JAPAN QUALITY ASSURANCE ORGANIZATION
2096, OHATA, TSURU-SHI, YAMANASHI 402-0045, JAPAN
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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**

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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.
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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)

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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

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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
___- Open Site No.1
_X_- Open Site No.2

_X_- 3 meters
___- 10 meters
___- 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
_X_-	Test Receiver (R-4)	ESHS30	Rohde & Schwarz	842053/001	2005/1	1 Year
__-	Test Receiver (R-5)	ESCS30	Rohde & Schwarz	100203	2004/2	1 Year
_X_-	Loop Antenna (AL-0)	HFH2-Z2	Rohde & Schwarz	879284/14	2004/6	1 Year

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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
___ - Open Site No.1
_X_ - Open Site No.2

_X_ - 3 meters
___ - 10 meters
___ - 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

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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

___- Anechoic Chamber ___- 3 meters
___- Open Site No.1 ___- 10 meters
___- 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
__-	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	Hewllet 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

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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
___	Frequency Counter	53131A	Hewlett Packard	3546A11807	2004/05	1 Year
___	Oven	-	Ohnishi Co. Ltd.	-	2004/08	1 Year
___	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
___	Test Receiver	ESI7	Rohde & Schwarz	100059	2004/10	1 Year
___	Spectrum Analyzer	8560E	Hewlett Packard	3240A00189	2004/9	1 Year
___	Spectrum Analyzer	8560E	Hewlett Packard	3240A00189	2004/9	1 Year
___	Spectrum Analyzer	8563E	Hewlett Packard	3221A00201	2004/5	1 Year
___	Spectrum Analyzer	8566B	Hewlett Packard	2140A01091	2004/4	1 Year
___	Spectrum Analyzer	8566B	Hewlett Packard	2747A05855	2004/5	1 Year
___	Function Generator	3325A	Hewlett Packard	2512A21776	2004/5	1 Year
___	FM Linear Detector	MS61A	Anritsu Corp.	M77486	2004/9	1 Year
___	Level Meter	ML422C	Anritsu Corp.	M87571	2004/6	1 Year

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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:

_____
_____

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1.5 TEST RESULTS

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

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

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

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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;

_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 : February 9, 2005

End of testing : February 10, 2005

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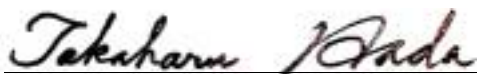
- JAPAN QUALITY ASSURANCE ORGANIZATION -

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	-

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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*

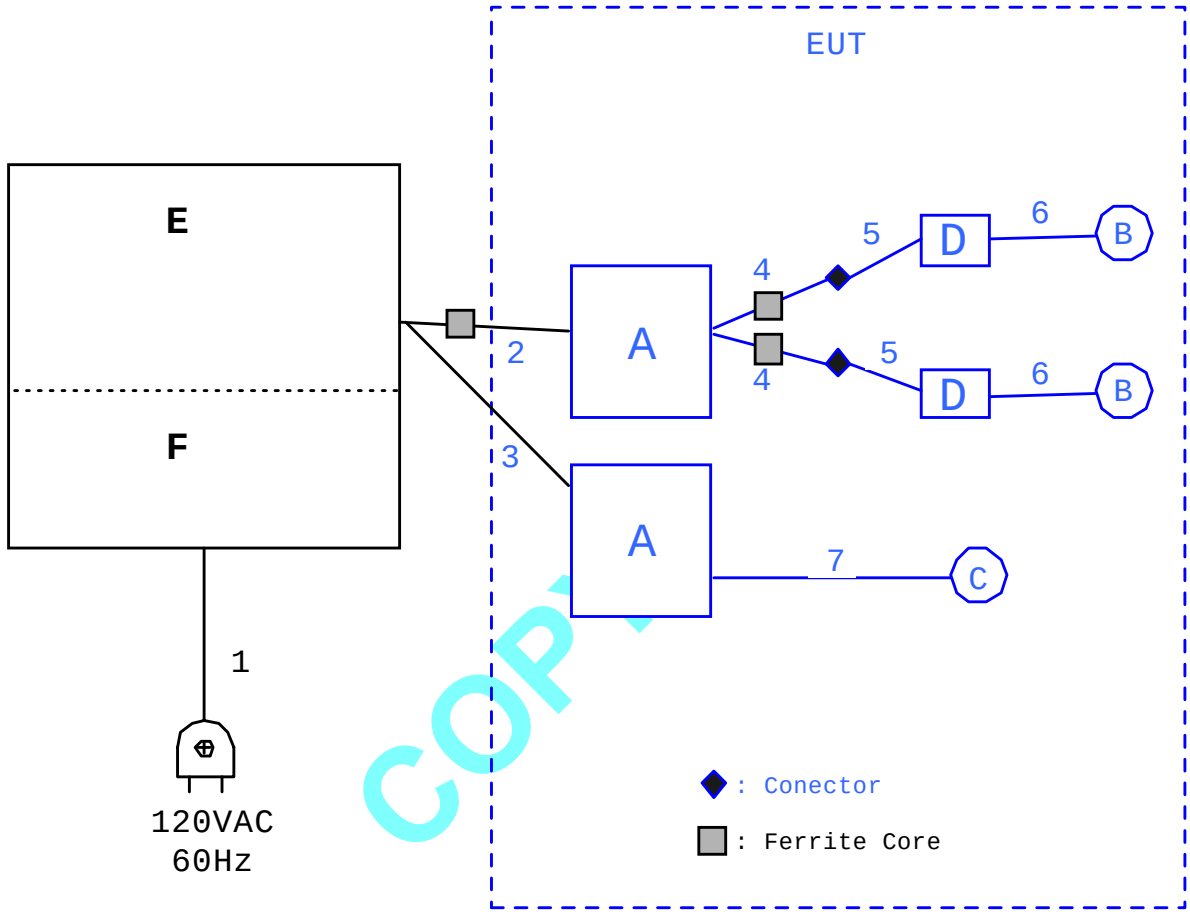
* The EUT was operated with the printer.(Input: 120Vac 60Hz, Output: 5.0Vdc)

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

The measurements ware 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.

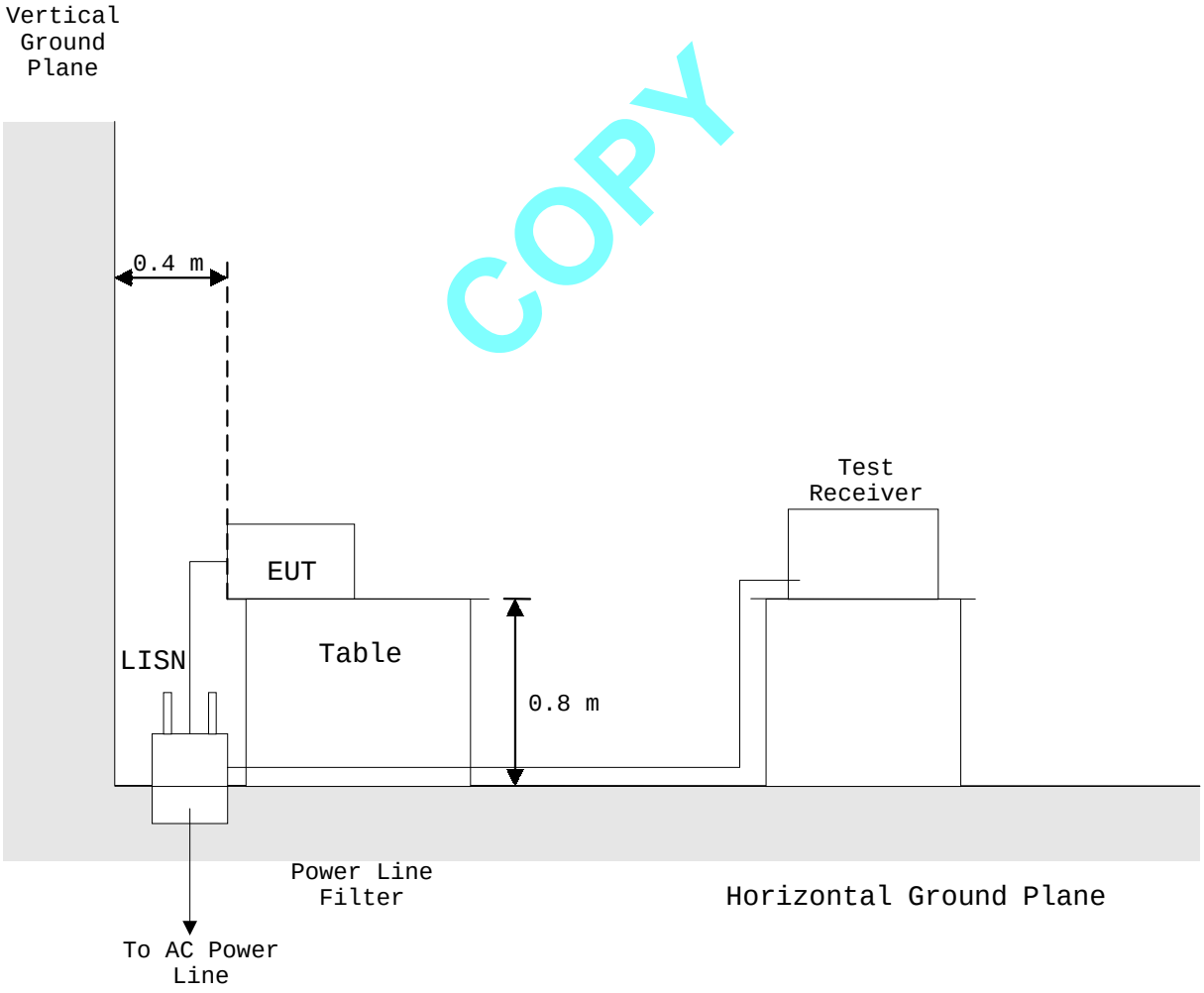
1.9 PRELIMINARY TEST AND TEST-SETUP (DRAWINGS)

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 -



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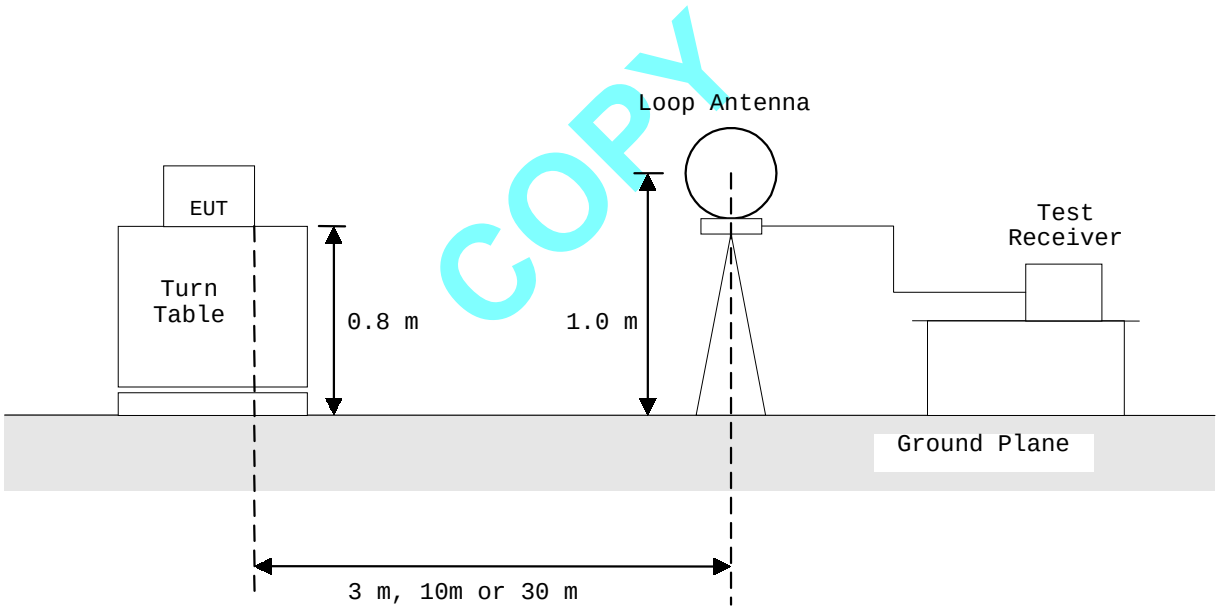
1.9.2 Radiated Emission (9 kHz – 30 MHz) :

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 -



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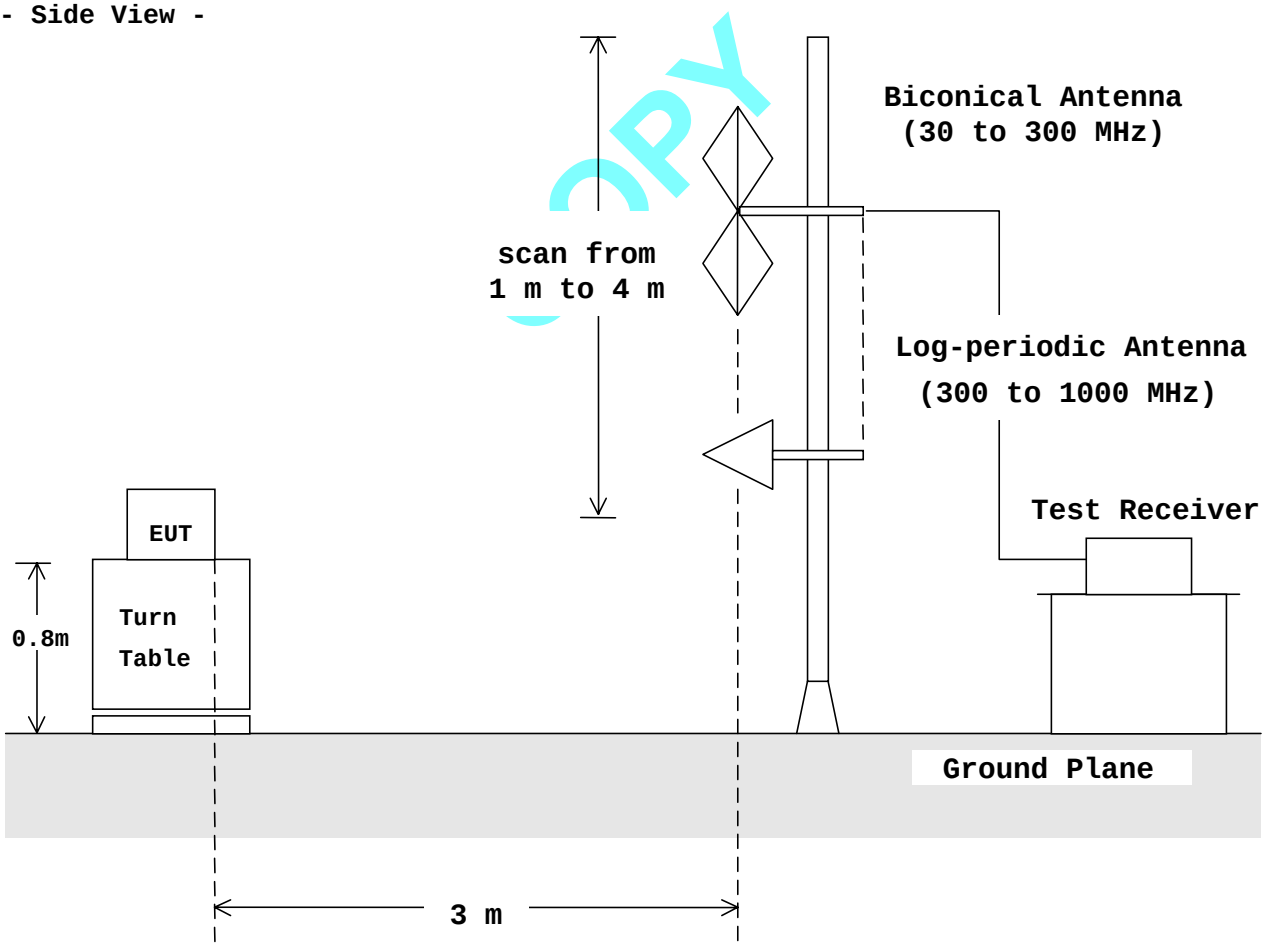
1.9.3 Radiated Emission (30 MHz – 1000 MHz) :

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 -



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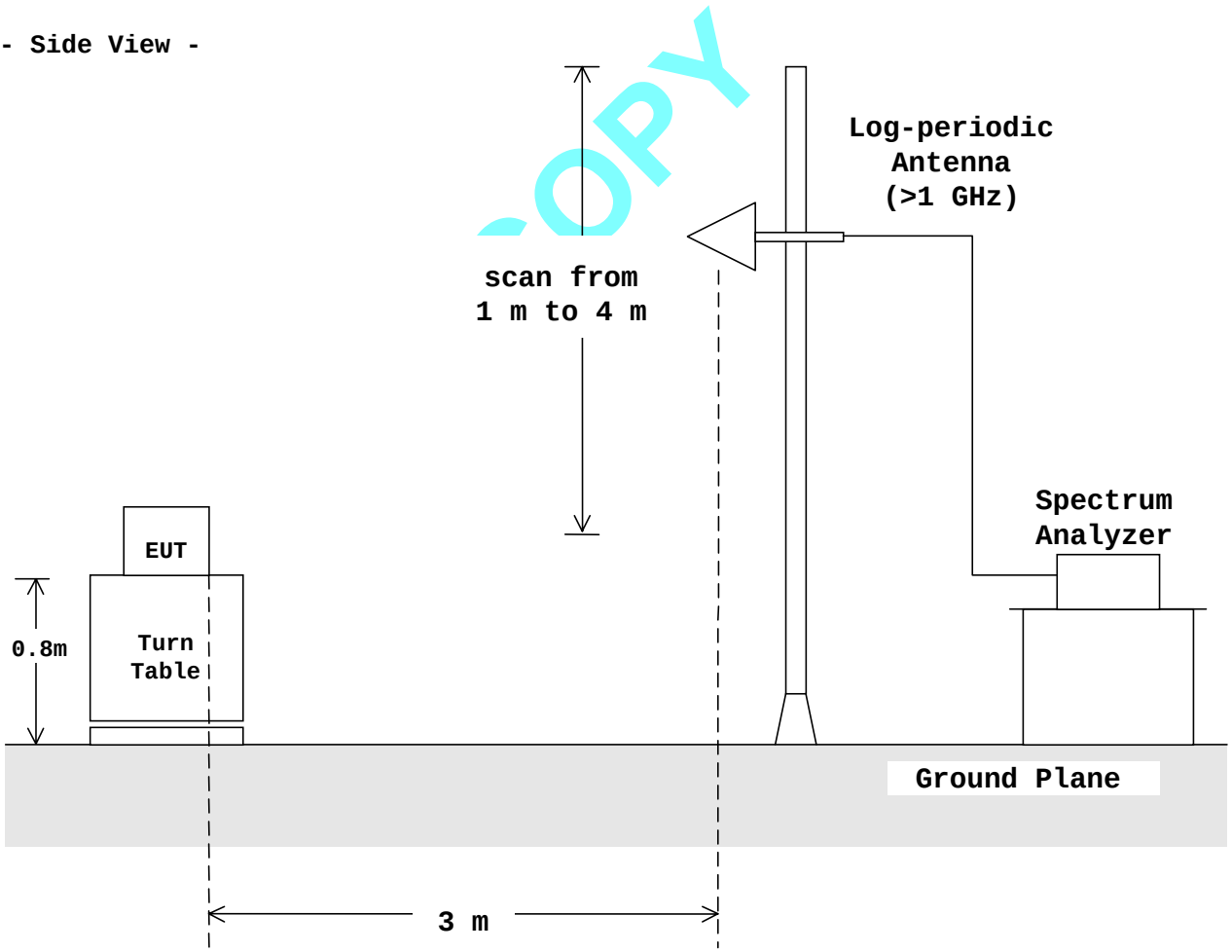
1.9.4 Radiated Emission (Above 1 GHz) :

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 -



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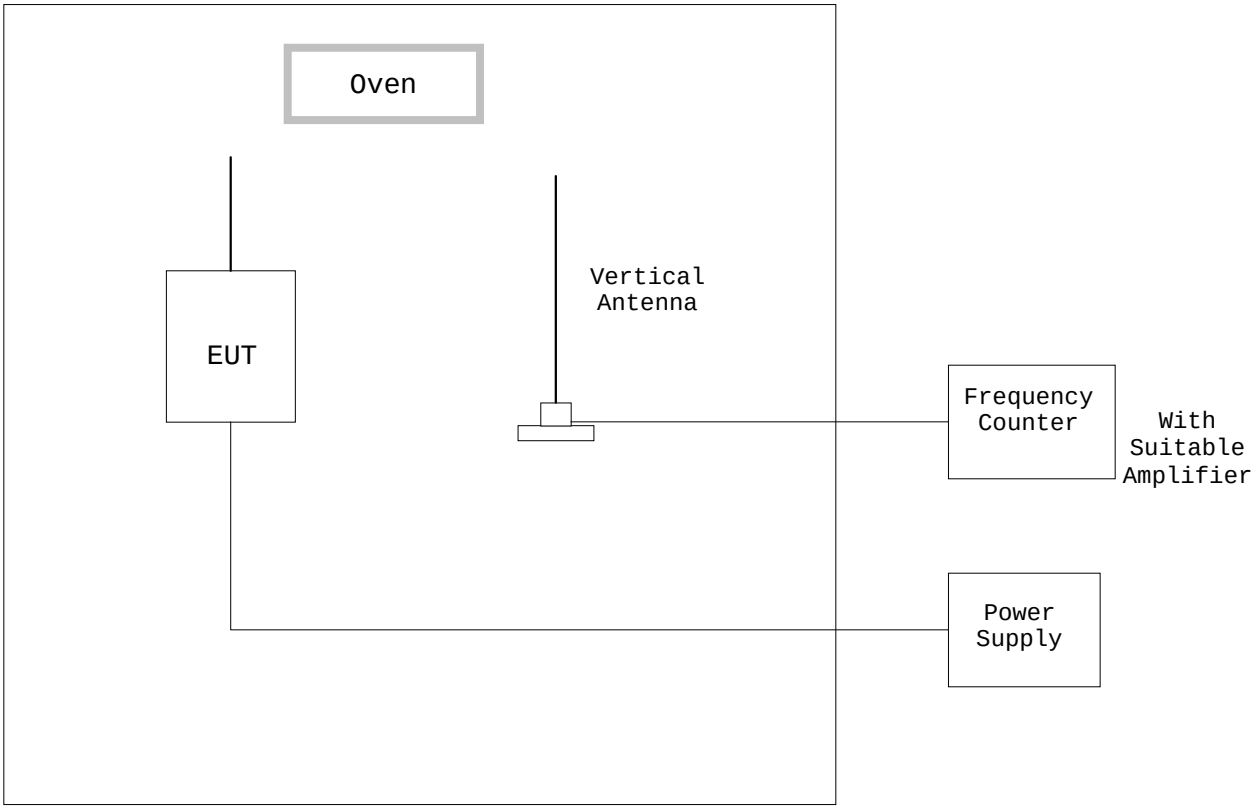
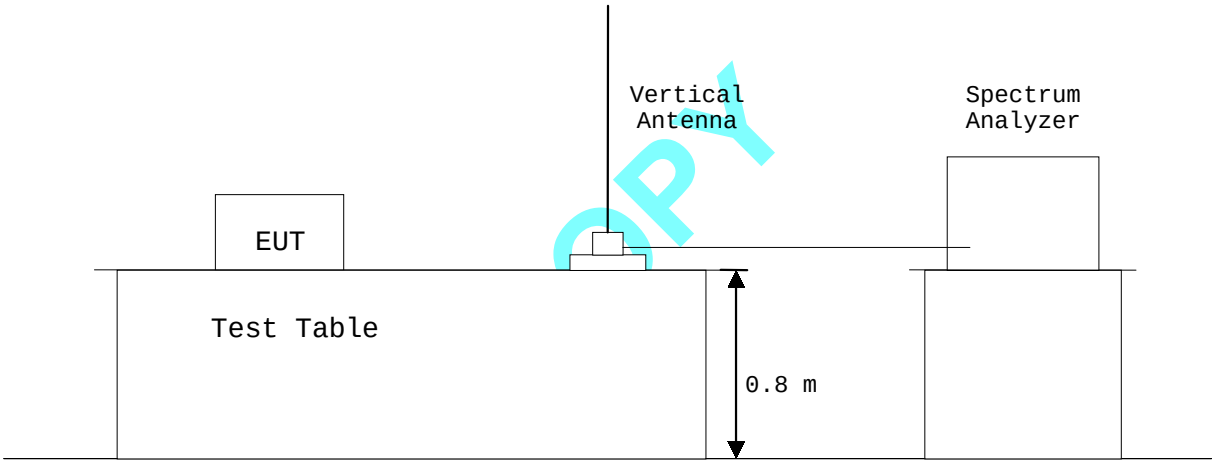
1.9.5 Frequency Stability :

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°C to +50°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°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.



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1.10 TEST ARRANGEMENT (PHOTOGRAPHS)

PHOTOGRAPHS OF EUT CONFIGURATION FOR CONDUCTED EMISSION MEASUREMENT

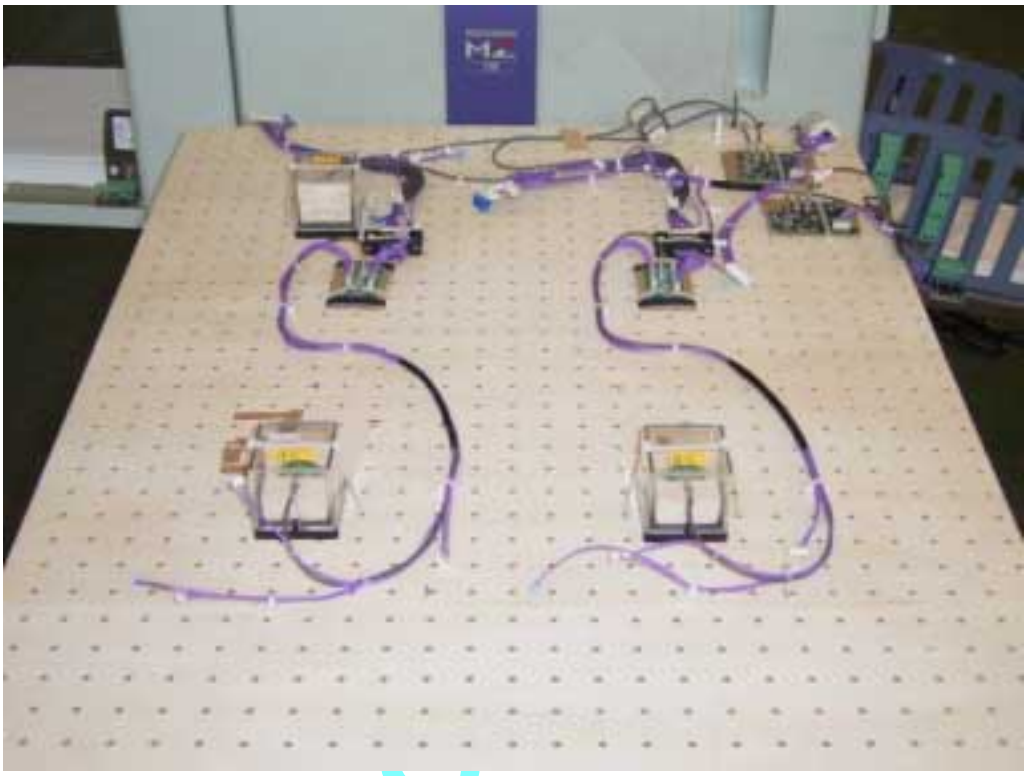
- Rear View –

- Side View –

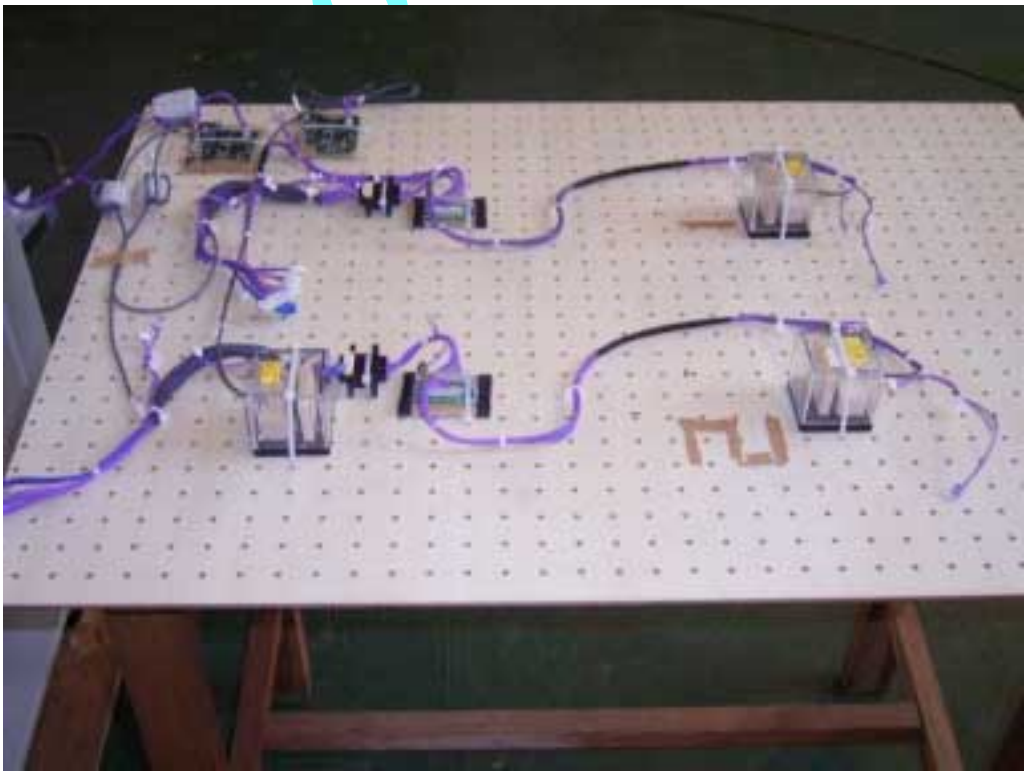
PHOTOGRAPHS OF EUT CONFIGURATION FOR RADIATED EMISSIONS MEASUREMENT

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)

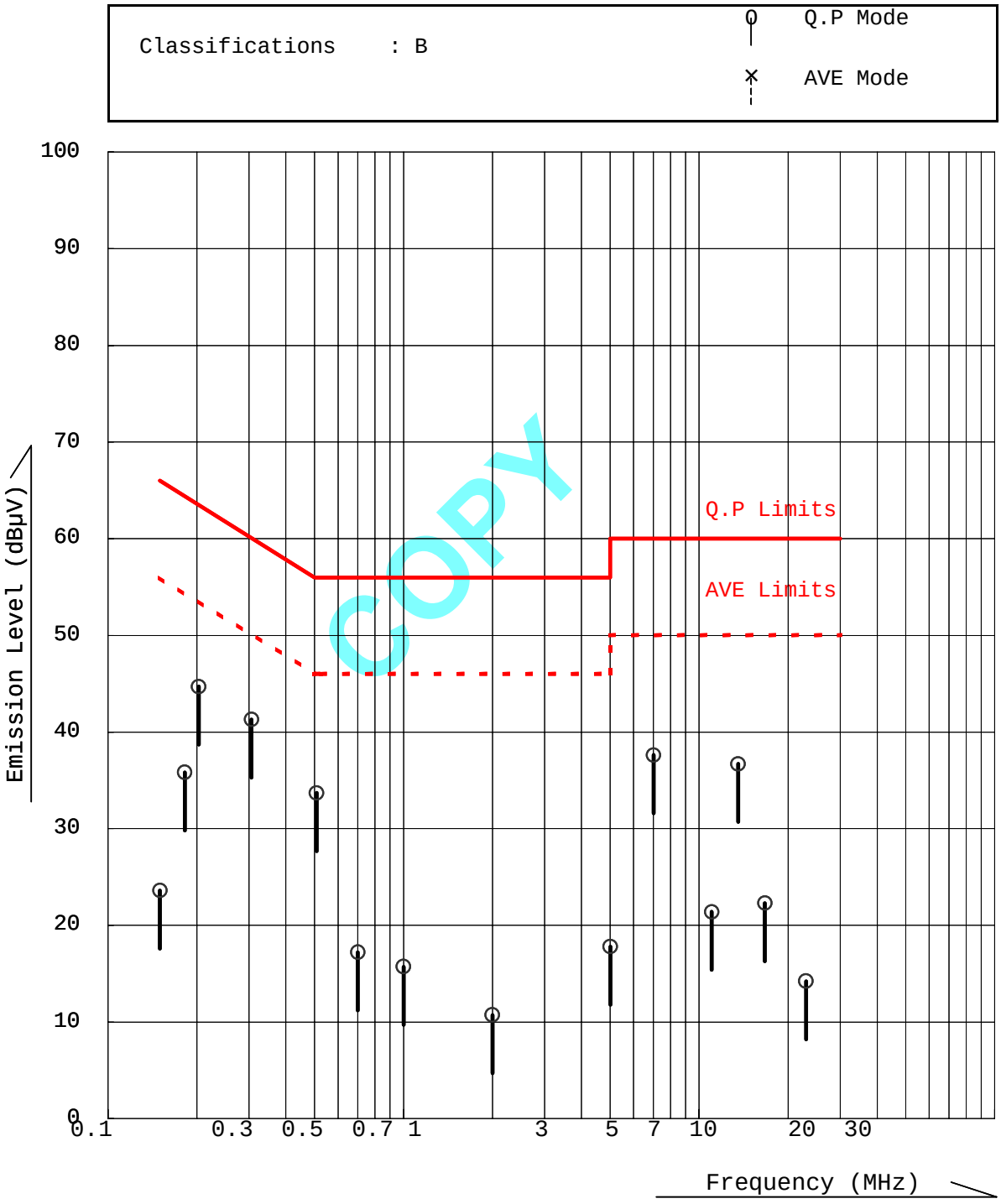
Frequency (MHz)	AMN Factor (dB)	Meter Reading (dBµV) V-A Q.P	V-A AVE	V-B Q.P	V-B AVE	Limits (dBµV) Q.P	Limits (dBµV) AVE	Emission Level (dBµV) Q.P	Emission Level (dBµV) AVE	Margin (dB) Q.P	Margin (dB) AVE	Comment
0.15	0.1	22.5	-	23.5	-	66.0	56.0	23.6	-	42.4	-	
0.18	0.1	35.7	-	35.7	-	64.4	54.4	35.8	-	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	-	

COPY

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 dBµV
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 (dBµV) V-A Q.P	V-A AVE	V-B Q.P	V-B AVE	Limits (dBµV) Q.P	Limits AVE	Emission Level (dBµV) Q.P	Emission Level AVE	Margin (dB) Q.P	Margin AVE	Comment
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 dBµV
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)

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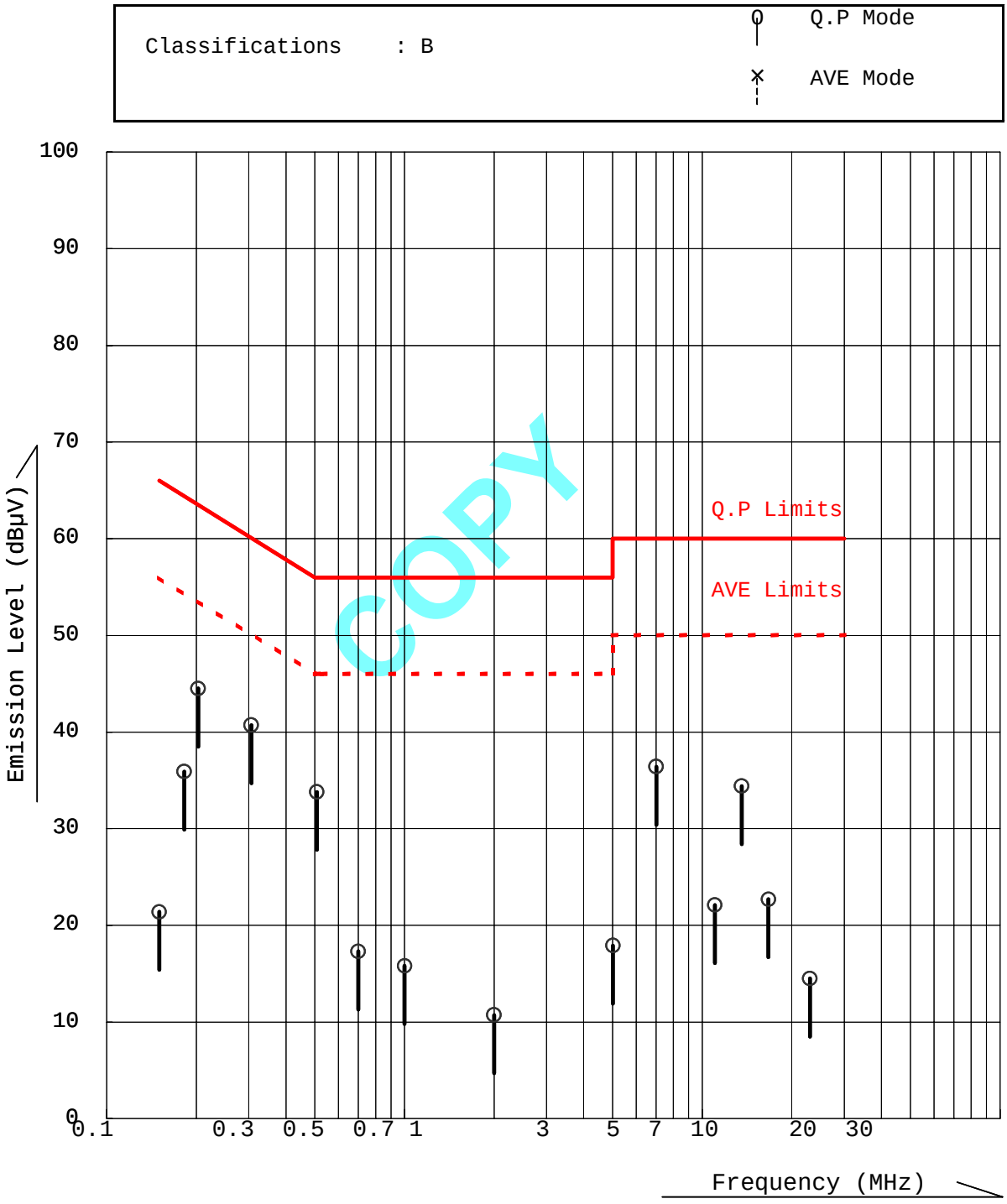
AC Power Line Conducted Emission Measurement (0.15 MHz – 30 MHz)

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



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

Frequency (MHz)	AMN Factor (dB)	Meter Reading (dBµV) V-A Q.P	V-A AVE	V-B Q.P	V-B AVE	Limits (dBµV) Q.P	Limits AVE	Emission Level (dBµV) Q.P	Emission Level AVE	Margin (dB) Q.P	Margin AVE	Comment
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 dBµV
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)

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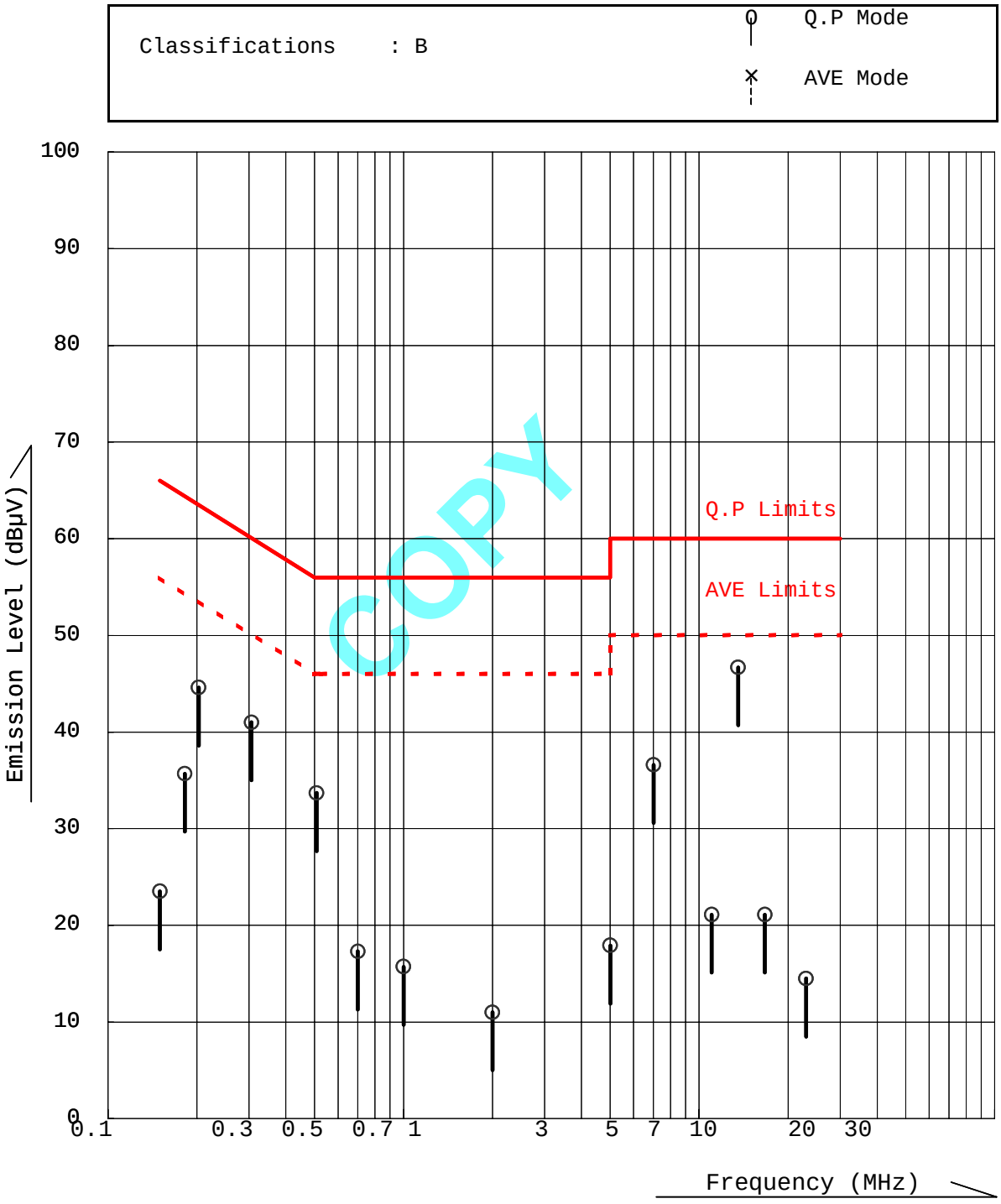
AC Power Line Conducted Emission Measurement (0.15 MHz – 30 MHz)

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 (dBμV/m)	Field Strength (dBμV/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 (dBμV/m)	Field Strength (dBμV/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 (dBμV/m)	Field Strength (dBμV/m)
Fundamental		
13.56	42.4	2.4
Harmonic Frequency		
27.12	< 27.0	< -13.0

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

2.3 Radiated Emissions Measurement(30 MHz - 1 GHz)

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)

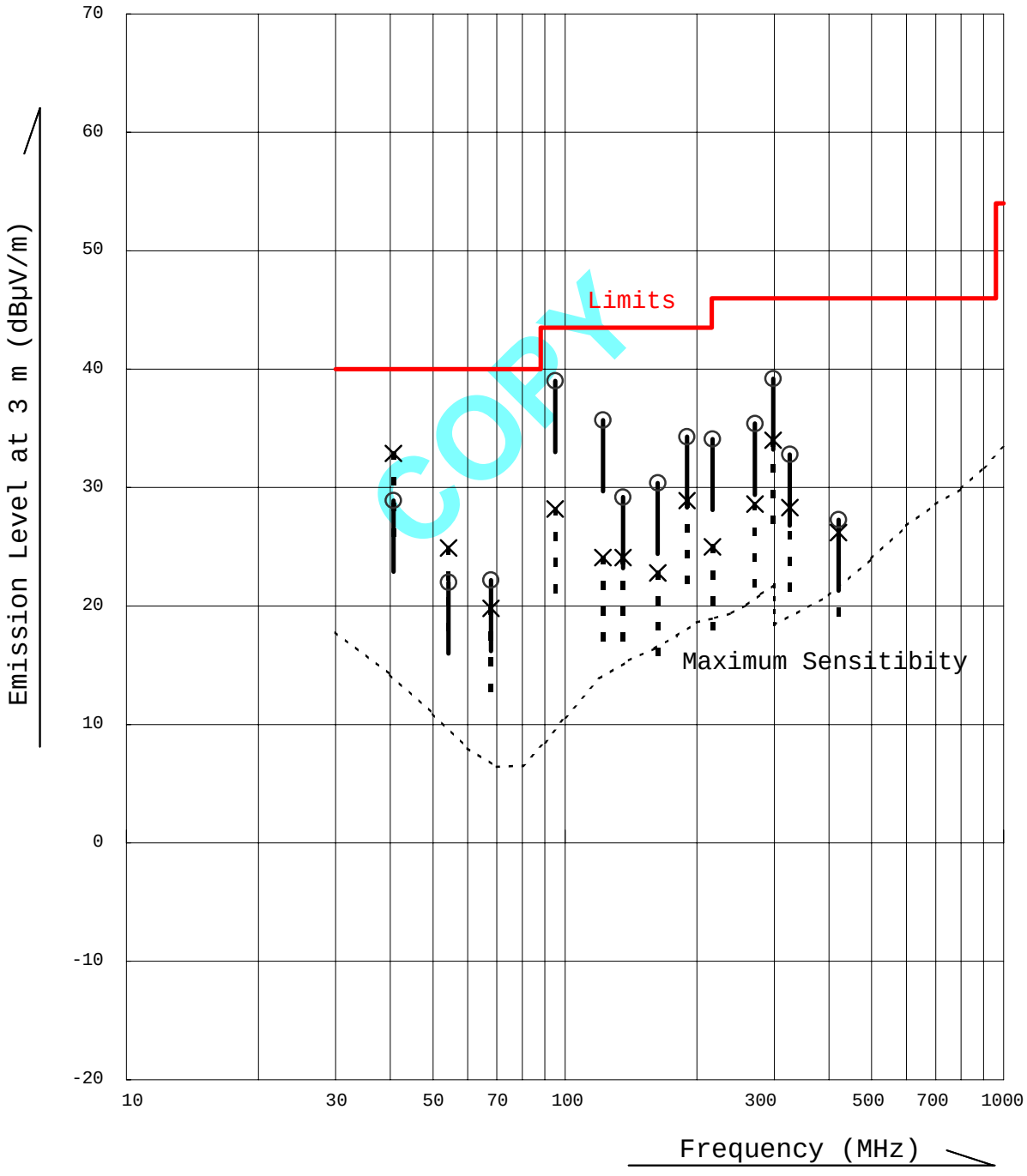
Frequency (MHz)	Antenna Factor (dB/m)	Meter Reading (dBµV) Horiz.	Ver.	Limits (dBµV/m)	Emission Level (dBµV/m) Horiz.	Ver.	Margin (dB) Horiz.	Ver.	Comment
40.7	16.1	12.8	16.8	40.0	28.9	32.9	11.1	7.1	
54.2	11.6	10.4	13.3	40.0	22.0	24.9	18.0	15.1	
67.8	8.7	13.5	11.1	40.0	22.2	19.8	17.8	20.2	
94.9	11.6	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 dBµV/m
Af : Antenna Factor Mr : Meter Reading
8) Setting of measuring instrument :
Detector Function : CISPR Quasi-Peak
IF Bandwidth : 120 kHz

Radiated Emissions Measurements (30 MHz - 1000 MHz)

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

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



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

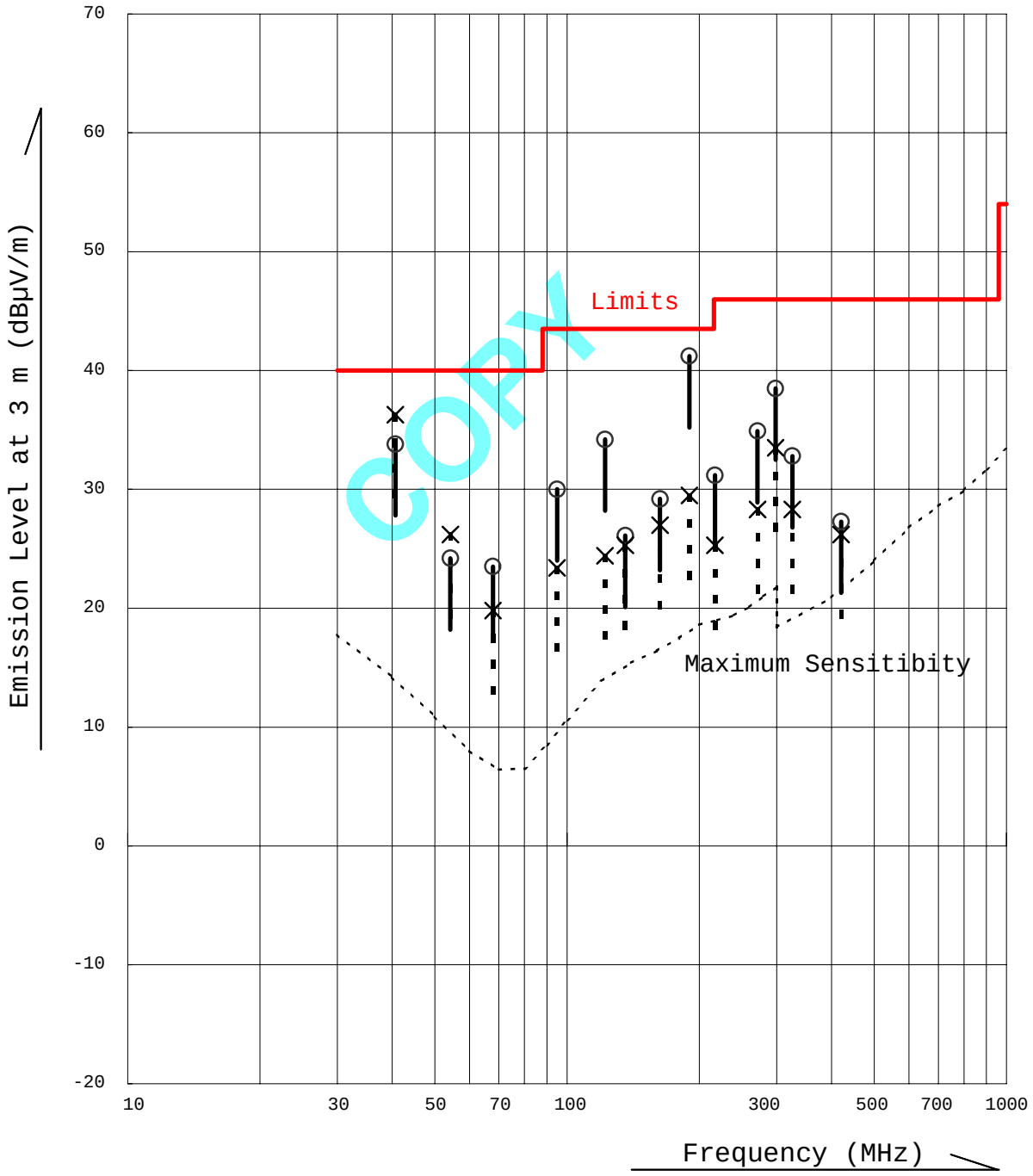
Frequency (MHz)	Antenna Factor (dB/m)	Meter Reading (dBμV) Horiz.		Ver.		Limits (dBμV/m)	Emission Level (dBμV/m) Horiz.		Ver.		Margin (dB) Horiz.		Ver.		Comment
40.7	16.1		17.7		20.2	40.0		33.8		36.3		6.2		3.7	
54.2	11.6		12.6		14.6	40.0		24.2		26.2		15.8		13.8	
67.8	8.7		14.8		11.1	40.0		23.5		19.8		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 dBμV/m
Af : Antenna Factor Mr : 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	O	Horizontal
Classifications : B	×	Vertical



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

Frequency (MHz)	Antenna Factor (dB/m)	Meter Reading (dBμV) Horiz.	Ver.	Limits (dBμV/m)	Emission Level (dBμV/m) Horiz.	Ver.	Margin (dB) Horiz.	Ver.	Comment
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 dBμV/m
Af : Antenna Factor Mr : 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	O	Horizontal
Classifications : B	×	Vertical