



EMI TEST REPORT

Test Report No. : 11548297H-A

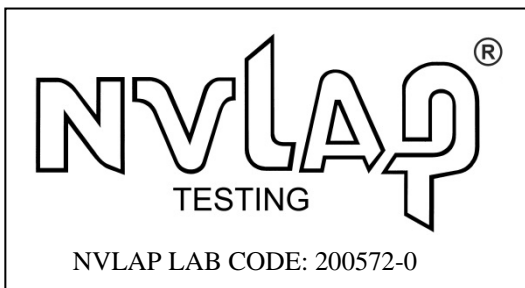
Applicant : ALPS ELECTRIC CO., LTD.
Type of Equipment : TPMS TUNER CONT
Model No. : TWD1J0004
FCC ID : CWTWD1J0004
Test regulation : FCC Part 15 Subpart B: 2016
Test Result : Complied

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: May 25, 2017

Representative test engineer: M. Niwa
Masafumi Niwa
Engineer
Consumer Technology Division

Approved by: M. Imura
Motoya Imura
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,
http://japan.ul.com/resources/emc_accredited/

REVISION HISTORY

Original Test Report No.: 11548297H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	11548297H-A	June 20, 2017	-	-

CONTENTS	PAGE
SECTION 1: Customer information	4
SECTION 2: Equipment under test (E.U.T.)	4
SECTION 3: Test specification, procedures & results	5
SECTION 4: Operation of E.U.T. during testing	7
SECTION 5: Radiated Emission	8
APPENDIX 1: Test data	9
Radiated Emission	9
APPENDIX 2: Test instruments	11
APPENDIX 3: Photographs of test setup.....	12
Radiated Emission	12
Worst Case Position	14

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 : Yasuhiro Yabe

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

2.1 Identification of E.U.T.

Type of Equipment : TPMS TUNER CONT
Model No. : TWD1J0004
Serial No. : Refer to Section 4, Clause 4.2
Receipt Date of Sample : May 9, 2017
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 No: TWD1J0004 (referred to as the EUT in this report) is the TPMS TUNER CONT.

General Specification

Feature of EUT : This TPMS TUNER CONT 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 : 16MHz

Radio Specification

Frequency of operation : 314.975 MHz
Oscillator Frequency : 29.5097 MHz
Local Oscillator Frequency : 314.755 MHz
Intermediate Frequency : 220 kHz
Bandwidth : 100 kHz
Type of modulation : FSK
Operating voltage : DC 12V
Antenna Type : Bar Antenna
Operating Temperature : -40 deg. C to +85 deg. C

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.

UL Japan, Inc.

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SECTION 3: Test specification, procedures & results

3.1 Test specification

Test specification : FCC Part 15 Subpart B
FCC Part 15 final revised on June 14, 2017 and effective July 14, 2017

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

* The revision on June 14, 2017, does not affect the test specification applied to the EUT.

3.2 Procedures and results

Item	Test Procedure	Limits	Deviation	Worst margin	Result
Conducted emission	FCC: ANSI C63.4: 2014 7. AC power - line conducted emission measurements	FCC:Part 15 Subpart B 15.107(a)	N/A *1)	N/A*1)	N/A
	IC: RSS-Gen 8.8	IC: RSS-Gen 8.8			
Radiated emission	FCC: ANSI C63.4: 2014 8. Radiated emission measurements	FCC: Part 15 Subpart B 15.109(a)	N/A	18.8 dB 304.275 MHz, QP Horizontal	Complied
	IC: RSS-Gen 7	IC: RSS-Gen 7.1.2			

*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 $k = 2$.

Polarity	Radiated emission (Below 1 GHz)			
	(3 m*)(+/-)		(10 m*)(+/-)	
	30 MHz - 200 MHz	200 MHz - 1000 MHz	30 MHz - 200 MHz	200 MHz - 1000 MHz
Horizontal	5.0 dB	5.3 dB	5.0 dB	5.0 dB
Vertical	4.7 dB	5.9 dB	5.0 dB	5.1 dB

Radiated emission (Above 1 GHz)				
(3 m*)(+/-)		(1 m*)(+/-)		(10 m*)(+/-)
1 GHz - 6 GHz	6 GHz - 18 GHz	10 GHz - 26.5 GHz	26.5 GHz - 40 GHz	1 GHz -18 GHz
5.2 dB	5.4 dB	5.5 dB	5.5 dB	5.4 dB

* 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.

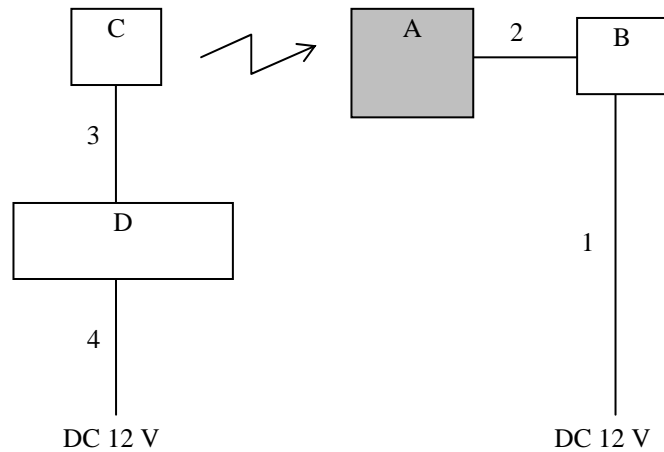
SECTION 4: Operation of E.U.T. during testing

4.1 Operating modes

Mode	Remarks
Receiving mode (Rx) 314.975 MHz	* TPMS TUNER CONT was operated manually by a test engineer and the test was performed with the EUT receiving 314.975 MHz.

* 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	TPMS TUNER CONT	TWD1J0004	17050101	ALPS ELECTRIC CO., LTD.	EUT
B	Jig board	-	-	ALPS ELECTRIC CO., LTD.	-
C	TPMS Transmitter	-	-	ALPS ELECTRIC CO., LTD.	-
D	Jig board	-	-	ALPS ELECTRIC CO., LTD.	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	1.5	Unshielded	Unshielded	-
2	Signal Cable	1.0	Unshielded	Unshielded	-
3	Signal Cable	0.2	Unshielded	Unshielded	-
4	DC Cable	1.0	Unshielded	Unshielded	-

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SECTION 5: Radiated Emission

5.1 Operating environment

Test place : No.2 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
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 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: $20 \times \log(3.65 \text{ m} / 3 \text{ m}) = 1.7 \text{ dB}$

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

5.5 Test result

Summary of the test results: Pass

Date: May 25, 2017

Test engineer: Takumi Shimada and Masafumi Niwa

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APPENDIX 1: Test data

Radiated Emission
(Below 1GHz)

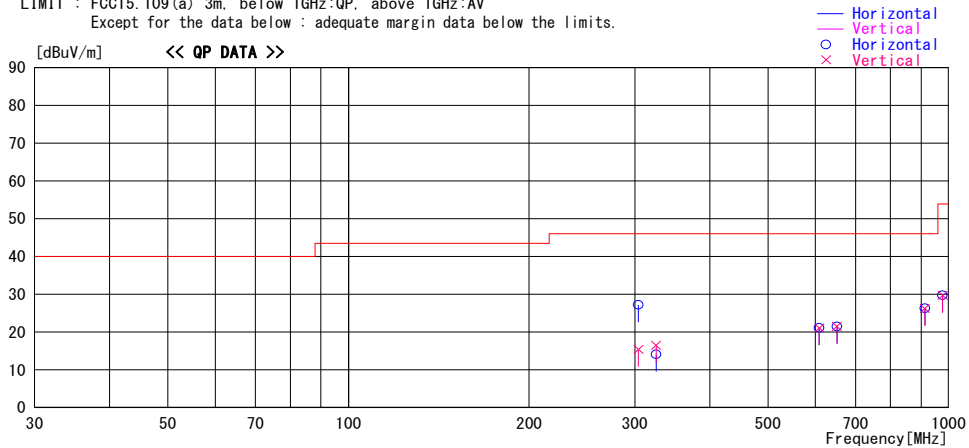
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2017/05/25

Report No. : 11548297H
Temp./Humi. : 25 deg. C / 61 % RH
Engineer : Takumi Shimada

Mode / Remarks : Rx 314.975MHz Worst Axis(Hori:X Vert:X)

LIMIT : FCC15.109 (a) 3m. below 1GHz:QP. above 1GHz:AV
Except for the data below : adequate margin data below the limits.



Frequency [MHz]	Reading [dBuV]	DET	Antenna		Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]
			Factor [dB/m]	Loss& Gain [dB]						
304.275	35.7	QP	13.5	-22.0	27.2	0	174	Hori.	46.0	18.8
304.275	23.9	QP	13.5	-22.0	15.4	0	100	Vert.	46.0	30.6
608.550	22.0	QP	19.1	-20.0	21.1	0	100	Hori.	46.0	24.9
608.550	22.0	QP	19.1	-20.0	21.1	0	100	Vert.	46.0	24.9
912.825	21.6	QP	22.1	-17.4	26.3	0	100	Hori.	46.0	19.7
912.825	21.5	QP	22.1	-17.4	26.2	0	100	Vert.	46.0	19.8
325.675	21.9	QP	14.0	-21.8	14.1	0	100	Hori.	46.0	31.9
325.675	24.3	QP	14.0	-21.8	16.5	0	100	Vert.	46.0	29.5
651.350	22.0	QP	19.4	-19.9	21.5	0	100	Hori.	46.0	24.5
651.350	22.0	QP	19.4	-19.9	21.5	0	100	Vert.	46.0	24.5
977.025	24.2	QP	22.3	-16.8	29.7	0	100	Hori.	53.9	24.2
977.025	24.2	QP	22.3	-16.8	29.7	0	100	Vert.	53.9	24.2

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

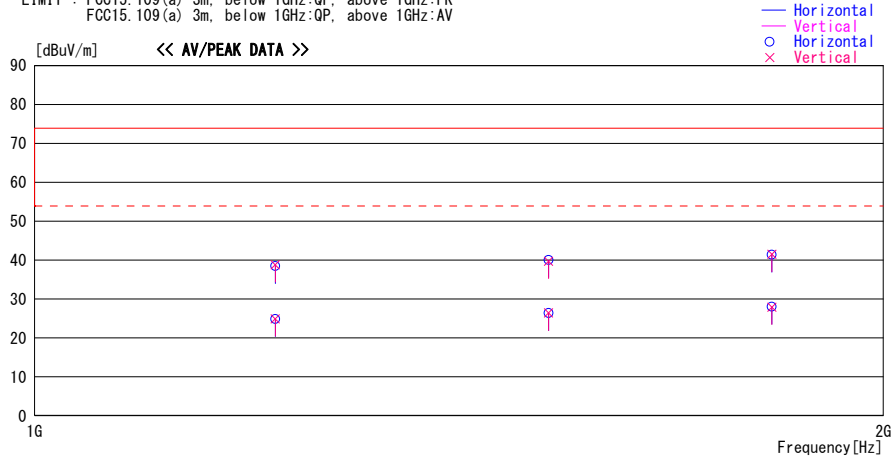
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber
Date : 2017/05/25

Report No. : 11548297H
Temp./Humi. : 22deg. C / 51% RH
Engineer : Masafumi Niwa

Mode / Remarks : Rx 314.975MHz Worst Axis (Hori:X,Vert:X)

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]							
1217.100	46.1	PK	24.5	-32.1	38.5	0	100	Hori.	73.9	35.4	
1217.100	32.4	AV	24.5	-32.1	24.8	0	100	Hori.	53.9	29.1	
1217.100	46.4	PK	24.5	-32.1	38.8	0	100	Vert.	73.9	35.1	
1217.100	32.5	AV	24.5	-32.1	24.9	0	100	Vert.	53.9	29.0	
1521.375	45.7	PK	25.9	-31.6	40.0	0	100	Hori.	73.9	33.9	
1521.375	32.1	AV	25.9	-31.6	26.4	0	100	Hori.	53.9	27.5	
1521.375	45.4	PK	25.9	-31.6	39.7	0	100	Vert.	73.9	34.2	
1521.375	32.1	AV	25.9	-31.6	26.4	0	100	Vert.	53.9	27.5	
1825.650	45.7	PK	26.8	-31.1	41.4	0	100	Hori.	73.9	32.5	
1825.650	32.3	AV	26.8	-31.1	28.0	0	100	Hori.	53.9	25.9	
1825.650	45.8	PK	26.8	-31.1	41.5	0	100	Vert.	73.9	32.4	
1825.650	32.2	AV	26.8	-31.1	27.9	0	100	Vert.	53.9	26.0	

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

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	2016/08/02 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2016/12/13 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-09	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	RE	2016/06/25 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2017/02/24 * 12
MCC-216	Microwave Cable	Junkosha	MWX221	1604S253(1 m) / 1608S087(5 m)	RE	2016/08/29 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2017/01/16 * 12
MMM-01	Digital Tester	Fluke	FLUKE 26-3	78030611	RE	2016/08/23 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2016/10/20 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2017/01/20 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
MSA-16	Spectrum Analyzer	Agilent	E4440A	MY46186390	RE	2017/02/21 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2016/09/15 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2016/10/15 * 12
MLA-22	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	RE	2017/01/26 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2016/07/26 * 12
MAT-98	Attenuator	KEYSIGHT	8491A	MY52462349	RE	2016/12/05 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2017/03/27 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE	2017/01/19 * 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

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