# FCC PART 15.247

# TEST REPORT

For

## Hytera Communications Co.,Ltd.

HYT Tower, Hi-Tech Industrial Park North, Nanshan District, Shenzhen, China

## FCC ID: YAMPOA47

| **Report Type:** | **Product Type:** |
|---|---|
| Original Report | Wireless PTT |

| | |
|---|---|
| **Test Engineer:** | Allen Qiao |
| **Report Number:** | RDG150929001-00 |
| **Report Date:** | 2015-10-10 |
| **Reviewed By:** | Sula Huang<br>RF Leader |
| **Test Laboratory:** | Bay Area Compliance Laboratories Corp. (Dongguan)<br>No.69 Pulongcun, Puxinhu Industrial Zone,<br>Tangxia, Dongguan, Guangdong, China<br>Tel: +86-769-86858888<br>Fax: +86-769-86858891<br>www.baclcorp.com.cn |

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# GENERAL INFORMATION

## Product Description for Equipment under Test (EUT)

The *Hytera Communications Co.,Ltd.*'s product, model number: *POA47 (FCC ID: YAMPOA47)* (the "EUT") in this report was a *Wireless PTT,* which was measured approximately: 40.9mm (L) x30.4 mm (W) x16.9 mm (H), rated input voltage: DC3.7V Li-ion battery or DC5V charging from adapter.

Adapter information: Switching Adapter
MODEL: DSA-12PFA FUS 050100
INPUT: 100-240V~50/60Hz 0.5A
OUTPUT: +5V, 1A

*All measurement and test data in this report was gathered from production sample serial number: 150929001(Assigned by BACL, Dongguan). The EUT was received on 2015-09-29.*

## Objective

This report is prepared on behalf of *Hytera Communications Co.,Ltd.* in accordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communications Commission's rules

The tests were performed in order to determine the EUT compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

## Related Submittal(s)/Grant(s)

No related submittal(s).

## Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

## Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China

Test site at Bay Area Compliance Laboratories Corp. (Dongguan) has been fully described in reports submitted to the Federal Communications Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 06, 2015.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 273710. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

# SYSTEM TEST CONFIGURATION

## Description of Test Configuration

The system was configured for testing in engineering mode.

## EUT Exercise Software

The test software: 'CSR Bluetest 3' was used in test, which was provided by manufacturer. The worst condition (maximum power) was setting by the software as following table:

| Test Mode | CSR Bluetest 3 | | |
|---|---|---|---|
| | 2402MHz | 2441MHz | 2480MHz |
| BDR(GFSK) | N/A | N/A | N/A |
| EDR (π/4-DQPSK) | N/A | N/A | N/A |
| EDR (8DPSK) | N/A | N/A | N/A |

## Equipment Modifications

No modification was made to the EUT tested.

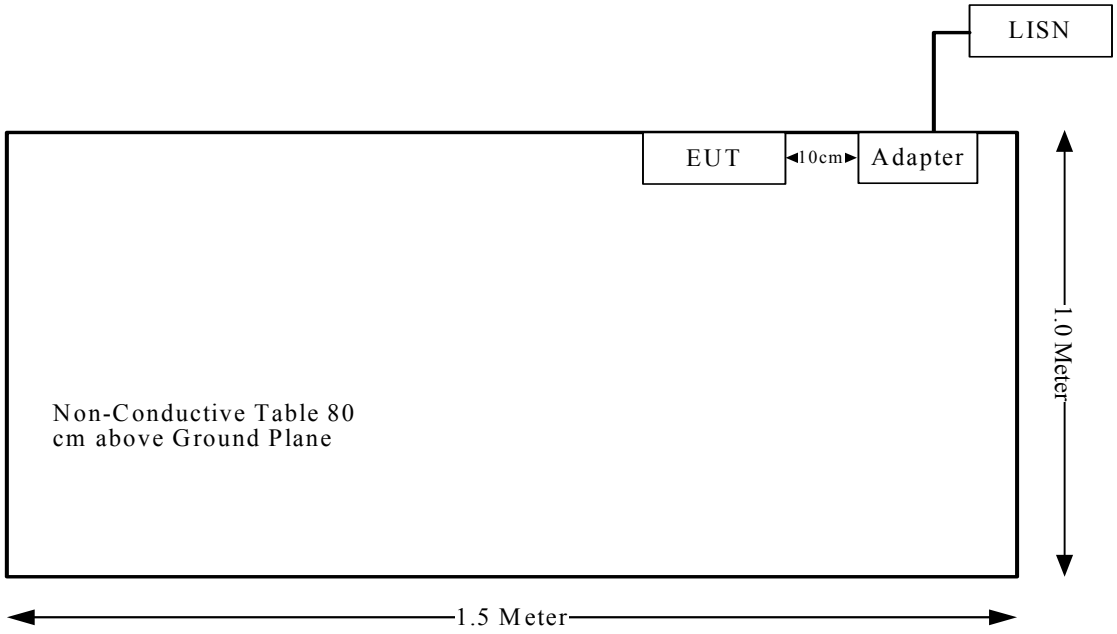
## Local Support Equipment List and Details

| Manufacturer | Description | Model | Serial Number |
|---|---|---|---|
| / | / | / | / |

## Support Cable List and Details

| Cable Description | Shielding Type | Ferrite Core | Length (m) | From | To |
|---|---|---|---|---|---|
| Adapter Cable | No | No | 1.5 | Adapter | EUT |

**Block Diagram of Test Setup**



# SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test | Result |
|---|---|---|
| FCC §15.247 (i) & §1.1310 & §2.1093 | RF Exposure | Compliance |
| §15.203 | Antenna Requirement | Compliance |
| §15.207 (a) | Conducted Emissions | Compliace |
| §15.205, §15.209, §15.247(d) | Spurious Emissions | Compliance |
| §15.247 (a)(1) | 20 dB Bandwidth | Compliance |
| §15.247(a)(1) | Channel Separation Test | Compliance |
| §15.247(a)(1)(iii) | Time of Occupancy (Dwell Time) | Compliance |
| §15.247(a)(1)(iii) | Quantity of hopping channel Test | Compliance |
| §15.247(b)(1) | Peak Output Power Measurement | Compliance |
| §15.247(d) | Band Edges | Compliance |

# FCC §15.247 (i) & §1.1310 & §2.1093- RF EXPOSURE

## Applicable Standard

According to§15.247(i) and §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB447498 D01 General RF Exposure Guidance v05r02:

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

**Measurement Result**

The maximum output power= 3.71 dBm (2.35mW) at 2402 MHz
[(max. power of channel, mW)/(min. test separation distance, mm)][√f(GHz)]
= 2.35/5*(√2.402) = 0.73 < 3.0

**So the SAR evaluation is not necessary.**

# FCC §15.203 - ANTENNA REQUIREMENT

## Applicable Standard

According to FCC § 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.

## Antenna Connector Construction

The EUT has one integral antenna arrangement, which was permanently attached and the antenna gain is 2 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

**Result:** Compliance.

# FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

## Applicable Standard

FCC§15.207

## Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner：

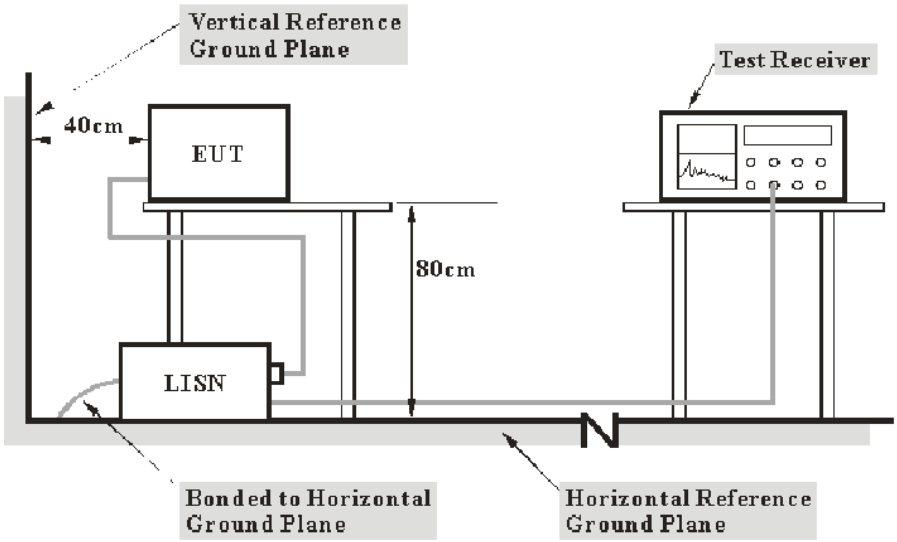
If $U_{lab}$ is less than or equal to $U_{cispr}$ of Table 1, then:
– compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
– non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.
If $U_{lab}$ is greater than $U_{cispr}$ of Table 1, then:
– compliance is deemed to occur if no measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit;
– non - compliance is deemed to occur if any measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit.

Based on CISPR 16-4-2: 2011, measurement uncertainty of conducted disturbance at mains port using AMN at Bay Area Compliance Laboratories Corp. (Dongguan) is 3.46 dB (150 kHz to 30 MHz).

Table 1 – Values of $U_{cispr}$

| Measurement | $U_{cispr}$ |
|---|---|
| Conducted disturbance at mains port using AMN (150 kHz to 30 MHz) | 3.4 dB |

## EUT Setup




Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

The adapter was connected to a 120 VAC/60 Hz power source.

## EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

| Frequency Range | IF B/W |
|---|---|
| 150 kHz – 30 MHz | 9 kHz |

## Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the first LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

## Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$V_C = V_R + A_C + VDF$

Herein,
$V_C$: corrected voltage amplitude
$V_R$: reading voltage amplitude
$A_c$: attenuation caused by cable loss
VDF: voltage division factor of AMN or ISN

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| R&S | EMI Test Receiver | ESCS 30 | 830245/006 | 2014-10-20 | 2015-10-20 |
| R&S | L.I.S.N | ESH2-Z5 | 892107/021 | 2015-06-09 | 2016-06-09 |
| R&S | Two-line V-network | ENV 216 | 3560.6550.12 | 2014-12-11 | 2015-12-11 |
| R&S | Test Software | EMC32 | Version8.53.0 | N/A | N/A |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207, with the worst margin reading of:

**9.5 dB** at **1.289541 MHz** in the **Neutral** conducted mode

## Test Data

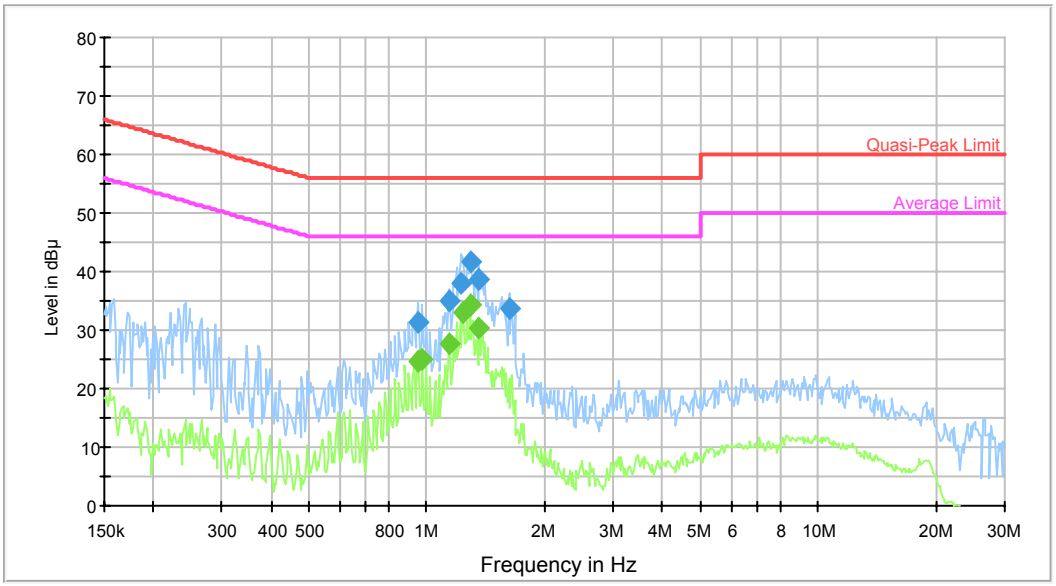
### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 26.2°C |
| **Relative Humidity:** | 49 % |
| **ATM Pressure:** | 100.3 kPa |

*The testing was performed by Allen Qiao on 2015-10-08.*

*Test Mode: Transmitting*

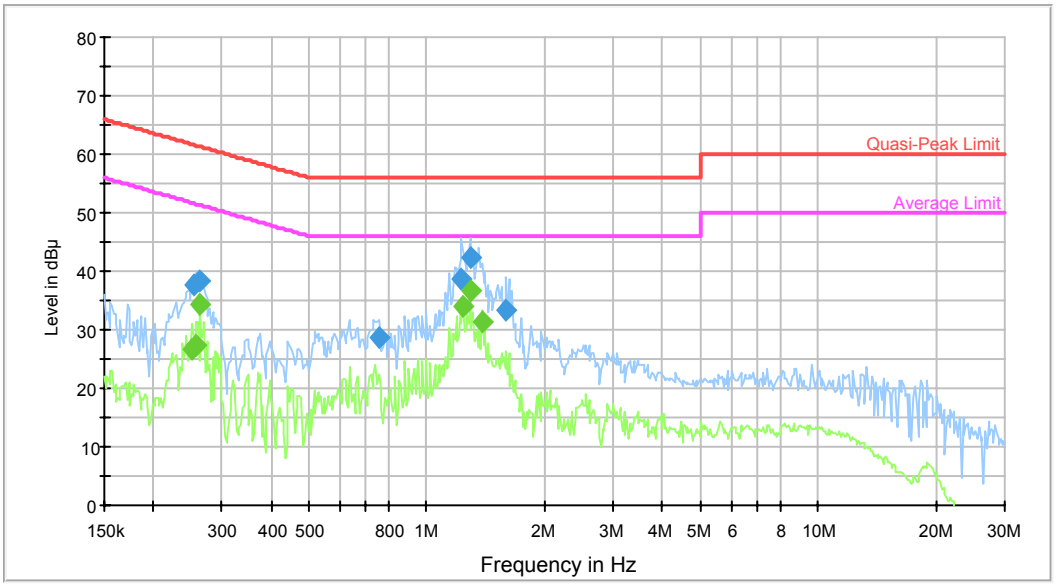
**AC120 V, 60 Hz, Line:**




| Frequency (MHz) | QuasiPeak (dBµV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) | Comment |
|---|---|---|---|---|---|---|---|
| 0.952654 | 31.2 | 9.000 | L1 | 9.8 | 24.8 | 56.0 | Compliance |
| 1.144267 | 34.9 | 9.000 | L1 | 9.8 | 21.1 | 56.0 | Compliance |
| 1.229340 | 38.1 | 9.000 | L1 | 9.8 | 17.9 | 56.0 | Compliance |
| 1.289541 | 41.6 | 9.000 | L1 | 9.8 | 14.4 | 56.0 | Compliance |
| 1.363512 | 38.6 | 9.000 | L1 | 9.8 | 17.4 | 56.0 | Compliance |
| 1.624765 | 33.6 | 9.000 | L1 | 9.8 | 22.4 | 56.0 | Compliance |

| Frequency (MHz) | Average (dBµV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) | Comment |
|---|---|---|---|---|---|---|---|
| 0.952654 | 24.7 | 9.000 | L1 | 9.8 | 21.3 | 46.0 | Compliance |
| 0.975701 | 25.1 | 9.000 | L1 | 9.8 | 20.9 | 46.0 | Compliance |
| 1.144267 | 27.5 | 9.000 | L1 | 9.8 | 18.5 | 46.0 | Compliance |
| 1.239175 | 33.1 | 9.000 | L1 | 9.8 | 12.9 | 46.0 | Compliance |
| 1.289541 | 34.4 | 9.000 | L1 | 9.8 | 11.6 | 46.0 | Compliance |
| 1.363512 | 30.2 | 9.000 | L1 | 9.8 | 15.8 | 46.0 | Compliance |

**AC120 V, 60 Hz, Neutral:**




| Frequency (MHz) | QuasiPeak (dBµV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) | Comment |
|---|---|---|---|---|---|---|---|
| 0.253797 | 37.8 | 9.000 | N | 9.8 | 23.8 | 61.6 | Compliance |
| 0.264113 | 38.4 | 9.000 | N | 9.8 | 22.9 | 61.3 | Compliance |
| 0.756101 | 28.7 | 9.000 | N | 9.8 | 27.3 | 56.0 | Compliance |
| 1.229340 | 38.5 | 9.000 | N | 9.8 | 17.5 | 56.0 | Compliance |
| 1.289541 | 42.2 | 9.000 | N | 9.8 | 13.8 | 56.0 | Compliance |
| 1.599078 | 33.4 | 9.000 | N | 9.8 | 22.6 | 56.0 | Compliance |

| Frequency (MHz) | Average (dBµV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) | Comment |
|---|---|---|---|---|---|---|---|
| 0.251783 | 26.6 | 9.000 | N | 9.8 | 25.1 | 51.7 | Compliance |
| 0.257874 | 27.4 | 9.000 | N | 9.8 | 24.1 | 51.5 | Compliance |
| 0.264113 | 34.3 | 9.000 | N | 9.8 | 17.0 | 51.3 | Compliance |
| 1.239175 | 33.8 | 9.000 | N | 9.8 | 12.2 | 46.0 | Compliance |
| 1.289541 | 36.5 | 9.000 | N | 9.8 | 9.5 | 46.0 | Compliance |
| 1.385415 | 31.3 | 9.000 | N | 9.8 | 14.7 | 46.0 | Compliance |

# FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

## Applicable Standard

FCC §15.247 (d); §15.209; §15.205;

## Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner：

If $U_{lab}$ is less than or equal to $U_{cispr}$ of Table 1, then:
- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If $U_{lab}$ is greater than $U_{cispr}$ of Table 1, then:
- compliance is deemed to occur if no measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit.

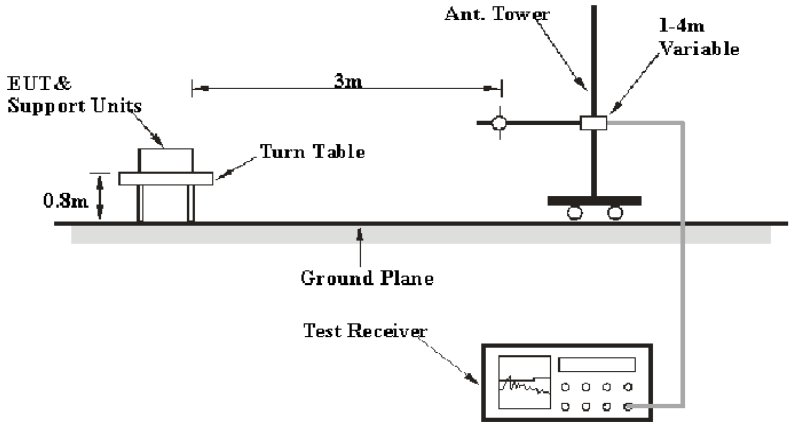
Based on CISPR 16-4-2: 2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Dongguan) is:
30M~200MHz: 5.0 dB
200M~1GHz: 6.2 dB
1G~6GHz: 4.45 dB
6G~18GHz: 5.23 dB

Table 1 – Values of $U_{cispr}$

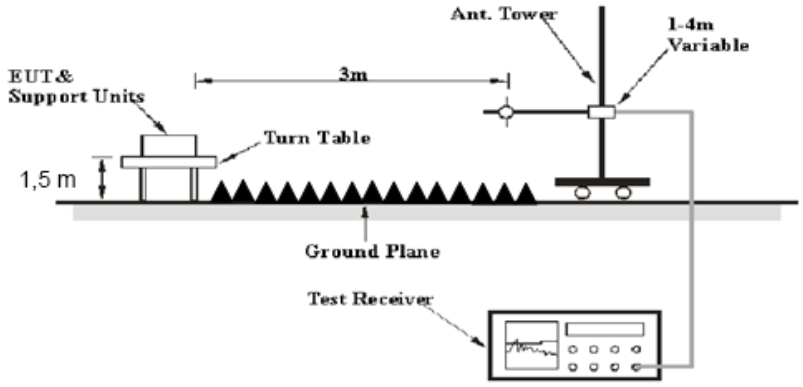
| Measurement | $U_{cispr}$ |
|---|---|
| Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz) | 6.3 dB |
| Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz) | 5.2 dB |
| Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz) | 5.5 dB |

## EUT Setup

**Below 1GHz:**



**Above 1GHz:**




The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

## EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

| Frequency Range | RBW | Video B/W | IF B/W | Detector |
|---|---|---|---|---|
| 30 MHz – 1000 MHz | 120 kHz | 300 kHz | 120 kHz | QP |
| Above 1 GHz | 1MHz | 3 MHz | / | PK |
| | 1MHz | 10 Hz | / | Ave. |

## Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz - 1 GHz, peak and average detection modes for frequencies above 1 GHz.

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| R&S | EMI Test Receiver | ESCI | 100224 | 2015-05-09 | 2016-05-09 |
| Sunol Sciences | Antenna | JB3 | A060611-3 | 2014-07-28 | 2017-07-27 |
| HP | Amplifier | 8447E | 2434A02181 | 2015-09-01 | 2016-09-01 |
| Agilent | Spectrum Analyzer | E4440A | SG43360054 | 2014-12-04 | 2015-12-04 |
| R&S | Spectrum Analyzer | FSEM | DE31388 | 2015-05-09 | 2016-05-09 |
| ETS LINDGREN | Horn Antenna | 3115 | 000 527 35 | 2015-09-06 | 2018-09-06 |
| Mini-Circuit | Amplifier | ZVA-213-S+ | 054201245 | 2015-02-19 | 2016-02-19 |
| Ducommun Technolagies | Horn Antenna | ARH-4223-02 | 1007726-01 1304 | 2014-06-16 | 2017-06-15 |
| Quinstar | Amplifier | QLW-18405536-JO | 15964001001 | 2015-09-06 | 2016-09-06 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

## Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart C, and section 15.205, 15.209 and 15.247, with the worst margin reading of:

**4.31 dB** at **2483.5 MHz** in the **Horizontal** polarization

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 24.7 °C |
| **Relative Humidity:** | 53 % |
| **ATM Pressure:** | 100.5 kPa |

** The testing was performed by Allen Qiao on 2015-09-30.*

*Test Mode: Transmitting*

*BDR Mode (GFSK):*

| Frequency | Receiver | | Rx Antenna | | Cable loss (dB) | Amplifier Gain (dB) | Corrected Amplitude (dBμV/m) | FCC 15.247 | |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | Reading (dBμV) | Detector (PK/QP/AV) | Polar (H/V) | Factor (dB) | | | | Limit (dBμV/m) | Margin (dB) |
| Low Channel: 2402 MHz | | | | | | | | | |
| 2402 | 67.12 | PK | H | 28.46 | 3.66 | 0.00 | 99.24 | N/A | N/A |
| 2402 | 56.95 | AV | H | 28.46 | 3.66 | 0.00 | 89.07 | N/A | N/A |
| 2402 | 60.76 | PK | V | 28.46 | 3.66 | 0.00 | 92.88 | N/A | N/A |
| 2402 | 50.98 | AV | V | 28.46 | 3.66 | 0.00 | 83.10 | N/A | N/A |
| 2390 | 26.29 | PK | H | 28.44 | 3.63 | 0.00 | 58.36 | 74.00 | 15.64 |
| 2390 | 13.32 | AV | H | 28.44 | 3.63 | 0.00 | 45.39 | 54.00 | 8.61 |
| 4804 | 49.65 | PK | H | 33.13 | 5.06 | 27.41 | 60.43 | 74.00 | 13.57 |
| 4804 | 30.08 | AV | H | 33.13 | 5.06 | 27.41 | 40.86 | 54.00 | 13.14 |
| 7206 | 32.09 | PK | H | 36.37 | 6.61 | 25.91 | 49.16 | 74.00 | 24.84 |
| 7206 | 18.78 | AV | H | 36.37 | 6.61 | 25.91 | 35.85 | 54.00 | 18.15 |
| 9608 | 30.11 | PK | H | 38.38 | 8.53 | 27.55 | 49.47 | 74.00 | 24.53 |
| 9608 | 16.89 | AV | H | 38.38 | 8.53 | 27.55 | 36.25 | 54.00 | 17.75 |
| 3310 | 33.96 | PK | H | 31.98 | 5.07 | 27.28 | 43.73 | 74.00 | 30.27 |
| 3310 | 20.74 | AV | H | 31.98 | 5.07 | 27.28 | 30.51 | 54.00 | 23.49 |
| 241.23 | 29.2 | QP | H | 12.23 | 1.86 | 21.48 | 21.81 | 46.00 | 24.19 |
| Middle Channel: 2441 MHz | | | | | | | | | |
| 2441 | 68.02 | PK | H | 28.56 | 3.76 | 0.00 | 100.34 | N/A | N/A |
| 2441 | 57.7 | AV | H | 28.56 | 3.76 | 0.00 | 90.02 | N/A | N/A |
| 2441 | 61.51 | PK | V | 28.56 | 3.76 | 0.00 | 93.83 | N/A | N/A |
| 2441 | 51.59 | AV | V | 28.56 | 3.76 | 0.00 | 83.91 | N/A | N/A |
| 4882 | 49.02 | PK | H | 33.40 | 5.19 | 27.42 | 60.19 | 74.00 | 13.81 |
| 4882 | 30.49 | AV | H | 33.40 | 5.19 | 27.42 | 41.66 | 54.00 | 12.34 |
| 7323 | 31.89 | PK | H | 36.58 | 6.75 | 25.88 | 49.34 | 74.00 | 24.66 |
| 7323 | 18.58 | AV | H | 36.58 | 6.75 | 25.88 | 36.03 | 54.00 | 17.97 |
| 9764 | 29.82 | PK | H | 38.35 | 8.62 | 27.20 | 49.59 | 74.00 | 24.41 |
| 9764 | 16.51 | AV | H | 38.35 | 8.62 | 27.20 | 36.28 | 54.00 | 17.72 |
| 3310 | 33.7 | PK | H | 31.98 | 5.07 | 27.28 | 43.47 | 74.00 | 30.53 |
| 3310 | 20.39 | AV | H | 31.98 | 5.07 | 27.28 | 30.16 | 54.00 | 23.84 |
| 2935 | 33.85 | PK | H | 30.53 | 6.40 | 27.54 | 43.24 | 74.00 | 30.76 |
| 2935 | 20.41 | AV | H | 30.53 | 6.40 | 27.54 | 29.80 | 54.00 | 24.20 |
| 241.23 | 29.3 | QP | H | 12.23 | 1.86 | 21.48 | 21.91 | 46.00 | 24.09 |
| High Channel: 2480 MHz | | | | | | | | | |
| 2480 | 68.48 | PK | H | 28.65 | 3.68 | 0.00 | 100.81 | N/A | N/A |
| 2480 | 58.67 | AV | H | 28.65 | 3.68 | 0.00 | 91.00 | N/A | N/A |
| 2480 | 61.55 | PK | V | 28.65 | 3.68 | 0.00 | 93.88 | N/A | N/A |
| 2480 | 51.75 | AV | V | 28.65 | 3.68 | 0.00 | 84.08 | N/A | N/A |
| 2483.5 | 28.76 | PK | H | 28.66 | 3.67 | 0.00 | 61.09 | 74.00 | 12.91 |
| 2483.5 | 16.74 | AV | H | 28.66 | 3.67 | 0.00 | 49.07 | 54.00 | 4.93 |
| 4960 | 48.34 | PK | H | 33.66 | 5.34 | 27.43 | 59.91 | 74.00 | 14.09 |
| 4960 | 32.65 | AV | H | 33.66 | 5.34 | 27.43 | 44.22 | 54.00 | 9.78 |
| 7440 | 32.51 | PK | H | 36.79 | 6.89 | 25.97 | 50.22 | 74.00 | 23.78 |
| 7440 | 19.27 | AV | H | 36.79 | 6.89 | 25.97 | 36.98 | 54.00 | 17.02 |
| 9920 | 30.03 | PK | H | 38.32 | 8.71 | 26.66 | 50.40 | 74.00 | 23.60 |
| 9920 | 16.88 | AV | H | 38.32 | 8.71 | 26.66 | 37.25 | 54.00 | 16.75 |
| 3310 | 34.45 | PK | H | 31.98 | 5.07 | 27.28 | 44.22 | 74.00 | 29.78 |
| 3310 | 21.21 | AV | H | 31.98 | 5.07 | 27.28 | 30.98 | 54.00 | 23.02 |
| 241.23 | 29.4 | QP | H | 12.23 | 1.86 | 21.48 | 22.01 | 46.00 | 23.99 |

*EDR Mode (π/4-DQPSK):*

| Frequency | Receiver | | Rx Antenna | | Cable loss (dB) | Amplifier Gain (dB) | Corrected Amplitude (dBμV/m) | FCC 15.247 | |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | Reading (dBμV) | Detector (PK/QP/AV) | Polar (H/V) | Factor (dB) | | | | Limit (dBμV/m) | Margin (dB) |
| Low Channel: 2402 MHz | | | | | | | | | |
| 2402 | 64.43 | PK | H | 28.46 | 3.66 | 0.00 | 96.55 | N/A | N/A |
| 2402 | 53.17 | AV | H | 28.46 | 3.66 | 0.00 | 85.29 | N/A | N/A |
| 2402 | 58.6 | PK | V | 28.46 | 3.66 | 0.00 | 90.72 | N/A | N/A |
| 2402 | 47.33 | AV | V | 28.46 | 3.66 | 0.00 | 79.45 | N/A | N/A |
| 2390 | 26.44 | PK | H | 28.44 | 3.63 | 0.00 | 58.51 | 74.00 | 15.49 |
| 2390 | 13.34 | AV | H | 28.44 | 3.63 | 0.00 | 45.41 | 54.00 | 8.59 |
| 4804 | 44.8 | PK | H | 33.13 | 5.06 | 27.41 | 55.58 | 74.00 | 18.42 |
| 4804 | 24.59 | AV | H | 33.13 | 5.06 | 27.41 | 35.37 | 54.00 | 18.63 |
| 7206 | 31.81 | PK | H | 36.37 | 6.61 | 25.91 | 48.88 | 74.00 | 25.12 |
| 7206 | 18.41 | AV | H | 36.37 | 6.61 | 25.91 | 35.48 | 54.00 | 18.52 |
| 9608 | 29.89 | PK | H | 38.38 | 8.53 | 27.55 | 49.25 | 74.00 | 24.75 |
| 9608 | 16.61 | AV | H | 38.38 | 8.53 | 27.55 | 35.97 | 54.00 | 18.03 |
| 3221 | 33.89 | PK | H | 31.64 | 6.18 | 27.35 | 44.36 | 74.00 | 29.64 |
| 3221 | 20.52 | AV | H | 31.64 | 6.18 | 27.35 | 30.99 | 54.00 | 23.01 |
| 241.23 | 29.1 | QP | H | 12.23 | 1.86 | 21.48 | 21.71 | 46.00 | 24.29 |
| Middle Channel: 2441 MHz | | | | | | | | | |
| 2441 | 65.27 | PK | H | 28.56 | 3.76 | 0.00 | 97.59 | N/A | N/A |
| 2441 | 53.92 | AV | H | 28.56 | 3.76 | 0.00 | 86.24 | N/A | N/A |
| 2441 | 59.32 | PK | V | 28.56 | 3.76 | 0.00 | 91.64 | N/A | N/A |
| 2441 | 48.12 | AV | V | 28.56 | 3.76 | 0.00 | 80.44 | N/A | N/A |
| 4882 | 43.69 | PK | H | 33.40 | 5.19 | 27.42 | 54.86 | 74.00 | 19.14 |
| 4882 | 24.82 | AV | H | 33.40 | 5.19 | 27.42 | 35.99 | 54.00 | 18.01 |
| 7323 | 31.58 | PK | H | 36.58 | 6.75 | 25.88 | 49.03 | 74.00 | 24.97 |
| 7323 | 18.17 | AV | H | 36.58 | 6.75 | 25.88 | 35.62 | 54.00 | 18.38 |
| 9764 | 29.54 | PK | H | 38.35 | 8.62 | 27.20 | 49.31 | 74.00 | 24.69 |
| 9764 | 16.3 | AV | H | 38.35 | 8.62 | 27.20 | 36.07 | 54.00 | 17.93 |
| 3221 | 33.57 | PK | H | 31.64 | 6.18 | 27.35 | 44.04 | 74.00 | 29.96 |
| 3221 | 20.23 | AV | H | 31.64 | 6.18 | 27.35 | 30.70 | 54.00 | 23.30 |
| 2935 | 33.59 | PK | H | 30.53 | 6.40 | 27.54 | 42.98 | 74.00 | 31.02 |
| 2935 | 20.28 | AV | H | 30.53 | 6.40 | 27.54 | 29.67 | 54.00 | 24.33 |
| 241.23 | 29.2 | QP | H | 12.23 | 1.86 | 21.48 | 21.81 | 46.00 | 24.19 |
| High Channel: 2480 MHz | | | | | | | | | |
| 2480 | 66.43 | PK | H | 28.65 | 3.68 | 0.00 | 98.76 | N/A | N/A |
| 2480 | 55.2 | AV | H | 28.65 | 3.68 | 0.00 | 87.53 | N/A | N/A |
| 2480 | 59.43 | PK | V | 28.65 | 3.68 | 0.00 | 91.76 | N/A | N/A |
| 2480 | 48.26 | AV | V | 28.65 | 3.68 | 0.00 | 80.59 | N/A | N/A |
| 2483.5 | 32.22 | PK | H | 28.66 | 3.67 | 0.00 | 64.55 | 74.00 | 9.45 |
| 2483.5 | 17.36 | AV | H | 28.66 | 3.67 | 0.00 | 49.69 | 54.00 | 4.31 |
| 4960 | 42.18 | PK | H | 33.66 | 5.34 | 27.43 | 53.75 | 74.00 | 20.25 |
| 4960 | 24.78 | AV | H | 33.66 | 5.34 | 27.43 | 36.35 | 54.00 | 17.65 |
| 7440 | 31.54 | PK | H | 36.79 | 6.89 | 25.97 | 49.25 | 74.00 | 24.75 |
| 7440 | 18.14 | AV | H | 36.79 | 6.89 | 25.97 | 35.85 | 54.00 | 18.15 |
| 9920 | 29.53 | PK | H | 38.32 | 8.71 | 26.66 | 49.90 | 74.00 | 24.10 |
| 9920 | 16.28 | AV | H | 38.32 | 8.71 | 26.66 | 36.65 | 54.00 | 17.35 |
| 3221 | 33.54 | PK | H | 31.64 | 6.18 | 27.35 | 44.01 | 74.00 | 29.99 |
| 3221 | 20.22 | AV | H | 31.64 | 6.18 | 27.35 | 30.69 | 54.00 | 23.31 |
| 241.23 | 29.3 | QP | H | 12.23 | 1.86 | 21.48 | 21.91 | 46.00 | 24.09 |

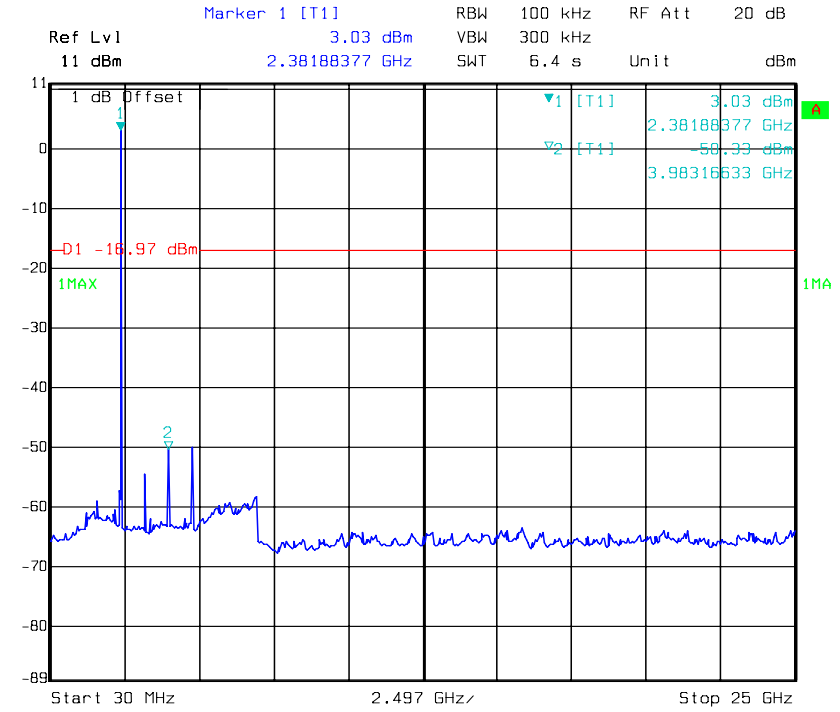
*EDR Mode (8-DPSK):*

| Frequency | Receiver | | Rx Antenna | | Cable loss (dB) | Amplifier Gain (dB) | Corrected Amplitude (dBμV/m) | FCC 15.247 | |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | Reading (dBμV) | Detector (PK/QP/AV) | Polar (H/V) | Factor (dB) | | | | Limit (dBμV/m) | Margin (dB) |
| Low Channel: 2402 MHz | | | | | | | | | |
| 2402 | 64.82 | PK | H | 28.46 | 3.66 | 0.00 | 96.94 | N/A | N/A |
| 2402 | 53.25 | AV | H | 28.46 | 3.66 | 0.00 | 85.37 | N/A | N/A |
| 2402 | 59.34 | PK | V | 28.46 | 3.66 | 0.00 | 91.46 | N/A | N/A |
| 2402 | 47.5 | AV | V | 28.46 | 3.66 | 0.00 | 79.62 | N/A | N/A |
| 2390 | 26.65 | PK | H | 28.44 | 3.63 | 0.00 | 58.72 | 74.00 | 15.28 |
| 2390 | 13.35 | AV | H | 28.44 | 3.63 | 0.00 | 45.42 | 54.00 | 8.58 |
| 4804 | 44.89 | PK | H | 33.13 | 5.06 | 27.41 | 55.67 | 74.00 | 18.33 |
| 4804 | 24.62 | AV | H | 33.13 | 5.06 | 27.41 | 35.40 | 54.00 | 18.60 |
| 7206 | 31.99 | PK | H | 36.37 | 6.61 | 25.91 | 49.06 | 74.00 | 24.94 |
| 7206 | 18.48 | AV | H | 36.37 | 6.61 | 25.91 | 35.55 | 54.00 | 18.45 |
| 9608 | 29.81 | PK | H | 38.38 | 8.53 | 27.55 | 49.17 | 74.00 | 24.83 |
| 9608 | 16.52 | AV | H | 38.38 | 8.53 | 27.55 | 35.88 | 54.00 | 18.12 |
| 3221 | 33.75 | PK | H | 31.64 | 6.18 | 27.35 | 44.22 | 74.00 | 29.78 |
| 3221 | 20.49 | AV | H | 31.64 | 6.18 | 27.35 | 30.96 | 54.00 | 23.04 |
| 241.23 | 29.2 | QP | H | 12.23 | 1.86 | 21.48 | 21.81 | 46.00 | 24.19 |
| Middle Channel: 2441 MHz | | | | | | | | | |
| 2441 | 65.67 | PK | H | 28.56 | 3.76 | 0.00 | 97.99 | N/A | N/A |
| 2441 | 53.99 | AV | H | 28.56 | 3.76 | 0.00 | 86.31 | N/A | N/A |
| 2441 | 60.05 | PK | V | 28.56 | 3.76 | 0.00 | 92.37 | N/A | N/A |
| 2441 | 48.19 | AV | V | 28.56 | 3.76 | 0.00 | 80.51 | N/A | N/A |
| 4882 | 43.6 | PK | H | 33.40 | 5.19 | 27.42 | 54.77 | 74.00 | 19.23 |
| 4882 | 23.84 | AV | H | 33.40 | 5.19 | 27.42 | 35.01 | 54.00 | 18.99 |
| 7323 | 31.64 | PK | H | 36.58 | 6.75 | 25.88 | 49.09 | 74.00 | 24.91 |
| 7323 | 18.24 | AV | H | 36.58 | 6.75 | 25.88 | 35.69 | 54.00 | 18.31 |
| 9764 | 29.51 | PK | H | 38.35 | 8.62 | 27.20 | 49.28 | 74.00 | 24.72 |
| 9764 | 16.29 | AV | H | 38.35 | 8.62 | 27.20 | 36.06 | 54.00 | 17.94 |
| 3221 | 33.45 | PK | H | 31.64 | 6.18 | 27.35 | 43.92 | 74.00 | 30.08 |
| 3221 | 20.14 | AV | H | 31.64 | 6.18 | 27.35 | 30.61 | 54.00 | 23.39 |
| 2935 | 33.26 | PK | H | 30.53 | 6.40 | 27.54 | 42.65 | 74.00 | 31.35 |
| 2935 | 20.08 | AV | H | 30.53 | 6.40 | 27.54 | 29.47 | 54.00 | 24.53 |
| 241.23 | 29.3 | QP | H | 12.23 | 1.86 | 21.48 | 21.91 | 46.00 | 24.09 |
| High Channel: 2480 MHz | | | | | | | | | |
| 2480 | 67.08 | PK | H | 28.65 | 3.68 | 0.00 | 99.41 | N/A | N/A |
| 2480 | 55.18 | AV | H | 28.65 | 3.68 | 0.00 | 87.51 | N/A | N/A |
| 2480 | 60.05 | PK | V | 28.65 | 3.68 | 0.00 | 92.38 | N/A | N/A |
| 2480 | 48.36 | AV | V | 28.65 | 3.68 | 0.00 | 80.69 | N/A | N/A |
| 2483.5 | 32.84 | PK | H | 28.66 | 3.67 | 0.00 | 65.17 | 74.00 | 8.83 |
| 2483.5 | 17.3 | AV | H | 28.66 | 3.67 | 0.00 | 49.63 | 54.00 | 4.37 |
| 4960 | 42 | PK | H | 33.66 | 5.34 | 27.43 | 53.57 | 74.00 | 20.43 |
| 4960 | 24.72 | AV | H | 33.66 | 5.34 | 27.43 | 36.29 | 54.00 | 17.71 |
| 7440 | 31.7 | PK | H | 36.79 | 6.89 | 25.97 | 49.41 | 74.00 | 24.59 |
| 7440 | 18.25 | AV | H | 36.79 | 6.89 | 25.97 | 35.96 | 54.00 | 18.04 |
| 9920 | 29.58 | PK | H | 38.32 | 8.71 | 26.66 | 49.95 | 74.00 | 24.05 |
| 9920 | 16.32 | AV | H | 38.32 | 8.71 | 26.66 | 36.69 | 54.00 | 17.31 |
| 3221 | 33.37 | PK | H | 31.64 | 6.18 | 27.35 | 43.84 | 74.00 | 30.16 |
| 3221 | 20.13 | AV | H | 31.64 | 6.18 | 27.35 | 30.60 | 54.00 | 23.40 |
| 241.23 | 29.1 | QP | H | 12.23 | 1.86 | 21.48 | 21.71 | 46.00 | 24.29 |

## Conducted Spurious Emissions at Antenna Port

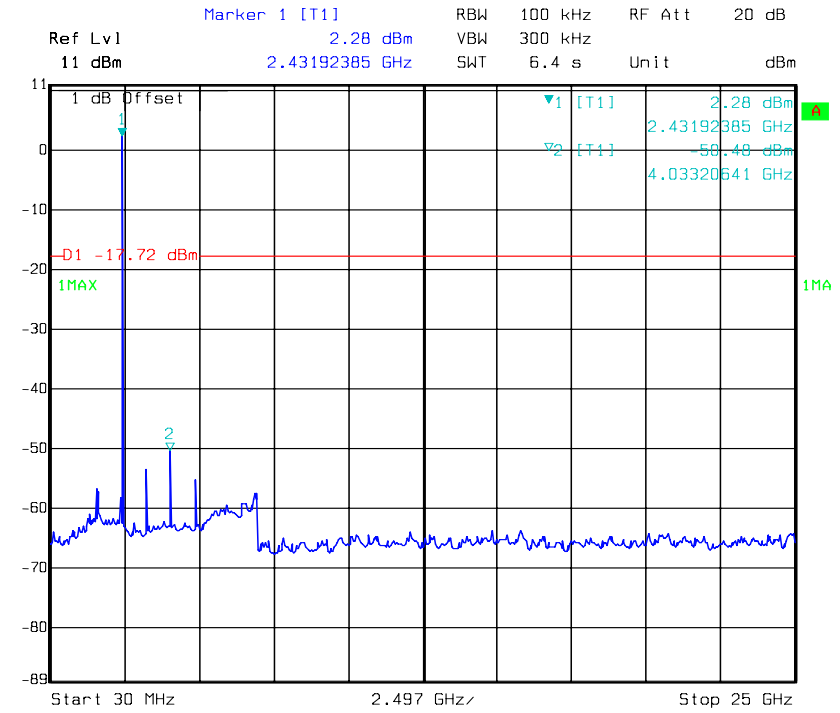
*BDR Mode (GFSK):*

### Low Channel



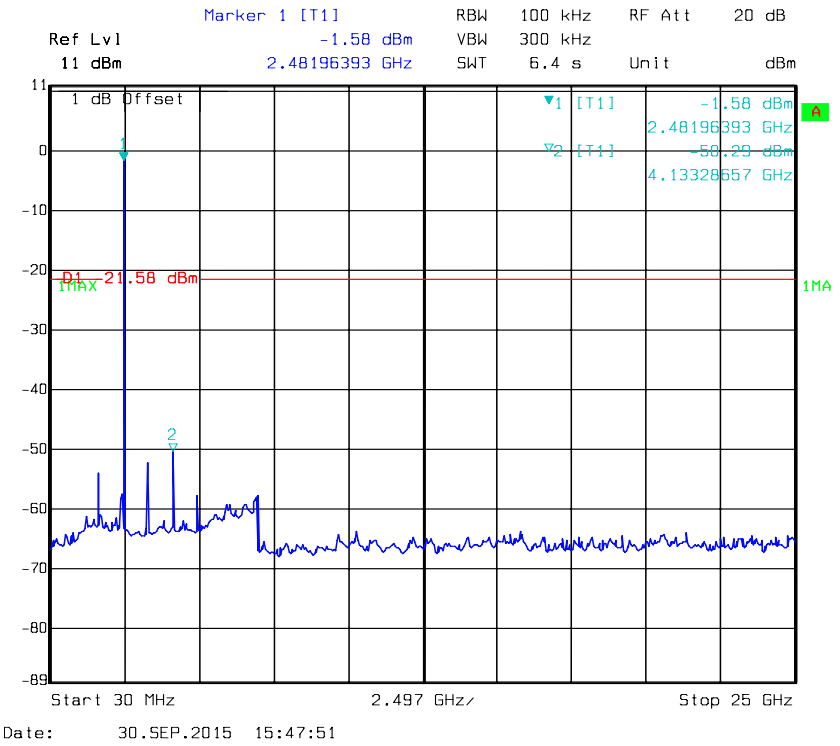

Date: 30.SEP.2015 15:44:26

### Middle Channel



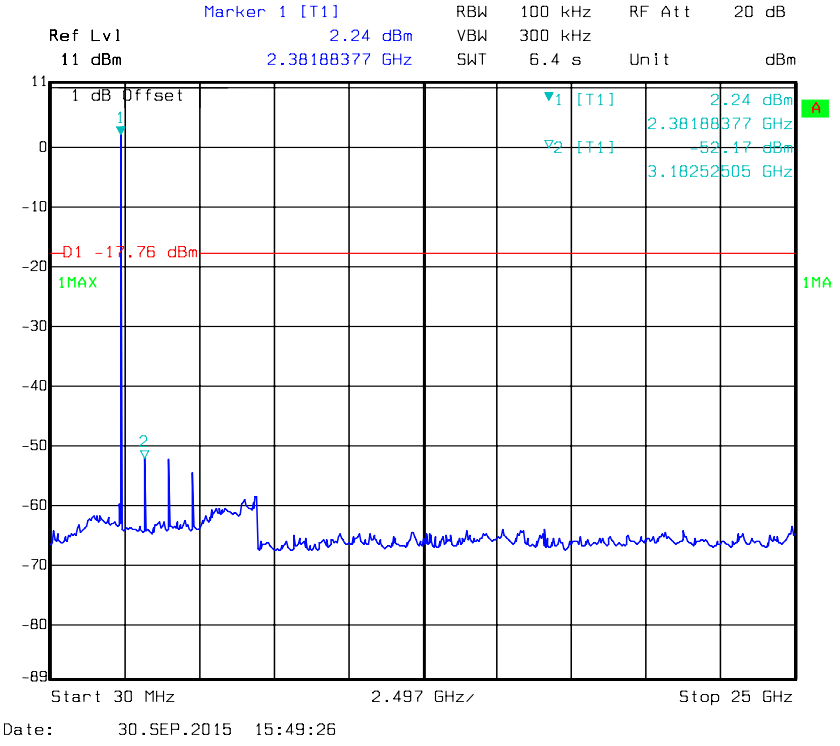

Date: 30.SEP.2015 15:46:25

**High Channel**

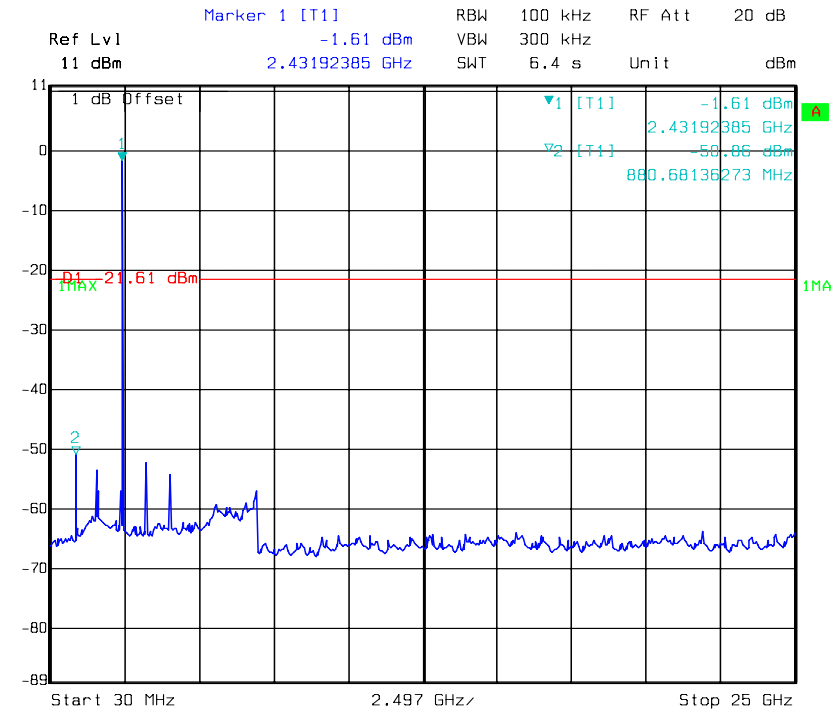



*EDR Mode (π/4-DQPSK):*

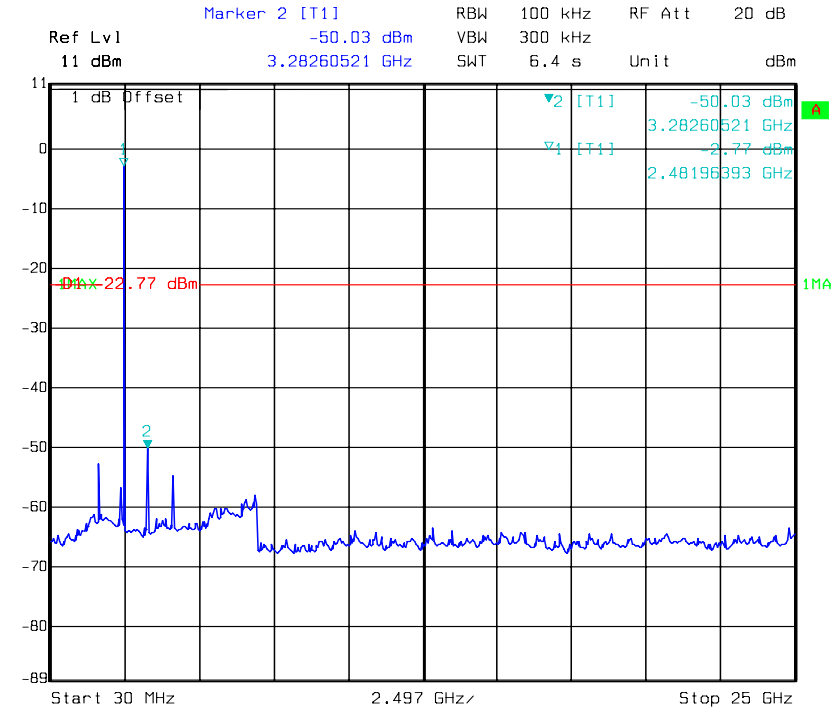
**Low Channel**



**Middle Channel**

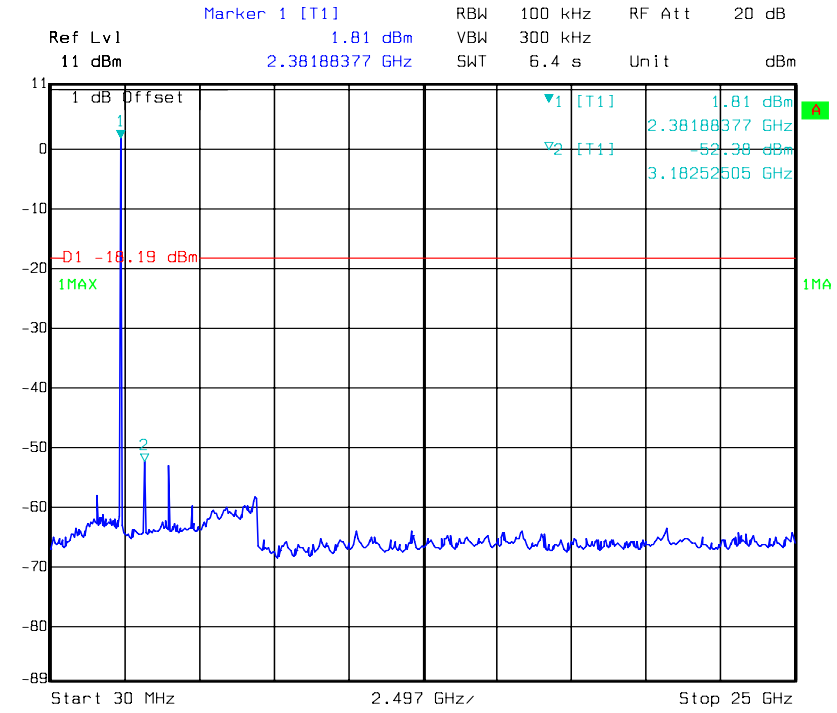



**High Channel**



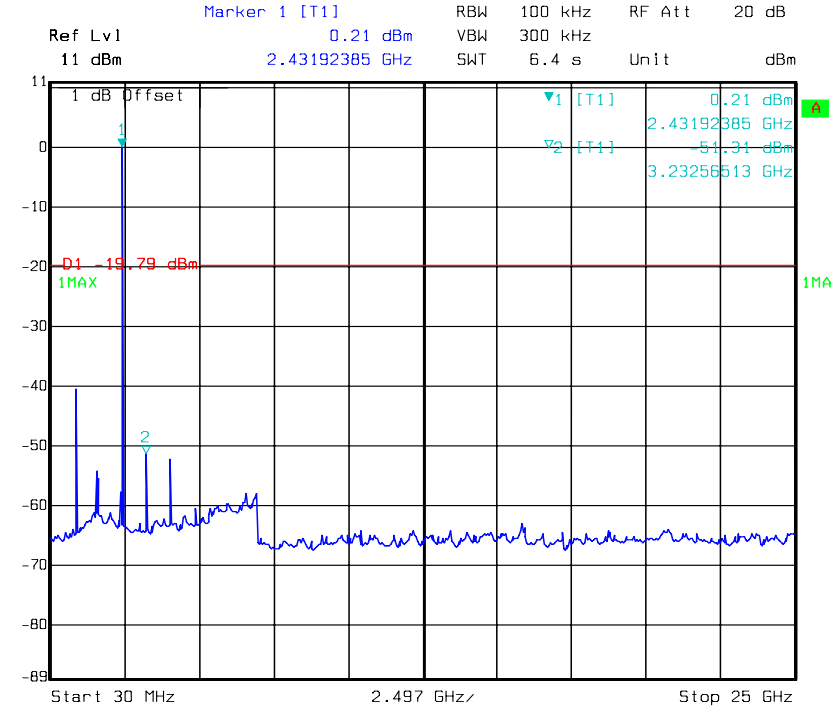
*EDR Mode (8-DPSK):*

**Low Channel**



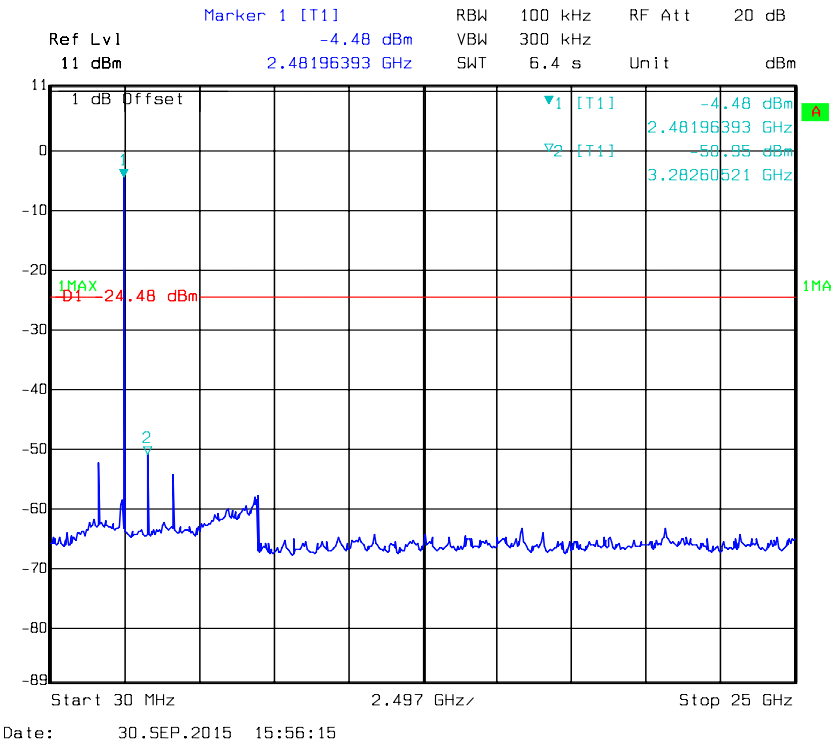

Date: 30.SEP.2015 15:53:17

**Middle Channel**




Date: 30.SEP.2015 15:55:07

**High Channel**



# FCC §15.247(a) (1) - CHANNEL SEPARATION TEST

## Applicable Standard

Frequency hopping systems shall have hoping channel carrier frequencies separated by a minimum of 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.50 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW.

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| R&S | Spectrum Analyzer | FSP 38 | 100478 | 2015-05-09 | 2016-05-09 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Procedure

According to PUBLIC NOTICE DA 00-705
Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25.9°C |
| **Relative Humidity:** | 53 % |
| **ATM Pressure:** | 100.5 kPa |

** The testing was performed by Allen Qiao on 2015-09-30.*

**Test Result:** Compliance.

Please refer to following tables and plots

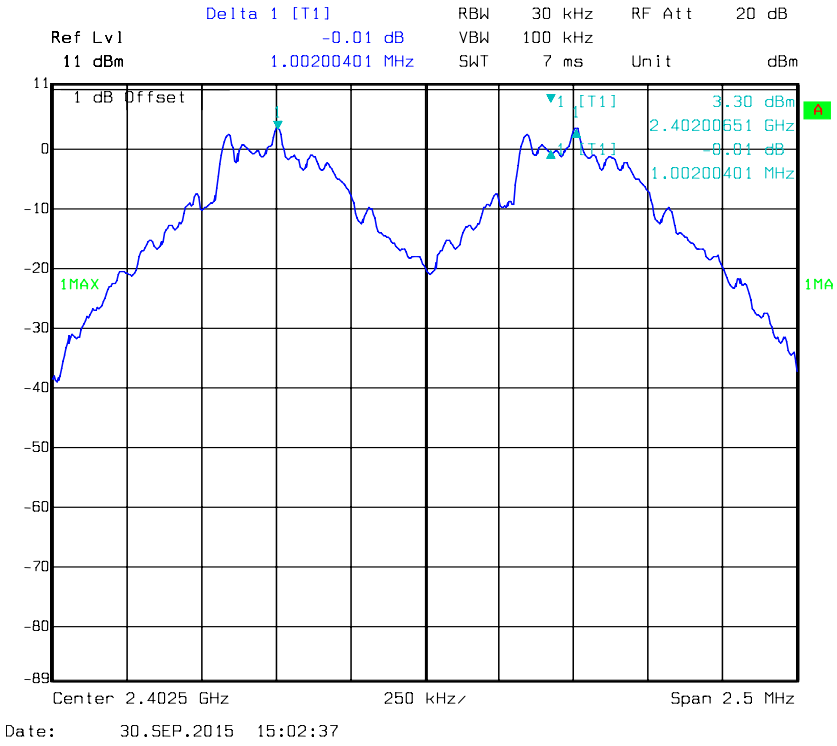
*Test Mode: Transmitting*

| Mode | Channel | Frequency MHz | Channel Seperation MHz | Limit MHz | Result |
|---|---|---|---|---|---|
| *BDR (GFSK)* | Low | 2402 | 1.002 | 0.585 | Compliant |
| | Adjacent | 2403 | | | |
| | Middle | 2441 | 1.002 | | |
| | Adjacent | 2442 | | | |
| | High | 2480 | 1.002 | | |
| | Adjacent | 2479 | | | |
| EDR (π/4-DQPSK) | Low | 2402 | 1.002 | 0.815 | Compliant |
| | Adjacent | 2403 | | | |
| | Middle | 2441 | 1.002 | | |
| | Adjacent | 2442 | | | |
| | High | 2480 | 1.002 | | |
| | Adjacent | 2479 | | | |
| *EDR (8-DPSK)* | Low | 2402 | 1.002 | 0.808 | Compliant |
| | Adjacent | 2403 | | | |
| | Middle | 2441 | 1.002 | | |
| | Adjacent | 2442 | | | |
| | High | 2480 | 1.002 | | |
| | Adjacent | 2479 | | | |

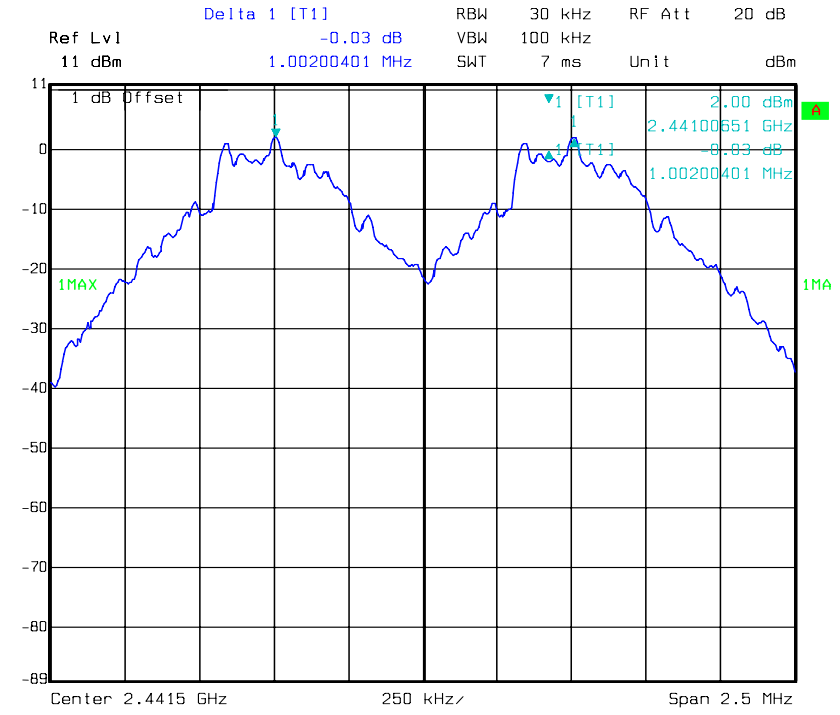
*Note: Limit= (2/3)*20dB bandwidth*

*BDR Mode (GFSK):*

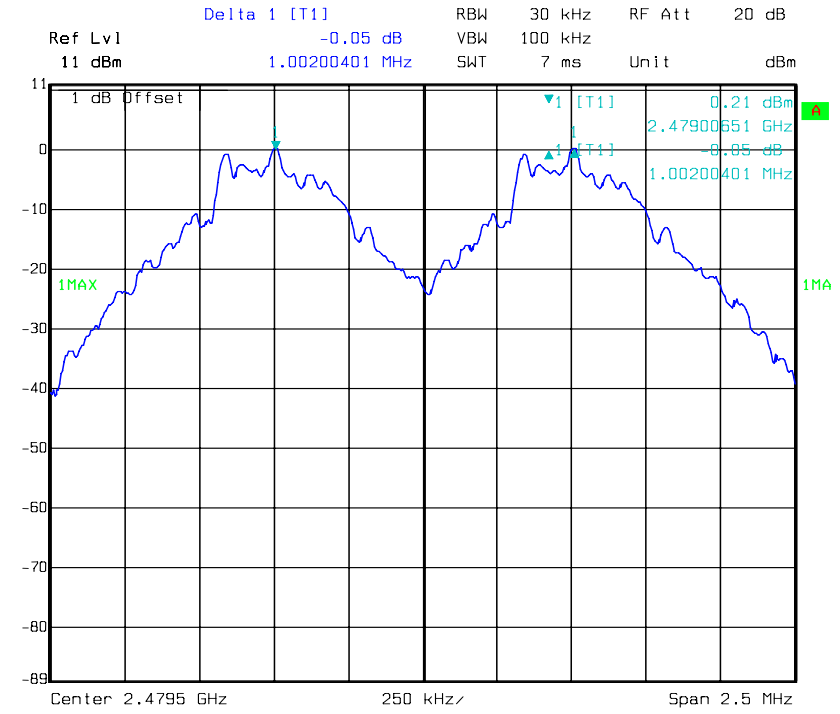
**Low Channel**



**Middle Channel**

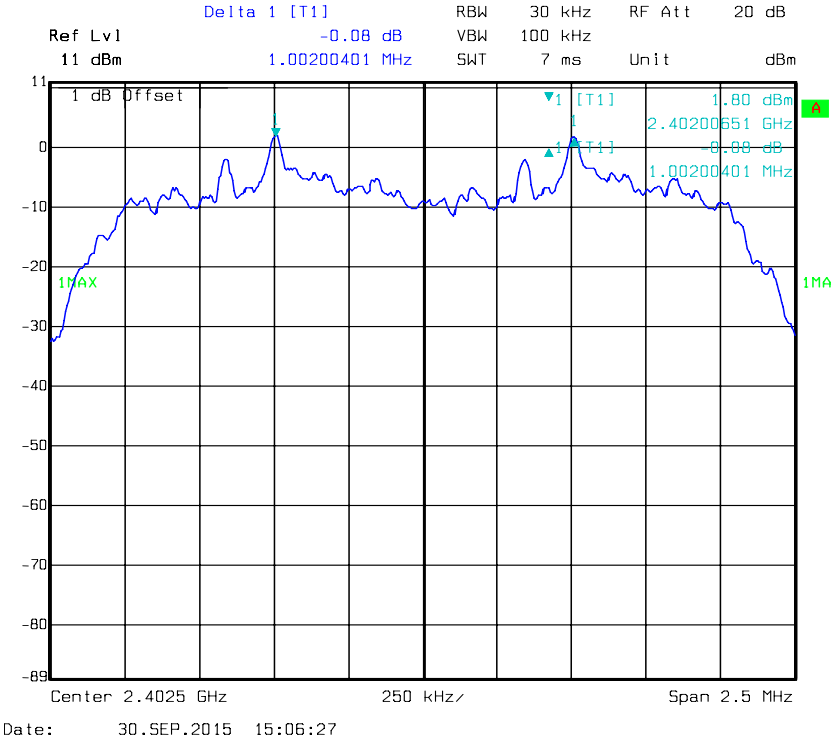



**High Channel**



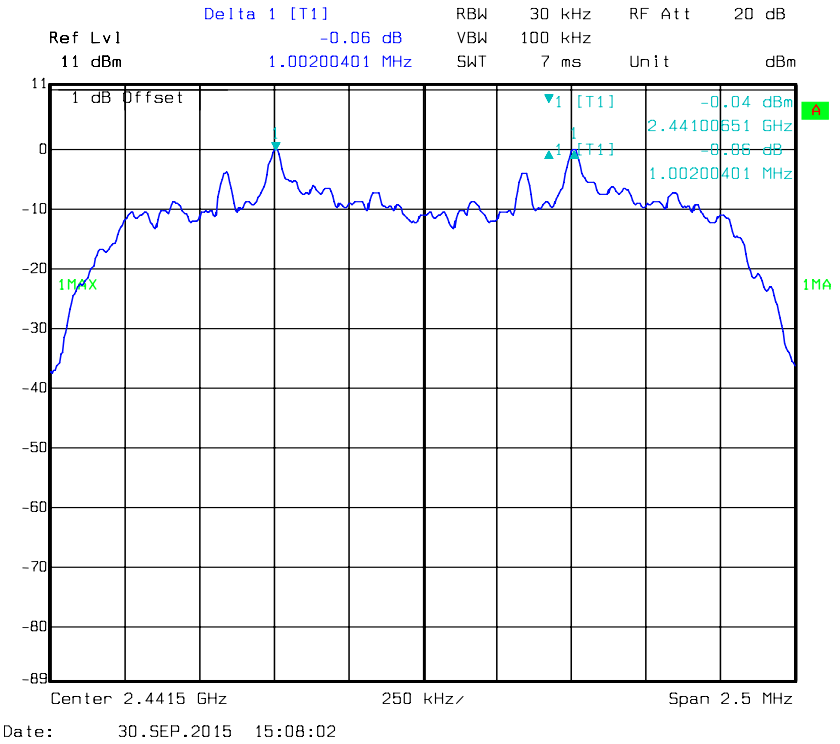
*EDR Mode (π/4-DQPSK):*

**Low Channel**



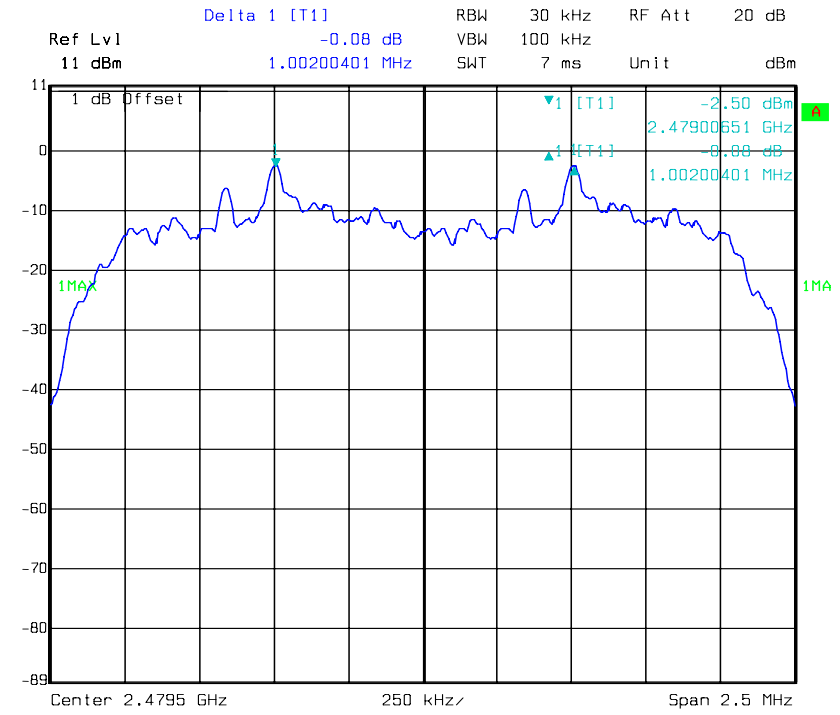

Date: 30.SEP.2015 15:06:27

**Middle Channel**



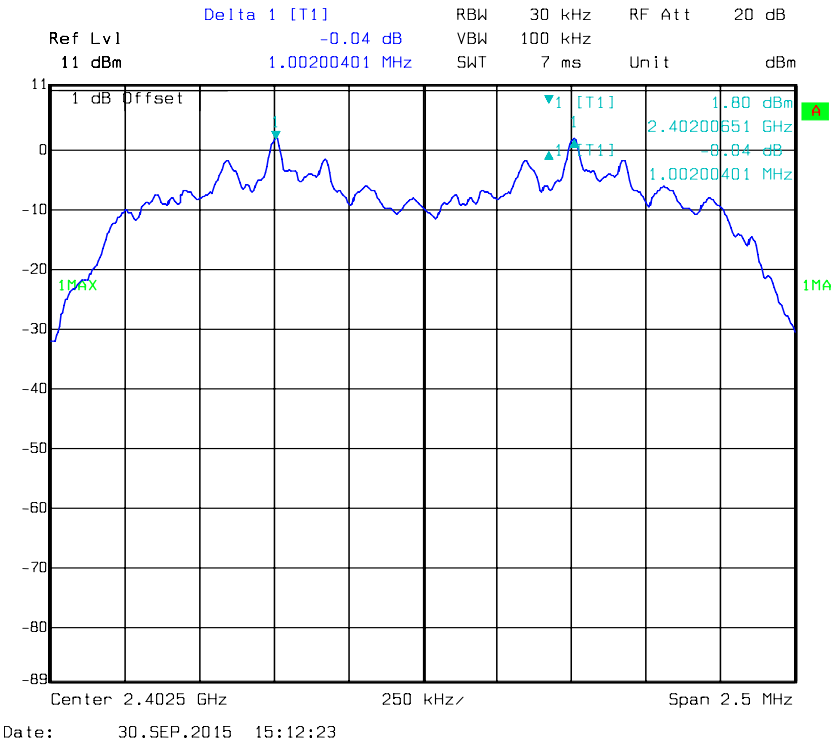

Date: 30.SEP.2015 15:08:02

**High Channel**

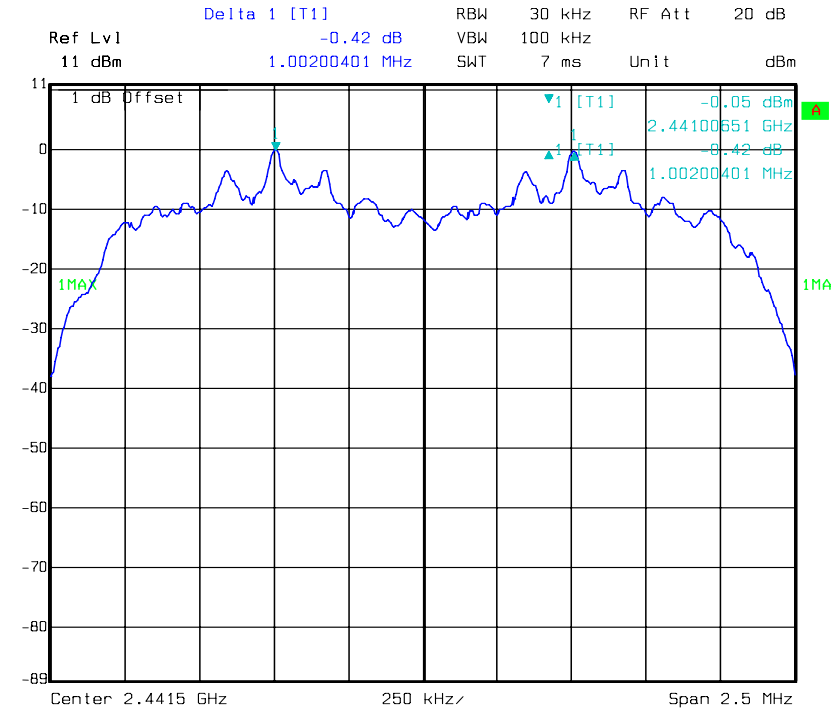



*EDR Mode (8-DPSK):*

**Low Channel**

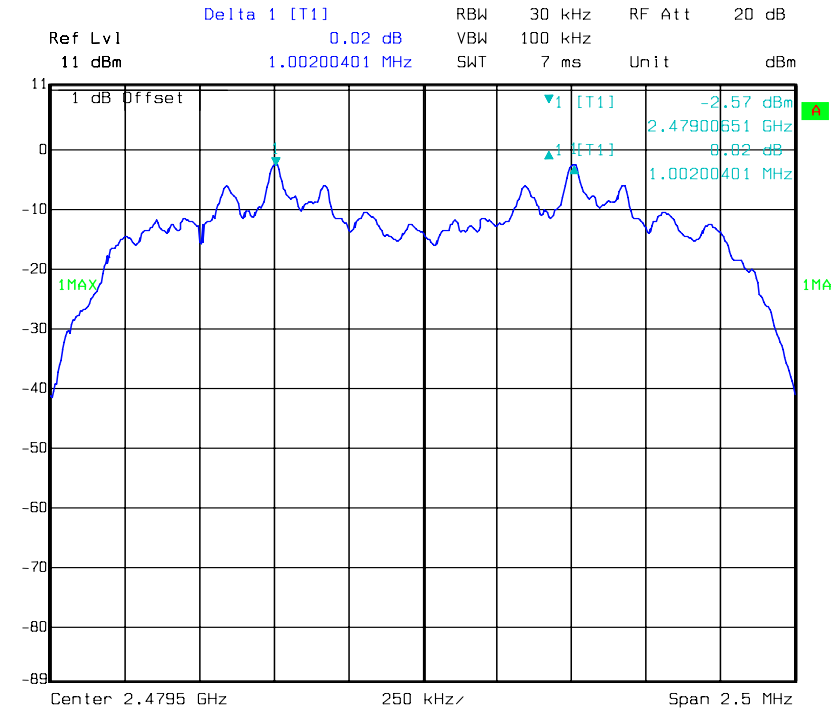


**Middle Channel**




Date: 30.SEP.2015 15:13:30

**High Channel**




Date: 30.SEP.2015 15:14:28

# FCC §15.247(a) (1) – 20 dB BANDWIDTH TESTING

## Applicable Standard

Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

## Test Procedure

According to PUBLIC NOTICE DA 00-705
Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| R&S | Spectrum Analyzer | FSP 38 | 100478 | 2015-05-09 | 2016-05-09 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25.9°C |
| **Relative Humidity:** | 59 % |
| **ATM Pressure:** | 100.5 kPa |

** The testing was performed by Allen Qiao on 2015-09-30.*

**Test Result:** Compliance.

Please refer to following tables and plots

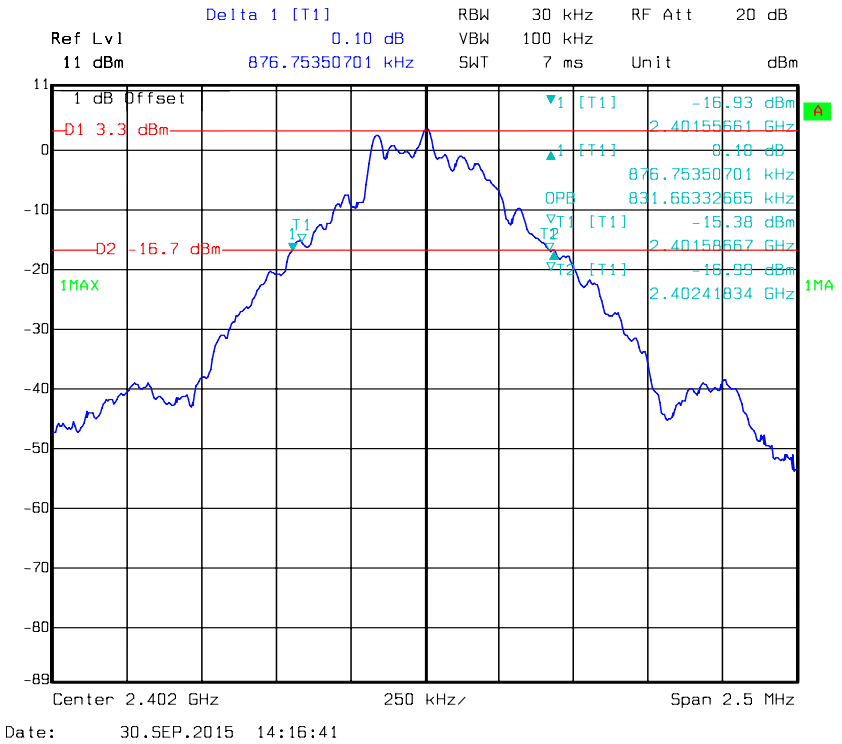
*Test Mode: Transmitting*

| Mode | Channel | Frequency (MHz) | 20 dB Bandwidth (MHz) |
|---|---|---|---|
| BDR Mode (GFSK) | Low | 2402 | 0.877 |
| | Middle | 2441 | 0.872 |
| | High | 2480 | 0.872 |
| EDR Mode (π/4-DQPSK): | Low | 2402 | 1.222 |
| | Middle | 2441 | 1.207 |
| | High | 2480 | 1.202 |
| EDR Mode (8-DPSK): | Low | 2402 | 1.212 |
| | Middle | 2441 | 1.212 |
| | High | 2480 | 1.212 |

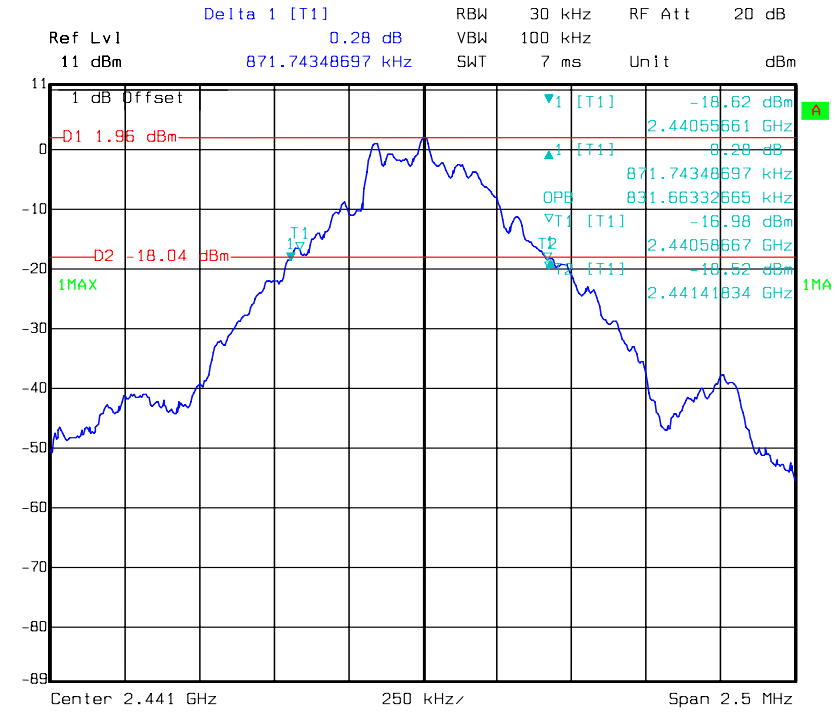
Please refer to the following plots.

*BDR Mode (GFSK):*

**Low Channel**

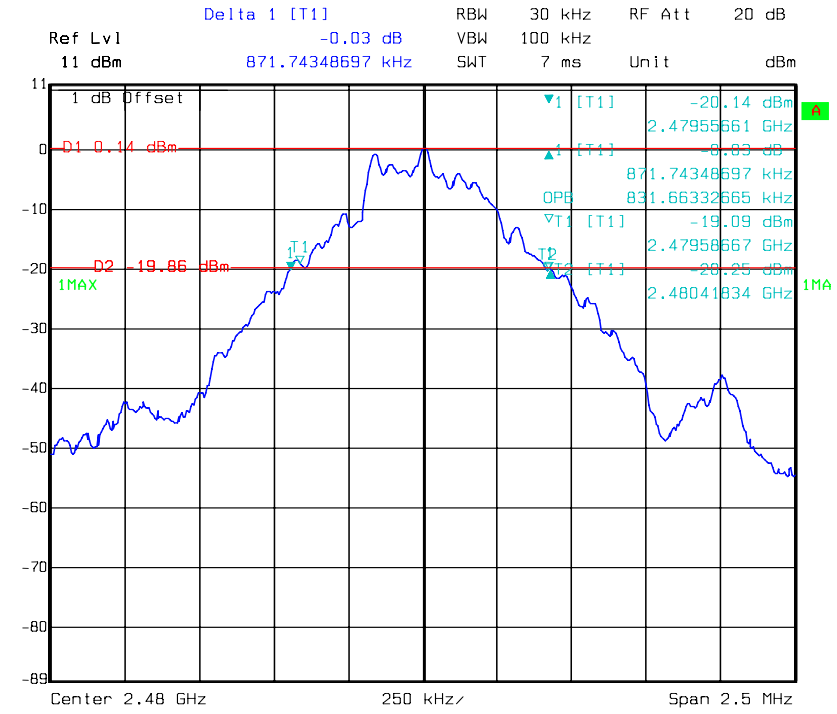


**Middle Channel**




Date: 30.SEP.2015 14:19:31

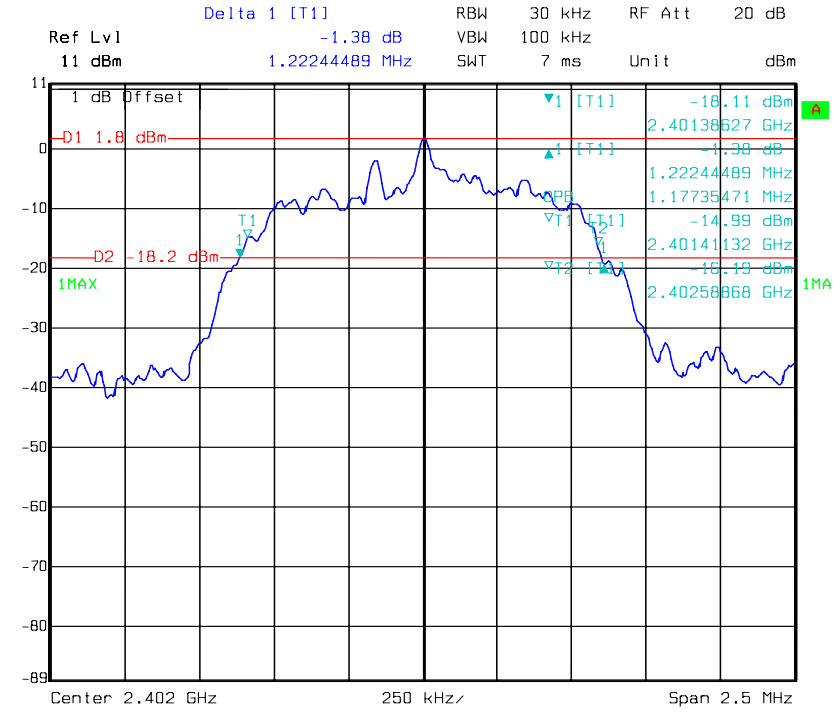
**High Channel**



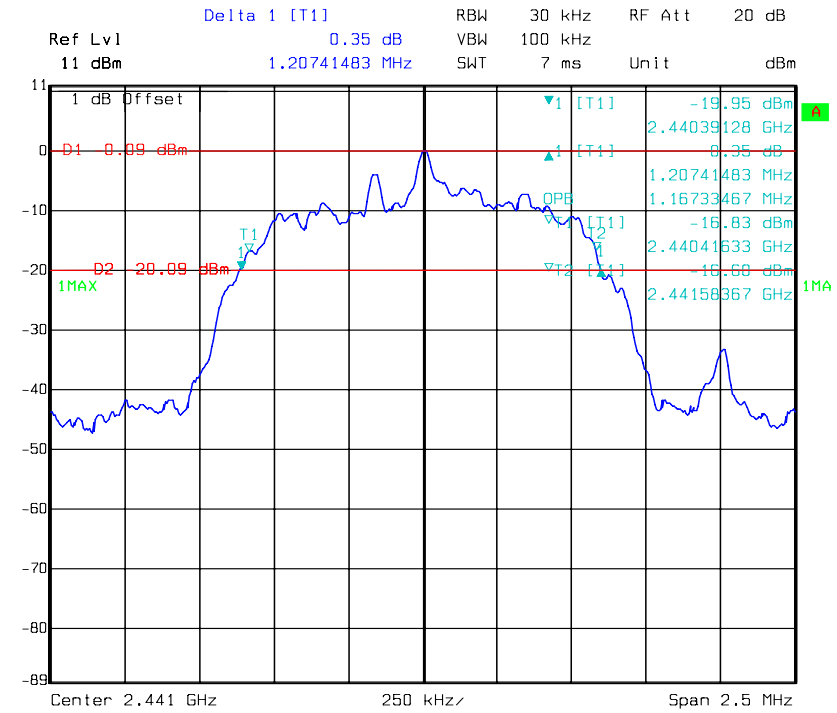

Date: 30.SEP.2015 14:21:06

*EDR Mode (π/4-DQPSK):*

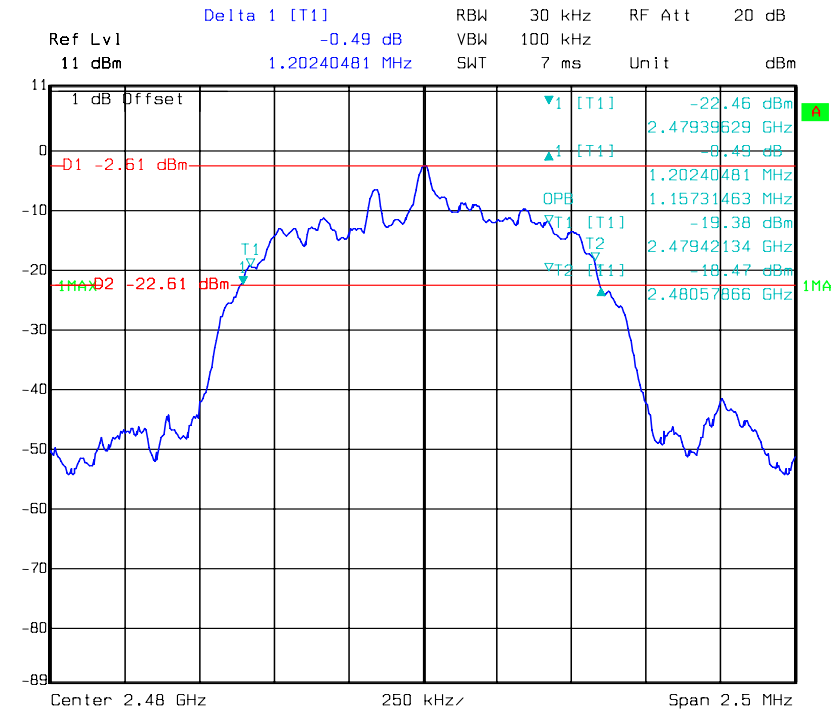
**Low Channel**




**Middle Channel**

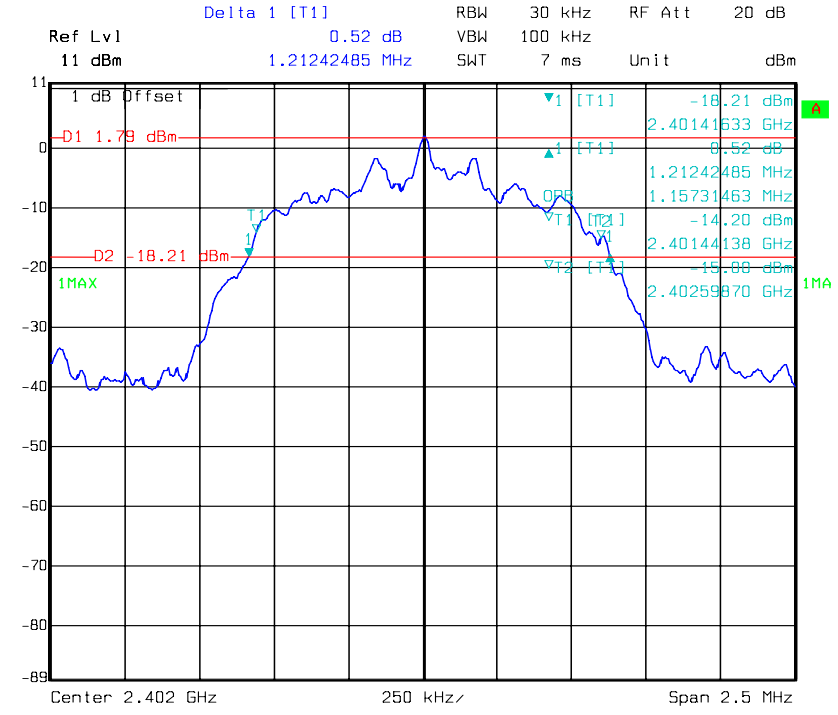


**High Channel**

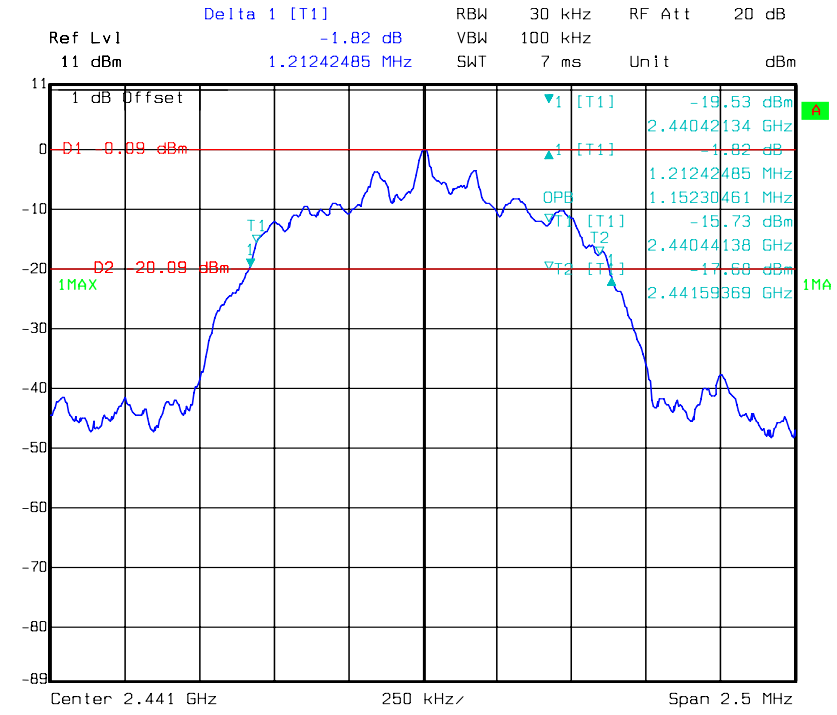



*EDR Mode (8-DPSK):*

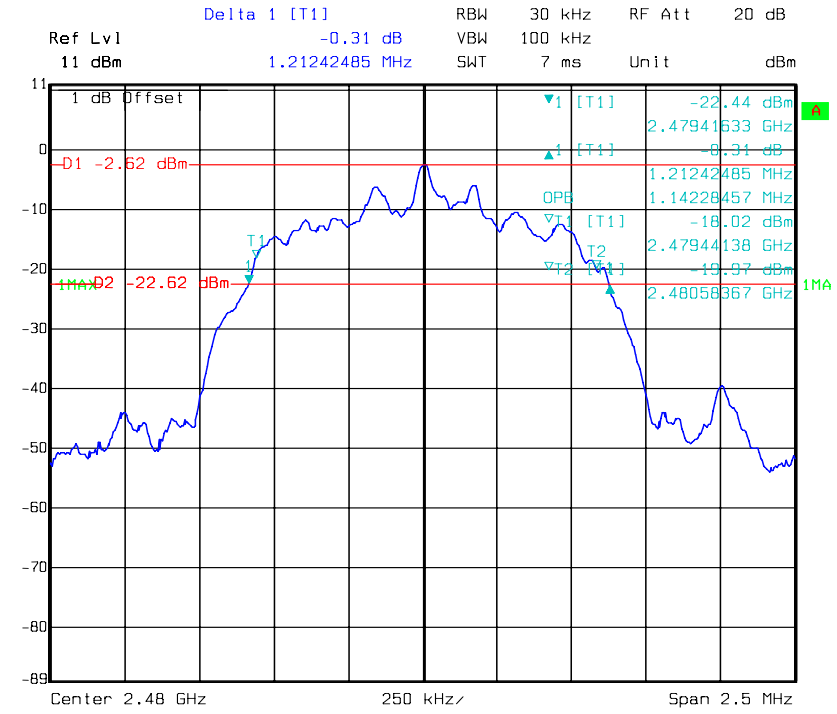
**Low Channel**



## Middle Channel




## High Channel



# FCC §15.247(a) (1) (iii) - QUANTITY OF HOPPING CHANNEL TEST

## Applicable Standard

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

## Test Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

2. Set the EUT in hopping mode from first channel to last.

3. By using the Max-Hold function record the Quantity of the channel.

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| R&S | Spectrum Analyzer | FSP 38 | 100478 | 2015-05-09 | 2016-05-09 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25.9°C |
| **Relative Humidity:** | 53 % |
| **ATM Pressure:** | 100.5 kPa |

** The testing was performed by Allen Qiao on 2015-09-30.*

**Test Result:** Compliance.

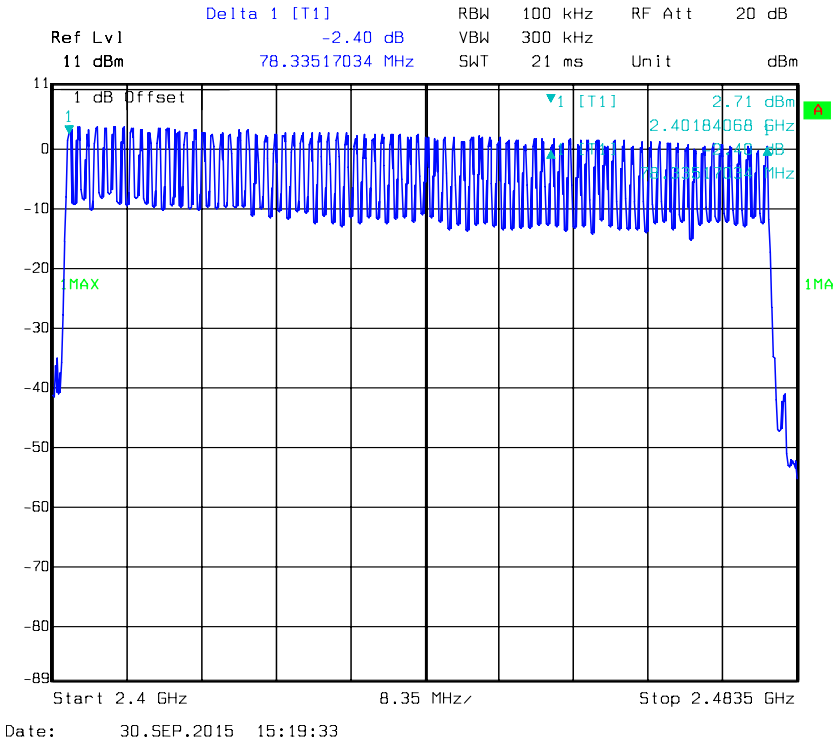
Please refer to following tables and plots

*Test Mode: Transmitting*

*BDR Mode (GFSK):*

| Frequency Range (MHz) | Number of Hopping Channel | Limit |
|---|---|---|
| 2400-2483.5 | 79 | ⩾15 |

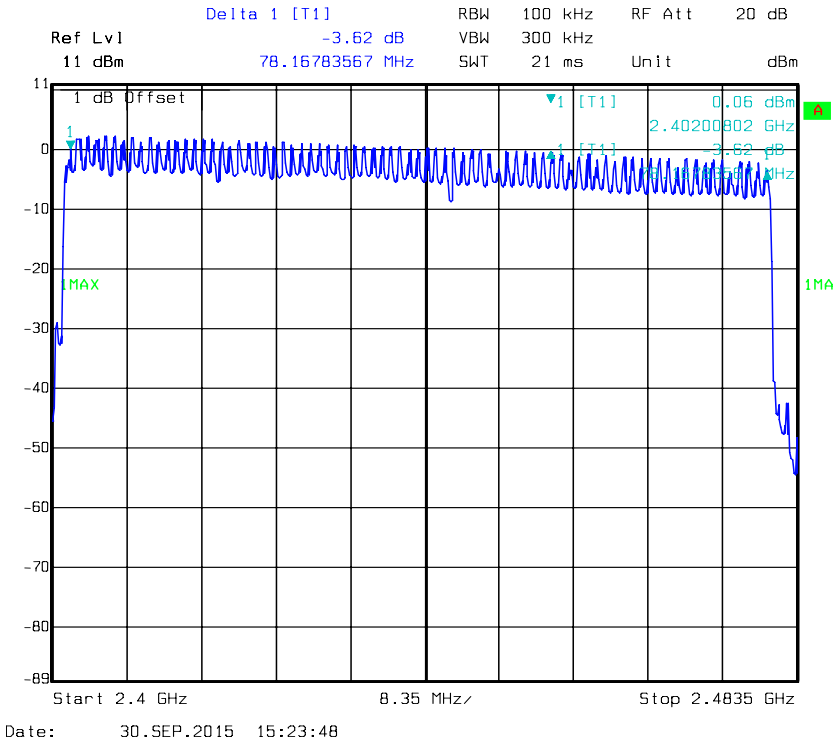
**Number of Hopping Channels**



*EDR Mode (π/4-DQPSK):*

| Frequency Range (MHz) | Number of Hopping Channel | Limit |
|---|---|---|
| 2400-2483.5 | 79 | ⩾15 |

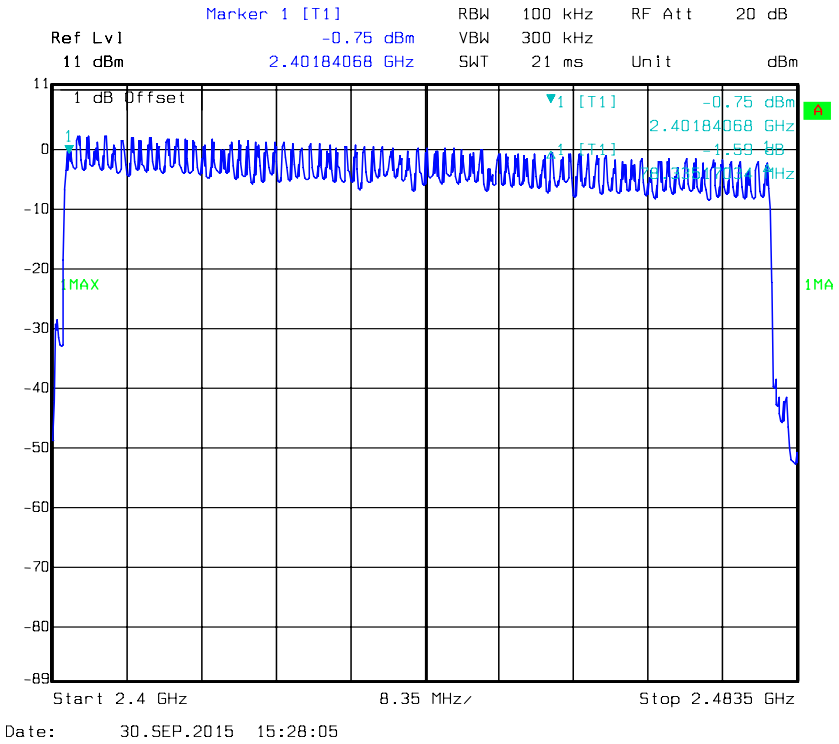
**Number of Hopping Channels**



*EDR Mode (8-DPSK):*

| Frequency Range (MHz) | Number of Hopping Channel | Limit |
|---|---|---|
| 2400-2483.5 | 79 | ≥15 |

**Number of Hopping Channels**



# FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME)

## Applicable Standard

Frequency hopping systems in the 2400-2483.5 MHz shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

## Test Procedure

The EUT was worked in channel hopping; Spectrum SPAN was set as 0. Sweep was set as 0.4 * channel no. (s), the quantity of pulse was get from single sweep. In addition, the time of single pulses was tested.

Dwell Time= time slot length * hope rate/ number of hopping channels * 31.6s
Hop rate=1600/s

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| R&S | Spectrum Analyzer | FSP 38 | 100478 | 2015-05-09 | 2016-05-09 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25.9°C |
| **Relative Humidity:** | 53 % |
| **ATM Pressure:** | 100.3 kPa |

** The testing was performed by Allen Qiao on 2015-10-08*

**Test Result:** Compliance.

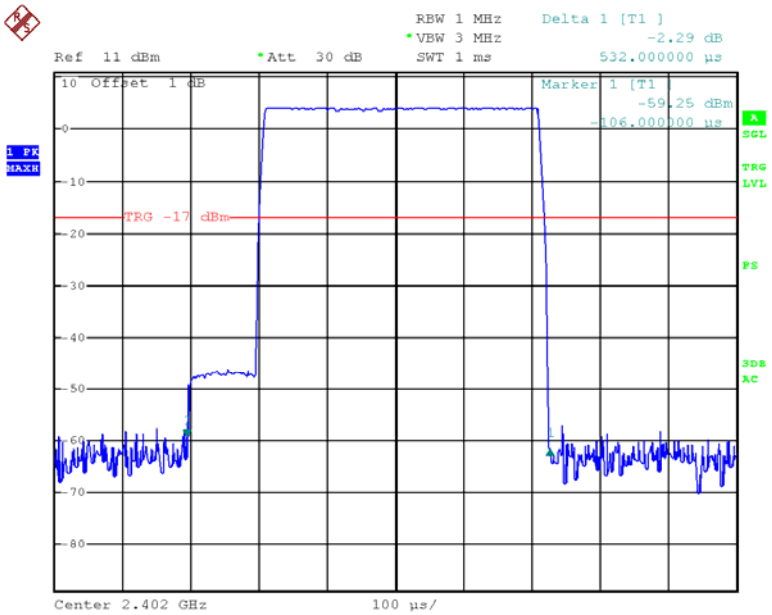
Please refer to following tables and plots

*Test Mode: Transmitting*

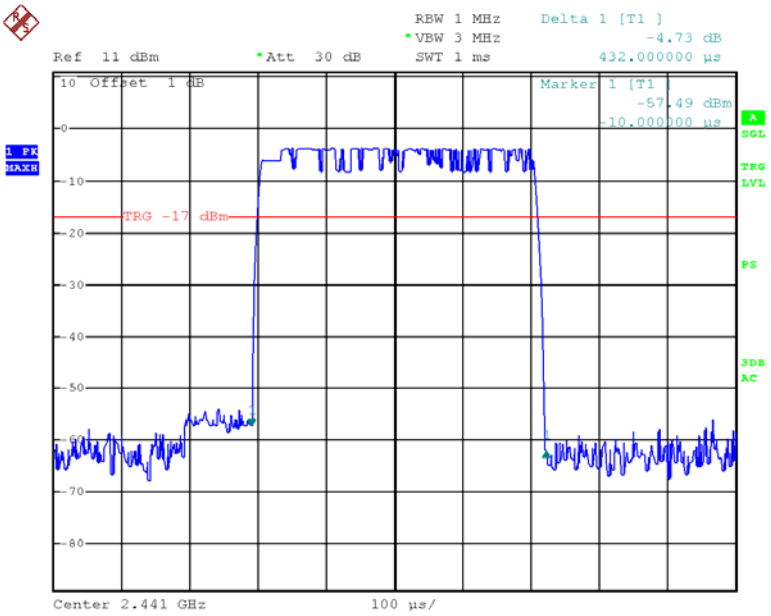
*BDR Mode (GFSK):*

| Mode | Channel | Pulse Width (ms) | Dwell Time (s) | Limit (s) | Result |
|---|---|---|---|---|---|
| ***DH1*** | Low | 0.532 | 0.170 | 0.4 | Pass |
| | Middle | 0.432 | 0.138 | 0.4 | Pass |
| | High | 0.436 | 0.140 | 0.4 | Pass |
| | Note: Dwell time=Pulse time (ms) × (1600/2/79 ) ×31.6 s | | | | |
| ***DH3*** | Low | 1.800 | 0.288 | 0.4 | Pass |
| | Middle | 1.800 | 0.288 | 0.4 | Pass |
| | High | 1.806 | 0.289 | 0.4 | Pass |
| | Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s | | | | |
| ***DH5*** | Low | 3.072 | 0.328 | 0.4 | Pass |
| | Middle | 3.062 | 0.327 | 0.4 | Pass |
| | High | 3.062 | 0.327 | 0.4 | Pass |
| | Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s | | | | |

**DH1: Low Channel**

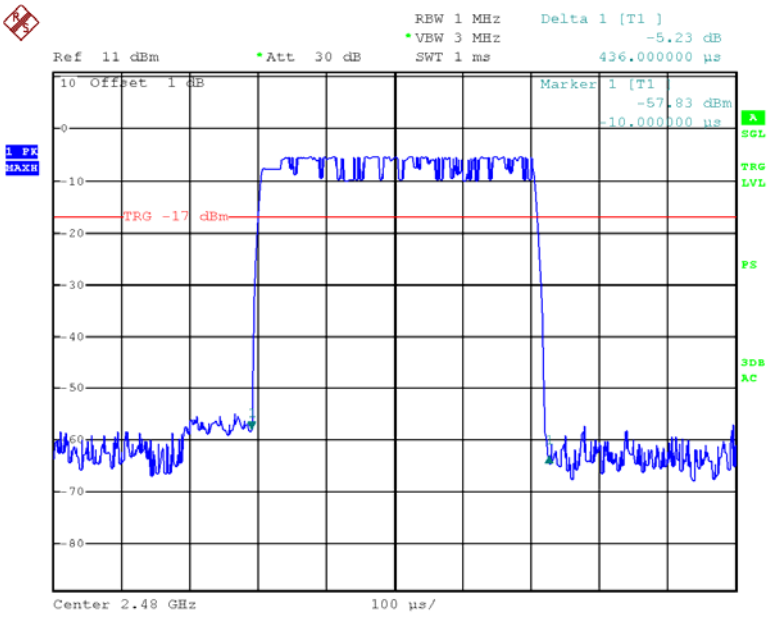


**DH1: Middle Channel**



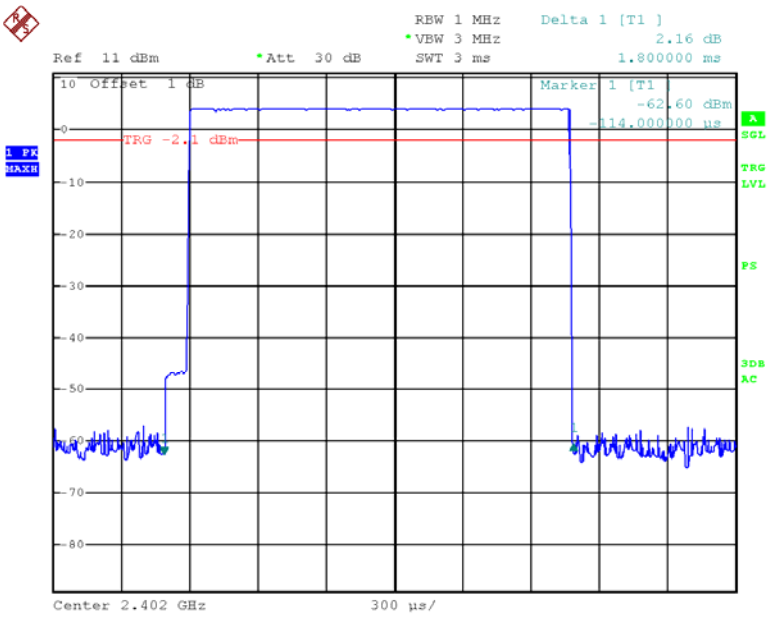

Date: 8.OCT.2015 14:33:12

**DH1: High Channel**



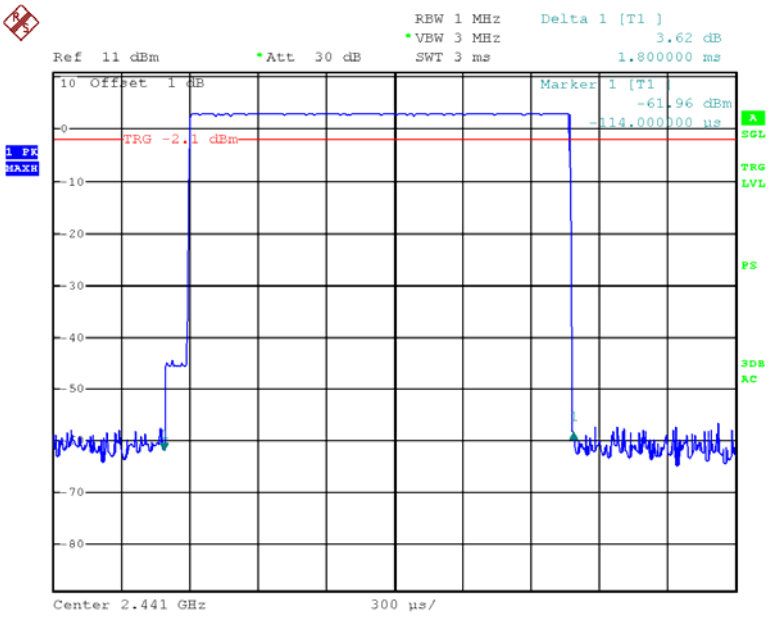

Date: 8.OCT.2015 14:31:01

**DH3: Low Channel**



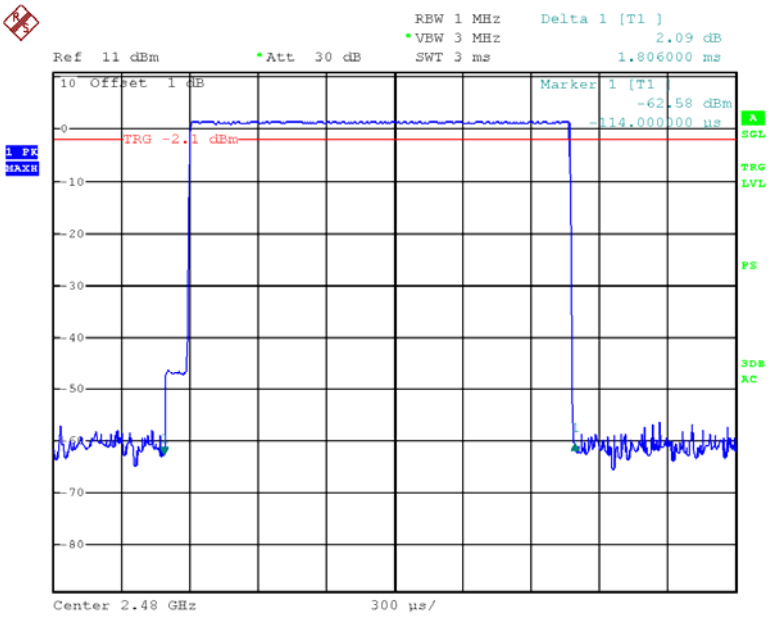

Date: 8.OCT.2015 14:48:58

**DH3: Middle Channel**



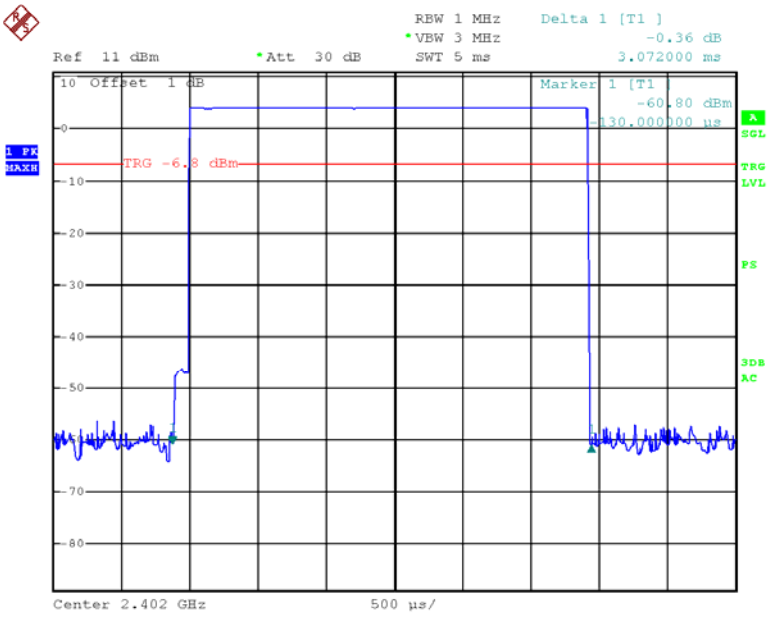

Date: 8.OCT.2015 14:49:10

**DH3: High Channel**



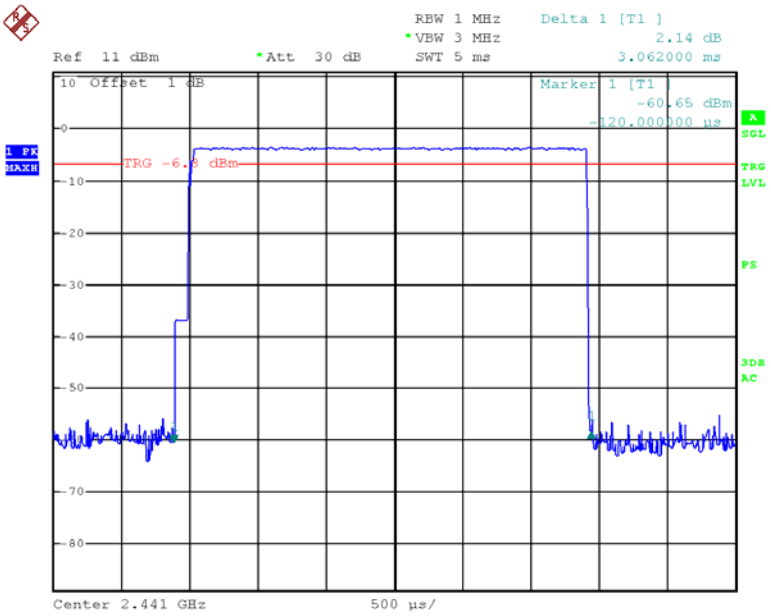

Date: 8.OCT.2015 14:49:24

**DH5: Low Channel**



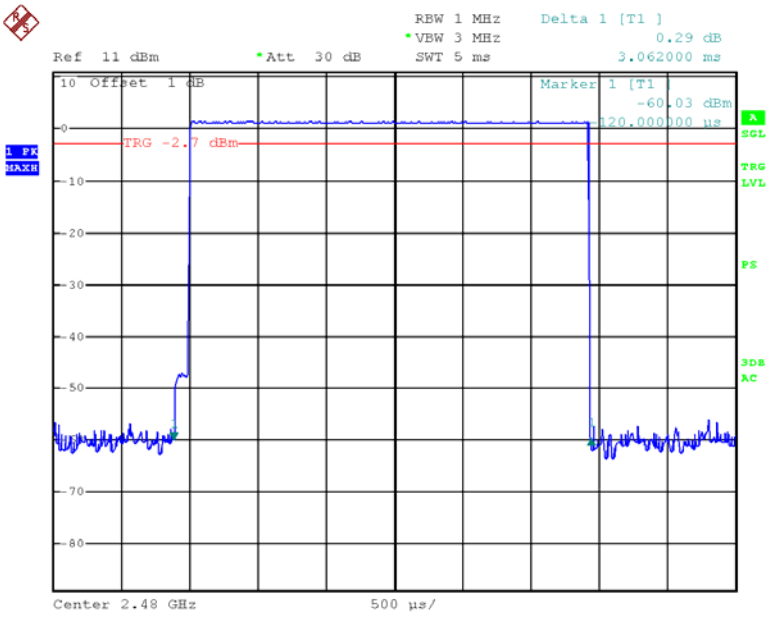

Date: 8.OCT.2015 14:56:26

**DH5: Middle Channel**




Date: 8.OCT.2015 14:56:04

**DH5: High Channel**

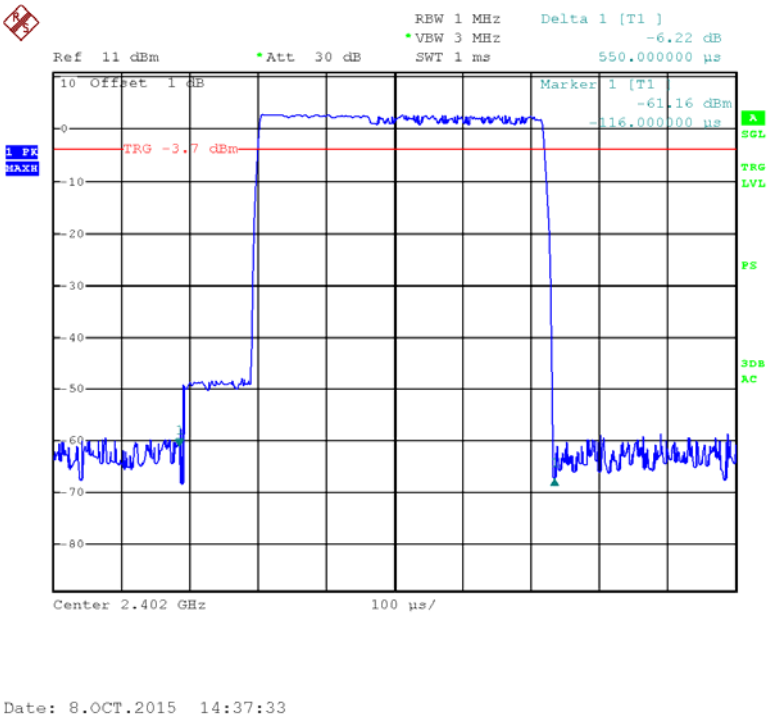



Date: 8.OCT.2015 14:54:39

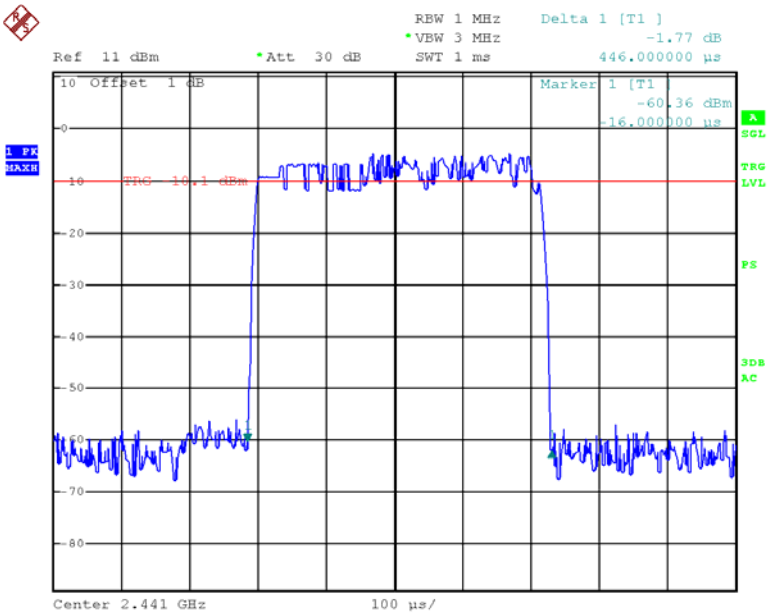
*EDR Mode (π/4-DQPSK):*

| Mode | Channel | Pulse Width (ms) | Dwell Time (s) | Limit (s) | Result |
|---|---|---|---|---|---|
| ***2DH1*** | Low | 0.550 | 0.176 | 0.4 | Pass |
| | Middle | 0.446 | 0.143 | 0.4 | Pass |
| | High | 0.546 | 0.175 | 0.4 | Pass |
| | Note: Dwell time=Pulse time (ms) × (1600/2/79 ) ×31.6 s | | | | |
| ***2DH3*** | Low | 1.818 | 0.291 | 0.4 | Pass |
| | Middle | 1.818 | 0.291 | 0.4 | Pass |
| | High | 1.818 | 0.291 | 0.4 | Pass |
| | Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s | | | | |
| ***2DH5*** | Low | 3.072 | 0.328 | 0.4 | Pass |
| | Middle | 3.072 | 0.328 | 0.4 | Pass |
| | High | 3.072 | 0.328 | 0.4 | Pass |
| | Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s | | | | |

**2DH1: Low Channel**

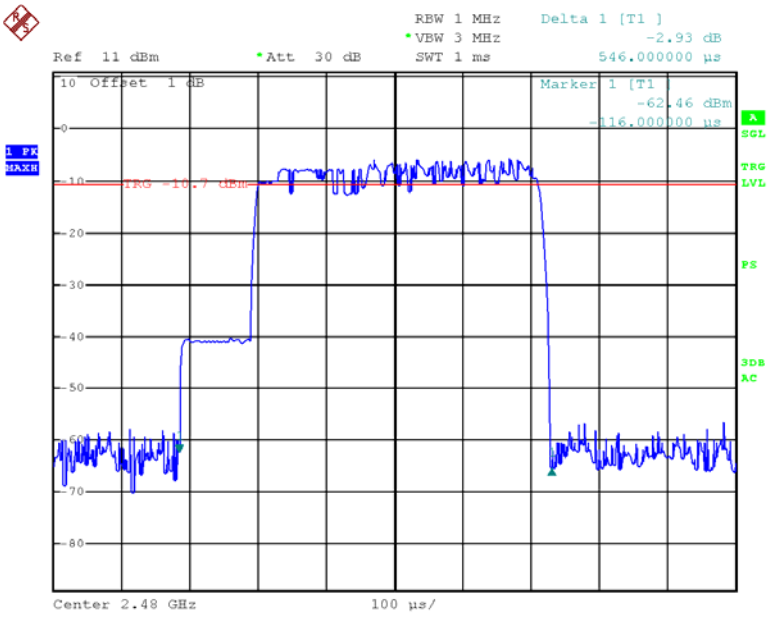


**2DH1: Middle Channel**



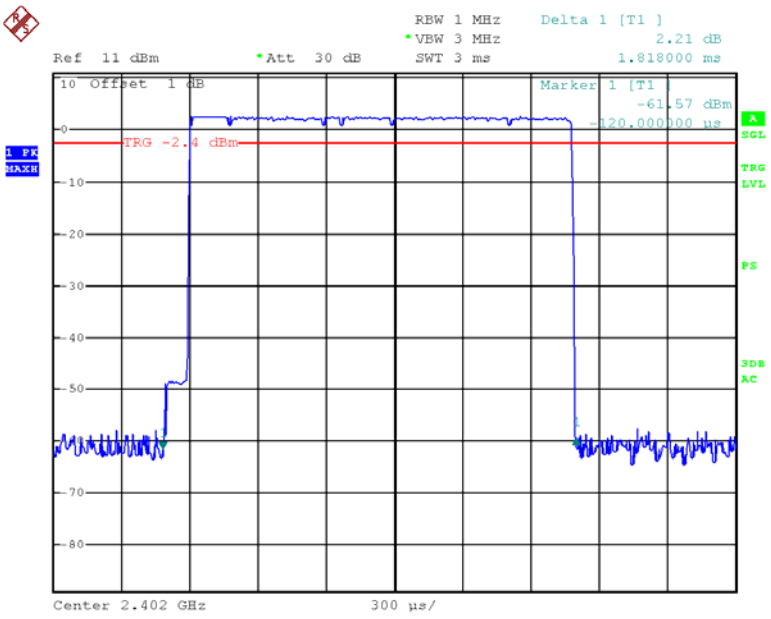

Date: 8.OCT.2015 14:38:31

**2DH1: High Channel**



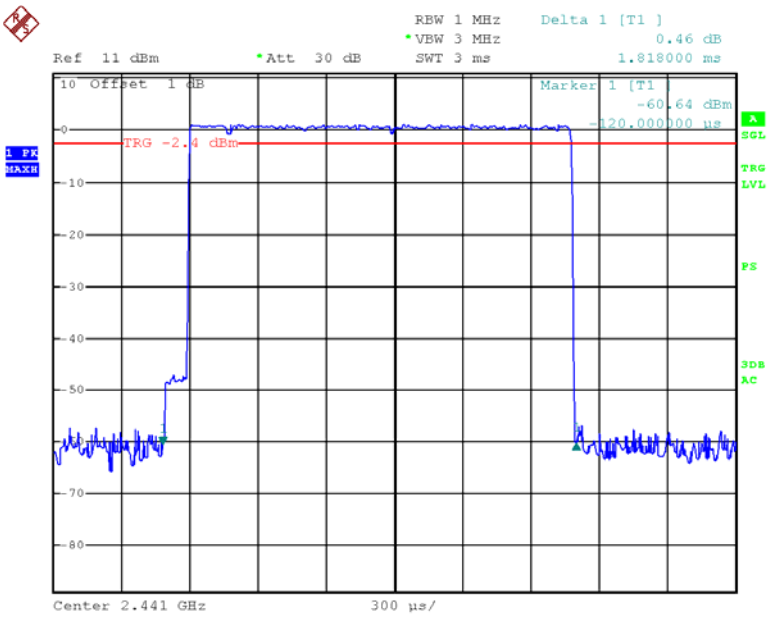

Date: 8.OCT.2015 14:39:28

**2DH3: Low Channel**



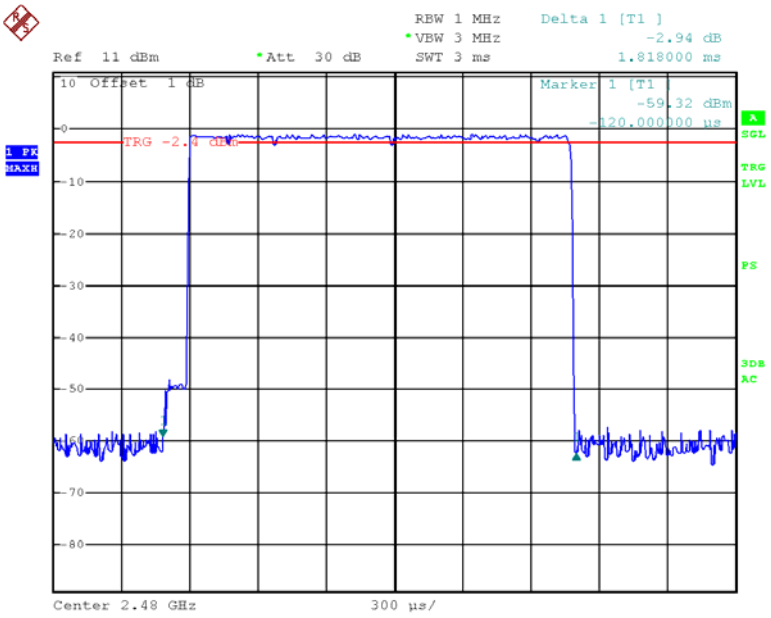

Date: 8.OCT.2015 14:51:29

**2DH3: Middle Channel**



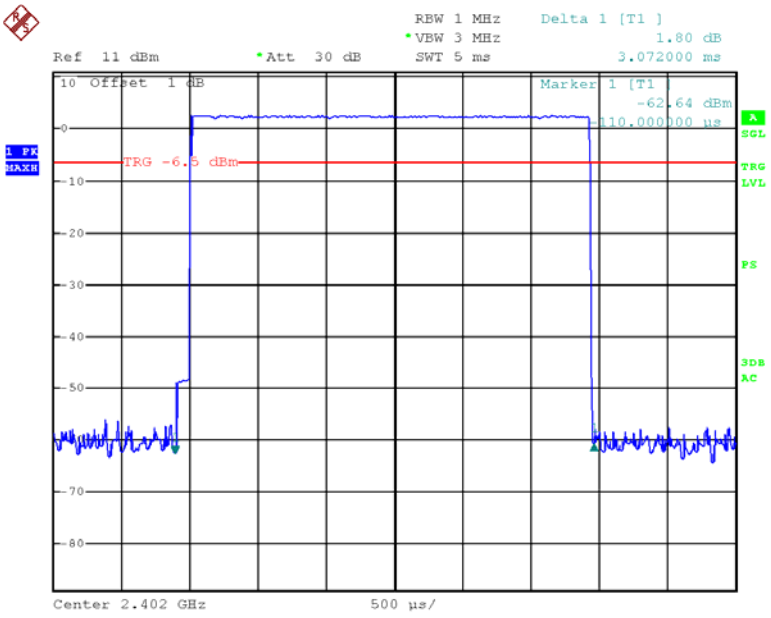

Date: 8.OCT.2015 14:51:18

**2DH3: High Channel**



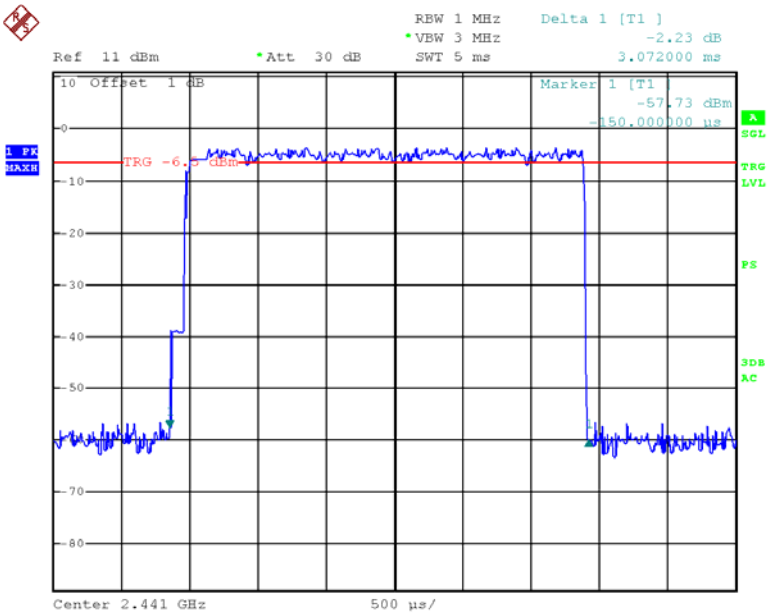

Date: 8.OCT.2015 14:51:08

**2DH5: Low Channel**



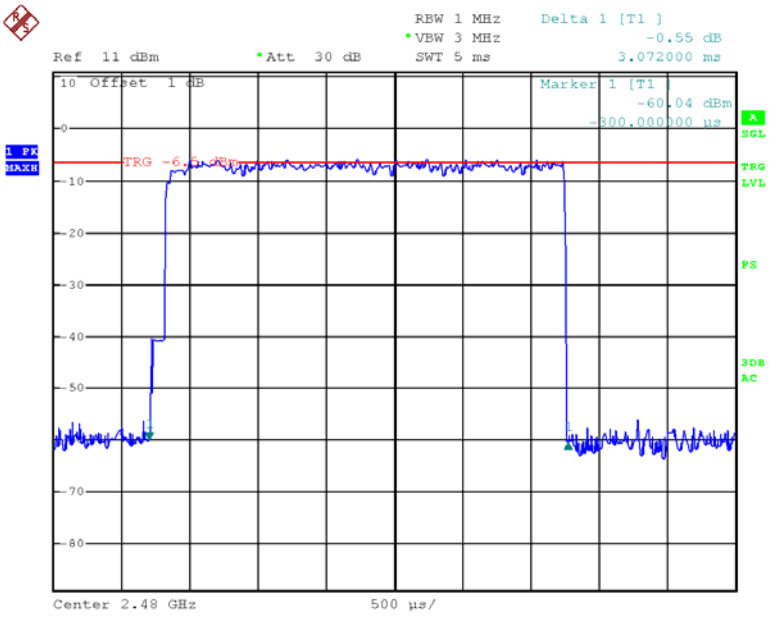

Date: 8.OCT.2015 14:57:21

**2DH5: Middle Channel**




Date: 8.OCT.2015 14:57:42

**2DH5: High Channel**

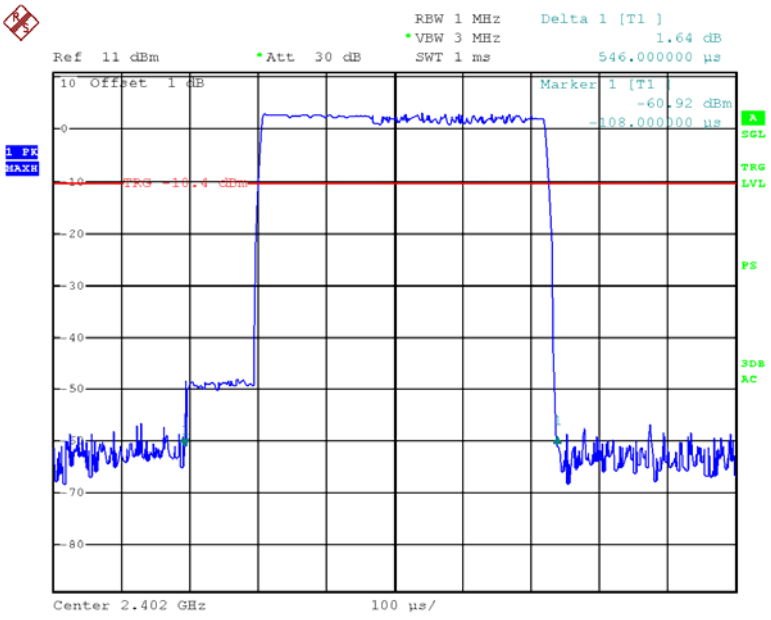



Date: 8.OCT.2015 14:58:09

*EDR Mode (8-DPSK):*

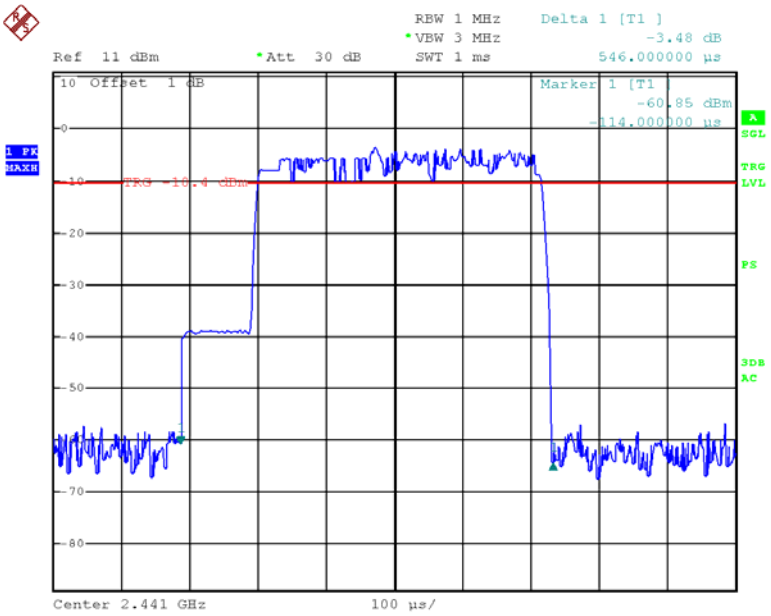
| Mode | Channel | Pulse Width (ms) | Dwell Time (s) | Limit (s) | Result |
|---|---|---|---|---|---|
| ***3DH1*** | Low | 0.546 | 0.175 | 0.4 | Pass |
| | Middle | 0.546 | 0.175 | 0.4 | Pass |
| | High | 0.546 | 0.175 | 0.4 | Pass |
| | Note: Dwell time=Pulse time (ms) × (1600/2/79 ) ×31.6 s | | | | |
| ***3DH3*** | Low | 1.818 | 0.291 | 0.4 | Pass |
| | Middle | 1.818 | 0.291 | 0.4 | Pass |
| | High | 1.812 | 0.290 | 0.4 | Pass |
| | Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s | | | | |
| ***3DH5*** | Low | 3.082 | 0.329 | 0.4 | Pass |
| | Middle | 3.072 | 0.328 | 0.4 | Pass |
| | High | 3.072 | 0.328 | 0.4 | Pass |
| | Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s | | | | |

**3DH1: Low Channel**



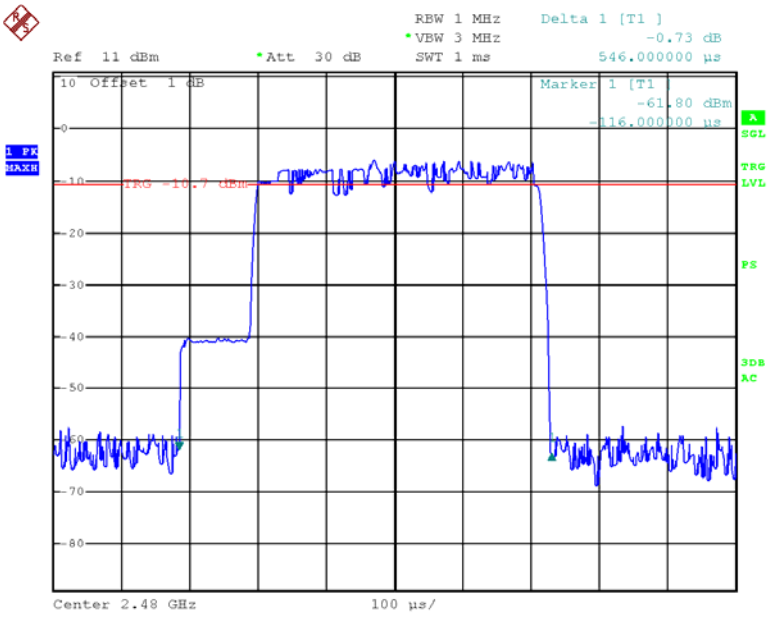

Date: 8.OCT.2015 14:42:36

**3DH1: Middle Channel**



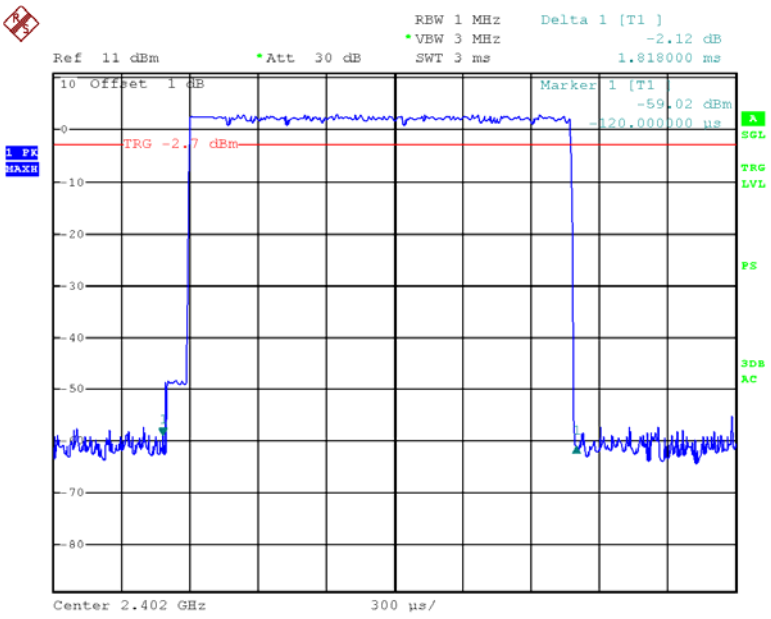

Date: 8.OCT.2015 14:41:34

**3DH1: High Channel**



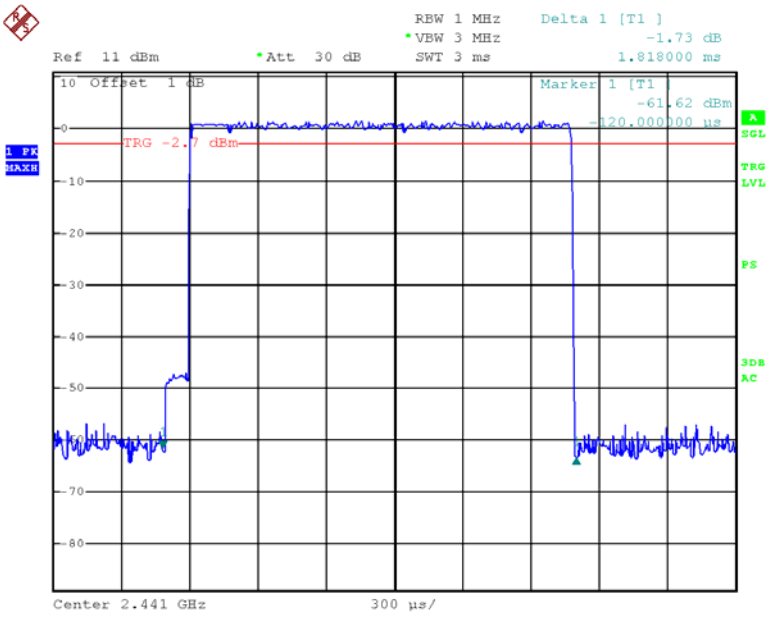

Date: 8.OCT.2015 14:40:40

**3DH3: Low Channel**



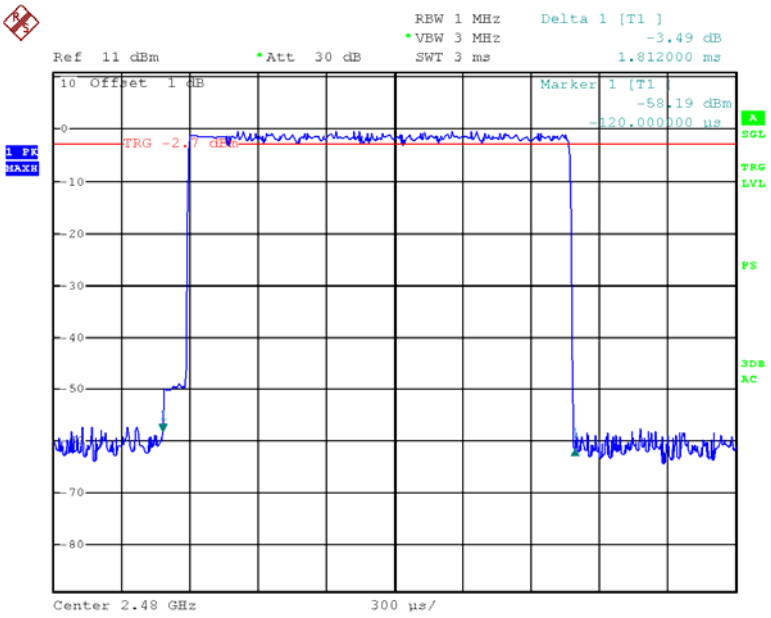

Date: 8.OCT.2015 14:52:24

**3DH3: Middle Channel**



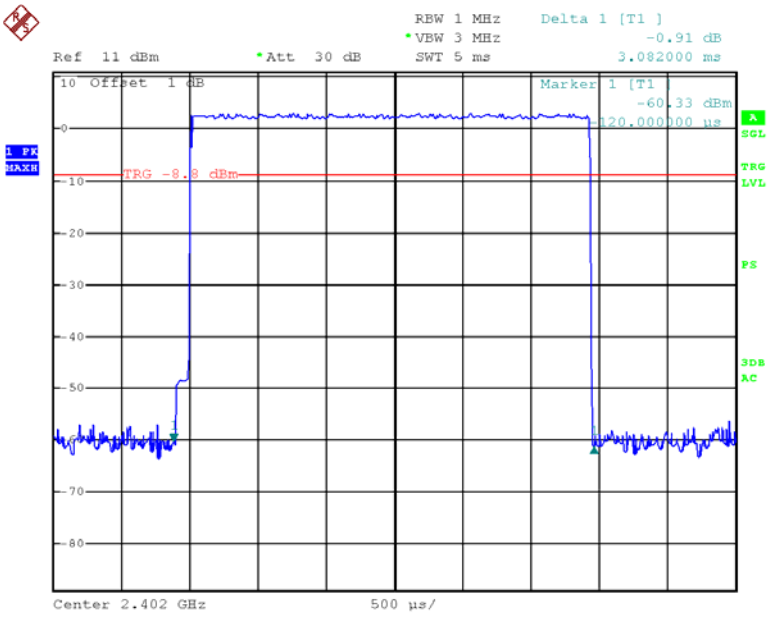

Date: 8.OCT.2015 14:52:39

**3DH3: High Channel**



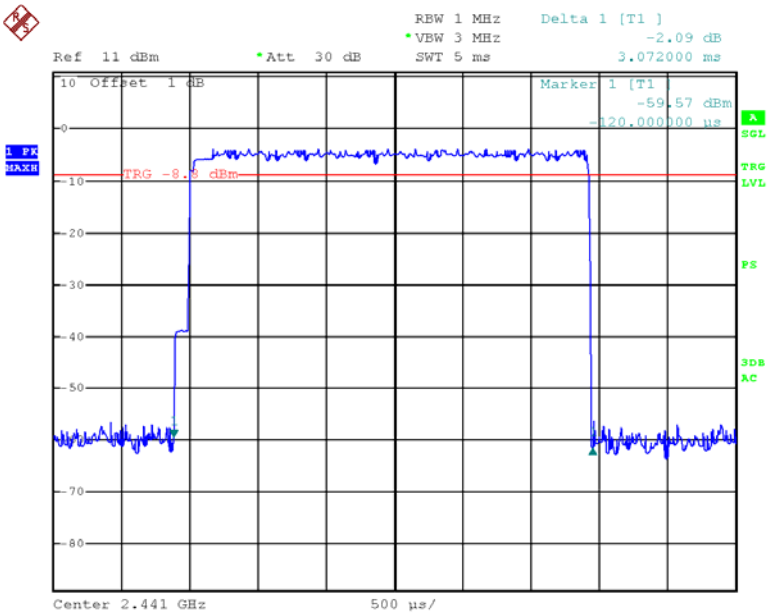

Date: 8.OCT.2015 14:52:55

**3DH5: Low Channel**



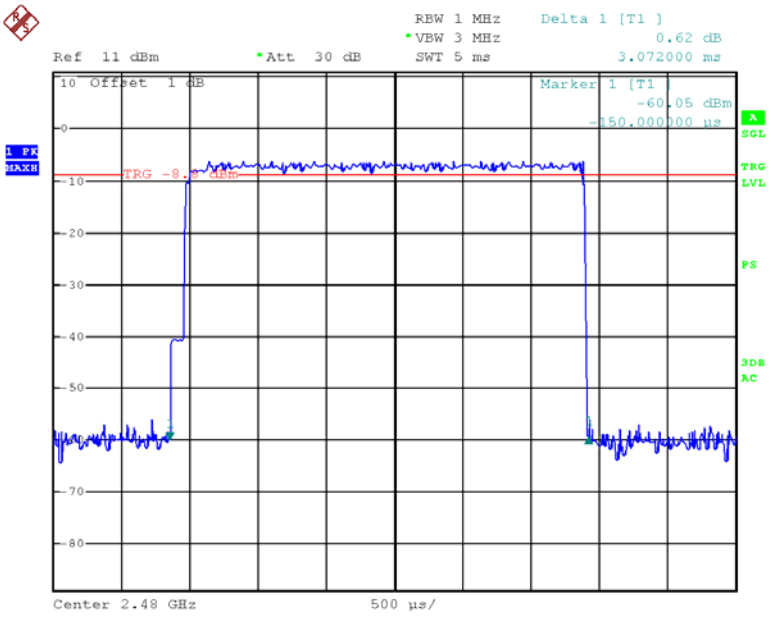

Date: 8.OCT.2015 15:00:07

**3DH5: Middle Channel**




Date: 8.OCT.2015 14:59:26

**3DH5: High Channel**




Date: 8.OCT.2015 14:58:49

# FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT

## Applicable Standard

According to §15.247(b) (1), for frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

## Test Procedure

According to PUBLIC NOTICE DA 00-705
Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

1. Place the EUT on a bench and set in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to an test equipment.
3. Add a correction factor to the display.

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| R&S | Spectrum Analyzer | FSP 38 | 100478 | 2015-05-09 | 2016-05-09 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 26.1 °C |
| **Relative Humidity:** | 56 % |
| **ATM Pressure:** | 100.5kPa |

** The testing was performed by Allen Qiao on 2015-09-30.*

**Test Result:** Compliance.

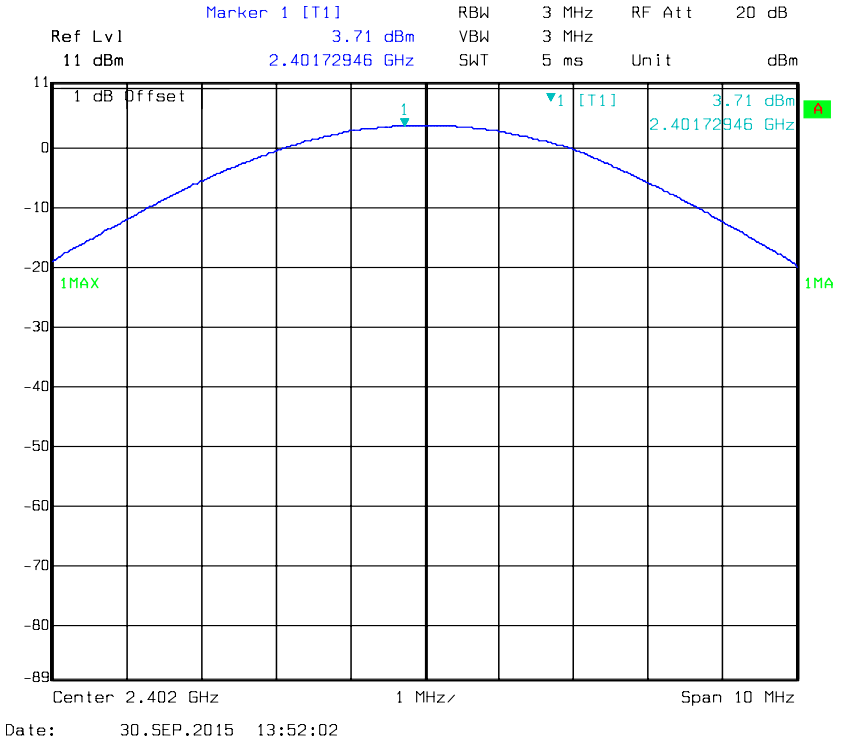
*Test Mode: Transmitting*

| Mode | Channel | Frequency | Output power | Limit |
|---|---|---|---|---|
| | | MHz | dBm | dBm |
| BDR (GFSK) | Low | 2402 | 3.71 | 30 |
| | Middle | 2441 | 2.31 | 30 |
| | High | 2480 | 0.46 | 30 |
| EDR (π/4-DQPSK) | Low | 2402 | 2.73 | 30 |
| | Middle | 2441 | 0.94 | 30 |
| | High | 2480 | -1.46 | 30 |
| EDR (8-DPSK) | Low | 2402 | 2.83 | 30 |
| | Middle | 2441 | 1.20 | 30 |
| | High | 2480 | -1.01 | 30 |

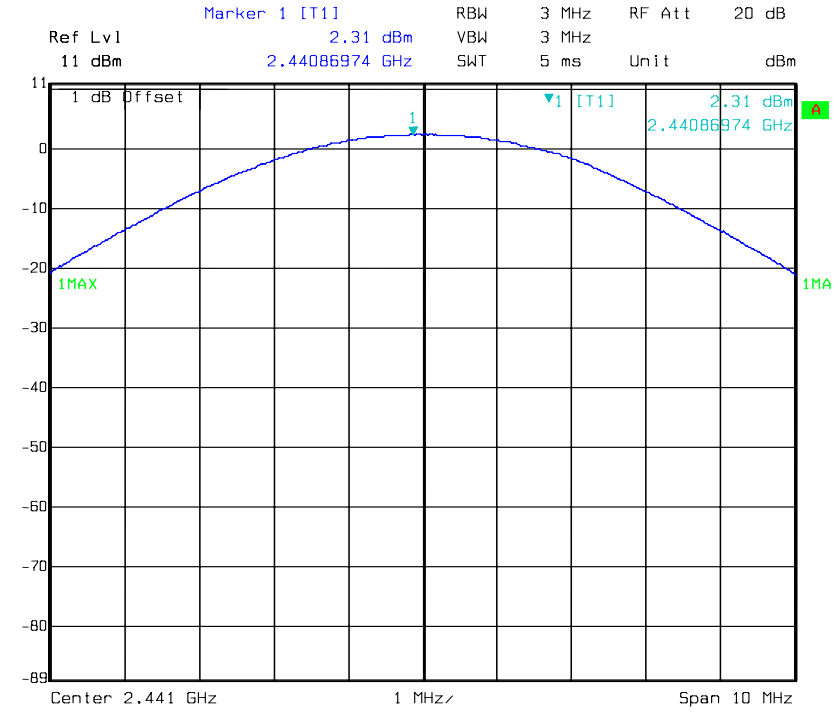
Note: The data above was tested in conducted mode.

*BDR Mode (GFSK):*

**Output Power, Low Channel**

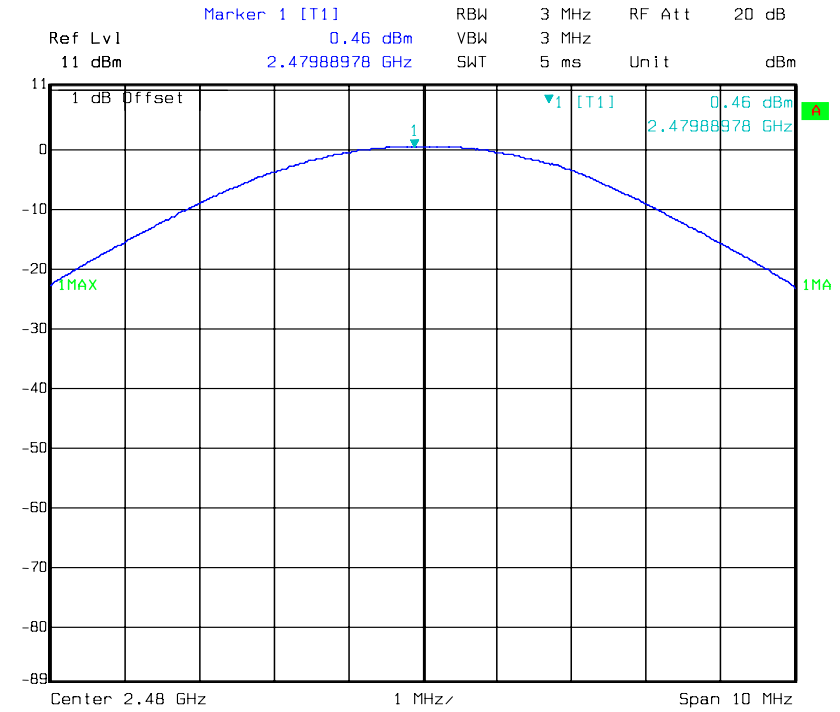


## Output Power, Middle Channel




Date: 30.SEP.2015 13:52:29

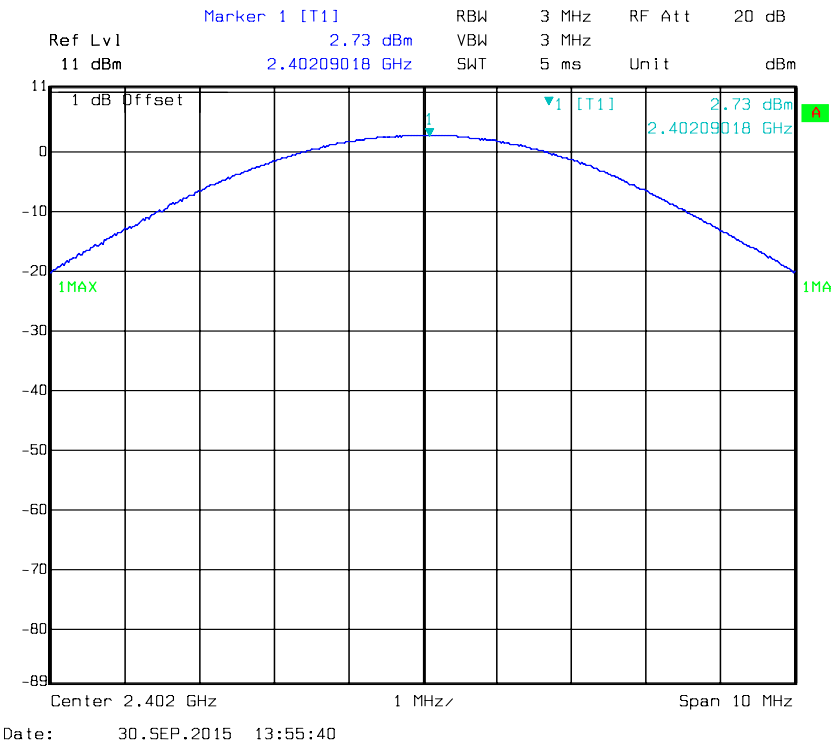
## Output Power, High Channel



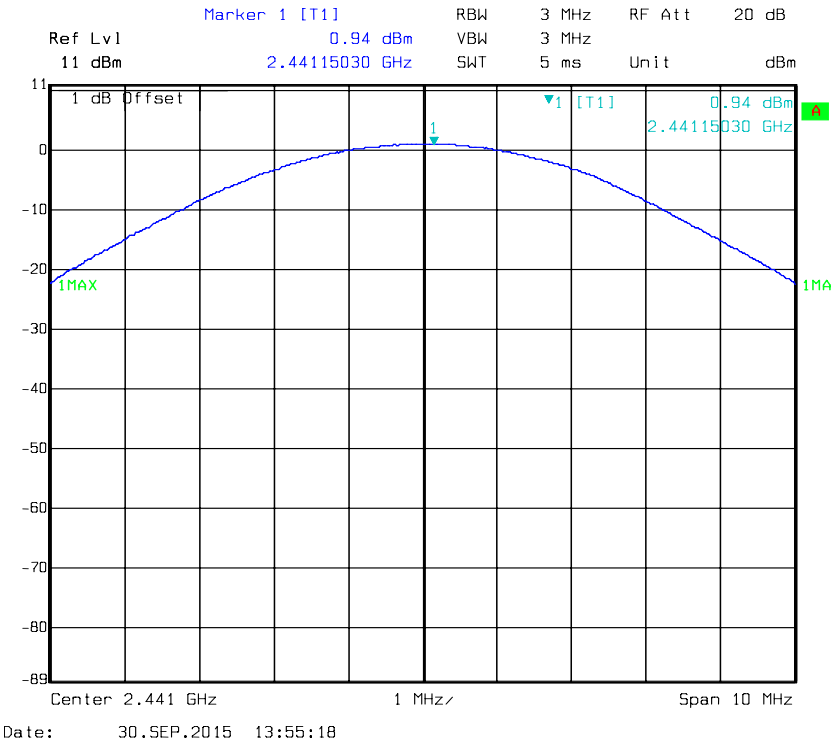

Date: 30.SEP.2015 13:53:05

*EDR Mode (π/4-DQPSK):*

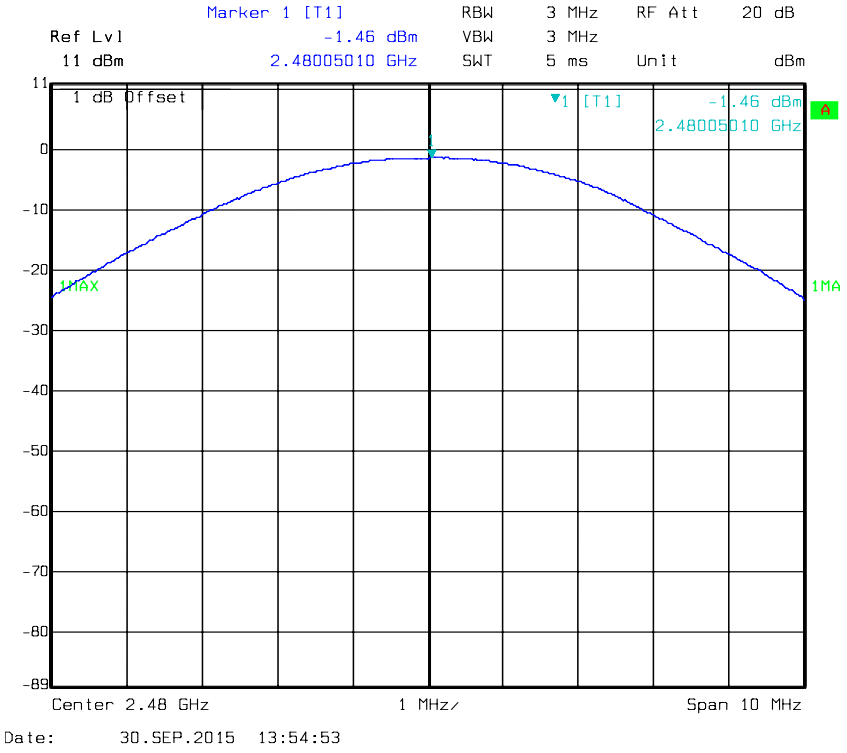
**Output Power, Low Channel**




**Output Power, Middle Channel**

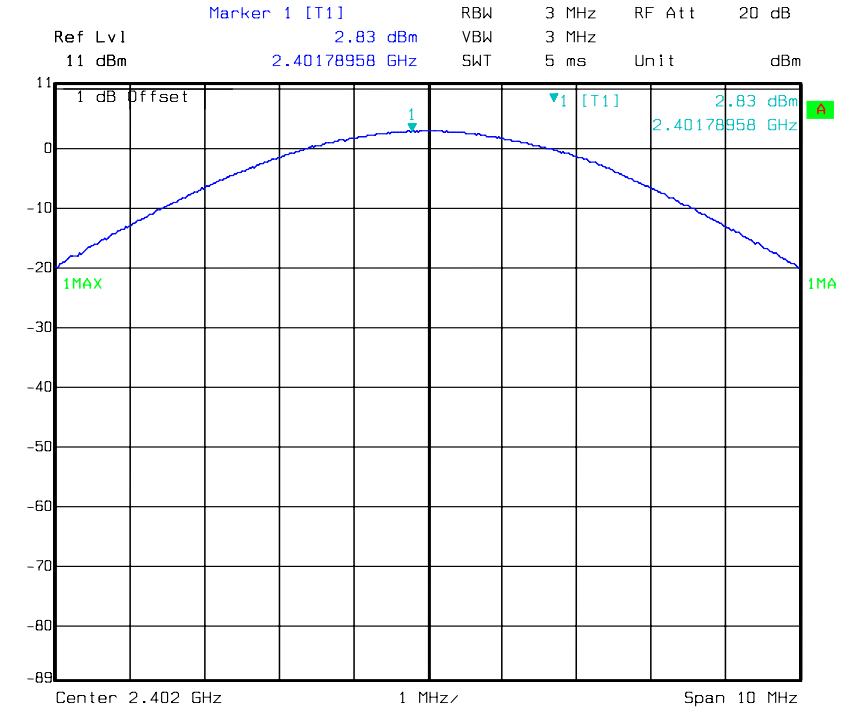


**Output Power, High Channel**

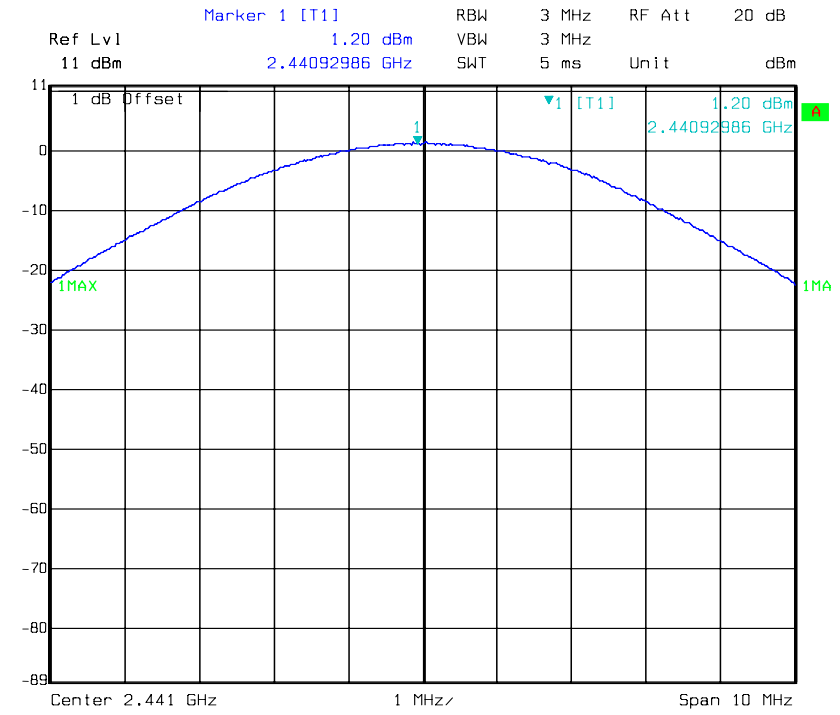



*EDR Mode (8-DPSK):*

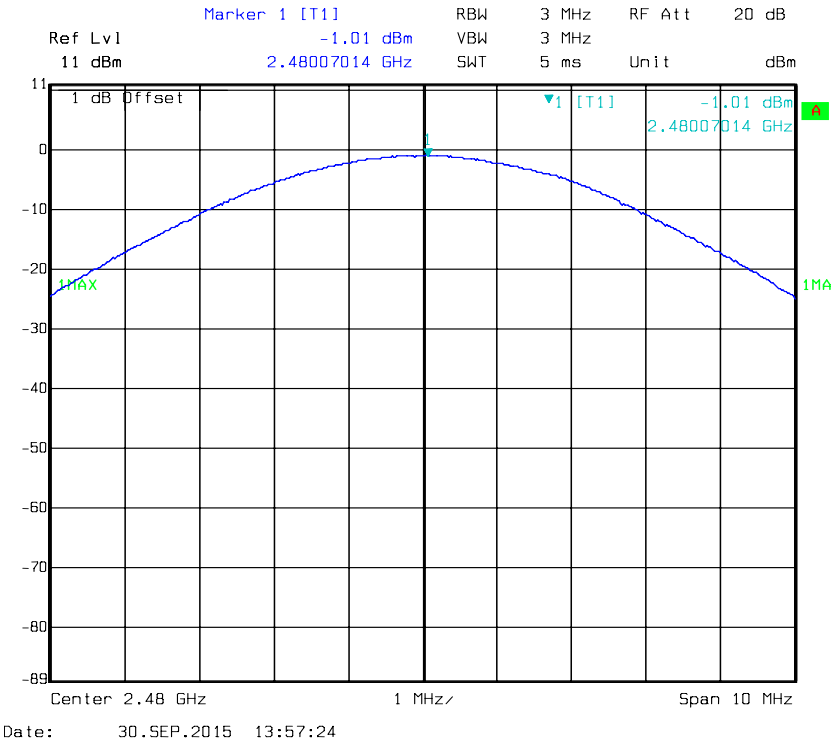
**Output Power, Low Channel**



## Output Power, Middle Channel




## Output Power, High Channel



# FCC §15.247(d) - BAND EDGES TESTING

## Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. 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)).

## Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| R&S | Spectrum Analyzer | FSP 38 | 100478 | 2015-05-09 | 2016-05-09 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

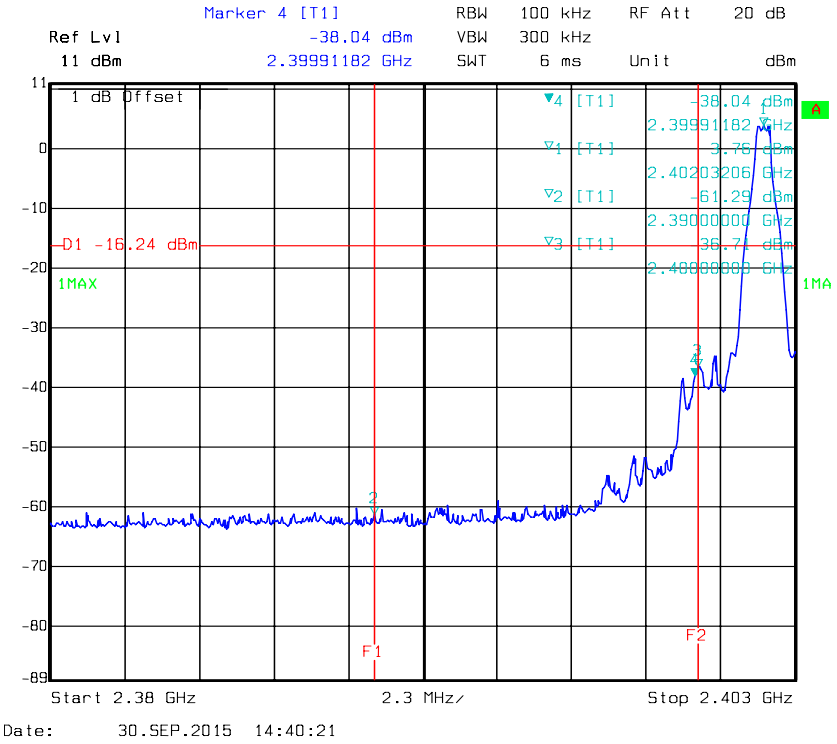
| | |
|---|---|
| **Temperature:** | 25.9°C |
| **Relative Humidity:** | 53 % |
| **ATM Pressure:** | 100.5 kPa |

** The testing was performed by Allen Qiao on 2015-09-30.*

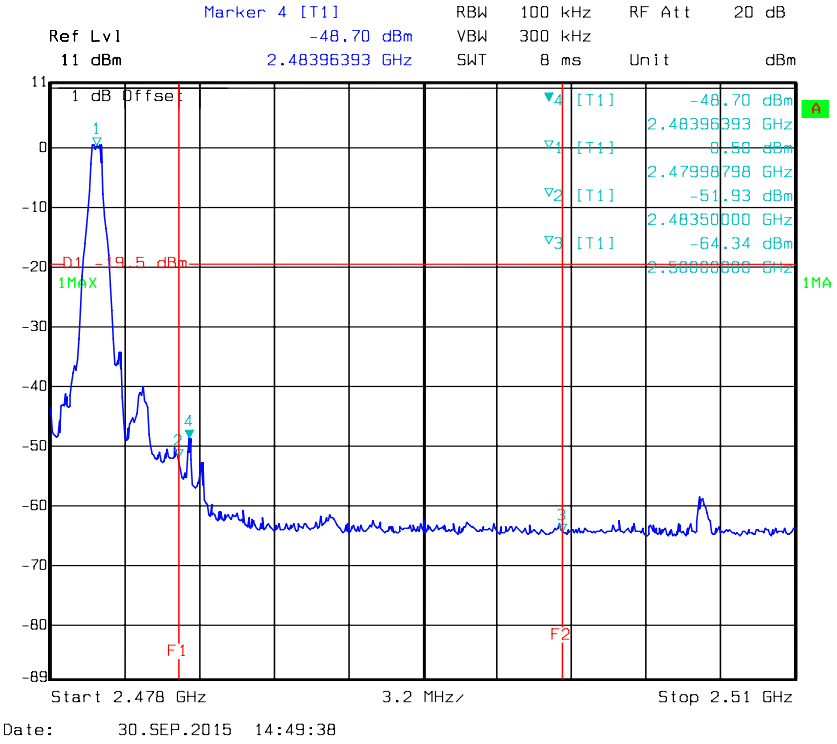
**Test Result:** Compliance

*BDR Mode (GFSK):*

**Band Edge, Left Side**

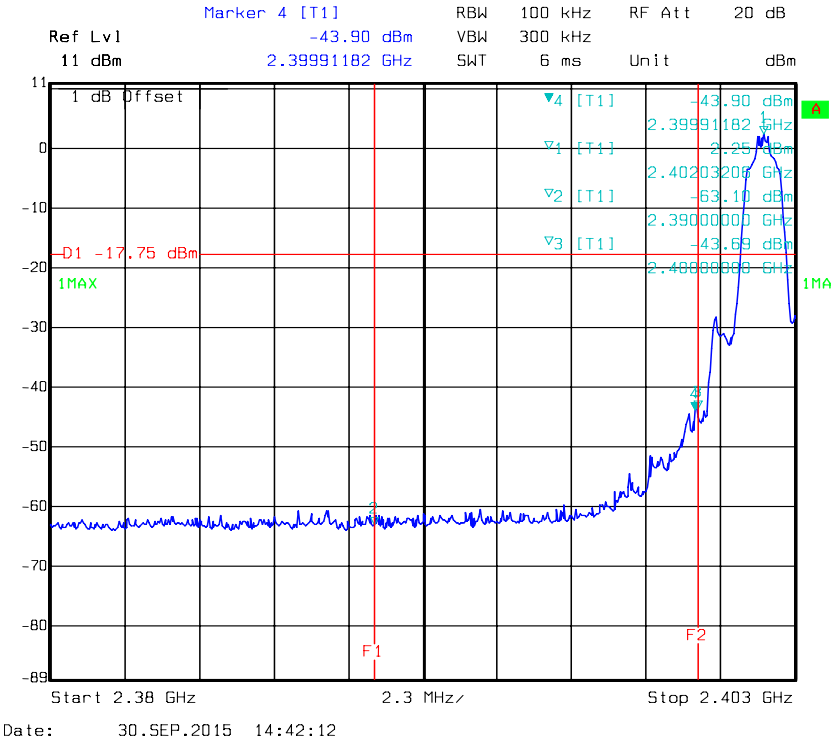



**Band Edge, Right Side**

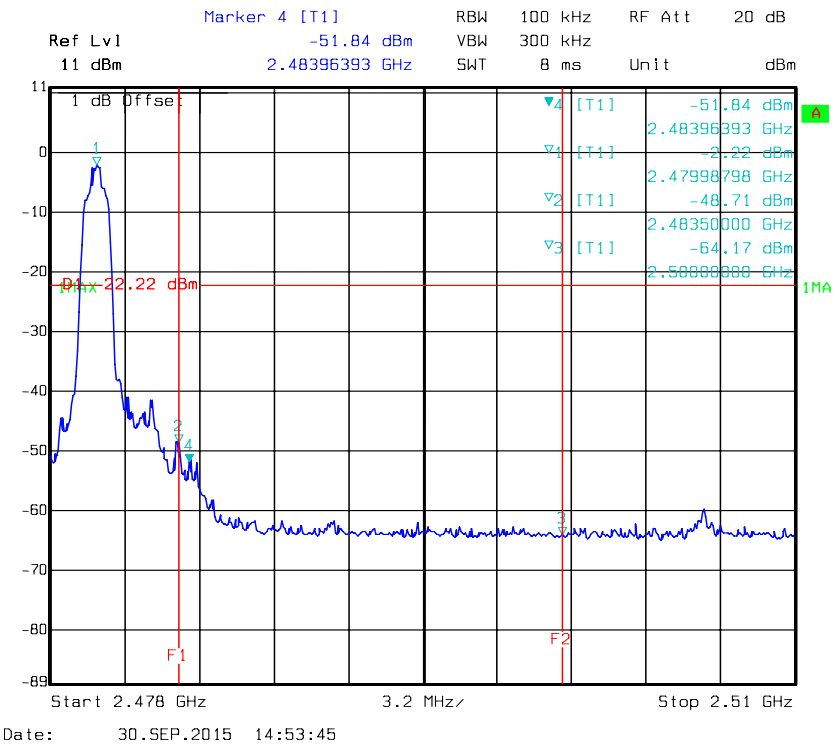


*EDR Mode (π/4-DQPSK):*

**Band Edge, Left Side**

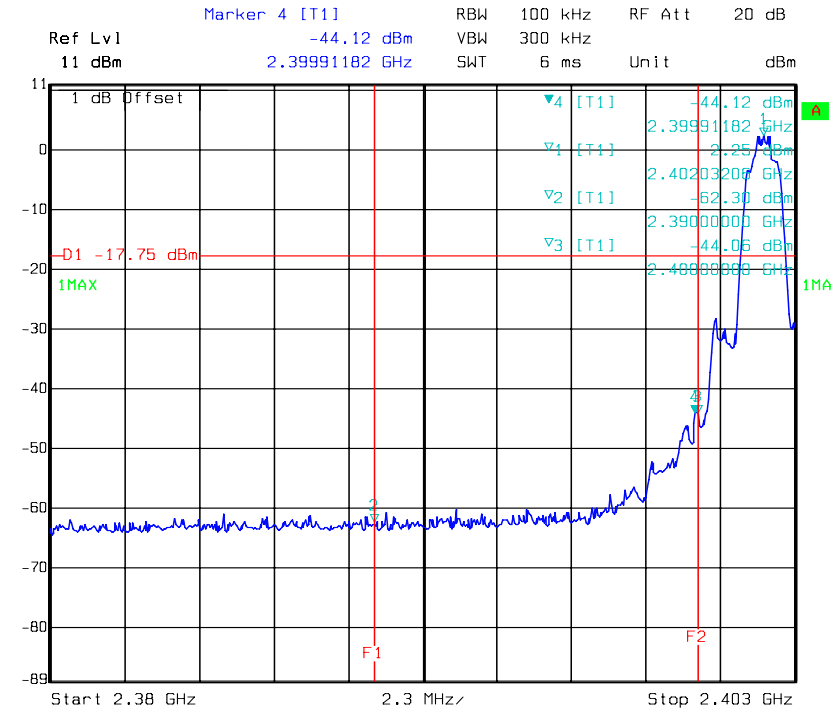



**Band Edge, Right Side**

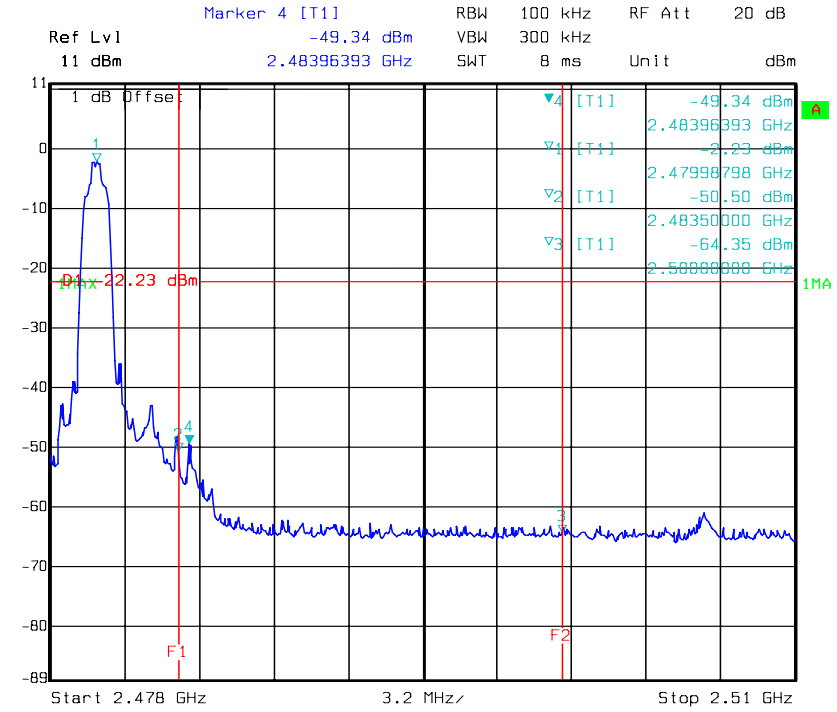


*EDR Mode (8-DPSK):*

**Band Edge, Left Side**




**Band Edge, Right Side**




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