

EMI TEST REPORT

Test Report No. : 23LE0091-HO-1

Applicant : **Matsushita Electric Industrial Co.,Ltd.
Panasonic System Solutions Company**

Type of Equipment : **Center Module**

Model No. : **WX-CC2010**

Test standard : **FCC Part 15 Subpart B Class A**

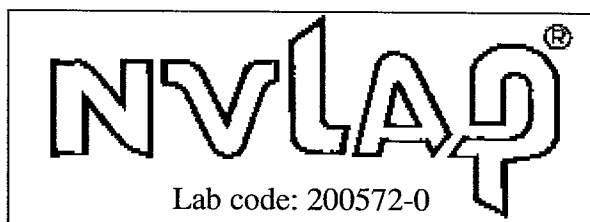
Test Result : **Complied**

1. This test report shall not be reproduced except 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 test 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 : August 1, 2003

Tested by : *K. Adachi*
Kenichi Adachi
EMC Service

Approved by : *[Signature]*
Hironobu Shimoji
Group Leader of EMC Service



This laboratory is accredited by the NIST/NVLAP, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.

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SECTION 1: Client information

Company name : Matsushita Electric Industrial Co.,Ltd.
Panasonic System Solutions Company

Brand name : Panasonic

Address : 4-3-1,TSUNASHIMA-HIGASHI,YOKOHAMA-CITY,
KANAGAWA, 223-8639 JAPAN

Telephone Number : +81 45 540 5525

Facsimile Number : +81 45 540 5511

Contact Person : Shinichi ohgo

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

2.1 Identification of E.U.T.

Type of Equipment : Center Module

Model No. : WX-CC2010

Serial No. : No.8

Rating : AC12V/1.2A

Country of Manufacture : Japan

Receipt Date of Sample : August 1, 2003

Condition of EUT : Engineering prototype

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2.2 Product description

Matsushita Electric Industrial Co.,Ltd. Panasonic System Solutions Company.
Model: WX-CC2010 (referred to as the EUT in this report) is the Center Module.
The clock frequency of this EUT is as follows;

(Transmitter)

Equipment identification	:	Center Module
Intended use/Purpose of the equipment	:	Drive Through System for the fast food store
Equipment Type	:	Transceiver
Frequency of Operation	:	from 468.6125MHz to 469.3875MHz
Other Clock Frequency	:	PLL clock 21.85MHz RF CPU clock 4.19MHz Baseband clock 3.58MHz
Modulation	:	Frequency modulation
Bandwidth / Channel spacing	:	12.5kHz / 25MHz
Transmit power or power range	:	20mW (not including the antenna gain)
Channel access protocol	:	Rotary SW
Mode of operation	:	Duplex
Antenna Gain	:	-3dB
Antenna Type	:	Whip ¼ Lambda Antenna
Antenna connector Type	:	BNC
Method of Frequency Generation	:	Synthesizer
Operating voltage (Inner)	:	6.4VDC, 3.3VDC, 2.5VDC, 1.9VDC
Operating temperature range	:	-10 deg. C. to 50 deg. C.
Power & Signal Cable Length	:	>3m

(Receiver)

Type of Receiver	:	Double Super heterodyne
Frequency operation	:	PLL clock 21.85MHz Receive VCO 447.2125-447.9875MHz
Intermediate Frequency	:	21.4MHz, 450kHz
Other Clock Frequency	:	AF CPU clock 8.38MHz DSP clock 16.384MHz RF CPU clock 4.19MHz Baseband clock 3.58MHz
Antenna Type	:	Internal Antenna
Antenna Connector Type	:	SH Connector
Method of Frequency Generation	:	Synthesizer
Power Supply	:	12VAC
Operating voltage	:	12VDC, 5VDC, 3.3VDC, 1.8VDC
Operating temperature	:	-10 deg. C. to 50 deg. C.

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SECTION 3: Test specification, procedures and results

3.1 Test specification

Test Specification : FCC Part 15 Subpart B Class A
Title : FCC 47CFR Part15 Radio Frequency Device
Subpart B Unintentional Radiators

3.2 Procedures and results

Item	Test Procedure	Limits	Deviation	Worst margin	Result
Conducted emission	ANSI C63.4: 2001	Class A	N/A	7.4dB(AV) 13.1145MHz, L	Complied
Radiated emission	ANSI C63.4: 2001	Class A	N/A	11.5dB 379.385MHz, Horizontal	Complied

*Note: UL Apex's EMI Work Procedure QPM05.

3.3 Confirmation

UL Apex Co., Ltd. hereby confirms that E.U.T., in the configuration tested, complies with the specifications, FCC Part15 Subpart B Class A.

3.4 Uncertainty

Conducted emission test

The measurement uncertainty (with a 95% confidence level) for this test was ± 1.3 dB.
The data listed in this test report has enough margin, more than the site margin.

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, more than the site margin.

3.5 Test location

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No.1 semi anechoic chamber.

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This semi anechoic chamber has been fully described in a report submitted to FCC office, and listed on February 01, 2002. (Registration number: No.1 :313583 Industry Canada: No.1 : IC4247)

*NVLAP Lab. code: 200572-0

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

Refer to APPENDIX 1 to 3.

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

4.1 Operating modes

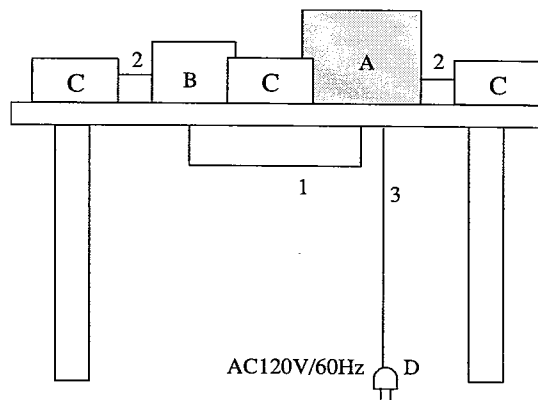
The EUT exercise program used during radiated testing was designed to exercise the various system components in a manner similar to typical use.

Test sequence is used : Receiving mode

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

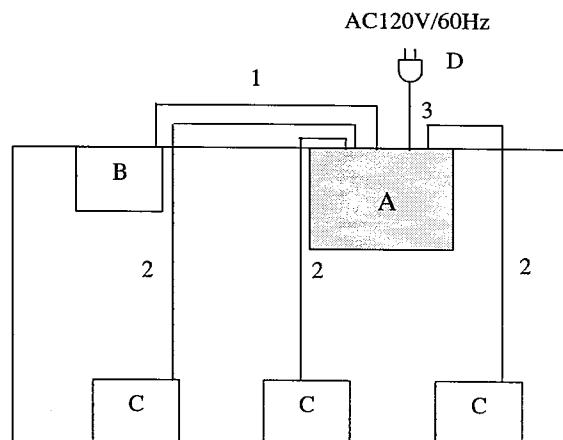
4.2 Configuration and peripherals

Front View



*Cabling was taken into consideration and test data was taken under worst case conditions.

Top View



* Cabling was taken into consideration and test data was taken under worst case conditions.

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Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	FCC ID	Remark
A	Center Module	WX-CC2010	No.8	Panasonic	ACJ9TAWX-CC2010	EUT
B	Speaker	-	-	Panasonic	-	-
C	Transceiver	WX-CT2030	No.25, No.31, No32	Panasonic	ACJ9TAWX-CT2030	-
D	AC Adaptor	WX-C516	AH0099	Panasonic	UL E140898	-

List of cables used

No.	Name	Length (m)	Shield	Backshell Material
1	Speaker cable	1.0	N	Polyvinyl chloride
2	LAN cable	3.0	N	Polyvinyl chloride
3	DC cable	2.0	N	Polyvinyl chloride

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SECTION 5: Conducted emission

5.1 Operating environment

The test was carried out in No.1 semi anechoic chamber, 19.2 x 11.2 x 7.7 m.

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 rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT and its peripherals was aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from LISN and excess AC cable was bundled in center. They were folded back and forth forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN to the input power source. All unused 50 ohm connectors of the LISN were resistively terminated in 50 ohm when not connected to the measuring equipment.

A drawing of the set up is shown in the photos of APPENDIX 1.

5.3 Test conditions

Frequency range : 0.15 MHz-30MHz
EUT position : Table top
EUT operation mode : Receiving mode

5.4 Test procedure

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT within No.1 semi anechoic chamber. The EUT was connected to a Line Impedance Stabilization Network (LISN). An overview sweep with peak detection has been performed. The measurements have been performed with a quasi-peak detector and if required, with an average detector.

The conducted emission measurements were made with the following detector function of the test receiver.

Detector Type : Quasi-Peak and Average
IF Bandwidth : 9 kHz

5.5 Results

Summary of the test results: Pass

Date: August 1, 2003

Test engineer: Kenichi Adachi

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SECTION 6: Radiated emission

6.1 Operating environment

The test was carried out in No.1 semi anechoic chamber, 19.2 x 11.2 x 7.7 m.

Temperature : See data
Humidity : See data

6.2 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.

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.

6.3 Test conditions

Frequency range : 30MHz – 300MHz (Biconical antenna) / 300MHz – 1000MHz (Logperiodic antenna)
Test distance : 3m
EUT position : Table top
EUT operation mode : Receiving mode

6.4 Test procedure

The Radiated Electric Field Strength intensity has been measured on a semi anechoic chamber with a ground plane and at a distance of 3m.

Measurements were performed with a quasi-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.

Frequency	Below 1GHz
Detector Type	Quasi-peak
IF Bandwidth	120 kHz

6.5 Results

Summary of the test results: Pass

Date: August 1, 2003

Test engineer: Kenichi Adachi

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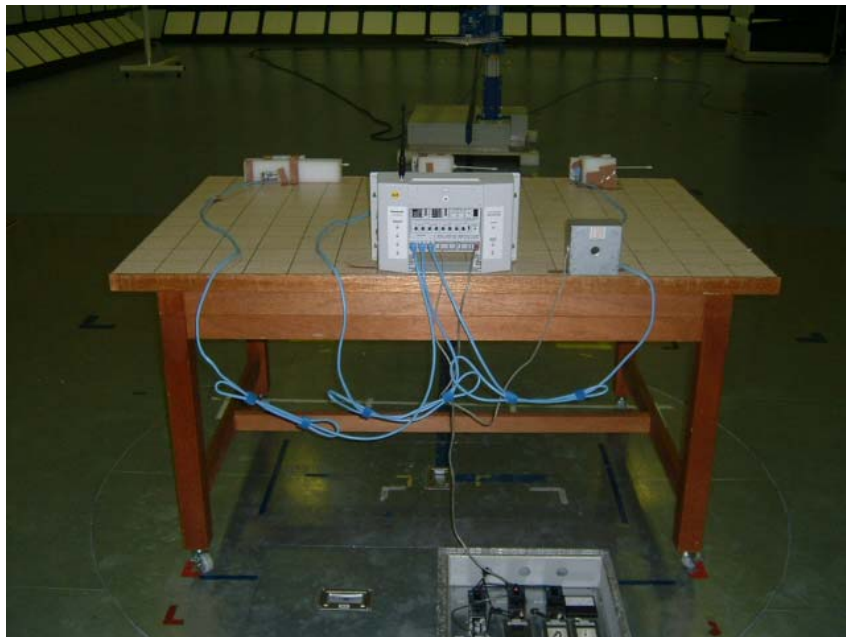
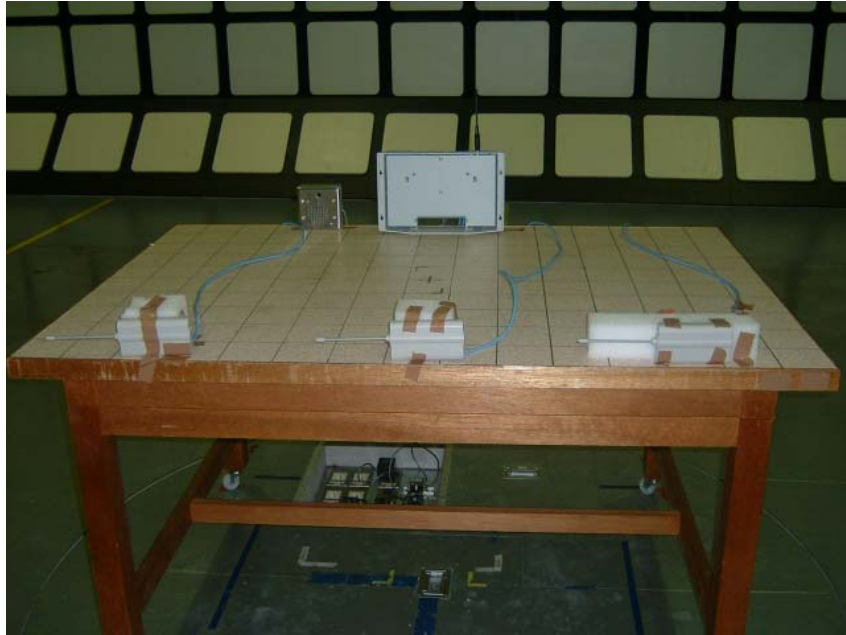
APPENDIX 1: Photographs of test setup

Conducted Emission



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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-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
MCC-01	Coaxial Cable	Suhner/storm/Agilent/TSJ	-	RE	2002/12/19 * 12
MLA-01	Logperiodic Antenna	Schwarzbeck	USLP9143	RE	2002/10/16 * 12
MOS-01	Digital Humidity Indicator	N.T	NT-1800	RE	2002/12/10 * 12
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	RE / CE	2002/11/01 * 12
MCC-03	Coaxial Cable	Fujikura/Suhner/Agilent/TSJ	-	CE/RE	2002/12/19 * 12
MLS-02	LISN(AMN)	Schwarzbeck	NSLK8127	CE	2002/11/11 * 12
MPA-04	Pre Amplifier	Agilent	8447D	RE	2003/03/13 * 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
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	RE	2003/04/28 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	RE	2003/05/08 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	RE	2003/04/28 * 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
MPA-02	Pre Amplifier	Agilent	87405A	RE	2003/04/17 * 12

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,

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APPENDIX 3: Data of EMI

DATA OF CONDUCTED EMISSION TEST

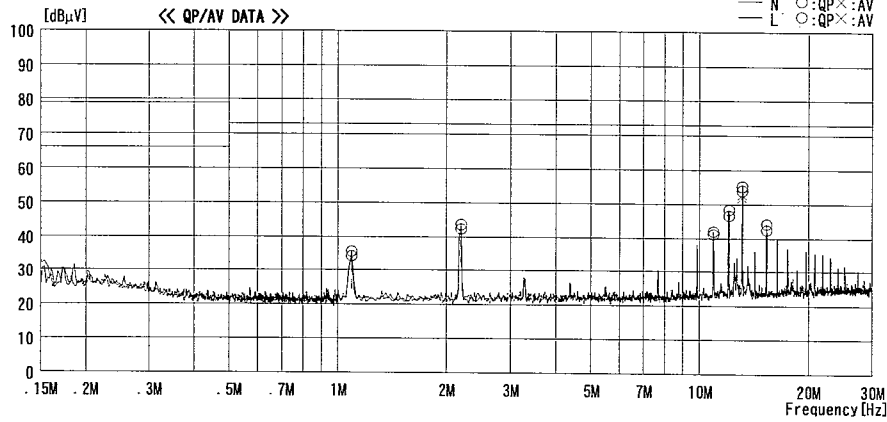
UL Apex Co., Ltd. Head Office EMC Lab. No.1 Semi Anechoic Chamber
 Date : 2003/08/01 21:43:24

Applicant : Matsushita Electric Industrial
 Kind of EUT : Center Module
 Model No. : WX-CC2010
 Serial No. : No. 8
 Report No. : 23LE0091-HO-1
 Power : AC 120V / 60Hz
 Temp°C/Humi% : 27 / 58
 Operator : Kenichi Adachi

Mode / Remarks : Receiving mode

LIMIT : FCC15B ClassA (QP) (0.15-30MHz)
 FCC15B ClassA (AV) (0.15-30MHz)

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NO	FREQ [MHz]	READING		C. F [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBµV]	AV [dBµV]		QP [dBµV]	AV [dBµV]	QP [dBµV]	AV [dBµV]	QP [dB]	AV [dB]	
1	1.0900	35.1	---	0.5	35.6	---	73.0	---	37.4	---	N
2	2.1900	41.7	---	0.6	42.3	---	73.0	---	30.7	---	N
3	10.9220	40.3	---	1.7	42.0	---	73.0	---	31.0	---	N
4	12.0440	44.9	---	1.7	46.6	---	73.0	---	26.4	---	N
5	13.1145	52.1	50.0	1.8	53.9	51.8	73.0	60.0	19.1	8.2	N
6	15.3310	40.5	---	2.0	42.5	---	73.0	---	30.5	---	N
7	1.0900	33.8	---	0.5	34.3	---	73.0	---	38.7	---	L
8	2.1900	43.1	---	0.6	43.7	---	73.0	---	29.3	---	L
9	10.9220	39.5	---	1.7	41.2	---	73.0	---	31.8	---	L
10	12.0440	46.7	---	1.7	48.4	---	73.0	---	24.6	---	L
11	13.1145	53.4	50.9	1.8	55.2	52.7	73.0	60.0	17.8	7.4	L
12	15.3310	42.3	---	2.0	44.3	---	73.0	---	28.7	---	L

CHART:WITHOUT FACTOR, Peak hold data. Data is uncorrected. CALCURATION: RESULT=READING+C. F (CABLE)
 Except for the above table : adequate margin data below the limits. MLS-02

Page:

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DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.1 Semi Anechoic Chamber
 Date : 2003/08/01 19:31:47

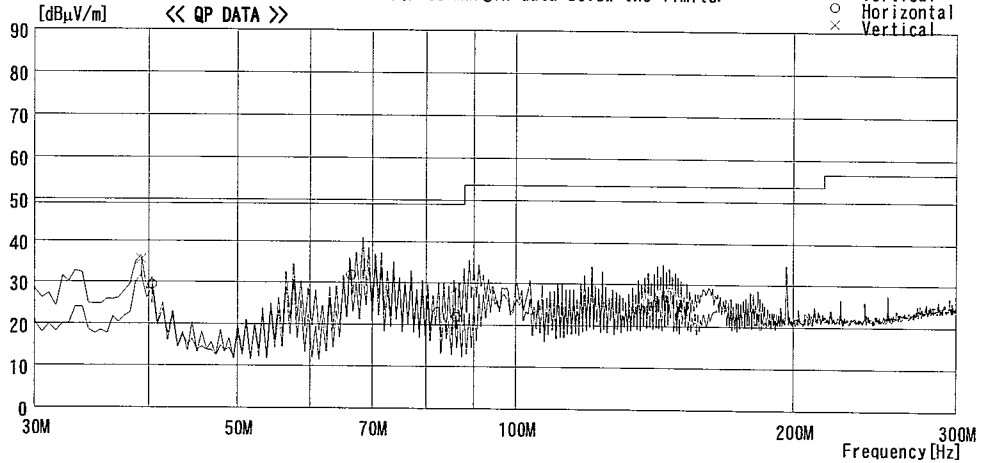
Applicant : Matsushita Electric Industrial
 Kind of EUT : Center Module
 Model No. : WX-CC2010
 Serial No. : No. 8
 Report No. : 23LE0091-HO-1
 Power : AC120V 60Hz
 Temp°C/Humi% : 24 / 53
 Operator : Kenichi Adachi

Mode / Remarks: Receiving mode

LIMIT : FCC Part15 Subpart.B Class A (3m)

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



No.	FREQ [MHz]	READING QP [dB μ V]	ANT FACTOR [dB/m]	LOSS [dB]	GAIN [dB]	RESULT [dB μ V/m]	LIMIT [dB μ V/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	40.318	35.6	14.5	7.2	27.9	29.4	49.0	19.6	179	107
2	66.475	44.9	7.1	7.6	27.8	31.8	49.0	17.2	349	86
3	86.111	34.3	7.1	7.9	27.3	22.0	49.0	27.0	385	48
----- Vertical -----										
4	39.240	41.4	14.9	7.2	27.9	35.6	49.0	13.4	100	214
5	68.623	49.0	6.7	7.7	27.7	35.7	49.0	13.3	100	156
6	86.112	41.1	7.1	7.9	27.3	28.8	49.0	20.2	100	242

CHART: WITHOUT FACTOR ANT TYPE : -30MHz LOOP, 30-300MHz BICONICAL, 300MHz-1000MHz LOGPERIODIC, 1000MHz- HORN
 CALCULATION : READING + ANT FACTOR + LOSS (CABLE+ATTEN.) - AMP. GAIN
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DATA OF RADIATED EMISSION TEST

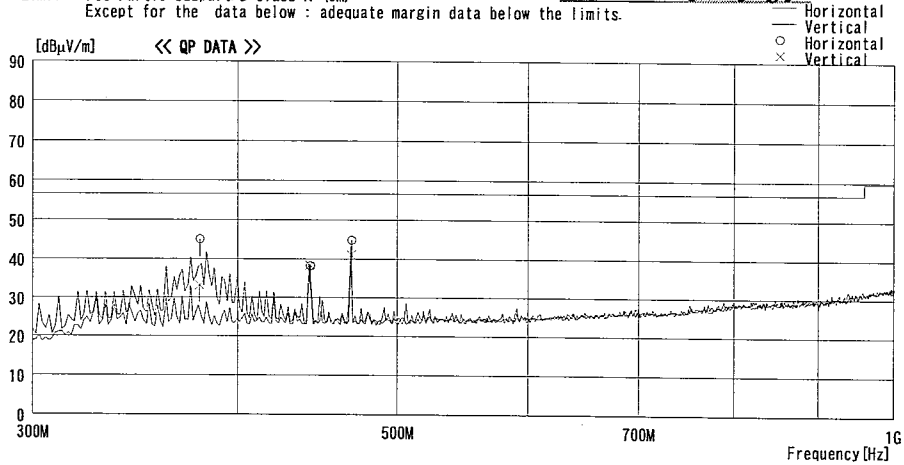
UL Apex Co., Ltd. Head Office EMC Lab. No.1 Semi Anechoic Chamber
 Date : 2003/08/01 20:23:29

Applicant : Matsushita Electric Industrial
 Kind of EUT : Center Module
 Model No. : WX-CC2010
 Serial No. : No. 8
 Report No. : 23LE0091-HO-1
 Power : AC120V 60Hz
 Temp/C/Humi% : 24 / 53
 Operator : Kenichi Adachi

Mode / Remarks : Receiving mode

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

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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	379.385	44.7	17.2	10.3	27.2	45.0	56.5	11.5	100	131
2	442.622	37.1	18.1	10.7	27.7	38.2	56.5	18.3	100	66
3	468.817	43.9	18.2	10.8	28.1	44.8	56.5	11.7	100	200
----- Vertical -----										
4	379.161	32.9	17.2	10.3	27.2	33.2	56.5	23.3	100	239
5	442.221	37.3	18.1	10.7	27.7	38.4	56.5	18.1	100	171
6	468.640	40.1	18.2	10.8	28.0	41.1	56.5	15.4	100	210

CHART:WITHOUT FACTOR ANT TYPE : -30MHz LOOP, 30-300MHz BICONICAL, 300MHz-1000MHz LOGPERIODIC, 1000MHz- HORN
 CALCULATION : READING + ANT FACTOR + LOSS (CABLE+ATTEN.) - AMP. GAIN
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