FCC PART 15C
TEST REPORT

No. 2013TAR831

for

TCT Mobile Limited

HSUPA/HSDPA/UMTS dual band/GSM Tri band mobile phone

Model Name: Yaris-4 VF

Marketing Name: Vodafone 785

FCC ID: RAD439

with

Hardware Version: PIO

Software Version: SVN05

Issued Date: 2013-12-27

DAkkS Deutsche Akkreditierungsstelle D-PL-12123-01-01

DAR accreditation (DIN EN ISO/IEC 17025): No. D-PL-12123-01-01
FCC 2.948 Listed: No.733176
IC O.A.T.S listed: No.6629B-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.

Test Laboratory:

TMC Beijing, Telecommunication Metrology Center of Ministry of Industry and Information Technology
Shouxiang Science Building, No 51, Xueyuan Road, Haidian District, Beijing, P.R.China 100191
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CONTENTS

1. Test Laboratory

1.1. Testing Location

Company Name:	TMC Beijing, Telecommunication Metrology Center of MIIT
Address:	Shouxiang Science Building, No 51, Xueyuan Road, Haidian District, Beijing, P.R.China
Postal Code:	100191
Telephone:	00861062304633
Fax:	00861062304633

1.2. Testing Environment

Normal Temperature:	15-35℃
Extreme Temperature:	-20/+55℃
Relative Humidity:	20-75%

1.3. Project data

Project Leader:	Zi Xiaogang
Testing Start Date:	2013-12-09
Testing End Date:	2013-12-24

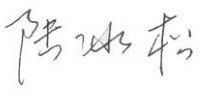
1.4. Signature

Zi Xiaogang

(Prepared this test report)

Sun Xiangqian

(Reviewed this test report)



Lu Bingsong

Deputy Director of the laboratory

(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name:	TCT Mobile Limited#
Address /Post:	5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park, Pudong Area Shanghai, P.R. China.
City:	Shanghai
Postal Code:	201203
Country:	China
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Contact Email	zhizhou.gong@jrdcom.com
Telephone:	0086-21-61460890
Fax:	0086-21-61460602

2.2. Manufacturer Information

Company Name:	TCT Mobile Limited#
Address /Post:	5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park, Pudong Area Shanghai, P.R. China.
City:	Shanghai
Postal Code:	201203
Country:	China
Telephone:	0086-21-61460890
Fax:	0086-21-61460602

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

3.1. About EUT

Description	HSUPA/HSDPA/UMTS dual band/GSM Tri band mobile phone
Model Name	Yaris-4 VF
Marketing Name	Vodafone 785
FCC ID	RAD439
Frequency Band	ISM 2400MHz~2483.5MHz
Type of Modulation	GFSK/π/4 DQPSK/8DPSK
Number of Channels	79
Power Supply	3.8V DC by Battery

Note: The EUT is a variant model of 4015A. All the result is coming from the 4015A.

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version
N13	359729050053645	PIO	SVN05
N14	359729050053090	PIO	SVN05

*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		
AE1	Battery	/	TCT-B-1064
AE2	Battery	/	TCT-B-1059
AE3	Battery	/	TCT-B-0520
AE4	Battery	/	TCT-B-0888
AE5	Battery	/	TCT-B-0880
AE6	Travel charger	/	TCT-CHR-1265
AE7	Travel charger	/	TCT-CHR-1399
AE8	Travel charger	/	13169CHR10
AE9	USB cable	/	TCT-DC-0203
AE10	USB cable	/	TCT-DC-0499
AE11	USB cable	/	/
AE12	USB cable	/	/

AE1, AE2

Model	CAB31P0000C1
Manufacturer	BYD
Capacitance	1300 mAh
Nominal voltage	3.7V

AE3

Model	CAB1400018C2
Manufacturer	SCUD

Capacitance	1400 mAh
Nominal Voltage	3.7 V
AE4	
Model	CAB60B0000C2
Manufacturer	BAK
Capacitance	1400 mAh
Nominal Voltage	3.7 V
AE5	
Model	CAB1400017C1
Manufacturer	BYD
Capacitance	1400 mAh
Nominal Voltage	3.7 V
AE6	
Model	CBA3007AG0C2
Manufacturer	TENPAO
Length of cable	/
AE7	
Model	CBA3007AG0C3
Manufacturer	YINGJU
Length of cable	/
AE8	
Model	CBA3008AG0C1
Manufacturer	BYD
Length of cable	/
AE9	
Model	CDA3122002C1
Manufacturer	JUWEI
Length of cable	100 cm
AE10	
Model	CDA3122002C2
Manufacturer	Shenghua
Length of cable	100 cm
AE11	
Model	CDA3122005C1
Manufacturer	JUWEI
Length of cable	/
AE12	
Model	CDA3122005C2
Manufacturer	Shenghua
Length of cable	/

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

3.4. Normal Accessory setting

Fully charged battery should be used during the test.

3.5. General Description

The Equipment Under Test (EUT) is a model of HSUPA/HSDPA/UMTS dual band/GSM Tri band mobile phone with integrated antenna. It consists of normal options: lithium battery, charger. Manual and specifications of the EUT were provided to fulfil the test.

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.

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.	10-1-12
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	2009
FCC Public Notice DA 00-705	Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems	March 2000
KDB412172 D01	Guidelines for Determining the Effective Radiated Power (ERP) and Equivalent Isotropically Radiated Power (EIRP) of a RF Transmitting System	2011

5. LABORATORY ENVIRONMENT

Control room / conducted chamber did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ˚C, Max. = 35 ˚C
Relative humidity	Min. =20 %, Max. = 80 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 2 MΩ
Ground system resistance	< 0.5 Ω

Fully-anechoic chamber 2 (8.6 meters×6.1 meters×3.85 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ˚C, Max. = 30 ˚C
Relative humidity	Min. = 35 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 2 MΩ
Ground system resistance	< 1 Ω
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 4000 MHz

Semi-anechoic chamber 2 / Fully-anechoic chamber 3 (10 meters×6.7 meters×6.15 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ˚C, Max. = 30 ˚C
Relative humidity	Min. = 35 %, Max. = 60 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 2 MΩ
Ground system resistance	< 0.5 Ω
Normalised site attenuation (NSA)	< ±3.5 dB, 3 m distance
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

6. SUMMARY OF TEST RESULTS

6.1. Summary of Test Results

Abbreviations used in this clause:

P Pass, The EUT complies with the essential requirements in the standard.

F Fail, The EUT does not comply with the essential requirements in the standard

NA Not Applicable, The test was not applicable

NP Not Performed, The test was not performed by TMC

SUMMARY OF MEASUREMENT RESULTS	Sub-clause	Verdict
Peak Output Power - Conducted	15.247 (b)(1)	**P**
Frequency Band Edges	15.247 (d)	**P**
Conducted Emission	15.247 (d)	**P**
Radiated Emission	15.247, 15.205, 15.209	**P**
Time of Occupancy (Dwell Time)	15.247 (a) (1)(iii)	**P**
20dB Bandwidth	15.247 (a)(1)	**NA**
Carrier Frequency Separation	15.247 (a)(1)	**P**
Number of hopping channels	15.247 (a)(b)(iii)	**P**
AC Powerline Conducted Emission	15.107, 15.207	**P**

Please refer to **ANNEX A** for detail.

The measurement is made according to Public notice DA 00-705 and ANSI C63.4.

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

7. Test Equipments Utilized

Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Due date
1	Vector Signal Analyzer	FSU26	200030	Rohde & Schwarz	2014-06-12
2	Bluetooth Tester	CBT32	100649	Rohde & Schwarz	2014-02-03

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Due date
1	Test Receiver	ESU26	100235	Rohde & Schwarz	2014-01-05
2	EMI Antenna	VULB 9163	9163482	Schwarzbeck	2014-02-17
3	EMI Antenna	3117	00119024	EMCO	2014-02-03
4	Dual-Ridge Waveguide Horn Antenna	3116	2663	ETS-Lindgren	2014-06-30
5	Dual-Ridge Waveguide Horn Antenna	3116	2661	ETS-Lindgren	2014-06-30
6	Bluetooth Tester	CBT	100153	Rohde & Schwarz	2014-09-15
7	LISN	ESH2-Z5	829991/012	Rohde & Schwarz	2014-03-17
8	Loop Antenna	HFH2-Z2	829324/007	Rohde & Schwarz	2014-12-12
9	Pre-amplifier(18GHz)	SCU18	1005277	Rohde & Schwarz	/
10	Pre-amplifier(26.5GHz)	SCU26	1006788	Rohde & Schwarz	/

Anechoic chamber

Fully anechoic chamber by Frankonia German.

ANNEX A: MEASUREMENT RESULTS

A.1. Measurement Method

A.1.1. Conducted Measurements

The measurement is made according to ANSI C63.10.

1). Connect the EUT to the test system correctly.

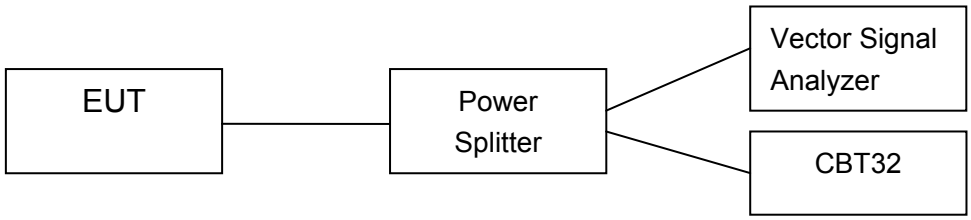
2). Set the EUT to the required work mode (Transmitter, receiver or transmitter & receiver).

3). Set the EUT to the required channel.

4). Set the EUT hopping mode (hopping or hopping off).

5). Set the spectrum analyzer to start measurement.

6). Record the values. Vector Signal Analyzer



A.1.2. Radiated Emission Measurements

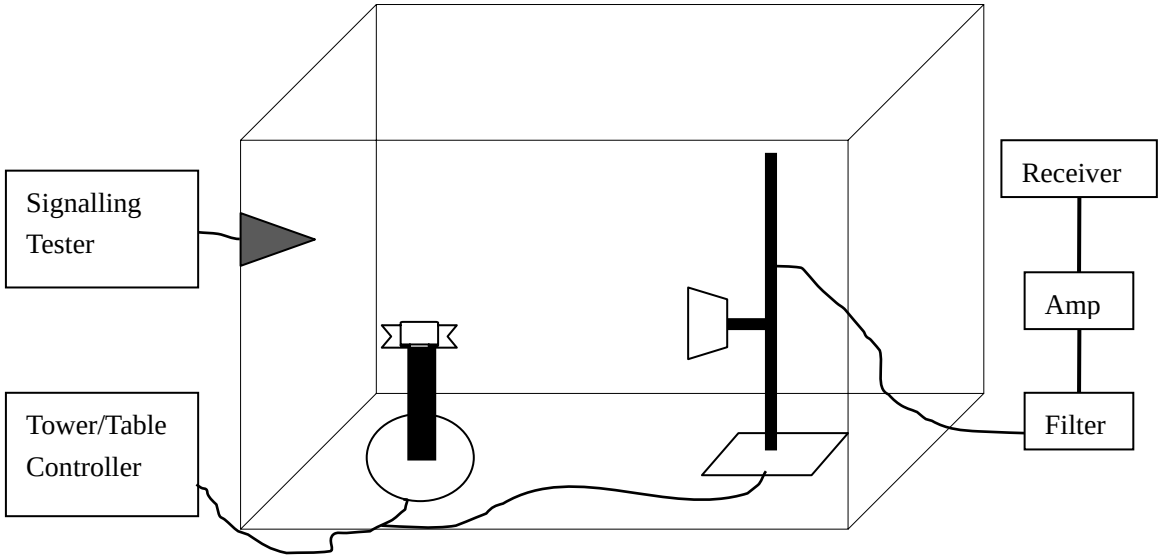
The measurement is made according to ANSI C63.10

The radiated emission test is performed in semi-anechoic chamber. The distance from the EUT to the reference point of measurement antenna is 3m. The test is carried out on both vertical and horizontal polarization and only maximization result of both polarizations is kept. During the test, the turntable is rotated 360° and the measurement antenna is moved from 1m to 4m to get the maximization result.

In the case of radiated emission, the used settings are as follows,

Sweep frequency from 30 MHz to 1GHz, RBW = 100 kHz, VBW = 300 kHz;

Sweep frequency from 1 GHz to 26GHz, RBW = 1MHz, VBW = 1MHz;



A.2. Peak Output Power - Conducted

Measurement Limit:

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

The measurement is made according to ANSI C63.10.

Test Condition

Hopping Mode	RBW	VBW	Span	Sweeptime
Hopping OFF	3MHz	3MHz	5MHz	2.5ms

Measurement Results:

For GFSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	7.20	7.85	8.10	P

Forπ/4 DQPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	7.02	7.67	7.91	P

For 8DPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	7.21	7.88	8.12	P

Conclusion: PASS

A.3. Frequency Band Edges - Conducted

Measurement Limit:

Standard	Limit (dBc)
FCC 47 CFR Part 15.247 (d)	> 20

The measurement is made according to ANSI C63.10.

Measurement Result:

For GFSK

Channel	Hopping	Band Edge Power (dBc)		Conclusion
0	Hopping OFF	Fig.1	-57.03	P
	Hopping ON	Fig.2	-55.40	P
78	Hopping OFF	Fig.3	-60.05	P
	Hopping ON	Fig.4	-60.63	P

Forπ/4 DQPSK

Channel	Hopping	Band Edge Power (dBc)		Conclusion
0	Hopping OFF	Fig.5	-56.11	P
	Hopping ON	Fig.6	-57.14	P
78	Hopping OFF	Fig.7	-60.24	P
	Hopping ON	Fig.8	-59.53	P

For 8DPSK

Channel	Hopping	Band Edge Power (dBc)		Conclusion
0	Hopping OFF	Fig.9	-56.58	P
	Hopping ON	Fig.10	-57.11	P
78	Hopping OFF	Fig.11	-59.65	P
	Hopping ON	Fig.12	-60.45	P

Conclusion: PASS

Test graphs as below

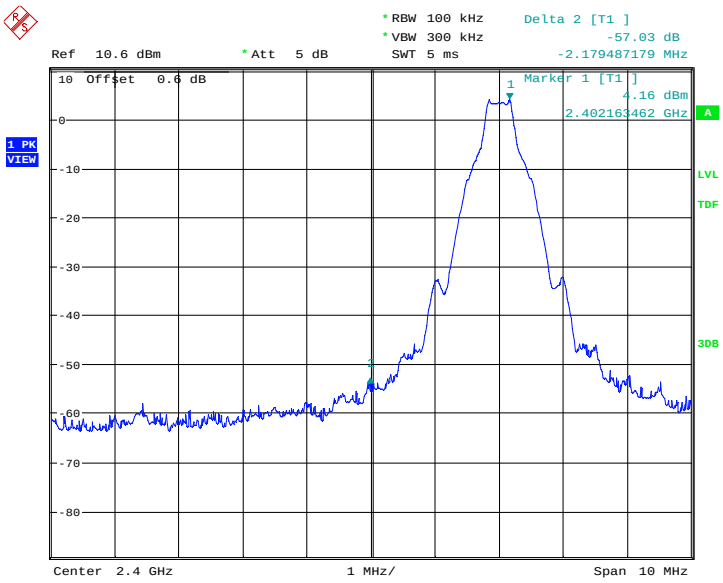


Fig.1. Frequency Band Edges: GFSK, Channel 0, Hopping Off

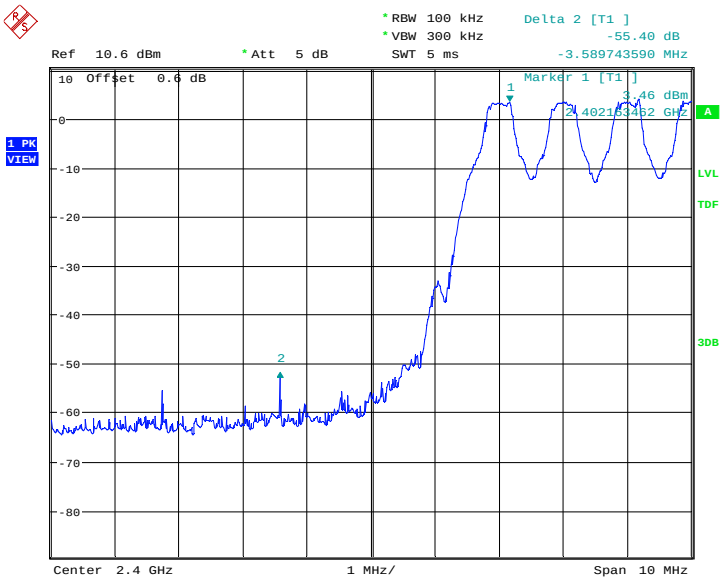


Fig.2. Frequency Band Edges: GFSK, Channel 0, Hopping On

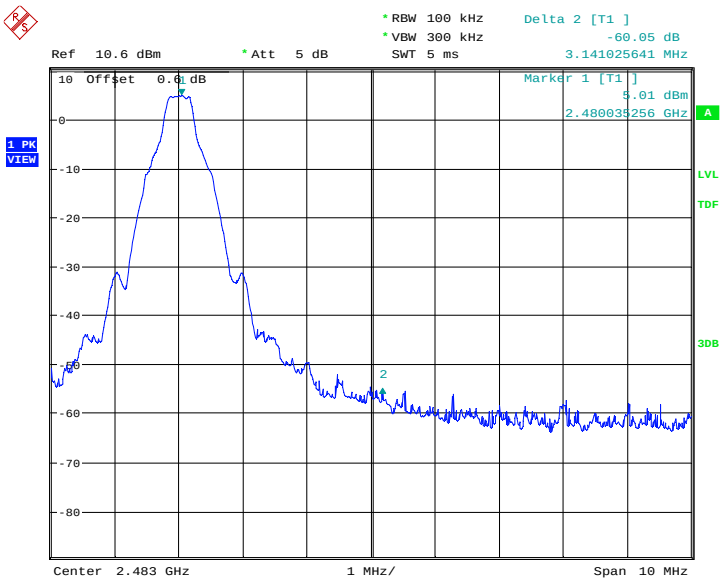


Fig.3. Frequency Band Edges: GFSK, Channel 78, Hopping Off

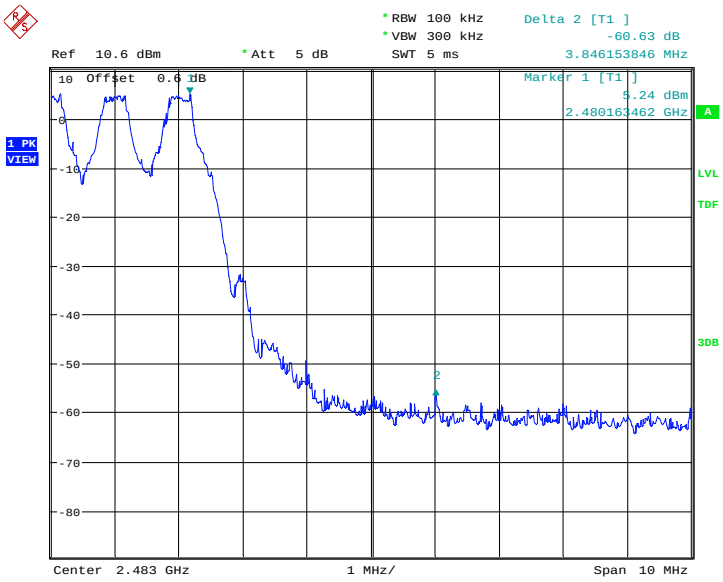


Fig.4. Frequency Band Edges: GFSK, Channel 78, Hopping On

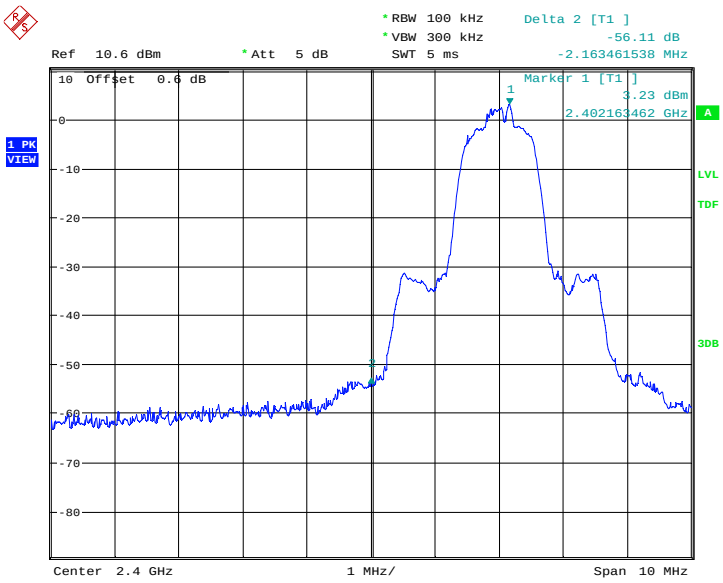


Fig.5. Frequency Band Edges: π/4 DQPSK, Channel 0, Hopping Off

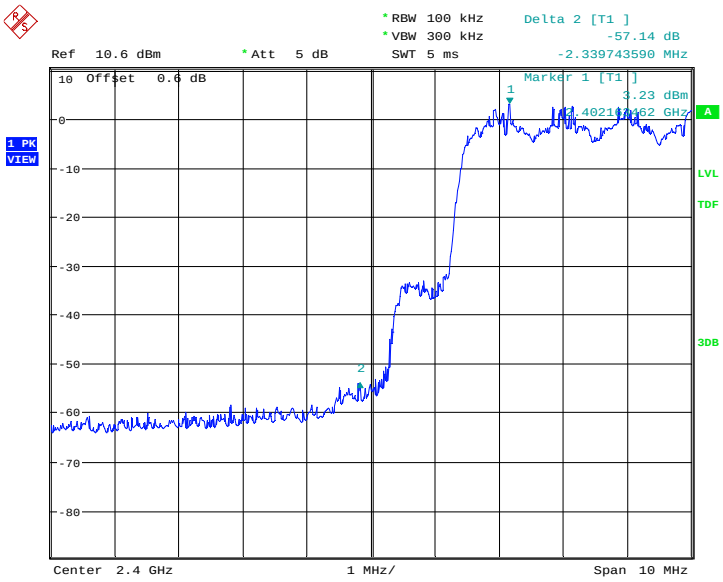


Fig.6. Frequency Band Edges: π/4 DQPSK, Channel 0, Hopping On

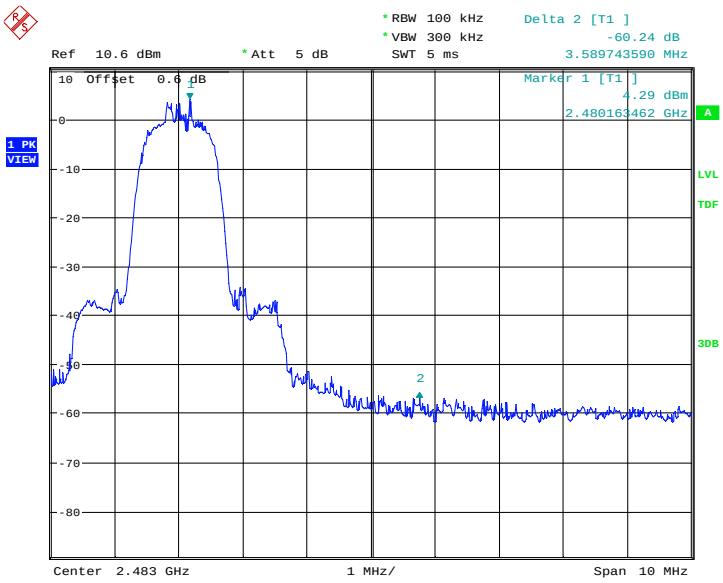


Fig.7. Frequency Band Edges: π/4 DQPSK, Channel 78, Hopping Off

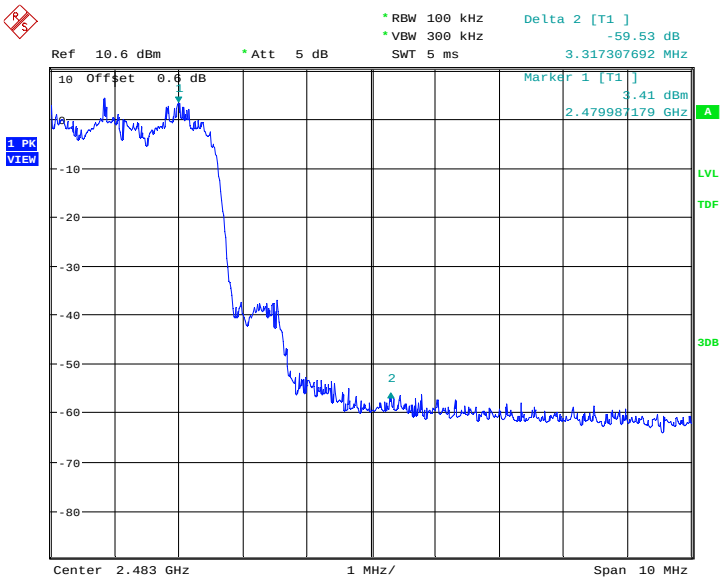


Fig.8. Frequency Band Edges: π/4 DQPSK, Channel 78, Hopping On

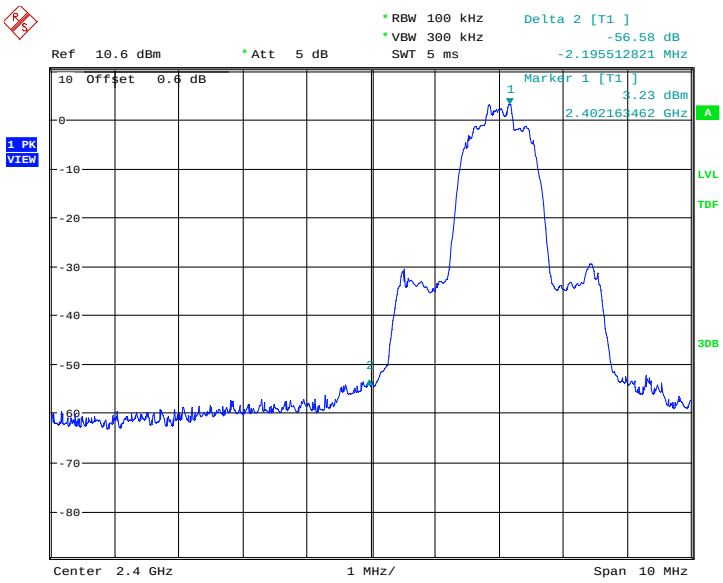


Fig.9. Frequency Band Edges: 8DPSK, Channel 0, Hopping Off

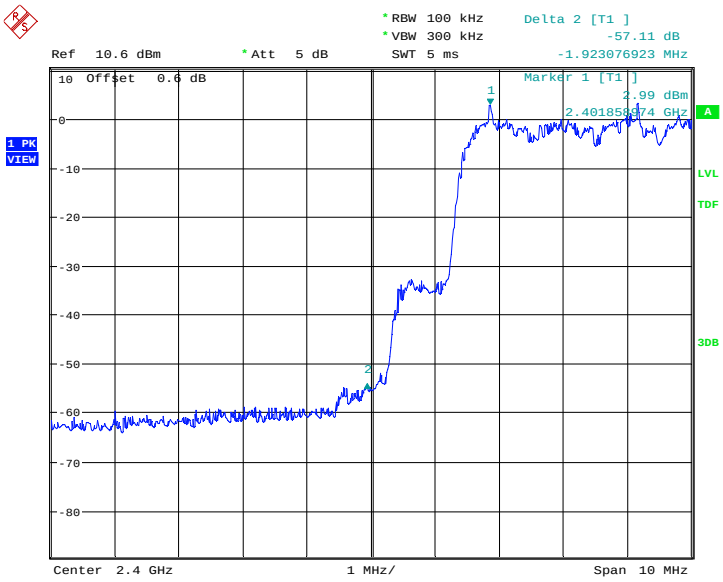


Fig.10. Frequency Band Edges: 8DPSK, Channel 0, Hopping On

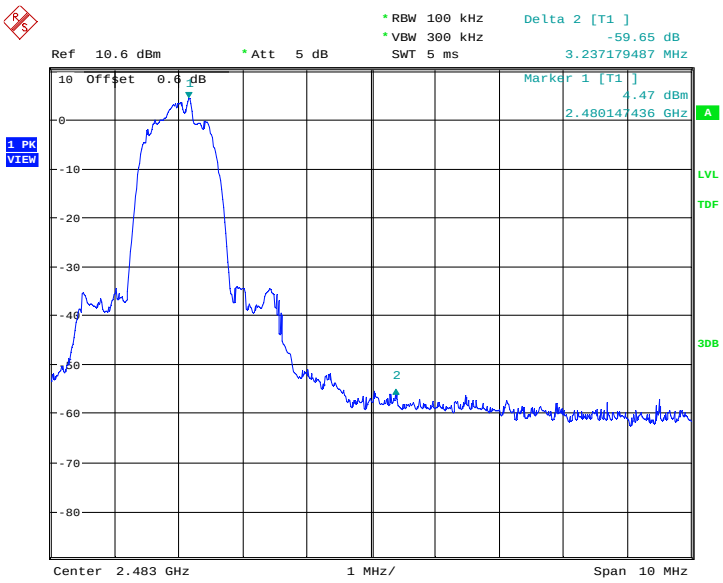


Fig.11. Frequency Band Edges: 8DPSK, Channel 78, Hopping Off

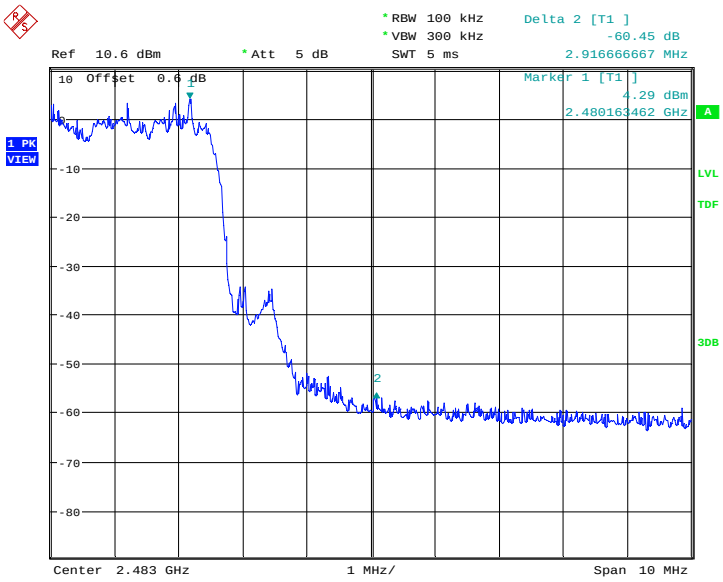


Fig.12. Frequency Band Edges: 8DPSK, Channel 78, Hopping On

A.4. Conducted Emission

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247 (d)	20dB below peak output power in 100 kHz bandwidth

The measurement is made according to ANSI C63.10

Measurement Results:

For GFSK

Channel	Frequency Range	Test Results	Conclusion
Ch 0 2402 MHz	Center Frequency	Fig.13	P
	30 MHz ~ 1 GHz	Fig.14	P
	1 GHz ~ 3 GHz	Fig.15	P
	3 GHz ~ 10 GHz	Fig.16	P
	10 GHz ~ 26 GHz	Fig.17	P
Ch 39 2441 MHz	Center Frequency	Fig.18	P
	30 MHz ~ 1 GHz	Fig.19	P
	1 GHz ~ 3 GHz	Fig.20	P
	3 GHz ~ 10 GHz	Fig.21	P
	10 GHz ~ 26 GHz	Fig.22	P
Ch 78 2480 MHz	Center Frequency	Fig.23	P
	30 MHz ~ 1 GHz	Fig.24	P
	1 GHz ~ 3 GHz	Fig.25	P
	3 GHz ~ 10 GHz	Fig.26	P
	10 GHz ~ 26 GHz	Fig.27	P

For π/4 DQPSK

Channel	Frequency Range	Test Results	Conclusion
Ch 0 2402 MHz	Center Frequency	Fig.28	P
	30 MHz ~ 1 GHz	Fig.29	P
	1 GHz ~ 3 GHz	Fig.30	P
	3 GHz ~ 10 GHz	Fig.31	P
	10 GHz ~ 26 GHz	Fig.32	P
Ch 39 2441 MHz	Center Frequency	Fig.33	P
	30 MHz ~ 1 GHz	Fig.34	P
	1 GHz ~ 3 GHz	Fig.35	P
	3 GHz ~ 10 GHz	Fig.36	P
	10 GHz ~ 26 GHz	Fig.37	P
Ch 78 2480 MHz	Center Frequency	Fig.38	P
	30 MHz ~ 1 GHz	Fig.39	P

	1 GHz ~ 3 GHz	Fig.40	P
	3 GHz ~ 10 GHz	Fig.41	P
	10 GHz ~ 26 GHz	Fig.42	P

For 8DPSK

Channel	Frequency Range	Test Results	Conclusion
Ch 0 2402 MHz	Center Frequency	Fig.43	P
	30 MHz ~ 1 GHz	Fig.44	P
	1 GHz ~ 3 GHz	Fig.45	P
	3 GHz ~ 10 GHz	Fig.46	P
	10 GHz ~ 26 GHz	Fig.47	P
Ch 39 2441 MHz	Center Frequency	Fig.48	P
	30 MHz ~ 1 GHz	Fig.49	P
	1 GHz ~ 3 GHz	Fig.50	P
	3 GHz ~ 10 GHz	Fig.51	P
	10 GHz ~ 26 GHz	Fig.52	P
Ch 78 2480 MHz	Center Frequency	Fig.53	P
	30 MHz ~ 1 GHz	Fig.54	P
	1 GHz ~ 3 GHz	Fig.55	P
	3 GHz ~ 10 GHz	Fig.56	P
	10 GHz ~ 26 GHz	Fig.57	P

Conclusion: PASS

Note:

The conducted spurious emission measurement over 9kHz - 30MHz had been investigated. All spurious emissions were attenuated at least 20dB compared to the limit.

Test graphs as below

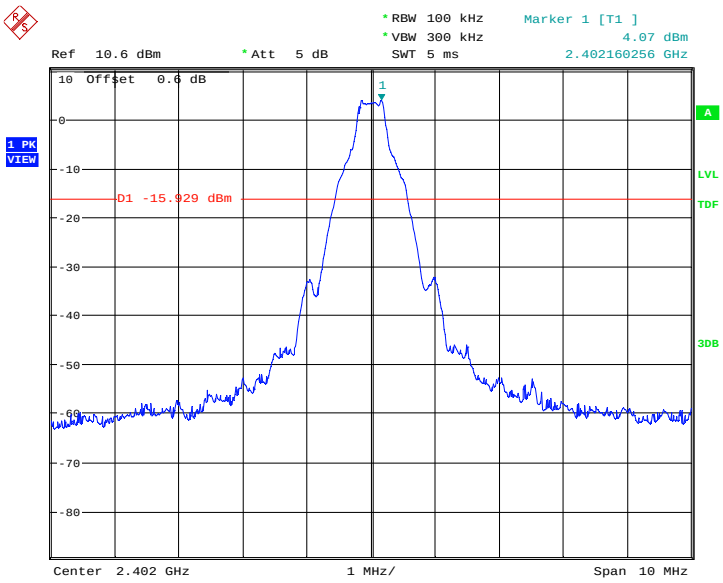


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Fig.13. Conducted spurious emission: GFSK, Channel 0,2402MHz

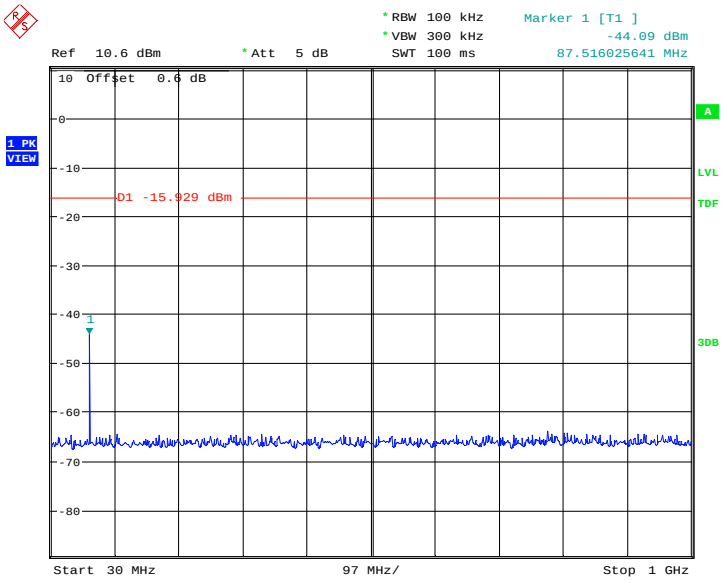

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Fig.14. Conducted spurious emission: GFSK, Channel 0, 30MHz - 1GHz

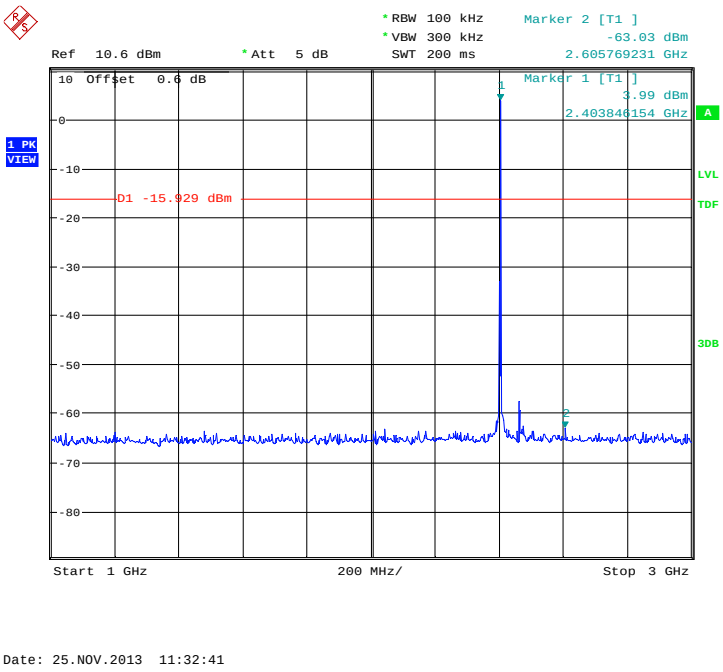


Fig.15. Conducted spurious emission: GFSK, Channel 0, 1GHz - 3GHz

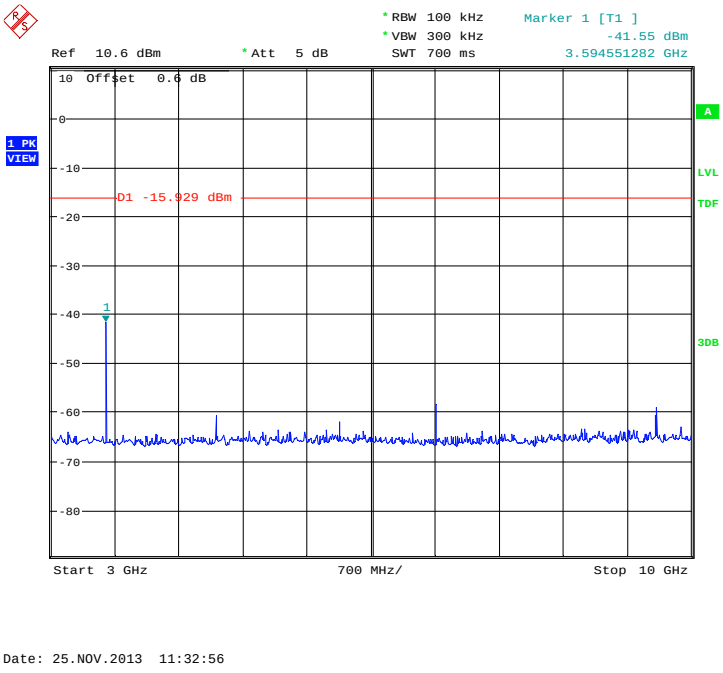


Fig.16. Conducted spurious emission: GFSK, Channel 0, 3GHz - 10GHz

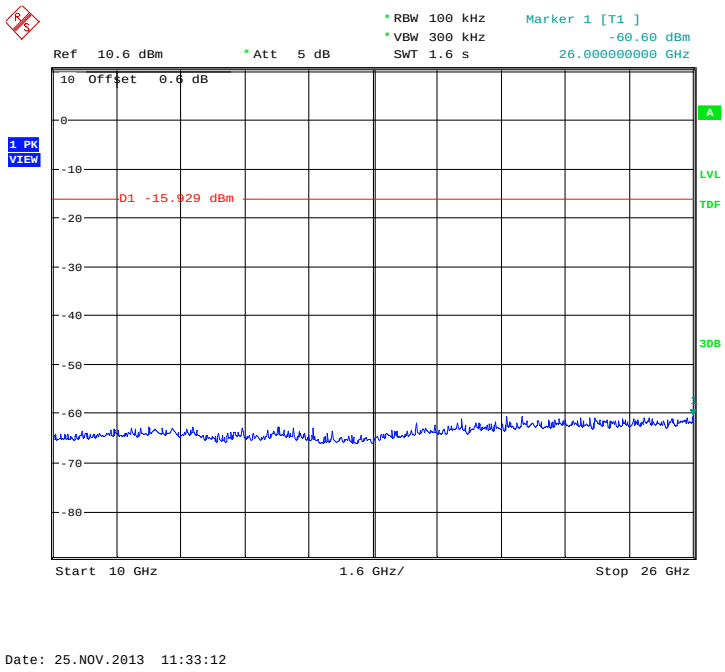


Fig.17. Conducted spurious emission: GFSK, Channel 0,10GHz - 26GHz

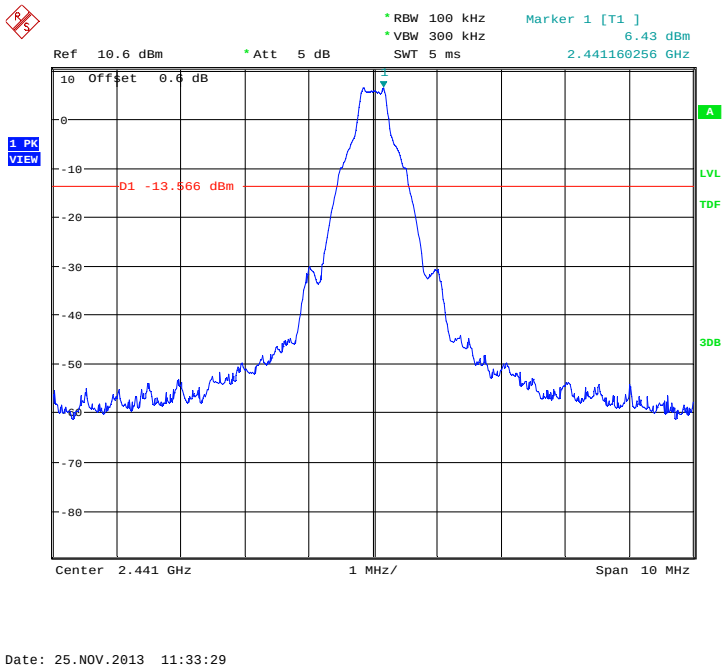


Fig.18. Conducted spurious emission: GFSK, Channel 39, 2441MHz

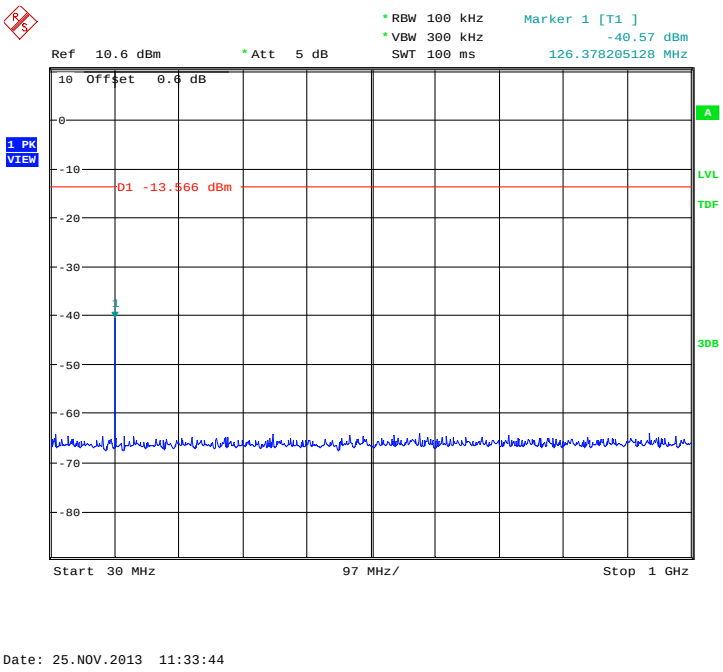


Fig.19. Conducted spurious emission: GFSK, Channel 39, 30MHz - 1GHz

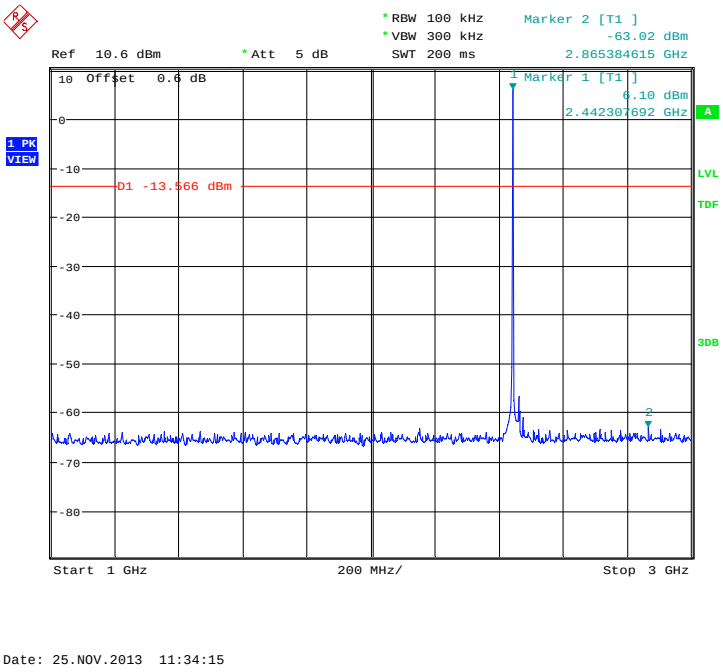


Fig.20. Conducted spurious emission: GFSK, Channel 39, 1GHz – 3GHz

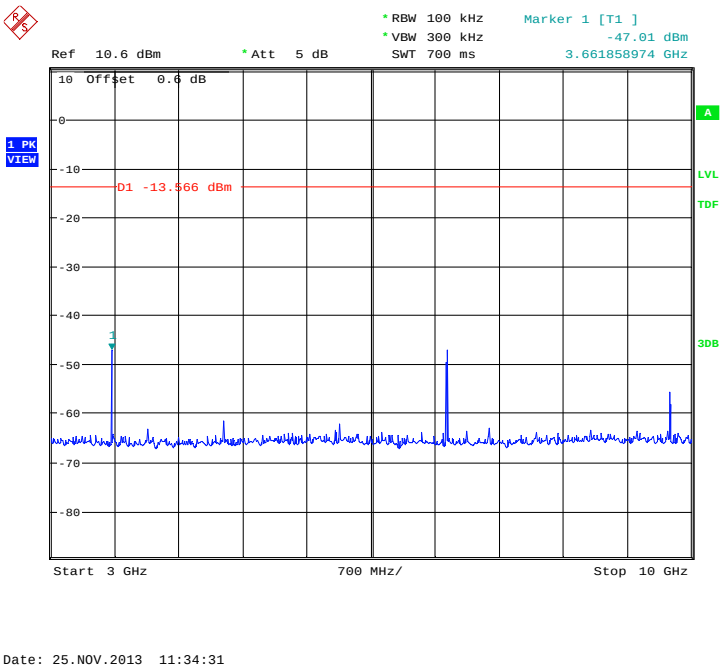


Fig.21. Conducted spurious emission: GFSK, Channel 39, 3GHz – 10GHz

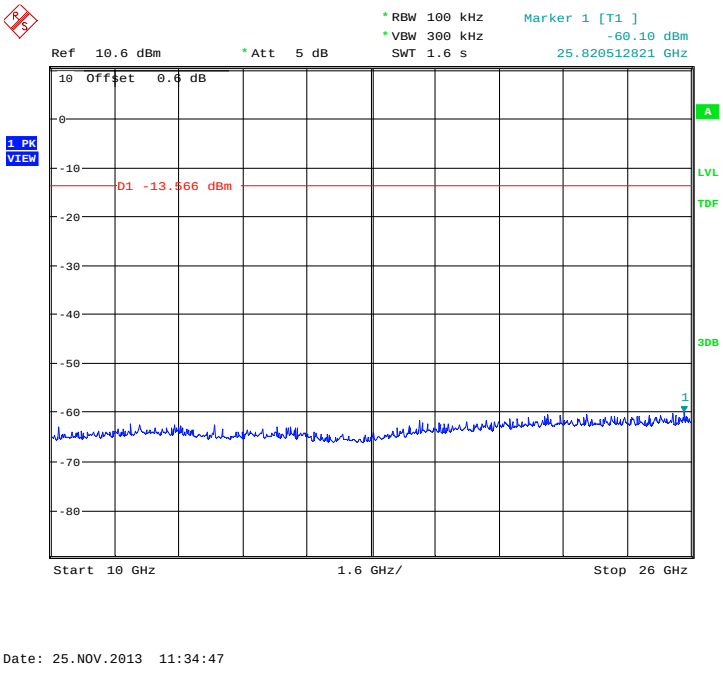


Fig.22. Conducted spurious emission: GFSK, Channel 39, 10GHz – 26GHz

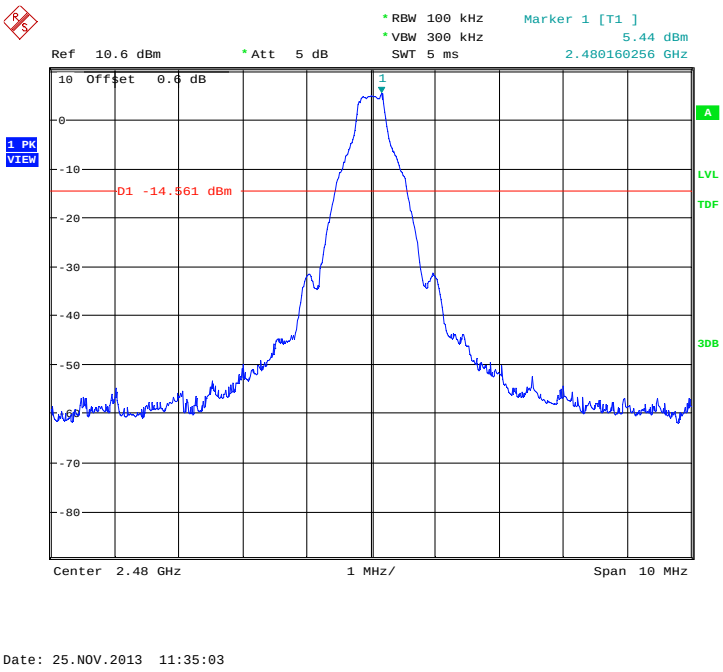


Fig.23. Conducted spurious emission: GFSK, Channel 78, 2480MHz

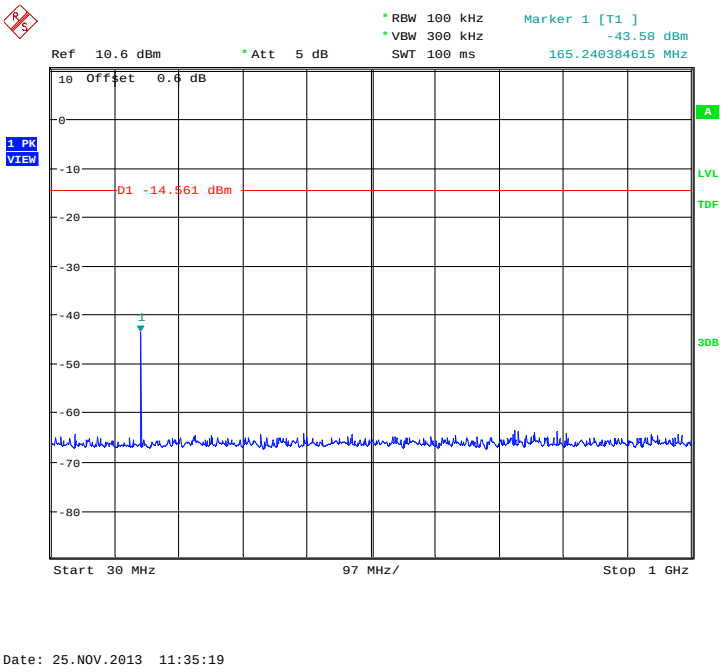


Fig.24. Conducted spurious emission: GFSK, Channel 78, 30MHz - 1GHz

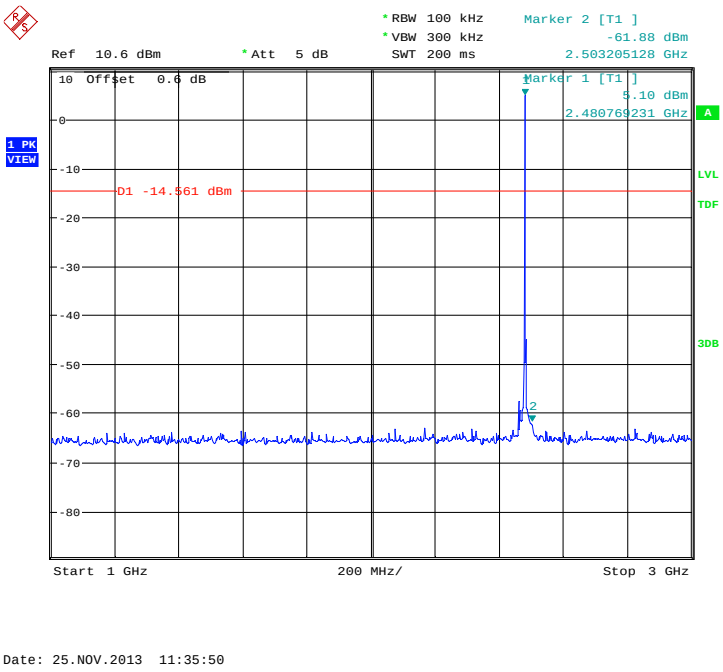


Fig.25. Conducted spurious emission: GFSK, Channel 78, 1GHz - 3GHz

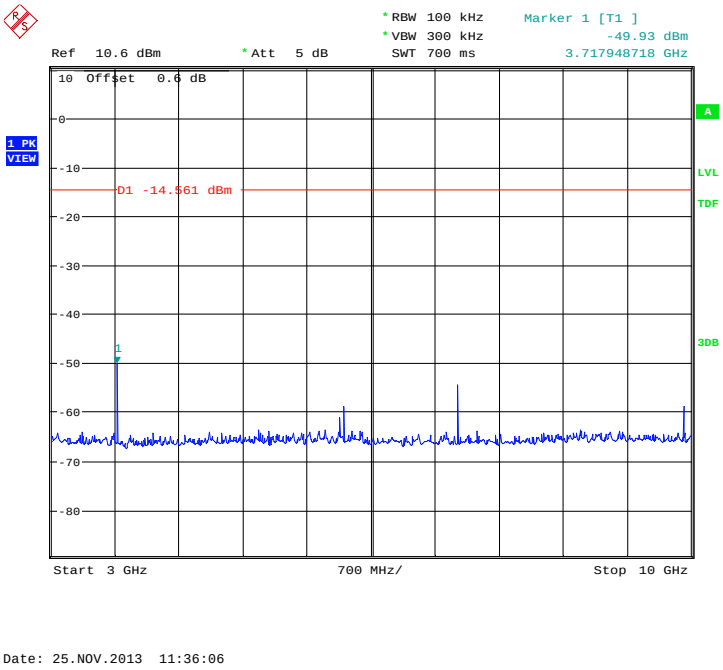


Fig.26. Conducted spurious emission: GFSK, Channel 78, 3GHz - 10GHz

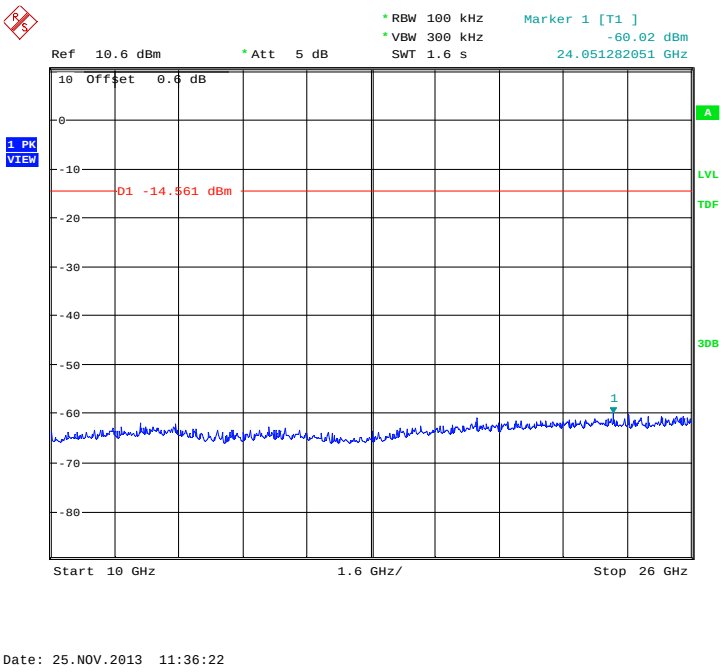


Fig.27. Conducted spurious emission: GFSK, Channel 78, 10GHz - 26GHz

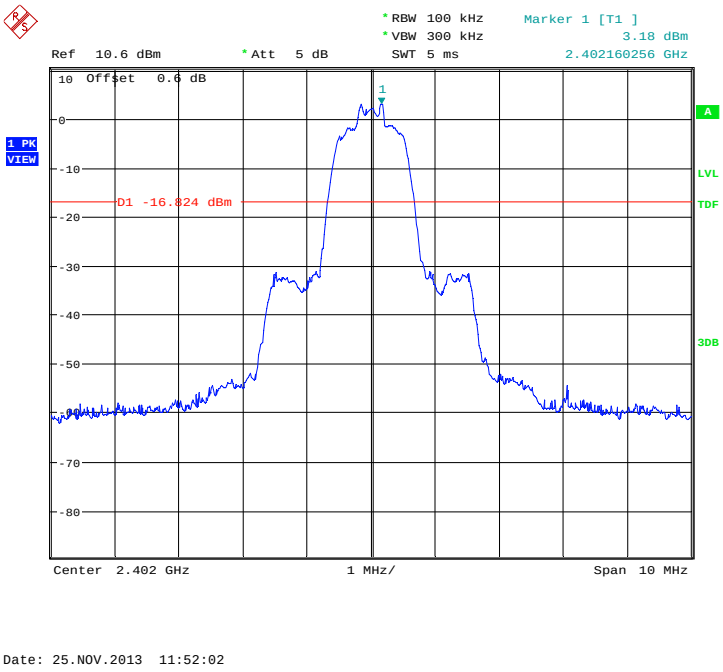


Fig.28. Conducted spurious emission: π/4 DQPSK, Channel 0,2402MHz

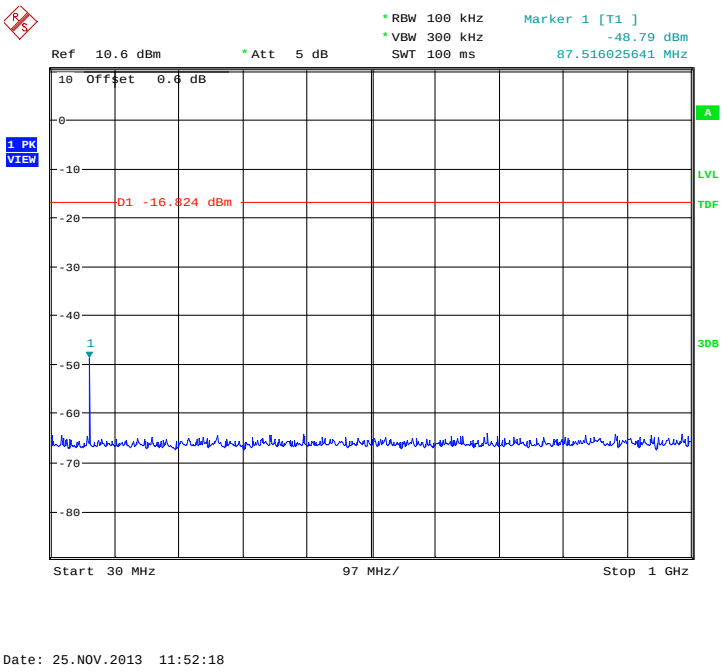


Fig.29. Conducted spurious emission: π/4 DQPSK, Channel 0, 30MHz - 1GHz

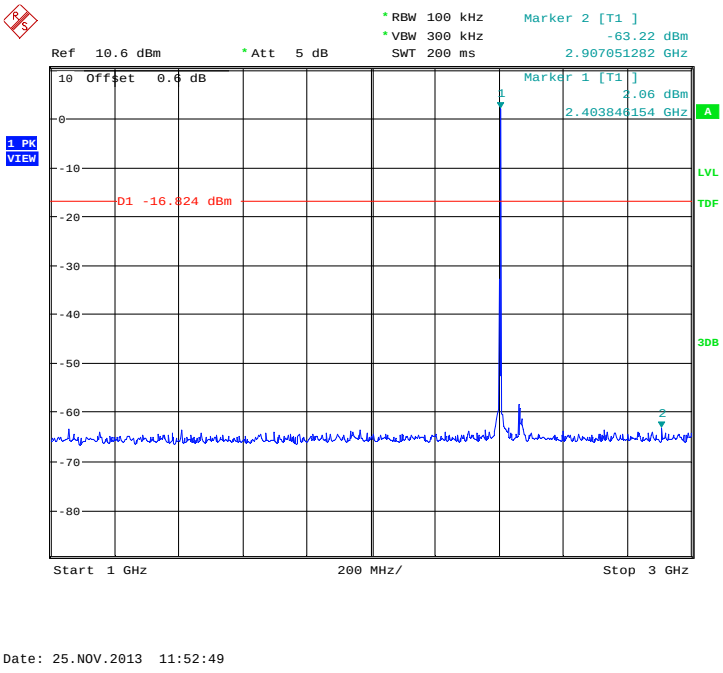


Fig.30. Conducted spurious emission: π/4 DQPSK, Channel 0, 1GHz - 3GHz

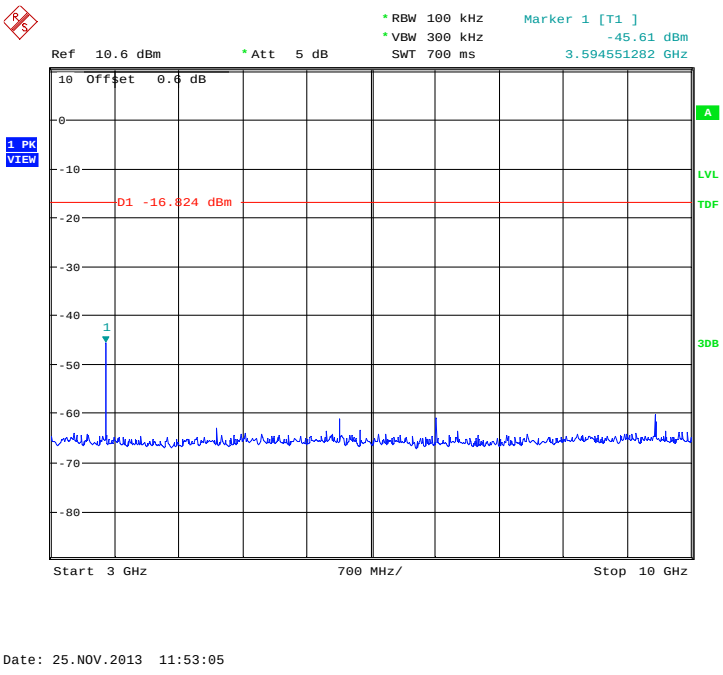


Fig.31. Conducted spurious emission: π/4 DQPSK, Channel 0, 3GHz - 10GHz

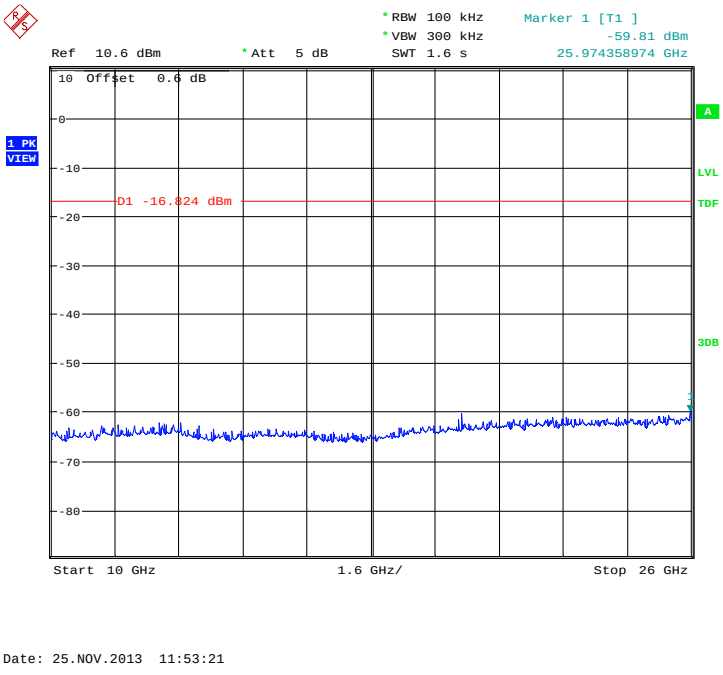


Fig.32. Conducted spurious emission: π/4 DQPSK, Channel 0,10GHz - 26GHz

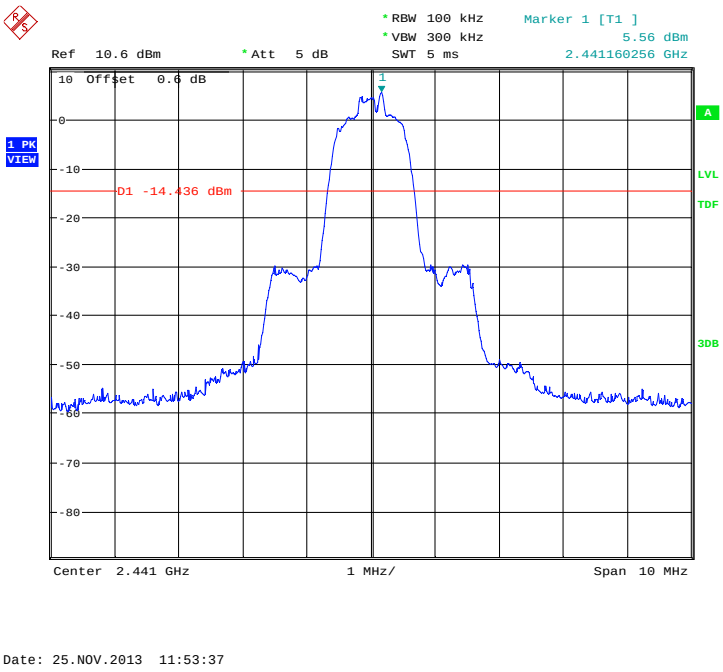


Fig.33. Conducted spurious emission: π/4 DQPSK, Channel 39, 2441MHz

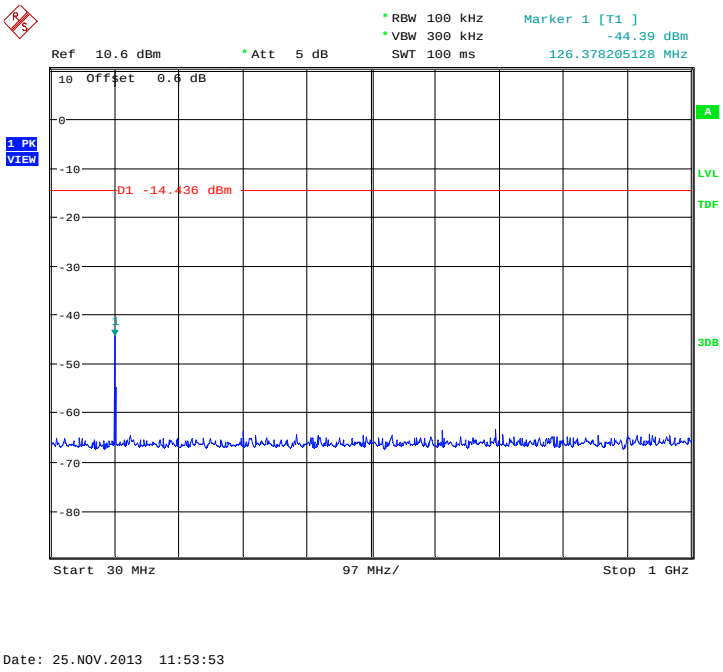


Fig.34. Conducted spurious emission: π/4 DQPSK, Channel 39, 30MHz - 1GHz

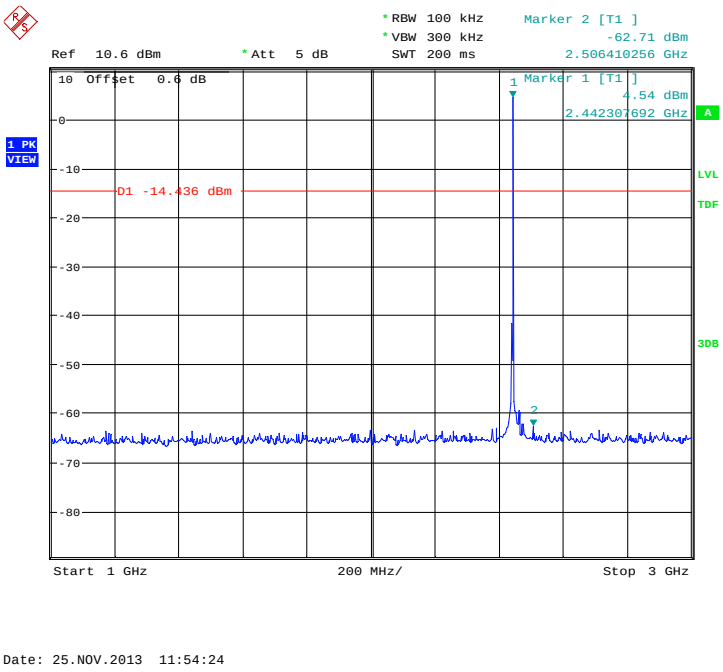


Fig.35. Conducted spurious emission: π/4 DQPSK, Channel 39, 1GHz - 3GHz

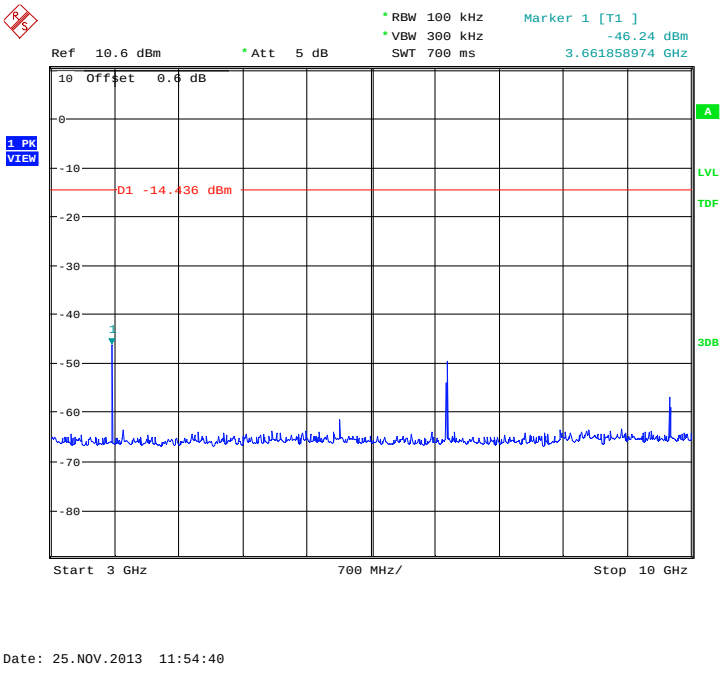


Fig.36. Conducted spurious emission: π/4 DQPSK, Channel 39, 3GHz - 10GHz

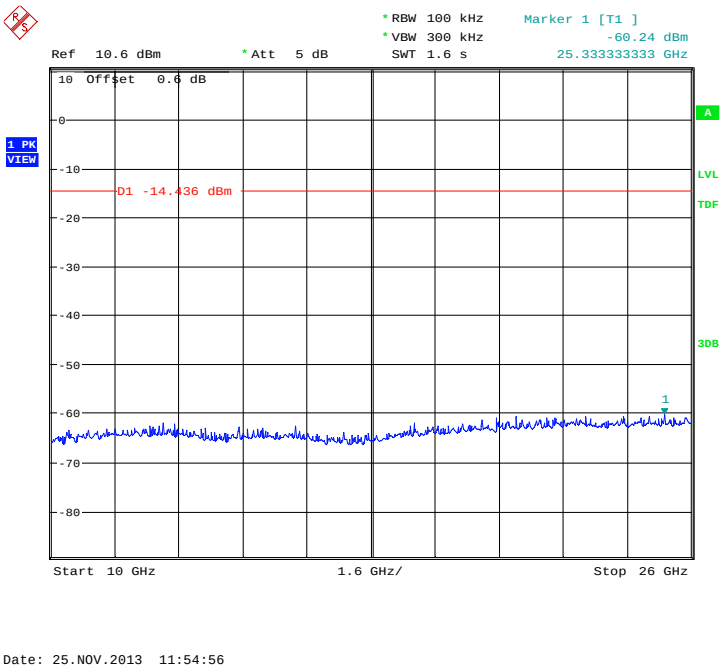


Fig.37. Conducted spurious emission: π/4 DQPSK, Channel 39, 10GHz – 26GHz

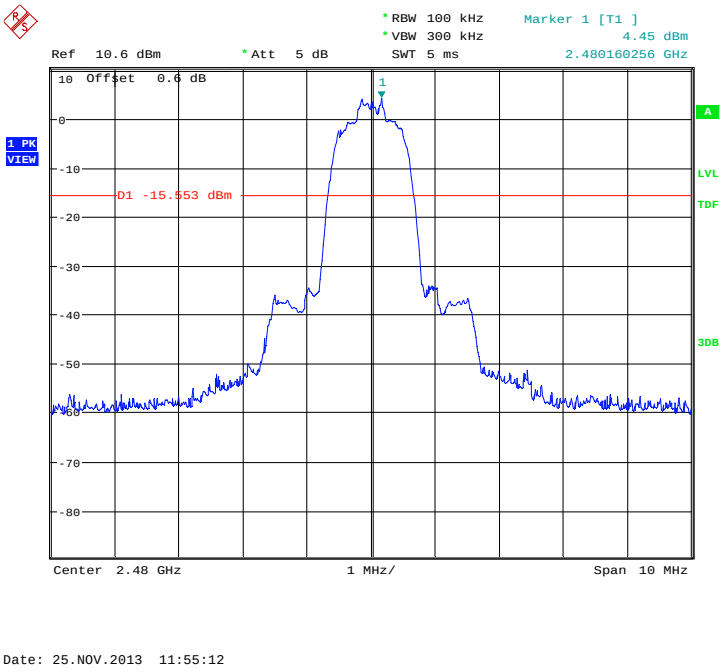


Fig.38. Conducted spurious emission: π/4 DQPSK, Channel 78, 2480MHz

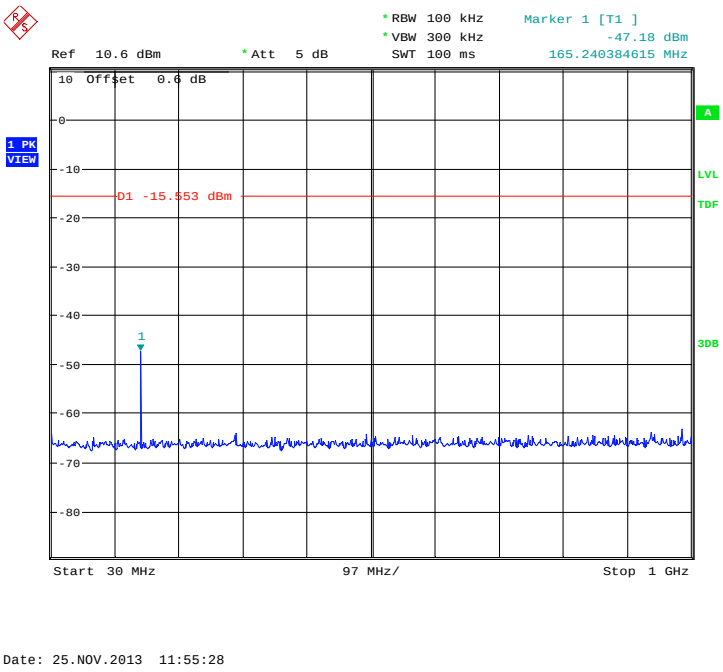


Fig.39. Conducted spurious emission: π/4 DQPSK, Channel 78, 30MHz - 1GHz

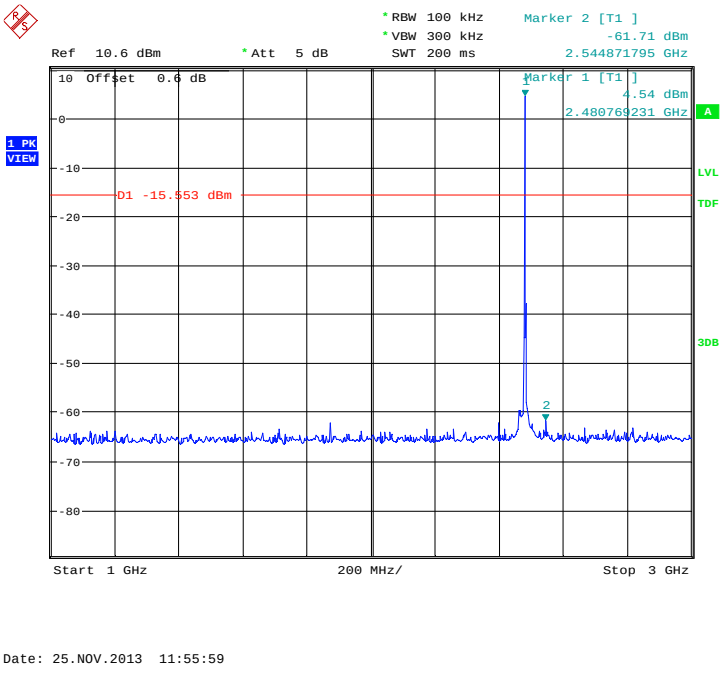


Fig.40. Conducted spurious emission: π/4 DQPSK, Channel 78, 1GHz - 3GHz

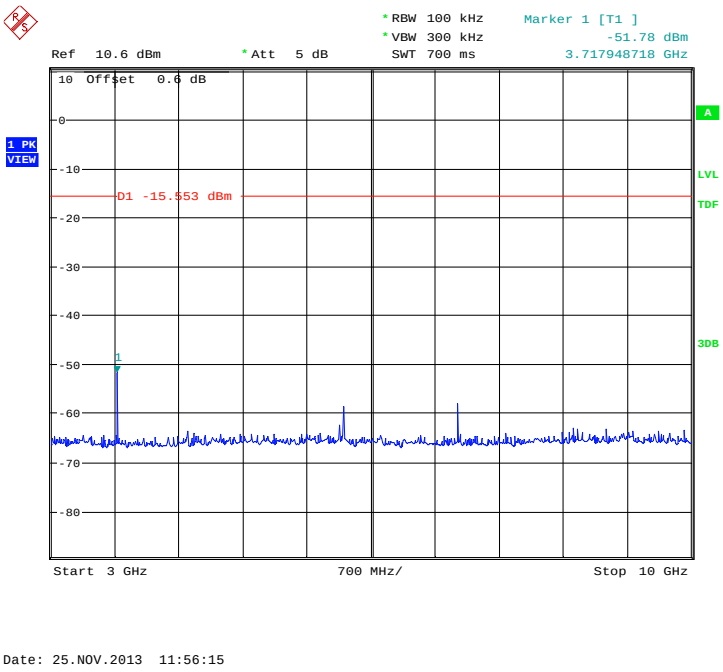


Fig.41. Conducted spurious emission: π/4 DQPSK, Channel 78, 3GHz - 10GHz

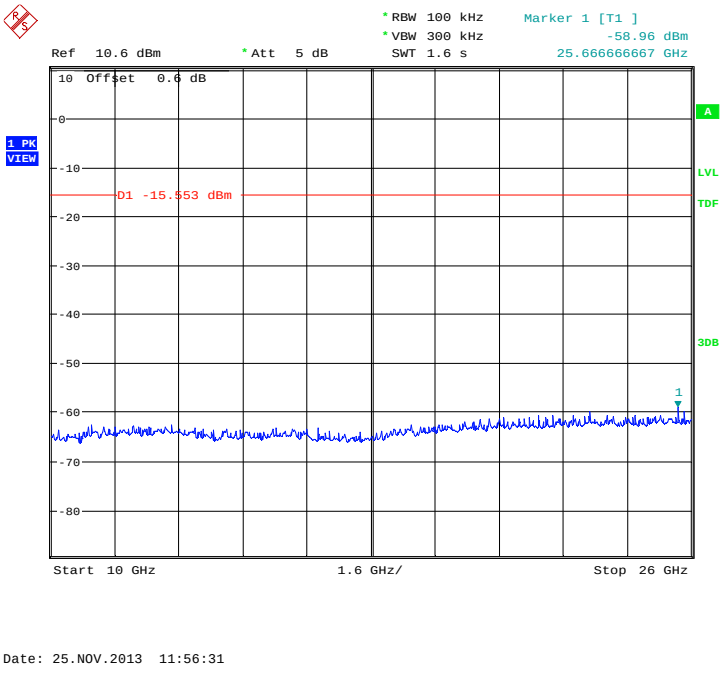


Fig.42. Fig.30 Conducted spurious emission: π/4 DQPSK, Channel 78, 10GHz - 26GHz

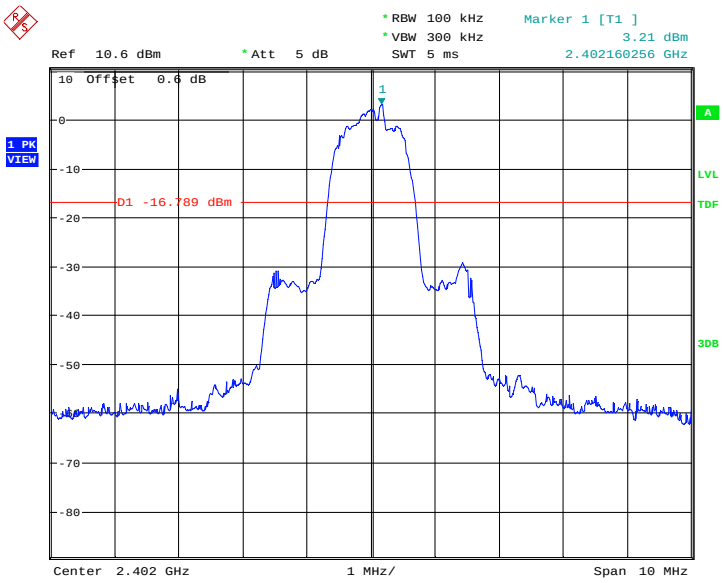


Fig.43. Conducted spurious emission: 8DPSK, Channel 0,2402MHz

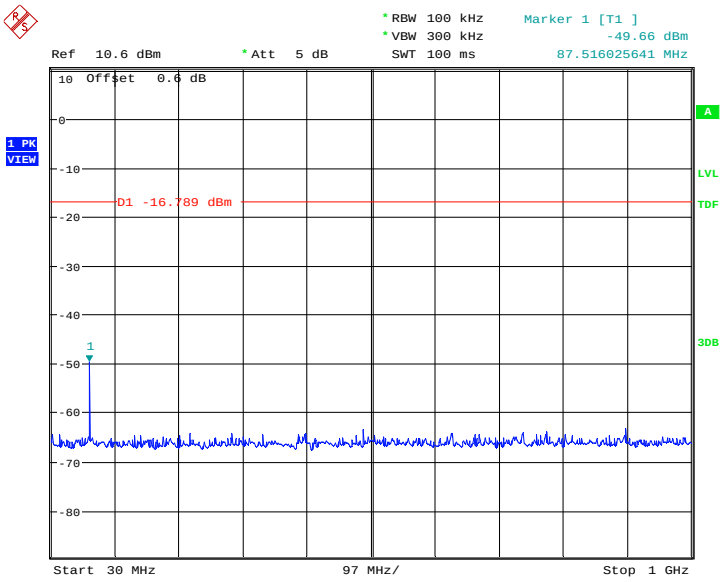


Fig.44. Conducted spurious emission: 8DPSK, Channel 0, 30MHz - 1GHz

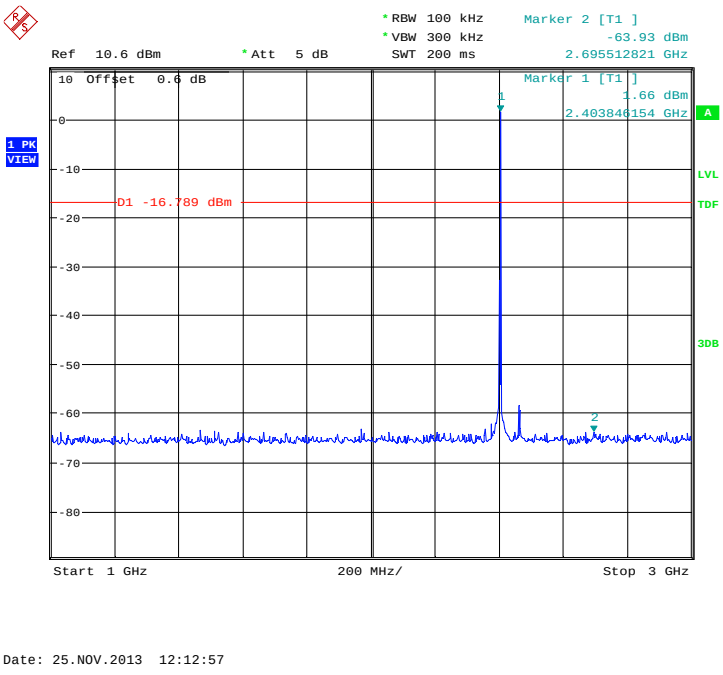


Fig.45. Conducted spurious emission: 8DPSK, Channel 0, 1GHz - 3GHz

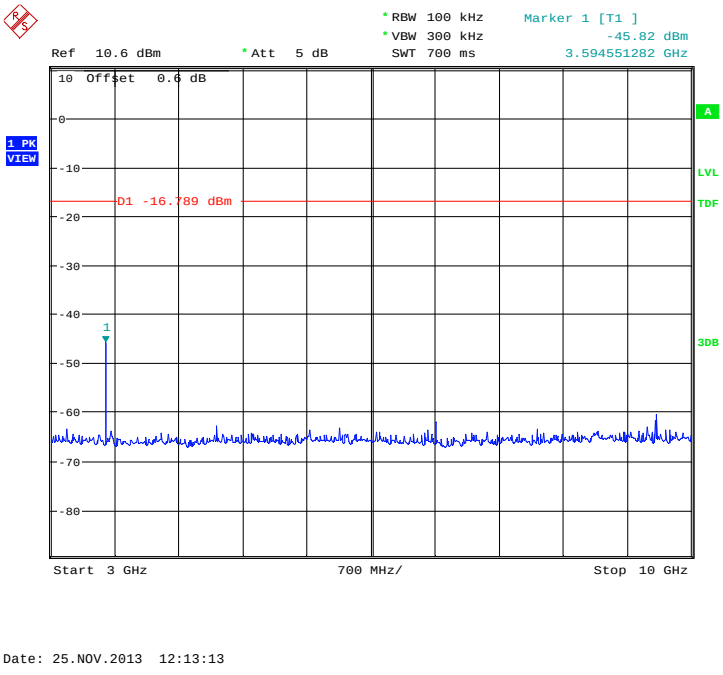


Fig.46. Conducted spurious emission: 8DPSK, Channel 0, 3GHz - 10GHz

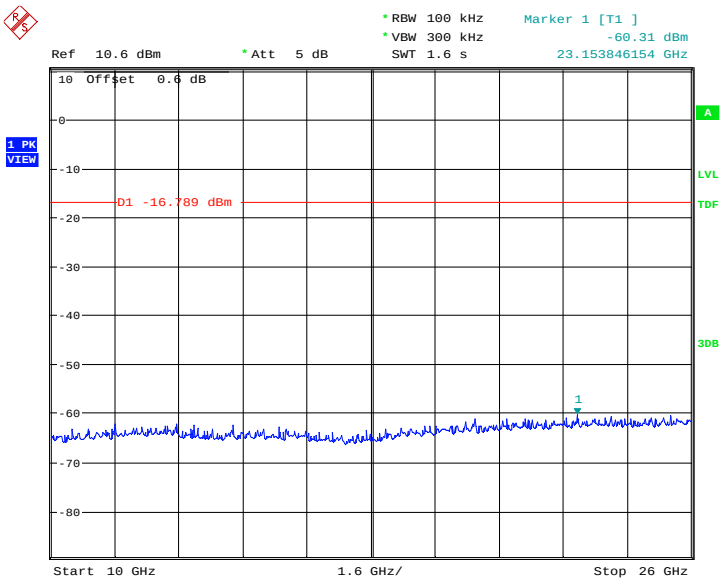


Fig.47. Conducted spurious emission: 8DPSK, Channel 0,10GHz - 26GHz

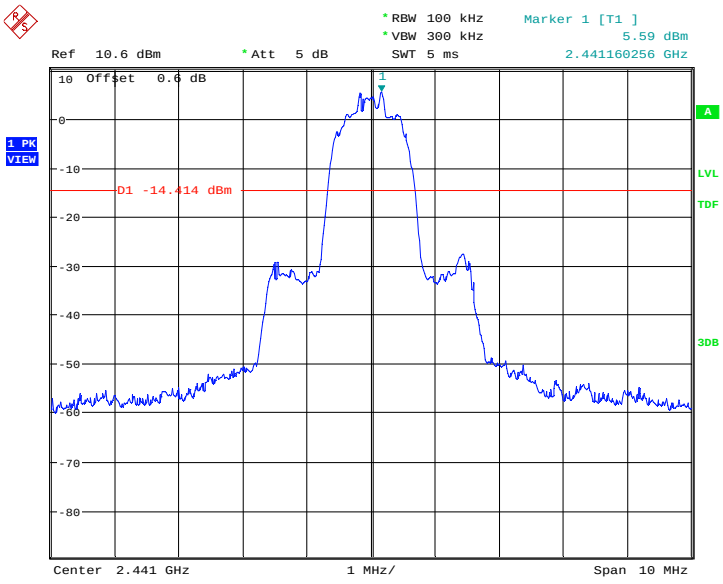


Fig.48. Conducted spurious emission: 8DPSK, Channel 39, 2441MHz

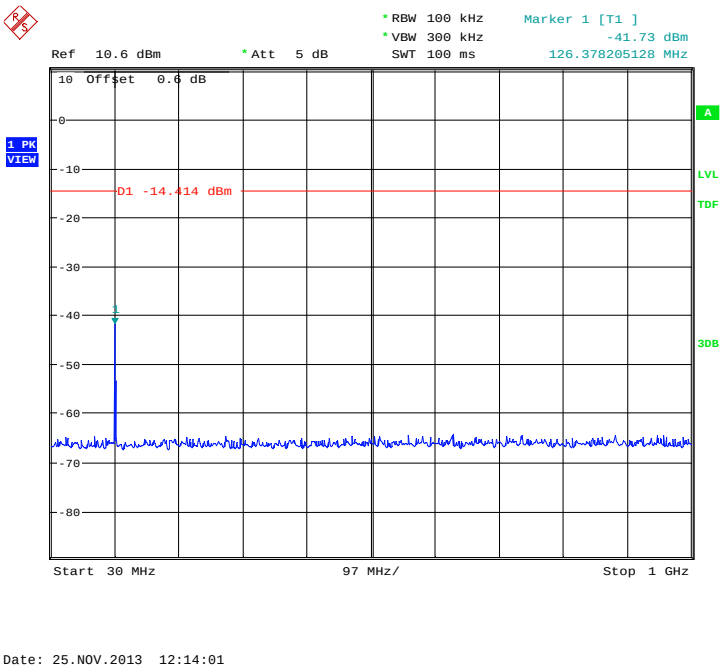


Fig.49. Conducted spurious emission: 8DPSK, Channel 39, 30MHz - 1GHz

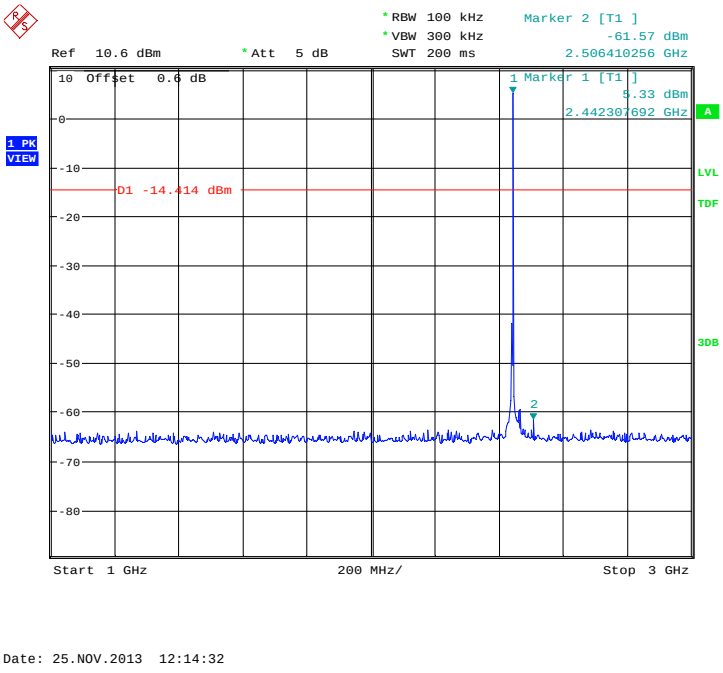


Fig.50. Conducted spurious emission: 8DPSK, Channel 39, 1GHz - 3GHz

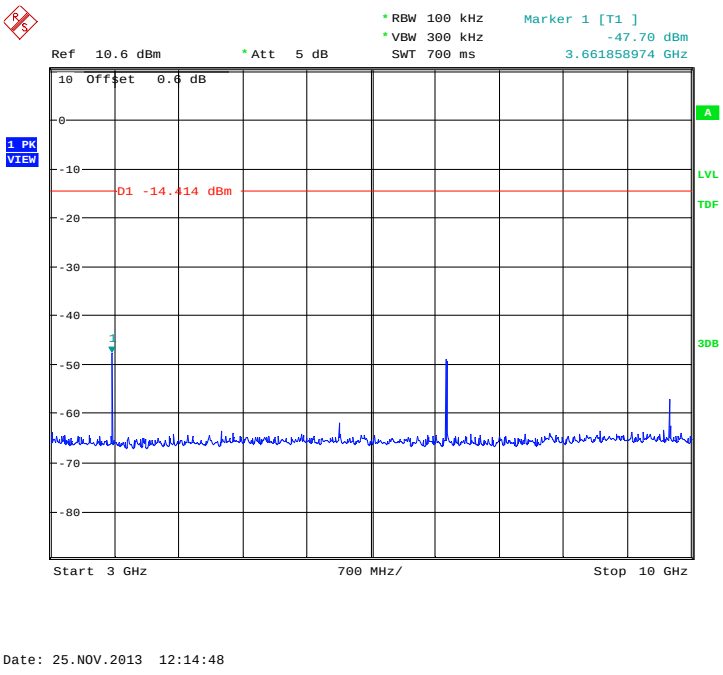


Fig.51. Conducted spurious emission: 8DPSK, Channel 39, 3GHz - 10GHz

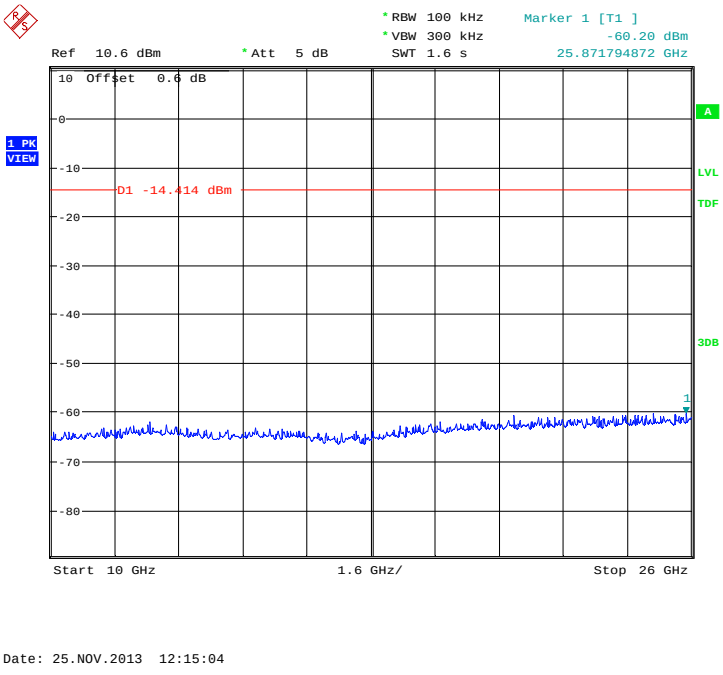


Fig.52. Conducted spurious emission: 8DPSK, Channel 39, 10GHz – 26GHz

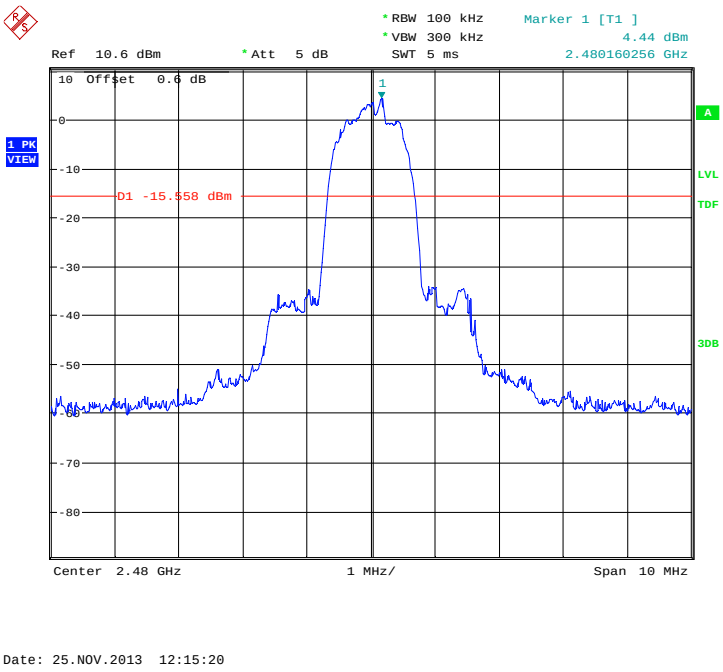


Fig.53. Conducted spurious emission: 8DPSK, Channel 78, 2480MHz

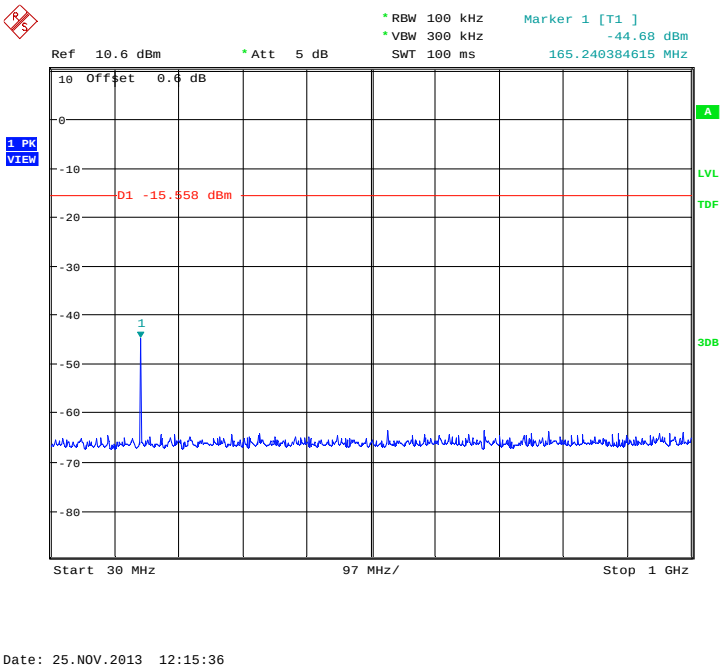


Fig.54. Conducted spurious emission: 8DPSK, Channel 78, 30MHz - 1GHz

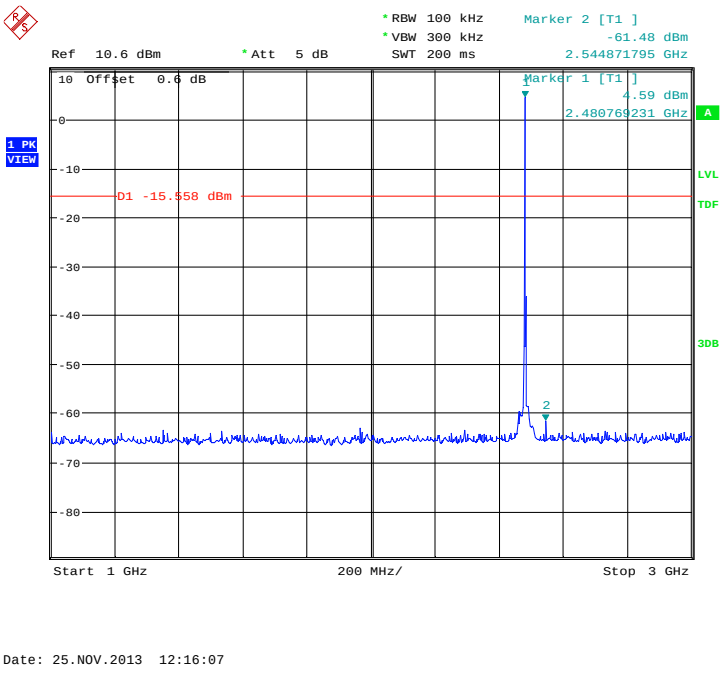


Fig.55. Conducted spurious emission: 8DPSK, Channel 78, 1GHz - 3GHz

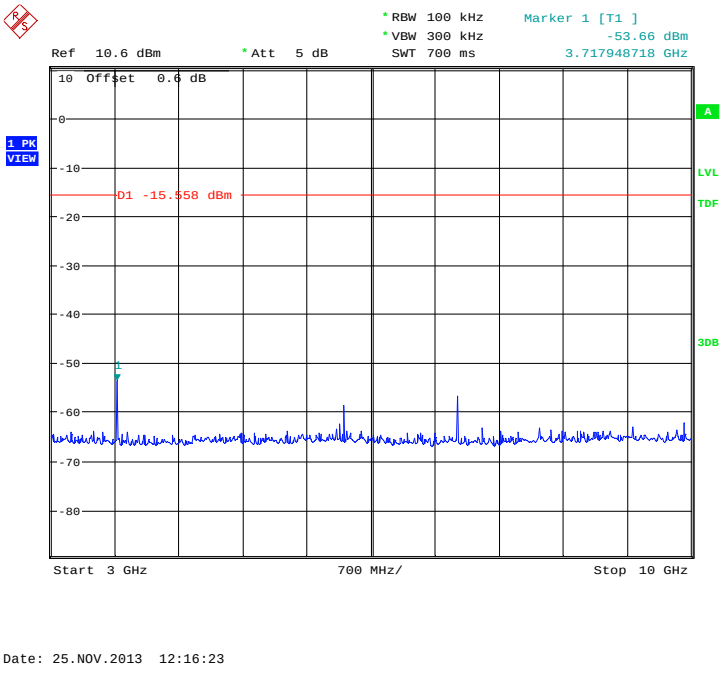


Fig.56. Conducted spurious emission: 8DPSK, Channel 78, 3GHz - 10GHz

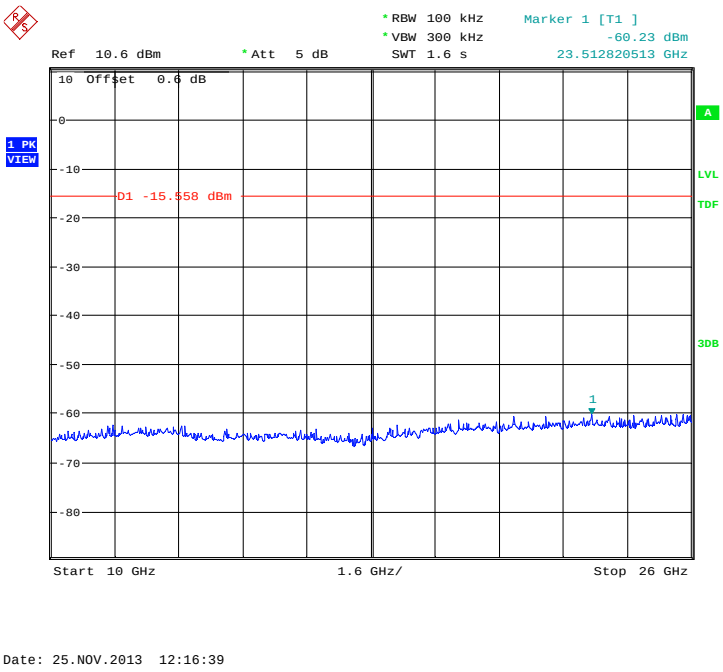


Fig.57. Conducted spurious emission: 8DPSK, Channel 78, 10GHz - 26GHz

A.5. 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)).

The measurement is made according to ANSI C63.10

Limit in restricted band:

Frequency of emission (MHz)	Field strength(uV/m)	Field strength(dBuV/m)
0.009-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Test Condition

The EUT was placed on a non-conductive table. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

Frequency of emission (MHz)	RBW/VBW	Sweep Time(s)
0.009-1000	100KHz/300KHz	5
1000-4000	1MHz/1MHz	15
4000-18000	1MHz/1MHz	40
18000-26500	1MHz/1MHz	20

Measurement Results:

Result=P_{Mea}+ARPL

For GFSK

Channel	Frequency Range	Test Results	Conclusion
Ch 0 2402 MHz	30 MHz ~ 1 GHz	Fig.58	P
	1 GHz ~ 18 GHz	Fig.59	P
Ch 39 2441 MHz	30 MHz ~ 1 GHz	Fig.60	P
	1 GHz ~ 18 GHz	Fig.61	P
Ch 78 2480 MHz	30 MHz ~ 1 GHz	Fig.62	P
	1 GHz ~ 18 GHz	Fig.63	P
Power	2.38GHz~2.4GHz---L	Fig.64	P
Power	2.45GHz~2.5GHz---H	Fig.65	P
For all channels	18 GHz ~ 26 GHz	Fig.66	P

Forπ/4 DQPSK

Channel	Frequency Range	Test Results	Conclusion
Ch 0 2402 MHz	30 MHz ~ 1 GHz	Fig.67	P
	1 GHz ~ 18 GHz	Fig.68	P
Ch 39 2441 MHz	30 MHz ~ 1 GHz	Fig.69	P
	1 GHz ~ 18 GHz	Fig.70	P
Ch 78 2480 MHz	30 MHz ~ 1 GHz	Fig.71	P
	1 GHz ~ 18 GHz	Fig.72	P
Power	2.38GHz~2.4GHz---L	Fig.73	P
Power	2.45GHz~2.5GHz---H	Fig.74	P
For all channels	18 GHz ~ 26 GHz	Fig.75	P

For 8DPSK

Channel	Frequency Range	Test Results	Conclusion
Ch 0 2402 MHz	30 MHz ~ 1 GHz	Fig.76	P
	1 GHz ~ 18 GHz	Fig.77	P
Ch 39 2441 MHz	30 MHz ~ 1 GHz	Fig.78	P
	1 GHz ~ 18 GHz	Fig.79	P
Ch 78 2480 MHz	30 MHz ~ 1 GHz	Fig.80	P
	1 GHz ~ 18 GHz	Fig.81	P
Power	2.38GHz~2.4GHz---L	Fig.82	P
Power	2.45GHz~2.5GHz---H	Fig.83	P
For all channels	18 GHz ~ 26 GHz	Fig.84	P

GFSK Ch 0 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	PMea(dBuv/m)	Polarization
2390.000	36.6	11.1	47.700	H
17556.000	45.8	26.4	19.400	H
17866.500	45.4	27.1	18.300	V
17748.000	45.1	27.1	18.000	V
17715.000	45.1	26.7	18.400	V
17706.000	45.0	26.7	18.300	V

GFSK Ch 39 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
17994.000	45.6	27.9	17.700	H
17787.000	45.4	27.1	18.300	V
17868.000	45.3	27.1	18.200	V
17673.000	44.9	26.7	18.200	V
17977.500	44.8	27.9	16.900	H
17757.000	44.5	27.1	17.400	H

GFSK Ch 78 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2483.500	37.0	11.2	48.200	H
17910.000	45.6	27.1	18.500	V
17968.500	45.4	27.9	17.500	V
17631.000	45.3	26.7	18.600	H
17890.500	45.3	27.1	18.200	H
17640.000	45.2	26.7	18.500	V

π/4 DQPSK Ch 0 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2483.500	36.6	11.2	47.800	H
17830.500	45.8	27.1	18.700	V
17836.500	45.4	27.1	18.300	H
17818.500	45.2	27.1	18.100	V
17989.500	45.2	27.9	17.300	H
17815.500	45.1	27.1	18.000	V

π/4 DQPSK Ch 39 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
17995.500	46.2	27.9	18.300	V
17961.000	45.7	27.9	17.800	V
17802.000	45.6	27.1	18.500	V
17734.500	45.5	26.7	18.800	H
17797.500	45.4	27.1	18.300	V
17845.500	45.0	27.1	17.900	V

π/4 DQPSK Ch 78 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2483.500	37.1	11.2	48.300	V
17955.000	45.3	27.9	17.400	H
17770.500	45.2	27.1	18.100	V
17739.000	45.0	27.1	17.900	V
17968.500	44.8	27.9	16.900	V
17784.000	44.7	27.1	17.600	H

8DPSK Ch 0 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2390.000	36.5	11.1	47.600	V
17946.000	45.9	27.9	18.000	H
17799.000	45.6	27.1	18.500	V
17764.500	45.2	27.1	18.100	V
17547.000	45.2	26.4	18.800	H
17857.500	44.9	27.1	17.800	V

8DPSK Ch 39 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
17808.000	46.2	27.1	19.100	H
17760.000	45.2	27.1	18.100	H
17659.500	45.0	26.7	18.300	V
17922.000	45.0	27.9	17.100	V
17832.000	44.9	27.1	17.800	H
17956.500	44.8	27.9	16.900	V

8DPSK Ch 78 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2483.500	37.1	11.2	48.300	H
17748.000	46.6	27.1	19.500	V
17926.500	46.2	27.9	18.300	V
17797.500	46.0	27.1	18.900	V
17961.000	45.7	27.9	17.800	V
17677.500	45.3	26.7	18.600	H

Conclusion: PASS

Note:

The radiated spurious emission measurement over 9kHz - 30MHz had been investigated. All spurious emissions were attenuated at least 20dB compared to the limit.

Test graphs as below:

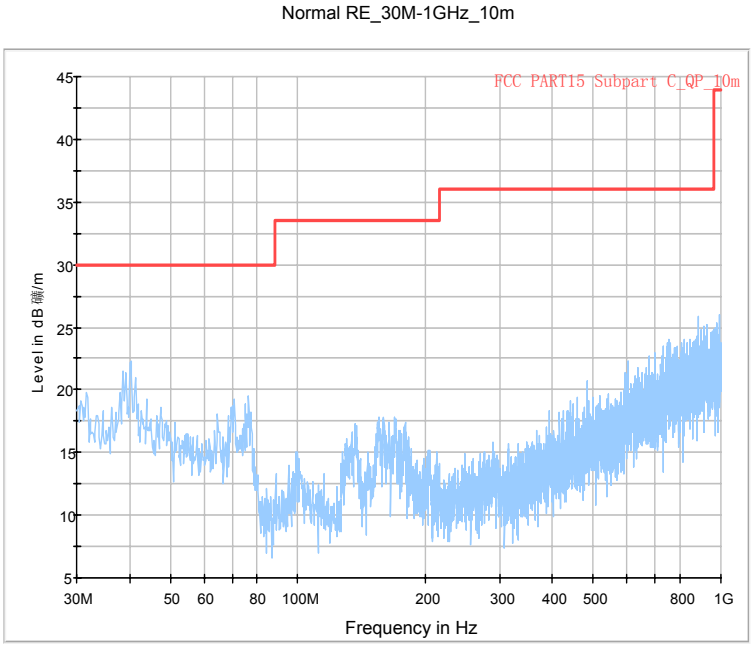


Fig.58. Radiated emission: GFSK, Channel 0, 30 MHz - 1 GHz

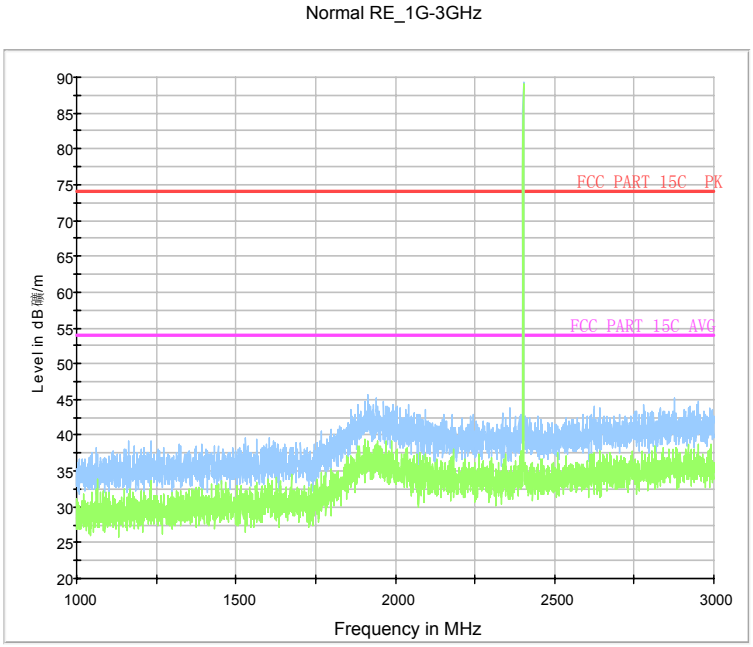


Fig.59. Radiated emission: GFSK, Channel 0, 1 GHz - 3 GHz

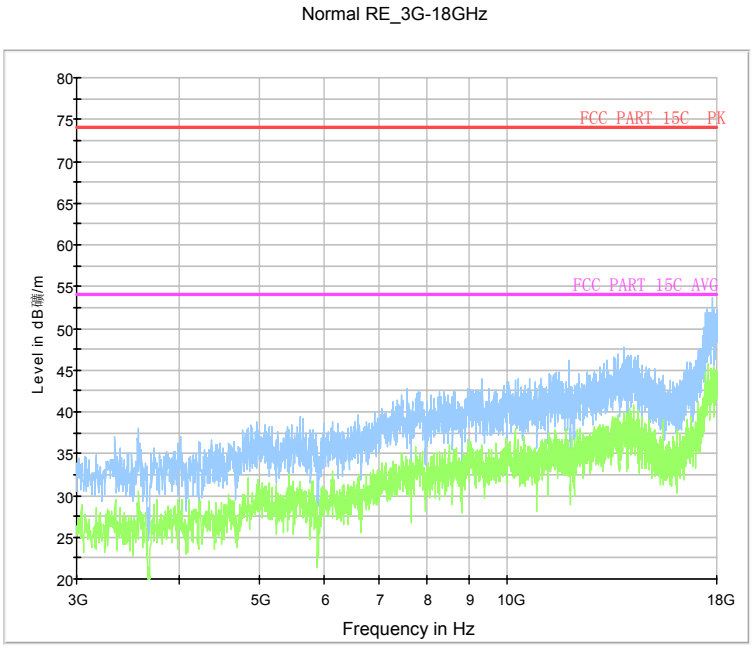


Fig.60. Radiated emission: GFSK, Channel 0, 3 GHz - 18 GHz

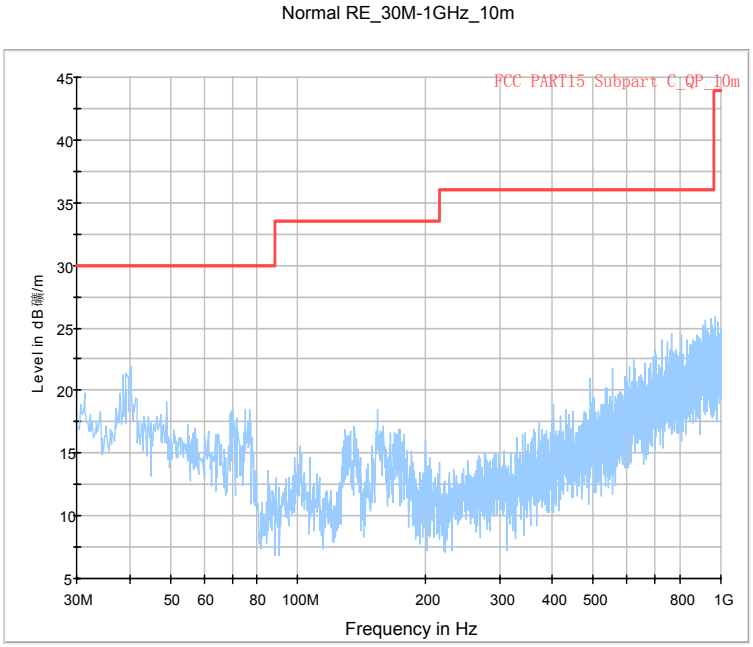


Fig.61. Radiated emission: GFSK, Channel 39, 30 MHz - 1 GHz

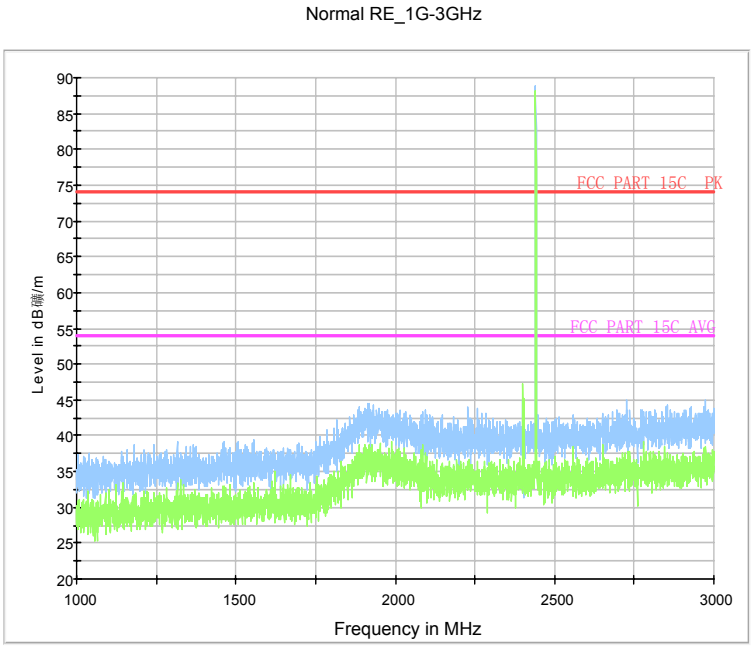


Fig.62. Radiated emission: GFSK, Channel 39, 1 GHz - 3 GHz

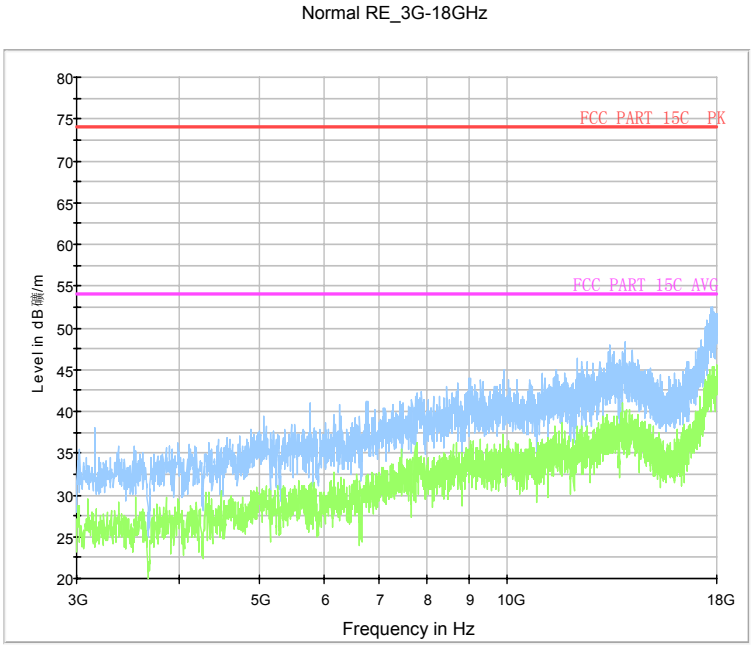


Fig.63. Radiated emission: GFSK, Channel 39, 3 GHz - 18 GHz

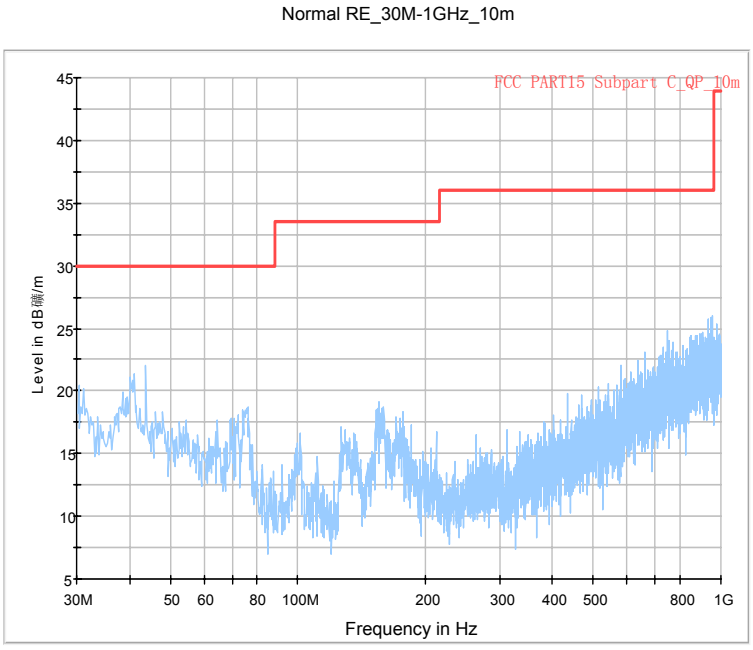


Fig.64. Radiated emission: GFSK, Channel 78, 30 MHz - 1 GHz

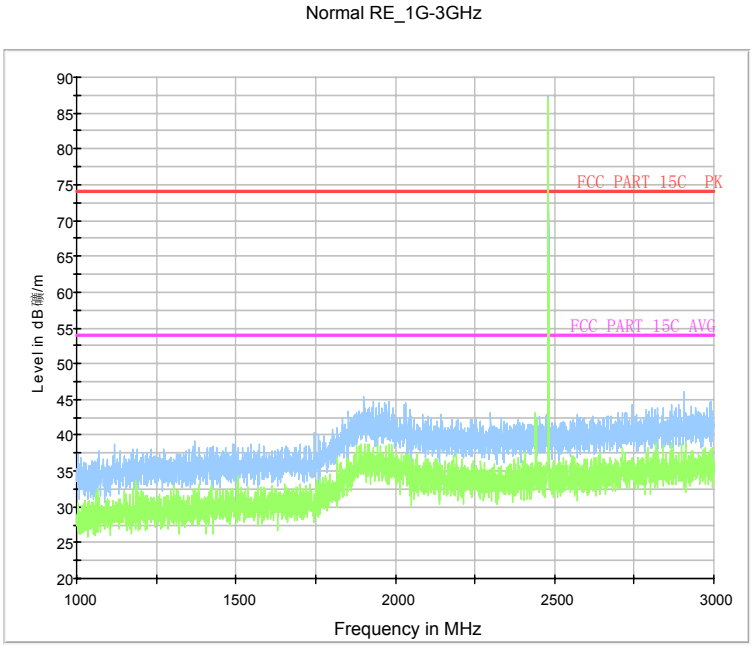


Fig.65. Radiated emission: GFSK, Channel 78, 1 GHz - 3 GHz

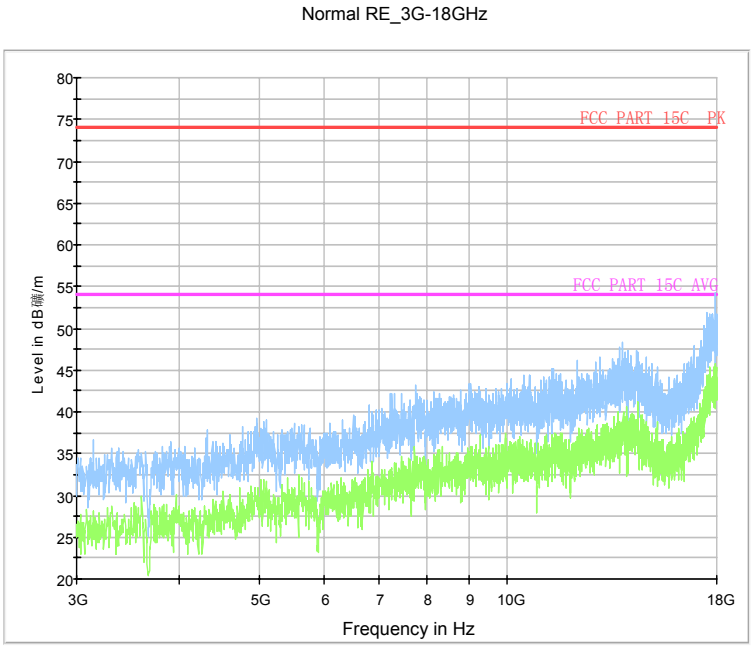


Fig.66. Radiated emission: GFSK, Channel 78, 3 GHz - 18 GHz

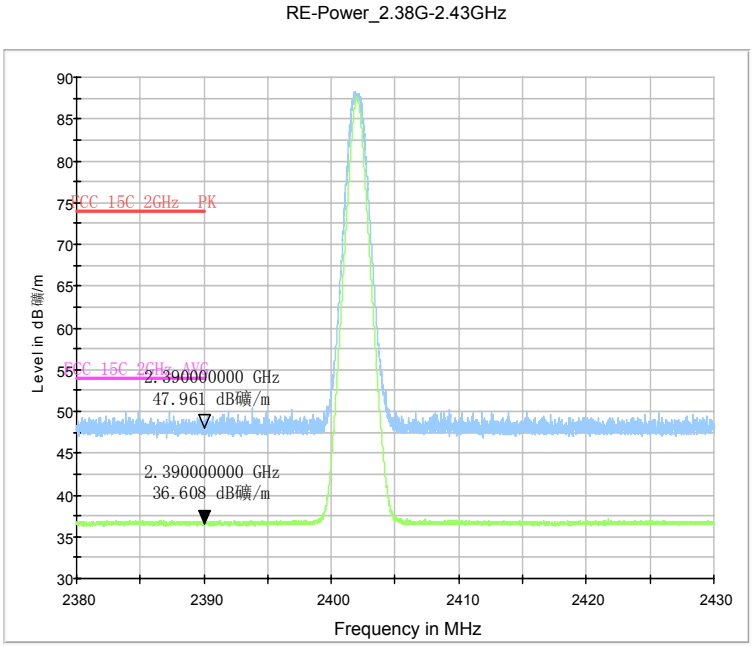


Fig.67. Radiated emission (Power): GFSK, low channel

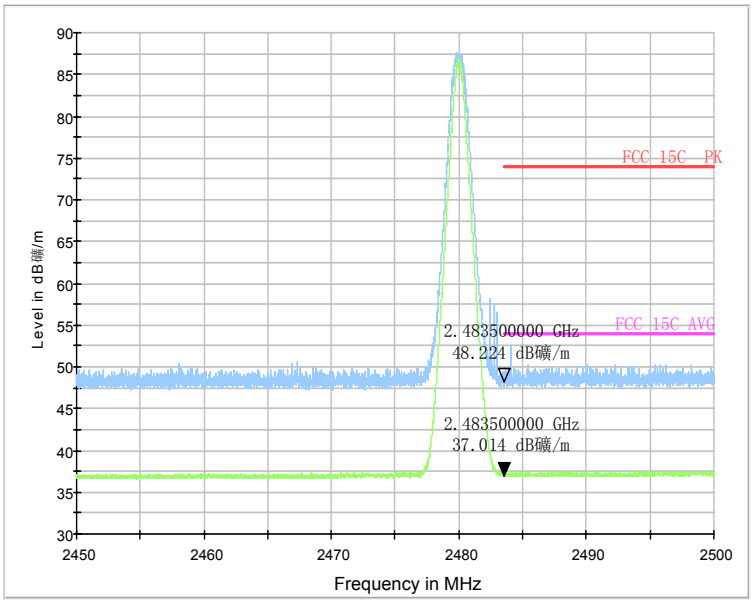


Fig.68. Radiated emission (Power) GFSK, high channel

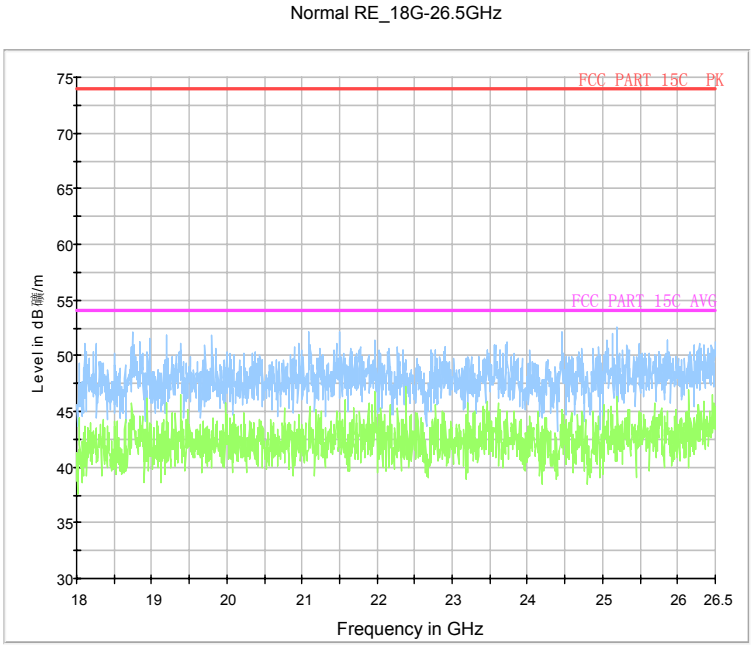


Fig.69. Radiated emission: GFSK, 18 GHz - 26 GHz

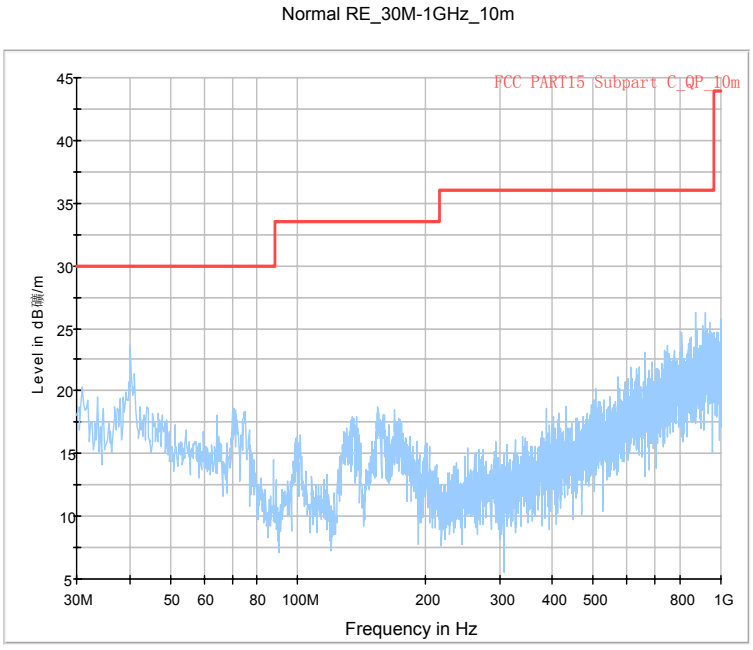


Fig.70. Radiated emission: π/4 DQPSK, Channel 0, 30 MHz - 1 GHz

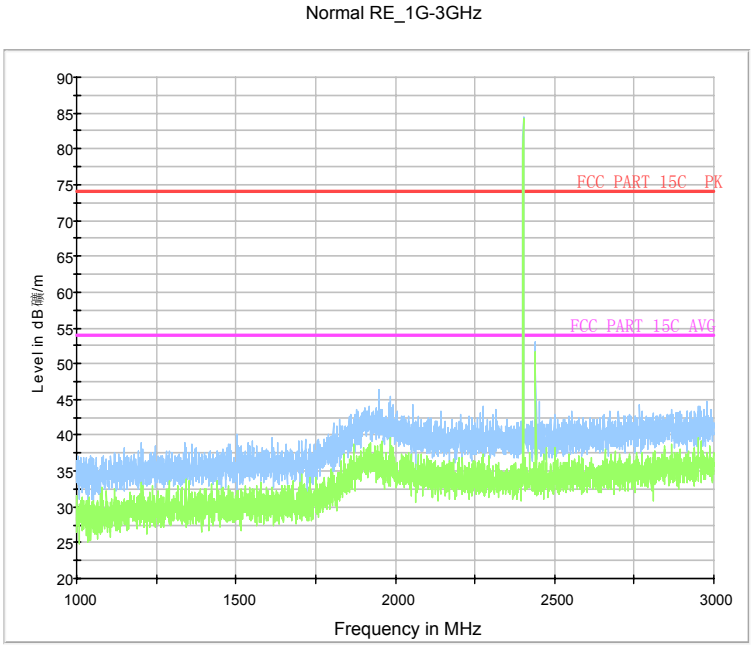


Fig.71. Radiated emission: π/4 DQPSK, Channel 0, 1 GHz - 3 GHz

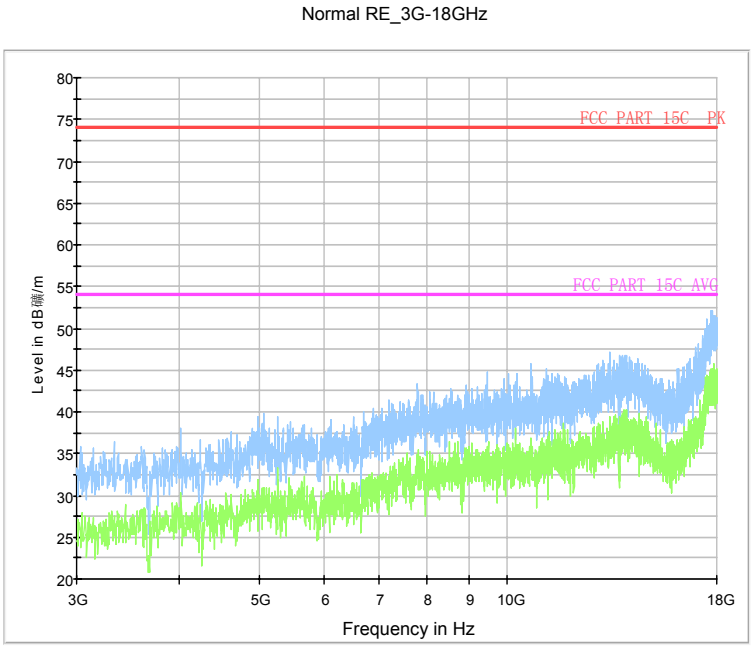


Fig.72. Radiated emission: π/4 DQPSK, Channel 0, 3 GHz - 18 GHz

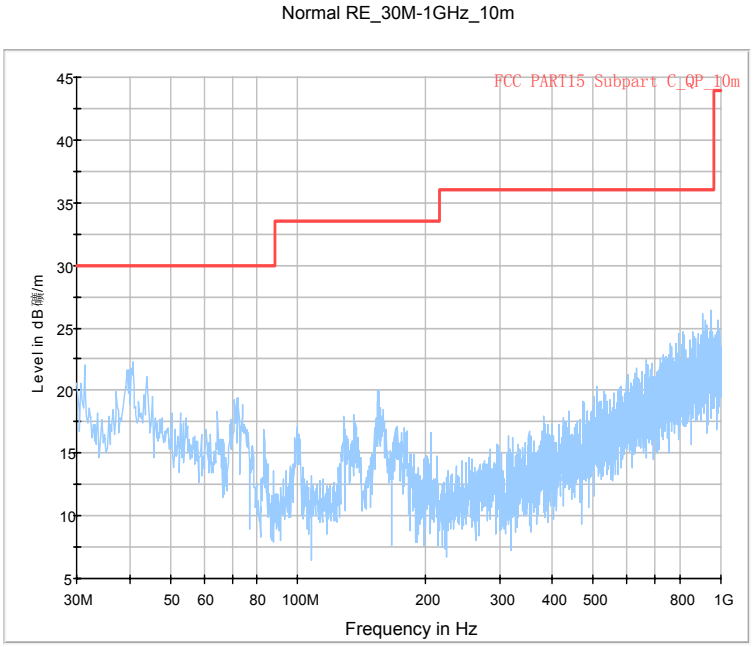


Fig.73. Radiated emission: π/4 DQPSK, Channel 39, 30 MHz - 1 GHz

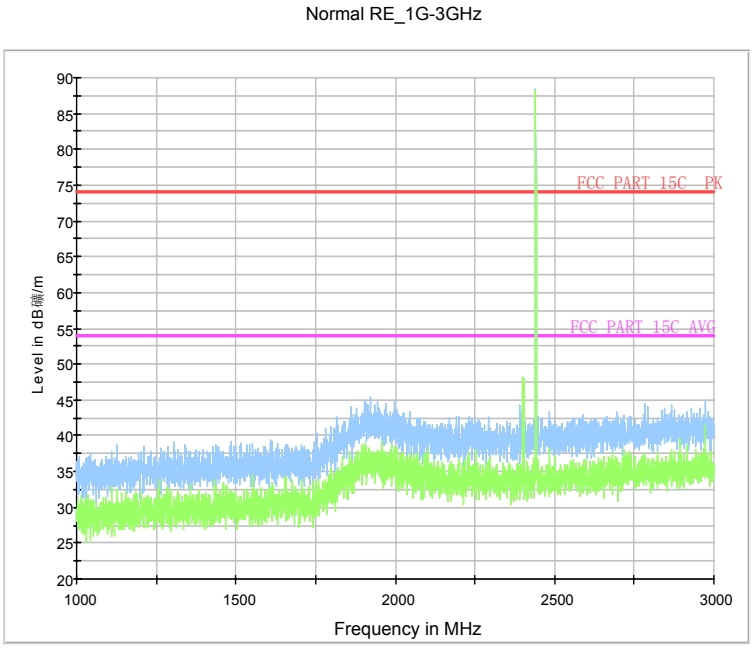


Fig.74. Radiated emission: π/4 DQPSK, Channel 39, 1 GHz - 3 GHz

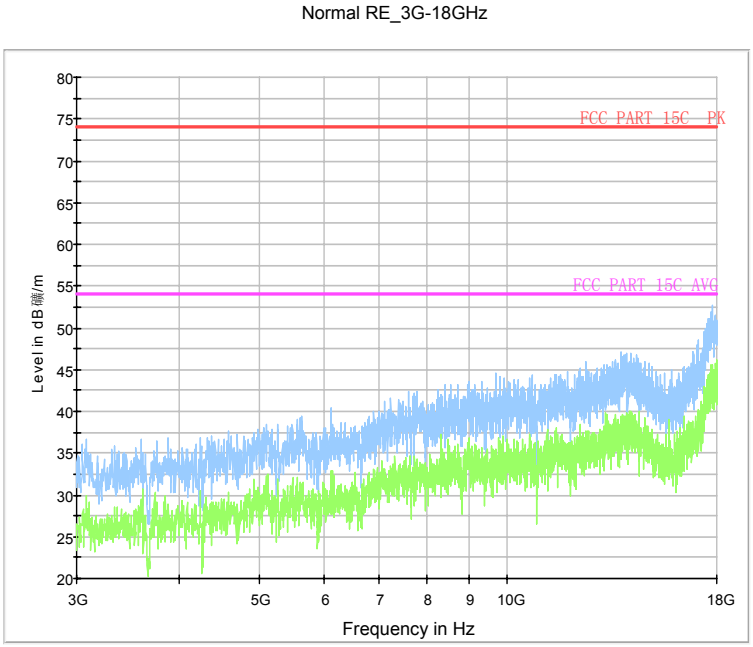


Fig.75. Radiated emission: π/4 DQPSK, Channel 39, 3 GHz - 18 GHz

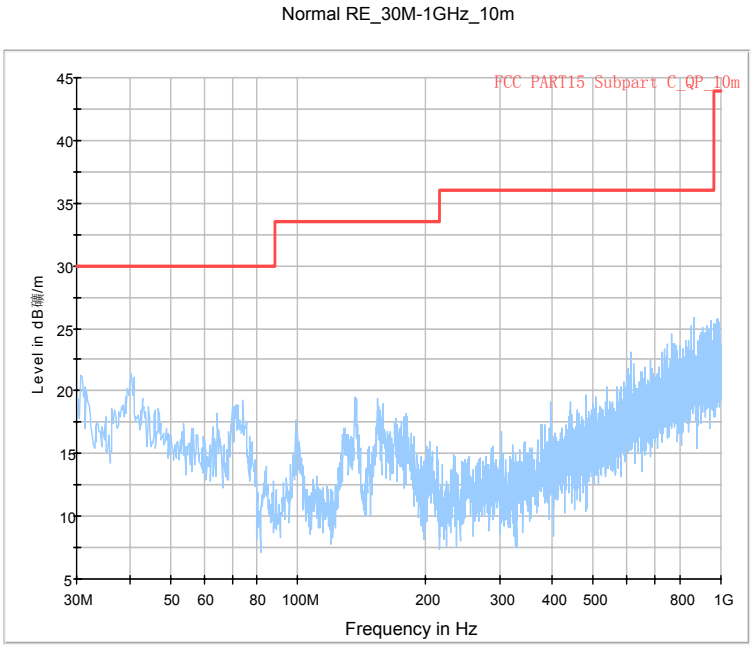


Fig.76. Radiated emission: π/4 DQPSK, Channel 78, 30 MHz - 1 GHz

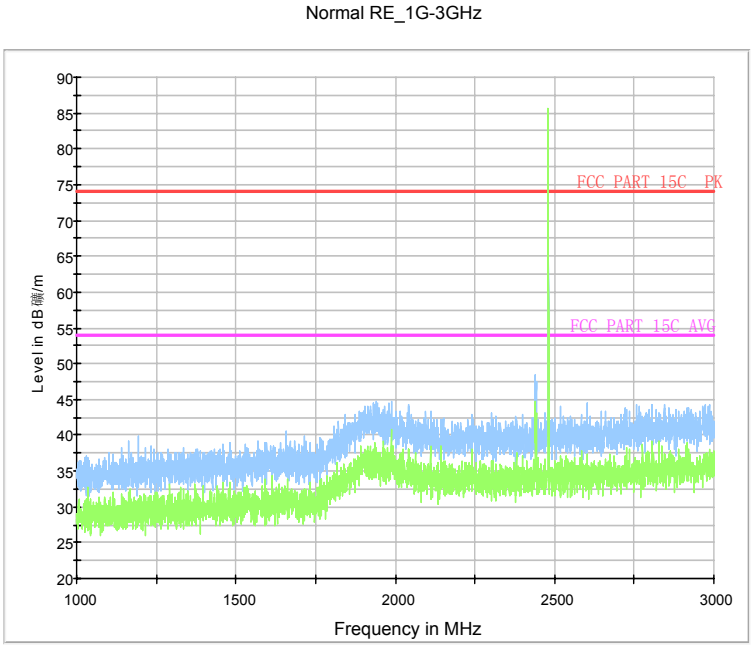


Fig.77. Radiated emission: π/4 DQPSK, Channel 78, 1 GHz - 3 GHz

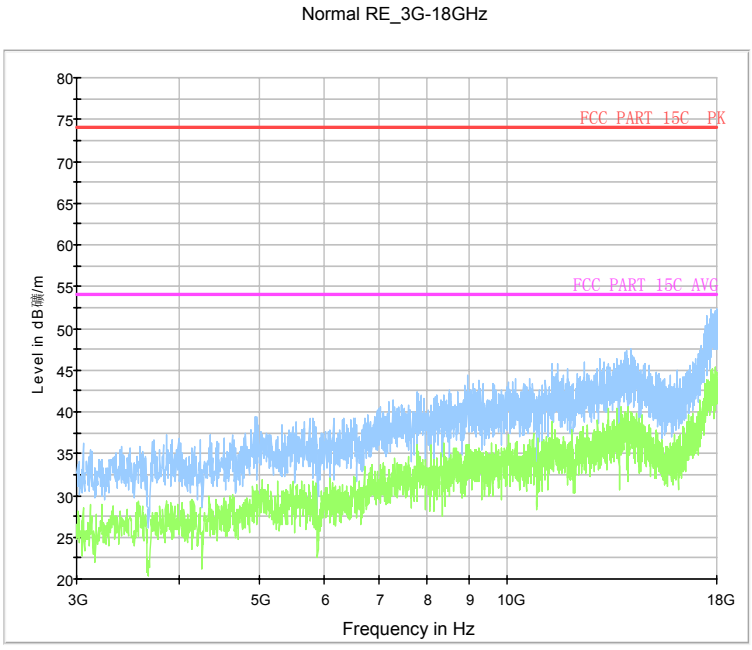


Fig.78. Radiated emission: π/4 DQPSK, Channel 78, 3 GHz - 18 GHz

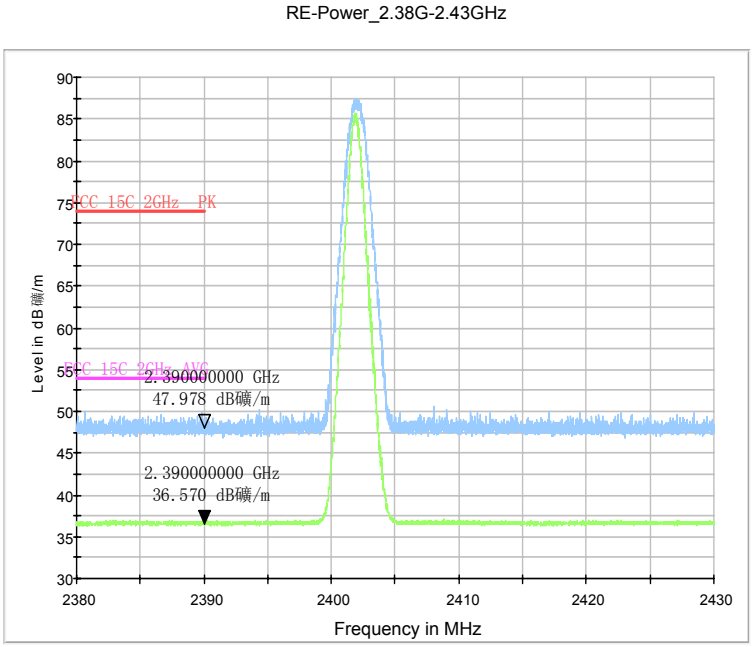


Fig.79. Radiated emission (Power): π/4 DQPSK, low channel

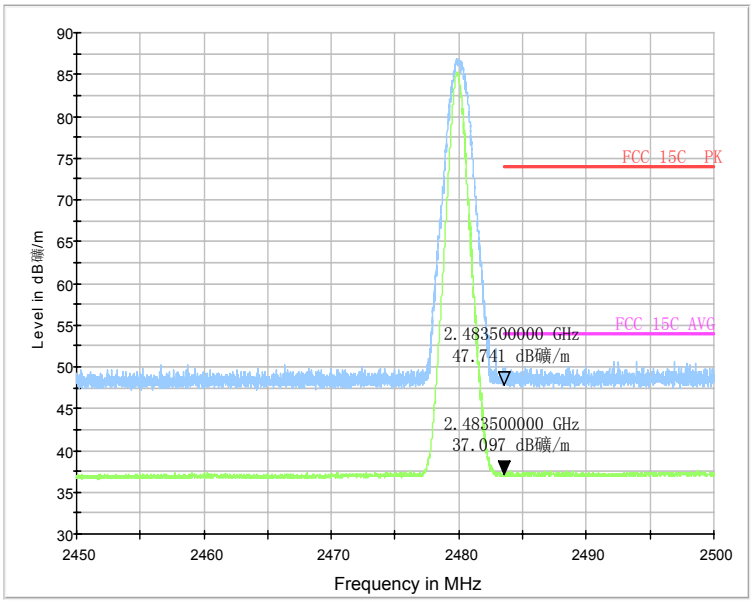


Fig.80. Radiated emission (Power): π/4 DQPSK, high channel

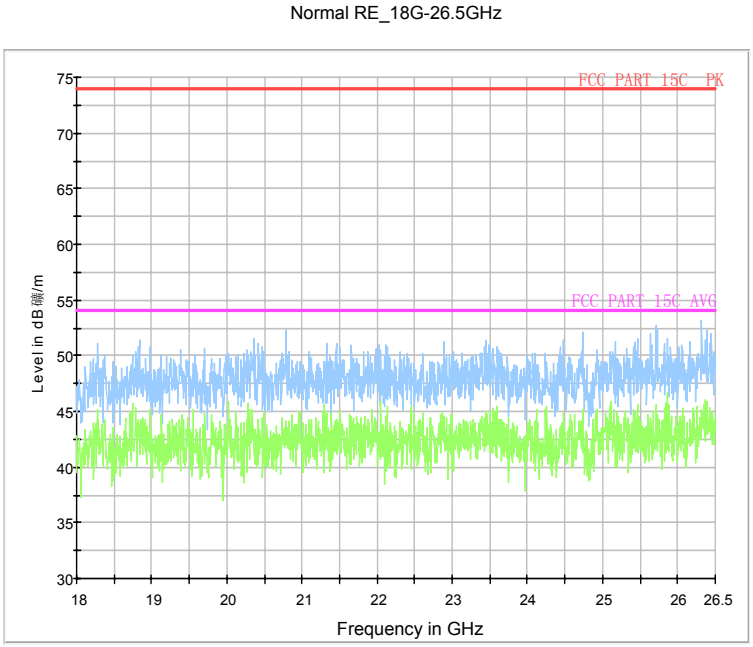


Fig.81. Radiated emission: π/4 DQPSK, 18 GHz - 26 GHz

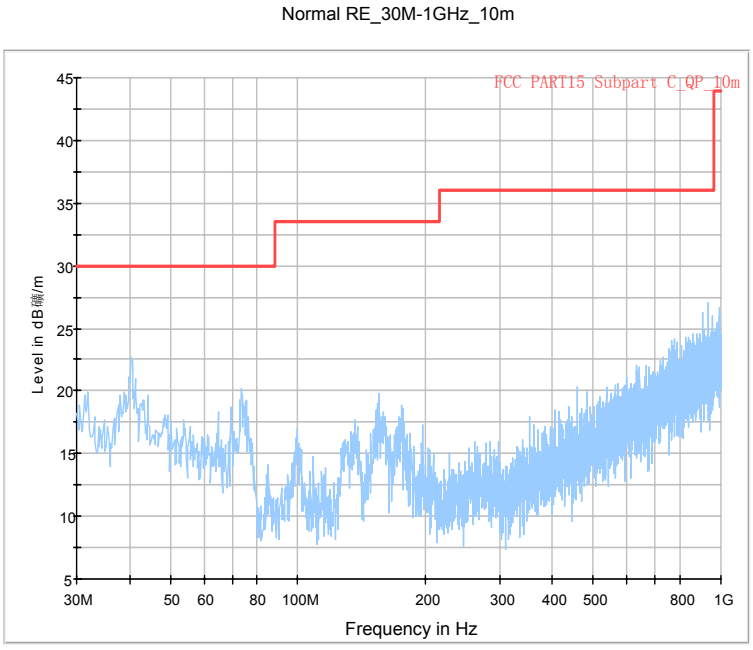


Fig.82. Radiated emission: 8DPSK, Channel 0, 30 MHz - 1 GHz

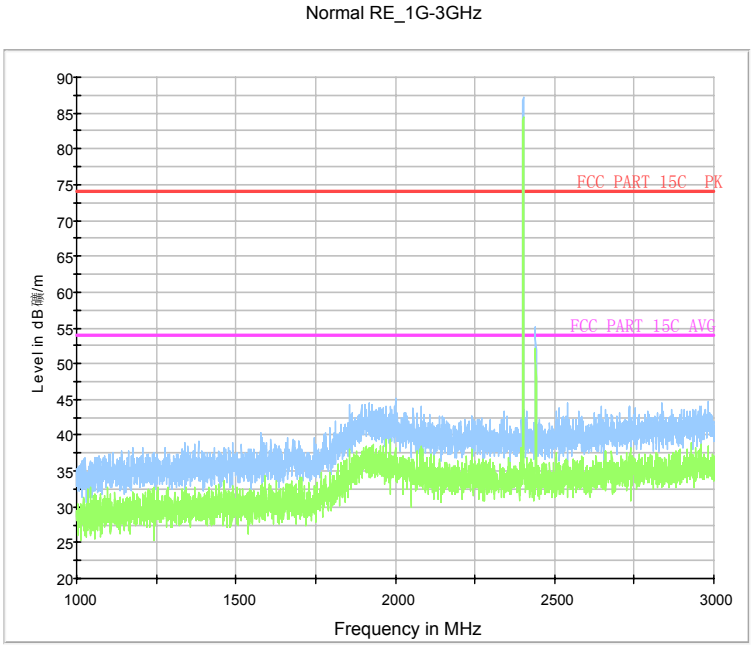


Fig.83. Radiated emission: 8DPSK, Channel 0, 1 GHz - 3 GHz

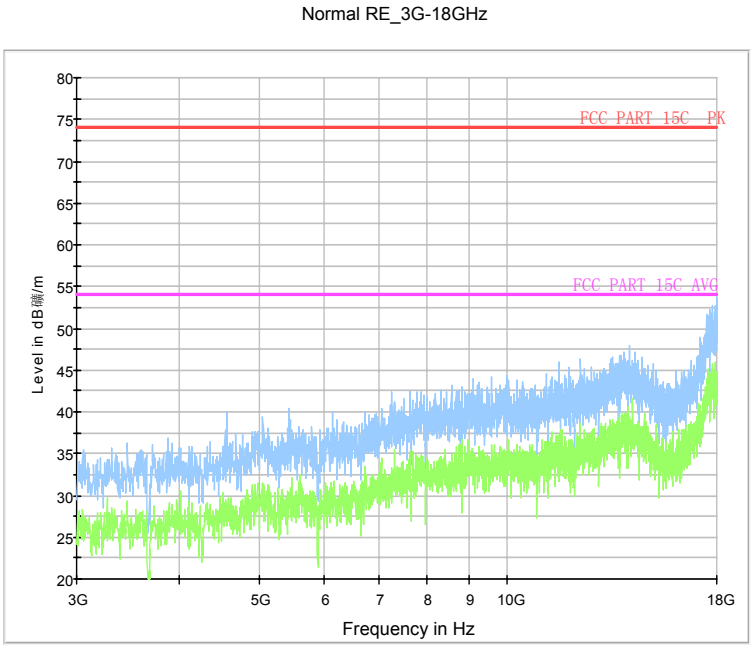


Fig.84. Radiated emission: 8DPSK, Channel 0, 3 GHz - 18 GHz

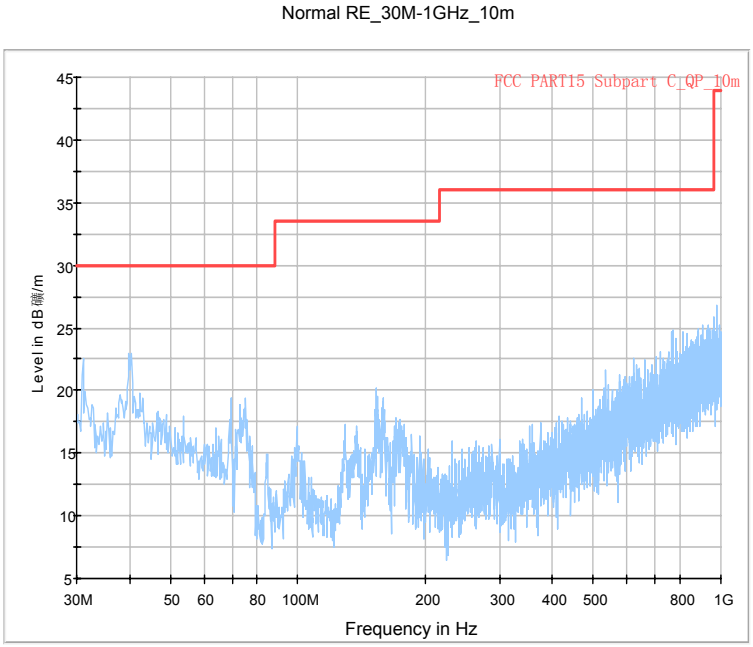


Fig.85. Radiated emission: 8DPSK, Channel 39, 30 MHz - 1 GHz

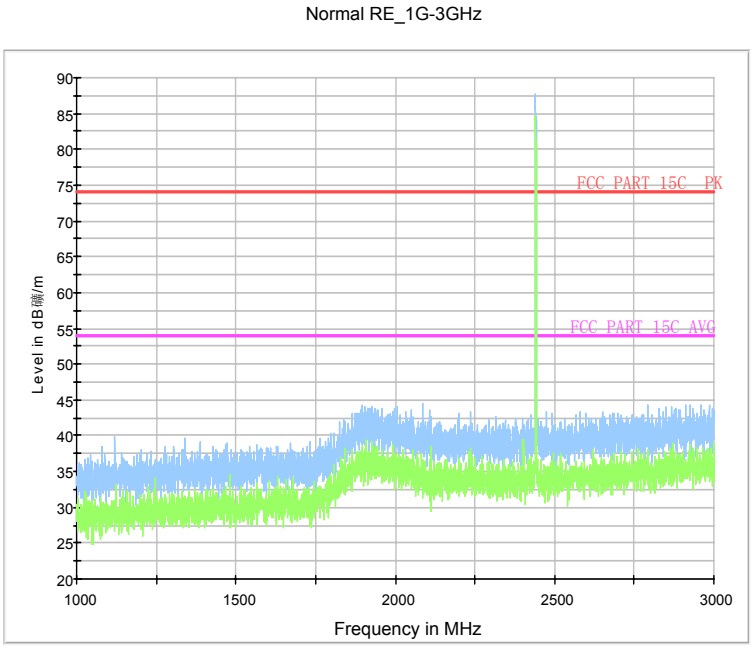


Fig.86. Radiated emission: 8DPSK, Channel 39, 1 GHz - 3 GHz

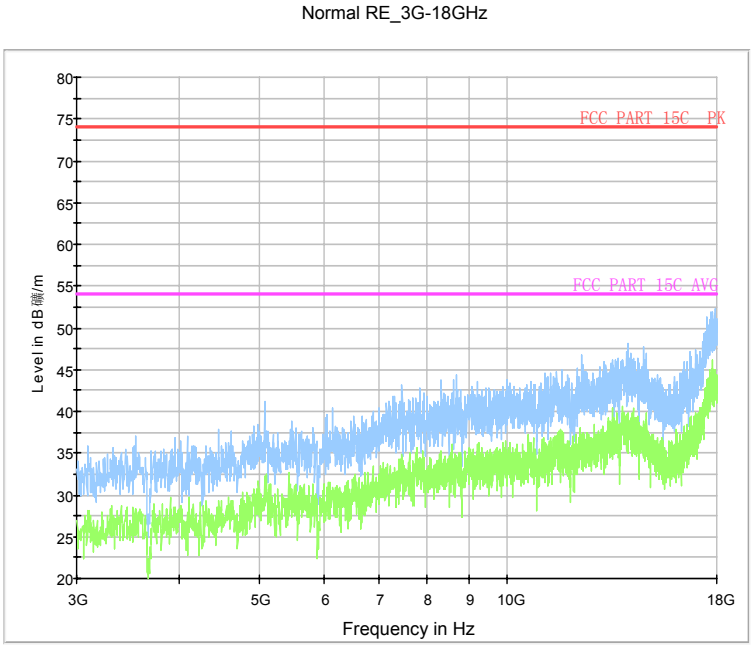


Fig.87. Radiated emission: 8DPSK, Channel 39, 3 GHz - 18 GHz

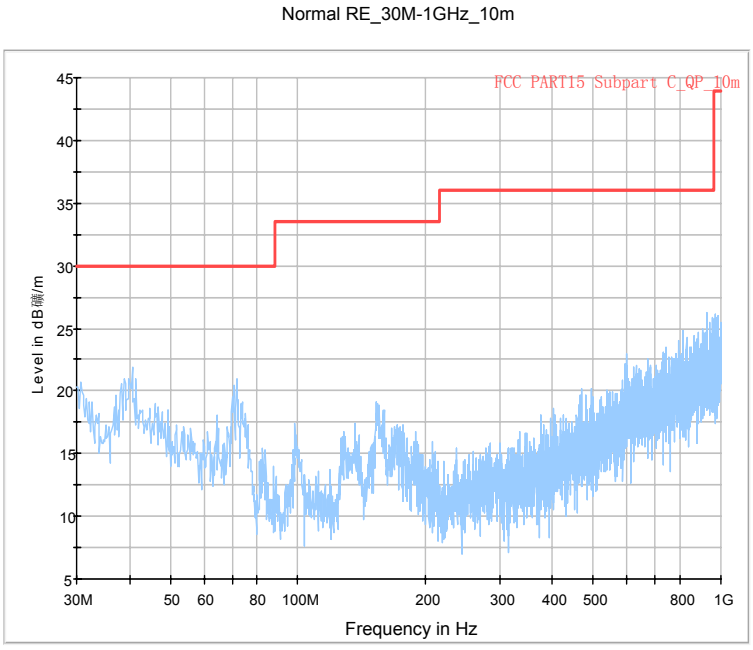


Fig.88. Radiated emission: 8DPSK, Channel 78, 30 MHz - 1 GHz

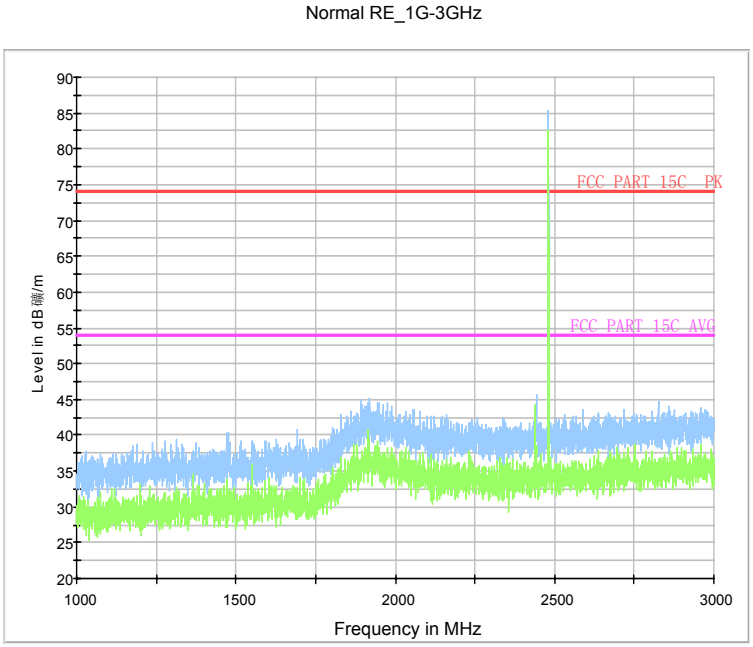


Fig.89. Radiated emission: 8DPSK, Channel 78, 1 GHz - 3 GHz

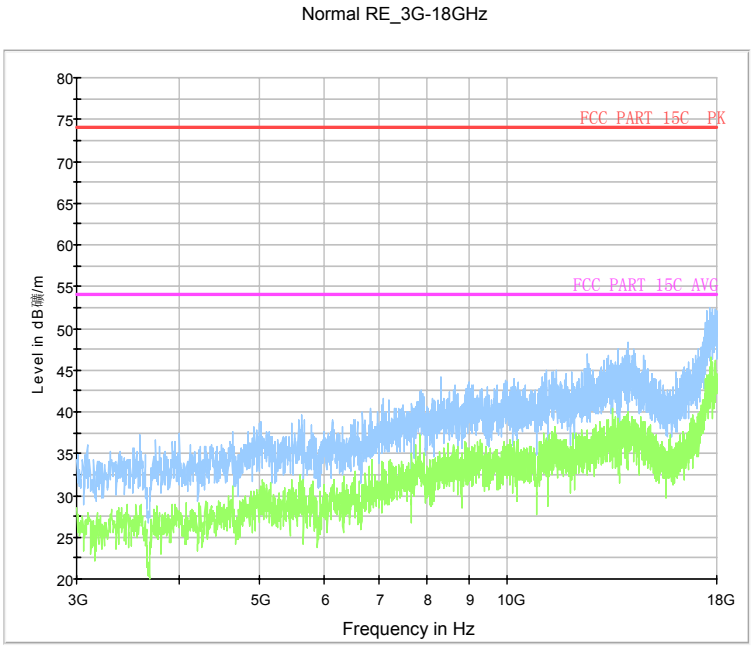


Fig.90. Radiated emission: 8DPSK, Channel 78, 3 GHz - 18 GHz

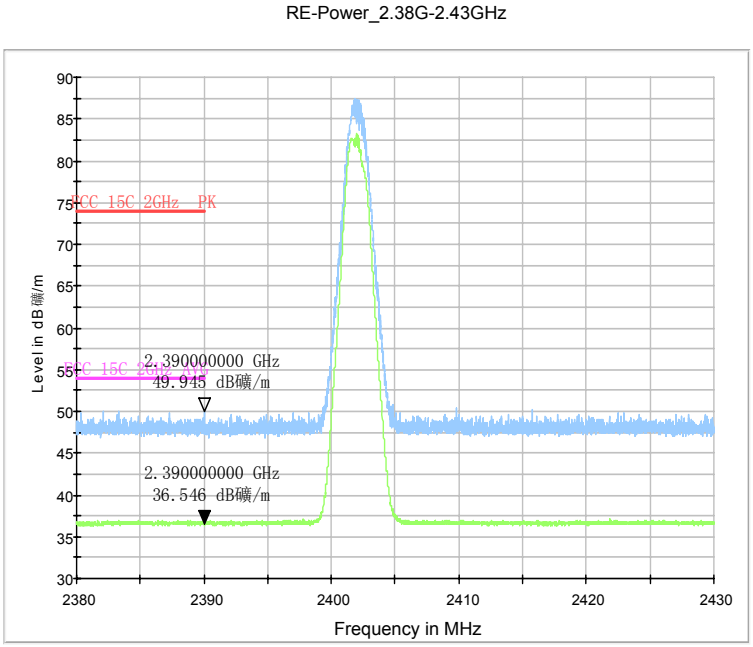


Fig.91. Radiated emission (Power): 8DPSK, low channel

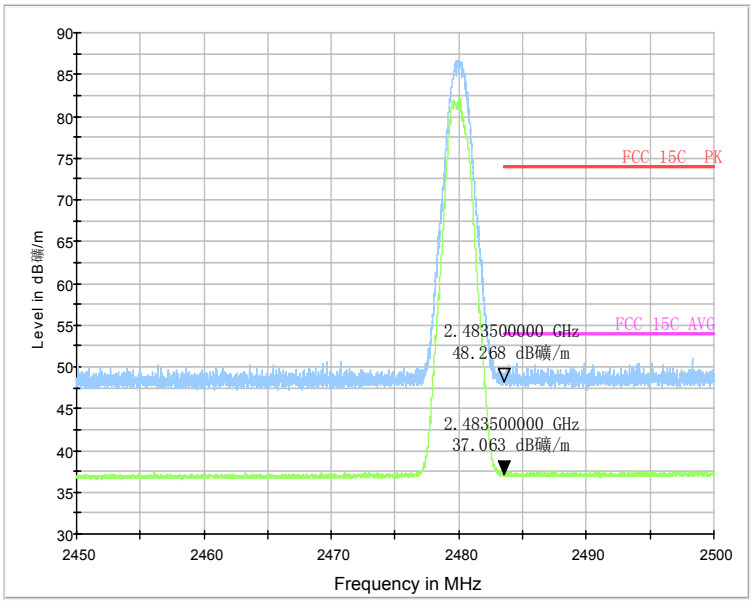


Fig.92. Radiated emission (Power): 8DPSK, high channel

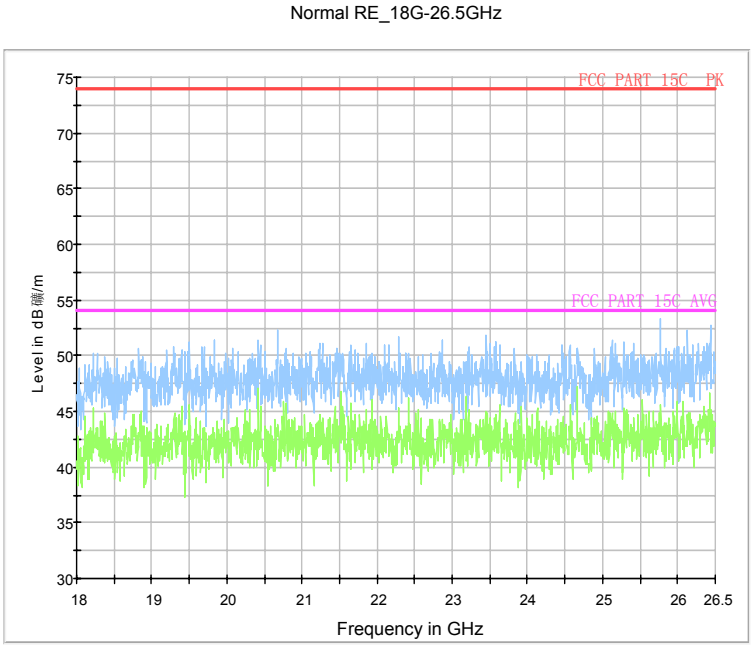


Fig.93. Radiated emission: 8DPSK, 18 GHz - 26 GHz

A.6. Time of Occupancy (Dwell Time)

Measurement Limit:

Standard	Limit (ms)
FCC 47 CFR Part 15.247(a) (1)(iii)	< 400

The measurement is made according to ANSI C63.10

According to Part 15.247(a) (1)(iii),the average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. So the dwell time results below are calculated by the width per pulse (Fig.85 e.g.)×0.4s×79.

Measurement Result:

For GFSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.85	108.51	P
		Fig.86		
	DH3	Fig.87	177.06	P
		Fig.88		
	DH5	Fig.89	162.29	P
		Fig.90		

For π/4 DQPSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.91	107.38	P
		Fig.92		
	DH3	Fig.93	189.14	P
		Fig.94		
	DH5	Fig.95	179.68	P
		Fig.96		

For 8DPSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.97	103.19	P
		Fig.98		
	DH3	Fig.99	185.85	P
		Fig.100		
	DH5	Fig.101	194.53	P
		Fig.102		

Conclusion: PASS

Test graphs as below:

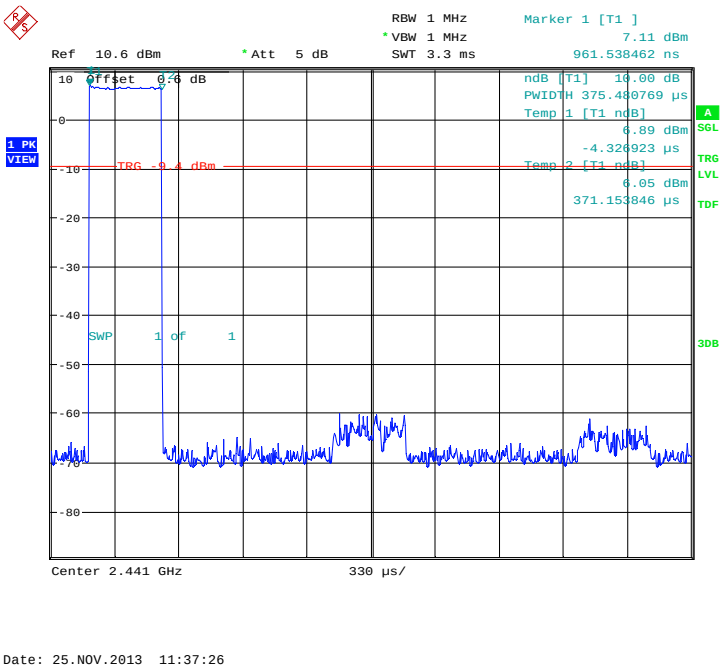


Fig.94. Time of occupancy (Dwell Time): Channel 39, Packet DH1

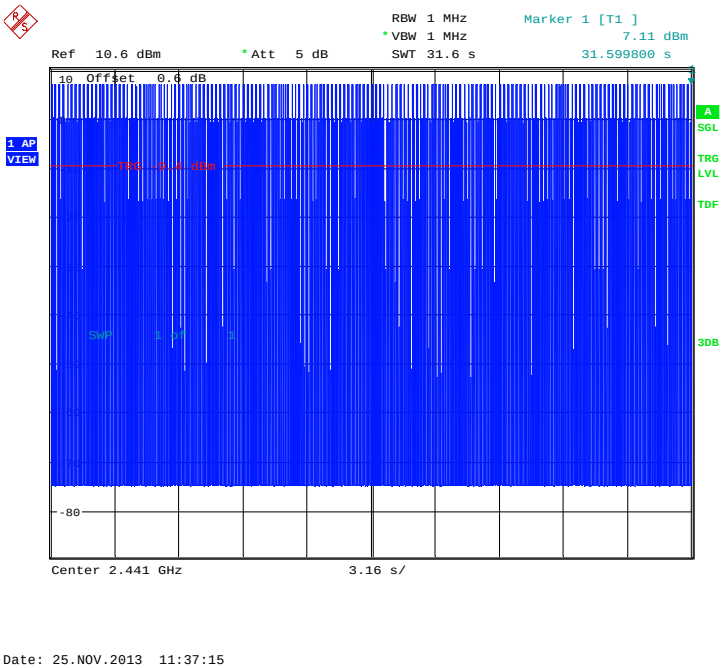


Fig.95. Number of Transmissions Measurement:Channel 39,Packet DH1

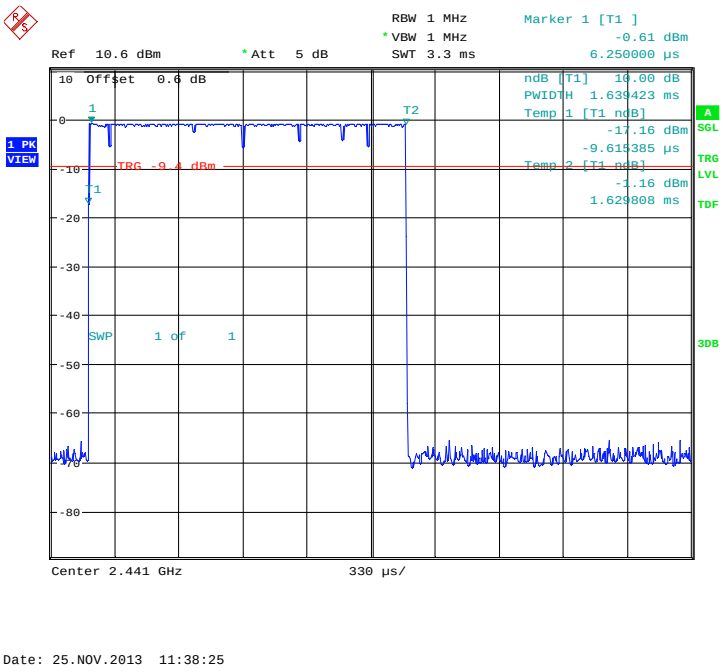


Fig.96. Time of occupancy (Dwell Time): Channel 39, Packet DH3

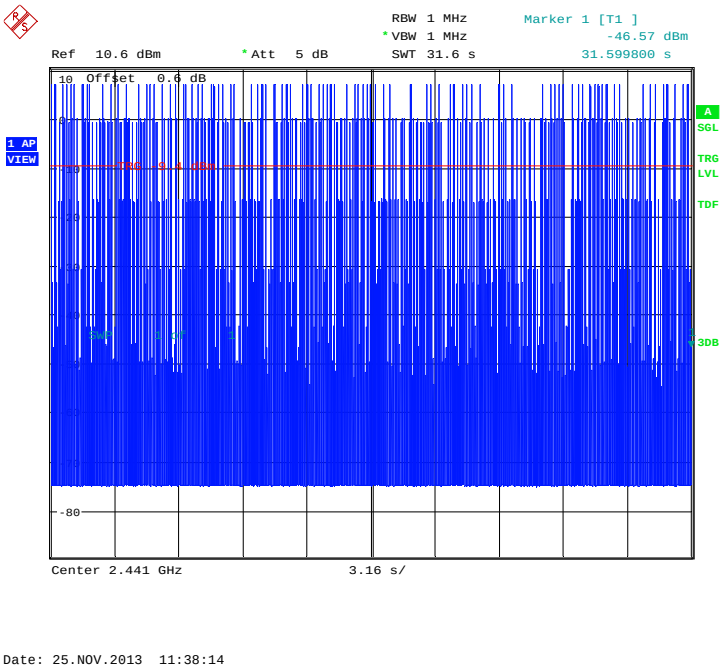


Fig.97. Number of Transmissions Measurement:Channel 39,Packet DH3

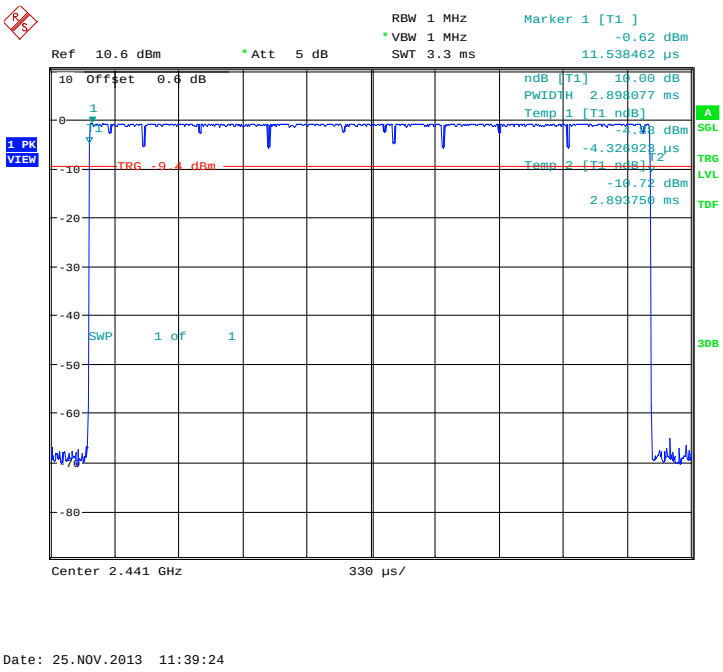


Fig.98. Time of occupancy (Dwell Time): Channel 39, Packet DH5

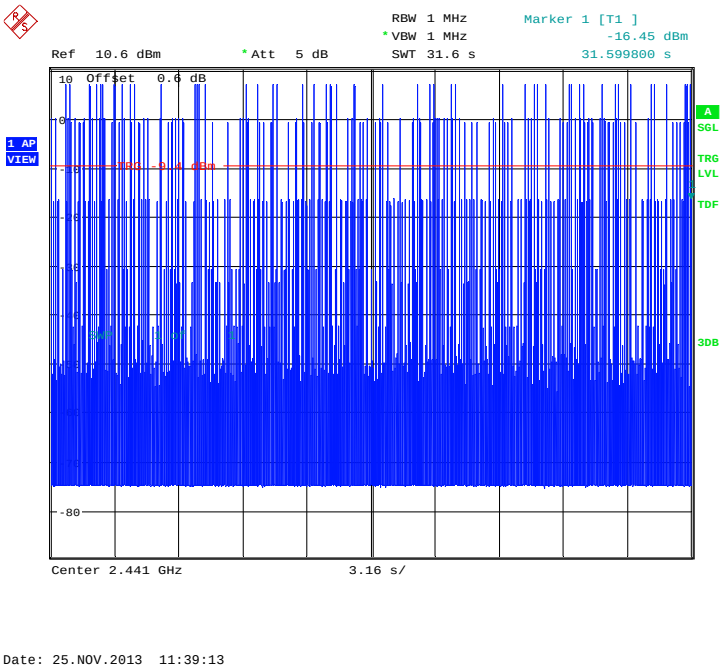


Fig.99. Number of Transmissions Measurement:Channel 39,Packet DH5

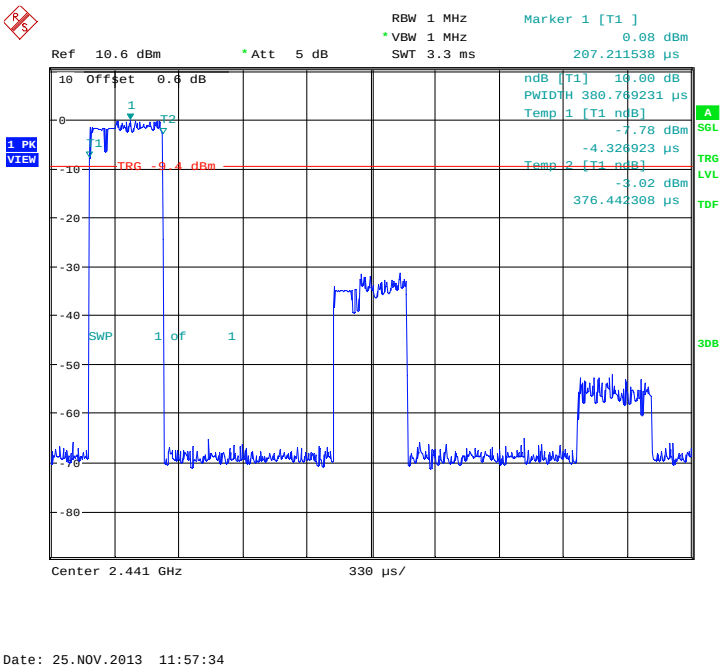


Fig.100. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH1

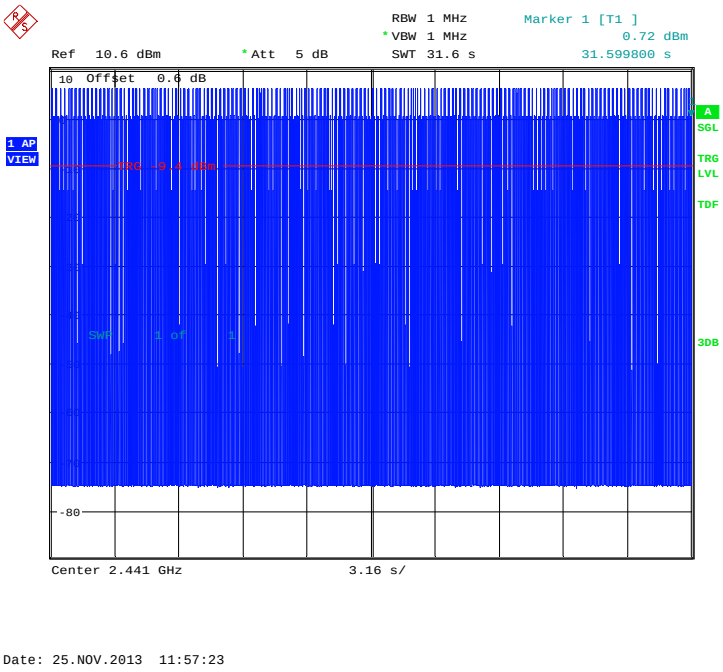


Fig.101. Number of Transmissions Measurement:Channel 39,Packet 2-DH1

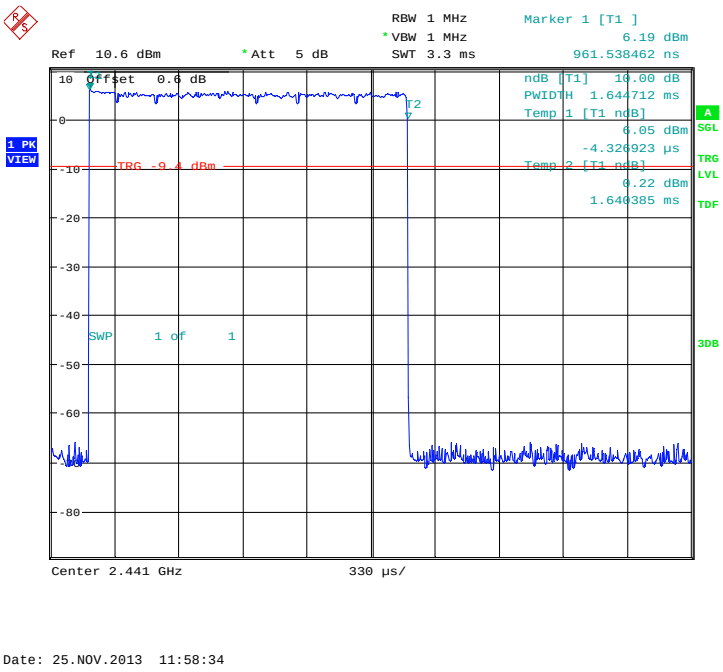


Fig.102. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH3

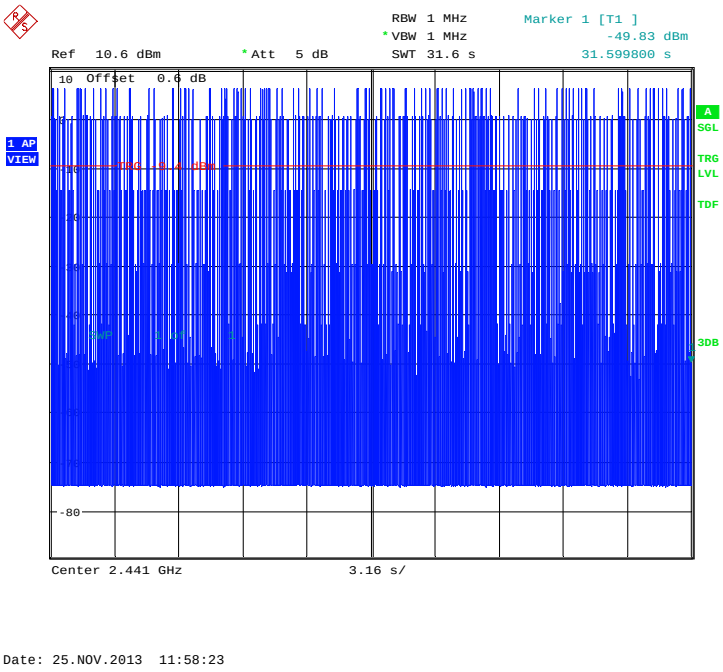


Fig.103. Number of Transmissions Measurement:Channel 39,Packet 2-DH3

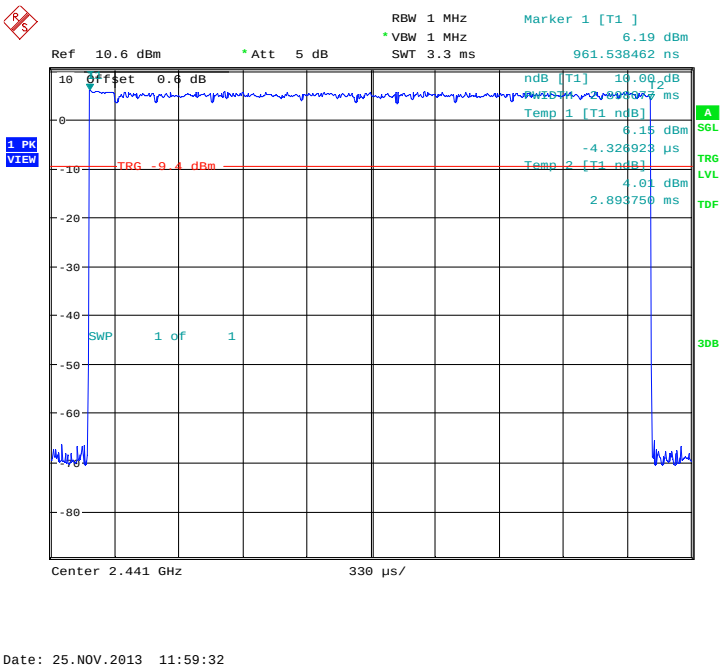


Fig.104. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH5

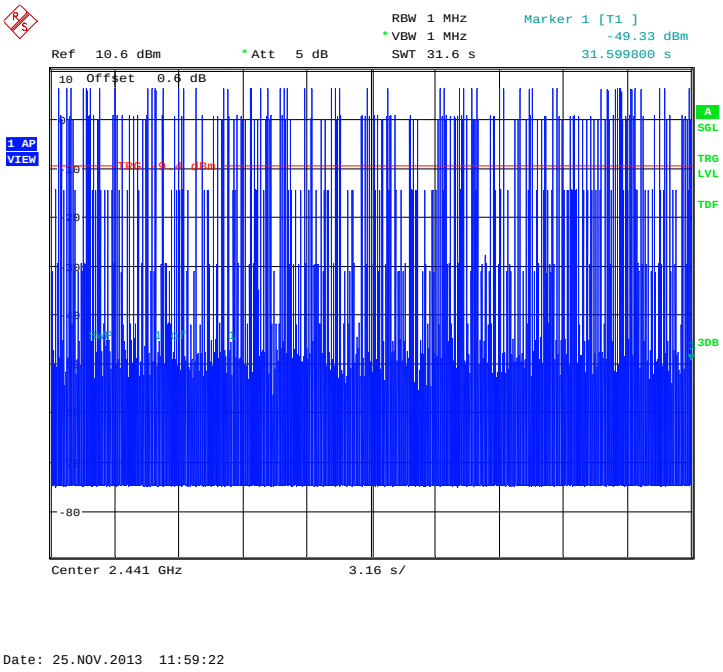


Fig.105. Number of Transmissions Measurement:Channel 39,Packet 2-DH5

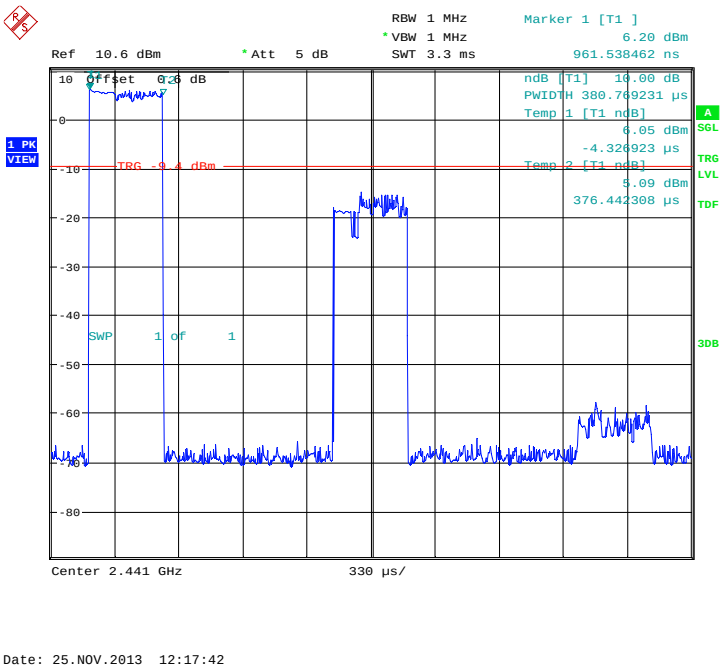


Fig.106. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH1

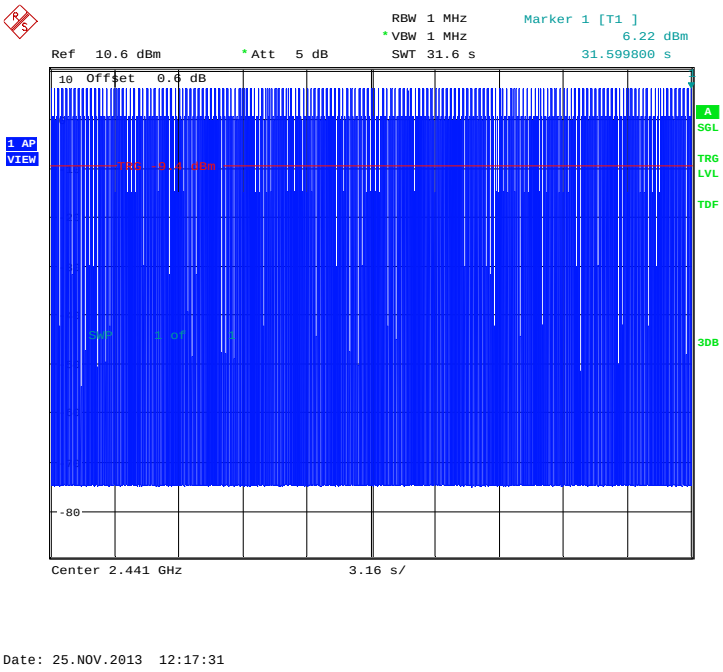


Fig.107. Number of Transmissions Measurement:Channel 39,Packet 3-DH1

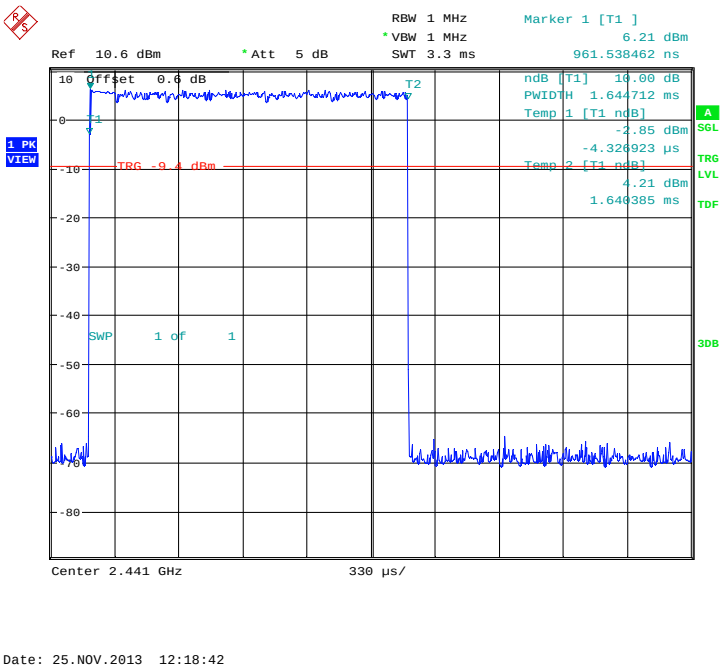


Fig.108. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH3

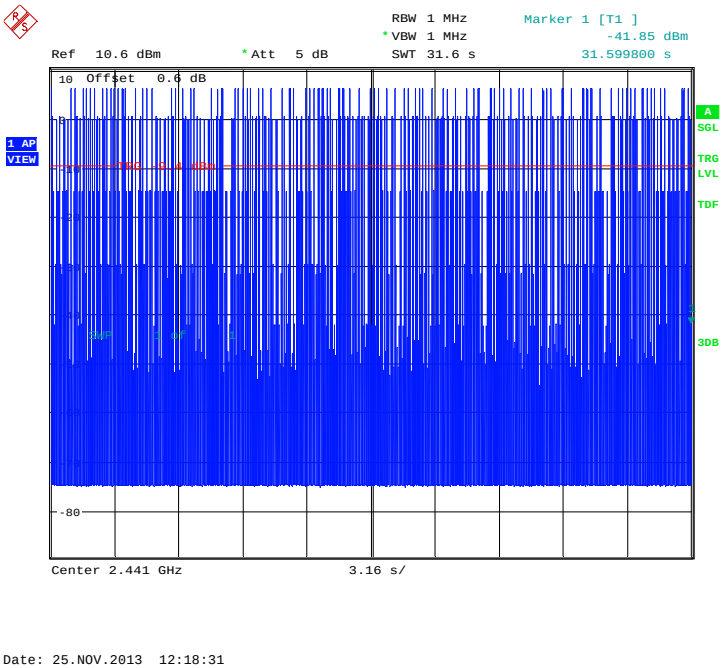


Fig.109. Number of Transmissions Measurement:Channel 39,Packet 3-DH3

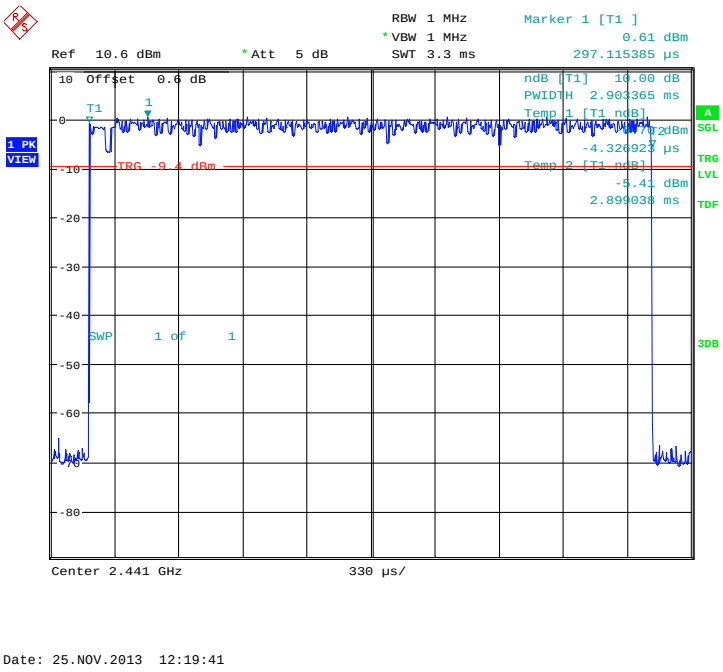


Fig.110. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH5

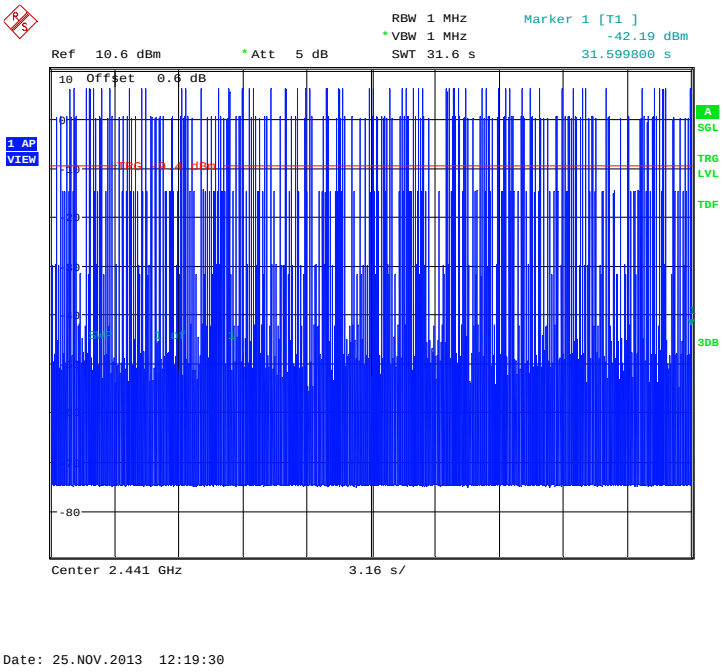


Fig.111. Number of Transmissions Measurement:Channel 39,Packet 3-DH5

A.7. 20dB Bandwidth

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247(a)(1)	NA *

The measurement is made according to ANSI C63.10

* Comment: This test case is not required according to the latest FCC 47 CFR Part 15.247. But the test results are necessary for “carrier frequency separation” test case, in Annex A.8.

Measurement Results:

For GFSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.103	870.19	NA
39	Fig.104	870.19	NA
78	Fig.105	870.19	NA

Forπ/4 DQPSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.106	1274.04	NA
39	Fig.107	1259.62	NA
78	Fig.108	1274.04	NA

For 8DPSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.109	1288.46	NA
39	Fig.110	1211.54	NA
78	Fig.111	1269.23	NA

Conclusion: NA

Test graphs as below:

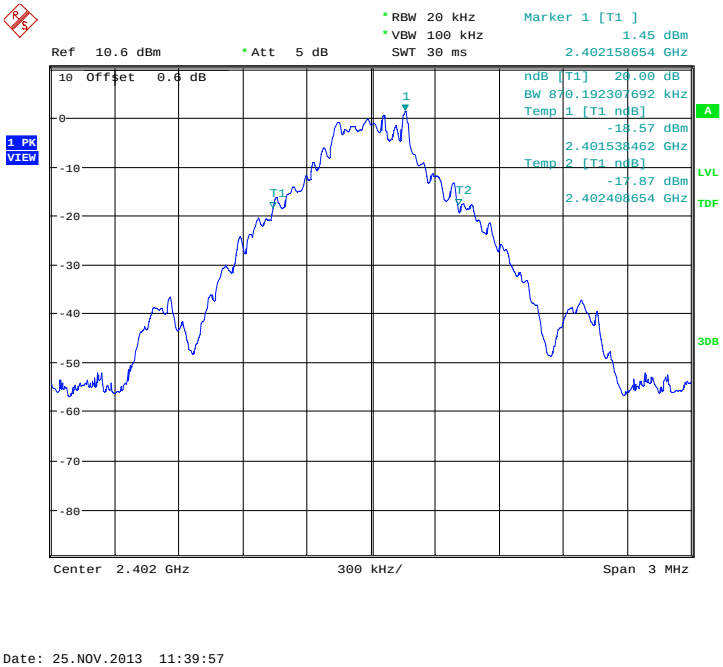


Fig.112. 20dB Bandwidth: GFSK, Channel 0

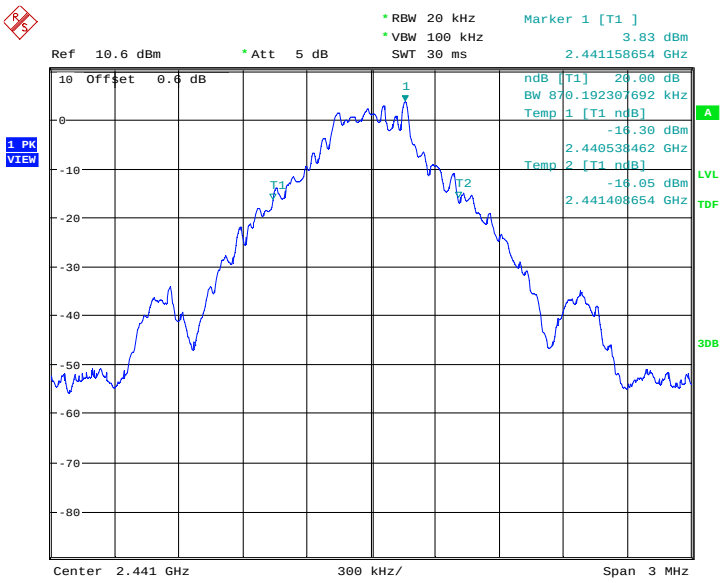


Fig.113. 20dB Bandwidth: GFSK, Channel 39

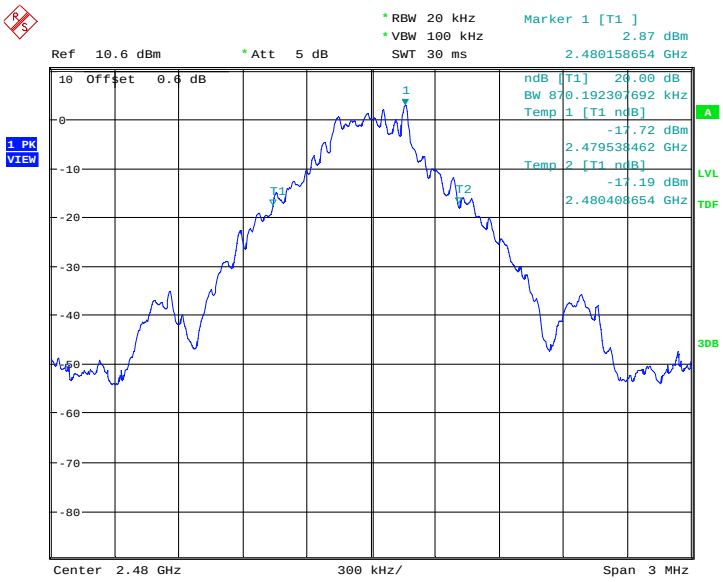


Fig.114. 20dB Bandwidth: GFSK, Channel 78

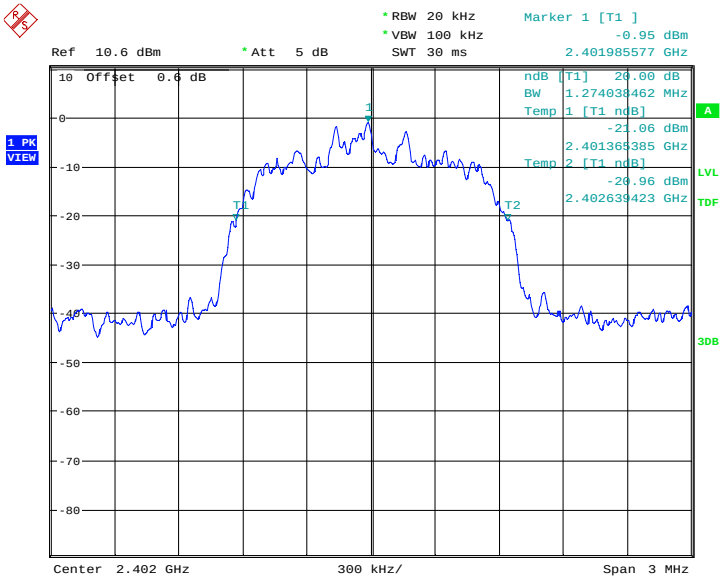


Fig.115. 20dB Bandwidth: π/4 DQPSK, Channel 0

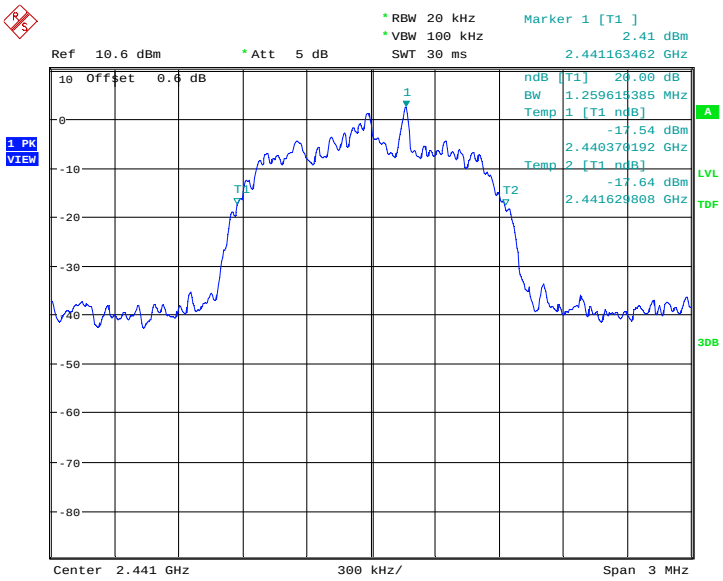
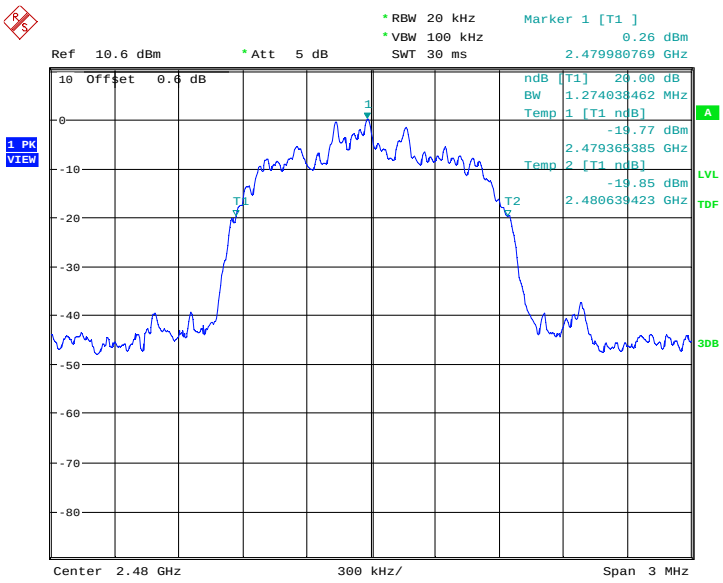
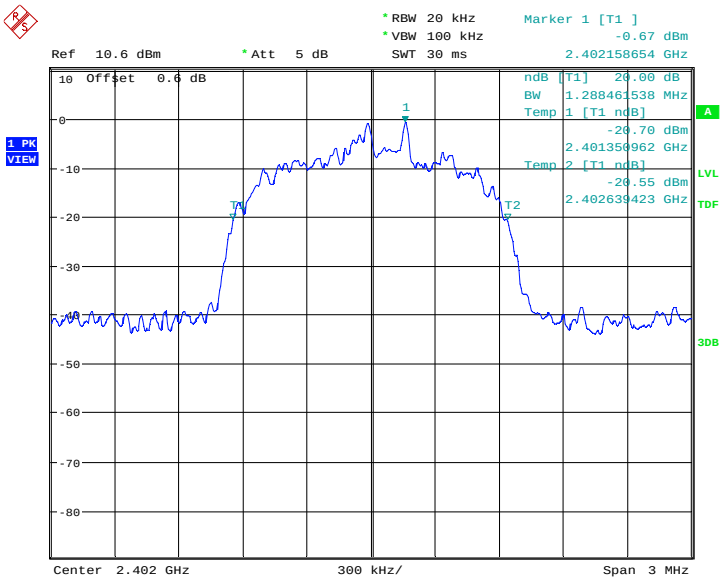


Fig.116. 20dB Bandwidth: π/4 DQPSK, Channel 39



Date: 25.NOV.2013 12:01:08

Fig.117. 20dB Bandwidth: π/4 DQPSK, Channel 78



Date: 25.NOV.2013 12:20:14

Fig.118. 20dB Bandwidth: 8DPSK, Channel 0

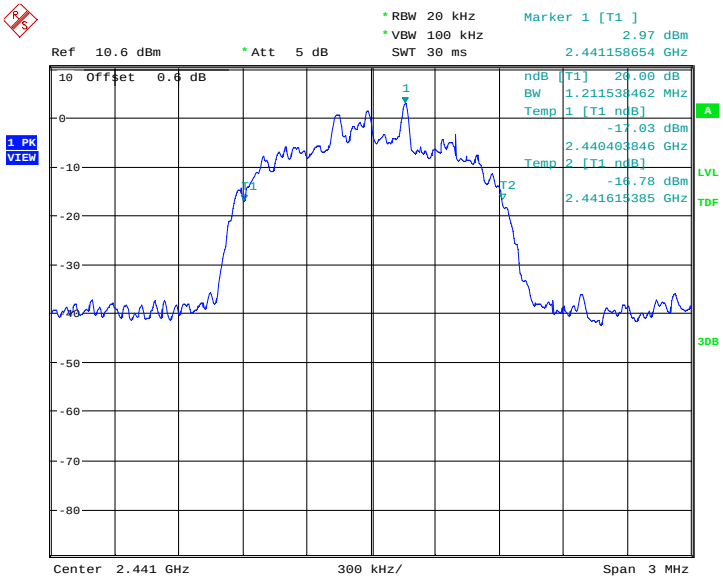


Fig.119. 20dB Bandwidth: 8DPSK, Channel 39

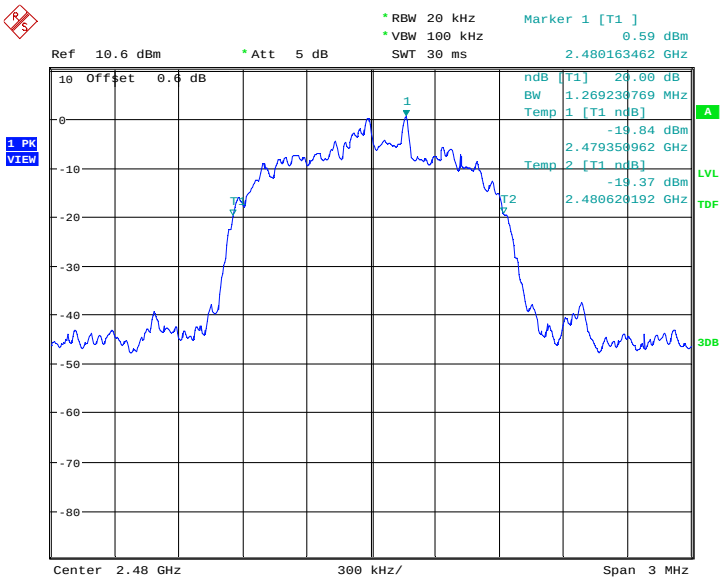


Fig.120. 20dB Bandwidth: 8DPSK, Channel 78

A.8. Carrier Frequency Separation

Measurement Limit:

Standard	Limit(kHz)
FCC 47 CFR Part 15.247(a)(1)	over 25 kHz or (2/3) * 20dB bandwidth

The measurement is made according to ANSI C63.10

* Comment: This limit should be over 25 kHz or (2/3) * 20dB bandwidth, whichever is greater.

Measurement Result:

For GFSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.112	1134.62	P

For π/4 DQPSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.113	971.15	P

For 8DPSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.114	1134.62	P

Conclusion: PASS

Test graphs as below:

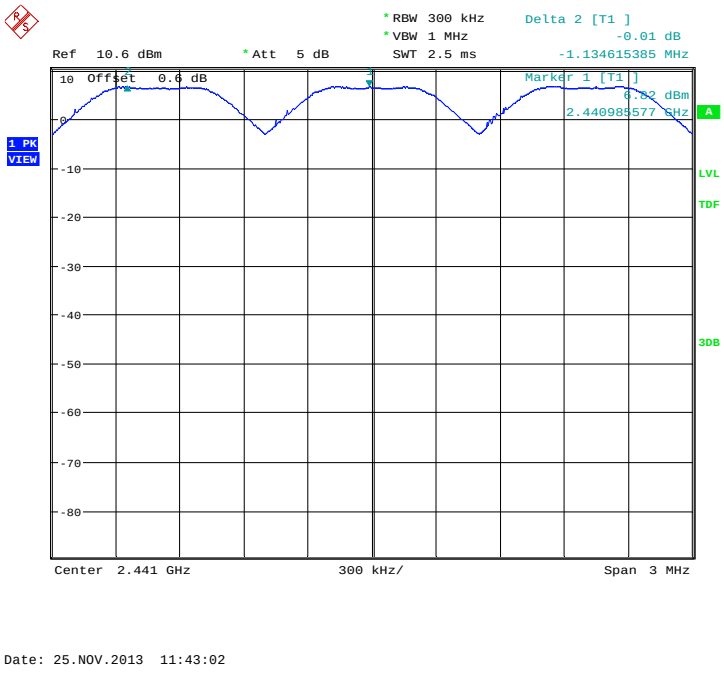


Fig.121. Carrier frequency separation measurement: GFSK, Channel 39

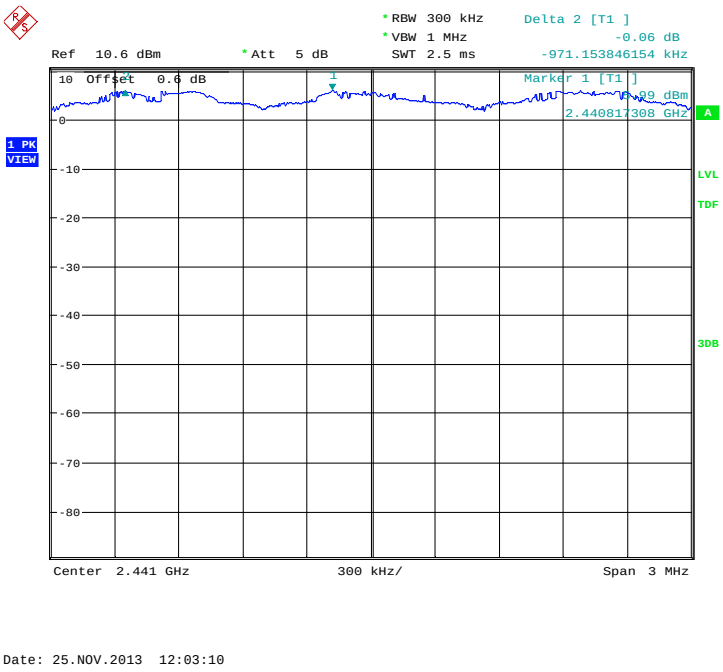


Fig.122. Carrier frequency separation measurement: π/4 DQPSK, Channel 39

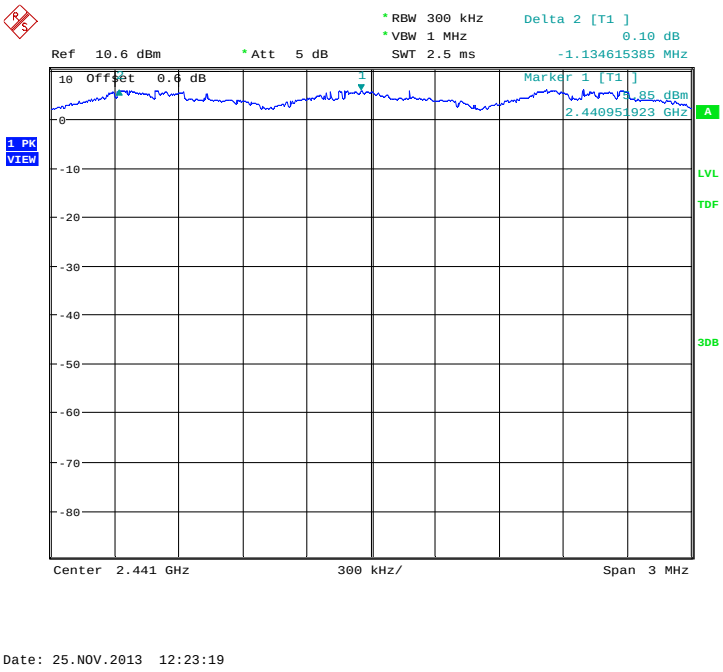


Fig.123. Carrier frequency separation measurement: 8DPSK, Channel 39

A.9. Number of Hopping Channels

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247(a) (1)(iii)	At least 15 non-overlapping channels

The measurement is made according to ANSI C63.10

Measurement Result:

For GFSK

Channel	Number of hopping channels		Conclusion
0~39	Fig.115	79	P
40~78	Fig.116		

Forπ/4 DQPSK

Channel	Number of hopping channels		Conclusion
0~39	Fig.117	79	P
40~78	Fig.118		

For 8DPSK

Channel	Number of hopping channels		Conclusion
0~39	Fig.119	79	P
40~78	Fig.120		

Conclusion: PASS

Test graphs as below:

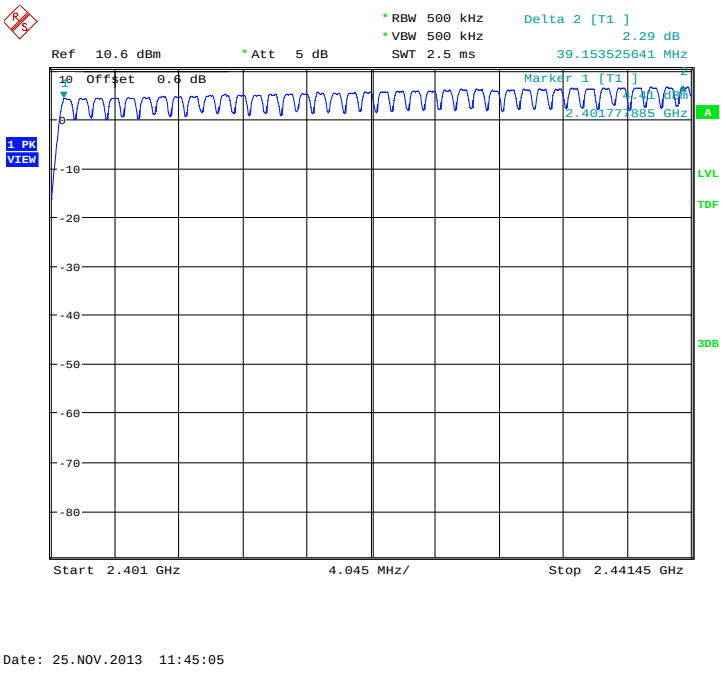


Fig.124. Number of hopping frequencies: GFSK, Channel 0 - 39

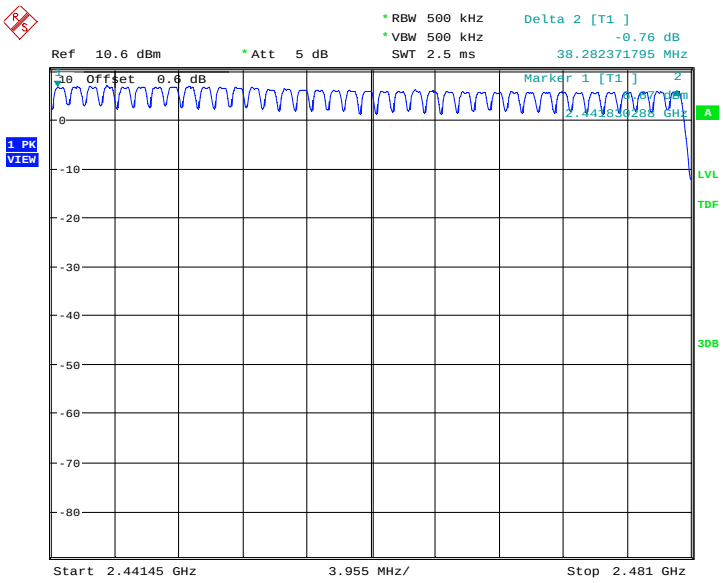


Fig.125. Number of hopping frequencies: GFSK, Channel 40 - 78

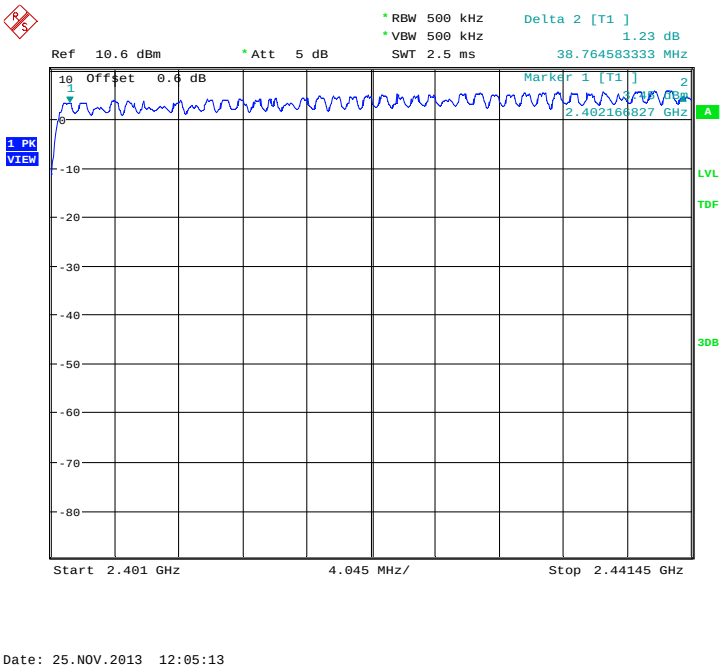


Fig.126. Number of hopping frequencies: π/4 DQPSK, Channel 0 - 39

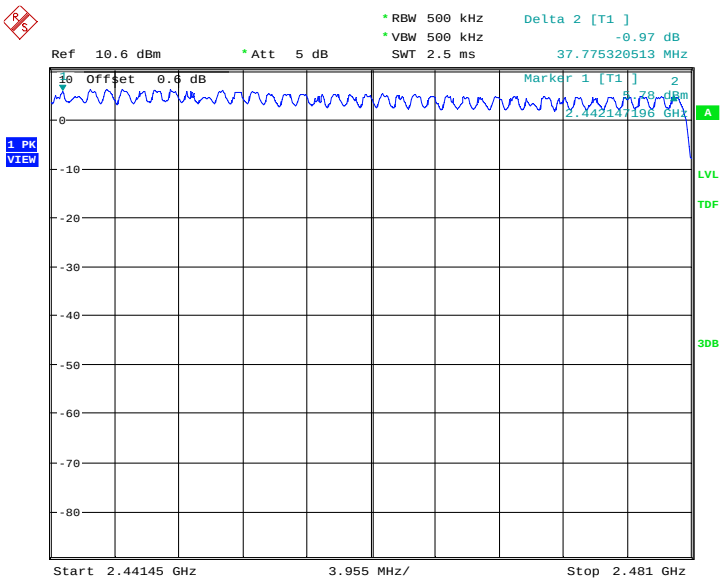


Fig.127. Number of hopping frequencies: π/4 DQPSK, Channel 40 - 78

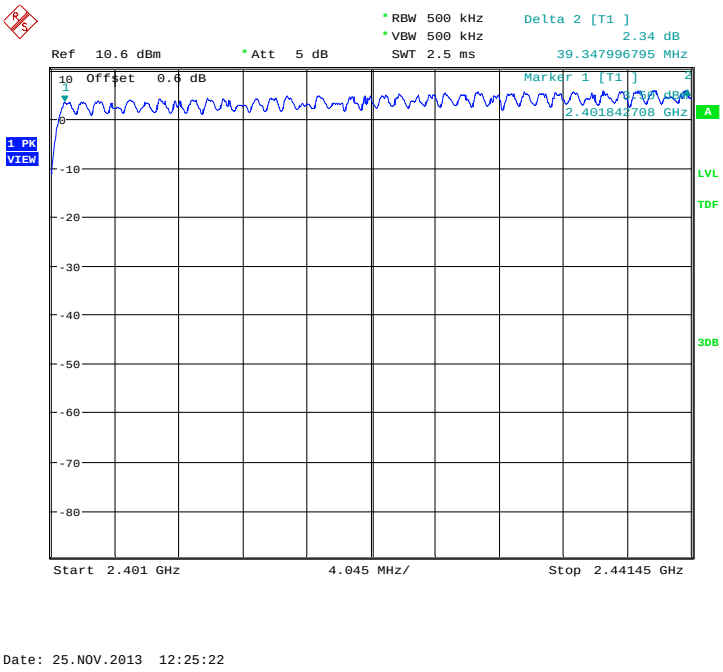


Fig.128. Number of hopping frequencies: 8DPSK, Channel 0 - 39

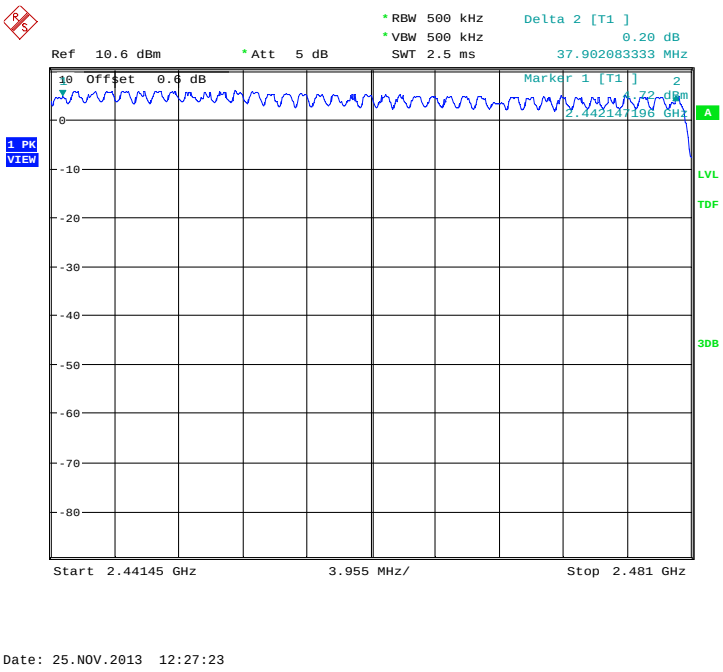


Fig.129. Number of hopping frequencies: 8DPSK, Channel 40 - 78

A.10. AC Powerline Conducted Emission

Test Condition

Voltage（V）	Frequency（Hz）
120	60

Measurement Result and limit:

Bluetooth (Quasi-peak Limit)

Frequency range (MHz)	Quasi-peak Limit (dBμV)	Conclusion
0.15 to 0.5	66 to 56	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.		

Bluetooth (Average Limit)

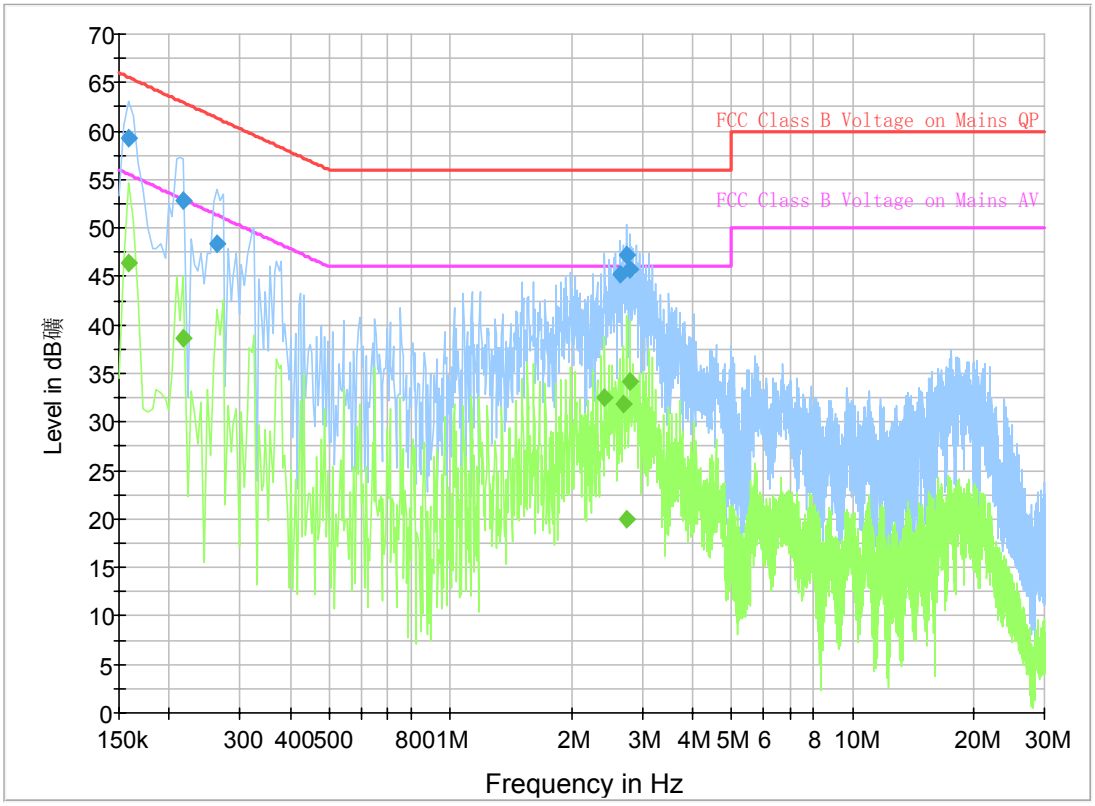
Frequency range (MHz)	Average Limit (dBμV)	Conclusion
0.15 to 0.5	56 to 46	P
0.5 to 5	46	
5 to 30	50	
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.		

The measurement is made according to ANSI C63.10

Conclusion: PASS

Test graphs as below:

Traffic:



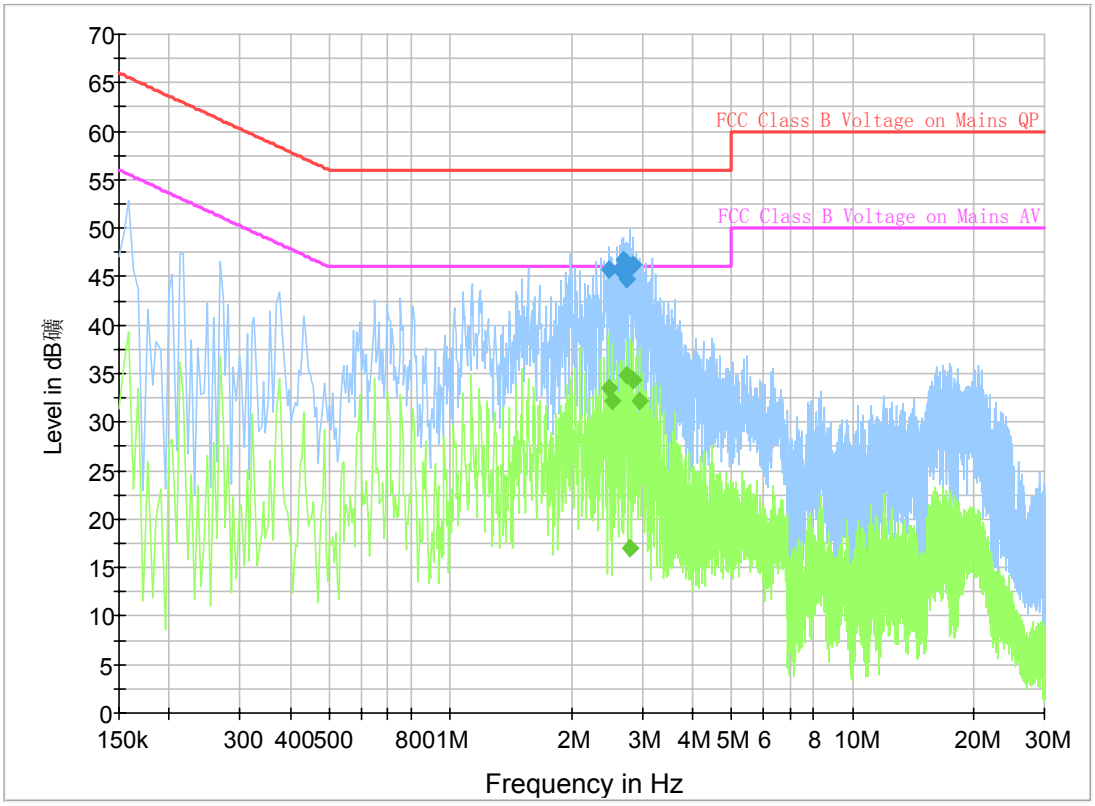
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.159000	59.2	GND	L1	9.8	6.3	65.5
0.217500	52.8	GND	L1	9.8	10.1	62.9
0.262500	48.3	GND	L1	9.8	13.1	61.4
2.638500	45.3	GND	L1	9.7	10.7	56.0
2.742000	47.2	GND	L1	9.7	8.8	56.0
2.800500	45.7	GND	L1	9.7	10.3	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.159000	46.3	GND	L1	9.8	9.2	55.5
0.217500	38.7	GND	L1	9.8	14.3	52.9
2.422500	32.6	GND	L1	9.7	13.4	46.0
2.683500	31.9	GND	L1	9.7	14.1	46.0
2.742000	19.9	GND	L1	9.7	26.1	46.0
2.800500	34.1	GND	L1	9.7	11.9	46.0

IDLE：



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
2.476500	45.8	GND	L1	9.7	10.2	56.0
2.638500	45.7	GND	L1	9.7	10.3	56.0
2.692500	46.6	GND	L1	9.7	9.4	56.0
2.751000	44.7	GND	L1	9.7	11.3	56.0
2.796000	46.0	GND	L1	9.7	10.0	56.0
2.854500	46.3	GND	L1	9.7	9.7	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
2.476500	33.6	GND	L1	9.7	12.4	46.0
2.535000	32.2	GND	L1	9.7	13.8	46.0
2.746500	34.8	GND	L1	9.7	11.2	46.0
2.796000	17.0	GND	L1	9.7	29.0	46.0
2.854500	34.3	GND	L1	9.7	11.7	46.0
2.958000	32.2	GND	L1	9.7	13.8	46.0

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