



EMI TEST REPORT

Test Report No. : 24HE0054-HO-2

Applicant : Matsushita Electric Industrial Co., Ltd.
Type of Equipment : RF Unit of
KEYLESS ACCESS SYSTEM
Model No. : EUE24B
Test standard : FCC Part 15 Subpart C 2004
Section 15.209, Section 15.231
FCC Part 15 Subpart B 2004
Section 15.109
FCC ID : ACJ8D8-EUE24B
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:

July 20, 2004

Tested by:

Makoto Kosaka
EMC Service

Approved by :

Hironobu Shimoji
Group Leader of
EMC Service

UL Apex Co., Ltd.

Head Office EMC Lab.

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

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CONTENTS

PAGE

SECTION 1: Client information.....	3
SECTION 2: Equipment under test (E.U.T.)	3
SECTION 3: Test specification, procedures & results	4
SECTION 4: Operation of E.U.T. during testing.....	7
SECTION 5: Radiated Emission (Fundamental and Spurious Emission)	8
APPENDIX 1: Photographs of test setup.....	9
Radiated Emission(Worst case position)	9
APPENDIX 2:Test Instruments.....	10
APPENDIX 3: Data of EMI test	11
Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission).....	11
Duty Factor and Automatically deactivate.....	12
-20dB Bandwidth	13
99%Occupied Bandwidth	14
Radiated Emission (Receiving).....	15

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SECTION 1: Client information

Company Name : Matsushita Electric Industrial Co., Ltd.
Address : 1006 Oaza Kadoma Kadoma Osaka 571-8501 Japan
Telephone Number : +81-585-32-4709
Facsimile Number : +81-585-34-1310
Contact Person : Yoshio Takahashi, Group Manager

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

2.1 Identification of E.U.T.

Type of Equipment : RF Unit of KEYLESS ACCESS SYSTEM
Model No. : EUE24B
Sample No. : 1
Country of Manufacture : JAPAN
Receipt Date of Sample : June 14, 2004
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)

2.2 Product Description

Model No: EUE24B is the KEYLESS REMOTE of KEYLESS ACCESS SYSTEM.
The clock frequency of EUT is 60.24MHz

Equipment Type : Transceiver
Power Supply : DC 5.0V

Transmitter Section

Frequency operation	311.9MHz
Type of modulation	FSK
Information antenna	Internal / Reverse F Antenna
Communication Device	Keyless Remote (FCC ID: ACJ8D8E24A04)

Receiver Section

	Receiver Section 1
Receiving frequency	311.9MHz
Receiver type	Super heterodyne
Intermediate frequency	10.7MHz
Local oscillator frequency	301.2MHz
Information antenna	Internal / Reverse F Antenna
Communication Device	Keyless Remote (FCC ID: ACJ8D8E24A04)

FCC 15.31 (e)

This EUT provides stable voltage(DC5.0V) constantly to RF Unit regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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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 15.231 Periodic operation in the band 40.66-40.70MHz
and above 70MHz

Test Specification : FCC Part 15 Subpart B 2004
Section 15.109 Radiated emission limits
Title : FCC 47CFR Part15 Radio Frequency Device
Subpart B Unintentional Radiators

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Deviation	Worst margin	Results
1	Automatically Deactivate	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.231(a)(2)	N/A	-	Complied *1)
2	Electric Field Strength of Fundamental Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.231(b)	N/A	8.9dB(AV(Pulse)) 311.933MHz Horizontal	Complied
3	Electric Field Strength of Spurious Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.205 Section 15.209 Section 15.231(b)	N/A	9.3dB(AV) 3.11936GHz Horizontal	Complied
4	-20dB Bandwidth	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.231(c)	N/A	-	Complied
5	Conducted emission AC Mains	ANSI C63.4:2003 7. AC powerline conducted emission measurements	Section 15.207	N/A*2)	N/A	N/A

Note: UL Apex's EMI Work procedures No. QPM05

*1) EUT has the specification of Automatically cease within 5 seconds.

*2) The test is not applicable since the EUT is DC drive and is not connected to the public utility (AC) power line.

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2) FCC Part15 Subpart B : 2004

No.	Item	Test Procedure	Specification	Remarks	Worst margin	Result
1	Radiated Emission	ANSI C63.4: 2003 8. Radiated emission measurements	FCC Section 15.109(a)	Radiated	13.4 dB(PK) 1807.2MHz Vertical	Complied
2	Conducted Emission	ANSI C63.4: 2003 7. AC powerline conducted emission measurements	FCC Section 15.107(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.

3.3 Addition to standards

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99% Occupied Band Width	RSS-210(issue 5): 2001 + Amendment:2002 + Amendment2:2003 + Amendment3:2004	RSS-210(issue 5): 2001 + Amendment:2002 + Amendment2:2003 + Amendment3:2004	Conducted	N/A	N/A	N/A

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 data listed in this test report has enough margin.

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3.5 Test Location

UL Apex Co., Ltd. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
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	Listed date (for FCC)	FCC Registration Number	IC Registration 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

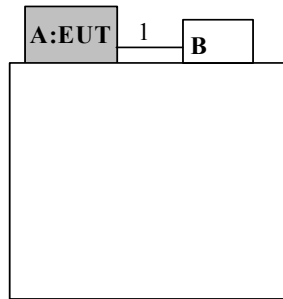
Refer to APPENDIX 1 to 3.

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

4.1 Operating Modes

The mode is used : Transmitting mode and Receiving mode (311.9MHz)
*a) As for 311.9MHz mode, the test was made with the continuous receiving mode (intentionally).

4.2 Configuration and peripherals



* Test data was taken under worse case position and cable length.

Description of EUT

No.	Item	Model number	Sample No.	Manufacturer	FCC ID
A	RF Unit	EUE24B	1	Matsushita Electric Industrial Co., Ltd.	ACJ8D8-EUE24B
B	Control & Power Box	-	-	Matsushita Electric Industrial Co., Ltd.	-

Listed cables

No.	Item	Length (m)	shield	Backshell materials
1	DC Power & Signal Cable	0.3	Y	Polyvinyl chloride

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SECTION 5: Radiated Emission (Fundamental and Spurious Emission)

5.1 Operating environment

Test place : No.2 semi anechoic chamber
Temperature : See data
Humidity : See data

5.2 Test configuration

EUT was placed on a platform of nominal size, 0.5m by 0.5m, raised 80cm above the conducting ground plane.

The EUT was set on the center of the turn table.

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-3200MHz (Tx mode) and 30MHz-2000MHz (Rx mode)
Test distance : 3m
EUT position : Top of Polyurethane
EUT operation mode : Transmitting and Receiving

5.4 Test procedure

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 with the Test Receiver or the Spectrum Analyzer.

Frequency	Below 1GHz	Above 1GHz
Instrument used	Test Receiver	Spectrum Analyzer
IF Bandwidth	PK: BW 120kHz (Tx) QP: BW 120kHz (Rx)	PK: RBW:1MHz/VBW: 1MHz (Tx/Rx) AV: RBW:1MHz/VBW:10Hz (Tx)

5.5 Test result

Summary of the test results: Pass

* The test was made on EUT in the normal use position where it was installed in the vehicular.

Date: July 20, 2004

Tested by: Makoto Kosaka

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APPENDIX 1: Photographs of test setup

This page has been submitted for a seperate exhibit.

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	2004/04/12 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	RE	2003/10/15 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	RE	2003/10/15 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	RE	2003/12/16 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	RE	2004/02/24 * 12
MPA-04	Pre Amplifier	Agilent	8447D	RE	2004/05/25 * 12
MPA-02	Pre Amplifier	Agilent	87405A	RE	2004/04/16 * 12
MHA-06	Horn Antenna	Schwarzbeck	BBHA9120D	RE	2004/01/10 * 12
MCC-04	Microwave Cable	Storm	421-011	RE	2004/01/06 * 12
MCC-24	Microwave Cable	Storm	-	RE	2004/05/01 * 12
MPA-01	Pre Amplifier	Agilent	8449B	RE	2004/02/06 * 12
MTR-02	Test Receiver	Rohde & Schwarz	ESCS30	RE	2004/02/03 * 12
MRENT-09	Spectrum Analyzer	Advantest	R3273	RE	2004/02/18 * 12

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

Test Item :

RE: Radiated Emission

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APPENDIX 3: Data of EMI test

Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)

UL Apex Co., Ltd. Head Office EMC Lab.
No.2 Semi Anechoic Chamber

COMPANY : Matsushita Electric Industrial Co., Ltd.
EQUIPMENT : RF Unit
MODEL : EUE24B
SAMPLE No. : 1
FCC ID : ACJ8D8-EUE24B
IC No. : 216J-EUE24B
POWER : DC 5.0V
Mode : Transmitting (311.9MHz)
EUT Position : X-axis

REPORT NO : 24HE0054-HO-2
REGULATION : FCC Part 15 Subpart C 15.209 & 231
TEST DISTANCE : 3m
DATE : 2004/07/20
Temperature : 23deg.C
Humidity : 60%
Engineer : Makoto Kosaka

PK DETECT(T/R : IF BW 120kHz)

No.	FREQ [MHz]	T/R READING		ANT Factor [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATT [dB]	Duty Factor [dB]	none	RESULT		Limit AV(Pulse) [dBuV/m]	MARGIN	
		HOR	VER							HOR	VER		HOR	VER
1	311.933	87.9	85.4	14.5	27.0	2.3	6.0	-17.2	0.0	66.5	64.0	75.4	8.9	11.4
2	623.865	30.3	27.9	19.7	28.6	3.9	6.0	-17.2	0.0	14.1	11.7	55.4	41.3	43.7
3	935.800	28.1	22.4	22.0	28.1	5.0	6.0	-17.2	0.0	15.8	10.1	55.4	39.6	45.3

PK DETECT(S/A : RBW 1MHz and VBW 1MHz)

No.	FREQ [GHz]	S/A READING		ANT Factor [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATT [dB]	none	none	RESULT		Limit PK [dBuV/m]	MARGIN	
		HOR	VER							HOR	VER		HOR	VER
4	1.24779	44.3	46.5	23.2	36.8	4.4	0.0	0.0	0.0	35.1	37.3	75.4	40.3	38.1
5	1.55972	46.3	47.0	24.8	36.5	5.0	0.0	0.0	0.0	39.6	40.3	74.0	34.4	33.7
6	1.87116	45.2	43.5	28.6	36.4	5.6	0.0	0.0	0.0	43.0	41.3	75.4	32.4	34.1
7	2.18357	45.1	45.0	30.5	36.3	6.1	0.0	0.0	0.0	45.4	45.3	75.4	30.0	30.1
8	2.49548	46.0	46.1	31.0	36.2	6.5	0.0	0.0	0.0	47.3	47.4	74.0	26.7	26.6
9	2.80743	44.3	43.5	31.9	36.4	6.9	0.0	0.0	0.0	46.7	45.9	74.0	27.3	28.1
10	3.11936	48.5	46.7	32.1	36.4	7.4	0.0	0.0	0.0	51.6	49.8	75.4	23.8	25.6

AV DETECT(S/A : RBW 1MHz and VBW 10Hz)

No.	FREQ [GHz]	S/A READING		ANT Factor [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATT [dB]	none	none	RESULT		Limit AV [dBuV/m]	MARGIN	
		HOR	VER							HOR	VER		HOR	VER
4	1.24779	33.2	34.7	23.2	36.8	4.4	0.0	0.0	0.0	24.0	25.5	55.4	31.4	29.9
5	1.55972	35.4	37.1	24.8	36.5	5.0	0.0	0.0	0.0	28.7	30.4	54.0	25.3	23.6
6	1.87116	32.0	32.2	28.6	36.4	5.6	0.0	0.0	0.0	29.8	30.0	55.4	25.6	25.4
7	2.18357	34.7	34.2	30.5	36.3	6.1	0.0	0.0	0.0	35.0	34.5	55.4	20.4	20.9
8	2.49548	36.7	36.8	31.0	36.2	6.5	0.0	0.0	0.0	38.0	38.1	54.0	16.0	15.9
9	2.80743	32.6	31.7	31.9	36.4	6.9	0.0	0.0	0.0	35.0	34.1	54.0	19.0	19.9
10	3.11936	43.0	38.9	32.1	36.4	7.4	0.0	0.0	0.0	46.1	42.0	55.4	9.3	13.4

Sample Calculation :

RESULT=Reading + ANT Factor - Amp Gain + Cable Loss + ATT + Duty Factor (below 1GHz)

* In the above table, factor 0.0dB represents no use

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

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

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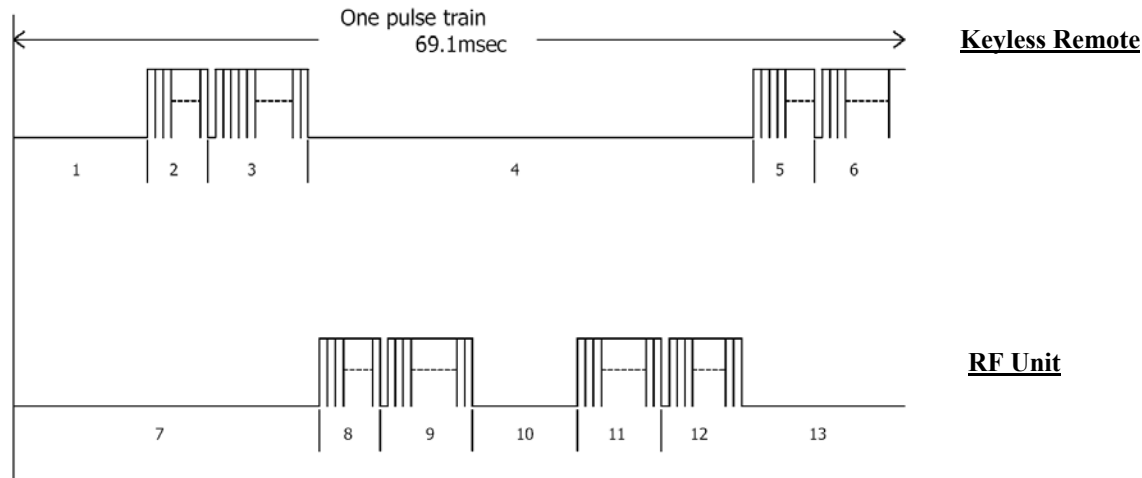
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Duty Factor and Automatically deactivate

*RF Unit transmits towards the Keyless Remote with the following sequence.



<The detail of pulse on SMART transmitting mode>

Start bit	 96us 96us
Bit "0"	 32us 32us
Bit "1"	 32us 32us

<Keyless Remote>

- 1 Wake up time 11.29msec
- 2 Preamble 2.56msec
- 3 ID code Data 2.56msec
- 4 Waiting time 45.27msec
- 5 Preamble 2.56msec
- 6 Response Code Data 4.86msec

<RF Unit>

- 7 Waiting time 20.29msec
- 8 Preamble 3.07msec
- 9 Command 1 Code Data 6.46msec
- 10 Waiting time 14.1msec
- 11 Preamble 3.07msec
- 12 Command 2 Code Data 6.46msec
- 13 Waiting time 15.65msec

Duty Factor Calculation

Total time of 8, 9, 11, 12 is 19.06(msec).
 $19.06 \times 0.5(50\% \text{ duty}) = 9.53\text{msec}(\text{high pulse})$

Duty factor

$$20\log(9.53\text{msec}/69.1\text{msec}) = -17.2\text{dB}$$

Automatically deactivate

*RF unit ceases to transmit within 69.1msec.

Although it is difficult for this RF unit to test the specification of deactivation independently, this is activated by the Key (FCC ID:ACJ 8D8E24A04) that had already been tested the deactivation. therefore this EUT complies with this Section 15.231(a)(2).

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-20dB Bandwidth

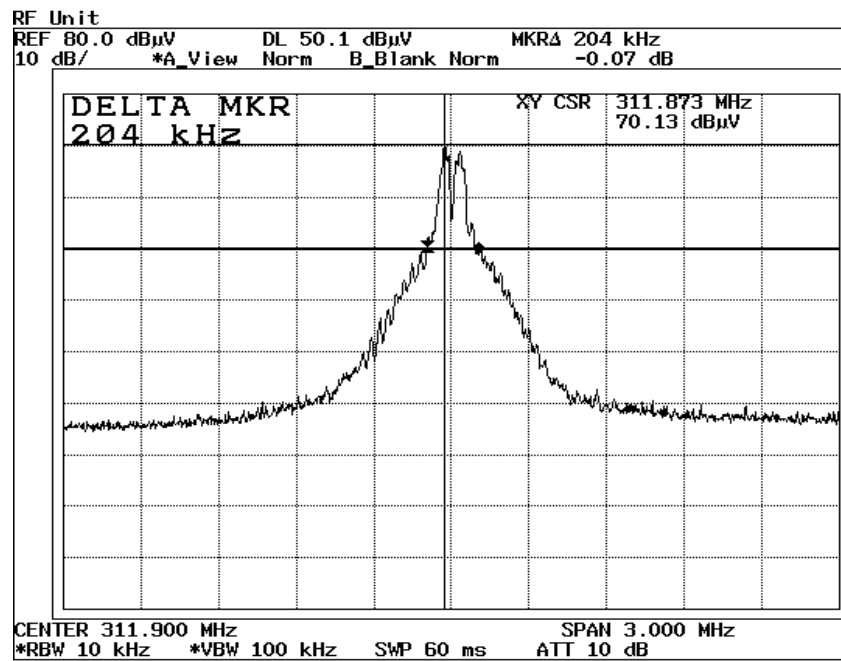
UL Apex Co., Ltd.
Head Office EMC Lab. No.2 Semi Anechoic Chamber

COMPANY : Matsushita Electric Industrial Co., Ltd.
EQUIPMENT : RF Unit
MODEL : EUE24B
Sample No. : 1
FCC ID : ACJ8D8-EUE24B
IC No. : 216J-EUE24B
POWER : DC5.0V
Mode : Transmitting (311.9MHz)

REPORT NO : 24HE0054-HO
REGULATION : Fcc Part15 Subpart C 231(c) / 205
DATE : 07/20/2004
TEMPERATURE : 23°C
HUMIDITY : 59%
ENGINEER : Makoto Kosaka

Bandwidth Limit : Fundamental Frequency 311.9MHz X 0.25% = 779.75 kHz

-20dB Bandwidth	Bandwidth Limit	Result
[kHz]	[kHz]	
204.00	779.75	Pass



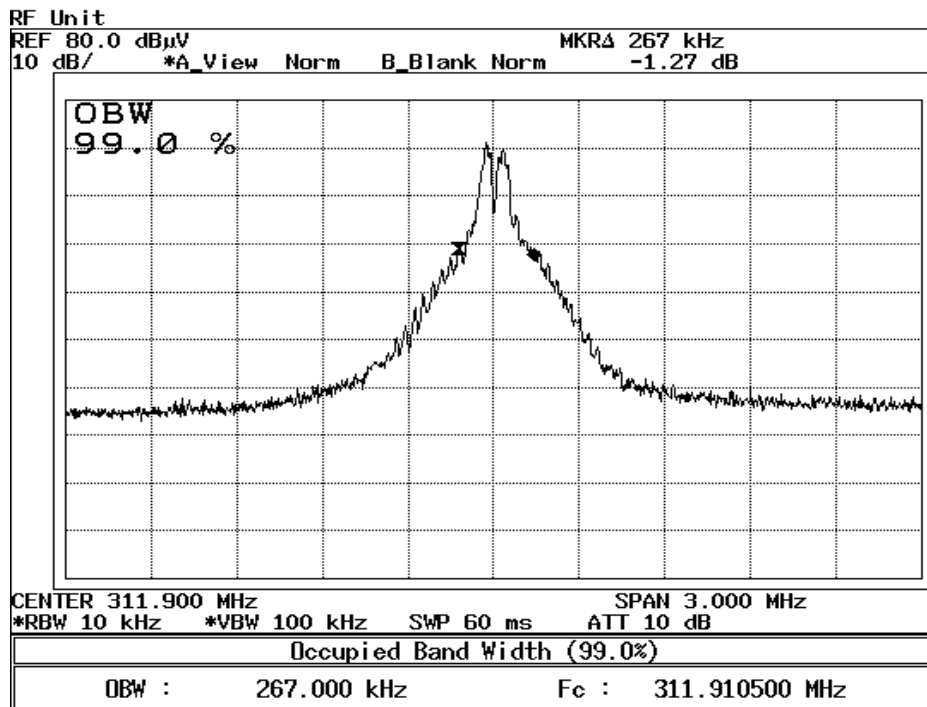
99%Occupied Bandwidth

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Head Office EMC Lab. No.2 Semi Anechoic Chamber

COMPANY : Matsushita Electric Industrial Co., Ltd.
EQUIPMENT : RF Unit
MODEL : EUE24B
Sample No. : 1
FCC ID : ACJ8D8-EUE24B
IC No. : 216J-EUE24B
POWER : DC5.0V
Mode : Transmitting (311.9MHz)

REPORT NO : 24HE0054-HO
REGULATION : Fcc Part15 Subpart C 231(c) / 205
DATE : 07/20/2004
TEMPERATURE : 23°C
HUMIDITY : 59%
ENGINEER : Makoto Kosaka

99% Occupied Bandwidth
[kHz]
267.000



Radiated Emission (Receiving)

DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2004/07/19 10:40:29

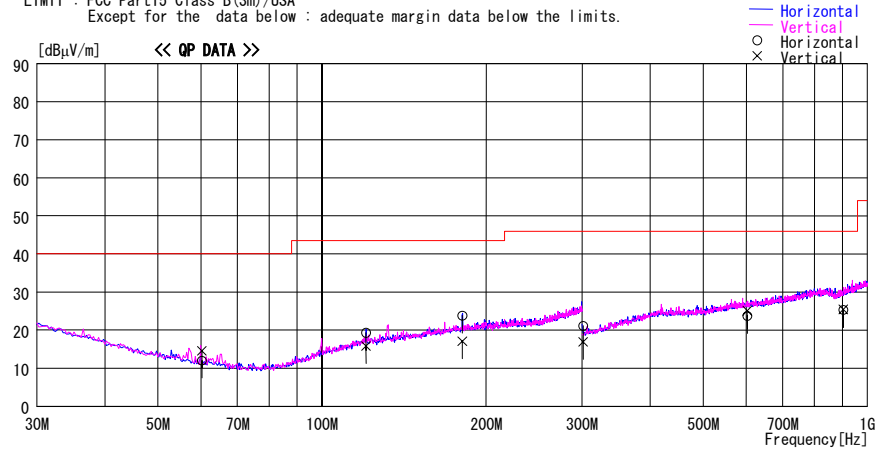
Applicant : Matsushita Electric Industrial
Kind of EUT : RF Unit
Model No. : EUE24B
Sample No. : 1

Report No. : 24HE0054-HO-2
Power : DC 5.0V
Temp°C/Humi% : 24deg.C / 61%
Operator : Makoto Kosaka

Mode / Remarks : Receiving (311.9MHz) / X-axis

LIMIT : FCC Part15 Class B(3m)/USA

Except for the data below : adequate margin data below the limits.



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	60.241	20.1	8.1	6.8	23.0	12.0	40.0	28.0	286	72
2	120.480	21.7	13.0	7.4	22.8	19.3	43.5	24.2	289	0
3	180.721	23.0	16.2	7.7	23.1	23.8	43.5	19.7	186	0
4	301.200	21.5	14.1	8.3	22.8	21.1	46.0	24.9	100	0
5	602.400	16.9	19.6	9.8	22.6	23.7	46.0	22.3	100	0
6	903.600	15.6	21.4	10.9	22.6	25.3	46.0	20.7	100	0
----- Vertical -----										
7	60.241	22.7	8.1	6.8	23.0	14.6	40.0	25.4	100	0
8	120.480	18.2	13.0	7.4	22.8	15.8	43.5	27.7	100	317
9	180.721	16.3	16.2	7.7	23.1	17.1	43.5	26.4	100	0
10	301.200	17.3	14.1	8.3	22.8	16.9	46.0	29.1	100	0
11	602.400	18.3	19.6	9.8	22.6	25.1	46.0	20.9	100	0
12	903.600	15.7	21.4	10.9	22.6	25.4	46.0	20.6	100	0

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:

Radiated Emission (Receiving)

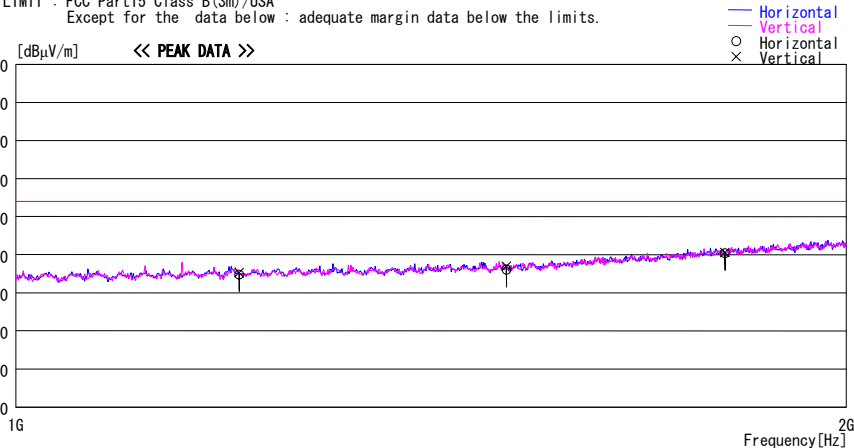
DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2004/07/20 15:18:16

Applicant : Matsushita Electric Industrial
Kind of EUT : RF Unit
Model No. : EUE24B
Sample No. : 1
Report No. : 24HE0054-HO-2
Power : DC 5.0V
Temp°C/Humi% : 24deg. C / 61%
Operator : Makoto Kosaka

Mode / Remarks : Receiving (311.9MHz)

LIMIT : FCC Part15 Class B (3m)/USA
Except for the data below : adequate margin data below the limits.



No.	FREQ [MHz]	READING PK [dBμV]	ANT FACTOR [dB/m]	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
				[dB]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	1204.800	44.3	23.0	4.4	36.9	34.8	54.0	19.2	100	0
2	1506.000	43.4	24.2	5.0	36.5	36.1	54.0	17.9	100	0
3	1807.200	43.5	27.8	5.5	36.4	40.4	54.0	13.6	100	0
----- Vertical -----										
4	1204.800	44.8	23.0	4.4	36.9	35.3	54.0	18.7	100	0
5	1506.000	44.3	24.2	5.0	36.5	37.0	54.0	17.0	100	0
6	1807.200	43.7	27.8	5.5	36.4	40.6	54.0	13.4	100	0

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: