FCC PART 15C
TEST REPORT
No. I14N00915-BT

For

Yulong Computer Telecommunication Scientific (Shenzhen) Co., Ltd

Mobile Phone

Model Name: Vodafone 890N

Marketing Name: Vodafone Smart 4 turbo

With

Hardware Version: T3

Software Version: 4.4.150.00.T3.140821.KTU84P.VF.DE

FCC ID: R38YL890N

Issued Date: Sep 18th, 2014

Test Laboratory:
FCC 2.948 Listed: No.310359
IC O.A.T.S listed: No.6629C-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 TMC Beijing.

TMC Beijing, Telecommunication Metrology Center of Ministry of Industry and Information Technology
No. 52, Huayuan Bei Road, Haidian District, Beijing, P. R. China 100191
Tel:+86(0)10-62304633-2678 , Fax:+86(0)10-62304633-2504 Email:welcome@emcite.com. www.emcite.com

CONTENTS

1. Test Laboratory

1.1. Testing Location

Company Name:	TMC Shenzhen, Telecommunication Metrology Center of MIIT
Address:	No. 12 Building, Shangsha Innovation and Technology Park, Futian District, Shenzhen, P. R. China
Postal Code:	518048
Telephone:	+86(0)755-33322000
Fax:	+86(0)755-33322001

1.2. Testing Environment

Normal Temperature:	15℃-30℃
Extreme Temperature:	-20℃/+55℃
Relative Humidity:	30%-60%

1.3. Project data

Project Leader:	Zhang Bojun
Test Engineer:	Tang Weisheng
Testing Start Date:	Aug 25th, 2014
Testing End Date:	Sep 12th, 2014

1.4. Signature

Tang Weisheng
(Prepared this test report)

Zhang Bojun
(Reviewed this test report)

Lu Minniu
Director of the laboratory
(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name:	Yulong Computer Telecommunication Scientific (Shenzhen) Co., Ltd
Address /Post:	Coolpad Information Harbor, 2nd Mengxi Road, Hi-Tech Industrial Park(North), Nanshan district, Shenzhen, P.R.C
City:	Shenzhen
Country:	China
E-mail:	liamei@yulong.com
Telephone:	+86 13410415799
Fax:	/

2.2. Manufacturer Information

Company Name:	Yulong Computer Telecommunication Scientific (Shenzhen) Co., Ltd
Address /Post:	Coolpad Information Harbor, 2nd Mengxi Road, Hi-Tech Industrial Park(North), Nanshan district, Shenzhen, P.R.C
City:	Shenzhen
Country:	China
E-mail:	liamei@yulong.com
Telephone:	+86 13410415799
Fax:	/

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

3.1. About EUT

Description	Mobile Phone
Model Name	Vodafone 890N
Marketing Name	Vodafone Smart 4 turbo
Frequency Band	2402MHz~2480MHz
Type of Modulation	GFSK/π/4 DQPSK/8DPSK
Number of Channels	79
FCC ID	R38YL890N

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

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version
EUT1	/	T3	4.4.150.00.T3.140821.KTU84P.VF.DE

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

3.3. Internal Identification of AE used during the test

AE ID*	Description	Type	SN
AE1	Battery	/	/
AE2	Adapter	CYSK05-050100A-UK	/
AE3	Adapter	CYSK05-050100A-CE	/

*AE ID: is used to identify the test accessory 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, 2013 Edition
ANSI C63.4	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	2003
FCC Public Notice DA 00-705	Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems	Mar, 2000

5. Laboratory Environment

Half-anechoic chamber (11.20 meters×6.10 meters×5.60 meters) did not exceed following limits:

Temperature	Min. = 15 ℃, Max. = 30 ℃
Relative humidity	Min. = 30 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 2M Ω
Ground system resistance	< 0.5 Ω
Normalized Site Attenuation (NSA)	< ±3.5dB, with 3m of Measuring distance, 30MHz – 1000MH
Uniformity of field strength	Between 0 and 6 dB, from 80MHz to 3000 MHz

Fully-anechoic chamber (11.20 meters×6.10 meters×6.60 meters) did not exceed following limits:

Temperature	Min. = 15 ℃, Max. = 30 ℃
Relative humidity	Min. = 30 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 2M Ω
Ground system resistance	< 0.5 Ω
VSWR	Between 0 and 6 dB, from 30MHz to 18 000 MHz

Conduction Lab did not exceed following limits:

Temperature	Min.=15 ℃, Max.=30 ℃
Relative humidity	Min.=30 %, Max.= 60 %
Shielding effectiveness	> 80 dB
Electrical insulation	> 2M Ω
Ground system resistance	< 0.5 Ω

6. Summary of Test Results

6.1. 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**

6.2. Statements

TMC has evaluated the test cases requested by the applicant/manufacturer as listed in section 6.1 of this report, for the EUT specified in section 3, according to the standards or reference documents listed in section 4.2

6.3. Terms used in the result table

Terms used in Verdict column

P	Pass
NA	Not Available
F	Fail

Abbreviations

AC	Alternating Current
BW	Band Width
ISM	Industrial, Scientific and Medical
RF	Radio Frequency

7. Test Equipments Utilized

Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Due date	Calibration Period
1	Vector Signal Analyzer	FSV40	100903	Rohde & Schwarz	2015-04-22	1 year
2	Bluetooth Tester	CBT32	100584	Rohde & Schwarz	2015-01-11	1 year

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Due date	Calibration Period
1	Chamber	FACT5-2.0	4166	ETS-Lindgren	2016-05-29	3 years
2	Test Receiver	ESCI	100701	Rohde & Schwarz	2015-07-30	1 year
3	Spectrum Analyzer	FSP40	100378	Rohde & Schwarz	2014-12-20	1 year
4	BiLog Antenna	VULB9163	9163-329	Schwarzbeck	2017-01-20	3 years
5	Test Receiver	ESCI	100702	Rohde & Schwarz	2015-07-30	1 year
6	LISN	ESH2-Z5	100196	Rohde & Schwarz	2015-01-14	1 year
7	Signal Generator	SMR40	100541	Rohde & Schwarz	2014-12-26	1 year
8	Dual-Ridge Waveguide Horn Antenna	3117	00066577	ETS-Lindgren	2016-04-01	3 years
9	Loop Antenna	HLA6120	35779	TESEQ	2016-02-25	3 years
10	EMI Antenna	3160-09	00118383	ETS-Lindgren	2015-09-05	3 years

Anechoic chamber

Fully anechoic chamber by ETS-Lindgren.

ANNEX A: EUT photograph

Pic A-1 Mobile phone

Pic A-2 Mobile phone

Pic A-3 Charger

Pic A-4 Charger

ANNEX B: MEASUREMENT RESULTS

B.0 Antenna requirement

Measurement Limit:

Standard	Requirement
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 2.4 dBi.
The RF transmitter uses an integrate antenna without connector.

B.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	1.54	Fig.2	1.52	Fig.3	1.64
π/4 DQPSK	Fig.4	1.21	Fig.5	1.22	Fig.6	1.20
8DPSK	Fig.7	1.18	Fig.8	1.78	Fig.9	1.30

See ANNEX C for test graphs.

Conclusion: Pass

B.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
π /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
π /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

B.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	2.402 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
π /4 DQPSK	0	2.402 GHz	Fig.31	P
		30 MHz-3 GHz	Fig.32	P
		3GHz-18GHz	Fig.33	P
	39	2.480 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	2.402 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

B.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	100kHz/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:

Mode	Channel	Frequency Range	Test Results	Conclusion
GFSK	0	30 MHz ~1 GHz	Fig.50	P
		1 GHz ~ 18 GHz	Fig.51	P
	39	30 MHz ~1 GHz	Fig.52	P
		1 GHz ~ 18 GHz	Fig.53	P
	78	30 MHz ~1 GHz	Fig.54	P
		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
π/4 DQPSK	0	30 MHz ~1 GHz	Fig.58	P
		1 GHz ~ 18 GHz	Fig.59	P
	39	30 MHz ~1 GHz	Fig.60	P
		1 GHz ~ 18 GHz	Fig.61	P
	78	30 MHz ~1 GHz	Fig.62	P
		1 GHz ~ 18 GHz	Fig.63	P
	Power(CH0)	2.38 GHz ~ 2.45 GHz	Fig.64	P
	Power(CH78)	2.45 GHz ~ 2.5 GHz	Fig.65	P
8DPSK	0	30 MHz ~1 GHz	Fig.66	P
		1 GHz ~ 18 GHz	Fig.67	P
	39	30 MHz ~1 GHz	Fig.68	P
		1 GHz ~ 18 GHz	Fig.69	P
	78	30 MHz ~1 GHz	Fig.70	P
		1 GHz ~ 18 GHz	Fig.71	P
	Power(CH0)	2.38 GHz ~ 2.45 GHz	Fig.72	P
	Power(CH78)	2.45 GHz ~ 2.5 GHz	Fig.73	P
/	All channels	18 GHz~ 26.5 GHz	Fig.74	P

GFSK CH0 (1-18GHz)

Frequency (MHz)	MaxPeak-ClearWrite	Polarization	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
14378.000	57.8	H	13.4	16.2	74.0
15177.000	57.7	V	13.1	16.3	74.0
15777.000	59.9	V	14.2	14.1	74.0
16155.000	60.2	H	14.5	13.8	74.0
16778.000	60.7	H	15.2	13.3	74.0
17275.000000	60.7	H	15.4	13.3	74.0

Frequency (MHz)	Average-Clear Write	Polarization	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
14529.000	45.1	V	12.6	8.9	54.0
15054.000	46.0	V	13.2	8.0	54.0
15690.000	47.7	H	13.9	6.3	54.0
16229.000	48.0	H	14.5	6.0	54.0
16834.000	48.8	H	15.5	5.2	54.0
17300.000000	48.5	H	15.4	5.5	54.0

GFSK CH39 (1-18GHz)

Frequency (MHz)	MaxPeak-ClearWrite	Polarization	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
14485.000	57.2	V	12.9	16.8	74.0
15060.000	58.0	H	13.2	16.0	74.0
15735.000	59.2	H	14.0	14.8	74.0
16129.000	59.4	H	14.6	14.6	74.0
16817.000	59.9	V	15.4	14.1	74.0
17309.000000	60.2	V	15.4	13.8	74.0

GFSK CH39 (1-18GHz)

Frequency (MHz)	Average-Clear Write	Polarization	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
14452.000	45.1	H	13.1	8.9	54.0
14977.000	45.7	H	13.8	8.3	54.0
15777.000	47.3	H	14.2	6.7	54.0
16334.000	47.5	H	15.1	6.5	54.0
16827.000	48.1	V	15.5	5.9	54.0
17363.000 000	47.6	H	15.5	6.4	54.0

GFSK CH78 (1-18GHz)

Frequency (MHz)	MaxPeak-ClearWrite	Polarization	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
14169.000	56.9	H	12.5	17.1	74.0
14809.000	57.5	V	13.4	16.5	74.0
15739.000	58.8	H	14.0	15.2	74.0
16277.000	59.3	V	14.7	14.7	74.0
16779.000	59.5	H	15.2	14.5	74.0
17389.000 000	59.9	V	15.6	14.1	74.0

Frequency (MHz)	Average-Clear Write	Polarization	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
14449.000	45.0	V	13.1	9.0	54.0
14976.000	45.7	V	13.8	8.3	54.0
15769.000	47.3	H	14.1	6.7	54.0
16317.000	47.3	V	15.0	6.7	54.0
16822.000	48.0	H	15.5	6.0	54.0
17412.000 000	47.5	V	15.6	6.5	54.0

π /4 DQPSK CH0 (1-18GHz)

Frequency (MHz)	MaxPeak-ClearWrite	Polarization	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
14421.000	57.0	H	13.3	17.0	74.0
15161.000	57.7	V	13.0	16.3	74.0
15758.000	59.3	H	14.1	14.7	74.0
16358.000	59.5	V	15.2	14.5	74.0
16920.000	60.2	V	15.8	13.8	74.0
17481.000000	60.3	V	15.7	13.7	74.0

Frequency (MHz)	Average-ClearWrite	Polarization	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
14510.000	45.0	V	12.8	9.0	54.0
15048.000	45.6	V	13.3	8.4	54.0
15784.000	47.3	V	14.2	6.7	54.0
16279.000	47.4	V	14.7	6.6	54.0
16819.000	48.1	V	15.5	5.9	54.0
17791.000000	47.8	V	15.7	6.2	54.0

π /4 DQPSK CH39 (1-18GHz)

Frequency (MHz)	MaxPeak-ClearWrite	Polarization	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
14549.000	57.2	H	12.6	16.8	74.0
14762.000	58.4	V	13.1	15.6	74.0
15667.000	59.5	H	13.8	14.5	74.0
16342.000	60.0	H	15.1	14.0	74.0
16864.000	60.6	V	15.7	13.4	74.0
17500.000000	60.6	H	15.7	13.4	74.0

π /4 DQPSK CH39 (1-18GHz)

Frequency (MHz)	Average-Clear Write	Polarization	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
14537.000	45.1	H	12.6	8.9	54.0
15159.000	45.7	H	13.0	8.3	54.0
15680.000	47.6	H	13.8	6.4	54.0
16191.000	48.1	H	14.4	5.9	54.0
16783.000	48.8	H	15.3	5.2	54.0
17326.000 000	48.4	H	15.4	5.6	54.0

π /4 DQPSK CH78 (1-18GHz)

Frequency (MHz)	MaxPeak-ClearWrite	Polarization	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
14465.000	57.6	V	13.0	16.4	74.0
15054.000	57.4	H	13.2	16.6	74.0
15699.000	59.3	V	13.9	14.7	74.0
16289.000	59.5	H	14.8	14.5	74.0
16878.000	59.9	H	15.8	14.1	74.0
17984.000 000	59.8	H	15.8	14.2	74.0

Frequency (MHz)	Average-Clear Write	Polarization	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
14451.000	44.9	H	13.1	9.1	54.0
14989.000	45.7	H	13.7	8.3	54.0
15779.000	47.2	H	14.2	6.8	54.0
16335.000	47.2	V	15.1	6.8	54.0
16825.000	47.9	H	15.5	6.1	54.0
17327.000 000	47.5	H	15.4	6.5	54.0

8DPSK CH0 (1-18GHz)

Frequency (MHz)	MaxPeak-ClearWrite	Polarization	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
14488.000	45.2	V	12.9	8.8	54.0
15151.000	45.8	V	12.9	8.2	54.0
15677.000	47.6	H	13.8	6.4	54.0
16268.000	47.9	H	14.7	6.1	54.0
16771.000	48.6	H	15.2	5.4	54.0
17273.000000	48.4	H	15.4	5.6	54.0

Frequency (MHz)	Average-Clear Write	Polarization	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
14387.000	57.3	H	13.4	16.7	74.0
15051.000	58.7	V	13.3	15.3	74.0
15723.000	60.0	V	14.0	14.0	74.0
16221.000	60.0	V	14.4	14.0	74.0
16834.000	61.5	V	15.5	12.5	74.0
17788.000000	60.4	V	15.7	13.6	74.0

8DPSK CH39 (1-18GHz)

Frequency (MHz)	MaxPeak-ClearWrite	Polarization	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
14009.0000	57.3	H	12.0	16.7	74.0
15028.0000	58.0	H	13.4	16.0	74.0
15697.0000	59.7	H	13.9	14.3	74.0
16199.0000	60.1	V	14.4	13.9	74.0
16879.0000	61.6	H	15.8	12.4	74.0
17421.000000	60.8	V	15.6	13.2	74.0

8DPSK CH39 (1-18GHz)

Frequency (MHz)	Average-Clear Write	Polarization	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
14502.000	45.1	V	12.8	8.9	54.0
15180.000	45.8	H	13.1	8.2	54.0
15727.000	47.4	H	14.0	6.6	54.0
16234.000	48.1	H	14.5	5.9	54.0
16770.000	48.8	H	15.2	5.2	54.0
17319.000 000	48.4	H	15.4	5.6	54.0

8DPSK CH78 (1-18GHz)

Frequency (MHz)	MaxPeak-ClearWrite	Polarization	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
14129.0000	57.2	H	12.3	16.8	74.0
14995.0000	57.9	V	13.6	16.1	74.0
15786.0000	59.5	H	14.2	14.5	74.0
16328.0000	59.5	V	15.0	14.5	74.0
16816.0000	61.1	H	15.4	12.9	74.0
17404.0000 00	60.6	H	15.6	13.4	74.0

Frequency (MHz)	Average-ClearWrite	Polarization	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
14511.00000	45.1	H	12.8	8.9	54.0
15049.0000	45.7	H	13.3	8.3	54.0
15782.0000	47.4	H	14.2	6.6	54.0
16312.0000	47.6	H	14.9	6.4	54.0
16825.0000	48.3	H	15.5	5.7	54.0
17327.0000 00	48.1	H	15.4	5.9	54.0

See ANNEX C for test graphs.

Conclusion: Pass

B.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.75	1.129	/
	39	Fig.76	1.353	
	78	Fig.77	1.129	
π /4 DQPSK	0	Fig.78	1.303	/
	39	Fig.79	1.397	
	78	Fig.80	1.310	
8DPSK	0	Fig.81	1.324	/
	39	Fig.82	1.368	
	78	Fig.83	1.324	

See ANNEX C for test graphs.

Conclusion: PASS

B.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.84	139.1	**P**
			Fig.85		
π /4 DQPSK	39	2-DH5	Fig.86	162.3	**P**
			Fig.87		
8DPSK	39	3-DH5	Fig.88	202.9	**P**
			Fig.89		

See ANNEX C for test graphs.

Conclusion: Pass

B.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.90	Fig.91	79	**P**
π /4 DQPSK	39	2-DH5	Fig.92	Fig.93	79	**P**
8DPSK	39	3-DH5	Fig.94	Fig.95	79	**P**

See ANNEX C for test graphs.

Conclusion: Pass

B.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.96	1.006	P
π /4 DQPSK	39	2-DH5	Fig.97	1.006	P
8DPSK	39	3-DH5	Fig.98	1.006	P

See ANNEX C for test graphs.

Conclusion: Pass

B.9 AC Power line Conducted Emission

Test Condition:

Voltage（V）	Frequency（Hz）
120	60

Measurement Result and limit:

BT (Quasi-peak Limit)-AE2

Frequency range (MHz)	Quasi-peak Limit (dBμV)	Result (dBμV)		Conclusion
		Traffic	Idle	
0.15 to 0.5	66 to 56	Fig.99	Fig.100	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)-AE2

Frequency range (MHz)	Average-peak Limit (dBμV)	Result (dBμV)		Conclusion
		Traffic	Idle	
0.15 to 0.5	56 to 46	Fig.99	Fig.100	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)-AE3

Frequency range (MHz)	Quasi-peak Limit (dBμV)	Result (dBμV)		Conclusion
		Traffic	Idle	
0.15 to 0.5	66 to 56	Fig.101	Fig.102	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)-AE3

Frequency range (MHz)	Average-peak Limit (dBμV)	Result (dBμV)		Conclusion
		Traffic	Idle	
0.15 to 0.5	56 to 46	Fig.101	Fig.102	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 C: TEST FIGURE LIST

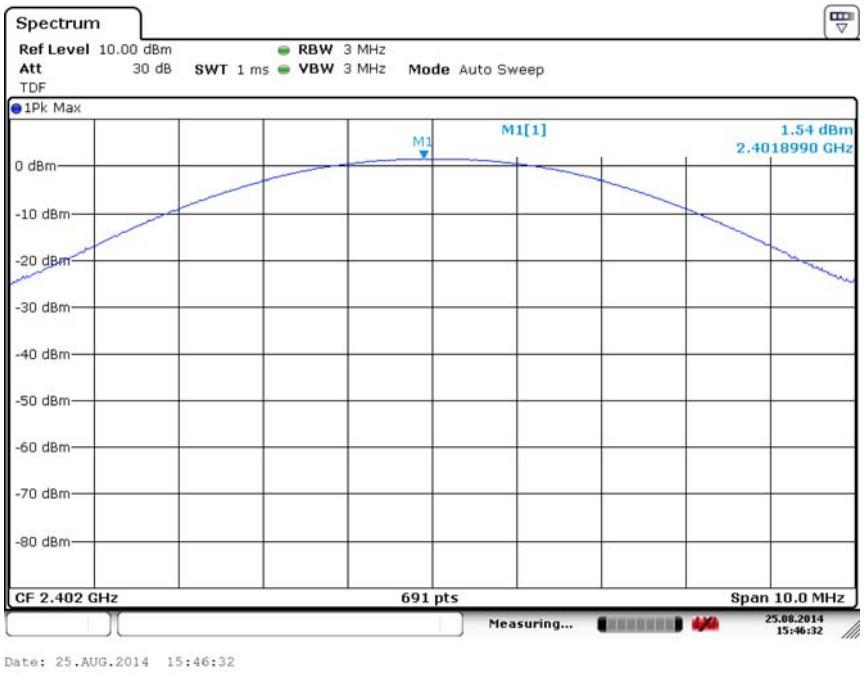


Fig. 1 Maximum Peak Output Power(GFSK, Ch 0)

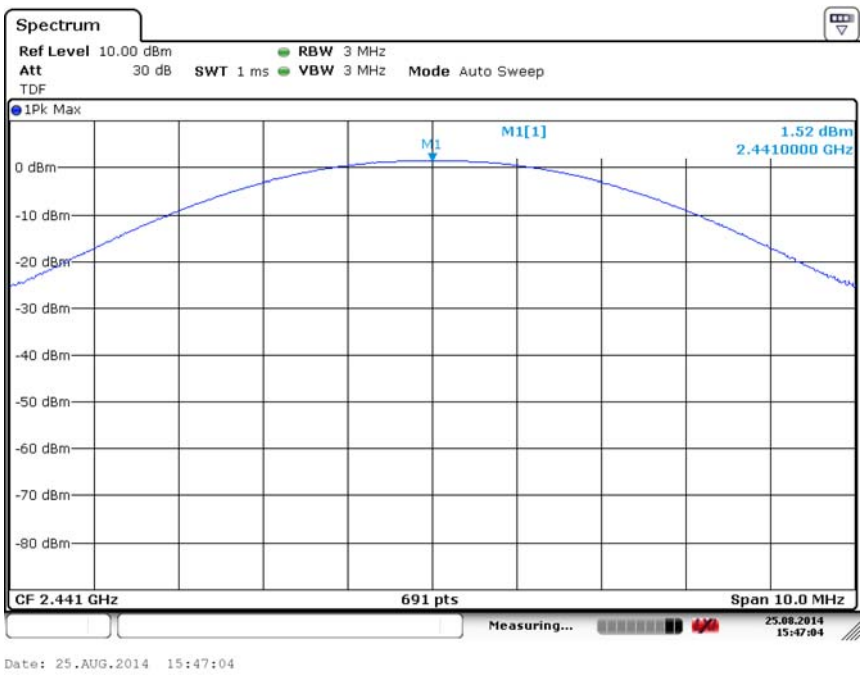
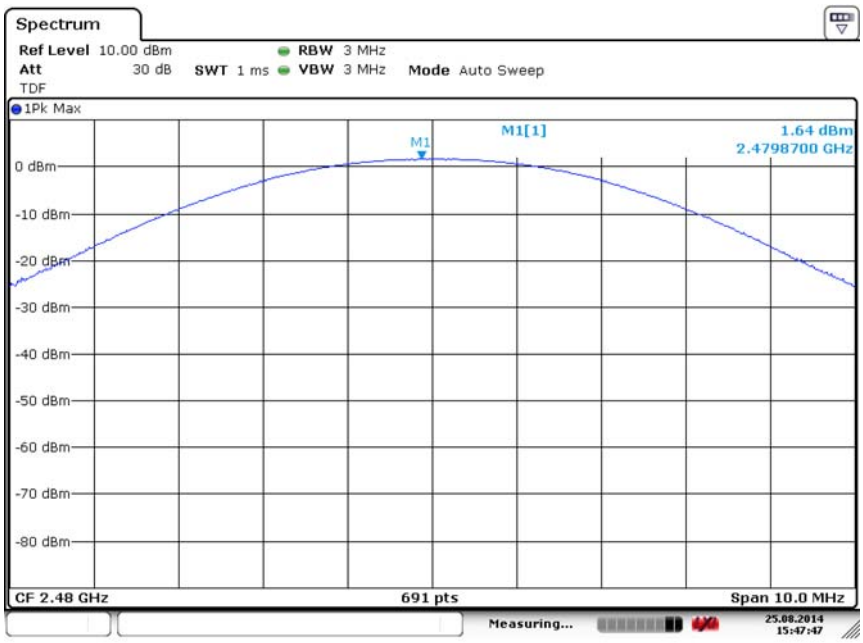
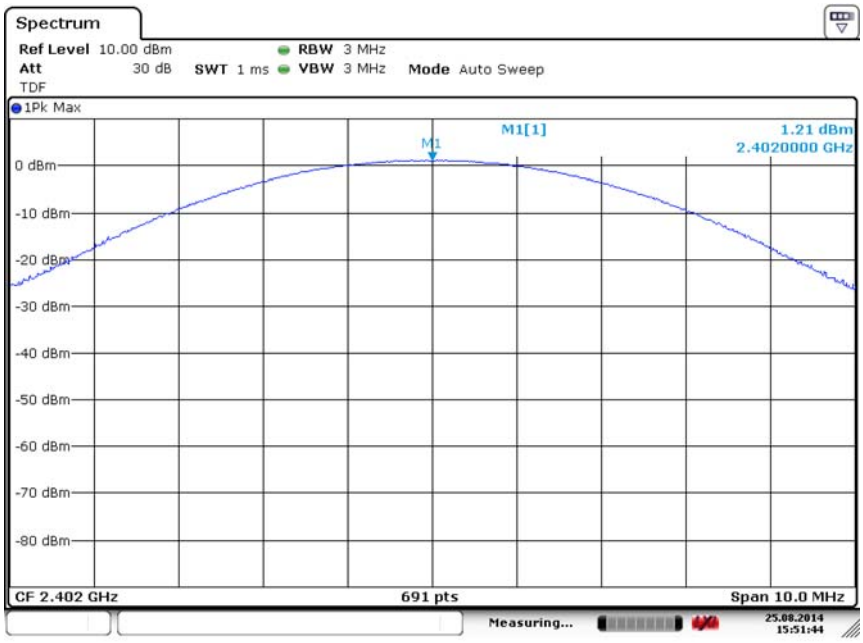


Fig. 2 Maximum Peak Output Power(GFSK, Ch 39)



Date: 25.AUG.2014 15:47:47

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



Date: 25.AUG.2014 15:51:45

Fig. 4 Maximum Peak Output Power(π /4 DQPSK, Ch 0)

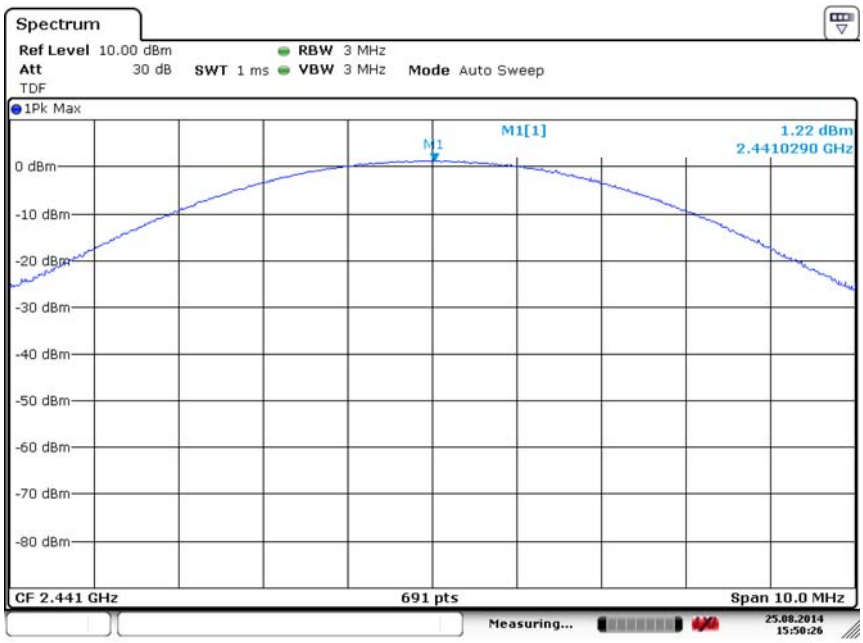


Fig. 5 Maximum Peak Output Power(π/4 DQPSK, Ch 39)

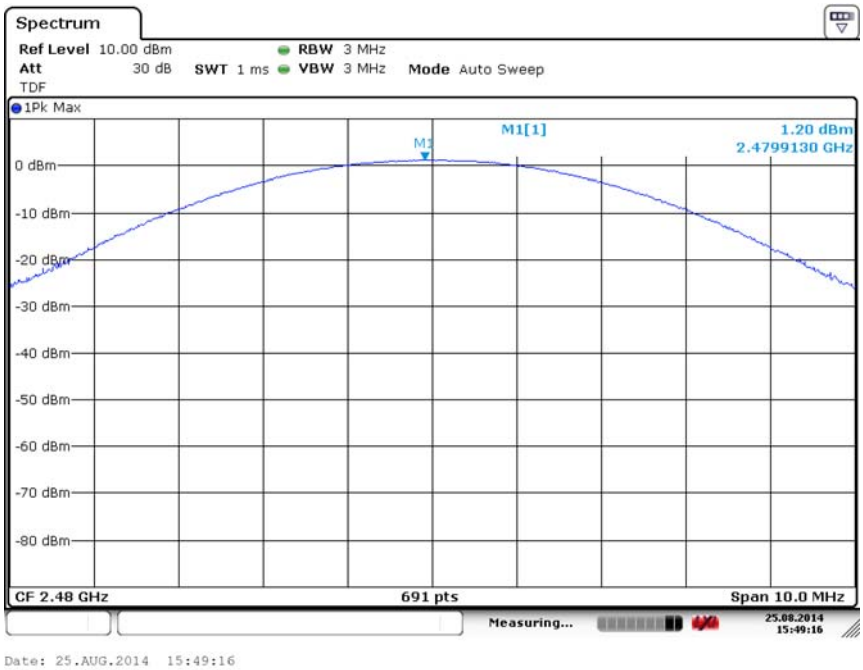


Fig. 6 Maximum Peak Output Power(π/4 DQPSK, Ch 78)

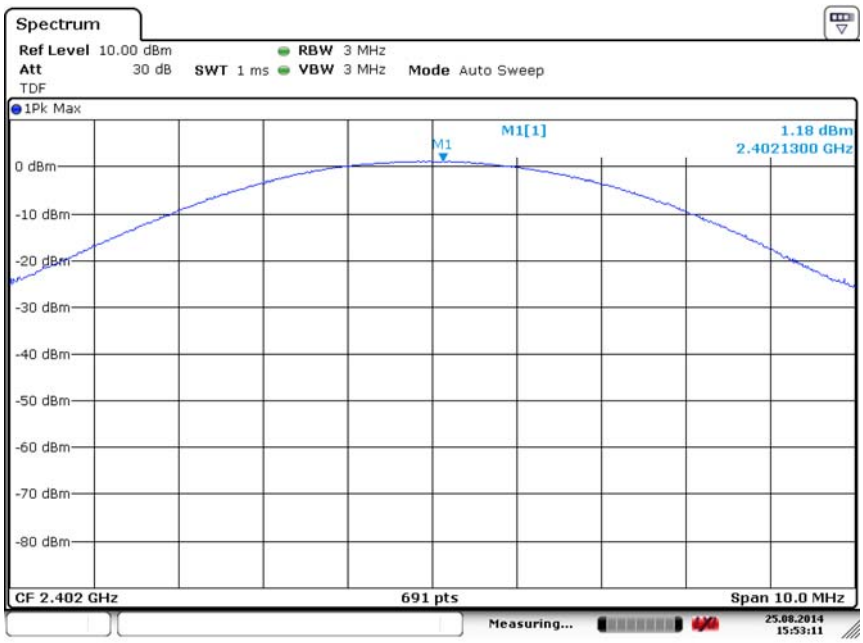


Fig. 7 Maximum Peak Output Power(8DPSK, Ch 0)

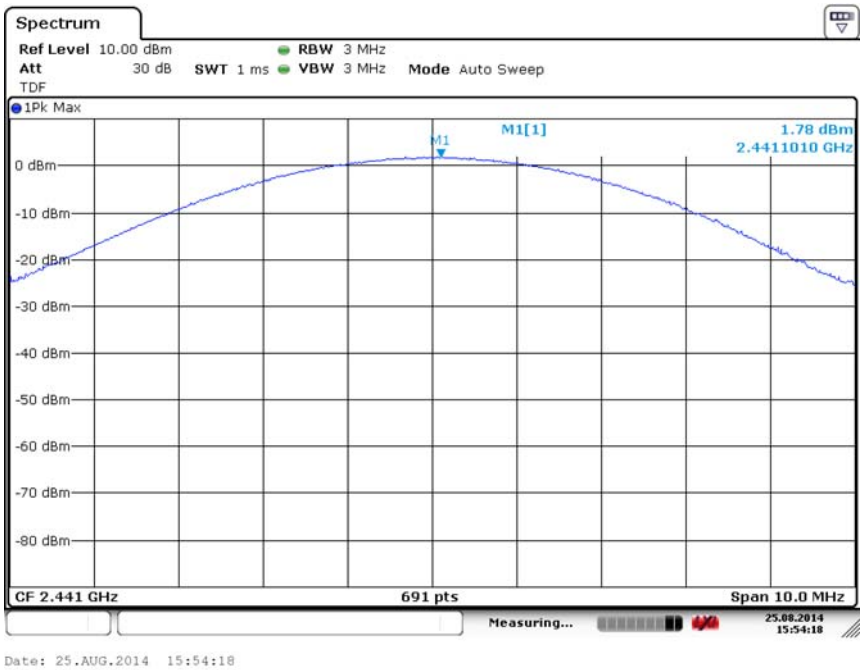


Fig. 8 Maximum Peak Output Power(8DPSK, Ch 39)

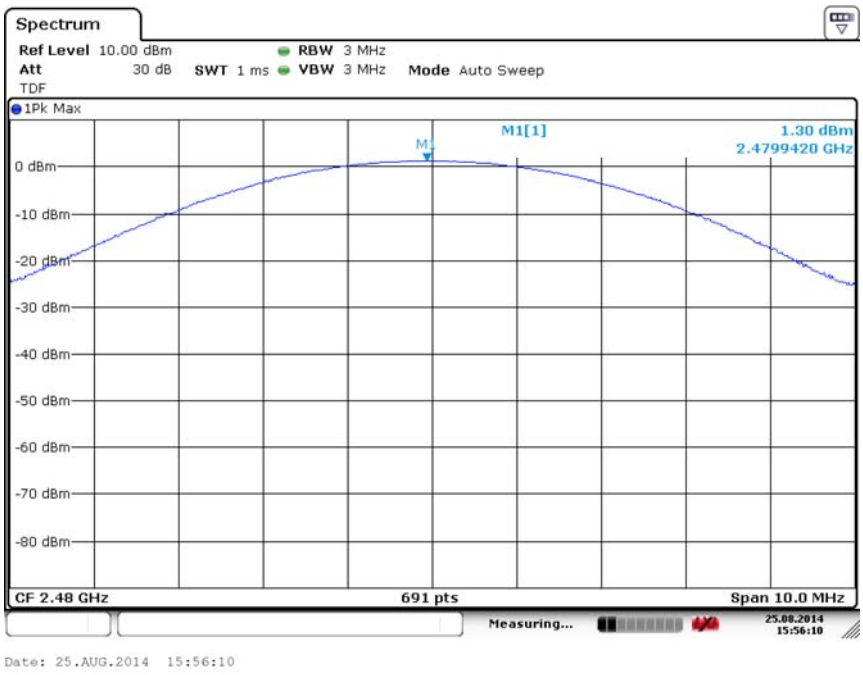


Fig. 9 Maximum Peak Output Power(8DPSK, Ch 78)

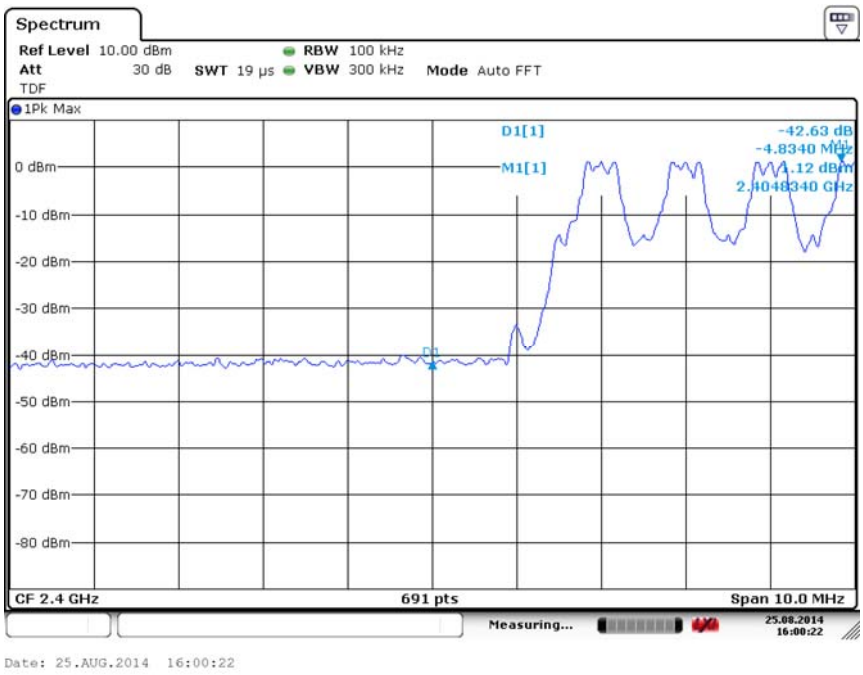


Fig. 10 Band Edges (GFSK, Ch 0, Hopping ON)

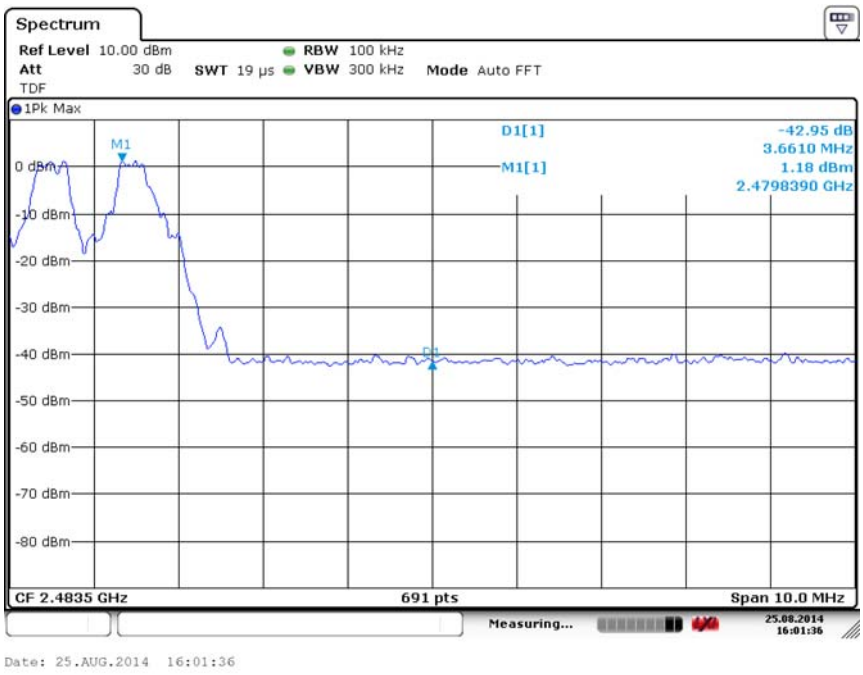


Fig. 11 Band Edges (GFSK, Ch 78, Hopping ON)

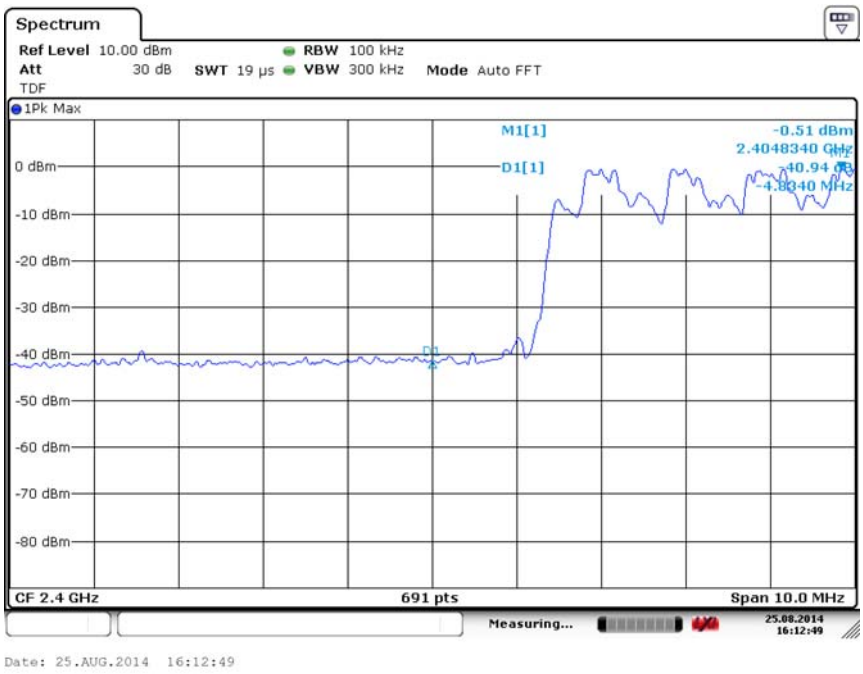


Fig. 12 Band Edges (π /4 DQPSK, Ch 0, Hopping ON)

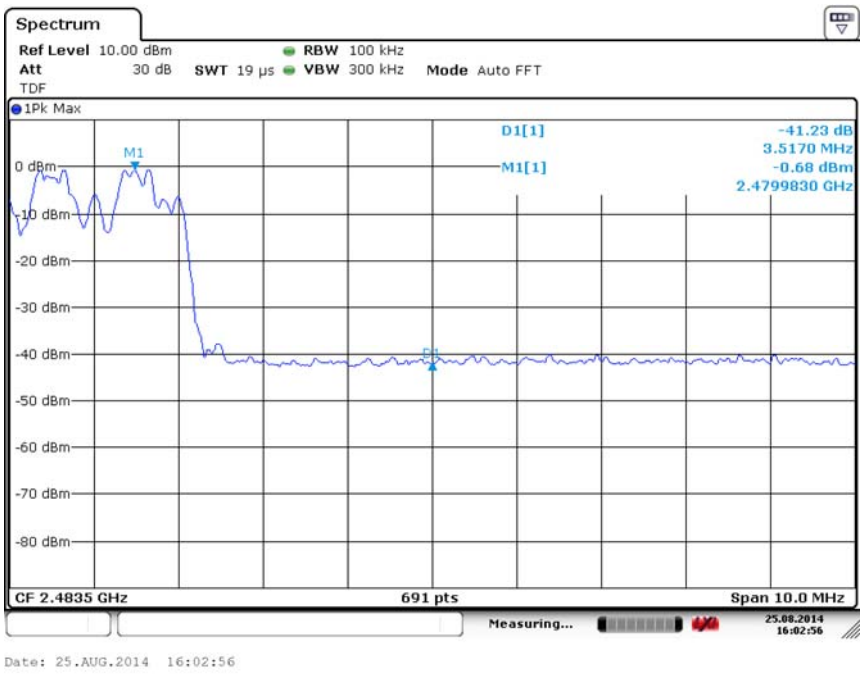


Fig. 13 Band Edges (π /4 DQPSK, Ch 78, Hopping ON)

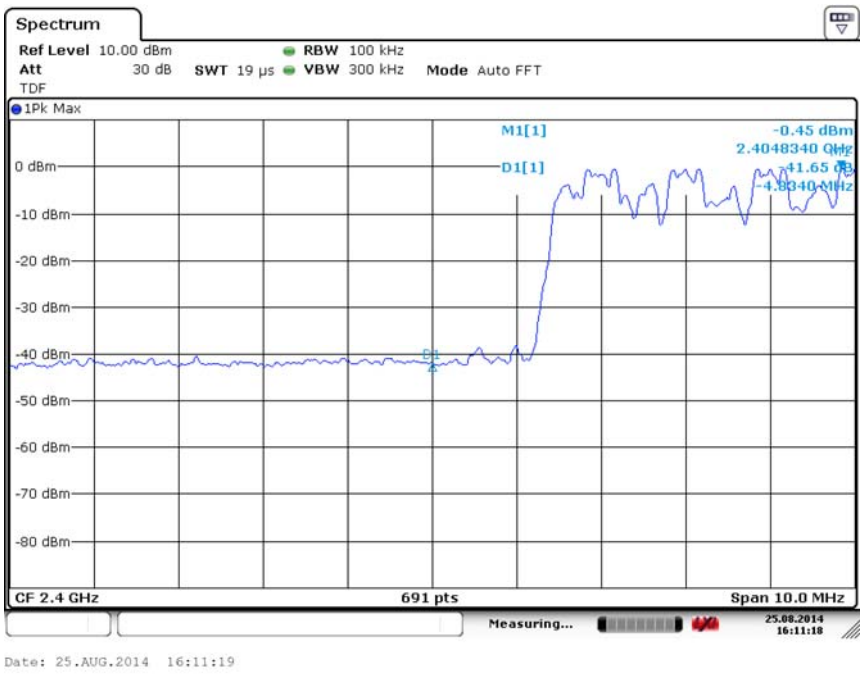


Fig. 14 Band Edges (8DPSK, Ch 0, Hopping ON)

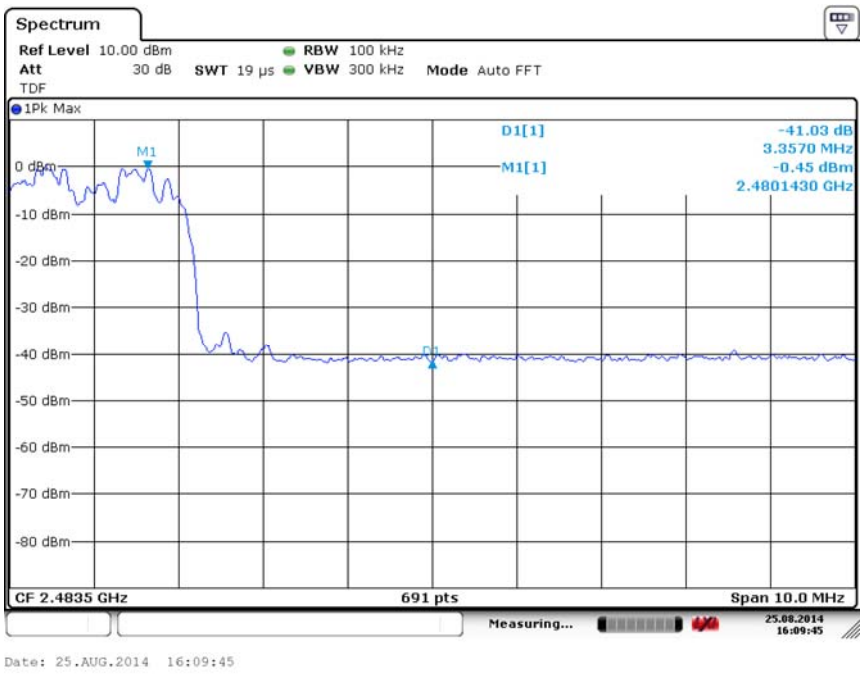


Fig. 15 Band Edges (8DPSK, Ch 78, Hopping ON)

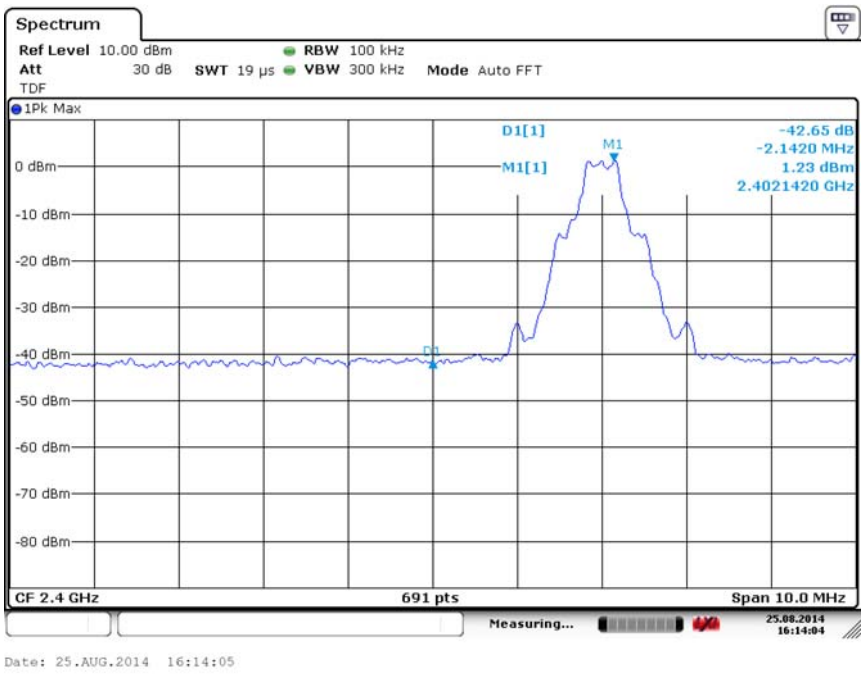


Fig. 16 Band Edges (GFSK, Ch 0, Hopping OFF)

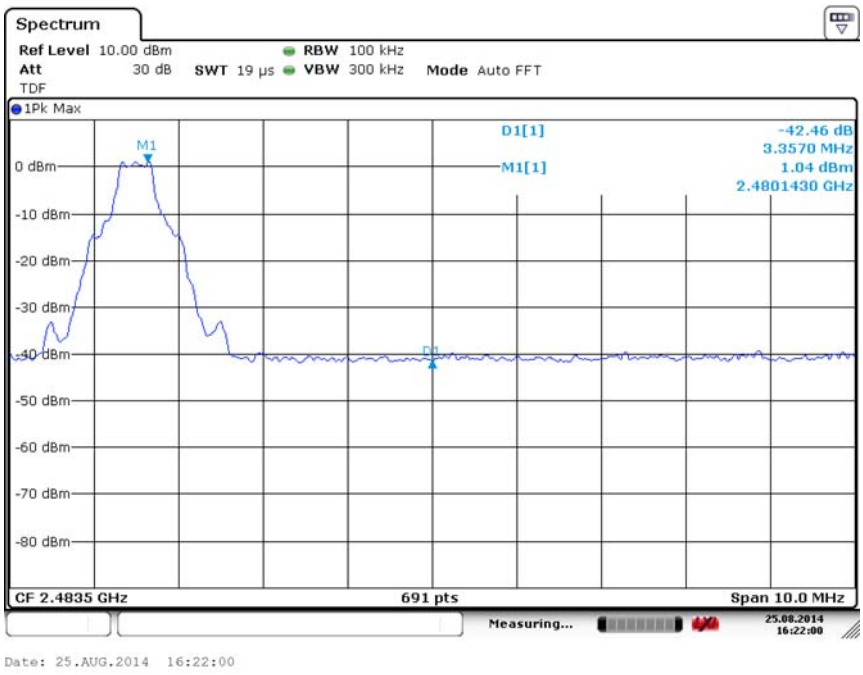


Fig. 17 Band Edges (GFSK, Ch 78, Hopping OFF)

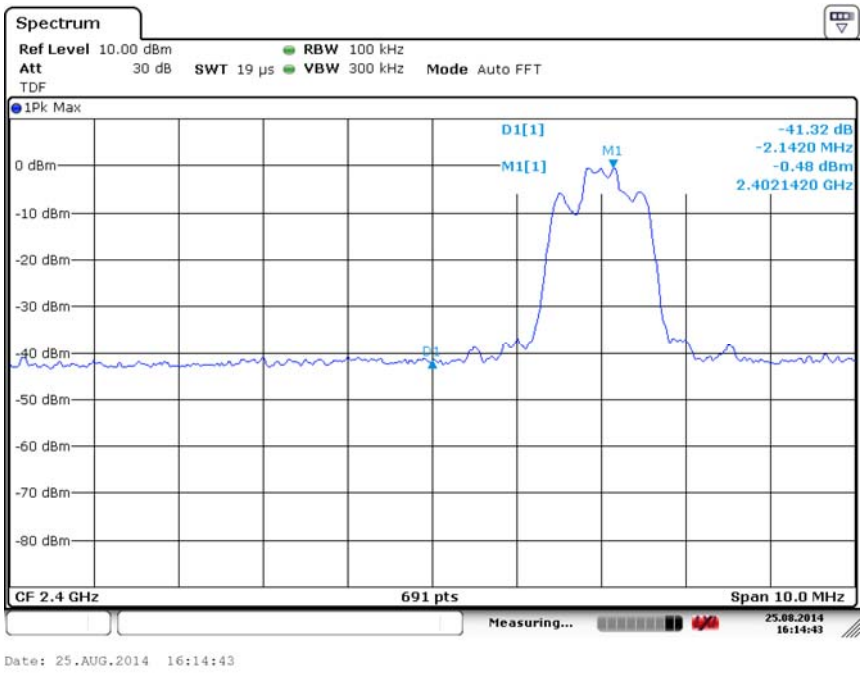


Fig. 18 Band Edges (π /4 DQPSK, Ch 0, Hopping OFF)

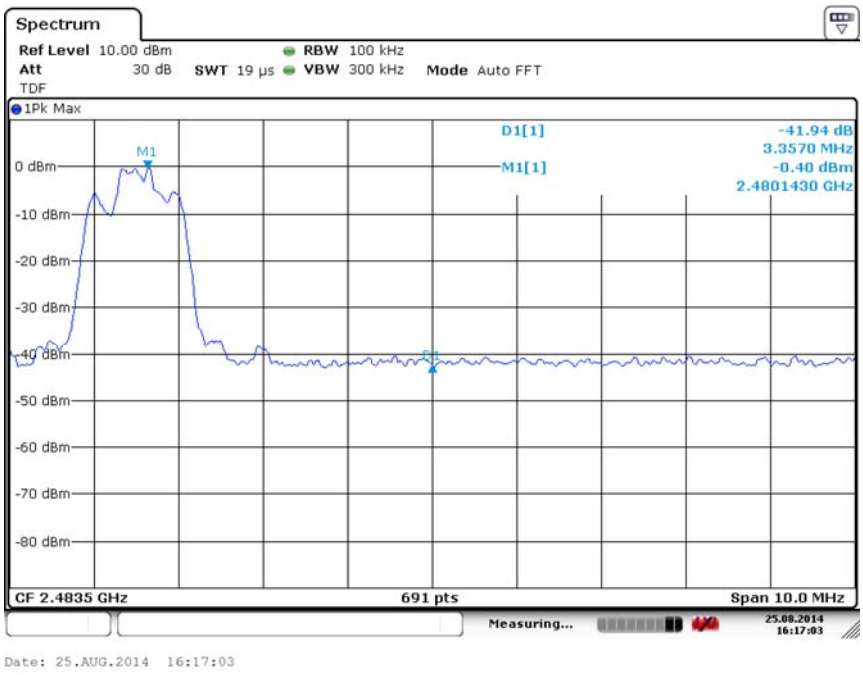


Fig. 19 Band Edges (π /4 DQPSK, Ch 78, Hopping OFF)

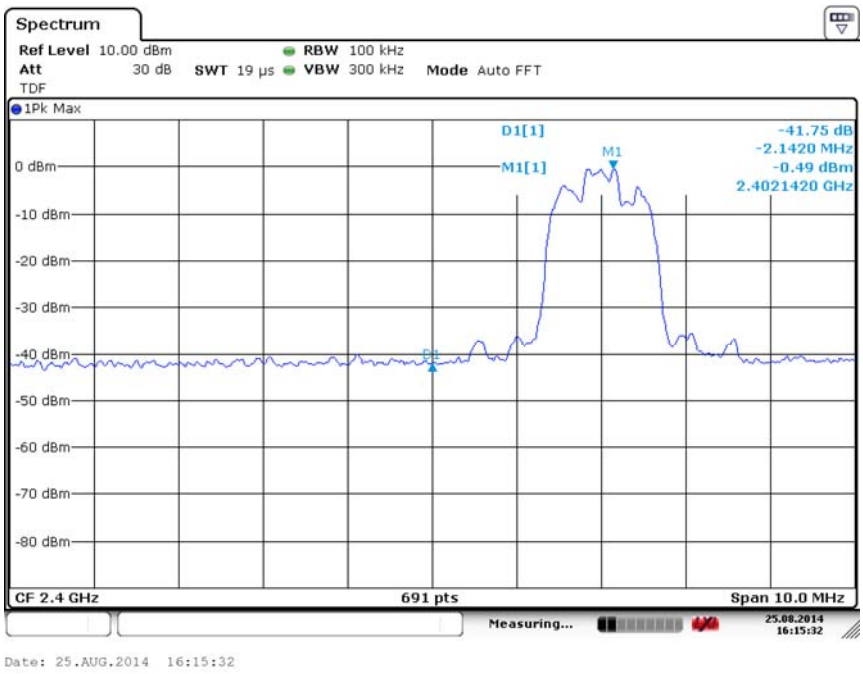


Fig. 20 Band Edges (8DPSK, Ch 0, Hopping OFF)

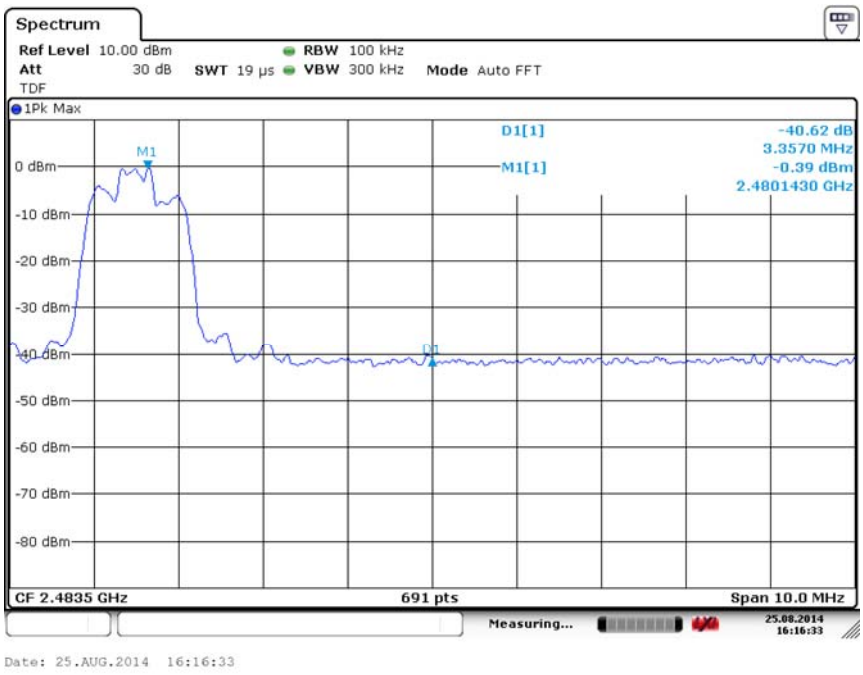


Fig. 21 Band Edges (8DPSK, Ch 78, Hopping OFF)

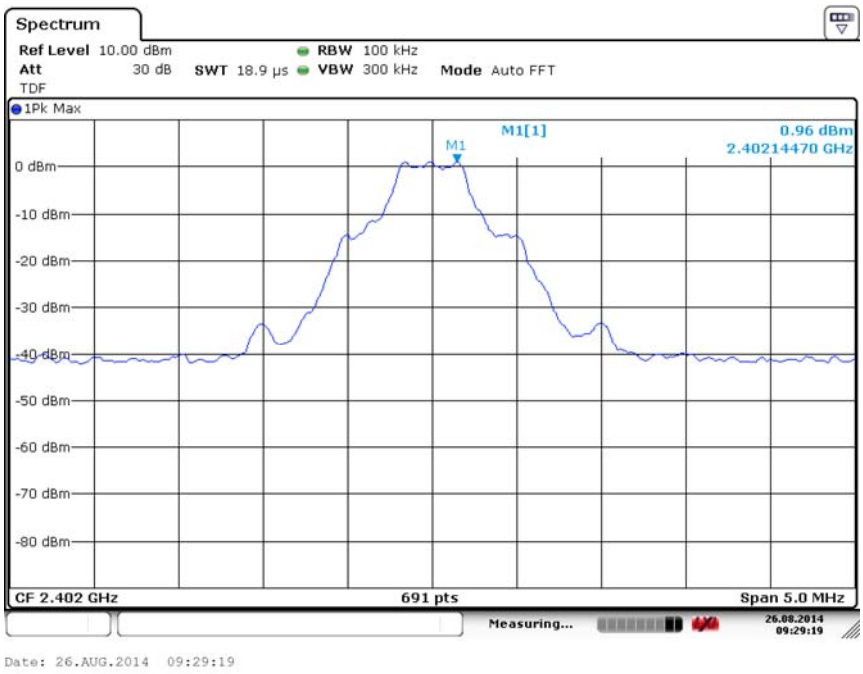


Fig. 22 Conducted Spurious Emission (GFSK, Ch0, 2.402GHz)

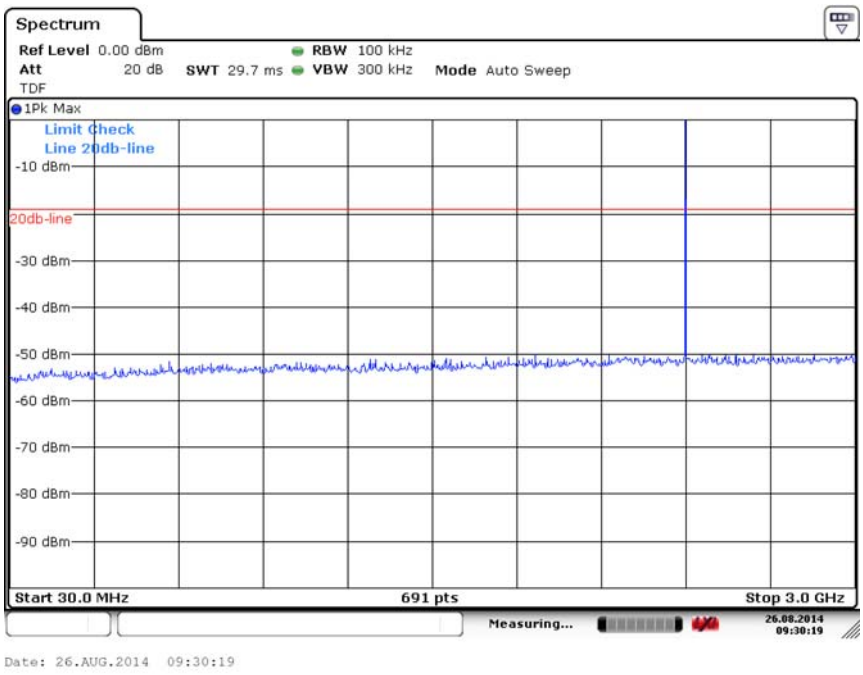


Fig. 23 Conducted Spurious Emission (GFSK, Ch0, 30 MHz-3 GHz)

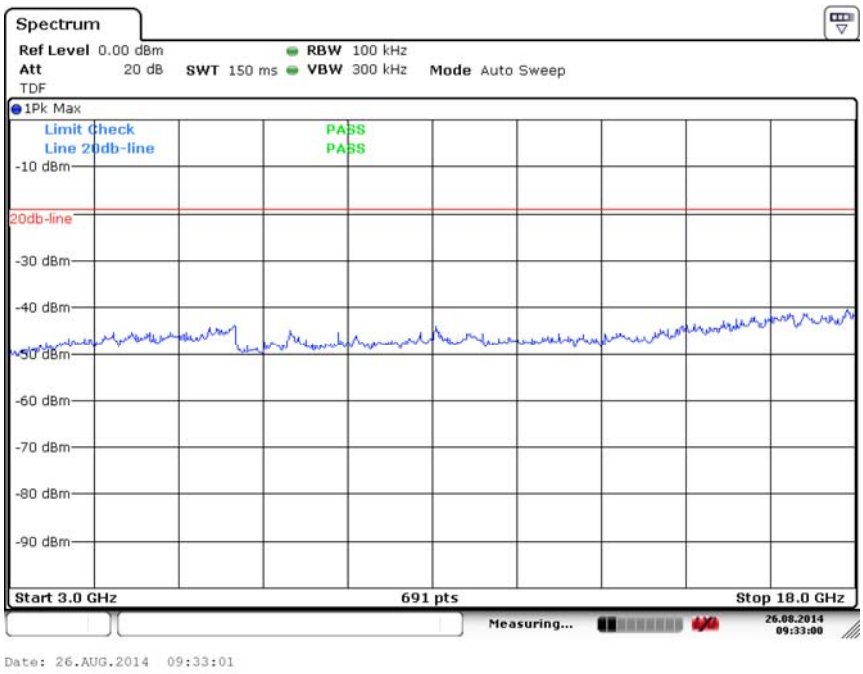


Fig. 24 Conducted Spurious Emission (GFSK, Ch0, 3GHz-18 GHz)

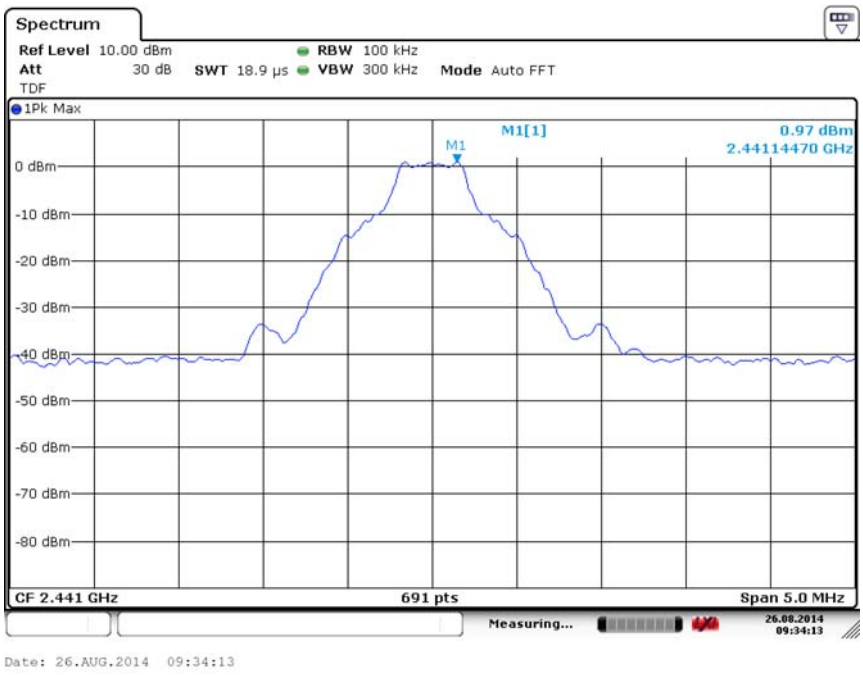


Fig. 25 Conducted Spurious Emission (GFSK, Ch39, 2.441GHz)

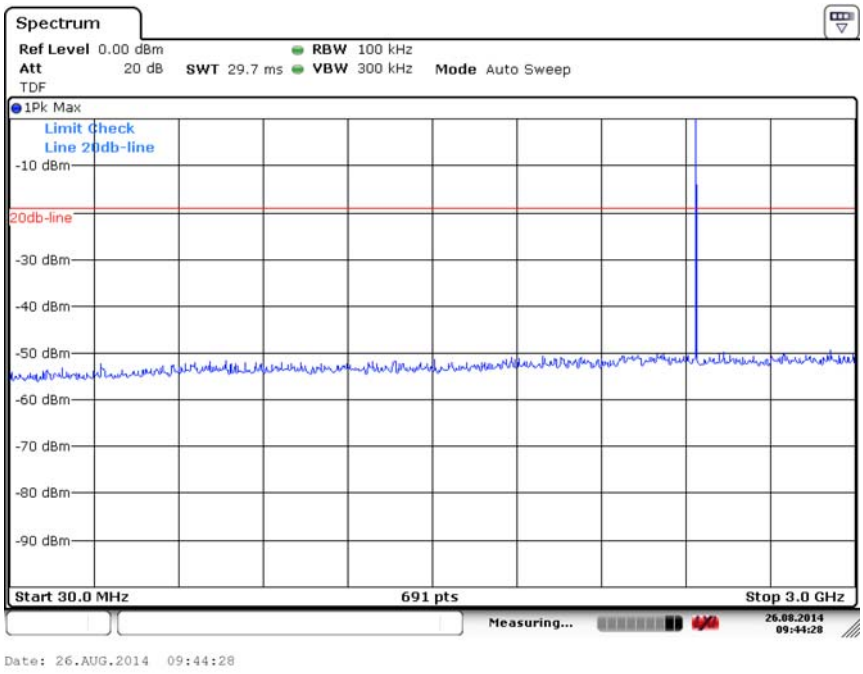


Fig. 26 Conducted Spurious Emission (GFSK, Ch39, 30 MHz-3 GHz)

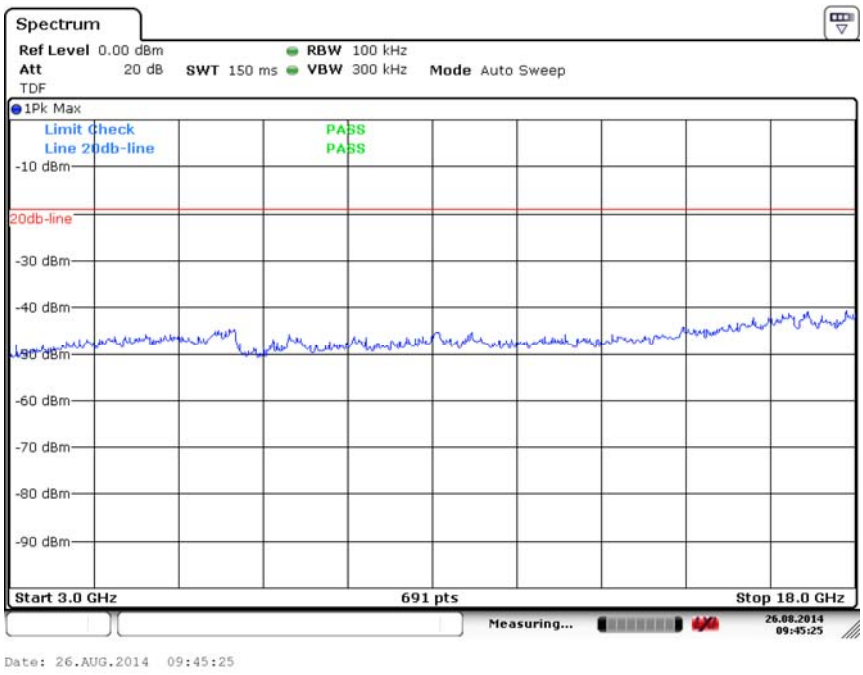


Fig. 27 Conducted Spurious Emission (GFSK, Ch39, 3GHz-18 GHz)

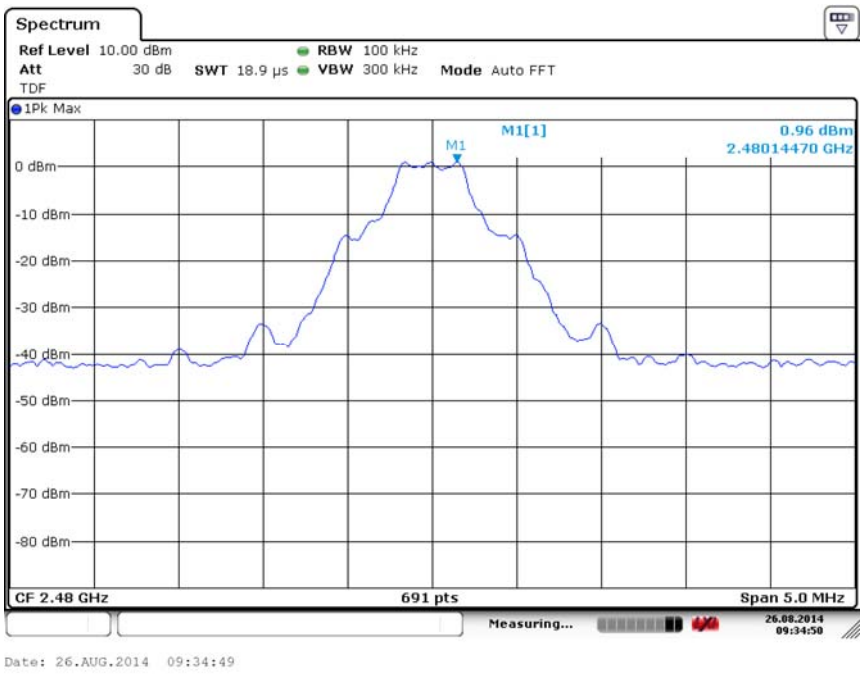


Fig. 28 Conducted Spurious Emission (GFSK, Ch78, 2.480GHz)

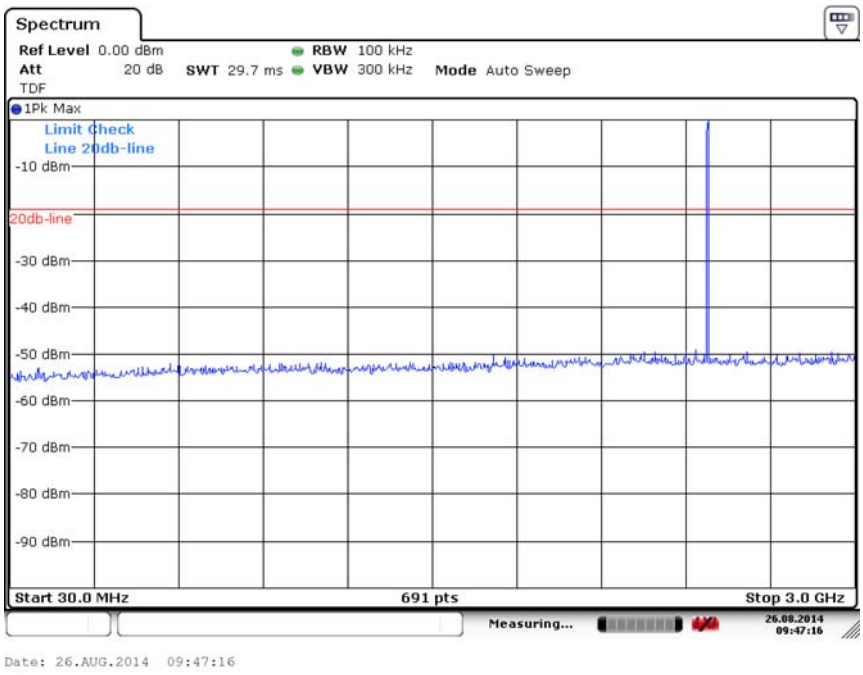


Fig. 29 Conducted Spurious Emission (GFSK, Ch78, 30 MHz-3 GHz)

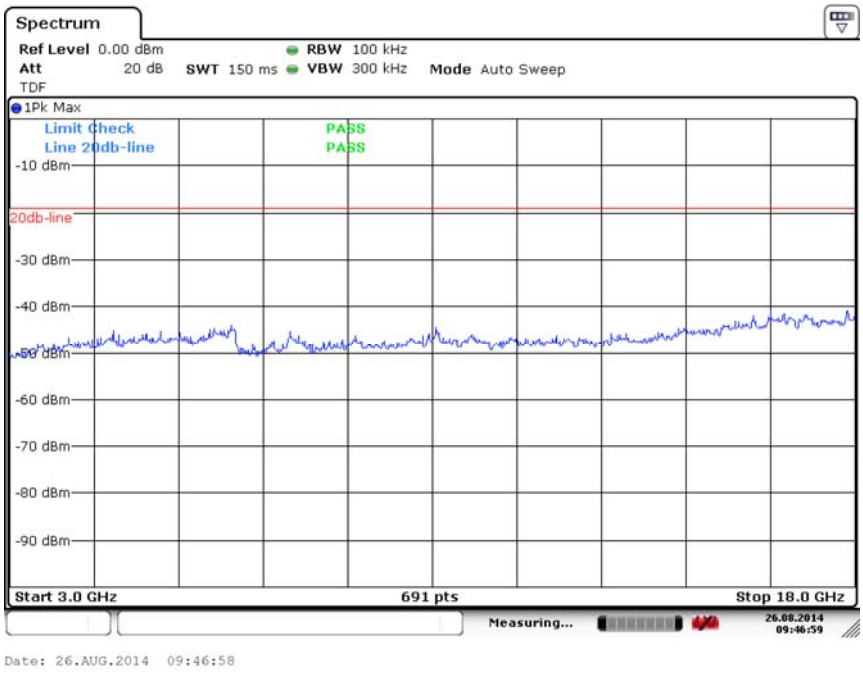


Fig. 30 Conducted Spurious Emission (GFSK, Ch78, 3GHz-18 GHz)

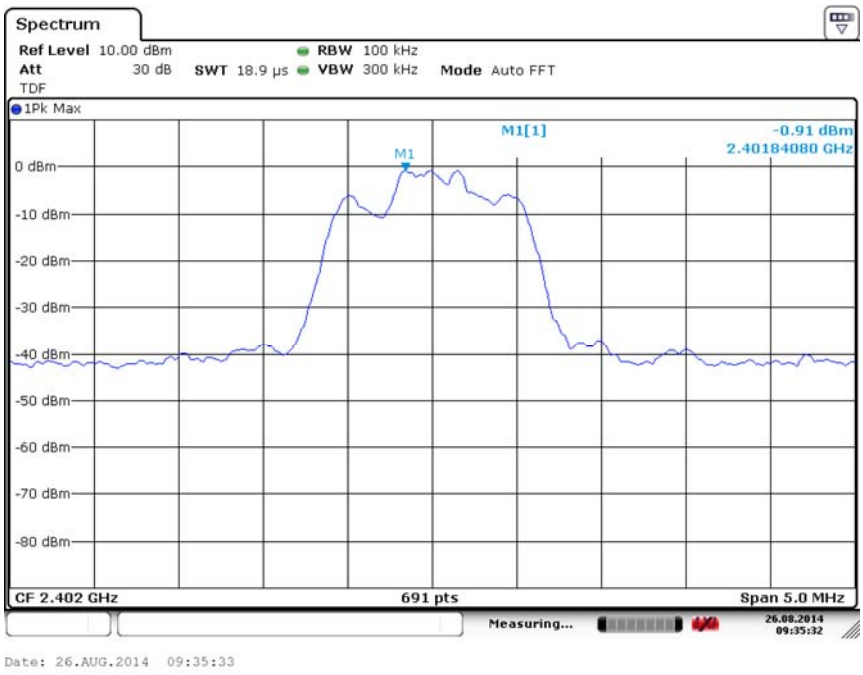


Fig. 31 Conducted Spurious Emission (π /4 DQPSK, Ch0, 2.402GHz)

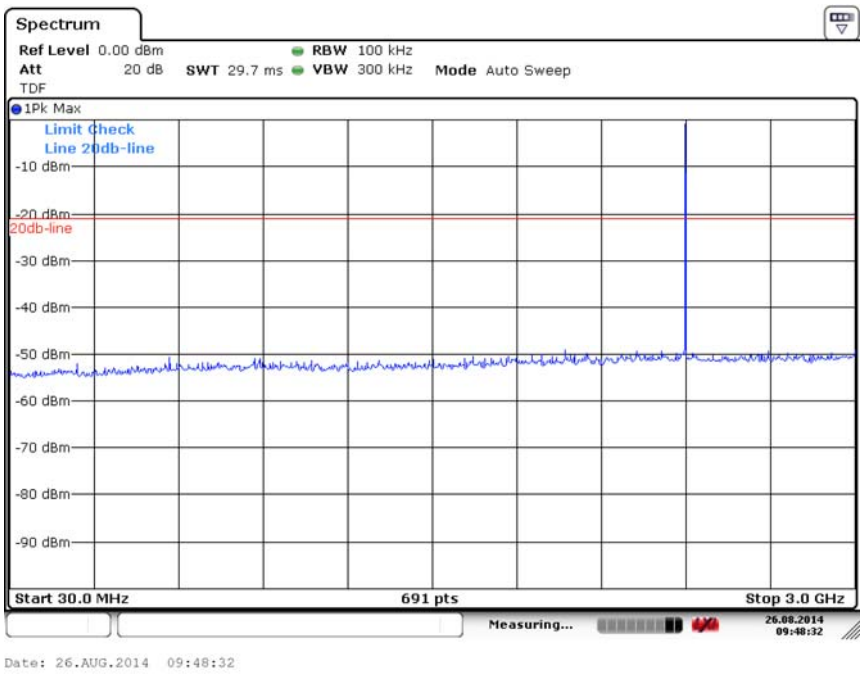


Fig. 32 Conducted Spurious Emission (π /4 DQPSK, Ch0, 30 MHz-3 GHz)

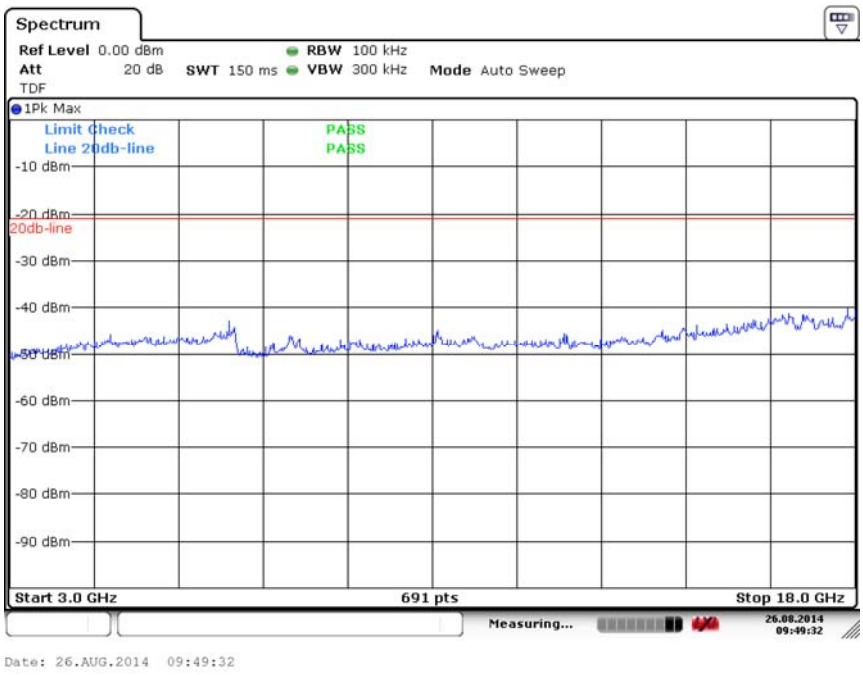


Fig. 33 Conducted Spurious Emission (π /4 DQPSK, Ch0, 3GHz-18 GHz)

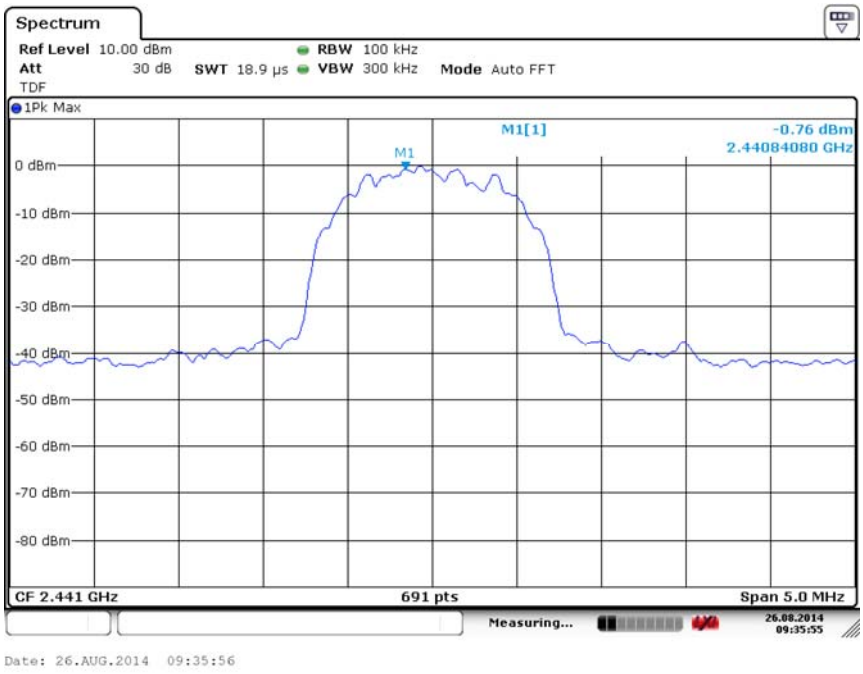


Fig. 34 Conducted Spurious Emission (π /4 DQPSK, Ch39, 2.441GHz)

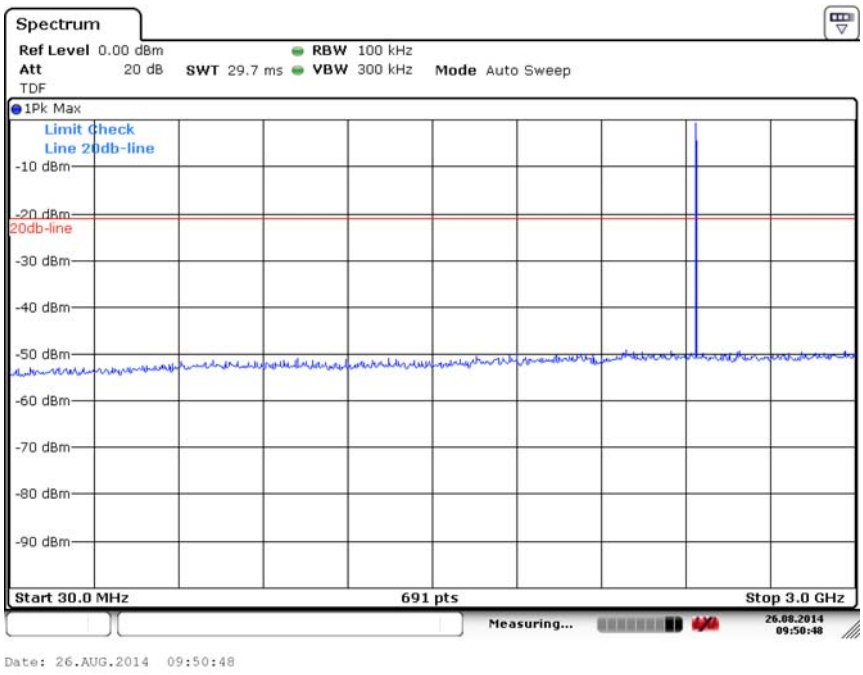


Fig. 35 Conducted Spurious Emission (π /4 DQPSK, Ch39, 30 MHz-3 GHz)

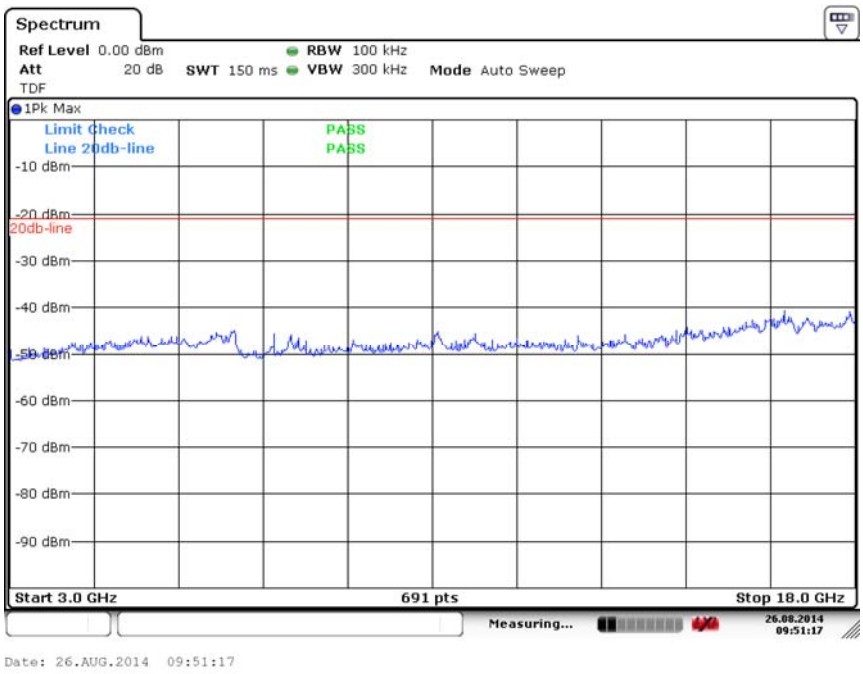


Fig. 36 Conducted Spurious Emission (π /4 DQPSK, Ch39, 3GHz-18 GHz)

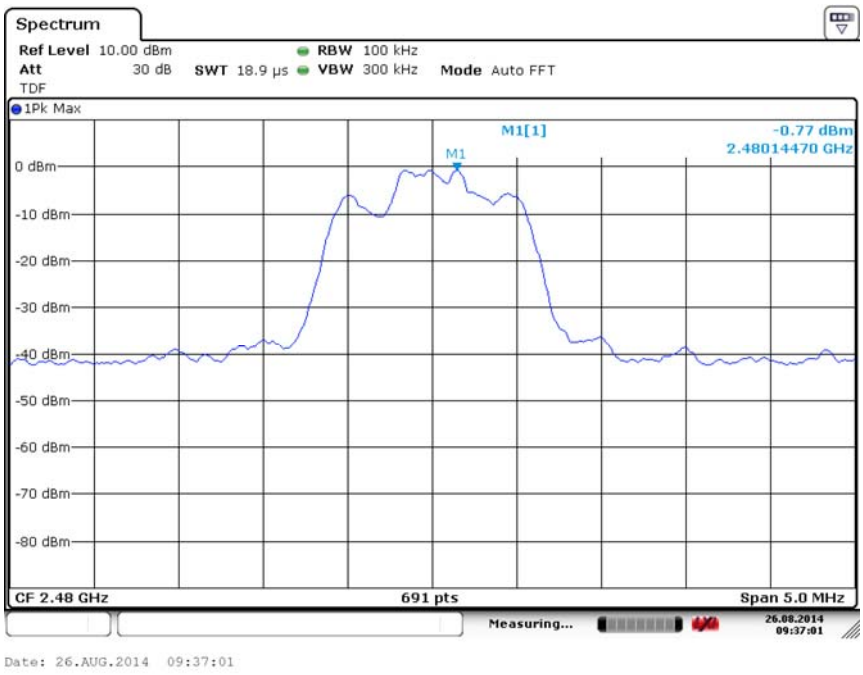


Fig. 37 Conducted Spurious Emission (π /4 DQPSK, Ch78, 2.480GHz)

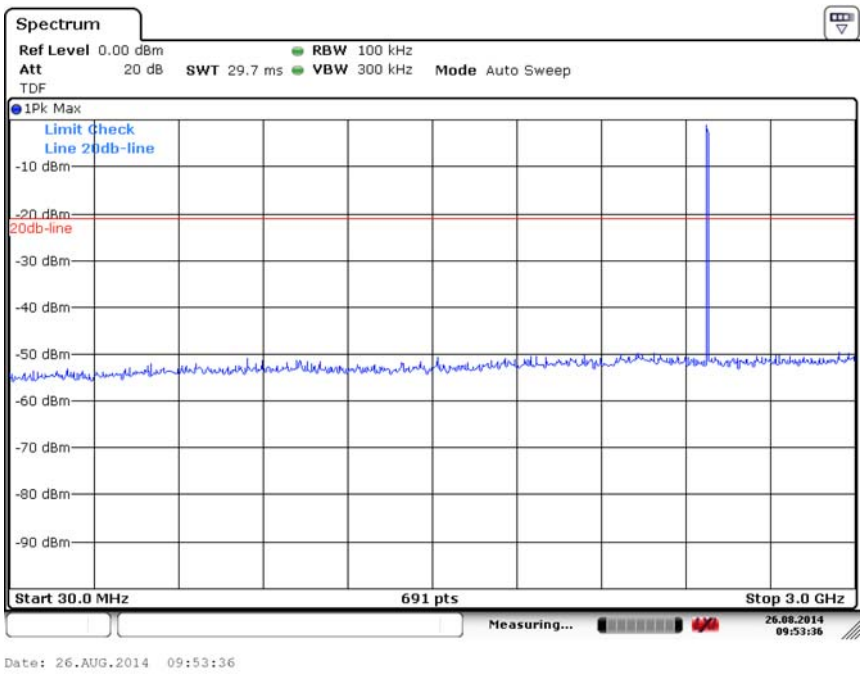


Fig. 38 Conducted Spurious Emission (π /4 DQPSK, Ch78, 30 MHz-3 GHz)

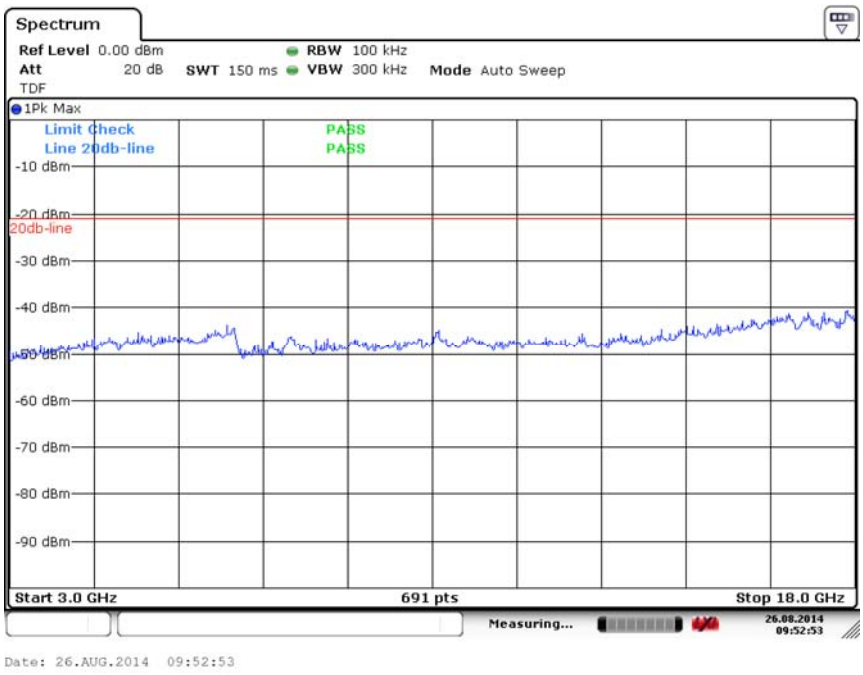


Fig. 39 Conducted Spurious Emission (π /4 DQPSK, Ch78, 3GHz-18 GHz)

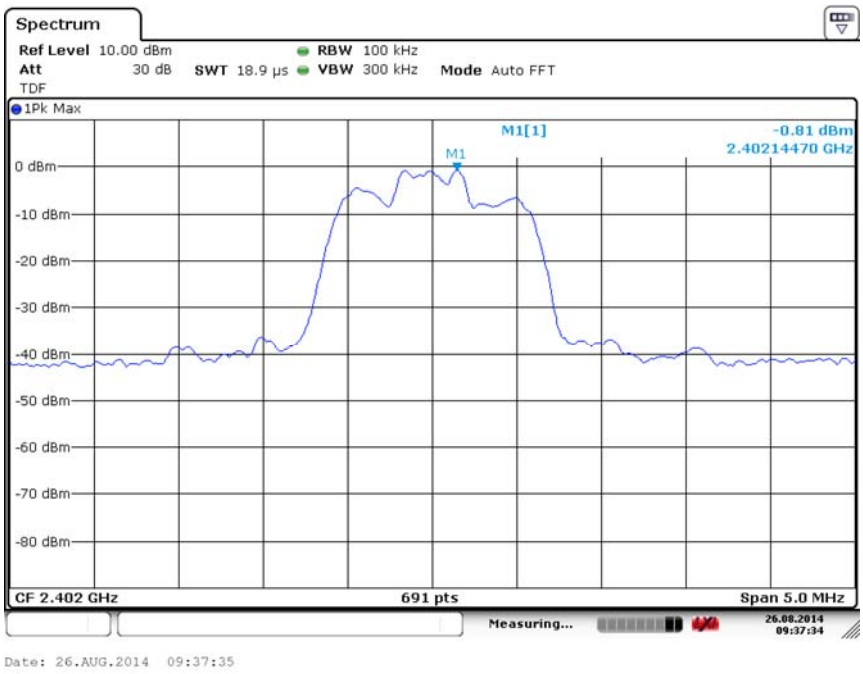


Fig. 40 Conducted Spurious Emission (8DPSK, Ch0, 2.402GHz)

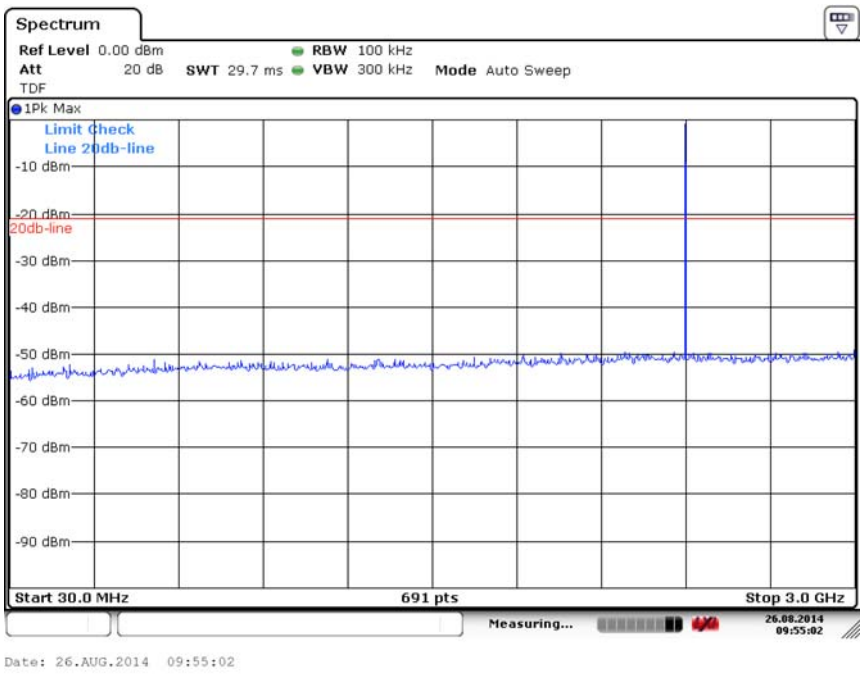


Fig. 41 Conducted Spurious Emission (8DPSK, Ch0, 30 MHz-3 GHz)

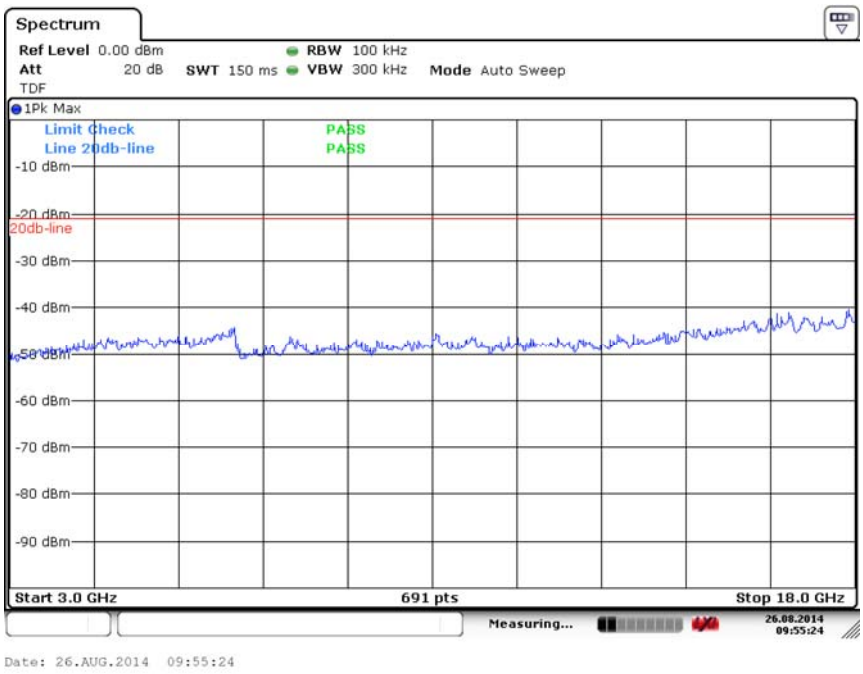


Fig. 42 Conducted Spurious Emission (8DPSK, Ch0, 3GHz-18 GHz)

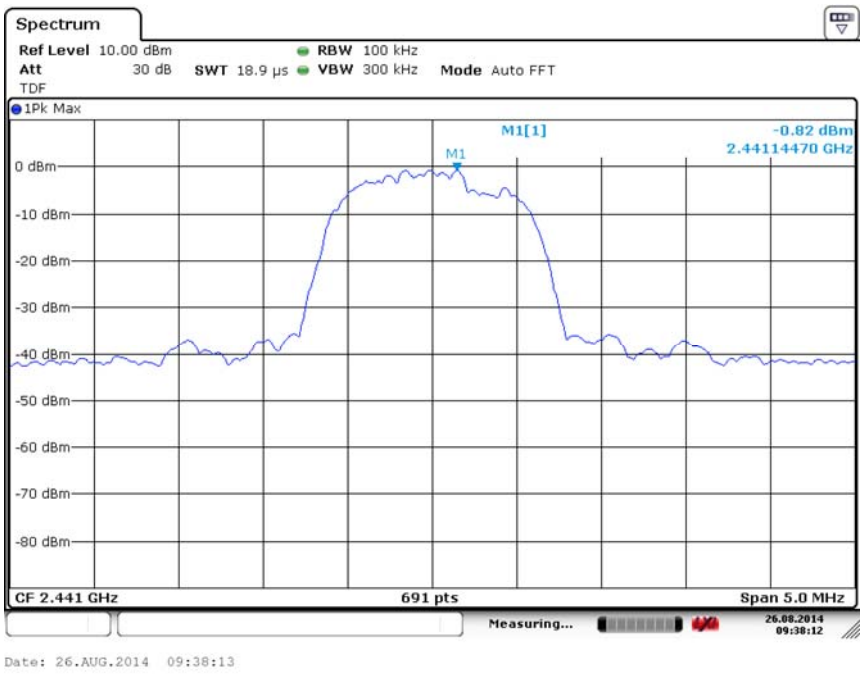


Fig. 43 Conducted Spurious Emission (8DPSK, Ch39, 2.441GHz)

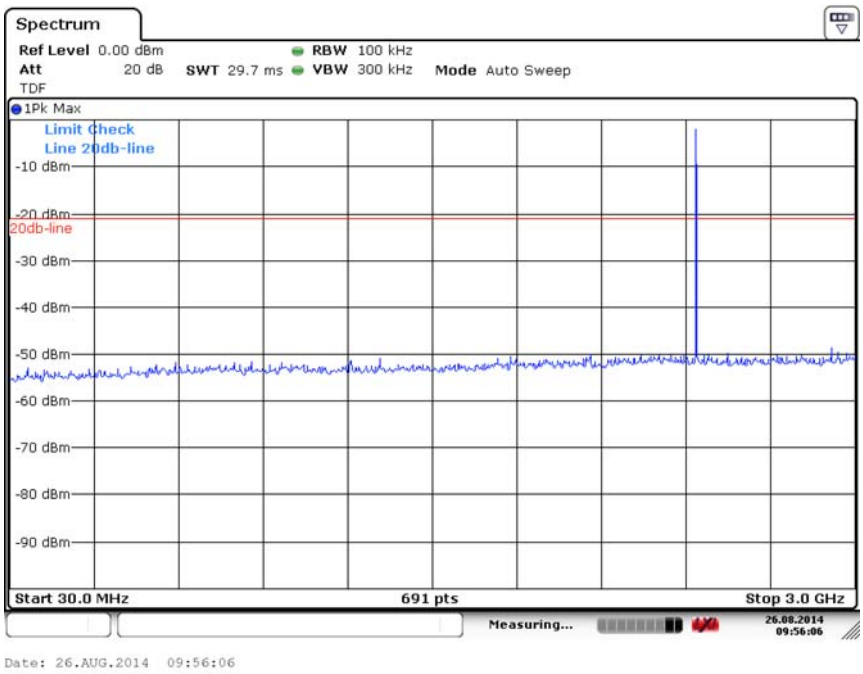


Fig. 44 Conducted Spurious Emission (8DPSK, Ch39, 30 MHz-3 GHz)

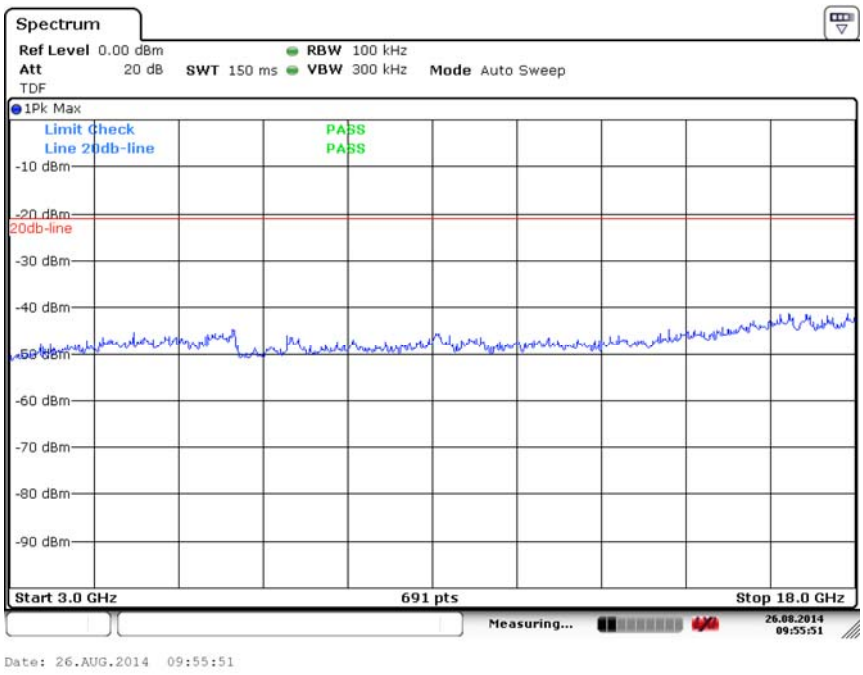


Fig. 45 Conducted Spurious Emission (8DPSK, Ch39, 3GHz-18 GHz)

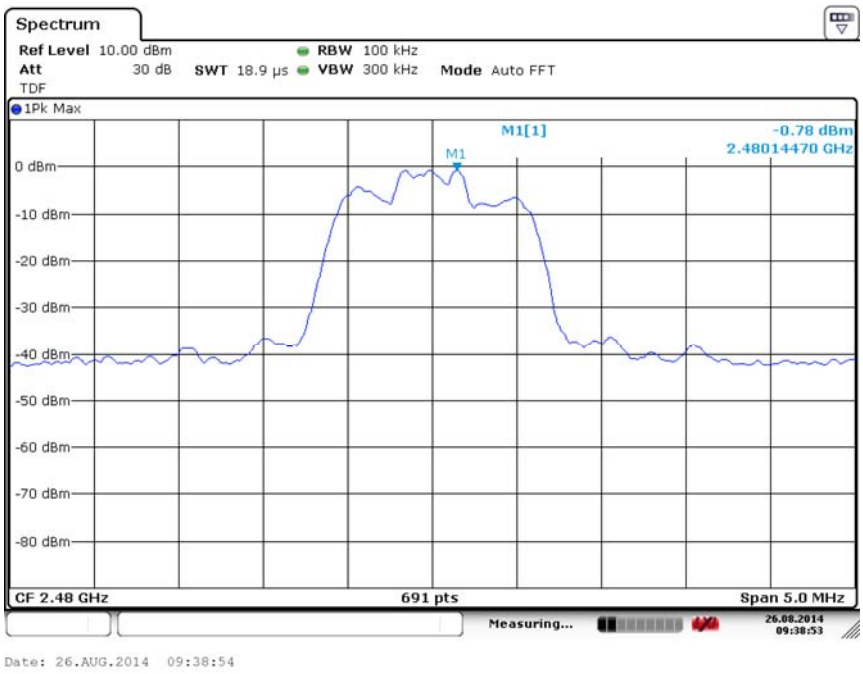


Fig. 46 Conducted Spurious Emission (8DPSK, Ch78, 2.480GHz)

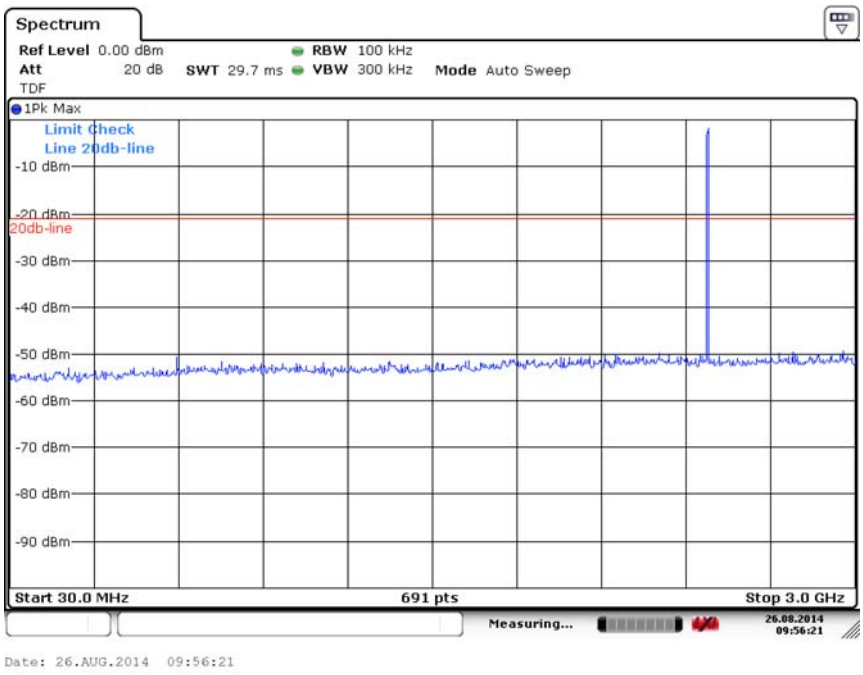


Fig. 47 Conducted Spurious Emission (8DPSK, Ch78, 30 MHz-3 GHz)

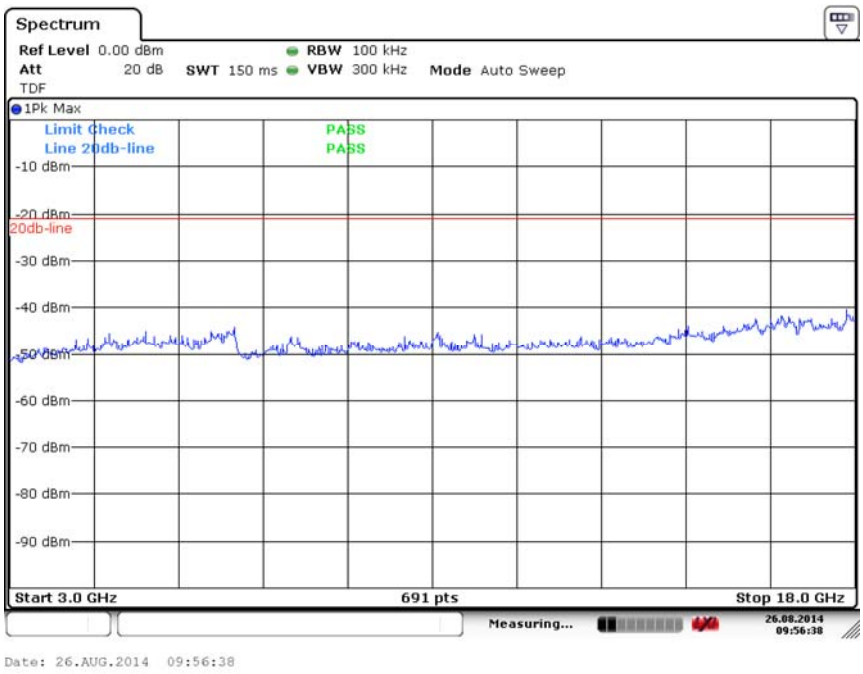


Fig. 48 Conducted Spurious Emission (8DPSK, Ch78, 3GHz-18 GHz)

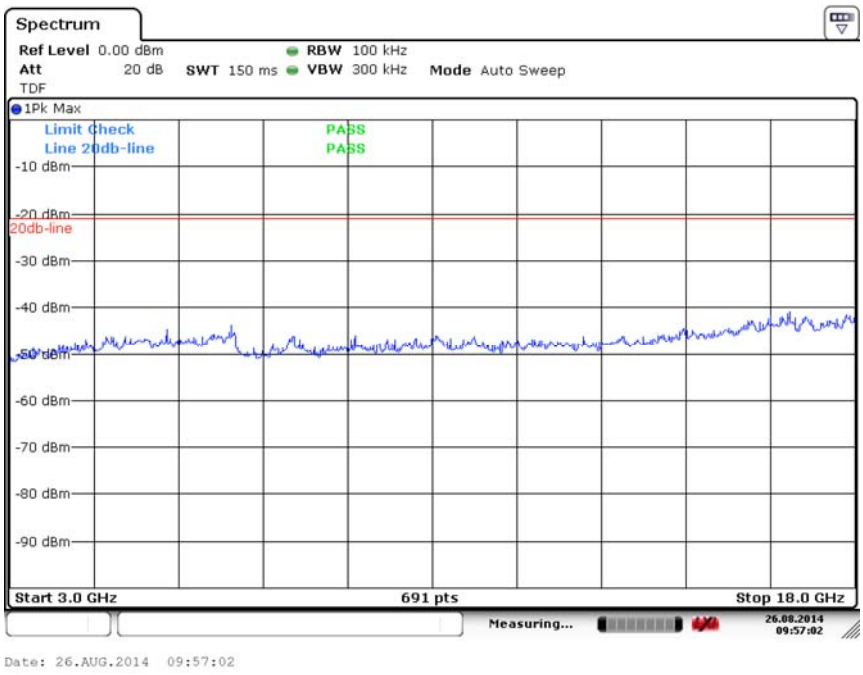


Fig. 49 Conducted Spurious Emission (All channel, 18 GHz-26 GHz)

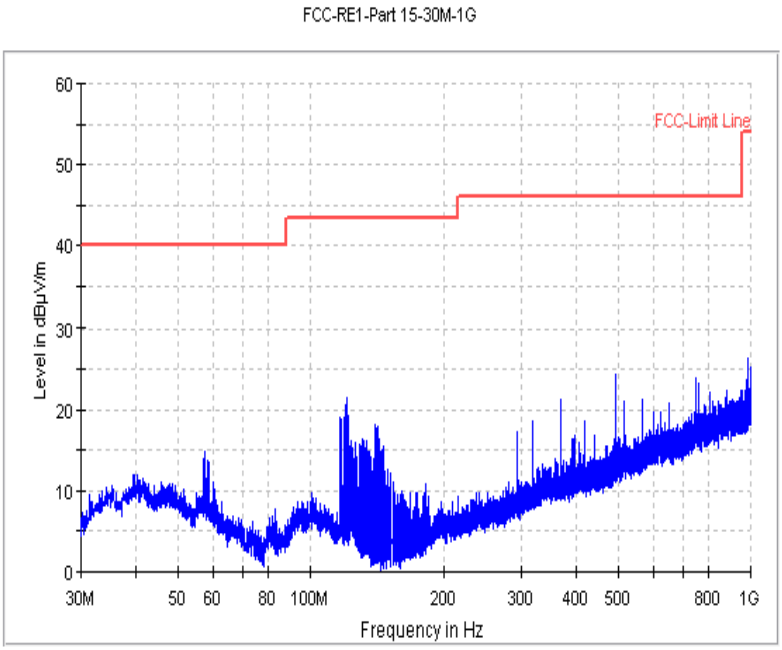


Fig. 50 Radiated Spurious Emission (GFSK, Ch0, 30 MHz ~1 GHz)

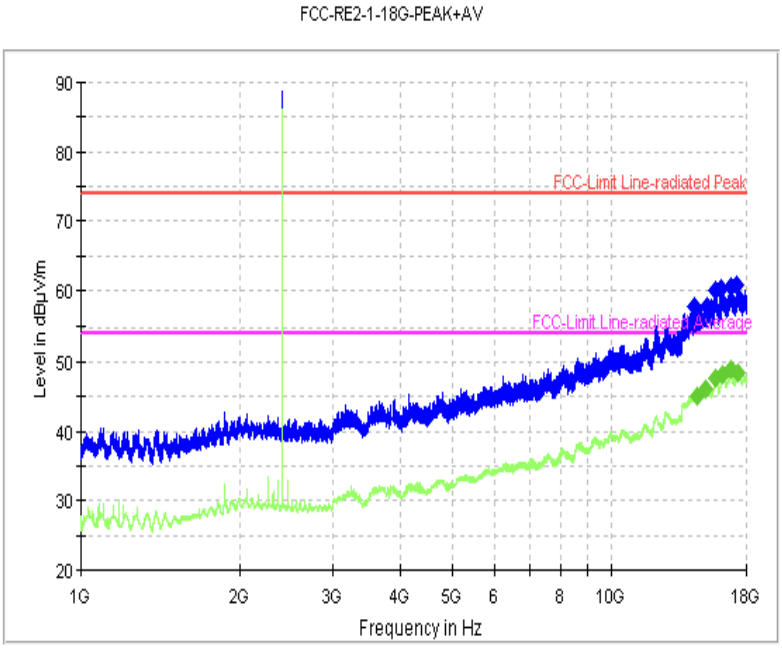


Fig. 51 Radiated Spurious Emission (GFSK, Ch0, 1 GHz ~18 GHz)

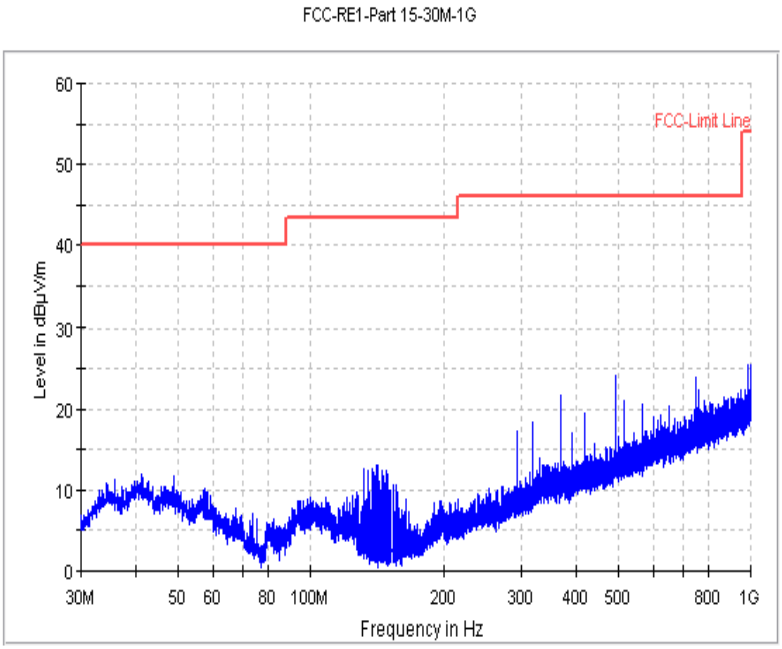


Fig. 52 Radiated Spurious Emission (GFSK, Ch39, 30 MHz ~1 GHz)

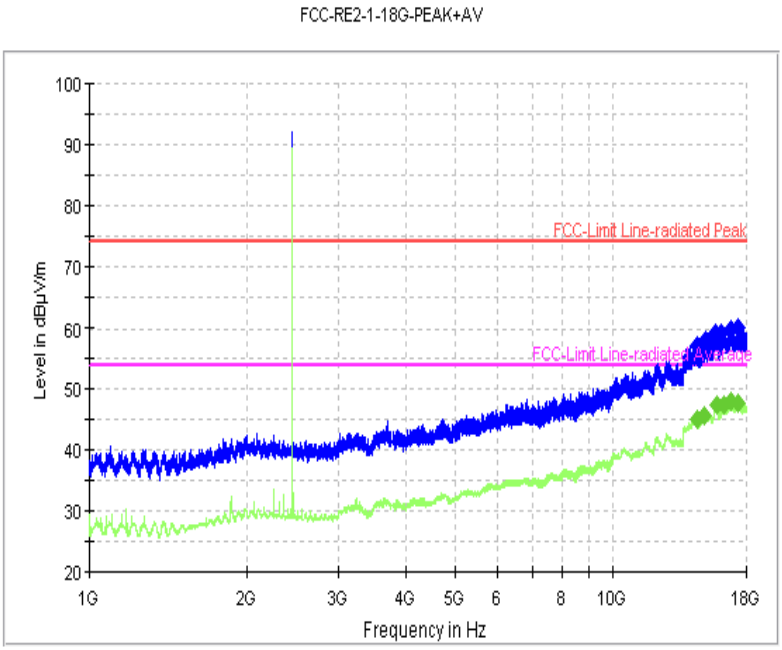


Fig. 53 Radiated Spurious Emission (GFSK, Ch39, 1 GHz ~18 GHz)

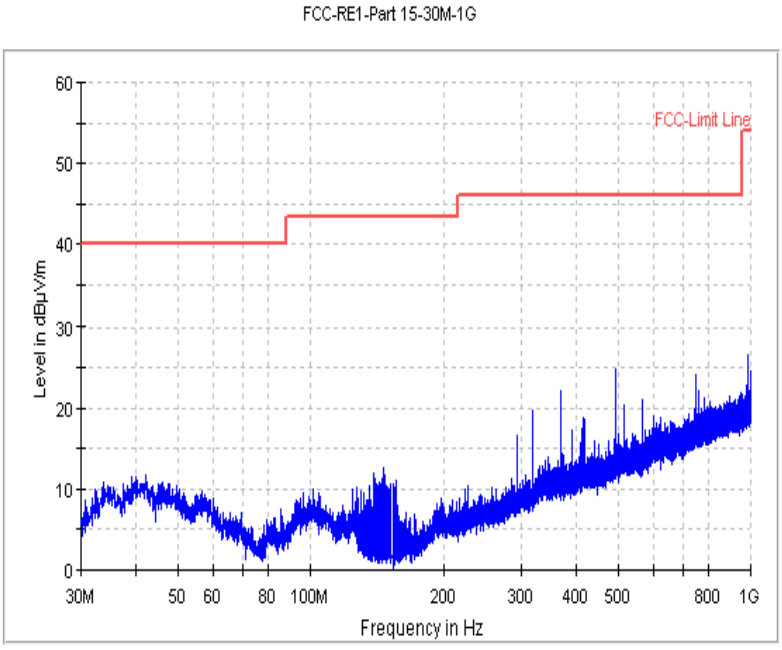


Fig. 54 Radiated Spurious Emission (GFSK, Ch78, 30 MHz ~1 GHz)

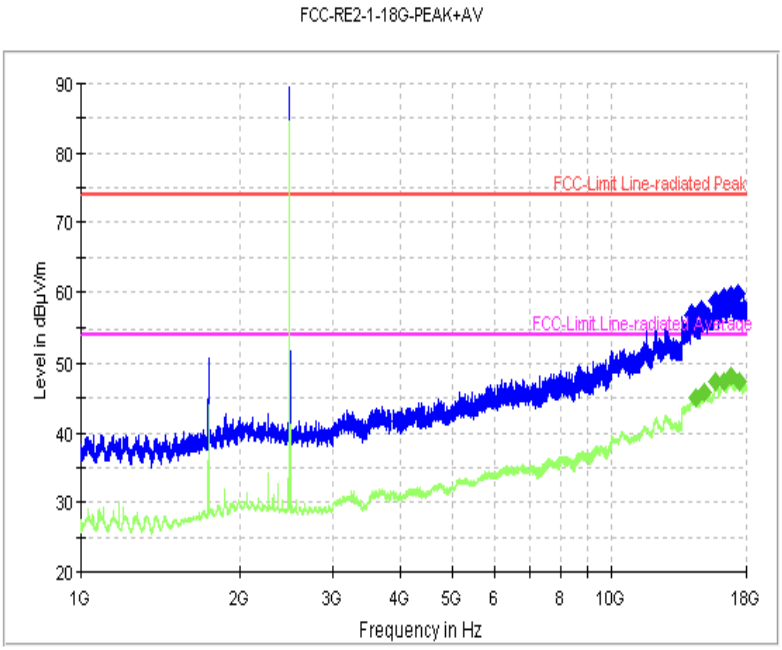


Fig. 55 Radiated Spurious Emission (GFSK, Ch78, 1 GHz ~18 GHz)

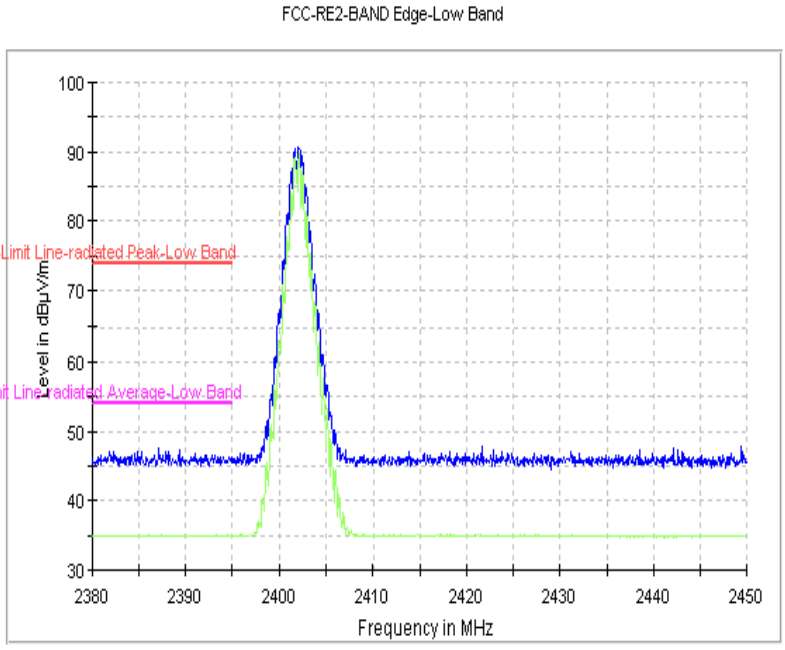


Fig. 56 Radiated Emission Power (GFSK, Ch0, 2380GHz~2450GHz)

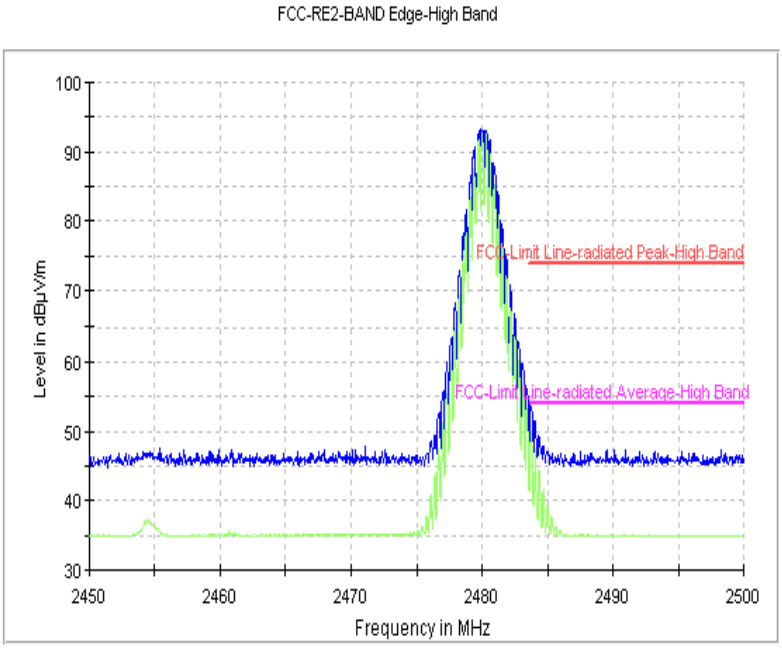


Fig. 57 Radiated Emission Power (GFSK, Ch78, 2450GHz~2500GHz)

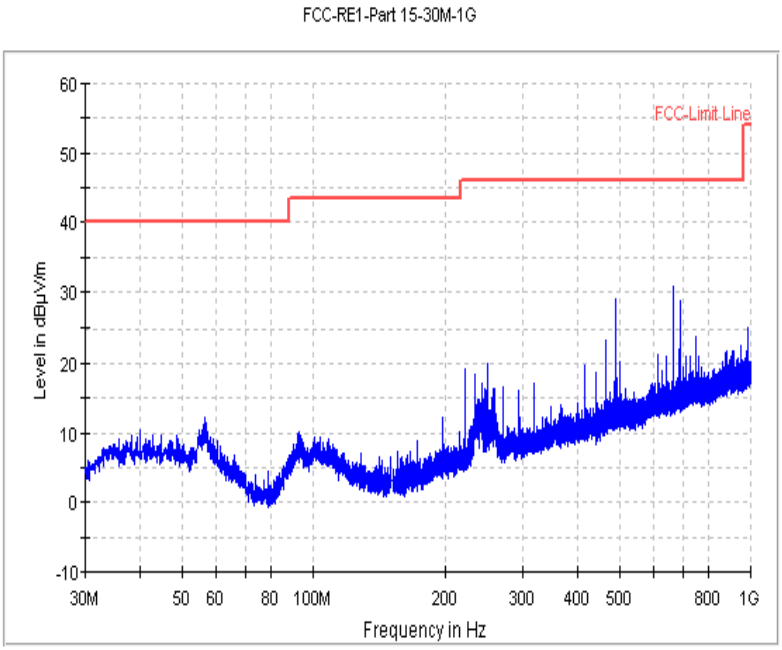


Fig. 58 Radiated Spurious Emission (π /4 DQPSK, Ch0, 30 MHz ~1 GHz)

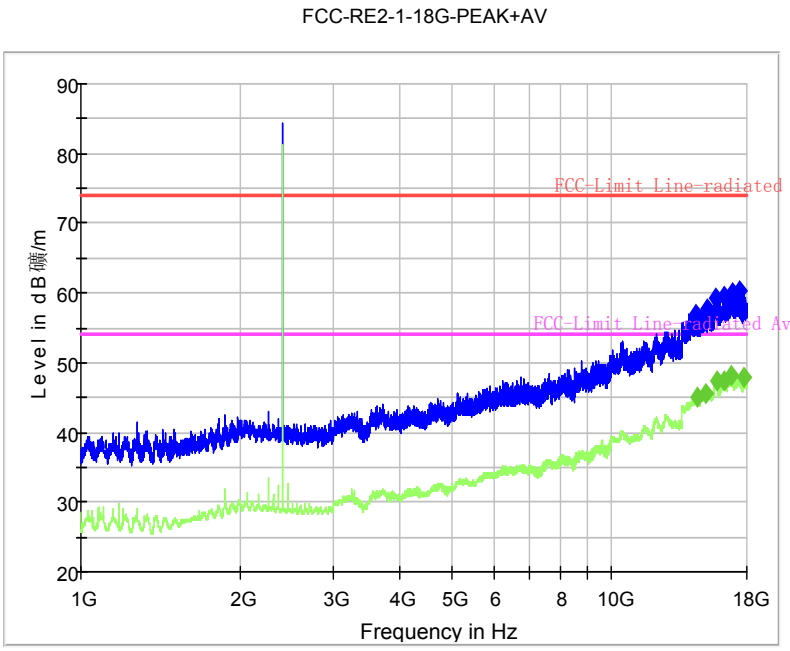


Fig. 59 Radiated Spurious Emission (π /4 DQPSK, Ch0, 1 GHz ~18 GHz)

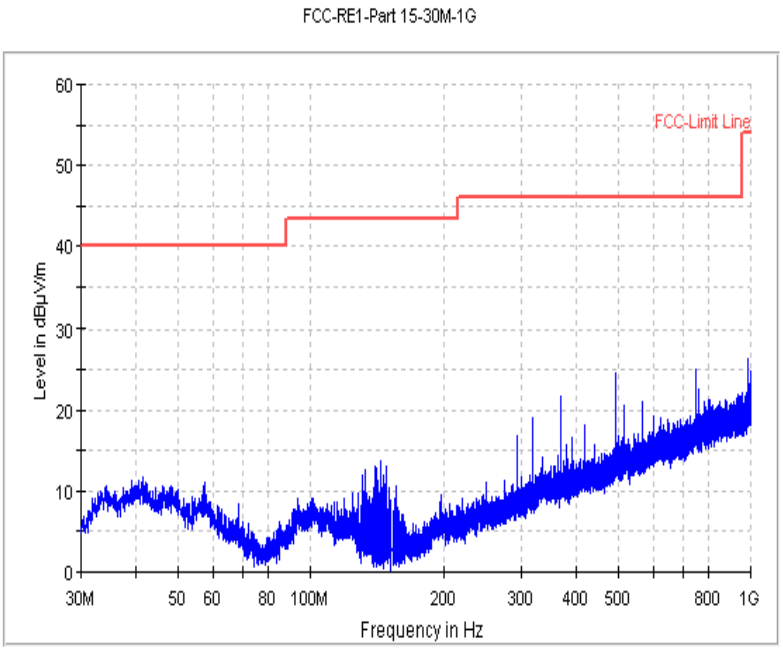


Fig. 60 Radiated Spurious Emission (π /4 DQPSK, Ch39, 30 MHz ~1 GHz)

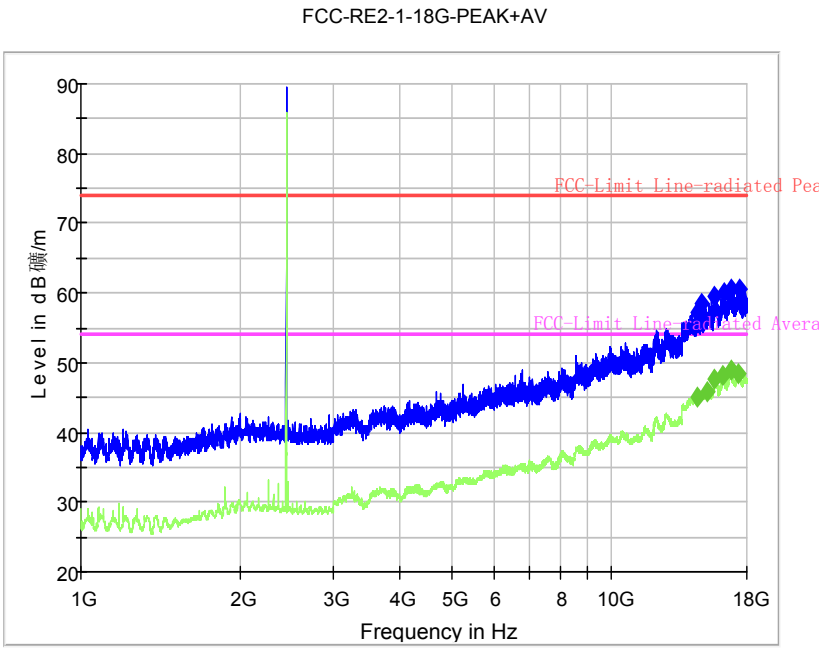


Fig. 61 Radiated Spurious Emission (π /4 DQPSK, Ch39, 1 GHz ~18 GHz)

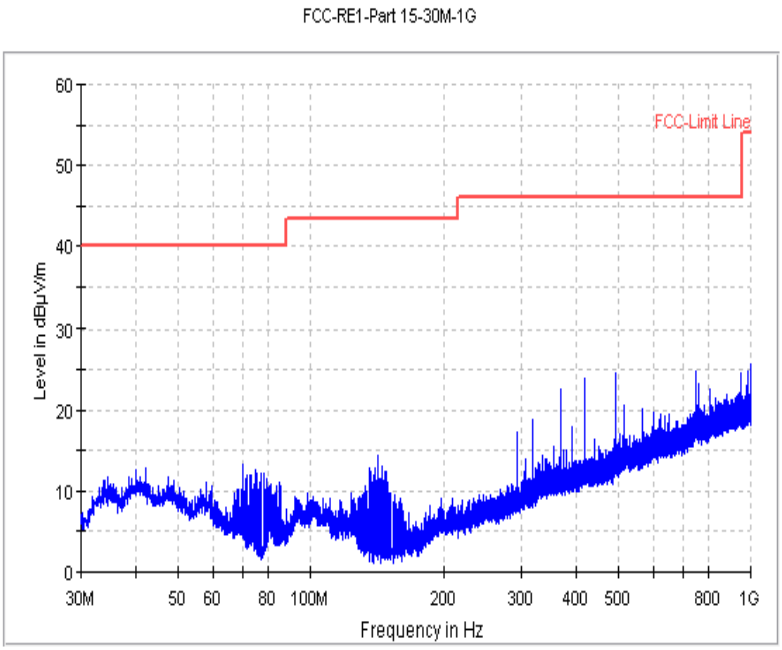


Fig. 62 Radiated Spurious Emission (π /4 DQPSK, Ch78, 30 MHz ~1 GHz)

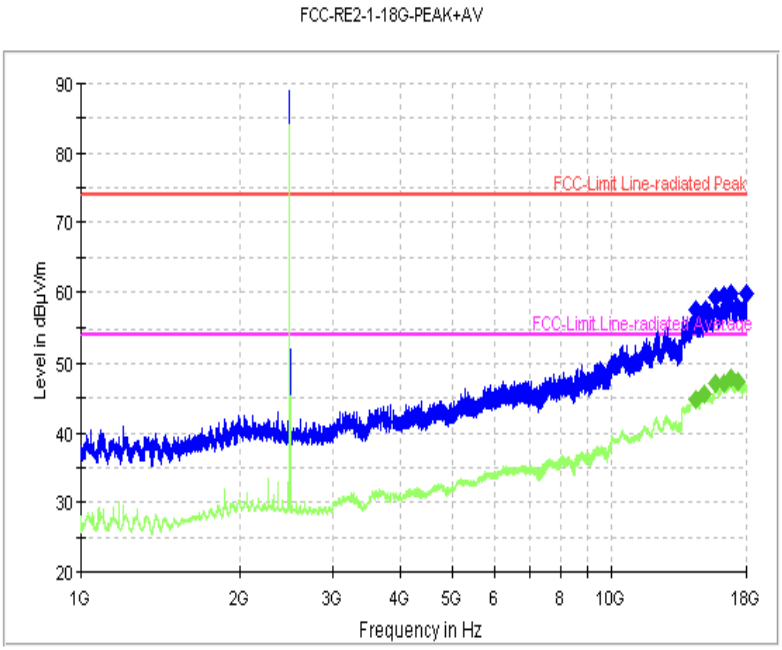


Fig. 63 Radiated Spurious Emission (π /4 DQPSK, Ch78, 1 GHz ~18 GHz)

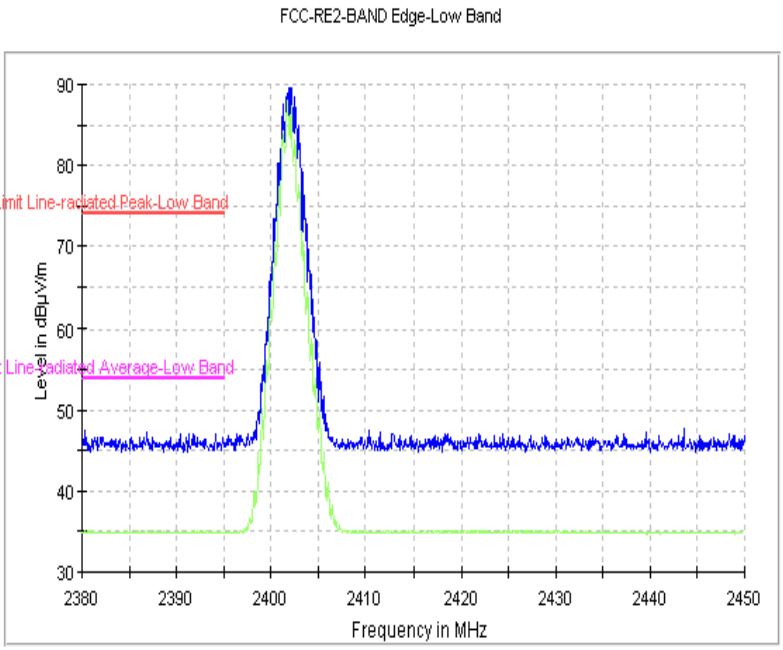


Fig. 64 Radiated Emission Power (π /4 DQPSK, Ch0, 2380GHz~2450GHz)

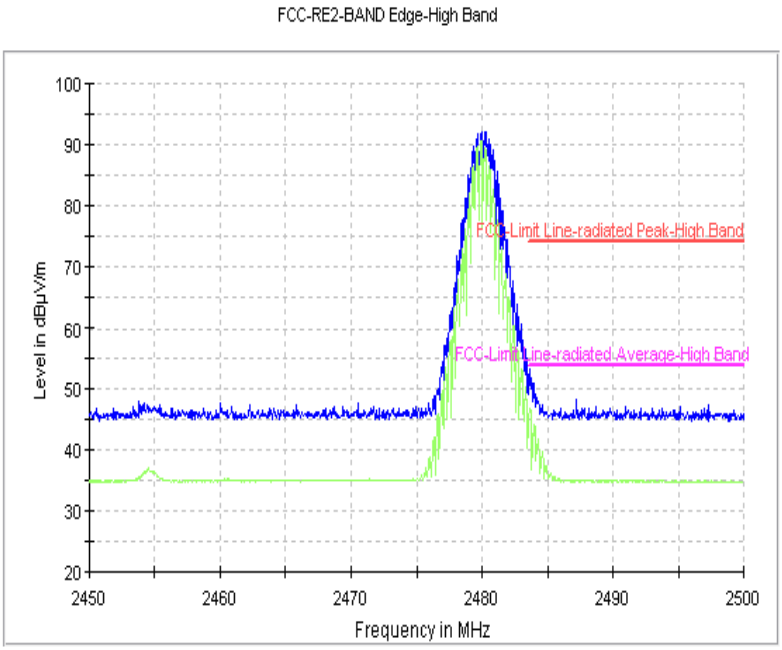


Fig. 65 Radiated Emission Power (π /4 DQPSK, Ch78, 2450GHz~2500GHz)

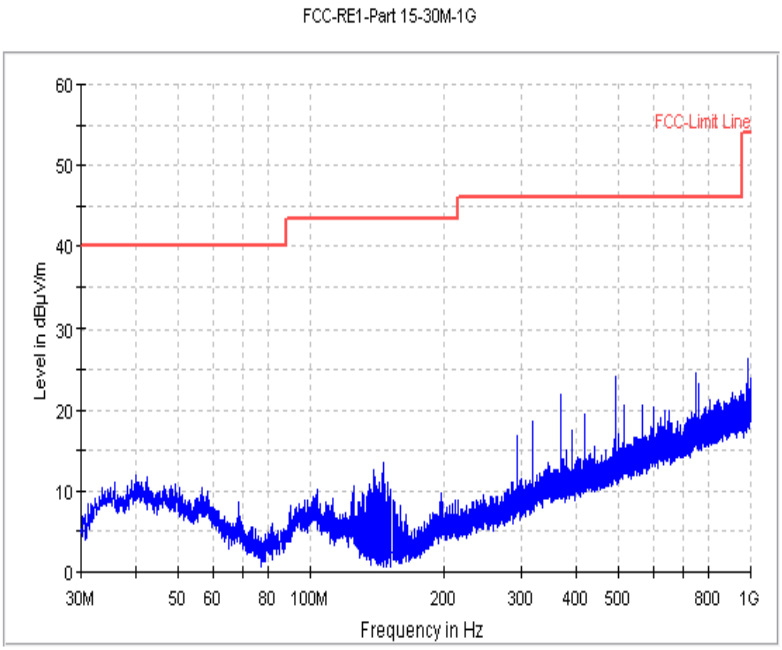


Fig. 66 Radiated Spurious Emission (8DPSK, Ch0, 30 MHz ~1 GHz)

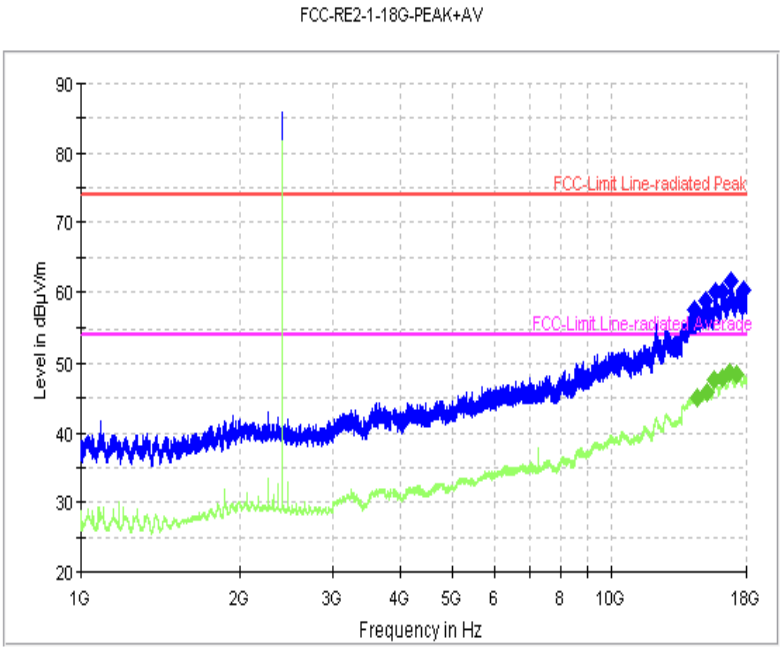


Fig. 67 Radiated Spurious Emission (8DPSK, Ch0, 1 GHz ~18 GHz)

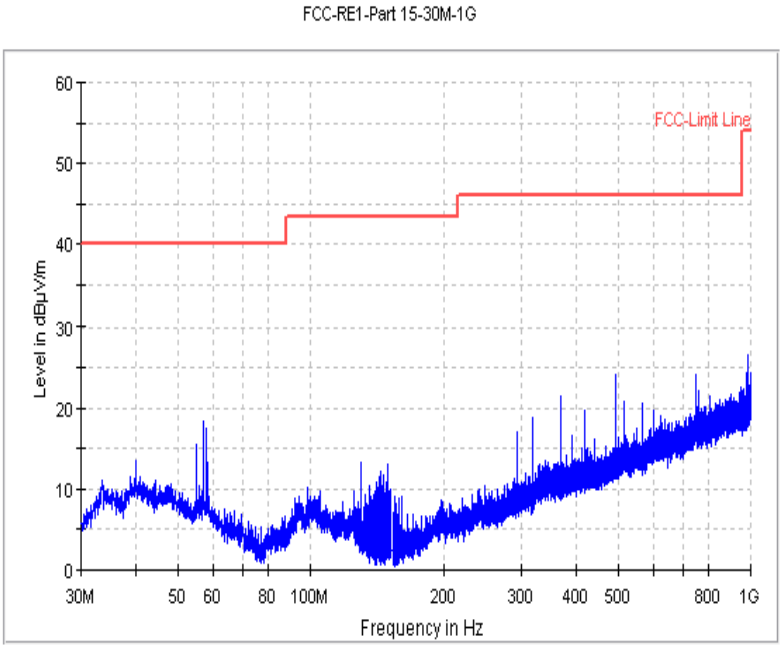


Fig. 68 Radiated Spurious Emission (8DPSK, Ch39, 30 MHz ~1 GHz)

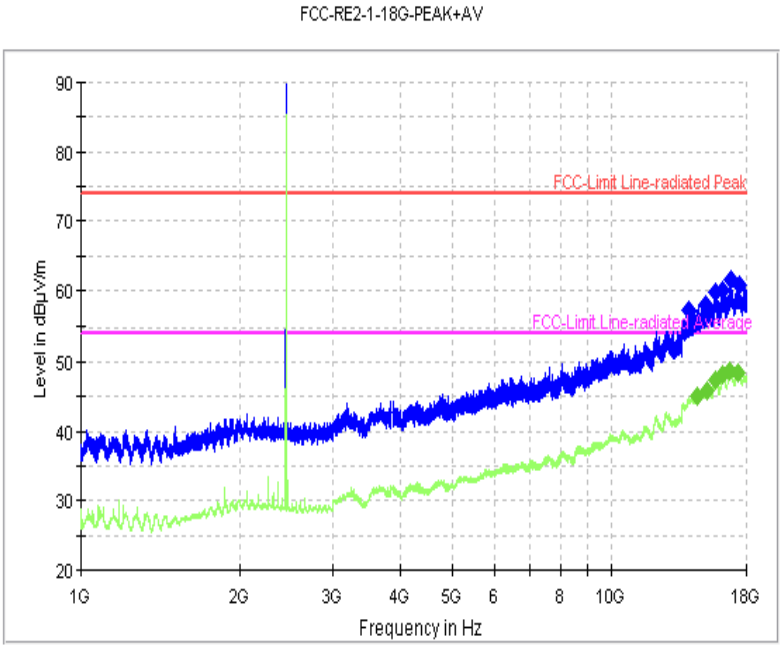


Fig. 69 Radiated Spurious Emission (8DPSK, Ch39, 1 GHz ~18 GHz)

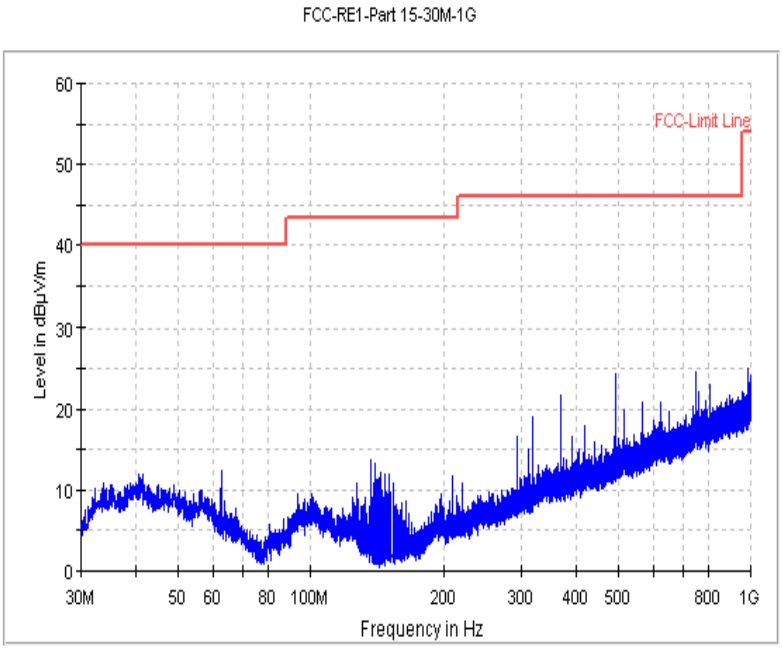


Fig. 70 Radiated Spurious Emission (8DPSK, Ch78, 30 MHz ~1 GHz)

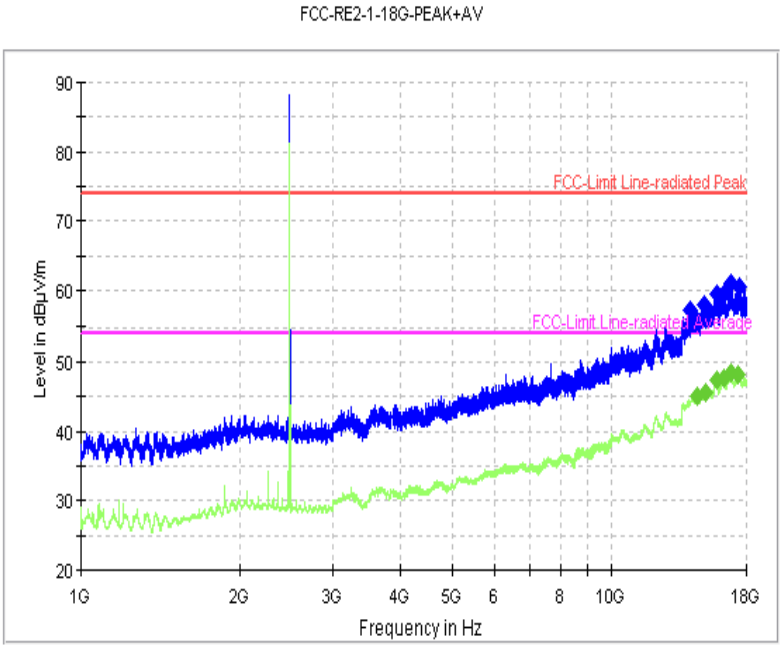


Fig. 71 Radiated Spurious Emission (8DPSK, Ch78, 1 GHz ~18 GHz)

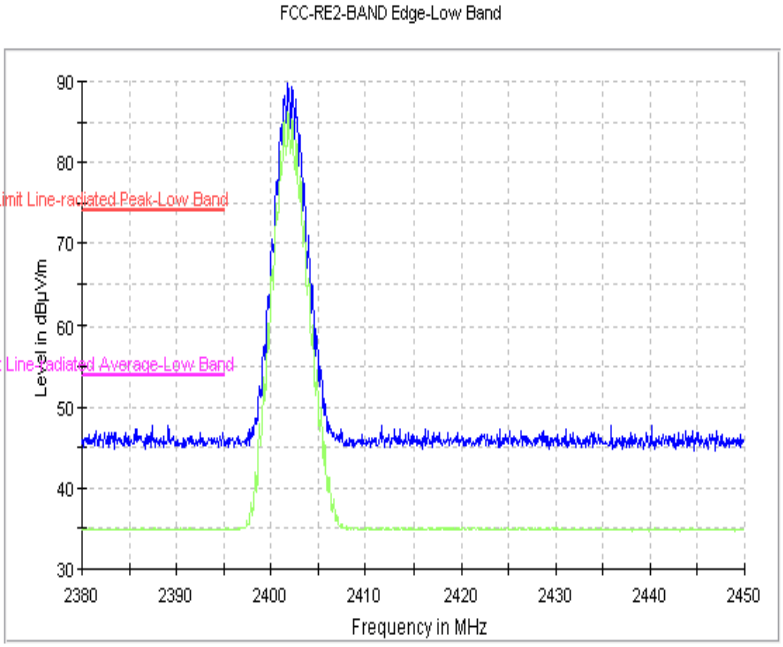


Fig. 72 Radiated Emission Power (8DPSK, Ch0, 2380GHz~2450GHz)

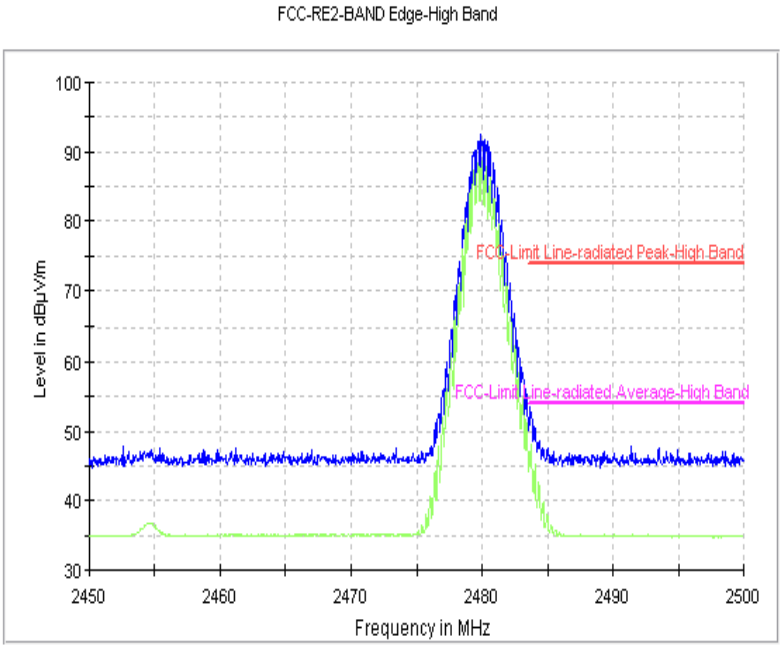


Fig. 73 Radiated Emission Power (8DPSK, Ch78, 2450GHz~2500GHz)

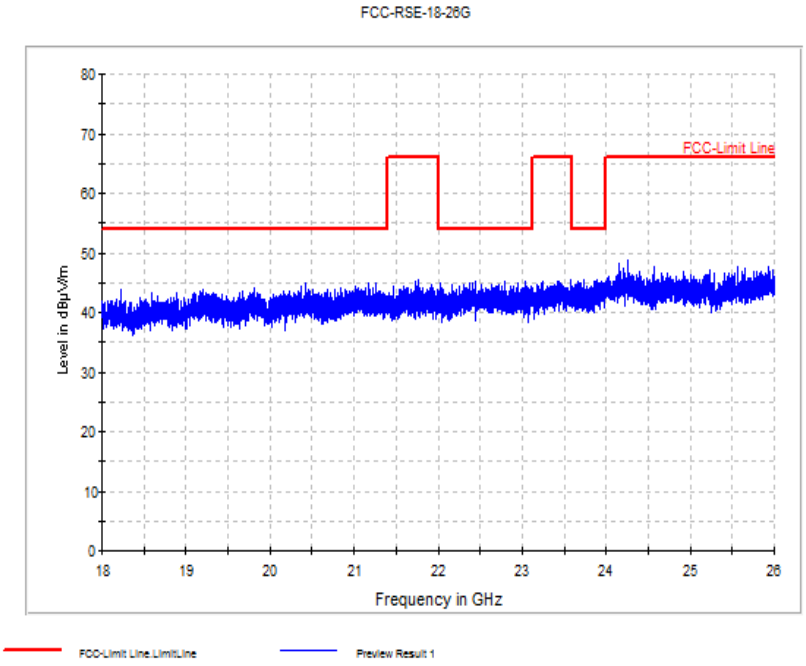


Fig. 74 Radiated Spurious Emission (All channel, 18 GHz ~26 GHz)

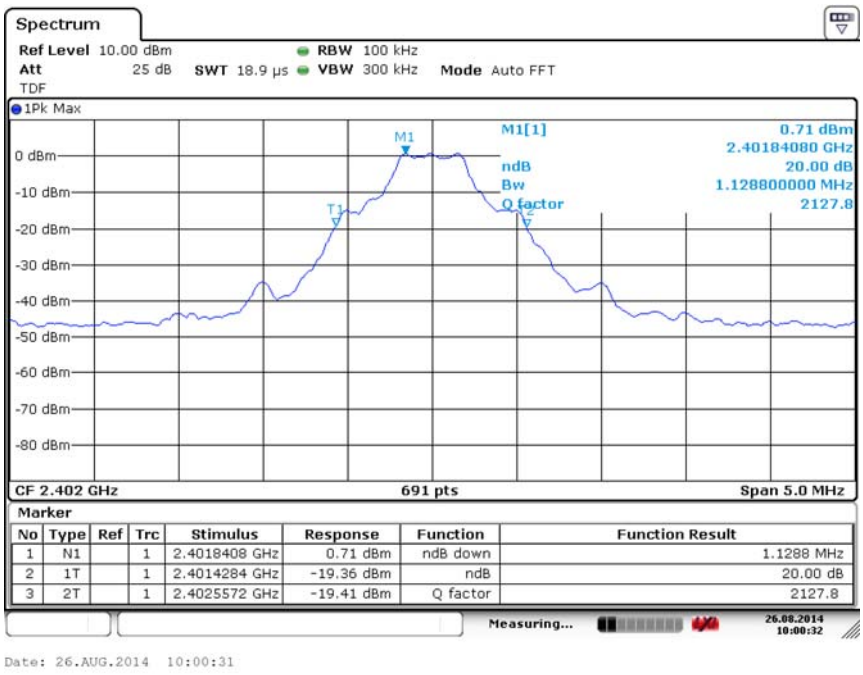


Fig. 75 Occupied 20dB Bandwidth (GFSK, Ch 0)

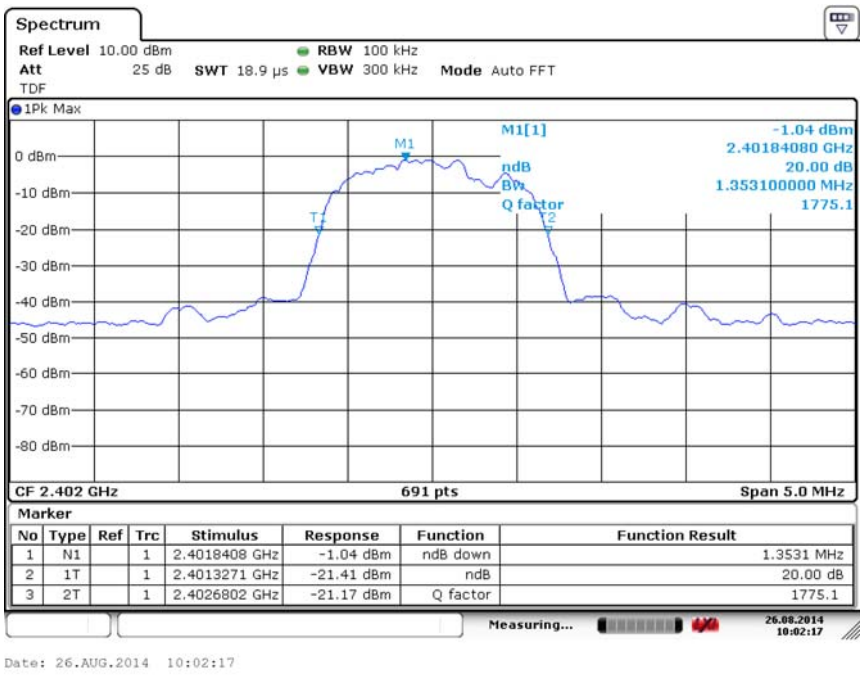


Fig. 76 Occupied 20dB Bandwidth (GFSK, Ch 39)

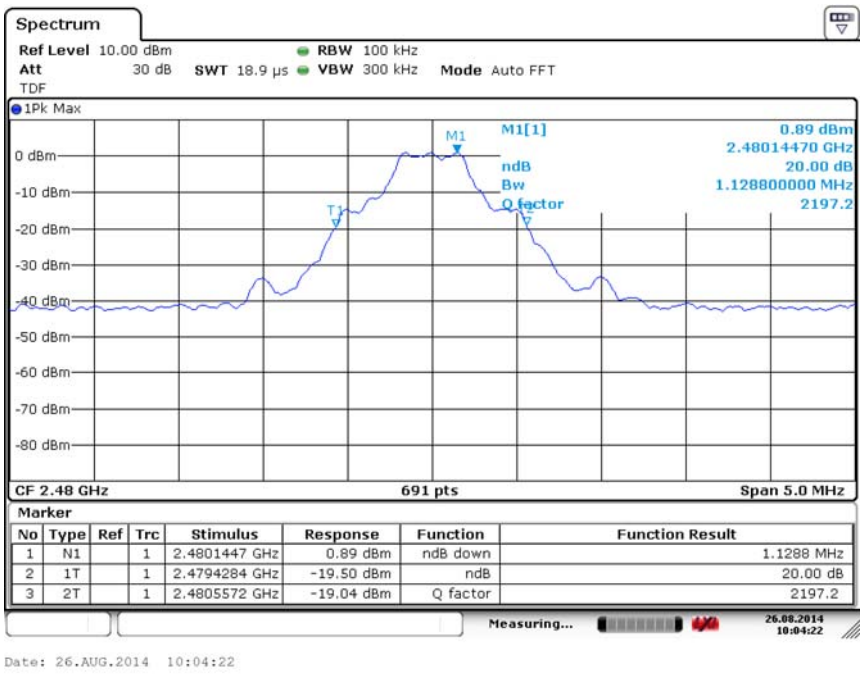


Fig. 77 Occupied 20dB Bandwidth (GFSK, Ch 78)

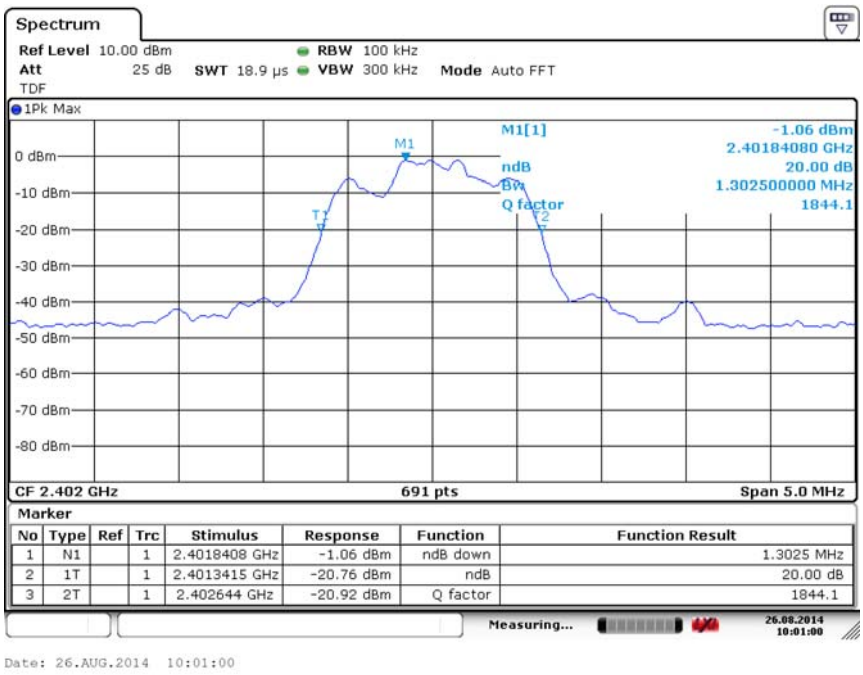


Fig. 78 Occupied 20dB Bandwidth (π /4 DQPSK, Ch 0)

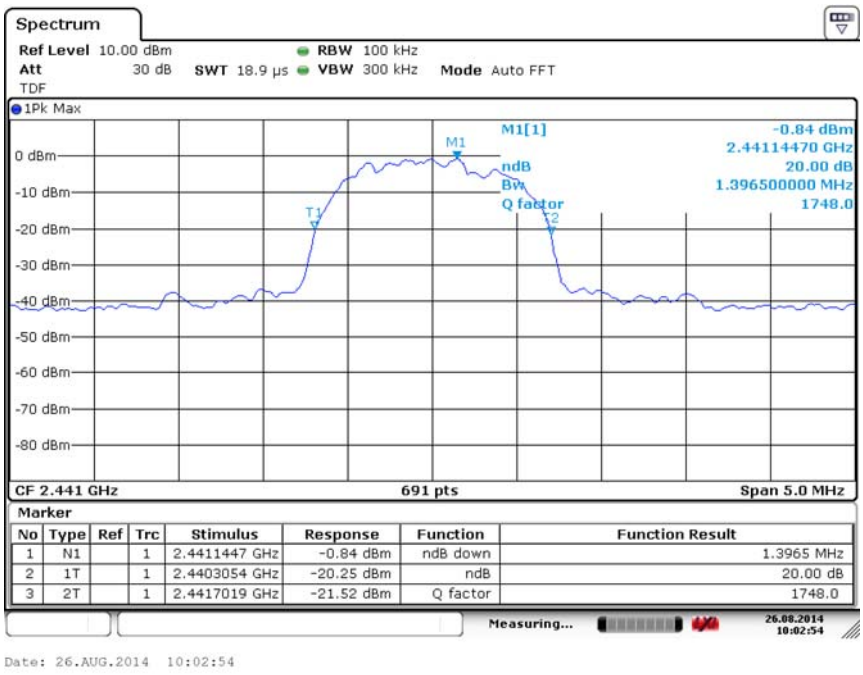


Fig. 79 Occupied 20dB Bandwidth (π /4 DQPSK, Ch 39)

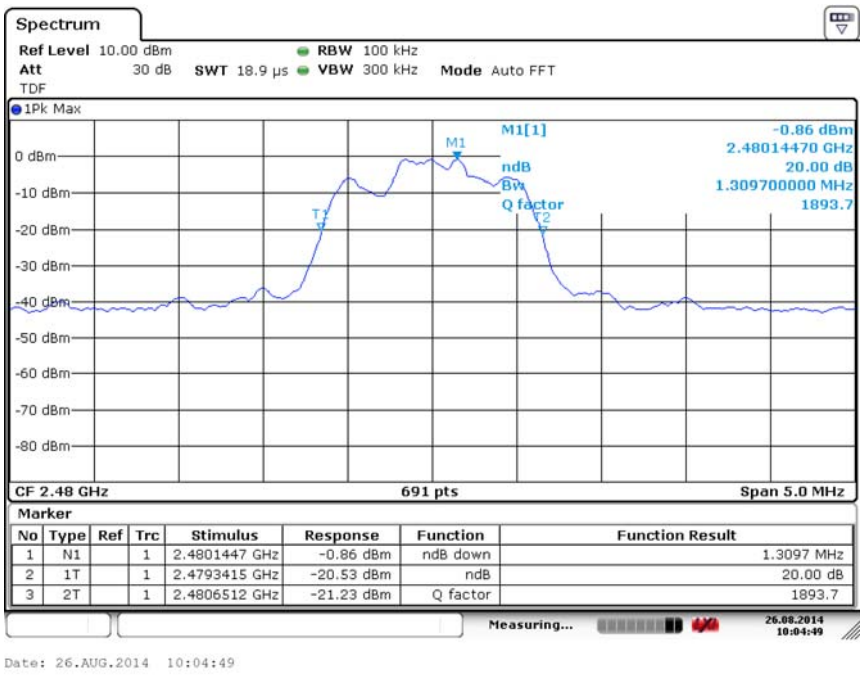


Fig. 80 Occupied 20dB Bandwidth (π /4 DQPSK, Ch 78)

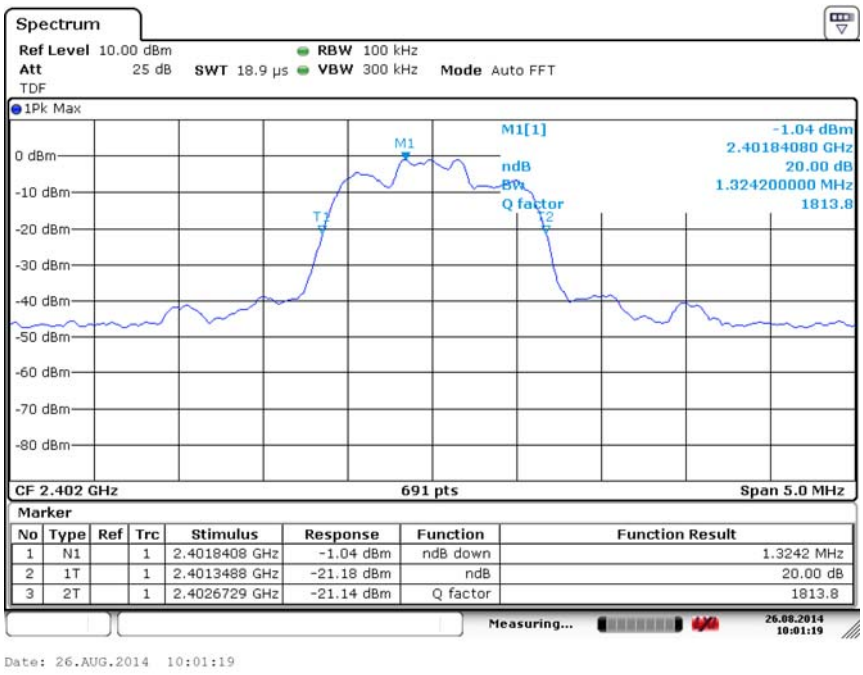


Fig. 81 Occupied 20dB Bandwidth (8DPSK, Ch 0)

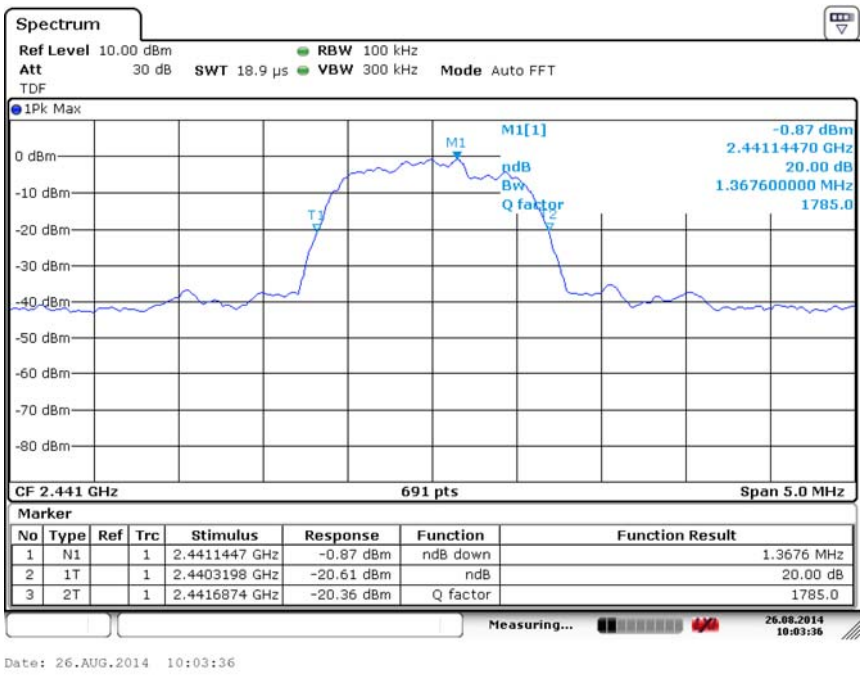


Fig. 82 Occupied 20dB Bandwidth (8DPSK, Ch 39)

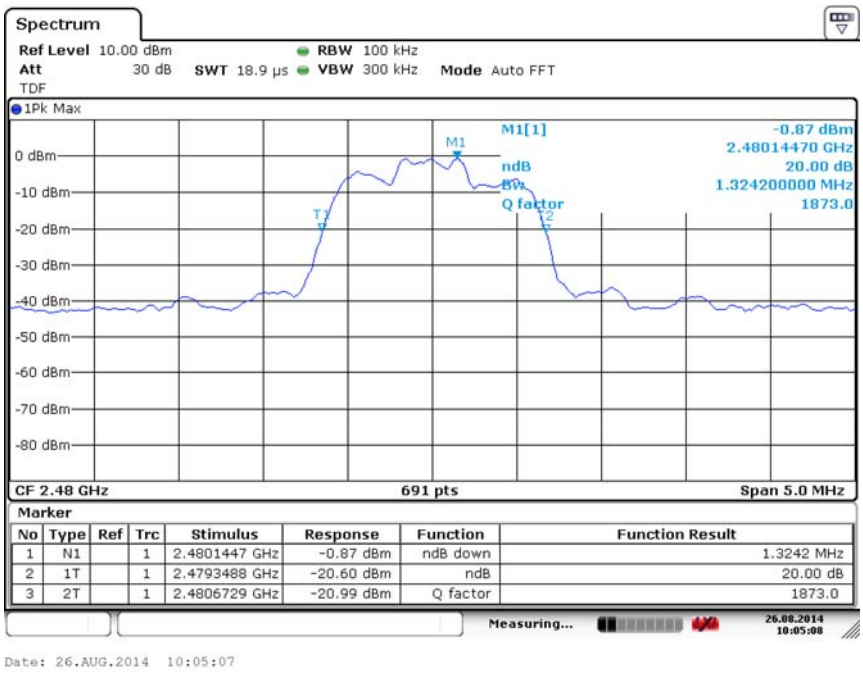


Fig. 83 Occupied 20dB Bandwidth (8DPSK, Ch 78)

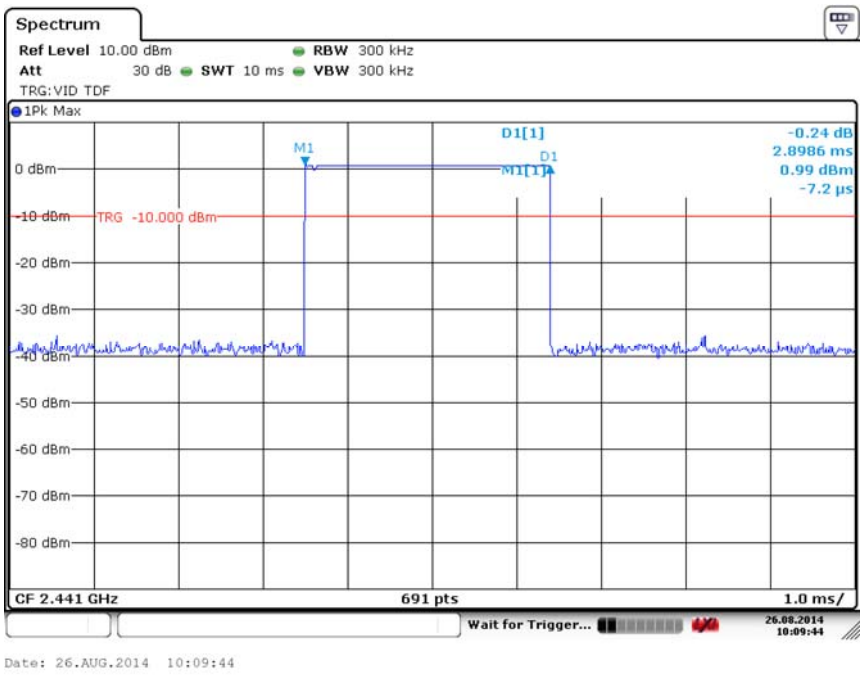


Fig. 84 Time of Occupancy(Dwell Time) (GFSK, Ch39)

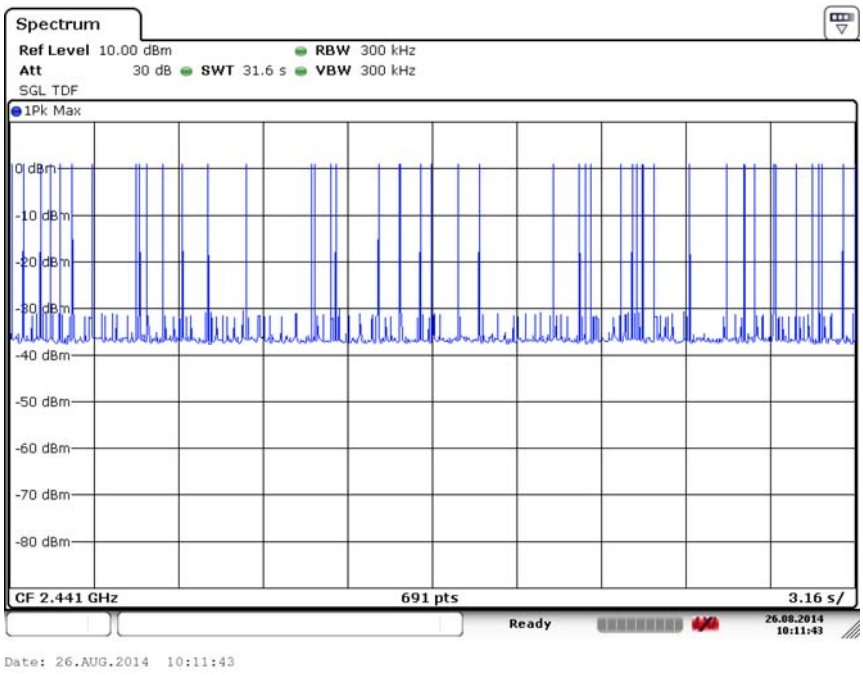


Fig. 85 Number of Transmissions (GFSK, Ch39)

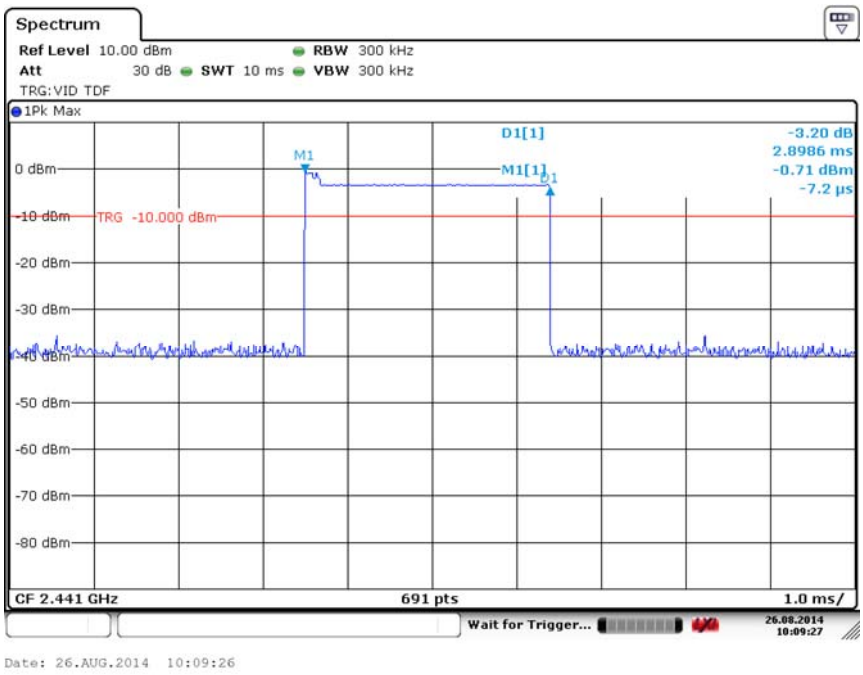


Fig. 86 Time of Occupancy(Dwell Time) (π /4 DQPSK, Ch39)

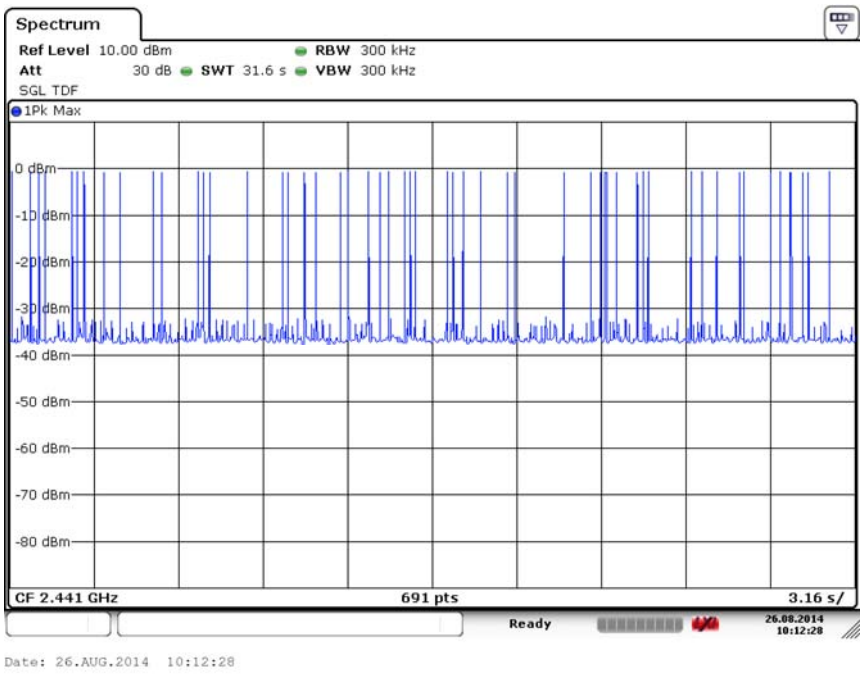


Fig. 87 Number of Transmissions (π /4 DQPSK, Ch39)

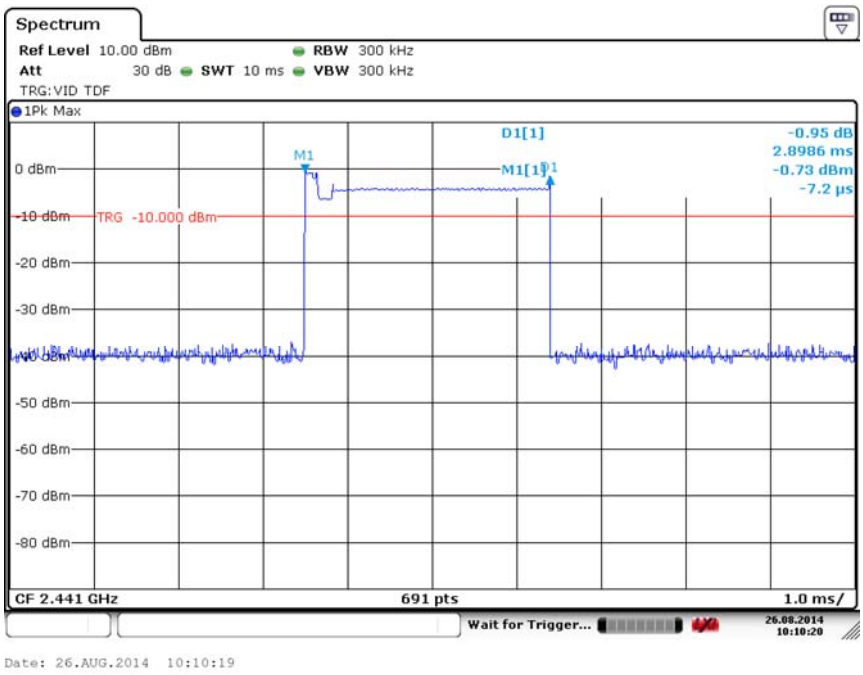


Fig. 88 Time of Occupancy(Dwell Time) (8DPSK, Ch39)

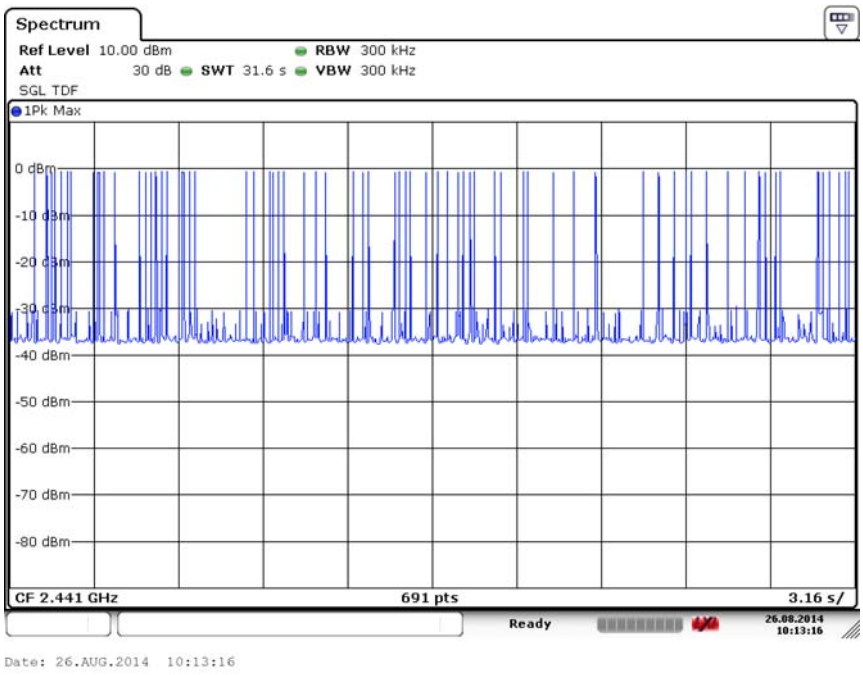


Fig. 89 Number of Transmissions (8DPSK, Ch39)

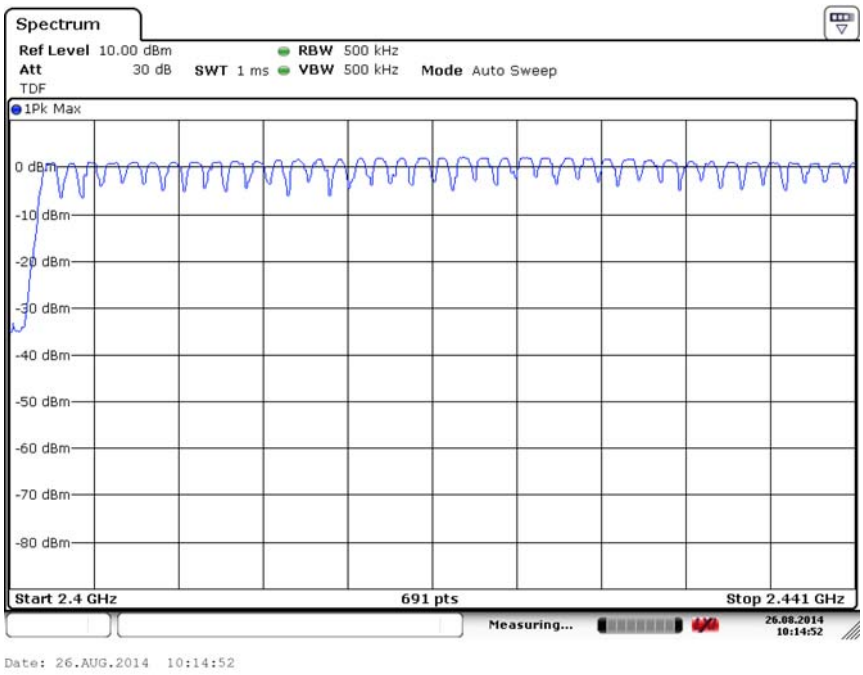


Fig. 90 Hopping channel ch0~39 (GFSK, Ch39)

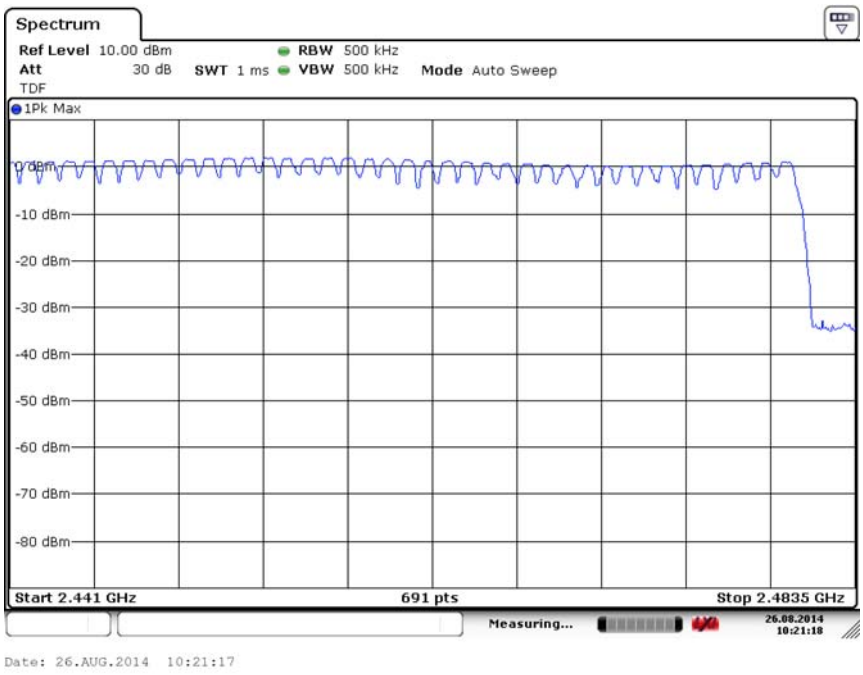


Fig. 91 Hopping channel ch39~78 (GFSK, Ch39)

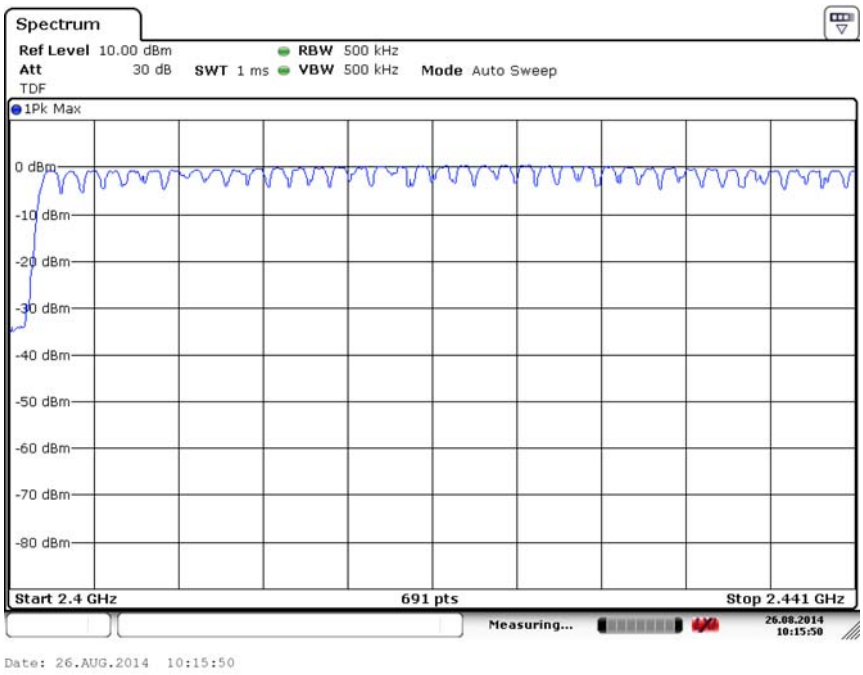


Fig. 92 Hopping channel ch0~39 (π /4 DQPSK, Ch39)

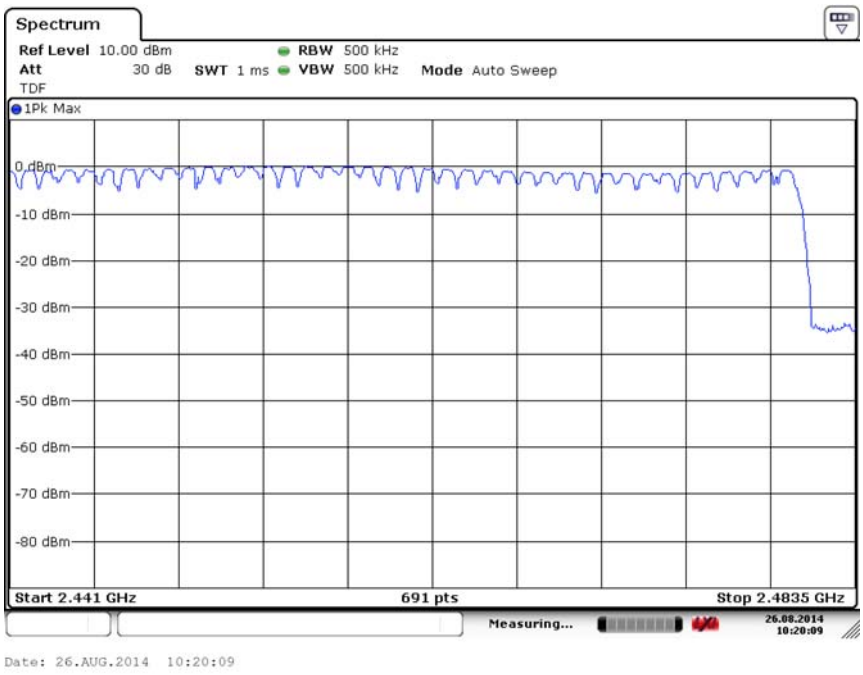


Fig. 93 Hopping channel ch39~78 (π /4 DQPSK, Ch39)

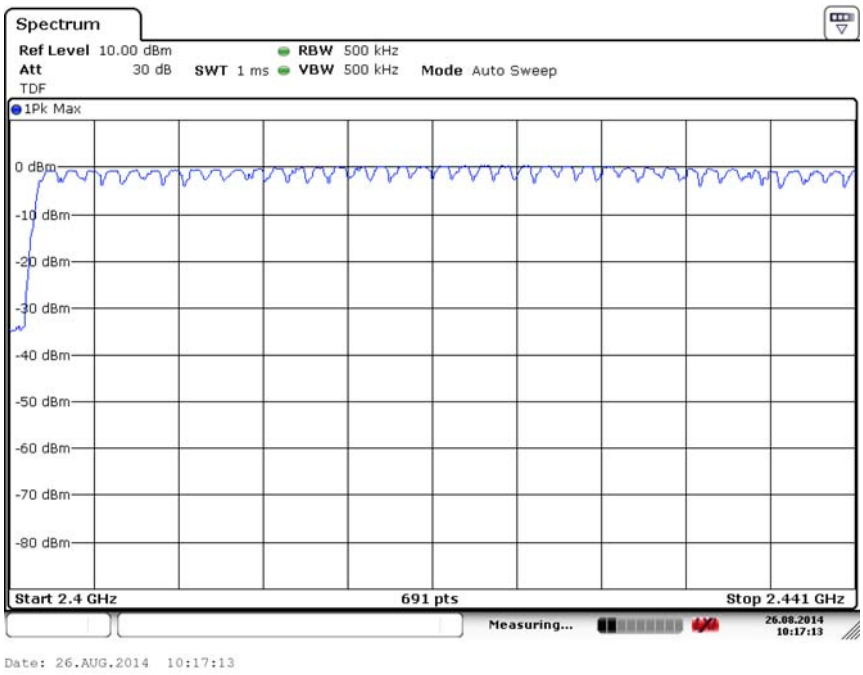


Fig. 94 Hopping channel ch0~39 (8DPSK, Ch39)

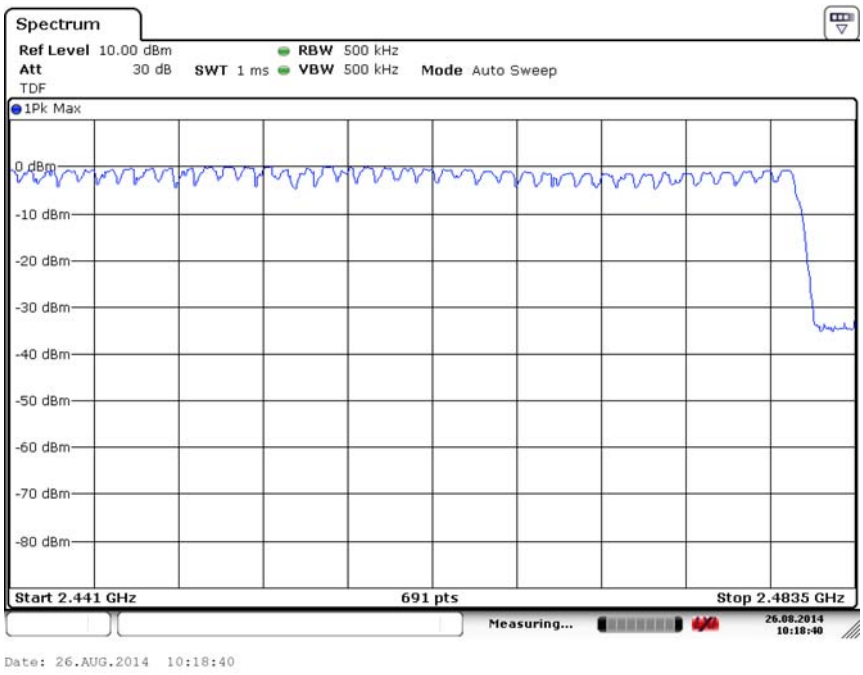


Fig. 95 Hopping channel ch39~78 (8DPSK, Ch39)

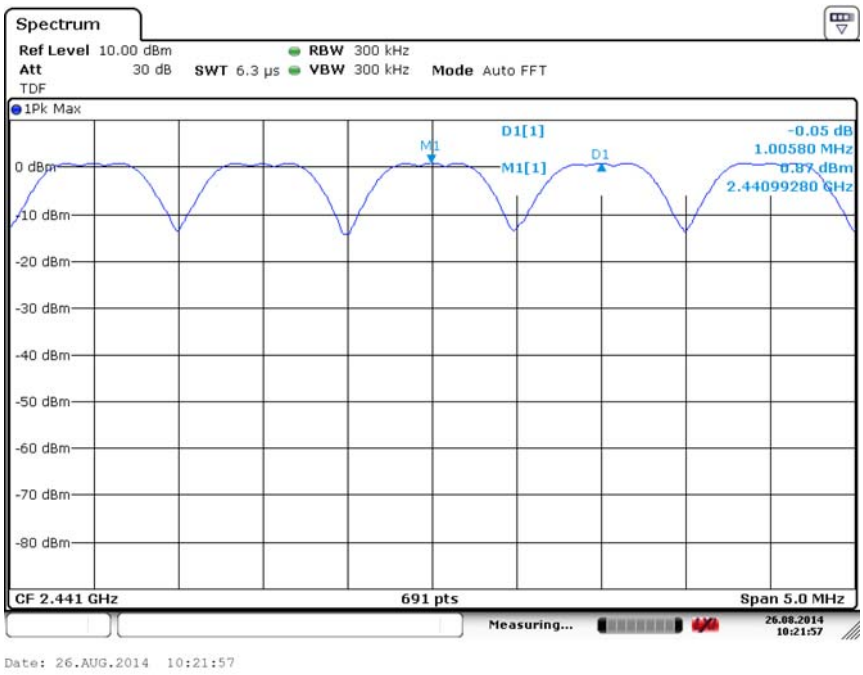


Fig. 96 Carrier Frequency Separation (GFSK, Ch39)

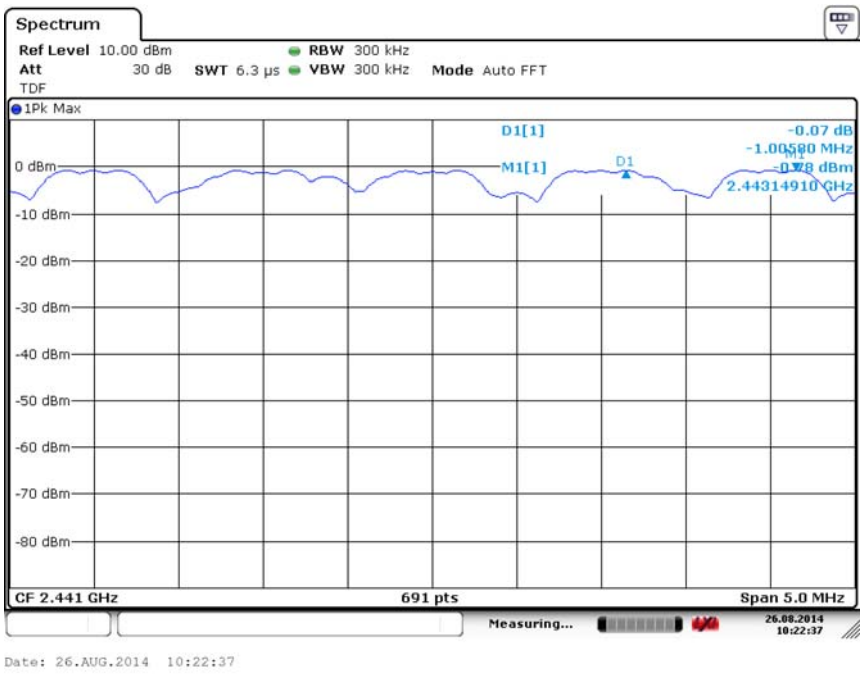


Fig. 97 Carrier Frequency Separation (π /4 DQPSK, Ch39)

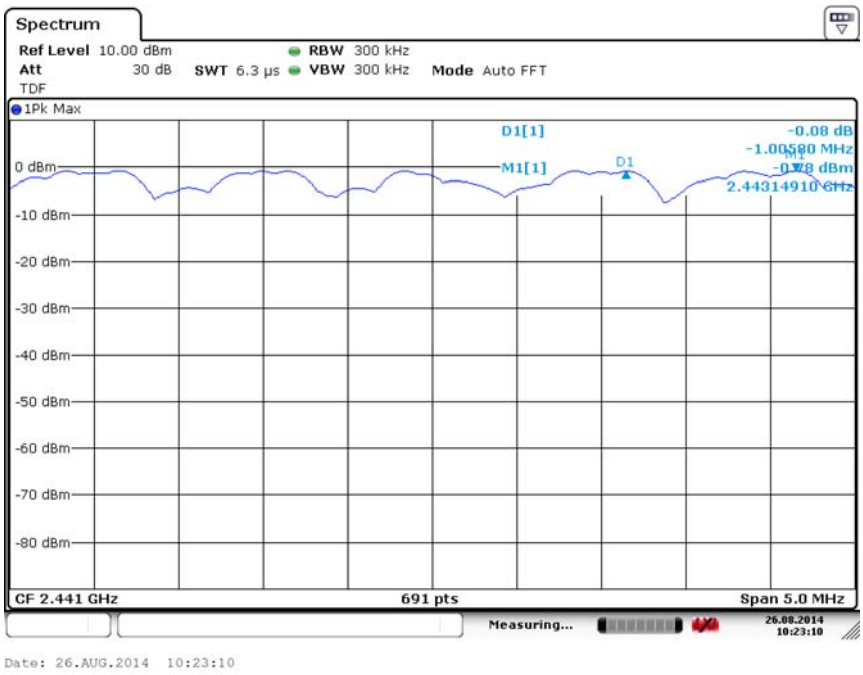


Fig. 98 Carrier Frequency Separation (8DPSK, Ch39)

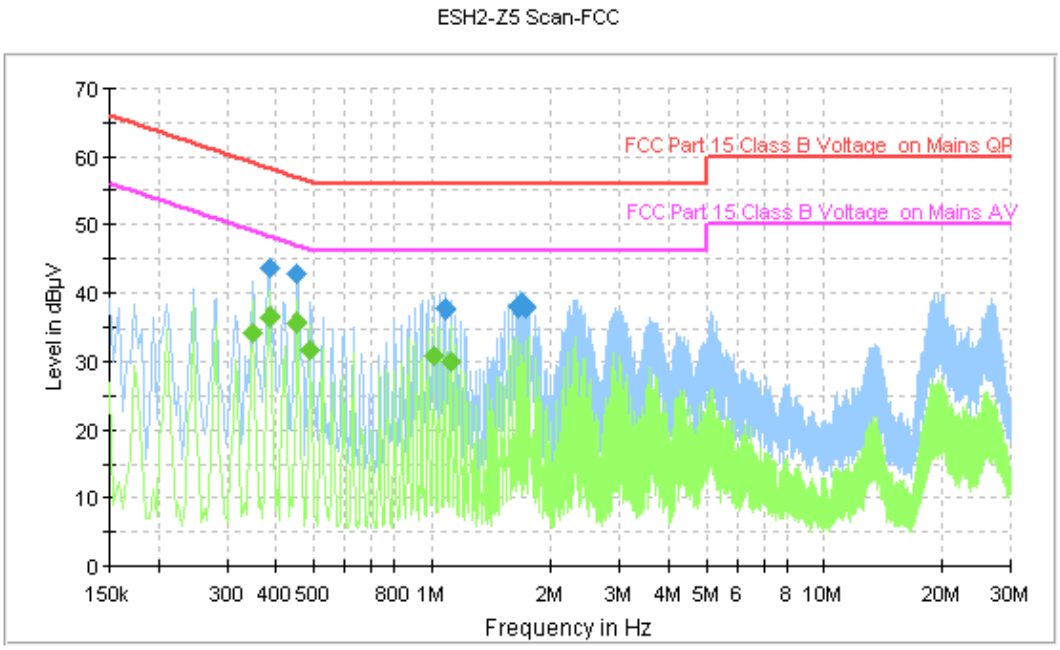


Fig. 99 AC Power line Conducted Emission (Traffic, AE2)

MEASUREMENT RESULT: " QuasiPeak "

Frequency (MHz)	QuasiPeak (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.386000	43.5	FLO	L1	10.0	14.7	58.1
0.454000	42.8	FLO	L1	10.0	14.0	56.8
1.086000	37.7	FLO	L1	10.1	18.3	56.0
1.642000	37.9	FLO	L1	10.1	18.1	56.0
1.678000	38.6	FLO	L1	10.1	17.4	56.0
1.714000	38.1	FLO	L1	10.1	17.9	56.0

MEASUREMENT RESULT: " Average "

Frequency (MHz)	CAverage (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.350000	34.3	FLO	L1	10.0	14.7	49.0
0.386000	36.6	FLO	L1	10.0	11.5	48.1
0.454000	35.7	FLO	L1	10.0	11.1	46.8
0.490000	31.9	FLO	L1	10.0	14.3	46.2
1.014000	31.0	FLO	L1	10.0	15.0	46.0
1.118000	30.2	FLO	L1	10.1	15.8	46.0

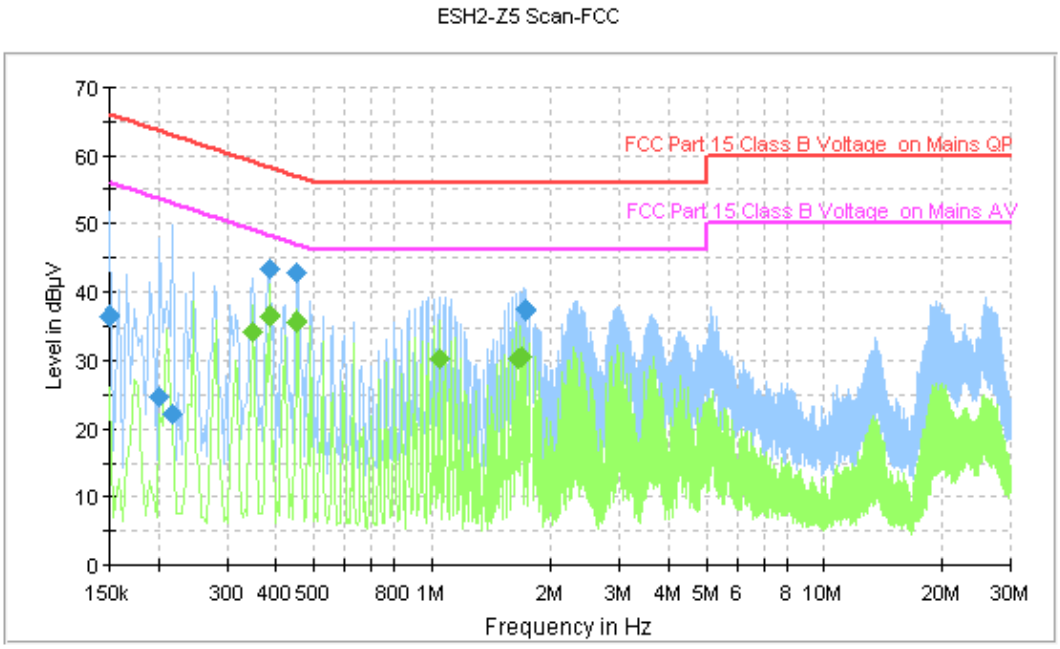


Fig. 100 AC Power line Conducted Emission (Idle, AE2)

MEASUREMENT RESULT: " QuasiPeak "

Frequency (MHz)	QuasiPeak (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	36.6	FLO	L1	10.0	29.4	66.0
0.202000	24.7	FLO	L1	10.0	38.8	63.5
0.218000	22.3	FLO	L1	10.0	40.6	62.9
0.386000	43.4	FLO	L1	10.0	14.7	58.1
0.454000	42.7	FLO	L1	10.0	14.1	56.8
1.714000	37.5	FLO	L1	10.1	18.5	56.0

MEASUREMENT RESULT: " Average "

Frequency (MHz)	CAverage (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.350000	34.4	FLO	L1	10.0	14.6	49.0
0.386000	36.5	FLO	L1	10.0	11.7	48.1
0.454000	35.7	FLO	L1	10.0	11.1	46.8
1.050000	30.4	FLO	L1	10.1	15.6	46.0
1.642000	30.4	FLO	L1	10.1	15.6	46.0
1.678000	30.7	FLO	L1	10.1	15.3	46.0

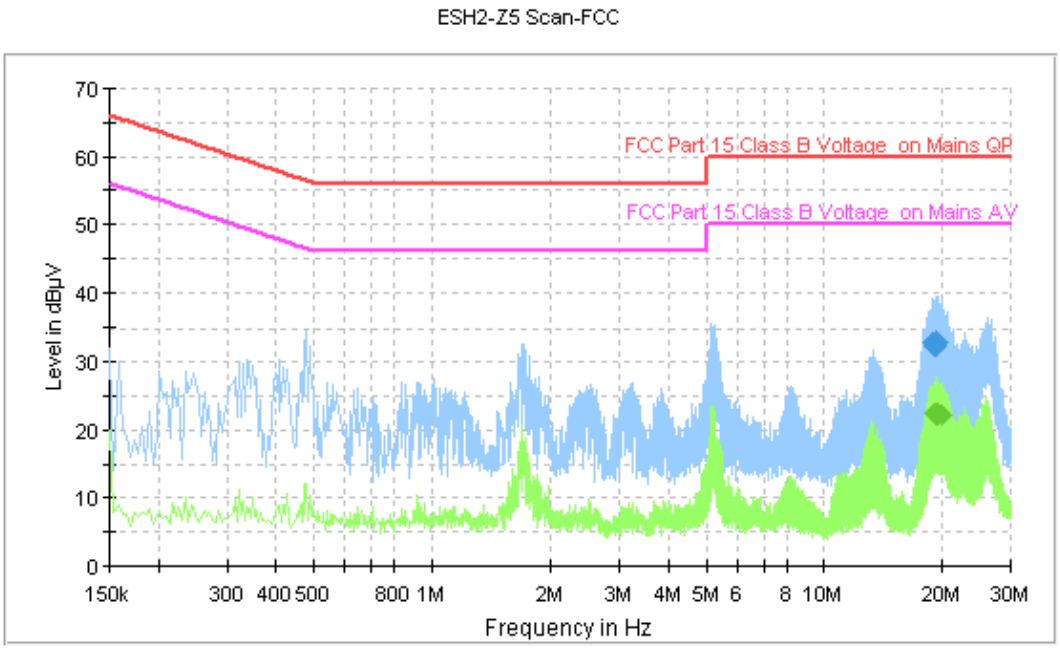


Fig. 101 AC Power line Conducted Emission (Traffic, AE3)

MEASUREMENT RESULT: " QuasiPeak "

Frequency (MHz)	QuasiPeak (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
19.022000	32.8	FLO	L1	10.5	27.2	60.0
19.122000	32.3	FLO	L1	10.5	27.7	60.0
19.270000	33.2	FLO	L1	10.5	26.8	60.0
19.334000	32.7	FLO	L1	10.5	27.3	60.0
19.366000	32.5	FLO	L1	10.5	27.5	60.0
19.506000	32.9	FLO	L1	10.5	27.1	60.0

MEASUREMENT RESULT: " Average "

Frequency (MHz)	CAverage (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
19.050000	22.4	FLO	L1	10.5	27.6	50.0
19.314000	22.5	FLO	L1	10.5	27.5	50.0
19.350000	22.2	FLO	L1	10.5	27.8	50.0
19.526000	22.3	FLO	L1	10.5	27.7	50.0
19.534000	22.4	FLO	L1	10.5	27.6	50.0
20.054000	22.3	FLO	L1	10.6	27.7	50.0

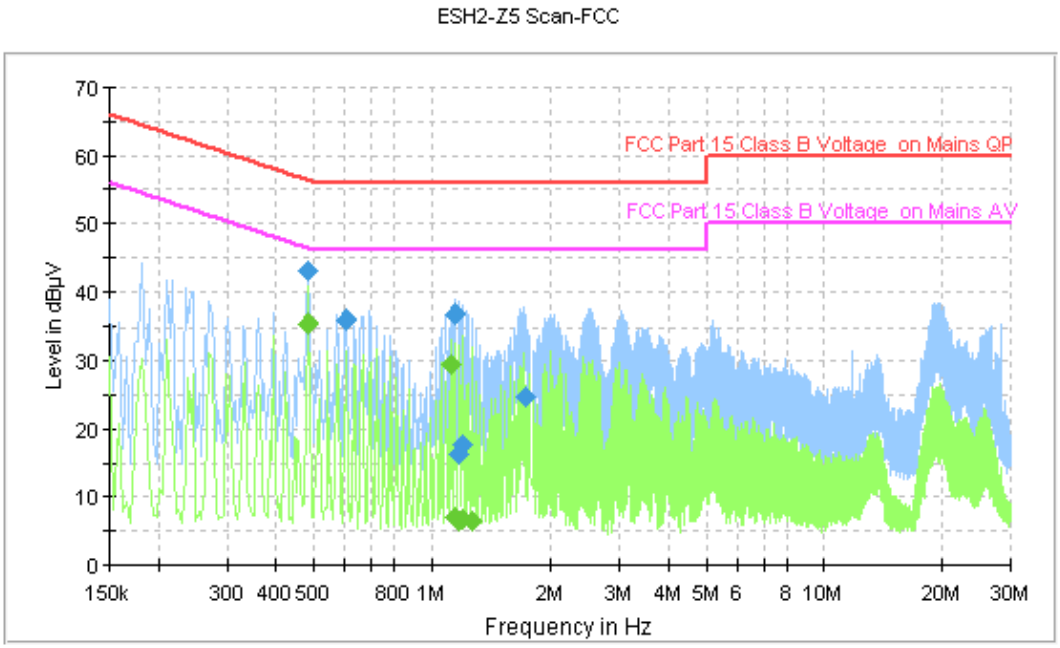


Fig. 102 AC Power line Conducted Emission (Idle, AE3)

MEASUREMENT RESULT: " QuasiPeak "

Frequency (MHz)	QuasiPeak (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.482000	43.1	FLO	L1	10.0	13.2	56.3
0.602000	36.0	FLO	L1	10.0	20.0	56.0
1.146000	36.8	FLO	L1	10.1	19.2	56.0
1.178000	16.2	FLO	L1	10.0	39.8	56.0
1.206000	17.6	FLO	L1	10.1	38.4	56.0
1.722000	24.7	FLO	L1	10.1	31.3	56.0

MEASUREMENT RESULT: " Average "

Frequency (MHz)	CAverage (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.482000	35.4	FLO	L1	10.0	10.9	46.3
1.118000	29.4	FLO	L1	10.1	16.6	46.0
1.146000	7.0	FLO	L1	10.1	39.0	46.0
1.178000	6.6	FLO	L1	10.0	39.4	46.0
1.206000	6.9	FLO	L1	10.1	39.1	46.0
1.266000	6.5	FLO	L1	10.1	39.5	46.0

***** END OF REPORT BODY *****