



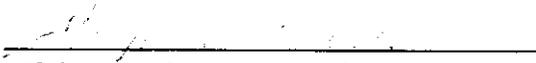
FCC ID : AK8SLVM10HF

**REPORT OF MEASUREMENTS**

Date : April 20, 1998  
Issue in : Tokyo, Japan

**JOA APPLICATION NO. : 80-71225**

1. Applicant : Sony Corporation  
7-35, 6-chome, Kitashinagawa,  
Shinagawa-ku, Tokyo 141, Japan
2. Manufacturer : Sony Corporation  
7-35, 6-chome, Kitashinagawa,  
Shinagawa-ku, Tokyo 141, Japan
3. Description of Equipment : Transmitter
  - a) FCC ID : AK8SLVM10HF
  - b) Trade Name : SONY
  - c) Model No. : SLV-M10HF
  - d) Operating Frequency : 13.56 MHz
  - e) Power Supply : 120 VAC 60 Hz
4. Applicable Rule : FCC Rules & Regulations Part 15  
Subpart C (June 23, 1989)
5. Place of Measurement : JQA EMC Engineering Dept.
6. Date of Measurement : April 17, 1998 (Completed)
7. Total Pages of This Report : 28 (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.

  
Shigeru Osawa, Assistant Manager  
Testing Div.  
EMC Engineering Dept.

## 1. Transmitter Fundamental and Spurious Emission: [§15.225 & §15.209]

### Measurement Method Employed:

Measurements were made under the conditions specified ANSI C63.4.

The transmitter under test was operated continuously in its normal operating mode for the purpose of the measurements. In order to secure the continuous operation of the EUT, rewiring in the circuit was done by the manufacturer so as to affect its intended operation.

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

The center of the loop antenna was 1 meter above ground. The wooden turntable was rotated 360 degrees to obtain the highest reading on the field strength meter or on the display of the spectrum analyzer.

The results were shown the maximum value.

### Measurement Results:

#### - Internal Large Antenna -

Operating Frequency : 13.56 MHz  
Distance of Measurement : 30 meters

Frequency (MHz)	Field Strength (dB/uV/m)
Fundamental 13.56	< 27.0
Harmonic Frequency 27.12	< 27.0

*27.6 dBuV/m @ 30m*

#### - Internal Small Antenna -

Operating Frequency : 13.56 MHz  
Distance of Measurement : 30 meters

Frequency (MHz)	Field Strength (dB/uV/m)
Fundamental 13.56	< 27.0
Harmonic Frequency 27.12	< 27.0

The distance of measurements was reduced to 10 meters.

- Internal Large Antenna -

Operating Frequency : 13.56 MHz  
Distance of Measurement : 10 meters

Frequency (MHz)	Field Strength (dB/uV/m)
Fundamental 13.56	40.5
Harmonic Frequency 27.12	< 27.0

- Internal Small Antenna -

Operating Frequency : 13.56 MHz  
Distance of Measurement : 10 meters

Frequency (MHz)	Field Strength (dB/uV/m)
Fundamental 13.56	< 27.0
Harmonic Frequency 27.12	< 27.0

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 :

$$\begin{aligned} 40.5 \text{ dB/uV/m} - 20\log_{10}((30/10)^2) &= 40.5 - 19.1 \\ &= 21.4 \text{ dB/uV/m at 30 meters} \end{aligned}$$

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



JQA APPLICATION NO. : 80-71225

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2. Radiated Spurious Emission: [§15.209]

Measurement Method Employed:

Measurements were made under the conditions specified ANSI C63.4. The transmitter under test was operated continuously in its normal operating mode for the purpose of the measurements. In order to secure the continuous operation of the device under test, rewiring in the circuit was done by the manufacturer so as to affect its intended operation. The receiving antenna polarized horizontally was varied from 1 to 4 meters and the wooden turntable was rotated 360 degrees to obtain the highest reading on the field strength meter or on the display of the spectrum analyzer. These measurements were repeated with the receiving antenna polarized vertically.

Measurement Results:

- Internal Large Antenna -  
 Operating Frequency : 13.56 MHz  
 Distance of Measurement : 3 meters

Frequency (MHz)	Antenna Factor (dB)	Meter Reading		Field Strength at 3 m	
		Horizontal (dB/uV)	Vertical (dB/uV)	Horizontal (uV/m)	Vertical (uV/m)
40.680	2.3	16.2	25.1	8.4	23.4
54.240	5.0	23.9	21.0	27.9	20.0
67.800	7.1	18.5	13.5	19.1	10.7
81.360	8.9	22.8	16.7	38.5	19.1
94.920	10.4	9.5	5.4	9.9	6.2
108.480	11.7	23.2	17.2	55.6	27.9
122.040	12.9	9.0	0.6	12.4	4.7
135.600	14.0	23.2	17.7	72.4	38.5
149.160	15.0	12.4	6.7	23.4	12.2
162.720	15.9	21.5	15.7	74.1	38.0
176.280	16.7	16.5	8.5	45.7	18.2
189.840	17.5	22.0	10.2	94.4	24.3
203.400	18.2	1.5	< -5.0	9.7	< 4.6
216.960	18.9	20.2	12.7	90.2	38.0
230.520	19.6	2.3	0.5	12.4	10.1
244.080	20.2	12.8	13.0	44.7	45.7
257.640	20.8	2.7	2.5	15.0	14.6
271.200	21.3	15.8	13.1	71.6	52.5
284.760	21.9	3.6	0.2	18.8	12.7
298.320	22.4	15.7	9.4	80.4	38.9
311.880	22.9	4.2	-0.7	22.6	12.9
325.440	23.3	16.9	9.5	102.3	43.7
339.000	23.8	5.6	2.3	29.5	20.2
352.560	24.2	14.2	16.9	83.2	113.5
366.120	24.6	4.6	4.7	28.8	29.2
379.680	25.0	10.2	13.8	57.5	87.1
393.240	25.4	1.3	2.5	21.6	24.8
406.800	25.8	5.2	8.6	35.5	52.5
420.360	26.2	-1.5	-2.0	17.2	16.2
433.920	26.5	3.3	4.0	30.9	33.5
447.480	26.9	< -5.0	< -5.0	< 12.4	< 12.4
461.040	27.2	2.0	1.6	28.8	27.5
474.600	27.5	-1.5	-1.5	20.0	20.0
488.160	27.9	1.0	3.1	27.9	35.5
501.720	28.2	< -5.0	< -5.0	< 14.5	< 14.5
515.280	28.5	-1.3	0.8	22.9	29.2
528.840	28.9	< -5.0	< -5.0	< 15.7	< 15.7
542.400	29.2	-0.6	< -5.0	26.9	< 16.2
555.960	29.5	< -5.0	< -5.0	< 16.8	< 16.8
569.520	29.9	-1.0	1.3	27.9	36.3
583.080	30.2	< -5.0	< -5.0	< 18.2	< 18.2
596.640	30.5	-1.9	-0.4	26.9	32.0
610.200	30.8	< -5.0	< -5.0	< 19.5	< 19.5

Frequency (MHz)	Antenna Factor (dB)	Meter Reading		Field Strength at 3 m	
		Horizontal (dB/uV)	Vertical (dB/uV)	Horizontal (uV/m)	Vertical (uV/m)
623.760	31.1	-1.2	-1.5	31.3	30.2
637.320	31.3	< -5.0	< -5.0	< 20.7	< 20.7
650.880	31.6	< -5.0	< -5.0	< 21.4	< 21.4
664.440	31.9	< -5.0	< -5.0	< 22.1	< 22.1
678.000	32.2	< -5.0	< -5.0	< 22.9	< 22.9
691.560	32.4	< -5.0	< -5.0	< 23.4	< 23.4
705.120	32.7	< -5.0	< -5.0	< 24.3	< 24.3
718.680	32.9	< -5.0	< -5.0	< 24.8	< 24.8
732.240	33.2	< -5.0	< -5.0	< 25.7	< 25.7
745.800	33.4	< -5.0	< -5.0	< 26.3	< 26.3
759.360	33.7	< -5.0	< -5.0	< 27.2	< 27.2
772.920	33.9	< -5.0	< -5.0	< 27.9	< 27.9
786.480	34.1	< -5.0	< -5.0	< 28.5	< 28.5
800.040	34.4	< -5.0	< -5.0	< 29.5	< 29.5
813.600	34.6	< -5.0	< -5.0	< 30.2	< 30.2
827.160	34.8	< -5.0	< -5.0	< 30.9	< 30.9
840.720	35.0	< -5.0	< -5.0	< 31.6	< 31.6
854.280	35.3	< -5.0	< -5.0	< 32.7	< 32.7
867.840	35.5	< -5.0	< -5.0	< 33.5	< 33.5
881.400	35.7	< -5.0	< -5.0	< 34.3	< 34.3
894.960	35.9	< -5.0	< -5.0	< 35.1	< 35.1
908.520	36.1	< -5.0	< -5.0	< 35.9	< 35.9
922.080	36.3	< -5.0	< -5.0	< 36.7	< 36.7
935.640	36.5	< -5.0	< -5.0	< 37.6	< 37.6
949.200	36.7	< -5.0	< -5.0	< 38.5	< 38.5
962.760	36.9	< -5.0	< -5.0	< 39.4	< 39.4
976.320	37.1	< -5.0	< -5.0	< 40.3	< 40.3
989.880	37.3	< -5.0	< -5.0	< 41.2	< 41.2

- Notes: 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 including in the antenna factor.
4. Sample calculation:

At 40.680 MHz

$$10^{(Af + Mr)/20} = 10^{(2.3 + 25.1)/20} = 23.4 \text{ uV/m}$$

$$23.4 \times (D-1 / D-2) \text{ in meter} = 23.4 \text{ uV/m}$$

Where,

Af = Antenna Factor including the cable loss

Mr = Meter reading

D-1 = Measured distance in meter : 3 m

D-2 = Specified distance in meter : 3 m

5. Measuring Instrument Setting:

Detector function : CISPR quasi-peak

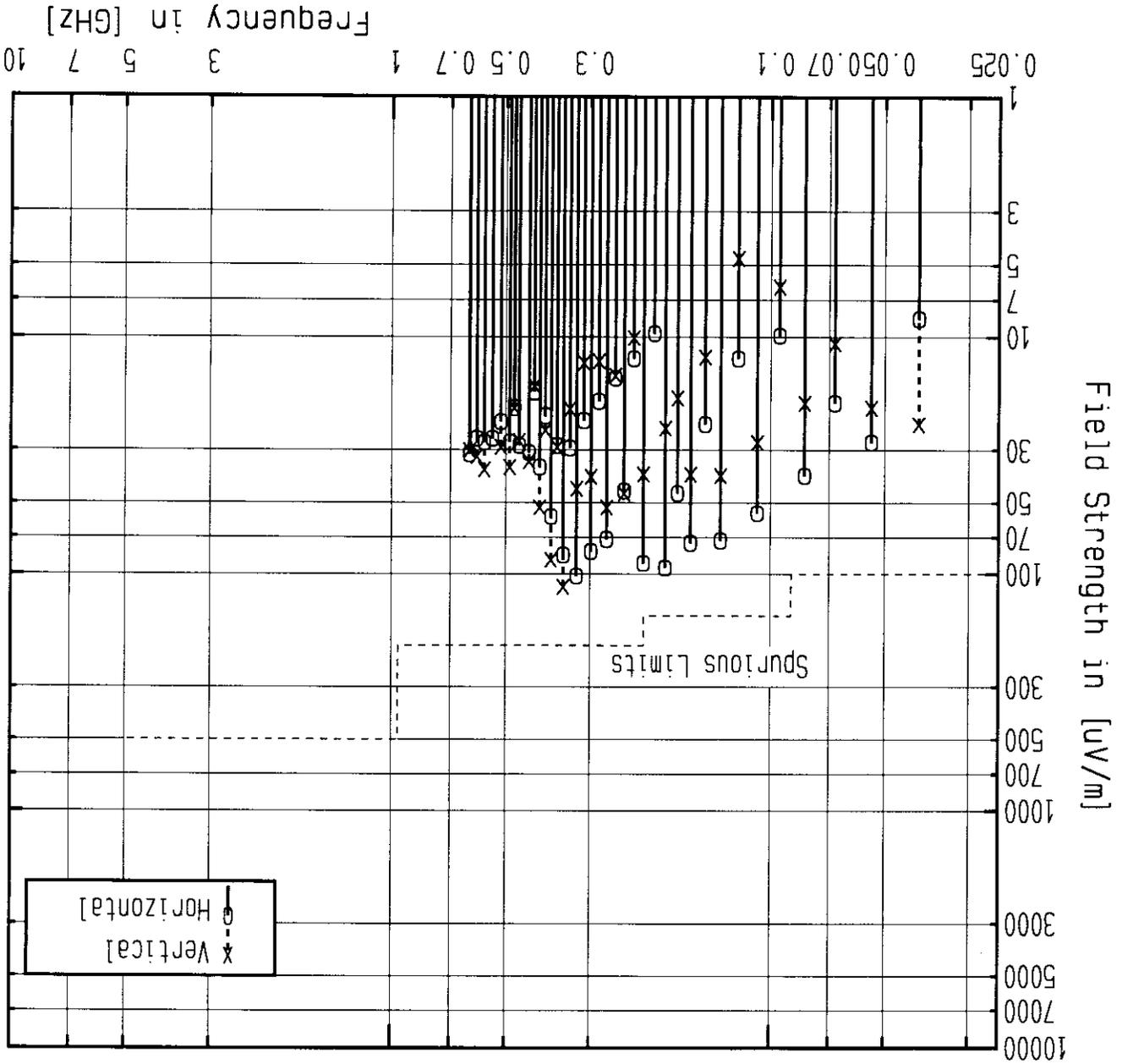
IF Bandwidth : 120 kHz

Radiated Spurious Emissions

FCC ID : AK8SLVM10HF

Operating Frequency : 13.56 MHz

Test Condition : Internal Large Antenna



Measurement Results:

- Internal Small Antenna -  
 Operating Frequency : 13.56 MHz  
 Distance of Measurement : 3 meters

Frequency (MHz)	Antenna Factor (dB)	Meter Reading		Field Strength at 3 m	
		Horizontal (dB/uV)	Vertical (dB/uV)	Horizontal (uV/m)	Vertical (uV/m)
40.680	2.3	9.3	18.3	3.8	10.7
54.240	5.0	9.2	6.4	5.1	3.7
67.800	7.1	6.7	4.2	4.9	3.7
81.360	8.9	17.7	13.7	21.4	13.5
94.920	10.4	8.1	3.8	8.4	5.1
108.480	11.7	22.5	16.7	51.3	26.3
122.040	12.9	12.9	4.8	19.5	7.7
135.600	14.0	22.0	17.8	63.1	38.9
149.160	15.0	20.1	11.8	56.9	21.9
162.720	15.9	21.5	16.3	74.1	40.7
176.280	16.7	13.9	6.5	33.9	14.5
189.840	17.5	20.2	14.2	76.7	38.5
203.400	18.2	1.7	-1.0	9.9	7.2
216.960	18.9	14.3	12.5	45.7	37.2
230.520	19.6	0.5	-1.1	10.1	8.4
244.080	20.2	11.8	12.9	39.8	45.2
257.640	20.8	3.3	2.8	16.0	15.1
271.200	21.3	15.2	12.5	66.8	49.0
284.760	21.9	4.2	0.2	20.2	12.7
298.320	22.4	15.1	9.4	75.0	38.9
311.880	22.9	5.1	0.5	25.1	14.8
325.440	23.3	16.1	9.8	93.3	45.2
339.000	23.8	6.1	4.8	31.3	26.9
352.560	24.2	11.7	14.4	62.4	85.1
366.120	24.6	3.0	3.5	24.0	25.4
379.680	25.0	8.3	11.8	46.2	69.2
393.240	25.4	-1.5	1.4	15.7	21.9
406.800	25.8	5.5	9.6	36.7	58.9
420.360	26.2	< -5.0	-0.5	< 11.5	19.3
433.920	26.5	2.0	5.5	26.6	39.8
447.480	26.9	< -5.0	< -5.0	< 12.4	< 12.4
461.040	27.2	4.3	3.3	37.6	33.5
474.600	27.5	< -5.0	< -5.0	< 13.3	< 13.3
488.160	27.9	3.6	2.5	37.6	33.1
501.720	28.2	< -5.0	< -5.0	< 14.5	< 14.5
515.280	28.5	3.6	1.8	40.3	32.7
528.840	28.9	< -5.0	< -5.0	< 15.7	< 15.7
542.400	29.2	0.9	4.2	32.0	46.8
555.960	29.5	< -5.0	< -5.0	< 16.8	< 16.8
569.520	29.9	-0.5	-0.7	29.5	28.8
583.080	30.2	< -5.0	< -5.0	< 18.2	< 18.2
596.640	30.5	0.4	2.3	35.1	43.7
610.200	30.8	< -5.0	< -5.0	< 19.5	< 19.5



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FCC ID : AK8SLVM10HF

Antenna Frequency (MHz)	Antenna Factor (dB)	Meter Reading Horizontal (dB/uV)	Meter Reading Vertical (dB/uV)	Field Strength at 3 m Horizontal (uV/m)	Field Strength at 3 m Vertical (uV/m)
623.760	31.1	< -5.0	-1.8	< 20.2	< 20.2
637.320	31.3	< -5.0	< -5.0	< 20.7	< 20.7
650.880	31.6	< -5.0	< -5.0	< 21.4	< 21.4
664.440	31.9	< -5.0	< -5.0	< 22.1	< 22.1
678.000	32.2	< -5.0	< -5.0	< 22.9	< 22.9
691.560	32.4	< -5.0	< -5.0	< 23.4	< 23.4
705.120	32.7	< -5.0	< -5.0	< 24.3	< 24.3
718.680	32.9	< -5.0	< -5.0	< 24.8	< 24.8
732.240	33.2	< -5.0	< -5.0	< 25.7	< 25.7
745.800	33.4	< -5.0	< -5.0	< 26.3	< 26.3
759.360	33.7	< -5.0	< -5.0	< 27.2	< 27.2
772.920	33.9	< -5.0	< -5.0	< 27.9	< 27.9
786.480	34.1	< -5.0	< -5.0	< 28.5	< 28.5
800.040	34.4	< -5.0	< -5.0	< 29.5	< 29.5
813.600	34.6	< -5.0	< -5.0	< 30.2	< 30.2
827.160	34.8	< -5.0	< -5.0	< 30.9	< 30.9
840.720	35.0	< -5.0	< -5.0	< 31.6	< 31.6
854.280	35.3	< -5.0	< -5.0	< 32.7	< 32.7
867.840	35.5	< -5.0	< -5.0	< 33.5	< 33.5
881.400	35.7	< -5.0	< -5.0	< 34.3	< 34.3
894.960	35.9	< -5.0	< -5.0	< 35.1	< 35.1
908.520	36.1	< -5.0	< -5.0	< 35.9	< 35.9
922.080	36.3	< -5.0	< -5.0	< 36.7	< 36.7
935.640	36.5	< -5.0	< -5.0	< 37.6	< 37.6
949.200	36.7	< -5.0	< -5.0	< 38.5	< 38.5
962.760	36.9	< -5.0	< -5.0	< 39.4	< 39.4
976.320	37.1	< -5.0	< -5.0	< 40.3	< 40.3
989.880	37.3	< -5.0	< -5.0	< 41.2	< 41.2

- Notes: 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 including in the antenna factor.  
4. Sample calculation:  
At 40.680 MHz

$$10^{(Af + Mr)/20} = 10^{(2.3 + 18.3)/20} = 10.7 \text{ uV/m}$$
$$10.7 \times (D-1 / D-2) \text{ in meter} = 10.7 \text{ uV/m}$$

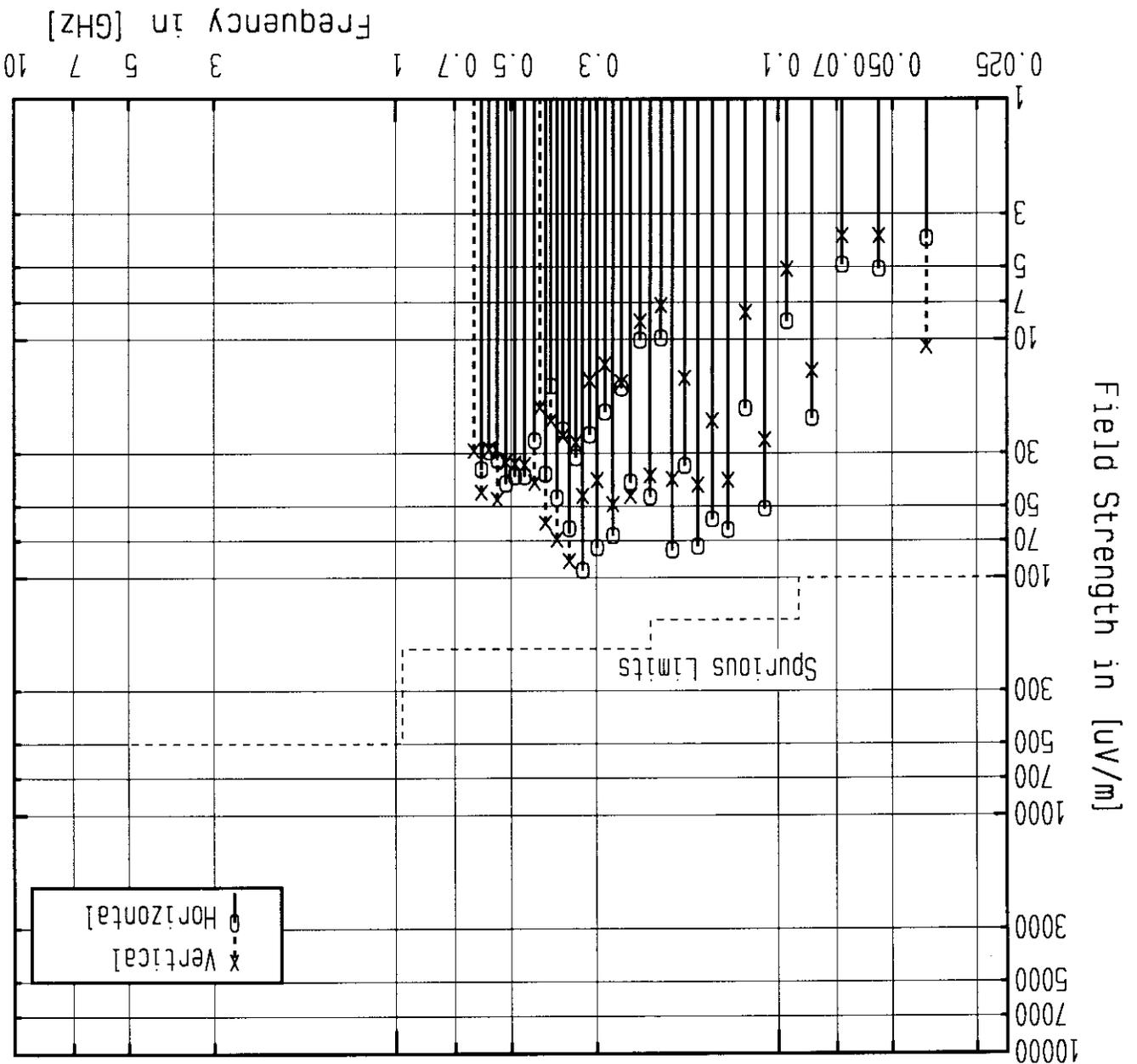
where,

- Af = Antenna Factor including the cable loss  
Mr = Meter reading  
D-1 = Measured distance in meter : 3 m  
D-2 = Specified distance in meter : 3 m
5. Measuring Instrument Setting:

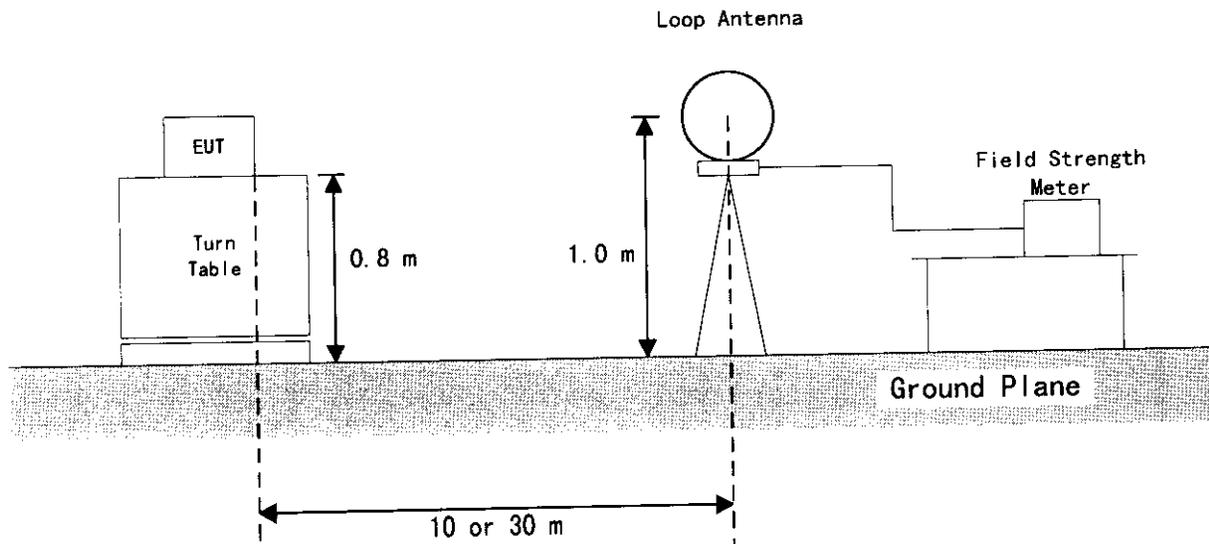
Detector function : CISPR quasi-peak  
IF Bandwidth : 120 KHz

Radiated Spurious Emissions

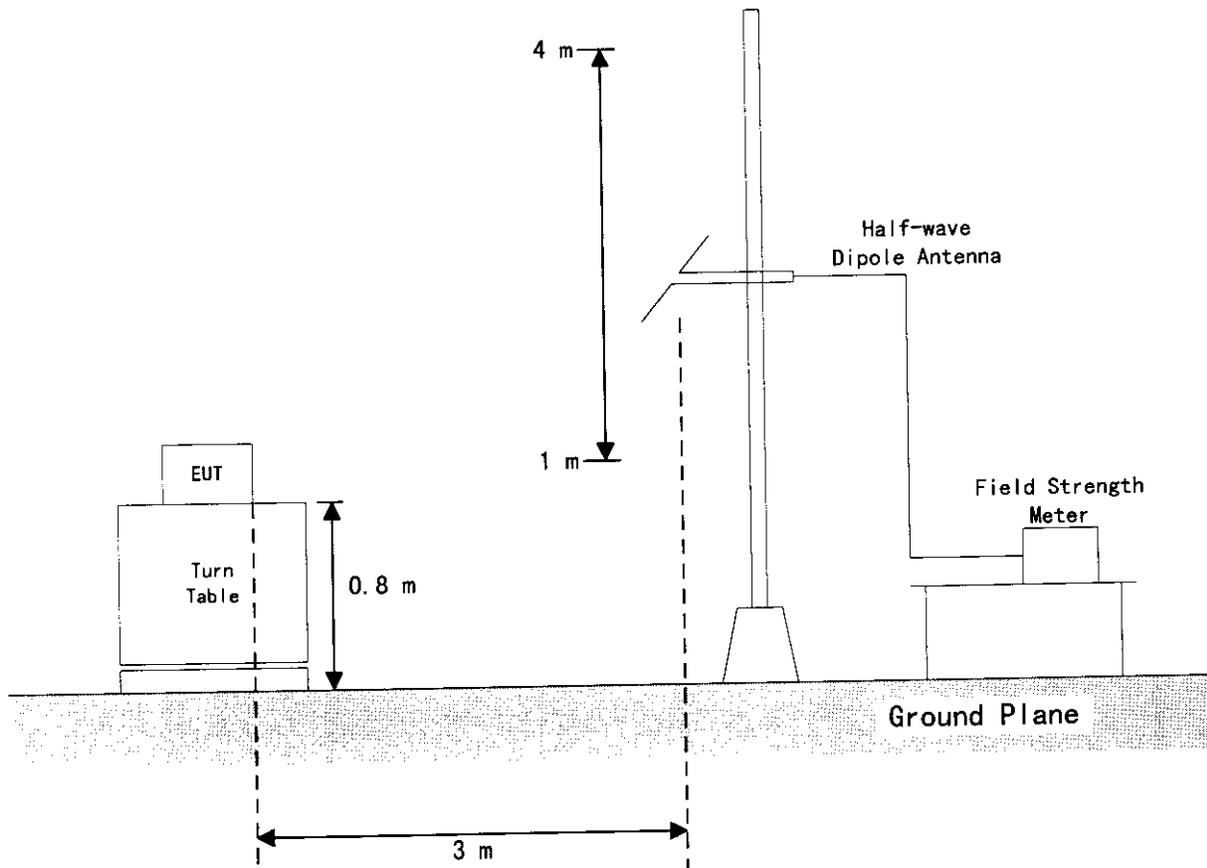
FCC ID : AK8SLVM10HF  
 Operating Frequency : 13.56 MHz  
 Test Condition : Internal Sma Antenna



## MEASUREMENT SET-UP FOR UP TO 30 MHz



## MEASUREMENT SET-UP FOR RADIATED EMISSIONS



3. Emission Limitation: [ §15.231(c) ]

Measurement Method Employed: By using a spectrum analyzer with a vertical antenna for picking up the signal, the measurements of the fundamental frequency were made under the following transmitting modes of the EUT.

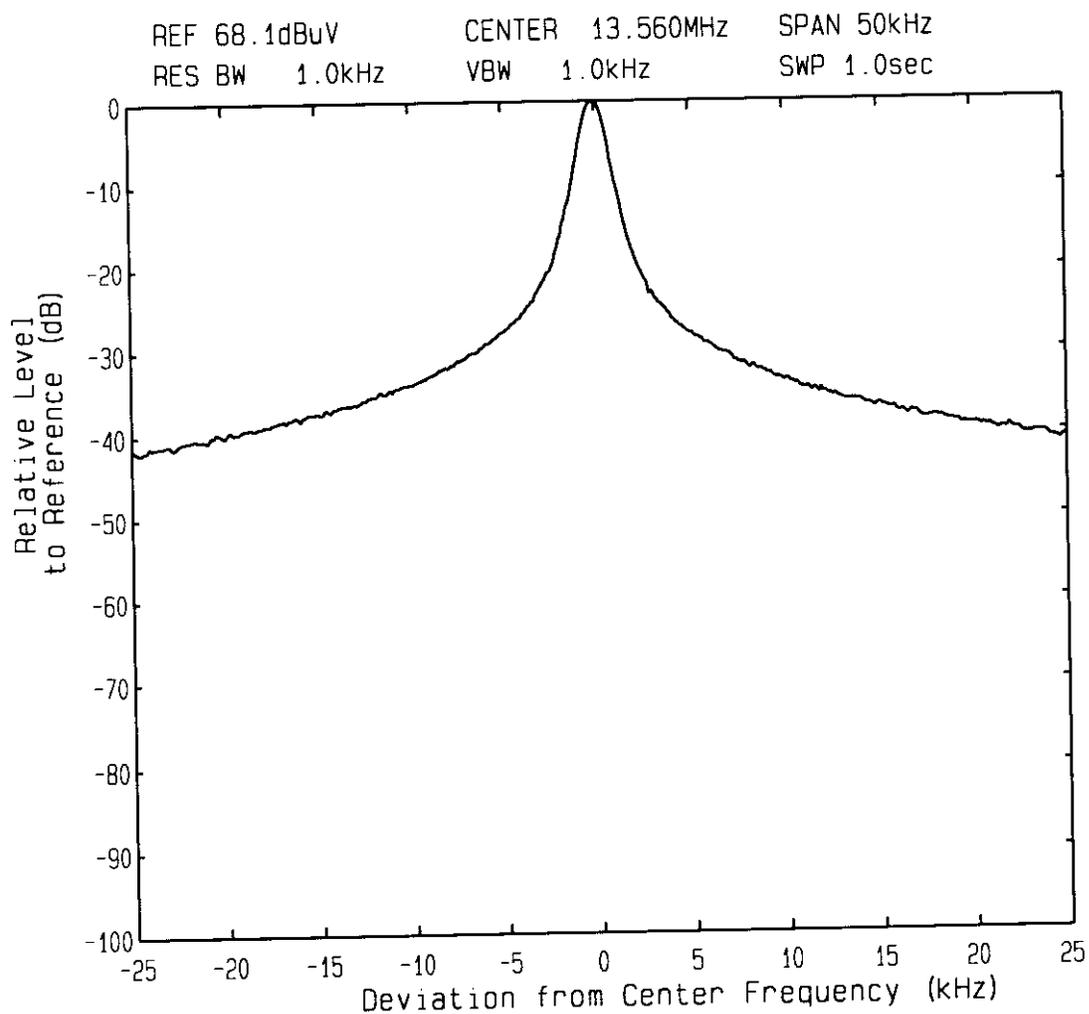
Measurements Results :  
Refer to the attached graphs.

## Emission Limitation

FCC ID : AK8SLVM10HF

Model : SLV-M10HF

Mode of EUT : Internal Large Antenna  
Internal Modulation

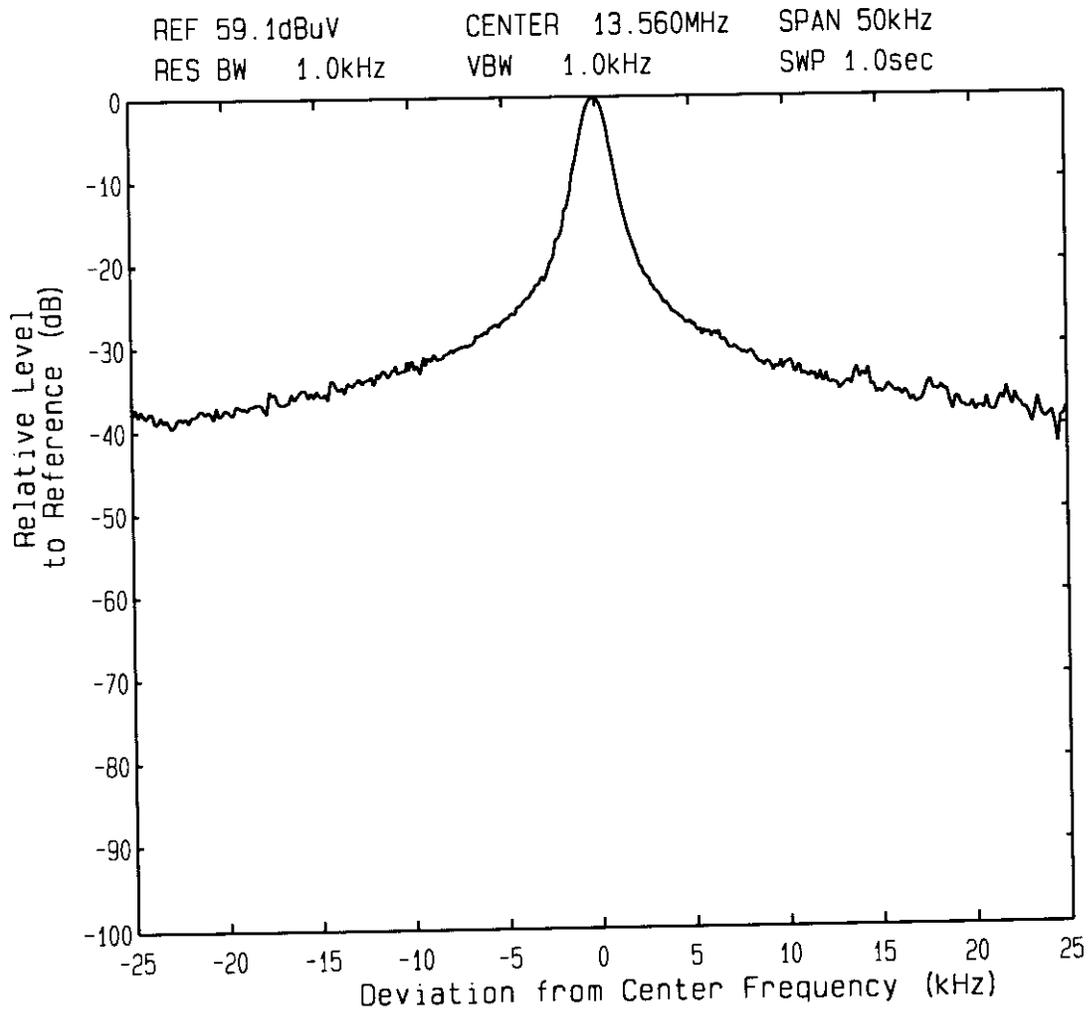


## Emission Limitation

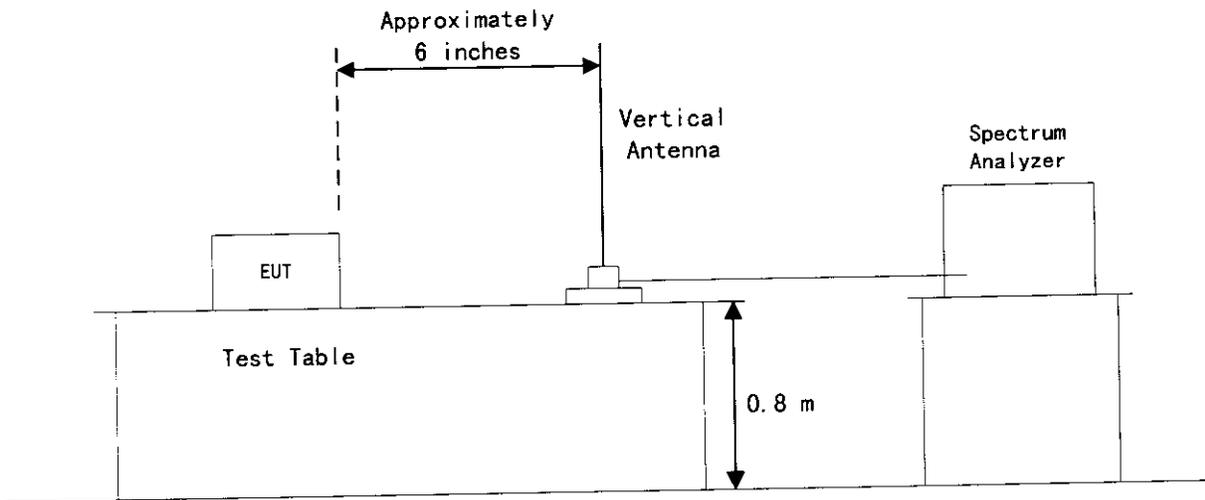
FCC ID : AK8SLVM10HF

Model : SLV-M10HF

Mode of EUT : Internal Small Antenna  
Internal Modulation



## MESUREMENT SET-UP FOR BAND WIDTH



4. Power Line Conducted Interference Voltage : [ §15.207 ]

- Internal Large Antenna -

Frequency (MHz)	LISN Factor (dB)	Meter Reading (dB)		Results (dB/uV)	
		One end & grounded	Other end & Grounded	One end & grounded	Other end & Grounded
0.48	0.2	26.4	29.4	26.6	29.6
0.58	0.2	36.7	37.4	36.9	37.6
0.67	0.2	33.9	34.7	34.1	34.9
0.86	0.2	35.5	36.1	35.7	36.3
0.96	0.2	34.3	35.6	34.5	35.8
1.15	0.2	35.4	36.6	35.6	36.8
2.40	0.2	32.7	32.5	32.9	32.7
3.45	0.2	30.3	28.5	30.5	28.7
4.98	0.2	28.2	25.2	28.4	25.4
5.20	0.2	30.1	26.8	30.3	27.0
8.24	0.2	17.2	14.3	17.4	14.5
10.00	0.2	9.0	9.6	9.2	9.8
11.44	0.2	11.6	8.0	11.8	8.2
13.00	0.3	15.1	14.9	15.4	15.2
13.56	0.3	25.9	26.0	26.2	26.3
15.00	0.3	16.7	16.5	17.0	16.8
16.00	0.3	21.9	21.8	22.2	22.1
19.00	0.4	16.0	15.5	16.4	15.9
21.00	0.4	15.8	15.5	16.2	15.9
24.00	0.5	21.7	22.9	22.2	23.4
27.12	0.5	38.8	38.9	39.3	39.4
30.00	0.6	7.8	8.3	8.4	8.9

Note: 1. The symbol of "<" means "or less".

2. Sample calculation at 0.48 MHz:

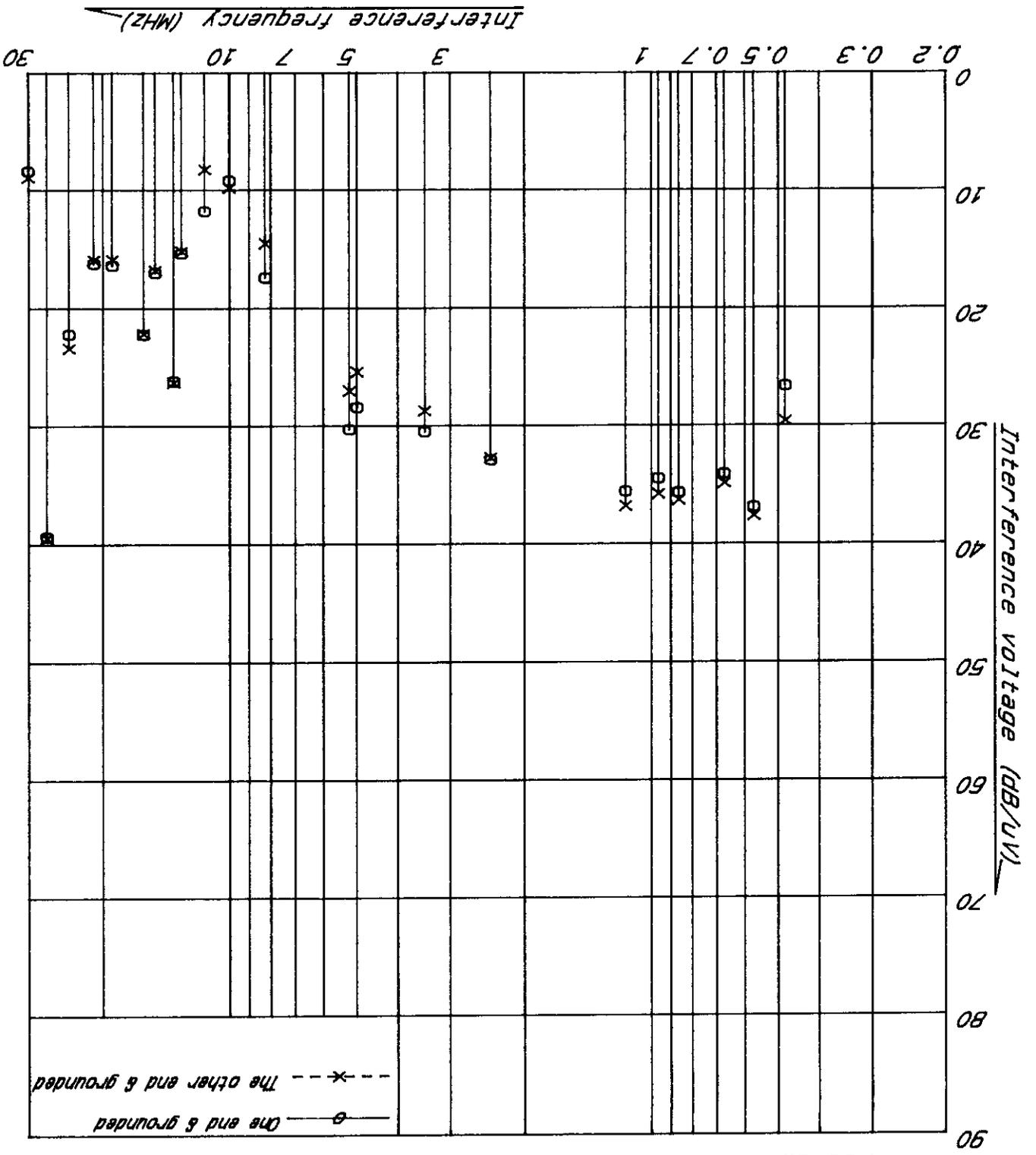
$$\text{Lisn Factor} + \text{Meter Reading} = 0.2 + 29.4 = 29.6 \text{ (dB/uV)}$$

**CONDUCTED RADIO NOISE MEASUREMENTS**

MODEL NO.: SLV-M10HF - Internal Large Antenna -

FCC ID : AK8SLVM10HF Function of EUT : TX

FCC ID : AK8SLVM10HF



- Internal Small Antenna -

Frequency (MHz)	LISN Factor (dB)	Meter Reading(dB)		Results (dB/uV)	
		One end & grounded	Other end & Grounded	One end & grounded	Other end & Grounded
0.48	0.2	26.2	29.2	26.4	29.4
0.57	0.2	36.5	37.2	36.7	37.4
0.68	0.2	34.3	35.3	34.5	35.5
0.86	0.2	35.2	36.4	35.4	36.6
0.96	0.2	34.3	35.3	34.5	35.5
1.15	0.2	35.2	35.9	35.4	36.1
2.40	0.2	32.9	31.8	33.1	32.0
3.45	0.2	29.6	26.7	29.8	26.9
4.98	0.2	28.3	23.8	28.5	24.0
5.20	0.2	30.3	30.1	30.5	30.3
8.24	0.2	17.0	13.5	17.2	13.7
10.00	0.2	8.3	9.5	8.5	9.7
11.44	0.2	10.4	7.3	10.6	7.5
13.00	0.3	15.3	14.9	15.6	15.2
13.56	0.3	38.1	34.6	38.4	34.9
15.00	0.3	16.6	16.4	16.9	16.7
16.00	0.3	22.4	21.8	22.7	22.1
19.00	0.4	16.0	15.6	16.4	16.0
21.00	0.4	16.0	15.4	16.4	15.8
24.00	0.5	21.7	22.9	22.2	23.4
27.12	0.5	4.3	4.2	4.8	4.7
30.00	0.6	8.5	8.6	9.1	9.2

Note: 1. The symbol of "<" means "or less".

2. Sample calculation at 0.48 MHz:

$$\text{Lisn Factor} + \text{Meter Reading} = 0.2 + 29.2 = 29.4 \text{ (dB/uV)}$$

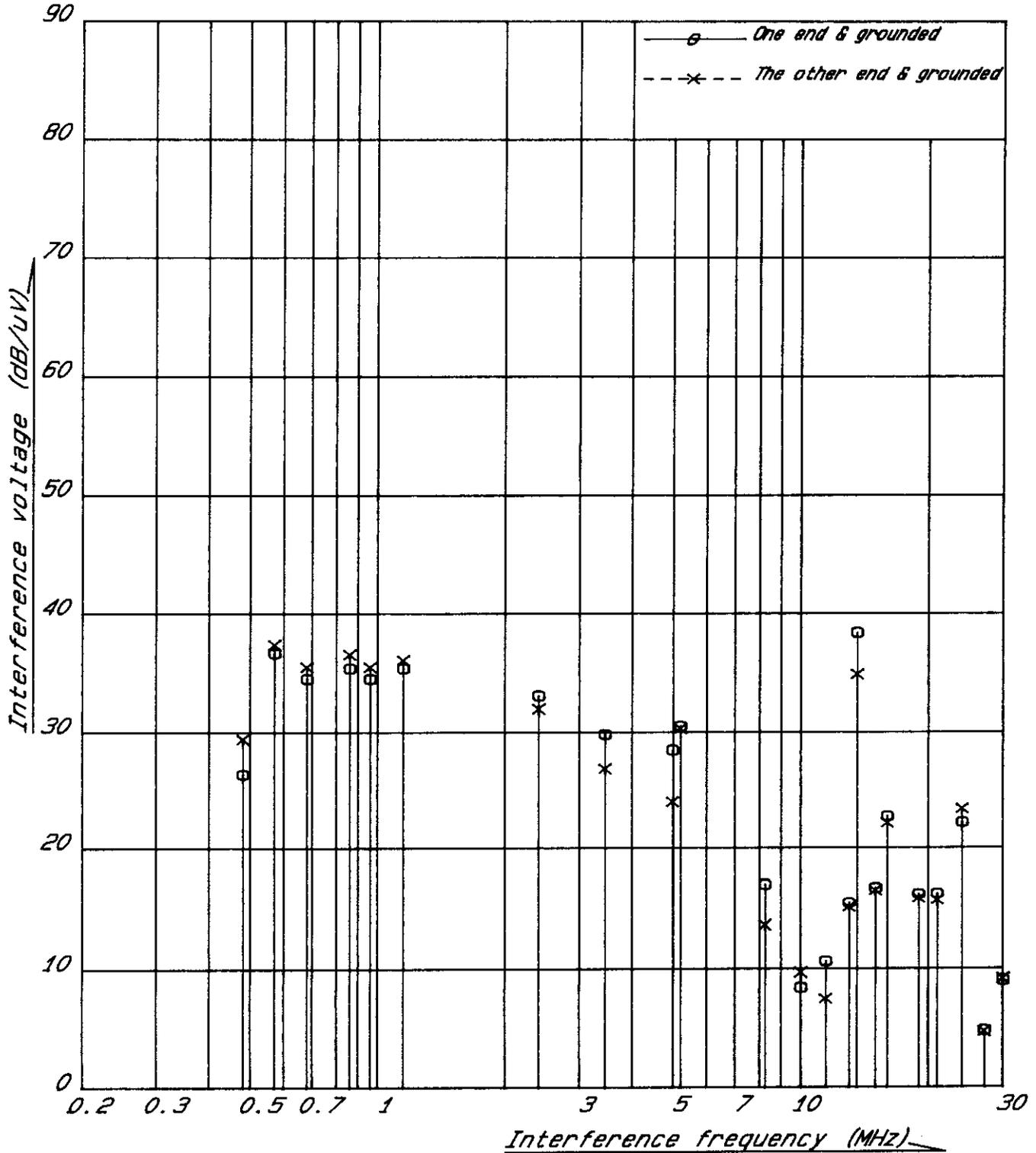
## CONDUCTED RADIO NOISE MEASUREMENTS

MODEL NO.: SLV-M10HF

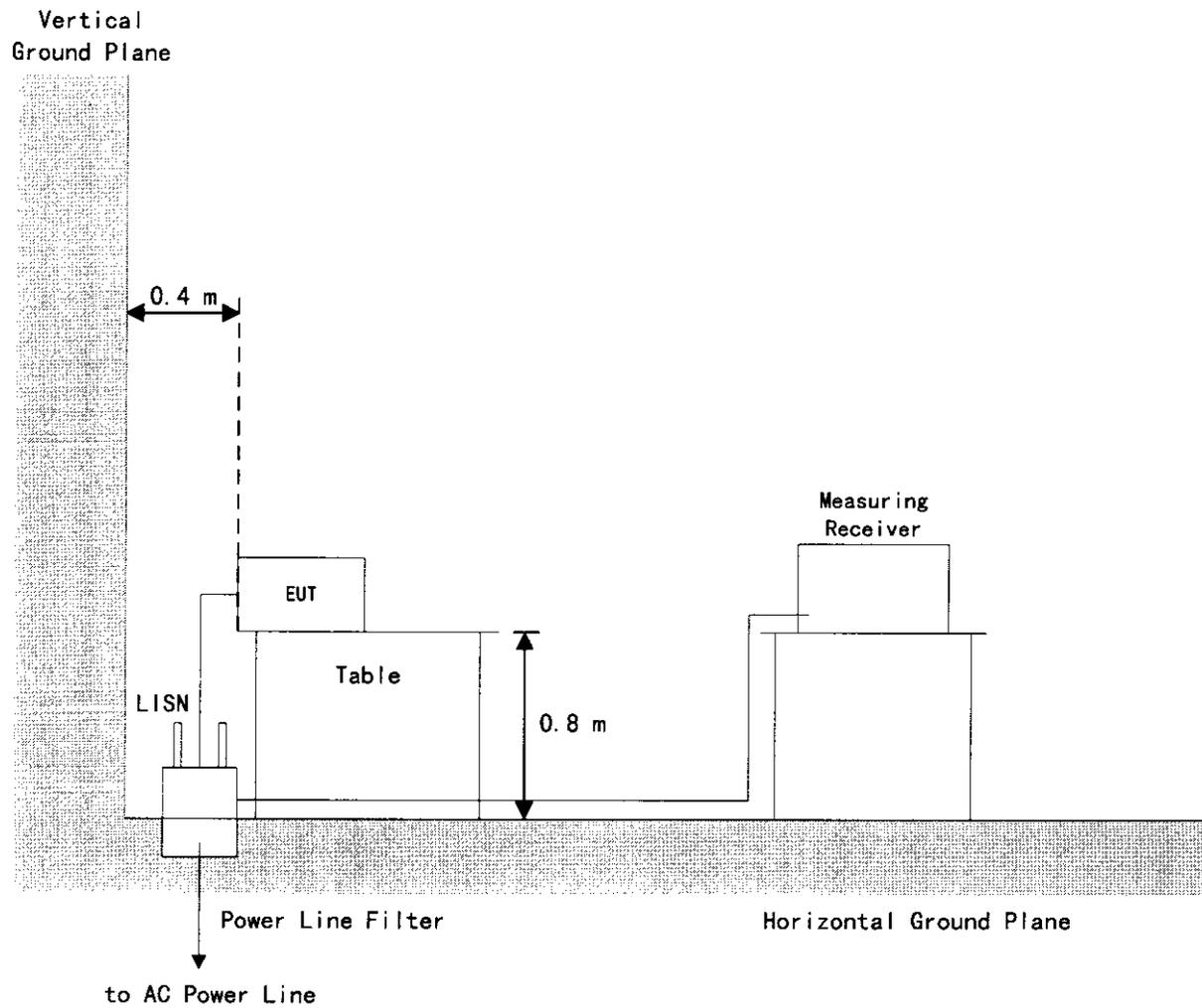
- Internal Small Antenna -

FCC ID : AKBSLVM10HF

Function of EUT : TX



## MEASUREMENT SET-UP FOR LINE CONDUCTED RF VOLTAGE



## 5. Frequency Stability : [ §15.225(c) ]

Measurement Method Employed:

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 with a variation in the primary voltage from 85 % to 115 % the rated supply voltage at the temperature of  $+20^{\circ}\text{C}$ .

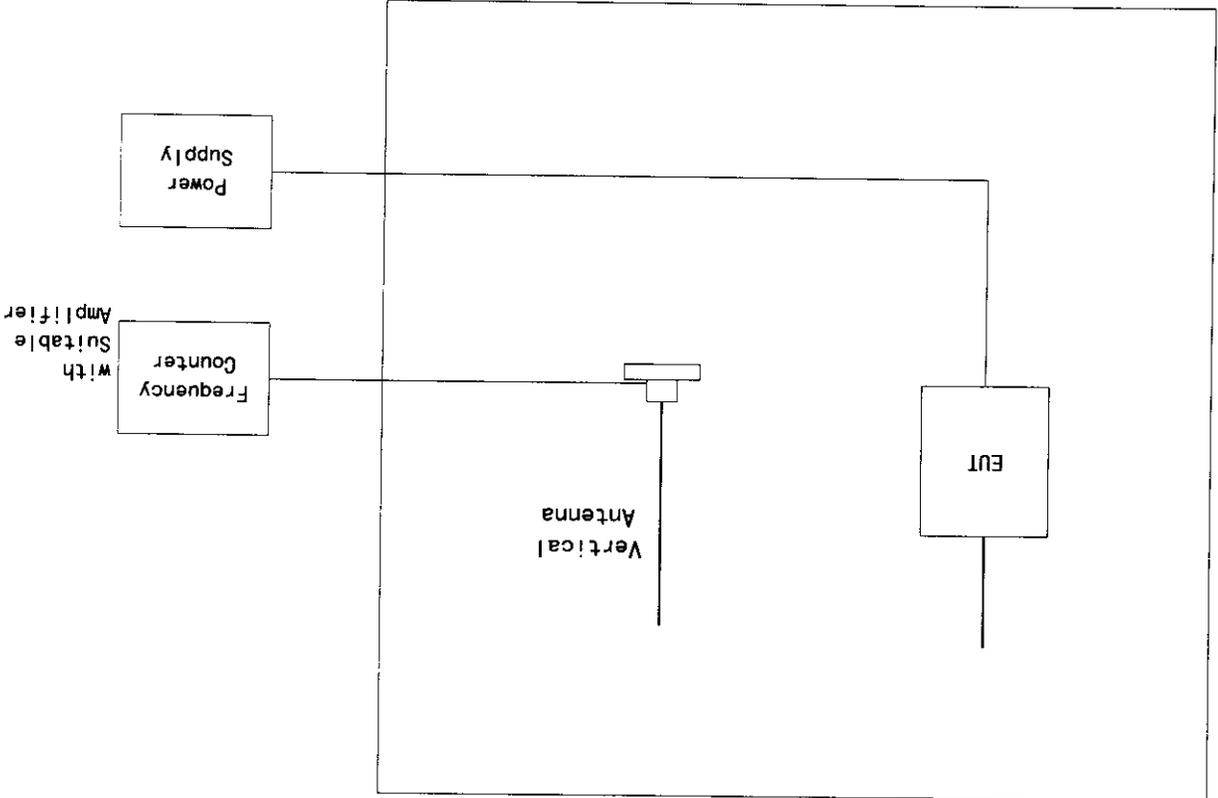
Measurement Results :

OPERATING FREQUENCY : 13.56 MHz

Ambient Temperature ( $^{\circ}\text{C}$ )	Frequency tolerance with time elapse(%)			
	0 minute	2 minutes	5 minutes	10 minutes
-20	-0.00116	-0.00109	-0.00098	-0.00083
+50	-0.00046	-0.00045	-0.00044	-0.00041

Primary Supply Voltage (V)	Frequency tolerance with time elapse(%)			
	0 minute	2 minutes	5 minutes	10 minutes
at $20^{\circ}\text{C}$ 102 (85%)	-0.00041	-0.00041	-0.00041	-0.00042
120 (100%)	-0.00040	-0.00041	-0.00041	-0.00042
138 (115%)	-0.00040	-0.00041	-0.00041	-0.00042

Specified Limit  $\pm 0.01\%$



MESUREMENT SET-UP FOR FREQUENCY STABILITY TOLERANCE

## LIST OF MEASUREMENT EQUIPMENT

<u>Equipment (Model No.)</u>	<u>Manufacturer</u>	<u>Date of Cal.</u>
1. Field Strength Meter		
ESVP	Rohde & Schwarz	May 1997
ESH3	Rohde & Schwarz	May 1997
2. Spectrum Analyzer		
8566B	Hewlett Packard	March 1998
3. Tuned Dipole Antenna		
KBA-511	Kyoritsu Electrical Works	November 1997
KBA-611	Kyoritsu Electrical Works	November 1997
4. Vertical Antenna		
91972-2	Stoddard Aircraft Radio Co., Ltd.	-
5. LISN		
KNW-407	Kyoritsu	March 1998
6. Frequency Counter		
53131A	Hewlett Packard	June 1997
7. Oven		
-	Ohnishi Co., Ltd.	July 1997
8. Loop Antenna		
HFH2-Z2	Rohde & Schwarz	November 1997