



# EMI TEST REPORT


**Test Report No. : 13367629H-B-R1**

**Applicant** : DENSO CORPORATION  
**Type of EUT** : Cockpit Control Unit (CCU)  
**Model Number of EUT** : DNNS118  
**FCC ID** : HYQDNNS118  
**Test regulation** : FCC Part 15 Subpart B: 2020  
ICES-003 Issue 6: 2016 (updated April 2019)  
**Test Result** : Complied (Refer to SECTION 3.2)

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by the A2LA accreditation body.
6. This test report covers EMC technical requirements. It does not cover administrative issues such as Manual or non- EMC test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in SECTION 1.
10. This report is a revised version of 13367629H-B. 13367629H-B is replaced with this report.

**Date of test:** June 6 to 15, 2020

**Representative test engineer:**   
Hiroki Numata  
Engineer  
Consumer Technology Division

**Approved by:**   
Tsubasa Takayama  
Leader  
Consumer Technology Division



CERTIFICATE 5107.02

- The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.  
 There is no testing item of "Non-accreditation".

**UL Japan, Inc.**

**Ise EMC Lab.**

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## **REVISION HISTORY**

### **Original Test Report No.: 13367629H-B**

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13367629H-B	August 5, 2020	-	-
1	13367629H-B-R1	October 23, 2020	P.16, 18	Correction of CALCULATION formula.

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## Reference: Abbreviations (Including words undescribed in this report)

AAN	Asymmetric Artificial Network	ILAC	International Laboratory Accreditation Conference
AC	Alternating Current	ISED	Innovation, Science and Economic Development Canada
AM	Amplitude Modulation	ISN	Impedance Stabilization Network
AMN	Artificial Mains Network	ISO	International Organization for Standardization
Amp, AMP	Amplifier	JAB	Japan Accreditation Board
ANSI	American National Standards Institute	LAN	Local Area Network
Ant, ANT	Antenna	LCL	Longitudinal Conversion Loss
AP	Access Point	LIMS	Laboratory Information Management System
ASK	Amplitude Shift Keying	LISN	Line Impedance Stabilization Network
Atten., ATT	Attenuator	MRA	Mutual Recognition Arrangement
AV	Average	N/A	Not Applicable
BPSK	Binary Phase-Shift Keying	NIST	National Institute of Standards and Technology
BR	Bluetooth Basic Rate	NS	No signal detect.
BT	Bluetooth	NSA	Normalized Site Attenuation
BT LE	Bluetooth Low Energy	NVLAP	National Voluntary Laboratory Accreditation Program
BW	BandWidth	OBW	Occupied Band Width
C.F	Correction Factor	OFDM	Orthogonal Frequency Division Multiplexing
Cal Int	Calibration Interval	PK	Peak
CAV	CISPR AV	PLT	long-term flicker severity
CCK	Complementary Code Keying	POHC(A)	Partial Odd Harmonic Current
CDN	Coupling Decoupling Network	Pol., Pola.	Polarization
Ch., CH	Channel	PR-ASK	Phase Reversal ASK
CISPR	Comite International Special des Perturbations Radioelectriques	Pst	short-term flicker severity
Corr.	Correction	QAM	Quadrature Amplitude Modulation
CPE	Customer premise equipment	QP	Quasi-Peak
CW	Continuous Wave	QPSK	Quadri-Phase Shift Keying
DBPSK	Differential BPSK	r.m.s., RMS	Root Mean Square
DC	Direct Current	RBW	Resolution Band Width
DET	Detector	RE	Radio Equipment
D-factor	Distance factor	REV	Reverse
Dmax	maximum absolute voltage change during an observation period	RF	Radio Frequency
DQPSK	Differential QPSK	RFID	Radio Frequency Identifier
DSSS	Direct Sequence Spread Spectrum	RSS	Radio Standards Specifications
EDR	Enhanced Data Rate	Rx	Receiving
e.i.r.p., EIRP	Equivalent Isotropically Radiated Power	SINAD	Ratio of (Signal + Noise + Distortion) to (Noise + Distortion)
EM clamp	Electromagnetic clamp	S/N	Signal to Noise ratio
EMC	ElectroMagnetic Compatibility	SA, S/A	Spectrum Analyzer
EMI	ElectroMagnetic Interference	SG	Signal Generator
EMS	ElectroMagnetic Susceptibility	SVSWR	Site-Voltage Standing Wave Ratio
EN	European Norm	THC(A)	Total Harmonic Current
e.r.p., ERP	Effective Radiated Power	THD(%)	Total Harmonic Distortion
EU	European Union	TR	Test Receiver
EUT	Equipment Under Test	Tx	Transmitting
Fac.	Factor	VBW	Video BandWidth
FCC	Federal Communications Commission	Vert.	Vertical
FHSS	Frequency Hopping Spread Spectrum	WLAN	Wireless LAN
FM	Frequency Modulation	xDSL	Generic term for all types of DSL technology (DSL: Digital Subscriber Line)
Freq.	Frequency		
FSK	Frequency Shift Keying		
Fund	Fundamental		
FWD	Forward		
GFSK	Gaussian Frequency-Shift Keying		
GNSS	Global Navigation Satellite System		
GPS	Global Positioning System		
Hori.	Horizontal		
ICES	Interference-Causing Equipment Standard		
I/O	Input/Output		
IEC	International Electrotechnical Commission		
IEEE	Institute of Electrical and Electronics Engineers		
IF	Intermediate Frequency		

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## **SECTION 1: Customer information**

Company Name : DENSO CORPORATION  
Address : 1-1 Showa-cho, Kariya-shi, Aichi ken, 448-8661 Japan  
Telephone Number : +81-566-20-3304  
Facsimile Number : +81-566-25-4920  
Contact Person : Naoto Makino

The information provided from the customer is as follows;

- Applicant, Type of EUT, Model Number of EUT, FCC ID on the cover and other relevant pages
- Operating/Test Mode(s) (Mode(s)) on all the relevant pages
- SECTION 1: Customer information
- SECTION 2: Equipment under test (EUT) other than the Receipt Date
- SECTION 4: Operation of EUT during testing

\* The laboratory is exempted from liability of any test results affected from the above information in SECTION 2 and 4.

## **SECTION 2: Equipment under test (EUT)**

### **2.1 Identification of EUT**

Type : Cockpit Control Unit (CCU)  
Model Number : DNNS118  
Serial Number : Refer to SECTION 4.2  
Rating : DC 13.2 V  
Receipt Date : May 21, 2020  
Country of Mass-production : Japan  
Condition : Production prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)  
Modification : No Modification by the test lab

## 2.2 Product Description

Model: DNNS118 (referred to as the EUT in this report) is a Cockpit Control Unit (CCU).

### General Specification

Feature of EUT:

Clock frequency(ies) in the system : 3.1 GHz (max.)

### Radio Specification

#### [AM/FM (incl.RBDS)/XM Radio]

	AM	FM (incl. RBDS)	XM
Equipment type	Receiver		
Frequency of operation	530 kHz to 1710 kHz	87.75 MHz to 107.9 MHz	2333.465 MHz to 2344.045 MHz
Antenna connector type	GT13		

#### [Bluetooth (Ver4.2 BR/EDR)]

	Bluetooth
Equipment type	Transceiver
Frequency of operation	2402 MHz to 2480 MHz
Type of modulation	FHSS (GFSK, $\pi/4$ -DQPSK, 8-DPSK)
Channel spacing	1 MHz
Antenna type	ASSEMBLY Bluetooth Antenna
Antenna Connector type	MHF PLUG
Antenna Gain	-0.88 dBi (max)

## **SECTION 3: Test specification, procedures & results**

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart B  
FCC Part 15 final revised on June 26, 2020 and effective July 27, 2020  
Title : FCC 47CFR Part15 Radio Frequency Device  
Subpart B Unintentional Radiators  
Test specification : ICES-003 Issue 6: 2016 (updated April 2019)  
Title : Spectrum Management and Telecommunications  
Interference-Causing Equipment Standard  
Information Technology Equipment (Including Digital Apparatus) –  
Limits and Methods of Measurement

\* The revision does not affect the test result conducted before its effective date.

### **3.2 Procedures and results**

Item	Test Procedure	Limits	Deviation	Worst margin	Result	Remarks
Conducted emission	FCC: ANSI C63.4: 2014 7. AC power - line conducted emission measurements IEEE 187: 2003 ----- ISED: ICES-003 Issue 6: 2016 (updated April 2019)	FCC:Part 15 Subpart B 15.107(a)	N/A	N/A	N/A	*1)
Radiated emission	FCC: ANSI C63.4: 2014 8. Radiated emission measurements IEEE 187: 2003 ----- ISED: ICES-003 Issue 6: 2016 (updated April 2019)	FCC: Part 15 Subpart B 15.109(a)	N/A	2.13 dB 216.000 MHz, QP, Vert., Mode 1	Complied# a)	-
Antenna Terminal	FCC: ANSI C63.4: 2014 12. Measurement of unintentional radiators other than ITE IEEE 187: 2003 ----- IC: -	FCC: Part 15 Subpart B 15.111(a)	N/A	27.64 dB 705.962 MHz, PK (Mode 3, Main part)	Complied b)	-
*Note: UL Japan, Inc's EMI Work Procedure 13-EM-W0420. *1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line. a) Refer to APPENDIX 1 (data of Radiated Emission) b) Refer to APPENDIX 1 (data of Antenna Terminal Conducted Emission)						
Symbols: Complied                   The data of this test item has enough margin, more than the measurement uncertainty. Complied#                The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.						

### **3.3 Addition to standard**

No addition, exclusion nor deviation has been made from the standard.

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### 3.4 Uncertainty

There is no applicable rule of uncertainty in this applied standard. Therefore, the results are derived depending on whether or not laboratory uncertainty is applied.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor  $k = 2$ .

#### Radiated emission

Measurement distance	Frequency range	Uncertainty (+/-)	
3 m	30 MHz to 200 MHz	(Horizontal)	4.8 dB
		(Vertical)	5.0 dB
	200 MHz to 1000 MHz	(Horizontal)	5.2 dB
		(Vertical)	6.3 dB
10 m	30 MHz to 200 MHz	(Horizontal)	4.8 dB
		(Vertical)	4.8 dB
	200 MHz to 1000 MHz	(Horizontal)	5.0 dB
		(Vertical)	5.0 dB
3 m	1 GHz to 6 GHz	4.9 dB	
	6 GHz to 18 GHz	5.2 dB	
1 m	10 GHz to 26.5 GHz	5.5 dB	
	26.5 GHz to 40 GHz	5.5 dB	
0.5 m	26.5 GHz to 40 GHz	5.5 dB	
10 m	1 GHz to 18 GHz	5.2 dB	

#### Antenna Terminal test

Test Item	Uncertainty (+/-)
Antenna terminal conducted emission / Power density / Burst power	2.6 dB



### 3.5 Test Location

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\* A2LA Certificate Number: 5107.02/ FCC Test Firm Registration Number: 199967 / ISED Lab Company Number: 2973C

Test site	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms	Maximum measurement distance
No.1 semi-anechoic chamber	19.2 x 11.2 x 7.7	7.0 x 6.0	No.1 Power source room	10 m
No.2 semi-anechoic chamber	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	12.0 x 8.5 x 5.9	6.8 x 5.75	No.3 Preparation room	3 m
No.3 shielded room	4.0 x 6.0 x 2.7	N/A	-	-
No.4 semi-anechoic chamber	12.0 x 8.5 x 5.9	6.8 x 5.75	No.4 Preparation room	3 m
No.4 shielded room	4.0 x 6.0 x 2.7	N/A	-	-
No.5 semi-anechoic chamber	6.0 x 6.0 x 3.9	6.0 x 6.0	-	-
No.5 measurement room	6.4 x 6.4 x 3.0	6.4 x 6.4	-	-
No.6 shielded room	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room	3.1 x 5.0 x 2.7	3.1 x 5.0	-	-
No.9 measurement room	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.11 measurement room	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

\* Size of vertical conducting plane (for Conducted Emission test) : 2.0 m x 2.0 m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

### 3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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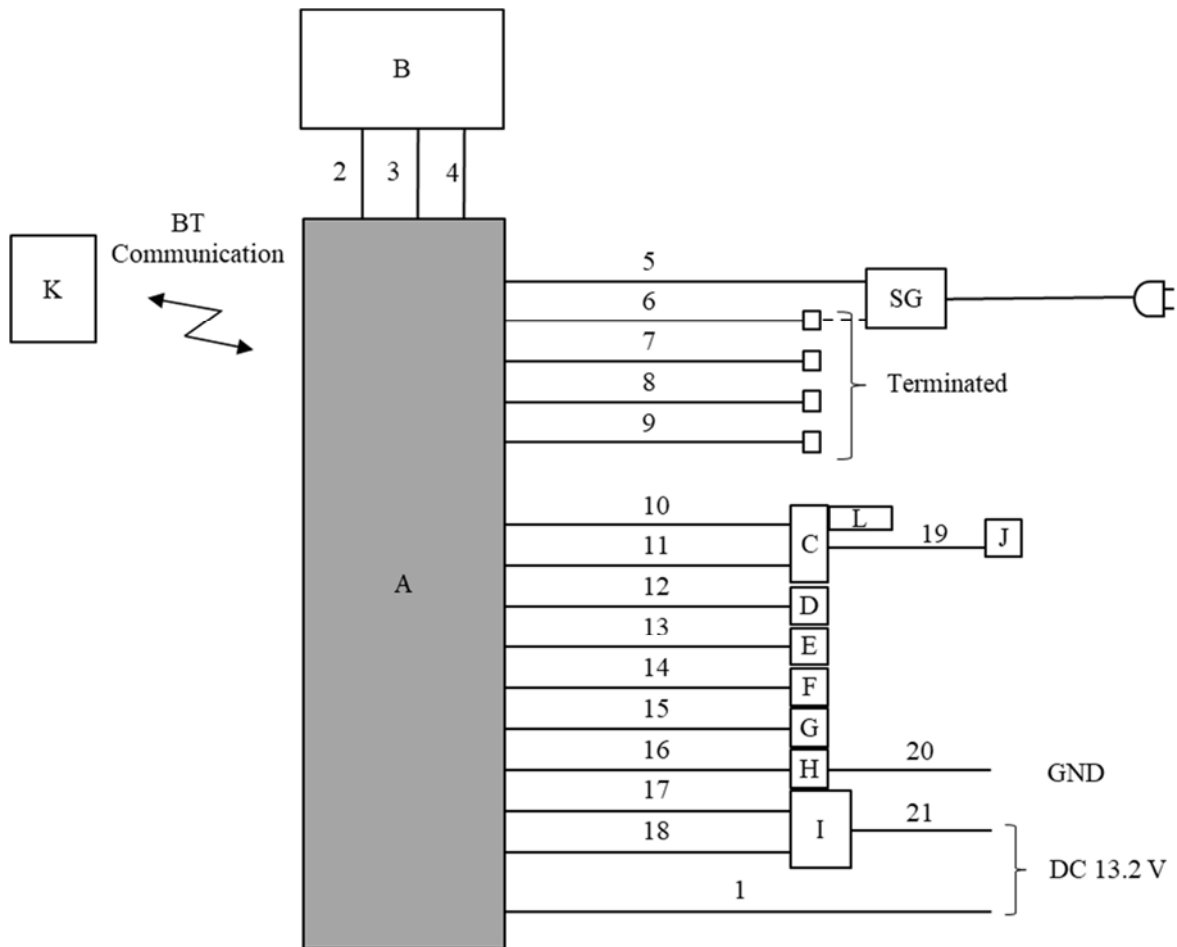
## SECTION 4: Operation of EUT during testing

### 4.1 Operating Mode(s)

Mode	Remarks
Mode 1: FM Receiving (Local) mode	Radiated emission test
Mode 2: FM Receiving (Other) mode	Radiated emission test
Mode 3: FM Tuning mode	Antenna terminal test

Software : F21SBM003-006

### 4.2 Configuration and peripherals



\* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.

**Description of EUT and Support equipment**

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Cockpit Control Unit	DNNS118	86201VC600	DENSO CORPORATION	EUT
B	Center Information Display	DNNS092	SD-EU-HM-RHD-058	DENSO CORPORATION	-
C	AUX-Box	86257FL001	-	-	-
D	Speaker	-	-	-	-
E	Speaker	-	-	-	-
F	Speaker	-	-	-	-
G	Speaker	-	-	-	-
H	CAN Terminated	-	-	-	-
I	Meter	-	457300-7520	DENSO CORPORATION	-
J	iPod	A1238(MC297J)	8K131HXB9ZU	Apple	-
K	iPod touch	A1367	C3RJ4SLADT75	Apple	-
L	USB Memory	USM4GR B	17116 DGMN	SONY	-

**List of cables used**

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	1.0	Unshielded	Unshielded	-
2	BT Cable	0.2	Shielded	Shielded	-
3	LVDS Cable	0.2	Shielded	Shielded	-
4	DC Cable	0.2	Unshielded	Unshielded	-
5	AM/FM Antenna Cable	1.4	Shielded	Shielded	-
6	XM Antenna Cable	1.4	Shielded	Shielded	-
7	USB Cable	1.5	Shielded	Shielded	-
8	USB Cable	1.5	Shielded	Shielded	-
9	Signal Cable	1.7	Unshielded	Unshielded	-
10	USB Cable	0.4	Shielded	Shielded	-
11	Signal Cable	1.7	Unshielded	Unshielded	-
12	Speaker Cable	1.5	Unshielded	Unshielded	-
13	Speaker Cable	1.5	Unshielded	Unshielded	-
14	Speaker Cable	1.5	Unshielded	Unshielded	-
15	Speaker Cable	1.9	Unshielded	Unshielded	-
16	Signal Cable	1.7	Unshielded	Unshielded	-
17	Signal Cable	1.7	Unshielded	Unshielded	-
18	Meter Cable	1.7	Shielded	Shielded	-
19	Audio Cable	1.5	Shielded	Shielded	-
20	DC Cable	3.0	Unshielded	Unshielded	-
21	DC Cable	3.0	Unshielded	Unshielded	-

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## **SECTION 5: Radiated Emission**

### **5.1 Operating environment**

Test place : No.4 semi anechoic chamber  
Temperature : See data  
Humidity : See data

### **5.2 Test configuration**

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane.

The EUT was set on the edge of the tabletop.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

Photographs of the set up are shown in APPENDIX 3.

### **5.3 Test conditions**

Frequency range : 30 MHz - 200 MHz (Biconical antenna) / 200 MHz - 1000 MHz (Logperiodic antenna)  
1000 MHz - 20000 MHz (Horn antenna)  
Test distance : 3 m  
EUT position : Table top  
EUT operation mode : See Clause 4.1

### **5.4 Test procedure**

The height of the measuring antenna varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver.

The radiated emission measurements were made with the following detector function of the Test Receiver.

The test of Local oscillator spurious has been measured up to appropriate frequency based on the result of the antenna terminal test.

For above 1 GHz, test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.

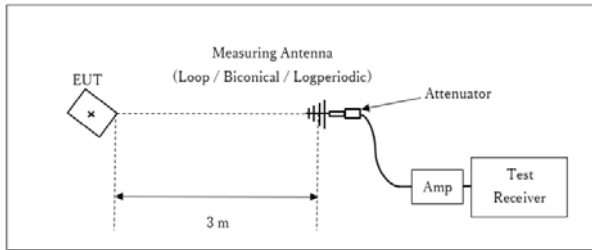
Frequency	Below 1GHz	Above 1GHz *1)
Instrument used	Test Receiver	Test Receiver
IF Bandwidth	QP: BW 120 kHz	PK: BW 1 MHz, CISPR AV: BW 1 MHz

\*1) The measurement data was adjusted to a 3 m distance using the following Distance Factor.

Distance Factor: See Figure 1.

**Figure 1: Test Setup**

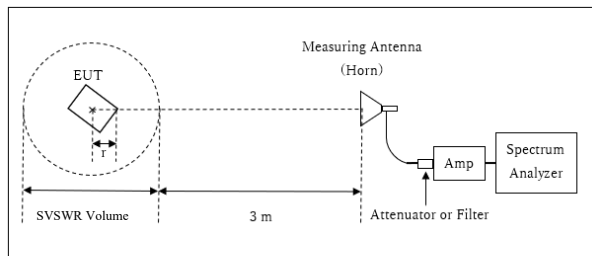
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 18 GHz

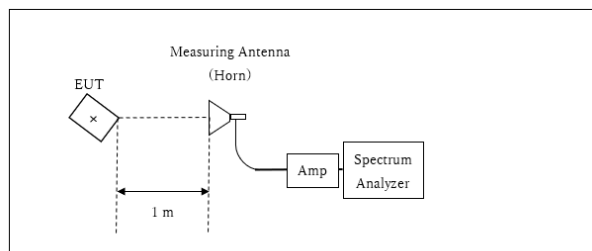


r : Radius of an outer periphery of EUT  
× : Center of turn table

Distance Factor:  $20 \times \log(3.1 \text{ m}^*/3.0 \text{ m}) = 0.29 \text{ dB}$   
\* Test Distance:  $(3 + \text{SVSWR Volume} / 2) - r = 3.1 \text{ m}$

SVSWR Volume: 2 m  
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)  
r = 0.90 m

18 GHz - 20 GHz



× : Center of turn table

Distance Factor:  $20 \times \log(1.0 \text{ m}^* / 3.0 \text{ m}) = -9.54 \text{ dB}$   
\*Test Distance: 1 m

The test was made on EUT at the normal use position.

## 6.5 Test result

Summary of the test results: Pass

The limit is rounded down to one decimal place.

The test result is rounded off to one or two decimal places, so some differences might be observed.

Date: June 15, 2020

Test engineer: Hiroki Numata

## **SECTION 6: Antenna Terminal**

### **6.1 Operating environment**

Test place : No.4 Measurement room  
Temperature : See data  
Humidity : See data

### **6.2 Test configuration**

EUT was placed on a wooden table of nominal size, 1.0 m by 1.5 m, raised 0.8 m from the ground.  
Photographs of the set up are shown in Appendix 3.

### **6.3 Test conditions**

Frequency range : 30 MHz - 1000 MHz / 1000 MHz - 2000 MHz  
Test distance : N / A  
EUT position : Table top  
EUT operation mode : See Clause 4.1

### **6.4 Test procedure**

The Antenna Terminal was measured with a spectrum analyzer connected to the antenna port.

Frequency	Below 1 GHz	Above 1 GHz
Instrument used	Spectrum Analyzer	Spectrum Analyzer *1)
IF Bandwidth	PK: RBW: 100 kHz / VBW: 300 kHz	PK: RBW: 1 MHz / VBW: 3 MHz

\*1) The Spectrum Analyzer was used in 3 dB resolution bandwidth.

### **6.5 Test result**

Summary of the test results: Pass

Date: June 6 and 7, 2020

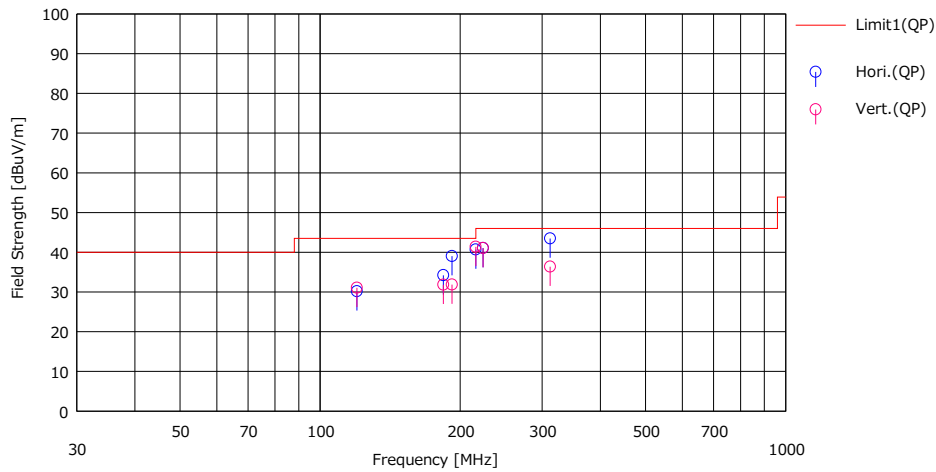
Test engineer: Kiyoshiro Okazaki

**APPENDIX 1: Test data**

**Radiated Emission**

Report No. 13367629H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date June 15, 2020  
Temperature / Humidity 23 deg. C / 58 % RH  
Engineer Hiroki Numata  
(Below 1 GHz)  
Mode Mode 1

Limit : FCC\_Part 15 Subpart B(15.109)\_Class B



No.	Freq. [MHz]	Reading	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result	Limit	Margn	Pda. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		[dBUV]				[dBUV/m]	[dB]	[dBUV/m]					
1	120.000	40.90	12.88	8.28	31.89	30.17	43.50	13.33	Hori.	171	211	BA	
2	184.000	41.00	16.20	8.85	31.83	34.22	43.50	9.28	Hori.	159	138	BA	
3	192.000	45.50	16.45	8.91	31.83	39.03	43.50	4.47	Hori.	167	71	BA	
4	216.000	52.30	11.07	9.11	31.81	40.67	43.50	2.83	Hori.	100	191	LA23	
5	224.000	52.50	11.17	9.18	31.80	41.05	46.00	4.95	Hori.	100	226	LA23	
6	312.000	51.60	13.82	9.80	31.76	43.46	46.00	2.54	Hori.	100	66	LA23	
7	120.000	41.80	12.88	8.28	31.89	31.07	43.50	12.43	Vert.	100	270	BA	
8	184.000	38.60	16.20	8.85	31.83	31.82	43.50	11.68	Vert.	100	209	BA	
9	192.000	38.30	16.45	8.91	31.83	31.83	43.50	11.67	Vert.	100	145	BA	
10	216.000	53.00	11.07	9.11	31.81	41.37	43.50	2.13	Vert.	100	168	LA23	
11	224.000	52.50	11.17	9.18	31.80	41.05	46.00	4.95	Vert.	100	162	LA23	
12	312.000	44.50	13.82	9.80	31.76	36.36	46.00	9.64	Vert.	100	115	LA23	

CHART: WITH FACTOR

ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN

CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + ATT) - GAIN(AMP)

Except for the above table: adequate margin data below the limits.

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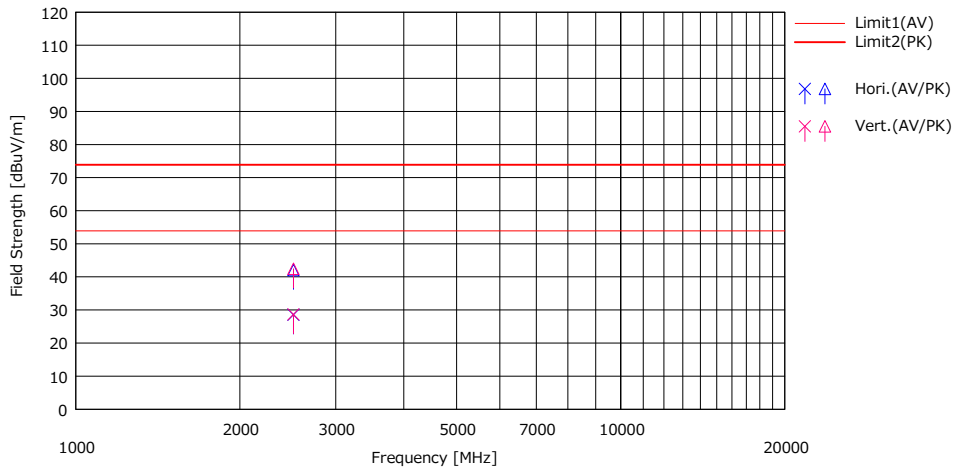
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## Radiated Emission

Report No. 13367629H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date June 15, 2020  
Temperature / Humidity 23 deg. C / 58 % RH  
Engineer Hiroki Numata  
(Above 1 GHz)  
Mode Mode 1

Limit : FCC\_Part 15 Subpart B(15.109)\_Class B



No.	Freq. [MHz]	Reading		Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result		Limit		Margin		Pola [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		(AV) [dBuV]	(PK) [dBuV]				(AV) [dBuV/m]	(PK) [dBuV/m]	(AV) [dBuV/m]	(PK) [dBuV/m]	(AV) [dB]	(PK) [dB]					
1	2509.498	30.00	43.50	27.66	2.71	31.82	28.55	42.05	53.90	73.90	25.35	31.85	Hori.	100	180	H21	
2	2509.498	30.10	43.90	27.66	2.71	31.82	28.65	42.45	53.90	73.90	25.25	31.45	Vert.	100	180	H21	

CHART: WITH FACTOR

ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN

CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + D-factor) - GAIN(AMP)

Except for the above table: adequate margin data below the limits.

**UL Japan, Inc.**

**Ise EMC Lab.**

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Telephone : +81 596 24 8999

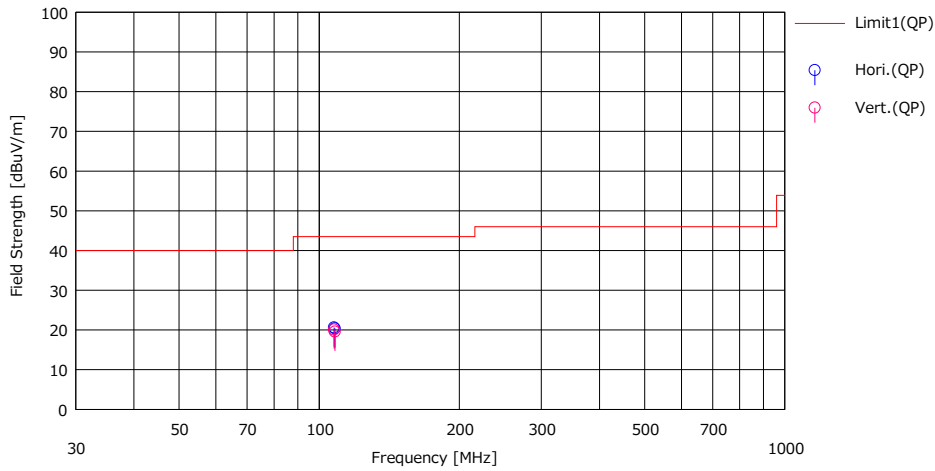
Facsimile : +81 596 24 8124



## Radiated Emission

Report No. 13367629H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date June 15, 2020  
Temperature / Humidity 23 deg. C / 58 % RH  
Engineer Hiroki Numata  
(Below 1 GHz)  
Mode Mode 2

Limit : FCC\_Part 15 Subpart B(15.109)\_Class B



No.	Freq. [MHz]	Reading	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result	Limit	Margin	Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		[dBuV]				[dBuV/m]	[dB]	[dBuV/m]					
1	107.680	33.00	11.33	8.16	31.90	20.59	43.50	22.91	Hori.	171	111	BA	
2	108.120	32.70	11.40	8.16	31.90	20.36	43.50	23.14	Hori.	163	81	BA	
3	107.680	32.50	11.33	8.16	31.90	20.09	43.50	23.41	Vert.	100	262	BA	
4	108.120	31.90	11.40	8.16	31.90	19.56	43.50	23.94	Vert.	100	110	BA	

CHART: WITH FACTOR

ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN

CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + ATT) - GAIN(AMP)

Except for the above table: adequate margin data below the limits.

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**Ise EMC Lab.**

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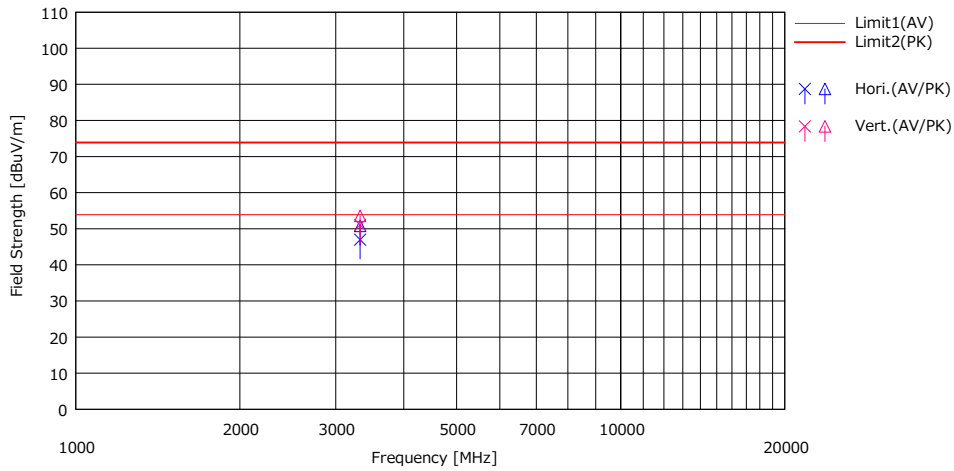
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Facsimile : +81 596 24 8124

## Radiated Emission

Report No. 13367629H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date June 15, 2020  
Temperature / Humidity 23 deg. C / 58 % RH  
Engineer Hiroki Numata  
(Above 1 GHz)  
Mode Mode 2

Limit : FCC\_Part 15 Subpart B(15.109)\_Class B



No.	Freq. [MHz]	Reading		Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result		Limit		Margin		Pda [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		(AV) [dBuV]	(PK) [dBuV]				(AV) [dBuV/m]	(PK) [dBuV/m]	(AV) [dBuV/m]	(PK) [dBuV/m]	(AV) [dB]	(PK) [dB]					
1	3325.625	47.10	50.90	28.31	3.10	31.54	46.97	50.77	53.90	73.90	6.93	23.13	Hori.	122	163	HA6	
2	3325.625	51.20	53.70	28.31	3.10	31.54	51.07	53.57	53.90	73.90	2.83	20.33	Vert.	113	171	HA6	

CHART: WITH FACTOR

ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN

CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + D-factor) - GAIN(AMP)

Except for the above table: adequate margin data below the limits.

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**Ise EMC Lab.**

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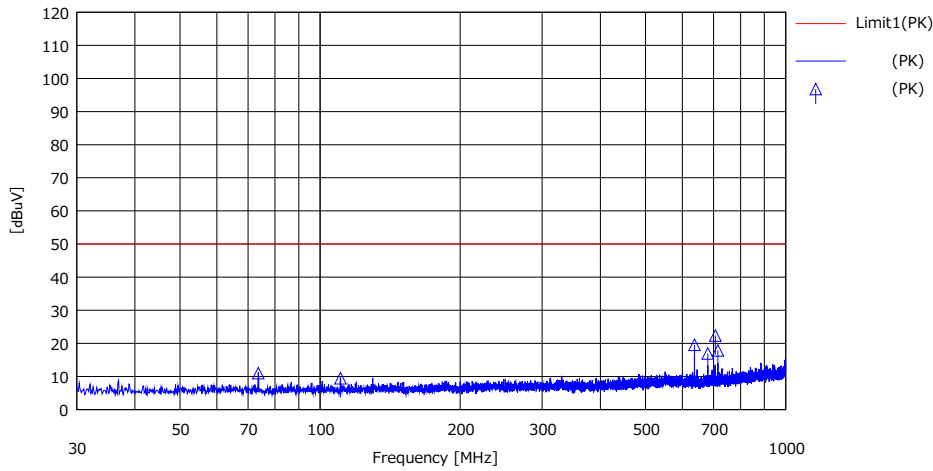
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Facsimile : +81 596 24 8124

## Antenna Terminal Conducted Emission

Report No. 13367629H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date June 6, 2020  
Temperature / Humidity 23 deg. C / 57 % RH  
Engineer Kiyoshiro Okazaki  
(Below 1 GHz)  
Mode Mode 3(Main Port)

Limit : FCC15.111 Antenna terminal measurement



No.	Freq. [MHz]	Reading	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result	Limit*1)	Margn	P.d.a.	Ant. Type	Comment
		(PK) [dBuV]				(PK) [dBuV]	(PK) [dB]				
1	73.651	34.90	0.00	8.04	31.95	10.99	50.00	39.01			
2	110.591	32.90	0.00	8.44	31.90	9.44	50.00	40.56			
3	637.052	39.70	0.00	11.89	32.01	19.58	50.00	30.42			
4	680.608	36.90	0.00	12.10	32.06	16.94	50.00	33.06			
5	705.962	42.20	0.00	12.21	32.05	22.36	50.00	27.64			
6	715.457	37.60	0.00	12.25	32.00	17.85	50.00	32.15			

\*Local frequency was not detected.

CHART: WITH FACTOR

CALCULATION: RESULT = READING + LOSS (CABLE + ATT) - GAIN(AMP))

\*1) 2 nW = -57 dBm = 50 dBuV

Except for the above table: adequate margin data below the limits.

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**Ise EMC Lab.**

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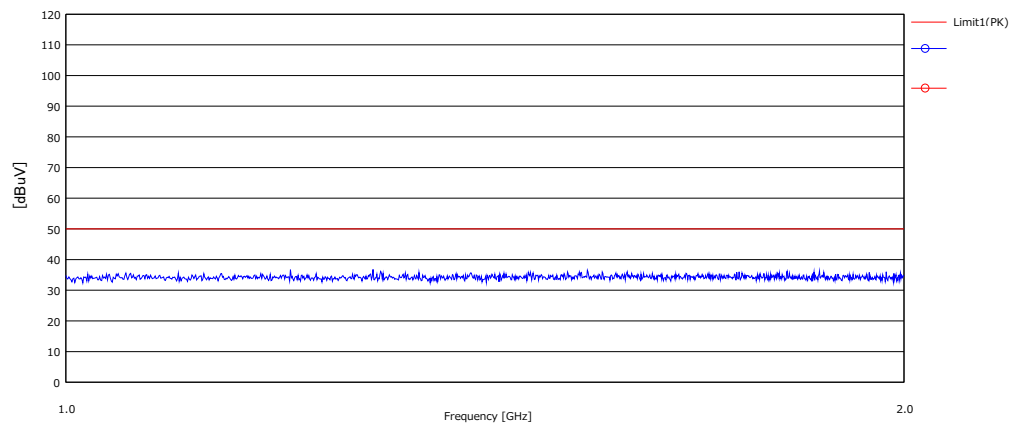
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Antenna Terminal Conducted Emission

Report No. 13367629H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date June 7, 2020  
Temperature / Humidity 23 deg. C / 54 % RH  
Engineer Kiyoshiro Okazaki  
(Above 1 GHz)  
Mode Mode 3(Main Port)

Limit : FCC15.111 Antenna terminal measurement



No signal detected

CHART: WITH FACTOR

CALCULATION: RESULT = READING + LOSS (CABLE + ATT) - GAIN(AMP))

\*Limit: 2 nW = -57 dBm = 50 dBuV

**UL Japan, Inc.**

**Ise EMC Lab.**

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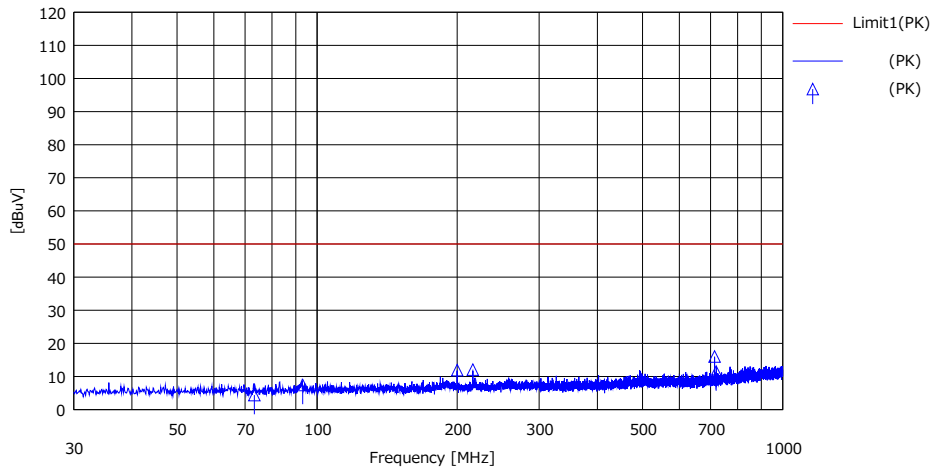
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Antenna Terminal Conducted Emission

Report No. 13367629H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date June 6, 2020  
Temperature / Humidity 23 deg. C / 57 % RH  
Engineer Kiyoshiro Okazaki  
(Below 1 GHz)  
Mode Mode 3(Sub Port)

Limit : FCC15.111 Antenna terminal measurement



No.	Freq. [MHz]	Reading	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result	Limit *1		P.d.a.	Ant. Type	Comment
		(PK) [dBuV]				(PK) [dBuV]	(PK) [dB]	(PK) [dB]			
1	73.321	28.30	0.00	8.04	31.95	4.39	50.00	45.61			
2	93.137	31.10	0.00	8.26	31.92	7.44	50.00	42.56			
3	200.000	34.50	0.00	9.25	31.82	11.93	50.00	38.07			
4	216.002	34.50	0.00	9.37	31.81	12.06	50.00	37.94			
5	714.062	35.80	0.00	12.25	32.01	16.04	50.00	33.96			
6	720.003	31.20	0.00	12.27	31.98	11.49	50.00	38.51			

CHART: WITH FACTOR

CALCULATION: RESULT = READING + LOSS (CABLE + ATT) - GAIN(AMP))

\*1) 2 nW = -57 dBm = 50 dBuV

Except for the above table: adequate margin data below the limits.

**UL Japan, Inc.**

**Ise EMC Lab.**

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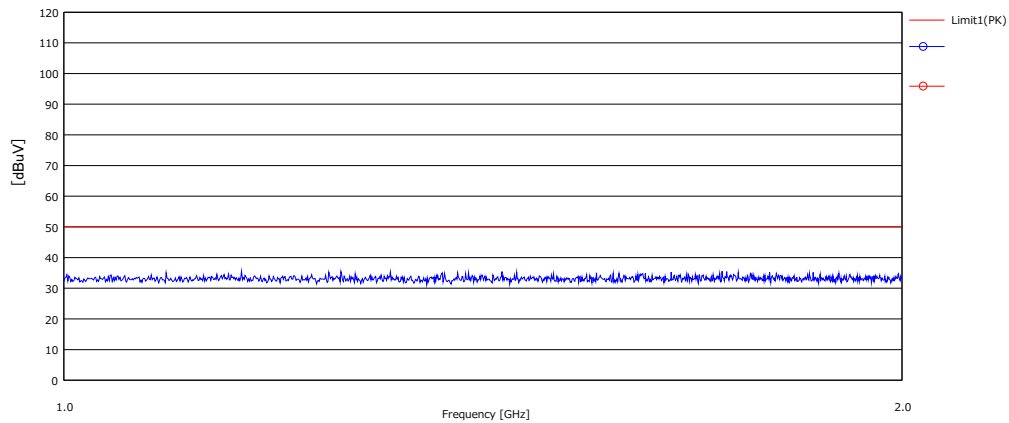
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Antenna Terminal Conducted Emission

Report No. 13367629H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.4  
Date June 7, 2020  
Temperature / Humidity 23 deg. C / 54 % RH  
Engineer Kiyoshiro Okazaki  
(Above 1 GHz)  
Mode Mode 3(Sub Port)

Limit : FCC15.111 Antenna terminal measurement



No signal detected

CHART: WITH FACTOR

CALCULATION: RESULT = READING + LOSS (CABLE + ATT) - GAIN(AMP))

\*Limit: 2 nW = -57 dBm = 50 dBuV

**UL Japan, Inc.**

**Ise EMC Lab.**

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## APPENDIX 2: Test instruments

### Test equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	MAEC-04	142011	AC4_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	05/25/2020	24
RE	MOS-15	141562	Thermo-Hygrometer	CUSTOM	CTH-201	0010	01/07/2020	12
RE	MMM-10	141545	DIGITAL HiTESTER	Hioki	3805	51201148	01/06/2020	12
RE	MJM-26	142227	Measure	KOMELON	KMC-36	-	-	-
RE	COTS-MEMI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	MAEC-04-SVSWR	142017	AC4_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/04/2019	24
RE	MBA-05	141425	Biconical Antenna	Schwarzbeck Mess - Elektronik	VHA9103+BBA9106	1302	08/24/2019	12
RE	MLA-23	141267	Logperiodic Antenna (200-1000MHz)	Schwarzbeck Mess - Elektronik	VUSLP9111B	9111B-192	08/24/2019	12
RE	MHA-21	141508	Horn Antenna 1-18GHz	Schwarzbeck Mess - Elektronik	BBHA9120D	557	05/22/2020	12
RE	MPA-12	141581	MicroWave System Amplifier	Keysight Technologies Inc	83017A	650	10/16/2019	12
RE	MCC-246	199563	Microwave Cable	HUBER+SUNER	SF126E/11PC35/11PC35/1000M,5000M	537061/126E / 537072/126E	06/11/2020	12
RE	MHA-17	141506	Horn Antenna 15-40GHz	Schwarzbeck Mess - Elektronik	BBHA9170	BBHA9170307	10/08/2019	12
AT	MDCB-02	141485	DC Block Filter	Keysight Technologies Inc	N9398C	51053	11/07/2019	12
AT	MMP-01	141550	Matching Pad Anritsu	ANRITSU	MB-009	40063	07/02/2020	12
AT	MPA-03	141577	Microwave System Power Amplifier	Keysight Technologies Inc	83050A	MY39500610	10/01/2019	12
AT	MAT-40	141308	Attenuator	Weinschel - API Technologies Corp	54A-20	S8132	10/09/2019	12
AT	MTR-09	141950	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	06/03/2020	12
AT	MSA-04	141885	Spectrum Analyzer	Keysight Technologies Inc	E4448A	US44300523	11/21/2019	12
RE / AT	MAT-34	141331	Attenuator(6dB)	TME	UFA-01	-	02/05/2020	12
RE / AT	MCC-50	141397	Coaxial Cable	UL Japan	-	-	03/24/2020	12
RE / AT	MPA-14	141583	Pre Amplifier	SONOMA INSTRUMENT	310	260833	02/18/2020	12

\*Hyphens for Last Calibration Date and Cal Int (month) are instruments that Calibration is not required (e.g. software), or instruments checked in advance before use.

The expiration date of the calibration is the end of the expired month.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

Test item:

RE: Radiated Emission

AT: Antenna Terminal Conducted Emission

**UL Japan, Inc.**

**Ise EMC Lab.**

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