

## FCC - TEST REPORT

Report Number : **68.950.19.0643.01** Date of Issue: **July 27, 2019**

Model : **TC03**

Product Type : **Wireless charger**

Applicant : **Matrix Industries, Inc.**

Address : **1455 Adams Dr, Suite 1190 Menlo Park, CA 94025, USA**

Production Facility : **Matrix Industries, Inc.**

Address : **1455 Adams Dr, Suite 1190 Menlo Park, CA 94025, USA**

Test Result : ☒ **Positive** ☐ **Negative**

Total pages including  
Appendices : **19**

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## 2 Details about the Test Laboratory

### Details about the Test Laboratory

#### Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch  
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FCC Registration No.: 514049

FCC Designation Number: CA5009

IC Registration No.: 10320A

### 3 Description of the Equipment Under Test

|                            |                                                                                    |
|----------------------------|------------------------------------------------------------------------------------|
| Product:                   | Wireless charger                                                                   |
| Model no.:                 | TC03                                                                               |
| FCC ID:                    | 2ANY2MTC03                                                                         |
| Options and accessories:   | N/A                                                                                |
| Rating:                    | 5Vdc 1.0A Max supplied by an external adapter                                      |
| RF Transmission Frequency: | 117-175KHz                                                                         |
| Antenna Type:              | Integrated coil antenna                                                            |
| Description of the EUT:    | The Equipment Under Test (EUT) is a wireless charger which operated at 117-175kHz. |

## 4 Summary of Test Standards

| Test Standards                             |                                                                        |
|--------------------------------------------|------------------------------------------------------------------------|
| FCC Part 15 Subpart C<br>10-1-2018 Edition | PART 15 - RADIO FREQUENCY DEVICES<br>Subpart C - Intentional Radiators |

All the test methods were according to ANSI C63.10 (2013).

## 5 Summary of Test Results

| Technical Requirements |                                  |            |           |                                     |                          |                          |
|------------------------|----------------------------------|------------|-----------|-------------------------------------|--------------------------|--------------------------|
| FCC Part 15 Subpart C  |                                  |            |           |                                     |                          |                          |
| Test Condition         |                                  | Pages      | Test Site | Test Result                         |                          |                          |
|                        |                                  |            |           | Pass                                | Fail                     | N/A                      |
| §15.207                | Conducted emission AC power port | 10         | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| --                     | 20dB bandwidth                   | 13         | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| §15.205                | Restricted bands of operation    | 13         | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| §15.209                | Radiated emission                | 14         | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| §15.203                | Antenna requirement              | See note 1 |           | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Note 1: The EUT uses an Integrated coil antenna, which gain is 0dBi. In accordance to §15.203, it is considered sufficiently to comply with the provisions of this section.

## 6 General Remarks

### Remarks

This submittal(s) (test report) is intended for FCC ID: 2ANY2MTC03, complies with Section 15.207, 15.209, 15.205 of the FCC Part 15, Subpart C rules.

### SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

□ - **Not** Performed

The Equipment under Test

■ - **Fulfills** the general approval requirements.

□ - **Does not** fulfill the general approval requirements.

Sample Received Date: June 20, 2019

Testing Start Date: July 2, 2019

Testing End Date: July 24, 2019

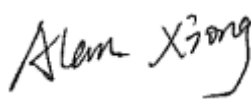
- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch -

Reviewed by:



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Project Manager

Prepared by:



Alan Xiong  
Project Engineer

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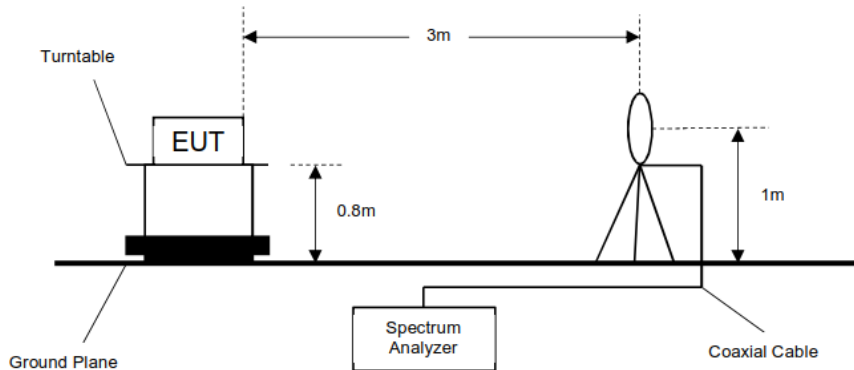


Tree Zhan  
Test Engineer

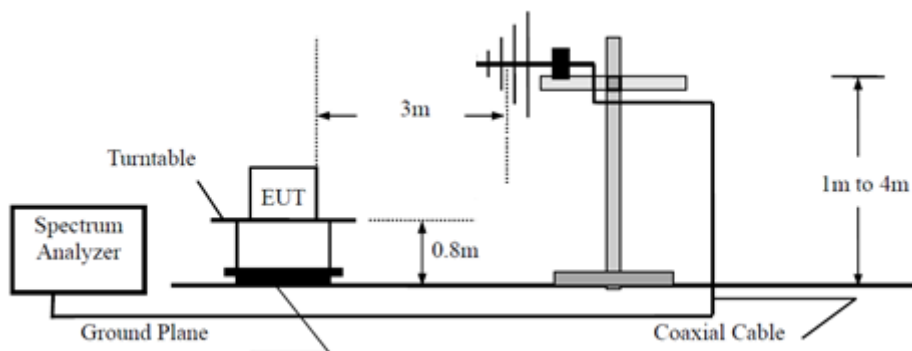
## 7 Test Setups

### 7.1 Radiated test setups

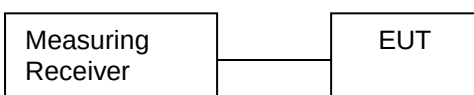
Below 30MHz



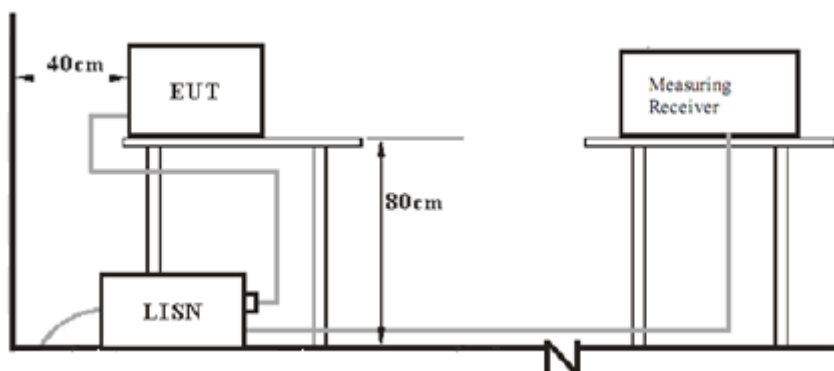
30MHz-1GHz



### 7.2 Conducted RF test setups



### 7.3 AC Power Line Conducted Emission test setups



## 8 Systems test configuration

Auxiliary Equipment Used during Test:

| Description         | Manufacturer | Model NO. | S/N |
|---------------------|--------------|-----------|-----|
| PowerWatch Series 2 | Matrix       | PW07      | --- |
| Adapter             | Apple        | A1357     | --- |

| Description | Length | Shielded/unshielded | With / without ferrite |
|-------------|--------|---------------------|------------------------|
| USB Cable   | 0.15m  | Shielded            | Without ferrite        |

## 9 Technical Requirement

### 9.1 Conducted Emission Test

#### Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through an Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

#### Limit

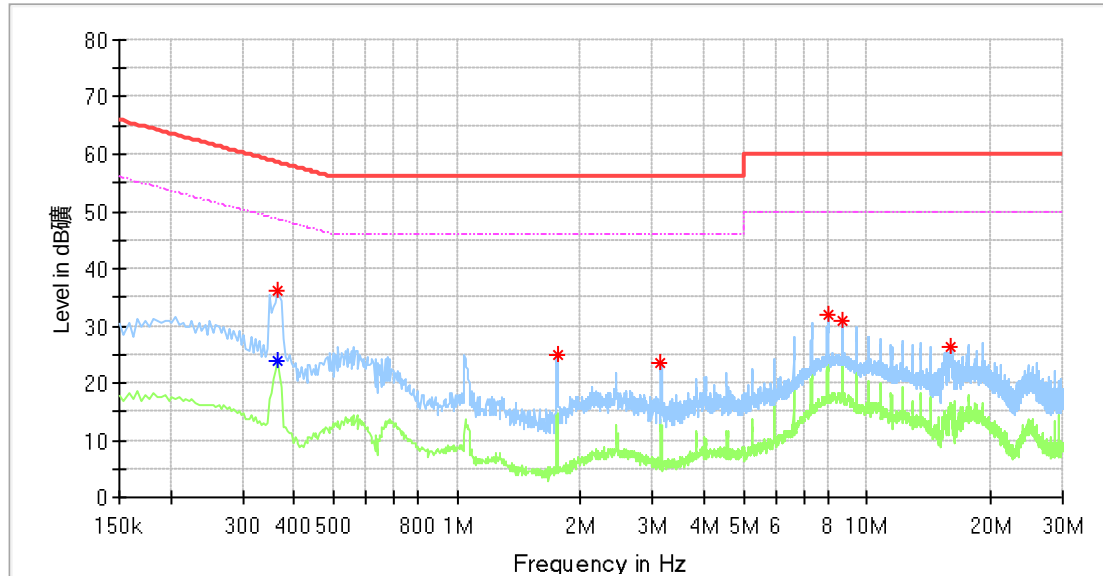
According to §15.207, conducted emissions limit as below:

| Frequency<br>MHz | QP Limit<br>dB $\mu$ V | AV Limit<br>dB $\mu$ V |
|------------------|------------------------|------------------------|
| 0.150-0.500      | 66-56*                 | 56-46*                 |
| 0.500-5          | 56                     | 46                     |
| 5-30             | 60                     | 50                     |

\*Decreasing linearly with logarithm of the frequency

## Conducted Emission

Product Type : Wireless charger  
 M/N : TC03  
 Operating Condition : Charging Mode  
 Test Specification : Line  
 Comment : AC 120V/60Hz



| Frequency (MHz) | MaxPeak (dBμV)* | Average (dBμV) | Limit (dBμV) | Margin (dB) | Line | Corr. (dB)** |
|-----------------|-----------------|----------------|--------------|-------------|------|--------------|
| 0.366000        | ---             | 23.70          | 48.59        | 24.89       | L1   | 10.3         |
| 0.366000        | 36.19           | ---            | 58.59        | 22.40       | L1   | 10.3         |
| 1.754000        | 24.77           | ---            | 56.00        | 31.23       | L1   | 10.3         |
| 3.134000        | 23.48           | ---            | 56.00        | 32.52       | L1   | 10.4         |
| 8.022000        | 32.05           | ---            | 60.00        | 27.95       | L1   | 10.6         |
| 8.718000        | 30.83           | ---            | 60.00        | 29.17       | L1   | 10.6         |
| 16.014000       | 26.16           | ---            | 60.00        | 33.84       | L1   | 10.8         |

Remark :

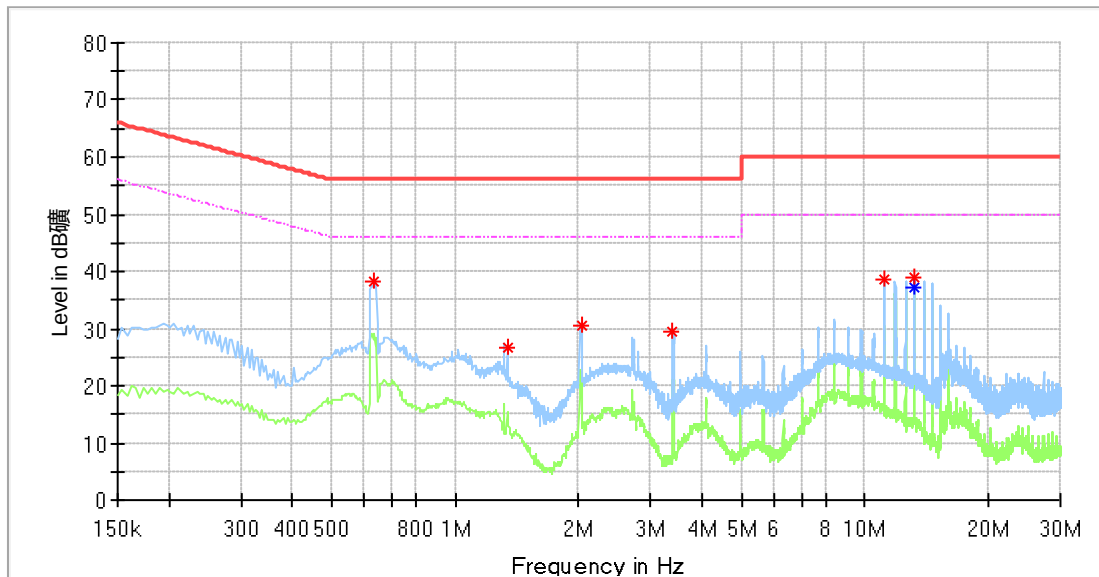
\* Max Peak=Reading Level + Correction Factor

\*\*Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

## Conducted Emission

Product Type : Wireless charger  
 M/N : TC03  
 Operating Condition : Charging Mode  
 Test Specification : Neutral  
 Comment : AC 120V/60Hz



| Frequency (MHz) | MaxPeak (dBμV) * | Average (dBμV) | Limit (dBμV) | Margin (dB) | Line | Corr. (dB) ** |
|-----------------|------------------|----------------|--------------|-------------|------|---------------|
| 0.634000        | 38.19            | ---            | 56.00        | 17.81       | N    | 10.3          |
| 1.338000        | 26.68            | ---            | 56.00        | 29.32       | N    | 10.3          |
| 2.030000        | 30.49            | ---            | 56.00        | 25.51       | N    | 10.3          |
| 3.402000        | 29.41            | ---            | 56.00        | 26.59       | N    | 10.4          |
| 11.162000       | 38.72            | ---            | 60.00        | 21.28       | N    | 10.7          |
| 13.254000       | 38.88            | ---            | 60.00        | 21.12       | N    | 10.8          |
| 13.254000       | ---              | 37.24          | 50.00        | 12.76       | N    | 10.8          |

Remark :

\* Max Peak=Reading Level + Correction Factor

\*\*Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

## 9.2 20 dB Bandwidth and 99% Occupied Bandwidth

### Test Method

1. Use the following spectrum analyzer settings:  
RBW=200Hz, VBW $\geq$ 3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 20 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be  $\geq$  20 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

### Limit

#### Limit [kHz]

\_\_\_\_\_  
No Limit

Test result:

Charging Mode:

| Frequency<br>KHz | 20dB<br>bandwidth<br>KHz | 99%<br>bandwidth<br>KHz | Result               |                      | Result |
|------------------|--------------------------|-------------------------|----------------------|----------------------|--------|
|                  |                          |                         | F <sub>L</sub> (KHz) | F <sub>H</sub> (KHz) |        |
| 118KHz           | 2.55                     | 2.08                    | 117                  | --                   | Pass   |
| 158KHz           | 2.43                     | 2.24                    | --                   | 159                  | Pass   |

Standby Mode:

| Frequency<br>KHz | 20dB<br>bandwidth<br>KHz | 99%<br>bandwidth<br>Hz | Result               |                      | Result |
|------------------|--------------------------|------------------------|----------------------|----------------------|--------|
|                  |                          |                        | F <sub>L</sub> (KHz) | F <sub>H</sub> (KHz) |        |
| 174.5KHz         | 1.00                     | 2.46                   | 173.2                | 175.7                | Pass   |

The fundamental frequency is outside the restricted bands of 15.205 section.

### 9.3 Radiated Emission Test

#### Test Method

- 1: The EUT was placed on a turn table which is 0.8m above ground for below 1GHz at 3 meters chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
- 3: The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4: For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 5: Use the following spectrum analyzer settings According to C63.10:

#### Limit

the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency<br>MHz | Field Strength<br>$\mu$ V/m | Field Strength<br>dB $\mu$ V/m | Detector | Measurement distance<br>meters |
|------------------|-----------------------------|--------------------------------|----------|--------------------------------|
| 0.009-0.490      | 2400/F(kHz)                 | 48.5-13.8                      | QP       | 300                            |
| 0.490-1.705      | 24000/F(kHz)                | 33.8-23.0                      | QP       | 30                             |
| 1.705-30         | 30                          | 29.5                           | QP       | 30                             |
| 30-88            | 100                         | 40                             | QP       | 3                              |
| 88-216           | 150                         | 43.5                           | QP       | 3                              |
| 216-960          | 200                         | 46                             | QP       | 3                              |
| 960-1000         | 500                         | 54                             | QP       | 3                              |
| Above 1000       | 500                         | 54                             | AV       | 3                              |
| Above 1000       | 5000                        | 74                             | PK       | 3                              |

Note 1: Limit 3m(dB $\mu$ V/m)=Limit 300m(dB $\mu$ V/m)+40Log(300m/3m) (Below 30MHz)

Note 2: Limit 3m(dB $\mu$ V/m)=Limit 30m(dB $\mu$ V/m)+40Log(30m/3m) (Below 30MHz)

### Radiated emissions test (9KHz-30MHz)

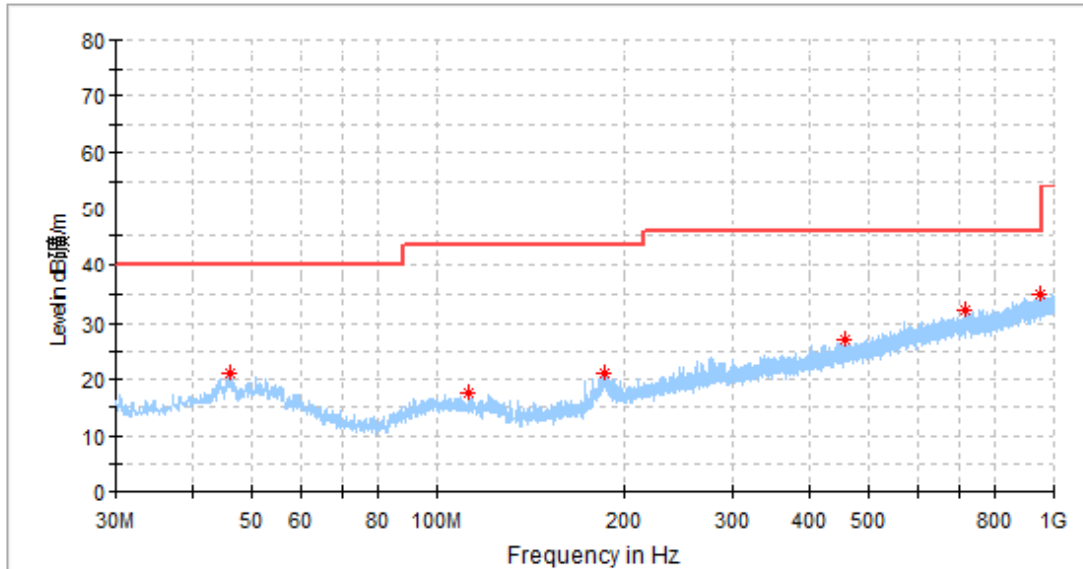
| Frequency Band | Frequency<br>MHz | Emission Level*<br>dBμV/m | Polarization | Limit<br>dBμV/m | Detector | Margin<br>dBμV/m | Correct factor**<br>(dB) | Result |
|----------------|------------------|---------------------------|--------------|-----------------|----------|------------------|--------------------------|--------|
| 9KHz-30MHz     | 0.119120         | 60.05                     | H            | 93.8            | QP       | 32.75            | 19.7                     | Pass   |
|                | 0.154975         | 50.35                     | H            | 93.8            | QP       | 43.45            | 19.7                     | Pass   |
|                | 0.164925         | 44.36                     | H            | 93.8            | QP       | 49.44            | 19.7                     | Pass   |
|                | 0.199750         | 44.39                     | H            | 93.8            | QP       | 49.41            | 19.7                     | Pass   |
|                | 0.229600         | 44.42                     | H            | 93.8            | QP       | 49.38            | 19.7                     | Pass   |
|                | 0.294275         | 44.35                     | H            | 93.8            | QP       | 49.45            | 19.7                     | Pass   |
|                | 0.324125         | 44.59                     | H            | 93.8            | QP       | 49.21            | 19.8                     | Pass   |
|                | Other frequency  | --                        | H            | 93.8            | QP       | --               | --                       | Pass   |
|                | 0.119120         | 55.05                     | V            | 93.8            | QP       | 37.75            | 19.7                     | Pass   |
|                | 0.154975         | 47.77                     | V            | 93.8            | QP       | 46.03            | 20.8                     | Pass   |
|                | 0.179850         | 32.89                     | V            | 93.8            | QP       | 60.91            | 19.7                     | Pass   |
|                | 0.214675         | 30.35                     | V            | 93.8            | QP       | 63.45            | 19.7                     | Pass   |
|                | Other frequency  | --                        | V            | 93.8            | QP       | --               | --                       | Pass   |

Remark:

- (1) \*Level=Reading Level + Correction Factor  
 \*\*Correction Factor=Cable Loss + LISN Factor  
 (The Reading Level is recorded by software which is not shown in the sheet)
- (2) Data of measurement within this frequency range shown "--" in the table above means the reading of emissions are the noise floor or attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain  
 Below 1GHz: Corrector factor = Antenna Factor + Cable Loss
- (4) All tested frequencies comply for the strictest limit (93.8dBμV/m). so the test result can considered as Pass.
- (5) Tested were performed at charging mode and standby mode, only worse case record in this report.

## Radiated emissions test (30MHz-1000MHz)

Product Type : Wireless charger  
 M/N : TC03  
 Operating Condition : Charging Mode  
 Test Specification : Horizontal  
 Comment : 30MHz-1000MHz



| Frequency (MHz) | MaxPeak* (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr.** (dB) |
|-----------------|-------------------|----------------|-------------|-------------|-----|---------------|--------------|
| 46.065625       | 20.97             | 40.00          | 19.03       | 100.0       | H   | 328.0         | 17.4         |
| 112.268125      | 17.47             | 43.50          | 26.03       | 100.0       | H   | 179.0         | 15.3         |
| 185.988125      | 21.04             | 43.50          | 22.46       | 200.0       | H   | 131.0         | 15.0         |
| 457.042500      | 27.14             | 46.00          | 18.86       | 100.0       | H   | 109.0         | 23.2         |
| 719.609375      | 32.26             | 46.00          | 13.74       | 200.0       | H   | 30.0          | 27.6         |
| 949.256875      | 35.12             | 46.00          | 10.88       | 100.0       | H   | 320.0         | 30.8         |

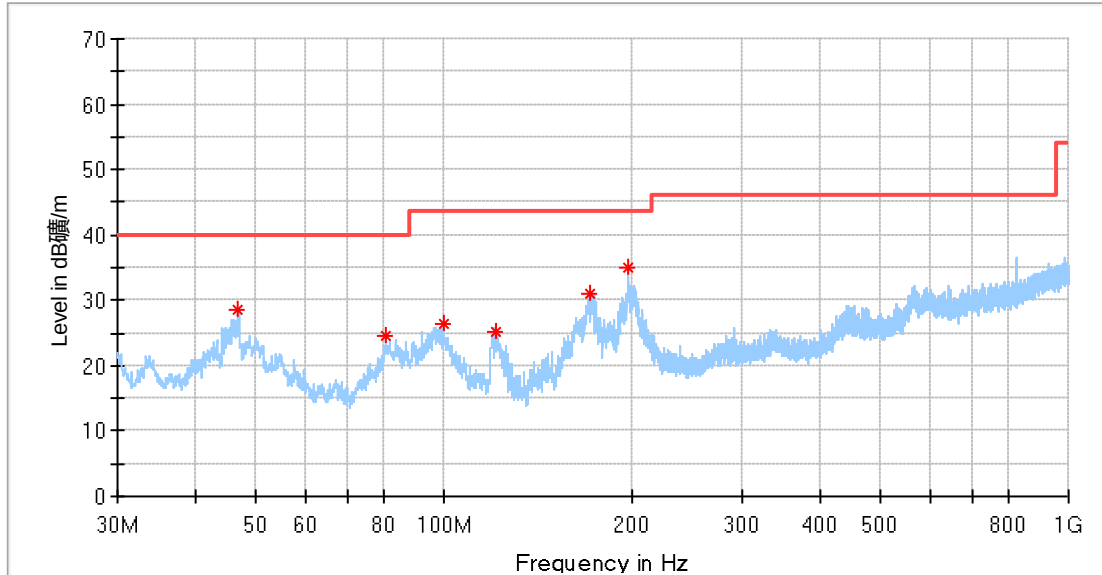
Remark :

\*Level=Reading Level + Correction Factor

\*\*Correction Factor=Antenna Factor + Cable Loss

(The Reading Level is recorded by software which is not shown in the sheet)

Product Type : Wireless charger  
 M/N : TC03  
 Operating Condition : Charging Mode  
 Test Specification : Vertical  
 Comment : 30MHz-1000MHz



| Frequency (MHz) | MaxPeak* (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr.** (dB) |
|-----------------|-------------------|----------------|-------------|-------------|-----|---------------|--------------|
| 46.853750       | 28.58             | 40.00          | 11.42       | 100.0       | V   | 38.0          | 18.0         |
| 80.500625       | 24.42             | 40.00          | 15.58       | 200.0       | V   | 227.0         | 11.9         |
| 99.961250       | 26.29             | 43.50          | 17.21       | 100.0       | V   | 218.0         | 16.4         |
| 120.998125      | 25.26             | 43.50          | 18.24       | 100.0       | V   | 124.0         | 14.5         |
| 170.710625      | 31.13             | 43.50          | 12.37       | 100.0       | V   | 109.0         | 13.9         |
| 196.900625      | 35.09             | 43.50          | 8.41        | 100.0       | V   | 148.0         | 16.2         |

Remark :

\*Level=Reading Level + Correction Factor

\*\*Correction Factor=Antenna Factor + Cable Loss

(The Reading Level is recorded by software which is not shown in the sheet)

## 10 Test Equipment List

### List of Test Instruments

#### Radiated Emission Test

| DESCRIPTION                         | MANUFACTURER    | MODEL NO. | SERIAL NO. | CAL. DUE DATE |
|-------------------------------------|-----------------|-----------|------------|---------------|
| EMI Test Receiver                   | Rohde & Schwarz | ESR 26    | 101269     | 2020-6-28     |
| Trilog Super Broadband Test Antenna | Schwarzbeck     | VULB 9163 | 707        | 2020-6-28     |
| Horn Antenna                        | Rohde & Schwarz | HF907     | 102294     | 2020-6-22     |
| Loop Antenna                        | Rohde & Schwarz | HFH2-Z2   | 100398     | 2020-7-7      |
| Pre-amplifier                       | Rohde & Schwarz | SCU 18    | 102230     | 2020-6-28     |
| Signal Generator                    | Rohde & Schwarz | SMY01     | 839369/005 | 2020-6-28     |
| Attenuator                          | Agilent         | 8491A     | MY39264334 | 2020-6-28     |
| 3m Semi-anechoic chamber            | TDK             | 9X6X6     | ----       | 2020-7-7      |

#### Conducted Emission Test

| Description       | Manufacturer      | Model no. | Serial no.     | cal. due date |
|-------------------|-------------------|-----------|----------------|---------------|
| EMI Test Receiver | Rohde & Schwarz   | ESR 3     | 101782         | 2020-6-28     |
| LISN              | Rohde & Schwarz   | ENV432    | 101318         | 2020-3-20     |
| Attenuator        | Shanghai Huaxiang | TS2-26-3  | 080928189      | 2020-6-28     |
| Test software     | Rohde & Schwarz   | EMC32     | Version9.15.00 | N/A           |

## 11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

| System Measurement Uncertainty                                                            |                                          |
|-------------------------------------------------------------------------------------------|------------------------------------------|
| Test Items                                                                                | Extended Uncertainty                     |
| Uncertainty for Conducted Emission 150kHz-30MHz<br>(for test using AMN ENV432 or ENV4200) | 3.21dB                                   |
| Uncertainty for Radiated Emission in 3m chamber<br>9kHz-30MHz                             | 4.46dB                                   |
| Uncertainty for Radiated Emission in 3m chamber<br>30MHz-1000MHz                          | Horizontal: 4.91dB;<br>Vertical: 4.89dB; |