EMI TEST REPORT

Test Report No. : 12434230Y-B

Applicant:	**Hitachi, Ltd. Service Platform Business Division Group**
Type of Equipment:	**Portable Biometric Reader**
Model No.:	**PC-KCM50**
FCC ID	**ZQDPCKCM50**
Test regulation:	**FCC Part 15 Subpart B:2018 Class B** **ICES-003 Issue 6 + Amendment 1 Class B (SMSE-015-16)**
Test result:	**Complied**

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 covers EMC technical requirements. It does not cover administrative issues such as Manual or non-EMC test related Requirements. (if applicable)
6. The all test items in this test report are conducted by UL Japan, Inc. Yokowa EMC Lab.
7. This test report must not be used by the customer to claim product certification, approval, or endorsement by any agency of the Federal Government.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.

Date of test:

July 30 and 31, 2018

Representative test engineer:

Kosuke Yamagishi
Engineer
Consumer Technology Division

Approved by:

Makoto Toyoda
Leader
Consumer Technology Division

RTL02610

☐ 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.
Yokowa EMC Lab.
108 Yokowa-cho, Ise-shi, Mie-ken, 516-1106 JAPAN
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REVISION HISTORY

Original Test Report No.: 12434230Y-B

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12434230Y-B	August 9, 2018	-	-

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Section 1: Customer information

Company Name	:	Hitachi, Ltd. Service Platform Business Division Group
Address	:	Hitachi Omori 2nd Bldg., 27-18 Minami-Oi 6-Chome,Shinagawa-ku, Tokyo, 140-8572 Japan
Telephone Number	:	+81 3 5471 2265
Facsimile Number	:	+81 3 5471 2582
Contact Person	:	Keiji Kitane

Section 2: Equipment under test (E.U.T.)

2. 1 Identification of E.U.T.

Type of equipment	:	Portable Biometric Reader
Model No.	:	PC-KCM50
Serial No.	:	Refer to Clause 4.2
Rating	:	DC 5 V, 500 mA
Country of Mass-production	:	Japan
Condition of EUT	:	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Size	:	55 x 91 x 18 (Width x Depth x Height (mm))
Modification of EUT	:	No modification by the test lab.
Receipt Date of Sample	:	July 30, 2018

2. 2 Product description

Model: PC-KCM50 (referred to as the EUT in this report) is a Portable Biometric Reader.

Feature of EUT:

Clock frequency(ies) in the system	:	168 MHz, 24 MHz
Radio Type	:	Transceiver
Frequency of Operation	:	2402 MHz - 2480 MHz
Modulation	:	GFSK
Power Supply (radio part input)	:	DC 3.3 V / 1.35 V
Antenna type	:	Internal Antenna
Antenna Gain	:	+ 1.7 dBi
Clock frequency (Maximum)	:	26 MHz

Section 3: Test specification, procedures and results

3. 1 Test Specification

Test Specification	:	FCC Part 15 Subpart B FCC Part 15 final revised on March 12, 2018 and effective April 11, 2018
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart B Unintentional Radiators
Test Specification	:	ICES-003 Issue 6 + Amendment 1 (SMSE-015-16)
Title	:	Spectrum Management and Telecommunications Interference-Causing Equipment Standard Information Technology Equipment (Including Digital Apparatus) – Limits and Methods of Measurement

3. 2 Procedures & results

Item	Test Procedure	Limits	Deviation	Worst margin	Result	Remarks
Conducted emission	ANSI C63.4: 2014 7. AC powerline conducted emission measurements	Class B	N/A	18.7 dB (0.15184 MHz, QP, N, 1.USB Communication)	Complied	-
Radiated emission	ANSI C63.4: 2014 8. Radiated emission measurements	Class B	N/A	7.8 dB (372.003 MHz, Horizontal, QP 1.USB Communication)	Complied	*1)
*1) Measurements were limited up to 12.5 GHz since the EUT has a Bluetooth module of highest operation frequency of 2.48 GHz. Test was performed consider this frequency. Note: UL Japan's EMI Work Procedures No. 13-EM-W0420						
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.

3. 4 Confirmation

UL Japan, Inc. hereby confirms that E.U.T., in the configuration tested, complies with the specifications FCC Part 15 Subpart B:2018 Class B and ICES-003 Issue 6 + Amendment 1 Class B (SMSE-015-16).

3. 5 Uncertainty

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

EMI

		Open area test site			Shielded room				Ucispr (±)
		No.1	No.2	No.3	No.1	No.2	No.3	No.7	
		(±)	(±)	(±)	(±)	(±)	(±)	(±)	
Conducted disturbance									
LISN (AMN)	9 kHz - 150 kHz	3.8 dB							3.8 dB
	150 kHz - 30 MHz	3.4 dB							3.4 dB
ISN (LCL= 55 dB - 40 dB)	150 kHz - 30 MHz	4.2 dB							5.0 dB
ISN (LCL= 65 dB - 50 dB)	150 kHz - 30 MHz	4.6 dB							5.0 dB
ISN (LCL= 75 dB - 60 dB)	150 kHz - 30 MHz	5.0 dB							5.0 dB
ISN (Screened)	150 kHz - 30 MHz	3.4 dB							5.0 dB
ISN (75 ohm)	150 kHz - 30 MHz	3.4 dB							5.0 dB
Current probe	150 kHz - 30 MHz	2.9 dB							2.9 dB
Capacitive Voltage Probe	150 kHz - 30 MHz	3.8 dB							3.9 dB
Voltage probe	150 kHz - 30 MHz	2.9 dB							2.9 dB
Radiated disturbance									
3 m	9 kHz - 30 MHz	3.3 dB	3.4 dB	3.4 dB	-	-	-	-	Not Defined
	30 MHz - 200 MHz (Horizontal)	4.6 dB	4.5 dB	4.7 dB	-	-	-	-	6.3 dB
	30 MHz - 200 MHz (Vertical)	4.7 dB	4.7 dB	4.9 dB	-	-	-	-	6.3 dB
	200 MHz - 1000 MHz (Horizontal)	4.9 dB	5.2 dB	5.2 dB	-	-	-	-	6.3 dB
	200 MHz - 1000 MHz (Vertical)	6.1 dB	6.2 dB	6.2 dB	-	-	-	-	6.3 dB
	1 GHz - 6 GHz	4.9 dB			-	-	-	-	5.2 dB
	6 GHz - 18 GHz	5.2 dB			-	-	-	-	5.5 dB
10 m	9 kHz - 30 MHz	3.1 dB	3.3 dB	3.2 dB	-	-	-	-	Not Defined
	30 MHz - 200 MHz (Horizontal)	4.6 dB	4.5 dB	4.7 dB	-	-	-	-	6.3 dB
	30 MHz - 200 MHz (Vertical)	4.5 dB	4.5 dB	4.8 dB	-	-	-	-	6.3 dB
	200 MHz - 1000 MHz (Horizontal)	4.7 dB	4.9 dB	4.9 dB	-	-	-	-	6.3 dB
	200 MHz - 1000 MHz (Vertical)	4.7 dB	5.0 dB	5.0 dB	-	-	-	-	6.3 dB
	1 GHz - 18 GHz	5.1 dB			-	-	-	-	Not Defined
Antenna terminal voltage									
30 MHz - 1000 MHz		3.8 dB							Not Defined
1 GHz - 2.15 GHz		3.9 dB							Not Defined

3. 6 Test Location

UL Japan, Inc. Yokowa EMC Lab.
108 Yokowa-cho, Ise-shi, Mie-ken, 516-1106 JAPAN
Telephone : +81 596 24 8750
Facsimile : +81 596 39 0232
FCC Test Firm Registration Number: 788329

	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 open area test site	2973A-1	-	40 x 20	-
No.2 open area test site	2973A-2	-	20 x 18	-
No.3 open area test site	2973A-3	-	20 x 18	-
No.1 shielded room	-	5.5 x 6.4 x 2.7	5.5 x 6.4	-
No.2 shielded room	-	4.5 x 3.6 x 2.7	4.5 x 3.6	-
No.3 shielded room	-	3.6 x 7.2 x 2.4	3.6 x 7.2	-
No.4 shielded room	-	5.5 x 5.0 x 2.4	4.35 x 3.35	-
No.5 shielded room	-	5.5 x 4.3 x 2.5	5.54 x 3.0	-
No.6 shielded room	-	5.2 x 3.2 x 2.9	5.2 x 3.2	-
No.7 shielded room	-	9.3 x 3.4 x 2.7	9.3 x 3.4	-
No.1 EMS lab. (Full-anechoic chamber)	-	5.0 x 8.0 x 3.5	-	-
No.2 EMS lab. (Full-anechoic chamber)	-	4.0 x 7.0 x 3.5	-	-

3. 7 Test setup, Data of EMI & Test instruments

Refer to Appendix 1 to 3.

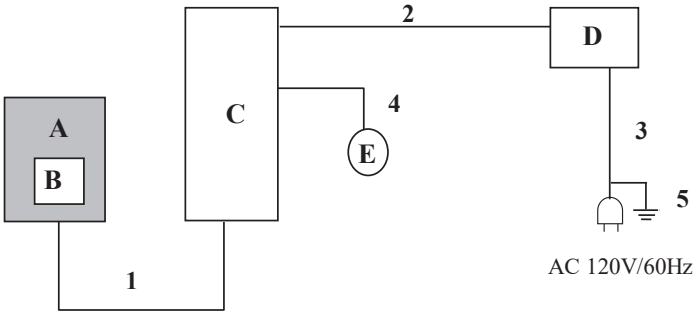
Section 4: Operation of E.U.T. during testing

4. 1 Operating modes

The EUT exercise program used during testing was designed to exercise the various system components in a manner similar to typical use.
Test sequence is used: 1. USB Communication
2. Standby

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

4. 2 Configuration and peripherals



*Cabling and setup 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	FCC ID	Remark
A	Portable Biometric Reader	PC-KCM50	42	Hitachi, Ltd. Service Platform Business Division Group	ZQDPCKCM50	EUT
B	Scan Jig	-	-	Hitachi, Ltd. Service Platform Business Division Group	N/A	-
C	Laptop PC	3168NGW	CND8210W7D	Hewlett Packard	N/A	-
D	AC Adapter	854054-002	1805	Hewlett Packard	N/A	-
E	Mouse	MODGO	PSA1047008394	Hewlett Packard	DoC	-

List of cables used

No.	Name	Length (m)	Cable Shield	Connector Shield	Remark
1	USB Cable	1.8	Shielded	Shielded	-
2	DC Power Cable	1.8	Unshielded	Unshielded	-
3	AC Power Cable	1.0	Unshielded	Unshielded	3 wire
4	USB Cable	1.8	Shielded	Shielded	-
5	Earth Cable	0.1	Unshielded	Unshielded	-

Section 5: Conducted emission

5. 1 Operating environment

The test was carried out in shielded room.
Temperature : See data
Humidity : See data

5. 2 Test configuration

EUT was placed on a wooden platform of nominal size, 1 m by 1.8 m raised 80 cm above the conducting ground plane. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT and its peripherals was aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80 cm from any other grounded conducting surface.
EUT was located 80 cm from the LISN and excess AC cable was bundled in center. I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle and were hanged at a 40 cm height to the ground plane. Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN to the input power source. All unused 50 ohm connectors of the LISN were resistively terminated in 50 ohm when not connected to the measuring equipment.
Photographs of the set up are shown in Appendix 1.

5. 3 Test conditions

Frequency range : 0.15 MHz - 30 MHz
EUT position : Table top

5. 4 Test procedure

The AC Mains Terminal Continuous disturbance Voltage had been measured with the EUT in shielded room.
The EUT was connected to a Line Impedance Stabilization Network (LISN).
An overview sweep with peak detection has been performed.
The measurements had been performed with a quasi-peak detector and if required, with an average detector.
The conducted emission measurements were made with the following detector function of the test receiver.
Detector Type : QP / CAV
IF Band width : 9 kHz / 9 kHz

5. 5 Results

Summary of the test results: Pass

Section 6: Radiated emission

6. 1 Operating environment

This test was carried out in open area test site.
Temperature : See data
Humidity : See data

6. 2 Test configuration

EUT was placed on a table which was consisted by polystyrene foam, polypropylene foam and polycarbonate of nominal size, 1 m by 1.5 m, raised 0.8 m above the conducting ground plane.
The rear of EUT and its peripherals was aligned and flushed with rear of tabletop.
I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle and were hanged 40 cm height to the ground plane. The measurements were performed for vertical or horizontal antenna polarization or both as necessary. 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 1.

6. 3 Test conditions

Frequency range : 30 MHz - 12500 MHz
Test distance : 3 m
EUT position : Table top

6. 4 Test procedure

The Radiated Electric Field Strength intensity has been measured on an open test site with a ground plane at a distance of 3 m*. (30 MHz - 1000 MHz)
* Measuring distance
☐ The boundary of the EUT is defined by an imaginary straight-line periphery describing a simple geometric configuration encompassing the EUT.
☒ The boundary of the EUT is defined by an imaginary circular periphery.
☐ This test repot use worse case for the setup.

Pre check measurements were performed in shielded room with a search coil at 30 MHz - 12500 MHz to distinguish disturbances of EUT from the ambient noise.
Measurements were performed with quasi-peak detector, average detector and peak detector.
The measuring antenna height was varied between 1 m 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 vertical or horizontal antenna polarization or both as necessary.
The radiated emission measurements were made with the following detector function of the test receiver and spectrum analyzer.

Frequency	:	30 MHz-1000 MHz	1000 MHz-12500 MHz *1)	
Instrument used	:	Test Receiver	Test Receiver	
Detector Type	:	QP	AV	PK
IF Band width	:	120 kHz	1 MHz	1 MHz

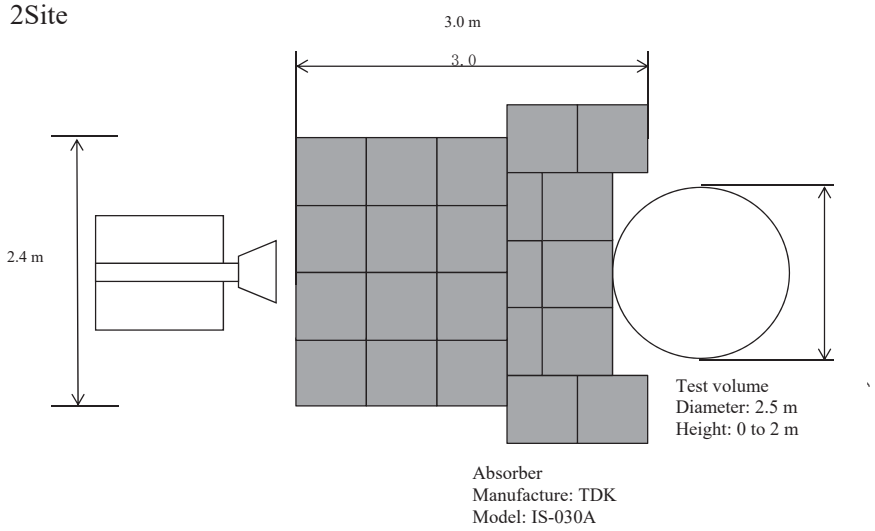
*1) The measurement data was adjusted to a 3 m distance using the following Distance Factor.
Distance factor: 20 log (Actual distance/3 m)
Distance factor and actual distance are shown in Appendix 2.

6. 5 Results

Summary of the test results: Pass

Figure. Absorber arrangement

2Site



Appendix 1: Data of EMI test

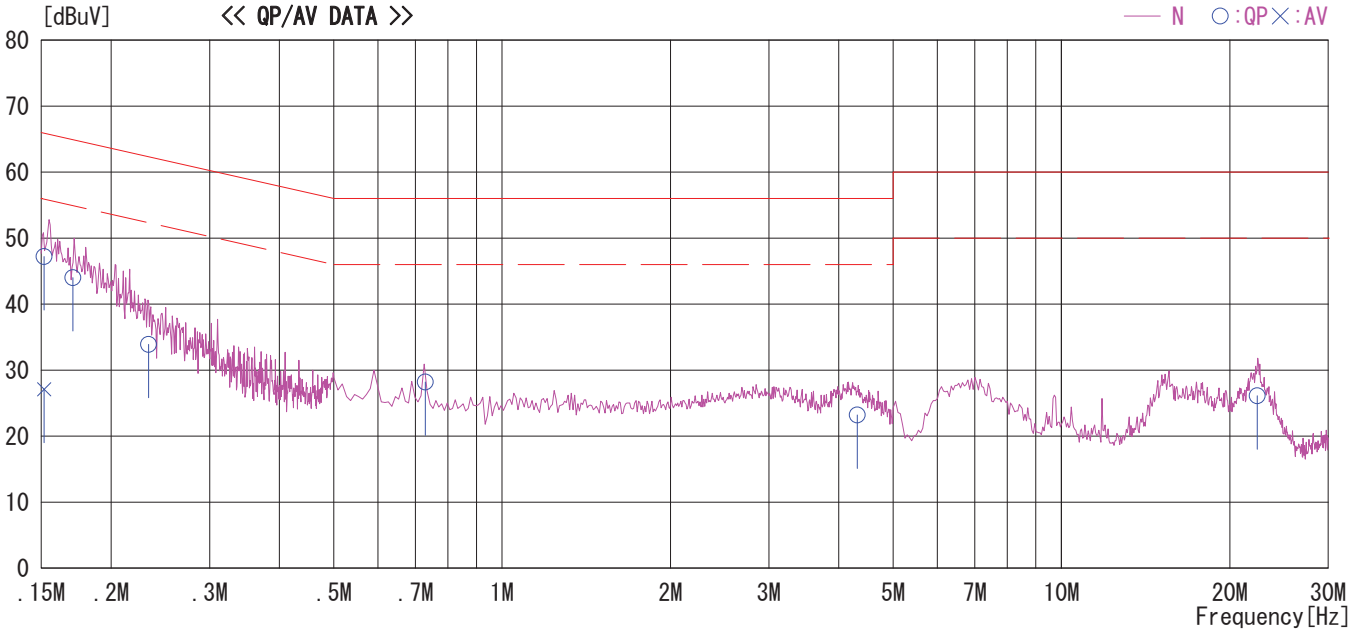
DATA OF CONDUCTED DISTURBANCE TEST

UL Japan, Inc. Yokowa EMC Lab. No.2 Shielded room
Date : 07/30/2018

Report No. : 12434230Y-B
Power : DC 5 V /Adapter In (AC 120 V/ 60 Hz)
Temp./Humi. : 26 deg.C / 59 % RH
Engineer : Kosuke Yamagishi

Mode / Remarks : 1.USB Communication / LS-12 LISN N Phase with Adapter_HP OFF(2017-10-10)

LIMIT : FCC Part 15 B CLASS B (QP)
FCC Part 15 B CLASS B (AV)



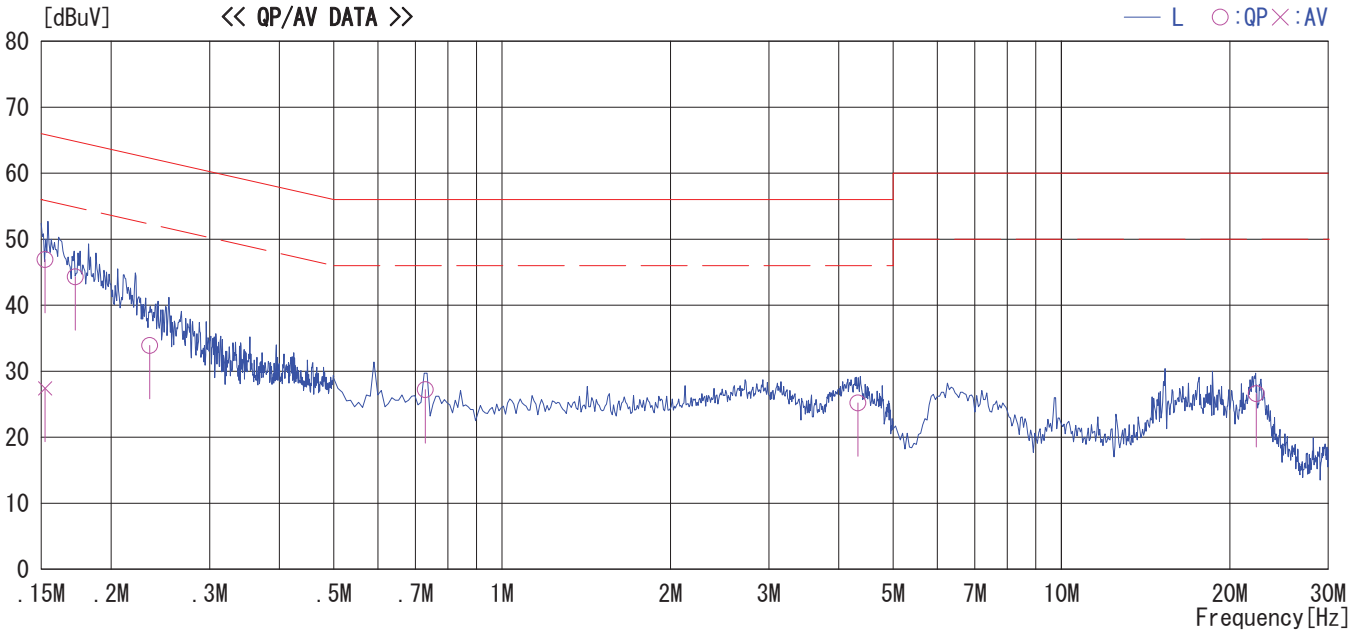


CHART:WITH FACTOR, Peak hold data. Except for the above table: adequate margin data below the limits.
CALCULATION:RESULT[dBuV]=READING[dBuV]+C.F(LOSS)[dB](LISN(or ISN or Probe)+CABLE+ATTEN(Except LS-11,12,13))

DATA OF CONDUCTED DISTURBANCE TEST

UL Japan, Inc. Yokowa EMC Lab. No.2 Shielded room
Date : 07/30/2018

Report No. : 12434230Y-B
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Temp./Humi. : 26 deg.C / 59 % RH
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Mode / Remarks : 1.USB Communication / LS-12 LISN N Phase with Adapter_HP OFF(2017-10-10)

LIMIT : FCC Part 15 B CLASS B (QP)
FCC Part 15 B CLASS B (AV)

Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase
	QP	AV	Factor	QP	AV	QP	AV	QP	AV	
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]	
0.15184	37.3	17.2	9.9	47.2	27.1	65.9	55.9	18.7	28.8	N
0.15245	37.0	17.5	9.9	46.9	27.4	65.9	55.9	19.0	28.5	L
0.17096	34.1	-----	9.9	44.0	-----	64.9	-----	20.9	-----	N
0.17261	34.4	-----	9.9	44.3	-----	64.8	-----	20.5	-----	L
0.23332	24.0	-----	9.9	33.9	-----	62.3	-----	28.4	-----	N
0.23437	24.0	-----	9.9	33.9	-----	62.3	-----	28.4	-----	L
0.72916	18.3	-----	9.9	28.2	-----	56.0	-----	27.8	-----	N
0.72926	17.3	-----	9.9	27.2	-----	56.0	-----	28.8	-----	L
4.31730	13.1	-----	10.1	23.2	-----	56.0	-----	32.8	-----	N
4.32458	15.1	-----	10.1	25.2	-----	56.0	-----	30.8	-----	L
22.30064	15.7	-----	10.9	26.6	-----	60.0	-----	33.4	-----	L
22.38378	15.2	-----	10.9	26.1	-----	60.0	-----	33.9	-----	N

CHART:WITH FACTOR, Peak hold data. Except for the above table: adequate margin data below the limits.
CALCULATION:RESULT[dBuV]=READING[dBuV]+C.F(LOSS)[dB](LISN(or ISN or Probe)+CABLE+ATTEN(Except LS-11,12,13))

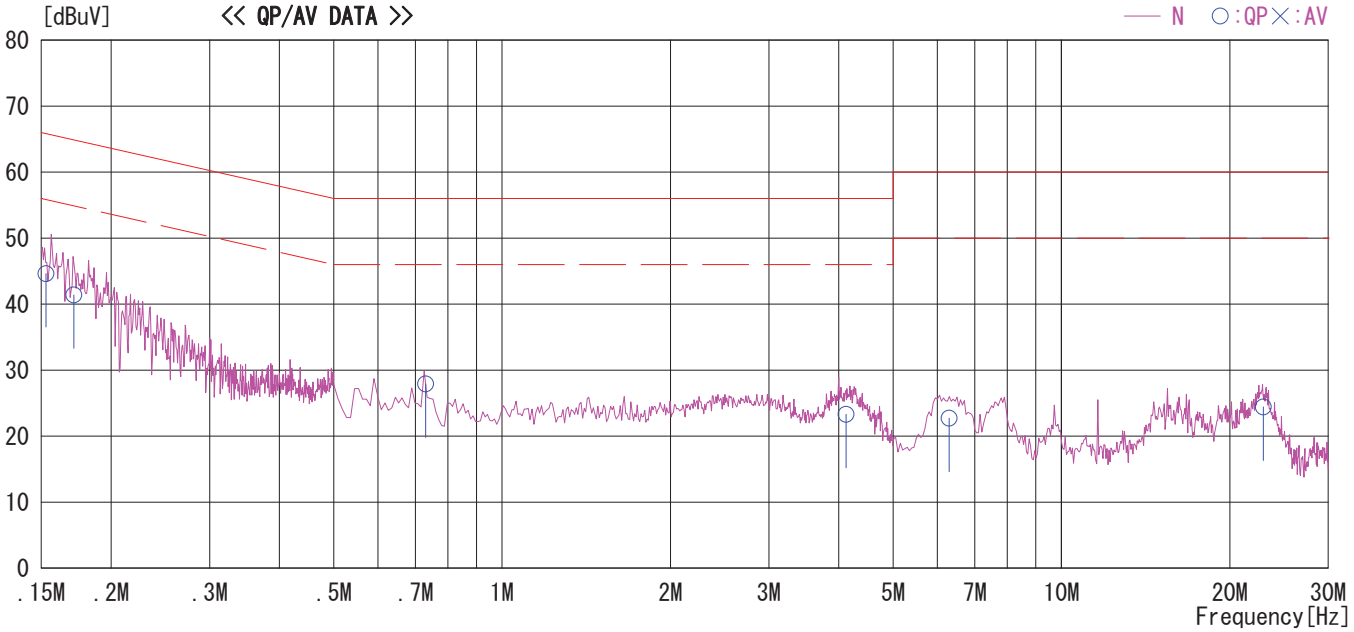
DATA OF CONDUCTED DISTURBANCE TEST

UL Japan, Inc. Yokowa EMC Lab. No.2 Shielded room
Date : 07/30/2018

Report No. : 12434230Y-B
Power : DC 5 V /Adapter In (AC 120 V/ 60 Hz)
Temp./Humi. : 26 deg.C / 59 % RH
Engineer : Kosuke Yamagishi

Mode / Remarks : 2.Standby / LS-12 LISN N Phase with Adapter_HP OFF(2017-10-10)

LIMIT : FCC Part 15 B CLASS B (QP)
FCC Part 15 B CLASS B (AV)



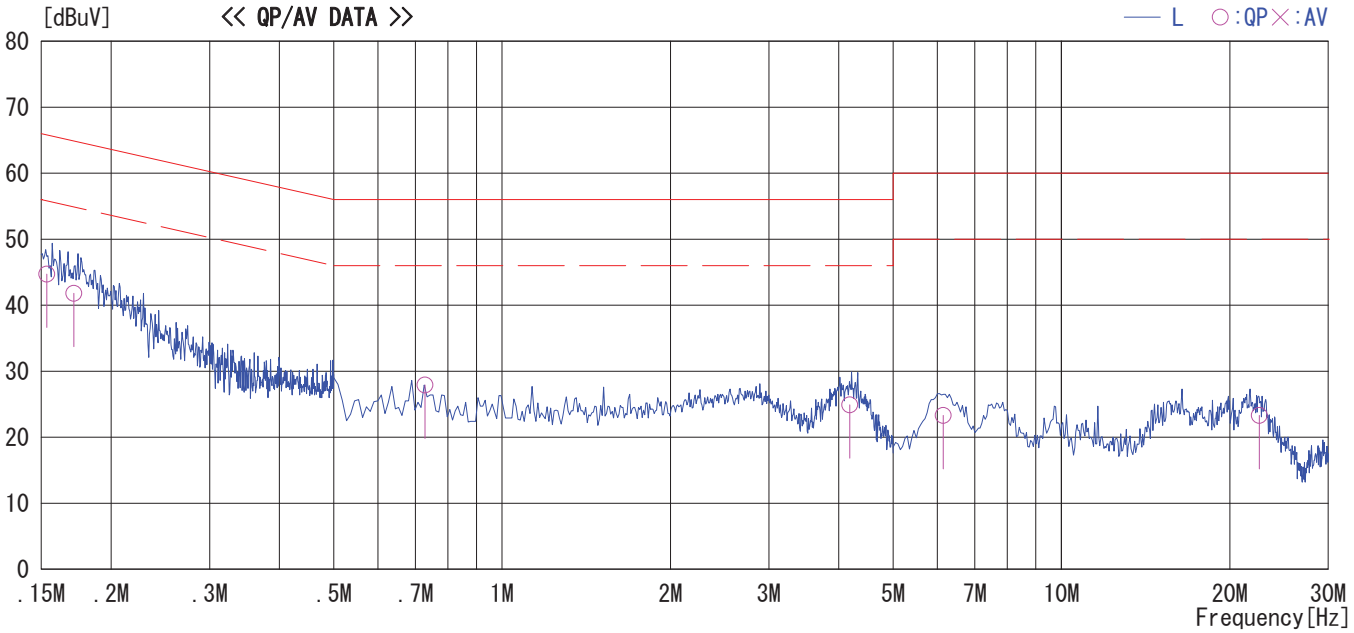


CHART:WITH FACTOR, Peak hold data. Except for the above table: adequate margin data below the limits.
CALCULATION:RESULT[dBuV]=READING[dBuV]+C.F(LOSS)[dB](LISN(or ISN or Probe)+CABLE+ATTEN(Except LS-11,12,13))

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Engineer : Kosuke Yamagishi

Mode / Remarks : 2.Standby / LS-12 LISN N Phase with Adapter_HP OFF(2017-10-10)

LIMIT : FCC Part 15 B CLASS B (QP)
FCC Part 15 B CLASS B (AV)

Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase
	QP	AV	Factor	QP	AV	QP	AV	QP	AV	
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]	
0.15303	34.7	----	9.9	44.6	----	65.8	----	21.2	----	N
0.15350	34.8	----	9.9	44.7	----	65.8	----	21.1	----	L
0.17158	31.5	----	9.9	41.4	----	64.9	----	23.5	----	N
0.17160	31.9	----	9.9	41.8	----	64.9	----	23.1	----	L
0.72846	18.0	----	9.9	27.9	----	56.0	----	28.1	----	L
0.72983	18.0	----	9.9	27.9	----	56.0	----	28.1	----	N
4.12056	13.2	----	10.1	23.3	----	56.0	----	32.7	----	N
4.18421	14.8	----	10.1	24.9	----	56.0	----	31.1	----	L
6.14850	13.0	----	10.3	23.3	----	60.0	----	36.7	----	L
6.29664	12.4	----	10.3	22.7	----	60.0	----	37.3	----	N
22.58595	12.4	----	10.9	23.3	----	60.0	----	36.7	----	L
22.95423	13.5	----	10.9	24.4	----	60.0	----	35.6	----	N

CHART:WITH FACTOR, Peak hold data. Except for the above table: adequate margin data below the limits.
CALCULATION:RESULT[dBuV]=READING[dBuV]+C.F(LOSS)[dB](LISN(or ISN or Probe)+CABLE+ATTEN(Except LS-11,12,13))

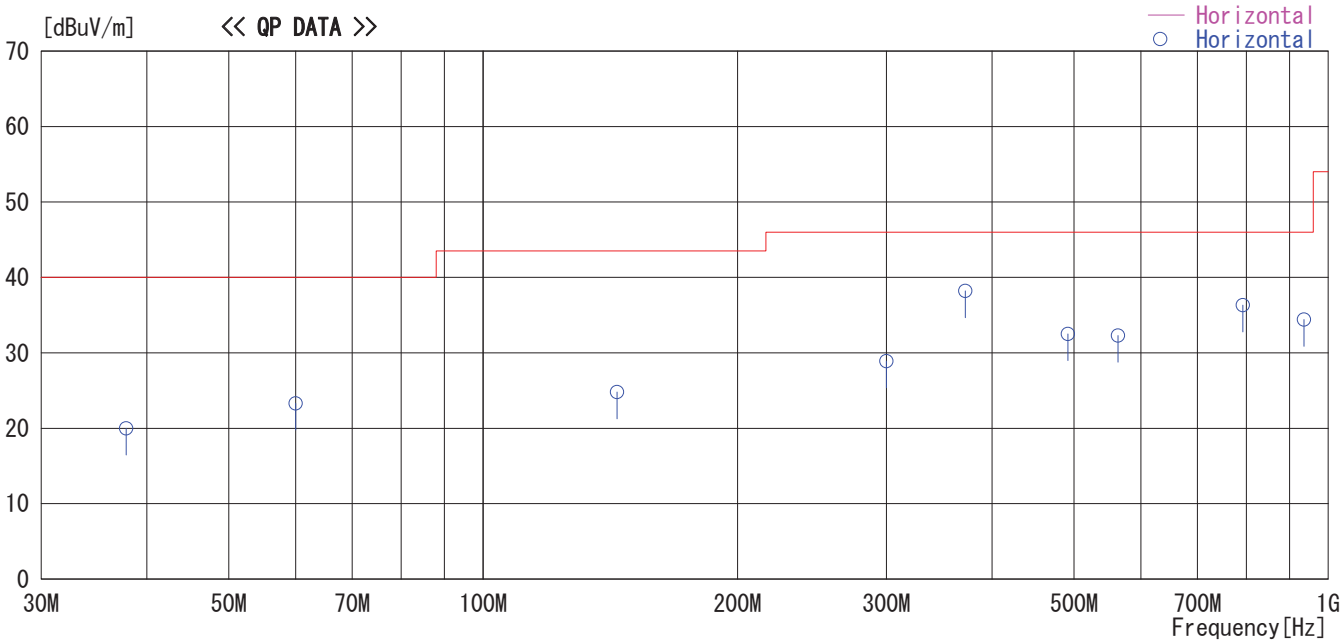
DATA OF RADIATED DISTURBANCE TEST

UL Japan, Inc. Yokowa EMC Lab. No.2 Open area test site
Date : 07/31/2018

Report No. : 12434230Y-B
Power : DC 5 V
Temp./Humi. : 26 deg.C / 70 % RH
Engineer : Kosuke Yamagishi

Mode / Remarks : 1.USB Communication

LIMIT : FCC Part 15B CLASS B (3m)



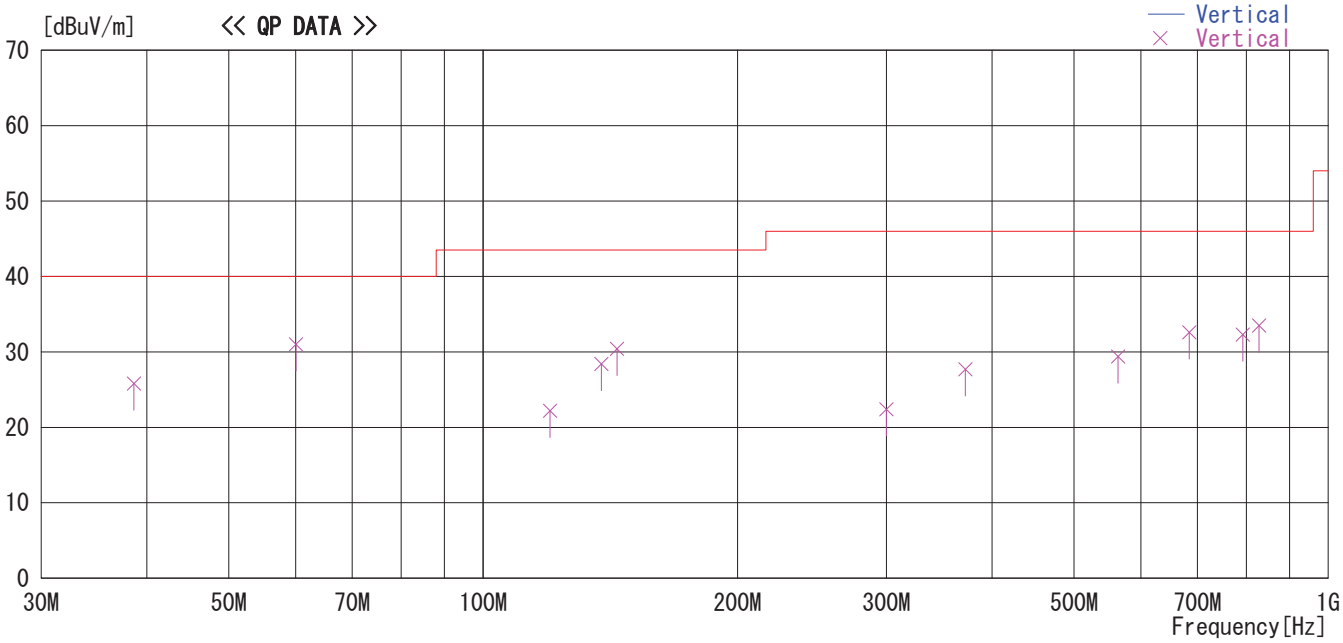


CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-199.99MHz:BICONICAL, 200MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.(ATTEN: Below 1GHz only)) - GAIN(AMP) + ANSI C63.5_ΔAF

DATA OF RADIATED DISTURBANCE TEST

UL Japan, Inc. Yokowa EMC Lab. No.2 Open area test site
Date : 07/31/2018

Report No. : 12434230Y-B
Power : DC 5 V
Temp./Humi. : 26 deg.C / 70 % RH
Engineer : Kosuke Yamagishi

Mode / Remarks : 1.USB Communication

LIMIT : FCC Part 15B CLASS B (3m)

Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Polar.	Limit	Margin
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]		[dBuV/m]	[dB]
37.815	30.6	QP	12.1	-22.7	20.0	Hori.	40.0	20.0
38.617	36.6	QP	11.9	-22.7	25.8	Vert.	40.0	14.2
60.004	36.4	QP	9.4	-22.5	23.3	Hori.	40.0	16.7
60.060	44.1	QP	9.4	-22.5	31.0	Vert.	40.0	9.0
120.002	33.0	QP	10.7	-21.5	22.2	Vert.	43.5	21.3
138.000	38.0	QP	11.8	-21.4	28.4	Vert.	43.5	15.1
144.000	34.0	QP	12.0	-21.2	24.8	Hori.	43.5	18.7
144.000	39.6	QP	12.0	-21.2	30.4	Vert.	43.5	13.1
299.998	37.9	QP	13.7	-22.7	28.9	Hori.	46.0	17.1
300.006	31.4	QP	13.7	-22.7	22.4	Vert.	46.0	23.6
372.001	35.1	QP	15.0	-22.4	27.7	Vert.	46.0	18.3
372.003	45.6	QP	15.0	-22.4	38.2	Hori.	46.0	7.8
492.000	36.7	QP	17.4	-21.6	32.5	Hori.	46.0	13.5
564.000	32.6	QP	18.1	-21.3	29.4	Vert.	46.0	16.6
564.003	35.5	QP	18.1	-21.3	32.3	Hori.	46.0	13.7
684.776	33.7	QP	19.6	-20.7	32.6	Vert.	46.0	13.4
792.000	35.7	QP	20.6	-20.0	36.3	Hori.	46.0	9.7
792.002	31.7	QP	20.6	-20.0	32.3	Vert.	46.0	13.7
828.001	32.1	QP	20.9	-19.5	33.5	Vert.	46.0	12.5
936.000	30.9	QP	21.7	-18.2	34.4	Hori.	46.0	11.6

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-199.99MHz:BICONICAL, 200MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.(ATTEN: Below 1GHz only)) - GAIN(AMP) + ANSI C63.5_ΔAF

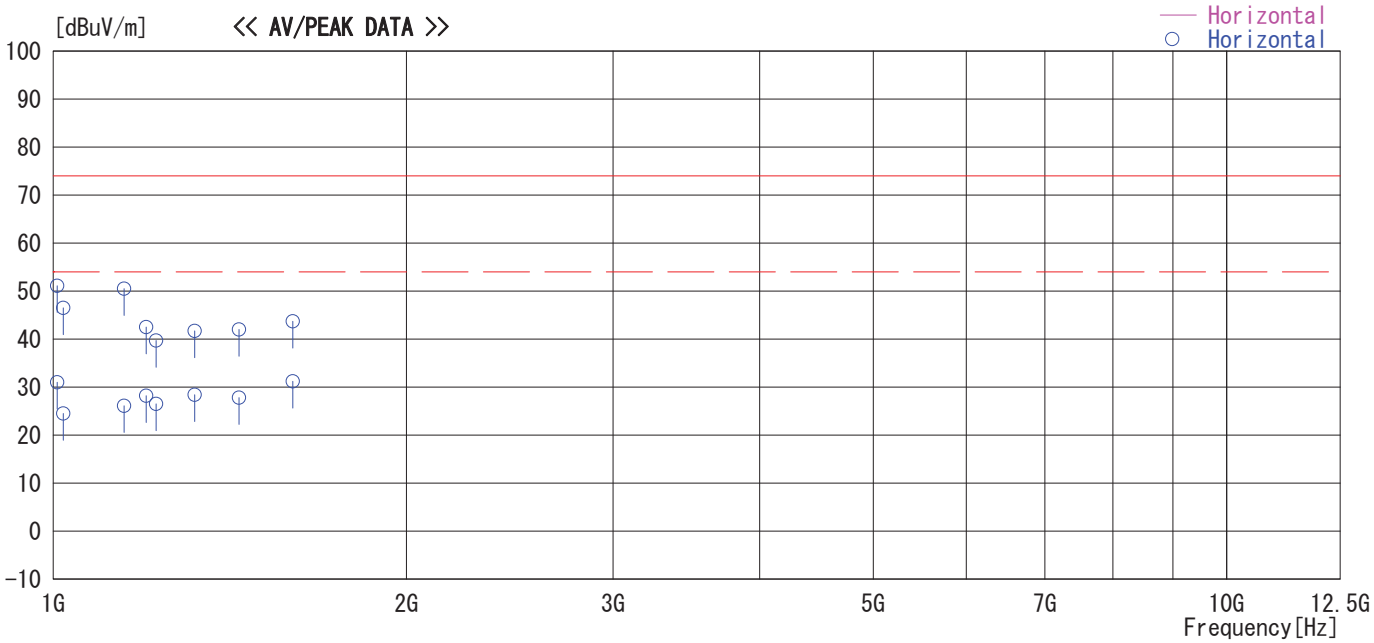
DATA OF RADIATED DISTURBANCE TEST

UL Japan, Inc. Yokowa EMC Lab. No.2 Open area test site
Date : 07/31/2018

Report No. : 12434230Y-B
Power : DC 5 V
Temp./Humi. : 27 deg.C / 71 % RH
Engineer : Kosuke Yamagishi

Mode / Remarks : 1.USB Communication

LIMIT : FCC Part 15B CLASS B (PK, 3m)
FCC Part 15B CLASS B (AV, 3m)



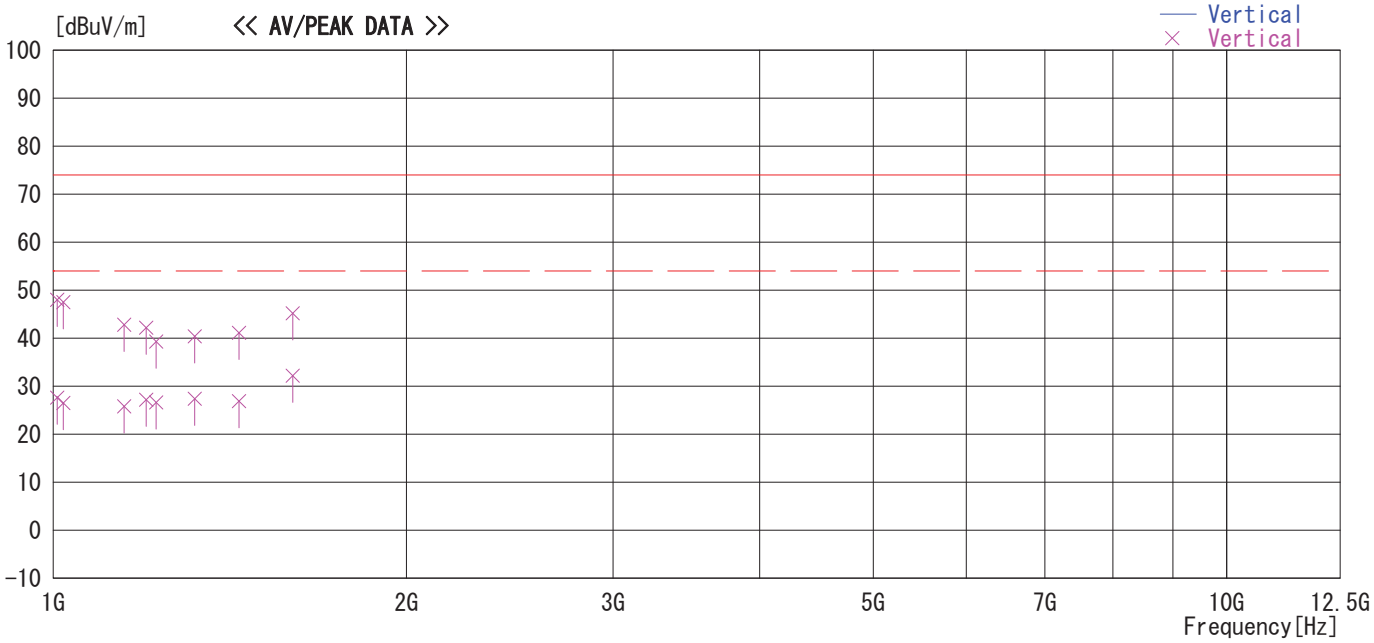


CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-199.99MHz:BICONICAL, 200MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+DISTANCE FACTOR) - GAIN(AMP). Actual distance: 3.65m.

DATA OF RADIATED DISTURBANCE TEST

UL Japan, Inc. Yokowa EMC Lab. No.2 Open area test site
Date : 07/31/2018

Report No. : 12434230Y-B
Power : DC 5 V
Temp./Humi. : 27 deg.C / 71 % RH
Engineer : Kosuke Yamagishi

Mode / Remarks : 1.USB Communication

LIMIT : FCC Part 15B CLASS B (PK, 3m)
FCC Part 15B CLASS B (AV, 3m)

Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]
1007.998	62.8	PK	24.7	-36.4	51.1	0	100	Hori.	74.0	22.9
1007.998	42.7	AV	24.7	-36.4	31.0	0	100	Hori.	54.0	23.0
1008.000	59.7	PK	24.7	-36.4	48.0	0	100	Vert.	74.0	26.0
1008.000	39.3	AV	24.7	-36.4	27.6	0	100	Vert.	54.0	26.4
1019.998	58.5	PK	24.3	-36.3	46.5	0	100	Hori.	74.0	27.5
1019.998	36.5	AV	24.3	-36.3	24.5	0	100	Hori.	54.0	29.5
1019.999	59.5	PK	24.3	-36.3	47.5	0	100	Vert.	74.0	26.5
1019.999	38.5	AV	24.3	-36.3	26.5	0	100	Vert.	54.0	27.5
1149.449	54.2	PK	24.5	-35.9	42.8	0	100	Vert.	74.0	31.2
1149.449	37.2	AV	24.5	-35.9	25.8	0	100	Vert.	54.0	28.2
1149.513	61.9	PK	24.5	-35.9	50.5	0	100	Hori.	74.0	23.5
1149.513	37.5	AV	24.5	-35.9	26.1	0	100	Hori.	54.0	27.9
1200.000	53.9	PK	24.1	-35.8	42.2	0	100	Vert.	74.0	31.8
1200.000	38.9	AV	24.1	-35.8	27.2	0	100	Vert.	54.0	26.8
1200.001	54.2	PK	24.1	-35.8	42.5	0	100	Hori.	74.0	31.5
1200.001	39.9	AV	24.1	-35.8	28.2	0	100	Hori.	54.0	25.8
1224.000	50.6	PK	24.4	-35.7	39.3	0	100	Vert.	74.0	34.7
1224.000	37.9	AV	24.4	-35.7	26.6	0	100	Vert.	54.0	27.4
1224.001	51.0	PK	24.4	-35.7	39.7	0	100	Hori.	74.0	34.3
1224.001	37.8	AV	24.4	-35.7	26.5	0	100	Hori.	54.0	27.5
1320.000	51.8	PK	25.4	-35.5	41.7	0	100	Hori.	74.0	32.3
1320.000	38.5	AV	25.4	-35.5	28.4	0	100	Hori.	54.0	25.6
1320.000	50.5	PK	25.4	-35.5	40.4	0	100	Vert.	74.0	33.6
1320.000	37.5	AV	25.4	-35.5	27.4	0	100	Vert.	54.0	26.6
1440.000	52.0	PK	25.2	-35.2	42.0	0	100	Hori.	74.0	32.0
1440.000	37.8	AV	25.2	-35.2	27.8	0	100	Hori.	54.0	26.2
1440.000	51.1	PK	25.2	-35.2	41.1	0	100	Vert.	74.0	32.9
1440.000	36.9	AV	25.2	-35.2	26.9	0	100	Vert.	54.0	27.1
1600.000	54.0	PK	24.6	-34.9	43.7	0	100	Hori.	74.0	30.3
1600.000	41.5	AV	24.6	-34.9	31.2	0	100	Hori.	54.0	22.8
1600.000	55.5	PK	24.6	-34.9	45.2	0	100	Vert.	74.0	28.8
1600.000	42.5	AV	24.6	-34.9	32.2	0	100	Vert.	54.0	21.8

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-199.99MHz:BICONICAL, 200MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+DISTANCE FACTOR) - GAIN(AMP). Actual distance: 3.65m.

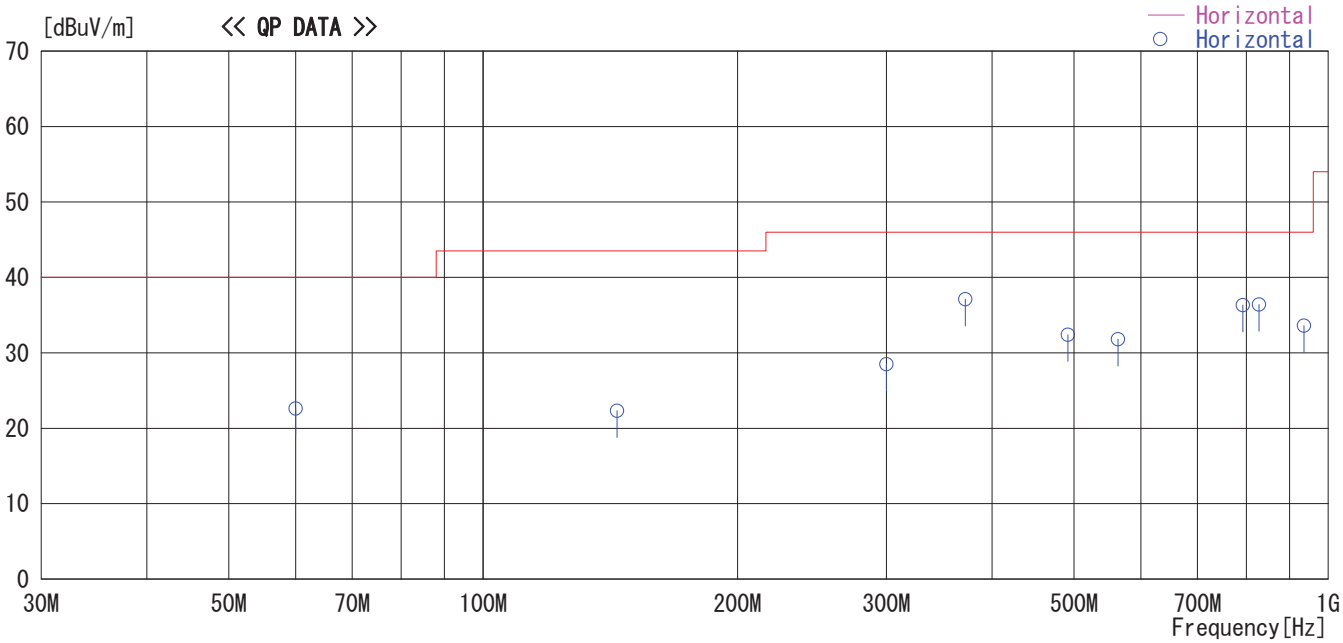
DATA OF RADIATED DISTURBANCE TEST

UL Japan, Inc. Yokowa EMC Lab. No.2 Open area test site
Date : 07/31/2018

Report No. : 12434230Y-B
Power : DC 5 V
Temp./Humi. : 26 deg.C / 70 % RH
Engineer : Kosuke Yamagishi

Mode / Remarks : 2.Standby

LIMIT : FCC Part 15B CLASS B (3m)



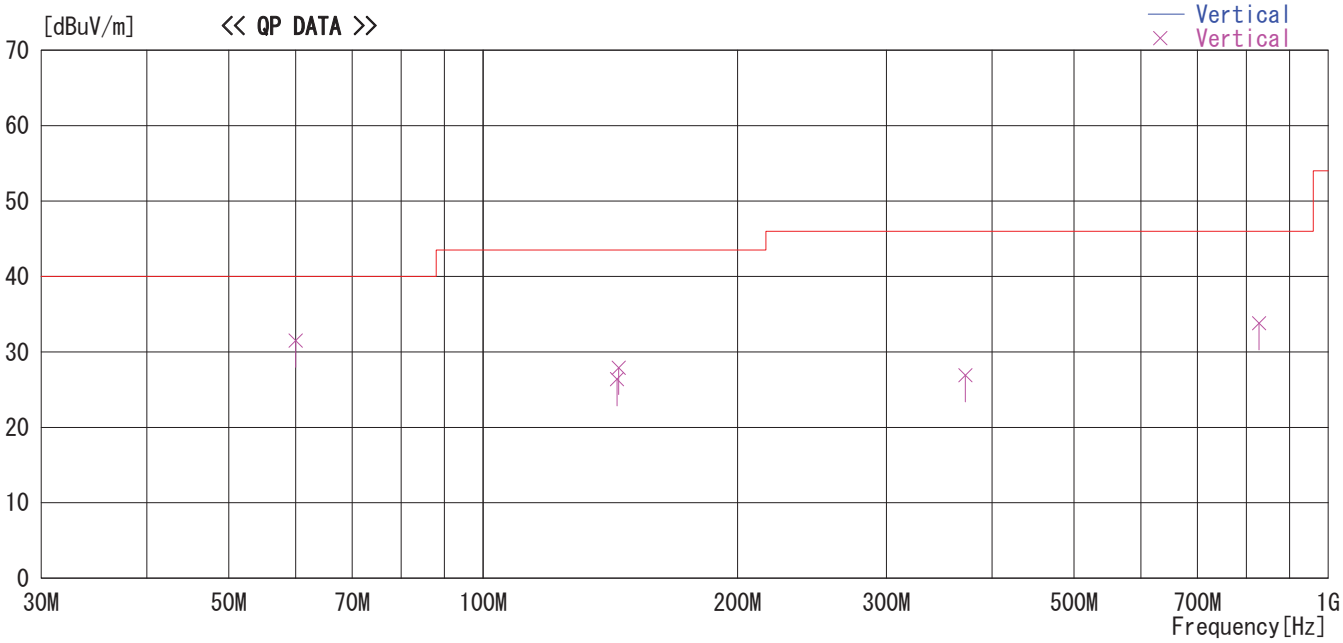


CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-199.99MHz:BICONICAL, 200MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.(ATTEN: Below 1GHz only)) - GAIN(AMP) + ANSI C63.5_ΔAF

DATA OF RADIATED DISTURBANCE TEST

UL Japan, Inc. Yokowa EMC Lab. No.2 Open area test site
Date : 07/31/2018

Report No. : 12434230Y-B
Power : DC 5 V
Temp./Humi. : 26 deg.C / 70 % RH
Engineer : Kosuke Yamagishi

Mode / Remarks : 2.Standby

LIMIT : FCC Part 15B CLASS B (3m)

Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Polar.	Limit	Margin
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]		[dBuV/m]	[dB]
60.001	44.6	QP	9.4	-22.5	31.5	Vert.	40.0	8.5
60.005	35.7	QP	9.4	-22.5	22.6	Hori.	40.0	17.4
144.008	35.6	QP	12.0	-21.2	26.4	Vert.	43.5	17.1
144.030	31.5	QP	12.0	-21.2	22.3	Hori.	43.5	21.2
144.667	37.1	QP	12.0	-21.2	27.9	Vert.	43.5	15.6
300.001	37.5	QP	13.7	-22.7	28.5	Hori.	46.0	17.5
372.000	34.3	QP	15.0	-22.4	26.9	Vert.	46.0	19.1
372.000	44.5	QP	15.0	-22.4	37.1	Hori.	46.0	8.9
492.000	36.6	QP	17.4	-21.6	32.4	Hori.	46.0	13.6
564.002	35.0	QP	18.1	-21.3	31.8	Hori.	46.0	14.2
792.000	35.7	QP	20.6	-20.0	36.3	Hori.	46.0	9.7
828.001	35.0	QP	20.9	-19.5	36.4	Hori.	46.0	9.6
828.002	32.4	QP	20.9	-19.5	33.8	Vert.	46.0	12.2
936.000	30.1	QP	21.7	-18.2	33.6	Hori.	46.0	12.4

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-199.99MHz:BICONICAL, 200MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.(ATTEN: Below 1GHz only)) - GAIN(AMP) + ANSI C63.5_ΔAF

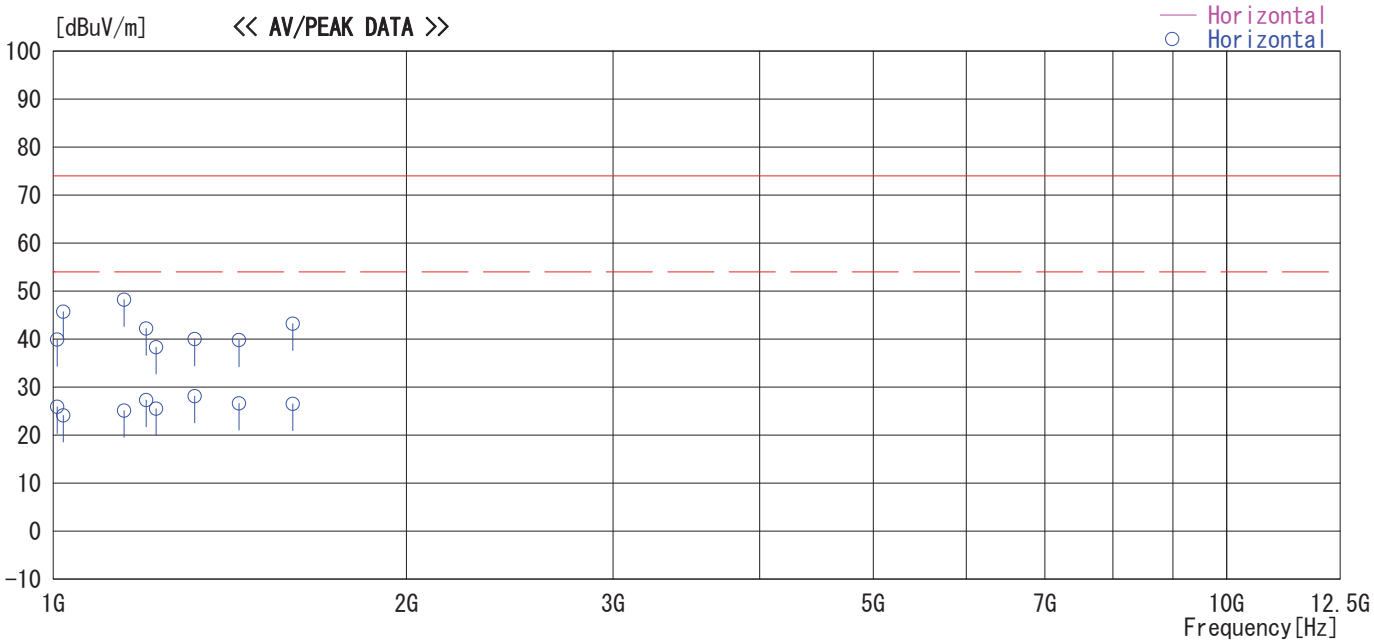
DATA OF RADIATED DISTURBANCE TEST

UL Japan, Inc. Yokowa EMC Lab. No.2 Open area test site
Date : 07/31/2018

Report No. : 12434230Y-B
Power : DC 5 V
Temp./Humi. : 27 deg.C / 71 % RH
Engineer : Kosuke Yamagishi

Mode / Remarks : 2.Standby

LIMIT : FCC Part 15B CLASS B (PK, 3m)
FCC Part 15B CLASS B (AV, 3m)



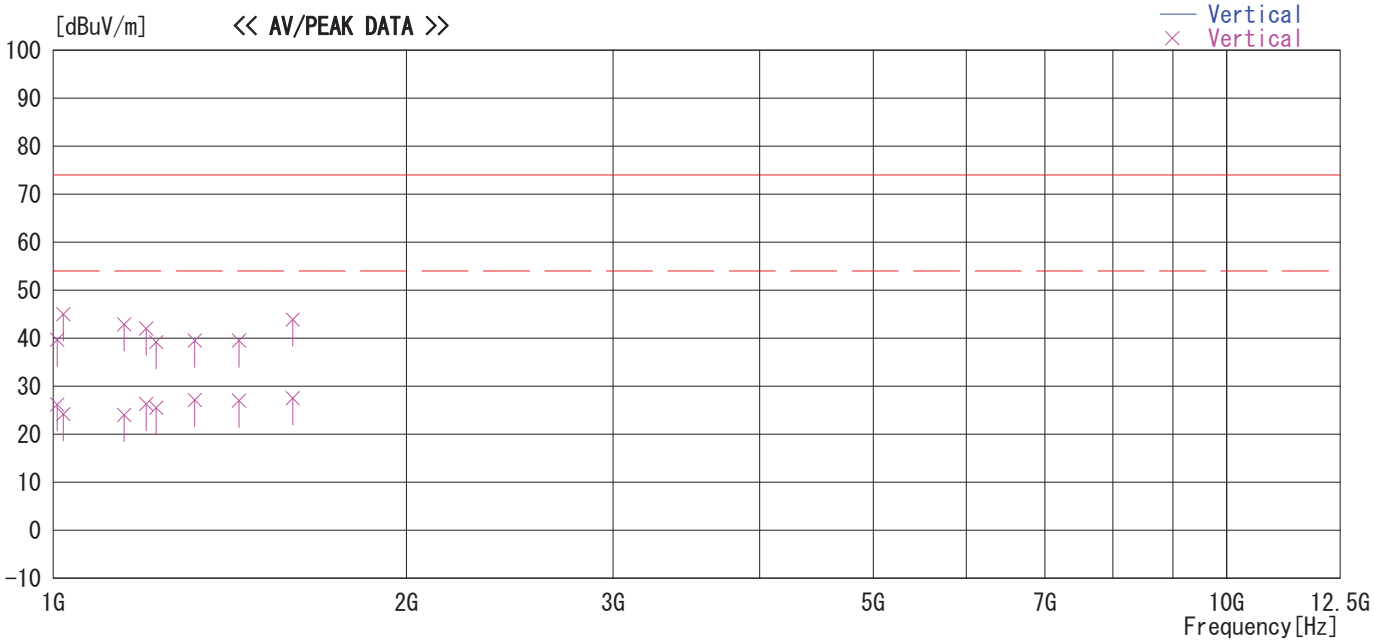


CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-199.99MHz:BICONICAL, 200MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+DISTANCE FACTOR) - GAIN(AMP). Actual distance: 3.65m.

DATA OF RADIATED DISTURBANCE TEST

UL Japan, Inc. Yokowa EMC Lab. No.2 Open area test site
Date : 07/31/2018

Report No. : 12434230Y-B
Power : DC 5 V
Temp./Humi. : 27 deg.C / 71 % RH
Engineer : Kosuke Yamagishi

Mode / Remarks : 2.Standby

LIMIT : FCC Part 15B CLASS B (PK, 3m)
FCC Part 15B CLASS B (AV, 3m)

Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]
1007.998	51.6	PK	24.7	-36.4	39.9	0	100	Hori.	74.0	34.1
1007.998	37.6	AV	24.7	-36.4	25.9	0	100	Hori.	54.0	28.1
1008.000	51.4	PK	24.7	-36.4	39.7	0	100	Vert.	74.0	34.3
1008.000	37.9	AV	24.7	-36.4	26.2	0	100	Vert.	54.0	27.8
1019.998	57.7	PK	24.3	-36.3	45.7	0	100	Hori.	74.0	28.3
1019.998	36.1	AV	24.3	-36.3	24.1	0	100	Hori.	54.0	29.9
1019.999	57.0	PK	24.3	-36.3	45.0	0	100	Vert.	74.0	29.0
1019.999	36.2	AV	24.3	-36.3	24.2	0	100	Vert.	54.0	29.8
1149.449	54.3	PK	24.5	-35.9	42.9	0	100	Vert.	74.0	31.1
1149.449	35.4	AV	24.5	-35.9	24.0	0	100	Vert.	54.0	30.0
1149.513	59.6	PK	24.5	-35.9	48.2	0	100	Hori.	74.0	25.8
1149.513	36.5	AV	24.5	-35.9	25.1	0	100	Hori.	54.0	28.9
1200.000	53.7	PK	24.1	-35.8	42.0	0	100	Vert.	74.0	32.0
1200.000	38.0	AV	24.1	-35.8	26.3	0	100	Vert.	54.0	27.7
1200.001	53.9	PK	24.1	-35.8	42.2	0	100	Hori.	74.0	31.8
1200.001	39.0	AV	24.1	-35.8	27.3	0	100	Hori.	54.0	26.7
1224.000	50.5	PK	24.4	-35.7	39.2	0	100	Vert.	74.0	34.8
1224.000	36.8	AV	24.4	-35.7	25.5	0	100	Vert.	54.0	28.5
1224.001	49.6	PK	24.4	-35.7	38.3	0	100	Hori.	74.0	35.7
1224.001	36.8	AV	24.4	-35.7	25.5	0	100	Hori.	54.0	28.5
1320.000	50.1	PK	25.4	-35.5	40.0	0	100	Hori.	74.0	34.0
1320.000	38.2	AV	25.4	-35.5	28.1	0	100	Hori.	54.0	25.9
1320.000	49.6	PK	25.4	-35.5	39.5	0	100	Vert.	74.0	34.5
1320.000	37.2	AV	25.4	-35.5	27.1	0	100	Vert.	54.0	26.9
1440.000	49.8	PK	25.2	-35.2	39.8	0	100	Hori.	74.0	34.2
1440.000	36.6	AV	25.2	-35.2	26.6	0	100	Hori.	54.0	27.4
1440.000	49.5	PK	25.2	-35.2	39.5	0	100	Vert.	74.0	34.5
1440.000	37.0	AV	25.2	-35.2	27.0	0	100	Vert.	54.0	27.0
1600.000	53.5	PK	24.6	-34.9	43.2	0	100	Hori.	74.0	30.8
1600.000	36.8	AV	24.6	-34.9	26.5	0	100	Hori.	54.0	27.5
1600.000	54.2	PK	24.6	-34.9	43.9	0	100	Vert.	74.0	30.1
1600.000	37.8	AV	24.6	-34.9	27.5	0	100	Vert.	54.0	26.5

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-199.99MHz:BICONICAL, 200MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+DISTANCE FACTOR) - GAIN(AMP). Actual distance: 3.65m.

Test report No.: 12434230Y-B

APPENDIX 2

Test Instruments

***Hyphens for Last Calibration Date, Calibration Due 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.
All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.
As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

Test item

CE : Conducted disturbance
RE : Radiated disturbance

Test report No.: 12434230Y-B

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
CE RE	146893	EMI Test Receiver	Rohde & Schwarz	ESU 26	100413	2018/7/27	2019/7/31	12
CE RE	146923	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
CE RE	146648	Tester	SANWA	PC500	7019227	2018/6/19	2019/6/30	12
CE RE	147540	Measure	Rubber KOMBE	GW-3H99W	-	-	-	-
CE	146874	Yokowa No.2 shield coaxial(0.01MHz-1000MHz)	UL Japan	CC-25,CC-27,CC-28,CC-29,SW-21,SW-22	YS0201	2018/6/14	2019/6/30	12
CE	146991	Digital Humidity Indicator	SATO	PC-5000TRH	B-15	2018/4/17	2019/4/30	12
RE	147517	Search Coil	UL Japan	-	-	-	-	-
RE	146984	Digital Humidity Indicator	SATO	PC-5000TRH	B-10	2018/4/17	2019/4/30	12
CE(EUT)	146973	LISN (AMN)	Rohde & Schwarz	ENV216	101055	2017/10/10	2018/10/31	12
RE	146611	Pre Amplifier	ANRITSU	MH648A	M97457	2018/7/12	2019/7/31	12
RE	146625	Attenuator	ANRITSU	MP721A	6200239014	2018/7/26	2019/7/31	12
RE	146572	Attenuator	ANRITSU	MP721B	6201150481	2017/10/25	2018/10/31	12
RE	146832	Biconical Antenna	Schwarzbeck	VHBB 9124	9124-731	2018/6/4	2019/6/30	12
RE	146964	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	185	2018/5/31	2019/5/31	12
RE	146806	Yokowa No.2 open coaxial(0.01-1000MHz)	UL Japan	CC-21,CC-22,CC-23,CC-24,CC-25,CC-27,SW-21,SW	YO0201	2017/10/20	2018/10/31	12

Test report No.: 12434230Y-B

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
RE	146944	Open area test site	JSE	3m、10m	2	2017/10/19	2018/10/31	12
RE	147319	Antenna Tilt Jig	Intelligent System Engineering Co., Ltd	Antenna Tilt Jig	T-0004	-	-	-
RE	146601	Pre Amplifier	AGILENT	HP8449B	3008A01672	2017/12/10	2018/12/31	12
RE	146712	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-684	2018/6/5	2019/6/30	12
RE	146820	Open area test site	JSE	3m,10m	2	2018/2/2	2019/2/28	12
RE	146811	Microwave Cable	Junkosha INC.	NWX315-0800NMSNMS/NWX315-0200NMSNMS/	NOV-27-15-001/1511-23	2018/1/19	2019/1/31	12