

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:

A handwritten signature in blue ink that appears to read 'T Nakamori'.

Takuya Nakamori

Laboratory Director,
EMC Test Laboratory

Reviewed by:

A handwritten signature in blue ink that appears to read '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:

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

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

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

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
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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 – 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)
Microcomputer	: 8

◆ 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 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

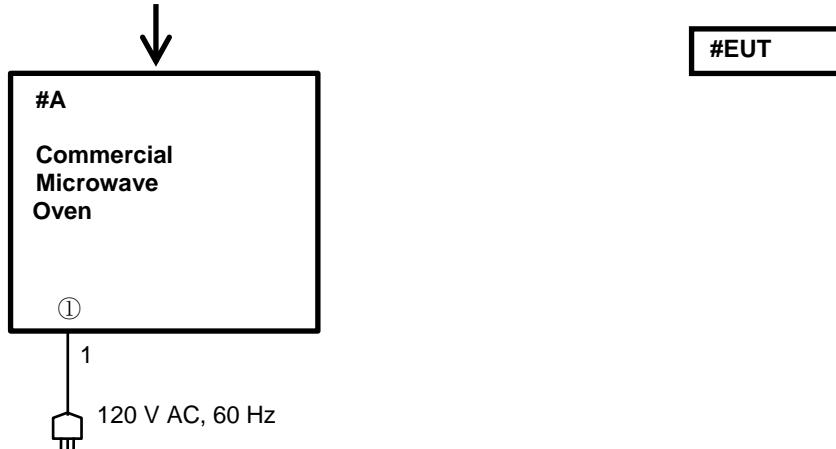
◆ Details of ports

Port No.	Name of port	Remarks
(1)	AC 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	EUT Warm-up Time: 10 minutes		
Resolution Bandwidth	:	9 kHz (8 MHz to 30 MHz)	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 [dB μ V]	Emission Level at 10 m [dB μ V/m]	Emission Level at 300 m [dB μ V/m]	Emission Level at 300 m [μ V/m]	Limit at 300 m [μ V/m]	Margin at 300 m [μ V/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 [dB μ V/m] = Reading at 10m [dB μ V] + Factor [dB/m]

Emission Level at 300 m [dB μ V/m] = Emission Level at 10 m [dB μ V/m] + $40\log(10/300)$ [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 μ 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.

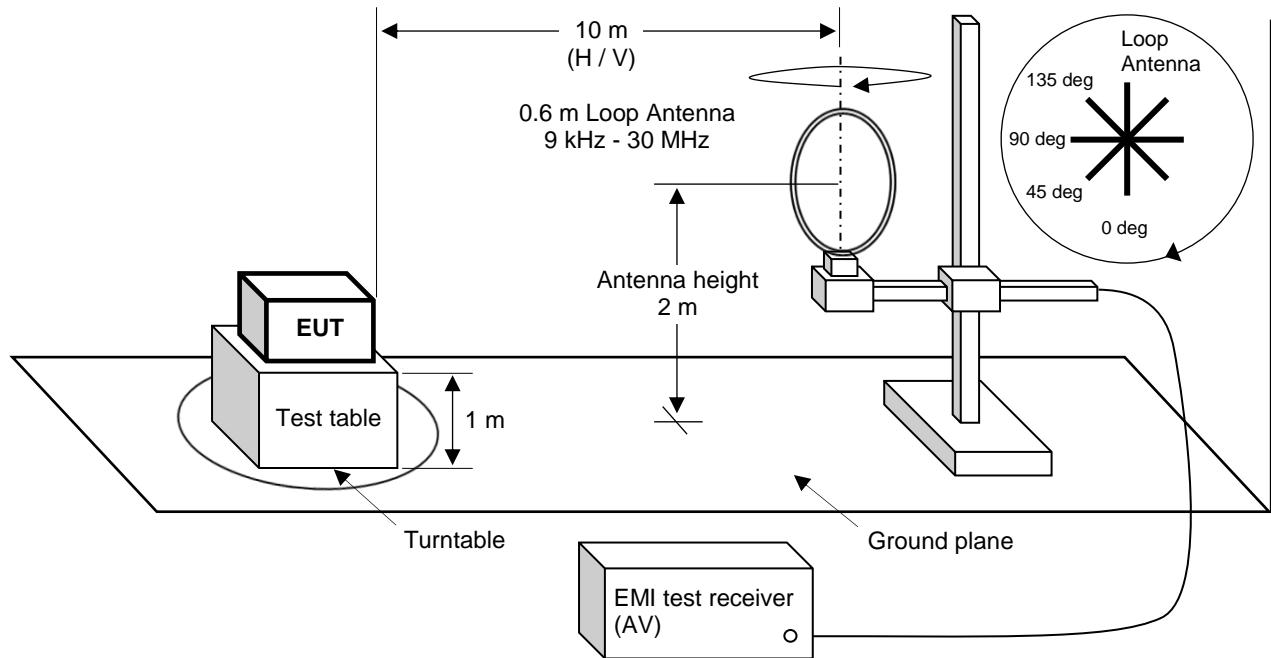
Pre-check : A loop antenna was set at a height of 2 m and a level with a small margin of Vertical axis ($0^\circ, 45^\circ, 90^\circ, 135^\circ$) and Horizontal Axis was measured using a spectrum analyzer.

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

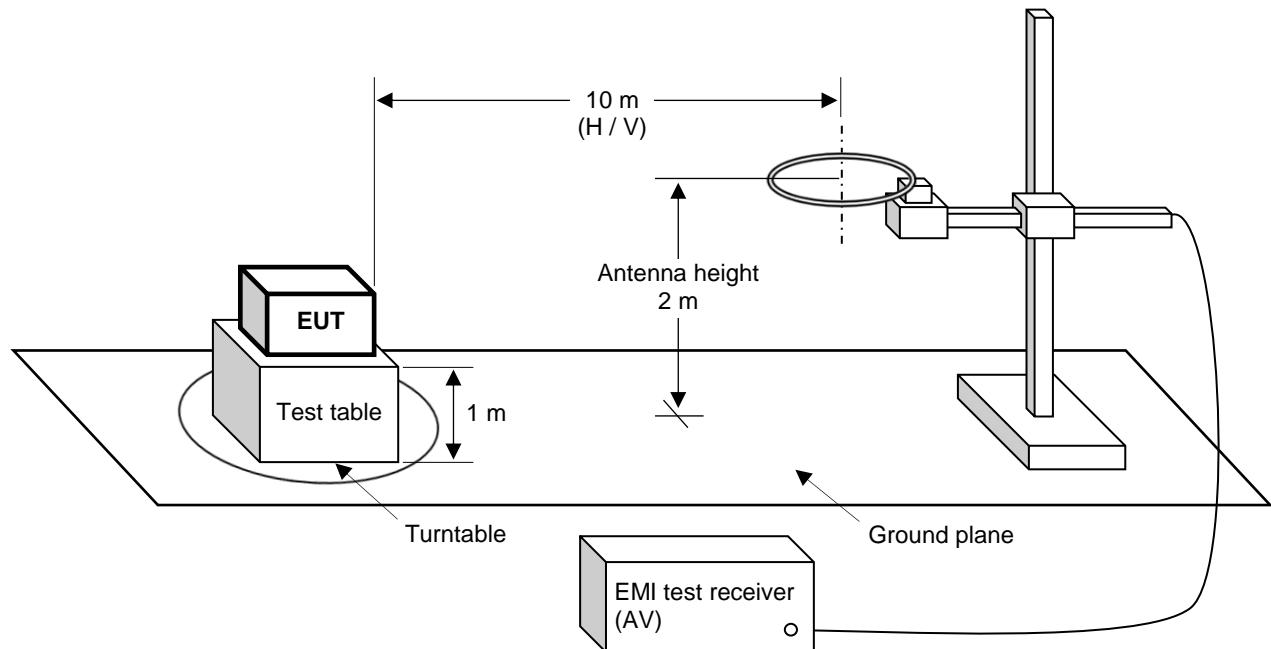
The emission levels from the EUT were maximized changing conditions; Turntable rotation, Antenna height and arrangement of the EUT.

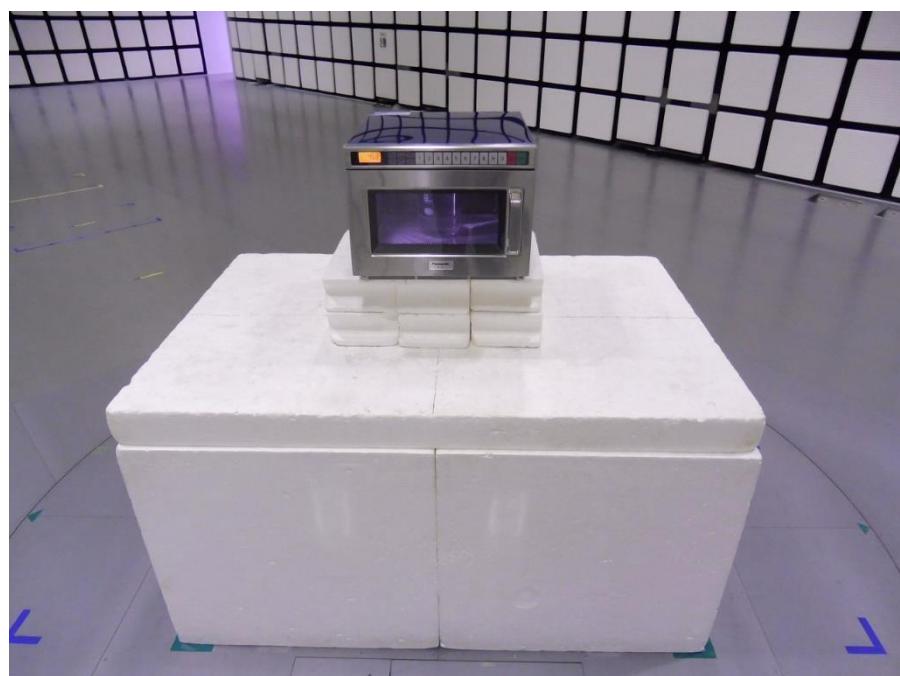
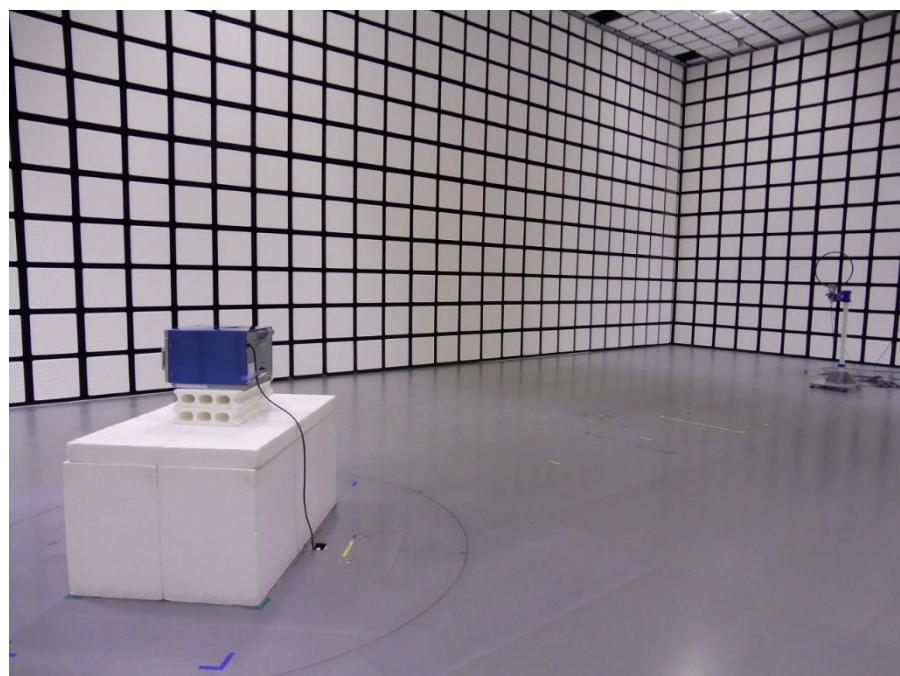
Drawing:

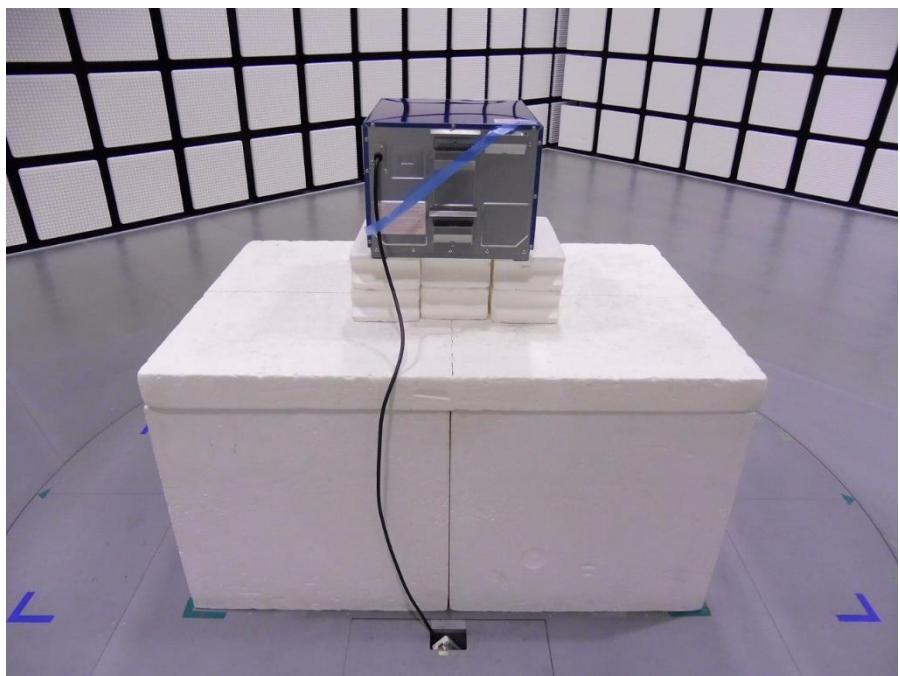
Vertical axis



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
Detector Function	:	Average		Environment: 20 deg.C / 38 % / 990 hPa
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 [dB μ V]	Emission Level at 10 m [dB μ V/m]	Emission Level at 300 m [dB μ V/m]	Emission Level at 300 m [μ V/m]	Limit at 300 m [μ V/m]	Margin at 300 m [μ V/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 [dB μ V/m] = Reading at 10m [dB μ V] + Factor [dB/m]

Emission Level at 300 m [dB μ V/m] = Emission Level at 10 m [dB μ V/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 μ 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

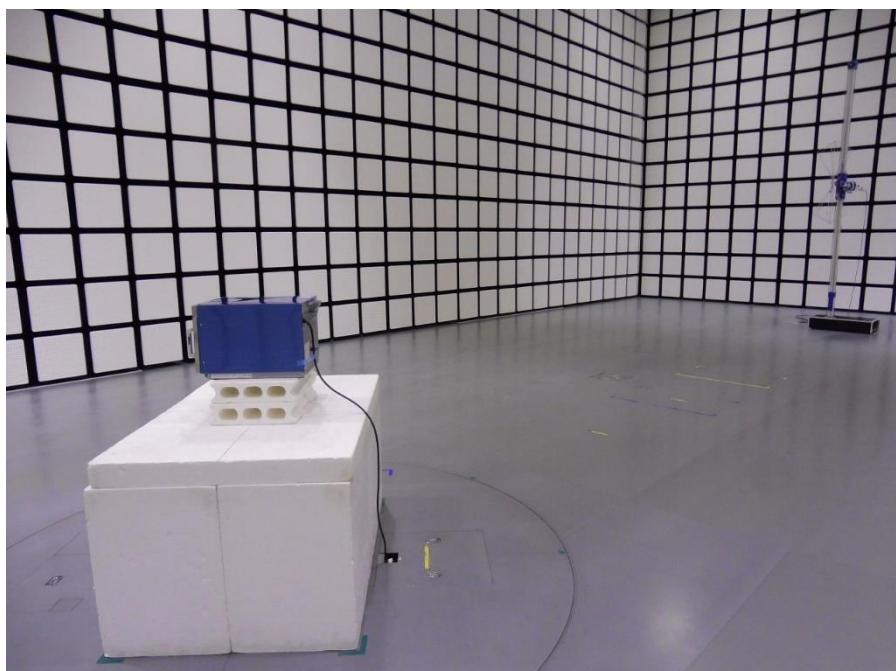
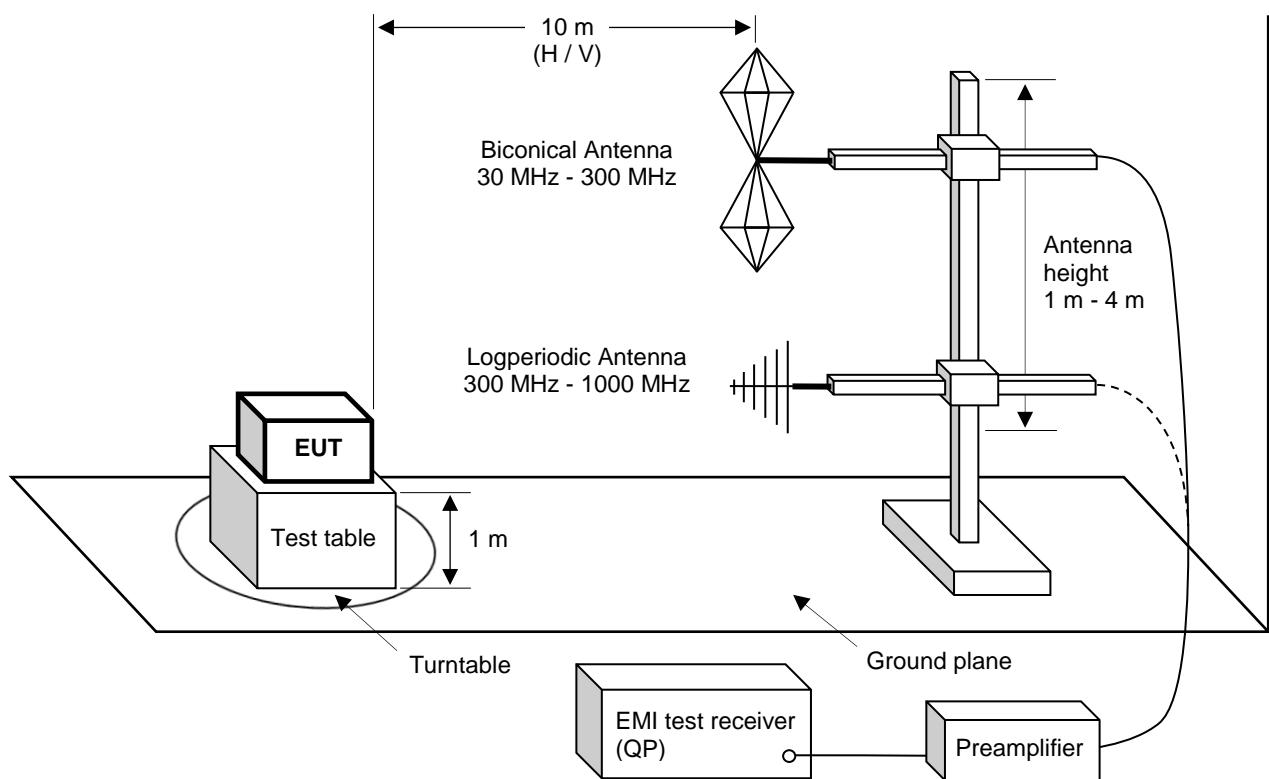
The EUT was placed on a 1 m high nonconductive turntable.
The turntable was separated from the antenna by a distance of 10 m.

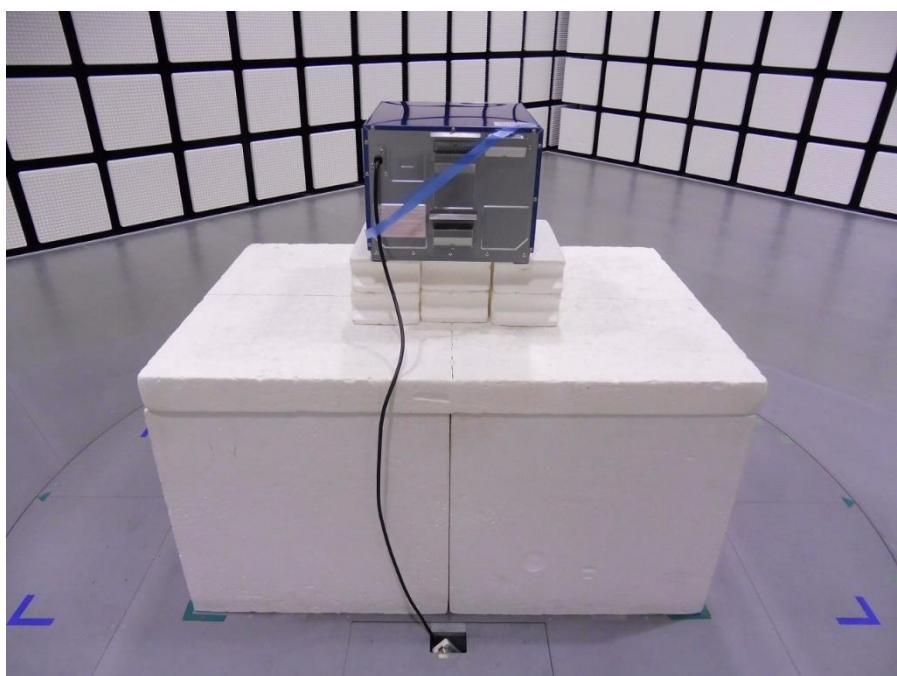
The operation mode was selected for maximum emission.

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]	θ_{3dB} E Plane [°]	θ_{3dB} H Plane [°]	θ_{3dB} min [°]	W min [m]
1 - 6	32.1	52.5	32.1	1.73

θ_{3dB} : The minimum 3 dB beam width of receive antenna.

W : The dimension of the line tangent to the EUT formed by θ_{3dB} at 3 m.

$$W = 2 \times 3 \text{ [m]} \times \tan(0.5 \times \theta_{3dB}) \doteq 1.73 \text{ m}$$

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

θ_{3dB} : The minimum 3 dB beam width of receive antenna.

W : The dimension of the line tangent to the EUT formed by θ_{3dB} at 3 m.

$$W = 2 \times 3 \text{ [m]} \times \tan(0.5 \times \theta_{3dB}) \doteq 0.90 \text{ m}$$

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

θ_{3dB} : The minimum 3 dB beam width of receive antenna.

W : The dimension of the line tangent to the EUT formed by θ_{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 [dB μ V]	Emission Level at 3 m [dB μ V/m]	Emission Level at 3 m [μ V/m]	Distance Factor K	Emission Level at 300 m [μ V/m]	Limit at 300 m [μ V/m]	Margin at 300 m [μ V/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 [dB μ V/m] = Reading at 3m [dB μ V] + Factor [dB/m]

Emission Level at 300 m [μ V/m] = K * Emission Level at 3m [μ 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 : 1050 ml Right Front

Antenna Polar.	Freq. [MHz]	Factor [dB/m]	Reading at 3 m [dB μ V]	Emission Level at 3 m [dB μ V/m]	Emission Level at 3 m [μ V/m]	Distance Factor K	Emission Level at 300 m [μ V/m]	Limit at 300 m [μ V/m]	Margin at 300 m [μ 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 μ V/m] = Reading at 3m [dB μ V] + Factor [dB/m]

Emission Level at 300 m [μ V/m] = K * Emission Level at 3m [μ 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 μ V]	Emission Level at 3 m [dB μ V/m]	Emission Level at 3 m [μ V/m]	Distance Factor K	Emission Level at 300 m [μ V/m]	Limit at 300 m [μ V/m]	Margin at 300 m [μ 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 μ V/m] = Reading at 3m [dB μ V] + Factor [dB/m]

Emission Level at 300 m [μ V/m] = K * Emission Level at 3m [μ 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 μ V]	Emission Level at 3 m [dB μ V/m]	Emission Level at 3 m [μ V/m]	Distance Factor K	Emission Level at 300 m [μ V/m]	Limit at 300 m [μ V/m]	Margin at 300 m [μ 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 μ V/m] = Reading at 3m [dB μ V] + Factor [dB/m]

Emission Level at 300 m [μ V/m] = K * Emission Level at 3m [μ 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:

Emission Level at 300 m [μ V/m]
= $K \cdot 10^{\{(Emission\ Level\ at\ 3\ m\ [dB\mu V/m])\ / 20\}}$
K: Conversion Factor for 3 m to 300 m

Example: Frequency 2398.59 MHz,
Emission Level at 3 m 59.6 dB μ V/m

Emission Level at 300 m [μ V/m]
= $0.01 \cdot 10^{\{59.6 / 20\}}$
= 9.550 μ V/m

Photographs of the Test Set-up

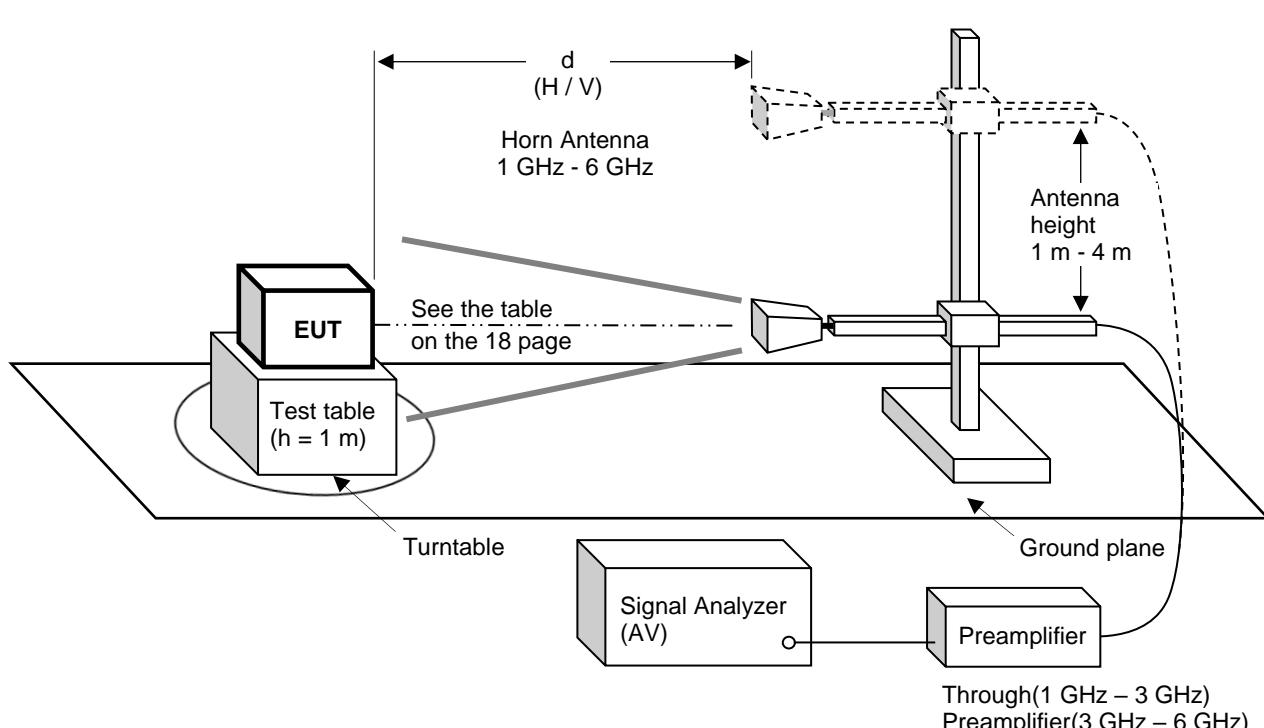
The EUT was placed on a 1 m high nonconductive turntable.
The turntable was separated from the antenna by a distance of 3 m.

The operation mode was selected for maximum emission.

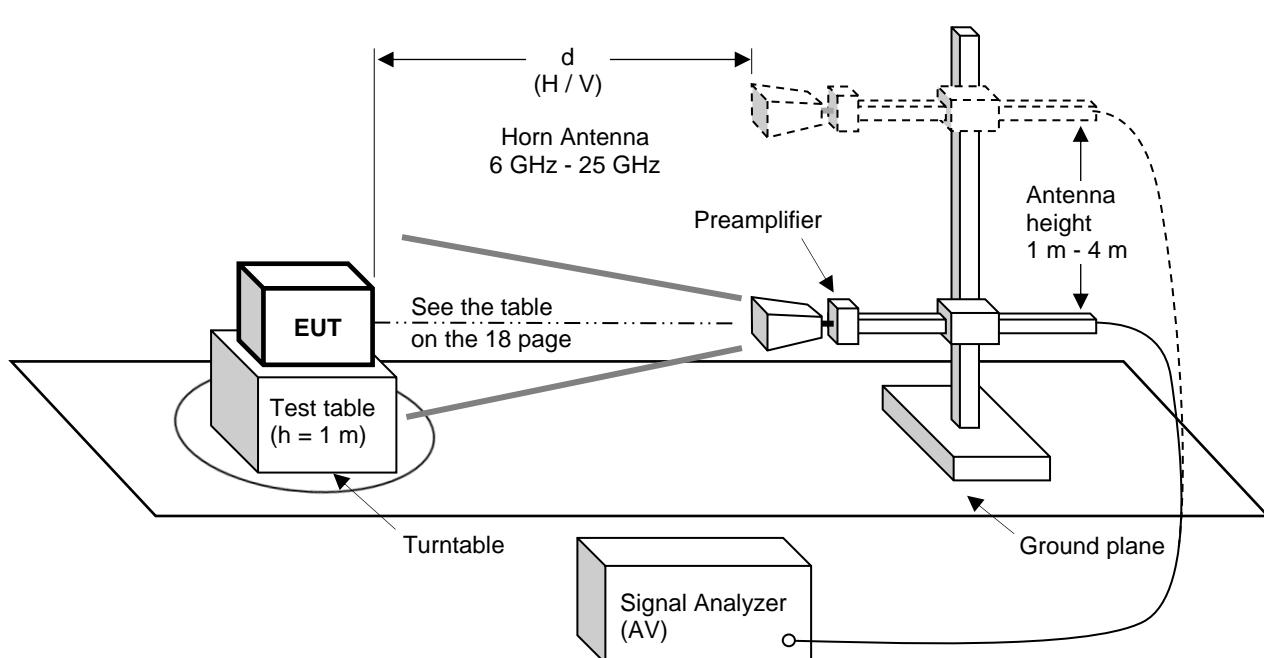
Pre-check: Radiated emission levels (AV value) which have small margin for the regulation were measured by means of signal analyzer changing antenna movement (1 m - 4 m) and table rotation (0 degree - 360 degree).
Final measurement: Emission levels (AV value) were measured by means of the signal analyzer (1 GHz - 25 GHz) referring the result of Pre-check.

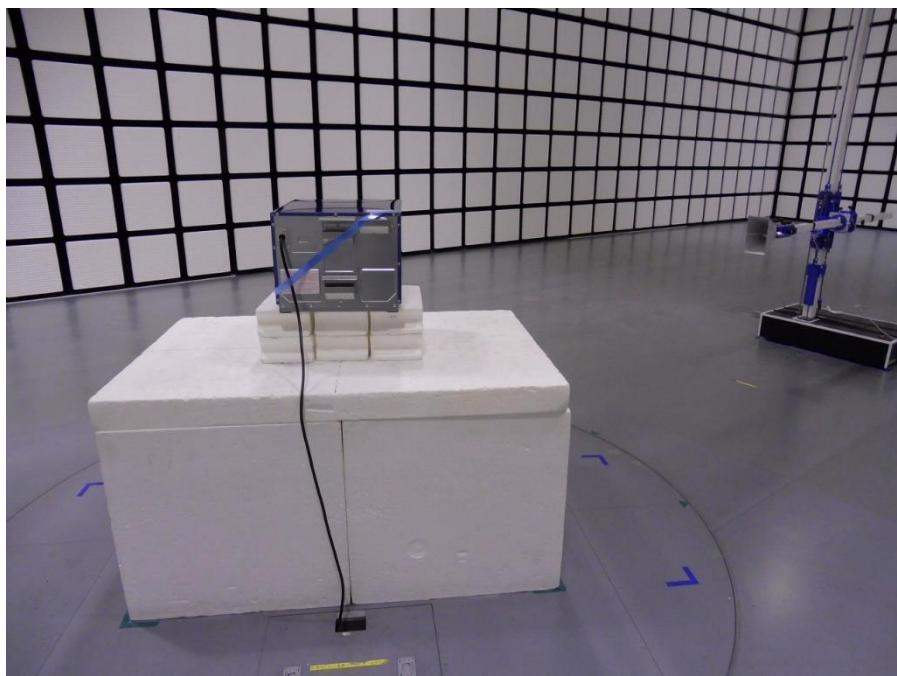
The emission level from the EUT were maximized changing conditions; Turn table rotation, Antenna height, azimuth and arrangement of the EUT.

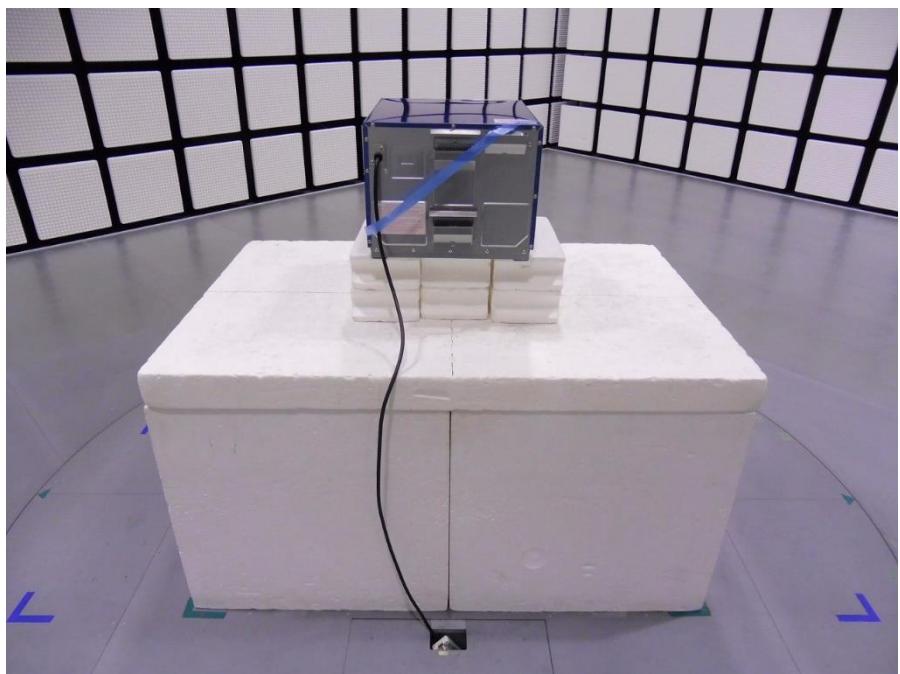
Drawing : 1 GHz - 6 GHz



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