# FCC PART 15.247

# TEST REPORT

For

# Eurosun international limited

3F, Bldg F1, F518 Idea Land, Baoyuan Road ,Xixiang Avenue,Bao An District, ShenZhen, China

## FCC ID: 2AJ33-8B100BT

| **Report Type:** | **Product Name:** |
|---|---|
| Original Report | Bluetooth headphone |

| | |
|---|---|
| **Test Engineer:** | Kevin Hu |
| **Report Number:** | RDG170315812 |
| **Report Date:** | 2017-04-14 |
| **Reviewed By:** | Henry Ding<br>EMC Leader |
| **Test Laboratory:** | Bay Area Compliance Laboratories Corp. (Chengdu)<br>No.5040, Huilongwan Plaza, No.1, Shawan Road,<br>Jinniu District, Chengdu, Sichuan, China<br>Tel: 028-65523123, Fax: 028-65525125<br>www.baclcorp.com |

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# TABLE OF CONTENTS

**GENERAL INFORMATION** ..... **4**
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) ..... 4
OBJECTIVE ..... 4
RELATED SUBMITTAL(S)/GRANT(S) ..... 4
TEST METHODOLOGY ..... 4
MEASUREMENT UNCERTAINTY ..... 5
TEST FACILITY ..... 5
**SYSTEM TEST CONFIGURATION** ..... **6**
DESCRIPTION OF TEST CONFIGURATION ..... 6
EUT EXERCISE SOFTWARE ..... 6
EQUIPMENT MODIFICATIONS ..... 6
SUPPORT EQUIPMENT LIST AND DETAILS ..... 6
EXTERNAL CABLE ..... 6
BLOCK DIAGRAM OF TEST SETUP ..... 7
**SUMMARY OF TEST RESULTS** ..... **8**
**FCC §15.247 (i) & §1.1310 & §2.1093- RF EXPOSURE** ..... **9**
APPLICABLE STANDARD ..... 9
**FCC §15.203 - ANTENNA REQUIREMENT** ..... **10**
APPLICABLE STANDARD ..... 10
ANTENNA CONNECTOR CONSTRUCTION ..... 10
**FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS** ..... **11**
APPLICABLE STANDARD ..... 11
MEASUREMENT UNCERTAINTY ..... 11
EUT SETUP ..... 11
EMI TEST RECEIVER SETUP ..... 12
TEST PROCEDURE ..... 12
CORRECTED AMPLITUDE & MARGIN CALCULATION ..... 12
TEST EQUIPMENT LIST AND DETAILS ..... 13
TEST DATA ..... 13
**FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS** ..... **16**
APPLICABLE STANDARD ..... 16
MEASUREMENT UNCERTAINTY ..... 16
EUT SETUP ..... 17
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP ..... 18
TEST PROCEDURE ..... 18
TEST EQUIPMENT LIST AND DETAILS ..... 18
CORRECTED AMPLITUDE & MARGIN CALCULATION ..... 19
TEST DATA ..... 19
**FCC §15.247(a) (1) - CHANNEL SEPARATION TEST** ..... **23**
APPLICABLE STANDARD ..... 23
TEST EQUIPMENT LIST AND DETAILS ..... 23
TEST PROCEDURE ..... 23
TEST DATA ..... 23
**FCC §15.247(a) (1) – 20 dB BANDWIDTH TESTING** ..... **29**
APPLICABLE STANDARD ..... 29

TEST PROCEDURE ....29
TEST EQUIPMENT LIST AND DETAILS ....29
TEST DATA ....29

**FCC §15.247(a) (1) (iii) - QUANTITY OF HOPPING CHANNEL TEST ....35**

APPLICABLE STANDARD ....35
TEST PROCEDURE ....35
TEST EQUIPMENT LIST AND DETAILS ....35
TEST DATA ....35

**FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME) ....39**

APPLICABLE STANDARD ....39
TEST PROCEDURE ....39
TEST EQUIPMENT LIST AND DETAILS ....39
TEST DATA ....39

**FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT ....55**

APPLICABLE STANDARD ....55
TEST PROCEDURE ....55
TEST EQUIPMENT LIST AND DETAILS ....55
TEST DATA ....55

**FCC §15.247(d) - BAND EDGES TESTING ....61**

APPLICABLE STANDARD ....61
TEST PROCEDURE ....61
TEST EQUIPMENT LIST AND DETAILS ....61
TEST DATA ....61

# GENERAL INFORMATION

## Product Description for Equipment under Test (EUT)

The ***Eurosun international limited's*** product, model number: ***8B100BT (FCC ID: 2AJ33-8B100BT)*** (the "EUT") in this report was a ***Bluetooth headphone****,* which was measured approximately: 18.5 cm (L) × 17 cm (W) × 7 cm (H), rated input voltage: DC 3.7V from battery or DC 5V for USB port.

**All measurement and test data in this report was gathered from final production sample, serial number: 170315812 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-03-15, and EUT conformed to test requirement.*

## Objective

This report is prepared on behalf of ***Eurosun international limited*** *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 Bluetooth BDR and EDR mode of 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)

N/A

## 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. (Chengdu). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

## Measurement Uncertainty

| Parameter | Measurement Uncertainty |
|---|---|
| Occupied Channel Bandwidth | ±5 % |
| RF output power, conducted | ±0.62dB |
| Unwanted Emissions, radiated | 30M~200MHz: 4.7 dB for Horizontal, 4.7 dB for Vertical<br>200M~1GHz:6.0 dB for Horizontal, 6.0 for Vertical<br>1G~6GHz: 5.13 dB, 6G~18GHz: 5.47 dB |
| Temperature | ±1℃ |
| Humidity | ±5% |
| DC and low frequency voltages | ±0.4% |
| Duty Cycle | 1% |
| AC Power Lines Conducted Emission | 3.17 dB (150 kHz to 30 MHz) |

## Test Facility

The test site used by BACL to collect test data is located in the No.5040, Huilongwan Plaza, No.1, Shawan Road, Jinniu District, Chengdu, Sichuan, China.

Test site at BACL has been fully described in reports submitted to the Federal Communication 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 April 24, 2015. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 560332. 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 software “FCCAssit 1.5” was used for testing, which was provided by manufacturer.
The maximum power was as below setting, which was provided by the manufacturer:

| Test Software Version | FCCAssit 1.5 | | |
|---|---|---|---|
| Test Frequency | 2402MHz | 2441MHz | 2480MHz |
| GFSK | 10 | 10 | 10 |
| π/4-DQPSK | 10 | 10 | 10 |
| 8DPSK | 10 | 10 | 10 |

## Equipment Modifications

No modification was made to the EUT.

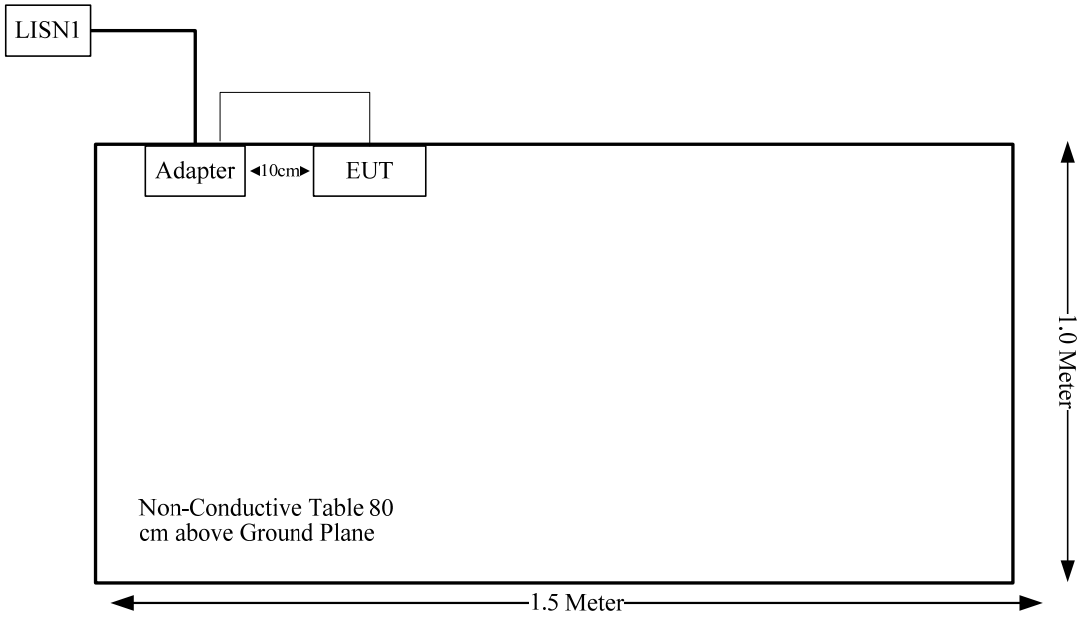
## Support Equipment List and Details

| Manufacturer | Description | Model | Serial Number |
|---|---|---|---|
| Huntkey | Adapter | HKA01105026 | 0D1603003303 |

## External Cable

| Cable Description | Shielding Type | Ferrite Core | Length (m) | From Port | To |
|---|---|---|---|---|---|
| USB Cable | No | No | 0.8 | USB Port of EUT | Adapter |

## 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 | Compliant |
| §15.203 | Antenna Requirement | Compliance |
| §15.207 (a) | Conducted Emissions | Compliance |
| §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 v06:

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 max conducted power including tune-up tolerance is -3.0 dBm (0.5 mW).
[(max. power of channel, mW)/(min. test separation distance, mm)][√f(GHz)]
= 0.5/5*(√2.480) = 0.2< 3.0

**So the stand-alone 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 internal antenna arrangement for BT, and the antenna gain is 0 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:

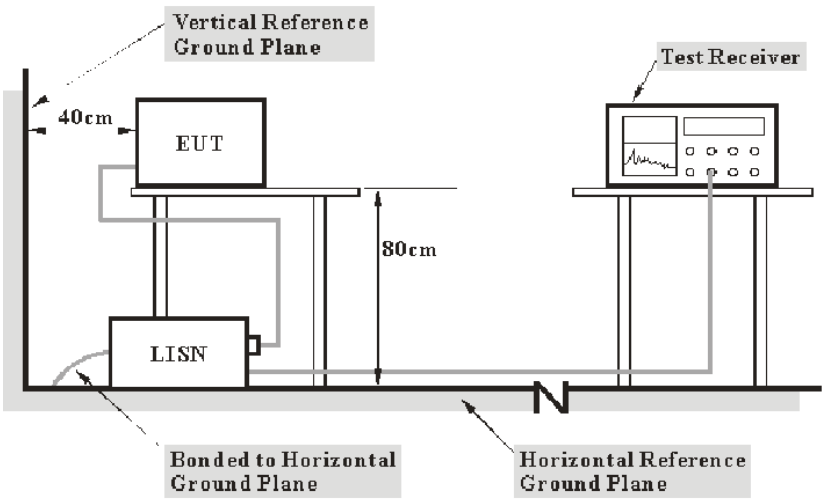
If $U_{lab}$ is less than or equal to $U_{cispr}$ of Table 1, then:
–compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
–non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.
If $U_{lab}$ is greater than $U_{cispr}$ 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. (Chengdu) is ±3.17 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 V/60 Hz AC 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 |
|---|---|---|---|---|---|
| Rohde & Schwarz | EMI Test Receiver | ESCS 30 | 836858/0016 | 2016-12-02 | 2017-12-01 |
| Rohde & Schwarz | L.I.S.N. | ENV216 | 3560.6550.06 | 2016-12-02 | 2017-12-01 |
| Rohde & Schwarz | PULSE LIMITER | ESH3Z2 | 357.8810.52 | 2016-10-31 | 2017-10-30 |
| N/A | Conducted Cable | NO.5 | N/A | 2016-11-10 | 2017-11-09 |
| R&S | Test Software | EMC32 | Version8.53.0 | N/A | N/A |

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

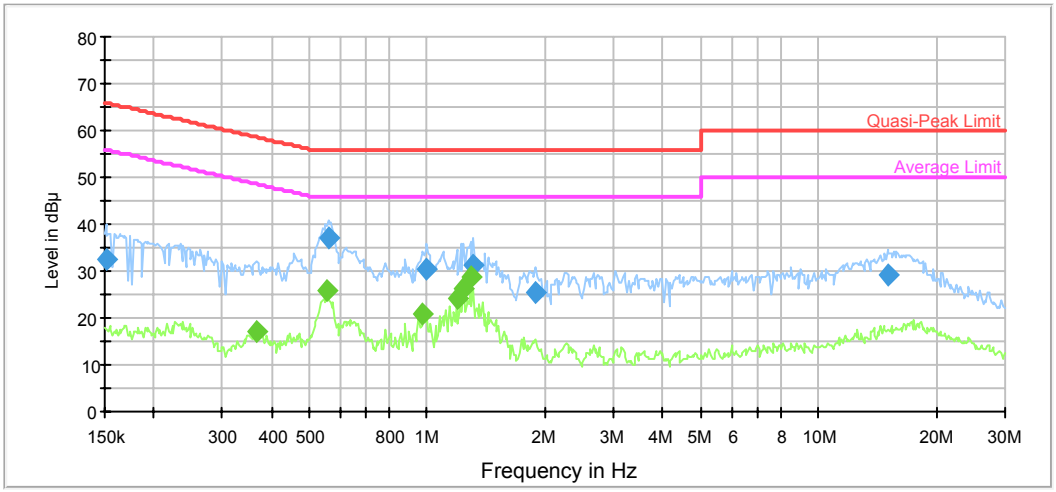
### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 23 °C |
| **Relative Humidity:** | 48 % |
| **ATM Pressure:** | 96.5 kPa |

*The testing was performed by Kevin Hu on 2017-04-12.*

*Test Mode: Transmitting*

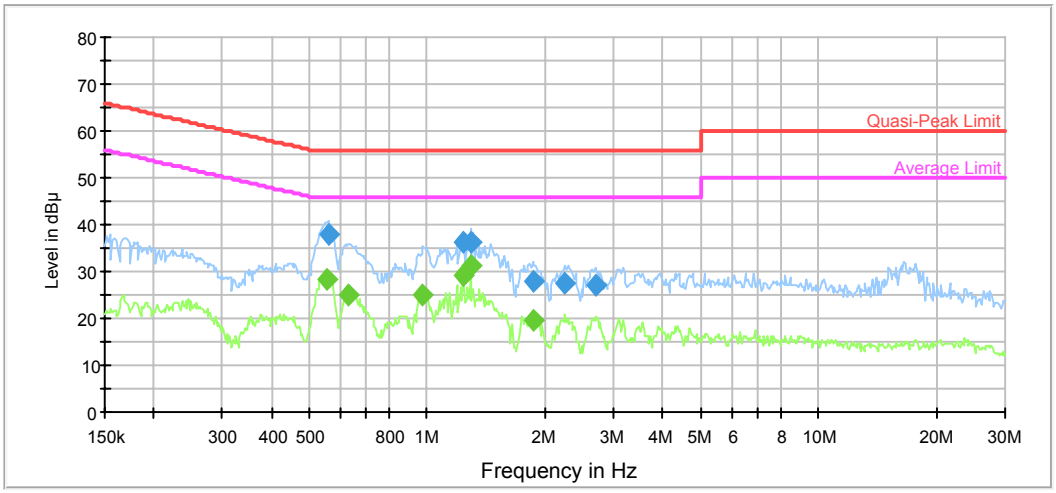
**AC120 V, 60 Hz, Line:**




| Frequency (MHz) | QuasiPeak (dBµV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) | Comment |
|---|---|---|---|---|---|---|---|
| 0.151200 | 32.3 | 9.000 | L1 | 19.7 | 33.6 | 65.9 | Compliance |
| 0.558572 | 36.9 | 9.000 | L1 | 19.7 | 19.1 | 56.0 | Compliance |
| 0.999305 | 30.2 | 9.000 | L1 | 19.7 | 25.8 | 56.0 | Compliance |
| 1.310256 | 31.5 | 9.000 | L1 | 19.7 | 24.5 | 56.0 | Compliance |
| 1.890344 | 25.4 | 9.000 | L1 | 19.8 | 30.6 | 56.0 | Compliance |
| 15.006489 | 29.1 | 9.000 | L1 | 20.1 | 30.9 | 60.0 | Compliance |

| Frequency (MHz) | Average (dBµV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) | Comment |
|---|---|---|---|---|---|---|---|
| 0.366160 | 17.1 | 9.000 | L1 | 19.7 | 31.5 | 48.6 | Compliance |
| 0.554139 | 25.9 | 9.000 | L1 | 19.7 | 20.1 | 46.0 | Compliance |
| 0.975701 | 20.8 | 9.000 | L1 | 19.7 | 25.2 | 46.0 | Compliance |
| 1.190776 | 24.4 | 9.000 | L1 | 19.7 | 21.6 | 46.0 | Compliance |
| 1.239175 | 26.4 | 9.000 | L1 | 19.7 | 19.6 | 46.0 | Compliance |
| 1.289541 | 28.7 | 9.000 | L1 | 19.7 | 17.3 | 46.0 | Compliance |

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




| Frequency (MHz) | QuasiPeak (dBµV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) | Comment |
|---|---|---|---|---|---|---|---|
| 0.558572 | 38.0 | 9.000 | N | 19.6 | 18.0 | 56.0 | Compliance |
| 1.239175 | 36.2 | 9.000 | N | 19.6 | 19.8 | 56.0 | Compliance |
| 1.289541 | 36.4 | 9.000 | N | 19.6 | 19.6 | 56.0 | Compliance |
| 1.860457 | 27.9 | 9.000 | N | 19.7 | 28.1 | 56.0 | Compliance |
| 2.252540 | 27.5 | 9.000 | N | 19.7 | 28.5 | 56.0 | Compliance |
| 2.684134 | 27.0 | 9.000 | N | 19.7 | 29.0 | 56.0 | Compliance |

| Frequency (MHz) | Average (dBµV) | Bandwidth (kHz) | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) | Comment |
|---|---|---|---|---|---|---|---|
| 0.554139 | 28.5 | 9.000 | N | 19.6 | 17.5 | 46.0 | Compliance |
| 0.629488 | 25.0 | 9.000 | N | 19.6 | 21.0 | 46.0 | Compliance |
| 0.975701 | 24.9 | 9.000 | N | 19.7 | 21.1 | 46.0 | Compliance |
| 1.239175 | 29.2 | 9.000 | N | 19.6 | 16.8 | 46.0 | Compliance |
| 1.289541 | 31.4 | 9.000 | N | 19.6 | 14.6 | 46.0 | Compliance |
| 1.860457 | 19.8 | 9.000 | N | 19.7 | 26.2 | 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 2, 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 2, 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.

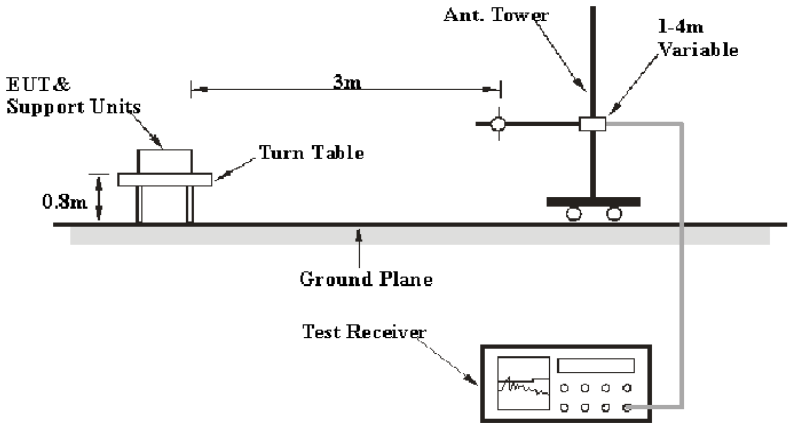
Based on CISPR 16-4-2-2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Chengdu) is:
30M~200MHz: ±4.7 dB;
200M~1GHz: ±6.0 dB;
1G~6GHz: ±5.13dB;
6G~25GHz: ±5.47 dB;

Table 2 – Values of $U_{cispr}$

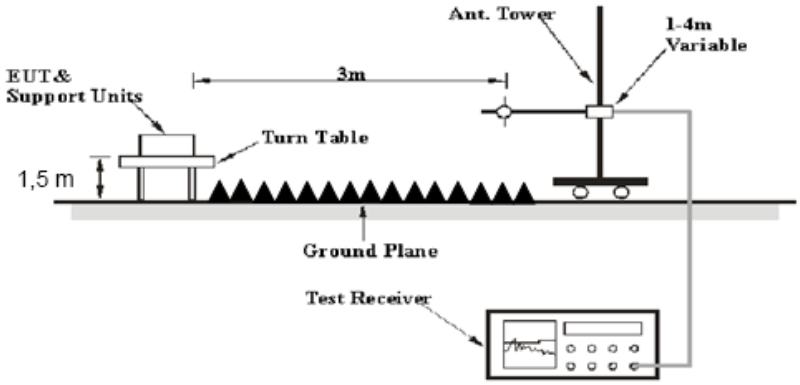
| Measurement | $U_{cispr}$ |
|---|---|
| Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz) | 6.3 dB |
| Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz) | 5.2 dB |
| Radiated disturbance (electric field strength in a FAR) (6 GHz to 18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

## 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 |
|---|---|---|---|---|---|
| Agilent | Amplifier | 8447D | 2944A10442 | 2016-12-02 | 2017-12-01 |
| Rohde & Schwarz | EMI Test Receiver | ESCI | 100028 | 2016-12-02 | 2017-12-01 |
| Sunol Sciences | Broadband Antenna | JB3 | A101808 | 2016-04-10 | 2019-04-09 |
| Rohde & Schwarz | Spectrum Analyzer | FSEM30 | 100018 | 2016-12-02 | 2017-12-01 |
| ETS | Horn Antenna | 3115 | 003-6076 | 2016-12-02 | 2017-12-01 |
| Ducommun Technologies | Horn Antenna | ARH-4223-02 | 1007726-0113024 | 2014-06-16 | 2017-06-15 |
| Mini-circuits | Amplifier | ZVA-183-S+ | 771001215 | 2016-05-20 | 2017-05-19 |
| HP | Amplifier | 8449B | 3008A00277 | 2016-12-02 | 2017-12-01 |
| EMCT | Semi-Anechoic Chamber | 966 | N/A | 2015-04-24 | 2018-04-23 |
| N/A | RF Cable (below 1GHz) | NO.1 | N/A | 2016-11-10 | 2017-11-09 |
| N/A | RF Cable (below 1GHz) | NO.4 | N/A | 2016-11-10 | 2017-11-09 |
| N/A | RF Cable (above 1GHz) | NO.2 | N/A | 2016-11-10 | 2017-11-09 |

*** Statement of Traceability:** BACL (Chengdu) attested 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 Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 22.3 °C |
| **Relative Humidity:** | 52 % |
| **ATM Pressure:** | 96.8kPa |

** The testing was performed by Kevin Hu on 2017-04-07.*

*Test Mode: Transmitting*

***30MHz*-25GHz:**

*BDR Mode (GFSK):*

| Frequency (MHz) | Receiver | | Rx Antenna | | Cable loss (dB) | Amplifier Gain (dB) | Corrected Amplitude (dBμV/m) | FCC 15.247 | |
|---|---|---|---|---|---|---|---|---|---|
| | Reading (dBμV) | Detector | Polar (H/V) | Factor (dB) | | | | Limit (dBμV/m) | Margin (dB) |
| Low Channel: 2402 MHz | | | | | | | | | |
| 2402 | 63.81 | PK | H | 23.53 | 3.00 | 0.00 | 90.34 | N/A | N/A |
| 2402 | 53.55 | AV | H | 23.53 | 3.00 | 0.00 | 80.08 | N/A | N/A |
| 2402 | 58.3 | PK | V | 23.53 | 3.00 | 0.00 | 84.83 | N/A | N/A |
| 2402 | 48.07 | AV | V | 23.53 | 3.00 | 0.00 | 74.60 | N/A | N/A |
| 2390 | 28.01 | PK | H | 23.57 | 3.00 | 0.00 | 54.58 | 74.00 | 19.42 |
| 2390 | 15.38 | AV | H | 23.57 | 3.00 | 0.00 | 41.95 | 54.00 | 12.05 |
| 4804 | 36.62 | PK | H | 30.77 | 5.12 | 26.87 | 45.64 | 74.00 | 28.36 |
| 4804 | 25.46 | AV | H | 30.77 | 5.12 | 26.87 | 34.48 | 54.00 | 19.52 |
| 7206 | 33.63 | PK | H | 34.71 | 6.16 | 26.35 | 48.15 | 74.00 | 25.85 |
| 7206 | 23.01 | AV | H | 34.71 | 6.16 | 26.35 | 37.53 | 54.00 | 16.47 |
| 3196 | 40.4 | PK | H | 25.30 | 3.72 | 26.48 | 42.94 | 74.00 | 31.06 |
| 3196 | 29.07 | AV | H | 25.30 | 3.72 | 26.48 | 31.61 | 54.00 | 22.39 |
| 33.88 | 40.3 | QP | H | 20.28 | 0.37 | 28.56 | 32.40 | 40.00 | 7.60 |
| 115.36 | 42.0 | QP | H | 14.44 | 0.62 | 28.20 | 28.90 | 43.50 | 14.60 |
| Middle Channel: 2441 MHz | | | | | | | | | |
| 2441 | 63.8 | PK | H | 23.40 | 3.00 | 0.00 | 90.20 | N/A | N/A |
| 2441 | 53.73 | AV | H | 23.40 | 3.00 | 0.00 | 80.13 | N/A | N/A |
| 2441 | 59.35 | PK | V | 23.40 | 3.00 | 0.00 | 85.75 | N/A | N/A |
| 2441 | 48.98 | AV | V | 23.40 | 3.00 | 0.00 | 75.38 | N/A | N/A |
| 4882 | 36.83 | PK | H | 31.02 | 5.09 | 26.87 | 46.07 | 74.00 | 27.93 |
| 4882 | 25.79 | AV | H | 31.02 | 5.09 | 26.87 | 35.03 | 54.00 | 18.97 |
| 7323 | 33.72 | PK | H | 34.95 | 6.22 | 26.40 | 48.49 | 74.00 | 25.51 |
| 7323 | 23.45 | AV | H | 34.95 | 6.22 | 26.40 | 38.22 | 54.00 | 15.78 |
| 3228 | 39.85 | PK | H | 25.48 | 3.77 | 26.49 | 42.61 | 74.00 | 31.39 |
| 3228 | 29.7 | AV | H | 25.48 | 3.77 | 26.49 | 32.46 | 54.00 | 21.54 |
| 1535 | 32.36 | PK | H | 24.16 | 2.70 | 26.36 | 32.86 | 74.00 | 41.14 |
| 1535 | 20.71 | AV | H | 24.16 | 2.70 | 26.36 | 21.21 | 54.00 | 32.79 |
| 33.88 | 40.4 | QP | H | 20.28 | 0.37 | 28.56 | 32.44 | 40.00 | 7.56 |
| 115.36 | 42.2 | QP | H | 14.44 | 0.62 | 28.20 | 29.06 | 43.50 | 14.44 |
| High Channel: 2480 MHz | | | | | | | | | |
| 2480 | 64.43 | PK | H | 23.27 | 2.99 | 0.00 | 90.69 | N/A | N/A |
| 2480 | 53.89 | AV | H | 23.27 | 2.99 | 0.00 | 80.15 | N/A | N/A |
| 2480 | 58.58 | PK | V | 23.27 | 2.99 | 0.00 | 84.84 | N/A | N/A |
| 2480 | 48.31 | AV | V | 23.27 | 2.99 | 0.00 | 74.57 | N/A | N/A |
| 2483.5 | 29.4 | PK | H | 23.26 | 2.99 | 0.00 | 55.65 | 74.00 | 18.35 |
| 2483.5 | 16.09 | AV | H | 23.26 | 2.99 | 0.00 | 42.34 | 54.00 | 11.66 |
| 4960 | 36.95 | PK | H | 31.27 | 5.05 | 26.88 | 46.39 | 74.00 | 27.61 |
| 4960 | 26.29 | AV | H | 31.27 | 5.05 | 26.88 | 35.73 | 54.00 | 18.27 |
| 7440 | 34.36 | PK | H | 35.18 | 6.27 | 26.45 | 49.36 | 74.00 | 24.64 |
| 7440 | 24 | AV | H | 35.18 | 6.27 | 26.45 | 39.00 | 54.00 | 15.00 |
| 3253 | 40.39 | PK | H | 25.62 | 3.81 | 26.50 | 43.32 | 74.00 | 30.68 |
| 3253 | 29.05 | AV | H | 25.62 | 3.81 | 26.50 | 31.98 | 54.00 | 22.02 |
| 33.88 | 40.0 | QP | H | 20.28 | 0.37 | 28.56 | 32.09 | 40.00 | 7.91 |
| 115.36 | 41.8 | QP | H | 14.44 | 0.62 | 28.20 | 28.66 | 43.50 | 14.84 |

*2EDR Mode (π/4-DQPSK):*

| Frequency (MHz) | Receiver | | Rx Antenna | | Cable loss (dB) | Amplifier Gain (dB) | Corrected Amplitude (dBμV/m) | FCC 15.247 | |
|---|---|---|---|---|---|---|---|---|---|
| | Reading (dBμV) | Detector | Polar (H/V) | Factor (dB) | | | | Limit (dBμV/m) | Margin (dB) |
| Low Channel: 2402 MHz | | | | | | | | | |
| 2402 | 64.71 | PK | H | 23.53 | 3.00 | 0.00 | 91.24 | N/A | N/A |
| 2402 | 52.95 | AV | H | 23.53 | 3.00 | 0.00 | 79.48 | N/A | N/A |
| 2402 | 59.38 | PK | V | 23.53 | 3.00 | 0.00 | 85.91 | N/A | N/A |
| 2402 | 48.14 | AV | V | 23.53 | 3.00 | 0.00 | 74.67 | N/A | N/A |
| 2390 | 28.49 | PK | H | 23.57 | 3.00 | 0.00 | 55.06 | 74.00 | 18.94 |
| 2390 | 15.42 | AV | H | 23.57 | 3.00 | 0.00 | 41.99 | 54.00 | 12.01 |
| 4804 | 37.6 | PK | H | 30.77 | 5.12 | 26.87 | 46.62 | 74.00 | 27.38 |
| 4804 | 25.22 | AV | H | 30.77 | 5.12 | 26.87 | 34.24 | 54.00 | 19.76 |
| 7206 | 33.76 | PK | H | 34.71 | 6.16 | 26.35 | 48.28 | 74.00 | 25.72 |
| 7206 | 22.98 | AV | H | 34.71 | 6.16 | 26.35 | 37.50 | 54.00 | 16.50 |
| 3196 | 40.66 | PK | H | 25.30 | 3.72 | 26.48 | 43.20 | 74.00 | 30.80 |
| 3196 | 29.13 | AV | H | 25.30 | 3.72 | 26.48 | 31.67 | 54.00 | 22.33 |
| 33.88 | 40.5 | QP | H | 20.28 | 0.37 | 28.56 | 32.59 | 40.00 | 7.41 |
| 115.36 | 42.7 | QP | H | 14.44 | 0.62 | 28.20 | 29.56 | 43.50 | 13.94 |
| Middle Channel: 2441 MHz | | | | | | | | | |
| 2441 | 65.23 | PK | H | 23.40 | 3.00 | 0.00 | 91.63 | N/A | N/A |
| 2441 | 53.05 | AV | H | 23.40 | 3.00 | 0.00 | 79.45 | N/A | N/A |
| 2441 | 60.52 | PK | V | 23.40 | 3.00 | 0.00 | 86.92 | N/A | N/A |
| 2441 | 48.58 | AV | V | 23.40 | 3.00 | 0.00 | 74.98 | N/A | N/A |
| 4882 | 36.76 | PK | H | 31.02 | 5.09 | 26.87 | 46.00 | 74.00 | 28.00 |
| 4882 | 25.97 | AV | H | 31.02 | 5.09 | 26.87 | 35.21 | 54.00 | 18.79 |
| 7323 | 33.54 | PK | H | 34.95 | 6.22 | 26.40 | 48.31 | 74.00 | 25.69 |
| 7323 | 24 | AV | H | 34.95 | 6.22 | 26.40 | 38.77 | 54.00 | 15.23 |
| 3228 | 40.36 | PK | H | 25.48 | 3.77 | 26.49 | 43.12 | 74.00 | 30.88 |
| 3228 | 30.03 | AV | H | 25.48 | 3.77 | 26.49 | 32.79 | 54.00 | 21.21 |
| 1535 | 32.47 | PK | H | 24.16 | 2.70 | 26.36 | 32.97 | 74.00 | 41.03 |
| 1535 | 20.38 | AV | H | 24.16 | 2.70 | 26.36 | 20.88 | 54.00 | 33.12 |
| 33.88 | 40.1 | QP | H | 20.28 | 0.37 | 28.56 | 32.19 | 40.00 | 7.81 |
| 115.36 | 41.8 | QP | H | 14.44 | 0.62 | 28.20 | 28.66 | 43.50 | 14.84 |
| High Channel: 2480 MHz | | | | | | | | | |
| 2480 | 65.17 | PK | H | 23.27 | 2.99 | 0.00 | 91.43 | N/A | N/A |
| 2480 | 53.04 | AV | H | 23.27 | 2.99 | 0.00 | 79.30 | N/A | N/A |
| 2480 | 61.12 | PK | V | 23.27 | 2.99 | 0.00 | 87.38 | N/A | N/A |
| 2480 | 48.26 | AV | V | 23.27 | 2.99 | 0.00 | 74.52 | N/A | N/A |
| 2483.5 | 29.02 | PK | H | 23.26 | 2.99 | 0.00 | 55.27 | 74.00 | 18.73 |
| 2483.5 | 16.35 | AV | H | 23.26 | 2.99 | 0.00 | 42.60 | 54.00 | 11.40 |
| 4960 | 38.71 | PK | H | 31.27 | 5.05 | 26.88 | 48.15 | 74.00 | 25.85 |
| 4960 | 26.2 | AV | H | 31.27 | 5.05 | 26.88 | 35.64 | 54.00 | 18.36 |
| 7440 | 34.25 | PK | H | 35.18 | 6.27 | 26.45 | 49.25 | 74.00 | 24.75 |
| 7440 | 23.57 | AV | H | 35.18 | 6.27 | 26.45 | 38.57 | 54.00 | 15.43 |
| 3253 | 40.36 | PK | H | 25.62 | 3.81 | 26.50 | 43.29 | 74.00 | 30.71 |
| 3253 | 28.19 | AV | H | 25.62 | 3.81 | 26.50 | 31.12 | 54.00 | 22.88 |
| 33.88 | 40.8 | QP | H | 20.28 | 0.37 | 28.56 | 32.89 | 40.00 | 7.11 |
| 115.36 | 42.5 | QP | H | 14.44 | 0.62 | 28.20 | 29.36 | 43.50 | 14.14 |

*3EDR Mode (8DPSK):*

| Frequency (MHz) | Receiver | | Rx Antenna | | Cable loss (dB) | Amplifier Gain (dB) | Corrected Amplitude (dBμV/m) | FCC 15.247 | |
|---|---|---|---|---|---|---|---|---|---|
| | Reading (dBμV) | Detector | Polar (H/V) | Factor (dB) | | | | Limit (dBμV/m) | Margin (dB) |
| Low Channel: 2402 MHz | | | | | | | | | |
| 2402 | 64.82 | PK | H | 23.53 | 3.00 | 0.00 | 91.35 | N/A | N/A |
| 2402 | 53.03 | AV | H | 23.53 | 3.00 | 0.00 | 79.56 | N/A | N/A |
| 2402 | 59.42 | PK | V | 23.53 | 3.00 | 0.00 | 85.95 | N/A | N/A |
| 2402 | 48.19 | AV | V | 23.53 | 3.00 | 0.00 | 74.72 | N/A | N/A |
| 2390 | 28.59 | PK | H | 23.57 | 3.00 | 0.00 | 55.16 | 74.00 | 18.84 |
| 2390 | 15.58 | AV | H | 23.57 | 3.00 | 0.00 | 42.15 | 54.00 | 11.85 |
| 4804 | 37.8 | PK | H | 30.77 | 5.12 | 26.87 | 46.82 | 74.00 | 27.18 |
| 4804 | 25.39 | AV | H | 30.77 | 5.12 | 26.87 | 34.41 | 54.00 | 19.59 |
| 7206 | 33.83 | PK | H | 34.71 | 6.16 | 26.35 | 48.35 | 74.00 | 25.65 |
| 7206 | 23.14 | AV | H | 34.71 | 6.16 | 26.35 | 37.66 | 54.00 | 16.34 |
| 3196 | 40.78 | PK | H | 25.30 | 3.72 | 26.48 | 43.32 | 74.00 | 30.68 |
| 3196 | 29.32 | AV | H | 25.30 | 3.72 | 26.48 | 31.86 | 54.00 | 22.14 |
| 33.88 | 41.6 | QP | H | 20.28 | 0.37 | 28.56 | 33.69 | 40.00 | 6.31 |
| 115.36 | 43.2 | QP | H | 14.44 | 0.62 | 28.20 | 30.06 | 43.50 | 13.44 |
| Middle Channel: 2441 MHz | | | | | | | | | |
| 2441 | 65.35 | PK | H | 23.40 | 3.00 | 0.00 | 91.75 | N/A | N/A |
| 2441 | 53.18 | AV | H | 23.40 | 3.00 | 0.00 | 79.58 | N/A | N/A |
| 2441 | 60.58 | PK | V | 23.40 | 3.00 | 0.00 | 86.98 | N/A | N/A |
| 2441 | 48.78 | AV | V | 23.40 | 3.00 | 0.00 | 75.18 | N/A | N/A |
| 4882 | 37.26 | PK | H | 31.02 | 5.09 | 26.87 | 46.50 | 74.00 | 27.50 |
| 4882 | 26.12 | AV | H | 31.02 | 5.09 | 26.87 | 35.36 | 54.00 | 18.64 |
| 7323 | 33.7 | PK | H | 34.95 | 6.22 | 26.40 | 48.47 | 74.00 | 25.53 |
| 7323 | 24.21 | AV | H | 34.95 | 6.22 | 26.40 | 38.98 | 54.00 | 15.02 |
| 3228 | 40.57 | PK | H | 25.48 | 3.77 | 26.49 | 43.33 | 74.00 | 30.67 |
| 3228 | 30.23 | AV | H | 25.48 | 3.77 | 26.49 | 32.99 | 54.00 | 21.01 |
| 1535 | 32.77 | PK | H | 24.16 | 2.70 | 26.36 | 33.27 | 74.00 | 40.73 |
| 1535 | 20.45 | AV | H | 24.16 | 2.70 | 26.36 | 20.95 | 54.00 | 33.05 |
| 33.88 | 41.8 | QP | H | 20.28 | 0.37 | 28.56 | 33.89 | 40.00 | 6.11 |
| 115.36 | 43.5 | QP | H | 14.44 | 0.62 | 28.20 | 30.36 | 43.50 | 13.14 |
| High Channel: 2480 MHz | | | | | | | | | |
| 2480 | 65.29 | PK | H | 23.27 | 2.99 | 0.00 | 91.55 | N/A | N/A |
| 2480 | 53.2 | AV | H | 23.27 | 2.99 | 0.00 | 79.46 | N/A | N/A |
| 2480 | 61.32 | PK | V | 23.27 | 2.99 | 0.00 | 87.58 | N/A | N/A |
| 2480 | 48.46 | AV | V | 23.27 | 2.99 | 0.00 | 74.72 | N/A | N/A |
| 2483.5 | 29.11 | PK | H | 23.26 | 2.99 | 0.00 | 55.36 | 74.00 | 18.64 |
| 2483.5 | 16.47 | AV | H | 23.26 | 2.99 | 0.00 | 42.72 | 54.00 | 11.28 |
| 4960 | 38.9 | PK | H | 31.27 | 5.05 | 26.88 | 48.34 | 74.00 | 25.66 |
| 4960 | 26.43 | AV | H | 31.27 | 5.05 | 26.88 | 35.87 | 54.00 | 18.13 |
| 7440 | 34.38 | PK | H | 35.18 | 6.27 | 26.45 | 49.38 | 74.00 | 24.62 |
| 7440 | 23.72 | AV | H | 35.18 | 6.27 | 26.45 | 38.72 | 54.00 | 15.28 |
| 3253 | 40.5 | PK | H | 25.62 | 3.81 | 26.50 | 43.43 | 74.00 | 30.57 |
| 3253 | 28.35 | AV | H | 25.62 | 3.81 | 26.50 | 31.28 | 54.00 | 22.72 |
| 33.88 | 42.1 | QP | H | 20.28 | 0.37 | 28.56 | 34.19 | 40.00 | 5.81 |
| 115.36 | 43.6 | QP | H | 14.44 | 0.62 | 28.20 | 30.46 | 43.50 | 13.04 |

# 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 |
|---|---|---|---|---|---|
| Rohde & Schwarz | EMI Test Receiver | ESCI | 100028 | 2016-12-02 | 2017-12-01 |
| N/A | RF Cable | N/A | N/A | Each Time | / |

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Procedure

1. Set the EUT in transmitting mode, spectrum Bandwidth was set at 30 kHz, maxhold the channel.
2. Set the adjacent channel of the EUT maxhold another trace.
3. Measure the channel separation.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 22.2~23.6 °C |
| **Relative Humidity:** | 40~48 % |
| **ATM Pressure:** | 95.8~97.1 kPa |

** The testing was performed by Kevin Hu from 2017-04-10 to 2017-04-11.*

**Test Result:** Compliance.

Please refer to following tables and plots

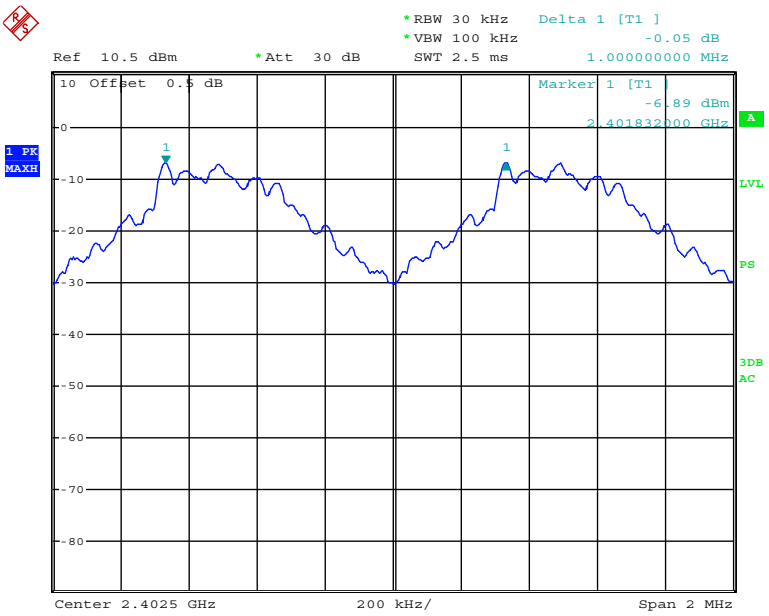
*Test Mode: Transmitting*

| Mode | Channel | Frequency (MHz) | Channel Separation (MHz) | Limit (MHz) |
|---|---|---|---|---|
| *BDR (GFSK)* | Low | 2402 | 1.000 | 0.59 |
| | Middle | 2441 | 1.000 | 0.59 |
| | High | 2480 | 1.004 | 0.59 |
| 2EDR (π/4-DQPSK) | Low | 2402 | 1.000 | 0.84 |
| | Middle | 2441 | 1.000 | 0.85 |
| | High | 2480 | 1.000 | 0.84 |
| 3EDR (8DPSK) | Low | 2402 | 1.000 | 0.83 |
| | Middle | 2441 | 1.004 | 0.84 |
| | High | 2480 | 1.000 | 0.84 |

*Note: Limit= (2/3) × 20dB bandwidth*

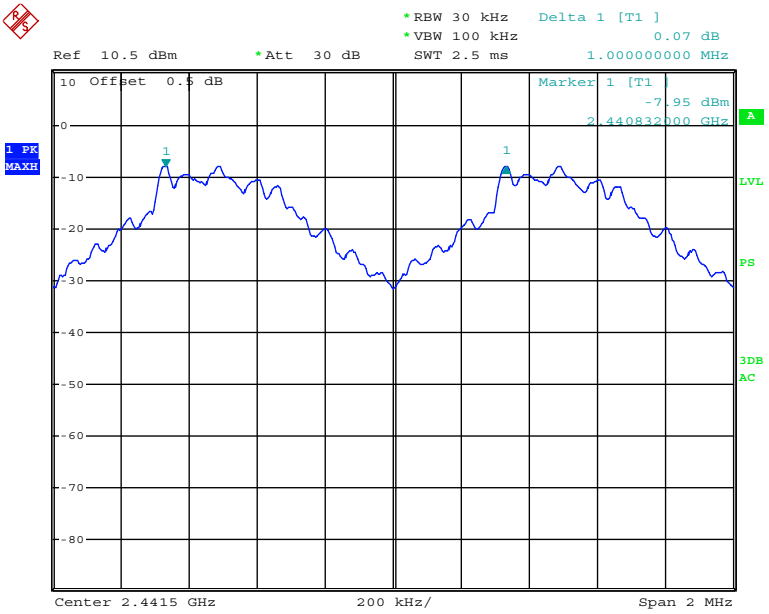
*BDR Mode (GFSK):*

**Low Channel**



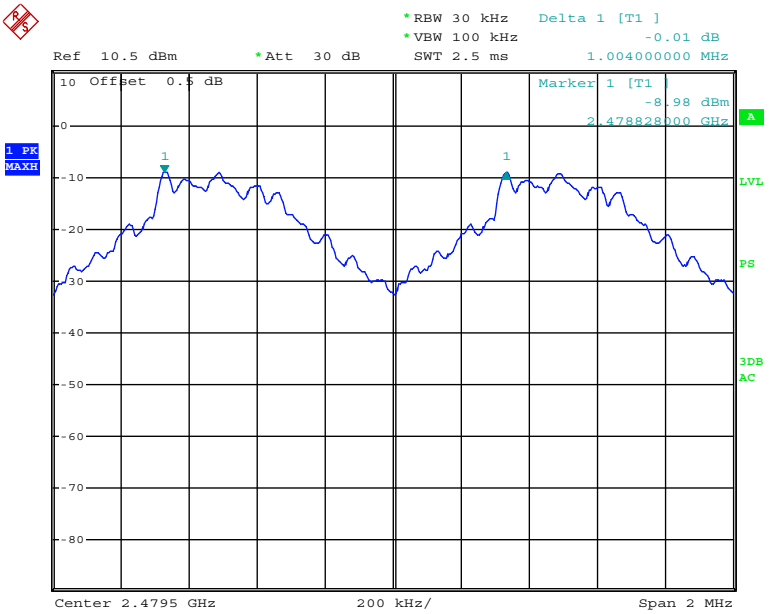

Date: 10.APR.2017 23:53:42

## Middle Channel




Date: 10.APR.2017 23:54:45

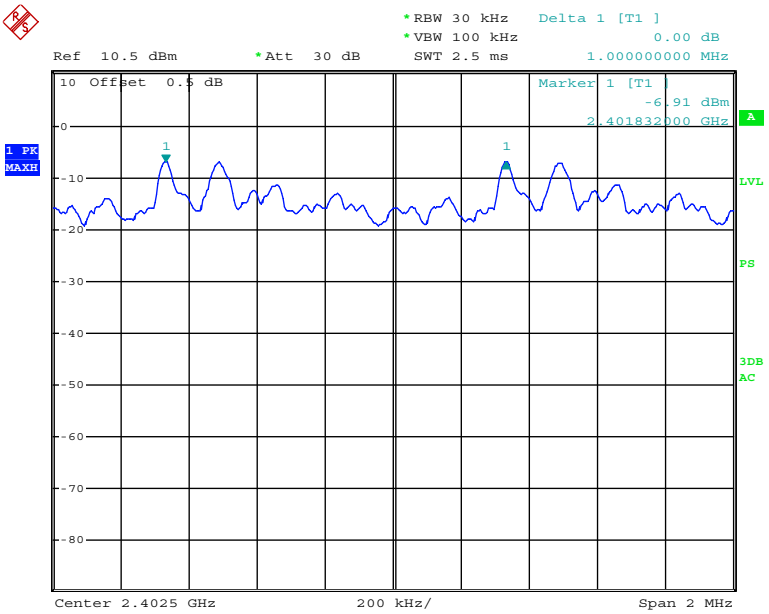
## High Channel




Date: 10.APR.2017 23:55:40

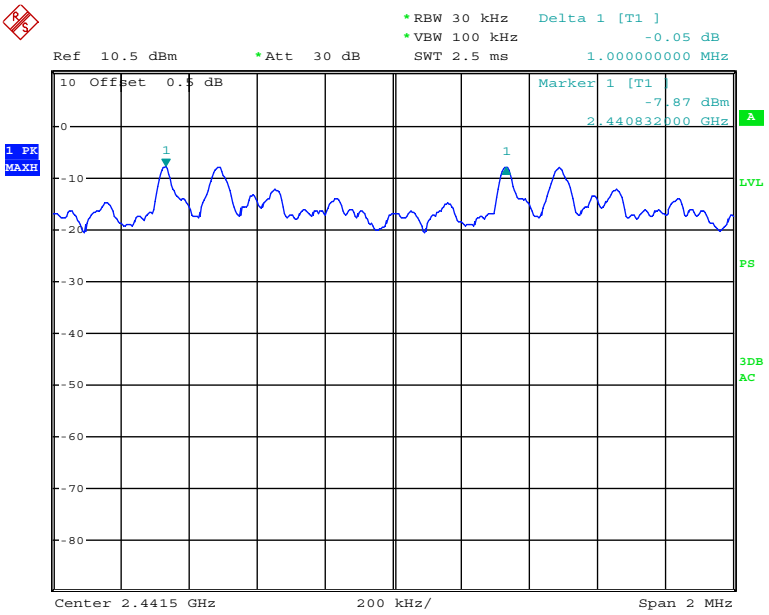
*2EDR Mode (π/4-DQPSK):*

**Low Channel**



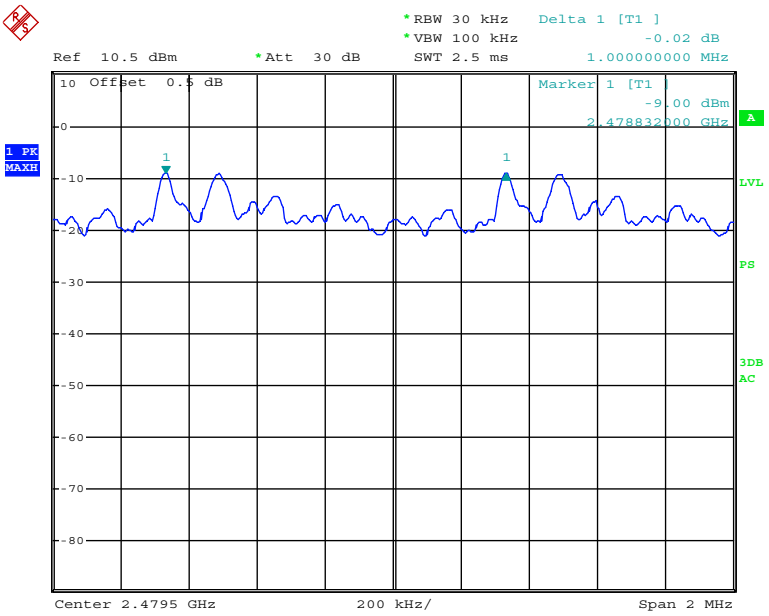

Date: 10.APR.2017 23:58:34

**Middle Channel**




Date: 10.APR.2017 23:57:39

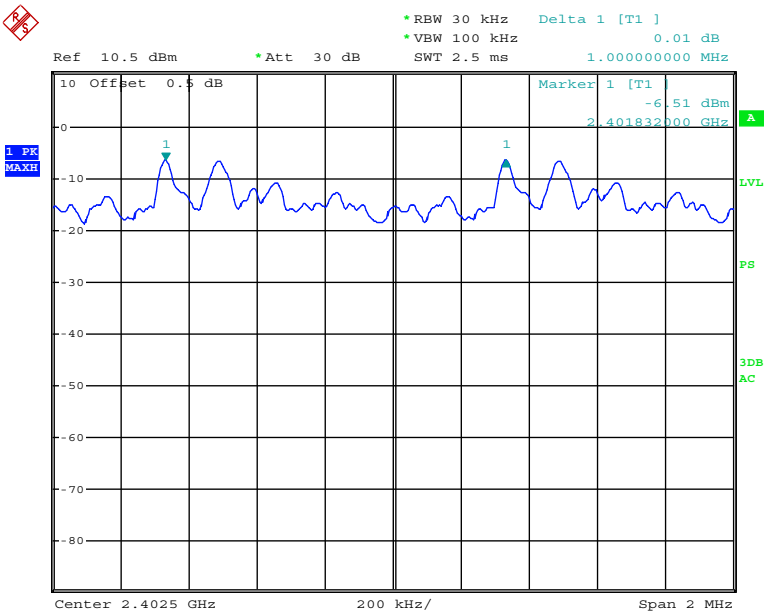
## High Channel




Date: 10.APR.2017 23:56:50

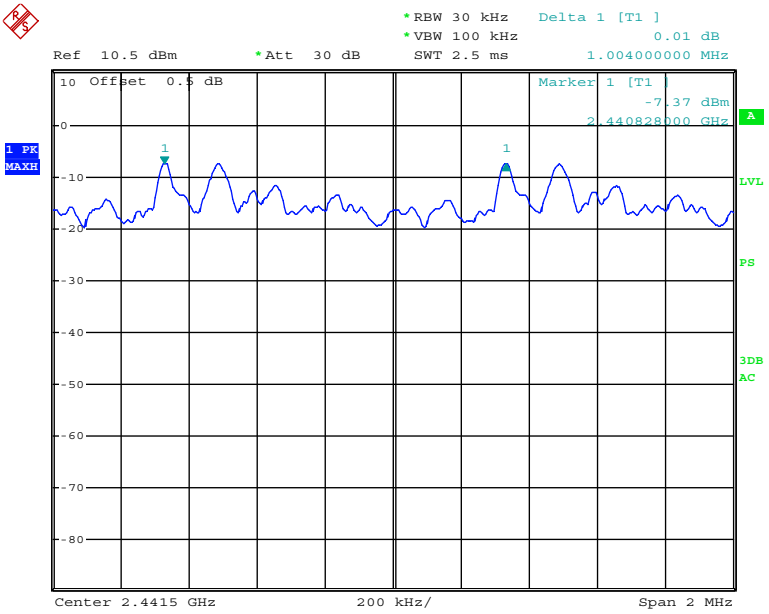
*3EDR Mode (8DPSK):*

## Low Channel



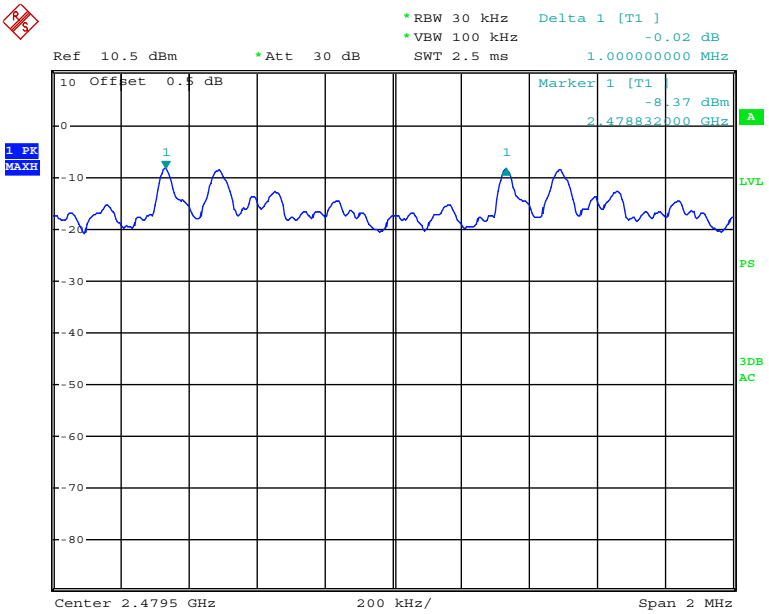

Date: 11.APR.2017 00:22:49

## Middle Channel




Date: 11.APR.2017 00:23:45

## High Channel




Date: 11.APR.2017 00:25:08

# 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

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on the test table without connection to measurement instrument. Turn on the EUT. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| Rohde & Schwarz | EMI Test Receiver | ESCI | 100028 | 2016-12-02 | 2017-12-01 |
| N/A | RF Cable | N/A | N/A | Each Time | / |

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 22.2~23.6 °C |
| **Relative Humidity:** | 40~48 % |
| **ATM Pressure:** | 95.8~97.1 kPa |

** The testing was performed by Kevin Hu from 2017-04-10 to 2017-04-11.*

**Test Result:** Compliance.

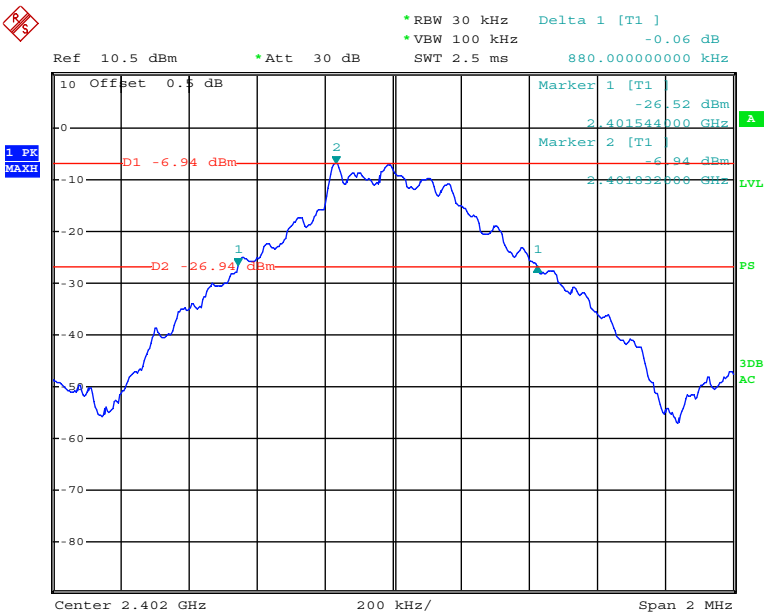
Please refer to following tables and plots

*Test Mode: Transmitting*

| Mode | Channel | Frequency (MHz) | 20 dB Bandwidth (MHz) |
|---|---|---|---|
| BDR Mode (GFSK) | Low | 2402 | 0.88 |
| | Middle | 2441 | 0.88 |
| | High | 2480 | 0.88 |
| 2EDR Mode (π/4-DQPSK) | Low | 2402 | 1.26 |
| | Middle | 2441 | 1.27 |
| | High | 2480 | 1.26 |
| 3EDR Mode (8DPSK) | Low | 2402 | 1.25 |
| | Middle | 2441 | 1.26 |
| | High | 2480 | 1.26 |

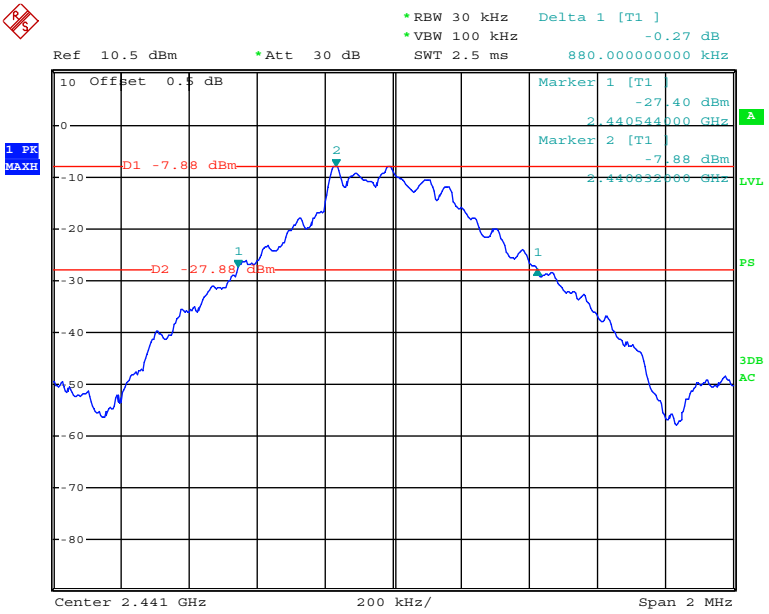
*BDR Mode (GFSK):*

**Low Channel**



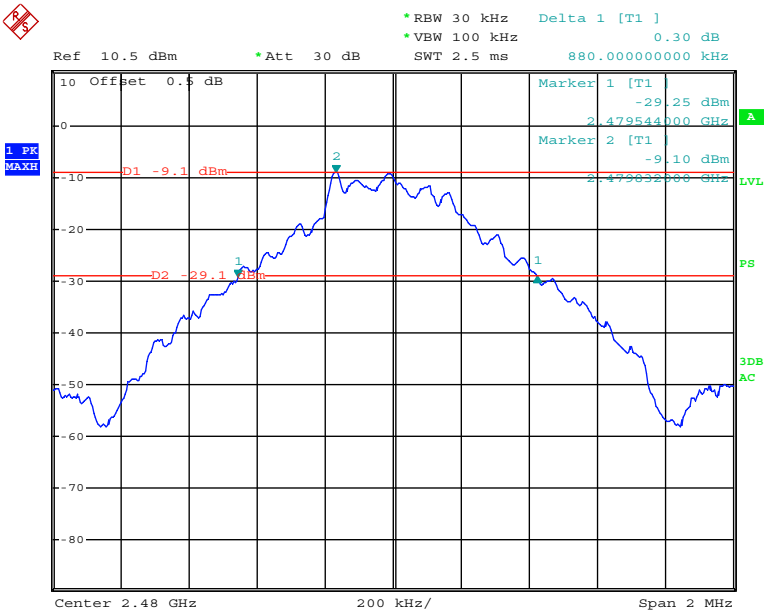

Date: 10.APR.2017 23:44:52

## Middle Channel




Date: 10.APR.2017 23:46:06

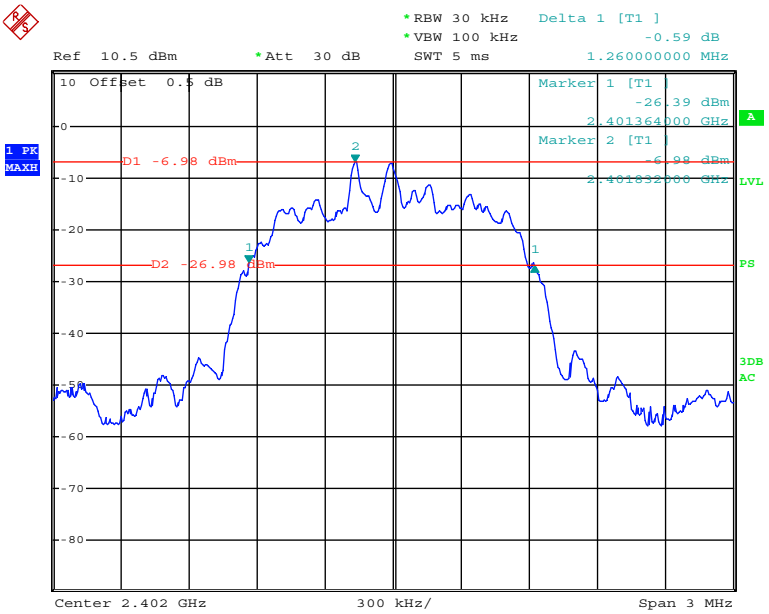
## High Channel




Date: 10.APR.2017 23:47:00

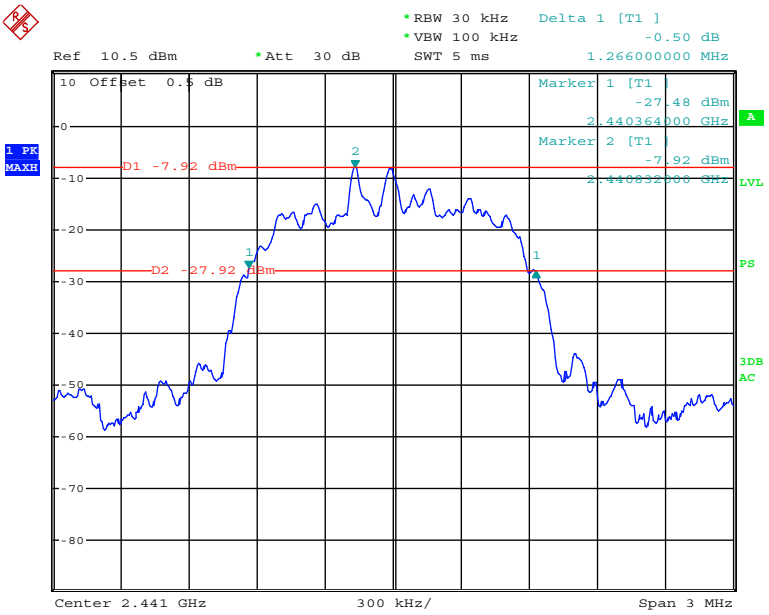
*2EDR Mode (π/4-DQPSK):*

**Low Channel**



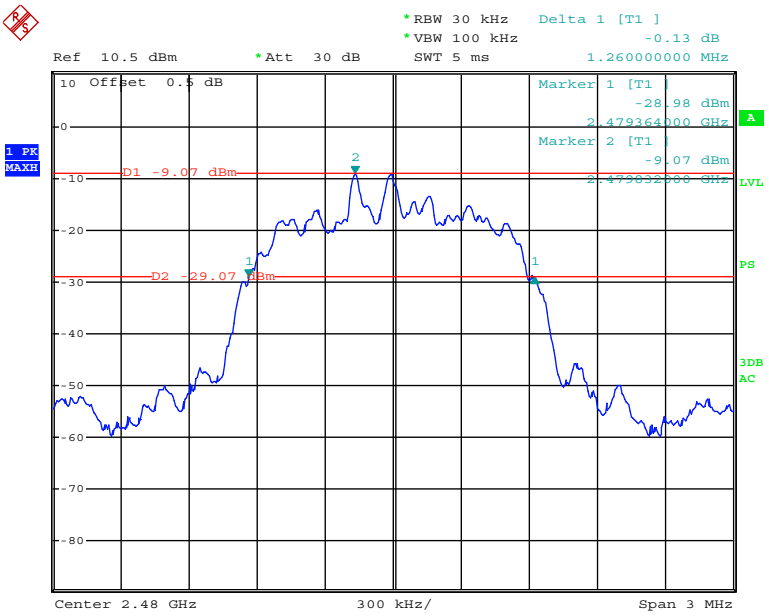

Date: 10.APR.2017 23:50:29

**Middle Channel**




Date: 10.APR.2017 23:49:21

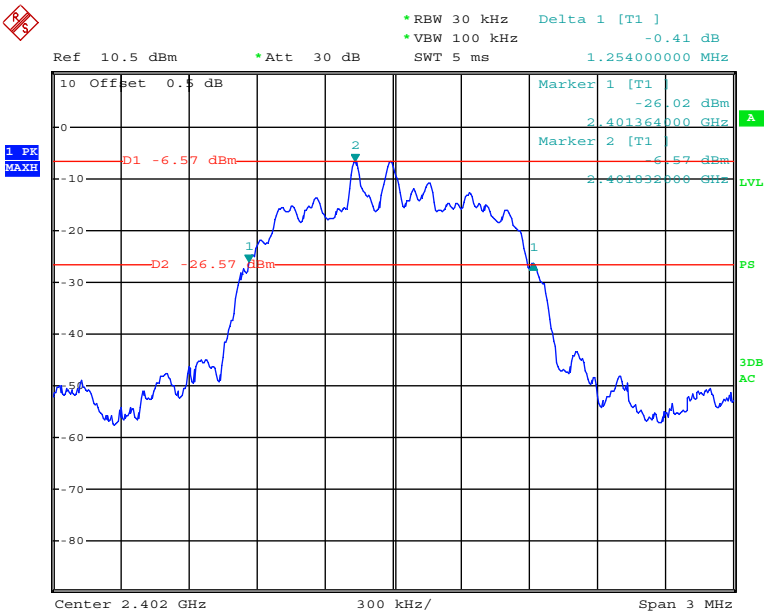
## High Channel




Date: 10.APR.2017 23:48:09

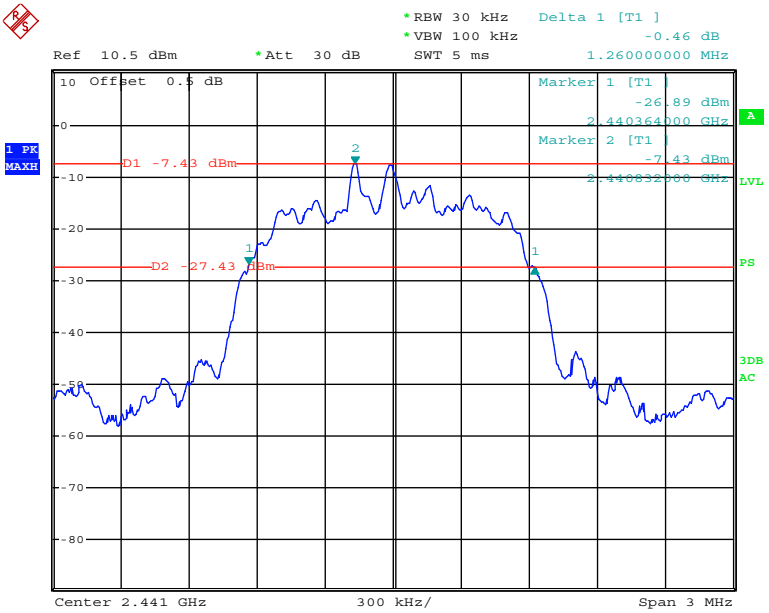
*3EDR Mode (8DPSK):*

## Low Channel



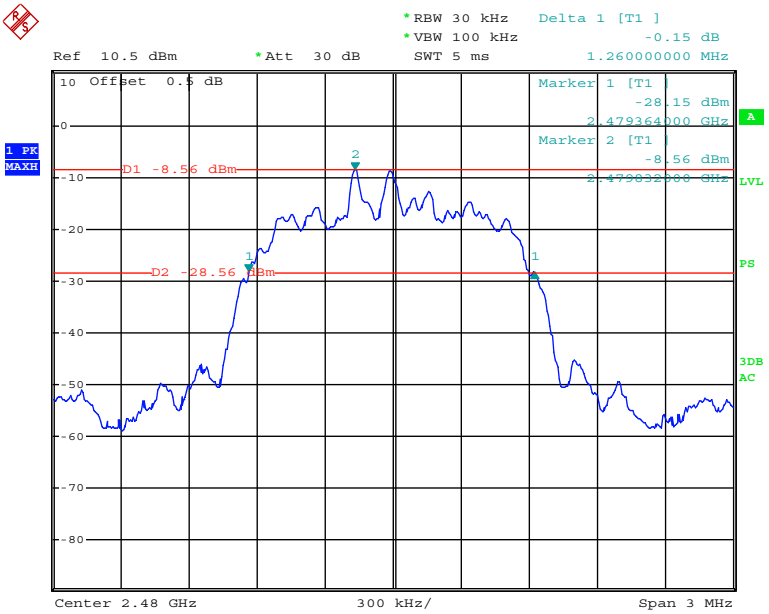

Date: 11.APR.2017 00:15:41

## Middle Channel




Date: 11.APR.2017 00:17:14

## High Channel




Date: 11.APR.2017 00:18:47

# 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 |
|---|---|---|---|---|---|
| Rohde & Schwarz | EMI Test Receiver | ESCI | 100028 | 2016-12-02 | 2017-12-01 |
| N/A | RF Cable | N/A | N/A | Each Time | / |

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 23.6 °C |
| **Relative Humidity:** | 40 % |
| **ATM Pressure:** | 95.8 kPa |

** The testing was performed by Kevin Hu on 2017-04-11.*

**Test Result:** Compliance.

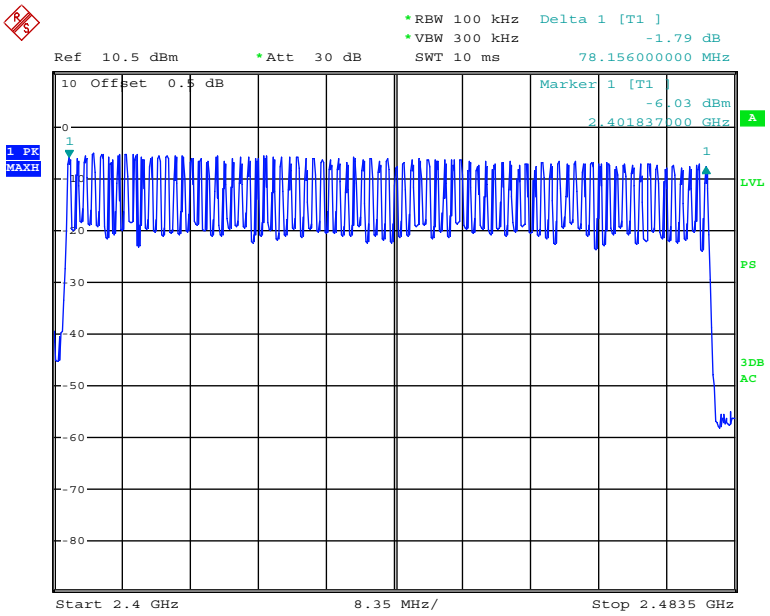
Please refer to following tables and plots

*Test Mode: Transmitting*

*BDR Mode (GFSK):*

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

**Number of Hopping Channels**

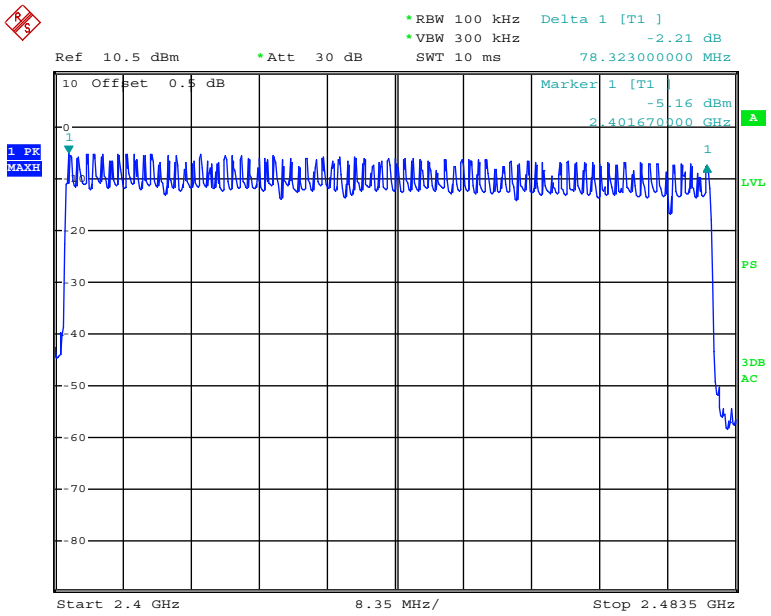



Date: 11.APR.2017 00:01:26

*2EDR Mode (π/4-DQPSK):*

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

**Number of Hopping Channels**

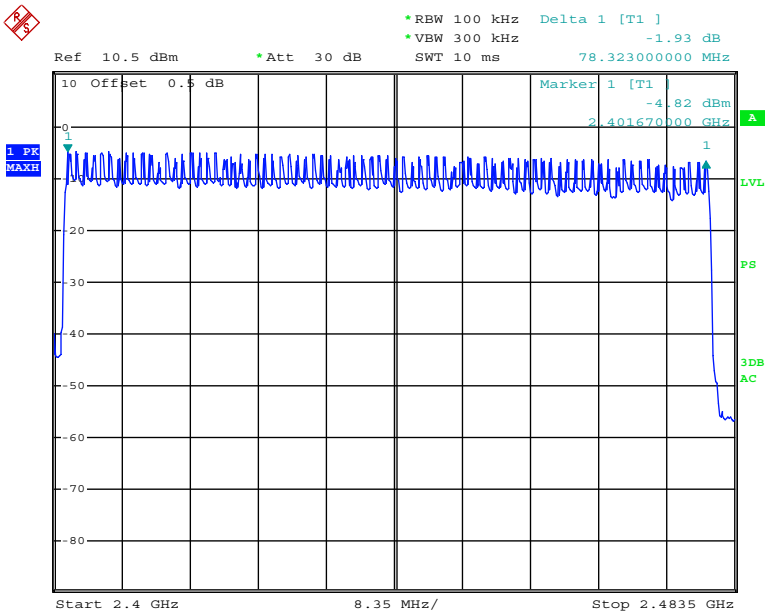



Date: 11.APR.2017 00:04:44

*3EDR Mode (3DPSK):*

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

**Number of Hopping Channels**




Date: 11.APR.2017 00:30:40

# 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; the time of single pulses was tested.

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| Rohde & Schwarz | EMI Test Receiver | ESCI | 100028 | 2016-12-02 | 2017-12-01 |
| N/A | RF Cable | N/A | N/A | Each Time | / |

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 23.6 °C |
| **Relative Humidity:** | 40 % |
| **ATM Pressure:** | 95.8 kPa |

** The testing was performed by Kevin Hu on 2017-04-11.*

**Test Result:** Compliance.

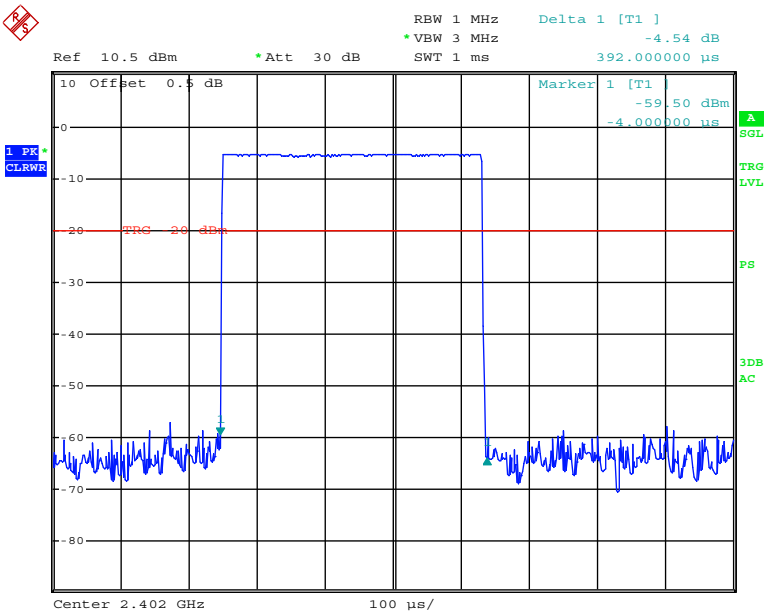
Please refer to following tables and plots

*Test Mode: Transmitting*

*BDR Mode (GFSK):*

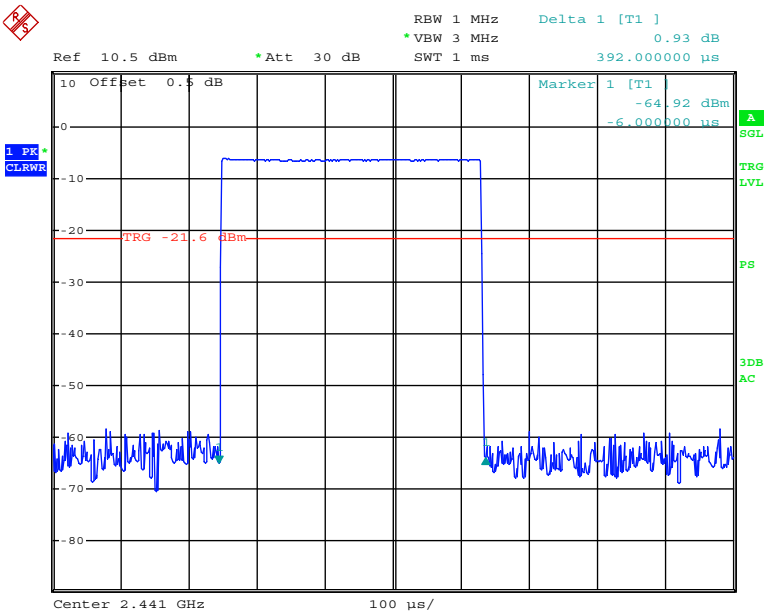
| Mode | Channel | Pulse Width (ms) | Dwell Time (s) | Limit (s) | Result |
|---|---|---|---|---|---|
| ***DH1*** | Low | 0.392 | 0.125 | 0.4 | Compliance |
| | Middle | 0.392 | 0.125 | 0.4 | Compliance |
| | High | 0.392 | 0.125 | 0.4 | Compliance |
| | Note: Dwell time=Pulse time (ms) × (1600/2/79 ) ×31.6 s | | | | |
| ***DH3*** | Low | 1.656 | 0.265 | 0.4 | Compliance |
| | Middle | 1.656 | 0.265 | 0.4 | Compliance |
| | High | 1.662 | 0.266 | 0.4 | Compliance |
| | Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s | | | | |
| ***DH5*** | Low | 2.920 | 0.311 | 0.4 | Compliance |
| | Middle | 2.910 | 0.310 | 0.4 | Compliance |
| | High | 2.910 | 0.310 | 0.4 | Compliance |
| | Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s | | | | |

**DH1: Low Channel**



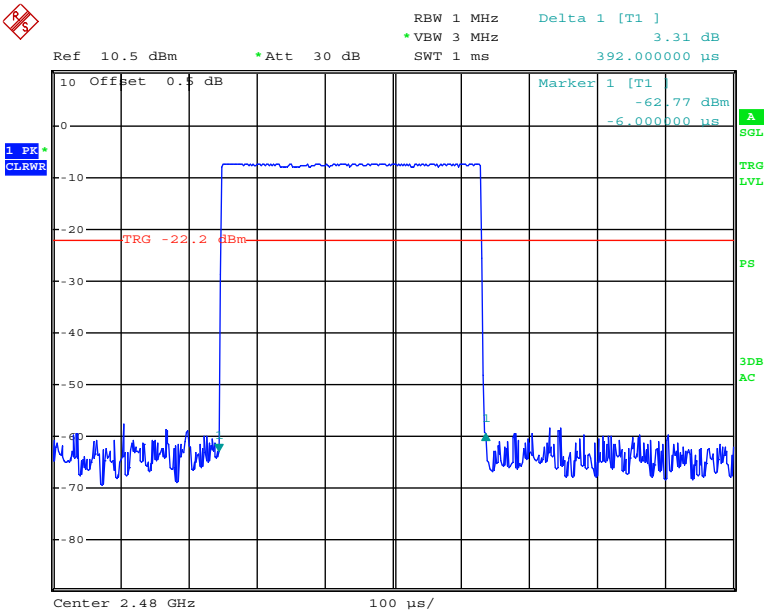

Date: 11.APR.2017 00:05:42

## DH1: Middle Channel



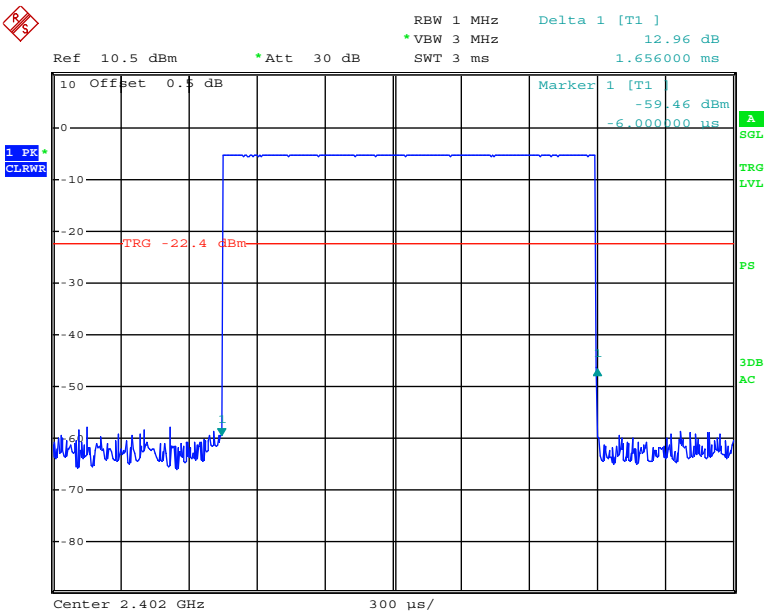

Date: 11.APR.2017 00:05:52

## DH1: High Channel



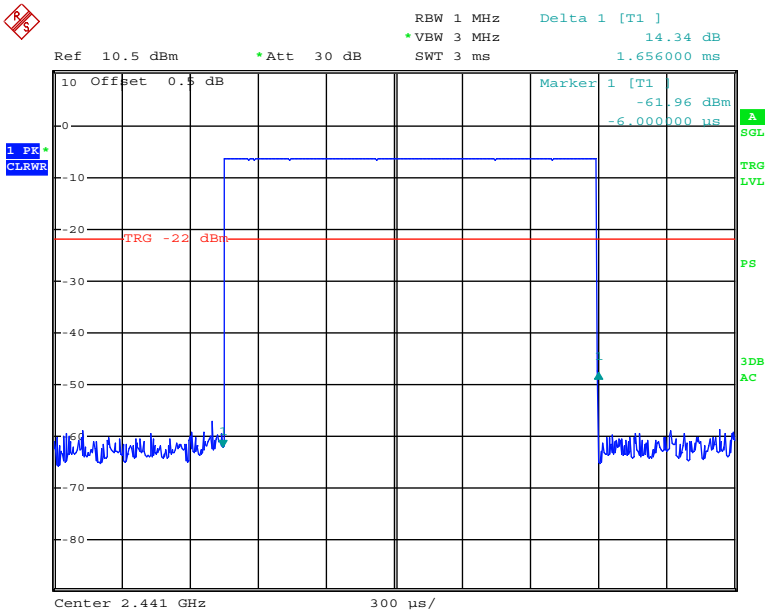

Date: 11.APR.2017 00:06:00

## DH3: Low Channel



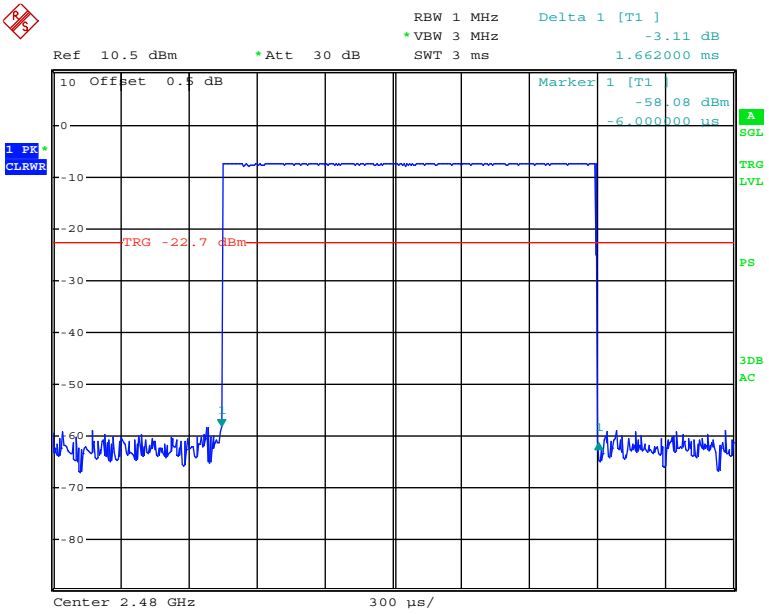

Date: 11.APR.2017 00:07:01

## DH3: Middle Channel



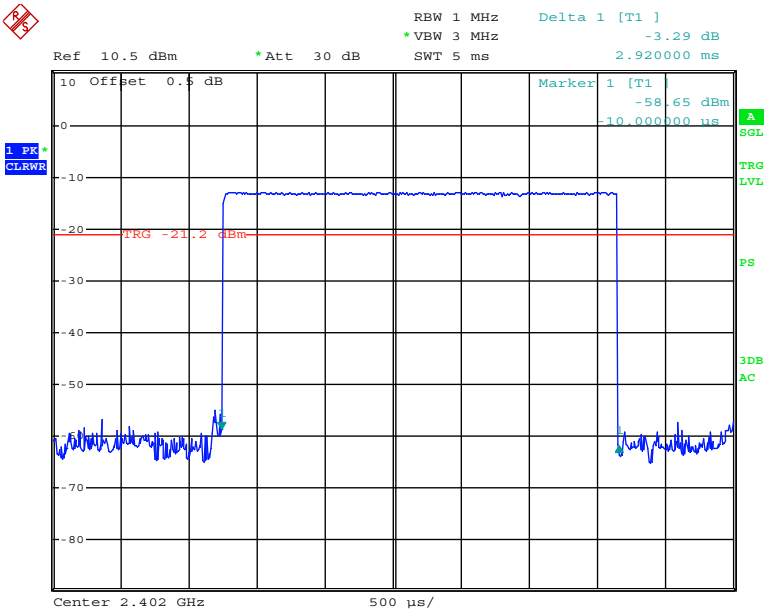

Date: 11.APR.2017 00:07:10

## DH3: High Channel



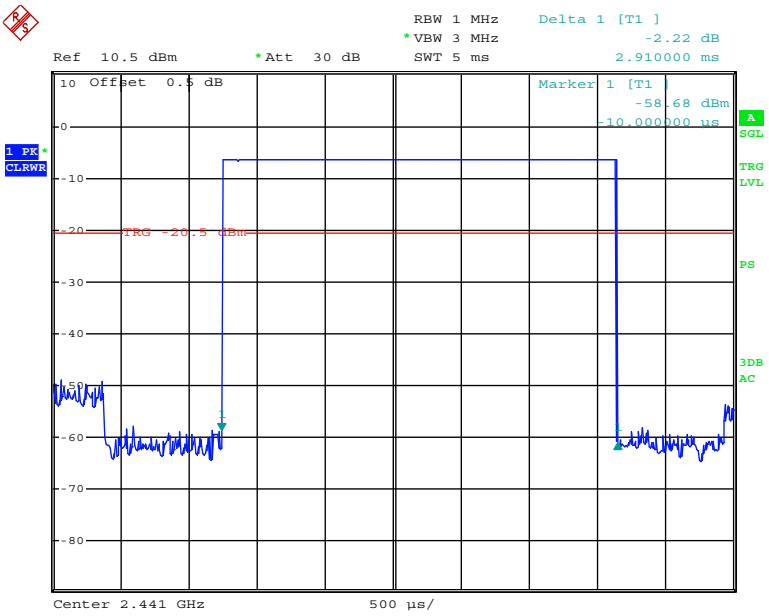

Date: 11.APR.2017 00:07:27

## DH5: Low Channel



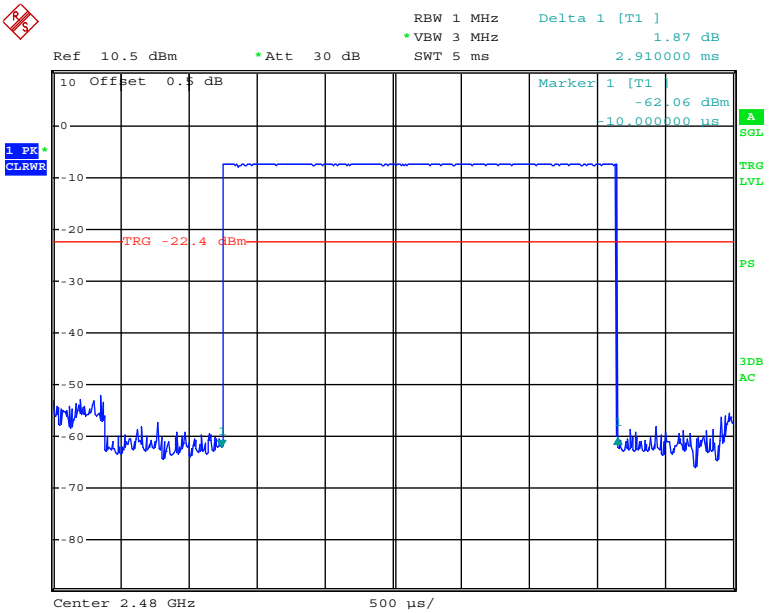

Date: 11.APR.2017 00:08:27

## DH5: Middle Channel




Date: 11.APR.2017 00:08:35

## DH5: High Channel

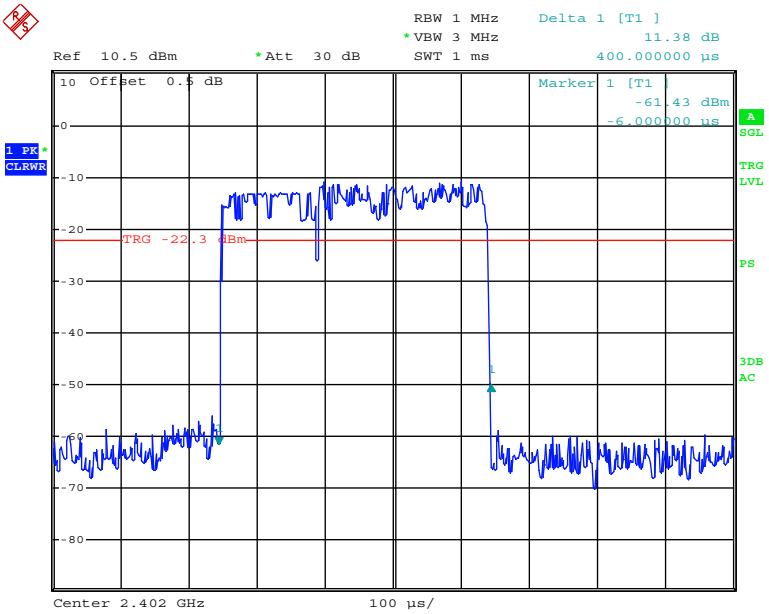



Date: 11.APR.2017 00:08:41

*2EDR Mode (π/4-DQPSK):*

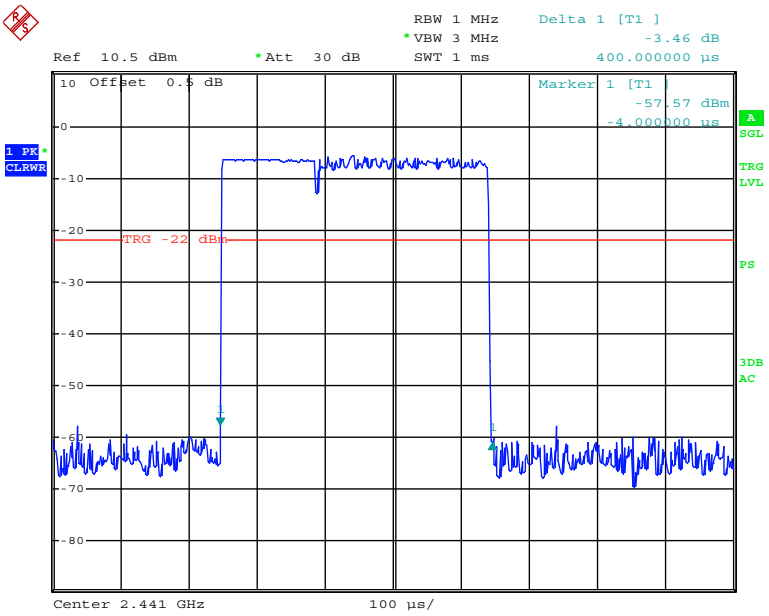
| Mode | Channel | Pulse Width (ms) | Dwell Time (s) | Limit (s) | Result |
|---|---|---|---|---|---|
| ***2DH1*** | Low | 0.400 | 0.128 | 0.4 | Compliance |
| | Middle | 0.400 | 0.128 | 0.4 | Compliance |
| | High | 0.402 | 0.129 | 0.4 | Compliance |
| | Note: Dwell time=Pulse time (ms) × (1600/2/79 ) ×31.6 s | | | | |
| ***2DH3*** | Low | 1.662 | 0.266 | 0.4 | Compliance |
| | Middle | 1.662 | 0.266 | 0.4 | Compliance |
| | High | 1.668 | 0.267 | 0.4 | Compliance |
| | Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s | | | | |
| ***2DH5*** | Low | 2.930 | 0.313 | 0.4 | Compliance |
| | Middle | 2.930 | 0.313 | 0.4 | Compliance |
| | High | 2.920 | 0.311 | 0.4 | Compliance |
| | Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s | | | | |

**2DH1: Low Channel**



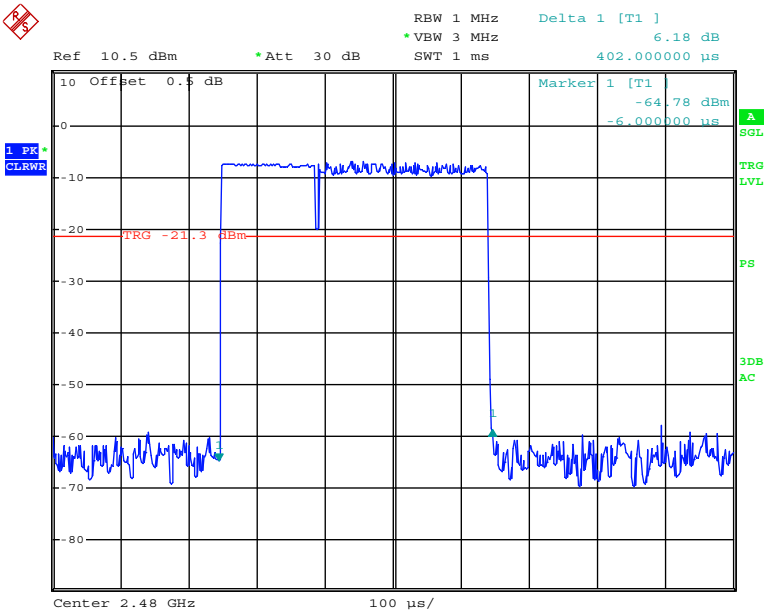

Date: 11.APR.2017 00:12:12

## 2DH1: Middle Channel



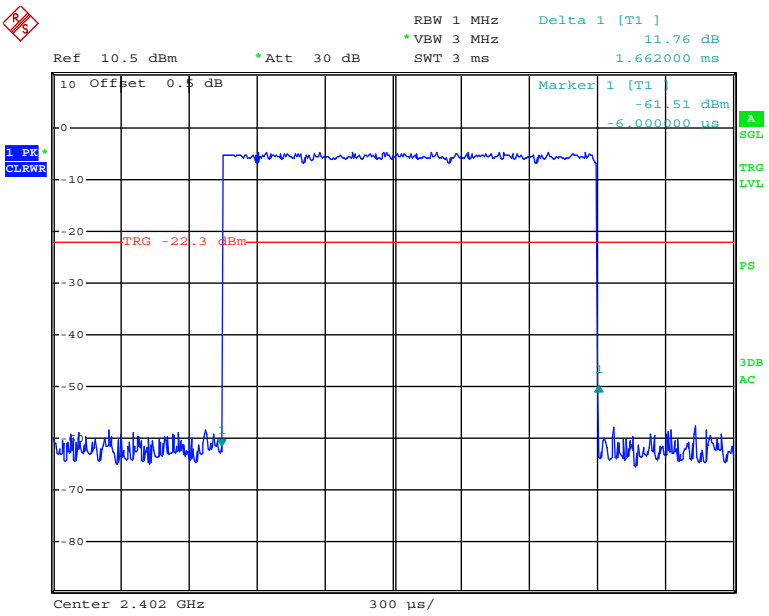

Date: 11.APR.2017 00:12:19

## 2DH1: High Channel



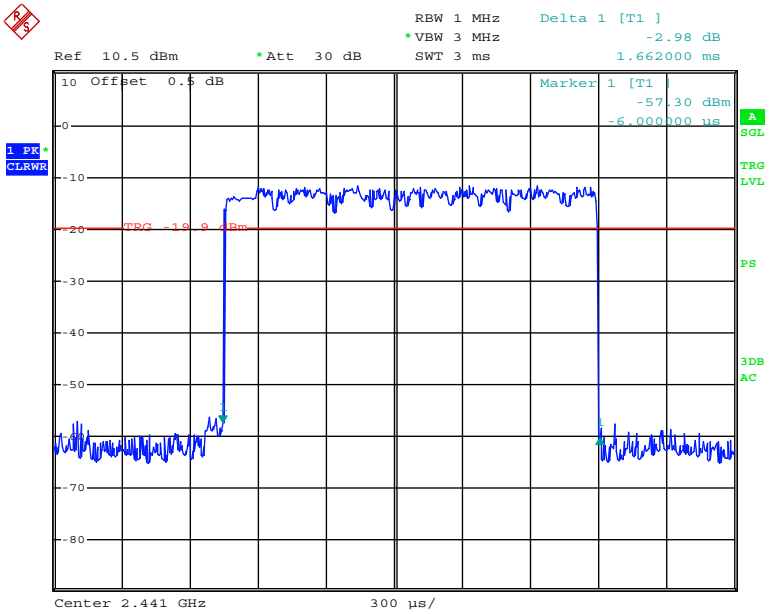

Date: 11.APR.2017 00:12:25

## 2DH3: Low Channel



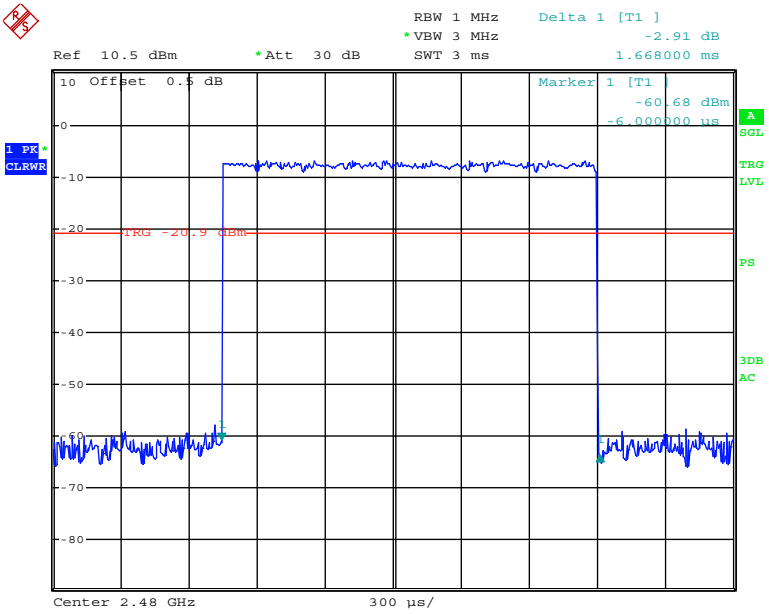

Date: 11.APR.2017 00:10:00

## 2DH3: Middle Channel



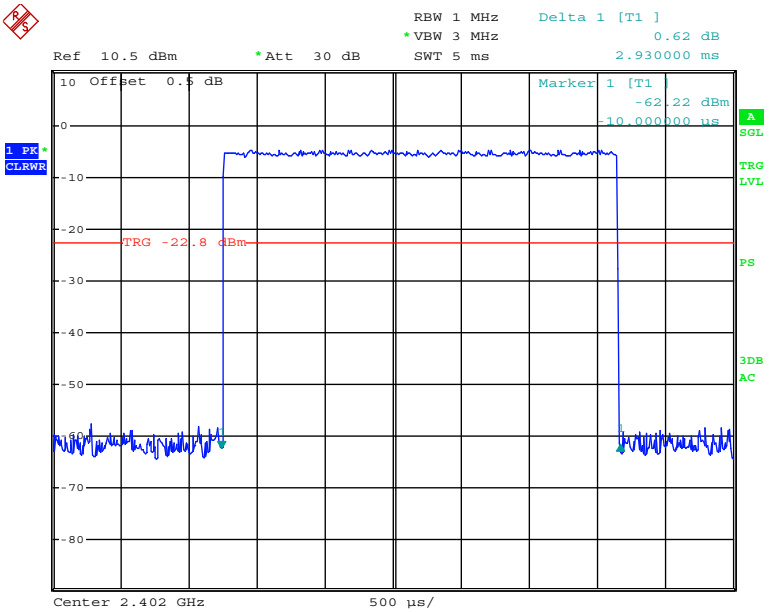

Date: 11.APR.2017 00:10:07

## 2DH3: High Channel



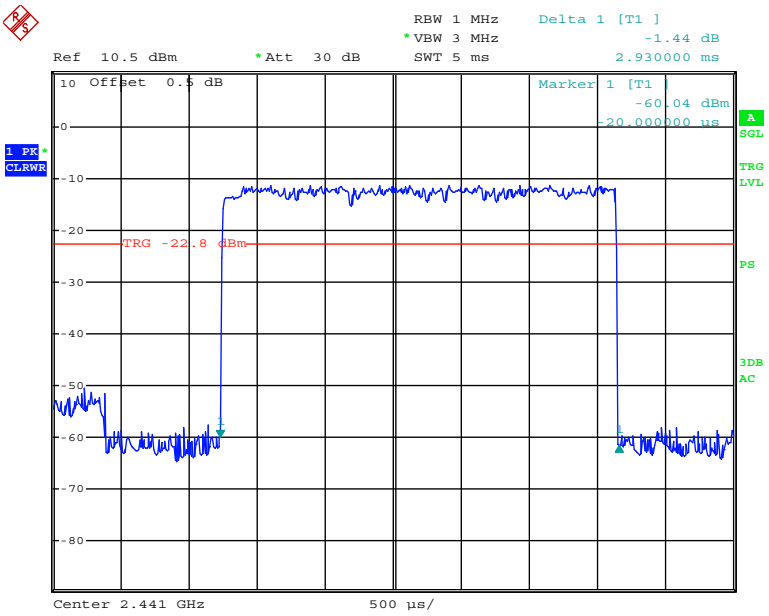

Date: 11.APR.2017 00:10:13

## 2DH5: Low Channel



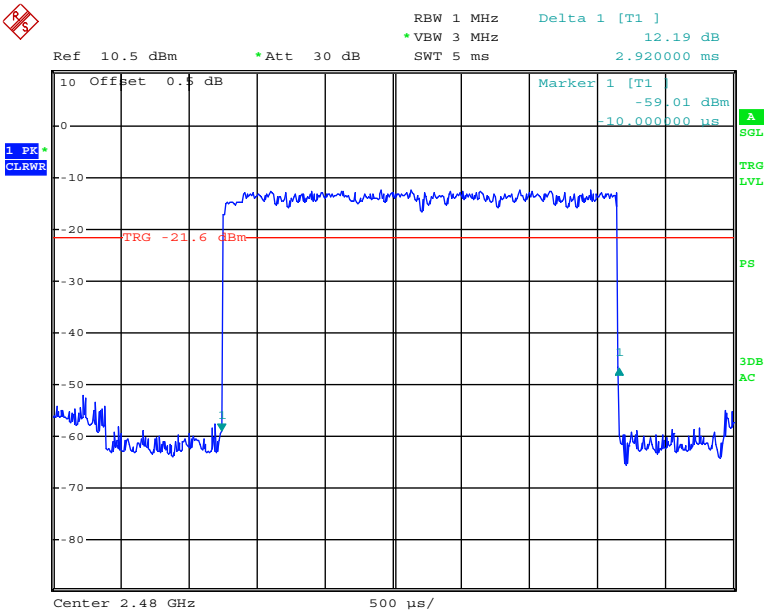

Date: 11.APR.2017 00:09:16

## 2DH5: Middle Channel




Date: 11.APR.2017 00:09:22

## 2DH5: High Channel

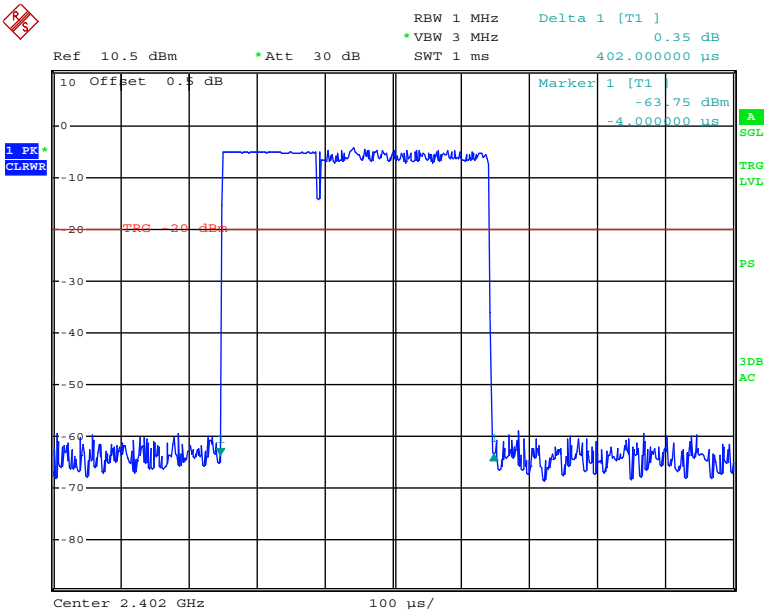



Date: 11.APR.2017 00:09:28

*3EDR Mode (8DPSK):*

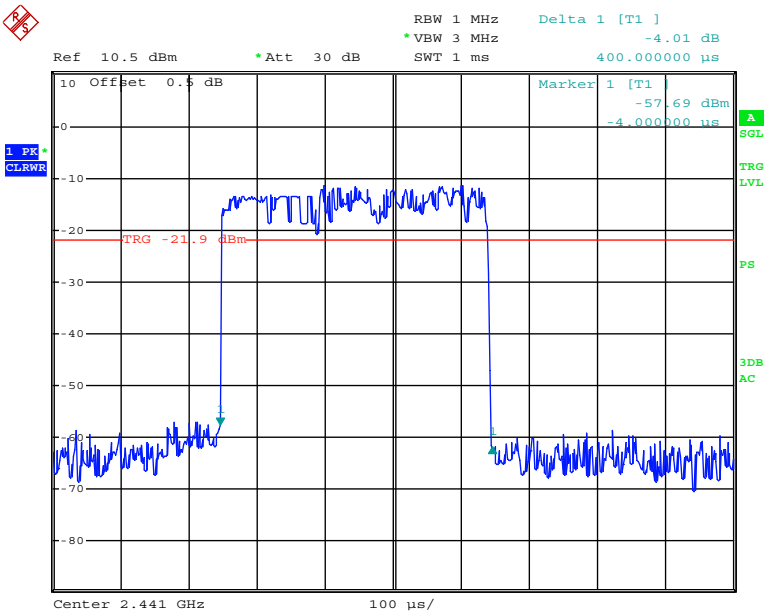
| Mode | Channel | Pulse Width (ms) | Dwell Time (s) | Limit (s) | Result |
|---|---|---|---|---|---|
| ***3DH1*** | Low | 0.402 | 0.129 | 0.4 | Compliance |
| | Middle | 0.400 | 0.128 | 0.4 | Compliance |
| | High | 0.402 | 0.129 | 0.4 | Compliance |
| | Note: Dwell time=Pulse time (ms) × (1600/2/79 ) ×31.6 s | | | | |
| ***3DH3*** | Low | 1.662 | 0.266 | 0.4 | Compliance |
| | Middle | 1.668 | 0.267 | 0.4 | Compliance |
| | High | 1.668 | 0.267 | 0.4 | Compliance |
| | Note: Dwell time=Pulse time (ms) × (1600/4/79) ×31.6 s | | | | |
| ***3DH5*** | Low | 2.920 | 0.311 | 0.4 | Compliance |
| | Middle | 2.920 | 0.311 | 0.4 | Compliance |
| | High | 2.920 | 0.311 | 0.4 | Compliance |
| | Note: Dwell time=Pulse time (ms) × (1600/6/79) ×31.6 s | | | | |

**3DH1: Low Channel**



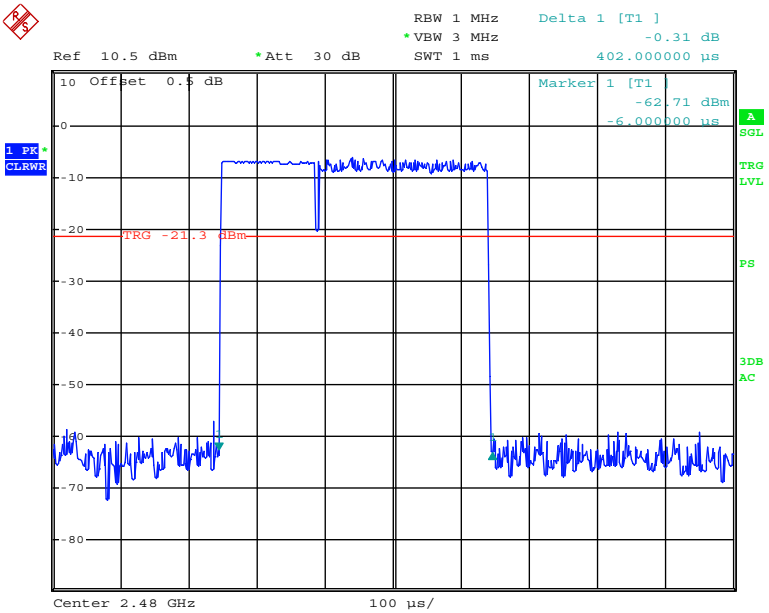

Date: 11.APR.2017 00:32:31

## 3DH1: Middle Channel



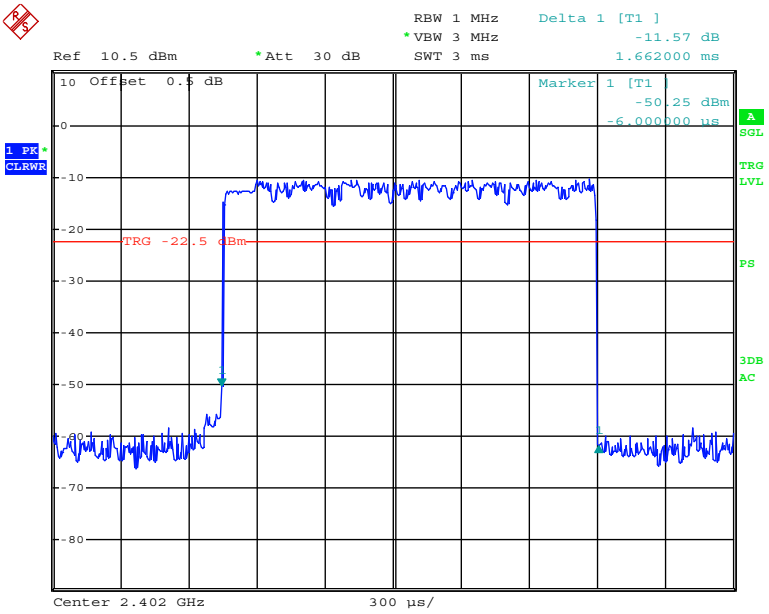

Date: 11.APR.2017 00:32:37

## 3DH1: High Channel



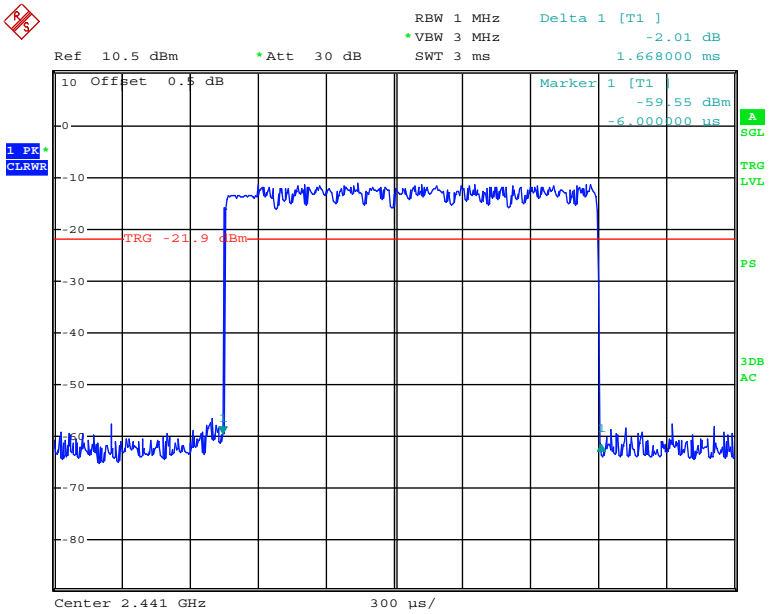

Date: 11.APR.2017 00:32:44

## 3DH3: Low Channel



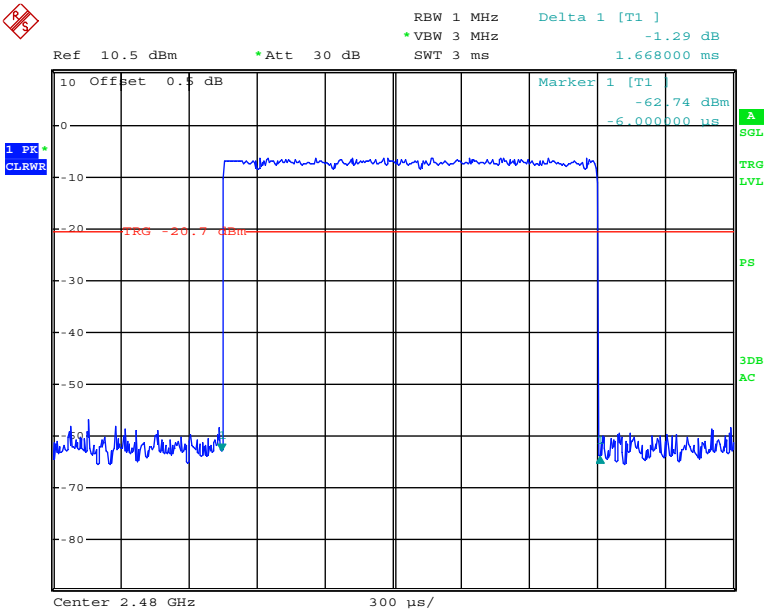

Date: 11.APR.2017 00:34:06

## 3DH3: Middle Channel



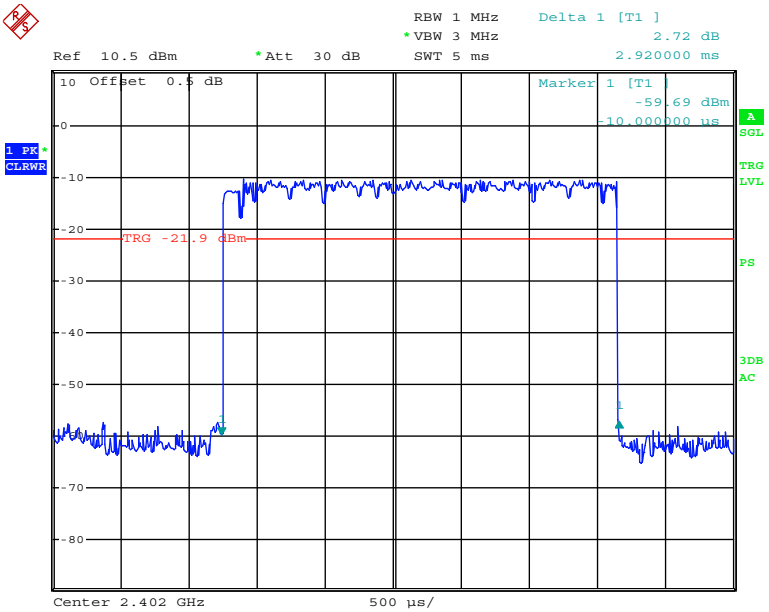

Date: 11.APR.2017 00:34:12

## 3DH3: High Channel



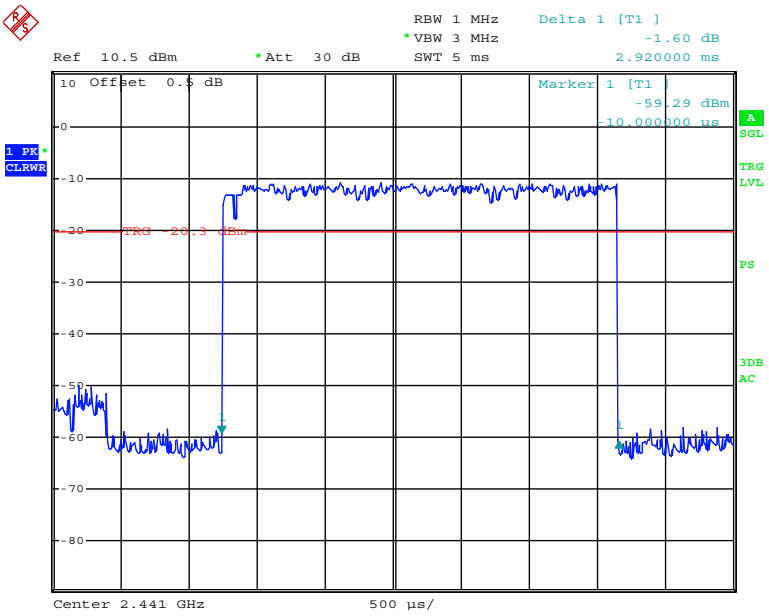

Date: 11.APR.2017 00:34:18

## 3DH5: Low Channel



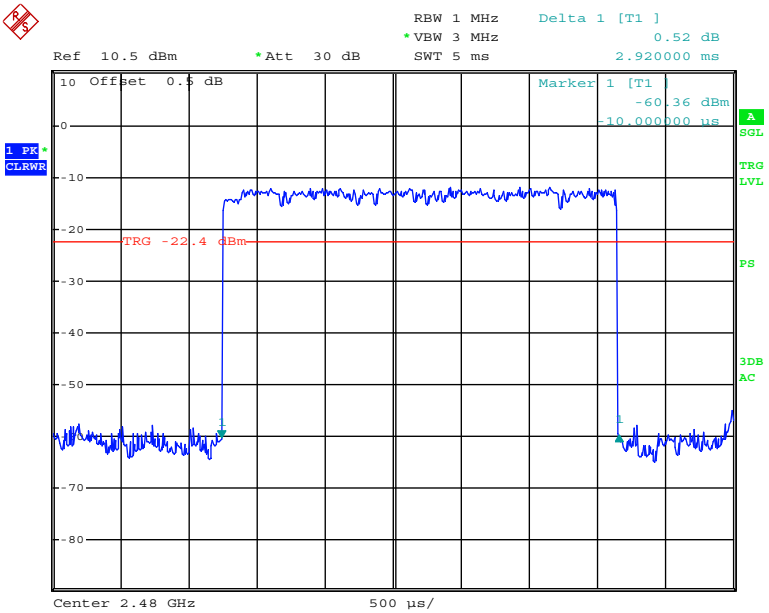

Date: 11.APR.2017 00:34:47

## 3DH5: Middle Channel




Date: 11.APR.2017 00:34:58

## 3DH5: High Channel




Date: 11.APR.2017 00:35:04

# 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

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 one 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 |
|---|---|---|---|---|---|
| Rohde & Schwarz | EMI Test Receiver | ESCI | 100028 | 2016-12-02 | 2017-12-01 |
| N/A | RF Cable | N/A | N/A | Each Time | / |

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 22.2~23.6 °C |
| **Relative Humidity:** | 40~48 % |
| **ATM Pressure:** | 95.8~97.1 kPa |

** The testing was performed by Kevin Hu from 2017-04-10 to 2017-04-11.*

**Test Result:** Compliance.

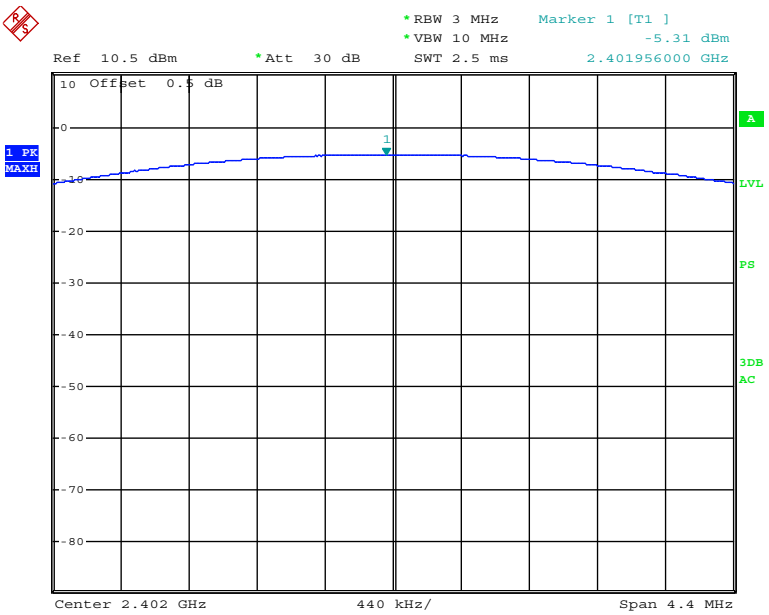
*Test Mode: Transmitting*

| Mode | Frequency (MHz) | Peak Output power (dBm) | Limit (dBm) |
|---|---|---|---|
| BDR Mode (GFSK) | 2402 | -5.31 | 30 |
| | 2441 | -6.25 | 30 |
| | 2480 | -7.47 | 30 |
| 2EDR Mode (π/4-DQPSK) | 2402 | -4.12 | 30 |
| | 2441 | -5.06 | 30 |
| | 2480 | -6.28 | 30 |
| 3EDR Mode (8DPSK) | 2402 | -3.69 | 30 |
| | 2441 | -4.48 | 30 |
| | 2480 | -5.61 | 30 |

Note: The data above was tested in conducted mode.

*BDR Mode (GFSK):*

**Low Channel**

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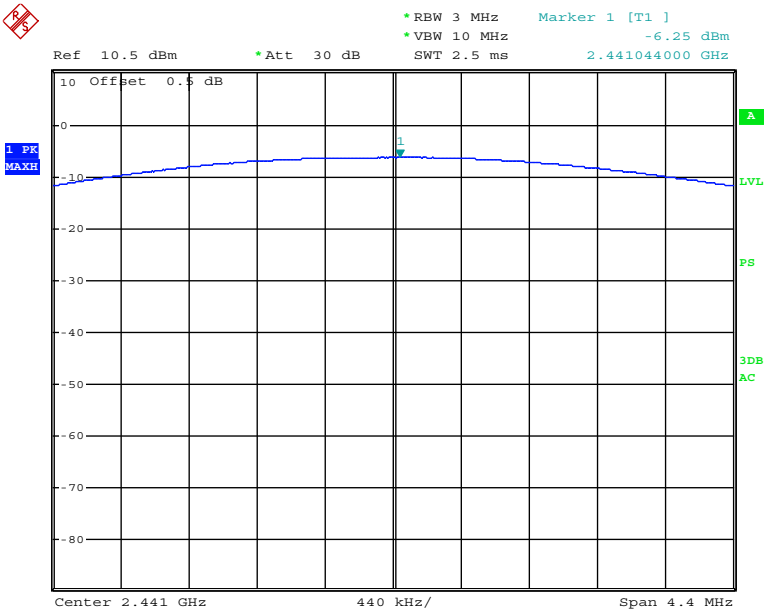
## Middle Channel

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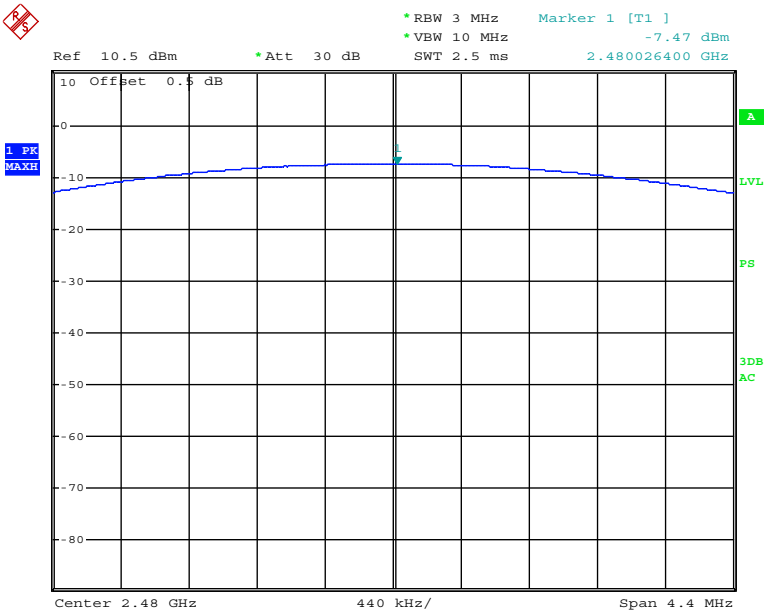
## High Channel

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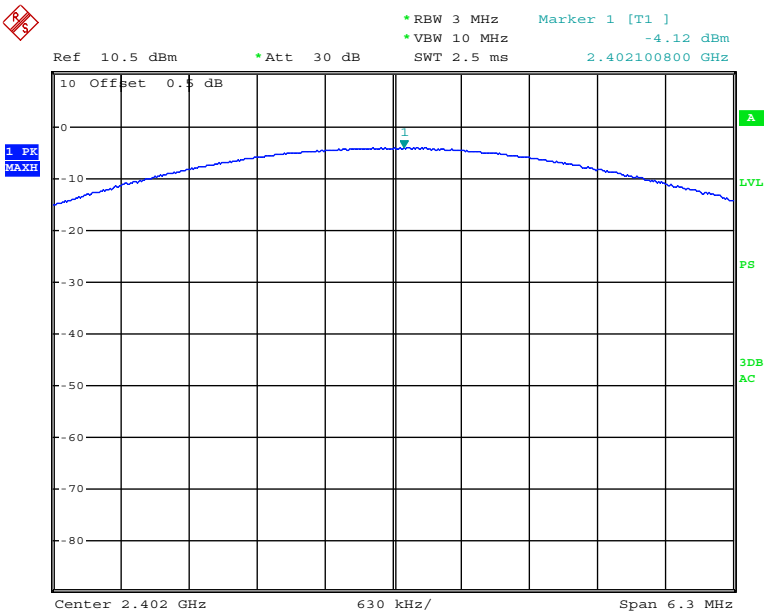
*2EDR Mode (π/4-DQPSK):*

**Low Channel**

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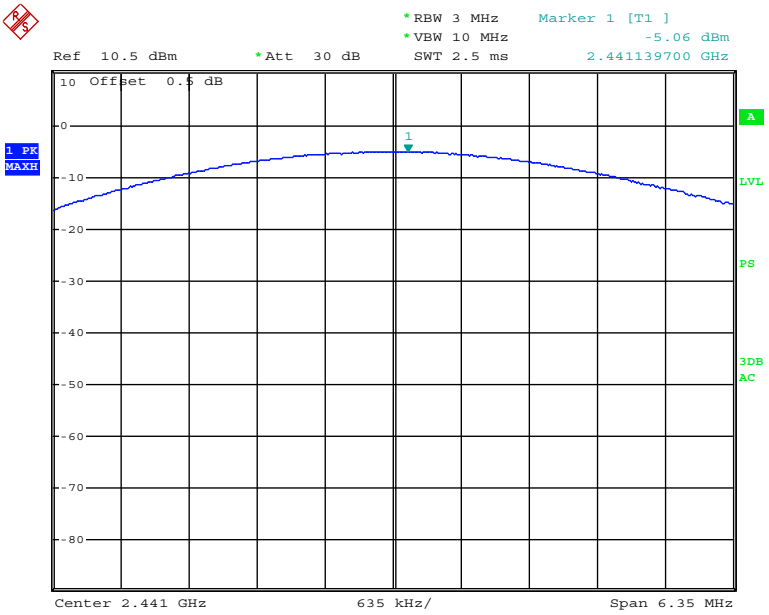
**Middle Channel**

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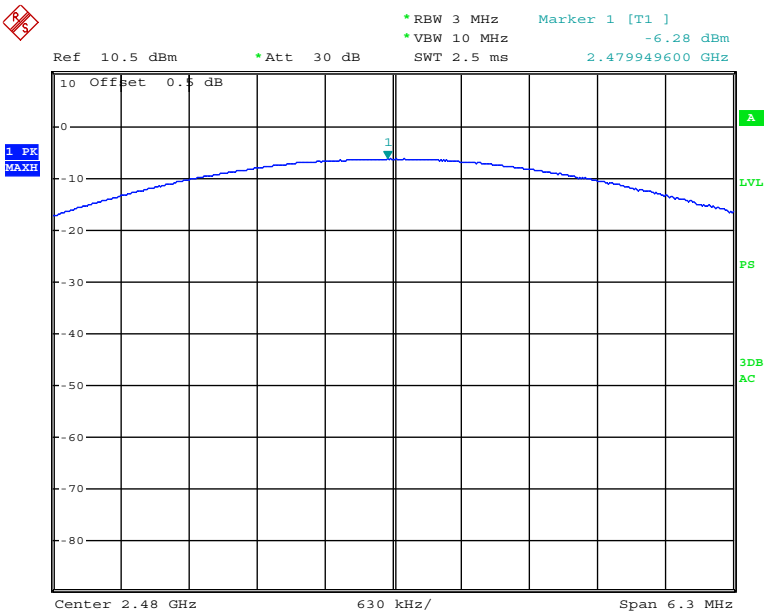
## High Channel

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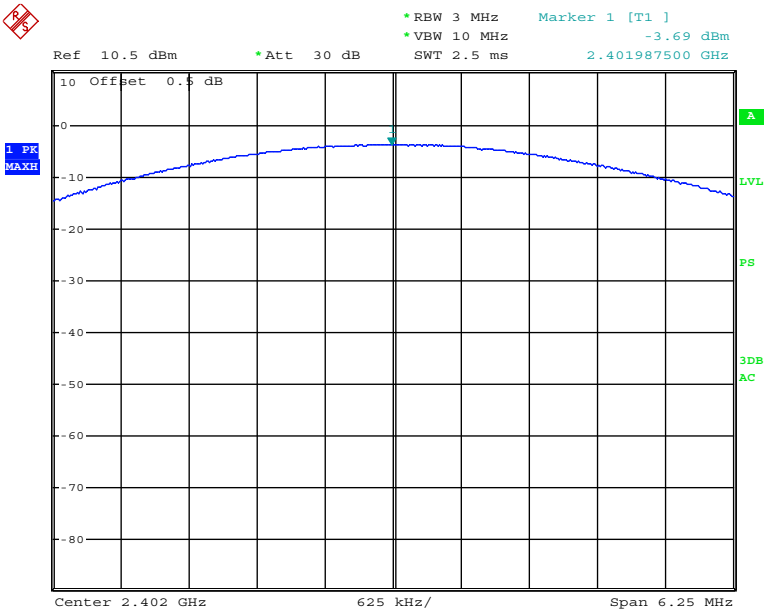
*3EDR Mode (8DPSK):*

## Low Channel

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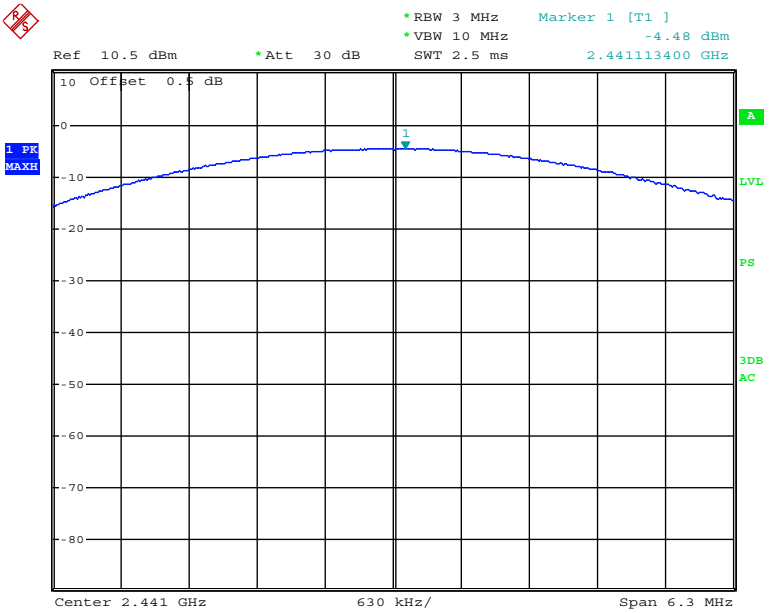
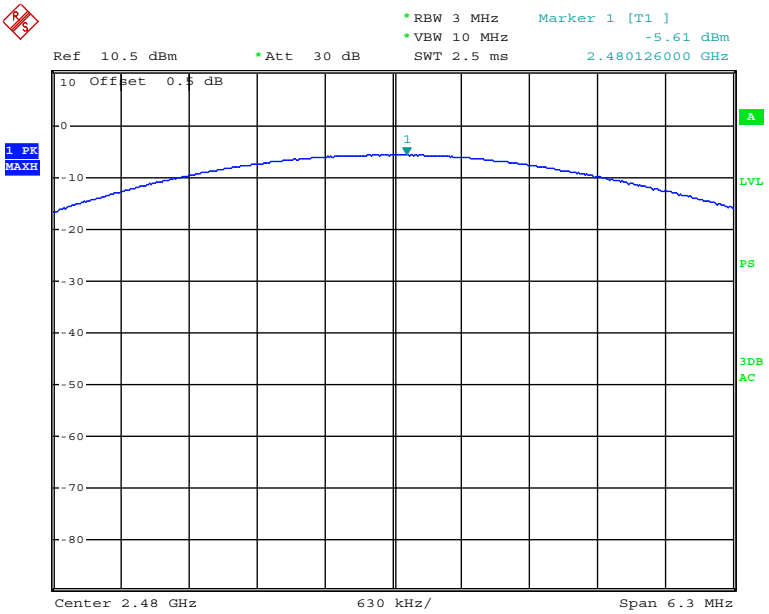
## Middle Channel




Date: 11.APR.2017 00:17:34

## High Channel

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# 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 |
|---|---|---|---|---|---|
| Rohde & Schwarz | EMI Test Receiver | ESCI | 100028 | 2016-12-02 | 2017-12-01 |
| N/A | RF Cable | N/A | N/A | Each Time | / |

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

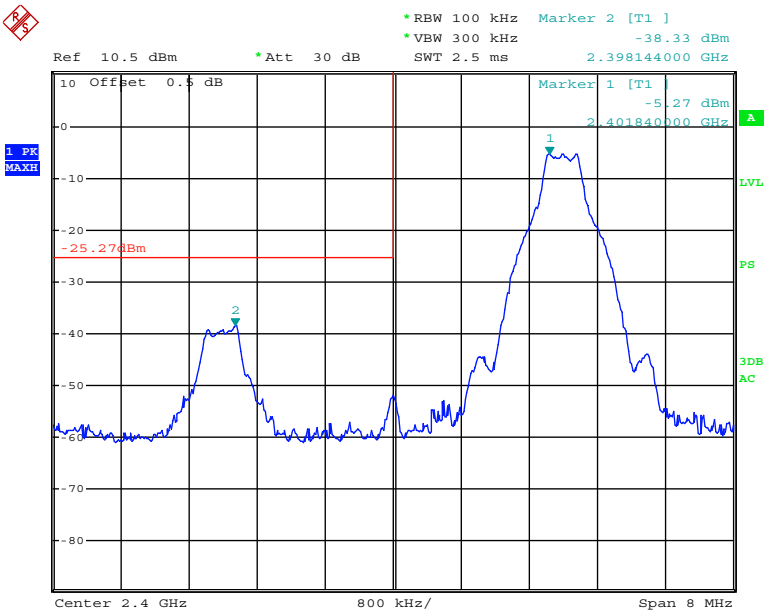
| | |
|---|---|
| **Temperature:** | 22.2~23.6 °C |
| **Relative Humidity:** | 40~48 % |
| **ATM Pressure:** | 95.8~97.1 kPa |

** The testing was performed by Kevin Hu from 2017-04-10 to 2017-04-11.*

**Test Result:** Compliance

*BDR Mode (GFSK):*

**Band Edge, Left Side**

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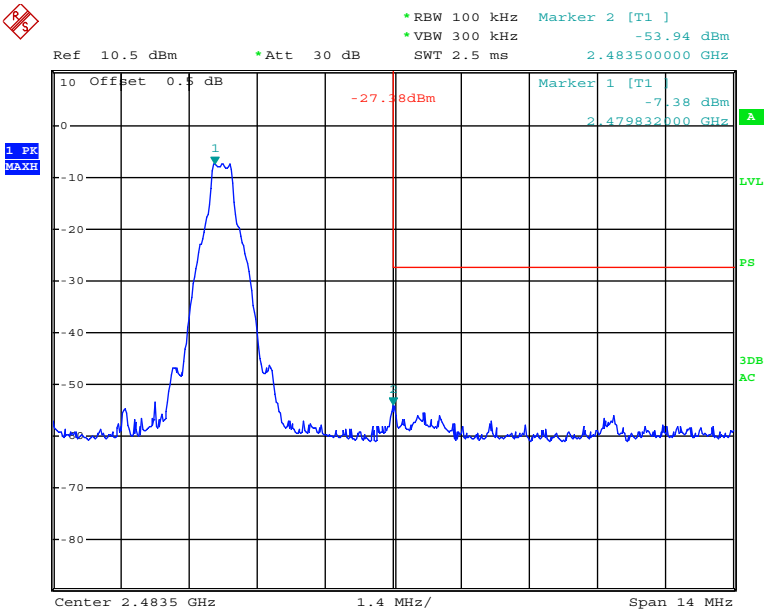
**Band Edge, Right Side**

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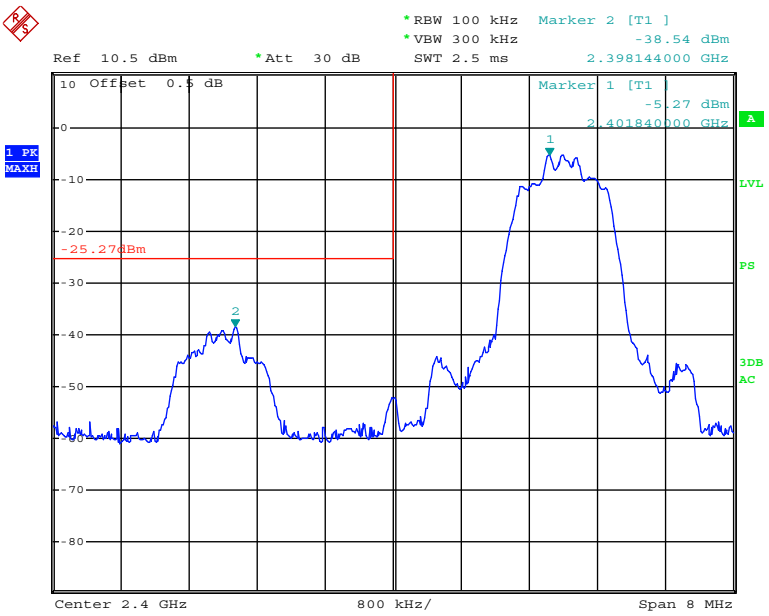
*2EDR Mode (π/4-DQPSK):*

**Band Edge, Left Side**

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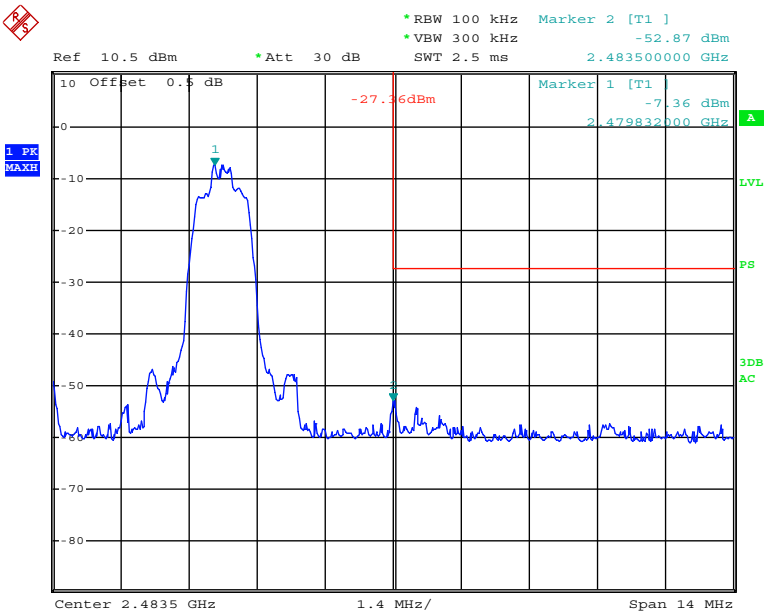
**Band Edge, Right Side**

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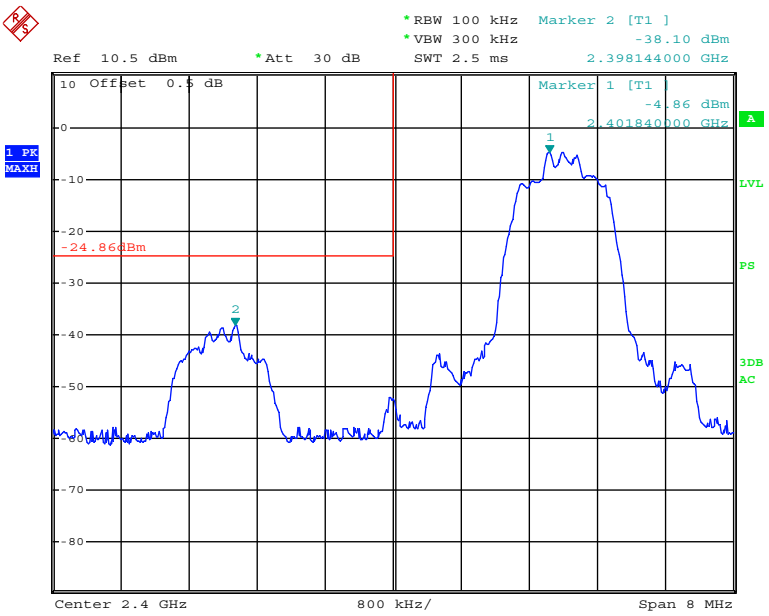
*3EDR Mode (8DPSK):*

**Band Edge, Left Side**

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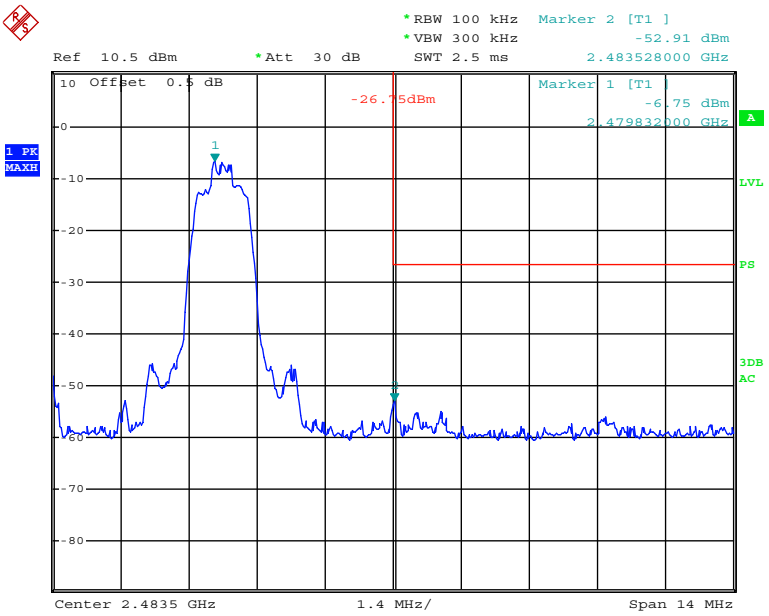
**Band Edge, Right Side**

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