

FCC - TEST REPORT

Report Number : **68.950.21.0105.01** Date of Issue: **March 01, 2021**

Model : **C302A**

Product Type : **OnePlus Warp Charger 50 Wireless Charger**

Brand name : **ONEPLUS**

Applicant : **OnePlus Technology (Shenzhen) Co., Ltd.**

Address : **18C02, 18C03, 18C04 and 18C05, Shum Yip Terra Building, Binhe**
: **Avenue North, Futian District, Shenzhen P.R.China**

Manufacturer : **OnePlus Technology (Shenzhen) Co., Ltd.**

Address : **18C02, 18C03, 18C04 and 18C05, Shum Yip Terra Building, Binhe**
: **Avenue North, Futian District, Shenzhen P.R.China**

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

Total pages including Appendices : **18**

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1 Table of Contents

| | | |
|-----|---|----|
| 1 | Table of Contents | 2 |
| 2 | Details about the Test Laboratory | 3 |
| 3 | Description of the Equipment Under Test | 4 |
| 4 | Summary of Test Standards | 5 |
| 5 | Summary of Test Results | 6 |
| 6 | General Remarks | 7 |
| 7 | Test Setups | 8 |
| 8 | Technical Requirement | 9 |
| 8.1 | Conducted Emission Test | 9 |
| 8.2 | 20 dB Bandwidth | 12 |
| 8.3 | Radiated Emission Test | 13 |
| 9 | Test Equipment List..... | 17 |
| 10 | System Measurement Uncertainty | 18 |

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
Building 12 & 13, Zhiheng Wisdomland Business Park, Nantou Checkpoint
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Shenzhen 518052
P.R. China

Telephone: 86 755 8828 6998

Fax: 86 755 828 5299

FCC Registration No.: 514049

3 Description of the Equipment Under Test

| | |
|----------------------------|--|
| Product: | OnePlus Warp Charger 50 Wireless Charger |
| Model no.: | C302A |
| FCC ID: | 2ABZ2-C302A |
| Rating: | Input: DC5V4A, DC9V2A, DC10V6.5A, DC20V3.25A Max Output: 50W Max |
| RF Transmission Frequency: | 110-148.5KHz |
| Antenna Type: | Integrated coil antenna |
| Description of the EUT: | The Equipment Under Test (EUT) is a Wireless Charger which operated at 110-148.5kHz. |

4 Summary of Test Standards

| Test Standards | |
|--|--|
| FCC Part 15 Subpart C 10-1-2019 Edition | PART 15 - RADIO FREQUENCY DEVICES 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 | | Test Site | Test Result | | |
| | | | Pass | Fail | N/A |
| §15.207 | Conducted emission AC power port | Site 1 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| -- | 20dB bandwidth | Site 1 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| §15.205 | Restricted bands of operation | Site 1 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| §15.209 | Radiated emission | 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) 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: January 12, 2021

Testing Start Date: January 12, 2021

Testing End Date: February 2, 2021

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

Reviewed by:

Prepared by:

Tested by:



John Zhi
Project Manager



Moon Xiong
Project Engineer

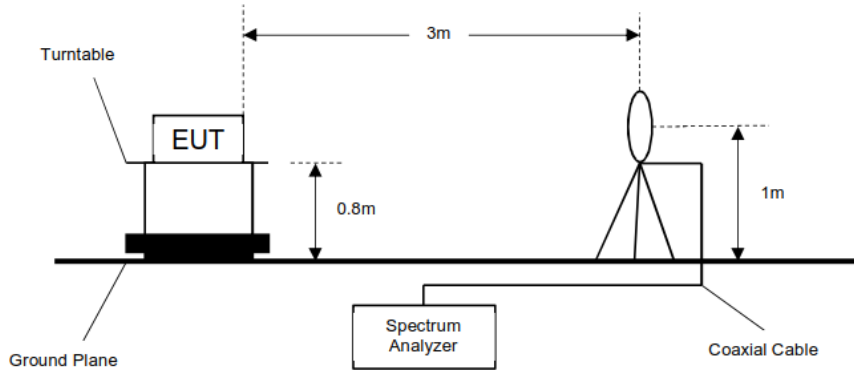


Tree Zhan
Test Engineer

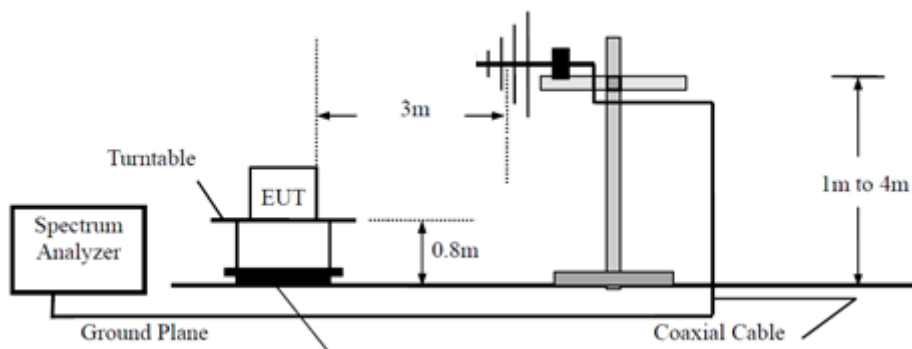
7 Test Setups

7.1 Radiated test setups

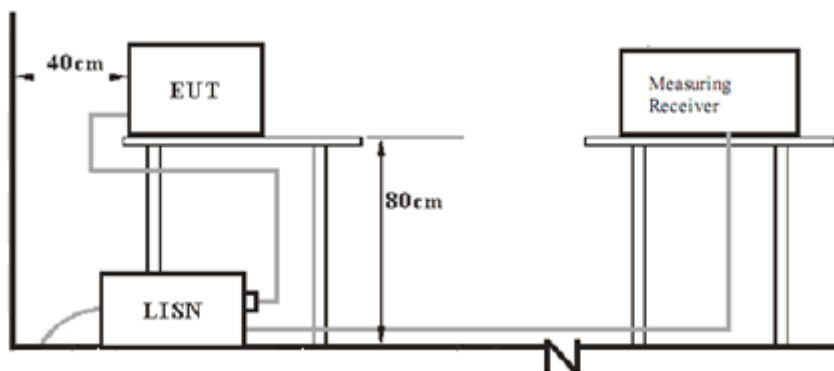
Below 30MHz



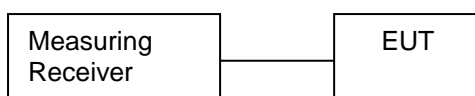
30MHz-1GHz



7.2 AC Power Conducted test setups



7.3 Conducted RF test setups



8 Technical Requirement

8.1 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

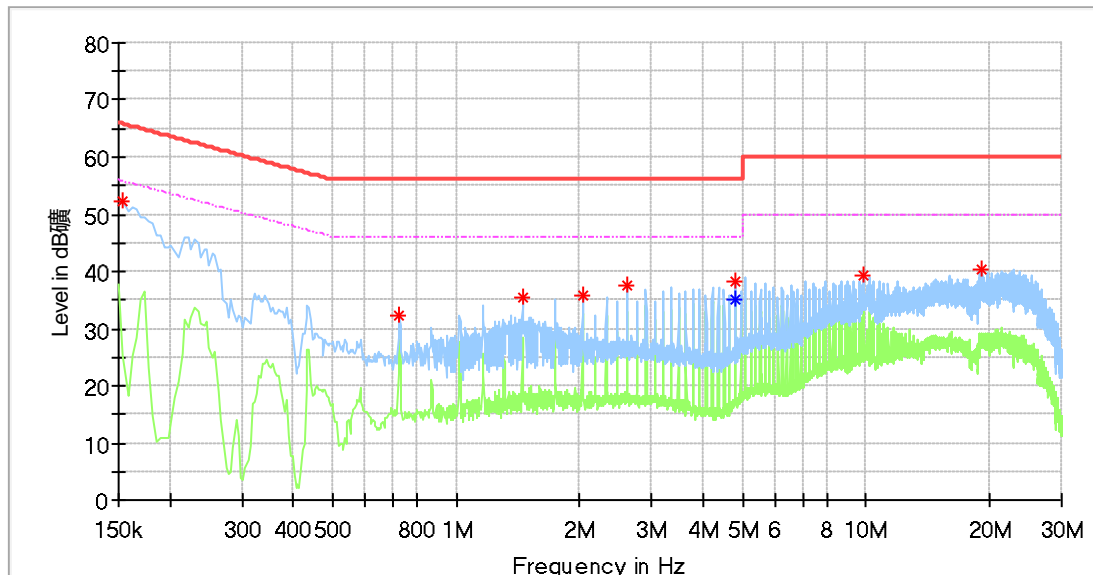
According to §15.207, conducted emissions limit as below:

| Frequency | QP Limit | AV Limit |
|-------------|------------|------------|
| MHz | dB μ V | dB μ 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

Model: C302A
 Test mode: Charging
 Test Voltage: AC 120V/60Hz
 Test Site: Shielding Room #4
 Remark:



Critical Freqs

| Frequency (MHz) | MaxPeak (dBμV) | Average (dBμV) | Limit (dBμV) | Margin (dB) | Line | Corr. (dB) |
|-----------------|----------------|----------------|--------------|-------------|------|------------|
| 0.154000 | 52.14 | --- | 65.78 | 13.64 | L1 | 10.32 |
| 0.726000 | 32.43 | --- | 56.00 | 23.57 | L1 | 10.33 |
| 1.454000 | 35.42 | --- | 56.00 | 20.58 | L1 | 10.36 |
| 2.034000 | 35.95 | --- | 56.00 | 20.05 | L1 | 10.38 |
| 2.614000 | 37.43 | --- | 56.00 | 18.57 | L1 | 10.40 |
| 4.794000 | 38.12 | --- | 56.00 | 17.88 | L1 | 10.51 |
| 4.794000 | --- | 35.15 | 46.00 | 10.85 | L1 | 10.51 |
| 9.878000 | 39.31 | --- | 60.00 | 20.69 | L1 | 10.75 |
| 19.178000 | 40.22 | --- | 60.00 | 19.78 | L1 | 11.21 |

Remark:

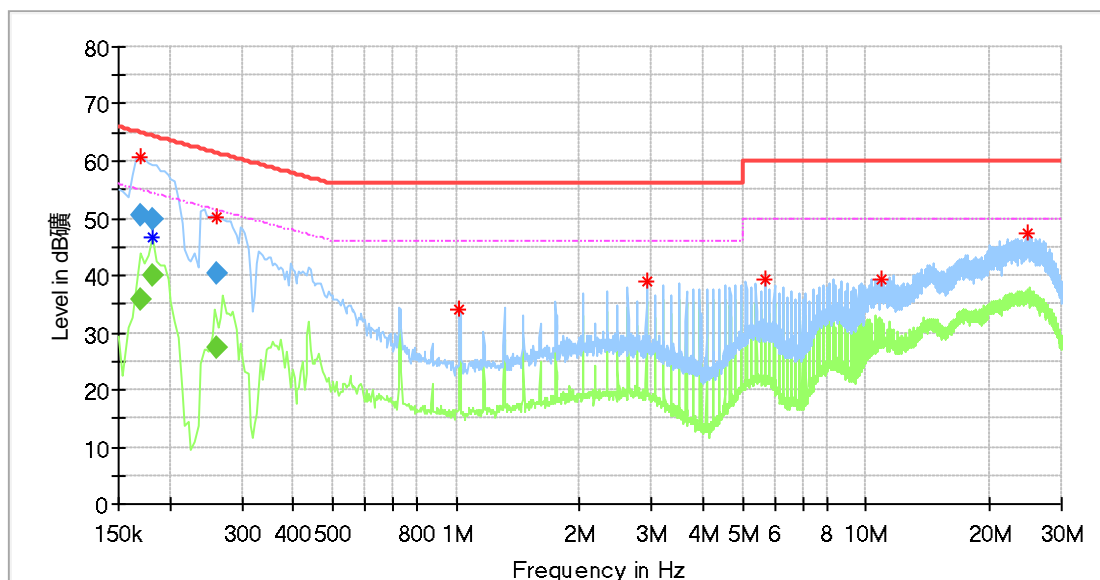
Level=Reading Level + Correction Factor

Correction Factor=Cable Loss + LISN Factor

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

Conducted Emission

Model: C302A
 Test mode: Charging
 Test Voltage: AC 120V/60Hz
 Test Site: Shielding Room #4
 Remark:



Critical Freqs

| Frequency (MHz) | MaxPeak (dBμV) | Average (dBμV) | Limit (dBμV) | Margin (dB) | Line | Corr. (dB) |
|-----------------|----------------|----------------|--------------|-------------|------|------------|
| 0.169500 | 60.72 | --- | 64.96 | 4.24 | N | 10.33 |
| 0.181500 | --- | 46.61 | 54.39 | 7.79 | N | 10.33 |
| 0.261500 | 50.15 | --- | 61.24 | 11.09 | N | 10.33 |
| 1.018000 | 34.21 | --- | 56.00 | 21.79 | N | 10.35 |
| 2.914000 | 38.82 | --- | 56.00 | 17.18 | N | 10.44 |
| 5.682000 | 39.32 | --- | 60.00 | 20.68 | N | 10.59 |
| 10.926000 | 39.23 | --- | 60.00 | 20.77 | N | 10.85 |
| 24.674000 | 47.43 | --- | 60.00 | 12.57 | N | 11.63 |

Final Result

| Frequency (MHz) | QuasiPeak (dBμV) | Average (dBμV) | Limit (dBμV) | Margin (dB) | Line | Corr. (dB) |
|-----------------|------------------|----------------|--------------|-------------|------|------------|
| 0.169500 | --- | 35.74 | 54.98 | 19.24 | N | 10.33 |
| 0.169500 | 50.63 | --- | 64.98 | 14.35 | N | 10.33 |
| 0.181500 | --- | 39.94 | 54.42 | 14.48 | N | 10.33 |
| 0.181500 | 49.74 | --- | 64.42 | 14.68 | N | 10.33 |
| 0.261500 | --- | 27.29 | 51.38 | 24.09 | N | 10.33 |
| 0.261500 | 40.43 | --- | 61.38 | 20.95 | N | 10.33 |

Remark:

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)

8.2 20 dB 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

| Frequency KHz | 20dB bandwidth KHz | Result | | Result |
|------------------|--------------------------|----------------------|----------------------|--------|
| | | F _L (KHz) | F _H (KHz) | |
| 110KHz | 2.6 | 111.69 | -- | Pass |
| 148.5KHz | 2.6 | -- | 146.94 | Pass |

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

8.3 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 MHz | Field Strength $\mu\text{V/m}$ | Field Strength $\text{dB}\mu\text{V/m}$ | Detector | Measurement distance meters |
|------------------|-----------------------------------|--|----------|--------------------------------|
| 0.009-0.490 | 2400/F(kHz) | 48.5-13.8 | AV | 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 $3\text{m}(\text{dB}\mu\text{V/m}) = \text{Limit } 300\text{m}(\text{dB}\mu\text{V/m}) + 40\text{Log}(300\text{m}/3\text{m})$ (Below 30MHz)

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

Radiated emissions test (9KHz-30MHz)

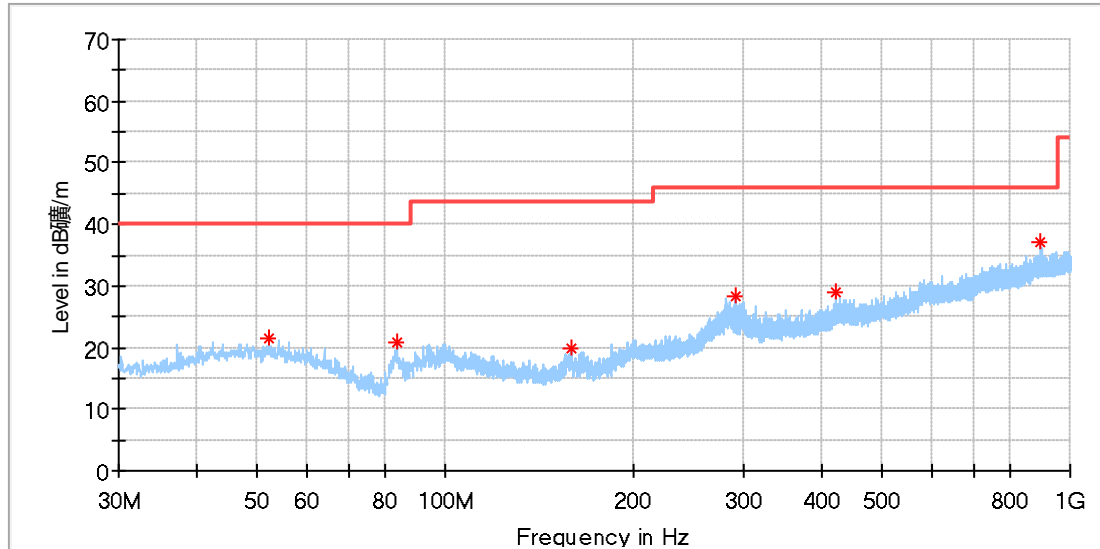
| Frequency Band | Frequency MHz | Emission Level dBμV/m | Polarization | Limit dBμV/m | Detector | Margin dBμV/m | Correct factor (dB) | Result |
|----------------|------------------|--------------------------|--------------|-----------------|----------|------------------|------------------------|--------|
| 9KHz-30MHz | 0.145488 | 98.81 | H | 104.35 | Average | 5.54 | 19.65 | Pass |
| | 0.144078 | 83.41 | H | 104.43 | Average | 21.02 | 19.66 | Pass |
| | 0.143373 | 100.76 | H | 104.47 | Average | 3.71 | 19.66 | Pass |
| | 0.433575 | 74.49 | H | 94.86 | Average | 20.37 | 19.61 | Pass |
| | 0.144454 | 85.89 | H | 104.41 | Average | 18.52 | 19.66 | Pass |
| | Other frequency | -- | H | | Average | -- | -- | Pass |
| | 0.145488 | 91.34 | V | 104.35 | Average | 13.01 | 19.65 | Pass |
| | 0.144454 | 72.48 | V | 104.41 | Average | 31.93 | 19.66 | Pass |
| | 0.009047 | 57.82 | V | 128.47 | Average | 70.65 | 20.03 | Pass |
| | 0.150000 | 73.00 | V | 104.08 | Average | 31.08 | 19.65 | Pass |
| | 0.433575 | 62.49 | V | 94.86 | Average | 32.37 | 19.61 | Pass |
| | Other frequency | -- | V | | Average | -- | -- | Pass |

Remark:

- (1) “*” means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
- (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

Radiated emissions test (30MHz-1000MHz)

Model: C302A
 Test Mode: Charging
 Test Voltage: AC 120V/50Hz
 Remark:



Critical Freqs

| Frequency (MHz) | MaxPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|----------------|-------------|-------------|-----|---------------|--------------|
| 52.249375 | 21.42 | 40.00 | 18.58 | 100.0 | H | 83.0 | 17.80 |
| 83.713750 | 20.79 | 40.00 | 19.21 | 200.0 | H | 172.0 | 12.03 |
| 159.313125 | 19.79 | 43.50 | 23.71 | 200.0 | H | 234.0 | 13.14 |
| 291.051250 | 28.27 | 46.00 | 17.73 | 100.0 | H | 73.0 | 18.50 |
| 421.880000 | 28.97 | 46.00 | 17.03 | 100.0 | H | 219.0 | 21.93 |
| 898.392500 | 36.99 | 46.00 | 9.01 | 200.0 | H | 0.0 | 29.58 |

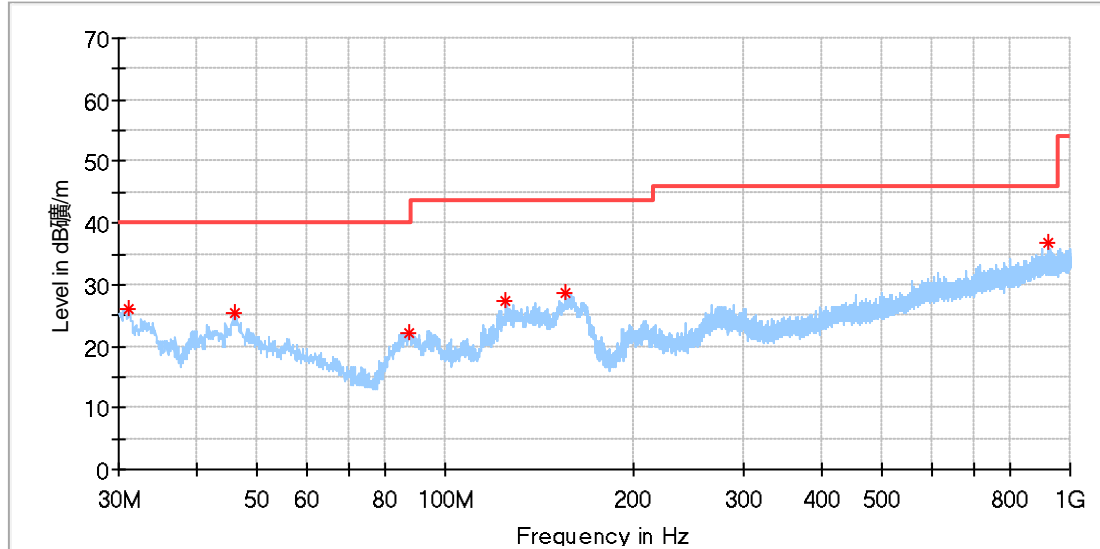
Remark:

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)

Model: C302A
 Test Mode: Charging
 Test Voltage: AC 120V/50Hz
 Remark:



Critical_Freqs

| Frequency (MHz) | MaxPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|----------------|-------------|-------------|-----|---------------|--------------|
| 31.151875 | 26.01 | 40.00 | 13.99 | 100.0 | V | 31.0 | 14.42 |
| 46.186875 | 25.28 | 40.00 | 14.72 | 100.0 | V | 83.0 | 17.77 |
| 87.654375 | 22.26 | 40.00 | 17.74 | 100.0 | V | 31.0 | 13.38 |
| 125.120625 | 27.43 | 43.50 | 16.07 | 100.0 | V | 327.0 | 13.32 |
| 155.978750 | 28.63 | 43.50 | 14.87 | 100.0 | V | 185.0 | 12.98 |
| 919.914375 | 36.63 | 46.00 | 9.37 | 100.0 | V | 0.0 | 29.66 |

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)

9 Test Equipment List

List of Test Instruments

Radiated Emission Test

| DESCRIPTION | MANUFACTURE R | MODEL NO. | EQUIPMENT ID | SERIAL NO. | CAL INTERVAL (YEAR) | CAL. DUE DATE |
|---|------------------|-----------|------------------------|---------------------|---------------------------|------------------|
| EMI Test Receiver | Rohde & Schwarz | ESR 7 | 68-4-74-19-001 | 102176 | 1 | 2021-6-29 |
| Trilog Super Broadband Test Antenna | Schwarzbeck | VULB 9163 | 68-4-80-14-002 | 707 | 1 | 2021-8-4 |
| Horn Antenna | Rohde & Schwarz | HF907 | 68-4-80-14-005 | 102294 | 1 | 2021-7-14 |
| Loop Antenna | Rohde & Schwarz | HFH2-Z2 | 68-4-80-14-006 | 100398 | 1 | 2021-9-2 |
| Pre-amplifier | Rohde & Schwarz | SCU 18 | 68-4-29-14-001 | 102230 | 1 | 2021-6-21 |
| Attenuator | Agilent | 8491A | 68-4-81-16-001 | MY39264334 | 1 | 2021-6-21 |
| 3m Semi-anechoic chamber | TDK | 9X6X6 | 68-4-90-14-001 | ---- | 3 | 2022-10-28 |
| Test software | Rohde & Schwarz | EMC32 | 68-4-90-14- 001-A10 | Version10.35.0 2 | N/A | N/A |

Conducted Emission Test

| DESCRIPTION | MANUFACTURE R | MODEL NO. | EQUIPMENT ID | SERIAL NO. | CAL INTERVAL (YEAR) | CAL. DUE DATE |
|-----------------------|----------------------|--------------------|------------------------|--------------------|---------------------------|------------------|
| EMI Test Receiver | Rohde & Schwarz | ESR 3 | 68-4-74-14-001 | 101782 | 1 | 2021-6-29 |
| LISN | Rohde & Schwarz | ENV4200 | 68-4-87-14-001 | 100249 | 1 | 2021-6-12 |
| LISN | Rohde & Schwarz | ENV432 | 68-4-87-16-001 | 101318 | 1 | 2021-6-12 |
| LISN | Rohde & Schwarz | ENV216 | 68-4-87-14-002 | 100326 | 1 | 2021-6-12 |
| ISN | Rohde & Schwarz | ENY81 | 68-4-87-14-003 | 100177 | 1 | 2021-6-12 |
| ISN | Rohde & Schwarz | ENY81-CA6 | 68-4-87-14-004 | 101664 | 1 | 2021-6-12 |
| High Voltage Probe | Schwarzbeck | TK9420(VT942 0) | 68-4-27-14-001 | 9420-584 | 1 | 2021-6-23 |
| RF Current Probe | Rohde & Schwarz | EZ-17 | 68-4-27-14-002 | 100816 | 1 | 2021-6-28 |
| Attenuator | Shanghai Huaxiang | TS2-26-3 | 68-4-81-16-003 | 080928189 | 1 | 2021-6-21 |
| Test software | Rohde & Schwarz | EMC32 | 68-4-90-14- 003-A10 | Version9.15.0 0 | N/A | N/A |

10 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 (for test using AMN ENV432 or ENV4200) | 3.62dB |
| Uncertainty for Radiated Emission in 3m chamber 9KHz-30MHz | 4.60 dB |
| Uncertainty for Radiated Emission in 3m chamber 30MHz-1000MHz | Horizontal: 4.63dB; Vertical: 4.61dB; |