Report Number: SZ1802FR11

# RF Test Report

| | | |
|---|---|---|
| Applicant | : | PEAG, LLC dba JLab Audio |
| Product Type | : | Speaker with bluetooth |
| Model Number | : | CRASHER SLIM Speaker |
| FCC ID | : | 2AHYVCRSHSLIM |
| EUT Rated Voltage | : | DC 5V |
| Test Voltage | : | 120 Vac / 60 Hz |
| Receive Date | : | Jan. 12 , 2018 |
| Test Period | : | Jan 15 ~ Jan. 31 , 2018 |
| Issued Date | : | Feb. 06 , 2018 |
| Applicable Standards | : | FCC 47 CFR PART 15 SUBPART C<br>ANSI C63.10:2013 |
| Test Result | : | Complied |

**Testing Laboratory**

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American Association for Laboratory Accreditation number: 3464.02



| | | | | |
|---|---|---|---|---|
| Approved By | : | Hai Wang | Reviewed By | : Mick. zhang |
| (Manager) | | (Hai. Wang) | (Testing Engineer) | (Mick. Zhang) |

# Revision History

| Rev. | Issue Date | Revisions |
|---|---|---|
| 00 | Feb. 06, 2018 | Initial Issue |
| | | |
| | | |
| | | |

# TABLE OF CONTENTS

# 1 General Information

## 1.1. Summary of Test Result

| FCC Standard | Item | Result | Remark |
|---|---|---|---|
| 15.207 | AC Power Conducted Emission | PASS | ----- |
| 15.203 | Antenna Requirement | PASS | ----- |
| 15.247(b)(1) | Max. Output Power | PASS | ----- |
| 15.247(d) | Transmitter Radiated Emissions | PASS | ----- |
| 15.247(a)(1) | 20dB RF Bandwidth | PASS | ----- |
| 15.247(a)(1) | Carrier Frequency Separation | PASS | ----- |
| 15.247(a)(1)(iii) | Number of Hopping | PASS | ----- |
| 15.247(a)(1)(iii) | Time of Occupancy (Dwell Time) | PASS | ----- |
| 15.247(d) | Out of Band Conducted Spurious Emission | PASS | ----- |

| Standard | Description |
|---|---|
| CFR47, Part 15, Subpart C §15.247 | Intentional Radiators |
| ANSI C63. 10: 2013 | American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices |
| ANSI C63. 4: 2014 | American National Standard for methods of measurement of radio – noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz |
| KDB 558074 D01 v04 | Guidance For Performing Compliance Measurements On Digital Transmission Systems (DTS) Operating Under Section 15.247 |
| Standard IC | Description |
| RSS-247 ISSUE 2: Feb., 2017 | Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence - Exempt Local Area Network (LE- LAN) Devices |
| RSS-Gen ISSUE 4: Nov., 2014 | Spectrum Management and Telecommunications Radio Standards Specification - General Requirements and Information for the Certification of Radio Apparatus |

The test results of this report relate only to the tested sample(s) identified in this report. Manufacturer or whom it may concern should recognize the pass or fail of the test result.

A Test Lab Techno Corp. tested the above equipment under the requirements outlined in the above standards. All indications of Pass/Fail in this report are opinions expressed by A Test Lab Techno Corp. Based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

A Test Lab Techno Corp. will not be liable for any loss or damage resulting from false, inaccurate, inappropriate or incomplete product information provided by the customer.

This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

## 1.2. Measurement Uncertainty

| Test Item | Frequency Range | Uncertainty (dB) |
|---|---|---|
| Conducted Emission | 9kHz ~ 150KHz | 2.6 |
| | 150kHz ~ 30MHz | 2.6 |
| Radiated Emission | 30MHz ~ 1000MHz | 5.6 |
| | 1000MHz ~ 18000MHz | 5.5 |
| | 18000MHz ~ 26500MHz | 4.9 |
| | 26500MHz ~ 40000MHz | 4.9 |
| Conducted Output Power | +0.26 dB / -0.29 dB | |
| RF Bandwidth | 4.95% | |
| Power Spectral Density | +0.72 dB / -0.78 dB | |

# 2 EUT Description

| | | | |
|---|---|---|---|
| Applicant | PEAG, LLC dba JLab Audio<br>2281 Las Palmas Drive,Suite 101 Carlsbad, CA 92011 | | |
| Manufacturer | Musilab Electronic (DongGuan) Co., Ltd<br>No.5 Huanwei Street,Fugang,Qingxi Town, Dongguan,Guangdong,China | | |
| Product | Speaker with bluetooth | | |
| Model Number | CRASHER SLIM Speaker | | |
| FCC ID | 2AHYVCRSHSLIM | | |
| Frequency Range | 2402 ~ 2480 MHz | | |
| Modulation Type | GFSK for 1Mbps | | |
| | π/4-DQPSK for 2Mbps | | |
| | 8DPSK for 3Mbps | | |
| Operate Temp. Range | -20 ~ 50℃ | | |
| Antenna information | Type | | Max. Gain (dBi) |
| | PCB Antenna | | 0 |
| RF Output Power | GFSK for 1Mbps | 0.00061 W | |
| (Conducted) | π/4-DQPSK for 2Mbps | 0.00130 W | |
| | 8DPSK for 3Mbps | 0.00141 W | |

# 3 Test Methodology

## 3.1. Mode of Operation

Decision of Test ATL has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

| Pre-Test Mode |
|---|
| Mode 1: Transmit mode |
| Mode 2: GFSK Continuous TX mode |
| Mode 3: π/4-DQPSK Continuous TX mode |
| Mode 4: 8DPSK Continuous TX mode |

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz and power line conducted emissions below 30MHz, which worst case was in TX mode only. By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “X axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

| Final-Test Mode |
|---|
| Mode 1: Transmit mode |
| Mode 2: GFSK Continuous TX mode |
| Mode 4: 8DPSK Continuous TX mode |

Description of Test Modes

Preliminary tests were performed in different modulation to find the worst case. The modulation has shown the worst-case in section 4.5. Investigation has been done on all the possible configurations for searching the worst cases.

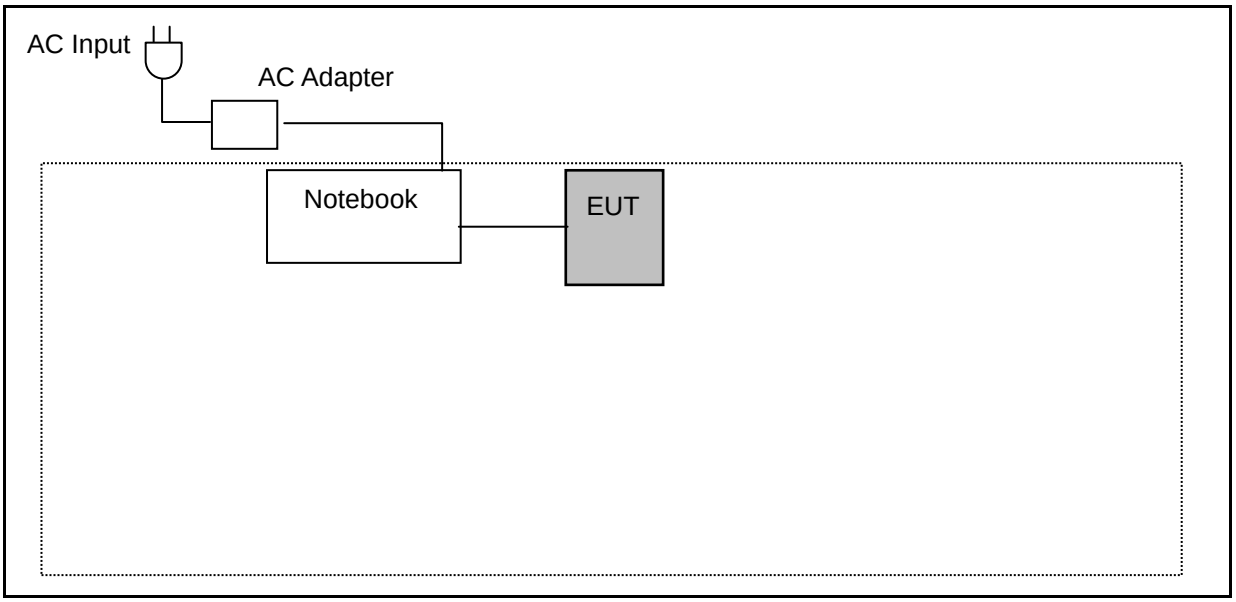
## 3.2. EUT Exercise Software

| | |
|---|---|
| 1 | Setup the EUT shown on “Configuration of Test System Details”. |
| 2 | Turn on the power of all equipment. |
| 3 | Turn on TX function |
| 4 | EUT run test program. |

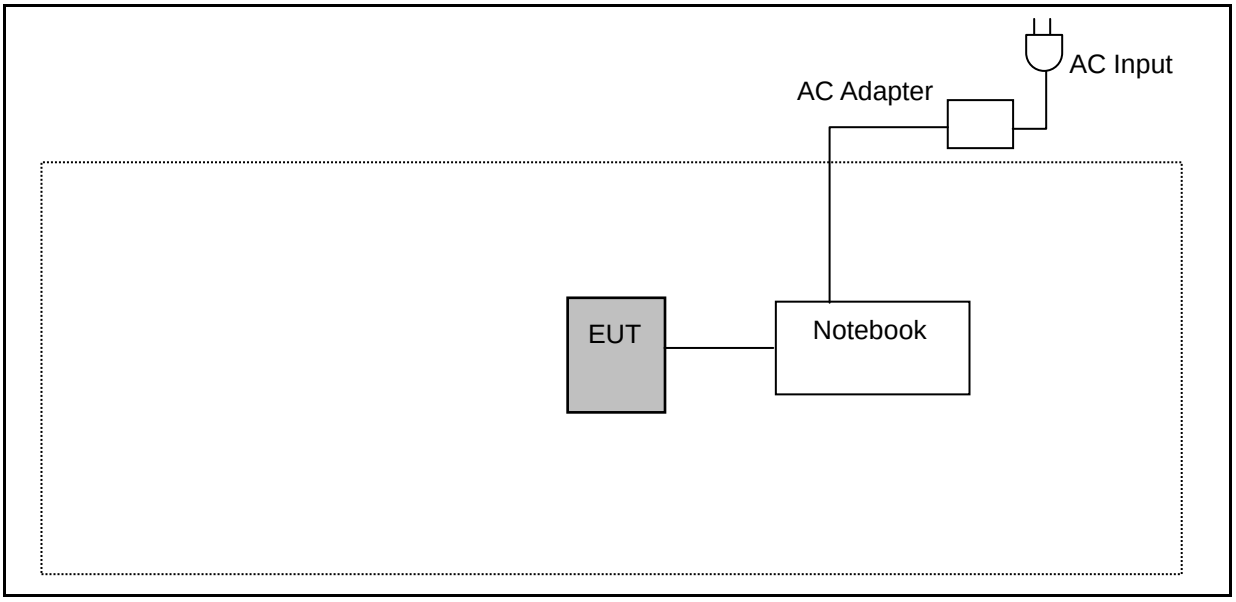
| Measurement Software | |
|---|---|
| 1 | EZ-EMC Ver. ATL-03A1-1 |
| 2 | EZ-EMC Ver ATL-ITC-3A1-1 |

## 3.3. Configuration of Test System Details

Conducted Emission




Radiated Emissions



## 3.4. Test Instruments

For Conducted Emission

| Equipment | Manufacturer | Model Number | Serial Number | Cal. Date | Cal. Period |
|---|---|---|---|---|---|
| Test Receiver | R&S | ESR3 | 101923 | 09/19/2017 | 1 year |
| LISN | R&S | ENV216 | 101942 | 09/19/2017 | 1 year |
| LISN | R&S | ENV216 | 101943 | 09/19/2017 | 1 year |
| RF Cable | EMCI | EMCCFD400 | 433LFC | 09/19/2017 | 1 year |
| Test Site | ATL | CE | CE | N.C.R. | ----- |

For Radiated Emissions_966A

| Equipment | Manufacturer | Model Number | Serial Number | Cal. Date | Remark |
|---|---|---|---|---|---|
| Preamplifier (10kHz~3GHz) | EMCI | EMC001330 | 980300 | 09/19/2017 | 1 year |
| Preamplifier (0.1GHz~26.5GHz) | EMCI | EMC012645SE | 980318 | 09/19/2017 | 1 year |
| Preamplifier (26.5GHz~40GHz) | EMCI | EMC2654045 | 980028 | 08/29/2017 | 1 year |
| Bilog Antenna (30MHz~1.4GHz) | Schwarzbeck | VULB 9168 | 672 | 11/15/2017 | 1 year |
| Horn Antenna (1GHz~18GHz) | ETS | 3117 | 00204949 | 11/15/2017 | 1 year |
| Horn Antenna (18GHz~26.5GHz) | ETS | 3160-09 | 00202549 | 11/15/2017 | 1 year |
| Horn Antenna (18GHz~40GHz) | ETS | 3116 | 00086467 | 09/19/2017 | 1 year |
| Receiver (3Hz~26.5GHz) | Keysight | N9038A | MY51210179 | 09/19/2017 | 1 year |
| Spectrum Analyzer (3Hz~43GHz) | Keysight | N9030A | MY55410268 | 09/19/2017 | 1 year |
| Cable (30MHz~1GHz) | EMCI | N/A | 1066LFC | 09/19/2017 | 1 year |
| Cable (1GHz~18GHz) | EMCI | N/A | 160719 | 09/19/2017 | 1 year |
| Cable (1GHz~18GHz) | EMCI | N/A | 160324 | 09/19/2017 | 1 year |
| Cable (1GHz~18GHz) | EMCI | N/A | 160322 | 09/19/2017 | 1 year |
| Test Site | 欧衡 | MFAC3M | RE-026 | 08/29/2017 | 1 year |

Note: N.C.R. = No Calibration Request.

For Conducted

| Equipment | Manufacturer | Model Number | Serial Number | Cal. Date | Remark |
|---|---|---|---|---|---|
| Power Sensor | Anritsu | U2021XA | SG54130003 | 09/19/2017 | 1 year |
| Spectrum Analyzer (10Hz~26.5GHz) | Agilent | N9020A | MY53420615 | 09/19/2017 | 1 year |
| Spectrum Analyzer (9KHz~26.5GHz) | Agilent | E4445A | MY46181814 | 09/19/2017 | 1 year |
| Programmable temp & humi chamber | ETAI | 9712A | 647 | 09/19/2017 | 1 year |
| Test Site | ATL | RF | RF | N.C.R. | ----- |

Note: N.C.R. = No Calibration Request.

## 3.5. Test Site Environment

| Items | Required (IEC 60068-1) | Actual |
|---|---|---|
| Temperature (°C) | 15-35 | 26 |
| Humidity (%RH) | 25-75 | 60 |
| Barometric pressure (mbar) | 860-1060 | 950 |

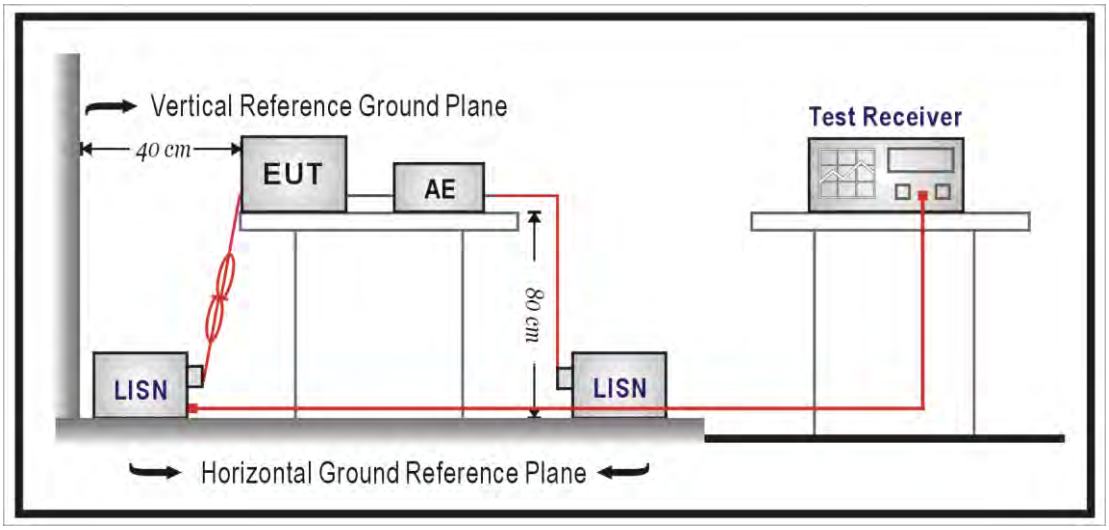
# 4 Measurement Procedure

## 4.1. AC Power Line Conducted Emission Measurement

■ **Limit**

| Frequency (MHz) | Quasi-peak | Average |
|---|---|---|
| 0.15 - 0.5 | 66 to 56 | 56 to 46 |
| 0.50 - 5.0 | 56 | 46 |
| 5.0 - 30.0 | 60 | 50 |

■ **Test Setup**



■ **Test Procedure**

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50Ω// 50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50Ω// 50uH coupling impedance with 50ohm termination.

Tabletop device shall be placed on a non-conducting platform, of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The wall of screened room shall be located 40cm to the rear of the EUT. Other surfaces of tabletop or floor standing EUT shall be at least 80cm from any other ground conducting surface including one or more LISNs. For floor-standing device shall be placed under the EUT with a 12mm insulating material.

Conducted emissions were investigated over the frequency range from 0.15 MHz to 30 MHz using a resolution bandwidth of 9 kHz. The equipment under test (EUT) shall be meet the limits in section 4.1, as applicable, including the average limit and the quasi-peak limit when using respectively, an average detector and quasi-peak detector measured in accordance with the methods described of related standard. When all of peak value were complied with quasi-peak and average limit from 150kHz to 30MHz then quasi-peak and average measurement was unnecessary.

The AMN shall be placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane for AMNs mounted on top of the ground reference plane. This distance is between the closest points of the AMN and the EUT. All other units of the EUT and associated equipment shall be at least 0,8 m from the AMN. If the mains power cable is longer than 1m then the cable shall be folded back and forth at the centre of the lead to form a bundle no longer than 0.4m. All of interconnecting cables that hang closer than 40cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long. All of EUT and AE shall be separate place more than 0.1m. All 50 Ω ports of the LISN shall be resistively terminated into 50 Ω loads when not connected to the measuring instrument.

If the reading of the measuring receiver shows fluctuations close to the limit, the reading shall be observed for at least 15 s at each measurement frequency; the higher reading shall be recorded with the exception of any brief isolated high reading which shall be ignored.

## 4.2. Radiated Interference Measurement

■ **Limit**

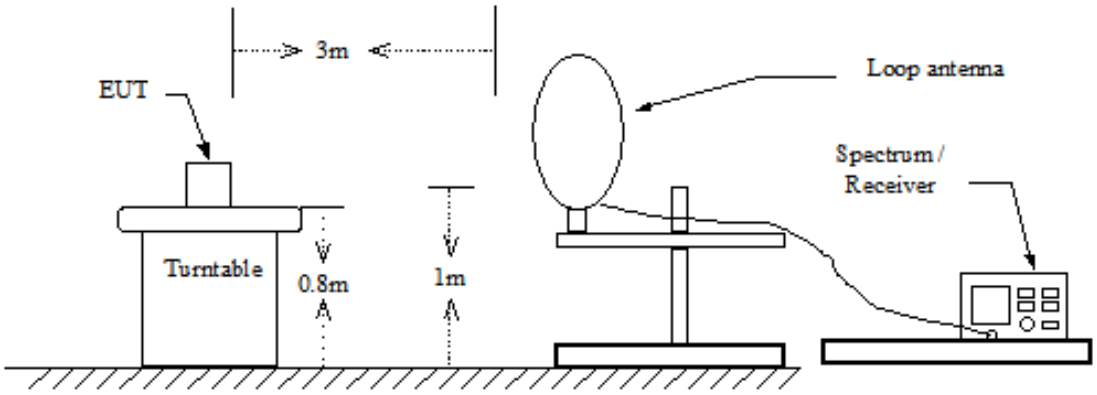
According to §15.209(a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (MHz) | Field Strength (μV/m at meter) | Measurement Distance (meters) |
|---|---|---|
| 0.009 – 0.490 | 2400 / F (kHz) | 300 |
| 0.490 – 1.705 | 24000 / F (kHz) | 30 |
| 1.705 – 30.0 | 30 | 30 |
| 30 - 88 | 100** | 3 |
| 88-216 | 150** | 3 |
| 216-960 | 200** | 3 |
| Above 960 | 500 | 3 |

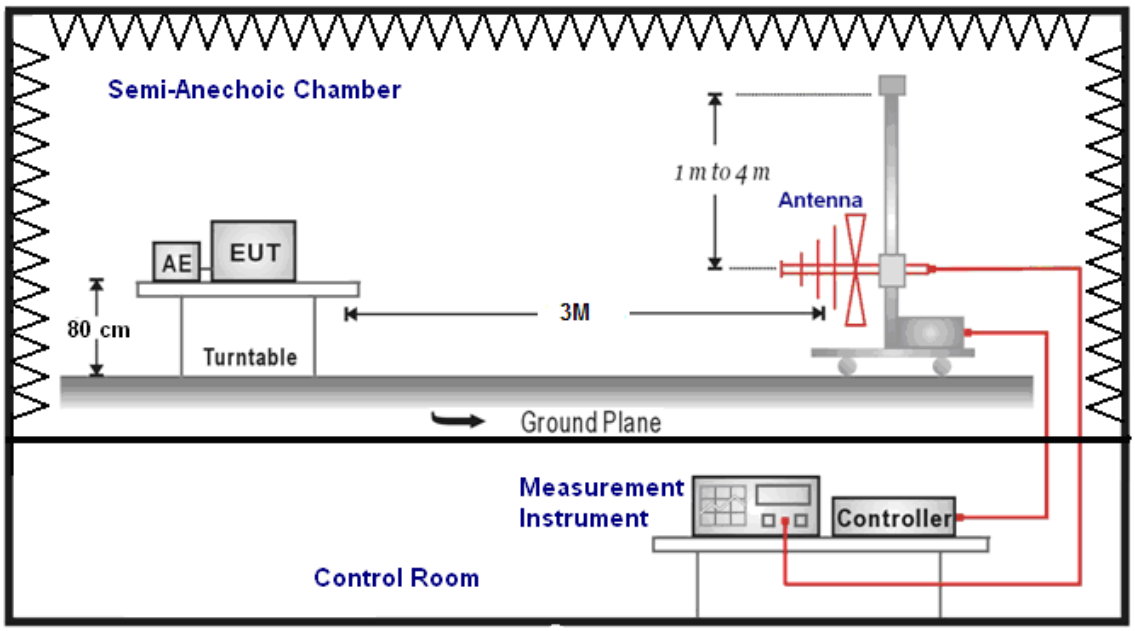
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

■ **Setup**

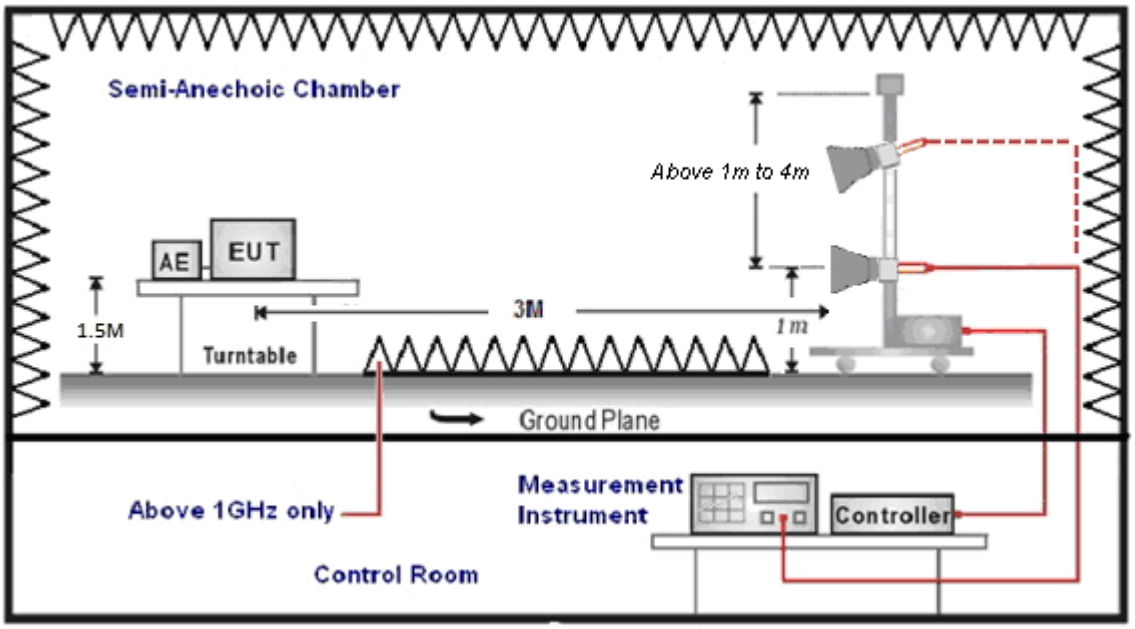
9kHz ~ 30MHz




Below 1GHz



Above 1GHz


Semi-Anechoic Chamber
Above 1m to 4m
AE
EUT
1.5M
3M
1 m
Turntable
Ground Plane
Above 1GHz only
Measurement
Instrument
Controller
Control Room

■ **Test Procedure**

Final radiation measurements were made on a three-meter, Semi Anechoic Chamber. The EUT system was placed on a nonconductive turntable which is 0.8 or 1.5 meters height(below 1GHz use 0.8m turntable / above 1GHz use 1.5m turntable), top surface 1.0 x 1.5 meter. The spectrum was examined from 250 MHz to 2.5 GHz in order to cover the whole spectrum below 10th harmonic which could generate from the EUT. During the test, EUT was set to transmit continuously & Measurements spectrum range from 9 kHz to 26.5 GHz is investigated.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

A nonconductive material surrounded the EUT to supporting the EUT for standing on tree orthogonal planes. At each condition, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

SCHWARZBECK MESS-ELEKTRONIK Biconilog Antenna at 3 Meter and the SCHWARZBECK Double Ridged Guide Antenna was used in frequencies 1 – 26.5 GHz at a distance of 1 meter. All test results were extrapolated to equivalent signal at 3 meters utilizing an inverse linear distance extrapolation Factor (20dB/decade).

For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. No post – detector video filters were used in the test.

The spectrum analyzer's 6 dB bandwidth was set to 1 MHz, and the analyzer was operated in the peak detection mode, for frequencies both below and up 1 GHz. The average levels were obtained by subtracting the duty cycle correction factor from the peak readings.

The following procedures were used to convert the emission levels measured in decibels referenced to 1 microvolt (dBuV) into field intensity in micro volts pre meter (uV/m).

The actual field intensity in decibels referenced to 1 microvolt in to field intensity in micro colts per meter (dBuV/m).

The actual field is intensity in referenced to 1 microvolt per meter (dBuV/m) is determined by algebraically adding the measured reading in dBuV, the antenna factor (dB), and cable loss (dB) and Subtracting the gain of preamplifier (dB) is auto calculate in spectrum analyzer.

(1) Amplitude (dBuV/m) = FI (dBuV) +AF (dBuV) +CL (dBuV)-Gain (dB)
FI= Reading of the field intensity.
AF= Antenna factor.
CL= Cable loss.
P.S Amplitude is auto calculate in spectrum analyzer.

(2) Actual Amplitude (dBuV/m) = Amplitude (dBuV)-Dis(dB)
The FCC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:
(a) For fundamental frequency : Transmitter Output < +30dBm
(b) For spurious frequency : Spurious emission limits = fundamental emission limit /10

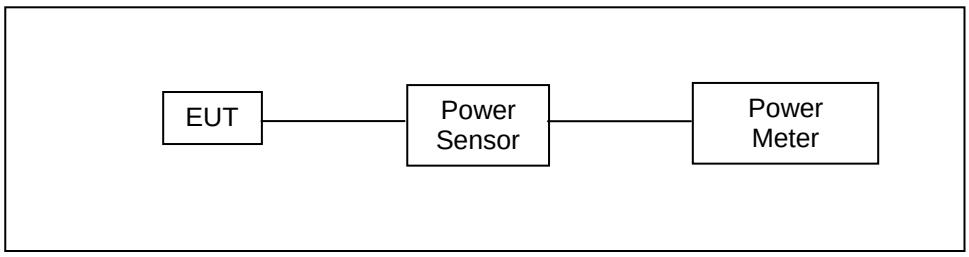
Data of measurement within this frequency range without mark in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

## 4.3. Maximum Conducted Output Power Measurement

■ **Limit**

For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels < 0.125 watt.

■ **Test Setup**




■ **Test Procedure**

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. The tests below are run with the EUT's transmitter set at high power in TX mode. The EUT is needed to force selection of output power level and channel number. While testing, EUT was set to transmit continuously. Remove the Subjective device's antenna and connect the RF output port to power sensor. The maximum peak output power shall not exceed 1 watt.

Use a direct connection between the antenna port of transmitter and the power sensor, for prevent the power sensor input attenuation 40-50 dB. Set the RBW Bandwidth of the emission or use a channel power meter mode.

For antennas with gains of 6 dBi or less, maximum allowed transmitter output is 1 watt (+30 dBm). For antennas with gains greater than 6 dBi, transmitter output level must be decreased by an amount equal to (GAIN - 6)/3 dBm.

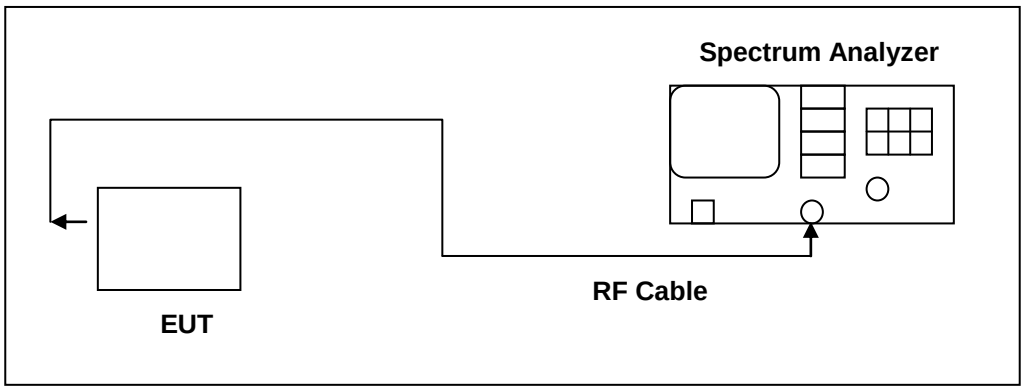
The antenna port of the EUT was connected to the input of a power sensor. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.

## 4.4. 20dB RF Bandwidth Measurement

■ **Limit**

N/A

■ **Test Setup**




■ **Test Procedure**

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage. The Bluetooth frequency hopping function of the EUT was enabled. The spectrum analyzer used the following settings:

1. Span = approx. 2 to 3 times the 20dB bandwidth, centered on a hopping frequency
2. RBW ≥ 1% of the 20dB span
3. VBW ≥ RBW
4. Sweep = auto
5. Detector function = peak
6. Trace = max hold

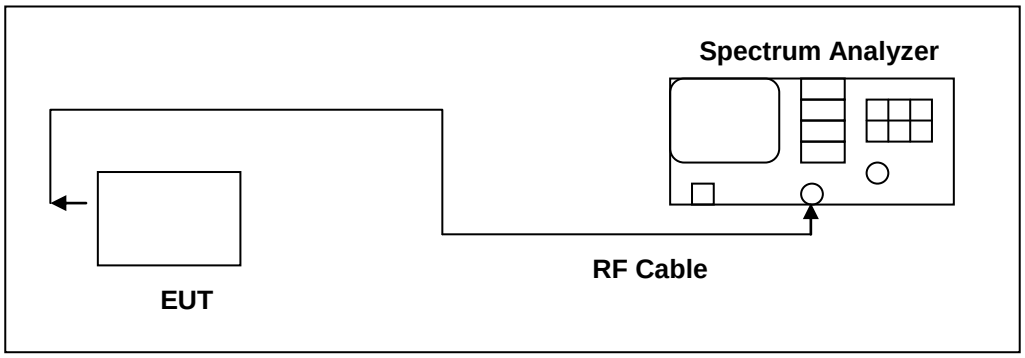
The trace was allowed to stabilize. The EUT was transmitting at its maximum data rate. The marker-to-peak function was used to set the marker to the peak of the emission. The marker-delta function was used to measure 20dB down one side of the emission. The marker-delta function and marker was moved to the other side of the emission until it was even with the reference marker. The marker-delta reading at this point was the 20dB bandwidth of the emission.

## 4.5. Carrier Frequency Separation Measurement

■ **Limit**

Title 47 of the CFR, Part 15 Subpart (c) 15.247(a)(1) requires the measurement of the bandwidth of the transmission between the -20 dB points on the transmitted spectrum. The results of this test determine the limits for channel spacing. The channel spacing shall be a minimum of 25 kHz or the 20 dB bandwidth, whichever is greater. 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.

■ **Test Setup**




■ **Test Procedure**

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage. The Bluetooth frequency hopping function of the EUT was enabled. The following spectrum analyzer settings were used:

1. Span = wide enough to capture the peaks of two adjacent channels
2. Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span
3. Video (or Average) Bandwidth (VBW) ≥ RBW
4. Sweep = auto
5. Detector function = peak
6. Trace = max hold

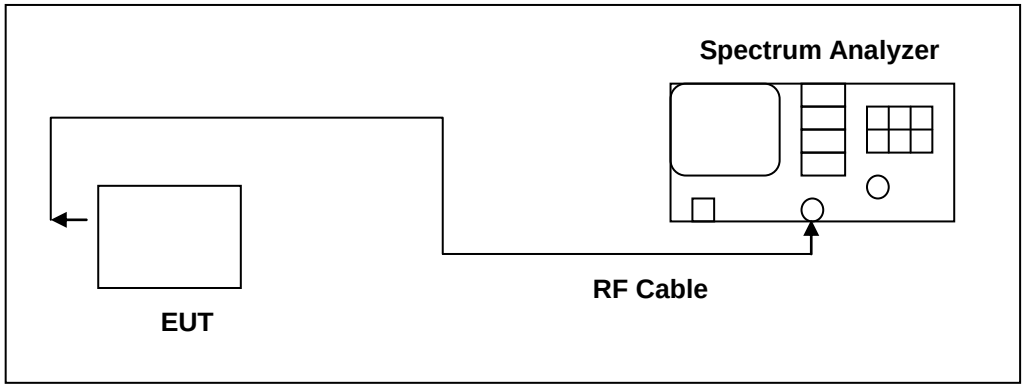
The trace was allowed to stabilize. The marker-delta function was used to determine the separation between the peaks of the adjacent channels.

## 4.6. Number of Hopping Measurement

■ **Limit**

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

■ **Test Setup**




■ **Test Procedure**

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage. The Bluetooth frequency hopping function of the EUT was enabled. The spectrum analyzer used the following settings:

1. Span = the frequency band of operation
2. RBW ≥ 1% of the span
3. VBW ≥ RBW
4. Sweep = auto
5. Detector function = peak
6. Trace = max hold

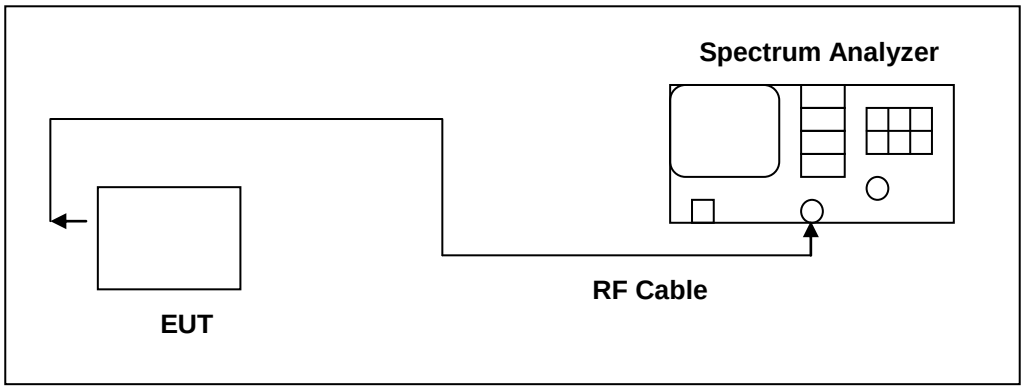
The trace was allowed to stabilize.

## 4.7. Time of Occupancy (Dwell Time) Measurement

■ **Limit**

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.

■ **Test Setup**




■ **Test Procedure**

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. The RF output port of the Equipment-Under-Test is directly coupled to the input of the spectrum through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage. The Bluetooth hopping function of the EUT was enabled. The following spectrum analyzer settings were used:

1. Span = zero span, centered on a hopping channel
2. RBW = 1 MHz
3. VBW ≥ RBW
4. Sweep = as necessary to capture the entire dwell time per hopping channel
5. Detector function = peak
6. Trace = max hold

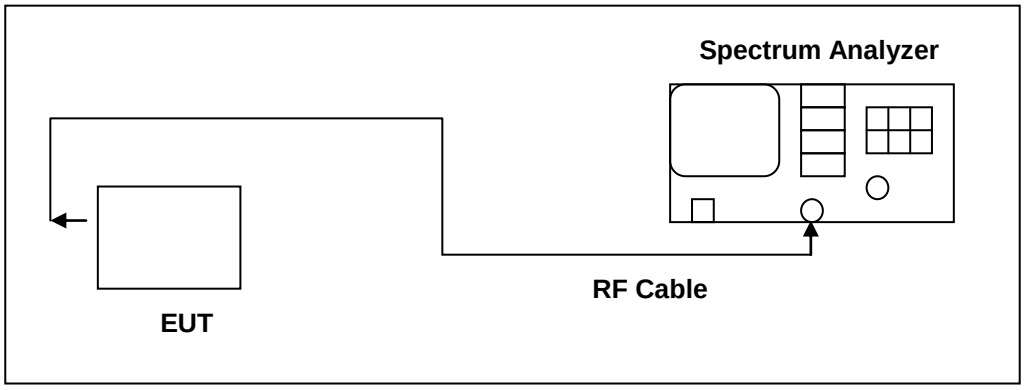
The marker-delta function was used to determine the dwell time.

## 4.8. Out of Band Conducted Emissions Measurement

■ **Limit**

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

■ **Test Setup**




■ **Test Procedure**

Testing must be done according to this procedure, FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems. This is the only method recognized by the FCC. In any 100 kHz bandwidth outside the EUT pass band, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20 dB below that of the maximum in-band 100 kHz emission, antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.
All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the pass band. The test was performed at 3 channels (Channel 0, 39, 78)

## 4.9. Antenna Measurement

- **Limit**

For intentional device, according to 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.

And According to 15.247 (b)(4), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

- **Antenna Connector Construction**

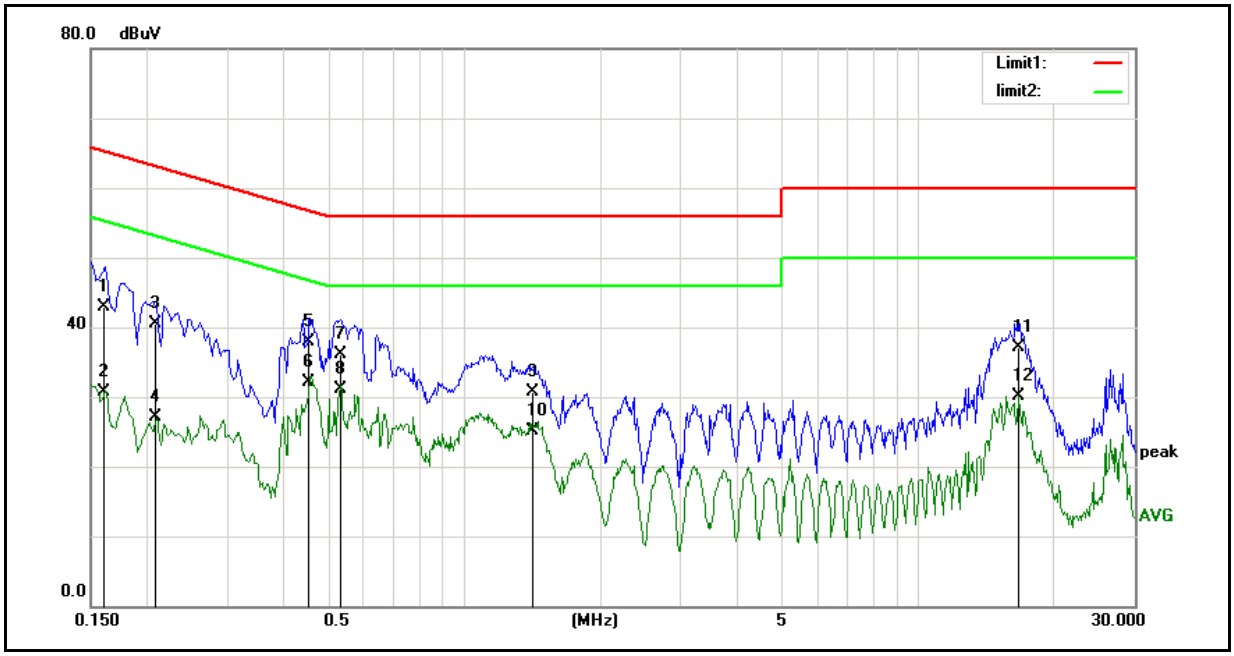
See section 2 – antenna information.

# 5 Test Results

## Annex A. Conducted Emission

■ **Test Result**

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Line: | L1 |
| Test item: | Conducted Emission | Power: | AC 120V/60Hz |
| Test Mode: | Mode 1 | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Description: | | | |

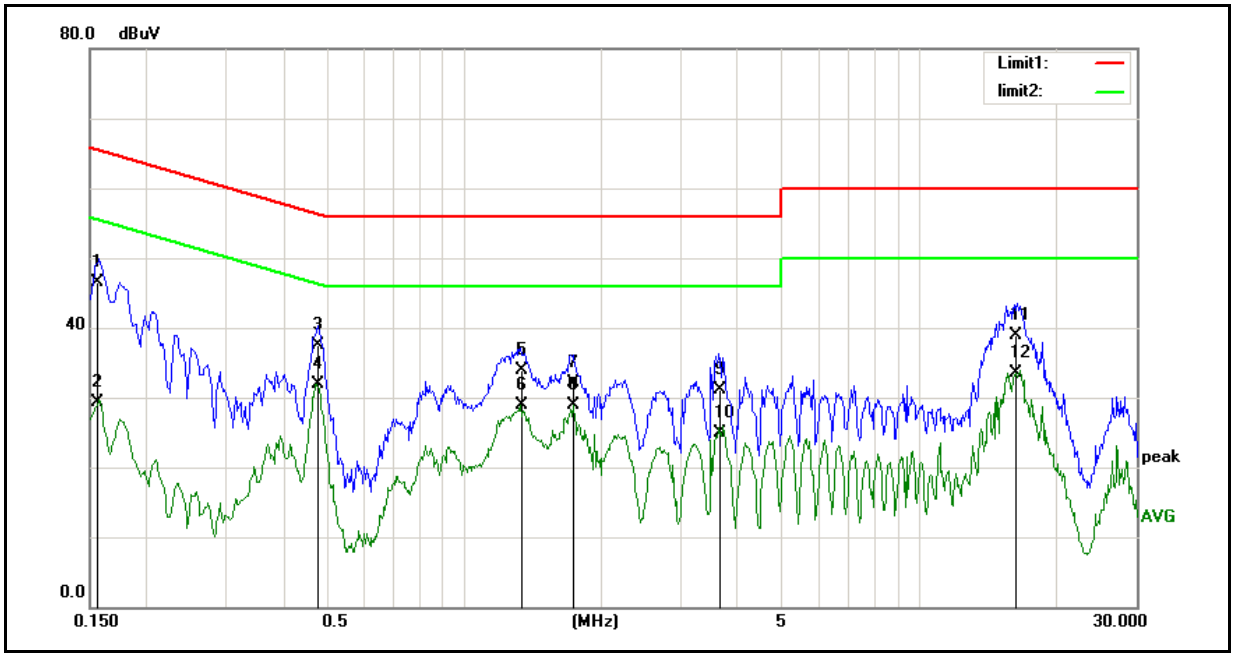



| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 0.1602 | 31.54 | 11.40 | 42.94 | 65.45 | -22.51 | QP |
| 2 | 0.1602 | 19.24 | 11.40 | 30.64 | 55.45 | -24.81 | AVG |
| 3 | 0.2091 | 29.49 | 11.06 | 40.55 | 63.24 | -22.69 | QP |
| 4 | 0.2091 | 16.13 | 11.06 | 27.19 | 53.24 | -26.05 | AVG |
| 5 | 0.4566 | 27.66 | 10.24 | 37.90 | 56.75 | -18.85 | QP |
| 6 | 0.4566 | 21.87 | 10.24 | 32.11 | 46.75 | -14.64 | AVG |
| 7 | 0.5347 | 26.01 | 10.17 | 36.18 | 56.00 | -19.82 | QP |
| 8 | 0.5347 | 20.94 | 10.17 | 31.11 | 46.00 | -14.89 | AVG |
| 9 | 1.4156 | 20.56 | 10.10 | 30.66 | 56.00 | -25.34 | QP |
| 10 | 1.4156 | 15.03 | 10.10 | 25.13 | 46.00 | -20.87 | AVG |
| 11 | 16.6040 | 27.03 | 10.16 | 37.19 | 60.00 | -22.81 | QP |
| 12 | 16.6040 | 19.88 | 10.16 | 30.04 | 50.00 | -19.96 | AVG |

Note: 1. Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Line: | N |
| Test item: | Conducted Emission | Power: | AC 120V/60Hz |
| Test Mode: | Mode 1 | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Description: | | | |




| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 0.1553 | 34.99 | 11.43 | 46.42 | 65.71 | -19.29 | QP |
| 2 | 0.1553 | 17.81 | 11.43 | 29.24 | 55.71 | -26.47 | AVG |
| 3 | 0.4757 | 27.25 | 10.21 | 37.46 | 56.41 | -18.95 | QP |
| 4 | 0.4757 | 21.77 | 10.21 | 31.98 | 46.41 | -14.43 | AVG |
| 5 | 1.3444 | 23.73 | 10.10 | 33.83 | 56.00 | -22.17 | QP |
| 6 | 1.3444 | 18.87 | 10.10 | 28.97 | 46.00 | -17.03 | AVG |
| 7 | 1.7419 | 21.91 | 10.11 | 32.02 | 56.00 | -23.98 | QP |
| 8 | 1.7419 | 18.77 | 10.11 | 28.88 | 46.00 | -17.12 | AVG |
| 9 | 3.6433 | 20.91 | 10.15 | 31.06 | 56.00 | -24.94 | QP |
| 10 | 3.6433 | 14.73 | 10.15 | 24.88 | 46.00 | -21.12 | AVG |
| 11 | 16.3259 | 28.78 | 10.16 | 38.94 | 60.00 | -21.06 | QP |
| 12 | 16.3259 | 23.29 | 10.16 | 33.45 | 50.00 | -16.55 | AVG |

Note: 1. Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

# Annex B. Conducted Test Results

■ **Test Result**

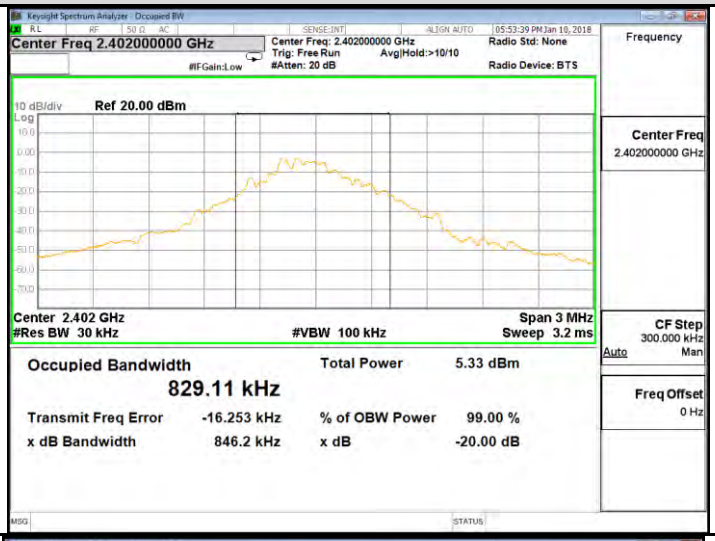
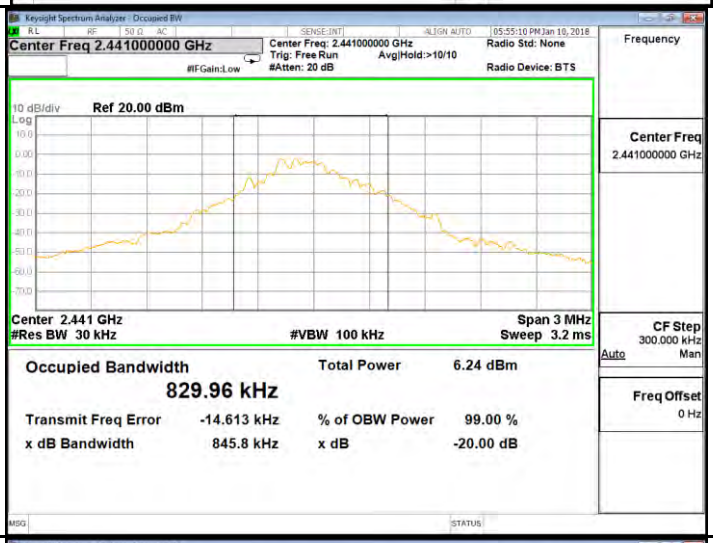
| Test Item | 20dB RF Bandwidth Measurement | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Mode | Frequency (MHz) | Packet Type | Average Power | | Peak Power | | Limit (W) |
| | | | (dBm) | (W) | (dBm) | (W) | |
| Mode 2 | 2402 | DH1 | -4.45 | 0.00036 | -3.97 | 0.00040 | < 0.125 |
| | | DH3 | -4.30 | 0.00037 | -3.92 | 0.00041 | < 0.125 |
| | | DH5 | -4.26 | 0.00037 | -3.87 | 0.00041 | < 0.125 |
| | 2441 | DH1 | -3.86 | 0.00041 | -3.39 | 0.00046 | < 0.125 |
| | | DH3 | -3.72 | 0.00042 | -3.31 | 0.00047 | < 0.125 |
| | | DH5 | -3.69 | 0.00043 | -3.28 | 0.00047 | < 0.125 |
| | 2480 | DH1 | -2.71 | 0.00054 | -2.26 | 0.00059 | < 0.125 |
| | | DH3 | -2.57 | 0.00055 | -2.23 | 0.00060 | < 0.125 |
| | | DH5 | **-2.55** | **0.00056** | **-2.18** | **0.00061** | < 0.125 |
| Mode 3 | 2402 | 2DH1 | -4.13 | 0.00039 | -0.61 | 0.00087 | < 0.125 |
| | | 2DH3 | -4.11 | 0.00039 | -0.59 | 0.00087 | < 0.125 |
| | | 2DH5 | -4.03 | 0.00040 | -0.54 | 0.00088 | < 0.125 |
| | 2441 | 2DH1 | -3.64 | 0.00043 | -0.18 | 0.00096 | < 0.125 |
| | | 2DH3 | -3.56 | 0.00044 | -0.04 | 0.00099 | < 0.125 |
| | | 2DH5 | -3.52 | 0.00044 | 0.09 | 0.00102 | < 0.125 |
| | 2480 | 2DH1 | -2.46 | 0.00057 | 0.93 | 0.00124 | < 0.125 |
| | | 2DH3 | -2.39 | 0.00058 | 1.01 | 0.00126 | < 0.125 |
| | | 2DH5 | **-2.34** | **0.00058** | **1.13** | **0.00130** | < 0.125 |
| Mode 4 | 2402 | 3DH1 | -3.95 | 0.00040 | -0.42 | 0.00091 | < 0.125 |
| | | 3DH3 | -3.93 | 0.00040 | -0.42 | 0.00091 | < 0.125 |
| | | 3DH5 | -3.83 | 0.00041 | -0.39 | 0.00091 | < 0.125 |
| | 2441 | 3DH1 | -3.49 | 0.00045 | 0.09 | 0.00102 | < 0.125 |
| | | 3DH3 | -3.45 | 0.00045 | 0.13 | 0.00103 | < 0.125 |
| | | 3DH5 | -3.41 | 0.00046 | 0.16 | 0.00104 | < 0.125 |
| | 2480 | 3DH1 | -2.29 | 0.00059 | 1.32 | 0.00136 | < 0.125 |
| | | 3DH3 | -2.25 | 0.00060 | 1.37 | 0.00137 | < 0.125 |
| | | 3DH5 | **-2.22** | **0.00060** | **1.49** | **0.00141** | < 0.125 |

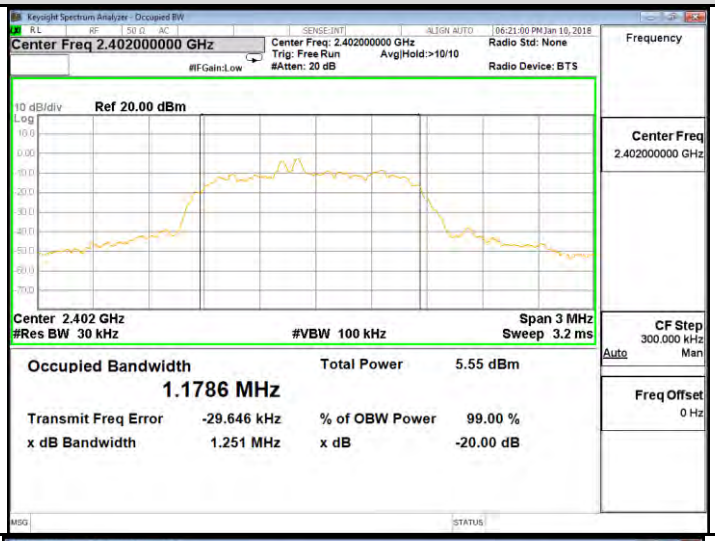
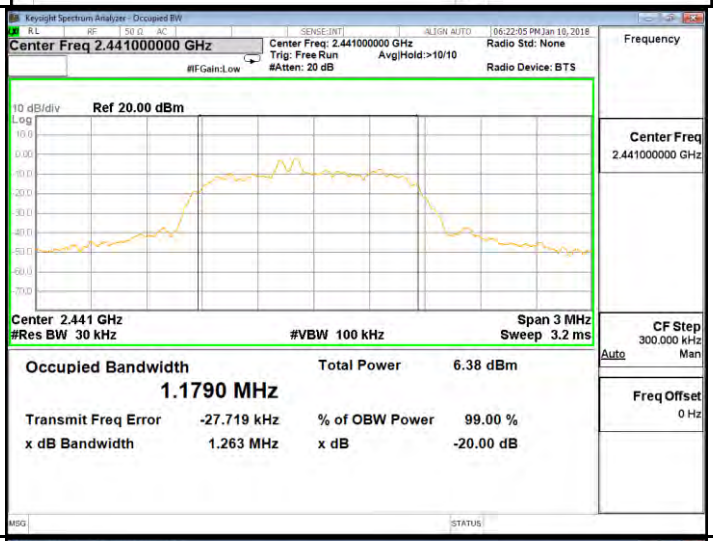
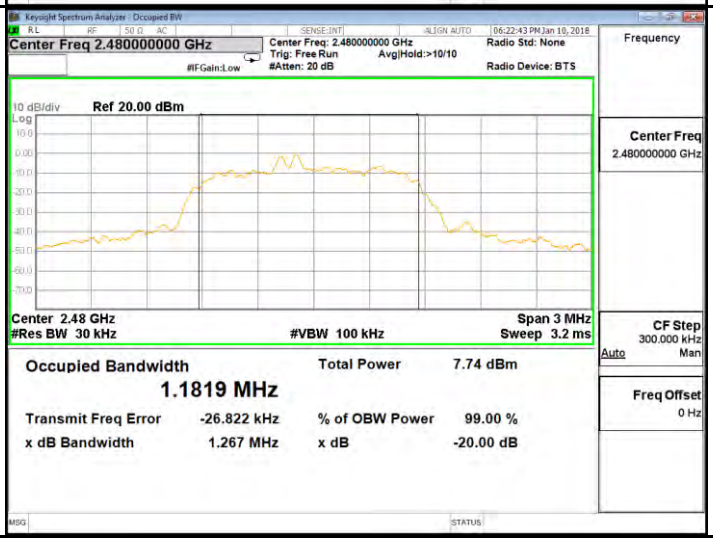
Note: The relevant measured result has the offset with cable loss already.

■ **Test Result**

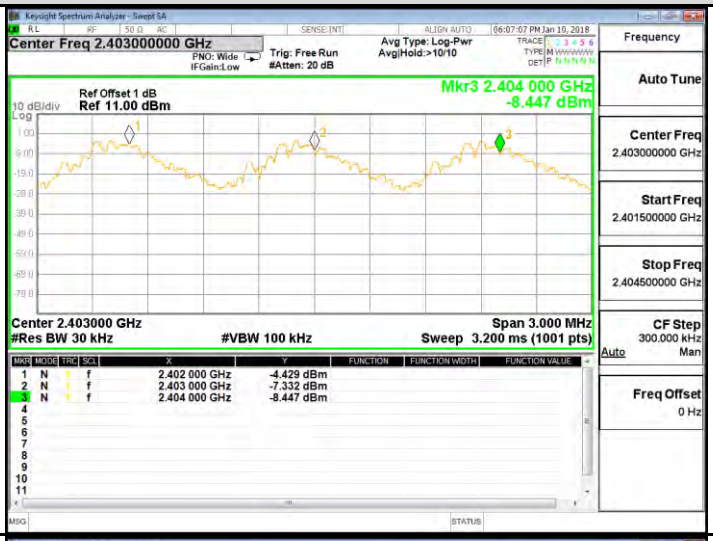
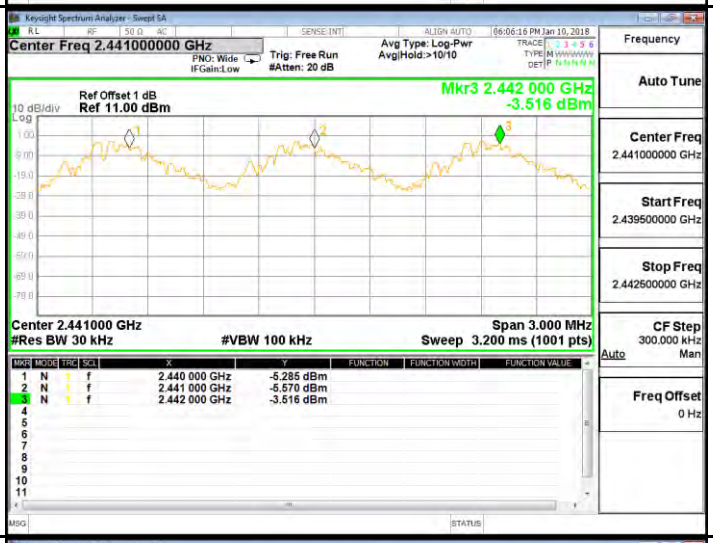
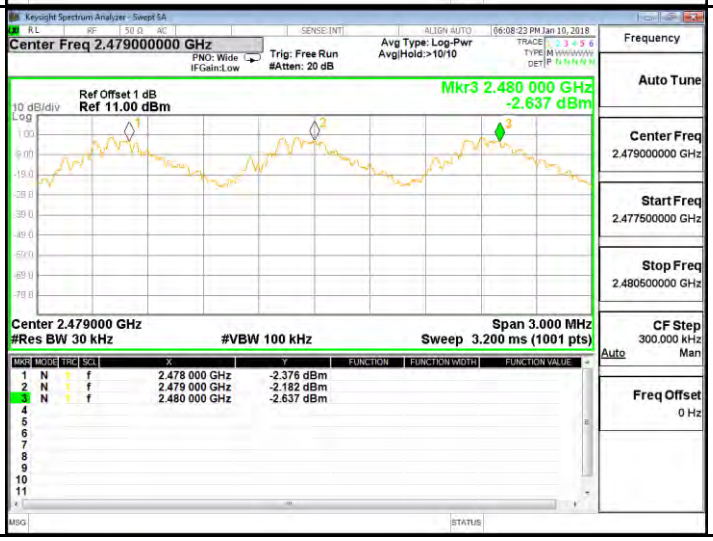
| Test Item | 20dB RF Bandwidth Measurement | |
|---|---|---|
| Test Mode | Frequency (MHz) | Measurement Results (kHz) |
| Mode 2 | 2402 | 846.2 |
| | 2441 | 845.8 |
| | 2480 | 844.4 |
| Mode 4 | 2402 | 1251 |
| | 2441 | 1263 |
| | 2480 | 1267 |

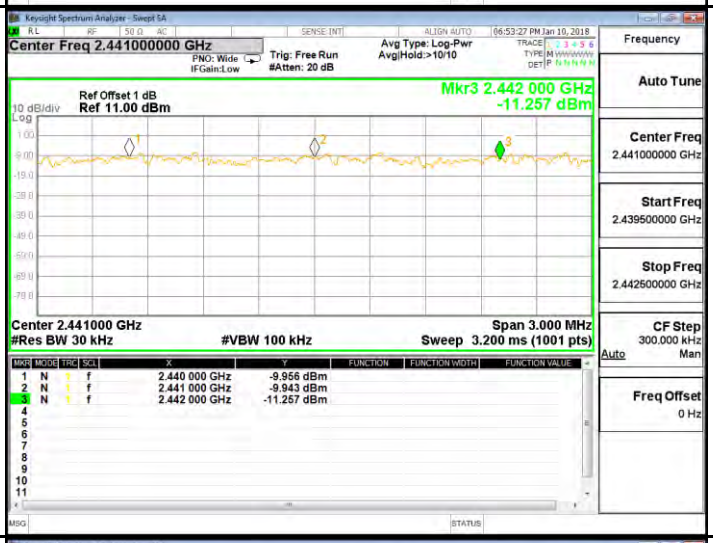
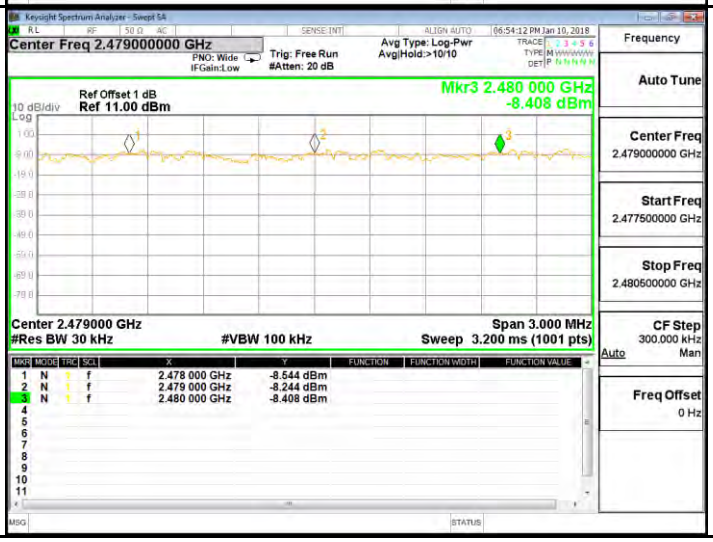
■ **Test Graphs**

| Test Item | 20dB RF Bandwidth Measurement | |
|---|---|---|
| Mode 2: GFSK Continuous TX mode | | |
| 2402 MHz |  | |
| 2441 MHz |  | |
| 2480 MHz |  | |

| Test Item | 20dB RF Bandwidth Measurement |
|---|---|
| Mode 4: 8DPSK Continuous TX mode | |
| 2402 MHz |  |
| 2441 MHz |  |
| 2480 MHz |  |

■ **Test Graphs**

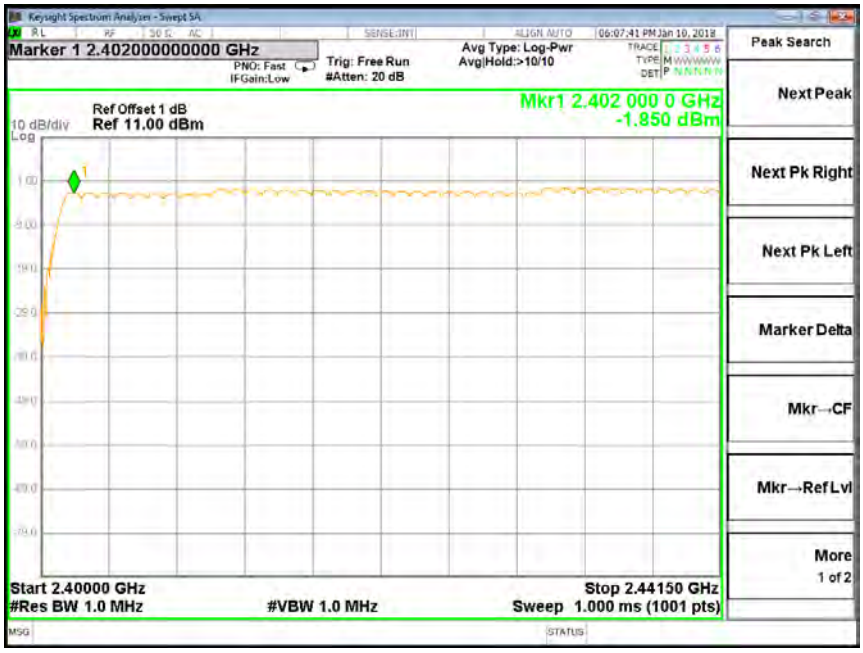
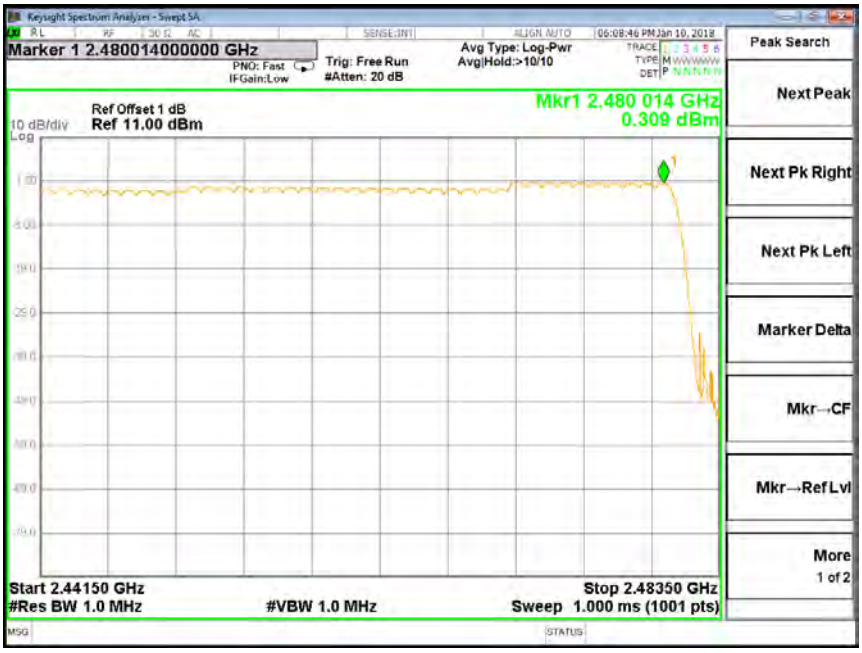
| Test Item | Carrier Frequency Separation Measurement | |
|---|---|---|
| Mode 2: GFSK Continuous TX mode | | |
| 2402 MHz |  | |
| 2441 MHz |  | |
| 2480 MHz |  | |

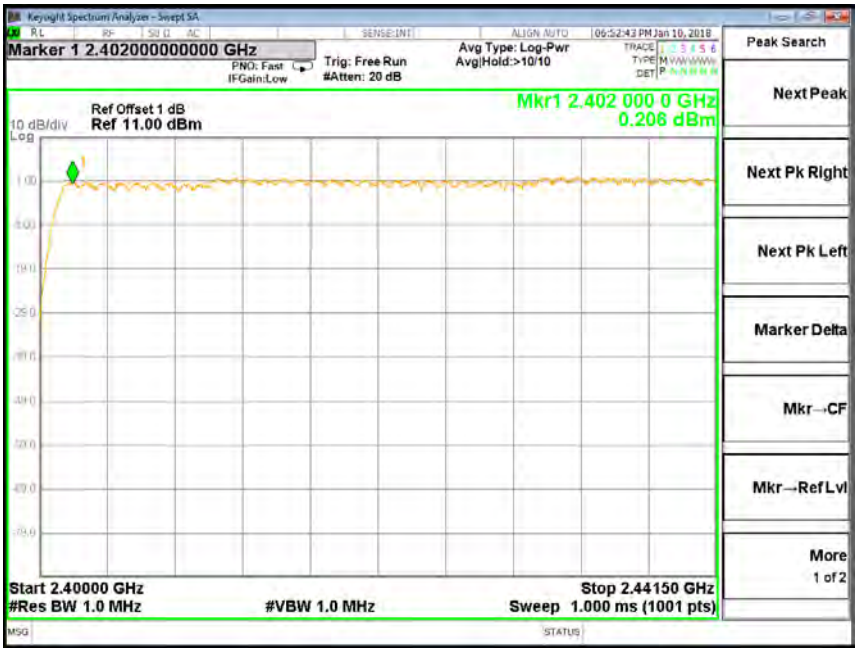
| Test Item | Carrier Frequency Separation Measurement | |
|---|---|---|
| Mode 4: 8DPSK Continuous TX mode | | |
| 2402 MHz | |  |
| 2441 MHz | |  |
| 2480 MHz | |  |

■ **Test Result**

| Test Item | Number of Hopping Measurement | | |
|---|---|---|---|
| Test Mode | Frequency Range (MHz) | Measurement Results (Ch) | Limit (ch) |
| Mode 2 | 2402 - 2480 | 79 | > 15 |
| Mode 4 | 2402 - 2480 | 79 | > 15 |

■ **Test Graphs**

| Test Item | Number of Hopping Measurement |
|---|---|
| Mode 2: GFSK Continuous TX mode | |
| CH0~CH39 |  |
| CH40~CH78 |  |

| Test Item | Number of Hopping Measurement |
|---|---|
| Mode 4: 8DPSK Continuous TX mode | |
| CH0~CH39 |  |
| CH40~CH78 |  |

■ **Test Result**

| Test Item | Time of Occupancy (Dwell Time) Measurement |
|---|---|
| Mode 2: GFSK Continuous TX mode | |
| DH1 | |
| Cycle Calculate | 79CH * 0.4 = 31.6 (sec) |
| The EUT Hopping Number per Sec | 1600 times/sec |
| Each Channel Dwell Times per Sec | 800/79CH = 10.13(times/sec) |
| Each Channel Dwell Times on Cycle(1) | 31.6 * 10.13 = 320.108(times) |
| Each Channel Dwell Times (2) | 0.45 ms (sec) |
| Dwell Times on Cycle (1) * (2) | 144.05 ms (sec) |
| LIMIT(msec) | < = 400 |
| DH3 | |
| Cycle Calculate | 79CH * 0.4 = 31.6 (sec) |
| The EUT Hopping Number per Sec | 1600 times/sec |
| Each Channel Dwell Times per Sec | 400/79CH = 5.1(times/sec) |
| Each Channel Dwell Times on Cycle(1) | 31.6 * 5.1 = 161.16(times) |
| Each Channel Dwell Times (2) | 1.7 ms (sec) |
| Dwell Times on Cycle (1) * (2) | 271.82 ms (sec) |
| LIMIT(msec) | < = 400 |
| DH5 | |
| Cycle Calculate | 79CH * 0.4 = 31.6 (sec) |
| The EUT Hopping Number per Sec | 1600 times/sec |
| Each Channel Dwell Times per Sec | 266.7/79CH = 3.37(times/sec) |
| Each Channel Dwell Times on Cycle(1) | 31.6 * 3.37 = 106.492(times) |
| Each Channel Dwell Times (2) | 2.96 ms (sec) |
| Dwell Times on Cycle (1) * (2) | 316.15 ms (sec) |
| LIMIT(msec) | < = 400 |

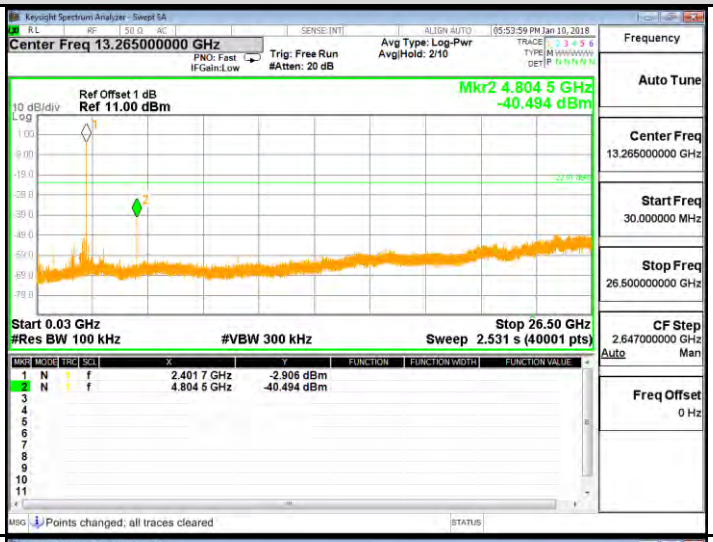
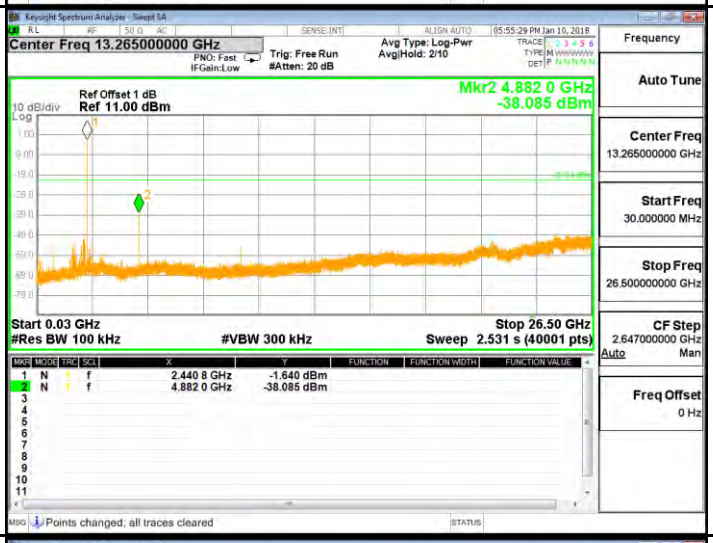
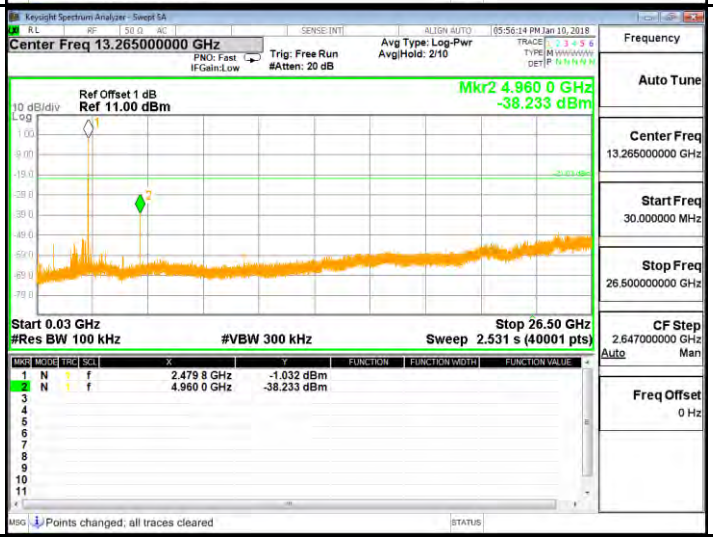
| Test Item | Time of Occupancy (Dwell Time) Measurement |
|---|---|
| Mode 4: 8DPSK Continuous TX mode | |
| 3DH1 | |
| Cycle Calculate | 79CH * 0.4 = 31.6 (sec) |
| The EUT Hopping Number per Sec | 1600 times/sec |
| Each Channel Dwell Times per Sec | 800/79CH = 10.13(times/sec) |
| Each Channel Dwell Times on Cycle(1) | 31.6 * 10.13 = 320.108(times) |
| Each Channel Dwell Times (2) | 0.45 ms (sec) |
| Dwell Times on Cycle (1) * (2) | 144.05 ms (sec) |
| LIMIT(msec) | < = 400 |
| 3DH3 | |
| Cycle Calculate | 79CH * 0.4 = 31.6 (sec) |
| The EUT Hopping Number per Sec | 1600 times/sec |
| Each Channel Dwell Times per Sec | 400/79CH = 5.1(times/sec) |
| Each Channel Dwell Times on Cycle(1) | 31.6 * 5.1 = 161.16(times) |
| Each Channel Dwell Times (2) | 1.7 ms (sec) |
| Dwell Times on Cycle (1) * (2) | 271.82 ms (sec) |
| LIMIT(msec) | < = 400 |
| 3DH5 | |
| Cycle Calculate | 79CH * 0.4 = 31.6 (sec) |
| The EUT Hopping Number per Sec | 1600 times/sec |
| Each Channel Dwell Times per Sec | 266.7/79CH = 3.37(times/sec) |
| Each Channel Dwell Times on Cycle(1) | 31.6 * 3.37 = 106.492(times) |
| Each Channel Dwell Times (2) | 2.96 ms (sec) |
| Dwell Times on Cycle (1) * (2) | 316.15 ms (sec) |
| LIMIT(msec) | < = 400 |

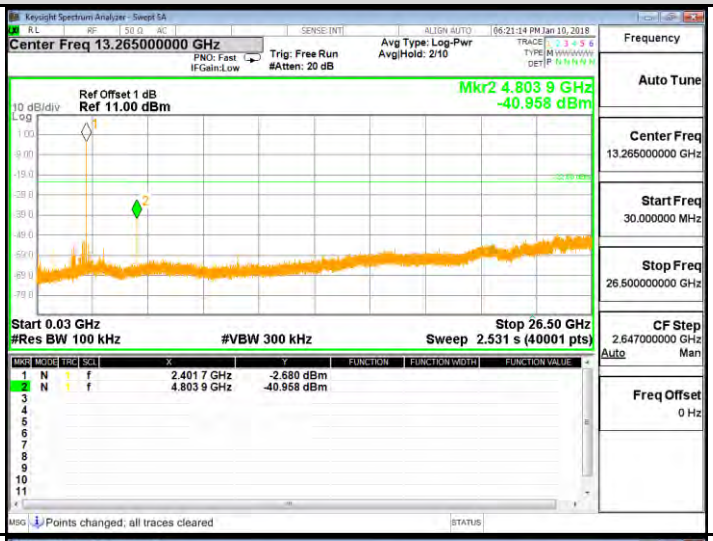
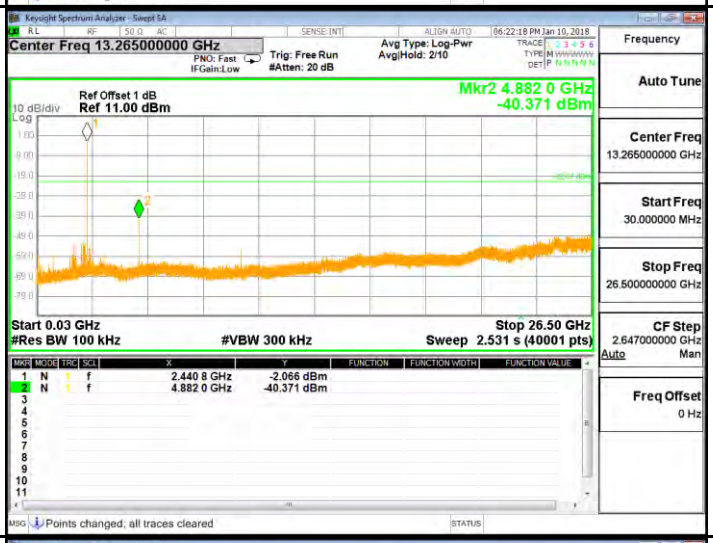
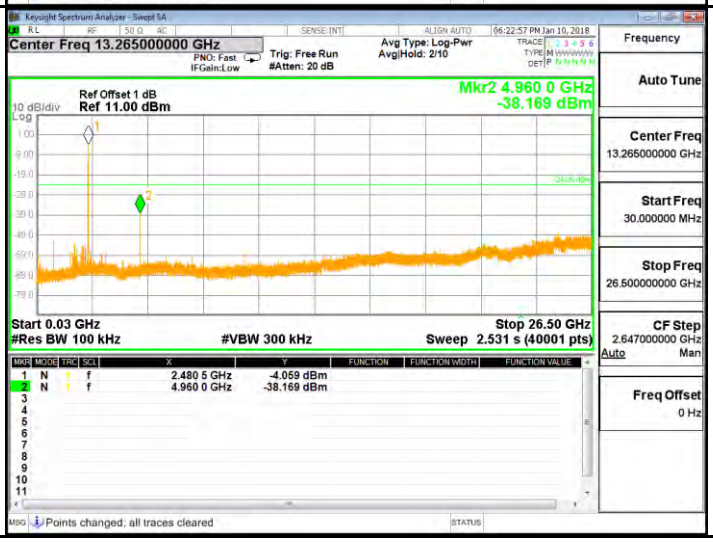
■ **Test Graphs**

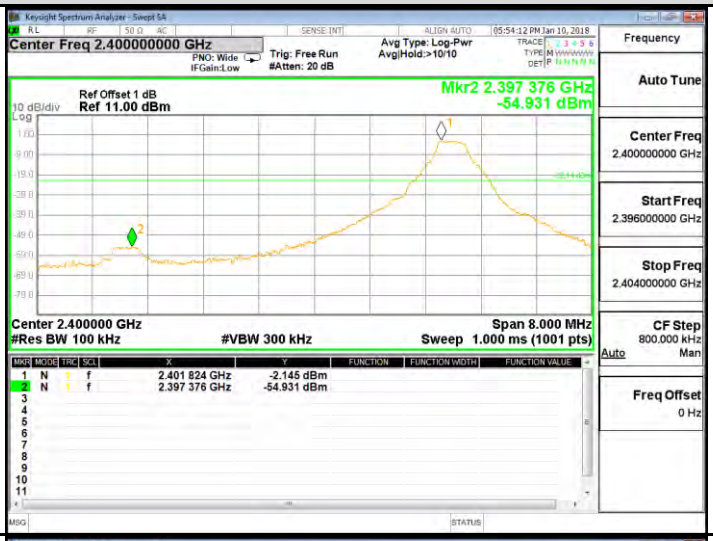
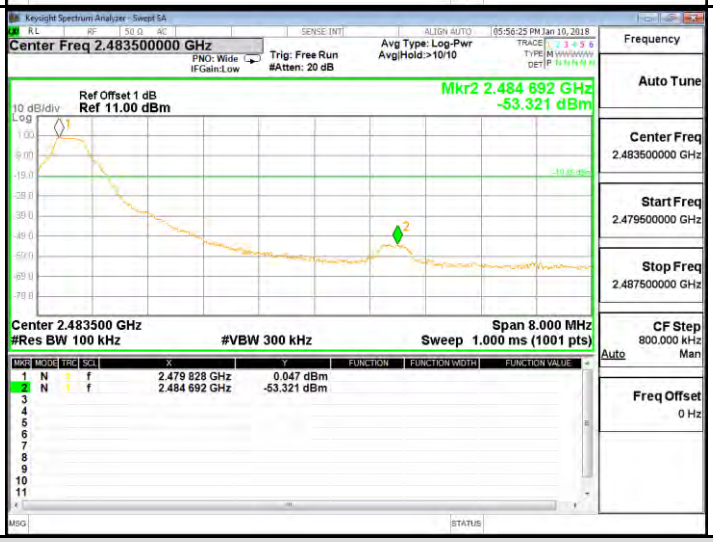
| Test Item | Time of Occupancy (Dwell Time) Measurement |
|---|---|
| Mode 2: GFSK Continuous TX mode | |
| DH1 |  |
| DH3 |  |
| DH5 |  |

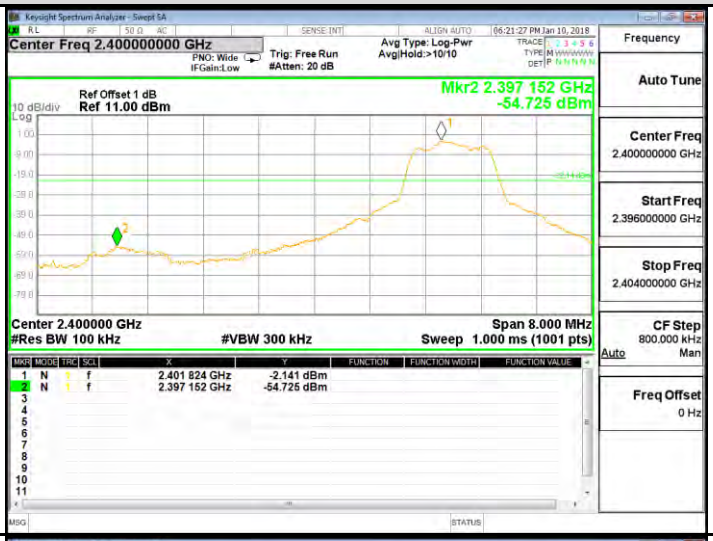
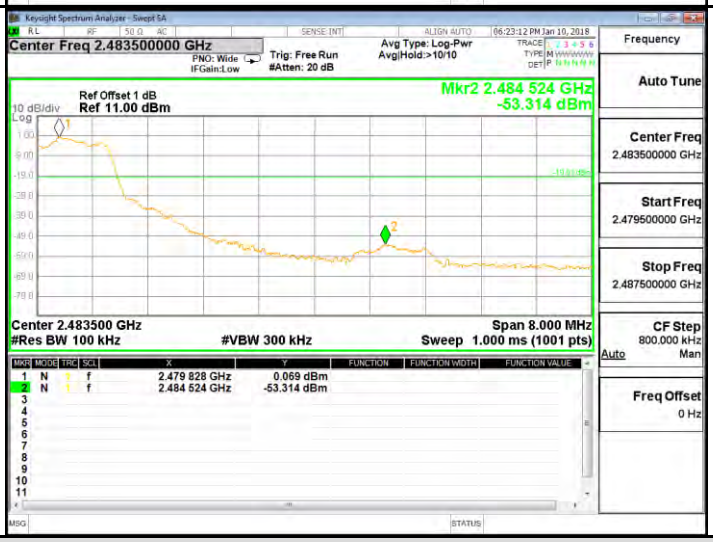
| Test Item | Time of Occupancy (Dwell Time) Measurement |
|---|---|
| Mode 4: 8DPSK Continuous TX mode | |
| DH1 |  |
| DH3 |  |
| DH5 |  |

■ **Test Graphs**

| Test Item | Out of Band Conducted Emissions Measurement | |
|---|---|---|
| Mode 2: GFSK Continuous TX mode | | |
| 2402 MHz |  | |
| 2441 MHz |  | |
| 2480 MHz |  | |

| Test Item | Out of Band Conducted Emissions Measurement | |
|---|---|---|
| Mode 4: 8DPSK Continuous TX mode | | |
| 2402 MHz |  | |
| 2441 MHz |  | |
| 2480 MHz |  | |

| Test Item | Out of Band Conducted Emissions Measurement |
|---|---|
| Mode 2: GFSK Continuous TX mode _ Un-hopping | |
| 2402 MHz |  |
| 2480 MHz |  |
| Mode 2: GFSK Continuous TX mode _ Hopping | |
| 2402 ~ 2480 MHz |  |

| Test Item | Out of Band Conducted Emissions Measurement |
|---|---|
| Mode 4: 8DPSK Continuous TX mode _ Un-hopping | |
| 2402 MHz |  |
| 2480 MHz |  |
| Mode 4: 8DPSK Continuous TX mode _ Hopping | |
| 2402 ~ 2480 MHz |  |

# Annex C. Radiated Emission Measurement

**Below 1GHz**

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Harmonic | Power: | DC 3.7V |
| Test Mode: | Mode 1 | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |

| Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Ant.Polar. H / V |
|---|---|---|---|---|---|---|---|
| 55.2207 | 34.58 | -12.29 | 22.29 | 40.00 | -17.71 | QP | H |
| 131.7575 | 37.05 | -12.08 | 24.97 | 43.50 | -18.53 | QP | H |
| 360.4476 | 32.76 | -8.67 | 24.09 | 46.00 | -21.91 | QP | H |
| 520.8881 | 28.25 | -4.99 | 23.26 | 46.00 | -22.74 | QP | H |
| 625.0778 | 28.47 | -3.13 | 25.34 | 46.00 | -20.66 | QP | H |
| 833.3170 | 27.30 | 0.59 | 27.89 | 46.00 | -18.11 | QP | H |
| 70.5836 | 36.88 | -13.45 | 23.43 | 40.00 | -16.57 | QP | V |
| 107.5100 | 40.42 | -14.82 | 25.60 | 43.50 | -17.90 | QP | V |
| 432.5457 | 28.67 | -6.19 | 22.48 | 46.00 | -23.52 | QP | V |
| 487.3149 | 29.65 | -5.23 | 24.42 | 46.00 | -21.58 | QP | V |
| 607.7866 | 28.38 | -2.93 | 25.45 | 46.00 | -20.55 | QP | V |
| 827.4932 | 28.11 | 0.55 | 28.66 | 46.00 | -17.34 | QP | V |

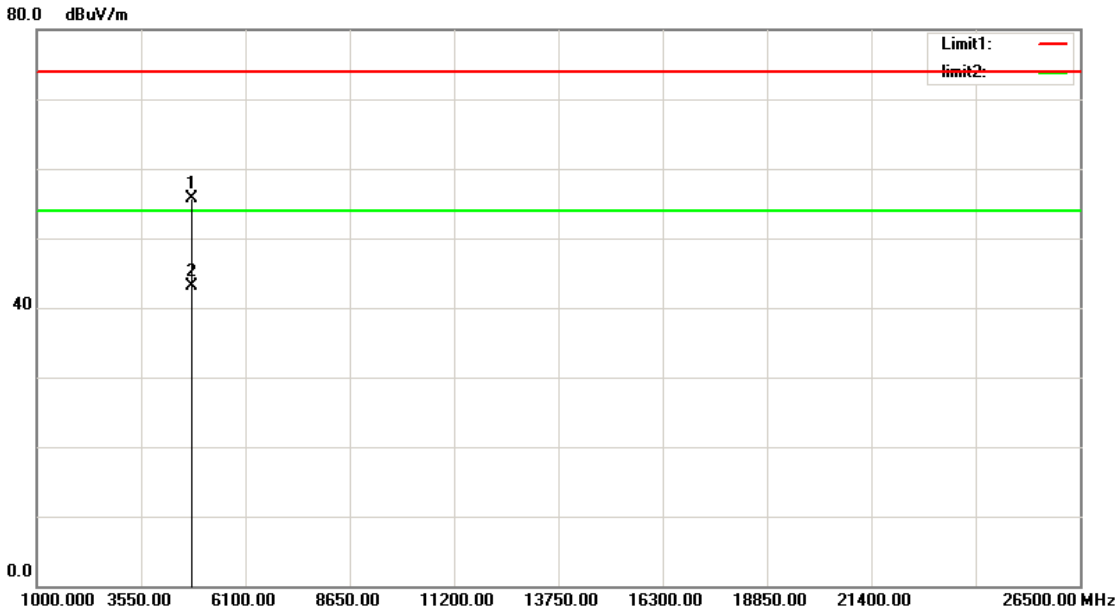
Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.

**Above 1GHz**

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Harmonic | Power: | DC 3.7V |
| Frequency: | 2402MHz | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | Mode 2 | Ant.Polar.: | Horizontal |



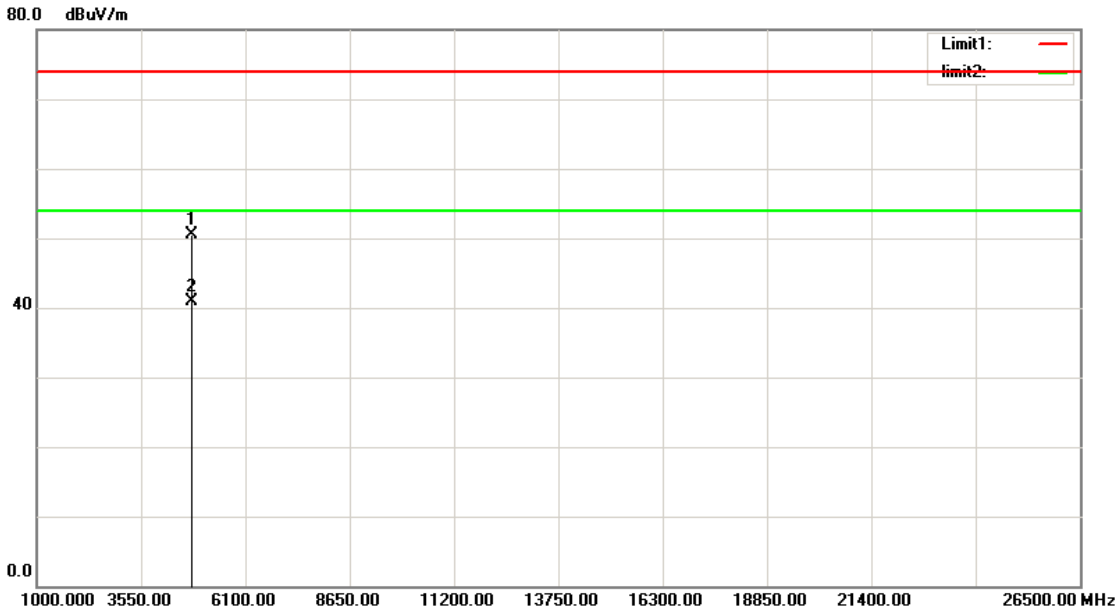

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 4804.000 | 60.14 | -4.35 | 55.79 | 74.00 | -18.21 | peak |
| 2 | 4804.000 | 47.42 | -4.35 | 43.07 | 54.00 | -10.93 | AVG |

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Harmonic | Power: | DC 3.7V |
| Frequency: | 2402MHz | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | Mode 2 | Ant.Polar.: | Vertical |



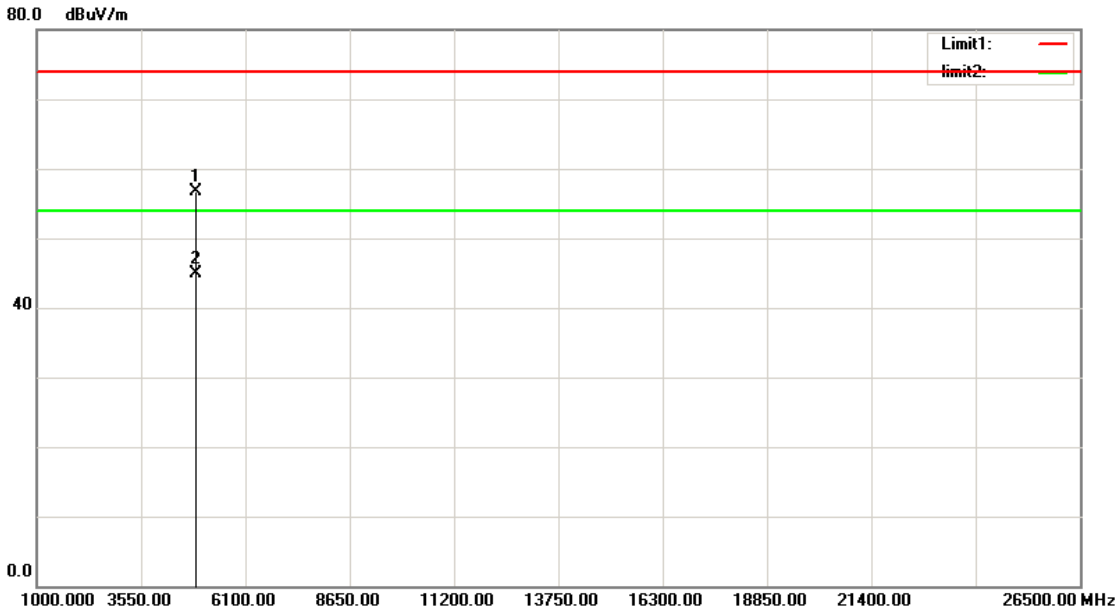

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 4804.000 | 54.86 | -4.35 | 50.51 | 74.00 | -23.49 | peak |
| 2 | 4804.000 | 45.31 | -4.35 | 40.96 | 54.00 | -13.04 | AVG |

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Harmonic | Power: | DC 3.7V |
| Frequency: | 2441MHz | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | Mode 2 | Ant.Polar.: | Horizontal |



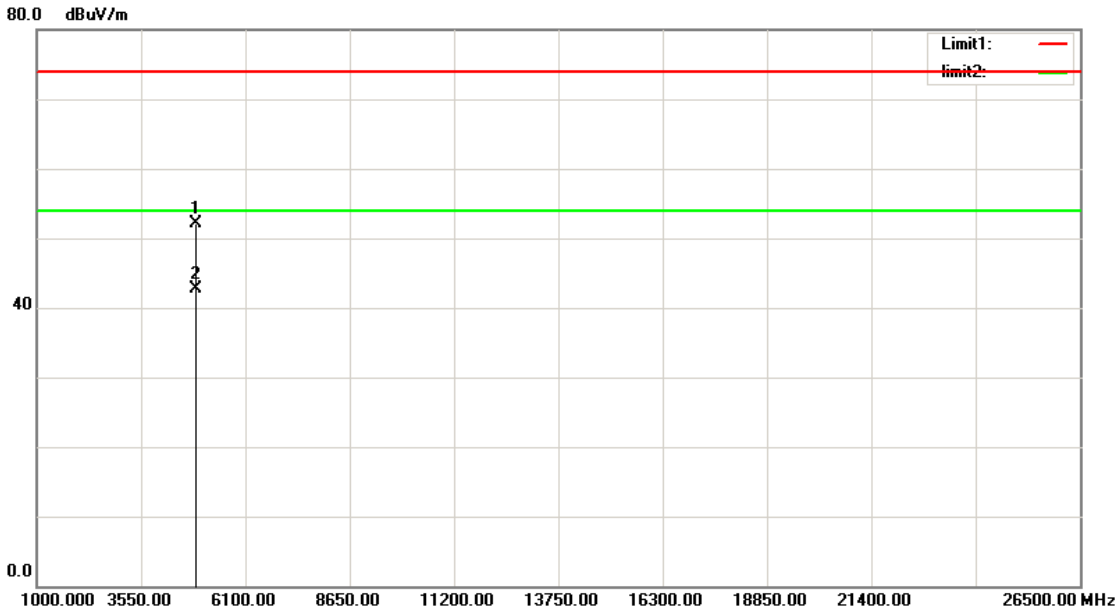

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 4882.000 | 60.98 | -4.37 | 56.61 | 74.00 | -17.39 | peak |
| 2 | 4882.000 | 49.26 | -4.37 | 44.89 | 54.00 | -9.11 | AVG |

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Harmonic | Power: | DC 3.7V |
| Frequency: | 2441MHz | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | Mode 2 | Ant.Polar.: | Vertical |



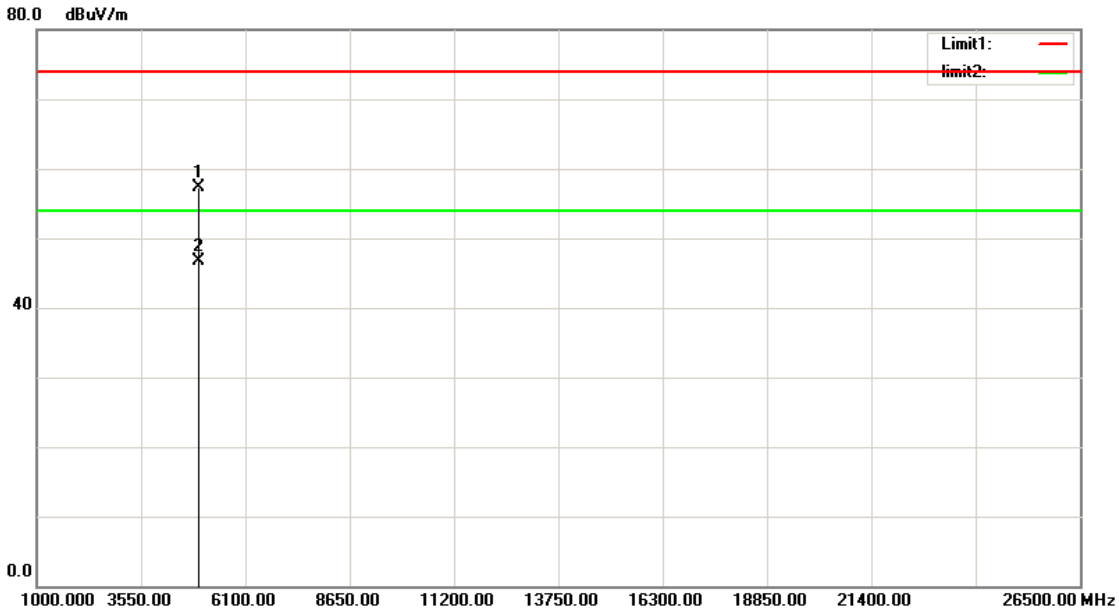

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 4882.000 | 56.43 | -4.37 | 52.06 | 74.00 | -21.94 | peak |
| 2 | 4882.000 | 47.11 | -4.37 | 42.74 | 54.00 | -11.26 | AVG |

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Harmonic | Power: | DC 3.7V |
| Frequency: | 2480MHz | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | Mode 2 | Ant.Polar.: | Horizontal |



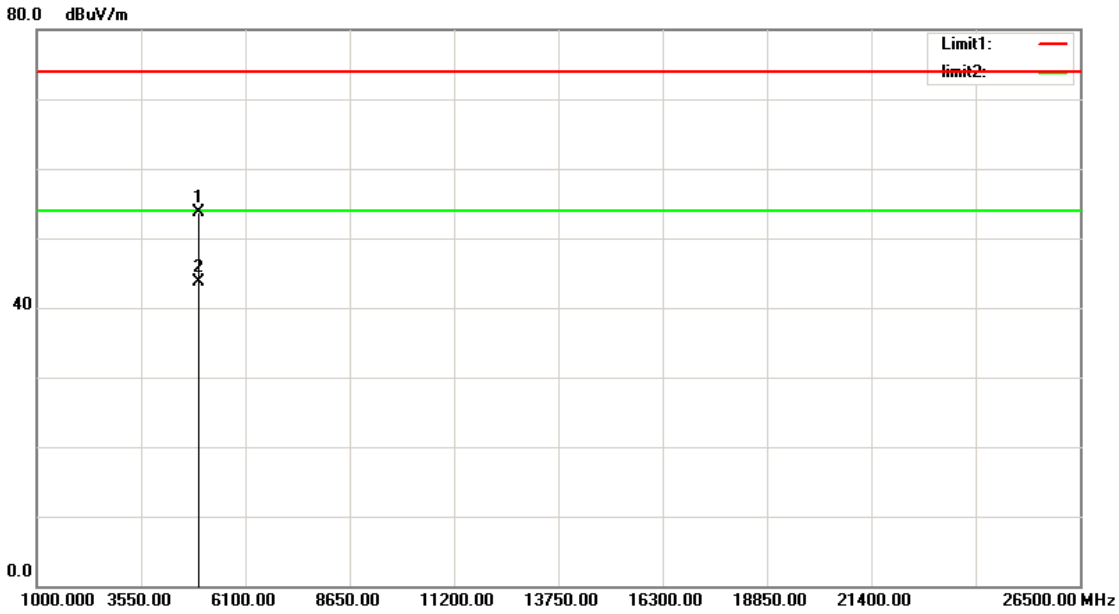

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 4960.000 | 61.68 | -4.39 | 57.29 | 74.00 | -16.71 | peak |
| 2 | 4960.000 | 50.99 | -4.39 | 46.60 | 54.00 | -7.40 | AVG |

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Harmonic | Power: | DC 3.7V |
| Frequency: | 2480MHz | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | Mode 2 | Ant.Polar.: | Vertical |



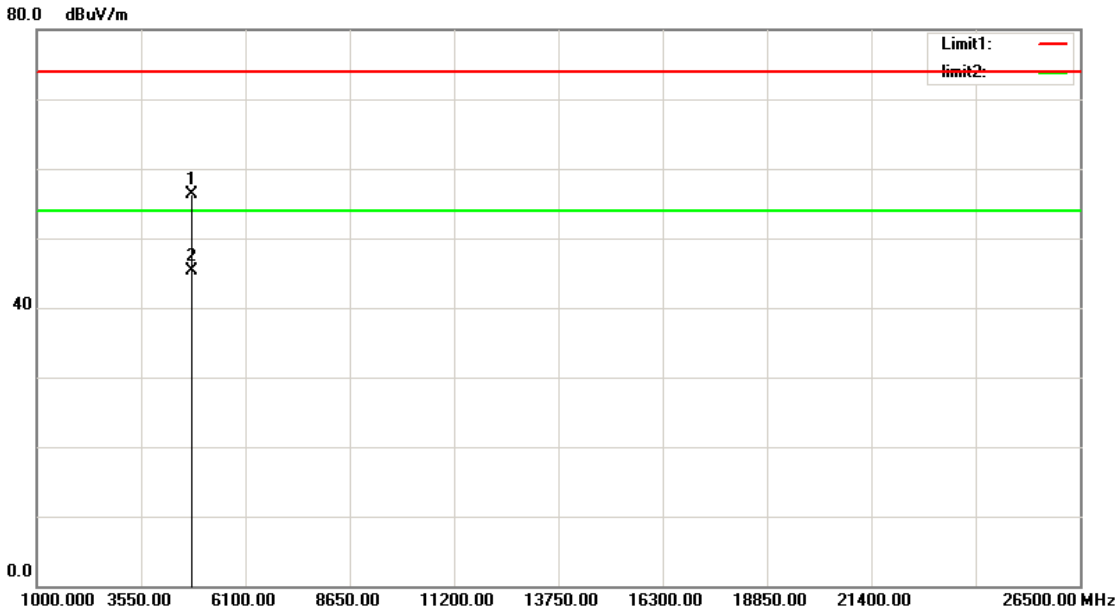

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 4960.000 | 58.19 | -4.39 | 53.80 | 74.00 | -20.20 | peak |
| 2 | 4960.000 | 48.14 | -4.39 | 43.75 | 54.00 | -10.25 | AVG |

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Harmonic | Power: | DC 3.7V |
| Frequency: | 2402MHz | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | Mode 4 | Ant.Polar.: | Horizontal |



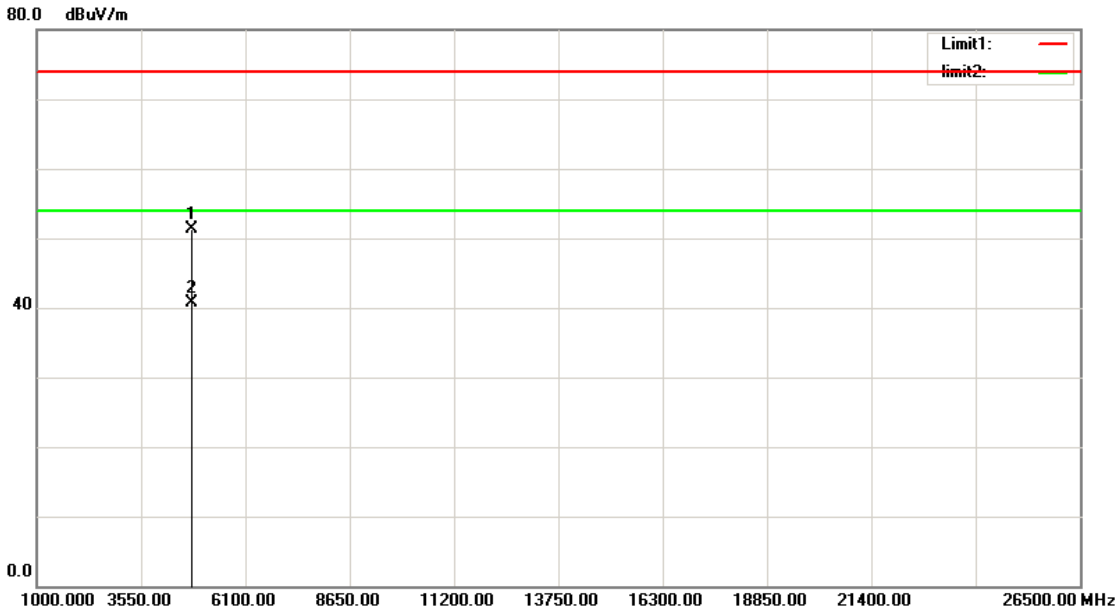

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 4804.000 | 60.64 | -4.35 | 56.29 | 74.00 | -17.71 | peak |
| 2 | 4804.000 | 49.73 | -4.35 | 45.38 | 54.00 | -8.62 | AVG |

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Harmonic | Power: | DC 3.7V |
| Frequency: | 2402MHz | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | Mode 4 | Ant.Polar.: | Vertical |



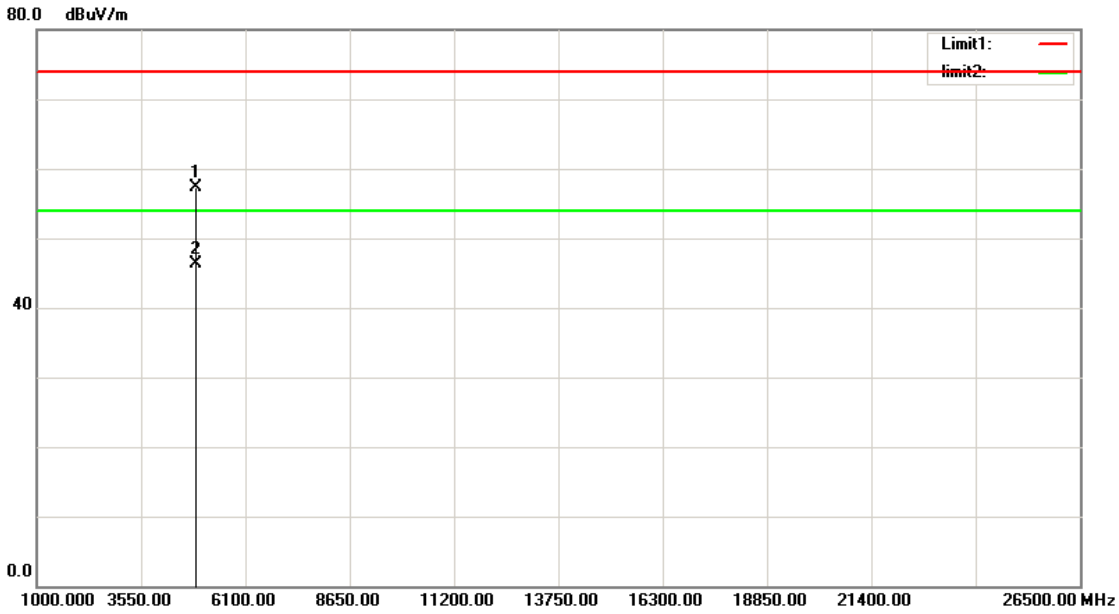

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 4804.000 | 55.72 | -4.35 | 51.37 | 74.00 | -22.63 | peak |
| 2 | 4804.000 | 44.98 | -4.35 | 40.63 | 54.00 | -13.37 | AVG |

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Harmonic | Power: | DC 3.7V |
| Frequency: | 2441MHz | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | Mode 4 | Ant.Polar.: | Horizontal |



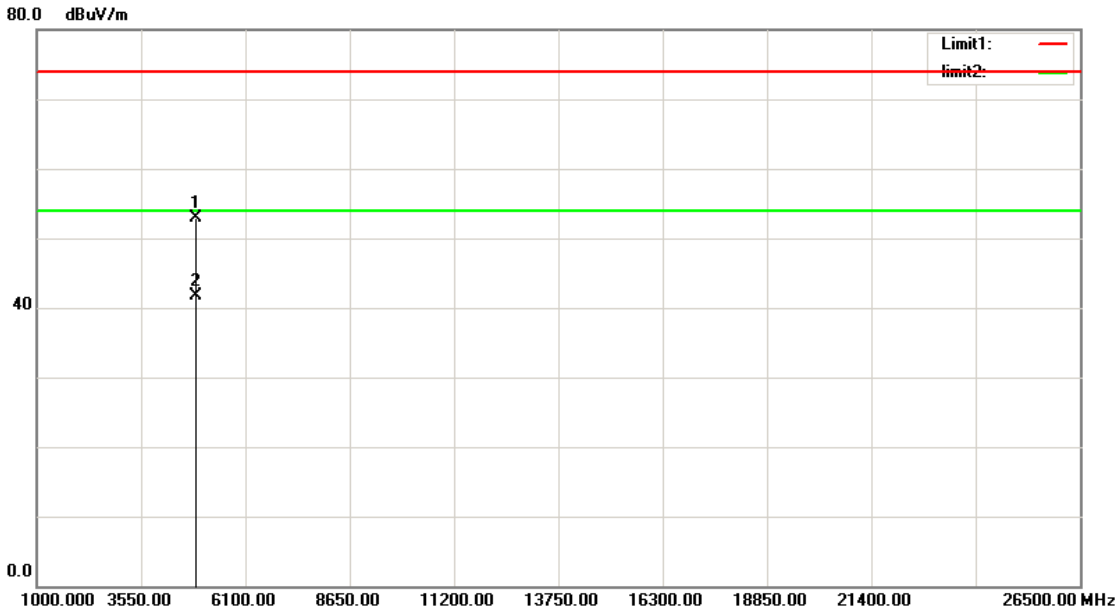

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 4882.000 | 61.68 | -4.37 | 57.31 | 74.00 | -16.69 | peak |
| 2 | 4882.000 | 50.65 | -4.37 | 46.28 | 54.00 | -7.72 | AVG |

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Harmonic | Power: | DC 3.7V |
| Frequency: | 2441MHz | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | Mode 4 | Ant.Polar.: | Vertical |



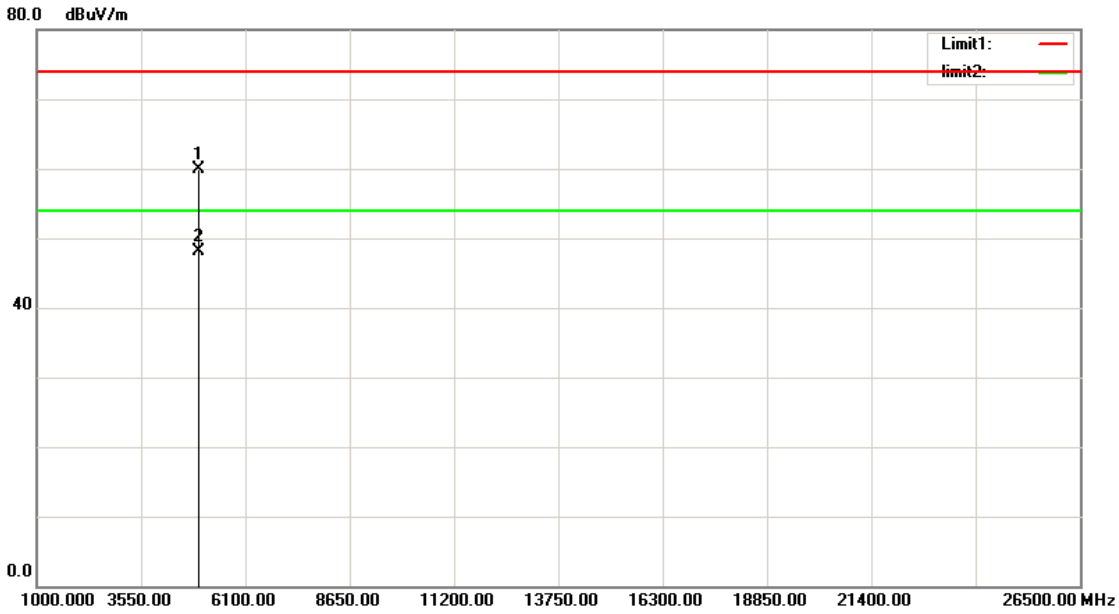

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 4882.000 | 57.26 | -4.37 | 52.89 | 74.00 | -21.11 | peak |
| 2 | 4882.000 | 46.13 | -4.37 | 41.76 | 54.00 | -12.24 | AVG |

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Harmonic | Power: | DC 3.7V |
| Frequency: | 2480MHz | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | Mode 4 | Ant.Polar.: | Horizontal |



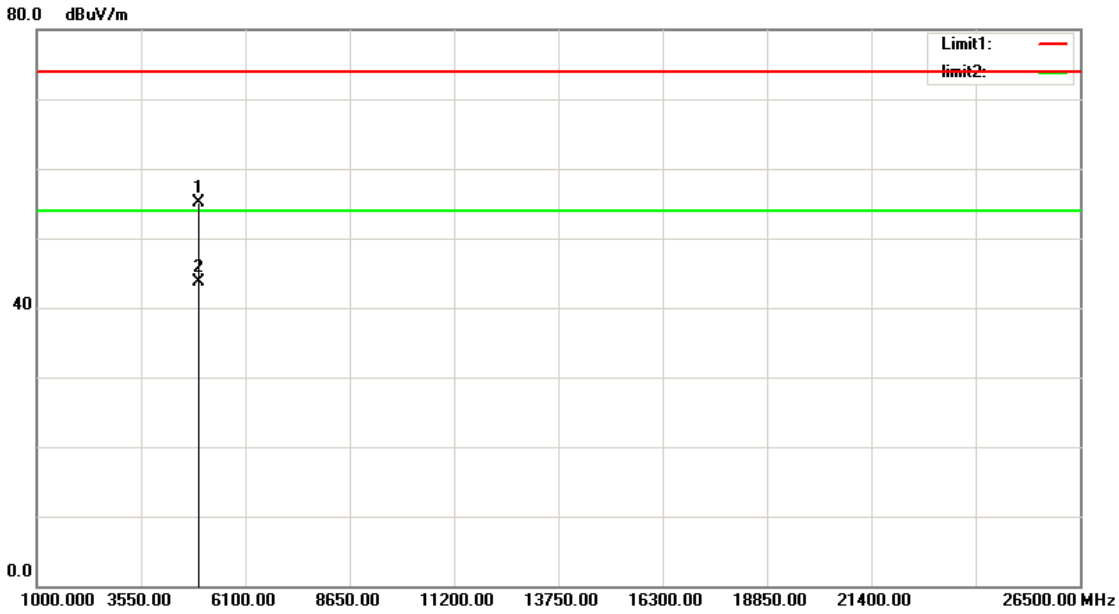

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 4960.000 | 64.21 | -4.39 | 59.82 | 74.00 | -14.18 | peak |
| 2 | 4960.000 | 52.58 | -4.39 | 48.19 | 54.00 | -5.81 | AVG |

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Harmonic | Power: | DC 3.7V |
| Frequency: | 2480MHz | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | Mode 4 | Ant.Polar.: | Vertical |




| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 4960.000 | 59.47 | -4.39 | 55.08 | 74.00 | -18.92 | peak |
| 2 | 4960.000 | 48.09 | -4.39 | 43.70 | 54.00 | -10.30 | AVG |

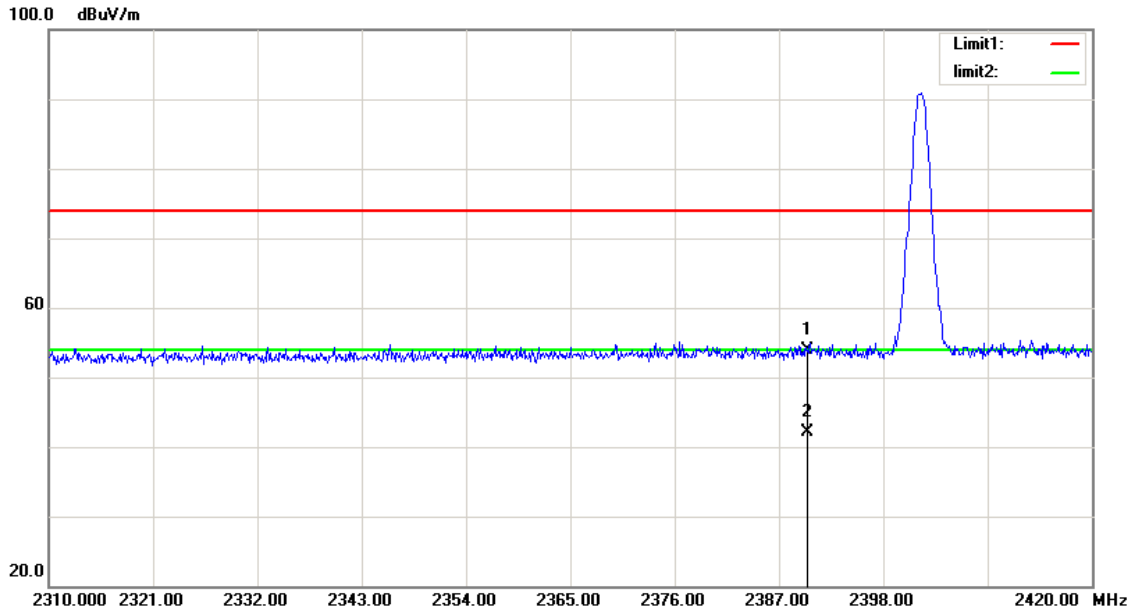
Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.

**Band Edge**

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Band edge | Power: | DC 3.7V |
| Frequency: | 2402MHz | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | Mode 2 | Ant.Polar.: | Horizontal |



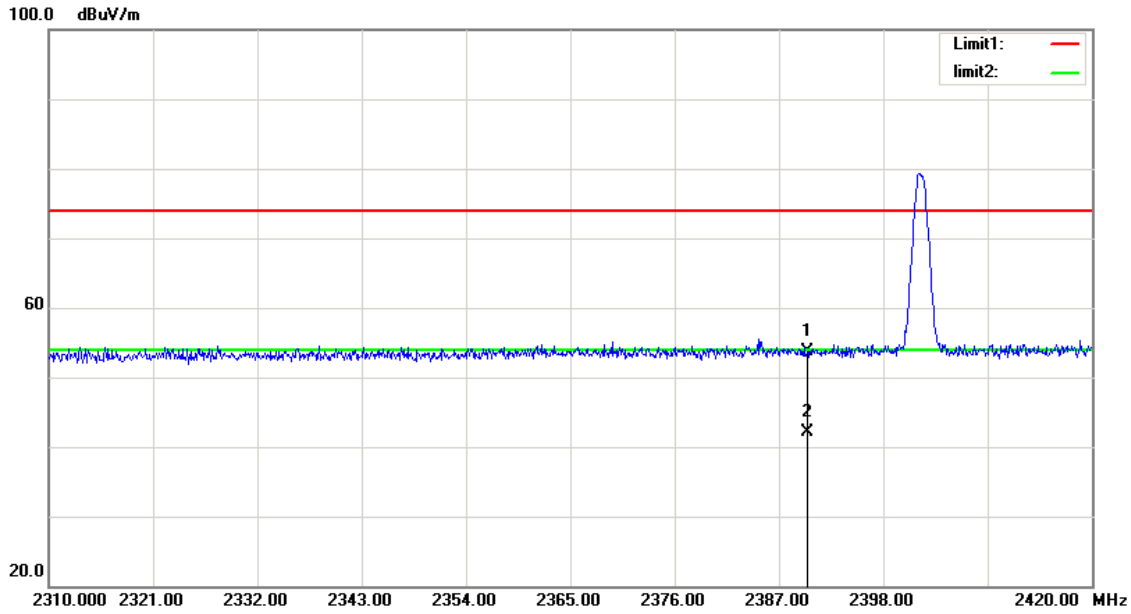

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 2390.000 | 14.58 | 39.41 | 53.99 | 74.00 | -20.01 | peak |
| 2 | 2390.000 | 2.62 | 39.41 | 42.03 | 54.00 | -11.97 | AVG |

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Band edge | Power: | DC 3.7V |
| Frequency: | 2402MHz | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | Mode 2 | Ant.Polar.: | Vertical |



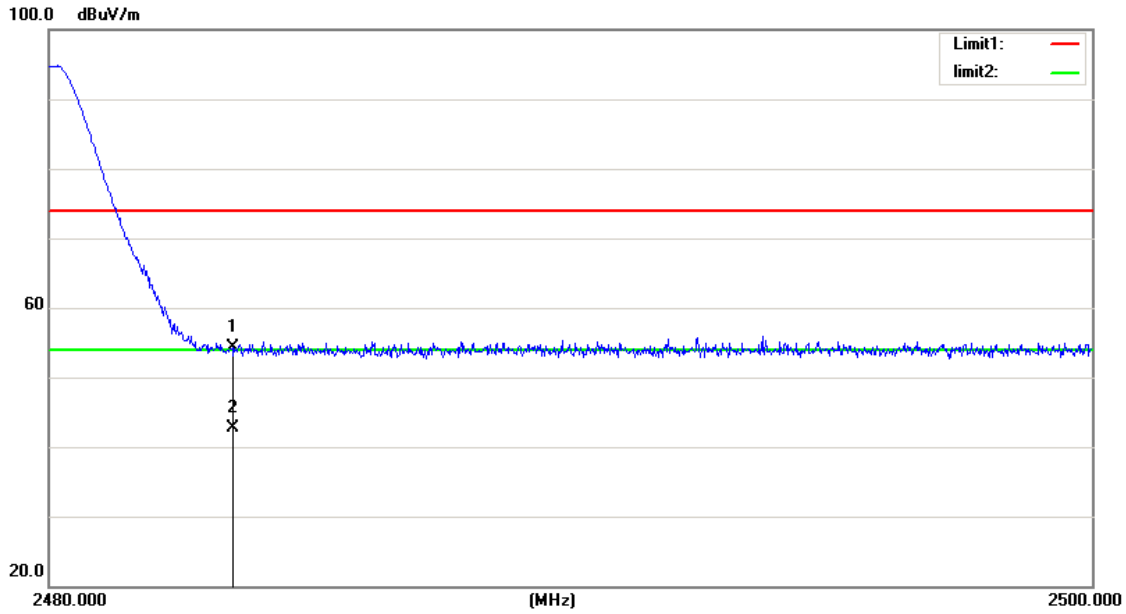

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 2390.000 | 14.32 | 39.41 | 53.73 | 74.00 | -20.27 | peak |
| 2 | 2390.000 | 2.63 | 39.41 | 42.04 | 54.00 | -11.96 | AVG |

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Band edge | Power: | DC 3.7V |
| Frequency: | 2480MHz | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | Mode 2 | Ant.Polar.: | Horizontal |



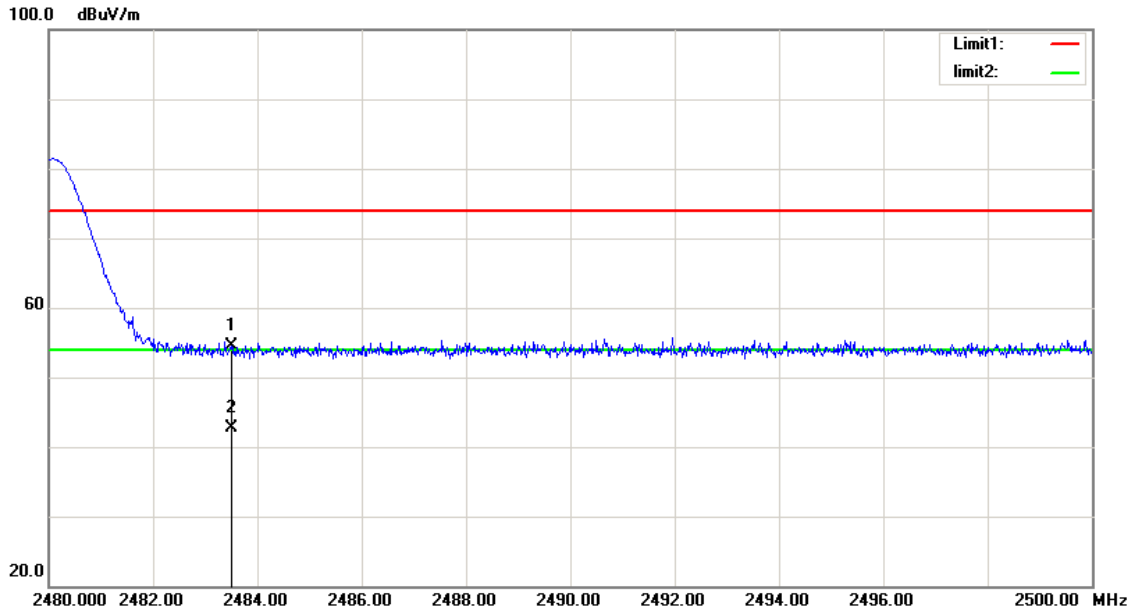

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 2483.500 | 14.42 | 39.83 | 54.25 | 74.00 | -19.75 | peak |
| 2 | 2483.500 | 2.78 | 39.83 | 42.61 | 54.00 | -11.39 | AVG |

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Band edge | Power: | DC 3.7V |
| Frequency: | 2480MHz | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | Mode 2 | Ant.Polar.: | Vertical |



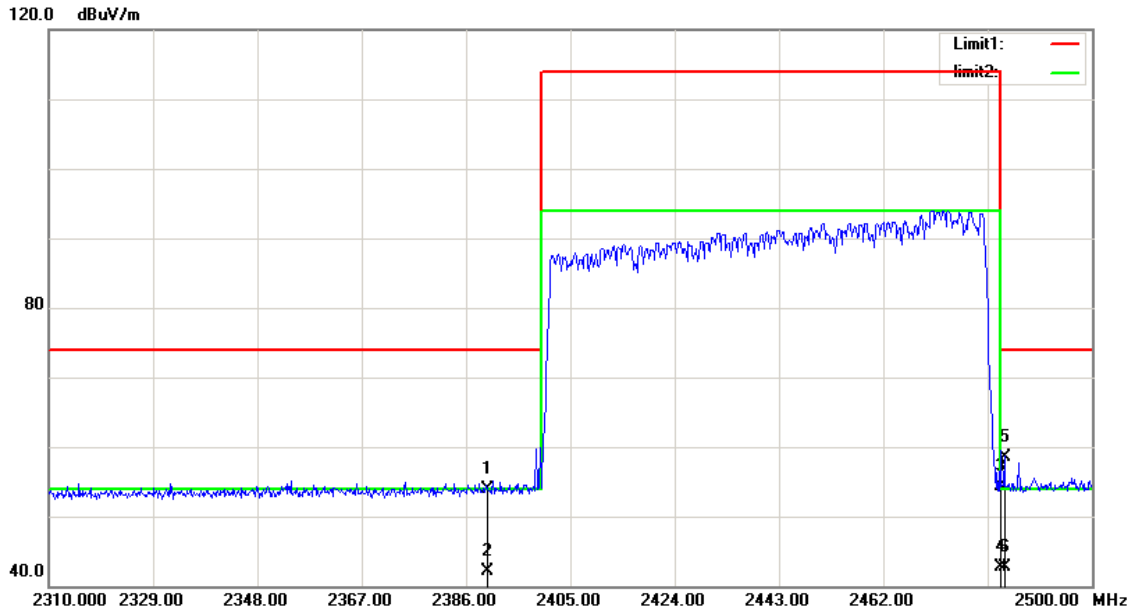

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 2483.500 | 14.75 | 39.83 | 54.58 | 74.00 | -19.42 | peak |
| 2 | 2483.500 | 2.78 | 39.83 | 42.61 | 54.00 | -11.39 | AVG |

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Band edge | Power: | DC 3.7V |
| Frequency: | hopping | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | Mode 2 | Ant.Polar.: | Horizontal |



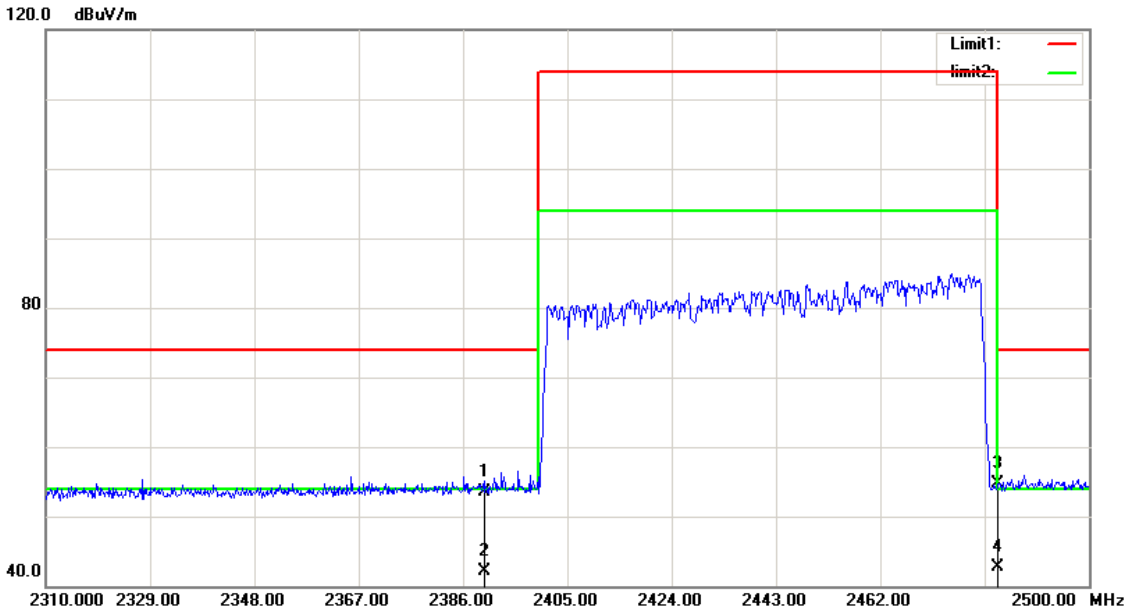

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 2390.000 | 14.42 | 39.41 | 53.83 | 74.00 | -20.17 | peak |
| 2 | 2390.000 | 2.64 | 39.41 | 42.05 | 54.00 | -11.95 | AVG |
| 3 | 2483.500 | 14.39 | 39.83 | 54.22 | 74.00 | -19.78 | peak |
| 4 | 2483.500 | 2.78 | 39.83 | 42.61 | 54.00 | -11.39 | AVG |
| 5 | 2484.045 | 18.77 | 39.83 | 58.60 | 74.00 | -15.40 | peak |
| 6 | 2484.045 | 2.78 | 39.83 | 42.61 | 54.00 | -11.39 | AVG |

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Band edge | Power: | DC 3.7V |
| Frequency: | hopping | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | Mode 2 | Ant.Polar.: | Vertical |



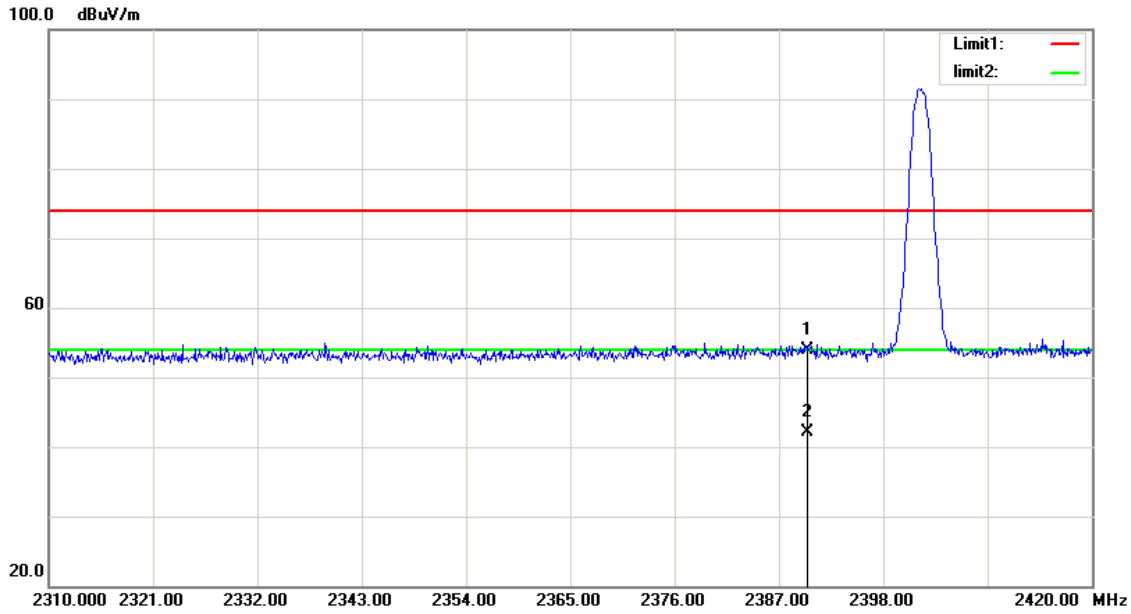

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 2390.000 | 14.00 | 39.41 | 53.41 | 74.00 | -20.59 | peak |
| 2 | 2390.000 | 2.64 | 39.41 | 42.05 | 54.00 | -11.95 | AVG |
| 3 | 2483.500 | 14.91 | 39.83 | 54.74 | 74.00 | -19.26 | peak |
| 4 | 2483.500 | 2.78 | 39.83 | 42.61 | 54.00 | -11.39 | AVG |

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Band edge | Power: | DC 3.7V |
| Frequency: | 2402MHz | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | Mode 4 | Ant.Polar.: | Horizontal |



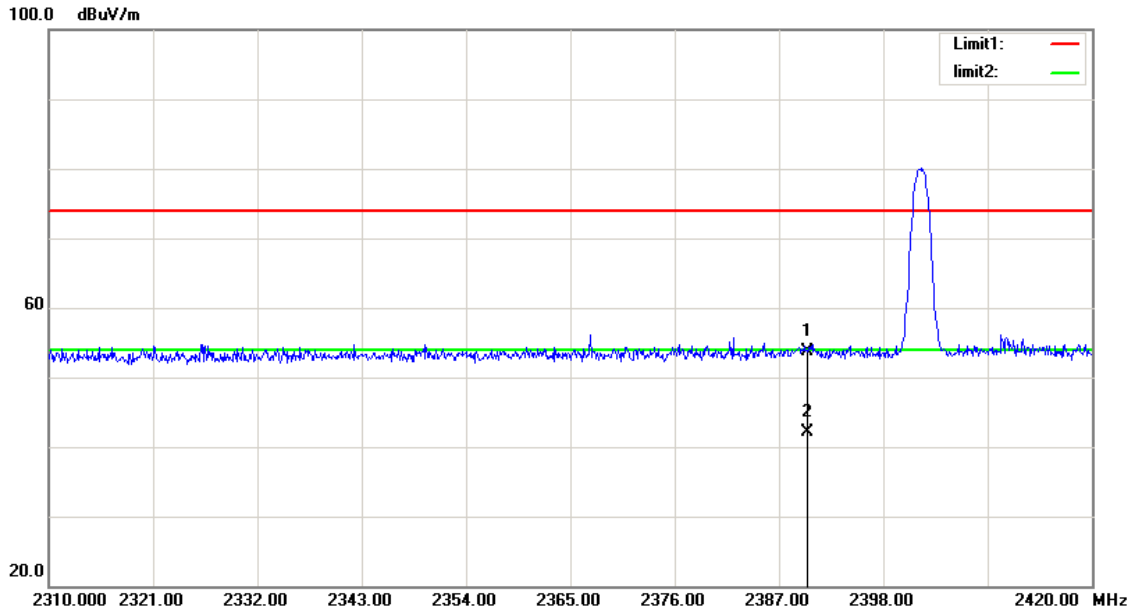

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 2390.000 | 14.53 | 39.41 | 53.94 | 74.00 | -20.06 | peak |
| 2 | 2390.000 | 2.65 | 39.41 | 42.06 | 54.00 | -11.94 | AVG |

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Band edge | Power: | DC 3.7V |
| Frequency: | 2402MHz | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | Mode 4 | Ant.Polar.: | Vertical |



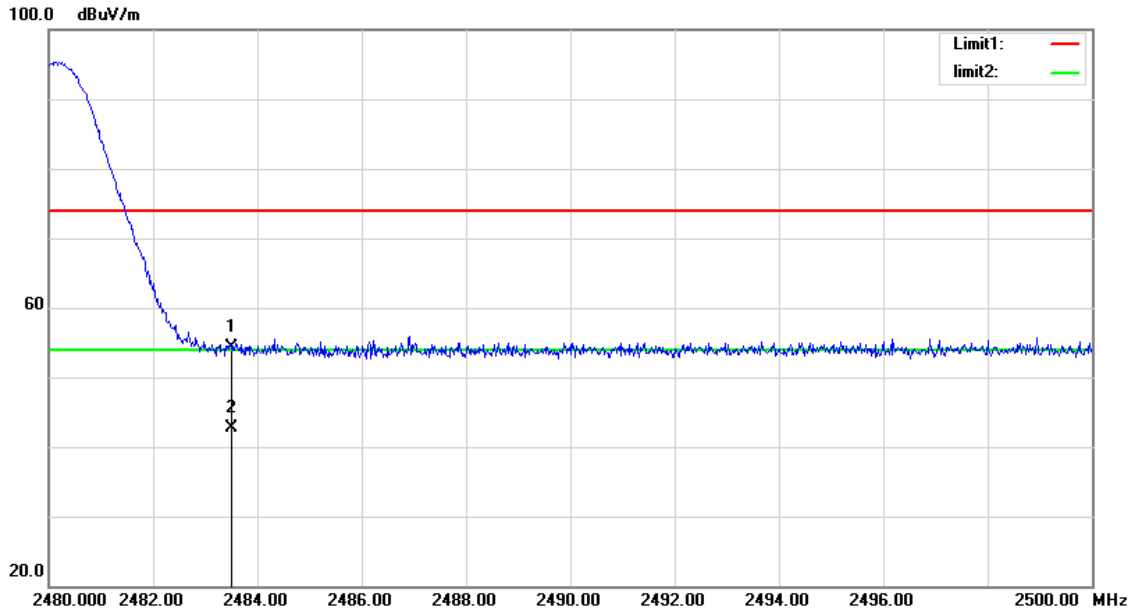

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 2390.000 | 14.39 | 39.41 | 53.80 | 74.00 | -20.20 | peak |
| 2 | 2390.000 | 2.64 | 39.41 | 42.05 | 54.00 | -11.95 | AVG |

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Band edge | Power: | DC 3.7V |
| Frequency: | 2480MHz | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | Mode 4 | Ant.Polar.: | Horizontal |



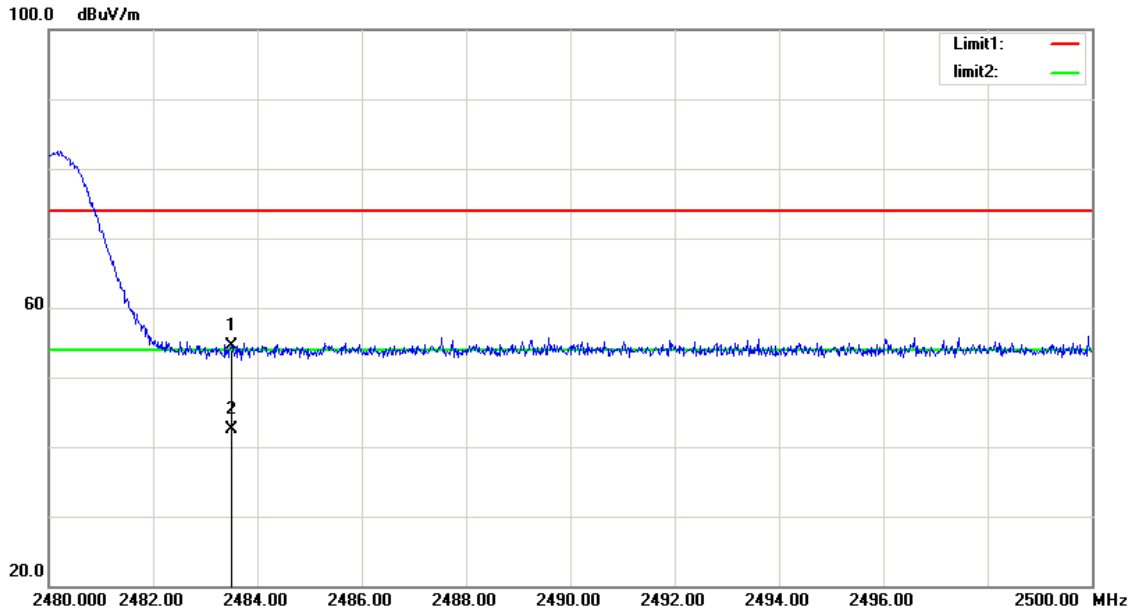

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 2483.500 | 14.44 | 39.83 | 54.27 | 74.00 | -19.73 | peak |
| 2 | 2483.500 | 2.79 | 39.83 | 42.62 | 54.00 | -11.38 | AVG |

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Band edge | Power: | DC 3.7V |
| Frequency: | 2480MHz | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | Mode 4 | Ant.Polar.: | Vertical |



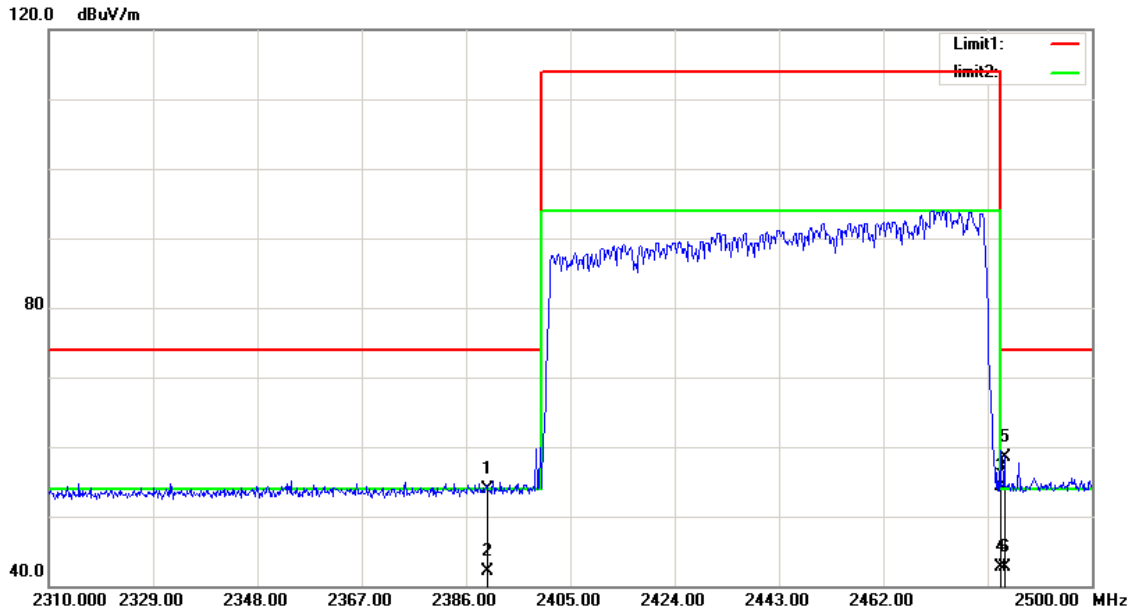

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 2483.500 | 14.71 | 39.83 | 54.54 | 74.00 | -19.46 | peak |
| 2 | 2483.500 | 2.77 | 39.83 | 42.60 | 54.00 | -11.40 | AVG |

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Band edge | Power: | DC 3.7V |
| Frequency: | hopping | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | Mode 4 | Ant.Polar.: | Horizontal |



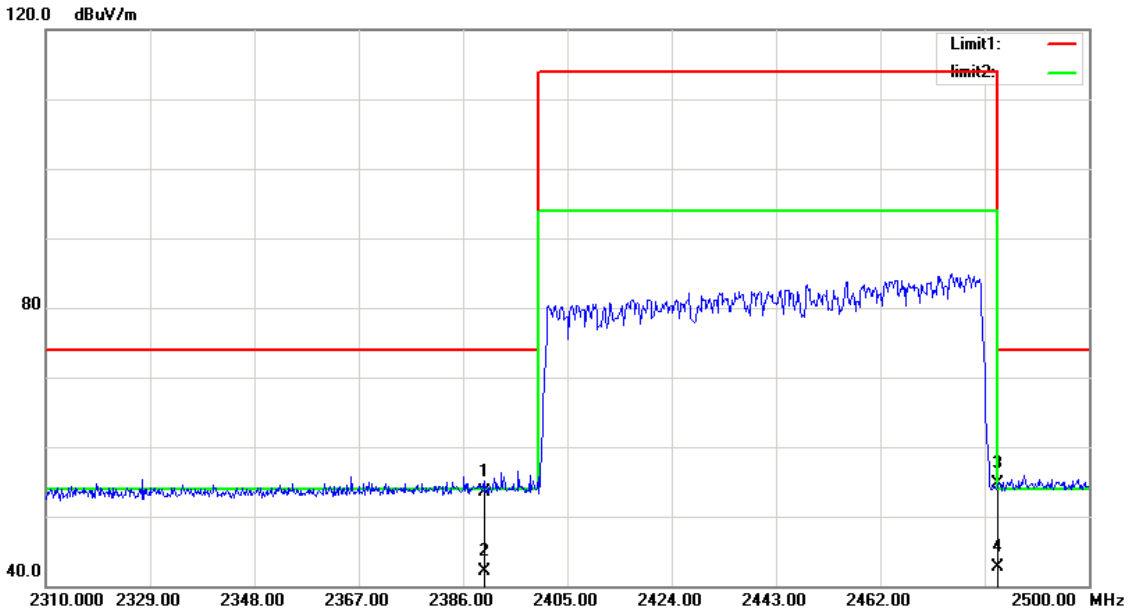

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 2390.000 | 14.42 | 39.41 | 53.83 | 74.00 | -20.17 | peak |
| 2 | 2390.000 | 2.64 | 39.41 | 42.05 | 54.00 | -11.95 | AVG |
| 3 | 2483.500 | 14.39 | 39.83 | 54.22 | 74.00 | -19.78 | peak |
| 4 | 2483.500 | 2.78 | 39.83 | 42.61 | 54.00 | -11.39 | AVG |
| 5 | 2484.045 | 18.77 | 39.83 | 58.60 | 74.00 | -15.40 | peak |
| 6 | 2484.045 | 2.78 | 39.83 | 42.61 | 54.00 | -11.39 | AVG |

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.

| | | | |
|---|---|---|---|
| Standard: | FCC Part 15.247 | Test Distance: | 3m |
| Test item: | Band edge | Power: | DC 3.7V |
| Frequency: | hopping | Temp.(℃)/Hum.(%RH): | 26(℃)/60%RH |
| Mode: | Mode 4 | Ant.Polar.: | Vertical |




| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 2390.000 | 14.00 | 39.41 | 53.41 | 74.00 | -20.59 | peak |
| 2 | 2390.000 | 2.64 | 39.41 | 42.05 | 54.00 | -11.95 | AVG |
| 3 | 2483.500 | 14.91 | 39.83 | 54.74 | 74.00 | -19.26 | peak |
| 4 | 2483.500 | 2.78 | 39.83 | 42.61 | 54.00 | -11.39 | AVG |

Note:1.Result (dBuV/m) = Correct Factor (dB/m) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. When the peak results are less than average limit, so not need to evaluate the average.