

Designated by Ministry of International Trade and Industry

KANSAI ELECTRONIC INDUSTRY DEVELOPMENT CENTER

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*Corporate Juridical Person***ENGINEERING TEST REPORT****REPORT NO. A-012-99-C**

Issued Date : January 28, 1999

This test report is to certify that the tested device properly complies with the requirements of:

FCC Rules and Regulations Part 15 Subpart C Intentional Radiators.

The tests necessary to show compliance to the requirements were performed and these results met the specifications of requirement. The results of this report should not be construed to imply compliance of equipment other than that which was tested. Unless the laboratory permission, this report should not be copied in part.

1. Applicant

Company Name : SANWA ELECTRONIC INSTRUMENT CO., LTD.

Mailing Address : 1-2-50, YOSHIDA HONMACHI, HIGASHI-OSAKA, 578-0982 Japan

2. Identification of Tested Device

FCC ID : L73RM-Y802

Device Name : REMOTE CONTROL TRANSMITTER

Trade Name : SONY

Model Number : RM-Y802

Serial Number : 990001 : Prototype Pre-production Production

Date of Manufacture : March, 1999

3. Test Items and Procedure

- AC Power Line Conducted Emission Measurement
 Radiated Emission Measurement
 Emission Bandwidth Measurement

Above all tests were performed under : ANSI C63.4-1992

4. Date

Receipt of Test Sample : April 20, 1999

Test Completed on : April 22, 1998

CERTIFIED BY :

Fumitoshi Nagaoka

Associate Director of Ikoma Testing Laboratory

ENGINEERING TEST REPORTTable of Contents

1. GENERAL INFORMATION	
1.1 Product Description	3
1.2 Description for Equipment Authorization	3
1.3 Test Facility	3
2. TESTED SYSTEM	
2.1 Test Mode	4
3. RADIATED EMISSION MEASUREMENT	
3.1 Reference Rule and Specification	5
3.2 Test Procedure	5
3.3 Photographs of EUT System Configuration	6
3.4 Test Results	7
4. EMISSION BANDWIDTH MEASUREMENT	
4.1 Reference Rule and Specification	11
4.2 Test Configuration	11
4.3 Test Results	11
5. LIST OF TEST EQUIPMENTS	13

ENGINEERING TEST REPORT

1. GENERAL INFORMATION

1.1 Product Description

The SONY Model No.RM-Y802 (referred to as the EUT in this report) is a Radio Remote control transmitter for remote control of the audio/visual equipments.

1) Technical Specifications

- Operating frequency range : 315.625 to 316.425 MHz (316.025 MHz in EUT)
- Type of antenna : Internal monopole antenna(impedance 50Ω, unbalanced)
- Type of Emission : F1D (FSK)

2) Contained Oscillators

- CPU clock : 4 MHz

3) Rated Power Supply : DC 3.0V ("AA" size Alkaline-Manganese dry cell battery ×2)

1.2 Description for Equipment Authorization

1) Rules Part(s) under which Equipment operated

FCC Rule Part 15, Subpart C ; Intentional Radiators,
§ 15.231 Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.

2) Kind of Equipment Authorization

- Certification Verification

3) Procedure of Application

- Original Equipment Modification

4) Highest Frequency used in the Device : 316.025 MHz

- Upper Frequency of Radiated measurement Range is
- | | |
|-------------------------------------|--|
| <input type="checkbox"/> | 1000 MHz. |
| <input type="checkbox"/> | 2000 MHz. |
| <input type="checkbox"/> | 5000 MHz. |
| <input checked="" type="checkbox"/> | Tenth harmonics of the highest fundamental frequency |

1.3 Test Facility

All tests described in this report were performed by:

N a m e : KANSAI ELECTRONIC INDUSTRY DEVELOPMENT CENTER (KEC)

IKOMA TESTING LABORATORY

Open Area Test Site No.1 No.2 No.3 No.4

Shielded Room No.2 No.4

Address : 12128, Takayama-cho Ikoma-city, Nara, 630-0101 Japan

These test facilities have been filed with the FCC under the criteria of ANSI C63.4-1992. Also the laboratory has been authorized by ITI(Interference Technology International,UK),TUV Product Service(GER) and TUV Rheinland(GER) based on their criteria for testing laboratory (EN45001).

ENGINEERING TEST REPORT**2. TESTED SYSTEM****2.1 Test Mode**

Continuously transmitted mode.

[Note]

The EUT was operated continuously in measurement. In addition the measurement of radiated emission, placed horizontally or vertically on the test table. The data of operation modes that produce the maximum emission were reported at each frequency.

ENGINEERING TEST REPORT

3. RADIATED EMISSION MEASUREMENT

3.1 Reference Rule and Specification

FCC Rule Part 15, Section 15.209 and Section 15.231(b)

3.2 Test Procedure

- 1) Configure the EUT System in accordance with ANSI C63.4-1992 section 8.
See also the block diagram and the photographs of EUT System configuration in this report.
- 2) If the EUT system is connected to a public power network, all power cords for the EUT System are connected the receptacle on the turn floor.
- 3) Warm up the EUT System.
- 4) Activate the EUT System and run the prepared software for the test, if require.
- 5) To find out the emissions of the EUT System, preliminary radiated measurement are performed at a closer distance than that specified for final radiated measurement using the spectrum analyzer(*1) and the broad band antenna. In the frequency above 1 GHz, it is performed using the spectrum analyzer(*2) and the horn antenna.
- 6) To find out an EUT System condition produces the maximum emission, the configuration of EUT System, the position of the cables, and the operation mode were changed under normal usage of the EUT.
- 7) The spectrum are scanned from 30 MHz to the upper frequency of measurement range, and collect the minimum six highest emissions on the spectrum analyzer relative to the total limits.
- 8) In final compliance test, the minimum six highest emissions recorded above are measured at the specified distance using the broad band antenna or the tuned dipole antenna and the test receiver(*3).
In the frequency above 1 GHz, the measurements are performed by the horn antenna and the test receiver(*4).
 the spectrum analyzer(*2) with pre-amplifier.

[Note]

- (*1) : Spectrum Analyzer Set Up Conditions
 Frequency range : 30 - 1000 MHz
 Resolution bandwidth : 100 kHz
 Detector function : Peak mode
- (*2) : Spectrum Analyzer Set Up Conditions
 Frequency range : 1 GHz - Upper frequency of measurement range
 Resolution bandwidth : 1 MHz
 Video bandwidth : 1 MHz
 Attenuator : 10 dB
 Detector function : Peak mode
- (*3) : Test Receiver Set Up Conditions
 Detector function : Peak/Quasi-Peak/Average detector
 IF bandwidth : 120 kHz
- (*4) : Test Receiver Set Up Conditions
 Detector function : Average
 IF bandwidth : 1 MHz

ENGINEERING TEST REPORT

3.4 Test Results

In the frequency 30 MHz to 1000 MHz

[Measurement Distance: 3m]

Emission Frequency [MHz]	Antenna Factor [dB/m]	Meter Reading [dB μ V]		Maximum Field Strength [dB μ V/m]	Limits [dB μ V/m]	
		Horizontal Polarization	Vertical Polarization		Peak Detector	Average Detector
<u>Fundamental</u> Peak Detector Measurement						
316.025	17.9	36.5	33.1	54.4	95.7	75.7
<u>Harmonics</u> Peak Detector Measurement						
632.050	25.0	15.4	10.9	40.4	75.7	55.7
948.075	28.9	12.7	10.7	41.6	75.7	55.7

In the frequency above 1 GHz

[Measurement Distance: 3m]

Measurement Frequency [MHz]	Antenna Factor [dB/m]	Amp Gain [dB]	Meter Reading [dB μ V]		Maximum Field Strength [dB μ V/m]	Limits [dB μ V/m]	
			Horizontal Polarization	Vertical Polarization		Peak Detector	Average Detector
<u>Harmonics</u> Peak Detector Measurement							
1264.100	23.7	36.9	48.8	47.2	35.6	75.7	55.7
1580.125	22.4	36.4	62.7	56.8	48.7	74.0	54.0
1896.150	23.9	35.9	55.0	51.7	43.0	75.7	55.7
2212.175	24.3	35.5	57.6	58.0	46.8	74.0	54.0
2528.200	24.4	35.3	53.4	53.2	42.5	75.7	55.7
2844.225	25.9	35.1	48.6	49.5	40.3	74.0	54.0
3160.025	26.1	34.9	46.2	<45.0	37.4	75.7	55.7

ENGINEERING TEST REPORT

- Continued -

In the frequency range : 30 MHz to 1000 MHz (Restricted Bands)

[Measurement Distance: 3m]

Emission Frequency [MHz]	Antenna Factor [dB/m]	Meter Reading [dB μ V]		Maximum Field Strength [dB μ V/m]	Limits [dB μ V/m]
		Horizaontal	Vertical		
(1)Quasi-Peak Detector Measurement					
37.50	16.0	<-2.0	<-1.0	<15.0	40.0
38.25	15.7	<-2.0	<-1.0	<14.7	40.0
73.00	8.1	<3.0	<1.0	<11.1	40.0
74.60	8.1	<1.0	<2.0	<10.1	40.0
74.80	8.1	<1.0	<2.0	<10.1	40.0
75.20	8.1	<0.0	<0.0	<8.1	40.0
108.00	13.1	<0.0	<0.0	<13.1	43.5
121.94	14.9	<-1.0	<0.0	<14.9	43.5
123.00	14.9	<-1.0	<0.0	<14.9	43.5
138.00	16.3	<-1.0	<0.0	<16.3	43.5
149.90	17.1	<-2.0	<0.0	<17.1	43.5
150.05	17.1	<-2.0	<0.0	<17.1	43.5
156.52475	17.2	<-2.0	<-2.0	<15.2	43.5
156.52525	17.2	<-2.0	<-2.0	<15.2	43.5
156.70	17.2	<-2.0	<-2.0	<15.2	43.5
156.90	17.2	<-2.0	<-2.0	<15.2	43.5
162.01	17.4	< 5.0	<2.0	<22.4	43.5
167.17	17.7	<-1.0	<0.0	<17.7	43.5
167.72	17.7	<-2.0	<-1.0	<16.7	43.5
173.20	18.0	<10.0	<10.0	<28.0	43.5
240.00	20.0	<-1.0	<0.0	<20.0	46.0
285.00	22.4	<5.0	<5.0	<27.4	46.0
322.00	18.0	<0.0	<0.0	<18.0	46.0
335.40	18.4	<0.0	<0.0	<18.4	46.0
399.90	20.0	<0.0	<0.0	<20.0	46.0
410.00	20.3	<0.0	<0.0	<20.3	46.0
608.00	24.7	<0.0	<0.0	<24.7	46.0
614.00	24.8	<0.0	<0.0	<24.8	46.0
960.00	28.8	<0.0	<0.0	<28.8	46.0
1000.00	28.6	<0.0	<0.0	<28.6	54.0

ENGINEERING TEST REPORT

- Continued -

In the frequency range : above 1 GHz (Restricted Bands)

[Measurement Distance: 3m]

Measurement Frequency [MHz]	Antenna Factor [dB/m]	Amp Gain [dB]	Meter Reading [dB μ V]		Maximum Field Strength [dB μ V/m]	Limits [dB μ V/m]	
			Horizontal Polarization	Vertical Polarization		Peak Detector	Average Detector
Peak Detector Measurement							
1000.00	25.8	37.2	<45.0	<45.0	<33.6	-	54.0
1264.100	23.7	36.9	48.8	47.2	35.6	74.0	54.0
1240.00	24.0	36.9	<45.0	<45.0	<32.1	-	54.0
1300.00	23.3	36.8	<45.0	<45.0	<31.5	-	54.0
1427.00	22.7	36.6	<45.0	<45.0	<31.1	-	54.0
1435.00	22.7	36.6	<45.0	<45.0	<31.1	-	54.0
1580.125	22.4	36.4	62.7	56.8	48.7	74.0	54.0
1626.50	22.3	36.3	<45.0	<45.0	<31.0	-	54.0
1645.50	22.4	36.3	<45.0	<45.0	<31.1	-	54.0
1646.50	22.4	36.3	<45.0	<45.0	<31.1	-	54.0
1660.00	22.4	36.2	<45.0	<45.0	<31.2	-	54.0
1710.00	22.8	36.2	<45.0	<45.0	<31.6	-	54.0
1718.80	23.0	36.1	<45.0	<45.0	<31.9	-	54.0
1722.20	23.1	36.1	<45.0	<45.0	<32.0	-	54.0
2200.00	24.3	35.5	<45.0	<45.0	<33.8	-	54.0
2212.175	24.3	35.5	57.6	58.0	46.8	74.0	54.0
2300.00	24.1	35.4	<45.0	<45.0	<33.7	-	54.0
2310.00	24.1	35.4	<45.0	<45.0	<33.7	-	54.0
2390.00	24.0	35.4	<45.0	<45.0	<33.6	-	54.0
2483.50	24.3	35.3	<45.0	<45.0	<34.0	-	54.0
2500.00	24.3	35.3	<45.0	<45.0	<34.0	-	54.0
2655.00	25.0	35.2	<45.0	<45.0	<34.8	-	54.0
2844.225	25.9	35.1	48.6	49.5	40.3	74.0	54.0
2900.00	25.7	35.1	<45.0	<45.0	<35.6	-	54.0
3260.00	26.4	34.7	<43.0	<43.0	<34.7	-	54.0
3267.00	26.5	34.7	<43.0	<43.0	<34.8	-	54.0

ENGINEERING TEST REPORT

- Continued -

[Note]

- 1) The cable loss is included in the antenna factor .
- 2) As measured with peak detector comply with average limit specified by the appropriate regulations, therefore average detector measurement were omitted.
- 3) All emission not reported were less than 10dB μ V at meter reading.

[Environment]

Temperature : 24°C Humidity : 51%

[Sample Calculation]

1) Below 1GHz

Frequency	:	316.025	[MHz]	(Fundamental)
Meter Reading	:	36.5	[dB μ V]	(at Horizontal Polarization)
Antenna Factor	:	17.9	[dB/m]	

Then, Field Strength is calculated as follows.

$$\text{Field Strength} = 36.5 + 17.9 = 54.4 \text{ [dB } \mu\text{V/m]}$$

2) Above 1GHz

Frequency	:	1264.100	[MHz]	(4th harmonics)
Meter Reading	:	48.8	[dB μ V]	(at horizontal polarization)
Antenna Factor	:	23.7	[dB/m]	
Amp Gain	:	36.9	[dB]	

Then, Field Strength is calculated as follows.

$$\text{Field Strength} = 48.8 + 23.7 - 36.9 = 35.6 \text{ [dB } \mu\text{V/m]}$$

[Calculation of Limit (Average detector)]

Fundamental

$$L = 20 \log \left(\frac{1}{3} \times (125 \times F - 21250) \right)$$

$$L = 75.7 \text{ [dB } \mu\text{V/m]}$$

where, L: Limit [dB μ V/m]
 F: Frequency [MHz]
 At F = 316.025 [MHz]

Spurious Emission

$$L = 75.7 - 20 = 55.7 \text{ [dB } \mu\text{V/m]}$$

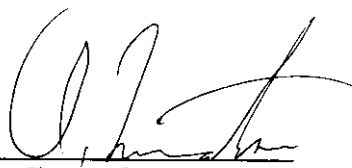
Limits of peak detector are up to 20 dB from the fundamental and spurious emissions average limits.

[Summary of Test Results]

Minimum margin was 25.3 dB at 1580.125 MHz (5th harmonics, Peak detector) at horizontal polarization.

Tested Date : April 22, 1999

Signature


 Ikuya Minematsu

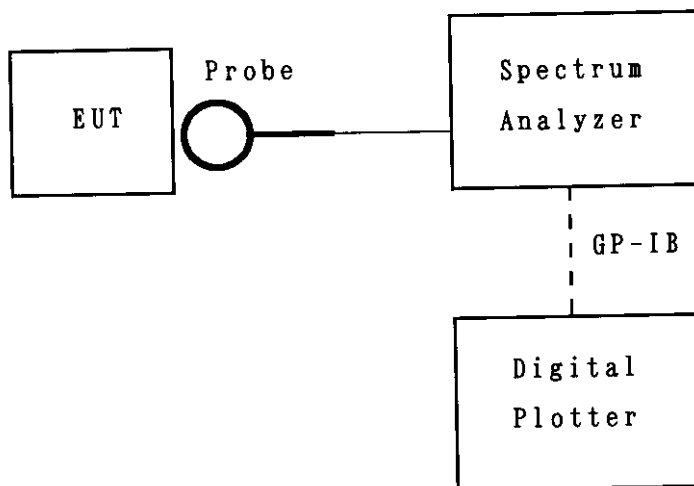
ENGINEERING TEST REPORT

4. EMISSION BANDWIDTH MEASUREMENT

4.1 Reference Rule and Specification

FCC Rule Part 15, Section 15.231(c).

4.2 Test Configuration



4.3 Test Results

Measured emission bandwidth = 466 kHz

See next Figure 1(the picture of spectrum analyzer)

[Note]

Emission Bandwidth was determined at the points 20dB down from the modulated carrier.

Spectrum Analyzer Setting:

Center Frequency	=	316.025 MHz
Frequency Span	=	200 kHz/div.
Resolution Bandwidth	=	100 kHz
Video Bandwidth	=	1 MHz
Sweep Time	=	20 msec
Trace Mode	:	MAX. HOLD

[Environment]

Temperature : 25°C Humidity : 65%

[Calculation of Limit]


Limit of Emission bandwidth = 316.025 MHz × 0.25% = 790.1 kHz

[Summary of Test Results]

Minimum margin of emission bandwidth was 324.1 kHz.

Tested Date : April 22, 1999

Signature


Ikuya Minematsu

ENGINEERING TEST REPORT

- Continued -

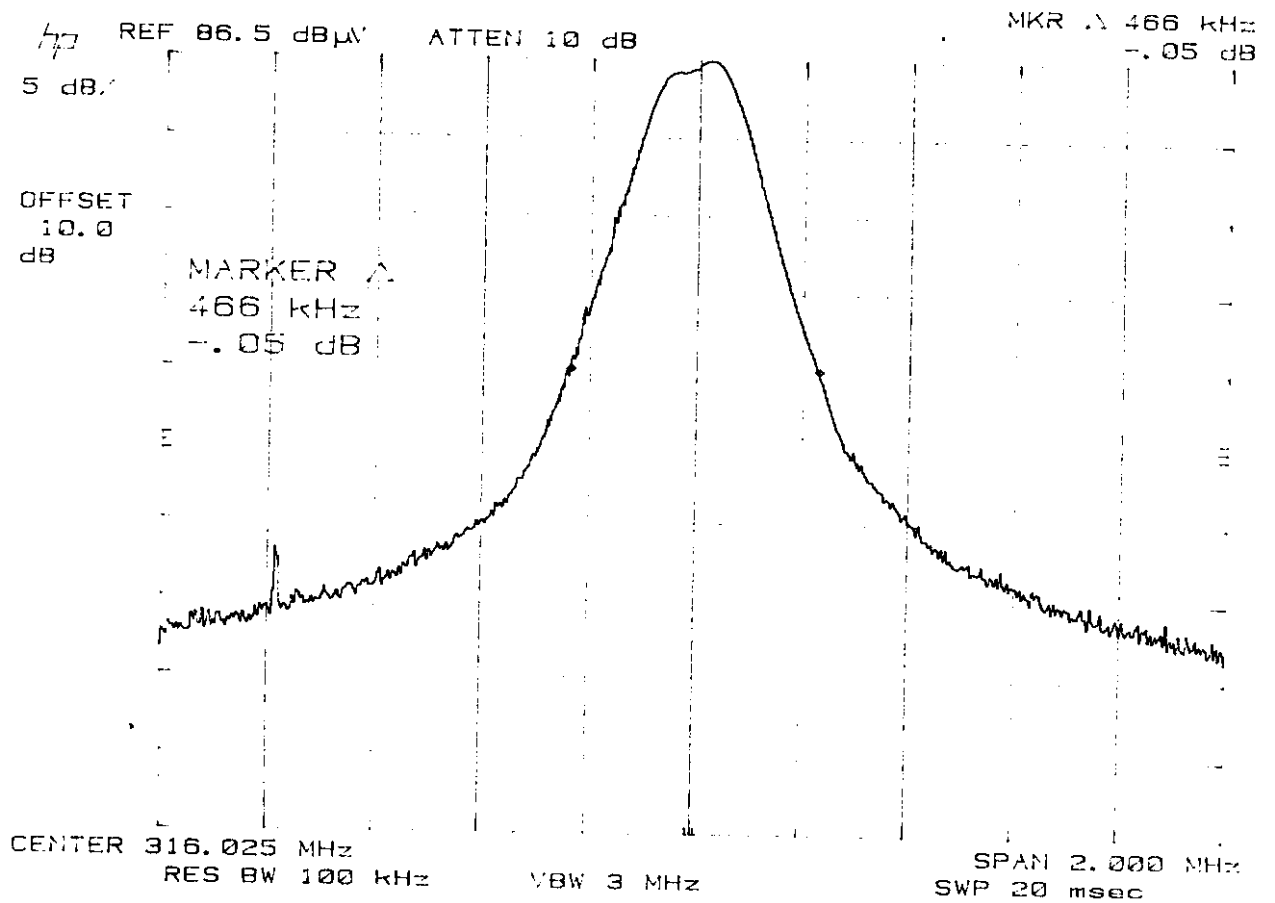


Figure 1

ENGINEERING TEST REPORT

5. LIST OF TEST EQUIPMENT

Equipment	Manufacturer	Model No	Specifications	KEC Control No.	Test Item (*)	Last Cal.	Next Cal.
Test Receiver	Rohde & Schwarz	ESVD	Frequency Range 20 MHz - 2.05 GHz	FS-79	N/A	1999/2	2000/2
		ESVP	Frequency Range 20 MHz - 1300 MHz	FS-48-3	1	1998/5	1999/5
Spectrum Analyzer	Hewlett Packard	8564E	Frequency Range 30 Hz - 40 GHz	SA-39	1	1998/12	1999/12
		8568B	Frequency Range 100 Hz - 1.5 GHz	FS-46-3	2	1998/6	1999/6
Biconical Antenna	Schwarzbeck	BBA9106	Frequency Range 30 MHz - 300 MHz	AN-80	1	1999/2	2000/2
Log-Periodic Antenna	Schwarzbeck	UHALP 9180A	Frequency Range 300 MHz - 1 GHz	AN-215	1	1999/2	2000/2
Tuned Dipole Antenna	Kyoritsu	KBA-511AS	Frequency Range 25 MHz - 500 MHz	AN-135	N/A	1999/2	2000/2
	Kyoritsu	KBA-611S	Frequency Range 500 MHz - 1 GHz	AN-137	N/A	1999/2	2000/2
Pre-Amplifier	Hewlett Packard	8449B	Frequency Range 1 GHz - 26.5 GHz	AM-52	1	1998/4	1999/4
Horn Antenna	Raven	91888-2	Frequency Range 1 GHz - 2 GHz	AN-167	1	1997/11	1999/11
		91889-2	Frequency Range 2 GHz - 5 GHz	AN-168	1	1997/11	1999/11
Digital Plotter	Hewlett Packard	7440A	Plot Area A4 size	FS-51-7	2	-	-

[Note]

Test Item(*) : 1. Radiated Emission Measurement
2. Emission Bandwidth Measurement
N/A. Not Applicable