# MEASUREMENT REPORT

## FCC PART 15.249

| | |
|---|---|
| **FCC ID:** | 2ANX4FOBF11 |
| **APPLICANT:** | Nationwide Industries Inc |
| **Application Type:** | Certification |
| **Product:** | NWI-IQ-FOB |
| **Model No.:** | NWI-IQ-F1 |
| **FCC Classification:** | Low Power Communication Device Transmitter (DXX) |
| **FCC Rule Part(s):** | Part 15.249 |
| **Test Procedure(s):** | ANSI C63.10 – 2013 |
| **Test Date:** | February 23 ~ March 16, 2018 |

Reviewed By : ( Kevin Guo )

Approved By : ( Marlin Chen )

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

# Revision History

| Report No. | Version | Description | Issue Date | Note |
|---|---|---|---|---|
| 1802RSU009-U1 | Rev. 01 | Initial report | 03-16-2018 | Valid |
| | | | | |

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## §2.1033 General Information

| | |
|---|---|
| **Applicant:** | Nationwide Industries Inc |
| **Applicant Address:** | 10333 Windhorst Road, Tampa, FL 33619, U.S.A. |
| **Manufacturer:** | Xiamen Xiangyu Industry&Trade Co., Ltd |
| **Manufacturer Address:** | No.500 West 2 Jinyuan Rd, Xinglin, Jimei District, Xiamen, China |
| **Test Site:** | MRT Technology (Suzhou) Co., Ltd |
| **Test Site Address:** | D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China |
| **FCC Registration No.:** | 893164 |
| **Test Device Serial No.:** | N/A ☐ Production ☒ Pre-Production ☐ Engineering |

### Test Facility / Accreditations

**Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.**

- **MRT facility is a FCC registered (MRT Reg. No. 893164) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.**
- **MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.**
- **MRT facility is a VCCI registered (R-4179, G-814, C-4664, T-2206) test laboratory with the site description on file at VCCI Council.**
- **MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, EU and TELEC Rules.**

Accredited Laboratory
MRT TECHNOLOGY (SUZHOU) CO., LTD.
Suzhou, Jiangsu, People's Republic of China
Electrical Testing

# 1. INTRODUCTION

## 1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

## 1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on September 30, 2013.

# 2. PRODUCT INFORMATION

## 2.1. Equipment Description

| | |
|---|---|
| Product Name | NWI-IQ-FOB |
| Model No. | NWI-IQ-F1 |
| Frequency Range | 2408 ~ 2476 MHz |
| Data Rate | 250Kbps |
| Channel Space | 1MHz |
| Type of Modulation | GFSK |
| Data Rate | 250Kbps |
| Antenna Type | INTEGRAL |
| Antenna Gain | 0dBi |

## 2.2. Operation Frequency and Channel List

| Channel | Frequency | Channel | Frequency | Channel | Frequency |
|---|---|---|---|---|---|
| 1 | 2408MHz | 2 | 2409MHz | 3 | 2410MHz |
| 4 | 2411MHz | 5 | 2412MHz | 6 | 2413MHz |
| 7 | 2414MHz | 8 | 2415MHz | 9 | 2416MHz |
| 10 | 2417MHz | 11 | 2418MHz | 12 | 2419MHz |
| 13 | 2420MHz | 14 | 2421MHz | 15 | 2422MHz |
| 16 | 2423MHz | 17 | 2424MHz | 18 | 2425MHz |
| 19 | 2426MHz | 20 | 2427MHz | 21 | 2428MHz |
| 22 | 2429MHz | 23 | 2430MHz | 24 | 2431MHz |
| 25 | 2432MHz | 26 | 2433MHz | 27 | 2434MHz |
| 28 | 2435MHz | 29 | 2436MHz | 30 | 2437MHz |
| 31 | 2438MHz | 32 | 2439MHz | 33 | 2440MHz |
| 34 | 2441MHz | 35 | 2442MHz | 36 | 2443MHz |
| 37 | 2444MHz | 38 | 2445MHz | 39 | 2446MHz |
| 40 | 2447MHz | 41 | 2448MHz | 42 | 2449MHz |
| 43 | 2450MHz | 44 | 2451MHz | 45 | 2452MHz |
| 46 | 2453MHz | 47 | 2454MHz | 48 | 2455MHz |
| 49 | 2456MHz | 50 | 2457MHz | 51 | 2458MHz |
| 52 | 2459MHz | 53 | 2460MHz | 54 | 2461MHz |
| 55 | 2462MHz | 56 | 2463MHz | 57 | 2464MHz |
| 58 | 2465MHz | 59 | 2466MHz | 60 | 2467MHz |
| 61 | 2468MHz | 62 | 2469MHz | 63 | 2470MHz |
| 64 | 2471MHz | 65 | 2472MHz | 66 | 2473MHz |
| 67 | 2474MHz | 68 | 2475MHz | 69 | 2476MHz |

## 2.3. Test Configuration

The EUT was tested as described in this report is in compliance with the requirements limits of FCC Rules Part 15.207,15.209, 15.215 and 15.249. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

## 2.4. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

## 2.5. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the FCC ID must be displayed on the device per Section 15.19(a)(5). Please see attachment for FCC ID label and label location.

# 3. DESCRIPTION OF TEST

## 3.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013), and the requirements provided in FCC 15.207, 15.209, 15.215 and 15.249 were performed in the report of the EUT.

**Deviation from measurement procedure…….....None**

## 3.2. AC Line Conducted Emissions

The line-conducted facility is located inside an 8'x4'x4' shielded enclosure. A 1m x 2m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50uH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground-plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the receiver and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The receiver was scanned from 150kHz to 30MHz. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or data exchange speed, or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions are used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

An extension cord was used to connect to a single LISN which powered by EUT. The extension cord was calibrated with LISN, the impedance and insertion loss are compliance with the requirements as stated in ANSI C63.10-2013.

### 3.3. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. A MF Model 210SS turntable is used for radiated measurement. It is a continuously rotatable, remote controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm high PVC support structure is placed on top of the turntable.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up for frequencies below 1GHz was placed on top of the 0.8 meter high, 1 x 1.5 meter table; and test set-up for frequencies 1-25GHz was placed on top of the 1.5 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions. According to 3dB Beam-Width of horn antenna, the horn antenna should be always directed to the EUT when rising height.

# 4. ANTENNA REQUIREMENTS

**Excerpt from §15.203 of the FCC Rules/Regulations:**

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 antenna of the EUT **is permanently attached.**
- There are no provisions for connection to an external antenna.

**Conclusion:**

This unit complies with the requirement of §15.203.

# 5. TEST EQUIPMENT CALIBRATION DATE

6. Conducted Emissions - SR2

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|---|---|---|---|---|---|
| EMI Test Receiver | R&S | ESR7 | MRTSUE06001 | 1 year | 2018/06/20 |
| Two-Line V-Network | R&S | ENV216 | MRTSUE06002 | 1 year | 2018/06/20 |
| Two-Line V-Network | R&S | ENV216 | MRTSUE06003 | 1 year | 2018/06/20 |
| Hygrothermograph | Testo | 608-H1 | MRTSUE06404 | 1 year | 2018/08/14 |
| Shielding Anechoic Chamber | Mikebang | Chamber-SR2 | MRTSUE06214 | 1 year | 2018/05/10 |

Radiated Emission – AC2

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cal. Due Date |
|---|---|---|---|---|---|
| MXE EMI Receiver | Agilent | N9038A | MRTSUE06125 | 1 year | 2018/08/18 |
| Broadband Coaxial Preamplifier | Schwarzbeck | BBV 9718 | MRTSUE06176 | 1 year | 2018/11/17 |
| Loop Antenna | Schwarzbeck | FMZB 1519 | MRTSUE06025 | 1 year | 2018/11/20 |
| Bilog Period Antenna | Schwarzbeck | VULB 9162 | MRTSUE06022 | 1 year | 2018/10/21 |
| Broad Band Horn Antenna | Schwarzbeck | BBHA 9120D | MRTSUE06171 | 1 year | 2018/11/18 |
| Broad Band Horn Antenna | Schwarzbeck | BBHA 9170 | MRTSUE06024 | 1 year | 2018/12/14 |
| Digitial Thermometer & Hygrometer | Minggao | ETH529 | MRTSUE06170 | 1 year | 2018/12/12 |
| Anechoic Chamber | RIKEN | Chamber-AC2 | MRTSUE06213 | 1 year | 2018/05/10 |

| Software | Version | Function |
|---|---|---|
| e3 | V8.3.5 | EMI Test Software |

# 7. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

| |
|---|
| AC Conducted Emission Measurement - SR2 |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>150kHz~30MHz: 3.46dB |
| Radiated Emission Measurement – AC1 |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>9kHz ~ 1GHz: 4.18dB<br>1GHz ~ 25GHz: 4.76dB |
| Radiated Emission Measurement – AC2 |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>9kHz ~ 1GHz: 3.85dB<br>1GHz ~ 25GHz: 4.32dB |
| 20dB Spectrum Bandwidth - TR3 |
| Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)):<br>0.28% |

# 8. TEST RESULT

## 8.1. Summary

**Company Name:** **Nationwide Industries Inc**

**Product:** **NWI-IQ-FOB**

| FCC Part Section(s) | Test Description | Test Limit | Test Condition | Test Result | Reference |
|---|---|---|---|---|---|
| 15.207 | AC Conducted Emissions 150kHz - 30MHz | < FCC 15.207 limits | Line Conducted | N/A | Section 7.2 |
| 15.209<br>15.249 | General Field Strength Limits (Restricted Bands and Radiated Emission Limits) | Emissions in restricted bands must meet the radiated limits detailed in 15.209 | Radiated | Pass | Section 7.3 & 7.4 |
| 15.215(c) | 20dB Spectrum Bandwidth | 20 dB bandwidth of the emission in the specific band | | Pass | Section 7.5 |

**Notes:**

1) All modes of operation and data rates were investigated. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst case emissions.

2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.

## 8.2. Conducted Emission

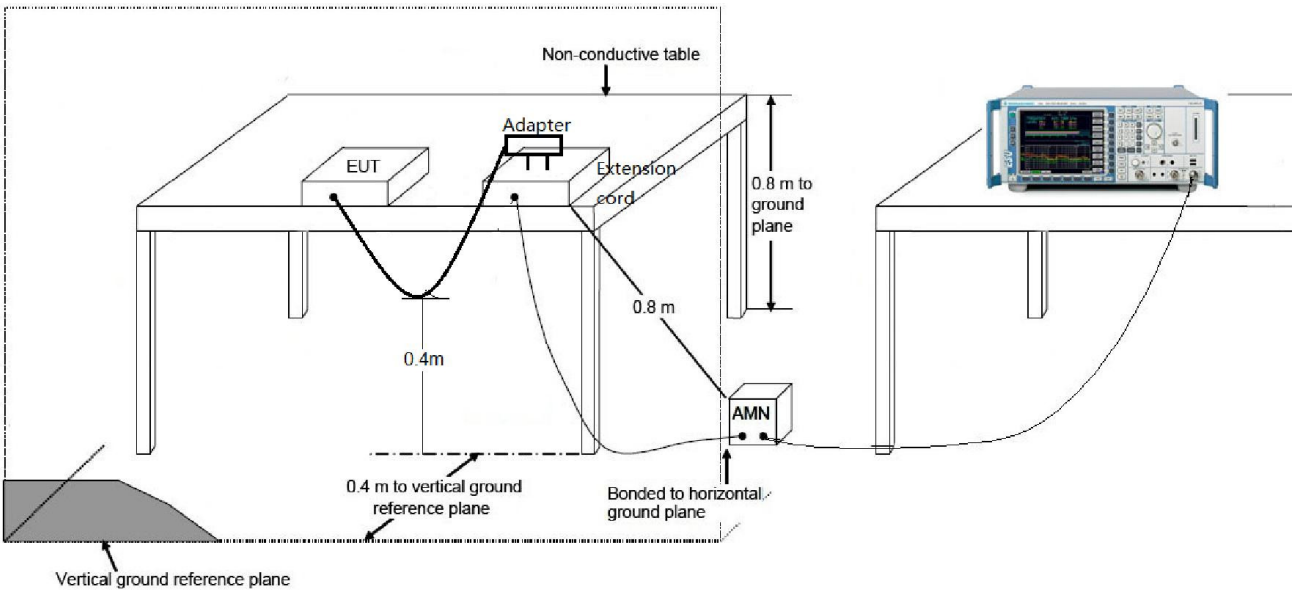
### 8.2.1.Test Limit

| FCC Part 15 Subpart C Paragraph 15.207 Limits | | |
|---|---|---|
| Frequency (MHz) | QP (dBuV) | AV (dBuV) |
| 0.15 - 0.50 | 66 - 56 | 56 - 46 |
| 0.50 - 5.0 | 56 | 46 |
| 5.0 - 30 | 60 | 50 |

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

### 8.2.2.Test Setup




### 8.2.3.Test Result

The EUT is powered by Cell battery, so this requirement does not apply.

## 8.3. Radiated Emission

### 8.3.1.Test Limit

| FCC Part 15 Subpart C Paragraph 15.209 | | |
|---|---|---|
| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement Distance (uV/m) |
| 0.009-0.490 | 2400/F(kHz) | 300 |
| 0.490-1.705 | 24000/F(kHz) | 30 |
| 1.705-30.0 | 30 | 30 |
| 30-80 | 100** | 3 |
| 80-216 | 150** | 3 |
| 216-960 | 200** | 3 |
| Above 960 | 500 | 3 |

Note 1: The lower limit shall apply at the transition frequency.

Note 2: Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

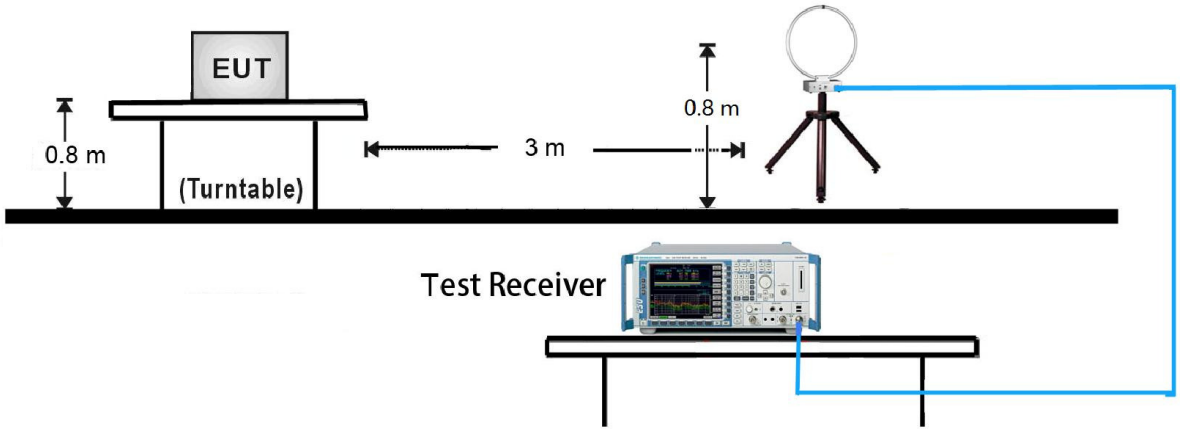
Note 3: E field strength (dBuV/m) = 20 log E field strength (uV/m).

| FCC Part 15 Subpart C Paragraph 15.249 | | |
|---|---|---|
| Fundamental Frequency | Field Strength of Fundamental (millivolts/meter) | Field Strength of Harmonics (microvolts/meter) |
| 902-928(MHz) | 50 | 500 |
| 2400-2483.5(MHz) | 50 | 500 |
| 5725-5875(MHz) | 50 | 500 |
| 24.0-24.25(GHz) | 250 | 2500 |

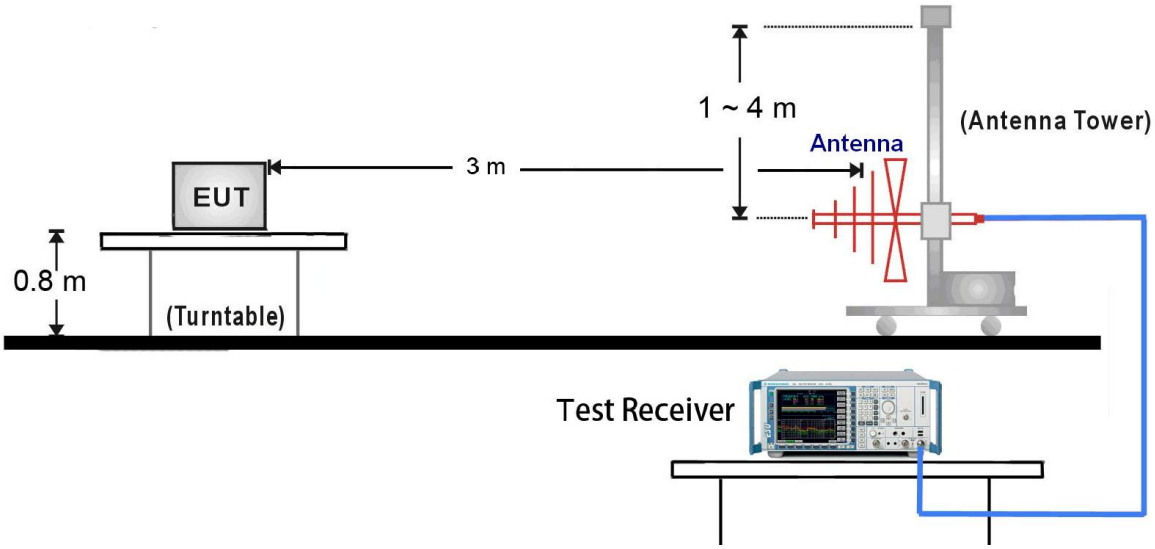
FCC Part 15.249 (d), Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

### 8.3.2.Test Setup

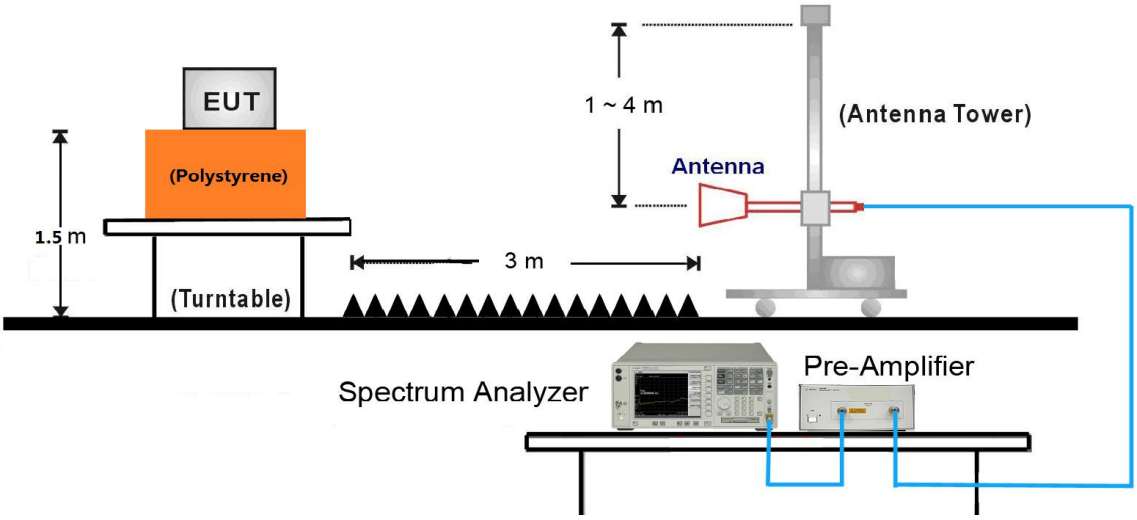
9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:




1GHz ~ 25GHz Test Setup:



### 8.3.3.Test Result

| Test Mode: | Transmission | Test Site: | AC2 |
|---|---|---|---|
| Remark: | **Fundamental** Radiated Emission | Test Engineer: | Flag Yang |

| Frequency (MHz) | Reading Level (dBμV) | Factor (dB) | Measure Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|
| 2408 | 61.9 | -0.4 | 61.5 | 114 | -52.5 | PK | Horizontal |
| | 56.1 | -0.4 | 55.7 | 114 | -58.3 | PK | Vertical |
| 2442 | 60.0 | -0.5 | 59.5 | 114 | -54.5 | PK | Horizontal |
| | 55.1 | -0.5 | 54.6 | 114 | -59.4 | PK | Vertical |
| 2476 | 60.8 | -0.5 | 60.3 | 114 | -53.7 | PK | Horizontal |
| | 53.0 | -0.5 | 52.5 | 114 | -61.5 | PK | Vertical |

Note 1: Peak Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: All readings below 1GHz are peak, above 1GHz are performed with peak and/or average measurements as necessary.

Note 3: Average measurement was not performed when the peak level lower than average limit.

| | | | |
|---|---|---|---|
| Test Mode: | Transmission | Test Site: | AC2 |
| Test Channel: | 2408MHz | Test Engineer: | Flag Yang |
| Remark: | 1. Average measurement was not performed if peak level lower than average limit.<br>2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report. | | |

| Mark | Frequency (MHz) | Reading Level (dBμV) | Factor (dB) | Measure Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|
| | 4816.5 | 41.6 | 5.5 | 47.1 | 74.0 | -26.9 | Peak | Horizontal |
| | 6746.0 | 32.4 | 10.8 | 43.2 | 74.0 | -30.8 | Peak | Horizontal |
| | 9763.5 | 31.0 | 17.0 | 48.0 | 74.0 | -26.0 | Peak | Horizontal |
| | 11633.5 | 29.2 | 21.0 | 50.2 | 74.0 | -23.8 | Peak | Horizontal |
| | 4816.5 | 46.4 | 5.5 | 51.9 | 74.0 | -22.1 | Peak | Vertical |
| | 6661.0 | 32.6 | 10.8 | 43.4 | 74.0 | -30.6 | Peak | Vertical |
| | 9636.0 | 32.1 | 16.2 | 48.3 | 74.0 | -25.7 | Peak | Vertical |
| | 11548.5 | 30.3 | 20.9 | 51.2 | 74.0 | -22.8 | Peak | Vertical |

Note 1: Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

| | | | |
|---|---|---|---|
| Test Mode: | Transmission | Test Site: | AC2 |
| Test Channel: | 2442MHz | Test Engineer: | Flag Yang |
| Remark: | 3. Average measurement was not performed if peak level lower than average limit.<br>4. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report. | | |

| Mark | Frequency (MHz) | Reading Level (dBμV) | Factor (dB) | Measure Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|
| | 4884.5 | 44.5 | 5.6 | 50.1 | 74 | -23.9 | Peak | Horizontal |
| | 6678.0 | 32.8 | 10.8 | 43.6 | 74 | -30.4 | Peak | Horizontal |
| | 10112.0 | 30.7 | 18.0 | 48.7 | 74 | -25.3 | Peak | Horizontal |
| | 11659.0 | 30.1 | 20.9 | 51.0 | 74 | -23.0 | Peak | Horizontal |
| | 4884.5 | 44.5 | 5.6 | 50.1 | 74 | -23.9 | Peak | Vertical |
| | 8624.5 | 32.2 | 14.3 | 46.5 | 74 | -27.5 | Peak | Vertical |
| | 10112.0 | 30.8 | 18.0 | 48.8 | 74 | -25.2 | Peak | Vertical |
| | 11642.0 | 29.8 | 21.0 | 50.8 | 74 | -23.2 | Peak | Vertical |

Note 1: Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

| | | | |
|---|---|---|---|
| Test Mode: | Transmission | Test Site: | AC2 |
| Test Channel: | 2476MHz | Test Engineer: | Flag Yang |
| Remark: | 5. Average measurement was not performed if peak level lower than average limit.<br>6. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report. | | |

| Mark | Frequency (MHz) | Reading Level (dBμV) | Factor (dB) | Measure Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|
| | 4952.5 | 41.0 | 5.7 | 46.7 | 74 | -27.3 | Peak | Horizontal |
| | 6516.5 | 33.8 | 10.5 | 44.3 | 74 | -29.7 | Peak | Horizontal |
| | 8735.0 | 31.0 | 14.6 | 45.6 | 74 | -28.4 | Peak | Horizontal |
| | 11565.5 | 30.6 | 20.8 | 51.4 | 74 | -22.6 | Peak | Horizontal |
| | 4952.5 | 42.5 | 5.7 | 48.2 | 74 | -25.8 | Peak | Vertical |
| | 6559.0 | 33.6 | 10.6 | 44.2 | 74 | -29.8 | Peak | Vertical |
| | 9687.0 | 33.1 | 16.4 | 49.5 | 74 | -24.5 | Peak | Vertical |
| | 11599.5 | 30.6 | 20.7 | 51.3 | 74 | -22.7 | Peak | Vertical |

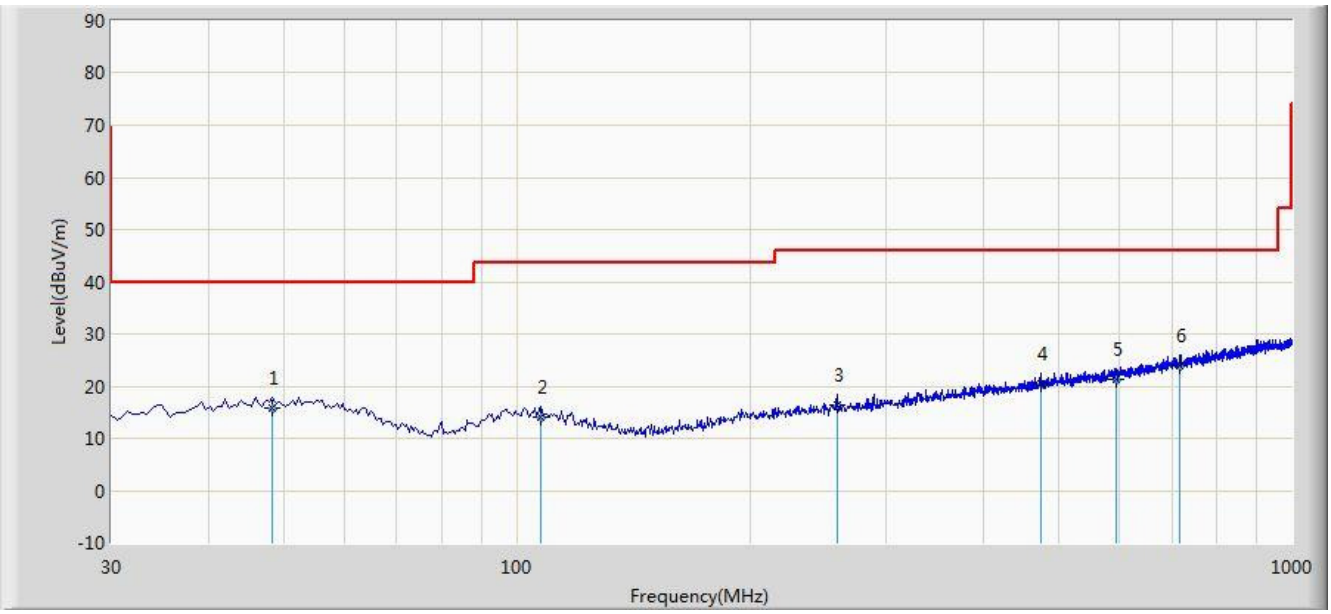
Note 1: Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

Note 2: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

**The worst case of Radiated Emission below 1GHz:**

| | |
|---|---|
| Site: AC2 | Time: 2018/03/03 - 14:53 |
| Limit: FCC_Part15.209_RE(3m) | Engineer: Flag Yang |
| Probe: VULB9162_0.03-8GHz | Polarity: Horizontal |
| EUT: NWI-IQ-FOB | Power: By Battery |
| **Worst Case Mode:** Transmit at Channel 2408MHz | |



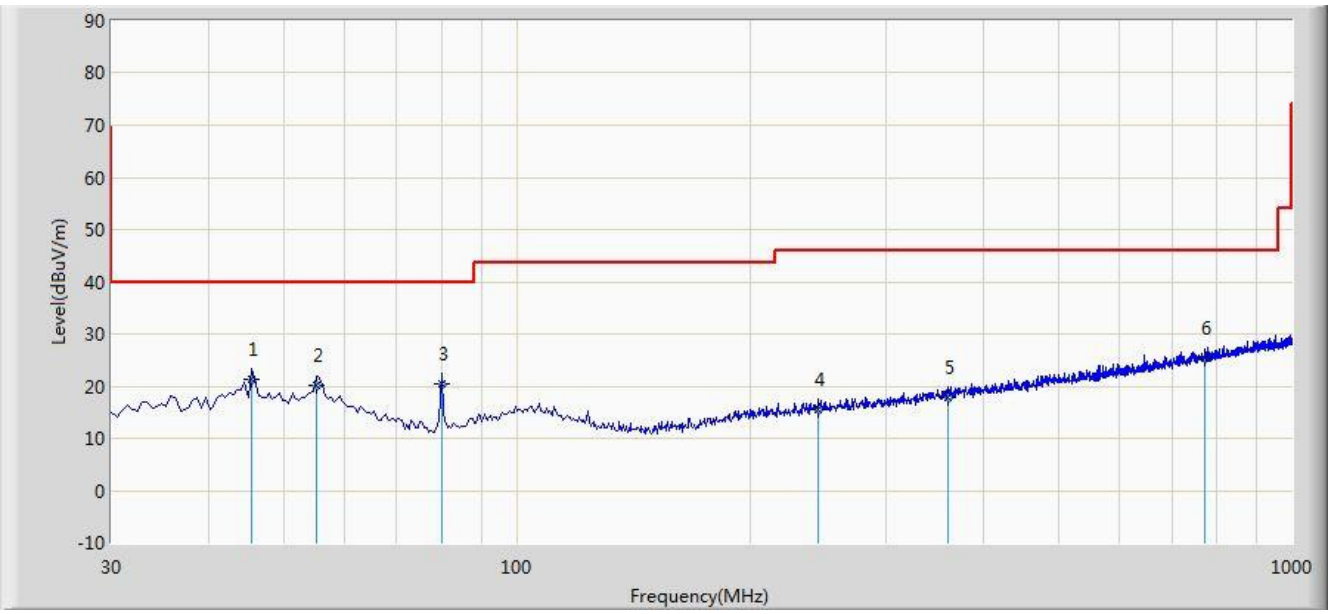

| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | 48.430 | 15.930 | 0.861 | -24.070 | 40.000 | 15.069 | QP |
| 2 | | | 107.600 | 14.146 | 0.945 | -29.354 | 43.500 | 13.200 | QP |
| 3 | | | 258.920 | 16.417 | 2.284 | -29.583 | 46.000 | 14.133 | QP |
| 4 | | | 475.230 | 20.534 | 2.295 | -25.466 | 46.000 | 18.239 | QP |
| 5 | | | 592.600 | 21.416 | 1.078 | -24.584 | 46.000 | 20.338 | QP |
| 6 | | * | 717.730 | 23.930 | 1.685 | -22.070 | 46.000 | 22.245 | QP |

Note 1: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

| | |
|---|---|
| Site: AC2 | Time: 2018/03/03 - 14:55 |
| Limit: FCC_Part15.209_RE(3m) | Engineer: Flag Yang |
| Probe: VULB9162_0.03-8GHz | Polarity: Vertical |
| EUT: NWI-IQ-FOB | Power: By Battery |
| **Worst Case Mode:** Transmit at Channel 2408MHz | |




| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | * | 45.520 | 21.305 | 6.276 | -18.695 | 40.000 | 15.029 | QP |
| 2 | | | 55.220 | 20.011 | 5.237 | -19.989 | 40.000 | 14.774 | QP |
| 3 | | | 79.955 | 20.574 | 11.041 | -19.426 | 40.000 | 9.533 | QP |
| 4 | | | 244.855 | 15.397 | 1.580 | -30.603 | 46.000 | 13.817 | QP |
| 5 | | | 360.285 | 17.839 | 1.526 | -28.161 | 46.000 | 16.314 | QP |
| 6 | | | 772.535 | 25.226 | 2.303 | -20.774 | 46.000 | 22.923 | QP |

Note 1: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

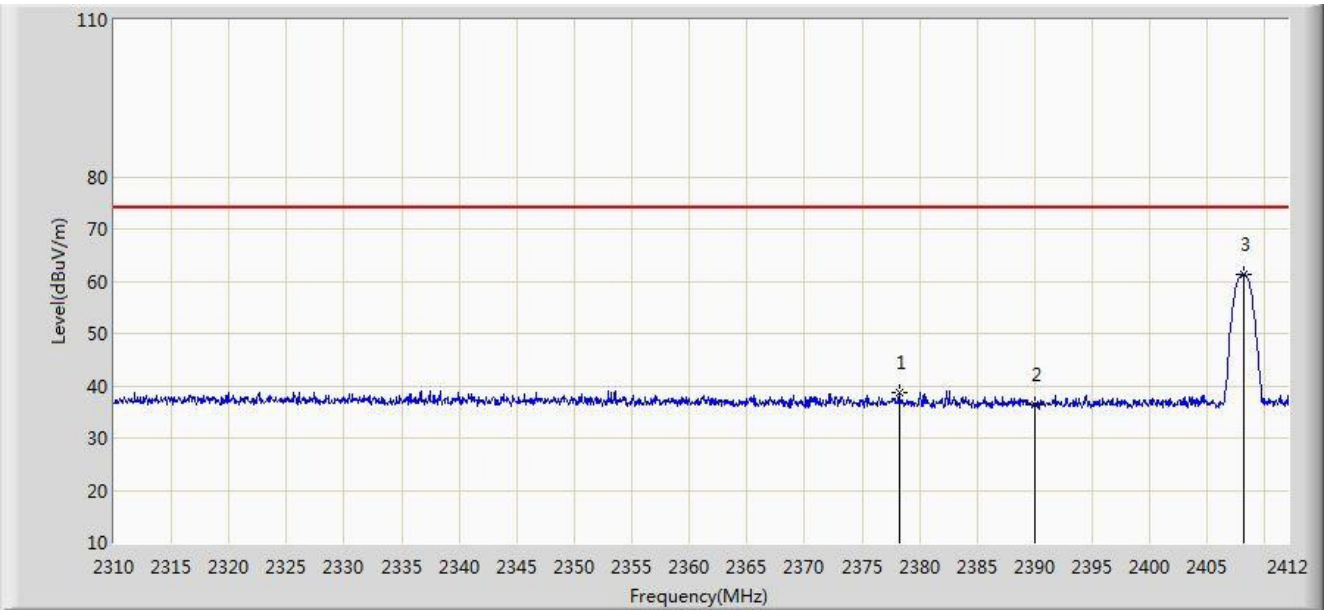
Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

## 8.4. Radiated Restricted Band Edge Measurement

### 8.4.1.Test Result

| | |
|---|---|
| Site: AC2 | Time: 2018/03/15 - 23:05 |
| Limit: FCC_Part15.209_RE(3m) | Engineer: Flag Yang |
| Probe: BBHA9120D_1-18GHz | Polarity: Horizontal |
| EUT: NWI-IQ-FOB | Power: By Battery |
| Test Mode: Transmit at Channel 2408MHz | |

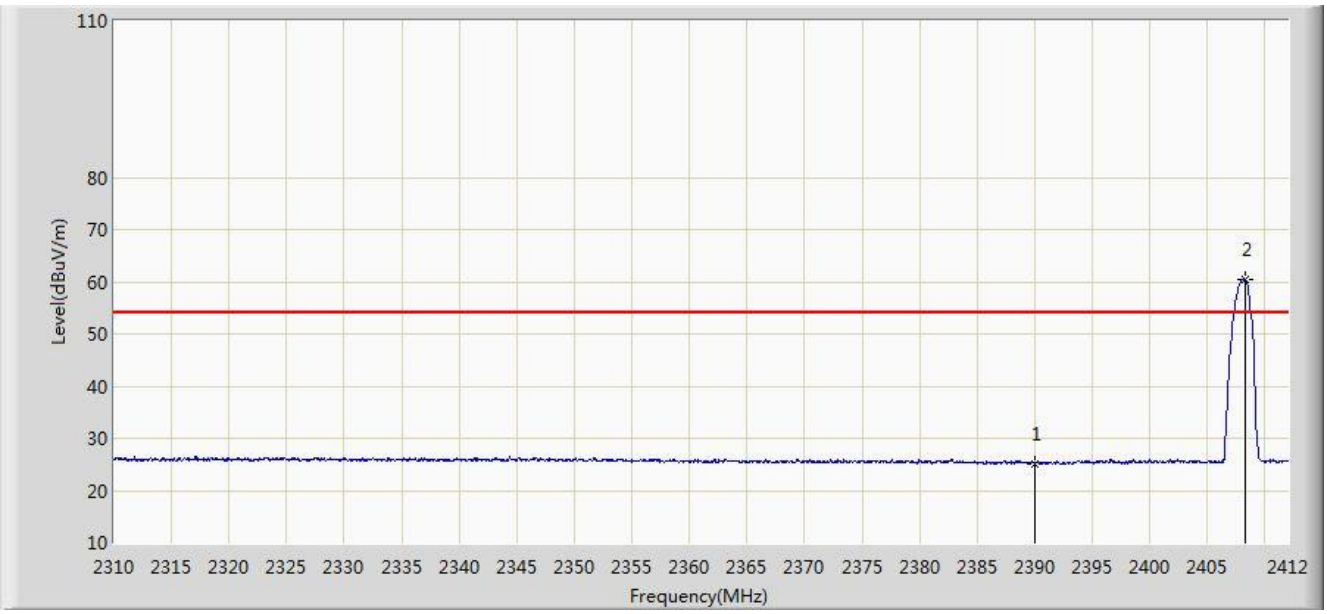



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | 2378.238 | 38.834 | 39.145 | -35.166 | 74.000 | -0.312 | PK |
| 2 | | | 2390.000 | 36.418 | 36.786 | -37.582 | 74.000 | -0.368 | PK |
| 3 | | * | 2408.124 | 61.433 | 61.876 | -12.567 | 74.000 | -0.444 | PK |

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

| | |
|---|---|
| Site: AC2 | Time: 2018/03/15 - 23:07 |
| Limit: FCC_Part15.209_RE(3m) | Engineer: Flag Yang |
| Probe: BBHA9120D_1-18GHz | Polarity: Horizontal |
| EUT: NWI-IQ-FOB | Power: By Battery |
| Test Mode: Transmit at Channel 2408MHz | |

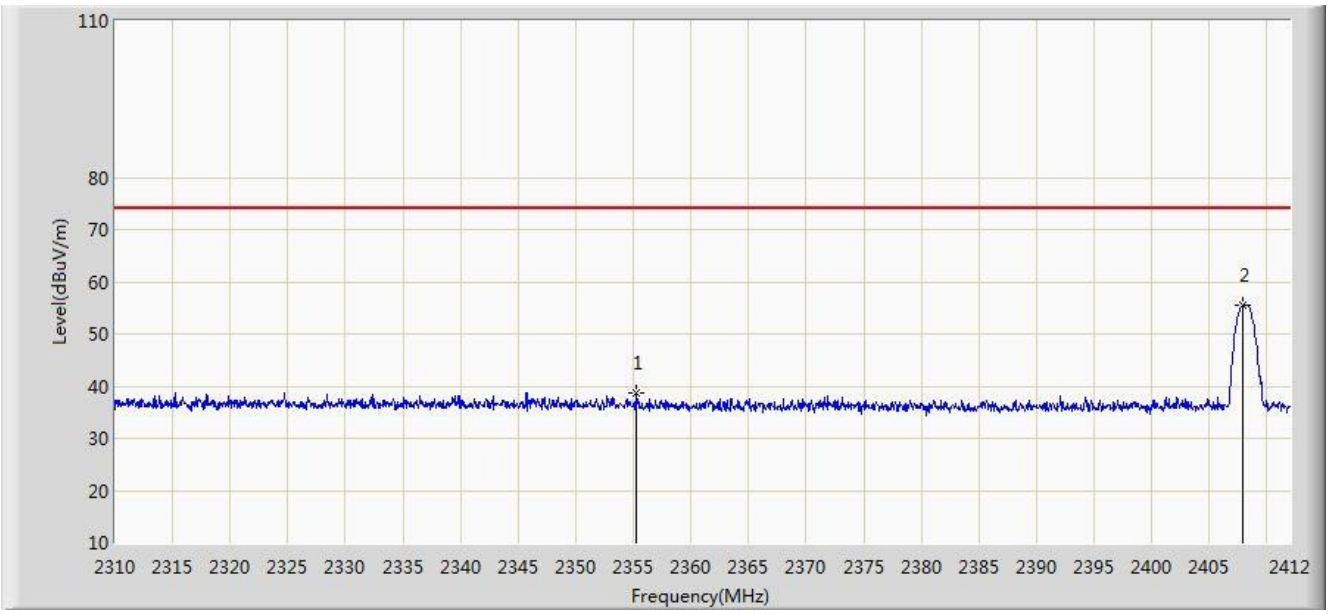



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | 2390.000 | 25.161 | 25.529 | -28.839 | 54.000 | -0.368 | AV |
| 2 | | * | 2408.277 | 60.507 | 60.951 | 6.507 | 54.000 | -0.444 | AV |

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

| | |
|---|---|
| Site: AC2 | Time: 2018/03/15 - 23:09 |
| Limit: FCC_Part15.209_RE(3m) | Engineer: Flag Yang |
| Probe: BBHA9120D_1-18GHz | Polarity: Vertical |
| EUT: NWI-IQ-FOB | Power: By Battery |
| Test Mode: Transmit at Channel 2408MHz | |

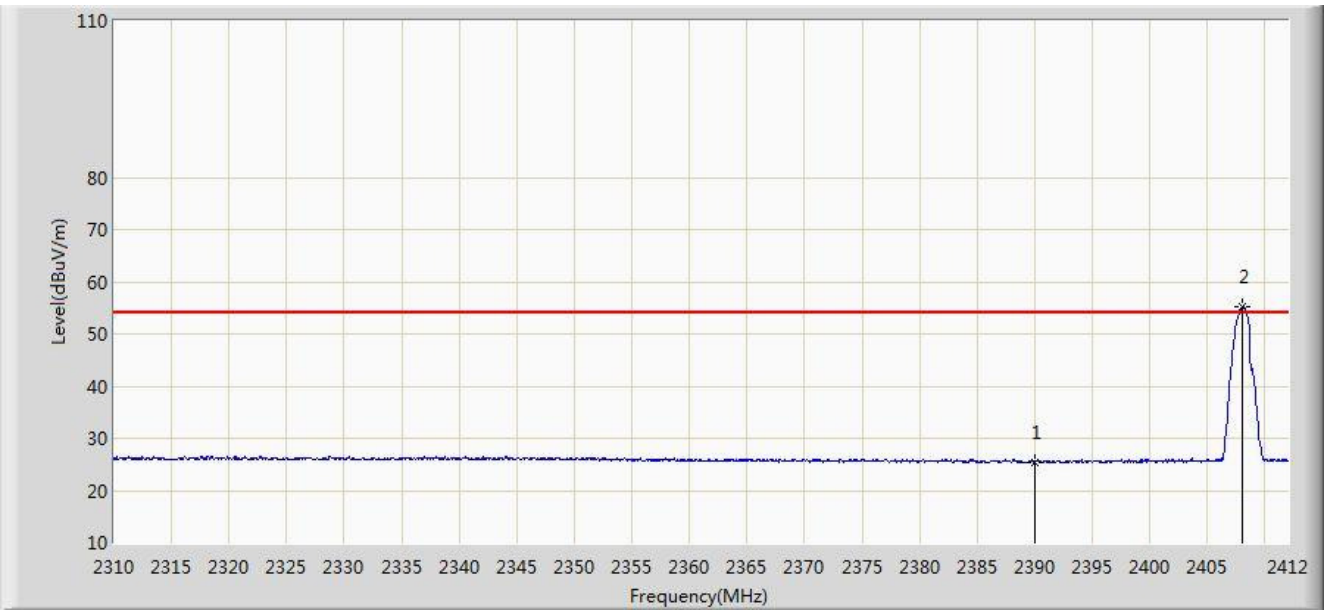



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | 2355.288 | 38.586 | 38.844 | -35.414 | 74.000 | -0.257 | PK |
| 2 | | * | 2407.971 | 55.639 | 56.082 | -18.361 | 74.000 | -0.442 | PK |

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

| | |
|---|---|
| Site: AC2 | Time: 2018/03/15 - 23:12 |
| Limit: FCC_Part15.209_RE(3m) | Engineer: Flag Yang |
| Probe: BBHA9120D_1-18GHz | Polarity: Vertical |
| EUT: NWI-IQ-FOB | Power: By Battery |
| Test Mode: Transmit at Channel 2408MHz | |

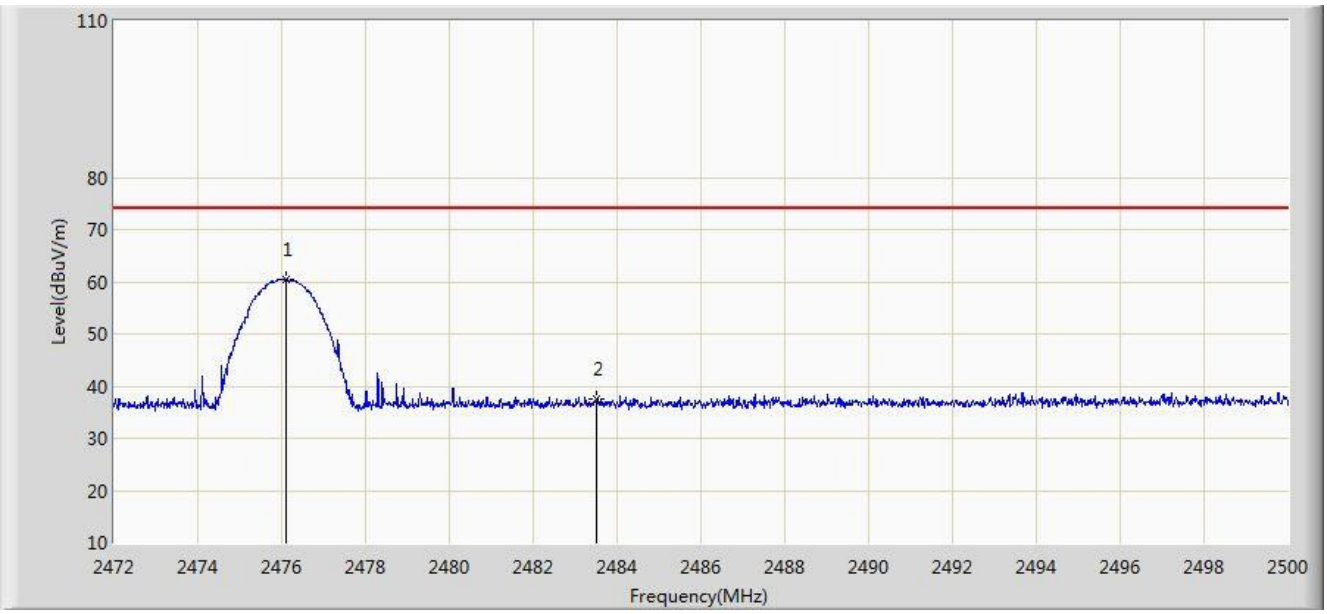



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | 2390.000 | 25.409 | 25.777 | -28.591 | 54.000 | -0.368 | AV |
| 2 | | * | 2408.073 | 55.228 | 55.671 | 1.228 | 54.000 | -0.443 | AV |

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

| | |
|---|---|
| Site: AC2 | Time: 2018/03/15 - 22:47 |
| Limit: FCC_Part15.209_RE(3m) | Engineer: Flag Yang |
| Probe: BBHA9120D_1-18GHz | Polarity: Horizontal |
| EUT: NWI-IQ-FOB | Power: By Battery |
| Test Mode: Transmit at Channel 2476MHz | |

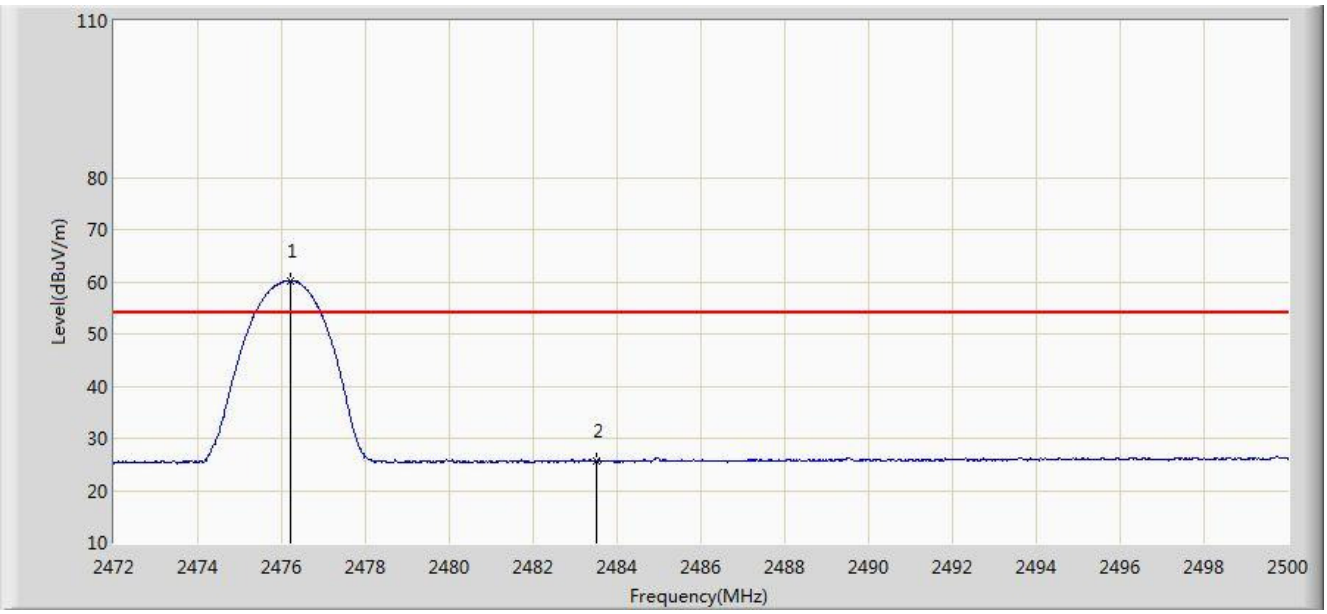



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | * | 2476.116 | 60.344 | 60.848 | -13.656 | 74.000 | -0.504 | PK |
| 2 | | | 2483.500 | 37.528 | 38.035 | -36.472 | 74.000 | -0.506 | PK |

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

| | |
|---|---|
| Site: AC2 | Time: 2018/03/15 - 22:54 |
| Limit: FCC_Part15.209_RE(3m) | Engineer: Flag Yang |
| Probe: BBHA9120D_1-18GHz | Polarity: Horizontal |
| EUT: NWI-IQ-FOB | Power: By Battery |
| Test Mode: Transmit at Channel 2476MHz | |

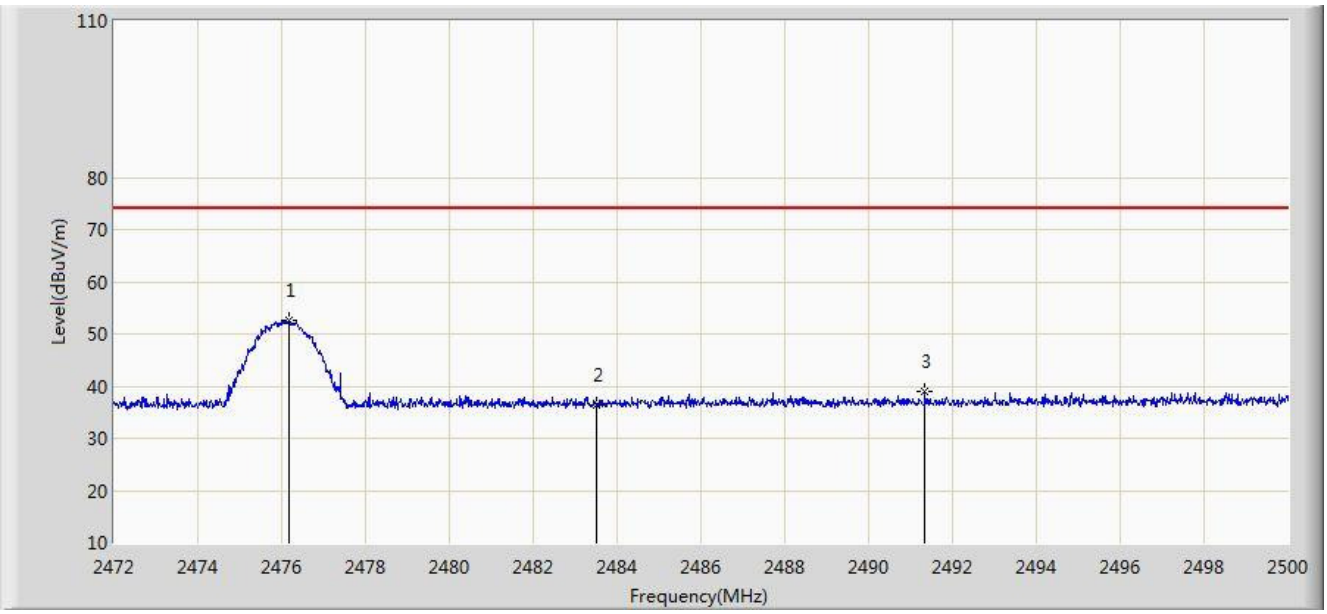



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | * | 2476.214 | 60.182 | 60.685 | 6.182 | 54.000 | -0.503 | AV |
| 2 | | | 2483.500 | 25.742 | 26.249 | -28.258 | 54.000 | -0.506 | AV |

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

| | |
|---|---|
| Site: AC2 | Time: 2018/03/15 - 22:59 |
| Limit: FCC_Part15.209_RE(3m) | Engineer: Flag Yang |
| Probe: BBHA9120D_1-18GHz | Polarity: Horizontal |
| EUT: NWI-IQ-FOB | Power: By Battery |
| Test Mode: Transmit at Channel 2476MHz | |

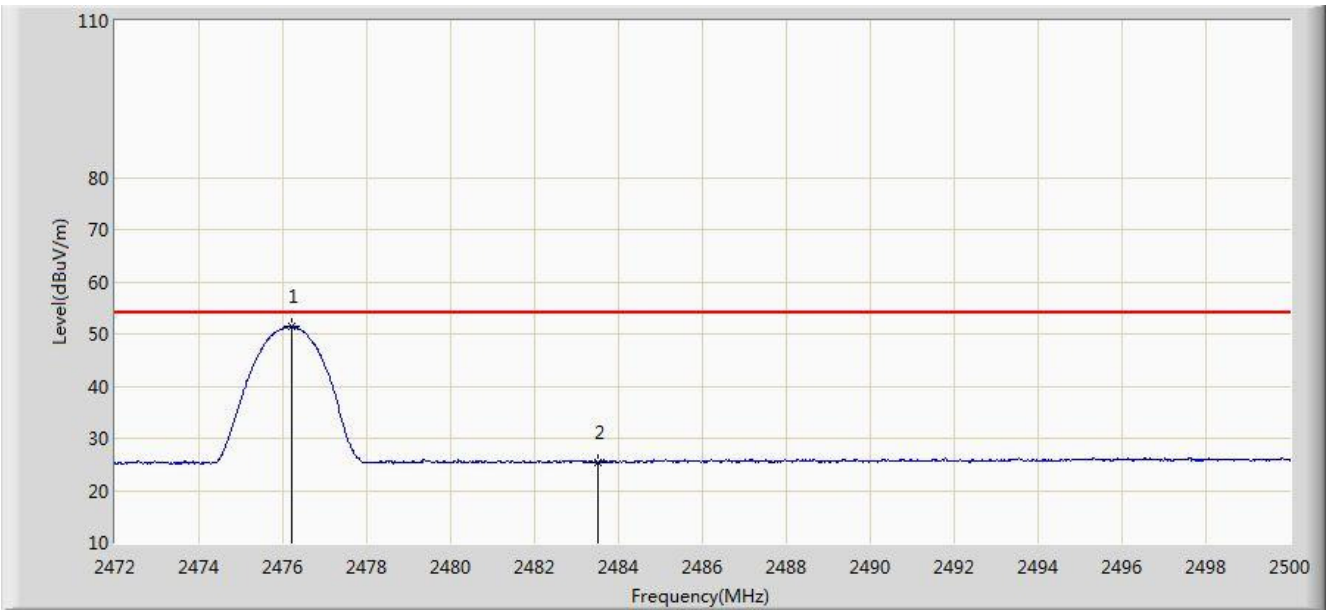



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | * | 2476.172 | 52.465 | 52.968 | -21.535 | 74.000 | -0.503 | PK |
| 2 | | | 2483.500 | 36.511 | 37.018 | -37.489 | 74.000 | -0.506 | PK |
| 3 | | | 2491.348 | 38.961 | 39.477 | -35.039 | 74.000 | -0.515 | PK |

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

| | |
|---|---|
| Site: AC2 | Time: 2018/03/15 - 23:03 |
| Limit: FCC_Part15.209_RE(3m) | Engineer: Flag Yang |
| Probe: BBHA9120D_1-18GHz | Polarity: Horizontal |
| EUT: NWI-IQ-FOB | Power: By Battery |
| Test Mode: Transmit at Channel 2476MHz | |




| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | * | 2476.214 | 51.347 | 51.850 | -2.653 | 54.000 | -0.503 | AV |
| 2 | | | 2483.500 | 25.376 | 25.883 | -28.624 | 54.000 | -0.506 | AV |

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

## 8.5. 20dB Spectrum Bandwidth Measurement

### 8.5.1.Test Limit

Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emission in the specific band (2400 ~ 2483.5).

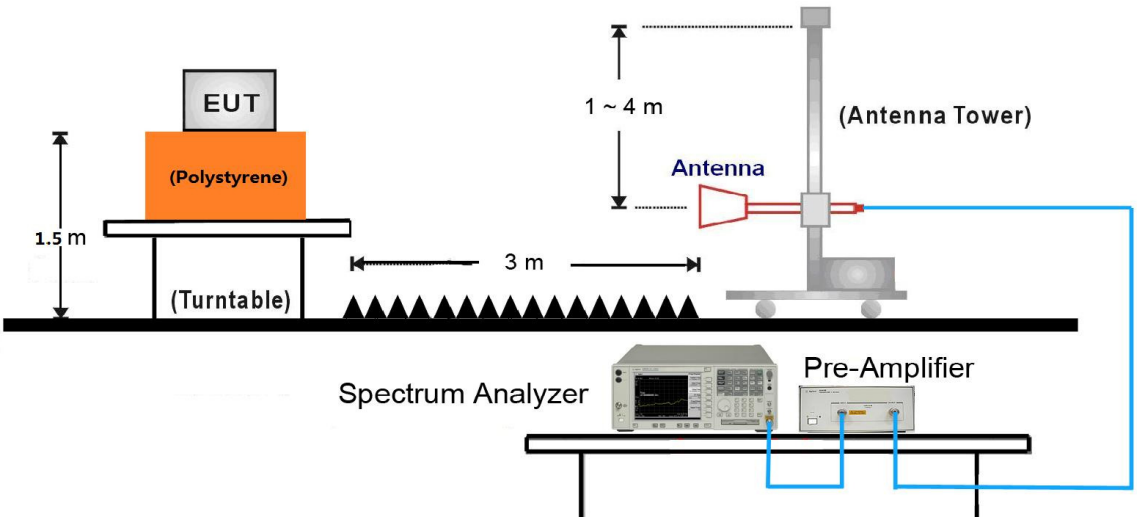
### 8.5.2.Test Procedure used

ANSI C63.10 Clause 6.9.2

### 8.5.3.Test Setting

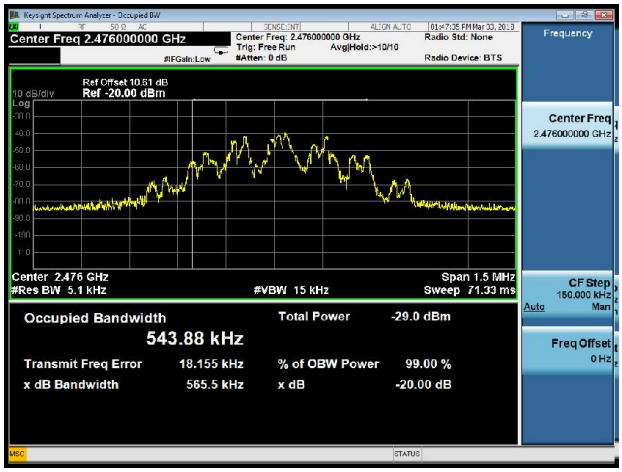
1. Set the spectrum span range to overlap the nominal center frequency
2. Set RBW = 100 kHz
3. VBW ≥ 3 × RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. Allow the trace was allowed to stabilize and marker the highest level.
8. Determine the display level (the highest level - 20dB) and place two markers, one at the lowest frequency and the other at the highest frequency.

### 8.5.4.Test Setup



### 8.5.5.Test Result

| Frequency (MHz) | Frequency Range_Low (MHz) | Frequency Range_High (MHz) | Result |
|---|---|---|---|
| 2408 | 2407.738 | --- | Pass |
| 2476 | --- | 2476.283 | Pass |

| 20dB Spectrum Bandwidth | |
|---|---|
| **2408 MHz** | **2476 MHz** |
| |  |

## 8.6. 99% Bandwidth Measurement

### 8.6.1.Test Limit

N/A

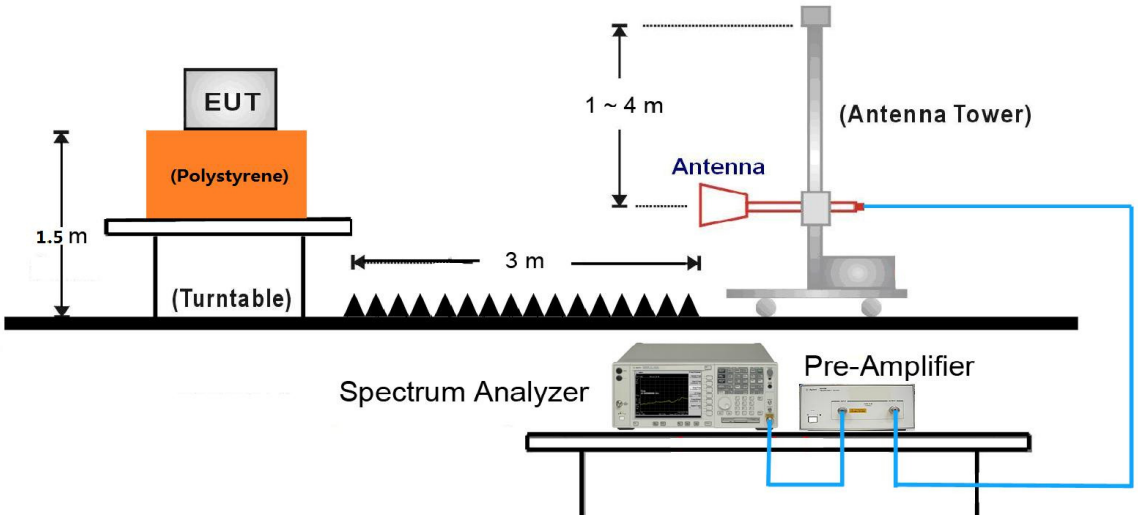
### 8.6.2.Test Procedure used

ANSI C63.10 Section 6.9

### 8.6.3.Test Setting

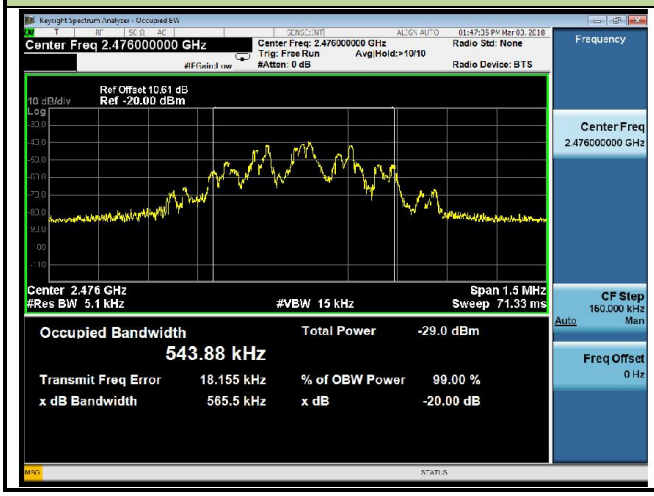
1. The analyzers' automatic bandwidth measurement capability was used to perform the 99% bandwidth measurement. The bandwidth measurement was not influenced by any intermediated power nulls in the fundamental emission.
2. RBW = approximately 1% to 5% of the OBW.
3. VBW ≥ 3 × RBW.
4. Detector = Peak.
5. Trace mode = max hold.

### 8.6.4.Test Setup



### 8.6.5.Test Result

| Frequency (MHz) | 99% Bandwidth (MHz) |
|---|---|
| 2408 | 0.507 |
| 2442 | 0.508 |
| 2476 | 0.544 |

| 99% Occupied Bandwidth | |
|---|---|
| **2408 MHz** | **2442 MHz** |
| | |
| **2476 MHz** | -- |
|  | |

# 9. CONCLUSION

The data collected relate only the item(s) tested and show that the device is in compliance with Part 15C of the FCC Rules.

The End