

REPORT OF MEASUREMENT

Date: April 13, 1998

Issued in: Osaka, Japan

JQA APPLICATION NO. : KL8070686

- | | |
|-----------------------------|---|
| 1. Applicant | : Sharp Corporation, Reliability Control Group
22-22 Nagaike-cho, Abeno-ku, Osaka 545, Japan |
| 2. Manufacturer | : Sharp Appliances (Thailand) Ltd.
64 Moo5, Tambol Bangsamuk Amphur Bangpakong,
Chachoengsao Province, Thailand |
| 3. Name of Product | : Microwave Oven |
| 4. Model No. | : R-820BK |
| 5. FCC ID | : APYDMR0117 |
| 6. Applied Regulations | : FCC Rules and Regulations Part 18
(September 27, 1985) |
| 7. Measurement Procedure | : MP-5 (1985) |
| 8. Begin and End of Testing | : March 4, 1998/March 27, 1998 |
| 9. Measuring Site | : JQA Kita-Kansai 1'st Open Test Site
7-7, Ishimaru 1-Chome, Minoh-Shi, Osaka 562-0027 Japan |

I HEREBY CERTIFY THAT: The data shown in this report were made in accordance with the procedures given in MP-5 (1985) and test results are according to the regulations for the test items indicated at page 6 and page 7.

T. Yamanaka

Manager of EMC Div.

JQA KITA-KANSAI Testing Center

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This test report consists of 13 pages including the cover. The test result only responds to the tested sample. It is not allowed to copy this report even partly without the allowance of the test laboratory.

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Test Methodology

Regarding a method of making average measurements in accordance with MP-5, it is made measurement using a receiver to make average measurements of the I.F. output of a spectrum analyzer which is tuned to the R.F. signal.
The alternative method has been submitted to FCC office (950523A).

Test Facility

The Kita-Kansai test sites used to make radiated and conducted measurement were established and submitted to FCC office (31040/SIT).

Description of Product (as Consumer ISM equipment)

- 1) Name : Microwave Oven
- 2) Model No. : R-820BK
- 3) Production Style : Prototype
- 4) Power Rating : AC 120V 60Hz
- 5) Frequency Generated: 4 MHz clock
- 6) Two magnetrons which are applied to the product:

Cat. No. 2M240H(L2): manufactured by Toshiba
Cat. No. 2M167B : manufactured by Matsushita

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Test Items

1. Frequency Measurements

Operating ISM Frequency: 2450 MHz $\pm$ 50 MHz

Testing Load Condition : 1000 ml of water in the beaker located in the center of the removable turntable.

- a) The variation of frequency with time, using the load mentioned above, starting with the EUT and load at room temperature and continuing until the load quantity has been reduced by evaporation to approximately 20 % of the original quantity in nominal rated supply voltage.
- b) The variation of frequency for line voltage variation from 80 % to 125 % of nominal rated voltage (AC 120V), starting with the EUT warm from 10 minutes use, with the load mentioned above, and with the load at room temperature at the beginning of the test.

2. Power Output Measurement

Testing Load Condition : 1000 ml of water in the beaker located in the center of the removable turntable.

- a) The measurement is made by the calorimetric method, using the load mentioned above, computing the power output from the observed temperature rise of the load over a period of time and also.
- b) The AC power input measurement is made at a time.

3. Conducted Emissions Measurement (0.01 MHz - 30 MHz)

Not Applicable

4. Radiated Emissions Measurement (1 MHz - 30 MHz)

Testing Load Condition : 700 ml of water, with the beaker located in the center of the removable turntable.

- a) Preliminary magnetic field measurements are made at 3 m distance in order to find frequencies of significant emissions from the EUT using shielded balanced loop. All of amplitude and frequency of the suspect signal are noted.
- b) Final radiated measurements are made at 30 m distance in order to compare with the limit, if the field strength values observed at 3 m distance are strong enough to warrant concern over their values as extrapolated to 300 m and 1600 m (using inverse linear variation of field with distance).

Note) $\mu\text{A/m} \times 120 \pi \rightarrow \mu\text{V/m}$

The measuring system is shown in page 8.

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5. Radiated Emissions Measurement (30 MHz - 1000 MHz)

Testing Load Condition : 700 ml of water, with the beaker located in the center of the removable turntable.

- a) Preliminary radiatd measurements are made at 1 m distance in order to find frequencies of significant emissions from the EUT using broadband antennas. All of amplitude and frequency of the suspect signal are noted.
- b) Secondly, the preliminary radiated measurements are made at 3 m distance in order to grasp the amplitude of the previously noted suspect signals, the EUT is rotated on the turntable, and the polarization and height of the receiving antenna are varied to obtain the highest field strength. All of amplitude and frequency of the resultant are noted.
- c) Final radiated measurements are made at 30 m distance in order to compare with the limit, if the field strength values observed at 3 m distance are strong enough to warrant concern over their values as extrapolated to 300 m and 1600 m (using inverse linear variation of field with distance).
The measuring system is shown in page 9.

6. Radiated Emissions Measurement (1 GHz - 18 GHz)

- a) For general radiated emissions measurement
Testing Load Condition : 700 ml of water, with the beaker located in the center of the removable turntable.
- b) For radiated emissions measurement on the second and third harmonic.
Testing Load Condition : Two loads, one of 700 ml and the other of 300 ml, of water are used, each load is tested both with the beaker located in the center of the removable turntable and with it in the right front center.

The measurements are made at 3 m distance. The measuring system consists of a small horn antenna without reflector, pad-attenuator (10 dB), pre amplifier, spectrum analyzer, step attenuator and test receiver.

In order to compare with the limits, the field strength values at 3 m distance are extrapolated to 300 m and 1600 m using inverse linear variation of field with distance.

The detailed measuring system is shown in page 10.

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Test Results

- Cat. No. 2M240H(L2) of Magnetron Used -

Test Item Nos.

1. Variation of operating frequency (2450.0 MHz $\pm$ 50 MHz)

(Test Room: Temp. 8 °C, Humi. 80 %)

a) $\left(\begin{array}{l} - 23.80 \text{ MHz} \\ - 24.80 \text{ MHz} \end{array} \right)$ as against the tolerance ($\pm$ 50 MHz) for center frequency (2450.0 MHz)
at line voltage AC 120V

b) $\left(\begin{array}{l} + 24.30 \text{ MHz} \\ - 46.90 \text{ MHz} \end{array} \right)$ as against the tolerance ($\pm$ 50 MHz) for center frequency (2450.0 MHz)
at line voltage AC 96V

$\left(\begin{array}{l} - 23.40 \text{ MHz} \\ - 25.60 \text{ MHz} \end{array} \right)$ as against the tolerance ($\pm$ 50 MHz) for center frequency (2450.0 MHz)
at line voltage AC 150V

2. R.F. output power

(Test Room: Temp. 25 °C, Humi. 45 %)

a) Calorimetric method: 725 W

b) Applied field strength limit: 30.1 μ V/m at 300 m

3. Conducted Emissions

Not Applicable

4. (1 to 30) MHz, the highest Radiated Emissions (Limits: 30.1 μ V/m at 300 m, 10 μ V/m at 1600 m)

(Test Site: Temp. 8 °C, Humi. 80 %)

less than 0.7 μ V/m at 300 m (at 1.00 MHz)
less than 0.1 μ V/m at 1600 m (at 1.00 MHz)

5. (30 to 1000) MHz, the highest Radiated Emissions (Limits: 30.1 μ V/m at 300 m, 10 μ V/m at 1600 m)

(Test Site: Temp. 8 °C, Humi. 80 %)

less than 0.7 μ V/m at 300 m (at 1000 MHz)
less than 0.1 μ V/m at 1600 m (at 1000 MHz)

6. (1 to 18) GHz, the highest Radiated Emissions (Limits: 30.1 μ V/m at 300 m, 10 μ V/m at 1600 m)

(Test Site: Temp. 8 °C, Humi. 80 %)

6.6 μ V/m (Ver.) at 300 m (at 4.937 GHz)
1.2 μ V/m (Ver.) at 1600 m (at 4.937 GHz)

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- Cat. No. 2M167B of Magnetron Used -

Test Item Nos.

1. Variation of operating frequency (2450.0 MHz $\pm$ 50 MHz)

(Test Room: Temp. 23 °C, Humi. 44 %)

a) $\left[\begin{array}{l} + 23.60 \text{ MHz} \\ - 35.00 \text{ MHz} \end{array} \right]$ as against the tolerance ($\pm$ 50 MHz) for center frequency (2450.0 MHz)
at line voltage AC 120Vb) $\left[\begin{array}{l} + 20.50 \text{ MHz} \\ - 33.90 \text{ MHz} \end{array} \right]$ as against the tolerance ($\pm$ 50 MHz) for center frequency (2450.0 MHz)
at line voltage AC 96V $\left[\begin{array}{l} + 20.30 \text{ MHz} \\ - 35.20 \text{ MHz} \end{array} \right]$ as against the tolerance ($\pm$ 50 MHz) for center frequency (2450.0 MHz)
at line voltage AC 150V

2. R.F. output power

(Test Room: Temp. 25 °C, Humi. 45 %)

a) Calorimetric method: 664.2 W

b) Applied field strength limit: 28.8 μ V/m at 300 m

3. Conducted Emissions

Not Applicable

4. (1 to 30) MHz, the highest Radiated Emissions (Limits: 28.8 μ V/m at 300 m, 10 μ V/m at 1600 m)

(Test Site: Temp. 23 °C, Humi. 44 %)

less than 0.7 μ V/m at 300 m (at 1.00 MHz)less than 0.1 μ V/m at 1600 m (at 1.00 MHz)5. (30 to 1000) MHz, the highest Radiated Emissions (Limits: 28.8 μ V/m at 300 m, 10 μ V/m at 1600 m)

(Test Site: Temp. 14 °C, Humi. 50 %)

less than 0.7 μ V/m at 300 m (at 1000 MHz)less than 0.1 μ V/m at 1600 m (at 1000 MHz)6. (1 to 18) GHz, the highest Radiated Emissions (Limits: 28.8 μ V/m at 300 m, 10 μ V/m at 1600 m)

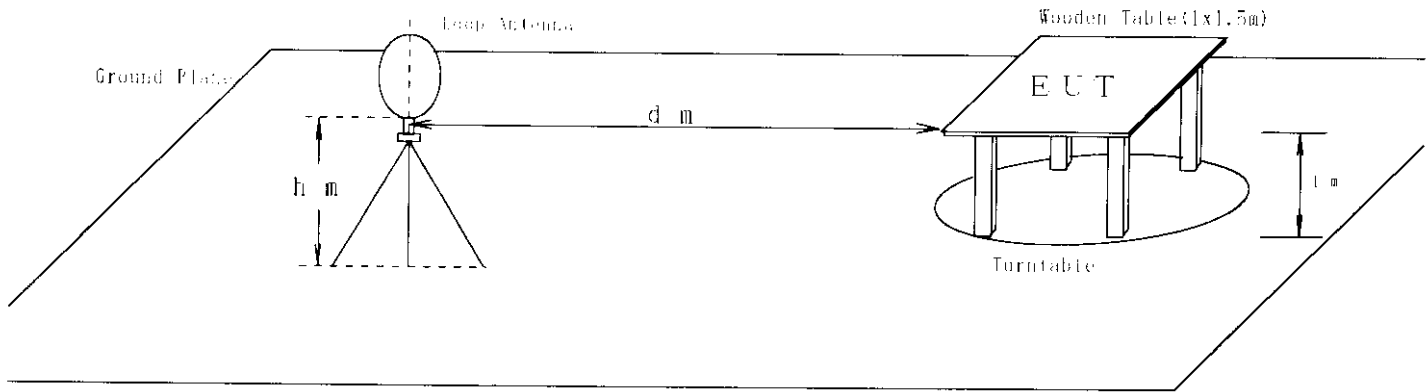
(Test Site: Temp. 23 °C, Humi. 44 %)

14.8 μ V/m (Ver.) at 300 m (at 4.927 GHz)2.8 μ V/m (Ver.) at 1600 m (at 4.927 GHz)

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TEST SET-UP SKETCH FOR RADIATED EMISSIONS MEASUREMENT

Frequency Range: (1 MHz - 30 MHz)



In case preliminary field measurement, it is made at 3 m:

d: 3 m h: 1 m

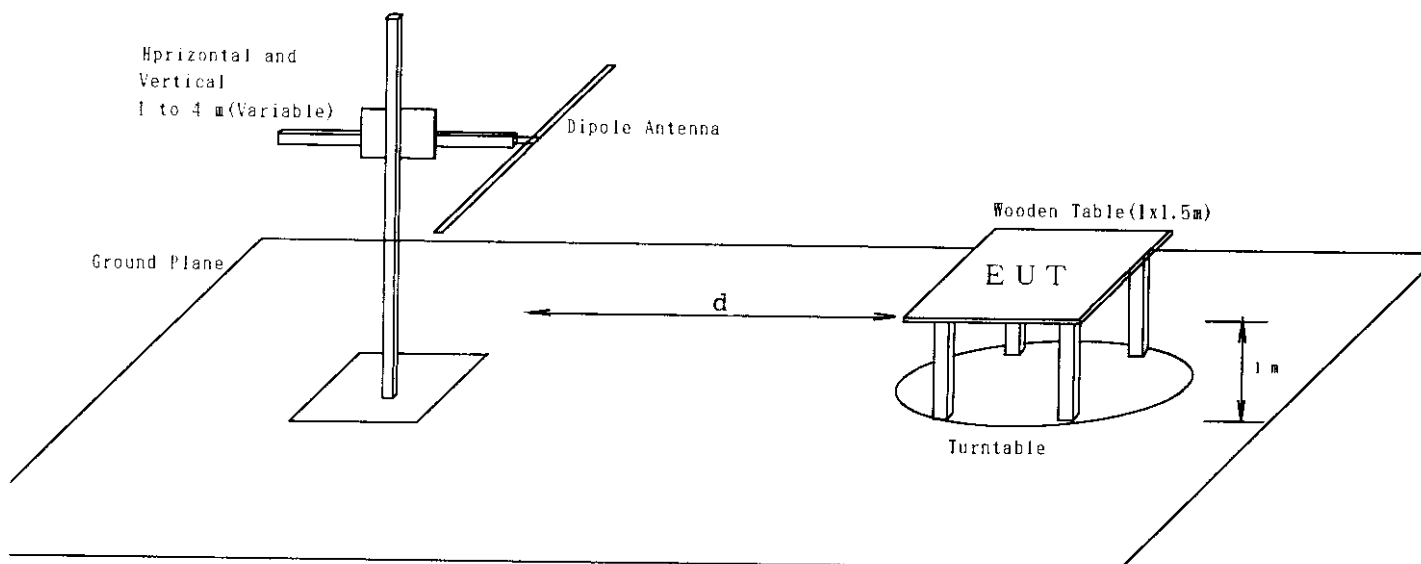
In case final field measurement, it is made at 30 m:

d: 30 m h: 2 m

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TEST SET-UP SKETCH FOR RADIATED EMISSIONS MEASUREMENT

Frequency Range: (30 MHz - 1000 MHz)



In case final preliminary radiated emissions measurement, it is made at 3 m (d)

In case final radiated emissions measurement, it is made at 30 m (d)

PHOTOGRAPH OF EUT CONFIGURATION FOR RADIATED EMISSIONS MEASUREMENT

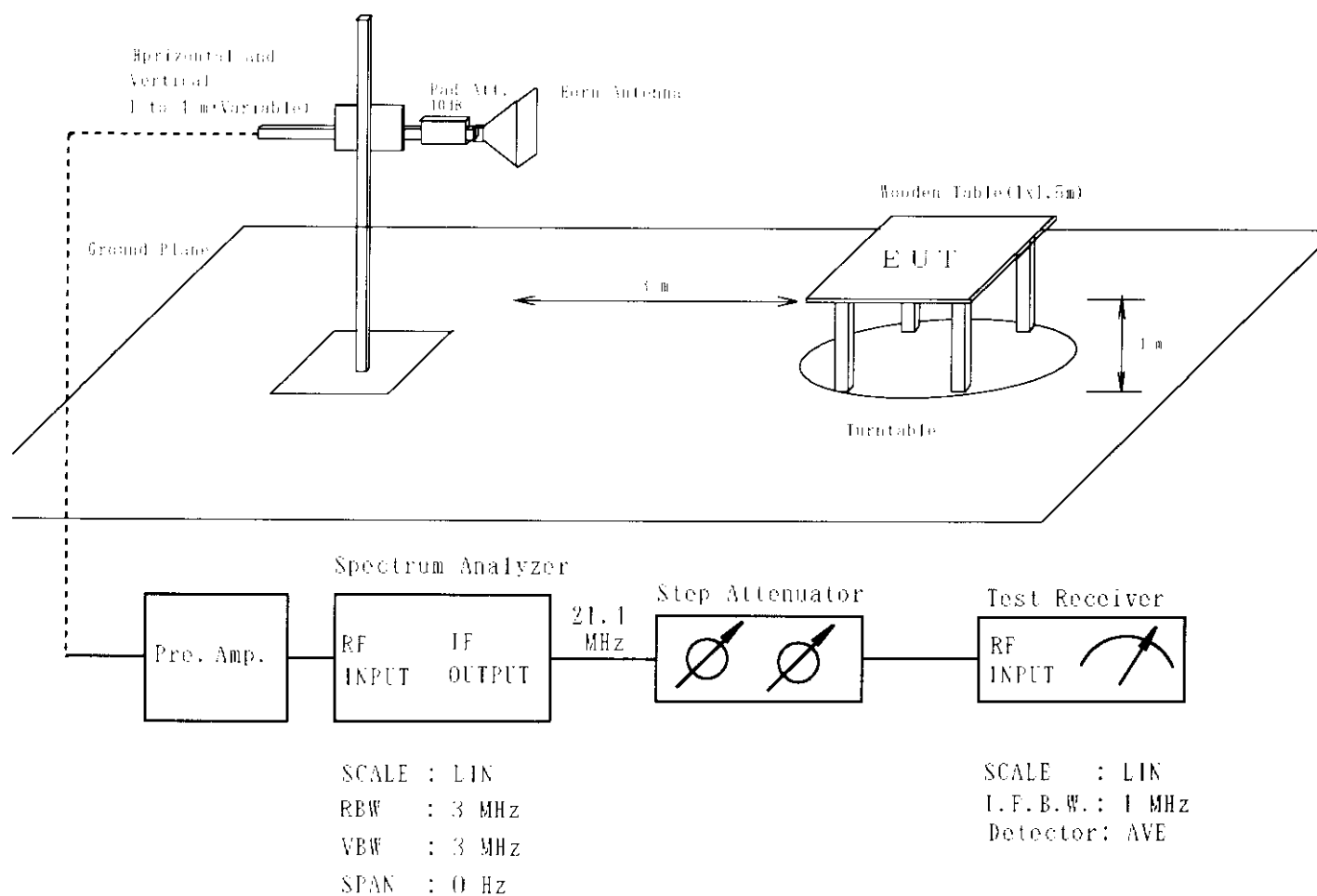
- Front View of the Tested System -

Not Applicable

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TEST SET-UP SKETCH FOR RADIATED EMISSIONS MEASUREMENT

Frequency Range: (1 GHz ~ 18 GHz)



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Test Instrumentation

TEST INSTRUMENT	MANUFACTURER/ MODEL NO.	ID NO.	LAST CAL.	CAL. INTERVAL
Receiver	Rohde & Schwarz ESV	A - 7	December, 1997	12 months
Spectrum Analyzer	Hewlett Packard HP8566B	A - 13	September, 1997	12 months
Dipole Antenna	Kyoritsu Electrical KBA-511A	C - 12	December, 1997	12 months
	Kyoritsu Electrical KBA-611	C - 22	December, 1997	12 months
Loop Antenna	Rohde & Schwarz HFH2-Z2	C - 2	January, 1998	12 months
Horn Antenna	EATON 91888-2	C - 40	April, 1997	12 months
	EATON 91889-2	C - 40	April, 1997	12 months
	EATON 94613-1	C - 40	April, 1997	12 months
	EATON 91891-2	C - 40	April, 1997	12 months
	EATON 94614-1	C - 40	April, 1997	12 months
Pre-Amplifier	WATKINS JOHNSON WJ-6882-824	A - 21	May, 1997	12 months
	WATKINS JOHNSON WJ-6870-506	A - 22	May, 1997	12 months
	WATKINS JOHNSON WJ-6611-513	A - 23	May, 1997	12 months
Microwave Counter	ADVANTEST TR5212	72520282	May, 1997	12 months
Digital Power Meter	YOKOGAWA 2533	50AU1264	May, 1997	12 months
Temperature Meter	YOKOGAWA 2455	74JJ0064	May, 1997	12 months
Signal Generator	Hewlett Packard HP8673D	B - 2	March, 1997	12 months
Step Attenuator	Tamagawa TRA-603D	2K419	May, 1997	12 months
Pad Attenuator	Weinschel 4T-10	D 73/D-74	May, 1997	12 months

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- Cat. No. 2M240H(L2) of Magnetron Used -
- and
- Cat. No. 2M167B of Magnetron Used -

For Radiated Emissions Measurement, (1 to 30) MHz and (30 to 1000) MHz, all meter readings were equal to noise level in test receiver used.

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- Cat. No. 2M240H(L2) of Magnetron Used -

Freq. (GHz)	Ant. Factor (dB)	Corr. Factor (dB)	Meter Reading at 3 m		Highest Field	
			Hori. (dB)	Ver. (dB)	at 300 m (μ V/m)	at 1600 m (μ V/m)
2.400	21.8	0.0	29	29	3.5	0.7
2.500	21.6	0.0	25	25	2.1	0.4
4.937	36.7	-21.3	36	41	6.6	1.2
7.405	36.9	-19.4	38	36	6.0	1.1
9.866	39.6	-24.0	39	39	5.4	1.0
12.250	44.2	-20.4	< 37	< 37	< 11.0	< 2.1
14.730	46.1	-23.5	< 40	< 40	< 13.5	< 2.5
17.250	44.9	-22.8	< 40	< 40	< 12.7	< 2.4

Sample calculation: $10^{(36.7 - 21.3)/20} \times \frac{3}{300} = 6.6 \mu\text{V/m}$
 at 4.937 GHz (300 m)

- Cat. No. 2M167B of Magnetron Used -

Freq. (GHz)	Ant. Factor (dB)	Corr. Factor (dB)	Meter Reading at 3 m		Highest Field	
			Hori. (dB)	Ver. (dB)	at 300 m (μ V/m)	at 1600 m (μ V/m)
1.610	20.6	-36.0	< 40	42	< 0.2	0.0
1.675	20.9	-37.1	42	43	0.2	0.0
2.400	21.8	0.0	32	33	5.5	1.0
2.500	21.6	-31.8	40	40	0.3	0.1
2.525	21.5	-31.7	39	41	0.3	0.1
4.927	36.7	-31.3	50	58	14.8	2.8
7.400	36.9	-29.4	43	44	3.8	0.7
9.864	39.6	-34.0	44	44	3.0	0.6
12.335	44.3	-33.8	< 42	< 42	< 4.2	< 0.8
14.785	46.1	-33.5	44	44	6.8	1.3
17.264	44.9	-32.8	45	45	7.2	1.3

Sample calculation: $10^{(50 - 36.7)/20} \times \frac{3}{1600} = 2.8 \mu\text{V/m}$
 at 4.927 GHz (1600 m)

- Note: 1. The spectrum was checked from 1 GHz to 18 GHz.
 Unlisted emissions were found to be undetectably weak.
 2. The symbol of "<" means "or less".
 3. The cable loss was including in the antenna factor.
 4. The pre-amplifier gain and the pad attenuator loss were including in the correction factor.