



RADIO TEST REPORT

Test Report No. : 13645592H-A-R1

Applicant : DAIHATSU MOTOR CO., LTD.
Type of EUT : Keyfree system
Model Number of EUT : DH19S-5
FCC ID : 2AVSADH19S-5
Test regulation : FCC Part 15 Subpart C: 2021
Test Result : Complied (Refer to SECTION 3.2)

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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.
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6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio 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 13645592H-A. 13645592H-A is replaced with this report.

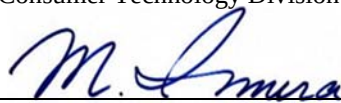
Date of test: January 8 to 19, 2021

Representative test engineer:


Yuta Moriya
Engineer

Consumer Technology Division

Approved by:


Motoya Imura
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".

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REVISION HISTORY

Original Test Report No.: 13645592H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13645592H-A	February 17, 2021	-	-
1	13645592H-A-R1	March 17, 2021	P.5	Correction of Receipt Date in Clause 2.1; From January 18, 2021 To December 18, 2020
1	13645592H-A-R1	March 17, 2021	P.10	Addition of “Section 1 (or 2 or 3) of Timing of transmission” in Remarks of Clause 4.1.
1	13645592H-A-R1	March 17, 2021	P.10	Addition of note *1) in Clause 4.1.

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Reference: Abbreviations (Including words undescribed in this report)

A2LA	The American Association for Laboratory Accreditation	MCS	Modulation and Coding Scheme
AC	Alternating Current	MRA	Mutual Recognition Arrangement
AFH	Adaptive Frequency Hopping	N/A	Not Applicable
AM	Amplitude Modulation	NIST	National Institute of Standards and Technology
Amp, AMP	Amplifier	NS	No signal detect.
ANSI	American National Standards Institute	NSA	Normalized Site Attenuation
Ant, ANT	Antenna	NVLAP	National Voluntary Laboratory Accreditation Program
AP	Access Point	OBW	Occupied Band Width
ASK	Amplitude Shift Keying	OFDM	Orthogonal Frequency Division Multiplexing
Atten., ATT	Attenuator	P/M	Power meter
AV	Average	PCB	Printed Circuit Board
BPSK	Binary Phase-Shift Keying	PER	Packet Error Rate
BR	Bluetooth Basic Rate	PHY	Physical Layer
BT	Bluetooth	PK	Peak
BT LE	Bluetooth Low Energy	PN	Pseudo random Noise
BW	BandWidth	PRBS	Pseudo-Random Bit Sequence
Cal Int	Calibration Interval	PSD	Power Spectral Density
CCK	Complementary Code Keying	QAM	Quadrature Amplitude Modulation
Ch., CH	Channel	QP	Quasi-Peak
CISPR	Comite International Special des Perturbations Radioelectriques	QPSK	Quadri-Phase Shift Keying
CW	Continuous Wave	RBW	Resolution Band Width
DBPSK	Differential BPSK	RDS	Radio Data System
DC	Direct Current	RE	Radio Equipment
D-factor	Distance factor	RF	Radio Frequency
DFS	Dynamic Frequency Selection	RMS	Root Mean Square
DQPSK	Differential QPSK	RSS	Radio Standards Specifications
DSSS	Direct Sequence Spread Spectrum	Rx	Receiving
EDR	Enhanced Data Rate	SA, S/A	Spectrum Analyzer
EIRP, e.i.r.p.	Equivalent Isotropically Radiated Power	SG	Signal Generator
EMC	ElectroMagnetic Compatibility	SVSWR	Site-Voltage Standing Wave Ratio
EMI	ElectroMagnetic Interference	TR	Test Receiver
EN	European Norm	Tx	Transmitting
ERP, e.r.p.	Effective Radiated Power	VBW	Video BandWidth
EU	European Union	Vert.	Vertical
EUT	Equipment Under Test	WLAN	Wireless LAN
Fac.	Factor		
FCC	Federal Communications Commission		
FHSS	Frequency Hopping Spread Spectrum		
FM	Frequency Modulation		
Freq.	Frequency		
FSK	Frequency Shift Keying		
GFSK	Gaussian Frequency-Shift Keying		
GNSS	Global Navigation Satellite System		
GPS	Global Positioning System		
Hori.	Horizontal		
ICES	Interference-Causing Equipment Standard		
IEC	International Electrotechnical Commission		
IEEE	Institute of Electrical and Electronics Engineers		
IF	Intermediate Frequency		
ILAC	International Laboratory Accreditation Conference		
ISED	Innovation, Science and Economic Development Canada		
ISO	International Organization for Standardization		
JAB	Japan Accreditation Board		
LAN	Local Area Network		
LIMS	Laboratory Information Management System		

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SECTION 1: Customer information

Company Name : DAIHATSU MOTOR CO., LTD.*
Address : 2-1-1, Momozono, Ikeda-shi, Osaka, 563-8651, Japan
Telephone Number : +81-72-754-4526
Facsimile Number : +81-72-754-3857
Contact Person : Kouji Ozawa

***Remarks:**

DAIHATSU MOTOR CO., LTD. designates DENSO CORPORATION and TOKAI RIKA CO., LTD. as manufacturer of the product (Immobilizer).

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 : Keyfree system
Model Number : DH19S-5
Serial Number : Refer to SECTION 4.2
Rating : DC 12.0 V
Receipt Date : December 18, 2020
Country of Mass-production : Malaysia and Republic of Indonesia
Condition : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification : No Modification by the test lab

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2.2 Product Description

Model: DH19S-5 (referred to as the EUT in this report) is a Keyfree system.

Radio Specification

[Transmitter part]

Radio Type	:	LF Transmitter
Frequency of Operation	:	125 kHz
Oscillation circuit	:	Ceramic resonator
Oscillator frequency	:	4 MHz
Modulation	:	ASK
Antenna type	:	Antenna (Outside Antenna D) Antenna (Outside Antenna P) Antenna (Outside Antenna B) Antenna (Inside Antenna Fr) Antenna (Inside Antenna Rr) Immobilizer Antenna
Antenna Specification	:	Antenna (Outside, Inside): Ferrite antenna coil Immobilizer Antenna: Loop antenna coil
Clock Frequency (maximum)	:	MPU: 8 MHz

[Receiver part]

Frequency of Operation	:	433.92 MHz
Oscillator frequency	:	30.265 MHz
Intermediate frequency	:	280 kHz
Modulation	:	FSK
Type of receiving system	:	Super-heterodyne
Antenna Specification	:	Internal antenna (Inverted F antenna)
Receiver Bandwidth	:	270 kHz

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on January 12, 2021 and effective February 11, 2021

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.209 Radiated emission limits; general requirements.

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

* Also the EUT complies with FCC Part 15 Subpart B.

3.2 Procedures and results

Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results	Remarks
Conducted Emission	<FCC> ANSI C63.10:2013 6 Standard test methods <ISED> RSS-Gen 8.8	<FCC> Section 15.207 <ISED> RSS-Gen 8.8	-	N/A	N/A	N/A	*1)
Electric Field Strength of Fundamental Emission	<FCC> ANSI C63.10:2013 6 Standard test methods <ISED> RSS-Gen 6.5, 6.12	<FCC> Section 15.209 <ISED> RSS-210 7.2 RSS-Gen 8.9	Radiated	N/A	14.1 dB 125 kHz 0 deg. Peak with Duty factor <Mode 3>	Complied a)	-
Electric Field Strength of Spurious Emission	<FCC> ANSI C63.10:2013 6 Standard test methods <ISED> RSS-Gen 6.5, 6.6, 6.13	<FCC> Section 15.209 <ISED> RSS-210 7.3 RSS-Gen 8.9	Radiated	N/A	11.0 dB 37.170 MHz, Vertical, QP <Mode 3>	Complied a)	-
-26 dB Bandwidth	<FCC> ANSI C63.10:2013 6 Standard test methods <ISED> -	<FCC> Reference data <ISED> -	Radiated	N/A	N/A	Complied b)	-

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

*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 -26 dB Bandwidth and 99 % Occupied Bandwidth)

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.

FCC Part 15.31 (e)

The battery voltage (DC 12V) is provided to the EUT. Input voltage to RF part doesn't go through the regulator. So the test was performed with the supply voltage varied between 85 % and 115% of the nominal rated supply voltage (DC 12 V) and the variation of the input power does not affect the test result, therefore the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the vehicle. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
99 % Occupied Band Width	RSS-Gen 6.7	-	Radiated	N/A	N/A	-

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

There is no applicable rule of uncertainty in this applied standard. Therefore, the following 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	9 kHz to 30 MHz		3.3 dB
10 m			3.2 dB
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

Antenna Terminal test

Test Item	Uncertainty (+/-)
-26 dB Bandwidth / 99 % Occupied Bandwidth	0.96 %

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3.5 Test Location

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*A2LA Certificate Number: 5107.02 / FCC Test Firm Registration Number: 199967

ISED Lab Company Number: 2973C / CAB identifier: JP0002

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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 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

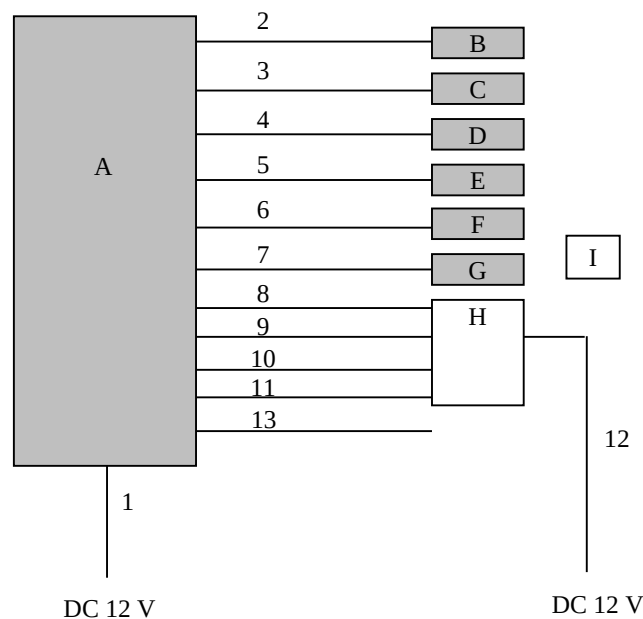
4.1 Operating Modes

Test mode	Remarks *1)
1) Tx 125 kHz Outside Antenna D	Section 2 of Timing of transmission
2) Tx 125 kHz Outside Antenna P	Section 2 of Timing of transmission
3) Tx 125 kHz Outside Antenna B	Section 2 of Timing of transmission
4) Tx 125 kHz Inside Antenna Fr	Section 2 of Timing of transmission
5) Tx 125 kHz Inside Antenna Rr	Section 2 of Timing of transmission
6) Tx 125 kHz Immobilizer Antenna	Section 3 of Timing of transmission
7) Tx 125 kHz Outside Antenna D + Outside Antenna P	Section 1 of Timing of transmission
* EUT was set by the software as follows; Software: 200213_RadioTest_RFIC_TypeA.s Version - (Date: December 3, 2020, Storage location: EUT memory) *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

*1) Refer to Timing of transmission in “Theory of Operation” for details.

Justification : The system was configured in typical fashion (as a user would normally use it) for testing.

4.2 Configuration and peripherals



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

* The input voltage (DC 12 V) passes through Item No. A without affecting it and is supplied to the antennas (Item No. G) without any drop in voltage.
For the antenna (Item No. B to F), a fixed voltage is supplied through the regulator.

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Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Body ECU	DH19S-5	No.360	DENSO CORPORATION	EUT
B	Antenna	Outside Antenna D	No.360-1	TOKAIRIKA CO.,LTD.	EUT
C	Antenna	Outside Antenna P	No.360-2	TOKAIRIKA CO.,LTD.	EUT
D	Antenna	Outside Antenna B	No.360-3	TOKAIRIKA CO.,LTD.	EUT
E	Antenna	Inside Antenna Fr	No.360-4	TOKAIRIKA CO.,LTD.	EUT
F	Antenna	Inside Antenna Rr	No.360-5	TOKAIRIKA CO.,LTD.	EUT
G	Antenna	Immobilizer Antenna	No. 360	TOKAIRIKA CO.,LTD.	EUT
H	Evaluation Bench	-	-	DENSO CORPORATION	-
I	Smart Key	-	No. 238	DENSO CORPORATION	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	3.0	Unshielded	Unshielded	-
2	Antenna Cable (AND)	3.0	Unshielded	Unshielded	-
3	Antenna Cable (ANP)	3.0	Unshielded	Unshielded	-
4	Antenna Cable (ANB)	3.0	Unshielded	Unshielded	-
5	Antenna Cable (ANF)	3.0	Unshielded	Unshielded	-
6	Antenna Cable (ANR)	3.0	Unshielded	Unshielded	-
7	Antenna Cable	3.0	Unshielded	Unshielded	-
8	Signal Cable (CN-C)	3.0	Unshielded	Unshielded	-
9	Signal Cable (CN-K)	3.0	Unshielded	Unshielded	-
10	Signal Cable (CN-M)	3.0	Unshielded	Unshielded	-
11	Signal Cable (CN-P)	3.0	Unshielded	Unshielded	-
12	DC Cable	3.0	Unshielded	Unshielded	-
13	Signal Cable	3.0	Unshielded	Unshielded	-

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SECTION 5: Radiated emission (Fundamental and Spurious Emission)

Test Procedure

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 Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

Frequency : From 9 kHz to 30 MHz

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for vertical polarization (antenna angle: 0 deg., 45 deg., 90 deg., and 135 deg.) and horizontal polarization.

*Refer to Figure 1 about Direction of the Loop Antenna.

Frequency: From 30 MHz to 1 GHz

The measuring antenna height 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.

The test was made with the detector (RBW / VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

Frequency	Below 30 MHz	30 MHz to 200 MHz	200 MHz to 1 GHz
Antenna Type	Loop	Biconical	Logperiodic

Frequency	From 9 kHz to 90 kHz and From 110 kHz to 150 kHz	From 90 kHz to 110 kHz	From 150 kHz to 490 kHz	From 490 kHz to 30 MHz	From 30 MHz to 1 GHz
Instrument used	Test Receiver				
Detector	PK / AV	QP	PK / AV	QP	QP
IF Bandwidth	200 Hz	200 Hz	9 kHz	9 kHz	120 kHz
Test Distance	10 m *1)	10 m *1)	10 m *1)	10 m *2)	3 m

*1) Distance Factor: $40 \times \log(10 \text{ m} / 300 \text{ m}) = -59.1 \text{ dB}$

*2) Distance Factor: $40 \times \log(10 \text{ m} / 30 \text{ m}) = -19.1 \text{ dB}$

Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open field test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

These tests were performed in semi anechoic chamber. Therefore the measured level of emissions may be higher than if measurements were made without a ground plane.

However test results were confirmed to pass against standard limit.

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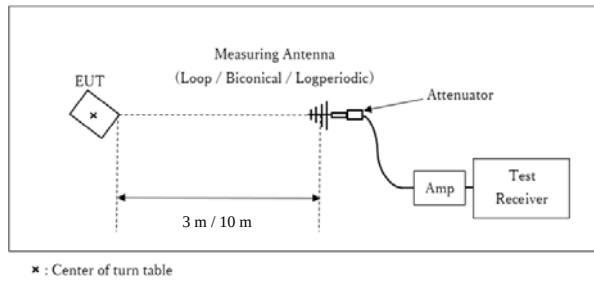
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[Test Setup]
Below 1 GHz



Test Distance: 3 m / 10 m

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

This EUT has two modes which transponder key is inserted or not. The worst case was confirmed with and without transponder key, as a result, the test without transponder key was the worst case. Therefore the test without transponder key was performed only.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Measurement range : 9 kHz - 1 GHz
Test data : APPENDIX 1
Test result : Pass

Date: January 19, 2021

Test engineer: Yuta Moriya

UL Japan, Inc.

Ise EMC Lab.

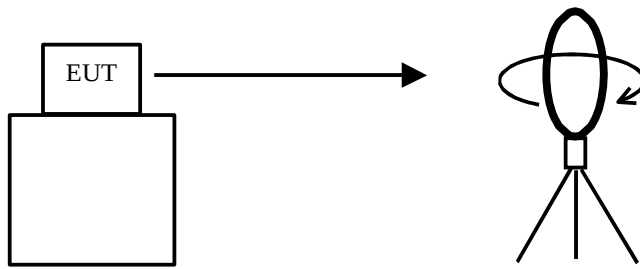
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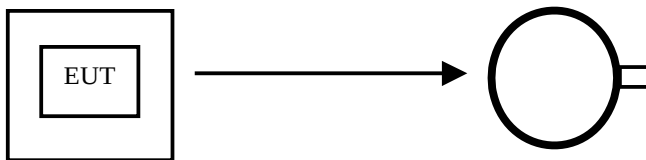
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Figure 1: Direction of the Loop Antenna

Side View (Vertical)

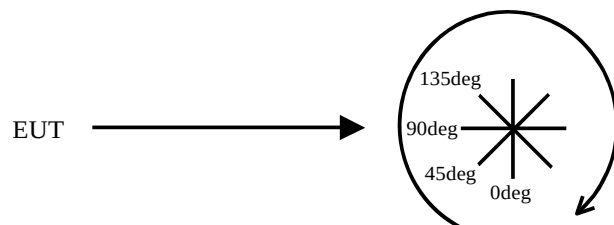


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



Front side: 0 deg.
Forward direction: clockwise

SECTION 6: -26 dB Bandwidth

Test Procedure

The test was measured with a spectrum analyzer using a test fixture.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
-26 dB Bandwidth	75 kHz	510 Hz	1.6 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

Test data : APPENDIX 1
Test result : Pass

SECTION 7: 99 % Occupied Bandwidth

Test Procedure

The test was measured with a spectrum analyzer using a test fixture.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
99 % Occupied Bandwidth	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak *1)	Max Hold *1)	Spectrum Analyzer

*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100 %.
Peak hold was applied as Worst-case measurement.

Test data : APPENDIX 1
Test result : Pass

APPENDIX 1: Test data

Radiated Emission below 30 MHz (Fundamental and Spurious Emission)

Report No. 13645592H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date January 19, 2021
Temperature / Humidity 22 deg. C / 31 % RH
Engineer Yuta Moriya
Mode Mode 1

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.12500	PK	77.1	18.9	-53.0	32.3	-	10.7	45.6	34.9	Fundamental (DC 10.2 V)
0deg	0.12500	PK	77.1	18.9	-53.0	32.3	-	10.7	45.6	34.9	Fundamental (DC 12.0 V)
0deg	0.12500	PK	77.1	18.9	-53.0	32.3	-	10.7	45.6	34.9	Fundamental (DC 13.8 V)
0deg	0.25000	PK	43.0	18.9	-53.0	32.3	-	-23.4	39.6	63.0	
0deg	0.37500	PK	39.0	18.8	-52.9	32.3	-	-27.4	36.1	63.5	
0deg	0.50000	QP	32.7	18.8	-12.9	32.2	-	6.3	33.6	27.3	
0deg	0.62500	QP	32.1	18.8	-12.9	32.2	-	5.8	31.7	25.9	
0deg	0.75000	QP	31.7	18.8	-12.9	32.2	-	5.4	30.1	24.7	
0deg	0.87500	QP	31.6	18.8	-12.9	32.2	-	5.3	28.7	23.4	
0deg	1.00000	QP	31.2	18.8	-12.8	32.2	-	4.9	27.6	22.7	
0deg	1.12500	QP	31.1	18.8	-12.8	32.2	-	4.8	26.5	21.7	
0deg	1.25000	QP	31.1	18.8	-12.8	32.2	-	4.9	25.6	20.8	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amplifier)

PK with Duty factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.12500	AV	77.1	18.9	-53.0	32.3	0.0	10.7	25.6	14.9	DC 10.2 V
0deg	0.12500	AV	77.1	18.9	-53.0	32.3	0.0	10.7	25.6	14.9	DC 12.0 V
0deg	0.12500	AV	77.1	18.9	-53.0	32.3	0.0	10.7	25.6	14.9	DC 13.8 V
0deg	0.25000	AV	43.0	18.9	-53.0	32.3	0.0	-23.4	19.6	43.0	
0deg	0.37500	AV	39.0	18.8	-52.9	32.3	0.0	-27.4	16.1	43.5	

Result of the fundamental emission at 10m without Distance factor

PK or QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.12500	PK	77.1	18.9	6.1	32.3	-	69.8	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

*It was confirmed that there was no difference by the input voltage in the spurious emission.

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

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

UL Japan, Inc.

Ise EMC Lab.

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Radiated Emission below 30 MHz (Fundamental and Spurious Emission)

Report No. 13645592H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date January 19, 2021
Temperature / Humidity 22 deg. C / 31 % RH
Engineer Yuta Moriya
Mode Mode 2

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.12500	PK	77.1	18.9	-53.0	32.3	-	10.7	45.6	35.0	Fundamental (DC 10.2 V)
0deg	0.12500	PK	77.1	18.9	-53.0	32.3	-	10.7	45.6	35.0	Fundamental (DC 12.0 V)
0deg	0.12500	PK	77.1	18.9	-53.0	32.3	-	10.7	45.6	35.0	Fundamental (DC 13.8 V)
0deg	0.25000	PK	42.1	18.9	-53.0	32.3	-	-24.3	39.6	63.9	
0deg	0.37500	PK	39.3	18.8	-52.9	32.3	-	-27.1	36.1	63.2	
0deg	0.50000	QP	32.6	18.8	-12.9	32.2	-	6.2	33.6	27.4	
0deg	0.62500	QP	32.1	18.8	-12.9	32.2	-	5.8	31.7	25.9	
0deg	0.75000	QP	31.8	18.8	-12.9	32.2	-	5.4	30.1	24.6	
0deg	0.87500	QP	31.5	18.8	-12.9	32.2	-	5.2	28.7	23.5	
0deg	1.00000	QP	31.2	18.8	-12.8	32.2	-	5.0	27.6	22.6	
0deg	1.12500	QP	31.1	18.8	-12.8	32.2	-	4.8	26.5	21.7	
0deg	1.25000	QP	31.0	18.8	-12.8	32.2	-	4.8	25.6	20.9	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amplifier)

PK with Duty factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.12500	AV	77.1	18.9	-53.0	32.3	0.0	10.7	25.6	15.0	DC 10.2 V
0deg	0.12500	AV	77.1	18.9	-53.0	32.3	0.0	10.7	25.6	14.9	DC 12.0 V
0deg	0.12500	AV	77.1	18.9	-53.0	32.3	0.0	10.7	25.6	14.9	DC 13.8 V
0deg	0.25000	AV	42.1	18.9	-53.0	32.3	0.0	-24.3	19.6	43.9	
0deg	0.37500	AV	39.3	18.8	-52.9	32.3	0.0	-27.1	16.1	43.2	

Result of the fundamental emission at 10m without Distance factor

PK or QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.12500	PK	77.1	18.9	6.1	32.3	-	69.8	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

*It was confirmed that there was no difference by the input voltage in the spurious emission.

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

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

UL Japan, Inc.

Ise EMC Lab.

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Facsimile : +81 596 24 8124

Radiated Emission below 30 MHz (Fundamental and Spurious Emission)

Report No. 13645592H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date January 19, 2021
Temperature / Humidity 22 deg. C / 31 % RH
Engineer Yuta Moriya
Mode Mode 3

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.12500	PK	77.9	18.9	-53.0	32.3	-	11.5	45.6	34.1	Fundamental (DC 10.2 V)
0deg	0.12500	PK	77.9	18.9	-53.0	32.3	-	11.5	45.6	34.1	Fundamental (DC 12.0 V)
0deg	0.12500	PK	77.9	18.9	-53.0	32.3	-	11.5	45.6	34.1	Fundamental (DC 13.8 V)
0deg	0.25000	PK	41.4	18.9	-53.0	32.3	-	-25.0	39.6	64.6	
0deg	0.37500	PK	39.6	18.8	-52.9	32.3	-	-26.8	36.1	62.9	
0deg	0.50000	QP	32.5	18.8	-12.9	32.2	-	6.1	33.6	27.5	
0deg	0.62500	QP	32.3	18.8	-12.9	32.2	-	5.9	31.7	25.7	
0deg	0.75000	QP	31.7	18.8	-12.9	32.2	-	5.3	30.1	24.7	
0deg	0.87500	QP	31.5	18.8	-12.9	32.2	-	5.2	28.7	23.5	
0deg	1.00000	QP	31.1	18.8	-12.8	32.2	-	4.8	27.6	22.7	
0deg	1.12500	QP	31.1	18.8	-12.8	32.2	-	4.9	26.5	21.7	
0deg	1.25000	QP	31.1	18.8	-12.8	32.2	-	4.9	25.6	20.8	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amplifier)

PK with Duty factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.12500	AV	77.9	18.9	-53.0	32.3	0.0	11.5	25.6	14.1	DC 10.2 V
0deg	0.12500	AV	77.9	18.9	-53.0	32.3	0.0	11.5	25.6	14.1	DC 12.0 V
0deg	0.12500	AV	77.9	18.9	-53.0	32.3	0.0	11.5	25.6	14.1	DC 13.8 V
0deg	0.25000	AV	41.4	18.9	-53.0	32.3	0.0	-25.0	19.6	44.6	
0deg	0.37500	AV	39.6	18.8	-52.9	32.3	0.0	-26.8	16.1	42.9	

Result of the fundamental emission at 10m without Distance factor

PK or QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.12500	PK	77.9	18.9	6.1	32.3	-	70.6	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

*It was confirmed that there was no difference by the input voltage in the spurious emission.

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

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

UL Japan, Inc.

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Radiated Emission below 30 MHz (Fundamental and Spurious Emission)

Report No. 13645592H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date January 19, 2021
Temperature / Humidity 22 deg. C / 31 % RH
Engineer Yuta Moriya
Mode Mode 4

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.12500	PK	77.1	18.9	-53.0	32.3	-	10.7	45.6	34.9	Fundamental (DC 10.2 V)
0deg	0.12500	PK	77.1	18.9	-53.0	32.3	-	10.7	45.6	34.9	Fundamental (DC 12.0 V)
0deg	0.12500	PK	77.1	18.9	-53.0	32.3	-	10.7	45.6	34.9	Fundamental (DC 13.8 V)
0deg	0.25000	PK	41.0	18.9	-53.0	32.3	-	-25.5	39.6	65.1	
0deg	0.37500	PK	39.9	18.8	-52.9	32.3	-	-26.5	36.1	62.6	
0deg	0.50000	QP	32.7	18.8	-12.9	32.2	-	6.3	33.6	27.3	
0deg	0.62500	QP	32.1	18.8	-12.9	32.2	-	5.8	31.7	25.9	
0deg	0.75000	QP	31.7	18.8	-12.9	32.2	-	5.4	30.1	24.7	
0deg	0.87500	QP	31.4	18.8	-12.9	32.2	-	5.1	28.7	23.6	
0deg	1.00000	QP	31.2	18.8	-12.8	32.2	-	5.0	27.6	22.6	
0deg	1.12500	QP	31.1	18.8	-12.8	32.2	-	4.8	26.5	21.7	
0deg	1.25000	QP	31.1	18.8	-12.8	32.2	-	4.9	25.6	20.8	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amplifier)

PK with Duty factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.12500	AV	77.1	18.9	-53.0	32.3	0.0	10.7	25.6	14.9	DC 10.2 V
0deg	0.12500	AV	77.1	18.9	-53.0	32.3	0.0	10.7	25.6	14.9	DC 12.0 V
0deg	0.12500	AV	77.1	18.9	-53.0	32.3	0.0	10.7	25.6	14.9	DC 13.8 V
0deg	0.25000	AV	41.0	18.9	-53.0	32.3	0.0	-25.5	19.6	45.1	
0deg	0.37500	AV	39.9	18.8	-52.9	32.3	0.0	-26.5	16.1	42.6	

Result of the fundamental emission at 10m without Distance factor

PK or QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.12500	PK	77.1	18.9	6.1	32.3	-	69.8	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

*It was confirmed that there was no difference by the input voltage in the spurious emission.

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

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

UL Japan, Inc.

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Radiated Emission below 30 MHz (Fundamental and Spurious Emission)

Report No. 13645592H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date January 19, 2021
Temperature / Humidity 22 deg. C / 31 % RH
Engineer Yuta Moriya
Mode Mode 5

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.12500	PK	77.8	18.9	-53.0	32.3	-	11.4	45.6	34.2	Fundamental (DC 10.2 V)
0deg	0.12500	PK	77.8	18.9	-53.0	32.3	-	11.4	45.6	34.2	Fundamental (DC 12.0 V)
0deg	0.12500	PK	77.8	18.9	-53.0	32.3	-	11.4	45.6	34.2	Fundamental (DC 13.8 V)
0deg	0.25000	PK	42.5	18.9	-53.0	32.3	-	-23.9	39.6	63.5	
0deg	0.37500	PK	39.1	18.8	-52.9	32.3	-	-27.3	36.1	63.4	
0deg	0.50000	QP	32.6	18.8	-12.9	32.2	-	6.2	33.6	27.4	
0deg	0.62500	QP	32.2	18.8	-12.9	32.2	-	5.8	31.7	25.9	
0deg	0.75000	QP	31.7	18.8	-12.9	32.2	-	5.3	30.1	24.8	
0deg	0.87500	QP	31.5	18.8	-12.9	32.2	-	5.1	28.7	23.6	
0deg	1.00000	QP	31.3	18.8	-12.8	32.2	-	5.1	27.6	22.5	
0deg	1.12500	QP	31.1	18.8	-12.8	32.2	-	4.9	26.5	21.7	
0deg	1.25000	QP	31.0	18.8	-12.8	32.2	-	4.8	25.6	20.8	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amplifier)

PK with Duty factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.12500	AV	77.8	18.9	-53.0	32.3	0.0	11.4	25.6	14.2	DC 10.2 V
0deg	0.12500	AV	77.8	18.9	-53.0	32.3	0.0	11.4	25.6	14.2	DC 12.0 V
0deg	0.12500	AV	77.8	18.9	-53.0	32.3	0.0	11.4	25.6	14.2	DC 13.8 V
0deg	0.25000	AV	42.5	18.9	-53.0	32.3	0.0	-23.9	19.6	43.5	
0deg	0.37500	AV	39.1	18.8	-52.9	32.3	0.0	-27.3	16.1	43.4	

Result of the fundamental emission at 10m without Distance factor

PK or QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.12500	PK	77.8	18.9	6.1	32.3	-	70.5	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

*It was confirmed that there was no difference by the input voltage in the spurious emission.

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

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

UL Japan, Inc.

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Radiated Emission below 30 MHz (Fundamental and Spurious Emission)

Report No. 13645592H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date January 19, 2021
Temperature / Humidity 22 deg. C / 31 % RH
Engineer Yuta Moriya
Mode Mode 6

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.12500	PK	60.8	18.9	-53.0	32.3	-	-5.6	45.6	51.2	Fundamental (DC 10.2 V)
0deg	0.12500	PK	60.8	18.9	-53.0	32.3	-	-5.6	45.6	51.2	Fundamental (DC 12.0 V)
0deg	0.12500	PK	60.8	18.9	-53.0	32.3	-	-5.6	45.6	51.2	Fundamental (DC 13.8 V)
0deg	0.25000	PK	41.7	18.9	-53.0	32.3	-	-24.7	39.6	64.3	
0deg	0.37500	PK	40.1	18.8	-52.9	32.3	-	-26.3	36.1	62.4	
0deg	0.50000	QP	32.7	18.8	-12.9	32.2	-	6.3	33.6	27.3	
0deg	0.62500	QP	32.2	18.8	-12.9	32.2	-	5.8	31.7	25.8	
0deg	0.75000	QP	31.8	18.8	-12.9	32.2	-	5.4	30.1	24.6	
0deg	0.87500	QP	31.4	18.8	-12.9	32.2	-	5.1	28.7	23.7	
0deg	1.00000	QP	31.4	18.8	-12.8	32.2	-	5.1	27.6	22.5	
0deg	1.12500	QP	31.1	18.8	-12.8	32.2	-	4.9	26.5	21.7	
0deg	1.25000	QP	31.4	18.8	-12.8	32.2	-	5.2	25.6	20.5	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amplifier)

PK with Duty factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.12500	AV	60.8	18.9	-53.0	32.3	0.0	-5.6	25.6	31.2	DC 10.2 V
0deg	0.12500	AV	60.8	18.9	-53.0	32.3	0.0	-5.6	25.6	31.2	DC 12.0 V
0deg	0.12500	AV	60.8	18.9	-53.0	32.3	0.0	-5.6	25.6	31.2	DC 13.8 V
0deg	0.25000	AV	41.7	18.9	-53.0	32.3	0.0	-24.7	19.6	44.3	
0deg	0.37500	AV	40.1	18.8	-52.9	32.3	0.0	-26.3	16.1	42.4	

Result of the fundamental emission at 10m without Distance factor

PK or QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.12500	PK	60.8	18.9	6.1	32.3	-	53.5	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

*It was confirmed that there was no difference by the input voltage in the spurious emission.

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

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

UL Japan, Inc.

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Radiated Emission below 30 MHz (Fundamental and Spurious Emission)

Report No. 13645592H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date January 19, 2021
Temperature / Humidity 22 deg. C / 31 % RH
Engineer Yuta Moriya
Mode Mode 7

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.12500	PK	71.0	18.9	-53.0	32.3	-	4.6	45.6	41.0	Fundamental (DC 10.2 V)
0deg	0.12500	PK	71.0	18.9	-53.0	32.3	-	4.6	45.6	41.0	Fundamental (DC 12.0 V)
0deg	0.12500	PK	71.0	18.9	-53.0	32.3	-	4.6	45.6	41.0	Fundamental (DC 13.8 V)
0deg	0.25000	PK	41.4	18.9	-53.0	32.3	-	-25.0	39.6	64.6	
0deg	0.37500	PK	44.1	18.8	-52.9	32.3	-	-22.3	36.1	58.4	
0deg	0.50000	QP	32.7	18.8	-12.9	32.2	-	6.3	33.6	27.3	
0deg	0.62500	QP	32.4	18.8	-12.9	32.2	-	6.0	31.7	25.7	
0deg	0.75000	QP	31.7	18.8	-12.9	32.2	-	5.4	30.1	24.7	
0deg	0.87500	QP	31.4	18.8	-12.9	32.2	-	5.1	28.7	23.6	
0deg	1.00000	QP	31.3	18.8	-12.8	32.2	-	5.0	27.6	22.6	
0deg	1.12500	QP	31.2	18.8	-12.8	32.2	-	4.9	26.5	21.6	
0deg	1.25000	QP	31.1	18.8	-12.8	32.2	-	4.8	25.6	20.8	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amplifier)

PK with Duty factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.12500	AV	71.0	18.9	-53.0	32.3	0.0	4.6	25.6	21.0	DC 10.2 V
0deg	0.12500	AV	71.0	18.9	-53.0	32.3	0.0	4.6	25.6	21.0	DC 12.0 V
0deg	0.12500	AV	71.0	18.9	-53.0	32.3	0.0	4.6	25.6	21.0	DC 13.8 V
0deg	0.25000	AV	41.4	18.9	-53.0	32.3	0.0	-25.0	19.6	44.6	
0deg	0.37500	AV	44.1	18.8	-52.9	32.3	0.0	-22.3	16.1	38.4	

Result of the fundamental emission at 10m without Distance factor

PK or QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.12500	PK	71.0	18.9	6.1	32.3	-	63.7	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

*It was confirmed that there was no difference by the input voltage in the spurious emission.

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

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

UL Japan, Inc.

Ise EMC Lab.

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Radiated Emission above 30 MHz (Spurious Emission)

Report No. 13645592H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 8, 2021
Temperature / Humidity 22 deg. C / 30 % RH
Engineer Yuta Moriya
Mode Mode 1

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	38.498	QP	22.0	15.3	7.3	32.0	12.6	40.0	27.4	
Hori.	61.963	QP	25.4	7.3	7.6	32.0	8.3	40.0	31.7	
Hori.	67.735	QP	30.0	6.4	7.6	32.0	12.1	40.0	27.9	
Hori.	73.919	QP	33.9	6.3	7.7	32.0	16.0	40.0	24.0	
Hori.	101.373	QP	24.2	10.4	8.0	31.9	10.6	43.5	32.9	
Hori.	432.936	QP	33.8	16.2	10.4	31.8	28.6	46.0	17.5	
Vert.	38.498	QP	26.2	15.3	7.3	32.0	16.8	40.0	23.2	
Vert.	61.963	QP	37.8	7.3	7.6	32.0	20.7	40.0	19.3	
Vert.	67.735	QP	37.8	6.4	7.6	32.0	19.9	40.0	20.1	
Vert.	73.919	QP	40.7	6.3	7.7	32.0	22.8	40.0	17.2	
Vert.	101.373	QP	40.3	10.4	8.0	31.9	26.7	43.5	16.8	
Vert.	432.936	QP	25.8	16.2	10.4	31.8	20.6	46.0	25.5	

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amplifier)

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

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

*It was confirmed that there was no difference by the input voltage in the spurious emission.

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Radiated Emission above 30 MHz (Spurious Emission)

Report No. 13645592H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 8, 2021
Temperature / Humidity 22 deg. C / 30 % RH
Engineer Yuta Moriya
Mode Mode 2

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	35.604	QP	21.0	16.3	7.2	32.0	12.6	40.0	27.4	
Hori.	67.942	QP	32.4	6.4	7.7	32.0	14.5	40.0	25.5	
Hori.	73.893	QP	33.6	6.3	7.7	32.0	15.7	40.0	24.3	
Hori.	101.593	QP	29.9	10.4	8.0	31.9	16.3	43.5	27.2	
Hori.	105.599	QP	28.6	11.0	8.0	31.9	15.7	43.5	27.8	
Hori.	369.442	QP	33.1	15.2	10.0	31.8	26.5	46.0	19.5	
Vert.	35.604	QP	29.6	16.3	7.2	32.0	21.2	40.0	18.8	
Vert.	67.942	QP	39.8	6.4	7.7	32.0	21.9	40.0	18.1	
Vert.	73.893	QP	41.3	6.3	7.7	32.0	23.4	40.0	16.6	
Vert.	101.593	QP	40.0	10.4	8.0	31.9	26.5	43.5	17.1	
Vert.	105.599	QP	40.0	11.0	8.0	31.9	27.1	43.5	16.4	
Vert.	369.442	QP	27.9	15.2	10.0	31.8	21.3	46.0	24.7	

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amplifier)

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

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

*It was confirmed that there was no difference by the input voltage in the spurious emission.

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Radiated Emission above 30 MHz (Spurious Emission)

Report No. 13645592H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 8, 2021
Temperature / Humidity 22 deg. C / 30 % RH
Engineer Yuta Moriya
Mode Mode 3

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	37.170	QP	22.0	15.8	7.2	32.0	13.1	40.0	27.0	
Hori.	39.846	QP	21.7	14.8	7.3	32.0	11.8	40.0	28.2	
Hori.	65.001	QP	24.6	6.7	7.6	32.0	6.9	40.0	33.1	
Hori.	74.936	QP	30.8	6.4	7.7	32.0	13.0	40.0	27.0	
Hori.	101.635	QP	31.5	10.4	8.0	31.9	18.0	43.5	25.5	
Hori.	389.267	QP	34.5	15.5	10.1	31.8	28.3	46.0	17.7	
Vert.	37.170	QP	38.0	15.8	7.2	32.0	29.1	40.0	11.0	
Vert.	39.846	QP	32.7	14.8	7.3	32.0	22.8	40.0	17.2	
Vert.	65.001	QP	39.1	6.7	7.6	32.0	21.4	40.0	18.6	
Vert.	74.936	QP	39.1	6.4	7.7	32.0	21.3	40.0	18.7	
Vert.	101.635	QP	39.1	10.4	8.0	31.9	25.6	43.5	17.9	
Vert.	389.267	QP	33.2	15.5	10.1	31.8	27.0	46.0	19.0	

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amplifier)

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

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

*It was confirmed that there was no difference by the input voltage in the spurious emission.

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Radiated Emission above 30 MHz (Spurious Emission)

Report No. 13645592H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 8, 2021
Temperature / Humidity 22 deg. C / 30 % RH
Engineer Yuta Moriya
Mode Mode 4

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	36.089	QP	22.0	16.1	7.2	32.0	13.4	40.0	26.6	
Hori.	64.513	QP	24.2	6.8	7.6	32.0	6.6	40.0	33.4	
Hori.	94.603	QP	29.3	9.2	7.9	31.9	14.5	43.5	29.1	
Hori.	100.191	QP	33.9	10.1	8.0	31.9	20.1	43.5	23.4	
Hori.	133.670	QP	25.1	13.9	8.3	31.9	15.4	43.5	28.1	
Hori.	385.563	QP	30.1	15.4	10.1	31.8	23.8	46.0	22.2	
Vert.	36.089	QP	23.7	16.1	7.2	32.0	15.1	40.0	24.9	
Vert.	64.513	QP	39.5	6.8	7.6	32.0	21.9	40.0	18.1	
Vert.	94.603	QP	41.3	9.2	7.9	31.9	26.5	43.5	17.0	
Vert.	100.191	QP	44.0	10.1	8.0	31.9	30.2	43.5	13.3	
Vert.	133.670	QP	33.9	13.9	8.3	31.9	24.3	43.5	19.3	
Vert.	385.563	QP	26.4	15.4	10.1	31.8	20.1	46.0	25.9	

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amplifier)

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

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

*It was confirmed that there was no difference by the input voltage in the spurious emission.

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Radiated Emission above 30 MHz (Spurious Emission)

Report No. 13645592H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 8, 2021
Temperature / Humidity 22 deg. C / 30 % RH
Engineer Yuta Moriya
Mode Mode 5

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	35.390	QP	20.7	16.4	7.2	32.0	12.4	40.0	27.6	
Hori.	39.120	QP	21.2	15.1	7.3	32.0	11.6	40.0	28.5	
Hori.	61.372	QP	24.3	7.4	7.6	32.0	7.3	40.0	32.7	
Hori.	68.085	QP	24.8	6.4	7.7	32.0	6.9	40.0	33.1	
Hori.	100.517	QP	30.6	10.2	8.0	31.9	16.9	43.5	26.7	
Hori.	398.358	QP	32.1	15.7	10.2	31.8	26.1	46.0	19.9	
Vert.	35.390	QP	28.0	16.4	7.2	32.0	19.7	40.0	20.3	
Vert.	39.120	QP	30.4	15.1	7.3	32.0	20.8	40.0	19.3	
Vert.	61.372	QP	36.3	7.4	7.6	32.0	19.3	40.0	20.7	
Vert.	68.085	QP	38.6	6.4	7.7	32.0	20.7	40.0	19.3	
Vert.	100.517	QP	40.5	10.2	8.0	31.9	26.8	43.5	16.8	
Vert.	398.358	QP	27.4	15.7	10.2	31.8	21.4	46.0	24.6	

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amplifier)

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

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

*It was confirmed that there was no difference by the input voltage in the spurious emission.

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Radiated Emission above 30 MHz (Spurious Emission)

Report No. 13645592H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date January 8, 2021
Temperature / Humidity 22 deg. C / 30 % RH
Engineer Yuta Moriya
Mode Mode 6

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	60.457	QP	23.2	7.6	7.6	32.0	6.4	40.0	33.6	
Hori.	92.045	QP	21.0	8.8	7.9	31.9	5.7	43.5	37.8	
Hori.	100.203	QP	20.1	10.1	8.0	31.9	6.3	43.5	37.2	
Hori.	108.118	QP	21.1	11.3	8.0	31.9	8.5	43.5	35.0	
Hori.	121.160	QP	21.1	12.9	8.2	31.9	10.2	43.5	33.3	
Hori.	228.006	QP	28.6	11.3	9.1	31.8	17.2	46.0	28.9	
Vert.	60.457	QP	34.0	7.6	7.6	32.0	17.2	40.0	22.8	
Vert.	92.045	QP	30.1	8.8	7.9	31.9	14.8	43.5	28.7	
Vert.	100.203	QP	27.0	10.1	8.0	31.9	13.2	43.5	30.3	
Vert.	108.118	QP	29.2	11.3	8.0	31.9	16.6	43.5	26.9	
Vert.	121.160	QP	27.8	12.9	8.2	31.9	16.9	43.5	26.6	
Vert.	228.006	QP	35.9	11.3	9.1	31.8	24.4	46.0	21.6	

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amplifier)

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

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

*It was confirmed that there was no difference by the input voltage in the spurious emission.

UL Japan, Inc.

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Radiated Emission above 30 MHz (Spurious Emission)

Report No. 13645592H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date January 19, 2021
Temperature / Humidity 22 deg. C / 31 % RH
Engineer Yuta Moriya
Mode Mode 7

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	51.537	QP	30.6	10.4	7.8	38.8	9.9	40.0	30.1	
Hori.	52.665	QP	30.0	10.0	7.8	38.8	9.0	40.0	31.0	
Hori.	67.685	QP	39.6	6.4	8.0	38.9	15.2	40.0	24.8	
Hori.	88.087	QP	37.9	8.0	8.4	38.9	15.4	43.5	28.1	
Hori.	100.551	QP	32.3	10.1	8.6	39.0	12.0	43.5	31.6	
Hori.	380.663	QP	36.2	15.1	11.3	38.5	24.0	46.0	22.0	
Vert.	51.537	QP	42.9	10.4	7.8	38.8	22.2	40.0	17.8	
Vert.	52.665	QP	48.2	10.0	7.8	38.8	27.2	40.0	12.8	
Vert.	67.685	QP	46.0	6.4	8.0	38.9	21.6	40.0	18.4	
Vert.	88.087	QP	42.9	8.0	8.4	38.9	20.4	43.5	23.1	
Vert.	100.551	QP	39.3	10.1	8.6	39.0	19.0	43.5	24.6	
Vert.	380.663	QP	29.0	15.1	11.3	38.5	16.8	46.0	29.2	

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amplifier)

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

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

*It was confirmed that there was no difference by the input voltage in the spurious emission.

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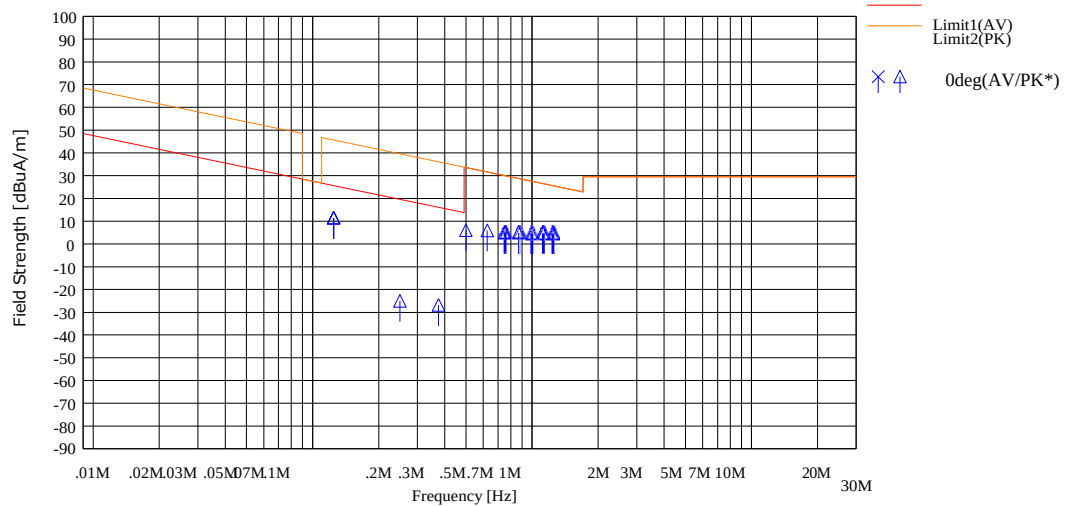
Facsimile : +81 596 24 8124

Radiated Emission Plot data, Worst case

Report No.	13645592H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.1
Date	January 8, 2021	January 19, 2021
Temperature / Humidity	22 deg. C / 30 % RH	22 deg. C / 31 % RH
Engineer	Yuta Moriya	Yuta Moriya
Mode	Mode 3	

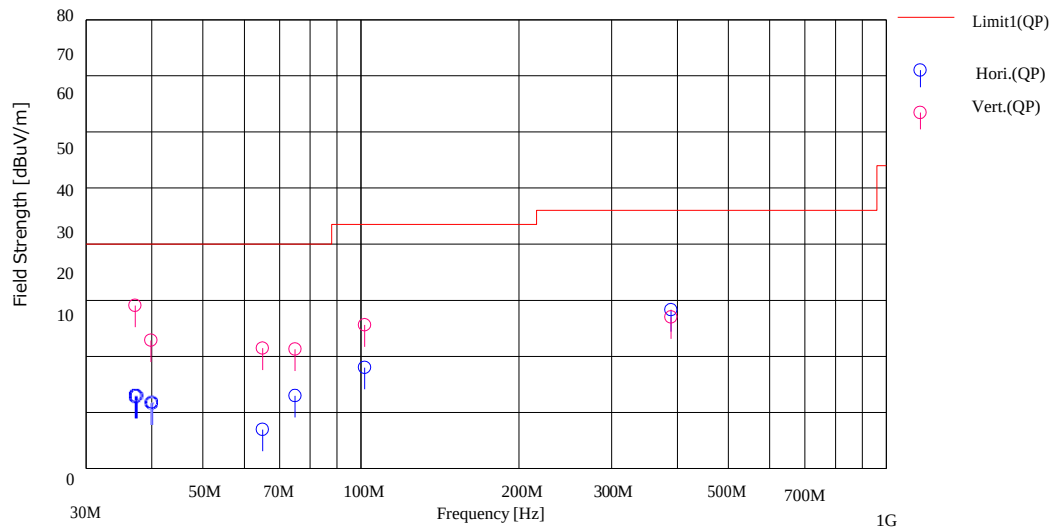
(below 30MHz)

Limit : FCC15.209(a), 9-90kHz:PK, 110-490kHz:PK, other:QP



* Data above 490 kHz were measured using a QP detector.

(above 30MHz)



*These plots data contains sufficient number to show the trend of characteristic features for EUT.

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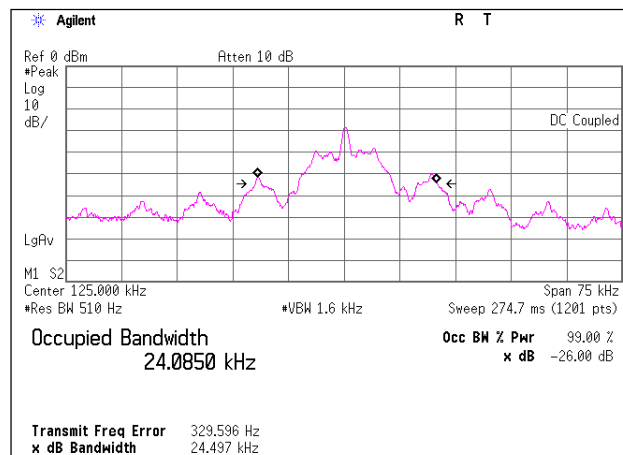
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

-26 dB Bandwidth and 99 % Occupied Bandwidth

Report No. 13645592H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date January 19, 2021
Temperature / Humidity 22 deg. C / 31 % RH
Engineer Yuta Moriya
Mode Mode 1

-26 dB Bandwidth [kHz]	99 % Occupied Bandwidth [kHz]
24.497	24.0850



*It was confirmed that there was no difference by the input voltage.

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Ise EMC Lab.

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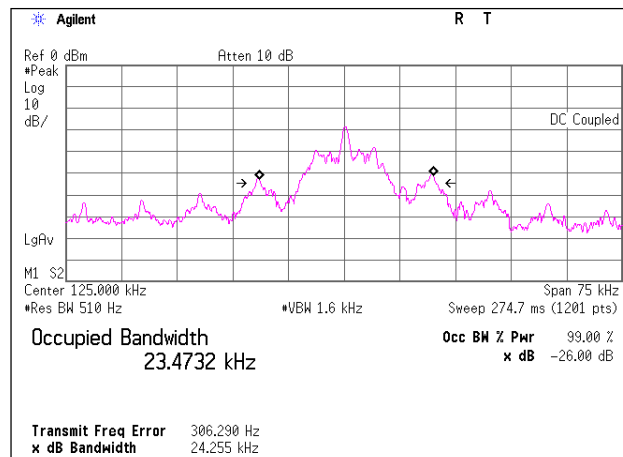
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

-26 dB Bandwidth and 99 % Occupied Bandwidth

Report No. 13645592H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date January 19, 2021
Temperature / Humidity 22 deg. C / 31 % RH
Engineer Yuta Moriya
Mode Mode 2

-26 dB Bandwidth [kHz]	99 % Occupied Bandwidth [kHz]
24.255	23.4732



*It was confirmed that there was no difference by the input voltage.

UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

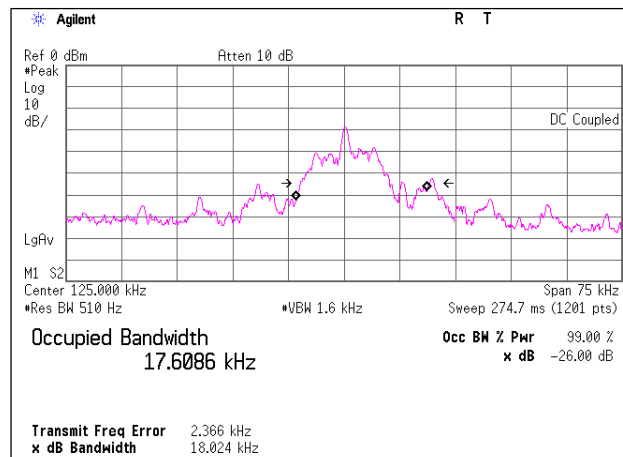
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

-26 dB Bandwidth and 99 % Occupied Bandwidth

Report No. 13645592H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date January 19, 2021
Temperature / Humidity 22 deg. C / 31 % RH
Engineer Yuta Moriya
Mode Mode 3

-26 dB Bandwidth [kHz]	99 % Occupied Bandwidth [kHz]
18.024	17.6086



*It was confirmed that there was no difference by the input voltage.

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Ise EMC Lab.

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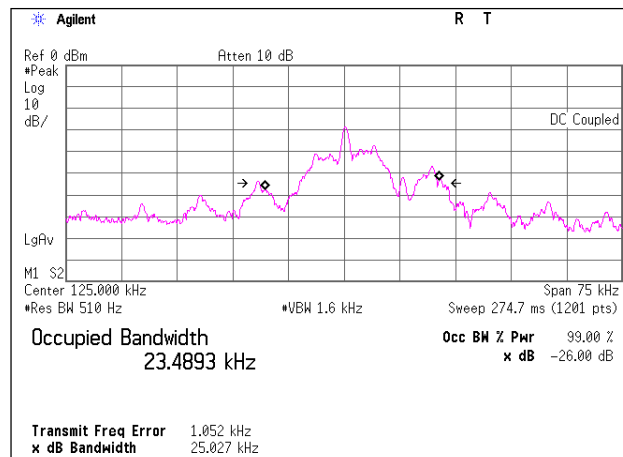
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

-26 dB Bandwidth and 99 % Occupied Bandwidth

Report No. 13645592H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date January 19, 2021
Temperature / Humidity 22 deg. C / 31 % RH
Engineer Yuta Moriya
Mode Mode 4

-26 dB Bandwidth [kHz]	99 % Occupied Bandwidth [kHz]
25.027	23.4893



*It was confirmed that there was no difference by the input voltage.

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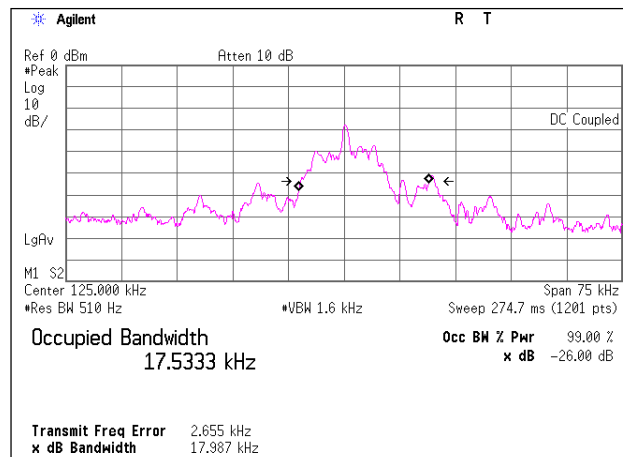
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

-26 dB Bandwidth and 99 % Occupied Bandwidth

Report No. 13645592H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date January 19, 2021
Temperature / Humidity 22 deg. C / 31 % RH
Engineer Yuta Moriya
Mode Mode 5

-26 dB Bandwidth [kHz]	99 % Occupied Bandwidth [kHz]
17.987	17.5333



*It was confirmed that there was no difference by the input voltage.

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-26 dB Bandwidth and 99 % Occupied Bandwidth

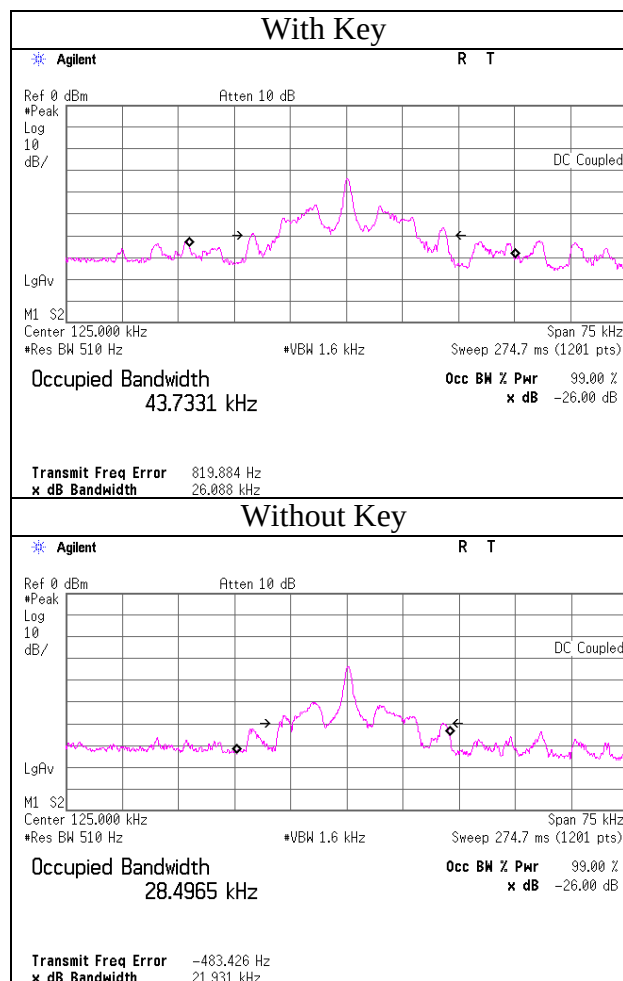
Report No. 13645592H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date January 19, 2021
Temperature / Humidity 22 deg. C / 31 % RH
Engineer Yuta Moriya
Mode Mode 6

With Key

-26 dB Bandwidth [kHz]	99 % Occupied Bandwidth [kHz]
26.088	43.7331

Without Key

-26 dB Bandwidth [kHz]	99 % Occupied Bandwidth [kHz]
21.931	28.4965



*It was confirmed that there was no difference by the input voltage.

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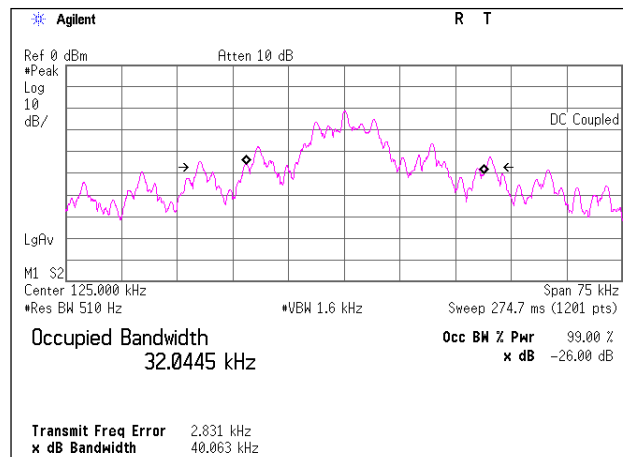
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-26 dB Bandwidth and 99 % Occupied Bandwidth

Report No. 13645592H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date January 19, 2021
Temperature / Humidity 22 deg. C / 31 % RH
Engineer Yuta Moriya
Mode Mode 7

-26 dB Bandwidth [kHz]	99 % Occupied Bandwidth [kHz]
40.063	32.0445



*It was confirmed that there was no difference by the input voltage.

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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. Inc	CTH-201	0010	01/15/2021	12
RE	MMM-10	141545	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	51201148	01/07/2021	12
RE	MJM-29	142230	Measure	KOMELON	KMC-36	-	-	-
RE	COTS-MEMI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	MAT-34	141331	Attenuator(6dB)	TME	UFA-01	-	02/05/2020	12
RE	MBA-05	141425	Biconical Antenna	Schwarzbeck Mess - Elektronik	VHA9103+BBA9106	VHA 91031302	08/31/2020	12
RE	MCC-50	141397	Coaxial Cable	UL Japan	-	-	11/06/2020	12
RE	MLA-23	141267	Logperiodic Antenna(200-1000MHz)	Schwarzbeck Mess - Elektronik	VUSLP9111B	9111B-192	09/02/2020	12
RE	MPA-14	141583	Pre Amplifier	SONOMA INSTRUMENT	310	260833	02/18/2020	12
RE	MTR-10	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	03/10/2020	12
RE	MAEC-01	141998	AC1_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	06/08/2020	24
RE	MOS-27	141566	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	A08Q26	01/15/2021	12
RE	MMM-03	141530	Digital Tester	Fluke Corporation	FLUKE 26-3	78030621	08/18/2020	12
RE	MJM-25	142226	Measure	KOMELON	KMC-36	-	-	-
RE	MCC-03	141215	Coaxial Cable	Fujikura/Suhner/TSJ	5D-2W/3D-2W/RG400u/RFM-E421(SW)	-/01068(Switcher)	06/25/2020	12
RE	MLPA-02	142152	Loop Antenna	Rohde & Schwarz	HFH2-Z2	836553/009	12/04/2020	12
RE	MCC-219	159670	Coaxial Cable	UL Japan Inc.	-	-	11/17/2020	12
RE	MPA-13	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	02/10/2020	12
RE	MAT-08	141213	Attenuator(6dB)	Weinschel Corp	2	BK7971	11/13/2020	12
RE	MTR-09	141950	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	06/03/2020	12
RE	KBA-05	141198	Biconical Antenna	Schwarzbeck Mess - Elektronik	VHA9103+BBA9106	2513	04/22/2020	12
RE	MCC-02	141350	Coaxial Cable	Suhner/storm/Agilent/TSJ	-	-	06/25/2020	12
RE	MLA-20	141264	LogperiodicAntenna (200-1000MHz)	Schwarzbeck Mess - Elektronik	VUSLP9111B	9111B-189	04/22/2020	12
RE	MPA-19	141585	Pre Amplifier	MITEQ	MLA-10K01-B01-35	1237616	02/10/2020	12
RE	MSA-16	141903	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46186390	12/18/2020	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: Spurious emission

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