



EMI TEST REPORT

Test Report No.: 23HE0104-HO-2

Applicant : TAKARA Co.,LTD.
Type of Equipment : Bowlingual
Model No. : 65000
Test standard : FCC Part 15 Subpart C Section 15.249
FCC ID : Q8H65000
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 30, 2003

Tested by : 

Yoshiaki Iwasa
EMC Section

Approved by : 

Hironobu Shimoji
Group Leader of EMC Section

UL Apex Co., Ltd.

Head Office EMC Lab.

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SECTION 1: Client information

Company name : TAKARA Co.,LTD.
Brand name : TAKARA
Address : AOTO4-19-16,KATSUSHIKA-KU,TOKYO,JAPAN
Telephone Number : +81 3 3603 2145
Facsimile Number : +81 3 3603 2180
Contact Person : OVERSEAS R&D,INTERNATIONAL DIVISION
MANAGER Mr.OSAMU FUKUI

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

2.1 Identification of E.U.T.

Type of Equipment : Bowlingual
Model No. : 65000
Serial No. : 18
Rating : DC1.5V/DC 6V
Country of Manufacture : China
Receipt Date of Sample : May 20, 2003
Condition of EUT : Engineering prototype

2.2 Product Description

TAKARA Co.,LTD., Model:65000 is Bowlingual. Clock frequency is 1MHz for TX UNIT and 24MHz for RX UNIT.

The specification is as following;

Carrier Frequency : CH10:927MHz
Type of Modulation : FM
Antenna Type : $1/4 \lambda$
Bandwidth & channel spacing : 230kHz / 1MHz
ITU code : F3E
Transmit power or power range : -7dBm
Duty cycle : 100%
Mode of operation : Simplex
Method of Frequency Generation : Synthesizer
Operating voltage : 1.0 - 1.6V
Operating temperature range : 0 - 40deg.C.

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SECTION 3: Test specification, procedures and results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C Section 15.249
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.249 Operation within the bands 902-928MHz, 2400-2483.5MHz,
5725-5785MHz and 24.0-24.25GHz

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Deviation	Worst margin	Results
1	Conducted Emission	ANSI C63.4:2001	Section 15.207(a)	N/A	N/A *1)	N/A
2	Radiated Emission	ANSI C63.4:2001	Section 15.249(a), (c), (d), (e) *2)	N/A	Fundamental 14.8dB(927MHz, Vertical) Spurious 5.8dB(1854MHz, Vertical)	Complied
3	-26dB Bandwidth	ANSI C63.4:2001	- *3)	N/A	N/A	N/A

*1)The test is not applicable since the EUT does not have AC Mains.
*2)The test is not applicable for Section 15.249(b).
*3) The test was performed as the additional testing.

3.3 Confirmation

UL Apex Co., Ltd. hereby confirms that E.U.T. , in the configuration tested, complies with the specifications FCC Part15 Subpart C Section 15.249.

3.4 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, more than the site margin.

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3.5 Test Location

UL Apex Co., Ltd. Head Office EMC Lab. No.2 semi anechoic chamber, 7.5 x 5.8 x 5.2m.
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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
June 05, 2002 (Registration number: 846015).

*NVLAP Lab. code: 200572-0

3.6 Test setup, Test instruments and Data of EMI

Refer to Appendix 1 to 3.

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

4.1 Operating Modes

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

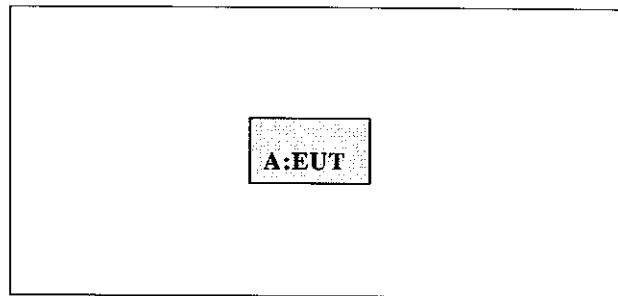
The operating mode/system was as follows:

Operation mode : TX UNIT:Continuous transmitting
*TX UNIT: Continuous transmitting after the power was supplied.

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

4.2 Configuration and peripherals

Top View



* Test data was taken under worse case conditions.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remark
A	TX UNIT	65000	18	TAKARA Co.,LTD.	EUT FCC ID : Q8H65000

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SECTION 5: Radiated emission (Fundamental and Spurious Emission)

5.1 Operating environment

The test was carried out in a No.2 semi anechoic chamber, 7.5 x 5.8 x 5.2m.

Temperature : See data
Humidity : See data

5.2 Test configuration

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane. The EUT was set on the center of the tabletop and the rear peripheral was aligned and flushed with rear of tabletop. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength. A drawing of the set up is shown in the photos of APPENDIX 1.

5.3 Test conditions

Frequency range : 30MHz - 300MHz(Biconical antenna) / 300MHz - 1000MHz(Logperiodic antenna) / 1GHz - 10GHz(Horn antenna)
Test distance : 3m
EUT position : Tabletop
EUT operation mode : TX UNIT:Continuous transmitting

5.4 Test procedure

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. Measurements were performed with a quasi-peak detector, average detector or peak detector. 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 radiated emission measurements were made with the following detector function of the test receiver.

	Below 1GHz	Above 1GHz
Detector Type	Quasi-Peak/Average/ Peak	Average/Peak
IF Bandwidth	120kHz	1MHz

5.5 Results

Summary of the test results: Pass

Date: May 26 and 29, 2003

Tested by: Yoshiaki Iwasa

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

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APPENDIX 2: Test instruments

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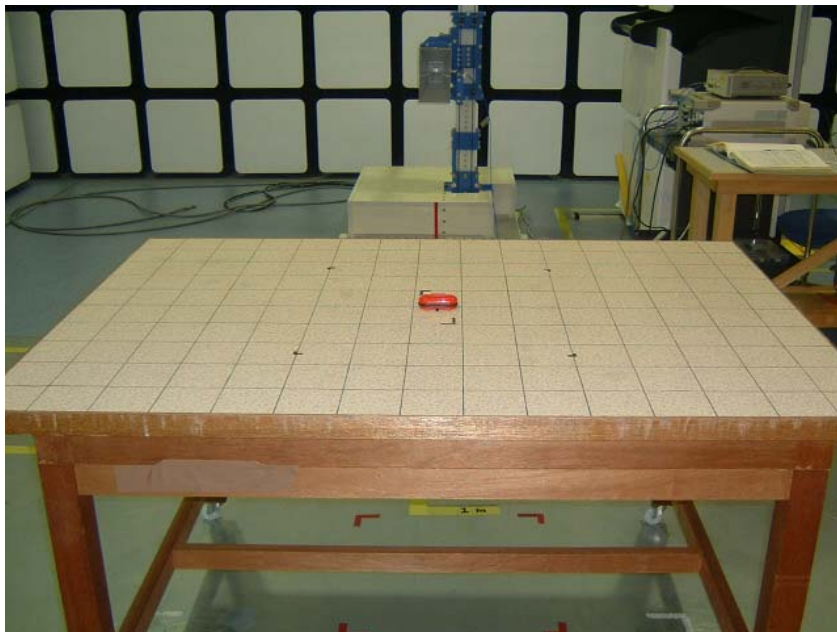
APPENDIX 3: Data of EMI test

Page 11 : Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)

Page 12 : -26dB Bandwidth

APPENDIX 1: Photographs of test setup

Radiated Emission



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APPENDIX 2

Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Test Item	Calibration Date * Interval(month)
MAEC-02	Anechoic Chamber	TDK	Semi Anechoic Chamber 3m	RE	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
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	2003/01/31 * 12
SA-07	Spectrum Analyzer	Advantest	R3273	RE	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
MHA-05	Horn Antenna	Schwarzbeck	BBHA9120D	RE	2003/01/11 * 12
MPA-01	Pre Amplifier	Agilent	8449B	RE	2003/02/08 * 12
MCC-11	Microwave coaxial cable	Suhner	SUCOFLEX 104	RE	2003/03/27 * 12
MCC-24	Microwave Cable	Storm	-	RE	2003/04/30 * 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 SPURIOUS EMISSIONS(30MHz to 10GHz)

UL Apex Co., Ltd.

Head Office EMC Lab. No.2 Semi Anechoic Chamber

COMPANY : TAKARA Co.,LTD.

EQUIPMENT : Bowlingual

MODEL : 65000

S/N : No.18

FCC ID : Q8H65000

POWER : DC 1.5V/DC6V

MODE : Tx (927MHz) (Continuance transmitting)

AXIS : Hor: Y-axis , Ver: Z-axis

REPORT NO : 23HE0104-HO - 2

REGULATION : FCC Part 15 Subpart C 15.249

TEST DISTANCE : 3m

DATE : 5/26/2003 5/30/2003

TEMPERATURE : 25°C 27°C

HUMIDITY : 48% 50%

ENGINEER : Yoshiaki Iwasa

(Below 1GHz)

(BW: 120kHz)

No.	FREQ [MHz]	T/R READING		ANT Factor [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	Band-Pass Filter [dB]	RESULT		Limit [dBuV/m]	MARGIN	
		HOR	VER					HOR	VER		HOR	VER
1	927.0	79.5	80.7	22.6	28.6	4.6	0.0	78.1	79.3	-	-	-
1	927.0	79.0	80.2	22.6	28.6	4.6	0.0	77.6	78.8	94.0	16.4	15.2
1	927.0	79.4	80.6	22.6	28.6	4.6	0.0	78.0	79.2	94.0	16.0	14.8

PK
QP
AV

(Above 1GHz)

PK DETECT

(RBW: 1MHz, VBW: 1MHz)

No.	FREQ [MHz]	S/A READING		ANT Factor [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	Band-Pass Filter [dB]	RESULT		Limit [dBuV/m]	MARGIN	
		HOR	VER					HOR	VER		HOR	VER
1	1482.5	49.1	49.4	24.2	37.3	3.5	0.0	39.5	39.8	74.0	34.5	34.2
2	1854.0	58.9	60.8	28.8	37.0	3.9	0.0	54.6	56.5	74.0	19.4	17.5
3	2781.0	49.1	49.7	31.8	37.1	4.7	0.0	48.6	49.1	74.0	25.4	24.9
4	3708.0	48.2	48.0	32.2	36.9	5.6	0.0	49.1	48.9	74.0	24.9	25.1
5	4635.0	45.7	45.9	34.2	36.9	6.3	0.0	49.2	49.4	74.0	24.8	24.6
6	5562.0	45.0	45.6	36.3	36.4	6.9	0.0	51.8	52.4	74.0	22.2	21.6
7	6489.0	45.4	45.8	38.4	36.6	7.3	0.0	54.6	55.0	74.0	19.4	19.0
8	7416.0	45.3	45.1	38.0	36.6	7.7	0.0	54.4	54.1	74.0	19.6	19.9
9	8343.0	45.2	44.6	37.4	37.0	8.1	0.0	53.7	53.1	74.0	20.3	20.9
10	9270.0	45.3	44.5	37.6	37.0	8.7	0.0	54.6	53.8	74.0	19.4	20.2

AV DETECT

(RBW: 1MHz, VBW: 10Hz)

No.	FREQ [MHz]	S/A READING		ANT Factor [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	Band-Pass Filter [dB]	RESULT		Limit [dBuV/m]	MARGIN	
		HOR	VER					HOR	VER		HOR	VER
1	1482.5	38.7	39.7	24.2	37.3	3.5	0.0	29.1	30.1	54.0	24.9	23.9
2	1854.0	52.4	52.5	28.8	37.0	3.9	0.0	48.1	48.2	54.0	5.9	5.8
3	2781.0	41.1	41.8	31.8	37.1	4.7	0.0	40.5	41.2	54.0	13.5	12.8
4	3708.0	38.0	40.0	32.2	36.9	5.6	0.0	38.8	40.9	54.0	15.2	13.1
5	4635.0	33.4	33.8	34.2	36.9	6.3	0.0	36.9	37.3	54.0	17.1	16.7
6	5562.0	32.9	33.1	36.3	36.4	6.9	0.0	39.7	39.9	54.0	14.3	14.1
7	6489.0	33.0	33.1	38.4	36.6	7.3	0.0	42.1	42.2	54.0	11.9	11.8
8	7416.0	33.1	33.1	38.0	36.6	7.7	0.0	42.1	42.1	54.0	11.9	11.9
9	8343.0	32.5	32.6	37.4	37.0	8.1	0.0	41.0	41.1	54.0	13.0	12.9
10	9270.0	32.5	32.6	37.6	37.0	8.7	0.0	41.8	41.9	54.0	12.2	12.1

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

*2: In the frequency over the fourth harmonic, the noise from the EUT was not seen. The data above is its base noise.

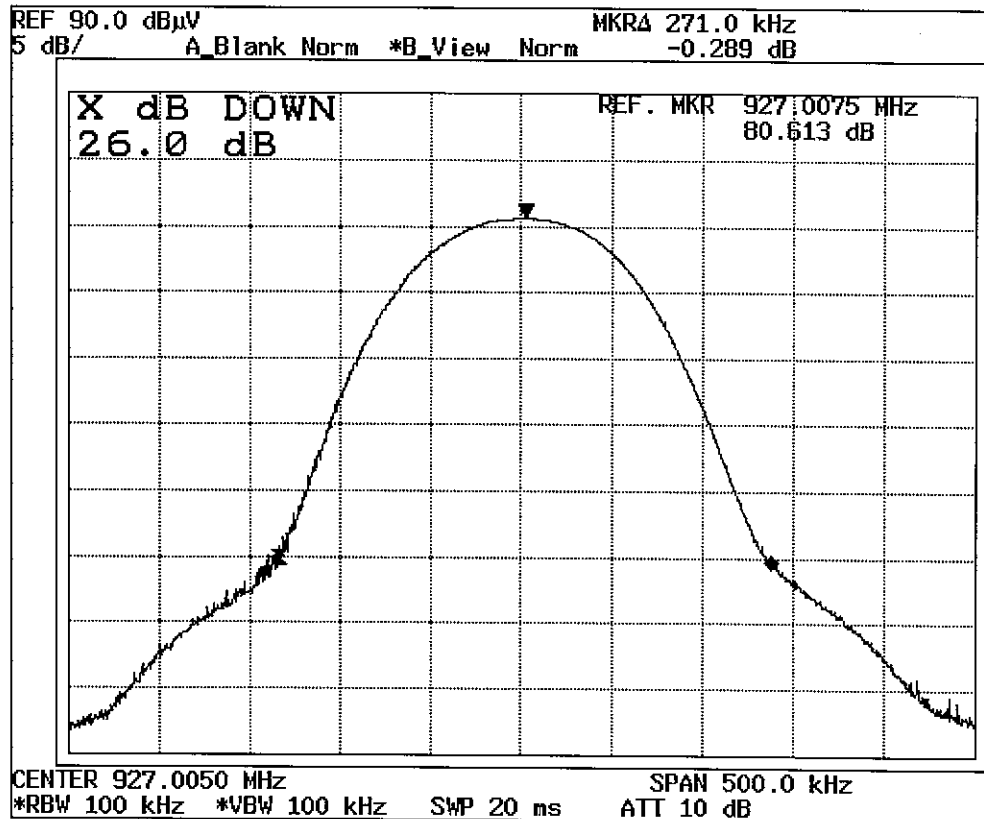
*3: Test distance 3meters RESULT=Reading + ANT Factor - Amp Gain + CABLE LOSS + Band Pass.

*4: EUT was placed in X axis when the measurement antenna was positioned horizontally.

*5: EUT was placed in Y axis when the measurement antenna was positioned vertically.

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

-26dB Bandwidth:TX(927MHz)



Frequency : 927MHz = -26dB Band width : 271kHz