



EMI TEST REPORT


Test Report No.: 27BE0279-YK-B

Applicant : Alps Electric Co., Ltd.
Type of Equipment : Passive Entry System (Control Unit)
Model No. : TWD1U631
FCC ID : CWTWDU631
Test Standard : FCC Part15 Subpart C Section 15.209: 2006
Test Result : Complied

1. This test report shall not be reproduced except in full, 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 the above regulation.
4. The test results in this test report are traceable to the national or international standards.

Date of test: October 11 and 12, 2006

Tested by: 
Toyokazu Imamura

Approved by: 
Osamu Watatani
Site Manager of Yamakita EMC Lab.

UL Apex Co., Ltd.

YAMAKITA EMC LAB.

907 Kawanishi, Yamakita-machi, Ashigarakami-gun, Kanagawa-ken, 258-0124 JAPAN

Telephone: +81 465 77 1011

Facsimile: +81 465 77 2112

MF060b (14.06.06)

Table of Contents	Page
1 Applicant Information	3
2 Product Description	4
3 Test Specification, Procedures and Results	5
4 System Test Configuration	7
5 Radiated Emissions	8
6 -26dB Bandwidth and Occupied Bandwidth	9
<u>Contents of Appendixes</u>	10
APPENDIX 1: Photographs of test setup	11
APPENDIX 2: Test Data	13
APPENDIX 3: Test instruments	18

UL Apex Co., Ltd.

YAMAKITA EMC LAB.

907 Kawanishi, Yamakita-machi, Ashigarakami-gun, Kanagawa-ken, 258-0124 JAPAN

Telephone: +81 465 77 1011

Facsimile: +81 465 77 2112

MF060b (14.06.06)

1 Applicant Information

Company Name : Alps Electric Co., Ltd.
Address : 6-3-36 Furukawanakazato, Osaki-shi, Miyagi-ken, 989-6181 JAPAN
Telephone Number : +81-229-23-5111
Facsimile Number : +81-229-23-3755
Contact Person : Tomosuke Takata

UL Apex Co., Ltd.

YAMAKITA EMC LAB.

907 Kawanishi, Yamakita-machi, Ashigarakami-gun, Kanagawa-ken, 258-0124 JAPAN

Telephone: +81 465 77 1011

Facsimile: +81 465 77 2112

MF060b (14.06.06)

2 Product Description

Type of Equipment : Passive Entry System (Control Unit)
Model No. : TWD1U631
Serial No. : TWD1U631-1
Rating : DC12V (Car Battery)
Country of Manufacture : Japan
Receipt Date of Sample : September 28, 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.

Model: TWD1U631 (referred to as the EUT in this report) is a Control Unit of Passive Entry System. The Passive Entry System is a system which locks, unlocks and can start engine only with the intelligent-key of the vehicle. Control unit is installed in vehicle. It performs transmission through LF antenna to hand unit (I-KEY unit), processes RF signal from RF TUNER, and performs actions according to the signal.

Equipment Type : Transmitter
Frequency of operation : 125kHz
Other clock frequency : 16MHz (Main), 32.768kHz (Sub)
Type of modulation : ASK
Antenna type : External Bar
Antenna connector type : None
Method of Frequency generation : Simplex
Emission designation : A1D
Operation temperature range : -30 ~ +80 deg. C.

***FCC Part15.31 (e)**

The power supply of the EUT is transformed to DC5.0V and provides stable voltage, DC5.0V constantly to Radio part. Therefore, the EUT complies with the power supply regulation.

***FCC Part15.203**

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

UL Apex Co., Ltd.

YAMAKITA EMC LAB.

907 Kawanishi, Yamakita-machi, Ashigarakami-gun, Kanagawa-ken, 258-0124 JAPAN

Telephone: +81 465 77 1011
Facsimile: +81 465 77 2112

MF060b (14.06.06)

3 Test Specification, Procedures and Results

3.1 Test specification

Test specification : FCC Part15 Subpart C: 2006
 Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
 Section 15.205: Restricted bands of operation
 Section 15.209: Radiated emission limits, general requirements

3.2 Procedures & Results

Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results
Conducted Emission	ANSI C63.4: 2003 7. AC powerline conducted emission measurements	Section 15.207(a)	-	N/A *1	-	N/A
Electric Field Strength of Fundamental Emission	ANSI C63.4: 2003 13. Measurement of intentional radiators	Section 15.209	Radiated	N/A	13.1dB (Horizontal, AV)	Complied
Electric Field Strength of Spurious Emission	ANSI C63.4: 2003 13. Measurement of intentional radiators	Section 15.205 & 209	Radiated	N/A	3.4dB (36.13MHz, Vertical)	Complied
-26dB Bandwidth	ANSI C63.4: 2003 13. Measurement of intentional radiators	-	Radiated	N/A	-	Complied

*1) The test is not applicable since the EUT has no AC mains.

Note: UL Apex's EMI Work Procedures No.QPM05.

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

3.3 Uncertainty

Radiated emission

The measurement uncertainty (with 95% confidence level) for this test using Loop antenna is ± 2.3 dB.
 The measurement uncertainty (with 95% confidence level) for this test using Biconical antenna is ± 4.5 dB.
 The measurement uncertainty (with 95% confidence level) for this test using Logperiodic antenna is ± 4.3 dB.
 The data listed in this report meets the limits unless the uncertainty is taken into consideration.

UL Apex Co., Ltd.

YAMAKITA EMC LAB.

907 Kawanishi, Yamakita-machi, Ashigarakami-gun, Kanagawa-ken, 258-0124 JAPAN

Telephone: +81 465 77 1011
 Facsimile: +81 465 77 2112

MF060b (14.06.06)

3.4 Test Location

UL Apex Co., Ltd. Yamakita EMC Lab.
907, Kawanishi, Yamakita-machi, Ashigarakami-gun, Kanagawa-ken 258-0124 JAPAN
Telephone number : +81 465 77 1011
Facsimile number : +81 465 77 2112
NVLAP Lab. code : 200441-0

No. 1 test site has been fully described in a report submitted to FCC office, and accepted on August 26, 2005 (Registration No.: 95486).
IC Registration No. : IC3489A

No. 2 test site has been fully described in a report submitted to FCC office, and accepted on April 4, 2005 (Registration No.: 466226).
IC Registration No. : IC3489A-2

No. 1 anechoic chamber has been fully described in a report submitted to FCC office, and accepted on November 2, 2005 (Registration No.: 95967).
IC Registration No. : IC3489A-B

Test room	Width x Depth x Height (m)	Test room	Width x Depth x Height (m)
No.1 shielded room	8.0 x 5.0 x 2.5	No.1 EMS lab. (Semi-anechoic chamber)	10.0 x 7.5 x 5.7
No.2 shielded room	5.0 x 4.0 x 2.5		
No.3 shielded room	4.0 x 5.0 x 2.7		

UL Apex Co., Ltd.

YAMAKITA EMC LAB.

907 Kawanishi, Yamakita-machi, Ashigarakami-gun, Kanagawa-ken, 258-0124 JAPAN

Telephone: +81 465 77 1011
Facsimile: +81 465 77 2112

MF060b (14.06.06)

4 System Test Configuration

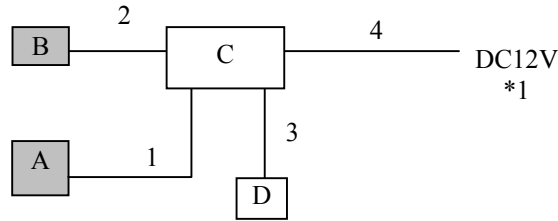
4.1 Justification

The system was configured in typical fashion (as a customer would normally use it) for testing.

Operation: Transmitting

* The test was performed with the operation of continuous transmitting to be set as the maximum data rate.

4.2 Configuration of Tested System



* Test data was taken under worse case conditions.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	FCC ID (Remarks)
A	Passive Entry System (Control Unit)	TWD1U631	TWD1U631-1	Alps Electric Co., Ltd.	CWTWDU631 (EUT)
B	Bar Antenna	-	-	Alps Electric Co., Ltd.	(EUT)
C	Checker Box	-	-	Alps Electric Co., Ltd.	-
D	Multi Vibrator	-	-	Alps Electric Co., Ltd.	-

*1) DC Power Supply (Model No.: PAN35-10A) was used for DC 12V input.

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Signal & DC power cable	1.0	Shielded	Shielded	-
2	Antenna cable	1.9	Unshielded	Unshielded	-
3	Cable for Multi Vibrator	0.2	Unshielded	Unshielded	-
4	DC power cable	1.1	Unshielded	Unshielded	-

UL Apex Co., Ltd.

YAMAKITA EMC LAB.

907 Kawanishi, Yamakita-machi, Ashigarakami-gun, Kanagawa-ken, 258-0124 JAPAN

Telephone: +81 465 77 1011

Facsimile: +81 465 77 2112

MF060b (14.06.06)

5 Radiated Emissions (Fundamental & Spurious)

5.1 Operating environment

The test was carried out in No.1 anechoic chamber.

Temperature : See test data
 Humidity : See test 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. A drawing of the set up is shown in the photos of Appendix 1.

5.3 Test conditions

Frequency range : 9kHz - 1GHz
 EUT position : Table top
 EUT operation mode : Transmitting

5.4 Test procedure

The Radiated Electric Field Strength intensity has been measured with a ground plane and at a distance of 3m.

Frequency: From 9kHz to 30MHz at distance 3m

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for each antenna angle 0deg., 45deg. and 90deg.

Frequency: From 30MHz to 1GHz at distance 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.

Measurements were performed with QP, PK, and AV detector.

The radiated emission measurements were made with the following detector function of the test receiver.

Frequency	9kHz - 90kHz and 110kHz - 150kHz	90kHz - 110kHz	150kHz - 490kHz	490kHz - 30MHz	30MHz - 1GHz
Detector Type	PK/AV	QP	PK/AV	QP	QP
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz
Measuring antenna	Loop antenna				Biconical (30-299MHz) Logperiodic (300MHz-1GHz)

The equipment and its antenna were previously checked at each position of three axes X, Y and Z. The position in which the maximum noise occurred was chosen to put into measurement. See the table below and photographs in page 12. With the position, the noise levels of all the frequencies were measured.

	EUT	EUT's antenna
Horizontal	X	X
Vertical	X	Y

5.5 Results

Summary of the test results : Pass

Date : October 11 and 12, 2006

Test engineer : Toyokazu Imamura

UL Apex Co., Ltd.

YAMAKITA EMC LAB.

907 Kawanishi, Yamakita-machi, Ashigarakami-gun, Kanagawa-ken, 258-0124 JAPAN

Telephone: +81 465 77 1011

Facsimile: +81 465 77 2112

MF060b (14.06.06)

6 -26dB Bandwidth and Occupied Bandwidth

6.1 Operating environment

The test was carried out in No.1 anechoic chamber.

6.2 Test procedure

The bandwidth was measured with a spectrum analyzer and an antenna which is placed by the EUT.

6.3 Results

Summary of the test results: Pass
Date : October 12, 2006 Test engineer : Toyokazu Imamura

UL Apex Co., Ltd.

YAMAKITA EMC LAB.

907 Kawanishi, Yamakita-machi, Ashigarakami-gun, Kanagawa-ken, 258-0124 JAPAN

Telephone: +81 465 77 1011

Facsimile: +81 465 77 2112

MF060b (14.06.06)

APPENDIX 1: Photographs of test setup

Page 11	:	Radiated emission
Page 12	:	Pre-check of the worst position

APPENDIX 2: Test Data

Page 13 - 16	:	Radiated Emission
13-15	:	Fundamental & Harmonics
16	:	Other
Page 17	:	-26dB Bandwidth and Occupied Bandwidth

APPENDIX 3: Test instruments

Page 18	:	Test instruments
---------	---	------------------

UL Apex Co., Ltd.

YAMAKITA EMC LAB.

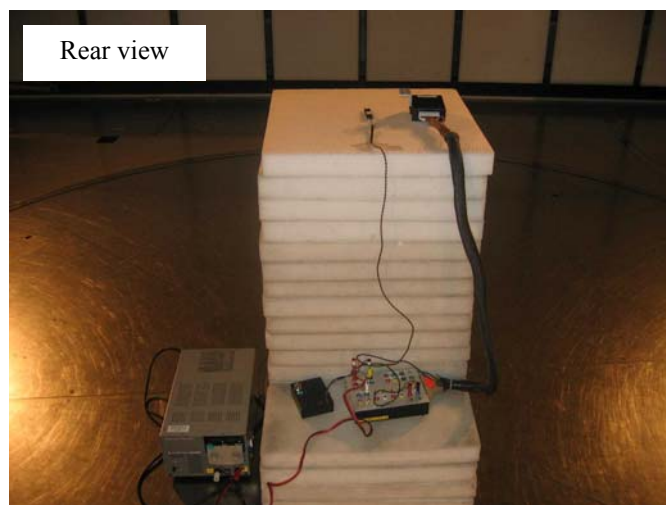
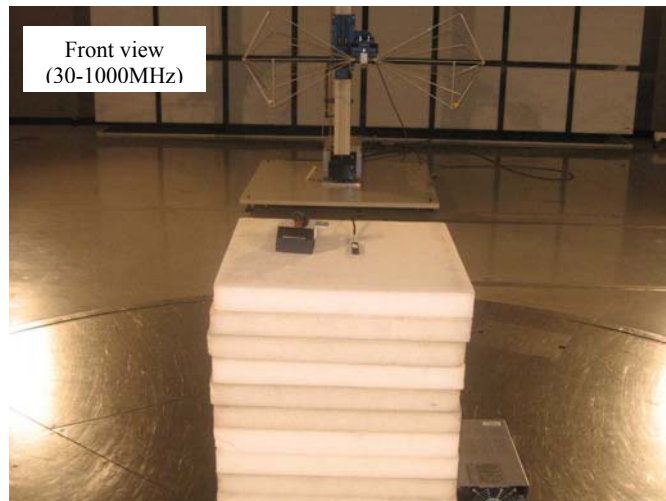
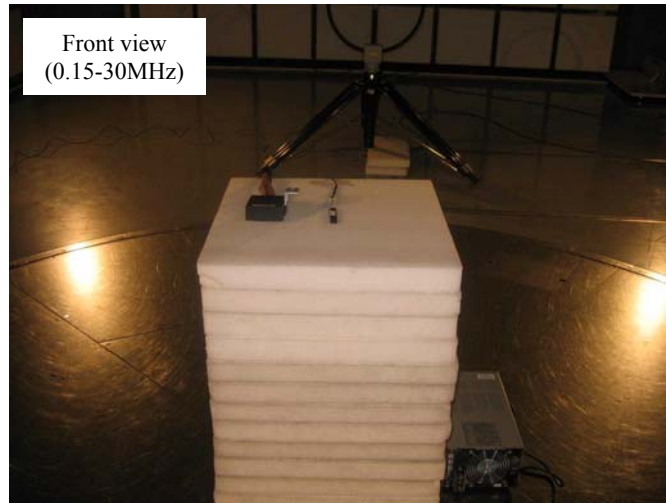
907 Kawanishi, Yamakita-machi, Ashigarakami-gun, Kanagawa-ken, 258-0124 JAPAN

Telephone: +81 465 77 1011

Facsimile: +81 465 77 2112

MF060b (14.06.06)

Radiated emission



UL Apex Co., Ltd.

YAMAKITA EMC LAB.

907 Kawanishi, Yamakita-machi, Ashigarakami-gun, Kanagawa-ken, 258-0124 JAPAN

Telephone: +81 465 77 1011

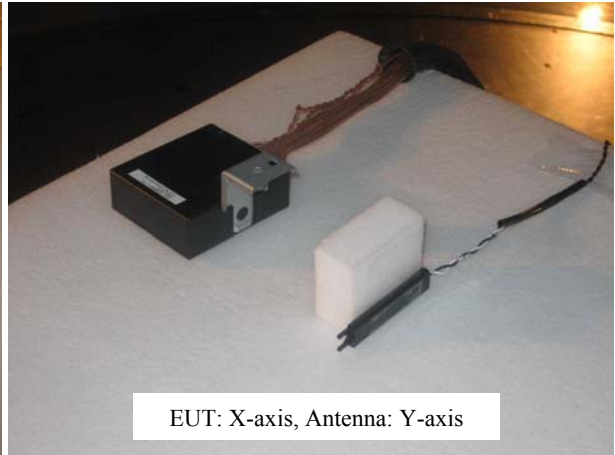
Facsimile: +81 465 77 2112

MF060b (14.06.06)

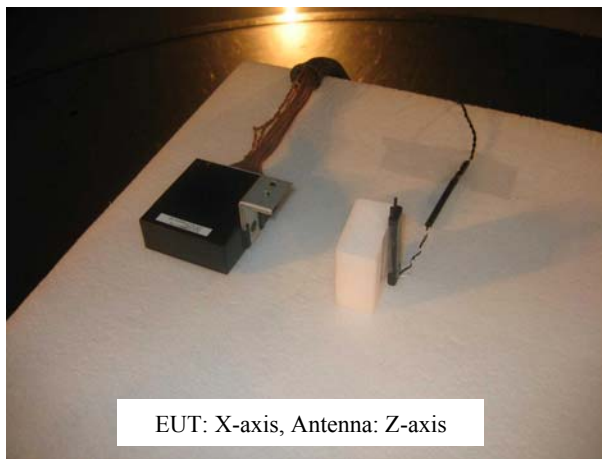
Pre-check of the worst position



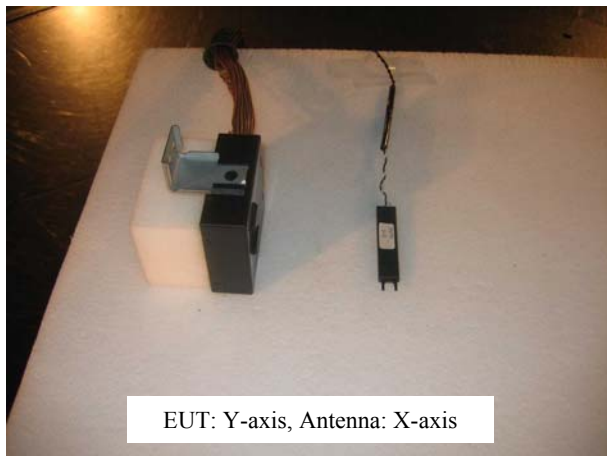
EUT: X-axis, Antenna: X-axis



EUT: X-axis, Antenna: Y-axis



EUT: X-axis, Antenna: Z-axis



EUT: Y-axis, Antenna: X-axis



EUT: Z-axis, Antenna: Y-axis

UL Apex Co., Ltd.

YAMAKITA EMC LAB.

907 Kawanishi, Yamakita-machi, Ashigarakami-gun, Kanagawa-ken, 258-0124 JAPAN

Telephone: +81 465 77 1011

Facsimile: +81 465 77 2112

MF060b (14.06.06)

DATA OF RADIATION TEST

UL Apex Co.,Ltd.
YAMAKITA No.1 ANECHOIC CHAMBER
Report No. : 27BE0279-YK-B

Applicant : Alps Electric Co., Ltd.
 Kind of Equipment : Passive Entry System (Control Unit)
 Model No. : TWD1U631
 Serial No. : TWD1U631-1
 Power : DC12V
 Mode : Transmitting
 Remarks : Antenna Hor:X Ver:Y /EUT:X (PK)
 Date : 10/12/2006
 Test Distance : 3 m
 Temperature : 20 °C Engineer : Toyokazu Imamura
 Humidity : 52 %
 Regulation : FCC Part15C § 15.209 9kHz-490kHz (3m) Pk

No.	FREQ. [MHz]	ANT TYPE	READING		ANT FACTOR [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATTEN. [dB]	RESULT		LIMITS [dB μ V/m]	MARGIN	
			HOR [dB μ V]	VER					HOR [dB μ V/m]	VER		HOR [dB]	VER
1.	0.13	BB	108.5	105.1	19.3	23.4	0.1	5.2	109.7	106.3	125.3	15.6	19.0
2.	0.25	BB	61.6	55.1	19.3	27.6	0.1	6.0	59.4	52.9	119.6	60.2	66.7
3.	0.38	BB	58.3	55.0	19.4	28.1	0.1	6.0	55.7	52.4	116.0	60.3	63.6

CALCULATION: READING + ANT.FACTOR + CABLE LOSS - AMP.GAIN + ATTEN.

■ANTENNA:KLP-01 (HFH2-Z2) 0.009-30MHz
 ■KCC-30_31_32_34 (RE) ■AMP:KAF-05 (8447D) ■RECEIVER:APRCV05 (ESS)

DATA OF RADIATION TEST

UL Apex Co.,Ltd.
YAMAKITA No.1 ANECHOIC CHAMBER
Report No. : 27BE0279-YK-B

Applicant : Alps Electric Co., Ltd.
 Kind of Equipment : Passive Entry System (Control Unit)
 Model No. : TWD1U631
 Serial No. : TWD1U631-1
 Power : DC12V
 Mode : Transmitting
 Remarks : Antenna Hor:X Ver:Y /EUT:X (AV)
 Date : 10/12/2006
 Test Distance : 3 m
 Temperature : 20 °C Engineer : Toyokazu Imamura
 Humidity : 52 %
 Regulation : FCC Part15C § 15.209 9KHz-30MHz (3m)

No.	FREQ. [MHz]	ANT TYPE	READING		ANT FACTOR [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATTEN. [dB]	RESULT		LIMITS [dB μV/m]	MARGIN	
			HOR [dB μV]	VER					HOR [dB μV/m]	VER		HOR [dB]	VER
1.	0.13	BB	91.0	87.3	19.3	23.4	0.1	5.2	92.2	88.5	105.3	13.1	16.8
2.	0.25	BB	42.8	37.7	19.3	27.6	0.1	6.0	40.6	35.5	99.6	59.0	64.1
3.	0.38	BB	39.2	38.2	19.4	28.1	0.1	6.0	36.6	35.6	96.0	59.4	60.4

CALCULATION: READING + ANT. FACTOR + CABLE LOSS - AMP. GAIN + ATTEN.

■ ANTENNA: KLP-01 (HFH2-Z2) 0.009-30MHz
 ■ KCC-30_31_32_34 (RE) ■ AMP: KAF-05 (8447D) ■ RECEIVER: APRCV05 (ESS)

DATA OF RADIATION TEST

UL Apex Co.,Ltd.
YAMAKITA No.1 ANECHOIC CHAMBER
Report No. : 27BE0279-YK-B

Applicant : Alps Electric Co., Ltd.
 Kind of Equipment : Passive Entry System (Control Unit)
 Model No. : TWD1U631
 Serial No. : TWD1U631-1
 Power : DC12V
 Mode : Transmitting
 Remarks : Antenna Hor:X Ver:Y /EUT:X (QP)
 Date : 10/12/2006
 Test Distance : 3 m
 Temperature : 20 °C Engineer : Toyokazu Imamura
 Humidity : 52 %
 Regulation : FCC Part15C § 15.209 9KHz-30MHz (3m)

No.	FREQ. [MHz]	ANT TYPE	READING		ANT FACTOR [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATTEN. [dB]	RESULT		LIMITS [dB μ V/m]	MARGIN	
			HOR [dB μ V]	VER					HOR [dB μ V/m]	VER		HOR [dB]	VER
1.	0.50	BB	31.0	41.9	19.4	28.2	0.1	6.0	28.3	39.2	73.6	45.3	34.4
2.	0.63	BB	46.7	43.0	19.4	28.4	0.2	6.0	43.9	40.2	71.6	27.7	31.4
3.	0.75	BB	30.1	30.3	19.4	28.4	0.2	6.0	27.3	27.5	70.1	42.8	42.6
4.	0.88	BB	41.0	37.5	19.5	28.3	0.2	6.0	38.4	34.9	68.7	30.3	33.8
5.	1.00	BB	34.0	32.1	19.5	28.3	0.2	6.0	31.4	29.5	67.6	36.2	38.1
6.	1.13	BB	37.0	33.9	19.5	28.3	0.2	6.0	34.4	31.3	66.5	32.1	35.2
7.	1.25	BB	27.7	31.3	19.5	28.4	0.2	6.0	25.0	28.6	65.7	40.7	37.1

CALCULATION: READING + ANT.FACTOR + CABLE LOSS - AMP.GAIN + ATTEN.

■ ANTENNA: KLP-01 (HFH2-Z2) 0.009-30MHz
 ■ KCC-30_31_32_34 (RE) ■ AMP: KAF-05 (8447D) ■ RECEIVER: APRCV05 (ESS)

DATA OF RADIATION TEST

UL Apex Co.,Ltd.
YAMAKITA No.1 ANECHOIC CHAMBER
Report No. : 27BE0279-YK-B

Applicant : Alps Electric Co., Ltd.
 Kind of Equipment : Passive Entry System (Control Unit)
 Model No. : TWD1U631
 Serial No. : TWD1U631-1
 Power : DC12V
 Mode : Transmitting
 Remarks : Antenna:Y EUT:Y
 Date : 10/11/2006
 Test Distance : 3 m
 Temperature : 25 °C
 Humidity : 60 %
 Regulation : FCC Part15C § 15.209

Engineer : Toyokazu Imamura

No.	FREQ. [MHz]	ANT TYPE	READING		ANT FACTOR [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATTEN. [dB]	RESULT		LIMITS [dB μ V/m]	MARGIN	
			HOR [dB μ V]	VER					HOR [dB μ V/m]	VER		HOR [dB]	VER
1.	36.13	BB	32.1	41.1	16.8	28.5	1.2	6.0	27.6	36.6	40.0	12.4	3.4
2.	45.38	BB	23.8	38.6	12.9	28.5	1.3	6.0	15.5	30.3	40.0	24.5	9.7
3.	72.50	BB	28.7	42.1	7.3	28.5	1.7	6.0	15.2	28.6	40.0	24.8	11.4

CALCULATION: READING + ANT. FACTOR + CABLE LOSS - AMP. GAIN + ATTEN.

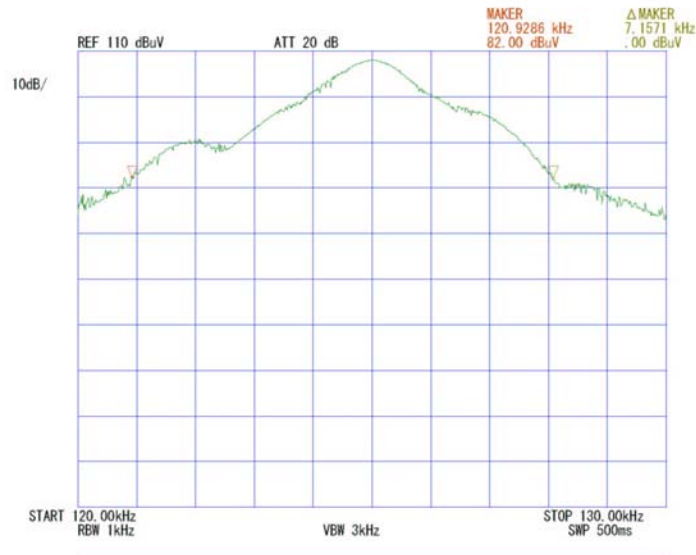
■ ANTENNA: KBA-03 (BBA9106) 30-299MHz/KLA-03 (USLP9143) 300-1000MHz
 ■ KCC-30_31_32_34 (RE) ■ AMP: KAF-05 (8447D) ■ RECEIVER: APRCV05 (ESS)

-26dB Bandwidth & Occupied Bandwidth

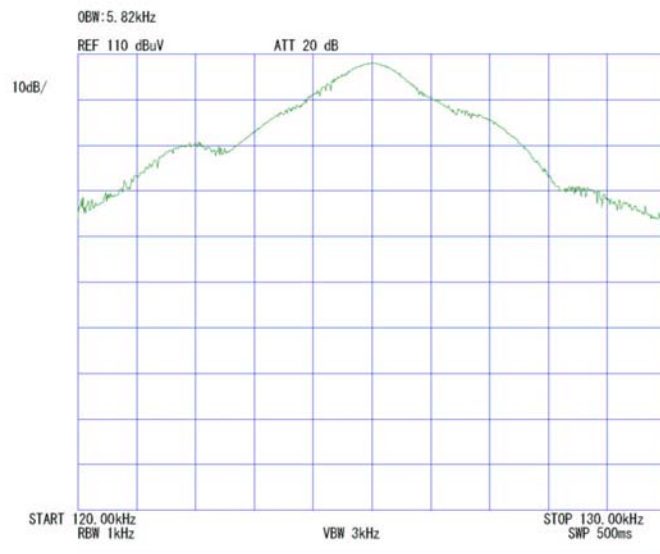
COMPANY : Alps Electric Co., Ltd.
EQUIPMENT : Passive Entry System (Control Unit)
MODEL NUMBER: TWD1U631
SERIAL NUMBER: TWD1U631-1
FCC ID : CWTWDU631
POWER : DC12V

UL Apex Co.,Ltd. Yamakita No.1 Anechoic Chamber
REPORT NO : 27BE0279-YK-B
REGULATION : -
DATE : 2006/10/12
TEMP./HUMI : 20deg.C./52%
TEST MODE : Transmitting
ENGINEER : Toyokazu Imamura

-26dB Bandwidth:7.16kHz



Occupied bandwidth:5.82kHz



Test Report No :27BE0279-YK-B

APPENDIX 3 Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Test Item	Calibration Date * Interval(month)
YA-RE	Radiated emission(software)	UL-Apex	RE(Ver.1.5)	RE/BW	-
KAEC-01(NSA)	Anechoic Chamber	JSE	Semi 3m	RE/BW	2006/08/31 * 12
KAF-05	Pre Amplifier	Agilent	8447D	RE/BW	2006/04/21 * 12
KAT6-01	Attenuator	INMET	18N-6dB	RE/BW	2006/03/24 * 12
KBA-03	Biconical Antenna	Schwarzbeck	BBA9106	RE	2006/01/17 * 12
KCC-30/31/32 /34/KRM-03	Coaxial Cable/RF Relay Matrix	Fujikura/Suhner/TSJ	5D-2W/S04272B/RFM- E421	RE/BW	2005/12/22 * 12
KLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	RE	2006/01/17 * 12
KSA-04	Spectrum Analyzer	Advantest	R3271A	RE/BW	2006/09/05 * 12
KOS-02	Digital Humidity Indicator	Custom	CTH-190	RE/BW	2006/07/10 * 24
APRCV05	Test Receiver	Rohde & Schwarz	ESS	RE	2006/09/02 * 12
KLP-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	RE/BW	2006/06/01 * 12

The expiration date of the calibration is the end of the expired month .

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

Test Item :

RE: Radiated Emission

BW: Bandwidth