FCC PART 15C
TEST REPORT

No. I23Z61098-IOT01

for

TCL Communication Ltd.

LTE/WCDMA/GSM mobile phone

Model Name: T312A,T312E

FCC ID: 2ACCJB211

with

Hardware Version: T300_MB_V1.01

Software Version: T312A_1SIM_V1.0_20230826_UNLOCK/

T312E_2SIM_V1.0_20230906_UNLOCK

Issued Date: 2023-9-15

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.

Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

No.52, HuayuanNorth Road, Haidian District, Beijing, P. R. China 100191.

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I23Z61098-IOT01	Rev.0	1st edition	2023-9-15

Note: the latest revision of the test report supersedes all previous version.

CONTENTS

1. Test Laboratory

1.1. Introduction &Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2017 accredited test laboratory under American Association for Laboratory Accreditation (A2LA) with lab code 7049.01, and is also an FCC accredited test laboratory (CN1349), and ISED accredited test laboratory (CAB identifier:CN0066). The detail accreditation scope can be found on A2LA website

1.2. Testing Location

Conducted testing Location: CTTL(huayuan North Road)

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

Radiated testing Location: CTTL(huayuan North Road)

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

1.3. Testing Environment

Normal Temperature:	20-27℃
Relative Humidity:	20-50%

1.4. Project data

Testing Start Date:	2023-8-28
Testing End Date:	2023-9-13

1.5. Signature

武乐

Wu Le

(Prepared this test report)

孙震宇

Sun Zhenyu

(Reviewed this test report)

胡晓宇

Hu Xiaoyu

(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name:	TCL Communication Ltd.
Address /Post:	5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong
City:	Hong Kong
Postal Code:	/
Country:	China
Telephone:	+86 755 3661 1621
Fax:	+86 755 3661 2000-81722

2.2. Manufacturer Information

Company Name:	TCL Communication Ltd.
Address /Post:	5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong
City:	Hong Kong
Postal Code:	/
Country:	China
Telephone:	+86 755 3661 1621
Fax:	+86 755 3661 2000-81722

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

3.1. About EUT

Description	LTE/WCDMA/GSM mobile phone
Model Name	T312A,T312E
FCC ID	2ACCJB211
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
Antenna gain	0.8dBi

3.2. Internal Identification of EUT

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt
EUT1 (T312A)	353032630001788	T300_MB_V1.01	T312A_1SIM_V1.0_20230826_UNLOCK	2023-8-30
EUT2 (T312A)	353032630001734	T300_MB_V1.01	T312A_1SIM_V1.0_20230826_UNLOCK	2023-8-28

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

3.3. Internal Identification of AE

AE ID*	Description	Model	Manufacture
AE1	Battery	TLi015MA	ZhongShan Tianmao Battery CO.,Ltd.
AE2	Battery	TLi015MB	ShenzhenAerospaceElectronic Co.,Ltd
AE3	Cable	CDA0000162C1	HUIZHOU JUWEI ELECTRONICS CO.,LTD.
AE4	Cable	CDA0000162C2	Huizhou Shenghua Technology Co., Ltd.
AE5	Charger	XT-252A-5055	Shenzhen Baijunda Electronic Co.,Ltd.

*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/WCDMA/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. Samples undergoing test were selected by the Client.

4. Reference Documents

4.1. Documents supplied by applicant

EUT parameters, referring to Annex A for detailed information, is supplied by the client or manufacturer, which is the basis of testing.

4.2. Reference Documents for testing

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

Reference	Title	Version
FCC Part15	FCC CFR 47, Part 15, Subpart C: 15.205 Restricted bands of operation; 15.209 Radiated emission limits, general requirements; 15.247 Operation within the bands 902–928MHz, 2400–2483.5 MHz, and 5725–5850 MHz.	2021
ANSI C63.10	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	June,2013

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	15.247 (b)(1)	P
Frequency Band Edges- Conducted	15.247 (d)	P
Transmitter Spurious Emission - Conducted	15.247 (d)	P
Radiated Unwanted 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)(iii)	P
AC Powerline Conducted Emission	15.107, 15.207	P
Antenna Requirement	15.203	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

The T312A is a new product for this testing. The T312E is a variant product of T312A and shares the T312A results. For detail differences between two models please refer the Declaration of Changes document.

6. Test Facilities Utilized

Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Vector Signal Analyzer	FSQ26	100024	R&S	1 year	2024-03-09
2	Bluetooth Tester	CBT	101042	R&S	1 year	2024-03-08
3	Test Receiver	ESCI	100344	R&S	1 year	2024-02-21
4	LISN	ENV216	101200	R&S	1 year	2024-06-05
5	Shielding Room	S81	/	ETS-Lindgren	/	/

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Test Receiver	ESW44	103144	R&S	1 year	2023-10-25
2	EMI Antenna	VULB 9163	01222	SCHWARZBECK	1 year	2024-02-28
3	EMI Antenna	3115	6914	ETS-Lindgren	1 year	2024-04-25
4	EMI Antenna	3116	2661	ETS-Lindgren	1 year	2024-01-30
5	Bluetooth Tester	CBT	101042	R&S	1 year	2024-03-08

7. Measurement Uncertainty

7.1. Peak Output Power - Conducted

Measurement Uncertainty:

Measurement Uncertainty (k=2)	0.66dB

7.2. Frequency Band Edges - Conducted

Measurement Uncertainty:

Measurement Uncertainty (k=2)	0.66dB

7.3. Transmitter Spurious Emission - Conducted

Measurement Uncertainty:

Frequency Range	Uncertainty (k=2)
30 MHz ~ 8 GHz	1.22dB
8 GHz ~ 12.75 GHz	1.51dB
12.7GHz ~ 26 GHz	1.51dB

7.4. Transmitter Spurious Emission - Radiated

Measurement Uncertainty:

Frequency Range	Uncertainty(dBm) (k=2)
9kHz-30MHz	/
30MHz ≤ f ≤ 1GHz	4.72
1GHz ≤ f ≤18GHz	4.84
18GHz ≤ f ≤40GHz	5.12

7.5. Time of Occupancy (Dwell Time)

Measurement Uncertainty:

Measurement Uncertainty (k=2)	0.88ms

7.6. 20dB Bandwidth

Measurement Uncertainty:

Measurement Uncertainty (k=2)	61.936Hz

7.7. Carrier Frequency Separation

Measurement Uncertainty:

Measurement Uncertainty (k=2)	61.936Hz

7.8. AC Powerline Conducted Emission

Measurement Uncertainty:

Measurement Uncertainty (k=2)	3.08dB

ANNEX A: EUT parameters

Disclaimer: The antenna gain provided by the client may affect the validity of the measurement results in this report, and the client shall bear the impact and consequences arising therefrom.

ANNEX B: Detailed Test Results

B.1. Measurement Method

B.1.1. Conducted Measurements

The measurement is made according to ANSI C63.10.

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

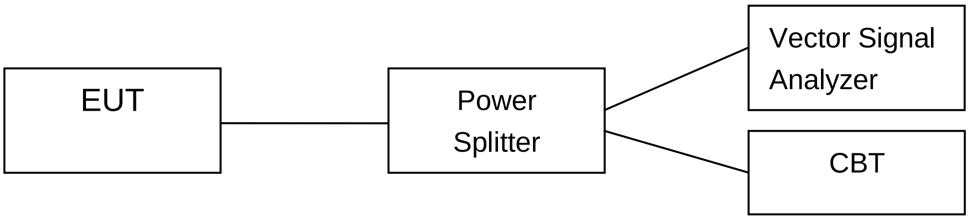
2). Set the EUT to the required work mode (Transmitter, receiver or transmitter & receiver).

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



B.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 EUT was placed on a non-conductive table with 80cm above the ground plane for measurement below 1GHz and 1.5m above the ground plane for measurement above 1GHz. The measurement antenna was placed at a distance of 3 meters from the EUT. 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 from 0° to 360°and the measurement antenna is moved from 1m to 4m to get the maximization result. The maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

B.2. Peak Output Power

B.2.1. 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	Limits	
FCC Part 15.247 (b)(1)	Bandwidth≤1MHz	30dBm (1W)
	Bandwidth>1MHz	21dBm (125mW)

Measurement Results:

For GFSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	9.09	8.69	5.71	P

For π/4 DQPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	9.86	9.24	6.27	P

For 8DPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
Peak Conducted Output Power (dBm)	9.97	9.39	6.23	P

Conclusion: PASS

B.2.2. E.I.R.P.

The radiated E.I.R.P. is listed below:

Antenna gain = 0.8dBi

For GFSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
E.I.R.P (dBm)	9.89	9.49	6.51	P

Forπ/4 DQPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
E.I.R.P (dBm)	10.66	10.04	7.07	P

For 8DPSK

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
E.I.R.P (dBm)	10.77	10.19	7.03	P

Note: E.I.R.P. are calculated with the antenna gain.

Conclusion: PASS

B.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:Auto
– 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	-58.82	P
	Hopping ON	Fig.2	-65.69	P
78	Hopping OFF	Fig.3	-61.54	P
	Hopping ON	Fig.4	-61.60	P

For π/4 DQPSK

Channel	Hopping	Band Edge Power (dBc)		Conclusion
0	Hopping OFF	Fig.5	-49.79	P
	Hopping ON	Fig.6	-57.38	P
78	Hopping OFF	Fig.7	-59.77	P
	Hopping ON	Fig.8	-59.82	P

For 8DPSK

Channel	Hopping	Band Edge Power (dBc)		Conclusion
0	Hopping OFF	Fig.9	-50.25	P
	Hopping ON	Fig.10	-55.86	P

78	Hopping OFF	Fig.11	-60.51	P
	Hopping ON	Fig.12	-63.06	P

Conclusion: PASS

Test graphs as below

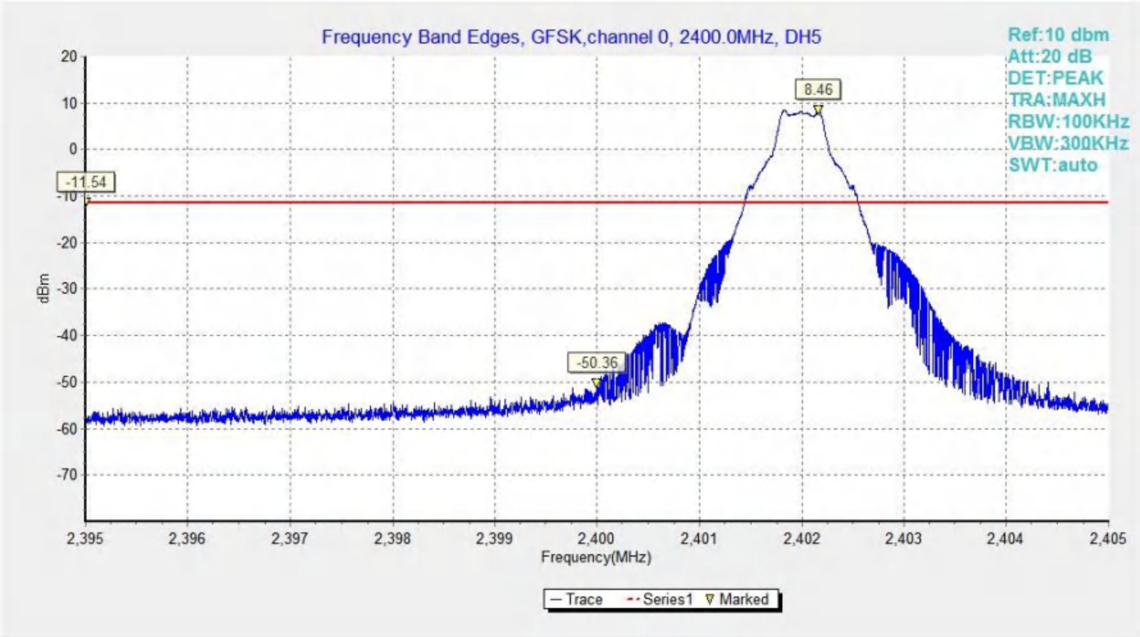


Fig.1. Frequency Band Edges: GFSK, Channel 0, Hopping Off

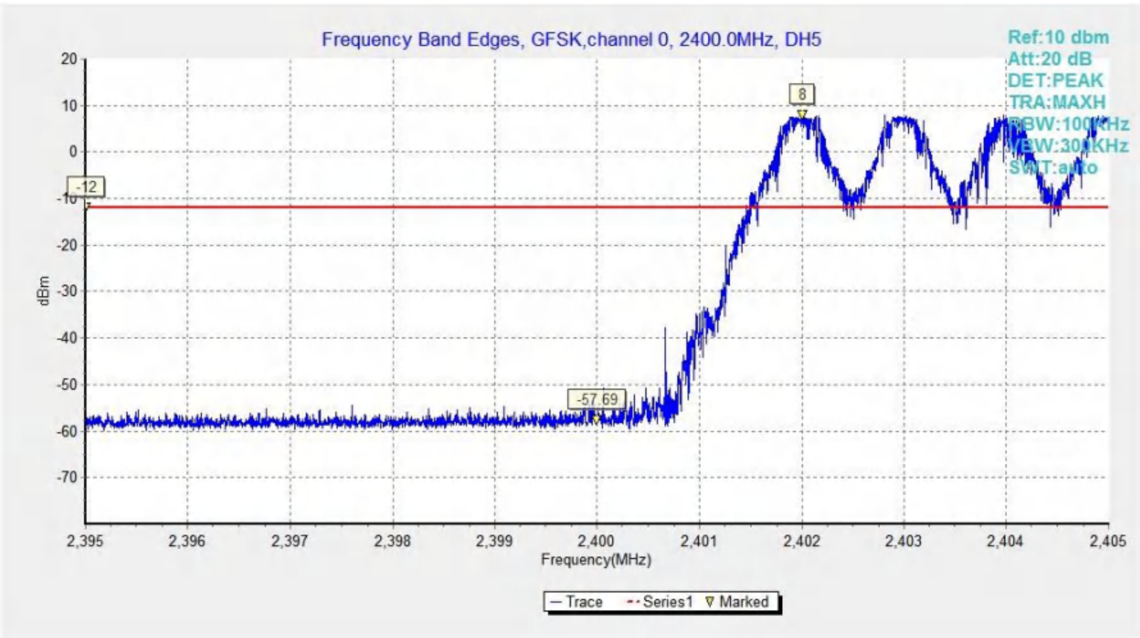


Fig.2. Frequency Band Edges: GFSK, Channel 0, Hopping On

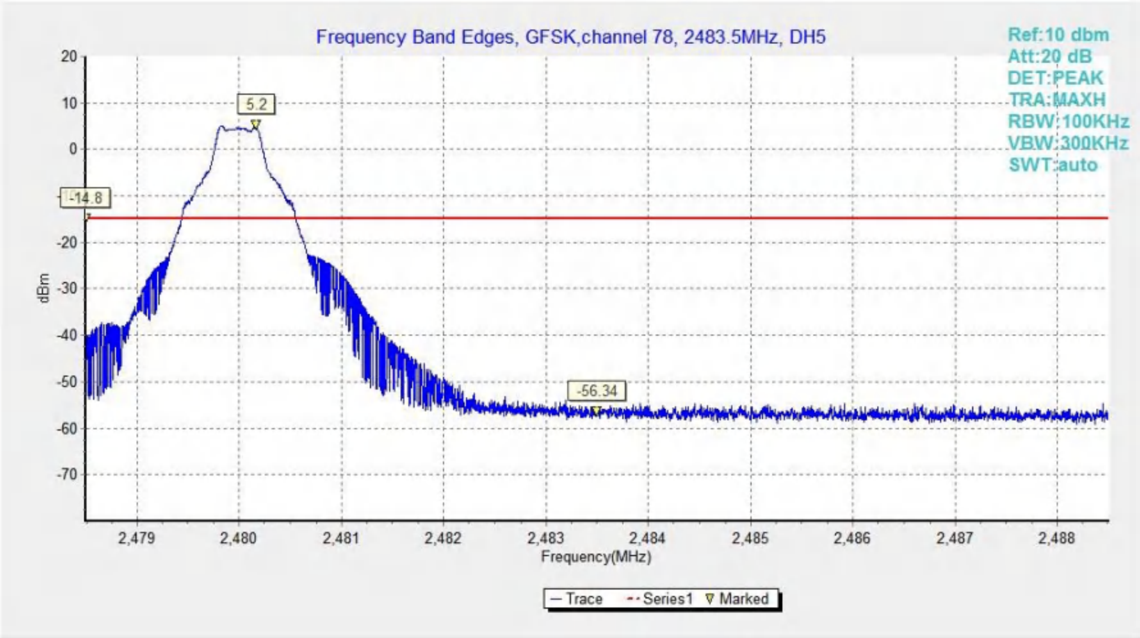


Fig.3. Frequency Band Edges: GFSK, Channel 78, Hopping Off

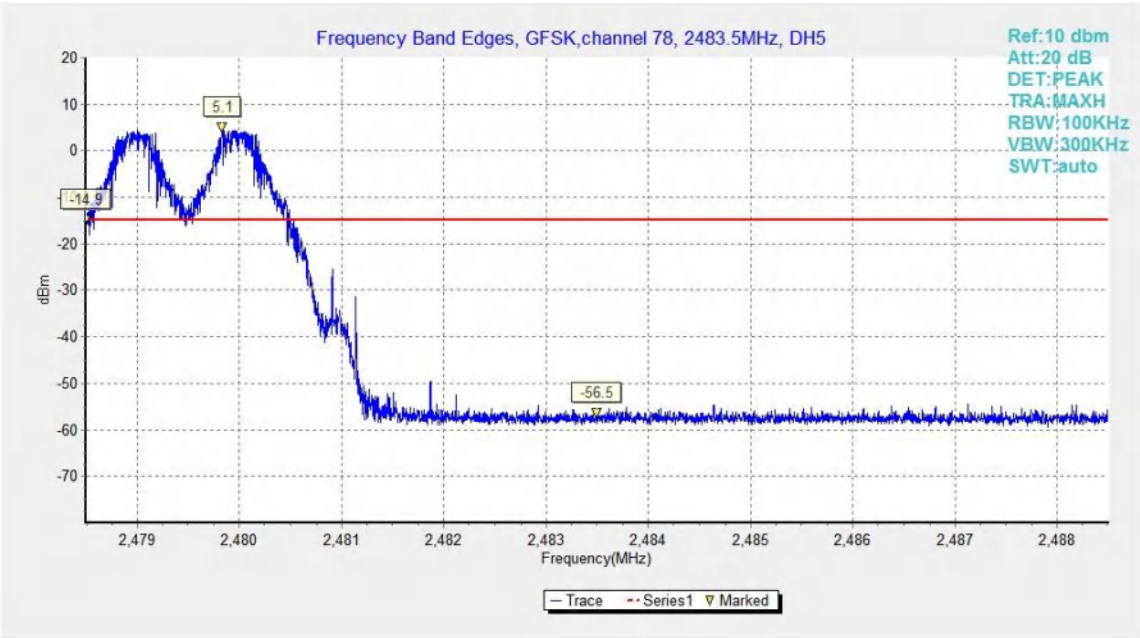


Fig.4. Frequency Band Edges: GFSK, Channel 78, Hopping On

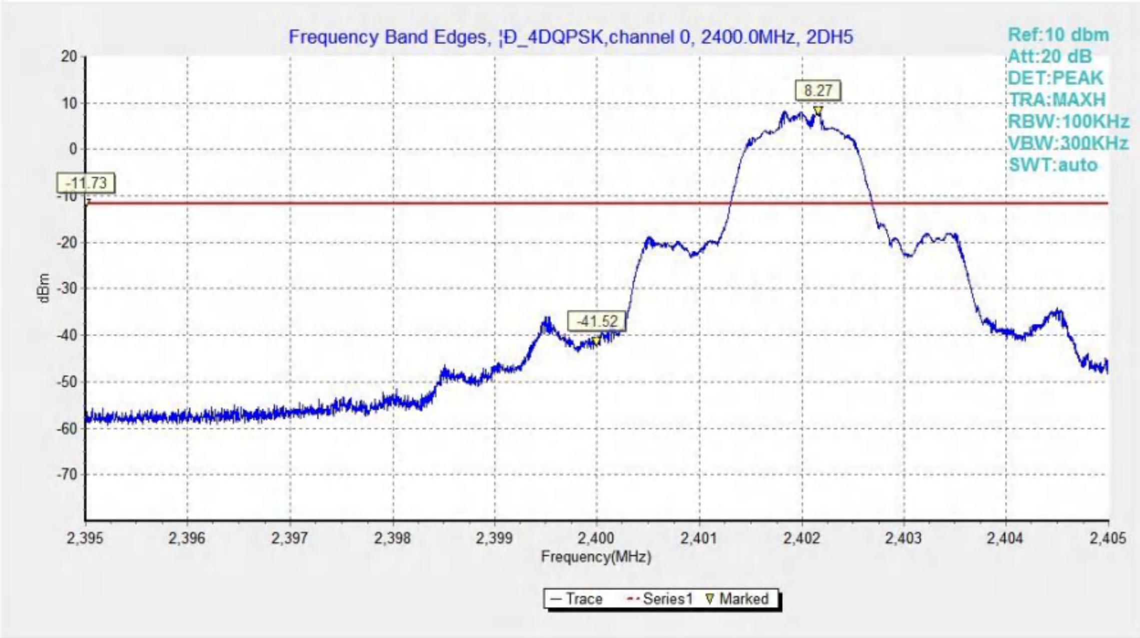


Fig.5. Frequency Band Edges: π/4 DQPSK, Channel 0, Hopping Off

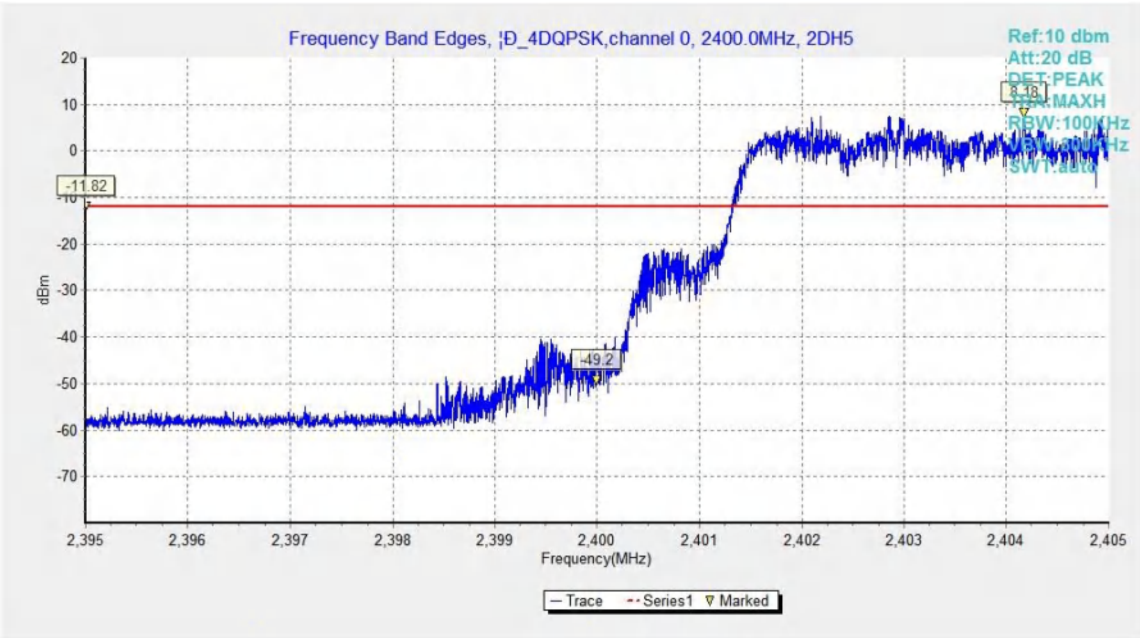


Fig.6. Frequency Band Edges: π/4 DQPSK, Channel 0, Hopping On

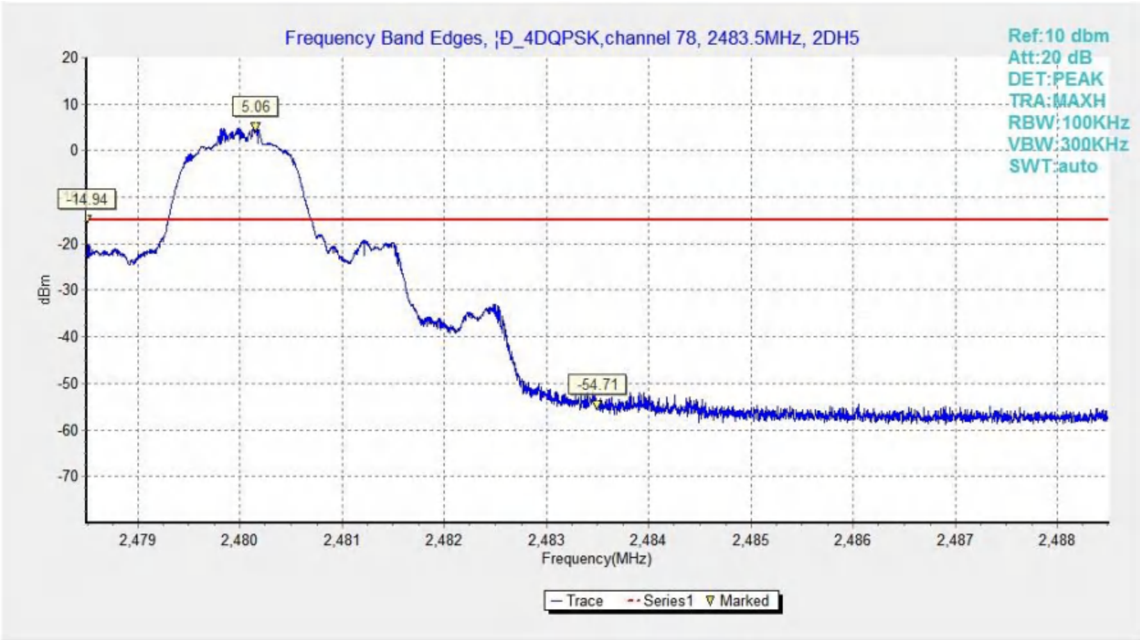


Fig.7. Frequency Band Edges: π/4 DQPSK, Channel 78, Hopping Off

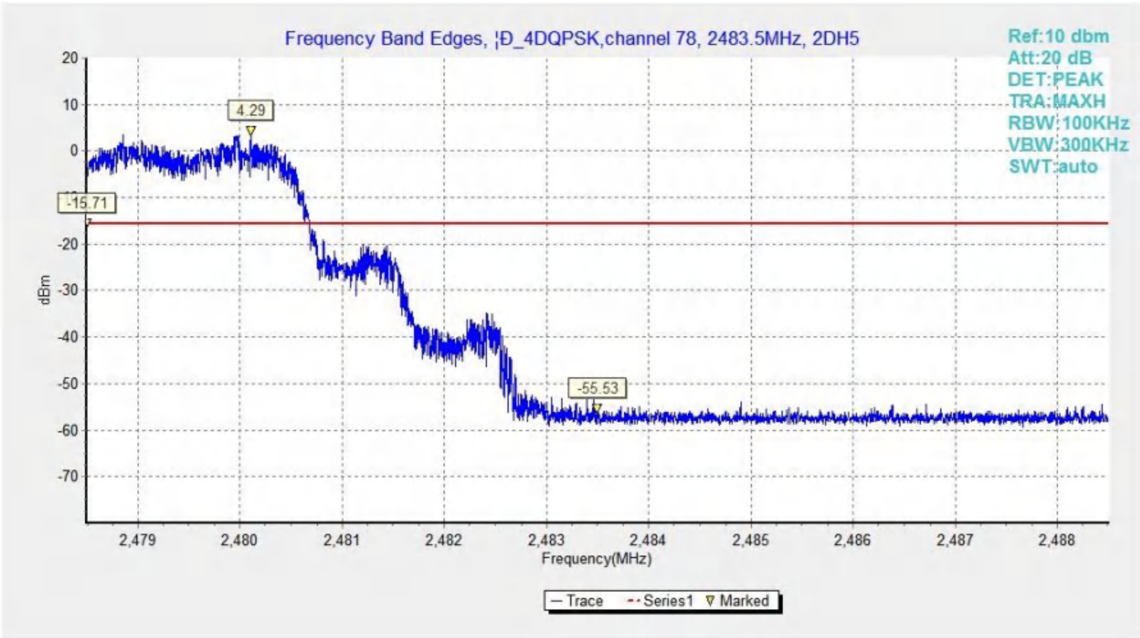


Fig.8. Frequency Band Edges: π/4 DQPSK, Channel 78, Hopping On

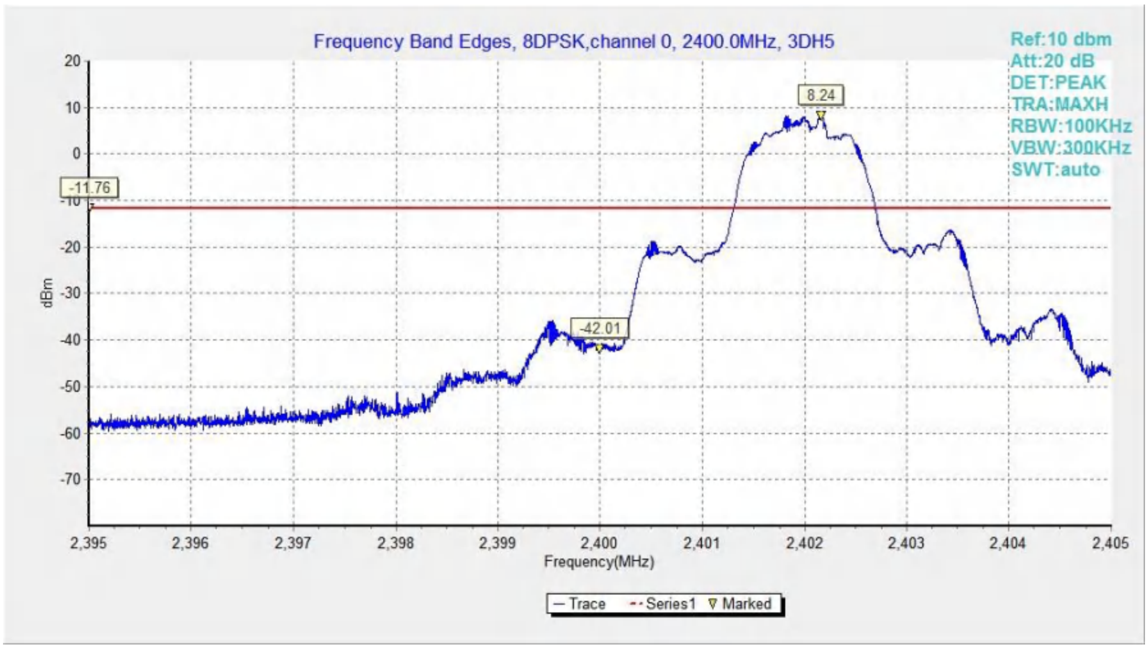


Fig.9. Frequency Band Edges: 8DPSK, Channel 0, Hopping Off

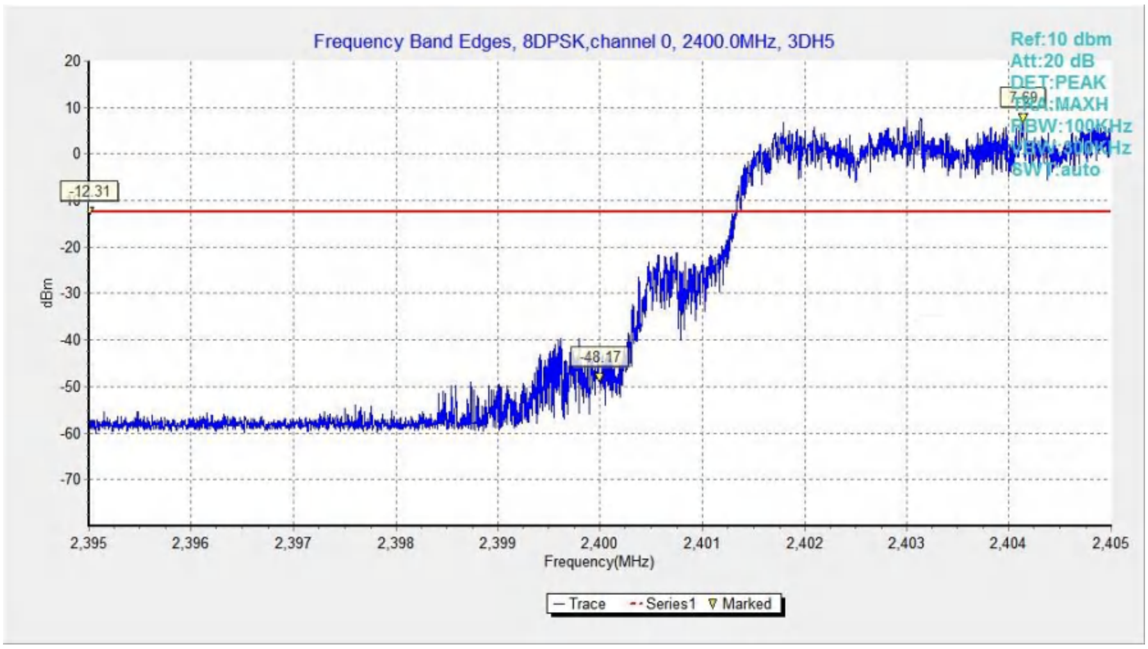


Fig.10. Frequency Band Edges: 8DPSK, Channel 0, Hopping On

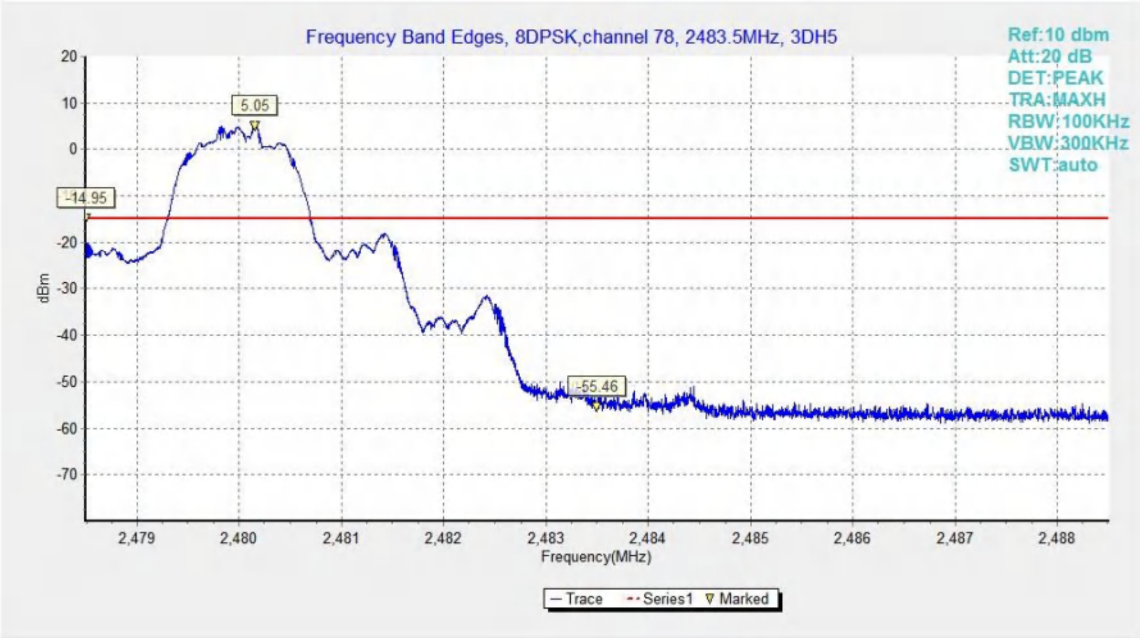


Fig.11. Frequency Band Edges: 8DPSK, Channel 78, Hopping Off

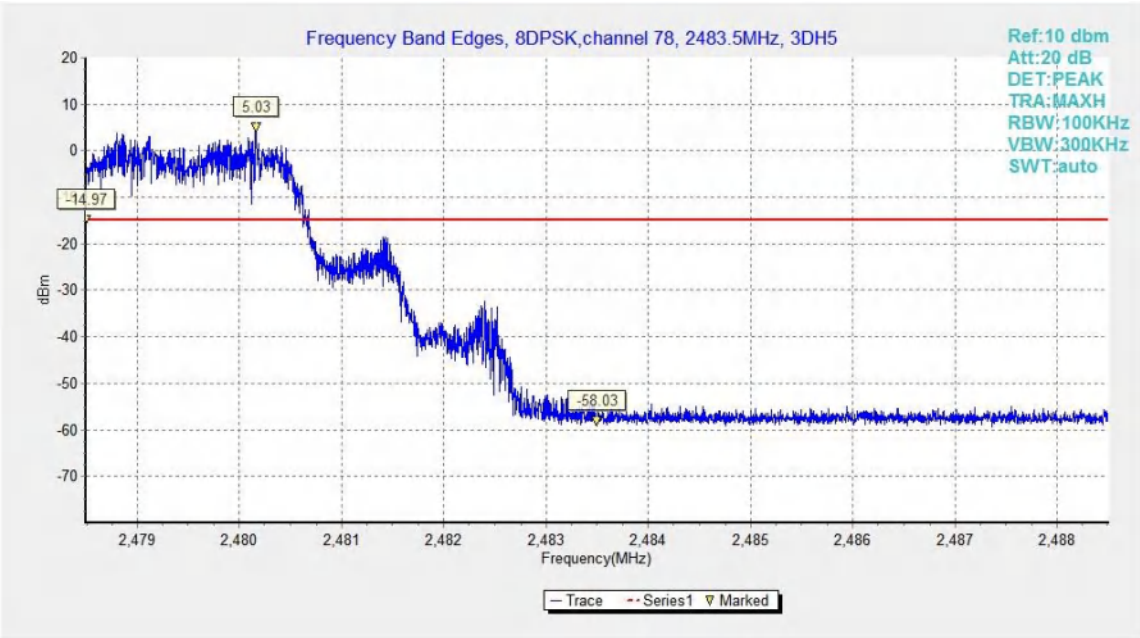


Fig.12. Frequency Band Edges: 8DPSK, Channel 78, Hopping On

B.4. Transmitter Spurious Emission - Conducted

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 π/4 DQPSK

Channel	Frequency Range	Test Results	Conclusion
Ch 0 2402 MHz	Center Frequency	Fig.28	P
	30 MHz ~ 1 GHz	Fig.29	P
	1 GHz ~ 3 GHz	Fig.30	P
	3 GHz ~ 10 GHz	Fig.31	P
	10 GHz ~ 26 GHz	Fig.32	P
Ch 39 2441 MHz	Center Frequency	Fig.33	P
	30 MHz ~ 1 GHz	Fig.34	P
	1 GHz ~ 3 GHz	Fig.35	P
	3 GHz ~ 10 GHz	Fig.36	P
	10 GHz ~ 26 GHz	Fig.37	P
Ch 78 2480 MHz	Center Frequency	Fig.38	P
	30 MHz ~ 1 GHz	Fig.39	P
	1 GHz ~ 3 GHz	Fig.40	P
	3 GHz ~ 10 GHz	Fig.41	P
	10 GHz ~ 26 GHz	Fig.42	P

For 8DPSK

Channel	Frequency Range	Test Results	Conclusion
Ch 0 2402 MHz	Center Frequency	Fig.43	P
	30 MHz ~ 1 GHz	Fig.44	P
	1 GHz ~ 3 GHz	Fig.45	P
	3 GHz ~ 10 GHz	Fig.46	P
	10 GHz ~ 26 GHz	Fig.47	P

Ch 39 2441 MHz	Center Frequency	Fig.48	P
	30 MHz ~ 1 GHz	Fig.49	P
	1 GHz ~ 3 GHz	Fig.50	P
	3 GHz ~ 10 GHz	Fig.51	P
	10 GHz ~ 26 GHz	Fig.52	P
Ch 78 2480 MHz	Center Frequency	Fig.53	P
	30 MHz ~ 1 GHz	Fig.54	P
	1 GHz ~ 3 GHz	Fig.55	P
	3 GHz ~ 10 GHz	Fig.56	P
	10 GHz ~ 26 GHz	Fig.57	P

Conclusion: PASS

Test graphs as below

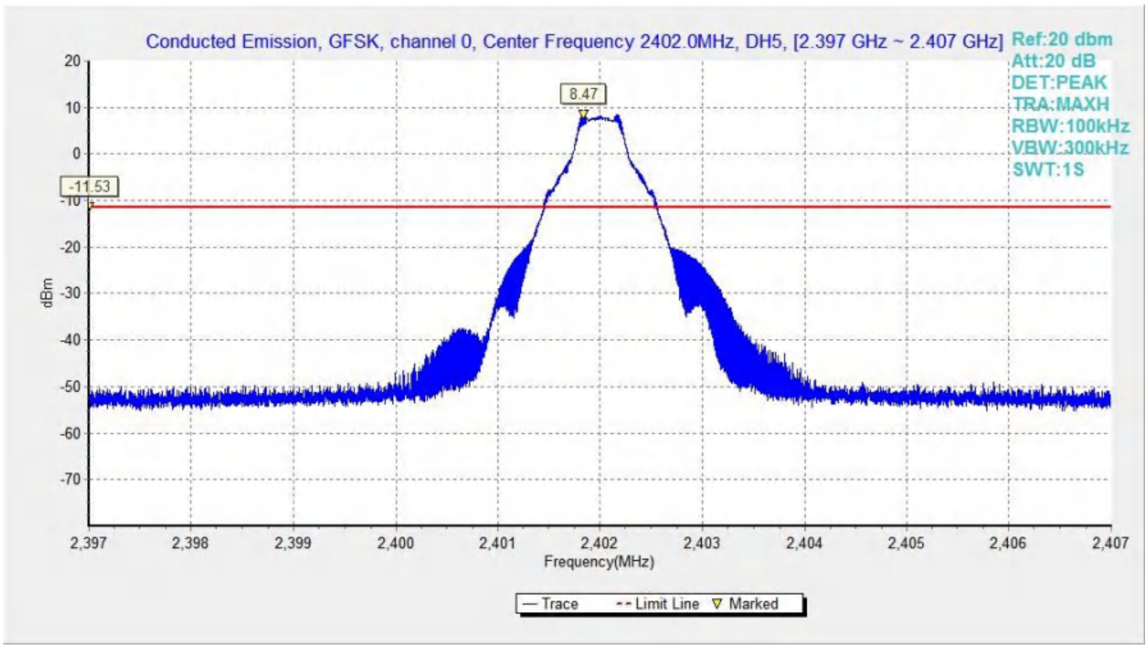


Fig.13. Conducted spurious emission: GFSK, Channel 0,2402MHz

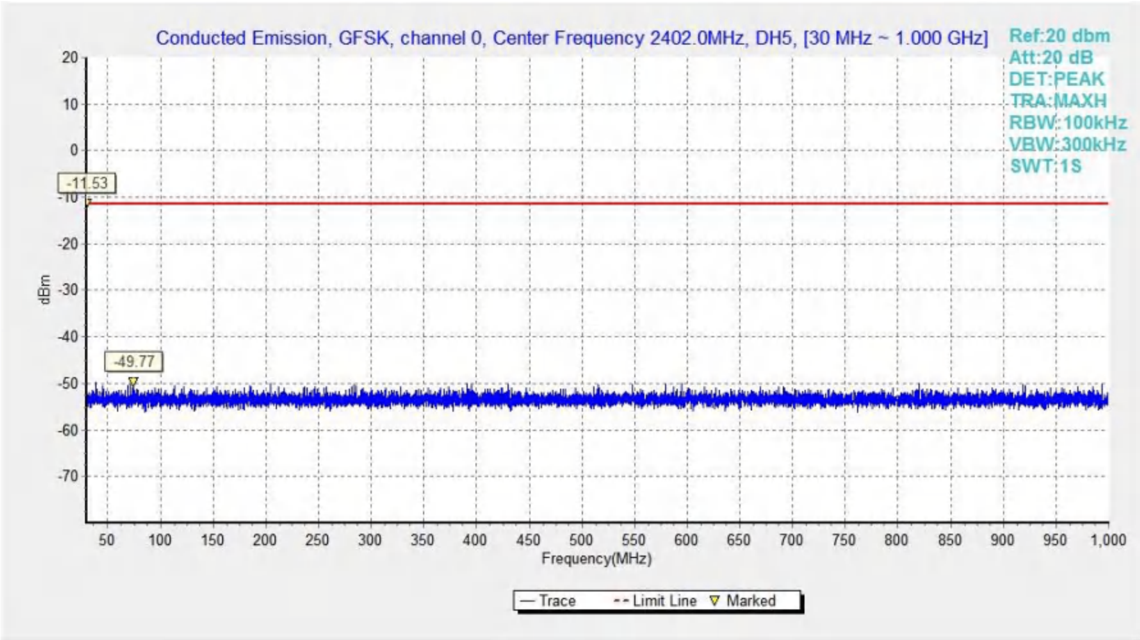


Fig.14. Conducted spurious emission: GFSK, Channel 0, 30MHz - 1GHz

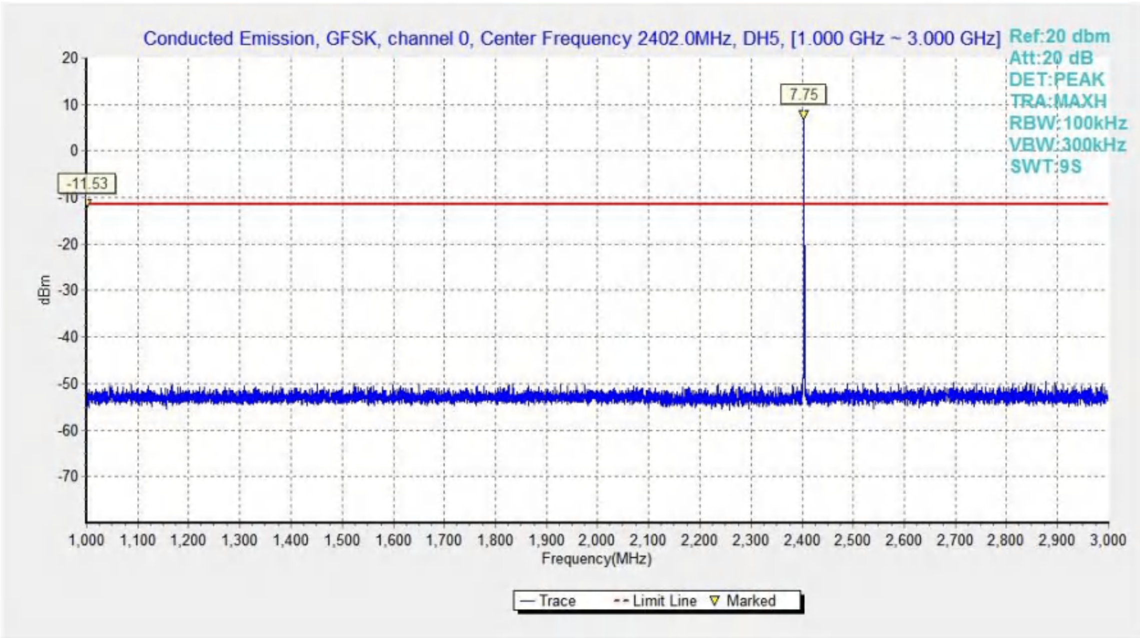


Fig.15. Conducted spurious emission: GFSK, Channel 0, 1GHz - 3GHz

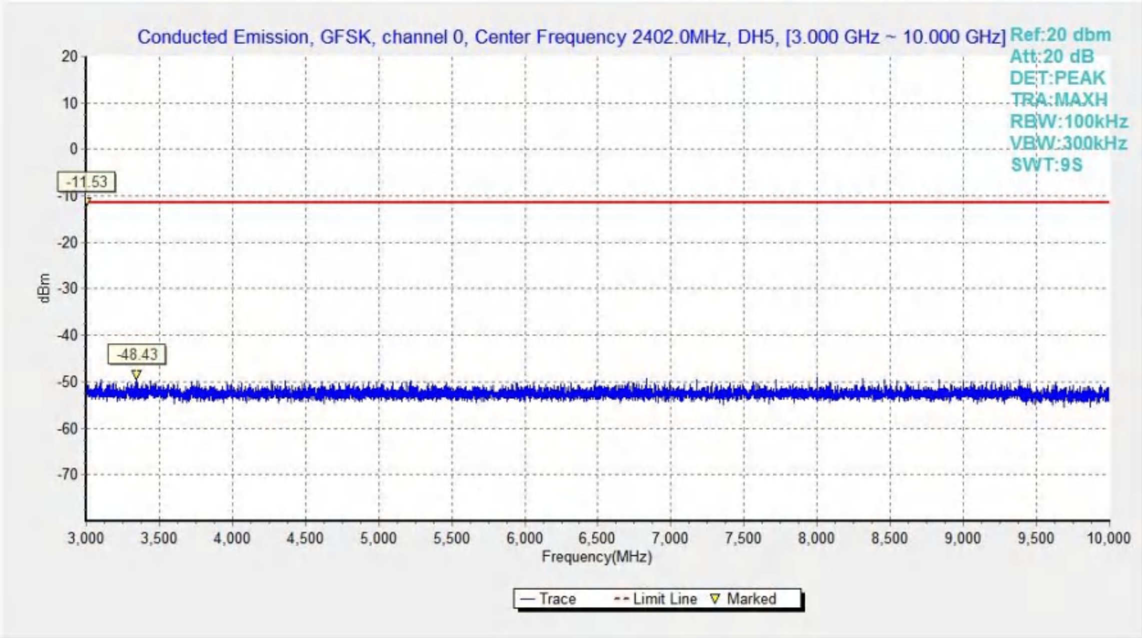


Fig.16. Conducted spurious emission: GFSK, Channel 0, 3GHz - 10GHz

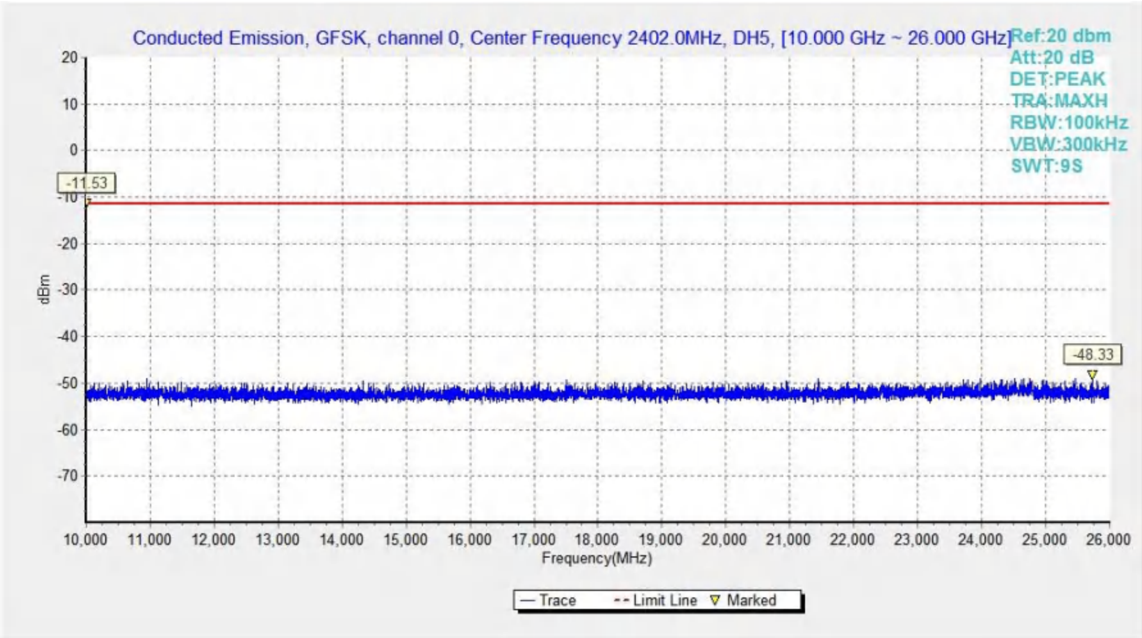


Fig.17. Conducted spurious emission: GFSK, Channel 0,10GHz - 26GHz

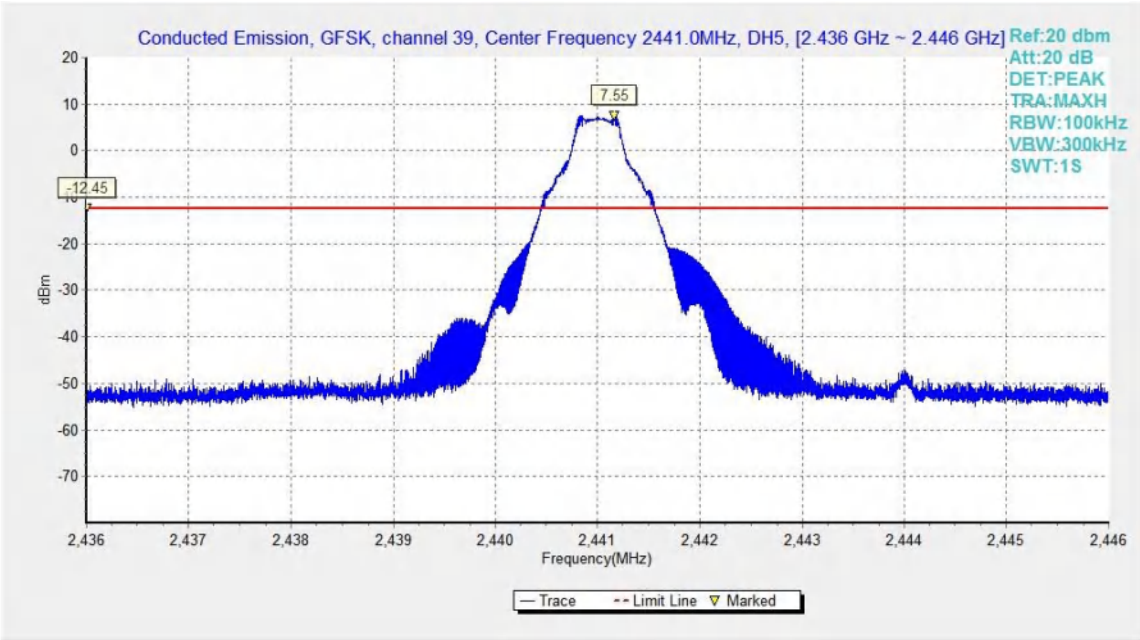


Fig.18. Conducted spurious emission: GFSK, Channel 39, 2441MHz

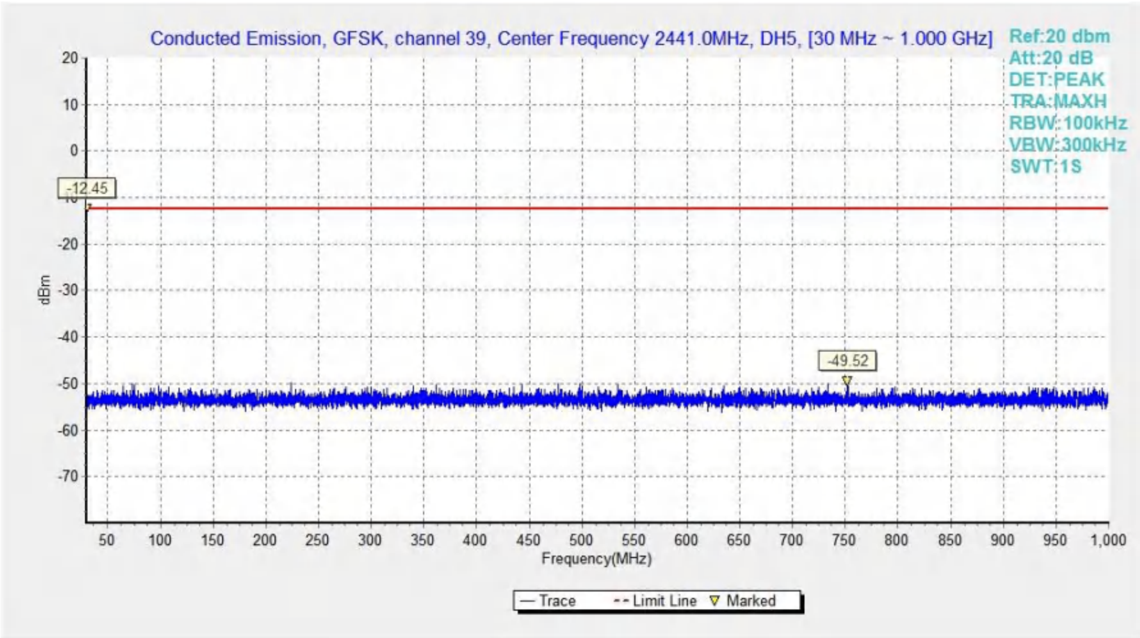


Fig.19. Conducted spurious emission: GFSK, Channel 39, 30MHz - 1GHz

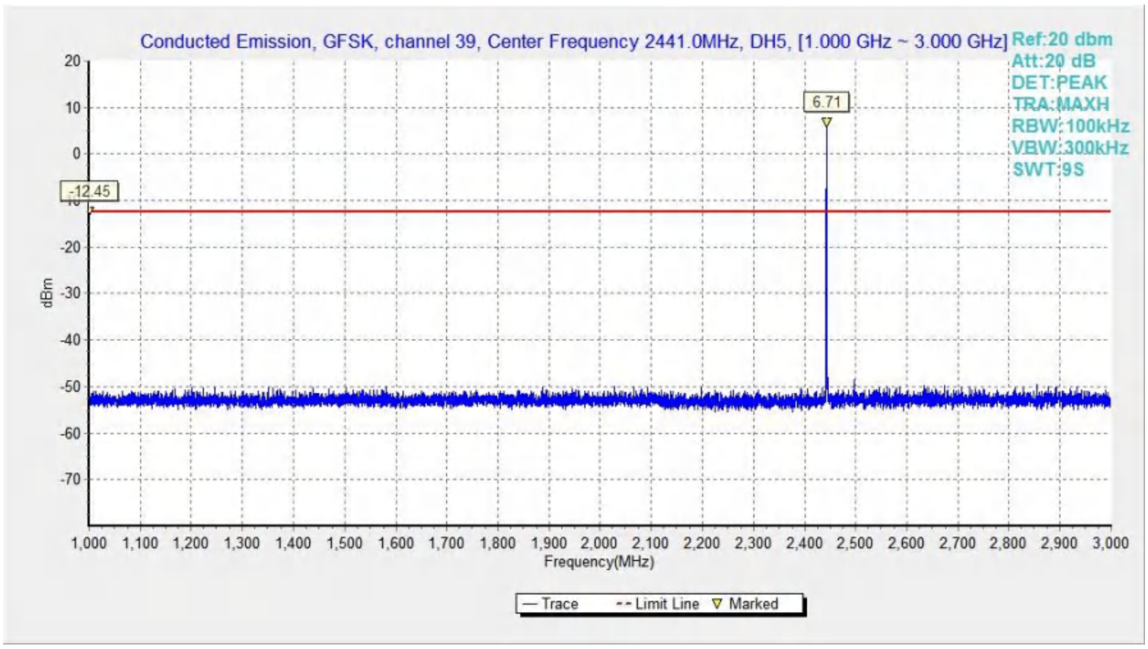


Fig.20. Conducted spurious emission: GFSK, Channel 39, 1GHz – 3GHz

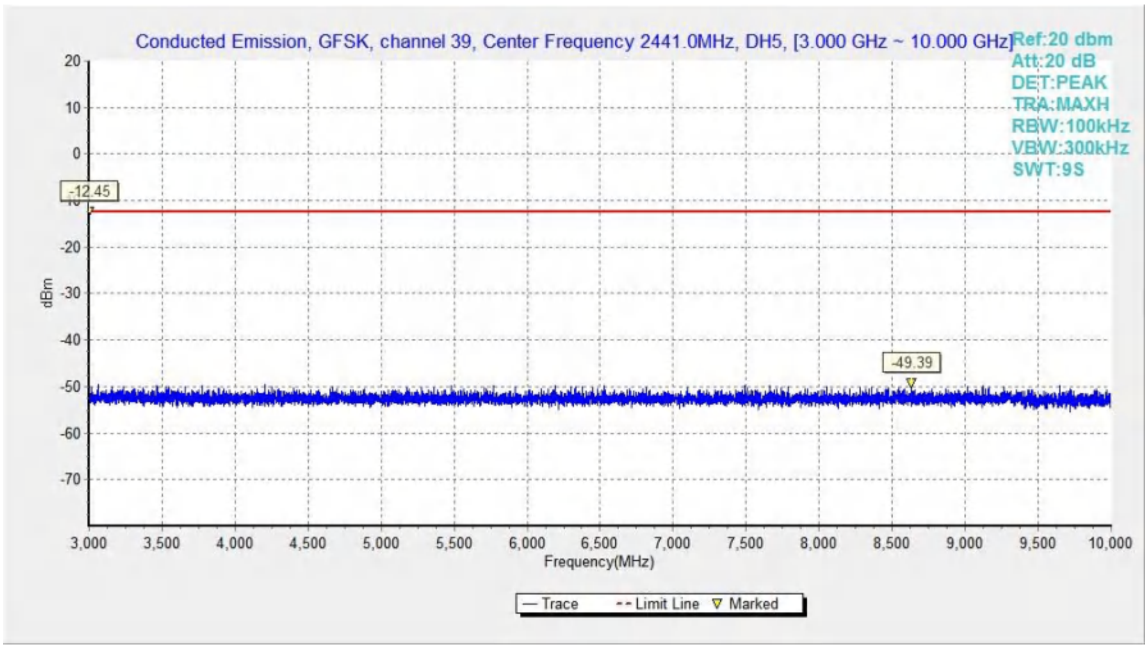


Fig.21. Conducted spurious emission: GFSK, Channel 39, 3GHz – 10GHz

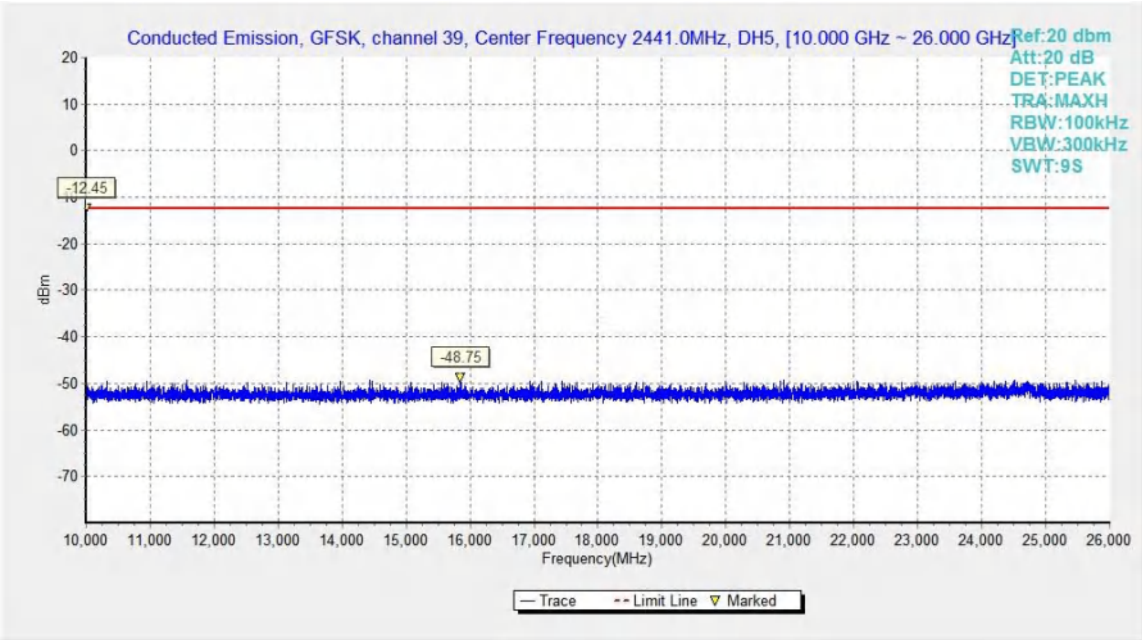


Fig.22. Conducted spurious emission: GFSK, Channel 39, 10GHz – 26GHz

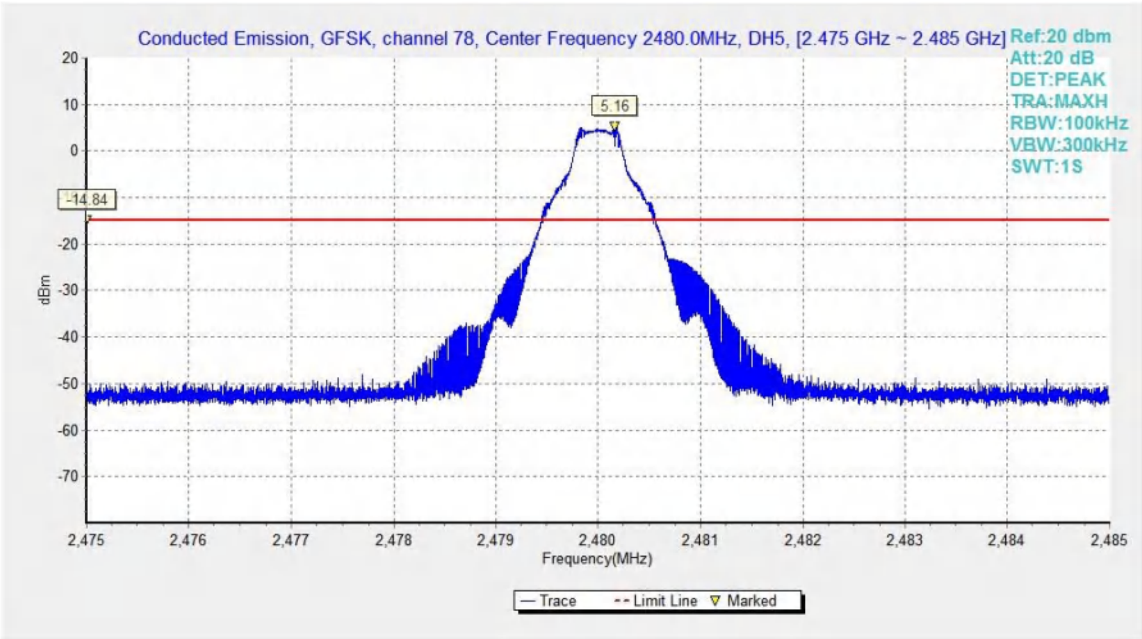


Fig.23. Conducted spurious emission: GFSK, Channel 78, 2480MHz

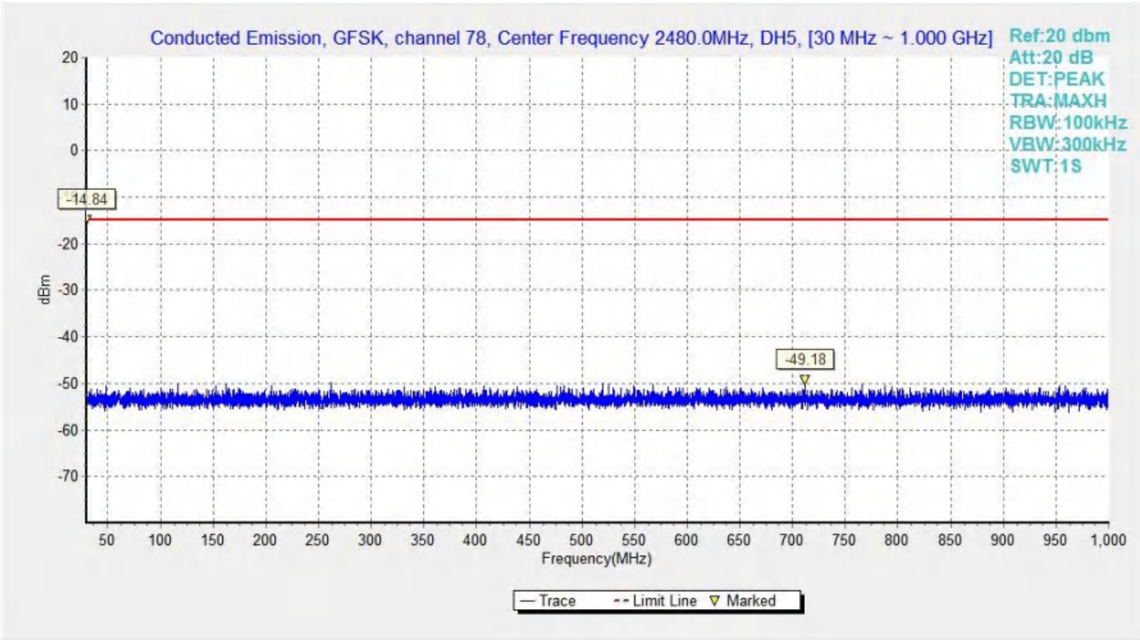


Fig.24. Conducted spurious emission: GFSK, Channel 78, 30MHz - 1GHz

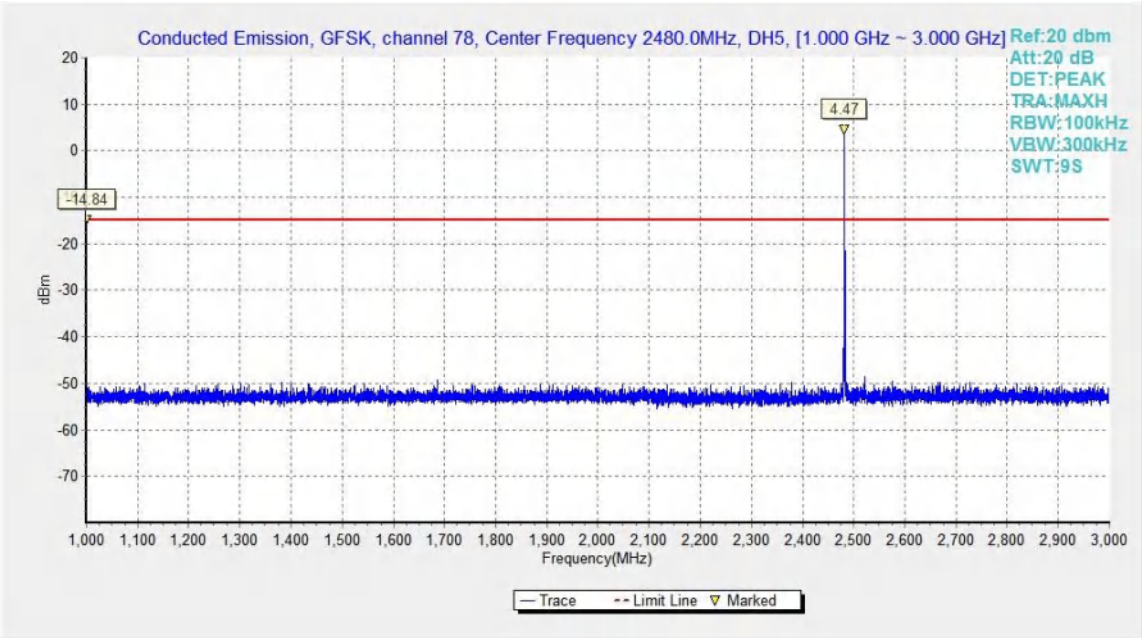


Fig.25. Conducted spurious emission: GFSK, Channel 78, 1GHz - 3GHz

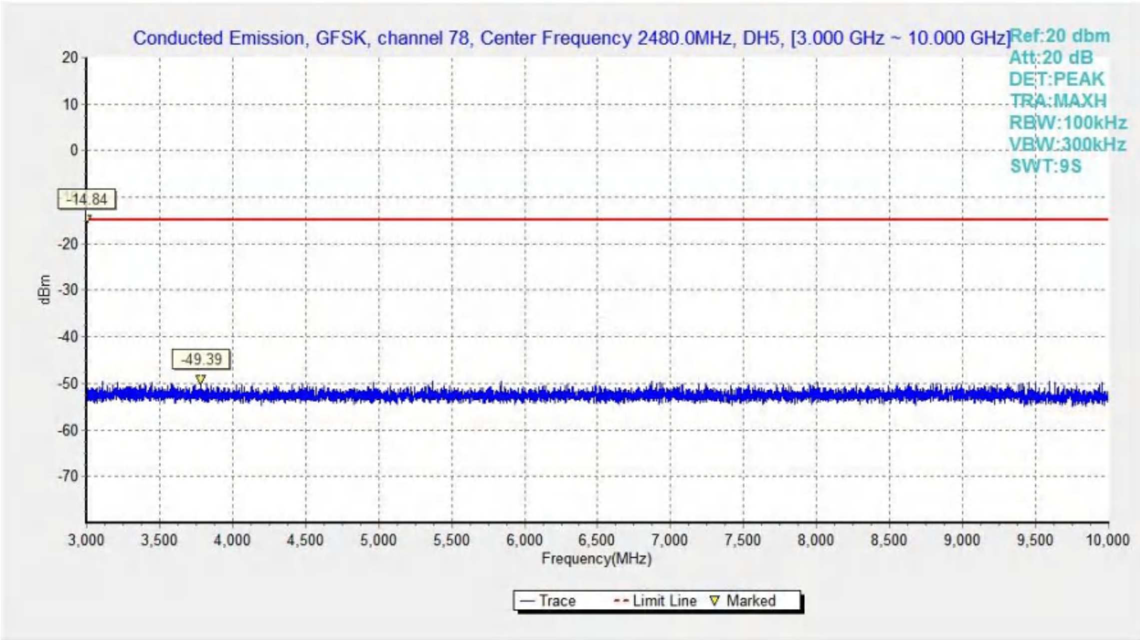


Fig.26. Conducted spurious emission: GFSK, Channel 78, 3GHz - 10GHz

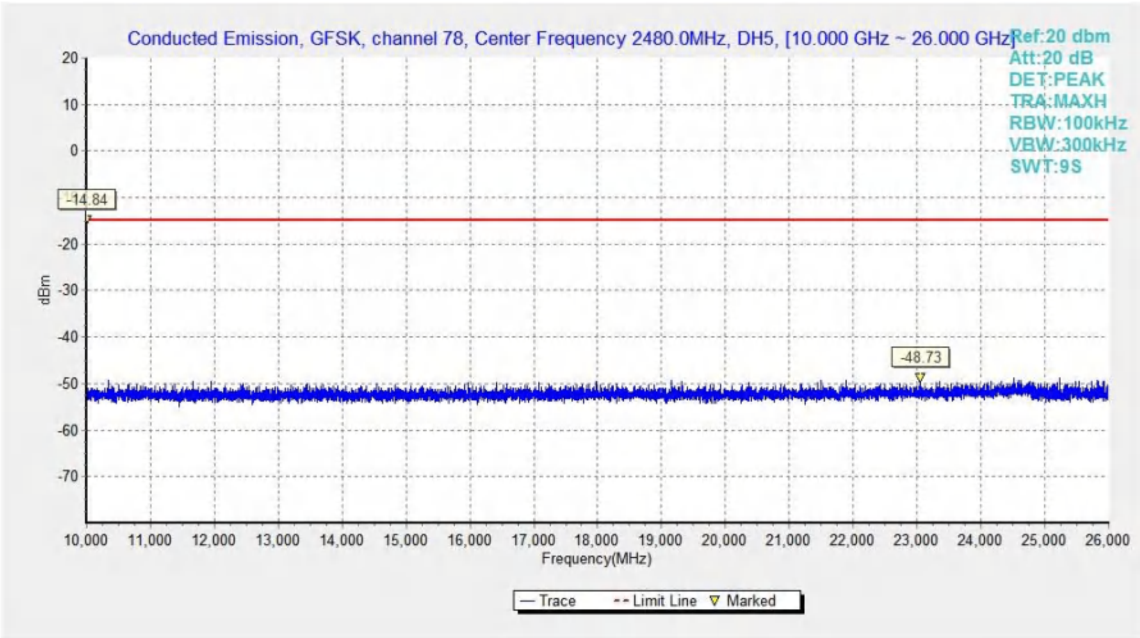


Fig.27. Conducted spurious emission: GFSK, Channel 78, 10GHz - 26GHz

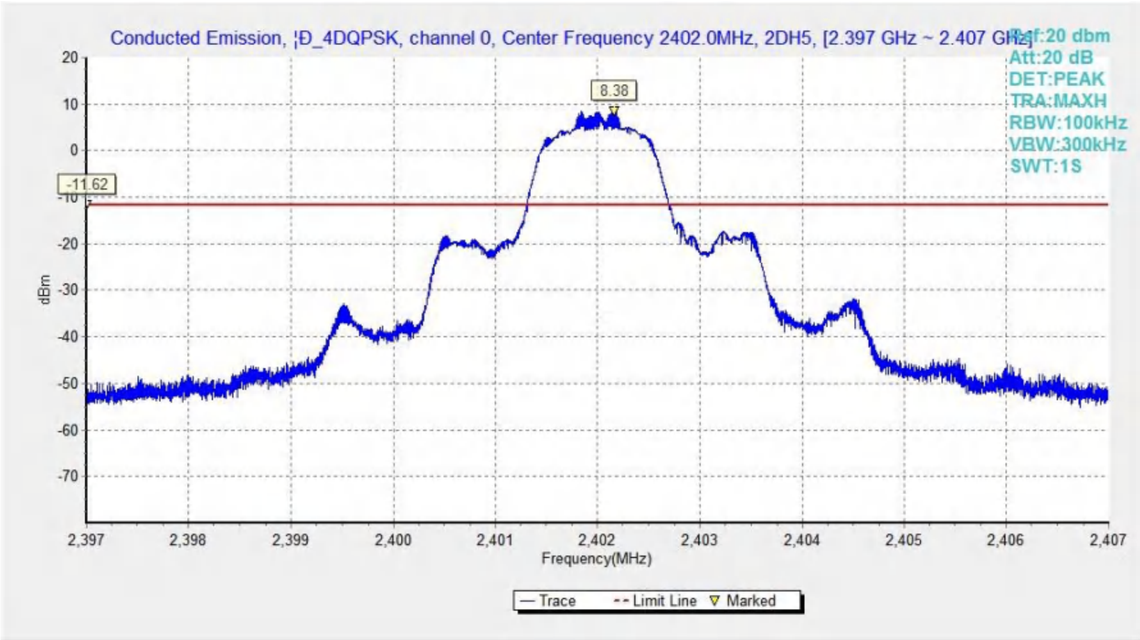


Fig.28. Conducted spurious emission: π/4 DQPSK, Channel 0,2402MHz

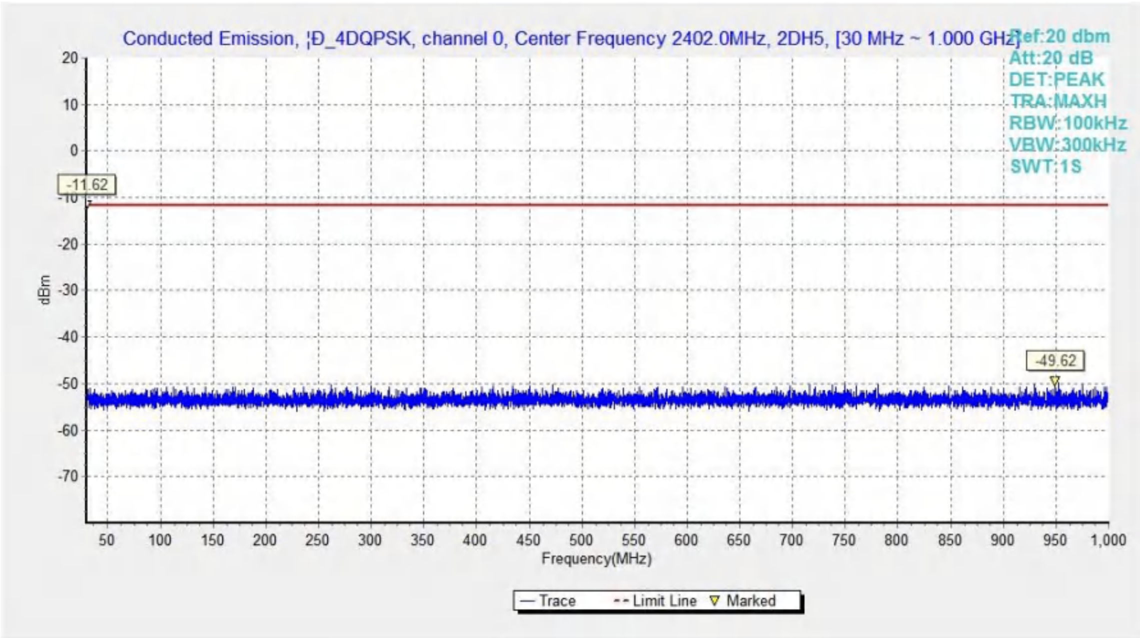


Fig.29. Conducted spurious emission: π/4 DQPSK, Channel 0, 30MHz - 1GHz

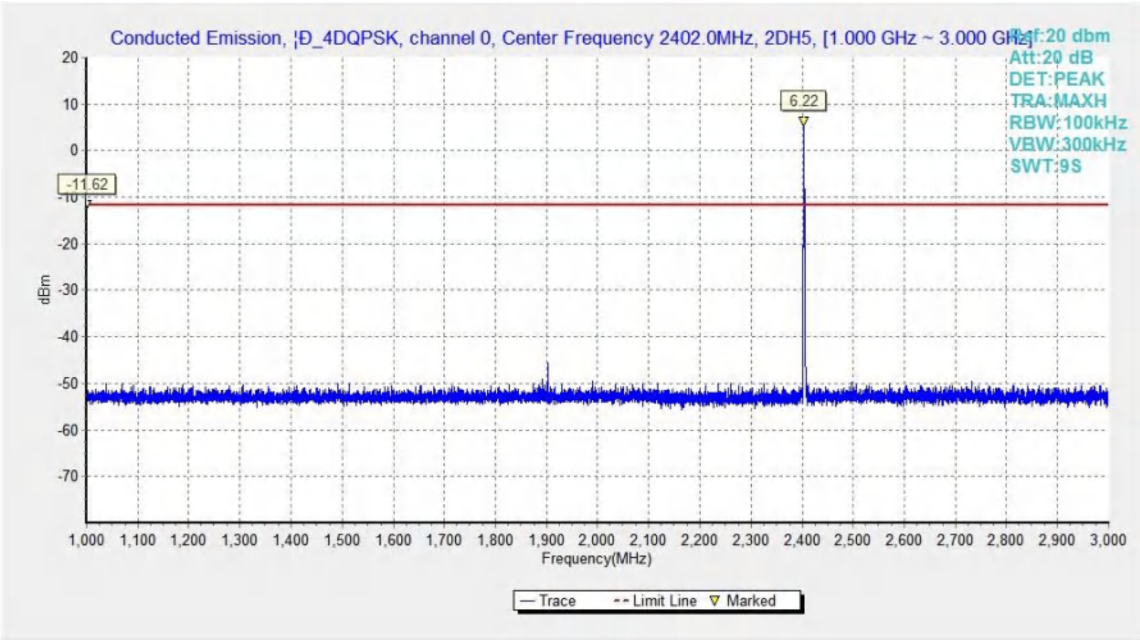


Fig.30. Conducted spurious emission: π/4 DQPSK, Channel 0, 1GHz - 3GHz

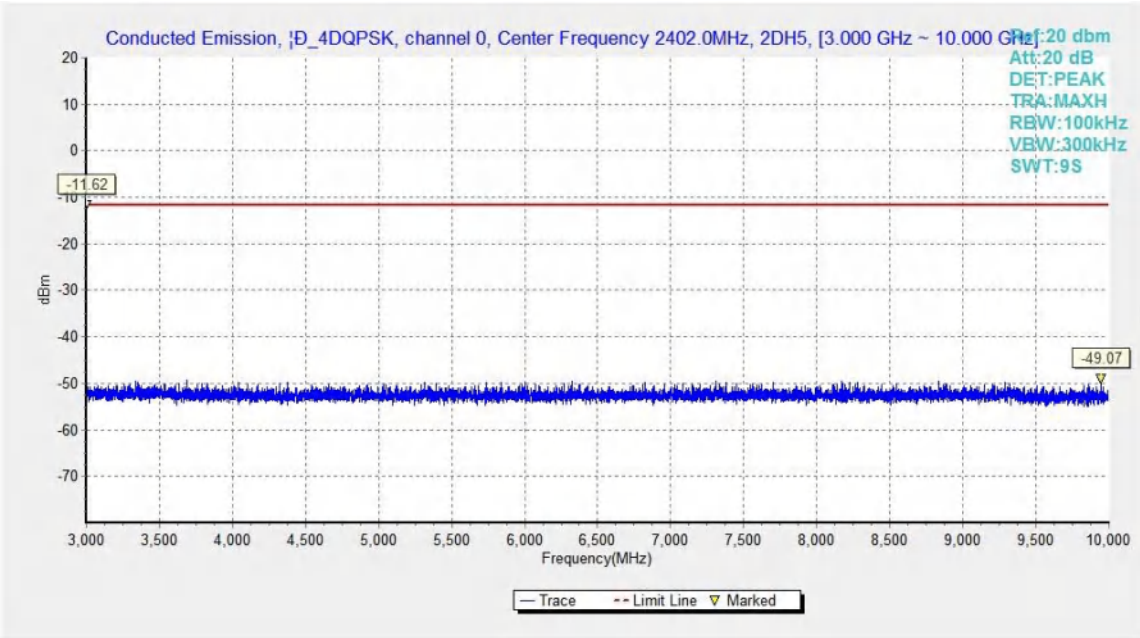


Fig.31. Conducted spurious emission: π/4 DQPSK, Channel 0, 3GHz - 10GHz

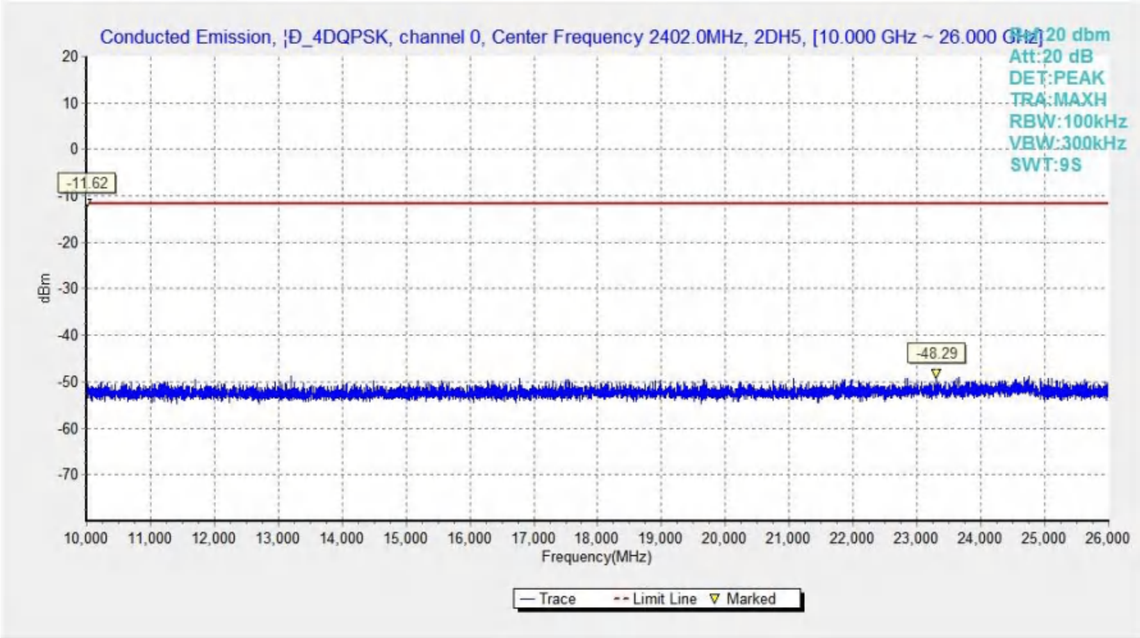


Fig.32. Conducted spurious emission: π/4 DQPSK, Channel 0,10GHz - 26GHz

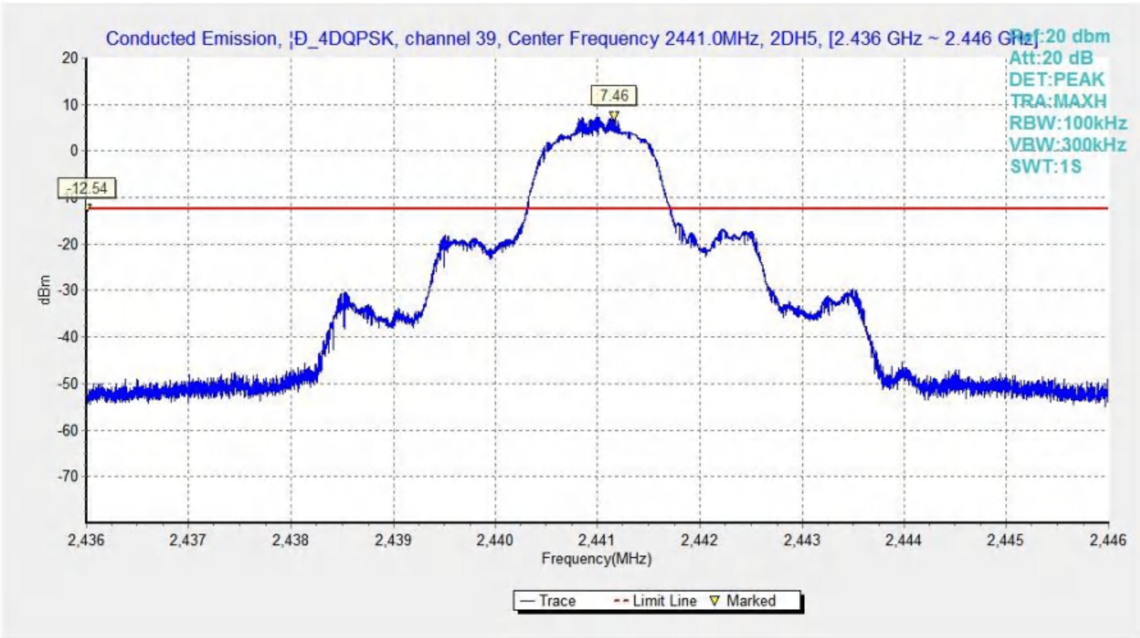


Fig.33. Conducted spurious emission: π/4 DQPSK, Channel 39, 2441MHz

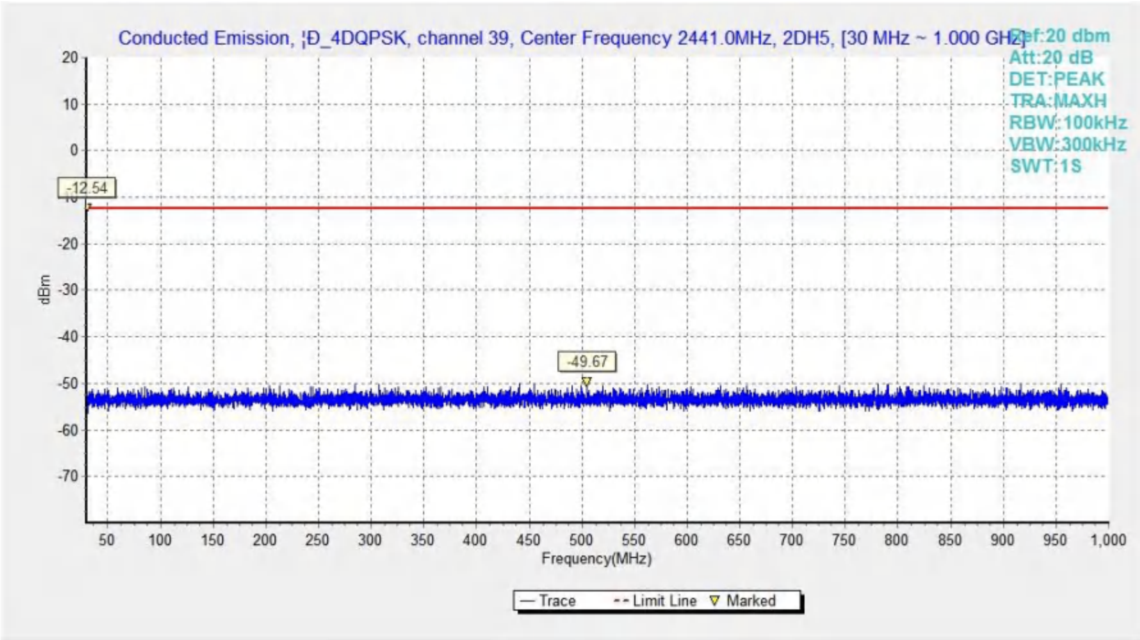


Fig.34. Conducted spurious emission: π/4 DQPSK, Channel 39, 30MHz - 1GHz

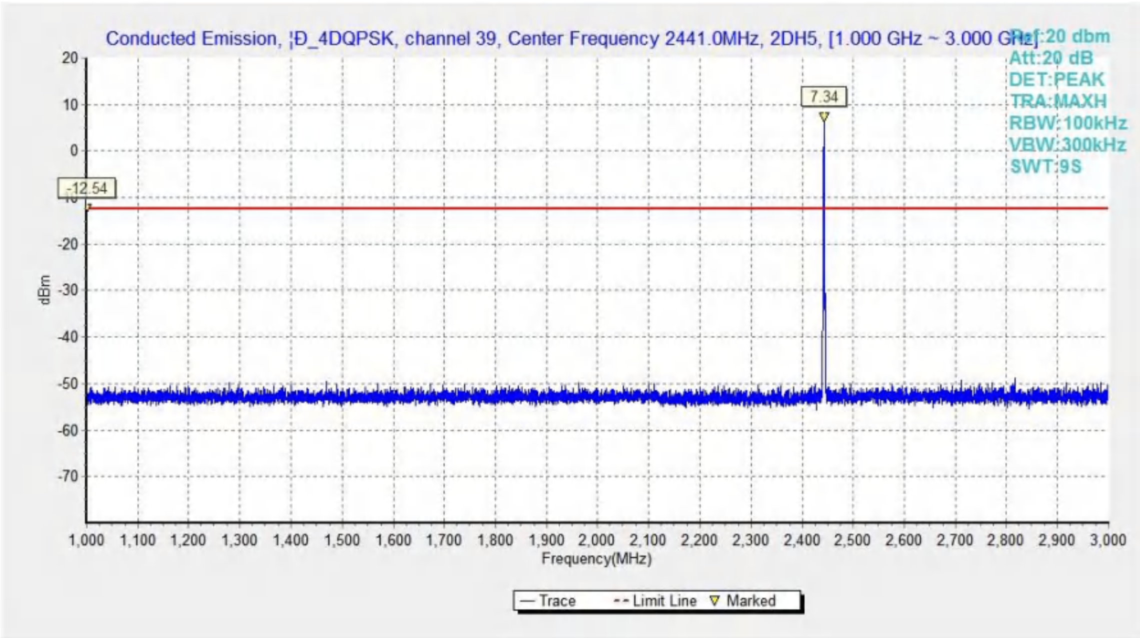


Fig.35. Conducted spurious emission: π/4 DQPSK, Channel 39, 1GHz - 3GHz

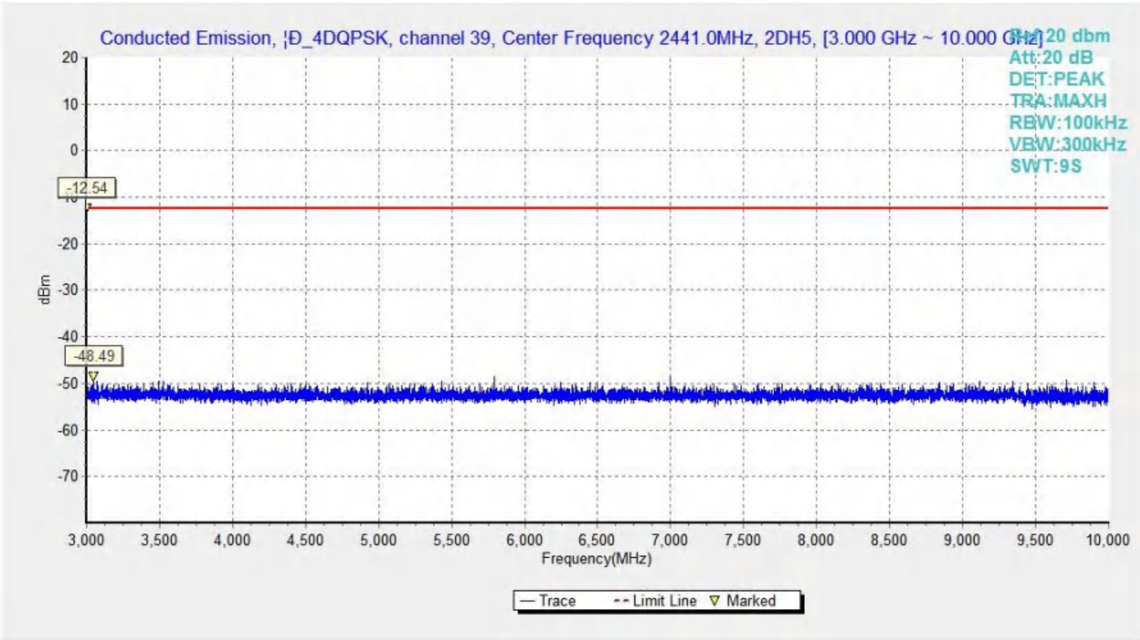


Fig.36. Conducted spurious emission: π/4 DQPSK, Channel 39, 3GHz - 10GHz

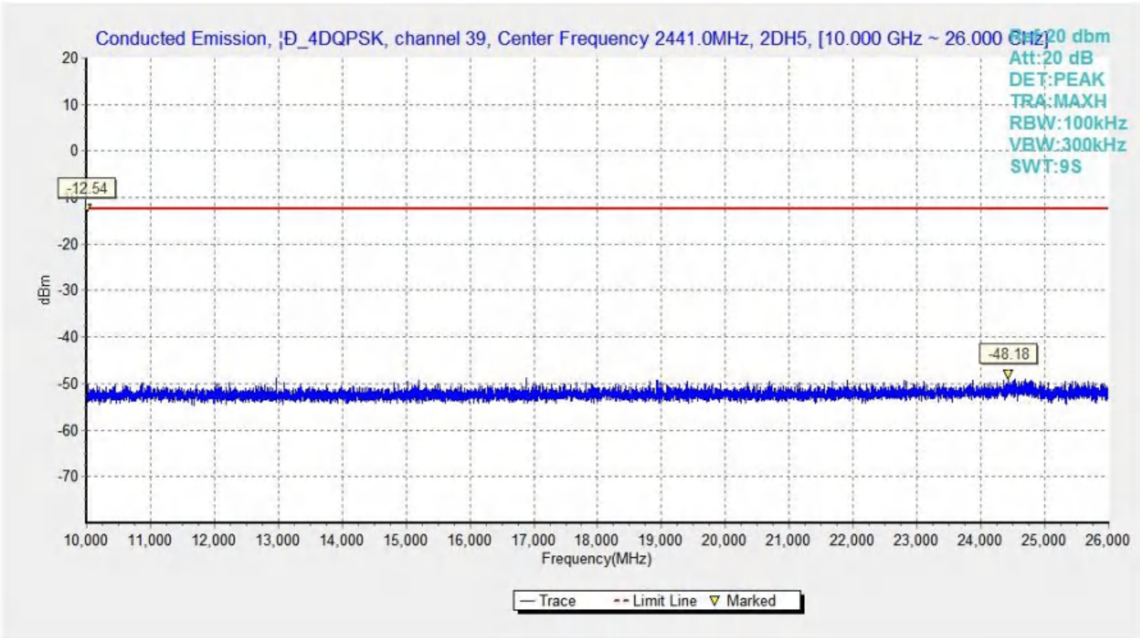


Fig.37. Conducted spurious emission: π/4 DQPSK, Channel 39, 10GHz – 26GHz

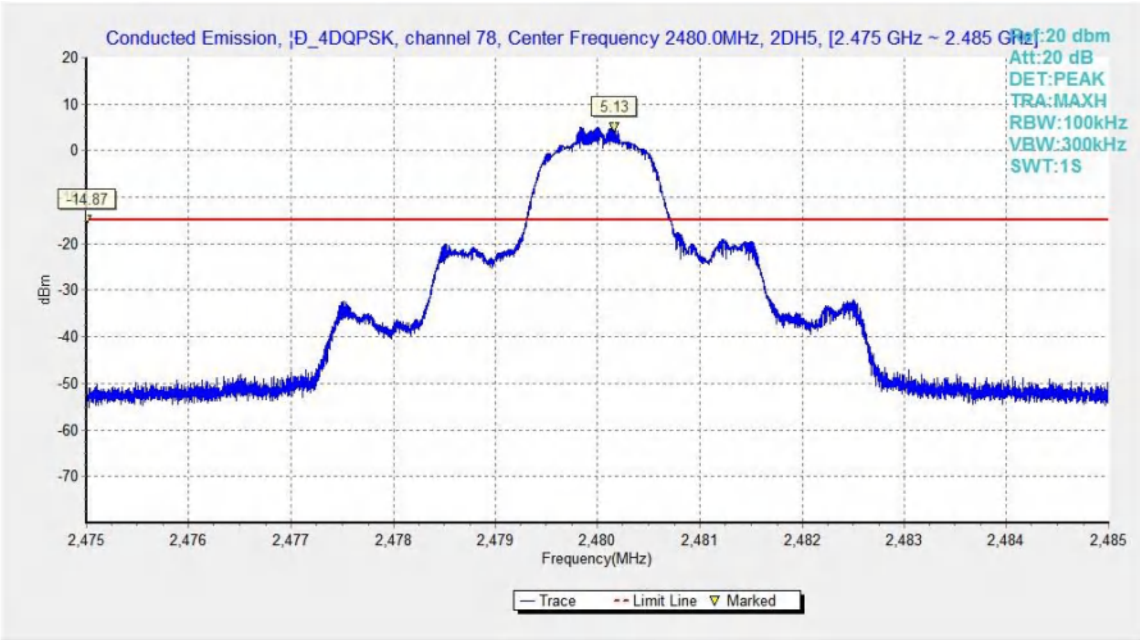


Fig.38. Conducted spurious emission: π/4 DQPSK, Channel 78, 2480MHz

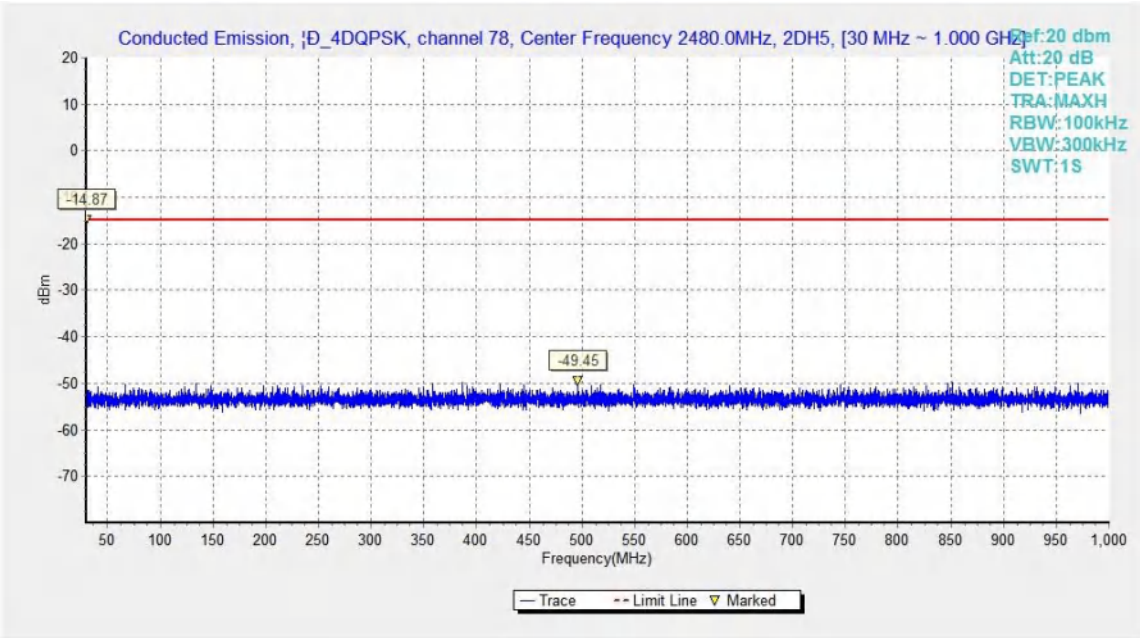


Fig.39. Conducted spurious emission: π/4 DQPSK, Channel 78, 30MHz - 1GHz

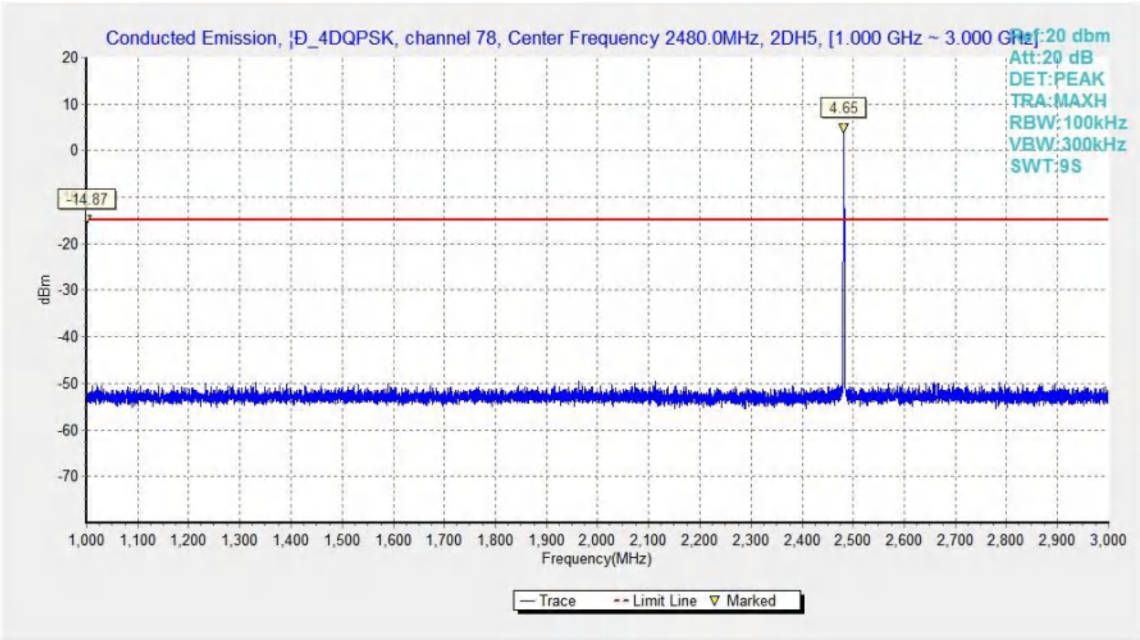


Fig.40. Conducted spurious emission: π/4 DQPSK, Channel 78, 1GHz - 3GHz

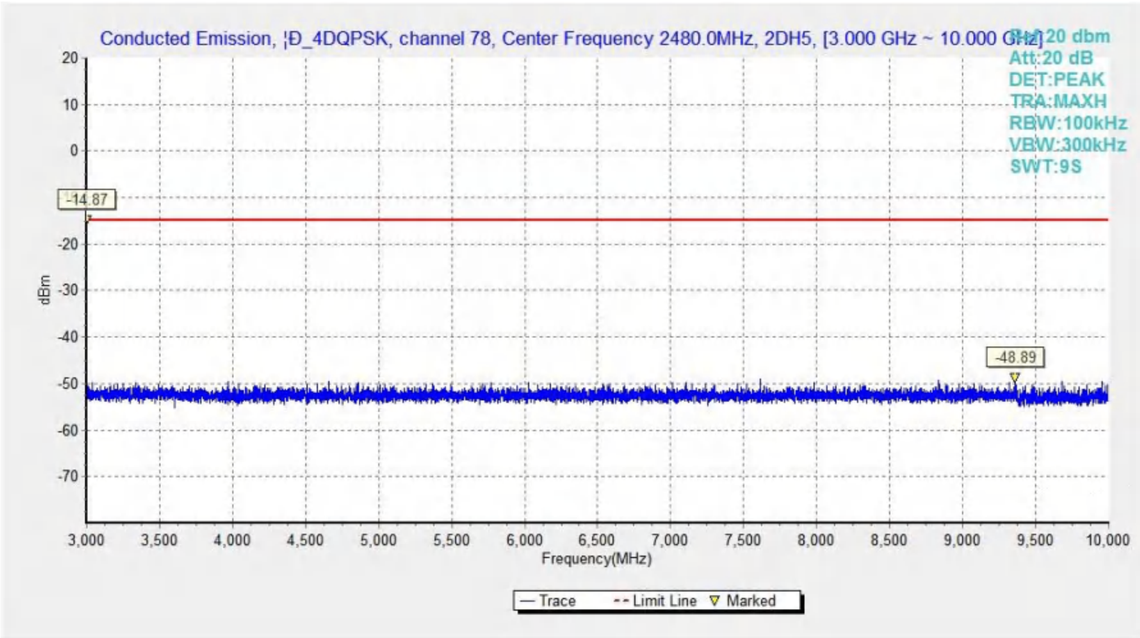


Fig.41. Conducted spurious emission: π/4 DQPSK, Channel 78, 3GHz - 10GHz

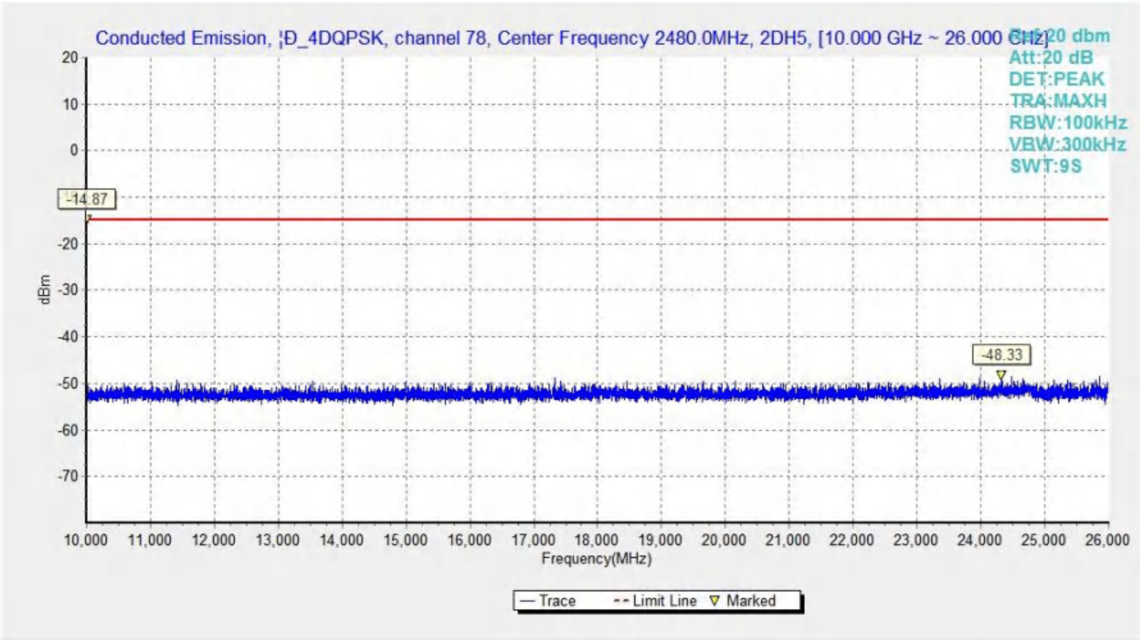


Fig.42. Conducted spurious emission: π/4 DQPSK, Channel 78, 10GHz - 26GHz

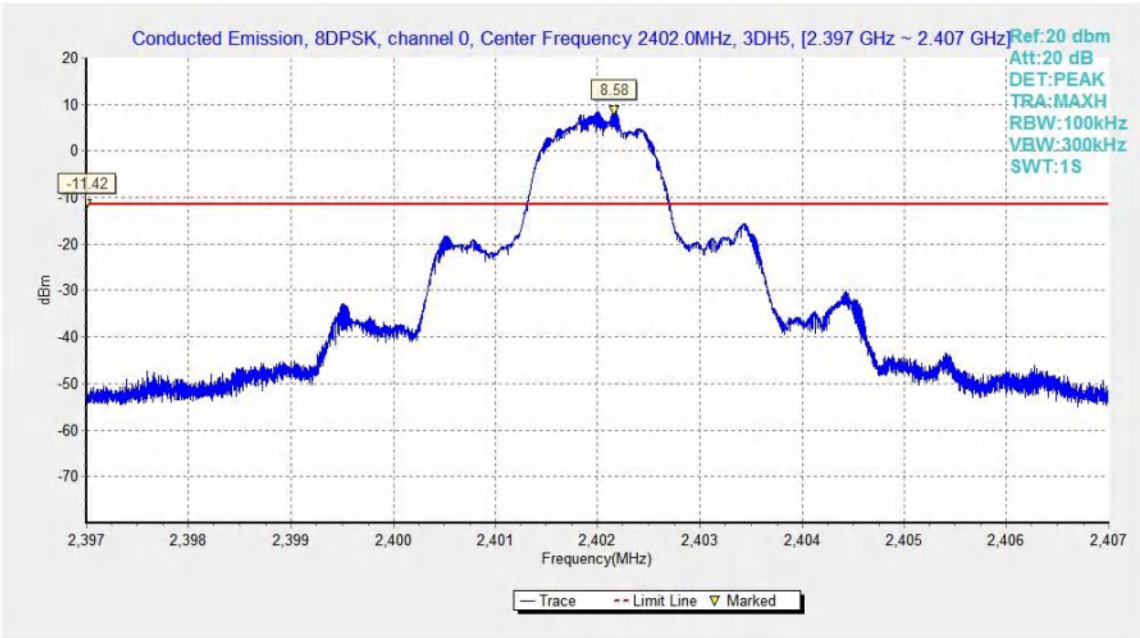


Fig.43. Conducted spurious emission: 8DPSK, Channel 0,2402MHz

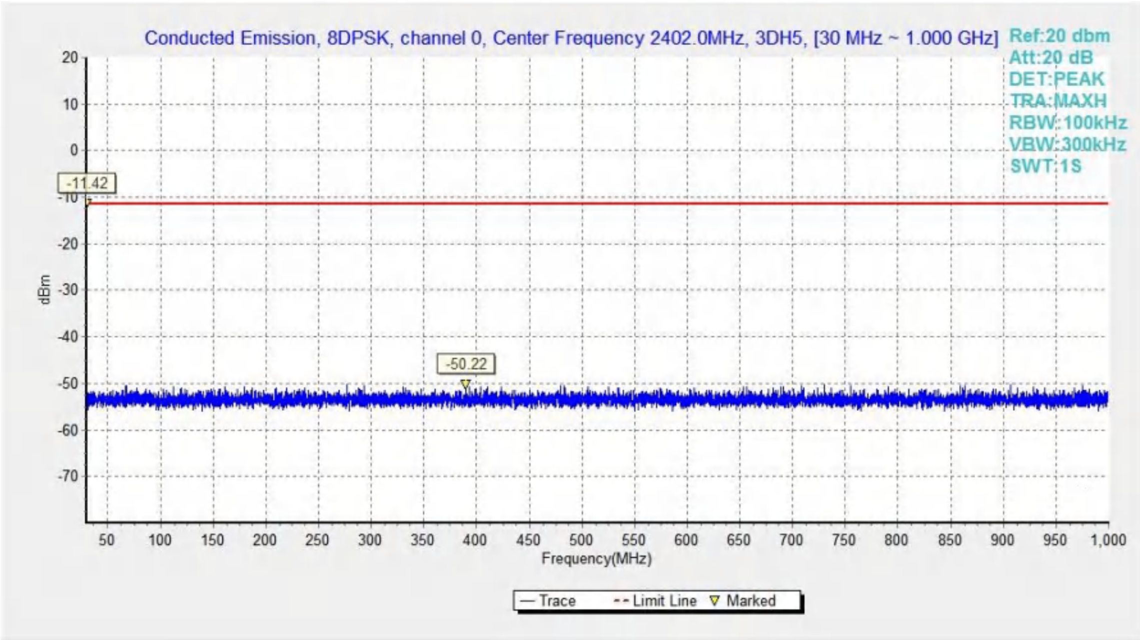


Fig.44. Conducted spurious emission: 8DPSK, Channel 0, 30MHz - 1GHz

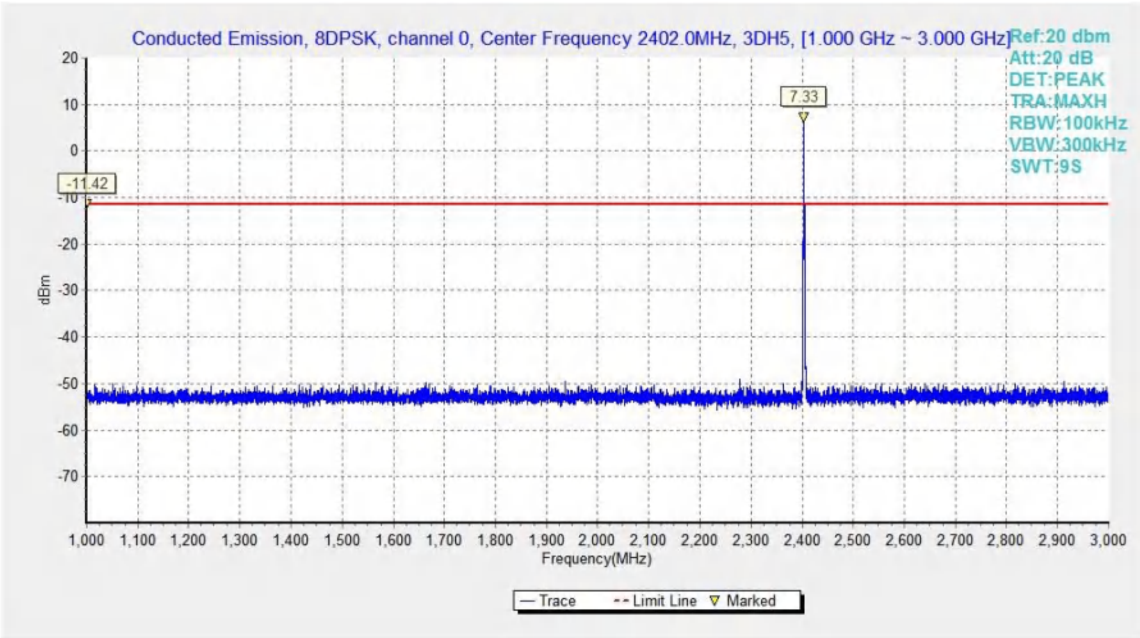


Fig.45. Conducted spurious emission: 8DPSK, Channel 0, 1GHz - 3GHz

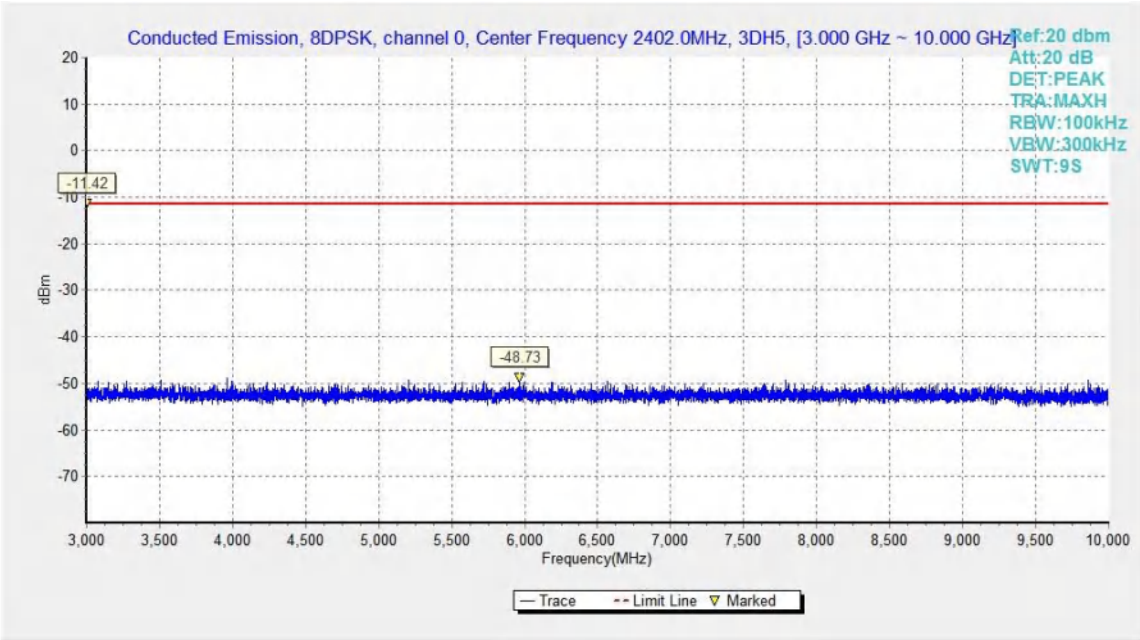


Fig.46. Conducted spurious emission: 8DPSK, Channel 0, 3GHz - 10GHz

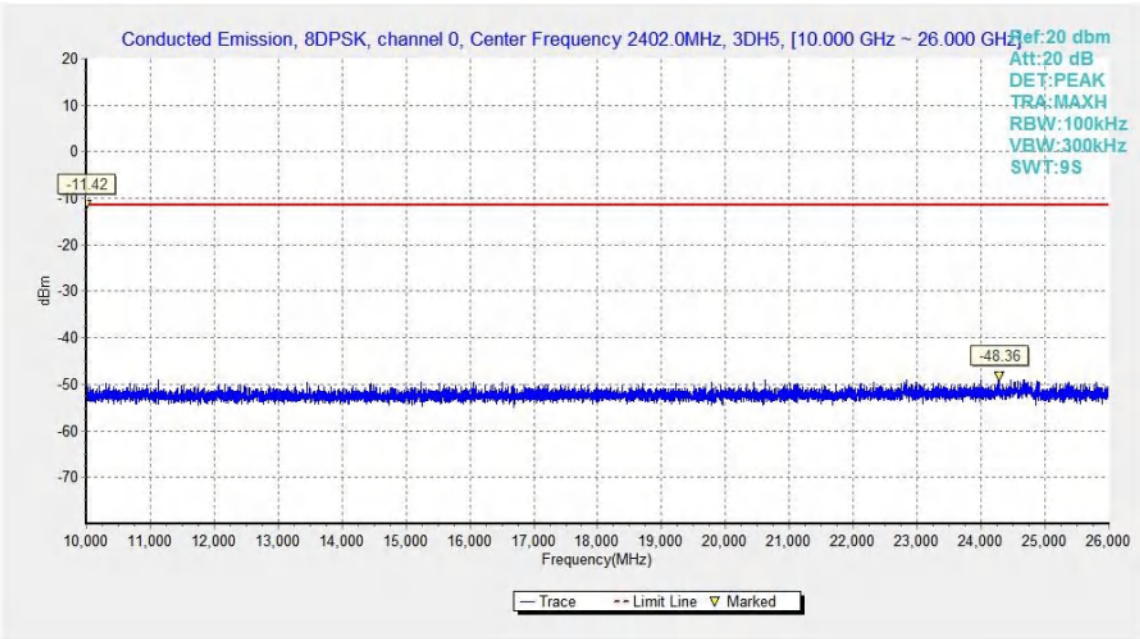


Fig.47. Conducted spurious emission: 8DPSK, Channel 0,10GHz - 26GHz

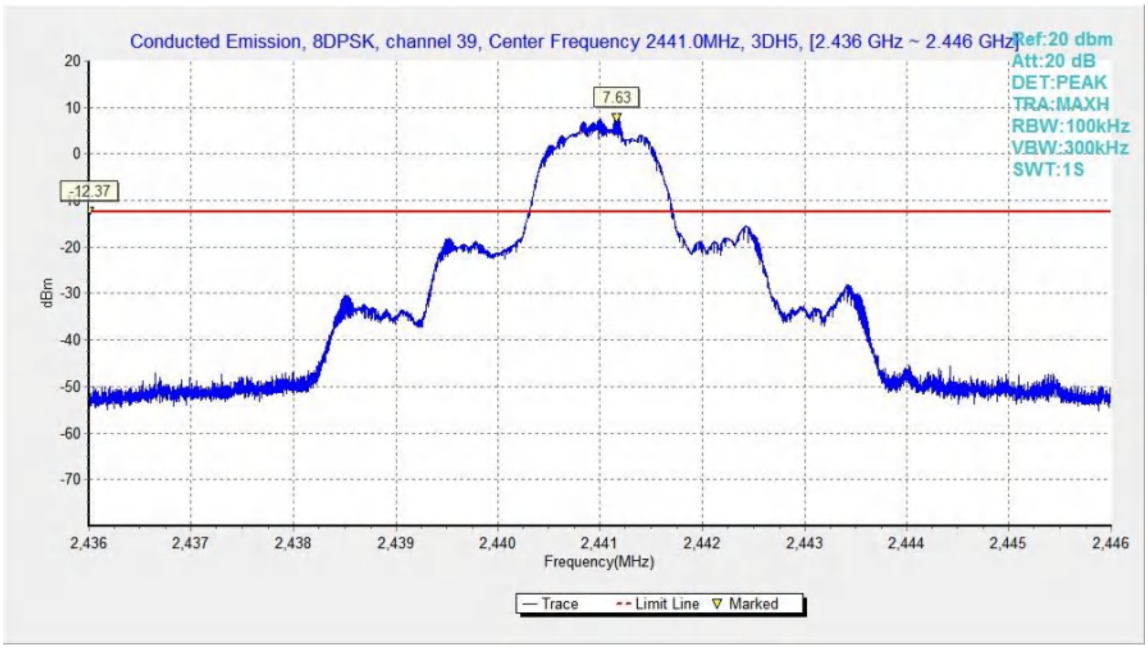


Fig.48. Conducted spurious emission: 8DPSK, Channel 39, 2441MHz

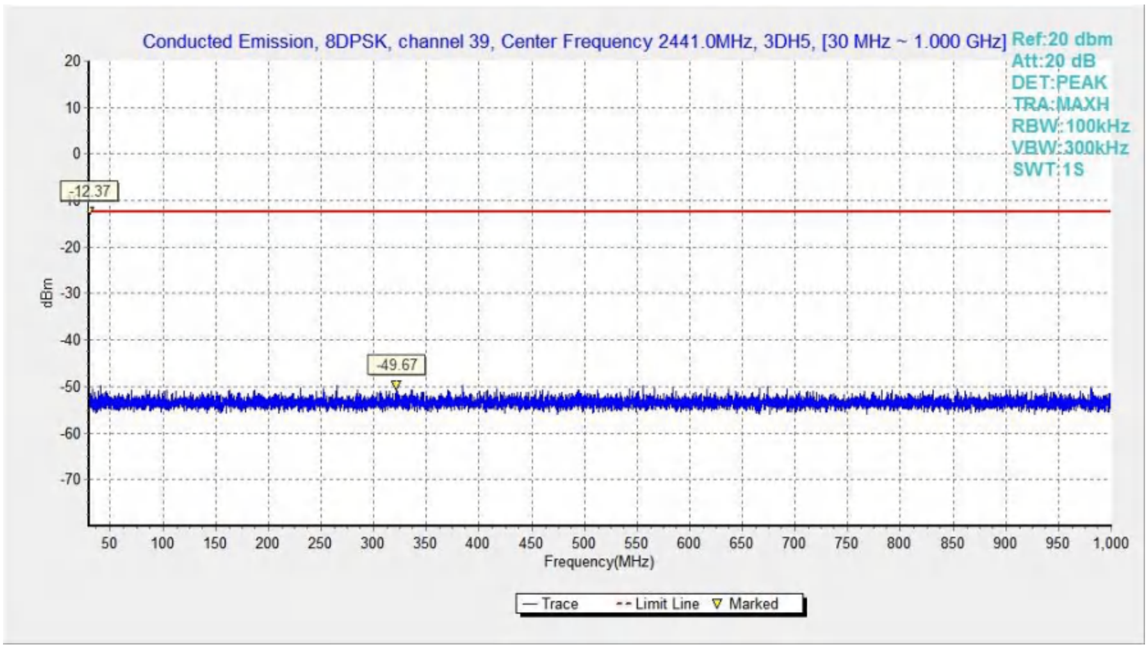


Fig.49. Conducted spurious emission: 8DPSK, Channel 39, 30MHz - 1GHz

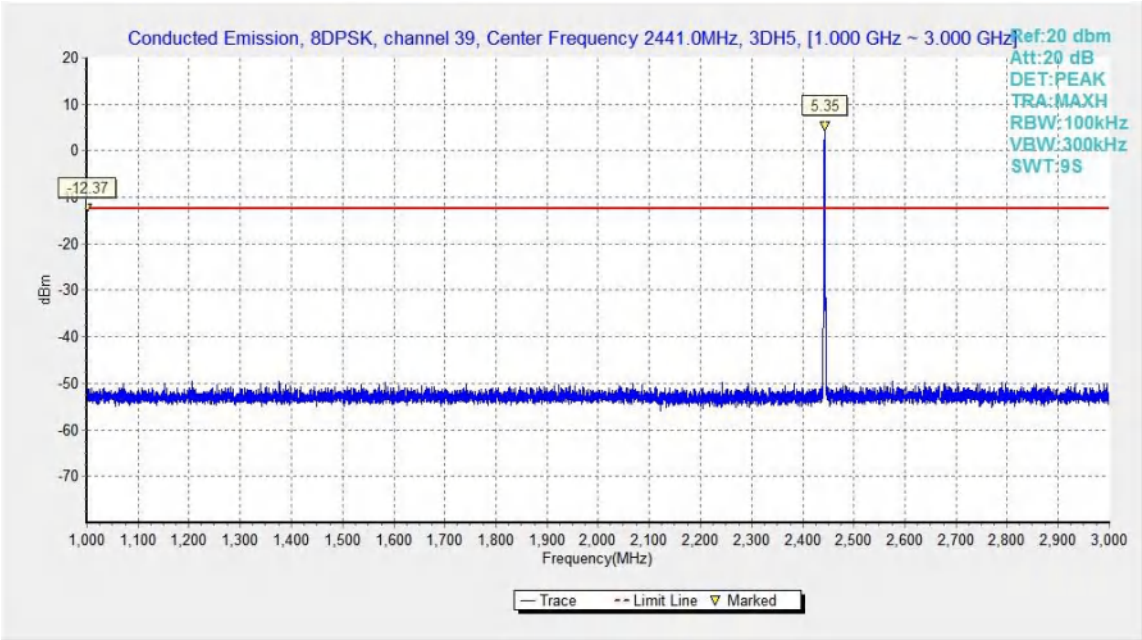


Fig.50. Conducted spurious emission: 8DPSK, Channel 39, 1GHz - 3GHz

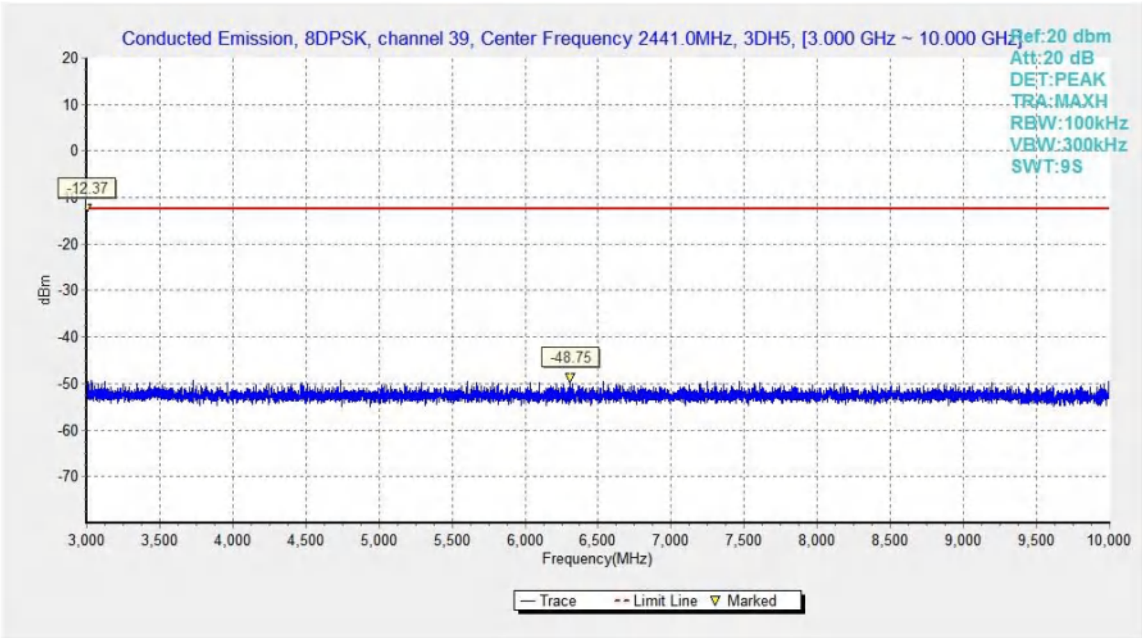


Fig.51. Conducted spurious emission: 8DPSK, Channel 39, 3GHz - 10GHz

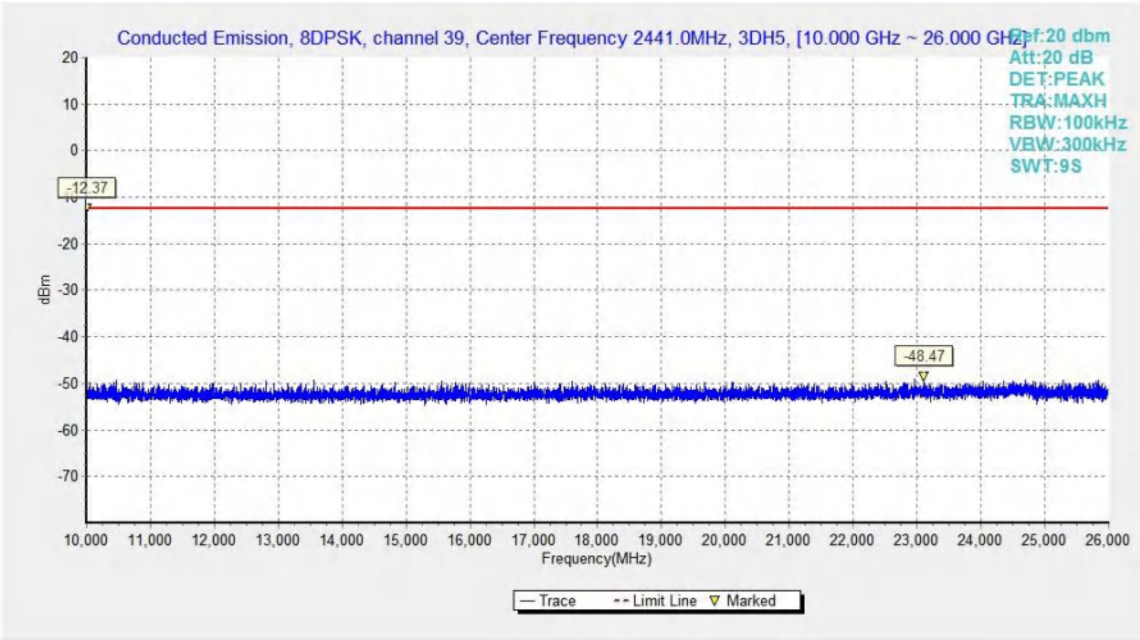


Fig.52. Conducted spurious emission: 8DPSK, Channel 39, 10GHz – 26GHz

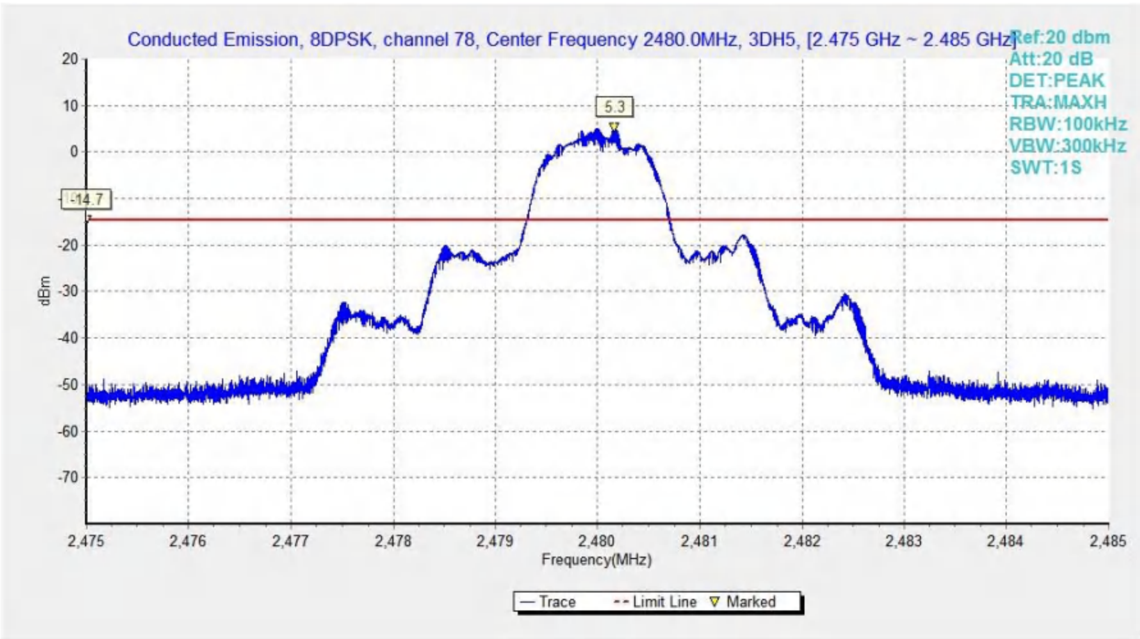


Fig.53. Conducted spurious emission: 8DPSK, Channel 78, 2480MHz

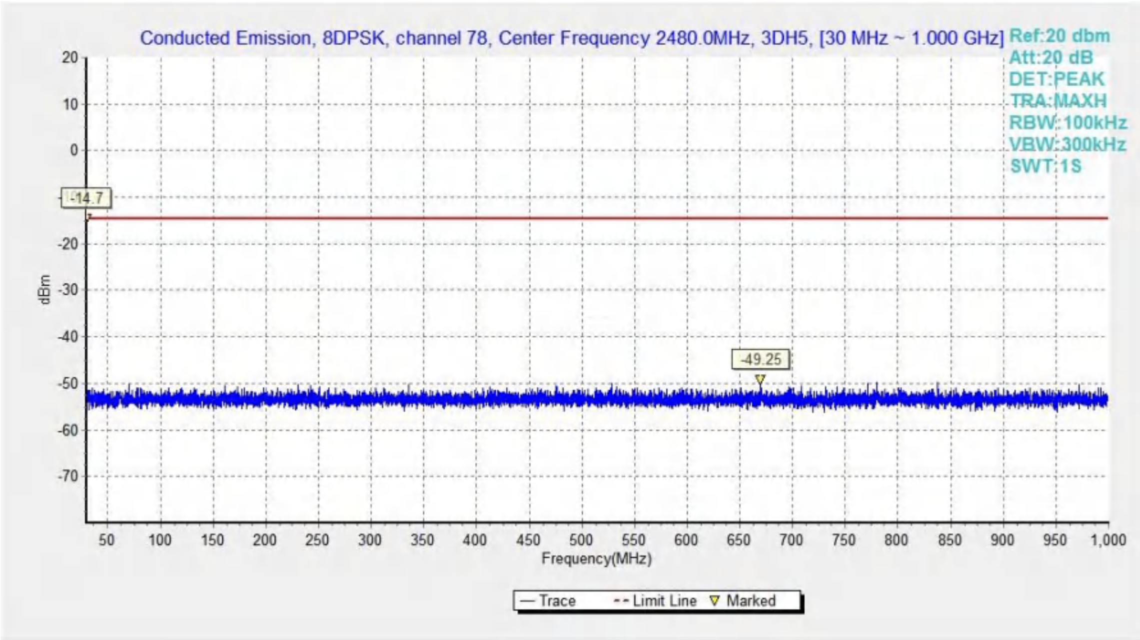


Fig.54. Conducted spurious emission: 8DPSK, Channel 78, 30MHz - 1GHz

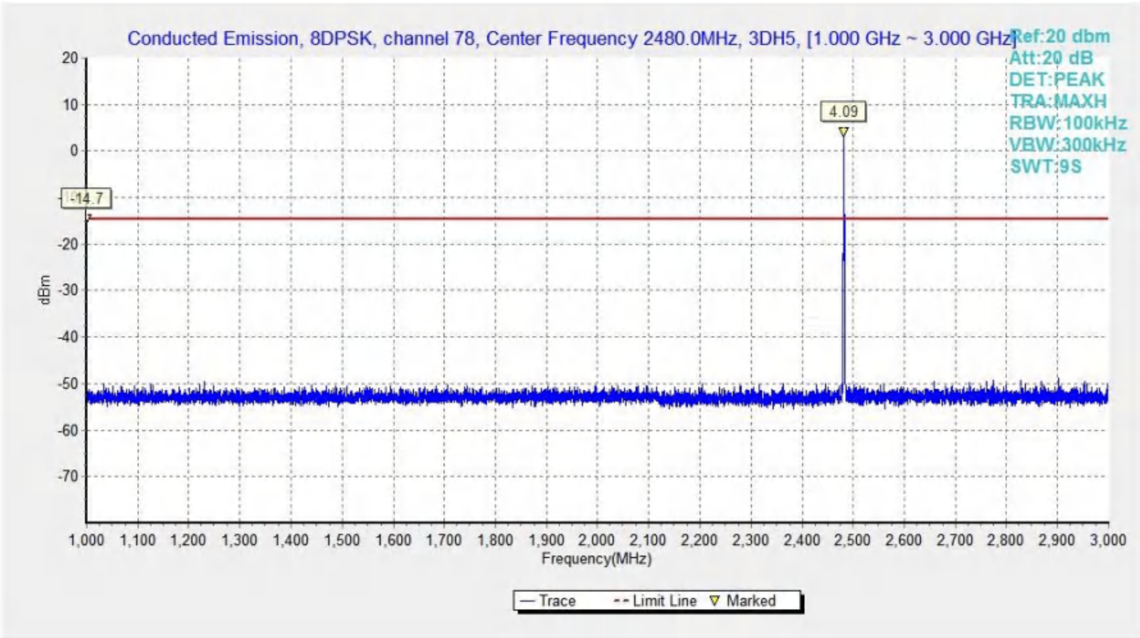


Fig.55. Conducted spurious emission: 8DPSK, Channel 78, 1GHz - 3GHz

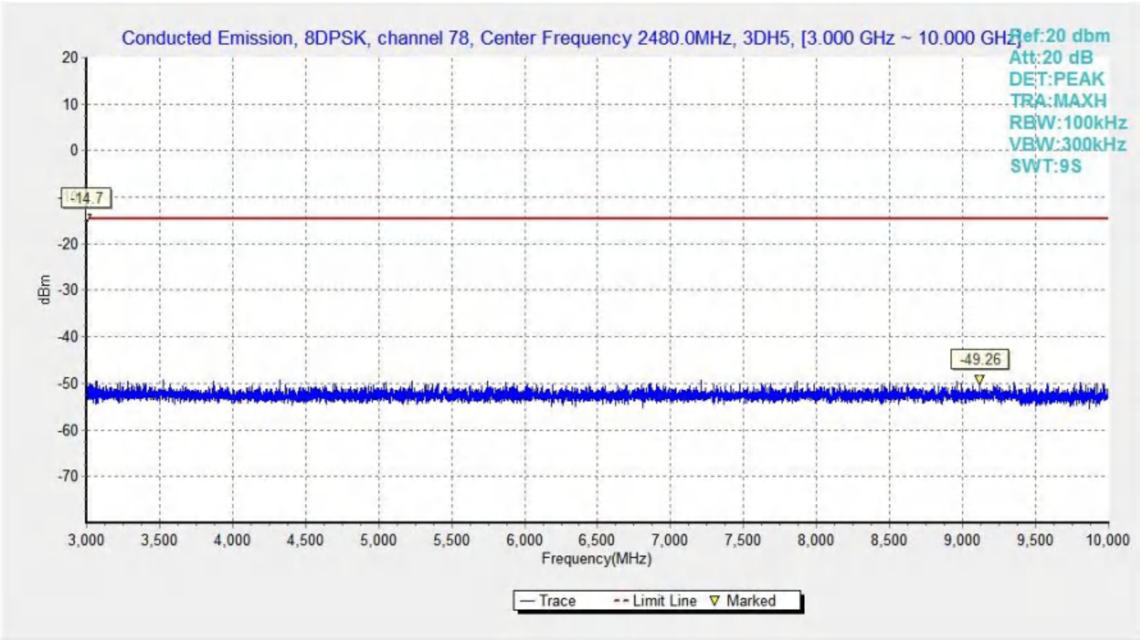


Fig.56. Conducted spurious emission: 8DPSK, Channel 78, 3GHz - 10GHz

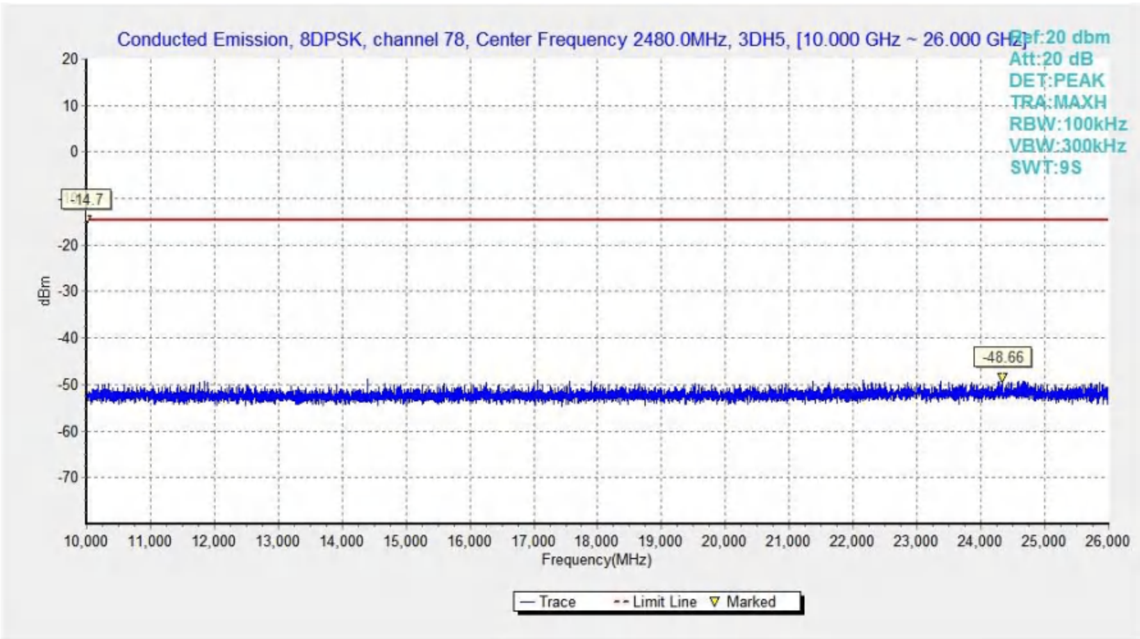


Fig.57. Conducted spurious emission: 8DPSK, Channel 78, 10GHz - 26GHz

B.5. Radiated Unwanted Emission

Limits

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 (MHz)	Field strength(μV/m)	Measurement distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

Frequency of emission (MHz)	Field strength (uV/m)	Field strength (dBuV/m)	Measurement distance (m)
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Note: When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor.

Test setup

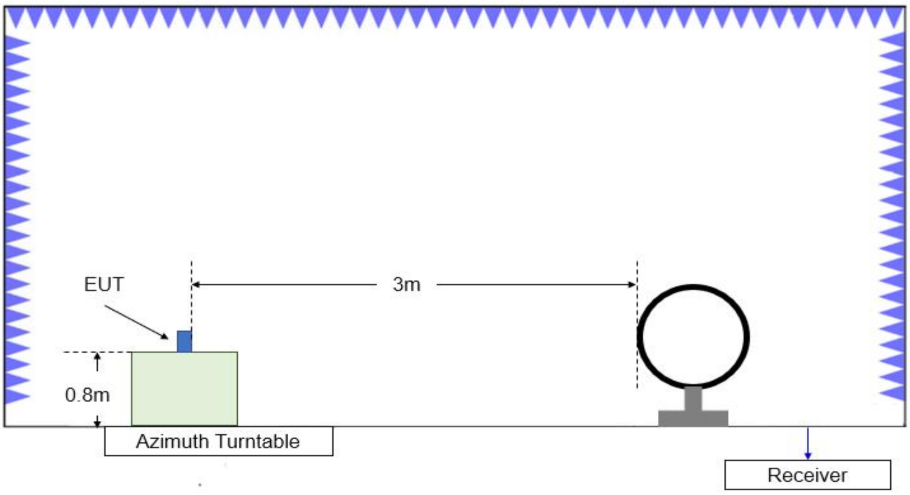


Figure B.5.1. Test Site Diagram (9kHz-30MHz)

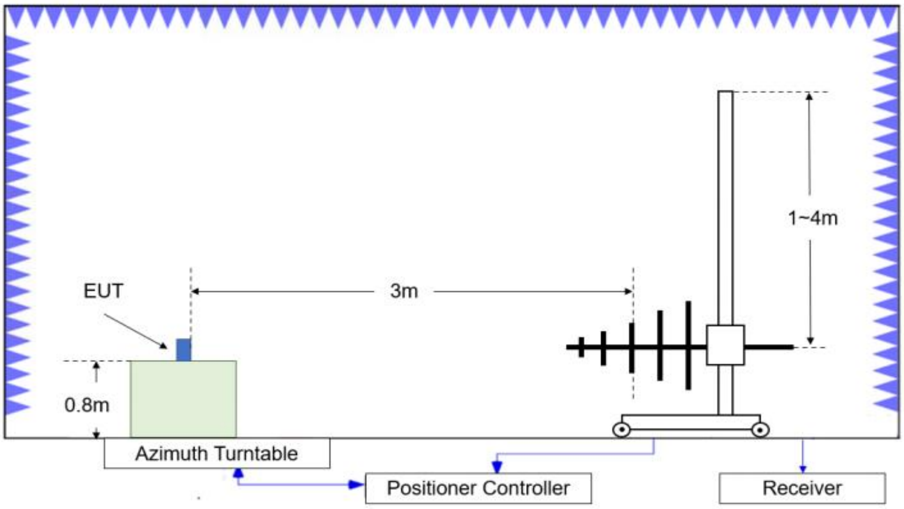


Figure B.5.2. Test Site Diagram (30MHz-1GHz)

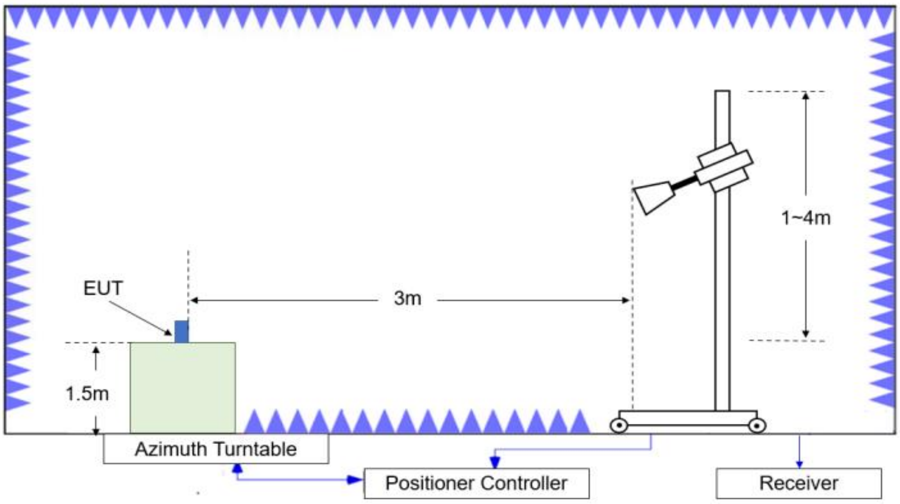


Figure B.5.3. Test Site Diagram (1GHz-40GHz)

Test Procedures

Radiated unwanted emissions from the EUT were measured according to ANSI C63.10-2013 (ANSI C63.10-2020).

Test setting

Frequency of emission (MHz)	RBW/VBW	Sweep Time(s)
30-1000	100kHz/300kHz	5
1000-3000	1MHz/3MHz	15
3000-18000	1MHz/3MHz	40
18000-26500	1MHz/3MHz	20

Sample Calculation

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

P_{Mea} is the field strength recorded from the instrument.

The measurement results are obtained as described below:

$Result=P_{Mea}+A_{Rpl=}$ P_{Mea}+Cable Loss+Antenna Factor

Test note

1. Investigation has been done on all modes and modulations/data rates. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.
2. Spurious emissions for all channels were investigated and almost the same below 1GHz. According to FCC 47 CFR §15.31, emission levels are not report much lower than the limit by over 20dB
3. Measurement frequencies were performed from 9 kHz to the 10^{th} harmonic of highest fundamental frequency or 40GHz, whichever is lower.

Test Result

EUT ID: EUT1

Radiated Spurious Emission

GFSK Ch 0

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17943.000	49.98	-29.40	46.00	33.38	74.00	24.02	H
14527.500	46.98	-30.60	41.90	35.68	74.00	27.02	H
12549.000	46.80	-31.20	39.20	38.80	74.00	27.20	V
9611.500	42.75	-34.30	37.60	39.45	74.00	31.25	H
7999.000	41.27	-35.40	36.90	39.77	74.00	32.73	V
2382.400	57.47	-19.80	28.20	49.07	74.00	16.53	V

GFSK Ch 39

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17951.500	50.66	-29.40	46.00	34.06	74.00	23.34	V
14494.000	47.11	-29.70	41.90	34.91	74.00	26.89	V
12568.500	46.04	-31.20	39.20	38.04	74.00	27.96	H
9166.500	42.78	-34.70	37.70	39.78	74.00	31.22	V
7443.500	40.82	-35.50	36.50	39.82	74.00	33.18	H
3497.500	38.35	-38.00	31.00	45.35	74.00	35.65	V

GFSK Ch 78

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17951.500	50.41	-29.40	46.00	33.81	74.00	23.59	H
12750.000	46.78	-31.80	39.60	38.88	74.00	27.22	H
14062.000	46.72	-30.20	41.70	35.22	74.00	27.28	V
9659.000	42.76	-34.00	37.70	39.06	74.00	31.24	H
7441.500	40.90	-35.50	36.50	39.90	74.00	33.10	V
2485.200	56.61	-19.70	28.20	48.11	74.00	17.39	V

π/4 DQPSK Ch 0

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17946.500	50.47	-29.40	46.00	33.87	74.00	23.53	V
12558.500	48.29	-31.20	39.20	40.29	74.00	25.71	V
14033.000	47.10	-31.10	41.60	36.60	74.00	26.90	H
8603.000	43.08	-35.00	37.50	40.58	74.00	30.92	V
7942.000	41.48	-35.40	36.80	40.08	74.00	32.52	V
2347.300	56.81	-19.60	28.20	48.21	74.00	17.19	H

π/4 DQPSK Ch 39

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17977.500	49.99	-29.40	46.00	33.39	74.00	24.01	H
14519.500	46.69	-30.60	41.90	35.39	74.00	27.31	V
12560.500	46.64	-31.20	39.20	38.64	74.00	27.36	V
8524.000	42.93	-34.30	37.40	39.83	74.00	31.07	V
7353.500	40.54	-35.90	36.60	39.84	74.00	33.46	H
3657.000	37.99	-37.90	31.60	44.29	74.00	36.01	V

π/4 DQPSK Ch 78

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17938.500	49.99	-29.40	46.00	33.39	74.00	24.01	H
12560.500	46.93	-31.20	39.20	38.93	74.00	27.07	H
14035.000	46.71	-31.10	41.60	36.21	74.00	27.29	V
8401.000	42.89	-34.40	37.30	39.99	74.00	31.11	V
7449.500	40.55	-35.50	36.50	39.55	74.00	33.45	H
2491.500	56.41	-19.70	28.20	47.91	74.00	17.59	H

8DPSK Ch 0

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17957.000	49.66	-29.40	46.00	33.06	74.00	24.34	H
12566.000	46.54	-31.20	39.20	38.54	74.00	27.46	V
14551.000	46.45	-30.60	41.90	35.15	74.00	27.55	V
9777.000	42.37	-33.80	38.00	38.17	74.00	31.63	V
7965.000	40.79	-35.40	36.80	39.39	74.00	33.21	H
2355.600	56.63	-19.60	28.20	48.03	74.00	17.37	V

8DPSK Ch 39

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17982.500	50.33	-29.40	46.00	33.73	74.00	23.67	H
14717.000	47.12	-30.20	41.40	36.02	74.00	26.88	V
12581.500	46.43	-32.20	39.30	39.33	74.00	27.57	H
9227.500	42.80	-34.30	37.60	39.50	74.00	31.20	H
7445.000	41.52	-35.50	36.50	40.52	74.00	32.48	V
3731.500	37.69	-37.70	32.30	43.09	74.00	36.31	V

8DPSK Ch 78

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17933.500	49.98	-29.40	46.00	33.38	74.00	24.02	H
14527.500	46.22	-30.60	41.90	34.92	74.00	27.78	V
12540.000	46.13	-31.20	39.20	38.13	74.00	27.87	V
9744.500	42.57	-34.50	37.80	39.27	74.00	31.43	V
7975.500	41.30	-35.40	36.90	39.80	74.00	32.70	H
2489.600	56.85	-19.70	28.20	48.35	74.00	17.15	V

Average Measurement results

GFSK Ch 0

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17980.000	40.79	-29.40	46.00	24.19	54.00	13.21	V
12557.500	37.61	-31.20	39.20	29.61	54.00	16.39	V
14782.500	37.09	-30.40	41.20	26.29	54.00	16.91	V
9627.000	33.30	-34.30	37.60	30.00	54.00	20.70	V
8000.000	31.85	-35.40	36.90	30.35	54.00	22.15	V
2362.400	45.35	-19.60	28.20	36.75	54.00	8.65	H

GFSK Ch 39

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17979.000	40.66	-29.40	46.00	24.06	54.00	13.34	H
14628.000	36.91	-30.80	41.70	26.01	54.00	17.09	H
12560.500	36.67	-31.20	39.20	28.67	54.00	17.33	H
3498.000	33.71	-38.00	31.00	40.71	54.00	20.29	V
9154.000	33.02	-34.30	37.70	29.62	54.00	20.98	H
7996.500	31.27	-35.40	36.90	29.77	54.00	22.73	V

GFSK Ch 78

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17949.000	40.38	-29.40	46.00	23.78	54.00	13.62	V
14657.000	36.68	-30.00	41.50	25.18	54.00	17.32	H
12561.500	36.66	-31.20	39.20	28.66	54.00	17.34	H
9609.500	33.01	-34.30	37.60	29.71	54.00	20.99	V
7236.000	31.23	-35.60	36.40	30.43	54.00	22.77	V
2490.800	44.78	-19.70	28.20	36.28	54.00	9.22	H

π/4 DQPSK Ch 0

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17985.000	40.85	-29.40	46.00	24.25	54.00	13.15	V
14652.000	37.29	-30.80	41.70	26.39	54.00	16.71	H
12561.500	36.98	-31.20	39.20	28.98	54.00	17.02	H
9606.500	33.09	-34.30	37.60	29.79	54.00	20.91	V
7995.000	31.41	-35.40	36.90	29.91	54.00	22.59	V
2344.400	45.06	-19.60	28.20	36.46	54.00	8.94	H

π/4 DQPSK Ch 39

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17974.000	40.58	-29.40	46.00	23.98	54.00	13.42	H
12563.000	37.10	-31.20	39.20	29.10	54.00	16.90	H
14484.000	36.89	-29.70	41.90	24.69	54.00	17.11	V
9140.500	32.82	-34.30	37.70	29.42	54.00	21.18	V
7967.000	31.41	-35.40	36.80	30.01	54.00	22.59	H
4383.000	27.63	-37.70	32.20	33.13	54.00	26.37	H

π/4 DQPSK Ch 78

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17945.500	40.85	-29.40	46.00	24.25	54.00	13.15	V
14555.500	36.92	-29.00	41.90	24.02	54.00	17.08	V
12313.500	36.57	-32.10	39.00	29.67	54.00	17.43	V
9184.500	32.94	-34.70	37.70	29.94	54.00	21.06	H
7968.500	31.34	-35.40	36.80	29.94	54.00	22.66	H
2494.400	44.85	-19.70	28.20	36.35	54.00	9.15	H

8DPSK Ch 0

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17976.000	40.84	-29.40	46.00	24.24	54.00	13.16	H
12560.500	37.57	-31.20	39.20	29.57	54.00	16.43	V
14674.000	37.12	-30.00	41.50	25.62	54.00	16.88	H
9180.000	33.18	-34.70	37.70	30.18	54.00	20.82	V
8000.000	31.51	-35.40	36.90	30.01	54.00	22.49	V
2385.100	45.13	-19.80	28.20	36.73	54.00	8.87	H

8DPSK Ch 39

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17949.500	40.81	-29.40	46.00	24.21	54.00	13.19	V
12562.500	37.03	-31.20	39.20	29.03	54.00	16.97	H
14759.500	36.75	-30.40	41.20	25.95	54.00	17.25	V
8326.500	33.07	-35.00	37.20	30.87	54.00	20.93	V
7446.500	31.33	-35.50	36.50	30.33	54.00	22.67	H
4336.500	27.79	-37.80	32.20	33.39	54.00	26.21	V

8DPSK Ch 78

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
17949.000	40.78	-29.40	46.00	24.18	54.00	13.22	H
12565.500	37.14	-31.20	39.20	29.14	54.00	16.86	H
14032.500	37.03	-31.10	41.60	26.53	54.00	16.97	H
9150.000	32.85	-34.30	37.70	29.45	54.00	21.15	H
7995.500	31.56	-35.40	36.90	30.06	54.00	22.44	V
2498.000	44.94	-19.70	28.20	36.44	54.00	9.06	V

Conclusion: Pass

Note: the spurious emission above 18G is noise only and did not show on the report.

Band edge compliance

Mode	Channel	Frequency Range	Test Results	Conclusion
GFSK	0	2.31GHz ~2.43GHz	Fig.58	P
	78	2.45GHz ~2.5GHz	Fig.59	P

Mode	Channel	Frequency Range	Test Results	Conclusion
π/4 DQPSK	0	2.31GHz ~2.43GHz	Fig.60	P
	78	2.45GHz ~2.5GHz	Fig.61	P

Mode	Channel	Frequency Range	Test Results	Conclusion
8DPSK	0	2.31GHz ~2.43GHz	Fig.62	P
	78	2.45GHz ~2.5GHz	Fig.63	P

Conclusion: PASS

Test graphs as below

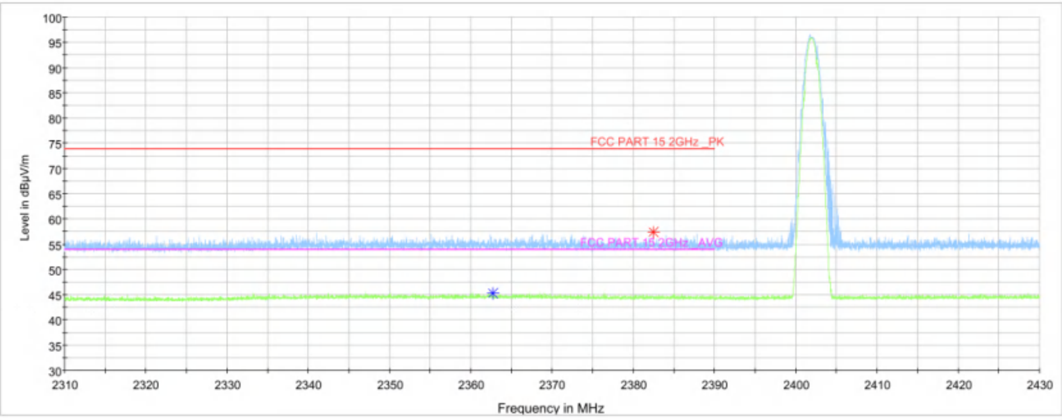


Fig.58. Frequency Band Edges: GFSK, Channel 0, Hopping Off, 2.31 GHz – 2.45GHz

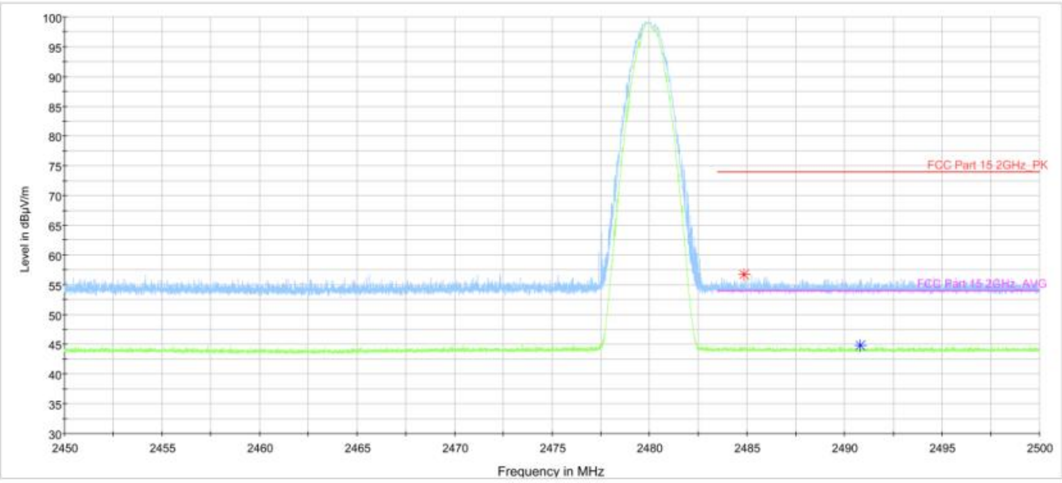


Fig.59. Frequency Band Edges: GFSK, Channel 78, Hopping Off, ch11, 2.45 GHz - 2.50GHz

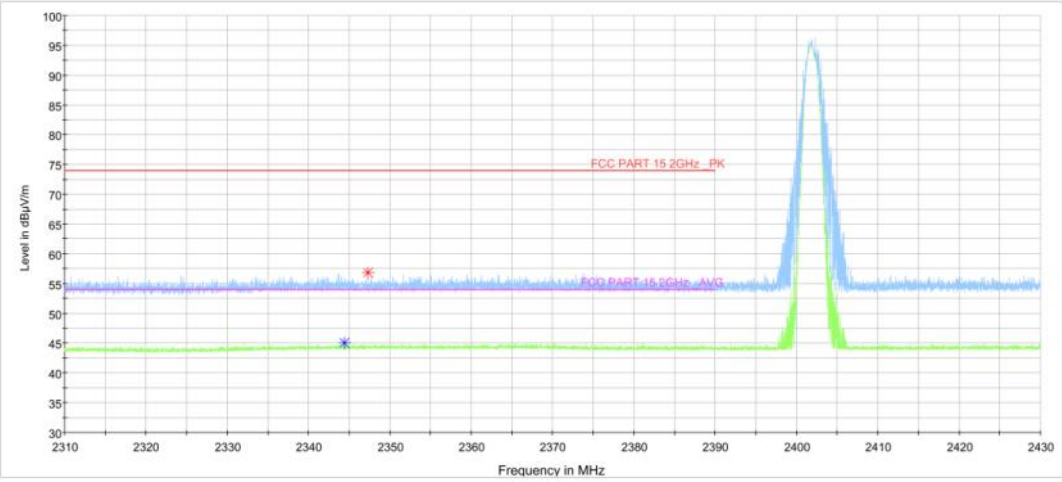


Fig.60. Frequency Band Edges: π/4 DQPSK, Channel 0, Hopping Off, 2.31 GHz - 2.45GHz

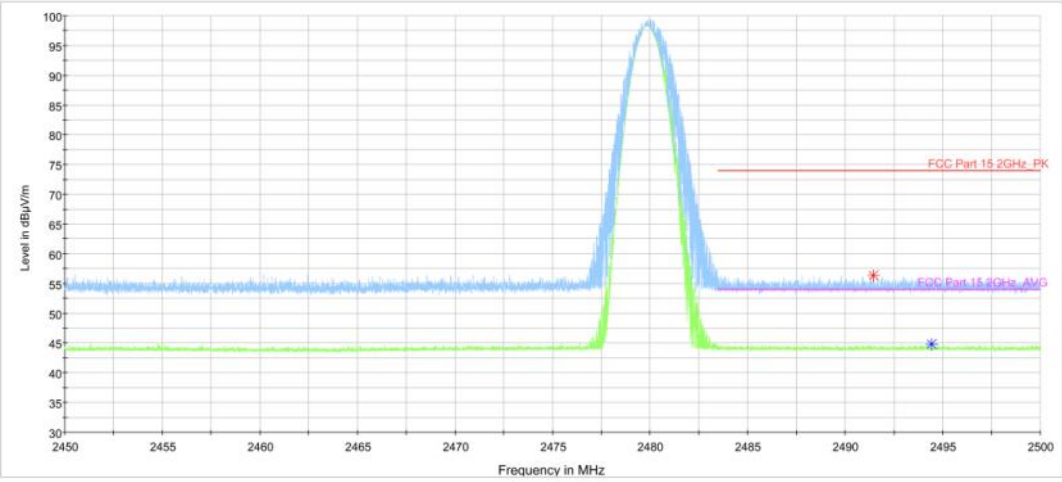


Fig.61. Frequency Band Edges: π/4 DQPSK, Channel 78, Hopping Off, 2.45 GHz - 2.50GHz

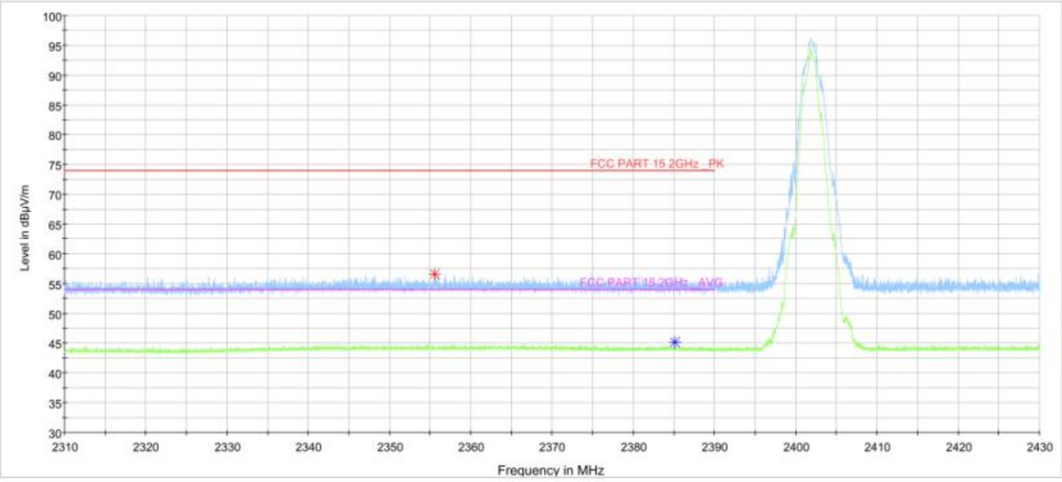


Fig.62. Frequency Band Edges: 8DPSK, Channel 0, 2.31 GHz - 2.45GHz

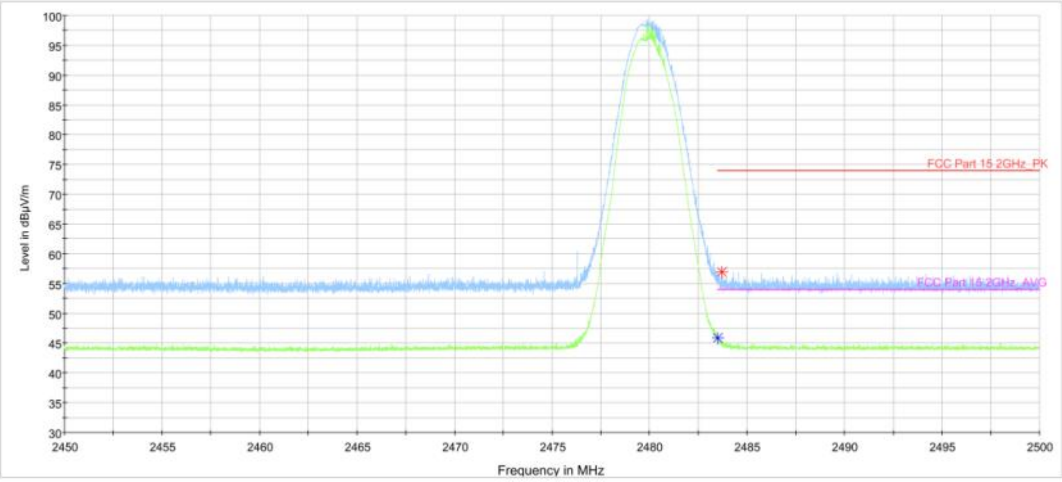


Fig.63. Frequency Band Edges: 8DPSK, Channel 78, 2.45 GHz - 2.50GHz

B.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 ≥ 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	Pulse time (ms)		Number of Transmissions		Dwell Time (ms)	Conclusion
39	DH1	Fig.64	0.41	Fig.65	320	131.2	P
	DH3	Fig.66	1.66	Fig.67	118	195.88	P
	DH5	Fig.68	2.91	Fig.69	64	186.24	P

For π/4 DQPSK

Channel	Packet	Pulse time (ms)		Number of Transmissions		Dwell Time (ms)	Conclusion
39	2DH1	Fig.70	0.4	Fig.71	319	127.6	P
	2DH3	Fig.72	1.66	Fig.73	112	185.92	P
	2DH5	Fig.74	2.9	Fig.75	78	226.2	P

For 8DPSK

Channel	Packet	Pulse time (ms)		Number of Transmissions		Dwell Time (ms)	Conclusion
39	3DH1	Fig.76	0.4	Fig.77	320	128	P
	3DH3	Fig.78	1.65	Fig.79	100	165	P
	3DH5	Fig.80	2.9	Fig.81	65	188.5	P

Conclusion: PASS

Test graphs as below:

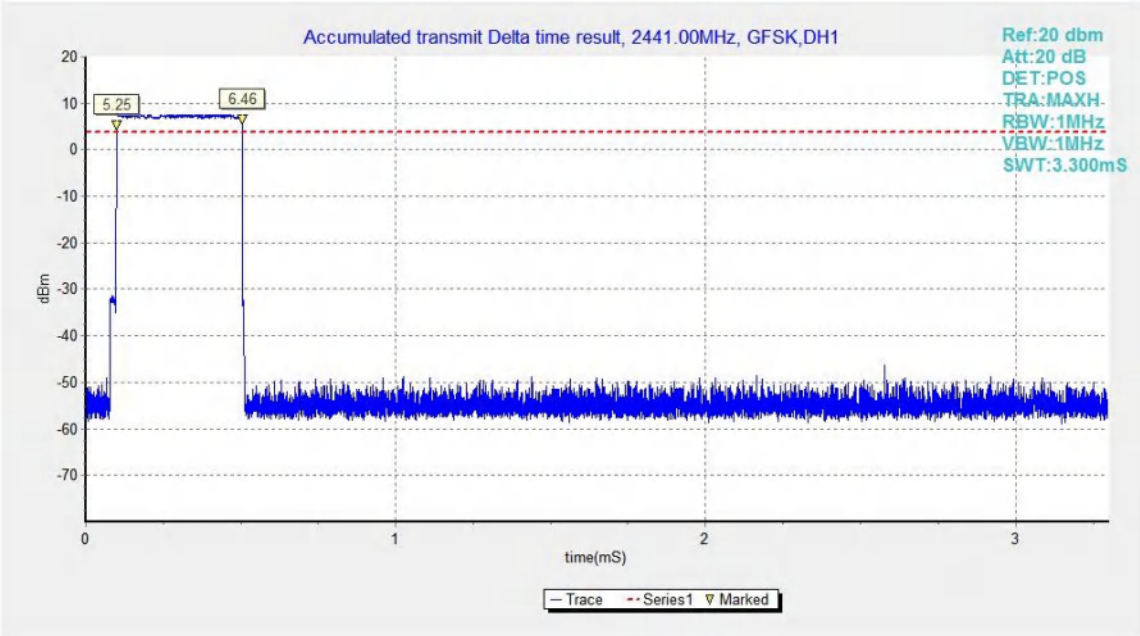


Fig.64. Time of occupancy (Dwell Time): Channel 39, Packet DH1

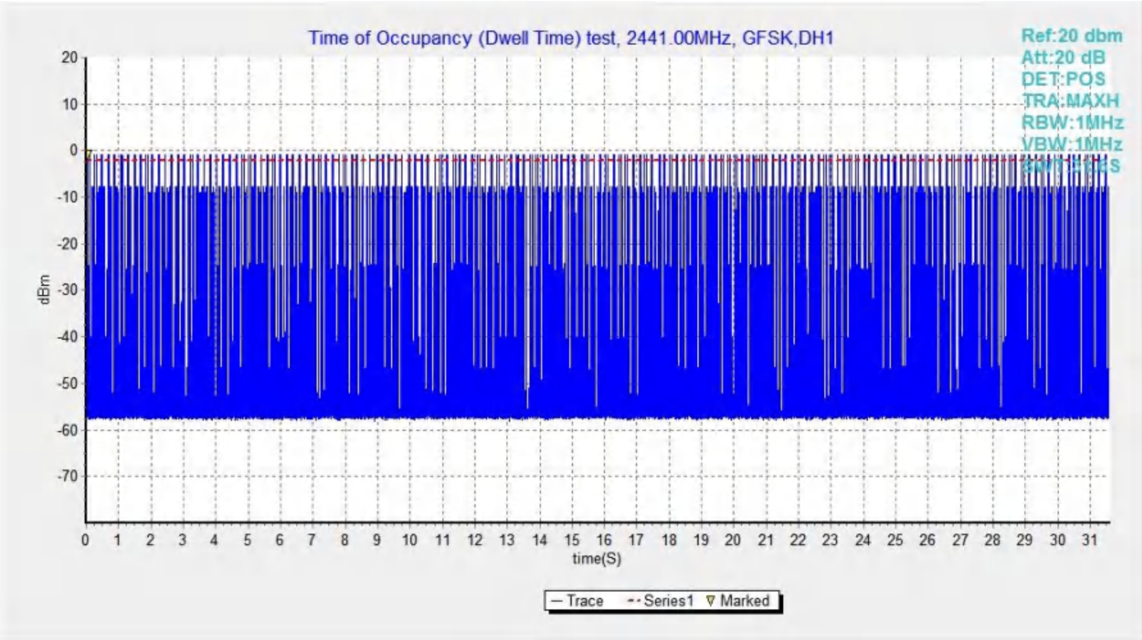


Fig.65. Number of Transmissions Measurement: Channel 39,Packet DH1

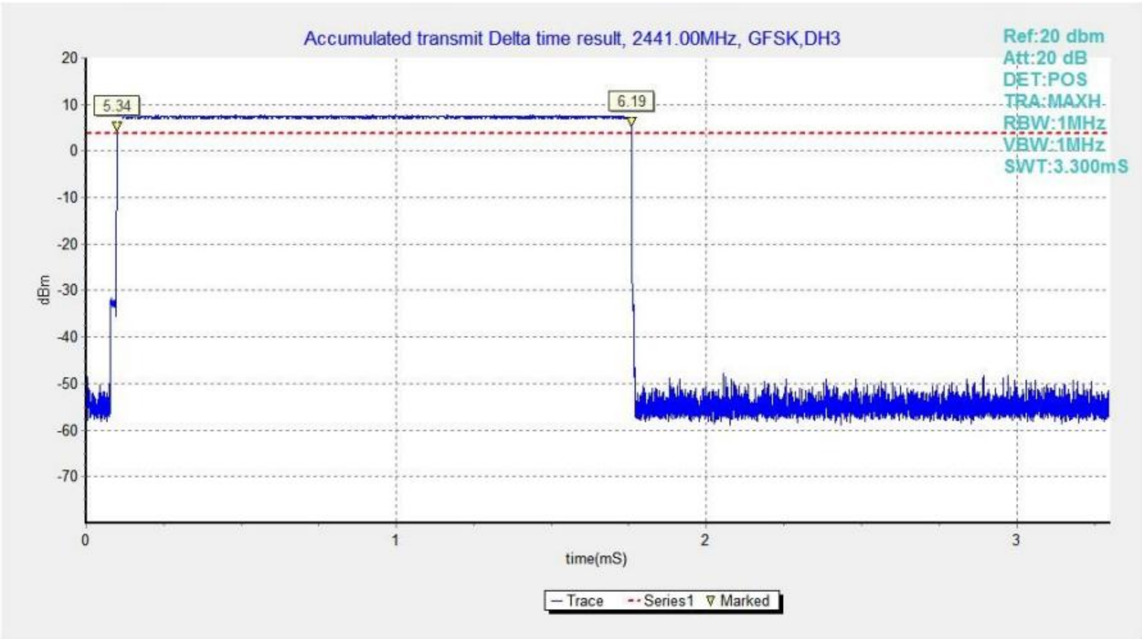


Fig.66. Time of occupancy (Dwell Time): Channel 39, Packet DH3

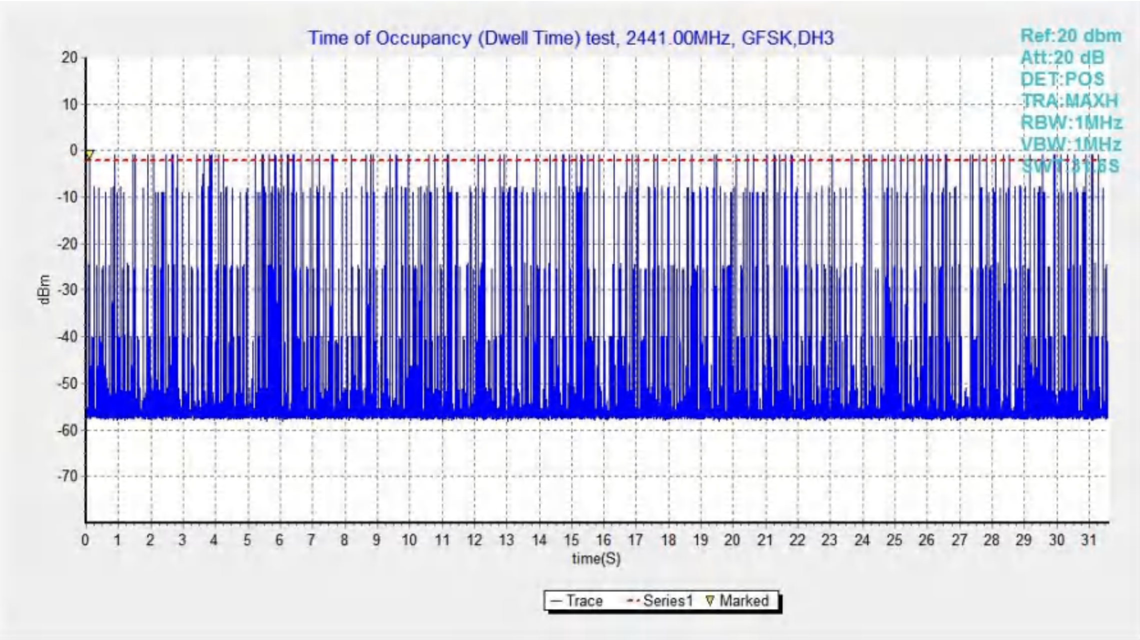


Fig.67. Number of Transmissions Measurement: Channel 39,Packet DH3

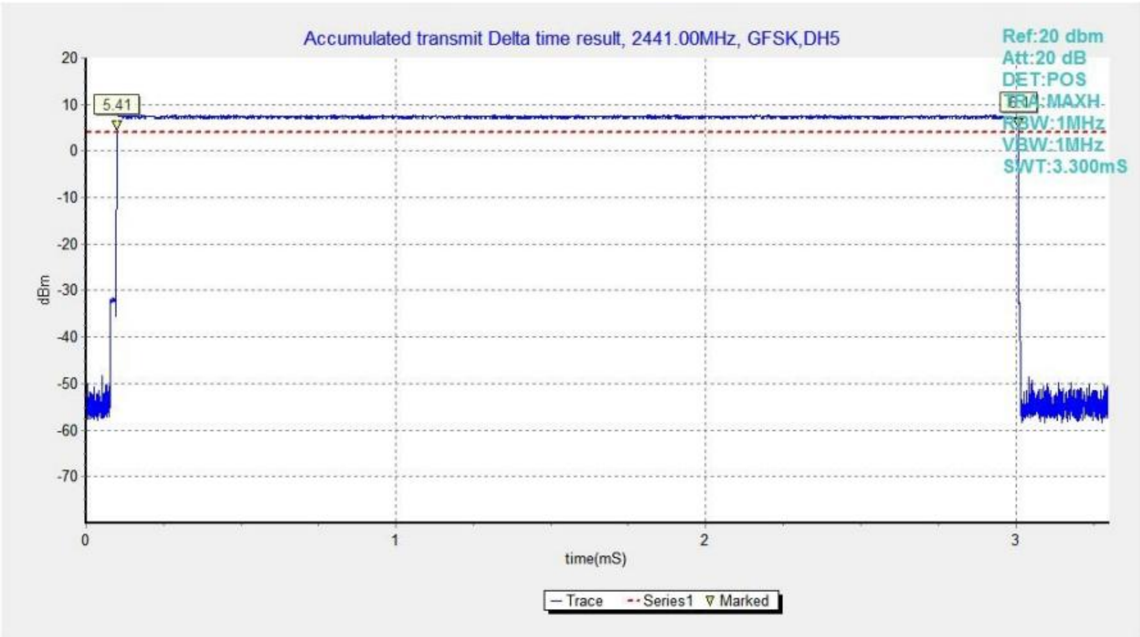


Fig.68. Time of occupancy (Dwell Time): Channel 39, Packet DH5

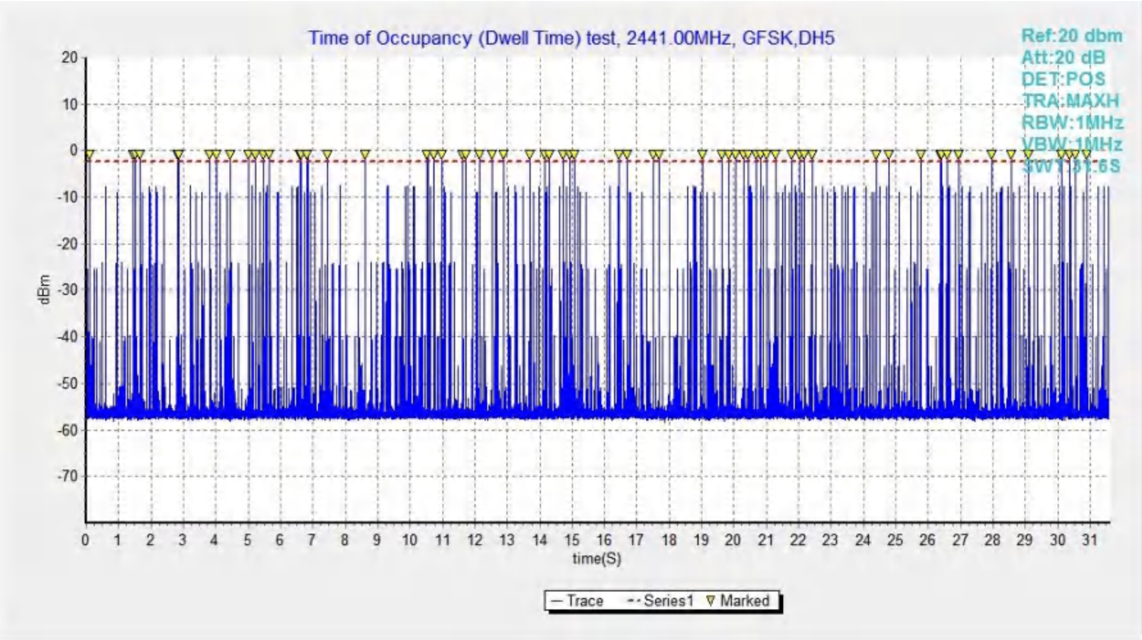


Fig.69. Number of Transmissions Measurement: Channel 39,Packet DH5

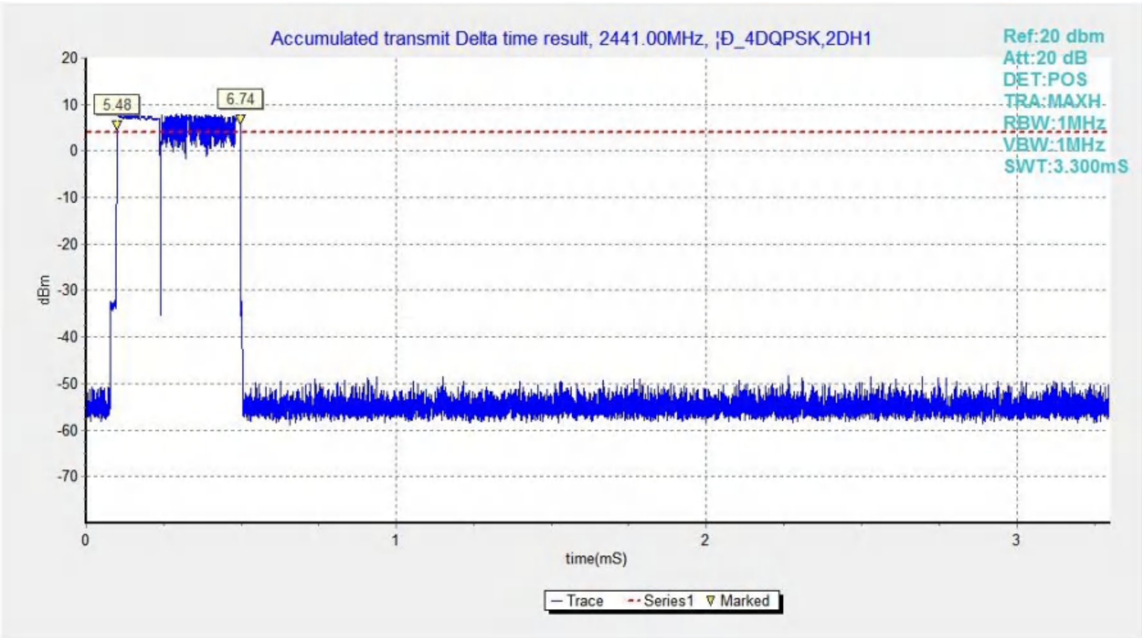


Fig.70. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH1

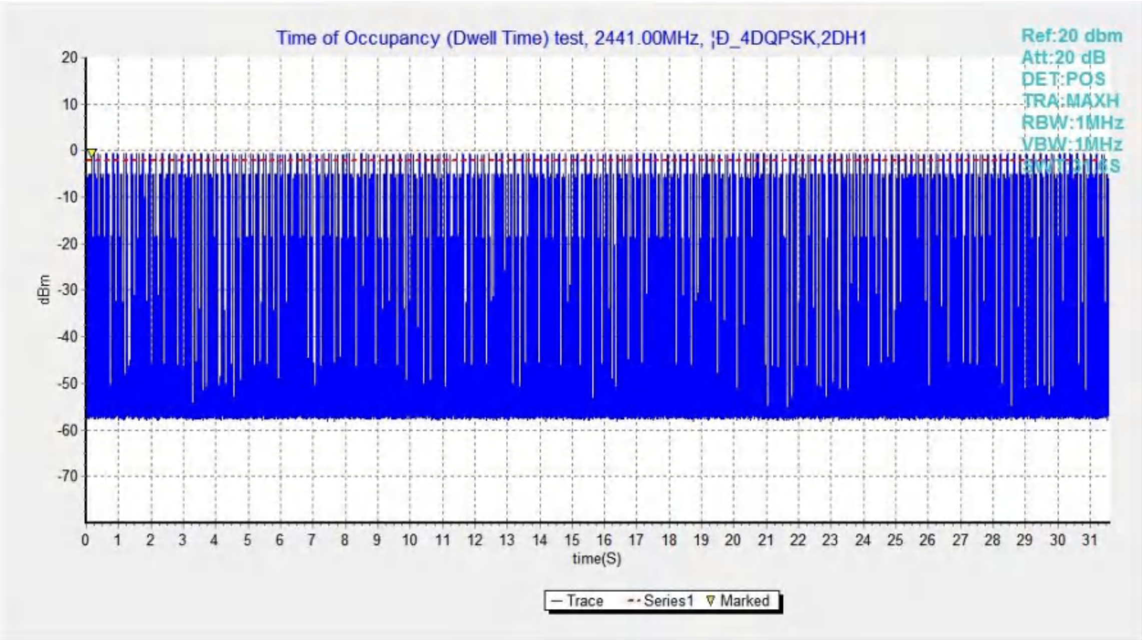


Fig.71. Number of Transmissions Measurement: Channel 39,Packet 2-DH1

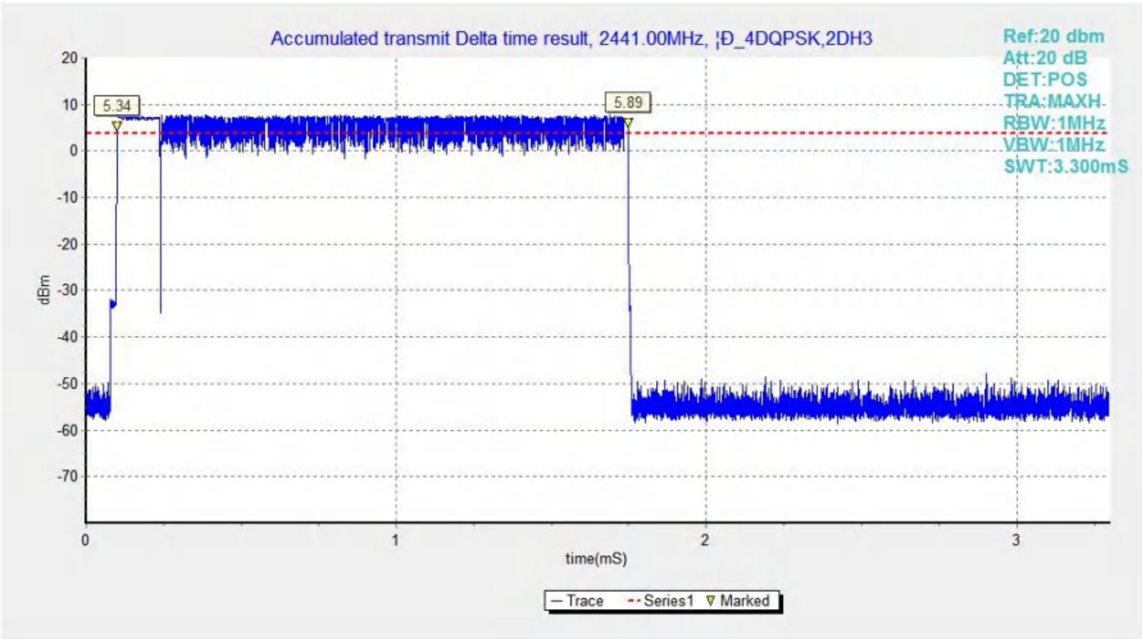


Fig.72. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH3

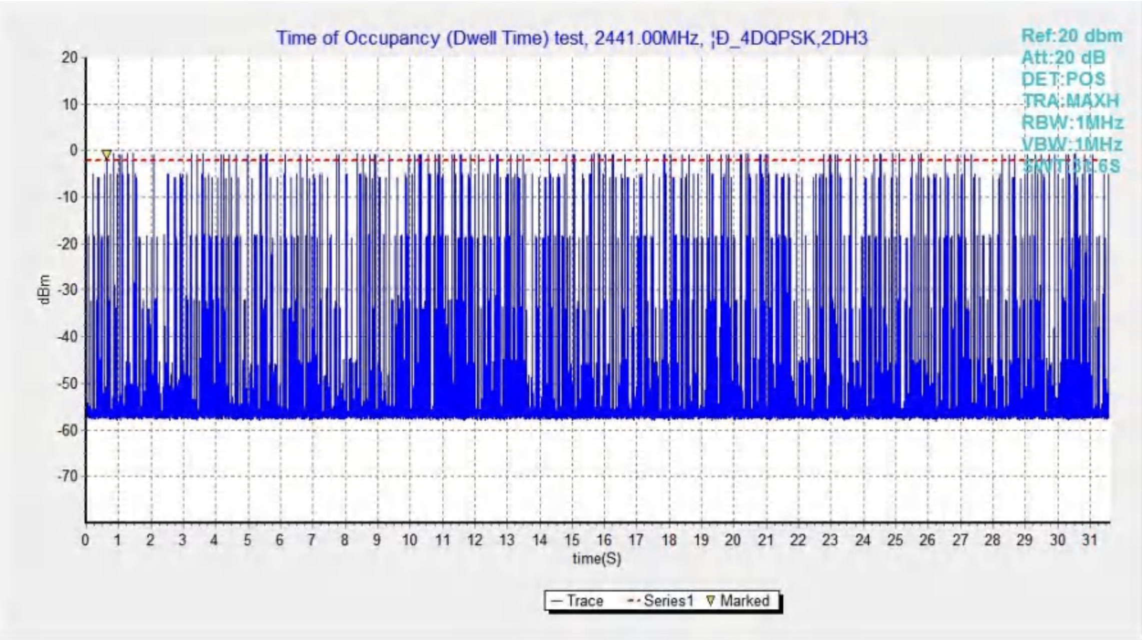


Fig.73. Number of Transmissions Measurement: Channel 39,Packet 2-DH3

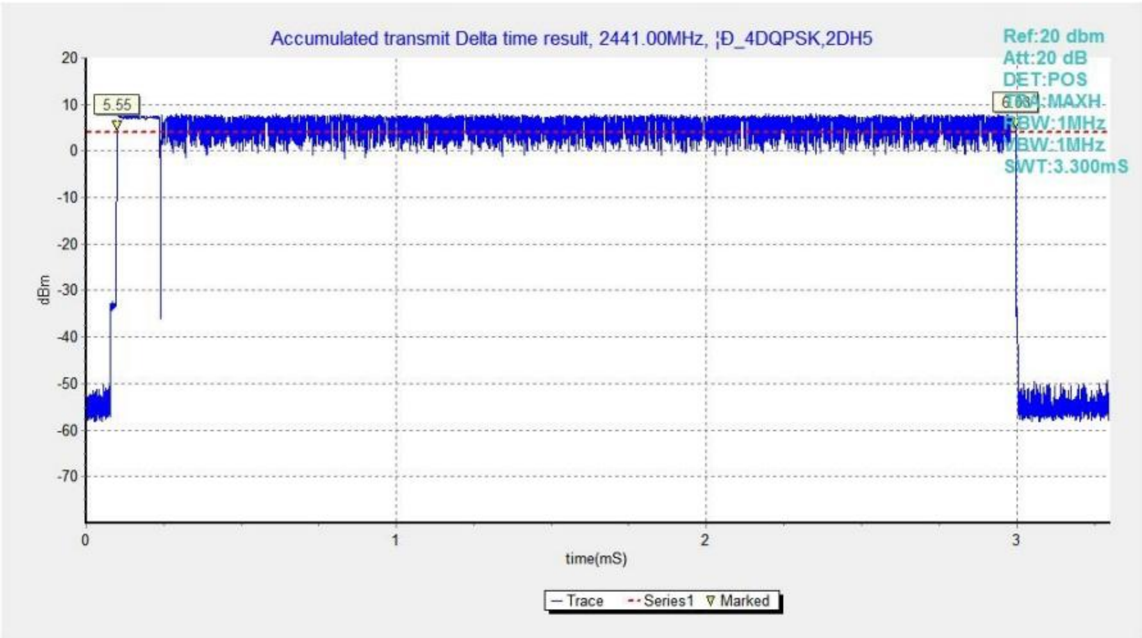


Fig.74. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH5

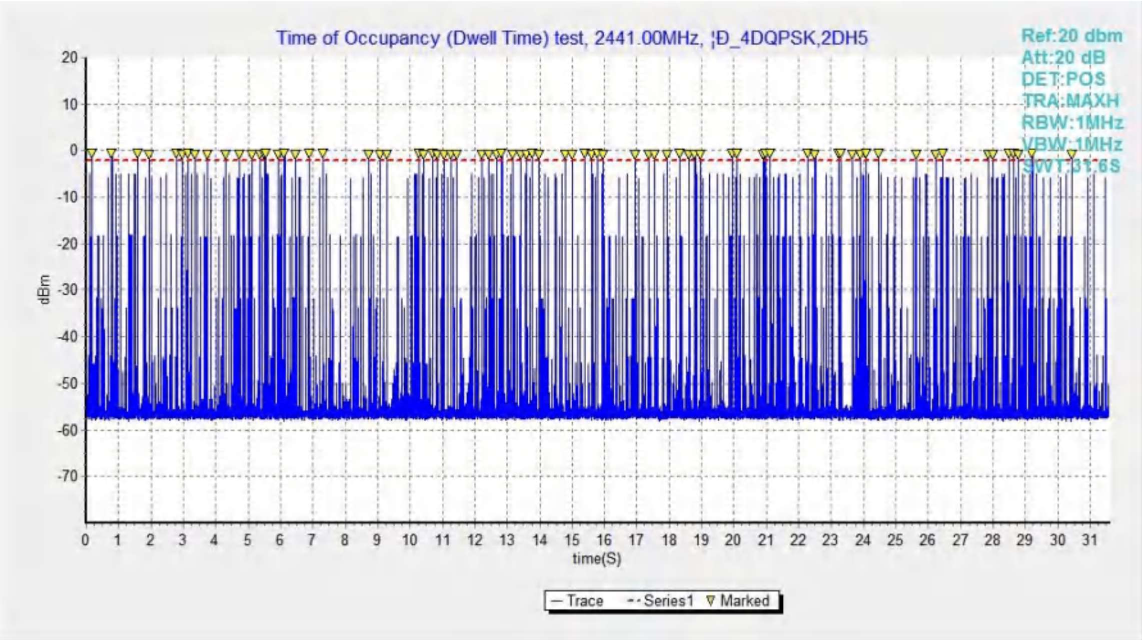


Fig.75. Number of Transmissions Measurement: Channel 39,Packet 2-DH5

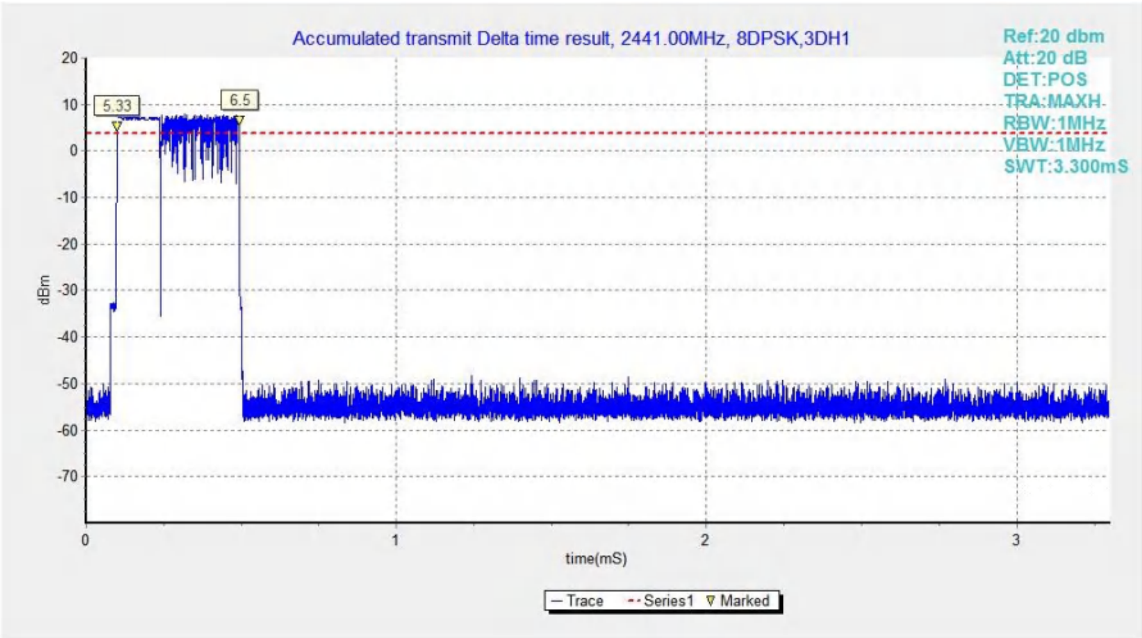


Fig.76. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH1

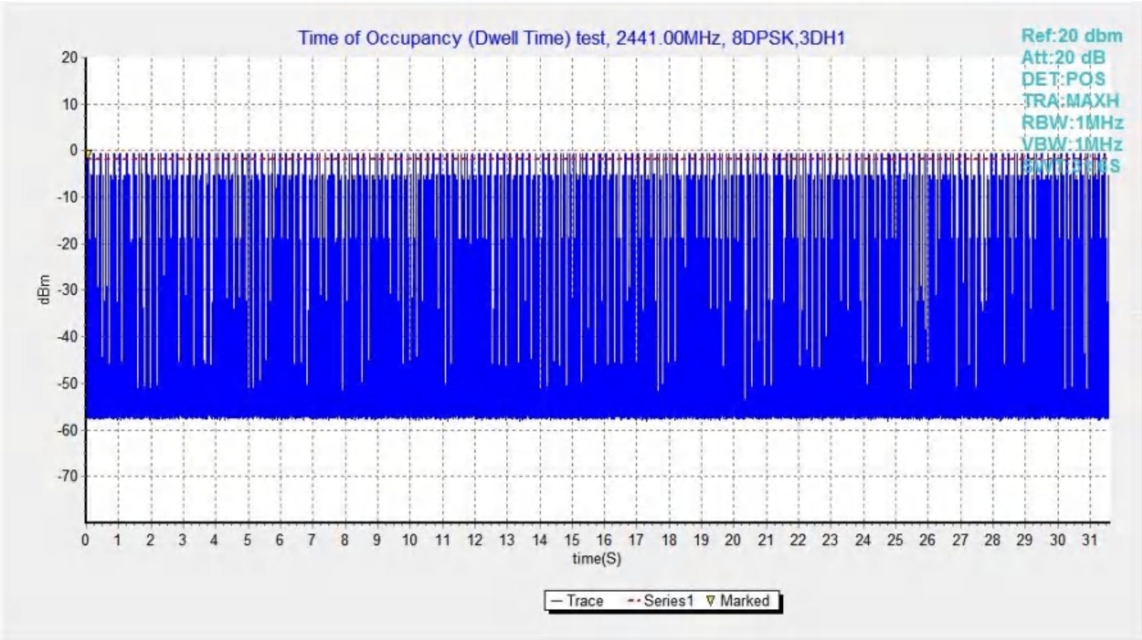


Fig.77. Number of Transmissions Measurement: Channel 39,Packet 3-DH1

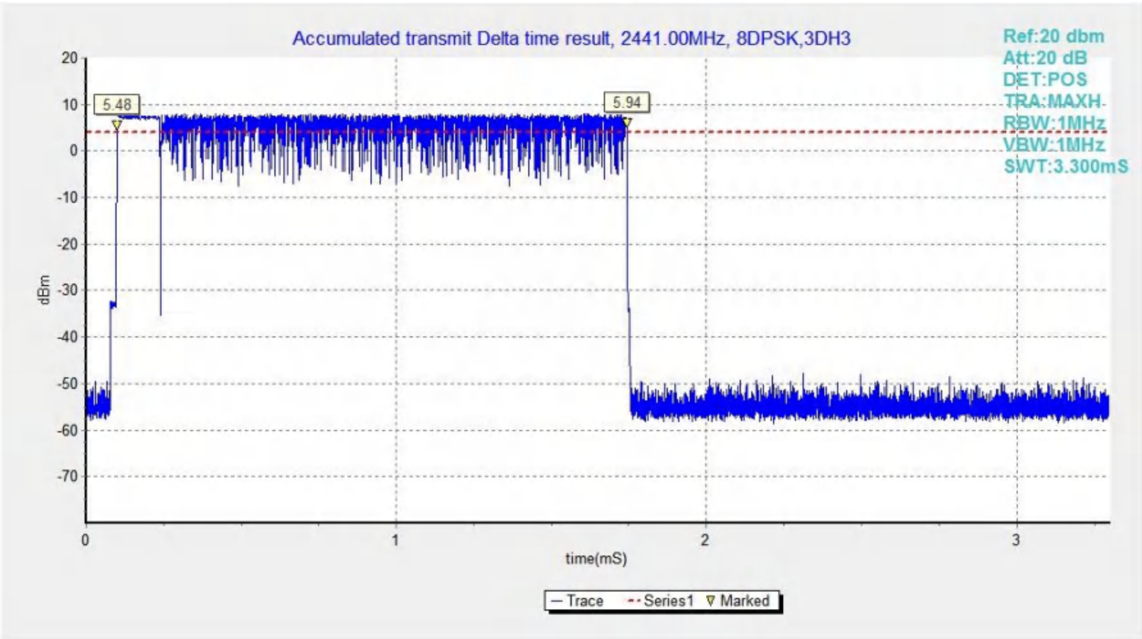


Fig.78. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH3

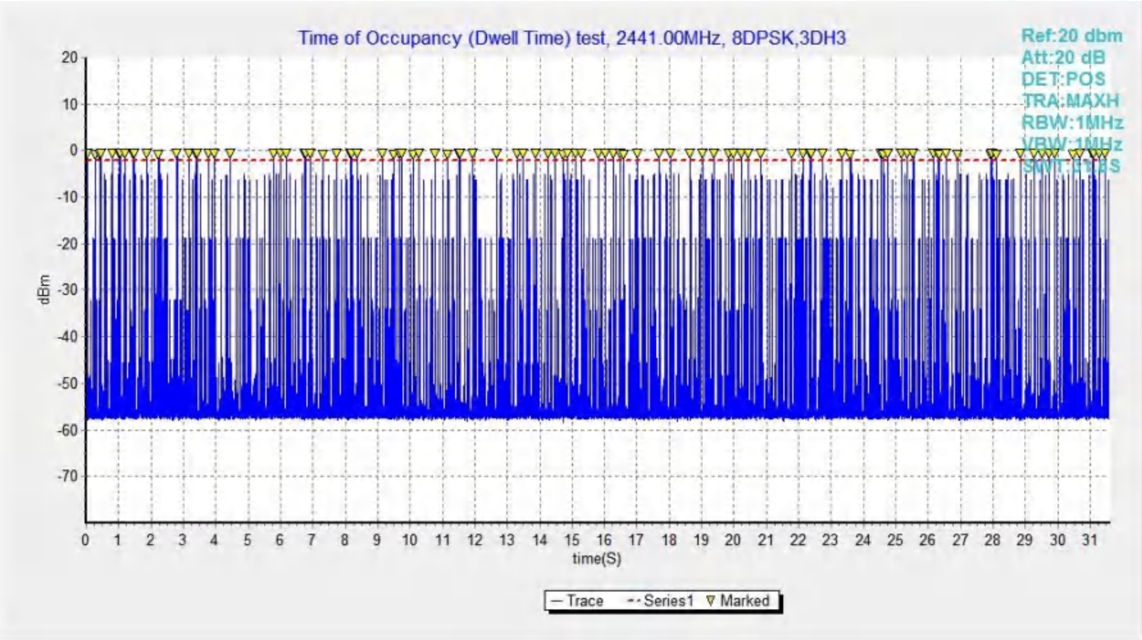


Fig.79. Number of Transmissions Measurement: Channel 39,Packet 3-DH3

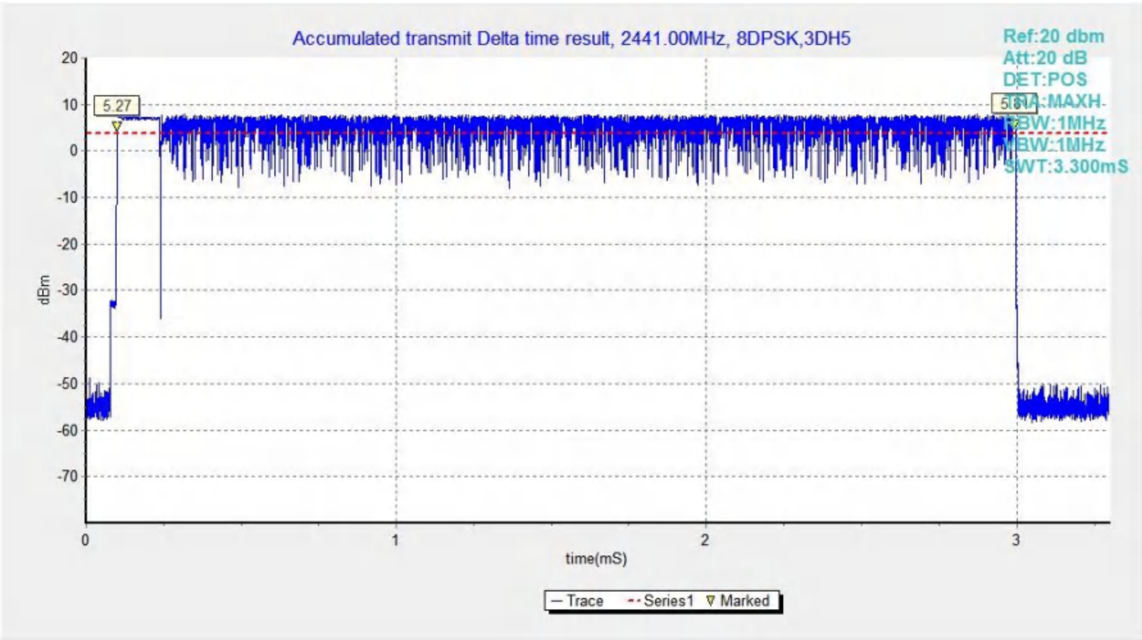


Fig.80. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH5

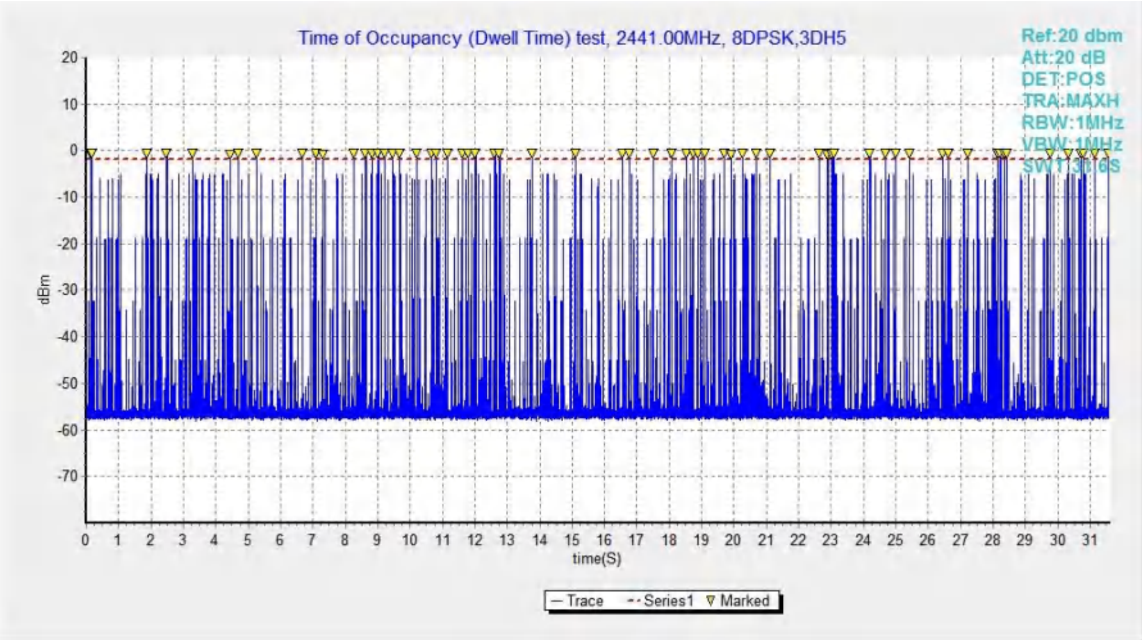


Fig.81. Number of Transmissions Measurement: Channel 39,Packet 3-DH5

B.7. 20dB Bandwidth

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

Measurement Procedure - Unwanted Emissions

1. Set RBW = 30kHz.

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.82	937.50	NA
39	Fig.83	935.25	NA
78	Fig.84	939.00	NA

For π/4 DQPSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.85	1284.00	NA
39	Fig.86	1297.50	NA
78	Fig.87	1308.00	NA

For 8DPSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.88	1284.75	NA
39	Fig.89	1298.25	NA
78	Fig.90	1287.75	NA

Conclusion: NA

Test graphs as below:

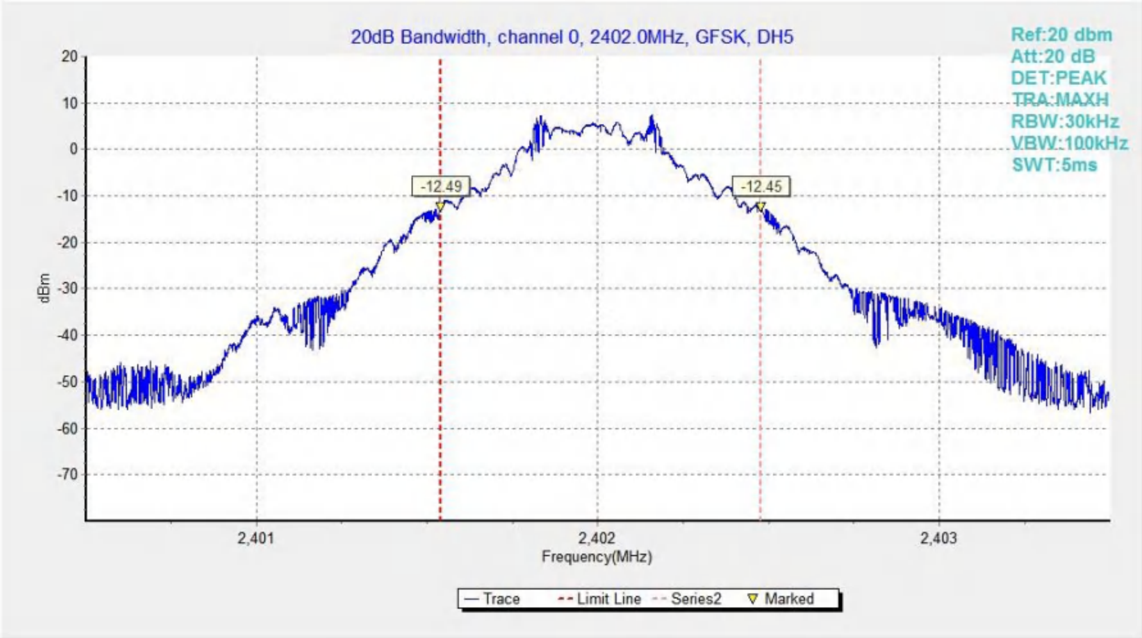


Fig.82. 20dB Bandwidth: GFSK, Channel 0

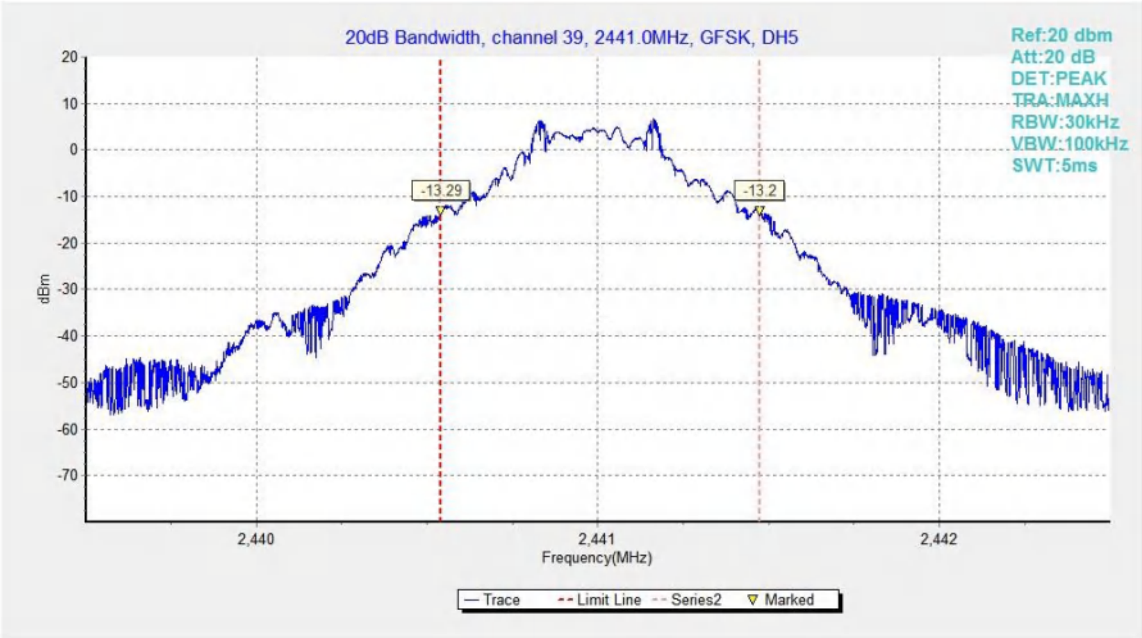


Fig.83. 20dB Bandwidth: GFSK, Channel 39

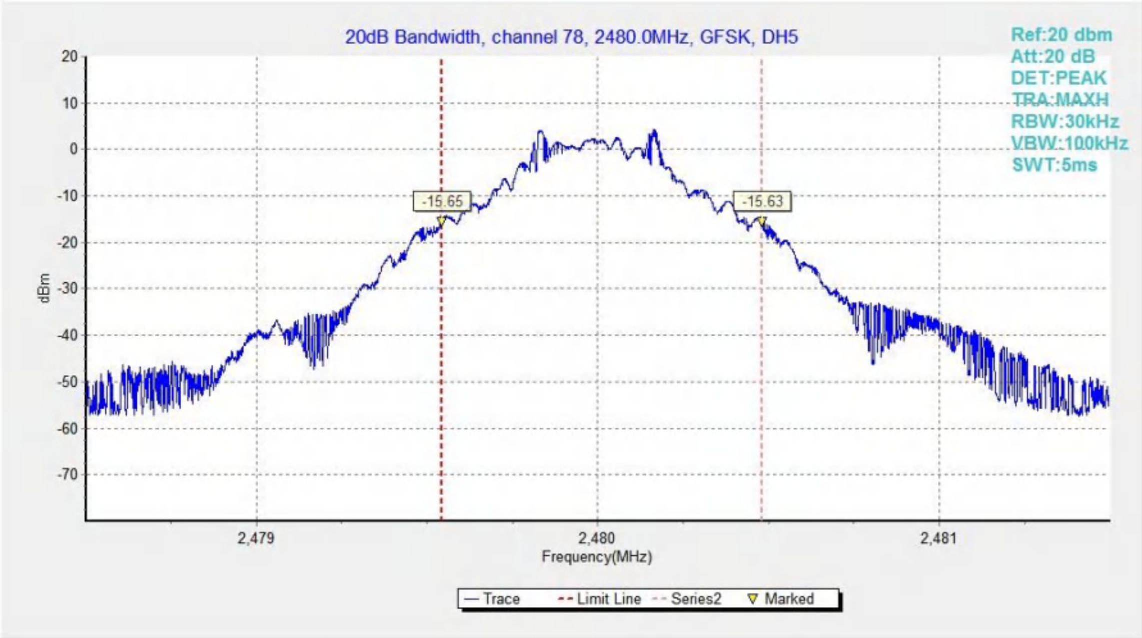


Fig.84. 20dB Bandwidth: GFSK, Channel 78

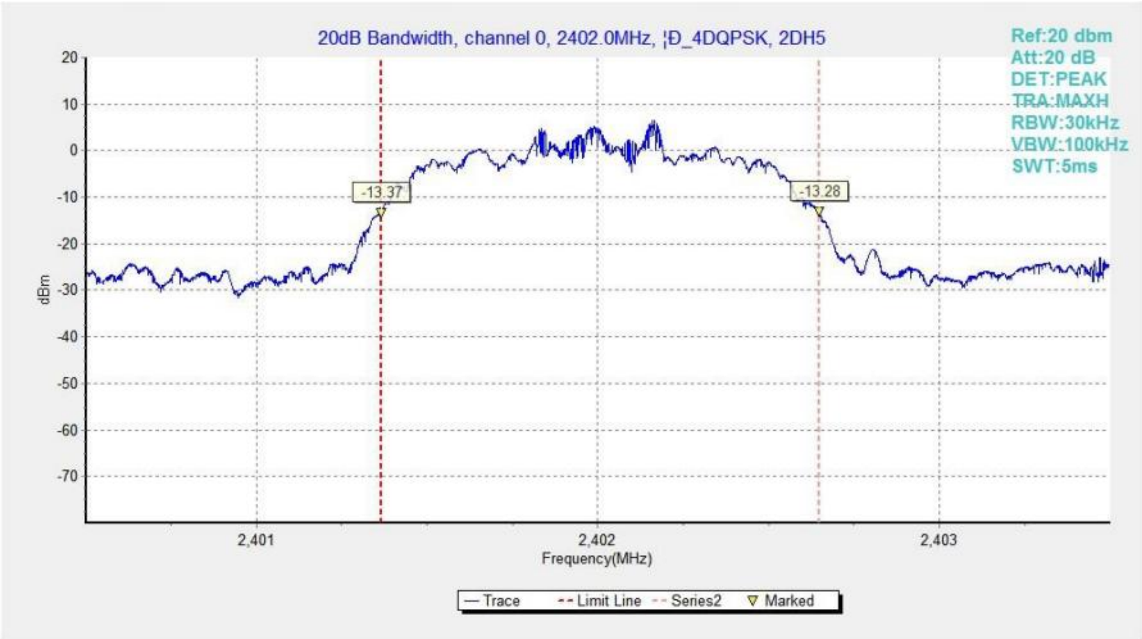


Fig.85. 20dB Bandwidth: π/4 DQPSK, Channel 0

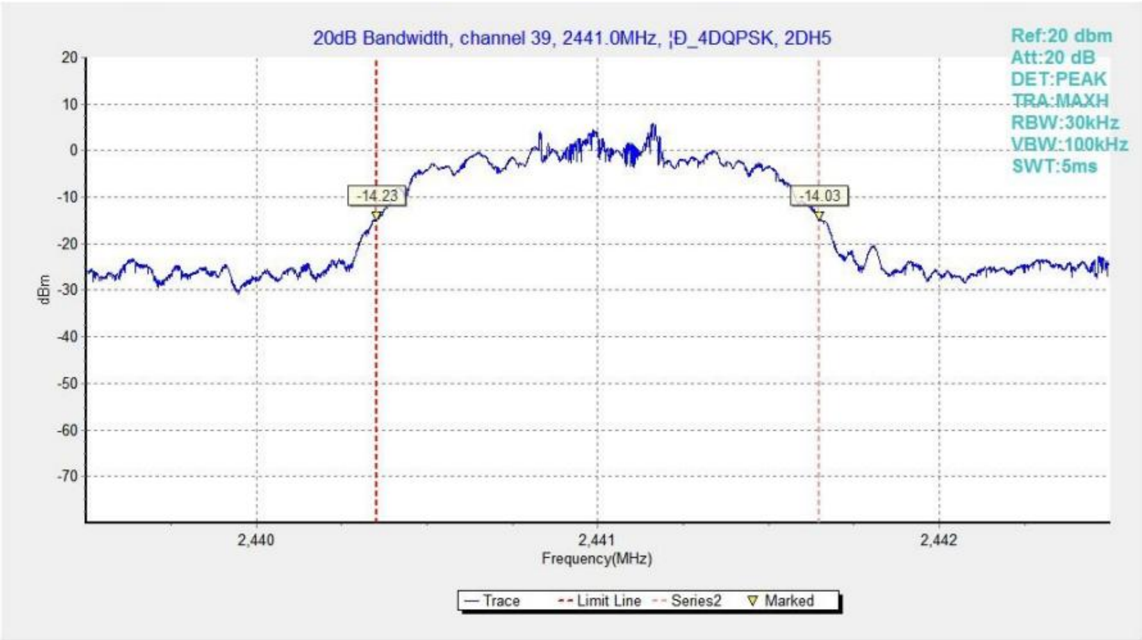


Fig.86. 20dB Bandwidth: π/4 DQPSK, Channel 39

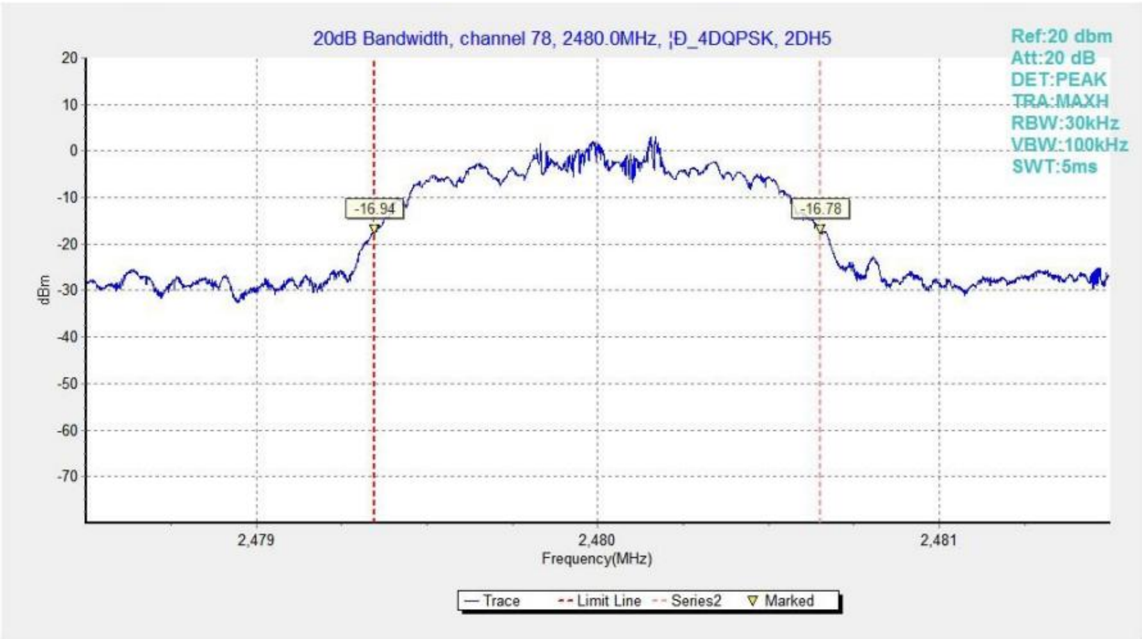


Fig.87. 20dB Bandwidth: π/4 DQPSK, Channel 78

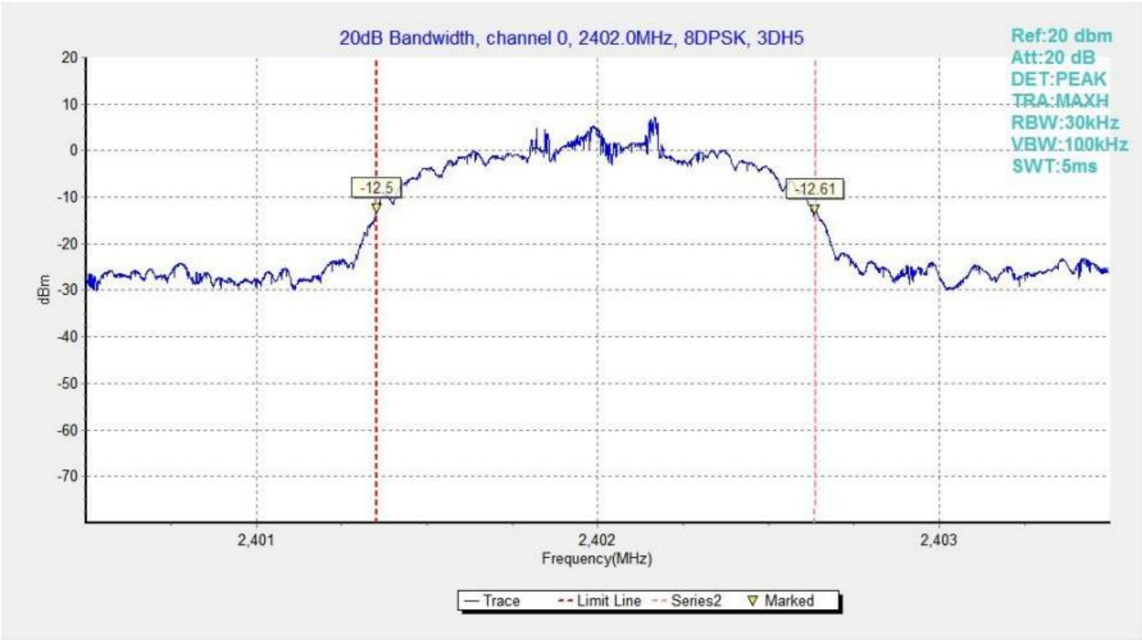


Fig.88. 20dB Bandwidth: 8DPSK, Channel 0

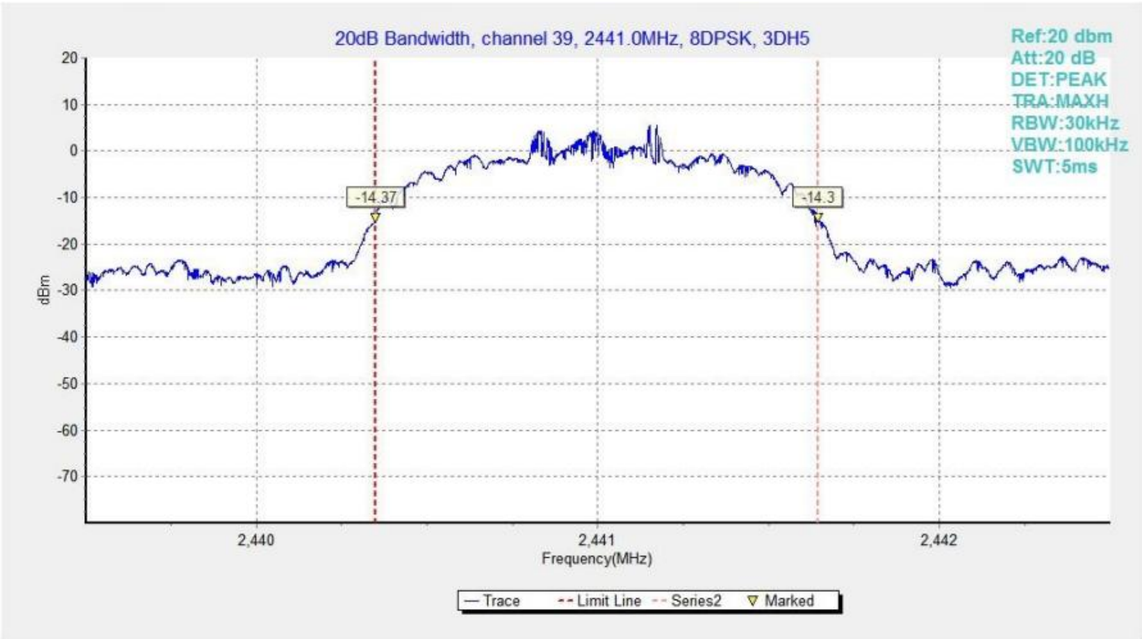


Fig.89. 20dB Bandwidth: 8DPSK, Channel 39

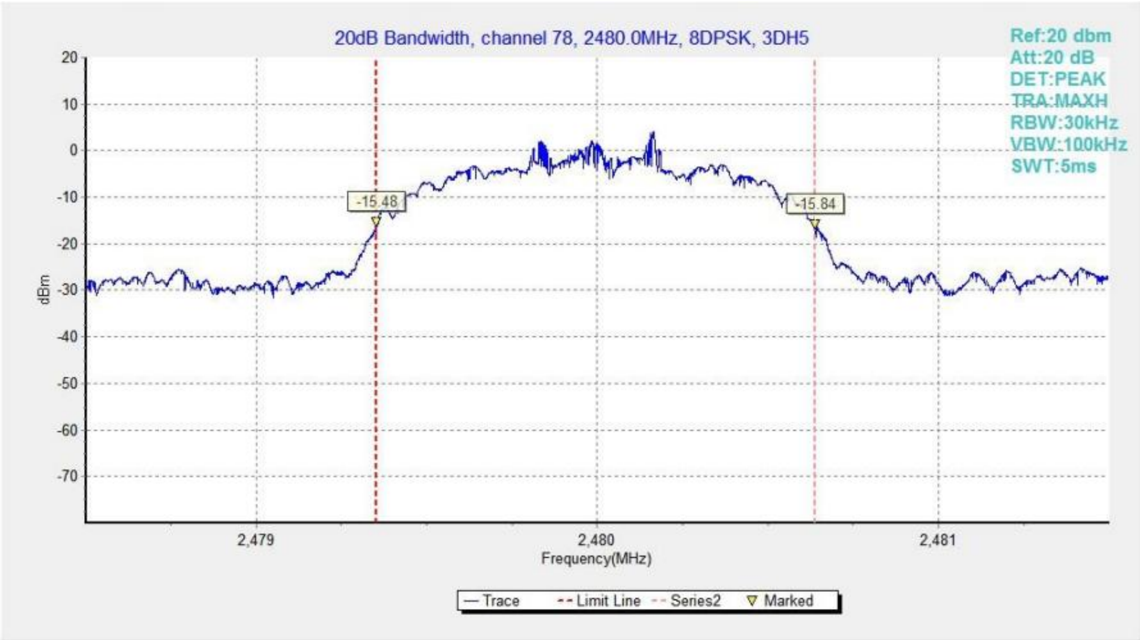


Fig.90. 20dB Bandwidth: 8DPSK, Channel 78

B.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=300kHz
- 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) * 20dB bandwidth, whichever is greater.

Measurement Limit:

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

Measurement Result:

For GFSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.91	1185.75	P

For π/4 DQPSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.92	1007.25	P

For 8DPSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.93	993.75	P

Conclusion: PASS

Test graphs as below:

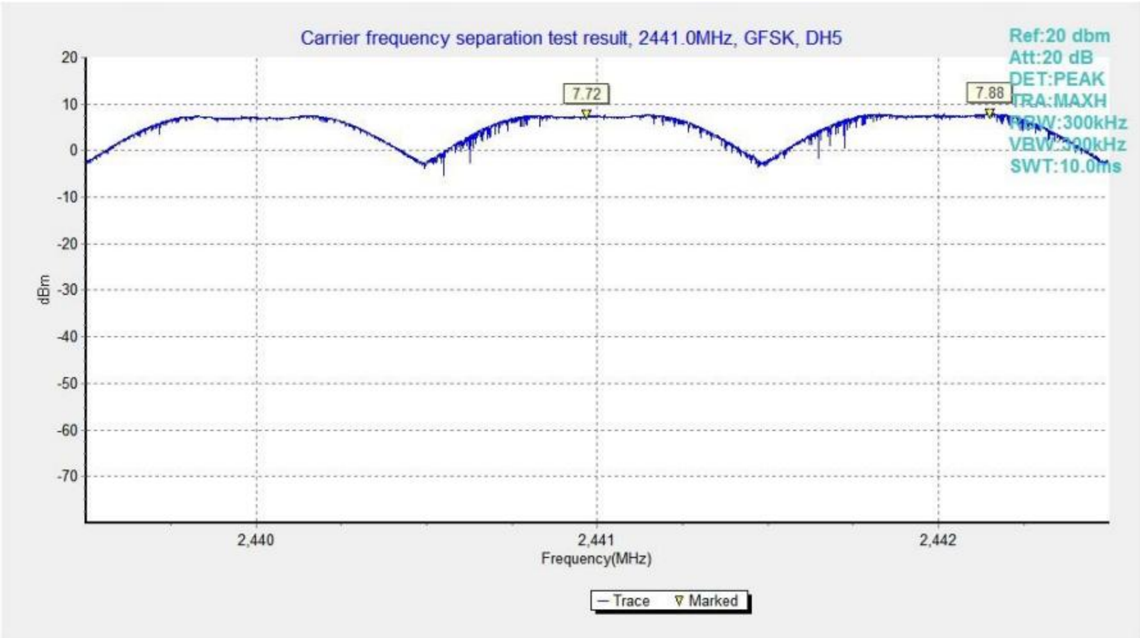


Fig.91. Carrier frequency separation measurement: GFSK, Channel 39

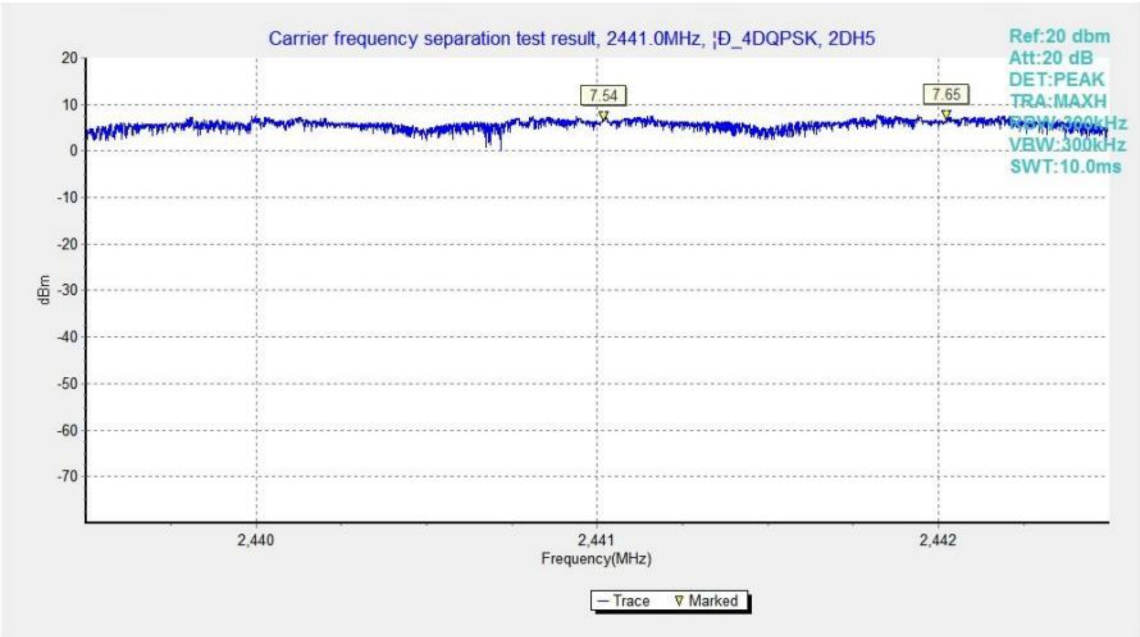


Fig.92. Carrier frequency separation measurement: π/4 DQPSK, Channel 39

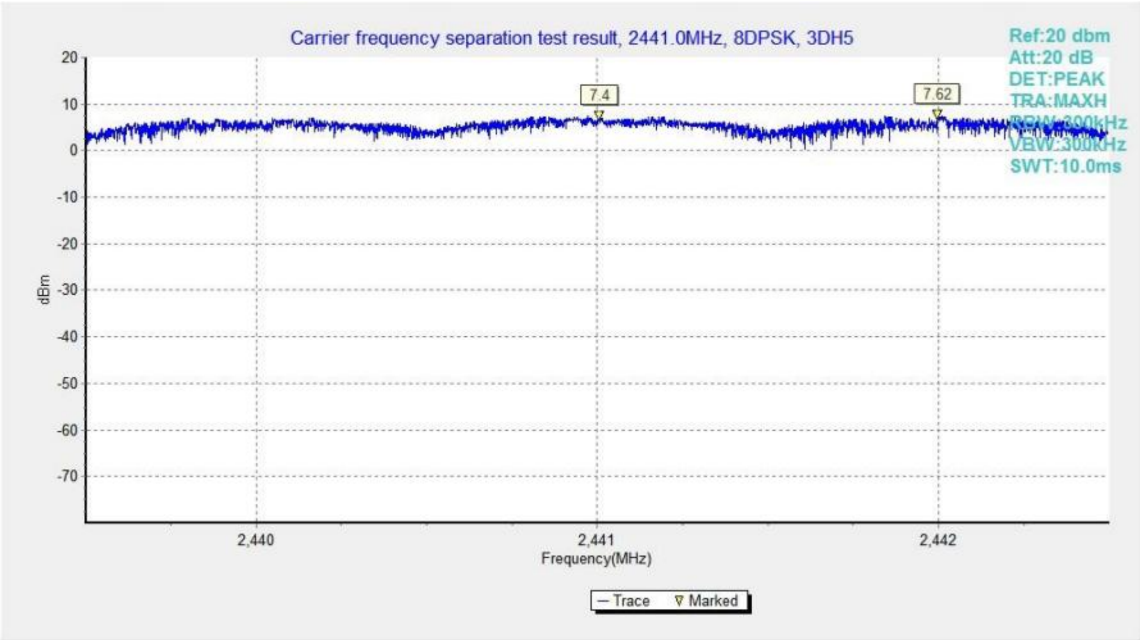


Fig.93. Carrier frequency separation measurement: 8DPSK, Channel 39

B.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

<table>
<tr><th>Channel</th><th colspan="2">Number of hopping channels</th><th>Conclusion</th></tr>
<tr><td>0~39</td><td>Fig.94</td><td rowspan="2">79</td><td rowspan="2">P</td></tr>
<tr><td>40~78</td><td>Fig.95</td></tr>
</table>

Forπ/4 DQPSK

<table>
<tr><th>Channel</th><th colspan="2">Number of hopping channels</th><th>Conclusion</th></tr>
<tr><td>0~39</td><td>Fig.96</td><td rowspan="2">79</td><td rowspan="2">P</td></tr>
<tr><td>40~78</td><td>Fig.97</td></tr>
</table>

For 8DPSK

<table>
<tr><th>Channel</th><th colspan="2">Number of hopping channels</th><th>Conclusion</th></tr>
<tr><td>0~39</td><td>Fig.98</td><td rowspan="2">79</td><td rowspan="2">P</td></tr>
<tr><td>40~78</td><td>Fig.99</td></tr>
</table>

Conclusion: PASS

Test graphs as below:

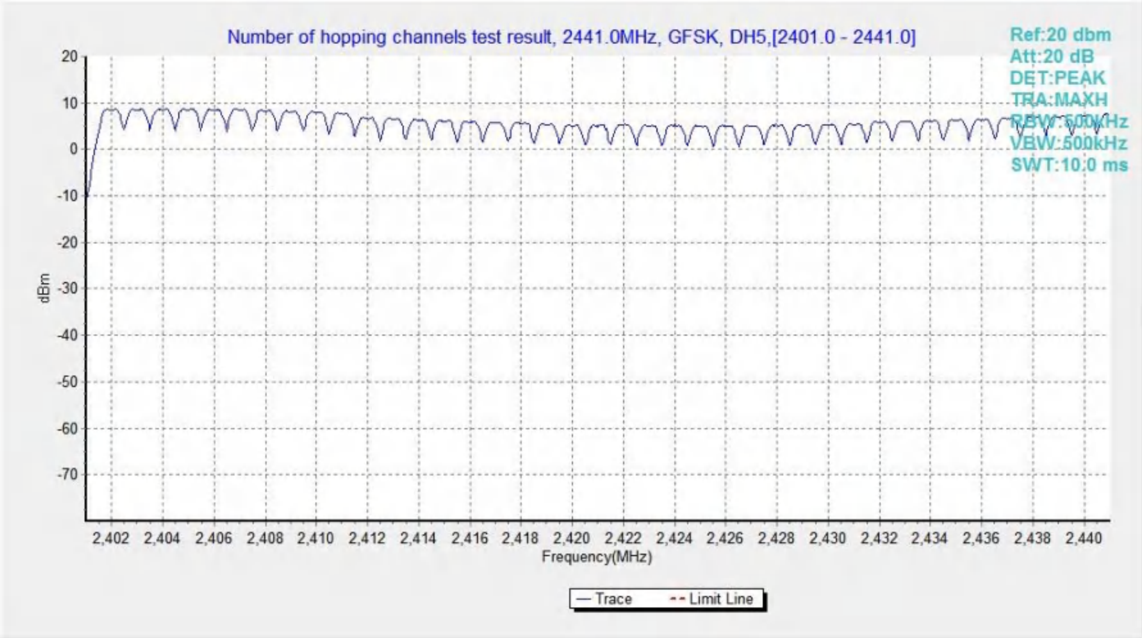


Fig.94. Number of hopping frequencies: GFSK, Channel 0 - 39

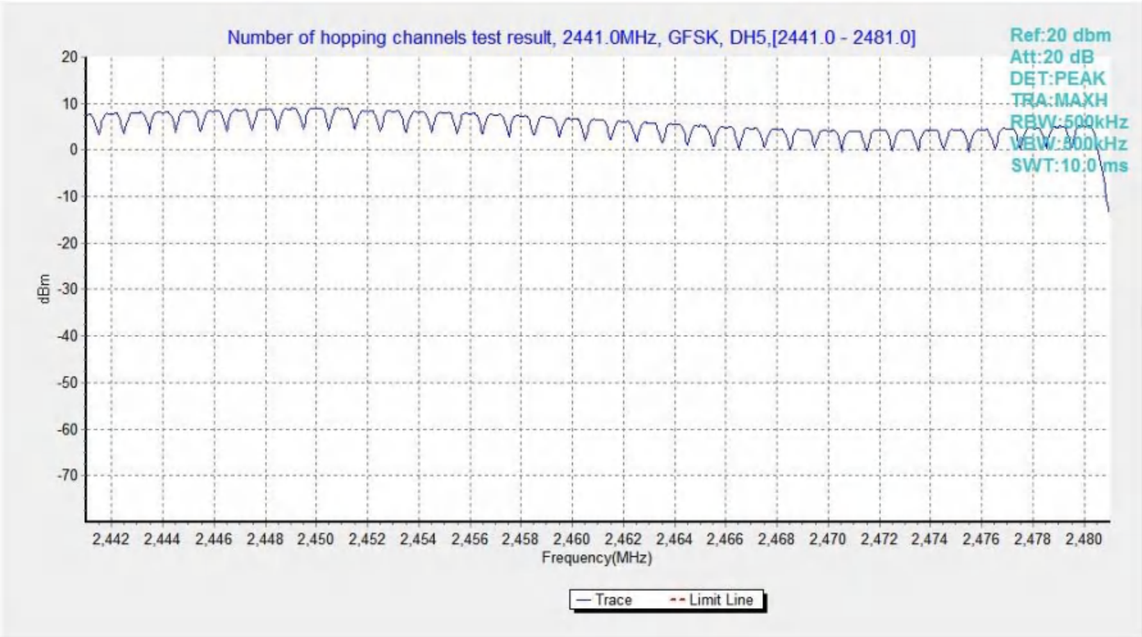


Fig.95. Number of hopping frequencies: GFSK, Channel 40 - 78

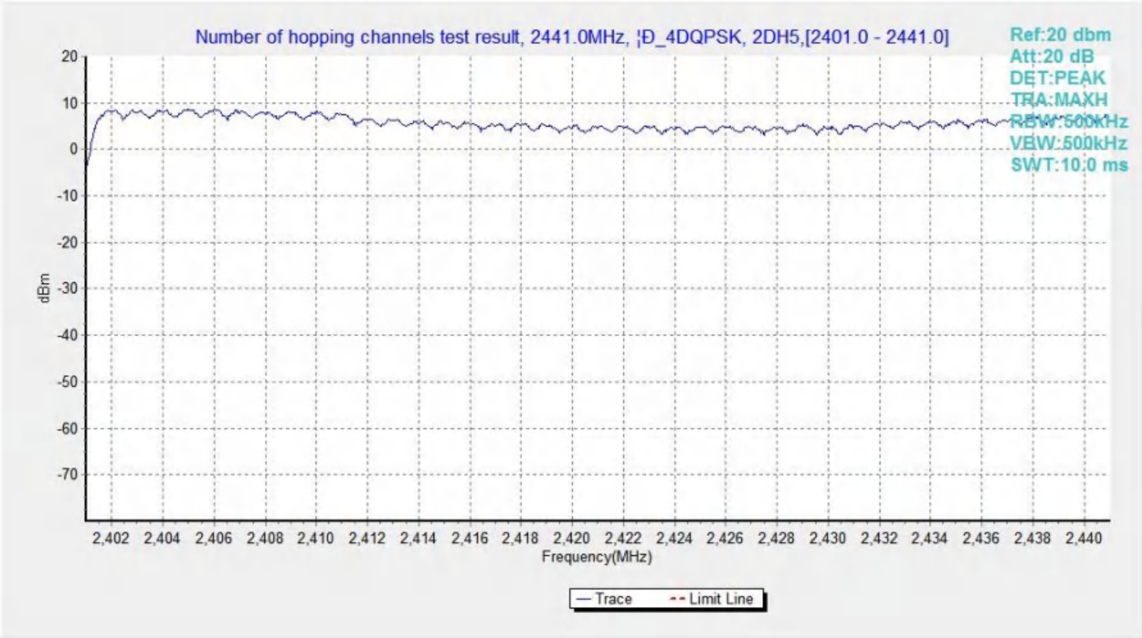


Fig.96. Number of hopping frequencies: π/4 DQPSK, Channel 0 - 39

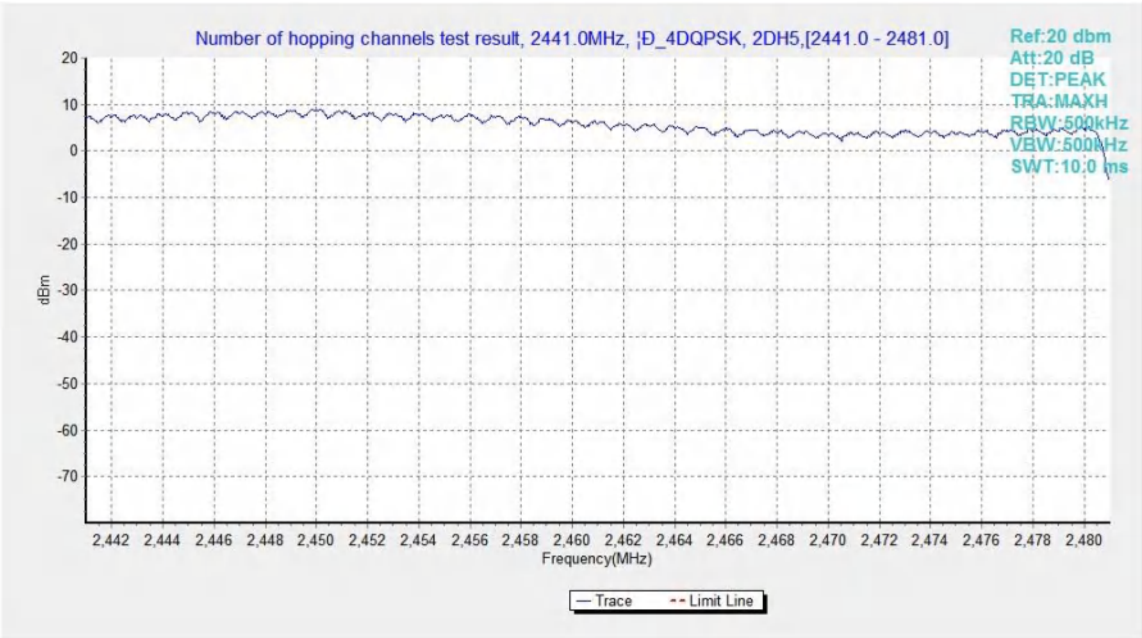


Fig.97. Number of hopping frequencies: π/4 DQPSK, Channel 40 - 78

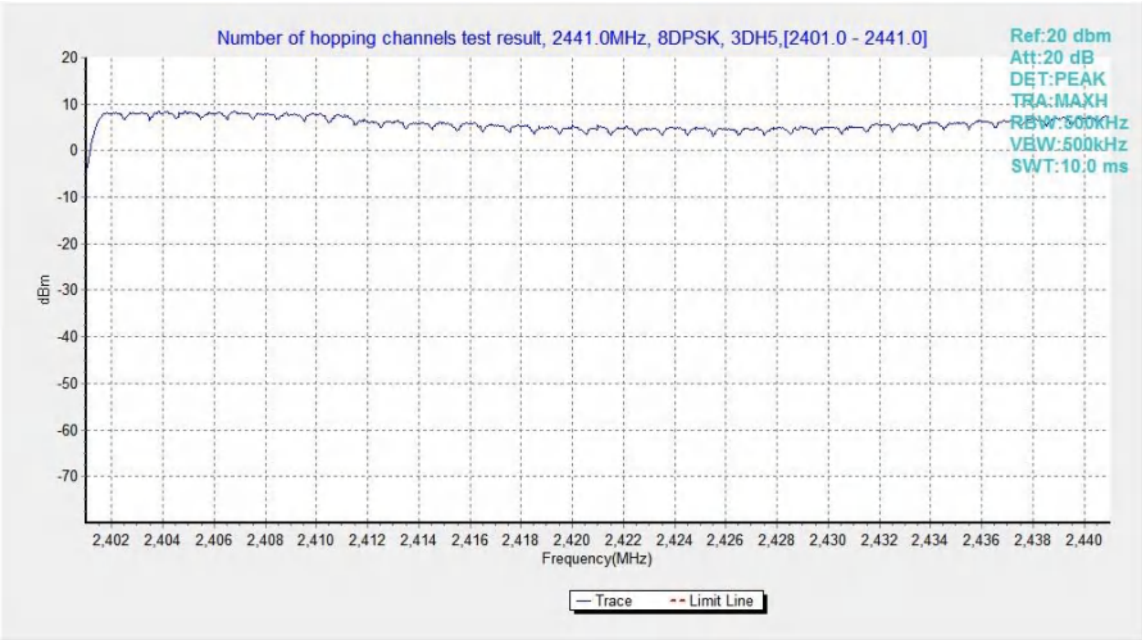


Fig.98. Number of hopping frequencies: 8DPSK, Channel 0 - 39

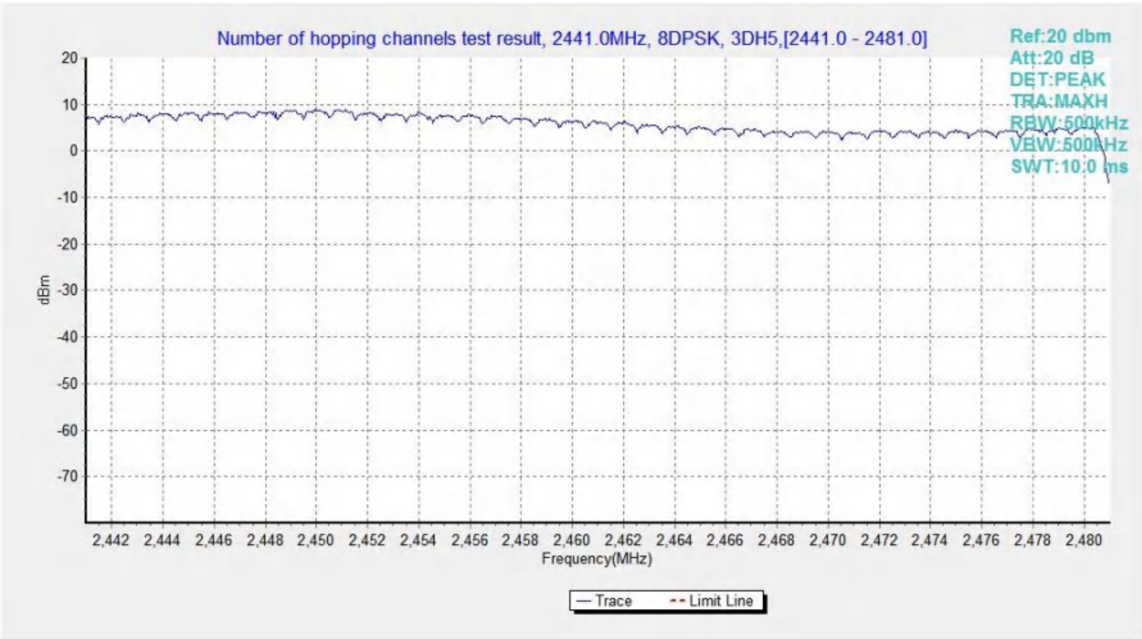


Fig.99. Number of hopping frequencies: 8DPSK, Channel 40 - 78

B.10. AC Powerline Conducted Emission

Summary

All AC line conducted spurious emissions are measured with a receiver connected to a grounded LISN while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for conducted spurious emissions. Only the conducted emissions of the configuration that produced the worst case emissions are reported in this section

Method of Measurement:

See Clause 6.2 of ANSI C63.10 specifically.

See Clause 4 and Clause 5 of ANSI C63.10 generally.

The conducted emissions from the AC port of the EUT are measured in a shielding room. The EUT is connected to a Line Impedance Stabilization Network (LISN). An overview sweep with peak detection was performed. The measurements were performed with a quasi-peak detector and if required, an average detector.

The conducted emission measurements were made with the following detector of the test receiver: Quasi-Peak / Average Detector.

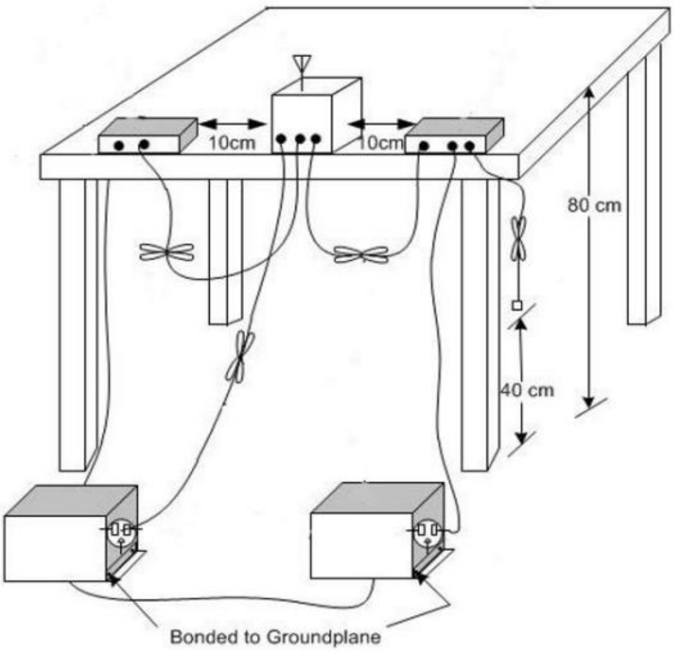
The measurement bandwidth is:

Frequency of Emission (MHz)	RBW/IF bandwidth
0.15-30	9kHz

Test Condition:

Voltage（V）	Frequency（Hz）
120	60

Test setup



Measurement Result and limit:

Bluetooth (Quasi-peak Limit)

Frequency range (MHz)	Quasi-peak Limit (dBμV)	Result (dBμV) With charger bluetooth	Result (dBμV) With charger Idle	Conclusion
0.15 to 0.5	66 to 56	Fig.B.10.1	Fig. B.10.2	**P**
0.5 to 5	56			
5 to 30	60			
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.				

Bluetooth (Average Limit)

Frequency range (MHz)	Average Limit (dBμV)	Result (dBμV) With charger bluetooth	Result (dBμV) With charger Idle	Conclusion
0.15 to 0.5	56 to 46	Fig.B.10.1	Fig. B.10.2	**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.				

Conclusion: Pass

Test graphs as below:

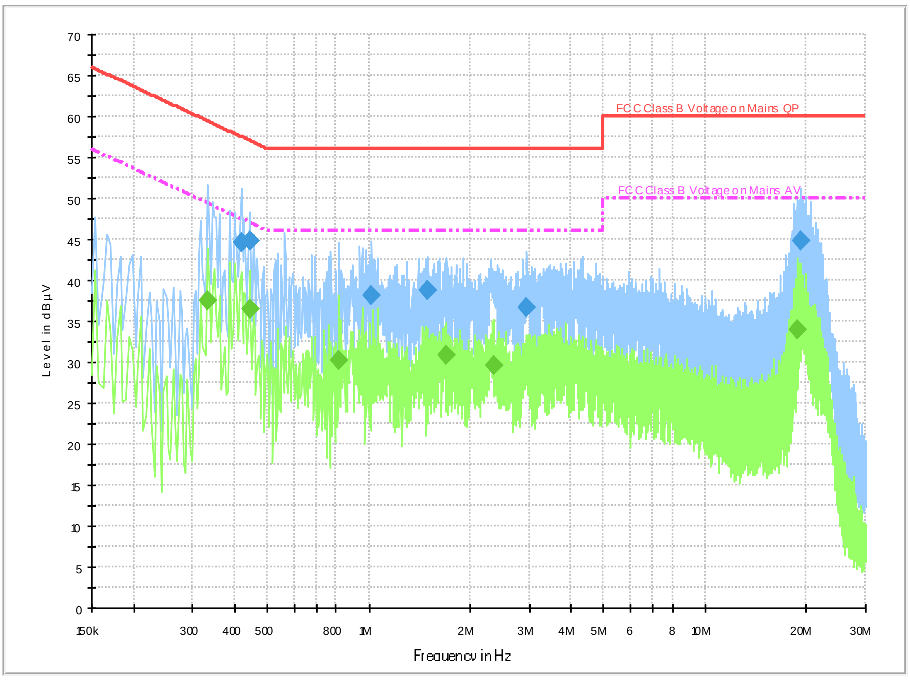


Fig.B.10.1 AC Powerline Conducted Emission- bluetooth

Note: The graphic result above is the maximum of the measurements for both phase line and neutral line.

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.418000	**44.6**	**2000.0**	**9.000**	**On**	**N**	**19.7**	**12.9**	**57.5**	
0.442000	**44.7**	**2000.0**	**9.000**	**On**	**N**	**19.7**	**12.3**	**57.0**	
1.022000	**38.2**	**2000.0**	**9.000**	**On**	**L1**	**19.7**	**17.8**	**56.0**	
1.490000	**38.7**	**2000.0**	**9.000**	**On**	**N**	**19.6**	**17.3**	**56.0**	
2.958000	**36.7**	**2000.0**	**9.000**	**On**	**N**	**19.6**	**19.3**	**56.0**	
19.214000	**44.7**	**2000.0**	**9.000**	**On**	**L1**	**19.7**	**15.3**	**60.0**	

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.330000	**37.5**	**2000.0**	**9.000**	**On**	**N**	**19.6**	**11.9**	**49.5**	
0.442000	**36.4**	**2000.0**	**9.000**	**On**	**L1**	**19.7**	**10.6**	**47.0**	
0.814000	**30.2**	**2000.0**	**9.000**	**On**	**N**	**19.7**	**15.8**	**46.0**	
1.694000	**30.8**	**2000.0**	**9.000**	**On**	**N**	**19.6**	**15.2**	**46.0**	
2.354000	**29.7**	**2000.0**	**9.000**	**On**	**L1**	**19.6**	**16.3**	**46.0**	
18.870000	**34.0**	**2000.0**	**9.000**	**On**	**L1**	**19.7**	**16.0**	**50.0**	

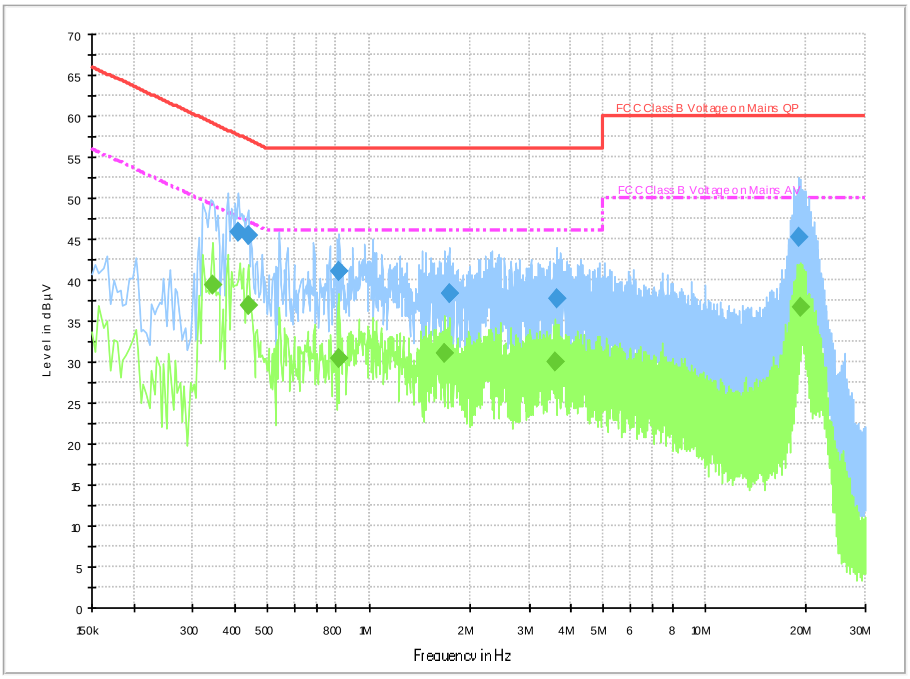


Fig.B.10.2 AC Powerline Conducted Emission-Idle

Note: The graphic result above is the maximum of the measurements for both phase line and neutral line.

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.410000	**45.8**	**2000.0**	**9.000**	**On**	**N**	**19.7**	**11.9**	**57.6**	
0.438000	**45.4**	**2000.0**	**9.000**	**On**	**N**	**19.7**	**11.7**	**57.1**	
0.818000	**41.0**	**2000.0**	**9.000**	**On**	**L1**	**19.7**	**15.0**	**56.0**	
1.730000	**38.4**	**2000.0**	**9.000**	**On**	**L1**	**19.6**	**17.6**	**56.0**	
3.642000	**37.7**	**2000.0**	**9.000**	**On**	**L1**	**19.6**	**18.3**	**56.0**	
19.062000	**45.3**	**2000.0**	**9.000**	**On**	**L1**	**19.7**	**14.7**	**60.0**	

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.342000	**39.4**	**2000.0**	**9.000**	**On**	**N**	**19.7**	**9.8**	**49.2**	
0.438000	**37.0**	**2000.0**	**9.000**	**On**	**N**	**19.7**	**10.1**	**47.1**	
0.810000	**30.3**	**2000.0**	**9.000**	**On**	**N**	**19.7**	**15.7**	**46.0**	
1.674000	**31.1**	**2000.0**	**9.000**	**On**	**N**	**19.6**	**14.9**	**46.0**	
3.574000	**29.9**	**2000.0**	**9.000**	**On**	**N**	**19.6**	**16.1**	**46.0**	
19.226000	**36.7**	**2000.0**	**9.000**	**On**	**L1**	**19.7**	**13.3**	**50.0**	

B.11. Antenna Requirement

The antenna of the device is permanently attached. There are no provisions for connection to an external antenna.
The unit complies with the requirement of FCC Part 15.203.

ANNEX C: Accreditation Certificate

ilac-MRA A2LA

Accredited Laboratory

A2LA has accredited

TELECOMMUNICATION TECHNOLOGY LABS, CAICT

Beijing, 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 17025:2017 *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 April 2017*).

Presented this 26th day of June 2023.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 7049.01
Valid to July 31, 2024

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

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