EMI TEST REPORT

Test Report No. : 24KE0135-HO-2

Applicant	:	**Alps Electric Co., Ltd.**
Type of Equipment	:	**Passive Entry System (Control Unit)**
Model No.	:	**TFWD1U625**
Test standard	:	**FCC Part 15 Subpart C : 2004 Section 15.209**
FCC ID	:	**CWTWD1U625**
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. We hereby certify that the data contain a true representation of the EMC profile.
4. The test results in this report are traceable to the national or international standards.

Date of test : August 27, 2004

Tested by :
Mitsuru Fujimura
EMC Service

Approved by :
Hironobu Shimoji
Group Leader of EMC Service

UL Apex Co., Ltd.
Head Office EMC Lab.
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SECTION 1: Client information

Company Name	: Alps Electric Co., Ltd.
Address	: 6-3-36 Nakazato, Furukawa-city Miyagi-pref., 989-6181 Japan
Telephone Number	: +81-229-23-5111
Facsimile Number	: +81-229-22-3755
Contact Person	: Tomosuke Takata

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

2.1 Identification of E.U.T.

Type of Equipment	: Passive Entry System (Control Unit)
Model No.	: TFWD1U625
Serial No.	: 5
Country of Manufacture	: Japan
Receipt Date of Sample	: July 15, 2004
Condition of EUT	: Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)

2.2 Product Description

Model No: TFWD1U625 is the Passive Entry System (Control Unit).

Rating	: DC 12.0V (Car battery)
Temperature of operation	: -35 deg. C. -+85 deg. C.
Other Clock Frequency	: 65.14MHz, 16MHz, 32.768kHz

Tx section

Frequency Characteristics	: 125kHz
Modulation	: Amplitude
Information antenna	: External (Bar antenna)

FCC 15.31 (e)
The power supply of this EUT is transformed to DC 5.0V and provides stable voltage (DC 5.0V) constantly to Radio part. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement
It is impossible for users to replace the antenna, because the antenna is a set with EUT and installed outside of EUT based on the specification. Therefore, the equipment complies with the antenna requirement of Section 15.203.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C : 2004
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.209 Radiated emission limits, general requirements

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Worst margin	Result
1	Electric Field Strength of Fundamental Emission	ANSI C63.4:2003	FCC Section 15.209	Radiated	29.1dB 0.125MHz 0 deg. PK	Complied
2	Electric Field Strength of Spurious Emission	ANSI C63.4:2003	FCC Section 15.205 FCC Section 15.209	Radiated	3.8dB QP 69.774MHz Horizontal	Complied
3	Conducted Emission	ANSI C63.4:2003	FCC Section 15.207(a)	AC Mains only*1)	N/A	N/A
Note: UL Apex's EMI Work procedures No. QPM05 *1) This test is not applicable since the EUT does not have AC power port.						

*These tests were performed without any deviations from test procedure except for additions or exclusions.

3.3 Addition to standards

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99% Occupied Band Width	RSS210(issue 5): 2001 + Amendment:2002 + Amendment2:2003 + Amendment3:2004	RSS210(issue 5): 2001 + Amendment:2002 + Amendment2:2003 + Amendment3:2004	Radiated	N/A	N/A	N/A
2	-26dB Bandwidth	ANSI C63.4:2003	Reference data	Radiated	N/A	N/A	N/A

3.4 Uncertainty

Radiated Emission Test
The measurement uncertainty (with a 95% confidence level) for this test using Loop antenna is ±1.8dB.
The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is ±4.5dB.
The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is ±5.2dB.
The measurement uncertainty (with a 95% confidence level) for this test using Horn Antenna is ±6.6dB.
The data listed in this report meets the limits unless the uncertainty is taken into consideration.

3.5 Test Location

UL Apex Co., Ltd. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8116 Facsimile : +81 596 24 8124

	Listed date (for FCC)	FCC Registration Number	IC Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	February 01, 2002	313583	IC4247	19.2 x 11.2 x 7.7m	7.0 x 6.0m	Preparation room
No.2 semi-anechoic chamber	June 05, 2002	846015	IC4247-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 shielded room	-	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.4 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 and No.2 semi-anechoic and No.3 shielded room.

3.6 Test set up, Test instruments and Data of EMI

Refer to APPENDIX 1 to 3.

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

4.1 Operating Modes

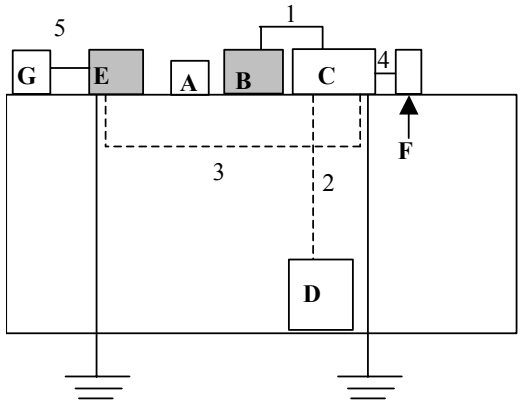
The sequence is used : Continuous Transmitting mode

Remarks:
This EUT has two antennas for Doors and Control Unit. Both antennas are identical to one another. And the antenna of Control Unit is installed inside. Therefore, the test was made with the antenna for Doors.
This EUT in actual use is set to have the maximum RF power that is supplied to Antenna.
The length of the antenna cable was set for the test in the worst condition (actual usage).

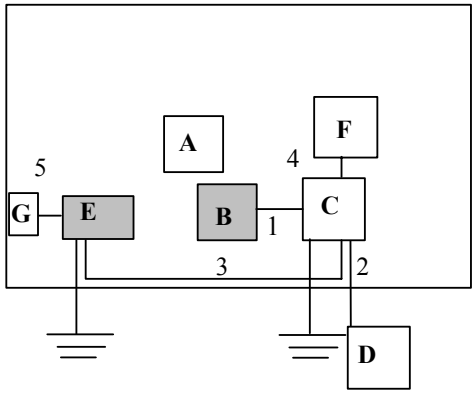
Justification: The system was configured in typical fashion (as a customer would normally use it) for testing.

4.2 Configuration and peripherals

Front View



Top View



* Test data was taken under worse case conditions.

(Hand Unit)

Support equipment

No.	Item	Model number	Serial number	Manufacturer	FCC ID
A	Passive Entry System (Hand Unit)	TFWB1U618	1	Alps Electric Co., Ltd.	CWTWBU618

(Control Unit)

Description of EUT and Support Equipment

No.	Item	Model number	Serial number	Manufacturer	FCC ID
B	Bar antenna	-	-	Alps Electric Co., Ltd.	-
C	Checker Box	N/A	N/A	Alps Electric Co., Ltd.	-
D	Car Battery	50B24L	N/A	YUASA	-
E	Control Unit	TFWD1U625	5	Alps Electric Co., Ltd.	CWTWD1U625
F	Checker PWB	-	-	Alps Electric Co., Ltd.	-
G	Tuner	TFWC1U119	4	Alps Electric Co., Ltd.	CWTWCU119

List of cables used

No.	Name	Length (m)	Shield	Remark
1	Antenna Cable	0.5	N	-
2	DC Power Cable	1.0	N	-
3	Signal & DC Power Cable	1.2	N	-
4	Cable for Checker PWB	0.3	N	-
5	Cable for Tuner	1.1	N	-

SECTION 5: Radiated emission (Fundamental and Spurious Emission)

5.1 Operating environment

Test place : No.1 semi anechoic chamber
Temperature : See data
Humidity : See data

Test Procedure
The Radiated Electric Field Strength intensity has been measured at a distance of 10m and at a distance of 3m.

Frequency : From 9kHz to 30MHz at distance 10m
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 a QP, PK, and AV detector.
The radiated emission measurements were made with the following detector function of the test receiver.

	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
Detector Type	PK/AV	QP	PK/AV	QP	QP
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz

* PK: Spectrum Analyzer RBW = 1MHz, VBW = 1MHz
* AV: Spectrum Analyzer RBW = 1MHz, VBW = 10Hz

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

* Part 15 Section 15.31 (f)(2) (9kHz-30MHz)
9kHz – 490kHz [Limit at 10m]=[Limit at 300m]-40log (10[m]/300[m])
490kHz – 30MHz[Limit at 10m]=[Limit at 30m]-40log (10[m]/30[m])

5.2 Results

Summary of the test results: Pass

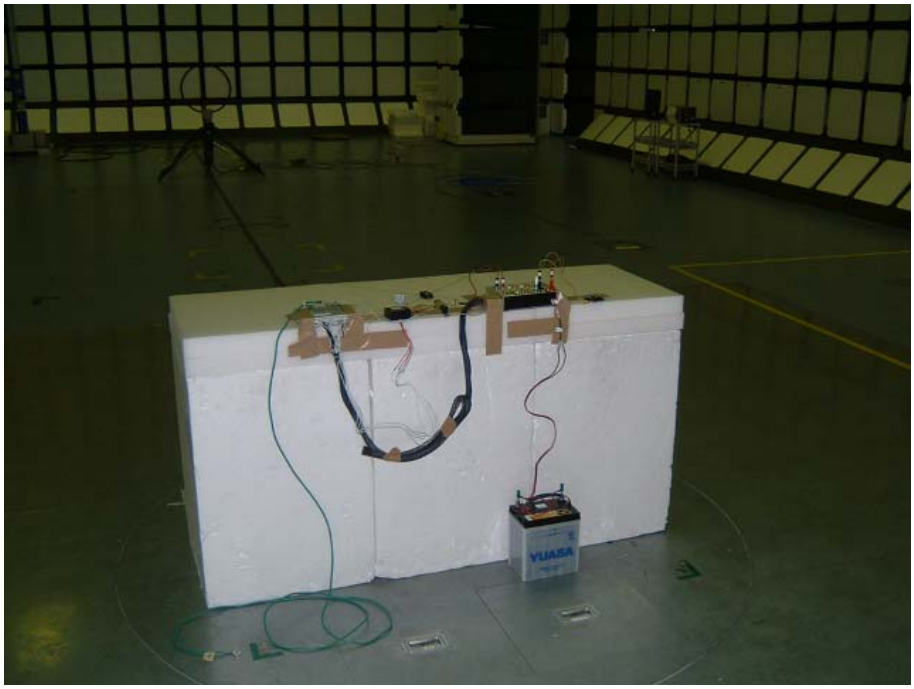
Date: August 27, 2004 Tested by: Mitsuru Fujimura

APPENDIX 1: Photographs of test setup

Radiated emission

Front

Rear



Worst Case Position (Horizontal : X-axis / Vertical: X-axis)

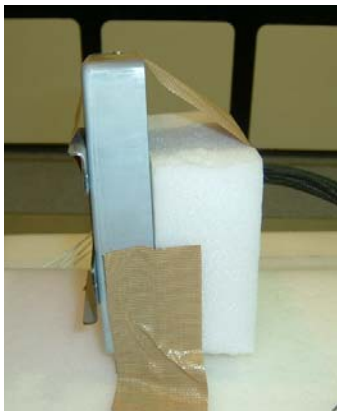
X-axis

Control Unit

Bar Antenna

Y-axis

Control Unit



Bar Antenna

Z-axis

Control Unit

Bar Antenna

APPENDIX 2: Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Test Item	Calibration Date * Interval(month)
MAEC-01	Anechoic Chamber	TDK	Semi Anechoic Chamber 10m	RE /ME	2003/12/27 * 12
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	RE /ME	2003/11/12 * 12
MCC-05	Microwave Cable	Storm	421-011	RE	2004/01/06 * 12
MCC-23	Microwave Cable	Storm	-	RE	2004/05/01 * 12
MPA-01	Pre Amplifier	Agilent	8449B	RE	2004/02/06 * 12
MHA-05	Horn Antenna	Schwarzbeck	BBHA9120D	RE	2004/01/10 * 12
MBA-01	Biconical Antenna	Schwarzbeck	BBA9106	RE	2003/10/15 * 12
MLA-01	Logperiodic Antenna	Schwarzbeck	USLP9143	RE	2003/10/15 * 12
MCC-01	Coaxial Cable	Suhner/storm/Agilent/ TSJ	-	RE	2003/12/19 * 12
MAT-06	Attenuator(6dB)	Weinschel Corp	2	RE /ME	2003/12/16 * 12
MPA-04	Pre Amplifier	Agilent	8447D	RE /ME	2004/05/25 * 12
MCC-03	Coaxial Cable	Fujikura/Suhner/Agilent/ TSJ	-	ME	2003/12/24 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	ME	2004/01/08 * 12
MCC-07	coaxial cable	-	-	ME	2004/01/26 * 12
MCC-08	coaxial cable	-	-	ME	2004/01/26 * 12

All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
Test Item:
RE: Radiated emission
ME: Radiated Magnetic Field Strength 9kHz – 30MHz

APPENDIX 3: Data of EMI test

Radiated Emission

DATA OF RADIATED EMISSION TEST

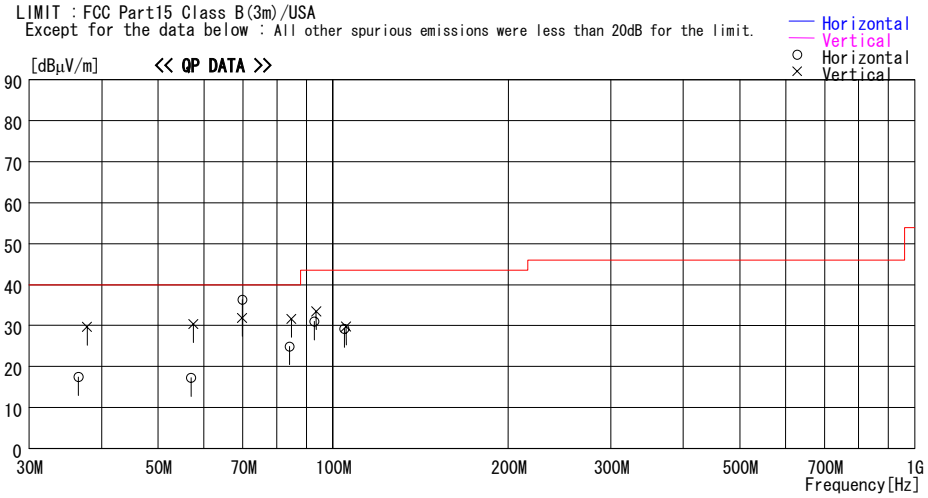
UL Apex Co., Ltd. Head Office EMC Lab. No.1 Semi Anechoic Chamber

Applicant : ALPS Electric Co.,Ltd.
Kind of EUT : Passive Keyless entry
Model No. : TFWD1U625
Serial No. : 5

Report No. : 24KE0135-HO
Power : DC 12V
Temp℃/Humi% : 23 / 65%
Operator : Mitsuru Fujimura

Mode / Remarks: Transmitting / X-axis (Max-axis)

LIMIT : FCC Part15 Class B(3m)/USA
Except for the data below : All other spurious emissions were less than 20dB for the limit.



No.	FREQ [MHz]	READING QP [dBμV]	ANT FACTOR [dB/m]	LOSS [dB]	GAIN [dB]	RESULT [dBμV/m]	LIMIT [dBμV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal ------										
1	36.493	22.5	15.6	7.2	27.9	17.4	40.0	22.6	100	359
2	57.017	28.7	8.8	7.4	27.7	17.2	40.0	22.8	337	256
3	69.774	49.8	6.7	7.6	27.8	36.3	40.0	3.8	234	183
4	84.144	38.0	6.9	7.8	27.8	24.9	40.0	15.1	213	159
5	92.778	42.2	8.5	7.9	27.6	31.0	43.5	12.5	182	157
6	104.521	38.0	10.9	8.0	27.7	29.2	43.5	14.3	277	0
----- Vertical ------										
7	37.766	35.3	15.0	7.1	27.8	29.6	40.0	10.4	100	208
8	57.510	42.1	8.6	7.4	27.8	30.3	40.0	9.7	100	123
9	69.764	45.3	6.7	7.6	27.8	31.8	40.0	8.2	100	284
10	84.766	44.6	7.0	7.8	27.8	31.6	40.0	8.4	100	16
11	93.521	44.5	8.6	7.9	27.6	33.4	43.5	10.1	100	238
12	105.270	38.5	11.0	8.0	27.7	29.8	43.5	13.7	100	269

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

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

Data of carrier and supurious emissions(9kHz to 30MHz)

UL Apex Co., Ltd.
Head Office EMC Lab. No.1 Semi Anechoic Chamber

Company : Alps Electric Co.,Ltd
Equipment : Passive Keyless entry
Model : TFWD1U625
Sample No. : 5
Power : DC 12.0V (Car battery)
Mode : Transmitting (125kHz)
EUT Position : X-axis (Max-axis)

Report No. : 24KE0135-HO
Regulation : FCC Part15C Section 15.209
Test Distance : 10m
Date : 2004/8/27
Temperature : 23deg.C
Humidity : 65%

ENGINEER : Mitsuru Fujimura

Frequency Rage : 9-90kHz & 110-490kHz / AV & PK DETECT(Test Receiver: BW 200Hz or 9kHz)
Other Frequency Rage : 490kHz-30MHz QP DETECT(Test Receiver: BW 9kHz)

No.	FREQ [kHz]	Loop Max Angle [deg]	T/R detector type	T/R READING [dBuV]	ANT Factor [dB/m]	ATTEN [dB]	CABLE LOSS [dB]	AMP GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]
1	125.06	0	PK	75.9	19.9	5.8	0.6	26.6	75.6	104.7	29.1
1	125.06	45	PK	74.7	19.9	5.8	0.6	26.6	74.4	104.7	30.3
1	125.06	90	PK	74.6	19.9	5.8	0.6	26.6	74.3	104.7	30.4
1	125.06	0	AV	43.1	19.9	5.8	0.6	26.6	42.8	84.7	41.9
2	250.12	0	PK	37.9	19.9	5.8	0.3	27.1	36.8	98.7	61.9
2	250.12	0	AV	26.2	19.9	5.8	0.3	27.1	25.1	78.7	53.6
3	375.18	0	PK	37.1	19.9	5.8	0.4	27.4	35.8	95.2	59.4
3	375.18	0	AV	24.5	19.9	5.8	0.4	27.4	23.2	75.2	52.0
4	500.24	0	QP	29.3	19.9	5.8	0.7	27.6	28.1	52.7	24.6
5	625.30	0	QP	28.5	19.8	5.8	0.6	27.8	26.9	50.8	23.9
6	750.36	0	QP	28.1	19.8	5.8	0.7	27.9	26.5	49.2	22.7
7	875.42	0	QP	27.7	19.8	5.8	0.7	27.9	26.1	47.8	21.7
8	1000.48	0	QP	27.5	19.8	5.8	0.7	27.9	25.9	46.7	20.8
9	1125.54	0	QP	27.4	19.8	5.8	0.7	27.9	25.8	45.7	19.9
10	1250.60	0	QP	27.4	19.8	5.8	0.5	27.8	25.7	44.7	19.0

REMARKS
ANTENNA TYPE : 10kHz-30MHz (Loop Antenna)
CALCULATION: READING + ANT Factor + Cable Loss - AMP Gain

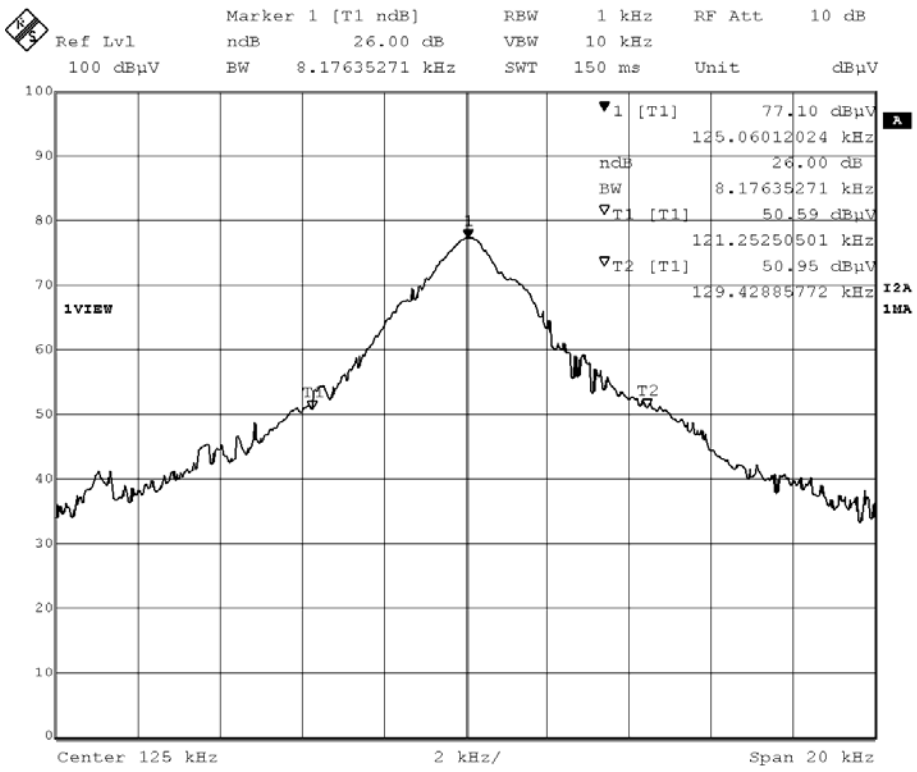
* The result is rounded off to the second decimal place. Therefore, there may be 0.1 difference for the result.
All other spurious emissions are more than 20dB below the limits.
Used Equipment: MLPA-01, MPA-04, MCC-(07+08+03),MAT-06,MTR-01

-26dB bandwidth

UL Apex Co., Ltd.
Head Office EMC Lab. No.1 Semi Anechoic Chamber

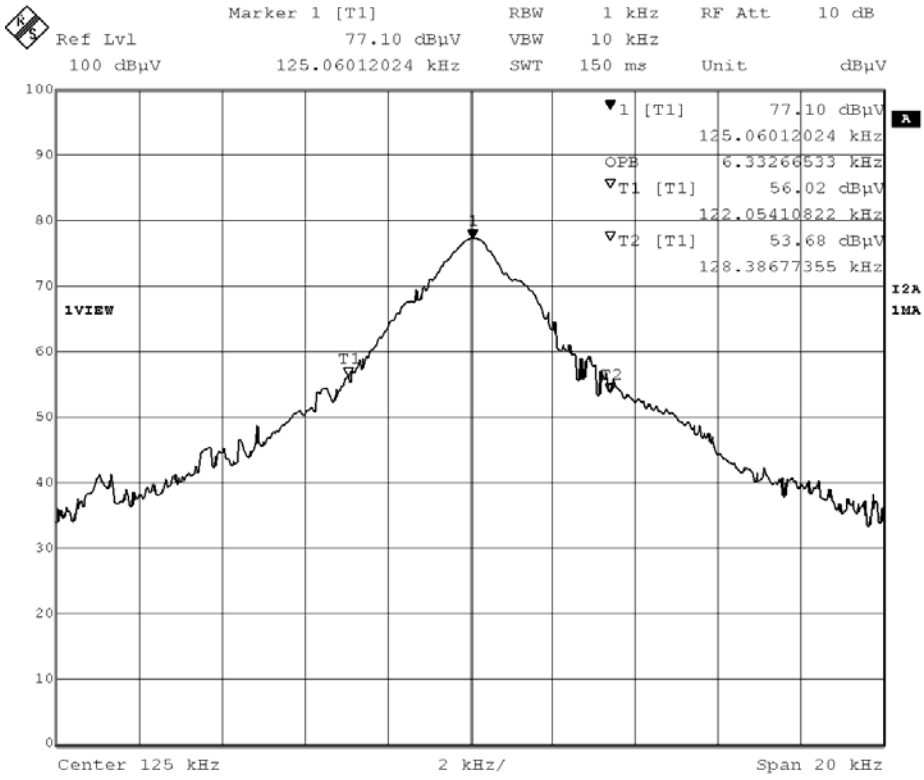
COMPANY	: Alps Electric Co.,Ltd.	REPORT NO.	: 24KE0135-HO
EQUIPMENT	: Passive Entry System (Control Unit)	REGULATION	: -
MODEL	: TFWD1U625	TEST DISTANCE	: 10 m
S/ N	: 5	DATE	: 08/27/2004
FCC ID	: CWTWD1U625	TEMPERATURE	: 24℃
POWER	: DC 12V	HUMIDITY	: 58%
MODE	: Transmitting	ENGINEER	: Mitsuru Fujimura

-26dB Bandwidth [kHz]
8.18



99% Occupied Bandwidth

UL Apex Co., Ltd.
Head Office EMC Lab. No.1 Semi Anechoic Chamber

COMPANY	: Alps Electric Co.,Ltd.		REPORT NO.	:	24KE0135-HO
EQUIPMENT	: Passive Entry System (Control Unit)		REGULATION	:	RSS210
MODEL	: TFWD1U625		TEST DISTANCE	:	10 m
S/ N	: 5		DATE	:	08/27/2004
FCC ID	: CWTWD1U625		TEMPERATURE	:	24℃
POWER	: DC 12V		HUMIDITY	:	58%
MODE	: Transmitting		ENGINEER	:	Mitsuru Fujimura

99% Occpied Bandwidth [kHz]
6.33