

# Test Report

FCC ID: 2ARI5-MD1001

Date of issue: Apr. 18, 2019

Report Number: MTi190416E107

Sample Description: MagDock

Model(s): MD1001

Applicant: Shenzhen Lingyi Innovation Tech Co., Ltd.

Address: 12 F, Block C, Central Avenue Building, Xixiang BLVD West,  
Baoan District, Shenzhen, China.

Date of Test: Mar. 28, 2019 – Apr. 18, 2019

Shenzhen Microtest Co., Ltd.  
<http://www.mtitest.com>

## Table of Contents

|          |                                                 |           |
|----------|-------------------------------------------------|-----------|
| <b>1</b> | <b>GENERAL INFORMATION .....</b>                | <b>4</b>  |
| 1.1      | FEATURE OF EQUIPMENT UNDER TEST (EUT).....      | 4         |
| 1.2      | TEST MODE .....                                 | 4         |
| 1.3      | EUT TEST SETUP.....                             | 5         |
| 1.4      | ANCILLARY EQUIPMENT .....                       | 5         |
| 1.5      | MEASUREMENT UNCERTAINTY .....                   | 5         |
| <b>2</b> | <b>SUMMARY OF TEST RESULT .....</b>             | <b>6</b>  |
| 2.1      | OPERATION CHANNEL LIST .....                    | 6         |
| 2.2      | TEST CHANNEL .....                              | 6         |
| <b>3</b> | <b>TEST FACILITIES AND ACCREDITATIONS .....</b> | <b>7</b>  |
| 3.1      | TEST LABORATORY .....                           | 7         |
| 3.2      | ENVIRONMENTAL CONDITIONS .....                  | 7         |
| 3.3      | MEASUREMENT UNCERTAINTY.....                    | 7         |
| 3.4      | TEST SOFTWARE .....                             | 7         |
| <b>4</b> | <b>LIST OF TEST EQUIPMENT .....</b>             | <b>8</b>  |
| <b>5</b> | <b>TEST RESULTS.....</b>                        | <b>9</b>  |
| 5.1      | ANTENNA REQUIREMENT .....                       | 9         |
| 5.1.1    | <i>Standard requirement</i> .....               | 9         |
| 5.1.2    | <i>EUT Antenna</i> .....                        | 9         |
| 5.2      | CONDUCTED EMISSION .....                        | 10        |
| 5.2.1    | <i>Limits</i> .....                             | 10        |
| 5.2.2    | <i>Test Procedures</i> .....                    | 10        |
| 5.2.3    | <i>Test Setup</i> .....                         | 10        |
| 5.2.4    | <i>Test Result</i> .....                        | 10        |
| 5.3      | RADIATED EMISSION.....                          | 15        |
| 5.3.1    | <i>Limits</i> .....                             | 15        |
| 5.3.2    | <i>Test Procedures</i> .....                    | 16        |
| 5.3.3    | <i>Test Setup</i> .....                         | 17        |
| 5.3.4    | <i>Test Result</i> .....                        | 17        |
| 5.4      | OCCUPIED BANDWIDTH.....                         | 22        |
| 5.4.1    | <i>Test method</i> .....                        | 22        |
| 5.4.2    | <i>Test result</i> .....                        | 22        |
|          | <b>PHOTOGRAPHS OF THE TEST SETUP .....</b>      | <b>24</b> |
|          | <b>PHOTOGRAPHS OF THE EUT.....</b>              | <b>26</b> |

## Test Result Certification

Applicant's name: Shenzhen Lingyi Innovation Tech Co., Ltd.

Address: 12 F, Block C, Central Avenue Building, Xixiang BLVD West, Baoan District, Shenzhen, China.

Manufacture's name: Shenzhen Lingyi Innovation Tech Co., Ltd.

Address: 12 F, Block C, Central Avenue Building, Xixiang BLVD West, Baoan District, Shenzhen, China.

Product name: MagDock

Trademark: Pitaka

Model name: MD1001

Standards: FCC Part 15C

Test Procedure: ANSI C63.10-2013

*This device described above has been tested by Shenzhen Microtest Co., Ltd. and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.*

Tested by:



Demi Mu

Apr. 18, 2019

Reviewed by:



Blue Zheng

Apr. 18, 2019

Approved by:



Smith Chen

Apr. 18, 2019

## 1 GENERAL INFORMATION

### 1.1 Feature of equipment under test (EUT)

|                            |                                                                                                                               |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Product name:              | MagDock                                                                                                                       |
| Model name:                | MD1001                                                                                                                        |
| Serial model:              | N/A                                                                                                                           |
| Deference in serial model: | N/A                                                                                                                           |
| Operation frequency:       | 115–205 kHz                                                                                                                   |
| Modulation type:           | Load modulation                                                                                                               |
| Antenna type:              | Coil Antenna (Gain: 1dBi)                                                                                                     |
| Power supply:              | DC 5V or 9V from adapter                                                                                                      |
| Battery:                   | N/A                                                                                                                           |
| Adapter information:       | Model:FC69U<br>Input:100-240V~50/60Hz 0.8A Max<br>Output: QC:5V-3A 9V-3A 12V-2.5A<br>PD: 5V-3A 9V-3A 12V-2.5A 15V-2A 20V-1.5A |
| Hardware Version:          | V3.0                                                                                                                          |
| Software Version:          | V1.2.4                                                                                                                        |

### 1.2 Test mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

| Test mode | Description                    |
|-----------|--------------------------------|
| Mode 1    | Mobile phone Wireless charging |
| Mode 2    | Apple watch Wireless charging  |
| Mode 3    | Combined wireless charging     |

Note1: The test modes were carried out for all operation modes. The final test mode of the EUT was the worst test mode for EMI, and its test data was showed.

Note2: EUT is tested under full load and belongs to the worst mode.

### 1.3 EUT test setup

See photographs of the test setup in the report for the actual setup and connections between EUT and support equipment.

### 1.4 Ancillary equipment

| Equipment    | Model | S/N             | Manufacturer |
|--------------|-------|-----------------|--------------|
| Adapter      | FC69U | KX2018490024444 | /            |
| Apple watch  | /     | /               | /            |
| Mobile phone | /     | /               | /            |

### 1.5 Measurement Uncertainty

Measurement Uncertainty for a Level of Confidence of 95 %,  $U=2 \times U_c(y)$

|                                  |                |
|----------------------------------|----------------|
| Conducted emission(150kHz~30MHz) | $\pm 2.5$ dB   |
| Radiated emission(30MHz~1GHz)    | $\pm 4.2$ dB   |
| Radiated emission (above 1GHz)   | $\pm 4.3$ dB   |
| Temperature                      | $\pm 1$ degree |
| Humidity                         | $\pm 5$ %      |

## 2 SUMMARY OF TEST RESULT

| Item | FCC Part No.    | Description of Test | Result |
|------|-----------------|---------------------|--------|
| 1    | FCC PART 15.203 | Antenna requirement | Pass   |
| 2    | FCC PART 15.207 | Conducted emission  | Pass   |
| 3    | FCC PART 15.209 | Radiated emission   | Pass   |
| 4    | FCC Part 15.215 | 20dB bandwidth      | Pass   |

### 2.1 Operation channel list

#### Channel List

| Channel              | Frequency (kHz) |
|----------------------|-----------------|
| Low                  | 115             |
| Middle(Mobile phone) | 142             |
| Middle(Apple watch)  | 129             |
| High                 | 205             |

### 2.2 Test channel

| Channel              | Frequency (kHz) |
|----------------------|-----------------|
| Middle(Mobile phone) | 142             |
| Middle(Apple watch)  | 129             |

### 3 TEST FACILITIES AND ACCREDITATIONS

#### 3.1 Test laboratory

|                       |                                                                                                                         |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------|
| Test Laboratory       | Shenzhen Microtest Co., Ltd                                                                                             |
| Location              | No.102A & 302A, East Block, Hengfang Industrial Park, Xingye Road, Xixiang, Bao'an District, Shenzhen, Guangdong, China |
| FCC Registration No.: | 448573                                                                                                                  |

#### 3.2 Environmental conditions

|                      |              |
|----------------------|--------------|
| Temperature:         | 20°C~30°C    |
| Humidity             | 30%~70%      |
| Atmospheric pressure | 98kPa~101kPa |

#### 3.3 Measurement uncertainty

Measurement Uncertainty for a Level of Confidence of 95 %,  $U=2 \times U_c(y)$

|                                  |                    |
|----------------------------------|--------------------|
| RF frequency                     | $1 \times 10^{-7}$ |
| RF power, conducted              | $\pm 1$ dB         |
| Conducted emission(150kHz~30MHz) | $\pm 2.5$ dB       |
| Radiated emission(30MHz~1GHz)    | $\pm 4.2$ dB       |
| Radiated emission (above 1GHz)   | $\pm 4.3$ dB       |
| Temperature                      | $\pm 1$ degree     |
| Humidity                         | $\pm 5$ %          |

#### 3.4 Test software

| Software Name  | Manufacturer | Model | Version   |
|----------------|--------------|-------|-----------|
| RF Test System | Farad        | LZ-RF | Lz_Rf 3A3 |

#### 4 LIST OF TEST EQUIPMENT

| Equipment No.                                                                                                                                   | Equipment Name                               | Manufacturer                  | Model          | Serial No.    | Calibration date | Due date   |
|-------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-------------------------------|----------------|---------------|------------------|------------|
| MTI-E001                                                                                                                                        | Spectrum Analyzer                            | Agilent                       | E4407B         | MY41441082    | 2018/09/18       | 2019/09/17 |
| MTI-E002                                                                                                                                        | CMU 200 universal radio communication tester | Rohde&schwarz                 | CMU 200        | 114587        | 2018/09/18       | 2019/09/17 |
| MTI-E004                                                                                                                                        | EMI Test Receiver                            | Rohde&schwarz                 | ESPI           | 1000314       | 2018/09/18       | 2019/09/17 |
| MTI-E006                                                                                                                                        | Broadband antenna                            | schwarabeck                   | VULB9163       | 872           | 2018/09/18       | 2019/09/17 |
| MTI-E007                                                                                                                                        | Horn antenna                                 | schwarabeck                   | BBHA9120D      | 1201          | 2018/09/18       | 2019/09/17 |
| MTI-E014                                                                                                                                        | amplifier                                    | America                       | 8447D          | 3113A06150    | 2018/09/18       | 2019/09/17 |
| MTI-E015                                                                                                                                        | Conduction Immunity Signal Generator         | Schloder                      | CDG6000        | 126A1343/2015 | 2018/09/18       | 2019/09/17 |
| MTI-E016                                                                                                                                        | Coupled decoupling network                   | Schloder                      | CDA M2/M3      | A2210332/2015 | 2018/09/18       | 2019/09/17 |
| MTI-E032                                                                                                                                        | Comprehensive test instrument                | Rohde&schwarz                 | CMW500         | 124192        | 2018/09/18       | 2019/09/17 |
| MTI-E034                                                                                                                                        | amplifier                                    | Agilent                       | 8449B          | 3008A02400    | 2018/09/18       | 2019/09/17 |
| MTI-E037                                                                                                                                        | Artificial power network                     | Schwarzbeck                   | NSLK8127       | #841          | 2018/09/18       | 2019/09/17 |
| MTI-E040                                                                                                                                        | Spectrum analyzer                            | Agilent                       | N9020A         | MY49100060    | 2018/09/18       | 2019/09/17 |
| MTI-E041                                                                                                                                        | Signal generator                             | Agilent                       | N5182A         | MY49060455    | 2018/09/18       | 2019/09/17 |
| MTI-E042                                                                                                                                        | Analog signal generator                      | Agilent                       | E4421B         | GB40051240    | 2018/09/18       | 2019/09/17 |
| MTI-E043                                                                                                                                        | Power probe                                  | Dare Instruments              | RPR3006W       | 16I00054SN016 | 2018/09/18       | 2019/09/17 |
| MTI-E047                                                                                                                                        | 10dB attenuator                              | Mini-Circuits                 | UNAT-10+       | 15542         | 2018/09/18       | 2019/09/17 |
| MTI-E049                                                                                                                                        | spectrum analyzer                            | Rohde&schwarz                 | FSP-38         | 100019        | 2018/09/18       | 2019/09/17 |
| MTI-E050                                                                                                                                        | PSG Signal generator                         | Agilent                       | E8257D         | MY46520873    | 2018/09/18       | 2019/09/17 |
| MTI-E061                                                                                                                                        | Active Loop Antenna 9kHz - 30MHz             | Schwarzbeek                   | FMZB 1519 B    | 00044         | 2018/09/18       | 2019/09/17 |
| MTI-E052                                                                                                                                        | 18-40GHz amplifier                           | Chengdu step Micro Technology | ZLNA-18-40G-21 | 1608001       | 2018/09/18       | 2019/09/17 |
| MTI-E053                                                                                                                                        | 15-40G Antenna                               | Schwarzbeek                   | BBHA9170       | BBHA9170582   | 2018/09/18       | 2019/09/17 |
| MTI-E058                                                                                                                                        | Artificial power network                     | Schwarzbeck                   | NSLK8127       | #841          | 2018/09/18       | 2019/09/17 |
| Note: the calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI). |                                              |                               |                |               |                  |            |

## **5 TEST RESULTS**

### **5.1 Antenna requirement**

#### **5.1.1 Standard requirement**

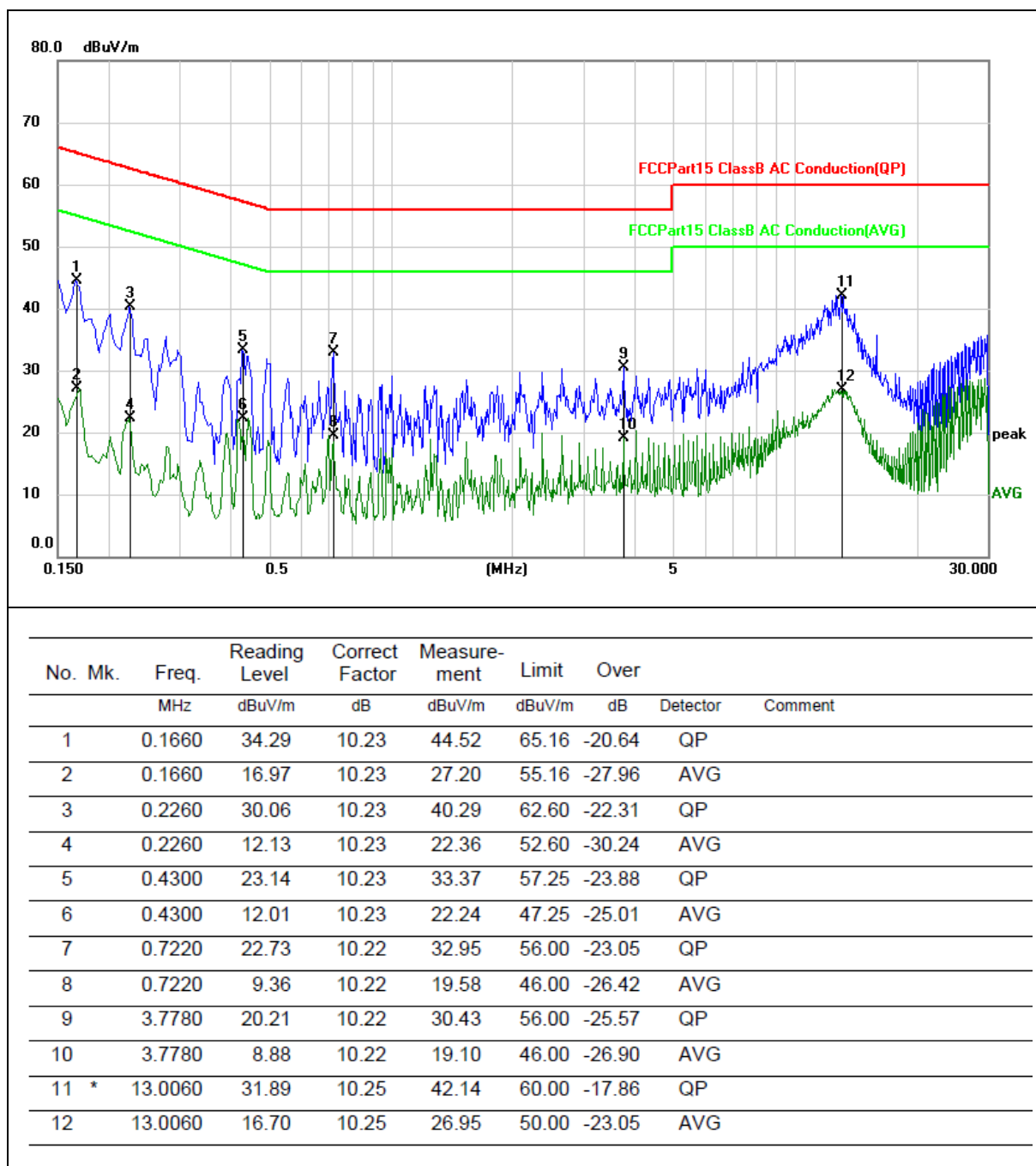
15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device

#### **5.1.2 EUT Antenna**

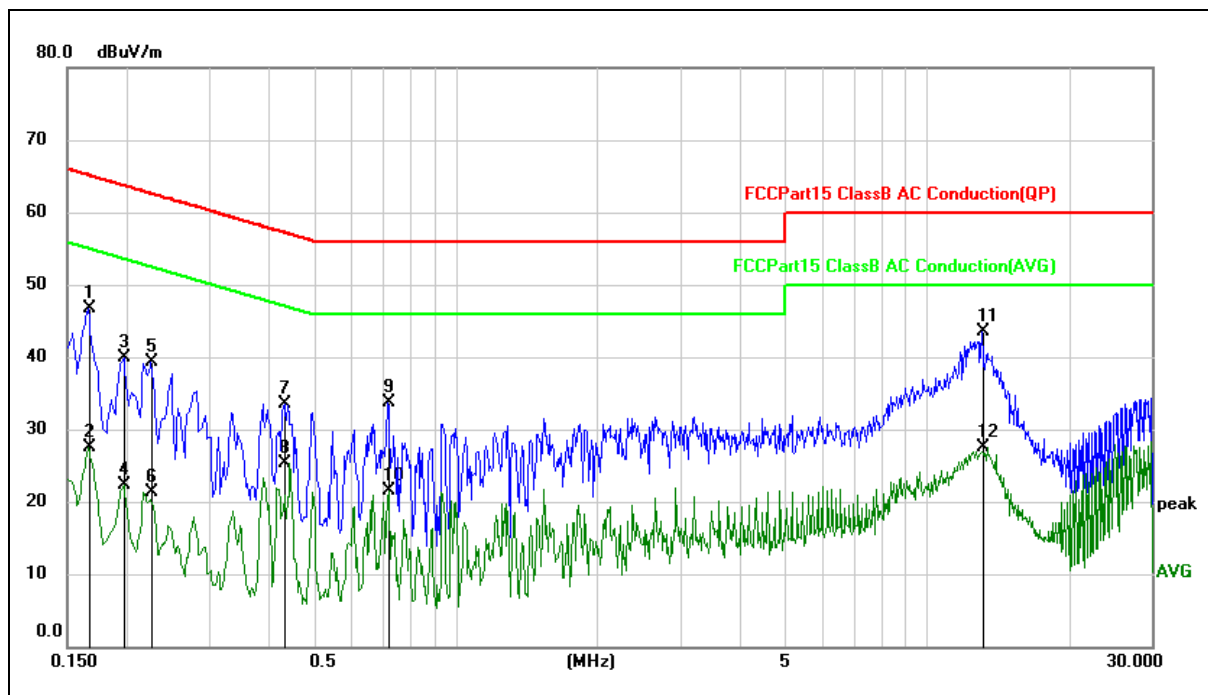
The EUT antenna is Coil Antenna. It comply with the standard requirement. In case of replacement of broken antenna the same antenna type must be used.



|               |                                    |                    |        |
|---------------|------------------------------------|--------------------|--------|
| Temperature:  | 27°C                               | Relative Humidity: | 65%    |
| Pressure:     | 101kPa                             | Phase:             | L      |
| Test voltage: | DC 9V from adapter<br>AC 120V/60Hz | Test mode:         | Mode 3 |

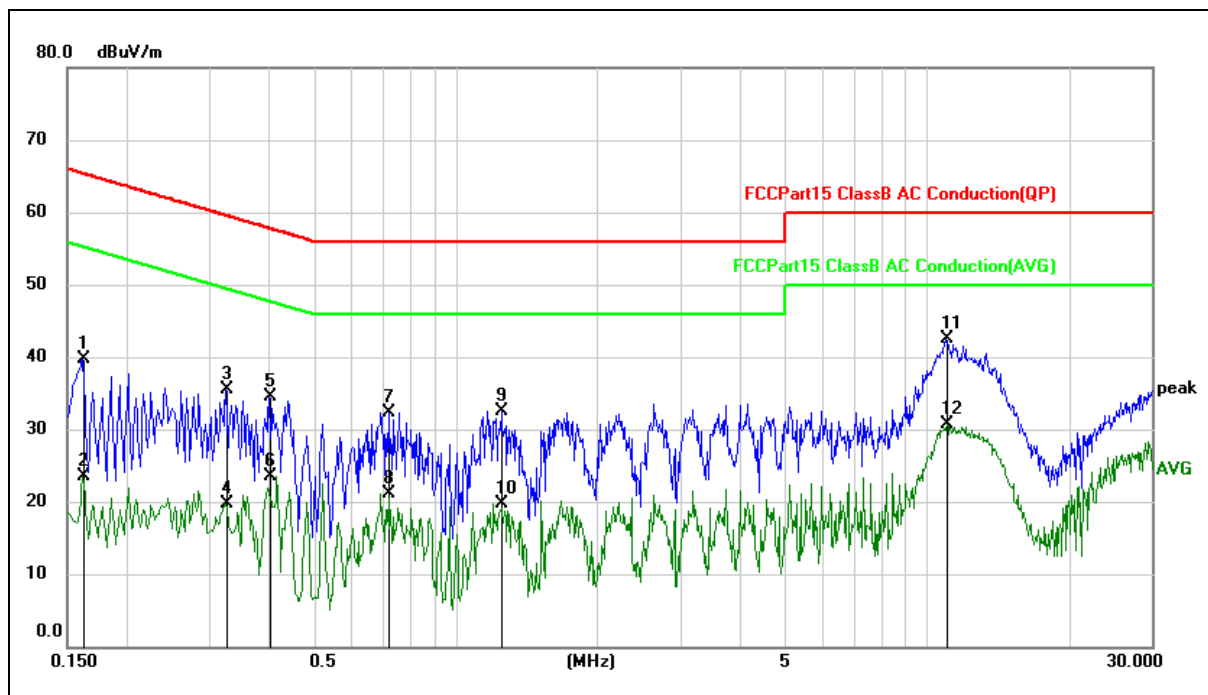


|               |                                    |                    |        |
|---------------|------------------------------------|--------------------|--------|
| Temperature:  | 27℃                                | Relative Humidity: | 65%    |
| Pressure:     | 101kPa                             | Phase:             | N      |
| Test voltage: | DC 9V from adapter<br>AC 120V/60Hz | Test mode:         | Mode 3 |



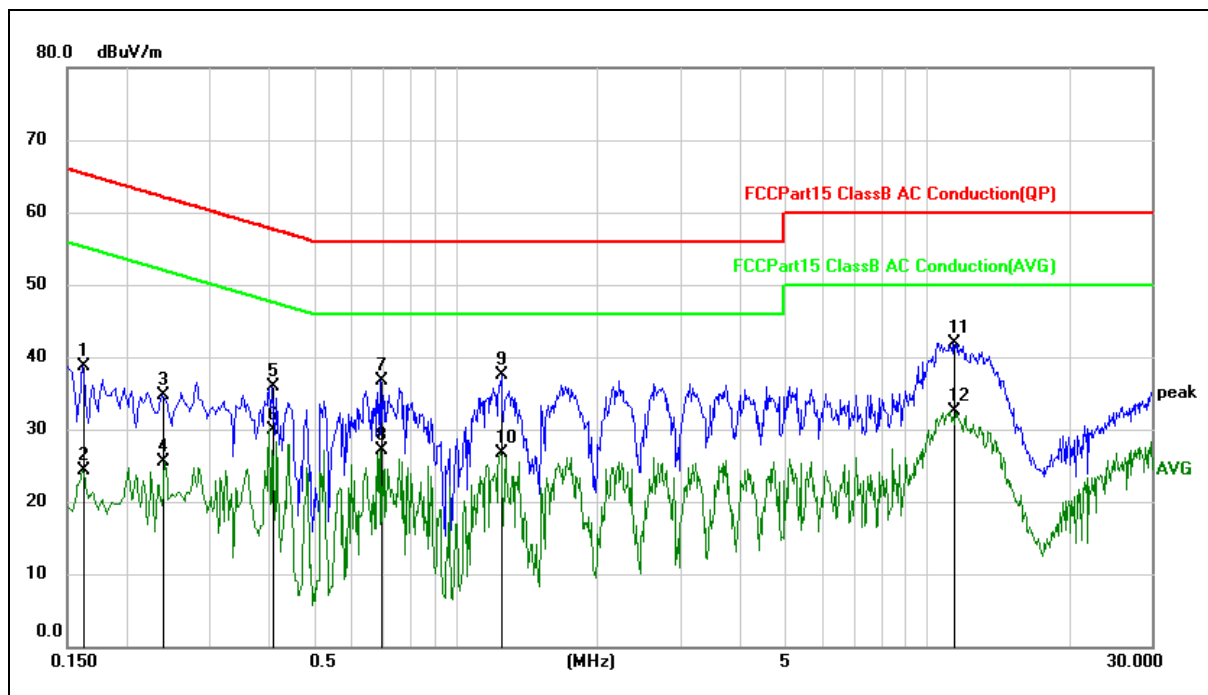
| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV/m | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Over<br>dB | Detector | Comment |
|-----|-----|--------------|----------------------------|-------------------------|----------------------------|-----------------|------------|----------|---------|
| 1   |     | 0.1660       | 36.54                      | 10.23                   | 46.77                      | 65.16           | -18.39     | QP       |         |
| 2   |     | 0.1660       | 17.19                      | 10.23                   | 27.42                      | 55.16           | -27.74     | AVG      |         |
| 3   |     | 0.1980       | 29.58                      | 10.23                   | 39.81                      | 63.69           | -23.88     | QP       |         |
| 4   |     | 0.1980       | 12.09                      | 10.23                   | 22.32                      | 53.69           | -31.37     | AVG      |         |
| 5   |     | 0.2260       | 29.15                      | 10.23                   | 39.38                      | 62.60           | -23.22     | QP       |         |
| 6   |     | 0.2260       | 11.00                      | 10.23                   | 21.23                      | 52.60           | -31.37     | AVG      |         |
| 7   |     | 0.4340       | 23.22                      | 10.23                   | 33.45                      | 57.18           | -23.73     | QP       |         |
| 8   |     | 0.4340       | 15.09                      | 10.23                   | 25.32                      | 47.18           | -21.86     | AVG      |         |
| 9   |     | 0.7180       | 23.57                      | 10.22                   | 33.79                      | 56.00           | -22.21     | QP       |         |
| 10  |     | 0.7180       | 11.28                      | 10.22                   | 21.50                      | 46.00           | -24.50     | AVG      |         |
| 11  | *   | 13.0860      | 33.16                      | 10.25                   | 43.41                      | 60.00           | -16.59     | QP       |         |
| 12  |     | 13.0860      | 17.23                      | 10.25                   | 27.48                      | 50.00           | -22.52     | AVG      |         |

|               |                                    |                    |        |
|---------------|------------------------------------|--------------------|--------|
| Temperature:  | 27℃                                | Relative Humidity: | 65%    |
| Pressure:     | 101kPa                             | Phase:             | L      |
| Test voltage: | DC 9V from adapter<br>AC 240V/60Hz | Test mode:         | Mode 3 |



| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV/m | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Over<br>dB | Detector | Comment |
|-----|-----|--------------|----------------------------|-------------------------|----------------------------|-----------------|------------|----------|---------|
| 1   |     | 0.1620       | 29.45                      | 10.23                   | 39.68                      | 65.36           | -25.68     | QP       |         |
| 2   |     | 0.1620       | 13.32                      | 10.23                   | 23.55                      | 55.36           | -31.81     | AVG      |         |
| 3   |     | 0.3260       | 25.22                      | 10.23                   | 35.45                      | 59.55           | -24.10     | QP       |         |
| 4   |     | 0.3260       | 9.57                       | 10.23                   | 19.80                      | 49.55           | -29.75     | AVG      |         |
| 5   |     | 0.4020       | 24.24                      | 10.23                   | 34.47                      | 57.81           | -23.34     | QP       |         |
| 6   |     | 0.4020       | 13.21                      | 10.23                   | 23.44                      | 47.81           | -24.37     | AVG      |         |
| 7   |     | 0.7220       | 22.17                      | 10.22                   | 32.39                      | 56.00           | -23.61     | QP       |         |
| 8   |     | 0.7220       | 10.82                      | 10.22                   | 21.04                      | 46.00           | -24.96     | AVG      |         |
| 9   |     | 1.2500       | 22.39                      | 10.21                   | 32.60                      | 56.00           | -23.40     | QP       |         |
| 10  |     | 1.2500       | 9.43                       | 10.21                   | 19.64                      | 46.00           | -26.36     | AVG      |         |
| 11  | *   | 10.9700      | 32.20                      | 10.24                   | 42.44                      | 60.00           | -17.56     | QP       |         |
| 12  |     | 10.9700      | 20.46                      | 10.24                   | 30.70                      | 50.00           | -19.30     | AVG      |         |

|               |                                    |                    |        |
|---------------|------------------------------------|--------------------|--------|
| Temperature:  | 27°C                               | Relative Humidity: | 65%    |
| Pressure:     | 101kPa                             | Phase:             | N      |
| Test voltage: | DC 9V from adapter<br>AC 240V/60Hz | Test mode:         | Mode 3 |



| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV/m | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Over<br>dB | Detector | Comment |
|-----|-----|--------------|----------------------------|-------------------------|----------------------------|-----------------|------------|----------|---------|
| 1   |     | 0.1620       | 28.40                      | 10.23                   | 38.63                      | 65.36           | -26.73     | QP       |         |
| 2   |     | 0.1620       | 14.12                      | 10.23                   | 24.35                      | 55.36           | -31.01     | AVG      |         |
| 3   |     | 0.2380       | 24.40                      | 10.23                   | 34.63                      | 62.17           | -27.54     | QP       |         |
| 4   |     | 0.2380       | 15.30                      | 10.23                   | 25.53                      | 52.17           | -26.64     | AVG      |         |
| 5   |     | 0.4100       | 25.68                      | 10.23                   | 35.91                      | 57.65           | -21.74     | QP       |         |
| 6   |     | 0.4100       | 19.58                      | 10.23                   | 29.81                      | 47.65           | -17.84     | AVG      |         |
| 7   |     | 0.6940       | 26.49                      | 10.22                   | 36.71                      | 56.00           | -19.29     | QP       |         |
| 8   |     | 0.6940       | 16.93                      | 10.22                   | 27.15                      | 46.00           | -18.85     | AVG      |         |
| 9   |     | 1.2540       | 27.20                      | 10.21                   | 37.41                      | 56.00           | -18.59     | QP       |         |
| 10  |     | 1.2540       | 16.56                      | 10.21                   | 26.77                      | 46.00           | -19.23     | AVG      |         |
| 11  |     | 11.4220      | 31.67                      | 10.24                   | 41.91                      | 60.00           | -18.09     | QP       |         |
| 12  | *   | 11.4220      | 22.27                      | 10.24                   | 32.51                      | 50.00           | -17.49     | AVG      |         |

### 5.3 Radiated emission

#### 5.3.1 Limits

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

| Frequencies (MHz) | Field Strength (micorvolts/meter) | Measurement Distance (meters) |
|-------------------|-----------------------------------|-------------------------------|
| 0.009~0.490       | 2400/F(KHz)                       | 300                           |
| 0.490~1.705       | 24000/F(KHz)                      | 30                            |
| 1.705~30.0        | 30                                | 30                            |
| 30~88             | 100                               | 3                             |
| 88~216            | 150                               | 3                             |
| 216~960           | 200                               | 3                             |
| Above 960         | 500                               | 3                             |

#### LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

| FREQUENCY (MHz) | Class B (dBuV/m) (at 3M) |         |
|-----------------|--------------------------|---------|
|                 | PEAK                     | AVERAGE |
| Above 1000      | 74                       | 54      |

Notes:

The limit for radiated test was performed according to FCC PART 15C.

The tighter limit applies at the band edges.

Emission level (dBuV/m)=20log Emission level (uV/m).

#### FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

| Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz) | Range (MHz)                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| Below 1.705                                                                                                                     | 30                                                                              |
| 1.705 – 108                                                                                                                     | 1000                                                                            |
| 108 – 500                                                                                                                       | 2000                                                                            |
| 500 – 1000                                                                                                                      | 5000                                                                            |
| Above 1000                                                                                                                      | 5 <sup>th</sup> harmonic of the highest frequency or 40 GHz, whichever is lower |

| Spectrum Parameter                    | Setting                                          |
|---------------------------------------|--------------------------------------------------|
| Attenuation                           | Auto                                             |
| Start Frequency                       | 1000 MHz                                         |
| Stop Frequency                        | 10th carrier harmonic                            |
| RB / VB (emission in restricted band) | 1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average |

| Receiver Parameter     | Setting                       |
|------------------------|-------------------------------|
| Attenuation            | Auto                          |
| Start ~ Stop Frequency | 9kHz~150kHz / RB 200Hz for QP |
| Start ~ Stop Frequency | 150kHz~30MHz / RB 9kHz for QP |

|                        |                                  |
|------------------------|----------------------------------|
| Start ~ Stop Frequency | 30MHz~1000MHz / RB 120kHz for QP |
|------------------------|----------------------------------|

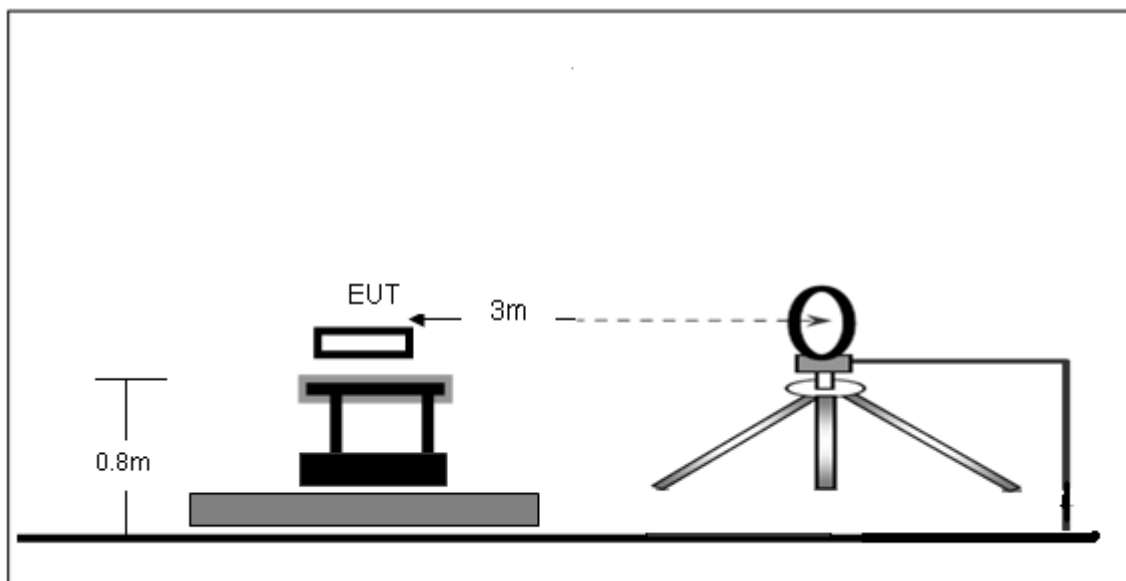
### 5.3.2 Test Procedures

- a. The measuring distance of at 3 m shall be used for measurements at frequency up to 25GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-chamber test. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment or of the substitution antenna shall be 0.8m; above 1GHz, the height was 1.5m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.
- g. For the radiated emission test above 1GHz:  
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.
- h. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

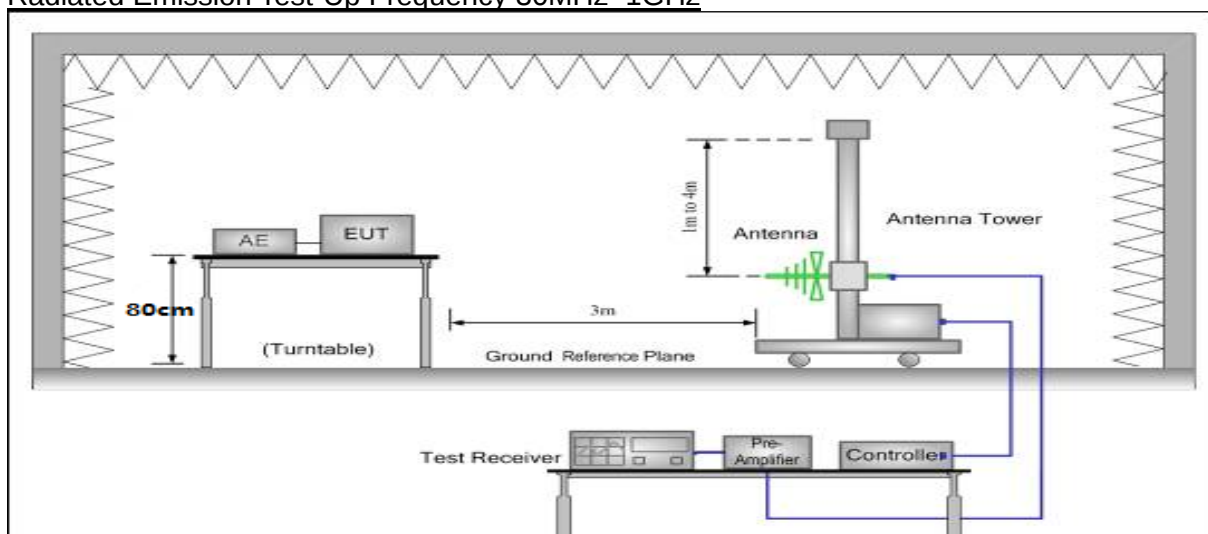
Note: Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

### 5.3.3 Test Setup

#### Radiated Emission Test-Up Frequency Below 30MHz



#### Radiated Emission Test-Up Frequency 30MHz~1GHz

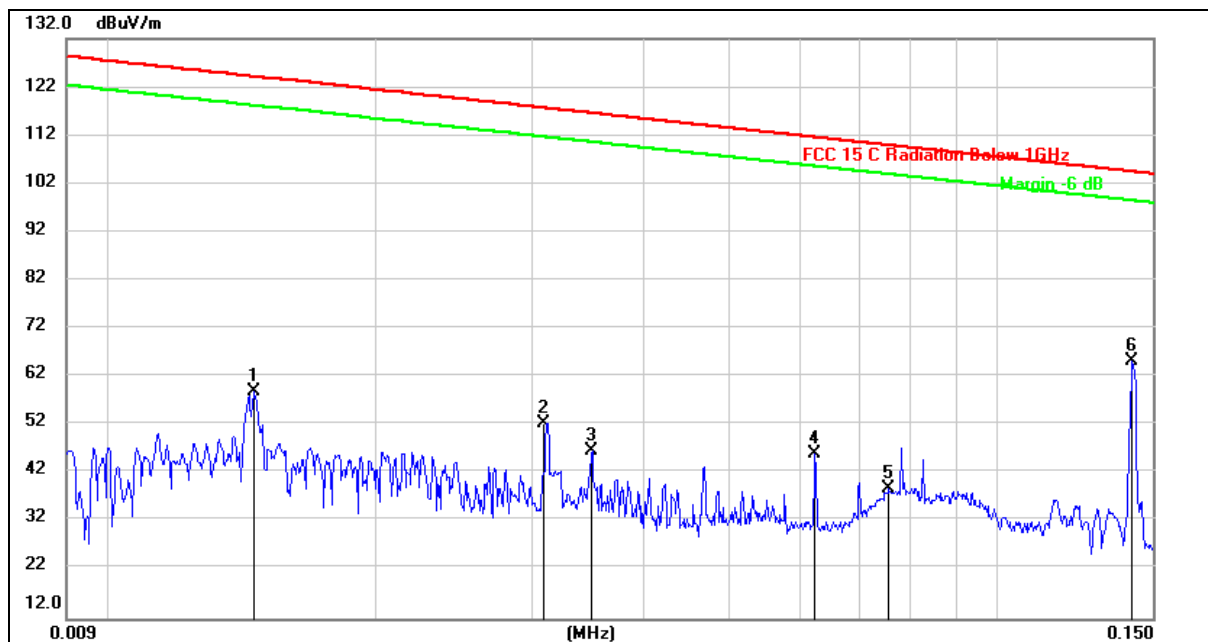


### 5.3.4 Test Result

Note: After a variety of mode tests, the result is that the two wireless charging emitters operate simultaneously with a voltage of 9V, with the worst results. After evaluation, the report only shows the worst mode.

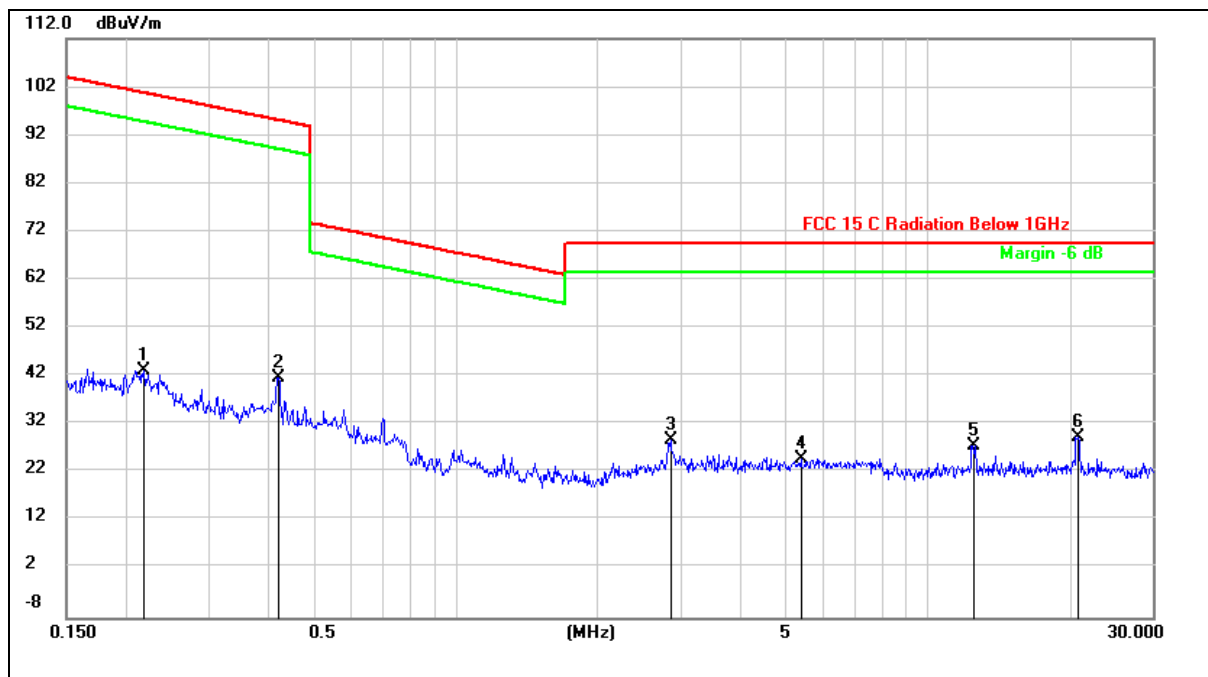
Frequency range (9kHz – 30MHz)

|               |                                    |                    |        |
|---------------|------------------------------------|--------------------|--------|
| Temperature:  | 23℃                                | Relative Humidity: | 59%    |
| Pressure:     | 101kPa                             | Test mode:         | Mode 3 |
| Test voltage: | DC 9V from adapter<br>AC 120V/60Hz |                    |        |



| No. | Mk. | Freq.  | Reading Level | Correct Factor | Measurement | Limit  | Over   |          |
|-----|-----|--------|---------------|----------------|-------------|--------|--------|----------|
|     |     | MHz    | dBuV          | dBuV/m         | dBuV/m      | dBuV/m | dB     | Detector |
| 1   |     | 0.0146 | 38.41         | 20.61          | 59.02       | 124.15 | -65.13 | peak     |
| 2   |     | 0.0309 | 31.80         | 20.42          | 52.22       | 117.67 | -65.45 | peak     |
| 3   |     | 0.0350 | 26.13         | 20.42          | 46.55       | 116.59 | -70.04 | peak     |
| 4   |     | 0.0625 | 25.69         | 20.43          | 46.12       | 111.59 | -65.47 | peak     |
| 5   |     | 0.0757 | 18.31         | 20.44          | 38.75       | 109.93 | -71.18 | peak     |
| 6   | *   | 0.1421 | 44.70         | 20.41          | 65.11       | 104.49 | -39.38 | peak     |

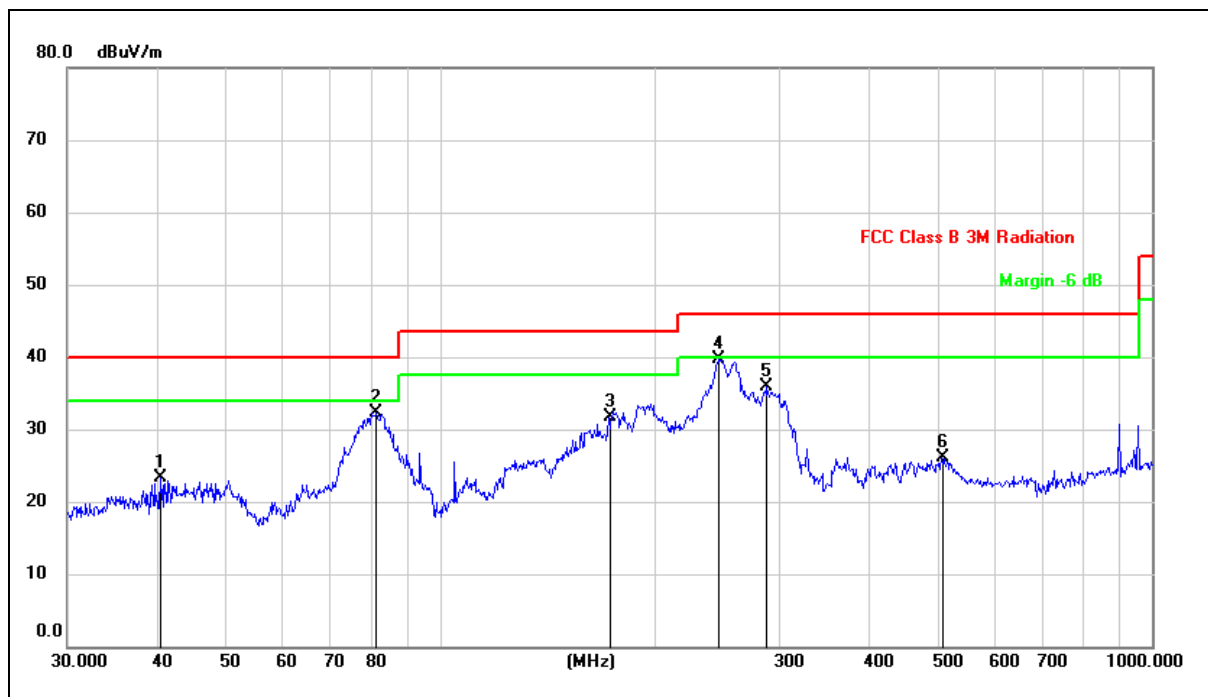
|               |                                    |                    |        |
|---------------|------------------------------------|--------------------|--------|
| Temperature:  | 23℃                                | Relative Humidity: | 59%    |
| Pressure:     | 101kPa                             | Test mode:         | Mode 3 |
| Test voltage: | DC 9V from adapter<br>AC 120V/60Hz |                    |        |



| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dBuV/m | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Over<br>dB | Detector |
|-----|-----|--------------|--------------------------|-----------------------------|----------------------------|-----------------|------------|----------|
| 1   |     | 0.2184       | 22.68                    | 20.35                       | 43.03                      | 100.78          | -57.75     | peak     |
| 2   |     | 0.4193       | 21.35                    | 20.31                       | 41.66                      | 95.15           | -53.49     | peak     |
| 3   |     | 2.8540       | 8.39                     | 20.27                       | 28.66                      | 69.50           | -40.84     | peak     |
| 4   |     | 5.3900       | 4.41                     | 20.33                       | 24.74                      | 69.50           | -44.76     | peak     |
| 5   |     | 12.4495      | 7.17                     | 20.36                       | 27.53                      | 69.50           | -41.97     | peak     |
| 6   | *   | 20.8137      | 9.10                     | 20.28                       | 29.38                      | 69.50           | -40.12     | peak     |

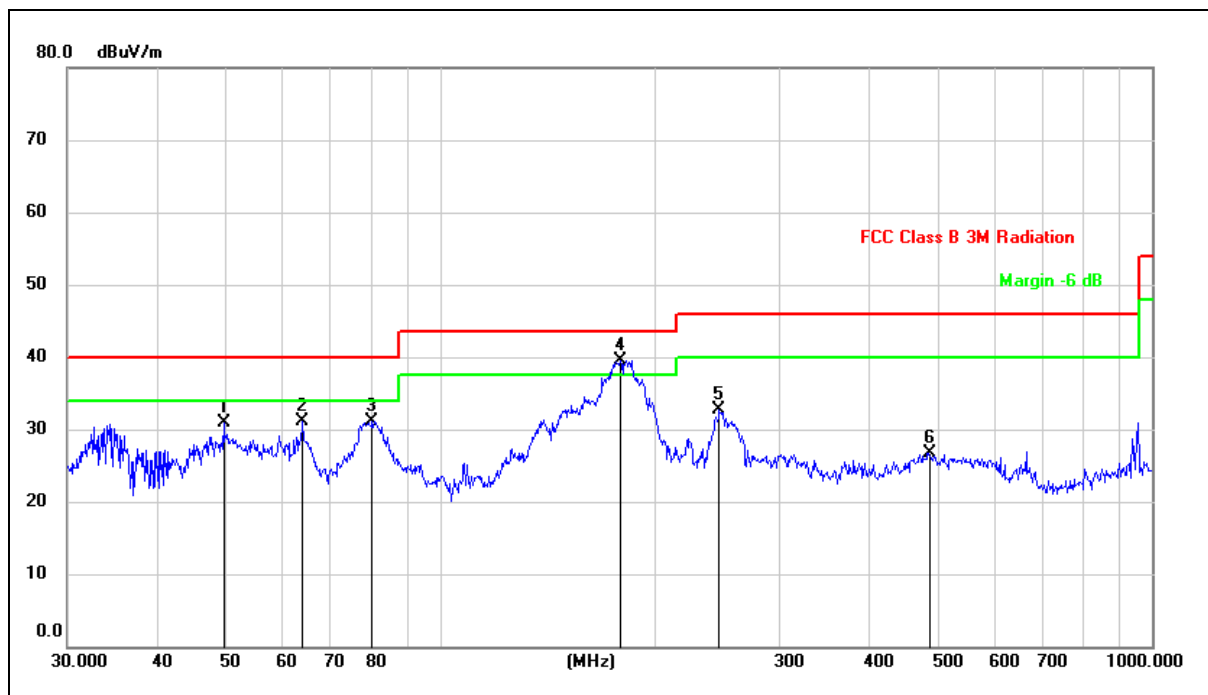
Frequency range (30MHz – 1GHz)

|               |                                    |                    |          |
|---------------|------------------------------------|--------------------|----------|
| Temperature:  | 23℃                                | Relative Humidity: | 59%      |
| Pressure:     | 101kPa                             | Polarization:      | Vertical |
| Test voltage: | DC 9V from adapter<br>AC 120V/60Hz | Test mode:         | Mode 3   |



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Over   |          |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------|
|     |     | MHz      | dBuV          | dBuV/m         | dBuV/m      | dBuV/m | dB     | Detector |
| 1   |     | 40.5591  | 33.93         | -10.54         | 23.39       | 40.00  | -16.61 | QP       |
| 2   |     | 81.4967  | 47.44         | -15.15         | 32.29       | 40.00  | -7.71  | QP       |
| 3   |     | 172.5988 | 46.19         | -14.52         | 31.67       | 43.50  | -11.83 | QP       |
| 4   | *   | 246.8146 | 49.90         | -10.13         | 39.77       | 46.00  | -6.23  | QP       |
| 5   |     | 287.9904 | 44.82         | -8.96          | 35.86       | 46.00  | -10.14 | QP       |
| 6   |     | 506.4791 | 31.18         | -5.09          | 26.09       | 46.00  | -19.91 | QP       |

|               |                                    |                    |            |
|---------------|------------------------------------|--------------------|------------|
| Temperature:  | 23℃                                | Relative Humidity: | 59%        |
| Pressure:     | 101kPa                             | Polarization:      | Horizontal |
| Test voltage: | DC 9V from adapter<br>AC 120V/60Hz | Test mode:         | Mode 3     |



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Over   |          |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------|
|     |     | MHz      | dBuV          | dBuV/m         | dBuV/m      | dBuV/m | dB     | Detector |
| 1   |     | 49.7068  | 40.56         | -9.66          | 30.90       | 40.00  | -9.10  | QP       |
| 2   |     | 64.2074  | 43.41         | -12.23         | 31.18       | 40.00  | -8.82  | QP       |
| 3   |     | 80.3619  | 45.52         | -14.49         | 31.03       | 40.00  | -8.97  | QP       |
| 4   | *   | 179.3863 | 51.36         | -11.82         | 39.54       | 43.50  | -3.96  | QP       |
| 5   |     | 246.8146 | 42.75         | -10.13         | 32.62       | 46.00  | -13.38 | QP       |
| 6   |     | 485.6093 | 31.98         | -5.29          | 26.69       | 46.00  | -19.31 | QP       |

## 5.4 Occupied bandwidth

### 5.4.1 Test method

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel

RBW  $\geq 1\%$  of the 20 dB bandwidth

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

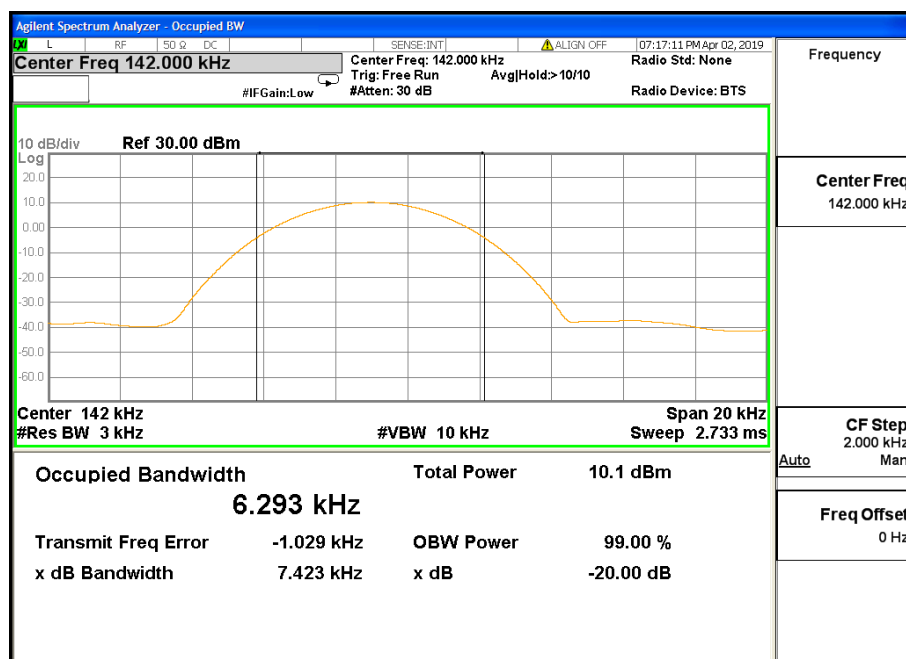
The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth and 99% occupied bandwidth of the emission.

### 5.4.2 Test result

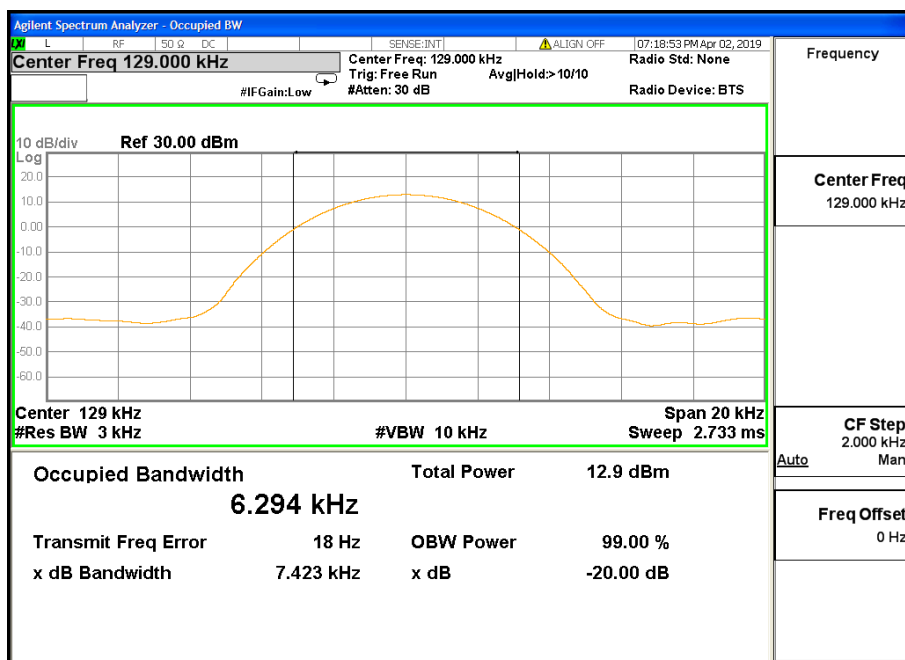
| Frequency (kHz) | 20dB emission bandwidth (kHz) | 99% occupied bandwidth (kHz) |
|-----------------|-------------------------------|------------------------------|
| 142             | 7.423                         | 6.293                        |
| 129             | 7.423                         | 6.294                        |

Test plots as below

Mobile phone:

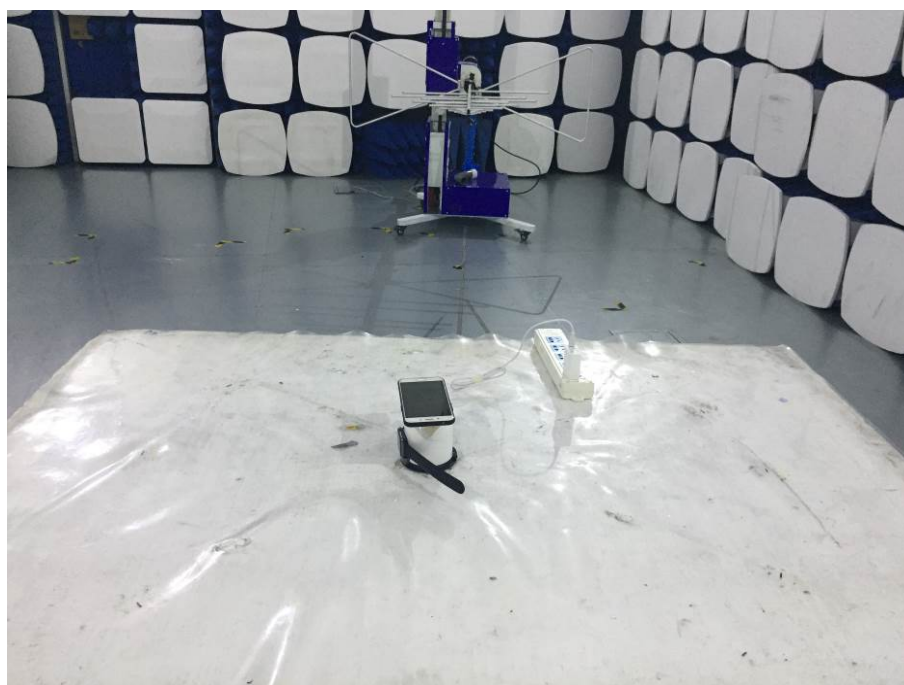
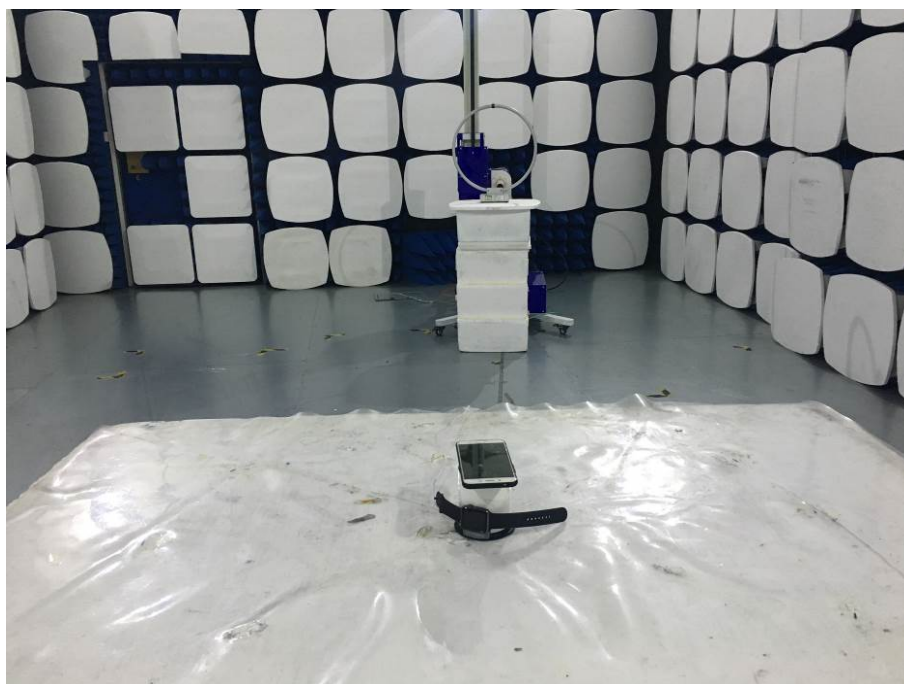


Apple watch:

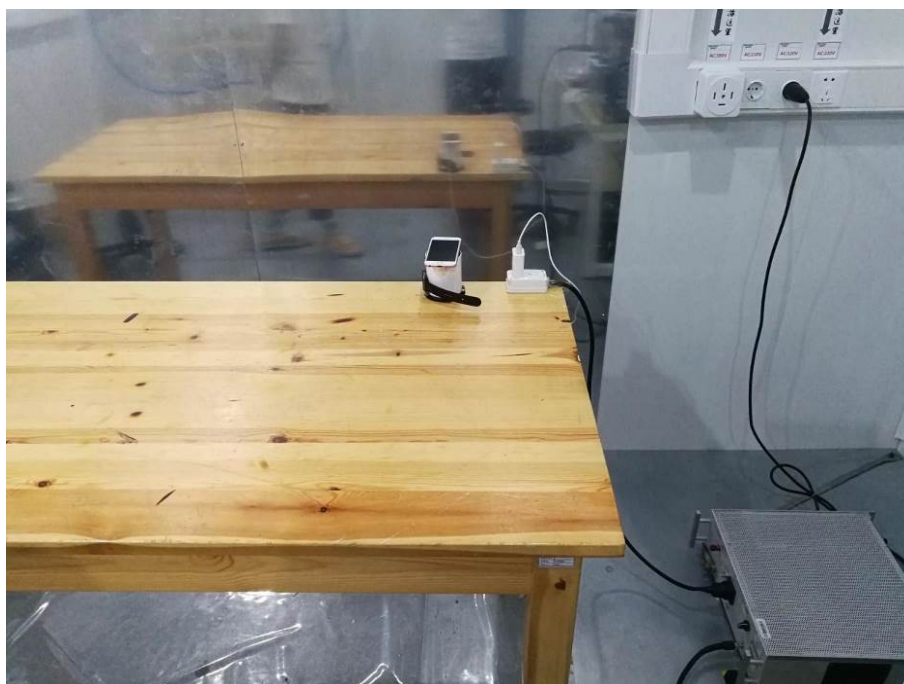


## Photographs of the Test Setup

Radiated emission



Conducted emission



## **Photographs of the EUT**

See the APPENDIX 1: EUT PHOTO in the report No.: MTi190416E107-1.

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