



RADIO TEST REPORT

Test Report No. : 27DE0185-HO-A-1

Applicant : Alps Electric Co., Ltd.
Type of Equipment : Remote Keyless Entry System (Hand Unit)
Model No. : TWB1U745
Test standard : FCC Part 15 Subpart C Section 15.231:2006
FCC ID : CWTWBU745
Test Result : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Apex Co., Ltd.
2. The results in this report apply only to the sample tested.
3. This equipment is in compliance with above regulation.
4. The test results in this report are traceable to the national or international standards.

Date of test : November 22, 2006

Tested by : 
Hiroka Umeyama
EMC Services

Approved by : 
Naoki Sakamoto
Group Leader of EMC Services



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://ulapex.jp/emc/nvlap.htm>

UL Apex Co., Ltd.

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SECTION 1: Client 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	:	+81-229-22-3755
Contact Person	:	Mitsuhiro Ono

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

2.1 Identification of E.U.T.

Type of Equipment	:	Remote Keyless Entry System (Hand Unit)
Model No.	:	TWB1U745
Serial No.	:	1
Rating	:	DC3.0V (Battery CR1620)
Country of Manufacture	:	Japan
Receipt Date of Sample	:	November 22, 2006
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: TWB1U745 (referred to as the EUT in this report) is the Remote Keyless Entry System (Hand Unit).
The Remote Keyless Entry System is a system of locks, unlocks, trunk and panic.

Clock Frequency	:	CPU: 1MHz (CR)
Equipment Type	:	Transmitter
Frequency of Operation	:	433.92MHz
Type of modulation	:	ASK
Mode of Operation	:	Simplex
Antenna Type	:	Printed Pattern Antenna
Method of Frequency generation	:	SAW Resonator

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C : 2006
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

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.

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3.2 Procedures and results

No.	Item	Test Procedure	Specification	Deviation	Worst margin	Results
1	Automatically Deactivate	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> -	<FCC> Section 15.231(a)(1) <IC> RSS-210 A1.1.1	N/A	-	Complied
2	Electric Field Strength of Fundamental Emission	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> RSS-Gen 4.6	<FCC> Section 15.231(b) <IC> RSS-210 A1.1.2	N/A	8.1dB 433.92MHz Horizontal	Complied
3	Electric Field Strength of Spurious Emission	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> RSS-Gen 4.7	<FCC> Section 15.205 Section 15.209 Section 15.231(b) <IC> RSS-210 A1.1.2, 2.6, 2.7	N/A	9.7dB 1301.76MHz Vertical, AV	Complied
4	-20dB Bandwidth	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> -	<FCC> Section 15.231(c) <IC> Reference data	N/A	-	Complied
5	Conducted emission	<FCC> ANSI C63.4:2003 7. AC powerline conducted emission measurements <IC> RSS-Gen 7.2.2	<FCC> Section 15.207 <IC> RSS-Gen 7.2.2	-	N/A*1)	N/A

Note: UL Apex's EMI Work procedures No. QPM05 and QPM15.

*1) The test is not applicable since the EUT does not have AC Mains.

3.3 Addition to standards

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99% Occupied Band Width	<IC> RSS-Gen 4.4.1	<IC> RSS-210 A1.1.3	Conducted	N/A	N/A	N/A

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3.4 Uncertainty

Radiated Emission Test

The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is ± 4.59 dB.
The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is ± 4.62 dB.
The measurement uncertainty (with a 95% confidence level) for this test using Horn Antenna is ± 5.27 dB.
The data listed in this test report has enough margin, more than the site margin.

3.5 Test Location

UL Apex Co., Ltd. Head Office EMC Lab. *NVLAP Lab. code: 200572-0

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	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	IC4247A	19.2 x 11.2 x 7.7m	7.0 x 6.0m	Preparation room
No.2 semi-anechoic chamber	655103	IC4247A-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	IC4247A-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	IC4247A-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	-
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	N/A	-
No.6 shielded room	-	-	4.0 x 4.5 x 2.7m	2.0 x 2.0 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 5.4 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	-

* 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.7 shielded room.

3.6 Test set up, Test instruments and Data of EMI

Refer to APPENDIX 1 to 3.

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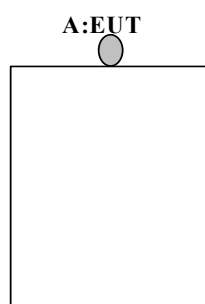
SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

The mode is used : 433.92 MHz Transmitting mode

Justification : 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	Remote Keyless Entry System (Hand Unit)	TWB1U745	1	Alps Electric Co., Ltd.	EUT

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SECTION 5: Radiated emission (Fundamental and Spurious 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, 0.5m by 0.5m, raised 80cm 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.
A drawing of the set up is shown in the photos of APPENDIX 1.

5.3 Test conditions

Frequency range : 30MHz-4400MHz
Test distance : 3m
EUT position : Top of urethane platform
EUT operation mode : See Clause 4.1

5.4 Test procedure

The Radiated Electric Field Strength intensity has been measured on No.4 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 intensity.
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.

	Below or equal to 1GHz	Above 1GHz (FCC15.205)	Above 1GHz (FCC15.231)
Detector Type	QP/ Peak with Duty factor	Peak and Average	Peak with Duty factor
IF Bandwidth	120kHz	PK: S/A:RBW 1MHz, VBW:1MHz AV: S/A:RBW 1MHz, VBW:10Hz	PK: S/A:RBW 1MHz, VBW:1MHz

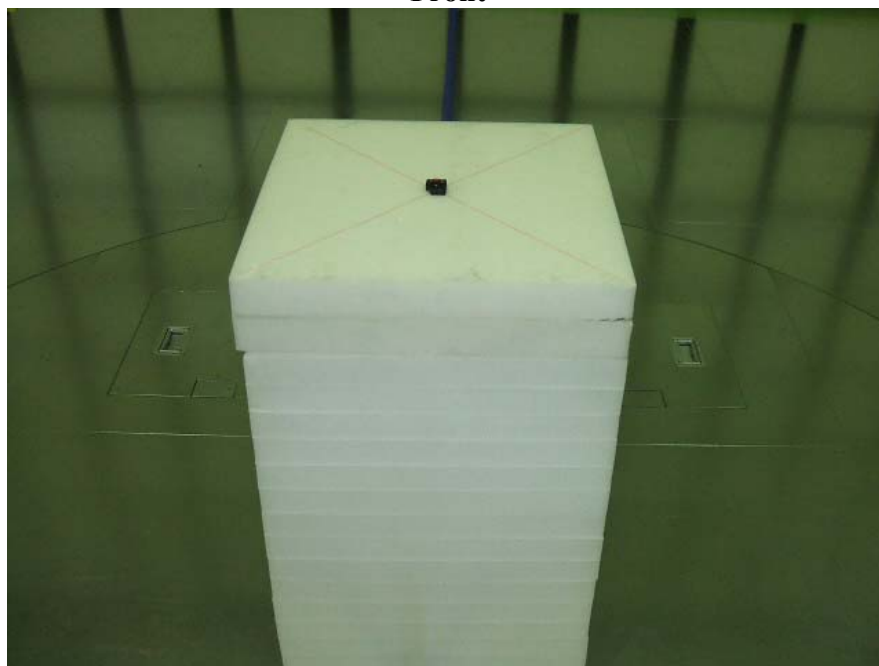
- The carrier level (or, noise levels) was (or were) measured at each position of all three axes X, Y and Z, and the position that has the maximum noise was determined.
With the position, the noise levels of all the frequencies was measured.

5.5 Results

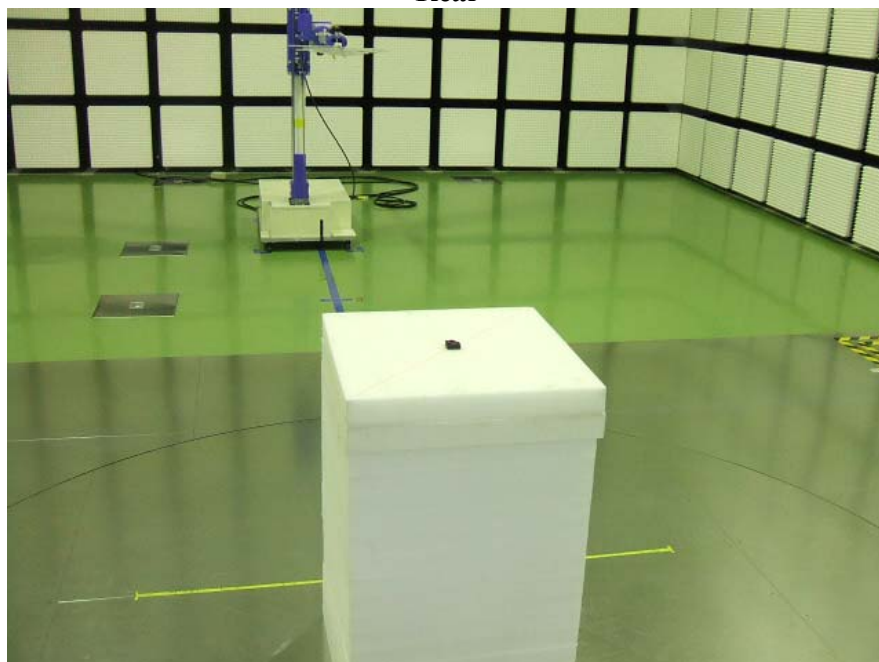
Summary of the test results: Pass

APPENDIX 1: Photographs of test setup

Radiated emission **Front**



Rear



Worst case position
(Horizontal: X-axis/Vertical : Z-axis)

X-axis



Y-axis



Z-axis



APPENDIX 2: Data of EMI test

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

UL Apex Co., Ltd.
Head Office EMC Lab. No.4 Semi Anechoic Chamber

COMPANY : Alps Electric Co., Ltd. REPORT NO : 27DE0185-HO
EQUIPMENT : Remote Keyless Entry System (Hand Unit) REGULATION : Fcc Part15 Subpart C 15.231(b) / 15.205 / 15.209
MODEL : TWB1U745 TEST DISTANCE : 3m
S/N : 1 DATE : 11/22/2006
POWER : DC 3.0V TEMPERATURE : 20°C
Mode : Continuous Transmitting 433.92MHz HUMIDITY : 645%
Axis : Hor.: X-axis, Ver.: Z-axis ENGINEER : Hiroka Umeyama

PK DETECT

No.	FREQ [MHz]	T/R READING		ANT Factor [dB/m]	AMP GAIN [dB]	LOSS [dB]	Duty Factor [dB]	RESULT		Limit [dBuV/m]	MARGIN	
		HOR	VER					HOR	VER		HOR	VER
1	433.92	81.6	81.2	18.7	31.9	10.9	-6.6	72.7	72.3	80.8	8.1	8.5
2	867.84	48.4	46.9	23.3	31.4	13.1	-6.6	46.8	45.3	60.8	14.0	15.5

PK DETECT (RBW: 1MHz, VBW: 1MHz)

(Inside Restricted bands)

No.	FREQ [MHz]	S/A READING		ANT Factor [dB/m]	AMP GAIN [dB]	LOSS [dB]		RESULT		Limit [dBuV/m]	MARGIN	
		HOR	VER					HOR	VER		HOR	VER
3	1301.76	52.1	54.3	24.4	34.4	1.6		43.7	45.9	73.9	30.2	28.0
9	3905.28	42.8	44.3	28.9	31.8	2.8		42.7	44.2	73.9	31.2	29.7
10	4339.20	43.5	41.9	29.8	31.6	3.0		44.7	43.1	73.9	29.2	30.8

AV DETECT (RBW: 1MHz, VBW: 10Hz)

(Inside Restricted bands)

No.	FREQ [MHz]	S/A READING		ANT Factor [dB/m]	AMP GAIN [dB]	LOSS [dB]		RESULT		Limit [dBuV/m]	MARGIN	
		HOR	VER					HOR	VER		HOR	VER
3	1301.76	49.7	52.6	24.4	34.4	1.6		41.3	44.2	53.9	12.6	9.7
9	3905.28	34.8	35.3	28.9	31.8	2.8		34.7	35.2	53.9	19.2	18.7
10	4339.20	34.9	31.1	29.8	31.6	3.0		36.1	32.3	53.9	17.8	21.6

PK MEASUREMENT Result = Reading (RBW: 1MHz, VBW: 1MHz)

(Outside Restricted bands)

No.	FREQ [MHz]	S/A READING		ANT Factor [dB/m]	AMP GAIN [dB]	LOSS [dB]	Duty Factor [dB]	RESULT		Limit [dBuV/m]	MARGIN	
		HOR	VER					HOR	VER		HOR	VER
4	1735.68	57.5	59.2	25.3	33.4	1.8		51.2	52.9	80.8	29.6	27.9
5	2169.60	58.6	56.5	26.0	32.8	2.0		53.8	51.7	80.8	27.0	29.1
6	2603.52	60.3	54.2	27.0	32.5	2.2		57.0	50.9	80.8	23.8	29.9
7	3037.44	59.7	59.3	27.6	32.3	2.4		57.4	57.0	80.8	23.4	23.8
8	3471.36	42.3	43.3	28.1	32.0	2.6		41.0	42.0	80.8	39.8	38.8

AV MEASUREMENT Result = Reading (RBW: 1MHz, VBW: 1MHz) + Duty Factor (Outside Restricted bands)

No.	FREQ [MHz]	S/A READING		ANT Factor [dB/m]	AMP GAIN [dB]	LOSS [dB]	Duty Factor [dB]	RESULT		Limit [dBuV/m]	MARGIN	
		HOR	VER					HOR	VER		HOR	VER
4	1735.68	57.5	59.2	25.3	33.4	1.8	-6.6	44.6	46.3	60.8	16.2	14.5
5	2169.60	58.6	56.5	26.0	32.8	2.0	-6.6	47.2	45.1	60.8	13.6	15.7
6	2603.52	60.3	54.2	27.0	32.5	2.2	-6.6	50.4	44.3	60.8	10.4	16.5
7	3037.44	59.7	59.3	27.6	32.3	2.4	-6.6	50.8	50.4	60.8	10.0	10.4
8	3471.36	42.3	43.3	28.1	32.0	2.6	-6.6	34.4	35.4	60.8	26.4	25.4

REMARKS ANTENNA TYPE:30-300MHz Biconical / 300-1000MHz Logperiodic / 1-4.4GHz Horn

CALCULATION RESULT=Reading + ANT Factor - Amp Gain + LOSS (Cable+ ATTN.)+Duty factor

Duty cycle Factor Measurement : -6.6 dB

* The result is rounded off to the second decimal place. Therefore, there may be 0.1 difference for the result.

*The limit was converted from V to dBuV, and it is rounded off to the second decimal place.

*Except for the above table : All other spurious emissions were less than 20dB for the limit.

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

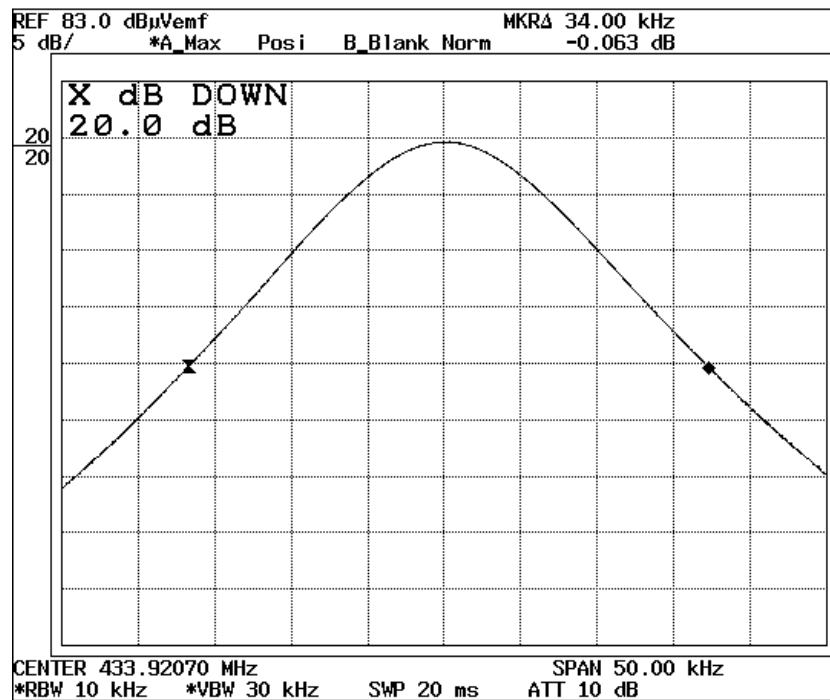
-20dB Bandwidth

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Head Office EMC Lab. No.4 Semi Anechoic Chamber

COMPANY	: Alps Electric Co., Ltd.	REPORT NO	: 27DE0185-HO
EQUIPMENT	: Remote Keyless Entry System (Hand Unit)	REGULATION	: Fcc Part15 Subpart C 15.231(c)
MODEL	: TWB1U745	TEST DISTANCE	: 3m
S/N	: 1	DATE	: 11/22/2006
POWER	: DC 3.0V	TEMPERATURE	: 20°C
Mode	: Continuous Transmitting 433.92MHz	HUMIDITY	: 645%
Axis	: Hor.: X-axis , Ver.: Z-axis	ENGINEER	: Hiroka Umeyama

Bandwidth Limit : Fundamental Frequency 433.92 MHz X 0.25% = 1084.8 kHz

-20dB Bandwidth	Bandwidth Limit	Result
[kHz]	[kHz]	
34.00	1084.80	Pass



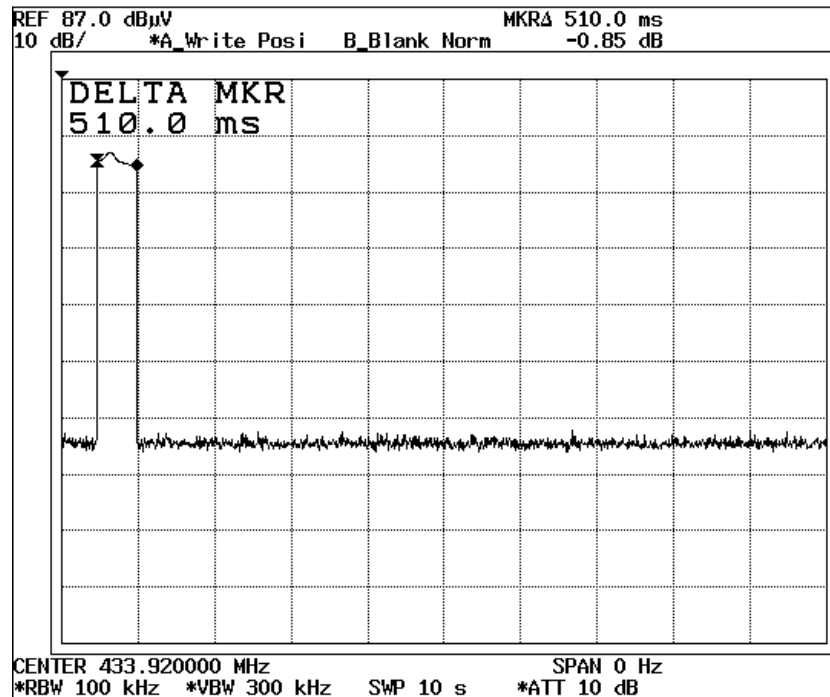
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Revised date : December 15, 2006
FCC ID : CWTWBU745

Automatically deactivate

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COMPANY	: Alps Electric Co., Ltd.	REPORT NO	: 27DE0185-HO
EQUIPMENT	: Remote Keyless Entry System (Hand Unit)	REGULATION	: Fcc Part15 Subpart C 15.231(a)(1)
MODEL	: TWB1U745	TEST DISTANCE	: -
S/N	: 1	DATE	: 11/22/2006
POWER	: DC 3.0V	TEMPERATURE	: 20°C
Mode	: Continuous Transmitting 433.92MHz	HUMIDITY	: 645%
Axis	: -	ENGINEER	: Hiroka Umeyama

Time of Transmitting [sec]	Limit [sec]	Result
0.51	5.00	Pass



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FCC ID : CWTWBU745

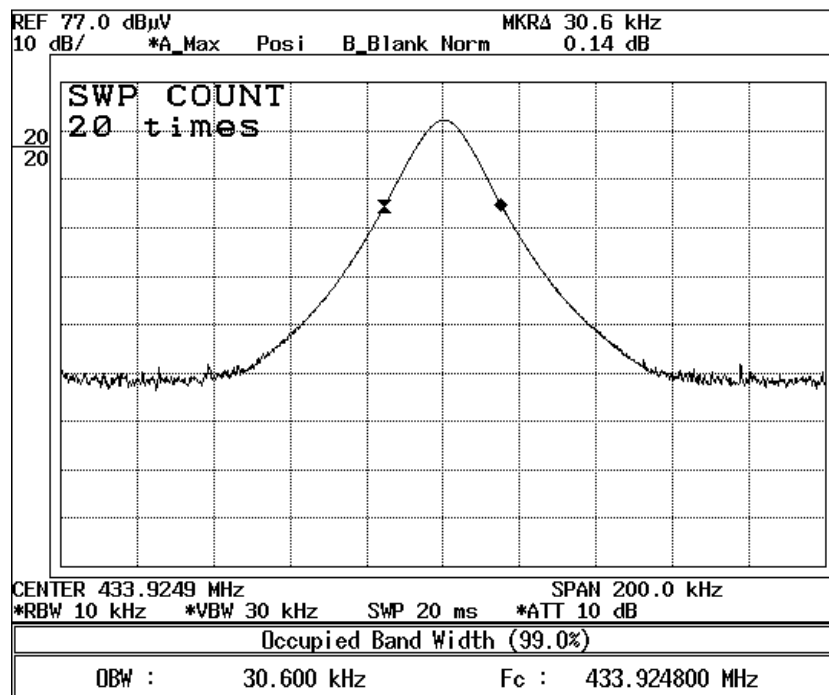
99% Occupied Bandwidth

UL Apex Co., Ltd.
Head Office EMC Lab. No.4 Semi Anechoic Chamber

COMPANY : Alps Electric Co., Ltd.
EQUIPMENT : Remote Keyless Entry System (Hand Unit)
MODEL : TWB1U745
S/N : 1
POWER : DC 3.0V
Mode : Continuous Transmitting 433.92MHz
Axis : Hor.: X-axis , Ver.: Z-axis

REPORT NO : 27DE0185-HO
REGULATION : RSS-Gen 4.4.1
TEST DISTANCE : 3m
DATE : 11/22/2006
TEMPERATURE : 20°C
HUMIDITY : 645%
ENGINEER : Hiroka Umeyama

99% Occupied Bandwidth
[kHz]
30.60



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Duty Cycle

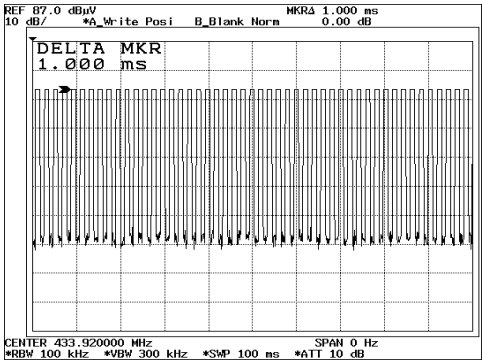
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EQUIPMENT	: Remote Keyless Entry System (Hand Unit	REGULATION	: Fcc Part15 Subpart C 15.231(b) / 15.205 / 15.209
MODEL	: TWB1U745	TEST DISTANCE	: -
S/N	: 1	DATE	: 11/22/2006
POWER	: DC 3.0V	TEMPERATURE	: 20℃
Mode	: Continuous Transmitting 433.92MHz	HUMIDITY	: 645%
Axis	: -	ENGINEER	: Hiroka Umeyama

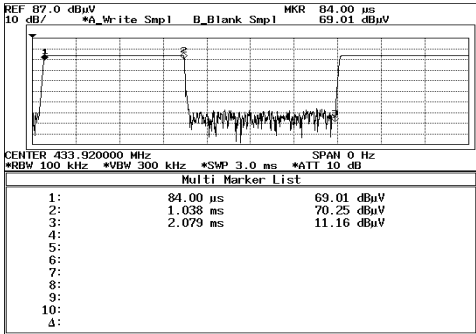
ON time	cycle	Duty cycle	Duty Factor
[ms]	[ms]		[dB]
46.75	100.00	0.47	-6.6

Cycle times: 49 times

total of 49 ON time: 46.746 ms



ON time(Worst): 0.954 ms



APPENDIX 3:Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Test Item	Calibration Date * Interval(month)
MAEC-04	Anechoic Chamber	TDK	Semi Anechoic Chamber 3m	RE	2006/03/06 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	RE	2006/01/19 * 24
MJM-07	Measure	PROMART	SEN1955	RE	-
MSTW-14	EMI measurement program	TSJ	TEPTO-DV	RE	-
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	RE	2006/01/29 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	RE	2006/01/29 * 12
MCC-50	Coaxial cable	UL Apex	-	RE	2006/03/09 * 12
MAT-31	Attenuator(6dB)	TME	UFA-01	RE	2006/03/11 * 12
MPA-14	Pre Amplifier	SONOA INSTRUMENT	310	RE	2006/03/25 * 12
MSA-05	Spectrum Analyzer	Advantest	R3273	RE	2006/05/20 * 12
MTR-02	Test Receiver	Rohde & Schwarz	ESCS30	RE	2006/02/02 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	RE	2006/08/17 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	RE	2006/03/27 * 12
MCC-57	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX104	RE	2006/04/15 * 12

All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

Test Item:

RE: Radiated emission

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