

EMI TEST REPORT

Test Report No. : 23IE0015-HO-1

Applicant : TOHOKU ALPS CO., LTD
AUTOMOTIVE PRODUCTS DIVISION

Type of Equipment : Hand Unit

Model No. : TFWB1U614

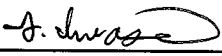
FCC ID : NHVWBU614

Test standard : FCC Part15 Subpart C 15.231 and
Subpart B 15.109

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.
5. This test report does not constitute an endorsement by NIST/NVLAP or U.S. Government.

Date of test : May 26 and 29, 2003

Tested by : 
Yoshiaki Iwasa
EMC Section

Approved by: 
Hironobu Shinoji
Group leader of EMC Section

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SECTION 1: Client information

Company name : TOHOKU ALPS CO.,LTD
AUTOMOTIVE PRODUCTS DIVISION
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 : Hideki Ueno

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

Type of Equipment : Hand Unit

Tx section

Model No.	TFWB1U614 (Hand Unit)	TFWD1U614 (Control Unit) *1)
Sample No.	1	1
Number of Channel	1	1
Frequency Characteristics	433.92MHz	125kHz
Modulation	FSK	ASK
Information antenna	Integral	Integral
Rating	DC3.0V Lithium Battery (CR2032)	DC 12.0V (Car battery)
Country of Manufacture	Japan	Japan

Rx section

Model No.	TFWD1U614 (Control Unit) *1)	TFWB1U614 (Hand Unit)
Sample No.	1	1
Type of Receiver	Single Super Heterodyne	Turned Radio Frequency Receiver
Receiving Frequency	433.92 MHz	125kHz
Local Oscillator Frequency	423.22MHz	None
Intermediate Frequency	10.7MHz	None
Information antenna	Integral	Integral
Rating	DC 12.0V (Car battery)	DC3.0V Lithium Battery (CR2032)

Country of Manufacture : Japan
Receipt Date of Sample : May 7, 2003
Condition of EUT : Engineering prototype

2.2 Product Description

The control unit of the passive entry system is a transmitter of 125kHz and a receiver of 433.92MHz.
The hand unit of passive entry system is a transmitter of 433.92MHz and a receiver of 125kHz.
These units are the new type of keyless entry system which communicates with each other.

*1) See reference our test report No. 23IE0015-HO-2.

UL Apex Co., Ltd.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

SECTION 3: Test specification, procedures and results**3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C
 Title : FCC 47CFR Part15 Radio Frequency Device
 Subpart C Intentional Radiators
 Section 15.231 Periodic operation in the band 40.66-40.70 MHz and above 70 MHz

Test Specification : FCC Part 15 Subpart B Section 15.109 Radiated emission limits
 Title : FCC 47CFR Part15 Radio Frequency Device
 Subpart B Unintentional Radiators

3.2 Methods & Procedures

No.	Item	Test Procedure	Specification	Remarks
1	Automatically deactivate	ANSI C63.4:2001	FCC Section 15.231(a)(1)	Radiated
2	Electric Field Strength of Fundamental Emission	ANSI C63.4:2001	FCC Section 15.231(b)	Radiated
3	Electric Field Strength of Spurious Emission	ANSI C63.4:2001	FCC Section 15.205 FCC Section 15.209 FCC Section 15.231(b)	Radiated
4	-20dB Bandwidth	ANSI C63.4:2001	FCC Section 15.231(c)	Radiated
5	Radiated emission	ANSI C63.4:2001	FCC Section 15.109(a)	Radiated
6	Conducted Emission	ANSI C63.4:2001	FCC Section 15.107(a) and 207	AC Mains only

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

3.3 Exclusion from standard

No.	Item	Test Procedure	Specification	Remarks
6	Conducted Emission	ANSI C63.4:2001	FCC Section 15.107(a) and 207	-

This test is not applicable since the EUT does not have AC power port.

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

4.1 Operating Modes

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to typical use.

The operating mode/system were as follows:

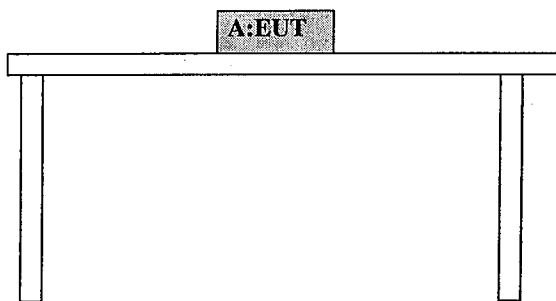
Operation mode is as follows;

- Transmitting mode
- Receiving mode

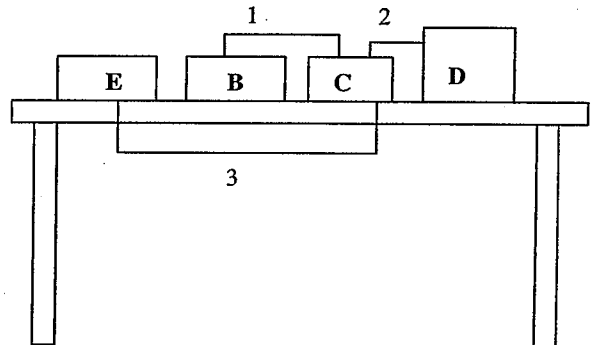
Justification: The system was configured in typical fashion (as a customer would normally use it) for testing.

4.2 Configuration and peripherals

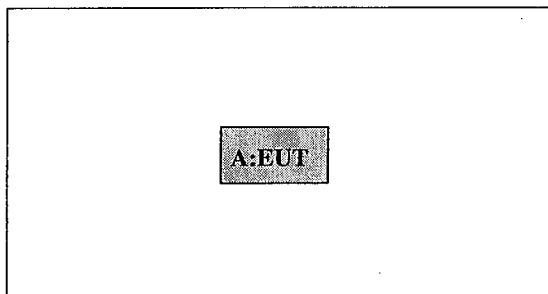
Front View (Hand Unit)



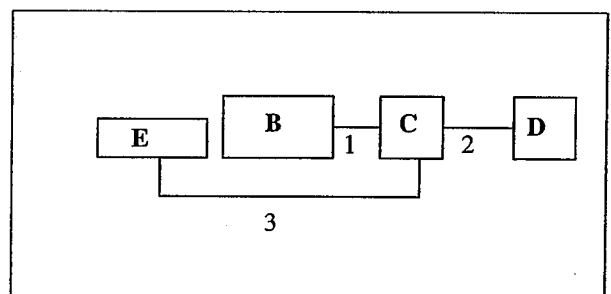
Front View (Control Unit)



Top View (Hand Unit)



Top View (Control Unit)



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(Hand Unit)

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	FCC ID
A	Hand Unit	TFWB1U614	1	TOHOKU ALPS	NHVWBU614

(Control Unit)

Description of EUT and Support Equipment

No.	Item	Model number	Serial number	Manufacturer	FCC ID
B	Control Unit	TFWD1U614	1	TOHOKU ALPS	NHVWBU614
C	Checker Box	N/A	N/A	TOHOKU ALPS	-
D	Car Battery	50B24L	N/A	YUASA	-
E	Bar antenna	-	-	-	-

List of cables used

No.	Name	Length (m)	Shield	Remark
1	Signal & DC Power Cable	0.5	N	-
2	DC Power Cable	0.5	N	-
3	Antenna Cable	1.2	N	-

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SECTION 5: Summary of test results

5.1 Test results

No.	Item	Test Procedure	Specification	Remarks	Result
1	Automatically deactivate	ANSI C63.4:2001	FCC Section 15.231(a)(1)	Radiated	Complied
2	Electric Field Strength of Fundamental Emission	ANSI C63.4:2001	FCC Section 15.231(b)	Radiated	Complied
3	Electric Field Strength of Spurious Emission	ANSI C63.4:2001	FCC Section 15.205 FCC Section 15.209 FCC Section 15.231(b)	Radiated	Complied
4	-20dB Bandwidth	ANSI C63.4:2001	FCC Section 15.231(c)	Radiated	Complied
5	Radiated emission	ANSI C63.4:2001	FCC Section 15.109(a)	Radiated	Complied

5.2 Confirmation

UL Apex Co., Ltd. hereby confirms that E.U.T., in the configuration tested, complies with the specifications FCC Part 15 Subpart C Section 15.231 and FCC Part 15 Subpart B Section 15.109(a)

5.3 Uncertainty

Radiated Emission Test

The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is ± 4.5 dB.

The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is ± 5.2 dB.

The measurement uncertainty (with a 95% confidence level) for this test using Horn Antenna is ± 6.6 dB.

☐ The result is within Head Office EMC lab's uncertainty.

☒ The data listed in this test report has enough margin.

5.4 Test Location

UL Apex Co., Ltd. EMC Head Office Division. No.1 and No.2 semi anechoic chambers.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone: +81 596 24 8116 Facsimile: +81 596 24 8124

This site has been fully described in a report submitted to FCC office, and listed on February 01, 2002 / June 05, 2002 (Registration number: 313583 / 846015).

*NVLAP Lab. code: 200572-0

5.5 Photographs of test setup, Data of EMI Test and Test instruments

Refer to Appendix 1 to 3.

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Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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SECTION 6: Radiated emissions and -20dB Bandwidth and Automatically deactivate

6.1 Operating environment

The test was carried out in No.1 and No.2 semi anechoic chamber.

Temperature : See data
Humidity : See data

Test Procedure

EUT was placed on a platform of nominal size, 1m by 1m, raised 80cm above the conducting ground plane.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization.

The Radiated Electric Field Strength intensity has been measured on No.1 and No.2 semi anechoic chambers with a ground plane and at a distance of 3m.

The measuring antenna height was varied between 1 to 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 EUT was also previously checked at each position of three axes X, Y and Z to find the worst position. The position in which the maximum noise occurred was chosen to put into measurement. Worst cases are referred to following page.

It was operated under transmitting mode.

The radiated emission measurement were made with the following function of the test receiver and spectrum analyzer.

433.92MHz Transmitting mode

Measurement range : 30MHz to 1000MHz QP Detector, IF BW 120kHz (Test receiver)

: 1GHz to 4.5GHz PK Detector, RBW 1MHz, VBW 1MHz(Spectrum analyzer)

Test data : 30MHz -4.5GHz : Page 14 (APPENDIX 3)

Test result : Pass

125kHz Receiving mode

Measurement range : 30MHz to 1000MHz CISPR QP Detector, IF BW 120kHz (Test receiver)

Test data : 30MHz -1000MHz : Page 15 (APPENDIX 3)

Test result : Pass

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6.2 -20dB Bandwidth (Reference data)

Bandwidth Limit: Fundamental Frequency $433.92\text{MHz} \times 0.25\% = 1084.8\text{kHz}$

Bandwidth Limit	measurement data (20dB down) Center Freq: 433.92MHz	Result
-20dB Bandwidth	78.47kHz	Pass

Test data : Page 16 (APPENDIX 3)

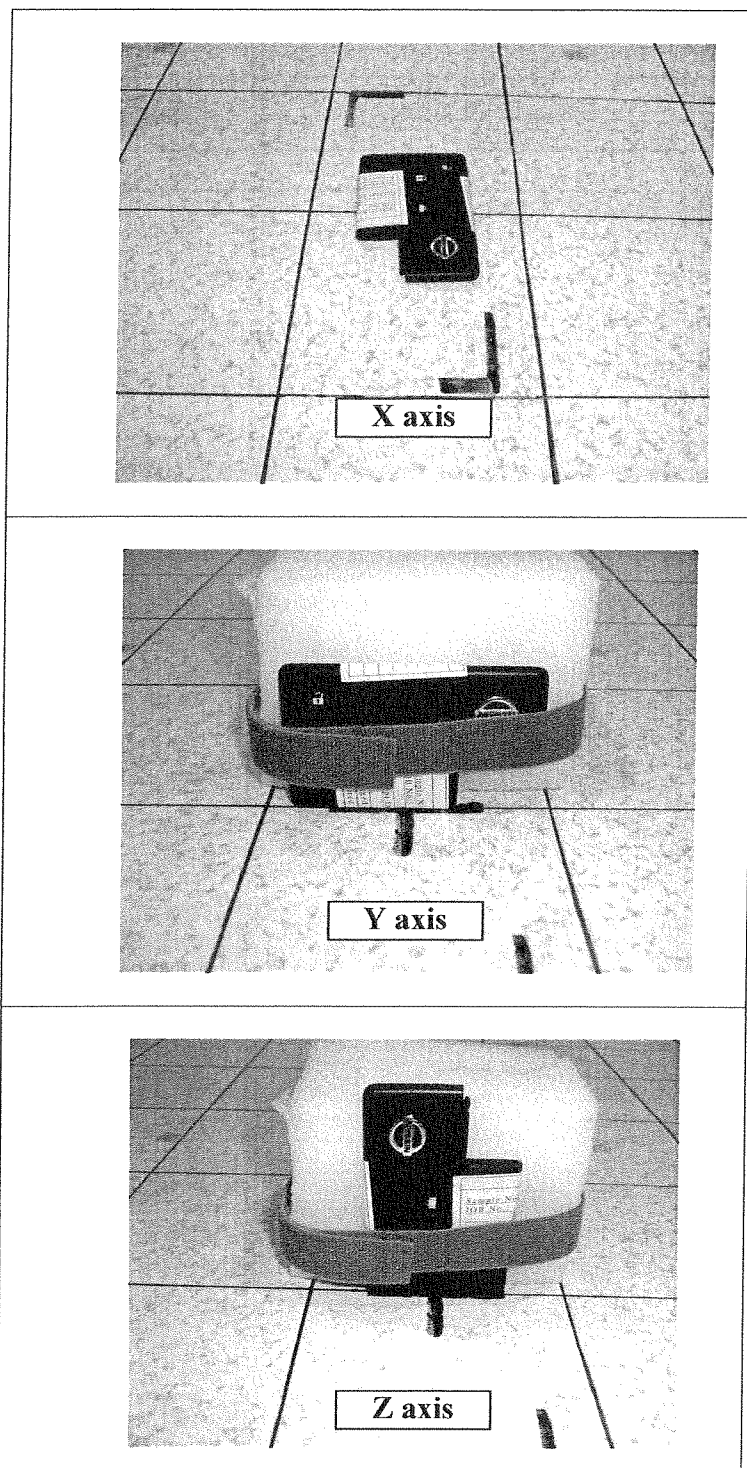
6.3 Automatically deactivate

Limit: A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

Test data : Page 16 (APPENDIX 3)

Test result : Pass (372.7ms)

Pre check of worse-case position



**Worse case X axis (Measurement Biconical antenna Polarization :Horizontal)
And Worst case Z axis (Measurement Biconical antenna Polarization: Vertical)**

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Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

Contents of Appendixes

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APPENDIX 2: Test instruments

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APPENDIX 3: Data of EMI test

Page 14-15 : Radiated emissions (Radiated)

Page 16 : -20dB Bandwidth

Page 17 : Automatically deactivate

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Head Office EMC Lab.

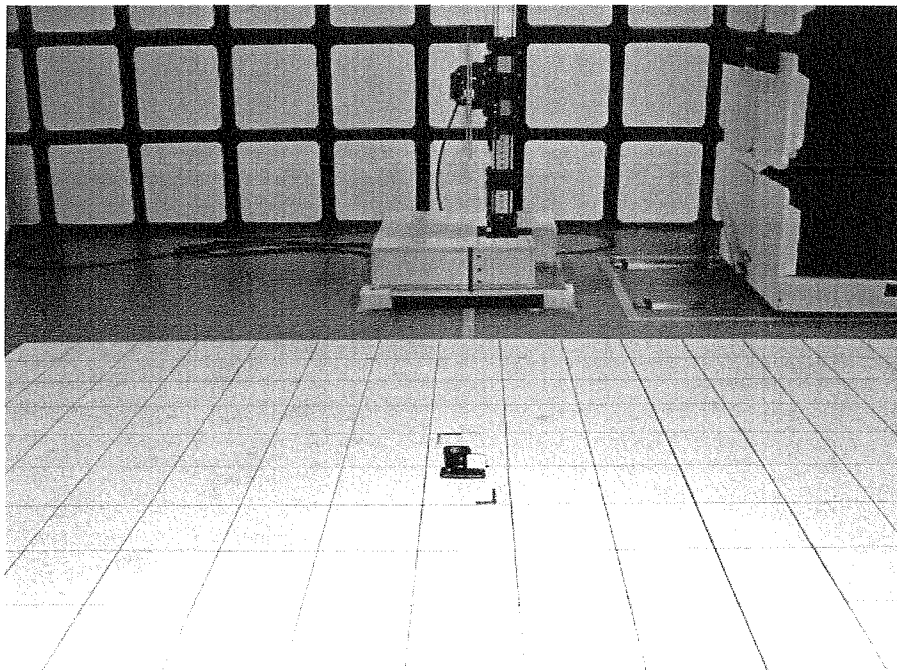
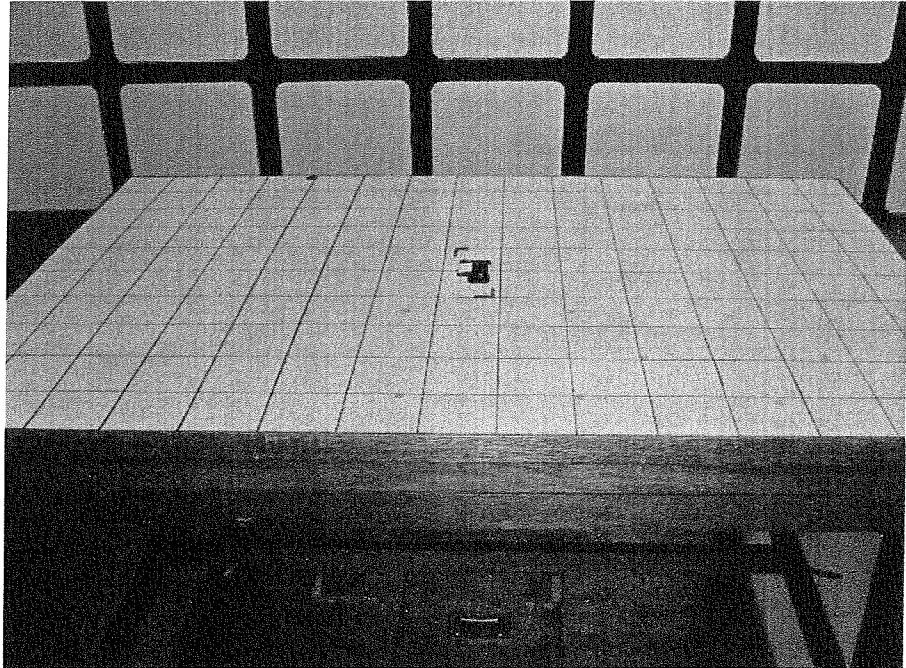
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Facsimile : +81 596 24 8124

APPENDIX 1: Photographs of test setup

Radiated emission



Test Report No : 23IE0032-HO ~ 1

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 / CE	2002/12/28 * 12
MAT-06	Attenuator(6dB)	Weinschel Corp	2	RE	2002/12/24 * 12
MBA-01	Biconical Antenna	Schwarzbeck	BBA9106	RE	2002/10/16 * 12
MLA-01	Logperiodic Antenna	Schwarzbeck	USLP9143	RE/RS	2002/10/16 * 12
MOS-01	Digital Humidity Indicator	N.T	NT-1800		2002/12/10 * 12
MPA-02	Pre Amplifier	Agilent	87405A	RE	2003/04/17 * 12
MTR-01	Test Receiver	Rohde & Schwarz	ES140	RE / CE	2002/11/01 * 12
MAEC-02	Anechoic Chamber	TDK	Semi Anechoic Chamber 3m	RE / CE	2003/04/11 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	RE	2002/12/24 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	MCC-12-01(8D-2W15m), MCC-12-02(5D-2W-0.7), MCC-12-03(5D-2W-0.8), MCC-12-04(5D-2W-1m), MCC-12-05(RF SW), MCC-12-06(RF SW), ※ MCC-12-07(5D-2W-0.4m)5/8追加	RE	2003/05/08 * 12
MCC-13	Coaxial Cable	Fujikura/Agilent	-	CE	2003/05/08 * 12
MOS-02	Digital Humidity Indicator	N.T	NT-1800	RE	2002/12/10 * 12
MPA-04	Pre Amplifier	Agilent	8447D	RE	2003/03/13 * 12
MTR-02	Test Receiver	Rohde & Schwarz	ESCS30	RE/CE	2003/01/31 * 12
SA-07	Spectrum Analyzer	Advantest	R3273	RE / CE	2002/12/10 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	RE	2002/10/16 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	RE	2002/10/16 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	RE	2002/12/13 * 12
MPSU-01	Power Supply	Rohde & Schwarz	HZ-9	EMI	Pre Check
MCB-01	Car Battery	Panasonic	B19L	RE	Pre Check

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

Test Item:

CE: Conducted emission,

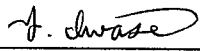
RE: Radiated emission,

DATA OF RADIATED EMISSIONS

UL APex Co., Ltd.
EMC HEAD OFFICE DIVISION No.1 SEMI ANECHOIC CHAMBER

COMPANY : TOHOKU ALPS CO., LTD.
EQUIPMENT : Keyless Entry System (Hand Unit)
MODEL : TFWB1U614
S/N : 1
FCC ID : NHVWBU614
POWER : DC3.0V
Mode : Transmitting

REPORT NO : 23IE0015-HO-1
REGULATION : Fcc Part15 Subpart C 231(b) / 205
TEST DISTANCE : 3m
DATE : 2003/05/26
TEMPERATURE : 25°C
HUMIDITY : 32%


ENGINEER : Yoshiaki Iwasa

Below 1GHz PK/QP DETECT (Test Receiver: BW 120kHz)

Above 1GHz PK/AV DETECT (Spectrum Analyzer : RBW 1MHz and VBW 1MHz)

No.	FREQ [MHz]	T/R READING : PK		ANT Factor [dB]	AMP GAIN [dB]	LOSS [dB]	Duty Factor [dB]	RESULT		Limit [dBuV/m]	MARGIN	
		HOR	VER					HOR	VER		HOR	VER
		[dBuV/m]	[dBuV/m]					[dBuV/m]	[dBuV/m]		[dB]	[dB]
0	433.92	46.26	46.6	17.7	27.5	9.0	0.0	45.5	45.8	80.8	35.3	35.0

No.	FREQ [MHz]	T/R READING : QP		ANT Factor [dB]	AMP GAIN [dB]	LOSS [dB]	Duty Factor [dB]	RESULT		Limit [dBuV/m]	MARGIN	
		HOR	VER					HOR	VER		HOR	VER
		[dBuV/m]	[dBuV/m]					[dBuV/m]	[dBuV/m]		[dB]	[dB]
1	867.80	29.6	26.5	22.7	27.0	9.7	0.0	35.0	31.9	60.8	25.8	28.9

No.	FREQ [MHz]	T/R READING : PK		ANT Factor [dB]	AMP GAIN [dB]	LOSS [dB]	Duty Factor [dB]	RESULT		Limit [dBuV/m]	MARGIN	
		HOR	VER					HOR	VER		HOR	VER
		[dBuV/m]	[dBuV/m]					[dBuV/m]	[dBuV/m]		[dB]	[dB]
2	1301.71	47.0	46.5	23.6	37.5	4.9	0.0	38.0	37.5	74.0	36.0	36.5
3	1735.56	48.0	47.9	27.3	37.1	5.5	0.0	43.7	43.6	80.8	37.1	37.2
4	2169.53	42.7	42.5	30.7	36.9	6.1	0.0	42.6	42.4	80.8	38.3	38.4
5	2603.38	43.2	44.1	31.1	37.0	6.5	0.0	43.8	44.7	80.8	37.0	36.1
6	3037.22	42.1	43.1	32.5	37.2	7.0	0.0	44.4	45.4	80.8	36.4	35.4
7	3471.27	43.5	43.2	31.3	37.0	7.5	0.0	45.3	45.0	80.8	35.5	35.9
8	3905.25	41.3	40.2	33.1	36.8	8.0	0.0	45.6	44.5	74.0	28.4	29.5
9	4339.00	40.5	40.8	33.4	36.9	8.4	0.0	45.4	45.7	74.0	28.6	28.3

No.	FREQ [MHz]	T/R READING : AV		ANT Factor [dB]	AMP GAIN [dB]	LOSS [dB]	Duty Factor [dB]	RESULT		Limit [dBuV/m]	MARGIN	
		HOR	VER					HOR	VER		HOR	VER
		[dBuV/m]	[dBuV/m]					[dBuV/m]	[dBuV/m]		[dB]	[dB]
10	1301.71	35.6	35.0	23.6	37.5	4.9	0.0	26.6	26.0	54.0	27.4	28.0
11	1735.56	36.8	36.7	27.3	37.1	5.5	0.0	32.5	32.4	60.8	28.3	28.4
12	2169.53	29.4	29.4	30.7	36.9	6.1	0.0	29.3	29.3	60.8	31.5	31.5
13	2603.38	29.8	29.7	31.1	37.0	6.5	0.0	30.4	30.3	60.8	30.4	30.5
14	3037.22	29.2	29.2	32.5	37.2	7.0	0.0	31.5	31.5	60.8	29.3	29.3
15	3471.27	30.8	30.1	31.3	37.0	7.5	0.0	32.6	31.9	60.8	28.2	28.9
16	3905.25	29.1	28.8	33.1	36.8	8.0	0.0	33.4	33.1	54.0	20.6	20.9
17	4339.00	28.6	28.9	33.4	36.9	8.4	0.0	33.5	33.8	54.0	20.5	20.2

REMARKS

ANTENNA TYPE: 30-300MHz Biconical / 300-1000MHz Logperiodic / 1-4.5GHz Horn

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

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

*The noise was measured at each position of all three axes X, Y and Z to compare the level, and the maximum noise.

DATA OF RADIATION TEST

UL Apex Co., Ltd. Head Office EMC Lab.
No.2 Semi Anechoic Chamber
Report No. : 231E0015-H0- 1

Applicant : ALPS ELECTRIC CO., LTD (TOHOKU ALPS CO., LTD)
Kind of Equipment : Keyless Entry system
Model No. : TFWB1U614
Serial No. : 1
Power : DC 3V
Mode : Rx
Remarks : X-axis, FCC ID: NHVWBU614, QP
Date : 5/29/2003
Test Distance : 3 m
Temperature : 25 °C
Humidity : 55 %
Regulation : FCC Part15B. 109(a)

Engineer : Yoshiaki Iwasa

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 [dB μ V]					HOR [dB μ V/m]	VER [dB μ V/m]		HOR [dB]	VER [dB]
1.	48.00	BB	20.3	20.4	11.7	27.9	0.8	6.0	10.9	11.0	40.0	29.1	29.0
2.	60.00	BB	23.3	24.6	8.2	27.7	0.9	6.0	10.7	12.0	40.0	29.3	28.0
3.	90.00	BB	20.0	20.0	7.7	27.2	1.1	6.1	7.7	7.7	43.5	35.8	35.8
4.	217.00	BB	19.1	19.1	16.5	26.7	2.0	6.0	16.9	16.9	46.0	29.1	29.1
5.	434.00	BB	20.1	20.1	17.7	27.5	0.8	6.2	17.3	17.3	46.0	28.7	28.7
6.	867.84	BB	21.0	21.0	21.8	28.5	1.6	6.1	22.0	22.0	46.0	24.0	24.0

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

Except for the above table:adequate margin data below the limits.
ANT.TYPE:30-300MHz Biconical, 300-1000MHz Logperiodic

DATA OF -20dB BANDWIDTH

UL Apex Co., Ltd.

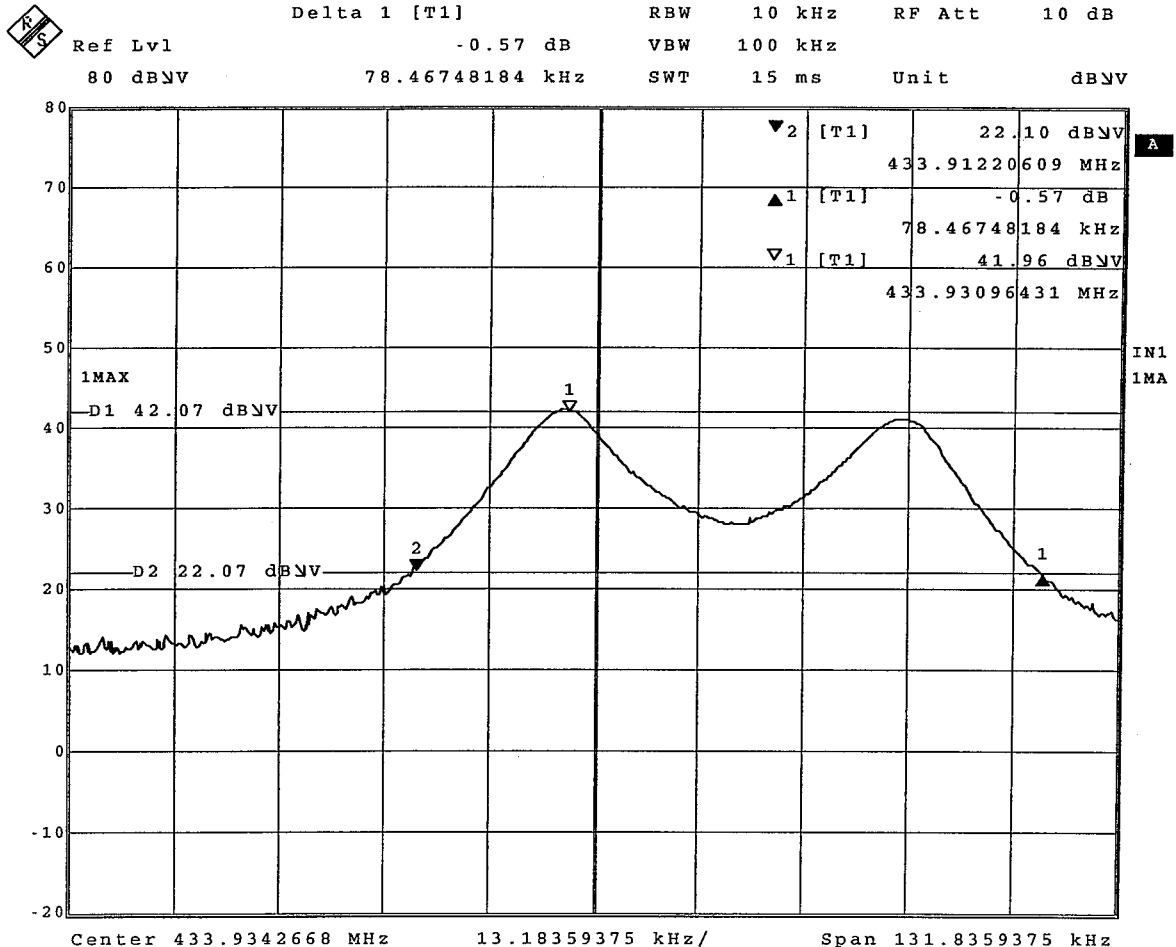
Head Office EMC Lab. No.1 Semi Anechoic Chamber

COMPANY : ALPS ELECTRIC CO.,LTD (TOHOKU ALPS CO.,LTD)	REPORT NO. : 23IE0015-HO- 1
EQUIPMENT : Hand Unit	REGULATION : Fcc Part15 Subpart C 231(b) / 205
MODEL : TFWB1U614	TEST DISTANCE : 3 m
S/N : 1	DATE : 05/26/2003
FCC ID : NHVWBU614	TEMPERATURE : 25°C
POWER : DC 3V	HUMIDITY : 52%
MODE : Transmitting	

Y. Iwase
Engineer : Yoshiaki Iwase

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

-20dB Bandwidth	Bandwidth Limit	Result
[kHz]	[kHz]	
78.47	1084.80	Pass



Date: 26.MAY.2003 15:54:23

DATA OF AUTOMATICALLY DEACTIVATE

UL Apex Co., Ltd.

Head Office EMC Lab. No.1 Semi Anechoic Chamber

COMPANY : ALPS ELECTRIC CO.,LTD (TOHOKU ALPS CO.,LTD)
 EQUIPMENT : Hand Unit
 MODEL : TFWBU614
 S/N : 1
 FCC ID : NHVWBU614
 POWER : DC3.0V
 Mode : Transmitting

REPORT NO : 23IE0015-HO- 1
 REGULATION : Fcc Part15 Subpart C 231(b) / 205
 TEST DISTANCE : 3 m
 DATE : 05/26/2003
 TEMPERATURE : 25°C
 HUMIDITY : 52%

J. Iwasa

ENGINEER : Yoshiaki Iwasa

Time of Transmitting [sec]	Limit [sec]	Result
0.55	5.00	Pass

