FCC PART 15C
TEST REPORT
No. I14Z47312-SRD01

for

TCT Mobile Limited

HSUPA/HSDPA/UMTS triband/GSM quadband mobile phone

Model Name: 4037A

FCC ID: RAD510

with

Hardware Version: PIO

Software Version: v9H2N

Issued Date: 2014-07-18

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
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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:	00861062304633-2504

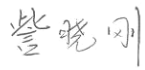
1.2. Testing Environment

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

1.3. Project data

Project Leader:	Zi Xiaogang
Testing Start Date:	2014-05-14
Testing End Date:	2014-05-22

1.4. Signature

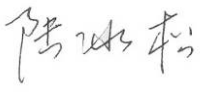


Zi Xiaogang

(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
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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 triband/GSM quadband mobile phone
Model Name	4037A
FCC ID	RAD510
Frequency Band	ISM 2400MHz~2483.5MHz
Type of Modulation	GFSK/π/4 DQPSK/8DPSK
Number of Channels	79
Power Supply	3.9V DC by Battery

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version
UT13a	/	PIO	v9H2N
UT40a	/	PIO	v9H2N

*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	/	Inbuilt
AE2	Charger	/	

AE1

Model	CAB60B0004C1
Manufacturer	BYD
Capacitance	1400 mAh

AE2

Model	CBA3007AG3C1
Manufacturer	BYD

*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 triband/GSM quadband 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.	10-1-13
ANSI C63.10	American National Standard for Testing Unlicensed Wireless Devices	2009
FCC Part 2	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations	10–1–13

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 ANSI C63.10.

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

This model is a variant product which market name is 4035A; all the test result has been derived from test report of 4035A.

7. Test Equipments Utilized

Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Due date
1	Vector Signal Analyzer	FSQ26	200136	Rohde & Schwarz	2015-01-06
2	Bluetooth Tester	CBT32	100649	Rohde & Schwarz	2015-02-09

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Due date
1	Test Receiver	ESU26	100376	Rohde & Schwarz	2014-11-05
2	EMI Antenna	VULB 9163	9163 175	Schwarzbeck	2014-07-13
3	EMI Antenna	3117	00119021	ETS-Lindgren	2015-04-19
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	2015-04-14
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.

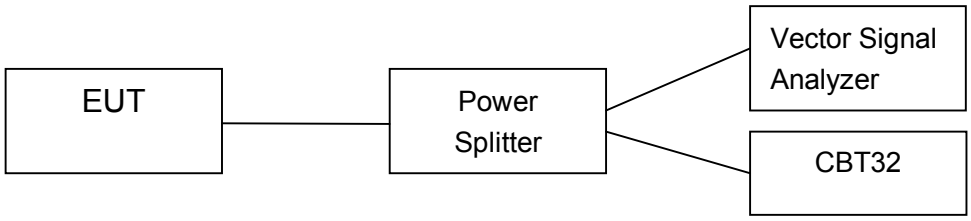
2). Set the EUT to the required work mode (Transmitter, receiver or transmitter & receiver).

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

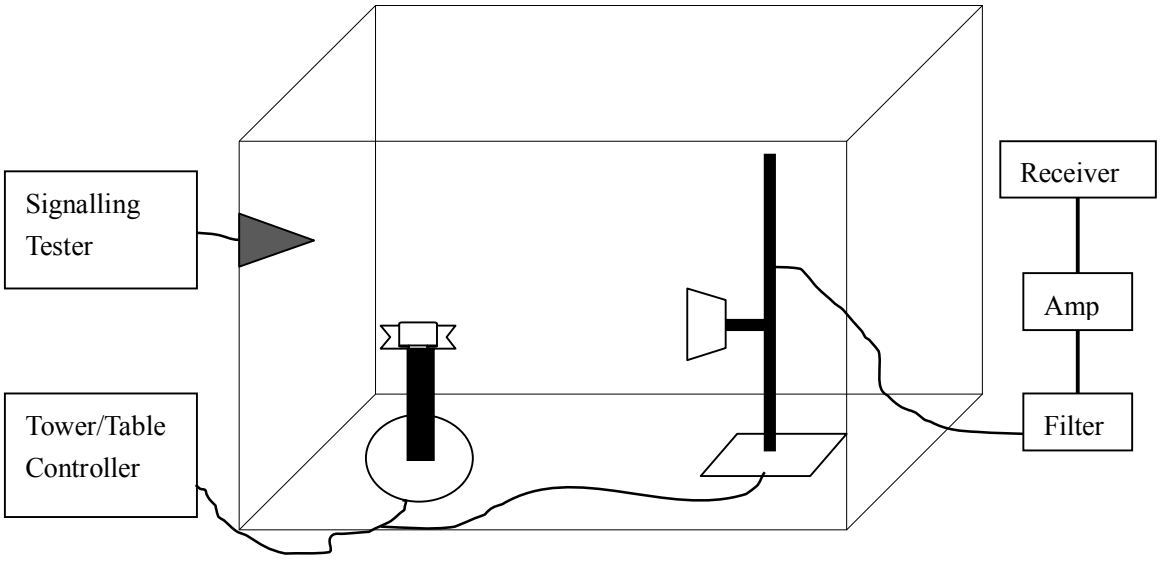
The measurement is made according to ANSI C63.10

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	Detector	Trace Mode
Hopping OFF	3MHz	3MHz	5MHz	2.5ms	Peak	Max Hold

Measurement Results:

For GFSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	6.48	7.09	7.10	P

Forπ/4 DQPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	6.31	6.95	6.94	P

For 8DPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	6.53	7.15	7.18	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.

Test Condition

Hopping Mode	RBW	VBW	Span	Sweeptime	Detector	Trace Mode
Hopping OFF/ON	100KHz	300KHz	10MHz	5ms	Peak	Max Hold

Observe the stored trace and measure the amplitude delta between the peak of the fundamental and the peak of the band-edge emission. This is not an abosolute field strength measurement; it is only a relative measurement to determine the amount by which the emission drops at the band edge relative to the highest fundamental emission level.

Measurement Result:

For GFSK

Channel	Hopping	Band Edge Power (dBc)		Conclusion
0	Hopping OFF	Fig.1	-58.81	P
	Hopping ON	Fig.2	-57.82	P
78	Hopping OFF	Fig.3	-62.52	P
	Hopping ON	Fig.4	-62.44	P

Forπ/4 DQPSK

Channel	Hopping	Band Edge Power (dBc)		Conclusion
0	Hopping OFF	Fig.5	-56.08	P
	Hopping ON	Fig.6	-56.14	P
78	Hopping OFF	Fig.7	-60.06	P
	Hopping ON	Fig.8	-60.18	P

For 8DPSK

Channel	Hopping	Band Edge Power (dBc)		Conclusion
0	Hopping OFF	Fig.9	-55.18	P
	Hopping ON	Fig.10	-54.34	P
78	Hopping OFF	Fig.11	-59.57	P
	Hopping ON	Fig.12	-56.57	P

Conclusion: PASS

Test graphs as below

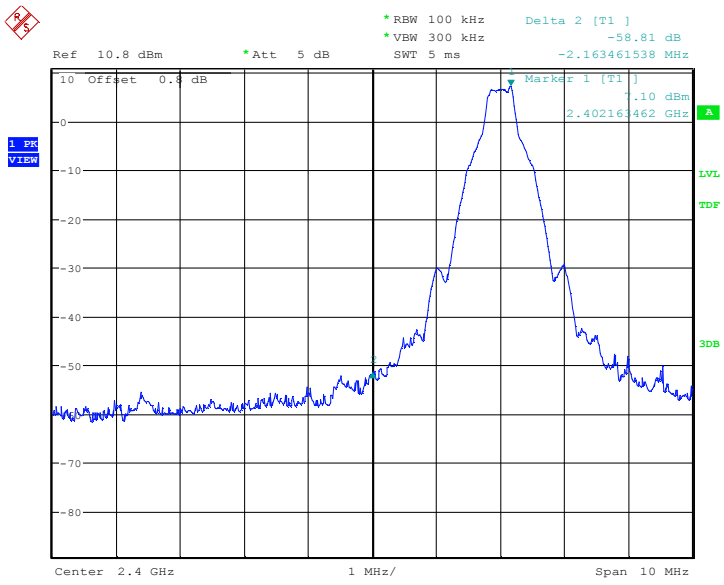


Fig.1. Frequency Band Edges: GFSK, Channel 0, Hopping Off

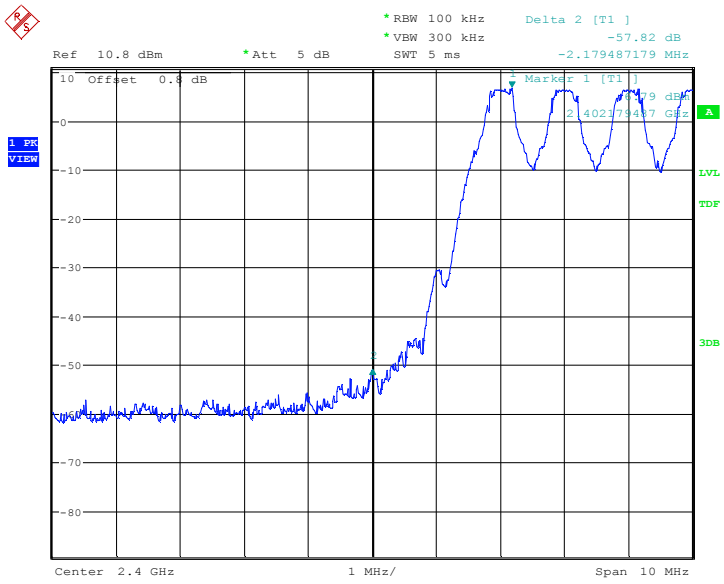


Fig.2. Frequency Band Edges: GFSK, Channel 0, Hopping On

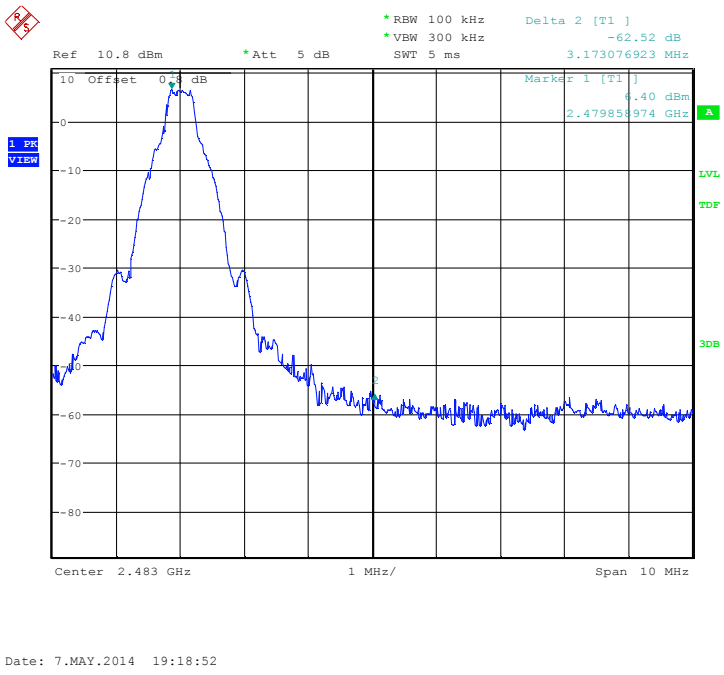


Fig.3. Frequency Band Edges: GFSK, Channel 78, Hopping Off

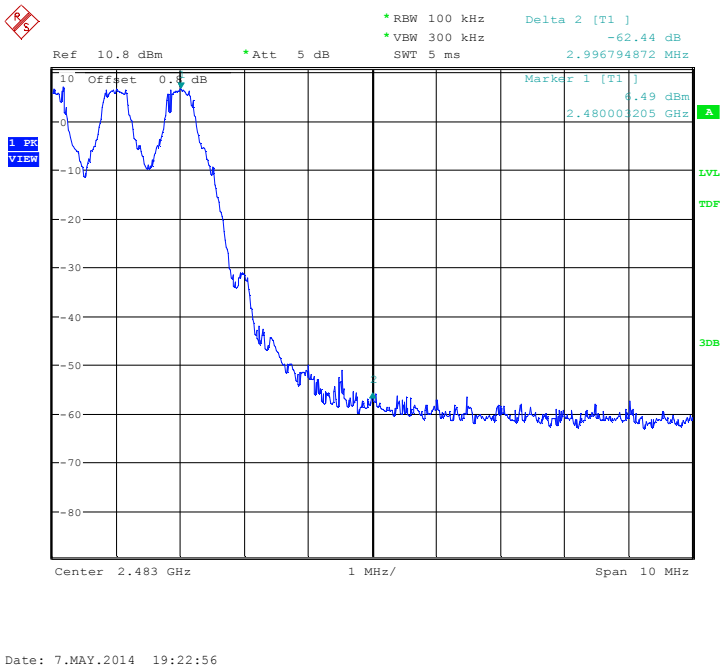


Fig.4. Frequency Band Edges: GFSK, Channel 78, Hopping On

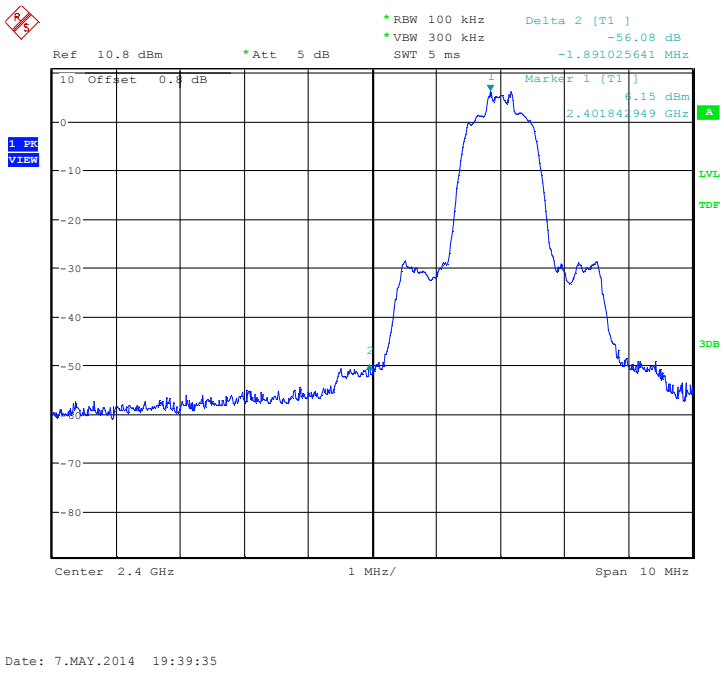


Fig.5. Frequency Band Edges: π/4 DQPSK, Channel 0, Hopping Off

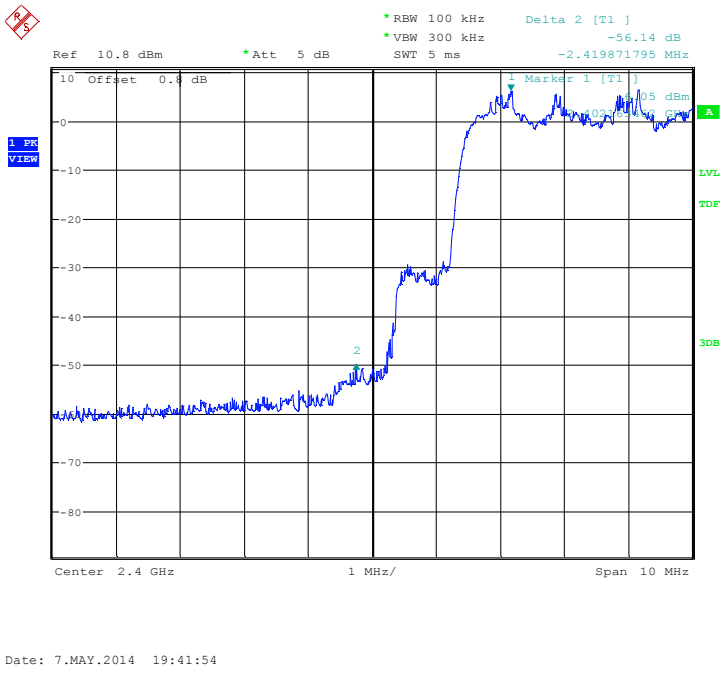


Fig.6. Frequency Band Edges: π/4 DQPSK, Channel 0, Hopping On

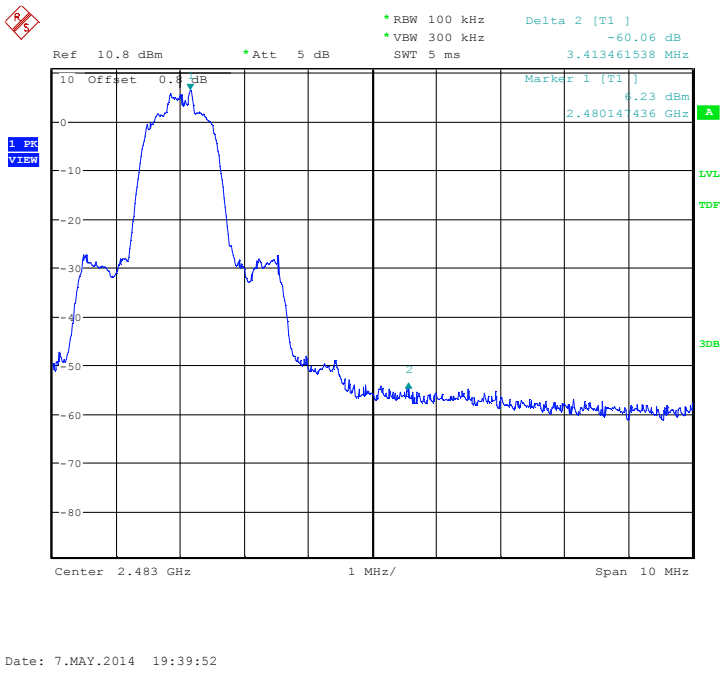


Fig.7. Frequency Band Edges: π/4 DQPSK, Channel 78, Hopping Off

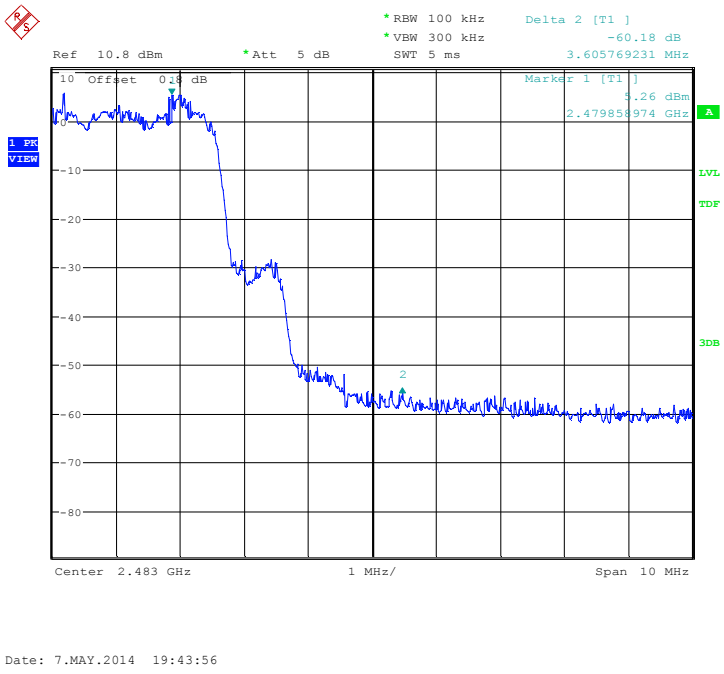


Fig.8. Frequency Band Edges: π/4 DQPSK, Channel 78, Hopping On

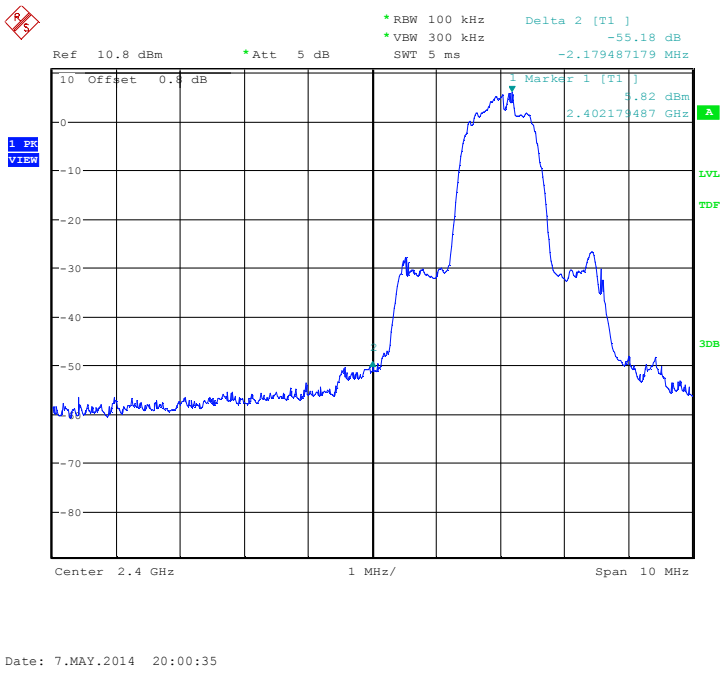


Fig.9. Frequency Band Edges: 8DPSK, Channel 0, Hopping Off

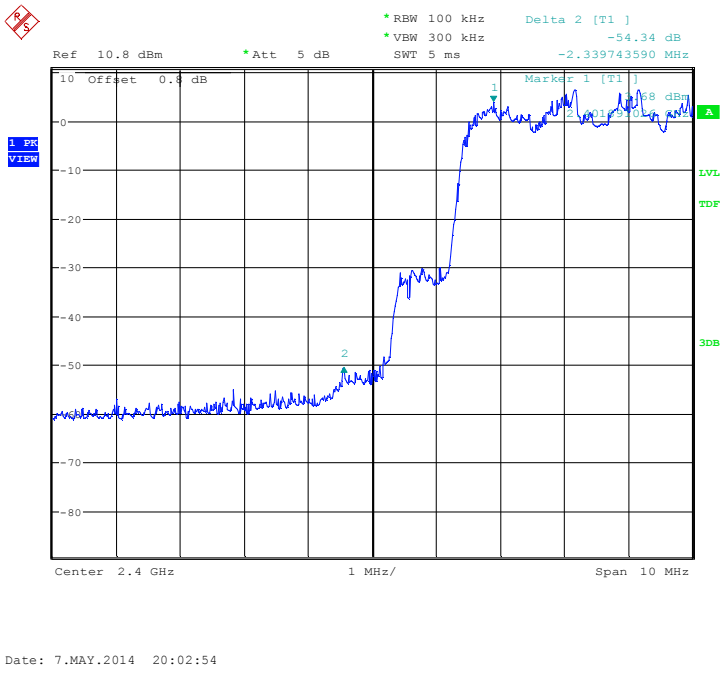


Fig.10. Frequency Band Edges: 8DPSK, Channel 0, Hopping On

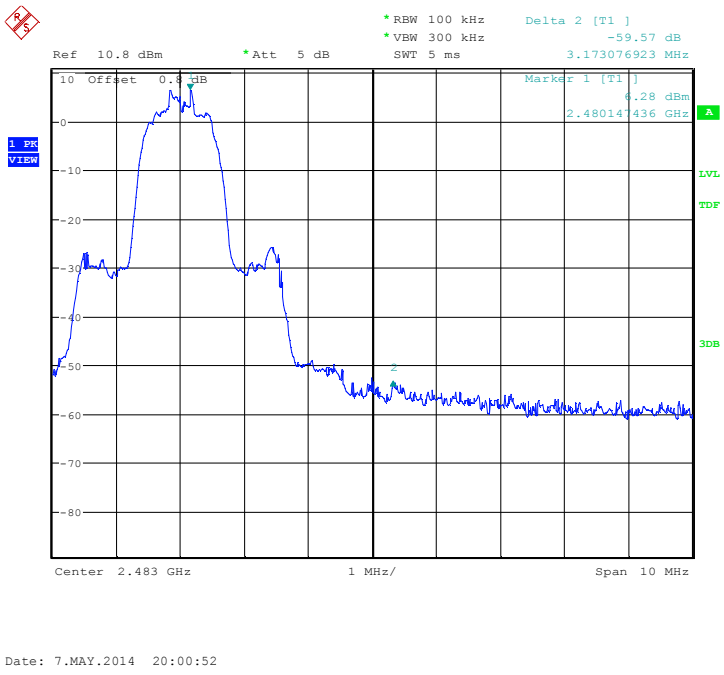


Fig.11. Frequency Band Edges: 8DPSK, Channel 78, Hopping Off

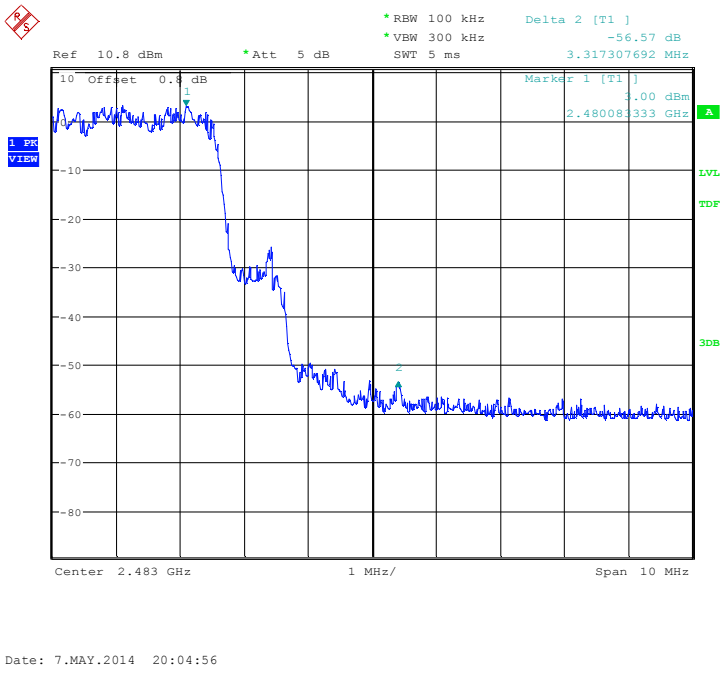


Fig.12. Frequency Band Edges: 8DPSK, Channel 78, Hopping On

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

Test Condition

Hopping Mode	RBW	VBW	Sweeptime	Detector	Trace Mode
Hopping OFF	100KHz	300KHz	Auto	Peak	Max Hold

Measurement Procedure – Reference Level

1. Set the RBW = 100 kHz.

2. Set the VBW ≥ 300 kHz.

3. Set the span to 5-30 % greater than the EBW.

4. Detector = peak.

5. Sweep time = auto couple.

6. Trace mode = max hold.

7. Allow trace to fully stabilize.

8. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW. Next, determine the power in 100 kHz band segments outside of the authorized frequency band using the following measurement:

Measurement Procedure - Unwanted Emissions

1. Set RBW = 100 kHz.

2. Set VBW ≥ 300 kHz.

3. Set span to encompass the spectrum to be examined.

4. Detector = peak.

5. Trace Mode = max hold.

6. Sweep = auto couple.

7. Allow the trace to stabilize (this may take some time, depending on the extent of the span).

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified above.

Measurement 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

Test graphs as below

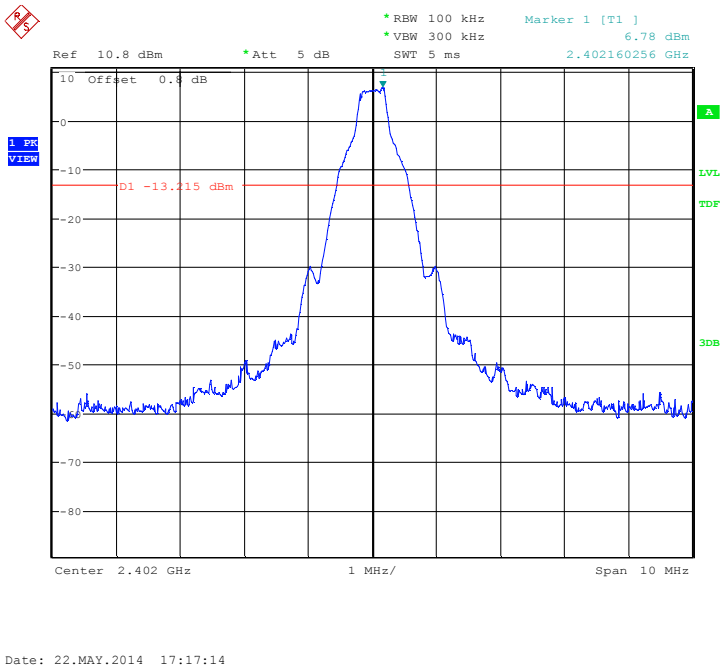


Fig.13. Conducted spurious emission: GFSK, Channel 0,2402MHz

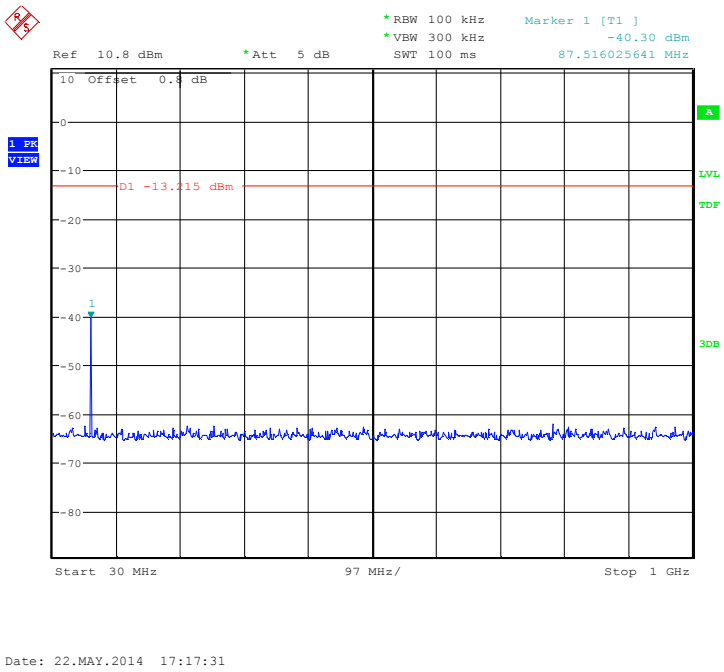


Fig.14. Conducted spurious emission: GFSK, Channel 0, 30MHz - 1GHz

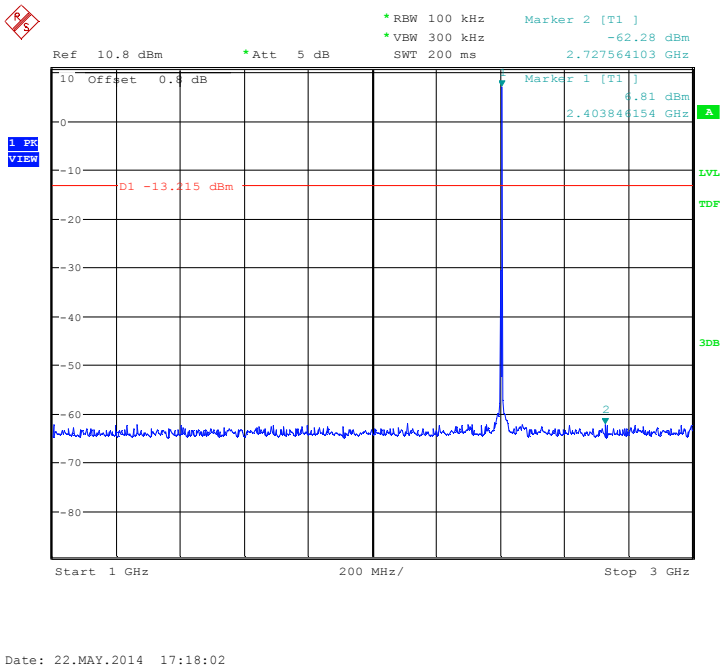


Fig.15. Conducted spurious emission: GFSK, Channel 0, 1GHz - 3GHz

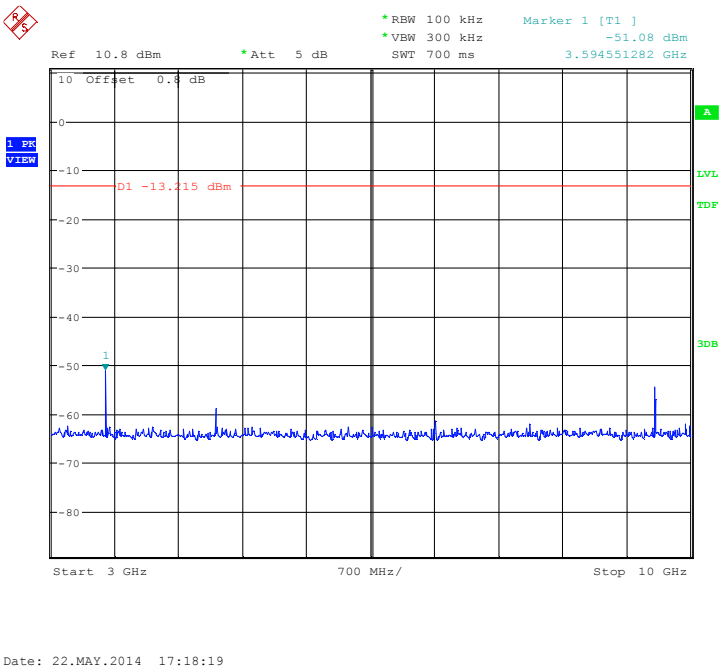


Fig.16. Conducted spurious emission: GFSK, Channel 0, 3GHz - 10GHz

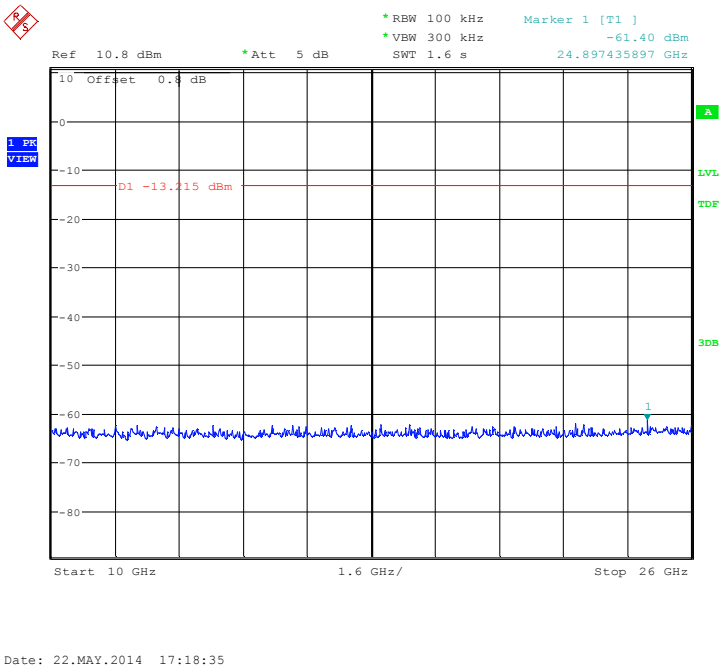


Fig.17. Conducted spurious emission: GFSK, Channel 0,10GHz - 26GHz

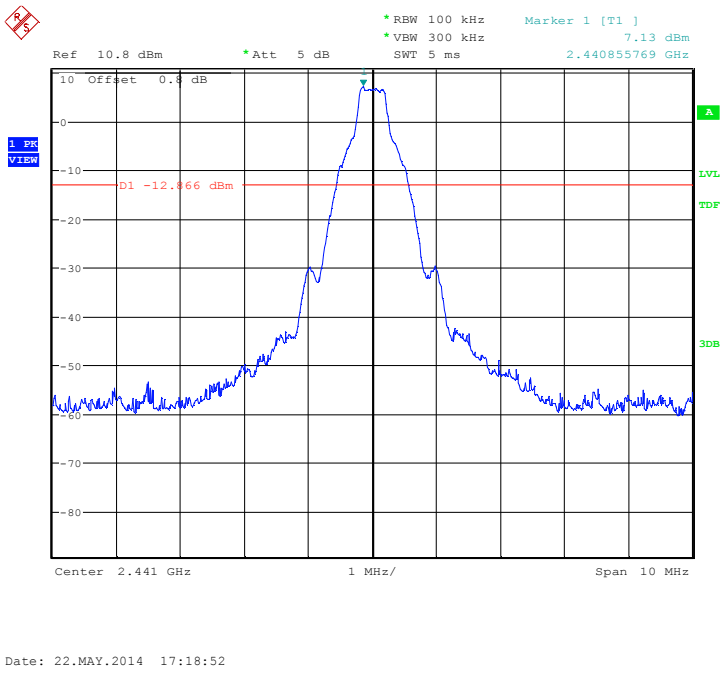


Fig.18. Conducted spurious emission: GFSK, Channel 39, 2441MHz

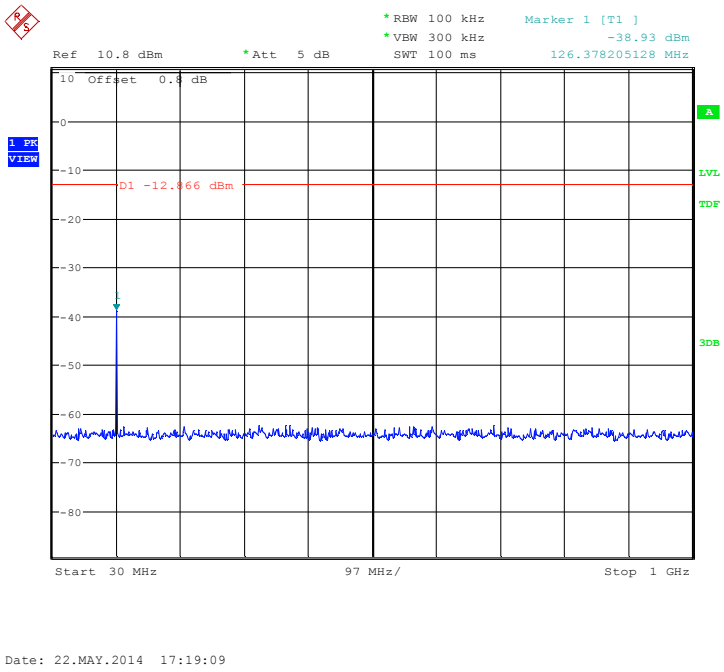


Fig.19. Conducted spurious emission: GFSK, Channel 39, 30MHz - 1GHz

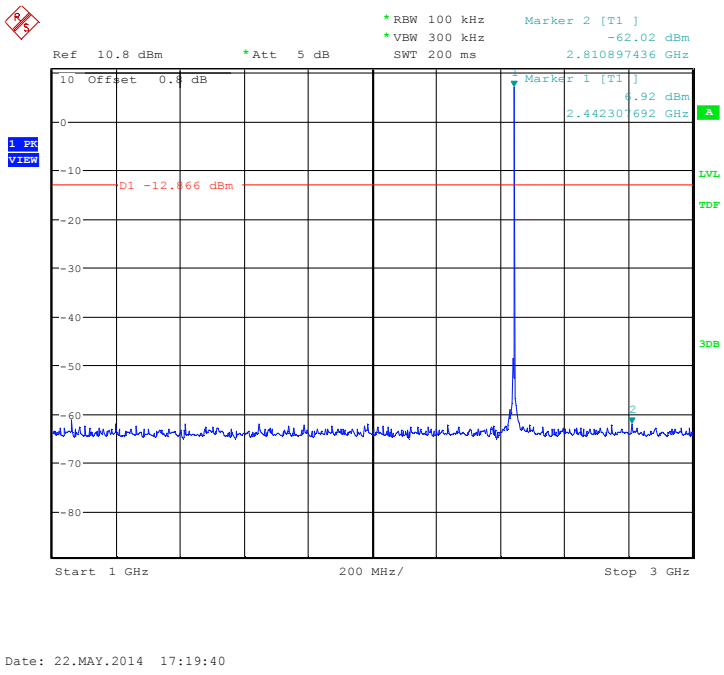


Fig.20. Conducted spurious emission: GFSK, Channel 39, 1GHz – 3GHz

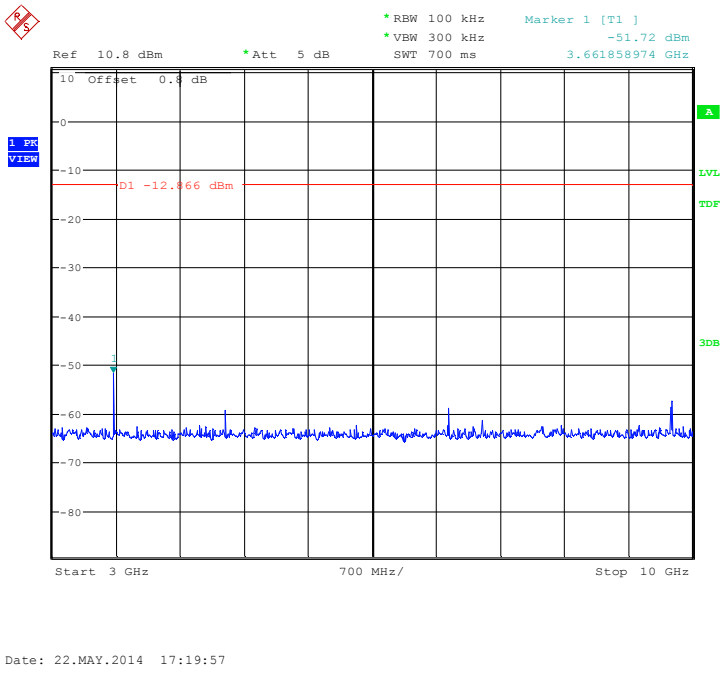


Fig.21. Conducted spurious emission: GFSK, Channel 39, 3GHz – 10GHz

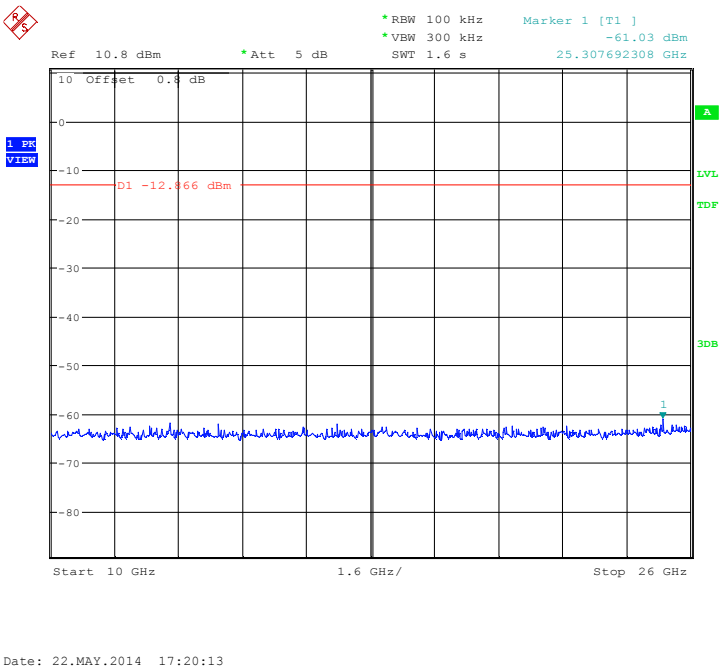


Fig.22. Conducted spurious emission: GFSK, Channel 39, 10GHz – 26GHz

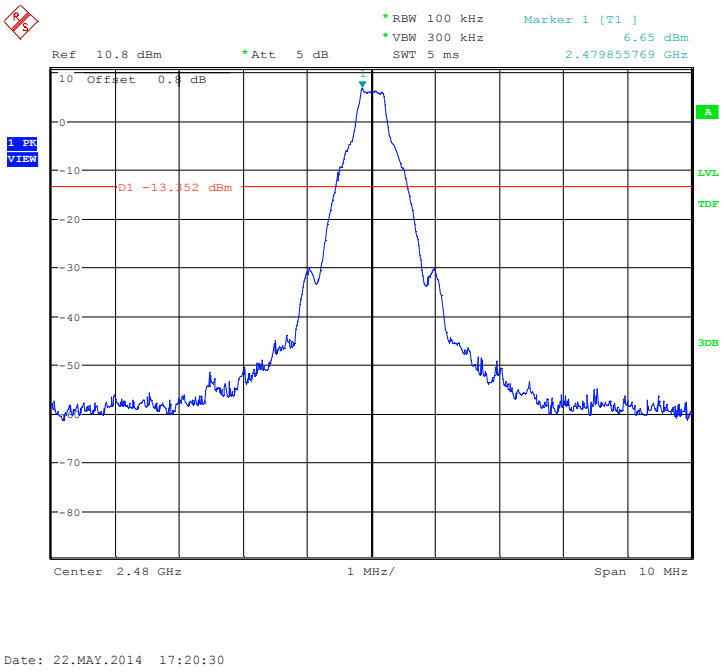


Fig.23. Conducted spurious emission: GFSK, Channel 78, 2480MHz

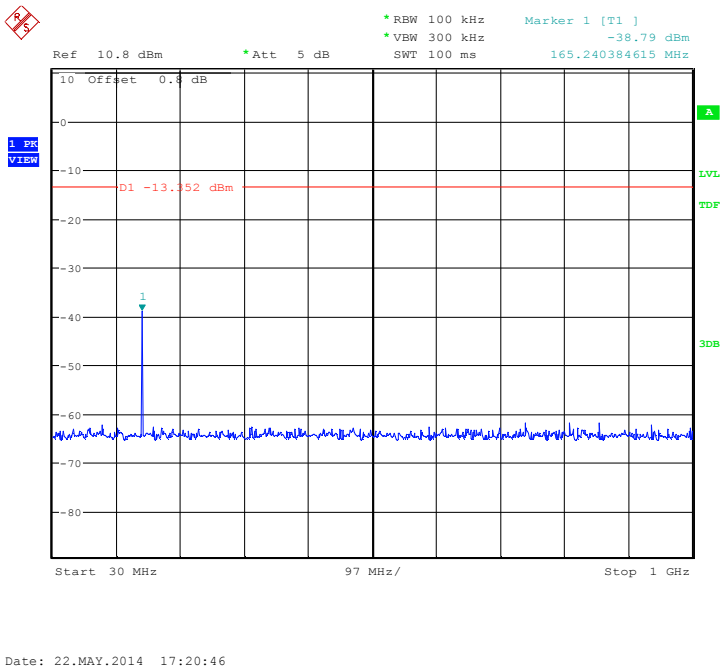


Fig.24. Conducted spurious emission: GFSK, Channel 78, 30MHz - 1GHz

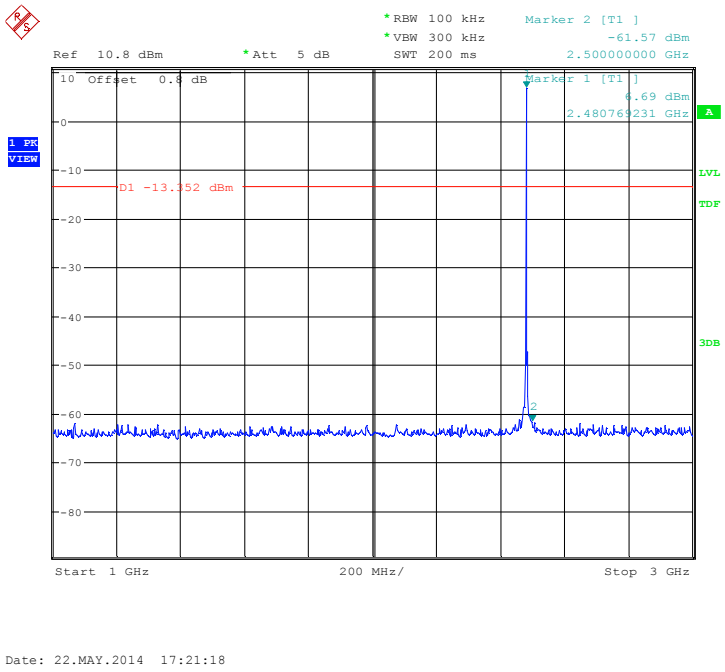


Fig.25. Conducted spurious emission: GFSK, Channel 78, 1GHz - 3GHz

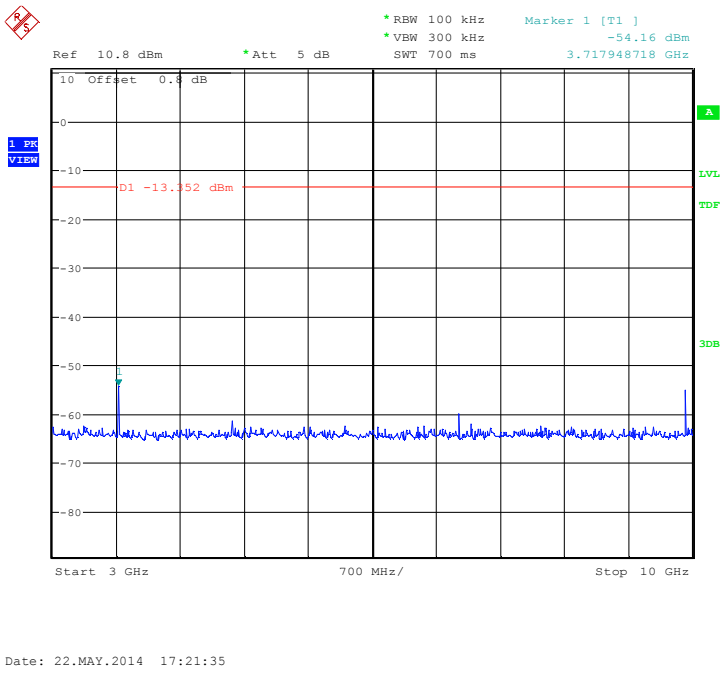


Fig.26. Conducted spurious emission: GFSK, Channel 78, 3GHz - 10GHz

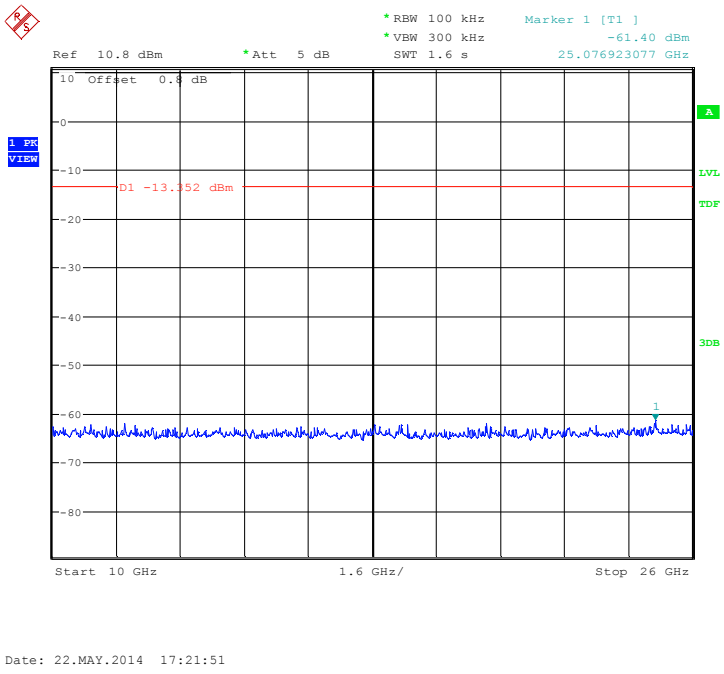


Fig.27. Conducted spurious emission: GFSK, Channel 78, 10GHz - 26GHz

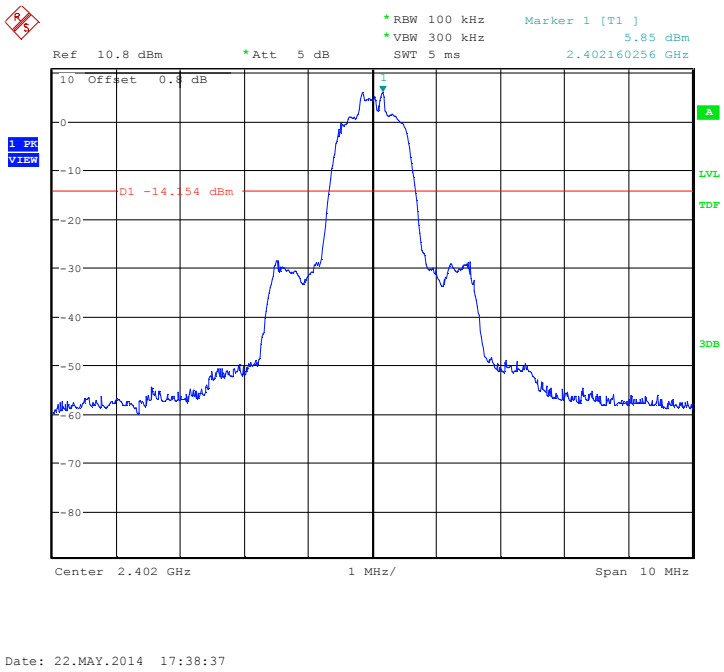


Fig.28. Conducted spurious emission: π/4 DQPSK, Channel 0,2402MHz

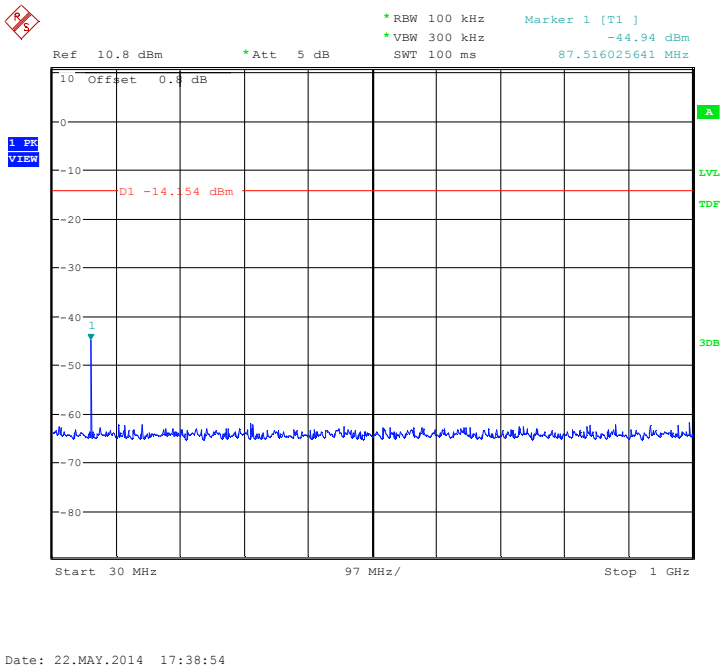


Fig.29. Conducted spurious emission: π/4 DQPSK, Channel 0, 30MHz - 1GHz

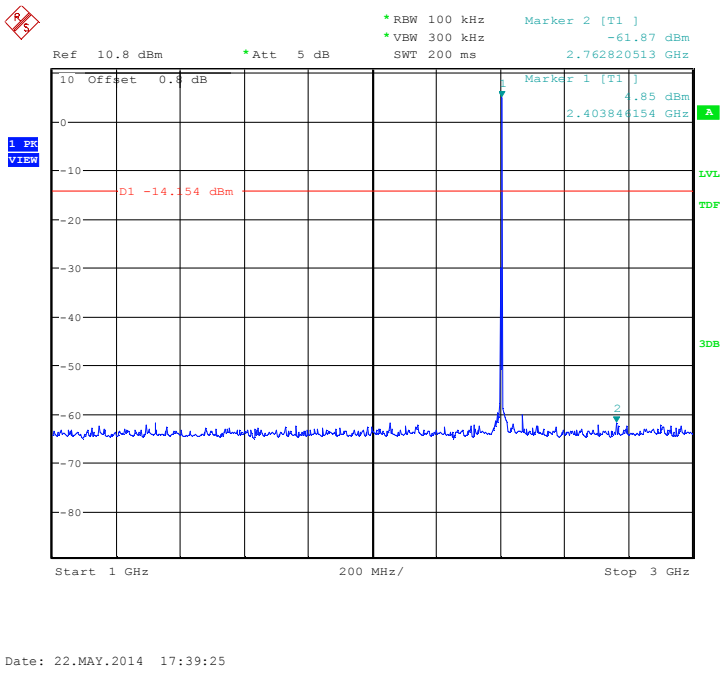


Fig.30. Conducted spurious emission: π/4 DQPSK, Channel 0, 1GHz - 3GHz

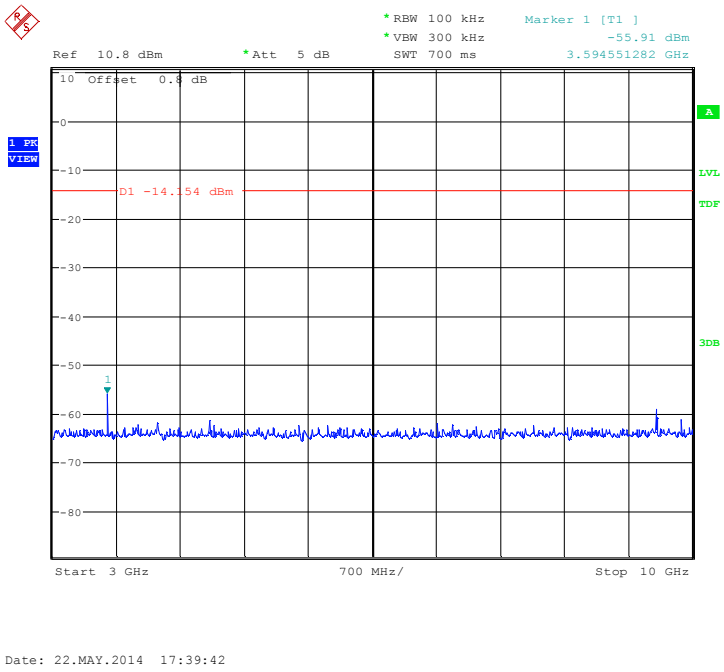


Fig.31. Conducted spurious emission: π/4 DQPSK, Channel 0, 3GHz - 10GHz

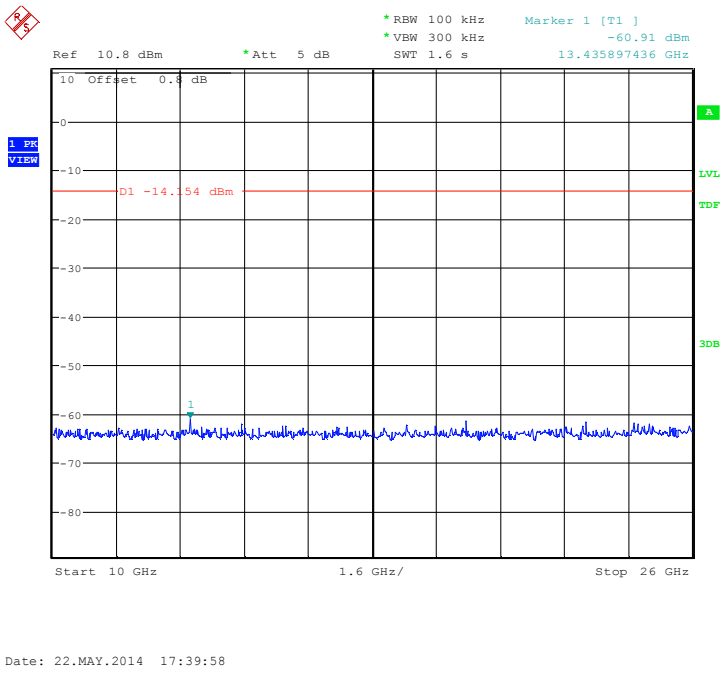


Fig.32. Conducted spurious emission: π/4 DQPSK, Channel 0,10GHz - 26GHz

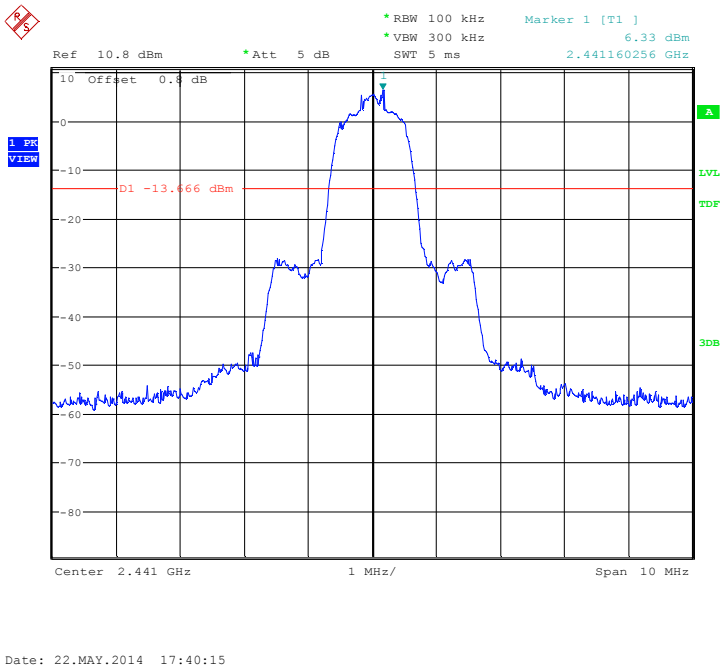


Fig.33. Conducted spurious emission: π/4 DQPSK, Channel 39, 2441MHz

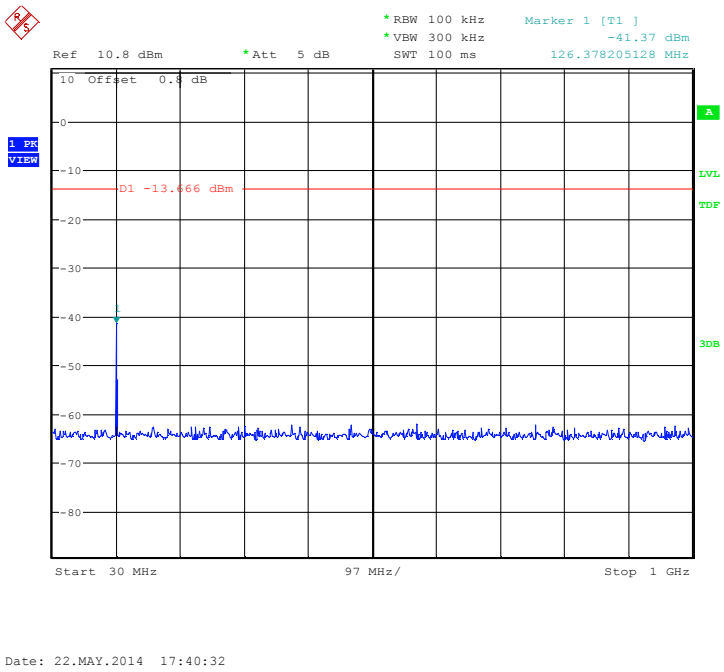


Fig.34. Conducted spurious emission: π/4 DQPSK, Channel 39, 30MHz - 1GHz

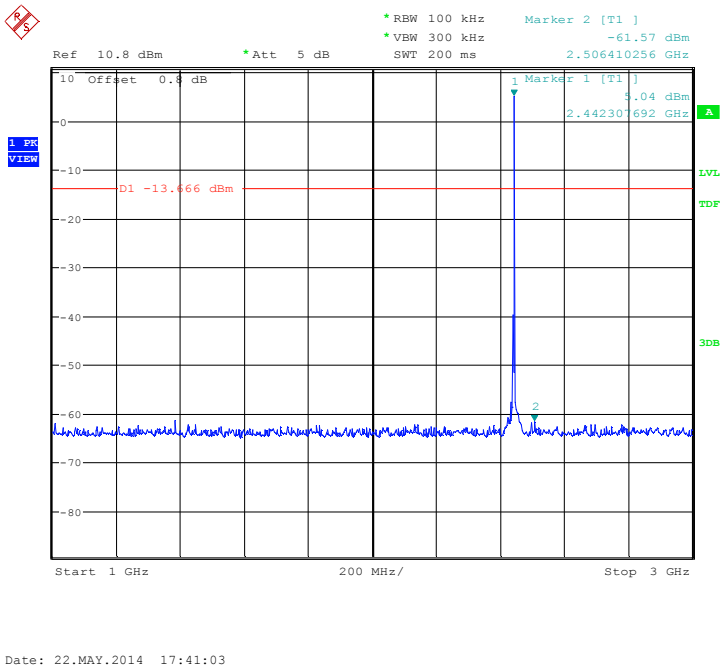


Fig.35. Conducted spurious emission: π/4 DQPSK, Channel 39, 1GHz - 3GHz

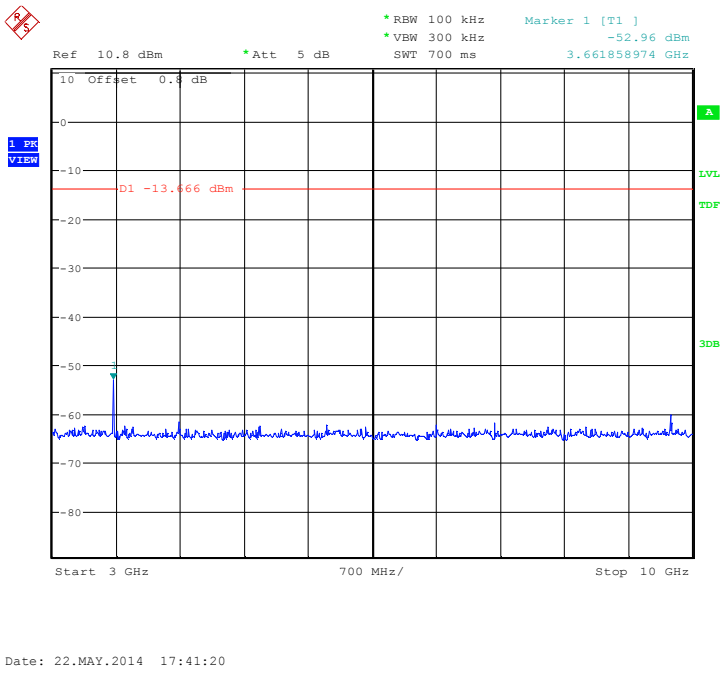


Fig.36. Conducted spurious emission: π/4 DQPSK, Channel 39, 3GHz - 10GHz

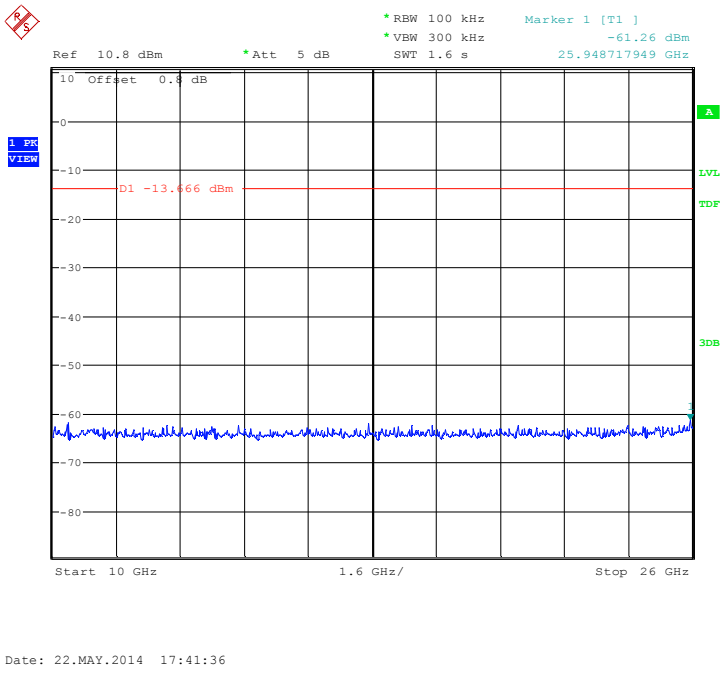


Fig.37. Conducted spurious emission: π/4 DQPSK, Channel 39, 10GHz – 26GHz

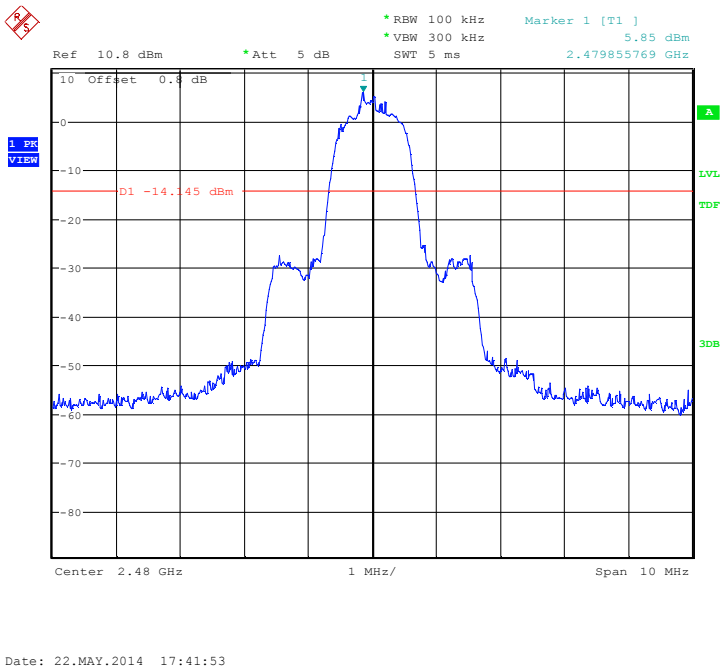


Fig.38. Conducted spurious emission: π/4 DQPSK, Channel 78, 2480MHz

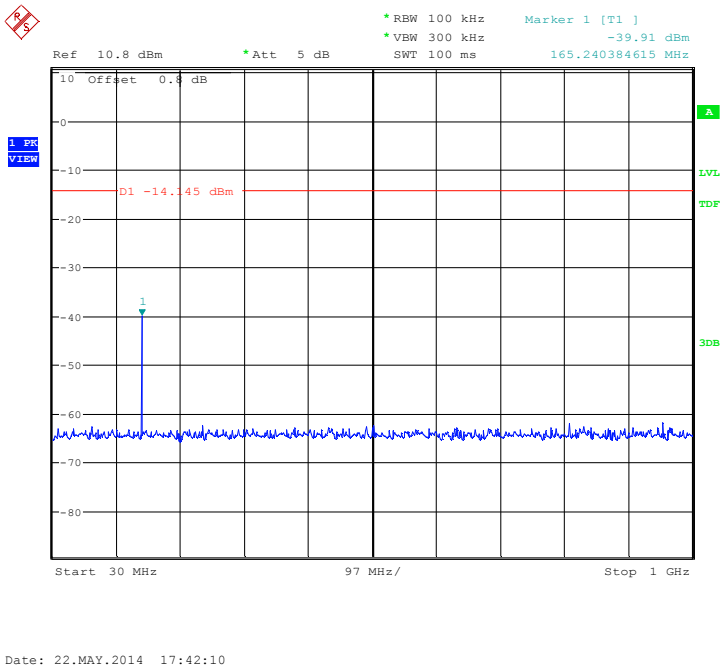


Fig.39. Conducted spurious emission: π/4 DQPSK, Channel 78, 30MHz - 1GHz

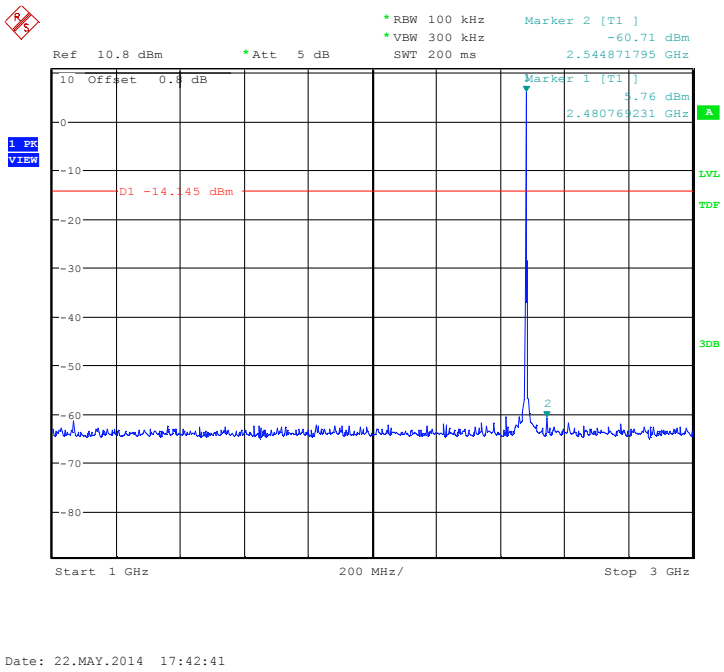


Fig.40. Conducted spurious emission: π/4 DQPSK, Channel 78, 1GHz - 3GHz

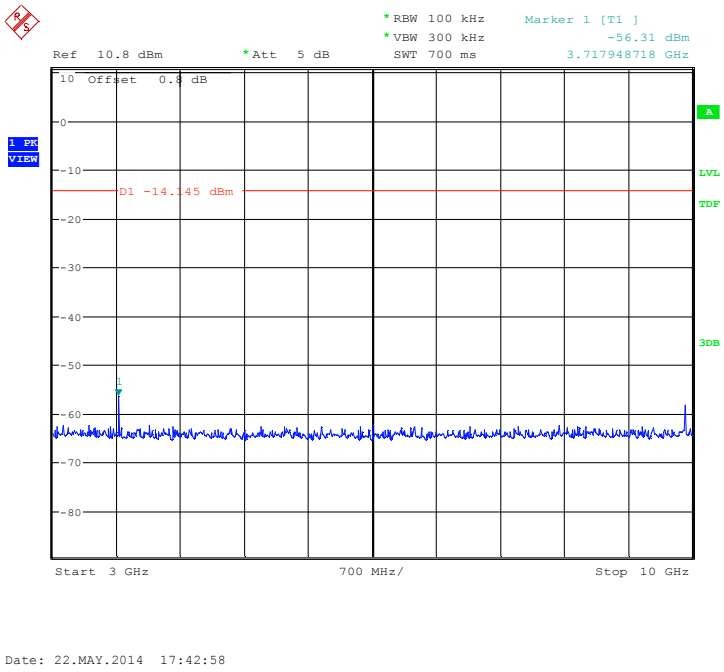


Fig.41. Conducted spurious emission: π/4 DQPSK, Channel 78, 3GHz - 10GHz

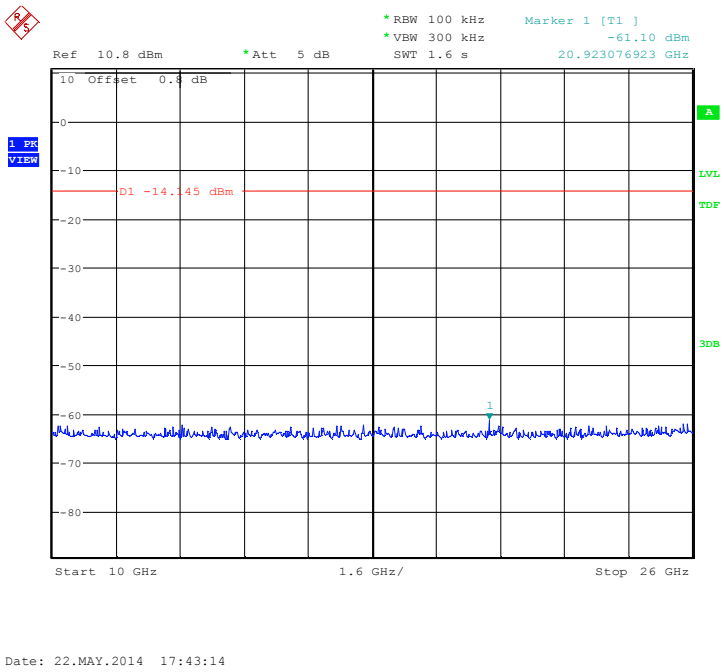


Fig.42. Fig.30 Conducted spurious emission: π/4 DQPSK, Channel 78, 10GHz - 26GHz

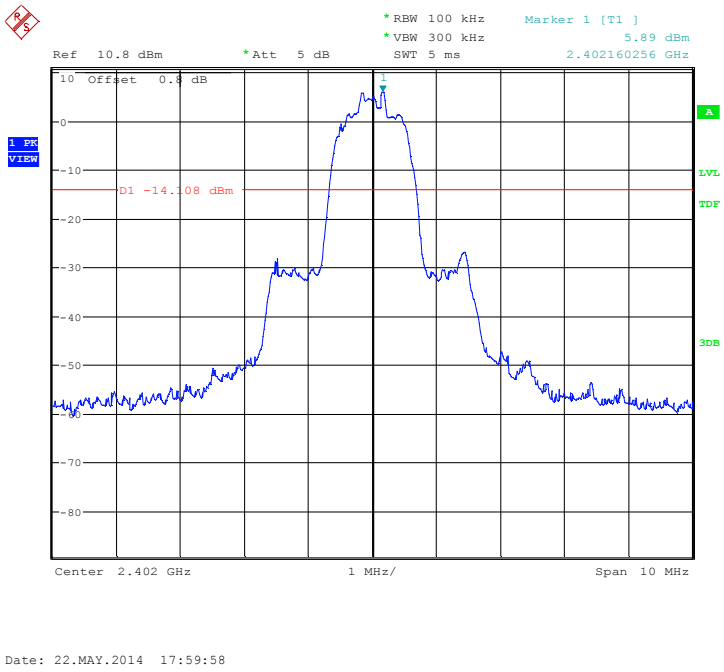


Fig.43. Conducted spurious emission: 8DPSK, Channel 0,2402MHz

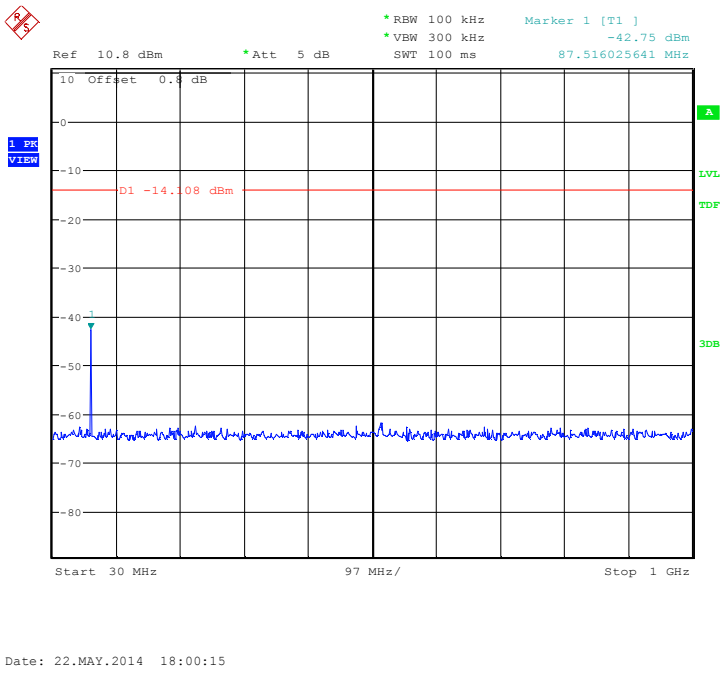


Fig.44. Conducted spurious emission: 8DPSK, Channel 0, 30MHz - 1GHz

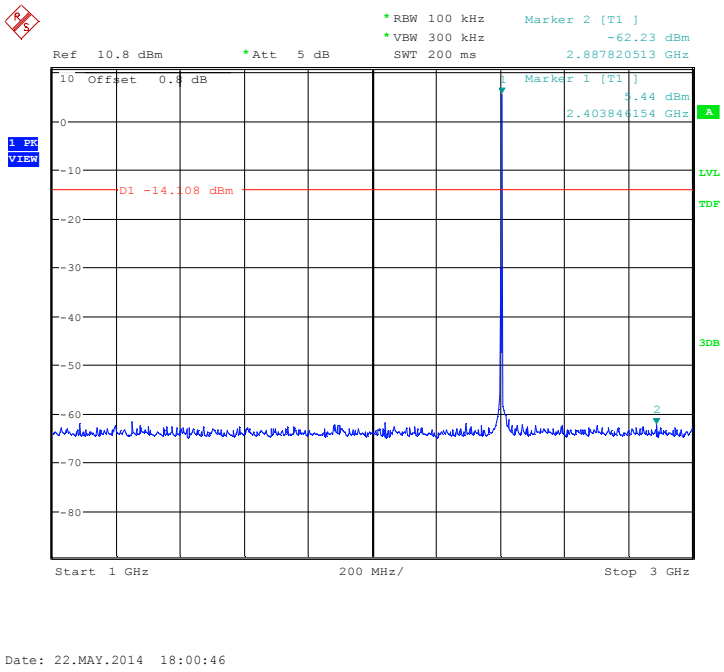


Fig.45. Conducted spurious emission: 8DPSK, Channel 0, 1GHz - 3GHz

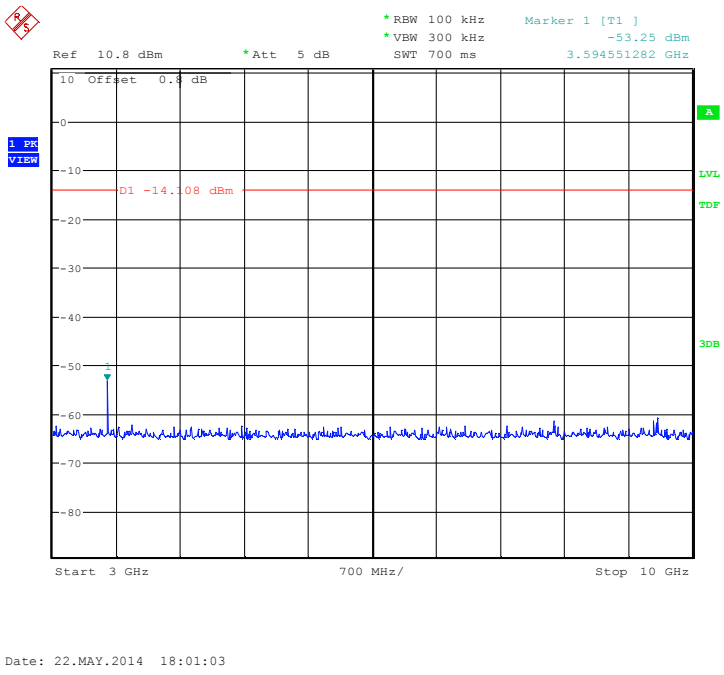


Fig.46. Conducted spurious emission: 8DPSK, Channel 0, 3GHz - 10GHz

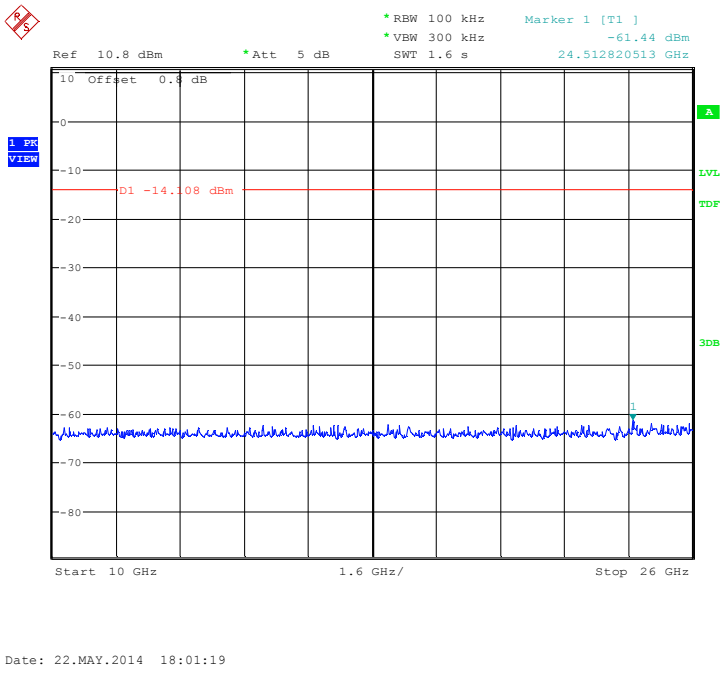


Fig.47. Conducted spurious emission: 8DPSK, Channel 0,10GHz - 26GHz

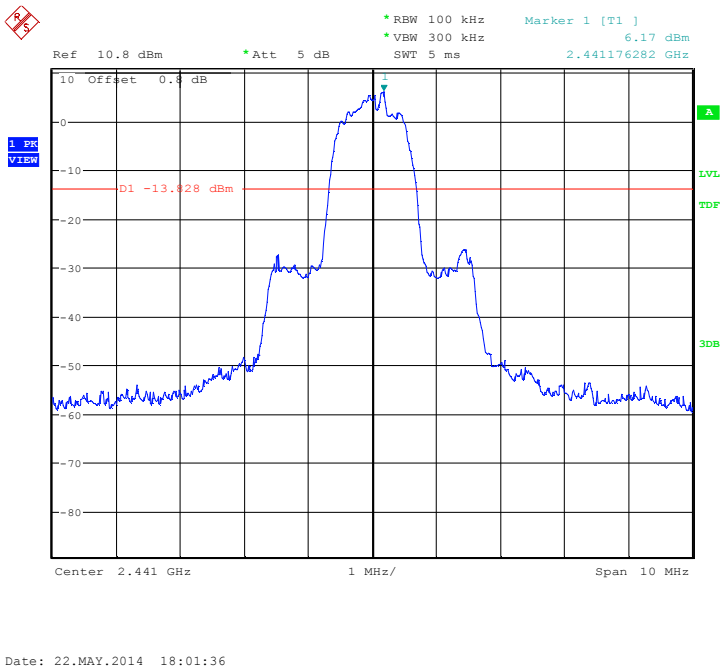


Fig.48. Conducted spurious emission: 8DPSK, Channel 39, 2441MHz

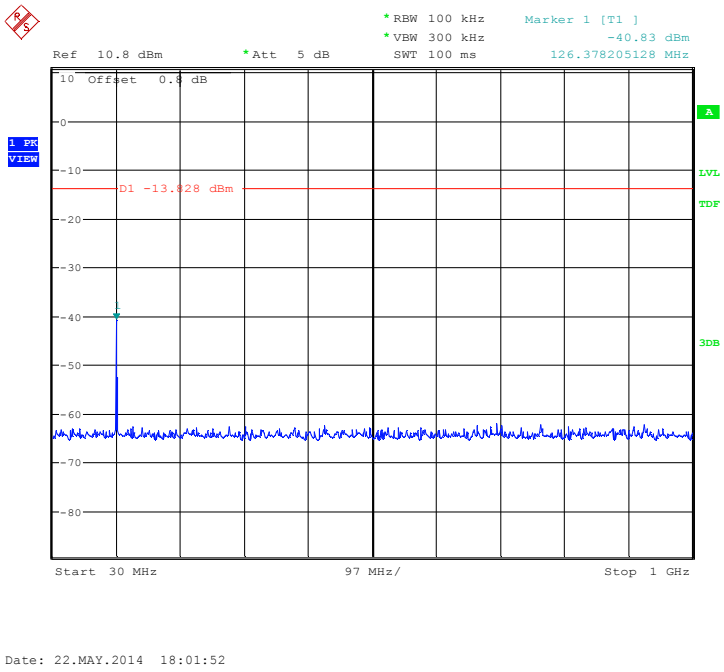


Fig.49. Conducted spurious emission: 8DPSK, Channel 39, 30MHz - 1GHz

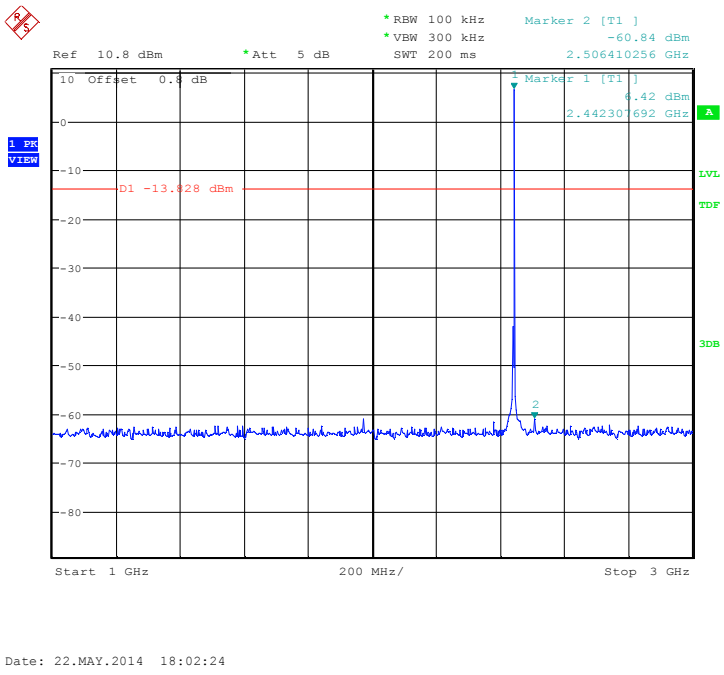


Fig.50. Conducted spurious emission: 8DPSK, Channel 39, 1GHz - 3GHz

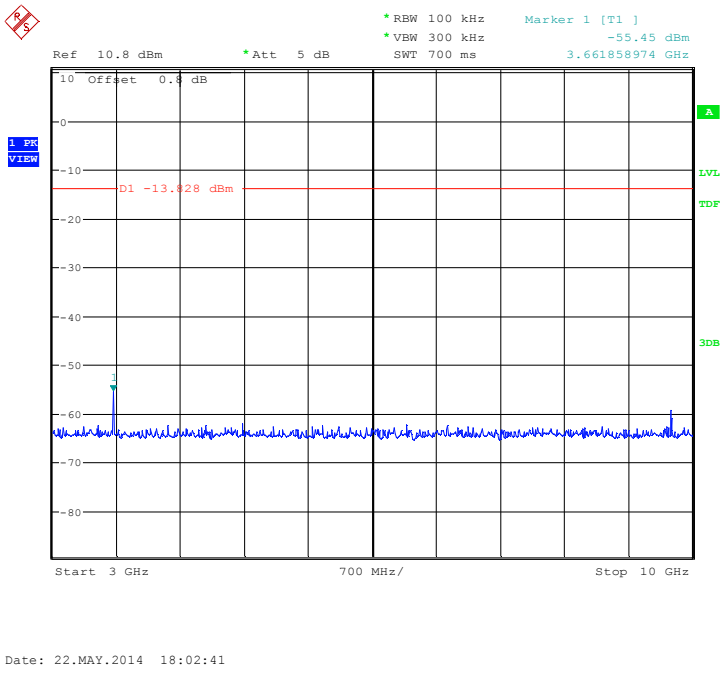


Fig.51. Conducted spurious emission: 8DPSK, Channel 39, 3GHz - 10GHz

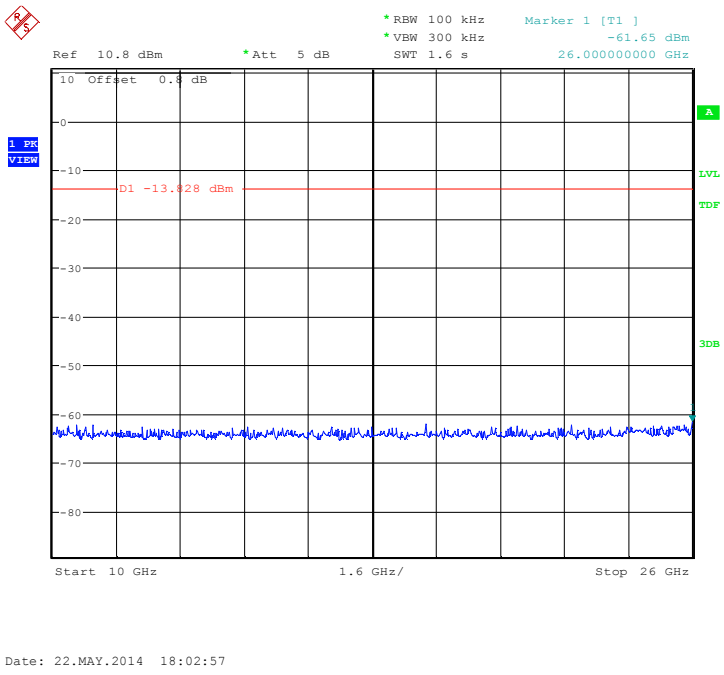


Fig.52. Conducted spurious emission: 8DPSK, Channel 39, 10GHz – 26GHz

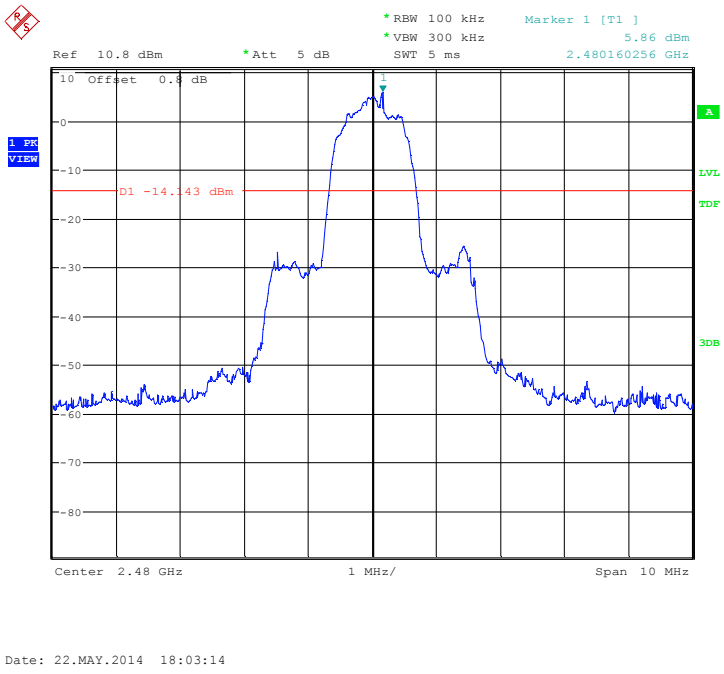


Fig.53. Conducted spurious emission: 8DPSK, Channel 78, 2480MHz

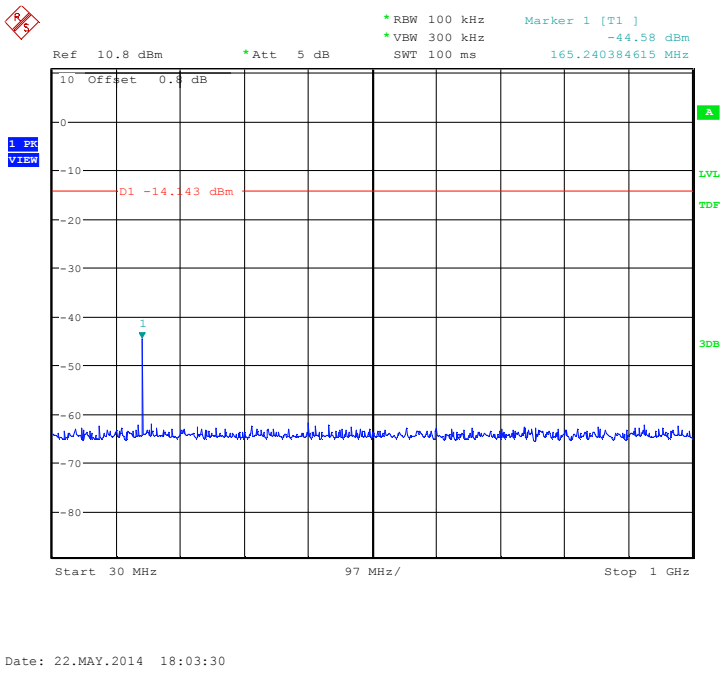


Fig.54. Conducted spurious emission: 8DPSK, Channel 78, 30MHz - 1GHz

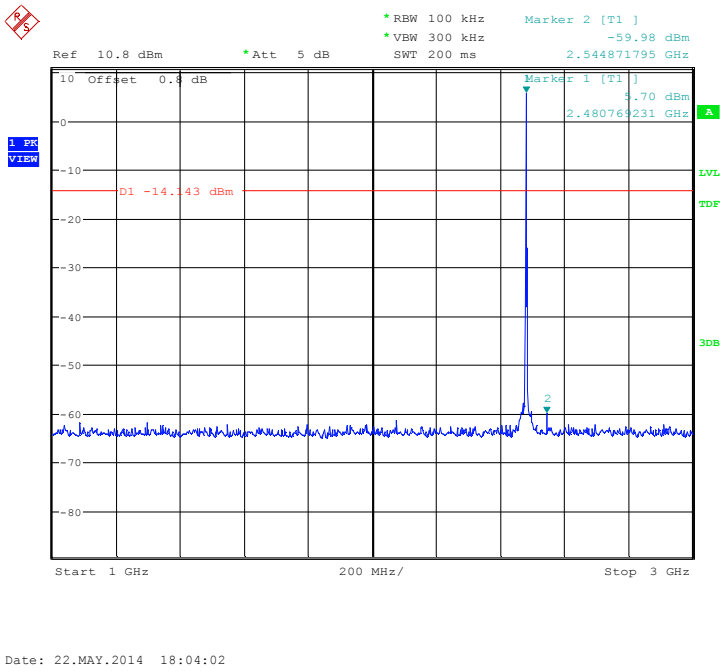


Fig.55. Conducted spurious emission: 8DPSK, Channel 78, 1GHz - 3GHz

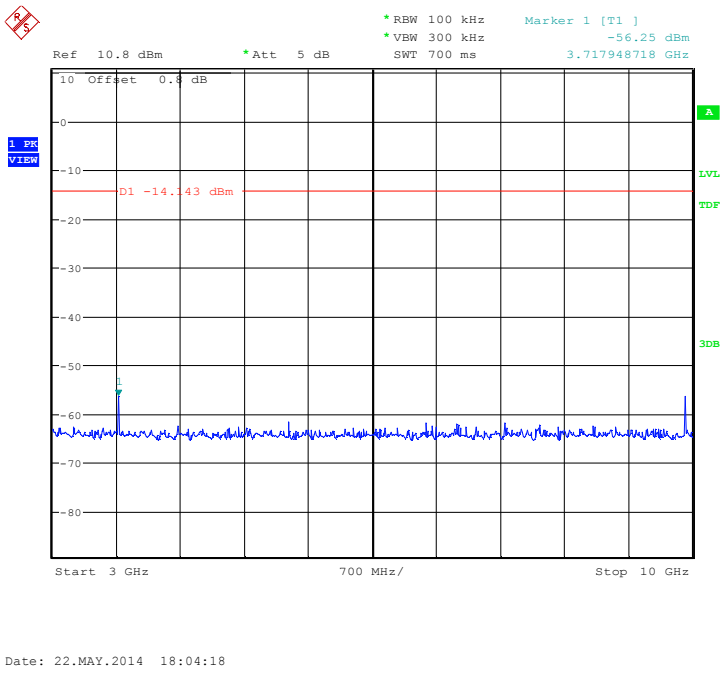


Fig.56. Conducted spurious emission: 8DPSK, Channel 78, 3GHz - 10GHz

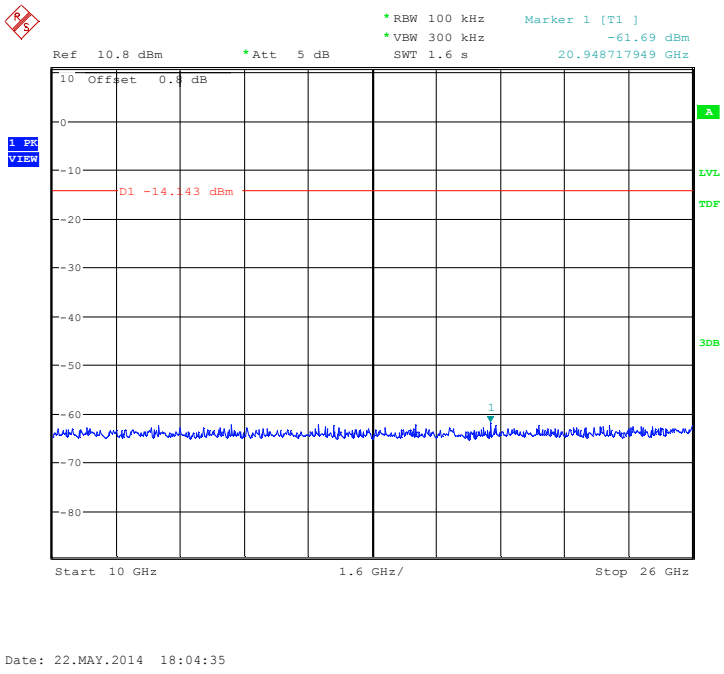


Fig.57. Conducted spurious emission: 8DPSK, Channel 78, 10GHz - 26GHz

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)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Test Condition

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

Frequency of emission (MHz)	RBW/VBW	Sweep Time(s)
30-1000	100KHz/300KHz	5
1000-4000	1MHz/1MHz	15
4000-18000	1MHz/1MHz	40
18000-26500	1MHz/1MHz	20

Measurement Results:

Result=P_{Mea}+ARPL

For GFSK

Channel	Frequency Range	Test Results	Conclusion
Ch 0 2402 MHz	1 GHz ~ 3 GHz	Fig.58	P
	3 GHz ~ 18 GHz	Fig.59	P
Ch 39 2441 MHz	30 MHz ~ 1 GHz	Fig.60	P
	1 GHz ~ 3 GHz	Fig.61	P
	3 GHz ~ 18 GHz	Fig.62	P
Ch 78 2480 MHz	1 GHz ~ 3 GHz	Fig.63	P
	3 GHz ~ 18 GHz	Fig.64	P
Power	2.38GHz~2.4GHz---L	Fig.65	P
Power	2.45GHz~2.5GHz---H	Fig.66	P

For all channels	18 GHz ~ 26 GHz	Fig.67	P

Forπ/4 DQPSK

Channel	Frequency Range	Test Results	Conclusion
Ch 0 2402 MHz	1 GHz ~ 3 GHz	Fig.68	P
	3 GHz ~ 18 GHz	Fig.69	P
Ch 39 2441 MHz	30 MHz ~ 1 GHz	Fig.70	P
	1 GHz ~ 3 GHz	Fig.71	P
	3 GHz ~ 18 GHz	Fig.72	P
Ch 78 2480 MHz	1 GHz ~ 3 GHz	Fig.73	P
	3 GHz ~ 18 GHz	Fig.74	P
Power	2.38GHz~2.4GHz---L	Fig.75	P
Power	2.45GHz~2.5GHz---H	Fig.76	P
For all channels	18 GHz ~ 26 GHz	Fig.77	P

For 8DPSK

Channel	Frequency Range	Test Results	Conclusion
Ch 0 2402 MHz	1 GHz ~ 3 GHz	Fig.78	P
	3 GHz ~ 18 GHz	Fig.79	P
Ch 39 2441 MHz	30 MHz ~ 1 GHz	Fig.80	P
	1 GHz ~ 3 GHz	Fig.81	P
	3 GHz ~ 18 GHz	Fig.82	P
Ch 78 2480 MHz	1 GHz ~ 3 GHz	Fig.83	P
	3 GHz ~ 18 GHz	Fig.84	P
Power	2.38GHz~2.4GHz---L	Fig.85	P
Power	2.45GHz~2.5GHz---H	Fig.86	P
For all channels	18 GHz ~ 26 GHz	Fig.87	P

GFSK Ch 0 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	PMea(dBuv/m)	Polarization
2390.000	33.7	-11.10	44.8	H
17982.000	42.6	27.90	14.7	V
17989.500	42.4	27.90	14.5	V
17995.500	42.2	27.90	14.3	V
17973.000	42.1	27.90	14.2	H
17976.000	42.1	27.90	14.2	V

GFSK Ch 39 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
17989.500	42.5	27.90	14.6	V
17998.500	42.2	27.90	14.3	V
17982.000	42.1	27.90	14.2	V
17995.500	42.1	27.90	14.2	V
17986.500	42.1	27.90	14.2	V
17979.000	42.0	27.90	14.1	H

GFSK Ch 78 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2483.500	34.5	-11.20	45.700	H
17976.000	42.4	27.90	14.500	V
17982.000	42.3	27.90	14.400	H
17949.000	42.2	27.90	14.300	H
17989.500	42.2	27.90	14.300	V
17965.500	42.2	27.90	14.300	H

π/4 DQPSK Ch 0 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2390.000	33.6	-11.10	44.7	V
17982.000	42.5	27.90	14.6	V
17992.500	42.5	27.90	14.6	H
17989.500	42.2	27.90	14.3	H
17998.500	42.1	27.90	14.2	V
17979.000	42.1	27.90	14.2	H

π/4 DQPSK Ch 39 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
17982.000	42.3	27.90	14.4	V
17992.500	42.2	27.90	14.3	V
17989.500	42.1	27.90	14.2	H
17979.000	42.1	27.90	14.2	V
17976.000	42.0	27.90	14.1	V
17983.500	41.9	27.90	14.0	V

π/4 DQPSK Ch 78 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2484.300	35.2	-11.20	46.4	H
17979.000	42.2	27.90	14.3	V
17992.500	42.2	27.90	14.3	V
17989.500	42.2	27.90	14.3	V
17995.500	42.2	27.90	14.3	V
17986.500	42.2	27.90	14.3	V

8DPSK Ch 0 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2390.000	33.6	-11.10	44.7	V
17976.000	42.5	27.90	14.6	H
17982.000	42.3	27.90	14.4	V
17992.500	42.2	27.90	14.3	V
17979.000	42.2	27.90	14.3	V
17995.500	41.9	27.90	14.0	H

8DPSK Ch 39 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
17989.500	42.1	27.90	14.2	V
17982.000	42.1	27.90	14.2	V
17965.500	42.0	27.90	14.1	V
17976.000	42.0	27.90	14.1	H
17979.000	42.0	27.90	14.1	V
17955.000	41.9	27.90	14.0	V

8DPSK Ch 78 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2483.500	34.5	-11.20	45.7	H
17982.000	42.4	27.90	14.5	V
17965.500	42.2	27.90	14.3	V
17989.500	42.1	27.90	14.2	V
17995.500	42.1	27.90	14.2	V
17979.000	42.0	27.90	14.1	V

Conclusion: PASS

Test graphs as below:

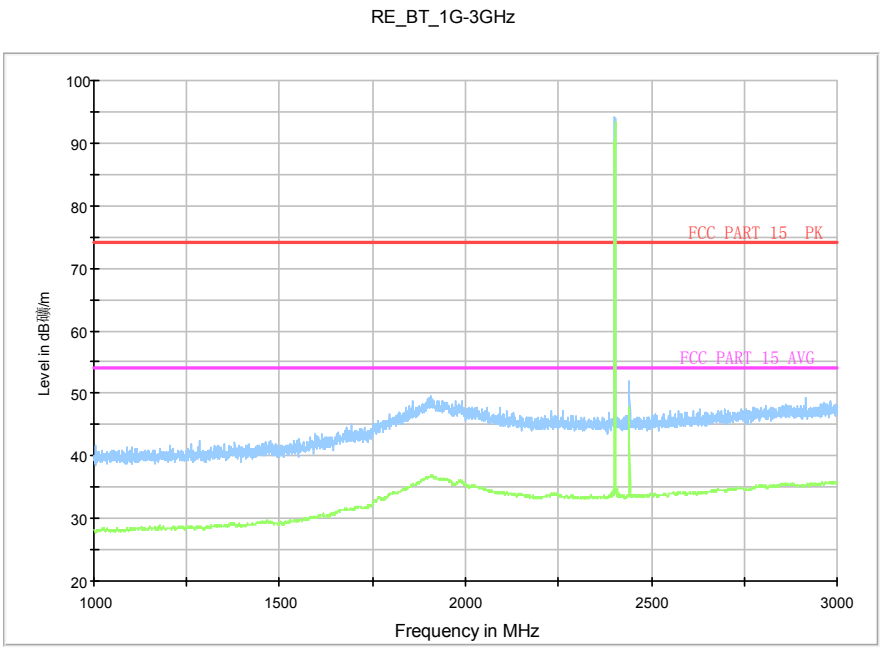


Fig.58. Radiated emission: GFSK, Channel 0, 1 GHz - 3 GHz

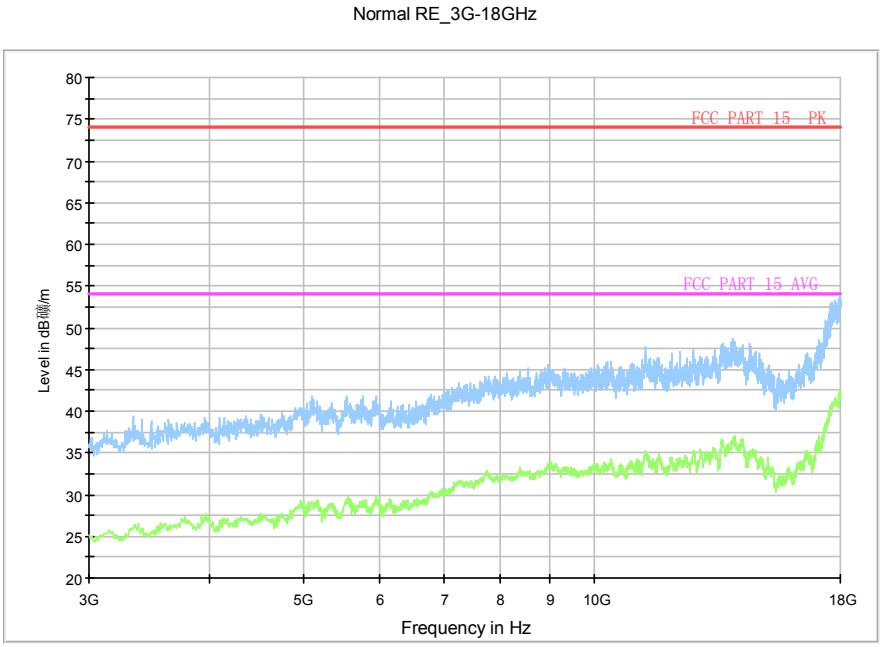


Fig.59. Radiated emission: GFSK, Channel 0, 3 GHz - 18 GHz

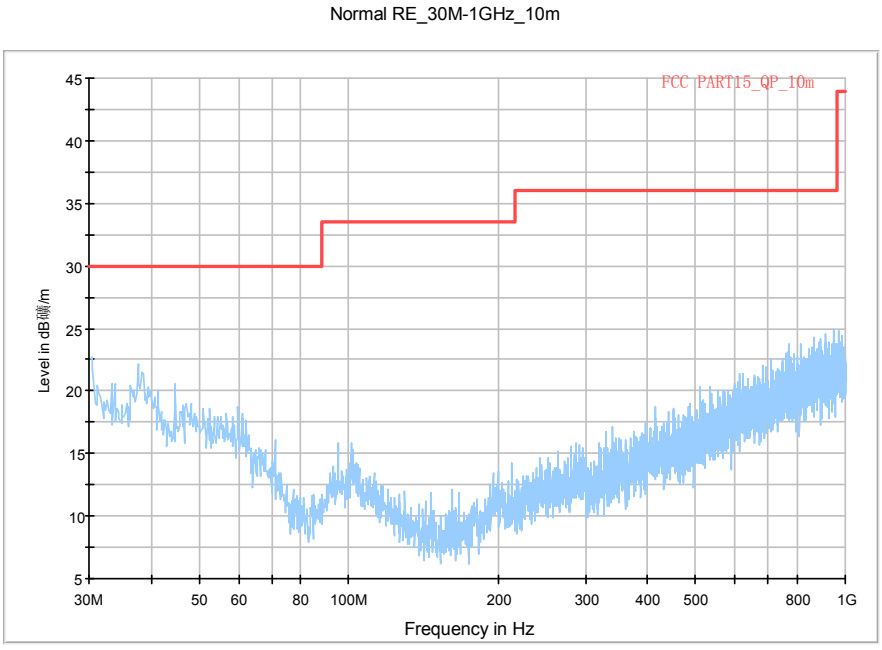


Fig.60. Radiated emission: GFSK, Channel 39, 30 MHz - 1 GHz

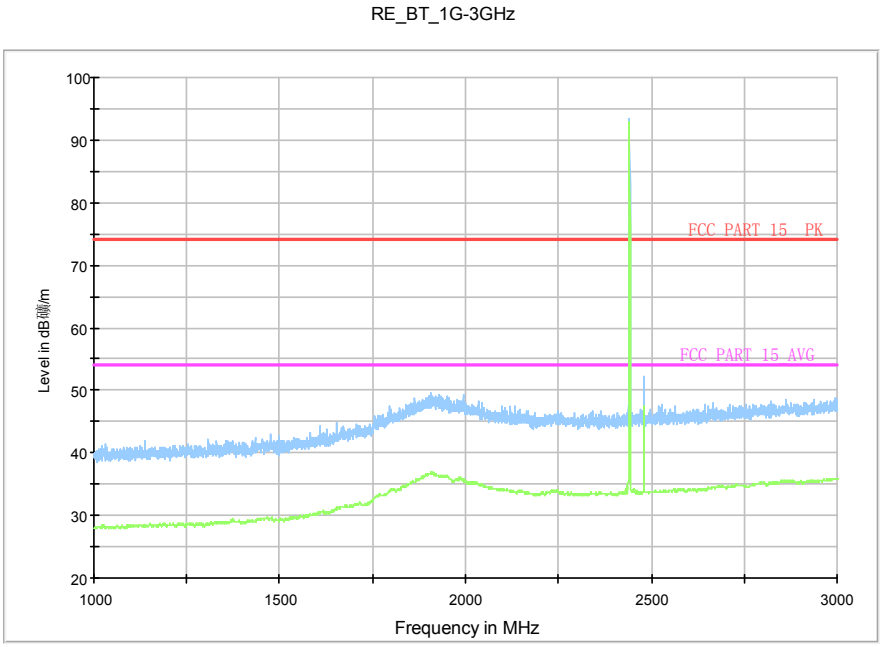


Fig.61. Radiated emission: GFSK, Channel 39, 1 GHz - 3 GHz

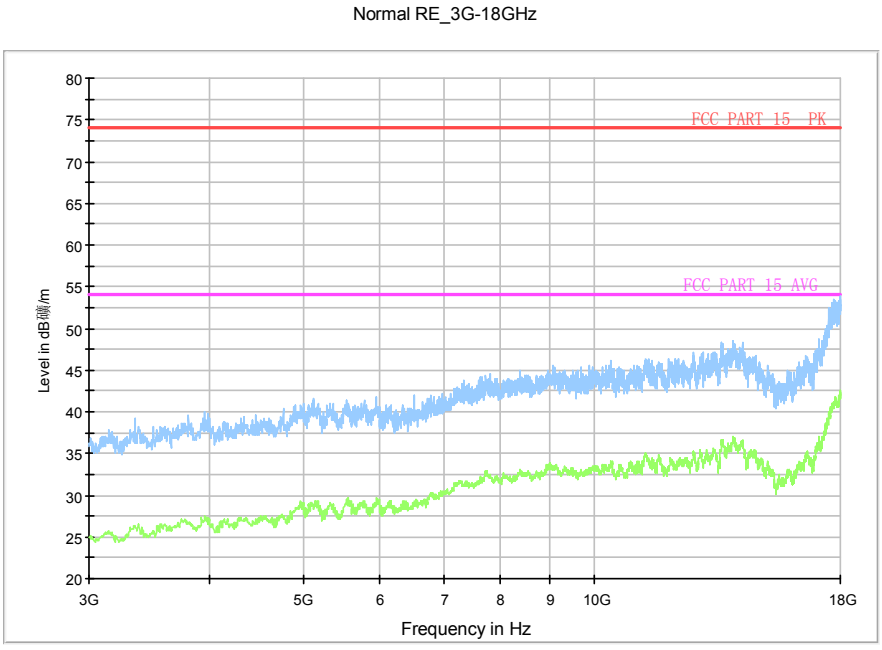


Fig.62. Radiated emission: GFSK, Channel 39, 3 GHz - 18 GHz

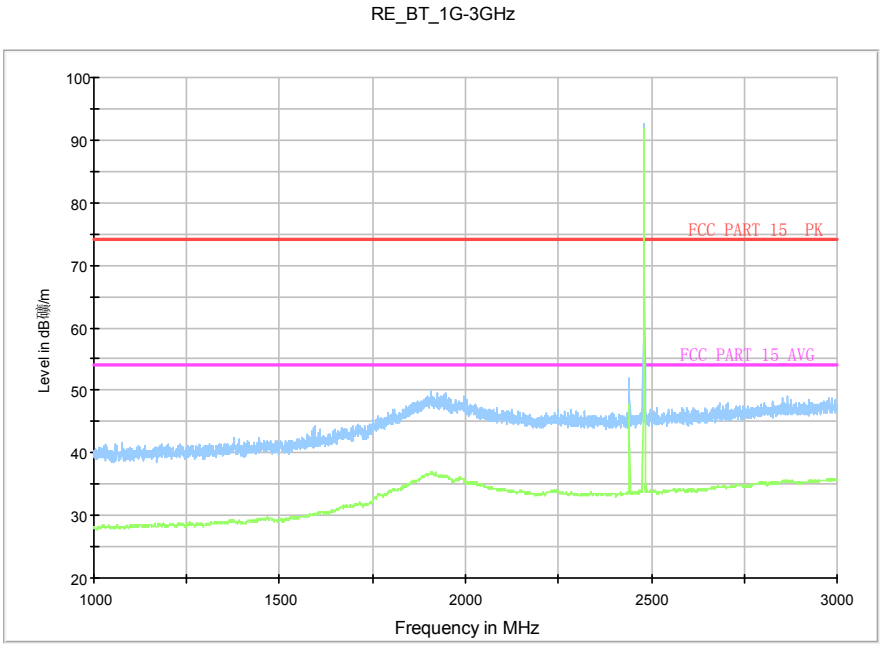


Fig.63. Radiated emission: GFSK, Channel 78, 1 GHz - 3 GHz

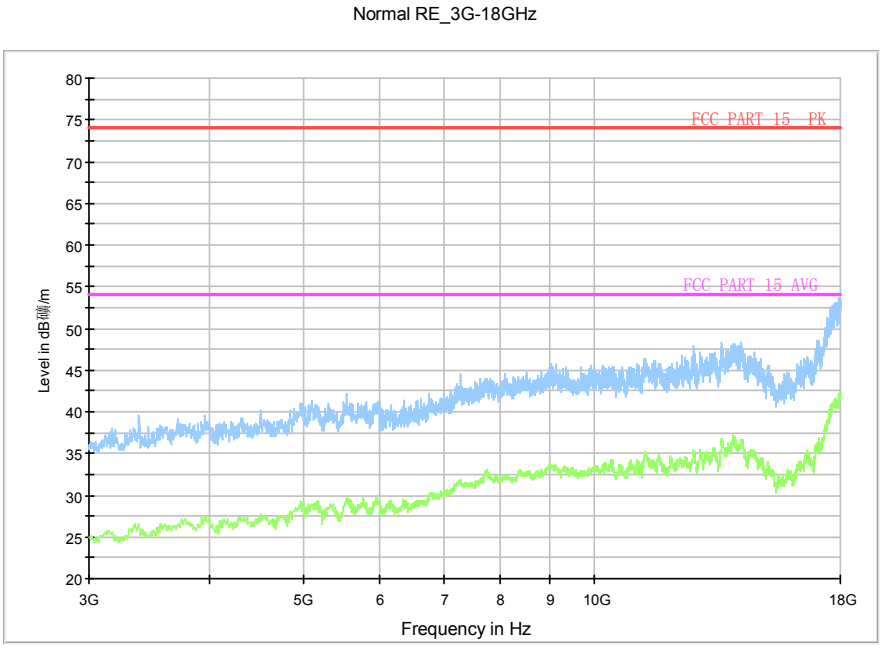


Fig.64. Radiated emission: GFSK, Channel 78, 3 GHz - 18 GHz

RE-BT-Power_2.38G-2.43GHz

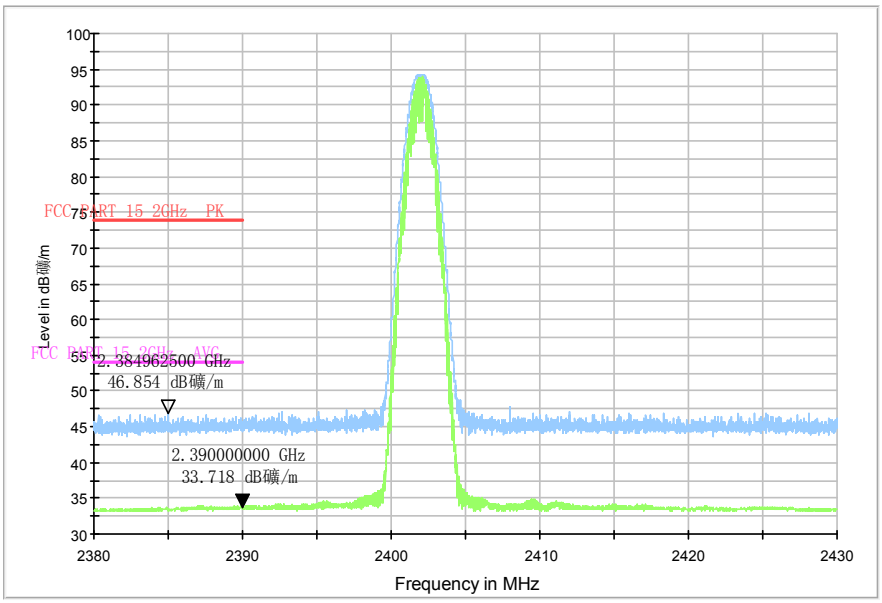


Fig.65. Radiated emission (Power): GFSK, low channel

RE-BT-Power_2.45G-2.5GHz

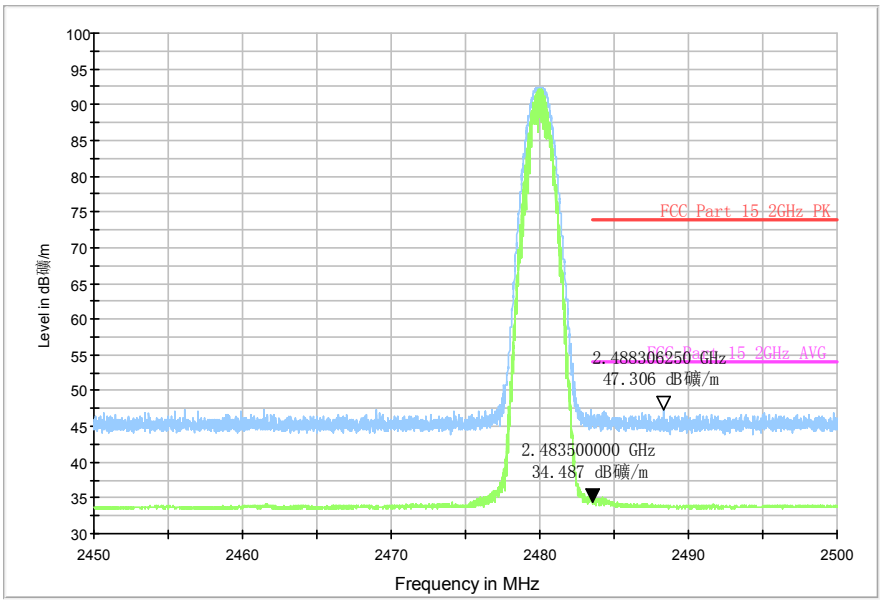


Fig.66. Radiated emission (Power) GFSK, high channel

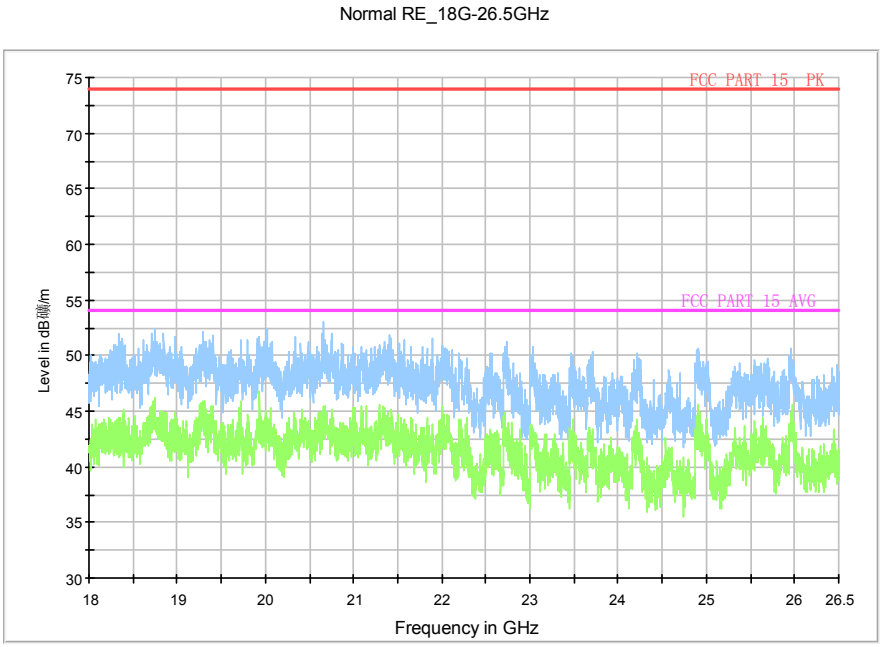


Fig.67. Radiated emission: GFSK, 18 GHz - 26 GHz

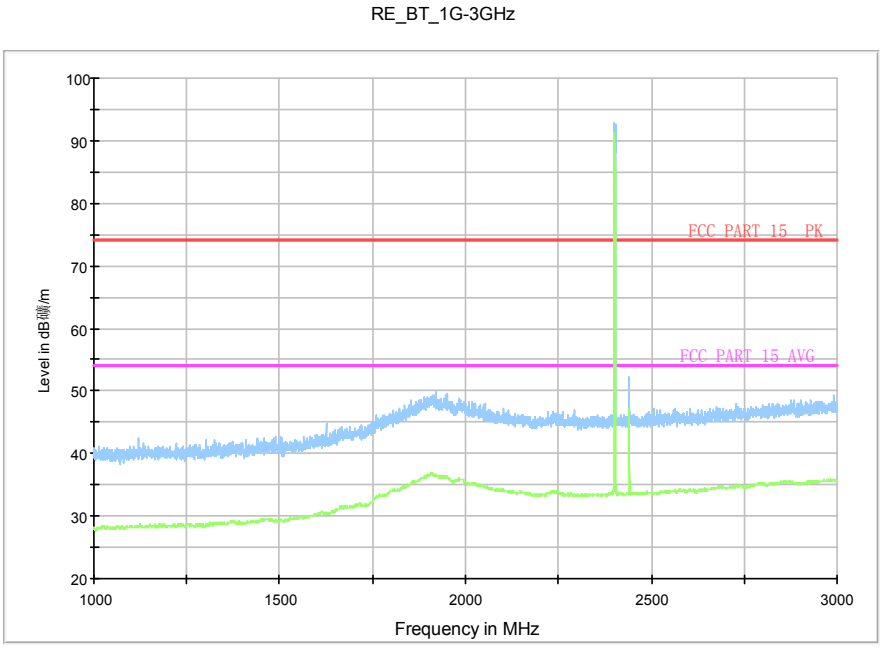


Fig.68. Radiated emission: π/4 DQPSK, Channel 0, 1 GHz - 3 GHz

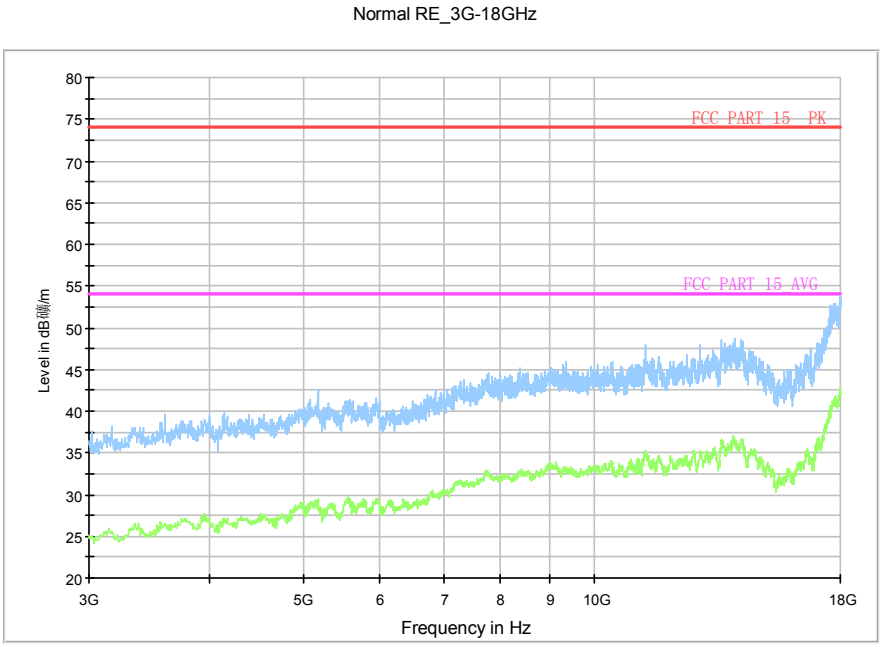


Fig.69. Radiated emission: π/4 DQPSK, Channel 0, 3 GHz - 18 GHz

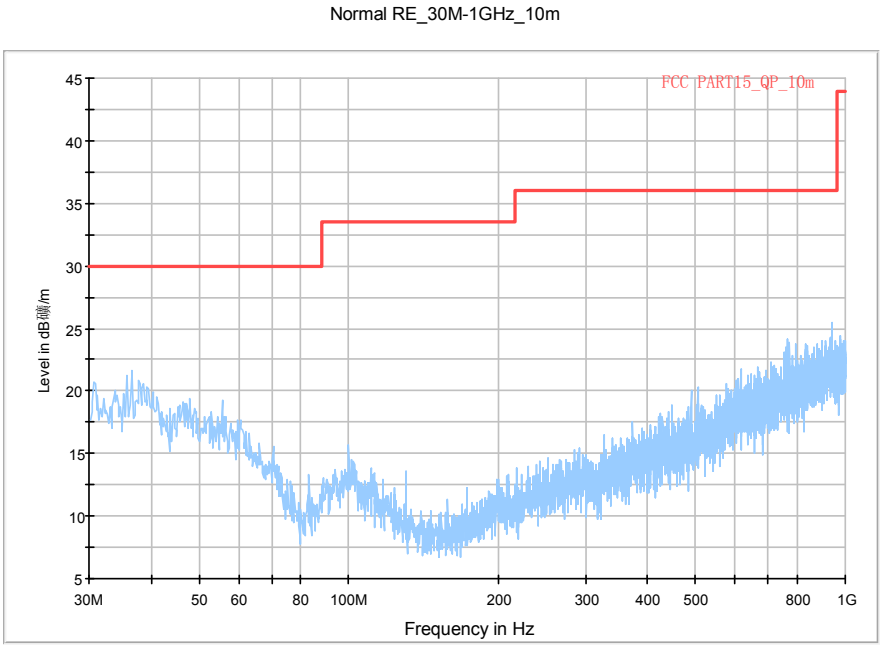


Fig.70. Radiated emission: π/4 DQPSK, Channel 39, 30 MHz - 1 GHz

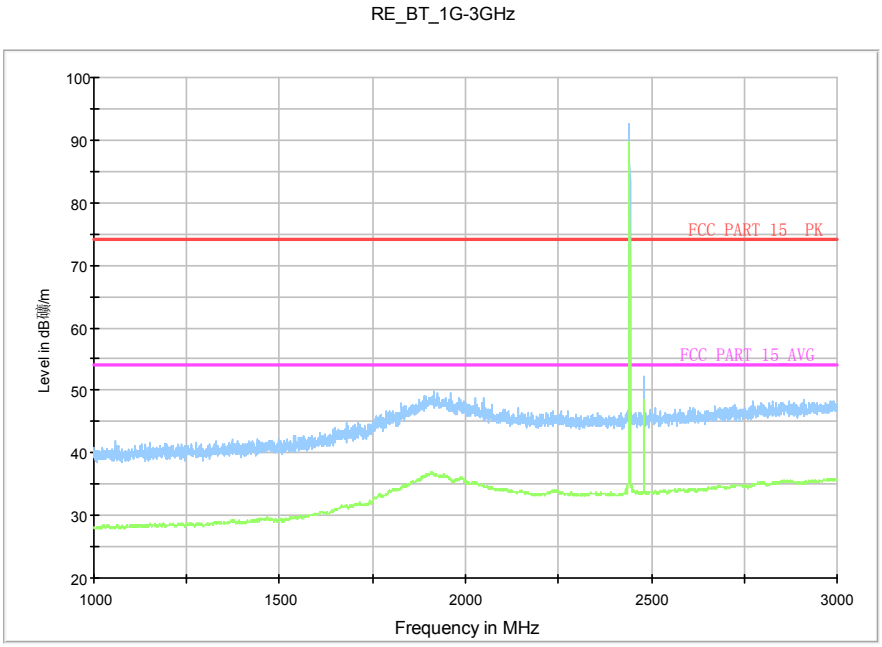


Fig.71. Radiated emission: π/4 DQPSK, Channel 39, 1 GHz - 3 GHz

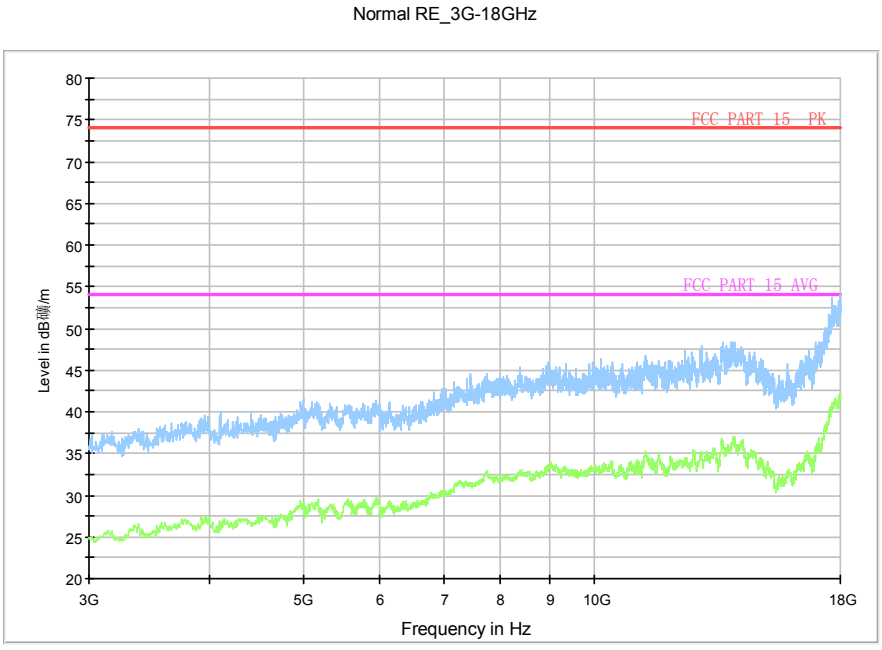


Fig.72. Radiated emission: π/4 DQPSK, Channel 39, 3 GHz - 18 GHz

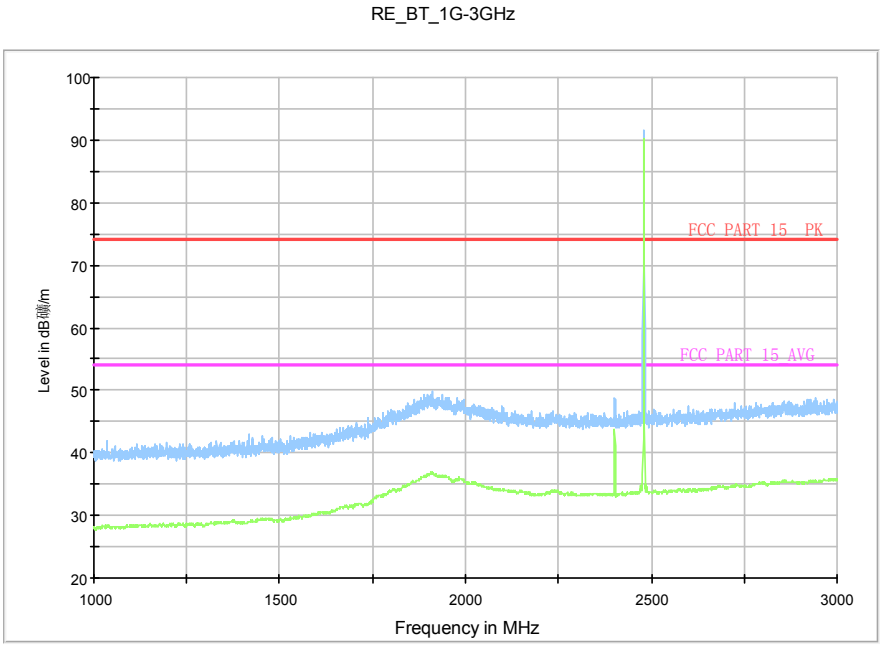


Fig.73. Radiated emission: π/4 DQPSK, Channel 78, 1 GHz - 3 GHz

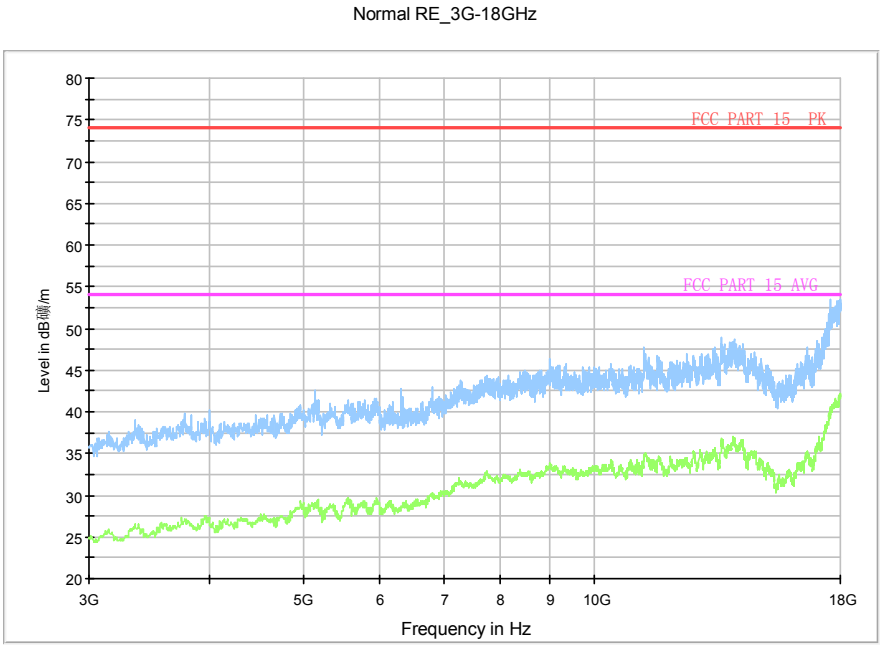


Fig.74. Radiated emission: π/4 DQPSK, Channel 78, 3 GHz - 18 GHz

RE-BT-Power_2.38G-2.43GHz

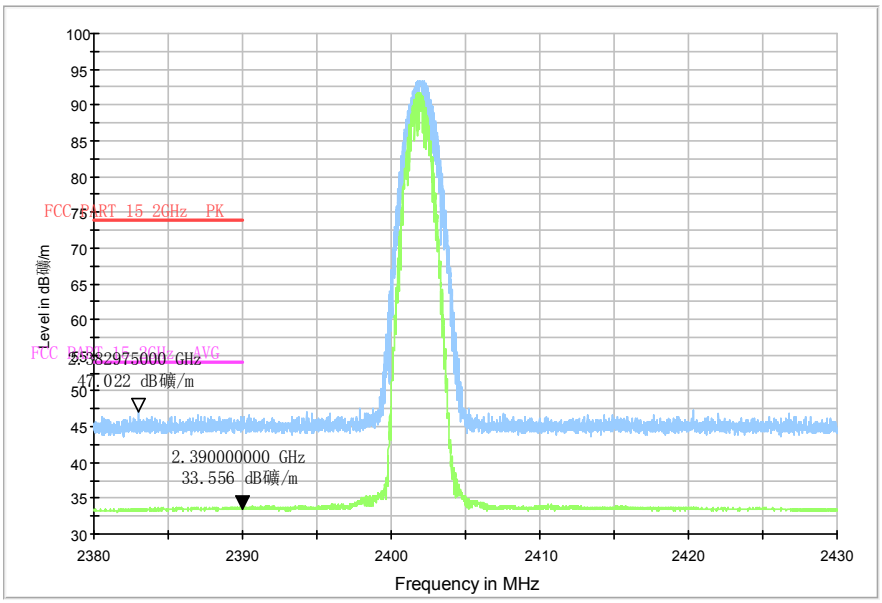


Fig.75. Radiated emission (Power): π/4 DQPSK, low channel

RE-BT-Power_2.45G-2.5GHz

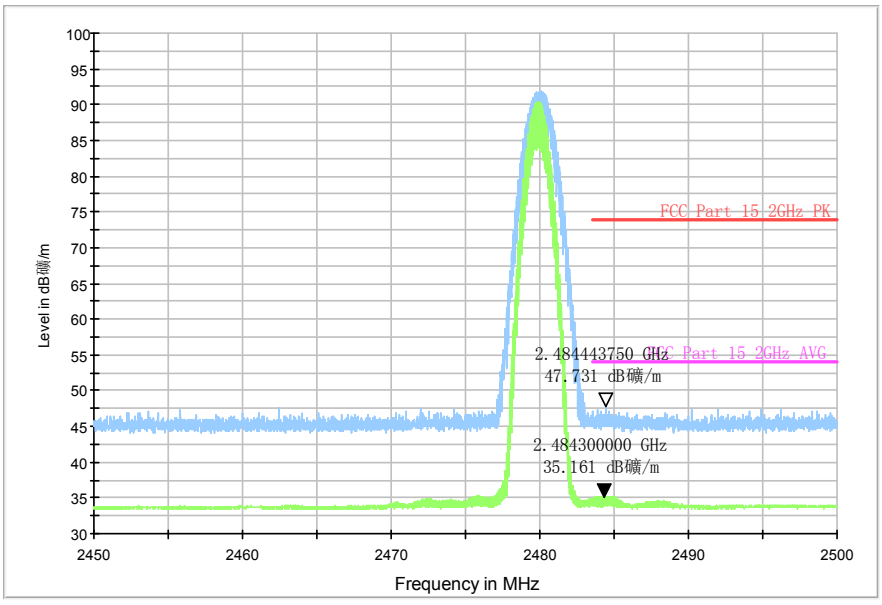


Fig.76. Radiated emission (Power): π/4 DQPSK, high channel

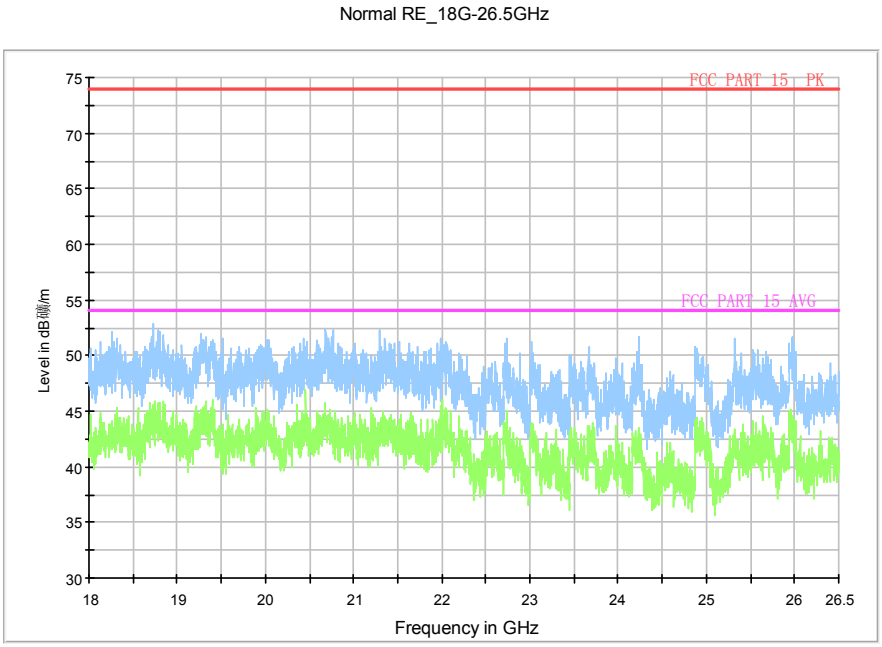


Fig.77. Radiated emission: π/4 DQPSK, 18 GHz - 26 GHz

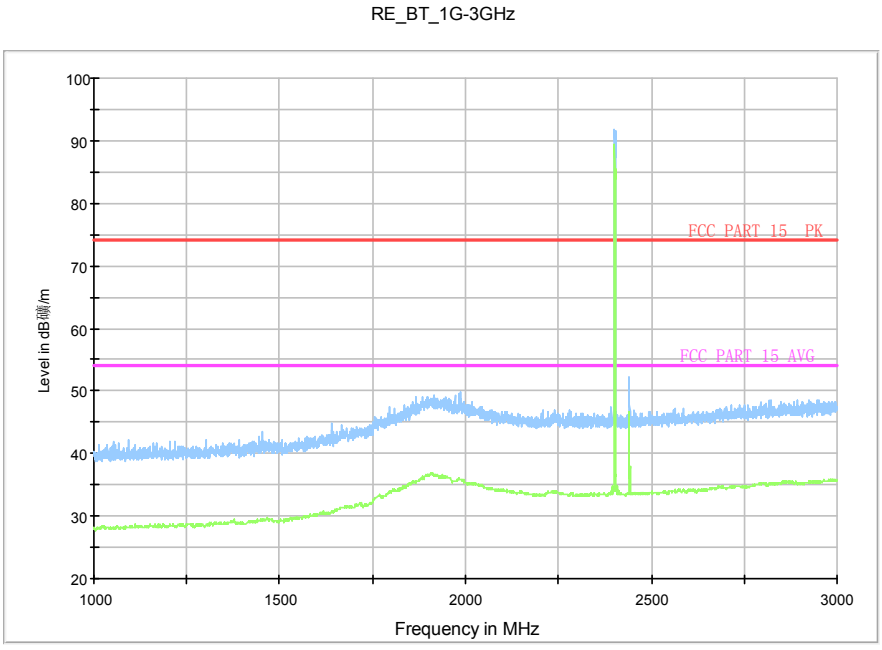


Fig.78. Radiated emission: 8DPSK, Channel 0, 1 GHz - 3 GHz

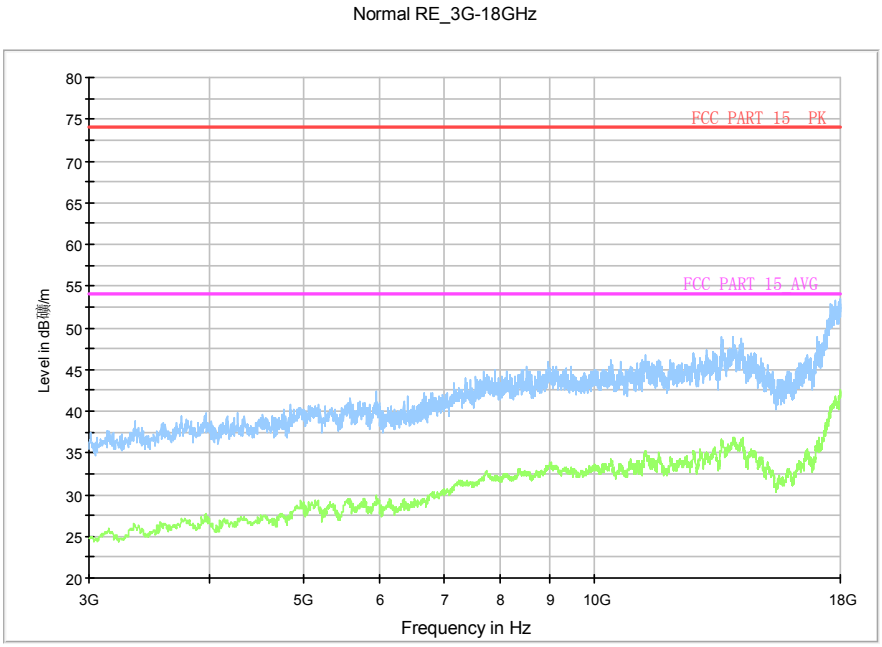


Fig.79. Radiated emission: 8DPSK, Channel 0, 3 GHz - 18 GHz

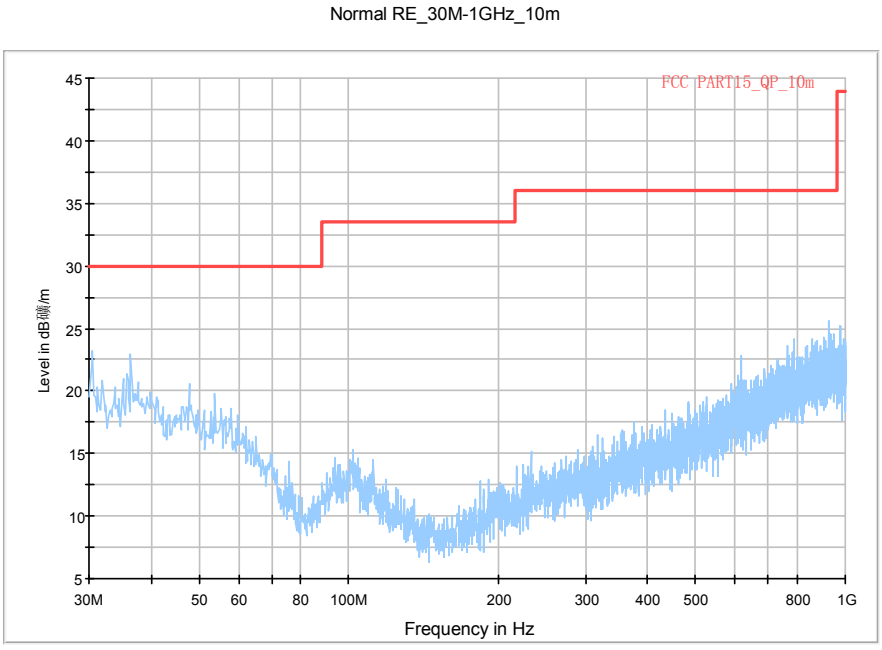


Fig.80. Radiated emission: 8DPSK, Channel 39, 30 MHz - 1 GHz

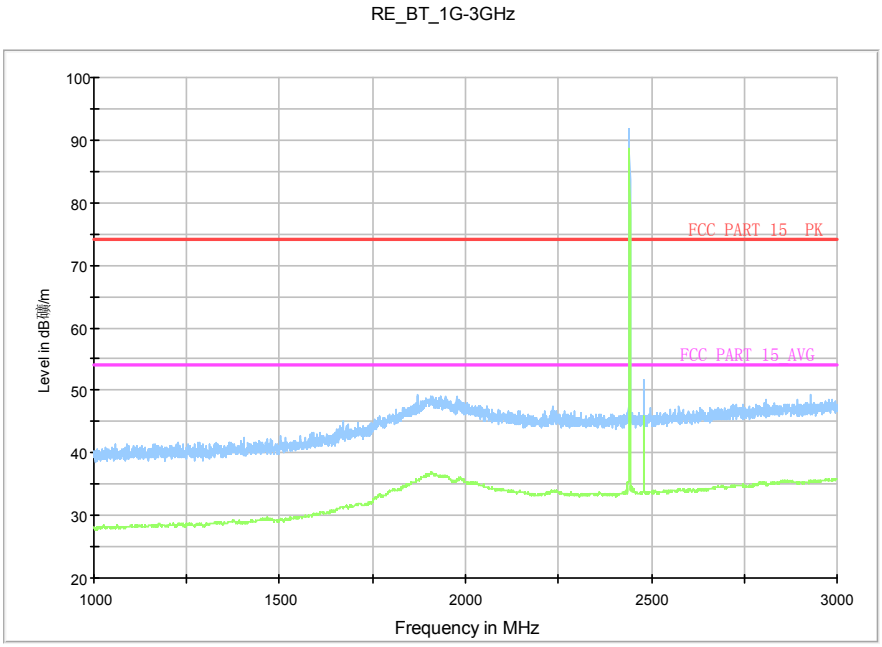


Fig.81. Radiated emission: 8DPSK, Channel 39, 1 GHz - 3 GHz

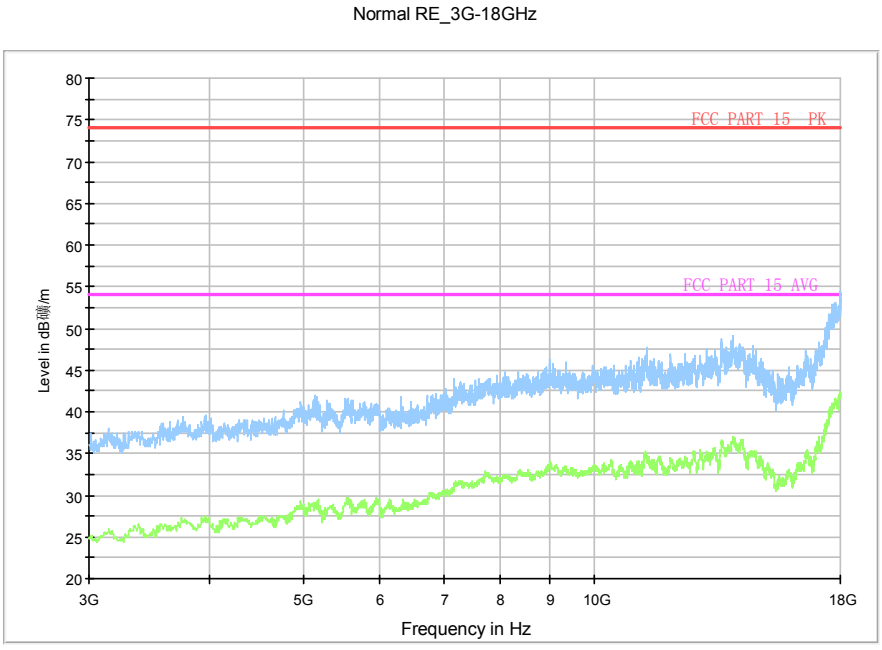


Fig.82. Radiated emission: 8DPSK, Channel 39, 3 GHz - 18 GHz

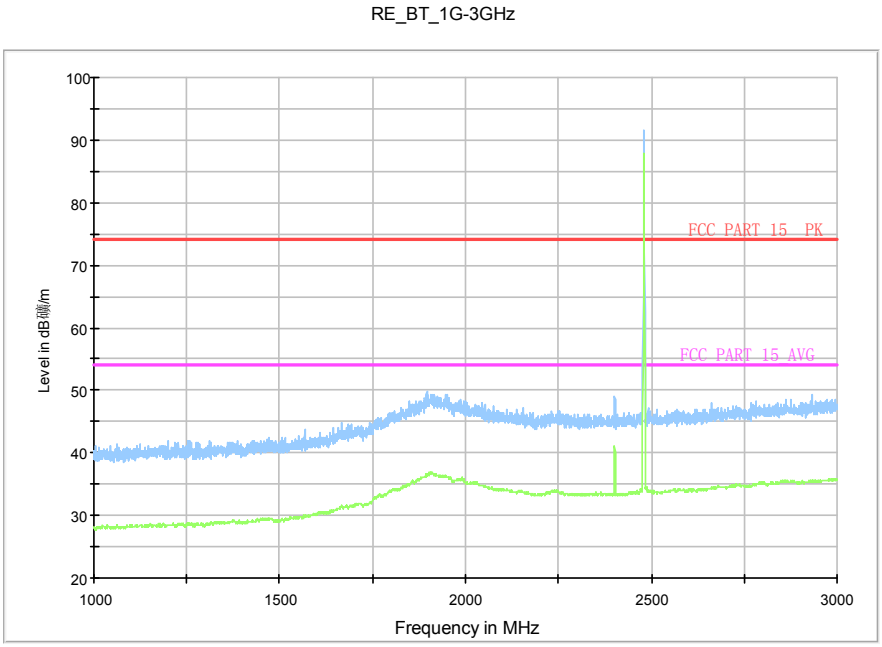


Fig.83. Radiated emission: 8DPSK, Channel 78, 1 GHz - 3 GHz

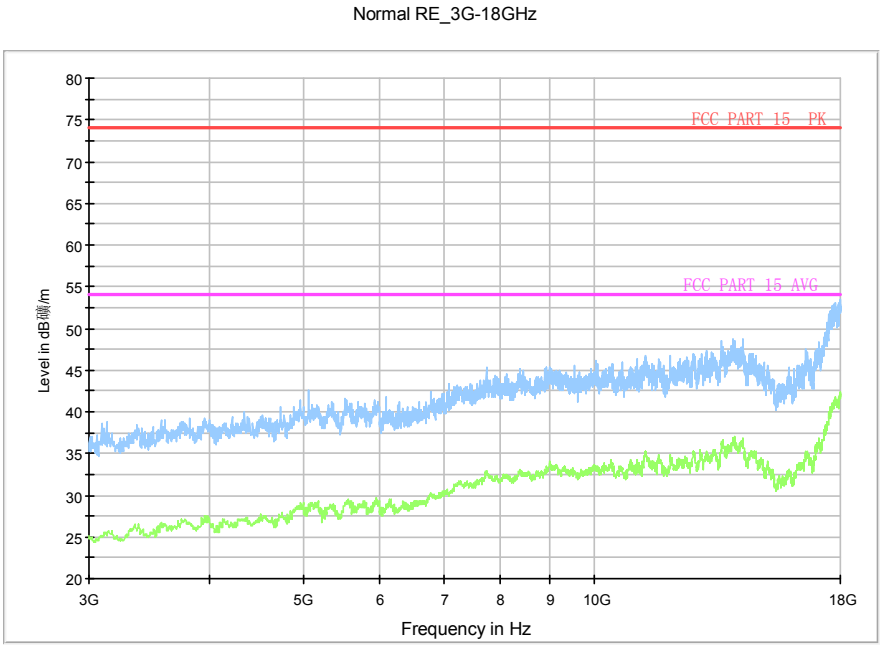


Fig.84. Radiated emission: 8DPSK, Channel 78, 3 GHz - 18 GHz

RE-BT-Power_2.38G-2.43GHz

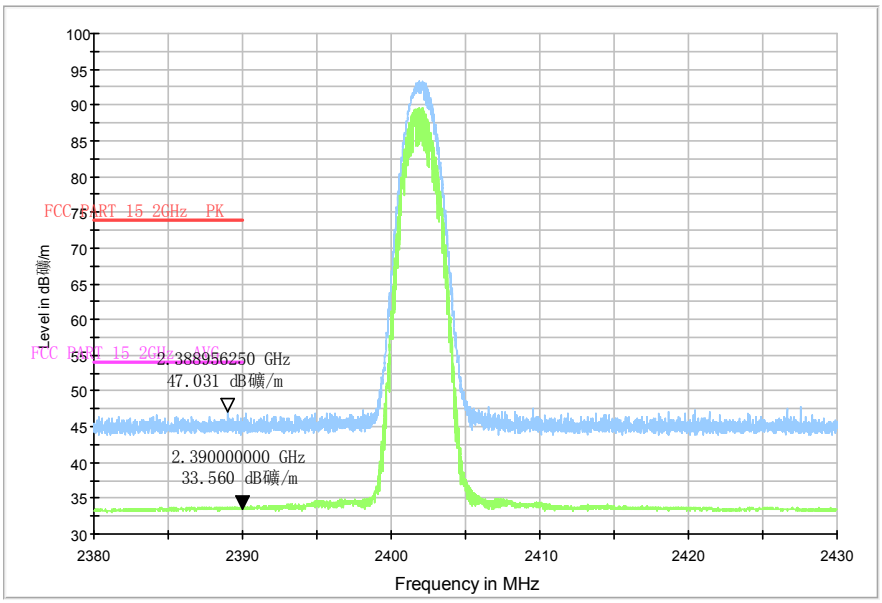


Fig.85. Radiated emission (Power): 8DPSK, low channel

RE-BT-Power_2.45G-2.5GHz

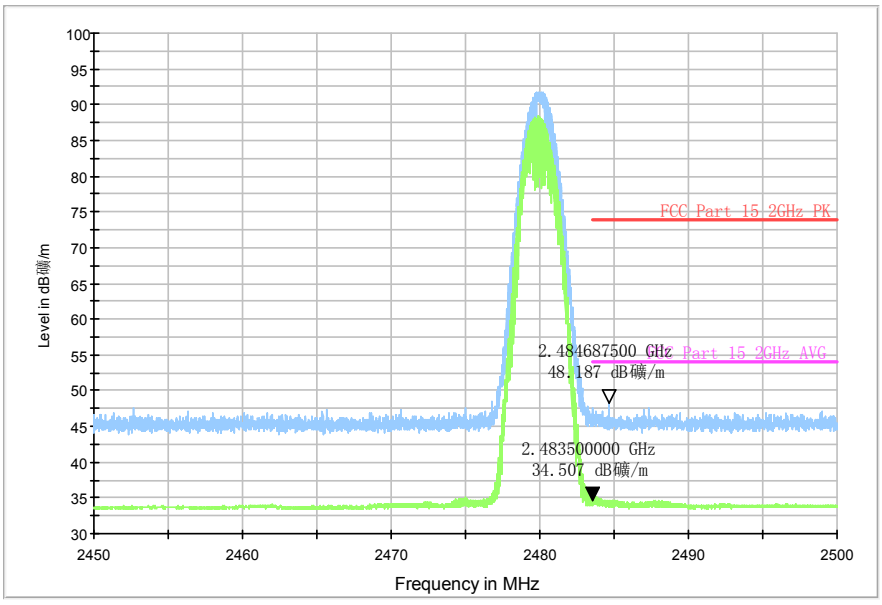


Fig.86. Radiated emission (Power): 8DPSK, high channel

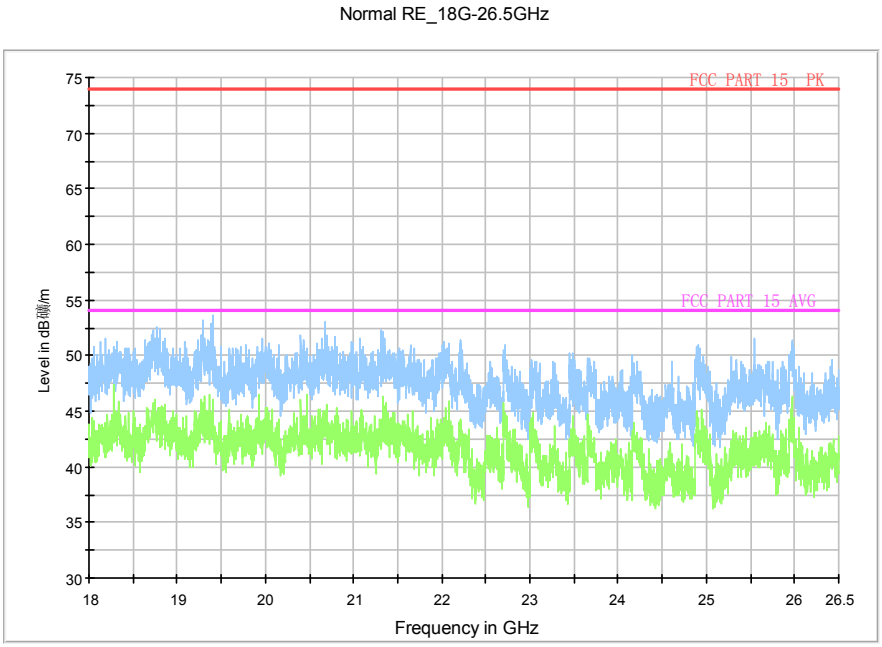


Fig.87. Radiated emission: 8DPSK, 18 GHz - 26 GHz

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

Measure a pulse time in time domain at middle frequency and then count the hopping number in 31.6s(which equals with 0.4 multiply 79) of middle frequency ,then multiply the pulse time and hopping number and record them.

Measurement Result:

For GFSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.88	105.51	P
		Fig.89		
	DH3	Fig.90	172.14	P
		Fig.91		
	DH5	Fig.92	162.00	P
		Fig.93		

For π/4 DQPSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.94	105.85	P
		Fig.95		
	DH3	Fig.96	169.54	P
		Fig.97		
	DH5	Fig.98	206.76	P
		Fig.99		

For 8DPSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.100	108.10	P
		Fig.101		
	DH3	Fig.102	162.60	P
		Fig.103		
	DH5	Fig.104	185.82	P
		Fig.105		

Conclusion: PASS

Test graphs as below:

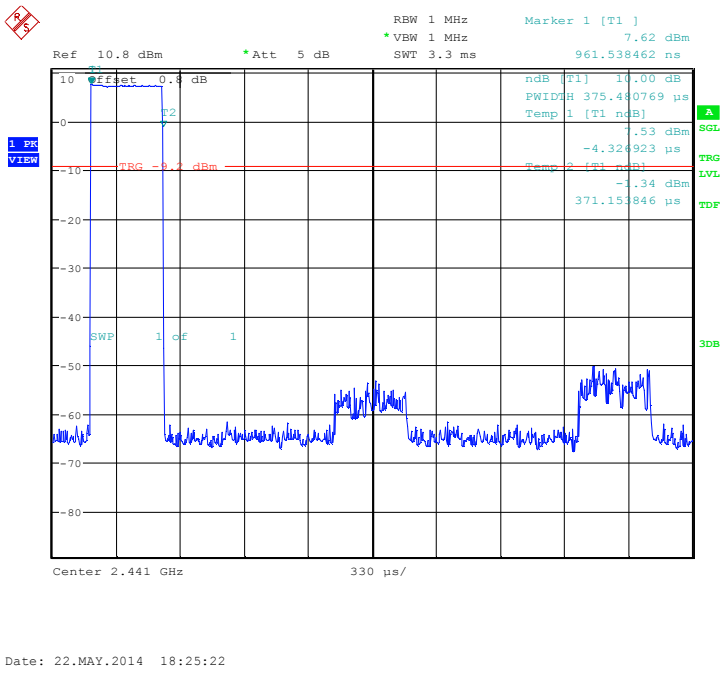


Fig.88. Time of occupancy (Dwell Time): Channel 39, Packet DH1

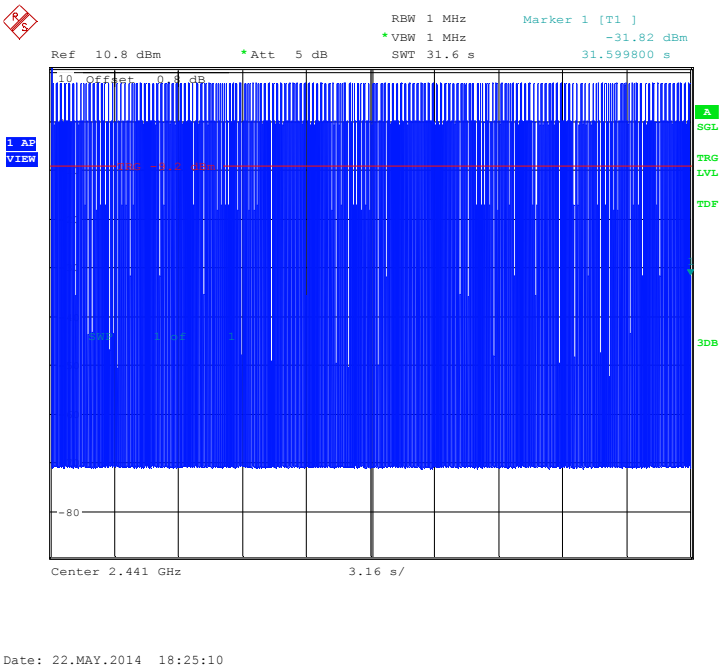


Fig.89. Number of Transmissions Measurement:Channel 39,Packet DH1

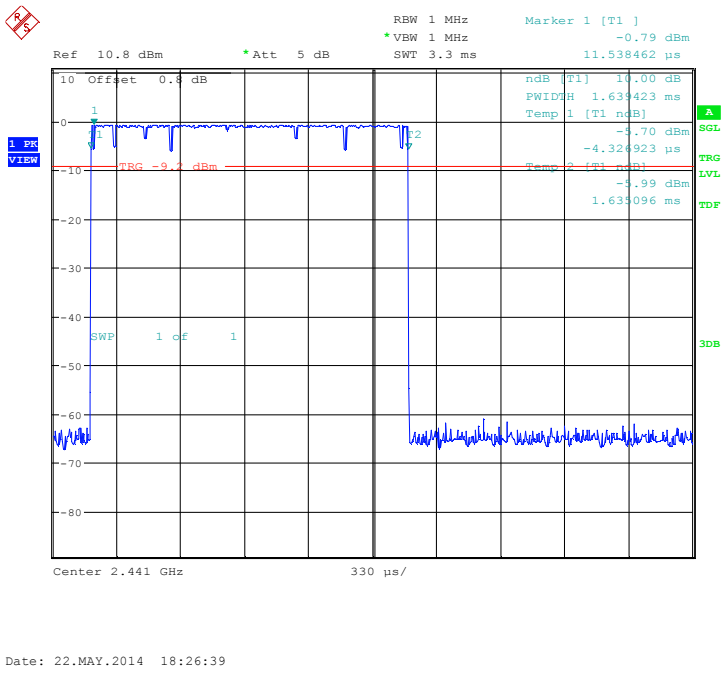


Fig.90. Time of occupancy (Dwell Time): Channel 39, Packet DH3

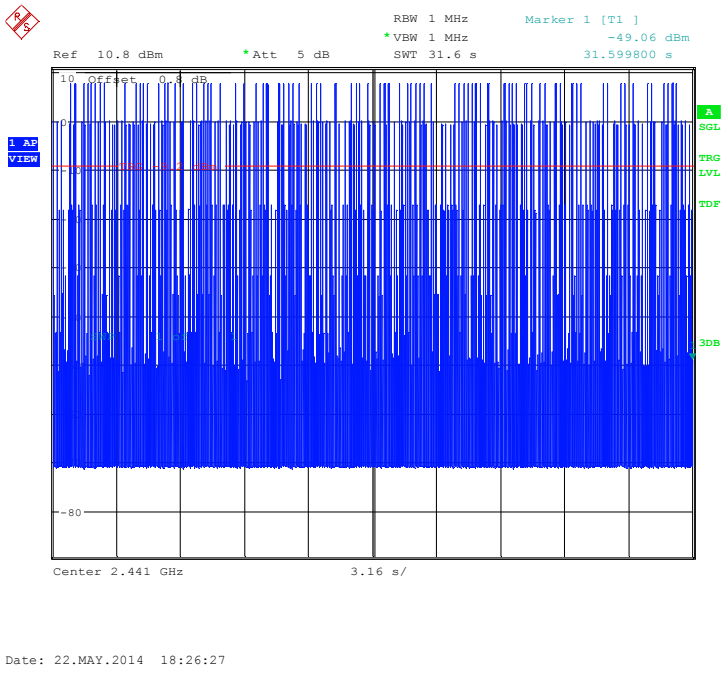


Fig.91. Number of Transmissions Measurement:Channel 39,Packet DH3

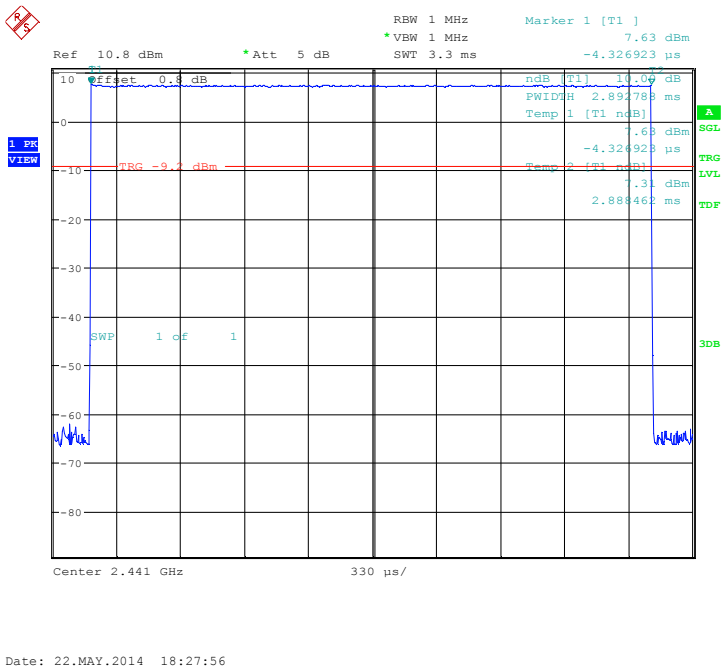


Fig.92. Time of occupancy (Dwell Time): Channel 39, Packet DH5

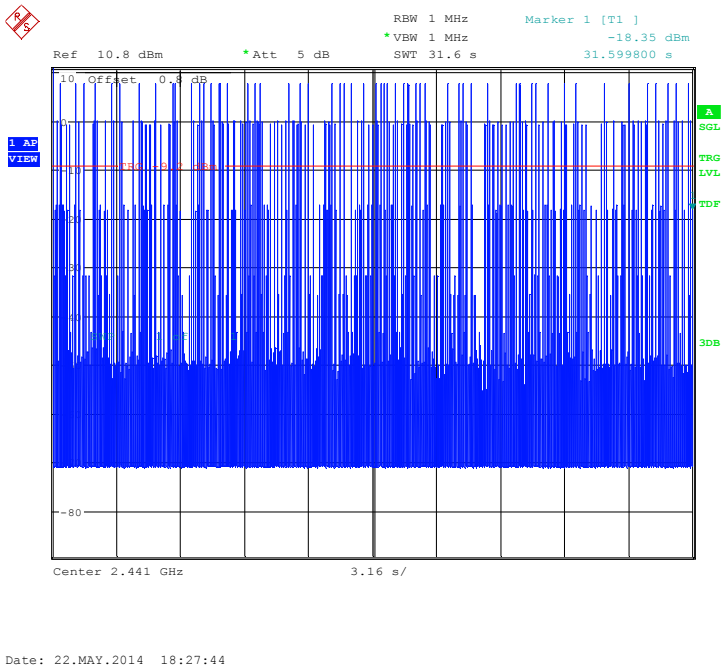


Fig.93. Number of Transmissions Measurement:Channel 39,Packet DH5

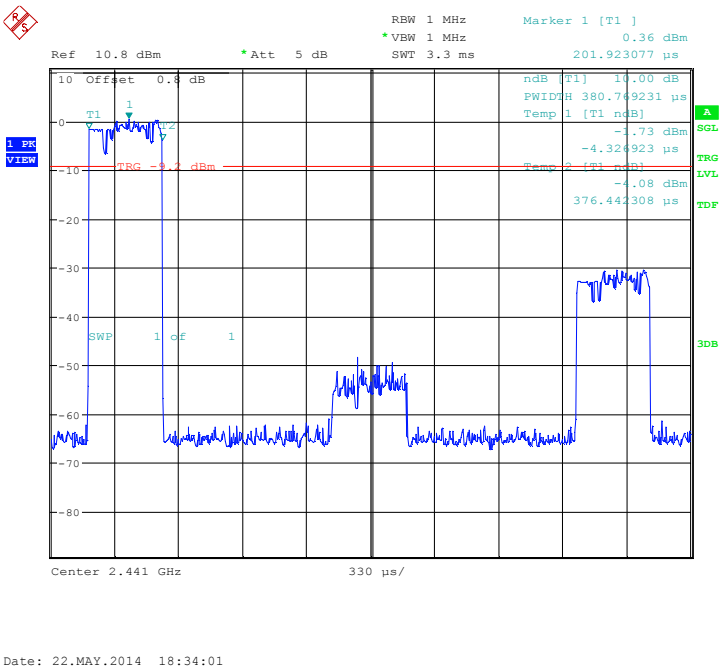


Fig.94. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH1

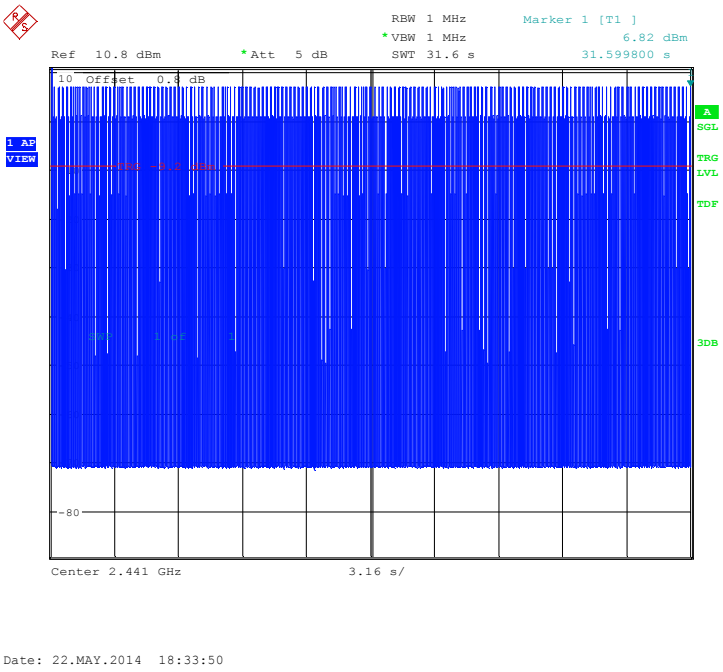


Fig.95. Number of Transmissions Measurement:Channel 39,Packet 2-DH1

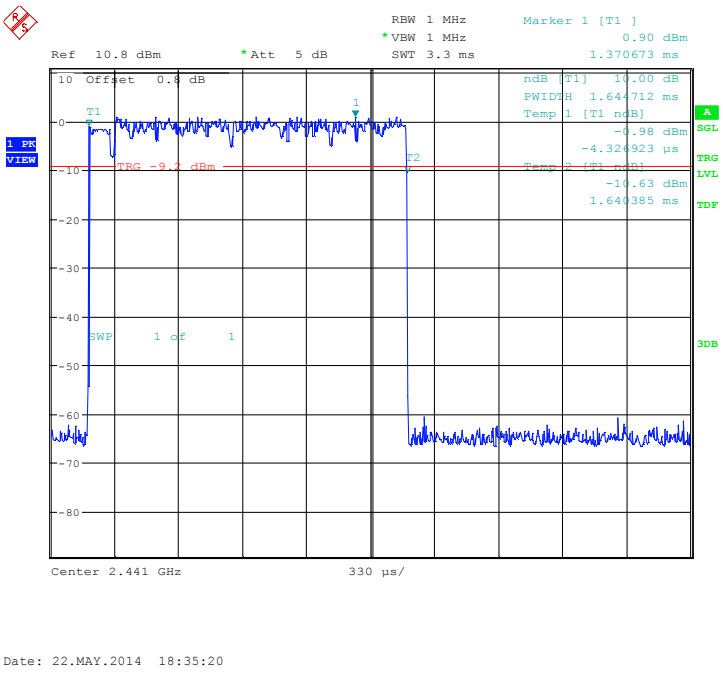


Fig.96. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH3

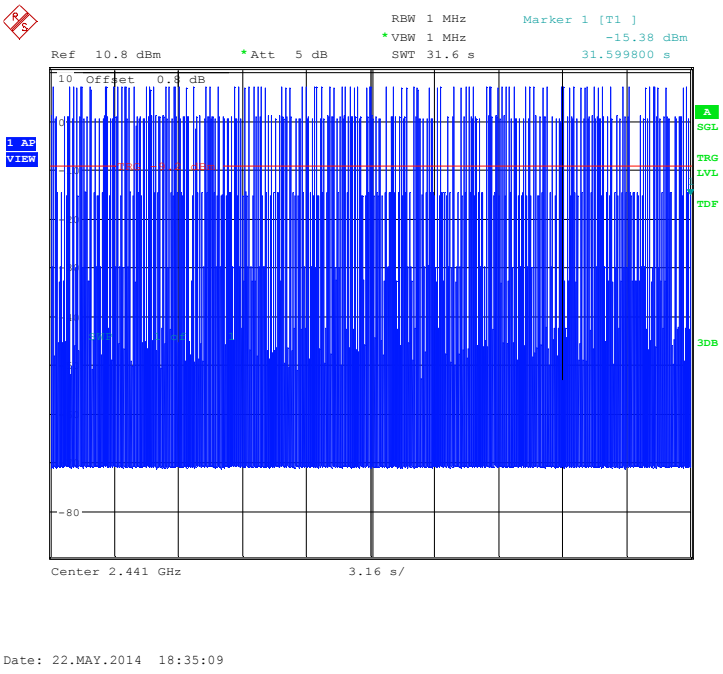


Fig.97. Number of Transmissions Measurement:Channel 39,Packet 2-DH3

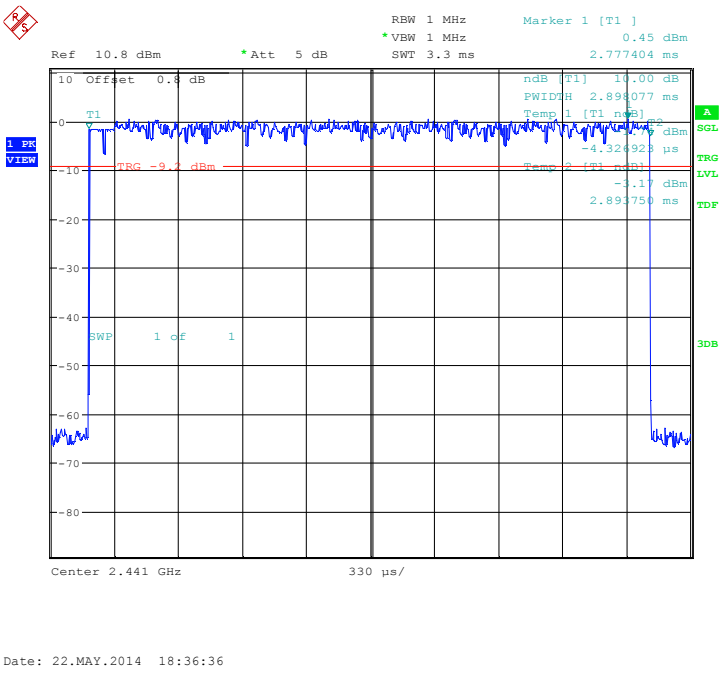


Fig.98. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH5

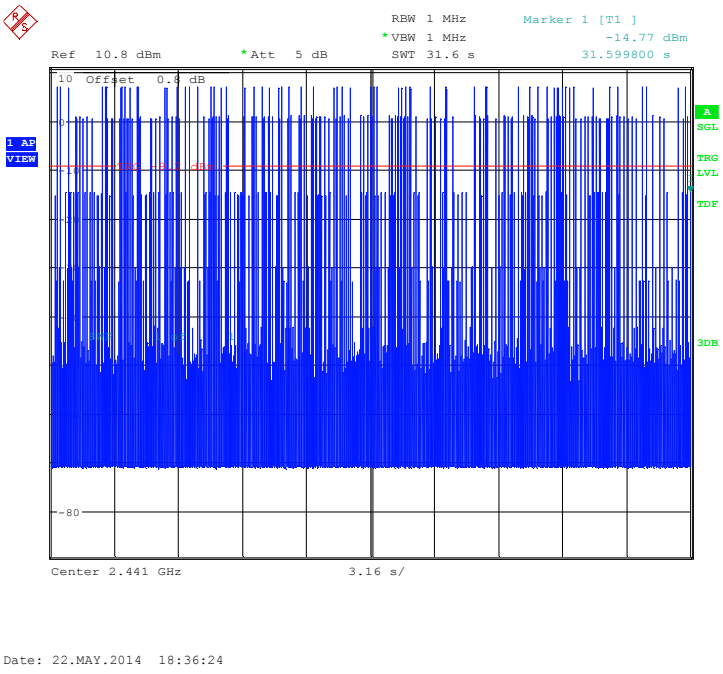


Fig.99. Number of Transmissions Measurement:Channel 39,Packet 2-DH5

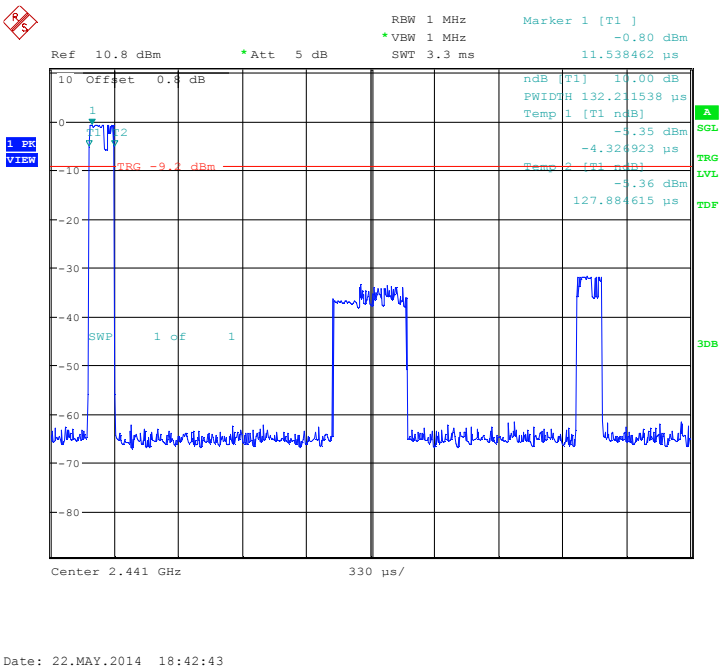


Fig.100. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH1

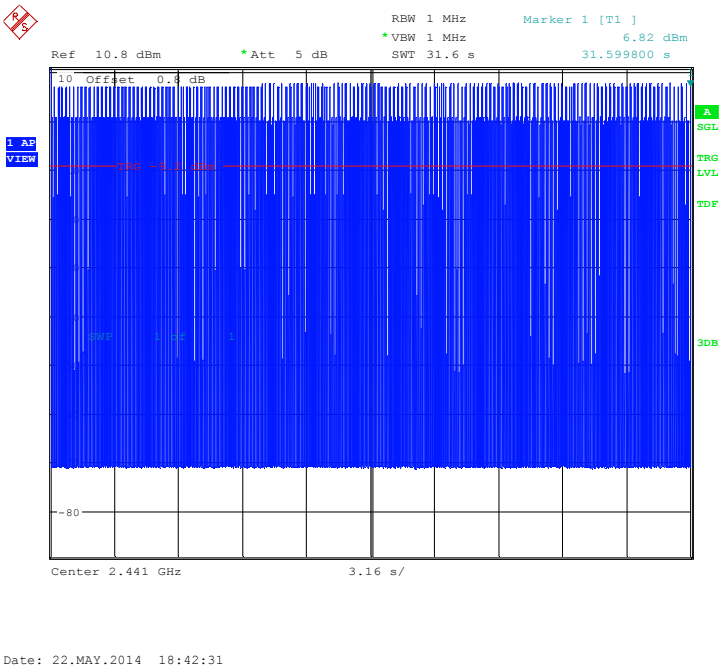


Fig.101. Number of Transmissions Measurement:Channel 39,Packet 3-DH1

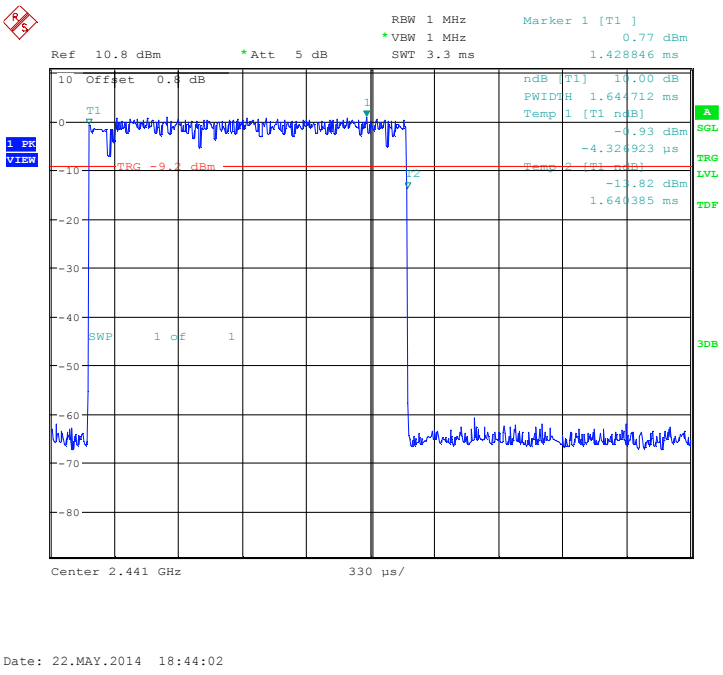


Fig.102. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH3

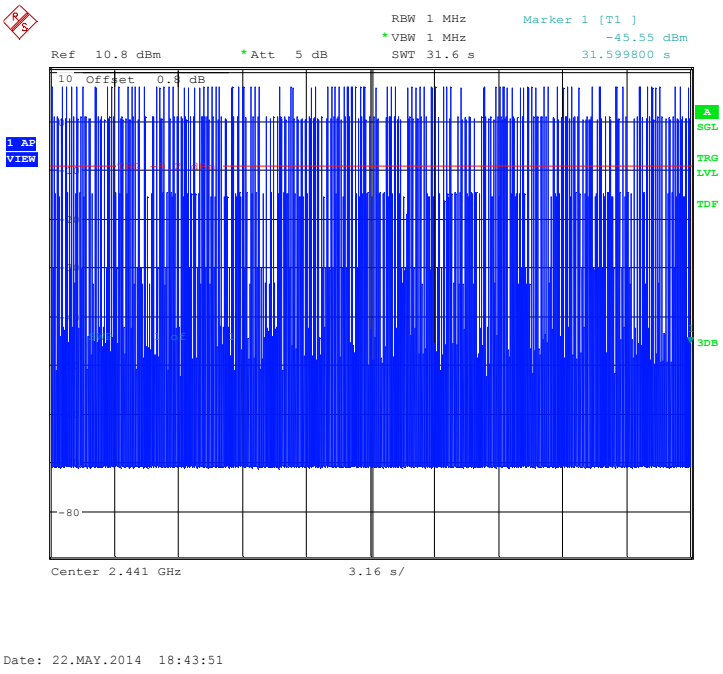


Fig.103. Number of Transmissions Measurement:Channel 39,Packet 3-DH3

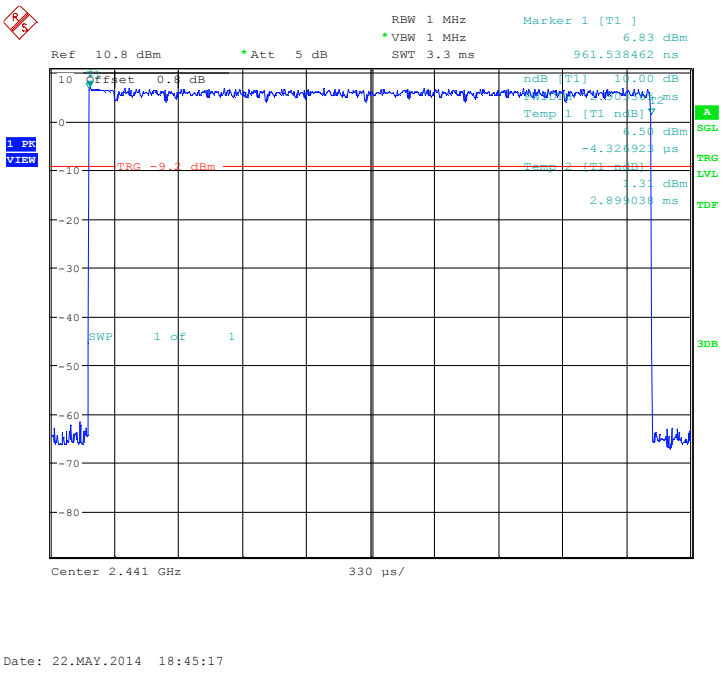


Fig.104. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH5

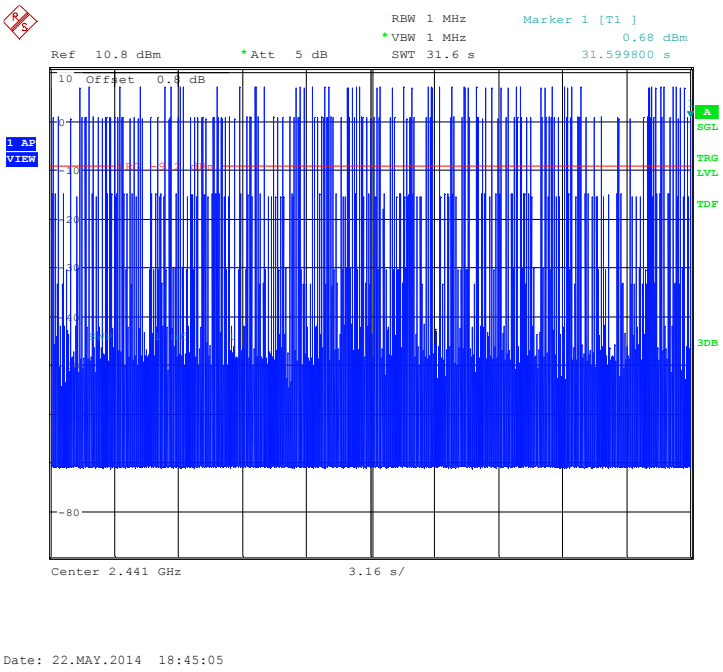


Fig.105. Number of Transmissions Measurement:Channel 39,Packet 3-DH5

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

Test Condition

Hopping Mode	RBW	VBW	SPAN	Sweeptime	Detector	Trace Mode
Hopping OFF	20KHz	100KHz	3MHz	Auto	Peak	Max Hold

Use NdB Down function of the SA to measure the 20dB Bandwidth

* 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.106	826.92	NA
39	Fig.107	870.19	NA
78	Fig.108	870.19	NA

Forπ/4 DQPSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.109	1269.23	NA
39	Fig.110	1259.62	NA
78	Fig.111	1274.04	NA

For 8DPSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.112	1259.62	NA
39	Fig.113	1274.04	NA
78	Fig.114	1264.42	NA

Conclusion: NA

Test graphs as below:

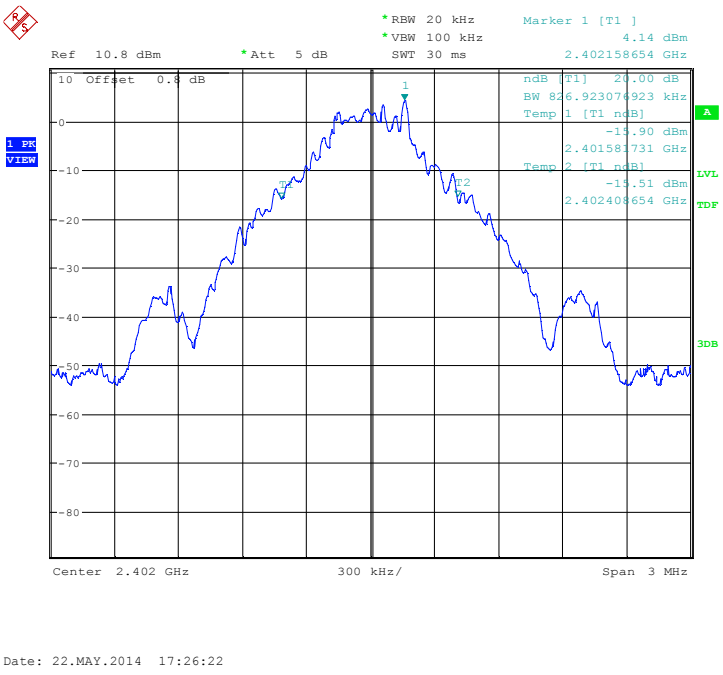


Fig.106. 20dB Bandwidth: GFSK, Channel 0

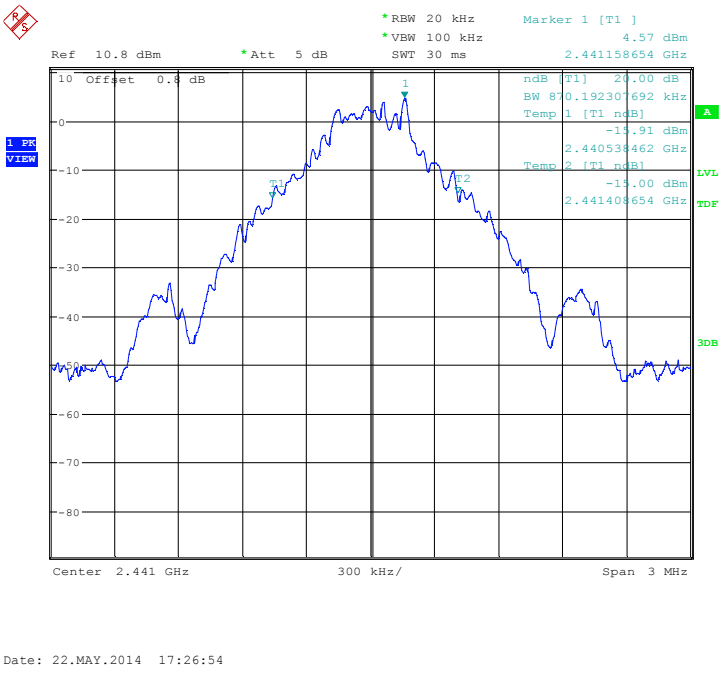


Fig.107. 20dB Bandwidth: GFSK, Channel 39

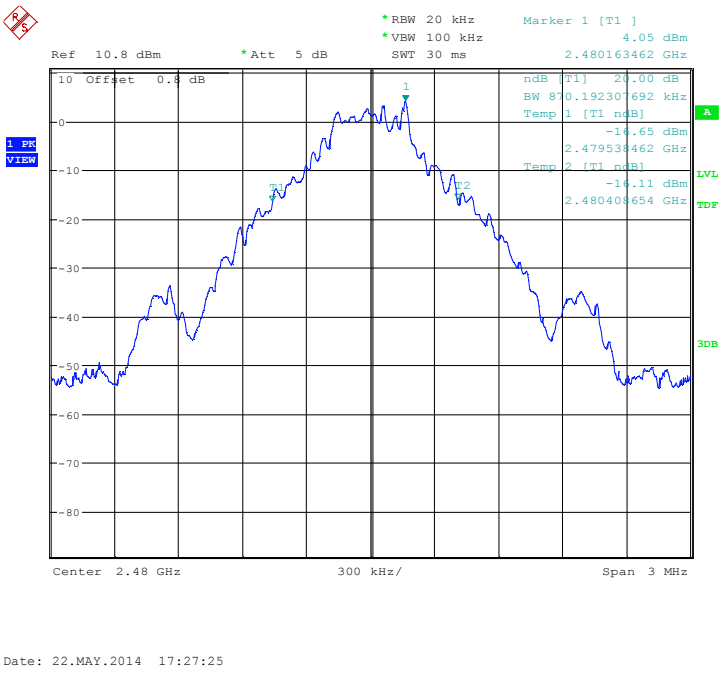


Fig.108. 20dB Bandwidth: GFSK, Channel 78

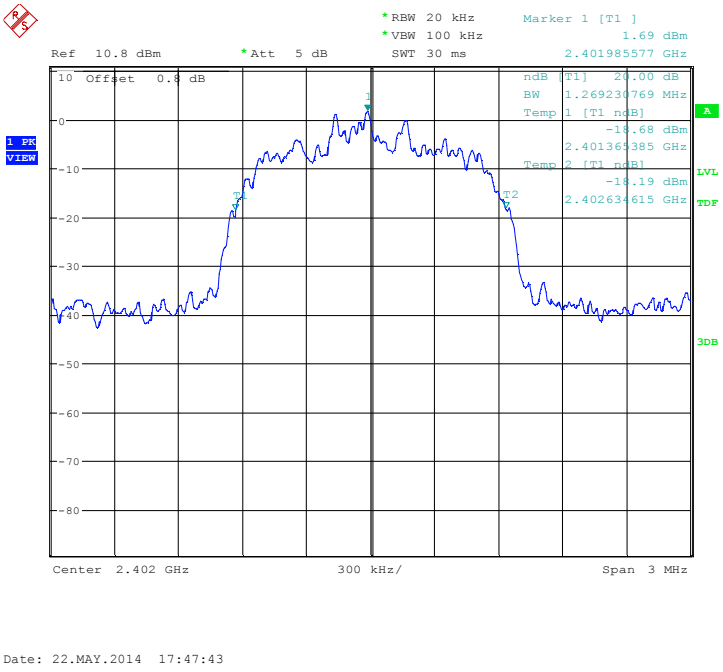


Fig.109. 20dB Bandwidth: π/4 DQPSK, Channel 0

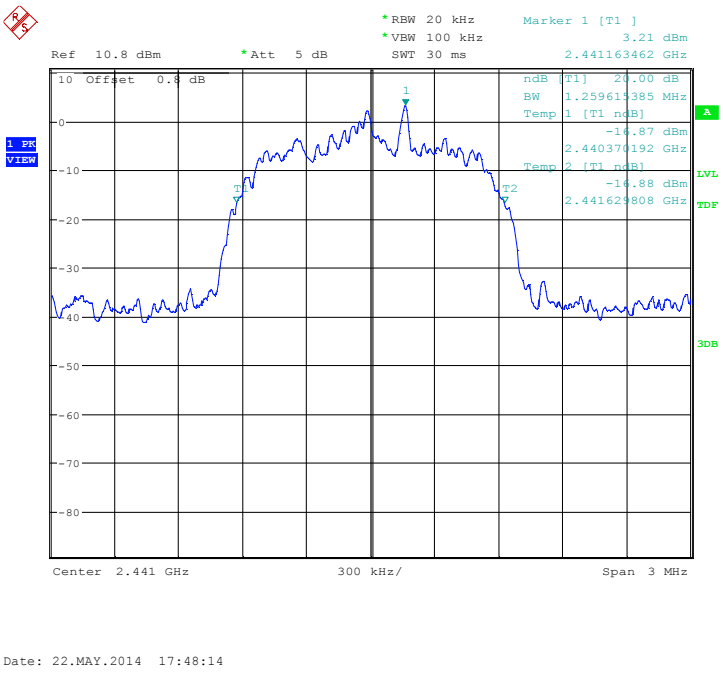


Fig.110. 20dB Bandwidth: π/4 DQPSK, Channel 39

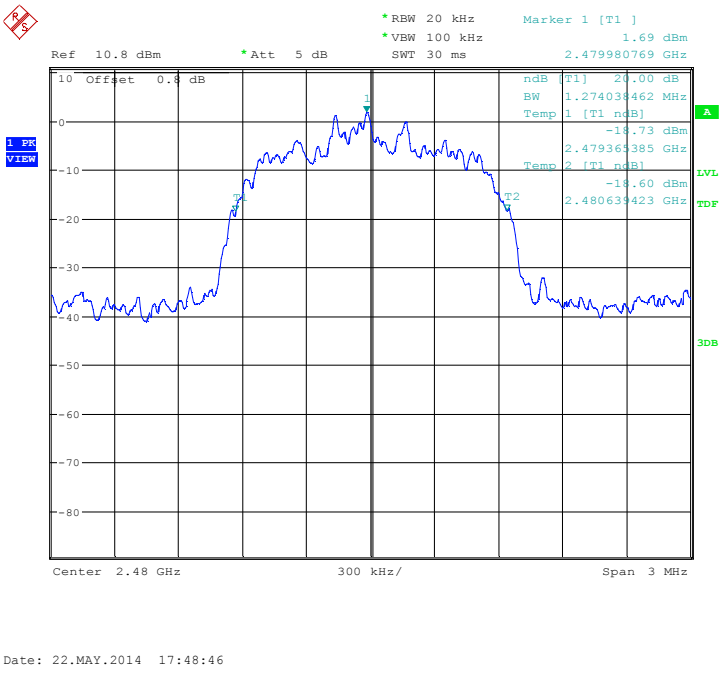


Fig.111. 20dB Bandwidth: π/4 DQPSK, Channel 78

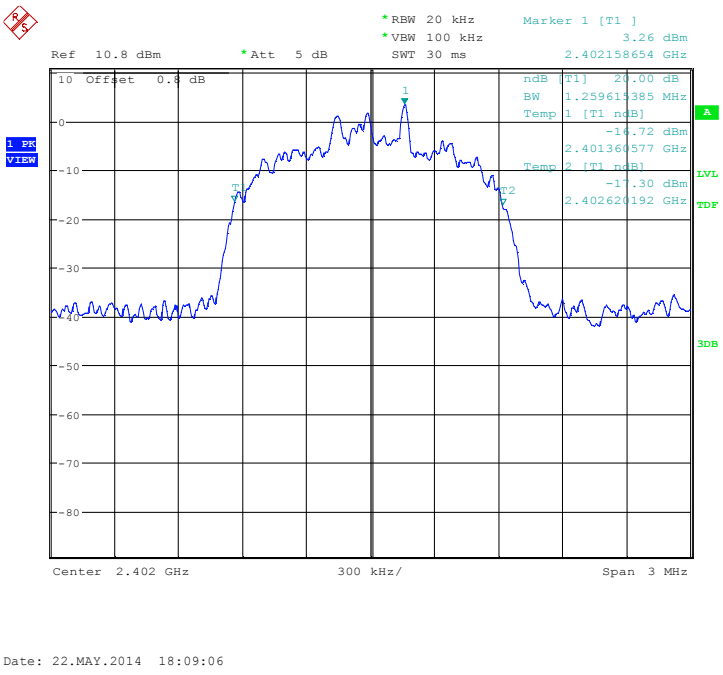


Fig.112. 20dB Bandwidth: 8DPSK, Channel 0

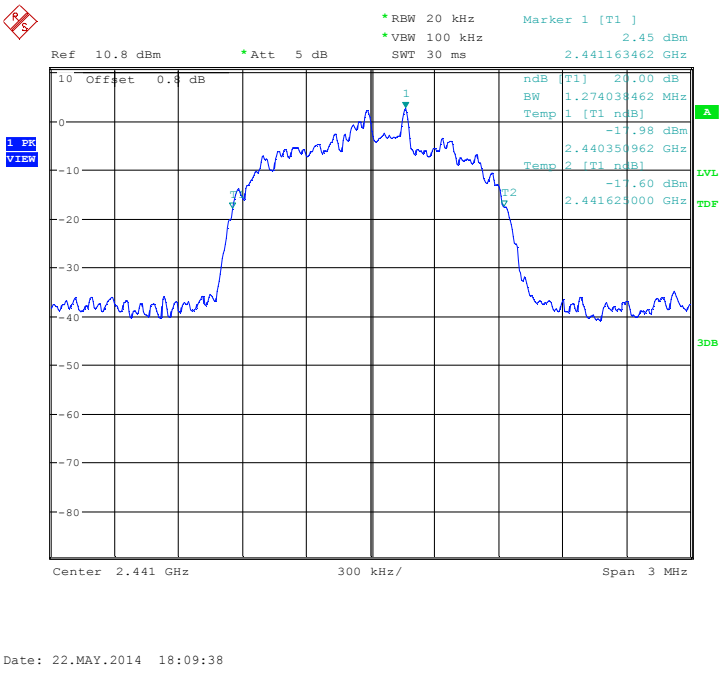


Fig.113. 20dB Bandwidth: 8DPSK, Channel 39

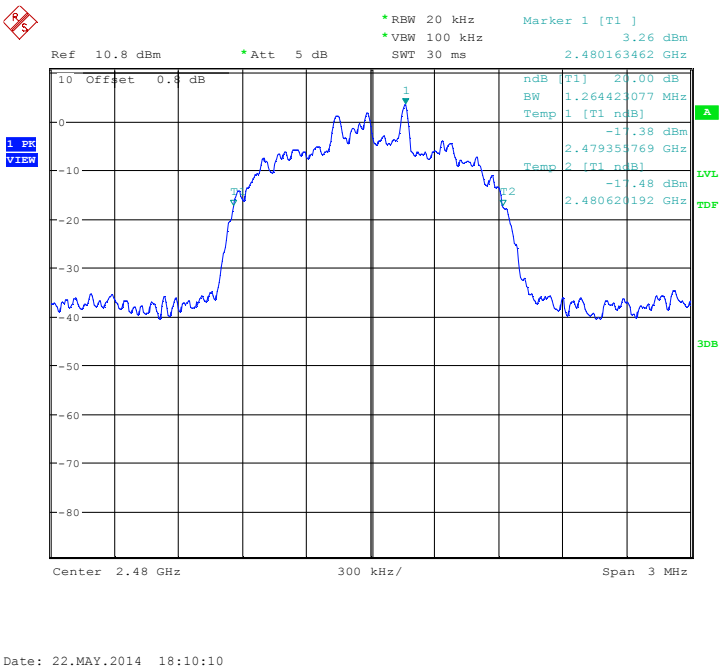


Fig.114. 20dB Bandwidth: 8DPSK, Channel 78

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

Test Condition

Hopping Mode	RBW	VBW	SPAN	Sweeptime	Detector	Trace Mode
Hopping ON	300KHz	1MHz	3MHz	Auto	Peak	Max Hold

Search the peak marks of the middle frequency and adjacent channel, the record the separation between them.

* 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.115	812.5	P

For π/4 DQPSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.116	793.27	P

For 8DPSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.117	692.31	P

Conclusion: PASS

Test graphs as below:

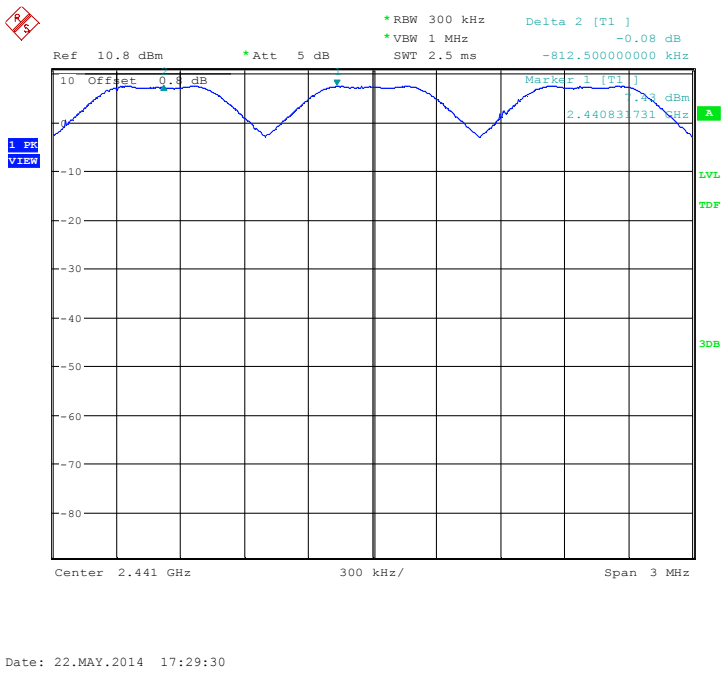


Fig.115. Carrier frequency separation measurement: GFSK, Channel 39

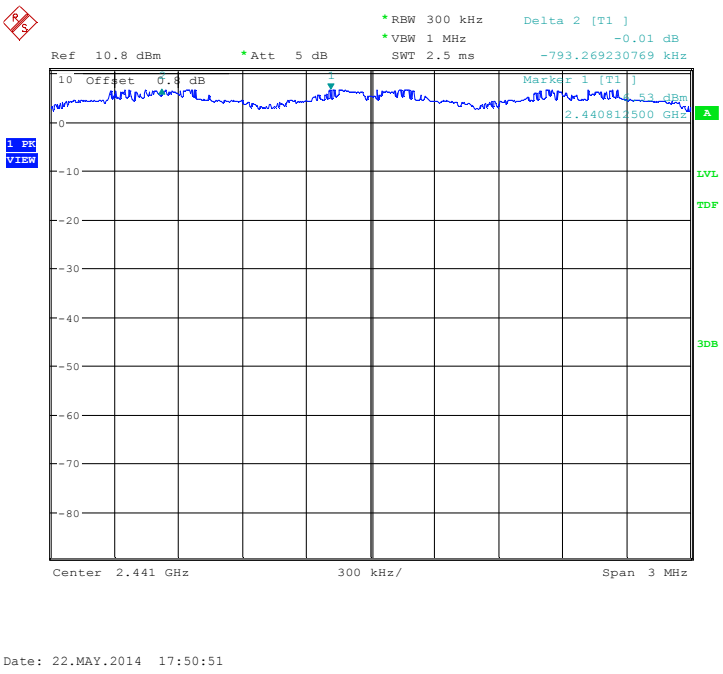


Fig.116. Carrier frequency separation measurement: π/4 DQPSK, Channel 39

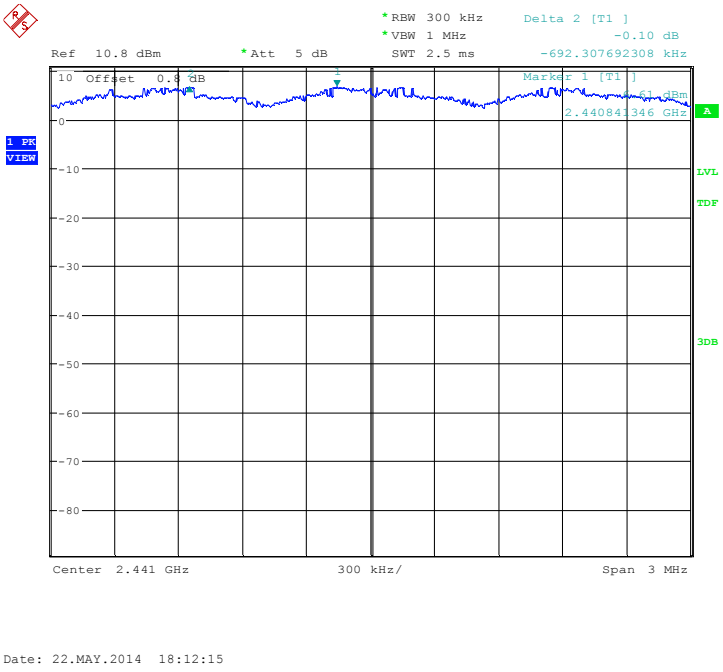


Fig.117. Carrier frequency separation measurement: 8DPSK, Channel 39

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

Test Condition

Hopping Mode	RBW	VBW	Sweeptime	Detector	Trace Mode
Hopping ON	500KHz	500KHz	Auto	Peak	Max Hold

Measurement Result:

For GFSK

Channel	Number of hopping channels		Conclusion
0~39	Fig.118	79	P
40~78	Fig.119		

Forπ/4 DQPSK

Channel	Number of hopping channels		Conclusion
0~39	Fig.120	79	P
40~78	Fig.121		

For 8DPSK

Channel	Number of hopping channels		Conclusion
0~39	Fig.122	79	P
40~78	Fig.123		

Conclusion: PASS

Test graphs as below:

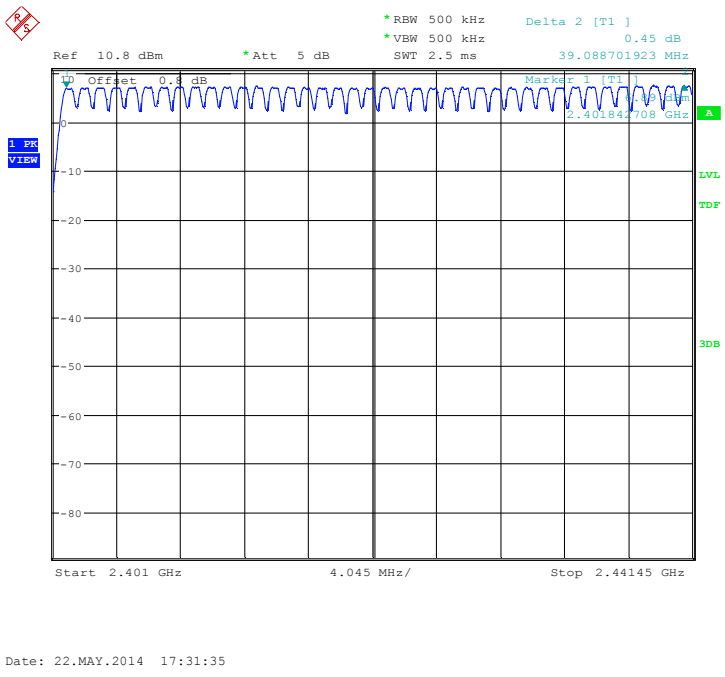


Fig.118. Number of hopping frequencies: GFSK, Channel 0 - 39

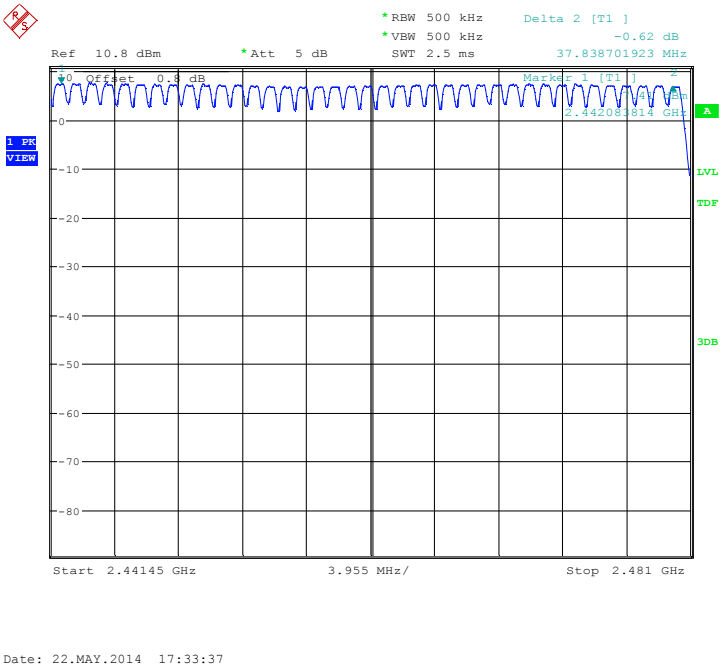


Fig.119. Number of hopping frequencies: GFSK, Channel 40 - 78

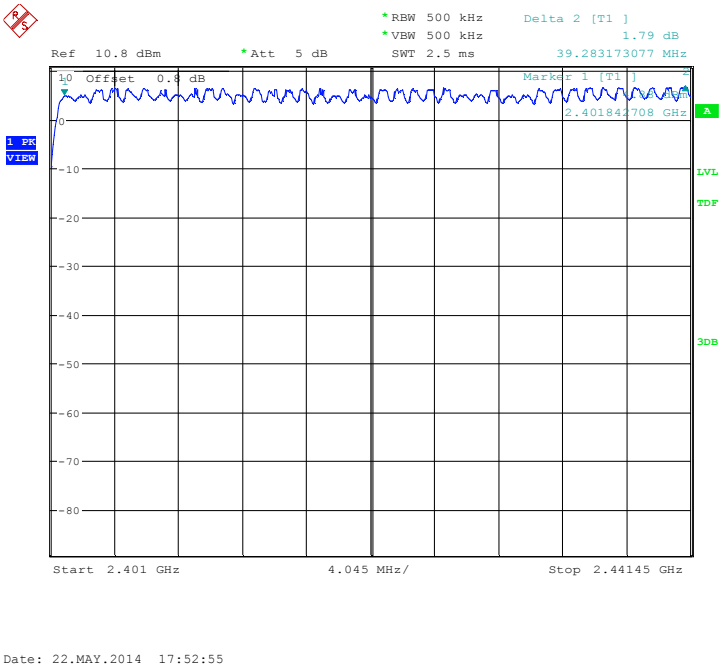


Fig.120. Number of hopping frequencies: π/4 DQPSK, Channel 0 - 39

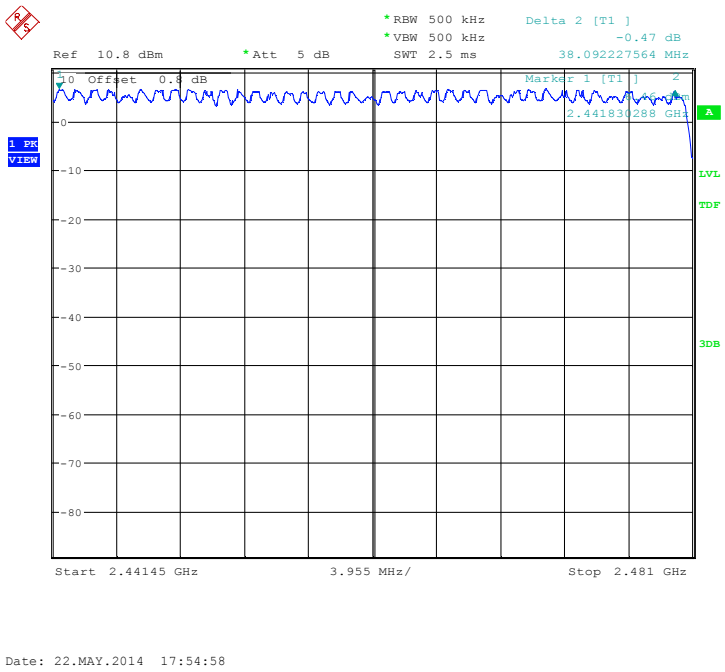


Fig.121. Number of hopping frequencies: π/4 DQPSK, Channel 40 - 78

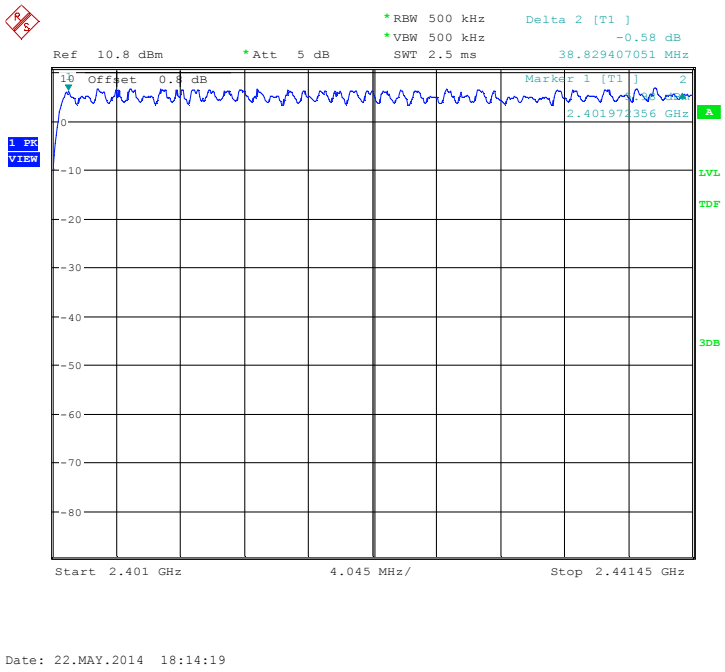


Fig.122. Number of hopping frequencies: 8DPSK, Channel 0 - 39

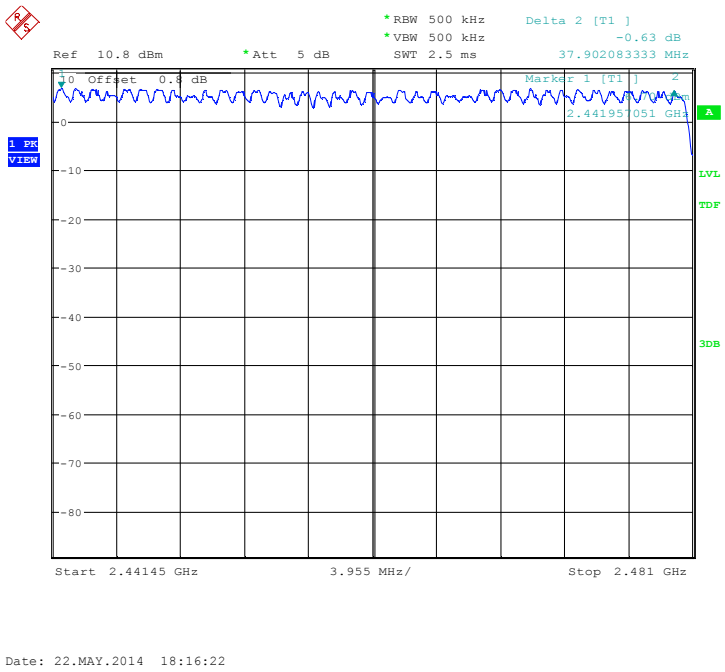


Fig.123. Number of hopping frequencies: 8DPSK, Channel 40 - 78

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)

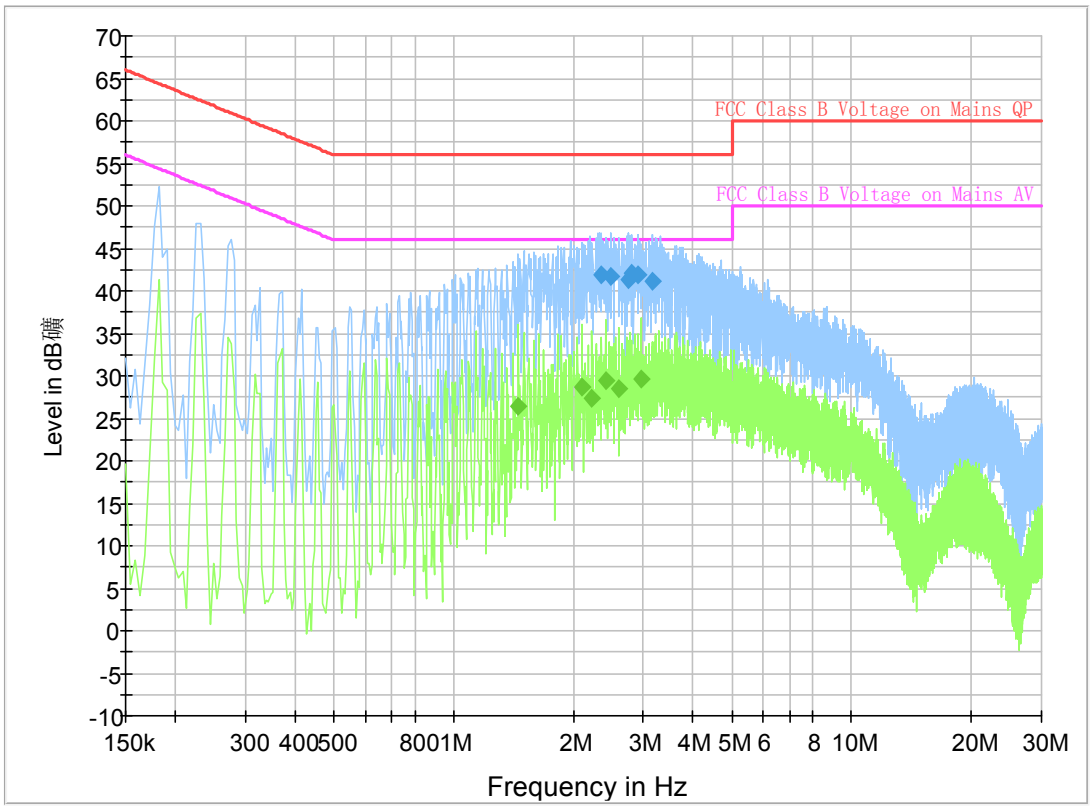
Frequency range (MHz)	Average Limit (dBμV)	Conclusion
0.15 to 0.5	56 to 46	P
0.5 to 5	46	
5 to 30	50	
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.		

The measurement is made according to ANSI C63.10

Conclusion: PASS

Test graphs as below:

Traffic:

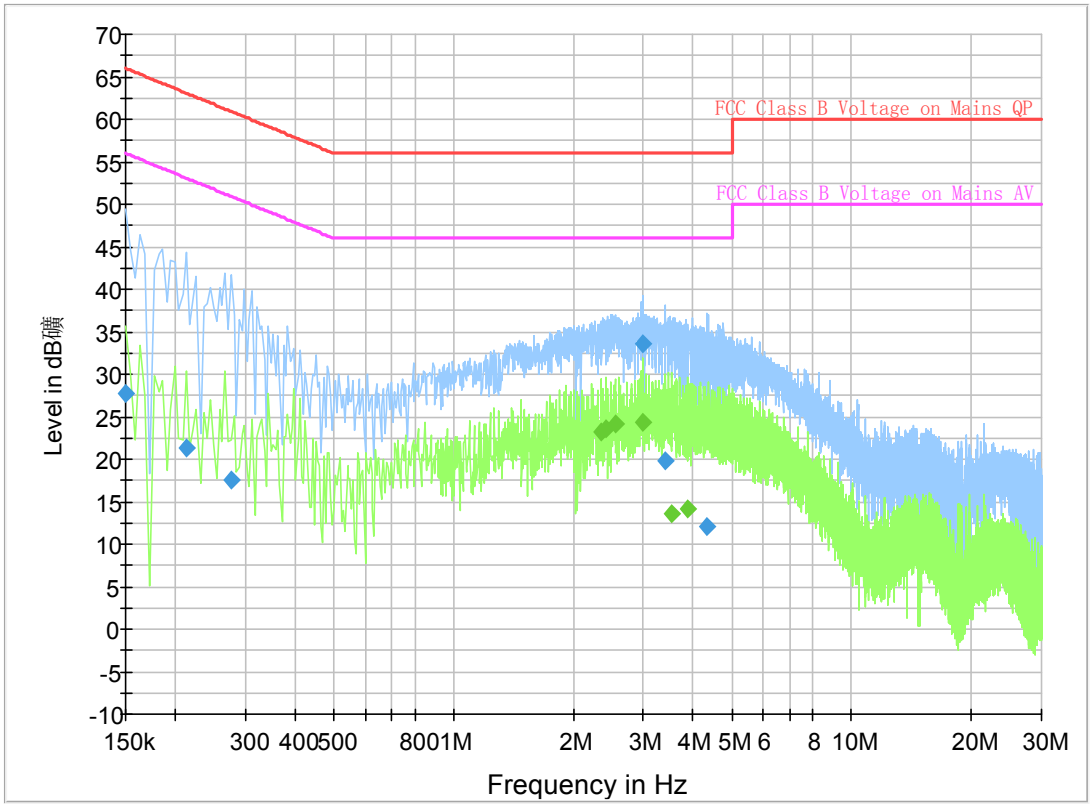


Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
2.359500	41.9	GND	L1	9.7	14.1	56.0
2.476500	41.8	GND	L1	9.7	14.2	56.0
2.751000	41.4	GND	L1	9.7	14.6	56.0
2.809500	42.1	GND	L1	9.7	13.9	56.0
2.899500	41.9	GND	L1	9.7	14.1	56.0
3.160500	41.1	GND	L1	9.7	14.9	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
1.455000	26.3	GND	L1	9.7	19.7	46.0
2.098500	28.7	GND	L1	9.7	17.3	46.0
2.229000	27.3	GND	L1	9.7	18.7	46.0
2.404500	29.4	GND	L1	9.7	16.6	46.0
2.593500	28.4	GND	L1	9.7	17.6	46.0
2.958000	29.5	GND	L1	9.7	16.5	46.0



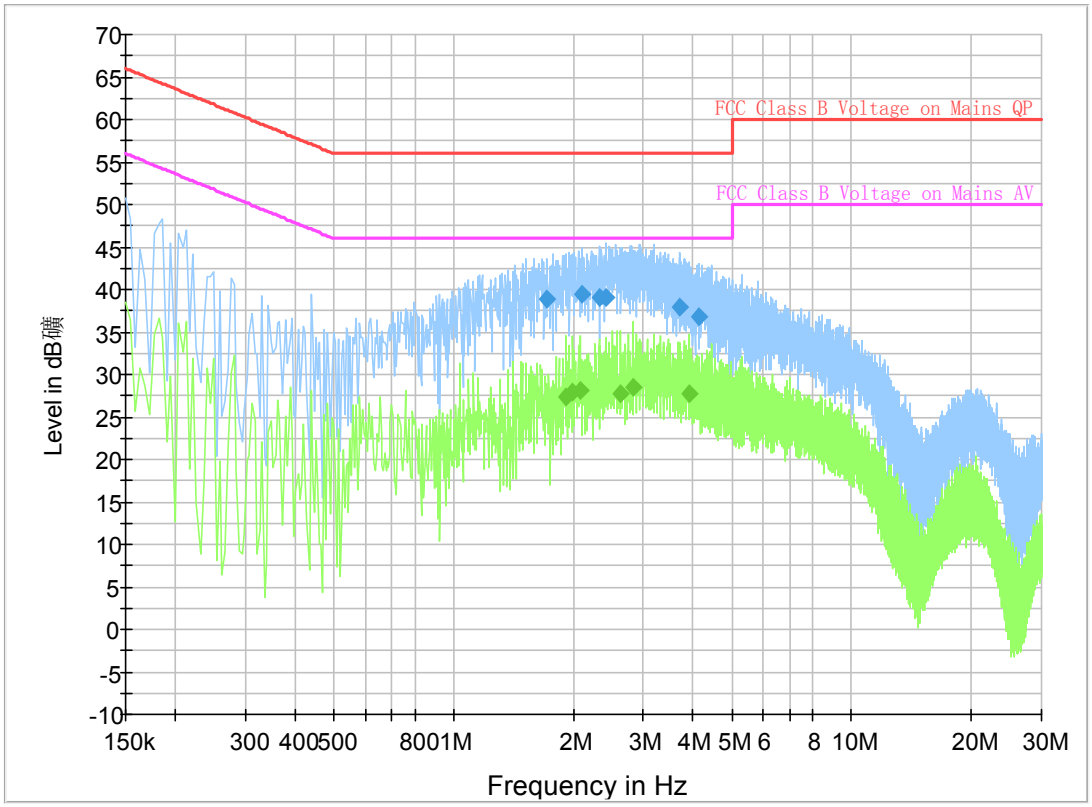
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	27.8	GND	N	9.8	38.2	66.0
0.213000	21.4	GND	N	9.8	41.7	63.1
0.276000	17.6	GND	N	9.8	43.4	60.9
2.980500	33.5	GND	L1	9.7	22.5	56.0
3.403500	19.7	GND	L1	9.7	36.3	56.0
4.348500	12.1	GND	N	9.7	43.9	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
2.355000	23.2	GND	L1	9.7	22.8	46.0
2.413500	23.7	GND	L1	9.7	22.4	46.0
2.544000	24.2	GND	L1	9.7	21.8	46.0
2.980500	24.3	GND	L1	9.7	21.7	46.0
3.534000	13.6	GND	L1	9.7	32.4	46.0
3.880500	14.1	GND	L1	9.7	31.9	46.0

Idle:



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
1.716000	38.8	GND	L1	9.7	17.2	56.0
2.098500	39.4	GND	L1	9.7	16.6	56.0
2.319000	39.1	GND	L1	9.7	16.9	56.0
2.404500	39.1	GND	L1	9.7	16.9	56.0
3.714000	37.9	GND	L1	9.7	18.1	56.0
4.119000	36.7	GND	L1	9.7	19.3	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
1.918500	27.3	GND	L1	9.7	18.7	46.0
1.995000	28.0	GND	L1	9.7	18.0	46.0
2.085000	28.0	GND	L1	9.7	18.0	46.0
2.625000	27.7	GND	L1	9.7	18.3	46.0
2.814000	28.6	GND	L1	9.7	17.4	46.0
3.903000	27.7	GND	L1	9.7	18.3	46.0

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