



FCC REPORT (Bluetooth)

Applicant: Beat A/S

Address of Applicant: Klingseyvej 15B, 2720 Vanløse, Denmark

Equipment Under Test (EUT)

Product Name: Mini PC

Model No.: MIB X

Trade Mark: MIB by BEAT

FCC ID: 2AFGT-MIBX

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.249:2014

Date of sample receipt: May 29, 2015

Date of Test: May 29-June 03, 2015

Date of report issued: July 21, 2015

Test Result : PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Robinson Lo

Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the GTS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of GTS or testing done by GTS in connection with, distribution or use of the product described in this report must be approved by GTS in writing.

This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

2 Version

| Version No. | Date | Description |
|-------------|---------------|-------------|
| 00 | July 21, 2015 | Original |
| | | |
| | | |
| | | |
| | | |

Tested By:

Sam. Gao

Date:

July 21, 2015

Project Engineer

Check By:

hank. yan

Date:

July 21, 2015

Reviewer

3 Contents

| | Page |
|---|------|
| 1 COVER PAGE..... | 1 |
| 2 VERSION | 2 |
| 3 CONTENTS | 3 |
| 4 TEST SUMMARY | 4 |
| 4.1 MEASUREMENT UNCERTAINTY | 4 |
| 5 GENERAL INFORMATION | 5 |
| 5.1 CLIENT INFORMATION | 5 |
| 5.2 GENERAL DESCRIPTION OF EUT | 5 |
| 5.3 TEST MODE | 6 |
| 5.4 DESCRIPTION OF SUPPORT UNITS | 7 |
| 5.5 TEST FACILITY..... | 7 |
| 5.6 TEST LOCATION | 7 |
| 5.7 DESCRIPTION OF SUPPORT UNITS | 7 |
| 5.8 OTHER INFORMATION REQUESTED BY THE CUSTOMER | 7 |
| 6 TEST INSTRUMENTS LIST | 8 |
| 7 TEST RESULTS AND MEASUREMENT DATA..... | 9 |
| 7.1 ANTENNA REQUIREMENT | 9 |
| 7.2 CONDUCTED EMISSIONS | 10 |
| 7.3 RADIATED EMISSION METHOD | 13 |
| 7.3.1 Field Strength of The Fundamental Signal | 15 |
| 7.3.2 Spurious emissions..... | 16 |
| 7.3.3 Bandedge emissions..... | 20 |
| 7.4 20dB OCCUPY BANDWIDTH | 21 |
| 8 TEST SETUP PHOTO | 23 |
| 9 EUT CONSTRUCTIONAL DETAILS | 25 |

4 Test Summary

| Test Item | Section in CFR 47 | Result |
|--|-----------------------|--------|
| Antenna requirement | 15.203 | Pass |
| AC Power Line Conducted Emission | 15.207 | Pass |
| Field strength of the fundamental signal | 15.249 (a) | Pass |
| Spurious emissions | 15.249 (a) (d)/15.209 | Pass |
| Band edge | 15.249 (d)/15.205 | Pass |
| 20dB Occupied Bandwidth | 15.215 (c) | Pass |

Pass: The EUT complies with the essential requirements in the standard.

4.1 Measurement Uncertainty

| Test Item | Frequency Range | Measurement Uncertainty | Notes |
|----------------------------------|-----------------|-------------------------|-------|
| Radiated Emission | 9kHz ~ 30MHz | $\pm 4.34\text{dB}$ | (1) |
| Radiated Emission | 30MHz ~ 1000MHz | $\pm 4.24\text{dB}$ | (1) |
| Radiated Emission | 1GHz ~ 26.5GHz | $\pm 4.68\text{dB}$ | (1) |
| AC Power Line Conducted Emission | 0.15MHz ~ 30MHz | $\pm 3.45\text{dB}$ | (1) |

Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

Remark : Test according to ANSI C63.4-2014

5 General Information

5.1 Client Information

| | |
|-------------------------|--|
| Applicant: | Beat A/S |
| Address of Applicant: | Klingseyvej 15B, 2720 Vanløse, Denmark |
| Manufacturer: | SHENZHEN MELE STAR TECHNOLOGY LIMITED |
| Address of Manufacture: | 3F,Bldg#1,28 Cuijing Road, Pingshan New District, Shenzhen, PR China. |
| Factory: | Shenzhen MeLE Precision Technology Limited |
| Address of Factory: | 3F East,Bldg#1,28 Cuijing Road, Pingshan New District, Shenzhen, PR China. |

5.2 General Description of EUT

| | |
|------------------------|---|
| Product Name: | Mini PC |
| Model No.: | MIB X |
| Operation Frequency: | 2402~2480MHz |
| Channel numbers: | 79 |
| Channel separation: | 1MHz |
| Modulation technology: | GFSK, Pi/4 QPSK, 8DPSK |
| Antenna Type: | Integral antenna |
| Antenna gain: | 2.0dBi(declare by Applicant) |
| Power Supply: | Adapter: Model No.: S12B22-120A100-04 Input: AC 100-240V, 50/60Hz, 0.5A Output: DC 12.0V, 1A |

| Operation Frequency each of channel | | | | | | | |
|-------------------------------------|-----------|---------|-----------|---------|-----------|---------|-----------|
| Channel | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
| 1 | 2402MHz | 21 | 2422MHz | 41 | 2442MHz | 61 | 2462MHz |
| 2 | 2403MHz | 22 | 2423MHz | 42 | 2443MHz | 62 | 2463MHz |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| 19 | 2420MHz | 39 | 2440MHz | 59 | 2460MHz | 79 | 2480MHz |
| 20 | 2421MHz | 40 | 2441MHz | 60 | 2461MHz | | |

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

| Channel | Frequency |
|---------------------|-----------|
| The lowest channel | 2402MHz |
| The middle channel | 2441MHz |
| The Highest channel | 2480MHz |

5.3 Test mode

| | |
|--|--|
| Transmitting mode | Keep the EUT in continuously transmitting mode |
| <i>Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.</i> | |

| Per-test mode. | | | |
|---|-------|-------|-------|
| We have verified the construction and function in typical operation, The EUT was placed on three different polar directions; i.e. X axis, Y axis, Z axis. which was shown in this test report and defined as follows: | | | |
| Axis | X | Y | Z |
| Field Strength(dBuV/m) | 94.24 | 95.19 | 94.98 |
| Final Test Mode: | | | |
| The EUT was tested in GFSK, Pi/4 QPSK, 8DPSK modulation, and found the GFSK modulation is the worst case. | | | |
| According to ANSI C63.4 2009 standards, the test results are both the “worst case” and “worst setup”: | | | |
| Y axis (see the test setup photo) | | | |

5.4 Description of Support Units

None

5.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **FCC —Registration No.: 600491**

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 600491, June 28, 2013.

- **Industry Canada (IC) —Registration No.: 9079A-2**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-2, June 26, 2013.

5.6 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

Room 301-309, 3th Floor, Block A, Huafeng Jinyuan Business Building, No. 300 Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, China

Tel: 0755-27798480

Fax: 0755-27798960

5.7 Description of Support Units (FCC DOC APPROVED)

| Manufacturer | Description | Model | Serial Number |
|--------------|-------------|------------|------------------|
| AOC | LCD TV | TFT24660AG | T49A5JA0006600B9 |
| DELL | KEYBOARD | SK-8115 | N/A |
| DELL | MOUSE | MOC5UO | N/A |

5.8 Other Information Requested by the Customer

None.

6 Test Instruments list

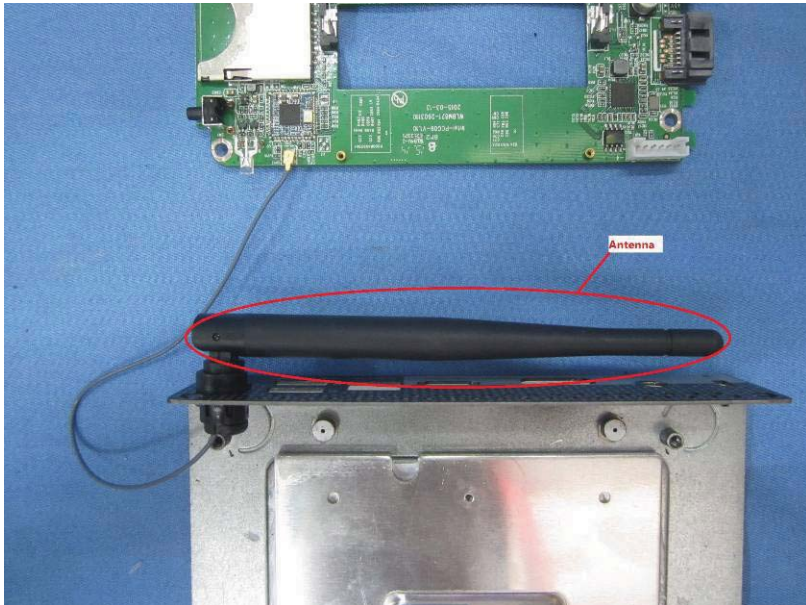
| Radiated Emission: | | | | | | |
|--------------------|-------------------------------|--------------------------------|-----------------------------|---------------|---------------------|-------------------------|
| Item | Test Equipment | Manufacturer | Model No. | Inventory No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
| 1 | 3m Semi- Anechoic Chamber | ZhongYu Electron | 9.2(L)*6.2(W)* 6.4(H) | GTS250 | Mar. 28 2015 | Mar. 27 2016 |
| 2 | Control Room | ZhongYu Electron | 6.2(L)*2.5(W)* 2.4(H) | GTS251 | N/A | N/A |
| 3 | Spectrum Analyzer | Agilent | E4440A | GTS533 | Jul. 01 2014 | Jun 30 2015 |
| 4 | EMI Test Receiver | Rohde & Schwarz | ESU26 | GTS203 | Jul. 01 2014 | Jun 30 2015 |
| 5 | BiConiLog Antenna | SCHWARZBECK MESS-ELEKTRONIK | VULB9163 | GTS214 | Jul. 01 2014 | Jun 30 2015 |
| 6 | Double -ridged waveguide horn | SCHWARZBECK MESS-ELEKTRONIK | 9120D-829 | GTS208 | June 27 2014 | June 26 2015 |
| 7 | Horn Antenna | ETS-LINDGREN | 3160 | GTS217 | Mar. 27 2015 | Mar. 26 2016 |
| 8 | EMI Test Software | AUDIX | E3 | N/A | N/A | N/A |
| 9 | Coaxial Cable | GTS | N/A | GTS213 | Mar. 28 2015 | Mar. 27 2016 |
| 10 | Coaxial Cable | GTS | N/A | GTS211 | Mar. 28 2015 | Mar. 27 2016 |
| 11 | Coaxial cable | GTS | N/A | GTS210 | Mar. 28 2015 | Mar. 27 2016 |
| 12 | Coaxial Cable | GTS | N/A | GTS212 | Mar. 28 2015 | Mar. 27 2016 |
| 13 | Amplifier(100kHz-3GHz) | HP | 8347A | GTS204 | Jul. 01 2014 | Jun. 30, 2015 |
| 14 | Amplifier(2GHz-20GHz) | HP | 8349B | GTS206 | Jul. 01 2014 | Jun. 30, 2015 |
| 15 | Amplifier (18-26GHz) | Rohde & Schwarz | AFS33-18002 650-30-8P-44 | GTS218 | June 27 2014 | June 26 2015 |
| 16 | Band filter | Amindeon | 82346 | GTS219 | Mar. 28 2015 | Mar. 27 2016 |

| Conducted Emission: | | | | | | |
|---------------------|-------------------|--------------------------------|----------------------|---------------|---------------------|-------------------------|
| Item | Test Equipment | Manufacturer | Model No. | Inventory No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
| 1 | Shielding Room | ZhongYu Electron | 7.0(L)x3.0(W)x3.0(H) | GTS264 | July 01 2014 | June 30 2015 |
| 2 | EMI Test Receiver | Rohde & Schwarz | ESCS30 | GTS223 | July 01 2014 | June 30 2015 |
| 3 | 10dB Pulse Limita | Rohde & Schwarz | N/A | GTS224 | July 01 2014 | June 30 2015 |
| 4 | Coaxial Switch | ANRITSU CORP | MP59B | GTS225 | July 01 2014 | June 30 2015 |
| 5 | LISN | SCHWARZBECK MESS-ELEKTRONIK | NSLK 8127 | GTS226 | July 01 2014 | June 30 2015 |
| 6 | Coaxial Cable | GTS | N/A | GTS227 | July 01 2014 | June 30 2015 |
| 7 | EMI Test Software | AUDIX | E3 | N/A | N/A | N/A |

| General used equipment: | | | | | | |
|-------------------------|----------------|--------------|-----------|---------------|---------------------|-------------------------|
| Item | Test Equipment | Manufacturer | Model No. | Inventory No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
| 1 | Barometer | ChangChun | DYM3 | GTS257 | July 08 2014 | July 07 2015 |

7 Test results and Measurement Data

7.1 Antenna requirement

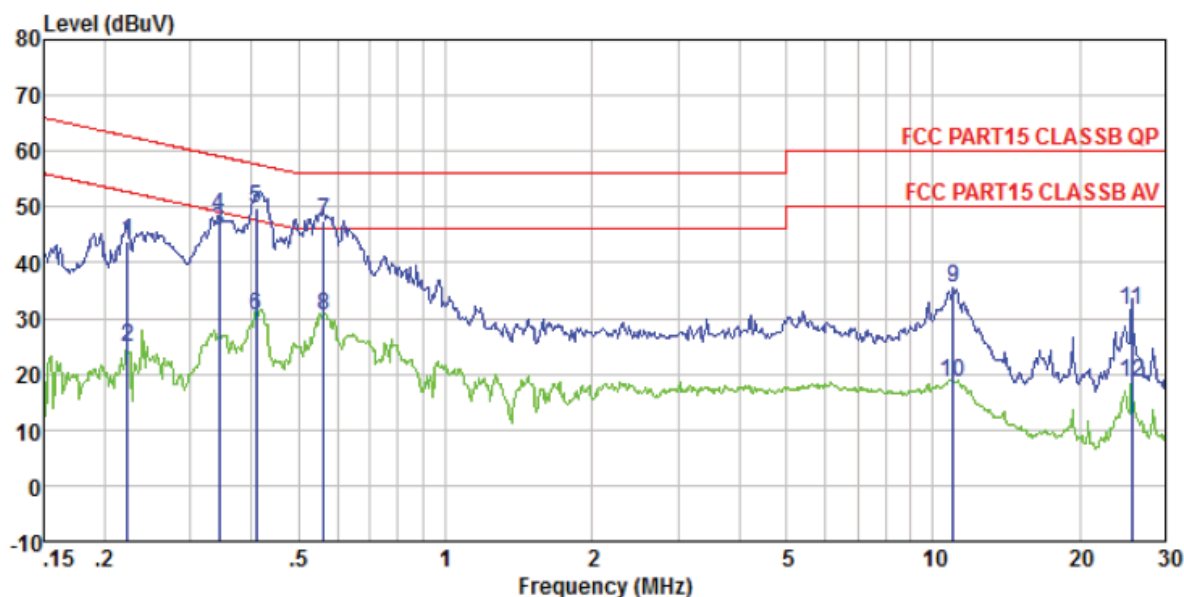
| | |
|--|-----------------------------|
| Standard requirement: | FCC Part15 C Section 15.203 |
| 15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. | |
| E.U.T Antenna: | |
| <p><i>The antenna is Integral antenna, the best case gain of the antenna is 2dBi</i></p>  | |

7.2 Conducted Emissions

| | | | | |
|--|---|--------------|-----------|-----------|
| Test Requirement: | FCC Part15 C Section 15.207 | | | |
| Test Method: | ANSI C63.10:2013 | | | |
| Test Frequency Range: | 150KHz to 30MHz | | | |
| Class / Severity: | Class B | | | |
| Receiver setup: | RBW=9KHz, VBW=30KHz, Sweep time=auto | | | |
| Limit: | Frequency range (MHz) | Limit (dBuV) | | |
| | | Quasi-peak | Average | |
| | | 0.15-0.5 | 66 to 56* | 56 to 46* |
| | | 0.5-5 | 56 | 46 |
| | | 5-30 | 60 | 50 |
| * Decreases with the logarithm of the frequency. | | | | |
| Test setup: | <div><p style="text-align: center;">Reference Plane</p><p><i>Remark:</i> E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p></div> | | | |
| Test procedure: | <div><ol style="list-style-type: none">1. The E.U.T is connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.</div> | | | |
| Test Instruments: | Refer to section 6.0 for details | | | |
| Test mode: | Refer to section 5.3 for details | | | |
| Test results: | Pass | | | |

Measurement data:

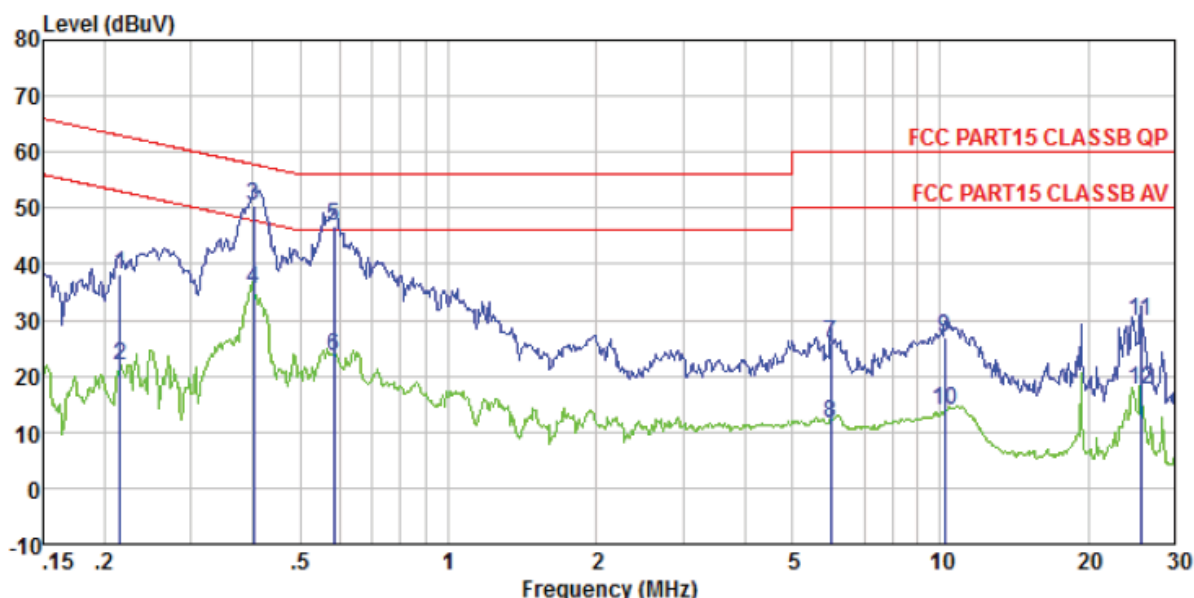
Line:



Site : Shielded room
 Condition : FCC PART15 CLASSB QP LISN-2013 LINE
 Job No. : 0738RF
 Test mode : Bluetooth mode
 Test Engineer: Qing

| | Freq | Read Level | LISN Factor | Cable Loss | Level | Limit Line | Over Limit | Remark |
|----|--------|------------|-------------|------------|-------|------------|------------|---------|
| | MHz | dBuV | dB | dB | dBuV | dBuV | dB | |
| 1 | 0.223 | 43.65 | 0.12 | 0.12 | 43.89 | 62.70 | -18.81 | QP |
| 2 | 0.223 | 24.50 | 0.12 | 0.12 | 24.74 | 52.70 | -27.96 | Average |
| 3 | 0.343 | 45.55 | 0.11 | 0.10 | 45.76 | 59.13 | -13.37 | QP |
| 4 | 0.343 | 48.18 | 0.11 | 0.10 | 48.39 | 49.13 | -0.74 | Average |
| 5 | 0.408 | 49.50 | 0.11 | 0.11 | 49.72 | 57.68 | -7.96 | QP |
| 6 | 0.408 | 30.40 | 0.11 | 0.11 | 30.62 | 47.68 | -17.06 | Average |
| 7 | 0.564 | 47.15 | 0.13 | 0.12 | 47.40 | 56.00 | -8.60 | QP |
| 8 | 0.564 | 30.27 | 0.13 | 0.12 | 30.52 | 46.00 | -15.48 | Average |
| 9 | 11.021 | 35.11 | 0.34 | 0.20 | 35.65 | 60.00 | -24.35 | QP |
| 10 | 11.021 | 18.10 | 0.34 | 0.20 | 18.64 | 50.00 | -31.36 | Average |
| 11 | 25.591 | 30.21 | 1.12 | 0.23 | 31.56 | 60.00 | -28.44 | QP |
| 12 | 25.591 | 17.19 | 1.12 | 0.23 | 18.54 | 50.00 | -31.46 | Average |

Neutral:



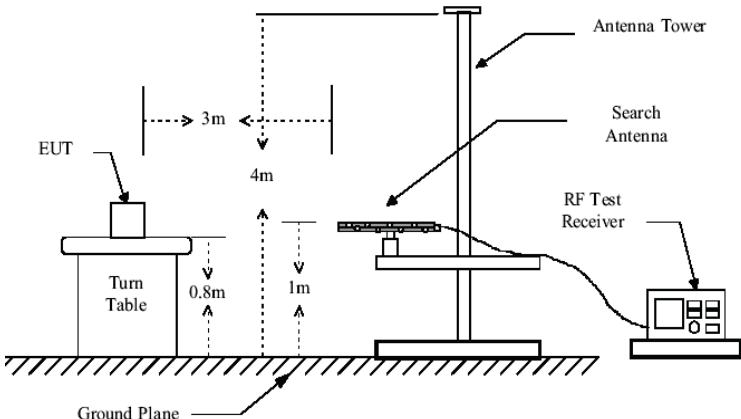
Site : Shielded room
 Condition : FCC PART15 CLASSB QP LISN-2013 NEUTRAL
 Job No. : 0738RF
 Test mode : Bluetooth mode
 Test Engineer: Qing

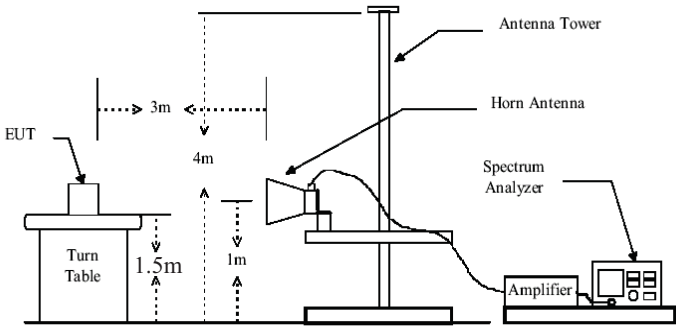
| | Freq | Read Level | LISN Factor | Cable Loss | Level | Limit Line | Over Limit | Remark |
|----|--------|------------|-------------|------------|-------|------------|------------|---------|
| | MHz | dBuV | dB | dB | dBuV | dBuV | dB | |
| 1 | 0.215 | 38.12 | 0.06 | 0.13 | 38.31 | 63.01 | -24.70 | QP |
| 2 | 0.215 | 21.59 | 0.06 | 0.13 | 21.78 | 53.01 | -31.23 | Average |
| 3 | 0.402 | 50.43 | 0.06 | 0.11 | 50.60 | 57.81 | -7.21 | QP |
| 4 | 0.402 | 35.36 | 0.06 | 0.11 | 35.53 | 47.81 | -12.28 | Average |
| 5 | 0.585 | 46.57 | 0.07 | 0.12 | 46.76 | 56.00 | -9.24 | QP |
| 6 | 0.585 | 23.28 | 0.07 | 0.12 | 23.47 | 46.00 | -22.53 | Average |
| 7 | 5.993 | 25.45 | 0.16 | 0.16 | 25.77 | 60.00 | -34.23 | QP |
| 8 | 5.993 | 11.29 | 0.16 | 0.16 | 11.61 | 50.00 | -38.39 | Average |
| 9 | 10.233 | 26.42 | 0.25 | 0.19 | 26.86 | 60.00 | -33.14 | QP |
| 10 | 10.233 | 13.44 | 0.25 | 0.19 | 13.88 | 50.00 | -36.12 | Average |
| 11 | 25.591 | 28.46 | 1.02 | 0.23 | 29.71 | 60.00 | -30.29 | QP |
| 12 | 25.591 | 16.34 | 1.02 | 0.23 | 17.59 | 50.00 | -32.41 | Average |

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Cable Loss
4. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

7.3 Radiated Emission Method

| | | | | | |
|---|--|------------|--------------------|--------|-------------------------|
| Test Requirement: | FCC Part15 C Section 15.209 | | | | |
| Test Method: | ANSI C63.10:2013 | | | | |
| Test Frequency Range: | 9kHz to 25GHz | | | | |
| Test site: | Measurement Distance: 3m | | | | |
| Receiver setup: | Frequency | Detector | RBW | VBW | Value |
| | 30MHz-1GHz | Quasi-peak | 120KHz | 300KHz | Quasi-peak |
| | Above 1GHz | Peak | 1MHz | 3MHz | Peak |
| | | Peak | 1MHz | 10Hz | Average |
| Limit: (Field strength of the fundamental signal) | Frequency | | Limit (dBuV/m @3m) | | Remark |
| | 2400MHz-2483.5MHz | | 94.00 | | Average Value |
| | | | 114.00 | | Peak Value |
| Limit: (Spurious Emissions) | Frequency | | Limit (uV/m) | Value | Measurement Distance |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | 30MHz-88MHz | 100 | QP | 3m | |
| | 88MHz-216MHz | 150 | QP | | |
| | 216MHz-960MHz | 200 | QP | | |
| | 960MHz-1GHz | 500 | QP | | |
| Above 1GHz | 500 | Average | | | |
| | 5000 | Peak | | | |
| Limit: (band edge) | Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation. | | | | |
| Test setup: | Below 1GHz | | | | |
| | <div></div> | | | | |
| | Above 1GHz | | | | |

| | |
|--------------------------|--|
| |  |
| Test Procedure: | <ol style="list-style-type: none"> 1. The EUT was placed on the top of a rotating table 0.8 for below 1GHz or 1.5 meters for above 1GHz above the ground at a 3 meter camber. The table was rotated 360 degrees . 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. |
| Test Instruments: | Refer to section 6.0 for details |
| Test mode: | Refer to section 5.3 for details |
| Test results: | Pass |

Measurement data:

7.3.1 Field Strength of The Fundamental Signal

Peak value:

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------------|----------------|---------------------|-----------------|--------------|
| 2402.00 | 91.05 | 27.58 | 5.39 | 30.18 | 93.84 | 114.00 | -20.16 | Vertical |
| 2402.00 | 88.64 | 27.58 | 5.39 | 30.18 | 91.43 | 114.00 | -22.57 | Horizontal |
| 2441.00 | 89.46 | 27.55 | 5.43 | 30.06 | 92.38 | 114.00 | -21.62 | Vertical |
| 2441.00 | 87.66 | 27.55 | 5.43 | 30.06 | 90.58 | 114.00 | -23.42 | Horizontal |
| 2480.00 | 92.13 | 27.52 | 5.47 | 29.93 | 95.19 | 114.00 | -18.81 | Vertical |
| 2480.00 | 89.10 | 27.52 | 5.47 | 29.93 | 92.16 | 114.00 | -21.84 | Horizontal |

Average value:

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------------|----------------|---------------------|-----------------|--------------|
| 2402.00 | 81.16 | 27.58 | 5.39 | 30.18 | 83.95 | 94.00 | -10.05 | Vertical |
| 2402.00 | 78.63 | 27.58 | 5.39 | 30.18 | 81.42 | 94.00 | -12.58 | Horizontal |
| 2441.00 | 79.30 | 27.55 | 5.43 | 30.06 | 82.22 | 94.00 | -11.78 | Vertical |
| 2441.00 | 76.37 | 27.55 | 5.43 | 30.06 | 79.29 | 94.00 | -14.71 | Horizontal |
| 2480.00 | 82.41 | 27.52 | 5.47 | 29.93 | 85.47 | 94.00 | -8.53 | Vertical |
| 2480.00 | 79.17 | 27.52 | 5.47 | 29.93 | 82.23 | 94.00 | -11.77 | Horizontal |

7.3.2 Spurious emissions

Note: Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.

■ Below 1GHz

Remark: The test was performed at the lowest, middle and highest channel. The data of lowest channel was found as the worst, so only the data of that channel is reported.

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------------|----------------|---------------------|-----------------|--------------|
| 36.25 | 40.44 | 14.63 | 0.62 | 30.06 | 25.63 | 40.00 | -14.37 | Vertical |
| 80.36 | 36.06 | 10.69 | 1.03 | 29.80 | 17.98 | 40.00 | -22.02 | Vertical |
| 146.89 | 43.86 | 10.24 | 1.55 | 29.42 | 26.23 | 43.50 | -17.27 | Vertical |
| 234.99 | 35.91 | 13.83 | 2.05 | 29.52 | 22.27 | 46.00 | -23.73 | Vertical |
| 428.02 | 37.25 | 17.51 | 2.99 | 29.44 | 28.31 | 46.00 | -17.69 | Vertical |
| 588.91 | 28.94 | 20.29 | 3.68 | 29.30 | 23.61 | 46.00 | -22.39 | Vertical |
| 52.21 | 31.38 | 15.15 | 0.79 | 29.98 | 17.34 | 40.00 | -22.66 | Horizontal |
| 108.27 | 31.29 | 14.39 | 1.26 | 29.64 | 17.30 | 43.50 | -26.20 | Horizontal |
| 152.66 | 38.58 | 10.39 | 1.59 | 29.39 | 21.17 | 43.50 | -22.33 | Horizontal |
| 229.29 | 43.29 | 13.62 | 2.01 | 29.47 | 29.45 | 46.00 | -16.55 | Horizontal |
| 386.63 | 37.84 | 16.78 | 2.79 | 29.56 | 27.85 | 46.00 | -18.15 | Horizontal |
| 533.83 | 42.35 | 19.26 | 3.46 | 29.30 | 35.77 | 46.00 | -10.23 | Horizontal |

■ Above 1GHz

| | |
|---------------|----------------|
| Test channel: | Lowest channel |
|---------------|----------------|

Peak value:

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------------|----------------|---------------------|-----------------|--------------|
| 4804.00 | 35.84 | 31.78 | 8.60 | 32.09 | 44.13 | 74.00 | -29.87 | Vertical |
| 7206.00 | 30.86 | 36.15 | 11.65 | 32.00 | 46.66 | 74.00 | -27.34 | Vertical |
| 9608.00 | 30.60 | 37.95 | 14.14 | 31.62 | 51.07 | 74.00 | -22.93 | Vertical |
| 12010.00 | * | | | | | 74.00 | | Vertical |
| 14412.00 | * | | | | | 74.00 | | Vertical |
| 4804.00 | 39.83 | 31.78 | 8.60 | 32.09 | 48.12 | 74.00 | -25.88 | Horizontal |
| 7206.00 | 32.48 | 36.15 | 11.65 | 32.00 | 48.28 | 74.00 | -25.72 | Horizontal |
| 9608.00 | 29.89 | 37.95 | 14.14 | 31.62 | 50.36 | 74.00 | -23.64 | Horizontal |
| 12010.00 | * | | | | | 74.00 | | Horizontal |
| 14412.00 | * | | | | | 74.00 | | Horizontal |

Average value:

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------------|----------------|---------------------|-----------------|--------------|
| 4804.00 | 24.93 | 31.78 | 8.60 | 32.09 | 33.22 | 54.00 | -20.78 | Vertical |
| 7206.00 | 19.71 | 36.15 | 11.65 | 32.00 | 35.51 | 54.00 | -18.49 | Vertical |
| 9608.00 | 18.88 | 37.95 | 14.14 | 31.62 | 39.35 | 54.00 | -14.65 | Vertical |
| 12010.00 | * | | | | | 54.00 | | Vertical |
| 14412.00 | * | | | | | 54.00 | | Vertical |
| 4804.00 | 29.00 | 31.78 | 8.60 | 32.09 | 37.29 | 54.00 | -16.71 | Horizontal |
| 7206.00 | 21.79 | 36.15 | 11.65 | 32.00 | 37.59 | 54.00 | -16.41 | Horizontal |
| 9608.00 | 18.49 | 37.95 | 14.14 | 31.62 | 38.96 | 54.00 | -15.04 | Horizontal |
| 12010.00 | * | | | | | 54.00 | | Horizontal |
| 14412.00 | * | | | | | 54.00 | | Horizontal |

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. The emission levels of other frequencies are very lower than the limit and not show in test report.
3. “*”, means this data is the too weak instrument of signal is unable to test.

| | |
|---------------|----------------|
| Test channel: | Middle channel |
|---------------|----------------|

Peak value:

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------------|----------------|---------------------|-----------------|--------------|
| 4882.00 | 35.43 | 31.85 | 8.67 | 32.12 | 43.83 | 74.00 | -30.17 | Vertical |
| 7323.00 | 30.59 | 36.37 | 11.72 | 31.89 | 46.79 | 74.00 | -27.21 | Vertical |
| 9764.00 | 30.36 | 38.35 | 14.25 | 31.62 | 51.34 | 74.00 | -22.66 | Vertical |
| 12205.00 | * | | | | | 74.00 | | Vertical |
| 14646.00 | * | | | | | 74.00 | | Vertical |
| 4882.00 | 39.34 | 31.85 | 8.67 | 32.12 | 47.74 | 74.00 | -26.26 | Horizontal |
| 7323.00 | 32.18 | 36.37 | 11.72 | 31.89 | 48.38 | 74.00 | -25.62 | Horizontal |
| 9764.00 | 29.61 | 38.35 | 14.25 | 31.62 | 50.59 | 74.00 | -23.41 | Horizontal |
| 12205.00 | * | | | | | 74.00 | | Horizontal |
| 14646.00 | * | | | | | 74.00 | | Horizontal |

Average value:

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------------|----------------|---------------------|-----------------|--------------|
| 4882.00 | 24.61 | 31.85 | 8.67 | 32.12 | 33.01 | 54.00 | -20.99 | Vertical |
| 7323.00 | 19.49 | 36.37 | 11.72 | 31.89 | 35.69 | 54.00 | -18.31 | Vertical |
| 9764.00 | 18.68 | 38.35 | 14.25 | 31.62 | 39.66 | 54.00 | -14.34 | Vertical |
| 12205.00 | * | | | | | 54.00 | | Vertical |
| 14646.00 | * | | | | | 54.00 | | Vertical |
| 4882.00 | 28.63 | 31.85 | 8.67 | 32.12 | 37.03 | 54.00 | -16.97 | Horizontal |
| 7323.00 | 21.54 | 36.37 | 11.72 | 31.89 | 37.74 | 54.00 | -16.26 | Horizontal |
| 9764.00 | 18.26 | 38.35 | 14.25 | 31.62 | 39.24 | 54.00 | -14.76 | Horizontal |
| 12205.00 | * | | | | | 54.00 | | Horizontal |
| 14646.00 | * | | | | | 54.00 | | Horizontal |

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. The emission levels of other frequencies are very lower than the limit and not show in test report.
3. “*”, means this data is the too weak instrument of signal is unable to test.

| | |
|---------------|-----------------|
| Test channel: | Highest channel |
|---------------|-----------------|

Peak value:

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------------|----------------|---------------------|-----------------|--------------|
| 4960.00 | 34.95 | 31.93 | 8.73 | 32.16 | 43.45 | 74.00 | -30.55 | Vertical |
| 7440.00 | 30.27 | 36.59 | 11.79 | 31.78 | 46.87 | 74.00 | -27.13 | Vertical |
| 9920.00 | 30.08 | 38.81 | 14.38 | 31.88 | 51.39 | 74.00 | -22.61 | Vertical |
| 12400.00 | * | | | | | 74.00 | | Vertical |
| 14880.00 | * | | | | | 74.00 | | Vertical |
| 4960.00 | 38.75 | 31.93 | 8.73 | 32.16 | 47.25 | 74.00 | -26.75 | Horizontal |
| 7440.00 | 31.81 | 36.59 | 11.79 | 31.78 | 48.41 | 74.00 | -25.59 | Horizontal |
| 9920.00 | 29.28 | 38.81 | 14.38 | 31.88 | 50.59 | 74.00 | -23.41 | Horizontal |
| 12400.00 | * | | | | | 74.00 | | Horizontal |
| 14880.00 | * | | | | | 74.00 | | Horizontal |

Average value:

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------------|----------------|---------------------|-----------------|--------------|
| 4960.00 | 24.22 | 31.93 | 8.73 | 32.16 | 32.72 | 54.00 | -21.28 | Vertical |
| 7440.00 | 19.23 | 36.59 | 11.79 | 31.78 | 35.83 | 54.00 | -18.17 | Vertical |
| 9920.00 | 18.45 | 38.81 | 14.38 | 31.88 | 39.76 | 54.00 | -14.24 | Vertical |
| 12400.00 | * | | | | | 54.00 | | Vertical |
| 14880.00 | * | | | | | 54.00 | | Vertical |
| 4960.00 | 28.19 | 31.93 | 8.73 | 32.16 | 36.69 | 54.00 | -17.31 | Horizontal |
| 7440.00 | 21.25 | 36.59 | 11.79 | 31.78 | 37.85 | 54.00 | -16.15 | Horizontal |
| 9920.00 | 17.99 | 38.81 | 14.38 | 31.88 | 39.30 | 54.00 | -14.70 | Horizontal |
| 12400.00 | * | | | | | 54.00 | | Horizontal |
| 14880.00 | * | | | | | 54.00 | | Horizontal |

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. The emission levels of other frequencies are very lower than the limit and not show in test report.
3. “*”, means this data is the too weak instrument of signal is unable to test.

7.3.3 Bandedge emissions

All of the restriction bands were tested, and only the data of worst case was exhibited.

| | |
|---------------|----------------|
| Test channel: | Lowest channel |
|---------------|----------------|

Peak value:

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------------|----------------|---------------------|-----------------|--------------|
| 2390.00 | 43.90 | 27.59 | 5.38 | 30.18 | 46.69 | 74.00 | -27.31 | Horizontal |
| 2400.00 | 60.83 | 27.58 | 5.39 | 30.18 | 63.62 | 74.00 | -10.38 | Horizontal |
| 2390.00 | 44.54 | 27.59 | 5.38 | 30.18 | 47.33 | 74.00 | -26.67 | Vertical |
| 2400.00 | 60.24 | 27.58 | 5.39 | 30.18 | 63.03 | 74.00 | -10.97 | Vertical |

Average value:

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------------|----------------|---------------------|-----------------|--------------|
| 2390.00 | 34.22 | 27.59 | 5.38 | 30.18 | 37.01 | 54.00 | -16.99 | Horizontal |
| 2400.00 | 43.99 | 27.58 | 5.39 | 30.18 | 46.78 | 54.00 | -7.22 | Horizontal |
| 2390.00 | 34.23 | 27.59 | 5.38 | 30.18 | 37.02 | 54.00 | -16.98 | Vertical |
| 2400.00 | 45.26 | 27.58 | 5.39 | 30.18 | 48.05 | 54.00 | -5.95 | Vertical |

| | |
|---------------|-----------------|
| Test channel: | Highest channel |
|---------------|-----------------|

Peak value:

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------------|----------------|---------------------|-----------------|--------------|
| 2483.50 | 46.12 | 27.53 | 5.47 | 29.93 | 49.19 | 74.00 | -24.81 | Horizontal |
| 2500.00 | 45.10 | 27.55 | 5.49 | 29.93 | 48.21 | 74.00 | -25.79 | Horizontal |
| 2483.50 | 47.14 | 27.53 | 5.47 | 29.93 | 50.21 | 74.00 | -23.79 | Vertical |
| 2500.00 | 46.20 | 27.55 | 5.49 | 29.93 | 49.31 | 74.00 | -24.69 | Vertical |

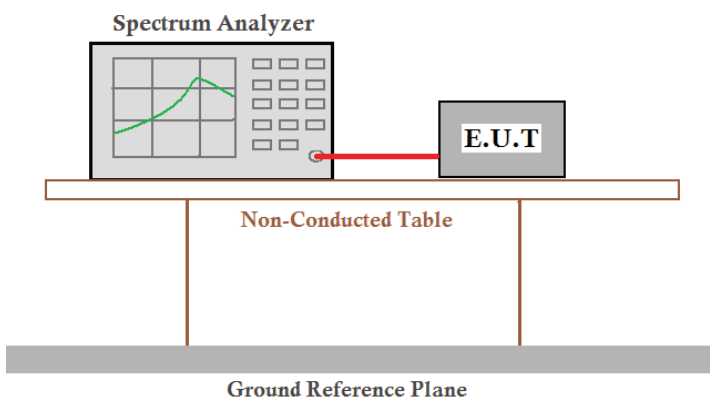
Average value:

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------------|----------------|---------------------|-----------------|--------------|
| 2483.50 | 37.06 | 27.53 | 5.47 | 29.93 | 40.13 | 54.00 | -13.87 | Horizontal |
| 2500.00 | 34.91 | 27.55 | 5.49 | 29.93 | 38.02 | 54.00 | -15.98 | Horizontal |
| 2483.50 | 38.35 | 27.53 | 5.47 | 29.93 | 41.42 | 54.00 | -12.58 | Vertical |
| 2500.00 | 34.92 | 27.55 | 5.49 | 29.93 | 38.03 | 54.00 | -15.97 | Vertical |

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

7.4 20dB Occupy Bandwidth

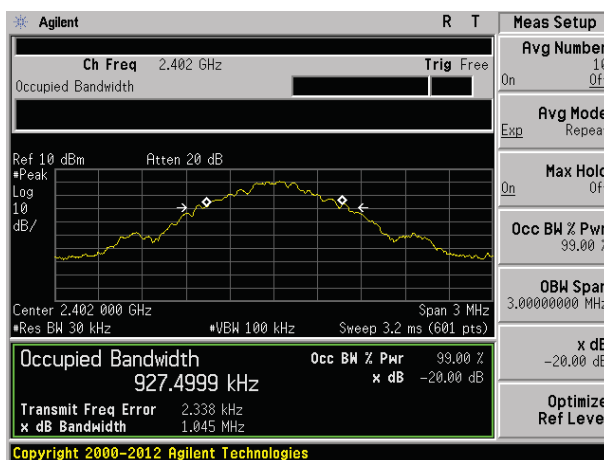
| | |
|-------------------|--|
| Test Requirement: | FCC Part15 C Section 15.249/15.215 |
| Test Method: | ANSI C63.10:2013 |
| Limit: | Operation Frequency range 2400MHz~2483.5MHz |
| Test setup: |  <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.</p> |
| Test Instruments: | Refer to section 6.0 for details |
| Test mode: | Refer to section 5.3 for details |
| Test results: | Pass |

Measurement Data

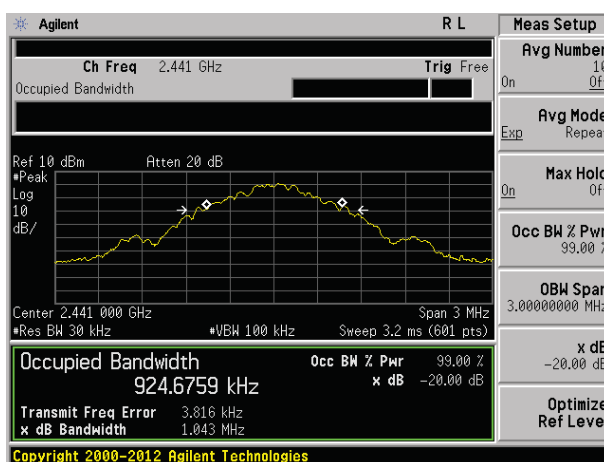
GFSK modulation is the worst case

| Test channel | 20dB bandwidth(MHz) | Result |
|--------------|---------------------|--------|
| Lowest | 1.045 | Pass |
| Middle | 1.043 | Pass |
| Highest | 1.045 | Pass |

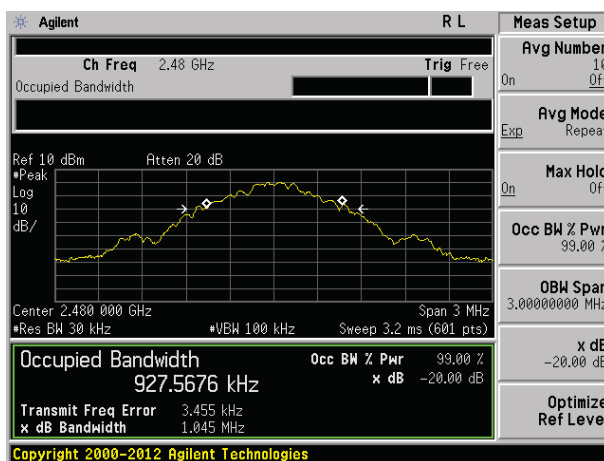
Test plot as follows:



Lowest channel



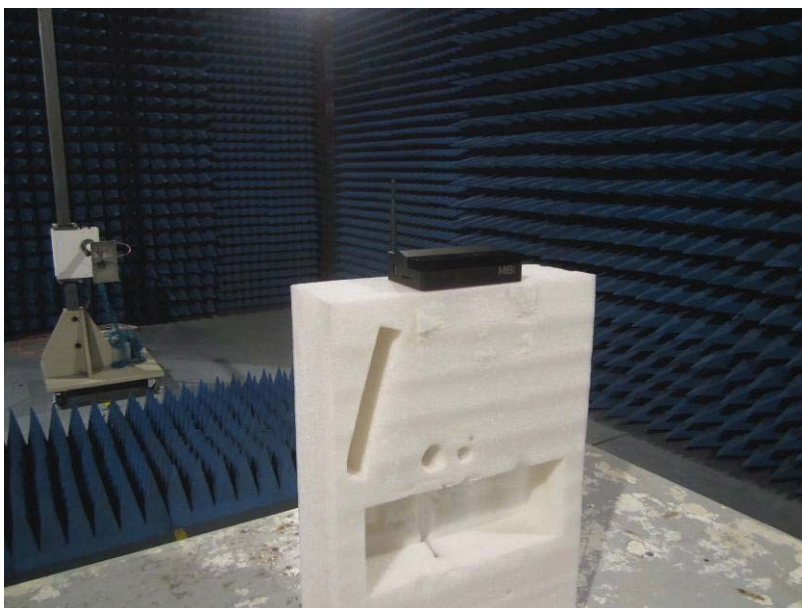
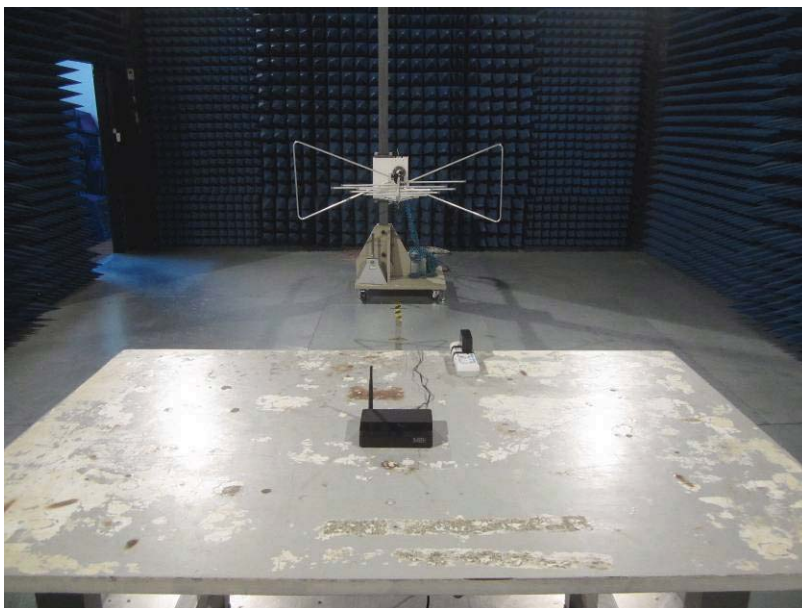
Middle channel



Highest channel

8 Test Setup Photo

Radiated Emission

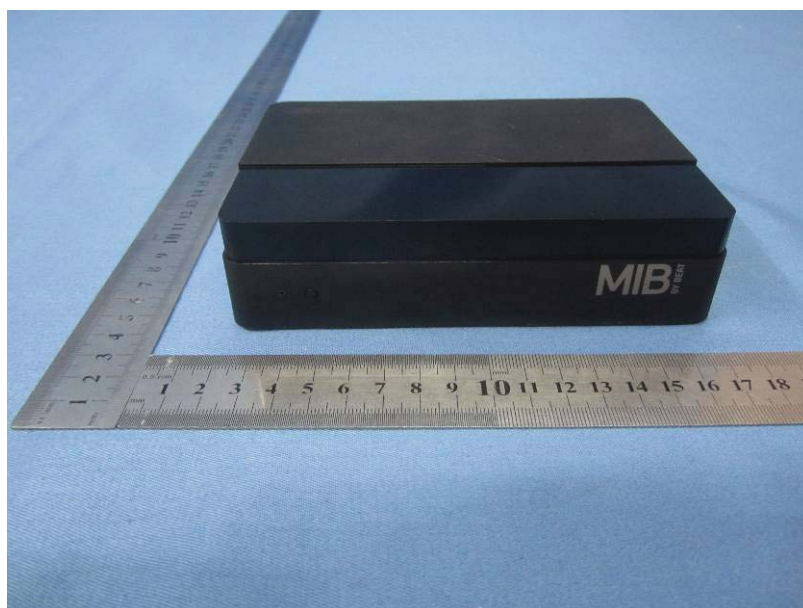


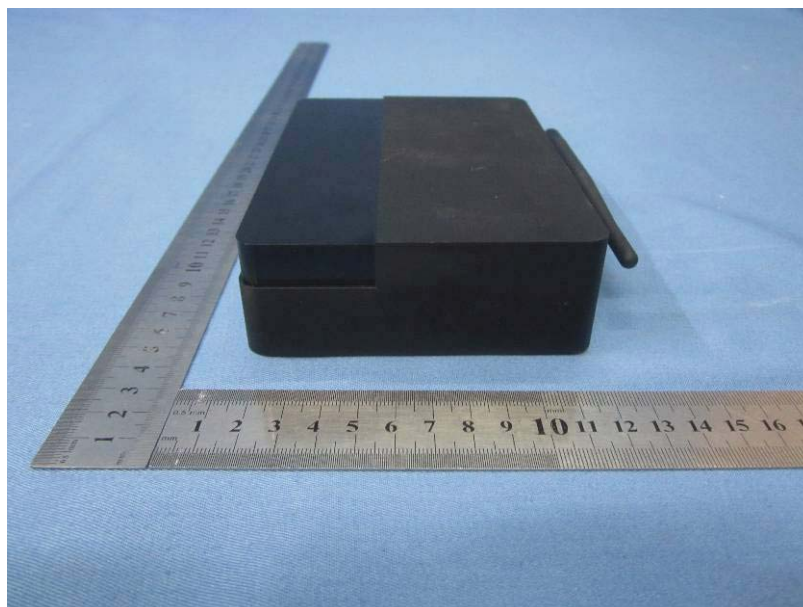
Conducted Emissions

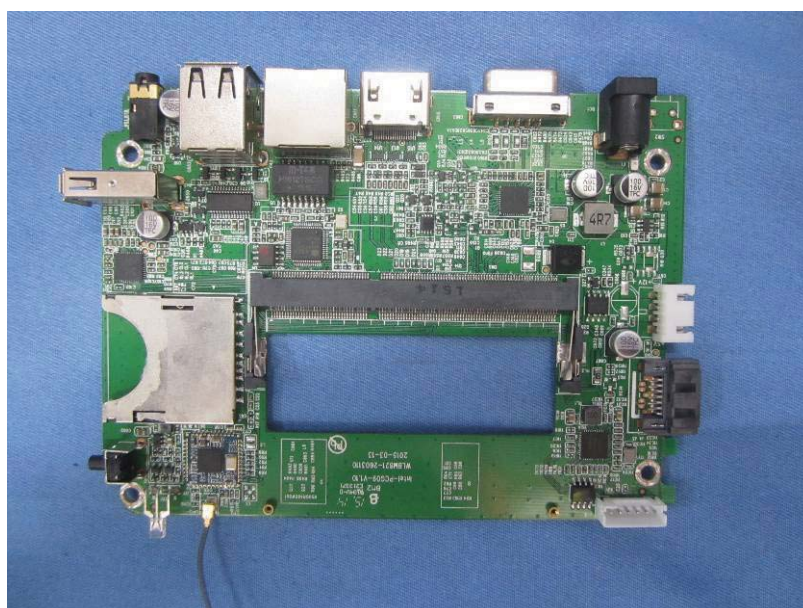


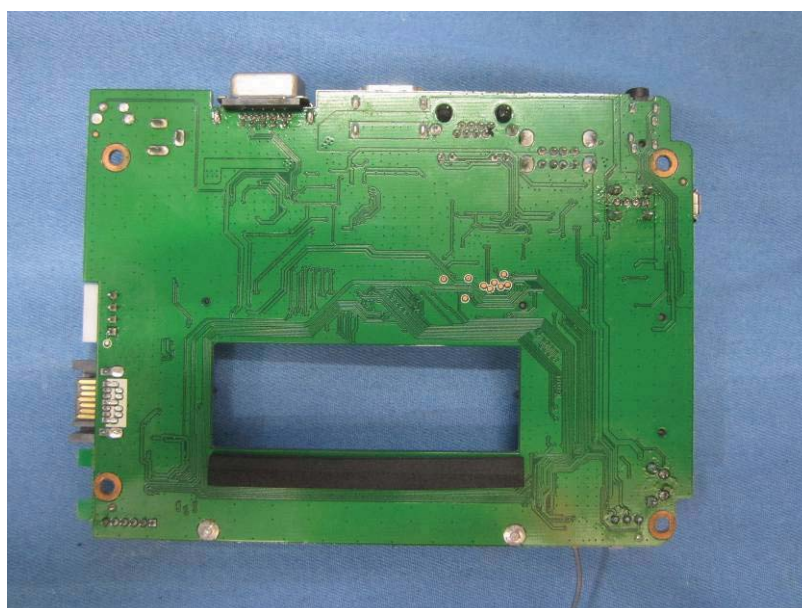
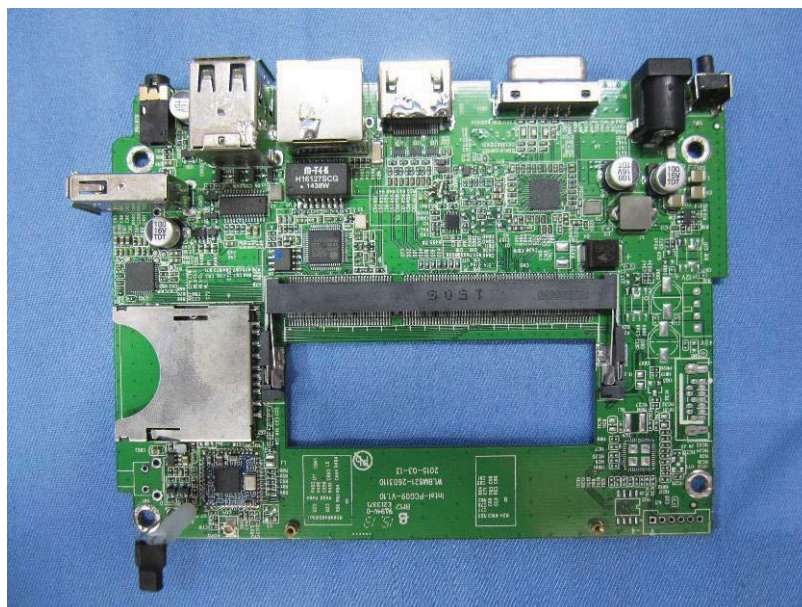
9 EUT Constructional Details

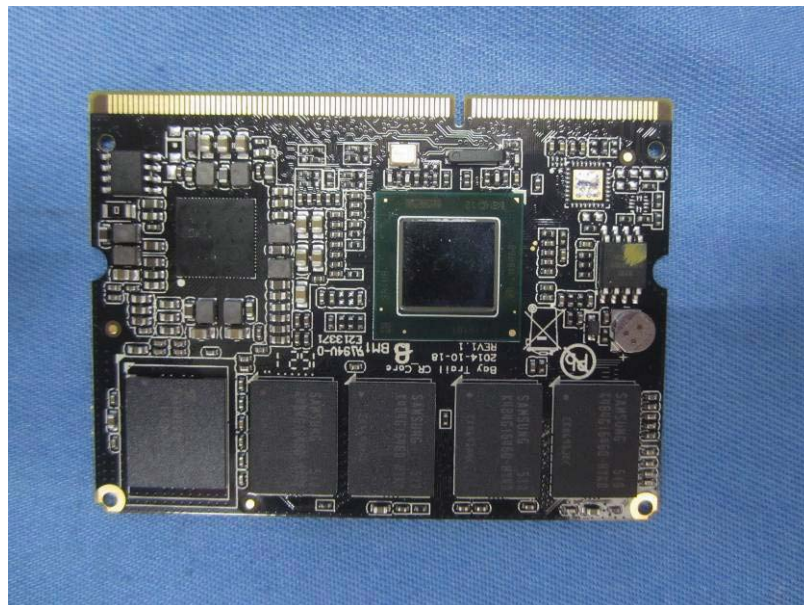


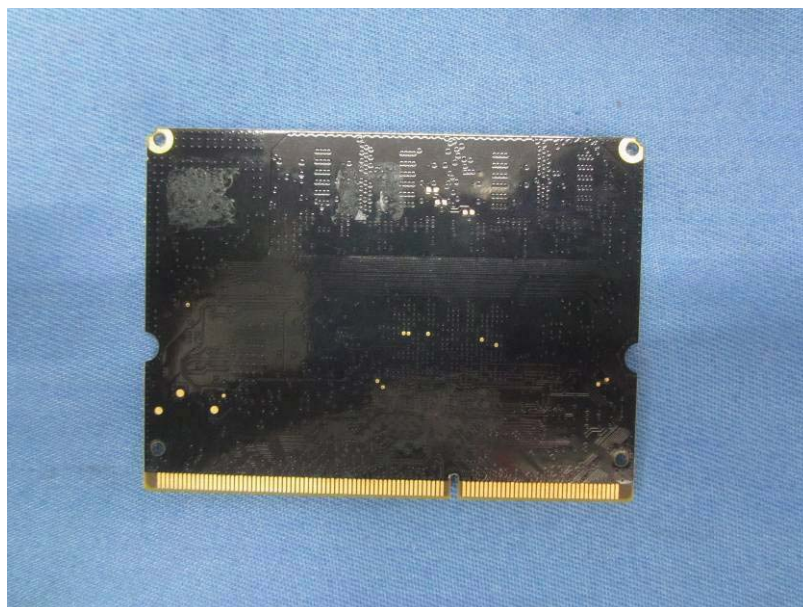














-----End-----