

REPORT OF MEASUREMENTS

Date : March 31, 1999
Issue in : Tokyo, Japan

JQA APPLICATION NO. : 80-80963

Applicant : Sony Kisarazu Corporation
8-4, Shiomi Kisarazu
Chiba 292-0834, Japan

Manufacturer : Sony Corporation
7-35, 6-chome, Kitashinagawa,
Shinagawa-ku, Tokyo 141-0001, Japan

Description of Equipment : Video Cassette Recorder
(Transmitter Portion)

FCC ID : AK8SLVM91HF
Trade Name : SONY
Model No. : SLV-M91HF
Operating Frequency : 13.56 MHz
Power Supply : 120 VAC 60 Hz

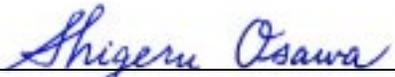
Applicable Rule : FCC Rules & Regulations Part 15
Subpart C (June 23, 1989)

Place of Measurement : JQA EMC Engineering Dept.

Date of Measurement : March 30, 1999(Completed)

Total Pages of This Report : 27 (including this page)

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/μV/m)
Fundamental 13.56	< 27.0
Harmonic Frequency 27.12	< 27.0

- Internal Small Antenna -

Operating Frequency : 13.56 MHz
Distance of Measurement : 30 meters

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

JQA APPLICATION NO.: 80-80963

Sheet 3 of 27 sheets

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/μV/m)
Fundamental 13.56	38.7
Harmonic Frequency 27.12	< 27.0

- Internal Small Antenna -
 Operating Frequency : 13.56 MHz
 Distance of Measurement : 10 meters

Frequency (MHz)	Field Strength (dB/μV/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 :

$$38.7 \text{ dB}/\mu\text{V}/\text{m} - 20\log_{10}((30/10)^2) = 38.7 - 19.1 \\ = 19.6 \text{ dB}/\mu\text{V}/\text{m} \text{ at } 30 \text{ meters}$$

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

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

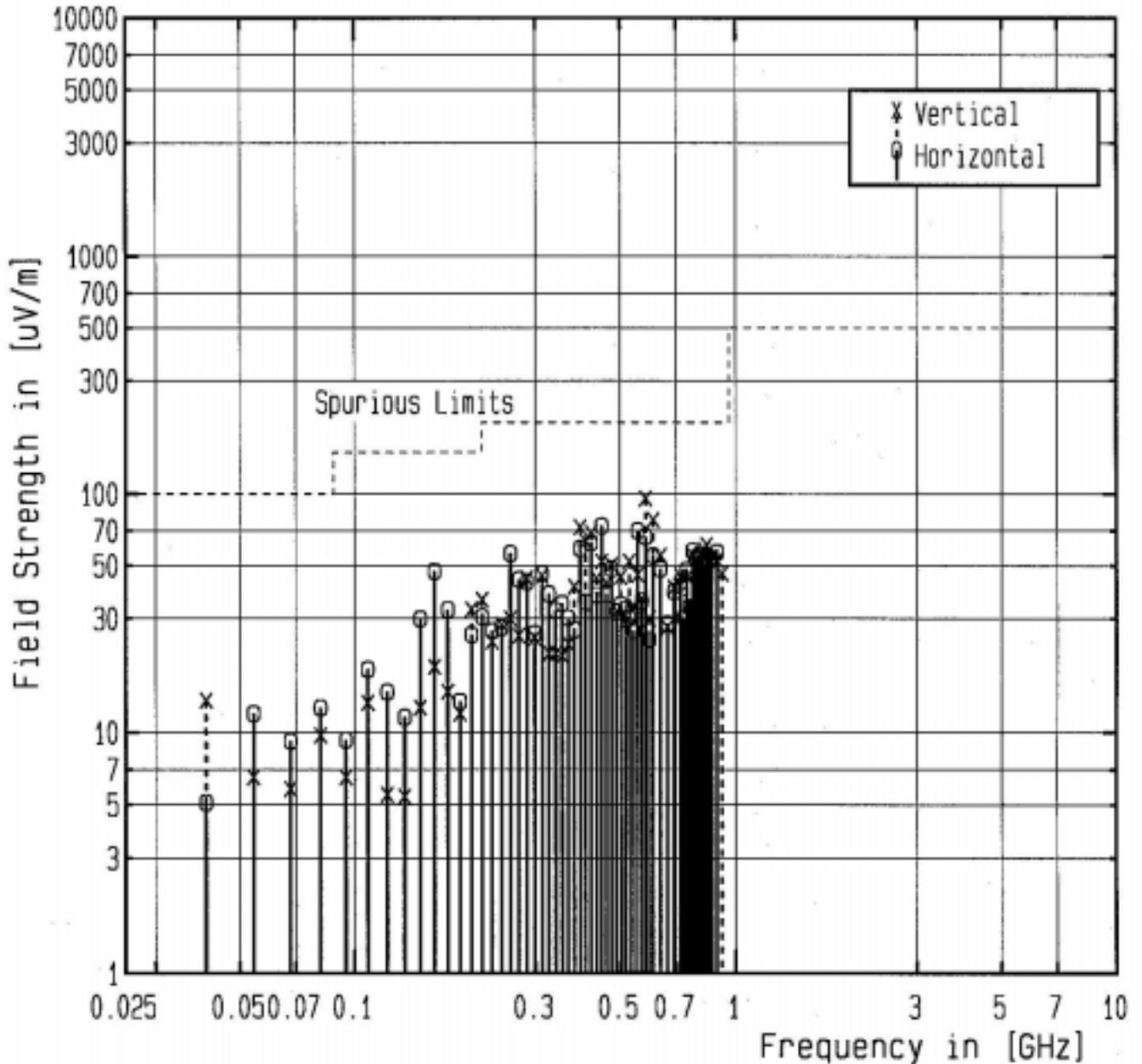
Frequency (MHz)	Antenna Factor (dB)	Meter Reading		Results	
		Horizontal (dB/μV)	Vertical (dB/μV)	Horizontal (μV/m)	Vertical (μV/m)
40.680	1.7	12.5	21.0	5.1	13.6
54.240	4.3	17.3	11.9	12.0	6.5
67.800	6.4	12.9	8.8	9.2	5.8
81.350	8.0	14.1	11.7	12.7	9.7
94.920	9.5	9.9	6.7	9.3	5.5
108.480	10.7	14.6	11.8	18.4	13.3
122.040	11.8	11.6	3.0	14.8	5.5
135.600	12.8	8.5	1.8	11.6	5.4
149.160	13.7	15.8	8.4	29.9	12.7
152.720	14.5	19.0	11.0	47.3	18.8
175.280	15.2	15.1	8.2	32.7	14.8
189.840	15.9	6.7	5.7	13.5	12.0
203.400	16.6	11.6	13.7	25.7	32.7
215.960	17.2	12.5	13.9	30.5	35.9
230.520	17.8	10.7	9.8	26.6	24.0
244.080	18.3	10.5	10.7	27.5	28.2
257.640	18.9	16.1	10.6	56.2	29.9
271.200	19.4	13.4	8.7	43.7	25.4
284.760	19.8	12.8	13.1	42.7	44.2
298.320	20.3	8.0	7.6	26.0	24.8
311.880	20.7	12.6	12.4	46.2	45.2
325.440	21.1	10.5	5.5	38.0	21.4
339.000	21.5	8.7	5.1	32.4	21.4
352.560	21.9	8.9	4.5	34.7	20.9
366.120	22.3	7.3	5.1	30.2	23.4
379.680	22.6	5.0	9.6	26.9	40.7
393.240	23.0	12.4	14.2	58.9	72.4

Frequency (MHz)	Antenna Factor (dB)	Meter Reading		Results	
		Horizontal (dB/ μ V)	Vertical (dB/ μ V)	Horizontal (μ V/m)	Vertical (μ V/m)
406.800	23.3	7.6	12.7	35.1	63.1
420.360	23.6	12.3	13.1	62.4	68.4
433.920	24.0	7.5	8.9	37.6	44.2
447.480	24.3	13.0	10.0	73.3	51.9
451.040	24.6	7.0	7.9	38.0	42.2
474.600	24.9	8.8	9.1	48.4	50.1
488.160	25.1	5.0	5.0	32.0	32.0
501.720	25.4	5.3	7.6	34.3	44.7
515.280	25.7	4.6	3.4	32.7	28.5
528.840	25.9	3.7	8.4	30.2	51.9
542.400	26.2	2.3	4.4	26.6	33.9
555.960	26.4	10.5	6.8	70.0	45.7
569.520	26.7	4.3	4.5	35.5	36.3
583.080	27.0	9.4	12.6	66.1	95.5
596.640	27.2	0.6	2.3	24.5	29.9
610.200	27.4	7.4	10.4	55.0	77.6
623.760	27.7	< 0.0	< 0.0	< 24.3	< 24.3
637.320	27.9	5.8	6.9	48.4	55.0
650.880	28.2	< 0.0	< 0.0	< 25.7	< 25.7
664.440	28.4	0.7	0.4	28.5	27.5
678.000	28.6	< 0.0	< 0.0	< 26.9	< 26.9
691.560	28.9	2.9	3.2	38.9	40.3
705.120	29.1	< 0.0	< 0.0	< 28.5	< 28.5
718.680	29.3	3.3	3.8	42.7	45.2
732.240	29.5	0.1	< 0.0	30.2	< 29.9
745.800	29.8	3.8	3.2	47.9	44.7
759.360	30.0	0.5	0.9	33.5	35.1
772.920	30.2	5.0	4.6	57.5	55.0
786.480	30.4	4.2	3.0	53.7	46.8
800.040	30.6	4.2	2.8	55.0	46.8
813.600	30.9	3.7	4.0	53.7	55.6
827.160	31.1	3.0	4.2	50.7	58.2
840.720	31.3	3.4	4.4	54.3	61.0
854.280	31.5	2.9	3.0	52.5	53.1
867.840	31.7	2.9	3.0	53.7	54.3
881.400	31.9	< 0.0	< 0.0	< 39.4	< 39.4
894.960	32.1	3.0	2.3	56.9	52.5
908.520	32.3	< 0.0	< 0.0	< 41.2	< 41.2
922.080	32.5	< 0.0	0.8	< 42.2	46.2
935.640	32.7	< 0.0	< 0.0	< 43.2	< 43.2
949.200	32.9	< 0.0	< 0.0	< 44.2	< 44.2
962.760	33.1	< 0.0	< 0.0	< 45.2	< 45.2
976.320	33.3	< 0.0	< 0.0	< 46.2	< 46.2
989.880	33.5	< 0.0	< 0.0	< 47.3	< 47.3

- 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.
4. Sample calculation :
at 40.680 MHz
$$10(Af+Mr)/20 = 10(1.7+21.0)/20 = 13.6 \mu\text{V/m}$$
Where,
Af = Antenna Factor including the cable loss.
Mr = Meter Reading
5. Measuring Instrument Setting:
Detector function : CISPR quasi-peak
IF Bandwidth : 120 kHz

Radiated Spurious Emissions

FCC ID : AK8SLVM91HF
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

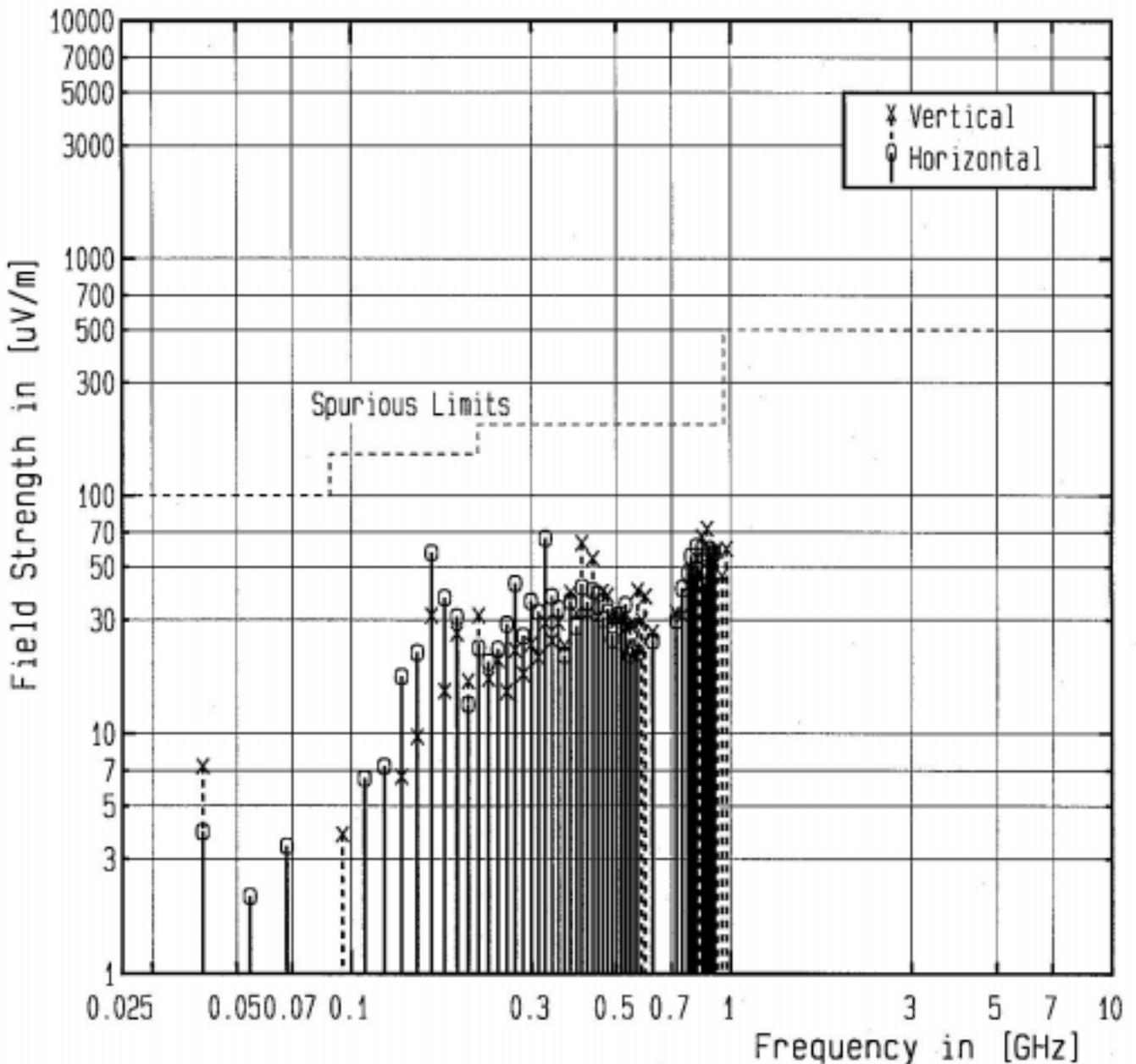
Frequency (MHz)	Antenna Factor (dB)	Meter Reading		Results	
		Horizontal (dB/ μ V)	Vertical (dB/ μ V)	Horizontal (μ V/m)	Vertical (μ V/m)
40.680	1.7	10.2	15.6	3.9	7.3
54.240	4.3	2.1	< 0.0	2.1	< 1.6
67.800	6.4	4.3	< 0.0	3.4	< 2.1
81.360	8.0	< 0.0	< 0.0	< 2.5	< 2.5
94.920	9.5	< 0.0	2.2	< 3.0	3.8
108.480	10.7	5.6	< 0.0	6.5	< 3.4
122.040	11.8	5.5	< 0.0	7.3	< 3.9
135.600	12.8	12.0	3.6	17.4	6.6
149.160	13.7	13.1	6.0	21.9	9.7
162.720	14.5	20.7	15.4	57.5	31.3
176.280	15.2	16.2	8.4	37.2	15.1
189.840	15.9	13.9	12.5	30.9	26.3
203.400	16.6	5.9	7.8	13.3	16.6
216.960	17.2	10.0	12.7	22.9	31.3
230.520	17.8	8.2	6.8	20.0	17.0
244.080	18.3	8.8	7.9	22.6	20.4
257.640	18.9	10.3	4.6	28.8	15.0
271.200	19.4	13.2	7.6	42.7	22.4
284.760	19.8	8.4	5.2	25.7	17.8
298.320	20.3	10.8	7.2	35.9	23.7
311.880	20.7	9.5	5.7	32.4	20.9
325.440	21.1	15.3	8.2	66.1	29.2
339.000	21.5	10.0	6.3	37.6	24.5
352.560	21.9	8.6	7.4	33.5	29.2
366.120	22.3	4.3	5.1	21.4	23.4
379.680	22.6	8.5	9.2	35.9	38.9
393.240	23.0	5.0	7.1	28.2	32.0
406.800	23.3	9.0	12.7	41.2	63.1
420.360	23.6	7.4	5.5	35.5	32.0
433.920	24.0	8.0	10.7	39.8	54.3
447.480	24.3	7.4	5.5	38.5	30.9
461.040	24.6	5.0	7.3	30.2	39.4
474.600	24.9	5.3	6.7	32.4	38.0
488.160	25.1	2.8	4.4	24.8	29.9
501.720	25.4	4.5	4.1	31.3	29.9
515.280	25.7	4.3	4.1	31.6	30.9
528.840	25.9	4.9	3.0	34.7	27.9
542.400	26.2	0.4	2.9	21.4	28.5
555.960	26.4	0.7	2.8	22.6	28.8
569.520	26.7	0.1	5.3	21.9	39.8

Frequency (MHz)	Antenna Factor (dB)	Meter Reading		Results	
		Horizontal (dB/ μ V)	Vertical (dB/ μ V)	Horizontal (μ V/m)	Vertical (μ V/m)
583.080	27.0	< 0.0	2.5	< 22.4	29.9
596.640	27.2	< 0.0	4.3	< 22.9	37.6
610.200	27.4	< 0.0	< 0.0	< 23.4	< 23.4
623.760	27.7	0.1	0.8	24.5	26.6
637.320	27.9	< 0.0	< 0.0	< 24.8	< 24.8
650.880	28.2	< 0.0	< 0.0	< 25.7	< 25.7
664.440	28.4	< 0.0	< 0.0	< 26.3	< 26.3
678.000	28.6	< 0.0	< 0.0	< 26.9	< 26.9
691.560	28.9	< 0.0	< 0.0	< 27.9	< 27.9
705.120	29.1	< 0.0	< 0.0	< 28.5	< 28.5
718.680	29.3	0.2	0.8	29.9	32.0
732.240	29.5	< 0.0	< 0.0	< 29.9	< 29.9
745.800	29.8	2.4	0.1	40.7	31.3
759.360	30.0	< 0.0	< 0.0	< 31.6	< 31.6
772.920	30.2	3.3	2.2	47.3	41.7
786.480	30.4	4.5	2.8	55.6	45.7
800.040	30.6	2.8	0.8	46.8	37.2
813.600	30.9	4.8	3.8	61.0	54.3
827.160	31.1	< 0.0	2.4	< 35.9	47.3
840.720	31.3	3.6	5.2	55.6	66.8
854.280	31.5	0.9	1.0	41.7	42.2
867.840	31.7	3.5	5.5	57.5	72.4
881.400	31.9	3.6	0.8	59.6	43.2
894.960	32.1	2.8	3.0	55.6	56.9
908.520	32.3	2.9	< 0.0	57.5	< 41.2
922.080	32.5	< 0.0	2.9	< 42.2	58.9
935.640	32.7	< 0.0	< 0.0	< 43.2	< 43.2
949.200	32.9	< 0.0	0.3	< 44.2	45.7
962.760	33.1	< 0.0	< 0.0	< 45.2	< 45.2
976.320	33.3	< 0.0	2.2	< 45.2	59.6
989.880	33.5	< 0.0	< 0.0	< 47.3	< 47.3

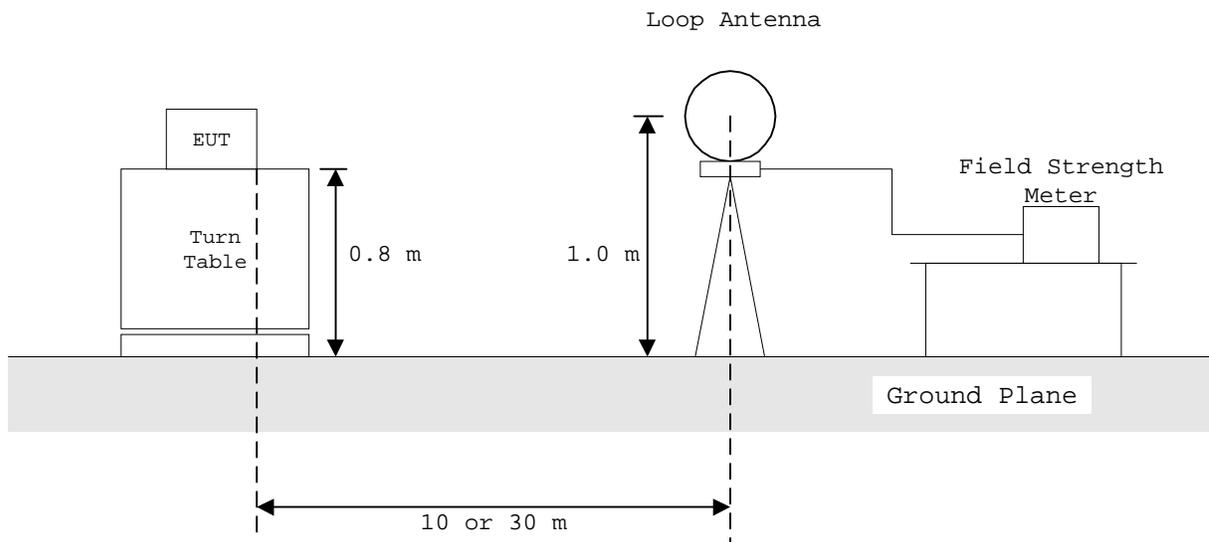
- Note: 1. The spectrum was checked from 30 MHz to 1000 MHz.
All emissions not listed were found to be more than 20 dB below the limits.
2. The symbol of "<" means "or less".
3. The cable loss was included in the antenna factor.
4. Sample calculation :
at 40.680 MHz
$$10(Af+Mr)/20 = 10(1.7+15.6)/20 = 7.3 \mu\text{V/m}$$
Where,
Af = Antenna Factor including the cable loss.
Mr = Meter Reading
5. Measuring Instrument Setting:
Detector function : CISPR quasi-peak
IF Bandwidth : 120 kHz

Radiated Spurious Emissions

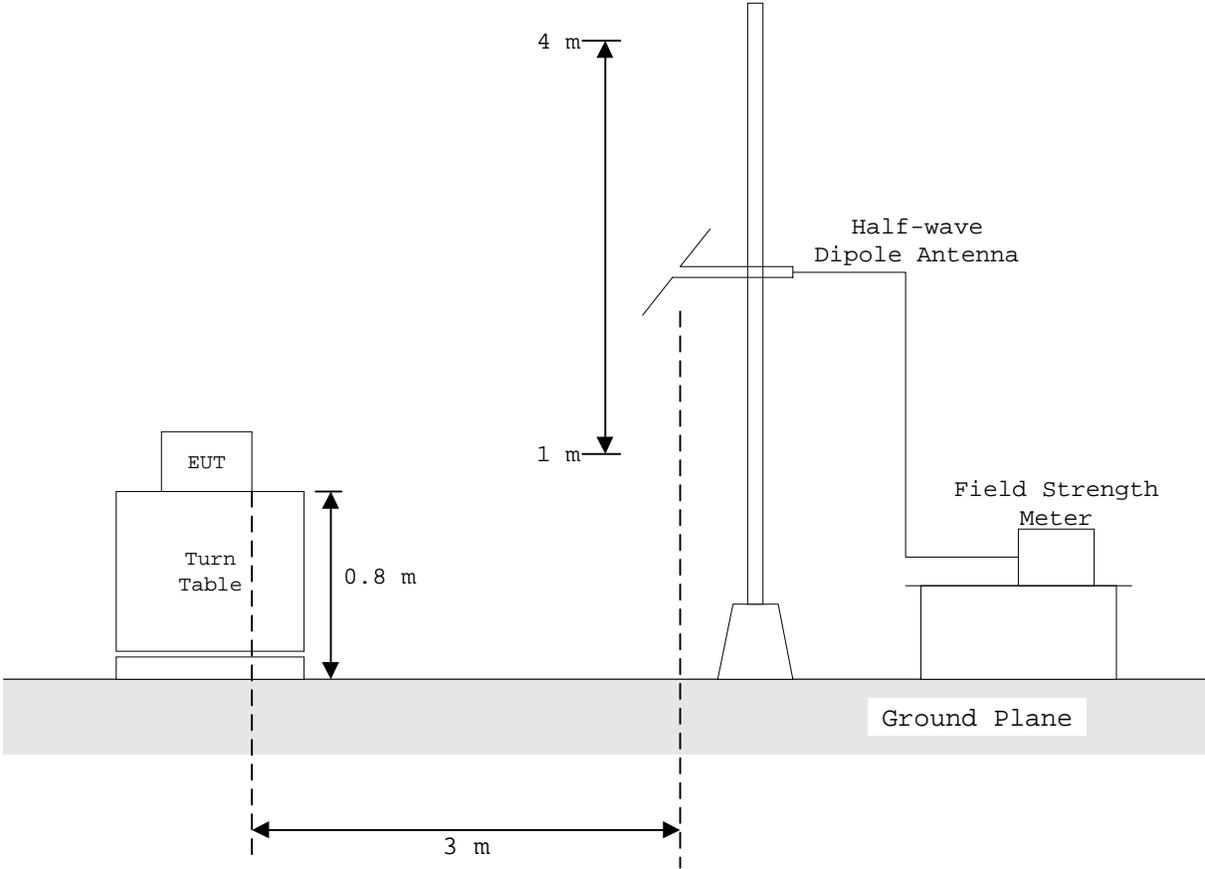
FCC ID : AK8SLVM91HF
Operating Frequency : 13.56 MHz
Test Condition : Internal Small Antenna



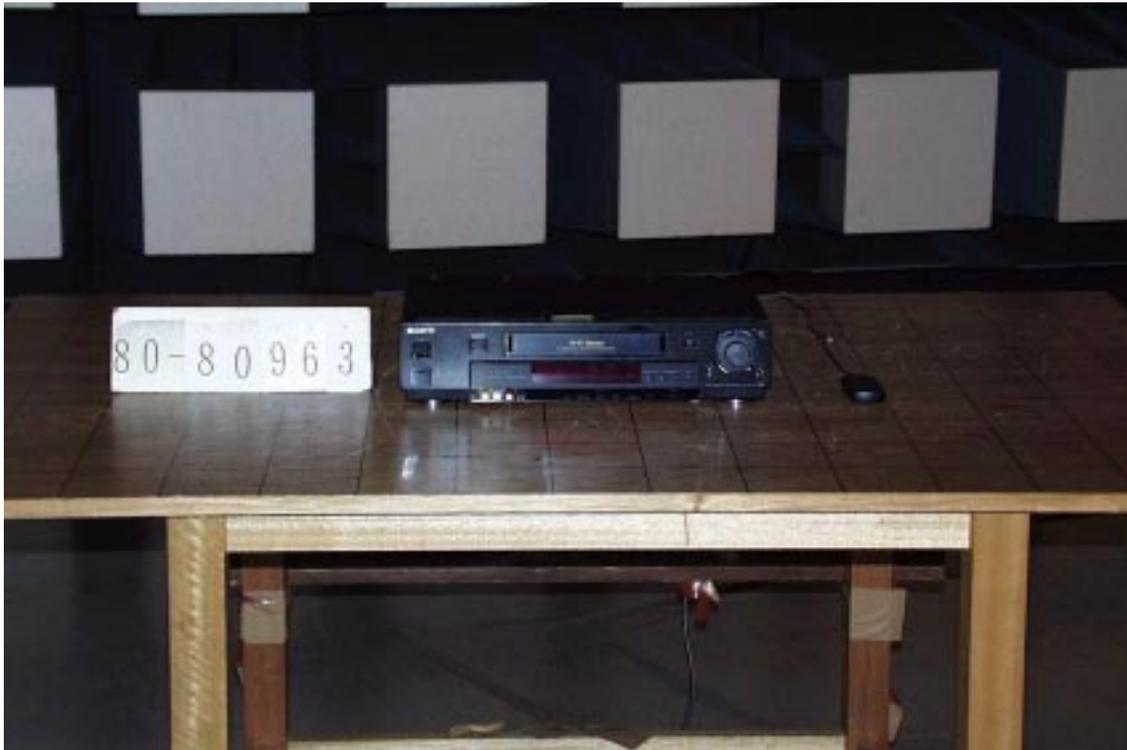
MEASUREMENT SET-UP FOR UP TO 30 MHz



MEASUREMENT SET-UP FOR RADIATED EMISSIONS



Configuration of EUT



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.

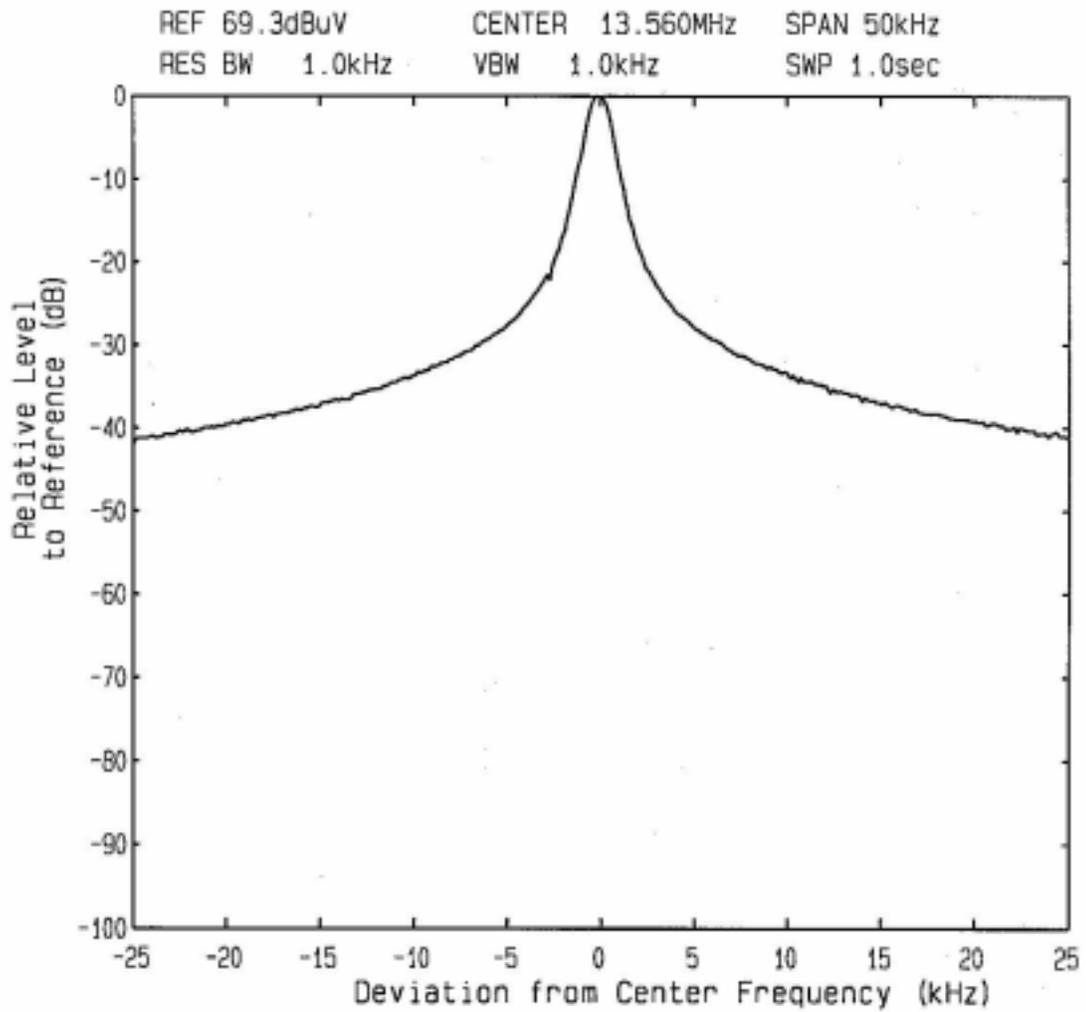
Emission Limitation

FCC ID : AK8SLVM91HF

Model : SLV-M91HF

Mode of EUT : Internal Large Antenna

Internal Modulation



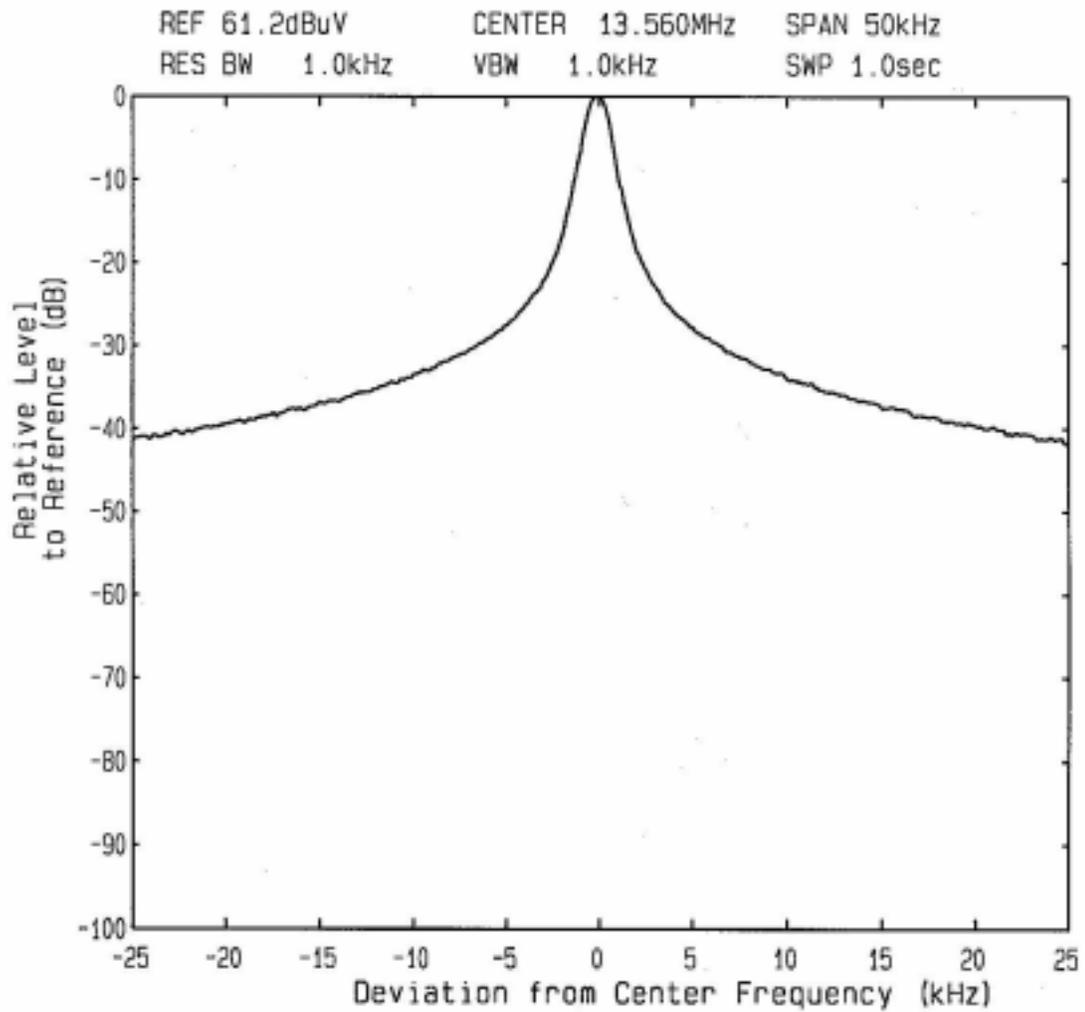
Emission Limitation

FCC ID : AK8SLVM91HF

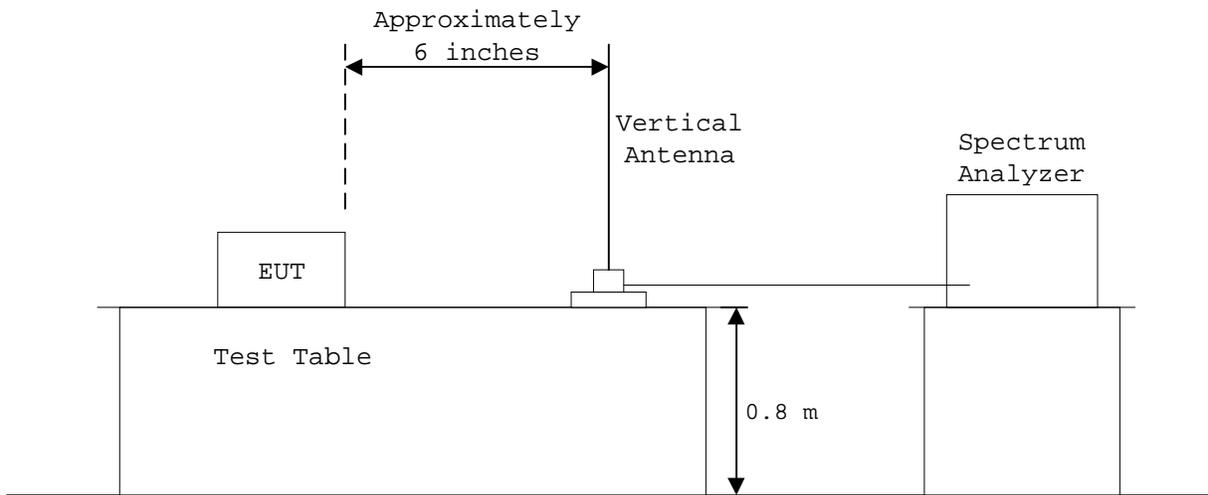
Model : SLV-M91HF

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/μV)	
		One end & Grounded	Other end & Grounded	One end & Grounded	Other end & Grounded
0.50	0.2	37.2	36.9	37.4	37.1
0.59	0.2	33.7	34.1	33.9	34.3
0.66	0.2	34.8	35.0	35.0	35.2
0.76	0.2	36.7	37.2	36.9	37.4
0.84	0.2	33.9	34.6	34.1	34.8
0.93	0.2	35.7	36.2	35.9	36.4
1.01	0.2	35.9	36.4	36.1	36.6
2.10	0.2	30.2	30.0	30.4	30.2
2.78	0.2	32.8	31.4	33.0	31.6
3.86	0.2	30.4	29.5	30.6	29.7
5.63	0.2	27.8	25.7	28.0	25.9
6.97	0.2	21.5	20.0	21.7	20.2
9.85	0.2	19.7	16.8	19.9	17.0
13.56	0.3	20.2	26.7	20.5	27.0
14.32	0.3	11.6	10.2	11.9	10.5
16.00	0.3	7.6	8.5	7.9	8.8
21.51	0.4	6.8	8.0	7.2	8.4
22.78	0.5	4.8	6.7	5.3	7.2
24.00	0.5	14.5	14.3	15.0	14.8
27.12	0.5	34.4	35.0	34.9	35.5

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

2. Sample calculation at 0.50 MHz:

$$\text{LISN Factor} + \text{Meter Reading} = 0.2 + 37.2 = 37.4 \text{ (dB/}\mu\text{V)}$$

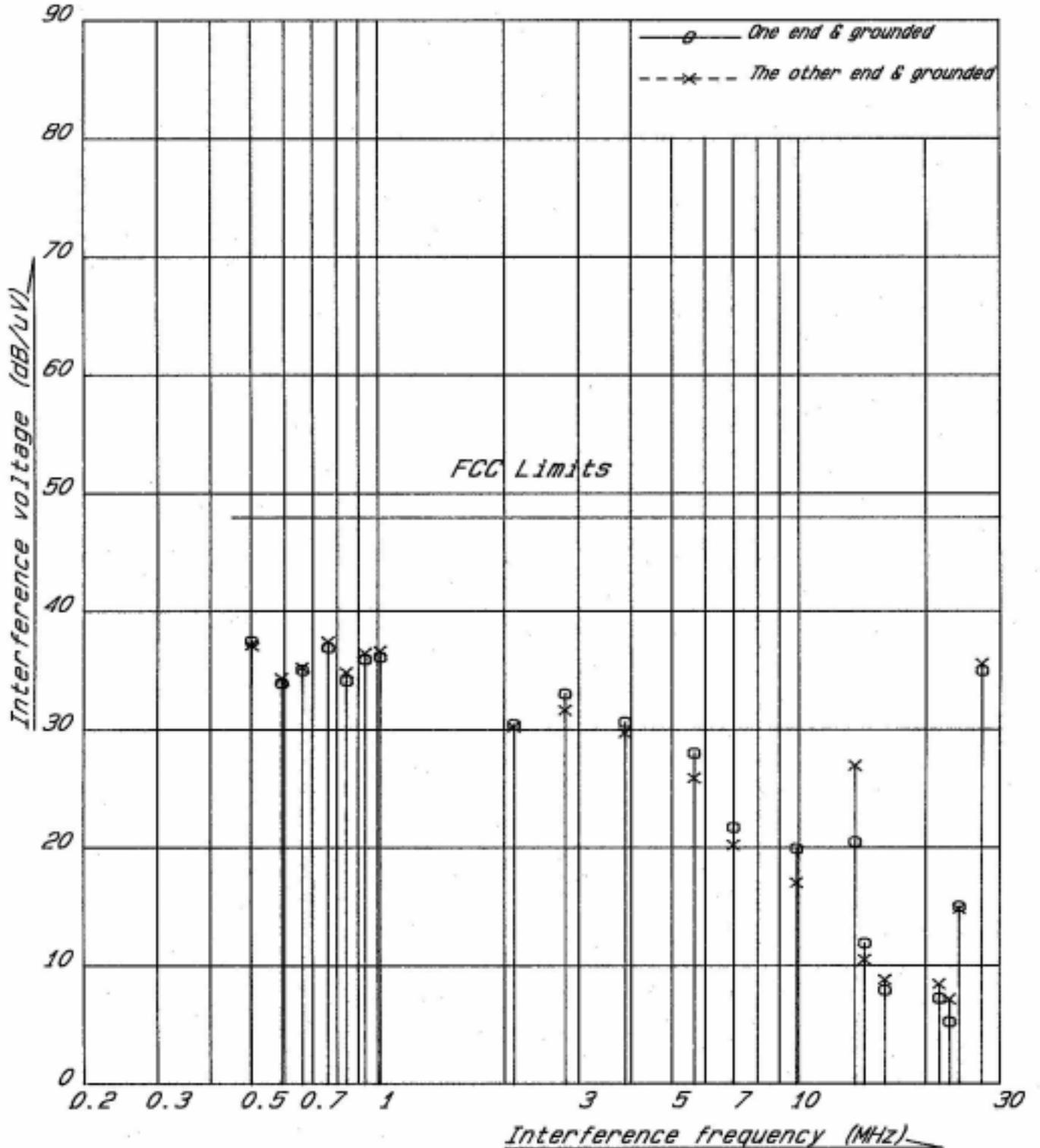
CONDUCTED RADIO NOISE MEASUREMENTS

MODEL NO.: SLV-M91HF

- Internal Large Antenna -

FCC ID : AK8SLVM91HF

Function of EUT : TX



- Internal Small Antenna -

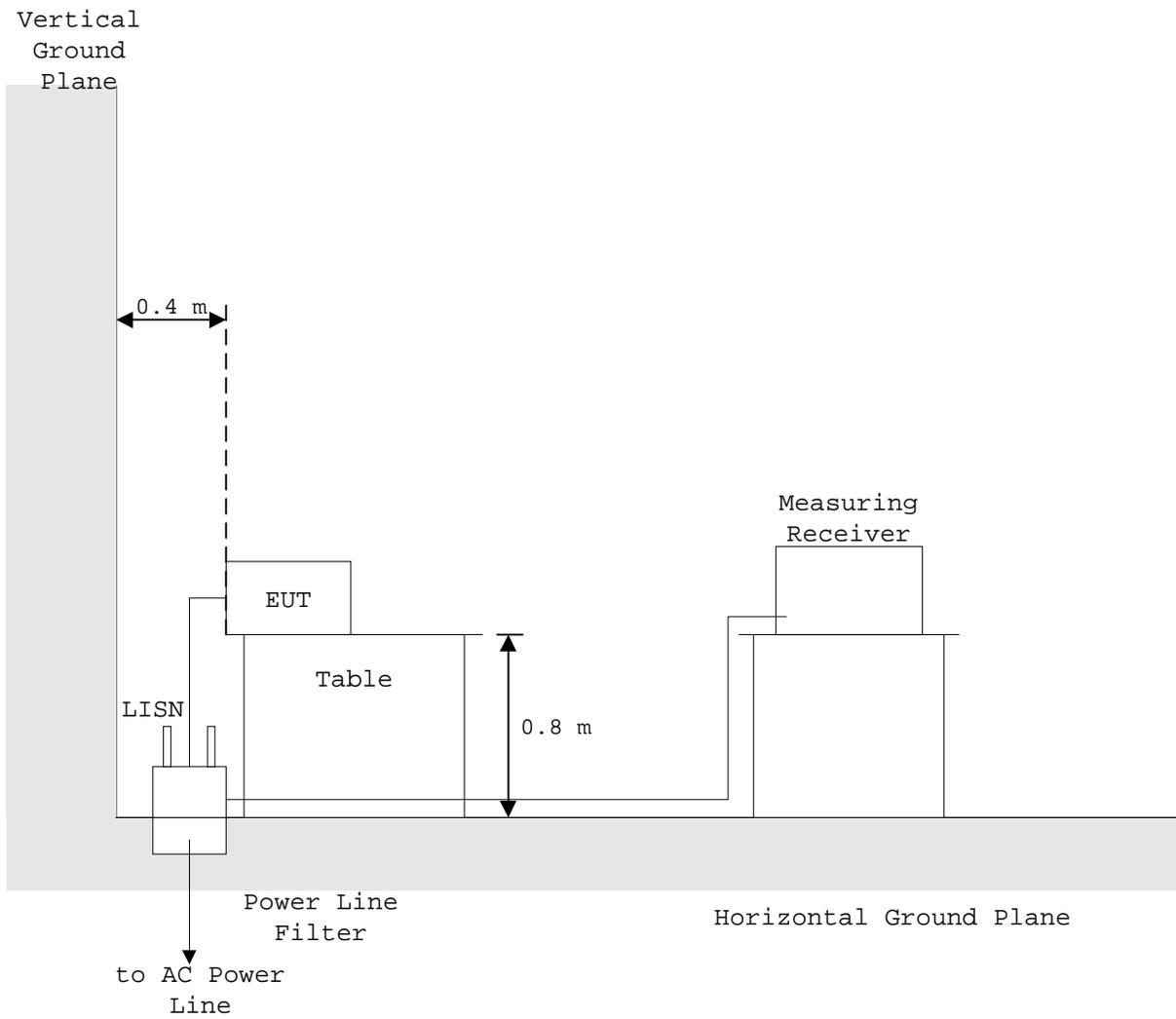
Frequency (MHz)	LISN Factor (dB)	Meter Reading(dB)		Results (dB/ μ V)	
		One end & Grounded	Other end & Grounded	One end & Grounded	Other end & Grounded
0.50	0.2	37.3	37.1	37.5	37.3
0.59	0.2	33.9	34.2	34.1	34.4
0.66	0.2	35.0	35.3	35.2	35.5
0.76	0.2	36.8	37.2	37.0	37.4
0.84	0.2	34.1	34.4	34.3	34.6
0.92	0.2	35.6	36.2	35.8	36.4
1.01	0.2	36.2	36.3	36.4	36.5
2.10	0.2	30.4	30.2	30.6	30.4
2.77	0.2	32.2	32.3	32.4	32.5
3.86	0.2	31.3	29.6	31.5	29.8
5.63	0.2	28.0	26.0	28.2	26.2
6.97	0.2	21.7	20.5	21.9	20.7
9.85	0.2	19.2	16.9	19.4	17.1
13.56	0.3	35.5	35.9	35.8	36.2
14.32	0.3	11.2	10.0	11.5	10.3
16.00	0.3	7.8	8.5	8.1	8.8
21.51	0.4	7.0	8.5	7.4	8.9
22.78	0.5	5.0	7.3	5.5	7.8
24.00	0.5	14.3	14.2	14.8	14.7
27.12	0.5	7.0	7.3	7.5	7.8

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

2. Sample calculation at 0.50 MHz:

$$\text{LISN Factor} + \text{Meter Reading} = 0.2 + 37.3 = 37.5 \text{ (dB}/\mu\text{V)}$$

MEASUREMENT SET-UP FOR LINE CONDUCTED RF VOLTAGE



Configuration of EUT



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°C to +50°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°C.

Measurement Results :

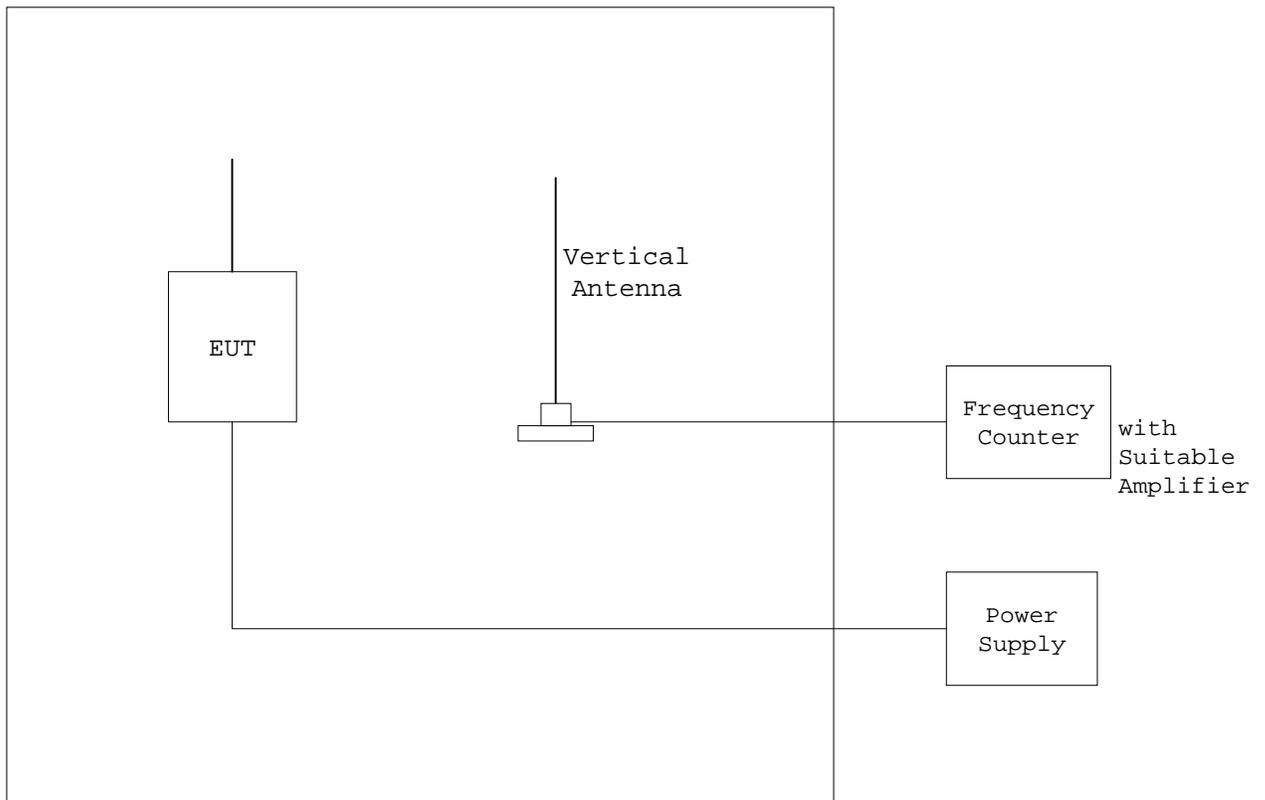
OPERATING FREQUENCY : 13.56 MHz

Ambient Temperature (°C)	Frequency tolerance with time elapse(%)			
	0 minute	2 minutes	5 minutes	10 minutes
-20	-0.000146	-0.00136	-0.00116	+0.00105
+50	+0.000057	+0.00057	+0.00052	+0.00045

Primary Supply Voltage (V)	Frequency tolerance with time elapse(%)			
	0 minute	2 minutes	5 minutes	10 minutes
at 20°C 102 (85%)	+0.00062	+0.00061	+0.00061	+0.00061
120 (100%)	+0.00063	+0.00063	+0.00062	+0.00061
138 (115%)	+0.00062	+0.00062	+0.00061	+0.00061

Specified Limit ±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 1998
ESH3	Rohde & Schwarz	May 1998
2. Spectrum Analyzer		
8566B	Hewlett Packard	April 1998
3. Tuned Dipole Antenna		
KBA-511	Kyoritsu Electrical Works	November 1998
KBA-611	Kyoritsu Electrical Works	November 1998
4. Vertical Antenna		
91972-2	Stoddard Aircraft Radio Co., Ltd.	-
5. LISN		
KNW-407	Kyoritsu	March 1998
6. Frequency Counter		
53131A	Hewlett Packard	June 1998
7. Oven		
-	Ohnishi Co., Ltd.	July 1998
8. Loop Antenna		
HFH2-Z2	Rohde & Schwarz	November 1998