Full

TEST REPORT

No. I18D00228-SRD01

For

Client : Mobiwire SAS

Production : 2G feature phone

Model Name : Mobiwire NIKITI, Altice F2

Brand Name : Mobiwire, Altice

FCC ID : QPN-NIKITI

Hardware Version: V01

Software Version: ELKI_DS_L_V01.2_181106_MP

Issued date: 2018-12-11

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 ECIT Shanghai.

Test Laboratory:

ECIT Shanghai, East China Institute of Telecommunications

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Revision Version

Report Number	Revision	Date	Memo
I18D00228-SRD01	00	2018-12-11	Initial creation of test report

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1. Test Laboratory

1.1. Testing Location

Company Name:	ECIT Shanghai, East China Institute of Telecommunications
Address:	7-8F, G Area, No. 668, Beijing East Road, Huangpu District, Shanghai, P. R. China
Postal Code:	200001
Telephone:	(+86)-021-63843300
Fax:	(+86)-021-63843301
FCC registration No	958356

1.2. Testing Environment

Normal Temperature:	15-35℃
Extreme Temperature:	-30/+50℃
Relative Humidity:	20-75%

1.3. Project data

Project Leader:	Liu Zeguang
Testing Start Date:	2018-12-03
Testing End Date:	2018-12-11

1.4. Signature

Yang Dejun
(Prepared this test report)

Shi Hongqi
(Reviewed this test report)

Zheng Zhongbin
(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name:	Mobiwire SAS
Address:	79 AVENUE FRANCOIS ARAGO 92017 NANTERRE CEDEX France.
Telephone:	+33668018722
Postcode:	/

2.2. Manufacturer Information

Company Name:	Mobiwire SAS
Address:	79 AVENUE FRANCOIS ARAGO 92017 NANTERRE CEDEX France.
Telephone:	+33688018722
Postcode:	/

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

3.1. About EUT

EUT Description	2G feature phone
Model name	Mobiwire NIKITI, Altice F2
BT Frequency	2402MHz-2480MHz
BT Channel	Channel0-Channel78
BT type of modulation	GFSK/ π /4 DQPSK/8DPSK
GSM Frequency Band	GSM850/GSM1900
UMTS Frequency Band	N/A
CDMA Frequency Band	N/A
LTE Frequency Band	N/A
Additional Communication Function	BT3.0
Extreme Temperature	-30/+50℃
Nominal Voltage	3.7V
Extreme High Voltage	4.2V
Extreme Low Voltage	3.6V

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

3.2. Internal Identification of EUT used during the test

EUT ID*	Model Name	SN or IMEI	HW Version	SW Version	Date of receipt
N07	Mobiwire NIKITI, Altice F2	354473095692456/354473095692464	V01	ELKI_DS_L_V01.2_181106_MP	2018-11-26
N02	Mobiwire NIKITI, Altice F2	354473095692290/354473095692308	V01	ELKI_DS_L_V01.2_181106_MP	2018-11-26

*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	SN
AE1	RF cable	---

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

4. Reference Documents

4.1. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part15	FCC CFR 47, Part 15,Subpart C: 15.205 Restricted bands of operation; 15.209 Radiated emission limits, general requirements; 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz.	2017/10/01
ANSI C63.10	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	2013

5. Summary of Test Results

A brief summary of the tests carried out is shown as following.

Measurement Items	Sub-clause of Part15C	Sub-clause of IC	Verdict
Maximum Peak Output Power	15.247(b)	/	P
20dB Occupied Bandwidth	15.247(a)	/	P
Band Edges Compliance	15.247(b)	/	P
Time Of Occupancy (Dwell Time)	15.247(a)	/	P
Carrier Frequency Separation	15.247(a)	/	P
Number Of Hopping Channels	15.247(a)	/	P
Transmitter Spurious Emission-Conducted	15.247	/	P
Transmitter Spurious Emission-Radiated	15.247,15.209,	/	P
AC Powerline Conducted Emission	15.107,15.207	/	P

Please refer to part 5 for detail.

The measurements are according to ANSI C63.10.

Terms used in Verdict column

P	Pass, the EUT complies with the essential requirements in the standard.
NP	Not Perform, the test was not performed by ECIT.
NA	Not Applicable, the test was not applicable.
F	Fail, the EUT does not comply with the essential requirements in the standard.

Test Conditions

Tnom	Normal Temperature
Tmin	Low Temperature
Tmax	High Temperature
Vnom	Normal Voltage
Vmin	Low Voltage

Vmax	High Voltage
Hnom	Norm Humidity
Anom	Norm Air Pressure

For this report, all the test case listed above are tested under Normal Temperature and Normal Voltage, and also under norm humidity, the specific conditions as following:

Temperature	Tnom	25℃
Voltage	Vnom	3.7V
Humidity	Hnom	48%
Air Pressure	Anom	1010hPa

Note:

a. All the test data for each data were verified, but only the worst case was reported.

b.The GFSK, π/4 DQPSK and 8DPSK were set in DH1 for GFSK, 2-DH1 for π/4 DQPSK, 3-DH1 for 8DPSK.

c.The DC and low frequency voltages' measurement uncertainty is ±2%.

5.1. Notes

All reported tests were carried out on a sample equipment to demonstrate limited compliance with section 3.

The test results of this test report relate exclusively to the item(s) tested as specified in section 5.

5.2. Statements

The Mobiwire NIKITI, Altice F2, supporting GSM/BT, manufactured by Mobiwire SAS, which is a new product for testing.

ECIT has verified that the compliance of the tested device specified in section 5 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 5 of this test report.

6. Test result

6.1. Peak Output Power-Conducted

6.1.1 Measurement Limit

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

6.1.2 Test Condition:

Hopping Mode	RBW	VBW	Span	Sweeptime
Hopping OFF	3MHz	10MHz	9MHz	Auto

6.1.3 Test procedure

The measurement is according to ANSI C63.10 clause 7.8.5.

1. The output power of EUT was connected to the spectrum analyzer and CBT32 by cable and divide. The path loss was compensated to the results for each measurement.
2. Enable EUT transmitter maximum power continuously.
3. Measure the conducted output power and record the results it.

6.1.4 Measurement Results:

For GFSK

Channel	Ch0 2402 MHz	Ch39 2441 MHz	CH78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	3.43	3.68	3.53	P
	Fig.1	Fig.2	Fig.3	

For π/4 DQPSK

Channel	Ch0 2402 MHz	Ch39 2441 MHz	CH78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	1.78	2.03	1.89	P
	Fig.4	Fig.5	Fig.6	

For 8DPSK

Channel	Ch0 2402 MHz	Ch39 2441 MHz	CH78 2480 MHz	Conclusion

Peak Conducted Output Power (dBm)	1.81	2.02	1.94	P
	Fig.7	Fig.8	Fig.9	

Conclusion: PASS

Test graphs an below

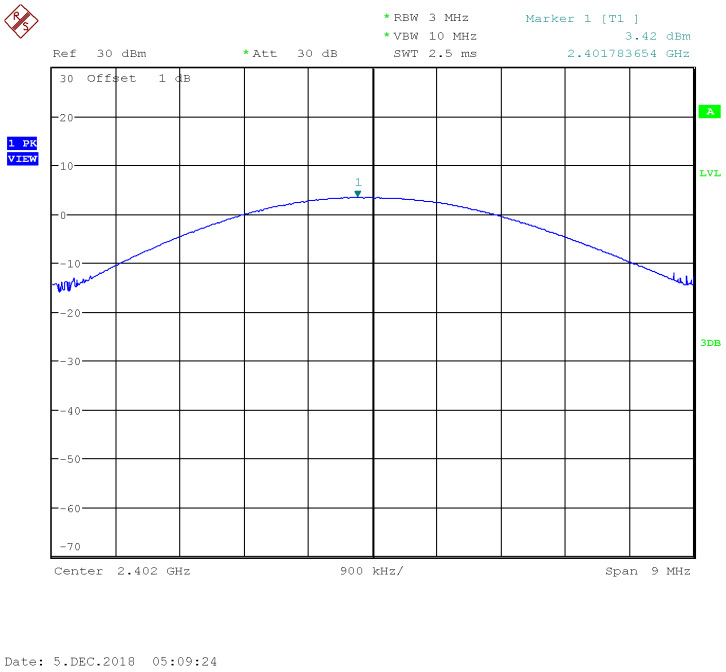


Fig.1 Peak Conducted Output Power CH0, DH1

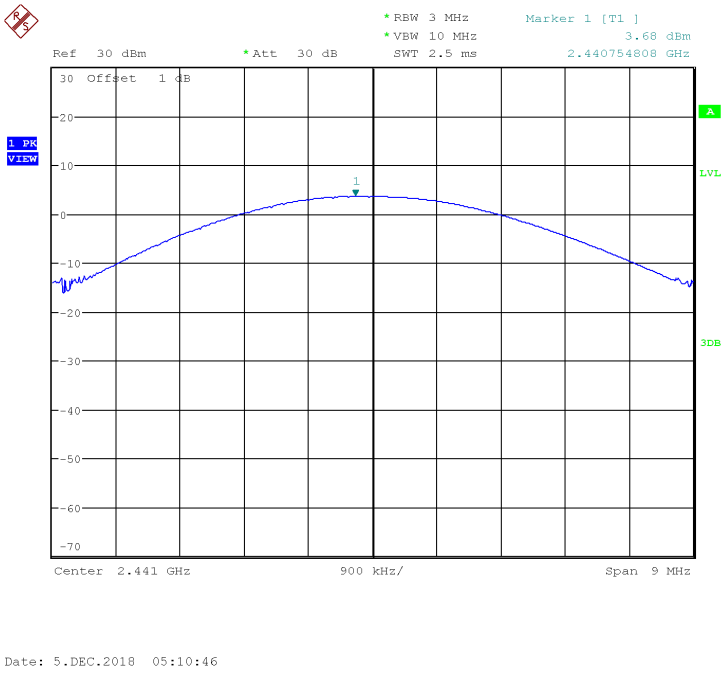


Fig.2 Peak Conducted Output Power CH39, DH1

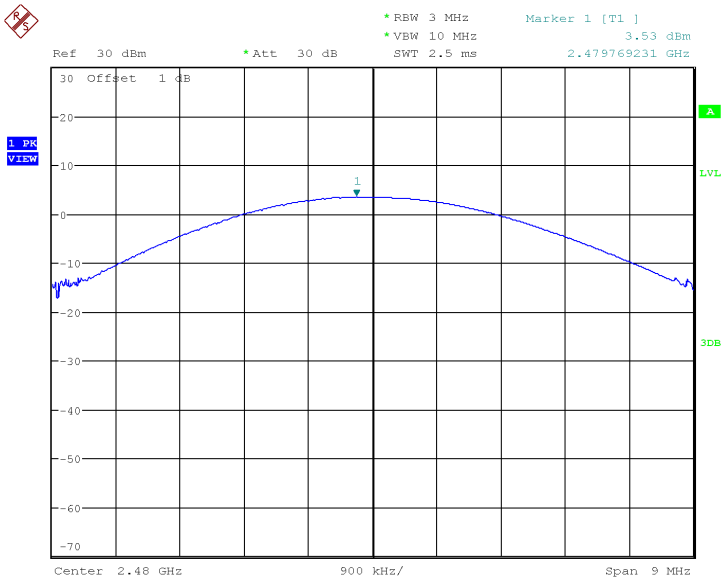


Fig.3 Peak Conducted Output Power CH78, DH1

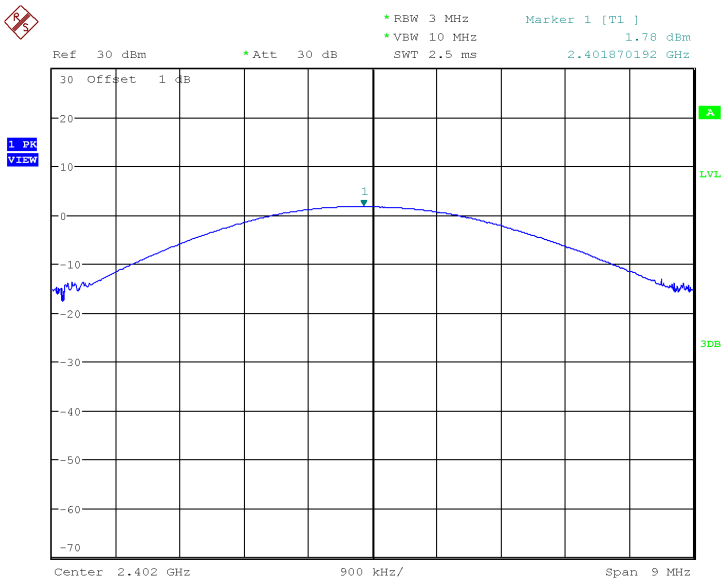


Fig.4 Peak Conducted Output Power CH0, 2DH1

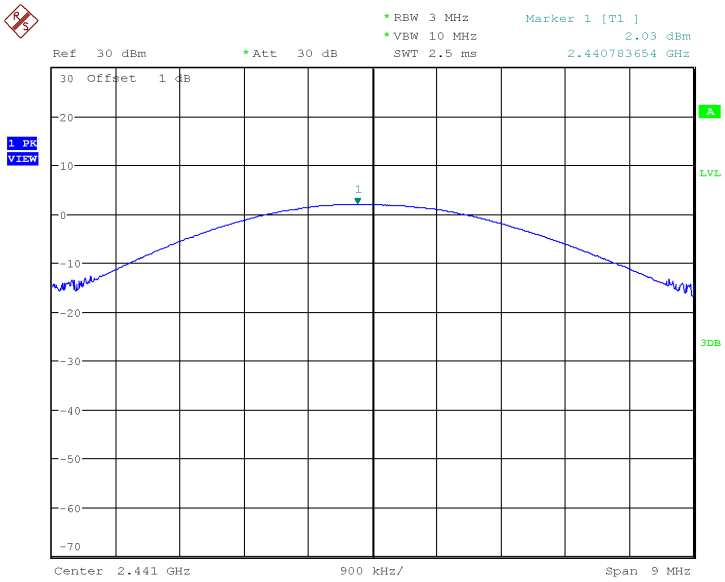


Fig.5 Peak Conducted Output Power CH39, 2DH1

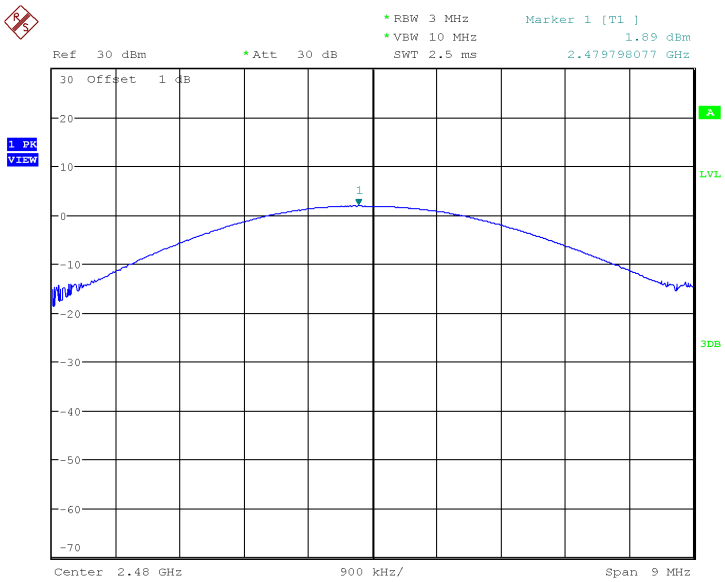


Fig.6 Peak Conducted Output Power CH78, 2DH1

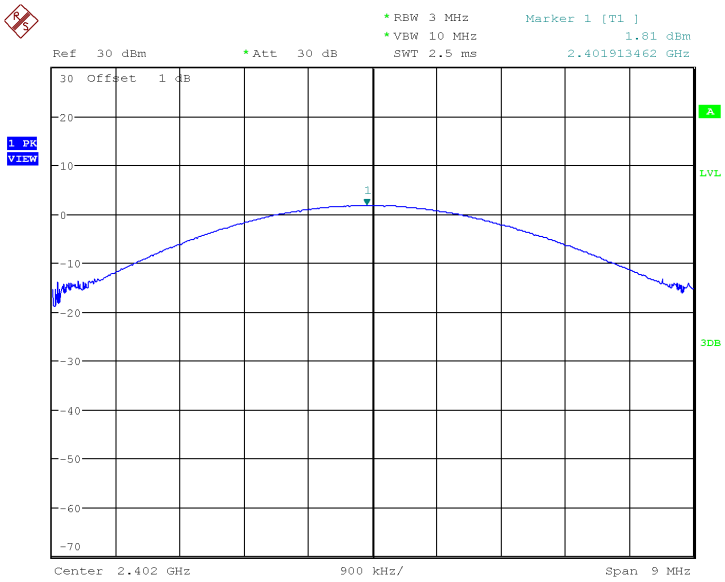


Fig.7 Peak Conducted Output Power CH0, 3DH1

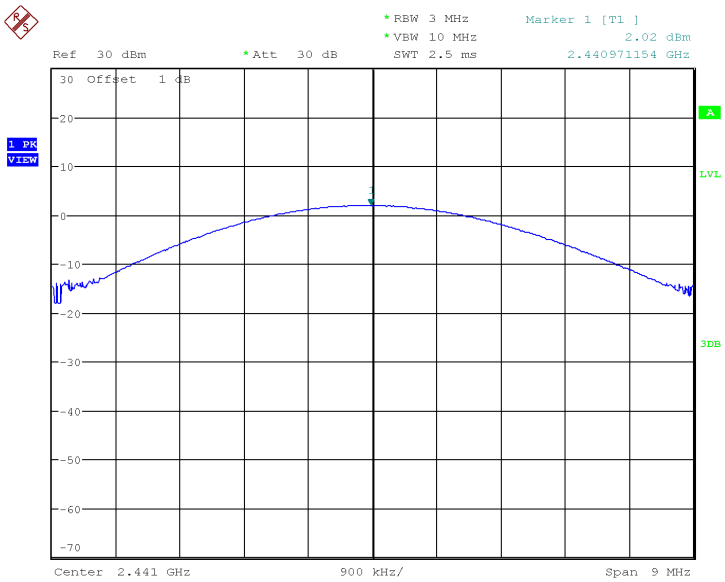


Fig.8 Peak Conducted Output Power CH39, 3DH1

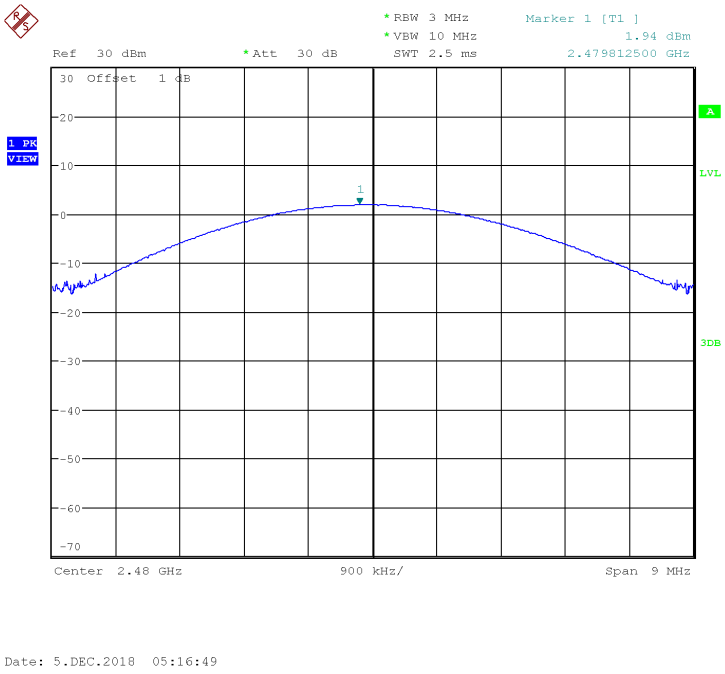


Fig.9 Peak Conducted Output Power CH78, 3DH1

6.2. Frequency Band Edges-Conducted

6.2.1 Measurement Limit:

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

6.2.2 Test procedure

The measurement is according to ANSI C63.10 clause 7.8.6.

1. Connect the EUT to spectrum analyzer.
2. Set RBW=100KHz, VBW=300KHz, span more than 1.5 times channel bandwidth (2MHz).
3. Detector =peak, sweep time=auto couple, trace mode=max hold.
4. Allow sweep to continue until the trace stabilizes.

6.2.3 Measurement results

For GFSK

Channel	Hopping	Band Edge Power (dBc)	Conclusion
0	Hopping OFF	Fig.10	P
	Hopping ON	Fig.11	P

78	Hopping OFF	Fig.12	P
	Hopping ON	Fig.13	P

For π/4 DQPSK

Channel	Hopping	Band Edge Power (dBc)	Conclusion
0	Hopping OFF	Fig.14	P
	Hopping ON	Fig.15	P
78	Hopping OFF	Fig.16	P
	Hopping ON	Fig.17	P

For 8DPSK

Channel	Hopping	Band Edge Power (dBc)	Conclusion
0	Hopping OFF	Fig.18	P
	Hopping ON	Fig.19	P
78	Hopping OFF	Fig.20	P
	Hopping ON	Fig.21	P

Conclusion: PASS

Test graphs an below

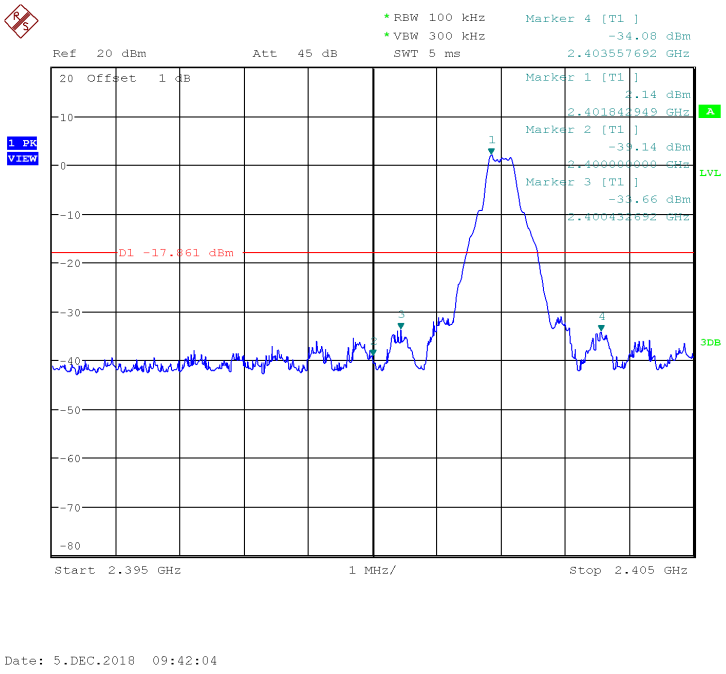


Fig.10 Frequency Band Edge: GFSK, Ch0, Hopping OFF

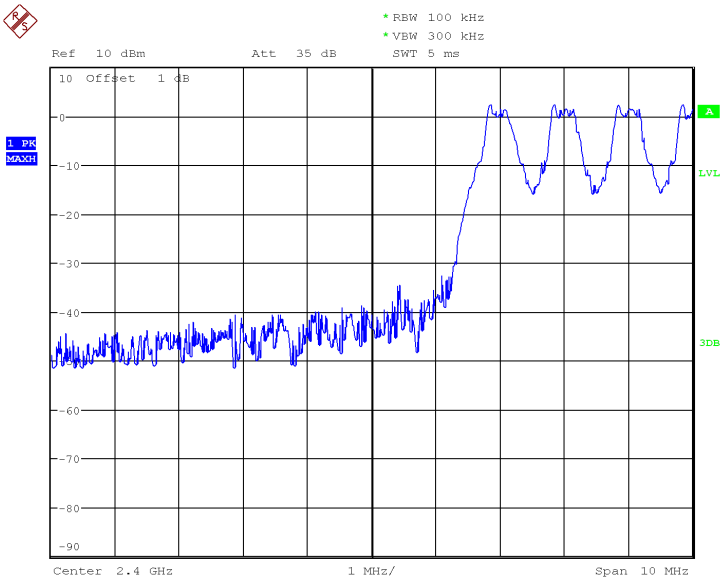


Fig.11 Frequency Band Edge: GFSK, Ch0, Hopping ON

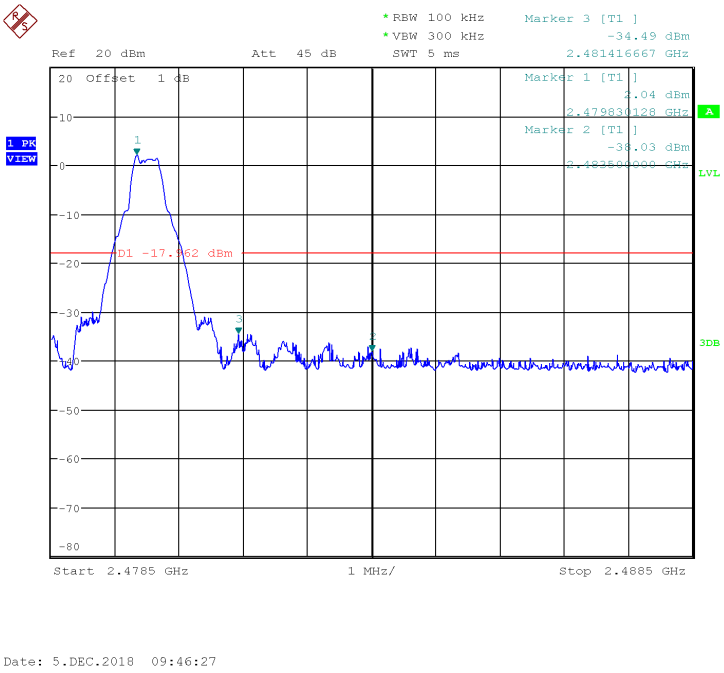


Fig.12 Frequency Band Edge: GFSK, Ch78, Hopping OFF

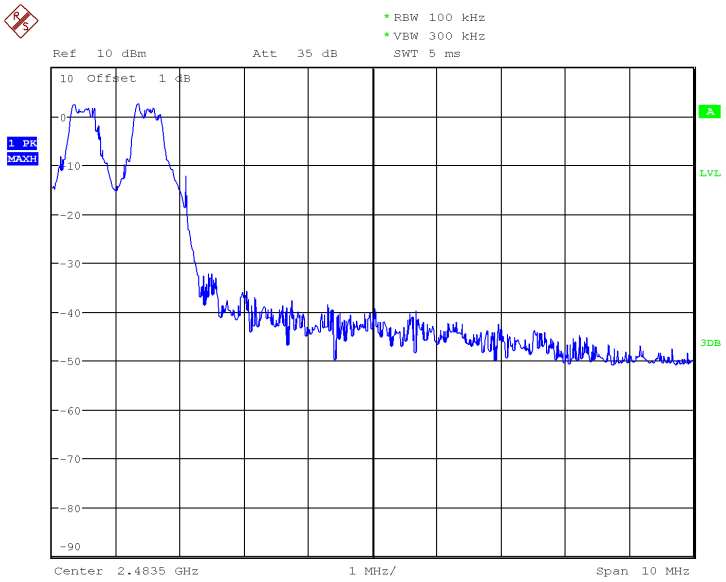


Fig.13 Frequency Band Edge: GFSK, Ch78, Hopping ON

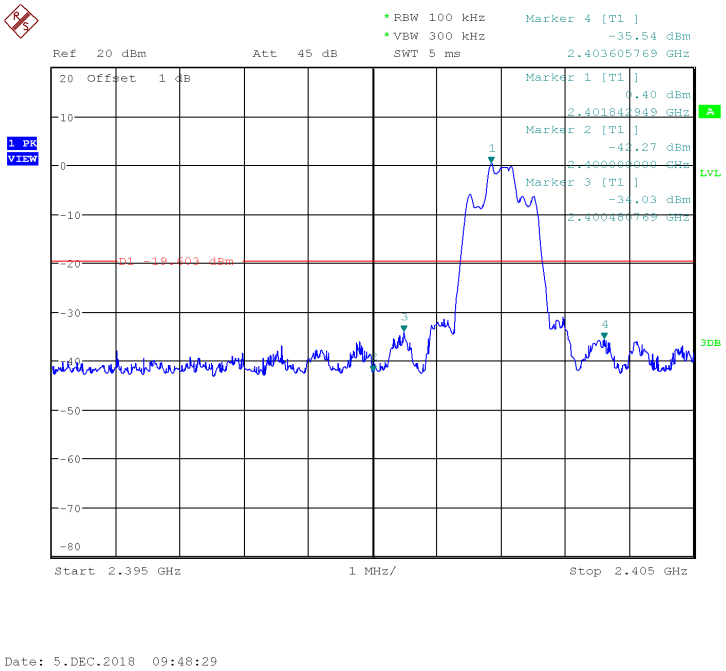


Fig.14 Frequency Band Edge: π/4 DQPSK, Ch0, Hopping OFF

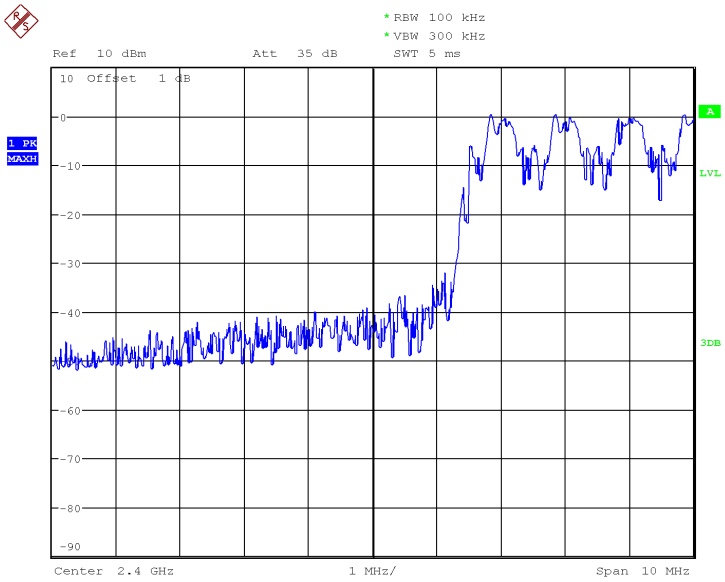


Fig.15 Frequency Band Edge: π/4 DQPSK, Ch0, Hopping ON

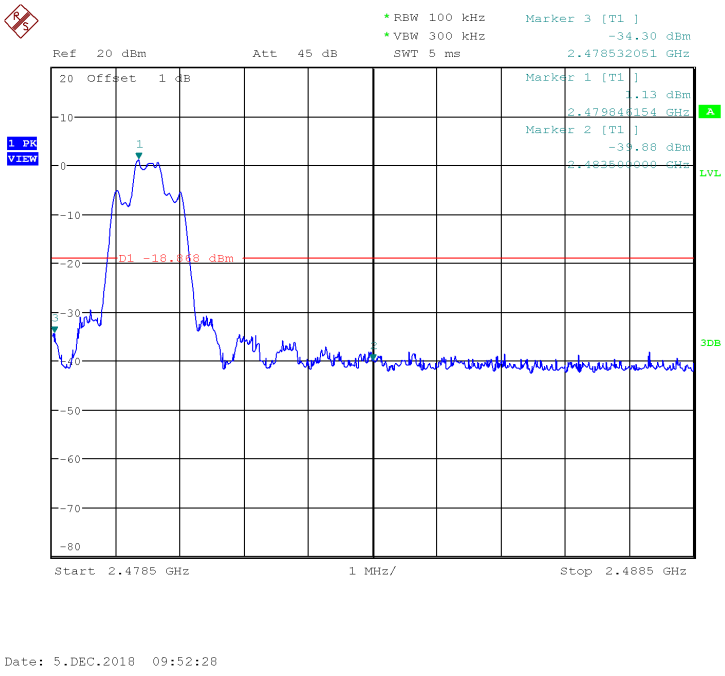


Fig.16 Frequency Band Edge: π/4 DQPSK, Ch78, Hopping OFF

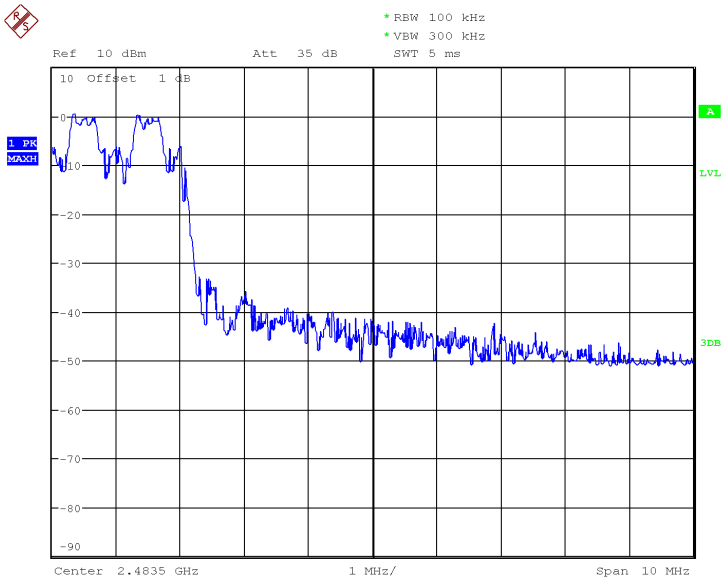


Fig.17 Frequency Band Edge: π/4 DQPSK, Ch78, Hopping ON

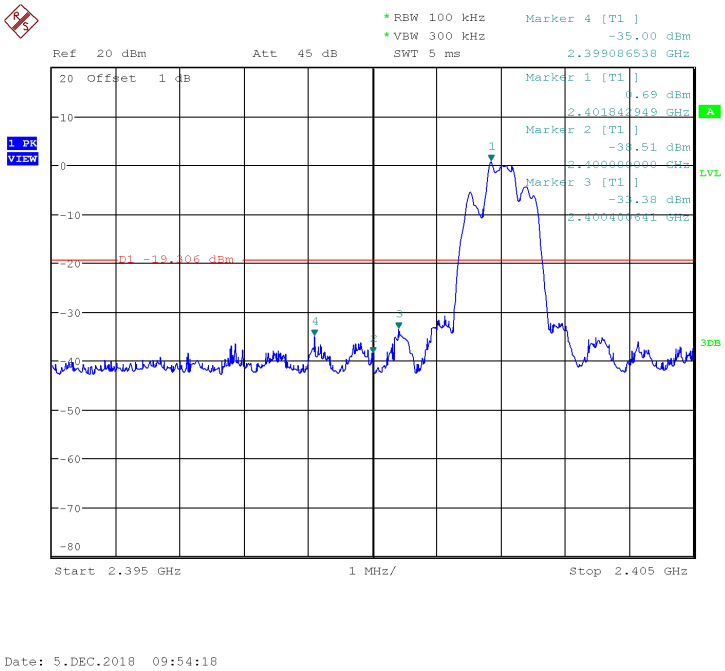


Fig.18 Frequency Band Edge: 8DPSK, Ch0, Hopping OFF

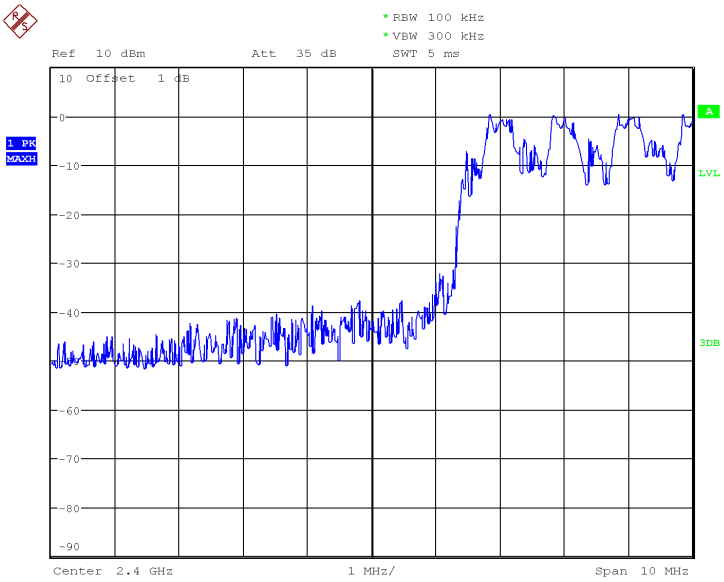


Fig.19 Frequency Band Edge: 8DPSK, Ch0, Hopping ON

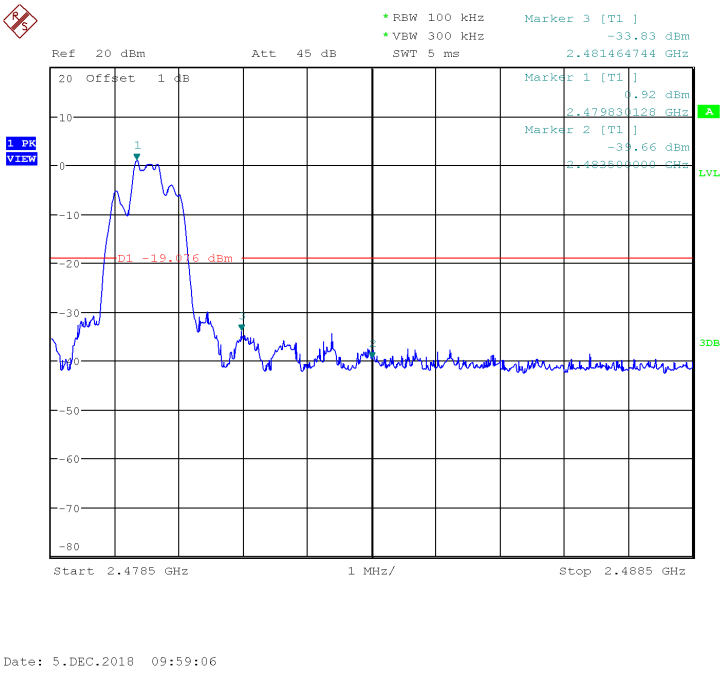


Fig.20 Frequency Band Edge: 8DPSK, Ch78, Hopping OFF

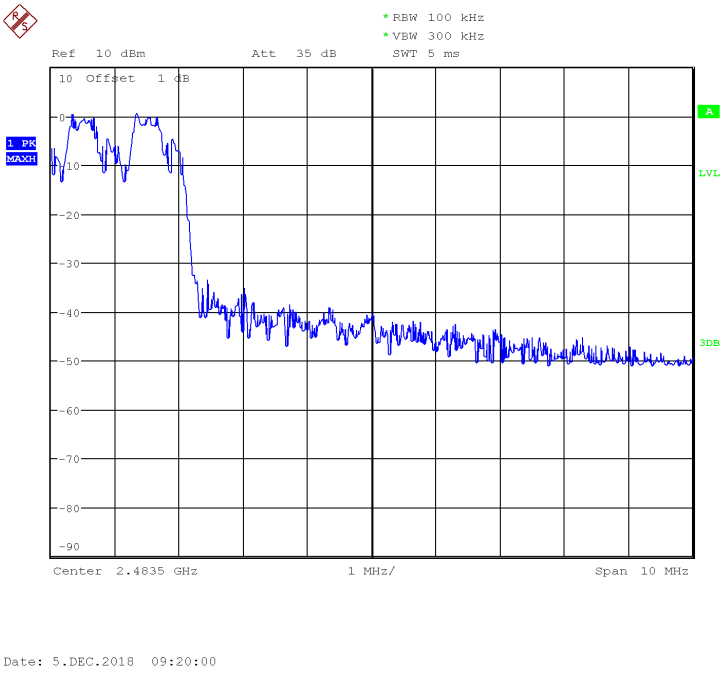


Fig.21 Frequency Band Edge: 8DPSK, Ch78, Hopping ON

6.3. Conducted Emission

6.3.1 Measurement Limit:

Standard	Limit
FCC 47 CFR Part15.247 (d)	20dB below peak output power in 100KHz bandwidth

6.3.2 Test procedures

The measurement is according to ANSI C63.10 clause 7.8.8.

1. Connect the EUT to spectrum analyzer.
2. Set RBW=100KHz, VBW=300KHz.
3. Detector =peak, sweep time=auto couple, trace mode=max hold.

6.3.3 Measurement Results:

For GFSK

Channel	Frequency Range	Test Results	Conclusion
Ch0 2402MHz	Center Freq.	Fig.22	P
	30MHz~26GHz	Fig.23	P
Ch39 2441MHz	Center Freq.	Fig.24	P

	30MHz~26GHz	Fig.25	P
Ch78 2480MHz	Center Freq.	Fig.26	P
	30MHz~26GHz	Fig.27	P

For π/4 DQPSK

Channel	Frequency Range	Test Results	Conclusion
Ch0 2402MHz	Center Freq.	Fig.28	P
	30MHz~26GHz	Fig.29	P
Ch39 2441MHz	Center Freq.	Fig.30	P
	30MHz~26GHz	Fig.31	P
Ch78 2480MHz	Center Freq.	Fig.32	P
	30MHz~26GHz	Fig.33	P

For 8DPSK

Channel	Frequency Range	Test Results	Conclusion
Ch0 2402MHz	Center Freq.	Fig.34	P
	30MHz~26GHz	Fig.35	P
Ch39 2441MHz	Center Freq.	Fig.36	P
	30MHz~26GHz	Fig.37	P
Ch78 2480MHz	Center Freq.	Fig.38	P
	30MHz~26GHz	Fig.39	P

Conclusion: PASS

Test graphs as below

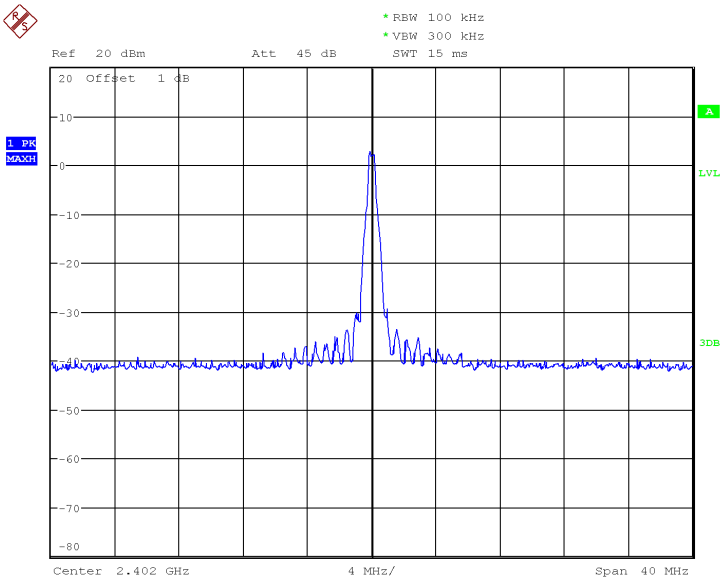


Fig.22 Conducted spurious emission: GFSK, Ch0, 2402MHz

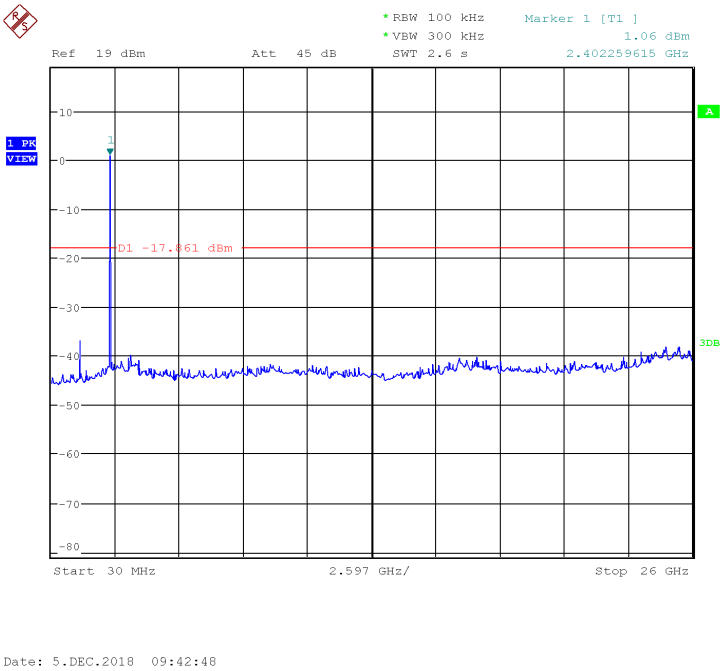


Fig.23 Conducted spurious emission: GFSK, Ch0, 30MHz~26GHz

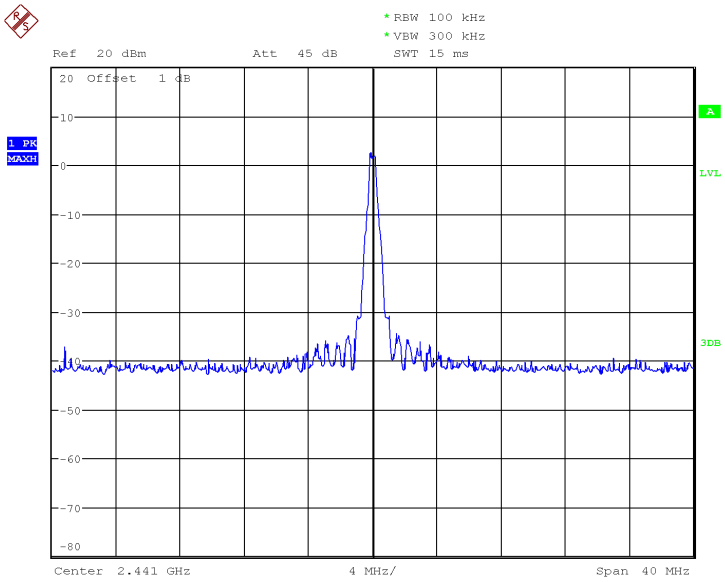


Fig.24 Conducted spurious emission: GFSK, Ch39, 2441MHz

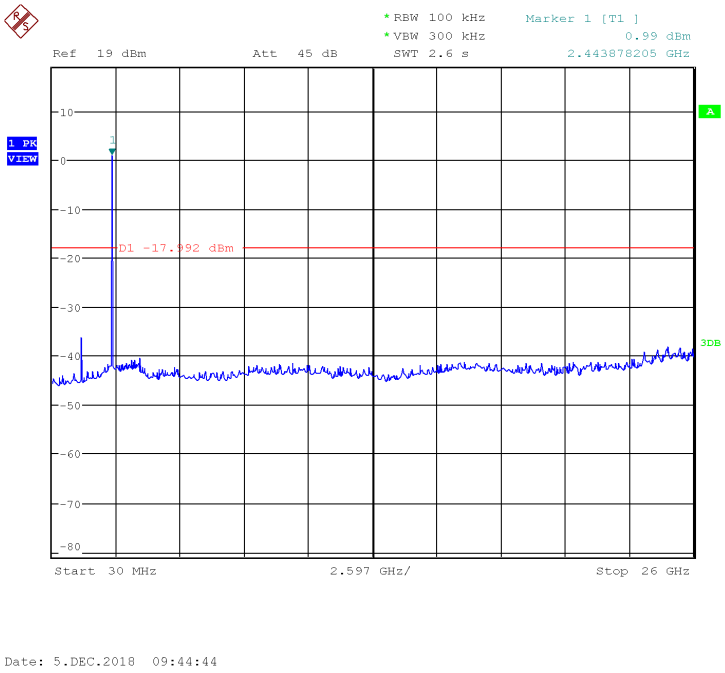


Fig.25 Conducted spurious emission: GFSK, Ch39, 30MHz~26GHz

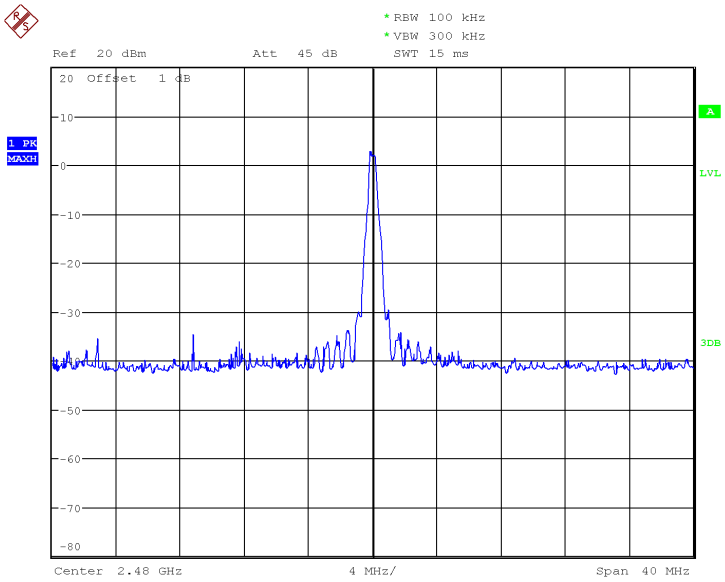


Fig.26 Conducted spurious emission: GFSK, Ch78, 2480MHz

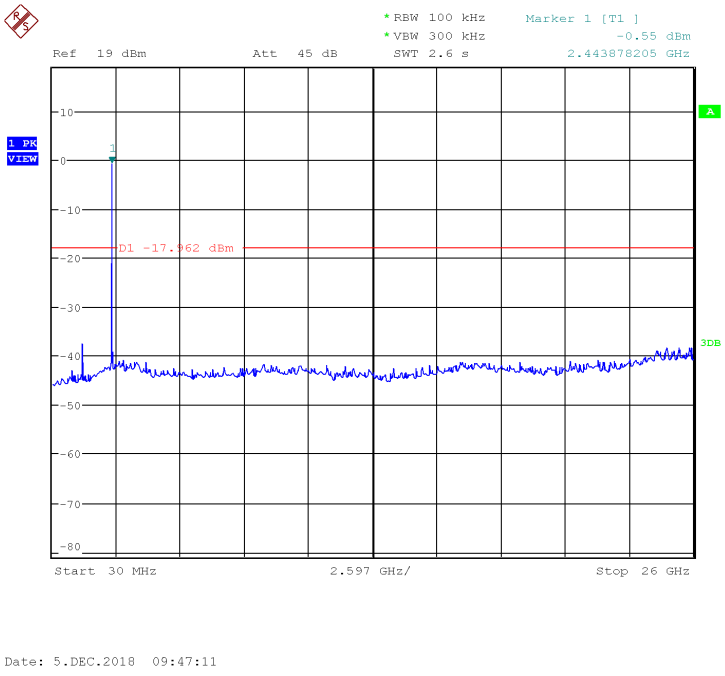


Fig.27 Conducted spurious emission: GFSK, Ch78, 30MHz~26GHz

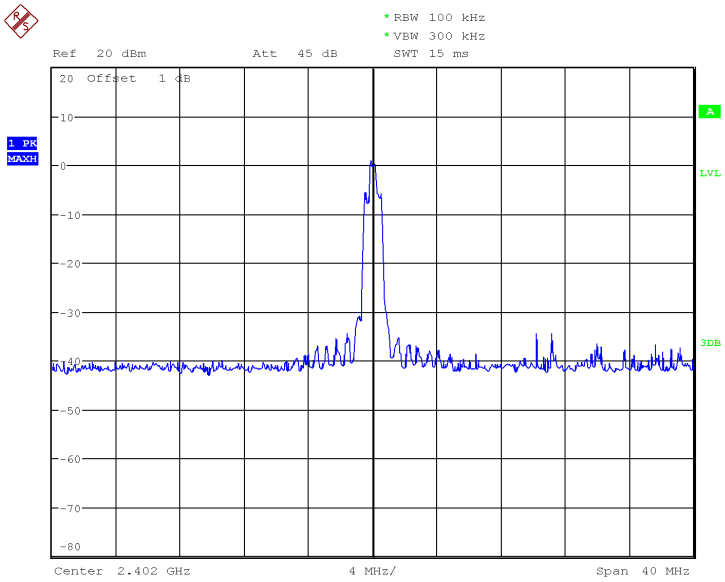


Fig.28 Conducted spurious emission: π/4 DQPSK, Ch0, 2402MHz

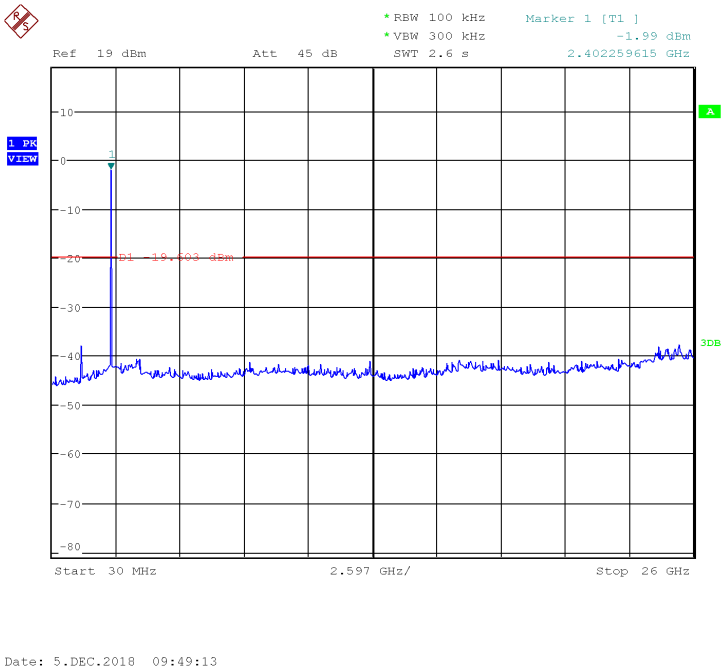


Fig.29 Conducted spurious emission: π/4 DQPSK, Ch0, 30MHz~26GHz

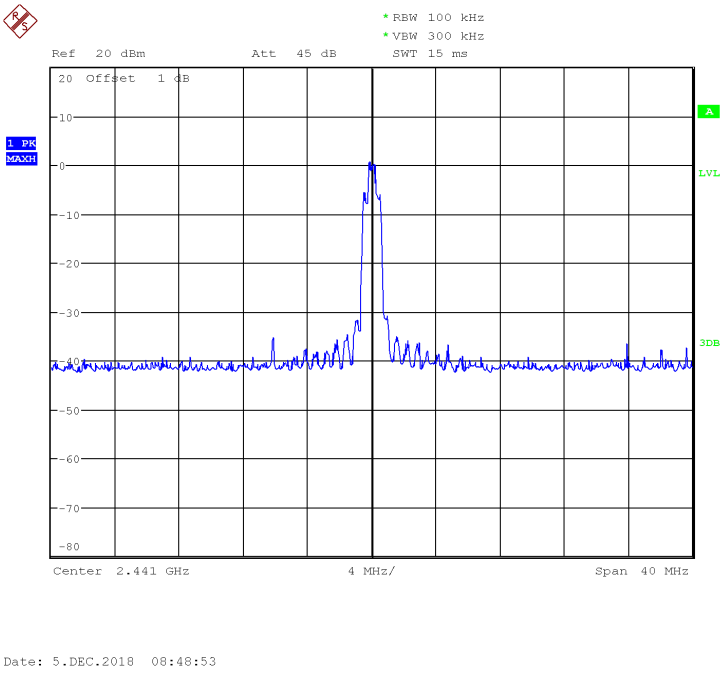


Fig.30 Conducted spurious emission: π/4 DQPSK, Ch39, 2441MHz

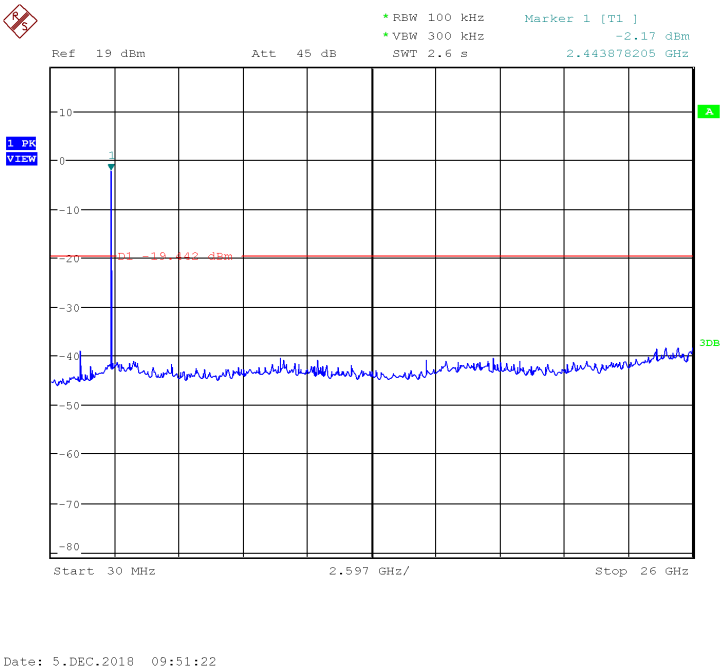


Fig.31 Conducted spurious emission: π/4 DQPSK, Ch39, 30MHz~26GHz

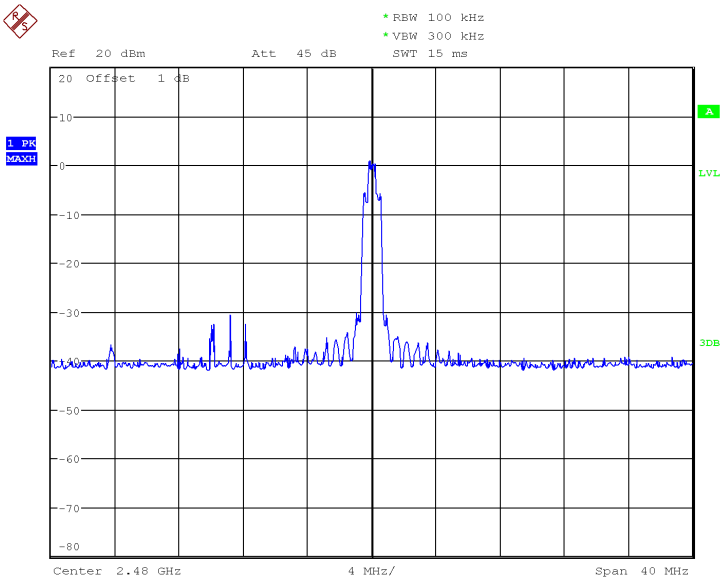


Fig.32 Conducted spurious emission: π/4 DQPSK, Ch78, 2480MHz

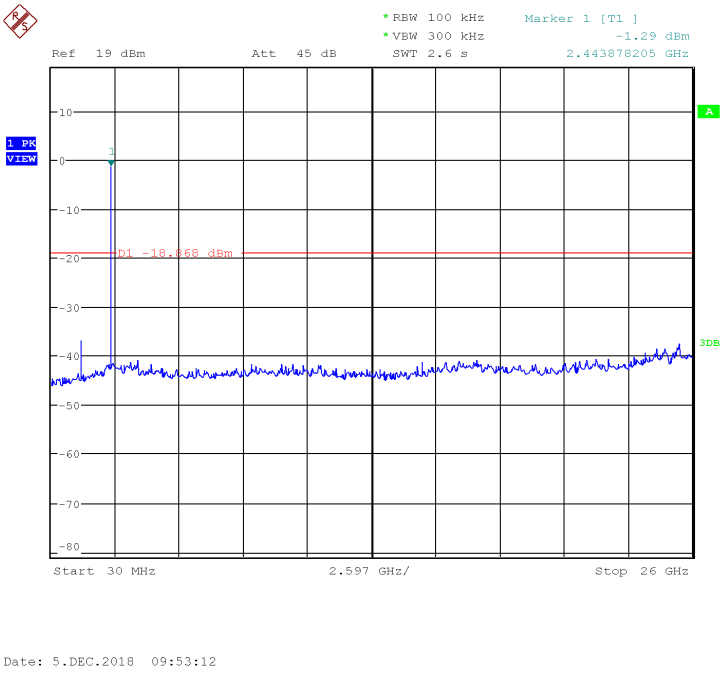


Fig.33 Conducted spurious emission: π/4 DQPSK, Ch78, 30MHz~26GHz

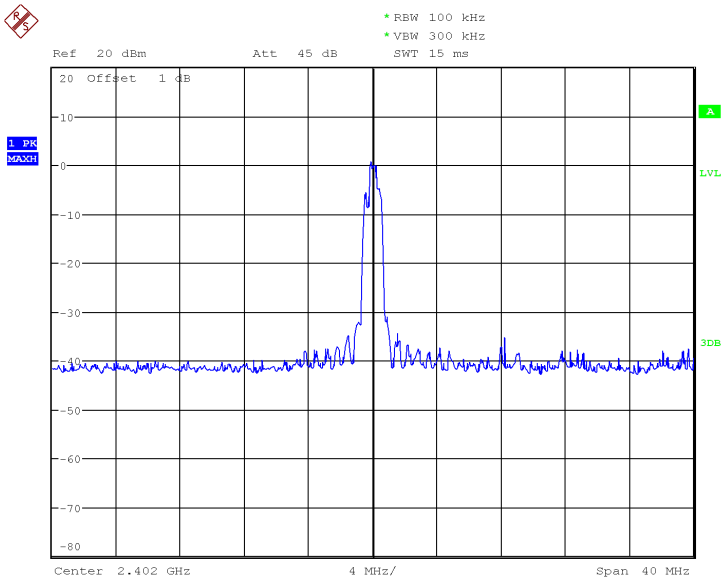


Fig.34 Conducted spurious emission: 8DPSK, Ch0, 2402MHz

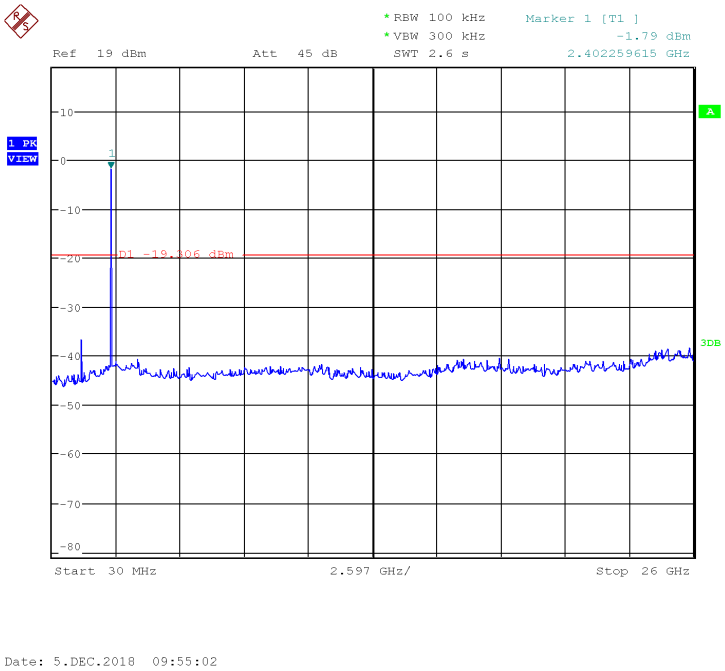


Fig.35 Conducted spurious emission: 8DPSK, Ch0, 30MHz~26GHz

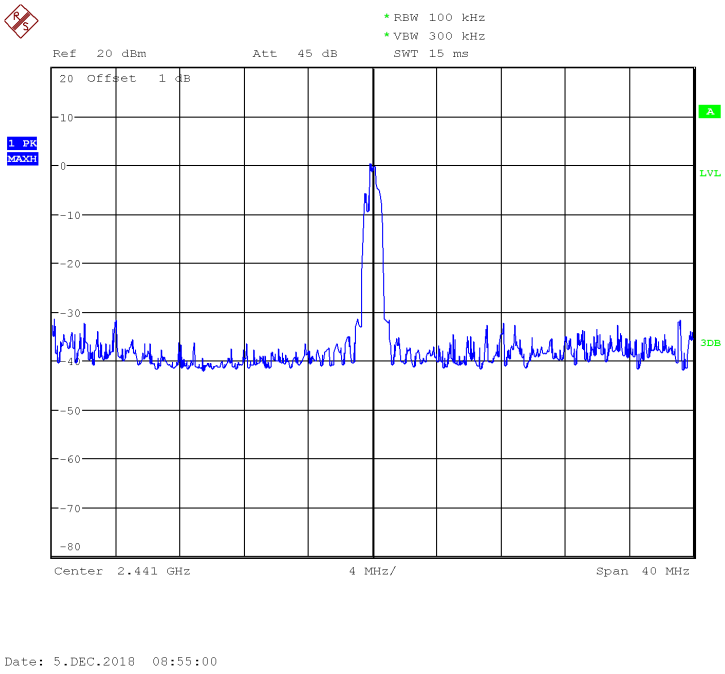


Fig.36 Conducted spurious emission: 8DPSK, Ch39, 2441MHz

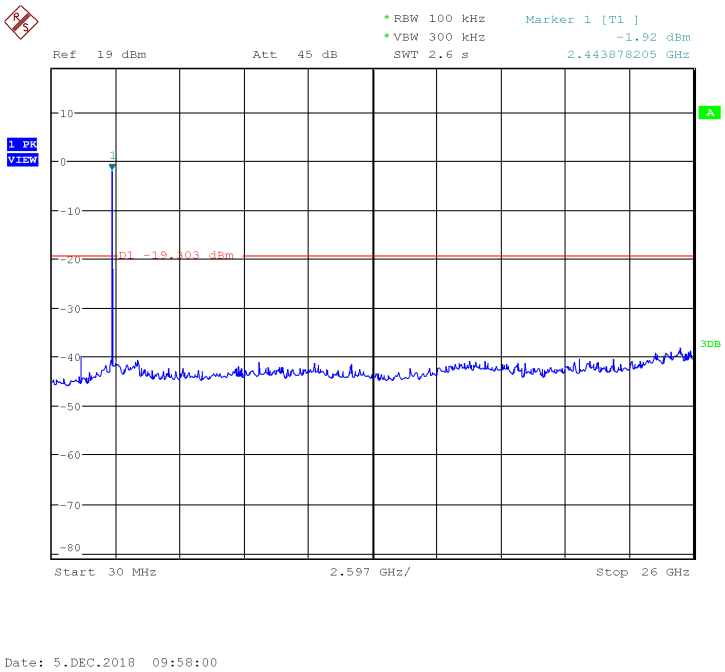


Fig.37 Conducted spurious emission: 8DPSK, Ch39, 30MHz~26GHz

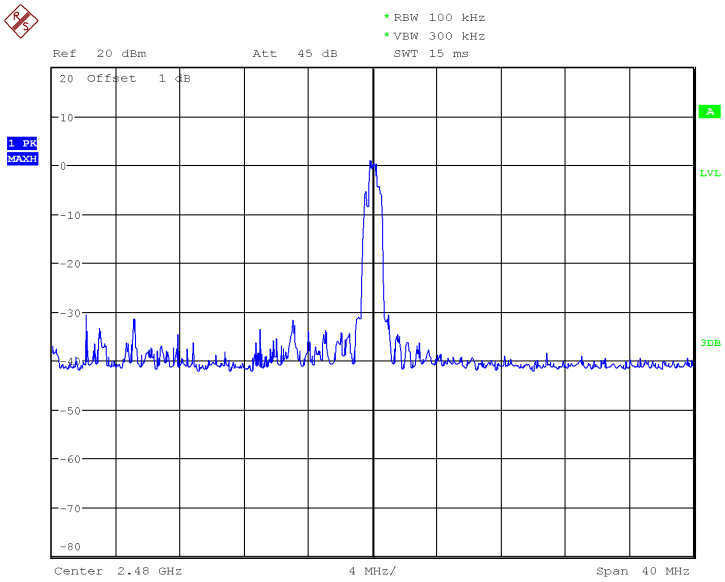


Fig.38 Conducted spurious emission: 8DPSK, Ch78, 2480MHz

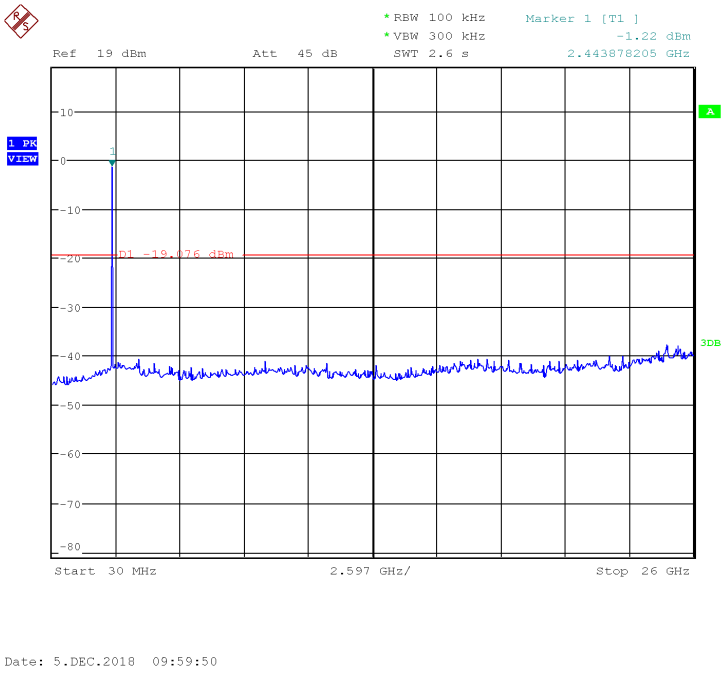


Fig.39 Conducted spurious emission: 8DPSK, Ch78, 30MHz~26GHz

6.4. Radiated Emission

6.4.1 Measurement Limit:

Standard	Limit

FCC 47 CFR Part 15.247, 15.205, 15.209	20dB below peak output power

In addition, radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see 15.205(c)).

Limit in restricted band:

Frequency of emission (MHz)	Field strength (uV/m)	Field strength (dBuV/m)
30~88	100	40
88~216	150	43.5
216~960	200	46
Above 960	500	54

6.4.2 Test Method

Portable, small, lightweight, or modular devices that may be handheld, worn on the body, or placed on a table during operation shall be positioned on a non-conducting platform, the top of which is 80 cm above the reference ground plane. The preferred area occupied by the EUT arrangement is 1 m by 1.5 m, For emissions testing at or below 1 GHz, the table height shall be 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. but it may be larger or smaller to accommodate various sized EUTs. For testing purposes, ceiling- and wall-mounted devices also shall be positioned on a tabletop (see also ANSI C63.10-2013 section 6.3.4 and 6.3.5). In making any tests involving handheld, body-worn, or ceiling-mounted equipment, it is essential to recognize that the measured levels may be dependent on the orientation (attitude) of the three orthogonal axes of the EUT. Thus, exploratory tests as specified in 8.3.1 shall be carried out for various axes orientations to determine the attitude having maximum or near-maximum emission level.

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

Frequency of emission (MHz)	RBW/VBW	Sweep Time (s)
30~1000	100KHz/300KHz	5
1000~4000	1MHz/3MHz	15
4000~18000	1MHz/3MHz	40
18000~26500	1MHz/3MHz	20

6.4.3 Measurement Results:

A “reference path loss” is established and A_{Rpi} is the attenuation of “reference path loss”, and including the gain of receive antenna, the gain of the preamplifier, the cable loss.

The measurement results are obtained as described below:

A_{Rpi} = Cable loss + Antenna Gain-Preamplifier gain

Result=P_{Mea} + A_{Rpi}

For GFSK

Channel	Frequency Range	Test Results	Conclusion
Ch78 2480MHz	30MH~1GHz	Fig.40	P
	1GHz~3GHz	Fig.41	P
	3GHz~18GHz	Fig.42	P
Power(low)	2.31GHz~2.5GHz	Fig.43	P
Power(high)	2.31GHz~2.5GHz	Fig.44	P

For π/4 DQPSK

Channel	Frequency Range	Test Results	Conclusion
Ch78 2480MHz	30MH~1GHz	Fig.45	P
	1GHz~3GHz	Fig.46	P
	3GHz~18GHz	Fig.47	P
Power(low)	2.31GHz~2.5GHz	Fig.48	P
Power(high)	2.31GHz~2.5GHz	Fig.49	P

For 8DPSK

Channel	Frequency Range	Test Results	Conclusion
Ch78 2480MHz	30MH~1GHz	Fig.50	P
	1GHz~3GHz	Fig.51	P
	3GHz~18GHz	Fig.52	P
Power(low)	2.31GHz~2.5GHz	Fig.53	P
Power(high)	2.31GHz~2.5GHz	Fig.54	P

GFSK Ch78 30MHz-1GHz

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
34.0	15.62	-22	37.62	V

36.1	13.72	-21.7	35.42	V
106.2	8.99	-23.4	32.39	V
220.9	14.17	-24	38.17	V
416.4	14.61	-18.6	33.21	V
706.8	20.32	-12.5	32.82	V

GFSK Ch78 1GHz-3GHz (Peak)

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
1239.9	54.76	-5.6	60.36	H
2581.8	54.08	7.3	46.78	V
2660.7	54.67	7.7	46.97	H
2744.9	54.58	7.7	46.88	V
2806.7	54.72	7.9	46.82	H
2934.0	56.26	8.7	47.56	H

GFSK Ch78 1GHz-3GHz (Average)

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
1239.9	41.45	-5.6	47.05	H
2581.8	42.01	7.3	34.71	V
2660.7	42.75	7.7	35.05	H
2744.9	42.63	7.7	34.93	V
2806.7	42.82	7.9	34.92	H
2934.0	43.74	8.7	35.04	H

GFSK Ch78 3GHz-18GHz (Peak)

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
14270.8	54.46	20.3	34.16	H
14725.8	55.07	21	34.07	V
15965.9	58.94	25	33.94	H

16298.9	58.19	25.8	32.39	V
16910.2	60.02	27.4	32.62	V
17602.4	59.8	27.7	32.1	V

GFSK Ch78 3GHz-18GHz (Average)

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
14270.8	42.41	20.3	22.11	H
14725.8	43.05	21	22.05	V
15965.9	46.68	25	21.68	H
16298.9	46.46	25.8	20.66	V
16910.2	47.81	27.4	20.41	V
17602.4	48.11	27.7	20.41	V

π/4 DQPSK Ch78 30MHz-1GHz

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
34.3	19.19	-22	41.19	V
36.3	13.98	-21.6	35.58	V
60.8	10.27	-22.3	32.57	H
112.1	8.63	-23.8	32.43	V
220.9	13.95	-24	37.95	V
909.0	23.35	-9.3	32.65	H

π/4 DQPSK Ch78 1GHz-3GHz (Peak)

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
1239.8	51.41	-5.6	57.01	H
2708.4	55.65	7.9	47.75	V
2736.6	54.41	7.8	46.61	V
2824.2	54.98	8.1	46.88	H
2863.9	55.53	8.5	47.03	H

2913.0	55.65	8.8	46.85	V

π/4 DQPSK Ch78 1GHz-3GHz (Average)

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
2708.4	42.56	7.9	34.66	V
2736.6	42.65	7.8	34.85	V
2824.2	42.84	8.1	34.74	H
2863.9	43.11	8.5	34.61	H
2913.0	43.39	8.8	34.59	V

π/4 DQPSK Ch78 3GHz-18GHz (Peak)

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
12954.6	51.77	17.2	34.57	V
13851.1	53.44	18.5	34.94	V
14294.1	55.24	20.7	34.54	V
15261.8	55.38	21.4	33.98	V
16092.2	58.92	24.9	34.02	H
17143.0	60.04	27.1	32.94	V

π/4 DQPSK Ch78 3GHz-18GHz (Average)

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
14294.1	42.75	20.7	22.05	V
15261.8	43.1	21.4	21.7	V
16092.2	46.75	24.9	21.85	H
17143.0	47.35	27.1	20.25	V

8DPSK Ch78 30MHz-1GHz

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
34.0	18.53	-22	40.53	V
34.8	15.27	-21.9	37.17	V

45.2	11.92	-20.2	32.12	V
194.9	8.87	-24.5	33.37	V
609.2	19.04	-13.9	32.94	H
825.1	22.13	-10.7	32.83	V

8DPSK Ch78 1GHz-3GHz (Peak)

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
1240.0	51.31	-5.6	56.91	H
2602.5	54.07	7.3	46.77	V
2674.2	54.79	7.8	46.99	V
2732.2	54.56	7.8	46.76	H
2883.2	56.35	8.7	47.65	H
2945.0	55.89	8.7	47.19	H

8DPSK Ch78 1GHz-3GHz (Average)

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
2602.5	42.1	7.3	34.8	V
2674.2	42.5	7.8	34.7	V
2732.2	42.56	7.8	34.76	H
2883.2	43.46	8.7	34.76	H
2945.0	43.52	8.7	34.82	H

8DPSK Ch78 3GHz-18GHz (Peak)

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
14279.1	55.05	20.5	34.55	H
14765.3	54.48	20.7	33.78	V
15407.6	55.76	22.7	33.06	V
15984.1	59.59	25.2	34.39	H
16511.0	58.25	25.8	32.45	V

17081.4	60.64	26.9	33.74	H

8DPSK Ch78 3GHz-18GHz (Average)

Frequency(MHz)	Result(dBuV/m)	ARpl (dB)	PMea(dBuV/m)	Polarity
14279.1	42.26	20.5	21.76	H
14765.3	42.48	20.7	21.78	V
15407.6	43.79	22.7	21.09	V
15984.1	47.08	25.2	21.88	H
16511.0	46.34	25.8	20.54	V
17081.4	47.46	26.9	20.56	H

Note: Only the worst case is written in the report.

Conclusion: PASS

Test graphs as below:

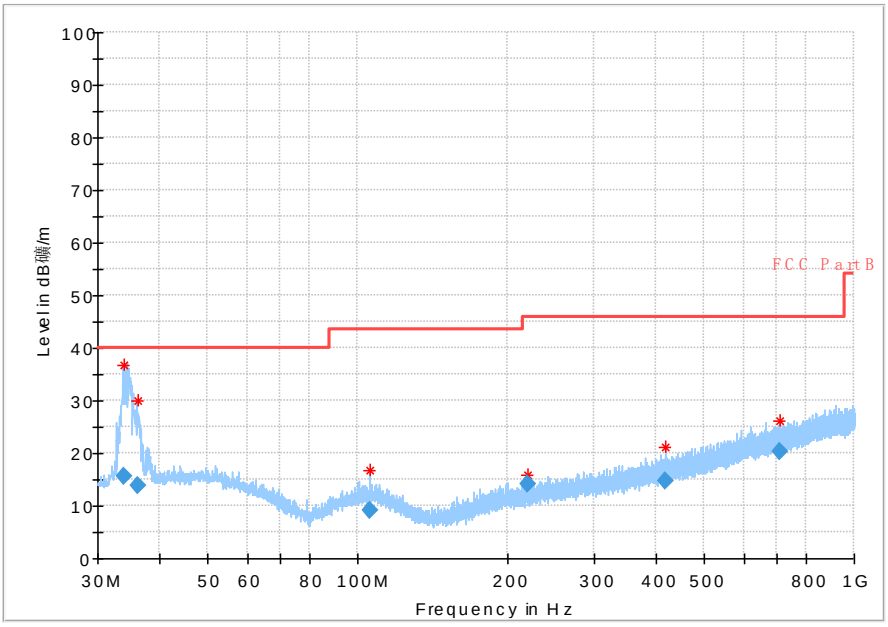


Fig.40 Radiated emission: GFSK, Ch78, 30MHz~1GHz

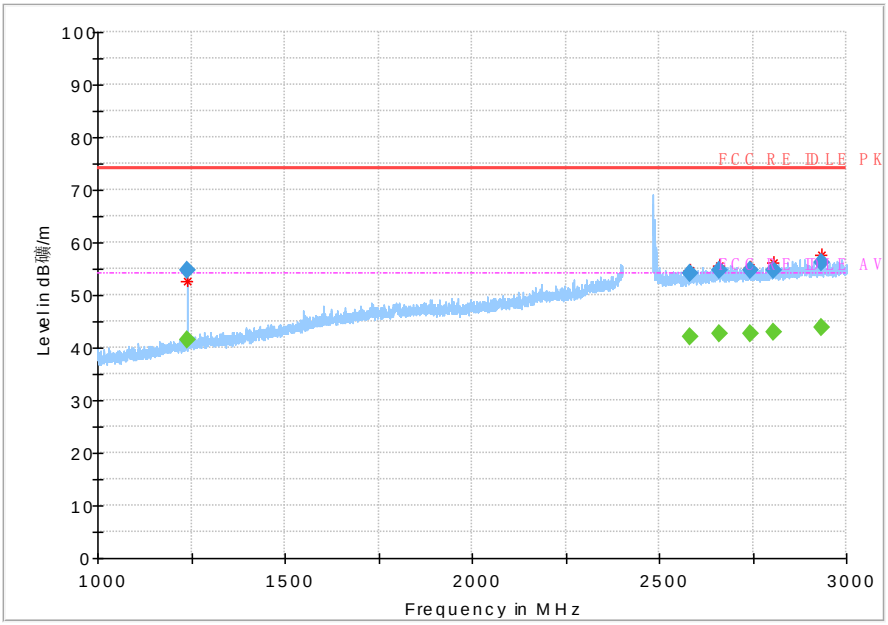


Fig.41 Radiated emission: GFSK, Ch78, 1GHz~3GHz

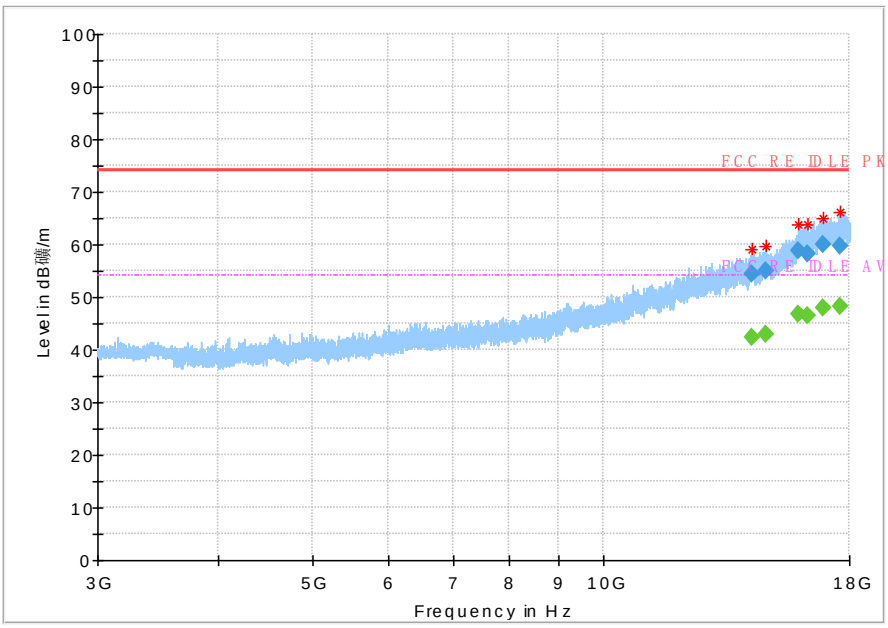
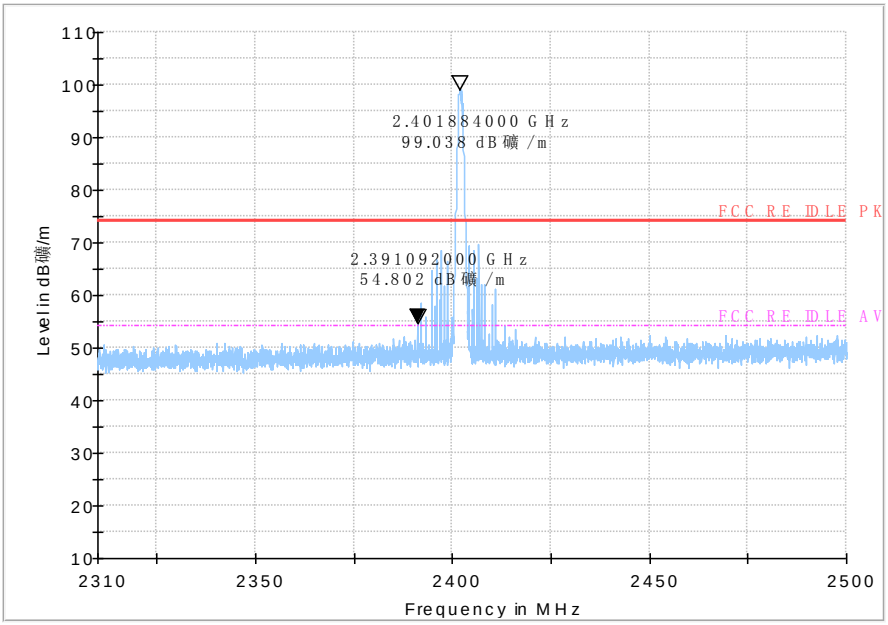


Fig.42 Radiated emission: GFSK, Ch78, 3GHz~18GHz



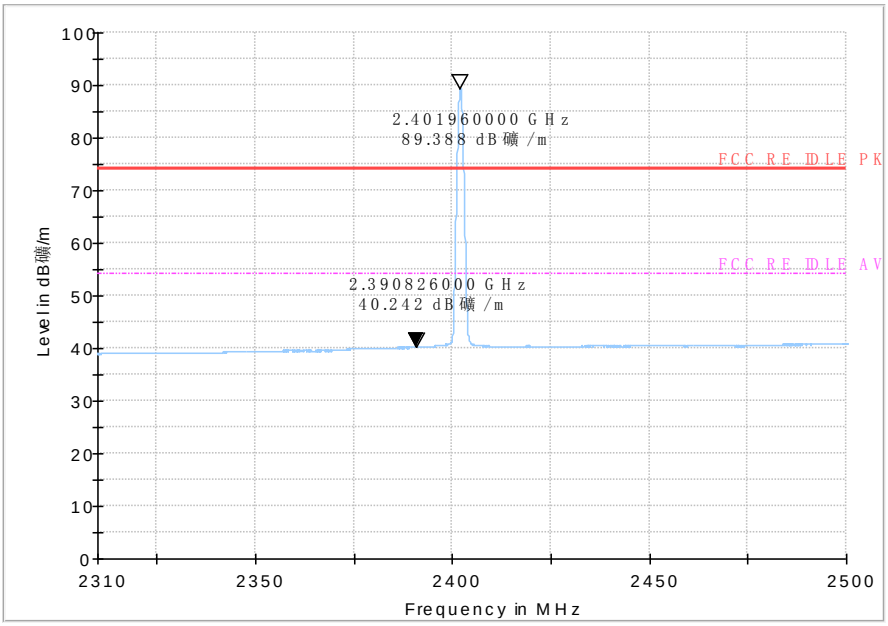
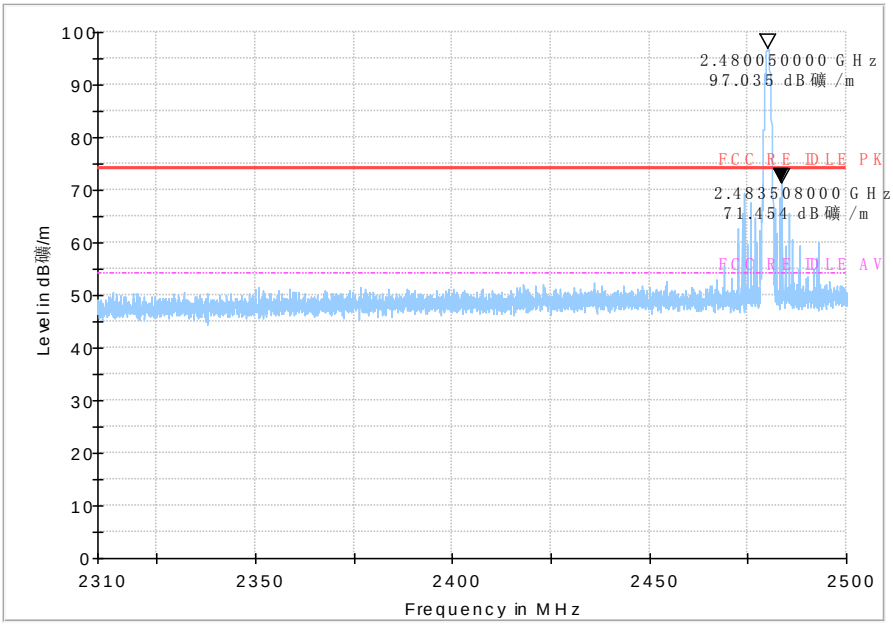


Fig.43 Radiated emission (Low): GFSK, low channel



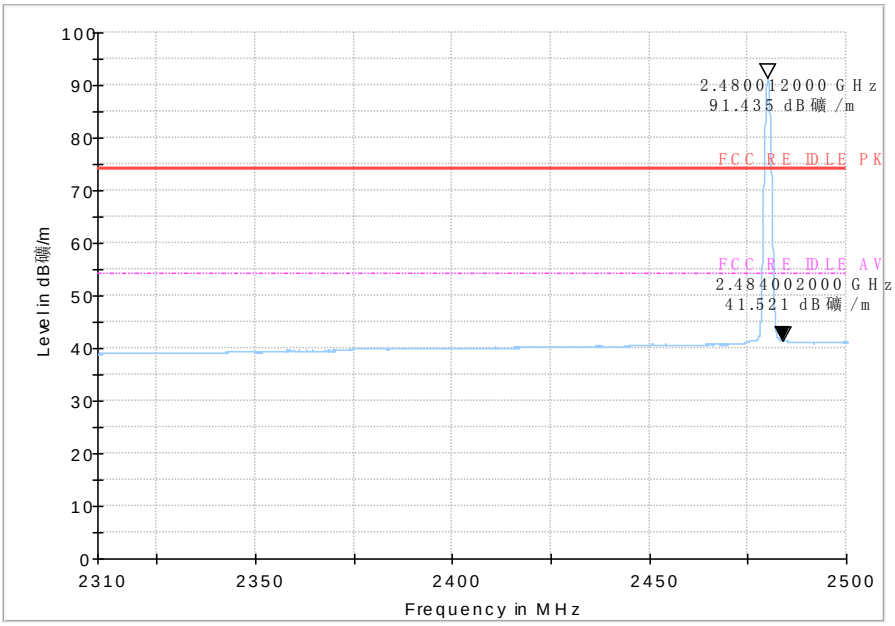


Fig.44 Radiated emission (High): GFSK, high channel

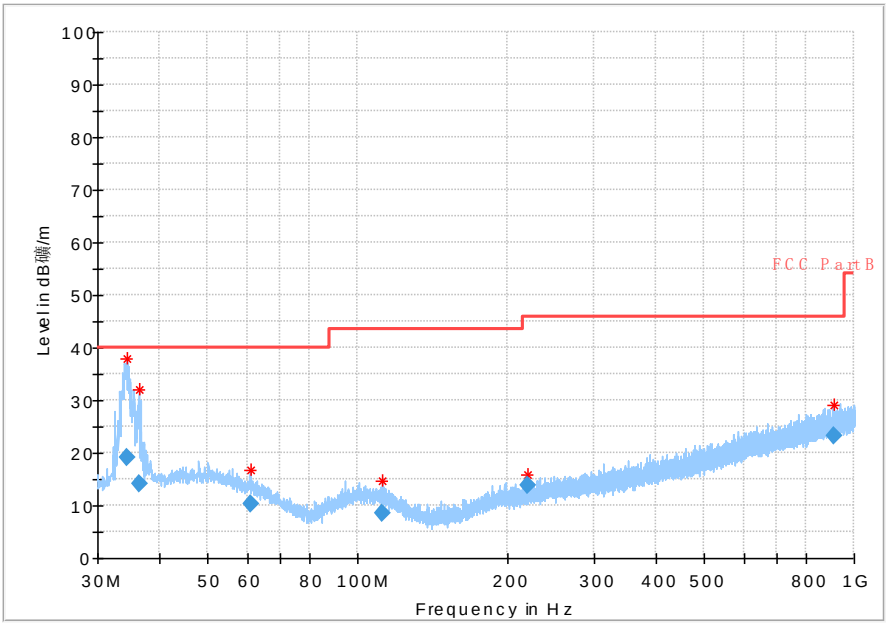


Fig.45 Radiated emission: π/4 DQPSK, Ch78, 30MHz~1GHz

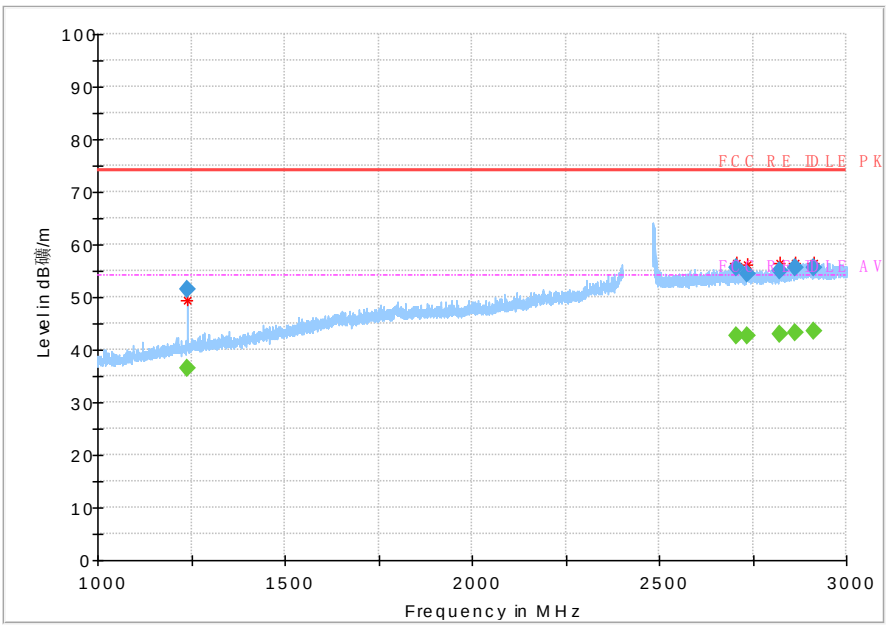


Fig.46 Radiated emission: π/4 DQPSK, Ch78, 1GHz~3GHz

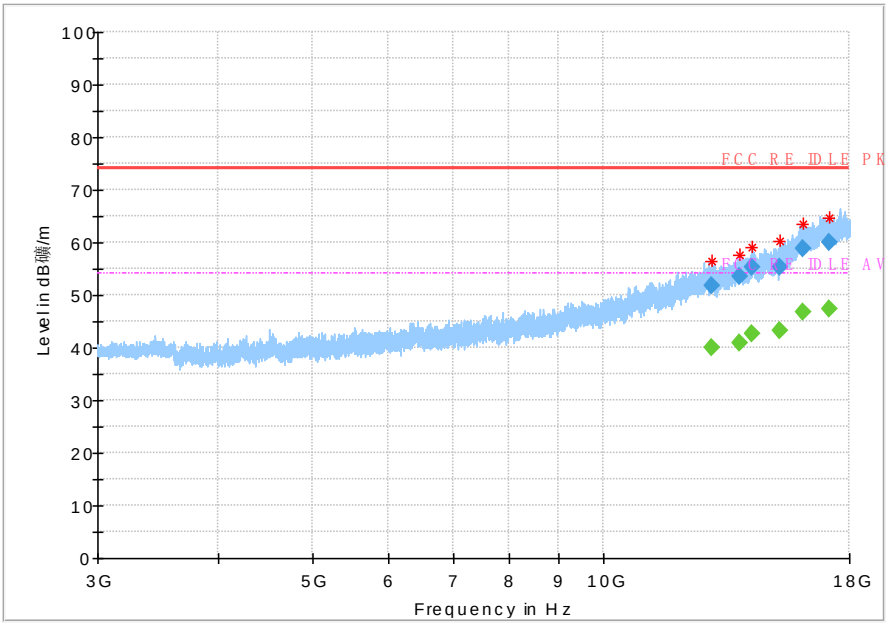
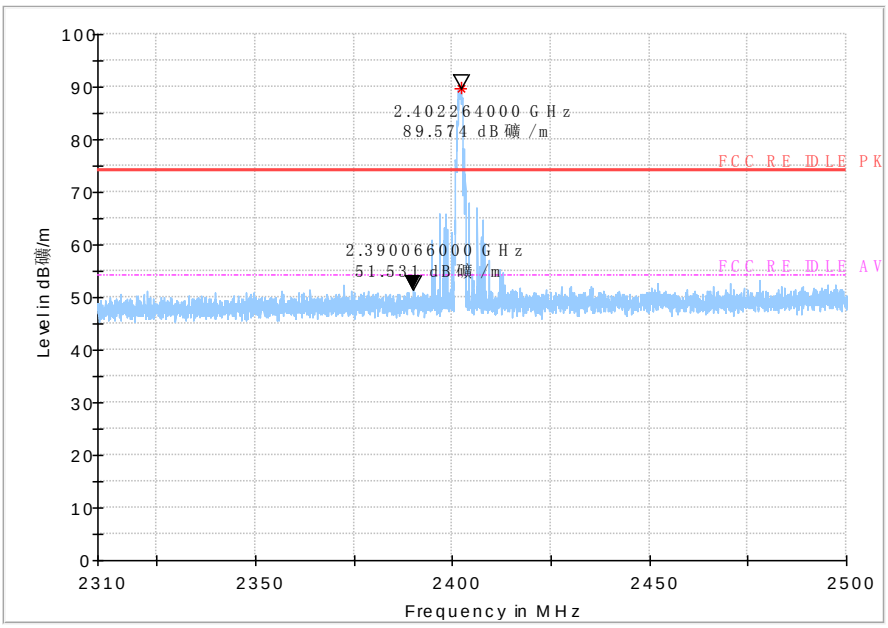


Fig.47 Radiated emission: π/4 DQPSK, Ch78, 3GHz~18GHz



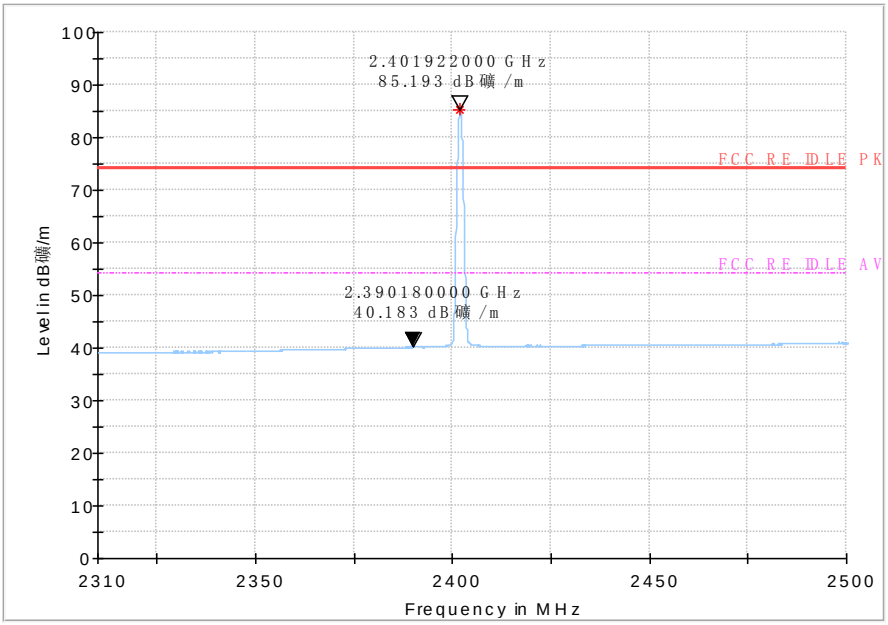
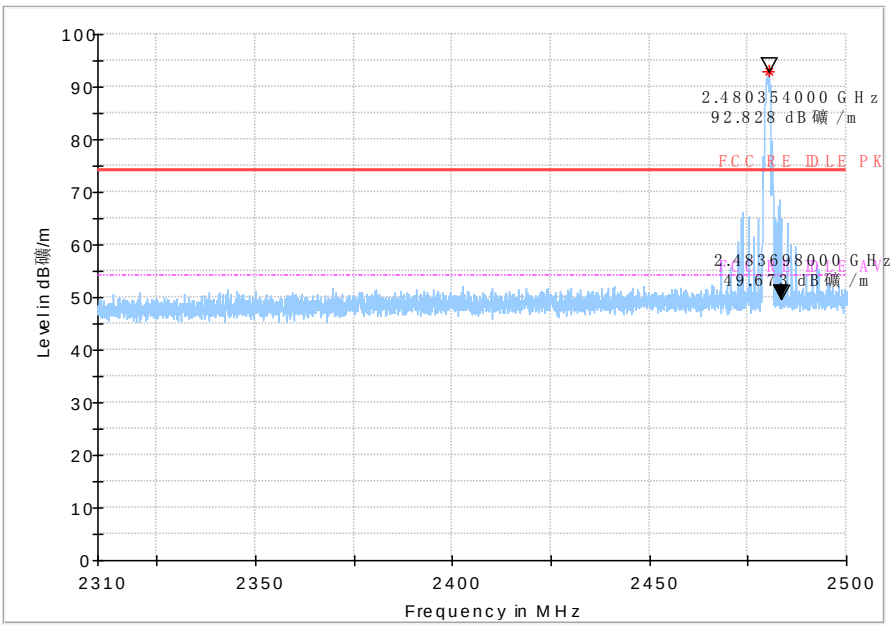


Fig.48 Radiated emission (Low): π/4 DQPSK, low channel



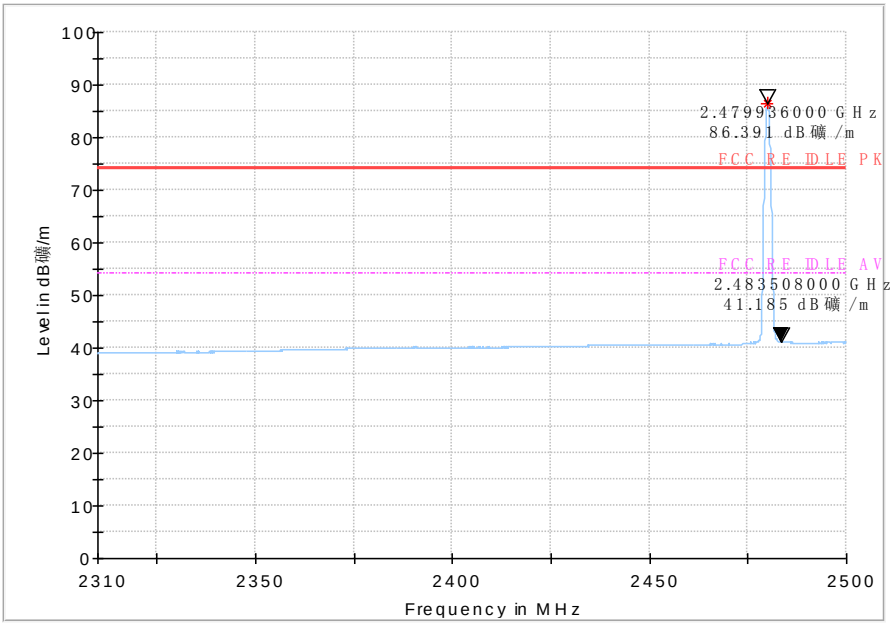


Fig.49 Radiated emission (High): π/4 DQPSK, high channel

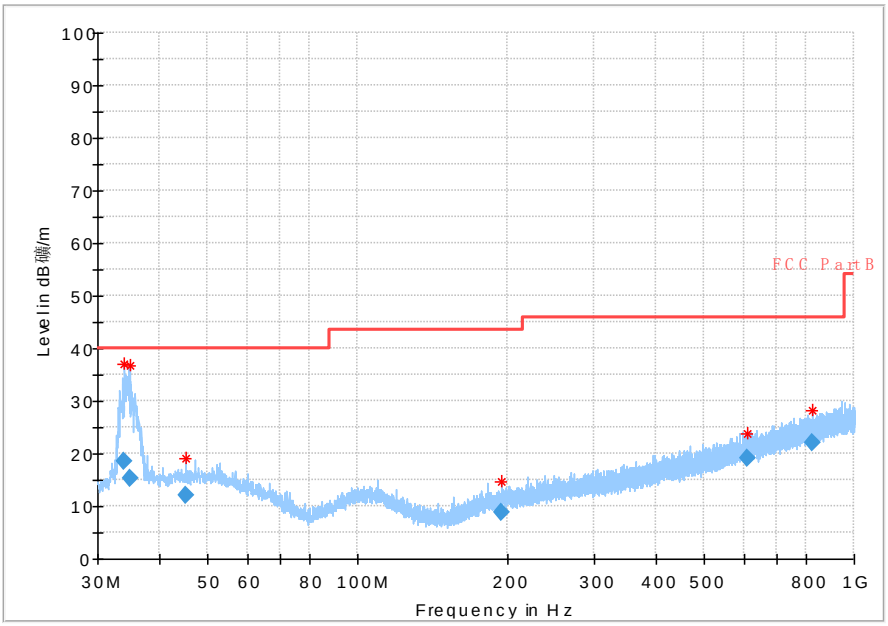


Fig.50 Radiated emission: 8DPSK, Ch78, 30MHz~1GHz

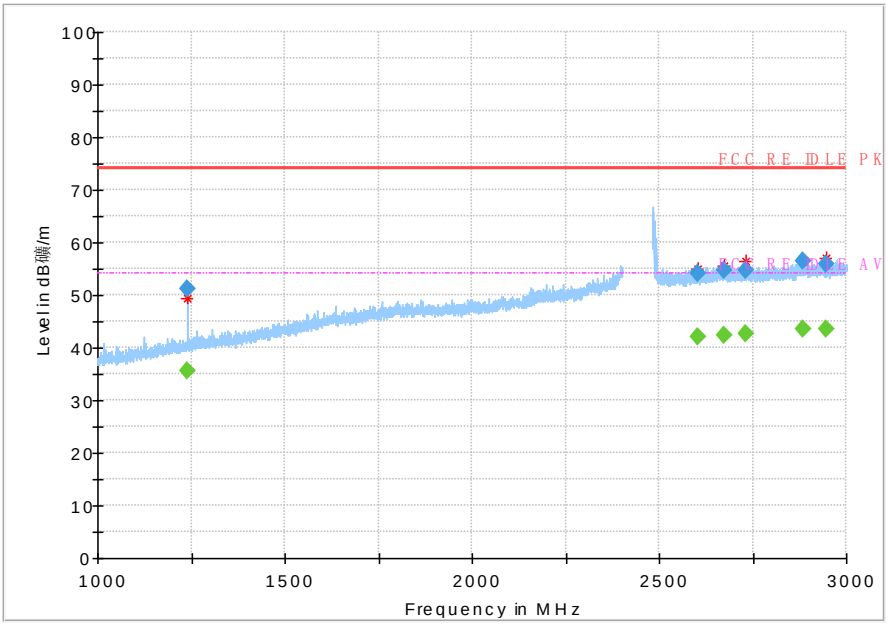


Fig.51 Radiated emission: 8DPSK, Ch78, 1GHz~3GHz

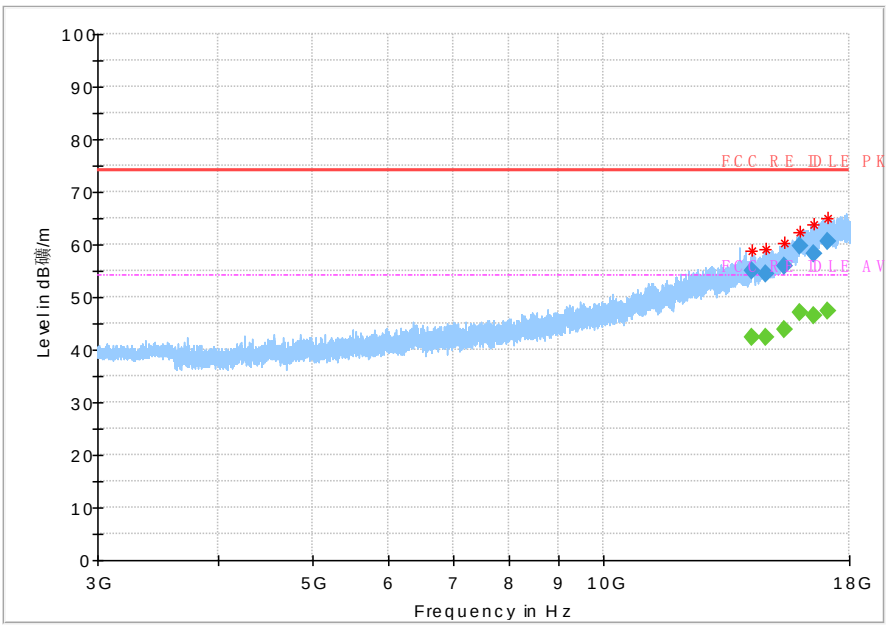
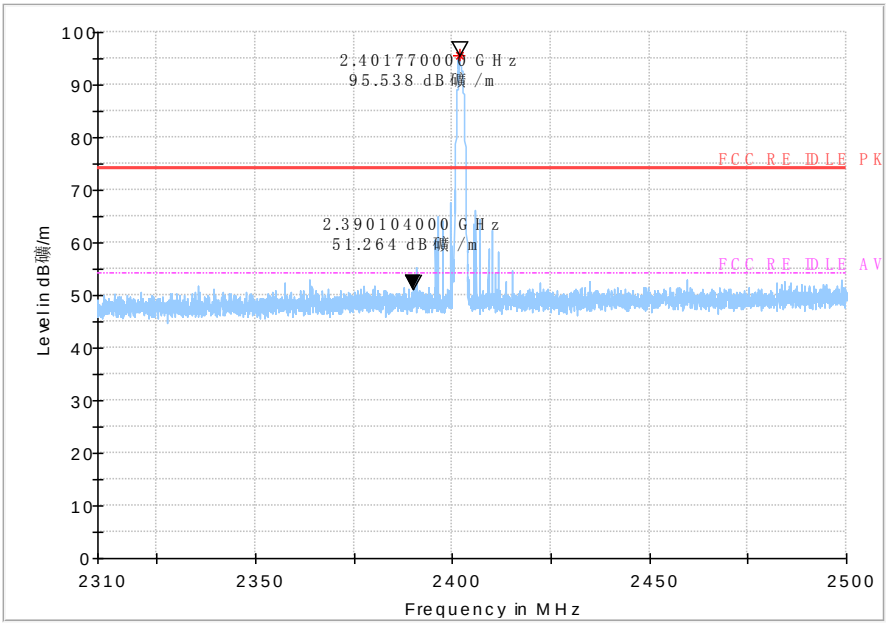


Fig.52 Radiated emission: 8DPSK, Ch78, 3GHz~18GHz



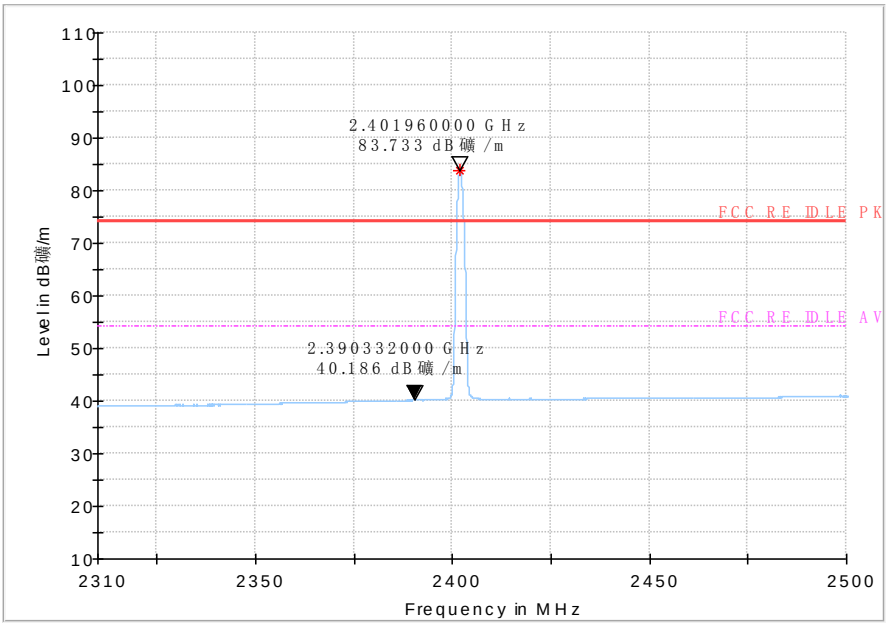
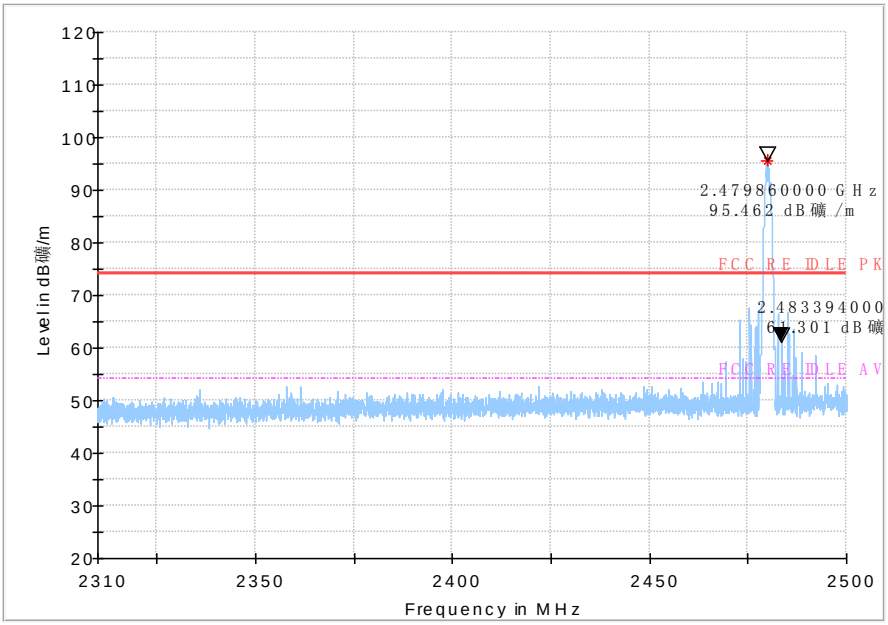


Fig.53 Radiated emission (Low): 8DPSK, low channel



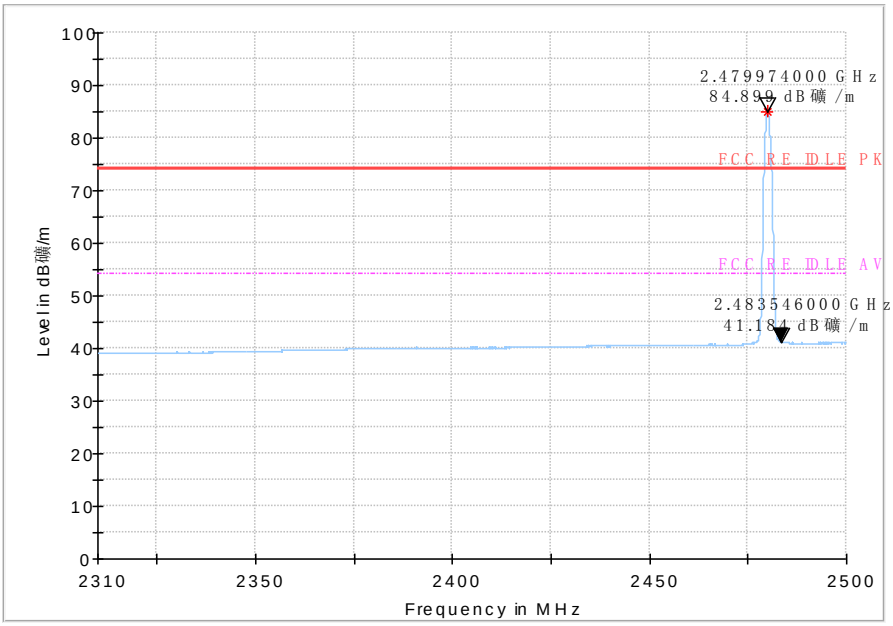
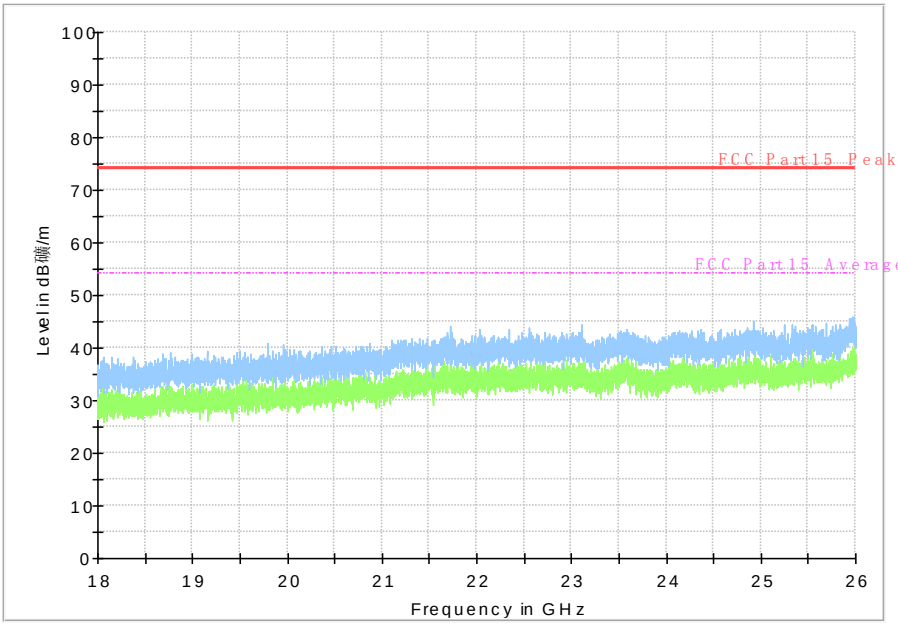


Fig.54 Radiated emission (High): 8DPSK, high channel



ALL Channel 18GHz~26GHz

6.5. Time Of Occupancy (Dwell Time)

6.5.1 Measurement Limit:

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

6.5.2 Test procedures

The measurement is according to ANSI C63.10 clause 7.8.4

1. Connect the EUT through cable and divide with CBT32 and spectrum analyzer.
2. Enable the EUT transmit maximum power.
3. Set the spectrum analyzer as step 4 to step 8.
4. Span: Zero span, centered on a hopping channel.
5. RBW shall be ≤ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.
6. Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to showtwo successive hops on a

channel.

7. Detector function: Peak.
8. Trace: Max hold.
9. Use the marker-delta function, and record it.

Note：For AFH mode, Test Period = 0.4 (second/ channel) x 20 Channel = 8 sec,
For FHSS mode, Test Period = 0.4 (second/ channel) x 79 Channel = 31.6 sec,
So the Time of Occupancy (Dwell Time) of AFH mode= Time of Occupancy (Dwell Time) of FHSS mode / 79 Channel x 20 Channel

Modulation type	Frequency(MHz)	Dwell Time (ms)	Limit(ms)	Conclusion
AFH(GFSK DH5)	2402-2421MHz	59.06	400	P
AFH(π/4 DQPSK DH5)	2402-2421MHz	59.79	400	P
AFH(8DPSK DH5)	2402-2421MHz	59.06	400	P

6.5.3 Measurement Result

For GFSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.55	60.72	P
		Fig.56		
	DH3	Fig.57	194.21	P
		Fig.58		
	DH5	Fig.59	233.28	P
		Fig.60		

For π/4 DQPSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	2DH1	Fig.61	63.36	P
		Fig.62		
	2DH3	Fig.63	194.21	P
		Fig.64		

	2DH5	Fig.65	236.16	P
		Fig.66		

For 8DPSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	3DH1	Fig.67	62.98	P
		Fig.68		
	3DH3	Fig.69	194.46	P
		Fig.70		
	3DH5	Fig.71	233.28	P
		Fig.72		

Conclusion: PASS

Test graphs as below:

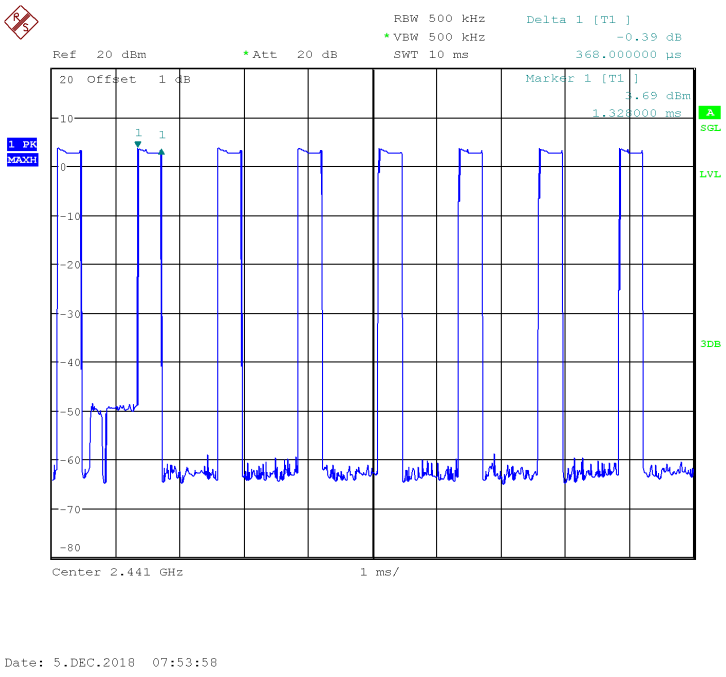


Fig.55 Time of occupancy (Dwell Time): Ch39, Packet DH1

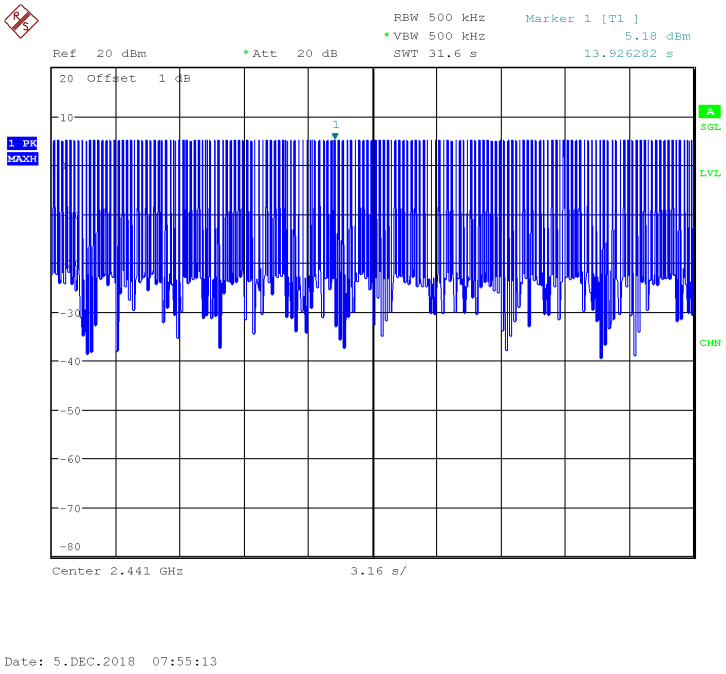


Fig.56 Number of Transmissions Measurement: Ch39, Packet DH1

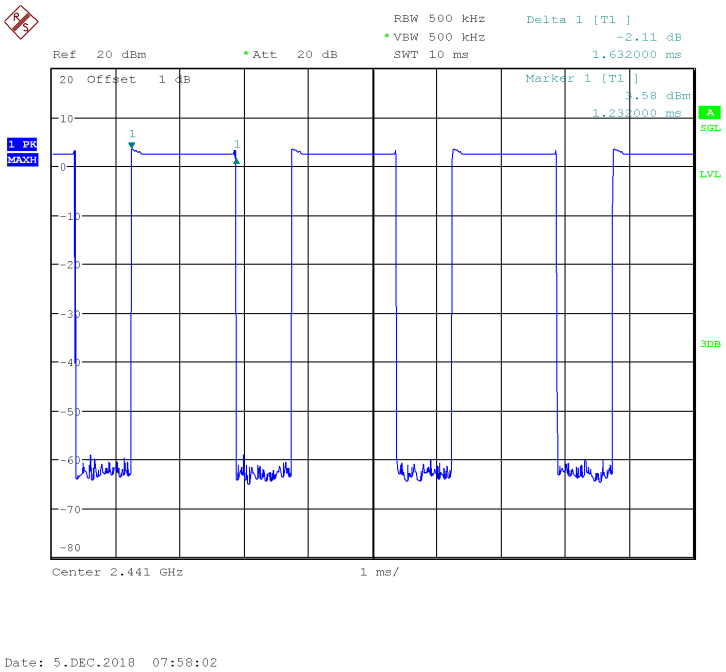


Fig.57 Time of occupancy (Dwell Time): Ch39, Packet DH3

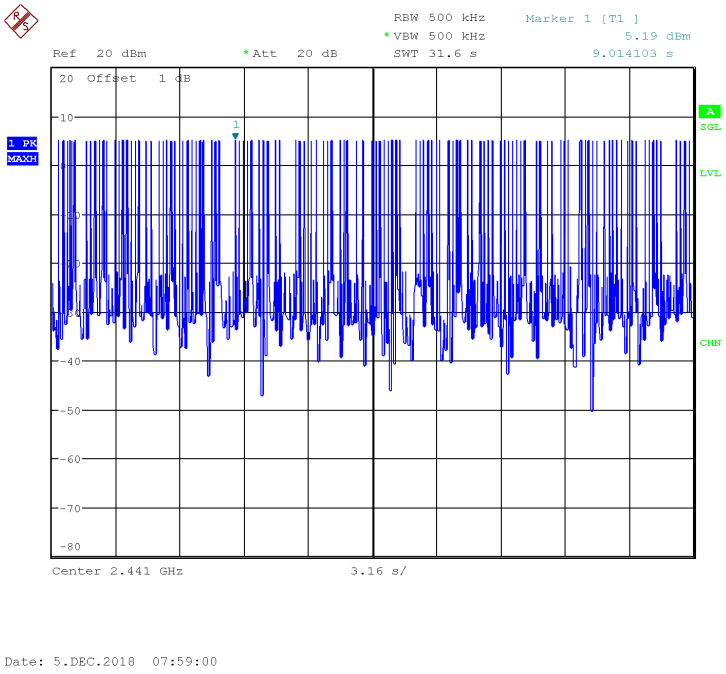


Fig.58 Number of Transmissions Measurement: Ch39, Packet DH3

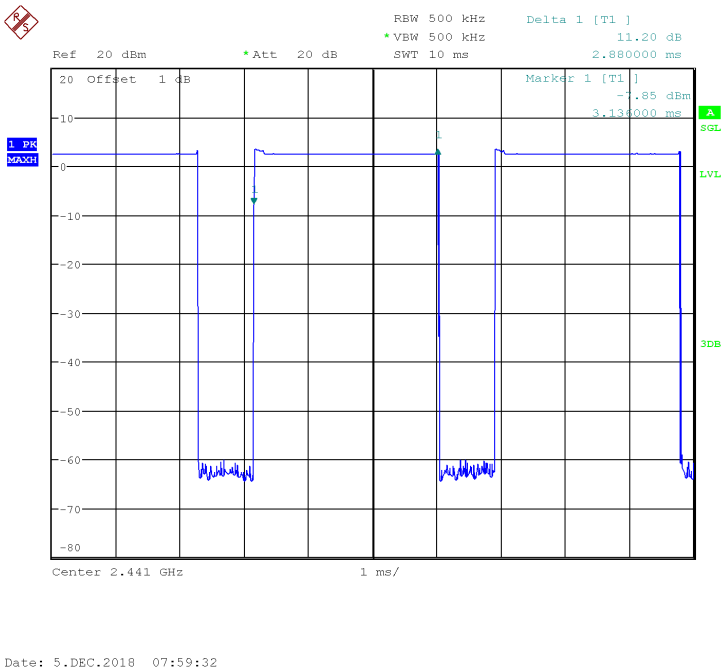


Fig.59 Time of occupancy (Dwell Time): Ch39,Packet DH5

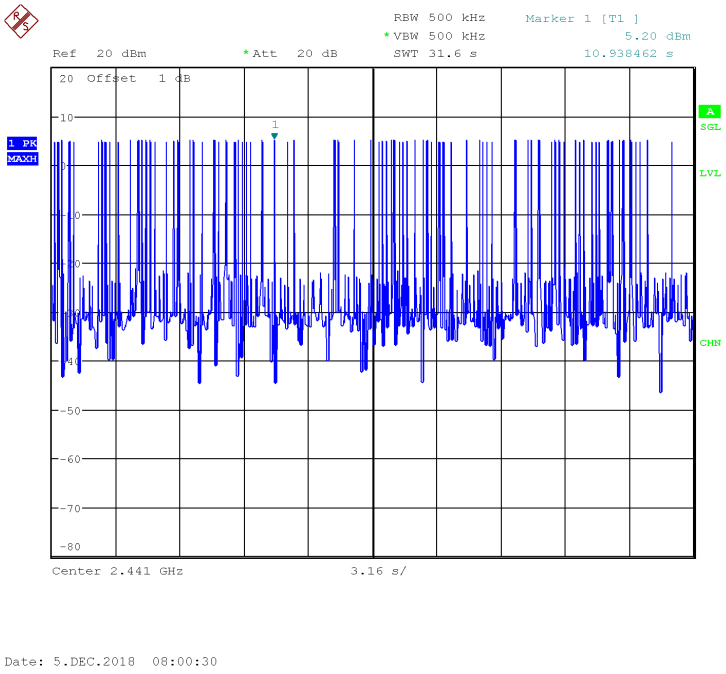


Fig.60 Number of Transmissions Measurement: Ch39, Packet DH5

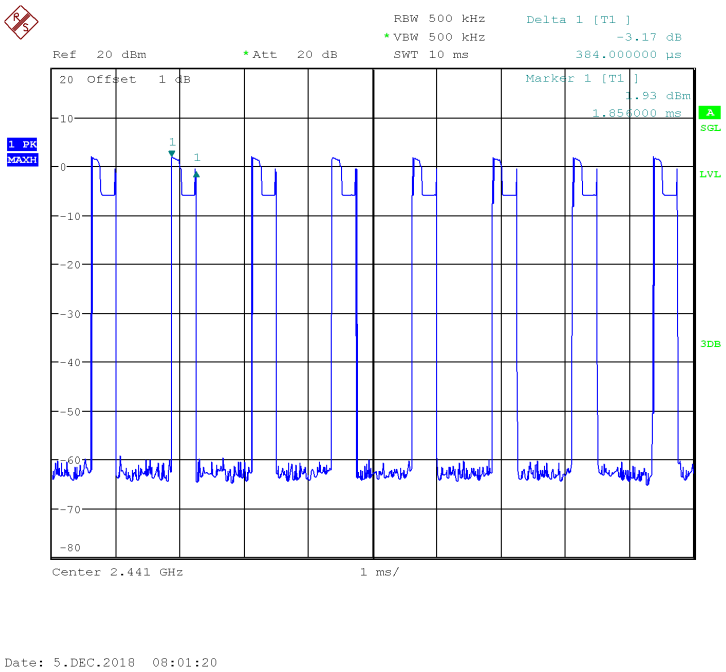


Fig.61 Time of occupancy (Dwell Time): Ch39, Packet 2-DH1

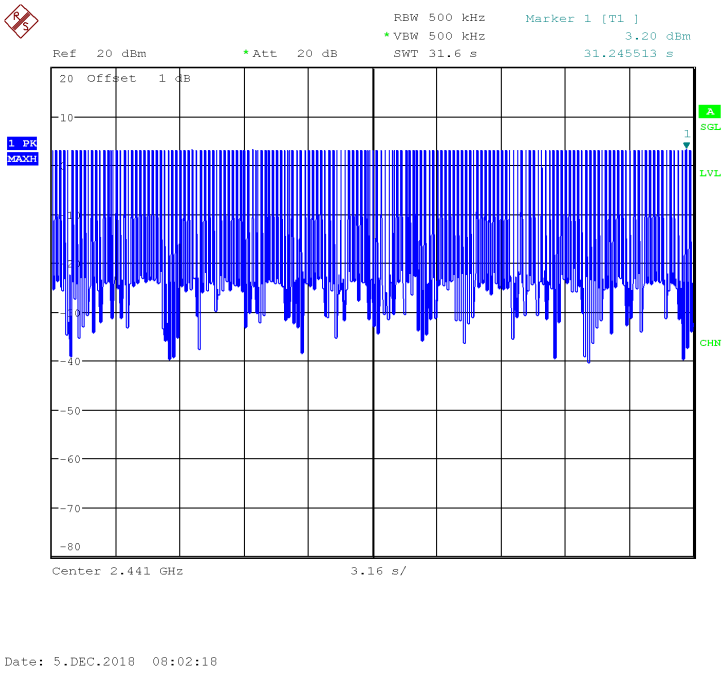


Fig.62 Number of Transmissions Measurement: Ch39, Packet 2-DH1

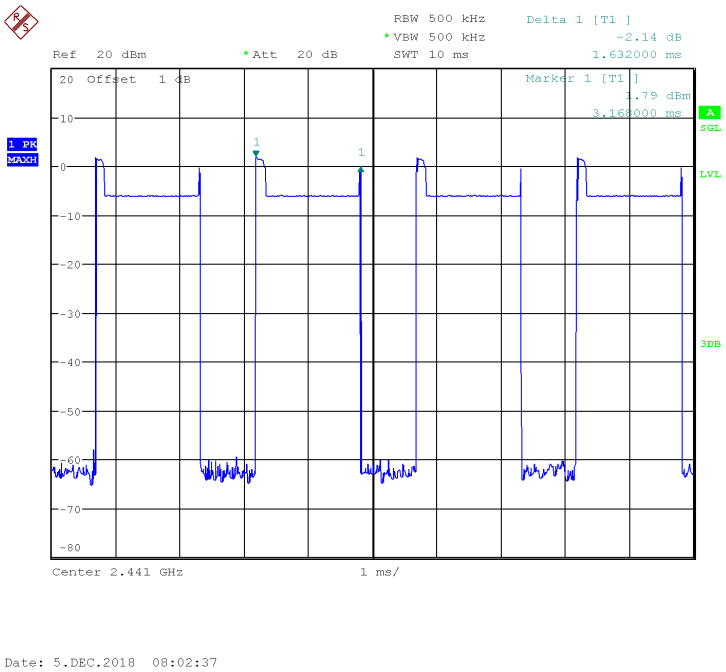


Fig.63 Time of occupancy (Dwell Time): Ch39,Packet 2-DH3

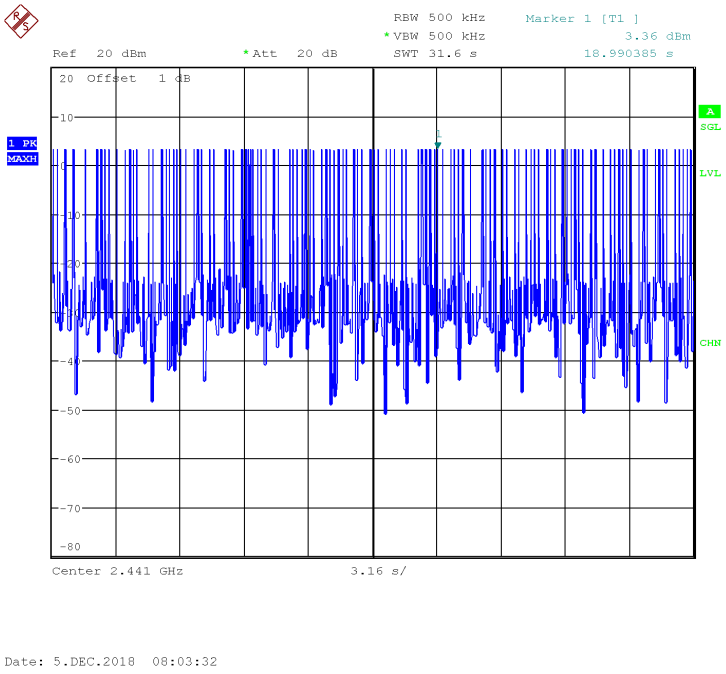


Fig.64 Number of Transmissions Measurement: Ch39, Packet 2-DH3

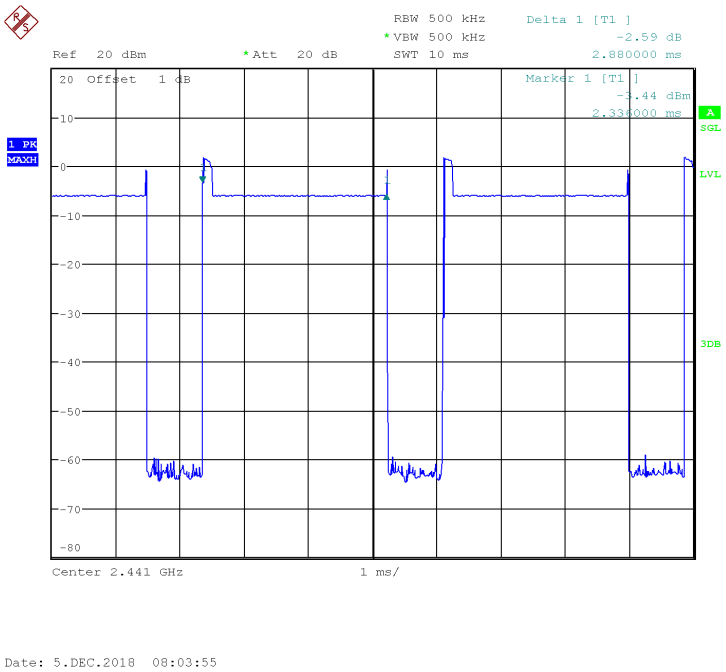


Fig.65 Time of occupancy (Dwell Time): Ch39, Packet 2-DH5

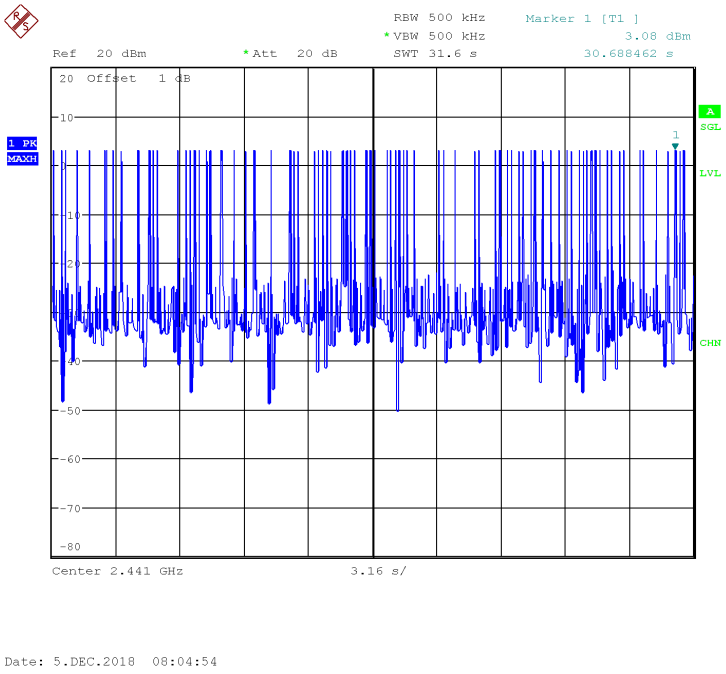


Fig.66 Number of Transmissions Measurement: Ch39, Packet 2-DH5

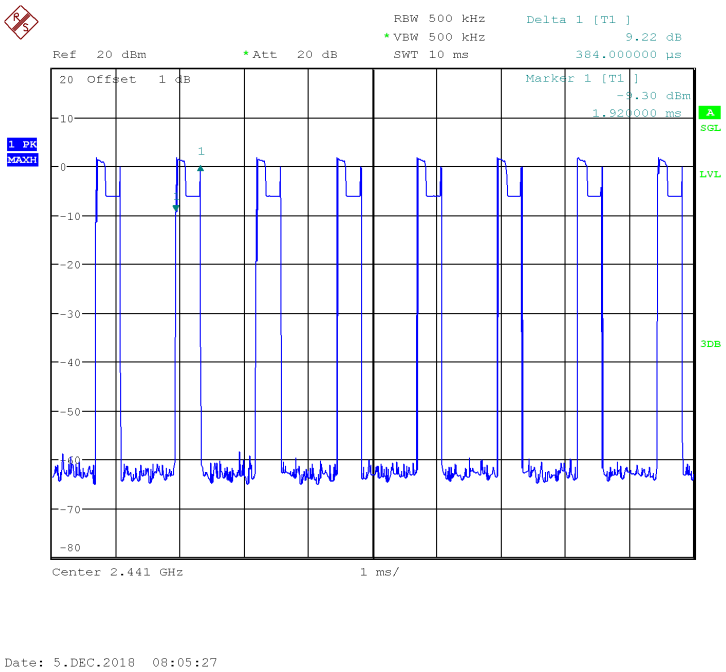


Fig.67 Time of occupancy (Dwell Time): Ch39,Packet 3-DH1

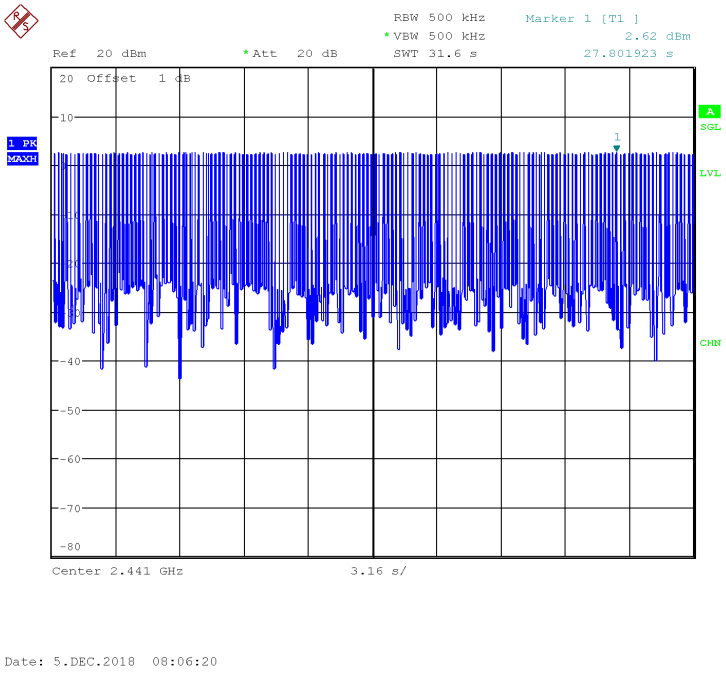


Fig.68 Number of Transmissions Measurement: Ch39, Packet 3-DH1

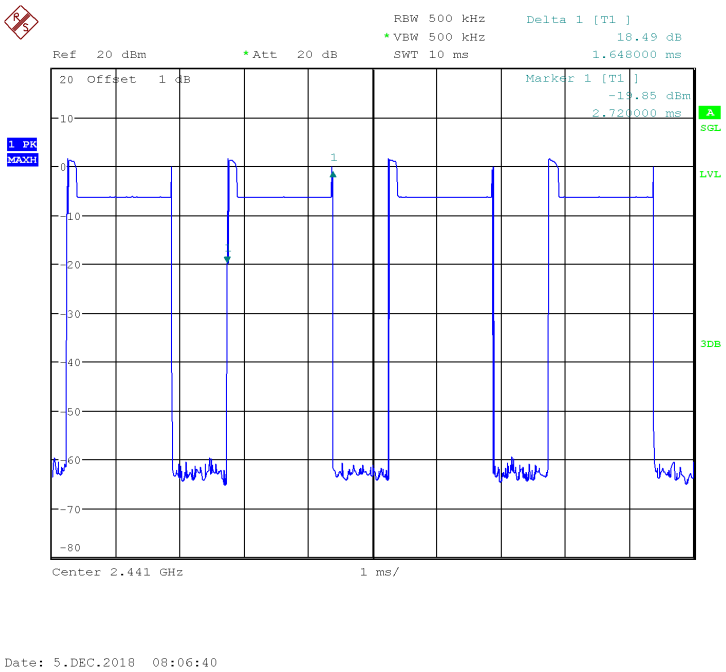


Fig.69 Time of occupancy (Dwell Time): Ch39,Packet 3-DH3

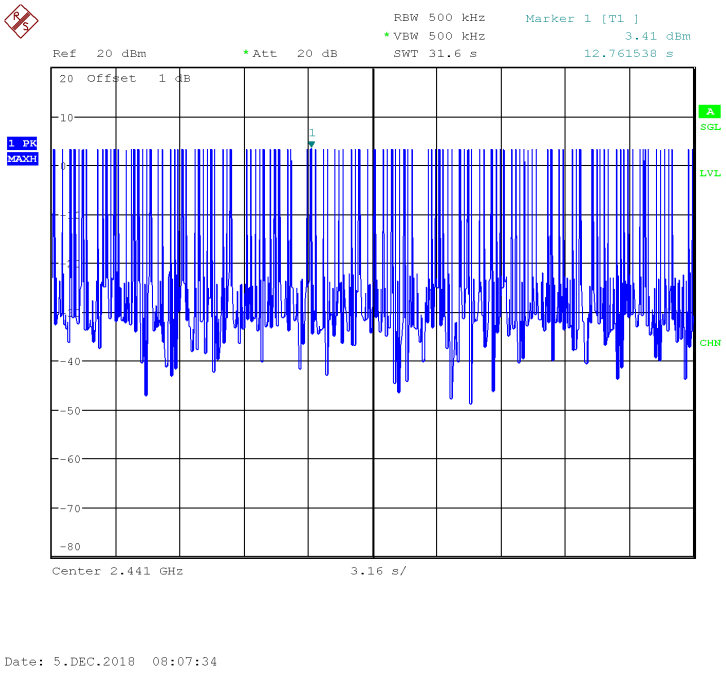


Fig.70 Number of Transmissions Measurement: Ch39, Packet 3-DH3

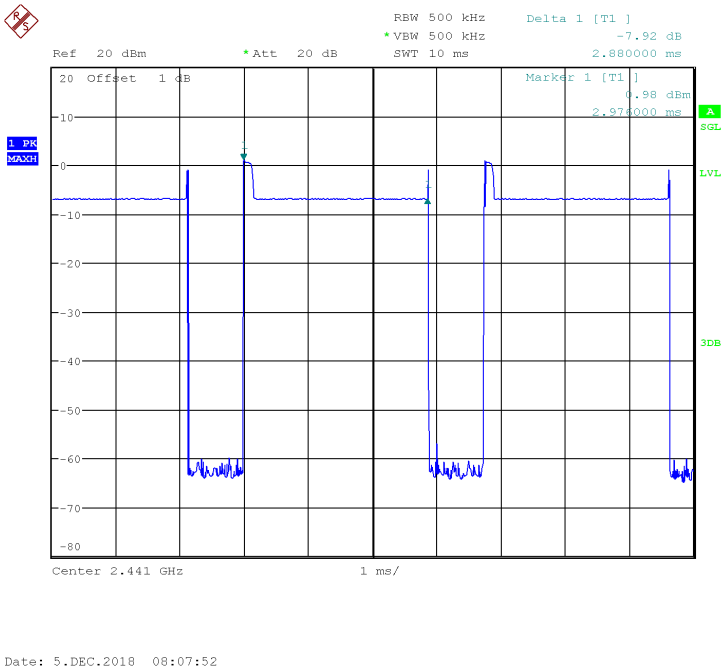


Fig.71 Time of occupancy (Dwell Time): Ch39,Packet 3-DH5

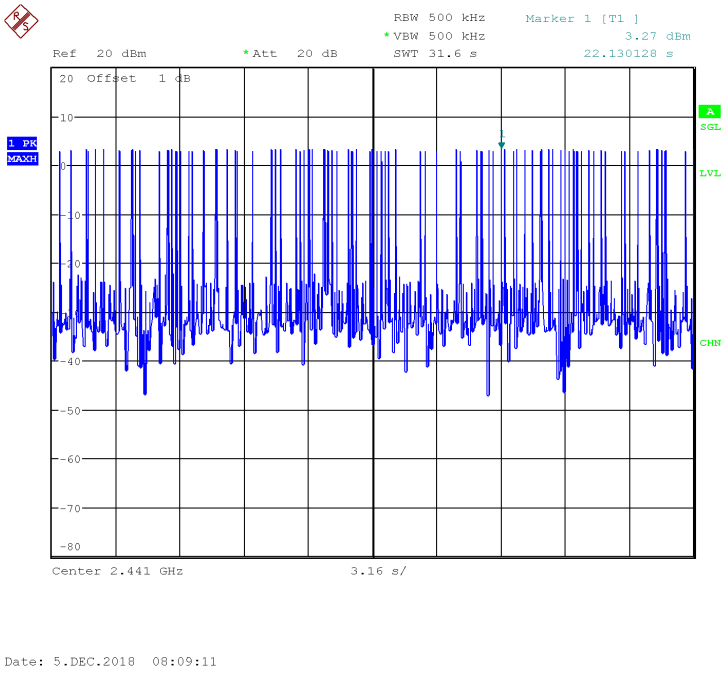


Fig.72 Number of Transmissions Measurement: Ch39, Packet 3-DH5

6.6. 20dB Bandwidth

6.6.1 Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247 (a) (1)	N/A

6.6.2 Test procedures

The measurement is according to ANSI C63.10 clause 7.8.7

1. Connect the EUT through cable and divide with CBT32 and spectrum analyzer.
2. Enable the EUT transmit maximum power.
3. Set the spectrum analyzer as step 4 to step 7.
4. Span: two or five times of OBW
5. RBW= 1% to 5% of the OBW; VBW is approximately three times of RBW; Max Hold.
6. Select the max peak, and N DB DOWN=20dB.
7. Record the results.

Measurement Result:

For GFSK

Channel	20dB Bandwidth (MHz)		Conclusion
0	Fig.73	0.760	P

39	Fig.74	0.841	P
78	Fig.75	0.846	P

For π/4 DQPSK

Channel	20dB Bandwidth (MHz)		Conclusion
0	Fig.76	1.216	P
39	Fig.77	1.221	P
78	Fig.78	1.216	P

For 8DPSK

Channel	20dB Bandwidth (MHz)		Conclusion
0	Fig.79	1.212	P
39	Fig.80	1.212	P
78	Fig.81	1.212	P

Conclusion: PASS

Test graphs as below:

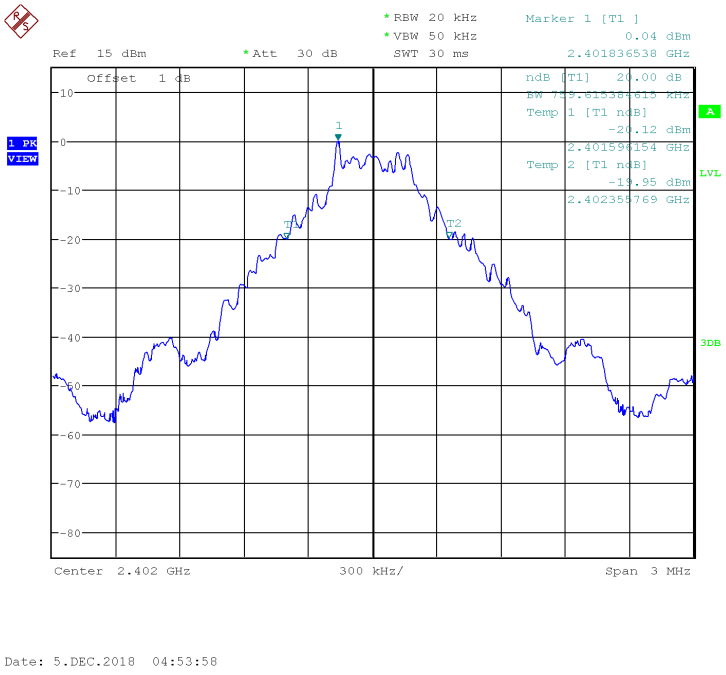


Fig.73 20dB Bandwidth: GFSK, Ch0

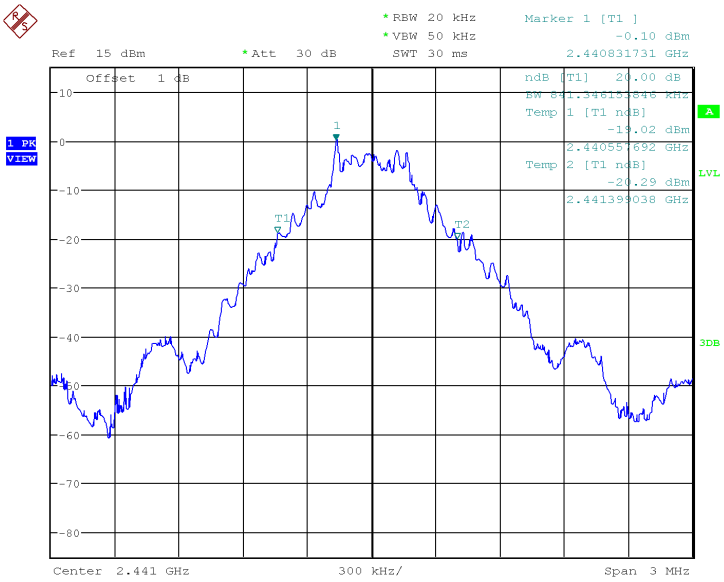


Fig.74 20dB Bandwidth: GFSK, Ch39

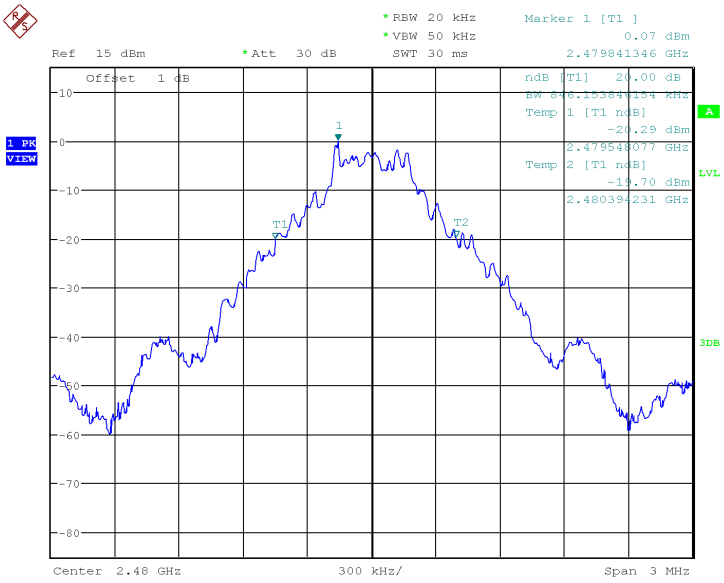


Fig.75 20dB Bandwidth: GFSK, Ch78

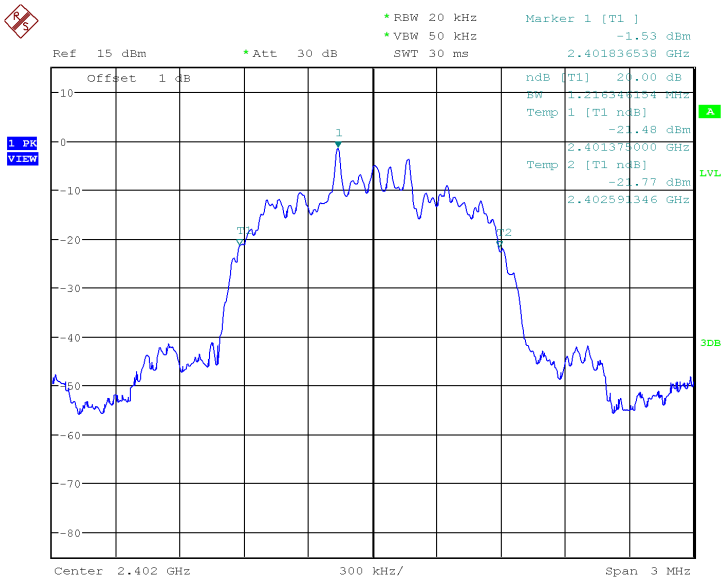


Fig.76 20dB Bandwidth: π/4 DQPSK, Ch0

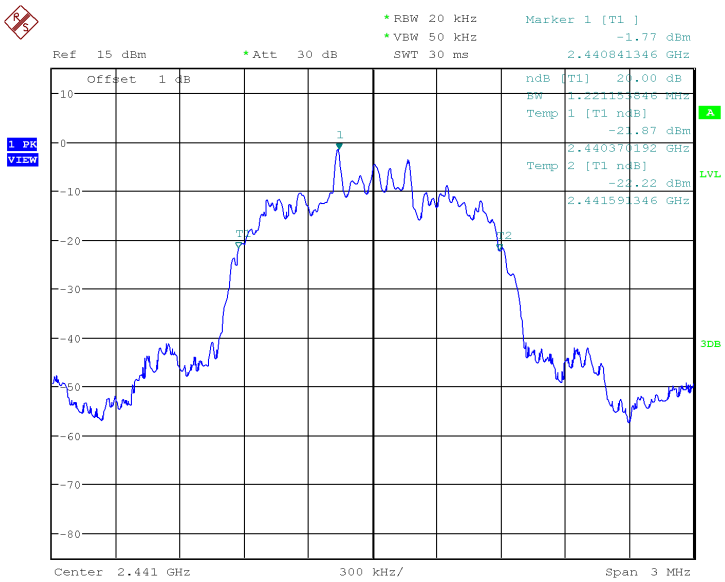


Fig.77 20dB Bandwidth: π/4 DQPSK, Ch39

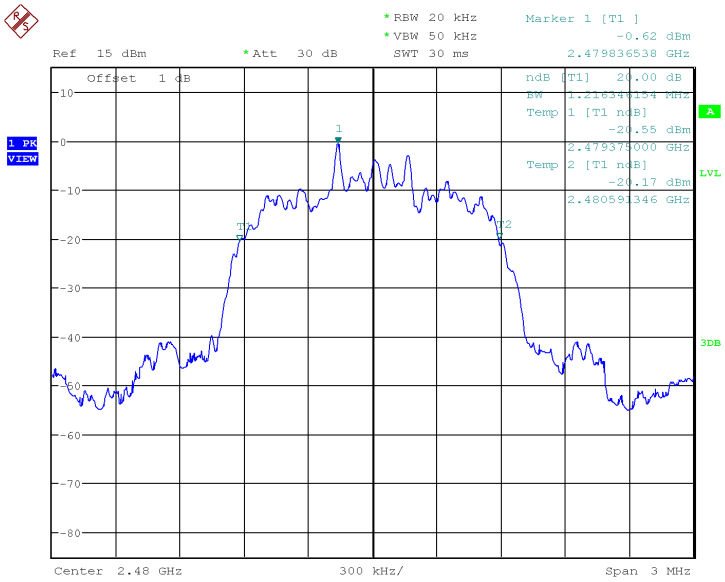


Fig.78 20dB Bandwidth: π/4 DQPSK, Ch78

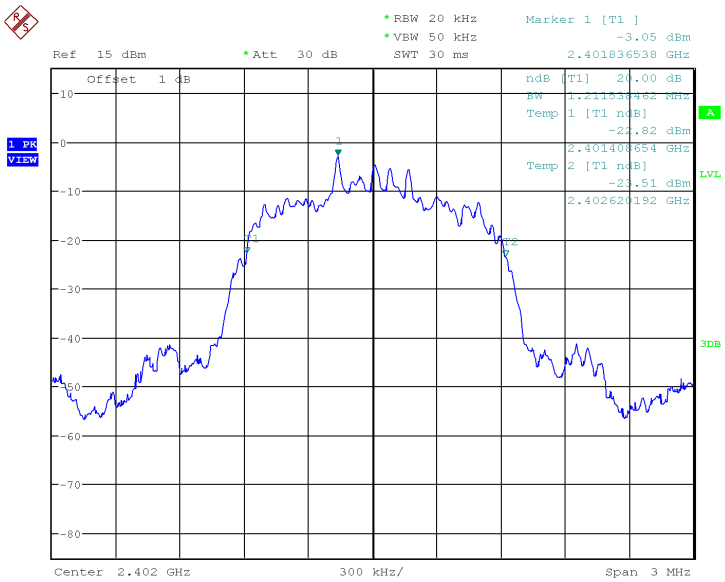


Fig.79 20dB Bandwidth: 8DPSK, Ch0

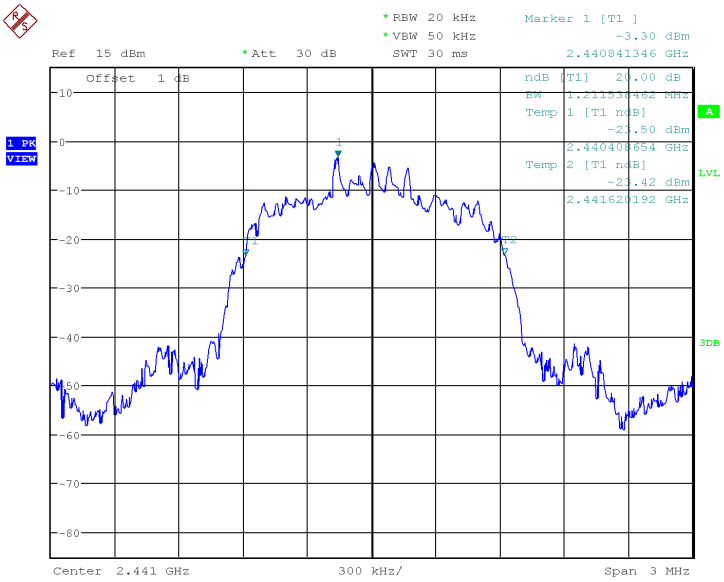


Fig.80 20dB Bandwidth: 8DPSK, Ch39

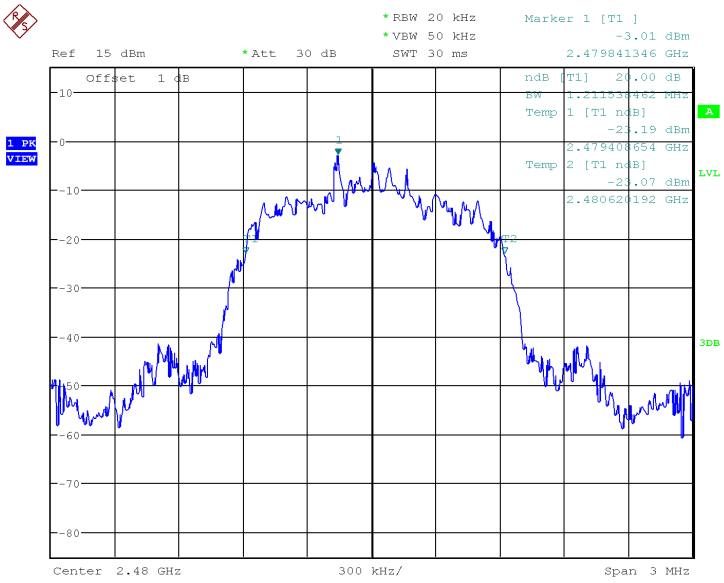


Fig.81 20dB Bandwidth: 8DPSK, Ch78

6.7. Carrier Frequency Separation

6.7.1 Measurement Limit:

Standard	Limit (KHz)

FCC 47 CFR Part 15.247 (a) (1)	Over 25KHz or (2/3)*20dB bandwidth

6.7.2 Test procedures

The measurement is according to ANSI C63.10 clause 7.8.2.

1. Connect the EUT through cable and divide with CBT32 and spectrum analyzer.
2. Enable the EUT transmit in hopping mode.
3. Span: Wide enough to capture the peaks of two adjacent channels.
4. RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
5. Video (or average) bandwidth (VBW) ≥ RBW.
6. Sweep: Auto.
7. Detector function: Peak.
8. Trace: Max hold.
9. Allow the trace to stabilize.

6.7.3 Measurement Result:

For GFSK

Channel	Carrier separation (KHz)		Conclusion
39	Fig.82	998.4	P

For π/4 DQPSK

Channel	Carrier separation (KHz)		Conclusion
39	Fig.83	993.6	P

For 8DPSK

Channel	Carrier separation (KHz)		Conclusion
39	Fig.84	1968	P

Conclusion: PASS

Test graphs as below:

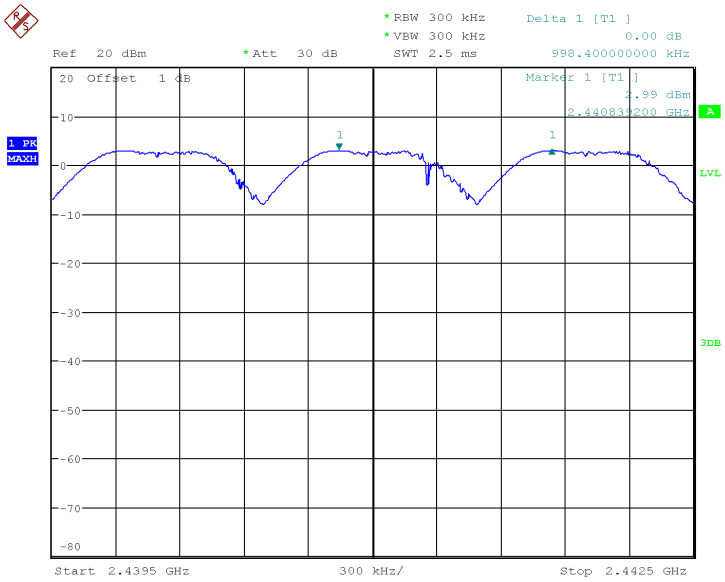


Fig.82 Carrier separation measurement: GFSK, Ch39

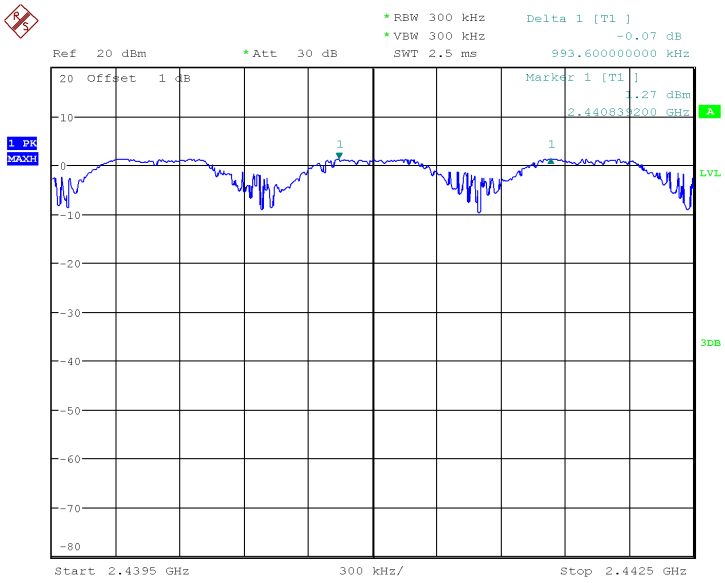


Fig.83 Carrier separation measurement: π/4 DQPSK, Ch39

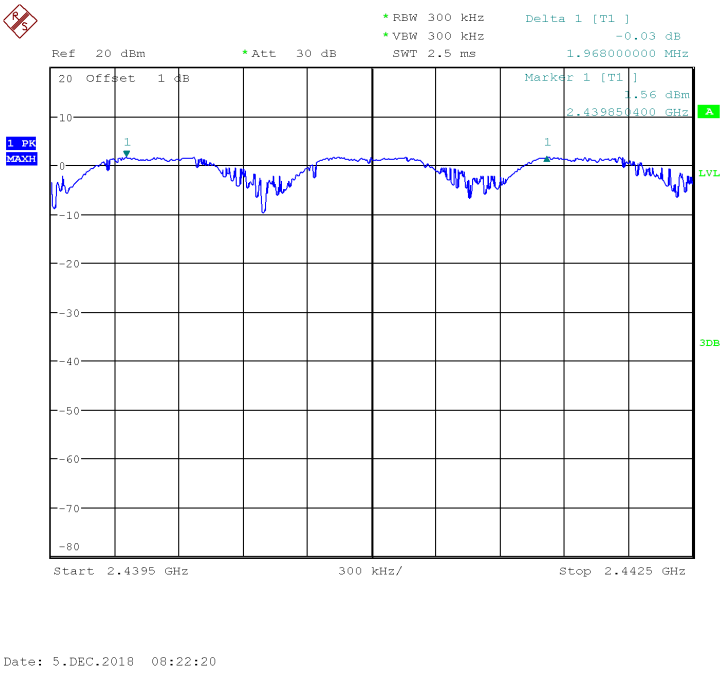


Fig.84 Carrier separation measurement: 8DPSK, Ch39

6.8. Number Of Hopping Channels

6.8.1 Measurement Limit:

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

6.8.2 Test procedure

The measurement is according to ANSI C63.10 clause 7.8.3.

1. Connect the EUT through cable and divide with CBT32 and spectrum analyzer.
2. Enable the EUT transmit in hopping mode.
3. Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
4. RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
5. VBW ⩾ RBW.
6. Sweep: Auto.
7. Detector function: Peak.
8. Trace: Max hold.
9. Allow the trace to stabilize.
10. Record the test rsults.

6.8.3 Measurement Result:

For GFSK

Channel	Number of hopping channels		Conclusion
0~39	Fig.85	79	P
40~78	Fig.86		P

For π/4 DQPSK

Channel	Number of hopping channels		Conclusion
0~39	Fig.87	79	P
40~78	Fig.88		P

For 8DPSK

Channel	Number of hopping channels		Conclusion
0~39	Fig.89	79	P
40~78	Fig.90		P

Conclusion: PASS

Test graphs as below:

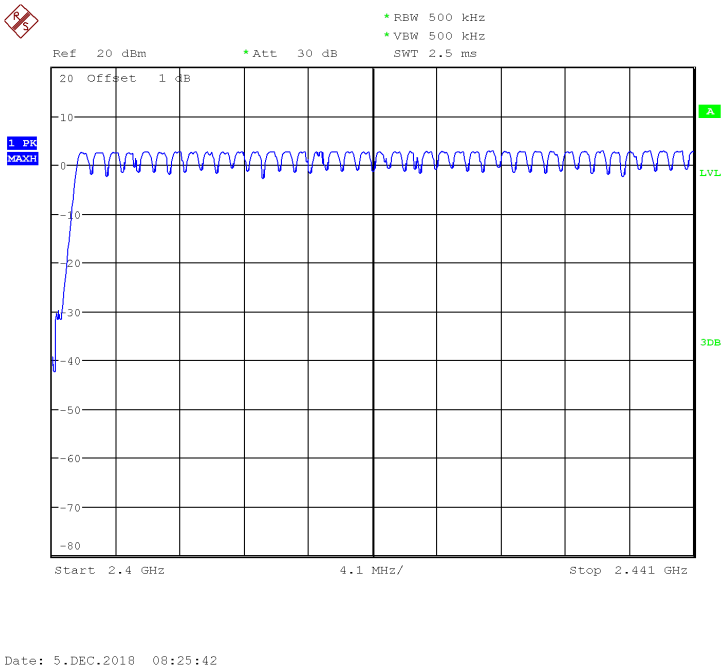


Fig.85 Number of hopping frequency: GFSK, Ch0~39

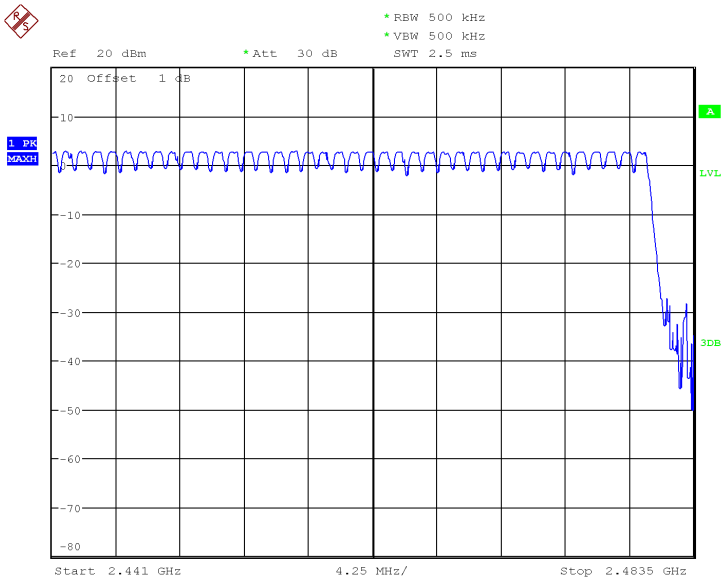


Fig.86 Number of hopping frequency: GFSK, Ch40~78

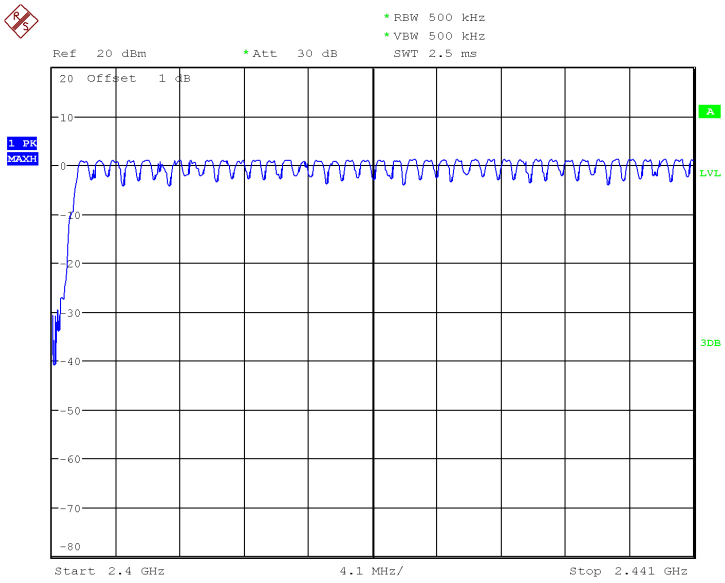


Fig.87 Number of hopping frequency: π/4 DQPSK, Ch0~39

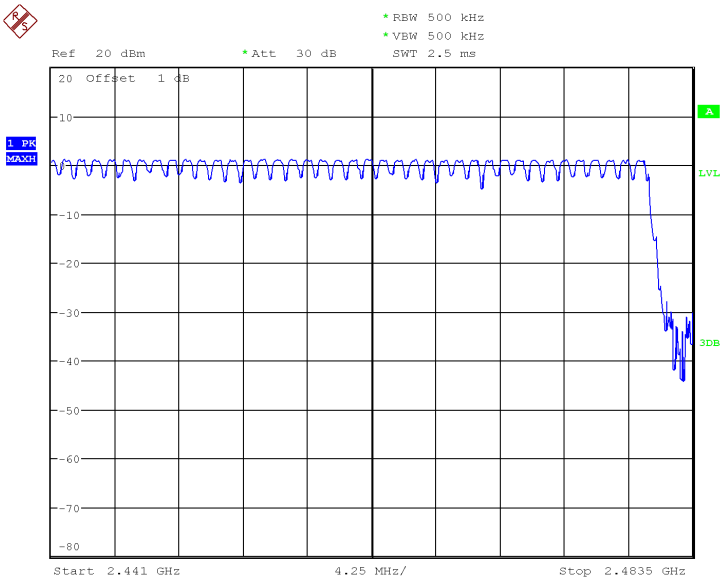


Fig.88 Number of hopping frequency: π/4 DQPSK, Ch40~78

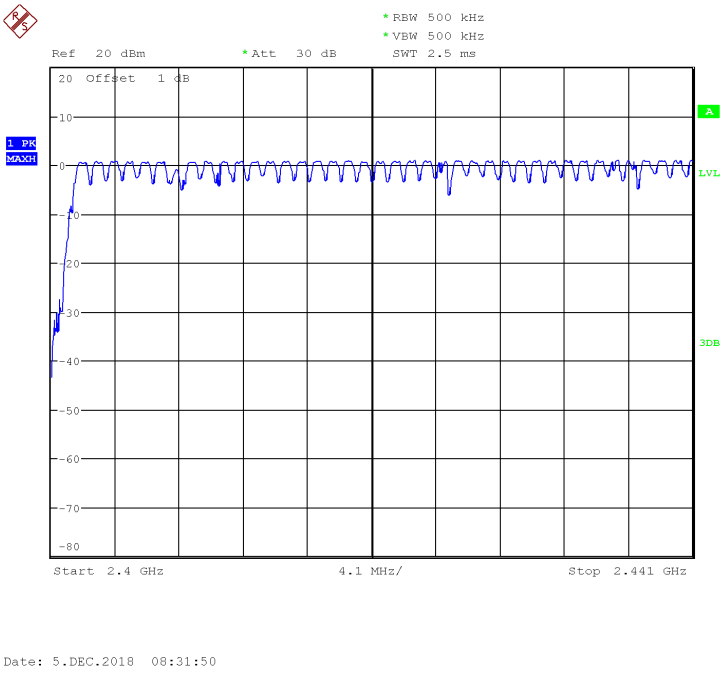


Fig.89 Number of hopping frequency: 8DPSK, Ch0~39

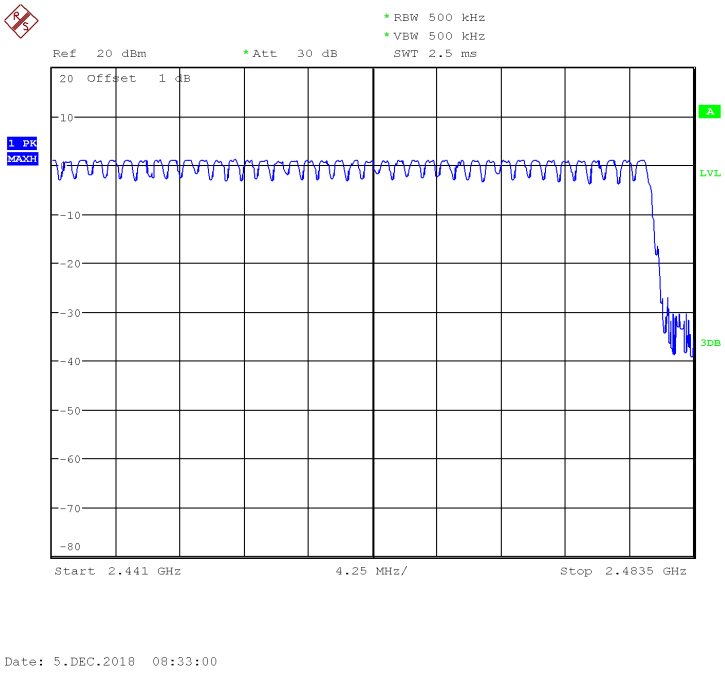


Fig.90 Number of hopping frequency: 8DPSK, Ch40~78

6.9. AC Powerline Conducted Emission

Method of Measurement: See ANSI C63.10-2013-clause 6.2

1 The one EUT cable configuration and arrangement and mode of operation that produced the emission with the highest amplitude relative to the limit is selected for the final measurement, while applying the appropriate modulating signal to the EUT.

2 If the EUT is relocated from an exploratory test site to a final test site, the highest emissions shall be remaximized at the final test location before final ac power-line conducted emission measurements are performed.

3 The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment in the system) is then performed for the full frequency range for which the EUT is being tested for compliance without further variation of the EUT arrangement, cable positions, or EUT mode of operation.

4 If the EUT is comprised of equipment units that have their own separate ac power connections, e.g., floor-standing equipment with independent power cords for each shelf that are able to connect directly to the ac power network, each current-carrying conductor of one unit is measured while the other units are connected to a second (or more) LISN(s). All units shall be separately measured. If a power strip is provided by the manufacturer, to supply all of the units making up the EUT, only the conductors in the power cord of the power strip shall be measured.

If the EUT uses a detachable antenna, these measurements shall be made with a suitable dummy load connected to the antenna output terminals; otherwise, the tests shall be made with the antenna connected and, if adjustable, fully extended. When measuring the ac conducted emissions from a device that operates between 150 kHz and 30 MHz a

non-detachable antenna may be replaced with a dummy load for the measurements within the fundamental emission band of the transmitter, but only for those measurements.36 Record the six highest EUT emissions relative to the limit of each of the current-carrying conductors of the power cords of the equipment that comprises the EUT over the frequency range specified by the procuring or regulatory agency. Diagram or photograph the test setup that was used. See Clause 8 for full reporting requirements.

Test Condition:

Voltage（V）	Frequency（Hz）
120	60

Measurement Result and limit:

(Quasi-peak-average Limit)

Frequency range (MHz)	Quasi-peak Limit (dBμV)	Average Limit (dBμV)	Result (dBμV) With charger BT	Conclusion
0.15 to 0.5	66 to 56	56 to 46	Fig.91	P
0.5 to 5	56	46		
5 to 30	60	50		
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.				

Conclusion: Pass

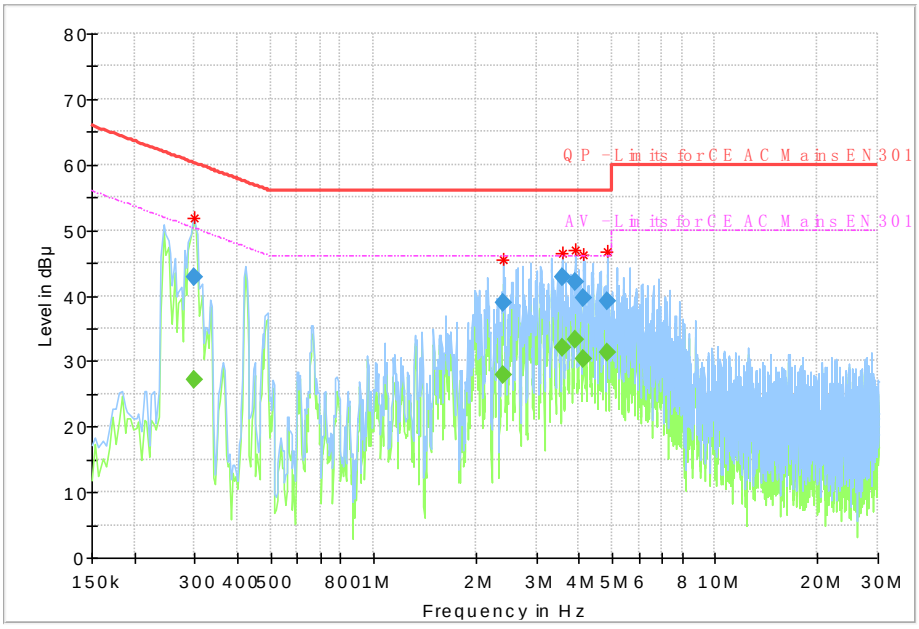


Fig.91 AC Powerline Conducted Emission

Frequency (MHz)	QuasiPeak (dB µ V)	Average (dB µ V)	Limit (dB µ	Margin (dB)	Meas. Time	Bandwidth (kHz)	Line	Filter	Corr. (dB)

0.299250	42.71	---	60.26	17.55	1000.0	9.000	N	ON	9.7
0.299250	---	27.09	50.26	23.18	1000.0	9.000	N	ON	9.7
2.399944	38.90	---	56.00	17.10	1000.0	9.000	L1	ON	9.7
2.399944	---	27.86	46.00	18.14	1000.0	9.000	L1	ON	9.7
3.564094	42.70	---	56.00	13.30	1000.0	9.000	L1	ON	9.7
3.564094	---	32.13	46.00	13.87	1000.0	9.000	L1	ON	9.7
3.888713	42.19	---	56.00	13.81	1000.0	9.000	L1	ON	9.7
3.888713	---	33.24	46.00	12.76	1000.0	9.000	L1	ON	9.7
4.131244	39.74	---	56.00	16.26	1000.0	9.000	L1	ON	9.7
4.131244	---	30.35	46.00	15.65	1000.0	9.000	L1	ON	9.7
4.851375	39.21	---	56.00	16.79	1000.0	9.000	L1	ON	9.8
4.851375	---	31.22	46.00	14.78	1000.0	9.000	L1	ON	9.8

7. Test Equipment and Ancillaries Used For Tests

The test equipments and ancillaries used are as follows.

Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration date	Cal.interval
1	Vector Signal	FSQ26	101091	Rohde&Schwarz	2018-05-11	1 Year
2	DC Power Supply	ZUP60-14	LOC-220Z006	TDL-Lambda	2018-05-11	1 Year
3	Bluetooth Tester	CBT32	100785	Rohde&Schwarz	2018-05-11	1 Year

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration date	Cal.interval
1	Universal Radio Communication Tester	CMU200	123123	R&S	2018-05-11	1 Year
2	EMI Test Receiver	ESU40	100307	R&S	2018-05-11	1 Year
3	TRILOG Broadband Antenna	VULB9163	VULB9163-515	Schwarzbeck	2017-02-25	3 Year
4	Double- ridged Waveguide Antenna	ETS-3117	00135890	ETS	2017-01-11	3 Year
5	2-Line V-Network	ENV216	101380	R&S	2018-05-11	1 Year

Anechoic chamber

Fully anechoic chamber by Frankonia German.

8. Test Environment

Shielding Room1 (6.0 meters×3.0 meters×2.7 meters) did not exceed following limits along the conducted RF performance testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	> 100 dB
Ground system resistance	< 0.5

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

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. =30 %, Max. = 60 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 10 k
Ground system resistance	< 0.5

Fully-anechoic chamber1 (6.9 meters×10.9 meters×5.4 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 25 %, Max. = 75 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 10 k
Ground system resistance	< 0.5
VSWR	Between 0 and 6 dB, from 1GHz to 18GHz
Site Attenuation Deviation	Between -4 and 4 dB,30MHz to 1GHz
Uniformity of field strength	Between 0 and 6 dB, from 80MHz to 3000 MHz

ANNEX A. Deviations from Prescribed Test Methods

No deviation from Prescribed Test Methods.

ANNEX B. Accreditation Certificate

Accredited Laboratory

A2LA has accredited

EAST CHINA INSTITUTE OF TELECOMMUNICATIONS

Shanghai, People's Republic of China

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 15th day of March 2017.

President and CEO
For the Accreditation Council
Certificate Number 3682.01
Valid to February 28, 2019

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

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