

# TEST REPORT



**Test Report File No.** : S21066-1(1)

**Date of Issue** : 7, February, 2022

**Type** : Commercial Microwave Oven

**Model No.** : NE-12521

**Applicant** : Panasonic Corporation of North America

**Address** : Two Riverfront Plaza, Newark, New Jersey, United States, 07102-5490

**Manufacturer** : Panasonic System Networks Vietnam Co., Ltd

**Address** : Lot J1-J2, Thang Long Industrial Park, Dong Anh Dist, Hanoi, Vietnam

**Test Result Accord** :  **Positive**  **Negative** to the standards at page 4

Approved by:

Reviewed by:

A handwritten signature in blue ink that reads 'T. Nakamori'.

Takuya Nakamori

Laboratory Director,  
EMC Test Laboratory

A handwritten signature in blue ink that reads 'M. Yamanaka'.

Masaki Yamanaka

Technical Manager

The test laboratory is not responsible for the data and information provided by the applicant, which may affect the validity of the results.

The results in this report apply only to the tested sample.

This test report shall not be reproduced in full or partial, without the written approval of the test laboratory.

This test report must not be used by the customer to claim product certification, approval, or endorsement by any agency of the U.S. Government.

This test report replaces already issued S21066-1 (21 January, 2022).

## Revision History

| Revision | Test Report No. | Date              | Description                         |
|----------|-----------------|-------------------|-------------------------------------|
| -        | S21066-1        | 21 January, 2022  | Original Issue                      |
| (1)      | S21066-1(1)     | 7, February, 2022 | Corrected the Applicant (Page 1, 7) |

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(\*) Data and information are provided by the applicant.  
The information on the cover and data is also provided by the customer.

# Definitions for Symbols used in this Test Report

Black box indicates (■) that the listed condition, standard, or equipment was applicable for this Report.  
Blank box indicates (□) that the listed condition, standard, or equipment was not applicable for this Report.

## Test Standards

The tests were performed according to the following standards:

- FCC Rules and Regulations Part 18 Subpart C - Technical Standards
- FCC / OST MP-5 (1986) - Test Procedure

## Purpose

The purpose of this report is to show compliance of the Commercial Microwave Oven/Model NE-12521 to the requirement of Part 18 of the FCC Rules and Regulations (47 CFR, PART 18, Subpart C).

## Requirement

The test requirements are as follows.

### ***Field strength limits (FCC Part 18, 18.305)***

The measured output power was found to be more than 500 W (see 6.3). Therefore, in accordance with Section 18.305 of Subpart C, the measured out-of-band emissions were compared with the limit calculated as following:

$$\text{LFS} = 25 * \text{SQRT} (\text{RF Power Output [W]}/500)$$

$$\text{LFS} = 25 * \text{SQRT} (1052.8 / 500)$$

$$\text{LFS} \approx 36.277 \text{ } \mu\text{V/m}$$

Where: LFS is the maximum allowable field strength for out-of-band emissions in  $\mu\text{V/m}$  at a 300 m measurement distance. Power Output is the measure output power in watts.

| Limit @300 m [ $\mu\text{V/m}$ ] | Limit @300 m [ $\text{dB}\mu\text{V/m}$ ] | Limit @10 m [ $\text{dB}\mu\text{V/m}$ ] | Limit @3 m [ $\text{dB}\mu\text{V/m}$ ] |
|----------------------------------|---|--|---|
| 36.277                           | 31.193                                    | 60.735                                   | 70.193                                  |

### ***Frequency measurements (OST MP-5, Sec. 4.5)***

Measurements are made of:

(a) The variation of frequency with time, using the load specified in Section 4.1 (OST MP-5), starting with the EUT and load at room temperature and continuing until the load quantity has been reduced by evaporation to approximately 20% of the original quantity.

This test is made with nominal rated AC supply voltage.

(b) The variation of frequency for line voltage variation from 80 % to 125 % of nominal rated voltage, starting with the EUT warm from at least 10 minutes use, with a load as specified in Section 4.1 (OST MP-5), and with this load at room temperature at the beginning of the test.

# Summary

## ◆ General Remarks:

- The tests were all good result.
- The Conduction test was not applied because of the EUT is non-consumer equipment.

## ◆ The Equipment Under Test:

- Fulfill the general approval requirements cited on page 4.
- Not fulfill the general approval requirements cited on page 4.

EUT received date : 28 November, 2021

Testing Start Date : 8 December, 2021

Testing End Date : 18 January, 2022

## ◆ Final Judgment:

The requirements according to the technical regulations and tested operation modes are

- MET.
- NOT MET.

|   | Frequency Range (MHz) | Minimum Margin (dB) | Detector |
|---|-----------------------|---------------------|----------|
| Radiated Emission   | 0.009 - 30            | 72.8                | AV       |
|   | 30 - 1000             | 44.6                | AV       |
|   | 1000 - 25000          | 11.6                | AV       |
| Remark: Port applicable to test : Refer to "Operation of the EUT during Testing " . |                       |                     |          |

## ◆ Test Site Description:

This testing was performed at following site:

Name of the Test Site : Panasonic Corporation, Product Analysis Center, EMC Test Laboratory  
Sasayama EMC Site

Address : 231-1 Yashiro, Tamba Sasayama-shi, Hyogo, 669-2356 Japan

TEL : +81(79) 552-5681

FAX : +81(79) 552-5682

Sasayama EMC Site is accredited by The Japan Accreditation Board for Conformity Assessment (JAB) for the specific scope of accreditation under Lab. Certificate No. : RTL02730

## Environmental Conditions

See each Test Data.

## Measurement Uncertainty

The data and results referenced in this document are true and accurate. The test results are traceable to the National or International Standards.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k=2$ , providing a level of confidence of approximately 95%.

- Measurement instrumentation uncertainty was “not” taken into account in the determination of compliance.
- Measurement instrumentation uncertainty was taken into account in the determination of compliance.

Our laboratory quotes measurement uncertainty as follows.

### **Radiated Emission (Magnetic Field) :**

|   |               |          |
|---|---------------|----------|
| 0.009 MHz – 30 MHz (0.6 m Loop antenna) | 10 m distance | ± 2.5 dB |
|---|---------------|----------|

### **Radiated Emission (Below 1 GHz : Electric Field) :**

|   |               |            |          |
|---|---------------|------------|----------|
| 30 MHz – 300 MHz<br>(Biconical Antenna)     | 10 m distance | Horizontal | ± 3.8 dB |
|   |               | Vertical   | ± 3.7 dB |
| 300 MHz – 1000 MHz<br>(Logperiodic Antenna) | 10 m distance | Horizontal | ± 2.7 dB |
|   |               | Vertical   | ± 3.1 dB |

### **Radiated Emission (Above 1 GHz : Electric Field) :**

|                                  |              |          |
|----------------------------------|--------------|----------|
| 1 GHz – 6 GHz (Horn Antenna)     | 3 m distance | ± 4.8 dB |
| 6 GHz – 18 GHz (Horn Antenna)    | 3 m distance | ± 5.0 dB |
| 18 GHz – 26.5 GHz (Horn Antenna) | 3 m distance | ± 5.4 dB |

# Equipment under Test\*

## ◆ Applicant

Company Name : Panasonic Corporation of North America

Address : Two Riverfront Plaza, Newark, New Jersey, United States, 07102-5490

## ◆ Identification of EUT A

Type : Commercial Microwave Oven

Rated Voltage : AC 120 V, 60 Hz

Model : NE-12521

Rated Power : Output 1200 W (IEC 705)

Serial No : 6CO1150002

Protection class : Class 2

Operating Frequency : 2450 MHz ± 50 MHz

Dimensions W x D x H (mm) : 422 x 508 x 337

Firmware Version : -

Software Version : -

Equipment authorization : Supplier's Declaration of Conformity

FCC ID : ACLAQ3F01

## ◆ Source of Interference & Internal Frequencies : Highest Frequency 8 MHz

| Clock Source         | Frequency (MHz) |
|----------------------|-----------------|
| <u>Microcomputer</u> | <u>8</u>        |

## ◆ Noise Suppression Components

None

## ◆ Measures for Electromagnetic Shielding

None

## Operation of the EUT during Testing\*

### ◆ Modification of the EUT

The test laboratory did not modify the EUT during the test.

### ◆ Power Supply System Utilized

Power supply system : 120 V / 60 Hz / 1φ

### ◆ Operation mode of the EUT

The equipment under test was operated during the measurement under the following conditions.  
Refer to “ Details of Ports “ and “ Block diagram of the equipment under test (EUT) “ for all relevant ports.

- High power mode (P10)

### ◆ Description of EUT:

| Symbol | Type                      | Model    | Serial No. | Manufacturer | EUT condition  |
|--------|---------------------------|----------|------------|--------------|----------------|
| A      | Commercial Microwave Oven | NE-12521 | 6CO1150002 | Panasonic    | Pre-Production |

EUT A :

Operating frequency : 2450MHz  
Type of Magnetron : 2M210  
Door Seal Type : Choke  
Employed mode : Stirrer

The following interface cables and the peripheral devices were connected during the measurement:

### ◆ Power Cables

| No. | Name of Cable<br>Model / Manufacturer      | Pin | Length<br>(m) | Shield     | Ferrite<br>Quantity | Ground<br>Line |
|-----|--|-----|---------------|------------|---------------------|----------------|
| 1   | AC Power Cord for EUT A<br>SJT / WELL SHIN | 3   | 1.5           | Unshielded | None                | Yes            |

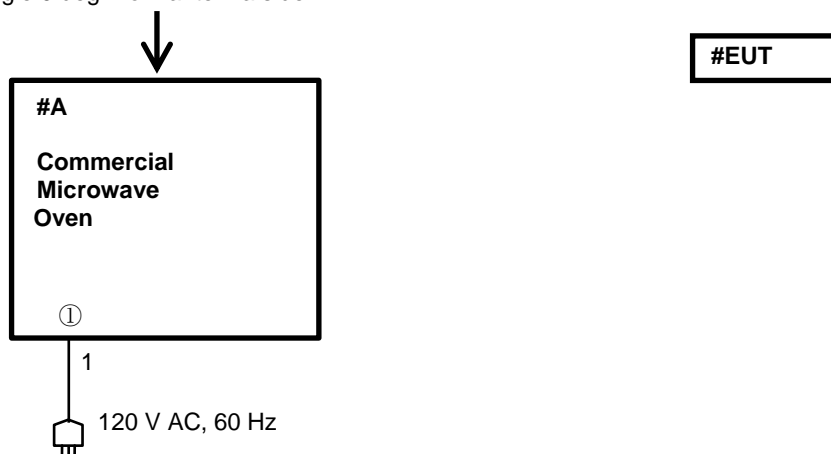
### ◆ Details of ports

| Port No. | Name of port   | Remarks |
|----------|----------------|---------|
| (1)      | AC 120 V/60 Hz |         |

### ◆ Block diagram of the EUT

- High power mode (P10)

Terntable is the course of  
the angle 0 deg. from antenna side





# Test Results and Conditions

## Radiated Emission (Magnetic Field)

The measurement of the Radiated Emission (Magnetic Field) in the frequency range 8 MHz - 30 MHz was performed in horizontal and vertical antenna position according to FCC Part 18 at:

**Test Location:**

- 10 m anechoic chamber

**Test Distance:**

- 10 m (with a 0.6 m loop antenna)

**Test Volume:**

- φ 0.64 m

Lists of the Test Equipment: Refer to Appendix A

**Result: The requirements are**                       **MET**                       **NOT MET**

Min. limit margin                      72.8 dB                      at 16.561 MHz  
(AV detector receiver with 0 deg antenna polarization)

|   |  |
|---|--|
| Test Condition of Instrument<br>Resolution Bandwidth    :    9 kHz (8 MHz to 30 MHz)<br><br>Detector Function         :    Average<br>Test Mode                    :    High power mode (P10)<br><br>Test Voltage                 :    120 V / 60Hz<br>Load                         :    1050 ml Center | EUT Warm-up Time: 10 minutes<br>Date: 8 December, 2021<br>Environment: 20 deg.C / 38 % / 990 hPa |
|---|--|

### Test Data

| Antenna Polar. | Freq. [MHz] | Factor [dB/m] | Reading at 10 m [dBμV] | Emission Level at 10 m [dBμV/m] | Emission Level at 300 m [dBμV/m] | Emission Level at 300 m [μV/m] | Limit at 300 m [μV/m] | Margin at 300 m [μV/m] | Margin at 300 m [dB] | Height [cm] | EUT Angle [deg.] |
|----------------|-------------|---------------|------------------------|---------------------------------|----------------------------------|--------------------------------|-----------------------|------------------------|----------------------|-------------|------------------|
| Hori.          | 13.260      | 20.8          | -3.3                   | 17.5                            | -41.585                          | 0.00833                        | 36.277                | 36.27                  | 72.8                 | 200         | 0                |
| 0              | 16.561      | 21.1          | -3.6                   | 17.5                            | -41.585                          | 0.00833                        | 36.277                | 36.27                  | 72.8                 | 200         | 225              |
| 45             | 26.782      | 21.3          | -4.3                   | 17.0                            | -42.085                          | 0.00787                        | 36.277                | 36.27                  | 73.3                 | 200         | 0                |
| 90             | 24.779      | 21.3          | -4.4                   | 16.9                            | -42.185                          | 0.00778                        | 36.277                | 36.27                  | 73.4                 | 200         | 18               |
| 135            | 26.728      | 21.3          | -4.0                   | 17.3                            | -41.785                          | 0.00814                        | 36.277                | 36.27                  | 73.0                 | 200         | 84               |

Factor [dB/m] = Antenna Factor [dB/m] + Cable Loss [dB] - Amp. Gain [dB]  
 Emission Level at 10 m [dBμV/m] = Reading at 10m [dBμV] + Factor [dB/m]  
 Emission Level at 300 m [dBμV/m] = Emission Level at 10 m [dBμV/m] + 40log(10/300) [dB]

Note: Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Description of calculation

9 kHz to 30 MHz

Calculation Formula to get field strength at 300 m from the measured at 10 m.

Calculation Formula:

$$\begin{aligned} & \text{Emission Level at 300 m } [\mu\text{V/m}] \\ & = 10^{\{( \text{Emission Level at 10 m } [\text{dB}\mu\text{V/m}] / 20 \} * (10/300)^2} \end{aligned}$$

Example: Frequency                      16.561 MHz,  
Emission Level at 10 m   17.5 dB $\mu$ V/m

$$\begin{aligned} & \text{Emission Level at 300 m } [\mu\text{V/m}] \\ & = 10^{(17.5 / 20) * (10/300)^2} \\ & = 0.00833 \mu\text{V/m} \end{aligned}$$

## Photographs of the Test Set-up

The EUT was placed on a 1 m high nonconductive turntable.

The turntable was separated from the antenna by a distance of 10 m.

The operation mode was selected for maximum emission.

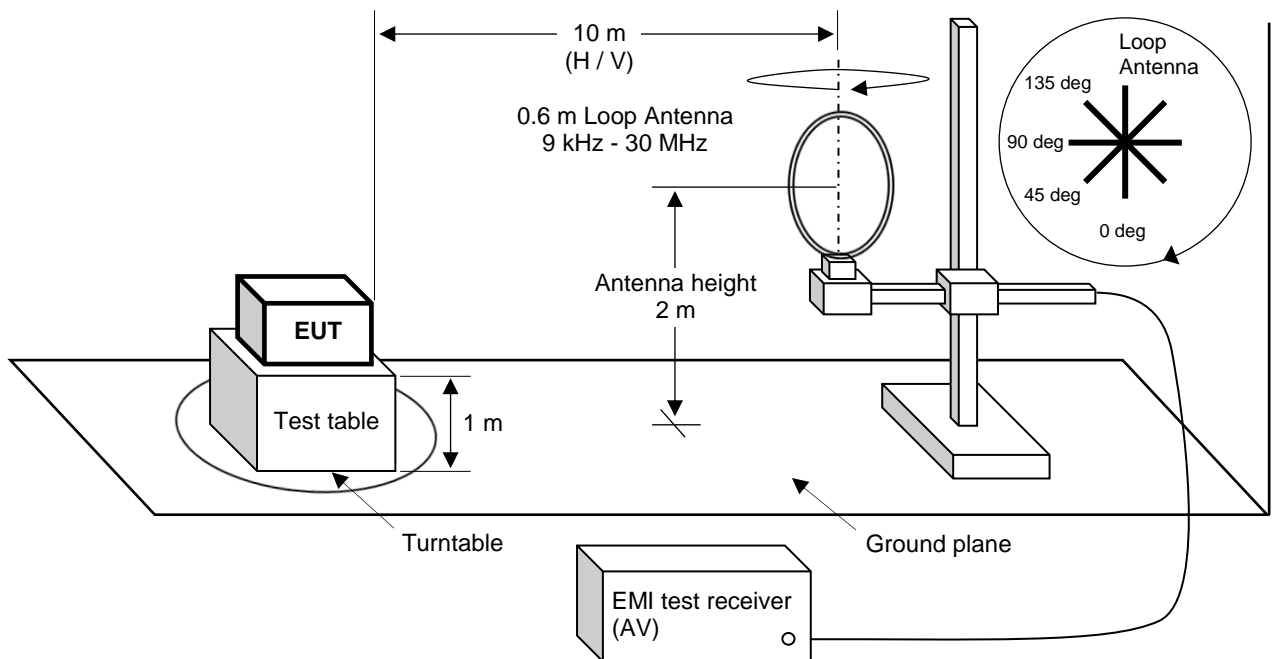
Pre-check : A loop antenna was set at a height of 2 m and a level with a small margin of Vertical axis (0°, 45°, 90°, 135°) and Horizontal Axis was measured using a spectrum analyzer.

Final measurement : Emission levels (AV value) were measured by means of the test receiver referring the result of Pre-check.

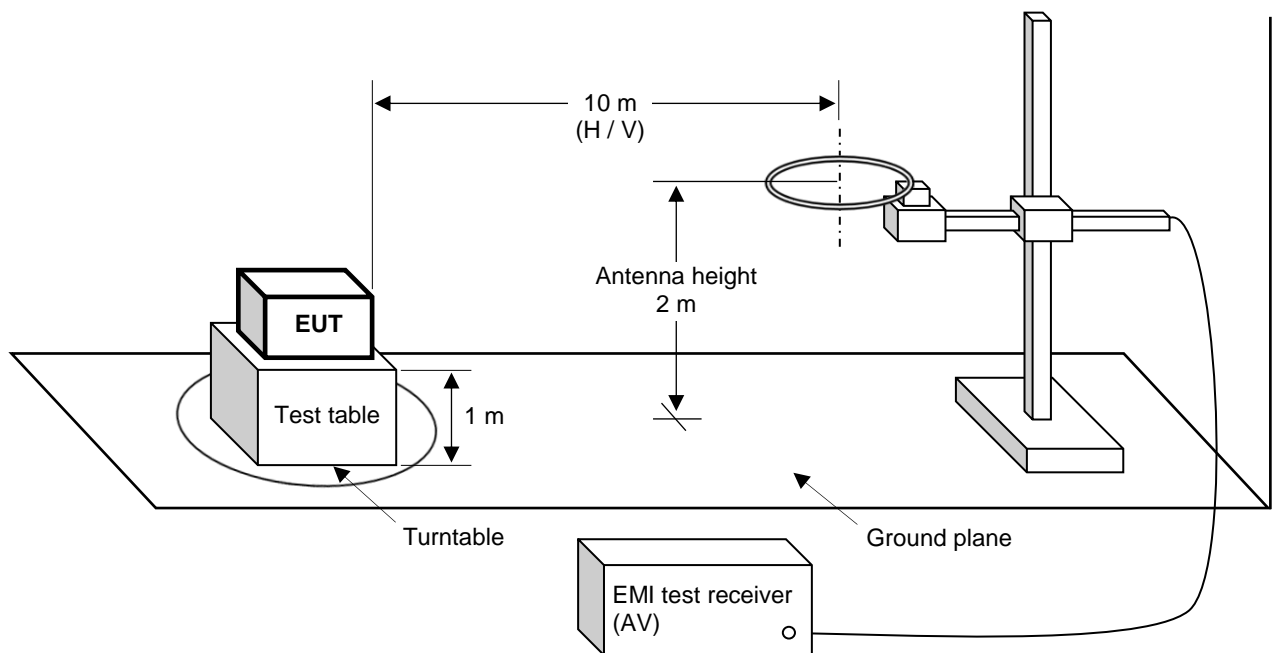
The emission levels from the EUT were maximized changing conditions; Turntable rotation, Antenna height and arrangement of the EUT.

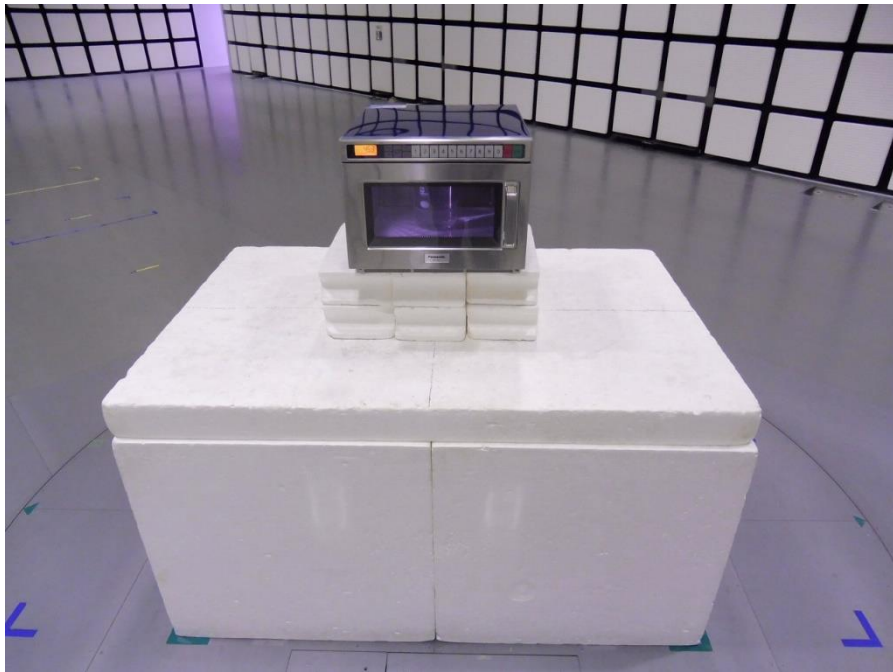
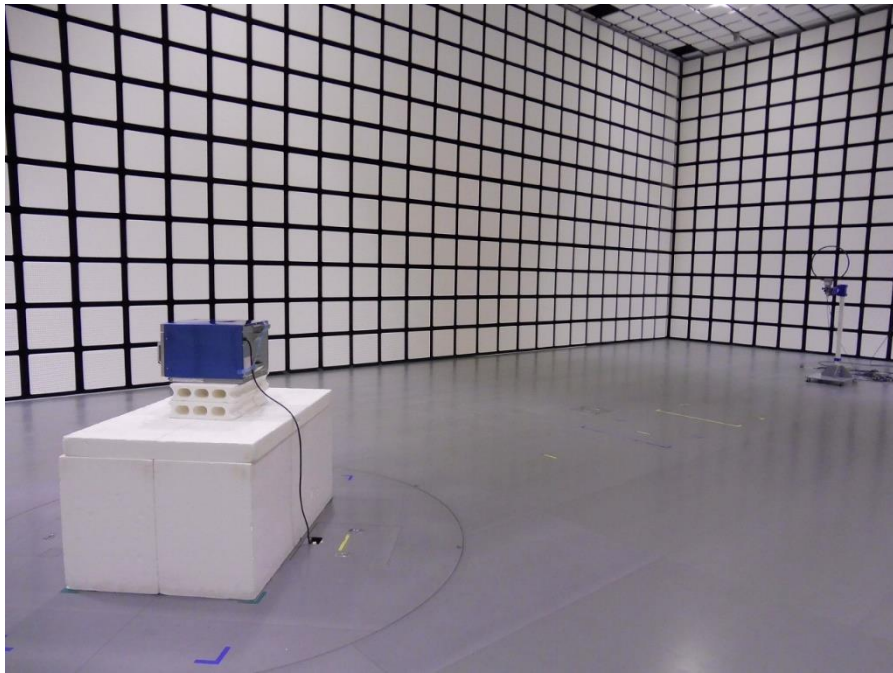
### Drawing:

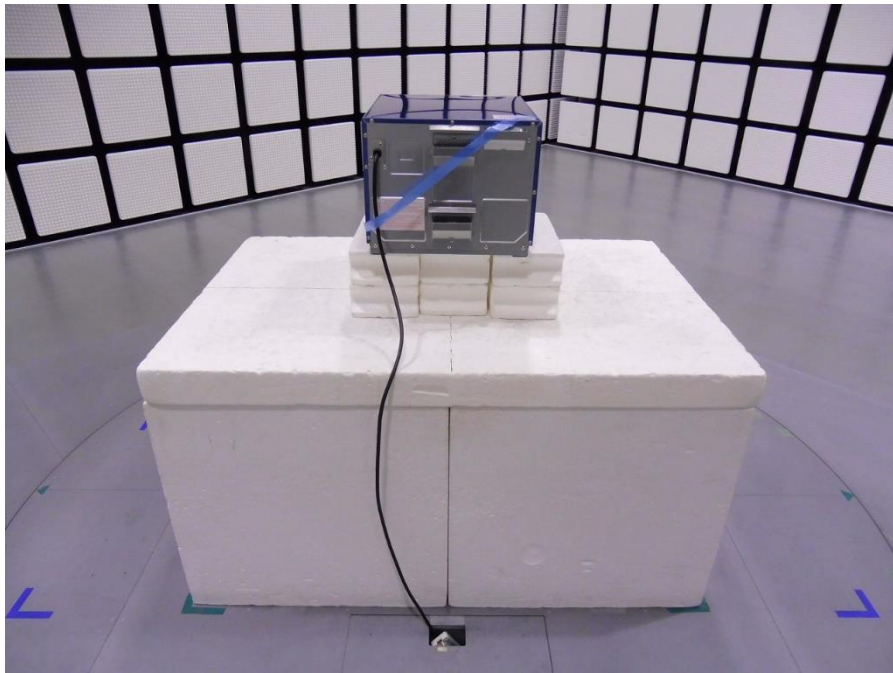
Vertical axis



Horizontal Axis







# Radiated Emission (Below 1 GHz : Electric Field)

The measurement of the Radiated Emission (Below 1 GHz : Electric Field) in the frequency range 30 MHz - 1000 MHz was performed in horizontal and vertical antenna position according to FCC Part 18 at:

**Test Location:**

- 10 m anechoic chamber

**Test Distance:**

- 10 m

**Test Volume:**

- φ 0.64 m

Lists of the Test Equipment: Refer to Appendix A

**Result: The requirements are**  MET  NOT MET

Min. limit margin 44.6 dB at 30.07 MHz  
(AV detector receiver with Vertical antenna polarization)

|  |  |
|--|--|
| Test Condition of Instrument                     | EUT Warm-up Time: 10 minutes           |
| Resolution Bandwidth : 120 kHz (30 MHz to 1 GHz) | Date: 8 December, 2021                 |
|  | Environment: 20 deg.C / 38 % / 990 hPa |
| Detector Function : Average                      |  |
| Test Mode : High power mode (P10)                |  |
| Test Voltage : 120 V / 60Hz                      |  |
| Load : 1050 ml Center                            |  |

## Test Data

| Antenna Polar. | Freq. [MHz] | Factor [dB/m] | Reading at 10 m [dBμV] | Emission Level at 10 m [dBμV/m] | Emission Level at 300 m [dBμV/m] | Emission Level at 300 m [μV/m] | Limit at 300 m [μV/m] | Margin at 300 m [μV/m] | Margin at 300 m [dB] | Height [cm] | EUT Angle [deg.] |
|----------------|-------------|---------------|------------------------|---------------------------------|----------------------------------|--------------------------------|-----------------------|------------------------|----------------------|-------------|------------------|
| Hori.          | 196.69      | -7.6          | 15.2                   | 7.6                             | -21.9                            | 0.080                          | 36.277                | 36.1970                | 53.1                 | 250         | 161              |
| Vert.          | 30.07       | -7.2          | 23.3                   | 16.1                            | -13.4                            | 0.213                          | 36.277                | 36.0642                | 44.6                 | 250         | 224              |
| Vert.          | 31.00       | -7.6          | 20.0                   | 12.4                            | -17.1                            | 0.139                          | 36.277                | 36.1380                | 48.3                 | 226         | 205              |
| Vert.          | 59.13       | -17.1         | 33.1                   | 16.0                            | -13.5                            | 0.210                          | 36.277                | 36.0667                | 44.7                 | 100         | 156              |
| Vert.          | 194.92      | -7.6          | 17.4                   | 9.8                             | -19.7                            | 0.103                          | 36.277                | 36.1740                | 50.9                 | 141         | 263              |
| Vert.          | 637.21      | -8.3          | 14.5                   | 6.2                             | -23.3                            | 0.068                          | 36.277                | 36.2089                | 54.5                 | 134         | 1                |

Factor [dB/m] = Antenna Factor [dB/m] + Cable Loss [dB] - Amp. Gain [dB]  
 Emission Level at 10 m [dBμV/m] = Reading at 10m [dBμV] + Factor [dB/m]  
 Emission Level at 300 m [dBμV/m] = Emission Level at 10 m [dBμV/m] + 20log(10/300) [dB]

Note: Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Description of calculation

30 MHz to 1 GHz

Calculation Formula to get field strength at 300 m from the measured at 10 m.

Calculation Formula:

$$\begin{aligned} & \text{Emission Level at 300 m } [\mu\text{V/m}] \\ & = 10^{\{( \text{Emission Level at 10 m } [\text{dB}\mu\text{V/m}] / 20 \} * (10/300)} \end{aligned}$$

Example: Frequency                      30.07 MHz,  
Emission Level at 10 m   16.1 dB $\mu$ V/m

$$\begin{aligned} & \text{Emission Level at 300 m } [\mu\text{V/m}] \\ & = 10^{(16.1 / 20) * (10/300)} \\ & = 0.213 \mu\text{V/m} \end{aligned}$$

## Photographs of the Test Set-up

The EUT was placed on a 1 m high nonconductive turntable.

The turntable was separated from the antenna by a distance of 10 m.

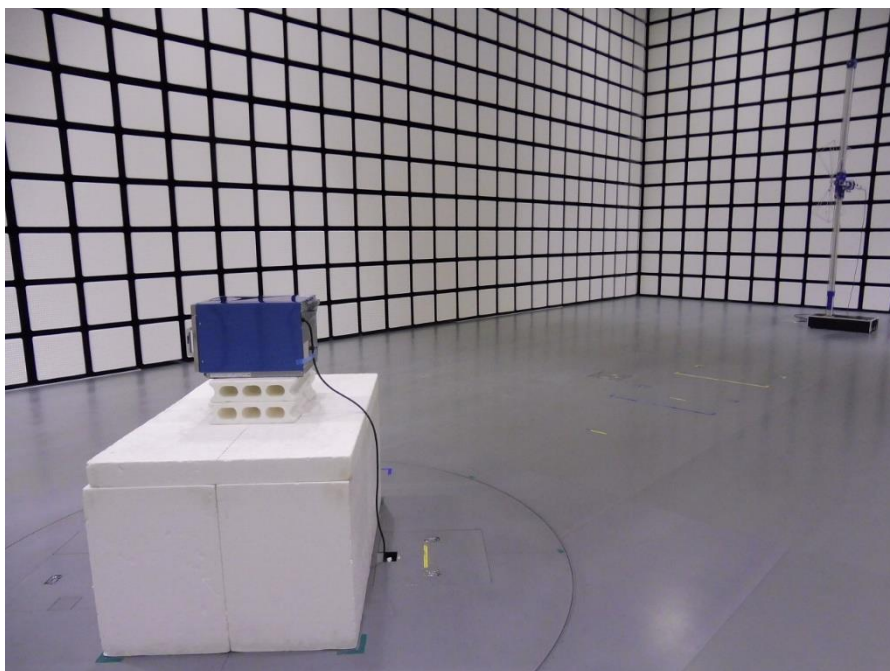
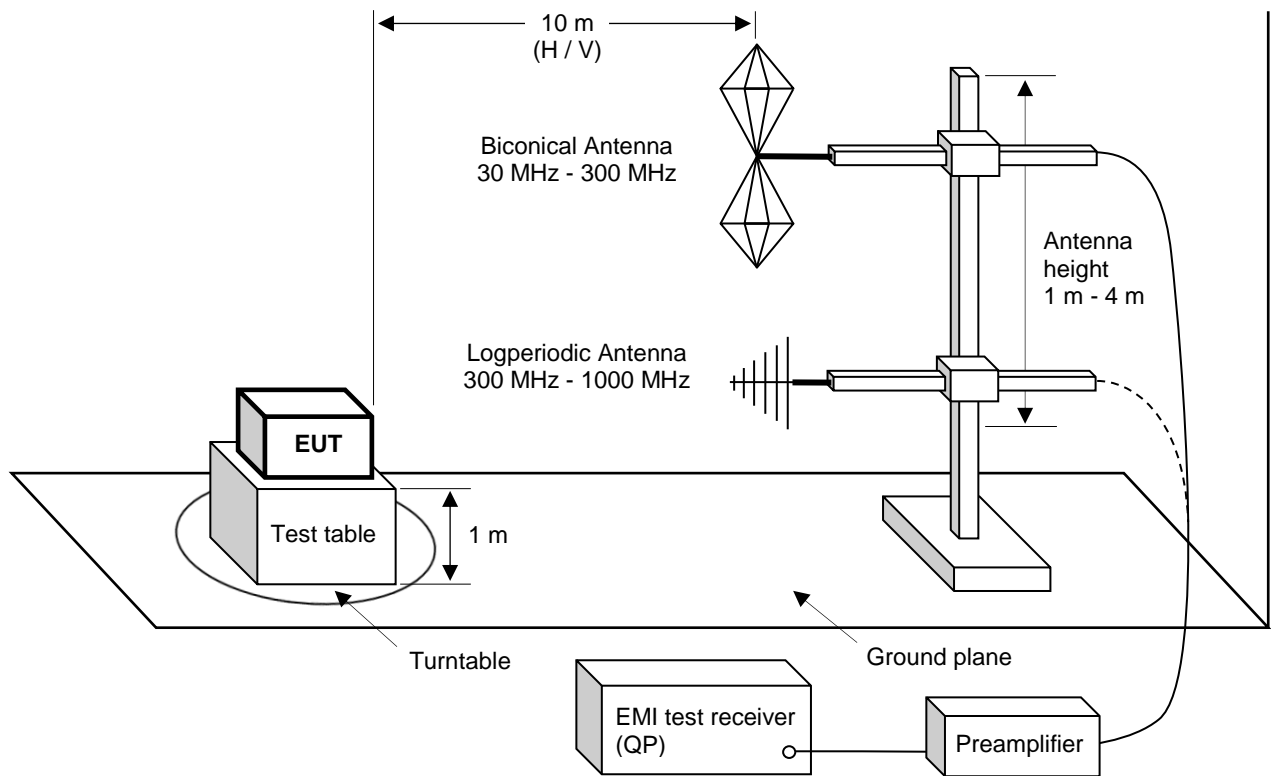
The operation mode was selected for maximum emission.

Pre-check: Radiated emission levels (AV value) which have small margin for the regulation were measured by means of spectrum analyzer changing antenna movement (1 m - 4 m) and table rotation (0 degree - 360 degree).

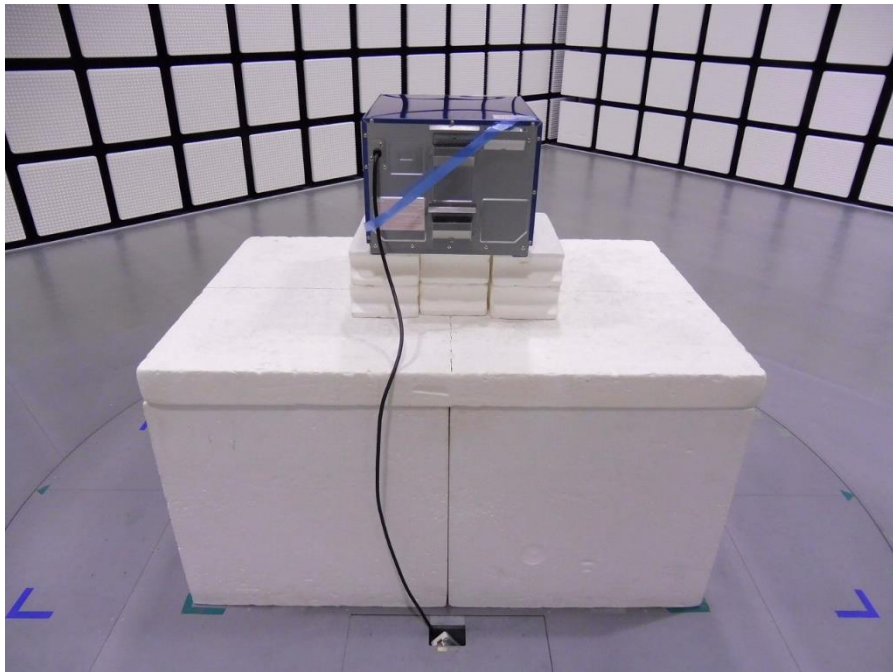
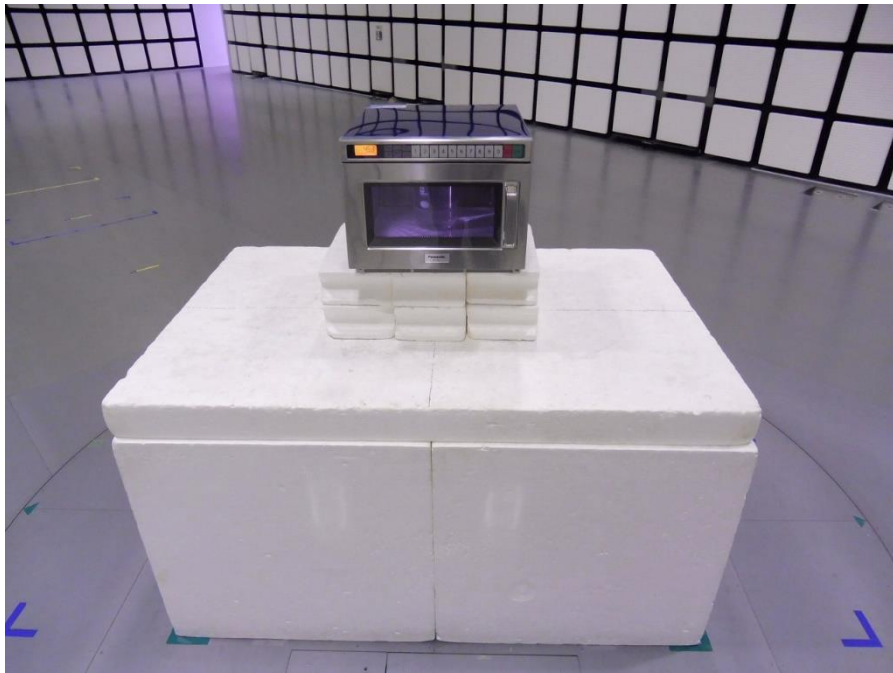
Final measurement: Emission levels (AV value) were measured by means of the test receiver referring the result of Pre-check.

The emission levels from the EUT were maximized changing conditions; Turntable rotation, Antenna height and arrangement of the EUT.

**Drawing :**







## Radiated Emission (Above 1 GHz : Electric Field)

The measurement of the Radiated Emission (Above 1 GHz : Electric Field) in the frequency range 1 GHz - 40 GHz was performed in horizontal and vertical antenna position according to FCC Part 18 at:

**Test Location:**

- 10 m anechoic chamber

**Test Distance:**

- 3 m

**Test Volume:**

- $\varphi$  0.64 m

Lists of the Test Equipment:

Refer to Appendix A

**Result: The requirements are**  MET  NOT MET

Min. limit margin 11.6 dB at 2398.59 MHz  
(AV detector receiver with Horizontal antenna polarization)

| Frequency [GHz] | $\theta_{3dB}$ E Plane [°] | $\theta_{3dB}$ H Plane [°] | $\theta_{3dB}$ min [°] | W min [m] |
|-----------------|----------------------------|----------------------------|------------------------|-----------|
| 1 - 6           | 32.1                       | 52.5                       | 32.1                   | 1.73      |

$\theta_{3dB}$  : The minimum 3 dB beam width of receive antenna.  
W : The dimension of the line tangent to the EUT formed by  $\theta_{3dB}$  at 3 m.  
 $W = 2 \times 3 \text{ [m]} \times \tan(0.5 \times \theta_{3dB}) \doteq 1.73 \text{ m}$

| Frequency [GHz] | $\theta_{3dB}$ E Plane [°] | $\theta_{3dB}$ H Plane [°] | $\theta_{3dB}$ min [°] | W min [m] |
|-----------------|----------------------------|----------------------------|------------------------|-----------|
| 6 - 18          | 29                         | 17                         | 17                     | 0.90      |

$\theta_{3dB}$  : The minimum 3 dB beam width of receive antenna.  
W : The dimension of the line tangent to the EUT formed by  $\theta_{3dB}$  at 3 m.  
 $W = 2 \times 3 \text{ [m]} \times \tan(0.5 \times \theta_{3dB}) \doteq 0.90 \text{ m}$

| Frequency [GHz] | $\theta_{3dB}$ E Plane [°] | $\theta_{3dB}$ H Plane [°] | $\theta_{3dB}$ min [°] | W min [m] |
|-----------------|----------------------------|----------------------------|------------------------|-----------|
| 18 - 26.5       | 9                          | 10                         | 9                      | 0.47      |

$\theta_{3dB}$  : The minimum 3 dB beam width of receive antenna.  
W : The dimension of the line tangent to the EUT formed by  $\theta_{3dB}$  at 3 m.  
 $W = 2 \times 3 \text{ [m]} \times \tan(0.5 \times \theta_{3dB}) \doteq 0.47 \text{ m}$

## Test Data

Test Condition of Instrument  
 Resolution Bandwidth : 1 MHz (1 GHz to 25 GHz)

EUT Warm-up Time: 10 minutes  
 Date: 8 December , 2021  
 Environment: 20 deg.C / 38 % / 990 hPa

Detector Function : Average  
 Test Mode : High power mode (P10)

Test Voltage : 120 V / 60Hz  
 Load : 1050 ml Center

| Antenna Polar. | Freq. [MHz] | Factor [dB/m] | Reading at 3 m [dBμV] | Emission Level at 3 m [dBμV/m] | Emission Level at 3 m [μV/m] | Distance Factor K | Emission Level at 300 m [μV/m] | Limit at 300 m [μV/m] | Margin at 300 m [μV/m] | Margin at 300 m [dB] | Height [cm] | EUT Angle [deg.] |
|----------------|-------------|---------------|-----------------------|--------------------------------|------------------------------|-------------------|--------------------------------|-----------------------|------------------------|----------------------|-------------|------------------|
| Hori.          | 2179.89     | 30.0          | 28.6                  | 58.6                           | 851.1                        | 0.0100            | 8.511                          | 36.277                | 27.766                 | 12.6                 | 100         | 3                |
| Hori.          | 2398.59     | 29.6          | 30.0                  | 59.6                           | 955.0                        | 0.0100            | 9.550                          | 36.277                | 26.727                 | 11.6                 | 100         | 309              |
| Hori.          | 2501.51     | 29.7          | 29.5                  | 59.2                           | 912.0                        | 0.0100            | 9.120                          | 36.277                | 27.157                 | 12.0                 | 100         | 309              |
| Hori.          | 4383.32     | -3.3          | 41.0                  | 37.7                           | 76.7                         | 0.0100            | 0.767                          | 36.277                | 35.510                 | 33.5                 | 100         | 7                |
| Hori.          | 4918.17     | -2.0          | 39.5                  | 37.5                           | 75.0                         | 0.0100            | 0.750                          | 36.277                | 35.527                 | 33.7                 | 100         | 114              |
| Hori.          | 6552.00     | -8.2          | 50.2                  | 42.0                           | 125.9                        | 0.0100            | 1.259                          | 36.277                | 35.018                 | 29.2                 | 100         | 114              |
| Hori.          | 7363.00     | -9.2          | 47.1                  | 37.9                           | 78.5                         | 0.0100            | 0.785                          | 36.277                | 35.492                 | 33.3                 | 100         | 142              |
| Hori.          | 7942.00     | -8.3          | 60.9                  | 52.6                           | 426.6                        | 0.0100            | 4.266                          | 36.277                | 32.011                 | 18.6                 | 100         | 156              |
| Hori.          | 8181.00     | -8.3          | 50.8                  | 42.5                           | 133.4                        | 0.0100            | 1.334                          | 36.277                | 34.943                 | 28.7                 | 100         | 282              |
| Hori.          | 24636.00    | -1.0          | 43.1                  | 42.1                           | 127.4                        | 0.0100            | 1.274                          | 36.277                | 35.003                 | 29.1                 | 100         | 303              |
| Vert.          | 2180.22     | 30.0          | 29.2                  | 59.2                           | 912.0                        | 0.0100            | 9.120                          | 36.277                | 27.157                 | 12.0                 | 100         | 16               |
| Vert.          | 2500.66     | 29.7          | 29.4                  | 59.1                           | 901.6                        | 0.0100            | 9.016                          | 36.277                | 27.261                 | 12.1                 | 100         | 170              |
| Vert.          | 2393.69     | 29.7          | 29.7                  | 59.4                           | 933.3                        | 0.0100            | 9.333                          | 36.277                | 26.944                 | 11.8                 | 100         | 357              |
| Vert.          | 4358.39     | -3.4          | 39.3                  | 35.9                           | 62.4                         | 0.0100            | 0.624                          | 36.277                | 35.653                 | 35.3                 | 100         | 105              |
| Vert.          | 4918.94     | -2.0          | 38.7                  | 36.7                           | 68.4                         | 0.0100            | 0.684                          | 36.277                | 35.593                 | 34.5                 | 100         | 110              |
| Vert.          | 6560.00     | -8.2          | 55.2                  | 47.0                           | 223.9                        | 0.0100            | 2.239                          | 36.277                | 34.038                 | 24.2                 | 100         | 260              |
| Vert.          | 7361.00     | -9.2          | 45.9                  | 36.7                           | 68.4                         | 0.0100            | 0.684                          | 36.277                | 35.593                 | 34.5                 | 100         | 55               |
| Vert.          | 7949.00     | -8.3          | 57.7                  | 49.4                           | 295.1                        | 0.0100            | 2.951                          | 36.277                | 33.326                 | 21.8                 | 100         | 57               |
| Vert.          | 8207.00     | -8.3          | 56.6                  | 48.3                           | 260.0                        | 0.0100            | 2.600                          | 36.277                | 33.677                 | 22.9                 | 100         | 62               |
| Vert.          | 24576.00    | -0.9          | 41.9                  | 41.0                           | 112.2                        | 0.0100            | 1.122                          | 36.277                | 35.155                 | 30.2                 | 100         | 4                |

Factor [dB/m] = Antenna Factor [dB/m] + Cable Loss [dB] - Amp. Gain [dB] + Distance Factor [dB]

Emission Level at 3 m [dBμV/m] = Reading at 3m [dBμV] + Factor [dB/m]

Emission Level at 300 m [μV/m] = K \* Emission Level at 3m [μV/m]

Note: Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Test Voltage : 120 V / 60Hz  
 Load : 1050 ml Right Front

| Antenna Polar. | Freq. [MHz] | Factor [dB/m] | Reading at 3 m [dB $\mu$ V] | Emission Level at 3 m [dB $\mu$ V/m] | Emission Level at 3 m [ $\mu$ V/m] | Distance Factor K | Emission Level at 300 m [ $\mu$ V/m] | Limit at 300 m [ $\mu$ V/m] | Margin at 300 m [ $\mu$ V/m] | Margin at 300 m [dB] | Height [cm] | EUT Angle [deg.] |
|----------------|-------------|---------------|-----------------------------|--------------------------------------|------------------------------------|-------------------|--------------------------------------|-----------------------------|------------------------------|----------------------|-------------|------------------|
| Hori.          | 4913.09     | -2.0          | 39.2                        | 37.2                                 | 72.4                               | 0.0100            | 0.724                                | 36.277                      | 35.553                       | 34.0                 | 100         | 253              |
| Hori.          | 7363.00     | -9.2          | 54.1                        | 44.9                                 | 175.8                              | 0.0100            | 1.758                                | 36.277                      | 34.519                       | 26.3                 | 100         | 100              |
| Vert.          | 4916.00     | -2.0          | 39.6                        | 37.6                                 | 75.9                               | 0.0100            | 0.759                                | 36.277                      | 35.518                       | 33.6                 | 100         | 259              |
| Vert.          | 7362.00     | -9.2          | 52.8                        | 43.6                                 | 151.4                              | 0.0100            | 1.514                                | 36.277                      | 34.763                       | 27.6                 | 100         | 209              |

Factor [dB/m] = Antenna Factor [dB/m] + Cable Loss [dB] - Amp. Gain [dB] + Distance Factor [dB]  
 Emission Level at 3 m [dB $\mu$ V/m] = Reading at 3m [dB $\mu$ V] + Factor [dB/m]  
 Emission Level at 300 m [ $\mu$ V/m] = K \* Emission Level at 3m [ $\mu$ V/m]

Note: Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Test Voltage : 120 V / 60Hz  
 Load : 450 ml Center

| Antenna Polar. | Freq. [MHz] | Factor [dB/m] | Reading at 3 m [dB $\mu$ V] | Emission Level at 3 m [dB $\mu$ V/m] | Emission Level at 3 m [ $\mu$ V/m] | Distance Factor K | Emission Level at 300 m [ $\mu$ V/m] | Limit at 300 m [ $\mu$ V/m] | Margin at 300 m [ $\mu$ V/m] | Margin at 300 m [dB] | Height [cm] | EUT Angle [deg.] |
|----------------|-------------|---------------|-----------------------------|--------------------------------------|------------------------------------|-------------------|--------------------------------------|-----------------------------|------------------------------|----------------------|-------------|------------------|
| Hori.          | 4915.35     | -2.0          | 39.2                        | 37.2                                 | 72.4                               | 0.0100            | 0.724                                | 36.277                      | 35.553                       | 34.0                 | 100         | 253              |
| Hori.          | 7367.00     | -9.2          | 43.7                        | 34.5                                 | 53.1                               | 0.0100            | 0.531                                | 36.277                      | 35.746                       | 36.7                 | 100         | 345              |
| Vert.          | 4913.23     | -2.0          | 39.6                        | 37.6                                 | 75.9                               | 0.0100            | 0.759                                | 36.277                      | 35.518                       | 33.6                 | 100         | 259              |
| Vert.          | 7367.00     | -9.2          | 41.2                        | 32.0                                 | 39.8                               | 0.0100            | 0.398                                | 36.277                      | 35.879                       | 39.2                 | 100         | 93               |

Factor [dB/m] = Antenna Factor [dB/m] + Cable Loss [dB] - Amp. Gain [dB] + Distance Factor [dB]  
 Emission Level at 3 m [dB $\mu$ V/m] = Reading at 3m [dB $\mu$ V] + Factor [dB/m]  
 Emission Level at 300 m [ $\mu$ V/m] = K \* Emission Level at 3m [ $\mu$ V/m]

Note: Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Test Voltage : 120 V / 60Hz  
 Load : 450 ml Right Front

| Antenna Polar. | Freq. [MHz] | Factor [dB/m] | Reading at 3 m [dB $\mu$ V] | Emission Level at 3 m [dB $\mu$ V/m] | Emission Level at 3 m [ $\mu$ V/m] | Distance Factor K | Emission Level at 300 m [ $\mu$ V/m] | Limit at 300 m [ $\mu$ V/m] | Margin at 300 m [ $\mu$ V/m] | Margin at 300 m [dB] | Height [cm] | EUT Angle [deg.] |
|----------------|-------------|---------------|-----------------------------|--------------------------------------|------------------------------------|-------------------|--------------------------------------|-----------------------------|------------------------------|----------------------|-------------|------------------|
| Hori.          | 4908.68     | -2.0          | 38.5                        | 36.5                                 | 66.8                               | 0.0100            | 0.668                                | 36.277                      | 35.609                       | 34.7                 | 100         | 352              |
| Hori.          | 7359.00     | -9.2          | 45.2                        | 36.0                                 | 63.1                               | 0.0100            | 0.631                                | 36.277                      | 35.646                       | 35.2                 | 100         | 81               |
| Vert.          | 4911.88     | -2.0          | 41.0                        | 39.0                                 | 89.1                               | 0.0100            | 0.891                                | 36.277                      | 35.386                       | 32.2                 | 100         | 357              |
| Vert.          | 7353.00     | -9.2          | 42.5                        | 33.3                                 | 46.2                               | 0.0100            | 0.462                                | 36.277                      | 35.815                       | 37.9                 | 100         | 95               |

Factor [dB/m] = Antenna Factor [dB/m] + Cable Loss [dB] - Amp. Gain [dB] + Distance Factor [dB]  
 Emission Level at 3 m [dB $\mu$ V/m] = Reading at 3m [dB $\mu$ V] + Factor [dB/m]  
 Emission Level at 300 m [ $\mu$ V/m] = K \* Emission Level at 3m [ $\mu$ V/m]

Note: Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Description of calculation

1 GHz to 25 GHz

Calculation Formula to get field strength at 300 m from the measured at 3 m.

Calculation Formula:

$$\begin{aligned} & \text{Emission Level at 300 m } [\mu\text{V/m}] \\ & = K * 10^{((\text{Emission Level at 3 m } [\text{dB}\mu\text{V/m}]) / 20)} \\ & \text{K: Conversion Factor for 3 m to 300 m} \end{aligned}$$

Example: Frequency                    2398.59 MHz,  
Emission Level at 3 m    59.6 dB $\mu$ V/m

$$\begin{aligned} & \text{Emission Level at 300 m } [\mu\text{V/m}] \\ & = 0.01 * 10^{(59.6 / 20)} \\ & = 9.550 \mu\text{V/m} \end{aligned}$$

## Photographs of the Test Set-up

The EUT was placed on a 1 m high nonconductive turntable.

The turntable was separated from the antenna by a distance of 3 m.

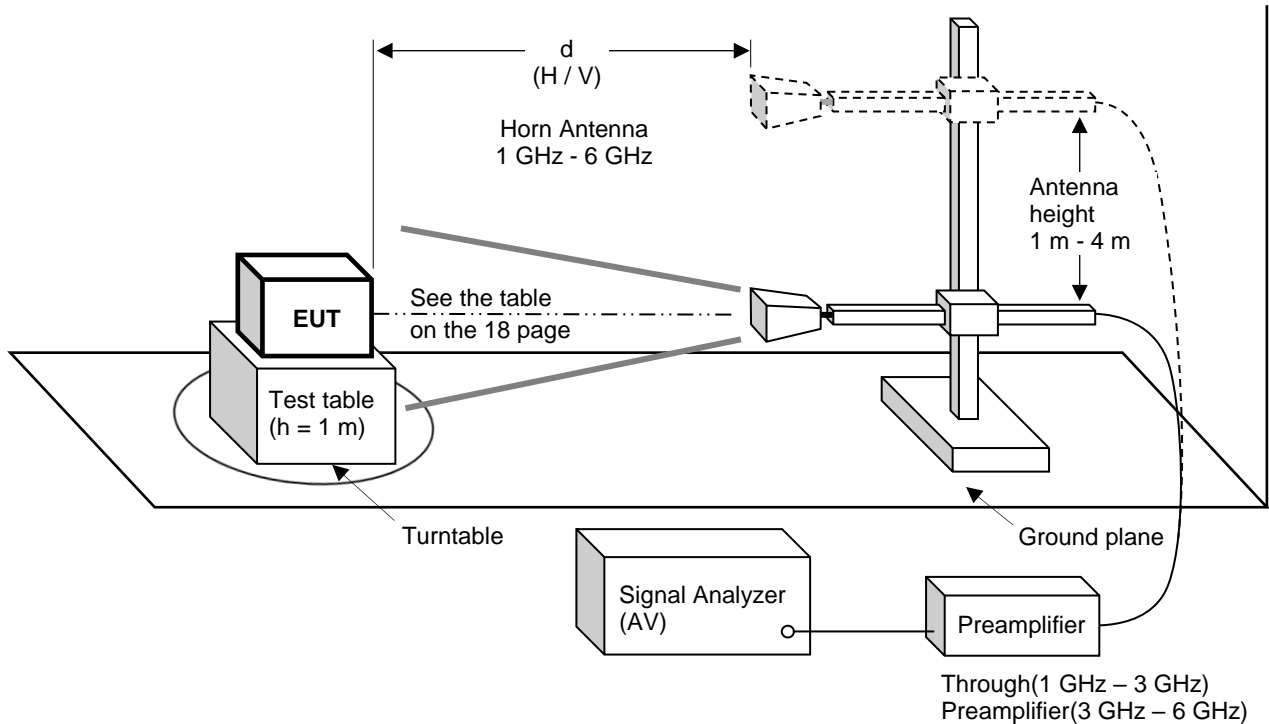
The operation mode was selected for maximum emission.

Pre-check: Radiated emission levels (AV value) which have small margin for the regulation were measured by means of signal analyzer changing antenna movement (1 m - 4 m) and table rotation (0 degree - 360 degree).

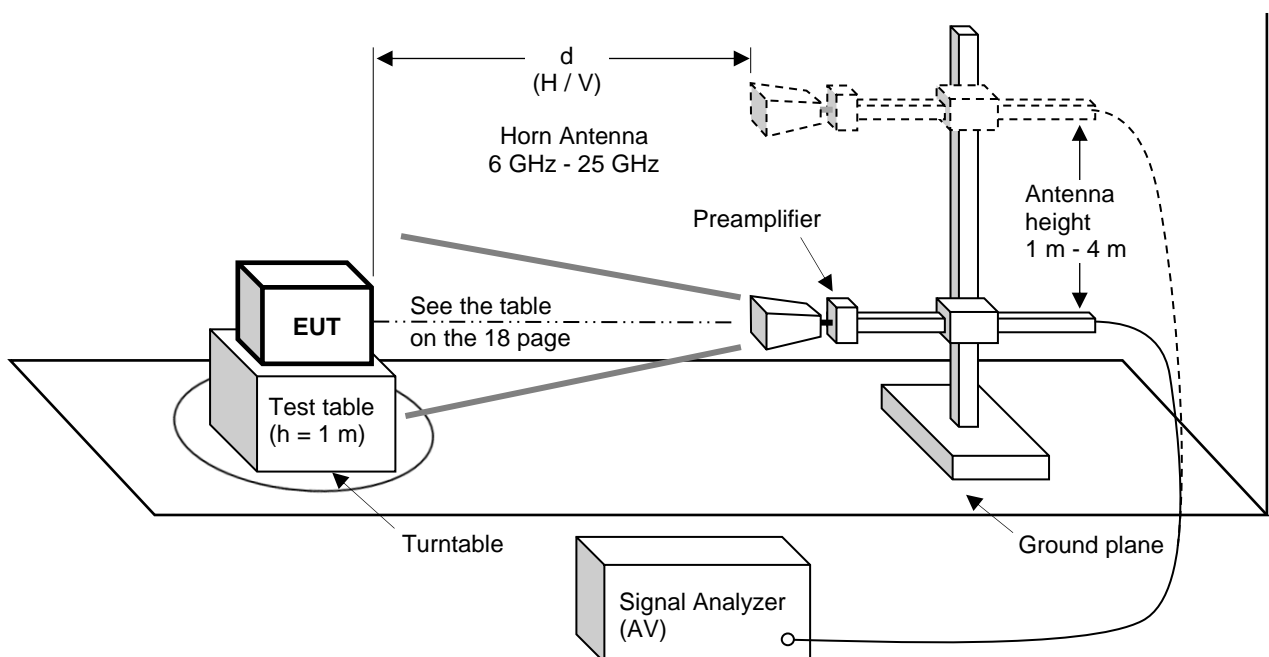
Final measurement: Emission levels (AV value) were measured by means of the signal analyzer (1 GHz - 25 GHz) referring the result of Pre-check.

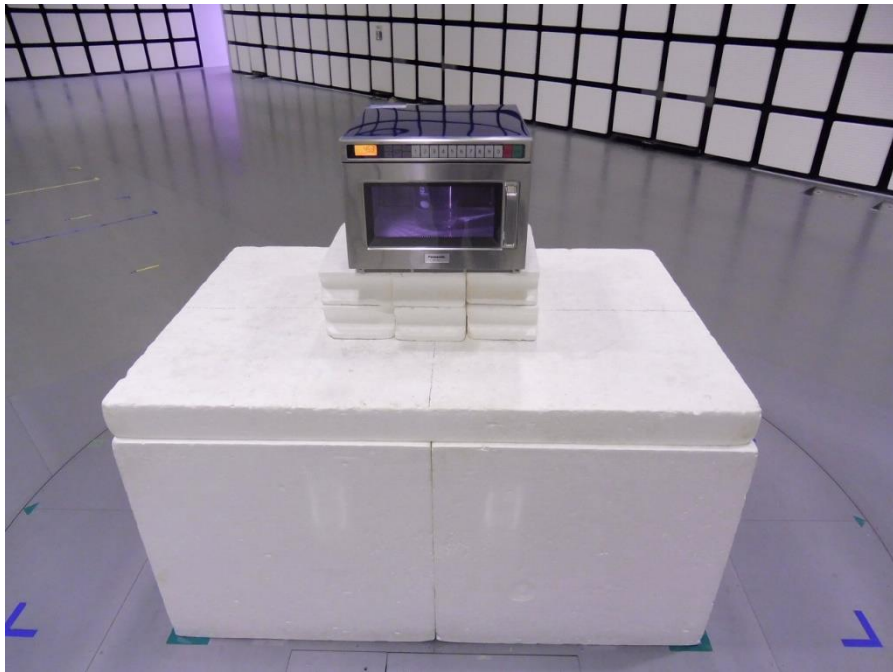
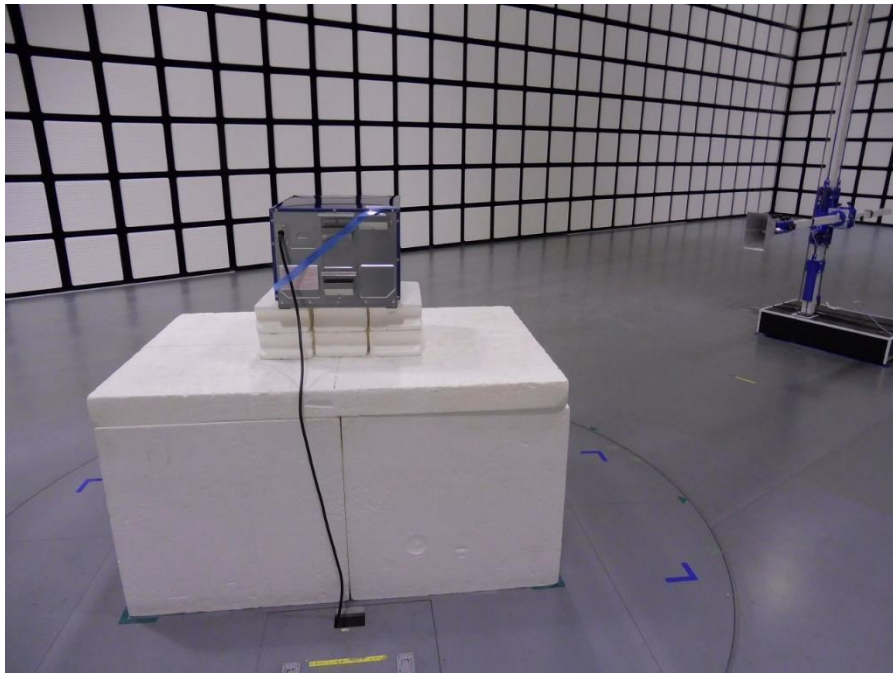
The emission level from the EUT were maximized changing conditions; Turn table rotation, Antenna height, azimuth and arrangement of the EUT.

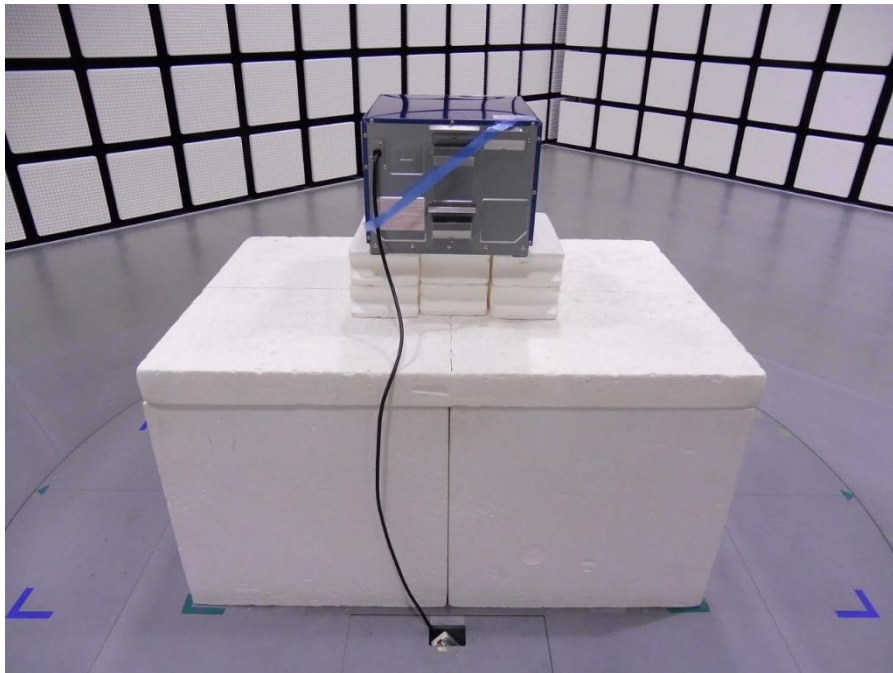
**Drawing : 1 GHz - 6 GHz**



**Drawing : 6 GHz - 25 GHz**









## Operating Frequency measurements (OST MP-5, 4.5)

The operating frequency was measured using a spectrum analyzer. Starting with the EUT at room temperature, a 1500 ml water load was placed in the center of the oven was operated at maximum output power. The fundamental operating frequency was monitored until the water load was reduced to 20 % of the original load.

**Test Location:**

- 10 m anechoic chamber

Lists of the Test Equipment:                      Refer to Appendix A

[AC 120 V]  
 Maximum frequency variation  
 Variation of frequency with time, using the Load  
 2.440 GHz - 2.477 GHz (1500 ml ~ 300 ml / Load)

EUT Warm-up Time: 10 minutes  
 Date: 8 December, 2021  
 Environment: 20 deg.C / 38 % / 990 hPa

|      | Time (minutes) | Frequency (GHz) | Time (minutes) | Frequency (GHz) | Time (minutes) | Frequency (GHz) |
|------|----------------|-----------------|----------------|-----------------|----------------|-----------------|
| 100% | 0              | 2.447           | -              | -               | -              | -               |
|      | 2              | 2.457           | 22             | 2.457           | 42             | 2.472           |
|      | 4              | 2.446           | 24             | 2.458           | 44             | 2.475           |
|      | 6              | 2.447           | 26             | 2.452           | 46             | 2.477           |
|      | 8              | 2.448           | 28             | 2.459           | 48             | 2.465           |
|      | 10             | 2.450           | 30             | 2.453           | 50             | 2.466           |
|      | 12             | 2.451           | 32             | 2.443           | 52             | 2.472           |
|      | 14             | 2.447           | 34             | 2.440           | 54             | 2.466           |
|      | 16             | 2.447           | 36             | 2.463           | 56             | 2.463           |
|      | 18             | 2.446           | 38             | 2.454           | 58             | 2.462           |
|      | 20             | 2.445           | 40             | 2.475           | 60             | 2.456           |
|      |                |                 |                |                 |                | 20%             |

## Variation in Operating Frequency with Line Voltage(OST MP-5, 4.5)

The EUT was operated / warmed by at least 10 minutes of use with a 1000 ml 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 % of the nominal rating.

### Test Location:

- 10 m anechoic chamber

Lists of the Test Equipment: Refer to Appendix A

[AC 120 V]

Variation of frequency for Line Voltage variation

2.446 GHz - 2.460 GHz (96 V ~ 150 V / 1500 ml Load)

EUT Warm-up Time: 10 minutes

Date: 18 January, 2022

Environment: 20 deg.C / 43 % / 993 hPa

| input voltage (%) | Voltage (V) | Frequency (GHz) |
|-------------------|-------------|-----------------|
| 80%               | 96          | 2.460           |
| 85%               | 102         | 2.460           |
| 90%               | 108         | 2.460           |
| 95%               | 114         | 2.446           |
| 100%              | 120         | 2.447           |
| 105%              | 126         | 2.452           |
| 110%              | 132         | 2.455           |
| 115%              | 138         | 2.456           |
| 125%              | 150         | 2.455           |

## Appendix A Lists of the Test Equipment

### Radiated Emission (Magnetic Field)

Test equipment list used to perform the radiated emission (magnetic field 9 kHz - 30 MHz).

| Device            | Model No. | Manufacturer    | Serial. No. | Reg. No. | Frequency range | Last Cal.      | Next Cal.       |
|-------------------|-----------|-----------------|-------------|----------|-----------------|----------------|-----------------|
| EMI test receiver | N9048B    | KEYSIGHT        | MY60450120  | RCV2001  | 9 kHz - 8.4 GHz | 3 August, 2021 | 31 August, 2022 |
| Loop antenna      | HFH2-Z2   | Rohde & Schwarz | 100014      | ANT5063  | 9 kHz - 30 MHz  | 19 June, 2021  | 30 June, 2022   |

| Device   | Model No. | Manufacturer     | Version     | Reg. No.  |
|----------|-----------|------------------|-------------|-----------|
| Software | ES10 RE   | TOYO Corporation | 2021.04.000 | S-SW048-1 |

### Radiated Emission (Electric Field)

Test equipment list used to perform the radiated emission (electric field 30 MHz - 1000 MHz).

| Device              | Model No.           | Manufacturer | Serial. No.      | Reg. No. | Frequency range  | Last Cal.       | Next Cal.       |
|---------------------|---------------------|--------------|------------------|----------|------------------|-----------------|-----------------|
| EMI test receiver   | N9048B              | KEYSIGHT     | MY60450120       | RCV2001  | 9 kHz - 8.4 GHz  | 3 August, 2021  | 31 August, 2022 |
| Biconical Antenna   | VHA 9103 & BBA 9106 | Schwarzbeck  | VHA9103 2397     | ANT1004  | 30 MHz - 300 MHz | 13 August, 2021 | 31 August, 2022 |
| Logperiodic Antenna | UHALP 9108-A        | Schwarzbeck  | UHALP9108-A 0737 | ANT1005  | 300 MHz - 1 GHz  | 13 August, 2021 | 31 August, 2022 |
| Preamplifier        | 310N                | SONOMA       | 394510           | AMP0510  | 100 kHz - 1 GHz  | 1 April, 2020   | 30 April, 2022  |

| Device   | Model No. | Manufacturer     | Version     | Reg. No.  |
|----------|-----------|------------------|-------------|-----------|
| Software | ES10 RE   | TOYO Corporation | 2021.04.000 | S-SW048-1 |

Test equipment list used to perform the Radiated Emission (Electric Field 1 GHz - 6 GHz).

| Device            | Model No.                    | Manufacturer    | Serial. No. | Reg. No. | Frequency range | Last Cal.        | Next Cal.         |
|-------------------|------------------------------|-----------------|-------------|----------|-----------------|------------------|-------------------|
| Signal Analyzer   | N9010B                       | KEYSIGHT        | MY59070439  | SPA0439  | 9 kHz - 40 GHz  | 2 November, 2021 | 30 November, 2022 |
| Horn antenna      | BBHA 9120D                   | Schwarzbeck     | 9120D-938   | ANT1006  | 1 GHz - 18 GHz  | 17 July, 2021    | 31 July, 2022     |
| Preamplifier (*1) | 8449B                        | HEWLETT PACKARD | 3008A01410  | AMP1003  | 1 GHz - 18 GHz  | 29 May, 2020     | 31 May, 2022      |
| Highpass Filter   | WHKX 10-2700-3000-18000-40SS | Wainwright      | SN 101      | FIL0105  | 3 GHz - 18 GHz  | 1 June, 2020     | 31 June, 2022     |

(\*1) : Through(1 GHz – 3 GHz),

| Device   | Model No. | Manufacturer     | Version     | Reg. No.  |
|----------|-----------|------------------|-------------|-----------|
| Software | ES10 RE   | TOYO Corporation | 2021.04.000 | S-SW048-1 |

Test equipment list used to perform the Radiated Emissions (Electric Field 6 GHz - 18 GHz).

| Device          | Model No.                | Manufacturer     | Serial. No. | Reg. No. | Frequency range | Last Cal.        | Next Cal.         |
|-----------------|--------------------------|------------------|-------------|----------|-----------------|------------------|-------------------|
| Signal Analyzer | N9010B                   | KEYSIGHT         | MY59070439  | SPA0439  | 9 kHz - 40 GHz  | 2 November, 2021 | 30 November, 2022 |
| Horn antenna    | HAP06-18A                | Schwarzbeck      | -           | ANT5059  | 6 GHz - 18 GHz  | 11 August 2021   | 31 August 2022    |
| Preamplifier    | HAP06-18A (Preamplifier) | TOYO Corporation | -           | AMP5032  | 6 GHz - 18 GHz  | 11 August 2021   | 31 August 2022    |

| Device   | Model No. | Manufacturer     | Version     | Reg. No.  |
|----------|-----------|------------------|-------------|-----------|
| Software | ES10 RE   | TOYO Corporation | 2021.04.000 | S-SW048-1 |

Test equipment list used to perform the Radiated Emissions (Electric Field 18 GHz – 25 GHz).

| Device          | Model No.                | Manufacturer     | Serial. No. | Reg. No. | Frequency range   | Last Cal.        | Next Cal.         |
|-----------------|--------------------------|------------------|-------------|----------|-------------------|------------------|-------------------|
| Signal Analyzer | N9010B                   | KEYSIGHT         | MY59070439  | SPA0439  | 9 kHz - 40 GHz    | 2 November, 2021 | 30 November, 2022 |
| Horn antenna    | HAP18-26A                | Schwarzbeck      | -           | ANT5060  | 18 GHz - 26.5 GHz | 11 August, 2021  | 31 August, 2022   |
| Preamplifier    | HAP18-26A (Preamplifier) | TOYO Corporation | -           | AMP5033  | 18 GHz - 26.5 GHz | 11 August, 2021  | 31 August, 2022   |

| Device   | Model No. | Manufacturer     | Version     | Reg. No.  |
|----------|-----------|------------------|-------------|-----------|
| Software | ES10 RE   | TOYO Corporation | 2021.04.000 | S-SW048-1 |

## Operating Frequency measurements Variation in Operating Frequency with Line Voltage

Test equipment list used to perform the Operating Frequency measurements and Variation in Operating Frequency with Line Voltage.

| Device          | Model No.  | Manufacturer | Serial. No. | Reg. No. | Frequency range | Last Cal.        | Next Cal.         |
|-----------------|------------|--------------|-------------|----------|-----------------|------------------|-------------------|
| Signal Analyzer | N9010B     | KEYSIGHT     | MY59070439  | SPA0439  | 9 kHz - 40 GHz  | 2 November, 2021 | 30 November, 2022 |
| Horn antenna    | BBHA 9120D | Schwarzbeck  | 9120D-938   | ANT1006  | 1 GHz - 18 GHz  | 17 July, 2021    | 31 July, 2022     |