



## EMI TEST REPORT for

**Class II Permissive Change for FCC ID: RPARFMHL00**  
(The change points are described in page 13 on this report.)

JQA File No. : 441-41263  
Model No. : 444-59003  
Type of Equipment : RF-MODULE (RFID Reader/Writer)  
Regulations Applied : CFR 47 FCC Rules and Regulations Part 15  
FCC ID : RPARFMHL00  
Applicant : RISO KAGAKU CORPORATION  
Address : 127-7, Taninosawa, Fukuda, Ami-machi, Inashiki-gun,  
Ibaraki-ken 300-1156, Japan  
Manufacture : RISO KAGAKU CORPORATION  
Address : 127-7, Taninosawa, Fukuda, Ami-machi, Inashiki-gun,  
Ibaraki-ken 300-1156, Japan  
Received date of EUT : February 9, 2005  
**Final Judgment** : **Passed**

**TEST RESULTS IN THIS REPORT** are obtained in use of equipment that is traceable to National Institute of Advanced Industrial Science and Technology (AIST) of Japan and National Institute of Information and Communications Technology (NICT) of Japan. **The test results** only responds to the tested sample. **THIS REPORT** should not be reproduced, except in full, without the approval of the JQA Safety & EMC Center EMC Engineering Department TSURU EMC Branch.

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## 1 DOCUMENTATION

### 1.1 TEST REGULATION

FCC Rules and Regulations Part 15 Subpart A and C (January 8, 2004) 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 C63.4-2003.

### 1.2 GENERAL INFORMATION

#### 1.2.1 Test facility :

1) Test Facility located at JQA Safety & EMC Center EMC Engineering Department TSURU EMC Branch:  
Open Site No.1, No.2, An Anechoic Chamber (3 m and 10 m, on common plane) and a Shielded Room

**FCC Registration Number: 90728 (Date of Listing : April 2, 2002)**

2) JQA Safety & EMC Center EMC Engineering Department TSURU EMC Branch is recognized under the National Voluntary Laboratory Accreditation Program for satisfactory compliance established in title 15, Part 285 Code of Federal Regulations.

**NVLAP Lab Code : 200192-0 (Effective through : June 30, 2005)**

#### 1.2.2 Description of the Equipment Under Test (EUT) :

1) Type of Equipment	: RF-MODULE (RFID Reader/Writer)
2) Product Type	: Pre-production
3) Category	: Low Power Communication Device
4) EUT Authorization	: Certification
5) FCC ID	: RPARFMHL00
6) Trade Name	: RISO
7) Model No.	: 444-59003
8) Operating Frequency Range	: 13.56 MHz
9) Highest Frequency Used in the EUT	: 13.56 MHz
10) Serial No.	: -
11) Date of Manufacture	: -
12) Power Rating	: 5.0VDC*
13) EUT Grounding	: None

\*:The EUT was operated with the printer.(Input: 120Vac 60Hz, Output: 5.0Vdc)

#### 1.2.3 Definitions for symbols used in this test report :

x - 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 Powerline Conducted Emissions**

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

**Test location :**

JQA Safety & EMC Center EMC Engineering Department TSURU EMC Branch  
2096 Ohata, Tsuru-shi Yamanashi-ken 402-0045, JAPAN

   - Shielded Room A  
   - Shielded Room B  
   - Anechoic Chamber  
   - Open Site No.1  
X - Open Site No.2

**Used test instruments :**

Type	Model No.	Manufacturer	Serial No.	Last Cal.	Interval
Test Receiver (R-3)	ESI7	Rohde & Schwarz	100059	2004/11	1 Year
Test Receiver (R-4)	ESHS30	Rohde & Schwarz	842053/001	2005/1	1 Year
X Test Receiver (R-5)	ESCS30	Rohde & Schwarz	100203	2004/2	1 Year
AMN (L-1)	KNW-407	Kyoritsu Electrical	8-833-5	2004/10	1 Year
X AMN (L-2)	KNW-407	Kyoritsu Electrical	8-680-14	2004/10	1 Year
AMN (L-3)	KNW-407	Kyoritsu Electrical	8-757-1	2004/6	1 Year
AMN (L-4)	KNW-242	Kyoritsu Electrical	8-755-1	2004/6	1 Year
AMN (L-5)	KNW-242C	Kyoritsu Electrical	8-837-14	2004/6	1 Year
AMN (L-6)	KNW-243C	Kyoritsu Electrical	8-692-5	2004/9	1 Year
AMN (L-7)	KNW-243C	Kyoritsu Electrical	8-831-3	2004/6	1 Year
AMN (L-8)	KNW-243C	Kyoritsu Electrical	8-831-4	2004/6	1 Year
AMN (L-9)	KNW-243C	Kyoritsu Electrical	8-831-2	2004/9	1 Year
ISN (L-10)	ENY41	Kyoritsu Electrical	0830663/046	2004/3	1 Year
ISN (L-11)	ENY22	Kyoritsu Electrical	0830661/029	2004/3	1 Year
RF Cable (CB-3)	3D-2W	Fujikura	-	2004/5	1 Year
X RF Cable (CB-4)	3D-2W	Fujikura	-	2004/5	1 Year
RF Cable (CB-5)	3D-2W	Fujikura	-	2004/5	1 Year
Pulse Limiter (PL-3)	ESH3-Z2	Rohde & Schwarz	-	2004/11	1 Year
X Pulse Limiter (PL-4)	ESH3-Z2	Rohde & Schwarz	-	2005/1	1 Year
Pulse Limiter (PL-5)	ESH3-Z2	Rohde & Schwarz	-	2004/2	1 Year
50ohm Termination(TM-1)	BNC-P-1.5	TDC	-	2004/3	1 Year
50ohm Termination(TM-2)	-	Y&R	-	2004/3	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 Safety & EMC Center EMC Engineering Department TSURU EMC Branch  
2096 Ohata, Tsuru-shi Yamanashi-ken 402-0045, JAPAN

   - Anechoic Chamber                    X - 3 meters  
   - Open Site No.1                       - 10 meters  
X - Open Site No.2                       - 30 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> - Test Receiver (R-3)	ESI7	Rohde & Schwarz	100059	2004/11	1 Year
<u>X</u> - Test Receiver (R-4)	ESHS30	Rohde & Schwarz	842053/001	2005/1	1 Year
<u>  </u> - Test Receiver (R-5)	ESCS30	Rohde & Schwarz	100203	2004/2	1 Year
<u>X</u> - Loop Antenna (AL-0)	HFH2-Z2	Rohde & Schwarz	879284/14	2004/6	1 Year

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

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

**Test location :**

JQA Safety & EMC Center EMC Engineering Department TSURU EMC Branch  
2096 Ohata, Tsuru-shi Yamanashi-ken 402-0045, JAPAN

   - Anechoic Chamber                    X - 3 meters  
   - Open Site No.1                       - 10 meters  
X - Open Site No.2                       - 30 meters

**Validation of Site Attenuation :**

- 1) Last Confirmed Date : 2004/5
- 2) Interval                            : 1 year

**Used test instruments :**

Type	Model No.	Manufacturer	Serial No.	Last Cal.	Interval
— Test Receiver(R-1)	ESVS10	Rohde & Schwarz	84231/004	2004/3	1 Year
X — Test Receiver(R-2)	ESVS10	Rohde & Schwarz	843744/018	2004/7	1 Year
— Test Receiver(R-3)	ESI7	Rohde & Schwarz	100059	2004/11	1 Year
— Test Receiver(R-5)	ESCS30	Rohde & Schwarz	100203	2004/2	1 Year
— Biconical Antenna(AB-1)	BBA9106	Schwarzbeck	VHA91031741	2004/5	1 Year
X — Biconical Antenna(AB-2)	BBA9106	Schwarzbeck	VHA91031516	2004/5	1 Year
— Biconical Antenna(AB-3)	BBA9106	Schwarzbeck	VHA11905516	2004/5	1 Year
— Log-Periodic Antenna(AL-1)	UHALP9107	Schwarzbeck	9107915	2004/5	1 Year
X — Log-Periodic Antenna(AL-2)	UHALP9107	Schwarzbeck	1357	2004/5	1 Year
— Log-Periodic Antenna(AL-3)	UHALP9108	Schwarzbeck	0278	2004/5	1 Year
— Dipole Antenna(AD-1)	KBA-511A	Kyoritsu Electrical	0-195-5	2004/9	1 Year
— Dipole Antenna(AD-2)	KBA-511A	Kyoritsu Electrical	0-228-13	2004/9	1 Year
— Dipole Antenna(AD-3)	KBA-611	Kyoritsu Electrical	0-196-8	2004/9	1 Year
— Dipole Antenna(AD-4)	KBA-611	Kyoritsu Electrical	0-230-6	2004/9	1 Year
— RF Cable(CN-1)	20D/5D-2W	Fujikura	-	2004/5	1 Year
X — RF Cable(CN-2)	20D/5D-2W	Fujikura	-	2004/5	1 Year
— RF Cable(CN-3)	20D/5D-2W	Fujikura	-	2004/5	1 Year

**1.3.4 The measurement of the Radiated Emissions(Above 1000 MHz)**

       - was performed in the following test site.

X - was not applicable.

**Test location :**

JQA Safety & EMC Center EMC Engineering Department TSURU EMC Branch  
2096 Ohata, Tsuru-shi Yamanashi-ken 402-0045, JAPAN

<u>      </u> - Anechoic Chamber	<u>      </u> - 3 meters
<u>      </u> - Open Site No.1	<u>      </u> - 10 meters
<u>      </u> - Open Site No.2	<u>      </u> - 30 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
Test Receiver (R-3)	ESI7	Rohde & Schwarz	100059	2004/11	1 Year
Test Receiver (R-5)	ESCS30	Rohde & Schwarz	100203	2004/2	1 Year
Spectrum Analyzer (S-1)	R3361C	Advantest	71720774	2004/4	1 Year
Spectrum Analyzer (S-4)	8563E	Hewlett Packard	3221A00201	2004/4	1 Year
Log-Periodic Antenna (AL-4)	USLP9143	Schwarzbeck	140	2004/6	1 Year
Log-Periodic Antenna (AL-5)	94612-1	Eaton	97062301	2004/4	1 Year
Horn Antenna (AH-5)	12-12	Scientific Atlanta	770	2004/5	1 Year
RF Cable (CS-1)	SUCOFLEX 104	Suhner	121947/4	2004/5	1 Year
RF Cable (CS-2)	SUCOFLEX 104	Suhner	35687/4	2004/5	1 Year
RF Cable (CS-3)	SUCOFLEX 104	Suhner	39934/4	2004/5	1 Year
RF Cable (CS-4)	SUCOFLEX 104	Suhner	52053/4	2004/5	1 Year
RF Cable (CS-5)	SUCOFLEX 104	Suhner	52146/4	2004/5	1 Year
Pre-Amplifier; (PA-1)	WJ-6811-513	Watkins Johnson	0288	2004/5	1 Year
Pre-Amplifier; (PA-2)	WJ-6682-824	Watkins Johnson	0052	2004/5	1 Year
Pre-Amplifier; (PA-3)	WJ-6870-506	Watkins Johnson	0018	2004/5	1 Year

**Setting of the spectrum analyzer :**

Resolution Bandwidth: 1 MHz  
Video Bandwidth : 10 Hz  
Sweep Time : 5 sec.  
Scale : Linear

**1.3.5 The measurement of the Frequency Stability**       - was performed.X - was not applicable.**Used test instruments :**

Type	Model No.	Manufacturer	Serial No.	Last Cal.	Interval
<u>      </u> - Frequency Counter	53131A	Hewlett Packard	3546A11807	2004/05	1 Year
<u>      </u> - Oven	-	Ohnishi Co. Ltd.	-	2004/08	1 Year
<u>      </u> - DC Power Supply	6628A	Hewlett Packard	3224A00284	2004/07	1 Year

**1.3.6 The measurement of the Occupied Bandwidth**       - was performed.X - was not applicable.**Used test instruments :**

Type	Model No.	Manufacturer	Serial No.	Last Cal.	Interval
<u>      </u> - Test Receiver	ESI7	Rohde & Schwarz	100059	2004/10	1 Year
<u>      </u> - Spectrum Analyzer	8560E	Hewlett Packard	3240A00189	2004/9	1 Year
<u>      </u> - Spectrum Analyzer	8560E	Hewlett Packard	3240A00189	2004/9	1 Year
<u>      </u> - Spectrum Analyzer	8563E	Hewlett Packard	3221A00201	2004/5	1 Year
<u>      </u> - Spectrum Analyzer	8566B	Hewlett Packard	2140A01091	2004/4	1 Year
<u>      </u> - Spectrum Analyzer	8566B	Hewlett Packard	2747A05855	2004/5	1 Year
<u>      </u> - Function Generator	3325A	Hewlett Packard	2512A21776	2004/5	1 Year
<u>      </u> - FM Linear Detector	MS61A	Anritsu Corp.	M77486	2004/9	1 Year
<u>      </u> - Level Meter	ML422C	Anritsu Corp.	M87571	2004/6	1 Year

**1.4 EUT MODIFICATION / Deviation from Standard****1.4.1 EUT MODIFICATION**

X - 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:**

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

COPY

**1.5 TEST RESULTS**

**AC Power Line Conducted Emission**  - Applicable  - NOT Applicable  
[§15.207(a)]

The requirements are

- PASSED  - NOT PASSED

**Remarks :**

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

The requirements are

- PASSED  - NOT PASSED

**Remarks:**

**Frequency Stability[§15.225(e)]**  - Applicable  - NOT Applicable

The requirements are

- PASSED  - NOT PASSED

**Remarks:** It is considered that this requirement is not affected by equipment modifications.

**Occupied Bandwidth[§15.225(d)]**  - Applicable  - NOT Applicable

The requirements are

- PASSED  - NOT PASSED

**Remarks:** It is considered that this requirement is not affected by equipment modifications.

## 1.6 SUMMARY

### General Remarks :

The EUT was tested according to the requirements of FCC Rules and Regulations Part 15 Subpart A and C (January 8, 2004) 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;

- 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 : February 9, 2005

End of testing : February 10, 2005

### - JAPAN QUALITY ASSURANCE ORGANIZATION -

Tested by:



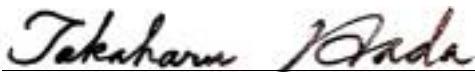
Yoichi Nakajima

Manager

TSURU EMC Branch

JQA EMC Engineering Dept.

Approved by:



Takaharu Hada

Director

TSURU EMC Branch

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.	Serial No.
A	RFID reader/writer	RISO KAGAKU CORPORATION	444-59003	-
B	D-Shape Antenna x2	RISO KAGAKU CORPORATION	444-59002	-
C	O-Shape Antenna	RISO KAGAKU CORPORATION	444-59006	-
D	Interconnecting PCB	RISO KAGAKU CORPORATION	024-17178	-

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

Symbol	Item	Manufacturer	Model No.	Serial No.
E	Duplicator	RISO KAGAKU CORP.	MZ790U	81920008
F	Exclusive Table	RISO KAGAKU CORP.	Exclusive Table N Type	-

Type of Cable :

Symbol	Description	Identification (Manufacturer etc.)	Shielded YES / NO	Ferrite Core	Connector type Shielded YES / NO	Length (m)
1	AC Cable	-	NO	NO	NO	3.0
2	Signal Cable	-	NO	YES	NO	1.5
3	Signal Cable	-	NO	NO	NO	1.5
4	Antenna Cable(Coaxial)	-	Yes	YES	YES	0.65
5	Antenna Cable(Twisted Wire)	-	NO	NO	NO	0.3
6	Antenna Cable(Coaxial)	-	YES	NO	YES	0.7
7	Antenna Cable(Coaxial)	-	YES	NO	YES	1.5

### 1.7.2 Operating condition

Power Supply Voltage : 5.0VDC\*

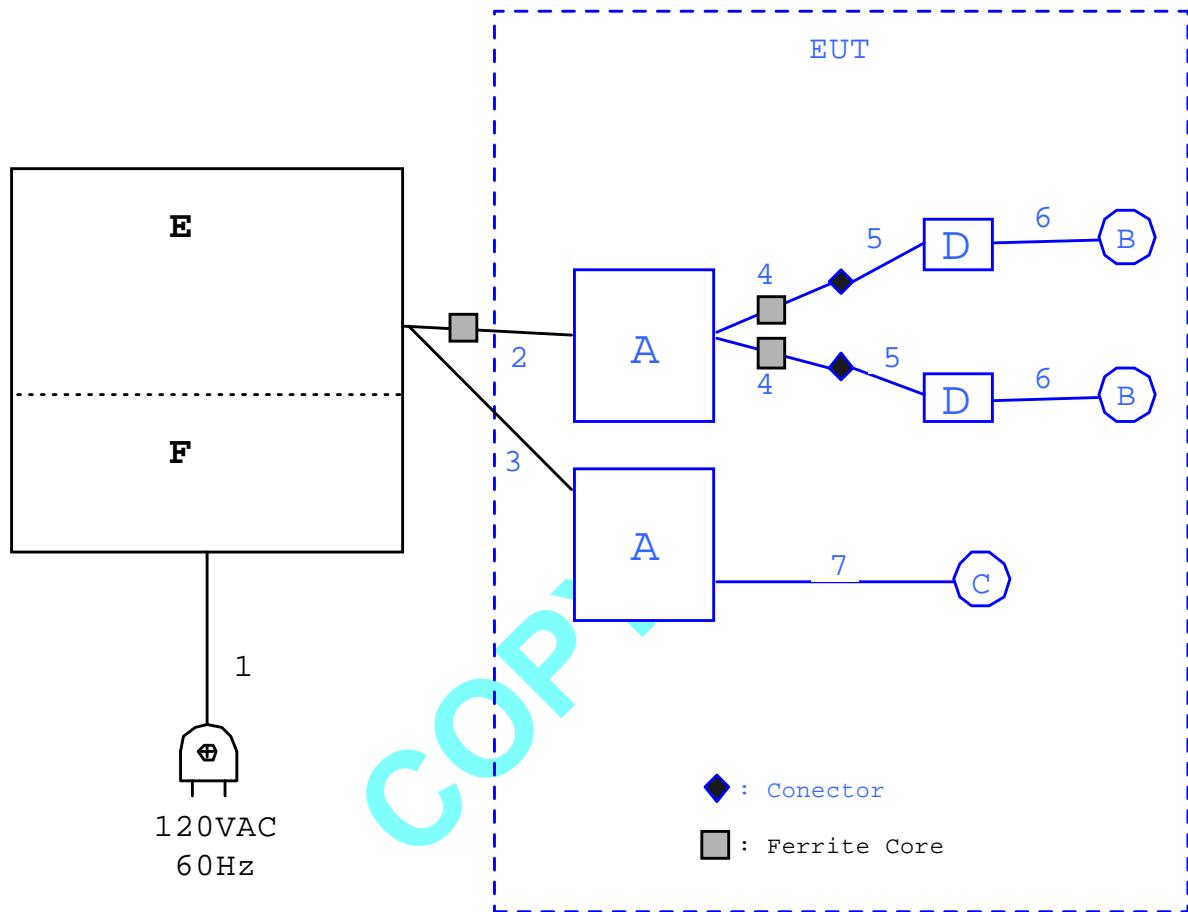
\* The EUT was operated with the printer.(Input: 120Vac 60Hz, Output: 5.0Vdc)

The tests have been carried out under continuous transmission/ Reception Mode.

The measurements were performed following 3 TX/RX conditions:

- (1) Module(Drum)+(D-shape Antenna 1)
- (2) Module(Drum)+(D-shape Antenna 1)
- (3) Module(Master)+(O-shape Antenna)

These 3 TX/RX conditions are not operated simultaneously.

**1.8 EUT ARRANGEMENT (DRAWINGS)**

The change points are the followings:

- (1) 3 ferrite cores are added on cable 4 and 2.
- (2) No.4 antenna cable length is changed to 0.65 m from 1.5 m.
- (3) No.5 antenna cable length is changed to 0.3 m from 0.1 m.

**1.9 PRELIMINARY TEST AND TEST-SETUP (DRAWINGS)****1.9.1 AC Power Line Conducted Emission ( 150 kHz - 30 MHz ) :**

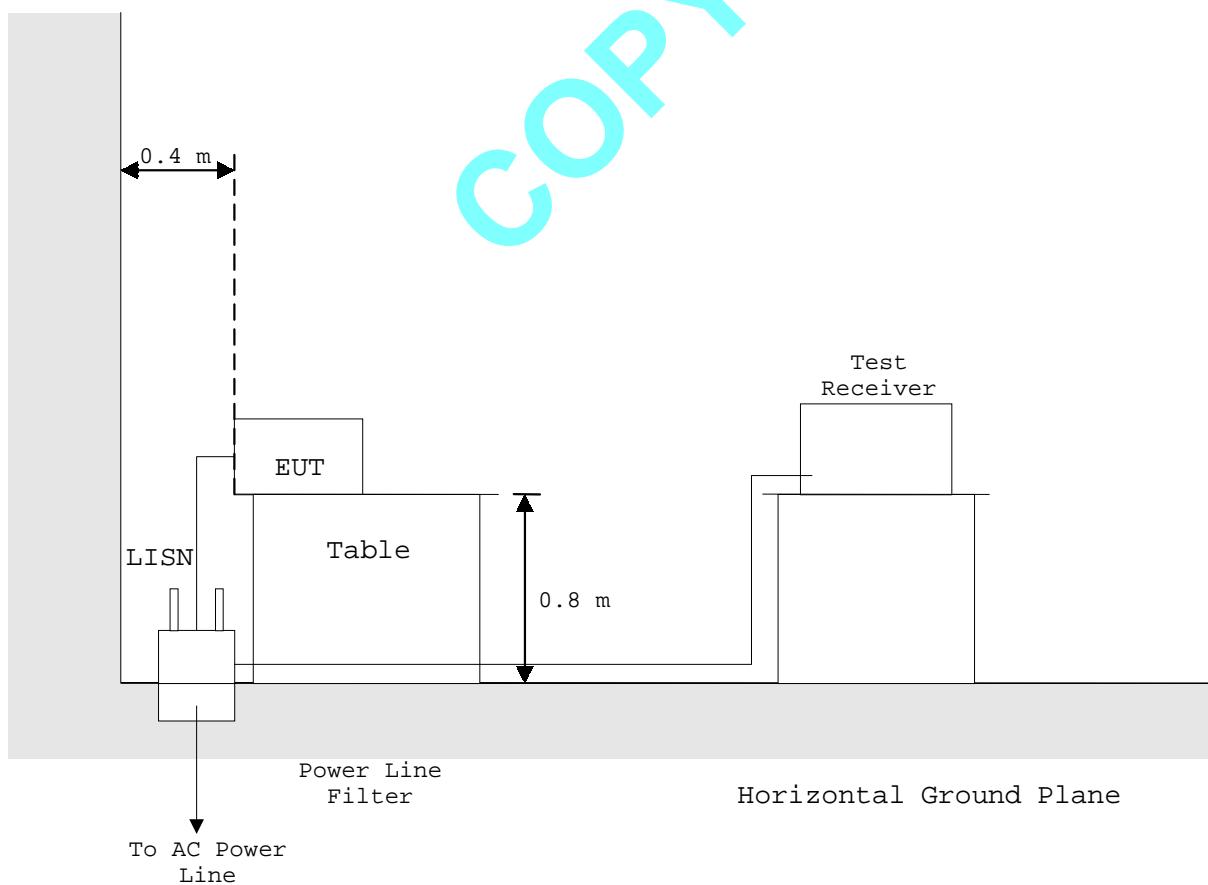
According to description of ANSI C63.4-2003 sec.13.1.3, the AC power line preliminary conducted emissions measurements were carried out.

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 -**

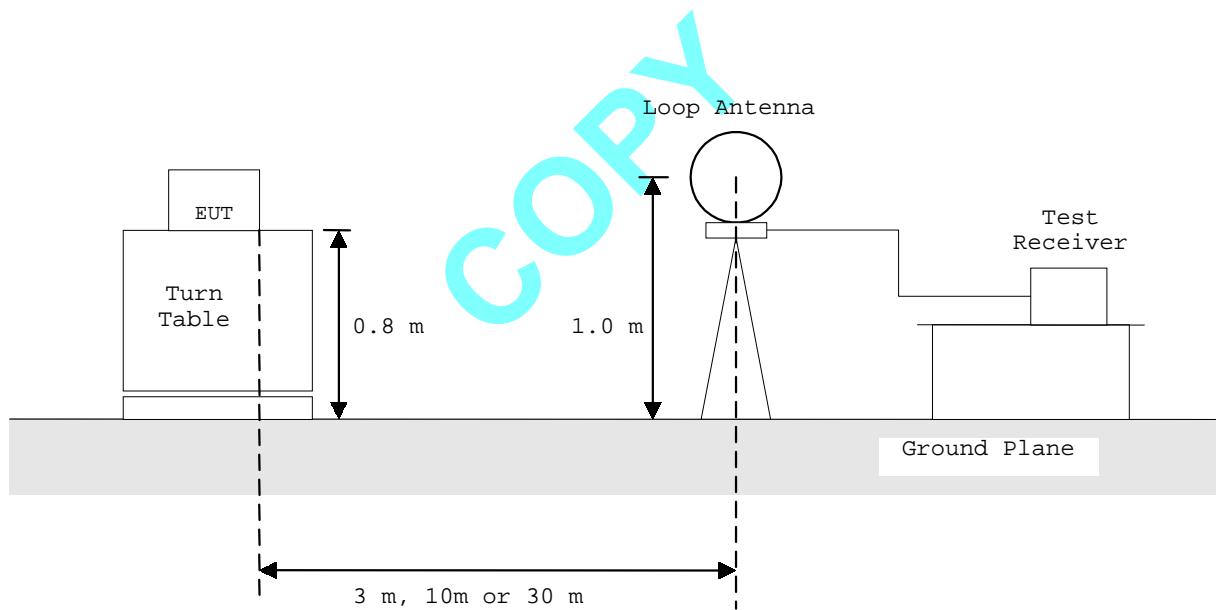
Vertical  
Ground  
Plane



**1.9.2 Radiated Emission ( 9 kHz - 30 MHz) :**

According to description of ANSI C63.4-2003 sec.13.1.4, 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.

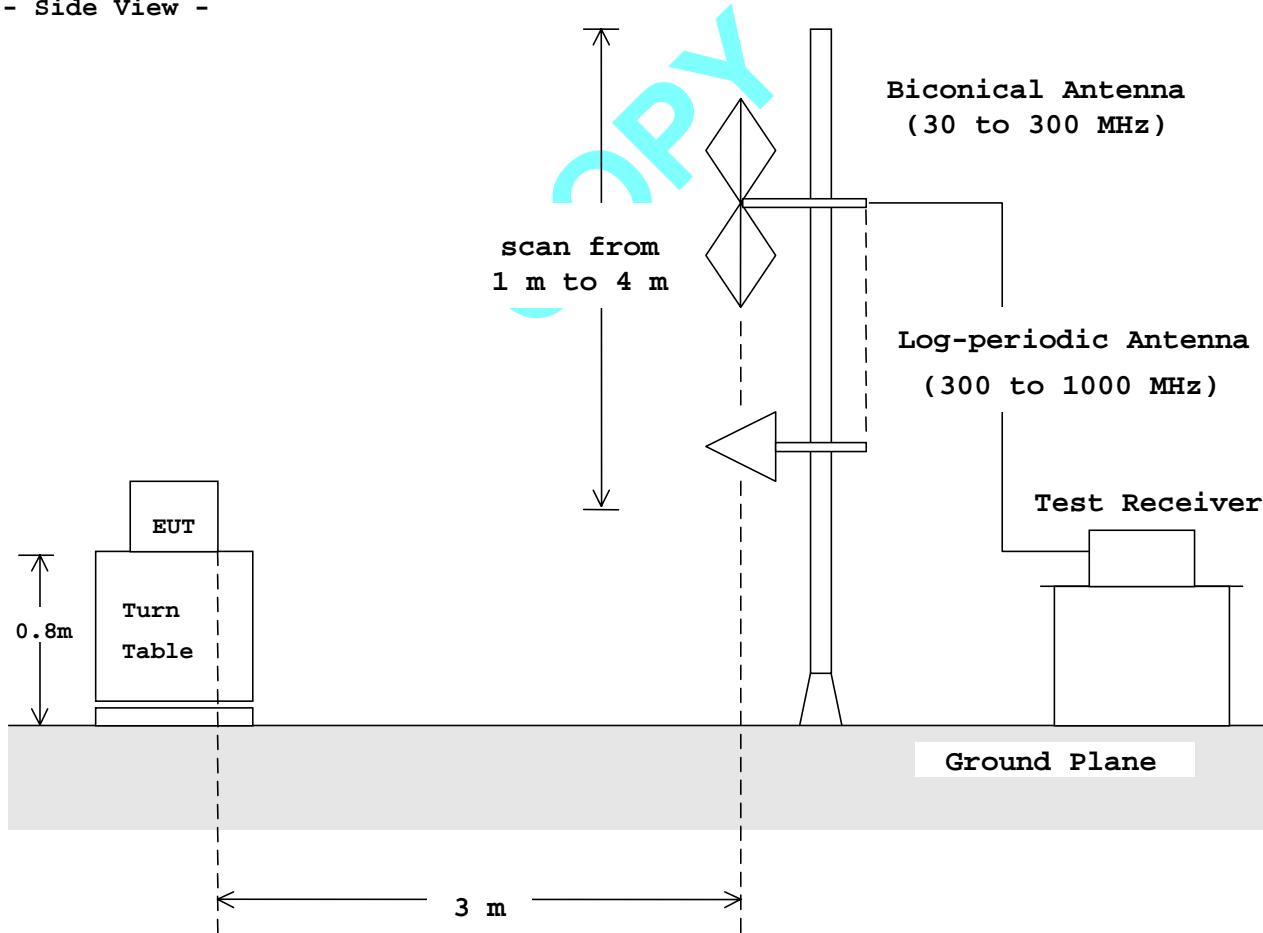
The EUT configuration, cable configuration and mode of operation were determined for producing the maximum level of emissions. These configurations were used for the final radiated emissions measurements.

**- Side View -**

**1.9.3 Radiated Emission ( 30 MHz - 1000 MHz ) :**

According to description of ANSI C63.4-2003 sec.13.1.4, 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.

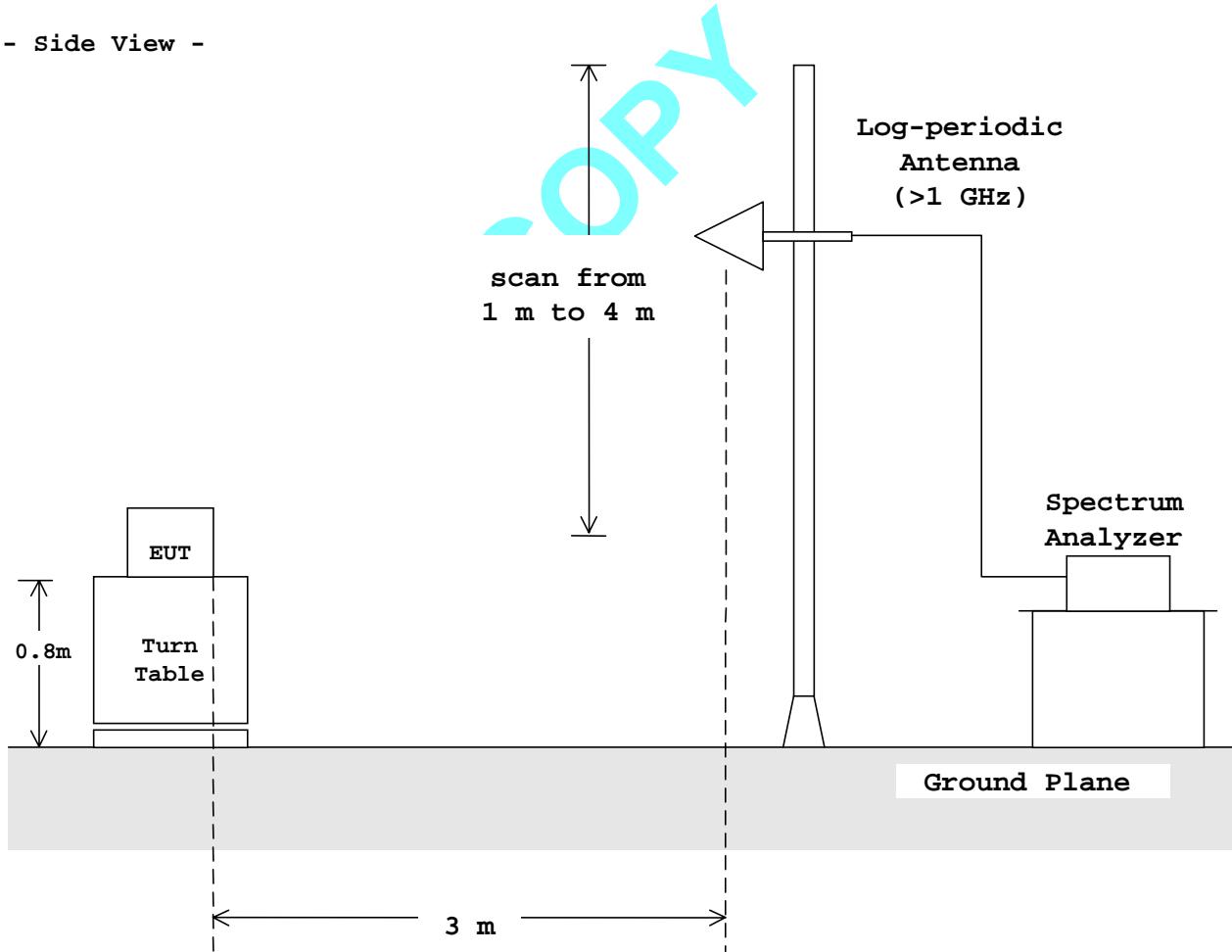
The EUT configuration, cable configuration and mode of operation were determined for producing the maximum level of emissions. These configurations were used for the final radiated emissions measurements.

**Anechoic Chamber****- Side View -**

**1.9.4 Radiated Emission (Above 1 GHz) :**

According to description of ANSI C63.4-2003 sec.13.1.4, 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.

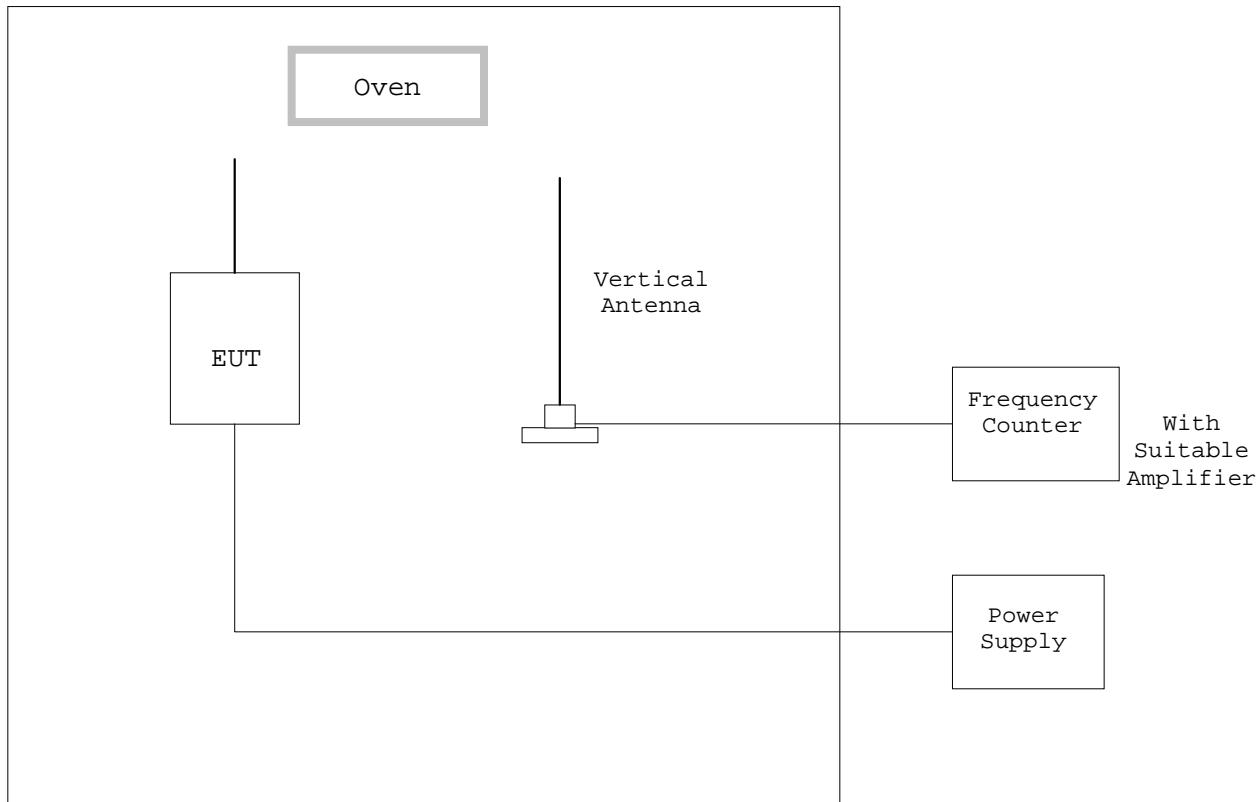
The EUT configuration, cable configuration and mode of operation were determined for producing the maximum level of emissions. These configurations were used for the final radiated emissions measurements.

**Anechoic Chamber****- Side View -**

**1.9.5 Frequency Stability :**

According to description of ANSI C63.4-2003 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  $-20^{\circ}\text{C}$  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  $+20^{\circ}\text{C}$ .

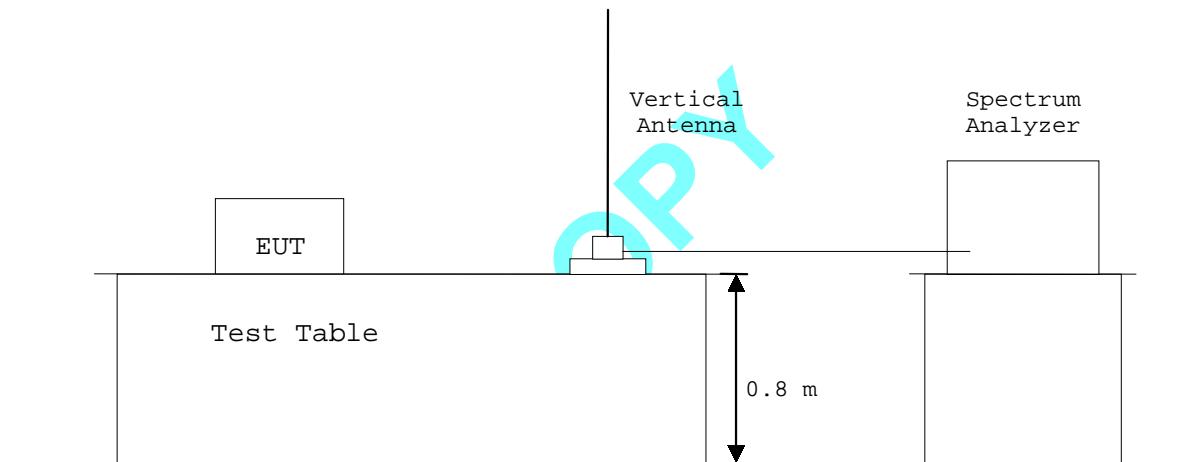
These measurements were carried out after allow sufficient time (approximately 1 hour) for the temperature of the chamber to stabilize.



**1.9.6 Occupied Bandwidth :**

According to description of ANSI C63.4-2003 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.

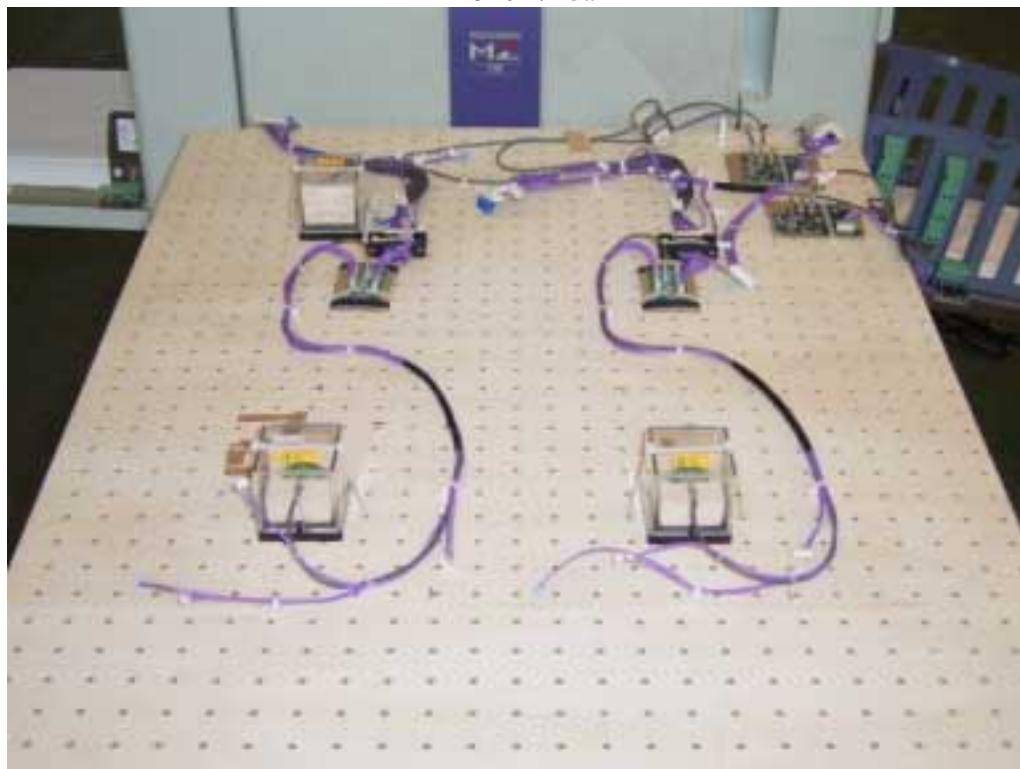


**1.10 TEST ARRANGEMENT (PHOTOGRAPHS)****PHOTOGRAPHS OF EUT CONFIGURATION FOR CONDUCTED EMISSION MEASUREMENT****- Rear View -****- Side View -**

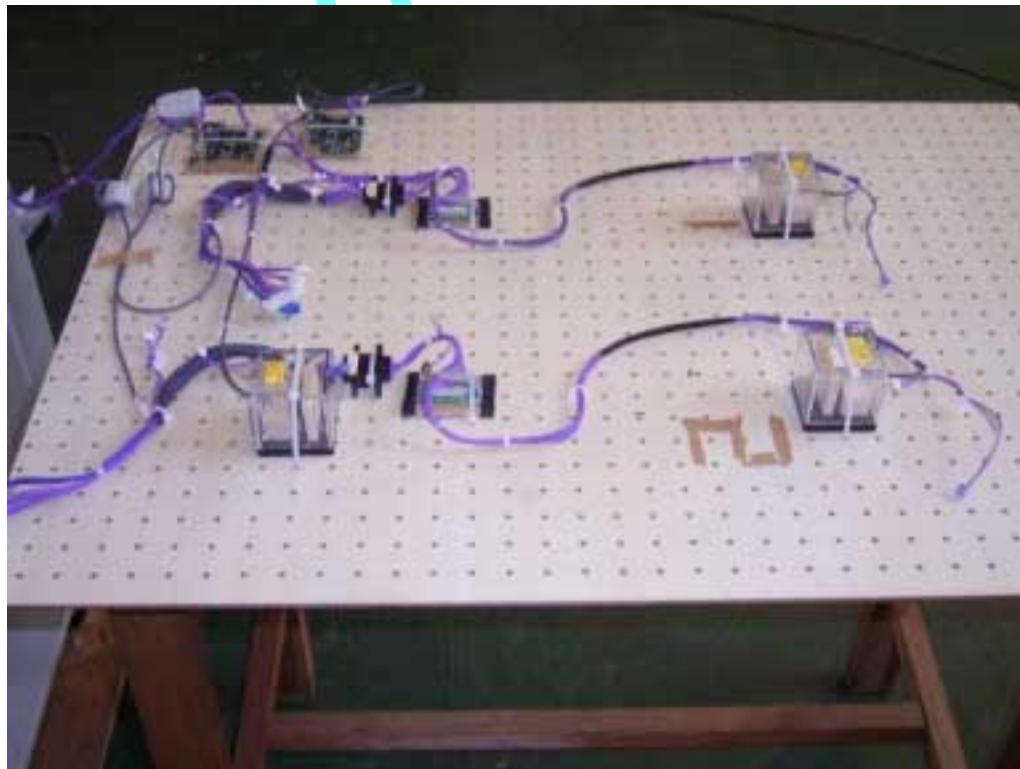
**PHOTOGRAPHS OF EUT CONFIGURATION FOR RADIATED EMISSIONS MEASUREMENT**

Photograph present configuration with maximum emission

- Front View -



- Side View -



**2. TEST DATA****2.1 AC Power Line Conducted Emission Measurement (0.15 MHz - 30 MHz)**

Date : February 10, 2005

Temp.: 8 °C Humi.: 55 %

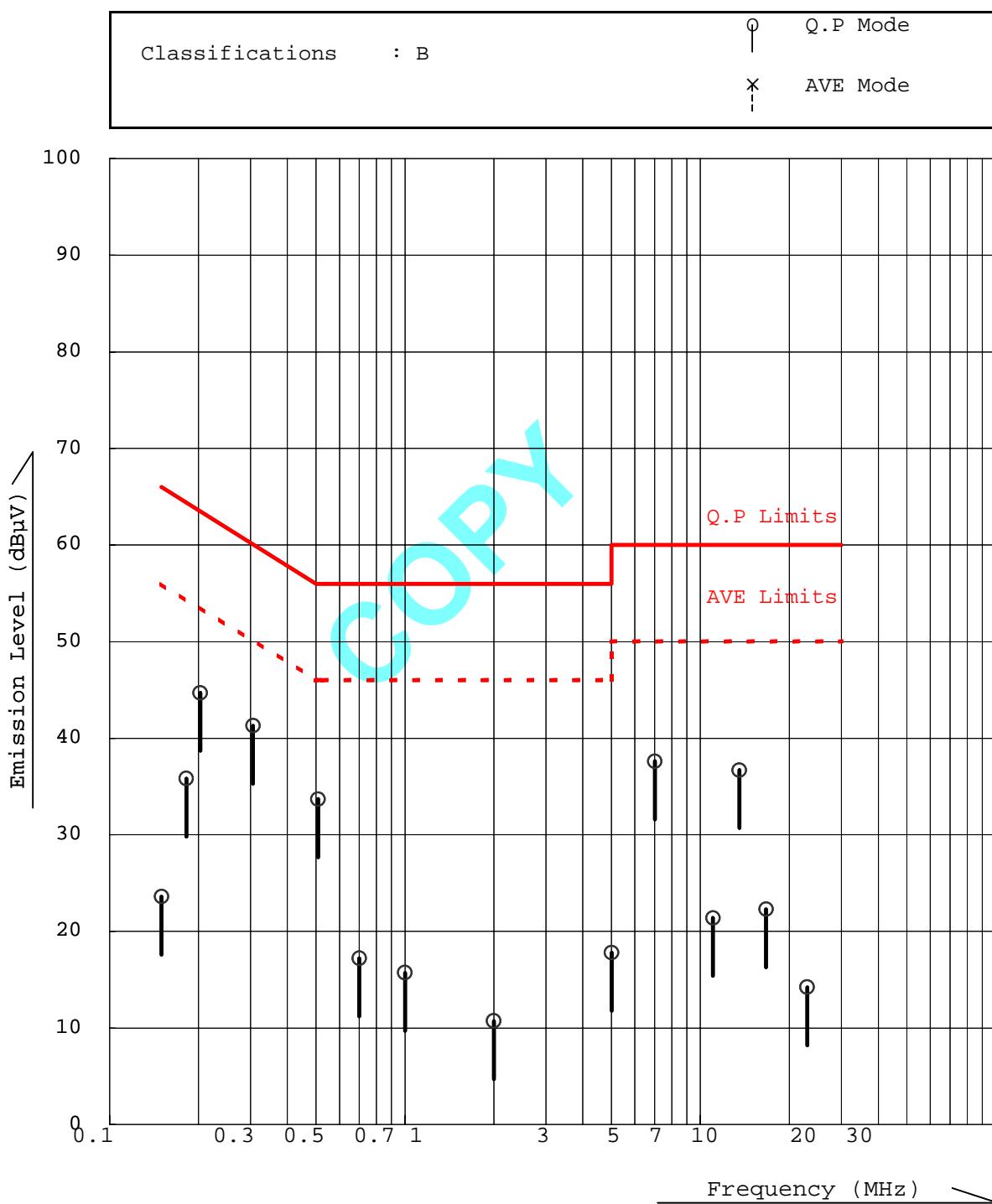
**Operating Condition** : TX/ RX  
**Operating Frequency** : 13.56 MHz

## 1) Module(Drum)+(D-shape Antenna 1)

Frequency (MHz)	AMN Factor (dB)	Meter Reading (dB $\mu$ V)				Limits (dB $\mu$ V)		Emission Level (dB $\mu$ V)		Margin (dB)	Comment
		Q.P	AVE	V-A	Q.P	AVE	V-B	Q.P	AVE		
0.15	0.1	22.5	-	23.5	-	66.0	56.0	23.6	-	42.4	-
0.18	0.1	35.7	-	35.7	-	64.4	54.4	35.8	-	28.6	-
0.20	0.1	44.5	-	44.6	-	63.5	53.5	44.7	-	18.8	-
0.31	0.1	41.2	-	41.2	-	60.1	50.1	41.3	-	18.8	-
0.51	0.1	33.6	-	33.6	-	56.0	46.0	33.7	-	22.3	-
0.70	0.1	17.1	-	17.1	-	56.0	46.0	17.2	-	38.8	-
1.00	0.1	15.6	-	15.6	-	56.0	46.0	15.7	-	40.3	-
2.00	0.1	10.6	-	10.6	-	56.0	46.0	10.7	-	45.3	-
5.01	0.1	17.6	-	17.7	-	60.0	50.0	17.8	-	42.2	-
7.01	0.1	37.4	-	37.5	-	60.0	50.0	37.6	-	22.4	-
11.02	0.2	21.2	-	21.1	-	60.0	50.0	21.4	-	38.6	-
13.56	0.3	36.3	-	36.4	-	60.0	50.0	36.7	-	23.3	-
16.69	0.3	22.0	-	21.9	-	60.0	50.0	22.3	-	37.7	-
23.00	0.5	13.6	-	13.7	-	60.0	50.0	14.2	-	45.8	-
30.00	0.6	< 10.0	-	< 10.0	-	60.0	50.0	< 10.6	-	> 49.4	-

Notes: 1) Test Location : Open Site No.2  
 2) The spectrum was checked from 0.15 MHz to 30 MHz  
 3) AMN(Artificial Mains Network) factor includes the cable loss for 5 meter.  
 4) The symbol of "<" means "or less".  
 5) The symbol of ">" means "more than".  
 6) The symbol of "--" means "Not applicable".  
 7) V-A : One end & Ground V-B : The other end & Ground  
 8) Q.P : Quasi-Peak Detector AVE : Average Detector  
 9) A sample calculation was made at 0.15 MHz  

$$Amn + Mr = 0.1 + 23.5 = 23.6 \text{ dB}\mu\text{V}$$
  
 Amn : AMN Factor Mr : Meter Reading  
 10) Setting of measuring instrument :  
 Detector Function : CISPR Quasi-Peak / Average  
 IF Bandwidth : 9 kHz / 10 kHz (0.15 MHz - 30 MHz)

**AC Power Line Conducted Emission Measurement (0.15 MHz - 30 MHz)**1) Module (Drum) + (D-shape Antenna 1)

## 2) Module(Drum)+(D-shape Antenna 2)

Frequency (MHz)	AMN Factor (dB)	Meter Reading (dB $\mu$ V)				Limits (dB $\mu$ V)		Emission Level (dB $\mu$ V)		Margin (dB)		Comment
		V-A		V-B		Q.P	AVE	Q.P	AVE	Q.P	AVE	
		Q.P	AVE	Q.P	AVE	Q.P	AVE	Q.P	AVE	Q.P	AVE	
0.15	0.1	21.3	-	21.2	-	66.0	56.0	21.4	-	44.6	-	
0.18	0.1	35.8	-	35.7	-	64.4	54.4	35.9	-	28.5	-	
0.20	0.1	44.3	-	44.4	-	63.5	53.5	44.5	-	19.0	-	
0.31	0.1	40.6	-	40.6	-	60.1	50.1	40.7	-	19.4	-	
0.51	0.1	33.7	-	33.7	-	56.0	46.0	33.8	-	22.2	-	
0.70	0.1	17.2	-	17.1	-	56.0	46.0	17.3	-	38.7	-	
1.00	0.1	15.7	-	15.7	-	56.0	46.0	15.8	-	40.2	-	
2.00	0.1	10.6	-	10.6	-	56.0	46.0	10.7	-	45.3	-	
5.01	0.1	17.8	-	17.7	-	60.0	50.0	17.9	-	42.1	-	
7.01	0.1	36.3	-	36.3	-	60.0	50.0	36.4	-	23.6	-	
11.02	0.2	21.9	-	21.9	-	60.0	50.0	22.1	-	37.9	-	
13.56	0.3	34.1	-	34.1	-	60.0	50.0	34.4	-	25.6	-	
16.69	0.3	22.4	-	22.4	-	60.0	50.0	22.7	-	37.3	-	
23.00	0.5	14.0	-	13.9	-	60.0	50.0	14.5	-	45.5	-	
30.00	0.6	< 10.0	-	< 10.0	-	60.0	50.0	< 10.6	-	> 49.4	-	

Notes:

- 1) Test Location : Open Site No.2
- 2) The spectrum was checked from 0.15 MHz to 30 MHz
- 3) AMN(Artificial Mains Network) factor includes the cable loss for 5 meter.
- 4) The symbol of "<" means "or less".
- 5) The symbol of ">" means "more than".
- 6) The symbol of "-" means "Not applicable".
- 7) V-A : One end & Ground V-B : The other end & Ground
- 8) Q.P : Quasi-Peak Detector AVE : Average Detector
- 9) A sample calculation was made at 0.15 MHz

$$Amn + Mr = 0.1 + 21.3 = 21.4 \text{ dB}\mu\text{V}$$

Amn : AMN Factor Mr : Meter Reading

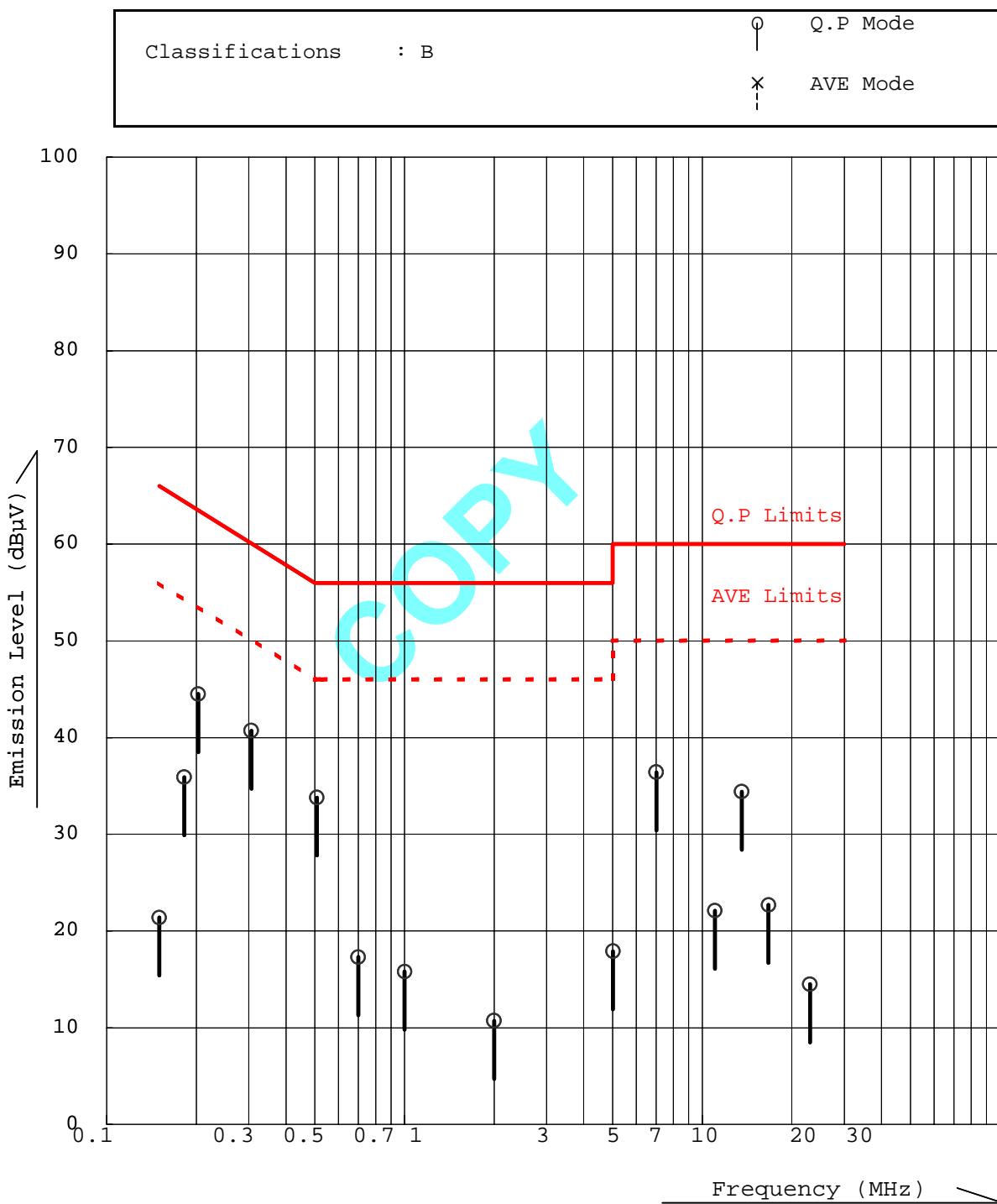
10) Setting of measuring instrument :

Detector Function : CISPR Quasi-Peak / Average

IF Bandwidth : 9 kHz / 10 kHz (0.15 MHz - 30 MHz)

**AC Power Line Conducted Emission Measurement (0.15 MHz - 30 MHz)**

2) Module(Drum)+(D-shape Antenna 2)



## 3) Module(Master)+(O-shape Antenna)

Frequency (MHz)	AMN Factor (dB)	Meter Reading (dB $\mu$ V)				Limits (dB $\mu$ V)		Emission Level (dB $\mu$ V)		Margin (dB)		Comment
		V-A		V-B		Q.P	AVE	Q.P	AVE	Q.P	AVE	
		Q.P	AVE	Q.P	AVE	Q.P	AVE	Q.P	AVE	Q.P	AVE	
0.15	0.1	22.3	-	23.4	-	66.0	56.0	23.5	-	42.5	-	
0.18	0.1	35.6	-	35.6	-	64.4	54.4	35.7	-	28.7	-	
0.20	0.1	44.4	-	44.5	-	63.5	53.5	44.6	-	18.9	-	
0.31	0.1	40.9	-	40.9	-	60.1	50.1	41.0	-	19.1	-	
0.51	0.1	33.6	-	33.6	-	56.0	46.0	33.7	-	22.3	-	
0.70	0.1	17.2	-	17.2	-	56.0	46.0	17.3	-	38.7	-	
1.00	0.1	15.6	-	15.6	-	56.0	46.0	15.7	-	40.3	-	
2.00	0.1	10.9	-	10.8	-	56.0	46.0	11.0	-	45.0	-	
5.01	0.1	17.8	-	17.8	-	60.0	50.0	17.9	-	42.1	-	
7.01	0.1	36.3	-	36.5	-	60.0	50.0	36.6	-	23.4	-	
11.02	0.2	19.8	-	20.9	-	60.0	50.0	21.1	-	38.9	-	
13.56	0.3	46.4	-	46.4	-	60.0	50.0	46.7	-	13.3	-	
16.69	0.3	20.7	-	20.8	-	60.0	50.0	21.1	-	38.9	-	
23.00	0.5	13.9	-	14.0	-	60.0	50.0	14.5	-	45.5	-	
30.00	0.6	< 10.0	-	< 10.0	-	60.0	50.0	< 10.6	-	> 49.4	-	

Notes:

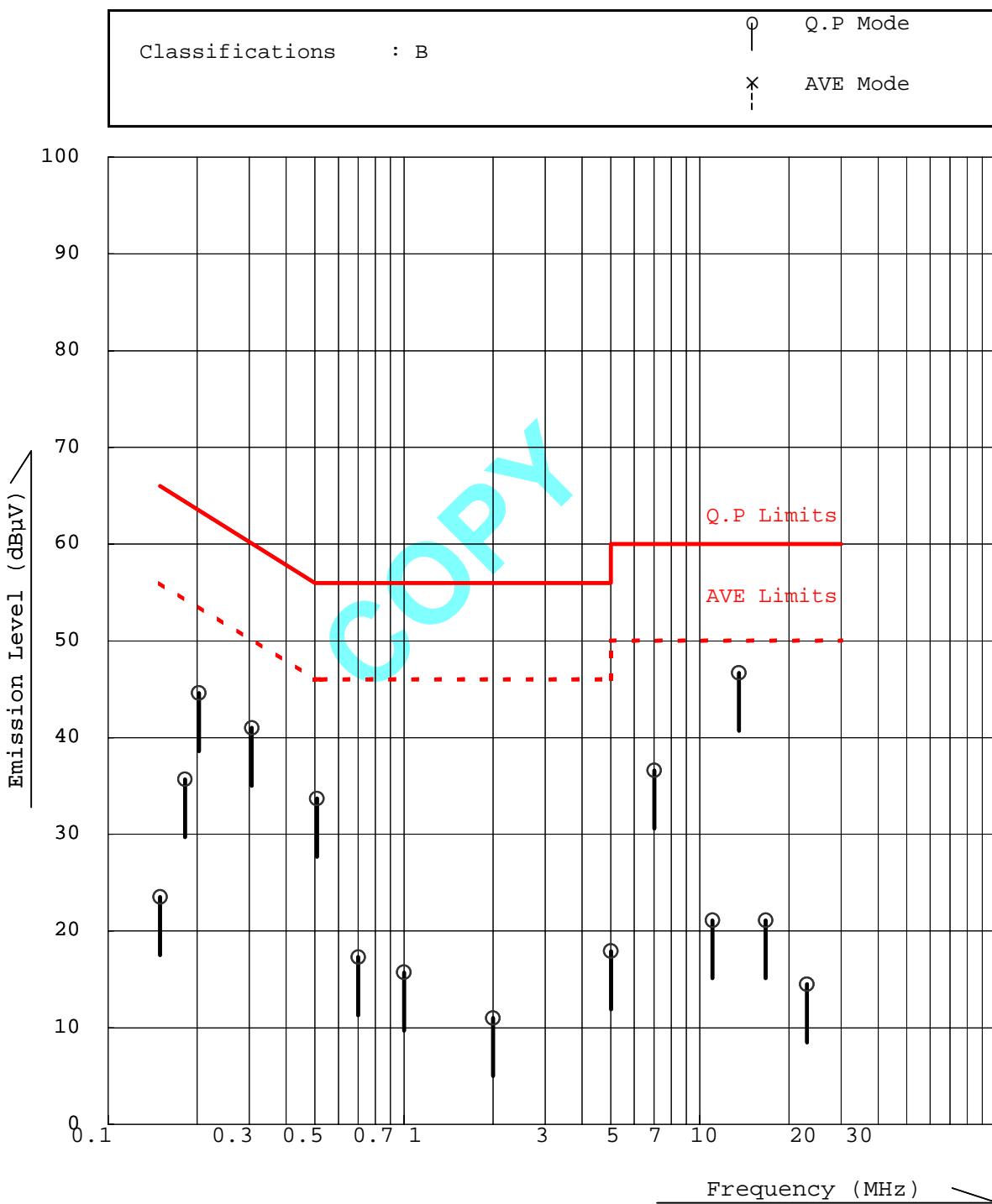
- 1) Test Location : Open Site No.2
- 2) The spectrum was checked from 0.15 MHz to 30 MHz
- 3) AMN(Artificial Mains Network) factor includes the cable loss for 5 meter.
- 4) The symbol of "<" means "or less".
- 5) The symbol of ">" means "more than".
- 6) The symbol of "--" means "Not applicable".
- 7) V-A : One end & Ground      V-B : The other end & Ground
- 8) Q.P : Quasi-Peak Detector      AVE : Average Detector
- 9) A sample calculation was made at 0.15 MHz  

$$Amn + Mr = 0.1 + 23.4 = 23.5 \text{ dB}\mu\text{V}$$

$$Amn : \text{AMN Factor} \quad Mr : \text{Meter Reading}$$
- 10) Setting of measuring instrument :  
Detector Function : CISPR Quasi-Peak / Average  
IF Bandwidth : 9 kHz / 10 kHz (0.15 MHz - 30 MHz)

**AC Power Line Conducted Emission Measurement (0.15 MHz - 30 MHz)**

3) Module (Master) + (O-shape Antenna)



**2.2 Radiated Emissions Measurement( 9 kHz - 30 MHz )**

Date : February 10, 2005  
Temp.: 8 °C Humi.: 55 %

**Operating Frequency** : 13.56 MHz  
**Distance of Measurement** : 3 meters

1) Module(Drum)+(D-shape Antenna 1)

Frequency (MHz)	Meter Reading (dB $\mu$ V/m)	Field Strength (dB $\mu$ V/m)
Fundamental 13.56	40.2	0.2
Harmonic Frequency 27.12	< 27.0	< -13.0

2) Module(Drum)+(D-shape Antenna 2)

Frequency (MHz)	Meter Reading (dB $\mu$ V/m)	Field Strength (dB $\mu$ V/m)
Fundamental 13.56	41.4	1.4
Harmonic Frequency 27.12	< 27.0	< -13.0

3) Module(Master)+(O-shape Antenna)

Frequency (MHz)	Meter Reading (dB $\mu$ V/m)	Field Strength (dB $\mu$ V/m)
Fundamental 13.56	42.4	2.4
Harmonic Frequency 27.12	< 27.0	< -13.0

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 :

Fundamental:  $40.2 \text{ dB}\mu\text{V/m} - 20\log_{10}((30/3)^2) = 40.2 - 40.0 = 0.2 \text{ dB}\mu\text{V/m}$  at 30 meters  
Limits for fundamental(§15.225(a)) =  $20\log_{10}(15848) = 84.0 \text{ dB}\mu\text{V/m}$   
Harmonic :  $27.0 \text{ dB}\mu\text{V/m} - 20\log_{10}((30/3)^2) = 27.0 - 40.0 = -13.0 \text{ dB}\mu\text{V/m}$  at 30 meters  
Limits for (§15.225(d)) =  $20\log_{10}(30) = 29.5 \text{ dB}\mu\text{V/m}$

**2.3 Radiated Emissions Measurement( 30 MHz - 1 GHz )**Date : February 10, 2005Temp.: 8 °C Humi.: 55 %**Operating Condition** : TX/ RX**Operating Frequency** : 13.56 MHz

1) Module(Drum)+(D-shape Antenna 1)

Frequency (MHz)	Antenna Factor (dB/m)	Meter Reading (dB $\mu$ V)		Limits (dB $\mu$ V/m)	Emission Level (dB $\mu$ V/m)		Margin (dB)	Comment
		Horiz.	Ver.		Horiz.	Ver.		
40.7	16.1	12.8	16.8	40.0	28.9	32.9	11.1	7.1
54.2	11.6	10.4	13.3	40.0	22.0	24.9	18.0	15.1
67.8	8.7	13.5	11.1	40.0	22.2	19.8	17.8	20.2
94.9	11.6	27.4	16.6	43.5	39.0	28.2	4.5	15.3
122.1	16.0	19.7	8.1	43.5	35.7	24.1	7.8	19.4
135.6	17.0	12.2	7.1	43.5	29.2	24.1	14.3	19.4
162.7	18.6	11.8	4.2	43.5	30.4	22.8	13.1	20.7
189.9	20.1	14.2	8.8	43.5	34.3	28.9	9.2	14.6
217.0	21.0	13.1	4.0	46.0	34.1	25.0	11.9	21.0
271.2	22.5	12.9	6.1	46.0	35.4	28.6	10.6	17.4
298.3	23.7	15.5	10.3	46.0	39.2	34.0	6.8	12.0
325.5	21.2	11.6	7.1	46.0	32.8	28.3	13.2	17.7
420.4	23.6	3.7	2.6	46.0	27.3	26.2	18.7	19.8
610.3	29.0	< -2.0	< -2.0	46.0	< 27.0	< 27.0	> 19.0	> 19.0
840.8	32.7	< -2.0	< -2.0	46.0	< 30.7	< 30.7	> 15.3	> 15.3
1000.0	35.4	< -2.0	< -2.0	54.0	< 33.4	< 33.4	> 20.6	> 20.6

Notes:

- 1) Test Location : Open Site No.2
- 2) Test Distance : 3 m
- 3) The spectrum was checked from 30 MHz to 1000 MHz.
- 4) Antenna factor includes the cable loss for 58 meter.
- 5) The symbol of "<" means "or less".
- 6) The symbol of ">" means "more than".
- 7) A sample calculation was made at 40.7 MHz  

$$Af + Mr = 16.1 + 16.8 = 32.9 \text{ dB}\mu\text{V/m}$$

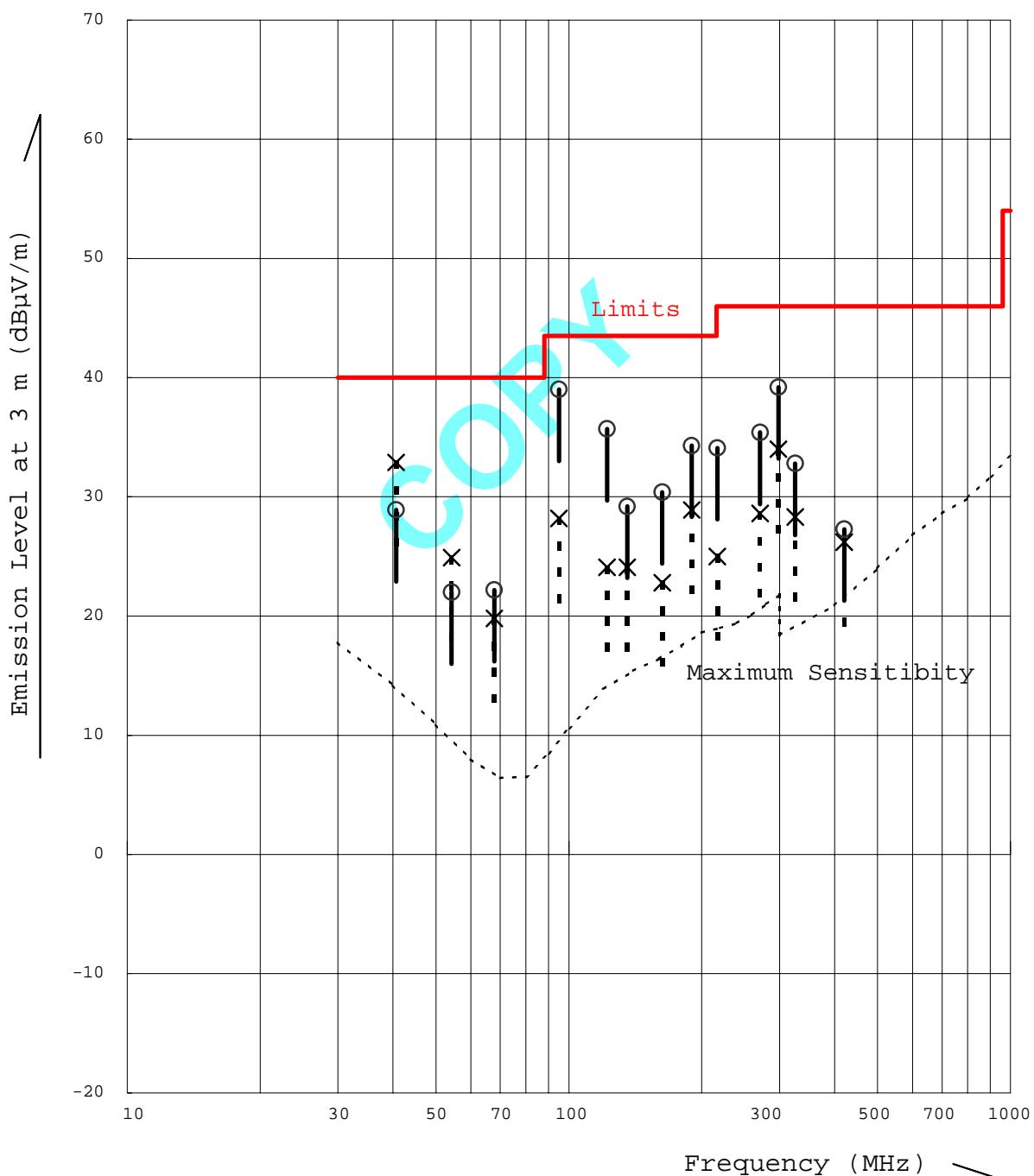
$$Af : \text{Antenna Factor} \quad Mr : \text{Meter Reading}$$
- 8) Setting of measuring instrument :  

$$\text{Detector Function : CISPR Quasi-Peak}$$

$$\text{IF Bandwidth : 120 kHz}$$

**Radiated Emissions Measurements (30 MHz - 1000 MHz)**1) Module (Drum) + (D-shape Antenna 1)

Measuring Distance : 3 m		○	Horizontal
Classifications : B		×	Vertical



## 2) Module(Drum)+(D-shape Antenna 2)

Frequency (MHz)	Antenna Factor (dB/m)	Meter Reading (dB $\mu$ V)		Limits (dB $\mu$ V/m)		Emission Level (dB $\mu$ V/m)		Margin (dB)		Comment
		Horiz.	Ver.	Horiz.	Ver.	Horiz.	Ver.	Horiz.	Ver.	
40.7	16.1	17.7	20.2	40.0	33.8	36.3	6.2	3.7		
54.2	11.6	12.6	14.6	40.0	24.2	26.2	15.8	13.8		
67.8	8.7	14.8	11.1	40.0	23.5	19.8	16.5	20.2		
94.9	11.6	18.4	11.8	43.5	30.0	23.4	13.5	20.1		
122.1	16.0	18.2	8.4	43.5	34.2	24.4	9.3	19.1		
135.6	17.0	9.1	8.3	43.5	26.1	25.3	17.4	18.2		
162.7	18.6	10.6	8.4	43.5	29.2	27.0	14.3	16.5		
189.9	20.1	21.1	9.4	43.5	41.2	29.5	2.3	14.0		
217.0	21.0	10.2	4.3	46.0	31.2	25.3	14.8	20.7		
271.2	22.5	12.4	5.8	46.0	34.9	28.3	11.1	17.7		
298.3	23.7	14.8	9.8	46.0	38.5	33.5	7.5	12.5		
325.5	21.2	11.6	7.1	46.0	32.8	28.3	13.2	17.7		
420.4	23.6	3.7	2.6	46.0	27.3	26.2	18.7	19.8		
610.3	29.0	< -2.0	< -2.0	46.0	< 27.0	< 27.0	> 19.0	> 19.0		
840.8	32.7	< -2.0	< -2.0	46.0	< 30.7	< 30.7	> 15.3	> 15.3		
1000.0	35.4	< -2.0	< -2.0	54.0	< 33.4	< 33.4	> 20.6	> 20.6		

Notes:

- 1) Test Location : Open Site No.2
- 2) Test Distance : 3 m
- 3) The spectrum was checked from 30 MHz to 1000 MHz.
- 4) Antenna factor includes the cable loss for 58 meter.
- 5) The symbol of "<" means "or less".
- 6) The symbol of ">" means "more than".
- 7) A sample calculation was made at 40.7 MHz  

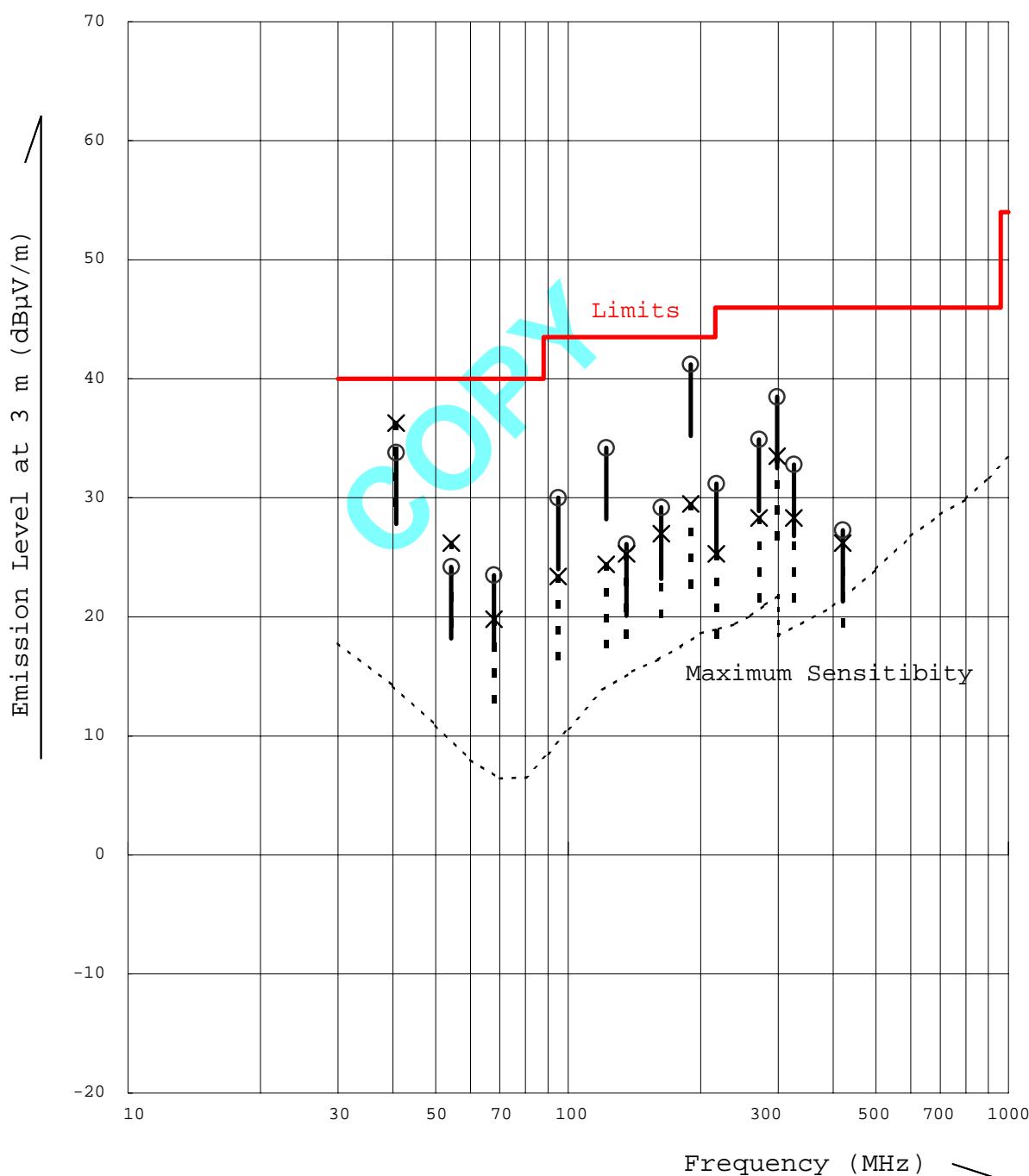
$$Af + Mr = 16.1 + 20.2 = 36.3 \text{ dB}\mu\text{V/m}$$

$$Af : \text{Antenna Factor} \quad Mr : \text{Meter Reading}$$
- 8) Setting of measuring instrument :
  - Detector Function : CISPR Quasi-Peak
  - IF Bandwidth : 120 kHz

**Radiated Emissions Measurements (30 MHz - 1000 MHz)**

2) Module(Drum)+(D-shape Antenna 2)

Measuring Distance : 3 m	0	Horizontal
Classifications : B	X	Vertical



## 3) Module(Master)+(O-shape Antenna)

Frequency (MHz)	Antenna Factor (dB/m)	Meter Reading (dB $\mu$ V)		Limits (dB $\mu$ V/m)		Emission Level (dB $\mu$ V/m)		Margin (dB)		Comment
		Horiz.	Ver.	Horiz.	Ver.	Horiz.	Ver.	Horiz.	Ver.	
40.68	16.1	13.5	18.1	40.0	29.6	34.2	10.4	5.8		
54.24	11.6	15.7	15.9	40.0	27.3	27.5	12.7	12.5		
67.81	8.7	21.0	19.0	40.0	29.7	27.7	10.3	12.3		
94.93	11.6	26.8	15.3	43.5	38.4	26.9	5.1	16.6		
122.05	16.0	18.4	8.2	43.5	34.4	24.2	9.1	19.3		
135.61	17.0	11.8	8.9	43.5	28.8	25.9	14.7	17.6		
162.73	18.6	23.4	15.3	43.5	42.0	33.9	1.5	9.6		
189.86	20.1	14.9	10.1	43.5	35.0	30.2	8.5	13.3		
216.98	21.0	13.0	2.4	46.0	34.0	23.4	12.0	22.6		
271.22	22.5	13.9	5.3	46.0	36.4	27.8	9.6	18.2		
298.34	23.7	17.3	10.3	46.0	41.0	34.0	5.0	12.0		
325.47	21.2	12.0	6.8	46.0	33.2	28.0	12.8	18.0		
420.39	23.6	4.2	3.3	46.0	27.8	26.9	18.2	19.1		
610.25	29.0	< -2.0	< -2.0	46.0	< 27.0	< 27.0	> 19.0	> 19.0		
840.79	32.7	< -2.0	< -2.0	46.0	< 30.7	< 30.7	> 15.3	> 15.3		
1000.00	35.4	< -2.0	< -2.0	54.0	< 33.4	< 33.4	> 20.6	> 20.6		

Notes:

- 1) Test Location : Open Site No.2
- 2) Test Distance : 3 m
- 3) The spectrum was checked from 30 MHz to 1000 MHz.
- 4) Antenna factor includes the cable loss for 58 meter.
- 5) The symbol of "<" means "or less".
- 6) The symbol of ">" means "more than".
- 7) A sample calculation was made at 40.7 MHz  

$$Af + Mr = 16.1 + 18.1 = 34.2 \text{ dB}\mu\text{V/m}$$

$$Af : \text{Antenna Factor} \quad Mr : \text{Meter Reading}$$
- 8) Setting of measuring instrument :
 

Detector Function : CISPR Quasi-Peak  
                           IF Bandwidth : 120 kHz

**Radiated Emissions Measurements (30 MHz - 1000 MHz)**

3) Module (Master) + (O-shape Antenna)

Measuring Distance : 3 m	○	Horizontal
Classifications : B	×	Vertical

