

EMI TEST REPORT

Test Report No. : 23EE0005-HO-1

Applicant : TOHOKU ALPS CO., LTD
CAR ELECTRONICS DIVISION

Type of Equipment : Passive Entry System

Model No. : TFWB1J441(Hand Unit)

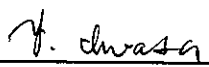
FCC ID : NHVWBJ441

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 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 19, 20, 23, 24 and 25, 2002

Tested by : 
Yoshiaki Iwasa
EMC Head Office Division

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

A-Pex International Co., Ltd.

EMC Head Office Division.

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

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

CONTENTS

	PAGE
SECTION 1: Client information	3
SECTION 2: Equipment under test (E.U.T.)	3
SECTION 3: Test specification, procedures and results	4
SECTION 4: Operation of E.U.T. during testing	5
SECTION 5: Summary of test results	7
SECTION 6: Radiated emissions and -20dB Bandwidth and Automatically deactivate	8
APPENDIX 1: Photographs of test setup	11
APPENDIX 2: Test instruments	11
APPENDIX 3: Data of EMI test	11

A-Pex International Co., Ltd.

EMC Head Office Division.

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

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

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-2.

A-Pex International Co., Ltd.

EMC Head Office Division.

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.

A-Pex International Co., Ltd.

EMC Head Office Division.

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

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

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:

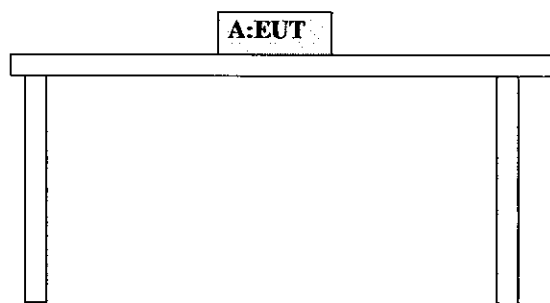
Operation mode is as follows;

- Transmitting mode
- Receiving mode

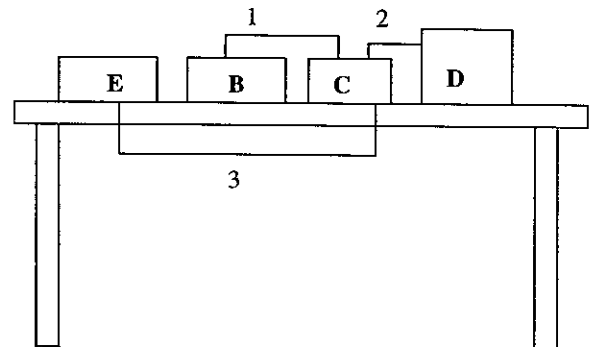
Justification: The system was configured in typical fashion (as a customer would normally use it) for testing.

4.2 Configuration and peripherals

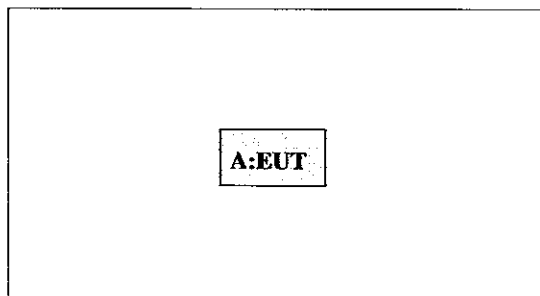
Front View (Hand Unit)



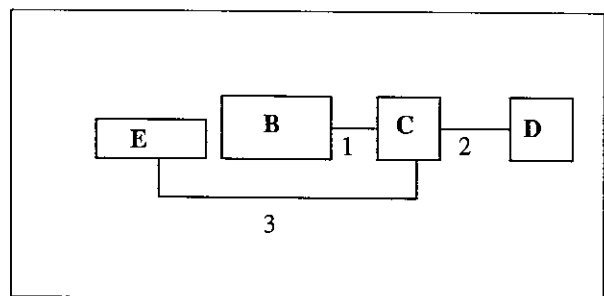
Front View (Control Unit)



Top View (Hand Unit)



Top View (Control Unit)



A-Pex International Co., Ltd.

EMC Head Office Division.

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

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

(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

(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	-

A-Pex International Co., Ltd.

EMC Head Office Division.

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

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

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

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 15.231 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 $\pm 4.5\text{dB}$.
The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is $\pm 5.2\text{dB}$.
The measurement uncertainty (with a 95% confidence level) for this test using Horn Antenna is $\pm 6.6\text{dB}$.
☐ 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.
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.

A-Pex International Co., Ltd.

EMC Head Office Division.

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

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

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

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.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(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.

312.125MHz Transmitting mode

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

: 1GHz to 3.2GHz PK Detector, RBW 1MHz, VBW 1MHz(Spectrum analyzer)

Test data : 30MHz -3.2GHz : 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

A-Pex International Co., Ltd.

EMC Head Office Division.

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

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

6.2 -20dB Bandwidth (Reference data)

Bandwidth Limit: Fundamental Frequency $312.125\text{MHz} \times 0.25\% = 780.3\text{kHz}$

Bandwidth Limit	measurement data (20dB down) Center Freq: 312.125MHz	Result
-20dB Bandwidth	104.9kHz	Pass

Test data : Page 16 (APPENDIX 3)

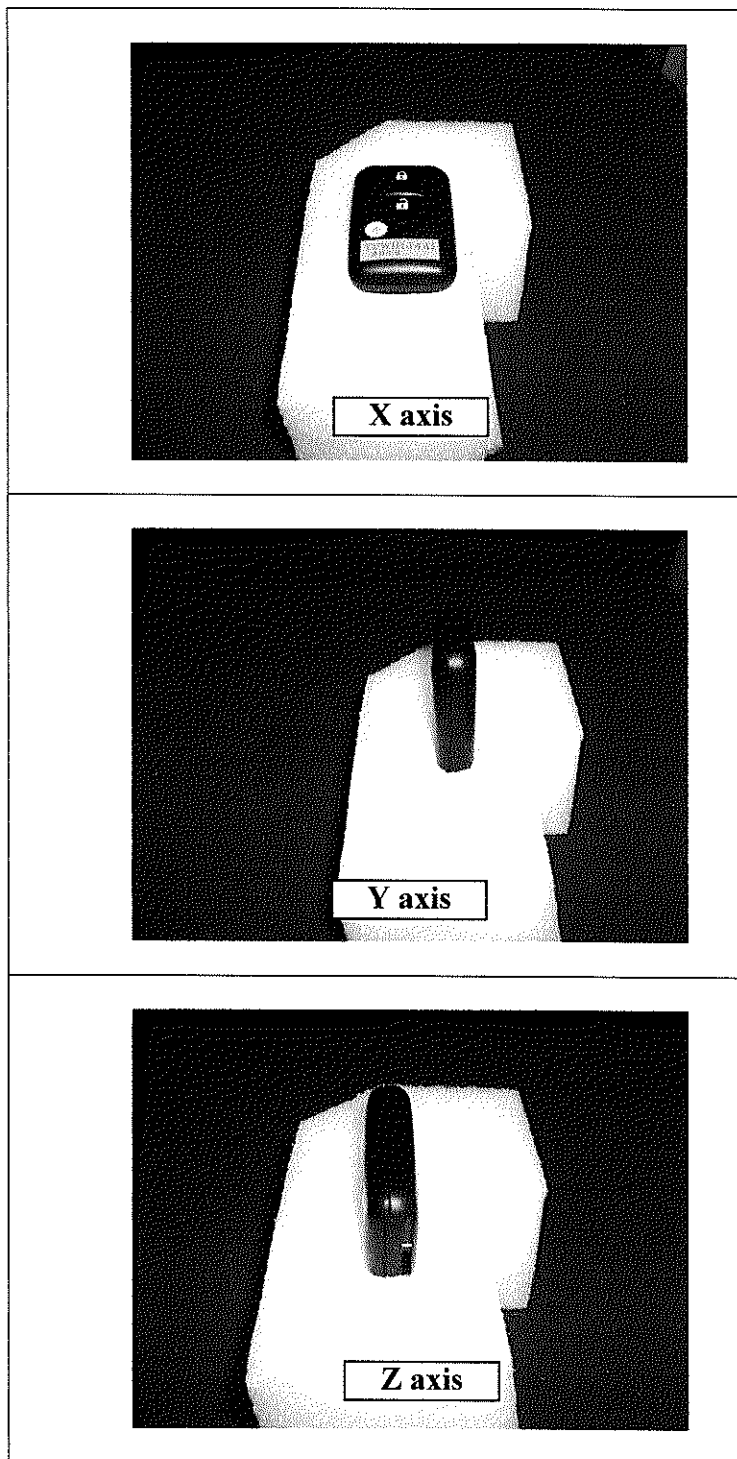
6.3 Automatically deactivate

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)

A-Pex International Co., Ltd.
EMC Head Office Division.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8116
Facsimile : +81 596 24 8124

APPENDIX 1: Photographs of test setup

Page 12 : Radiated emission

APPENDIX 2: Test instruments

Page 13 : Test instruments

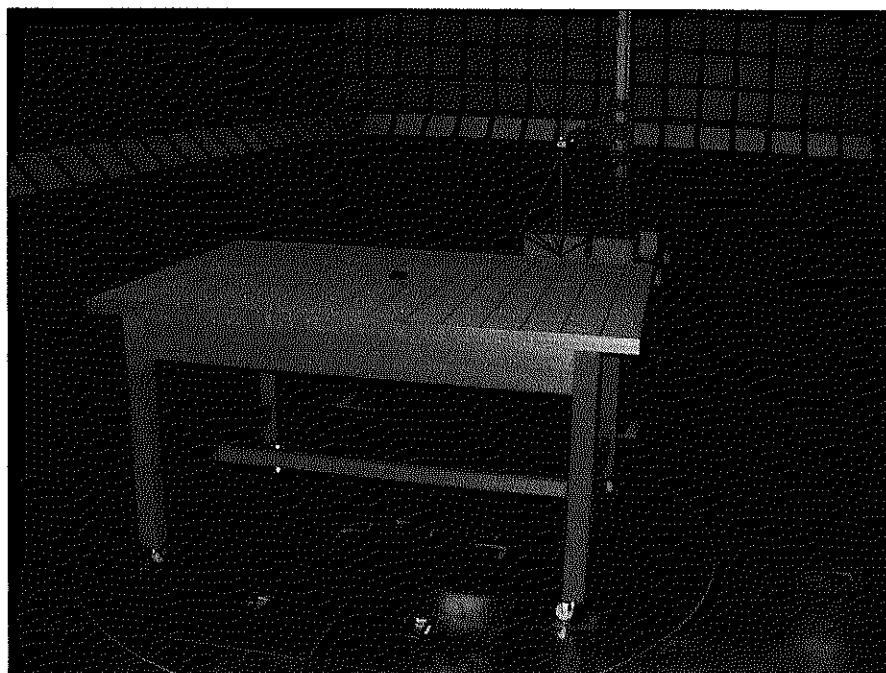
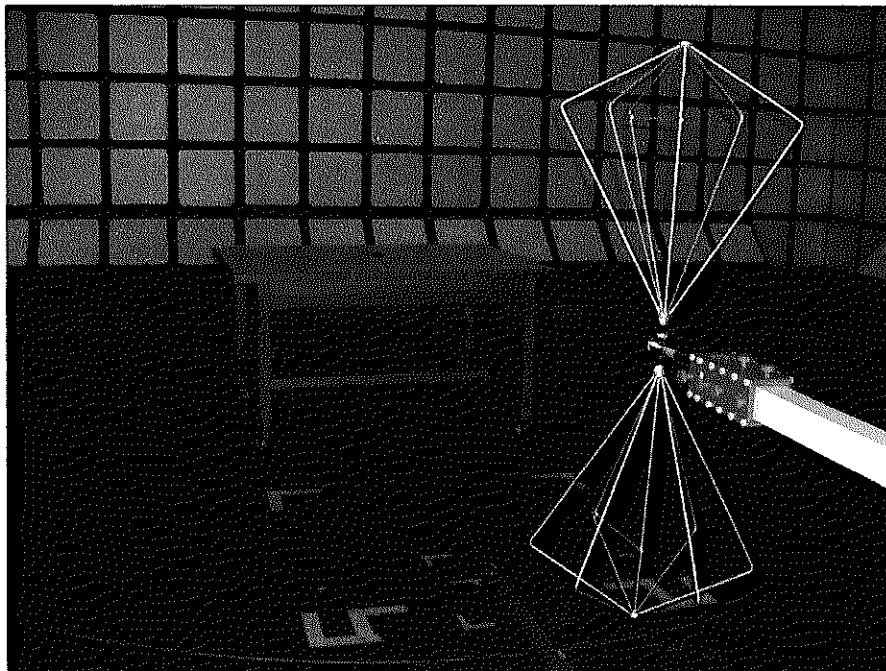
APPENDIX 3: Data of EMI test

Page 14-15 : Radiated emissions (Radiated)

Page 16 : -20dB Bandwidth/Automatically deactivate

APPENDIX 1: Photographs of test setup

Radiated emission



Test Report No : 23EE0005-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	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/TSJ	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

DATA OF RADIATED EMISSIONS

A-Pex International Co., Ltd.
EMC HEAD OFFICE DIVISION No.1 SEMI ANECHOIC CHAMBER

COMPANY : TOHOKU ALPS CO., LTD.
EQUIPMENT : Passive Entry System (Hand Unit)
MODEL : TFWB1J441
S/N : 8
FCC ID : NHVWB1441
POWER : DC3.0V
Mode : Transmitting(X-axis)

REPORT NO : 23EE0005-HO-1
REGULATION : Fcc Part15 Subpart C 231(b) / 205
TEST DISTANCE : 3m
DATE : 2002/12/20
TEMPERATURE : 25°C
HUMIDITY : 32%

ENGINEER : Yoshiaki Iwasa

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]			[dB]	[dB]
1	312.11	51.9	41.6	14.8	23.8	9.7	0.0	52.6	42.3	75.4	22.8	33.1
2	312.16	52.6	41.7	14.8	23.8	9.7	0.0	53.3	42.4	75.4	22.1	33.0

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]			[dB]	[dB]
3	624.24	43.3	32.2	19.8	24.0	11.5	0.0	50.6	39.5	55.4	4.8	15.9
4	624.34	41.4	32.6	19.8	24.0	11.5	0.0	48.7	39.9	55.4	6.7	15.5
5	936.42	20.0	20.0	22.7	27.0	9.7	0.0	25.4	25.4	55.4	30.0	30.0

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]			[dB]	[dB]
6	1248.54	47.5	47.1	25.2	37.3	3.4	0.0	38.8	38.4	75.4	36.6	37.0
7	1248.79	47.0	46.5	25.7	37.1	3.7	0.0	39.4	38.9	75.4	36.1	36.6
8	1560.70	44.3	44.9	26.3	36.9	4.1	0.0	37.8	38.4	74.0	36.2	35.6
9	1560.97	50.4	48.0	27.0	36.8	4.7	0.0	45.3	42.9	74.0	28.7	31.1
10	1872.86	44.5	44.3	27.7	36.7	5.3	0.0	40.8	40.6	75.4	34.6	34.8
11	2184.77	46.9	45.7	28.1	36.8	5.8	0.0	44.0	42.8	75.4	31.4	32.6
12	2496.88	46.8	46.3	28.4	36.8	6.2	0.0	44.6	44.1	74.0	29.4	29.9
13	2808.99	48.4	46.3	28.4	36.8	6.2	0.0	46.2	44.1	74.0	27.8	29.9
14	3121.10	44.5	44.3	28.4	36.8	6.2	0.0	42.3	42.1	75.4	33.1	33.3

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]			[dB]	[dB]
15	1248.54	37.1	36.0	25.2	37.3	3.4	0.0	28.4	27.3	55.4	27.0	28.1
16	1248.79	36.4	34.8	25.7	37.1	3.7	0.0	28.8	27.2	55.4	26.7	28.3
17	1560.70	32.0	32.0	26.3	36.9	4.1	0.0	25.5	25.5	54.0	28.5	28.5
18	1560.97	43.4	38.0	27.0	36.8	4.7	0.0	38.3	32.9	54.0	15.7	21.1
19	1872.86	31.9	31.8	27.7	36.7	5.3	0.0	28.2	28.1	55.4	27.2	27.3
20	2184.77	34.9	33.2	28.1	36.8	5.8	0.0	32.0	30.3	55.4	23.4	25.1
21	2496.88	34.8	33.6	28.4	36.8	6.2	0.0	32.6	31.4	54.0	21.4	22.6
22	2808.99	38.4	34.5	28.4	36.8	6.2	0.0	36.2	32.3	54.0	17.8	21.7
24	3121.10	32.2	31.8	28.4	36.8	6.2	0.0	30.0	29.6	55.4	25.4	25.8

REMARKS

ANTENNA TYPE:30-300MHz Biconical / 300-1000MHz Logperiodic / 1-3.2GHz 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

A-Pex International Co., Ltd.
No.2 SEMI ANECHOIC CHAMBER
Report No. : 23EE0005-H0-1

Applicant : Tohoku Alps Co., Ltd.
Kind of Equipment : Passive Entry System
Model No. : TFWB1J441
Serial No. : 4
Power : DC 3.0V
Mode : Receiving
Remarks : DETECTOR : QP, X-axis
Date : 12/24/2002
Test Distance : 3 m
Temperature : 27 °C
Humidity : 33 %
Regulation : FCC Part15B CLASS B

y. chrisa
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.	100.00	BB	20.0	21.0	10.7	26.9	1.1	5.8	10.7	11.7	43.5	32.8	31.8
2.	150.00	BB	21.1	21.0	15.2	26.5	1.3	5.8	16.9	16.8	43.5	26.6	26.7
3.	200.00	BB	20.9	20.3	17.4	26.1	1.7	5.8	19.7	19.1	43.5	23.8	24.4
4.	400.00	BB	20.0	20.1	17.3	27.0	2.5	5.8	18.6	18.7	46.0	27.4	27.3
5.	600.00	BB	20.2	20.3	19.1	27.7	3.1	5.8	20.5	20.6	46.0	25.5	25.4
6.	900.00	BB	20.5	20.7	22.7	27.1	4.0	5.7	25.8	26.0	46.0	20.2	20.0

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

DATA OF RADIATED EMISSIONS

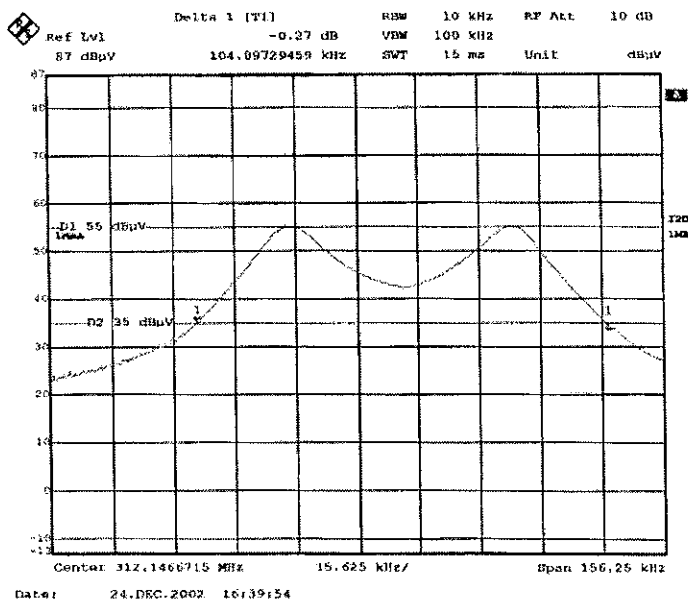
A-Pex International Co., Ltd.
EMC HEAD OFFICE DIVISION No.1 SEMI ANECHOIC CHAMBER

COMPANY : TOHOKU ALPS CO., LTD.
EQUIPMENT : Passive Entry System (Hand Unit)
MODEL : TFWBJ441
S/N : 4
FCC ID : NHVWBJ441
POWER : DC3.0V
Mode : Transmitting(X-axis)

REPORT NO : 23EE0005-HO-1
REGULATION : Fcc Part15 Subpart C 231(b) / 205
TEST DISTANCE : 3m
DATE : 2002/12/20
TEMPERATURE : 25°C
HUMIDITY : 32%

Y. Iwasa
ENGINEER : Yoshiaki Iwasa

-20dB bandwidth



Automatically deactivate (15.231(a)(1))

