# EMC TEST REPORT

| | |
|---|---|
| **Report No.:** | SET2020-15139 |
| **Product Name:** | Microwave Oven |
| **Trade Name:** | Midea, IKEA |
| **Model No. :** | MM720C##-PM0A(K), MM720C***-PM0A(K) |
| **FCC ID :** | VG8MM720CYY-PM |
| **Applicant:** | Guangdong Midea Kitchen Appliances Manufacturing Co.,Ltd. |
| **Received Date:** | 2020.12.01 |
| **Tested Date:** | 2020.12.01-2020.12.11 |
| **Issued by:** | CCIC Southern Testing Co., Ltd. |
| **Lab Location:** | Electronic Testing Building, No.43 Shahe Road, Xili Street, Nanshan District, Shenzhen, Guangdong, China<br>**Tel:** 86 755 26627338 **Fax:** 86 755 26627238 |

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# Test Report

| | |
|---|---|
| **Product Name** ..... | Microwave Oven |
| **Model No.** ..... | MM720C##-PM0A(K), MM720C***-PM0A(K) |
| **Trade Name** ..... | Midea, IKEA |
| **Applicant** ..... | Guangdong Midea Kitchen Appliances Manufacturing Co.,Ltd. |
| **Applicant Address** ..... | No.6, Yong An Road, Beijiao, Shunde, Foshan, China |
| **Manufacturer** ..... | Guangdong Midea Kitchen Appliances Manufacturing Co.,Ltd. |
| **Manufacturer Address** ..... | No.6, Yong An Road, Beijiao, Shunde, Foshan, China |
| **Factory 01** ..... | Guangdong Midea Kitchen Appliances Manufacturing Co.,Ltd. |
| **Factory Address** ..... | No.6, Yong An Road, Beijiao, Shunde, Foshan, China |
| **Factory 02** ..... | The 2nd branch of Guangdong Midea Kitchen Appliance Manufacturing Co., Ltd |
| **Factory Address** ..... | No.1 Workshop, No.18 Sanle Road, Beijiao neighborhood committee, Beijiao Town, Shunde District, Foshan City, Guangdong Province, China |
| **Test Standards** ..... | 47 CFR Part 18 |
| **Test Result** ..... | PASS |

**Tested by** ..... Zhang Pei Sen 2020.12.11

Pei Sen Zhang Test Engineer

**Reviewed by** ..... Chris You 2020.12.11

Chris You Senior Engineer

**Approved by** ..... Shuangwen Zhang

Shuangwen Zhang, Manager 2020.12.11

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| Change History | | |
|---|---|---|
| Issue | Date | Reason for change |
| 1.0 | 2020.12.11 | First edition |
| | | |
| | | |

# 1. GENERAL INFORMATION

## 1.1 GENERAL DESCRIPTION OF EUT

| | |
|---|---|
| EUT Name ..... : | Microwave Oven |
| Trade Name……..: | Midea, IKEA |
| Brand Name……: | N/A |
| Hardware Version..... : | N/A |
| Software Version ..... : | N/A |
| Model | MM720C##-PM0A(K), MM720C***-PM0A(K) model designations are as follows:<br>First “M” indicates controller type, mechanical type knob.<br>Second “M” indicates microwave function.<br>720: "7" indicates the microwave output power is 700W,<br>“20” indicate cavity capacity is 20 liters;<br>C: indicates the design No.;<br>## or *** = 0-9, A-Z or blank, indicates different appearance;<br>P: indicates paint cavity;<br>Third “M” indicates Loop change sequence code.<br>0: Built-in Kit frame size, installation method, etc.,<br>A(K): indicates voltage.<br>Model of MM720C2CZ-PM0A was selected for the final testing. |
| Power Supply ..... : | 120V AC/60Hz |
| Rated input Power(microwave): | 900W |
| Rated output Power(microwave): | 700W |
| Frequency..... : | 2450MHz(ClassB/Group 2) |
| Magnetron Model..... : | 2M217J |
| Magnetron Manufacturer ... : | WITOL |
| Description of Support Units : | -Load for power output measurement: 1000 milliliters of water in the beaker located in the center of the oven.<br>-Load for frequency measurement: 1000 milliliters of water in the beaker located in the center of the oven.<br>-Load for measurement of radiation on second and third harmonic: Two loads, one of 700 and the other of 300 milliliters, of water are used. Each load is tested both with the beaker located in the center of the oven and with it in the right front corner.<br>-Load for all other measurements: 700 milliliters of water, with the beaker located in the center of the oven. |

*Note 1*:The EUT have the following typical setups during the test:

Setup1: Microwave heating mode (According to FCC PART 18);

*Note 2:* For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

## 1.2 Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 18:

| No. | Identity | Document Title |
|---|---|---|
| 1 | 47 CFR Part 18:2017 | Radio Frequency Devices |

Test detailed items/section required by FCC rules and results are as below:

| Emission | | | |
|---|---|---|---|
| Standard | Item | Class / Severity | Result |
| 47 CFR PART 18 | Conducted Emission (150 kHz to 30 MHz) | 18.307(b) | PASS |
| | Radiated Emission (30 MHz to1 GHz) | 18.305(b) | PASS |

## 1.3 Facilities and Accreditations

### 1.3.1 Facilities

**FCC-Registration No.: CN5031**

CCIC Southern Testing Co., Ltd. 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 our files. Designation Number: CN5031, valid time is until December 31, 2020

**ISED Registration: 11185A-1**

CCIC Southern Testing Co., Ltd. EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 11185A-1 on Aug. 04, 2016, valid time is until December 31, 2020.

**NVLAP Lab Code: 201008**

CCIC-SET is a third party testing organization accredited by NVLAP according to ISO/IEC 17025. The accreditation certificate number is 201008-0.

Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

| | |
|---|---|
| Temperature (°C): | 15°C- 35°C |
| Relative Humidity (%): | 25% -75% |
| Atmospheric Pressure (kPa): | 86kPa-106kPa |

### 1.3.2 Measurement Uncertainty

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

| | |
|---|---|
| Uncertainty of Conducted Emission: | Uc = 3.6 dB (k=2) |
| Uncertainty of Radiated Emission: | Uc = 4.5 dB (k=2) |

# 2. EQUIPMENTS LIST

## A. Equipments List:

| Description | Manufacturer | Model | Serial No. | Calibration Date | Calibration Due. Date |
|---|---|---|---|---|---|
| Test Receiver | KEYSIGHT | N9038A | A141202036 | 2020.11.21 | 2021.09.20 |
| LISN | ROHDE&SCHWARZ | ESH2-Z5 | A0304221 | 2020.04.03 | 2021.04.03 |
| Shield Room | Xinju Electronics | L7300*W4500*H3100 | A181003226 | 2018.09.06 | 2021.09.05 |
| EMI Test Receiver | ROHDE&SCHWARZ | ESIB7 | A0501375 | 2020.07.29 | 2021.06.23 |
| Broadband Ant. | 2786 | ETC | A150402239 | 2018.09.17 | 2021.09.16 |
| 3M Anechoic Chamber | Albatross | SAC-3MAC 9*6*6m | A0412375 | 2019.03.26 | 2023.03.25 |
| EMI Test Receiver | ROHDE&SCHWARZ | ESW26 | A180502935 | 2020.09.22 | 2021.08.12 |
| System Simulator | ROHDE&SCHWARZ | CMW500 | A150802214 | 2019.07.30 | 2021.07.29 |
| 5M Anechoic Chamber | Albatross | SAC-5MAC 12.8x6.8x6.4m | A0304210 | 2019.03.25 | 2023.03.24 |
| EMI Horn Ant. | ROHDE&SCHWARZ | HF906 | A0304225 | 2019.04.17 | 2022.04.17 |
| Spectrum Analyzer | KEYSIGHT | E7515A | A160702555 | 2019.04.01 | 2021.04.01 |

# 3. EMC EMISSION TEST

## 3.1 Test Procedure

Test Requirement: 47 CFR PART 18
Test Method: FCC/OST MP-5:1986
Power Supply: 120V AC/60Hz
Frequency Range: 2400-2500MHz
Detector: Peak
Limit: ISM equipment may be operated at any frequency above 9KHz and the frequency band 2400-2500MHz is allocated for use by ISM equipment

| ISM frequency | Tolerance |
|---|---|
| 6.78 MHz | ±15.0 kHz |
| 13.56 MHz | ±7.0 kHz |
| 27.12 MHz | ±163.0 kHz |
| 40.68 MHz | ±20.0 kHz |
| 915 MHz | ±13.0 MHz |
| 2,450 MHz | ±50.0 MHz |
| 5,800 MHz | ±75.0 MHz |
| 24,125 MHz | ±125.0 MHz |
| 61.25 GHz | ±250.0 MHz |
| 122.50 GHz | ±500.0 MHz |
| 245.00 GHz | ±1.0 GHz |

### 3.1.1 Frequency For Normal Voltage

The operating frequency was measured using a spectrum analyzer. Starting with the EUT at room temperature, a 1000mL water load was placed in the center of the oven and the oven was operated at maximum output power. The fundamental operating frequency was monitored until the water load was reduced to 20 percent of the original load.

### 3.1.2 Frequency For Line Voltage

The EUT was operated / warmed by at least 10 minutes of use with a 1000mL water load at room temperature at the beginning of the test. Then the operating frequency was monitored as the input voltage was varied between 80 and 125 percent of the nominal rating.

### 3.1.3 Measurement data

| Operating Mode | Frequency(MHz) |
|---|---|
| Normal Voltage | 2243.6-2470.8 |
| Line Voltage | 2240.2-2458.1 |

## 3.2 RADIATION HAZARD TEST

### 3.2.1 Test Setup

The EUT was set-up according to the FCC MP-5 and FCC Part 18 for radiation Hazard measurement. The measurement was using a microwave leakage meter to measure the radiation leakage in the as-received condition with the oven door closed A1000mLwater load in a breaker was located in the center of the oven and the microwave oven was set to maximum power. While the oven operating, the microwave meter will check the leakage and then record the maximum leakage.

### 3.2.2 Limit

A maximum of 1.0mW/cm$^2$ is allowed in according with the applicable FCC standards

### 3.2.3 Test results

There was no microwave leakage exceeding a power level of 0.16mW/cm$^2$Observed at any point 5cm or more from the external surface of the oven

## 3.3 RF OUTPUT POWER MEASUREMENT

### 3.3.1 Test Standard

| | |
|---|---|
| Test Requirement | 47 CFR PART 18 |
| Test Method | FCC/OST MP-5:1986 |
| Power Supply | 120V AC/60Hz |

### 3.3.2 EUT Operating mode

Test the EUT in microwave mode with full power.

### 3.3.3 Test Data

| Mass of Water(g) | Mass of the container(g) | ambient temperature (℃) | Initial temperature(℃) | Final temperature(℃) | Heating Time(S) | Output Power(Watt) |
|---|---|---|---|---|---|---|
| 1000 | 280 | 23.0 | 14 | 30 | 120 | 574.7 |

Formula:

$$P = \frac{4.2 \times mw(T_2 - T_1) + 0.9 \times mc(T_2 - T_0)}{t}$$

P is the microwave power output, in watts

Mw is the mass of the water, in grams

Mc is the mass of the container, in grams

T0 is the ambient temperature, in degrees Celsius

T1 is Initial temperature of the water, in degrees Celsius

T2 is final temperature of the water, in degrees Celsius

T is heating time, in seconds, excluding the magnetron filament heating-up time

# 4. CONDUCTED EMISSION

## 4.1.1 Conducted Emission Limit

| Frequency range (MHz) | Conducted Limit (dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 - 0.50 | 66 to 56 | 56 to 46 |
| 0.50 - 5 | 56 | 46 |
| 5 - 30 | 60 | 50 |

**Note:**

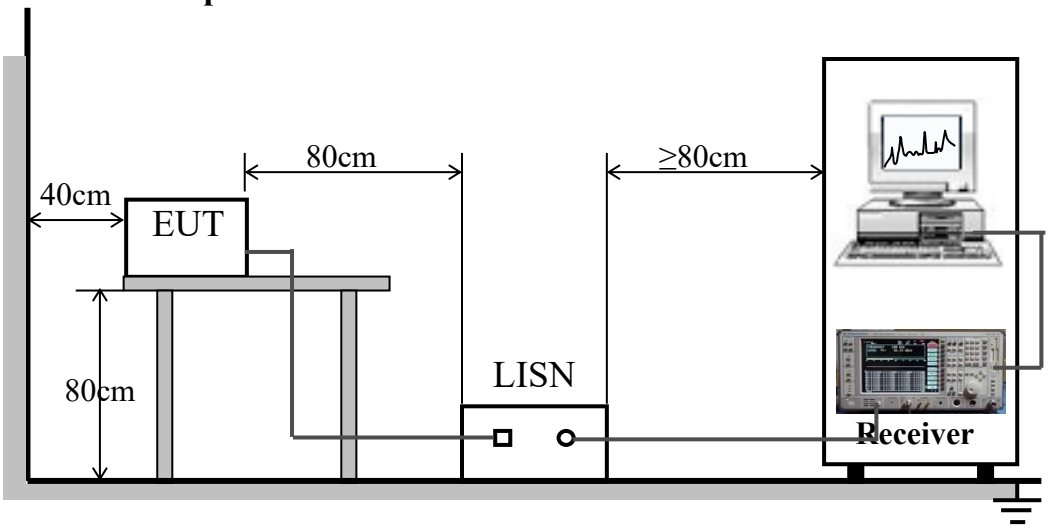
a) The limit decreases linearly with the logarithm of the frequency in the range 0.05 MHz to 0.5 MHz.

b) The lower limit is applicable at the transition frequency.

## 4.1.2 Test Procedure

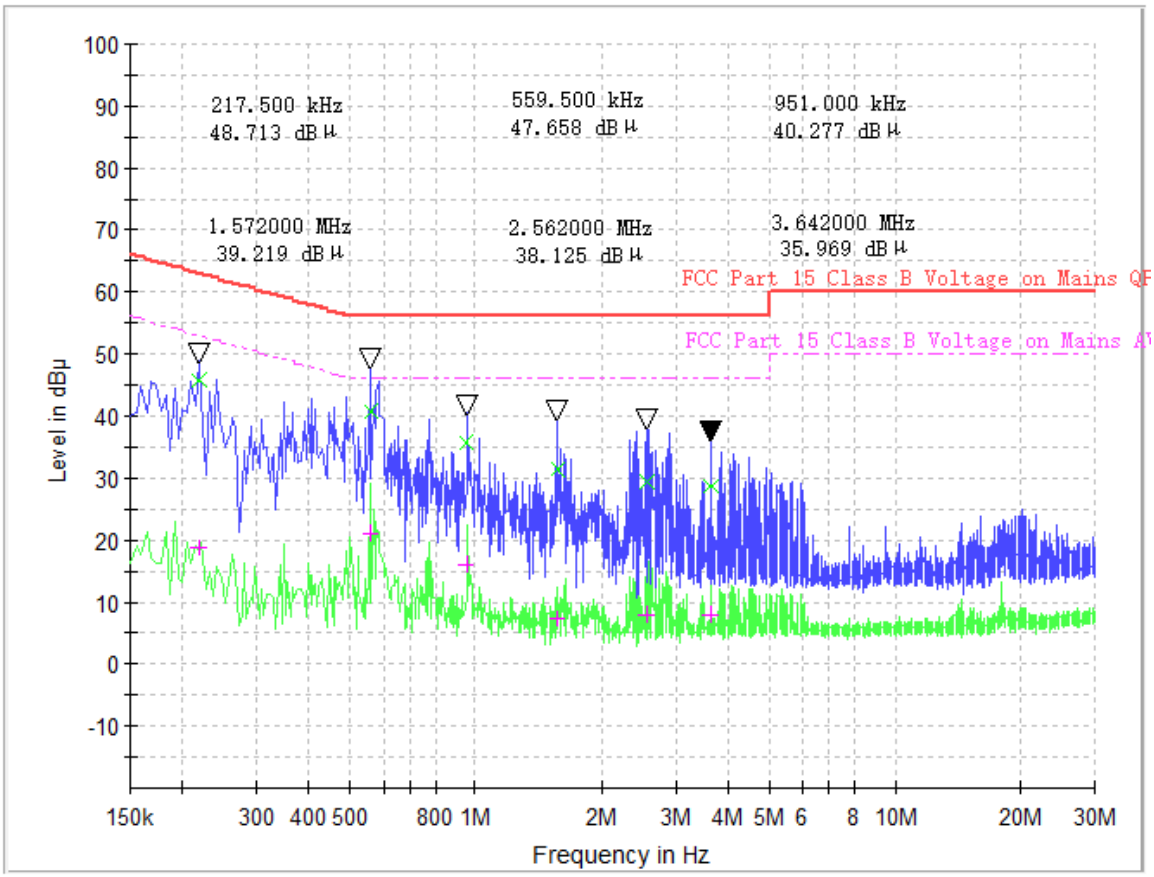
The EUT is placed on a 0.8m high insulating table, which stands on the grounded conducting floor, and keeps 0.4m away from the grounded conducting wall. The EUT is connected to the power mains through a LISN which provides 50Ω/50μH of coupling impedance for the measuring instrument. The Common Antenna is used for the call between the EUT and the System Simulator (SS). A Pulse Limiter is used to protect the measuring instrument. The factors of the whole test system are calibrated to correct the reading.

## 4.1.3 Test Setup



**A. Test Result:**

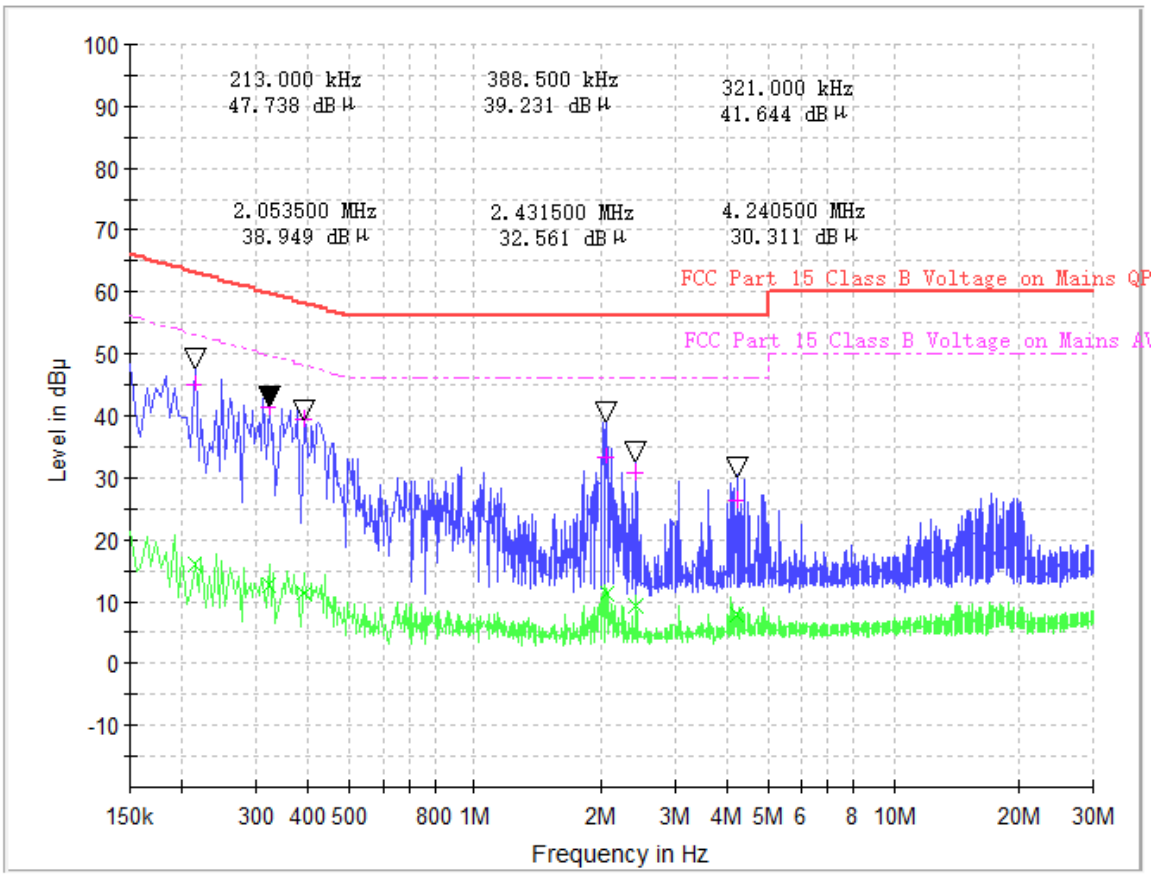
Mains terminal disturbance voltage, Setup1,L phase




(Plot A: L Phase)

| Conducted Disturbance at Mains Terminals | | | | | | | |
|---|---|---|---|---|---|---|---|
| L Test Data | | | | | | | |
| QP | | | | AV | | | |
| Frequency (MHz) | Limits (dBµV) | Measurement Value (dBµV) | Margin (dB) | Frequency (MHz) | Limits (dBµV) | Measurement Value (dBµV) | Margin (dB) |
| 0.217500 | 62.9 | 45.72 | 17.18 | 0.217500 | 52.9 | 18.60 | 34.30 |
| 0.559500 | 56.0 | 40.75 | 15.25 | 0.559500 | 46.0 | 20.78 | 25.22 |
| 0.951000 | 56.0 | 35.52 | 20.48 | 0.951000 | 46.0 | 15.85 | 30.15 |
| 1.572000 | 56.0 | 31.14 | 24.86 | 1.572000 | 46.0 | 7.24 | 38.76 |
| 2.562000 | 56.0 | 29.18 | 26.82 | 2.562000 | 46.0 | 7.95 | 38.05 |
| 3.642000 | 56.0 | 28.74 | 27.26 | 3.642000 | 46.0 | 7.70 | 38.30 |

Mains terminal disturbance voltage, Setup 1, N phase




(Plot B: N Phase)

| Conducted Disturbance at Mains Terminals | | | | | | | |
|---|---|---|---|---|---|---|---|
| N Test Data | | | | | | | |
| QP | | | | AV | | | |
| Frequency (MHz) | Limits (dBµV) | Measurement Value (dBµV) | Margin (dB) | Frequency (MHz) | Limits (dBµV) | Measurement Value (dBµV) | Margin (dB) |
| 0.213000 | 63.1 | 45.16 | 17.94 | 0.213000 | 53.1 | 15.95 | 37.15 |
| 0.321000 | 59.7 | 41.36 | 18.34 | 0.321000 | 49.7 | 12.42 | 37.28 |
| 0.388500 | 58.1 | 39.29 | 18.81 | 0.388500 | 48.1 | 11.28 | 36.82 |
| 2.053500 | 56.0 | 33.42 | 22.58 | 2.053500 | 46.0 | 11.32 | 34.68 |
| 2.431500 | 56.0 | 30.70 | 25.30 | 2.431500 | 46.0 | 9.20 | 36.80 |
| 4.240500 | 56.0 | 26.28 | 29.72 | 4.240500 | 46.0 | 7.85 | 38.15 |

**Test Result: PASS**

# 5. RADIATED EMISSION

## 5.1.1 Radiated Emission Limits

(a) ISM equipment operation on a frequency specified in §18.301 is permitted unlimited radiated energy in the band specified for that frequency.

(b) The field strength levels of emissions which lie outside the bands specified in §18.301,unless otherwise indicated, shall not exceed the following:

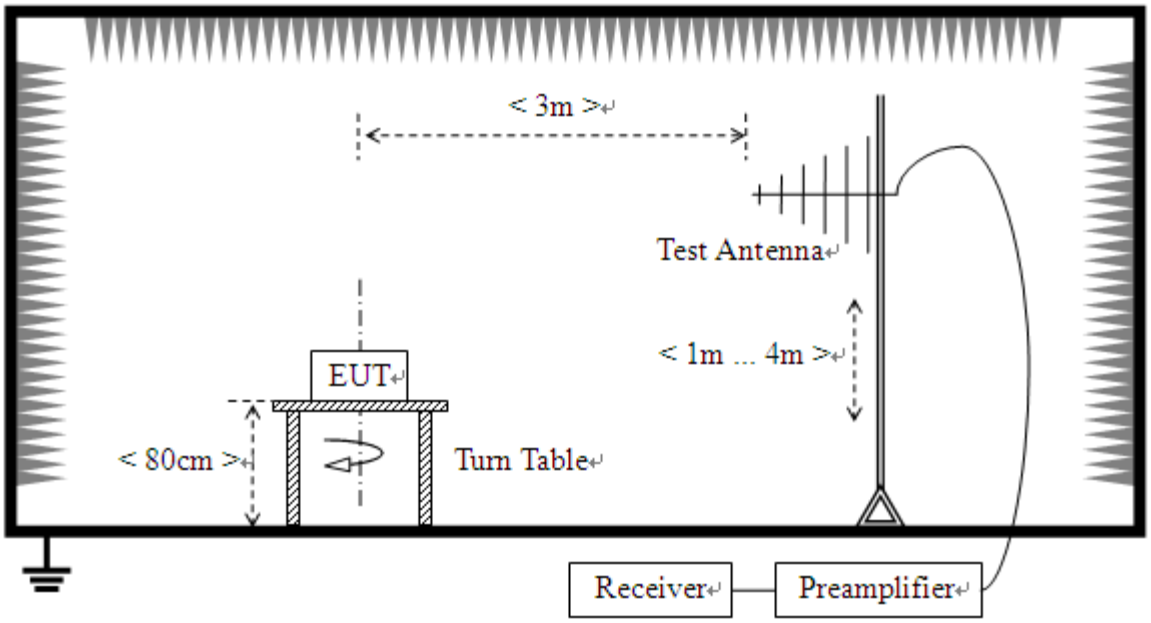
| RF Power generated by equipment(watts) | Field strength limit(uV/m) @300m |
|---|---|
| Below 500 | 25 |
| 500 or more | 25*SQRT(power/500) |

Power =574.7W

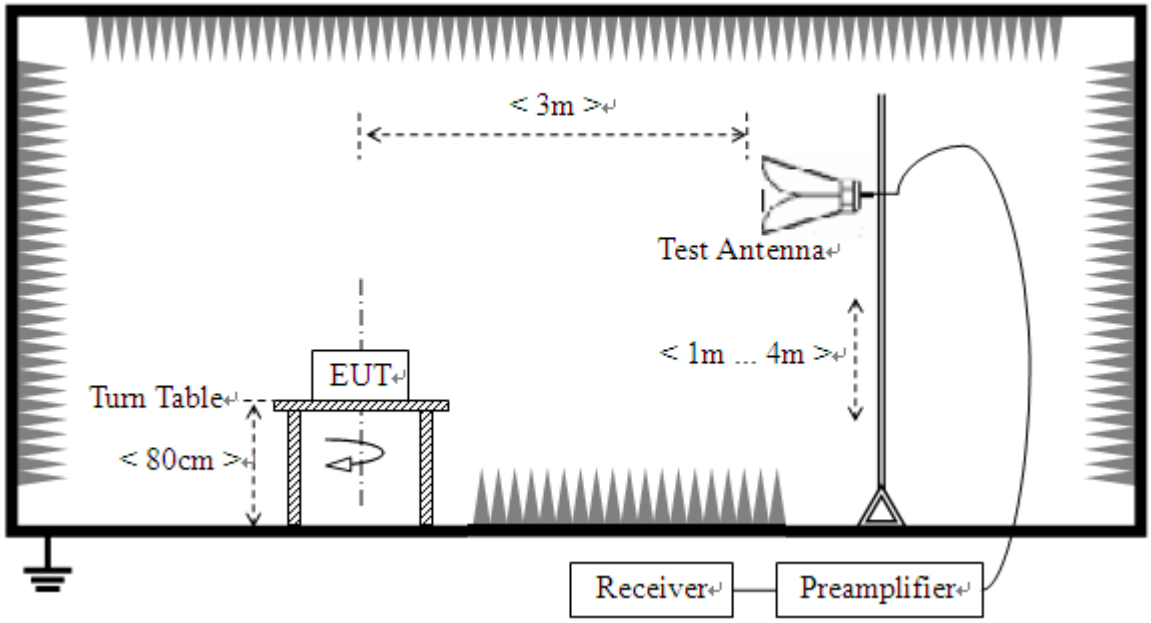
Limit=20lg(25*SQRT(power/500))+20lg(300/3) @ 3m distance.

## 5.1.2 Test Setup

For radiated emissions from 30MHz to1GHz



For radiated emissions above 1GHz




### 5.1.3 Test Procedure

a.The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. 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 open area test site. 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 0.8 m; 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.

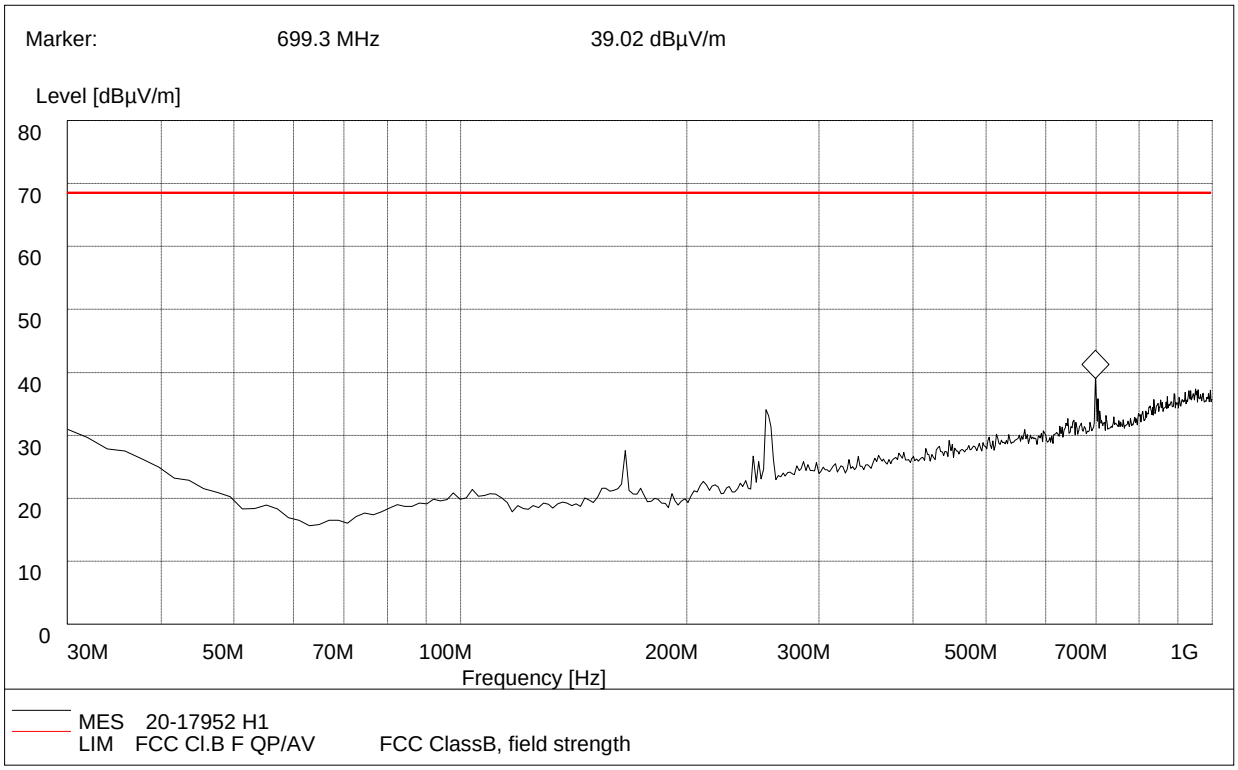
e.If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.

f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

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

**Test Result:**

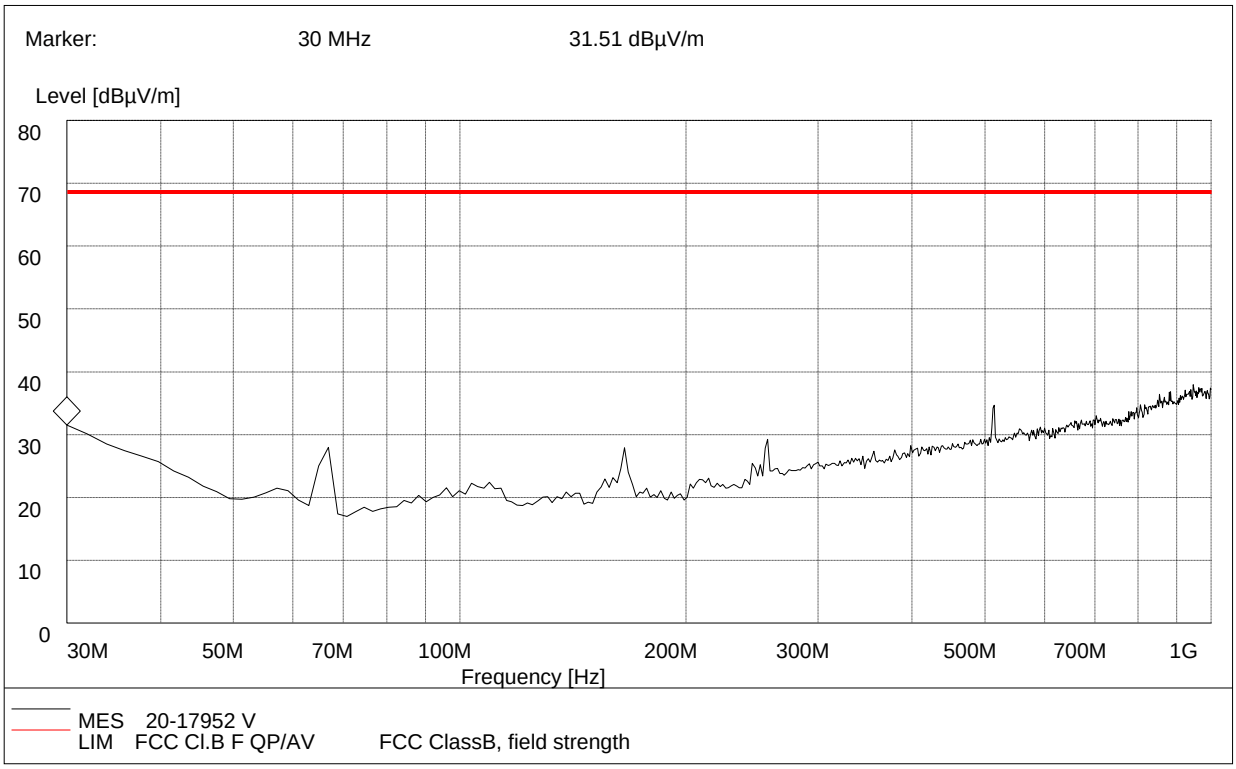
Radiation disturbances, antenna polarization:Setup1,Horizontal




(Plot C: Test Antenna Vertical 30M - 1G)

| Frequency (MHz) | Quasi Peak (dBµV/m) | Bandwidth (kHz) | Antenna height (cm) | Limit (dBµV/m) | Margin (dB) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|
| 699.36 | 36.91 | 120.000 | 118.0 | 68.56 | 31.65 | Horizontal | Pass |

Radiation disturbances, antenna polarization:Setup1,Vertical




(Plot D: Test Antenna Horizontal30M - 1G)

| Frequency (MHz) | Quasi Peak (dBµV/m) | Bandwidth (kHz) | Antenna height (cm) | Limit (dBµV/m) | Margin (dB) | Antenna | Verdict |
|---|---|---|---|---|---|---|---|
| 515.00 | 31.89 | 120.000 | 120.0 | 68.56 | 36.67 | Vertical | Pass |

**Above 1GHz**Setup1

| NO. | Freq. [MHz] | Level [dBμV/m] | Factor [dB] | Limit [dBμV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
|---|---|---|---|---|---|---|---|---|
| 1 | 2031.75 | 55.56 | -7.50 | 68.56 | 13.00 | 100 | 330 | Horizontal |
| 2 | 2253.81 | 59.62 | -6.35 | 68.56 | 8.94 | 100 | 20 | Horizontal |
| 3 | 2641.91 | 60.05 | -3.56 | 68.56 | 8.51 | 100 | 40 | Horizontal |
| 4 | 4036.25 | 57.98 | 1.93 | 68.56 | 10.58 | 100 | 350 | Horizontal |
| 5 | 6578.89 | 60.72 | 10.05 | 68.56 | 7.84 | 100 | 330 | Horizontal |
| 6 | 8559.63 | 62.03 | 12.10 | 68.56 | 6.53 | 100 | 230 | Horizontal |

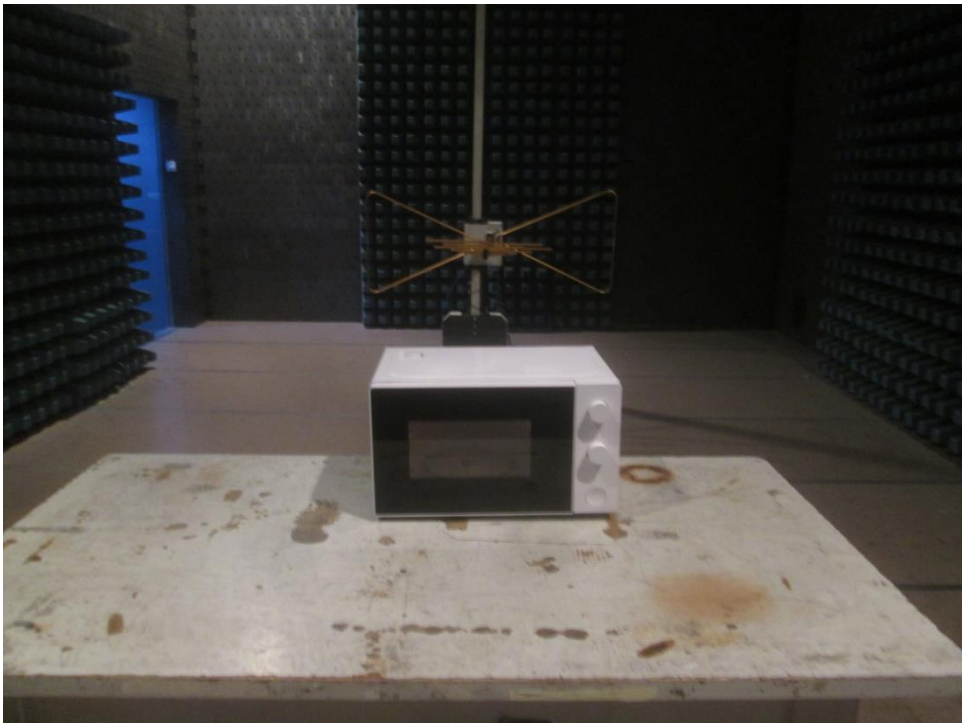
| NO. | Freq. [MHz] | Level [dBμV/m] | Factor [dB] | Limit [dBμV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
|---|---|---|---|---|---|---|---|---|
| 1 | 2205.30 | 59.39 | -6.49 | 68.56 | 9.17 | 100 | 260 | Vertical |
| 2 | 2596.89 | 61.51 | -3.85 | 68.56 | 7.05 | 100 | 280 | Vertical |
| 3 | 3143.03 | 58.14 | -0.64 | 68.56 | 10.42 | 100 | 280 | Vertical |
| 4 | 4015.25 | 57.69 | 1.95 | 68.56 | 10.87 | 100 | 60 | Vertical |
| 5 | 4700.42 | 61.25 | 4.61 | 68.56 | 7.31 | 100 | 80 | Vertical |
| 6 | 8455.11 | 61.47 | 11.78 | 68.56 | 7.09 | 100 | 120 | Vertical |

**REMARKS:**

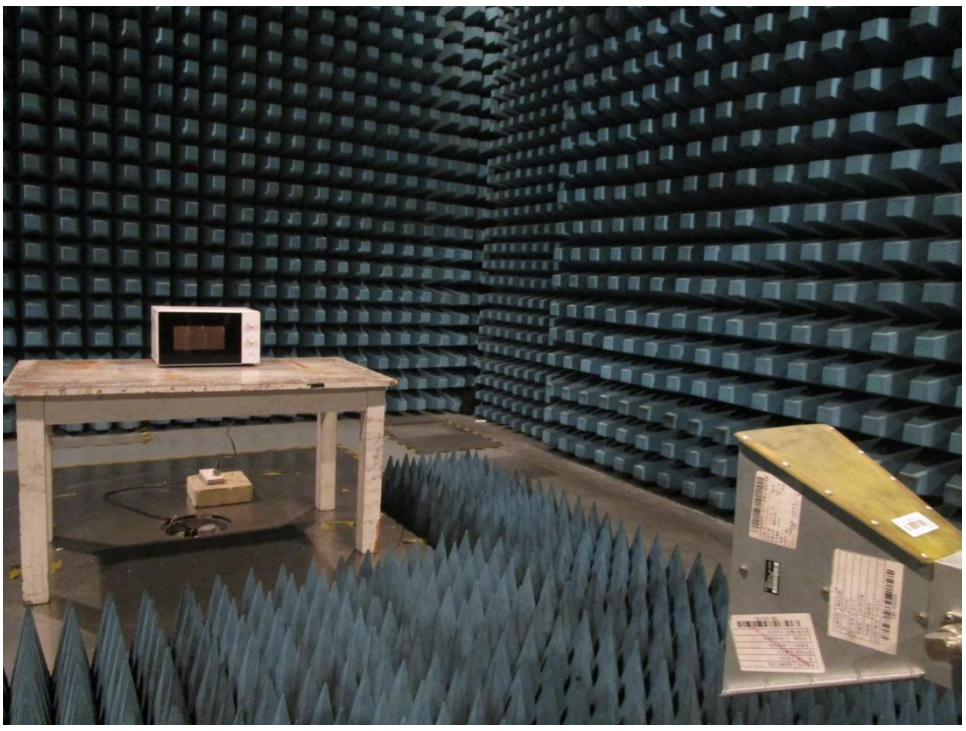
1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
   - Pre-Amplifier Factor(dB)

# APPENDIX I：PHOTOGRAPHS OF EMC TEST CONFIGURATION

**1. Radiated Emission Measurement below 1GHz**



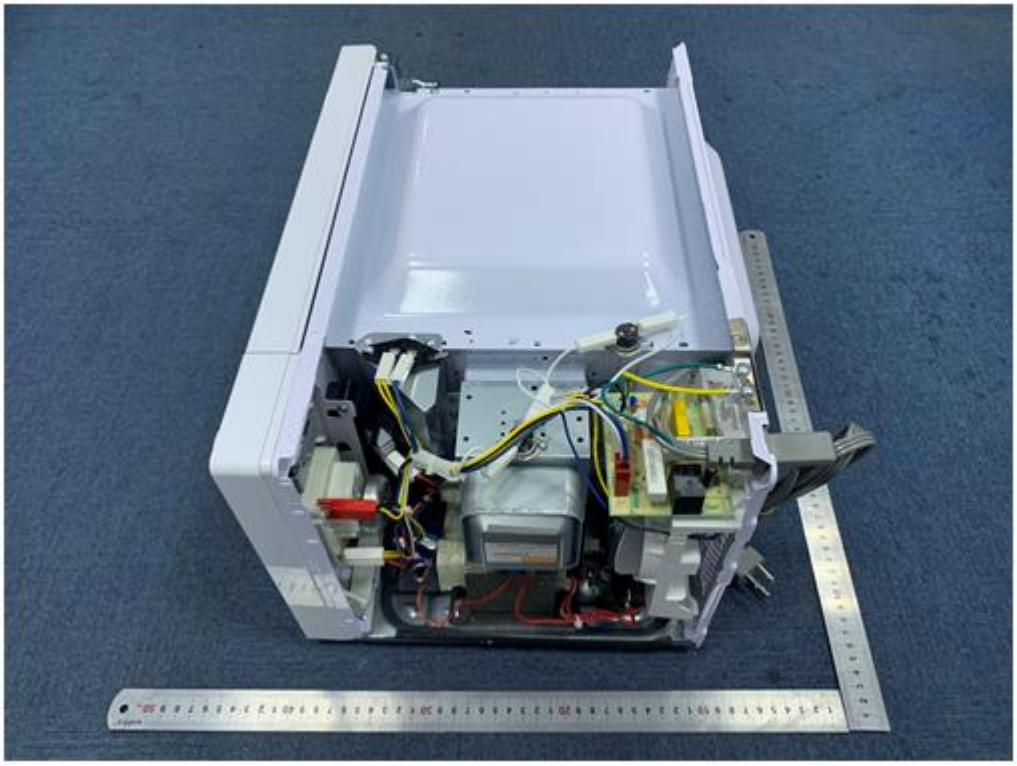
**2. Radiated Emission Measurement above 1GHz**



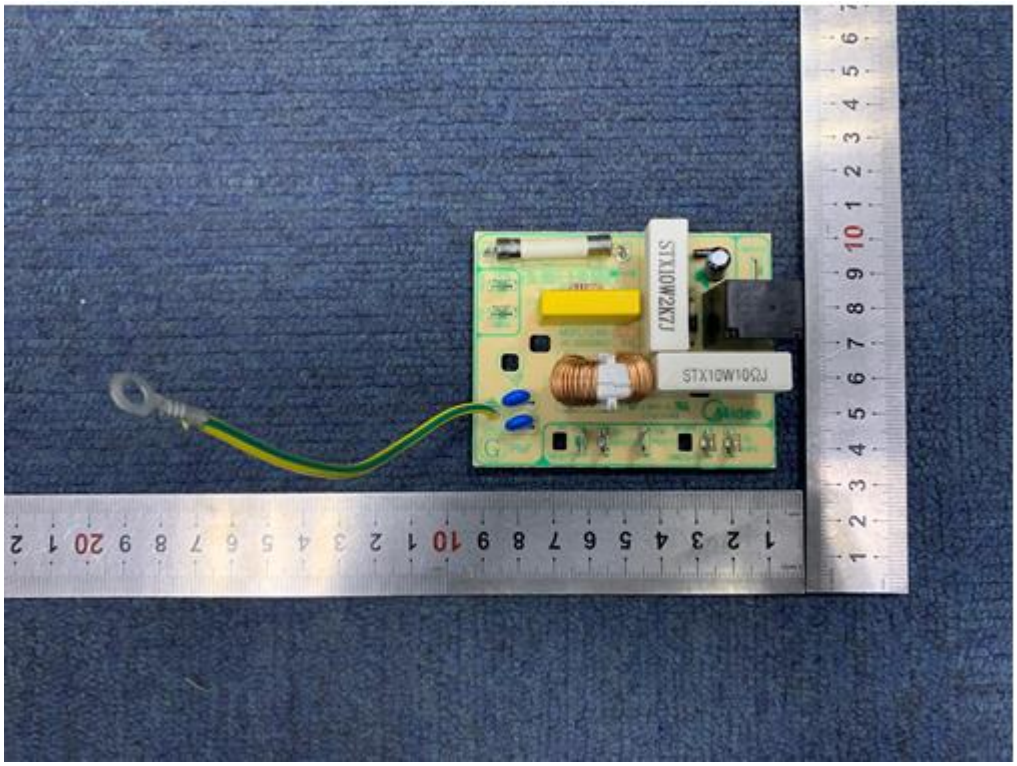
**3. Conducted emission at AC mains input/output port Measurement**

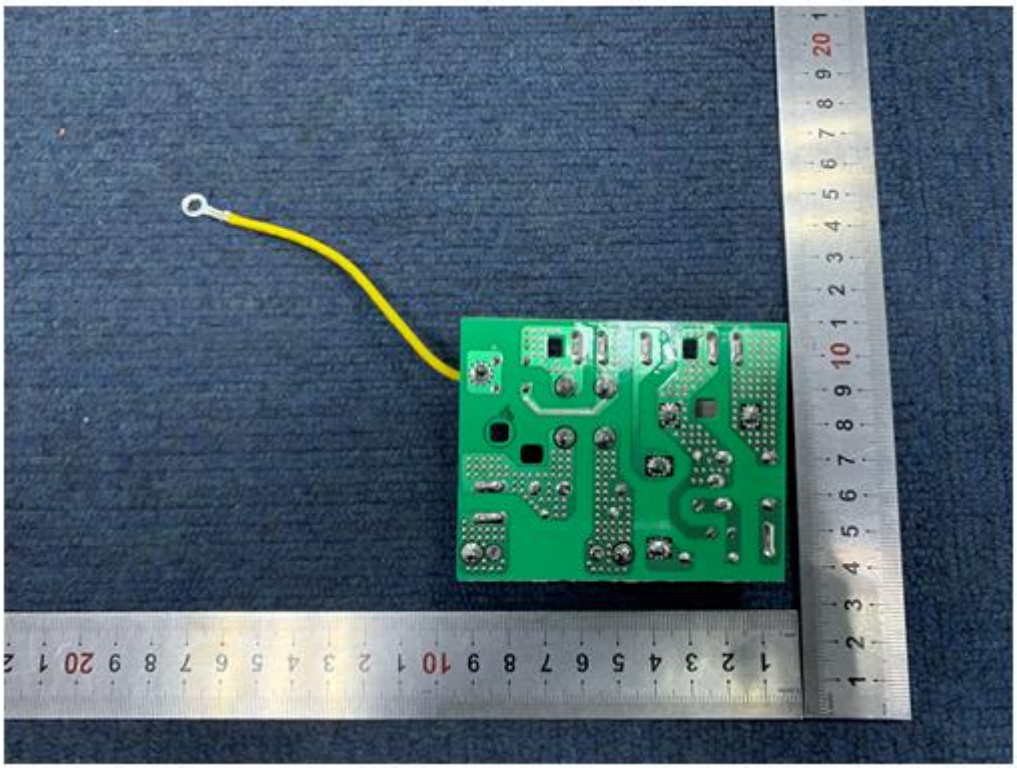
# APPENDIX II: PHOTOGRAPHS OF PRODUCT PHOTO

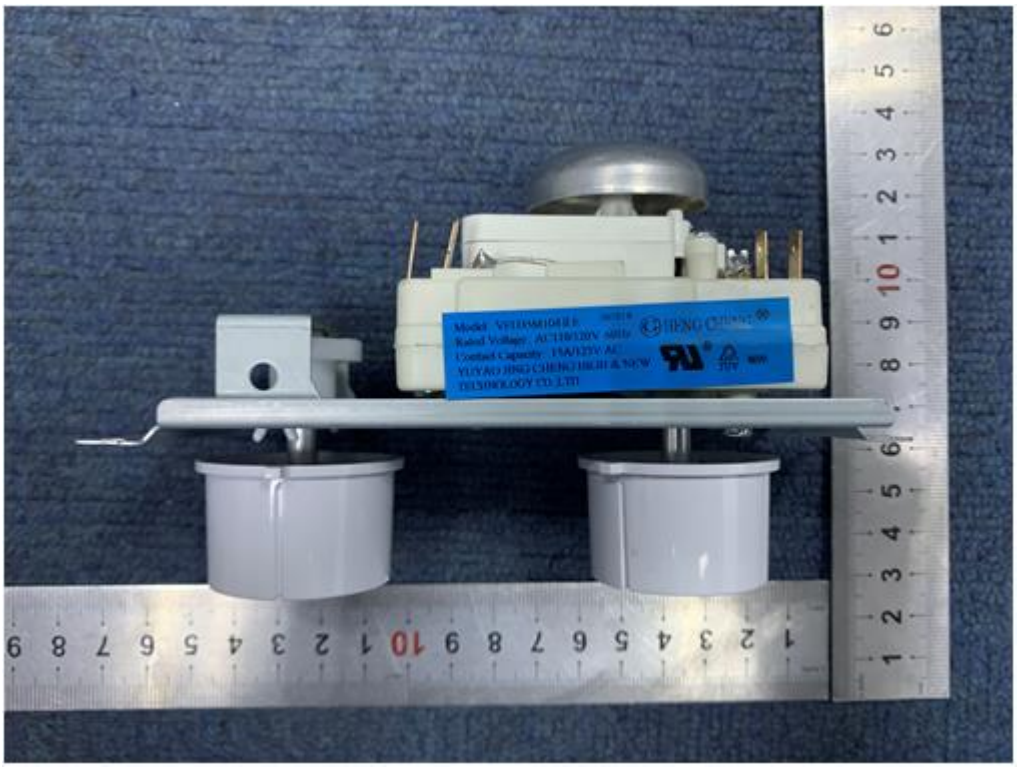
**External Photo**

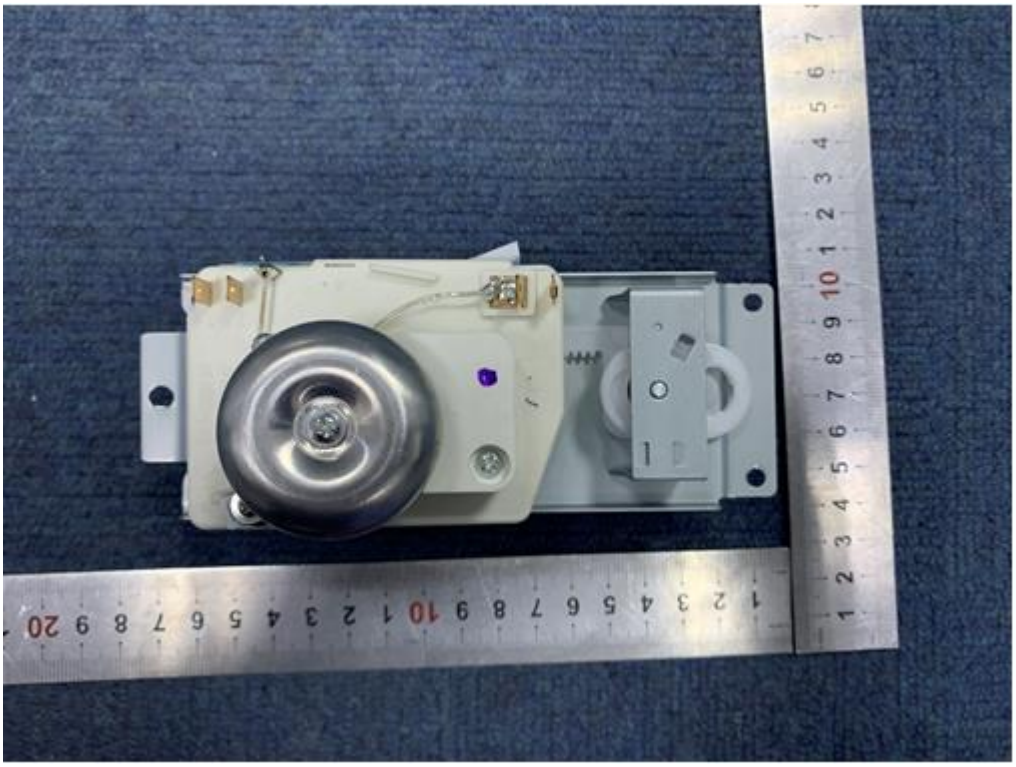


**Internal Photo**



STX10M2KZJ
STX10W10ΩJ







※※※ **End Of Report** ※※※