

# TEST REPORT



**Test Report File No.** : S21068-1(1)

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

**Type** : Commercial Microwave Oven

**Model No.** : NE-17521

**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 S21068-1 (25 January, 2022).

## Revision History

Revision	Test Report No.	Date	Description
-	S21068-1	25 January, 2022	Original Issue
(1)	S21068-1(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-17521 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:

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

$$\text{LFS} = 25 * \text{SQRT} (1421.8 / 500)$$

$$\text{LFS} \approx 42.157 \text{ } \mu\text{V/m}$$

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 [ $\text{dB}\mu\text{V/m}$ ]
42.157	32.497	62.040	72.497

### ***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 : 19 January, 2022

Testing Start Date : 20 January, 2022

Testing End Date : 21 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	73.4	AV
	30 - 1000	41.2	AV
	1000 - 25000	15.6	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
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### **Radiated Emission (Below 1 GHz : Electric Field) :**

30 MHz – 300 MHz (Biconical Antenna)	10 m distance	Horizontal	± 3.8 dB
		Vertical	± 3.7 dB
300 MHz – 1000 MHz (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 – 25 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 208 / 230 V, 60 Hz

Model : NE-17521

Rated Power : Output 1700 W (IEC 705)

Serial No : 6CO1190001

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 : ACLAQ3E81

## ◆ 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 : 230 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-17521	6CO1190001	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 Model / Manufacturer	Pin	Length (m)	Shield	Ferrite Quantity	Ground Line
1	AC Power Cord for EUT A SJT / WELL SHIN	3	1.5	Unshielded	None	Yes

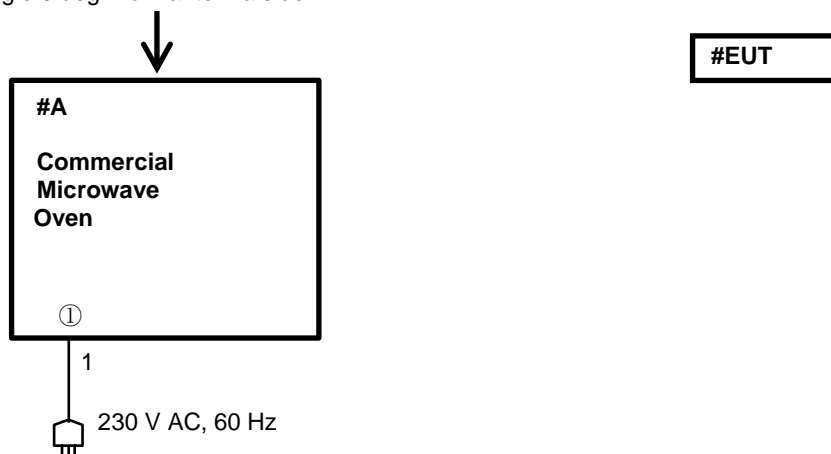
### ◆ Details of ports

Port No.	Name of port	Remarks
(1)	AC 230 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:**

- $\varnothing$  0.64 m

Lists of the Test Equipment: Refer to Appendix A

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

Min. limit margin 73.4 dB at 15.110 MHz  
(AV detector receiver with 0 deg antenna polarization)

Test Condition of Instrument  
Resolution Bandwidth : 9 kHz (8 MHz to 30 MHz)  
EUT Warm-up Time: 10 minutes  
Date: 20 January, 2022  
Environment: 18 deg.C / 38 % / 989 hPa

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

Test Voltage : 230 V / 60Hz  
Load : 1050 ml Center

## Test Data

Antenna Polar.	Freq. [MHz]	Factor [dB/m]	Reading at 10 m [dB $\mu$ V]	Emission Level at 10 m [dB $\mu$ V/m]	Emission Level at 300 m [dB $\mu$ V/m]	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.	14.651	20.9	-2.8	18.1	-41.0	0.00893	42.157	42.149	73.5	200	322
0	15.110	21.0	-2.8	18.2	-40.9	0.00903	42.157	42.148	73.4	200	230
45	17.317	21.1	-3.6	17.5	-41.6	0.00833	42.157	42.149	74.1	200	123
90	17.682	21.1	-3.7	17.4	-41.7	0.00824	42.157	42.149	74.2	200	265
135	13.980	20.9	-3.0	17.9	-41.2	0.00872	42.157	42.149	73.7	200	41

Factor [dB/m] = Antenna Factor [dB/m] + Cable Loss [dB] - Amp. Gain [dB]  
Emission Level at 10 m [dB $\mu$ V/m] = Reading at 10m [dB $\mu$ V] + Factor [dB/m]  
Emission Level at 300 m [dB $\mu$ V/m] = Emission Level at 10 m [dB $\mu$ V/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                      15.110 MHz,  
Emission Level at 10 m   18.2 dB $\mu$ V/m

$$\begin{aligned} & \text{Emission Level at 300 m } [\mu\text{V/m}] \\ & = 10^{(18.2 / 20) * (10/300)^2} \\ & = 0.00903 \mu\text{V/m} \end{aligned}$$

## 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.

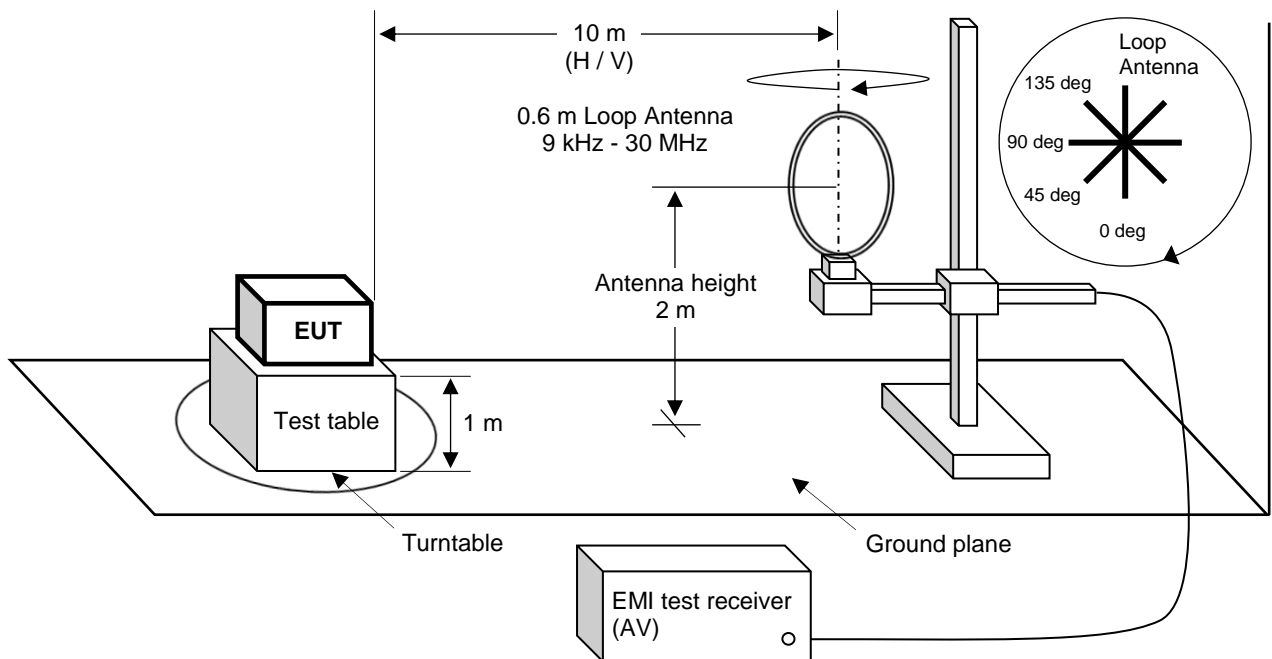
Pre-check : A loop antenna was set at a height of 2 m and a level with a small margin of Vertical axis (0°, 45°, 90°, 135°) and Horizontal Axis was measured using a spectrum analyzer.

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

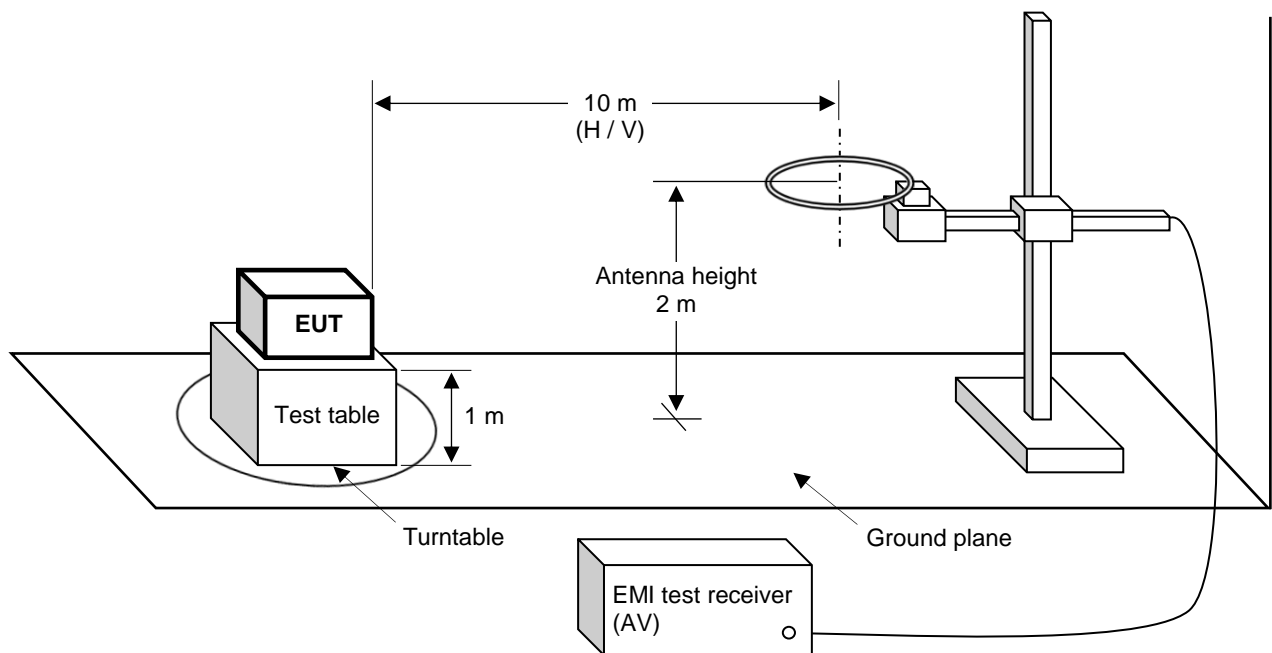
The emission levels from the EUT were maximized changing conditions; Turntable rotation, Antenna height and arrangement of the EUT.

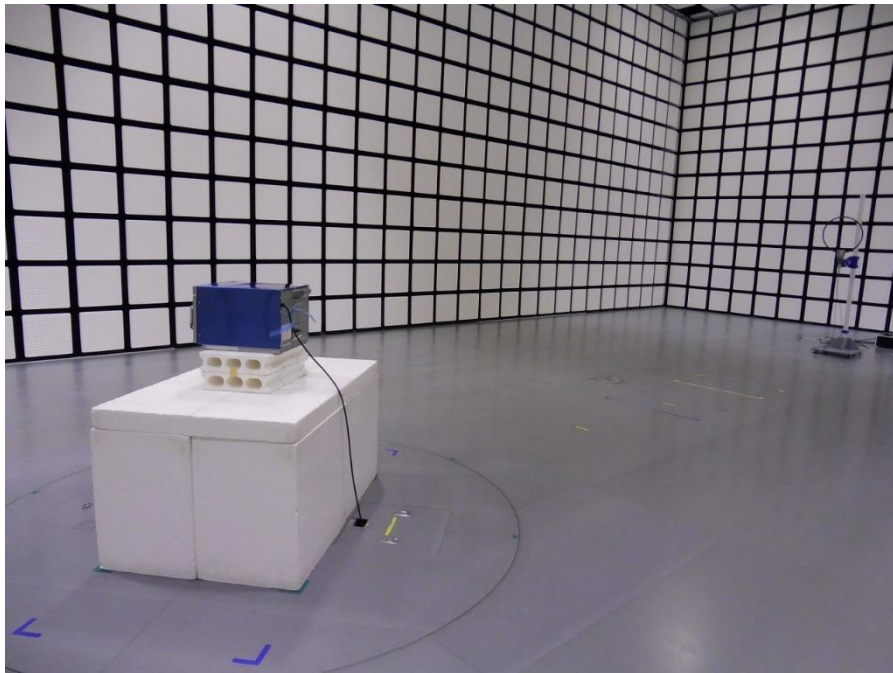
### Drawing:

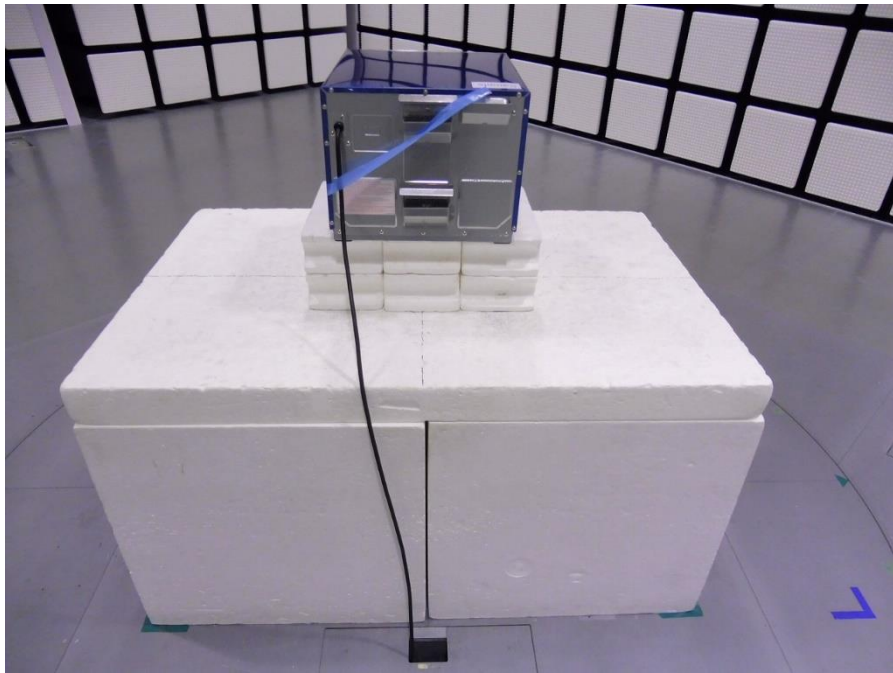
Vertical axis



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 41.2 dB at 65.57 MHz  
(AV detector receiver with Vertical antenna polarization)

Test Condition of Instrument

Resolution Bandwidth : 120 kHz (30 MHz to 1 GHz)

EUT Warm-up Time: 10 minutes

Date: 20 January, 2022

Environment: 18 deg.C / 38 % / 989 hPa

Detector Function : Average

Test Mode : High power mode (P10)

Test Voltage : 230 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.	144.44	-9.8	20.2	10.4	-19.1	0.110	42.157	42.0471	51.6	399	277
Hori.	273.99	-5.6	17.5	11.9	-17.6	0.131	42.157	42.0263	50.1	232	229
Hori.	343.93	-14.5	19.6	5.1	-24.4	0.060	42.157	42.0975	56.9	188	13
Hori.	687.80	-7.3	17.1	9.8	-19.7	0.103	42.157	42.0544	52.2	399	239
Vert.	31.46	-7.7	19.2	11.5	-18.0	0.125	42.157	42.0322	50.5	257	309
Vert.	65.57	-18.5	39.3	20.8	-8.7	0.365	42.157	41.7920	41.2	218	132
Vert.	198.82	-7.5	18.4	10.9	-18.6	0.117	42.157	42.0405	51.1	399	202
Vert.	268.81	-5.7	15.1	9.4	-20.1	0.098	42.157	42.0591	52.6	358	233
Vert.	338.76	-14.6	20.4	5.8	-23.7	0.065	42.157	42.0924	56.2	358	248
Vert.	692.06	-7.2	17.0	9.8	-19.7	0.103	42.157	42.0544	52.2	240	304

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                      65.57 MHz,  
Emission Level at 10 m   20.8 dB $\mu$ V/m

$$\begin{aligned} & \text{Emission Level at 300 m } [\mu\text{V/m}] \\ & = 10^{(20.8 / 20) * (10/300)} \\ & = 0.365 \mu\text{V/m} \end{aligned}$$

## 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.

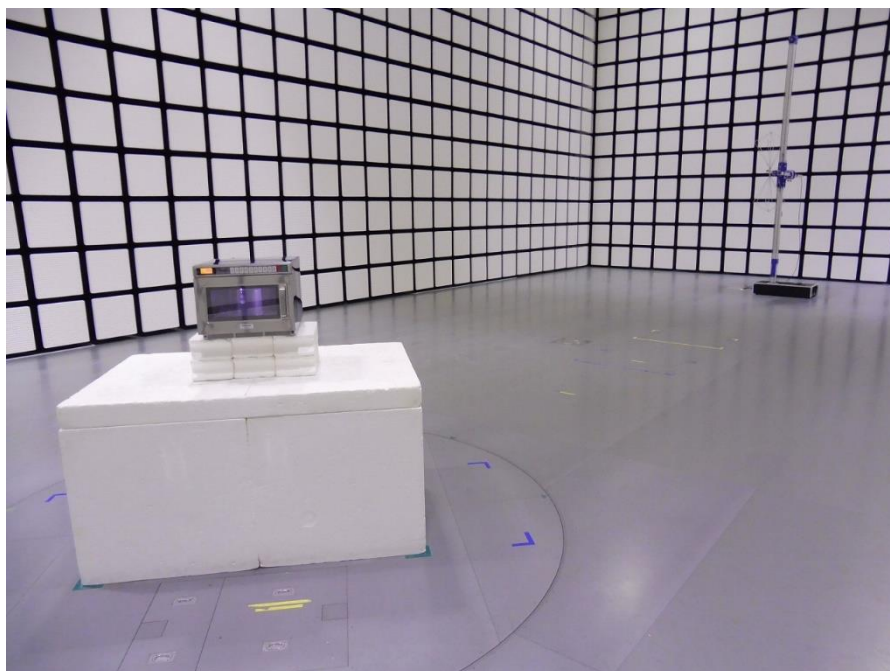
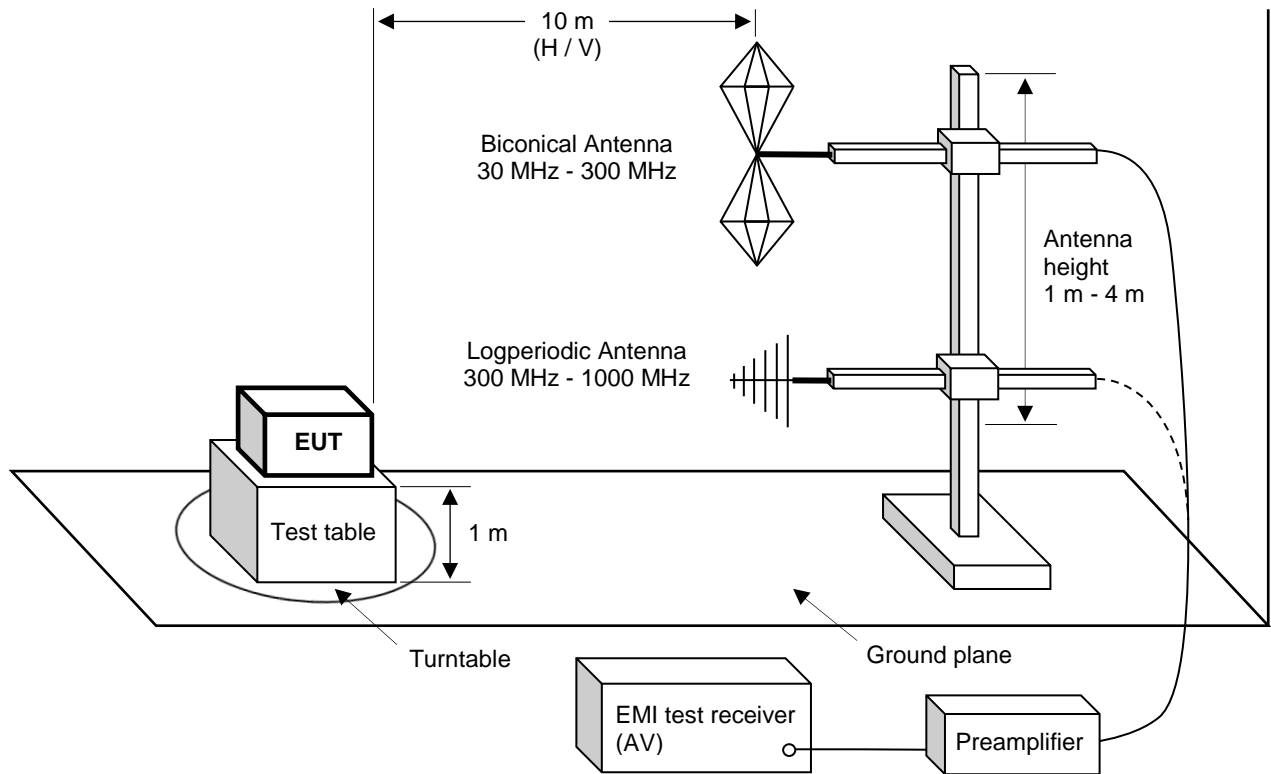
The operation mode was selected for maximum emission.

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).

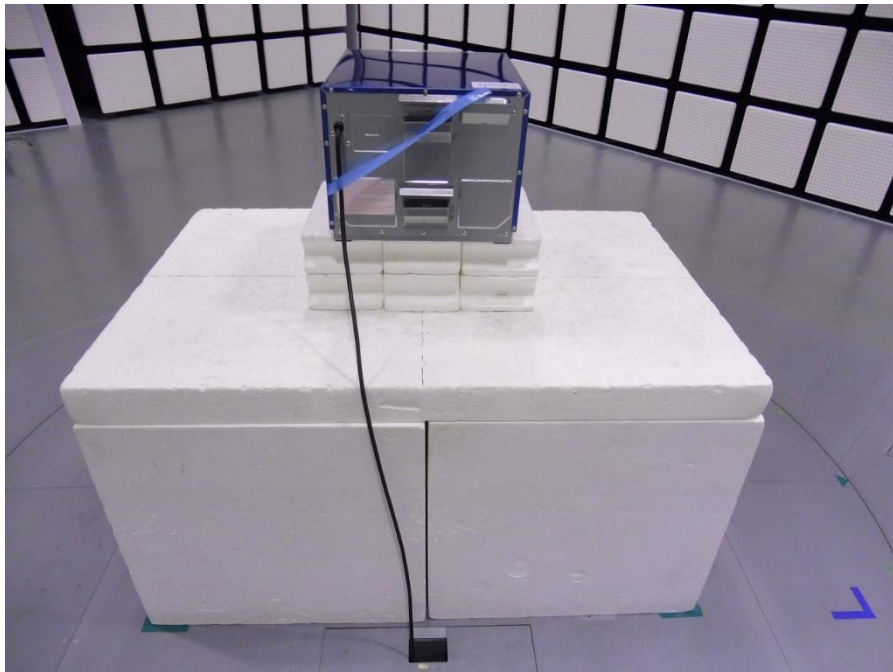
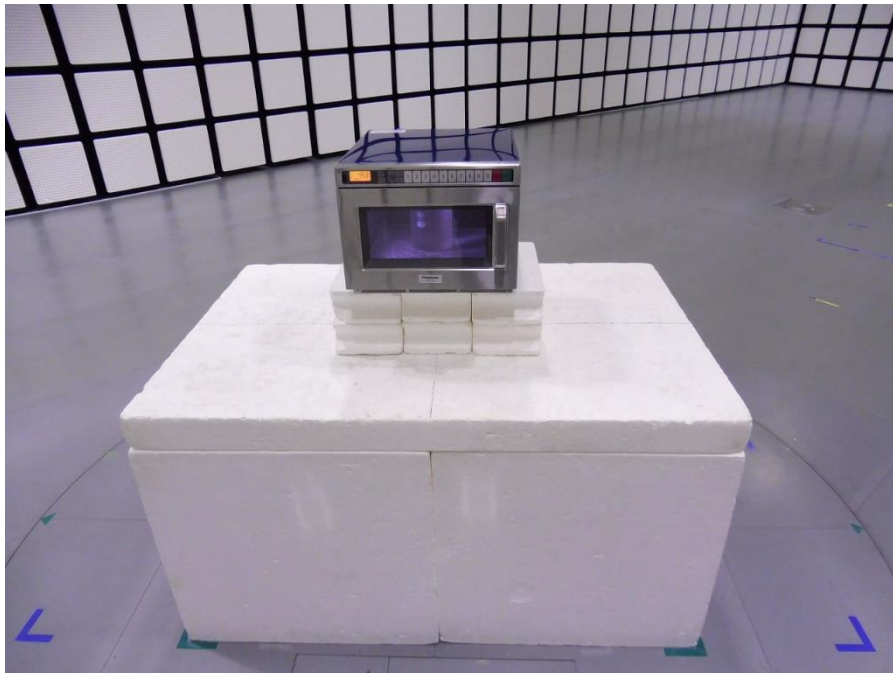
Final measurement: Emission levels (AV value) were measured by means of the test receiver referring the result of Pre-check.

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 15.6 dB at 2397.49 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: 20 January, 2022  
Environment: 18 deg.C / 38 % / 989 hPa  
Date: 21 January, 2022  
Environment: 15 deg.C / 48 % / 999 hPa

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

Test Voltage : 230 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.	2179.69	29.9	25.0	54.9	555.9	0.0100	5.559	42.157	36.598	17.6	101	257
Hori.	2221.88	30.1	20.6	50.7	342.8	0.0100	3.428	42.157	38.730	21.8	149	300
Hori.	2397.49	29.6	27.3	56.9	699.8	0.0100	6.998	42.157	35.159	15.6	105	45
Hori.	2500.69	29.7	20.5	50.2	323.6	0.0100	3.236	42.157	38.922	22.3	100	3
Hori.	2712.87	30.2	20.8	51.0	354.8	0.0100	3.548	42.157	38.609	21.5	100	16
Hori.	4913.12	-2.0	40.6	38.6	85.1	0.0100	0.851	42.157	41.306	33.9	150	324
Hori.	5189.58	-1.7	49.5	47.8	245.5	0.0100	2.455	42.157	39.703	24.7	132	129
Hori.	7133.41	-9.1	53.7	44.6	169.8	0.0100	1.698	42.157	40.459	27.9	141	244
Hori.	7400.06	-9.2	42.5	33.3	46.2	0.0100	0.462	42.157	41.695	39.2	100	97
Hori.	14174.16	-3.6	46.0	42.4	131.8	0.0100	1.318	42.157	40.839	30.1	124	301
Hori.	24694.72	-1.2	42.4	41.2	114.8	0.0100	1.148	42.157	41.009	31.3	155	136
Vert.	2180.88	30.0	21.9	51.9	393.6	0.0100	3.936	42.157	38.222	20.6	100	16
Vert.	2397.23	29.7	21.1	50.8	346.7	0.0100	3.467	42.157	38.690	21.7	143	12
Vert.	2504.47	29.7	22.3	52.0	398.1	0.0100	3.981	42.157	38.176	20.5	100	12
Vert.	2765.08	30.4	20.4	50.8	346.7	0.0100	3.467	42.157	38.690	21.7	137	348
Vert.	4914.40	-2.0	56.1	54.1	507.0	0.0100	5.070	42.157	37.088	18.4	107	2
Vert.	5183.38	-1.7	44.3	42.6	134.9	0.0100	1.349	42.157	40.808	29.9	100	7
Vert.	7129.90	-9.0	52.7	43.7	153.1	0.0100	1.531	42.157	40.626	28.8	129	220
Vert.	7398.15	-9.2	44.9	35.7	61.0	0.0100	0.610	42.157	41.548	36.8	150	37
Vert.	14140.38	-3.7	42.1	38.4	83.2	0.0100	0.832	42.157	41.326	34.1	105	169
Vert.	24551.64	-0.9	42.8	41.9	124.5	0.0100	1.245	42.157	40.913	30.6	150	259

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 : 230 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.	4910.63	-2.0	48.6	46.6	213.8	0.0100	2.138	42.157	40.019	25.9	101	65
Hori.	7342.70	-9.3	46.3	37.0	70.8	0.0100	0.708	42.157	41.449	35.5	114	100
Vert.	4919.83	-2.0	46	44.0	158.5	0.0100	1.585	42.157	40.573	28.5	142	351
Vert.	7365.56	-9.2	43.3	34.1	50.7	0.0100	0.507	42.157	41.650	38.4	114	252

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 : 230 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.	4911.31	-2.0	48.3	46.3	206.5	0.0100	2.065	42.157	40.092	26.2	136	68
Hori.	7380.09	-9.2	43.0	33.8	49.0	0.0100	0.490	42.157	41.668	38.7	100	113
Vert.	4910.68	-2.0	43.4	41.4	117.5	0.0100	1.175	42.157	40.983	31.1	128	26
Vert.	7367.79	-9.2	45.1	35.9	62.4	0.0100	0.624	42.157	41.534	36.6	139	264

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 : 230 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.	4906.74	-2.0	45.7	43.7	153.1	0.0100	1.531	42.157	40.626	28.8	109	79
Hori.	7345.01	-9.3	42.2	32.9	44.2	0.0100	0.442	42.157	41.716	39.6	109	241
Vert.	4910.40	-2.0	42.9	40.9	110.9	0.0100	1.109	42.157	41.048	31.6	150	353
Vert.	7346.03	-9.2	42.4	33.2	45.7	0.0100	0.457	42.157	41.700	39.3	100	48

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                    2397.49 MHz,  
                  Emission Level at 3 m    56.9 dB $\mu$ V/m

$$\begin{aligned} & \text{Emission Level at 300 m } [\mu\text{V/m}] \\ & = 0.01 * 10^{(56.9 / 20)} \\ & = 6.998 \mu\text{V/m} \end{aligned}$$

## 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.

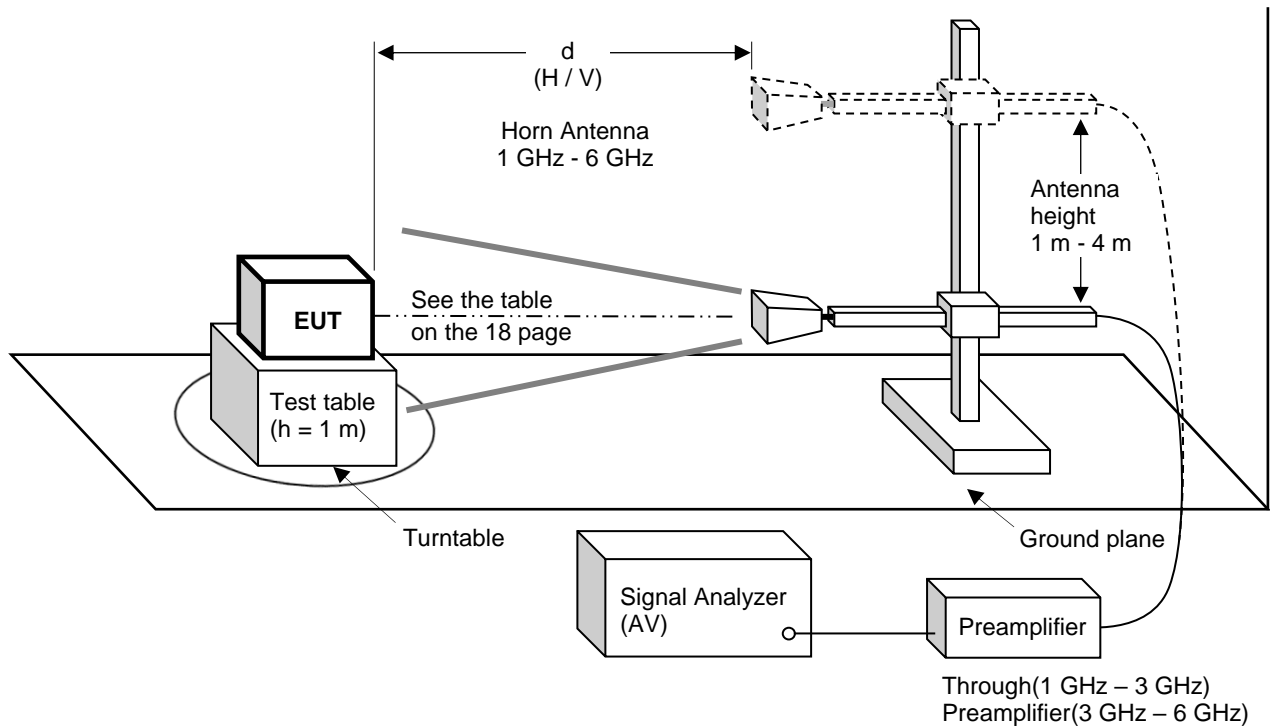
The operation mode was selected for maximum emission.

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).

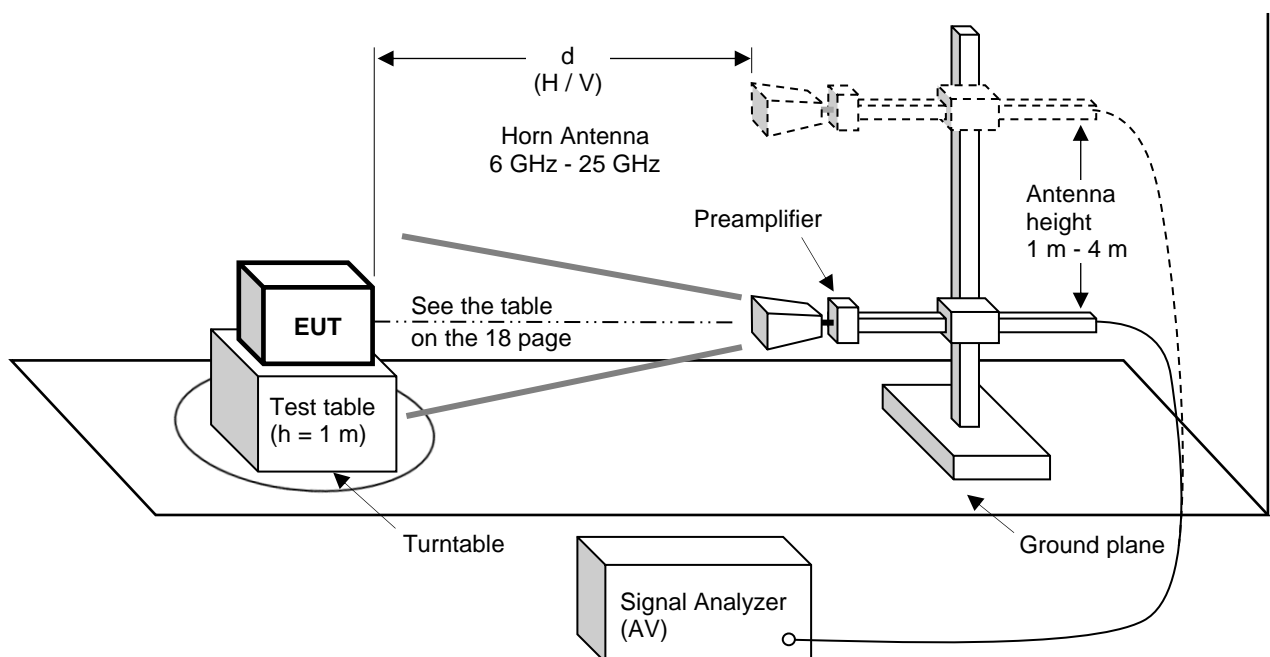
Final measurement: Emission levels (AV value) were measured by means of the signal analyzer (1 GHz - 25 GHz) referring the result of Pre-check.

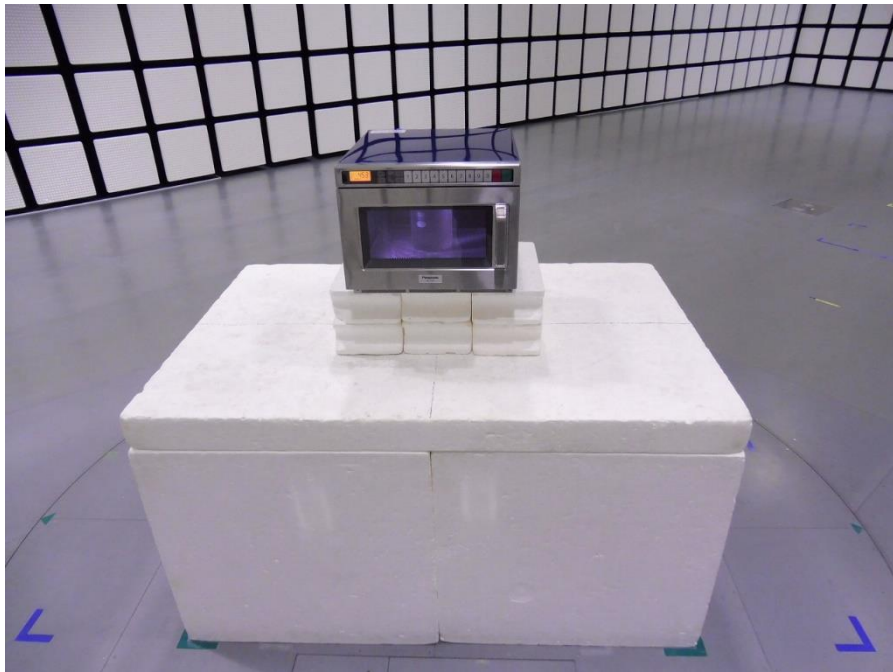
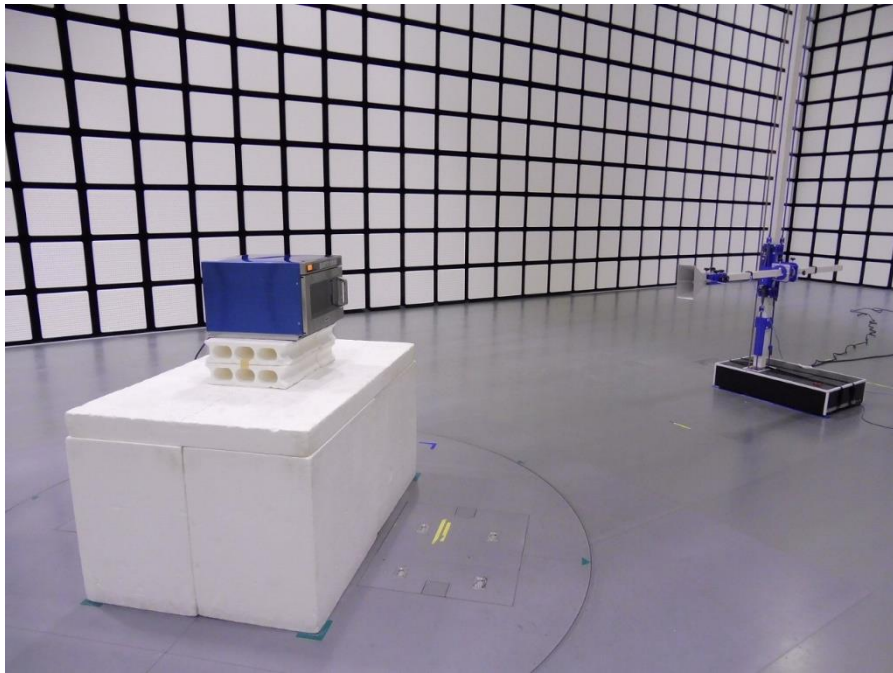
The emission level from the EUT were maximized changing conditions; Turn table rotation, Antenna height, azimuth and arrangement of the EUT.

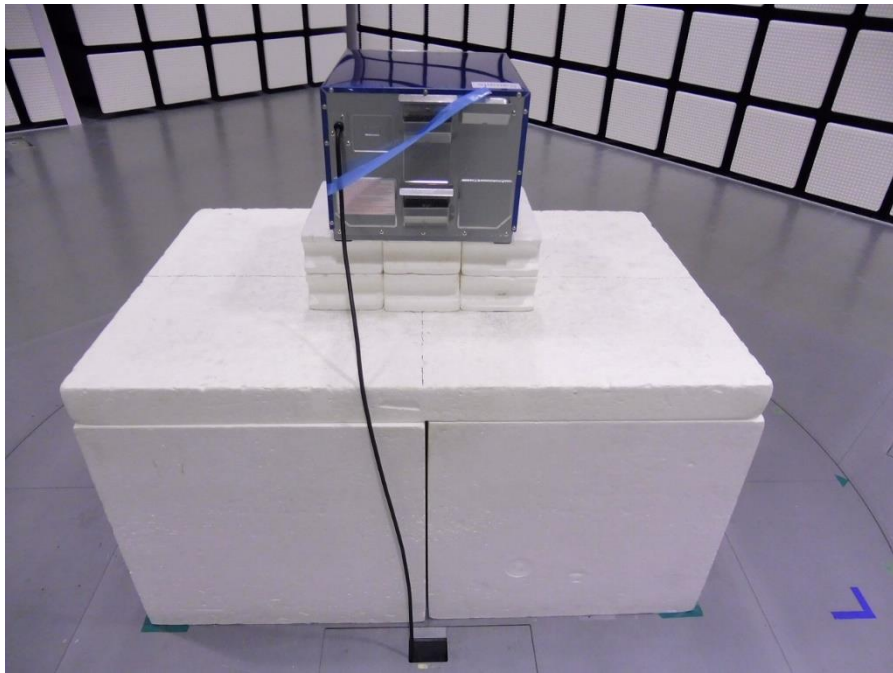
**Drawing : 1 GHz - 6 GHz**



**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 2000 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 230 V]  
 Maximum frequency variation  
 Variation of frequency with time, using the Load  
 2.450 GHz - 2.478 GHz (1500 ml ~ 300 ml / Load)

EUT Warm-up Time: 10 minutes  
 Date: 21 January, 2022  
 Environment: 15 deg.C / 48 % / 999 hPa

	Time (minutes)	Frequency (GHz)	Time (minutes)	Frequency (GHz)	Time (minutes)	Frequency (GHz)	
100%	0	2.462	-	-	-	-	
	2	2.458	22	2.455	42	2.458	
	4	2.459	24	2.455	44	2.465	
	6	2.459	26	2.456	46	2.467	
	8	2.457	28	2.473			
	10	2.450	30	2.473			
	12	2.457	32	2.472			
	14	2.457	34	2.467			
	16	2.458	36	2.454			
	18	2.457	38	2.468			
	20	2.455	40	2.478			
							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 230 V]

Variation of frequency for Line Voltage variation

2.455 GHz - 2.462 GHz (184 V ~ 264.5 V / 1500 ml Load)

EUT Warm-up Time: 10 minutes

Date: 21 January, 2022

Environment: 15 deg.C / 48 % / 999 hPa

input voltage (%)	Voltage (V)	Frequency (GHz)
80%	184	2.462
85%	195.5	2.459
90%	207	2.459
95%	218.5	2.458
100%	230	2.457
105%	241.5	2.458
110%	253	2.455
115%	264.5	2.456
125%	287.5	*

\* : Powered down for protection.

## 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