



EMI TEST REPORT

Test Report No. : 13397619H-B-R2

Applicant : YOSHIKAWA KOGYO Co.,Ltd.
Type of EUT : DETECTOR
Model Number of EUT : YS-F-R023A
FCC ID : 2AWRK-YS-RA0848
Test regulation : FCC Part 15 Subpart B: 2020
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.
4. The test results in this test report are traceable to the national or international standards.
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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 13397619H-B-R1. 13397619H-B-R1 is replaced with this report.

Date of test: June 24 to August 26, 2020

Representative test engineer:

Kiyoshiro Okazaki
Engineer
Consumer Technology Division

Approved by:

Shinichi Miyazono
Engineer
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.: 13397619H-B

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13397619H-B	August 4, 2020	-	-
1	13397619H-B-R1	August 24, 2020	P.5	Correction of Radio type of Transmitter part in Clause 2.2; From Transceiver to Transmitter
1	13397619H-B-R1	August 24, 2020	P.9	Correcton of Support equipment information in Clause 4.2; <Mode number of No. C> From XVR3B04 to YS-F-V027A-R <Item and Model number of No. D> From Small Speaker, YS-K-S003A-M to Speaker, YS-F-S003A
2	13397619H-B-R2	August 28, 2020	P.1	Addition of test date
2	13397619H-B-R2	August 28, 2020	P.5	Addition of "Intermediate Frequency: 10.7 MHz" in Receiver part of Clause 2.2
2	13397619H-B-R2	August 26, 2020	P.6	Update for FCC version in Clause 3.1; From FCC Part 15 final revised on May 26, 2020 and effective July 27, 2020 except 15.258 To FCC Part 15 final revised on June 26, 2020 and effective July 27, 2020
2	13397619H-B-R2	August 28, 2020	P.6	Addition of "Communications Receiver used w/Pt 15 Transmitter" in Clasue 3.2.
2	13397619H-B-R2	August 28, 2020	P.9	Addition of Mode 3 in Clasue 4.1
2	13397619H-B-R2	August 28, 2020	P.10	Addition of Test Place in Clause 5.1
2	13397619H-B-R2	August 28, 2020	P.11	Addition of Test distance:3m to Below 1GHz in Test Setup diagram in Clasue 5.4
2	13397619H-B-R2	August 28, 2020	P.11	Addition of test date in Clasue 5.5
2	13397619H-B-R2	August 28, 2020	P.16, 17	Addition of test data for Mode 3
2	13397619H-B-R2	August 28, 2020	P.18	Addition of Test equipment by additional testing in APPENDIX 2.
2	13397619H-B-R2	August 28, 2020	P.21, 23	Addition of Testsetup photo by additional testing in APPENDIX 3.

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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	P _{LT}	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	P _{ST}	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	:	YOSHIKAWA KOGYO Co.,Ltd.
Address	:	8-1 Hibikinokita Wakamatsu-ku Kitakyusyu City Fukuoka 808-0138 Japan
Telephone Number	:	+81-93-695-3093
Facsimile Number	:	+81-93-695-3094
Contact Person	:	Toshiharu Konomi

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	:	DETECTOR
Model Number	:	YS-F-R023A
Serial Number	:	Refer to SECTION 4.2
Rating	:	DC 48 V / 2 A
Receipt Date	:	June 19, 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: YS-F-R023A (referred to as the EUT in this report) is a DETECTOR.

Radio Specification

[Transmitter part]

Radio Type	:	Transmitter
Frequency of Operation	:	125 kHz
Modulation	:	ASK
Antenna type	:	Internal Antenna
Clock frequency (Maximum)	:	CPU 8 MHz

[Receiver part]

Radio Type	:	Receiver
Frequency of Operation	:	315 MHz
Intermediate Frequency	:	10.7 MHz

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

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

3.2 Procedures and results

[Part 15 Class A Digital Device]

Item	Test Procedure	Limits	Deviation	Worst margin	Result	Remarks
Conducted emission	FCC: ANSI C63.4: 2014 7. AC power - line conducted emission measurements	Class A	N/A	N/A	N/A	*1)
Radiated emission	FCC: ANSI C63.4: 2014 8. Radiated emission measurements	Class A	N/A	10.6 dB 30.883 MHz, Vertical, QP <Mode 2>	Complied a)	-
*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)						
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.						

[Communications Receiver used w/Pt 15 Transmitter]

Item	Test Procedure	Limits	Deviation	Worst margin	Result	Remarks
Conducted emission	FCC: ANSI C63.4: 2014 7. AC power - line conducted emission measurements	Class B	N/A	N/A	N/A	*1)
Radiated emission	FCC: ANSI C63.4: 2014 8. Radiated emission measurements	Class B	N/A	10.05 dB 325.700 MHz, Horizontal, QP <Mode 3>	Complied a)	-
*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)						
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

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.

SECTION 4: Operation of EUT during testing

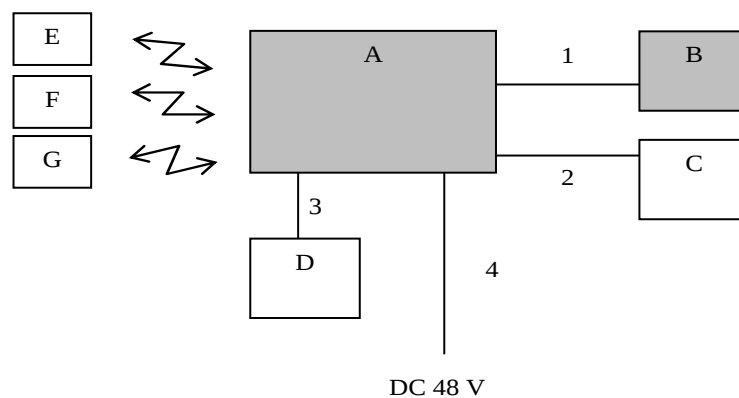
4.1 Operating Mode(s)

Mode	Remarks
Mode 1	Alarm status with 8M zone
Mode 2	Safe status with 8M zone
Mode 3	Receiving Mode
*EUT was set by the software as follows; Software: v21.81.02	

*The test signal level was confirmed to be sufficient to stabilize the local oscillator of the EUT.

* It was confirmed by using checker that the EUT receives the signal from the transmitter (pair of EUT).

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	Remarks
A	DETECTOR	YS-F-R023A	001573	YOSHIKAWA KOGYO Co.,Ltd.	EUT
B	UHF Antenna	-	001	YOSHIKAWA KOGYO Co.,Ltd.	EUT
C	Indicator lamp	YS-F-V027A-R	-	Schneider Electric	-
D	Speaker	YS-F-S003A	01238	YOSHIKAWA KOGYO Co.,Ltd.	-
E	Tag	YS-K-T010	403510	YOSHIKAWA KOGYO Co.,Ltd.	-
F	Tag	YS-F-T003A	346	YOSHIKAWA KOGYO Co.,Ltd.	-
G	Tag	YS-F-T008A	594	YOSHIKAWA KOGYO Co.,Ltd.	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal Cable	4.0	Unshielded	Unshielded	-
2	Signal Cable	5.7	Unshielded	Unshielded	-
3	Signal Cable	5.2	Unshielded	Unshielded	-
4	DC Cable	2.2	Unshielded	Unshielded	-

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SECTION 5: Radiated Emission

5.1 Operating environment

Test place : No.1 and 3 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 - 2000 MHz (Horn antenna)
Test distance : 3 m / 10m
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.

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.

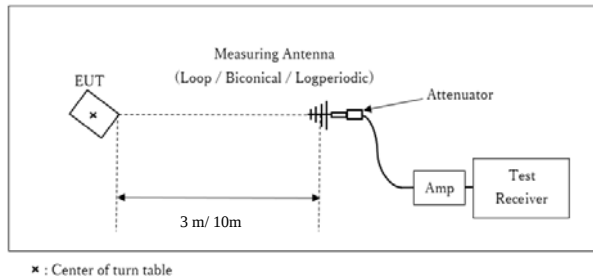
Frequency	Below 1GHz	Above 1GHz *1)
Instrument used	Test Receiver	Test Receiver
IF Bandwidth	QP: BW 120 kHz	PK: BW 1 MHz, CISPR AV: BW 1 MHz

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

Distance Factor: See Figure 2.

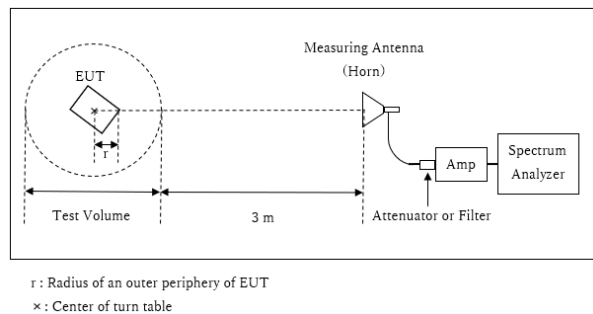
Figure 2: Test Setup

Below 1 GHz



Test Distance: 3 m / 10m

1 GHz - 2 GHz



Distance Factor: $20 \times \log (3.25 \text{ m}^*/3.0 \text{ m}) = 2.17 \text{ dB}$
* Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.25 \text{ m}$

SVSWR Volume: 1.5m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
 $r = 0.5 \text{ m}$

Distance Factor: $20 \times \log (3.0 \text{ m}^* / 10.0 \text{ m}) = -10.46 \text{ dB}$
*Test Distance: 3 m

- The 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.

5.5 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.

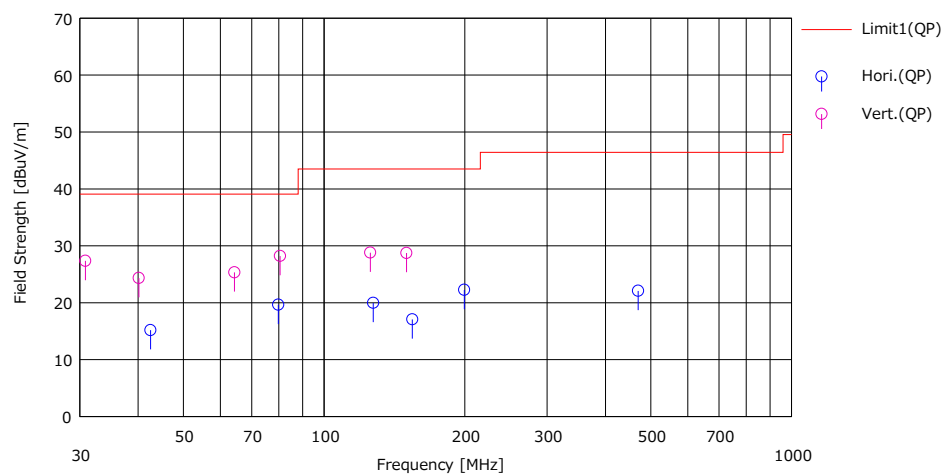
Date:	June 24, 2020	Test engineer:	Kiyoshiro Okazaki
	July 2, 2020	Test engineer:	Hiroyuki Furutaka
	August 26, 2020	Test engineer:	Kiyoshiro Okazaki

APPENDIX 1: Test data

Radiated Emission

Report No. 13397619H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date July 2, 2020
Temperature / Humidity 21 deg. C / 52 % RH
Engineer Hiroyuki Furutaka
(Below 1 GHz)
Mode Mode 1

Limit : FCC_Part 15 Subpart B(15.109)_Class A



No.	Freq. [MHz]	Reading [QP] [dBuV]	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [QP] [dBuV/m]	Limit [QP] [dBuV/m]	Margin [QP] [dB]	Pola. [H/V]	Height [m]	Angle [deg]	Ant. Type	Comment
1	42.515	32.80	13.61	7.58	38.82	15.17	39.10	23.9	Hori.	400	5	BA	
2	79.810	43.50	6.77	8.24	38.87	19.64	39.10	19.4	Hori.	400	9	BA	
3	127.446	36.70	13.32	8.89	38.94	19.97	43.50	23.5	Hori.	400	283	BA	
4	154.500	31.70	15.08	9.23	38.94	17.07	43.50	26.4	Hori.	400	334	BA	
5	199.516	35.00	16.48	9.71	38.93	22.26	43.50	21.2	Hori.	400	17	BA	
6	470.000	31.80	16.73	11.96	38.41	22.08	46.40	24.3	Hori.	167	341	LA20	
7	30.840	40.90	17.92	7.33	38.81	27.34	39.10	11.7	Vert.	100	201	BA	
8	40.125	41.10	14.53	7.53	38.82	24.34	39.10	14.7	Vert.	100	296	BA	
9	64.305	49.40	6.80	7.98	38.84	25.34	39.10	13.7	Vert.	100	238	BA	
10	80.489	52.00	6.84	8.25	38.87	28.22	39.10	10.8	Vert.	100	253	BA	
11	125.541	45.70	13.17	8.87	38.94	28.80	43.50	14.7	Vert.	100	26	BA	
12	150.063	43.60	14.89	9.18	38.94	28.73	43.50	14.7	Vert.	100	157	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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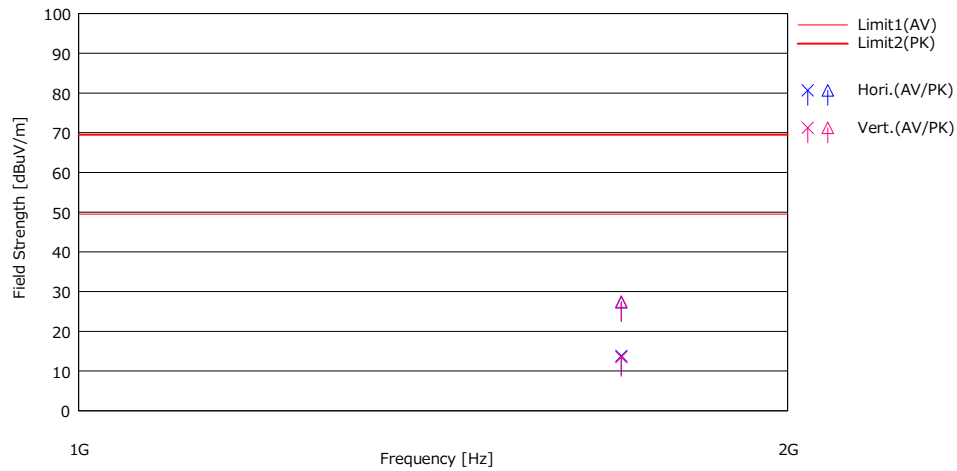
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Radiated Emission

Report No. 13397619H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date June 24, 2020
Temperature / Humidity 21 deg. C / 55 % RH
Engineer Kiyoshiro Okazaki
(Above 1 GHz)
Mode Mode 1

Limit : FCC_Part 15 Subpart B(15.109)_Class A



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	1700.000	32.20	45.70	25.01	-7.78	35.64	13.79	27.29	49.50	69.50	35.7	42.2	Hori.	100	0	HA6	
2	1700.000	31.90	45.90	25.01	-7.78	35.64	13.49	27.49	49.50	69.50	36.0	42.0	Vert.	100	0	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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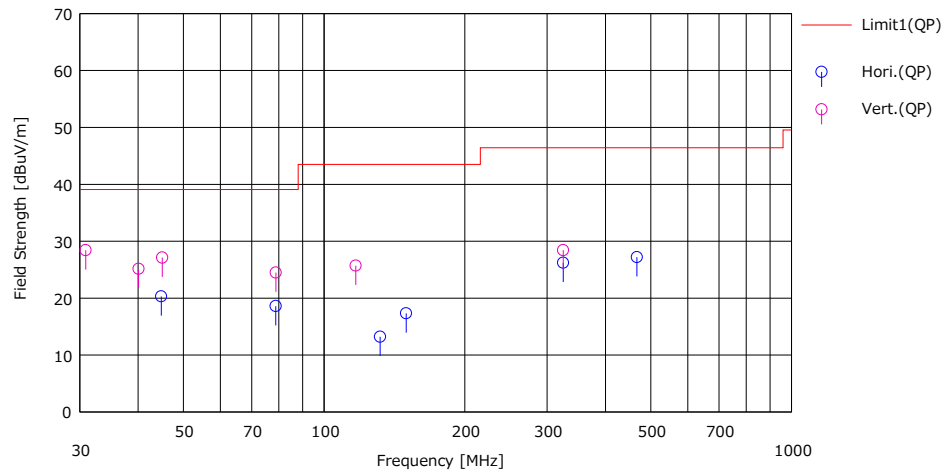
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Radiated Emission

Report No. 13397619H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date July 2, 2020
Temperature / Humidity 21 deg. C / 52 % RH
Engineer Hiroyuki Furutaka
(Below 1 GHz)
Mode Mode 2

Limit : FCC_Part 15 Subpart B(15.109)_Class A



No.	Freq.	Reading	Ant.Fac	Loss	Gain	Result	Limit	Margjn	Pob.	Height	Angle	Ant. Type	Comment
		(QP)				(QP)	(QP)	(QP)					
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[H/V]	[cm]	[deg]		
1	44.825	38.70	12.80	7.62	38.82	20.30	39.10	18.8	Hori.	400	195	BA	
2	78.825	42.60	6.64	8.22	38.87	18.59	39.10	20.5	Hori.	400	4	BA	
3	131.838	29.50	13.71	8.94	38.94	13.21	43.50	30.2	Hori.	400	64	BA	
4	149.831	32.20	14.88	9.18	38.94	17.32	43.50	26.1	Hori.	400	115	BA	
5	324.777	39.90	14.11	10.87	38.67	26.21	46.40	20.1	Hori.	300	253	LA20	
6	467.188	37.00	16.66	11.94	38.41	27.19	46.40	19.2	Hori.	157	334	LA20	
7	30.883	42.00	17.90	7.33	38.81	28.42	39.10	10.6	Vert.	100	91	BA	
8	40.100	41.90	14.54	7.53	38.82	25.15	39.10	13.9	Vert.	100	279	BA	
9	45.041	45.60	12.71	7.63	38.82	27.12	39.10	11.9	Vert.	100	98	BA	
10	78.835	48.50	6.64	8.22	38.87	24.49	39.10	14.6	Vert.	100	265	BA	
11	116.884	43.60	12.29	8.76	38.95	25.70	43.50	17.8	Vert.	100	192	BA	
12	324.777	42.10	14.11	10.87	38.67	28.41	46.40	17.9	Vert.	100	316	LA20	

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.

UL Japan, Inc.

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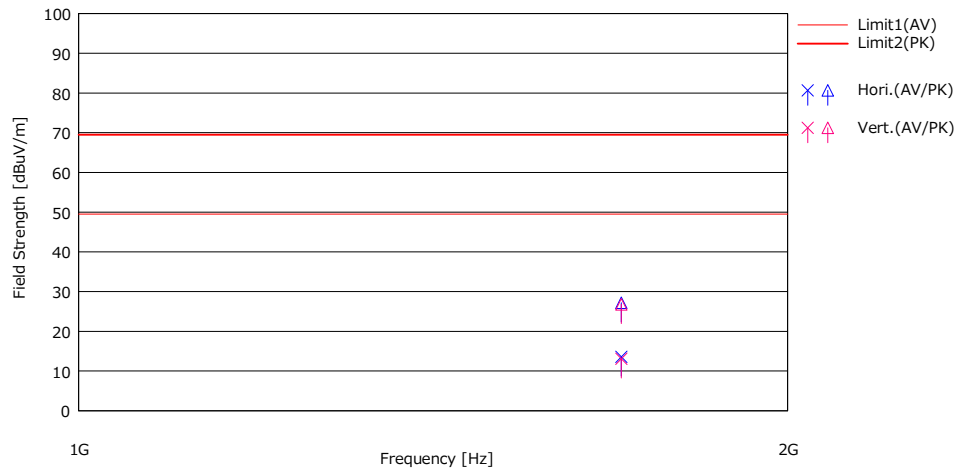
Telephone : +81 596 24 8999

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Radiated Emission

Report No. 13397619H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date June 24, 2020
Temperature / Humidity 21 deg. C / 55 % RH
Engineer Kiyoshiro Okazaki
(Above 1 GHz)
Mode Mode 2

Limit : FCC_Part 15 Subpart B(15.109)_Class A



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	1700.000	32.00	45.60	25.01	-7.78	35.64	13.59	27.19	49.50	69.50	35.9	42.3	Hori.	100	0	HA6	
2	1700.000	31.50	45.20	25.01	-7.78	35.64	13.09	26.79	49.50	69.50	36.4	42.7	Vert.	100	0	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.

UL Japan, Inc.

Ise EMC Lab.

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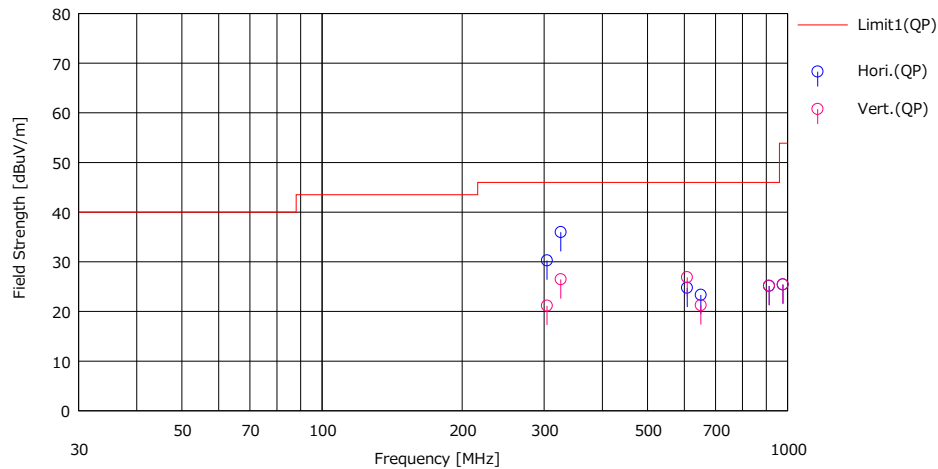
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Radiated Emission

Report No. 13397619H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date August 26, 2020
Temperature / Humidity 20 deg. C / 55 % RH
Engineer Kiyoshiro Okazaki
(Below 1 GHz)
Mode Mode 3

Limit : FCC_Part 15 Subpart B(15.109)_Class B



No.	Freq. [MHz]	Reading (QP)	Ant.Fac	Loss	Gain	Result (QP)	Limit (QP)	Morgan (QP)	Pola	Height	Angle	Ant. Type	Comment
		[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[H/V]	[cm]	[deg]		
1	304.300	38.60	13.53	10.09	31.98	30.24	46.00	15.76	Hori.	100	265	LA22	
2	325.700	43.40	14.29	10.24	31.98	35.95	46.00	10.05	Hori.	100	147	LA22	
3	608.600	25.30	19.37	12.08	31.99	24.76	46.00	21.24	Hori.	100	135	LA22	
4	651.400	23.90	19.12	12.30	31.99	23.33	46.00	22.67	Hori.	100	221	LA22	
5	912.900	20.30	22.03	13.64	30.83	25.14	46.00	20.86	Hori.	100	2	LA22	
6	977.100	19.70	22.22	13.98	30.48	25.42	53.90	28.48	Hori.	100	1	LA22	
7	304.300	29.50	13.53	10.09	31.98	21.14	46.00	24.86	Vert.	100	88	LA22	
8	325.700	33.90	14.29	10.24	31.98	26.45	46.00	19.55	Vert.	112	327	LA22	
9	608.600	27.40	19.37	12.08	31.99	26.86	46.00	19.14	Vert.	100	334	LA22	
10	651.400	21.80	19.12	12.30	31.99	21.23	46.00	24.77	Vert.	100	350	LA22	
11	912.900	20.30	22.03	13.64	30.83	25.14	46.00	20.86	Vert.	100	332	LA22	
12	977.100	19.70	22.22	13.98	30.48	25.42	53.90	28.48	Vert.	100	335	LA22	

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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APPENDIX 2: Test instruments

Test equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	MAEC-02	142004	AC2_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	05/26/2020	24
RE	MOS-41	192300	Thermo-Hygrometer	CUSTOM	CTH-201	0013	12/19/2019	12
RE	MMM-01	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	08/20/2019	12
RE	MJM-27	142228	Measure	KOMELON	KMC-36	-	-	-
RE	COTS-ME MI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	MAEC-02-SVSWR	142006	AC2_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-06902	04/01/2019	24
RE	MHA-06	141512	Horn Antenna 1-18GHz	Schwarzbeck Mess - Elektronik	BBHA9120D	254	09/03/2019	12
RE	MCC-216	141392	Microwave Cable	Junkosha	MWX221	1604S253(1 m) / 537073/126E(5 m)	02/18/2020	12
RE	MPA-10	141579	Pre Amplifier	Keysight Technologies Inc	8449B	3008A02142	01/07/2020	12
RE	MTR-09	141950	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	06/03/2020	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	CTH-201	A08Q26	01/07/2020	12
RE	MMM-03	141530	Digital Tester	Fluke Corporation	FLUKE 26-3	78030621	08/20/2019	12
RE	MJM-25	142226	Measure	KOMELON	KMC-36	-	-	-
RE	MAT-08	141213	Attenuator(6dB)	Weinschel Corp	2	BK7971	11/14/2019	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	Logperiodic Antenna (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	MAEC-03	142008	AC3_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	2020/05/22	24
RE	MOS-13	141554	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	1301	2020/01/07	12
RE	MMM-08	141532	DIGITAL HiTESTER	Hioki	3805	51201197	2020/01/06	12
RE	MJM-16	142183	Measure	KOMELON	KMC-36	-	-	-
RE	MAEC-03-SVSWR	142013	AC3_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	2019/04/08	24
RE	MAT-95	142314	Attenuator	Pasternack	PE7390-6	D/C 1504	2020/06/17	12
RE	MBA-03	141424	Biconical Antenna	Schwarzbeck Mess - Elektronik	VHA9103+BBA9106	1915	2020/08/13	12
RE	MCC-51	141323	Coaxial cable	UL Japan	-	-	2020/07/06	12
RE	MLA-22	141266	Logperiodic Antenna(200-1000MHz)	Schwarzbeck Mess - Elektronik	VUSLP9111B	9111B-191	2020/08/13	12
RE	MPA-13	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	2020/02/10	12
RE	MTR-09	141950	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	2020/06/03	12
RE	MHA-20	141507	Horn Antenna 1-18GHz	Schwarzbeck Mess - Elektronik	BBHA9120D	258	2019/09/26	12
RE	MPA-11	141580	MicroWave System Amplifier	Keysight Technologies Inc	83017A	MY39500779	2020/03/24	12
RE	MCC-231	177964	Microwave Cable	Junkosha INC.	MMX221	1901S329(1m)/ 1902S579(5m)	2020/03/02	12

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*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