# FCC TEST REPORT

## FCC ID: 2ARE7-TX2

On Behalf of

ShenZhenShi NewStone Technology co., Ltd

2.4G Controller

Model No.: TX2, TX1, TX3, TX4, TX5, TX6 , TX7, TX8, TX9

| | | |
|---|---|---|
| Prepared for | : | ShenZhenShi NewStone Technology co., Ltd |
| Address | : | B2 blvd, YuHong Industrial Park, No.20, XingYe West Road, ShaJing Town, ShenZhen, China |

| | | |
|---|---|---|
| Prepared By | : | Shenzhen Alpha Product Testing Co., Ltd. |
| Address | : | Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103, Shenzhen, Guangdong, China |

| | | |
|---|---|---|
| Report Number | : | T1881576 06 |
| Date of Receipt | : | October 09, 2018 |
| Date of Test | : | October 09-25, 2018 |
| Date of Report | : | October 25, 2018 |
| Version Number | : | REV0 |

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# TEST REPORT DECLARATION

| | | |
|---|---|---|
| Applicant | : | ShenZhenShi NewStone Technology co., Ltd |
| Address | : | B2 blvd, YuHong Industrial Park, No.20, XingYe West Road, ShaJing Town, ShenZhen, China |
| Manufacturer | : | ShenZhenShi NewStone Technology co., Ltd |
| Address | : | B2 blvd, YuHong Industrial Park, No.20, XingYe West Road, ShaJing Town, ShenZhen, China |
| EUT Description | : | 2.4G Controller |
| | | (A) Model No. : TX2, TX1, TX3, TX4, TX5, TX6 , TX7, TX8, TX9 |
| | | (B) Trademark : N/A |

Measurement Standard Used:

**FCC Rules and Regulations Part 15 Subpart C Section 15.247: 2017,**

**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).....…..: | Reak Yang<br>Project Engineer | Reak Yang …… |
| Approved by (name + signature)…....: | Simple Guan<br>Project Manager | …… |
| Date of issue…… ……...: | October 25, 2018 | |

## Revision History

| Revision | Issue Date | Revisions | Revised By |
|---|---|---|---|
| 00 | October 25, 2018 | 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)<br>ANSI C63.10 :2013 | P |
| Bandwidth | FCC Part 15: 15.215<br>ANSI C63.10 :2013 | P |
| Carrier Frequency Separation | FCC Part 15: 15.247(a)(1)<br>ANSI C63.10 :2013 | P |
| Number Of Hopping Channel | FCC Part 15: 15.247(a)(1)(iii)<br>ANSI C63.10 :2013 | P |
| Dwell Time | FCC Part 15: 15.247(a)(1)(iii)<br>ANSI C63.10 :2013 | P |
| Radiated Emission | FCC Part 15: 15.209<br>FCC Part 15: 15.247(d)<br>ANSI C63.10 :2013 | P |
| Band Edge Compliance | FCC Part 15: 15.247(d)<br>ANSI C63.10 :2013 | P |
| Power Line Conducted Emissions | FCC Part 15: 15.207<br>ANSI C63.10 :2013 | N/A |
| Antenna requirement | FCC Part 15: 15.203 | P |
| Note: | 1. P is an abbreviation for Pass.<br>2. F is an abbreviation for Fail.<br>3. N/A is an abbreviation for Not Applicable. | |

# 2. GENERAL INFORMATION

## 2.1.Description of Device (EUT)

| | | |
|---|---|---|
| Description | : | 2.4G Controller |
| Model Number | : | TX2, TX1, TX3, TX4, TX5, TX6 , TX7, TX8, TX9 |
| Diff | : | All models are the same, except the appearance color, this report performs the model TX2. |
| Trademark | : | N/A |
| Test Voltage | : | 4*DC 1.5V AAA Battery |
| Operation frequency | : | 2405-2478MHz |
| Channel No. | : | 74 Channels(Channel Spacing 1MHz) |
| Modulation type | : | FSK |
| Antenna Type | : | Internal Antenna, Maximum Gain is 0dBi |
| Software version | : | V1.0 |
| Hardware version | : | V1.0 |

Note: 1.The equipment can hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies.

2. Each frequency is used equally on the average by transmitter.

3. The receiver has input bandwidth that matches the hopping channel bandwidth of the transmitter and shift frequencies in synchronization with the transmitted signals by a special identification code in the signals.

4. Transmitter and receiver can subject to match with each other, but other compatible devices instead of.

## 2.2.Accessories of Device (EUT)

Accessory 1 : N/A

## 2.3.Tested Supporting System Details

| No. | Description | Manufacturer | Model | Serial Number | Certification or DOC |
|---|---|---|---|---|---|
| 1 | N/A | N/A | N/A | N/A | N/A |

## 2.4.Block Diagram of connection between EUT and simulators

EUT

## 2.5.Test Mode Description

| Tested mode, channel, and data rate information | | |
|---|---|---|
| **Mode** | **Channel** | **Frequency (MHz)** |
| FSK | Low :CH1 | 2405 |
| | Middle: CH37 | 2441 |
| | High: CH74 | 2478 |
| | Hopping | 2405-2478 |

## 2.6.Test Conditions

| Items | Required | Actual |
|---|---|---|
| Temperature range: | 15-35℃ | 27℃ |
| Humidity range: | 25-75% | 56% |
| Pressure range: | 86-106kPa | 98kPa |

## 2.7. Additional instructions

The operation (Used for test) from client

| | | | |
|---|---|---|---|
| Mode | Special operated method is used.<br>The operation provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually. | | |
| Power level setup in software | | | |
| Mode | Channel | Frequency (MHz) | Soft Set |
| FSK | CH1 | 2405 | TX level is set as defaults value. |
| | CH37 | 2441 | |
| | CH74 | 2478 | |
| | Hopping | 2405-2478 | |

## 2.8.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
Designation Number: CN1236

July 25, 2017 Certificated by IC
Registration Number: 12135A

## 2.9.Measurement Uncertainty

(95% confidence levels, k=2)

| Item | Uncertainty |
|---|---|
| Uncertainty for Power point Conducted Emissions Test | 2.77dB |
| Uncertainty for Radiation Emission test in 3m chamber (below 30MHz) | 2.16 dB(Polarize: V) |
| | 2.62dB(Polarize: H) |
| Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz) | 3.76dB(Polarize: V) |
| | 3.82dB(Polarize: H) |
| Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz) | 4.22dB(Polarize: H) |
| | 4.18dB(Polarize: V) |
| Uncertainty for radio frequency | 5.6×10-8 |
| Uncertainty for conducted RF Power | 0.39dB |
| Uncertainty for temperature | 0.2℃ |
| Uncertainty for humidity | 1% |
| Uncertainty for DC and low frequency voltages | 0.06% |

## 2.10.Test Equipment List

| Equipment | Manufacturer | Model No. | Serial No. | Last cal. | Cal. Due day |
|---|---|---|---|---|---|
| Horn Antenna | SCHWARZBECK | BBHA 9120 D | BBHA 9120 D(1201) | 2018.04.13 | 2020.04.12 |
| Filter | KANGMAI | ZLPF-LDC-1000- 1959 | 1209002075 | 2018.09.21 | 2019.09.20 |
| Filter | WAINWRIGHT | WHKX2.80 /18G- 12SS | SN1 | 2018.09.21 | 2019.09.20 |
| RF Cable | Resenberger | Cable 4 | N/A | 2018.09.21 | 2019.09.20 |
| Signal Analyzer | Agilent | N9020A | MY499100060 | 2018.09.21 | 2019.09.20 |
| Filter | WAINWRIGHT | WHKX1.0G/15G- 10SS | SN40 | 2018.09.21 | 2019.09.20 |
| Test Receiver | ROHDE&SCHWARZ | ESR | 1316.3003K03-102082-Wa | 2018.09.21 | 2019.09.20 |
| Bilog Antenna | SCHWARZBECK | VULB 9168 | 9168-438 | 2018.04.13 | 2020.04.12 |
| 9*6*6 anechoic chamber | CHENYU | 9*6*6 | N/A | 2018.09.21 | 2019.09.20 |
| RF Cable | Resenberger | Cable 1 | N/A | 2018.09.21 | 2019.09.20 |
| RF Cable | Resenberger | Cable 2 | N/A | 2018.09.21 | 2019.09.20 |
| RF Cable | Resenberger | Cable 3 | N/A | 2018.09.21 | 2019.09.20 |
| Loop Antenna | SCHWARZBECK | FMZB 1519B | 00005 | 2018.09.21 | 2019.09.20 |
| Horn Antenna | SCHWARZBECK | BBHA 9170 | BBHA 9170294 | 2017.03.16 | 2019.03.15 |
| Preamplifier | SCHWARZBECK | BBV9721 | 9721-031 | 2018.09.02 | 2019.09.01 |
| Spectrum analyzer | ROHDE&SCHWARZ | FSQ40 | 200061 | 2017.12.28 | 2018.12.27 |
| Power Meter | Anritsu | ML2487A | 6K00001491 | 2018.09.21 | 2019.09.20 |
| 20dB Attenuator | ICPROBING | IATS1 | 82347 | 2018.09.21 | 2019.09.20 |

# 3. MAXIMUM PEAK OUTPUT POWER

## 3.1.Limit

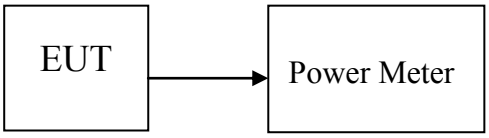
Please refer section15.247.

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

| Test site: RF site | | | | |
|---|---|---|---|---|
| Mode | Freq (MHz) | PK Output Power (dBm) | PK Output Power (mW) | Limit (mW) |
| FSK | 2405 | 8.03 | 6.35 | 125 |
| | 2441 | 7.56 | 5.70 | 125 |
| | 2478 | 6.81 | 4.80 | 125 |
| 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

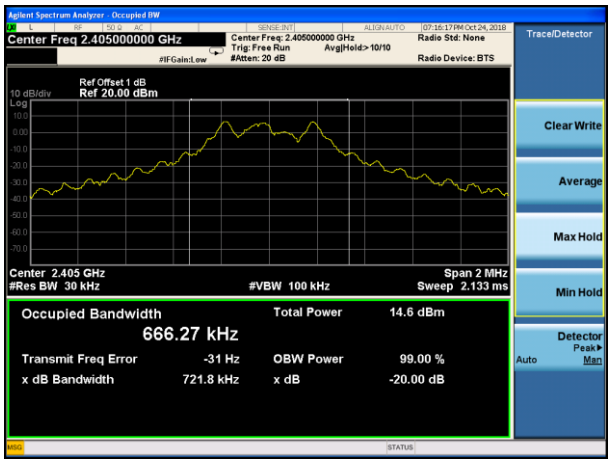
The transmitter output was directly connected to a spectrum analyzer with a 50Ω cable. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30kHz RBW and 100kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

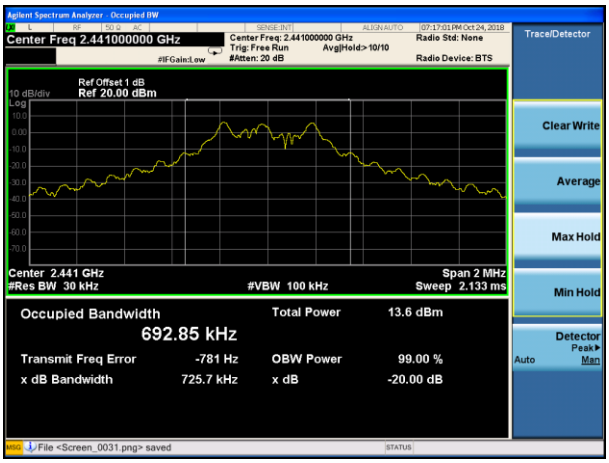
## 4.3.Test Result

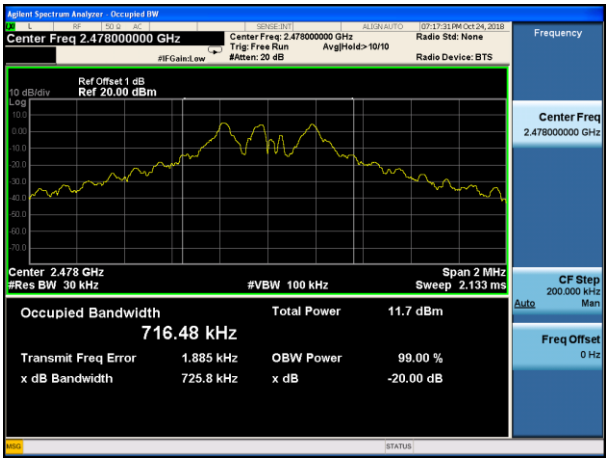
| Mode | Freq (MHz) | 20dB Bandwidth (MHz) | Limit (kHz) | Conclusion |
|---|---|---|---|---|
| FSK | 2405 | 0.7218 | / | PASS |
| | 2441 | 0.7257 | / | PASS |
| | 2478 | 0.7258 | / | PASS |

Original Test data For 20dB bandwidth

FSK:



# 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

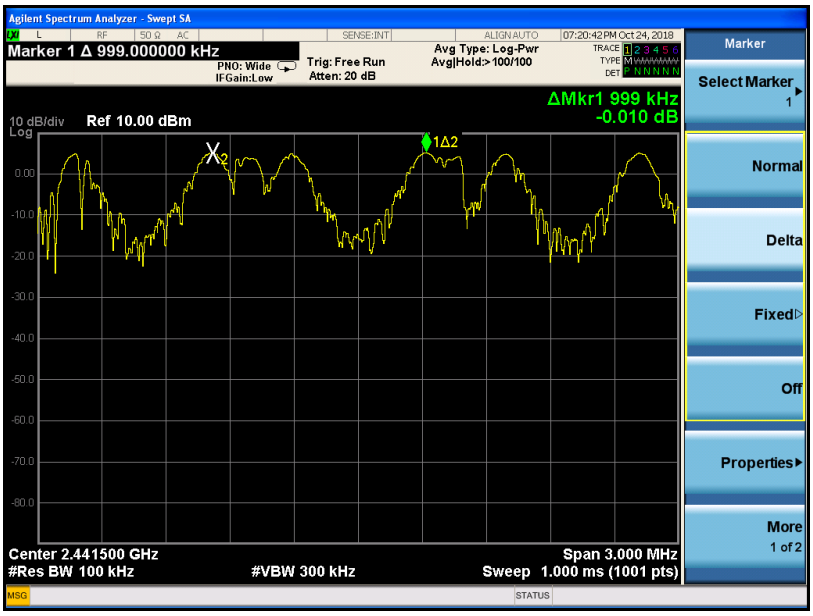
The transmitter output was directly connected to a spectrum analyzer with a 50Ω cable. The carrier frequency was measured by spectrum analyzer with 100kHz RBW and 300kHz VBW.

## 5.3.Test Result

| Mode/Channel | Channel separation (MHz) | 20dB Bandwidth (KHz) | Limit (KHz) | Conclusion |
|---|---|---|---|---|
| FSK | 0.999 | 725.8 | 483.9 | PASS |

Original test data for channel separation

FSK



# 6. NUMBER OF HOPPING CHANNEL

## 6.1.Limit

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

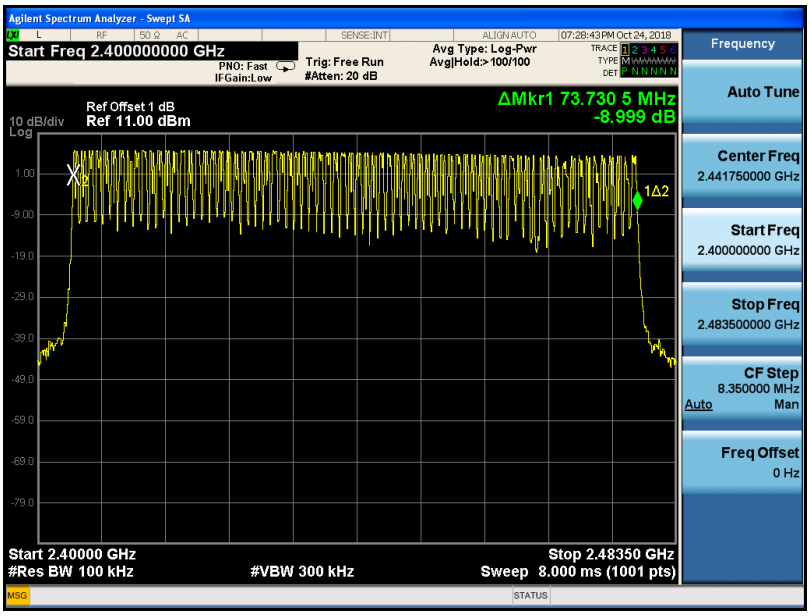
## 6.2.Test Procedure

The transmitter output was directly connected to a spectrum analyzer with a 50Ω cable. 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 |
|---|---|---|---|
| FSK | 74 | >15 | PASS |

Original test data for hopping channel number
FSK



# 7. DWELL TIME

## 7.1.Test limit

Please refer section15.247

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 greater than 0.4 s within period of 0.4 sec- onds multiplied by the number of hopping channel 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.

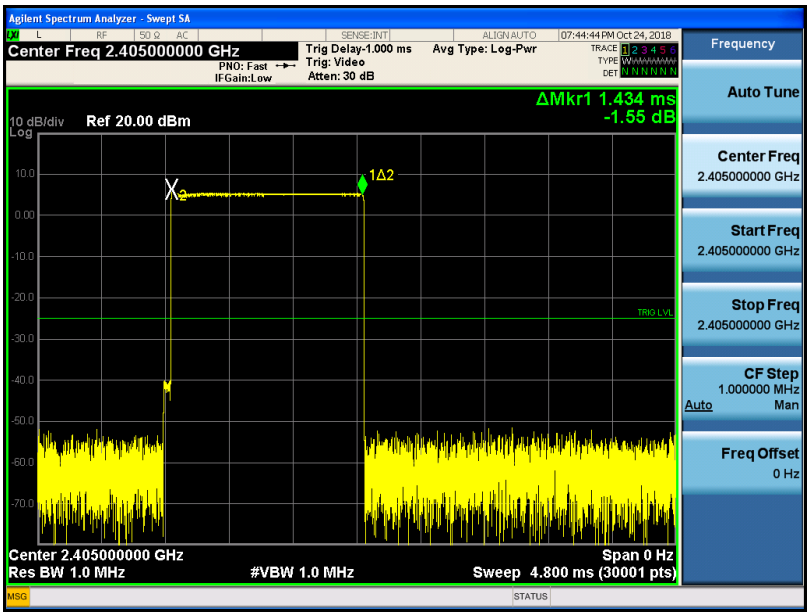
## 7.3.Test Result

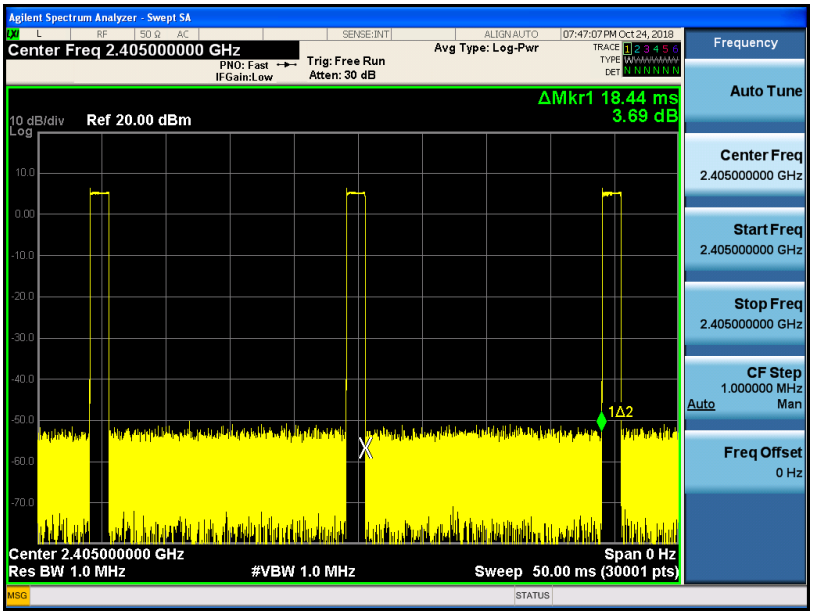
PASS.

Detailed information please see the following page.

| Mode | Frequency (MHz) | Pulse Duration (ms) | Dwell Time (s) | Limit (s) | Conclusion |
|---|---|---|---|---|---|
| FSK | 2405 | 1.434 | 0.072 | <0.4 | PASS |
| Note: Dwell Time=$T_{on}/T_{on+off}$=1.434/(1.434+18.44) | | | | | |

FSK



# 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

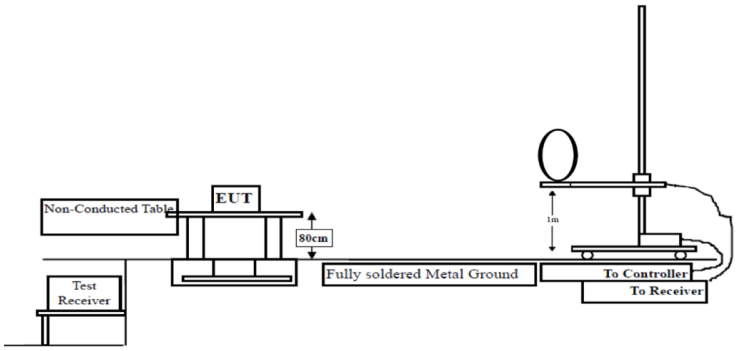
| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090 - 0.110 | 16.42 - 16.423 | 399.9 - 410 | 4.5 - 5.15 |
| [1]0.495 - 0.505 | 16.69475 - 16.69525 | 608 - 614 | 5.35 - 5.46 |
| 2.1735 - 2.1905 | 16.80425 - 16.80475 | 960 - 1240 | 7.25 - 7.75 |
| 4.125 - 4.128 | 25.5 - 25.67 | 1300 - 1427 | 8.025 - 8.5 |
| 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

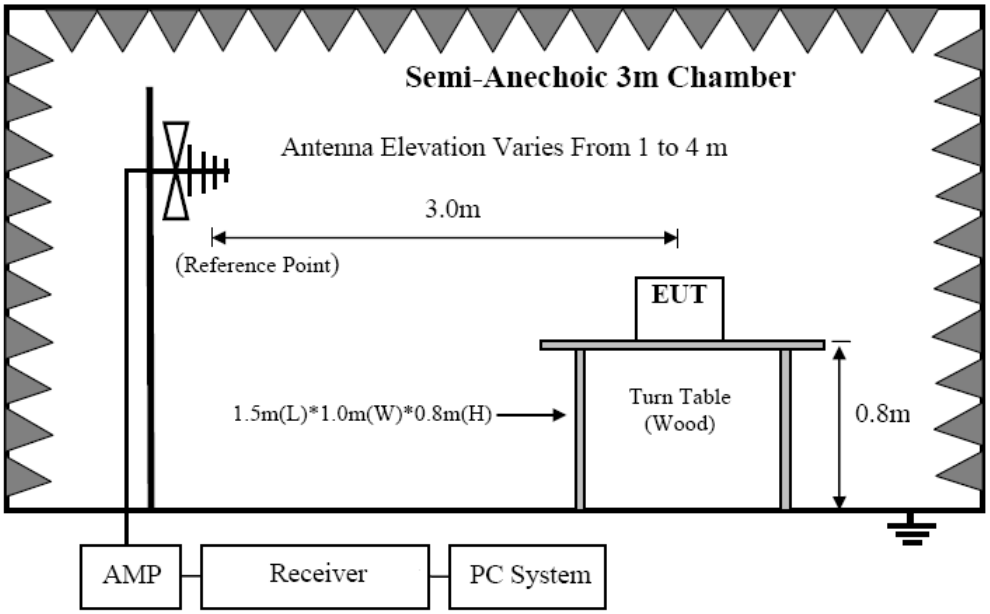
| FREQUENCY MHz | DISTANCE Meters | FIELD STRENGTHS LIMIT | |
|---|---|---|---|
| | | μV/m | dB(μV)/m |
| 0.009-0.490 | 300 | 2400/F(KHz) | / |
| 0.490-1.705 | 30 | 24000/F(KHz) | / |
| 1.705-30 | 30 | 30 | 29.5 |
| 30 ~ 88 | 3 | 100 | 40.0 |
| 88 ~ 216 | 3 | 150 | 43.5 |
| 216 ~ 960 | 3 | 200 | 46.0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

## 8.2.Block Diagram of Test setup

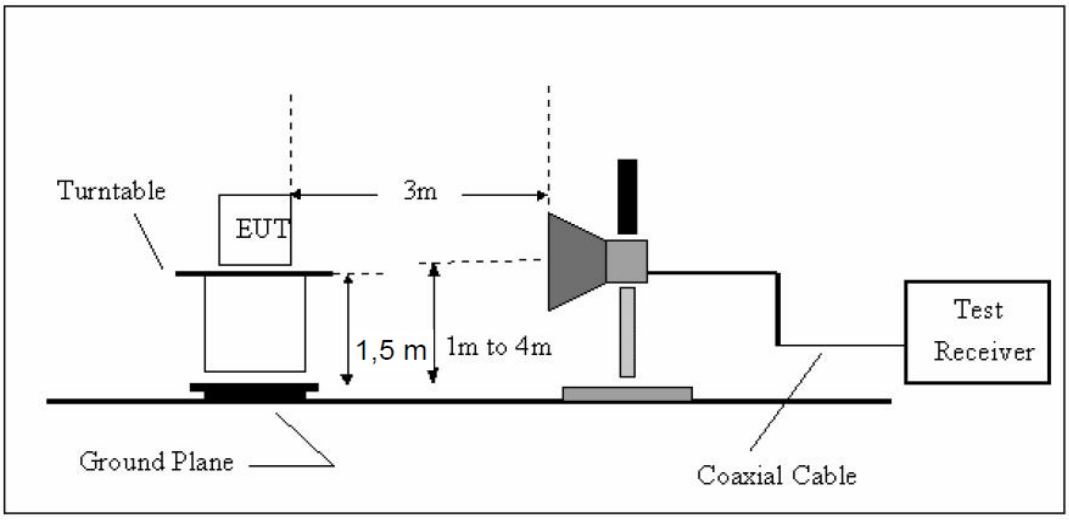
8.2.1 In 3m Anechoic Chamber Test Setup Diagram for 9KHzHz to 30MHz




8.2.2 In 3m Anechoic Chamber Test Setup Diagram for 30MHz to 1GHz




8.2.3 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 for below 1GHz test, 150 cm above the ground plane inside a semi-anechoic chamber for above 1GHz test

(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

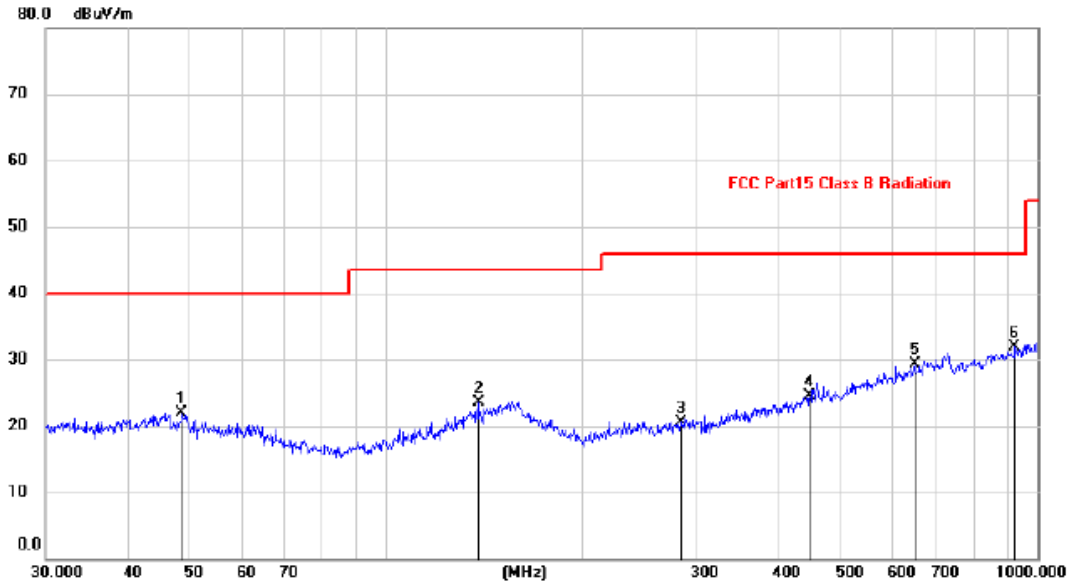
We have scanned the 10th harmonic from 9KHz to the EUT's highest frequency..
Detailed information please see the following page.

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.

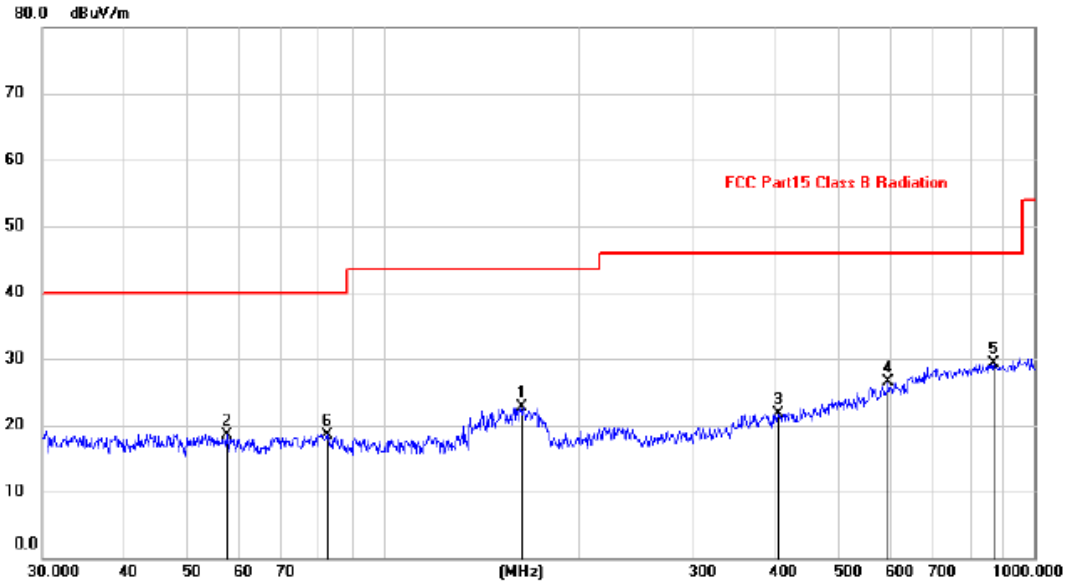
From 30MHz to 1000MHz: Conclusion: PASS

Polarization: ***Vertical***




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | Antenna Height | Table Degree | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | cm | degree | Comment |
| 1 | | 48.5016 | 8.23 | 13.66 | 21.89 | 40.00 | -18.11 | peak | | | |
| 2 | | 138.3873 | 9.68 | 13.73 | 23.41 | 43.50 | -20.09 | peak | | | |
| 3 | | 283.9791 | 7.57 | 13.03 | 20.60 | 46.00 | -25.40 | peak | | | |
| 4 | | 446.4141 | 7.64 | 16.86 | 24.50 | 46.00 | -21.50 | peak | | | |
| 5 | | 647.3854 | 8.95 | 20.27 | 29.22 | 46.00 | -16.78 | peak | | | |
| 6 | * | 922.5157 | 8.37 | 23.53 | 31.90 | 46.00 | -14.10 | peak | | | |

Polarization: ***Horizontal***




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | Antenna Height | Table Degree | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | cm | degree | Comment |
| 1 | | 163.7547 | 8.38 | 14.28 | 22.66 | 43.50 | -20.84 | peak | | | |
| 2 | | 57.5938 | 5.46 | 13.10 | 18.56 | 40.00 | -21.44 | peak | | | |
| 3 | | 404.6664 | 6.00 | 15.66 | 21.66 | 46.00 | -24.34 | peak | | | |
| 4 | | 599.3211 | 7.26 | 19.32 | 26.58 | 46.00 | -19.42 | peak | | | |
| 5 | * | 866.0878 | 6.77 | 22.61 | 29.38 | 46.00 | -16.62 | peak | | | |
| 6 | | 82.3588 | 9.03 | 9.54 | 18.57 | 40.00 | -21.43 | peak | | | |

Remark: All modes have been tested, and only worst data of FSK Channel Low mode was listed in this report.

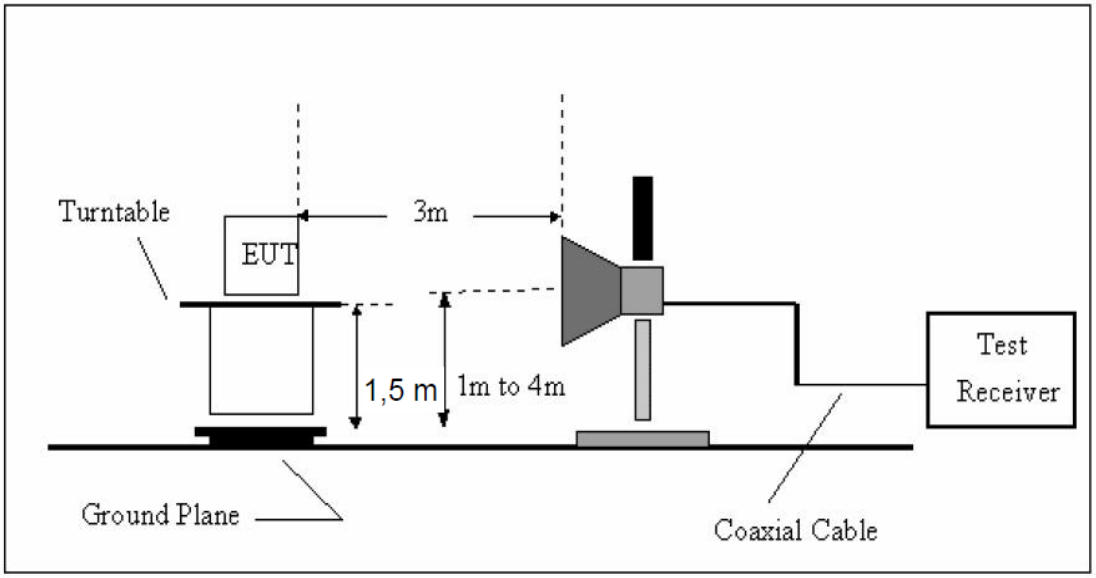
From 1G-25GHz

| Test Mode: FSK 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 |
| 4810 | 44.20 | V | 33.95 | 10.18 | 34.26 | 54.07 | 74 | 19.93 | PK |
| 4810 | 34.16 | V | 33.95 | 10.18 | 34.26 | 44.03 | 54 | 9.97 | AV |
| 7215 | / | | / | | | | | | |
| 9620 | / | | / | | | | | | |
| 4810 | 43.76 | H | 33.95 | 10.18 | 34.26 | 53.63 | 74 | 20.37 | PK |
| 4810 | 34.28 | H | 33.95 | 10.18 | 34.26 | 44.15 | 54 | 9.85 | AV |
| 7215 | | | | | | | | | |
| 9620 | | | | | | | | | |
| Test Mode: FSK TX Mid | | | | | | | | | |
| 4882 | 41.57 | V | 33.93 | 10.2 | 34.29 | 51.41 | 74 | 22.59 | PK |
| 4882 | 32.11 | V | 33.93 | 10.2 | 34.29 | 41.95 | 54 | 12.05 | AV |
| 7323 | / | | | | | | | | |
| 9764 | / | | | | | | | | |
| 4882 | 42.02 | H | 33.93 | 10.2 | 34.29 | 51.86 | 74 | 22.14 | PK |
| 4882 | 32.73 | H | 33.93 | 10.2 | 34.29 | 42.57 | 54 | 11.43 | AV |
| 7323 | | | | | | | | | |
| 9764 | | | | | | | | | |
| Test Mode: FSK TX High | | | | | | | | | |
| 4956 | 42.16 | V | 33.98 | 10.22 | 34.25 | 52.11 | 74 | 21.89 | PK |
| 4956 | 32.82 | V | 33.98 | 10.22 | 34.25 | 42.77 | 54 | 11.23 | AV |
| 7434 | / | | | | | | | | |
| 9912 | / | | | | | | | | |
| 4956 | 42.41 | H | 33.98 | 10.22 | 34.25 | 52.36 | 74 | 21.64 | PK |
| 4956 | 31.82 | H | 33.98 | 10.22 | 34.25 | 41.77 | 54 | 12.23 | AV |
| 7434 | / | | | | | | | | |
| 9912 | / | | | | | | | | |

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

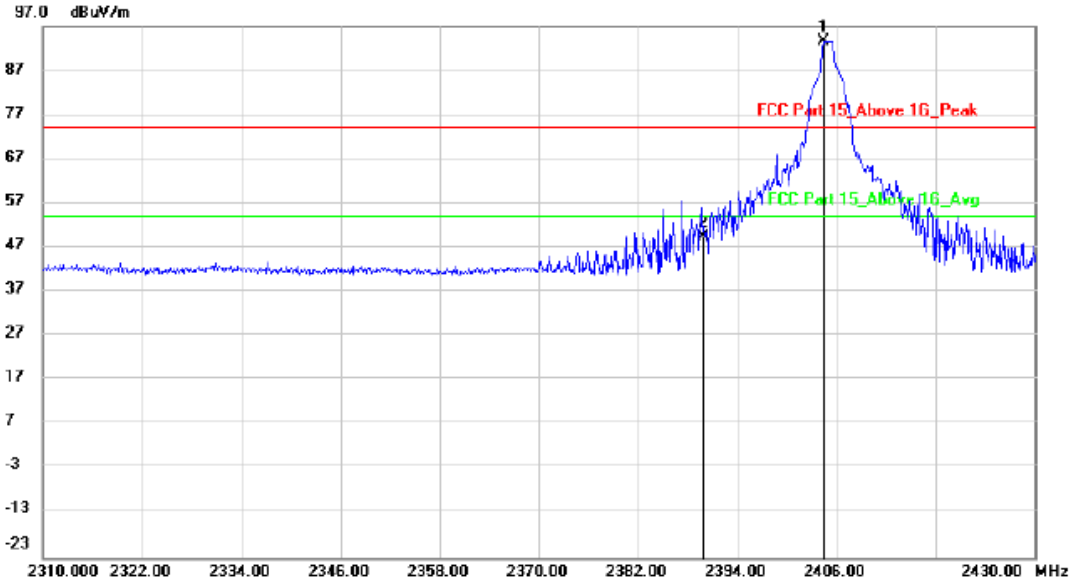
All restriction band and non- restriction band have been tested， only worse case is reported.

## 9.4.Test Result

PASS. (See below detailed test data)

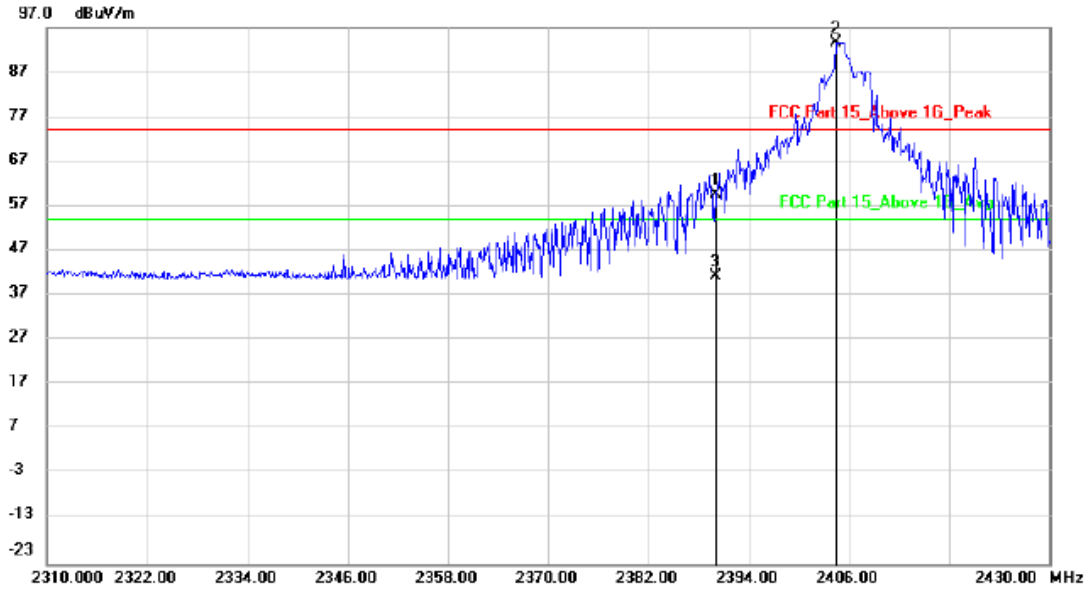
Radiated Method:

Test mode: FSK Tx Low (Vertical)



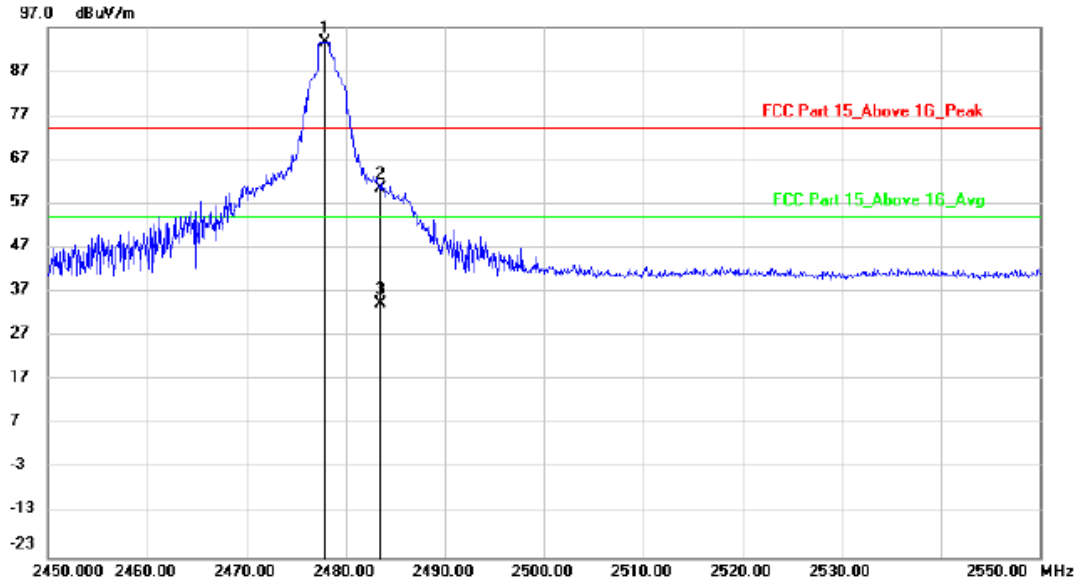

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | Antenna Height | Table Degree | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | cm | degree | Comment |
| 1 | * | 2404.440 | 96.98 | -3.41 | 93.57 | 74.00 | 19.57 | peak | | | |
| 2 | | 2390.000 | 52.82 | -3.40 | 49.42 | 74.00 | -24.58 | peak | | | |

Test mode: FSK Tx Low (Horizontal)



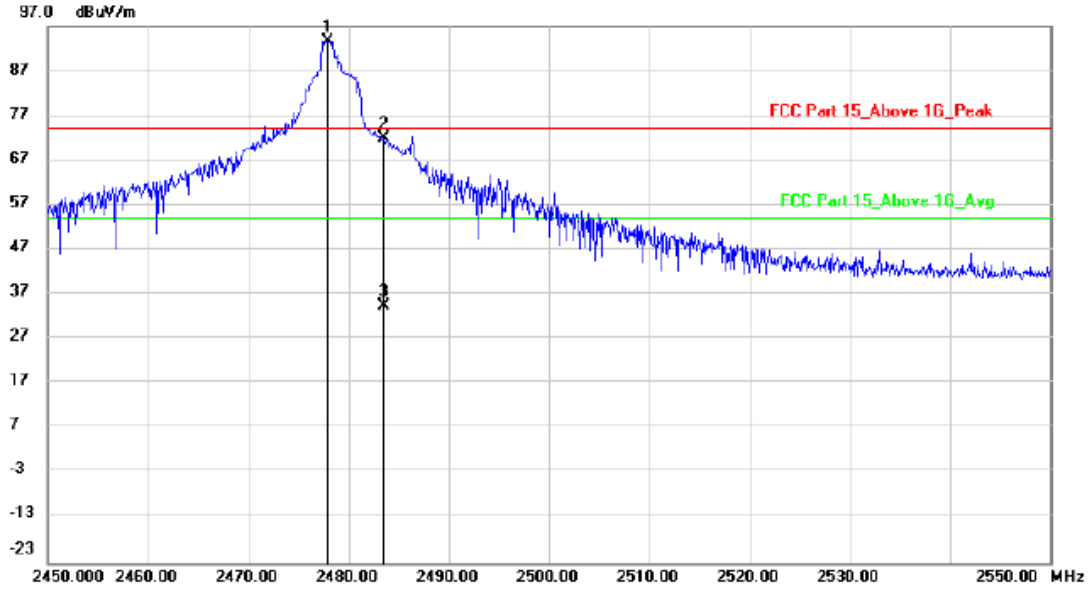

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | Antenna Height | Table Degree | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | cm | degree | Comment |
| 1 | | 2390.000 | 63.13 | -3.40 | 59.73 | 74.00 | -14.27 | peak | | | |
| 2 | * | 2404.440 | 96.98 | -3.41 | 93.57 | 74.00 | 19.57 | peak | | | |
| 3 | | 2390.000 | 44.63 | -3.40 | 41.23 | 54.00 | -12.77 | AVG | | | |

Test mode: FSK Tx High (Vertical)




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | Antenna Height | Table Degree | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | cm | degree | Comment |
| 1 | * | 2477.900 | 96.97 | -3.39 | 93.58 | 74.00 | 19.58 | peak | | | |
| 2 | | 2483.500 | 64.02 | -3.38 | 60.64 | 74.00 | -13.36 | peak | | | |
| 3 | | 2483.500 | 37.69 | -3.38 | 34.31 | 54.00 | -19.69 | AVG | | | |

Test mode: FSK Tx High (Horizontal)




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | Antenna Height | Table Degree | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | cm | degree | Comment |
| 1 | * | 2477.900 | 96.97 | -3.39 | 93.58 | 74.00 | 19.58 | peak | | | |
| 2 | | 2483.500 | 75.45 | -3.38 | 72.07 | 74.00 | -1.93 | peak | | | |
| 3 | | 2483.500 | 37.93 | -3.38 | 34.55 | 54.00 | -19.45 | AVG | | | |

Note:

1, All the other emissions not reported were too low to read and deemed to comply with FCC limit.

2. If peak Result comply with AV limit, AV Result is deemed to comply with AV limit, no necessary to report.

Conducted Method

FSK

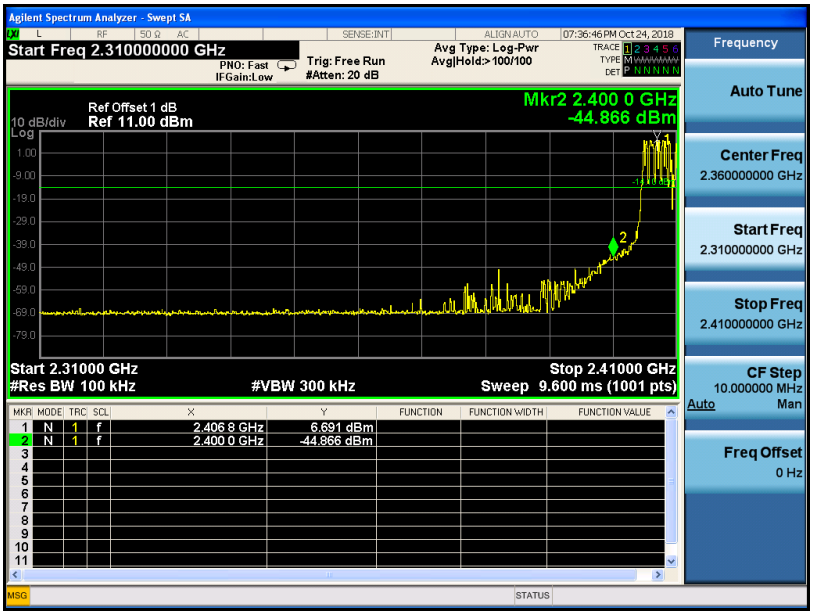
Hopping-off

CH Low:

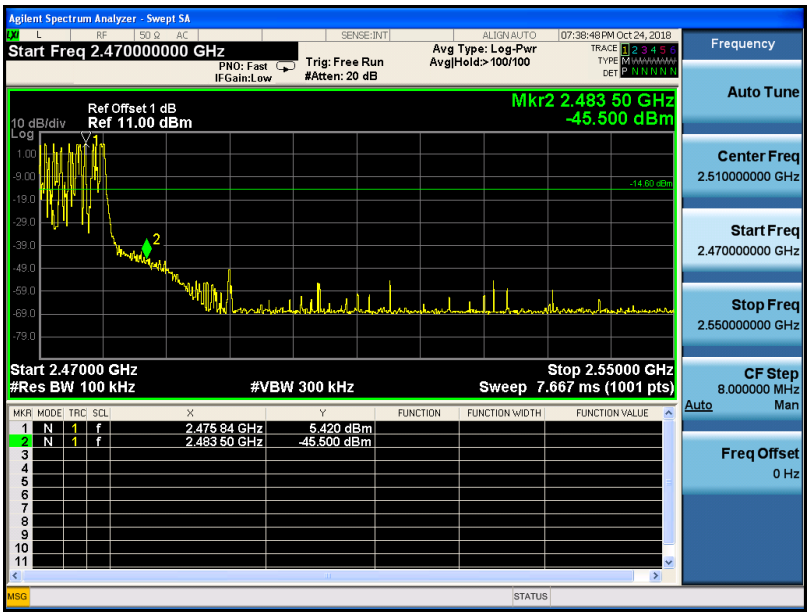
CH High:

Hopping-on

Low

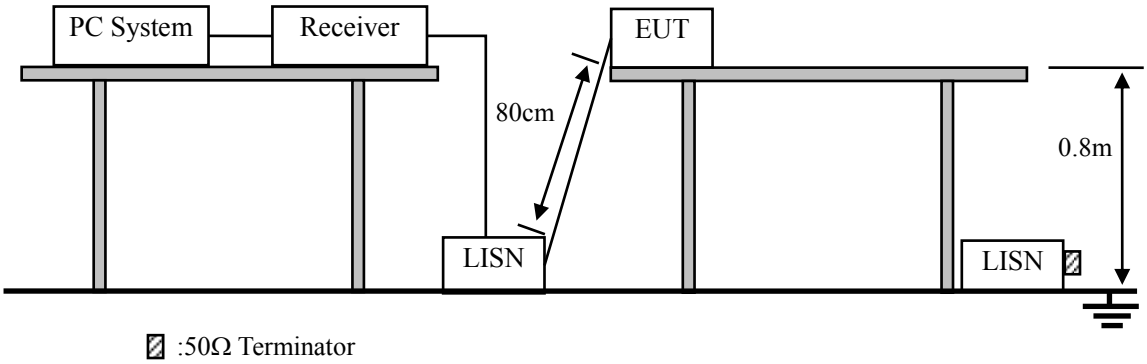



High



# 10. POWER LINE CONDUCTED EMISSIONS

## 10.1. Block Diagram of Test Setup




## 10.2. Limit

| Frequency | Maximum RF Line Voltage | |
|---|---|---|
| | Quasi-Peak Level dB(μV) | Average Level dB(μV) |
| 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

Not applicable.

The EUT is supplied by battery only, so this item does not applicable.

# 11. ANTENNA REQUIREMENTS

## 11.1. Limit

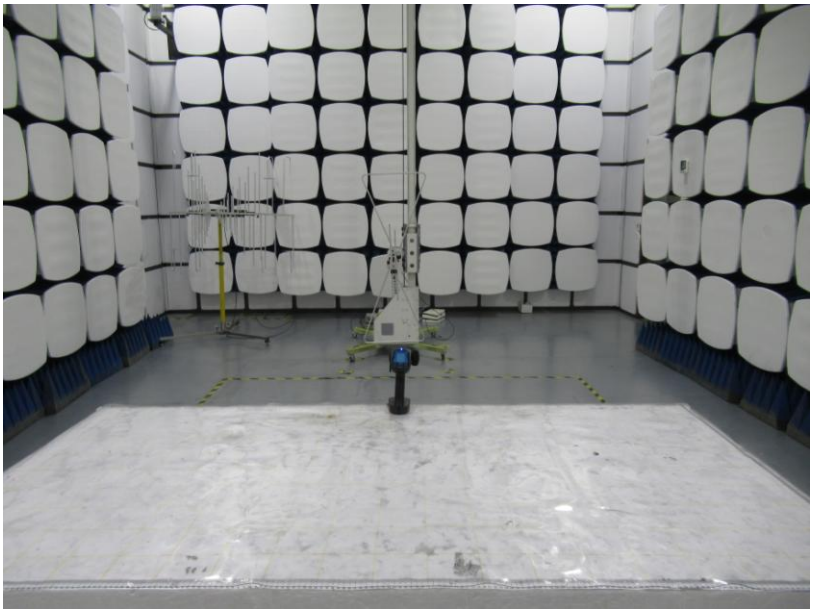
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional 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

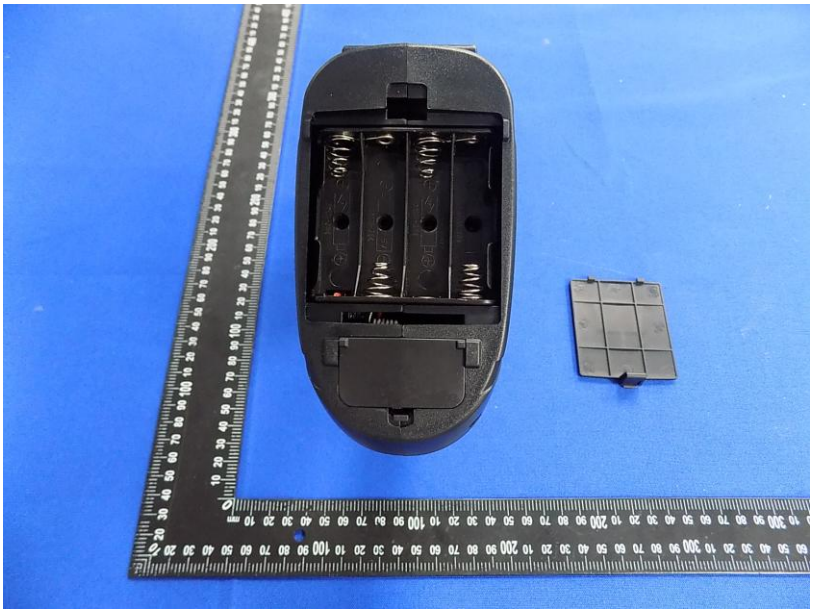
The EUT antenna is integrated Antenna. It complies with the standard requirement.

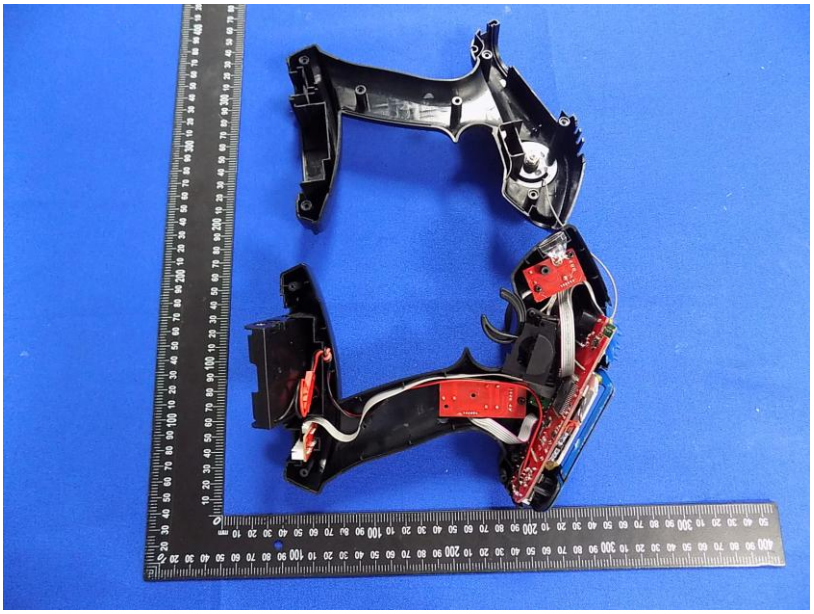
# 12. TEST SETUP PHOTO

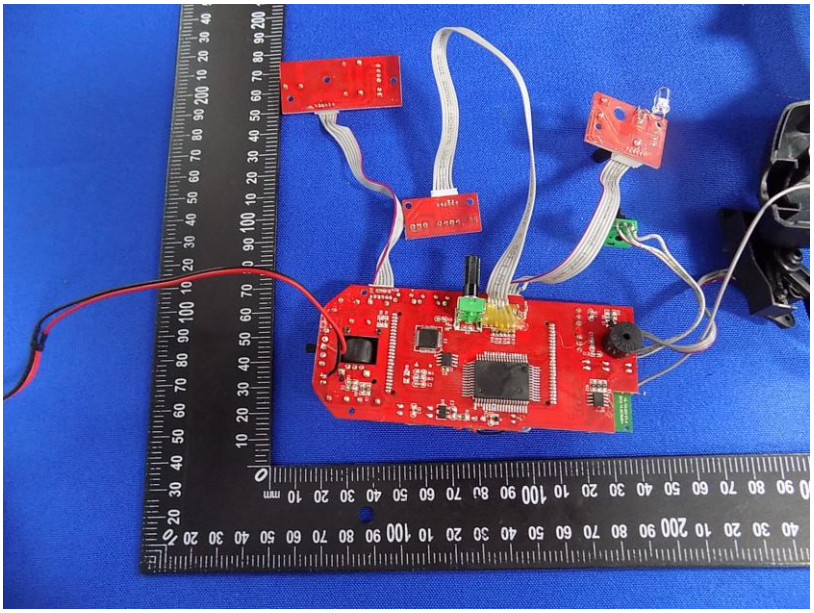
## 12.1. Photos of Radiated emission

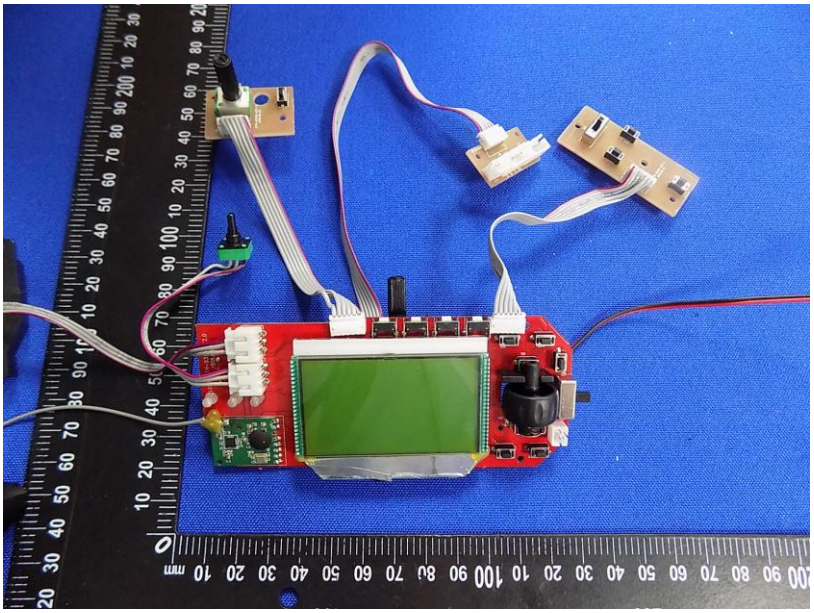


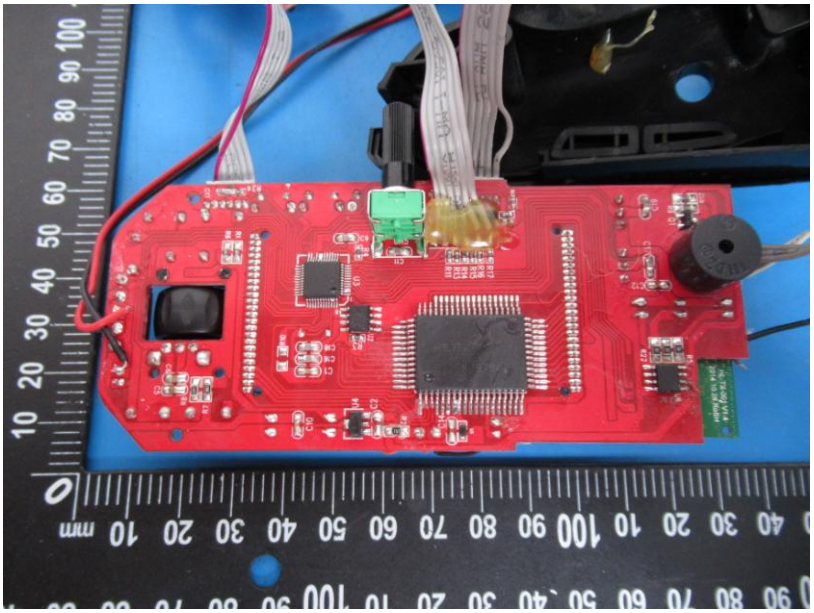
# 13. PHOTOS OF EUT

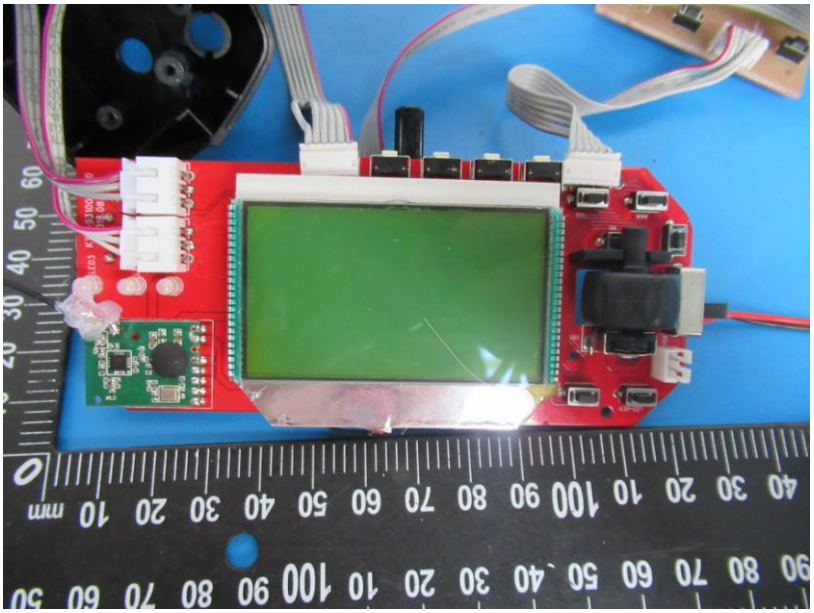


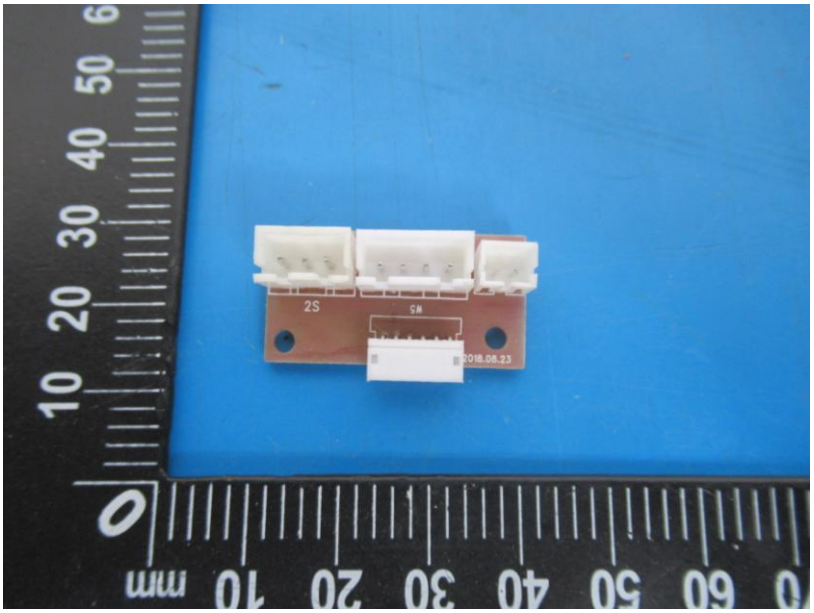


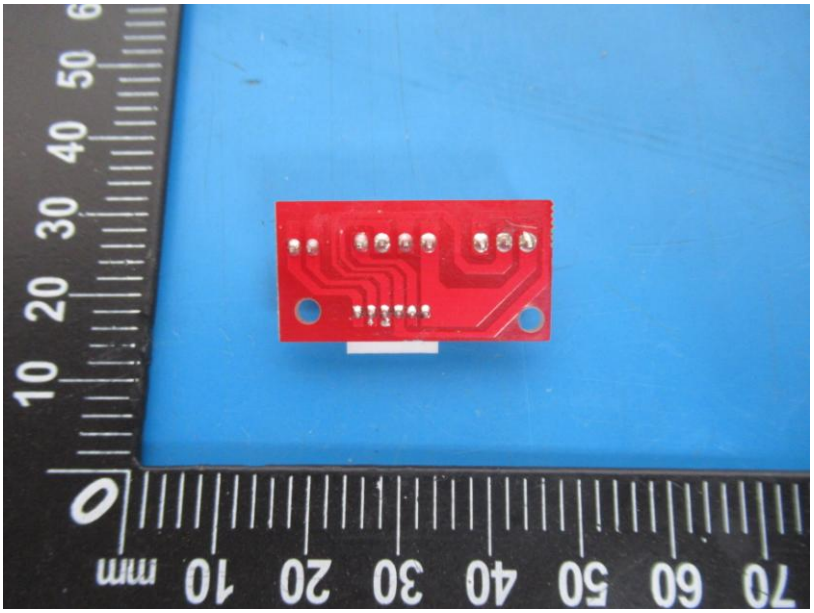


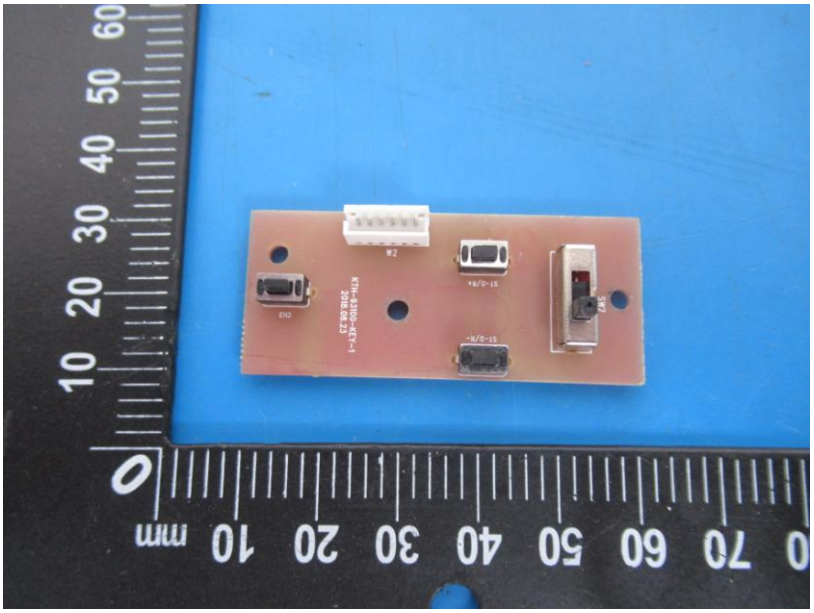


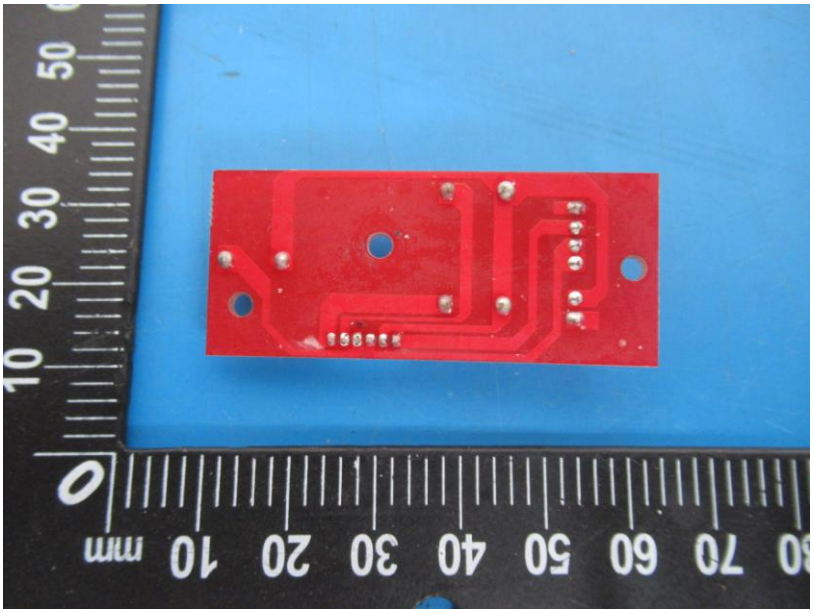


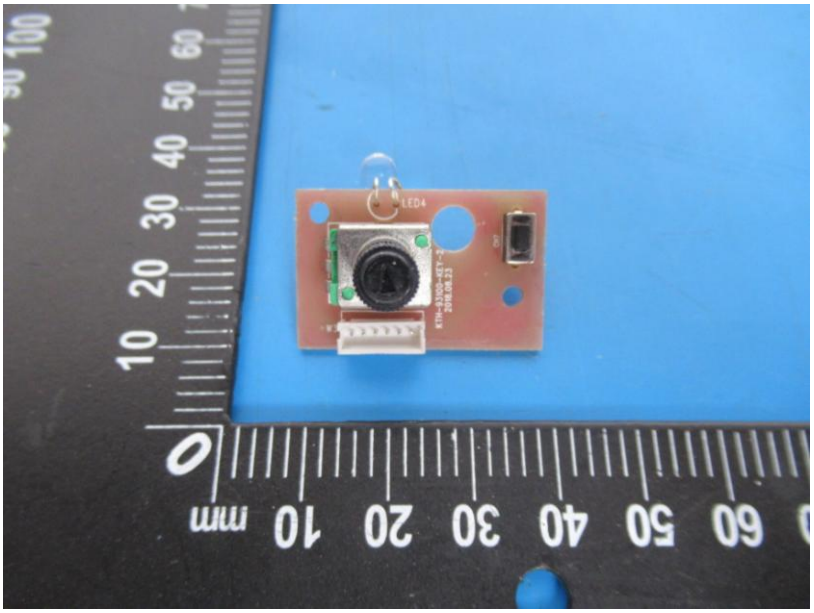


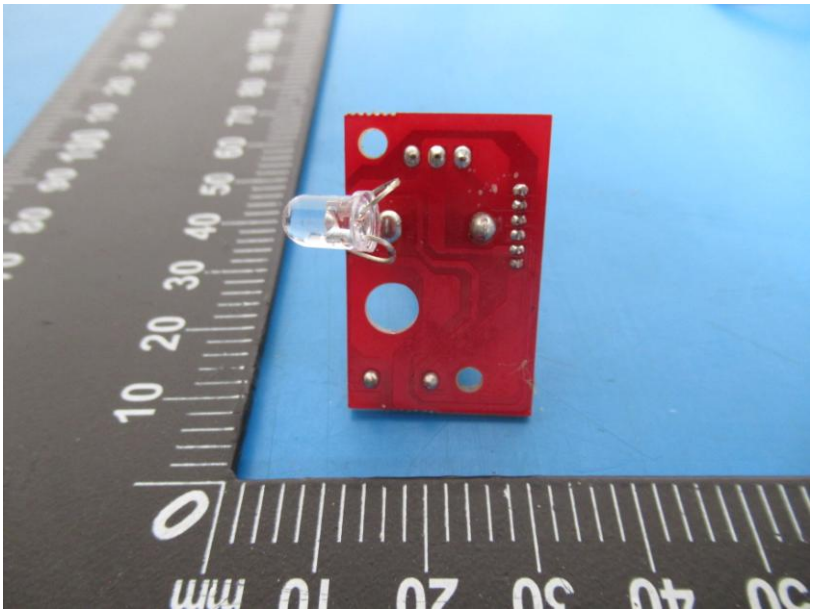

2S
M5
2018.06.23

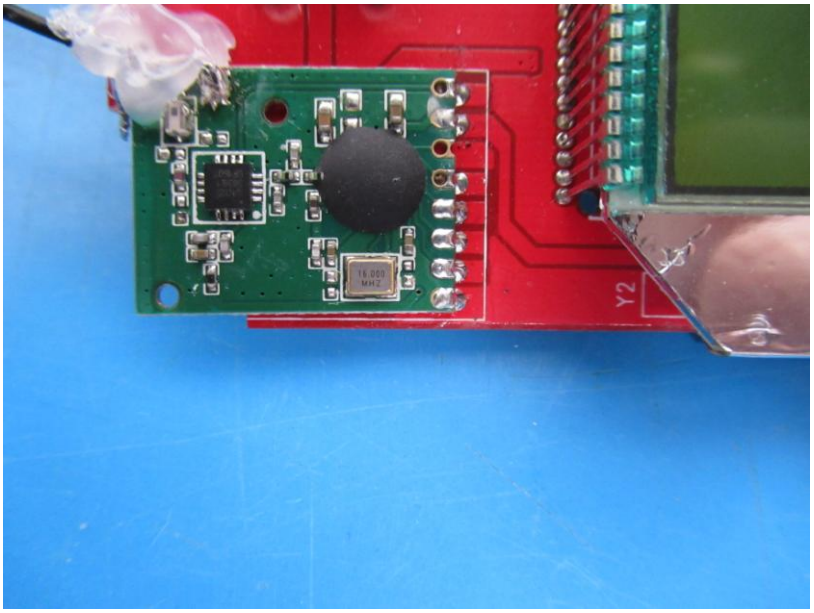













**---------THE END OF REPORT-------**