



EMI TEST REPORT

Test Report No. : 23GE0067-HO-2

Applicant : YAMAHA CORPORATION

Type of Equipment : DIGITAL AUDIO SERVER

Model No. : MCX-1000

**Test standard : FCC Part 15 Subpart C
Section 15.207, Section 15.247**

FCC ID : A6RMCX1000A

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 : April 3, 4, 17 and 18, 2003

Tested by : 

Hiroka Umeyama
Head Office EMC Lab.

Approved by : 

Hironobu Shimoji
Group Leader of Head Office EMC Lab.

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SECTION 1: Client information

Company Name : YAMAHA CORPORATION
Brand Name : YAMAHA
Address : 10-1 Nakazawa-cho, Hamamatsu 430-8650 Japan
Telephone Number : +81-53-460-3325
Facsimile Number : +81-53-471-1147
Contact Person : Hiroshi Yamazaki

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

2.1 Identification of E.U.T.

Type of Equipment : DIGITAL AUDIO SERVER
Model No. : MCX-1000
Serial No. : N010123Y0
Rating : AC120V/60Hz
Country of Manufacture : Japan
Receipt Date of Sample : April 3, 2003
Condition of EUT : Engineering prototype

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2.2 Product Description

YAMAHA CORPORATION, Model No: MCX-1000 is the DIGITAL AUDIO SERVER.

As a music server or player, data is transmitted on radio.

The clock frequency of EUT is 33.33MHz, 24.576MHz, 33.8688MHz, 0.032768MHz, 25MHz, 14.3181MHz (Server), and 44MHz (Wireless LAN card), and 33.8688MHz (CD-R Drive).

| | | |
|--------------------------------|---|--|
| Equipment Type | : | Transceiver |
| Frequency band | : | 2400-2483.5MHz |
| Frequency operation | : | 2412-2462MHz |
| Type of modulation | : | CCK, BPSK, QPSK |
| Channel spacing | : | 5MHz |
| Emission designation | : | G1D |
| Channel access protocol | : | CSMA/CA |
| Mode of operation | : | Simplex |
| Antenna Type | : | Detachable Printed and External Antenna (ADA24MMCXR02) |
| Antenna connector Type | : | MMCX (Reserve) |
| Reference standard (radio) | : | 802.11b |
| Method of Frequency Generation | : | Crystal and Synthesizer |

(1) Specification

| | | |
|--------------------------|---|---|
| Model Name | : | MCX-1000 |
| Network Connections | : | Wired LAN : Ethernet 10/100 Base-T Wireless LAN : IEEE 802.11b |
| Audio Connections | : | Input : Analog 2 , Digital 2(1:optical , 1:coaxial) Output : Analog 2 , Digital 2(1:optical , 1:coaxial) |
| Display Output | : | S-video , Composite |
| HDD capacity | : | 80 GB |
| Power Supply | : | AC 120V 60Hz |
| Power Consumption | : | 59W |
| Temperature of operation | : | +5deg.C. - +35deg.C. |
| Weight | : | 12 Kg |
| Dimensions | : | 435(W) x 432(L) x 135(H) |
| Panel Color | : | BLACK/SILVER |

(2) Feature

- Distribution to the client by wireless LAN. It corresponds also to wired LAN connection.
- The high-speed store from a built-in CD drive to HDD (MAX 24x)
- High-speed CDR writing.(CD-R MAX 8x, CD-RW MAX 4 x, only audio disk)
- YAMAHA AV receiver control with RS-232C.
- 80GB Hard Disk Drive Adoption.

FCC Part15.31(e)

The host device MCX-1000 constantly provide the stable power supply (DC3.3V) to Wireless LAN Card, and the DIGITAL AUDIO SERVER complies power supply regulation.

FCC Part 15.203 Antenna requirement

DIGITAL AUDIO SERVER and its antenna comply with this requirement since they are built in host device MCX-1000 when they are put up for sale and they are used with a particular antenna connector for this EUT.

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz

3.2 Procedures and results

| No. | Item | Test Procedure | Specification | Remarks | Deviation | Worst margin | Results |
|-----|---------------------------|-----------------|----------------------|------------------------|-----------|---------------------------------|----------|
| 1 | Conducted emission | ANSI C63.4:2001 | Section 15.207 | - | N/A | 15.6dB 0.2180MHz N/L1 | Complied |
| 2 | 6dB Bandwidth | ANSI C63.4:2001 | Section 15.247(a)(2) | Conducted | N/A | - | Complied |
| 3 | Maximum Peak Output Power | ANSI C63.4:2001 | Section 15.247(b)(3) | Conducted | N/A | - | Complied |
| 4 | Out of Band Emission | ANSI C63.4:2001 | Section 15.247 (c) | Conducted/ Radiated | N/A | 3.4 dB 2483.5MHz Vertical | Complied |
| 5 | Restricted Band Edges | ANSI C63.4:2001 | Section 15.247 (c) | Radiated | N/A | - | Complied |
| 6 | Power Density | ANSI C63.4:2001 | Section 15.247 (d) | - | N/A | - | Complied |

3.3 Confirmation

UL Apex Co., Ltd. hereby confirms that E.U.T., in the configuration tested, complies with the specifications FCC Part 15 Subpart C Section 15.207 and 15.247.

3.4 Uncertainty

Conducted Emission

The measurement uncertainty (with a 95% confidence level) for this test was $\pm 1.3\text{dB}$.

☐ 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.

Spurious Emission (Radiated)

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.

Other test except Conducted Emission and Spurious Emission (Radiated)

The measurement uncertainty (with a 95% confidence level) for this test was $\pm 3.0\text{dB}$.

☐ 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.

3.5 Test Location

A-Pex International Co., Ltd. EMC Head Office Division

⇒UL Apex Co., Ltd. Head Office EMC Lab.

No.1 and No.2 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, and June 05, 2002. (Registration number: No. 1: 313583 No.2 :846015 Industry Canada: No.1: IC4247 No.2 : IC4247-2)

*NVLAP Lab. code: 200572-0

3.6 Test set up, 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 and conducted testing was designed to exercise the various system components in a manner similar to typical use.

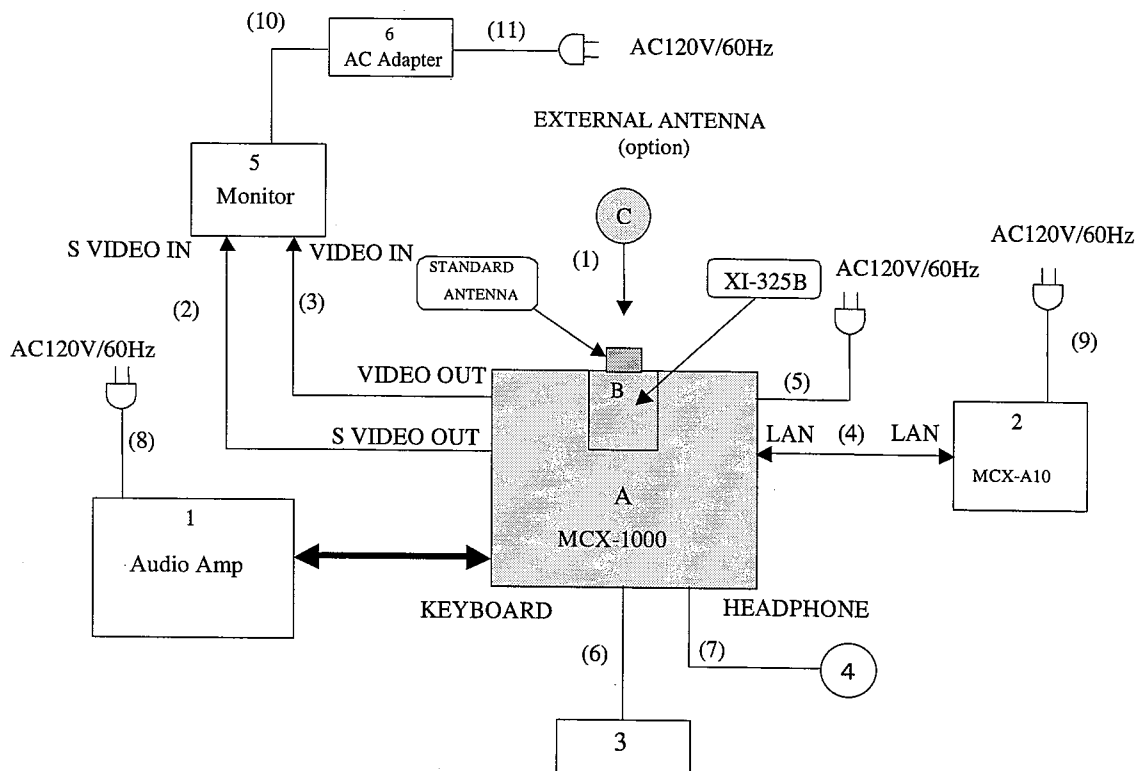
The sequence is used :

1. Transmitting mode (ch1:2412MHz)
2. Transmitting mode (ch6:2432MHz)
3. Transmitting mode (ch11:2462MHz)
4. Standby

(*Out of Band emission testing had been performed with both EXT-Antenna and Standard-Antenna.)

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

4.2 Configuration and peripherals



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

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EUT (MCX-1000 side)

| Terminal name |
|---------------------|
| S VIDEO IN |
| VIDEO IN |
| RS-232C |
| COAXIAL IN |
| COAXIAL OUT |
| ANALOG (L/R) IN |
| ANALOG (L/R) OUT |

AV amp Terminal(DSP-AX10side)

| Terminal name |
|----------------------|
| MONITOR OUT |
| S VIDEO |
| MONITOR OUT VIDEO |
| RS-232C |
| DIGITAL INPUT (7) |
| DIGITAL INPUT (8) |
| AUDIO (3) (PLAY) |
| AUDIO (4) (REC) |

Description of EUT

| No. | Item | Model number | Serial number | Manufacturer | FCC ID | Remark |
|-----|--|--------------|---------------|--------------|--------------------|--------|
| A | DIGITAL AUDIO SERVER | MCX-1000 | N010123Y0 | YAMAHA | - | EUT |
| B | Wireless LAN Card (with STANDARD ANTENNA) | XI-325B | X3252BNT00022 | Z.com | M4Y-000 325/DOC | EUT |
| C | External Antenna | ADA24MMCXR02 | - | SmartAnt | - | EUT |

Support equipment

| No. | Item | Model number | Serial number | Manufacturer | FCC ID | Remark |
|-----|------------------------|--------------|---------------|--------------|----------|--------|
| 1 | Audio Amplifier | DSP-AX10 | Y0583110Q | YAMAHA | - | |
| 2 | DIGITAL AUDIO TERMINAL | MCX-A10 | N010083Y0 | YAMAHA | - | |
| 3 | Keyboard | SK-1000REW | 0004572C | DELL | GYUR36SK | |
| 4 | Headphone | MDR-CD780 | - | SONY | - | |
| 5 | Monitor | AX3852U | 02102821 | IYAMA | - | |
| 6 | AC Adapter(Monitor) | LSE9802B1240 | - | LI SHIN | - | |

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List of cables used

| No. | Name | Length (m) | Shield | Backshell Material |
|------------|------------------------|------------|--------|--------------------|
| (1) | External Antenna | 1.5 | Y | Polyvinyl chloride |
| (2), (12) | S VIDEO | 1.6 | Y | Polyvinyl chloride |
| (3) | VIDEO | 1.5 | Y | Polyvinyl chloride |
| (4) | LAN | 2.0 | Y | Polyvinyl chloride |
| (5) | AC Power(MCX-1000) | 1.6 | N | Polyvinyl chloride |
| (6) | Keyboard | 1.9 | Y | Polyvinyl chloride |
| (7) | Head Phone | 3.5 | Y | Polyvinyl chloride |
| (8) | AC Power(Audio Amp) | 1.5 | N | Polyvinyl chloride |
| (9) | AC Power(MCX-A10) | 1.7 | N | Polyvinyl chloride |
| (10) | AC Power(AC Adapter) | 1.8 | N | Polyvinyl chloride |
| (11) | DC Power(AC Adapter) | 1.4 | N | Polyvinyl chloride |
| (13) | VIDEO | 1.6 | Y | Polyvinyl chloride |
| (14) | RS-232C | 1.8 | Y | Polyvinyl chloride |
| (15), (16) | COAXIAL(DIGITAL Audio) | 1.6 | Y | Polyvinyl chloride |
| (17) | ANALOG Audio L/R | 1.6 | Y | Polyvinyl chloride |
| (18) | ANALOG Audio L/R | 1.5 | Y | Polyvinyl chloride |

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SECTION 5: Conducted Emission, Section 15.207

Test Procedure

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, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. I/O cables and AC cables that were connected to the peripherals were 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 50ohm connectors of the LISN were resistively terminated in 50ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT on a reference ground plane 7.0 x 6.0m in a 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 CISPR quasi-peak detector (IF BW 9 kHz).

Measurement range: 0.15-30MHz

Test data : **APPENDIX 3**
Test result : **Pass**
Test instruments : **MCC-13, MLS-06, MLS-07, SA-07, MTR-02, MTA-01**

SECTION 6: 6dB Bandwidth, Section 15.247(a)(2)

Test Procedure

The minimum 6dB bandwidth was measured with a spectrum analyzer connected to the antenna port.

Test data : **APPENDIX 3**
Test result : **Pass**
Test instruments : **MTR-01, MCC-04**

SECTION 7: Maximum Peak Output Power, Section 15.247(b)(3)

Test Procedure

The Maximum Peak Output Power was measured with a spectrum analyzer connected to the antenna port.

Test data : APPENDIX 3
Test result : Pass
Test instruments : MTR-01, MCC-04

SECTION 8: Out of Band Emission and Restricted Band Edge, Section 15.247 (c)

[Conducted]

Test Procedure

The Out of Band Emission (Conducted) was measured with a spectrum analyzer connected to the antenna port.

Test data : APPENDIX 3
Test result : Pass
Test instruments : MTR-01, MCC-04

[Radiated]

Test Procedure

EUT was placed on a platform of nominal size, 1m by 1.5m, 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 in the semi anechoic chamber (19.2x11.2x7.7m) 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.

In any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

Test data : APPENDIX 3
Test result : Pass
Test instruments : MCC-01/13, MCC-05, MCC-06/11, MHA-05, MPA-01/04
MBA-01/03, MLA-01/03, MRENT-04, MAT-06/07, MHA-01, MBF-01/02/03,
MTR-01, SA-07

SECTION 9: Power Density, Section 15.247 (c)

Test Procedure

The Power Density was measured with a spectrum analyzer connected to the antenna port.

Test data : APPENDIX 3
Test result : Pass
Test instruments : MTR-01, MCC-04

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APPENDIX 1: Photographs of test setup

Page 13 : Conducted Emission
Page 14 : Other test except Conducted Emission and Spurious Emission (Radiated)
Page 15-16 : Spurious Emission (Radiated) EXT-ANT/STANDARD-ANT

APPENDIX 2: Test instruments

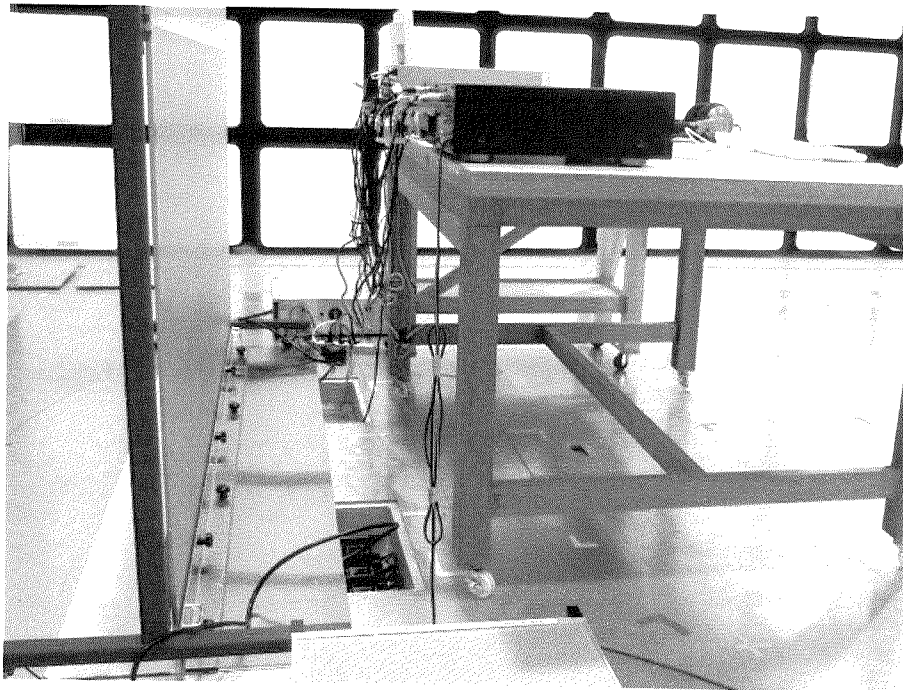
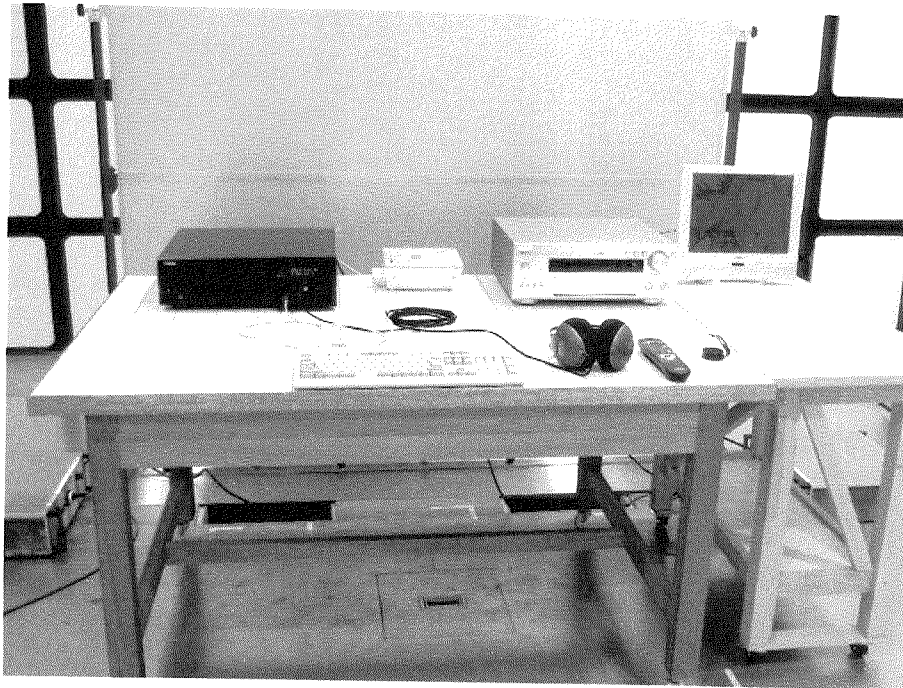
Page 17 : Test instruments

APPENDIX 3: Data of EMI test

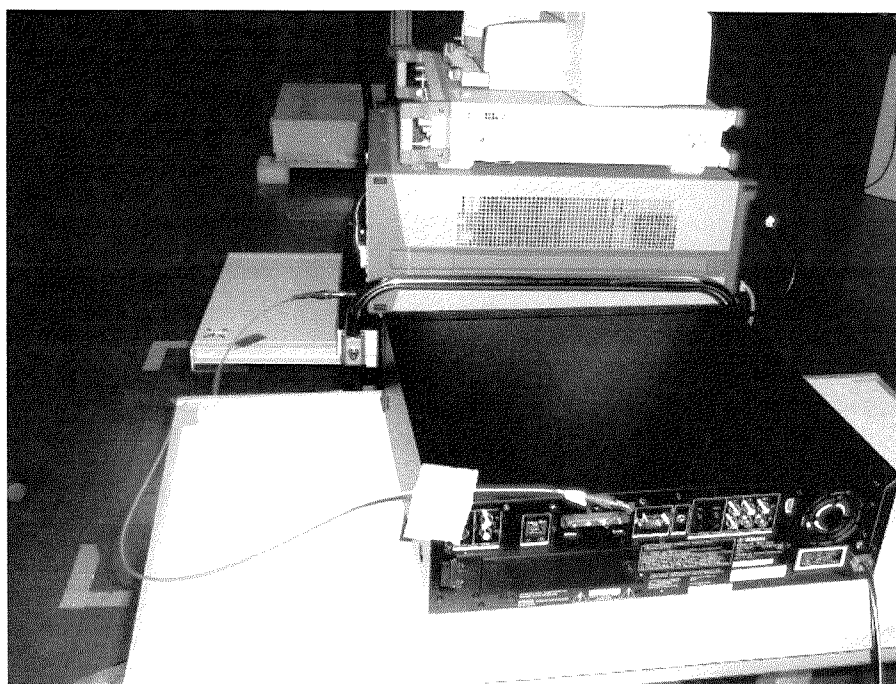
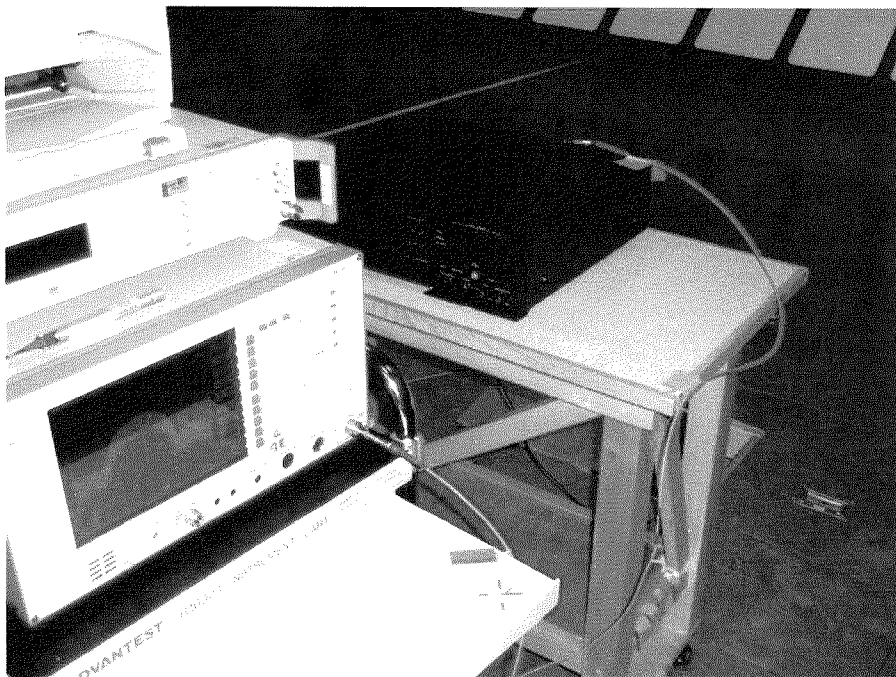
Page 18-23 : Conducted emission
Page 24-26 : 6dB Bandwidth
Page 27-29 : Maximum Peak Output Power
Page 30-50 : Out of Band Emission and Restricted Band Edge
Page 51-54 : Power Density

APPENDIX 1: Photographs of test setup

Conducted Emission



Other test except Conducted Emission and Spurious Emission (Radiated)



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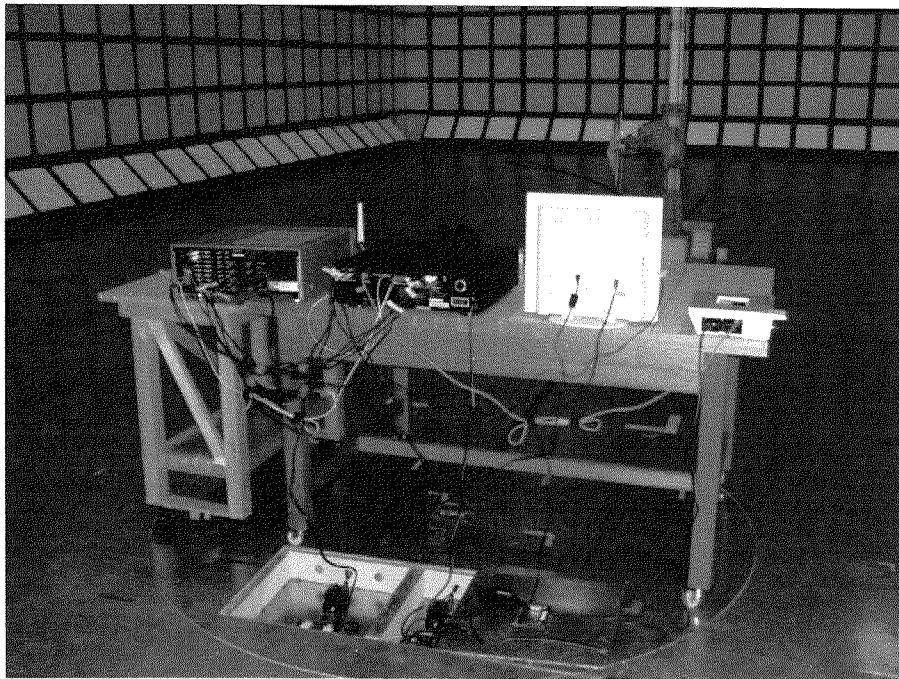
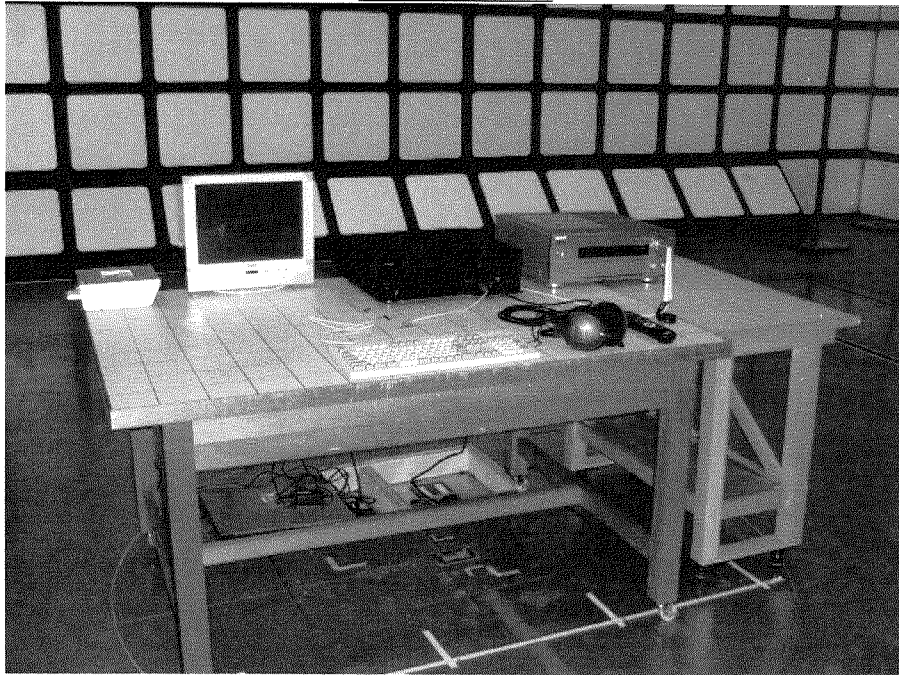
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Spurious Emission (Radiated)
EXT-Antenna



Spurious Emission (Radiated)
STANDARD antenna

