

EMI TEST REPORT

Test Report No. : 23EE0005-HO-2

Applicant : TOHOKU ALPS CO., LTD
CAR ELECTRONICS DIVISION

Type of Equipment : Passive Entry System

Model No. : TFWD1J441 (Control Unit)

FCC ID : NHVWDJ441

Test standard : FCC Part15 Subpart C 15.209 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 A-Pex International 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 : December 25, 2002

Tested by : 
Hiroka Umeyama
EMC Head Office Division

Approved by: 
Horonobu Shimoji
Group leader of EMC Head Office Division

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SECTION 1: Client information

Company name : TOHOKU ALPS CO., LTD CAR ELECTRONICS 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 : TOMOSUKE TAKATA

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

Type of Equipment : Passive Entry System

Tx section

Model No.	TFWB1J441 (Hand Unit)	TFWD1J441 (Control Unit) *1)
Sample No.	8	3
Number of Channel	1	1
Frequency Characteristics	312.125MHz	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.	TFWD1J441 (Control Unit) *1)	TFWB1J441 (Hand Unit)
Sample No.	3	4
Type of Receiver	Single Super Heterodyne	Turned Radio Frequency Receiver
Receiving Frequency	312.125 MHz	125kHz
Local Oscillator Frequency	322.825MHz	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 : December 17, 2002
Condition of EUT : Production model

2.2 Product Description

The control unit of the passive entry system is a transmitter of 125kHz and a receiver of 312.125MHz.
The hand unit of passive entry system is a transmitter of 312.125MHz 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. 23EE0005-HO-1.

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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 15.209 Radiated emission limits, general requirements.

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	Electric Field Strength of Fundamental Emission	ANSI C63.4:2001	FCC Section 15.209	Radiated
2	Electric Field Strength of Spurious Emission	ANSI C63.4:2001	FCC Section 15.205 FCC Section 15.209	Radiated
3	-20dB Bandwidth	ANSI C63.4:2001	Reference data	-
4	Radiated emission	ANSI C63.4:2001	FCC Section 15.109(a)	Radiated
5	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
5	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:

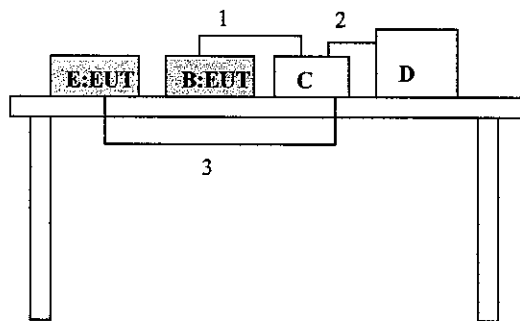
Operation mode is as follows;

- Transmitting mode
- Receiving mode

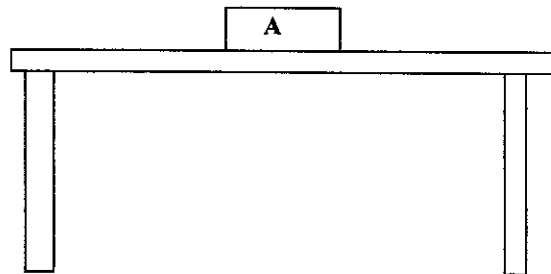
Justification: The system was configured in typical fashion (as a customer would normally use it) for testing.

4.2 Configuration and peripherals

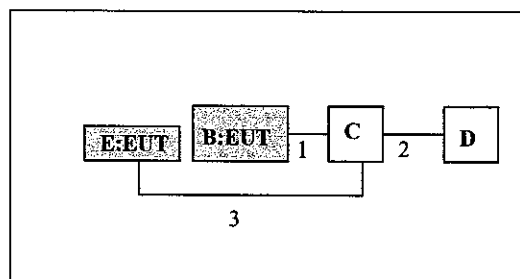
Front View (Control Unit)



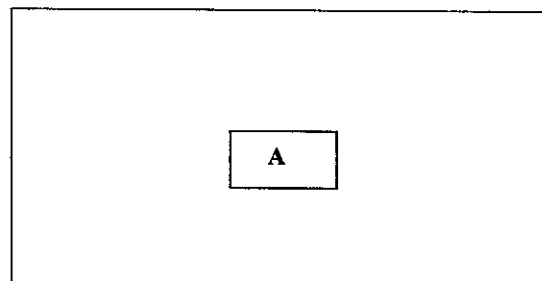
Front View (Hand Unit)



Top View (Control Unit)



Top View (Hand Unit)



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(Control Unit)

Description of EUT and Support Equipment

No.	Item	Model number	Serial number	Manufacturer	FCC ID
B	Passive Entry System (Control Unit)	TFWD1J441	3	TOHOKU ALPS	NHVWDJ441
C	Checker Box	N/A	N/A	OMRON Corporation	-
D	Car Battery	50B24L	N/A	YUASA	-
E	Bar antenna	TFWD1J441	3	SUMIDA	NHVWDJ441

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	-

(Hand Unit)

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	FCC ID
A	Passive Entry System (Hand Unit)	TFWB1J441	8,4	TOHOKU ALPS	NHVWBJ441

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SECTION 5: Summary of test results

5.1 Test results

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

5.2 Confirmation

A-Pex International Co., Ltd. hereby confirms that E.U.T., in the configuration tested, complies with the specifications FCC Part 15 Subpart C Section 15.209 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 Loop Antenna is $\pm 1.9\text{dB}$.

The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is $\pm 4.5\text{dB}$.

The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is $\pm 5.2\text{dB}$.

☒ The data listed in this test report may exceed the test limit because it does not have enough margin.

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

5.4 Test Location

A-Pex International Co., Ltd. EMC Head Office Division. No.1 and No.2 semi anechoic chambers.

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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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SECTION 6: Radiated emissions and -20dB Bandwidth

6.1 Operating environment

The test was carried out in 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.2 semi anechoic chamber 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(Hand) 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.

125kHz Transmitting mode

Measurement range : 9kHz to 90kHz AV/PK Detector, IF BW 200Hz (Test receiver)
: 90kHz to 110kHz CISPR QP Detector, IF BW 200Hz (Test receiver)
: 110kHz to 150kHz AV/PK Detector, IF BW 200Hz (Test receiver)
: 150kHz to 490kHz AV/PK Detector, IF BW 10kHz (Test receiver)
: 490kHz to 30MHz QP Detector, IF BW 10kHz (Test receiver)
: 30MHz to 1000MHz CISPR QP Detector, IF BW 120kHz (Test receiver)

Test data : 30MHz -3.2GHz : Page 13-14 (APPENDIX 3)

Test result : Pass

312.125MHz 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

6.2 -20dB Bandwidth (Reference data)

Fundamental Frequency 125kHz:

Test data : Page 16 (APPENDIX 3)

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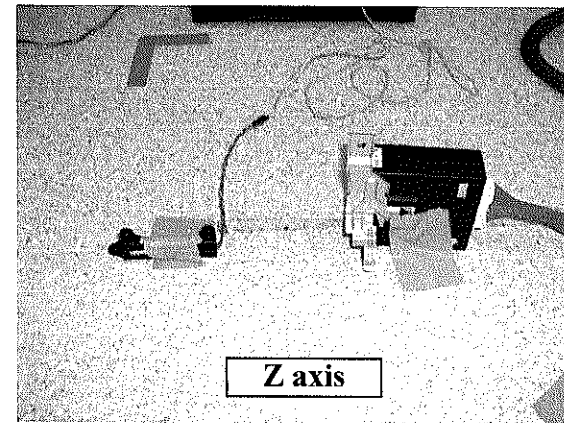
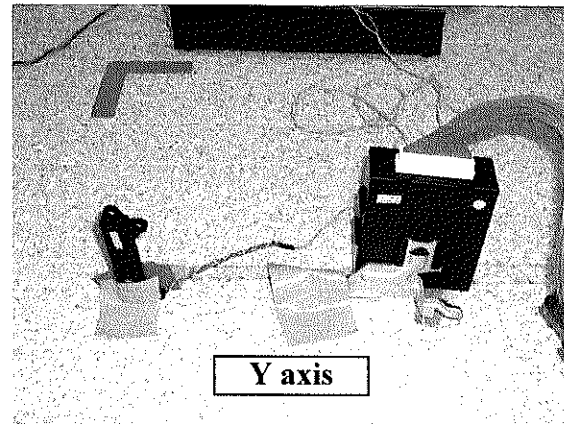
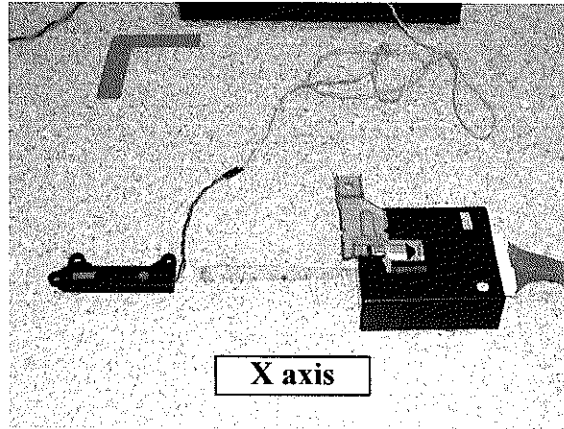
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6.4 Pre check of worse-case position



Worse case Z axis (9kHz – 30MHz, Measurement Loop antenna angle: 0deg)

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APPENDIX 1: Photographs of test setup

Page 11 : Radiated emission

APPENDIX 2: Test instruments

Page 12 : Test instruments

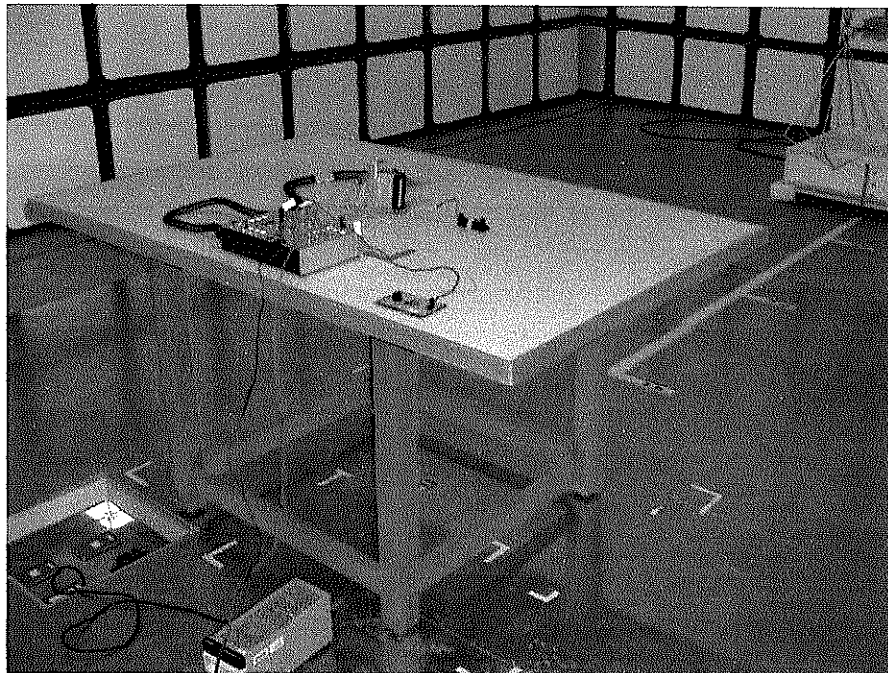
APPENDIX 3: Data of EMI test

Page 13-15 : Radiated emissions (Radiated)

Page 16 : -20dB Bandwidth

APPENDIX 1: Photographs of test setup

Radiated emission



Test Report No : 23EE0005-HO-2

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	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
MCC-01	Coaxial Cable	Suhner/storm/Agilent/TS J	MCC-01-01(421-014-10m) MCC-01-02(421-014-16m) MCC-01-03(421-014-7.5m) MCC-01-04(SF M86PE-15cm) MCC-01-05(876 5C,RF SWITCHER SW1-A) MCC-01-06(SF M141-15cm) MCC-01-07(SF M141-15cm) MCC-01-08(876 5C,RF SWITCHER SW2-A) MCC-01-09(876 5C,RF SWITCHER SW3-A) MCC-01-10(421-010-1m)	RE	2002/12/19 * 12
MLA-01	Logperiodic Antenna	Schwarzbeck	USLP9143	RE	2002/10/16 * 12
MPA-02	Pre Amplifier	Agilent	87405A	RE	2002/12/26 * 12
MAEC-02	Anechoic Chamber	TDK	Semi Anechoic Chamber 3m	RE	2002/04/12 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	RE	2002/12/24 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	RE	2002/05/02 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	MCC-12-01(8D-2W-15m) MCC-12-02(5D-2W-0.7m) MCC-12-05(RF SW) MCC-12-03(5D-2W-0.8m) MCC-12-06(RF SW) MCC-12-04(5D-2W-1m)	RE	2002/05/09 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	RE	2002/05/02 * 12
MPA-04	Pre Amplifier	Agilent	8447D	RE	2002/03/13 * 12
SA-07	Spectrum Analyzer	Advantest	R3273	RE	2002/12/10 * 12
MTR-02	Test Receiver	Rohde & Schwarz	ESCS30	RE	2002/10/11 * 12
MHA-05	Horn Antenna	Schwarzbeck	BBHA9120D	RE	2003/01/11 * 12
MCC-05	Microwave Cable	Storm	421-011	RE	2003/01/14 * 12
MCC-06	Microwave Cable	Storm	421-011	RE	2003/01/14 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	RE	2002/12/13 * 12
MCC-07	coaxial cable	-	-	RE	2002/02/08 * 12
MCC-08	coaxial cable	-	-	RE	2002/02/08 * 12

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

Test Item:

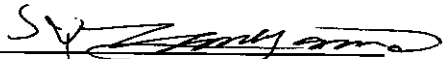
RE: Radiated emission

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

A-Pex International Co., Ltd.
Head office No.2 Semi Anechoic Chamber

Company : TOHOKU ALPS CO., LTD.
Equipment : Passive Entry System (Control Unit)
Model : TFWD1J441
Sample No. : 3
Power : DC12.0V
Mode : Transmitting (125kHz)
Temperature : 22deg.C
Humidity : 37%

Report No. : 23EE0005-HO-2
Regulation : FCC Part15C Section 15.209
Test Distance : 3m
Date : 2002/12/25
FCC ID : NHVWDJ441


ENGINEER : Hiroka Umeyama

No.	FREQ [kHz]	Loop Max Angle [deg]	detector	T/R	ANT Factor [dB]	ATTEN [dB]	CABLE LOSS [dB]	AMP GAIN [dB]	RESULT	LIMIT	MARGIN
			type	READING [dBuV]					[dBuV/m]	[dBuV/m]	[dB]
1	125.00	0	PK	113.6	19.9	0.0	0.3	26.7	107.1	125.7	18.6
2	125.00	0	AV	95.2	19.9	0.0	0.3	26.7	88.7	105.7	17.0
3	250.00	0	PK	75.3	19.9	0.0	0.6	27.5	68.3	119.6	51.3
4	250.00	0	AV	52.7	19.9	0.0	0.6	27.5	45.7	99.6	53.9
5	375.00	0	PK	67.9	19.9	0.0	0.7	27.9	60.6	116.1	55.5
6	375.00	0	AV	50.7	19.9	0.0	0.7	27.9	43.4	96.1	52.7
7	500.00	0	QP	50.7	19.9	0.0	0.5	28.0	43.1	73.6	30.5
8	625.00	0	QP	52.6	19.9	0.0	0.5	28.0	45.0	71.7	26.7
9	750.00	0	QP	36.3	19.9	0.0	0.5	28.1	28.6	70.1	41.5
10	875.00	0	QP	47.1	19.9	0.0	0.5	28.1	39.4	68.8	29.4
11	1000.00	0	QP	33.9	19.8	0.0	0.5	28.1	26.1	67.6	41.5
12	1125.00	0	QP	42.6	19.8	0.0	0.5	28.1	34.8	66.6	31.8
13	1250.00	0	QP	33.5	19.8	0.0	0.5	28.1	25.7	65.7	40.0

REMARKS

ANTENNA TYPE : 10kHz-30MHz (Loop Antenna)

CALCULATION: READING + ANT Factor + ATTEN + Cable Loss - AMP Gain

For fundamental, the measured field strength was extrapolated to distance 300m, using the formula that field strength varies as the inverse distance square (40dB per decade of distance).

Sample calculation:

Peak: $102.2\text{dBuV/m} - 40\log(300/3) = 102.2 - 80 = 22.2\text{dBuV/m}$ at 300m

Limits for fundamental (section 15.209(a)) $= 20\log(2400/125) + 20 = 45.7\text{dBuV/m}$

Average: $76.7\text{dBuV/m} - 40\log(300/3) = 76.7 - 80 = -3.3\text{dBuV/m}$ at 300m

Limits for fundamental (section 15.209(a)) $= 20\log(2400/125) = 25.7\text{dBuV/m}$

Limit: (9kHz - 490kHz): $2400/\text{Freq}$ (Converted dBuV/m) + $40\log(300/3)$

Limit: (490kHz - 1.705MHz): $24000/\text{Freq}$ (Converted dBuV/m) + $40\log(30/3)$

Limit: (1.705MHz - 30MHz): 30 (Converted dBuV/m) + $40\log(30/3)$

All other spurious emissions are more than 20dB below the limits.

DATA OF RADIATION TEST

A-Pex International Co., Ltd.
No.2 SEMI ANECHOIC CHAMBER
Report No. : 23EE0005-H0 = 2

Applicant : Tohoku Alps Co., Ltd.
Kind of Equipment : Passive Entry System
Model No. : TFWB1J441
Serial No. : 3
Power : DC12V
Mode : Receiving(125kHz)
Remarks : FCC ID:NHVWDJ441 Detector:QP
Date : 12/25/2002
Test Distance : 3 m
Temperature : 22 °C
Humidity : 37 %
Regulation : FCC Part15C § 15.209(a)


Engineer : Hiroka Umeyama

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 [dB μV]					HOR [dB μV/m]	VER [dB μV/m]		HOR [dB]	VER [dB]
1.	30.00	BB	34.0	38.5	18.8	27.5	0.7	5.8	31.8	36.3	40.0	8.2	3.7
2.	51.17	BB	43.7	40.1	12.2	27.4	0.8	5.8	35.1	31.5	40.0	4.9	8.5
3.	82.00	BB	32.0	38.3	8.0	27.1	1.0	5.8	19.7	26.0	40.0	20.3	14.0
4.	140.00	BB	25.3	25.8	15.1	26.5	1.3	5.8	21.0	21.5	43.5	22.5	22.0
5.	155.00	BB	28.6	26.4	15.3	26.4	1.4	5.8	24.7	22.5	43.5	18.8	21.0
6.	190.00	BB	21.3	35.2	17.1	26.1	1.6	5.8	19.7	33.6	43.5	23.8	9.9
7.	218.00	BB	29.3	24.6	17.7	26.2	1.7	5.8	28.3	23.6	46.0	17.7	22.4
8.	360.00	BB	26.7	28.6	16.1	26.7	2.3	5.7	24.1	26.0	46.0	21.9	20.0
9.	409.80	BB	25.2	21.1	17.4	27.1	2.5	5.8	23.8	19.7	46.0	22.2	26.3
10.	509.00	BB	23.0	22.4	18.6	27.6	2.7	5.8	22.5	21.9	46.0	23.5	24.1

CALCULATION: READING[dB μV] + ANT.FACTOR[dB/m] + CABLE LOSS[dB] - AMP.GAIN[dB] + ATTEN[dB].

All other spurious emissions were less than 20dB for the limit.

ANT.TYPE : 30-300MHz Biconical, 300-1000MHz Logperiodic, 1000MHz- Horn

DATA OF RADIATION TEST

A-Pex International Co., Ltd.
No.2 SEMI ANECHOIC CHAMBER
Report No. : 23EE0005-H0- 2

Applicant : Tohoku Alps Co., Ltd.
Kind of Equipment : Passive Entry System
Model No. : TFWD1J441
Serial No. : 3
Power : DC12V
Mode : Receiving(312.125MHz)
Remarks : FCC ID:NHVWDJ441 Detector:QP
Date : 12/25/2002
Test Distance : 3 m
Temperature : 22 °C
Humidity : 37 %
Regulation : FCC Part15B. 109(a)

Engineer :  Hiroka Umeyama

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.	32.00	BB	21.4	26.6	18.1	27.5	0.7	5.8	18.5	23.7	40.0	21.5	16.3
2.	88.00	BB	22.5	21.1	8.2	27.0	1.1	5.8	10.6	9.2	40.0	29.4	30.8
3.	125.00	BB	20.9	20.3	13.3	26.7	1.2	5.8	14.5	13.9	43.5	29.0	29.6
4.	177.50	BB	19.9	20.1	16.5	26.2	1.5	5.8	17.5	17.7	43.5	26.0	25.8
5.	210.00	BB	19.6	19.7	17.6	26.2	1.7	5.8	18.5	18.6	43.5	25.0	24.9
6.	322.83	BB	36.9	29.1	15.1	26.3	2.1	5.7	33.5	25.7	46.0	12.5	20.3
7.	645.65	BB	21.1	22.1	19.1	27.7	3.3	5.8	21.6	22.6	46.0	24.4	23.4
8.	968.48	BB	29.9	29.8	22.8	27.0	4.0	5.7	35.4	35.3	54.0	18.6	18.7

CALCULATION: $\text{READING}[\text{dB } \mu \text{V}] + \text{ANT. FACTOR}[\text{dB/m}] + \text{CABLE LOSS}[\text{dB}] - \text{AMP. GAIN}[\text{dB}] + \text{ATTEN}[\text{dB}]$.

All other spurious emissions were less than 20dB for the limit.

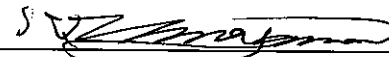
ANT. TYPE : 30-300MHz Biconical, 300-1000MHz Logperiodic, 1000MHz- Horn

-20dB Bandwidth

A-Pex International Co., Ltd.
Head office No.2 Semi Anechoic Chamber

Company : TOHOKU ALPS CO., LTD.
Equipment : Passive Entry System (Control Unit)
Model : TFWD1J441
Sample No. : 3
Power : DC12.0V
Mode : Transmitting (125kHz)
Temperature : 22deg.C
Humidity : 37%

Report No. : 23EE0005-HO - 2
Regulation : FCC Part15C Section 15.209
Test Distance : 3m
Date : 2002/12/25
FCC ID : NHVWDJ441


ENGINEER : Hiroka Umeyama

