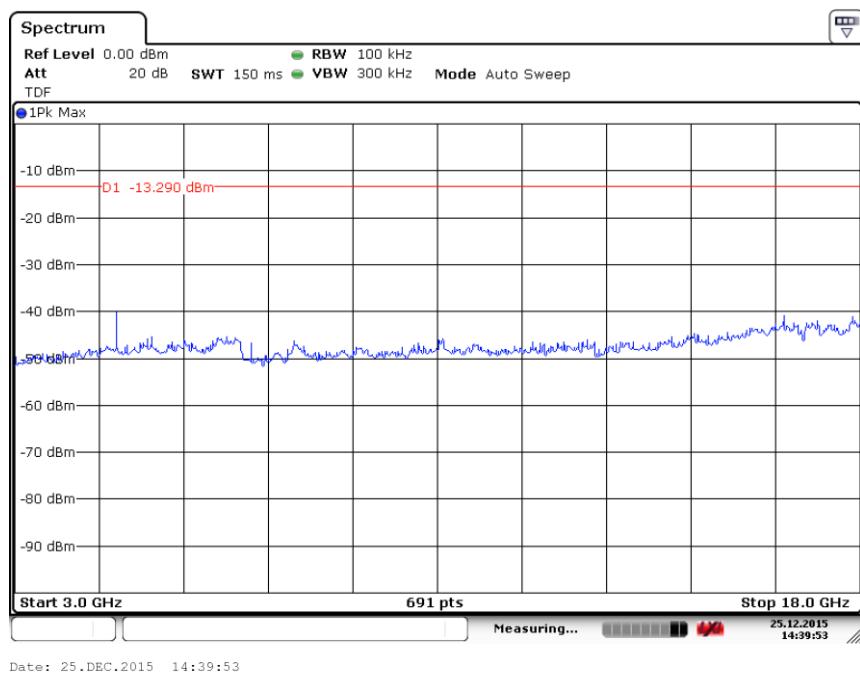


Date: 25.DEC.2015 14:39:23

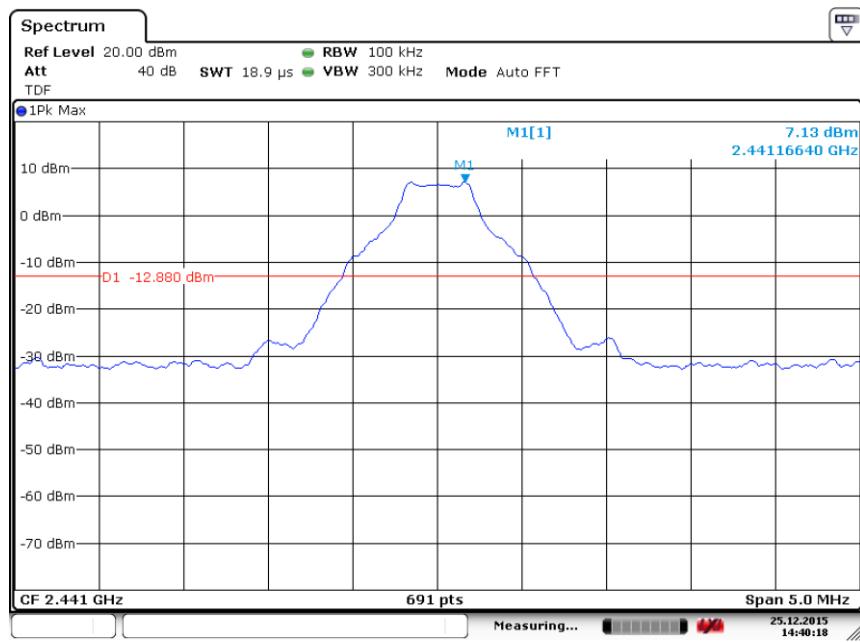
**Fig. 22 Conducted Spurious Emission (GFSK, Ch0, 2.402GHz)**



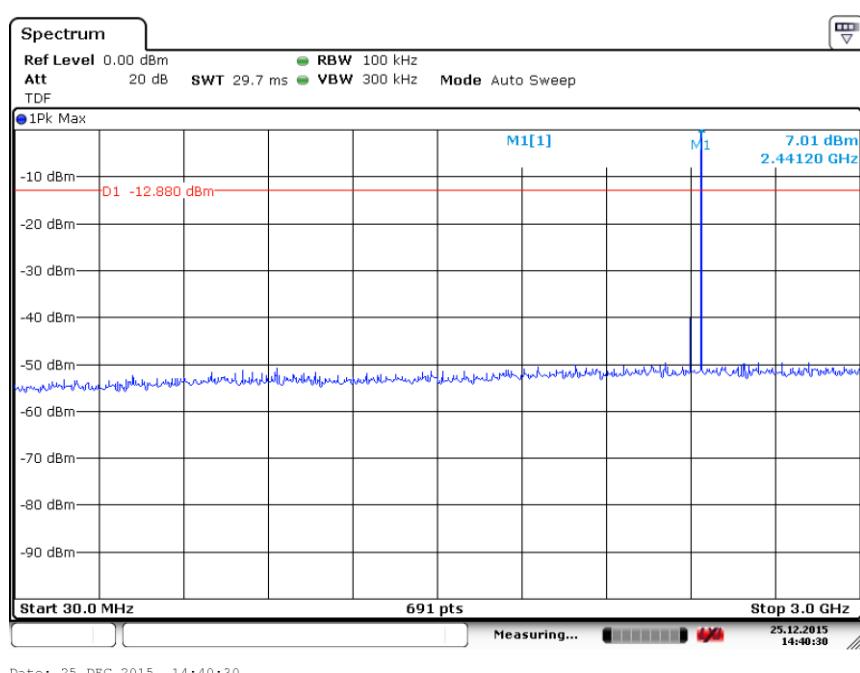
**Fig. 23 Conducted Spurious Emission (GFSK, Ch0, 30 MHz-3 GHz)**



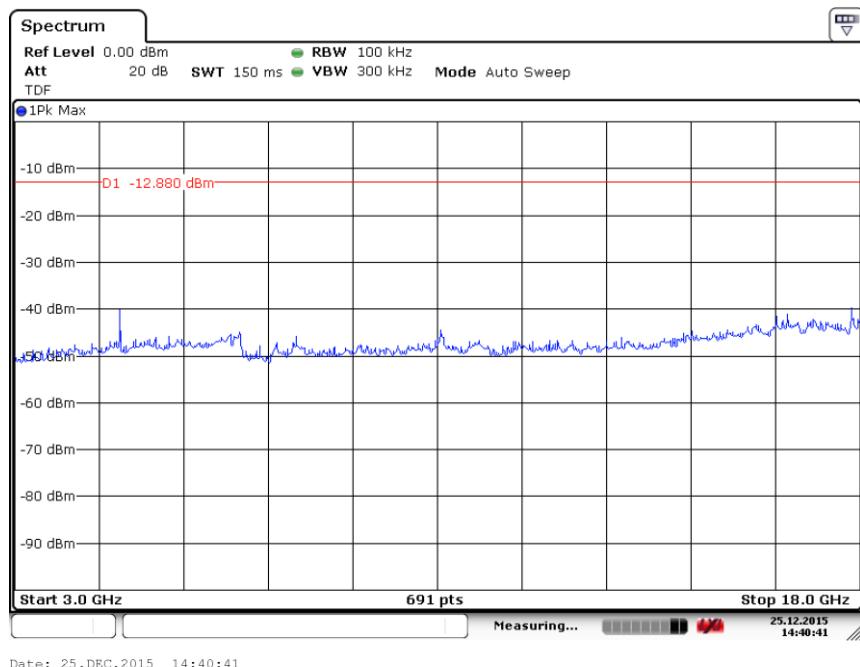
**Fig. 24 Conducted Spurious Emission (GFSK, Ch0, 3GHz-18 GHz)**



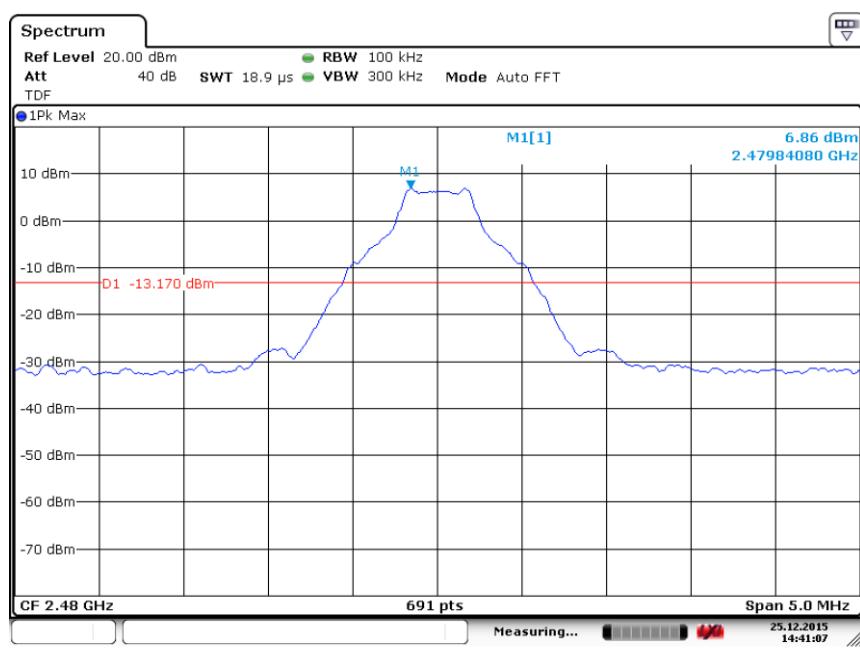
**Fig. 25 Conducted Spurious Emission (GFSK, Ch39, 2.441GHz)**



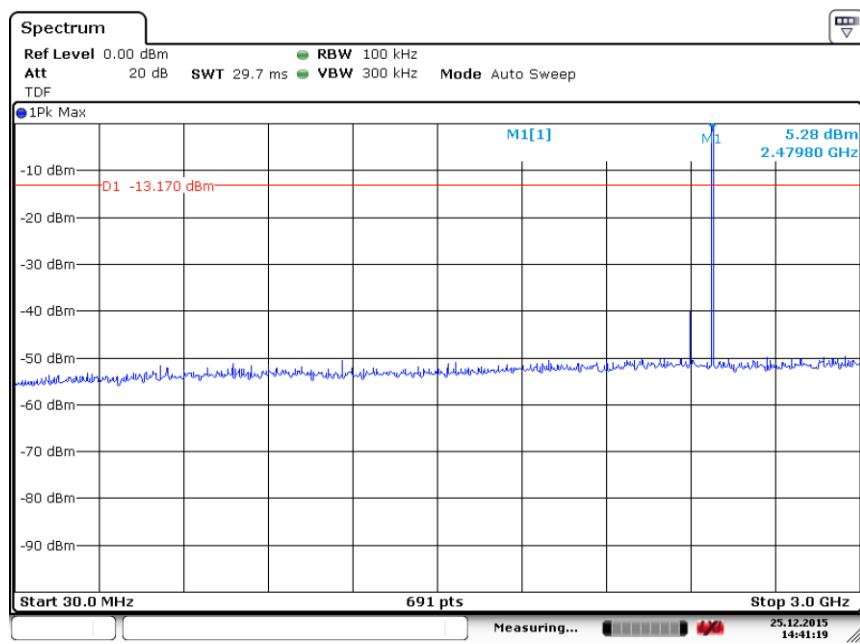
**Fig. 26 Conducted Spurious Emission (GFSK, Ch39, 30 MHz-3 GHz)**



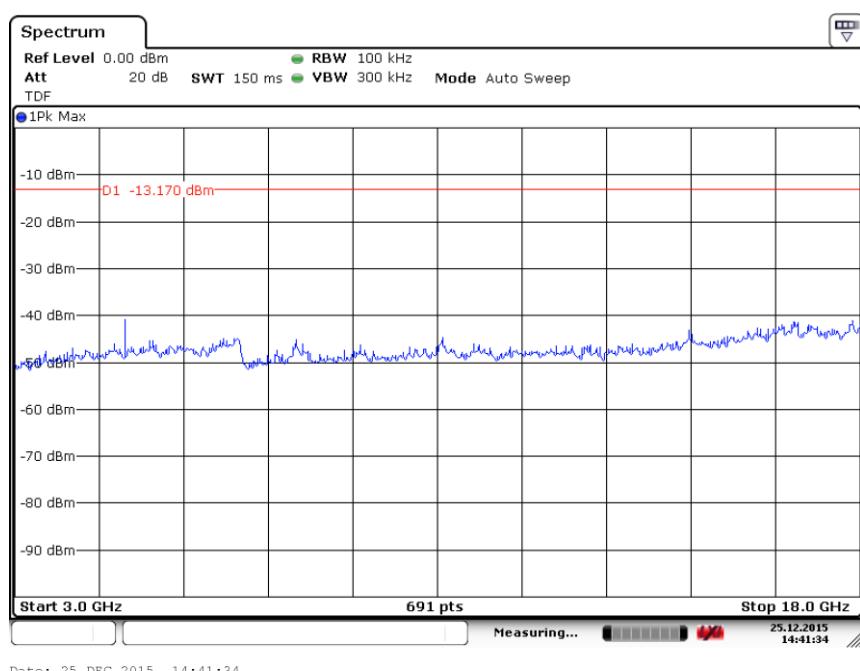
**Fig. 27 Conducted Spurious Emission (GFSK, Ch39, 3GHz-18 GHz)**



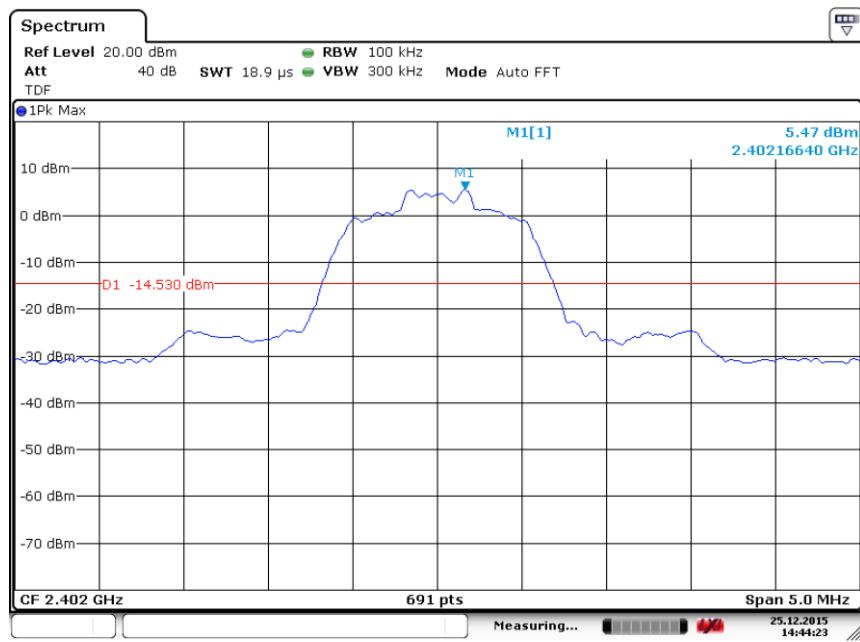
**Fig. 28 Conducted Spurious Emission (GFSK, Ch78, 2.480GHz)**



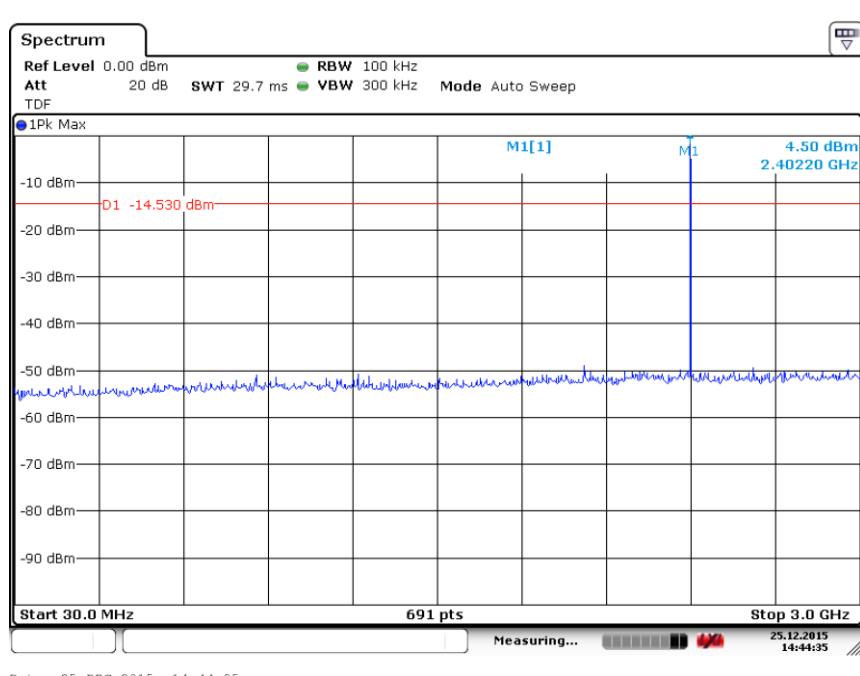
**Fig. 29 Conducted Spurious Emission (GFSK, Ch78, 30 MHz-3 GHz)**



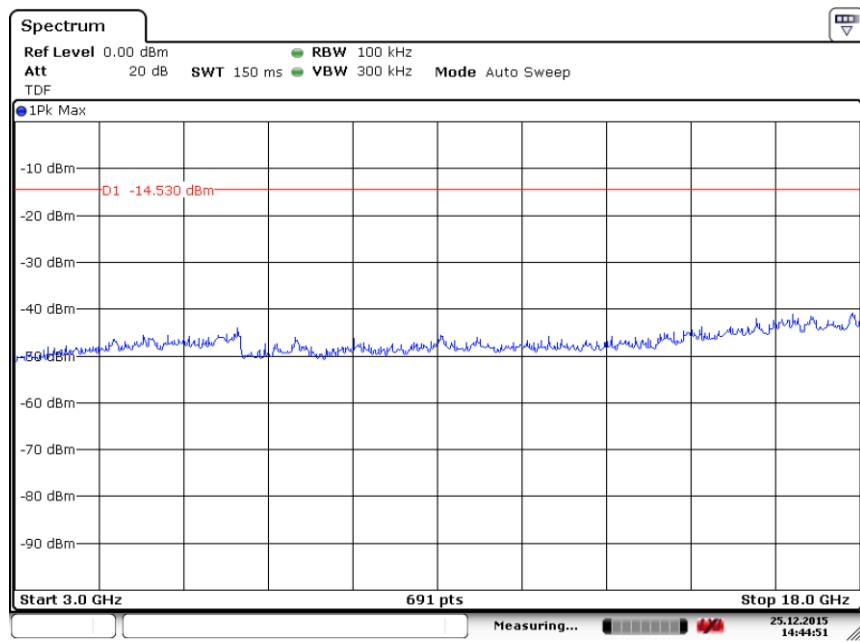
**Fig. 30 Conducted Spurious Emission (GFSK, Ch78, 3GHz-18 GHz)**



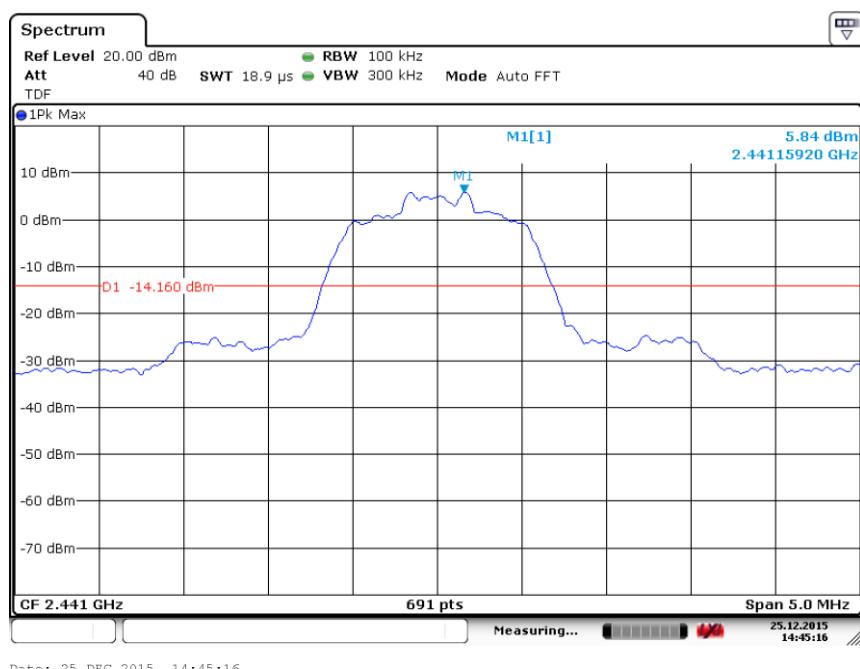
**Fig. 31 Conducted Spurious Emission ( $\pi/4$  DQPSK, Ch0, 2.402GHz)**



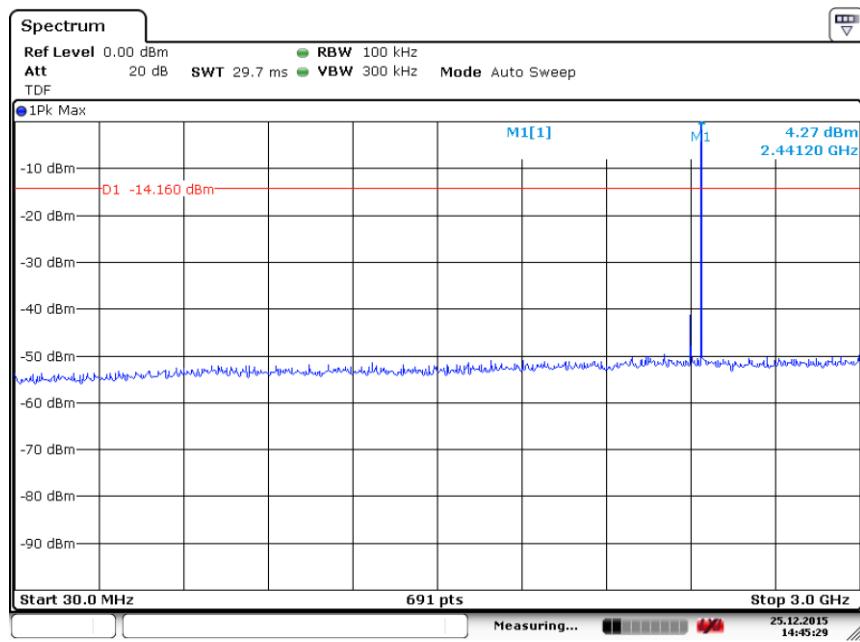
**Fig. 32 Conducted Spurious Emission ( $\pi/4$  DQPSK, Ch0, 30 MHz-3 GHz)**



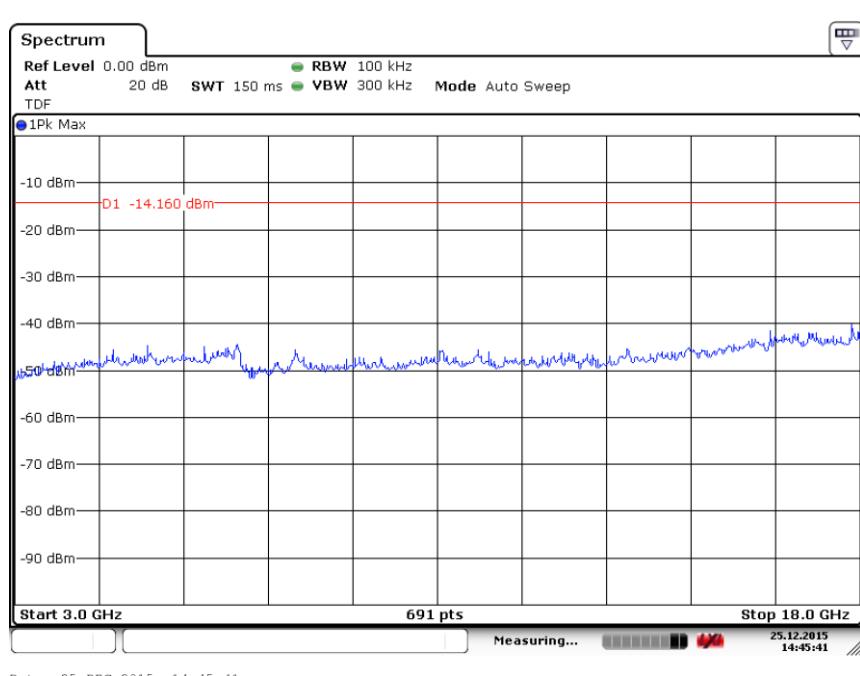
**Fig. 33 Conducted Spurious Emission ( $\pi/4$  DQPSK, Ch0, 3GHz-18 GHz)**



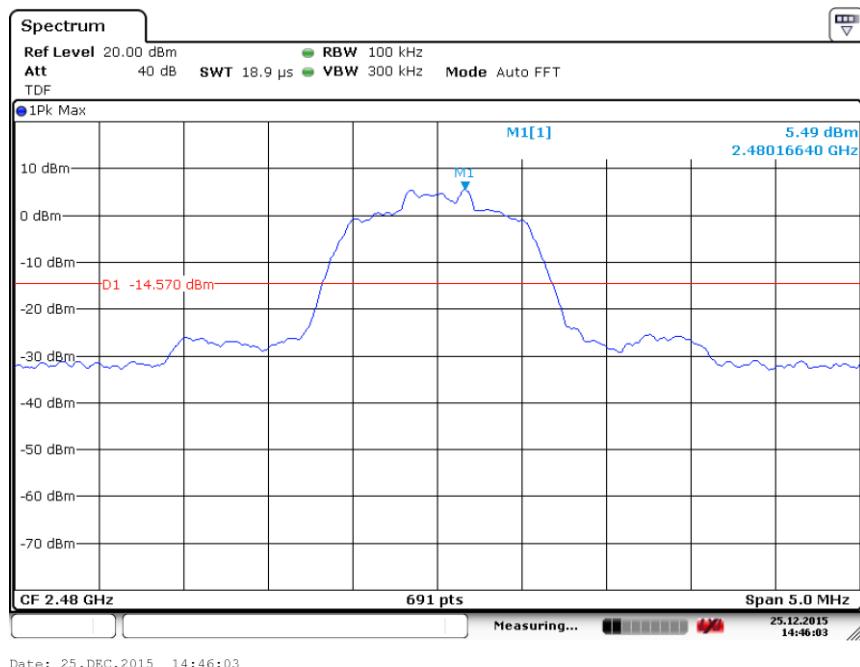
**Fig. 34 Conducted Spurious Emission ( $\pi/4$  DQPSK, Ch39, 2.441GHz)**



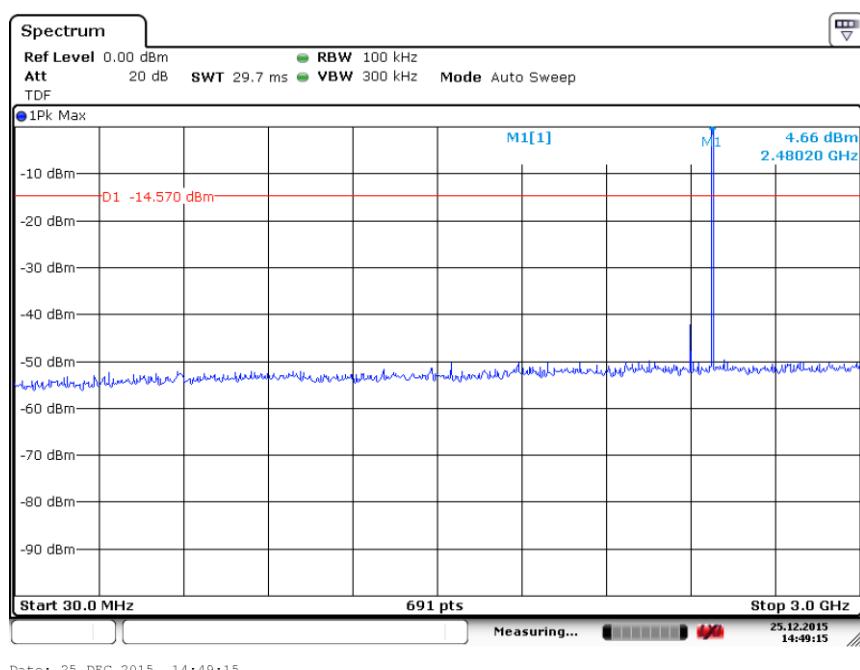
**Fig. 35 Conducted Spurious Emission ( $\pi/4$  DQPSK, Ch39, 30 MHz-3 GHz)**



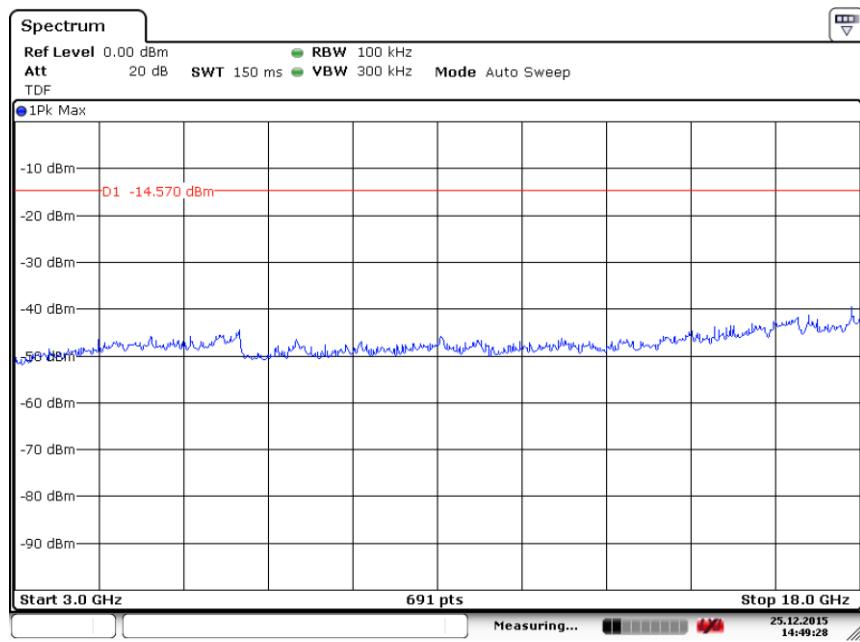
**Fig. 36 Conducted Spurious Emission ( $\pi/4$  DQPSK, Ch39, 3GHz-18 GHz)**



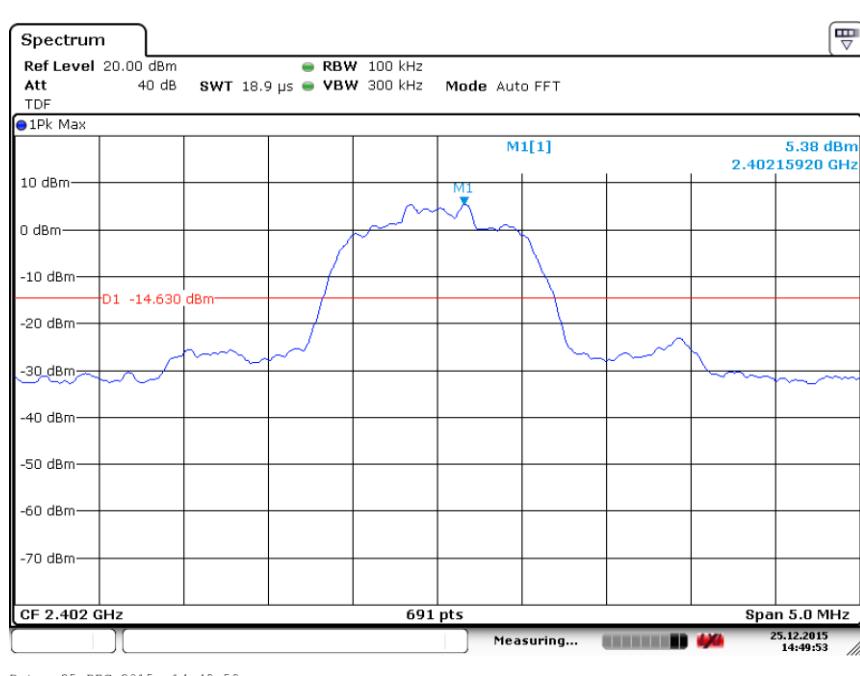
**Fig. 37 Conducted Spurious Emission ( $\pi/4$  DQPSK, Ch78, 2.480GHz)**



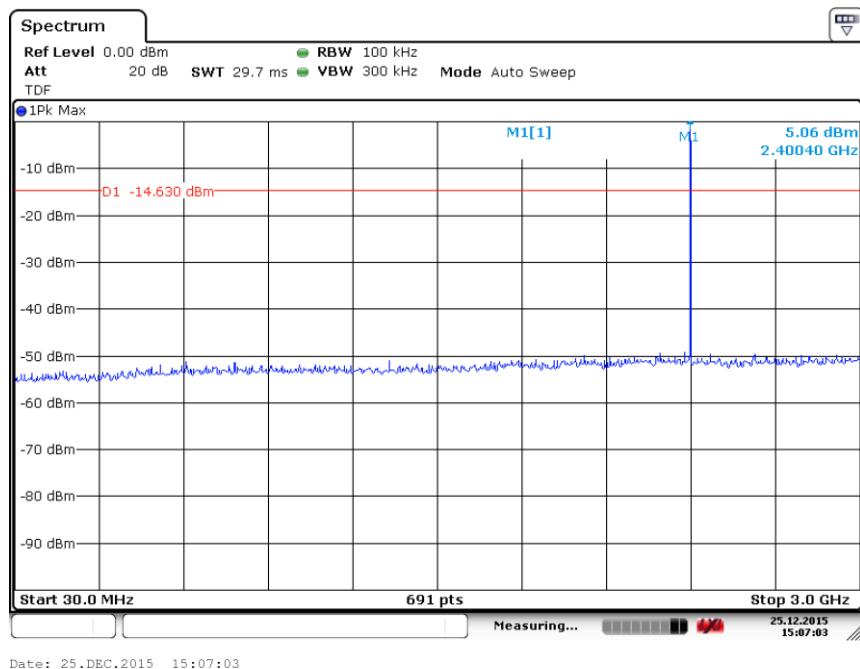
**Fig. 38 Conducted Spurious Emission ( $\pi/4$  DQPSK, Ch78, 30 MHz-3 GHz)**



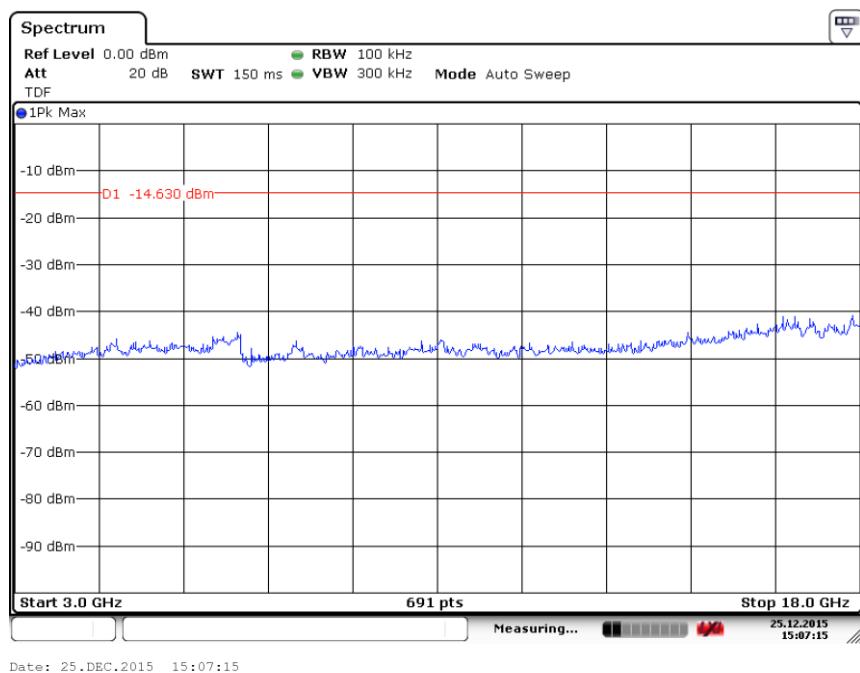
**Fig. 39 Conducted Spurious Emission ( $\pi/4$  DQPSK, Ch78, 3GHz-18 GHz)**



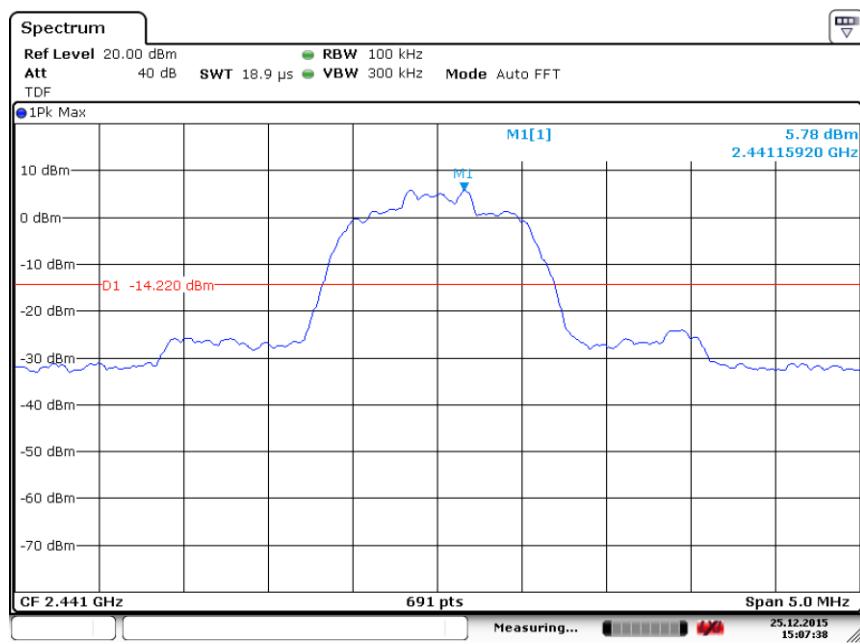
**Fig. 40 Conducted Spurious Emission (8DPSK, Ch0, 2.402GHz)**



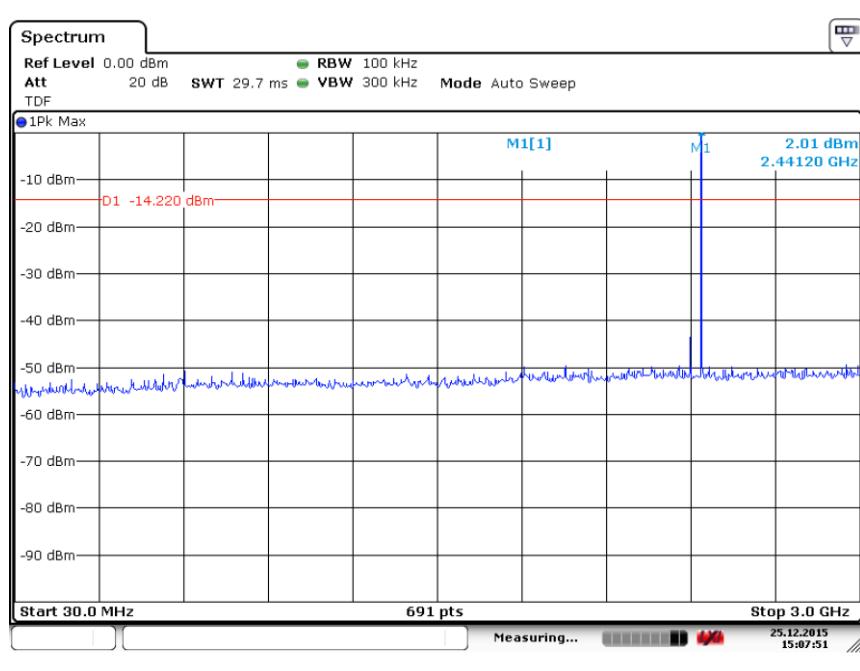
**Fig. 41 Conducted Spurious Emission (8DPSK, Ch0, 30 MHz-3 GHz)**



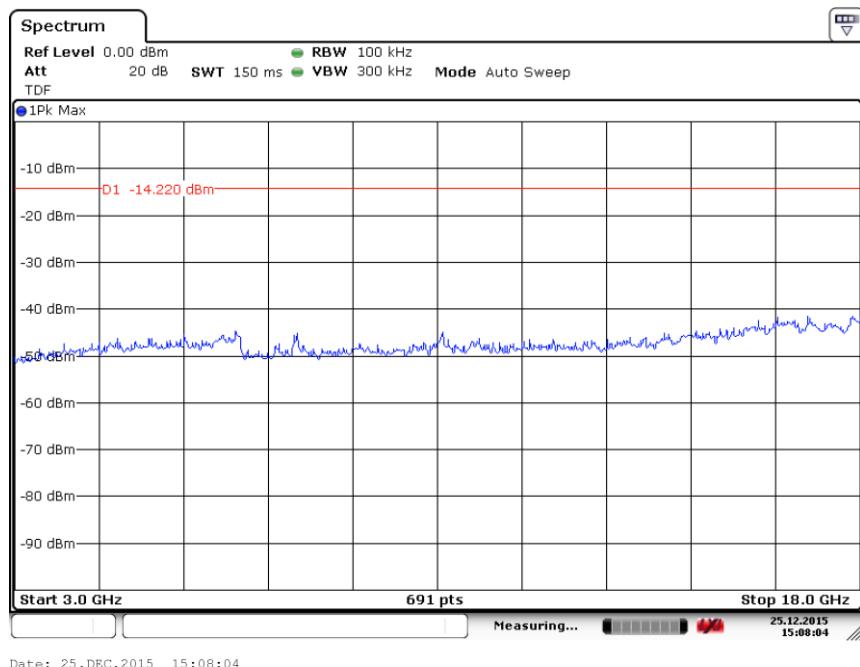
**Fig. 42 Conducted Spurious Emission (8DPSK, Ch0, 3GHz-18 GHz)**



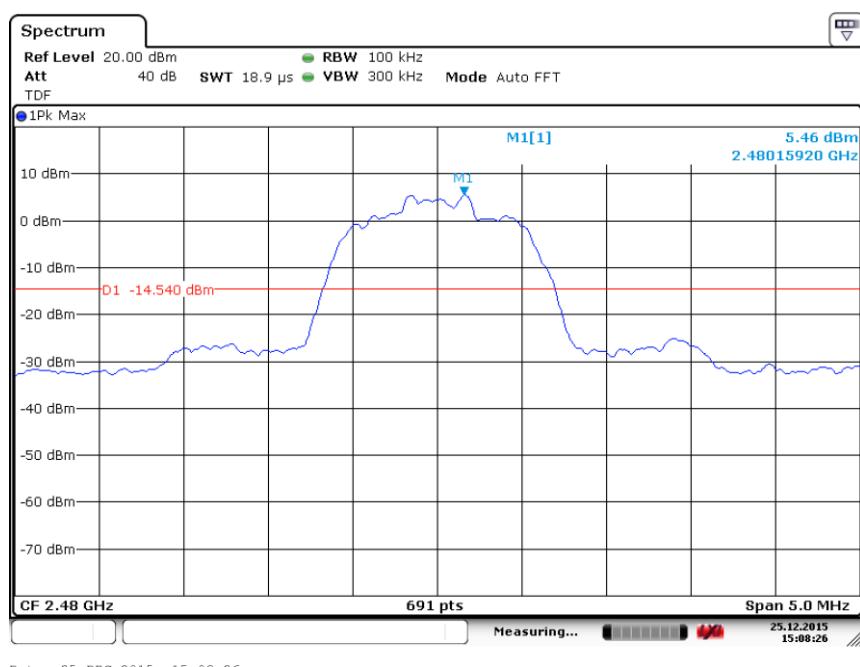
**Fig. 43 Conducted Spurious Emission (8DPSK, Ch39, 2.441GHz)**



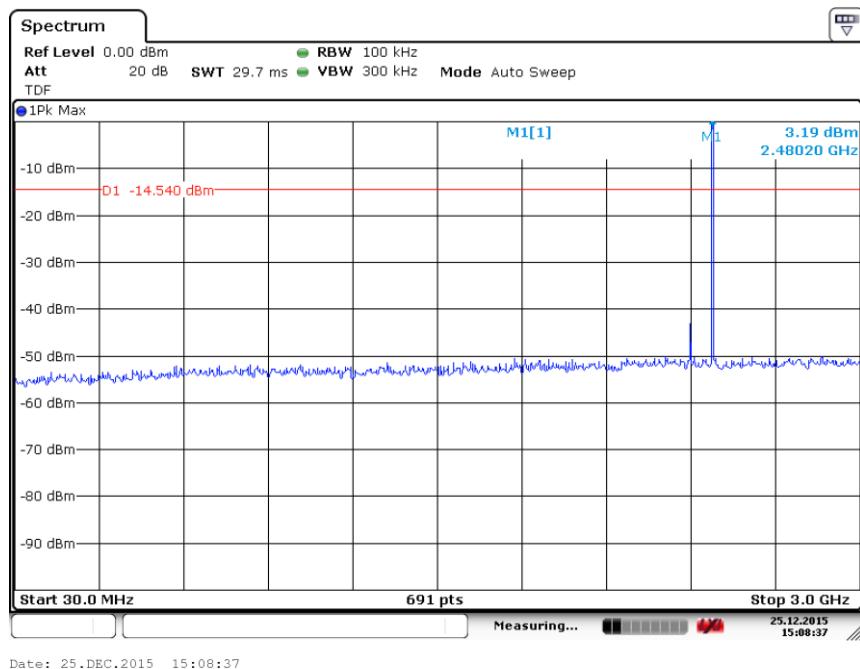
**Fig. 44 Conducted Spurious Emission (8DPSK, Ch39, 30 MHz-3 GHz)**



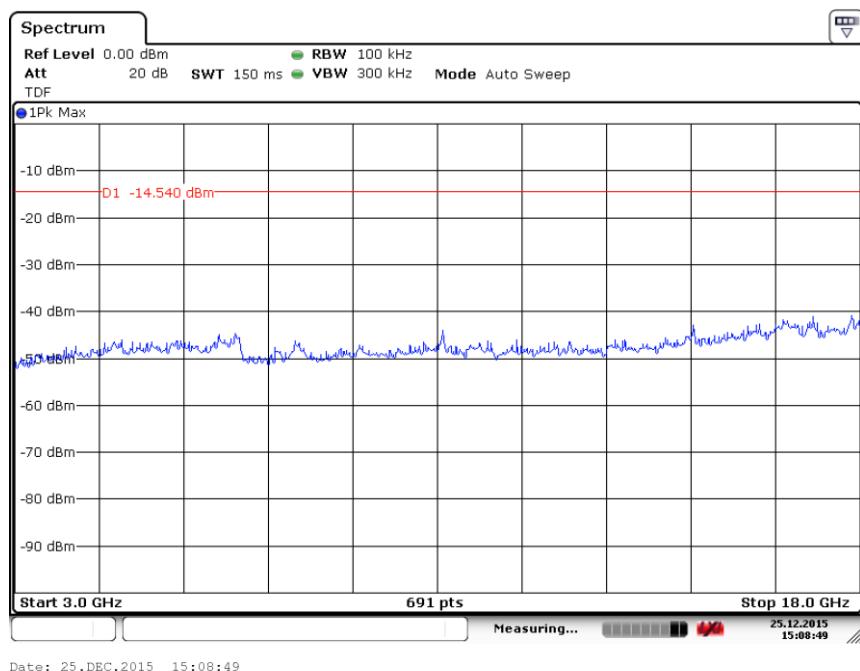
**Fig. 45 Conducted Spurious Emission (8DPSK, Ch39, 3GHz-18 GHz)**



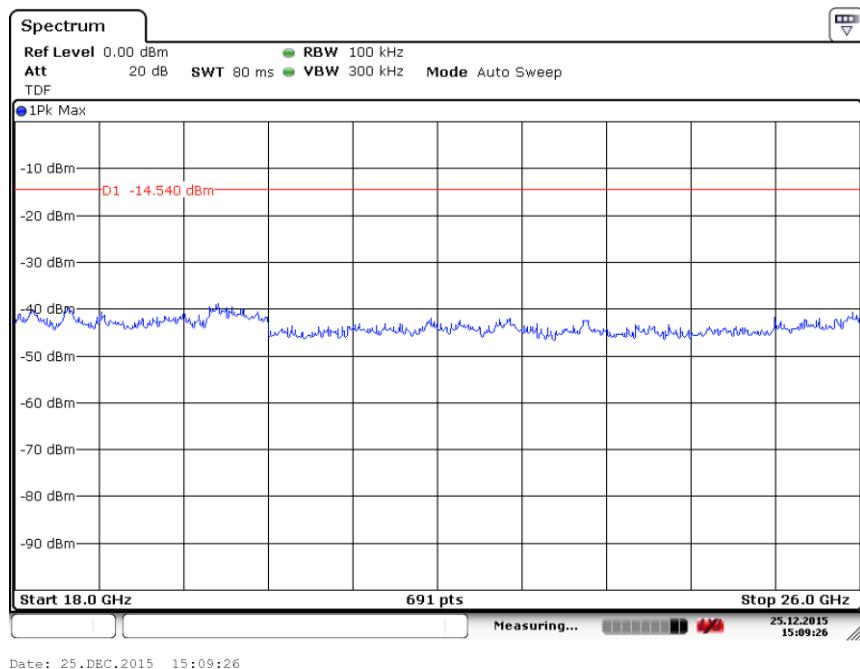
**Fig. 46 Conducted Spurious Emission (8DPSK, Ch78, 2.480GHz)**



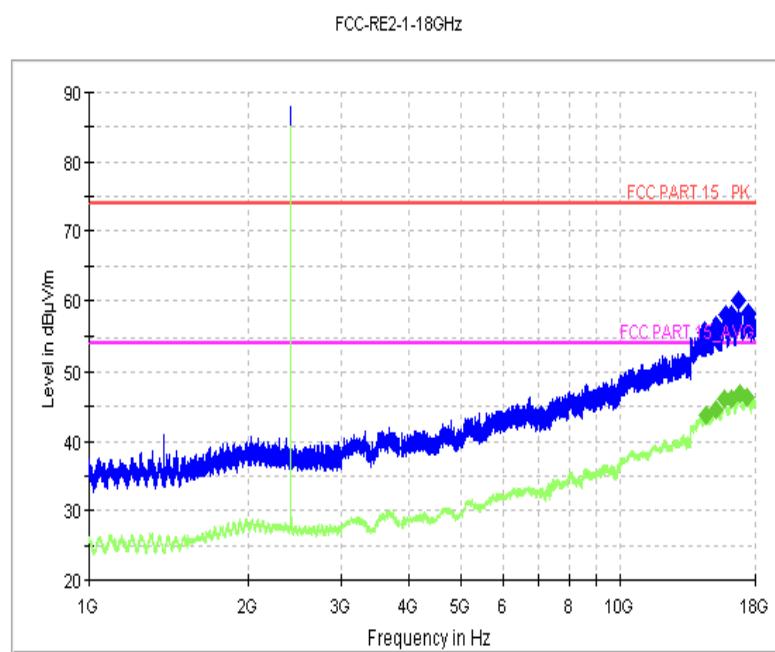
**Fig. 47 Conducted Spurious Emission (8DPSK, Ch78, 30 MHz-3 GHz)**



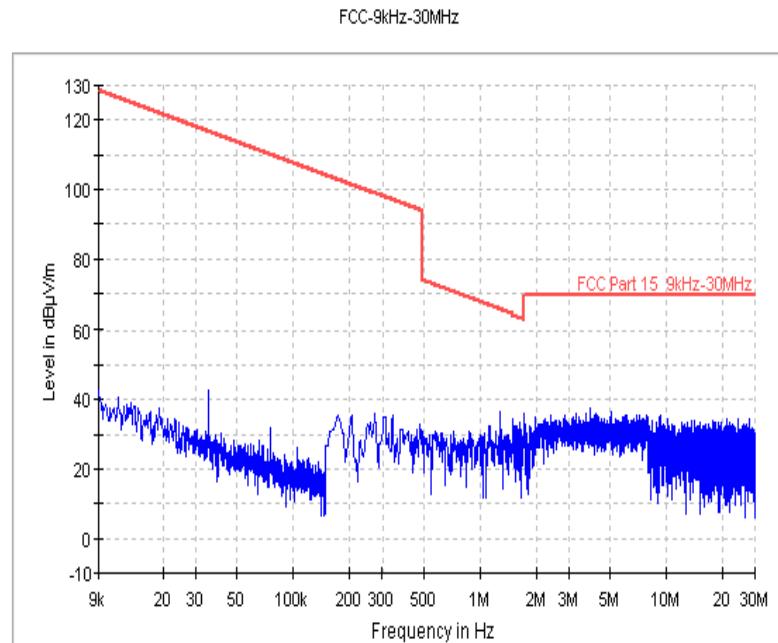
**Fig. 48 Conducted Spurious Emission (8DPSK, Ch78, 3GHz-18 GHz)**



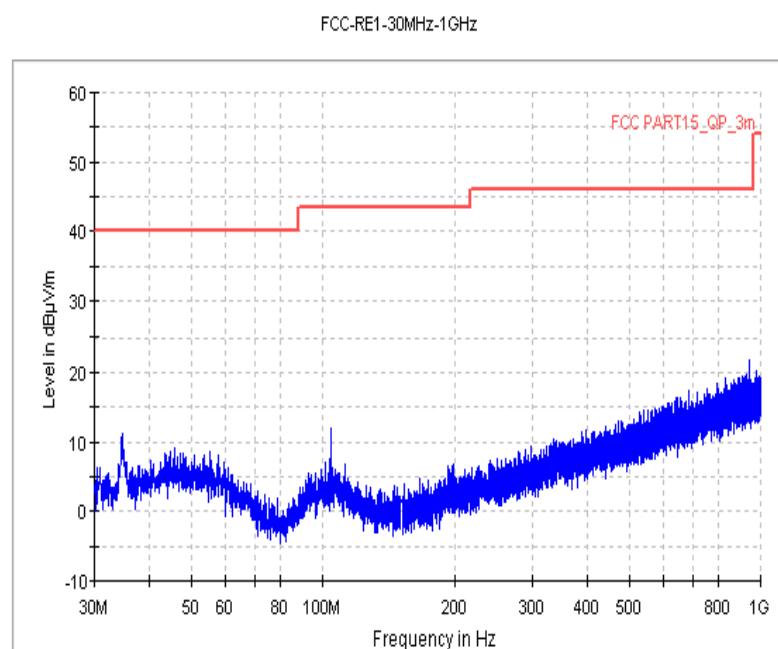
**Fig. 49 Conducted Spurious Emission (All channel, 18 GHz-26 GHz)**



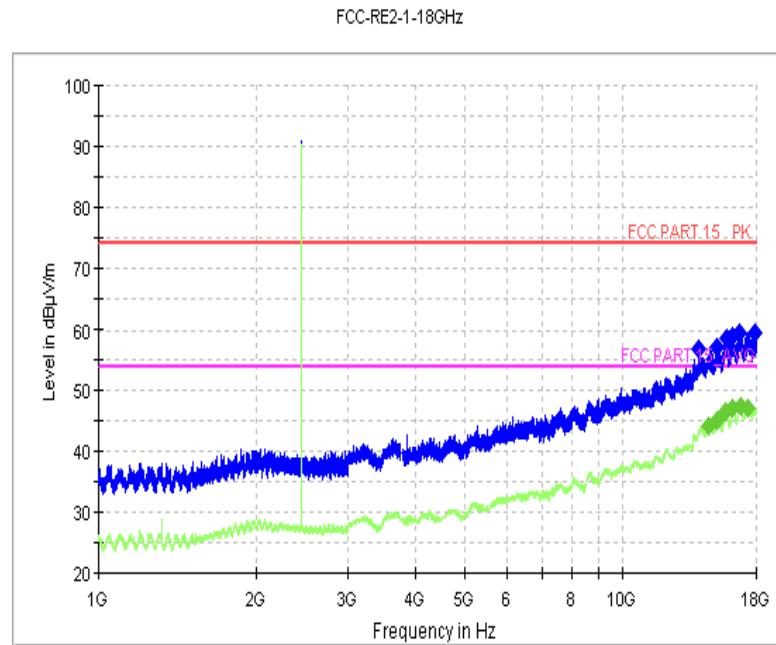
**Fig.50 Radiated Spurious Emission (GFSK, Ch0, 1 GHz-18GHz)**



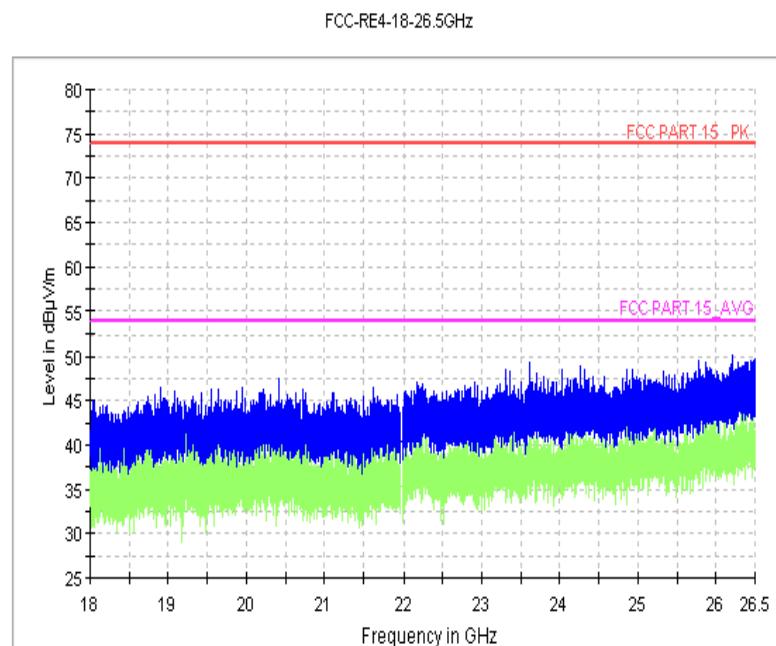
**Fig.51 Radiated Spurious Emission (GFSK, Ch39, 9 kHz-30MHz)**



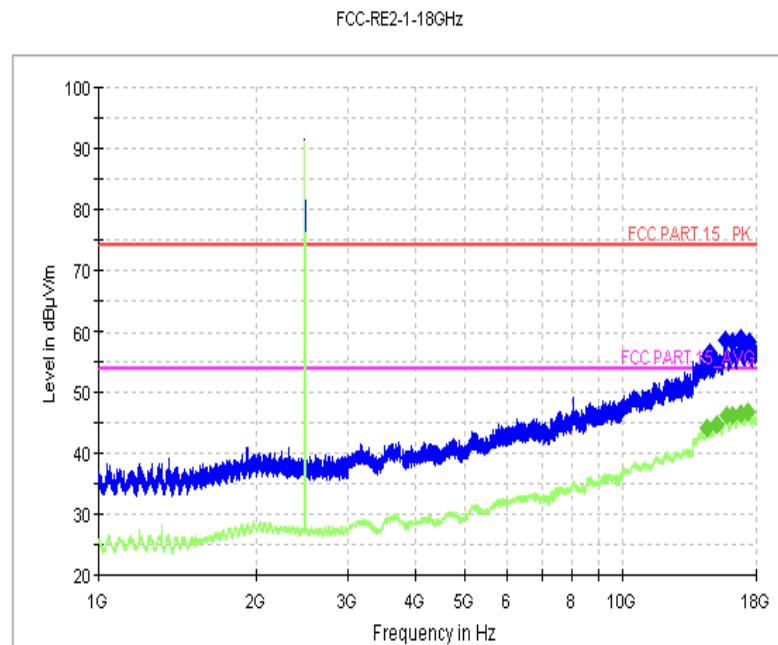
**Fig.52 Radiated Spurious Emission (GFSK, Ch39, 30MHz-1 GHz)**



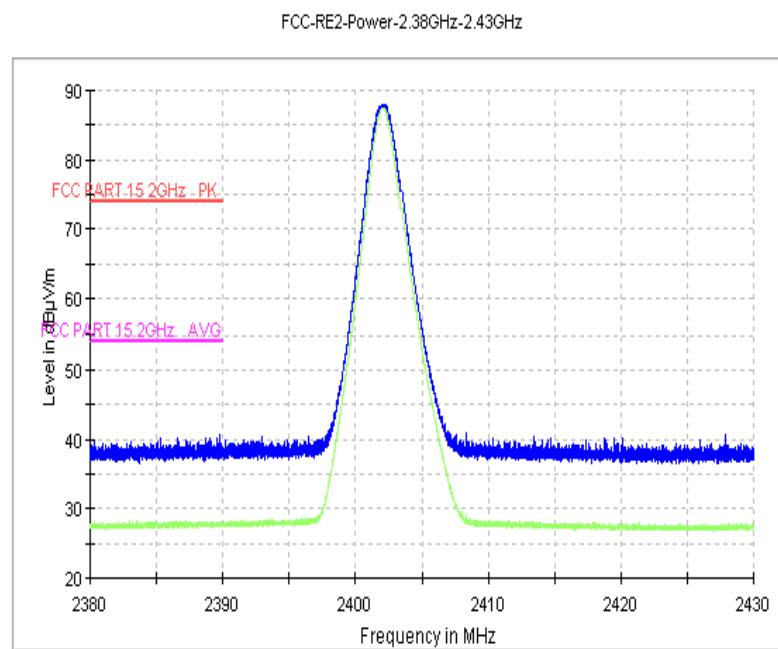
**Fig.53 Radiated Spurious Emission (GFSK, Ch39, 1 GHz-18GHz)**



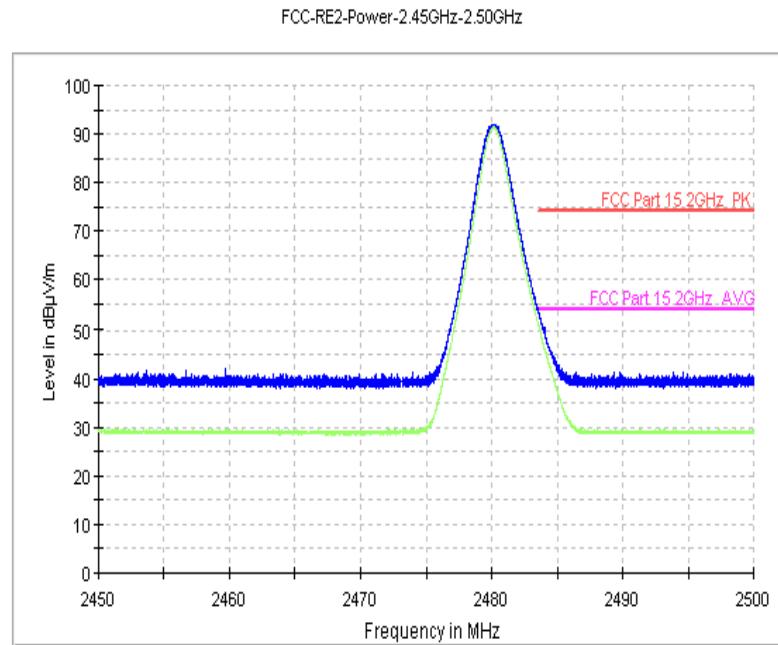
**Fig.54 Radiated Spurious Emission (GFSK, Ch39, 18 GHz-26.5GHz)**



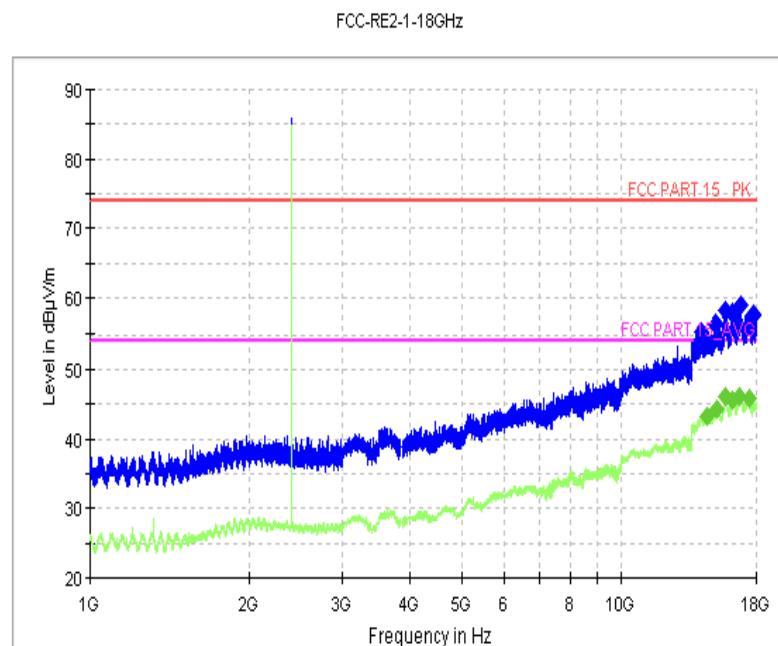
**Fig.55 Radiated Spurious Emission (GFSK, Ch78, 1 GHz-18 GHz)**



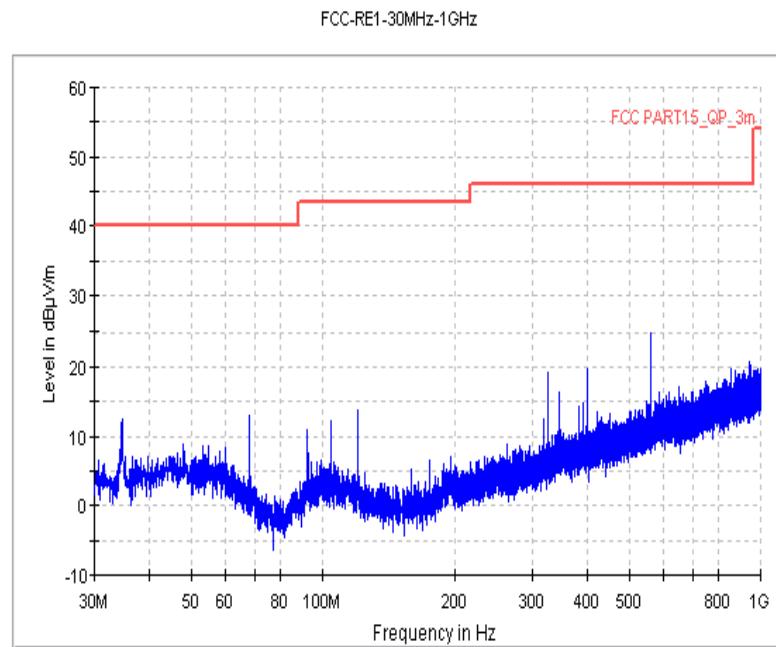
**Fig.56 Radiated Emission Power (GFSK, Ch0, 2380GHz~2450GHz)**



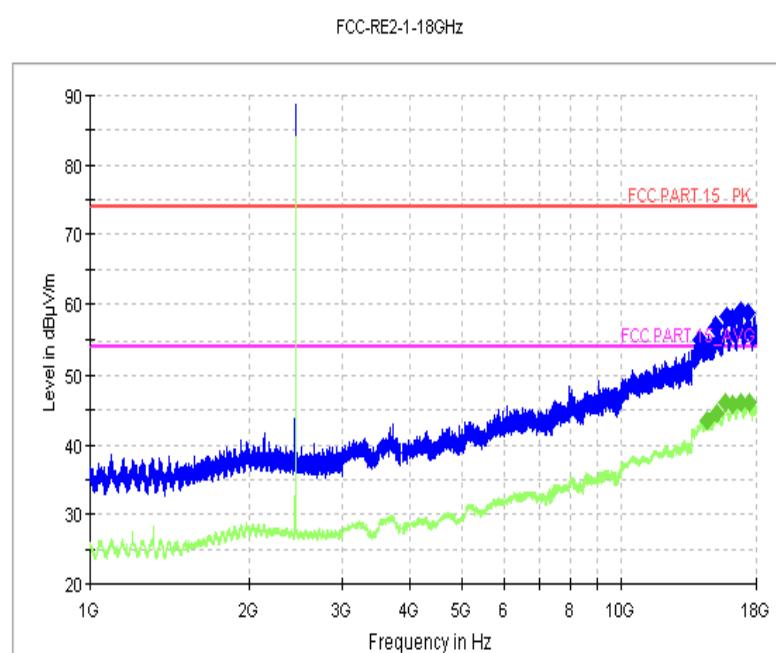
**Fig.57 Radiated Emission Power (GFSK, Ch78, 2450GHz~2500GHz)**



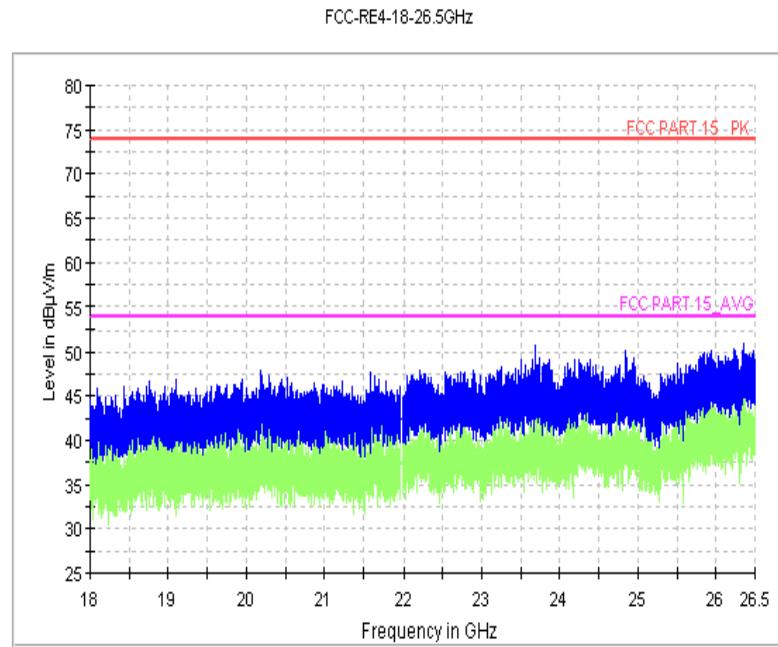
**Fig.58 Radiated Spurious Emission ( $\pi/4$  DQPSK, Ch0, 1 GHz-18GHz)**



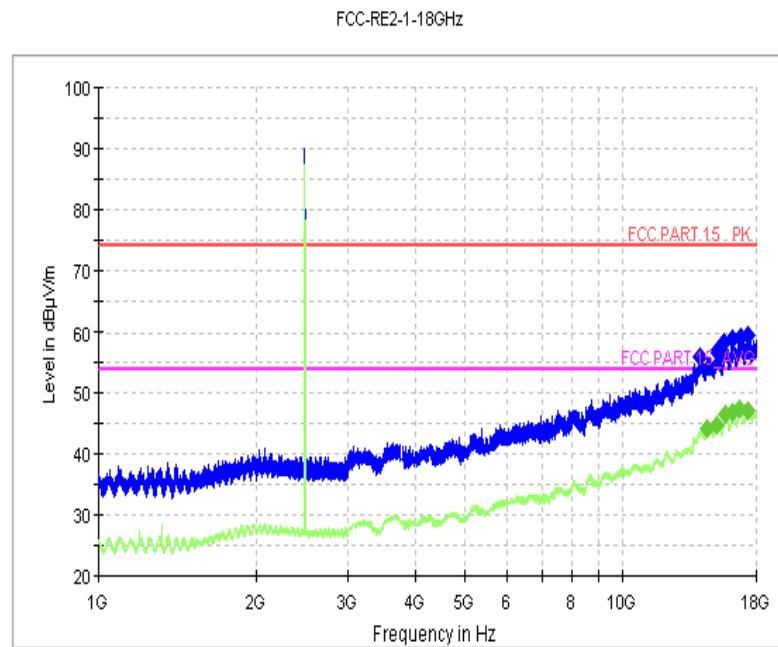
**Fig.59 Radiated Spurious Emission ( $\pi/4$  DQPSK, Ch39, 30MHz-1 GHz)**



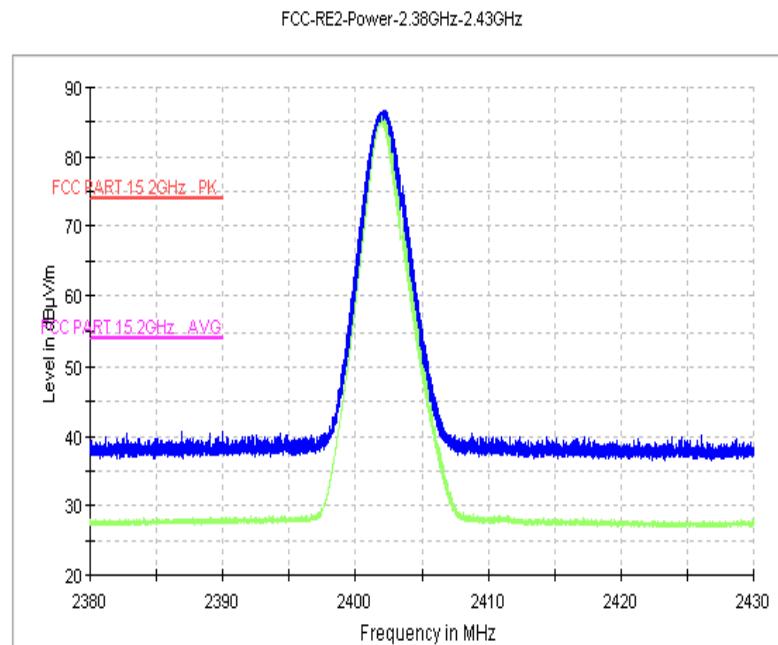
**Fig.60 Radiated Spurious Emission ( $\pi/4$  DQPSK, Ch39, 1 GHz-18GHz)**



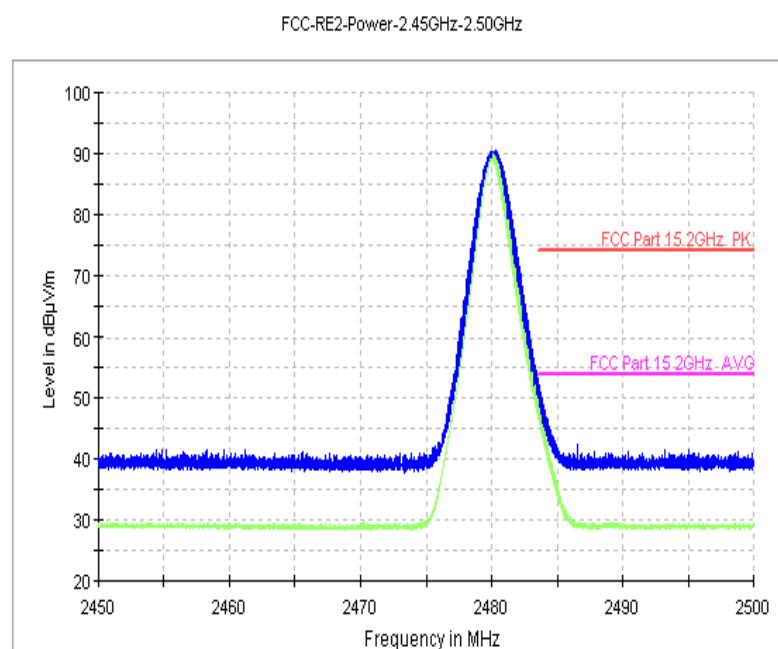
**Fig.61 Radiated Spurious Emission ( $\pi/4$  DQPSK, Ch39, 18 GHz-26.5GHz)**



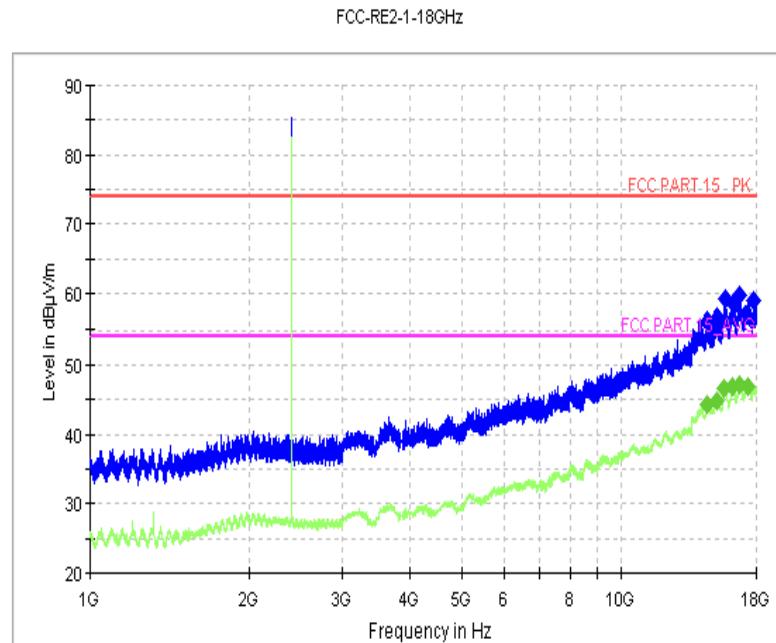
**Fig.62 Radiated Spurious Emission ( $\pi/4$  DQPSK, Ch78, 1 GHz-18 GHz)**



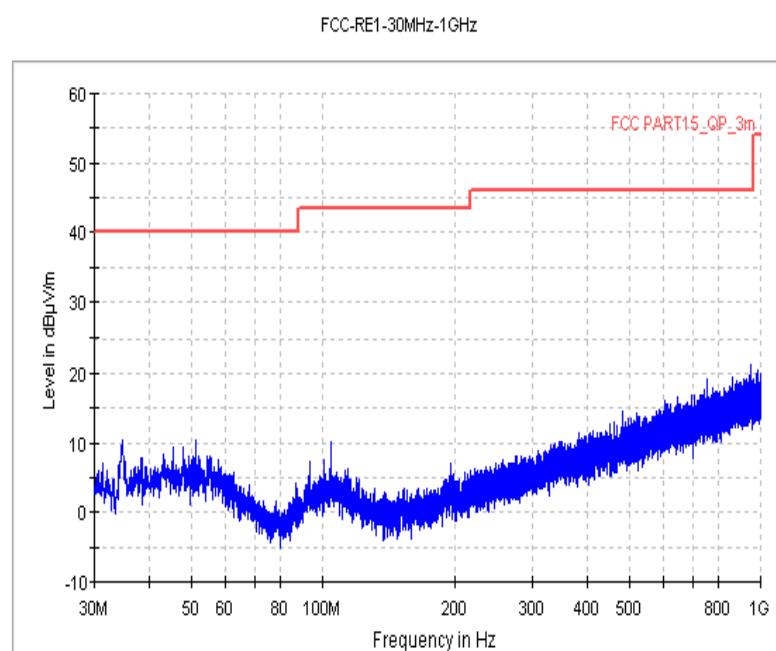
**Fig.63 Radiated Emission Power ( $\pi/4$  DQPSK, Ch0, 2380GHz~2450GHz)**



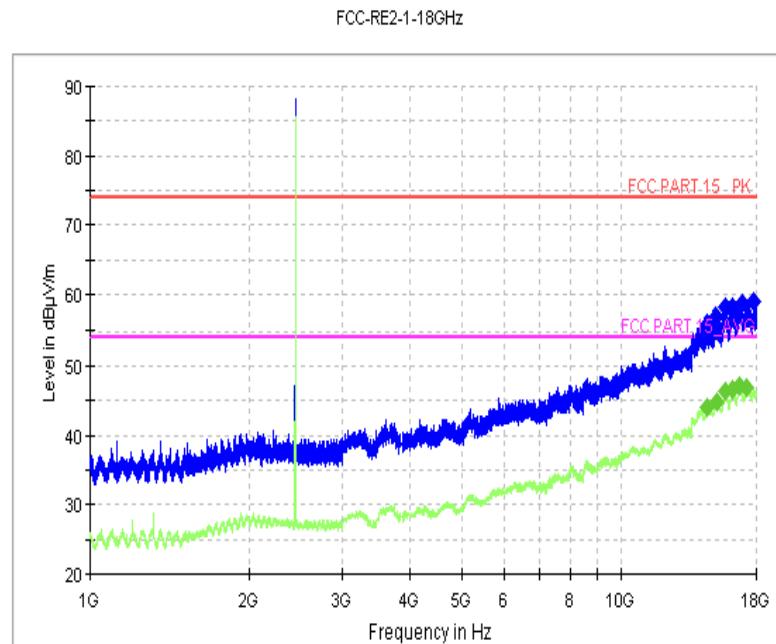
**Fig.64 Radiated Emission Power ( $\pi/4$  DQPSK, Ch78, 2450GHz~2500GHz)**



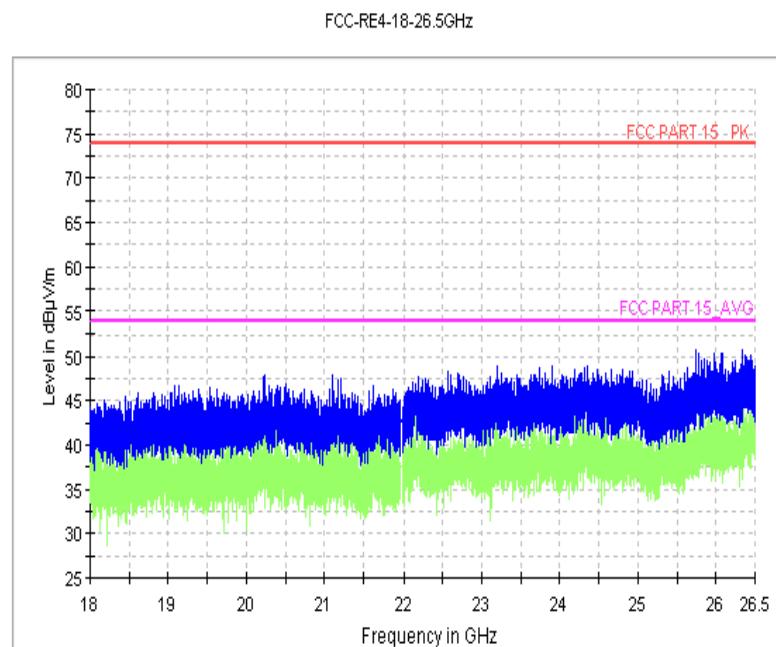
**Fig.65 Radiated Spurious Emission (8DPSK, Ch0, 1 GHz-18GHz)**



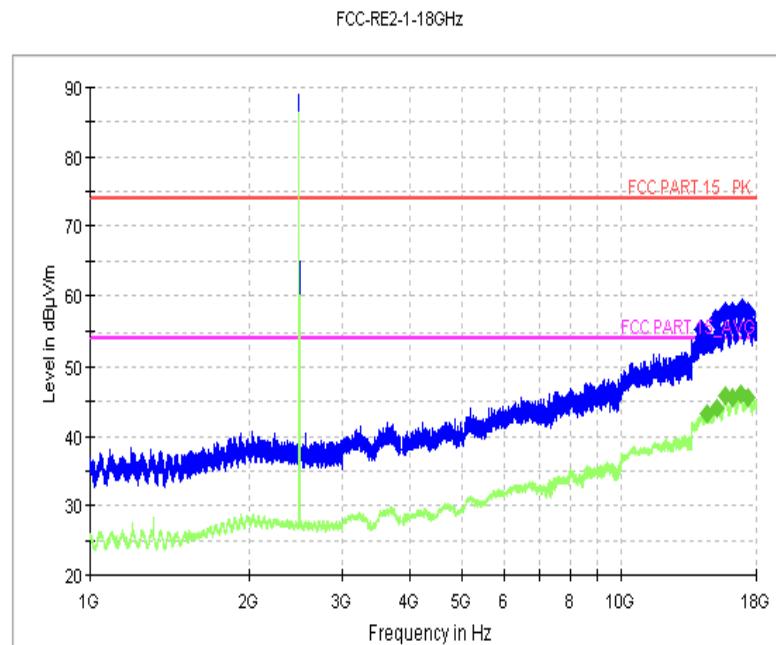
**Fig.66 Radiated Spurious Emission (8DPSK, Ch39, 30MHz-1 GHz)**



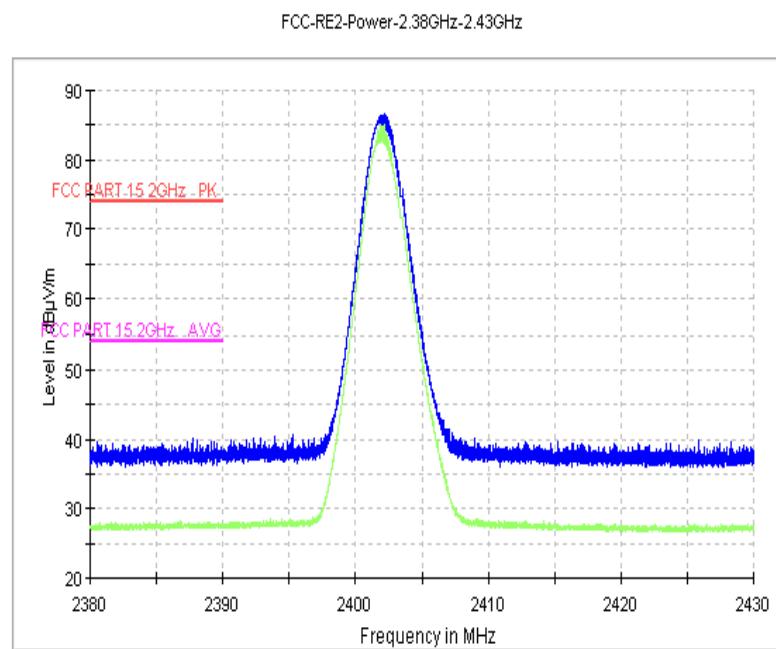
**Fig.67 Radiated Spurious Emission (8DPSK, Ch39, 1 GHz-18GHz)**



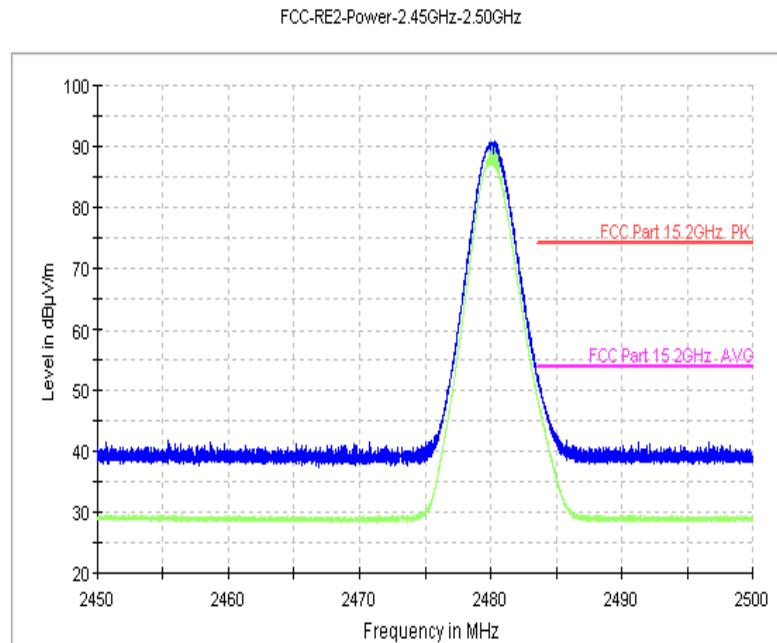
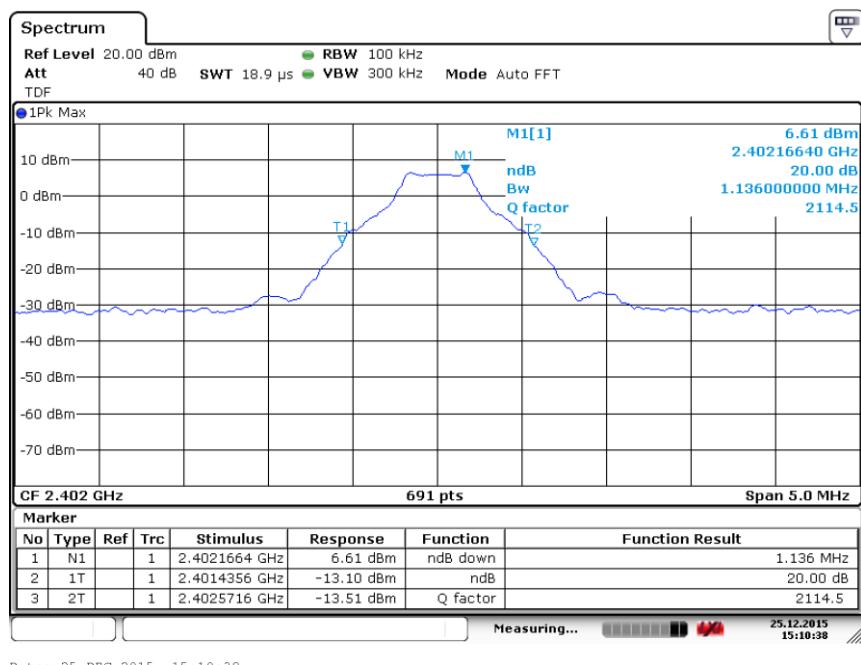
**Fig.68 Radiated Spurious Emission (8DPSK, Ch39, 18 GHz-26.5GHz)**

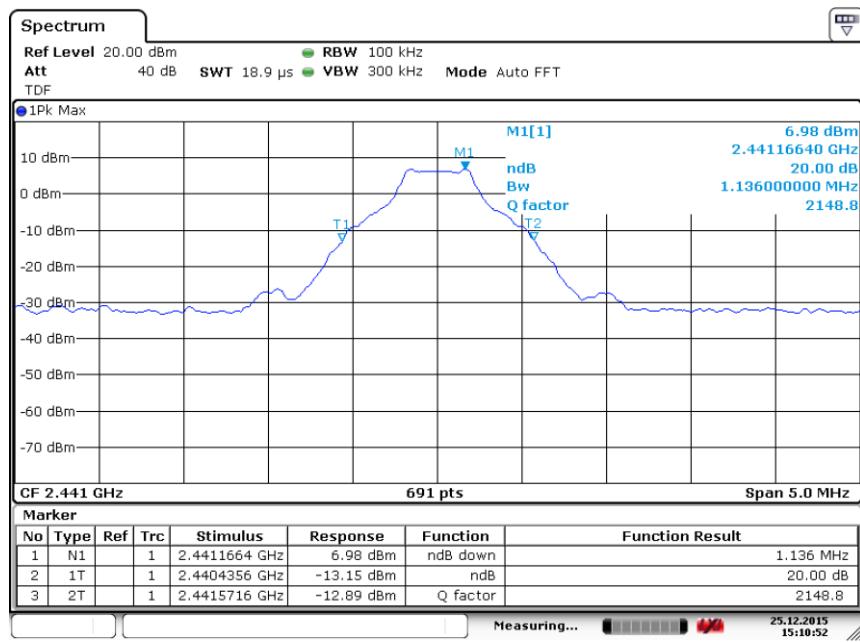


**Fig.69 Radiated Spurious Emission (8DPSK, Ch78, 1 GHz-18 GHz)**

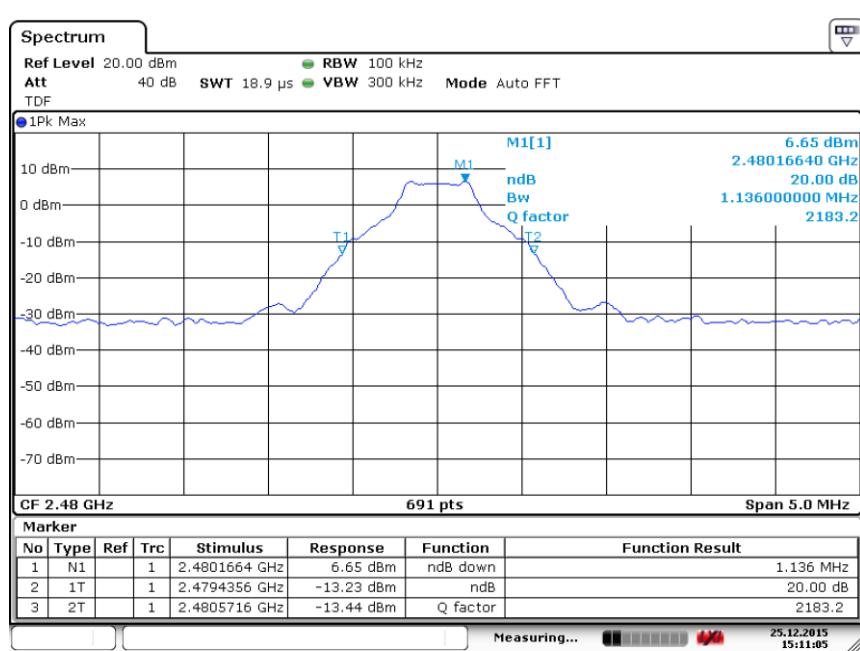


**Fig.70 Radiated Emission Power (8DPSK, Ch0, 2380GHz~2450GHz)**

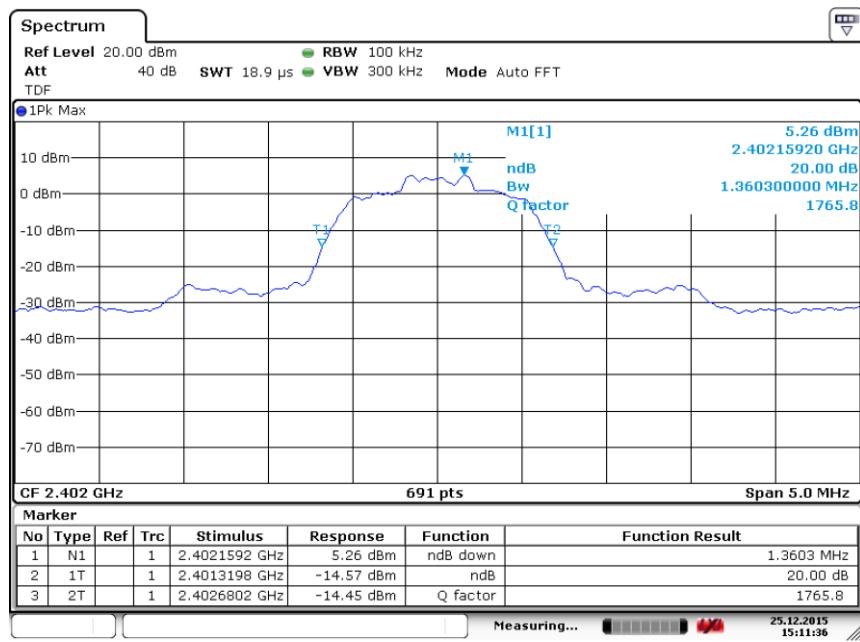
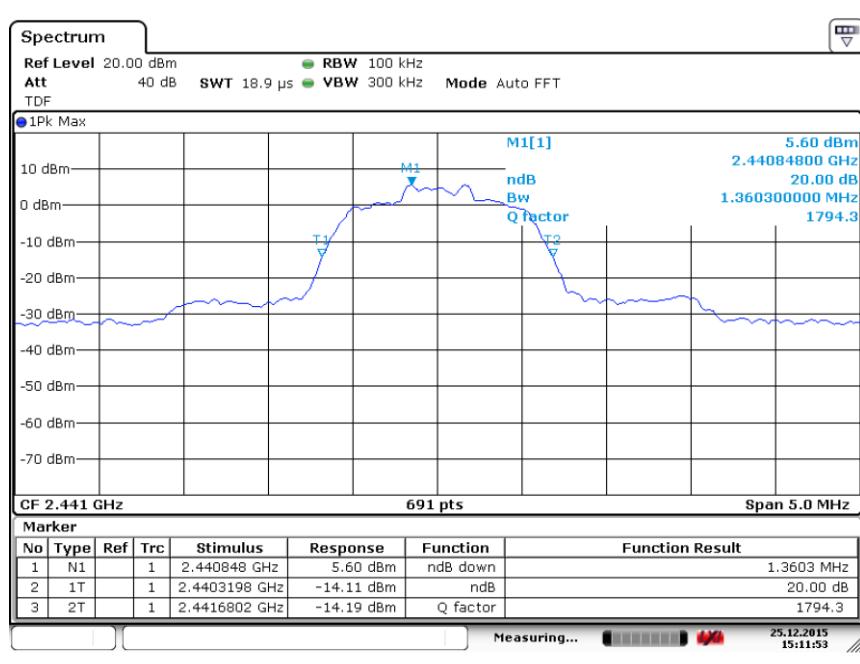

**Fig.71 Radiated Emission Power (8DPSK, Ch78, 2450GHz~2500GHz)**

**Fig. 72 Occupied 20dB Bandwidth (GFSK, Ch 0)**

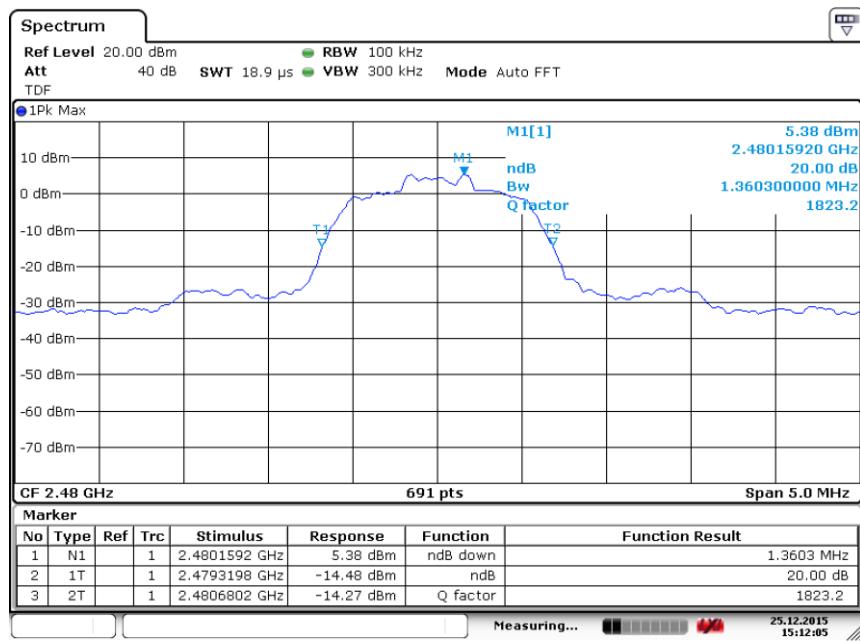
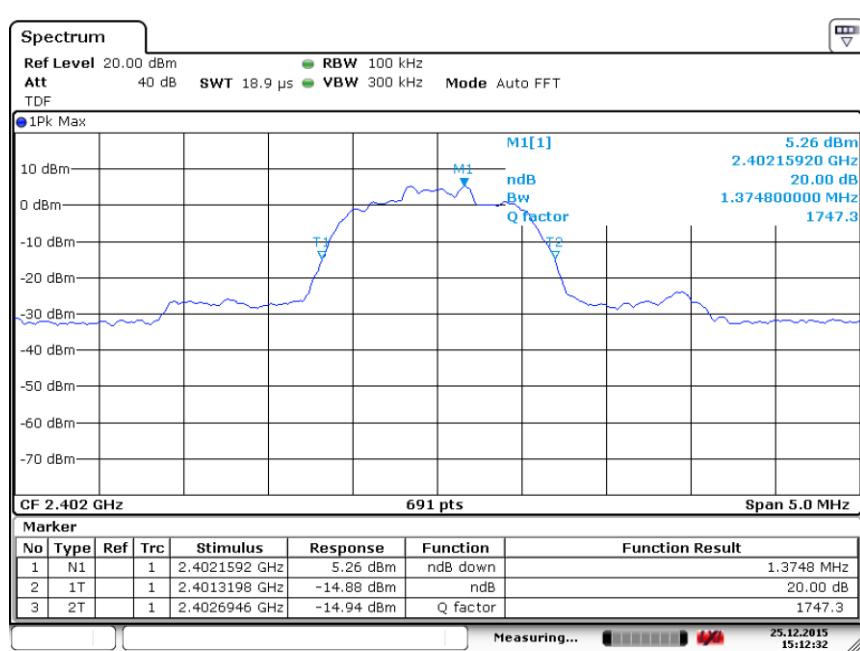


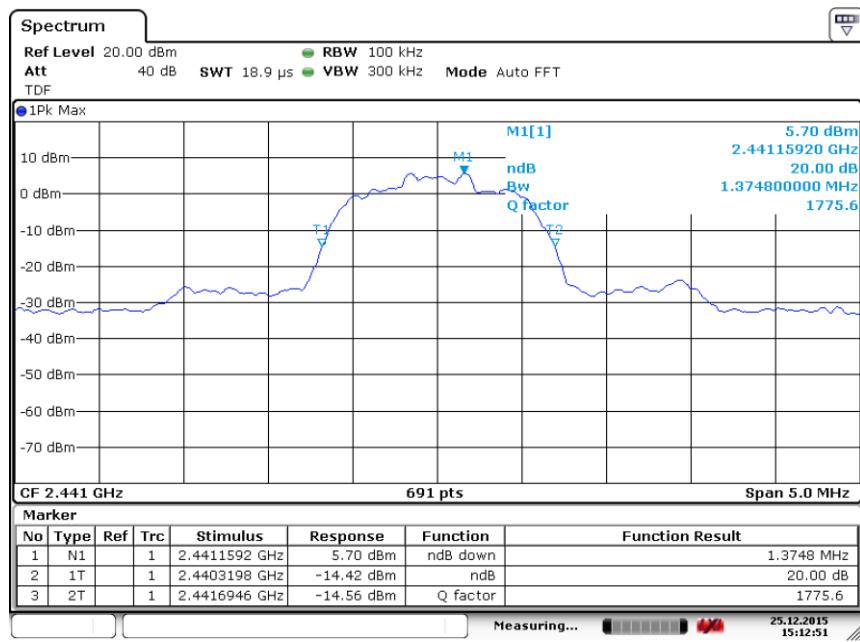
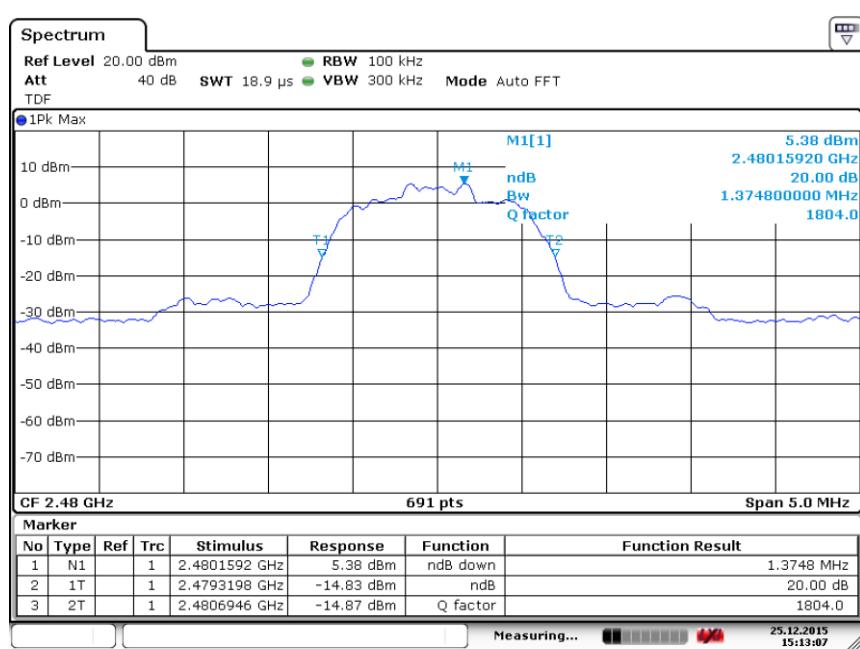
**Fig. 73 Occupied 20dB Bandwidth (GFSK, Ch 39)**

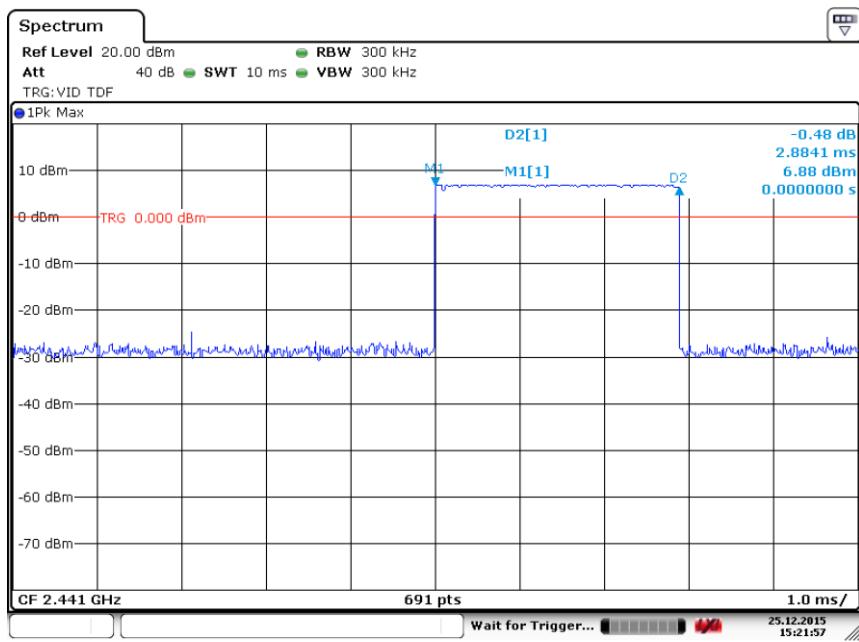


**Fig. 74 Occupied 20dB Bandwidth (GFSK, Ch 78)**


**Fig. 75 Occupied 20dB Bandwidth ( $\pi/4$  DQPSK, Ch 0)**

**Fig. 76 Occupied 20dB Bandwidth ( $\pi/4$  DQPSK, Ch 39)**

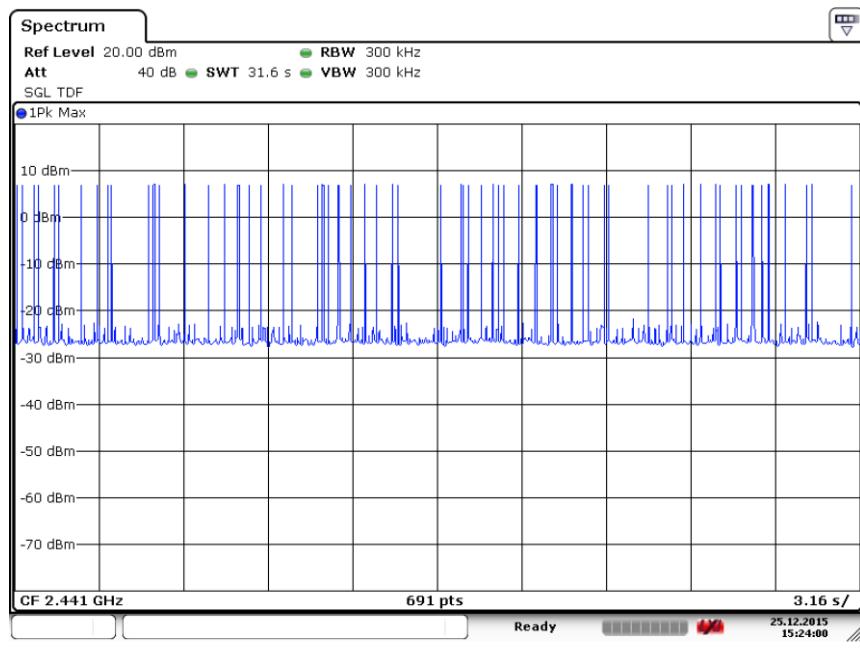

**Fig. 77 Occupied 20dB Bandwidth ( $\pi/4$  DQPSK, Ch 78)**

**Fig. 78 Occupied 20dB Bandwidth (8DPSK, Ch 0)**


**Fig. 79 Occupied 20dB Bandwidth (8DPSK, Ch 39)**

**Fig. 80 Occupied 20dB Bandwidth (8DPSK, Ch 78)**



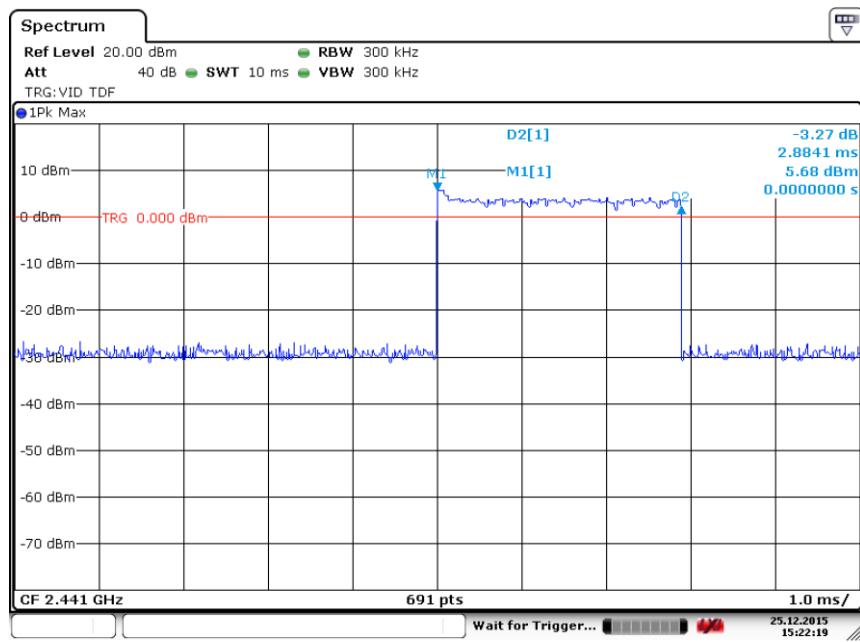
Date: 25.DEC.2015 15:21:57

**Fig. 81 Time of Occupancy(Dwell Time) (GFSK, Ch39)**



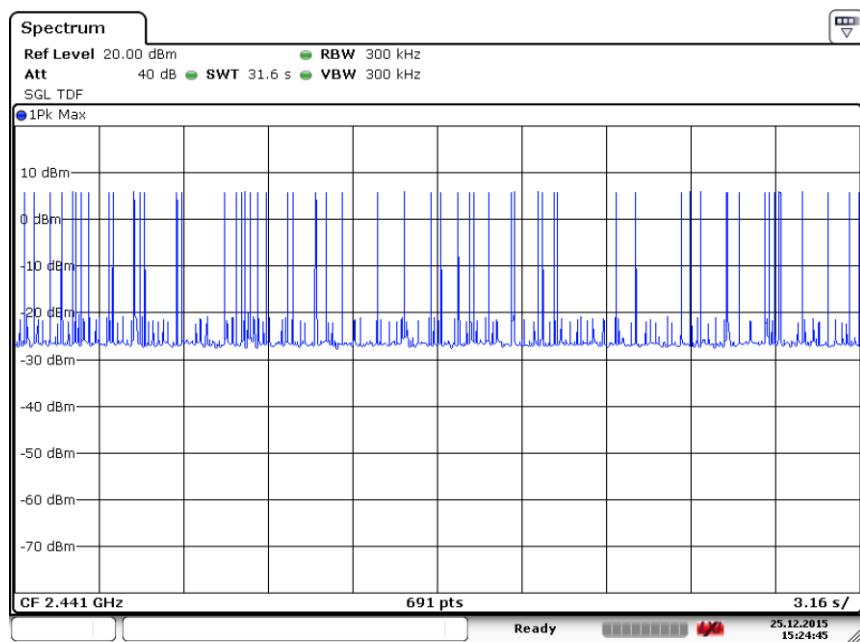
Date: 25.DEC.2015 15:24:00

**Fig. 82 Number of Transmissions (GFSK, Ch39)**



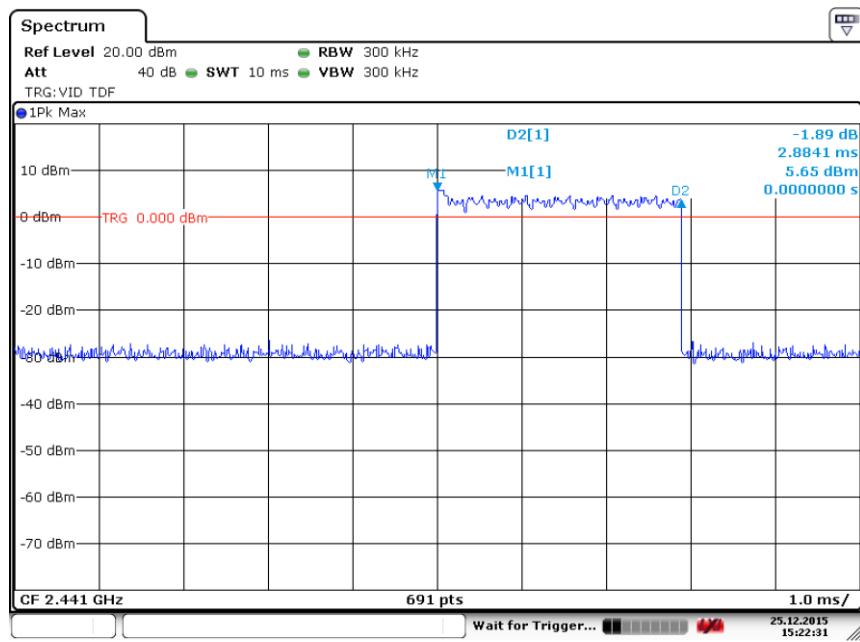
Date: 25.DEC.2015 15:22:19

**Fig. 83 Time of Occupancy(Dwell Time) ( $\pi/4$  DQPSK, Ch39)**



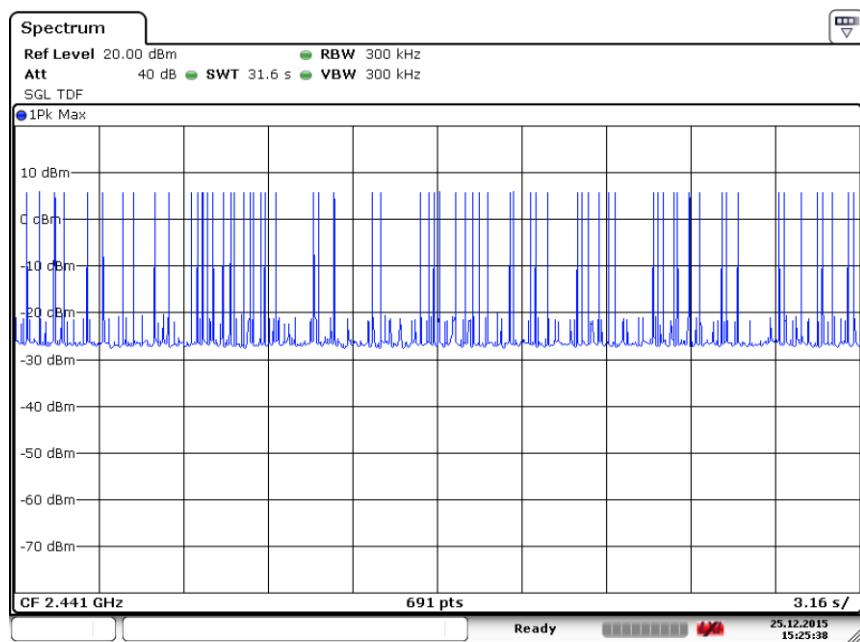
Date: 25.DEC.2015 15:24:45

**Fig. 84 Number of Transmissions ( $\pi/4$  DQPSK, Ch39)**



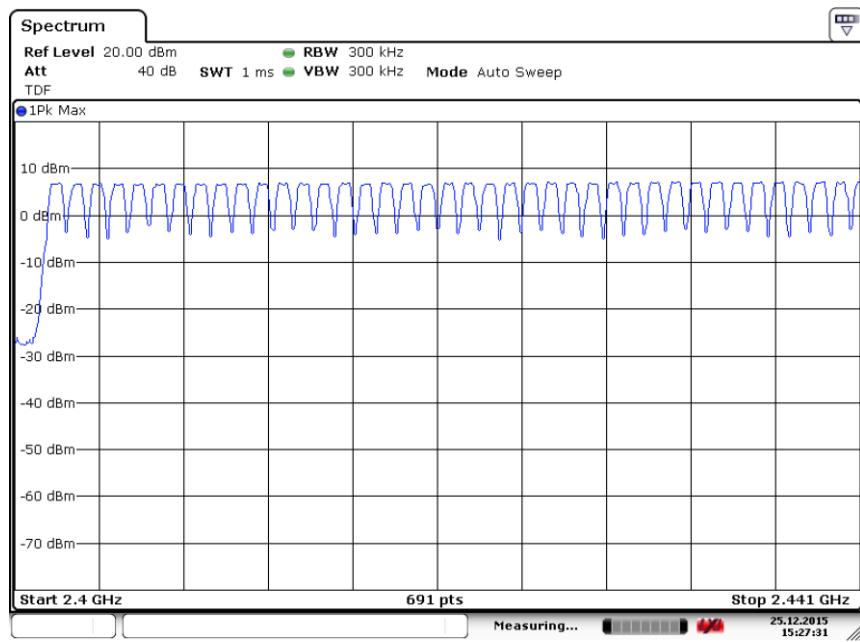
Date: 25.DEC.2015 15:22:32

**Fig. 85 Time of Occupancy(Dwell Time) (8DPSK, Ch39)**

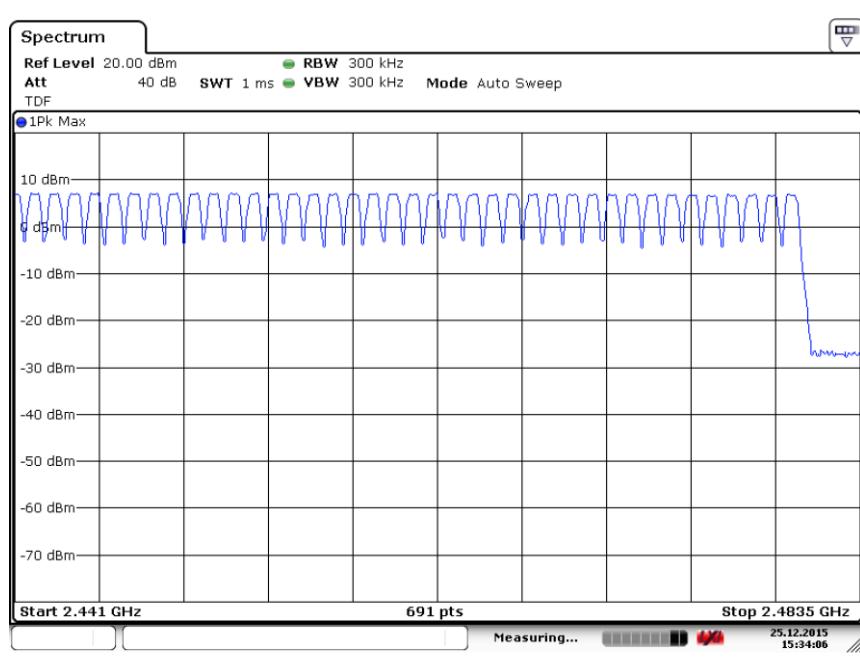


Date: 25.DEC.2015 15:25:38

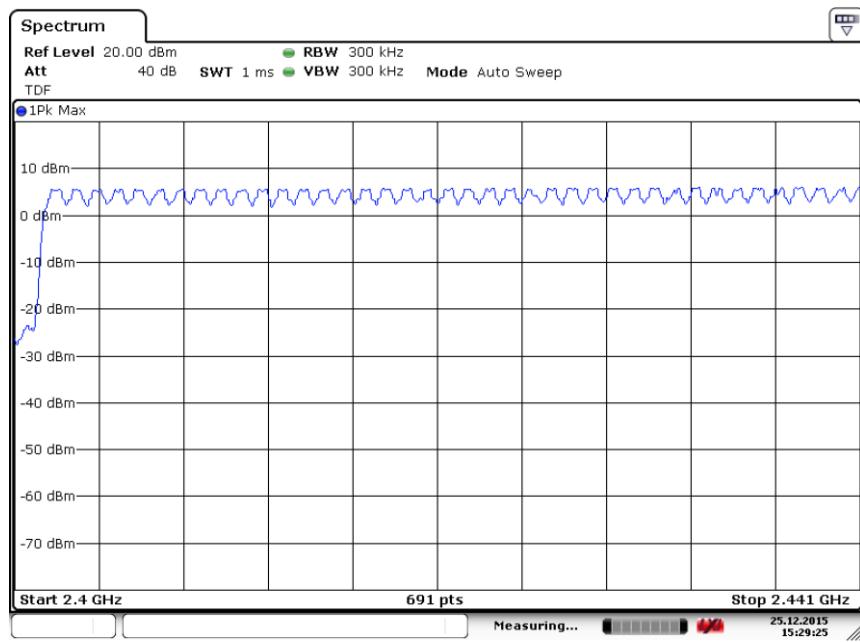
**Fig. 86 Number of Transmissions (8DPSK, Ch39)**



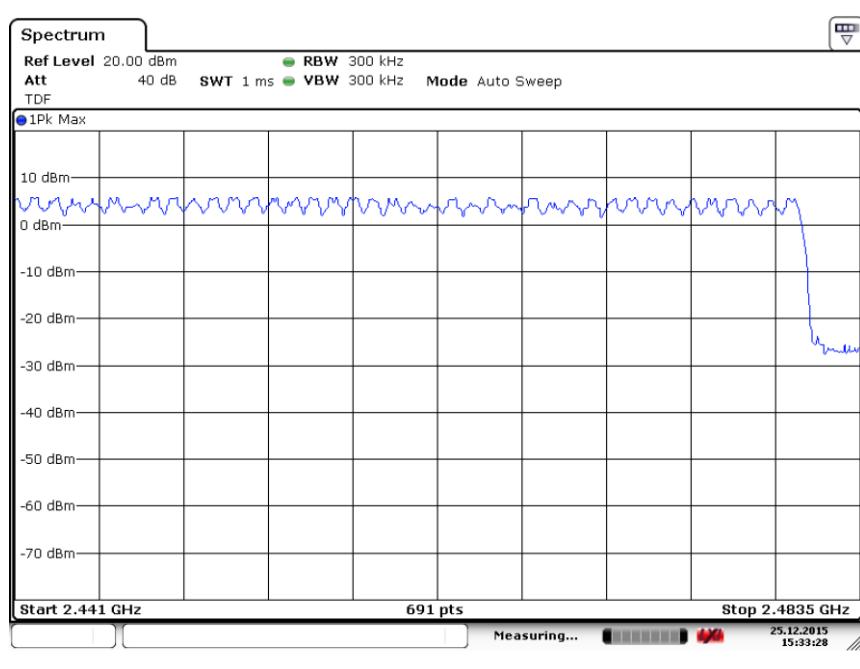
**Fig. 87 Hopping channel ch0~39 (GFSK, Ch39)**



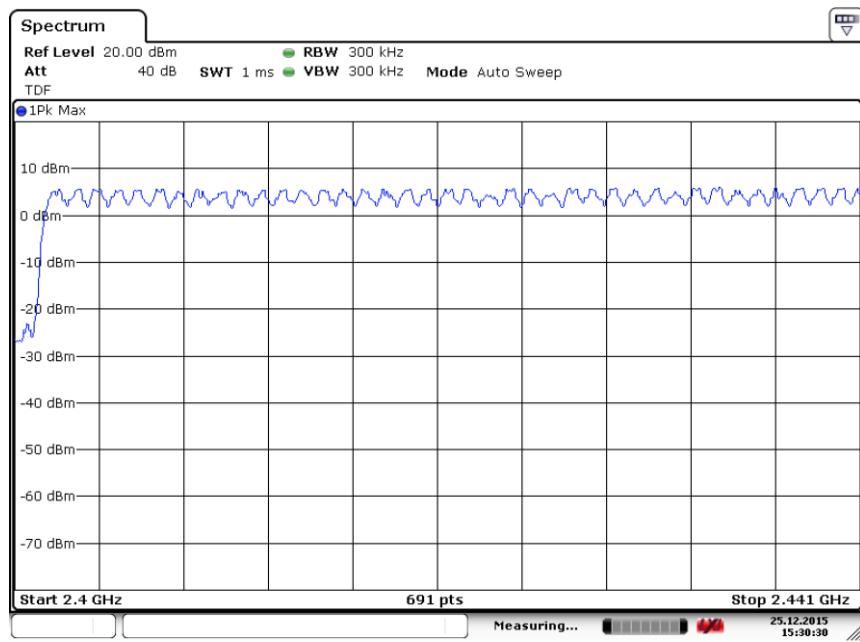
**Fig. 88 Hopping channel ch39~78 (GFSK, Ch39)**



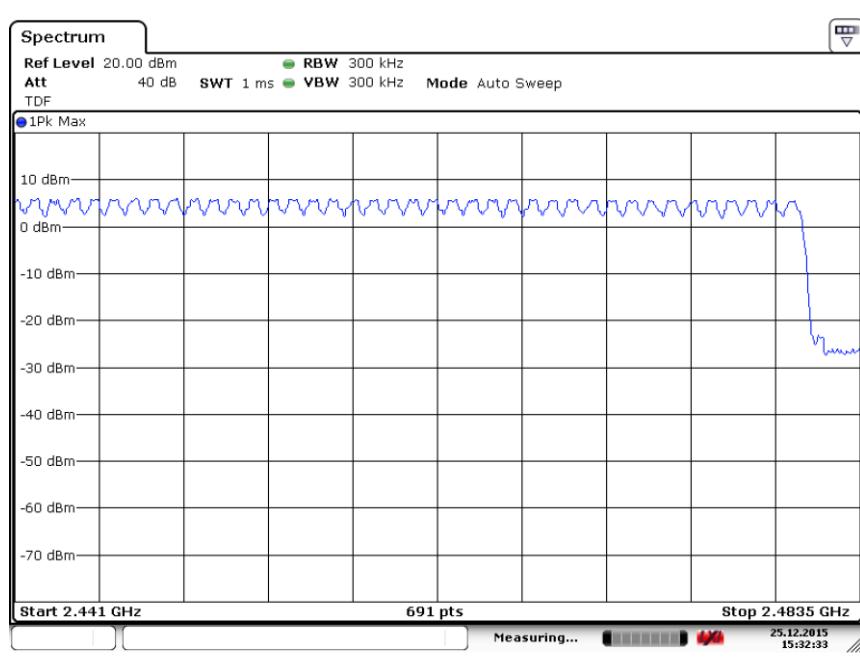
**Fig. 89 Hopping channel ch0~39 ( $\pi/4$  DQPSK, Ch39)**



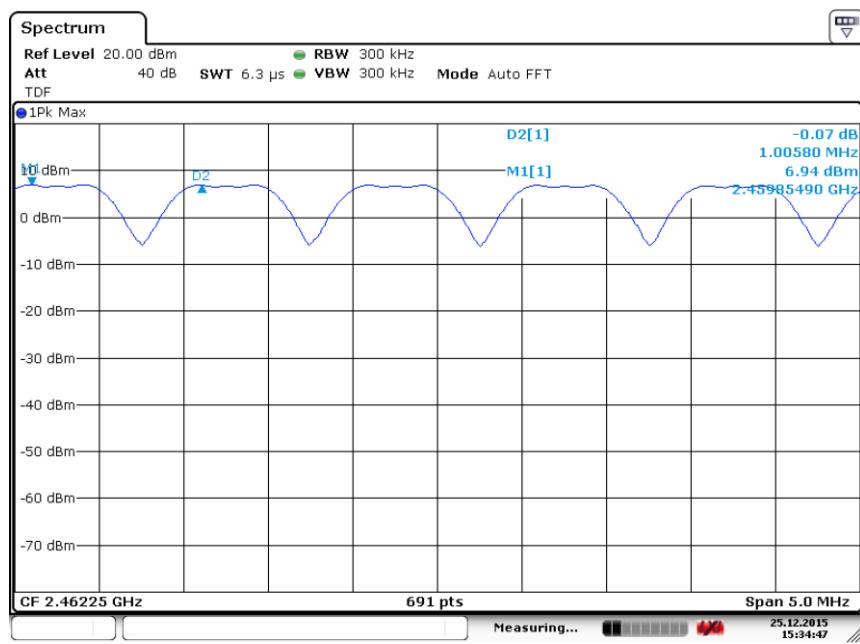
**Fig. 90 Hopping channel ch39~78 ( $\pi/4$  DQPSK, Ch39)**



**Fig. 91 Hopping channel ch0~39 (8DPSK, Ch39)**

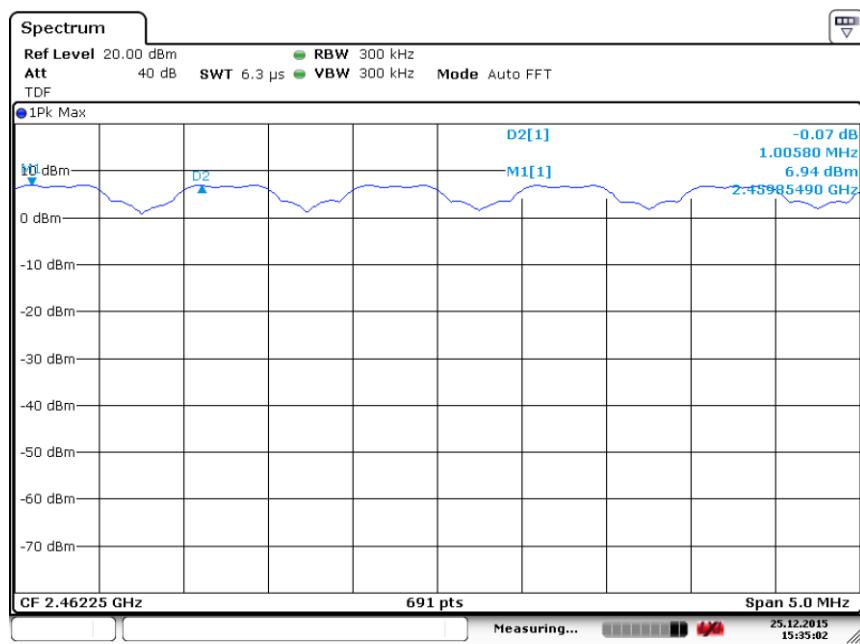


**Fig. 92 Hopping channel ch39~78 (8DPSK, Ch39)**



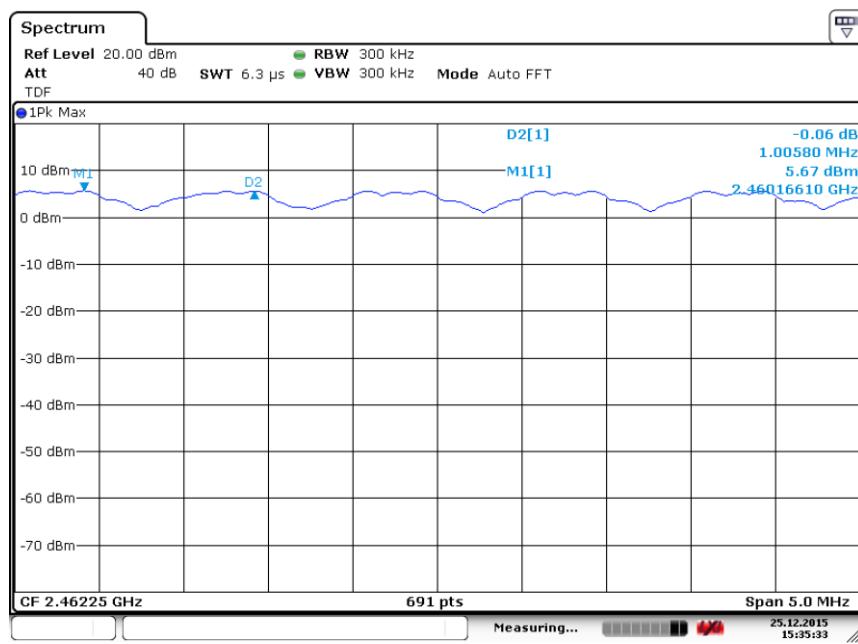
Date: 25.DEC.2015 15:34:47

**Fig. 93 Carrier Frequency Separation (GFSK, Ch39)**



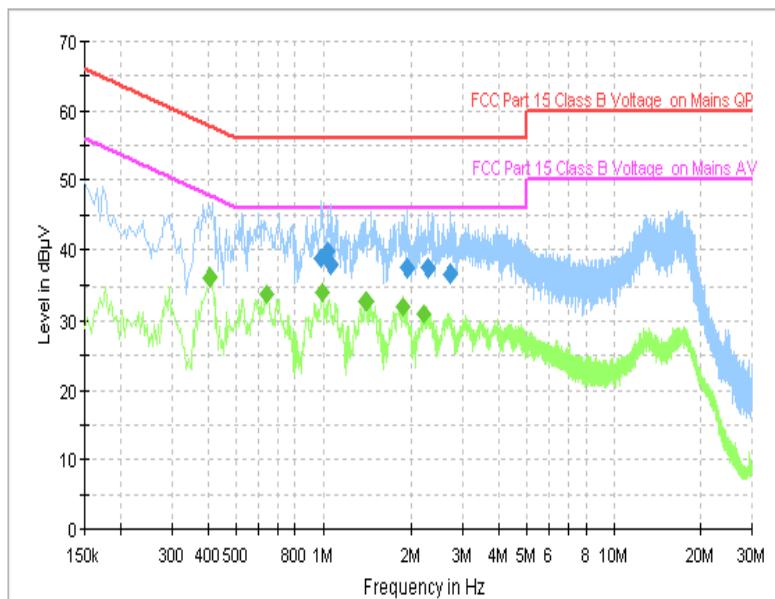
Date: 25.DEC.2015 15:35:02

**Fig. 94 Carrier Frequency Separation ( $\pi/4$  DQPSK, Ch39)**



**Fig. 95 Carrier Frequency Separation (8DPSK, Ch39)**

ESH2-Z5 Scan-FCC

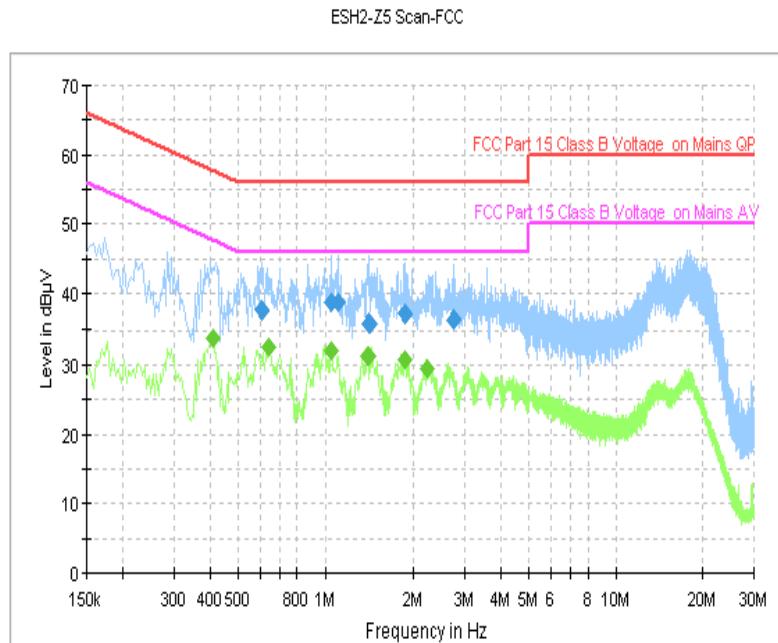

**Fig. 96 AC Power line Conducted Emission (Traffic, AE1)**

MEASUREMENT RESULT: " QuasiPeak "

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.982000	38.8	GND	N	10.1	17.2	56.0
1.042000	39.9	GND	N	10.1	16.1	56.0
1.066000	38.0	GND	N	10.1	18.0	56.0
1.922000	37.6	GND	N	10.1	18.4	56.0
2.274000	37.4	GND	N	10.2	18.6	56.0
2.714000	36.7	GND	N	10.2	19.3	56.0

MEASUREMENT RESULT: " Average "

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.406000	36.1	GND	L1	10.0	11.6	47.7
0.638000	33.9	GND	L1	10.0	12.1	46.0
0.990000	34.0	GND	L1	10.1	12.0	46.0
1.398000	32.8	GND	L1	10.1	13.2	46.0
1.862000	32.0	GND	L1	10.1	14.0	46.0
2.210000	31.1	GND	L1	10.1	14.9	46.0



**Fig. 97 AC Power line Conducted Emission (Idle, AE1)**

MEASUREMENT RESULT: " QuasiPeak "

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.602000	37.7	GND	L1	10.0	18.3	56.0
1.054000	38.7	GND	N	10.1	17.3	56.0
1.106000	38.6	GND	N	10.1	17.4	56.0
1.410000	35.9	GND	N	10.1	20.1	56.0
1.862000	37.2	GND	N	10.1	18.8	56.0
2.738000	36.3	GND	N	10.2	19.7	56.0

MEASUREMENT RESULT: " Average "

Frequency (MHz)	Average (dB $\mu$ V)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.410000	33.8	GND	L1	10.0	13.9	47.6
0.638000	32.4	GND	L1	10.0	13.6	46.0
1.046000	32.0	GND	L1	10.1	14.0	46.0
1.398000	31.4	GND	L1	10.1	14.6	46.0
1.862000	30.8	GND	L1	10.1	15.2	46.0
2.222000	29.5	GND	L1	10.1	16.5	46.0



**ANNEX C: Persons involved in this testing**

Test Name	Tester
Maximum Peak Output Power	Xu Ye, Tang Weisheng
Peak Power Spectral Density	Xu Ye, Tang Weisheng
Occupied 6dB Bandwidth	Xu Ye, Tang Weisheng
Band Edges Compliance	Xu Ye, Tang Weisheng
Transmitter Spurious Emission - Conducted	Xu Ye, Tang Weisheng
Transmitter Spurious Emission - Radiated	Xu Ye, Tang Weisheng
AC Powerline Conducted Emission	Xu Ye, Tang Weisheng

**\*\*\*END OF REPORT\*\*\***