RADIO TEST REPORT

Test Report No. : 10551584H-R1

Applicant	:	**ALPS ELECTRIC CO., LTD.**
Type of Equipment	:	**KEYLESS TRANSMITTER**
Model No.	:	**TWB1G0084**
Test regulation	:	**FCC Part 15 Subpart C: 2014**
FCC ID	:	**CWTWB1G0084**
Test Result	:	**Complied**

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with above regulation.
4. The test results in this report are traceable to the national or international standards.
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6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 10551584H. 10551584H is replaced with this report.

Date of test: November 17 and 18, 2014

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://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap

REVISION HISTORY

Original Test Report No.: 10551584H

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10551584H	December 3, 2014	-	-
1	10551584H-R1	December 15, 2014	P. 9	Correction of Measurement range

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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	:	KEYLESS TRANSMITTER
Model No.	:	TWB1G0084
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 3.0V
Receipt Date of Sample	:	November 10, 2014
Country of Mass-production	:	China
Condition of EUT	:	Engineering 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: TWB1G0084 (referred to as the EUT in this report) is the KEYLESS TRANSMITTER.

General Specification

Clock frequencies in the system	:	13.56MHz

Radio Specification

Radio Type	:	Transmitter
Frequency of Operation	:	433.92MHz
Modulation	:	FSK
Antenna Type	:	Pattern Antenna
Method of Frequency Generation	:	Crystal
Operating voltage (inner)	:	DC 3.0V
Operating temperature range	:	-20 to +60 deg. C

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C: 2014, final revised on August 15, 2014 and effective October 14, 2014
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.231 Periodic operation in the band 40.66 - 40.70MHz and above 70MHz

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted emission	**FCC:** ANSI C63.4:2003 7. AC powerline conducted emission measurements	**FCC:** Section 15.207	N/A	N/A *1)	-
	IC: RSS-Gen 8.8	**IC:** RSS-Gen 8.8			
Automatically Deactivate	**FCC:** ANSI C63.4:2003 13. Measurement of intentional radiators	**FCC:** Section 15.231(a)(1)	N/A	Complied	Radiated
	IC: -	**IC:** RSS-210 A1.1.1			
Electric Field Strength of Fundamental Emission	**FCC:** ANSI C63.4:2003 13. Measurement of intentional radiators	**FCC:** Section 15.231(b)	2.4dB 433.920MHz Horizontal, PK with Duty factor	Complied	Radiated
	IC: RSS-Gen 6.12	**IC:** RSS-210 A1.1.2			
Electric Field Strength of Spurious Emission	**FCC:** ANSI C63.4:2003 13. Measurement of intentional radiators	**FCC:** Section 15.205 Section 15.209 Section 15.231(b)	2.2dB 3905.280MHz Vertical, PK with Duty factor	Complied	Radiated
	IC: RSS-Gen 6.13	**IC:** RSS-210 A1.1.2, 2.5.1 RSS-Gen 8.9			
-20dB Bandwidth	**FCC:** ANSI C63.4:2003 13. Measurement of intentional radiators	**FCC:** Section 15.231(c)	N/A	Complied	Radiated
	IC: -	**IC:** Reference data			
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. *1) The test is not applicable since the EUT does not have AC Mains.					

FCC 15.31 (e)

This test was performed with the New Battery (DC 3.0V) and the constant voltage was supplied to the EUT during the tests. Therefore, the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	**IC:** RSS-Gen 6.6	**IC:** -	N/A	Complied	Radiated

Other than above, 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**						
	(3m*)(±dB)				**(1m*)(±dB)**		**(0.5m*)(±dB)**
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.0dB	5.1dB	5.0dB	5.1dB	6.0dB	4.9dB	4.3dB
No.2	3.9dB	5.2dB	5.0dB	4.9dB	5.9dB	4.7dB	4.2dB
No.3	4.3dB	5.1dB	5.2dB	5.2dB	6.0dB	4.8dB	4.2dB
No.4	4.6dB	5.2dB	5.0dB	5.2dB	6.0dB	5.7dB	4.2dB

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

Radiated emission test(3m)
The data listed in this report meets the limits unless the uncertainty is taken into consideration.

3.5 Test Location

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Telephone : +81 596 24 8999 Facsimile : +81 596 24 8124

	FCC Registration Number	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	313583	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	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	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	134570	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	-	-	8.0 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 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Data of EMI, Test instruments, and Test set up.

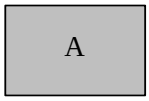
Refer to APPENDIX.

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

4.1 Operating Modes

Test Item*	Mode
Automatically Deactivate	Normal use mode
Electric Field Strength of Fundamental Emission Electric Field Strength of Spurious Emission -20dB & 99% Occupied Bandwidth Duty Cycle	Continuous Transmitting mode
* The system was configured in typical fashion (as a customer would normally use it) for testing.	

4.2 Configuration and peripherals



* Test data was taken under worse case conditions.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	KEYLESS TRANSMITTER	TWB1G0084	2014110701 *1) 2014110702 *2)	ALPS ELECTRIC CO., LTD.	EUT

*1) Used for Normal use mode
*2) Used for Continuous Transmitting mode

SECTION 5: Radiated emission (Electric Field Strength of Fundamental and Spurious Emission)

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m above the conducting ground plane. The EUT was set on the center 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.

(Below 30MHz)
The noise level was checked by moving a search-coil (Loop Antenna) close to the EUT.

(Above 30MHz)
The Radiated Electric Field Strength has been measured on Semi anechoic chamber with a ground plane and at a distance of 3m.
The measuring antenna height was varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
The measurements were performed for both vertical and horizontal antenna polarization.
The radiated emission measurements were made with the following detector function of the test receiver/spectrum analyzer.

Test Antennas are used as below;

Frequency	Below 30MHz	30MHz to 300MHz	300MHz to 1GHz	Above 1GHz
Antenna Type	Loop	Biconical	Logperiodic	Horn

	From 9kHz to 90kHz and From 110kHz to 150kHz	From 90kHz to 110kHz	From 150kHz to 490kHz	From 490kHz to 30MHz	From 30MHz to 1GHz	Above 1GHz
Detector Type	Peak	Peak	Peak	Peak	Peak and Peak with Duty factor	Peak and Peak with Duty factor
IF Bandwidth	200Hz	200Hz	9.1kHz	9.1kHz	120kHz	PK: S/A:RBW 1MHz, VBW:3MHz

* For the test below 30MHz, the noise was not detected when it was confirmed with PK detect.

- The carrier level was measured at each position of all three axes X, Y and Z, and the position that has the maximum noise was determined.
Noise levels of all the frequencies were measured at the position.

*The result is rounded off to the second decimal place, so some differences might be observed.

Measurement range : 9kHz-4.4GHz
Test data : APPENDIX
Test result : Pass

SECTION 6: Automatically deactivate

Test Procedure

The measurement was performed with Electric field strength using a spectrum analyzer.

Test data : APPENDIX
Test result : Pass

SECTION 7: -20dB and 99% Occupied Bandwidth

Test Procedure

The measurement was performed in the antenna height to gain the maximum of Electric field strength.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20dB Bandwidth	300kHz	3kHz	9.1kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 % of Span	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer

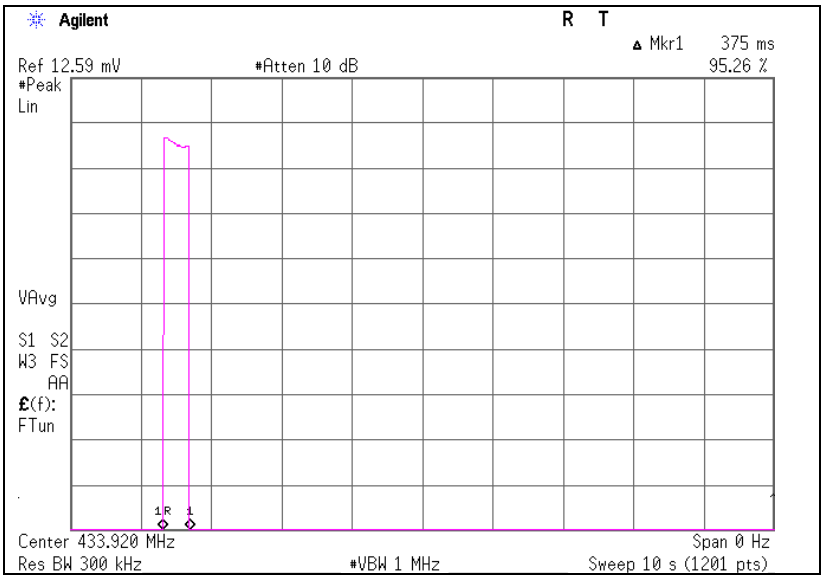
Test data : APPENDIX
Test result : Pass

APPENDIX 1: Data of EMI test

Automatically deactivate

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	10551584H
Date	11/17/2014
Temperature/ Humidity	21 deg. C / 53% RH
Engineer	Masatoshi Nishiguchi
Mode	433.92MHz Normal use mode

Time of Transmitting [sec]	Limit [sec]	Result
0.375	5.00	Pass



Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber	
Report No.	10551584H	
Date	11/17/2014	11/18/2014
Temperature/ Humidity	24 deg. C / 46% RH	24 deg. C / 40% RH
Engineer	Masatoshi Nishiguchi (Below 1GHz)	Masatoshi Nishiguchi (Above 1GHz)
Mode	433.92MHz Continuous Transmitting mode	

PK

Frequency	Detector	Reading [dBuV]		Ant Factor	Loss	Gain	Duty Factor	Result [dBuV/m]		Limit	Margin [dB]		Remark Inside or Outside
[MHz]		Hor	Ver	[dB/m]	[dB]	[dB]	[dB]	Hor	Ver	[dBuV/m]	Hor	Ver	of Restricted Bands
433.920	PK	81.9	81.7	17.8	10.7	32.0	-	78.4	78.2	100.8	22.4	22.6	Carrier
867.840	PK	44.2	42.8	22.4	13.1	31.1	-	48.6	47.2	80.8	32.2	33.6	Outside
1301.760	PK	44.9	45.2	24.9	1.9	34.5	-	37.2	37.5	73.9	36.7	36.4	Inside
1735.680	PK	46.2	47.4	25.8	2.1	33.5	-	40.6	41.8	80.8	40.2	39.0	Outside
2169.600	PK	46.7	44.1	26.4	2.4	32.9	-	42.6	40.0	80.8	38.2	40.8	Outside
2603.520	PK	45.1	44.7	27.0	2.6	32.6	-	42.1	41.7	80.8	38.7	39.1	Outside
3037.440	PK	49.9	51.4	27.4	2.8	32.4	-	47.7	49.2	80.8	33.1	31.6	Outside
3471.360	PK	43.2	43.9	27.8	3.0	32.2	-	41.8	42.5	80.8	39.0	38.3	Outside
3905.280	PK	50.1	51.9	28.7	3.2	32.1	-	49.9	51.7	73.9	24.0	22.2	Inside
4339.200	PK	46.0	44.9	29.6	3.4	31.9	-	47.1	46.0	73.9	26.8	27.9	Inside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amprifier)

AV (Peak with Duty factor)

Frequency	Detector	Reading [dBuV]		Ant Factor	Loss	Gain	Duty Factor	Result [dBuV/m]		Limit	Margin [dB]		Remark
[MHz]		Hor	Ver	[dB/m]	[dB]	[dB]	[dB]	Hor	Ver	[dBuV/m]	Hor	Ver	
433.920	PK	81.9	81.7	17.8	10.7	32.0	0.0	78.4	78.2	80.8	2.4	2.6	Carrier
867.840	PK	44.2	42.8	22.4	13.1	31.1	0.0	48.6	47.2	60.8	12.2	13.6	Outside
1301.760	PK	44.9	45.2	24.9	1.9	34.5	0.0	37.2	37.5	53.9	16.7	16.4	Inside
1735.680	PK	46.2	47.4	25.8	2.1	33.5	0.0	40.6	41.8	60.8	20.2	19.0	Outside
2169.600	PK	46.7	44.1	26.4	2.4	32.9	0.0	42.6	40.0	60.8	18.2	20.8	Outside
2603.520	PK	45.1	44.7	27.0	2.6	32.6	0.0	42.1	41.7	60.8	18.7	19.1	Outside
3037.440	PK	49.9	51.4	27.4	2.8	32.4	0.0	47.7	49.2	60.8	13.1	11.6	Outside
3471.360	PK	43.2	43.9	27.8	3.0	32.2	0.0	41.8	42.5	60.8	19.0	18.3	Outside
3905.280	PK	50.1	51.9	28.7	3.2	32.1	0.0	49.9	51.7	53.9	4.0	2.2	Inside
4339.200	PK	46.0	44.9	29.6	3.4	31.9	0.0	47.1	46.0	53.9	6.8	7.9	Inside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amprifier) + Duty factor (Refer to Duty factor data sheet)

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

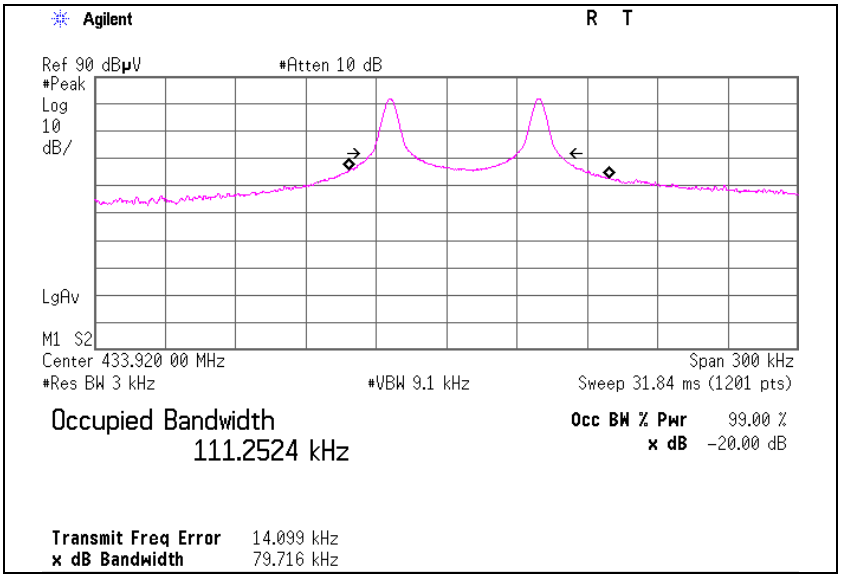
-20dB and 99% Occupied Bandwidth

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	10551584H
Date	11/17/2014
Temperature/ Humidity	21 deg. C / 53% RH
Engineer	Masatoshi Nishiguchi
Mode	433.92MHz Continuous Transmitting mode

Bandwidth Limit : Fundamental Frequency **433.92** MHz x 0.25% = 1084.80 kHz

-20dB Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
79.72	1084.80	Pass

99% Occupied Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
111.25	1084.80	Pass



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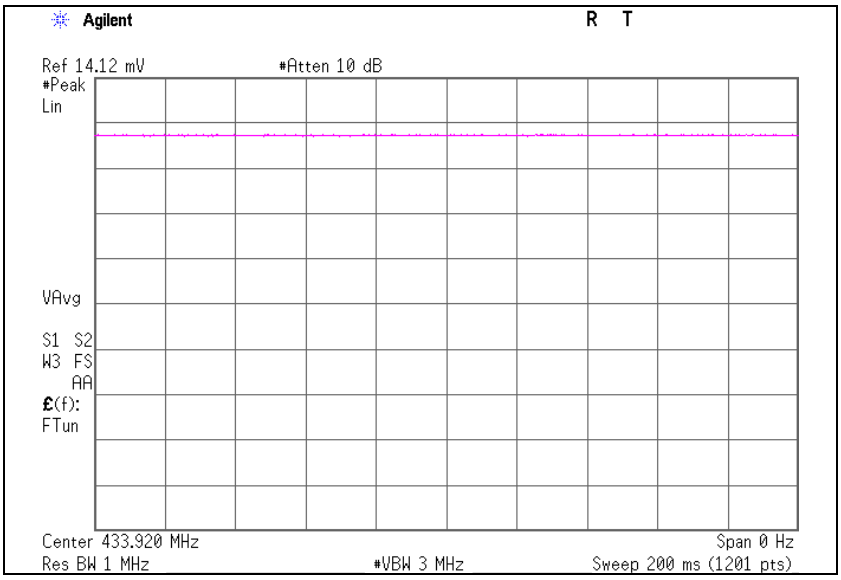
Duty Cycle

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Report No.	10551584H
Date	11/17/2014
Temperature/ Humidity	21 deg. C / 53% RH
Engineer	Masatoshi Nishiguchi
Mode	433.92MHz Continuous Transmitting mode

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
100.000	100.00	1.0000	0.00

*Duty = 20log(ON time/100ms)



APPENDIX 2: Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2014/02/27 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2014/02/20 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MRENT-116	Spectrum Analyzer	Agilent	E4440A	MY46187620	RE	2014/03/05 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2014/08/19 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2014/10/18 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2014/10/18 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2014/07/14 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2014/04/14 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2014/03/14 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2014/05/26 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2014/05/26 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2014/03/24 * 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, 99% Occupied Bandwidth, -20dB bandwidth, Automatically deactivate and Duty cycle tests