# FCC PART 15C
# TEST REPORT
# No. I17N00290-BT

**For**

**Doro AB**

**LTE phone**

**Model Name: DSB-0090**

**With**

**Hardware Version: 1011**

**Software Version: FRANK01A-S10A_DSB0090_201_USER_170503**

**FCC ID: WS5DSB0090**

**Issued Date: 2017-05-05**

**Test Laboratory:**

***FCC 2.948 Listed: No.342690***

**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, Academy of Telecommunication Research, MIIT.

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

Tel: +86(0)10-62304633-2512, Fax: +86(0)10-62304633-2504

Email: cttl_terminals@catr.cn, website: www.chinattl.com

## REPORT HISTORY

| Report Number | Revision | Description | Issue Date |
|---|---|---|---|
| I17N00290-BT | Rev.0 | 1st edition | 2017-05-05 |

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# 1. Test Laboratory

## 1.1. Testing Location

Location: CTTL(South Branch)

Address: TCL International E city, No. 1001, Zhongshanyuan Road, Nanshan District, Shenzhen, Guangdong, China 518000

## 1.2. Testing Environment

Normal Temperature: 15-35℃

Relative Humidity: 20-75%

## 1.3. Project data

Testing Start Date: 2017-03-21

Testing End Date: 2017-04-26

## 1.4. Signature

**Lin Kanfeng**

**(Prepared this test report)**

**Tang Weisheng**

**(Reviewed this test report)**

**Zhang Bojun**

**(Approved this test report)**

# 2. Client Information

## 2.1. Applicant Information

| | |
|---|---|
| Company Name: | Doro AB |
| Address: | Magistratsvägen 10 SE-226 43 Lund Sweden |
| City: | Lund |
| Postal Code: | / |
| Country: | Sweden |
| Telephone: | +46 46 280 5000 |
| Fax: | +46 46 280 5001 |

## 2.2. Manufacturer Information

| | |
|---|---|
| Company Name: | CK TELECOM LTD. |
| Address: | Technology Road. High-Tech Development Zone. Heyuan, Guangdong, P.R. China |
| City: | Heyuan |
| Postal Code: | / |
| Country: | China |
| Telephone: | 0755-26739100 ext.8515 |
| Fax: | 0755-26739600 |

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

## 3.1. About EUT

| | |
|---|---|
| Description | LTE phone |
| Model Name | DSB-0090 |
| Market Name | Doro8040 |
| Frequency Band | 2402MHz~2480MHz |
| Type of Modulation | GFSK/π /4 DQPSK/8DPSK |
| Number of Channels | 79 |
| FCC ID | WS5DSB0090 |

## 3.2. Internal Identification of EUT

| EUT ID* | IMEI | HW Version | SW Version | Receive Date |
|---|---|---|---|---|
| EUT1 | 355115080003723 | 1011 | FRANK01A-S10A_DSB0090_201_USER_170503 | 2017-03-21 |

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

## 3.3. Internal Identification of AE

| AE ID* | Description | SN |
|---|---|---|
| AE1 | Charger | / |
| AE2 | Charger | / |

AE1

| | |
|---|---|
| Model | A2-3762-501000 |
| Manufacturer | Dongguan Aohai Power Technology Co., LTD |

AE2

| | |
|---|---|
| Model | A806A-050100U-UK1 |
| Manufacturer | Dongguan Aohai Power Technology Co., LTD |

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

# 4. Reference Documents

## 4.1. Documents supplied by applicant

EUT feature information is supplied by the applicant or manufacturer, which is the basis of testing.

## 4.2. Reference Documents for testing

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

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

# 5. Test Results

## 5.1. Summary of Test Results

| No | Test cases | Sub-clause of Part15C | Verdict |
|---|---|---|---|
| 0 | Antenna Requirement | 15.203 | **P** |
| 1 | Maximum Peak Output Power | 15.247 (b) | **P** |
| 2 | Band Edges Compliance | 15.247 (d) | **P** |
| 3 | Conducted Spurious Emission | 15.247 (d) | **P** |
| 4 | Radiated Spurious Emission | 15.247,15.205,15.209 | **P** |
| 5 | Occupied 20dB bandwidth | 15.247(a) | **/** |
| 6 | Time of Occupancy(Dwell Time) | 15.247(a) | **P** |
| 7 | Number of Hopping Channel | 15.247(a) | **P** |
| 8 | Carrier Frequency Separation | 15.247(a) | **P** |
| 9 | AC Powerline Conducted Emission | 15.107,15.207 | **P** |

See **ANNEX A and ANNEX B** for details.

## 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.

## 5.3. Terms used in the result table

Terms used in Verdict column

| | |
|---|---|
| P | Pass |
| NA | Not Available |
| F | Fail |

Abbreviations

| | |
|---|---|
| AC | Alternating Current |
| AFH | Adaptive Frequency Hopping |
| BW | Band Width |
| E.I.R.P. | equivalent isotropic radiated power |
| ISM | Industrial, Scientific and Medical |
| R&TTE | Radio and Telecommunications Terminal Equipment |
| RF | Radio Frequency |
| Tx | Transmitter |

## 5.4. Laboratory Environment

**Semi-anechoic chamber** did not exceed following limits along the EMC testing

| | |
|---|---|
| Temperature | Min. = 15 ˚C, Max. = 30 ˚C |
| Relative humidity | Min. = 35 %, Max. = 60 % |
| Shielding effectiveness | 0.014MHz - 1MHz, >60dB;<br>1MHz - 1000MHz, >90dB. |
| Electrical insulation | > 2 MΩ |
| Ground system resistance | < 4Ω |
| Normalised site attenuation (NSA) | < ±4dB, 3m/10m distance, from 30 to 1000 MHz |
| Uniformity of field strength | Between 0 and 6 dB, from 80 to 3000 MHz |

**Shielded room** did not exceed following limits along the EMC testing

| | |
|---|---|
| Temperature | Min. = 15 ˚C, Max. = 30 ˚C |
| Relative humidity | Min. = 35 %, Max. = 60 % |
| Shielding effectiveness | 0.014MHz - 1MHz, >60dB;<br>1MHz - 1000MHz, >90dB. |
| Electrical insulation | > 2 MΩ |
| Ground system resistance | < 4 Ω |

**Fully-anechoic chamber** did not exceed following limits along the EMC testing

| | |
|---|---|
| Temperature | Min. = 15 ˚C, Max. = 30 ˚C |
| Relative humidity | Min. = 35 %, Max. = 60 % |
| Shielding effectiveness | 0.014MHz - 1MHz, >60dB;<br>1MHz - 1000MHz, >90dB. |
| Electrical insulation | > 2 MΩ |
| Ground system resistance | < 4Ω |
| Voltage Standing Wave Ratio (VSWR) | ≤6dB, from 1 to 18 GHz,3m distance |

## 6. Test Facilities Utilized

### Conducted test system

| No. | Equipment | Model | Serial Number | Manufacturer | Calibration Due date | Calibration Period |
|---|---|---|---|---|---|---|
| 1 | Vector Signal Analyzer | FSV40 | 100903 | Rohde & Schwarz | 2018-01-18 | 1 year |
| 2 | Bluetooth Tester | CBT32 | 100584 | Rohde & Schwarz | 2018-01-05 | 1 year |

### Radiated emission test system

| No. | Equipment | Model | Serial Number | Manufacturer | Calibration Due date | Calibration Period |
|---|---|---|---|---|---|---|
| 1 | LISN | ESH2-Z5 | 100196 | R&S | 2018-01-05 | 1 year |
| 2 | Test Receiver | ESCI | 100701 | R&S | 2017-08-09 | 1 year |
| 3 | Loop Antenna | HLA6120 | 35779 | TESEQ | 2019-05-02 | 3 years |
| 4 | BiLog Antenna | VULB9163 | 9163 329 | Schwarzbeck | 2020-02-17 | 3 years |
| 5 | Horn Antenna | 3117 | 00066585 | ETS-Lindgren | 2019-03-05 | 3 years |
| 6 | Test Receiver | ESR7 | 101675 | R&S | 2017-07-21 | 1 year |
| 7 | Spectrum Analyzer | FSP 40 | 100378 | R&S | 2017-12-15 | 1 year |
| 8 | Chamber | FACT5-2.0 | 4166 | ETS-Lindgren | 2018-05-13 | 3 years |

### Anechoic chamber

Fully anechoic chamber by ETS-Lindgren

# ANNEX A: MEASUREMENT RESULTS FOR RECEIVER

## A.0 Antenna requirement

**Measurement Limit:**

| Standard | Requirement |
|---|---|
| FCC CRF Part 15.203 | An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded. |

**Conclusion: The Directional gains of antenna used for transmitting is 1.0dBi.**
**The RF transmitter uses an integrate antenna without connector.**

## A.1 Maximum Peak Output Power

**Measurement Limit:**

| Standard | Limit (dBm) |
|---|---|
| FCC CRF Part 15.247(b)(1) | < 21 |

**Measurement Results:**

| Mode | Test Result (dBm) | | | | | |
|---|---|---|---|---|---|---|
| | 2402MHz (Ch0) | | 2441MHz (Ch39) | | 2480 MHz (Ch78) | |
| GFSK | Fig.1 | 6.34 | Fig.2 | 6.19 | Fig.3 | 5.13 |
| π /4 DQPSK | Fig.4 | 5.67 | Fig.5 | 5.40 | Fig.6 | 4.06 |
| 8DPSK | Fig.7 | 5.79 | Fig.8 | 5.51 | Fig.9 | 4.19 |

**Conclusion: Pass**

## A.2 Band Edges Compliance

**Measurement Limit:**

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

**Measurement Result:**

| Mode | Channel | Hopping | Test Results | Conclusion |
|---|---|---|---|---|
| GFSK | 0 | ON | Fig.10 | P |
| | 78 | ON | Fig.11 | P |
| π /4 DQPSK | 0 | ON | Fig.12 | P |
| | 78 | ON | Fig.13 | P |
| 8DPSK | 0 | ON | Fig.14 | P |
| | 78 | ON | Fig.15 | P |

| Mode | Channel | Hopping | Test Results | Conclusion |
|---|---|---|---|---|
| GFSK | 0 | OFF | Fig.16 | P |
| | 78 | OFF | Fig.17 | P |
| π /4 DQPSK | 0 | OFF | Fig.18 | P |
| | 78 | OFF | Fig.19 | P |
| 8DPSK | 0 | OFF | Fig.20 | P |
| | 78 | OFF | Fig.21 | P |

**See ANNEX B for test graphs.**

**Conclusion: Pass**

## A.3 Conducted Emission

**Measurement Limit:**

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

**Measurement Results:**

| MODE | Channel | Frequency Range | Test Results | Conclusion |
|---|---|---|---|---|
| GFSK | 0 | 2.402 GHz | Fig.22 | P |
| | | 30 MHz-1GHz | Fig.23 | P |
| | | 1GHz-3GHz | Fig.24 | P |
| | | 3GHz-10GHz | Fig.25 | P |
| | 39 | 2.441 GHz | Fig.26 | P |
| | | 30 MHz-1GHz | Fig.27 | P |
| | | 1GHz-3GHz | Fig.28 | P |
| | | 3GHz-10GHz | Fig.29 | P |
| | 78 | 2.480 GHz | Fig.30 | P |
| | | 30 MHz-1GHz | Fig.31 | P |
| | | 1GHz-3GHz | Fig.32 | P |
| | | 3GHz-10GHz | Fig.33 | P |
| π /4 DQPSK | 0 | 2.402 GHz | Fig.34 | P |
| | | 30 MHz-1GHz | Fig.35 | P |
| | | 1GHz-3GHz | Fig.36 | P |
| | | 3GHz-10GHz | Fig.37 | P |
| | 39 | 2.441 GHz | Fig.38 | P |
| | | 30 MHz-1GHz | Fig.39 | P |
| | | 1GHz-3GHz | Fig.40 | P |
| | | 3GHz-10GHz | Fig.41 | P |
| | 78 | 2.480 GHz | Fig.42 | P |
| | | 30 MHz-1GHz | Fig.43 | P |
| | | 1GHz-3GHz | Fig.44 | P |
| | | 3GHz-10GHz | Fig.45 | P |
| 8DPSK | 0 | 2.402 GHz | Fig.46 | P |
| | | 30 MHz-1GHz | Fig.47 | P |
| | | 1GHz-3GHz | Fig.48 | P |
| | | 3GHz-10GHz | Fig.49 | P |
| | 39 | 2.441 GHz | Fig.50 | P |
| | | 30 MHz-1GHz | Fig.51 | P |
| | | 1GHz-3GHz | Fig.52 | P |
| | | 3GHz-10GHz | Fig.53 | P |
| | 78 | 2.480 GHz | Fig.54 | P |
| | | 30 MHz-1GHz | Fig.55 | P |

| | | | | |
|---|---|---|---|---|
| | | 1GHz-3GHz | Fig.56 | P |
| | | 3GHz-10GHz | Fig.57 | P |
| / | All channel | 10GHz-26GHz | Fig.58 | P |

**See ANNEX B for test graphs.**

**Conclusion: Pass**

## A.4 Radiated Emission

**Measurement Limit:**

| Standard | Limit |
|---|---|
| FCC 47 CFR Part 15.247, 15.205, 15.209 | 20dB below peak output power |

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

**Limit in restricted band:**

| Frequency of emission (MHz) | Field strength(μV/m) | Measurement distance(meters) |
|---|---|---|
| 0.009-0.490 | 2400/F(kHz) | 300 |
| 0.490-1.705 | 24000/F(kHz) | 30 |
| 1.705-30.0 | 30 | 30 |
| 30-88 | 100 | 3 |
| 88-216 | 150 | 3 |
| 216-960 | 200 | 3 |
| Above 960 | 500 | 3 |

**Test Condition:**

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

| Frequency of emission (MHz) | RBW/VBW | Sweep Time(s) |
|---|---|---|
| 30-1000 | 120kHz/300kHz | 5 |
| 1000-4000 | 1MHz/3MHz | 15 |
| 4000-18000 | 1MHz/3MHz | 40 |
| 18000-26500 | 1MHz/3MHz | 20 |

**Note**: According to the performance evaluation, the radiated emission margin of EUT is over 20dB in the band from 9kHz to 30MHz. Therefore, the measurement starts from 30MHz to tenth harmonic.

The measurement results include the horizontal polarization and vertical polarization measurements.

**Measurement Results:**

| Mode | Channel | Frequency Range | Test Results | Conclusion |
|---|---|---|---|---|
| GFSK | 0 | 1 GHz ~18 GHz | Fig.59 | P |
| | 39 | 9 kHz ~30 MHz | Fig.60 | P |
| | | 30 MHz ~1 GHz | Fig.61 | P |
| | | 1 GHz ~18 GHz | Fig.62 | P |
| | | 18 GHz ~26.5 GHz | Fig.63 | P |
| | 78 | 1 GHz ~18 GHz | Fig.64 | P |
| | Power(CH0) | 2.38 GHz ~ 2.45 GHz | Fig.65 | P |
| | Power(CH78) | 2.45 GHz ~ 2.5 GHz | Fig.66 | P |
| π /4 DQPSK | 0 | 1 GHz ~18 GHz | Fig.67 | P |
| | 39 | 9 kHz ~30 MHz | Fig.68 | P |
| | | 30 MHz ~1 GHz | Fig.69 | P |
| | | 1 GHz ~18 GHz | Fig.70 | P |
| | | 18 GHz ~26.5 GHz | Fig.71 | P |
| | 78 | 1 GHz ~18 GHz | Fig.72 | P |
| | Power(CH0) | 2.38 GHz ~ 2.45 GHz | Fig.73 | P |
| | Power(CH78) | 2.45 GHz ~ 2.5 GHz | Fig.74 | P |
| 8DPSK | 0 | 1 GHz ~18 GHz | Fig.75 | P |
| | 39 | 9 kHz ~30 MHz | Fig.76 | P |
| | | 30 MHz ~1 GHz | Fig.77 | P |
| | | 1 GHz ~18 GHz | Fig.78 | P |
| | | 18 GHz ~26.5 GHz | Fig.79 | P |
| | 78 | 1 GHz ~18 GHz | Fig.80 | P |
| | Power(CH0) | 2.38 GHz ~ 2.45 GHz | Fig.81 | P |
| | Power(CH78) | 2.45 GHz ~ 2.5 GHz | Fig.82 | P |

**GFSK CH0 (1-18GHz)**

| Frequency (MHz) | MaxPeak (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Corr. (dB) | Pol |
|---|---|---|---|---|---|
| 13908.500000 | 57.19 | 74.00 | 16.81 | 21.1 | V |
| 14672.500000 | 57.74 | 74.00 | 16.26 | 21.3 | H |
| 15571.000000 | 60.09 | 74.00 | 13.91 | 23.6 | V |
| 15630.000000 | 60.91 | 74.00 | 13.09 | 24.2 | V |
| 16593.500000 | 62.67 | 74.00 | 11.33 | 26.3 | H |
| 17713.000000 | 62.34 | 74.00 | 11.66 | 27.7 | V |

| Frequency (MHz) | Average (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Corr. (dB) | Pol |
|---|---|---|---|---|---|
| 13909.000000 | 45.87 | 54.00 | 8.13 | 21.1 | V |
| 14686.000000 | 46.16 | 54.00 | 7.84 | 21.5 | H |
| 15575.500000 | 47.90 | 54.00 | 6.10 | 23.8 | H |
| 16058.500000 | 49.39 | 54.00 | 4.61 | 25.4 | V |
| 16581.000000 | 51.17 | 54.00 | 2.83 | 26.4 | V |
| 17707.500000 | 50.99 | 54.00 | 3.01 | 27.6 | H |

**GFSK CH39 (1-18GHz)**

| Frequency (MHz) | MaxPeak (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Corr. (dB) | Pol |
|---|---|---|---|---|---|
| 13832.000000 | 56.85 | 74.00 | 17.15 | 19.9 | V |
| 14676.500000 | 57.79 | 74.00 | 16.21 | 21.4 | H |
| 15414.000000 | 59.18 | 74.00 | 14.82 | 22.8 | H |
| 16059.000000 | 61.16 | 74.00 | 12.84 | 25.4 | H |
| 16597.500000 | 62.72 | 74.00 | 11.28 | 26.3 | H |
| 17698.000000 | 61.92 | 74.00 | 12.08 | 27.3 | V |

| Frequency (MHz) | Average (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Corr. (dB) | Pol |
|---|---|---|---|---|---|
| 12738.000000 | 43.65 | 54.00 | 10.35 | 19.8 | V |
| 14686.500000 | 45.66 | 54.00 | 8.34 | 21.6 | V |
| 15576.000000 | 47.35 | 54.00 | 6.65 | 23.8 | H |
| 15713.500000 | 48.86 | 54.00 | 5.14 | 24.1 | V |
| 16651.000000 | 50.63 | 54.00 | 3.37 | 26.0 | V |
| 17705.500000 | 50.28 | 54.00 | 3.72 | 27.6 | V |

**GFSK CH78 (1-18GHz)**

| Frequency (MHz) | MaxPeak (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Corr. (dB) | Pol |
|---|---|---|---|---|---|
| 13891.500000 | 56.68 | 74.00 | 17.32 | 20.2 | V |
| 14618.000000 | 56.97 | 74.00 | 17.03 | 21.6 | V |
| 15113.000000 | 58.93 | 74.00 | 15.07 | 22.7 | V |
| 15663.500000 | 60.46 | 74.00 | 13.54 | 23.6 | V |
| 16650.000000 | 61.80 | 74.00 | 12.20 | 26.0 | H |
| 17692.000000 | 62.02 | 74.00 | 11.98 | 27.0 | H |

| Frequency (MHz) | Average (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Corr. (dB) | Pol |
|---|---|---|---|---|---|
| 13909.500000 | 45.07 | 54.00 | 8.93 | 21.1 | V |
| 14693.500000 | 45.16 | 54.00 | 8.84 | 21.6 | V |
| 15108.500000 | 47.11 | 54.00 | 6.89 | 22.7 | V |
| 15739.000000 | 48.76 | 54.00 | 5.24 | 24.4 | V |
| 16627.000000 | 50.40 | 54.00 | 3.60 | 26.1 | V |
| 17707.000000 | 50.15 | 54.00 | 3.85 | 27.6 | H |

**π /4 DQPSK CH0 (1-18GHz)**

| Frequency (MHz) | MaxPeak (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Corr. (dB) | Pol |
|---|---|---|---|---|---|
| 13917.500000 | 56.70 | 74.00 | 17.30 | 20.6 | H |
| 14703.500000 | 57.28 | 74.00 | 16.72 | 21.5 | V |
| 15568.500000 | 59.30 | 74.00 | 14.70 | 23.5 | H |
| 16066.500000 | 60.43 | 74.00 | 13.57 | 25.4 | H |
| 16660.000000 | 62.11 | 74.00 | 11.89 | 25.5 | V |
| 17708.500000 | 63.20 | 74.00 | 10.80 | 27.6 | H |

| Frequency (MHz) | Average (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Corr. (dB) | Pol |
|---|---|---|---|---|---|
| 13913.000000 | 44.76 | 54.00 | 9.24 | 20.9 | V |
| 14683.000000 | 45.31 | 54.00 | 8.69 | 21.5 | V |
| 15573.000000 | 46.94 | 54.00 | 7.06 | 23.7 | V |
| 15739.000000 | 48.51 | 54.00 | 5.49 | 24.4 | H |
| 17110.000000 | 50.33 | 54.00 | 3.67 | 26.2 | H |
| 17708.000000 | 50.25 | 54.00 | 3.75 | 27.6 | V |

**π /4 DQPSK CH39 (1-18GHz)**

| Frequency (MHz) | MaxPeak (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Corr. (dB) | Pol |
|---|---|---|---|---|---|
| 13869.000000 | 56.15 | 74.00 | 17.85 | 20.1 | V |
| 14515.500000 | 56.57 | 74.00 | 17.43 | 21.0 | H |
| 15118.500000 | 58.31 | 74.00 | 15.69 | 22.4 | V |
| 15926.500000 | 60.51 | 74.00 | 13.49 | 24.8 | V |
| 16631.000000 | 61.53 | 74.00 | 12.47 | 26.0 | H |
| 17706.500000 | 62.05 | 74.00 | 11.95 | 27.6 | H |

| Frequency (MHz) | Average (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Corr. (dB) | Pol |
|---|---|---|---|---|---|
| 13909.000000 | 44.67 | 54.00 | 9.33 | 21.1 | H |
| 14680.000000 | 45.20 | 54.00 | 8.80 | 21.4 | V |
| 15576.500000 | 47.07 | 54.00 | 6.93 | 23.8 | V |
| 15925.500000 | 48.59 | 54.00 | 5.42 | 24.7 | V |
| 16592.500000 | 50.20 | 54.00 | 3.80 | 26.3 | V |
| 17708.500000 | 50.11 | 54.00 | 3.89 | 27.6 | V |

**π /4 DQPSK CH78 (1-18GHz)**

| Frequency (MHz) | MaxPeak (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Corr. (dB) | Pol |
|---|---|---|---|---|---|
| 13865.500000 | 56.53 | 74.00 | 17.47 | 20.0 | H |
| 14648.000000 | 56.67 | 74.00 | 17.33 | 21.3 | V |
| 15109.000000 | 59.06 | 74.00 | 14.94 | 22.8 | V |
| 15677.500000 | 60.31 | 74.00 | 13.69 | 23.8 | V |
| 16630.500000 | 62.01 | 74.00 | 11.99 | 26.0 | H |
| 17697.000000 | 61.56 | 74.00 | 12.44 | 27.3 | H |

| Frequency (MHz) | Average (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Corr. (dB) | Pol |
|---|---|---|---|---|---|
| 13910.000000 | 44.92 | 54.00 | 9.08 | 21.2 | V |
| 14693.500000 | 45.22 | 54.00 | 8.78 | 21.6 | H |
| 15576.000000 | 47.03 | 54.00 | 6.97 | 23.8 | V |
| 15739.000000 | 48.52 | 54.00 | 5.48 | 24.4 | V |
| 16592.500000 | 50.41 | 54.00 | 3.59 | 26.3 | V |
| 17704.000000 | 49.89 | 54.00 | 4.11 | 27.5 | H |

**8DPSK CH0 (1-18GHz)**

| Frequency (MHz) | MaxPeak (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Corr. (dB) | Pol |
|---|---|---|---|---|---|
| 12686.000000 | 54.81 | 74.00 | 19.19 | 19.6 | V |
| 14541.000000 | 57.34 | 74.00 | 16.66 | 20.6 | V |
| 15199.000000 | 58.88 | 74.00 | 15.12 | 23.0 | H |
| 15971.500000 | 59.74 | 74.00 | 14.26 | 25.5 | H |
| 17121.500000 | 61.83 | 74.00 | 12.17 | 26.1 | V |
| 17699.000000 | 61.52 | 74.00 | 12.48 | 27.4 | V |

| Frequency (MHz) | Average (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Corr. (dB) | Pol |
|---|---|---|---|---|---|
| 13909.000000 | 44.78 | 54.00 | 9.22 | 21.1 | H |
| 14690.500000 | 45.17 | 54.00 | 8.83 | 21.6 | V |
| 15576.000000 | 46.88 | 54.00 | 7.12 | 23.8 | V |
| 15739.000000 | 48.46 | 54.00 | 5.54 | 24.4 | H |
| 17110.000000 | 50.35 | 54.00 | 3.65 | 26.2 | V |
| 17708.000000 | 50.28 | 54.00 | 3.72 | 27.6 | V |

**8DPSK CH39 (1-18GHz)**

| Frequency (MHz) | MaxPeak (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Corr. (dB) | Pol |
|---|---|---|---|---|---|
| 12787.500000 | 55.38 | 74.00 | 18.62 | 19.5 | H |
| 14680.000000 | 56.70 | 74.00 | 17.31 | 21.4 | H |
| 15206.500000 | 58.75 | 74.00 | 15.25 | 23.0 | V |
| 15736.500000 | 60.02 | 74.00 | 13.98 | 24.3 | V |
| 17118.500000 | 62.06 | 74.00 | 11.94 | 26.2 | V |
| 17712.500000 | 61.99 | 74.00 | 12.01 | 27.7 | V |

| Frequency (MHz) | Average (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Corr. (dB) | Pol |
|---|---|---|---|---|---|
| 13909.500000 | 44.71 | 54.00 | 9.29 | 21.1 | V |
| 14686.500000 | 45.32 | 54.00 | 8.68 | 21.6 | V |
| 15573.000000 | 47.09 | 54.00 | 6.91 | 23.7 | V |
| 16072.000000 | 48.59 | 54.00 | 5.41 | 25.4 | H |
| 16584.500000 | 50.21 | 54.00 | 3.79 | 26.4 | V |
| 17708.000000 | 50.09 | 54.00 | 3.91 | 27.6 | H |

**8DPSK CH78 (1-18GHz)**

| Frequency (MHz) | MaxPeak (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Corr. (dB) | Pol |
|---|---|---|---|---|---|
| 12604.000000 | 56.57 | 74.00 | 17.43 | 20.3 | V |
| 14571.500000 | 57.03 | 74.00 | 16.97 | 21.1 | H |
| 15116.000000 | 58.41 | 74.00 | 15.59 | 22.5 | V |
| 15972.500000 | 60.49 | 74.00 | 13.51 | 25.5 | H |
| 16610.500000 | 61.97 | 74.00 | 12.04 | 26.0 | V |
| 17890.000000 | 62.02 | 74.00 | 11.98 | 28.2 | H |

| Frequency (MHz) | Average (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Corr. (dB) | Pol |
|---|---|---|---|---|---|
| 13418.500000 | 43.77 | 54.00 | 10.24 | 20.4 | V |
| 14683.500000 | 45.10 | 54.00 | 8.90 | 21.5 | H |
| 15572.500000 | 47.14 | 54.00 | 6.86 | 23.7 | H |
| 15739.500000 | 48.60 | 54.00 | 5.40 | 24.4 | V |
| 16651.000000 | 50.37 | 54.00 | 3.63 | 26.0 | V |
| 17707.500000 | 50.09 | 54.00 | 3.91 | 27.6 | H |

**See ANNEX B for test graphs.**

**Conclusion: Pass**

## A.5 Occupied 20dB Bandwidth

**Measurement Limit:**

| Standard | Limit (kHz) |
|---|---|
| FCC 47 CFR Part 15.247 (a) | / |

**Measurement Result:**

| Mode | Channel | Occupied 20dB Bandwidth ( MHz) | | conclusion |
|---|---|---|---|---|
| GFSK | 0 | Fig.83 | 0.947 | / |
| | 39 | Fig.84 | 0.946 | |
| | 78 | Fig.85 | 0.947 | |
| π /4 DQPSK | 0 | Fig.86 | 1.271 | / |
| | 39 | Fig.87 | 1.272 | |
| | 78 | Fig.88 | 1.265 | |
| 8DPSK | 0 | Fig.89 | 1.281 | / |
| | 39 | Fig.90 | 1.285 | |
| | 78 | Fig.91 | 1.281 | |

**See ANNEX B for test graphs.**

**Conclusion: PASS**

## A.6 Time of Occupancy (Dwell Time)

**Measurement Limit:**

| Standard | Limit |
|---|---|
| FCC 47 CFR Part 15.247(a) | < 400 ms |

**Measurement Results:**

| Mode | Channel | Packet | Dwell Time(ms) | | | Conclusion |
|---|---|---|---|---|---|---|
| GFSK | 39 | DH5 | Fig.92 | Fig.93 | 306.6 | **P** |
| π /4 DQPSK | 39 | 2-DH5 | Fig.94 | Fig.95 | 306.9 | **P** |
| 8DPSK | 39 | 3-DH5 | Fig.96 | Fig.97 | 307.1 | **P** |

**See ANNEX B for test graphs.**

**Conclusion: Pass**

## A.7 Number of Hopping Channels

**Measurement Limit:**

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

**Measurement Results:**

| Mode | Packet | Number of hopping channels | | Test result | Conclusion |
|---|---|---|---|---|---|
| GFSK | DH5 | Fig.98 | Fig.99 | 79 | **P** |
| π /4 DQPSK | 2-DH5 | Fig.100 | Fig.101 | 79 | **P** |
| 8DPSK | 3-DH5 | Fig.102 | Fig.103 | 79 | **P** |

**See ANNEX B for test graphs.**

**Conclusion: Pass**

## A.8 Carrier Frequency Separation

**Measurement Limit:**

| Standard | Limit |
|---|---|
| FCC 47 CFR Part 15.247(a) | By a minimum of 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater |

**Measurement Results:**

| Mode | Channel | Packet | Separation of hopping channels | Test result (MHz) | Conclusion |
|---|---|---|---|---|---|
| GFSK | 39 | DH5 | Fig.104 | 1.00 | P |
| π /4 DQPSK | 39 | 2-DH5 | Fig.105 | 1.01 | P |
| 8DPSK | 39 | 3-DH5 | Fig.106 | 1.00 | P |

**See ANNEX B for test graphs.**

**Conclusion: Pass**

## A.9 AC Power line Conducted Emission

**Test Condition:**

| Voltage（V） | Frequency（Hz） |
|---|---|
| 120 | 60 |

**Measurement Result and limit:**

BT (Quasi-peak Limit)-AE1

| Frequency range (MHz) | Quasi-peak Limit (dBμV) | Result (dBμV) Traffic | Conclusion |
|---|---|---|---|
| 0.15 to 0.5 | 66 to 56 | Fig.107 | 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. | | | |

BT (Average Limit)-AE1

| Frequency range (MHz) | Average-peak Limit (dBμV) | Result (dBμV) Traffic | Conclusion |
|---|---|---|---|
| 0.15 to 0.5 | 56 to 46 | Fig.107 | 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. | | | |

BT (Quasi-peak Limit)-AE1

| Frequency range (MHz) | Quasi-peak Limit (dBμV) | Result (dBμV) Idle | Conclusion |
|---|---|---|---|
| 0.15 to 0.5 | 66 to 56 | Fig.108 | 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. | | | |

BT (Average Limit)-AE1

| Frequency range (MHz) | Average-peak Limit (dBμV) | Result (dBμV) Idle | Conclusion |
|---|---|---|---|
| 0.15 to 0.5 | 56 to 46 | Fig.108 | 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. | | | |

BT (Quasi-peak Limit)-AE2

| Frequency range (MHz) | Quasi-peak Limit (dBμV) | Result (dBμV) Traffic | Conclusion |
|---|---|---|---|
| 0.15 to 0.5 | 66 to 56 | Fig.109 | 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. | | | |

BT (Average Limit)-AE2

| Frequency range (MHz) | Average-peak Limit (dBμV) | Result (dBμV) Traffic | Conclusion |
|---|---|---|---|
| 0.15 to 0.5 | 56 to 46 | Fig.109 | 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. | | | |

BT (Quasi-peak Limit)-AE2

| Frequency range (MHz) | Quasi-peak Limit (dBμV) | Result (dBμV) Idle | Conclusion |
|---|---|---|---|
| 0.15 to 0.5 | 66 to 56 | Fig.110 | 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. | | | |

BT (Average Limit)-AE2

| Frequency range (MHz) | Average-peak Limit (dBμV) | Result (dBμV) Idle | Conclusion |
|---|---|---|---|
| 0.15 to 0.5 | 56 to 46 | Fig.110 | 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. | | | |

**Test Condition:**

| Voltage（V） | Frequency（Hz） |
|---|---|
| 240 | 60 |

**Measurement Result and limit:**

BT (Quasi-peak Limit)-AE1

| Frequency range (MHz) | Quasi-peak Limit (dBμV) | Result (dBμV) Traffic | Conclusion |
|---|---|---|---|
| 0.15 to 0.5 | 66 to 56 | Fig.111 | 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. | | | |

BT (Average Limit)-AE1

| Frequency range (MHz) | Average-peak Limit (dBμV) | Result (dBμV) Traffic | Conclusion |
|---|---|---|---|
| 0.15 to 0.5 | 56 to 46 | Fig.111 | 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. | | | |

BT (Quasi-peak Limit)-AE1

| Frequency range (MHz) | Quasi-peak Limit (dBμV) | Result (dBμV) Idle | Conclusion |
|---|---|---|---|
| 0.15 to 0.5 | 66 to 56 | Fig.112 | 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. | | | |

BT (Average Limit)-AE1

| Frequency range (MHz) | Average-peak Limit (dBμV) | Result (dBμV) Idle | Conclusion |
|---|---|---|---|
| 0.15 to 0.5 | 56 to 46 | Fig.112 | 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. | | | |

BT (Quasi-peak Limit)-AE2

| Frequency range (MHz) | Quasi-peak Limit (dBμV) | Result (dBμV) Traffic | Conclusion |
|---|---|---|---|
| 0.15 to 0.5 | 66 to 56 | Fig.113 | 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. | | | |

BT (Average Limit)-AE2

| Frequency range (MHz) | Average-peak Limit (dBμV) | Result (dBμV) Traffic | Conclusion |
|---|---|---|---|
| 0.15 to 0.5 | 56 to 46 | Fig.113 | 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. | | | |

BT (Quasi-peak Limit)-AE2

| Frequency range (MHz) | Quasi-peak Limit (dBμV) | Result (dBμV) Idle | Conclusion |
|---|---|---|---|
| 0.15 to 0.5 | 66 to 56 | Fig.114 | 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. | | | |

BT (Average Limit)-AE2

| Frequency range (MHz) | Average-peak Limit (dBμV) | Result (dBμV) Idle | Conclusion |
|---|---|---|---|
| 0.15 to 0.5 | 56 to 46 | Fig.114 | 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. | | | |

**Note:** The measurement results include the L1 and N measurements.

**See ANNEX B for test graphs.**

**Conclusion: Pass**

## ANNEX B: TEST FIGURE LIST

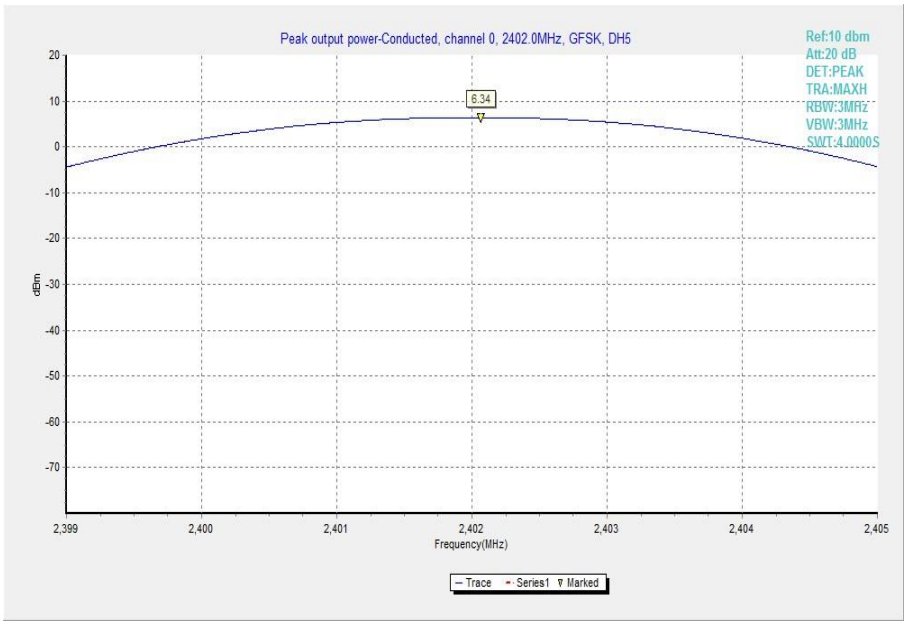


**Fig. 1 Maximum Peak Output Power(GFSK, Ch 0)**

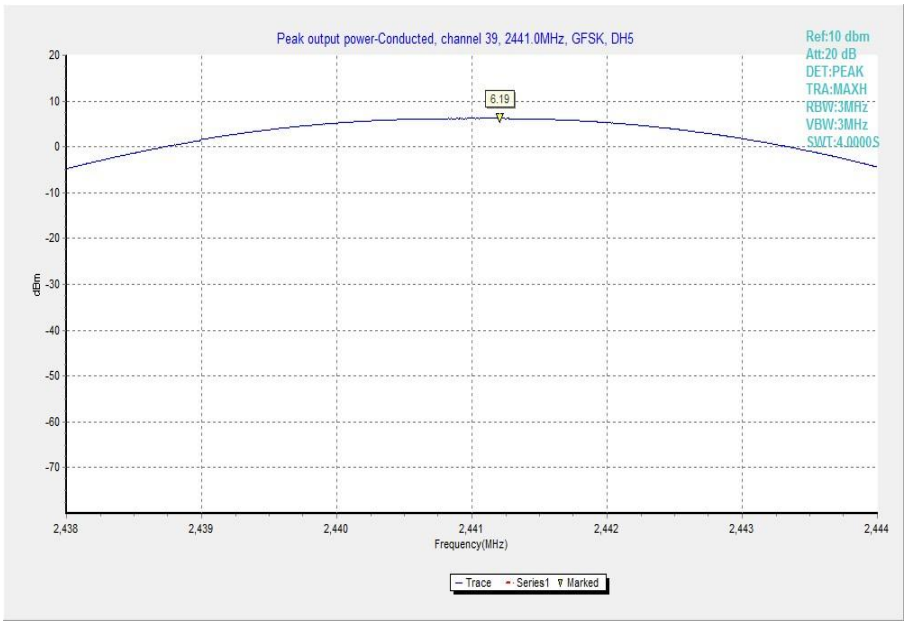


**Fig. 2 Maximum Peak Output Power(GFSK, Ch 39)**

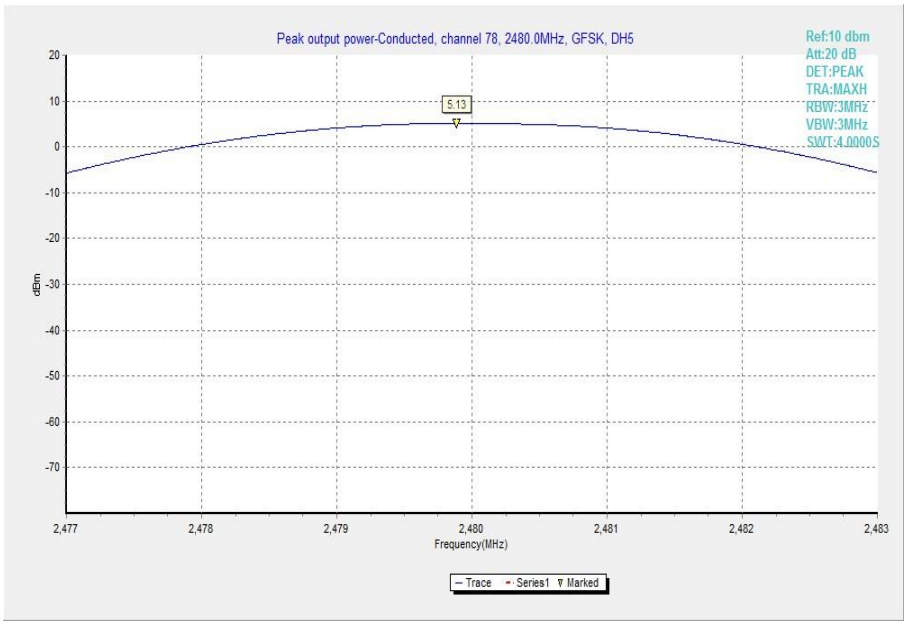


**Fig. 3 Maximum Peak Output Power(GFSK, Ch 78)**

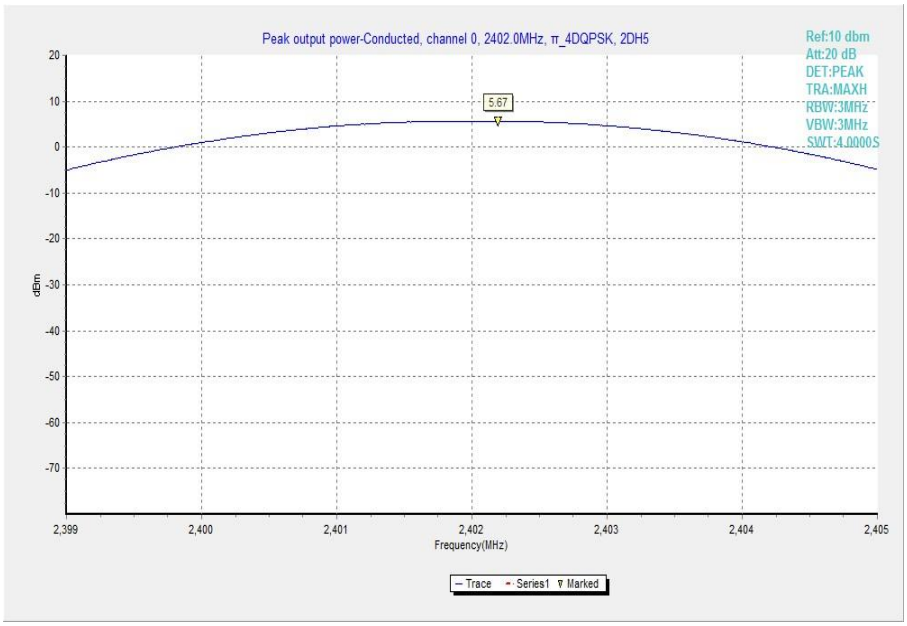


**Fig. 4 Maximum Peak Output Power(π /4 DQPSK, Ch 0)**

**Fig. 5 Maximum Peak Output Power(π /4 DQPSK, Ch 39)**

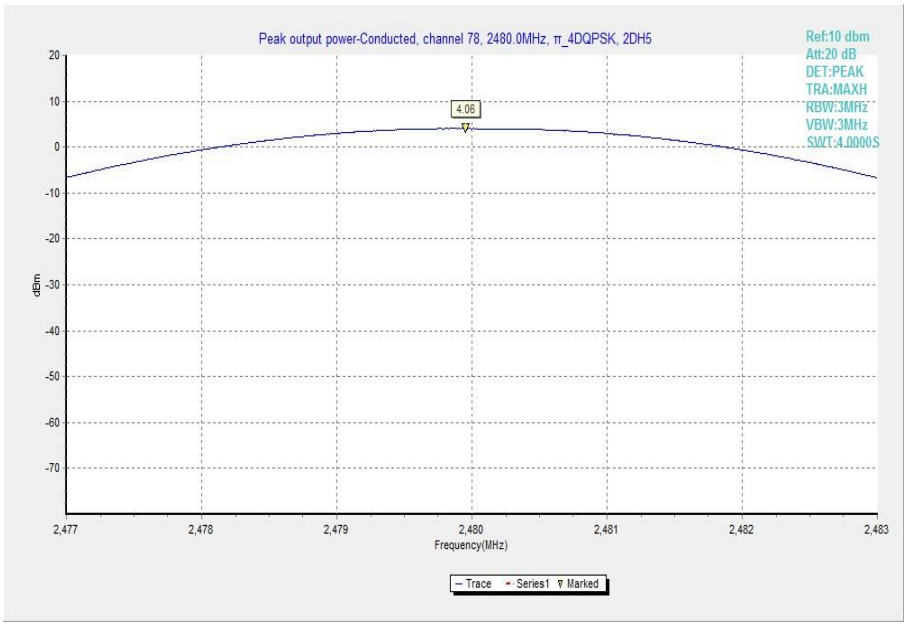


**Fig. 6 Maximum Peak Output Power(π /4 DQPSK, Ch 78)**

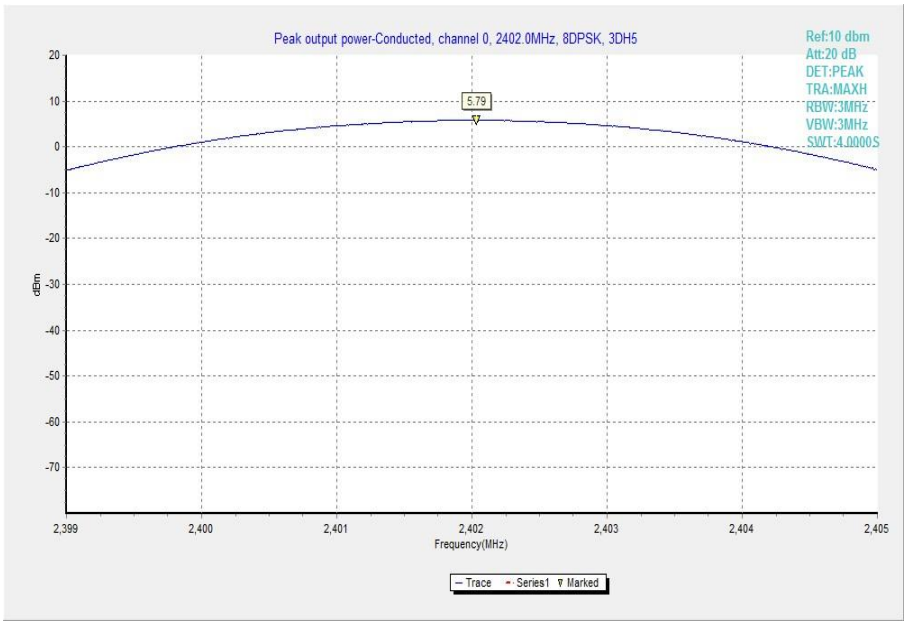


**Fig. 7 Maximum Peak Output Power(8DPSK, Ch 0)**

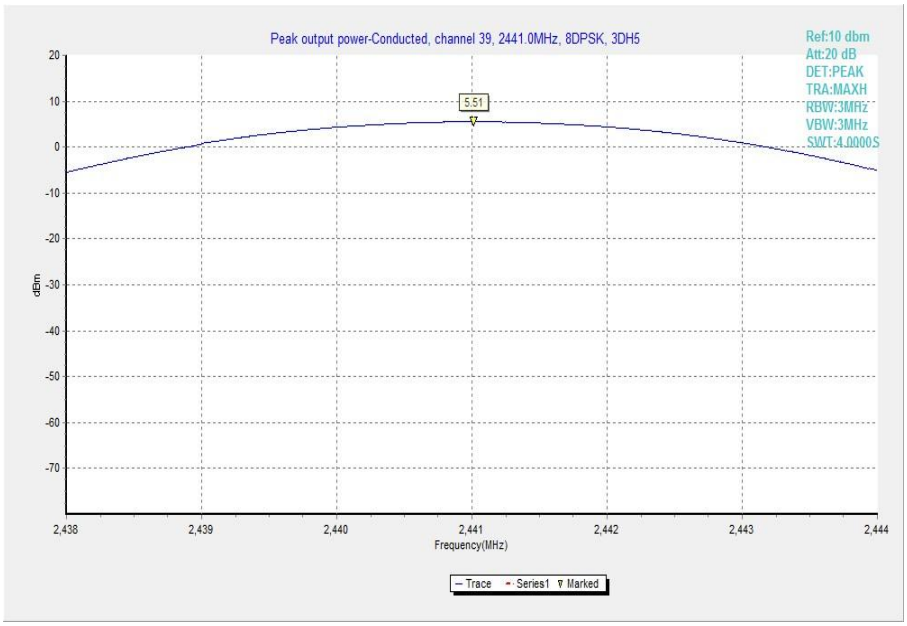


**Fig. 8 Maximum Peak Output Power(8DPSK, Ch 39)**

**Fig. 9 Maximum Peak Output Power(8DPSK, Ch 78)**

**Fig. 10 Band Edges (GFSK, Ch 0, Hopping ON)**

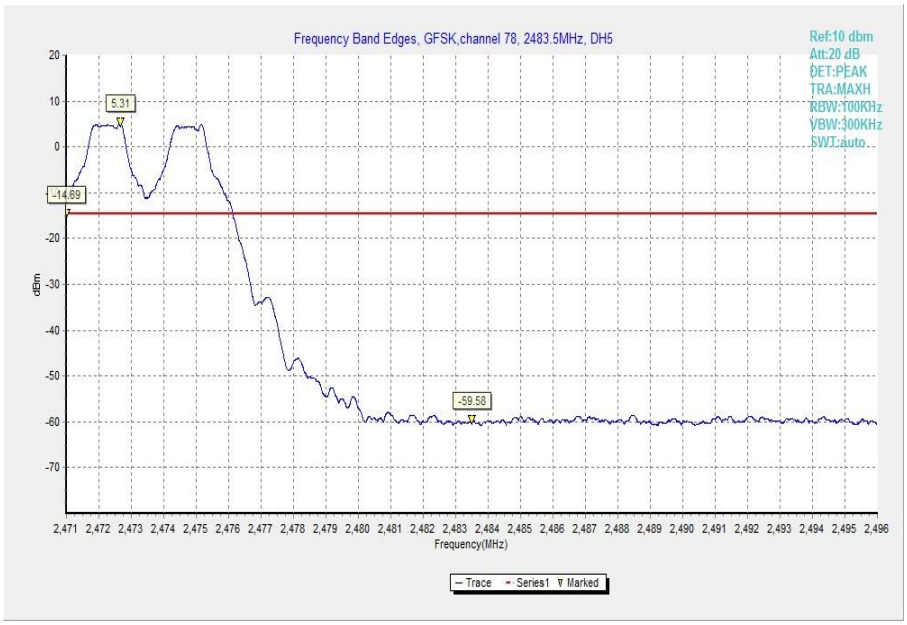


**Fig. 11 Band Edges (GFSK, Ch 78, Hopping ON)**

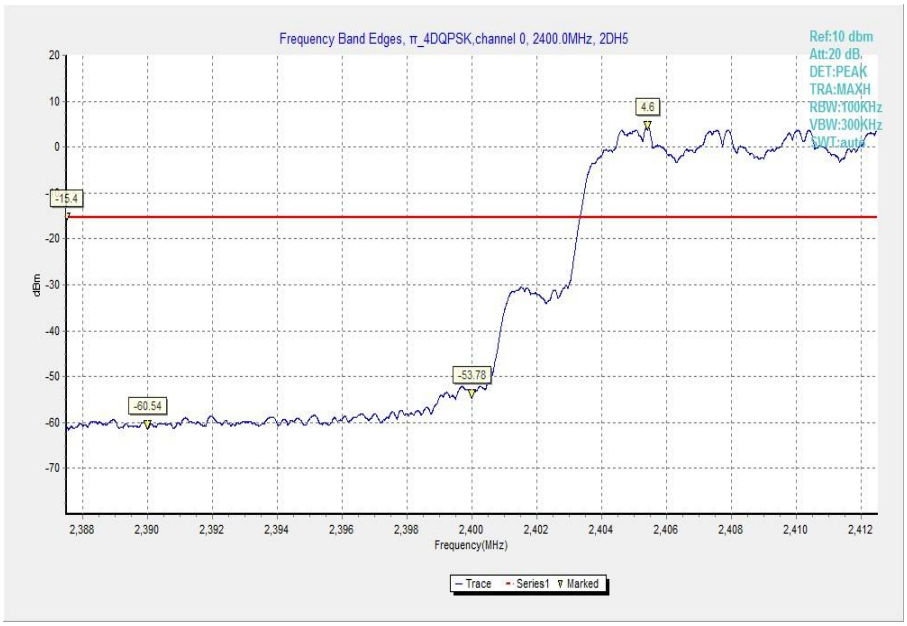


**Fig. 12 Band Edges (π /4 DQPSK, Ch 0, Hopping ON)**

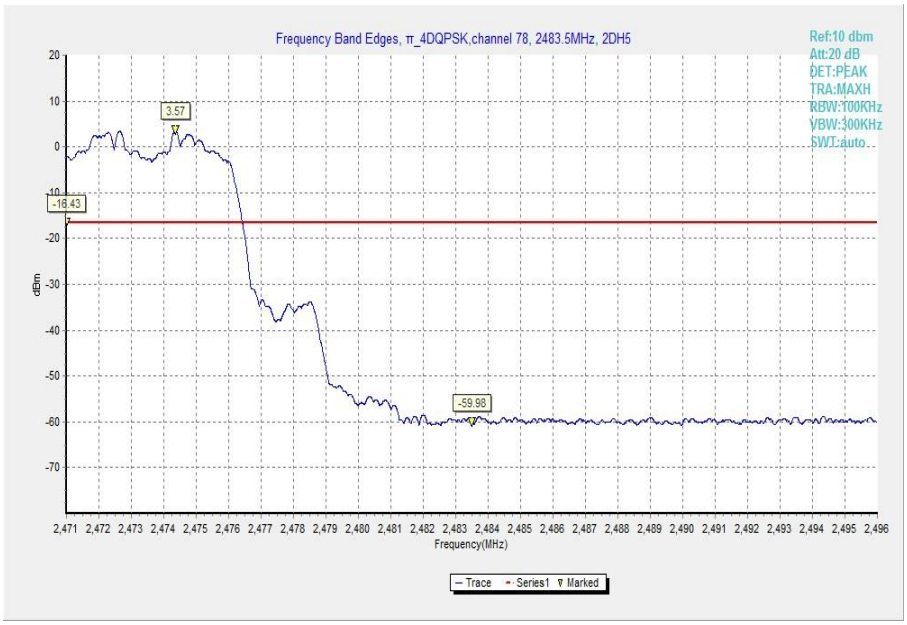


**Fig. 13 Band Edges (π /4 DQPSK, Ch 78, Hopping ON)**

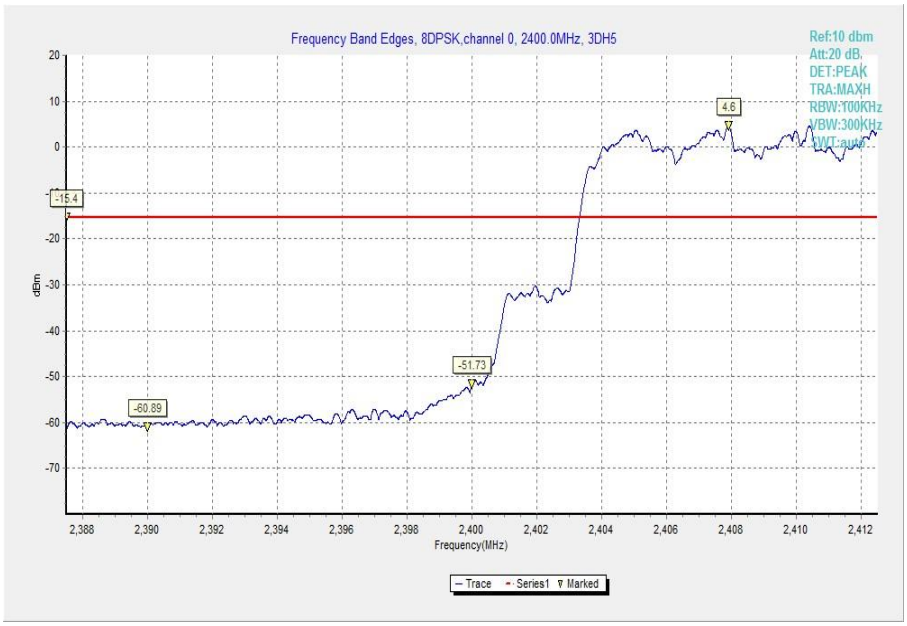


**Fig. 14 Band Edges (8DPSK, Ch 0, Hopping ON)**

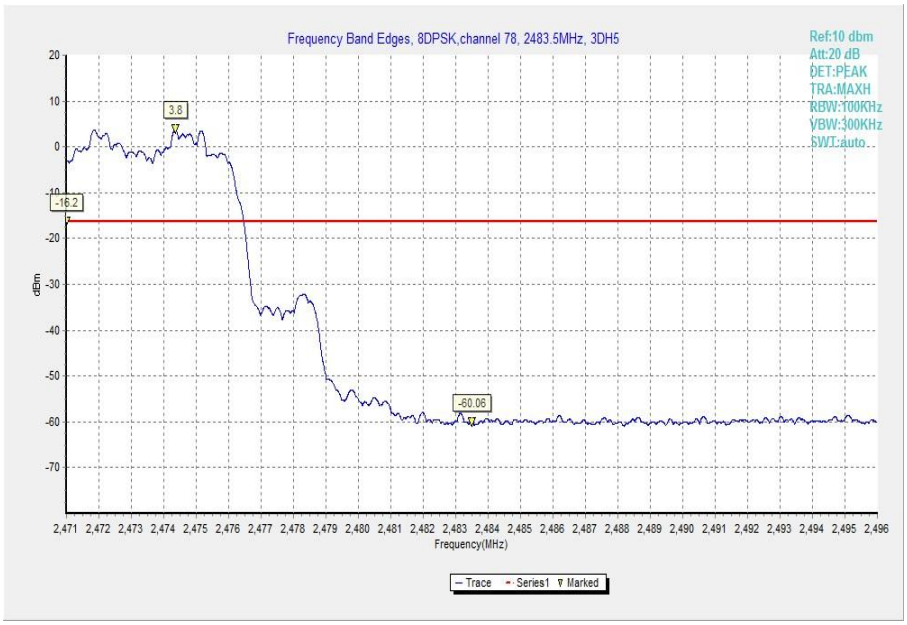


**Fig. 15 Band Edges (8DPSK, Ch 78, Hopping ON)**

**Fig. 16 Band Edges (GFSK, Ch 0, Hopping OFF)**

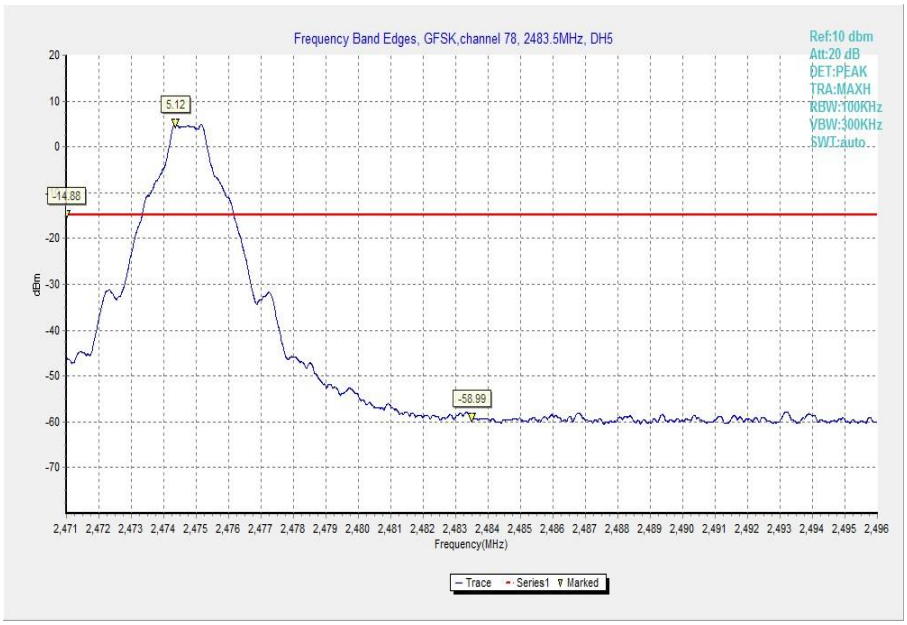


**Fig. 17 Band Edges (GFSK, Ch 78, Hopping OFF)**

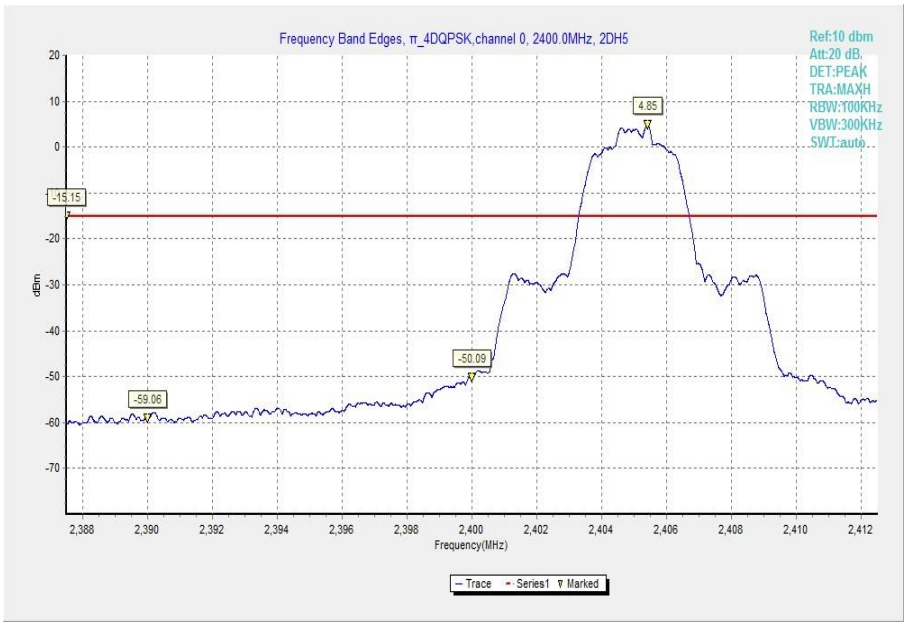


**Fig. 18 Band Edges (π /4 DQPSK, Ch 0, Hopping OFF)**

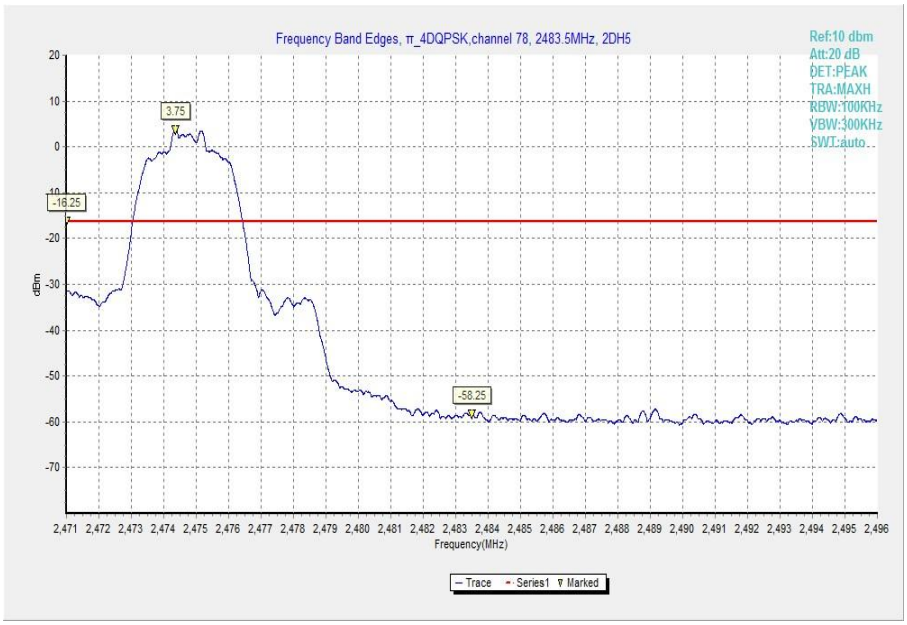


**Fig. 19 Band Edges (π /4 DQPSK, Ch 78, Hopping OFF)**

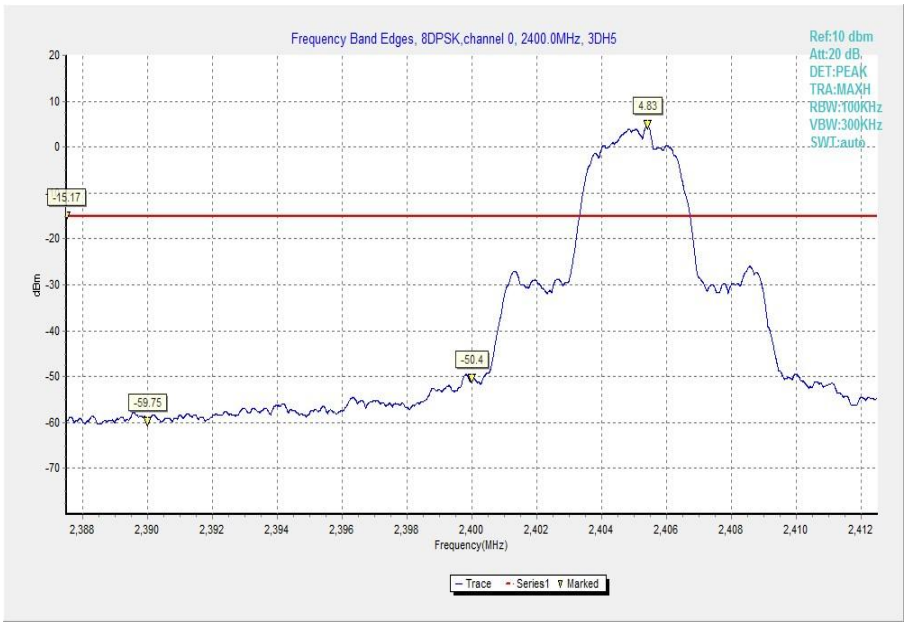


**Fig. 20 Band Edges (8DPSK, Ch 0, Hopping OFF)**

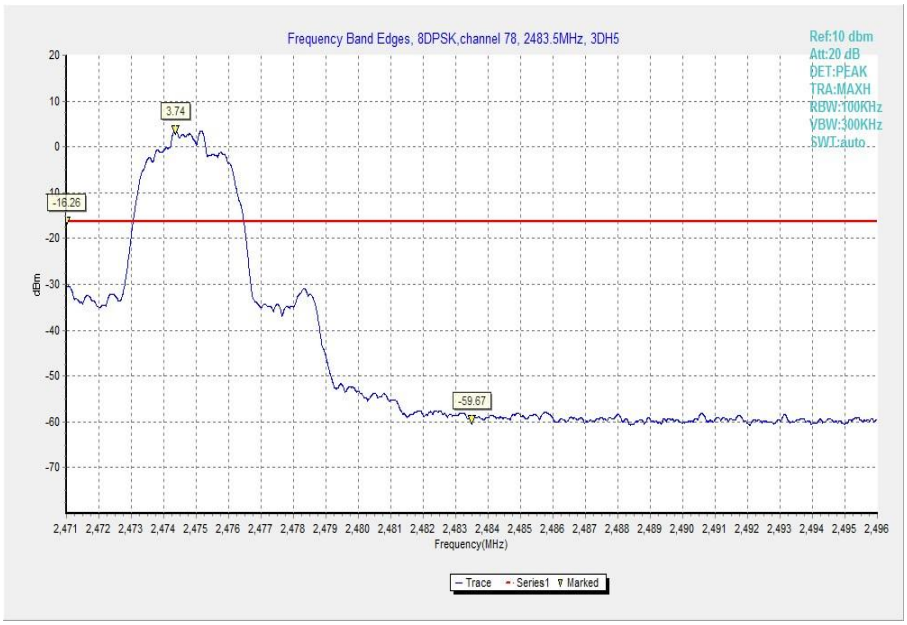


**Fig. 21 Band Edges (8DPSK, Ch 78, Hopping OFF)**

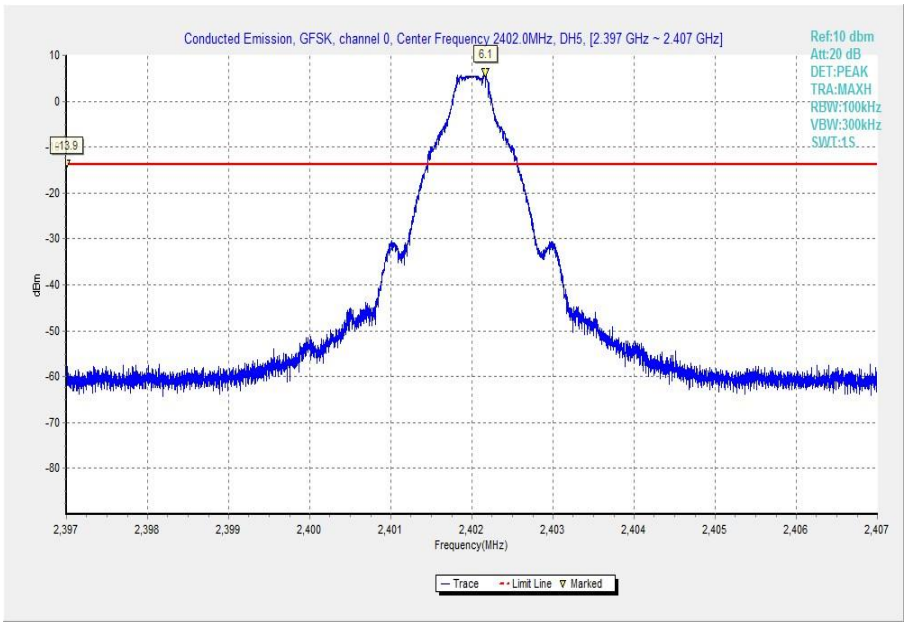


**Fig. 22 Conducted Spurious Emission (GFSK, Ch0, 2.402GHz)**

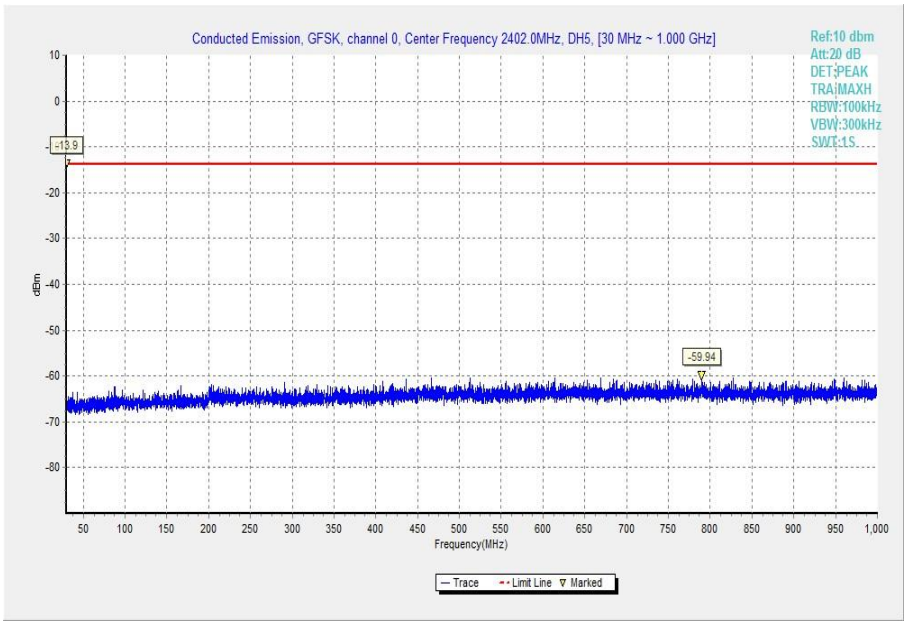


**Fig. 23 Conducted Spurious Emission (GFSK, Ch0, 30 MHz-1 GHz)**

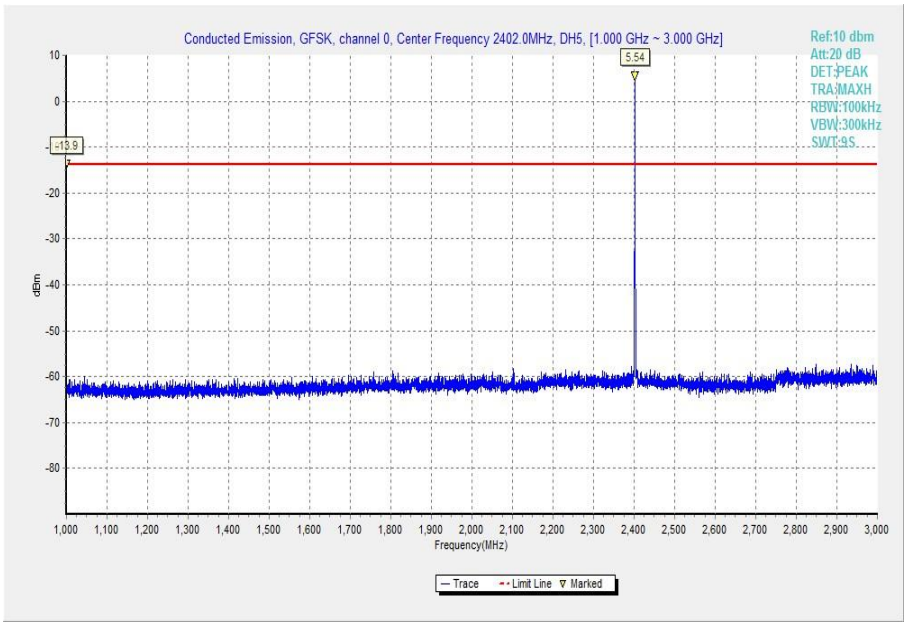


**Fig. 24 Conducted Spurious Emission (GFSK, Ch0, 1GHz-3 GHz)**

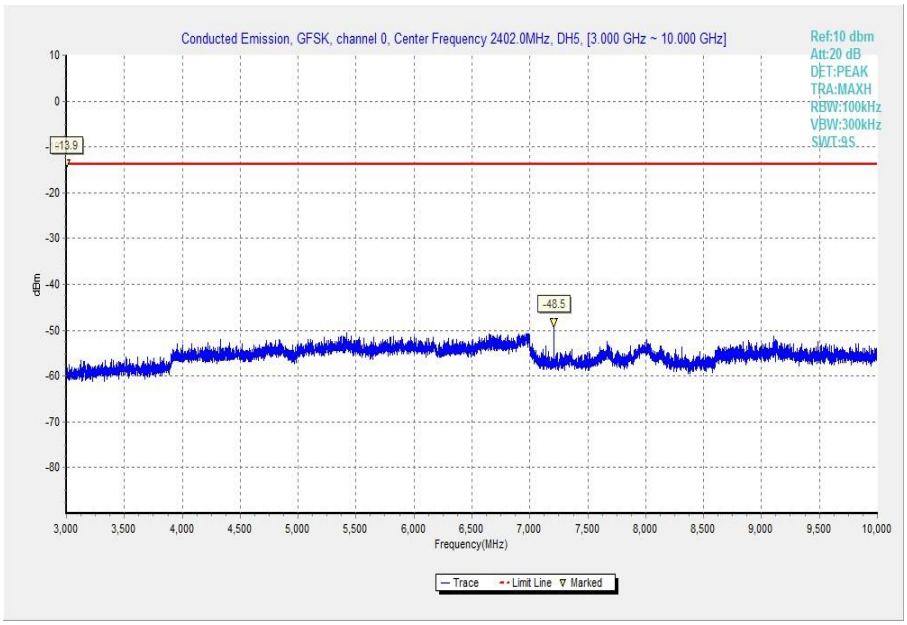


**Fig. 25 Conducted Spurious Emission (GFSK, Ch0, 3GHz-10 GHz)**

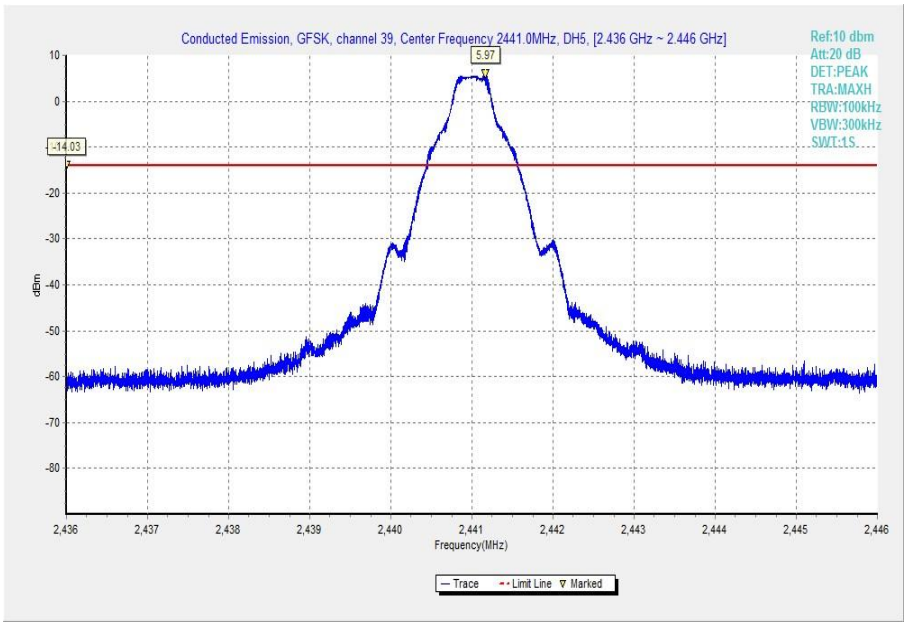


**Fig. 26 Conducted Spurious Emission (GFSK, Ch39, 2.441GHz)**

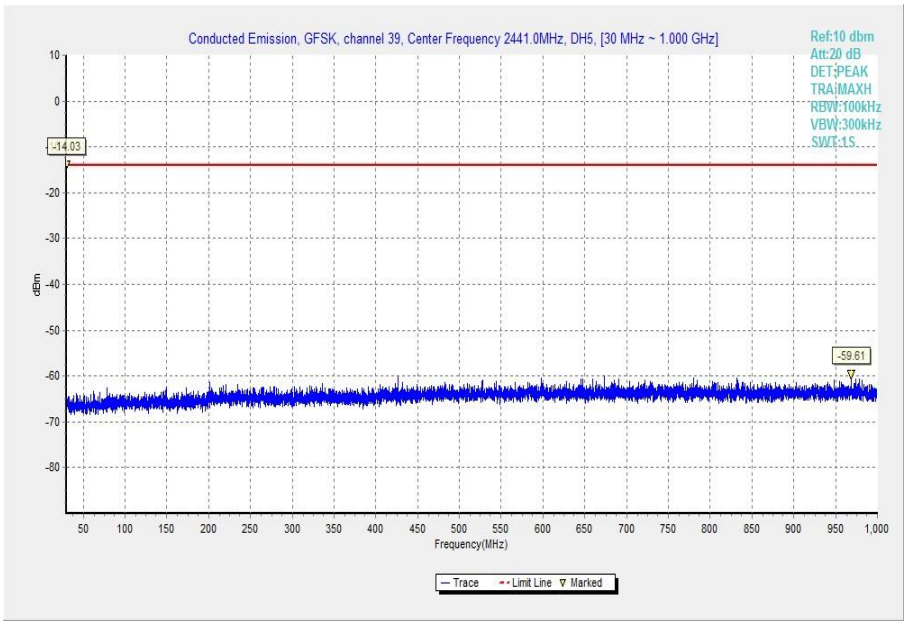


**Fig. 27 Conducted Spurious Emission (GFSK, Ch39, 30 MHz-1 GHz)**

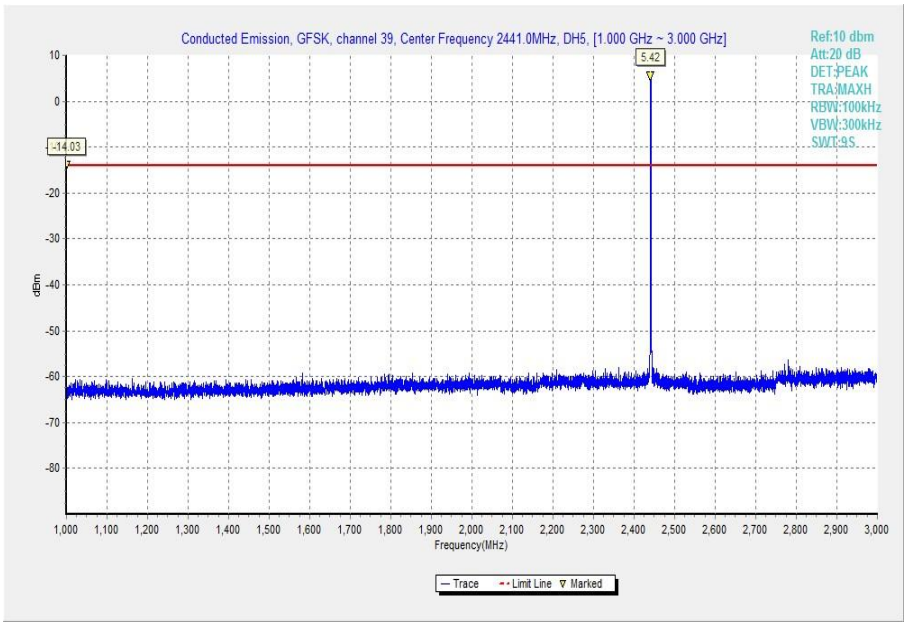


**Fig. 28 Conducted Spurious Emission (GFSK, Ch39, 1GHz-3 GHz)**

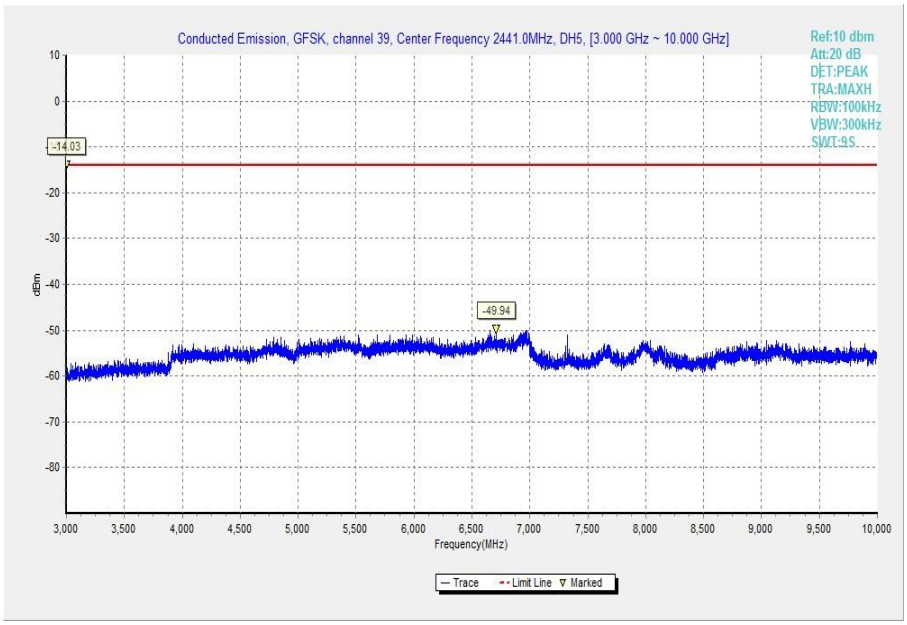


**Fig. 29 Conducted Spurious Emission (GFSK, Ch39, 3GHz-10 GHz)**

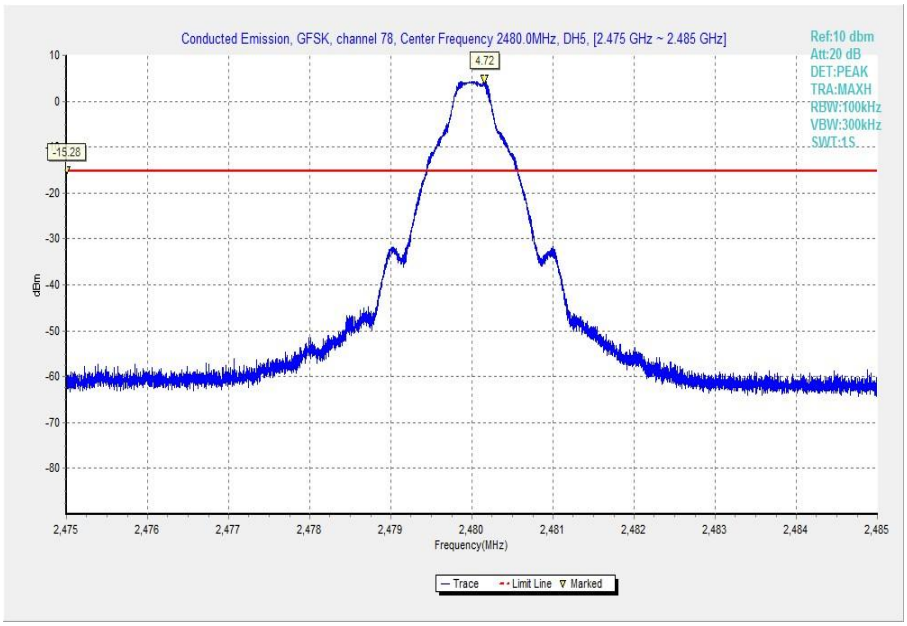


**Fig. 30 Conducted Spurious Emission (GFSK, Ch78, 2.480GHz)**

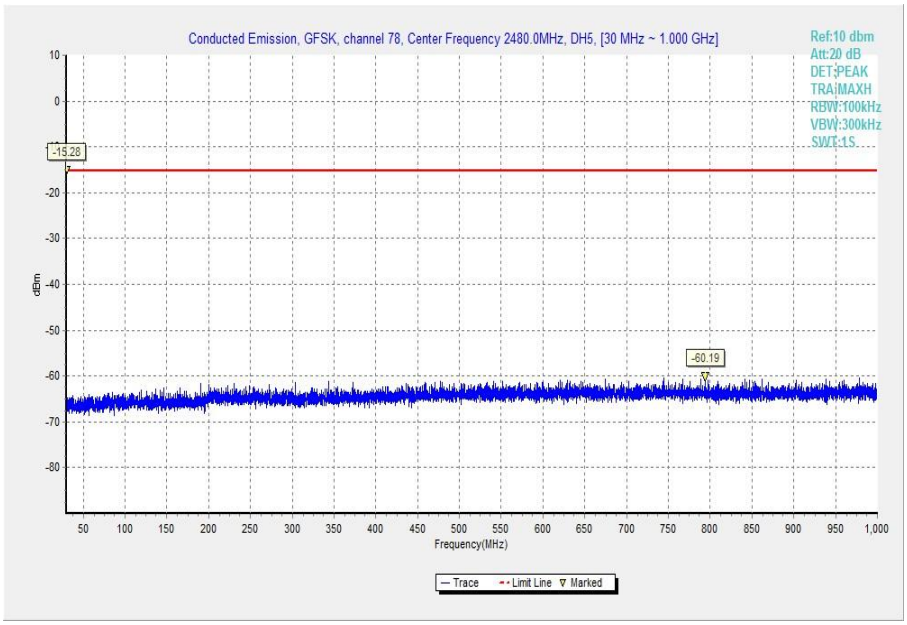


**Fig. 31 Conducted Spurious Emission (GFSK, Ch78, 30 MHz-1 GHz)**

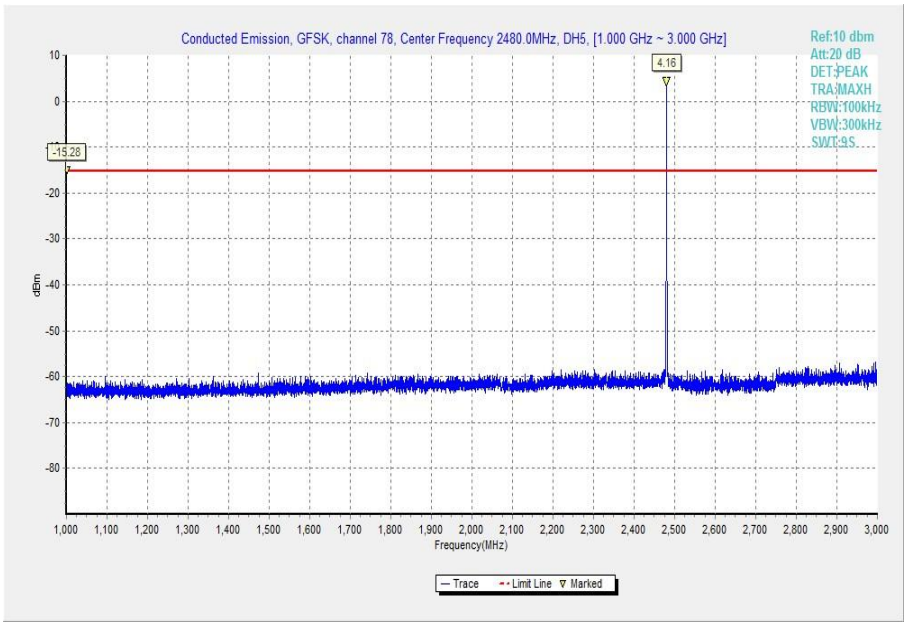


**Fig. 32 Conducted Spurious Emission (GFSK, Ch78, 1GHz-3 GHz)**

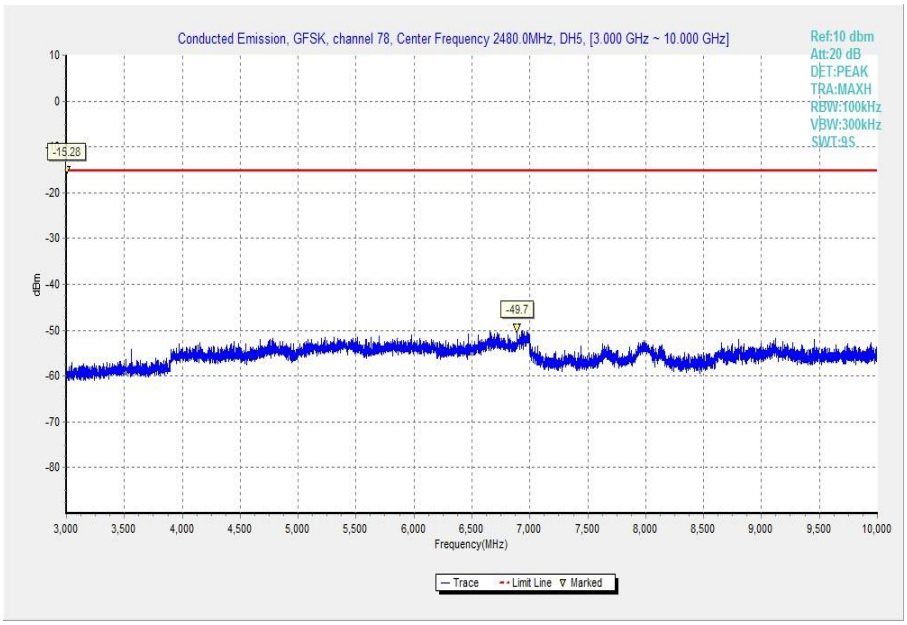


**Fig. 33 Conducted Spurious Emission (GFSK, Ch78, 3GHz-10 GHz)**

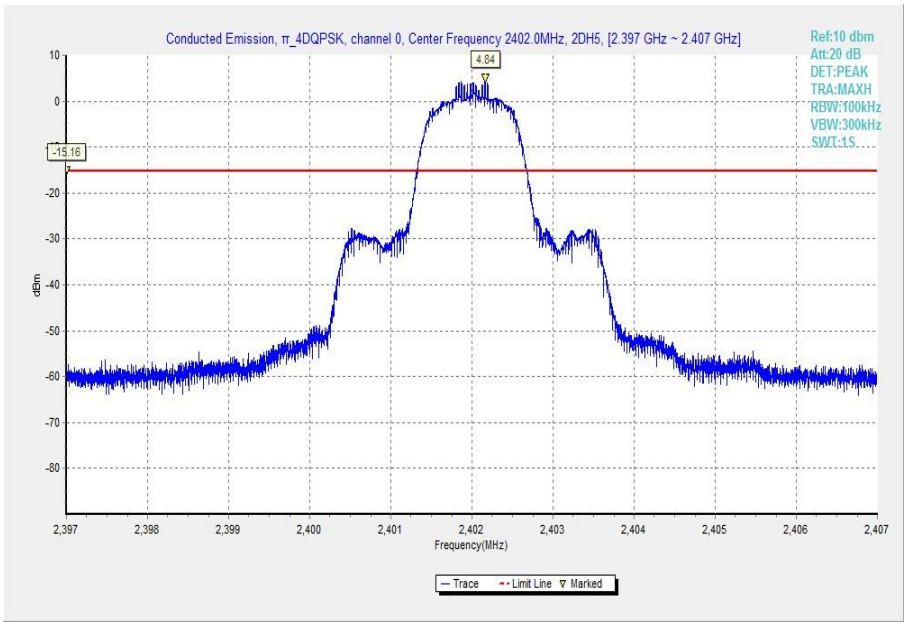


**Fig. 34 Conducted Spurious Emission (π /4 DQPSK, Ch0, 2.402GHz)**

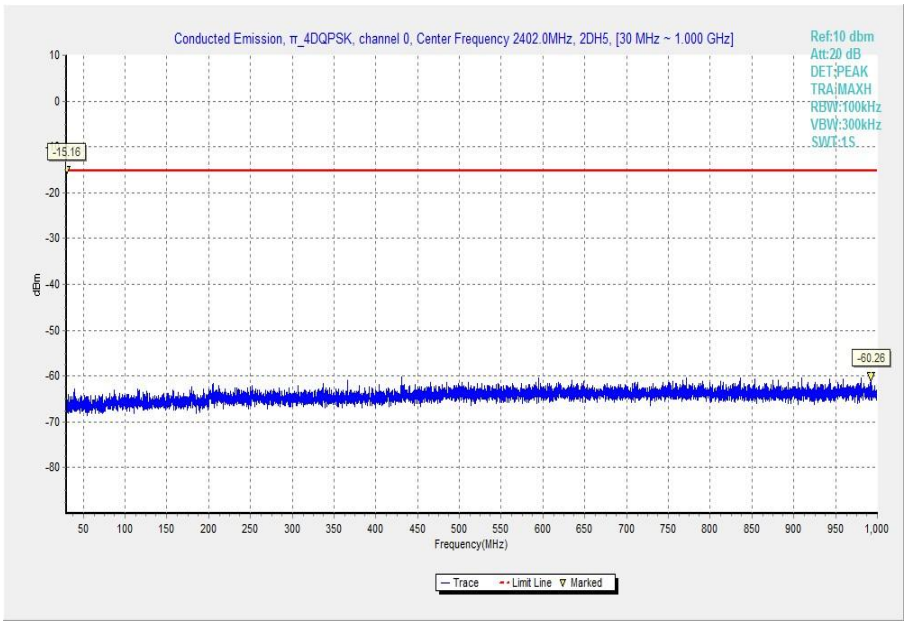


**Fig. 35 Conducted Spurious Emission (π /4 DQPSK, Ch0, 30 MHz-1 GHz)**

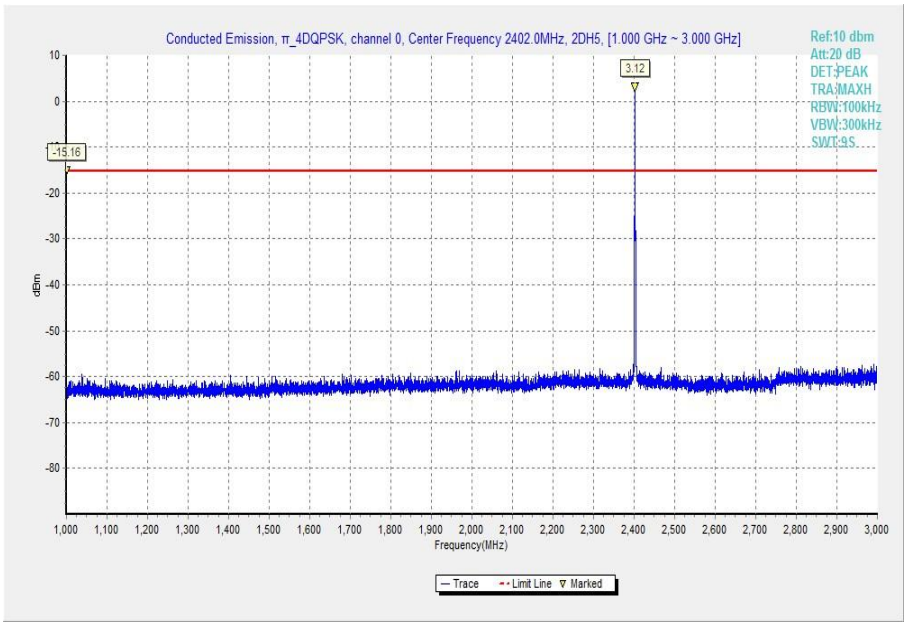


**Fig. 36 Conducted Spurious Emission (π /4 DQPSK, Ch0, 1GHz-3 GHz)**

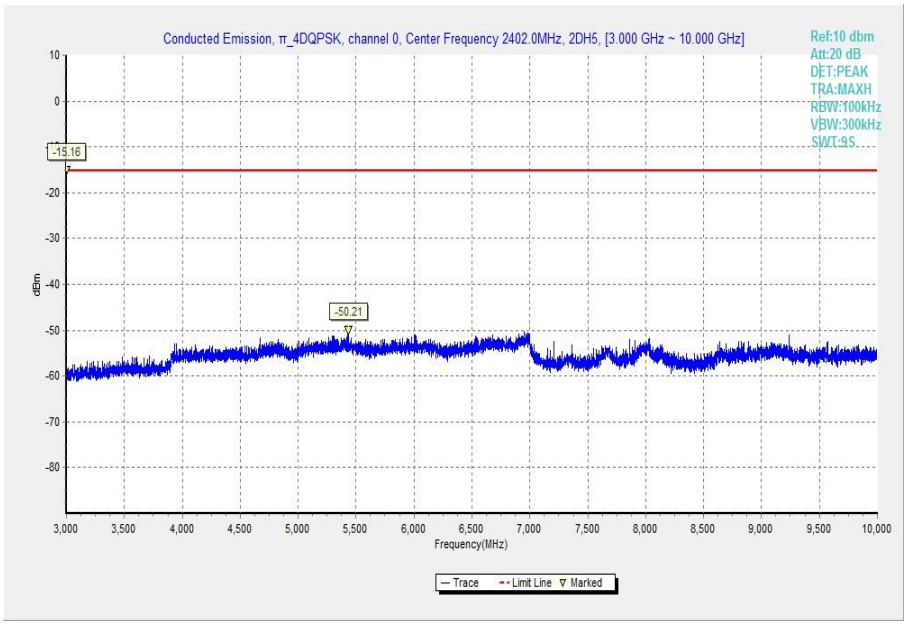


**Fig. 37 Conducted Spurious Emission (π /4 DQPSK, Ch0, 3GHz-10 GHz)**

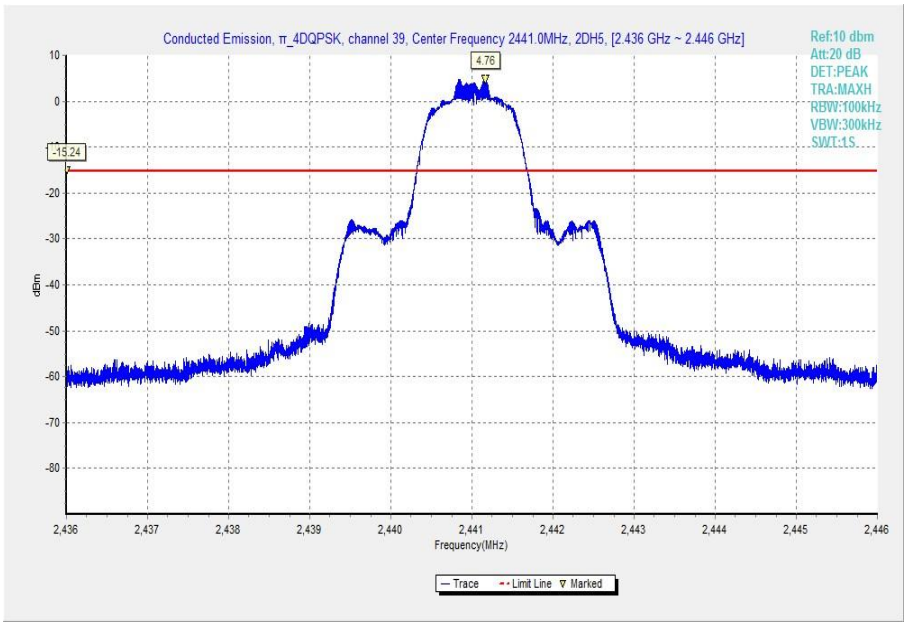


**Fig. 38 Conducted Spurious Emission (π /4 DQPSK, Ch39, 2.441GHz)**

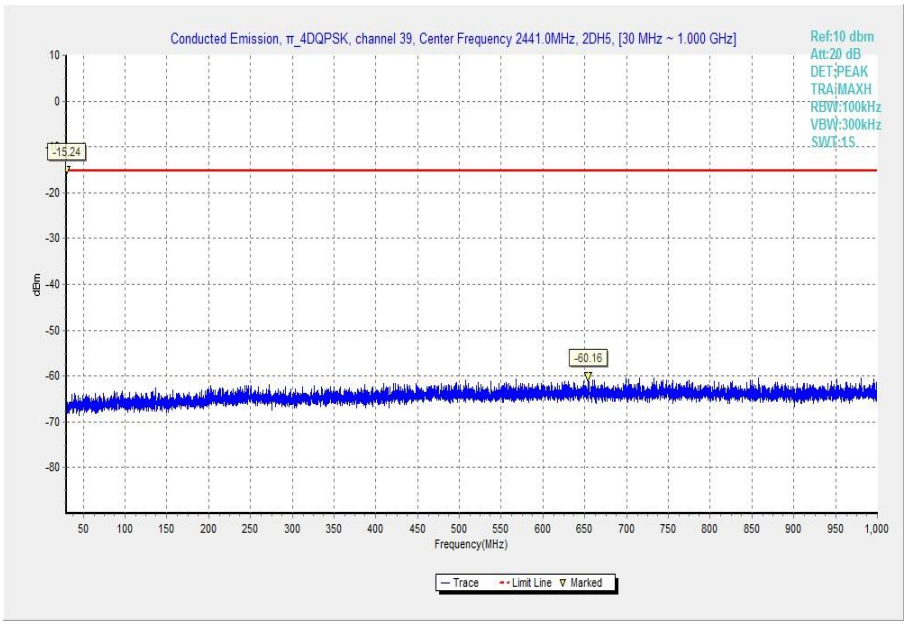


**Fig. 39 Conducted Spurious Emission (π /4 DQPSK, Ch39, 30 MHz-1 GHz)**

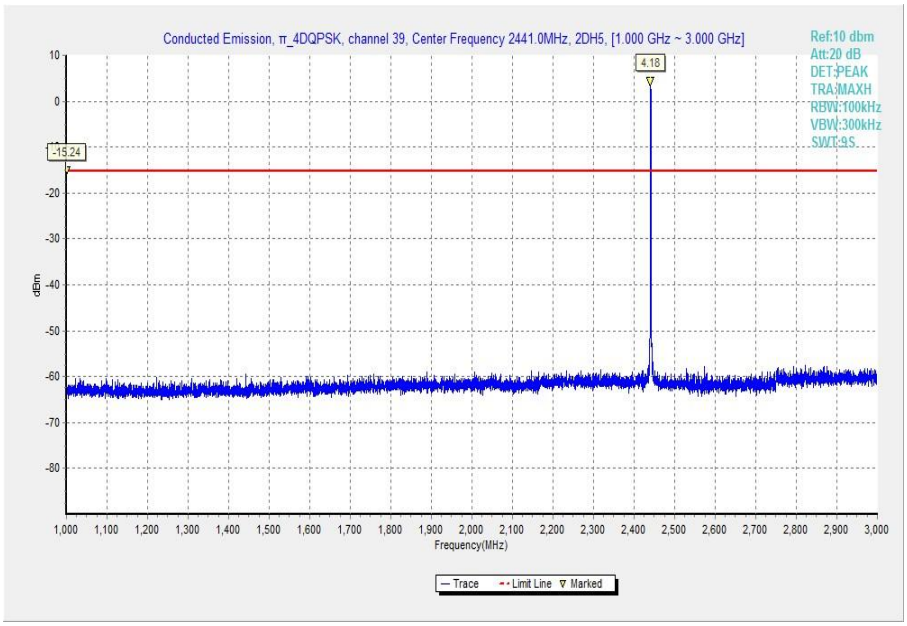


**Fig. 40 Conducted Spurious Emission (π /4 DQPSK, Ch39, 1 GHz-3 GHz)**

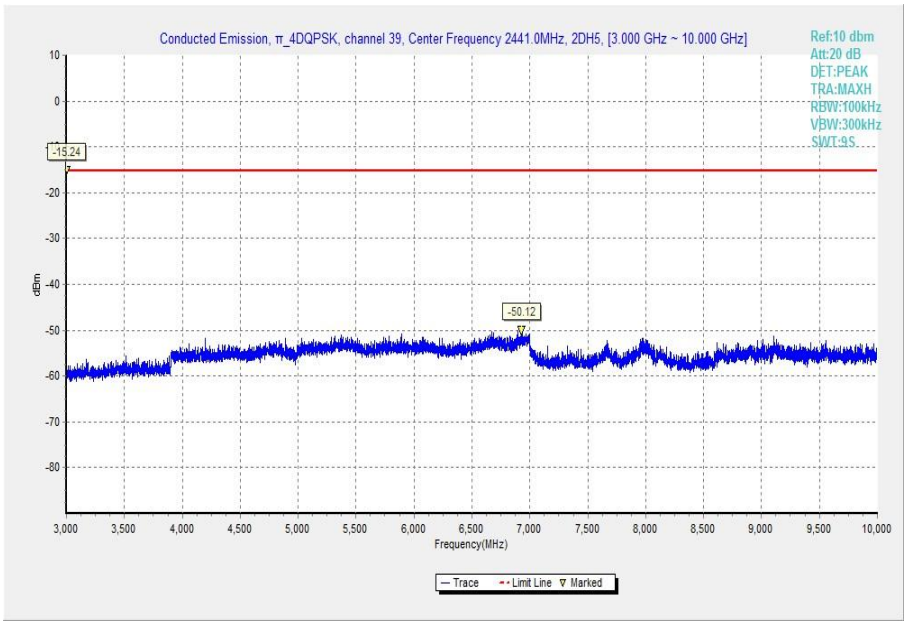


**Fig. 41 Conducted Spurious Emission (π /4 DQPSK, Ch39, 3GHz-10 GHz)**

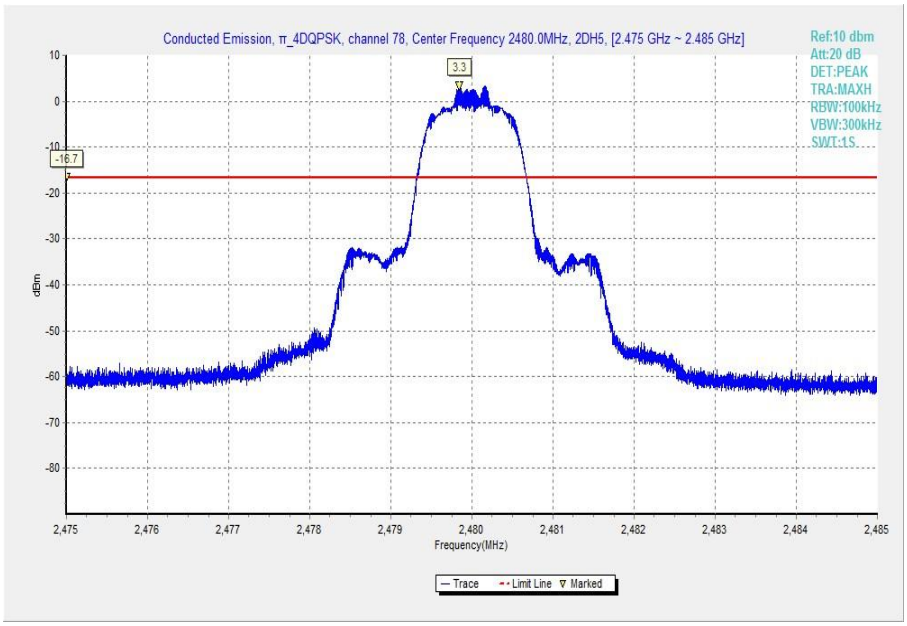


**Fig. 42 Conducted Spurious Emission (π /4 DQPSK, Ch78, 2.480GHz)**

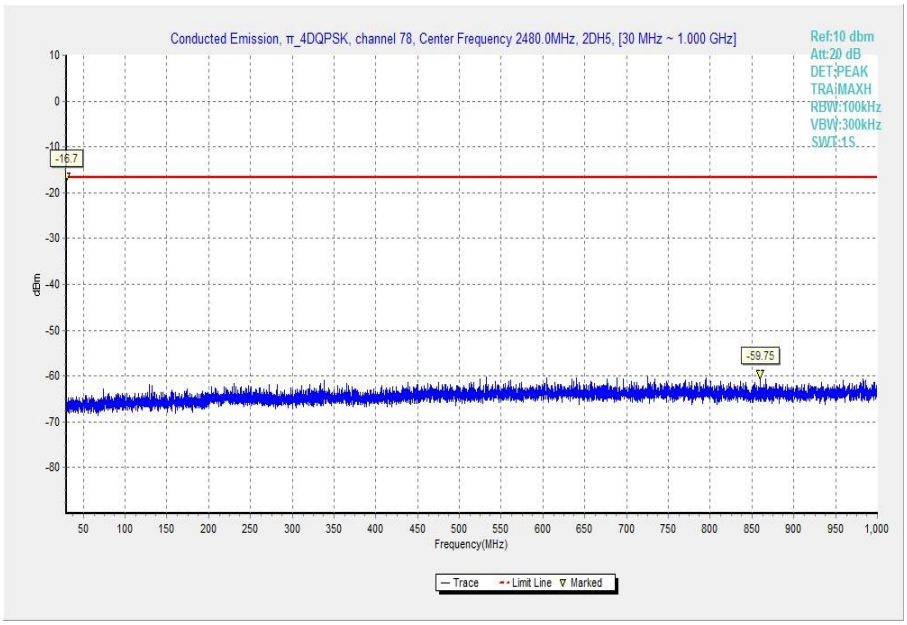


**Fig. 43 Conducted Spurious Emission (π /4 DQPSK, Ch78, 30 MHz-1 GHz)**

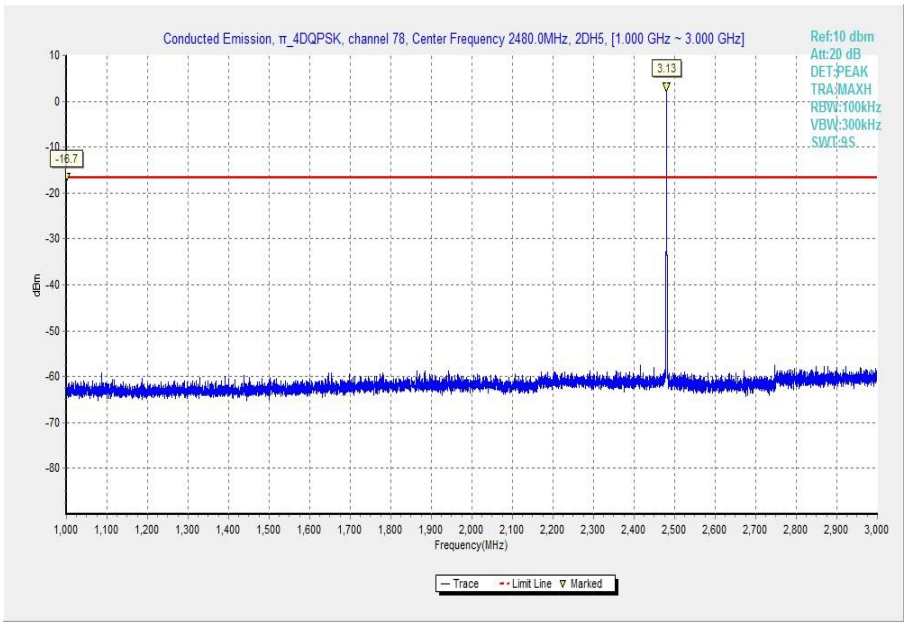


**Fig. 44 Conducted Spurious Emission (π /4 DQPSK, Ch78, 1GHz-3 GHz)**

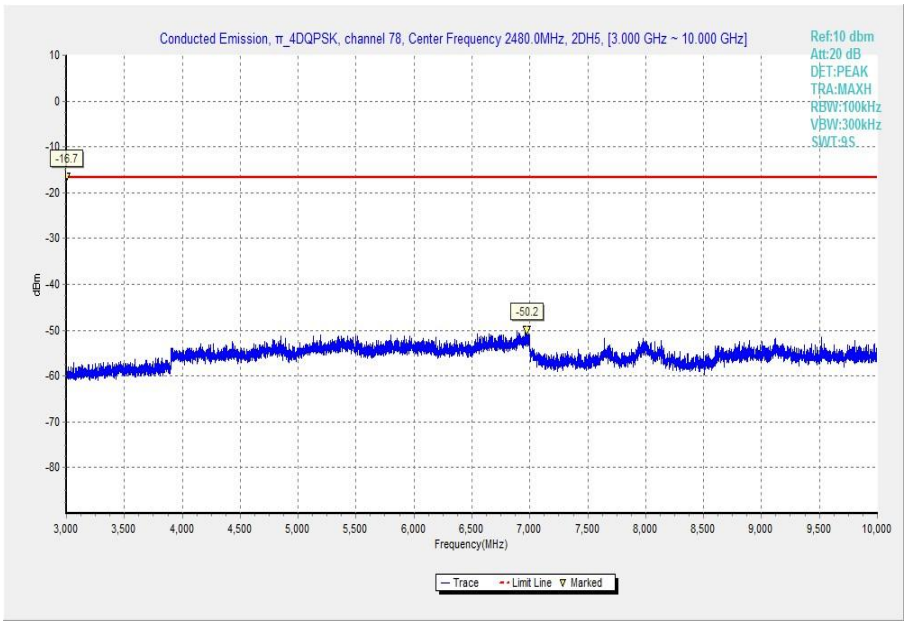


**Fig. 45 Conducted Spurious Emission (π /4 DQPSK, Ch78, 3GHz-10 GHz)**

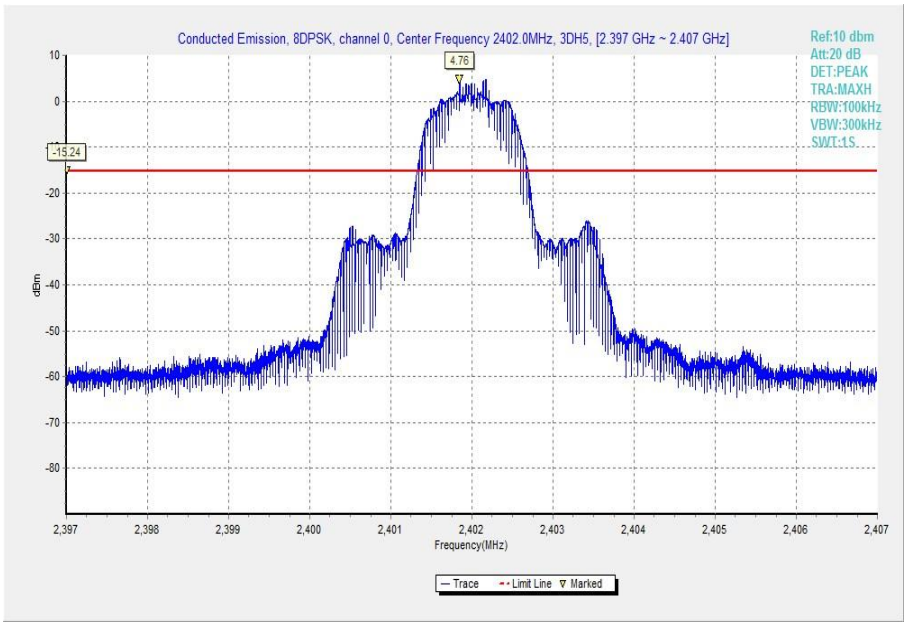


**Fig. 46 Conducted Spurious Emission (8DPSK, Ch0, 2.402GHz)**

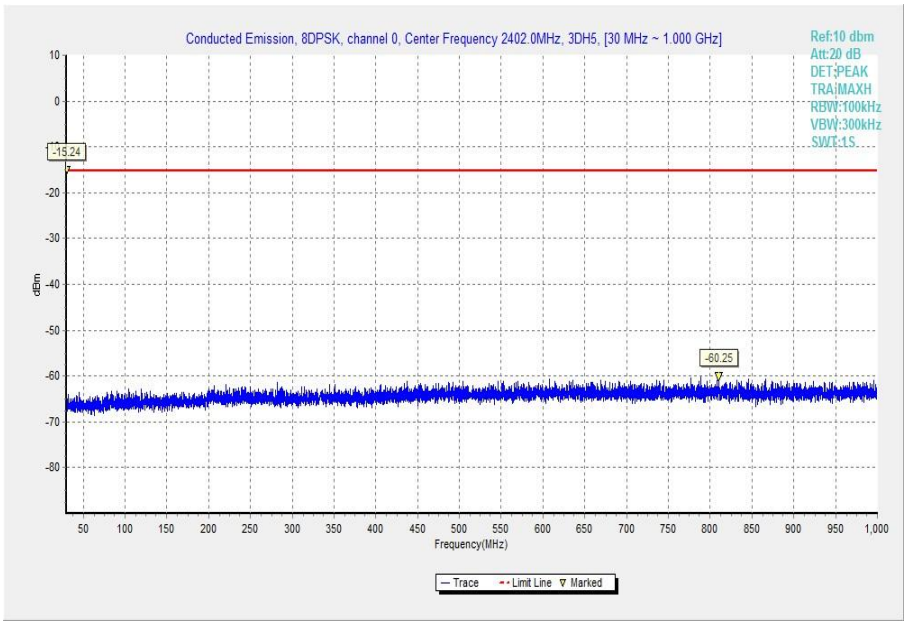


**Fig. 47 Conducted Spurious Emission (8DPSK, Ch0, 30 MHz-1 GHz)**

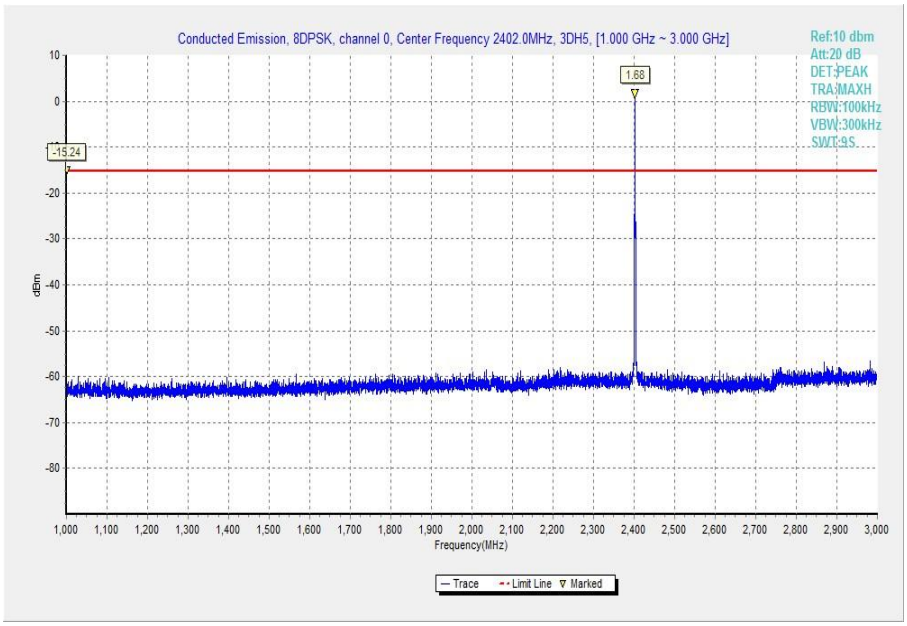


**Fig. 48 Conducted Spurious Emission (8DPSK, Ch0, 1GHz-3 GHz)**

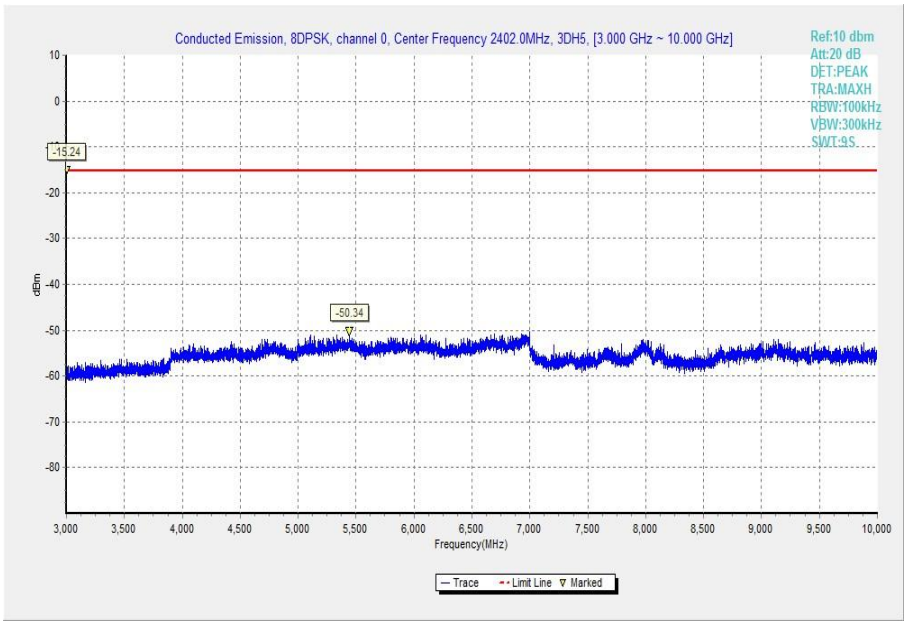


**Fig. 49 Conducted Spurious Emission (8DPSK, Ch0, 3GHz-10 GHz)**

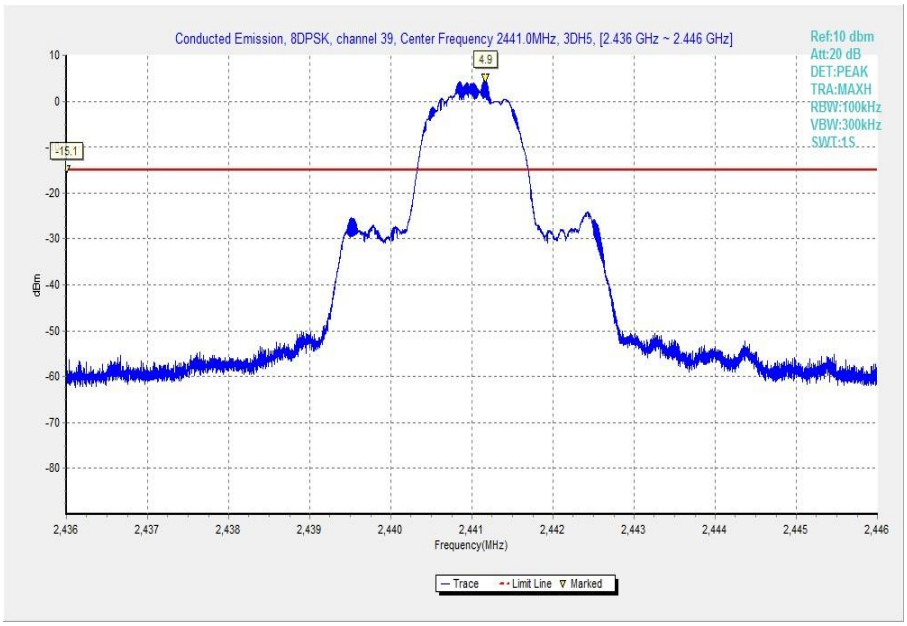


**Fig. 50 Conducted Spurious Emission (8DPSK, Ch39, 2.441GHz)**