

REPORT OF MEASUREMENTS

Date : November 26, 1998
Issue in : Yamanashi, Japan

JQA APPLICATION NO. : 85-80489

1. Applicant : MITSUBISHI ELECTRIC CORPORATION
840, Chiyoda-Machi, Himeji-shi
Hyogo-ken, 670-0993 JAPAN

2. Manufacturer : MITSUBISHI ELECTRIC CORPORATION
HIMEJI WORKS
840, Chiyoda-Machi, Himeji-shi
Hyogo-ken, 670-0993 JAPAN

3. Description of Equipment
a) FCC ID : BGBX1T148IMB22102
b) Trade Name : -
c) Model No. : IMB221-02
d) Power Supply : 12.0 VDC

4. Applicable Rule : FCC Rules & Regulations Part 15
Subpart C (June 23, 1989)

5. Place of Measurement : JQA EMC Engineering Dept.
Tsuru Branch

6. Date of Measurement : November 26, 1998

7. Total Pages of This Report : 9 (including this page)

8. I certify that I am authorized to sign for the report and that all the statement in this report and in the exhibits hereto are true and correct to the best my knowledge and belief.



Masaaki Takahashi, Director
Tsuru Branch
JQA EMC Engineer Dept.

1. Radiated Field Strength and Harmonic Emission: [§ 15.209]

Measurement Method Employed: The field strength measurements of the immobilizer system fundamental and harmonics radiation were made at the distance of 30 meters away from the system under test which was placed on the wooden turntable 0.8 meter in height.

The receiving loop antenna was positioned with its plane vertical at 30 meters from the system and rotated about its vertical axis for maximum response at each azimuth about the system.

The center of loop antenna was set to 1 meter above ground. The wooden turntable was rotated through 360 degrees and the system under test was tested by positioned three orthogonal planes, to obtain the highest reading on the field strength meter.

The results were shown the maximum value.

Measurement Results:

Operating Frequency : 134 kHz
Distance of Measurement : 30 meters

Frequency (MHz)	Antenna Factor (dB)	Meter Reading (dB/uV)	Field Strength (dB/uV/m)
0.134	10.7	< 32.0	< 42.7
0.268	10.6	< 32.0	< 42.6
0.402	10.6	< 32.0	< 42.6
0.536	10.6	< 32.0	< 42.6
0.670	10.6	< 32.0	< 42.6
0.804	10.5	< 32.0	< 42.5
0.938	10.4	< 32.0	< 42.4
1.072	10.4	< 32.0	< 42.4
1.206	10.5	< 32.0	< 42.5
1.340	10.5	< 32.0	< 42.5

Since, the fundamental field strength was found undetectable weak of the field strength meter.

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The distance of measurements was reduced to 10 meters.

Operating Frequency	:	134 kHz
Distance of Measurement	:	10 meters

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For fundamental, field strength was extrapolated to distance 300 meters using the formula that field strength varies as the inverse distance square (40 dB per decade of distance).

Calculation :

$$42.7 \text{ dB/uV/m} - 20\log_{10}((300/10)^2) =$$
$$42.7 \text{ dB/uV/m} - 59.1 \text{ dB} = -16.4 \text{ dB/uV/m at 300 meters}$$

Limits for fundamental = $20\log_{10}(2400/F)$ F = Frequency in kHz
= $20\log_{10}(2400/134) = 25.1 \text{ dB/uV/m}$

Measuring Instruments Setting :

Frequency Range : 110 kHz to 490 kHz

Detector Function : Average

IF Bandwidth : 10 kHz

Frequency Range : 536.8 kHz to 1340 kHz

Detector Function : CISPR QP

IF Bandwidth : 9 kHz

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2. Radiated Spurious Emissions [§ 15.209]

Frequency (MHz)	Antenna Factor (dB)	Meter Reading		Limits (dB/uV/m)	Field strength at 3 m	
		Horiz. (dB/uV)	Vert. (dB/uV)		Horiz. (dB/uV/m)	Vert. (dB/uV/m)
30.000	18.7	< -2.0	< -2.0	40.0	<16.2	<17.2
42.000	14.2	< -2.0	3.6	40.0	<12.2	17.8
44.000	13.5	1.9	14.0	40.0	15.4	27.5
46.400	12.8	1.5	16.0	40.0	14.3	28.8
51.000	11.3	0.9	14.9	40.0	12.2	26.2
60.000	8.7	< -2.0	4.9	40.0	< 6.7	13.6
70.000	6.3	-1.6	4.7	40.0	4.7	11.0
100.000	10.5	-0.9	-0.4	43.5	9.6	10.1
120.000	13.2	2.8	0.4	43.5	16.0	13.6
150.000	16.1	< -2.0	< -2.0	43.5	<14.1	<14.1
170.000	17.5	< -2.0	< -2.0	43.5	<15.5	<15.5
200.000	19.1	< -2.0	< -2.0	43.5	<17.1	<17.1
220.000	19.9	< -2.0	< -2.0	43.5	<17.9	<17.9
240.000	19.9	< -2.0	< -2.0	46.0	<17.9	<17.9
270.000	20.2	< -2.0	< -2.0	46.0	<18.2	<18.2
300.000	21.2	< -2.0	< -2.0	46.0	<19.2	<19.2
350.000	18.8	< -2.0	< -2.0	46.0	<16.8	<16.8
427.800	20.3	19.8	0.3	46.0	23.5	20.6
470.000	20.9	18.6	< -2.0	46.0	21.1	<18.9
700.000	24.4	< -2.0	< -2.0	46.0	<22.4	<22.4
1000.000	28.9	3.9	< -2.0	54.0	<26.9	<26.1

Note: 1. The spectrum was checked from 30 MHz to 1000 MHz.
 All emissions not listed were found to be more than 20 dB below the limits.

2. The symbol of “<” means “or less”.

3. The cable loss was included in the antenna factor. average limits.

4. Sample calculation :

at 44.0 MHz

$$AF + Mr = 13.5 + 1.9 = 15.4 \text{ dB/uV/m}$$

Where,

Af = Antenna Factor including the cable loss.

Mr = Meter Reading

5. Measuring Instrument Setting:

(1) Below 1000 MHz

Detector function : CISPR quasi-peak

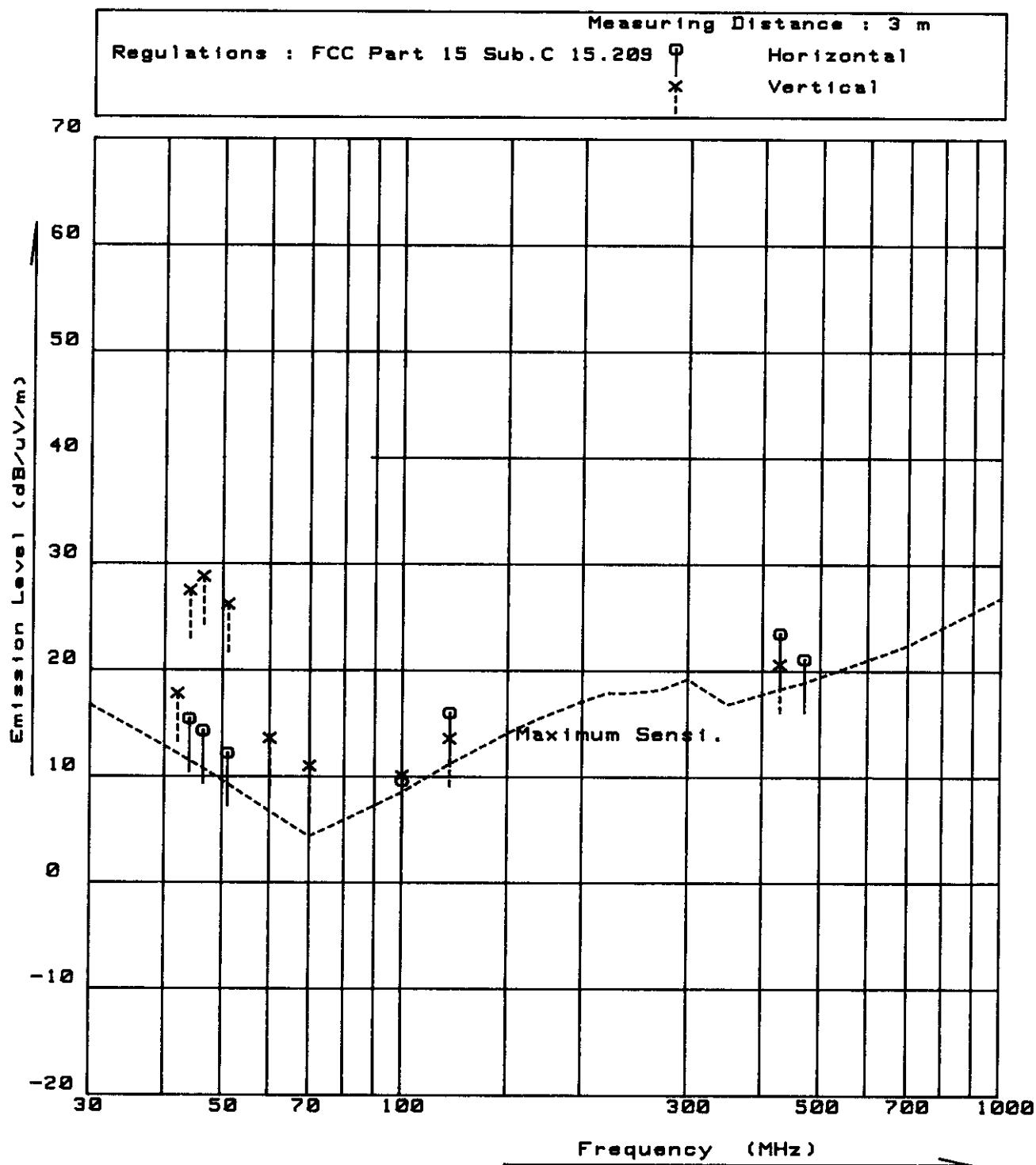
IF Bandwidth : 120 kHz

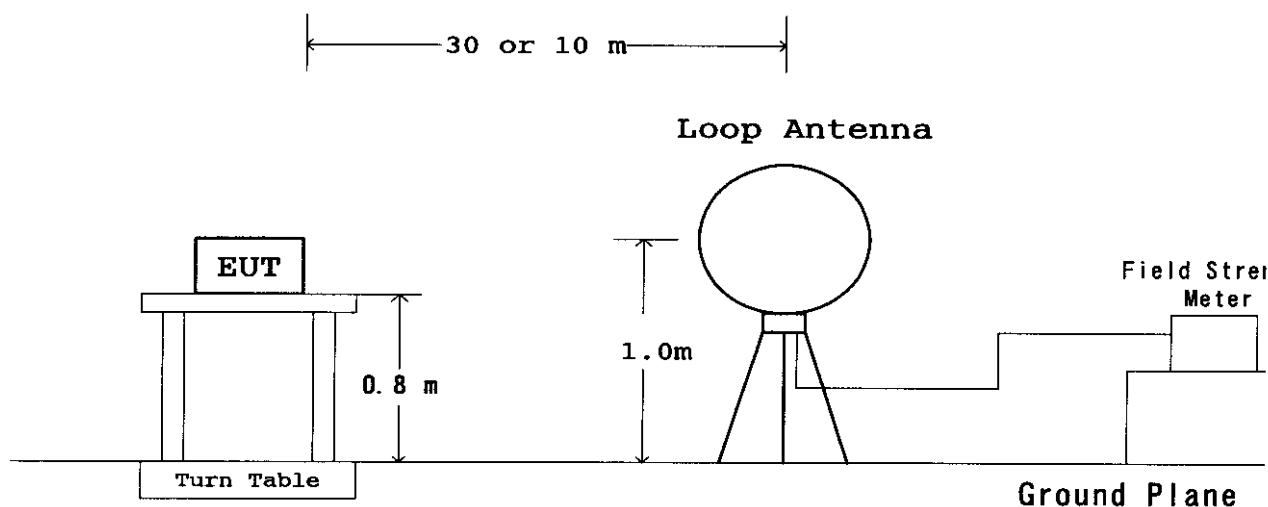
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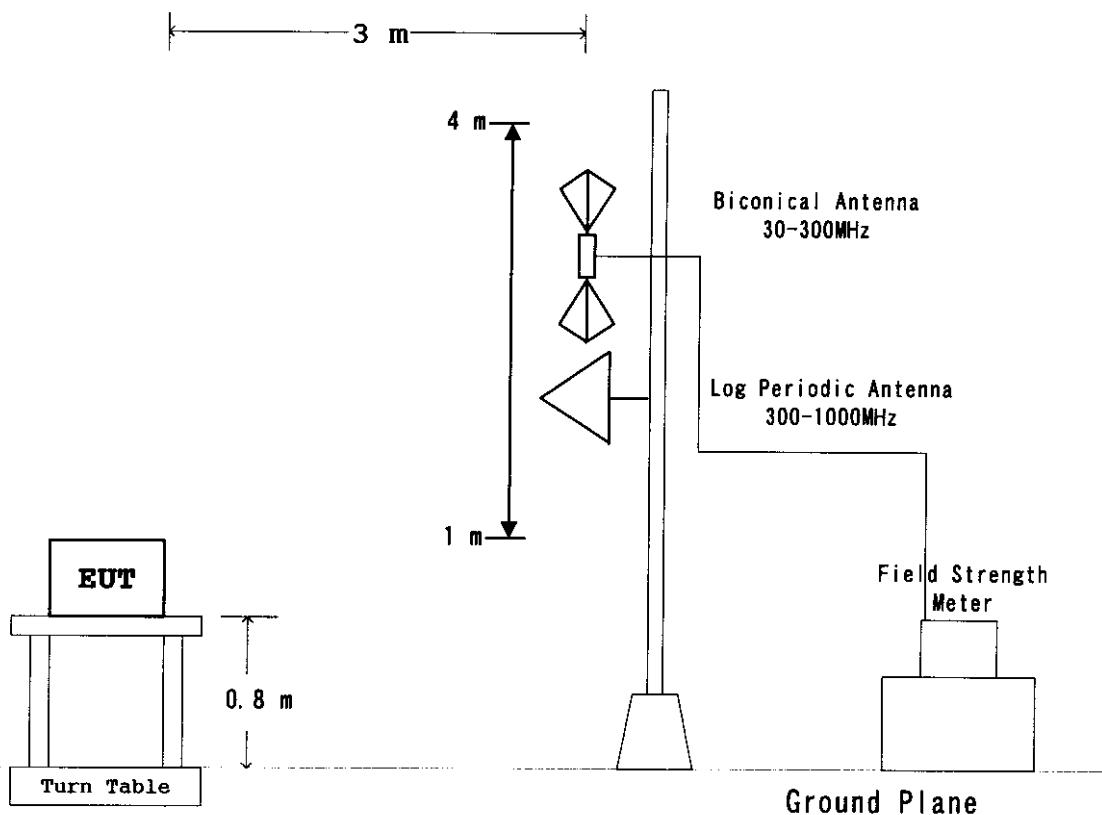
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RADIATED SPURIOUS EMISSION MEASUREMENTS

Model No.: IMB221-02



Measuelement Set Up for up to 30 MHz

MEASUREMENT SET-UP FOR RADIATED EMISSIONS

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LIST OF MEASUREMENT EQUIPMENT

<u>Equipment (Model No.)</u>	<u>Manufacturer</u>	<u>Date of Cal.</u>
1. Field Strength Meter		
ESH3	Rohde & Schwarz	May 1998
2. Field Strength Meter		
ESV	Rohde & Schwarz	May 1998
3. DC Power Supply		
PAB 18-2.5DU	KIKUSUI ELECTRONICS CORP	--
4. Loop Antenna		
HFH2-Z2	Rohde & Schwarz	Feb. 1998
5. Biconical Antenna		
BBA9106	Schwarzbeck	May 1998
6. Log-periodic Antenna		
UHALP9107	Schwarzbeck	May 1998