# FCC REPORT (Bluetooth 4.0)

| | |
|---|---|
| **Applicant:** | Pendo Technology China Corporation |
| **Address of Applicant:** | Unit 205, Kong Yue Building, 99 Shanghai Multimedia Valley, 777 Guangzhong West Road, Shanghai, China |
| **Manufacturer:** | Pendo Technology China Corporation |
| **Address of Manufacturer:** | Unit 205, Kong Yue Building, 99 Shanghai Multimedia Valley, 777 Guangzhong West Road, Shanghai, China |

**Equipment Under Test (EUT)**

| | |
|---|---|
| Product Name: | HYPEN |
| Model No.: | PH-A510-C, PH-A510-H, PH-A510-A, PH-A510-B, PH-A510-D, PH-A510-E, PH-A510-F, PH-A510-G, PH-A510-J, PH-A510-K |
| Trade Mark: | PendoTech |
| **FCC ID:** | 2AI7GPH-A510-C |
| **Applicable standards:** | FCC CFR Title 47 Part 15 Subpart C Section 15.249:2016 |
| **Date of sample receipt:** | March 16, 2017 |
| **Date of Test:** | March 17-23, 2017 |
| **Date of report issued:** | March 27, 2017 |
| **Test Result :** | PASS * |

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

Authorized Signature:

**Robinson Lo**
**Laboratory Manager**

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

# 2 Version

| Version No. | Date | Description |
|---|---|---|
| *00* | *March 27, 2017* | *Original* |
| | | |
| | | |
| | | |
| | | |

***Prepared By:*** Joe. li ***Date:*** *March 27, 2017*

***Project Engineer***

***Check By:*** Andy. wu ***Date:*** *March 27, 2017*

***Reviewer***

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# 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.*

*Remark: Test according to ANSI C63.10 2013 and ANSI C63.4: 2014*

## 4.1 Measurement Uncertainty

| Test Item | Frequency Range | Measurement Uncertainty | Notes |
|---|---|---|---|
| Radiated Emission | 9kHz ~ 30MHz | ± 4.34dB | (1) |
| Radiated Emission | 30MHz ~ 1000MHz | ± 4.24dB | (1) |
| Radiated Emission | 1GHz ~ 26.5GHz | ± 4.68dB | (1) |
| AC Power Line Conducted Emission | 0.15MHz ~ 30MHz | ± 3.45dB | (1) |
| Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%. | | | |

# 5 General Information

## 5.1 General Description of EUT

| | |
|---|---|
| Product Name: | HYPEN |
| Model No.: | PH-A510-C, PH-A510-H, PH-A510-A, PH-A510-B, PH-A510-D, PH-A510-E, PH-A510-F, PH-A510-G, PH-A510-J, PH-A510-K |
| Test Model No. : | PH-A510-C |
| *Remark: All above models are identical in the same PCB layout, interior structure and electrical circuits. The only difference is the model name for commercial purpose.* | |
| Operation Frequency: | 2402MHz~2480MHz |
| Channel numbers: | 40 |
| Channel separation: | 2MHz |
| Modulation type: | GFSK |
| Antenna Type: | PCB antenna |
| Antenna gain: | 1.5dBi (declare by Applicant) |
| Power supply: | DC 5V, 0.5A<br>or<br>DC 3.7V 1000mAh, Rechargeable Li-polymer Battery |

| Operation Frequency each of channel | | | | | | | |
|---|---|---|---|---|---|---|---|
| Channel | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
| 1 | 2402MHz | 11 | 2422MHz | 21 | 2442MHz | 31 | 2462MHz |
| 2 | 2404MHz | 12 | 2424MHz | 22 | 2444MHz | 32 | 2464MHz |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| 9 | 2418MHz | 19 | 2438MHz | 29 | 2458MHz | 39 | 2478MHz |
| 10 | 2420MHz | 20 | 2440MHz | 30 | 2460MHz | 40 | 2480MHz |

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 | 2440MHz |
| The Highest channel | 2480MHz |

## 5.2 Test mode

| | |
|---|---|
| Transmitting mode | Keep the EUT in continuously transmitting mode |
| *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.* | |

**Pre-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) | 88.56 | 88.73 | 87.23 |

## 5.3 Description of Support Units

| Manufacturer | Description | Model | Serial Number | FCC Approval |
|---|---|---|---|---|
| Emerson Network Power | USB Charger | A1299 | N/A | FCC Doc |

## 5.4 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 fuly describe in a report file with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 600491, June 22, 2016.

● **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, August 15, 2016.

## 5.5 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

Address: No. 301-309, 3/F., Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China

Tel: 0755-27798480

Fax: 0755-27798960

## 5.6 Description of Support Units

| Manufacturer | Description | Model | Serial Number | FCC Approval |
|---|---|---|---|---|
| Emerson Network Power | USB Charger | A1299 | N/A | FCC DoC |

## 5.7 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 | July 03 2015 | July 02 2020 |
| 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 | June 29 2016 | June 28 2017 |
| 4 | EMI Test Receiver | Rohde & Schwarz | ESU26 | GTS203 | June 29 2016 | June 28 2017 |
| 5 | BiConiLog Antenna | SCHWARZBECK MESS-ELEKTRONIK | VULB9163 | GTS214 | June 29 2016 | June 28 2017 |
| 6 | Double -ridged waveguide horn | SCHWARZBECK MESS-ELEKTRONIK | 9120D-829 | GTS208 | June 29 2016 | June 28 2017 |
| 7 | Horn Antenna | ETS-LINDGREN | 3160 | GTS217 | June 29 2016 | June 28 2017 |
| 8 | EMI Test Software | AUDIX | E3 | N/A | N/A | N/A |
| 9 | Coaxial Cable | GTS | N/A | GTS213 | June 29 2016 | June 28 2017 |
| 10 | Coaxial Cable | GTS | N/A | GTS211 | June 29 2016 | June 28 2017 |
| 11 | Coaxial cable | GTS | N/A | GTS210 | June 29 2016 | June 28 2017 |
| 12 | Coaxial Cable | GTS | N/A | GTS212 | June 29 2016 | June 28 2017 |
| 13 | Amplifier(100kHz-3GHz) | HP | 8347A | GTS204 | June 29 2016 | June 28 2017 |
| 14 | Amplifier(2GHz-20GHz) | HP | 8349B | GTS206 | June 29 2016 | June 28 2017 |
| 15 | Amplifier (18-26GHz) | Rohde & Schwarz | AFS33-18002 650-30-8P-44 | GTS218 | June 29 2016 | June 28 2017 |
| 16 | Band filter | Amindeon | 82346 | GTS219 | June 29 2016 | June 28 2017 |
| 17 | Power Meter | Anritsu | ML2495A | GTS540 | June 29 2016 | June 28 2017 |
| 18 | Power Sensor | Anritsu | MA2411B | GTS541 | June 29 2016 | June 28 2017 |

| 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 | 7.3(L)x3.1(W)x2.9(H) | GTS252 | May.16 2014 | May.15 2019 |
| 2 | EMI Test Receiver | R&S | ESCI 7 | GTS552 | June. 29 2016 | June. 28 2017 |
| 3 | Coaxial Switch | ANRITSU CORP | MP59B | GTS225 | June. 29 2016 | June. 28 2017 |
| 4 | Artificial Mains Network | SCHWARZBECK MESS | NSLK8127 | GTS226 | June. 29 2016 | June. 28 2017 |
| 5 | Coaxial Cable | GTS | N/A | GTS227 | N/A | N/A |
| 6 | EMI Test Software | AUDIX | E3 | N/A | N/A | N/A |
| 7 | Thermo meter | KTJ | TA328 | GTS233 | June. 29 2016 | June. 28 2017 |

# 7 Test results and Measurement Data

## 7.1 Antenna requirement

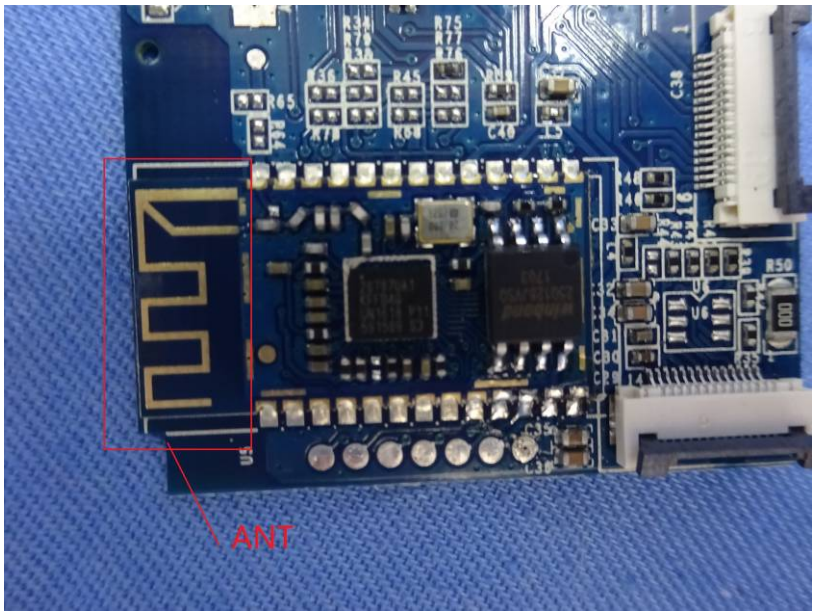
| | |
|---|---|
| **Standard requirement:** | FCC Part15 C Section 15.203 |

**15.203 requirement:**

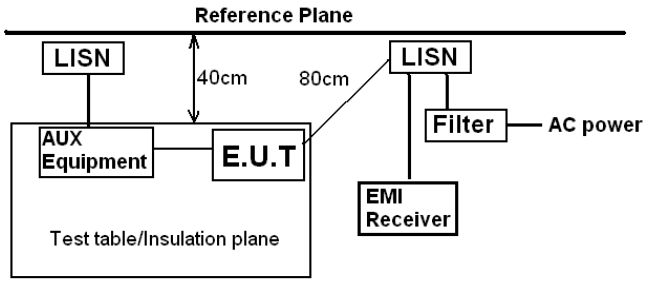
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

**EUT Antenna:**

*The antenna is PCB antenna, the best case gain of the antenna is 1.5dBi*

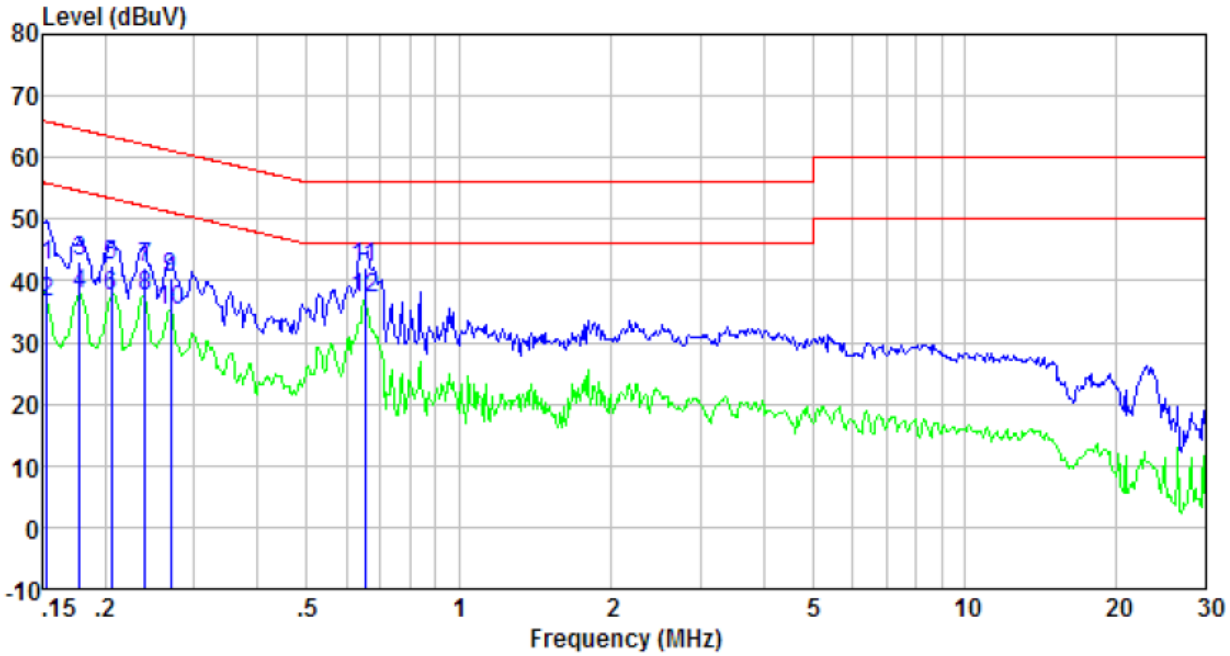


## 7.2 Conducted Emissions

| | |
|---|---|
| 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<br>0.15-0.5: 66 to 56* / 56 to 46*<br>0.5-5: 56 / 46<br>5-30: 60 / 50<br>* Decreases with the logarithm of the frequency. |
| Test setup: |  <br>*Remark:*<br>*E.U.T: Equipment Under Test*<br>*LISN: Line Impedence Stabilization Network*<br>*Test table height=0.8m* |
| Test procedure: | 1. The E.U.T and simulators are 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.<br>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).<br>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. |
| Test Instruments: | Refer to section 6.0 for details |
| Test mode: | Refer to section 5.2 for details |
| Test results: | Pass |

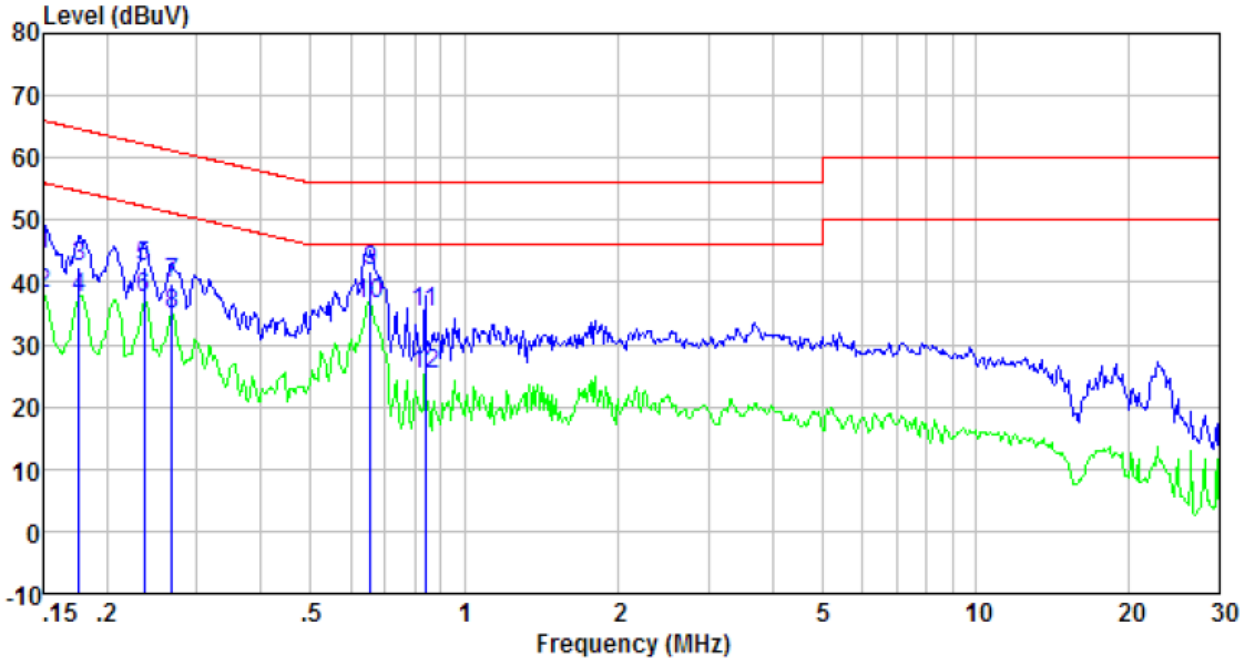
**Measurement data:**

**Line:**




| Freq MHz | Reading level dBuV | lISN/ISN factor dB | Cable loss dB | level dBuV | Limit level dBuV | Over limit dB | Remark |
|---|---|---|---|---|---|---|---|
| 0.153 | 41.77 | 0.42 | 0.12 | 42.31 | 65.82 | -23.51 | QP |
| 0.153 | 35.94 | 0.42 | 0.12 | 36.48 | 55.82 | -19.34 | Average |
| 0.178 | 42.44 | 0.42 | 0.13 | 42.99 | 64.59 | -21.60 | QP |
| 0.178 | 37.43 | 0.42 | 0.13 | 37.98 | 54.59 | -16.61 | Average |
| 0.205 | 42.02 | 0.43 | 0.13 | 42.58 | 63.40 | -20.82 | QP |
| 0.205 | 37.06 | 0.43 | 0.13 | 37.62 | 53.40 | -15.78 | Average |
| 0.239 | 41.62 | 0.44 | 0.12 | 42.18 | 62.13 | -19.95 | QP |
| 0.239 | 36.90 | 0.44 | 0.12 | 37.46 | 52.13 | -14.67 | Average |
| 0.269 | 39.92 | 0.44 | 0.11 | 40.47 | 61.16 | -20.69 | QP |
| 0.269 | 34.73 | 0.44 | 0.11 | 35.28 | 51.16 | -15.88 | Average |
| 0.651 | 41.59 | 0.29 | 0.13 | 42.01 | 56.00 | -13.99 | QP |
| 0.651 | 36.58 | 0.29 | 0.13 | 37.00 | 46.00 | -9.00 | Average |

**Neutral:**

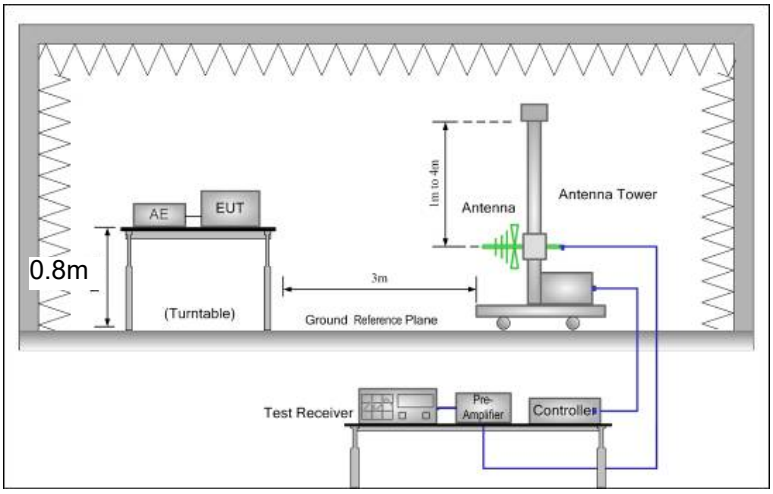



| Freq MHz | Reading level dBuV | lISN/ISN factor dB | Cable loss dB | level dBuV | Limit level dBuV | Over limit dB | Remark |
|---|---|---|---|---|---|---|---|
| 0.150 | 43.97 | 0.41 | 0.12 | 44.50 | 66.00 | -21.50 | QP |
| 0.150 | 37.77 | 0.41 | 0.12 | 38.30 | 56.00 | -17.70 | Average |
| 0.176 | 41.94 | 0.41 | 0.13 | 42.48 | 64.68 | -22.20 | QP |
| 0.176 | 37.01 | 0.41 | 0.13 | 37.55 | 54.68 | -17.13 | Average |
| 0.237 | 41.83 | 0.42 | 0.12 | 42.37 | 62.22 | -19.85 | QP |
| 0.237 | 36.87 | 0.42 | 0.12 | 37.41 | 52.22 | -14.81 | Average |
| 0.267 | 39.28 | 0.42 | 0.11 | 39.81 | 61.20 | -21.39 | QP |
| 0.267 | 34.37 | 0.42 | 0.11 | 34.90 | 51.20 | -16.30 | Average |
| 0.654 | 41.26 | 0.26 | 0.13 | 41.65 | 56.00 | -14.35 | QP |
| 0.654 | 36.16 | 0.26 | 0.13 | 36.55 | 46.00 | -9.45 | Average |
| 0.839 | 34.78 | 0.22 | 0.13 | 35.13 | 56.00 | -20.87 | QP |
| 0.839 | 24.91 | 0.22 | 0.13 | 25.26 | 46.00 | -20.74 | Average |

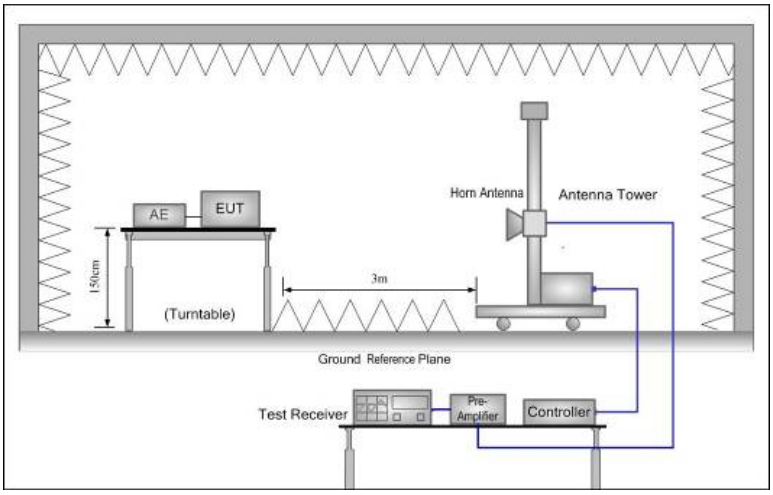
*Notes:*

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

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Test Frequency Range:</td><td>30MHz to 25GHz</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><th>Frequency</th><th>Detector</th><th>RBW</th><th>VBW</th><th>Remark</th></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>Peak</td><td>1MHz</td><td>10Hz</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:<br>(Field strength of the fundamental signal)</td><td>
<table>
<tr><th>Frequency</th><th>Limit (dBuV/m @3m)</th><th>Remark</th></tr>
<tr><td>2400MHz-2483.5MHz</td><td>94.00</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:<br>(Spurious Emissions)</td><td>
<table>
<tr><th>Frequency</th><th>Limit (dBuV/m @3m)</th><th>Remark</th></tr>
<tr><td>30MHz-88MHz</td><td>40.00</td><td>Quasi-peak Value</td></tr>
<tr><td>88MHz-216MHz</td><td>43.50</td><td>Quasi-peak Value</td></tr>
<tr><td>216MHz-960MHz</td><td>46.00</td><td>Quasi-peak Value</td></tr>
<tr><td>960MHz-1GHz</td><td>54.00</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>54.00</td><td>Average Value</td></tr>
<tr><td>74.00</td><td>Peak Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:<br>(band edge)</td><td>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.</td></tr>
<tr><td>Test setup:</td><td>Below 1GHz<br> 

<br>Above 1GHz</td></tr>
</table>

| | |
|---|---|
| |  |
| Test Procedure: | 1. The EUT was placed on the top of a rotating table (0.8m for below 1GHz and 1.5 meters for above 1GHz) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.<br>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.<br>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.<br>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.<br>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.<br>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 5.2 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) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|---|---|---|---|---|---|---|---|---|
| 2402.00 | 85.01 | 27.58 | 5.39 | 30.18 | 87.80 | 114.00 | -26.20 | Vertical |
| 2402.00 | 83.64 | 27.58 | 5.39 | 30.18 | 86.43 | 114.00 | -27.57 | Horizontal |
| 2440.00 | 83.97 | 27.55 | 5.43 | 30.06 | 86.89 | 114.00 | -27.11 | Vertical |
| 2440.00 | 82.80 | 27.55 | 5.43 | 30.06 | 85.72 | 114.00 | -28.28 | Horizontal |
| 2480.00 | 85.67 | 27.52 | 5.47 | 29.93 | 88.73 | 114.00 | -25.27 | Vertical |
| 2480.00 | 83.47 | 27.52 | 5.47 | 29.93 | 86.53 | 114.00 | -27.47 | Horizontal |

**Average value:**

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|---|---|---|---|---|---|---|---|---|
| 2402.00 | 74.50 | 27.58 | 5.39 | 30.18 | 77.29 | 94.00 | -16.71 | Vertical |
| 2402.00 | 73.08 | 27.58 | 5.39 | 30.18 | 75.87 | 94.00 | -18.13 | Horizontal |
| 2440.00 | 73.24 | 27.55 | 5.43 | 30.06 | 76.16 | 94.00 | -17.84 | Vertical |
| 2440.00 | 70.66 | 27.55 | 5.43 | 30.06 | 73.58 | 94.00 | -20.42 | Horizontal |
| 2480.00 | 74.90 | 27.52 | 5.47 | 29.93 | 77.96 | 94.00 | -16.04 | Vertical |
| 2480.00 | 72.94 | 27.52 | 5.47 | 29.93 | 76.00 | 94.00 | -18.00 | Horizontal |

NOTE:RBW 3MHz VBW 3MHz peak detector is for PK value， RMS detector is for AV value

### 7.3.2 Spurious emissions

■ Below 1GHz

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|---|---|---|---|---|---|---|---|---|
| 36.77 | 39.92 | 11.20 | 0.63 | 30.06 | 21.69 | 40.00 | -18.31 | Vertical |
| 44.12 | 39.89 | 12.25 | 0.71 | 30.02 | 22.83 | 40.00 | -17.17 | Vertical |
| 51.84 | 38.32 | 12.20 | 0.79 | 29.98 | 21.33 | 40.00 | -18.67 | Vertical |
| 327.89 | 38.07 | 14.03 | 2.51 | 29.84 | 24.77 | 46.00 | -21.23 | Vertical |
| 410.38 | 37.88 | 15.68 | 2.91 | 29.48 | 26.99 | 46.00 | -19.01 | Vertical |
| 492.47 | 36.58 | 17.38 | 3.27 | 29.32 | 27.91 | 46.00 | -18.09 | Vertical |
| 218.31 | 41.16 | 10.78 | 1.95 | 29.38 | 24.51 | 46.00 | -21.49 | Horizontal |
| 256.52 | 40.61 | 12.04 | 2.16 | 29.70 | 25.11 | 46.00 | -20.89 | Horizontal |
| 292.06 | 39.83 | 13.21 | 2.32 | 29.95 | 25.41 | 46.00 | -20.59 | Horizontal |
| 327.89 | 43.78 | 14.03 | 2.51 | 29.84 | 30.48 | 46.00 | -15.52 | Horizontal |
| 437.12 | 34.33 | 16.23 | 3.03 | 29.42 | 24.17 | 46.00 | -21.83 | Horizontal |
| 798.98 | 28.91 | 21.30 | 4.45 | 29.20 | 25.46 | 46.00 | -20.54 | Horizontal |

■ Above 1GHz

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

**Peak value:**

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|---|---|---|---|---|---|---|---|---|
| 4804.00 | 35.71 | 31.78 | 8.60 | 32.09 | 44.00 | 74.00 | -30.00 | Vertical |
| 7206.00 | 30.77 | 36.15 | 11.65 | 32.00 | 46.57 | 74.00 | -27.43 | Vertical |
| 9608.00 | 30.53 | 37.95 | 14.14 | 31.62 | 51.00 | 74.00 | -23.00 | Vertical |
| 12010.00 | * | | | | | 74.00 | | Vertical |
| 14412.00 | * | | | | | 74.00 | | Vertical |
| 4804.00 | 39.68 | 31.78 | 8.60 | 32.09 | 47.97 | 74.00 | -26.03 | Horizontal |
| 7206.00 | 32.39 | 36.15 | 11.65 | 32.00 | 48.19 | 74.00 | -25.81 | Horizontal |
| 9608.00 | 29.80 | 37.95 | 14.14 | 31.62 | 50.27 | 74.00 | -23.73 | 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) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|---|---|---|---|---|---|---|---|---|
| 4804.00 | 24.83 | 31.78 | 8.60 | 32.09 | 33.12 | 54.00 | -20.88 | Vertical |
| 7206.00 | 19.64 | 36.15 | 11.65 | 32.00 | 35.44 | 54.00 | -18.56 | Vertical |
| 9608.00 | 18.82 | 37.95 | 14.14 | 31.62 | 39.29 | 54.00 | -14.71 | Vertical |
| 12010.00 | * | | | | | 54.00 | | Vertical |
| 14412.00 | * | | | | | 54.00 | | Vertical |
| 4804.00 | 28.88 | 31.78 | 8.60 | 32.09 | 37.17 | 54.00 | -16.83 | Horizontal |
| 7206.00 | 21.71 | 36.15 | 11.65 | 32.00 | 37.51 | 54.00 | -16.49 | Horizontal |
| 9608.00 | 18.42 | 37.95 | 14.14 | 31.62 | 38.89 | 54.00 | -15.11 | 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. *"*", 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) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|---|---|---|---|---|---|---|---|---|
| 4880.00 | 36.12 | 31.85 | 8.67 | 32.12 | 44.52 | 74.00 | -29.48 | Vertical |
| 7320.00 | 31.04 | 36.37 | 11.72 | 31.89 | 47.24 | 74.00 | -26.76 | Vertical |
| 9760.00 | 30.77 | 38.35 | 14.25 | 31.62 | 51.75 | 74.00 | -22.25 | Vertical |
| 12200.00 | * | | | | | 74.00 | | Vertical |
| 14640.00 | * | | | | | 74.00 | | Vertical |
| 4880.00 | 40.16 | 31.85 | 8.67 | 32.12 | 48.56 | 74.00 | -25.44 | Horizontal |
| 7320.00 | 32.70 | 36.37 | 11.72 | 31.89 | 48.90 | 74.00 | -25.10 | Horizontal |
| 9760.00 | 30.08 | 38.35 | 14.25 | 31.62 | 51.06 | 74.00 | -22.94 | Horizontal |
| 12200.00 | * | | | | | 74.00 | | Horizontal |
| 14640.00 | * | | | | | 74.00 | | Horizontal |

**Average value:**

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|---|---|---|---|---|---|---|---|---|
| 4880.00 | 25.17 | 31.85 | 8.67 | 32.12 | 33.57 | 54.00 | -20.43 | Vertical |
| 7320.00 | 19.87 | 36.37 | 11.72 | 31.89 | 36.07 | 54.00 | -17.93 | Vertical |
| 9760.00 | 19.02 | 38.35 | 14.25 | 31.62 | 40.00 | 54.00 | -14.00 | Vertical |
| 12200.00 | * | | | | | 54.00 | | Vertical |
| 14640.00 | * | | | | | 54.00 | | Vertical |
| 4880.00 | 29.26 | 31.85 | 8.67 | 32.12 | 37.66 | 54.00 | -16.34 | Horizontal |
| 7320.00 | 21.97 | 36.37 | 11.72 | 31.89 | 38.17 | 54.00 | -15.83 | Horizontal |
| 9760.00 | 18.65 | 38.35 | 14.25 | 31.62 | 39.63 | 54.00 | -14.37 | Horizontal |
| 12200.00 | * | | | | | 54.00 | | Horizontal |
| 14640.00 | * | | | | | 54.00 | | Horizontal |

*Remark:*

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *"*", 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) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|---|---|---|---|---|---|---|---|---|
| 4960.00 | 36.30 | 31.93 | 8.73 | 32.16 | 44.80 | 74.00 | -29.20 | Vertical |
| 7440.00 | 31.17 | 36.59 | 11.79 | 31.78 | 47.77 | 74.00 | -26.23 | Vertical |
| 9920.00 | 30.88 | 38.81 | 14.38 | 31.88 | 52.19 | 74.00 | -21.81 | Vertical |
| 12400.00 | * | | | | | 74.00 | | Vertical |
| 14880.00 | * | | | | | 74.00 | | Vertical |
| 4960.00 | 40.38 | 31.93 | 8.73 | 32.16 | 48.88 | 74.00 | -25.12 | Horizontal |
| 7440.00 | 32.83 | 36.59 | 11.79 | 31.78 | 49.43 | 74.00 | -24.57 | Horizontal |
| 9920.00 | 30.20 | 38.81 | 14.38 | 31.88 | 51.51 | 74.00 | -22.49 | 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) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|---|---|---|---|---|---|---|---|---|
| 4960.00 | 25.36 | 31.93 | 8.73 | 32.16 | 33.86 | 54.00 | -20.14 | Vertical |
| 7440.00 | 20.00 | 36.59 | 11.79 | 31.78 | 36.60 | 54.00 | -17.40 | Vertical |
| 9920.00 | 19.14 | 38.81 | 14.38 | 31.88 | 40.45 | 54.00 | -13.55 | Vertical |
| 12400.00 | * | | | | | 54.00 | | Vertical |
| 14880.00 | * | | | | | 54.00 | | Vertical |
| 4960.00 | 29.49 | 31.93 | 8.73 | 32.16 | 37.99 | 54.00 | -16.01 | Horizontal |
| 7440.00 | 22.11 | 36.59 | 11.79 | 31.78 | 38.71 | 54.00 | -15.29 | Horizontal |
| 9920.00 | 18.79 | 38.81 | 14.38 | 31.88 | 40.10 | 54.00 | -13.90 | 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. *"*", means this data is the too weak instrument of signal is unable to test.*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

### 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) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 2390.00 | 38.62 | 27.59 | 5.38 | 30.18 | 41.41 | 74.00 | -32.59 | Horizontal |
| 2400.00 | 54.80 | 27.58 | 5.39 | 30.18 | 57.59 | 74.00 | -16.41 | Horizontal |
| 2390.00 | 38.77 | 27.59 | 5.38 | 30.18 | 41.56 | 74.00 | -32.44 | Vertical |
| 2400.00 | 56.38 | 27.58 | 5.39 | 30.18 | 59.17 | 74.00 | -14.83 | Vertical |

**Average value:**

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 2390.00 | 30.14 | 27.59 | 5.38 | 30.18 | 32.93 | 54.00 | -21.07 | Horizontal |
| 2400.00 | 41.12 | 27.58 | 5.39 | 30.18 | 43.91 | 54.00 | -10.09 | Horizontal |
| 2390.00 | 29.78 | 27.59 | 5.38 | 30.18 | 32.57 | 54.00 | -21.43 | Vertical |
| 2400.00 | 42.36 | 27.58 | 5.39 | 30.18 | 45.15 | 54.00 | -8.85 | Vertical |

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

**Peak value:**

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 2483.50 | 40.22 | 27.53 | 5.47 | 29.93 | 43.29 | 74.00 | -30.71 | Horizontal |
| 2500.00 | 40.20 | 27.55 | 5.49 | 29.93 | 43.31 | 74.00 | -30.69 | Horizontal |
| 2483.50 | 40.35 | 27.53 | 5.47 | 29.93 | 43.42 | 74.00 | -30.58 | Vertical |
| 2500.00 | 40.80 | 27.55 | 5.49 | 29.93 | 43.91 | 74.00 | -30.09 | Vertical |

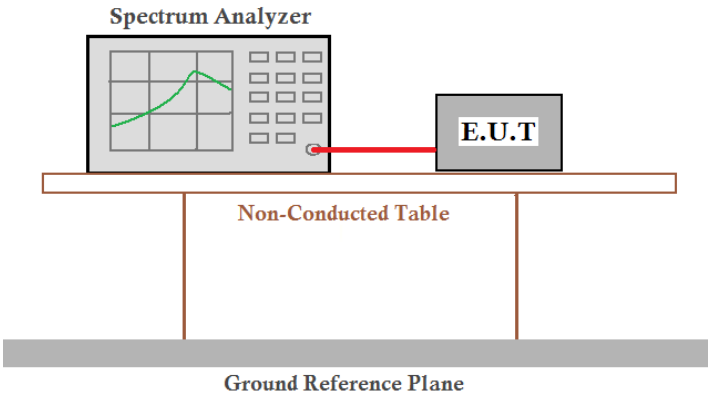
**Average value:**

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
|---|---|---|---|---|---|---|---|---|
| 2483.50 | 32.91 | 27.53 | 5.47 | 29.93 | 35.98 | 54.00 | -18.02 | Horizontal |
| 2500.00 | 31.52 | 27.55 | 5.49 | 29.93 | 34.63 | 54.00 | -19.37 | Horizontal |
| 2483.50 | 33.77 | 27.53 | 5.47 | 29.93 | 36.84 | 54.00 | -17.16 | Vertical |
| 2500.00 | 31.09 | 27.55 | 5.49 | 29.93 | 34.20 | 54.00 | -19.80 | Vertical |

*Remark:*

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

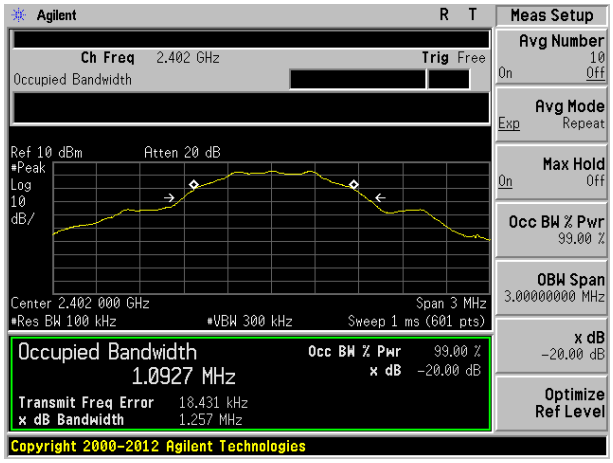
## 7.4 20dB Occupy Bandwidth

| | |
|---|---|
| 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: |  |
| Test Instruments: | Refer to section 6.0 for details |
| Test mode: | Refer to section 5.2 for details |
| Test results: | Pass |

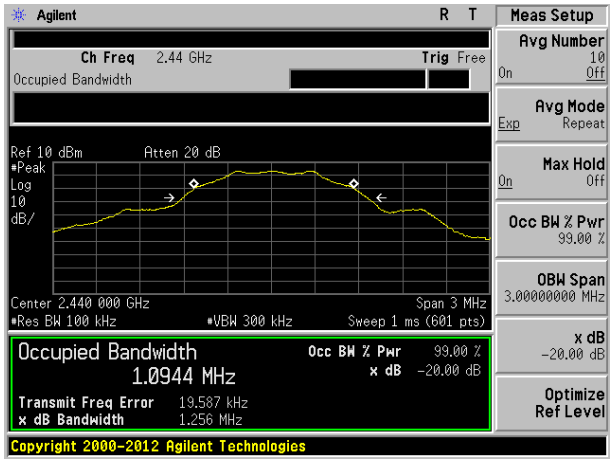
**Measurement Data**

| Test channel | 20dB bandwidth(MHz) | Result |
|---|---|---|
| Lowest | 1.257 | Pass |
| Middle | 1.256 | Pass |
| Highest | 1.256 | Pass |

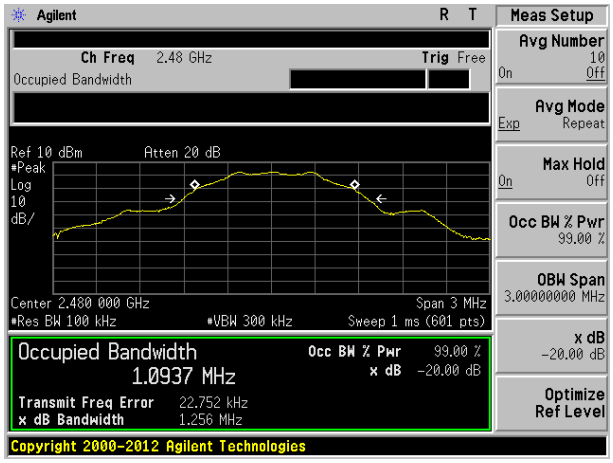
Test plot as follows:




Lowest channel




Middle channel

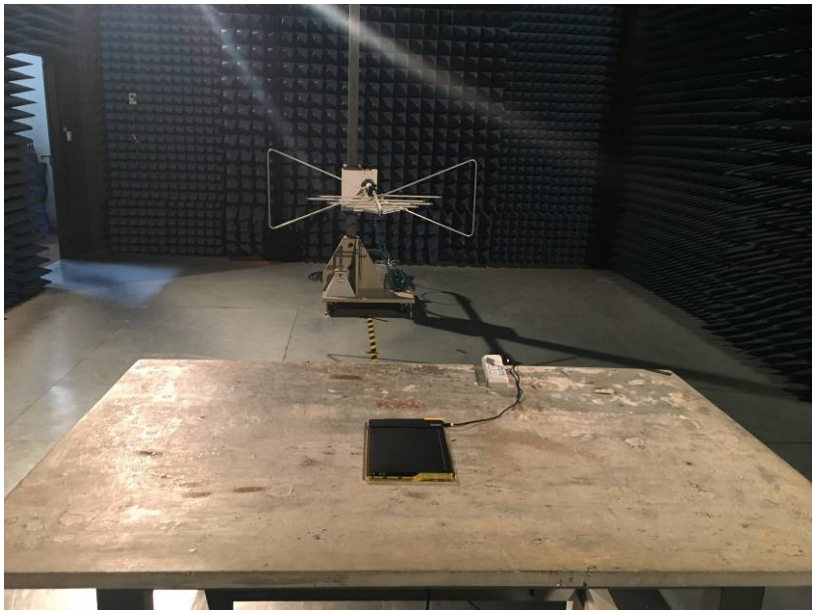



Highest channel

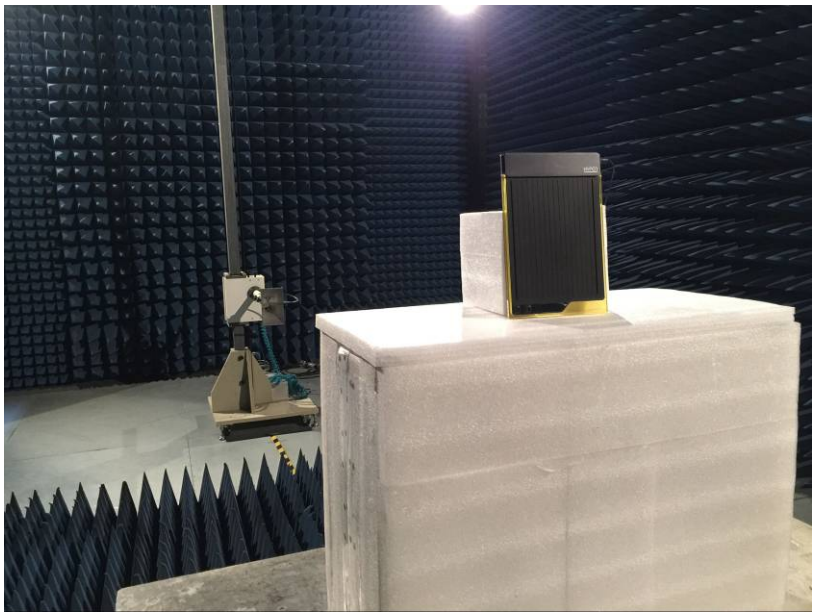
# 8 Test Setup Photo

## Radiated Emission

Below 1GHz

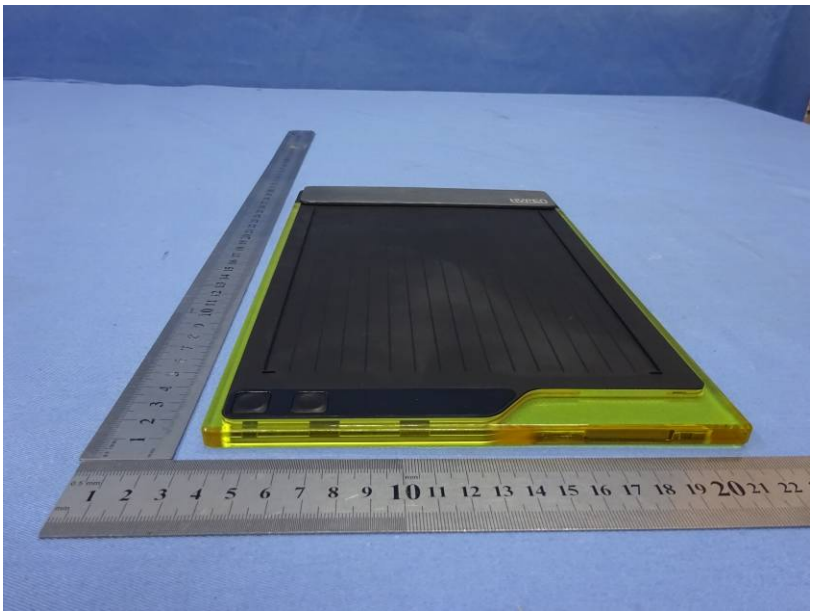


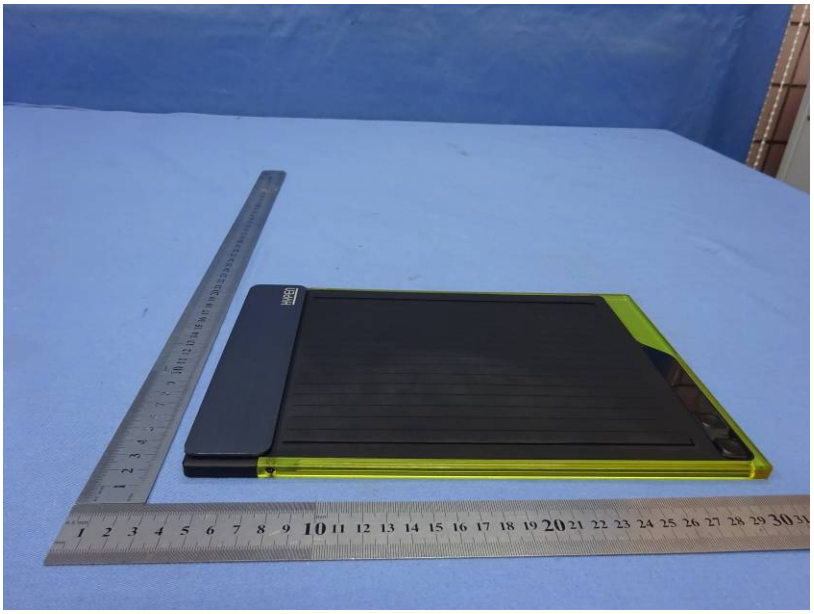
Above 1GHz

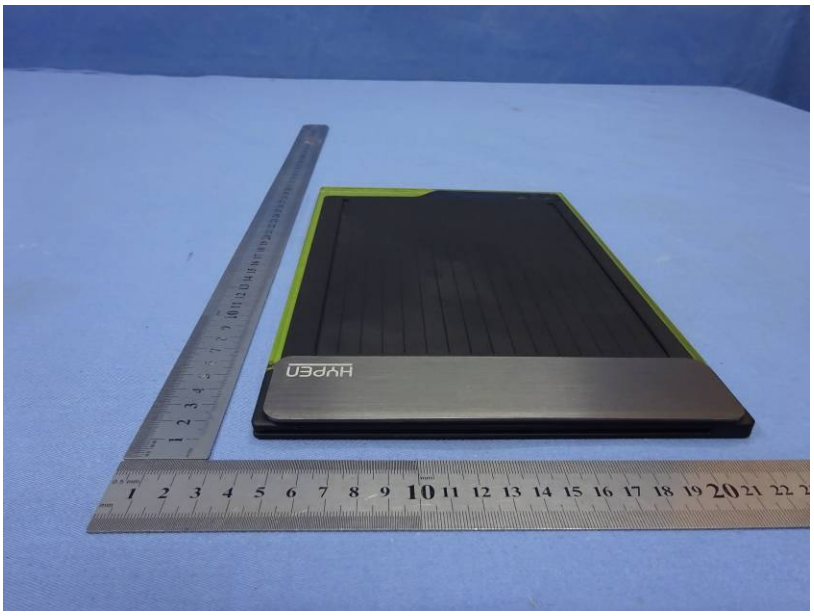


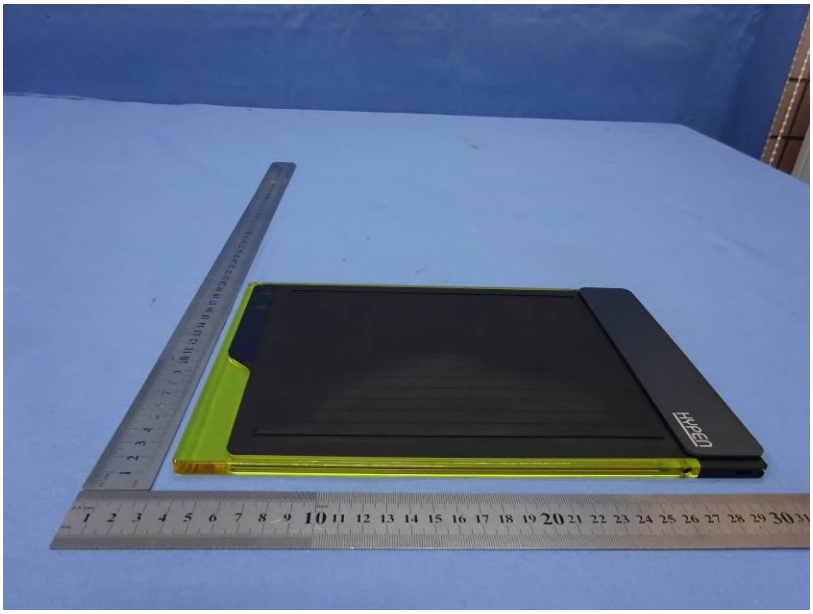
Conducted Emission

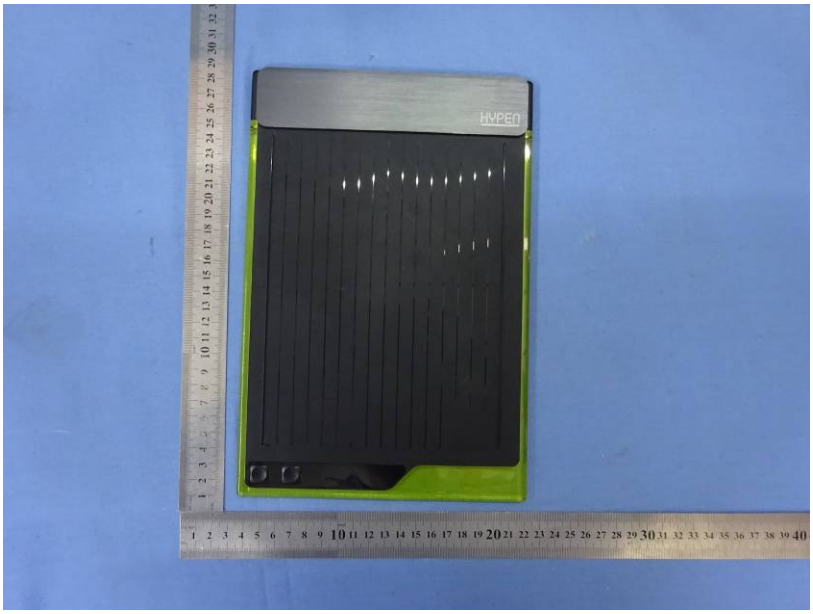
# 9 EUT Constructional Details

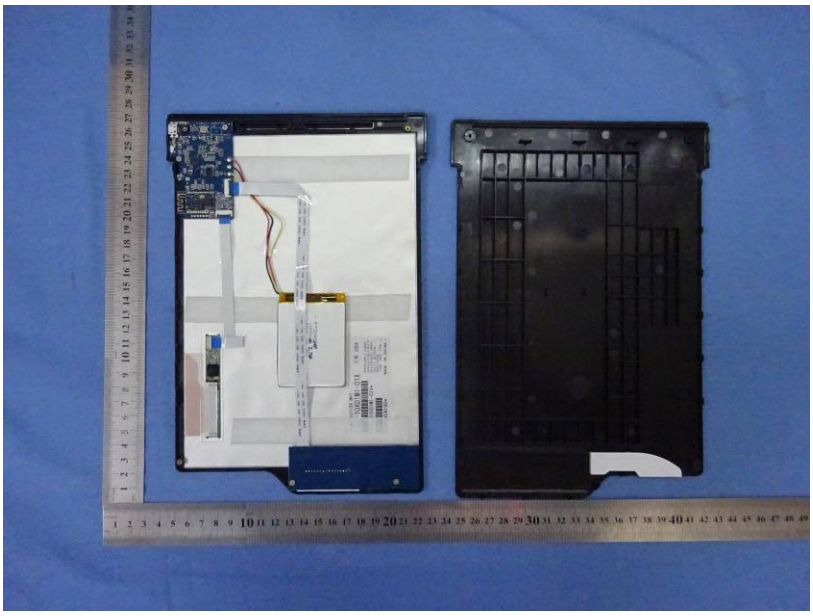


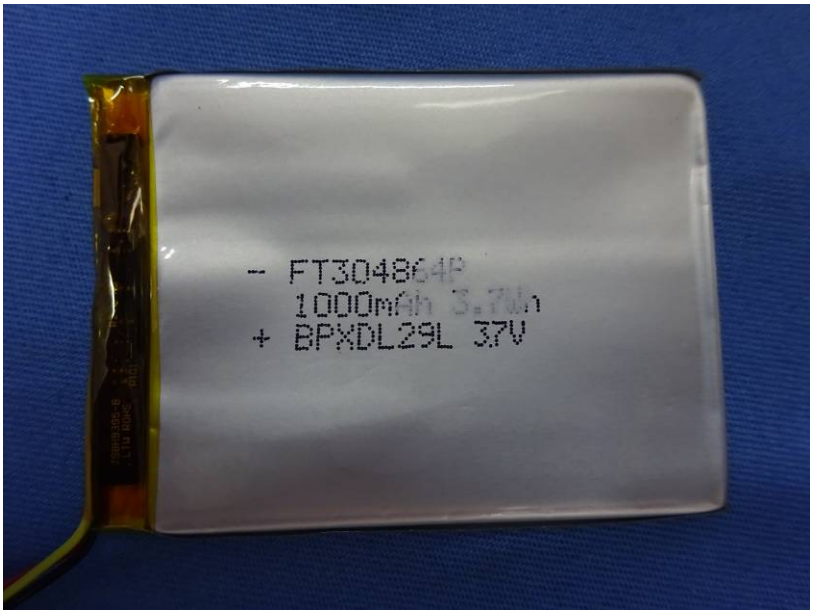


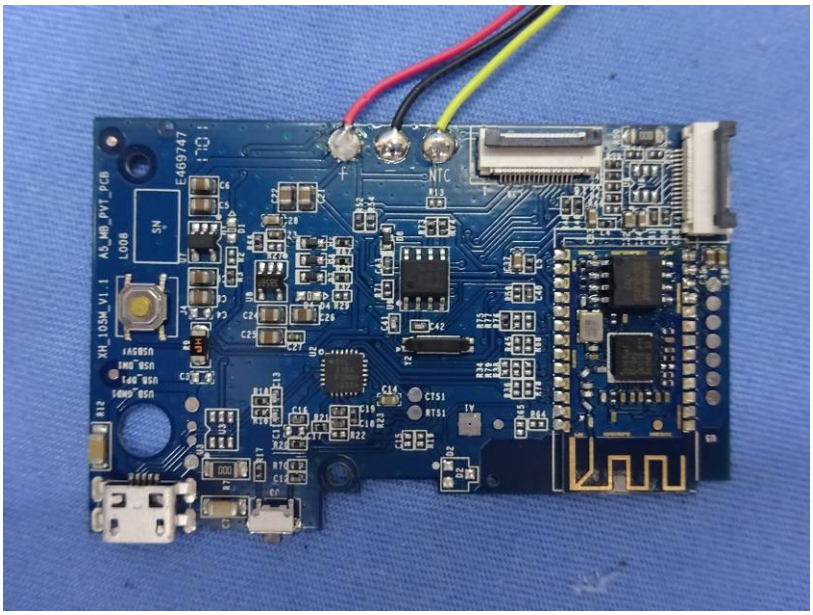

HYPEN

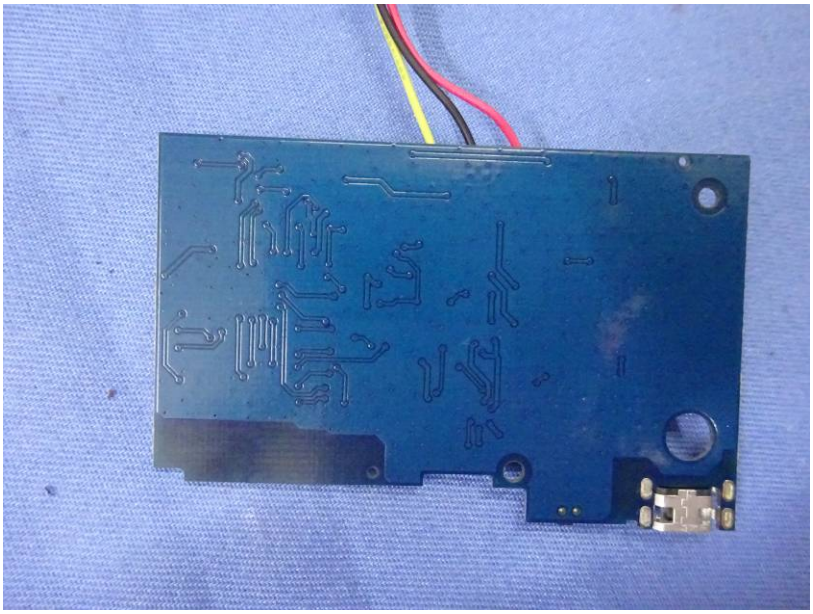


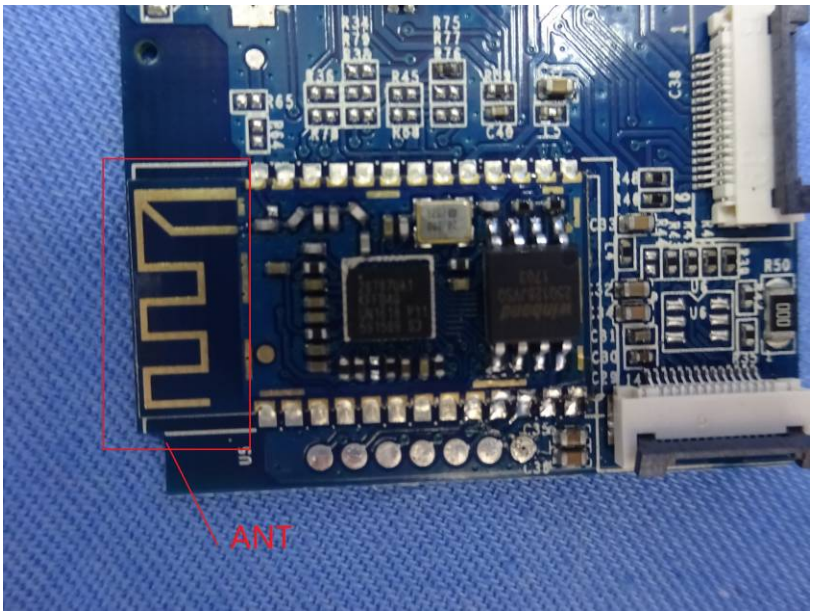





- FT304864P
1000mAh 3.7Wh
+ BPXDL29L 37V



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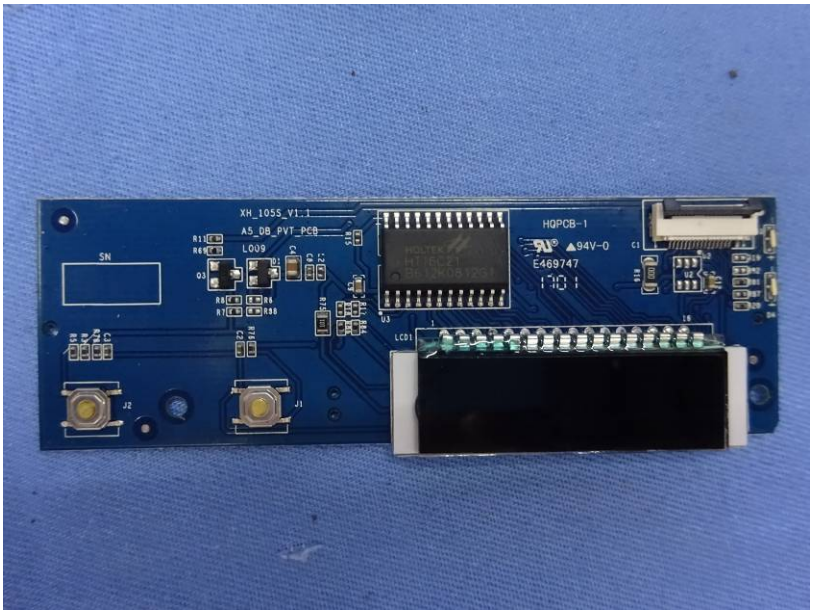


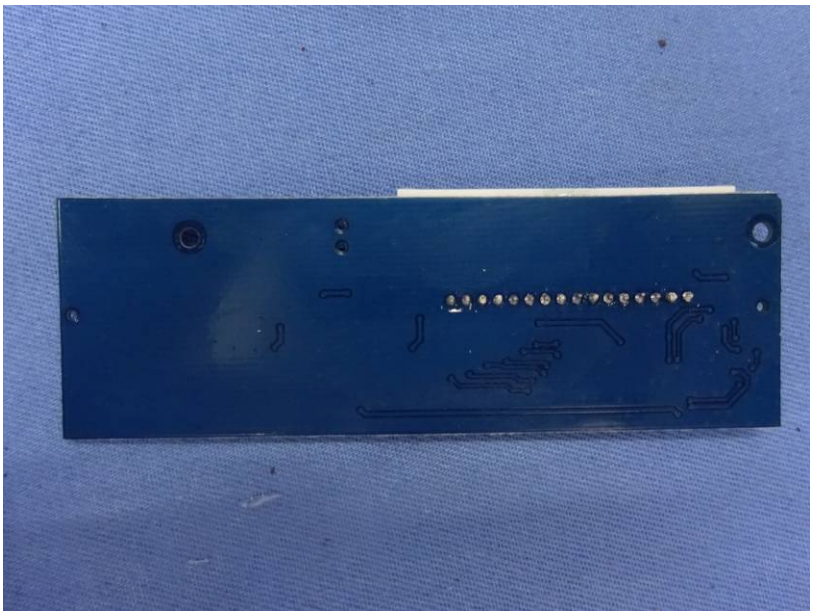

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