



FCC PART 15C TEST REPORT No. I16Z42402-SRD05

for

TCL Communication Ltd.

LTE / UMTS / GSM mobile phone

Model Name: VFD502

FCC ID: 2ACCJH049

with

Hardware Version: PIO

Software Version: 8FI2

Issued Date: 2017-1-10



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TESTING
CNAS L0570

Note:

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

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I16Z42402-SRD05	Rev.0	1st edition	2017-1-10

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1. Test Laboratory

1.1. Testing Location

Location 1:CTTL(huayuan North Road)

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

Location 2:CTTL(Shouxiang)

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

1.2. Testing Environment

Normal Temperature: 15-35°C

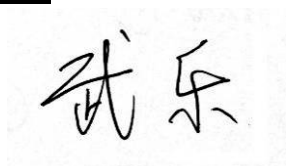
Relative Humidity: 20-75%

1.3. Project data

Testing Start Date: 2016-4-6

Testing End Date: 2017-1-10

1.4. Signature



Wu Le

(Prepared this test report)



Sun Zhenyu

(Reviewed this test report)



Li Zhuofang

(Approved this test report)



2. Client Information

2.1. Applicant Information

Company Name: TCL Communication Ltd.
Address /Post: 5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park,
Pudong Area Shanghai, P.R. China. 201203
City: Shanghai
Postal Code: 201203
Country: China
Telephone: 0086-21-31363544
Fax: 0086-21-61460602

2.2. Manufacturer Information

Company Name: TCL Communication Ltd.
Address /Post: 5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park,
Pudong Area Shanghai, P.R. China. 201203
City: Shanghai
Postal Code: 201203
Country: China
Telephone: 0086-21-31363544
Fax: 0086-21-61460602

3. Equipment UnderTest (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Description	LTE / UMTS / GSM mobile phone
Model Name	VFD502
FCC ID	2ACCJH049
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

3.2. Internal Identification of EUT

EUT ID*	SN or IMEI	HW Version	SW Version
EUT1	014698000200142	PIO	8FI2
EUT2		PIO	8FI2

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

3.3. Internal Identification of AE

AE ID*	Description		
AE1	battery	/	/
AE2	battery	/	/
AE3	Travel charger	/	16TCT-CH-0485
AE4	Travel charger	/	15TCT-CH-0865
AE5	Travel charger	/	16TCT-CH-0478
AE51	USB cable	/	16TCT-DC-0148
AE1			
Model	CAB2000047C1		
Manufacturer	BYD		
Capacitance	2000 mAh		
Nominal voltage	3.8V		
AE2			
Model	CAB2000013C2		
Manufacturer	SCUD		
Capacitance	2000 mAh		
Nominal voltage	3.8V		
AE3			
Model	CBA0066AA4C1		
Manufacturer	BYD		
Length of cable	/		

AE4	
Model	CBA3068AB1C1
Manufacturer	BYD
Length of cable	/
AE5	
Model	CBA3068AA1C4
Manufacturer	Aohai
Length of cable	/
AE51	
Model	CDA6050000C8
Manufacturer	PUAN
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 LTE / UMTS / GSM mobile phone with integrated antenna. It consists of normal options: lithium battery, charger. Manual and specifications of the EUT were provided to fulfill 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.

Reference	Title	Version
FCC Part15	FCC CFR 47, Part 15, Subpart C:	2015
	15.205 Restricted bands of operation;	
	15.209 Radiated emission limits, general requirements;	
	15.247 Operation within the bands 902–928MHz,	
ANSI C63.10	2400–2483.5 MHz, and 5725–5850 MHz.	June,2013
	American National Standard for Testing Unlicensed Wireless Devices	

5. Test Results

5.1. 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 CTTL

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.

5.2. Statements

CTTL has evaluated the test cases requested by the applicant /manufacturer as listed in section 5.1 of this report for the EUT specified in section 3 according to the standards or reference documents listed in section 4.2

This model is a variant product which model name is VFD500; all the test result has been derived from test report of VFD500 besides Radiated Transmitter Spurious Emission and AC Powerline Conducted Emission.

6. Test Facilities Utilized

Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Vector Signal Analyzer	FSQ26	200136	Rohde & Schwarz	1 year	2017-10-25
2	Bluetooth Tester	CBT32	100649	Rohde & Schwarz	1 year	2017-10-26
3	Shielding Room	S81	/	ETS-Lindgren	/	/
4	LISN	ENV216	101200	Rohde & Schwarz	1 year	2017-07-10
5	Test Receiver	ESCI	100344	Rohde & Schwarz	1 year	2017-07-05

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Test Receiver	ESU26	100235	Rohde & Schwarz	1 year	2017-03-02
2	Loop antenna	HFH2-Z2	829324/00 7	Rohde & Schwarz	3 years	2017-12-16
3	BiLog Antenna	VULB9163	301	Schwarzbeck	3 years	2017-12-16
4	Dual-Ridge Waveguide Horn Antenna	3115	6914	EMCO	3 years	2017-12-15
5	Dual-Ridge Waveguide Horn Antenna	3116	2661	ETS-Lindgren	3 years	2017-06-17
6	Semi-anechoic chamber	/	CT000332 -1074	Frankonia German	/	/
7	Vector Signal Analyzer	FSV40	101047	Rohde & Schwarz	1 year	2017-06-28
8	Bluetooth Tester	CBT	101042	Rohde & Schwarz	1 year	2017-03-02

Test Software Utilized

Test Item	Test Software and Version	Software Vendor
Radiated Continuous Emission	EMC32 V8.40.0	R&S
Conducted Continuous Emission	EMC32 V8.52.0	R&S

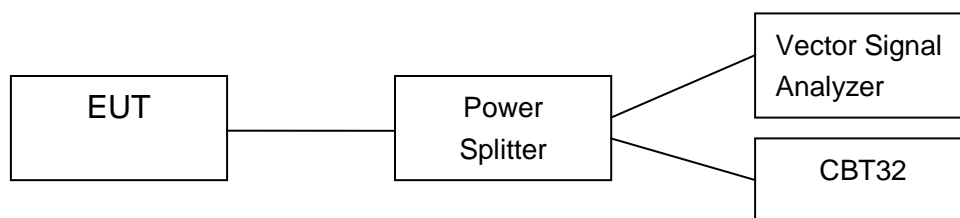
ANNEX A: Detailed Test Results

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

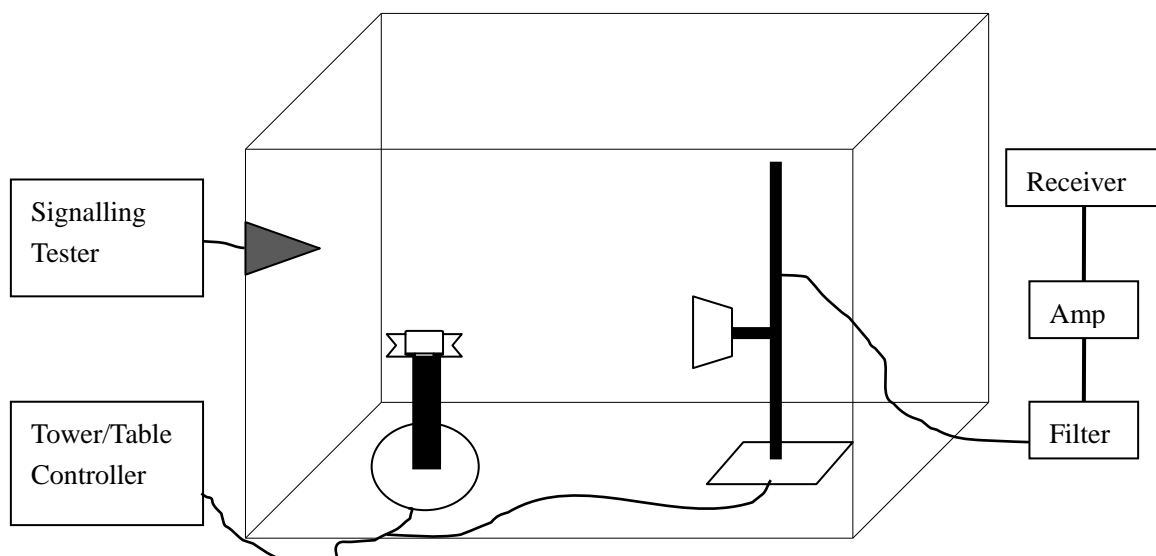
The measurement is made according to ANSI C63.10

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

Method of Measurement: See ANSI C63.10-clause 7.8.5

a) Use the following spectrum analyzer settings:

- Span: 6MHz
- RBW: 3MHz
- VBW: 3MHz
- Sweep time: 2.5ms
- Detector function: peak
- Trace: max hold

b) Allow trace to stabilize.

c) Use the marker-to-peak function to set the marker to the peak of the emission.

d) The indicated level is the peak output power.

Measurement Limit:

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

Measurement Results:

For GFSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	5.83	8.00	6.42	P

For $\pi/4$ DQPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	4.49	6.53	4.87	P

For 8DPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	4.66	6.71	5.11	P

Conclusion: PASS

A.3. Frequency Band Edges – Conducted

Method of Measurement: See ANSI C63.10-clause 7.8.6

Connect the spectrum analyzer to the EUT using an appropriate RF cable connected to the EUT output. Configure the spectrum analyzer settings as described below (be sure to enter all losses between the unlicensed wireless device output and the spectrum analyzer).

- Span: 10 MHz
- Resolution Bandwidth: 100 kHz
- Video Bandwidth: 300 kHz
- Sweep Time: 5ms
- Detector: Peak
- Trace: max hold

Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel.

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 absolute 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 Limit:

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

Measurement Result:

For GFSK

Channel	Hopping	Band Edge Power (dBc)		Conclusion
0	Hopping OFF	Fig.1	-45.68	P
	Hopping ON	Fig.2	-46.26	P
78	Hopping OFF	Fig.3	-50.02	P
	Hopping ON	Fig.4	-55.17	P

For $\pi/4$ DQPSK

Channel	Hopping	Band Edge Power (dBc)		Conclusion
0	Hopping OFF	Fig.5	-49.84	P
	Hopping ON	Fig.6	-47.60	P
78	Hopping OFF	Fig.7	-52.61	P
	Hopping ON	Fig.8	-51.79	P

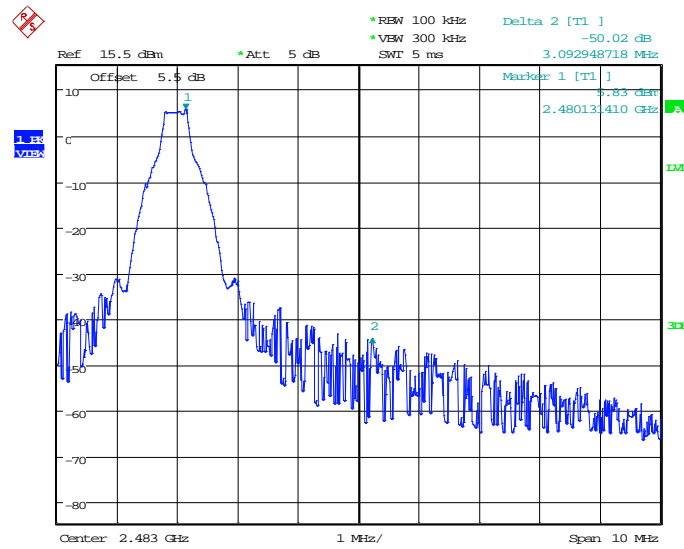
For 8DPSK

Channel	Hopping	Band Edge Power (dBc)		Conclusion
0	Hopping OFF	Fig.9	-47.95	P
	Hopping ON	Fig.10	-50.51	P

Test graphs as below

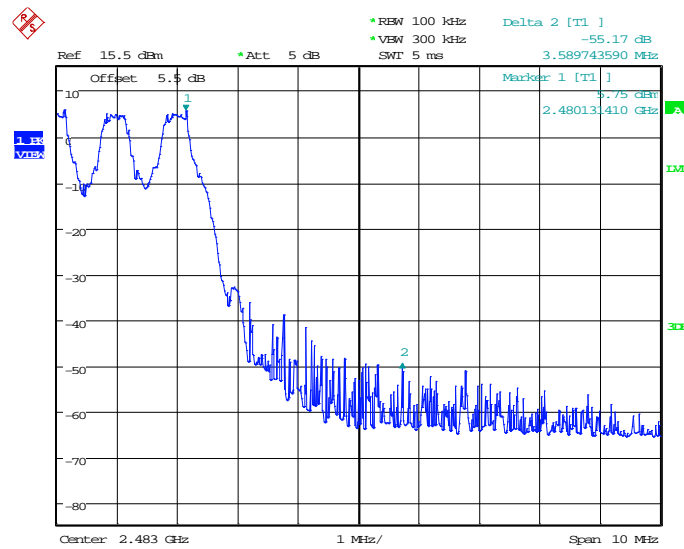


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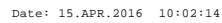
Date: 15.APR.2016 09:40:30

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



Date: 15.APR.2016 09:44:35

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



Offset: 5.5 dB

Ref: 15.5 dBm

*Att: 5 dB

*REW: 100 kHz

*VIEW: 300 kHz

SWT: 5 ms

Delta 2 [T1]

-47.60 dB

-2.211538462 MHz

Marker 1 [T1]

2.75 GHz

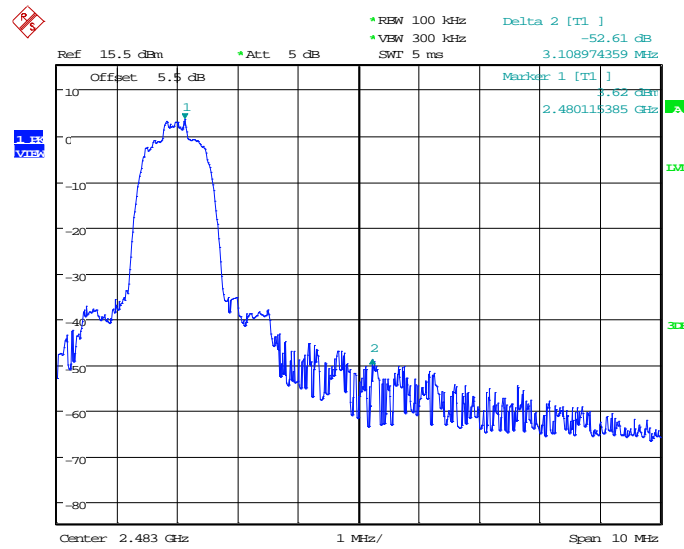
2.402003205 GHz

Center: 2.4 GHz

1 MHz/

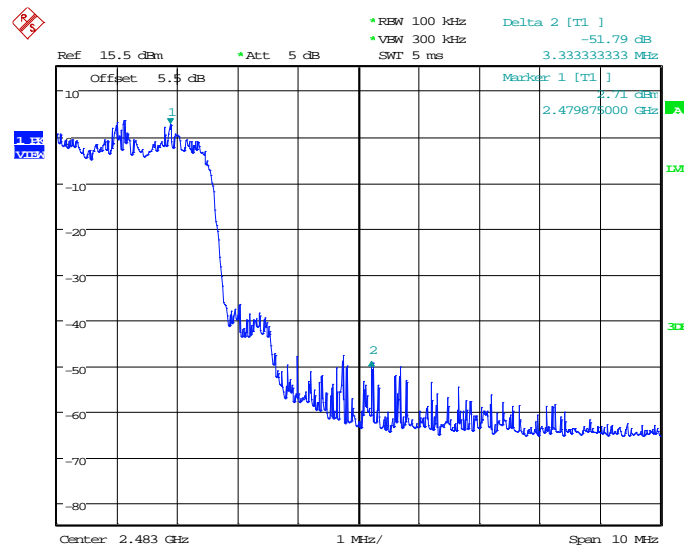
Span: 10 MHz

Date: 15.APR.2016 10:04:34



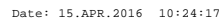
Date: 15.APR.2016 10:02:31

Fig.7. Frequency Band Edges: $\pi/4$ DQPSK, Channel 78, Hopping Off



Date: 15.APR.2016 10:06:36

Fig.8. Frequency Band Edges: $\pi/4$ DQPSK, Channel 78, Hopping On

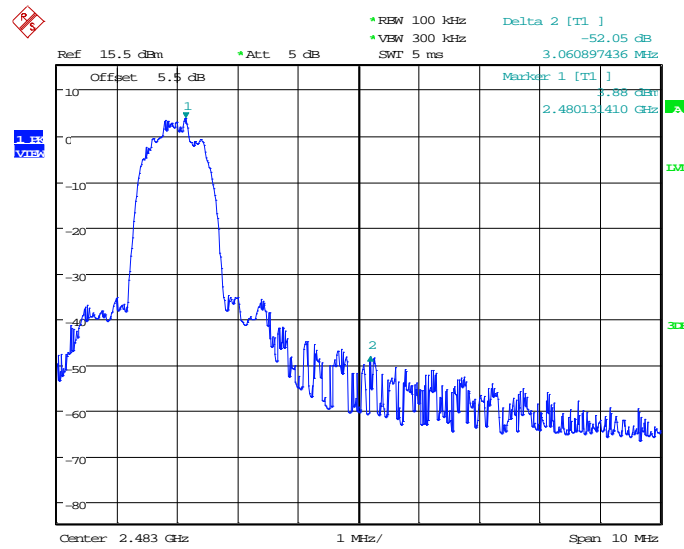


Ref 15.5 dBm *Att 5 dB SWI 5 ms REW 100 kHz VEW 300 kHz Delta 2 [T1] -50.51 dB -2.195512821 MHz

Offset 5.5 dB Marker 1 [T1] 2.58 GHz 2.40198179 GHz

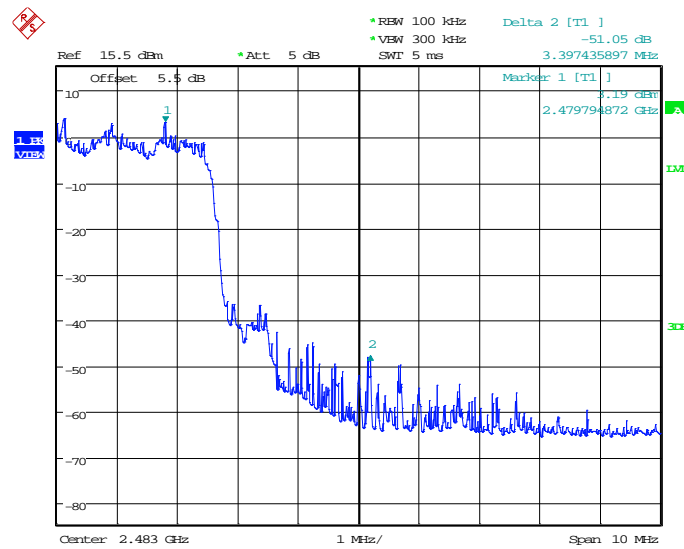
Center 2.4 GHz 1 MHz/ Span 10 MHz

Date: 15.APR.2016 10:26:37



Date: 15.APR.2016 10:24:34

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



Date: 15.APR.2016 10:28:40

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

A.4. Conducted Emission

Method of Measurement: See ANSI C63.10-clause 7.8.8

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 Limit:

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

Measurement Results:

For GFSK

Channel	Frequency Range	Test Results	Conclusion
Ch 0	Center Frequency	Fig.13	P

2402 MHz	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 $\pi/4$ 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

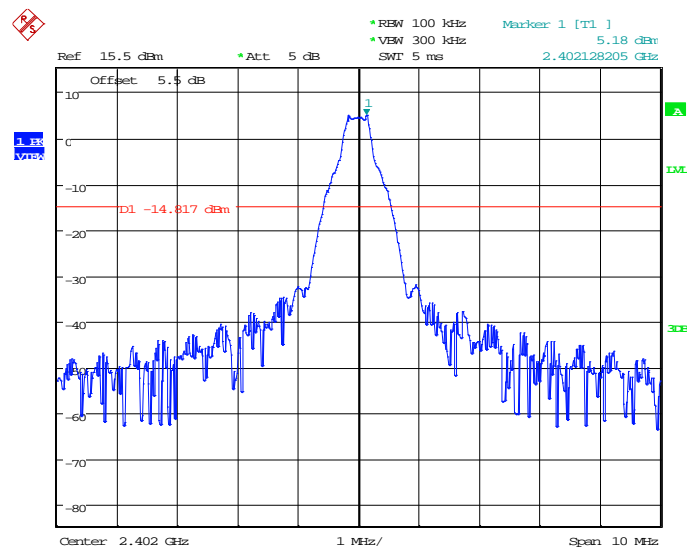
For 8DPSK

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

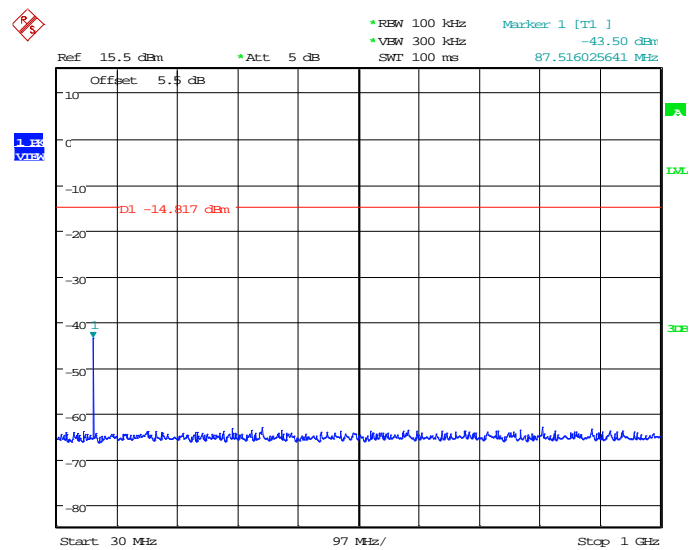
Conclusion: PASS

Test graphs as below



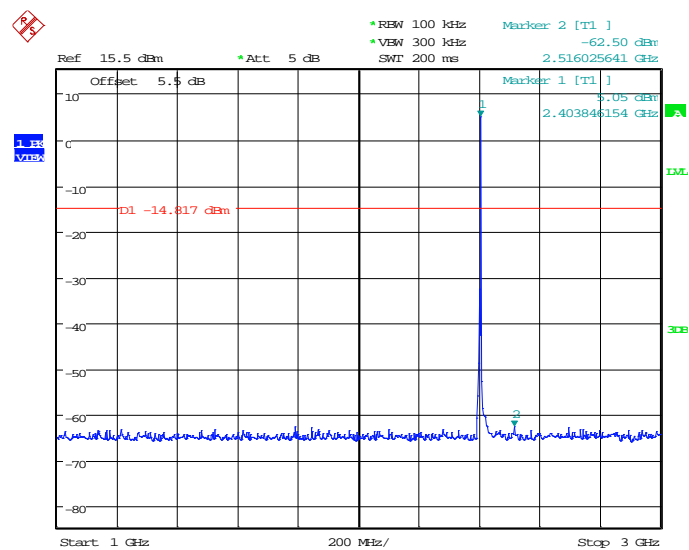
Date: 15.APR.2016 09:44:54

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



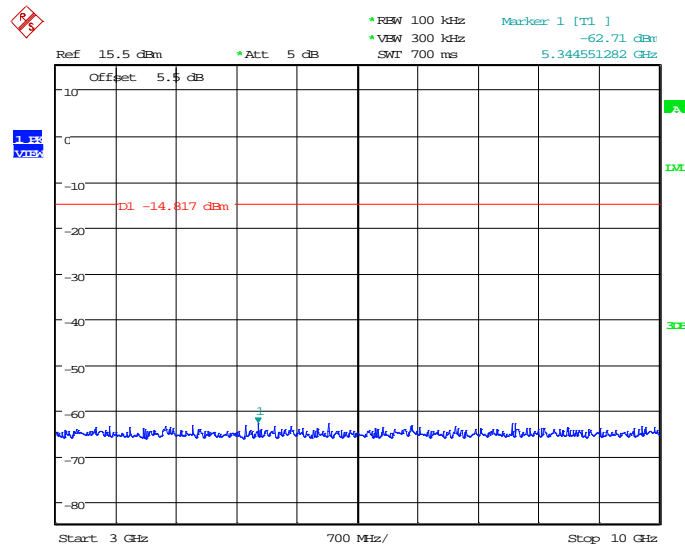
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Fig.14. Conducted spurious emission: GFSK, Channel 0, 30MHz - 1GHz



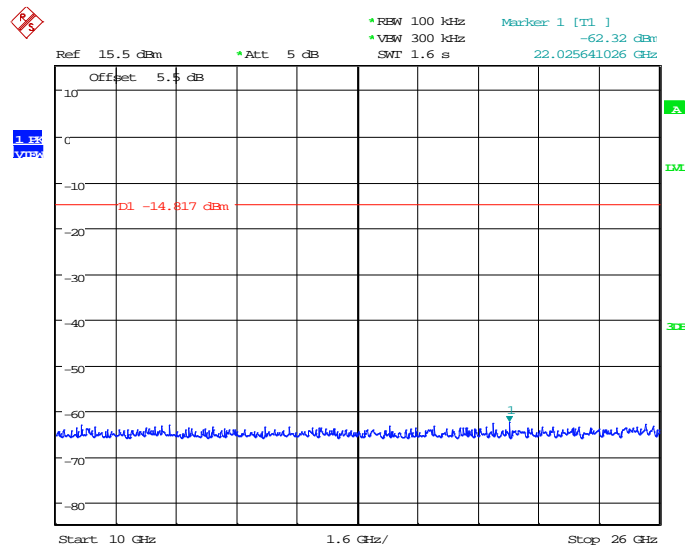
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Fig.15. Conducted spurious emission: GFSK, Channel 0, 1GHz - 3GHz



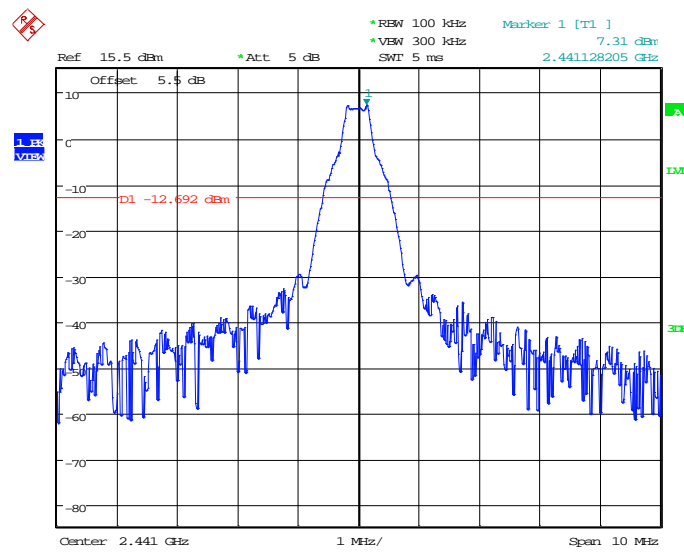
Date: 15.APR.2016 09:45:59

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



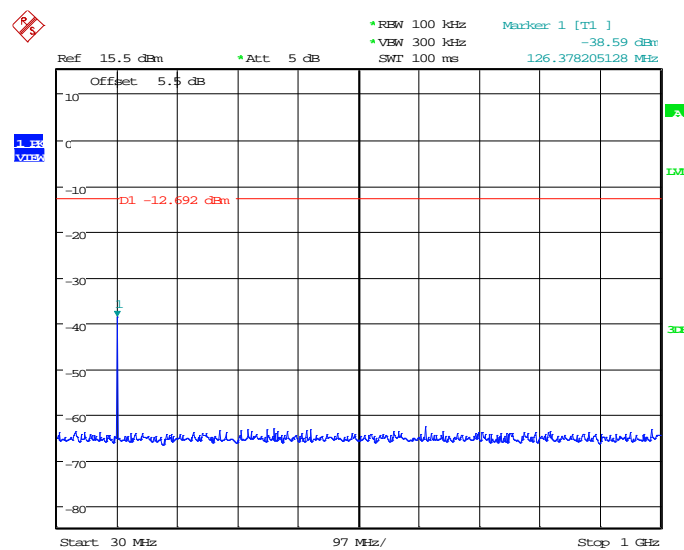
Date: 15.APR.2016 09:46:15

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



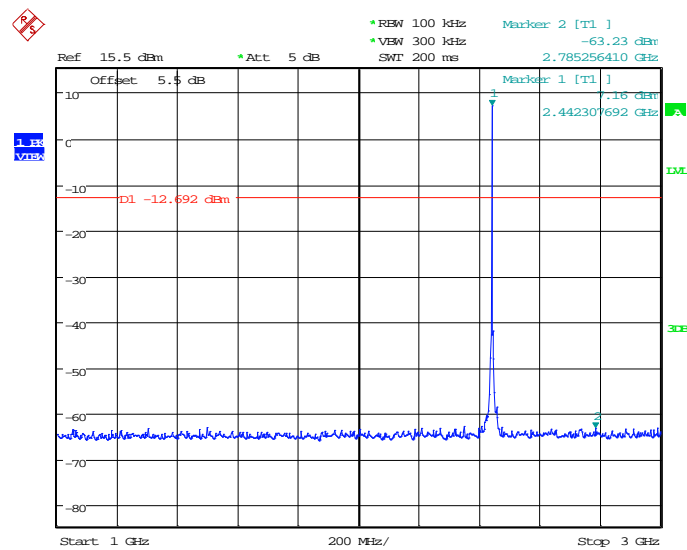
Date: 15.APR.2016 09:46:32

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



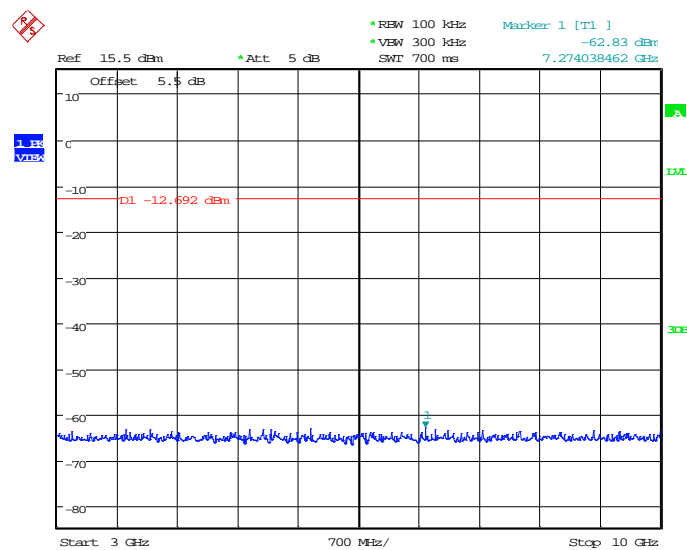
Date: 15.APR.2016 09:46:48

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



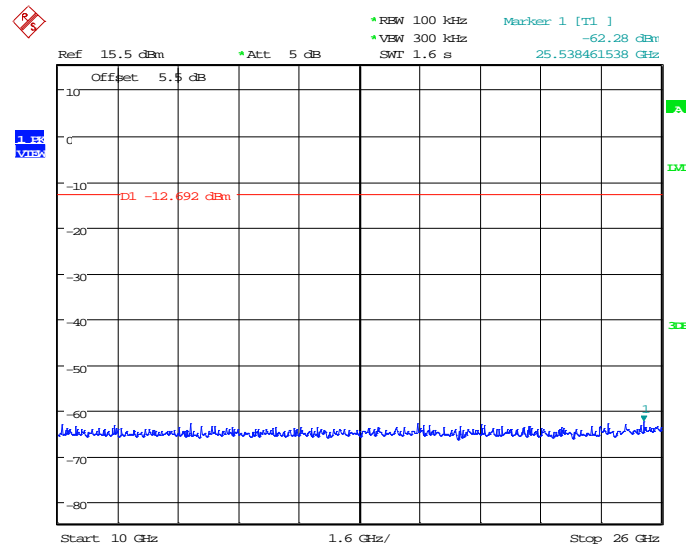
Date: 15.APR.2016 09:47:20

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



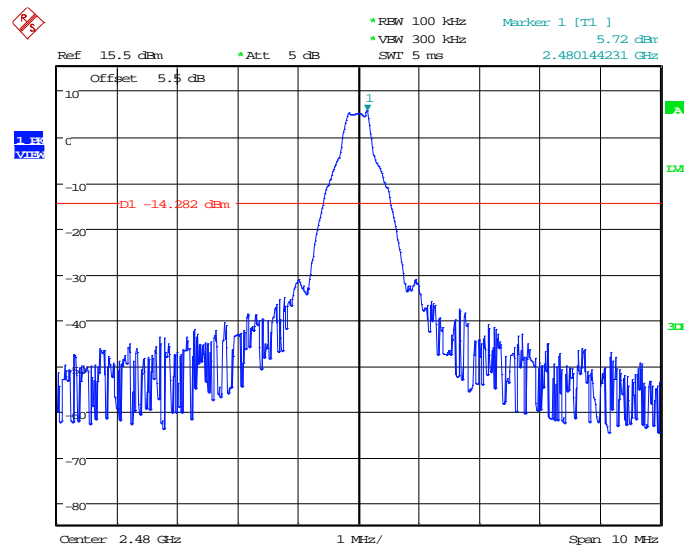
Date: 15.APR.2016 09:47:36

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



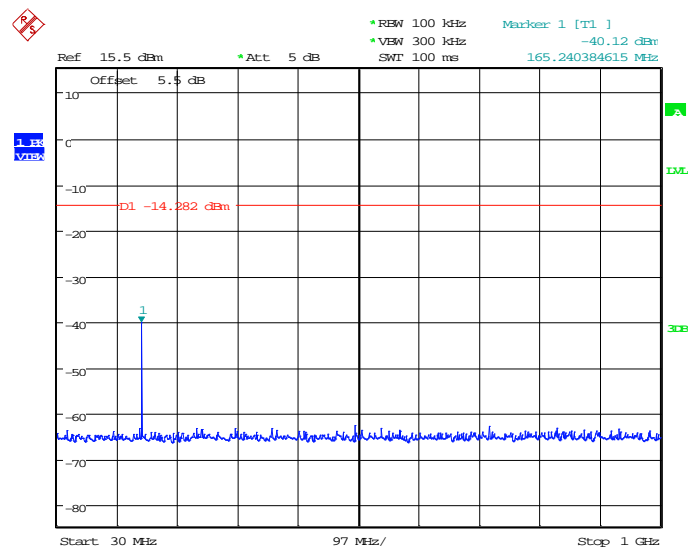
Date: 15.APR.2016 09:47:53

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



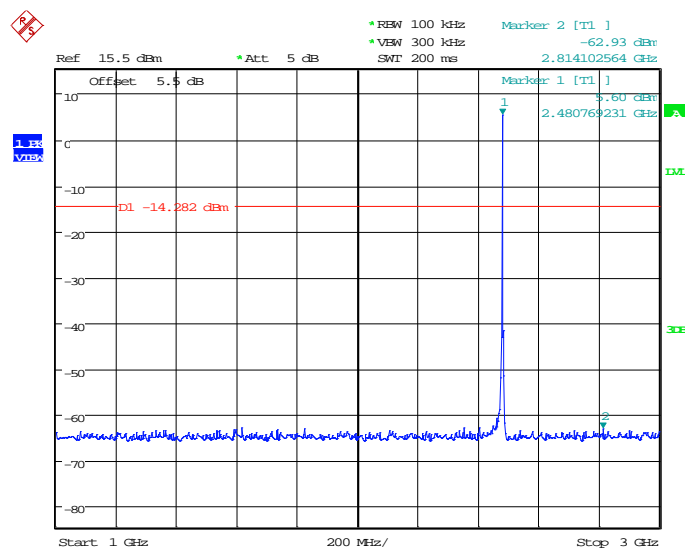
Date: 15.APR.2016 09:48:10

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



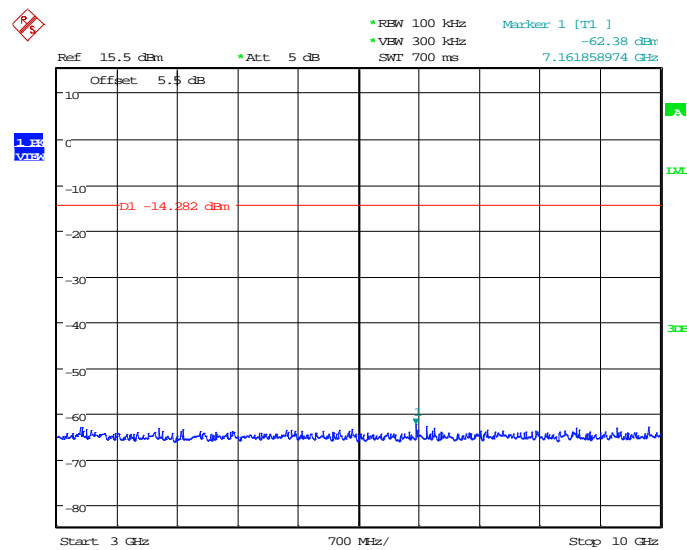
Date: 15.APR.2016 09:48:26

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



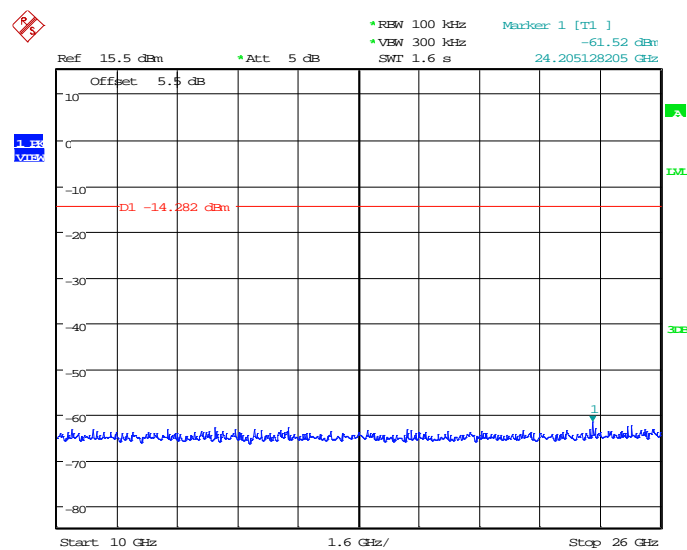
Date: 15.APR.2016 09:48:58

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



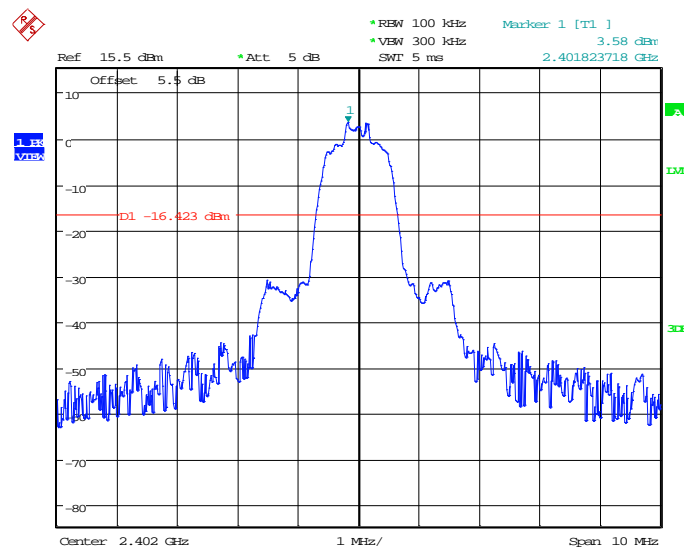
Date: 15.APR.2016 09:49:14

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



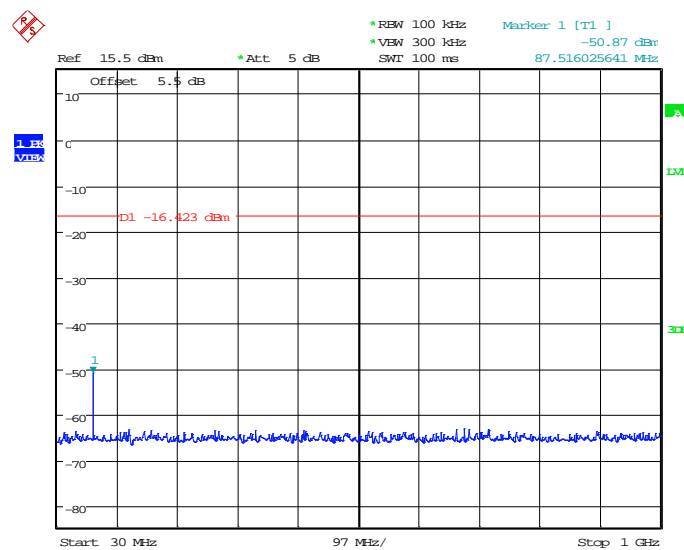
Date: 15.APR.2016 09:49:31

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



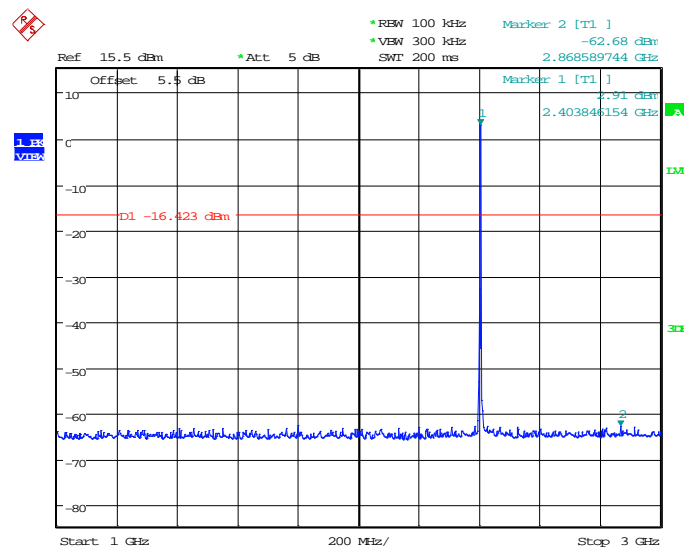
Date: 15.APR.2016 10:06:55

Fig.28. Conducted spurious emission: $\pi/4$ DQPSK, Channel 0,2402MHz



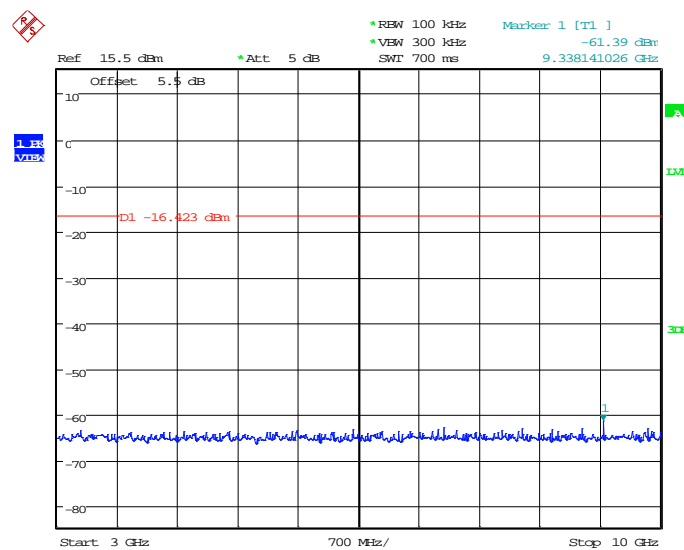
Date: 15.APR.2016 10:07:11

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



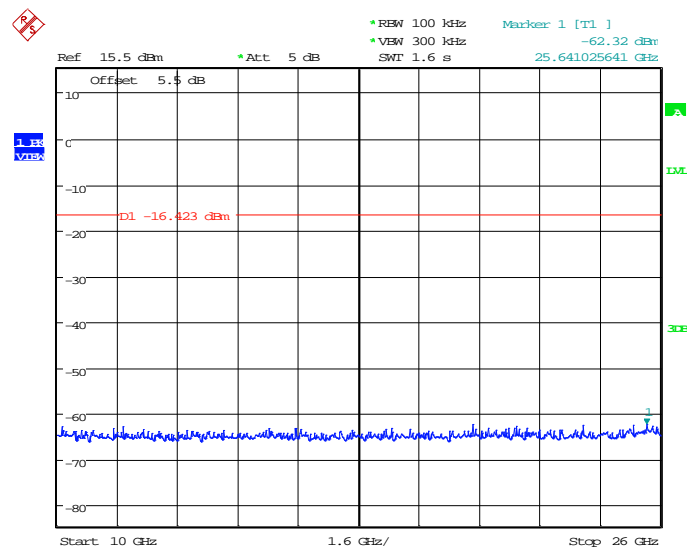
Date: 15.APR.2016 10:07:43

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



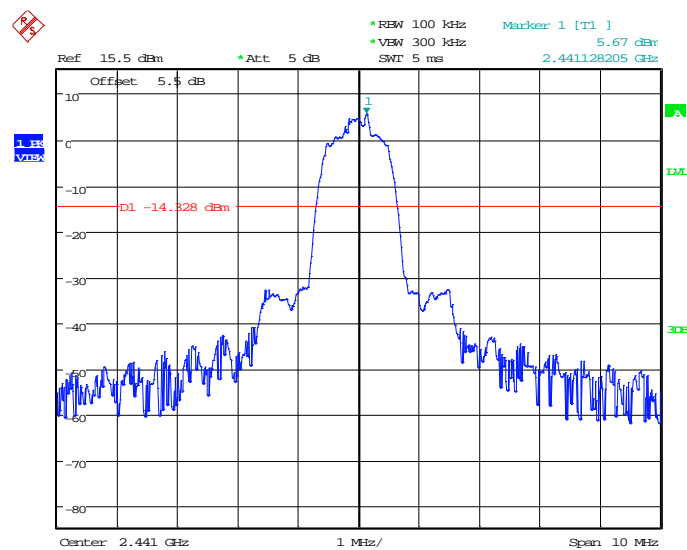
Date: 15.APR.2016 10:08:00

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



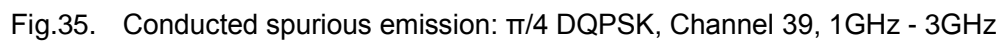
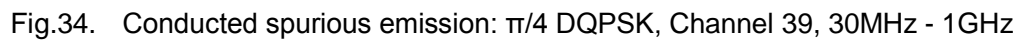
Date: 15.APR.2016 10:08:16

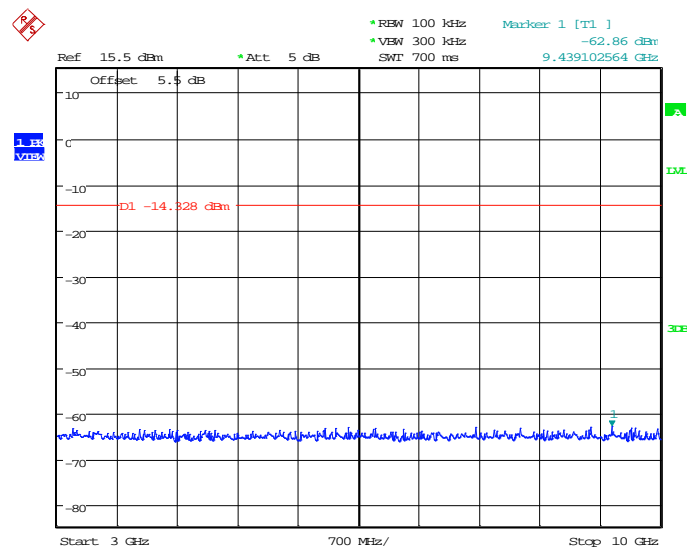
Fig.32. Conducted spurious emission: $\pi/4$ DQPSK, Channel 0, 10GHz - 26GHz



Date: 15.APR.2016 10:08:33

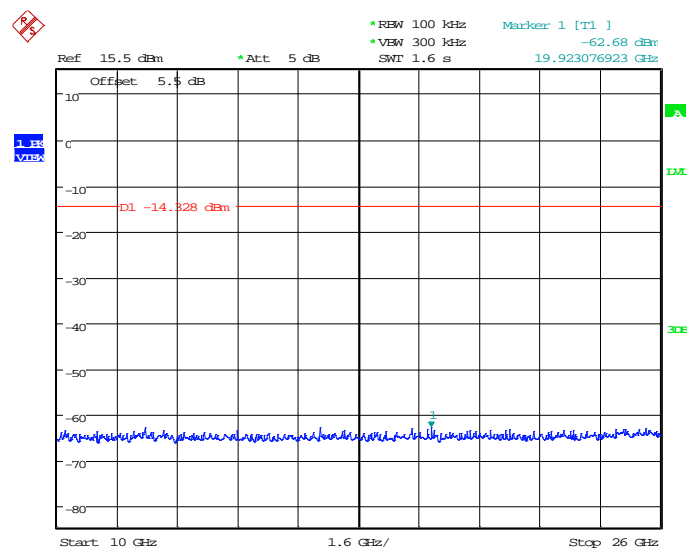
Fig.33. Conducted spurious emission: $\pi/4$ DQPSK, Channel 39, 2441MHz





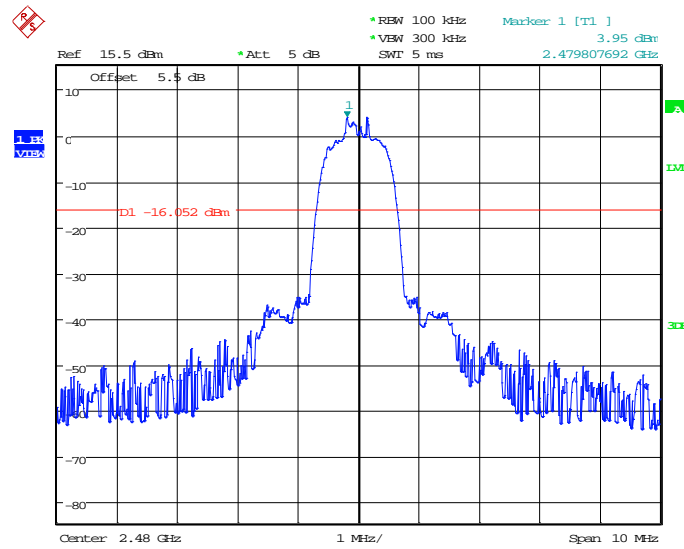
Date: 15.APR.2016 10:09:38

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



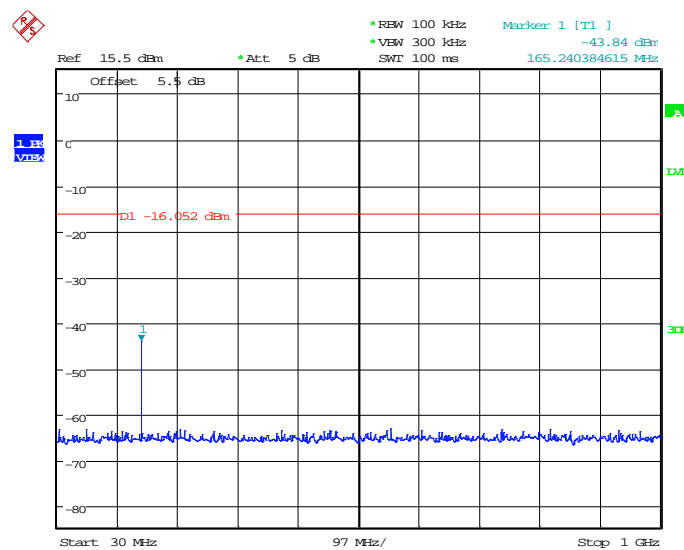
Date: 15.APR.2016 10:09:54

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



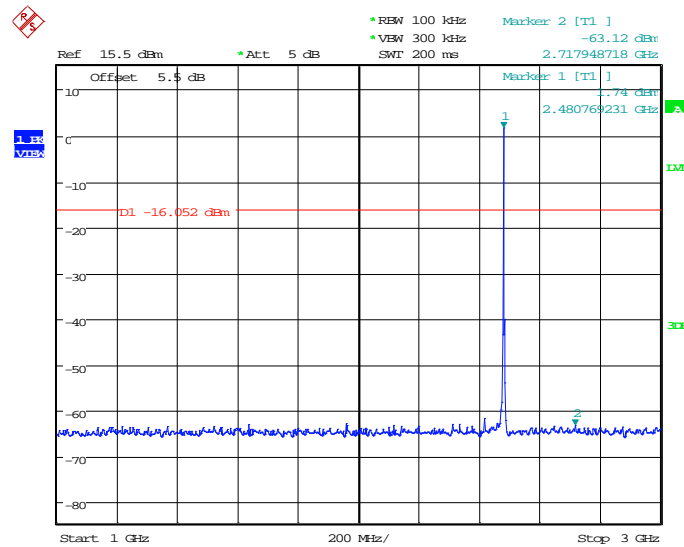
Date: 15.APR.2016 10:10:11

Fig.38. Conducted spurious emission: $\pi/4$ DQPSK, Channel 78, 2480MHz



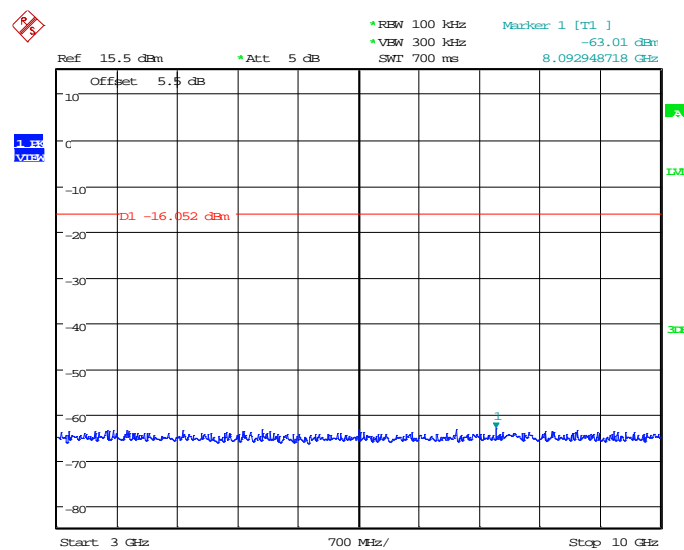
Date: 15.APR.2016 10:10:27

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



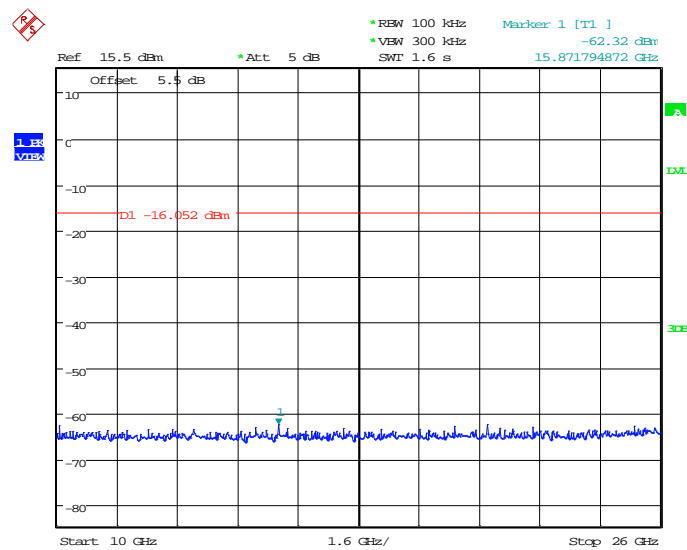
Date: 15.APR.2016 10:10:59

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



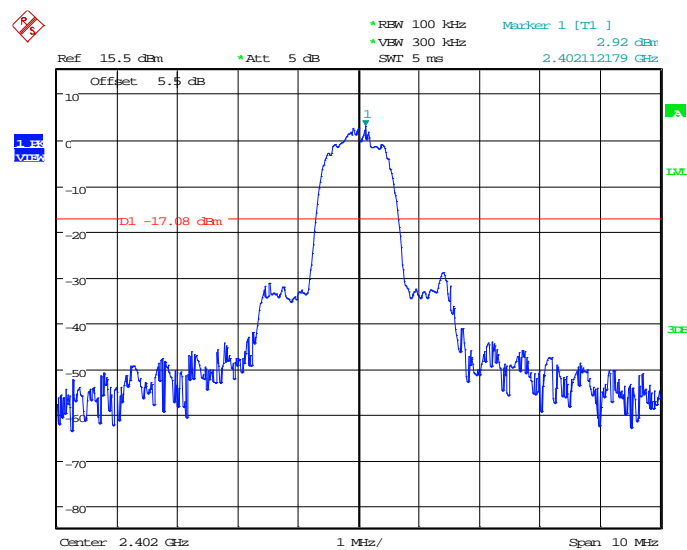
Date: 15.APR.2016 10:11:16

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



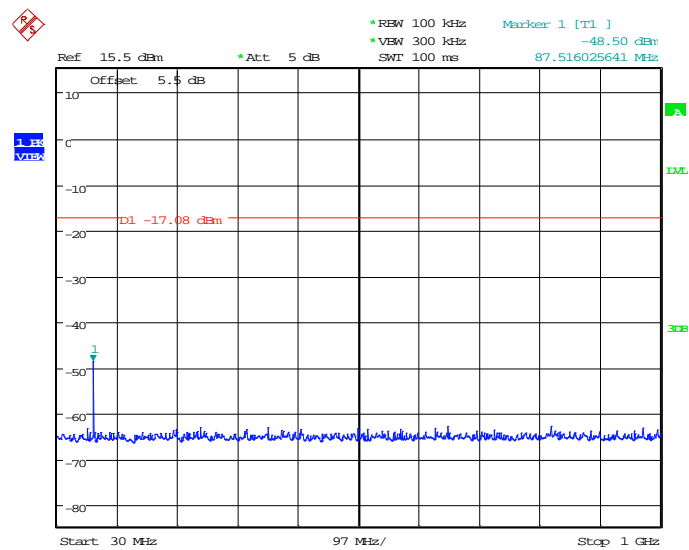
Date: 15.APR.2016 10:11:32

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



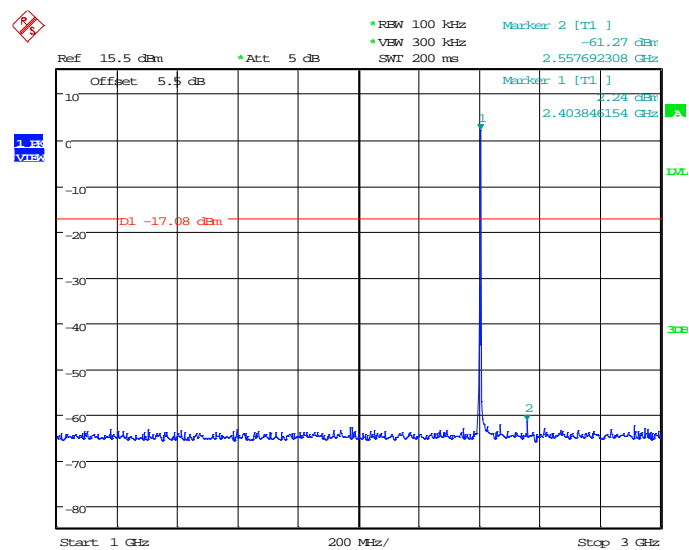
Date: 15.APR.2016 10:28:59

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



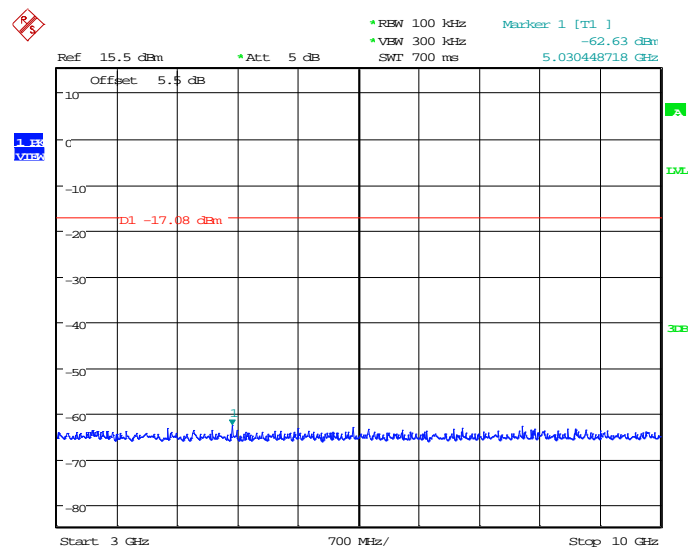
Date: 15.APR.2016 10:29:15

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



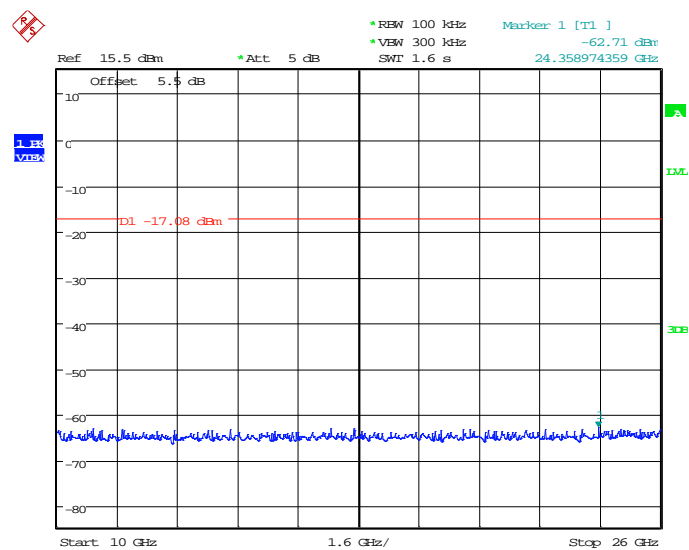
Date: 15.APR.2016 10:29:47

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



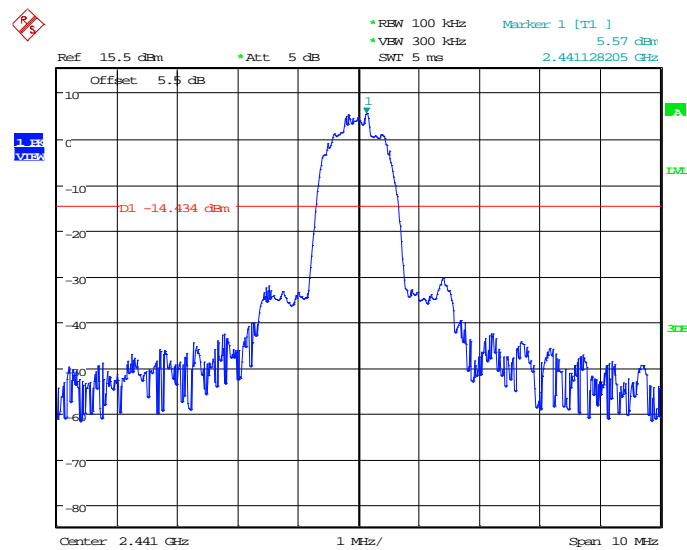
Date: 15.APR.2016 10:30:03

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



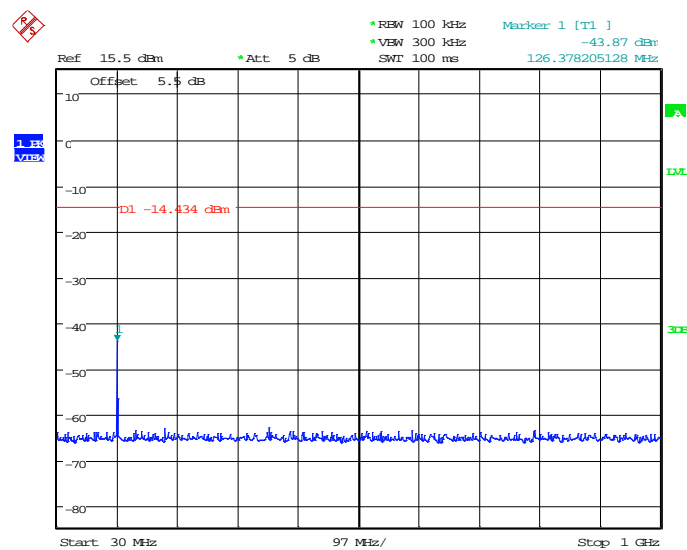
Date: 15.APR.2016 10:30:20

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



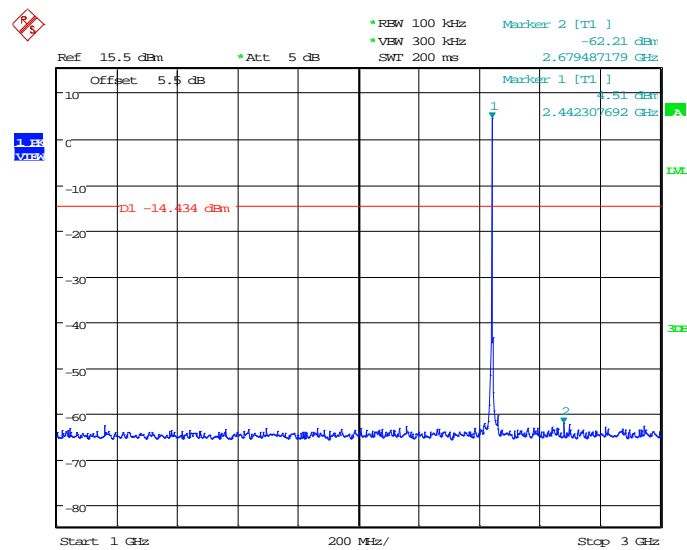
Date: 15.APR.2016 10:30:37

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



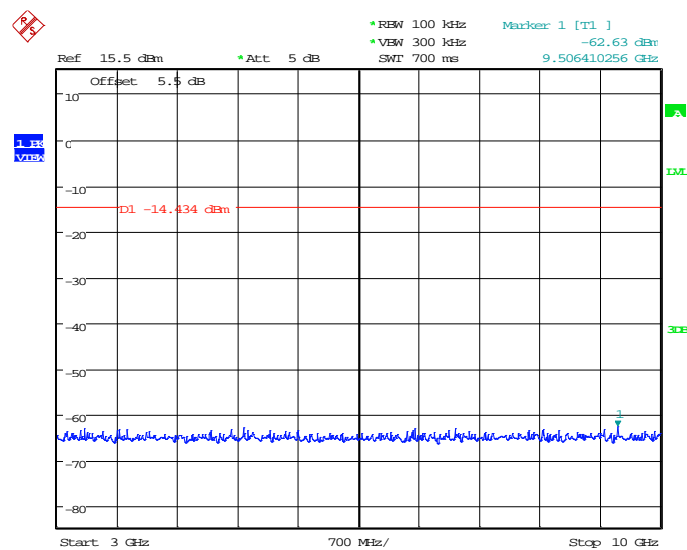
Date: 15.APR.2016 10:30:53

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



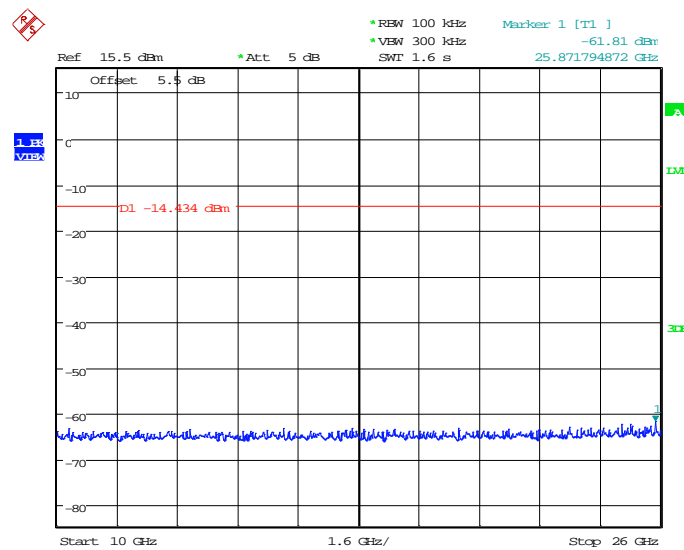
Date: 15.APR.2016 10:31:25

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



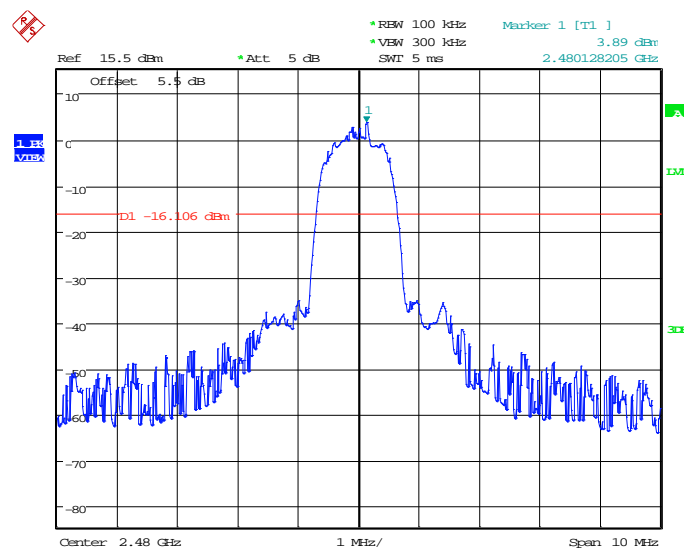
Date: 15.APR.2016 10:31:41

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



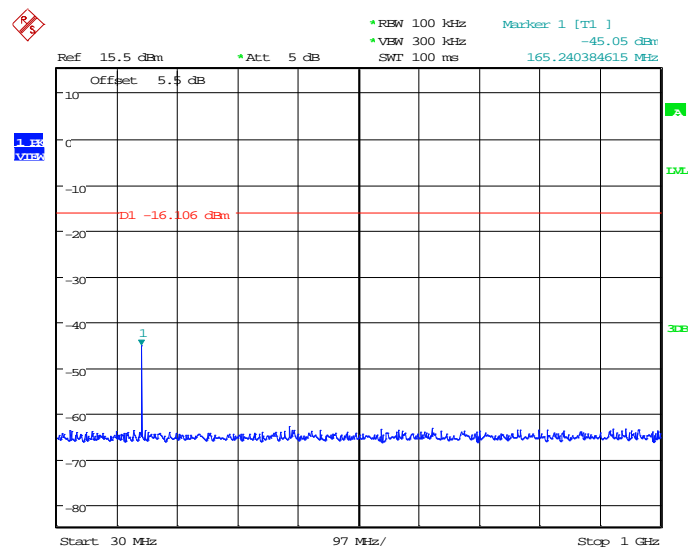
Date: 15.APR.2016 10:31:58

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



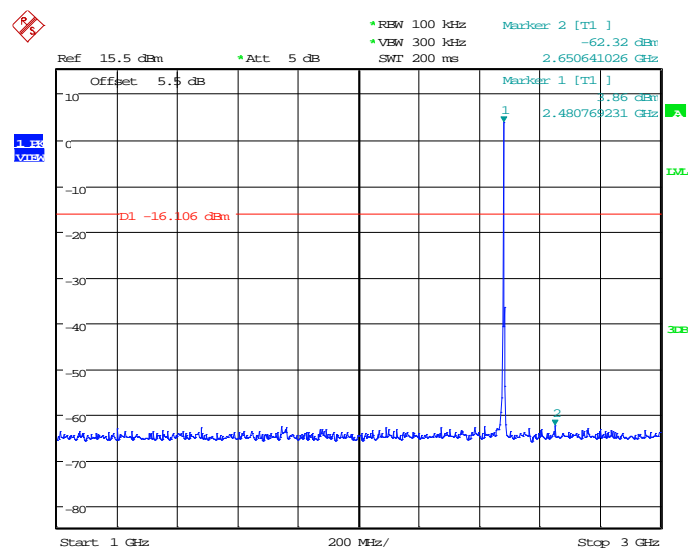
Date: 15.APR.2016 10:32:15

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



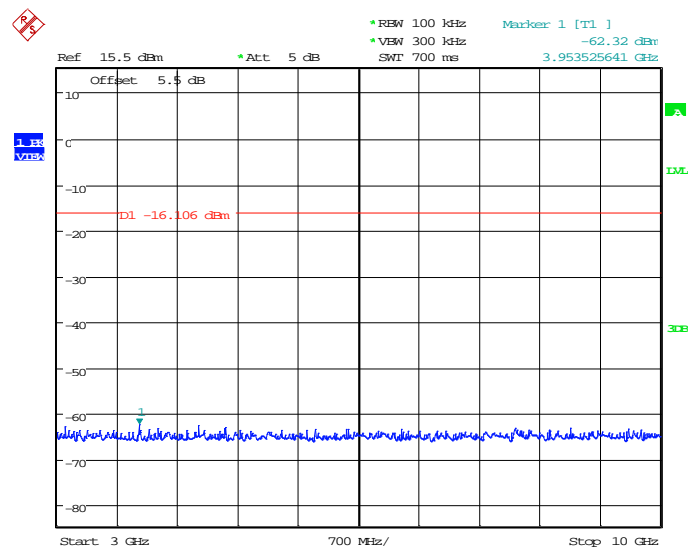
Date: 15.APR.2016 10:32:31

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



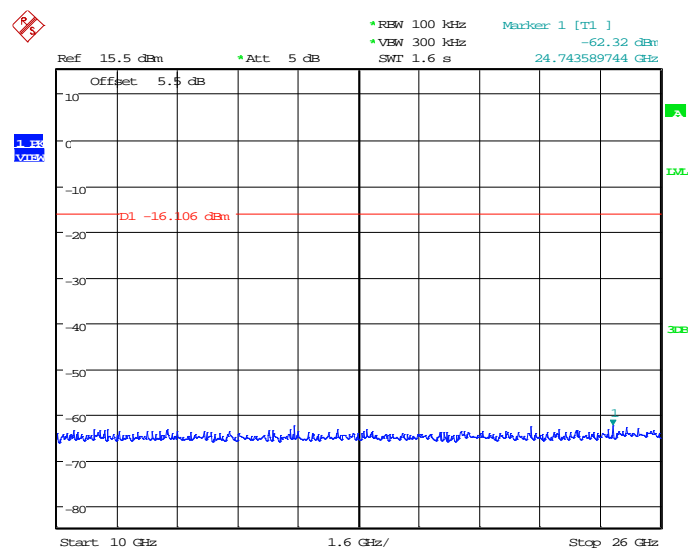
Date: 15.APR.2016 10:33:03

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



Date: 15.APR.2016 10:33:19

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



Date: 15.APR.2016 10:33:36

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	9 kHz ~ 30 MHz	Fig.60	P
	30 MHz ~ 1 GHz	Fig.61	P
	1 GHz ~ 3 GHz	Fig.62	P
	3 GHz ~ 18 GHz	Fig.63	P
Ch 78 2480 MHz	1 GHz ~ 3 GHz	Fig.64	P
	3 GHz ~ 18 GHz	Fig.65	P
Power	2.38GHz~2.4GHz---L	Fig.66	P
Power	2.45GHz~2.5GHz---H	Fig.67	P

For all channels	18 GHz ~ 26 GHz	Fig.68	P
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For $\pi/4$ DQPSK

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

For 8DPSK

Channel	Frequency Range	Test Results	Conclusion
Ch 0 2402 MHz	1 GHz ~ 3 GHz	Fig.79	P
	3 GHz ~ 18 GHz	Fig.80	P
Ch 39 2441 MHz	30 MHz ~ 1 GHz	Fig.81	P
	1 GHz ~ 3 GHz	Fig.82	P
	3 GHz ~ 18 GHz	Fig.83	P
Ch 78 2480 MHz	1 GHz ~ 3 GHz	Fig.84	P
	3 GHz ~ 18 GHz	Fig.85	P
Power	2.38GHz~2.4GHz---L	Fig.86	P
Power	2.45GHz~2.5GHz---H	Fig.87	P
For all channels	18 GHz ~ 26 GHz	Fig.88	P

GFSK Ch 0 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	PMea(dBuv/m)	Polarization
2389.810	42.2	-11.1	53.300	H
18000.000	49.3	-1.1	50.366	H
17988.000	49.2	27.9	21.300	V
17999.500	49.2	27.9	21.300	V
17997.000	49.2	27.9	21.300	H
17996.000	49.0	27.9	21.100	H

GFSK Ch 39 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
17998.000	49.2	27.9	21.300	H
17993.500	49.1	27.9	21.200	V
17996.000	49.1	27.9	21.200	H
17998.500	49.0	27.9	21.100	H
17995.500	48.9	27.9	21.000	V
17988.500	48.9	27.9	21.000	V

GFSK Ch 78 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2483.965	42.0	-11.2	53.2	V
17993.000	49.2	27.9	21.3	H
17993.500	49.2	27.9	21.3	V
17999.000	49.1	27.9	21.2	V
17991.000	49.1	27.9	21.2	V
17992.500	49.1	27.9	21.2	H

 $\pi/4$ DQPSK Ch 0 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2389.750	41.7	-11.1	52.8	H
17999.500	49.4	27.9	21.5	H
17999.000	49.4	27.9	21.5	V
17994.500	49.3	27.9	21.4	H
17997.500	49.1	27.9	21.2	H
17998.500	49.0	27.9	21.1	V

 $\pi/4$ DQPSK Ch 39 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
17999.000	49.3	27.9	21.4	V
17993.500	49.2	27.9	21.3	H
17997.500	49.1	27.9	21.2	H
18000.000	49.1	-1.1	50.2	V
17997.000	49.0	27.9	21.1	V
17998.000	49.0	27.9	21.1	H

 $\pi/4$ DQPSK Ch 78 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2483.865	42.0	-11.2	53.2	V
17995.500	49.4	27.9	21.5	V
17999.500	49.3	27.9	21.4	V
17993.000	49.1	27.9	21.2	V
17998.500	49.0	27.9	21.1	H
17997.500	49.0	27.9	21.1	H

8DPSK Ch 0 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2389.585	41.6	-11.1	52.7	H
17998.000	49.3	27.9	21.4	H
17995.500	49.2	27.9	21.3	V
17999.000	49.2	27.9	21.3	H
17991.500	49.1	27.9	21.2	V
17996.500	49.1	27.9	21.2	H

8DPSK Ch 39 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
17999.500	49.2	27.9	21.3	H
17991.500	49.1	27.9	21.2	H
17997.500	49.0	27.9	21.1	V
17995.500	49.0	27.9	21.1	H
17992.500	48.8	27.9	20.9	H
17995.000	48.8	27.9	20.9	V

8DPSK Ch 78 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2483.369	41.9	-11.2	53.1	V
18000.000	49.2	-1.1	50.3	V
17998.500	49.2	27.9	21.3	H
17990.500	49.1	27.9	21.2	H
17997.000	49.0	27.9	21.1	H
17996.500	49.0	27.9	21.1	H

GFSK Ch 0 - Peak

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	PMea(dBuv/m)	Polarization
2387.995	54.3	-11.1	65.4	H
17997.000	60.4	27.9	32.5	H
17996.500	60.1	27.9	32.2	V
17995.500	60.1	27.9	32.2	V
17993.000	59.8	27.9	31.9	H
17971.500	59.5	27.9	31.6	V

GFSK Ch 39 - Peak

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
17998.000	60.4	27.9	32.5	H
17996.000	60.2	27.9	32.3	H
17973.000	59.8	27.9	31.9	V
17990.500	59.7	27.9	31.8	H
18000.000	59.5	-1.1	60.6	H
17991.500	59.5	27.9	31.6	V

GFSK Ch 78 - Peak

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2483.995	56.6	-11.2	67.8	V
17991.000	60.4	27.9	32.5	H
17996.000	60.1	27.9	32.2	V
17993.000	60.0	27.9	32.1	H
18000.000	59.9	-1.1	61.0	H
17985.500	59.9	27.9	32.0	H

$\pi/4$ DQPSK Ch 0 - Peak

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2389.620	54.6	-11.1	65.700	H
17998.000	59.9	27.9	32.000	H
17994.500	59.8	27.9	31.900	V
17997.500	59.7	27.9	31.800	H
17991.500	59.7	27.9	31.800	H
17974.000	59.6	27.9	31.700	V

 $\pi/4$ DQPSK Ch 39 - Peak

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
17989.000	60.0	27.9	32.1	H
17997.000	59.7	27.9	31.8	H
17959.500	59.6	27.9	31.7	V
17992.500	59.5	27.9	31.6	V
17999.500	59.4	27.9	31.5	V
18000.000	59.4	-1.1	60.5	V

 $\pi/4$ DQPSK Ch 78 - Peak

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2484.030	55.1	-11.2	66.3	H
17999.500	60.0	27.9	32.1	V
17997.000	60.0	27.9	32.1	V
17999.000	59.9	27.9	32.0	H
17996.000	59.9	27.9	32.0	H
17997.500	59.8	27.9	31.9	V

8DPSK Ch 0 - Peak

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2388.175	54.7	-11.1	65.8	H
17998.000	59.8	27.9	31.9	H
17975.000	59.8	27.9	31.9	V
17983.000	59.7	27.9	31.8	H
17958.500	59.4	27.9	31.5	V
17992.500	59.4	27.9	31.5	H

8DPSK Ch 39 - Peak

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
17983.500	60.2	27.9	32.3	V
17990.000	59.9	27.9	32.0	H
17991.500	59.8	27.9	31.9	V
17999.500	59.7	27.9	31.8	H
17986.500	59.4	27.9	31.5	H
17996.500	59.4	27.9	31.5	H

8DPSK Ch 78 - Peak

Frequency(MHz)	Result(dBuV/m)	ARPL (dB)	Pmea(dBuV/m)	Polarization
2484.885	56.1	-11.2	67.3	H
17993.000	60.4	27.9	32.5	V
17996.500	60.3	27.9	32.4	V
17994.000	59.9	27.9	32.0	H
17998.000	59.8	27.9	31.9	V
17983.000	59.3	27.9	31.4	H

Sample calculation: 8DPSK Ch 78 - Peak, 2484.885 MHz

Peak ERP(dBm) = PMea(67.3dBuV/m) + ARpl (-11.2 dB) = 56.1 dBuV/m

Conclusion: PASS

Test graphs as below:

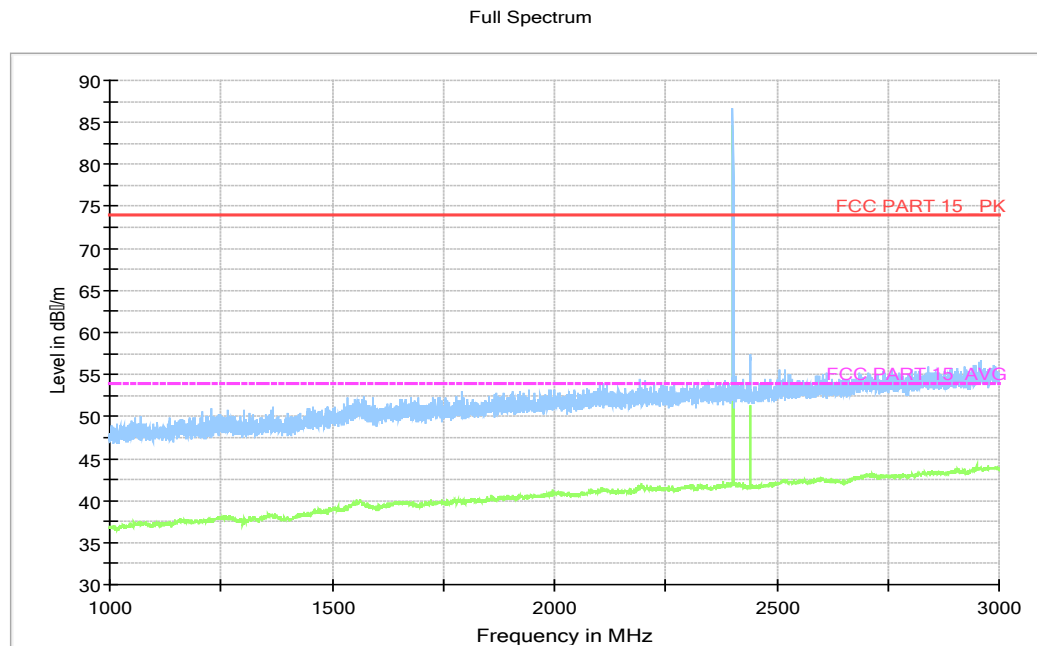


Fig.58. Radiated emission: GFSK, Channel 0, 1 GHz - 3 GHz

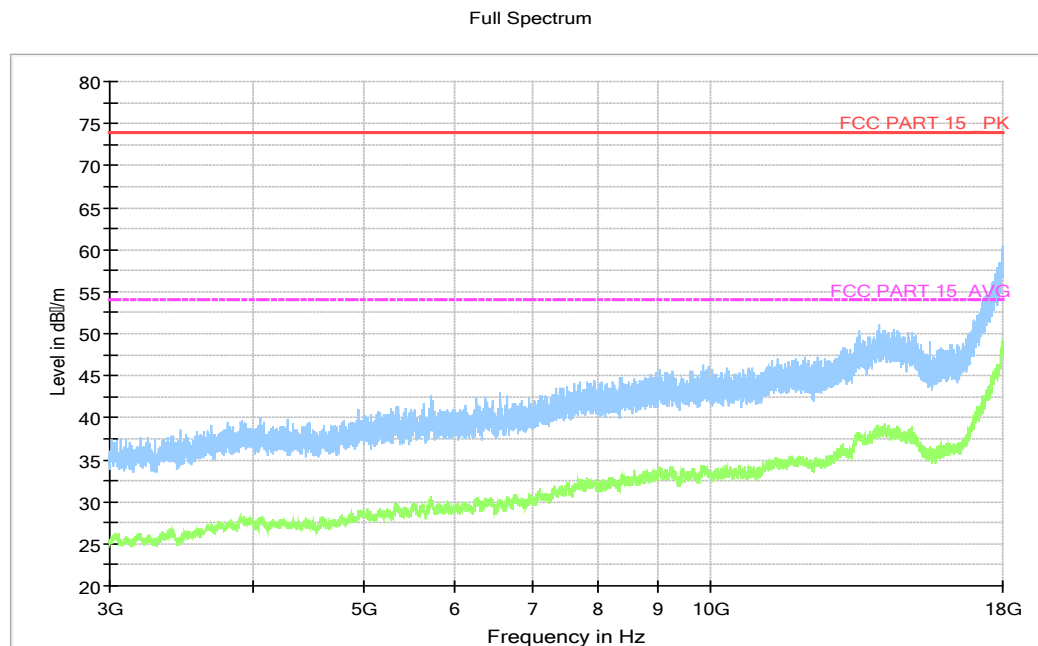


Fig.59. Radiated emission: GFSK, Channel 0, 3 GHz - 18 GHz

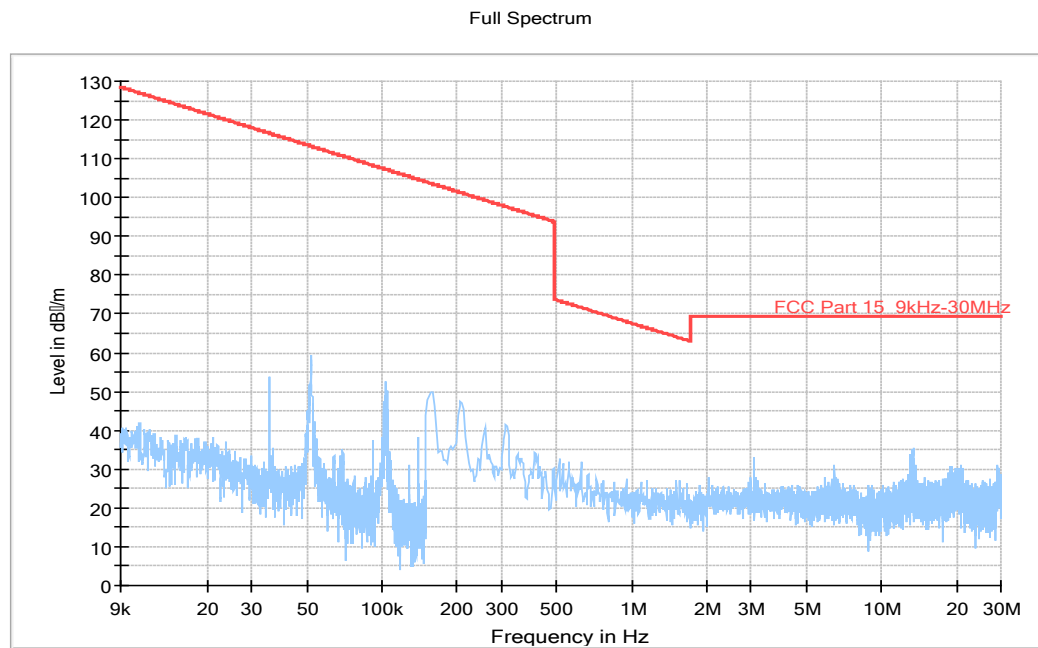


Fig.60. Radiated emission: GFSK, Channel 39, 9 kHz - 30 MHz

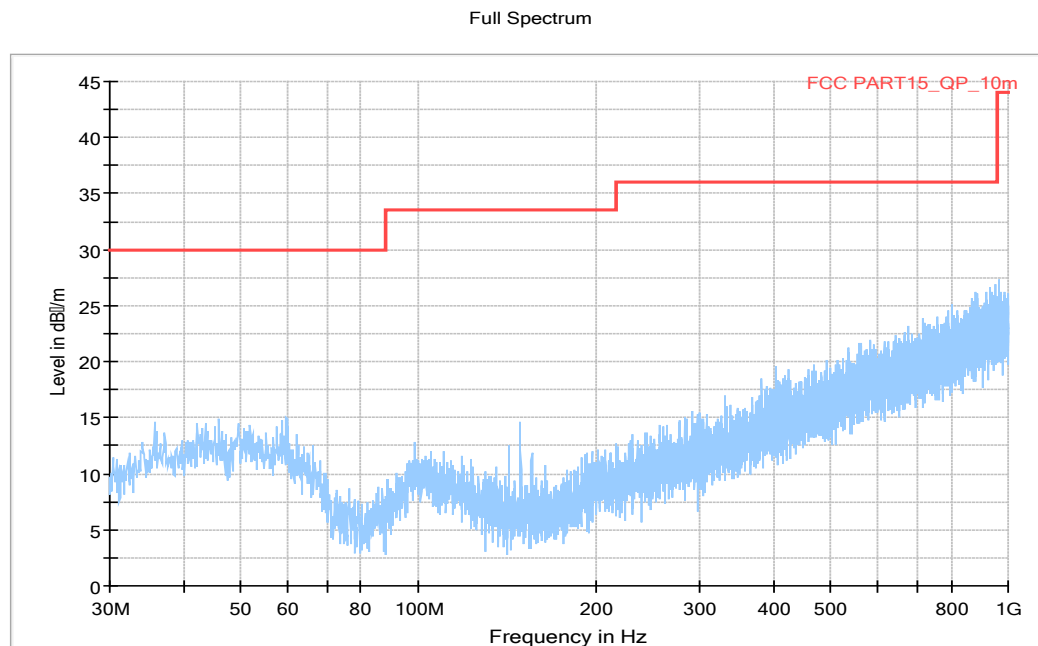


Fig.61. Radiated emission: GFSK, Channel 39, 30 MHz - 1 GHz

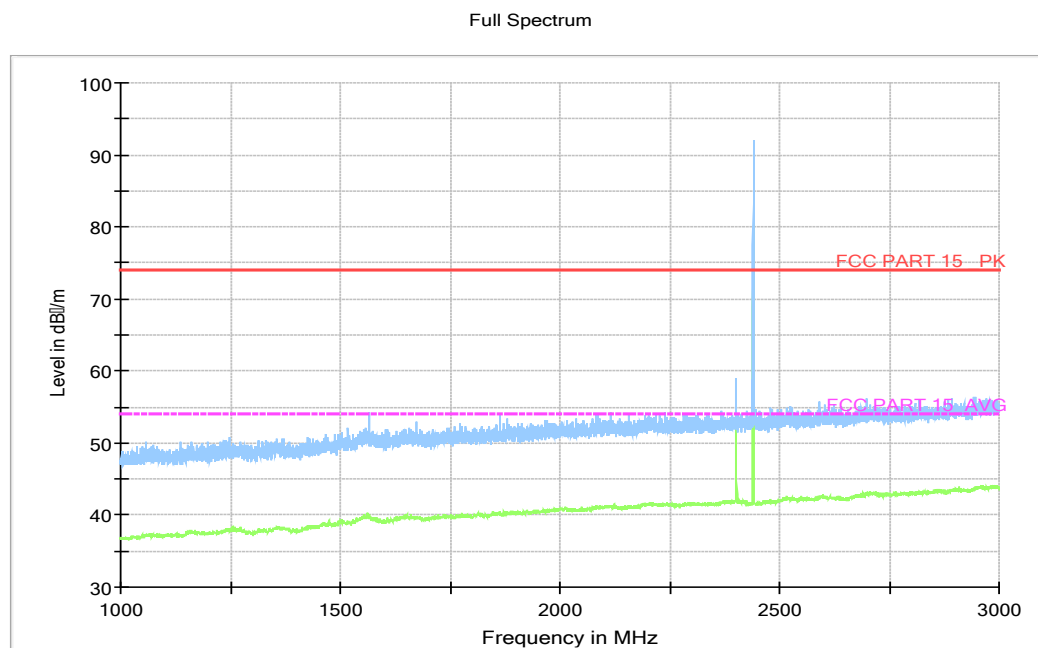


Fig.62. Radiated emission: GFSK, Channel 39, 1 GHz - 3 GHz

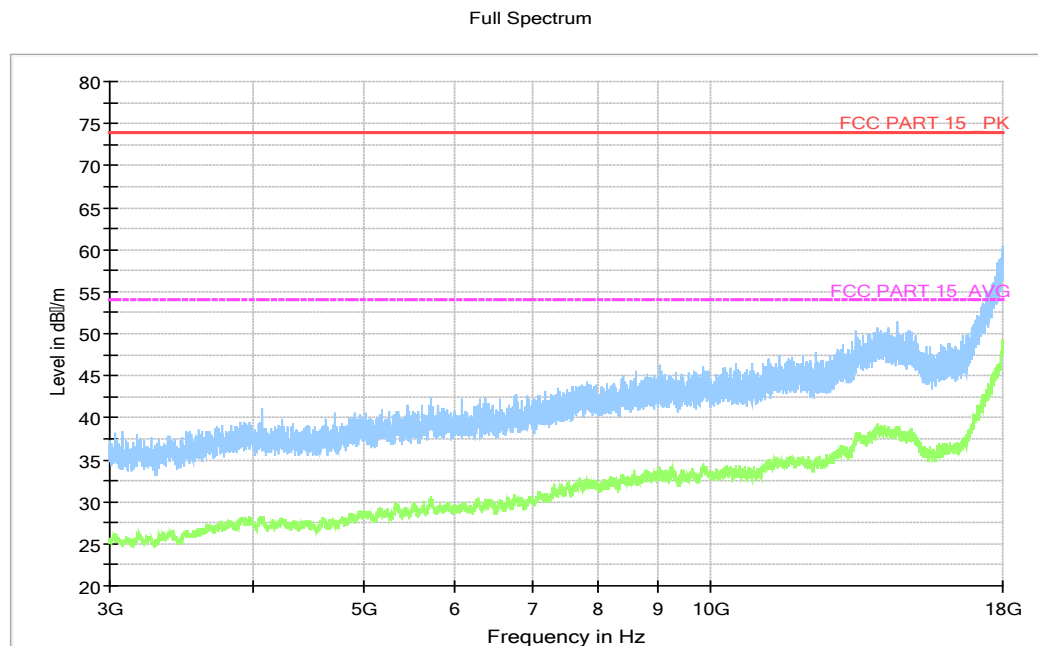


Fig.63. Radiated emission: GFSK, Channel 39, 3 GHz - 18 GHz

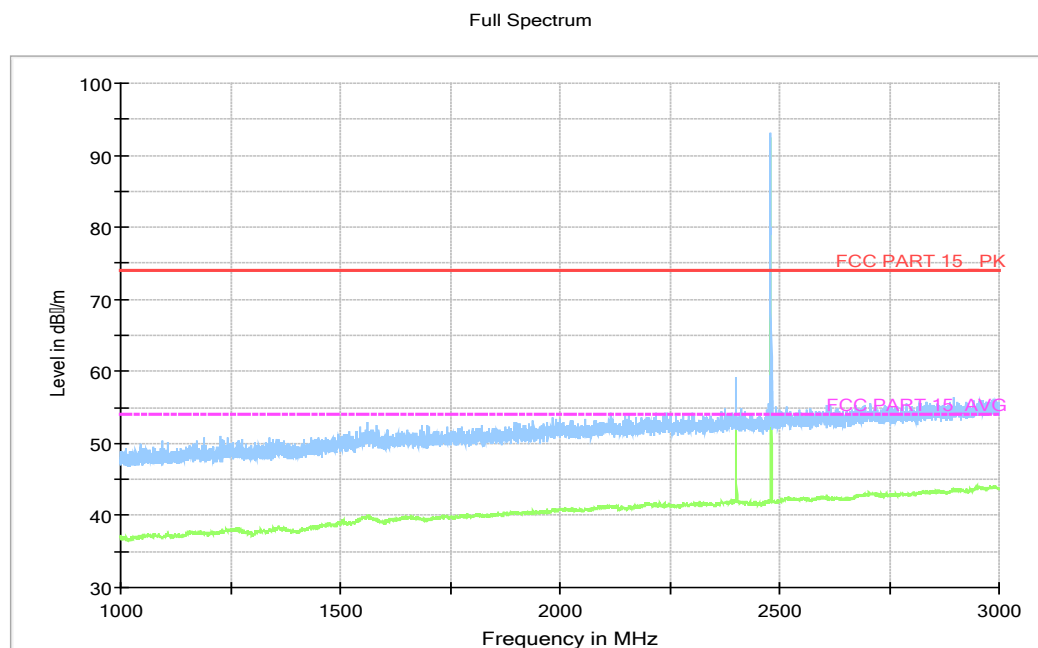


Fig.64. Radiated emission: GFSK, Channel 78, 1 GHz - 3 GHz

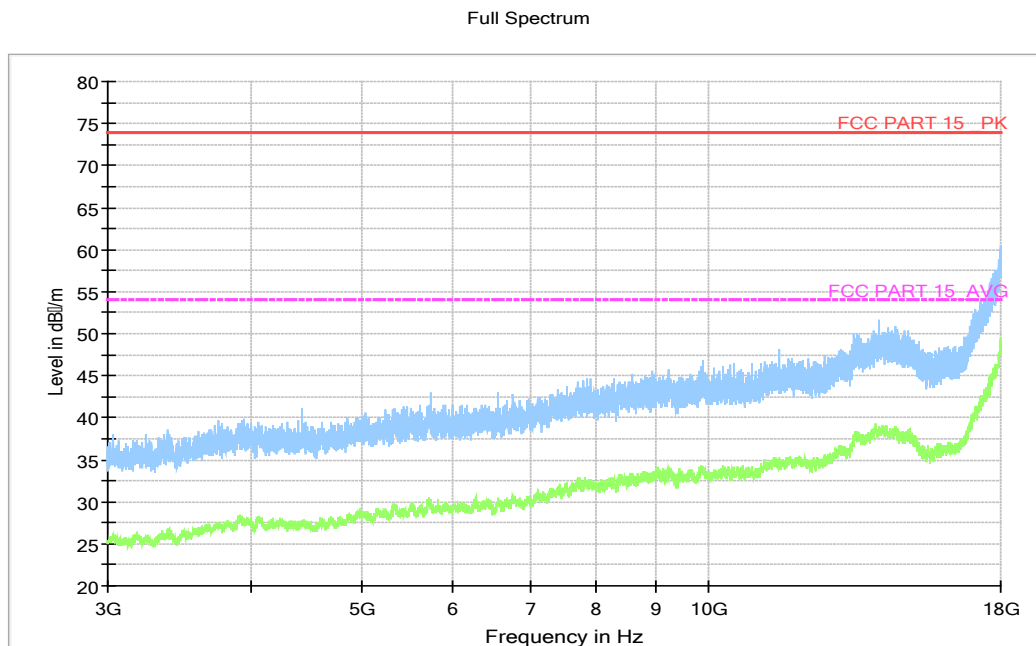


Fig.65. Radiated emission: GFSK, Channel 78, 3 GHz - 18 GHz

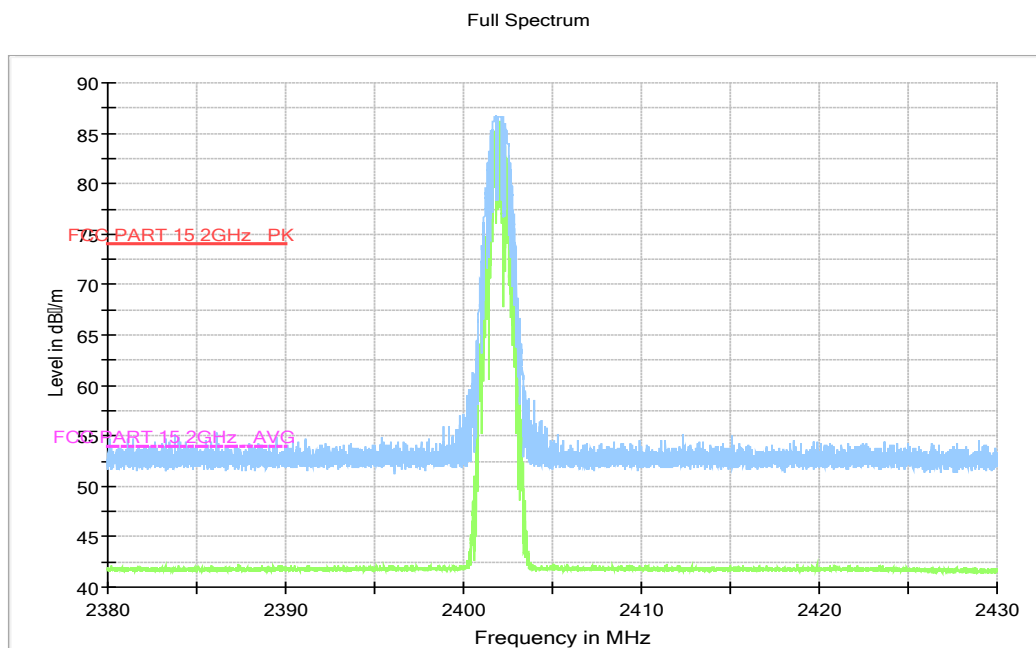


Fig.66. Radiated emission (Power): GFSK, low channel

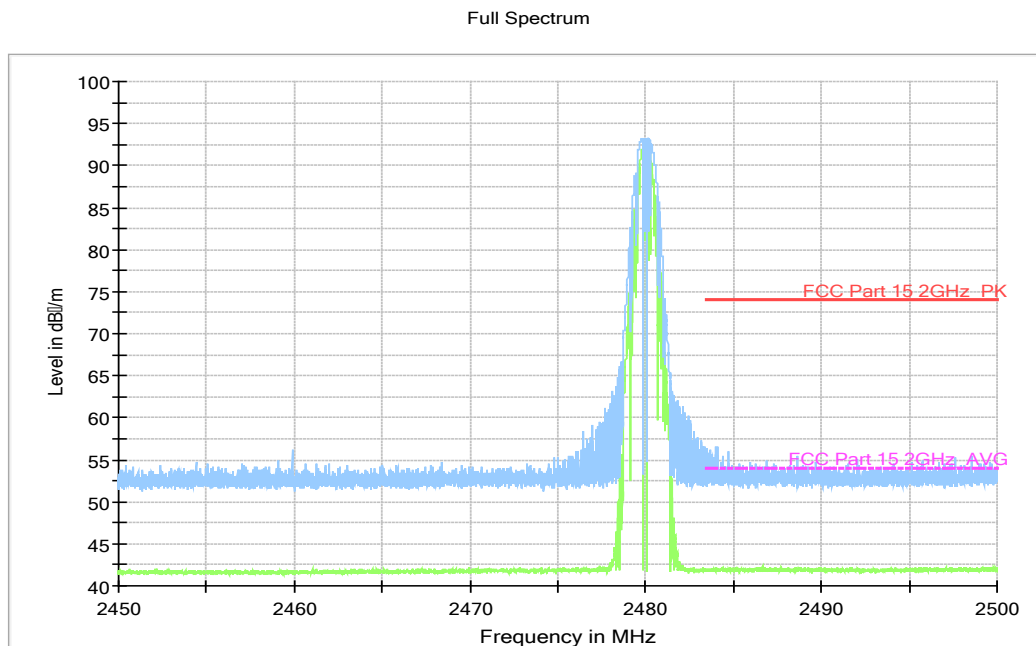


Fig.67. Radiated emission (Power) GFSK, high channel

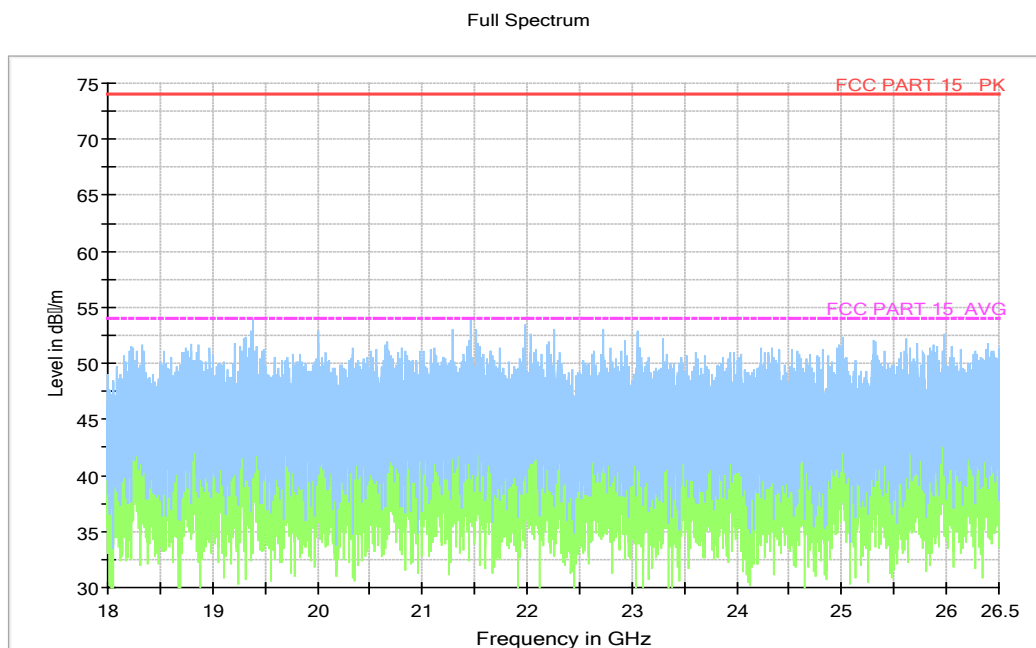


Fig.68. Radiated emission: GFSK, 18 GHz - 26 GHz

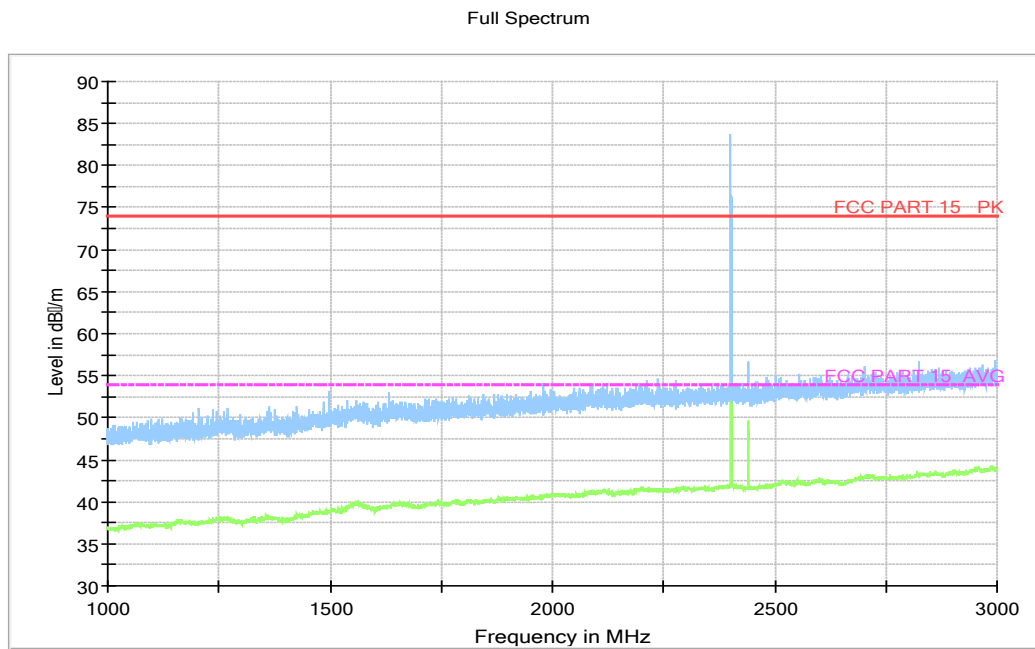


Fig.69. Radiated emission: $\pi/4$ DQPSK, Channel 0, 1 GHz - 3 GHz

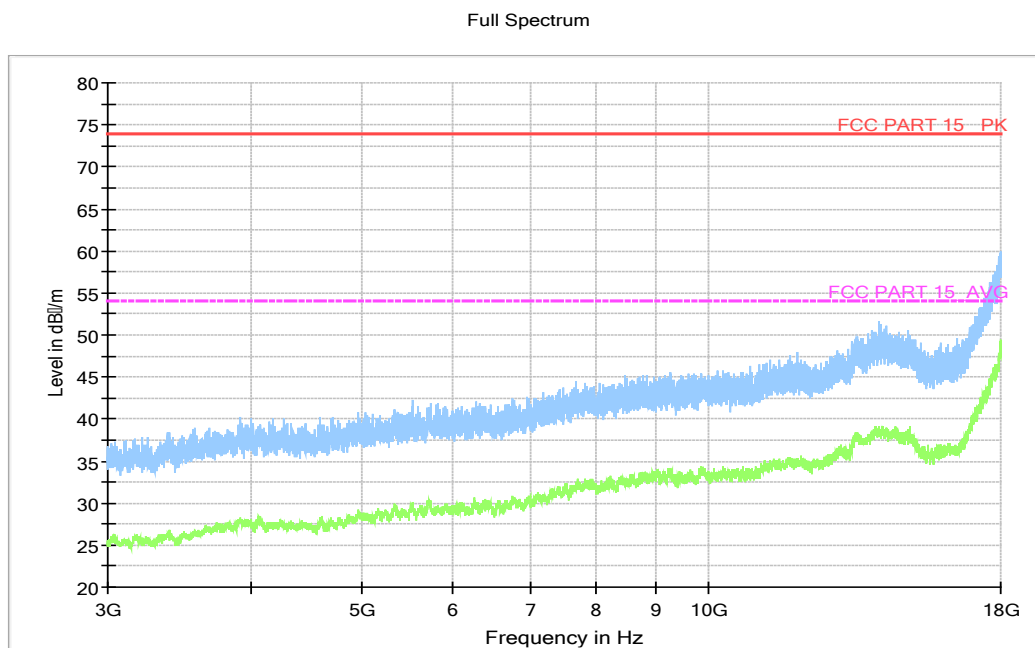


Fig.70. Radiated emission: $\pi/4$ DQPSK, Channel 0, 3 GHz - 18 GHz

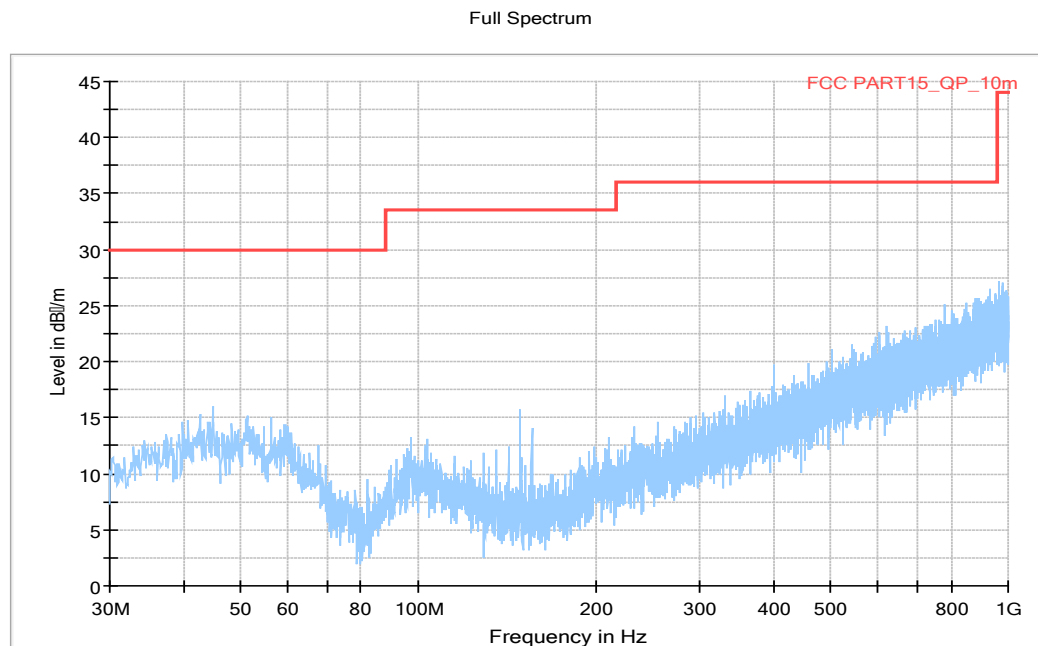


Fig.71. Radiated emission: $\pi/4$ DQPSK, Channel 39, 30 MHz - 1 GHz

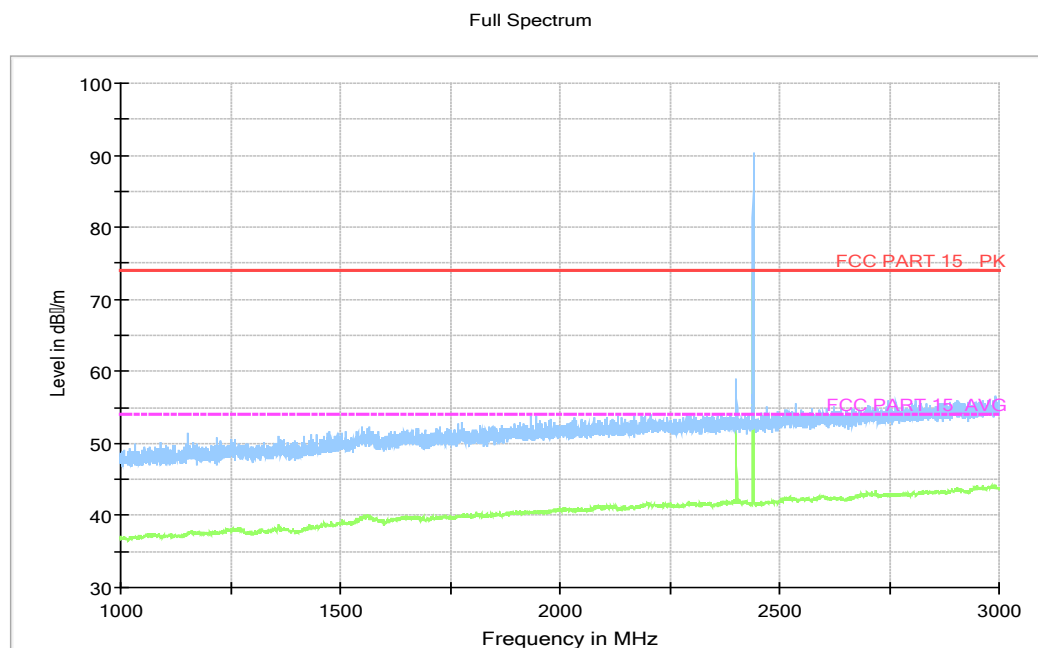


Fig.72. Radiated emission: $\pi/4$ DQPSK, Channel 39, 1 GHz - 3 GHz

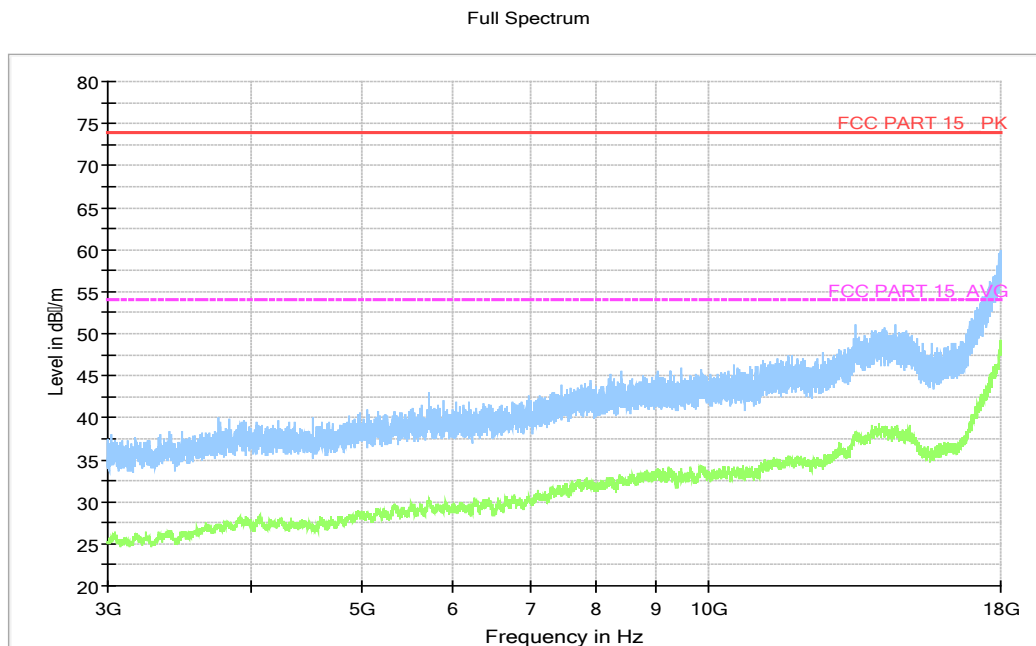


Fig.73. Radiated emission: $\pi/4$ DQPSK, Channel 39, 3 GHz - 18 GHz

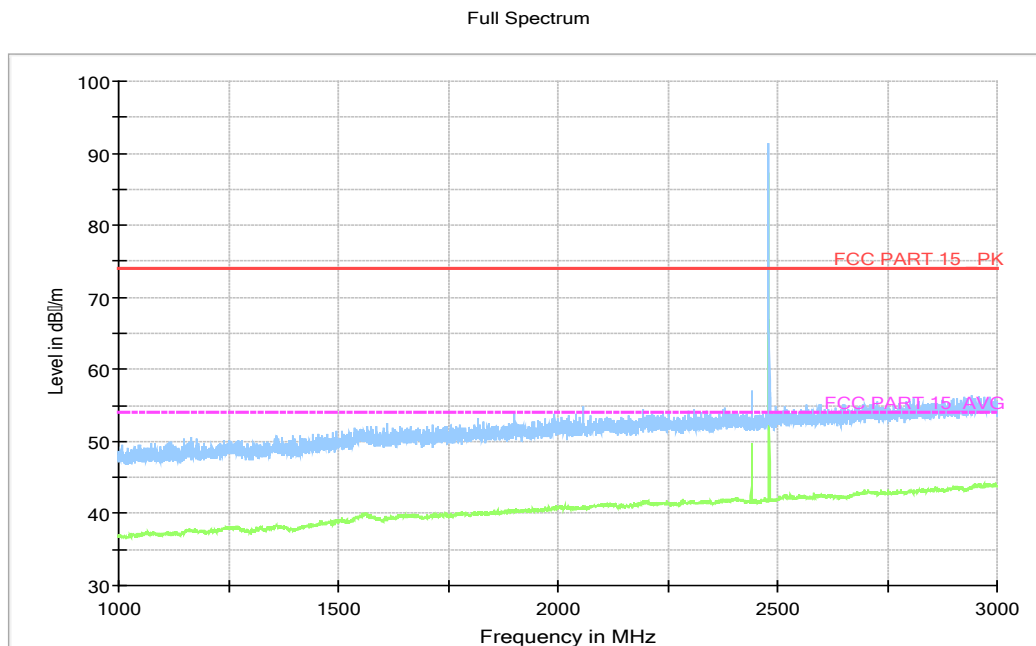


Fig.74. Radiated emission: $\pi/4$ DQPSK, Channel 78, 1 GHz - 3 GHz

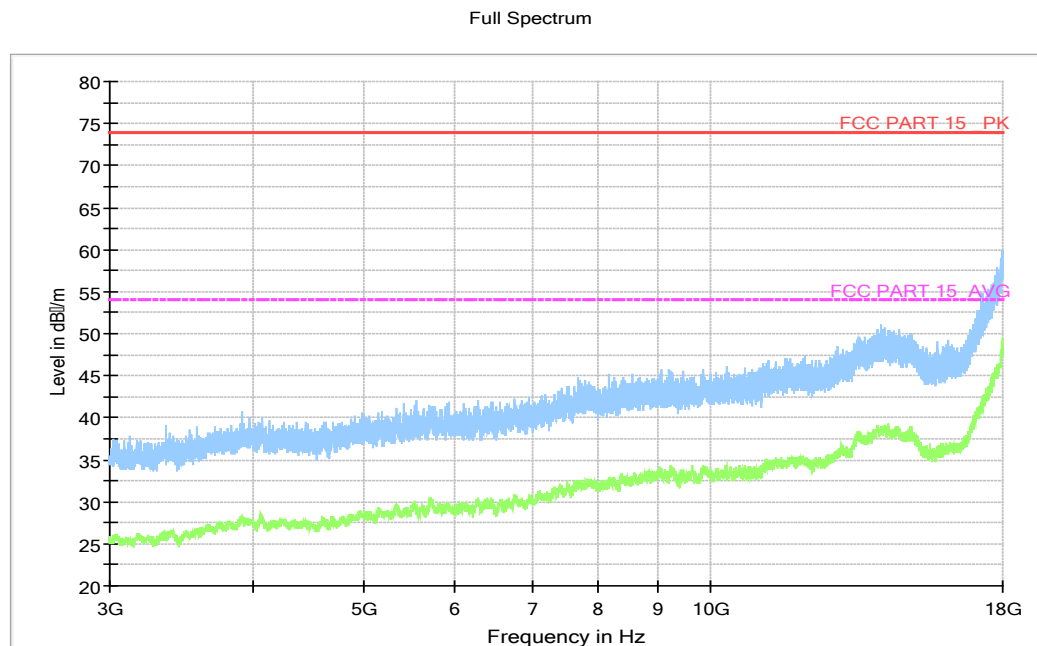


Fig.75. Radiated emission: $\pi/4$ DQPSK, Channel 78, 3 GHz - 18 GHz

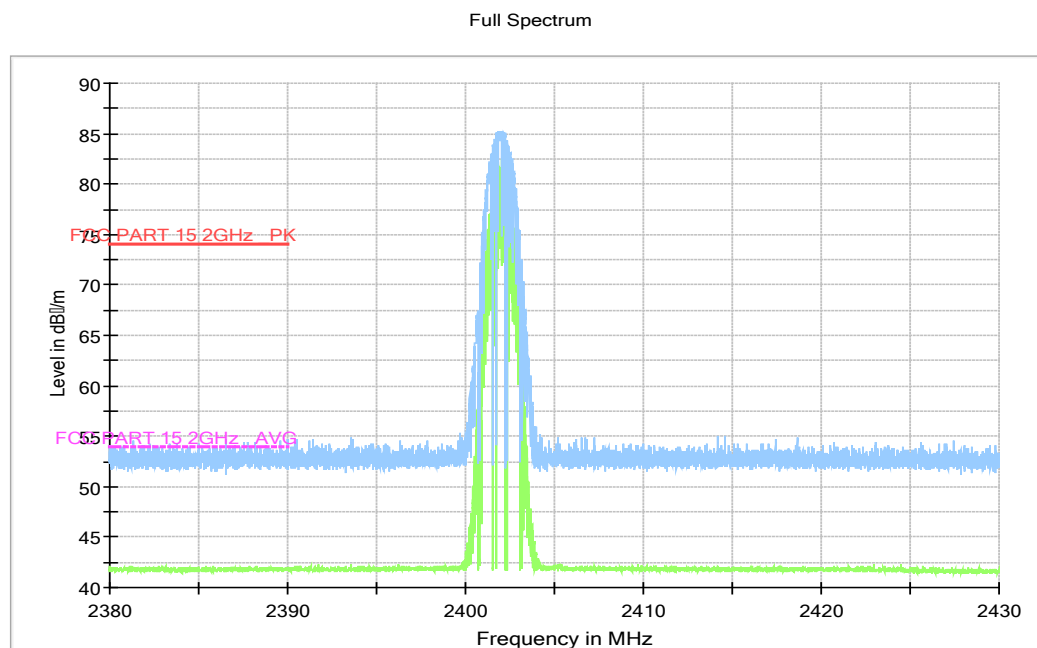


Fig.76. Radiated emission (Power): $\pi/4$ DQPSK, low channel

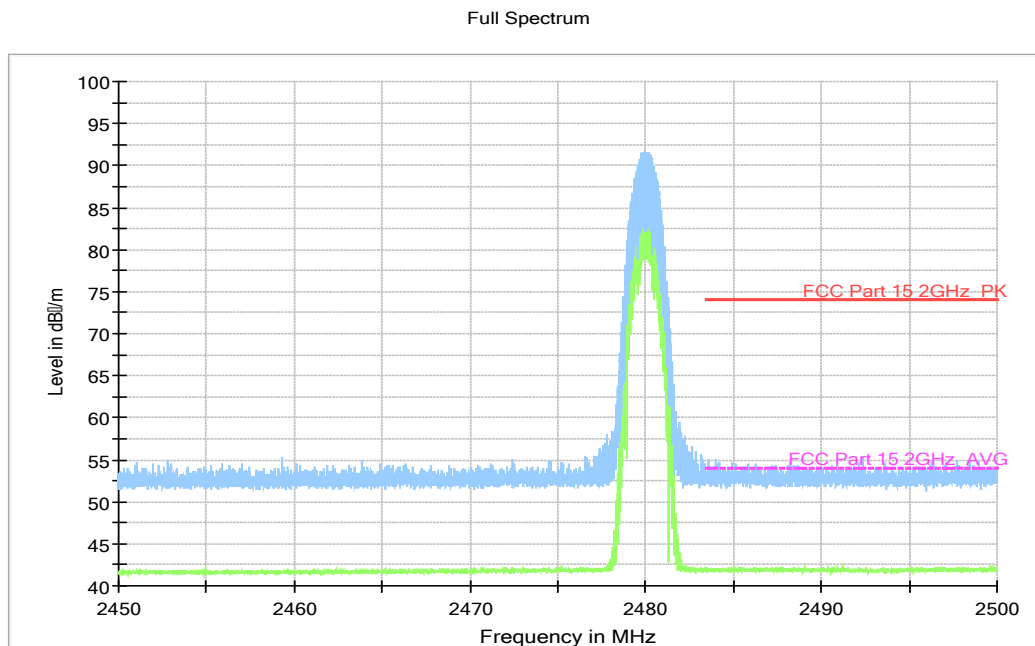


Fig.77. Radiated emission (Power): $\pi/4$ DQPSK, high channel

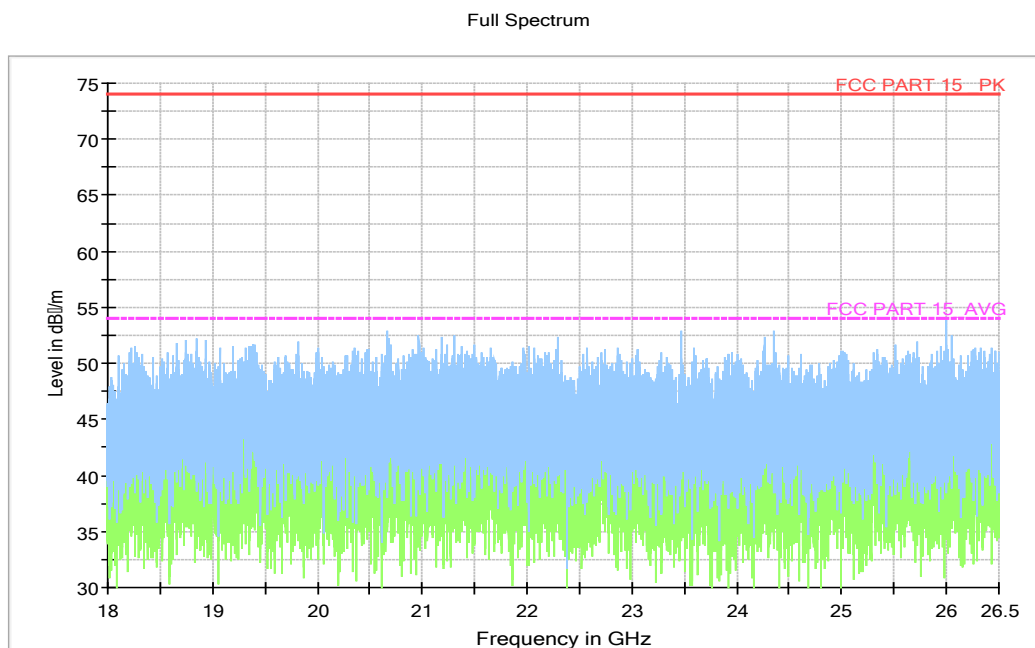


Fig.78. Radiated emission: $\pi/4$ DQPSK, 18 GHz - 26 GHz

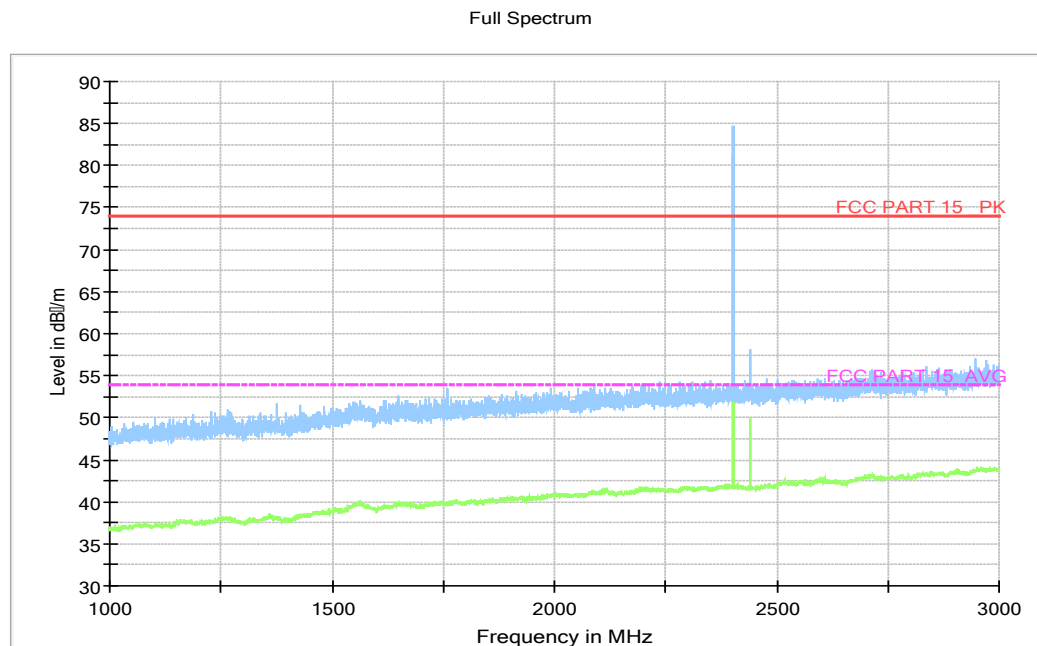


Fig.79. Radiated emission: 8DPSK, Channel 0, 1 GHz - 3 GHz

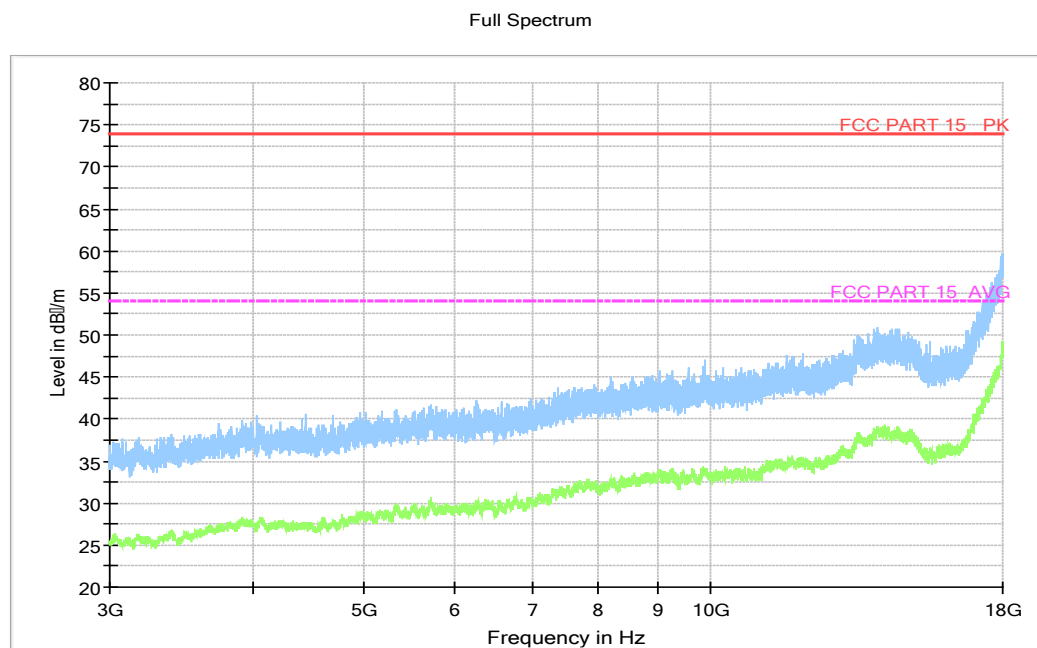


Fig.80. Radiated emission: 8DPSK, Channel 0, 3 GHz - 18 GHz

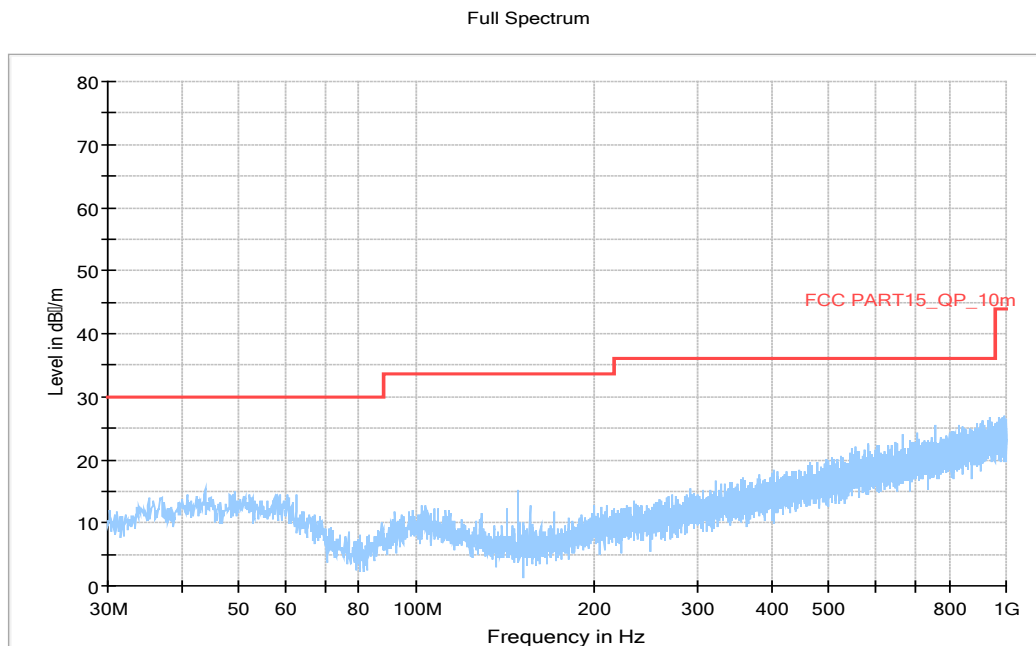


Fig.81. Radiated emission: 8DPSK, Channel 39, 30 MHz - 1 GHz

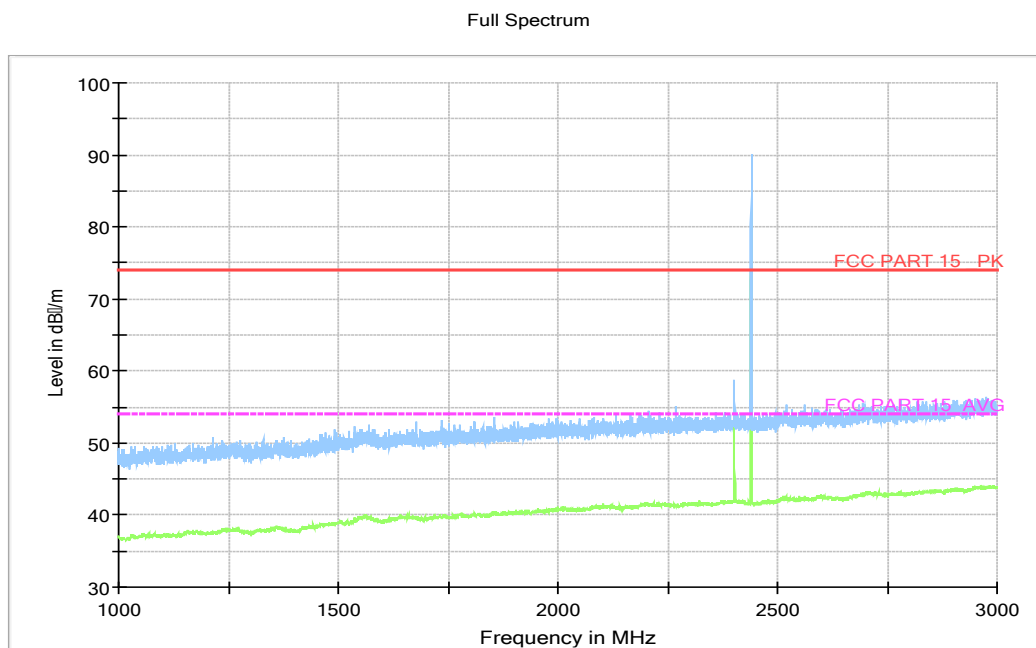


Fig.82. Radiated emission: 8DPSK, Channel 39, 1 GHz - 3 GHz

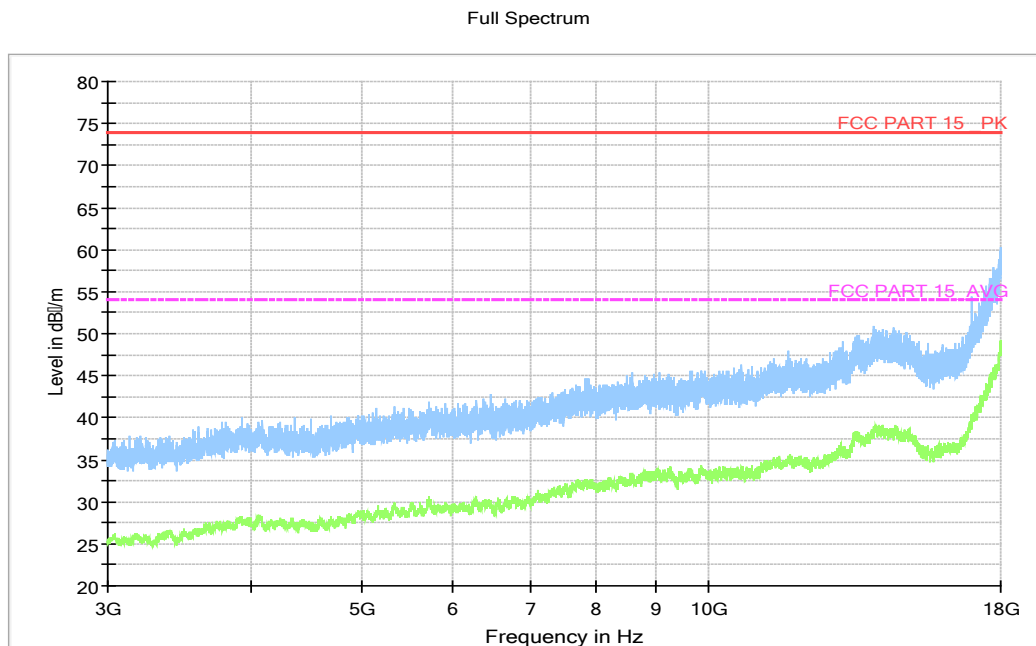


Fig.83. Radiated emission: 8DPSK, Channel 39, 3 GHz - 18 GHz

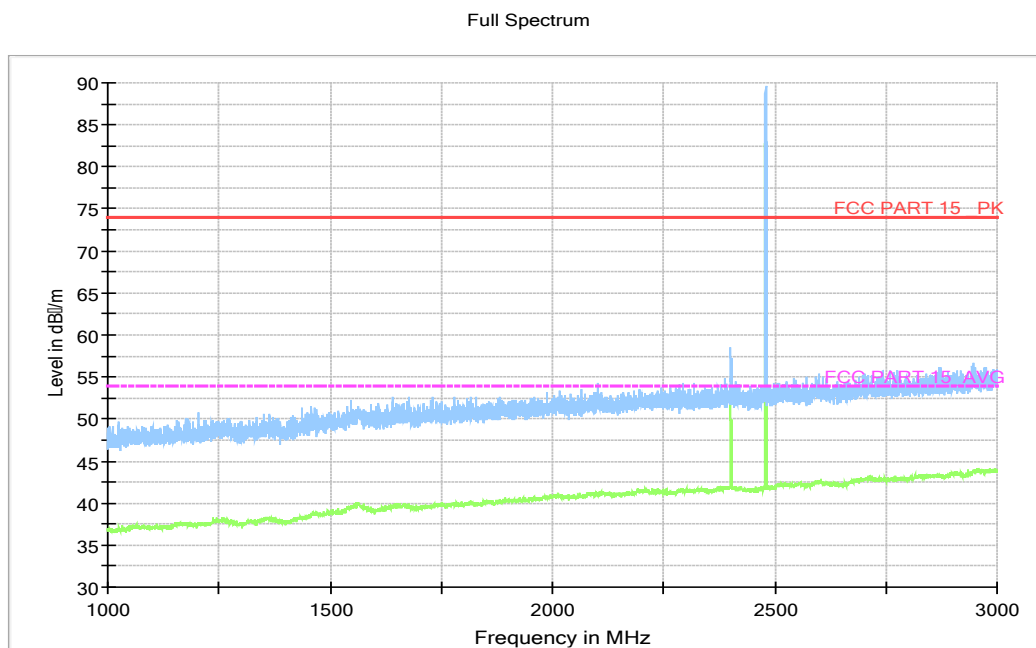


Fig.84. Radiated emission: 8DPSK, Channel 78, 1 GHz - 3 GHz

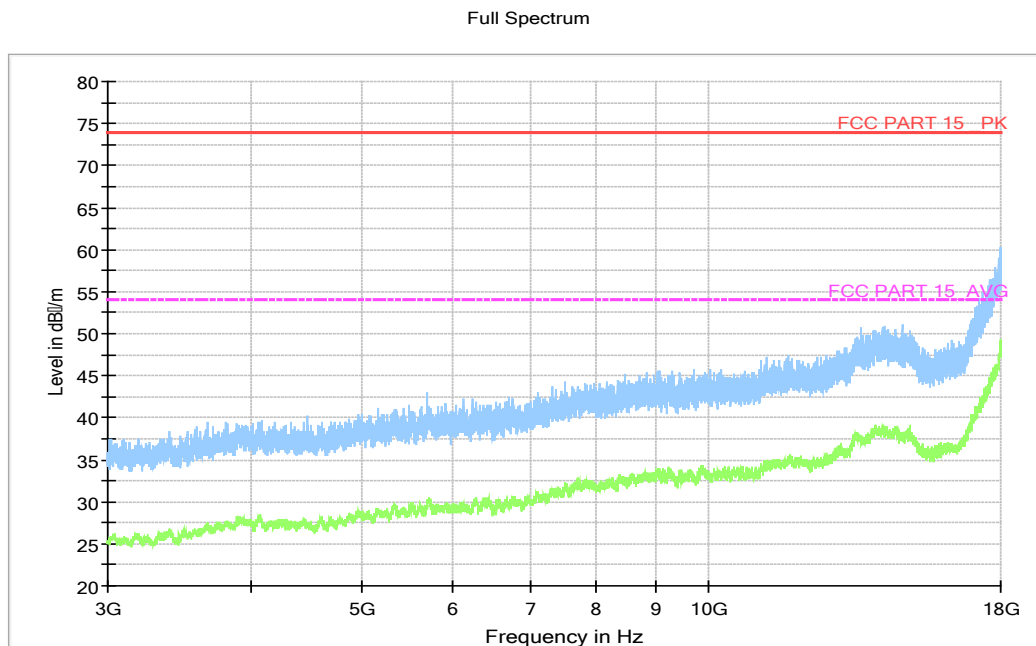


Fig.85. Radiated emission: 8DPSK, Channel 78, 3 GHz - 18 GHz

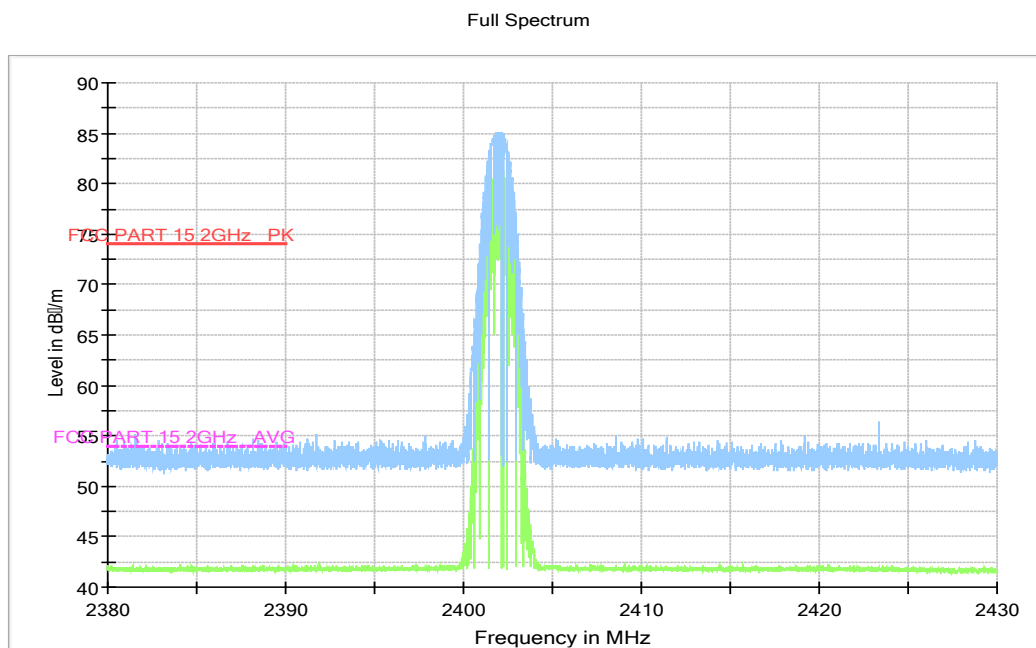


Fig.86. Radiated emission (Power): 8DPSK, low channel

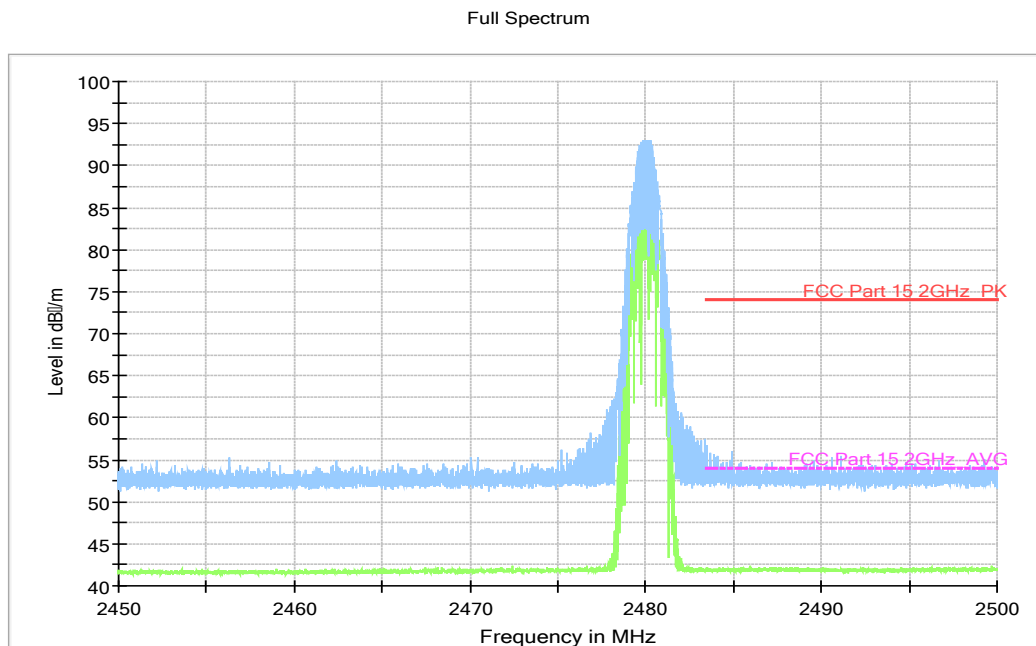


Fig.87. Radiated emission (Power): 8DPSK, high channel

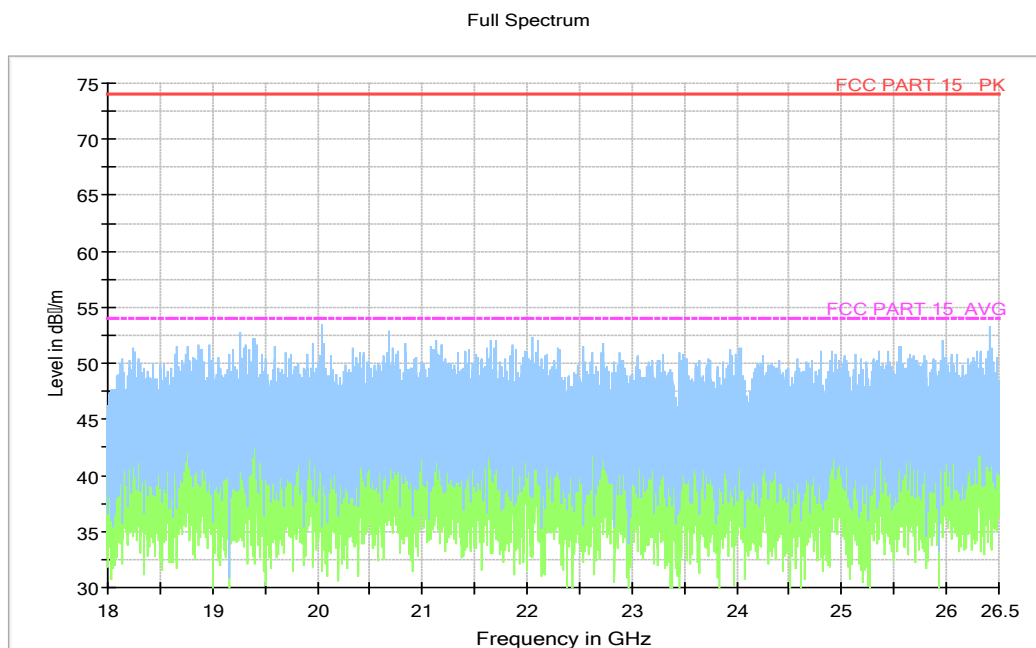


Fig.88. Radiated emission: 8DPSK, 18 GHz - 26 GHz

A.6. Time of Occupancy (Dwell Time)

Method of Measurement: See ANSI C63.10-clause 7.8.4

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

- Span = zero span, centered on a hopping channel
- RBW = 1 MHz
- VBW \geq RBW
- Sweep = as necessary to capture the entire dwell time per hopping channel
- Detector function = peak
- Trace = max hold

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 Limit:

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

Measurement Result:

For GFSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.89	109.26	P
		Fig.90		
	DH3	Fig.91	201.65	P
		Fig.92		
	DH5	Fig.93	252.13	P
		Fig.94		

For $\pi/4$ DQPSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.95	109.64	P
		Fig.96		
	DH3	Fig.97	167.76	P
		Fig.98		
	DH5	Fig.99	203.24	P
		Fig.100		

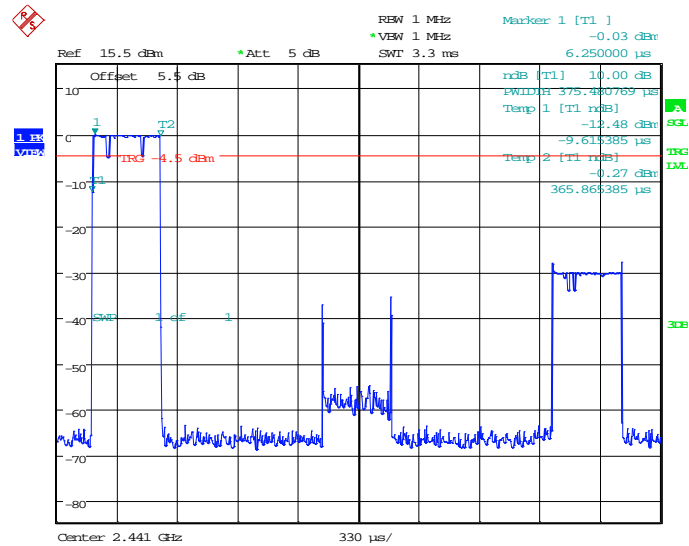
For 8DPSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.101	105.85	P
		Fig.102		
	DH3	Fig.103	200.65	P

	DH5	Fig.104	206.14	P
		Fig.105		
		Fig.106		

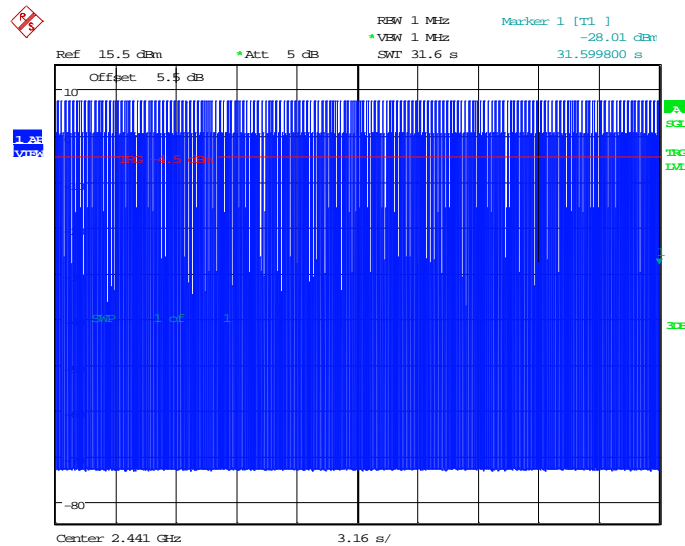
Conclusion: PASS

Test graphs as below:



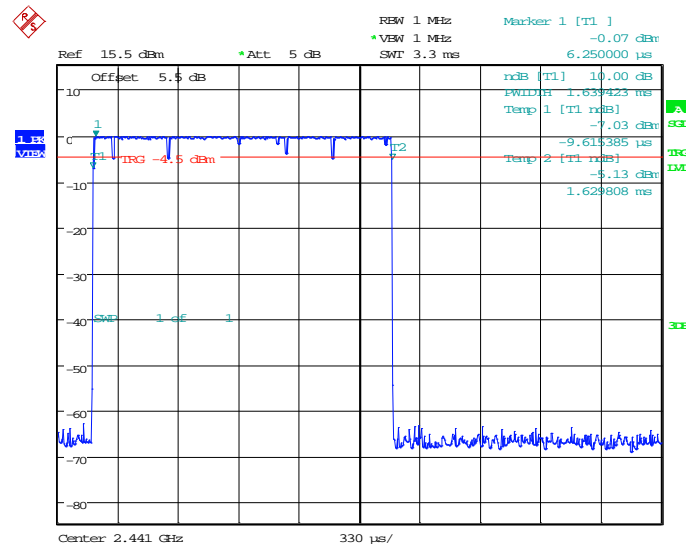
Date: 15.APR.2016 09:50:55

Fig.89. Time of occupancy (Dwell Time): Channel 39, Packet DH1



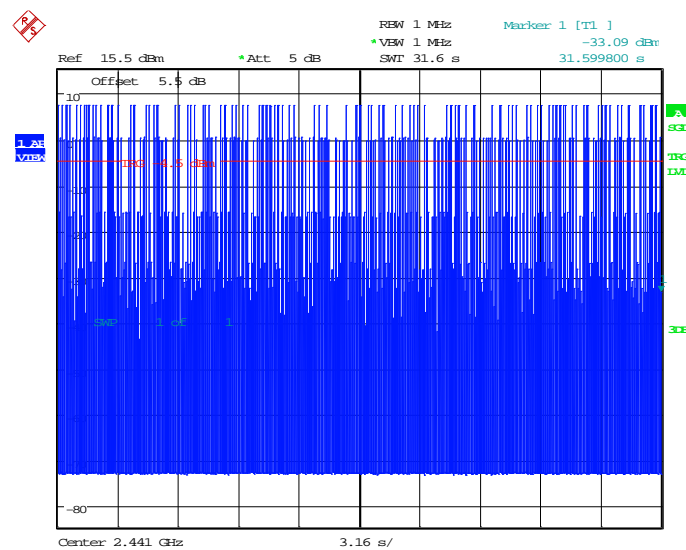
Date: 15.APR.2016 09:50:43

Fig.90. Number of Transmissions Measurement:Channel 39,Packet DH1



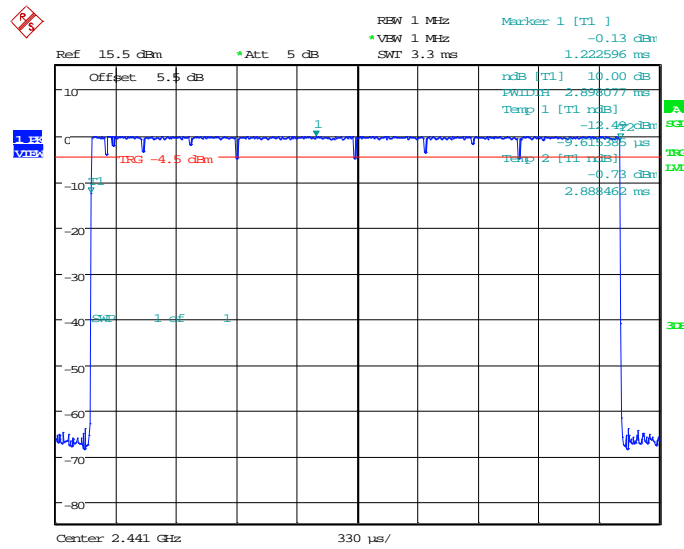
Date: 15.APR.2016 09:52:13

Fig.91. Time of occupancy (Dwell Time): Channel 39, Packet DH3



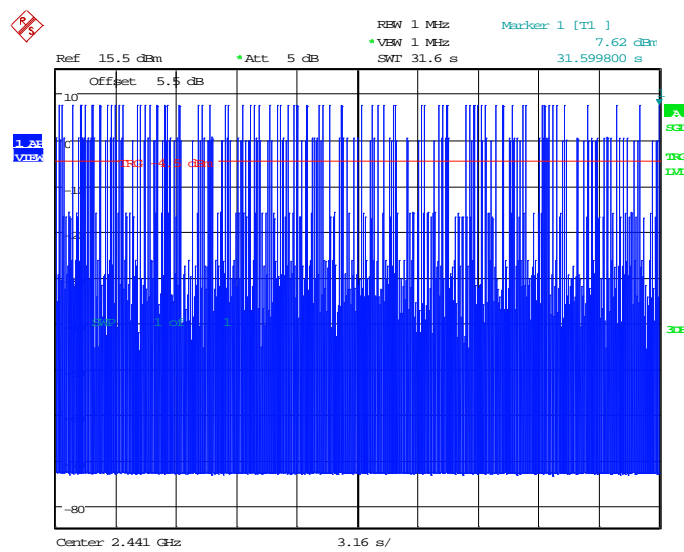
Date: 15.APR.2016 09:52:01

Fig.92. Number of Transmissions Measurement:Channel 39,Packet DH3



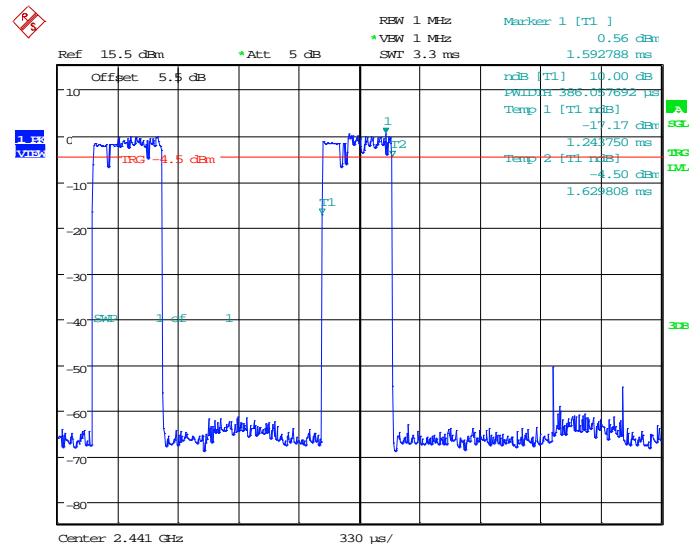
Date: 15.APR.2016 09:53:29

Fig.93. Time of occupancy (Dwell Time): Channel 39, Packet DH5



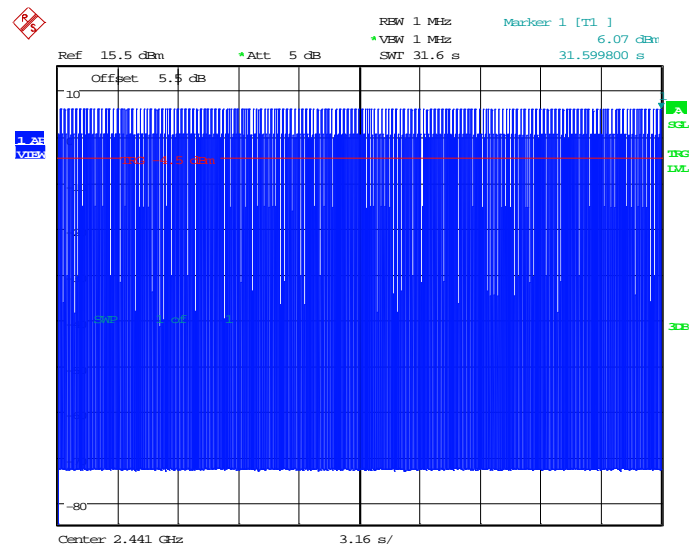
Date: 15.APR.2016 09:53:18

Fig.94. Number of Transmissions Measurement: Channel 39, Packet DH5



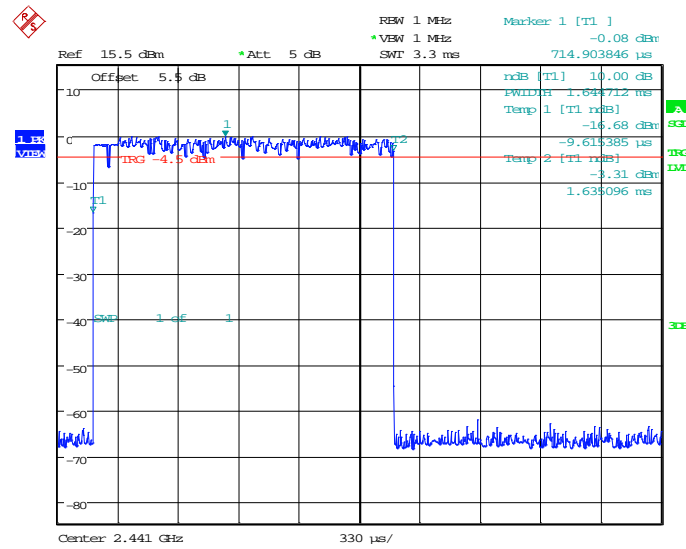
Date: 15.APR.2016 10:12:56

Fig.95. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH1



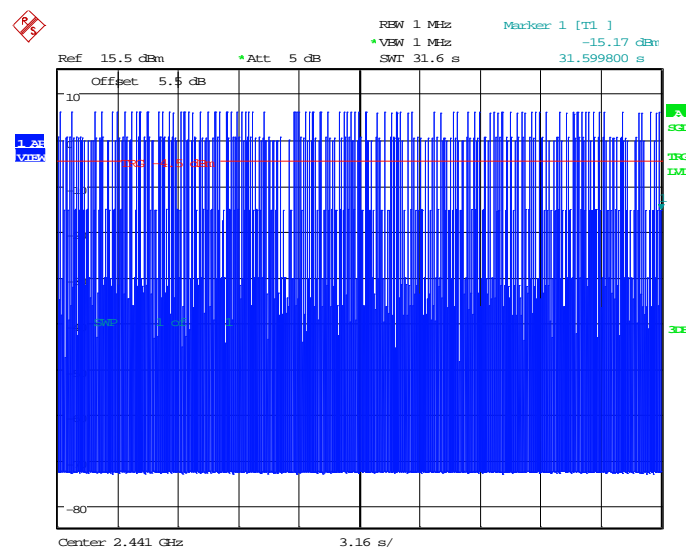
Date: 15.APR.2016 10:12:44

Fig.96. Number of Transmissions Measurement:Channel 39,Packet 2-DH1



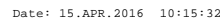
Date: 15.APR.2016 10:14:16

Fig.97. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH3



Date: 15.APR.2016 10:14:04

Fig.98. Number of Transmissions Measurement:Channel 39,Packet 2-DH3

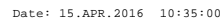


REF 15.5 dBm *Att 5 dB REW 1 MHz Marker 1 [T1] 0.57 dBm
 *VIEW 1 MHz SWF 31.6 s 31.599800 s

Offset 5.5 dB
 1 dB
 VIBX
 10
 0
 -10
 -20
 -30
 -40
 -50
 -60
 -70
 -80
 Center 2.441 GHz 3.16 s/



Fig.100. Number of Transmissions Measurement:Channel 39,Packet 2-DH5



Ref 15.5 dBm *Att 5 dB REW 1 MHz Marker 1 [T1] 5.91 dBm
 *VIEW 1 MHz SWI 31.6 s 31.599800 s

Offset: 5.5 dB

10

1 dB
 VISE

Top: -4.5 dBm

-80

Center 2.441 GHz 3.16 s/



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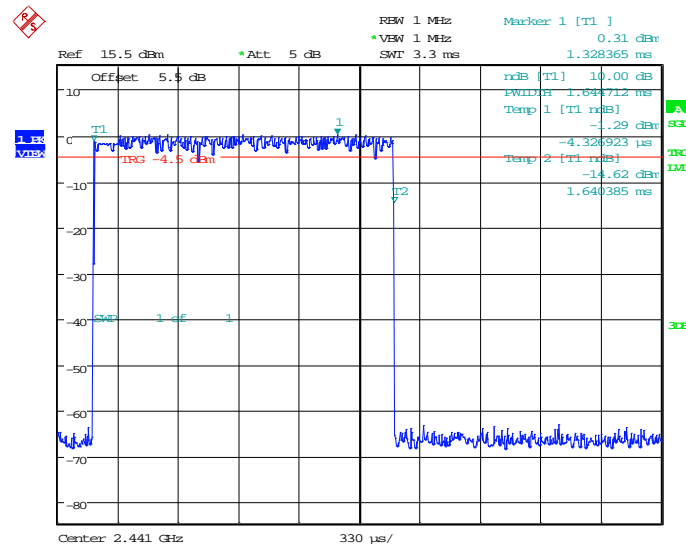


Fig.103. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH3

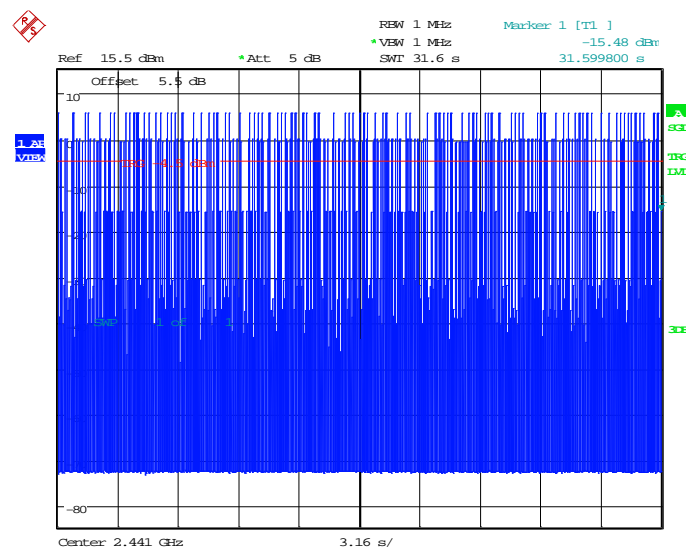
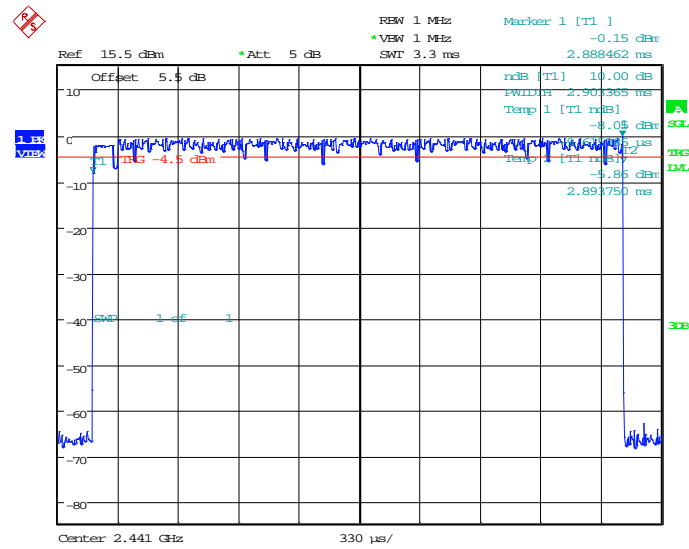
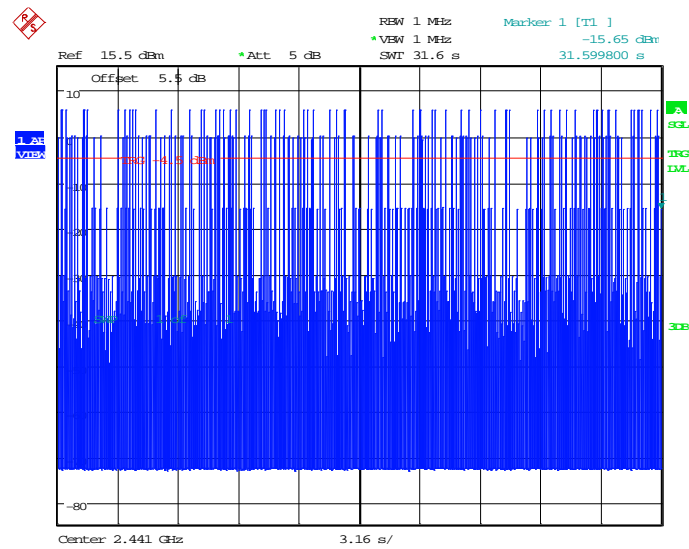


Fig.104. Number of Transmissions Measurement:Channel 39,Packet 3-DH3



Date: 15.APR.2016 10:37:36

Fig.105. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH5



Date: 15.APR.2016 10:37:24

Fig.106. Number of Transmissions Measurement:Channel 39,Packet 3-DH5

A.7. 20dB Bandwidth

Method of Measurement: See ANSI C63.10-clause 6.9.2

Measurement Procedure - Unwanted Emissions

1. Set RBW = 20kHz.
2. Set VBW = 100 kHz.
3. Set span to 3MHz
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).

Measurement Limit:

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

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.107	870.19	NA
39	Fig.108	870.19	NA
78	Fig.109	870.19	NA

For $\pi/4$ DQPSK

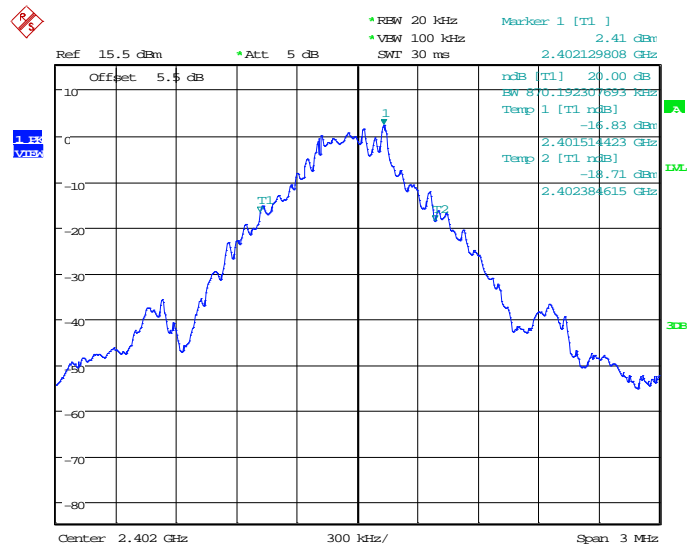
Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.110	1274.04	NA
39	Fig.111	1259.62	NA
78	Fig.112	1269.23	NA

For 8DPSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.113	1269.23	NA
39	Fig.114	1259.62	NA
78	Fig.115	1269.23	NA

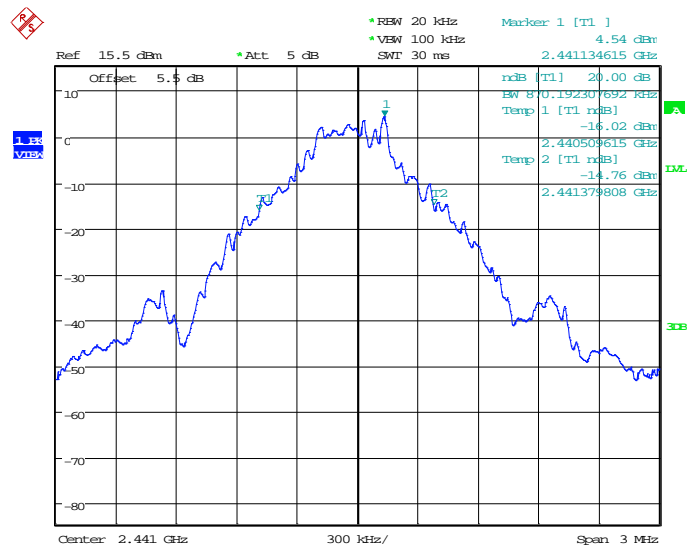
Conclusion: NA

Test graphs as below:



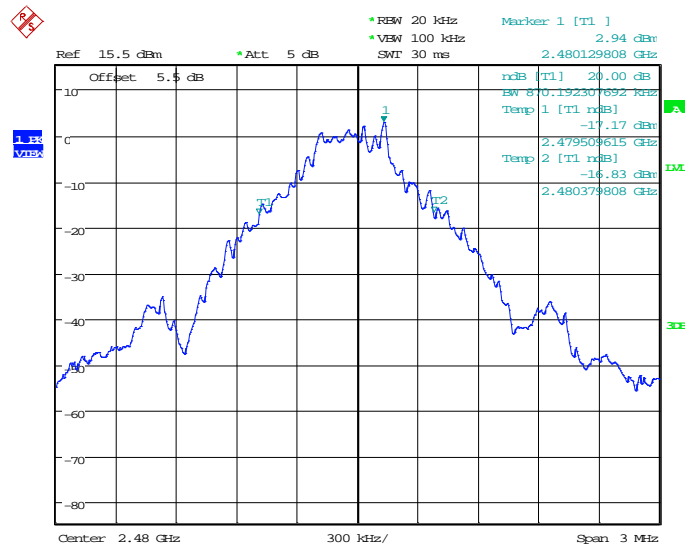
Date: 15.APR.2016 09:54:03

Fig.107. 20dB Bandwidth: GFSK, Channel 0



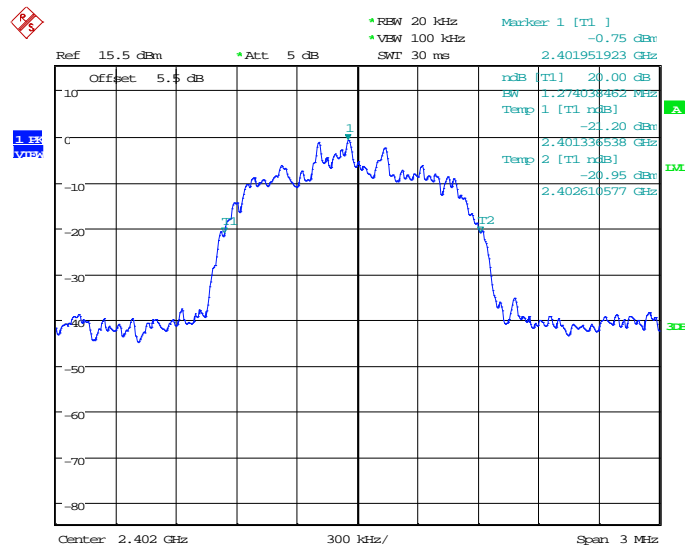
Date: 15.APR.2016 09:54:35

Fig.108. 20dB Bandwidth: GFSK, Channel 39



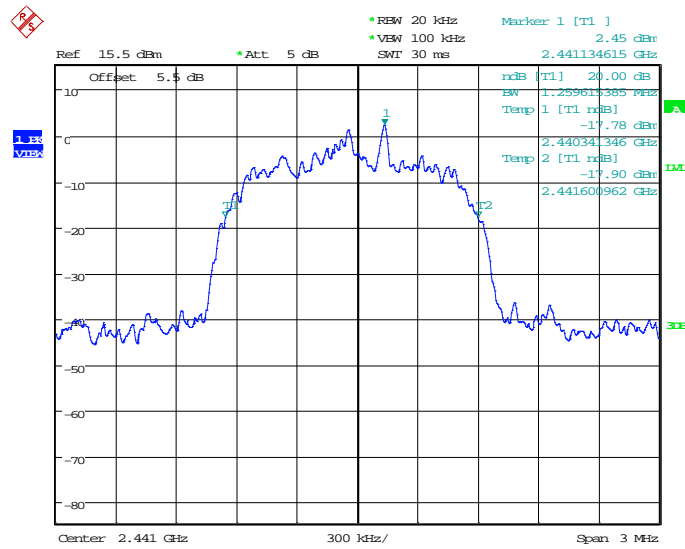
Date: 15.APR.2016 09:55:07

Fig.109. 20dB Bandwidth: GFSK, Channel 78



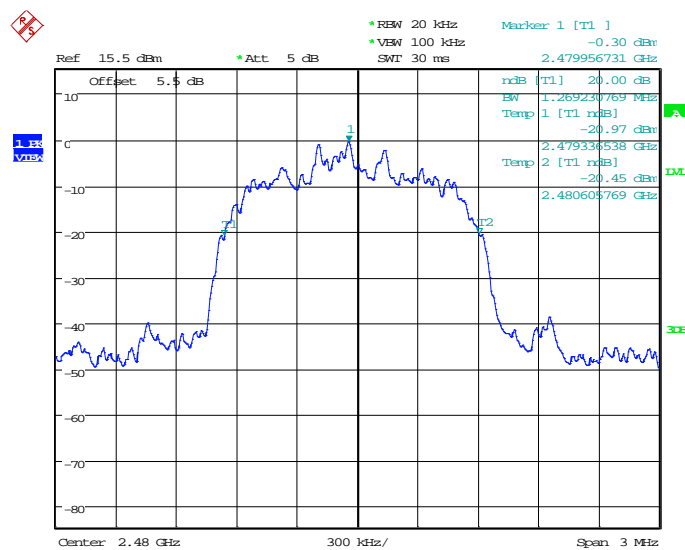
Date: 15.APR.2016 10:16:06

Fig.110. 20dB Bandwidth: $\pi/4$ DQPSK, Channel 0



Date: 15.APR.2016 10:16:38

Fig.111. 20dB Bandwidth: $\pi/4$ DQPSK, Channel 39



Date: 15.APR.2016 10:17:10

Fig.112. 20dB Bandwidth: $\pi/4$ DQPSK, Channel 78

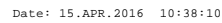
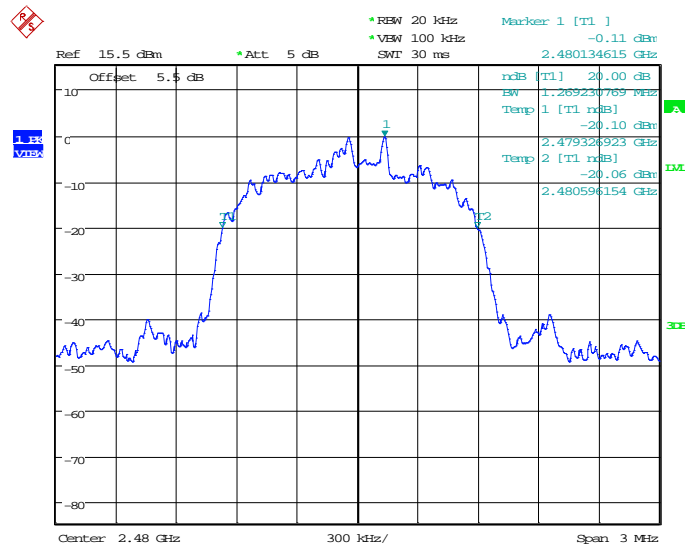


Fig.113. 20dB Bandwidth: 8DPSK, Channel 0



Fig.114. 20dB Bandwidth: 8DPSK, Channel 39



Date: 15.APR.2016 10:39:14

Fig.115. 20dB Bandwidth: 8DPSK, Channel 78

A.8. Carrier Frequency Separation

Method of Measurement: See ANSI C63.10-clause 7.8.2

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

- Span = 3MHz
- RBW=300kHz
- VBW=1MHz
- Sweep = auto
- Detector function = peak
- Trace = max hold
- Allow the trace to stabilize

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

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

Measurement Limit:

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

Measurement Result:

For GFSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.116	985.58	P

For $\pi/4$ DQPSK

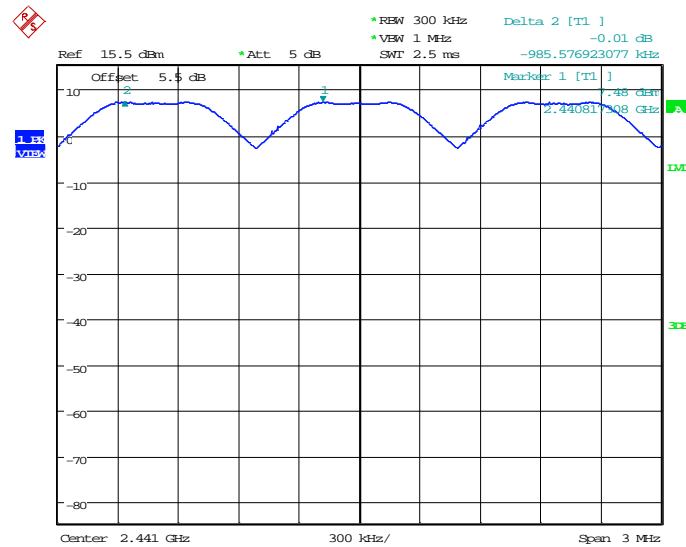
Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.117	1019.23	P

For 8DPSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.118	1177.88	P

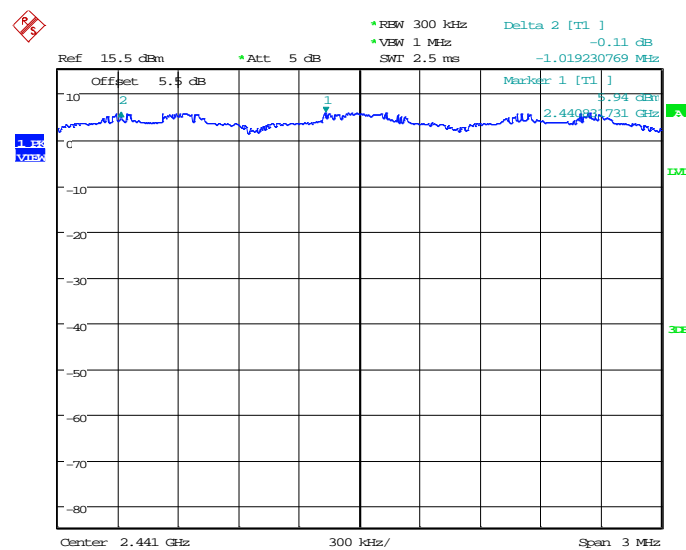
Conclusion: PASS

Test graphs as below:



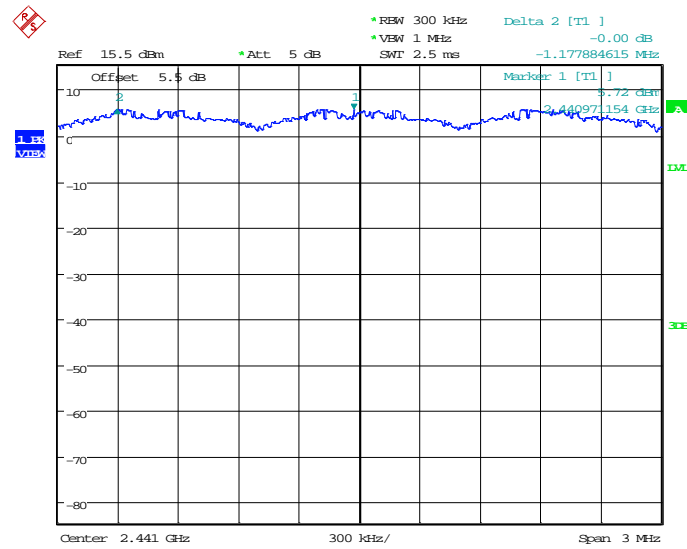
Date: 15.APR.2016 09:57:11

Fig.116. Carrier frequency separation measurement: GFSK, Channel 39



Date: 15.APR.2016 10:19:14

Fig.117. Carrier frequency separation measurement: $\pi/4$ DQPSK, Channel 39



Date: 15.APR.2016 10:41:18

Fig.118. Carrier frequency separation measurement: 8DPSK, Channel 39

A.9. Number of Hopping Channels

Method of Measurement: See ANSI C63.10-clause 7.8.3

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

- Span = the frequency band of operation
- RBW = 500kHz
- VBW = 500kHz
- Sweep = auto
- Detector function = peak
- Trace = max hold
- Allow the trace to stabilize

It might prove necessary to break the span up into subranges to show clearly all of the hopping frequencies. Compliance of an EUT with the appropriate regulatory limit shall be determined for the number of hopping channels. A plot of the data shall be included in the test report.

Measurement Limit:

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

Measurement Result:

For GFSK

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

For $\pi/4$ DQPSK

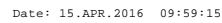
Channel	Number of hopping channels		Conclusion
0~39	Fig.121	79	P
40~78	Fig.122		

For 8DPSK

Channel	Number of hopping channels		Conclusion
0~39	Fig.123	79	P
40~78	Fig.124		

Conclusion: PASS

Test graphs as below:

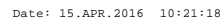


Ref 15.5 dBm *Att 5 dB *BW 500 kHz Delta 2 [T1] -1.58 dB
 *VIEW 500 kHz 38.092227564 MHz
 SWI 2.5 ms

Offset 5.5 dB Marker 1 [T1] 7.30 dBm
 38.092227564 MHz

Start 2.44145 GHz 3.955 MHz/ Stop 2.481 GHz

Date: 15.APR.2016 10:01:17

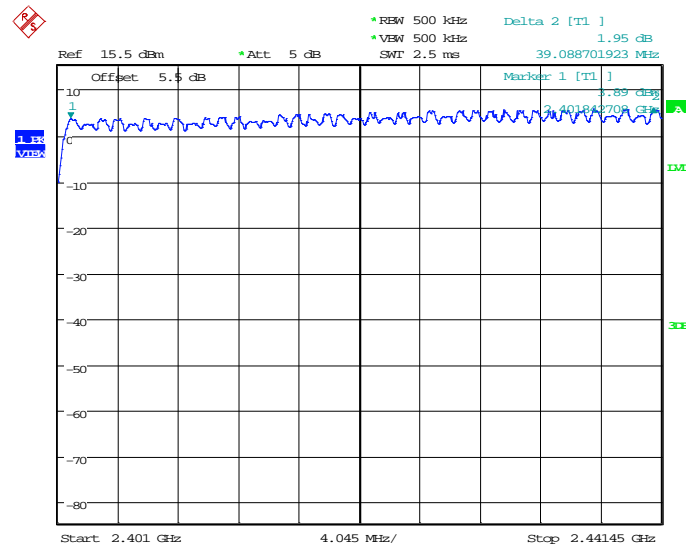


Ref 15.5 dBm • Att 5 dB • RBW 500 kHz Delta 2 [T1] -1.50 dB
 • VSW 500 kHz 38.092227564 MHz
 SWT 2.5 ms

Offset 5.5 dB Marker 1 [T1] 2.441830288 GHz -1.50 dBm

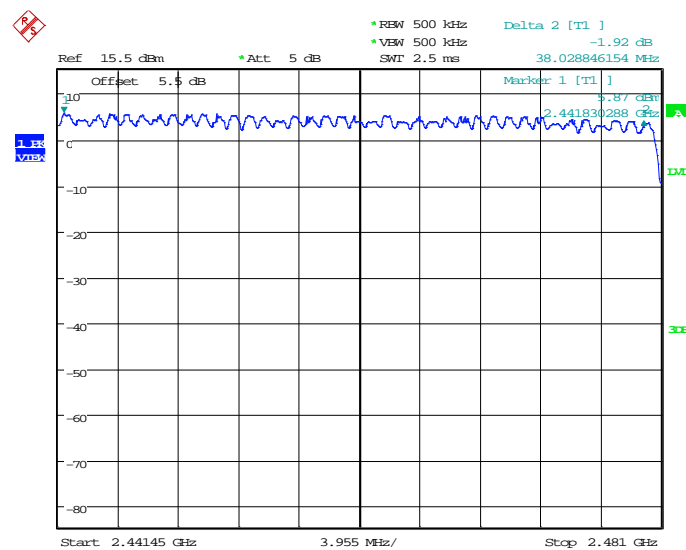
Start 2.44145 GHz 3.955 MHz/ Stop 2.481 GHz

Date: 15.APR.2016 10:23:21



Date: 15.APR.2016 10:43:22

Fig.123. Number of hopping frequencies: 8DPSK, Channel 0 - 39



Date: 15.APR.2016 10:45:24

Fig.124. 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 (dB μ V)	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 (dB μ V)	Conclusion
0.15 to 0.5	56 to 46	P
0.5 to 5	46	
5 to 30	50	

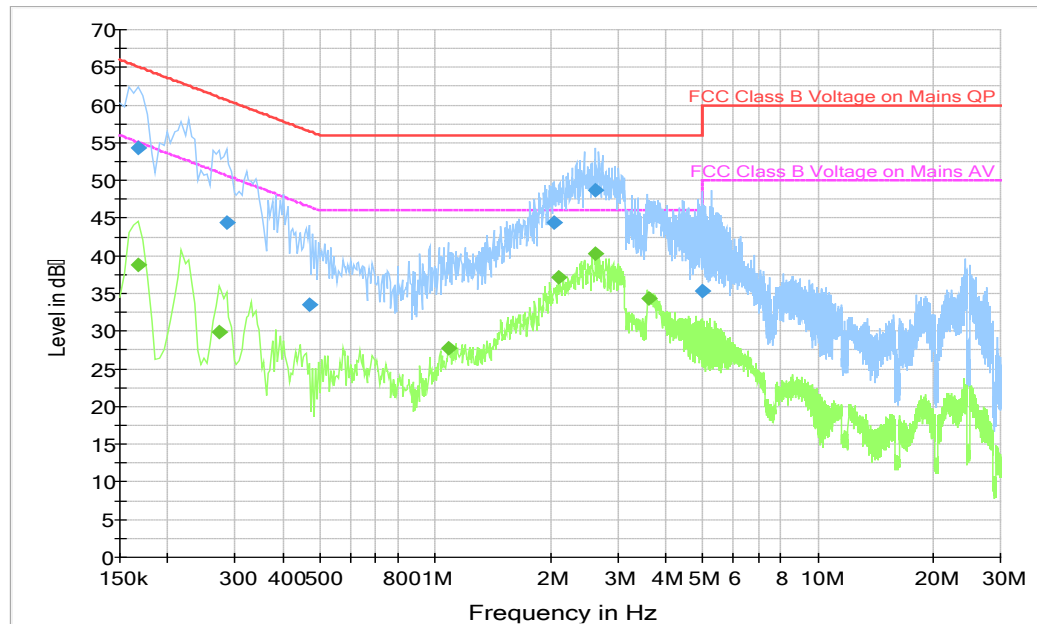
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

The measurement is made according to ANSI C63.10

Conclusion: PASS

Test graphs as below:

Traffic (CBA3068AB1C1):



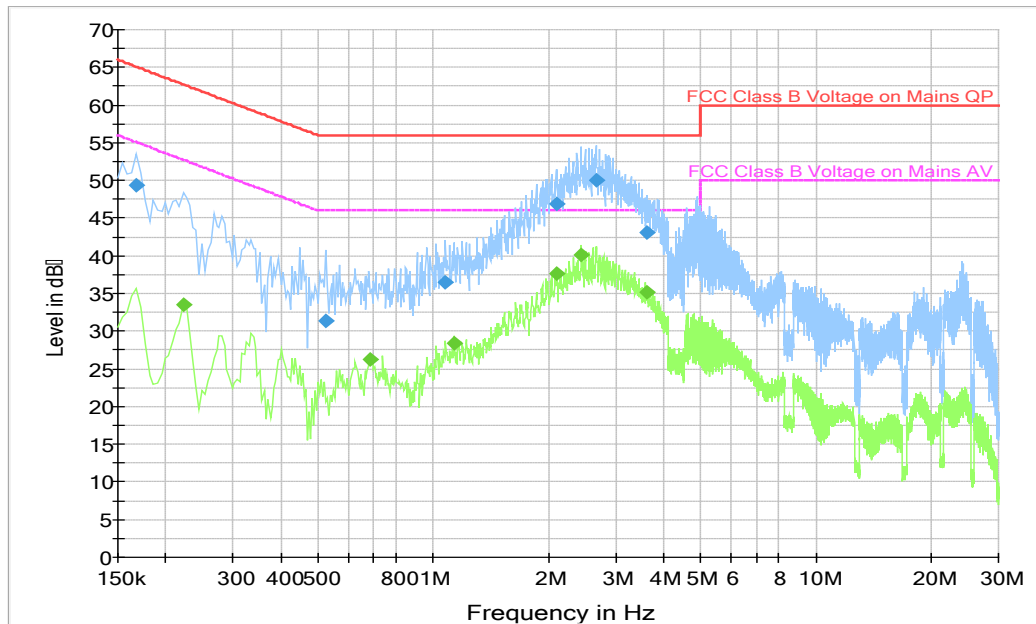
Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.168000	54.3	2000.0	9.000	On	L1	19.8	10.7	65.1
0.285000	44.4	2000.0	9.000	On	L1	19.8	16.2	60.7
0.469500	33.5	2000.0	9.000	On	L1	19.9	23.1	56.5
2.053500	44.4	2000.0	9.000	On	L1	19.7	11.6	56.0
2.620500	48.7	2000.0	9.000	On	L1	19.2	7.3	56.0
4.983000	35.3	2000.0	9.000	On	N	19.6	20.7	56.0

Final Result 2

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.168000	38.8	2000.0	9.000	On	L1	19.8	16.2	55.1
0.271500	30.0	2000.0	9.000	On	L1	19.8	21.1	51.1
1.081500	27.7	2000.0	9.000	On	L1	19.7	18.3	46.0
2.103000	37.1	2000.0	9.000	On	L1	19.6	8.9	46.0
2.620500	40.3	2000.0	9.000	On	L1	19.2	5.7	46.0
3.610500	34.4	2000.0	9.000	On	L1	19.5	11.6	46.0

Idle (CBA3068AB1C1):



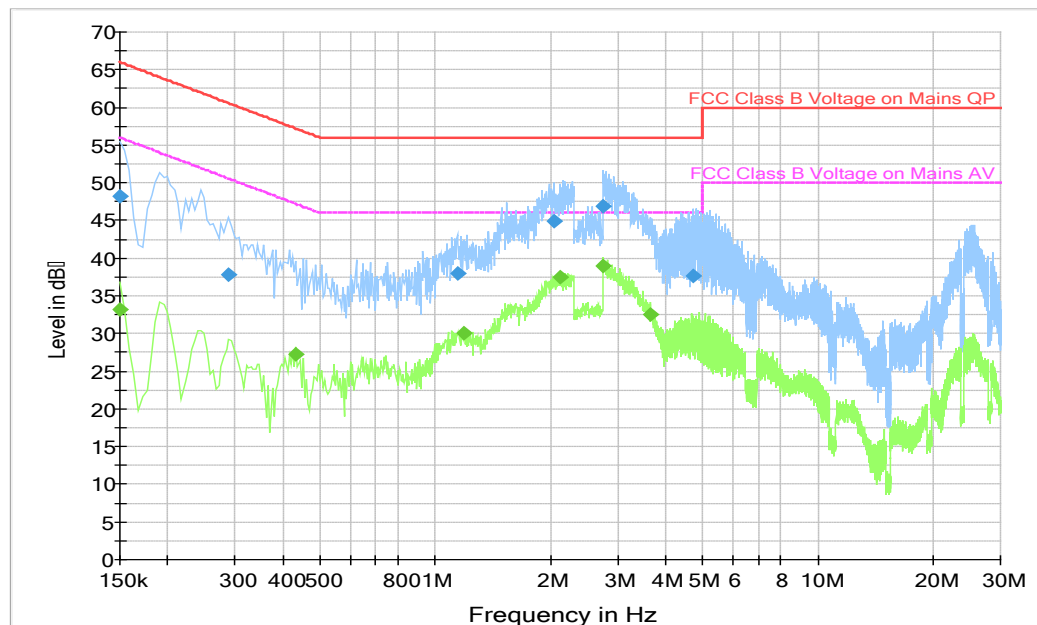
Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.168000	49.4	2000.0	9.000	On	N	19.8	15.7	65.1
0.523500	31.4	2000.0	9.000	On	N	19.9	24.6	56.0
1.077000	36.5	2000.0	9.000	On	L1	19.7	19.5	56.0
2.094000	46.9	2000.0	9.000	On	L1	19.7	9.1	56.0
2.661000	50.0	2000.0	9.000	On	L1	19.4	6.0	56.0
3.619500	43.0	2000.0	9.000	On	L1	19.5	13.0	56.0

Final Result 2

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.222000	33.5	2000.0	9.000	On	N	19.8	19.3	52.7
0.685500	26.3	2000.0	9.000	On	N	19.8	19.7	46.0
1.131000	28.4	2000.0	9.000	On	L1	19.7	17.6	46.0
2.094000	37.6	2000.0	9.000	On	L1	19.7	8.4	46.0
2.436000	40.1	2000.0	9.000	On	L1	19.1	5.9	46.0
3.619500	35.2	2000.0	9.000	On	L1	19.5	10.8	46.0

Traffic (CBA0066AA4C1):



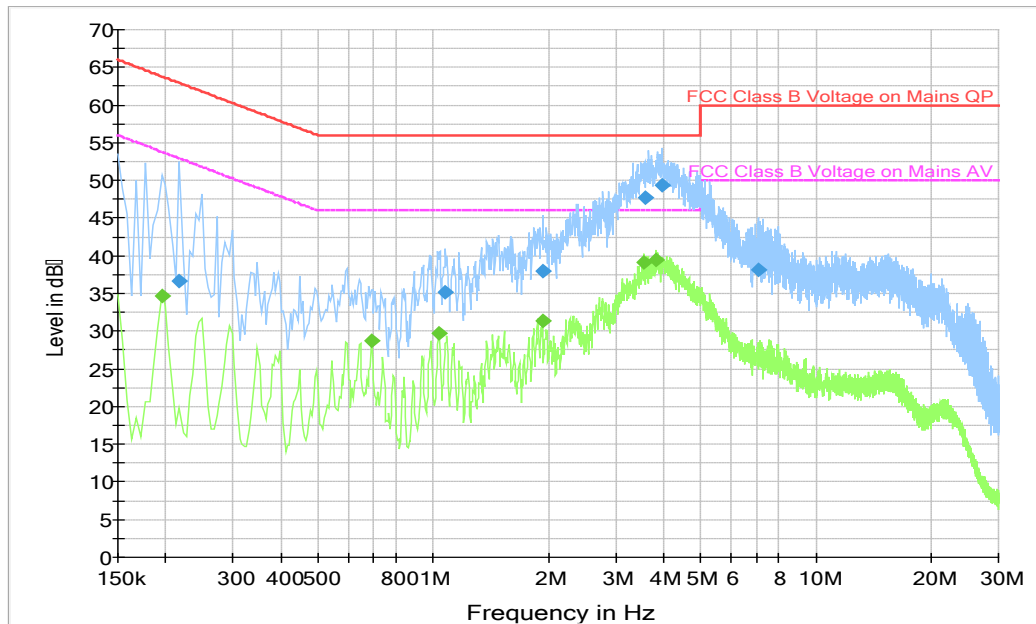
Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	48.3	2000.0	9.000	On	L1	20.2	17.7	66.0
0.289500	37.8	2000.0	9.000	On	L1	19.8	22.8	60.5
1.144500	37.9	2000.0	9.000	On	L1	19.7	18.1	56.0
2.044500	44.9	2000.0	9.000	On	L1	19.7	11.1	56.0
2.755500	47.0	2000.0	9.000	On	L1	19.0	9.0	56.0
4.713000	37.6	2000.0	9.000	On	N	19.6	18.4	56.0

Final Result 2

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	33.2	2000.0	9.000	On	L1	20.2	22.8	56.0
0.433500	27.3	2000.0	9.000	On	L1	19.9	19.9	47.2
1.185000	30.1	2000.0	9.000	On	L1	19.7	15.9	46.0
2.112000	37.5	2000.0	9.000	On	L1	19.6	8.5	46.0
2.755500	39.0	2000.0	9.000	On	L1	19.0	7.0	46.0
3.646500	32.5	2000.0	9.000	On	L1	19.5	13.5	46.0

Traffic (CBA3068AA1C4):



Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.217500	36.7	2000.0	9.000	On	L1	19.8	26.2	62.9
1.077000	35.2	2000.0	9.000	On	N	19.7	20.8	56.0
1.936500	38.0	2000.0	9.000	On	N	19.7	18.0	56.0
3.570000	47.6	2000.0	9.000	On	L1	19.5	8.4	56.0
3.957000	49.3	2000.0	9.000	On	L1	19.5	6.7	56.0
7.084500	38.1	2000.0	9.000	On	L1	19.6	21.9	60.0

Final Result 2

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.195000	34.6	2000.0	9.000	On	L1	19.8	19.2	53.8
0.690000	28.8	2000.0	9.000	On	L1	19.8	17.2	46.0
1.036500	29.7	2000.0	9.000	On	L1	19.7	16.3	46.0
1.927500	31.4	2000.0	9.000	On	L1	19.7	14.6	46.0
3.561000	39.2	2000.0	9.000	On	L1	19.5	6.8	46.0
3.808500	39.4	2000.0	9.000	On	L1	19.5	6.6	46.0

END OF REPORT