



EMI TEST REPORT

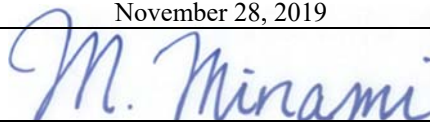
Test Report No. : 13004795H-C-R1

Applicant : ASAHI DENSO CO., LTD.
Type of Equipment : Steering Lock
Model No. : CL9
FCC ID : T8VCL9
Test regulation : FCC Part 15 Subpart B: 2019
Test Result : Complied (Refer to SECTION 3.2)

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this 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. Ise EMC Lab.
7. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the US Government.
8. The information provided from the customer for this report is identified in SECTION 1.
9. This report is a revised version of 13004795H-C. 13004795H-C is replaced with this report.

Date of test: November 28, 2019

Representative test engineer:



Masaya Minami
Engineer

Consumer Technology Division

Approved by:



Shinichi Miyazono
Engineer

Consumer Technology Division



This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
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- ☐ This report contains data that are not covered by the NVLAP accreditation.
☒ There is no testing item of "Non-accreditation".

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REVISION HISTORY

Original Test Report No.: 13004795H-C

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13004795H-C		-	-
1	13004795H-C-R1	January 22, 2020	P.1	Correction of note 7. From: This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government. To: This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the US Government.
1	13004795H-C-R1	January 22, 2020	P.1	Correction of note for the application scope. From: The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan. To: This report contains data that are not covered by the NVLAP accreditation.
1	13004795H-C-R1	January 22, 2020	P.6	Correction of erroneous description in Clause 3.2 From N/AN/A to N/A From CompliedComplied to Complied
1	13004795H-C-R1	January 22, 2020	P.9	Addition of the software information in Clause 4.1.
1	13004795H-C-R1	January 22, 2020	P.12, 13	Addition of the description about plot data marker.

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Reference: Abbreviations (Including words undescribed in this report)

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

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SECTION 1: Customer information

Company Name	:	ASAHI DENSO CO., LTD.
Address	:	6-2-1 Somejidai, Hamakita-ku, Hamamatsu, Shizuoka 434-0046, Japan
Telephone Number	:	+81-53-586-7383
Facsimile Number	:	+81-53-584-1589
Contact Person	:	Tomohiro Yaguchi

The information provided from the customer is as follows;

- Applicant, Type of Equipment, Model No. 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 (E.U.T.)
 - SECTION 4: Operation of E.U.T. 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 (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment	:	Steering Lock
Model No.	:	CL9
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 12.0 V
Receipt Date of Sample (Information from test lab.)	:	September 10, 2019
Country of Mass-production	:	Japan
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

Model: CL9 (referred to as the EUT in this report) is a Steering Lock.

Radio Specification

[Transmitter part]

Radio Type	:	Transceiver
Frequency of Operation	:	134.2 kHz
Modulation	:	ASK
Antenna type	:	Coil Antenna
Clock frequency (Maximum)	:	4 MHz

[Receiver part]

Radio Type	:	Receiver
Frequency of Operation	:	433.92 MHz

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart B
FCC Part 15 final revised on July 19, 2019 and effective August 19, 2019 except 15.258
Title : FCC 47CFR Part15 Radio Frequency Device
Subpart B Unintentional Radiators

3.2 Procedures and results

[Receiver]						
Item	Test Procedure	Limits	Deviation	Worst margin	Result	Remarks
Conducted emission	FCC: ANSI C63.4: 2014 7. AC power - line conducted emission measurements	FCC:Part 15 Subpart B 15.107(a)	N/A	N/A	N/A	*1)
	ISED: RSS-Gen 7.1	ISED: RSS-Gen 7.2				
Radiated emission	FCC: ANSI C63.4: 2014 8. Radiated emission measurements	FCC: Part 15 Subpart B 15.109(a)	N/A	6.42 dB 55.824 MHz, Vertical, QP	Complied a)	-
	ISED: RSS-Gen 7.1	ISED: RSS-Gen 7.3				
Antenna Terminal	FCC: ANSI C63.4: 2014 12. Measurement of unintentional radiators other than ITE	FCC: Part 15 Subpart B 15.111(a)	N/A	N/A	N/A	*2)
	ISED: - RSS-Gen 7.1	ISED: RSS-Gen 7.4				
*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. *2) The receiving antenna (of this EUT) is installed inside the EUT and cannot be removed (permanently attached). Therefore, Radiated emission test was performed.						
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.

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
10 m	1 GHz to 18 GHz	5.2 dB

3.5 Test Location

UL Japan, Inc. Ise EMC Lab.

*NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967 / ISED Lab Company Number: 2973C

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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 E.U.T. during testing

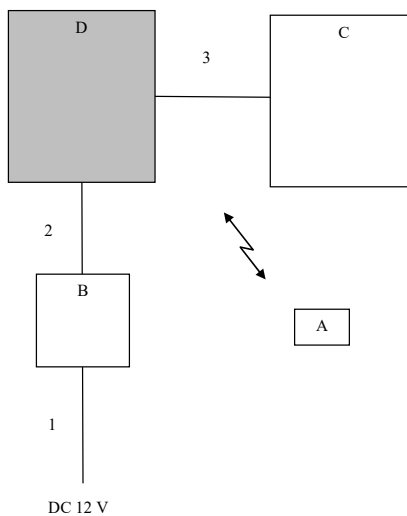
4.1 Operating Mode(s)

Mode	Remarks
1) Receiving mode	-
*EUT was set by the software as follows; Software: CL9-085_LFLoop Version 1.00	

*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.

*Item No. D includes Receiver Antenna.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	SMART KEY	CL9-904	19462671911180001	ASAHI DENSO CO., LTD.	-
B	Switch	CL9-LUB	9Y18	ASAHI DENSO CO., LTD.	-
C	LF Antenna	CZ162A	9522	ASAHI DENSO CO., LTD.	-
D	Steering Lock	CL9	19462661911180001	ASAHI DENSO CO., LTD.	EUT

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	1.0	Unshielded	Unshielded	-
2	Signal Cable	0.5	Unshielded	Unshielded	-
3	Signal Cable	0.5	Unshielded	Unshielded	-

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SECTION 5: Radiated Emission

5.1. Operating environment

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

5.2. Test configuration

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

The EUT was set on the edge of the tabletop.

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

Photographs of the set up are shown in Appendix 3.

5.3. Test conditions

Frequency range : 30 MHz - 200 MHz (Biconical antenna) / 200 MHz - 1000 MHz (Logperiodic antenna)
1000 MHz - 5000 MHz (Horn antenna)
Test distance : 3 m
EUT position : Table top
EUT operation mode : See Clause 4.1

5.4. Test procedure

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

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

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

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 1 GHz	Above 1 GHz *1)
Instrument used	Test Receiver	Spectrum Analyzer
IF Bandwidth	QP: BW 120 kHz	PK: RBW: 1 MHz / VBW: 3 MHz AV *2): RBW: 1 MHz / VBW: 10 Hz

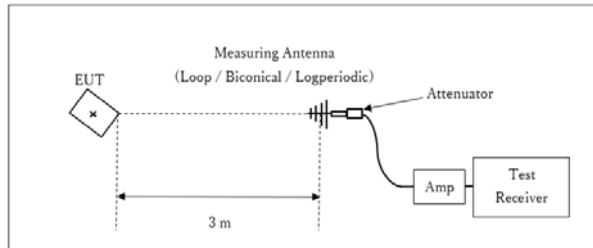
*1) The measurement data was adjusted to a 3 m distance using the following Distance Factor.

Distance Factor: $20 \times \log(3.9 \text{ m} / 3 \text{ m}) = 2.28 \text{ dB}$

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

Figure 2: Test Setup

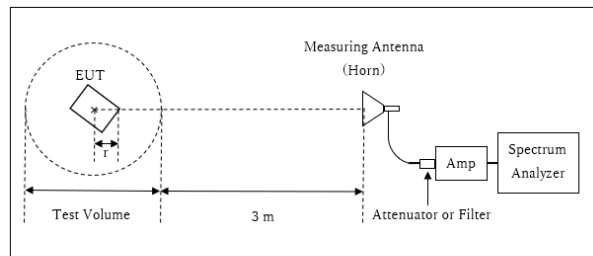
Below 1 GHz



x : Center of turn table

Test Distance: 3 m

1 GHz - 5 GHz



r : Radius of an outer periphery of EUT

x : Center of turn table

Distance Factor: $20 \times \log(3.9 \text{ m}^*/3.0 \text{ m}) = 2.28 \text{ dB}$

* Test Distance: $(3 + \text{Test Volume} / 2) - r = 3.9 \text{ m}$

Test Volume: 2 m

(Test Volume has been calibrated based on CISPR 16-1-4.)

$r = 0.1 \text{ m}$

- 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.

6.5 Test result

Summary of the test results: Pass

The limit is rounded down to one decimal place.

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

Date: November 28, 2019

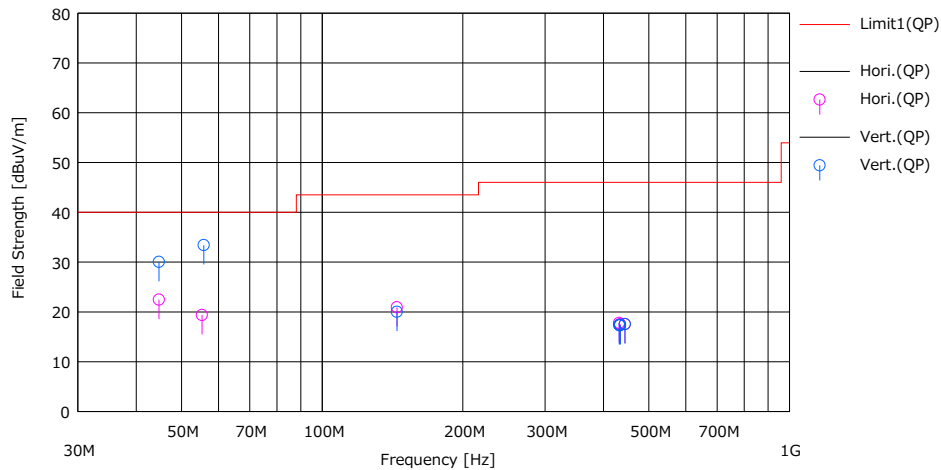
Test engineer: Masaya Minami

APPENDIX 1: Test data

Radiated Emission

Report No. 13004795H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date November 28, 2019
Temperature / Humidity 21 deg. C / 38 % RH
Engineer Masaya Minami
(Below 1 GHz)
Mode Mode 1

Limit : FCC_Part 15 Subpart B(15.109)_Class B



No.	Freq. [MHz]	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
1	44.749	33.80	13.11	7.71	32.17	22.45	40.00	17.55	Hori.	28.4	143	BA	
2	55.324	34.40	9.24	7.86	32.15	19.35	40.00	20.65	Hori.	31.0	254	BA	
3	144.562	29.40	14.69	8.88	32.06	20.91	43.50	22.59	Hori.	22.9	121	BA	
4	43.2220	22.43	16.33	10.97	31.96	17.77	46.00	28.23	Hori.	100	0	LA21	
5	43.3695	22.00	16.36	10.98	31.96	17.38	46.00	28.62	Hori.	23.4	278	LA21	
6	43.4145	22.10	16.37	10.98	31.96	17.49	46.00	28.51	Hori.	100	0	LA21	
7	44.4620	21.80	16.65	11.05	31.96	17.54	46.00	28.46	Hori.	100	0	LA21	
8	44.760	41.40	13.10	7.71	32.17	30.04	40.00	9.96	Vert.	100	356	BA	
9	55.824	48.60	9.08	7.87	32.15	33.40	40.00	6.60	Vert.	122	355	BA	
10	144.562	28.50	14.69	8.88	32.06	20.01	43.50	23.49	Vert.	100	61	BA	
11	43.2220	22.00	16.33	10.97	31.96	17.34	46.00	28.66	Vert.	100	0	LA21	
12	43.3695	21.90	16.36	10.98	31.96	17.28	46.00	28.72	Vert.	100	0	LA21	
13	43.4145	22.00	16.37	10.98	31.96	17.39	46.00	28.61	Vert.	100	0	LA21	
14	44.4620	21.80	16.65	11.05	31.96	17.54	46.00	28.46	Vert.	100	0	LA21	

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

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)

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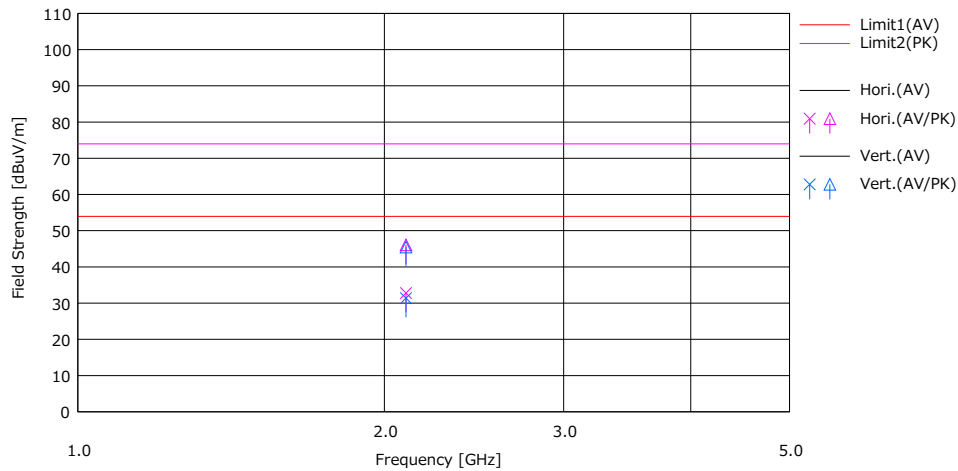
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Radiated Emission

Report No. 13004795H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date November 28, 2019
Temperature / Humidity 21 deg. C / 38 % RH
Engineer Masaya Minami
(Above 1 GHz)
Mode Mode 1

Limit : FCC_Part 15 Subpart B(15.109)_Class B



No.	Freq. [MHz]	Reading		Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result		Limit		Margin		Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		(AV) [dBuV]	(PK) [dBuV]				(AV) [dBuV/m]	(PK) [dBuV/m]	(AV) [dBuV/m]	(PK) [dBuV/m]	(AV) [dB]	(PK) [dB]					
1	2100.000	32.78	46.06	27.19	4.82	31.99	32.80	46.08	54.00	74.00	21.20	27.92	Hori.	115	351	H21	
2	2100.000	31.35	45.45	27.19	4.82	31.99	31.37	45.47	54.00	74.00	22.63	28.53	Vert.	123	343	H21	

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

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)

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APPENDIX 2: Test instruments

Test Instruments

Test item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
RE	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	-	-	-
RE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE	142227	Measure	KOMELON	KMC-36	-	-	-	-
RE	141508	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	09/26/2019	09/30/2020	12
RE	141545	DIGITAL HiTESTER	HIOKI	3805	51201148	01/29/2019	01/31/2020	12
RE	141562	Thermo-Hygrometer	CUSTOM	CTH-201	0010	01/11/2019	01/31/2020	12
RE	142011	AC4 Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	06/28/2018	06/30/2020	24
RE	141583	Pre Amplifier	SONOMA INSTRUMENT	310	260833	02/08/2019	02/29/2020	12
RE	141267	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	9111B-192	08/24/2019	08/31/2020	12
RE	141397	Coaxial Cable	UL Japan	-	-	06/18/2019	06/30/2020	12
RE	141425	Biconical Antenna	Schwarzbeck	VHA9103+BBA9106	1302	08/24/2019	08/31/2020	12
RE	142017	AC4 Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/04/2019	04/30/2021	24
RE	141331	Attenuator	TME	UFA-01	-	02/05/2019	02/29/2020	12
RE	141581	MicroWave System Amplifier	AGILENT	83017A	650	10/16/2019	10/31/2020	12
RE	141900	Spectrum Analyzer	AGILENT	E4440A	MY46185823	11/15/2018	11/30/2019	12
RE	141412	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	06/17/2019	06/30/2020	12

*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:

RE: Radiated emission

UL Japan, Inc.

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