



EMI TEST REPORT

JQA APPLICATION NO. : 400-00071

Model No. : MLU-100A

Type of Equipment : Memory Label Reader/Writer

Regulations Applied : CFR 47 FCC Rules and Regulations Part 15

FCC ID : AK8MLU100A

Applicant : Sony Corporation

Address : 4-14-1, Asahi-cho, Atsugi-shi,
Kanagawa-ken 243-0014, Japan

Manufacture : Sony Corporation

Address : 4-14-1, Asahi-cho, Atsugi-shi,
Kanagawa-ken 243-0014, Japan

Received date of EUT : April 26, 2000

Final Judgment : Passed

TEST RESULTS IN THIS REPORT are obtained in use of equipment that is traceable to Electrotechnical Lab. of MITI Japan and Communications Research Lab. of MPT Japan.

The test results only respond to the tested sample. It is not allowed to copy this report even partly without the allowance of the JQA EMC Engineering Dept. Testing Div.

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1 DOCUMENTATION

1.1 TEST REGULATION

FCC Rules and Regulations Part 15 Subpart A and C (June 23, 1989) Intentional Radiators

Test procedure :

AC power line conducted emission, radiated emission, frequency stability and occupied bandwidth tests were performed according to the procedures in ANSI C63.4-1992.

1.2 GENERAL INFORMATION

1.2.1 Test facility :

1) Test Facility located at EMC Engineering Dept. Testing Div. :

- No.2 and 3 Anechoic Chambers(3 meters Site).
- Shielded Enclosure.

Expiration date of FCC test facility filing : June 4, 2002

TSURU EMC Branch: Open Site No.1, No.2, An Anechoic Chamber (3 m and 10 m, on common plane) and a Shielded Room (Date of Listing: March 30,1999)

2) EMC Engineering Dept. Testing Div. and TSURU EMC Branch are recognized under the National Voluntary Laboratory accreditation Program for satisfactory compliance established in title 15, Part 285 Code of Federal Regulations.

NVLAP Lab Code : 200189-0 (Effective through : June 30, 2000)

NVLAP Lab Code : 200192-0 (Effective through : June 30, 2000)

1.2.2 Description of the Equipment Under Test (EUT) :

- | | |
|---|---|
| 1) Type of Equipment | : Memory Label Reader/Writer |
| 2) Product Type | : Pre-Production |
| 3) Category | : Low Power Communication Device Transmitter |
| 4) EUT Authorization | : Certification |
| 5) FCC ID | : AK8MLU100A |
| 6) Trade Name | : SONY |
| 7) Model No. | : MLU-100A |
| 8) Operating Frequency Range | : 13.56 MHz |
| 9) Highest Frequency Used in the EUT | : 13.56 MHz |
| 10) Serial No. | : 1001 |
| 11) Date of Manufacture | : - |
| 12) Power Rating | : DC 9.0V |
| The EUT was operated with the AC adaptor(Model:AC-E90HG, Input:120VAC 60Hz, Output:9.0VDC by SONY). | |
| 13) EUT Grounding | : None |

1.2.3 Definitions for symbols used in this test report :

- indicates that the listed condition, standard or equipment is applicable for this report.
- - indicates that the listed condition, standard or equipment is not applicable for this report.

1.3 TEST CONDITION**1.3.1 The measurement of the AC Power Line Conducted Emission** x - was performed in the following test site. - was not applicable.**Test location :**

Safety Testing Center EMC Engineering Dept. Testing Div.
 21-25, Kinuta 1-chome, Setagaya-ku, Tokyo 157-8573, Japan

 x - Shielded Enclosure - Anechoic Chamber No. 2 (portable Type)**Used test instruments :**

| Type | Model No. | Manufacturer | Serial No. | Last Cal. | Interval |
|-------------------------------------|-----------|---------------------|--------------|-----------|----------|
| <u> x </u> - Test Receiver | ESH-2 | Rohde & Schwarz | 880370/016 | Sep. 1999 | 1 Year |
| <u> </u> - Test Receiver | ESH-3 | Rohde & Schwarz | 881460/030 | Jun. 1999 | 1 Year |
| <u> x </u> - LISN(for Peripheral) | KNW-407 | Kyoritsu Electrical | 8-833-6 | Apr. 2000 | 1 Year |
| <u> x </u> - LISN(for EUT) | KNW-407 | Kyoritsu Electrical | 8-855-2 | Apr. 2000 | 1 Year |
| <u> </u> - LISN | KNW-407 | Kyoritsu Electrical | 8-757-1 | Apr. 2000 | 1 Year |
| <u> </u> - RF Cable | 3D-2W | Fujikura | 155-21-006E0 | Apr. 2000 | 1 Year |
| <u> x </u> - RF Cable | 3D-2W | Fujikura | 155-21-007E0 | Apr. 2000 | 1 Year |
| <u> x </u> - 50ohm Termination | | SUHNER | 154-06-501E0 | Jan. 2000 | 1 Year |
| <u> </u> - 50ohm Termination | | SUHNER | 154-06-502E0 | Jan. 2000 | 1 Year |

1.3.2 The measurement of the Radiated Emission(9 kHz - 30 MHz)x - was performed in the following test site.

___ - was not applicable.

Test location :

JQA SAFTY TESTING CENTER EMC ENGINEERING DEPT. TSURU EMC BRANCH
 2096 Ohhata, Tanbozawa, Tsuru-shi Yamanashi-ken 402-0045, JAPAN

___ - Open Site No. 1 (3, 10 or 30 meters)

x - Open Site No. 2 (3, 10 or 30 meters)

___ - Anechoic Chamber(3 or 10 meters)

Validation of Site Attenuation :

1) Last Confirmed Date : N/A

2) Interval : N/A

Used test instruments :

| Type | Model No. | Manufacturer | Serial No. | Last Cal. | Interval |
|----------------------------|-----------|---------------------|--------------|-----------|----------|
| <u>x</u> - Test Receiver | ESH-2 | Rohde & Schwarz | 880370/016 | Sep. 1999 | 1 Year |
| ___ - Test Receiver | ESV | Rohde & Schwarz | 872148/039 | May 2000 | 1 Year |
| ___ - Test Receiver | ESVS10 | Rohde & Schwarz | 826148/002 | Jun. 1999 | 1 Year |
| ___ - Test Receiver | ESVP | Rohde & Schwarz | 881487/004 | May 2000 | 1 Year |
| ___ - Test Receiver | ESVP | Rohde & Schwarz | 881487/005 | Dec. 1999 | 1 Year |
| <u>x</u> - Antenna | HFH2-Z2 | Rohde & Schwarz | 881058/61 | May 2000 | 1 Year |
| ___ - Antenna | KBA-511A | Kyoritsu Electrical | 0-170-1 | Nov. 1999 | 1 Year |
| ___ - Antenna | KBA-511A | Kyoritsu Electrical | 0-201-13 | Nov. 1999 | 1 Year |
| ___ - Antenna | KBA-611 | Kyoritsu Electrical | 0-147-14 | Nov. 1999 | 1 Year |
| ___ - Antenna | KBA-611 | Kyoritsu Electrical | 0-210-5 | Nov. 1999 | 1 Year |
| ___ - Biconical Antenna | BBA9106 | Schwarzbeck | VHA91031150 | May 2000 | 1 Year |
| ___ - Biconical Antenna | BBA9106 | Schwarzbeck | 11905078E0 | May 2000 | 1 Year |
| ___ - Log-Periodic Antenna | UHALP9107 | Schwarzbeck | 11905079E0 | May 2000 | 1 Year |
| ___ - Log-Periodic Antenna | UHALP9107 | Schwarzbeck | 11905110 | May 2000 | 1 Year |
| ___ - RF Cable | 5D-2W | Fujikura | 155-21-001E0 | Feb. 2000 | 1 Year |
| ___ - RF Cable | 5D-2W | Fujikura | 155-21-002E0 | Feb. 2000 | 1 Year |

1.3.3 The measurement of the Radiated Emission(30 MHz - 1000 MHz)

- was performed in the following test site.
- was not applicable.

Test location :

Safety Testing Center EMC Engineering Dept. Testing Div.
 21-25, Kinuta 1-chome, Setagaya-ku, Tokyo 157-8573, Japan

- Anechoic Chamber No. 2 (3 meters)
- Anechoic Chamber No. 3 (3 meters)

Validation of Site Attenuation :

- 1) Last Confirmed Date :March, 2000
- 2) Interval :1 year

Used test instruments :

| Type | Model No. | Manufacturer | Serial No. | Last Cal. | Interval |
|--|-----------|---------------------|--------------|-----------|----------|
| <input type="checkbox"/> - Test Receiver | ESH-2 | Rohde & Schwarz | 880370/016 | Sep. 1999 | 1 Year |
| <input type="checkbox"/> - Test Receiver | ESV | Rohde & Schwarz | 872148/039 | May 2000 | 1 Year |
| <input type="checkbox"/> - Test Receiver | ESVS10 | Rohde & Schwarz | 826148/002 | Jun. 1999 | 1 Year |
| <input checked="" type="checkbox"/> - Test Receiver | ESVP | Rohde & Schwarz | 881487/004 | May 2000 | 1 Year |
| <input type="checkbox"/> - Test Receiver | ESVR | Rohde & Schwarz | 881487/005 | Dec. 1999 | 1 Year |
| <input type="checkbox"/> - Antenna | HFH2-Z2 | Rohde & Schwarz | 881058/61 | May 2000 | 1 Year |
| <input type="checkbox"/> - Antenna | KBA-511A | Kyoritsu Electrical | 0-170-1 | Nov. 1999 | 1 Year |
| <input type="checkbox"/> - Antenna | KBA-511A | Kyoritsu Electrical | 0-201-13 | Nov. 1999 | 1 Year |
| <input type="checkbox"/> - Antenna | KBA-611 | Kyoritsu Electrical | 0-147-14 | Nov. 1999 | 1 Year |
| <input type="checkbox"/> - Antenna | KBA-611 | Kyoritsu Electrical | 0-210-5 | Nov. 1999 | 1 Year |
| <input checked="" type="checkbox"/> - Biconical Antenna | BBA9106 | Schwarzbeck | VHA91031150 | May 2000 | 1 Year |
| <input type="checkbox"/> - Biconical Antenna | BBA9106 | Schwarzbeck | 11905078E0 | May 2000 | 1 Year |
| <input checked="" type="checkbox"/> - Log-Periodic Antenna | UHALP9107 | Schwarzbeck | 11905079E0 | May 2000 | 1 Year |
| <input type="checkbox"/> - Log-Periodic Antenna | UHALP9107 | Schwarzbeck | 11905110 | May 2000 | 1 Year |
| <input checked="" type="checkbox"/> - RF Cable | 5D-2W | Fujikura | 155-21-001E0 | Feb. 2000 | 1 Year |
| <input type="checkbox"/> - RF Cable | 5D-2W | Fujikura | 155-21-002E0 | Feb. 2000 | 1 Year |

1.3.4 The measurement of the Radiated Emission(Above 1000 MHz) - was performed in the following test site. x - was not applicable.**Test location :**

Safety Testing Center EMC Engineering Dept. Testing Div.
 21-25, Kinuta 1-chome, Setagaya-ku, Tokyo 157-8573, Japan

 - No. 2 site (3 meters) - No. 3 site (3 meters)**Validation of Site Attenuation :**

1) Last Confirmed Date : N/A

2) Interval : N/A

Used test instruments :

| Type | Model No. | Manufacturer | Serial No. | Last Cal. | Interval |
|-----------------------------------|-------------------|--------------------|--------------|-----------|----------|
| <u> </u> - Spectrum Analyzer | 8563E | Hewlett Packard | 3221A00201 | May 2000 | 1 Year |
| <u> </u> - Spectrum Analyzer | 8560E | Hewlett Packard | 3240A00189 | Sep. 1999 | 1 Year |
| <u> </u> - Spectrum Analyzer | 8566B | Hewlett Packard | 2140A01091 | Apr. 2000 | 1 Year |
| <u> </u> - RF Pre-selector | 85685A | Hewlett Packard | 2648A00522 | Apr. 2000 | 1 Year |
| <u> </u> - Spectrum Analyzer | 8566B | Hewlett Packard | 2747A05855 | May 2000 | 1 Year |
| <u> </u> - RF Pre-selector | 85685A | Hewlett Packard | 2091A00933 | May 2000 | 1 Year |
| <u> </u> - Log-Periodic Antenna | HL 025 | Rohde & Schwarz | 340182/015 | Nov. 1999 | 1 Year |
| <u> </u> - RF Amplifier | DBP-0102N5334272B | DBS Microwave Inc. | 012 | Jun. 1999 | 1 Year |
| <u> </u> - RF Amplifier | WJ-6882-814 | Watkins-Johnson | 0414 | Jun. 1999 | 1 Year |
| <u> </u> - RF Amplifier | WJ-5315-556 | Watkins-Johnson | 106 | Jun. 1999 | 1 Year |
| <u> </u> - RF Amplifier | WJ-5320-307 | Watkins-Johnson | 645 | Jun. 1999 | 1 Year |
| <u> </u> - RF Cable(10m) | S 04272B | Suhner | 155-21-011E0 | May 2000 | 1 Year |
| <u> </u> - RF Cable(2m) | SUCOFLEX 104 | Suhner | 155-21-012E0 | May 2000 | 1 Year |
| <u> </u> - RF Cable(1m) | SUCOFLEX 104 | Suhner | 155-21-013E0 | May 2000 | 1 Year |

1.3.5 The measurement of the Frequency Stability

- was performed.

- was not applicable.

Used test instruments :

| Type | Model No. | Manufacturer | Serial No. | Last Cal. | Interval |
|---|-----------|------------------|------------|-----------|----------|
| <input checked="" type="checkbox"/> - Frequency Counter | 53131A | Hewlett Packard | 3546A11807 | May 2000 | 1 Year |
| <input checked="" type="checkbox"/> - Oven | - | Ohnishi Co. Ltd. | - | Aug. 1999 | 1 Year |
| <input type="checkbox"/> - DC Power Supply | 6628A | Hewlett Packard | 3224A00284 | July 1999 | 1 Year |

1.3.6 The measurement of the Occupied Bandwidth

- was performed.

- was not applicable.

Used test instruments :

| Type | Model No. | Manufacturer | Serial No. | Last Cal. | Interval |
|---|-----------|-----------------|------------|-----------|----------|
| <input type="checkbox"/> - Spectrum Analyzer | 8560E | Hewlett Packard | 3240A00189 | Sep. 1999 | 1 Year |
| <input type="checkbox"/> - Spectrum Analyzer | 8563E | Hewlett Packard | 3221A00201 | May 2000 | 1 Year |
| <input checked="" type="checkbox"/> - Spectrum Analyzer | 8566B | Hewlett Packard | 2140A01091 | Apr. 2000 | 1 Year |
| <input type="checkbox"/> - Spectrum Analyzer | 8566B | Hewlett Packard | 2747A05855 | May 2000 | 1 Year |
| <input type="checkbox"/> - Function Generator | 3325A | Hewlett Packard | 2512A21776 | May 2000 | 1 Year |
| <input type="checkbox"/> - FM Linear Detector | MS61A | Anritsu Corp. | M77486 | Sep. 1999 | 1 Year |
| <input type="checkbox"/> - Level Meter | ML422C | Anritsu Corp. | M87571 | June 1999 | 1 Year |

1.4 EUT MODIFICATION / Deviation from Standard

1.4.1 EUT MODIFICATION

- No modifications were conducted by JQA to achieve compliance to Class B levels.
 -To achieve compliance to Class B levels, the following changes were made by JQA during the compliance test.

The modifications will be implemented in all production models of this equipment.

Applicant :

Date :

Typed Name :

Position :

1.4.2 Deviation from Standard:

- No deviations from the standard described in clause 1.1.
 - The following deviations were employed from the standard described in clause 1.1:

1.5 TEST RESULTS

AC Power Line Conducted Emission x - **Applicable** ___ - **NOT Applicable**

The requirements are x - **PASSED** ___ - **NOT PASSED**

Remarks :

Radiated Emission [§15.225(a)(b)] x - **Applicable** ___ - **NOT Applicable**

The requirements are x - **PASSED** ___ - **NOT PASSED**

Remarks:

Frequency Stability [§15.225(c)] x - **Applicable** ___ - **NOT Applicable**

The requirements are x - **PASSED** ___ - **NOT PASSED**

Remarks:

Occupied Bandwidth [§15.225(b)] x - **Applicable** ___ - **NOT Applicable**

The requirements are x - **PASSED** ___ - **NOT PASSED**

Remarks:

COPY

1.6 SUMMARY**General Remarks :**

The EUT was tested according to the requirements of FCC Rules and Regulations Part 15 Subpart A and C (June 23, 1989) under the test configuration, as shown in clause 1.7 to 1.10.

The conclusion for the test items of which are required by the applied regulation is indicated under the final judgment.

Final Judgment :

The "as received" sample;

- x - fulfill the test requirements of the regulation mentioned on clause 1.1.
- fulfill the test requirements of the regulation mentioned on clause 1.1, but with certain qualifications.
- doesn't fulfill the test regulation mentioned on clause 1.1.

Begin of testing : April 26, 2000

End of testing : May 19, 2000

- JAPAN QUALITY ASSURANCE ORGANIZATION -

Approved by:



Masaaki Takahashi
Manager
JQA EMC Engineering Dept.

Signatories:

Issued by:



Shigeru Osawa
Assistant Manager
JQA EMC Engineering Dept.

1.7 TEST CONFIGURATION / OPERATION OF EUT

1.7.1 Test Configuration

The equipment under test (EUT) consists of :

| Symbol | Item | Manufacturer | Model No. | FCC ID | Serial No. |
|--------|----------------------------|------------------|-----------|------------|------------|
| A(*1) | Memory Label Reader/Writer | Sony Corporation | MLU-100A | AK8MLU100A | 1001 |
| B | AC Adaptor | Sony Corporation | AC-E90HG | N/A | - |

Note 1. This equipment was operated with the AC adaptor (Input:120VAC, 60Hz, Output:9.0VDC by Sony).

The measurement was carried out with the following support equipment connected :

| Symbol | Item | Manufacturer | Model No. | FCC ID | Serial No. |
|--------|-------------------------|------------------|-------------|-------------|------------|
| C | Personal Computer | Dell Computer | MMM | E2KSTNGRMT | S36M9 |
| D | Monitor | Sony Corporation | GDM-17SE1 | AK8GDM17SE1 | 2100506 |
| E | Mouse | Microsoft | 2.1A | C3KKMP3 | 2023610 |
| F | Key Board | Dell Computer | SK-1000REW | GYVR26SK | M960493442 |
| G | Printer | Hewlett Packard | 895Cxi | N/A(DoC) | SG9541WOQT |
| H | AC Adaptor(for Printer) | Hewlett Packard | C6409-60014 | N/A | B9D12B |

Type of Cable :

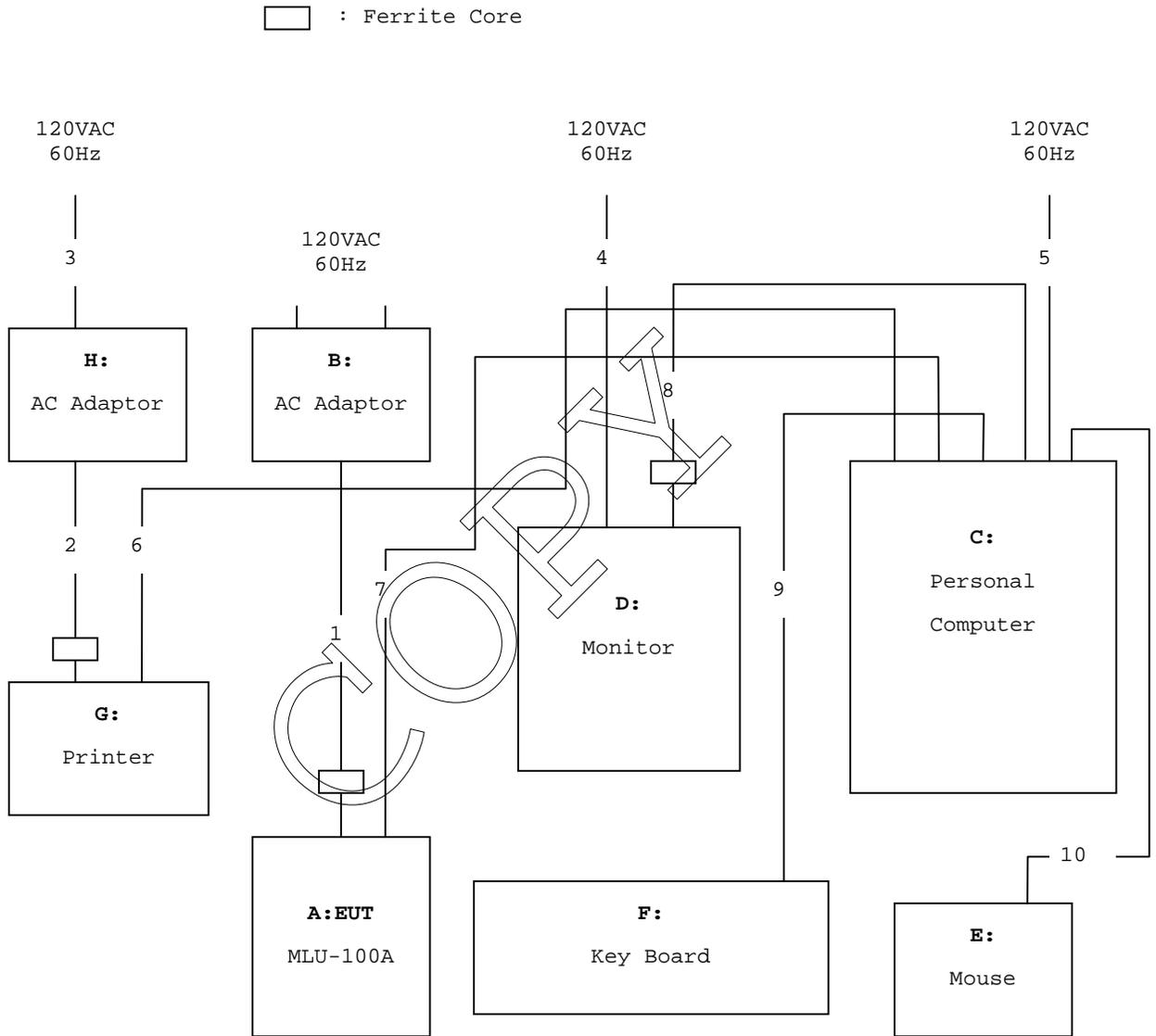
| Symbol | Description | Identification (Manufacturer etc.) | Shielded YES / NO | Ferrite Core | Connector type Shielded YES / NO | Length (m) |
|--------|-------------------------------|---------------------------------------|----------------------|-----------------|--|---------------|
| 1 | AC Adaptor Cable(for EUT) | Sony Corporation | NO | YES | NO | 2.0 |
| 2 | AC Adaptor Cable(for Printer) | Hewlett Packard | YES | YES | NO | 2.0 |
| 3 | AC Adaptor Cable(for Printer) | Hewlett Packard | NO | NO | NO | 1.7 |
| 4 | AC Power Cable(for Monitor) | Hirakawa Hewtech | NO | NO | NO | 2.4 |
| 5 | AC Power Cable(for Computer) | Hirakawa Hewtech | NO | NO | NO | 2.4 |
| 6 | Printer Cable | Hewlett Packard | YES | NO | YES | 1.8 |
| 7 | RS-232C Cable | Sanwa Supply | YES | NO | YES | 2.0 |
| 8 | Monitor Cable | TTL | YES | YES | YES | 1.8 |
| 9 | Key Board Cable | Dell Computer | YES | NO | YES | 1.8 |
| 10 | Mouse Cable | Microsoft | YES | NO | YES | 1.9 |

1.7.2 Operating condition

Power supply Voltage : 120 VAC, 60Hz(for AC Adaptor)

The tests have been carried out under the transmitting condition.

1.8 EUT ARRANGEMENT (DRAWINGS)



1.9 PRELIMINARY TEST AND TEST-SETUP (DRAWINGS)

1.9.1 AC Power Line Conducted Emission (450 kHz - 30 MHz) :

According to description of ANSI C63.4-1992 sec.13.1.3.1, the AC power line preliminary conducted emissions measurements were carried out.

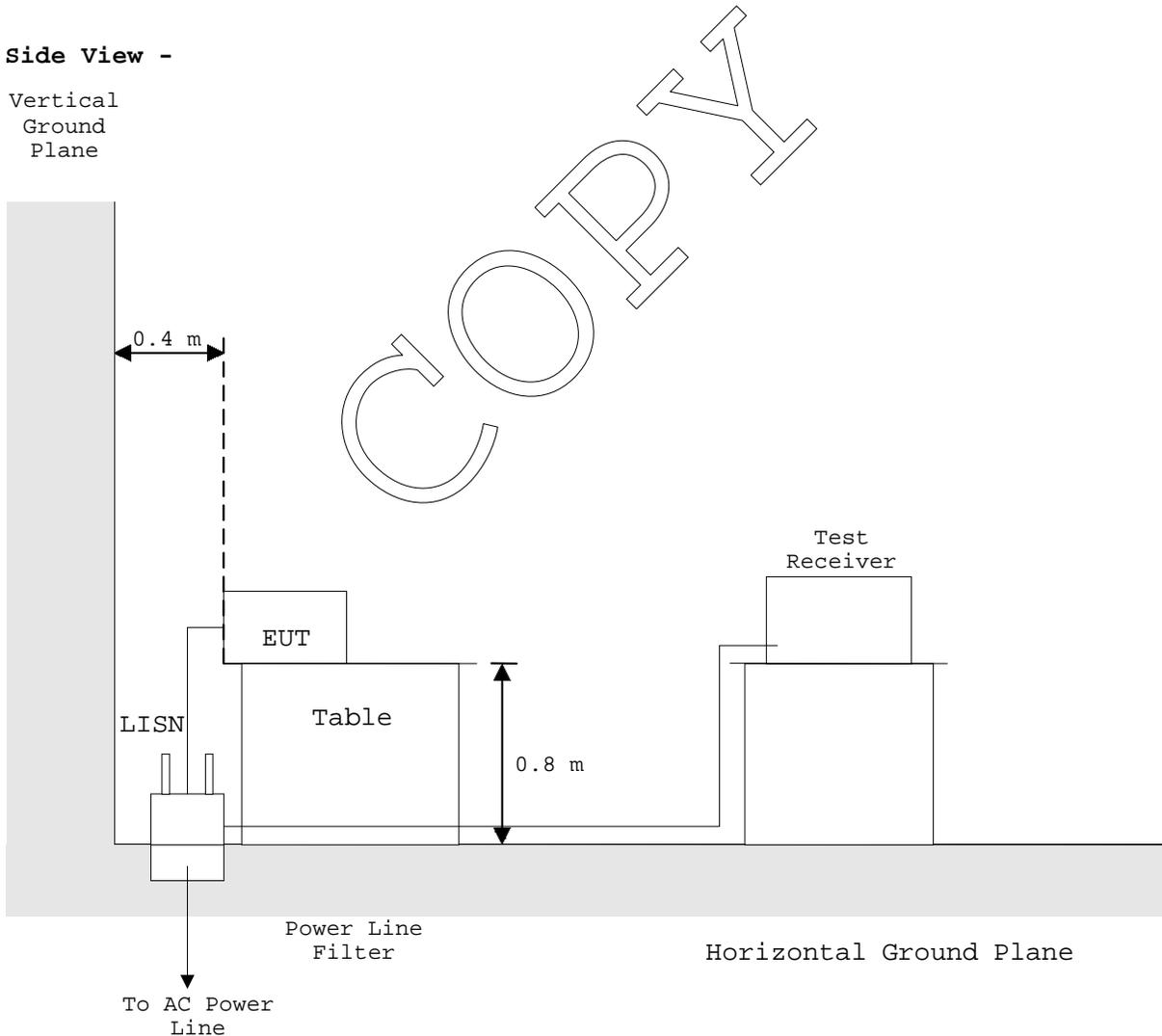
The preliminary conducted measurements were performed using the spectrum analyzer to observe the emission characteristics of the EUT.

The EUT configuration, cable configuration and mode of operation were determined for producing the maximum level of emissions. These configurations were used for final AC power line conducted emissions measurements.

Shielded Enclosure

- Side View -

Vertical
Ground
Plane

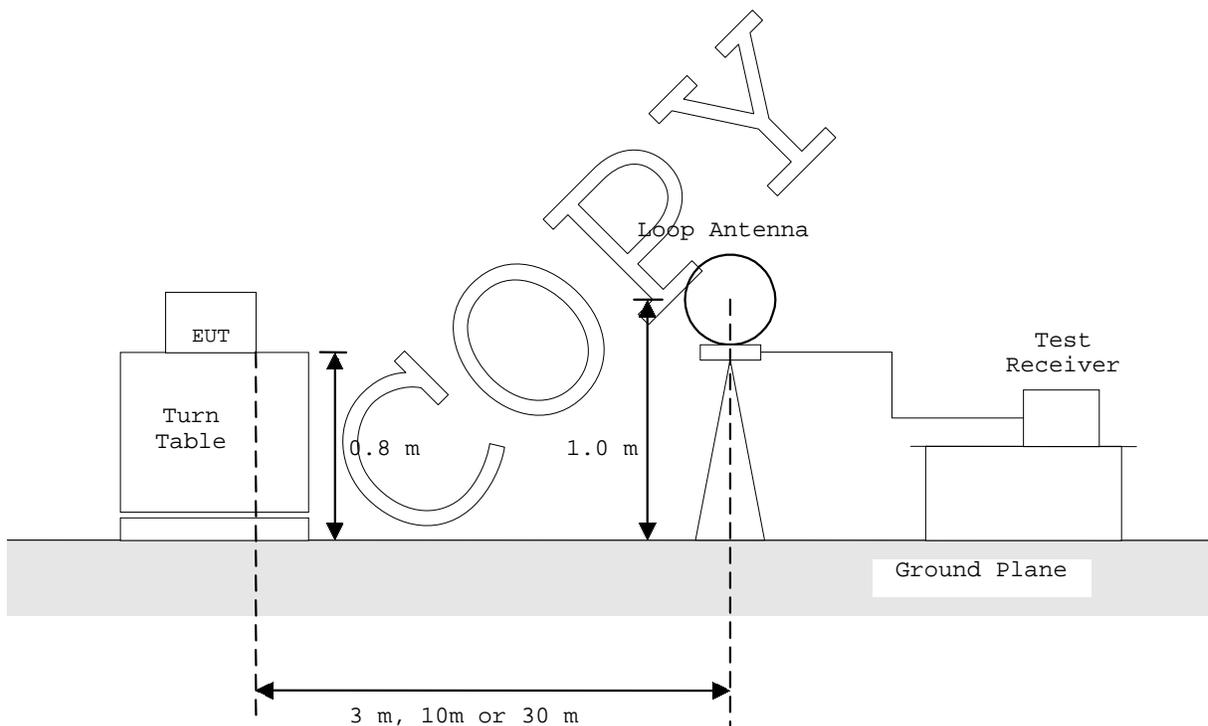


1.9.2 Radiated Emission (9 kHz - 30 MHz) :

According to description of ANSI C63.4-1992 sec.13.1.4.1, the preliminary radiated emissions measurement were carried out. The preliminary radiated measurements were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT.

The EUT configuration, cable configuration and mode of operation were determined for producing the maximum level of emissions. These configurations were used for the final radiated emissions measurements.

- Side View -



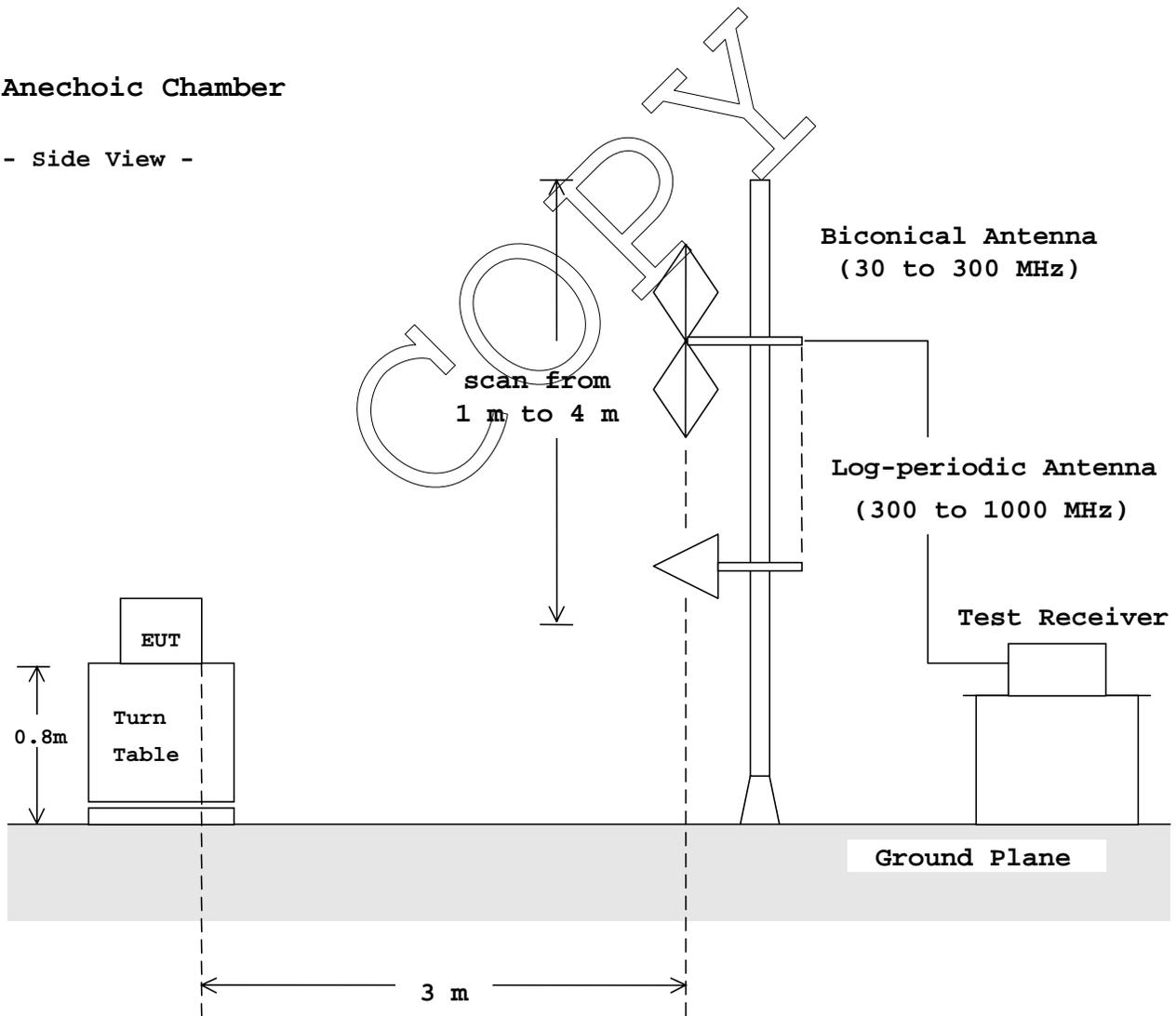
1.9.3 Radiated Emission (30 MHz - 1000 MHz) :

According to description of ANSI C63.4-1992 sec.13.1.4.1, the preliminary radiated emissions measurement were carried out. The preliminary radiated measurements were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT.

The EUT configuration, cable configuration and mode of operation were determined for producing the maximum level of emissions. These configurations were used for the final radiated emissions measurements.

Anechoic Chamber

- Side View -



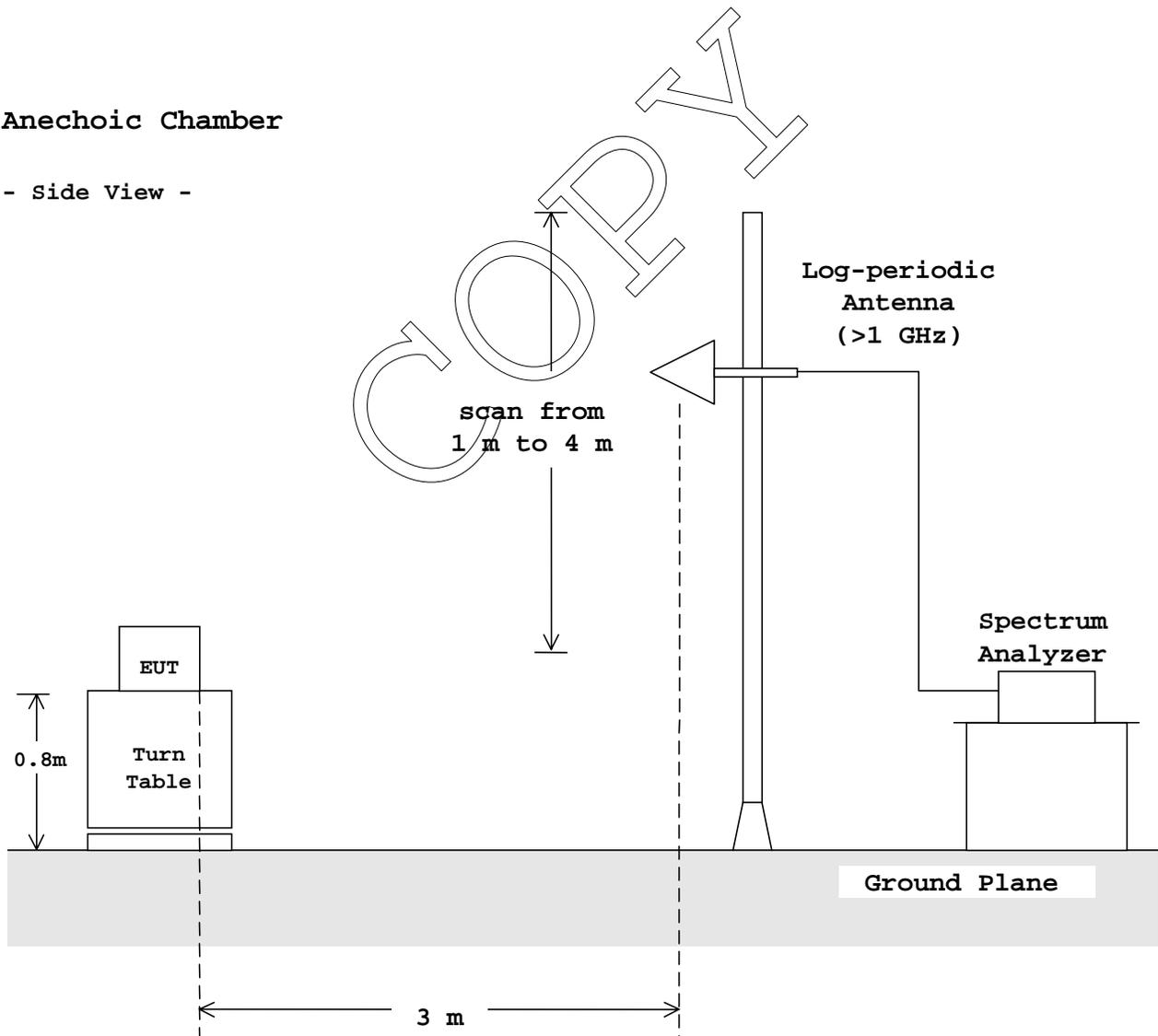
1.9.4 Radiated Emission (Above 1 GHz) :

According to description of ANSI C63.4-1992 sec.13.1.4.1, the preliminary radiated emissions measurements were carried out. The preliminary radiated measurements were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT.

The EUT configuration, cable configuration and mode of operation were determined for producing the maximum level of emissions. These configurations were used for the final radiated emissions measurements.

Anechoic Chamber

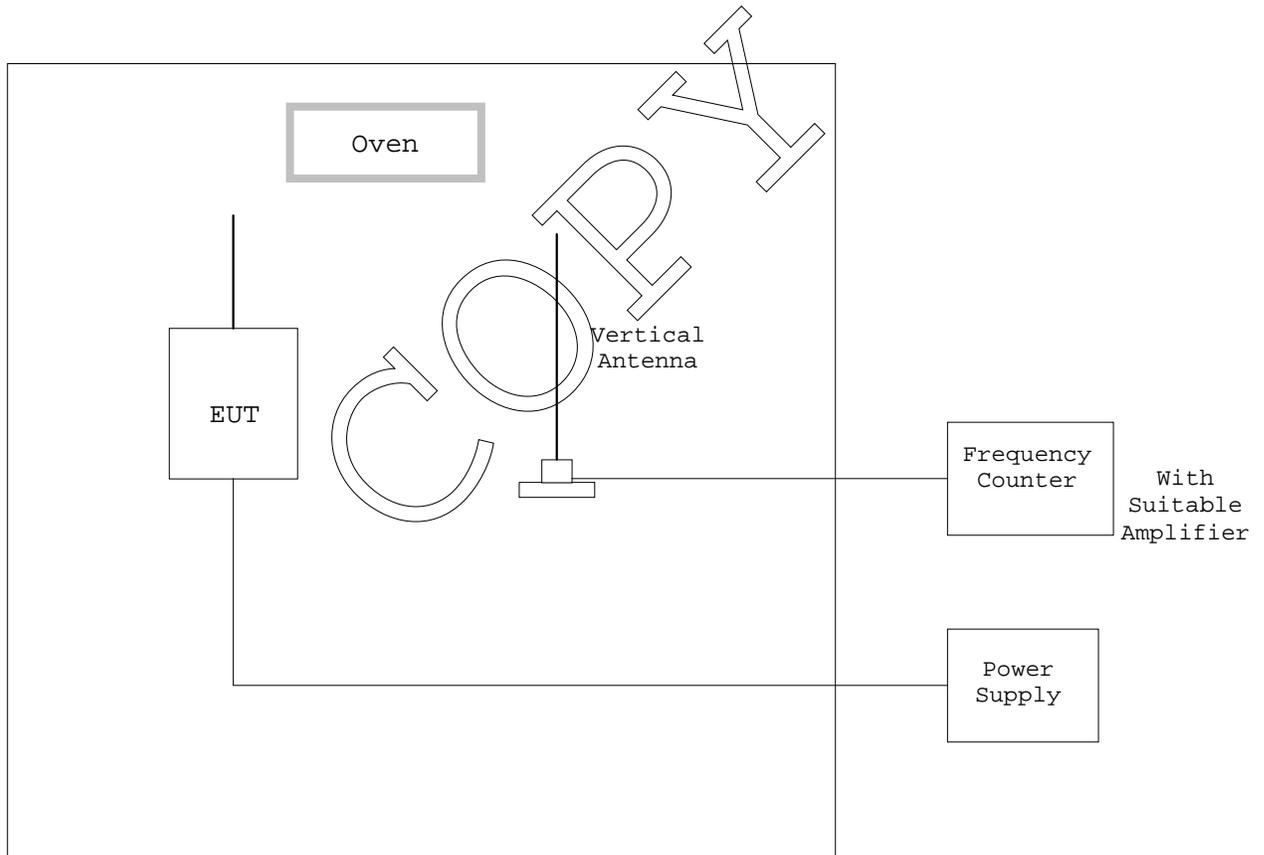
- Side View -



1.9.5 Frequency Stability :

According to description of ANSI C63.4-1992 sec.13.1.5 and sec.13.1.6, the frequency stability measurements were carried out. By using frequency counter with suitable RF amplifier, the carrier frequency of the transmitter under test was measured with a temperature variation of -20°C to $+50^{\circ}\text{C}$ at the normal supply voltage, and if required, with a variation in the primary voltage from 85 % to 115 % the rated supply voltage at the temperature of $+20^{\circ}\text{C}$.

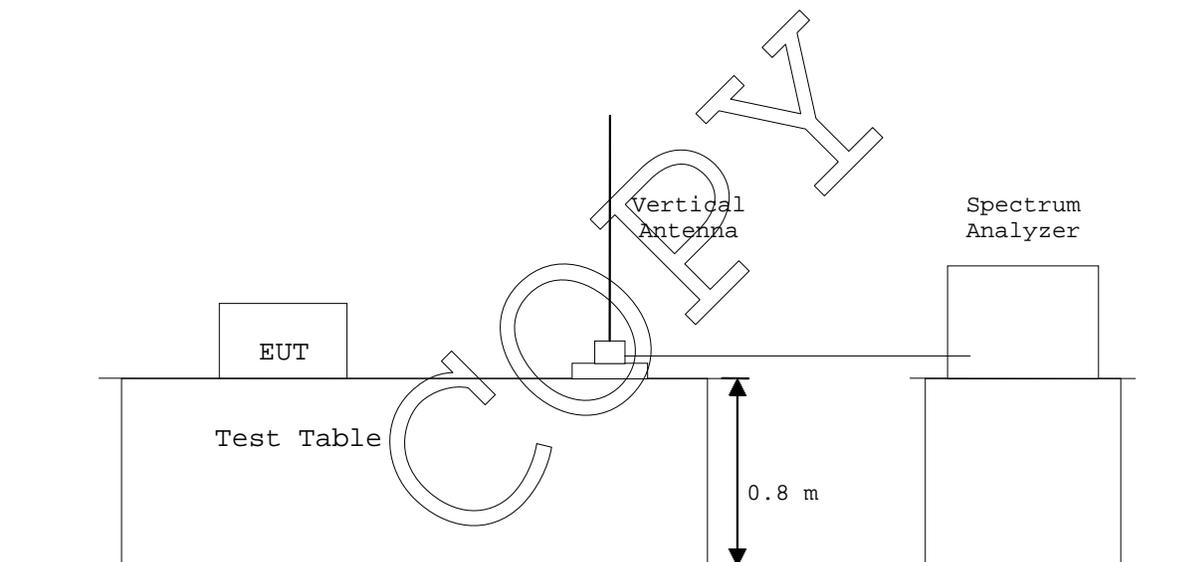
These measurements were carried out after allow sufficient time (approximately 1 hour) for the temperature of the chamber to stabilize.



1.9.6 Occupied Bandwidth :

According to description of ANSI C63.4-1992 sec.13.1.7, the occupied bandwidth measurements were carried out. By using a spectrum analyzer with a vertical antenna for picking up the signal, the measurements of the emission were made under the transmitting modes of the EUT.

The resolution bandwidth of spectrum analyzer was set to the value specified in sec.13.1.7.



1.10 TEST ARRANGEMENT (PHOTOGRAPHS)**PHOTOGRAPHS OF EUT CONFIGURATION FOR AC POWER LINE CONDUCTED EMISSIONS MEASUREMENT**

Photograph present configuration with maximum emission

- Front View -



- Side View -



COPY

PHOTOGRAPHS OF EUT CONFIGURATION FOR RADIATED EMISSIONS MEASUREMENT

Photograph present configuration with maximum emission
- Front View -



- Rear View -



TEST DATA

2.1 AC Power Line Conducted Emission Measurement(0.45 MHz - 30 MHz)

Date : April 26, 2000
 Temp. : 22 °C Humi. : 46 %

| Frequency (MHz) | LISN Factor (dB) | Meter Reading (dBuV) | | | | Limits (dBuV) | | Emission Level (dBuV) | | Margins (dB) | |
|--------------------|------------------------|----------------------|---|------|---|------------------|-----|--------------------------|-----|-----------------|-----|
| | | V-A | | V-B | | Q.P | AVE | Q.P | AVE | Q.P | AVE |
| 4.72 | 0.2 | 12.5 | - | 14.8 | - | 48.0 | - | 15.0 | - | 33.0 | - |
| 5.06 | 0.2 | 13.7 | - | 15.9 | - | 48.0 | - | 16.1 | - | 31.9 | - |
| 5.86 | 0.2 | 12.0 | - | 14.2 | - | 48.0 | - | 14.4 | - | 33.6 | - |
| 6.30 | 0.2 | 15.6 | - | 17.8 | - | 48.0 | - | 18.0 | - | 30.0 | - |
| 7.42 | 0.2 | 12.7 | - | 14.8 | - | 48.0 | - | 15.0 | - | 33.0 | - |
| 8.66 | 0.2 | 14.9 | - | 16.9 | - | 48.0 | - | 17.1 | - | 30.9 | - |
| 9.00 | 0.2 | 14.8 | - | 16.7 | - | 48.0 | - | 16.9 | - | 31.1 | - |
| 9.33 | 0.2 | 15.6 | - | 17.3 | - | 48.0 | - | 17.5 | - | 30.5 | - |
| 9.67 | 0.2 | 19.8 | - | 21.3 | - | 48.0 | - | 21.5 | - | 26.5 | - |
| 10.80 | 0.2 | 24.5 | - | 25.5 | - | 48.0 | - | 25.7 | - | 22.3 | - |
| 11.02 | 0.2 | 25.9 | - | 26.8 | - | 48.0 | - | 27.0 | - | 21.0 | - |
| 12.48 | 0.3 | 11.4 | - | 10.3 | - | 48.0 | - | 11.7 | - | 36.4 | - |
| 13.56 | 0.3 | 40.3 | - | 39.0 | - | 48.0 | - | 40.6 | - | 7.4 | - |
| 14.95 | 0.3 | 13.3 | - | 12.8 | - | 48.0 | - | 13.6 | - | 34.4 | - |
| 26.59 | 0.5 | 14.0 | - | 14.7 | - | 48.0 | - | 15.2 | - | 32.8 | - |
| 27.12 | 0.5 | 37.2 | - | 37.8 | - | 48.0 | - | 38.3 | - | 9.7 | - |
| 27.22 | 0.5 | 32.3 | - | 32.9 | - | 48.0 | - | 33.4 | - | 14.6 | - |

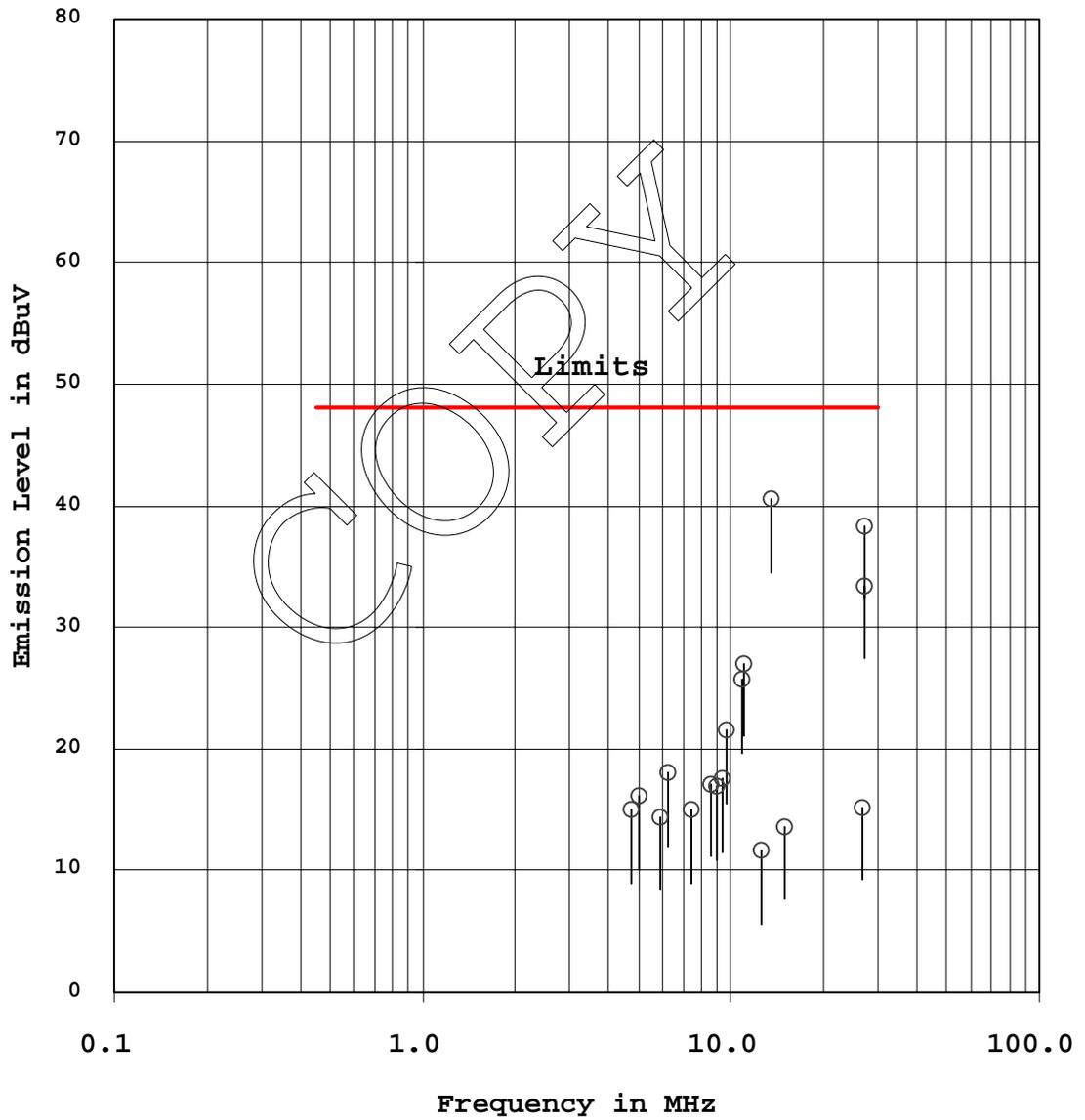
- Notes :
- 1) The spectrum was checked from 0.45 MHz to 30 MHz.
 - 2) The cable loss is included in the LISN factor.
 - 3) The symbol of "<"means "or less".
 - 4) The symbol of ">"means "or greater".
 - 5) The symbol of "-"means "Not applicable".
 - 6) V-A : One end & Ground V-B : The other end & Ground
 - 7) Q.P : Quasi-peak AVE : Average
 - 8) A sample calculation was made at 4.72 (MHz).
 $Lf + Mr = 0.2 + 14.8 = 15(\text{dBuV})$
 Lf = LISN Factor
 Mr = Meter Reading

Tested by : Shigeru Osawa
 Shigeru Osawa
 Testing Engineer

AC POWER LINE CONDUCTED EMISSION MEASUREMENT

Model No. : MLU-100A

| | |
|-------------------------------------|--------------|
| Standard : CFR 47 FCC Rules Part 15 | o Quasi-peak |
| Category : Class B | x Average |
| | - - - |



2.2 Radiated Emissions Measurement(9 kHz - 1000 MHz)Date : May 12, 2000

Operating Frequency : 13.56 MHz
 Distance of Measurement : 10 meters

| Frequency (MHz) | Field Strength (dB μ V/m) |
|-----------------------------|----------------------------------|
| Fundamental 13.56 | < 27.0 |
| Harmonic Frequency 27.12 | < 27.0 |

The distance of measurements was reduced to 3 meters.

Operating Frequency : 13.56 MHz
 Distance of Measurement : 3 meters

| Frequency (MHz) | Field Strength (dB μ V/m) |
|-----------------------------|----------------------------------|
| Fundamental 13.56 | 46.7 |
| Harmonic Frequency 27.12 | 33.7 |

Note: 1. Meter reading value shows field strength, because the value includes antenna factor.

2. The symbol of "<" means "or less".

3. Measuring Instrument Setting:

Detector Function : CISPR Quasi-peak Peak
 IF Band width : 9 kHz

For fundamental, the measured field strength was extrapolated to distance 30 meters, using the formula that field strength varies as the inverse distance square(40 dB per decade of distance).

Calculation :

$$46.7 \text{ dB}\mu\text{V/m} - 20\log_{10}((30/3)^2) = 32.3 - 40.0 = 6.7 \text{ dB}\mu\text{V/m at 30 meters}$$

Limits for fundamental(§15.225(a)) = $20\log_{10}(10000) = 80 \text{ dB}\mu\text{V/m}$

Date : April 26, 2000Temp.: 22 °C Humi.: 53 %

Operating Frequency : 13.560 MHz

Distance of Measurement : 3.0 meters

| Frequency (MHz) | Antenna Factor (dB) | Meter Reading (dBuV) | | Limits (dBuV/m) | Emission Levels (dBuV/m) | | Margins (dB) | |
|--------------------|---------------------------|-------------------------|-------|--------------------|-----------------------------|-------|-----------------|-------|
| | | Horiz. | Vert. | | Horiz. | Vert. | Horiz. | Vert. |
| 40.68 | 14.4 | 0.5 | 7.1 | 40.0 | 14.9 | 21.5 | 25.1 | 18.5 |
| 54.24 | 10.0 | 5.9 | 9.0 | 40.0 | 15.9 | 19.0 | 24.1 | 21.0 |
| 81.36 | 7.9 | 13.2 | 13.0 | 40.0 | 21.1 | 20.9 | 18.9 | 19.1 |
| 108.48 | 12.3 | 9.6 | 12.0 | 43.5 | 21.9 | 24.3 | 21.6 | 19.2 |
| 135.60 | 15.0 | 11.1 | 10.3 | 43.5 | 26.1 | 25.3 | 17.5 | 18.3 |
| 216.96 | 18.5 | 5.1 < | 0.0 | 46.0 | 23.6 < | 18.5 | 22.4 > | 27.5 |
| 244.08 | 19.4 | 20.9 | 12.3 | 46.0 | 40.3 | 31.7 | 5.7 | 14.3 |
| 271.20 | 20.2 | 14.9 | 10.2 | 46.0 | 35.1 | 30.4 | 10.9 | 15.6 |
| 298.32 | 21.7 | 9.2 | 3.3 | 46.0 | 30.9 | 25.0 | 15.1 | 21.0 |
| 800.04 | 25.6 | 4.2 | 0.3 | 46.0 | 29.8 | 25.9 | 16.3 | 20.2 |
| 827.16 | 25.9 | 2.4 | 0.2 | 46.0 | 28.3 | 26.1 | 17.7 | 19.9 |
| 854.28 | 26.2 | 2.3 | 1.5 | 46.0 | 28.5 | 27.7 | 17.5 | 18.3 |
| 881.40 | 26.6 | 0.5 | 0.8 | 46.0 | 27.1 | 27.4 | 19.0 | 18.7 |

Notes : 1) The spectrum was checked from 30 MHz to 1000 MHz.
2) The cable loss is included in the antenna factor.

3) The symbol of "<" means "or less".

4) The symbol of ">" means "or greater".

5) A sample calculation was made at 40.68 (MHz).

$$Af + Mr = 14.4 + 7.1 = 21.5 \text{ (dBuV/m)}$$

Af = Antenna Factor

Mr = Meter Reading

Tested by :



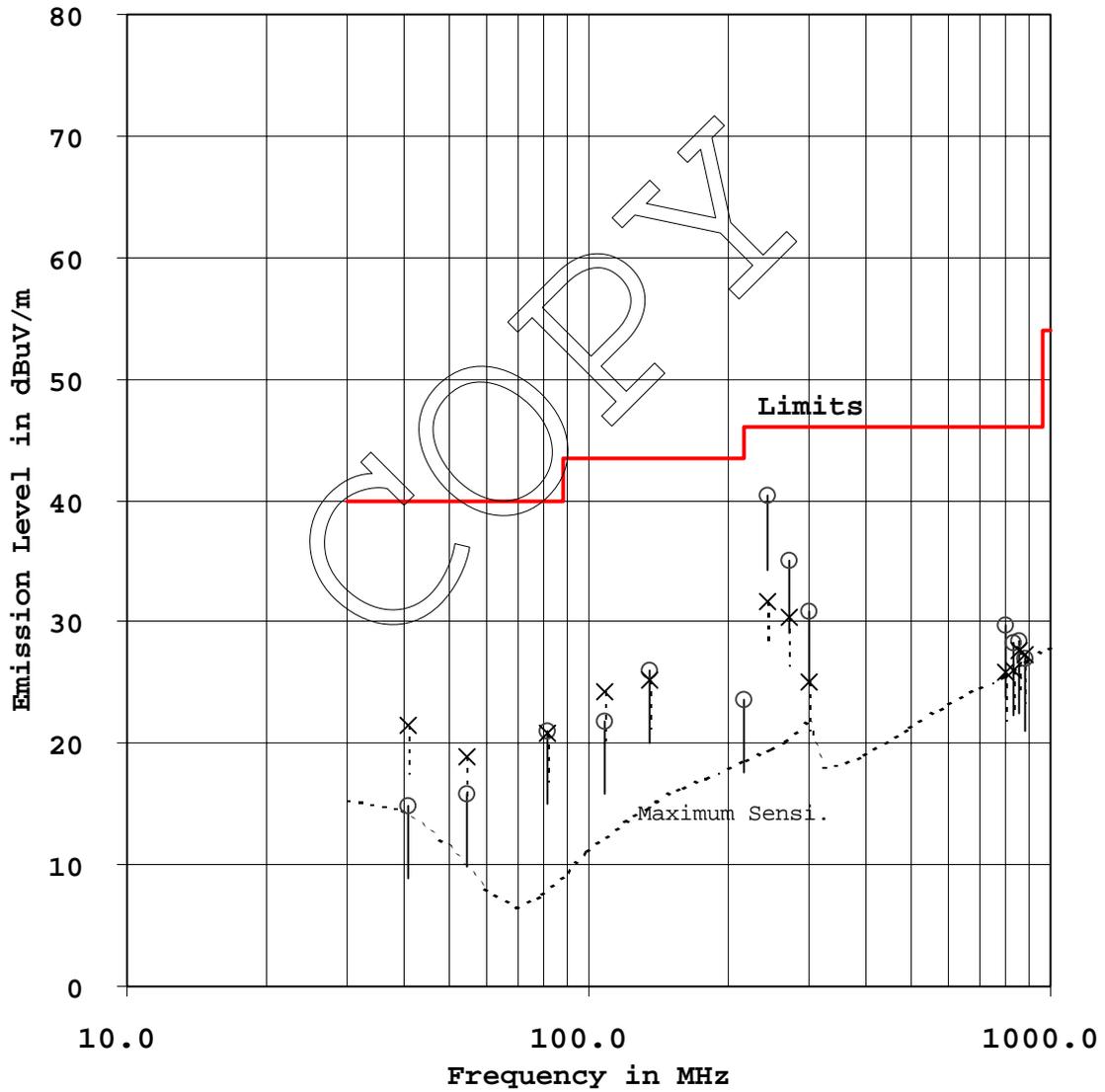
Shigeru Osawa

Testing Engineer

RADIATED EMISSION MEASUREMENT

Model No. : MLU-100A

| | |
|-------------------------------------|--------------|
| Standard : CFR 47 FCC Rules Part 15 | ○ Horizontal |
| | × Vertical |



2.3 Frequency Stability MeasurementDate : May 9, 2000

OPERATING FREQUENCY : 13.56 MHz

| Ambient Temperature (°C) | Frequency tolerance with time elapse(%) | | | |
|-----------------------------|---|-----------|-----------|------------|
| | 0 minute | 2 minutes | 5 minutes | 10 minutes |
| -20 | -0.00106 | -0.00074 | -0.00058 | -0.00048 |
| +50 | -0.00011 | -0.00002 | +0.00008 | +0.00017 |

| Primary Supply Voltage (V) | Frequency tolerance with time elapse(%) | | | |
|----------------------------------|---|-----------|-----------|------------|
| | 0 minute | 2 minutes | 5 minutes | 10 minutes |
| at 20°C 102 (85%) | -0.00018 | -0.00012 | -0.00013 | -0.00014 |
| 120 (100%) | -0.00018 | -0.00012 | -0.00013 | -0.00014 |
| 138 (115%) | -0.00018 | -0.00012 | -0.00013 | -0.00014 |

Specified Limit $\pm 0.01\%$

Tested by :

Shigeru Osawa

Shigeru Osawa

Testing Engineer

2.4 Occupied Bandwidth Measurement

Date : May 19, 2000Temp. : 25 °C Humi. : 50 %

Measurements Results : Refer to the attached graphs.

Tested by : Shigeru Osawa

Shigeru Osawa

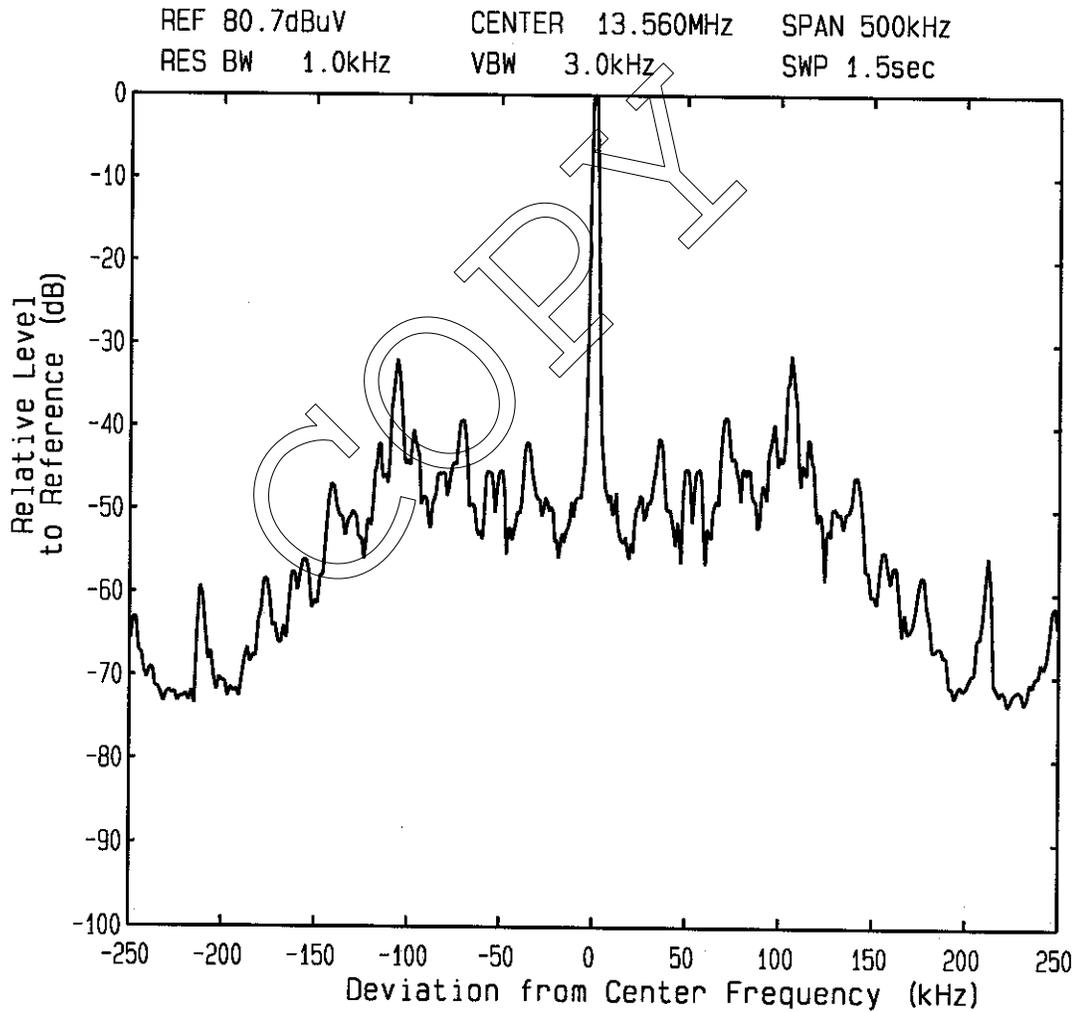
Testing Engineer

COPY

Emission Limitation

FCC ID : AK8MLU100A
Model : MLU-100A

Mode of EUT : Transmit



Emission Limitation

FCC ID : AK8MLU100A

Model : MLU-100A

Mode of EUT : Transmit

