



# EMI TEST REPORT


**Test Report No. : 10885711H-B**

**Applicant** : ALPS ELECTRIC CO., LTD.  
**Type of Equipment** : TPMS/KEYLESS TUNER  
**Model No.** : TD1G049  
**Test regulation** : FCC Part 15 Subpart B: 2015  
**FCC ID** : CWTD1G049  
**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 must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
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)

**Date of test:** July 22, 2015

**Representative test engineer:**   
Masatoshi Nishiguchi  
Engineer  
Consumer Technology Division

**Approved by:**   
Takashi Nakazawa  
Leader  
Consumer Technology Division



NVLAP LAB CODE: 200572-0

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,  
[http://japan.ul.com/resources/emc\\_accredited/](http://japan.ul.com/resources/emc_accredited/)

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## **SECTION 1: Customer information**

Company Name : ALPS ELECTRIC CO., LTD.  
Address : 6-3-36, Nakazato, Furukawa, Osaki-city, Miyagi-pref, 989-6181, Japan  
Telephone Number : +81-229-23-5111  
Facsimile Number : +81-229-23-5129  
Contact Person : Toshiya Ikarashi

## **SECTION 2: Equipment under test (E.U.T.)**

### **2.1 Identification of E.U.T.**

Type of Equipment : TPMS/KEYLESS TUNER  
Model No. : TD1G049  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : DC 12.0 V  
Receipt Date of Sample : July 16, 2015  
Country of Mass-production : Japan and Mexico  
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 No: TD1G049 (referred to as the EUT in this report) is the TPMS/KEYLESS TUNER.

#### **General Specification**

Feature of EUT : This TPMS/KEYLESS TUNER receives and detects RF signal from remote control, and performs locking or unlocking of a door.  
It also receives RF signal from TPMS sensor, warns trouble of air pressure.  
Clock frequency in the system : 30.32 MHz / 16 MHz

#### **Radio Specification**

Frequency of operation : 433.92 MHz  
Oscillator Frequency : 16 MHz (CPU), 30.32 MHz (RF\_IC)  
Local Oscillator Frequency : 1734.56 MHz  
Intermediate Frequency : 280 kHz  
Type of modulation : FSK  
Rating Voltage : DC 12.0 V (Operating Voltage: DC 9.0 V to DC 16.0 V)  
Antenna Type : Monopole antenna  
Type of receiving system : Super-heterodyne

#### **FCC15.111(b)**

The receiving antenna (of this EUT) is installed inside the EUT and cannot be removed (permanently attached). Therefore, Radiated emission test was performed.

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

### **3.1 Test specification**

Test specification : FCC Part 15 Subpart B: 2015, final revised on June 12, 2015 and effective July 13, 2015

Title : FCC 47CFR Part15 Radio Frequency Device  
Subpart B Unintentional Radiators

### **3.2 Procedures and results**

Item	Test Procedure	Limits	Deviation	Worst margin	Result
Conducted emission	FCC: ANSI C63.4: 2003 7. AC powerline conducted emission measurements	FCC:Part 15 Subpart B 15.107(a)	N/A *1)	N/A	N/A
Radiated emission	FCC: ANSI C63.4: 2003 8. Radiated emission measurements	FCC: Part 15 Subpart B 15.109(a)	N/A	10.7 dB 77.250 MHz Vertical,QP	Complied

\*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.

### **3.3 Addition to standard**

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

### **3.4 Uncertainty**

#### **EMI**

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

Test room (semi- anechoic chamber)	Radiated emission						
	(3 m*)(+dB)				(1 m*)(+dB)		(0.5 m*)(+dB)
	9 kHz - 30 MHz	30 MHz - 300 MHz	300 MHz - 1 GHz	1 GHz - 10 GHz	10 GHz - 18 GHz	18 GHz - 26.5 GHz	26.5 GHz - 40 GHz
No.1	4.3 dB	5.1 dB	6.2 dB	5.5 dB	5.8 dB	5.8 dB	4.3 dB
No.2	4.2 dB	5.1 dB	6.2 dB	5.4 dB	5.7 dB	5.9 dB	5.6 dB
No.3	4.4 dB	5.1 dB	6.3 dB	5.2 dB	5.5 dB	5.8 dB	5.5 dB
No.4	4.7 dB	5.3 dB	6.3 dB	5.3 dB	5.7 dB	5.9 dB	5.5 dB

\*3m/1m/0.5m = Measurement distance

#### **Radiated emission test (3 m)**

The data listed in this test report has enough margin, more than the site margin.

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### 3.5 Test Location

UL Japan, Inc. Ise EMC Lab. \*NVLAP Lab. code: 200572-0  
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Telephone : +81 596 24 8999 Facsimile : +81 596 24 8124

	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	4.0 x 4.5 x 2.7m	4.0 x 4.5 m	-
No.6 measurement room	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	8.8 x 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	6.2 x 4.7 x 3.0m	4.8 x 4.6m	-

\* 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.

## SECTION 4: Operation of E.U.T. during testing

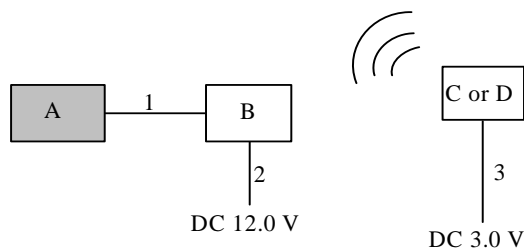
### 4.1 Operating modes

Mode	Remarks
Keyless Receiving mode (Rx) 433.92MHz TPMS Receiving mode (Rx) 433.92MHz	* TPMS/KEYLESS TUNER was operated manually by a test engineer and the test was performed with the EUT receiving 433.92MHz.

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

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

### 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	Remark
A	Receiver	TD1G049	H6-150715010	Alps Electric Co., Ltd.	EUT
B	SW Box & Receiving Checker	-	150715013	Alps Electric Co., Ltd.	-
C	Keyless transmitter	-	15715012	-	Pair of EUT
D	TPMS transmitter	-	15715011	-	Pair of EUT

### List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Harness cable	1.0	Unshielded	Unshielded	-
2	DC cable	2.8	Unshielded	Unshielded	-
3	DC cable	0.4	Unshielded	Unshielded	-

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## **SECTION 5: Radiated Emission**

### **5.1 Operating environment**

Test place : No.2 semi anechoic chamber  
Temperature : See data  
Humidity : See data

### **5.2 Test configuration**

EUT was placed on a wooden table of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane. The EUT was set on the center 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 - 300 MHz (Biconical antenna) / 300 MHz - 1000 MHz (Logperiodic antenna)  
1000 MHz - 10000 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.

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

\*1) When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

- 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

Date: July 22, 2015

Test engineer: Ken Fujita



**APPENDIX 1: Data of EMI test**

**Radiated Emission**  
**(Below 1GHz)**

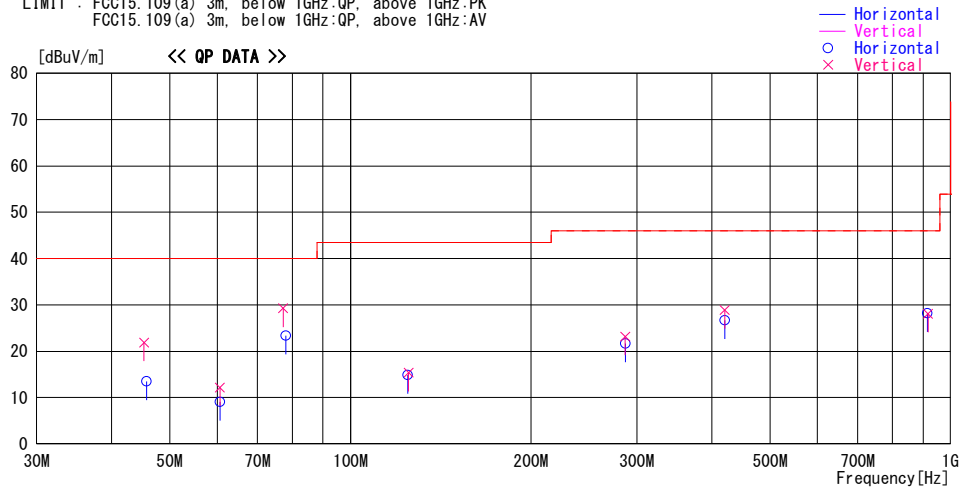
**DATA OF RADIATED EMISSION TEST**

UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber  
Date : 2015/07/22

Report No. : 10885711H  
Temp./Humi. : 21deg. C / 72% RH  
Engineer : Ken Fujita

Mode / Remarks : Keyless Receiving mode (Rx) 433.92MHz

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK  
FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]							
45.300	31.2	QP	12.3	-21.6	21.9	0	100	Vert.	40.0	18.1	
45.750	22.9	QP	12.2	-21.6	13.5	0	100	Hori.	40.0	26.5	
60.640	23.1	QP	7.3	-21.3	9.1	0	100	Hori.	40.0	30.9	
60.640	26.2	QP	7.3	-21.3	12.2	0	100	Vert.	40.0	27.8	
77.250	43.8	QP	6.6	-21.1	29.3	114	100	Vert.	40.0	10.7	
78.024	37.8	QP	6.7	-21.1	23.4	114	232	Hori.	40.0	16.6	
124.500	22.2	QP	13.1	-20.4	14.9	0	100	Hori.	43.5	28.6	
124.950	22.7	QP	13.1	-20.4	15.4	0	100	Vert.	43.5	28.1	
286.950	22.8	QP	19.0	-18.6	23.2	0	100	Vert.	46.0	22.8	
287.400	21.3	QP	19.0	-18.6	21.7	0	100	Hori.	46.0	24.3	
420.304	27.7	QP	17.8	-18.8	26.7	311	191	Hori.	46.0	19.3	
420.409	29.9	QP	17.8	-18.8	28.9	0	100	Vert.	46.0	17.1	
914.839	21.3	QP	22.7	-15.8	28.2	0	100	Hori.	46.0	17.8	
917.172	21.2	QP	22.7	-15.8	28.1	0	100	Vert.	46.0	17.9	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz--HORN  
CALCULATION : RESULT = READING + ANT FACTOR + LOSS & GAIN(CABLE - GAIN(AMP))

\*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.

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**Radiated Emission  
(Below 1GHz)**

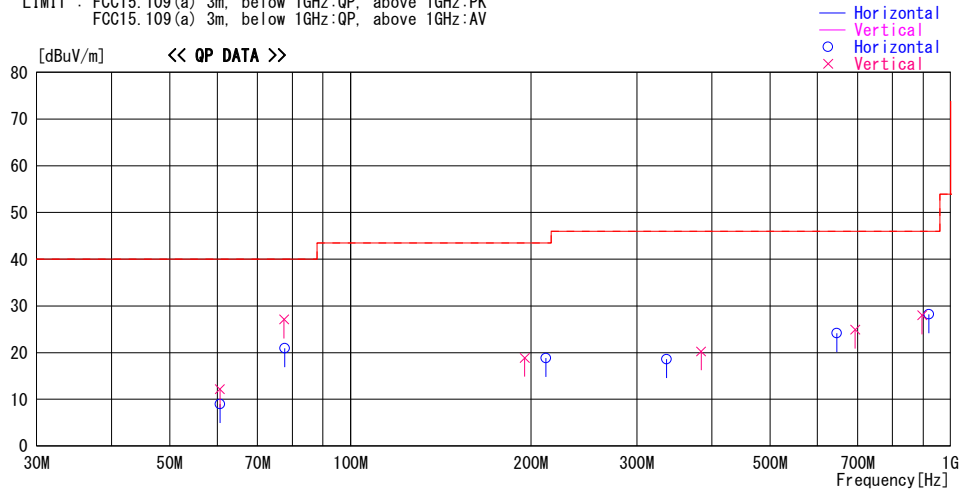
**DATA OF RADIATED EMISSION TEST**

UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber  
Date : 2015/07/22

Report No. : 10885711H  
Temp./Humi. : 21deg. C / 72% RH  
Engineer : Ken Fujita

Mode / Remarks : TPMS Receiving mode (Rx) 433.92MHz

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK  
FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV



Frequency [MHz]	Reading [dBuV]	DET	Antenna		Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
60.640	23.0	QP	7.3	-21.3	9.0	0	100	Hori.	40.0	31.0	
60.640	26.2	QP	7.3	-21.3	12.2	0	100	Vert.	40.0	27.8	
77.550	41.6	QP	6.6	-21.1	27.1	87	100	Vert.	40.0	12.9	
77.700	35.3	QP	6.7	-21.1	20.9	0	220	Hori.	40.0	19.1	
195.149	22.2	QP	16.5	-19.8	18.9	0	100	Vert.	43.5	24.6	
211.799	21.7	QP	16.7	-19.6	18.8	0	100	Hori.	43.5	24.7	
336.166	21.5	QP	15.7	-18.6	18.6	0	100	Hori.	46.0	27.4	
383.999	22.0	QP	17.1	-18.8	20.3	0	100	Vert.	46.0	25.7	
646.501	21.9	QP	20.2	-17.9	24.2	0	100	Hori.	46.0	21.8	
693.168	21.8	QP	20.6	-17.5	24.9	0	100	Vert.	46.0	21.1	
896.172	21.4	QP	22.5	-15.9	28.0	0	100	Vert.	46.0	18.0	
919.505	21.3	QP	22.7	-15.8	28.2	0	100	Hori.	46.0	17.8	

CHART: WITH FACTOR ANT TYPE: -30MHz: LOOP, 30-300MHz: BICONICAL, 300MHz-1000MHz: LOGPERIODIC, 1000MHz-: HORN  
CALCULATION : RESULT = READING + ANT FACTOR + LOSS & GAIN (CABLE - GAIN (AMP))

\*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.

**Radiated Emission**  
**(Above 1GHz)**

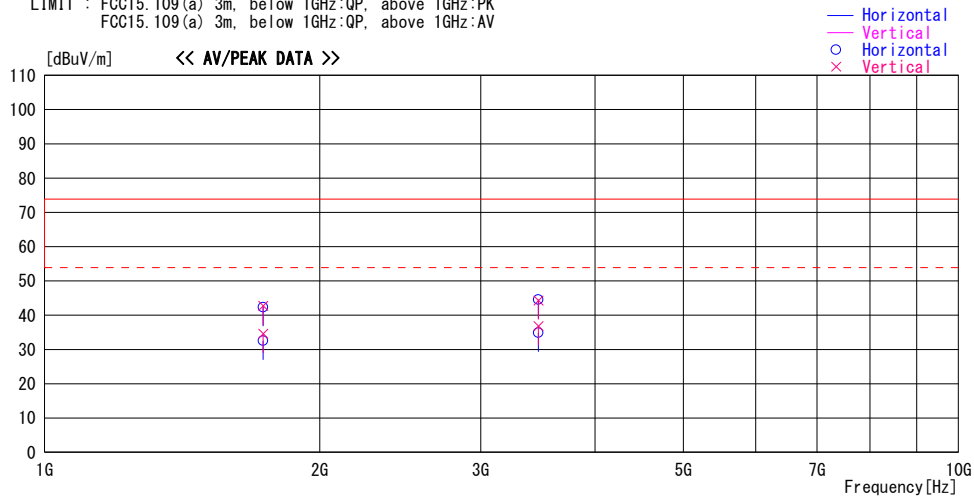
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LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK  
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Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]							
1734.560	47.4	PK	27.9	-32.9	42.4	0	100	Hori.	73.9	31.5	
1734.560	37.6	AV	27.9	-32.9	32.6	0	100	Hori.	53.9	21.3	
1734.560	47.7	PK	27.9	-32.9	42.7	0	100	Vert.	73.9	31.2	
1734.560	39.6	AV	27.9	-32.9	34.6	0	100	Vert.	53.9	19.3	
3469.120	37.8	AV	29.9	-30.9	36.8	0	100	Vert.	53.9	17.1	
3469.120	45.6	PK	29.9	-30.9	44.6	0	100	Hori.	73.9	29.3	
3469.120	35.9	AV	29.9	-30.9	34.9	0	100	Hori.	53.9	19.0	
3469.120	45.3	PK	29.9	-30.9	44.3	0	100	Vert.	73.9	29.6	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz:-HORN  
CALCULATION : RESULT = READING + ANT FACTOR + LOSS & GAIN (CABLE - GAIN (AMP))

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## Radiated Emission (Above 1GHz)

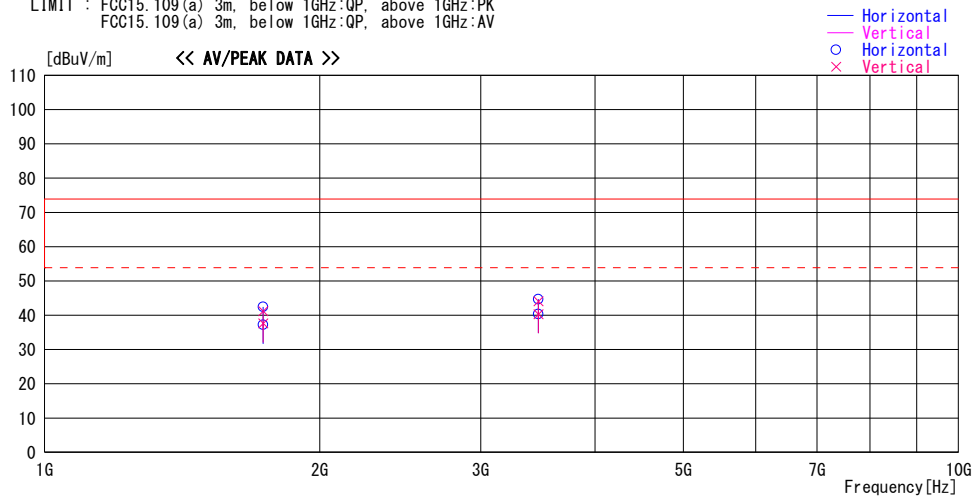
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Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]							
1734.560	47.5	PK	27.9	-32.9	42.5	0	100	Hori.	73.9	31.4	
1734.560	42.2	AV	27.9	-32.9	37.2	0	100	Hori.	53.9	16.7	
1734.560	46.2	PK	27.9	-32.9	41.2	0	100	Vert.	73.9	32.7	
1734.560	42.6	AV	27.9	-32.9	37.6	0	100	Vert.	53.9	16.3	
3469.120	41.3	AV	29.9	-30.9	40.3	0	100	Vert.	53.9	13.6	
3469.120	45.7	PK	29.9	-30.9	44.7	0	100	Hori.	73.9	29.2	
3469.120	41.4	AV	29.9	-30.9	40.4	0	100	Hori.	53.9	13.5	
3469.120	45.1	PK	29.9	-30.9	44.1	0	100	Vert.	73.9	29.8	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz--HORN  
CALCULATION : RESULT = READING + ANT FACTOR + LOSS & GAIN(CABLE - GAIN(AMP))

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## **APPENDIX 2: Test instruments**

### **EMI test equipment**

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2015/07/01 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2015/01/13 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2014/11/12 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2015/06/08 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2014/10/18 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2014/10/18 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2015/02/06 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2014/11/11 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2014/09/26 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2015/02/05 * 12
MCC-166	Microwave Cable	Junkosha	MWX221	1303S120(1m) / 1311S167(5m)	RE	2014/09/24 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2015/01/28 * 12
MMM-01	Digital Tester	Fluke	FLUKE 26-3	78030611	RE	2014/08/28 * 12

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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