



FCC TEST REPORT

FCC ID: RVUZJ-5809

On Behalf of

SHENZHEN ZIJIANG ELECTRONICS CO., LTD

Portable thermal printer

Model No.: ZJ-5809, POS-5809

Prepared for : SHENZHEN ZIJIANG ELECTRONICS CO., LTD
Address : 4 Floor of No.2 Building of Donglongxing Science Park, Huaning
Road, Dalang Street, Longhua District, Shenzhen, Guangdong, China

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TEST REPORT DECLARATION

Applicant : SHENZHEN ZIJIANG ELECTRONICS CO., LTD
 Address : 4 Floor of No.2 Building of Donglongxing Science Park, Huaning Road, Dalang Street, Longhua District, Shenzhen, Guangdong, China
 Manufacturer : SHENZHEN ZIJIANG ELECTRONICS CO., LTD
 Address : 4 Floor of No.2 Building of Donglongxing Science Park, Huaning Road, Dalang Street, Longhua District, Shenzhen, Guangdong, China
 EUT Description : Portable thermal printer
 (A) Model No. : ZJ-5809, POS-5809
 (B) Trademark : N/A

Measurement Standard Used:

**FCC Rules and Regulations Part 15 Subpart C Section 15.247,
ANSI C63.10:2013**

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits both conducted and radiated emissions. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

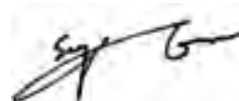
After the test, our opinion is that EUT compliance with the requirement of the above standards.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....: Lucas Pang
 Project Engineer



Approved by (name + signature).....: Simple Guan
 Project Manager



Date of issue..... : June 11, 2019

Revision History

| Revision | Issue Date | Revisions | Revised By |
|----------|---------------|------------------------|-------------|
| V0 | June 11, 2019 | Initial released Issue | Simple Guan |

1. SUMMARY OF STANDARDS AND RESULTS

1.1. Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

| Test Item | Standards Paragraph | Result |
|--------------------------------|---|--------|
| Maximum Peak Output Power | FCC Part 15: 15.247(b)(1) ANSI C63.10 :2013 | P |
| Bandwidth | FCC Part 15: 15.215 ANSI C63.10 :2013 | P |
| Carrier Frequency Separation | FCC Part 15: 15.247(a)(1) ANSI C63.10 :2013 | P |
| Number Of Hopping Channel | FCC Part 15: 15.247(a)(1)(iii) ANSI C63.10 :2013 | P |
| Dwell Time | FCC Part 15: 15.247(a)(1)(iii) ANSI C63.10 :2013 | P |
| Radiated Emission | FCC Part 15: 15.209 FCC Part 15: 15.247(d) ANSI C63.10 :2013 | P |
| Band Edge Compliance | FCC Part 15: 15.247(d) ANSI C63.10 :2013 | P |
| Power Line Conducted Emissions | FCC Part 15: 15.207 ANSI C63.10 :2013 | P |
| Antenna requirement | FCC Part 15: 15.203 | P |
| Note: | 1. P is an abbreviation for Pass. 2. F is an abbreviation for Fail. 3. N/A is an abbreviation for Not Applicable. | |

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

| | |
|------------------------|--|
| Description | : Portable thermal printer |
| Model No. | : ZJ-5809, POS-5809 |
| DIFF | : It's just that the name of the model is different. So all the tests were carried out on ZJ-5809. |
| Power supply | : DC 5V from adapter with AC 120V/60Hz, DC 7.4V from battery. |
| Radio Technology | : Bluetooth V4.2 EDR |
| Operation frequency | : 2402 MHz -2480 MHz |
| Modulation | : GFSK, $\pi/4$ -DPSK |
| Channel spacing | : 1MHz |
| Antenna Type | : PCB Antenna, Maximum Gain is 0dBi |
| Software | : M58.C-Z05-AA |
| Hardware | : ZJ-M58-IV1.1 |
| Intend use environment | : Residential, commercial and light industrial environment |
| Note | : USB port only has charging function and can't transmit data. |

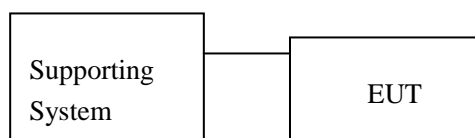
2.2. Accessories of Device (EUT)

Accessories1 : AC ADAPTER
 Manufacturer : UPRITE ELECTRONICS CO., LTD
 Model : ZL-U010WL0502000
 Power supply : Input:100-240V ~0.5A 50/60Hz
 Output: 5V=2A

2.3. Tested Supporting System Details

| No. | Description | Manufacturer | Model | Serial Number | Certification or DOC |
|-----|-------------|--------------|--------------|----------------------------|----------------------|
| 1. | Notebook PC | ACER | ASPIRE M1830 | PTSF90C003050 05CAC3000 | DOC |

2.4. Block Diagram of connection between EUT and simulators



2.5. Test Mode Description

| Tested mode, channel, and data rate information | | |
|---|--------------|-----------------|
| Mode | Channel | Frequency (MHz) |
| GFSK | Low :CH1 | 2402 |
| | Middle: CH40 | 2441 |
| | High: CH79 | 2480 |
| π /4 DQPSK | Low :CH1 | 2402 |
| | Middle: CH40 | 2441 |
| | High: CH79 | 2480 |

2.6. Test Conditions

| Items | Required | Actual |
|--------------------|-----------|--------|
| Temperature range: | 15-35°C | 27°C |
| Humidity range: | 25-75% | 56% |
| Pressure range: | 86-106kPa | 980kPa |

2.7. Test Facility

Shenzhen Alpha Product Testing Co., Ltd

Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103,
Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission

Registration Number: 293961

July 25, 2017 Certificated by IC

Registration Number: 12135A

2.8. Measurement Uncertainty

(95% confidence levels, k=2)

| Item | Uncertainty |
|--|----------------------|
| Uncertainty for Power point Conducted Emissions Test | 2.74dB |
| Uncertainty for Radiation Emission test in 3m chamber (below 30MHz) | 2.13 dB(Polarize: V) |
| | 2.57dB(Polarize: H) |
| Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz) | 3.77dB(Polarize: V) |
| | 3.80dB(Polarize: H) |
| Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz) | 4.16dB(Polarize: H) |
| | 4.13dB(Polarize: V) |
| Uncertainty for radio frequency | 5.4×10^{-8} |
| Uncertainty for conducted RF Power | 0.37dB |
| Uncertainty for temperature | 0.2°C |
| Uncertainty for humidity | 1% |
| Uncertainty for DC and low frequency voltages | 0.06% |

2.9. Test Equipment List

| Equipment | Manufacture | Model No. | Serial No. | Last cal. | Cal Interval |
|------------------------|---------------|-------------------------|-------------------|------------|--------------|
| 3m Semi-Anechoic | ETS-LINDGREN | N/A | SEL0017 | 2018.09.21 | 1 Year |
| Spectrum analyzer | Agilent | E4407B | MY46185649 | 2018.09.21 | 1 Year |
| Receiver | R&S | ESCI | 1166.5950K03-1011 | 2018.09.21 | 1 Year |
| Receiver | R&S | ESCI | 101202 | 2018.09.21 | 1 Year |
| Bilog Antenna | Schwarzbeck | VULB 9168 | VULB9168-438 | 2018.04.13 | 2 Year |
| Horn Antenna | EMCO | 3115 | 640201028-06 | 2018.04.13 | 2 Year |
| Active Loop Antenna | Beijing Daze | ZN30900A | SEL0097 | 2018.04.13 | 2 Year |
| Cable | Resenberger | N/A | No.1 | 2018.09.21 | 1 Year |
| Cable | SCHWARZBECK | N/A | No.2 | 2018.09.21 | 1 Year |
| Cable | SCHWARZBECK | N/A | No.3 | 2018.09.21 | 1 Year |
| Pre-amplifier | Schwarzbeck | BBV9743 | 9743-019 | 2018.09.21 | 1 Year |
| Pre-amplifier | R&S | AFS33-18002650-30-8P-44 | SEL0080 | 2018.09.21 | 1 Year |
| Temperature controller | Terchy | MHQ | 120 | 2018.09.21 | 1 Year |
| L.I.S.N.#1 | Schwarzbeck | NSLK8126 | 8126466 | 2018.09.21 | 1 Year |
| L.I.S.N.#2 | ROHDE&SCHWARZ | ENV216 | 101043 | 2018.09.21 | 1 Year |
| 20db Attenuator | ICPROBING | IATS1 | 82347 | 2018.09.21 | 1 Year |
| Horn Antenna | SCHWARZBECK | BBHA 9170 | BBHA 9170294 | 2018.04.13 | 2 Year |
| Power Meter | Anritsu | ML2487A | 6K00001491 | 2018.09.21 | 1 Year |

3. MAXIMUM PEAK OUTPUT POWER

3.1.Limit

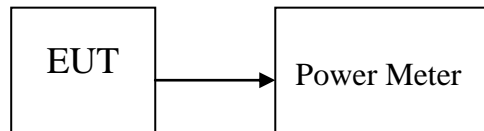
Please refer section 15.247.

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts, the e.i.r.p shall not exceed 4W

3.2.Test Procedure

The transmitter output is connected to the RF Power Meter. The RF Power Meter is set to the peak power detection.

3.3.Test Setup



3.4.Test Result

| Mode | Freq (MHz) | PK Output Power (dBm) | PK Output Power (mW) | Limit (dBm) | Result |
|------------------|------------|-----------------------|----------------------|-------------|--------|
| GFSK | 2402 | -3.051 | 0.495 | 21 | Pass |
| | 2441 | -3.083 | 0.492 | 21 | Pass |
| | 2480 | -2.84 | 0.520 | 21 | Pass |
| π /4 DQPSK | 2402 | -1.842 | 0.654 | 21 | Pass |
| | 2441 | -1.818 | 0.658 | 21 | Pass |
| | 2480 | -1.734 | 0.671 | 21 | Pass |
| Conclusion: PASS | | | | | |

4. BANDWIDTH

4.1.Limit

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

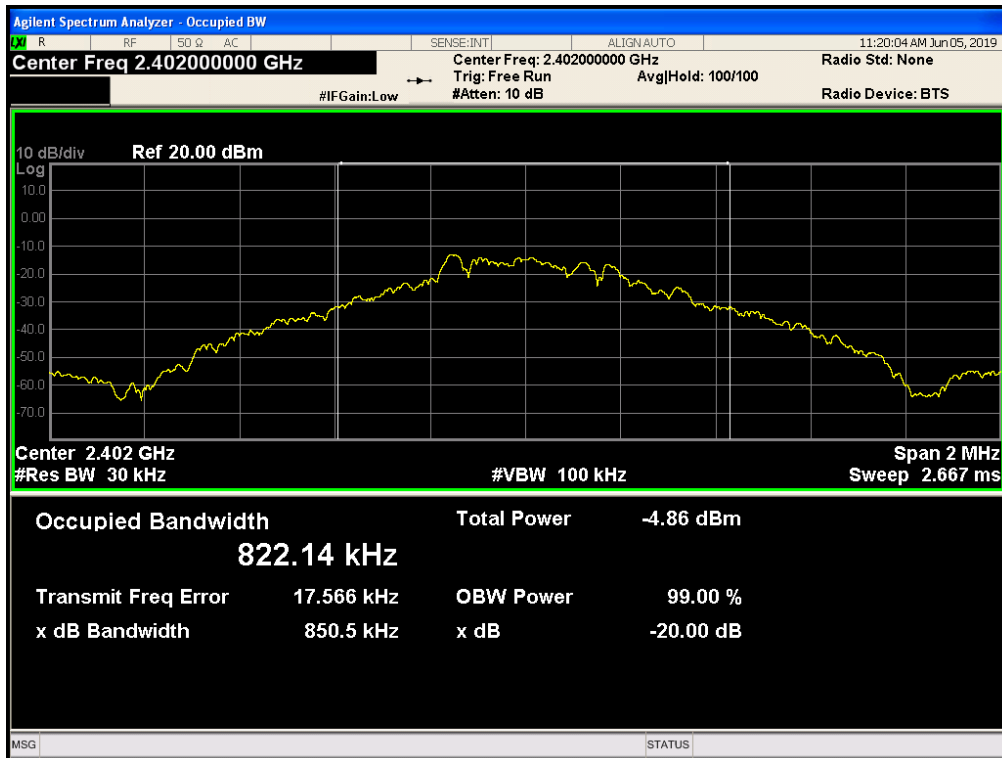
4.2.Test Procedure

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30kHz RBW and 100kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

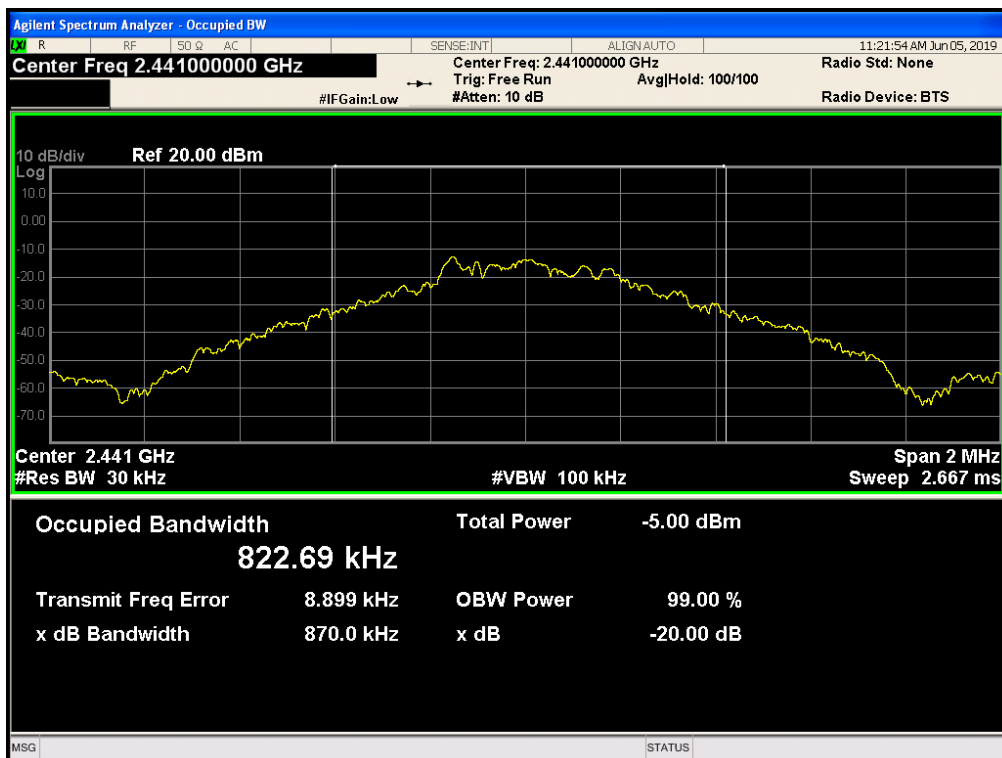
4.3.Test Result

| Mode | Frequency (MHz) | 99% OBW (MHz) | -20 dB Bandwidth (MHz) | Limit -20 dB Bandwidth (MHz) | Verdict |
|----------------|-----------------|---------------|------------------------|------------------------------|---------|
| GFSK | 2402 | 0.8221 | 0.8505 | N/A | Pass |
| | 2441 | 0.8227 | 0.87 | N/A | Pass |
| | 2480 | 0.8156 | 0.8757 | N/A | Pass |
| π /4 DQPSK | 2402 | 1.1561 | 1.233 | N/A | Pass |
| | 2441 | 1.1614 | 1.2152 | N/A | Pass |
| | 2480 | 1.1653 | 1.2537 | N/A | Pass |

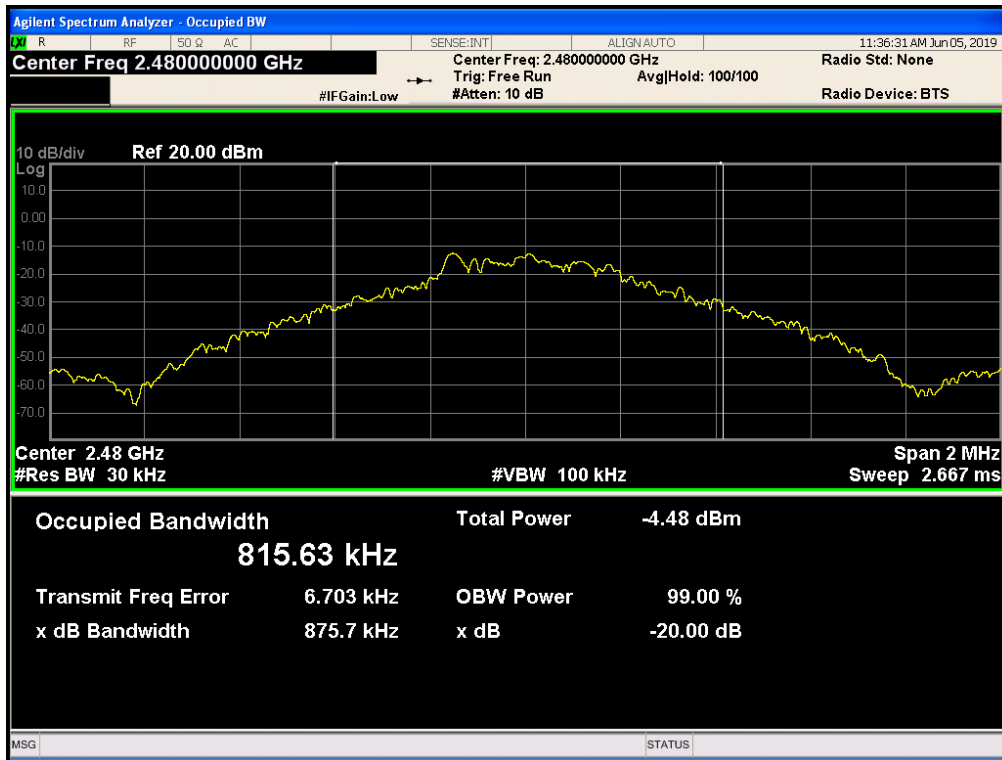
1-DH1 2402MHz



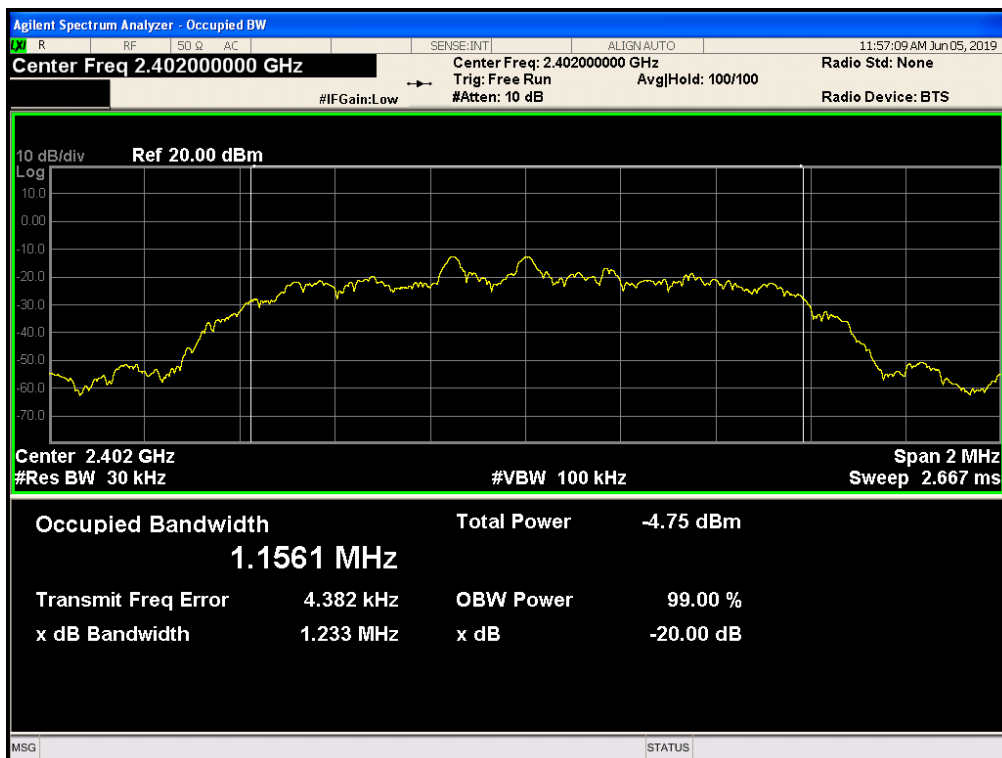
1-DH1 2441MHz



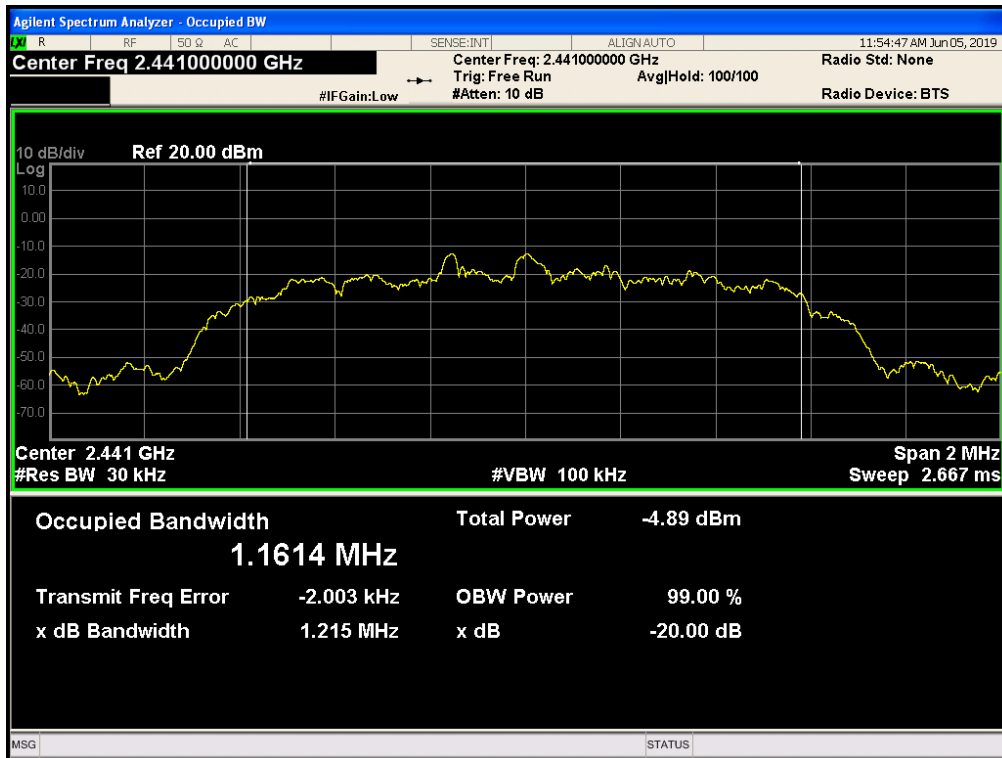
1-DH1 2480MHz



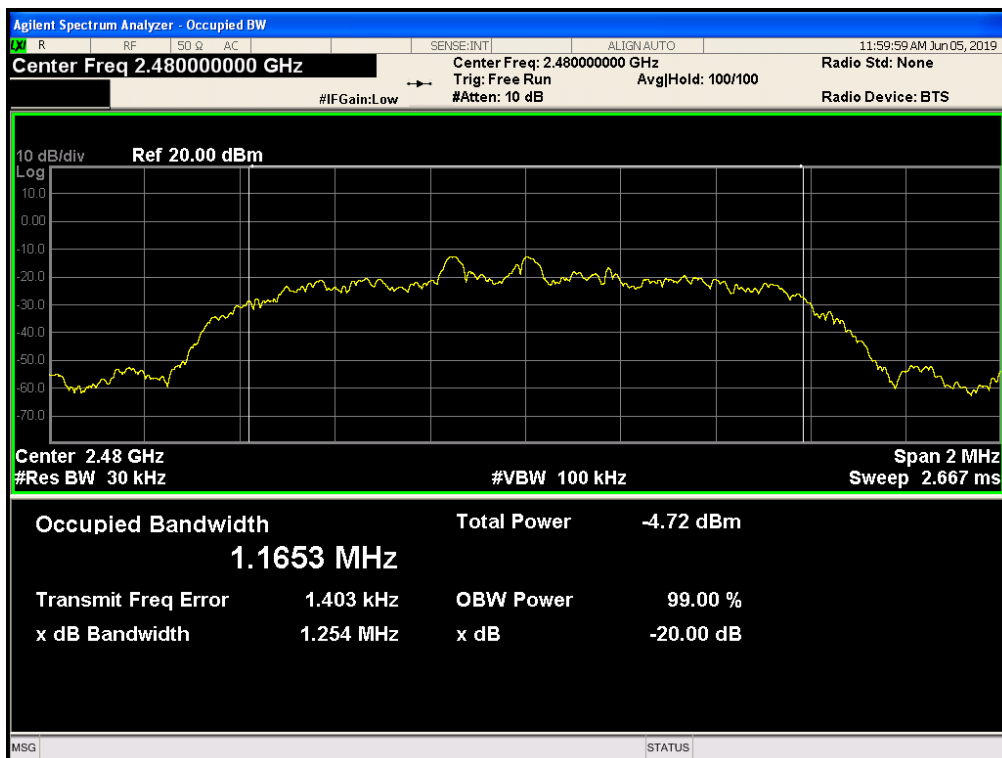
2-DH1 2402MHz



2-DH1 2441MHz



2-DH1 2480MHz



5. CARRIER FREQUENCY SEPARATION

5.1.Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, 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, whichever is greater, provided the systems operate with an output power no greater than 125 mW

5.2.Test Procedure

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The carrier frequency was measured by spectrum analyzer with 20kHz RBW and 62kHz VBW.

5.3.Test Result

| Mode | Hopping Freq1 (MHz) | Hopping Freq2 (MHz) | HFS (MHz) | Limit (MHz) | Verdict |
|----------------|------------------------|------------------------|--------------|----------------|---------|
| GFSK | 2440.852 | 2441.839 | 0.987 | 0.58 | Pass |
| π /4 DQPSK | 2441.047 | 2442.022 | 0.975 | 0.584 | Pass |

6. NUMBER OF HOPPING CHANNEL

6.1.Limit

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

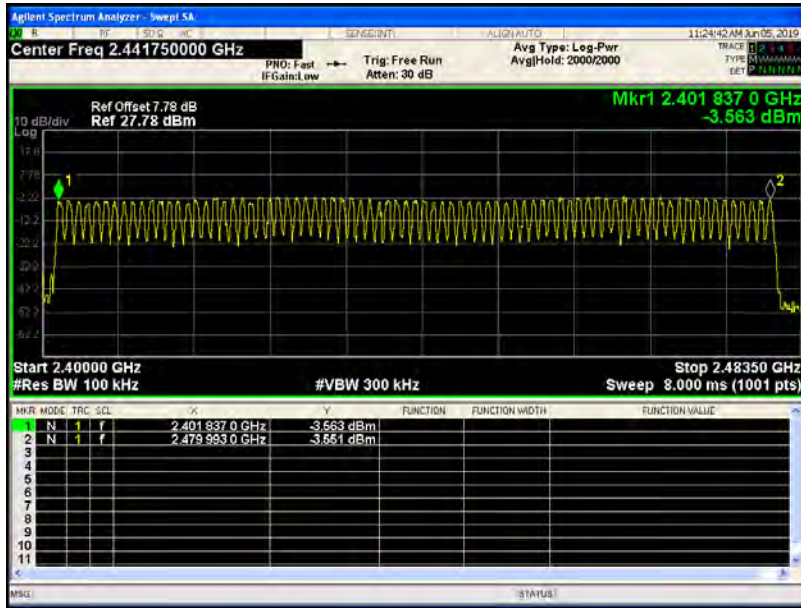
6.2.Test Procedure

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The number of hopping channel was measured by spectrum analyzer with 100kHz RBW and 300KHz VBW.

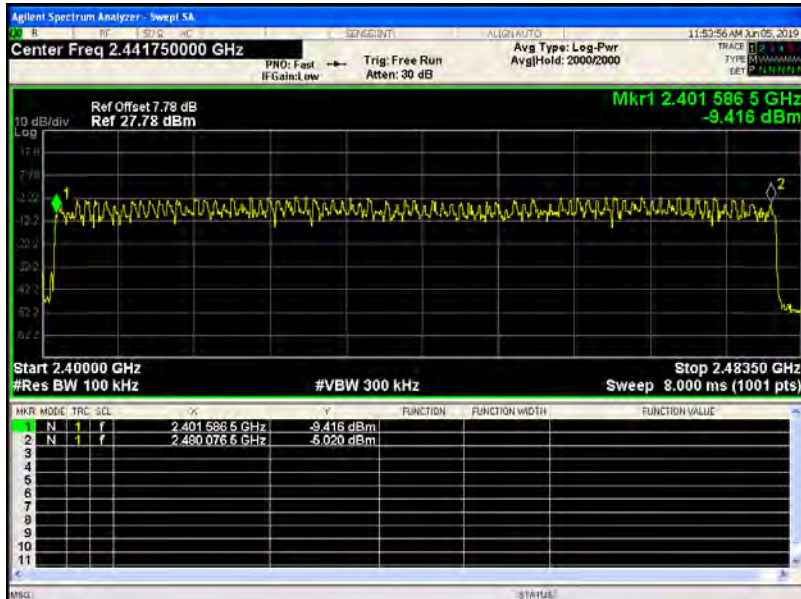
6.3.Test Result

| Mode | Number of hopping channel | Limit | Conclusion |
|----------------|---------------------------|-------|------------|
| GFSK | 79 | >15 | PASS |
| π /4 DQPSK | 79 | >15 | PASS |

Original test data for hopping channel number



GFSK



$\pi/4$ DQPSK

7. DWELL TIME

7.1. Test limit

Please refer section 15.247

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 s within period of 0.4 seconds multiplied by the number of hopping channels employed.

7.2. Test Procedure

7.2.1. Place the EUT on the table and set it in transmitting mode.

7.2.2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

7.2.3. Set center frequency of spectrum analyzer = operating frequency.

7.2.4. Set the spectrum analyzer as RBW=1MHz, VBW=1MHz, Span = 0Hz, Sweep = auto.

7.2.5. Repeat above procedures until all frequency measured were complete.

7.3. Test Result

PASS.

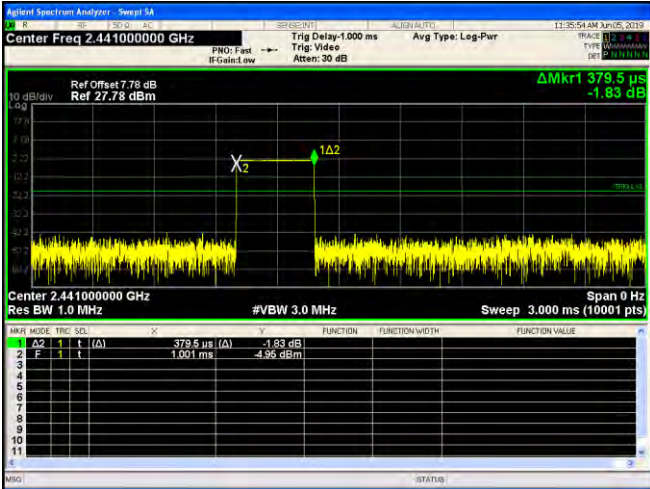
Detailed information please see the following page.

| Mode | Data Packet | Frequency (MHz) | Pulse Duration (ms) | Dwell Time (ms) | Limit (ms) | Conclusion |
|----------------|-------------|-----------------|---------------------|-----------------|------------|------------|
| GFSK | DH1 | 2441 | 0.379 | 121.28 | <400 | PASS |
| | DH3 | 2441 | 1.636 | 261.76 | | PASS |
| | DH5 | 2441 | 2.883 | 307.52 | | PASS |
| π /4 DQPSK | DH1 | 2441 | 0.373 | 119.36 | <400 | PASS |
| | DH3 | 2441 | 1.626 | 260.16 | | PASS |
| | DH5 | 2441 | 2.889 | 308.16 | | PASS |

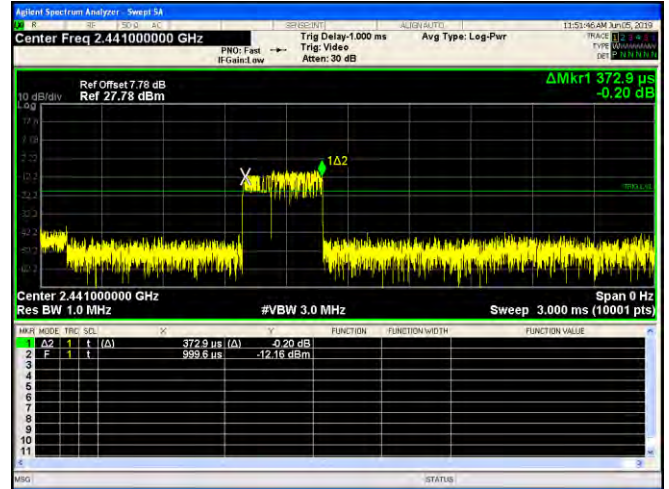
Dwell time

GFSK

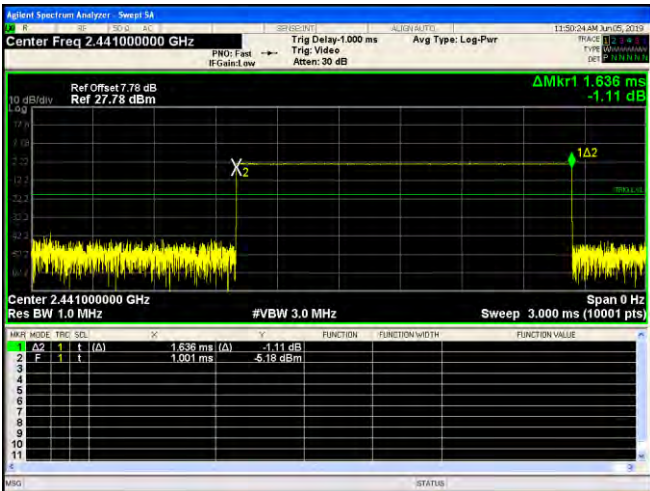
$\pi/4$ -DQPSK



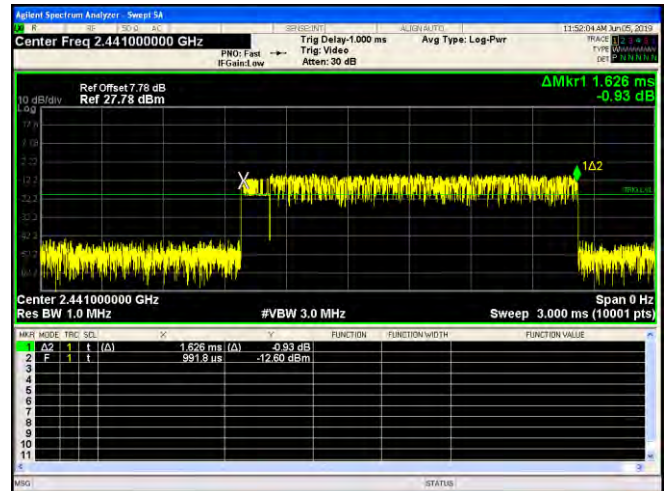
Channel 39 / 2441 MHz - DH1



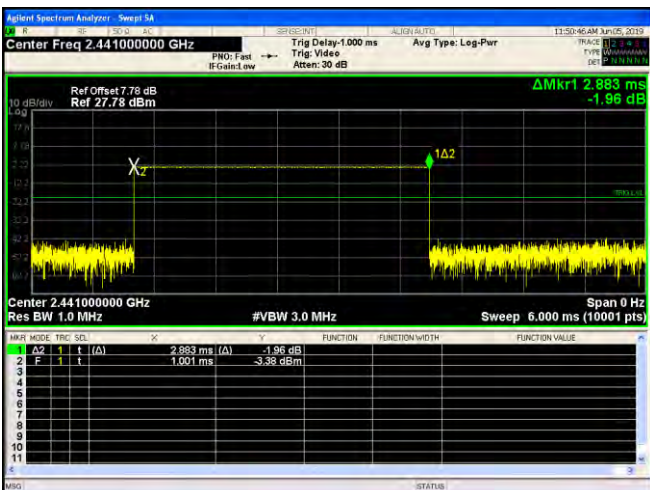
Channel 39 / 2441 MHz - 2DH1



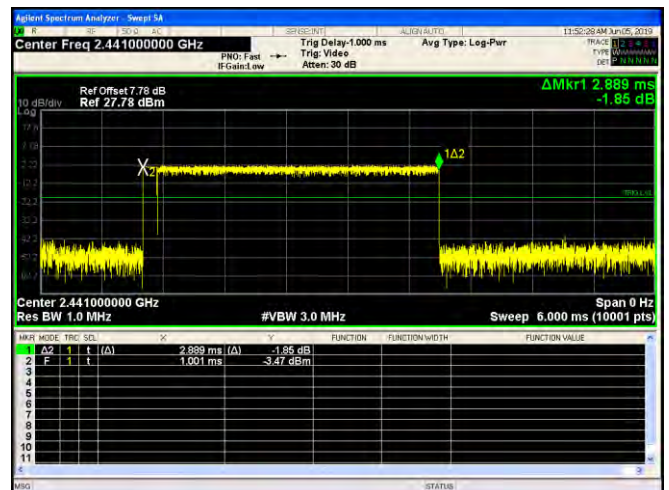
Channel 39 / 2441 MHz - DH3



Channel 39 / 2441 MHz - 2DH3



Channel 39 / 2441 MHz - DH5



Channel 39 / 2441 MHz - 2DH5

8. RADIATED EMISSIONS

8.1.Limit

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

15.205 Restricted frequency band

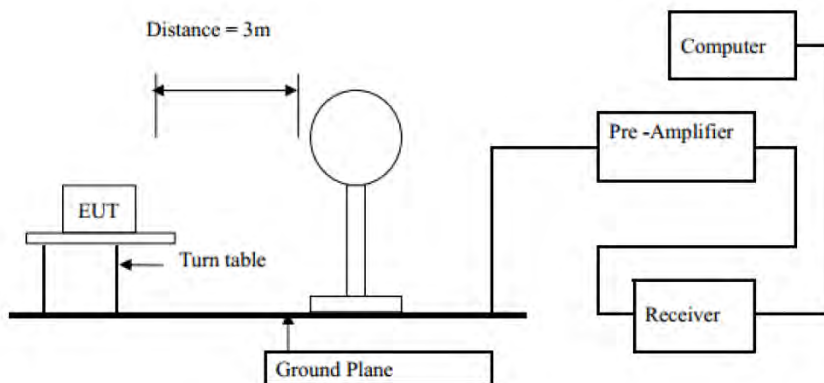
| MHz | MHz | MHz | GHz |
|----------------------------|-----------------------|-----------------|------------------|
| 0.090 - 0.110 | 16.42 - 16.423 | 399.9 - 410 | 4.5 - 5.15 |
| ¹ 0.495 - 0.505 | 16.69475 - 16.69525 | 608 - 614 | 5.35 - 5.46 |
| 2.1735 - 2.1905 | 16.80425 - 16.80475 | 960 - 1240 | 7.25 - 7.75 |
| 4.125 - 4.128 | 25.5 - 25.67 | 1300 - 1427 | 8.025 - 8.5 |
| 4.17725 - 4.17775 | 37.5 - 38.25 | 1435 - 1626.5 | 9.0 - 9.2 |
| 4.20725 - 4.20775 | 73 - 74.6 | 1645.5 - 1646.5 | 9.3 - 9.5 |
| 6.215 - 6.218 | 74.8 - 75.2 | 1660 - 1710 | 10.6 - 12.7 |
| 6.26775 - 6.26825 | 108 - 121.94 | 1718.8 - 1722.2 | 13.25 - 13.4 |
| 6.31175 - 6.31225 | 123 - 138 | 2200 - 2300 | 14.47 - 14.5 |
| 8.291 - 8.294 | 149.9 - 150.05 | 2310 - 2390 | 15.35 - 16.2 |
| 8.362 - 8.366 | 156.52475 - 156.52525 | 2483.5 - 2500 | 17.7 - 21.4 |
| 8.37625 - 8.38675 | 156.7 - 156.9 | 2690 - 2900 | 22.01 - 23.12 |
| 8.41425 - 8.41475 | 162.0125 - 167.17 | 3260 - 3267 | 23.6 - 24.0 |
| 12.29 - 12.293 | 167.72 - 173.2 | 3332 - 3339 | 31.2 - 31.8 |
| 12.51975 - 12.52025 | 240 - 285 | 3345.8 - 3358 | 36.43 - 36.5 |
| 12.57675 - 12.57725 | 322 - 335.4 | 3600 - 4400 | (²) |

15.209 Limit

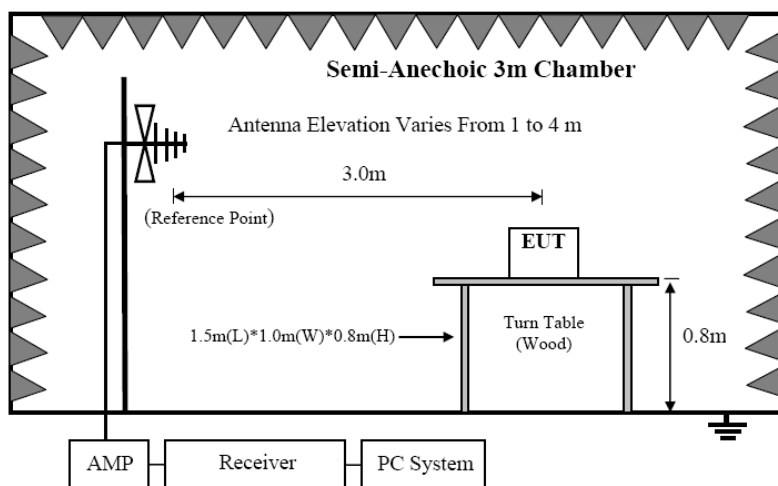
| FREQUENCY MHz | DISTANCE Meters | FIELD STRENGTHS LIMIT | |
|------------------|--------------------|---|-----------------------------------|
| | | $\mu\text{V}/\text{m}$ | $\text{dB}(\mu\text{V})/\text{m}$ |
| 0.009-0.490 | 300 | 2400/F(KHz) | / |
| 0.490-1.705 | 30 | 24000/F(KHz) | / |
| 1.705-30 | 30 | 30 | 29.5 |
| 30 ~ 88 | 3 | 100 | 40.0 |
| 88 ~ 216 | 3 | 150 | 43.5 |
| 216 ~ 960 | 3 | 200 | 46.0 |
| 960 ~ 1000 | 3 | 500 | 54.0 |
| Above 1000 | 3 | 74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average) | |

8.2. Block Diagram of Test setup

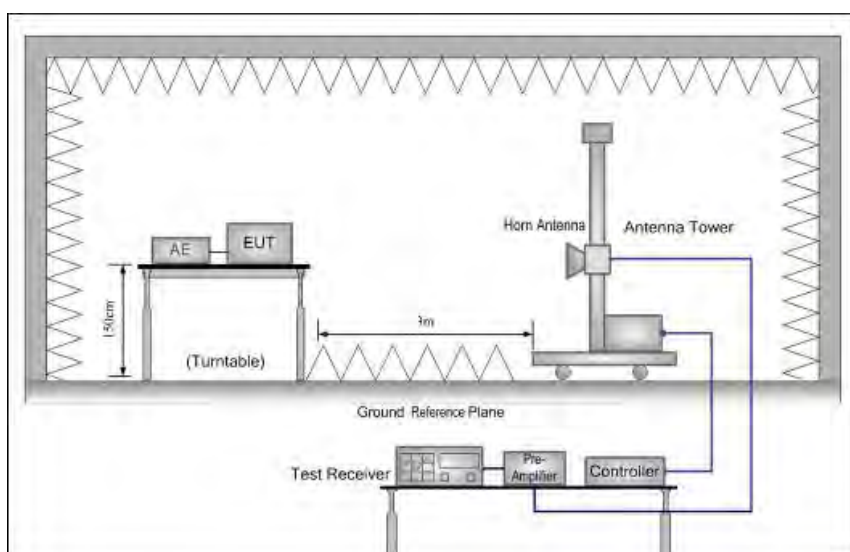
8.2.1 In 3m Anechoic Chamber Test Setup Diagram for below 30MHz



8.2.1 In 3m Anechoic Chamber Test Setup Diagram for below 1GHz



8.2.2 In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.

8.3. Test Procedure

- (1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber.
- (2) Setup EUT and simulator as shown in section 1.4 and 6.1
- (3) Test antenna was located 3m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.
 - (a) Change work frequency or channel of device if practicable.
 - (b) Change modulation type of device if practicable.
 - (c) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions
- (4) Spectrum frequency from 9KHz to 25GHz (tenth harmonic of fundamental frequency) was investigated
- (5) For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10 :2013on Radiated Emission test.
- (6) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure; RBW is set at 1MHz, VBW is set at 10Hz for Average measure.

8.4. Test Result

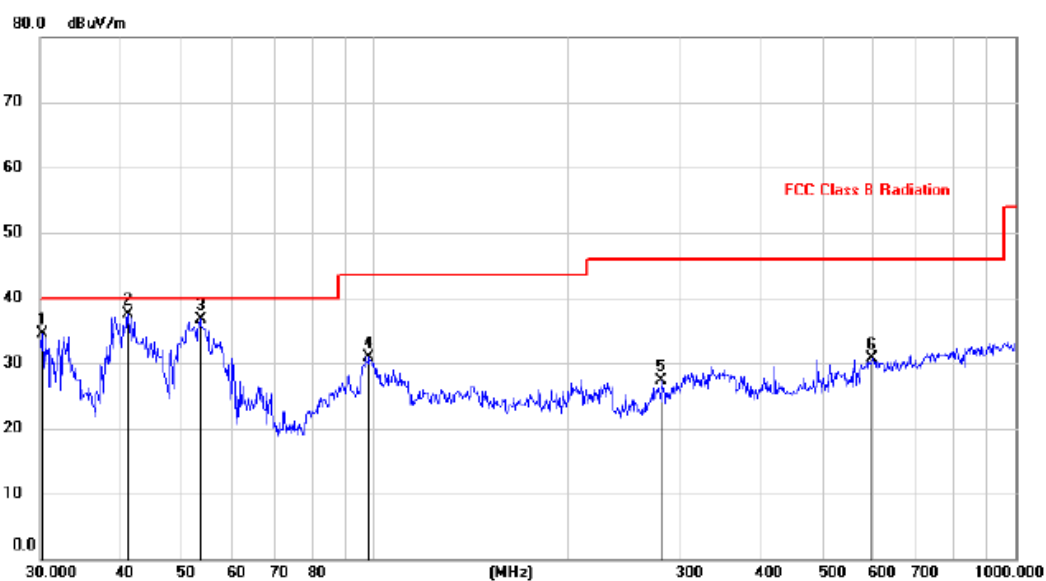
We have scanned the 10th harmonic from 9KHz to the EUT's highest frequency..
Detailed information please see the following page.

From 9KHz to 30MHz: Conclusion: PASS

Note: The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

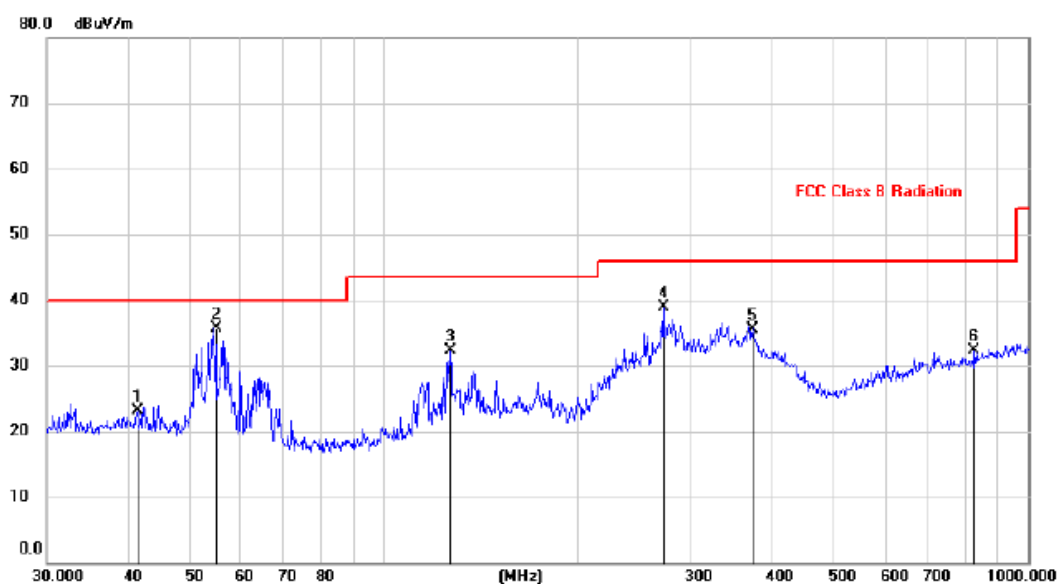
From 30MHz to 1000MHz: Conclusion: PASS

Vertical:



| No. | Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB | Measure- ment dBuV/m | Limit dBuV/m | Margin dB | Detector | Antenna Height cm | Table Degree degree | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|----------|-------------------------|---------------------------|---------|
| 1 | | 30.2109 | 21.16 | 13.27 | 34.43 | 40.00 | -5.57 | peak | | | |
| 2 | * | 41.1319 | 23.34 | 14.11 | 37.45 | 40.00 | -2.55 | peak | | | |
| 3 | | 53.3179 | 23.34 | 13.44 | 36.78 | 40.00 | -3.22 | peak | | | |
| 4 | | 97.7980 | 20.67 | 10.31 | 30.98 | 43.50 | -12.52 | peak | | | |
| 5 | | 280.0237 | 14.42 | 12.97 | 27.39 | 46.00 | -18.61 | peak | | | |
| 6 | | 599.3211 | 11.42 | 19.32 | 30.74 | 46.00 | -15.26 | peak | | | |

Horizontal:



| No. | Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB | Measure- ment dBuV/m | Limit dBuV/m | Margin dB | Antenna Height cm | Table Degree | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|-------------------------|-----------------|---------|
| 1 | | 41.4215 | 8.98 | 14.11 | 23.09 | 40.00 | -16.91 | | | peak |
| 2 | * | 54.6429 | 22.39 | 13.31 | 35.70 | 40.00 | -4.30 | | | peak |
| 3 | | 126.7723 | 19.26 | 13.02 | 32.28 | 43.50 | -11.22 | | | peak |
| 4 | | 271.3246 | 26.06 | 12.81 | 38.87 | 46.00 | -7.13 | | | peak |
| 5 | | 373.3112 | 20.34 | 15.26 | 35.60 | 46.00 | -10.40 | | | peak |
| 6 | | 824.5968 | 10.36 | 21.88 | 32.24 | 46.00 | -13.76 | | | peak |

Remark: All modes have been tested, and only worst data of GFSK mode, Channel TX 2402MHz (AC 120V/60Hz) was listed in this report.

From 1G-25GHz

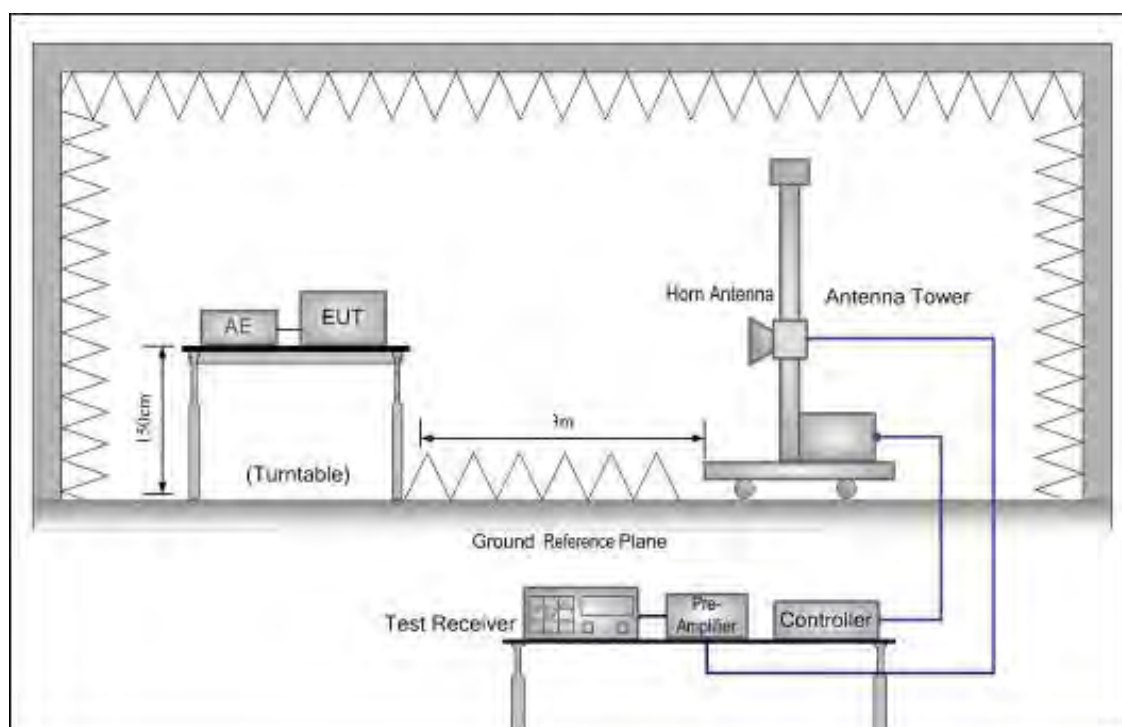
| Test Mode: GFSK TX Low | | | | | | | | | |
|---|---------------------|-------------|-----------------------|----------------|-----------------|-----------------|----------------|-------------|--------|
| Freq (MHz) | Read Level (dBuV/m) | Polar (H/V) | Antenna Factor (dB/m) | Cable loss(dB) | Amp Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
| 4804 | 43.47 | V | 33.95 | 10.18 | 34.26 | 53.34 | 74 | 20.66 | PK |
| 4804 | 30.19 | V | 33.95 | 10.18 | 34.26 | 40.06 | 54 | 13.94 | AV |
| 7206 | / | / | / | / | / | / | / | / | / |
| 9608 | / | / | / | / | / | / | / | / | / |
| 4824 | 42.77 | H | 33.95 | 10.18 | 34.26 | 52.64 | 74 | 21.36 | PK |
| 4824 | 31.62 | H | 33.95 | 10.18 | 34.26 | 41.49 | 54 | 12.51 | AV |
| 7206 | / | / | / | / | / | / | / | / | / |
| 9608 | / | / | / | / | / | / | / | / | / |
| Test Mode: GFSK TX Mid | | | | | | | | | |
| 4882 | 43.81 | V | 33.93 | 10.18 | 34.26 | 53.66 | 74 | 20.34 | PK |
| 4882 | 32.82 | V | 33.93 | 10.18 | 34.26 | 42.67 | 54 | 11.33 | AV |
| 7323 | / | / | / | / | / | / | / | / | / |
| 9764 | / | / | / | / | / | / | / | / | / |
| 4882 | 43.42 | H | 33.93 | 10.18 | 34.26 | 53.27 | 74 | 20.73 | PK |
| 4882 | 31.46 | H | 33.93 | 10.18 | 34.26 | 41.31 | 54 | 12.69 | AV |
| 7323 | / | / | / | / | / | / | / | / | / |
| 9764 | / | / | / | / | / | / | / | / | / |
| Test Mode: GFSK TX High | | | | | | | | | |
| 4960 | 42.99 | V | 33.98 | 10.18 | 34.26 | 52.89 | 74 | 21.11 | PK |
| 4960 | 34.79 | V | 33.98 | 10.18 | 34.26 | 44.69 | 54 | 9.31 | AV |
| 7440 | / | / | / | / | / | / | / | / | / |
| 9920 | / | / | / | / | / | / | / | / | / |
| 4960 | 44.42 | H | 33.98 | 10.18 | 34.26 | 54.32 | 74 | 19.68 | PK |
| 4960 | 32.39 | H | 33.98 | 10.18 | 34.26 | 42.29 | 54 | 11.71 | AV |
| 7440 | / | / | / | / | / | / | / | / | / |
| 9920 | / | / | / | / | / | / | / | / | / |
| Note: | | | | | | | | | |
| 1, Result = Read level + Antenna factor + cable loss-Amp factor | | | | | | | | | |
| 2, All the other emissions not reported were too low to read and deemed to comply with FCC limit. | | | | | | | | | |

From 1G-25GHz

| Test Mode: $\pi/4$ DQPSK TX Low | | | | | | | | | |
|---|---------------------|-------------|-----------------------|----------------|-----------------|-----------------|----------------|-------------|--------|
| Freq (MHz) | Read Level (dBuV/m) | Polar (H/V) | Antenna Factor (dB/m) | Cable loss(dB) | Amp Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
| 4804 | 43.99 | V | 33.95 | 10.18 | 34.26 | 53.86 | 74 | 20.14 | PK |
| 4804 | 30.5 | V | 33.95 | 10.18 | 34.26 | 40.37 | 54 | 13.63 | AV |
| 7206 | / | / | / | / | / | / | / | / | / |
| 9608 | / | / | / | / | / | / | / | / | / |
| 4824 | 43.31 | H | 33.95 | 10.18 | 34.26 | 53.18 | 74 | 20.82 | PK |
| 4824 | 31.67 | H | 33.95 | 10.18 | 34.26 | 41.54 | 54 | 12.46 | AV |
| 7206 | / | / | / | / | / | / | / | / | / |
| 9608 | / | / | / | / | / | / | / | / | / |
| Test Mode: $\pi/4$ DQPSK TX Mid | | | | | | | | | |
| 4882 | 44.17 | V | 33.93 | 10.18 | 34.26 | 54.02 | 74 | 19.98 | PK |
| 4882 | 32.59 | V | 33.93 | 10.18 | 34.26 | 42.44 | 54 | 11.56 | AV |
| 7323 | / | / | / | / | / | / | / | / | / |
| 9764 | / | / | / | / | / | / | / | / | / |
| 4882 | 42.99 | H | 33.93 | 10.18 | 34.26 | 52.84 | 74 | 21.16 | PK |
| 4882 | 31.75 | H | 33.93 | 10.18 | 34.26 | 41.6 | 54 | 12.4 | AV |
| 7323 | / | / | / | / | / | / | / | / | / |
| 9764 | / | / | / | / | / | / | / | / | / |
| Test Mode: $\pi/4$ DQPSK TX High | | | | | | | | | |
| 4960 | 43.22 | V | 33.98 | 10.18 | 34.26 | 53.12 | 74 | 20.88 | PK |
| 4960 | 34.42 | V | 33.98 | 10.18 | 34.26 | 44.32 | 54 | 9.68 | AV |
| 7440 | / | / | / | / | / | / | / | / | / |
| 9920 | / | / | / | / | / | / | / | / | / |
| 4960 | 44.15 | H | 33.98 | 10.18 | 34.26 | 54.05 | 74 | 19.95 | PK |
| 4960 | 31.9 | H | 33.98 | 10.18 | 34.26 | 41.8 | 54 | 12.2 | AV |
| 7440 | / | / | / | / | / | / | / | / | / |
| 9920 | / | / | / | / | / | / | / | / | / |
| Note: | | | | | | | | | |
| 1, Result = Read level + Antenna factor + cable loss-Amp factor | | | | | | | | | |
| 2, All the other emissions not reported were too low to read and deemed to comply with FCC limit. | | | | | | | | | |

9. BAND EDGE COMPLIANCE

9.1. Block Diagram of Test Setup



9.2. Limit

All the lower and upper band-edges emissions appearing within restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

9.3. Test Procedure

All restriction band and non- restriction band have been tested , only worse case is reported.

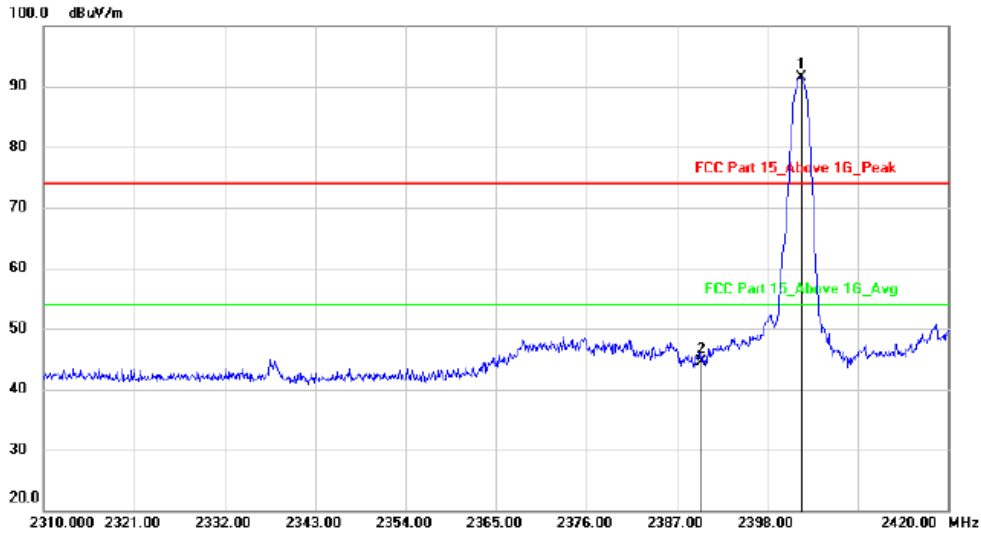
9.4. Test Result

PASS. (See below detailed test data)

Radiated Method:

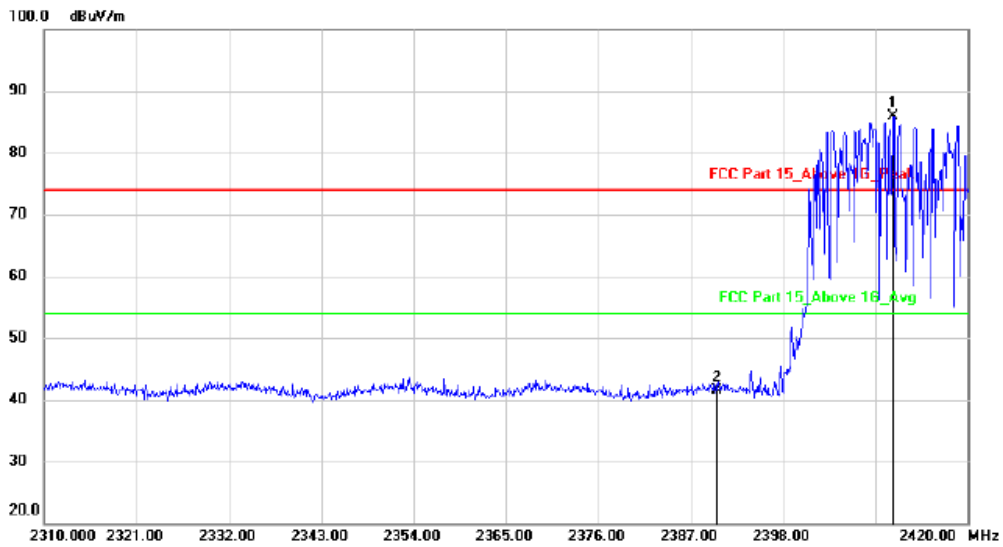
Polarization: Vertical

Test Mode: GFSK-Low



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | degree | Comment |
| 1 | * | 2402.180 | 94.93 | -3.41 | 91.52 | 74.00 | 17.52 | peak | | |
| 2 | | 2390.000 | 47.95 | -3.40 | 44.55 | 74.00 | -29.45 | peak | | |

hopping-off



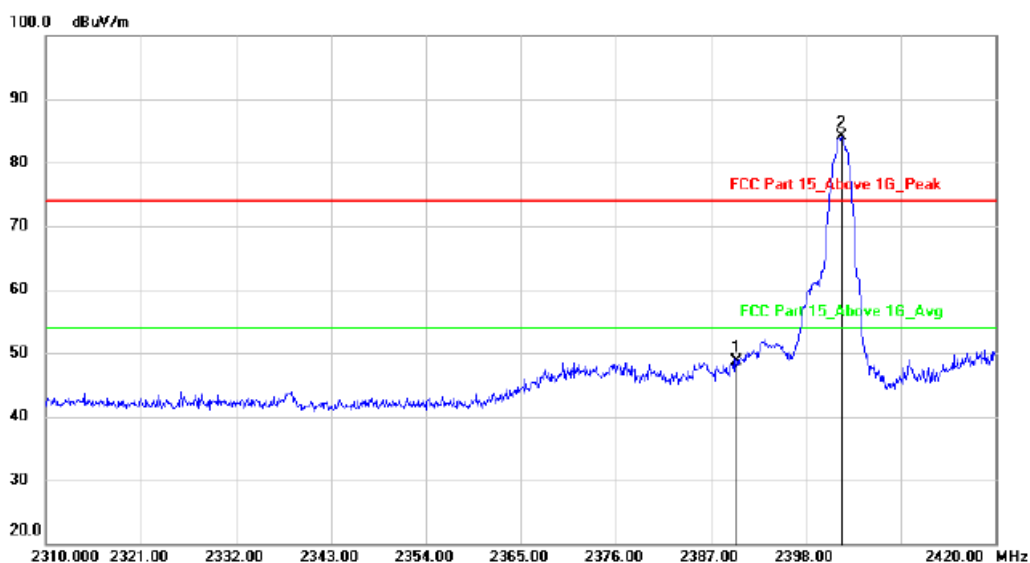
| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | degree | Comment |
| 1 | * | 2411.090 | 89.24 | -3.40 | 85.84 | 74.00 | 11.84 | peak | | |
| 2 | | 2390.000 | 44.97 | -3.40 | 41.57 | 74.00 | -32.43 | peak | | |

hopping-on

Polarization: Horizontal:

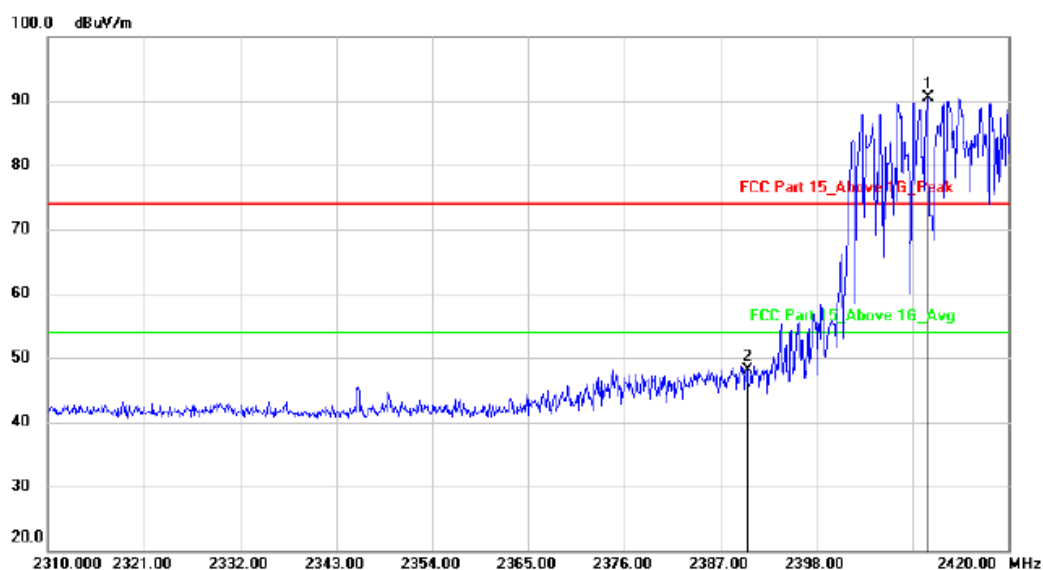
Test Mode:

GFSK-Low



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | degree | Comment |
| 1 | | 2390.000 | 52.01 | -3.40 | 48.61 | 74.00 | -25.39 | | | peak |
| 2 | * | 2402.180 | 87.51 | -3.41 | 84.10 | 74.00 | 10.10 | | | peak |

hopping-off

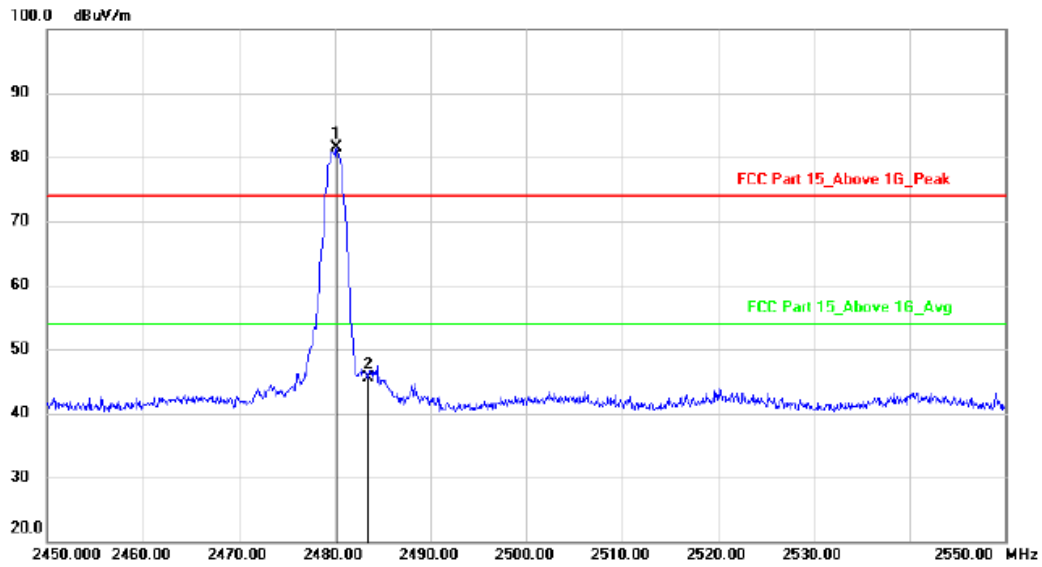


| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | degree | Comment |
| 1 | * | 2410.760 | 93.95 | -3.40 | 90.55 | 74.00 | 16.55 | | | peak |
| 2 | | 2390.000 | 51.46 | -3.40 | 48.06 | 74.00 | -25.94 | | | peak |

hopping-on

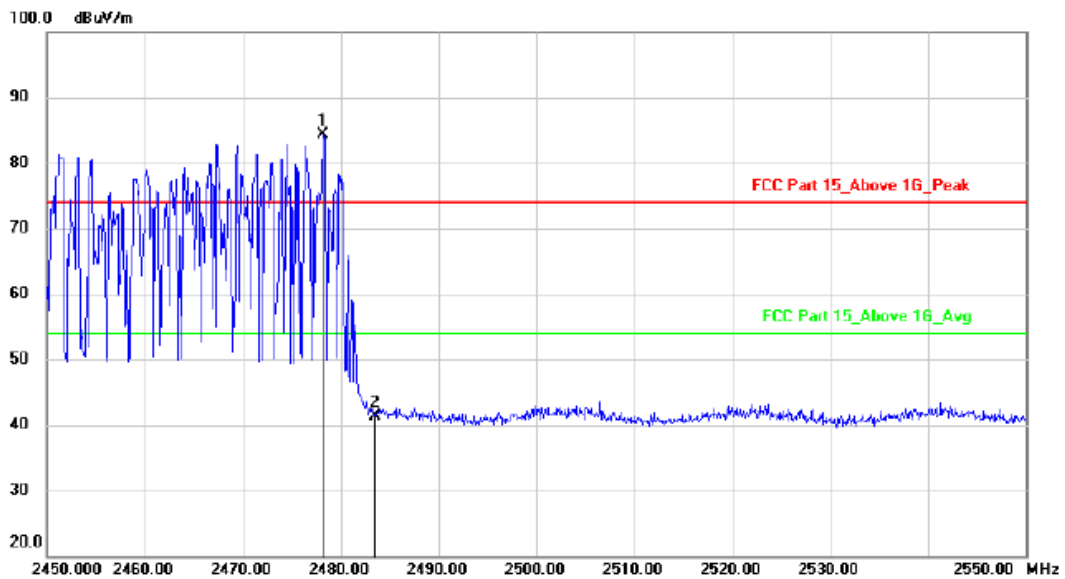
Polarization: Vertical

Test Mode: GFSK-High



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | degree | Comment |
| 1 | * | 2480.200 | 84.90 | -3.38 | 81.52 | 74.00 | 7.52 | | | peak |
| 2 | | 2483.500 | 48.86 | -3.38 | 45.48 | 74.00 | -28.52 | | | peak |

hopping-off

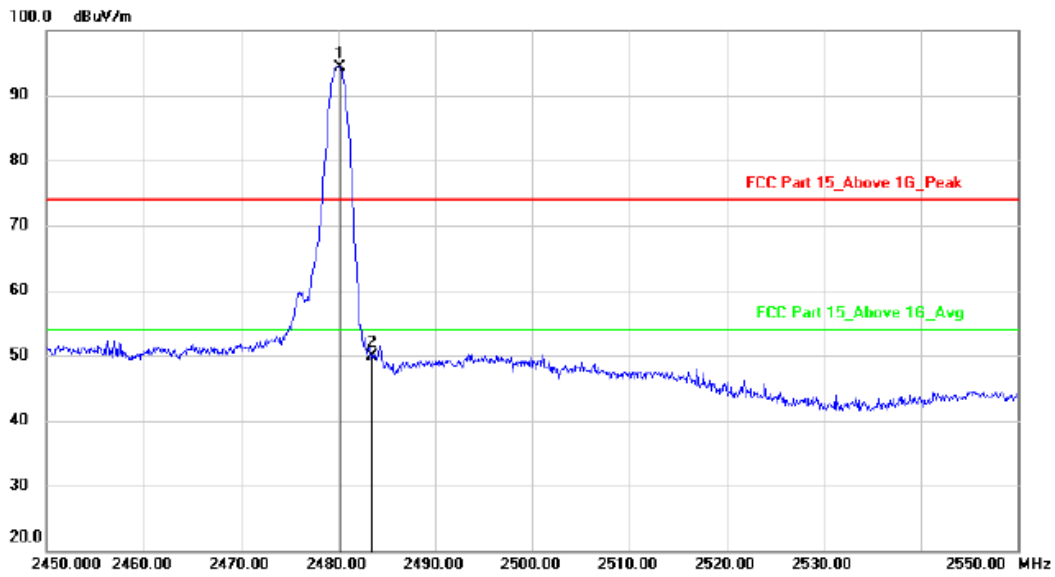


| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | degree | Comment |
| 1 | * | 2478.200 | 87.72 | -3.39 | 84.33 | 74.00 | 10.33 | | | peak |
| 2 | | 2483.500 | 44.76 | -3.38 | 41.38 | 74.00 | -32.62 | | | peak |

hopping-on

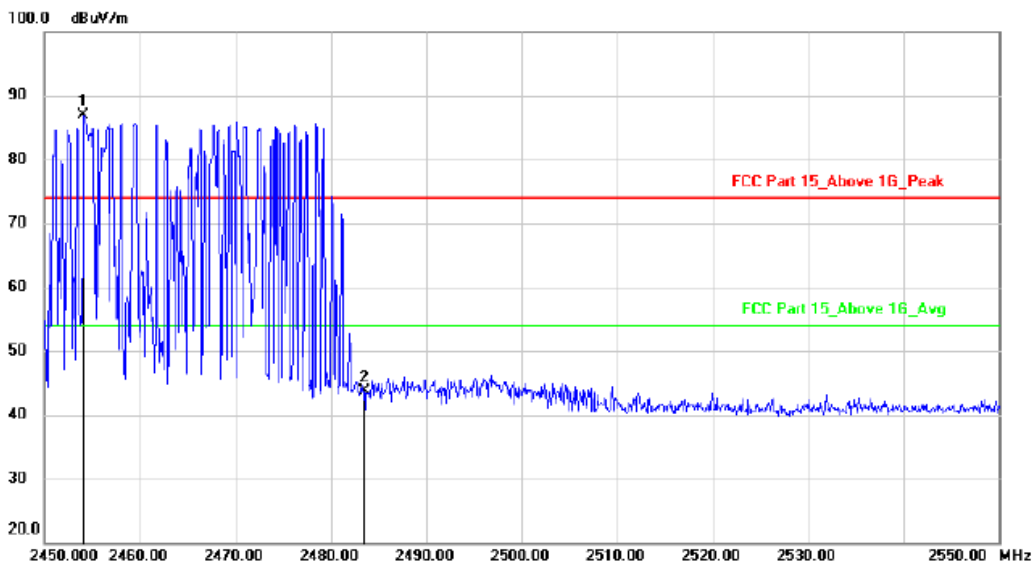
Polarization: Horizontal

Test Mode: GFSK-High



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | degree | Comment |
| 1 | * | 2480.200 | 97.75 | -3.38 | 94.37 | 74.00 | 20.37 | | | peak |
| 2 | | 2483.500 | 53.32 | -3.38 | 49.94 | 74.00 | -24.06 | | | peak |

hopping-off

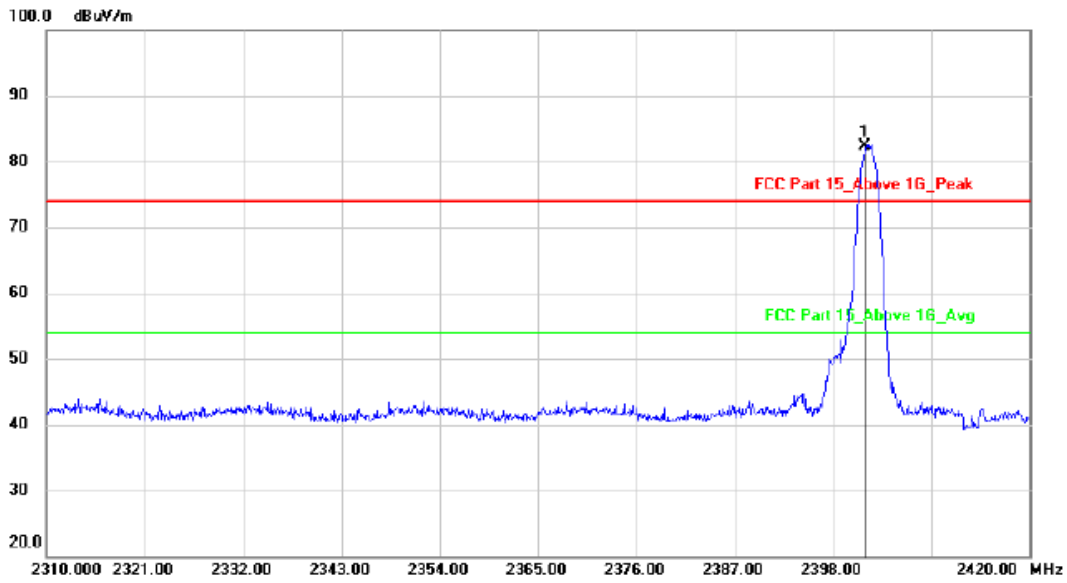


| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | degree | Comment |
| 1 | * | 2454.100 | 90.28 | -3.39 | 86.89 | 74.00 | 12.89 | | | peak |
| 2 | | 2483.500 | 47.17 | -3.38 | 43.79 | 74.00 | -30.21 | | | peak |

hopping-on

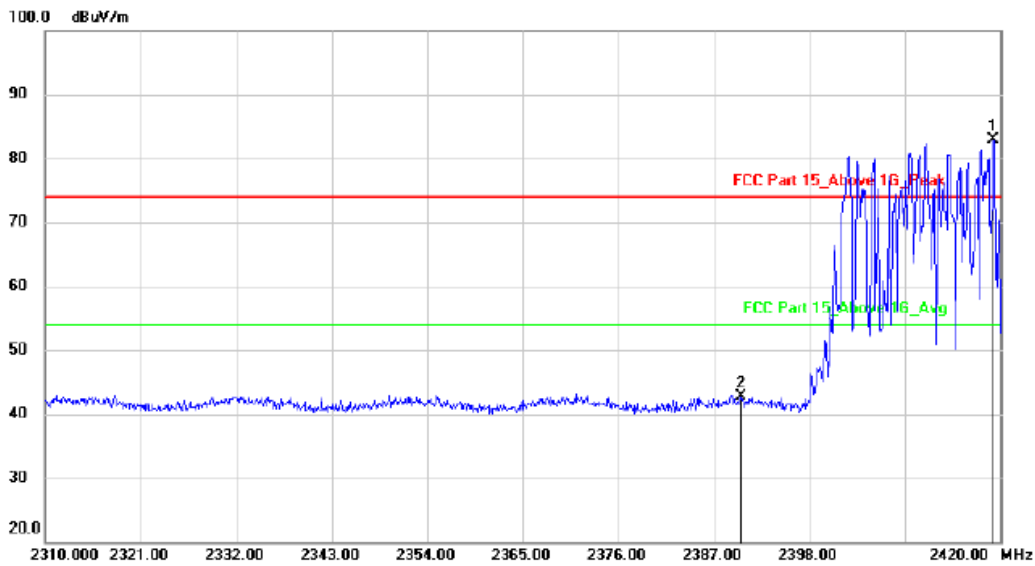
Polarization: Vertical

Test Mode: $\pi/4$ DQPSK-Low



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | degree | Comment |
| 1 | * | 2401.630 | 85.74 | -3.41 | 82.33 | 74.00 | 8.33 | peak | | |

hopping-off

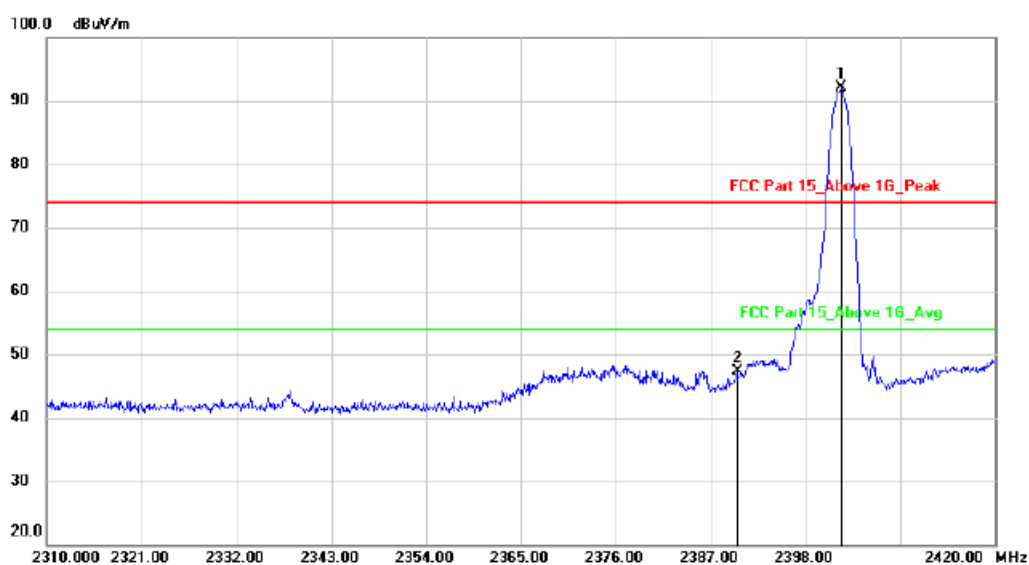


| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | degree | Comment |
| 1 | * | 2419.230 | 86.33 | -3.41 | 82.92 | 74.00 | 8.92 | peak | | |
| 2 | | 2390.000 | 46.07 | -3.40 | 42.67 | 74.00 | -31.33 | peak | | |

hopping-on

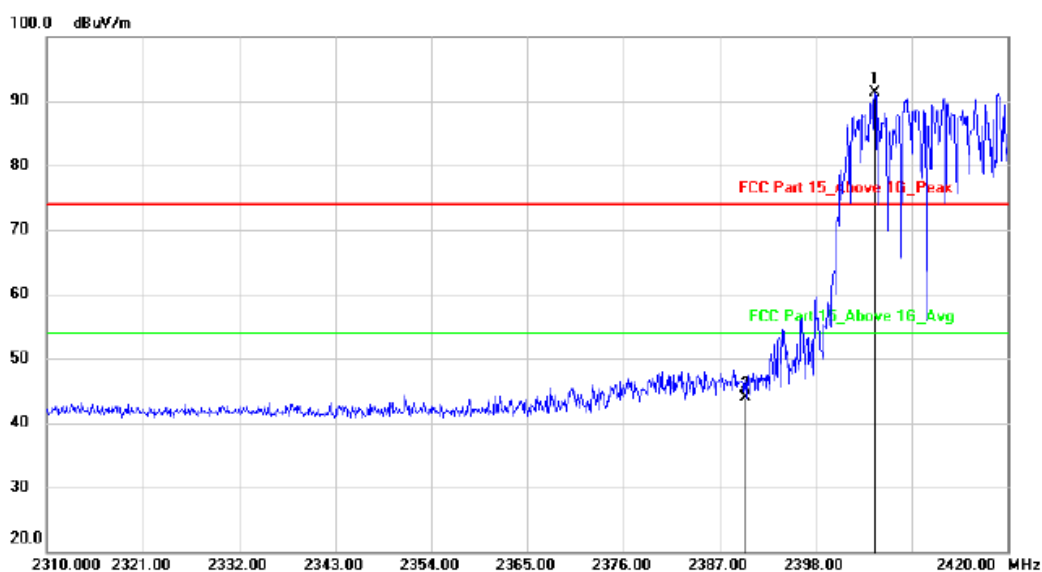
Polarization: Horizontal

Test Mode: $\pi/4$ DQPSK-Low



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | degree | Comment |
| 1 | * | 2402.180 | 95.42 | -3.41 | 92.01 | 74.00 | 18.01 | peak | | |
| 2 | | 2390.000 | 50.68 | -3.40 | 47.28 | 74.00 | -26.72 | peak | | |

hopping-off

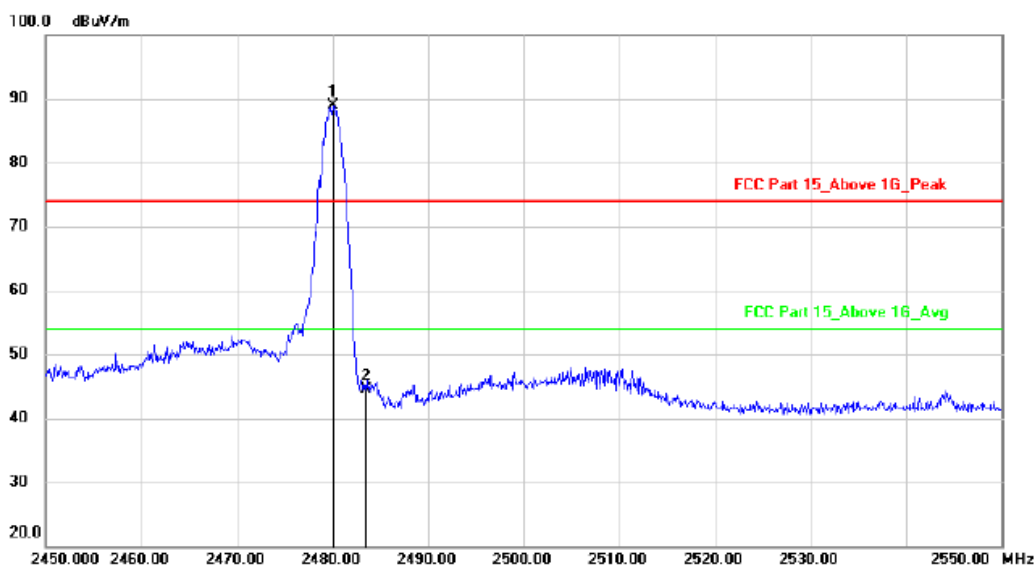


| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | degree | Comment |
| 1 | * | 2404.820 | 94.74 | -3.41 | 91.33 | 74.00 | 17.33 | peak | | |
| 2 | | 2390.000 | 47.29 | -3.40 | 43.89 | 74.00 | -30.11 | peak | | |

hopping-on

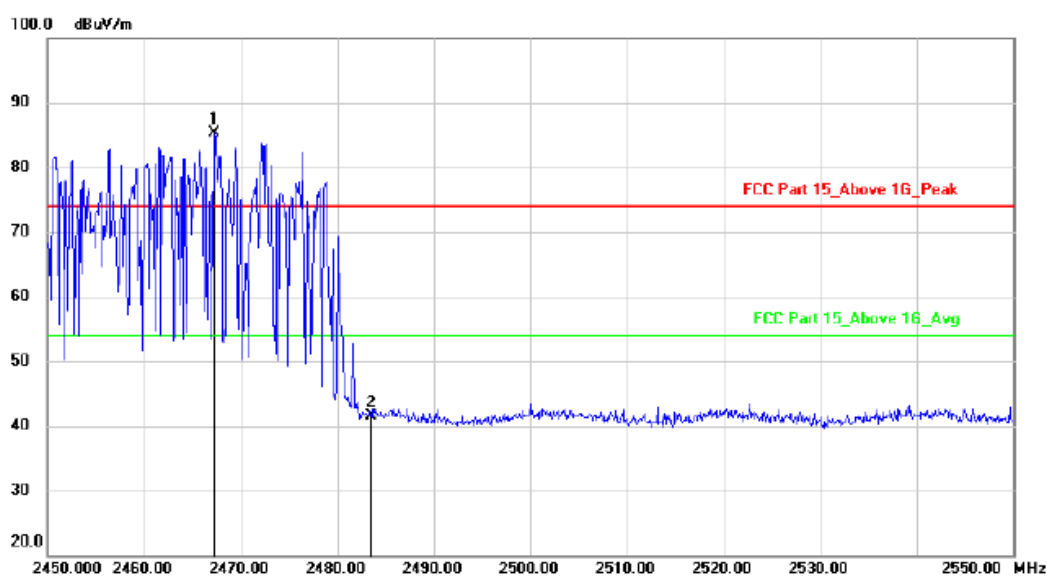
Polarization: Vertical

Test Mode: $\pi/4$ DQPSK-High



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | degree | Comment |
| 1 | * | 2480.000 | 92.32 | -3.38 | 88.94 | 74.00 | 14.94 | | | peak |
| 2 | | 2483.500 | 47.86 | -3.38 | 44.48 | 74.00 | -29.52 | | | peak |

hopping-off

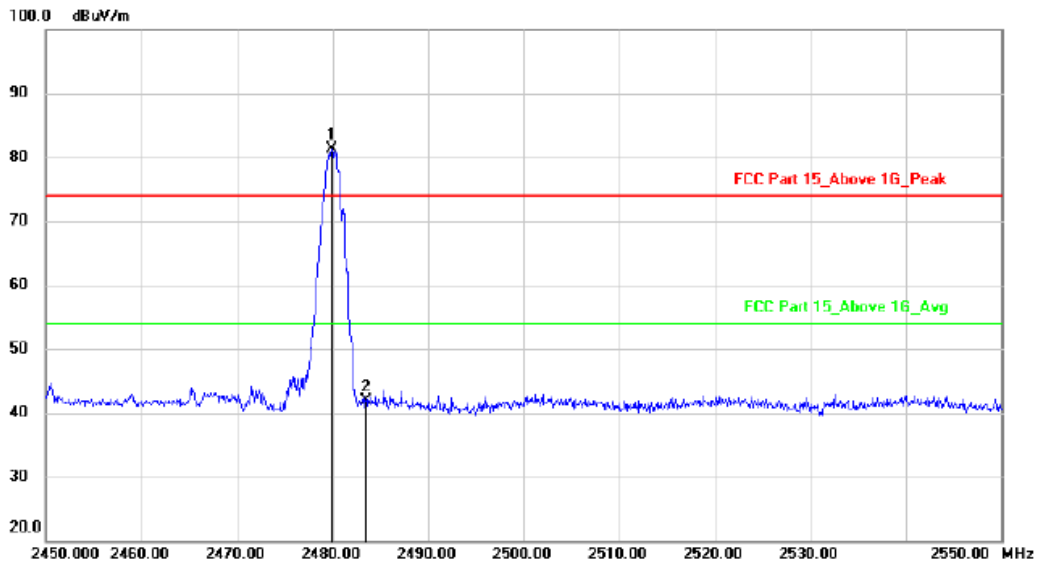


| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | degree | Comment |
| 1 | * | 2467.300 | 88.73 | -3.39 | 85.34 | 74.00 | 11.34 | | | peak |
| 2 | | 2483.500 | 44.92 | -3.38 | 41.54 | 74.00 | -32.46 | | | peak |

hopping-on

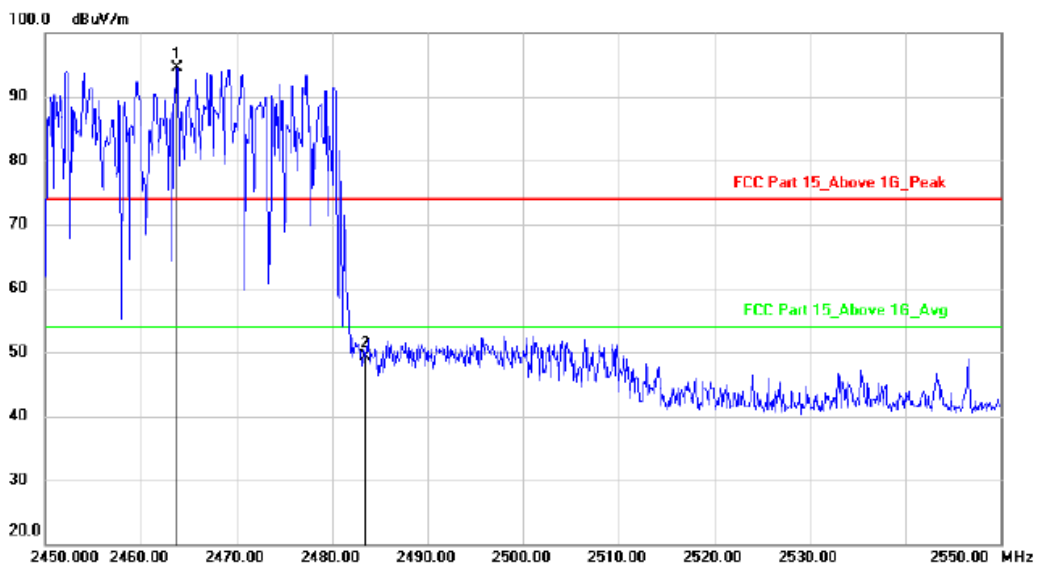
Polarization: Horizontal

Test Mode: $\pi/4$ DQPSK-High



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | degree | Comment |
| 1 | * | 2479.900 | 84.69 | -3.38 | 81.31 | 74.00 | 7.31 | | | peak |
| 2 | | 2483.500 | 45.21 | -3.38 | 41.83 | 74.00 | -32.17 | | | peak |

hopping-off



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | cm | degree | Comment |
| 1 | * | 2463.800 | 97.90 | -3.40 | 94.50 | 74.00 | 20.50 | | | peak |
| 2 | | 2483.500 | 52.74 | -3.38 | 49.36 | 74.00 | -24.64 | | | peak |

hopping-on

Note: 1. *:Maximum data; x:Over limit; !:over margin.

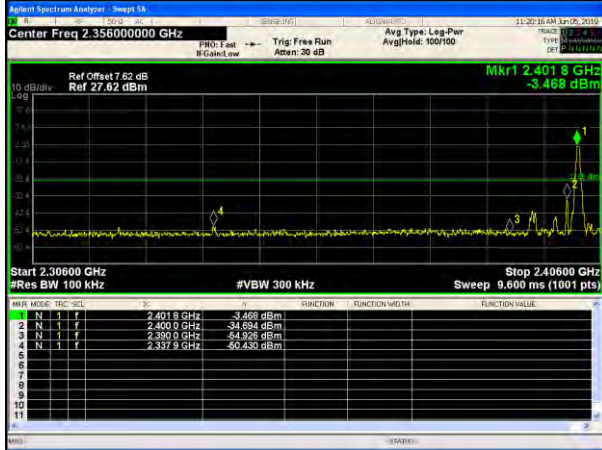
2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Conducted Method

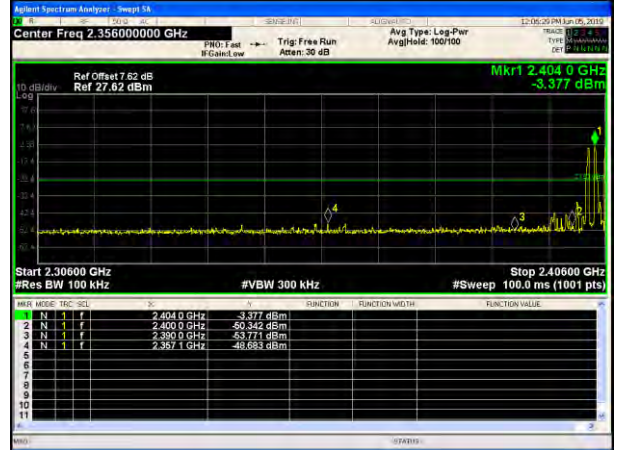
GFSK Mode:

Test channel:

Lowest channel



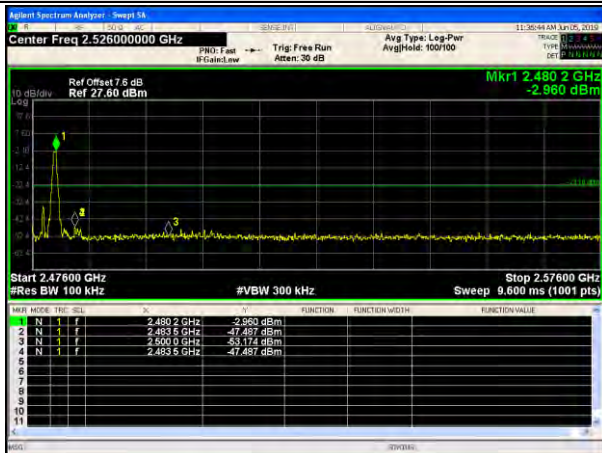
No-hopping mode



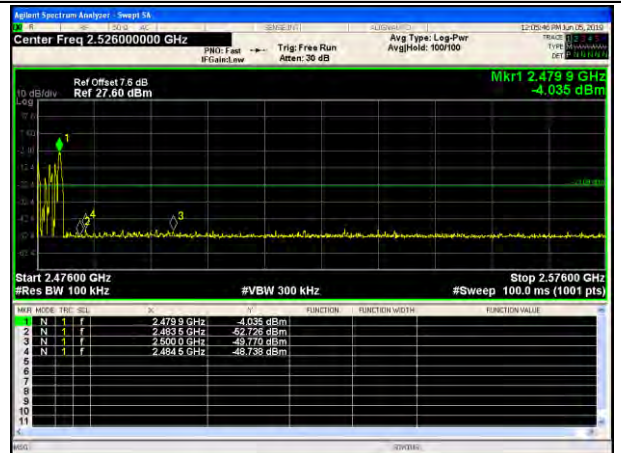
Hopping mode

Test channel:

Highest channel



No-hopping mode

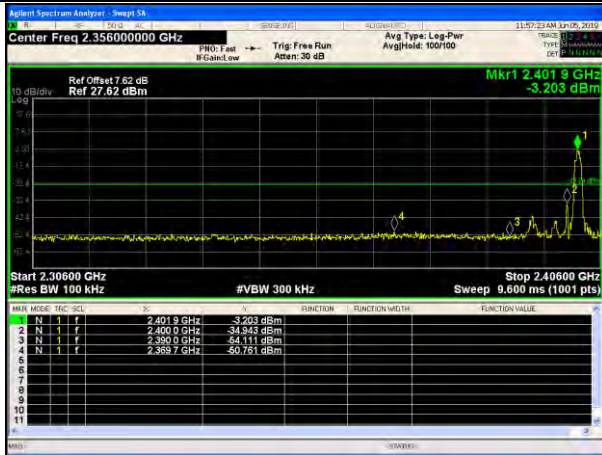


Hopping mode

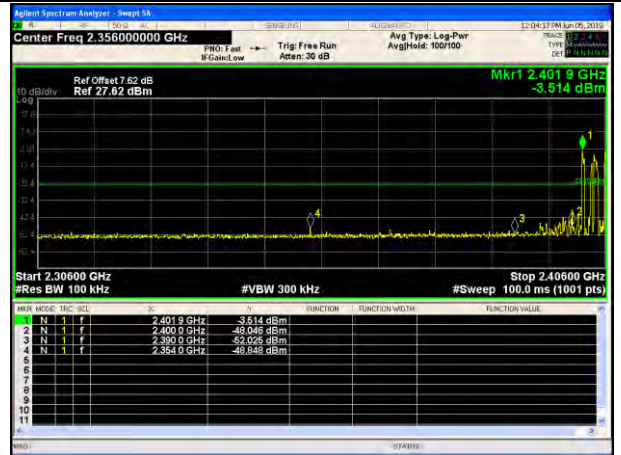
Pi/4QPSK Mode:

Test channel:

Lowest channel



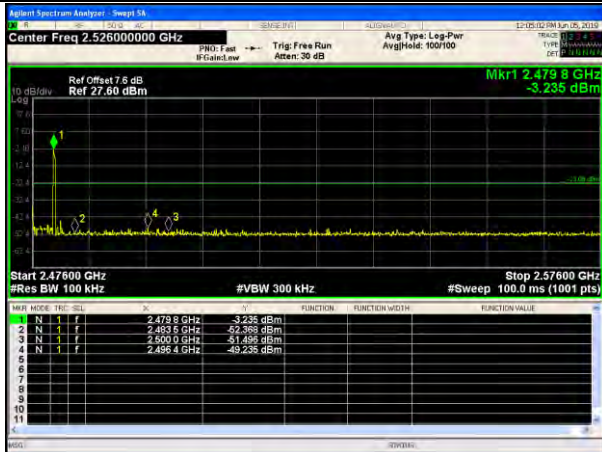
No-hopping mode



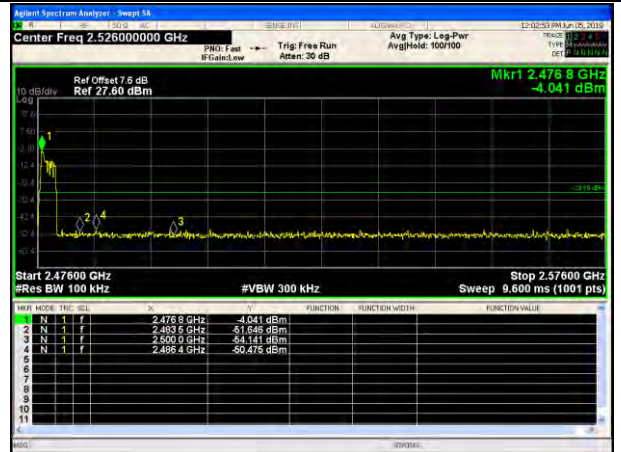
Hopping mode

Test channel:

Highest channel



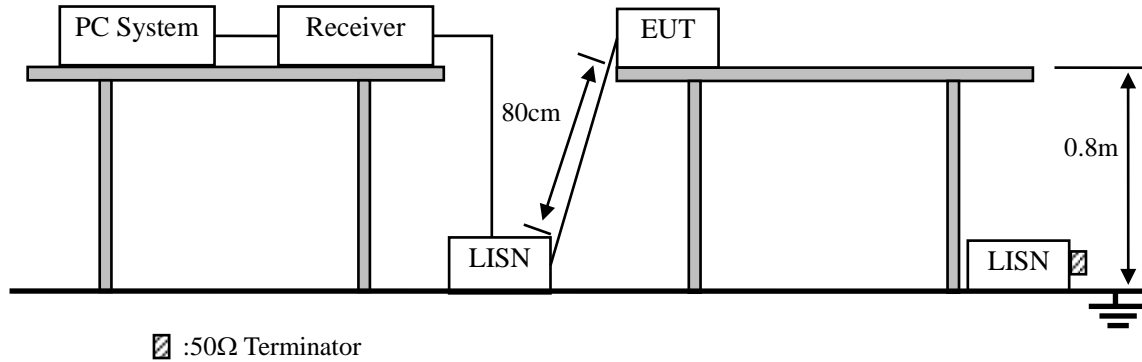
No-hopping mode



Hopping mode

10. POWER LINE CONDUCTED EMISSIONS

10.1. Block Diagram of Test Setup



10.2. Limit

| Frequency | Maximum RF Line Voltage | |
|-----------------|----------------------------------|-------------------------------|
| | Quasi-Peak Level dB(μ V) | Average Level dB(μ V) |
| 150kHz ~ 500kHz | 66 ~ 56* | 56 ~ 46* |
| 500kHz ~ 5MHz | 56 | 46 |
| 5MHz ~ 30MHz | 60 | 50 |

Notes: 1. * Decreasing linearly with logarithm of frequency.

2. The lower limit shall apply at the transition frequencies.

10.3. Test Procedure

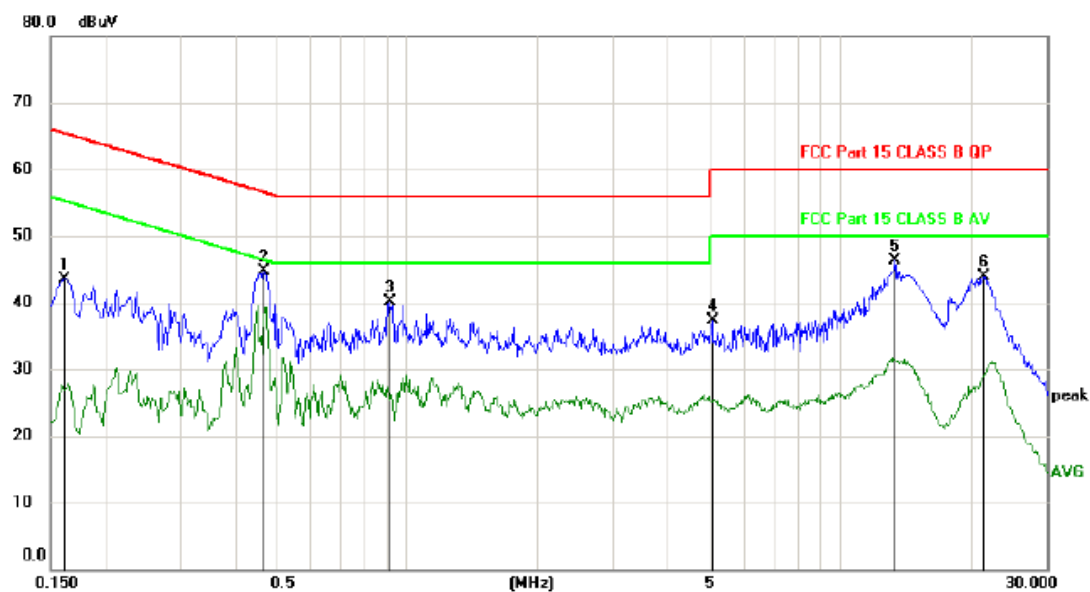
- (1) The EUT was placed on a non-metallic table, 80cm above the ground plane.
- (2) Setup the EUT and simulator as shown in 10.1
- (3) The EUT Power connected to the power mains through a power adapter and a line impedance stabilization network (L.I.S.N1). The other peripheral devices power cord connected to the power mains through a line impedance stabilization network (L.I.S.N2), this provided a 50-ohm coupling impedance for the EUT (Please refer to the block diagram of the test setup and photographs). Both sides of power line were checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10 :2013on conducted Emission test.
- (4) The bandwidth of test receiver is set at 10KHz.
- (5) The frequency range from 150 KHz to 30MHz is checked.

10.4. Test Result

PASS. (See below detailed test data)

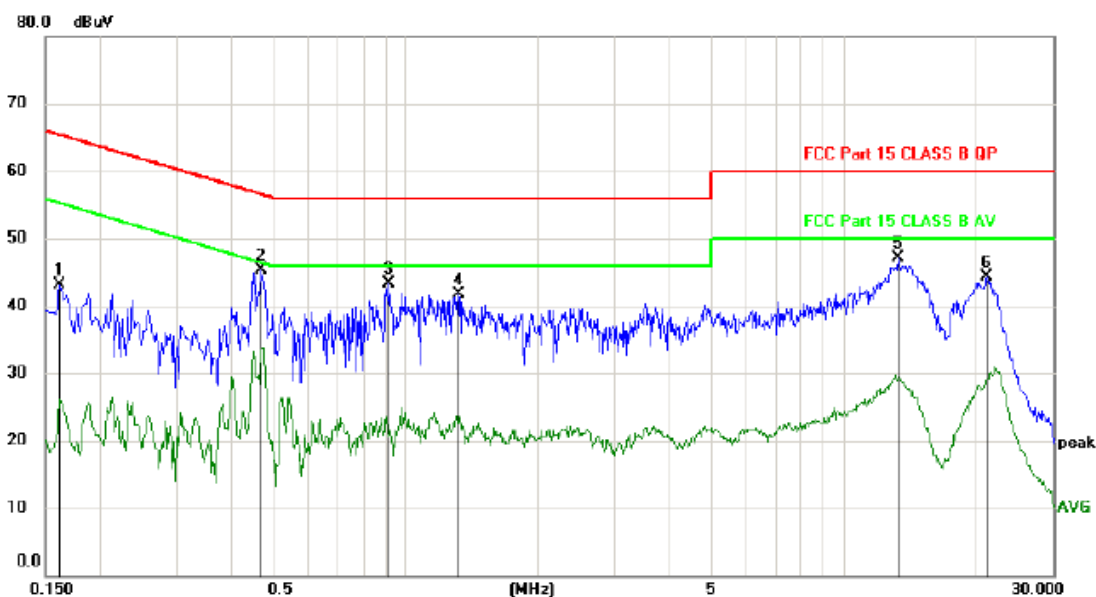
Note: If peak Result comply with AV limit, QP and AV Result is deemed to comply with AV limit

Line:



| No. | Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB | Measure- ment dBuV | Limit dBuV | Margin dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|--------------|----------|---------|
| 1 | | 0.1620 | 33.87 | 9.63 | 43.50 | 65.36 | -21.86 | peak | |
| 2 | * | 0.4680 | 34.95 | 9.68 | 44.63 | 56.55 | -11.92 | peak | |
| 3 | | 0.9090 | 30.46 | 9.72 | 40.18 | 56.00 | -15.82 | peak | |
| 4 | | 5.0700 | 27.27 | 10.06 | 37.33 | 60.00 | -22.67 | peak | |
| 5 | | 13.3920 | 36.13 | 10.11 | 46.24 | 60.00 | -13.76 | peak | |
| 6 | | 21.4410 | 33.80 | 10.19 | 43.99 | 60.00 | -16.01 | peak | |

Neutral:



| No. | Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB | Measure- ment dBuV | Limit dBuV | Margin dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|--------------|----------|---------|
| 1 | | 0.1620 | 33.39 | 9.63 | 43.02 | 65.36 | -22.34 | peak | |
| 2 | * | 0.4680 | 35.71 | 9.68 | 45.39 | 56.55 | -11.16 | peak | |
| 3 | | 0.9150 | 33.59 | 9.73 | 43.32 | 56.00 | -12.68 | peak | |
| 4 | | 1.3230 | 31.87 | 9.75 | 41.62 | 56.00 | -14.38 | peak | |
| 5 | | 13.3020 | 36.93 | 10.11 | 47.04 | 60.00 | -12.96 | peak | |
| 6 | | 21.2070 | 34.08 | 10.18 | 44.26 | 60.00 | -15.74 | peak | |

Remark: All modes have been tested, and only worst data of GFSK mode, Channel TX 2402MHz (AC 120V/60Hz) was listed in this report.

11. ANTENNA REQUIREMENTS

11.1. Limit

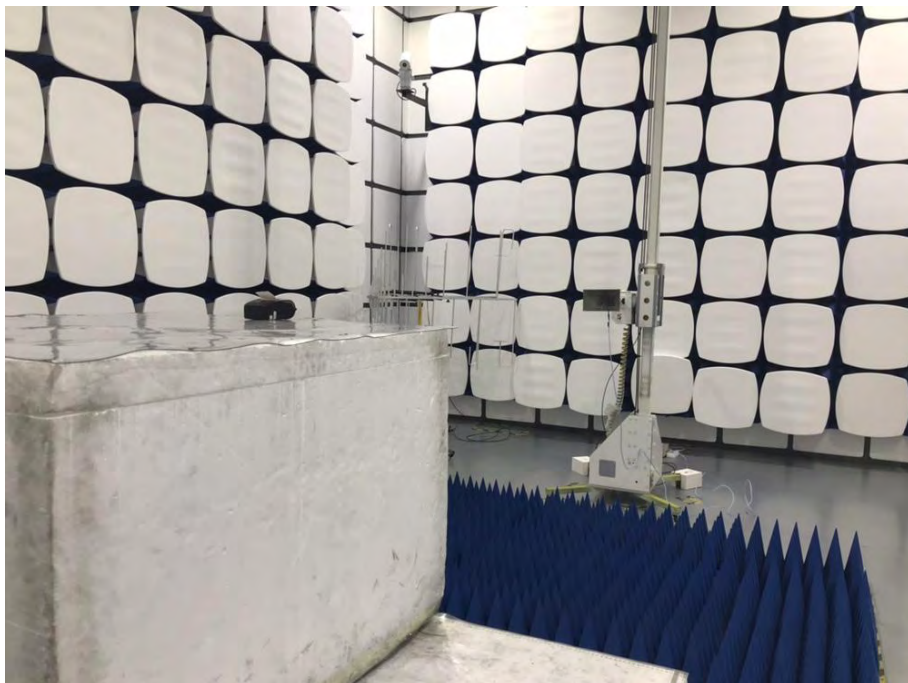
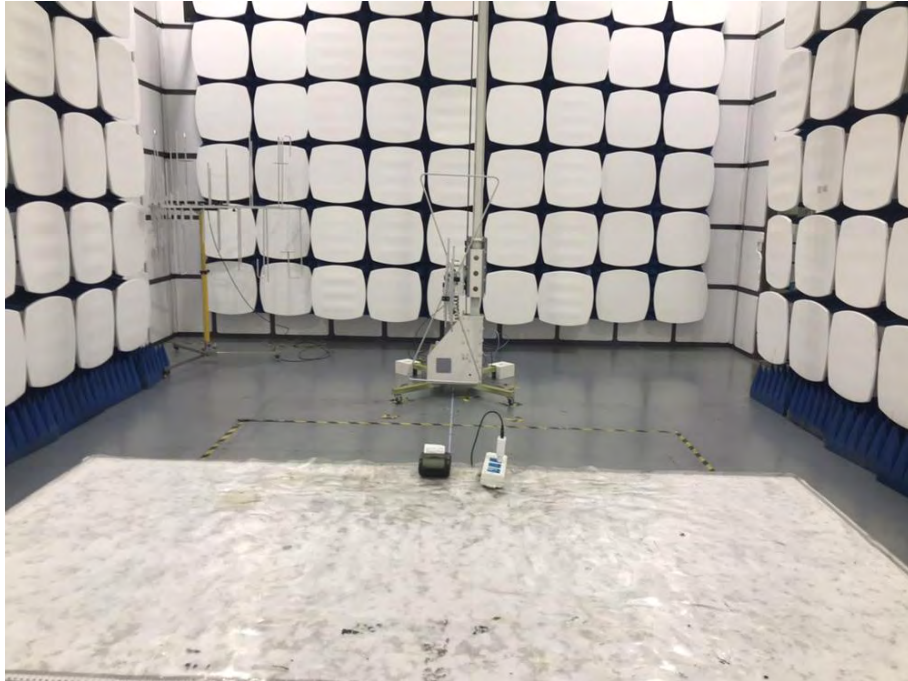
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

11.2. Result

The EUT antenna is Internal Antenna. It complies with the standard requirement.

12. TEST SETUP PHOTO

12.1. Photos of Radiated emission

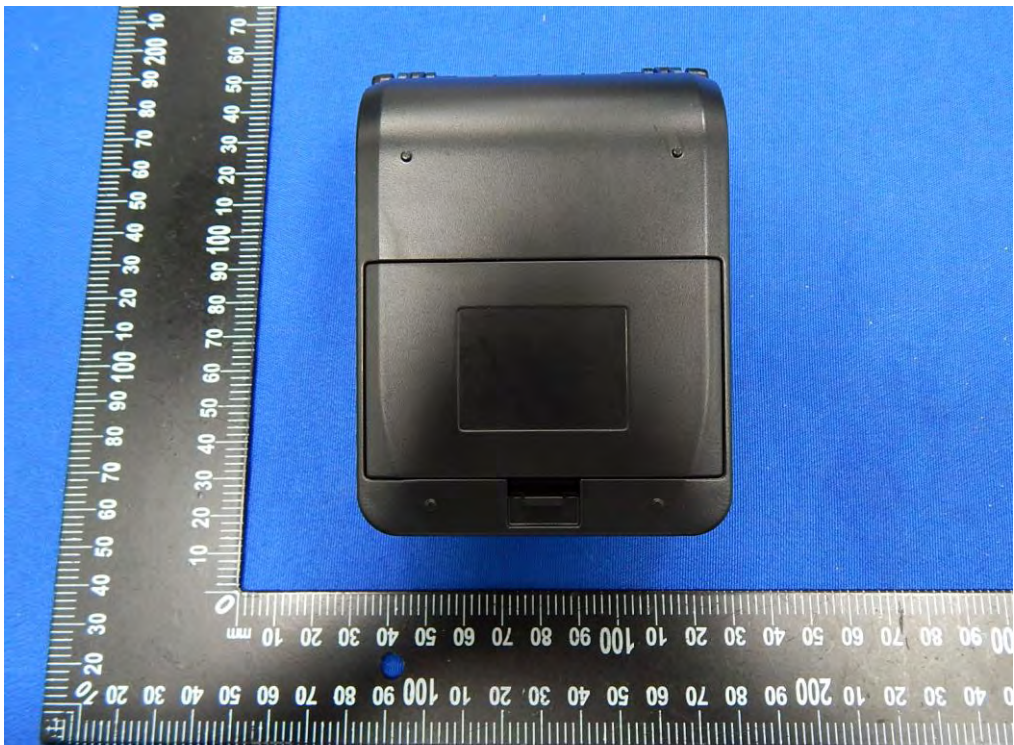


12.2.Photos of Conducted Emission test

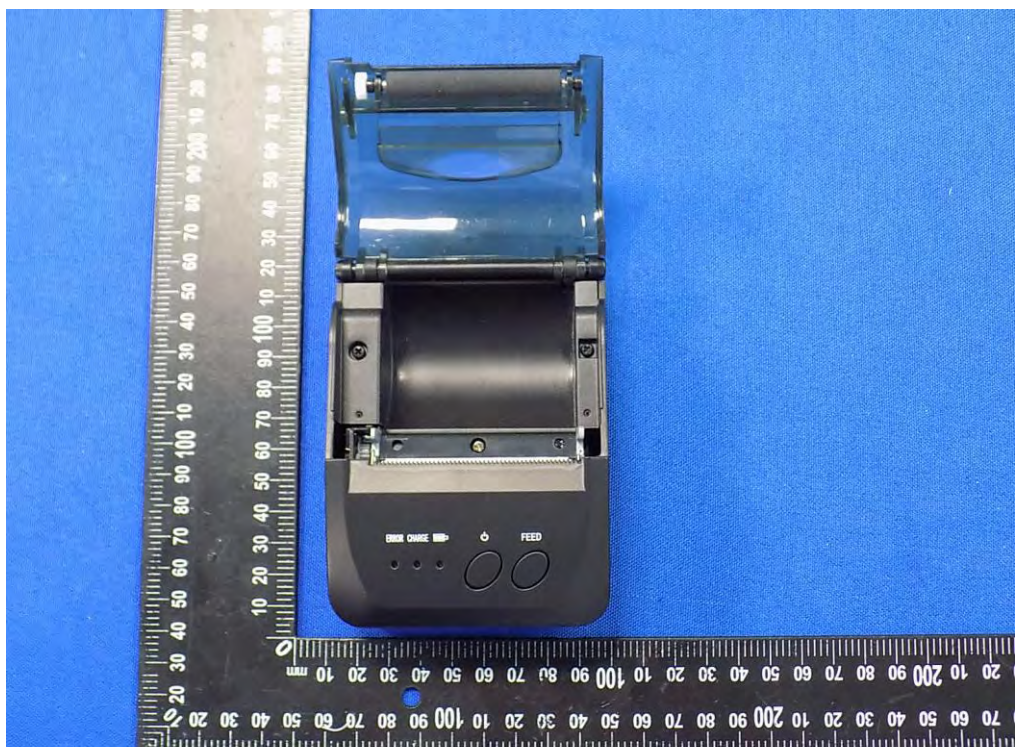


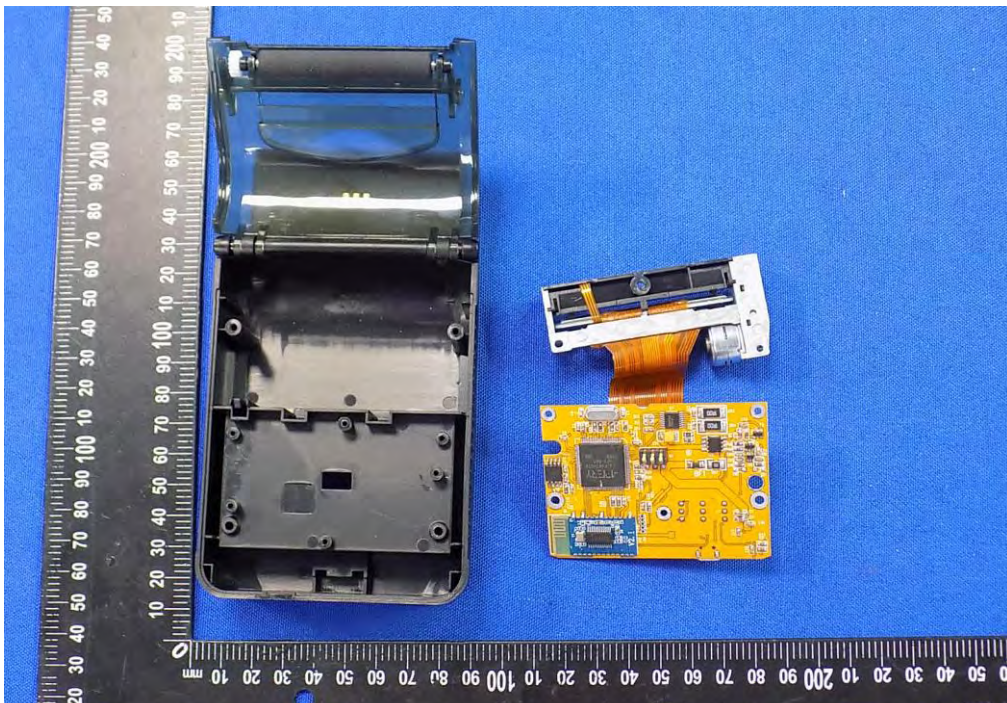
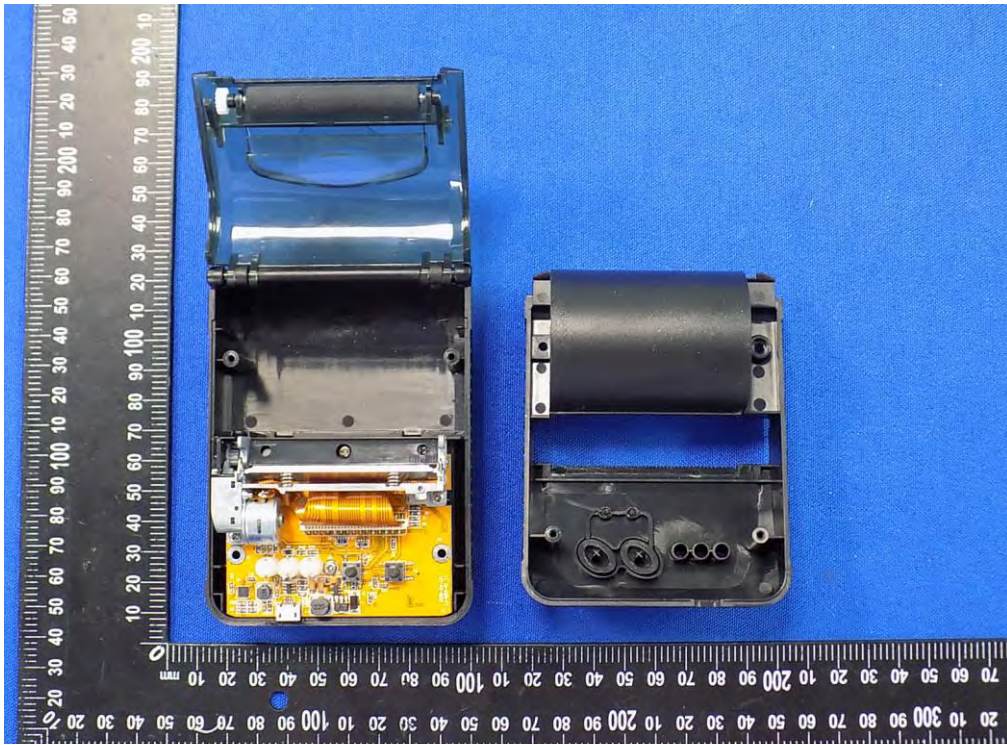
13. PHOTOS OF EUT

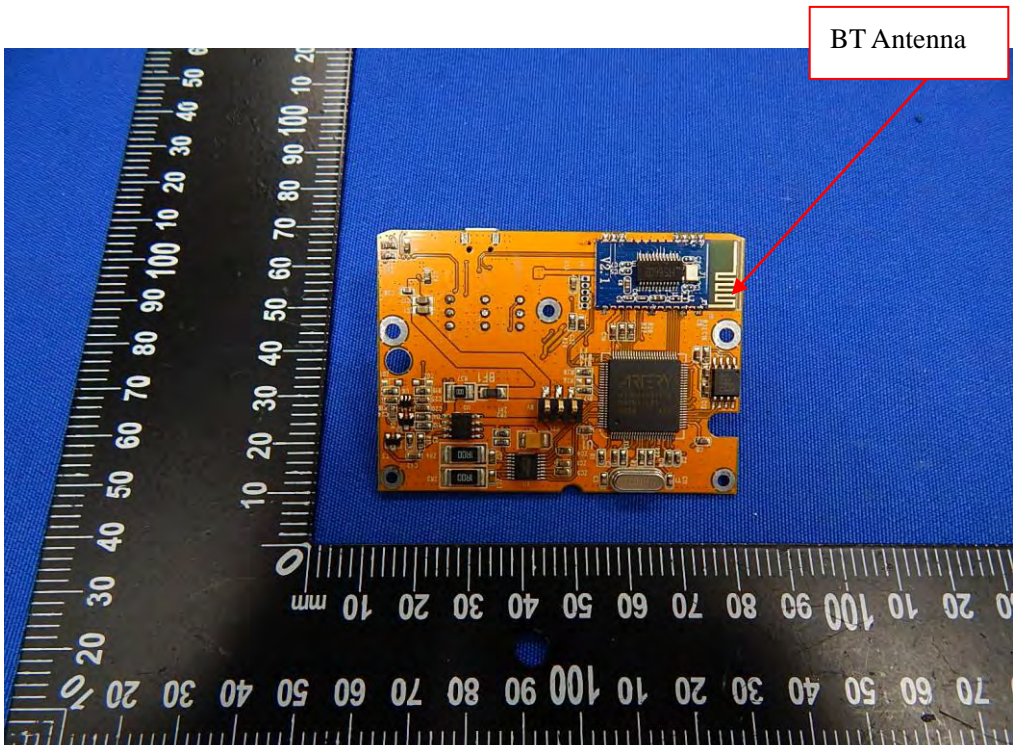
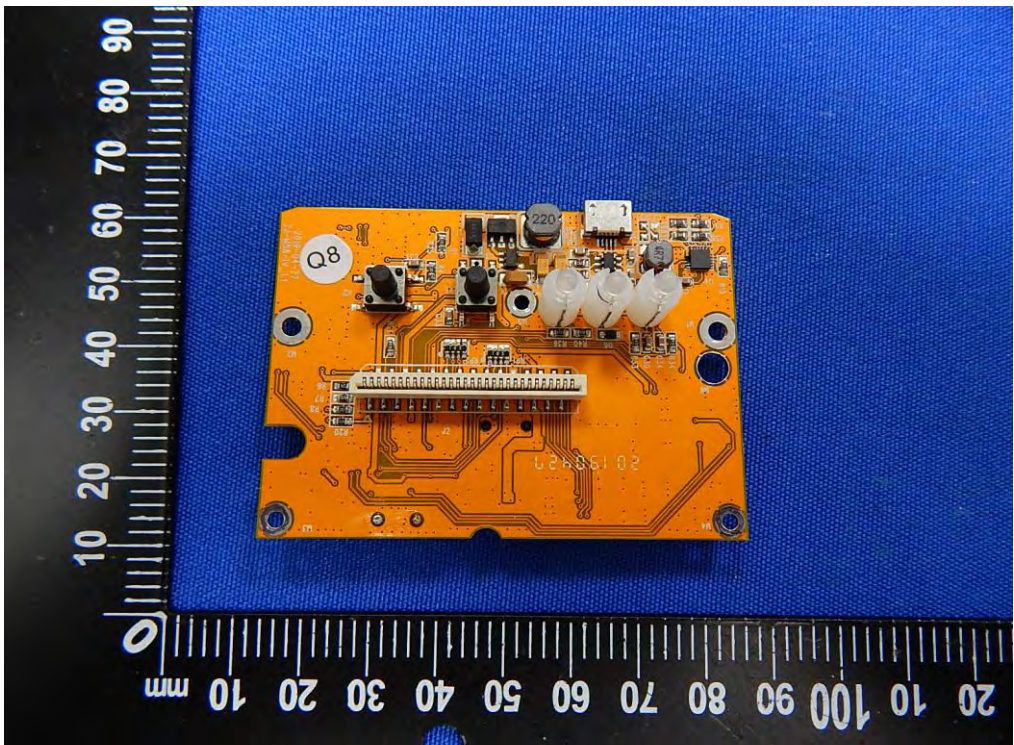


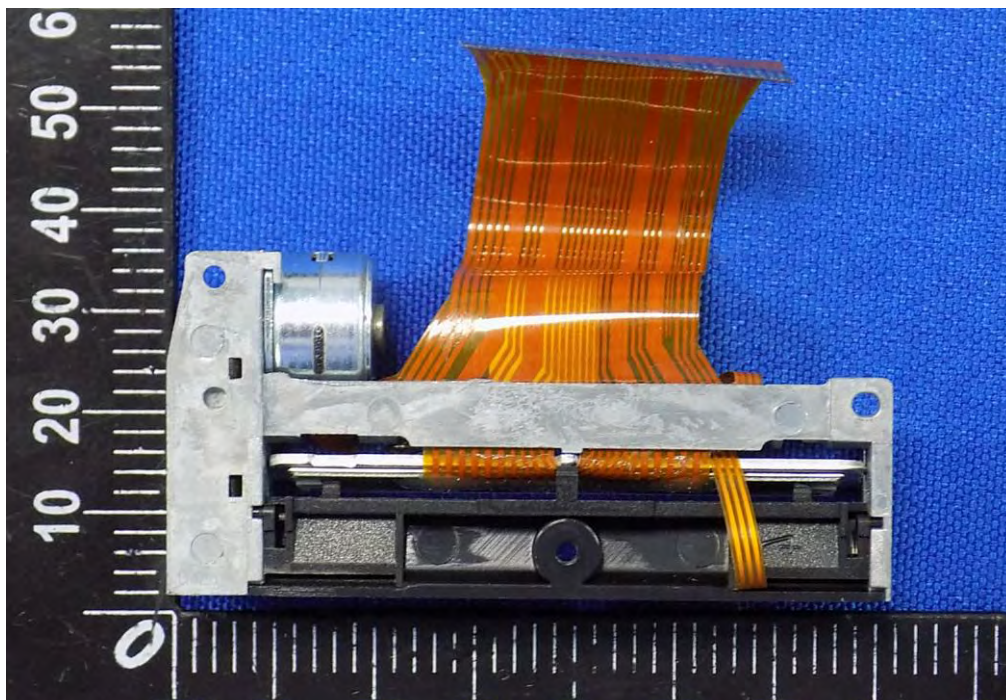
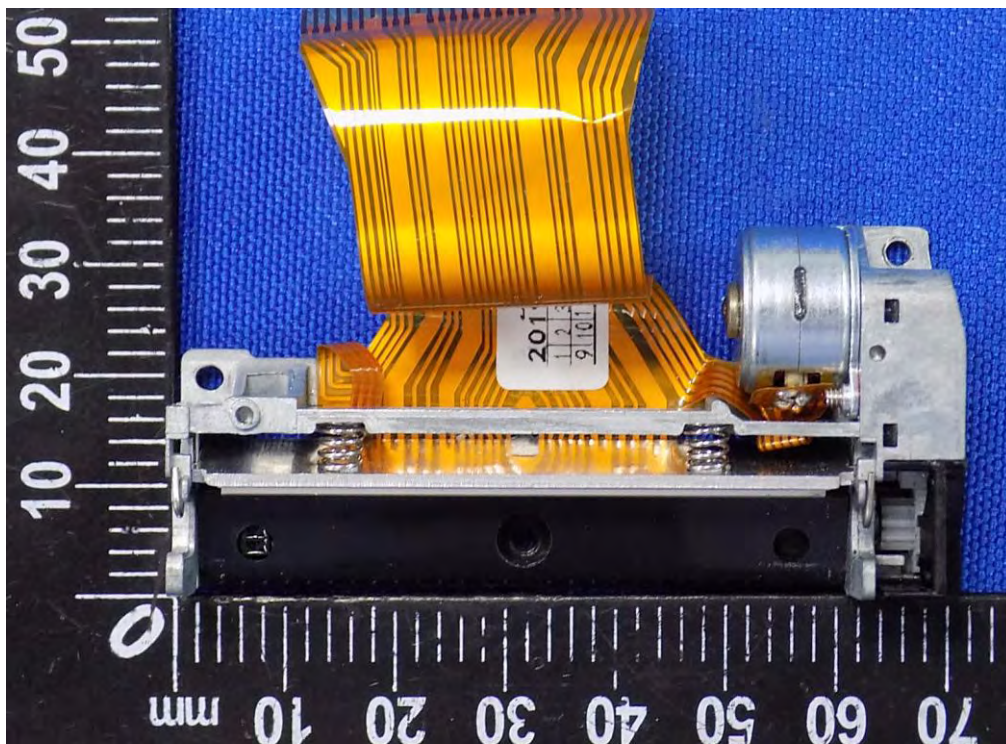












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