

# **EMISSION TEST REPORT**

**Test Report No. : 17A0046-02I-1**  
**OMRON Corporation, model: V700-H01**  
**FCC Part 15 Subpart C**

1. This test report shall not be reproduced except in full, without the written approval of A-Pex International Co., Ltd.
2. This test report does not constitute an endorsement by NIST/NVLAP or U.S. Government.
3. This equipment is in compliance with above regulation. We hereby certify that the data are contain a true representation of the emission profile.
4. The results in this report apply only to the sample tested.
5. This test report clearly shows that EUT, V700-H01, Antenna is in compliance with FCC Part 15 Subpart C, specification.

Date of test: January 29, 1998

Issued date: February 12, 1998

Tested by:

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Approved by:

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Tetsuya Hashimoto  
Group Leader of EMC section



This laboratory is registered by NIST/NVLAP,  
U.S.A. The tests report have been performed in  
accordance with its terms of registration.

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## 1 GENERAL INFORMATION

APPLICANT : OMRON Corporation  
REGULATION(S) : FCC Part 15 Subpart C  
MODEL NUMBER : V700-H01  
SERIAL NUMBER : 504  
KIND OF EQUIPMENT : Antenna  
TESTED DATE : January 29, 1998.  
REPORT FILE NUMBER : 17A0046-02I-1  
TEST SITE : A-PEX Yokowa NO.1 Open Test Site

Test report  
FCC ID :  
Our reference : 17A0046-02I-1  
Page : 4 of 13  
Issued date : 98-02-12

## 1.1 Tested Methodology

Radiated testing were performed according to the procedures in FCC/ANSI C63.4(1992).  
Radiated testing was performed at a distance of 3 meters from the antenna to EUT .

## 1.2 Test Facility

The open area site measurement facility used to collect the radiated data is located on 108, Yokowa-cho, Ise-shi, Mie-ken, 516-11 Japan.  
This site has been fully described in a report dated Aug. 1, 1997 submitted to FCC office, and accepted in a letter dated Sep. 16, 1997 (31040/SIT 1300F2).

## 2 Product Description

The device is a Radio Frequency. Identification System (called ID system) operated at DC 24V.

It is consisted of a Controller (V700-CD1D) and a Read Write Antenna (V700-H01 or H02, abbr. : ANT) AND and communicates with ID tag (e.g. V700-D13P31) via contactless.

The technical description is as follows:

1. Turns on the power of a test device. Then, the operation of the Controller and the oscillation of the ANT start.
2. Connects to a PC and turns on the power of the PC.
3. Starts a test program, "UCOMH" on the PC.
4. Inputs "OORDSRH10010" at the end after inputting "9600, 0, 1, 2" as setting values. Then, communication between the ANT and a tag starts.
5. Turns off the power of the PC and removes it. The communication continues.

The clock frequency used in the EUT

FPGA : 1MHz

Carrier Frequency : 125kHz

## 3 Tested System Details

The FCC IDs for all equipment, plus description of all cables used in the tested system are:

| Model                                           | FCC ID | Description   | Cable description                               | Backshell Material |
|-------------------------------------------------|--------|---------------|-------------------------------------------------|--------------------|
| (1) OMRON<br>M/N: V700-H01<br>S/N: 504<br>(EUT) |        | Antenna       | ---                                             | ---                |
| (2) OMRON<br>M/N: V700-CD1D<br>S/N: 306         |        | ID Controller | RWH/ID System Cable/ Shielded                   | ---                |
| (3) OMRON<br>M/N: S82K-05024<br>S/N: 188401     |        | Power Supply  | ---                                             | ---                |
| (4) OMRON<br>M/N: V700-D13P31<br>S/N: 333       |        | Tag           | DC Cable / Unshielded<br>FG Cable 1/ Unshielded | ---                |

## 4 SYSTEM TEST CONFIGURATION

### 4.1 Justification

The measurement was performed with the system configuration shown in Figure 3.2.  
Running mode was taken for the EUT operation mode.

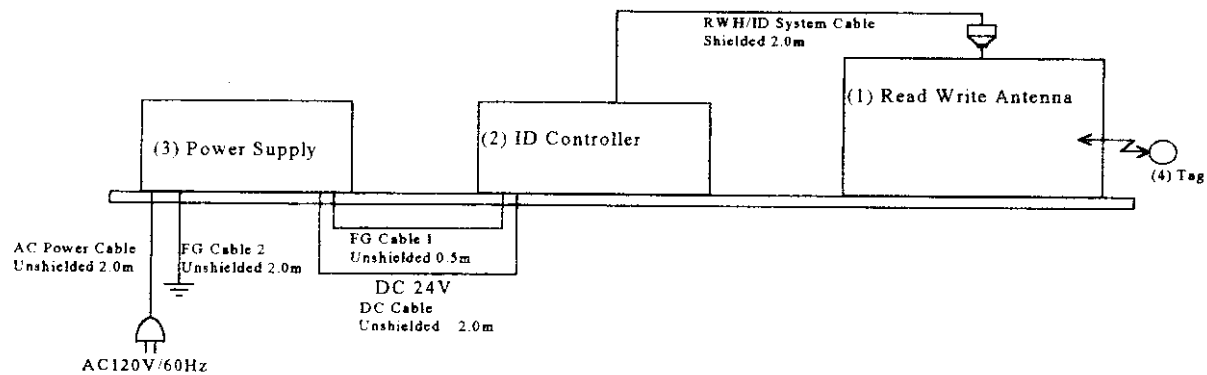
### 4.2 Test Procedure

#### Tabletop Equipment Radiated Emissions

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane.  
Test was made with the antenna positioned in both the horizontal and vertical planes of polarization.  
The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

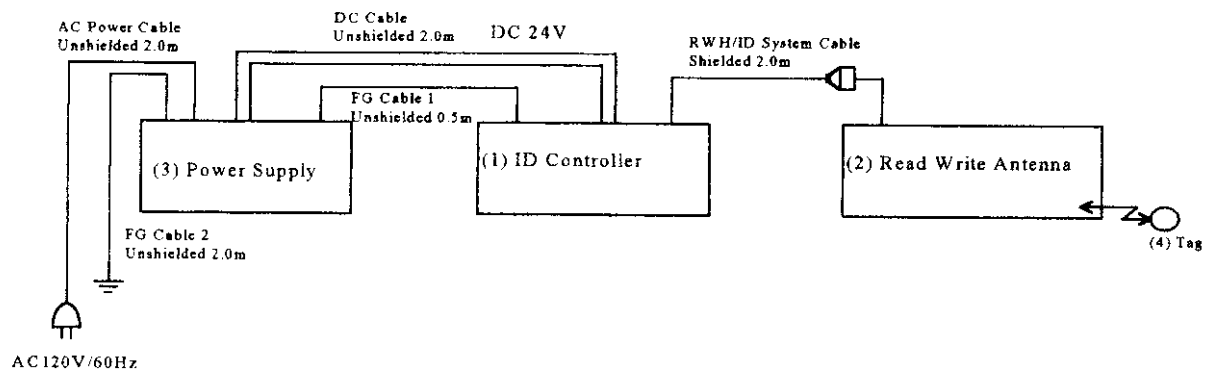
**Figure 4.2 Configuration of Tested System**

Front View



\* Cabling was taken into consideration and test data was taken under worst case conditions.

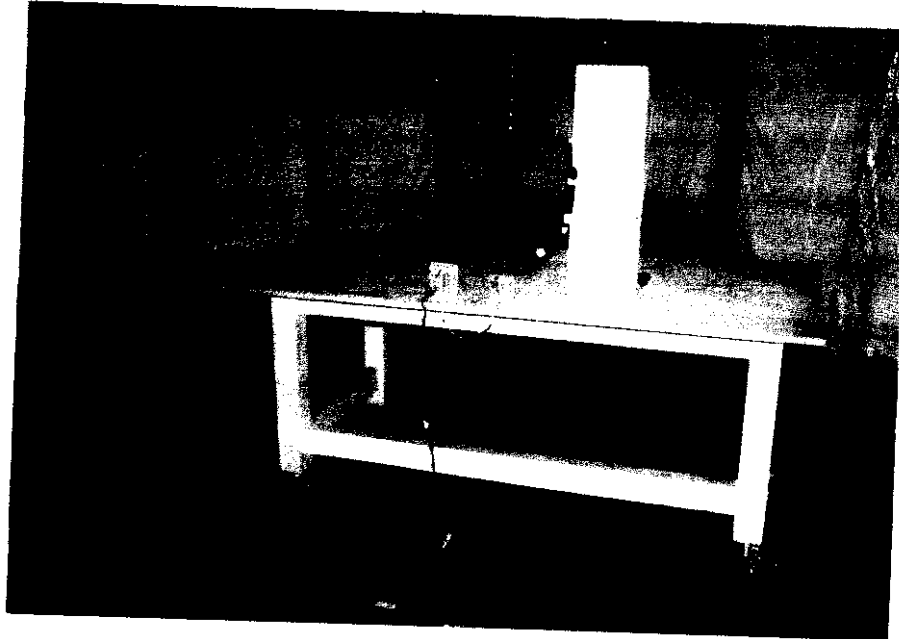
Top View



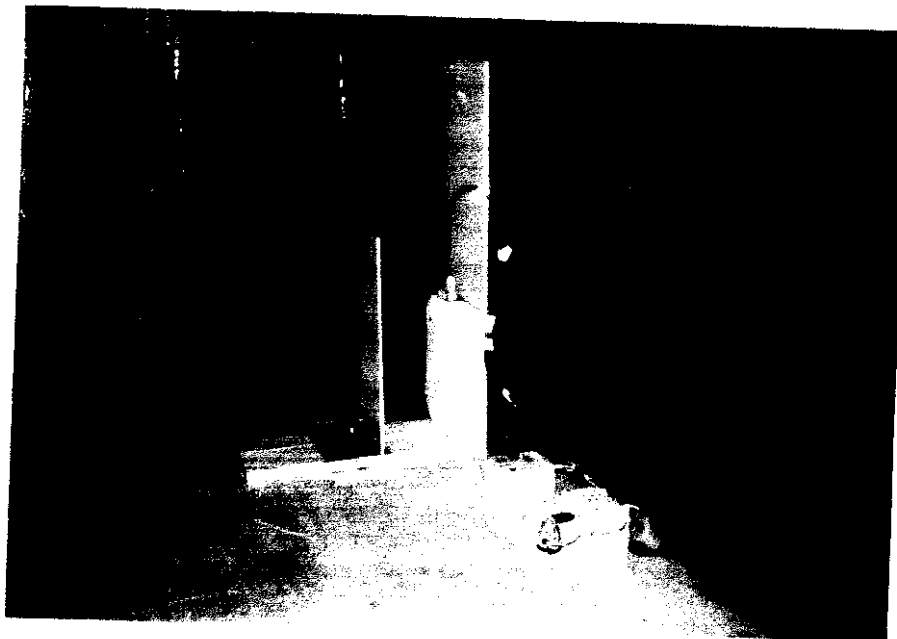
\* Cabling was taken into consideration and test data was taken under worst case conditions.

## 5 RADIATED MEASUREMENT PHOTOS

Figure 5.1 Radiated Measurement Photos



Front View



Rear View



## 5.2 Measurement Uncertainty

### Radiated Emission Test

The measurement uncertainty (with a 95% confidence level) for this test was  $\pm 3.3\text{dB}$ .

- ☐ The data listed in this test report may exceed the test limit because it does not have enough margin (more than 3.3dB).
- ☒ The data listed in this test report has enough margin, more than 3.3dB.

## 6 RADIATED EMISSION DATA

The initial step in collecting radiated data was a spectrum analyzer peak scan of the measurement range(30MHz-1,000MHz).

The final data was reported in the worst-case emissions.

The minimum margin to the limit is as follows :

### \* 10KHz ~ 30MHz

| Frequency<br>(MHz) | Receiver<br>Reading<br>(dB $\mu$ V) | Correction<br>Factor<br>(dB $\mu$ V) | Field<br>Strength<br>(dB $\mu$ V/m) | Limit<br>(dB $\mu$ V/m) | Margin<br>(dB $\mu$ V) |
|--------------------|-------------------------------------|--------------------------------------|-------------------------------------|-------------------------|------------------------|
| 0.6246             | 54.8                                | -28.7                                | 26.1                                | 31.6                    | 5.5                    |

### \* 30MHz ~ 1GHz

| Frequency<br>(MHz) | Receiver<br>Reading<br>(dB $\mu$ V) | Correction<br>Factor<br>(dB $\mu$ V) | Field<br>Strength<br>(dB $\mu$ V/m) | Limit<br>(dB $\mu$ V/m) | Margin<br>(dB $\mu$ V) |
|--------------------|-------------------------------------|--------------------------------------|-------------------------------------|-------------------------|------------------------|
| 75.95              | 52.0                                | -15.5                                | 36.5                                | 40.0                    | 3.5                    |

\* All readings are QP mode. (except 110~490 KHz, the data for this band is taken by AV mode)

\* The spurious was not preceibved regarding to the frequency above 1GHz.

## 6.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor, Cable Factor and Antenna Pad, and subtracting the Amplifier Gain from the measured reading. The sample calculation is as follows :

**\* 110KHz ~ 490KHz**

$$FS = RA + AF + CF - AG - EX$$

where FS = Field Strength

RA = Receiver Reading

AF = Antenna Factor

CF = Cable Factor

AG = Amplifier Gain

EX = Proper Extrapolation Factor

Assume a receiver reading of 54.8 dB  $\mu$  V is obtained. The antenna Factor of 20.0 dB is added. The Amplifier Gain of 20.0 dB is subtracted, giving a field strength of 6.4 dB  $\mu$  V/m.

$$FS = 95.4 + 20.0 - 20.0 - 89.0 = 6.4 \text{ dB } \mu \text{ V/m}$$

**\* 490KHz ~ 30MHz**

$$FS = RA + AF + CF - AG - EX$$

where FS = Field Strength

RA = Receiver Reading

AF = Antenna Factor

CF = Cable Factor

AG = Amplifier Gain

EX = Proper Extrapolation Factor

Assume a receiver reading of 54.8 dB  $\mu$  V is obtained. The antenna Factor of 20.0 dB is added. The Amplifier Gain of 20.0 dB is subtracted, giving a field strength of 26.1 dB  $\mu$  V/m.

$$FS = 54.8 + 20.0 - 20.0 - 28.7 = 26.1 \text{ dB } \mu \text{ V/m}$$

**\* 30MHz ~ 1GHz**

$$FS = RA + AF + CF + AT - AG$$

where FS = Field Strength

RA = Receiver Reading

AF = Antenna Factor

CF = Cable Factor

AT = Antenna Pad

AG = Amplifier Gain

Assume a receiver reading of 52.0 dB  $\mu$  V is obtained. The antenna Factor of 5.35 dB, Cable Factor of 1.77 dB and Antenna Pad of 6.0 dB is added. The Amplifier Gain of 27.34 dB is subtracted, giving a field strength of 37.78 dB  $\mu$  V/m.

$$FS = 52.0 + 5.35 + 1.77 + 6.0 - 27.34 = 37.78 \text{ dB } \mu \text{ V/m}$$

## 7 TEST EQUIPMENT USED

| NAME                                                    | MANUFACTURER    | MODEL       | Control No. | Calibrated Until  |
|---------------------------------------------------------|-----------------|-------------|-------------|-------------------|
| <input type="checkbox"/> Pre Amplifier                  | Hewlett Packard | 8447D       | AP1         | February 18, 1998 |
| <input checked="" type="checkbox"/> Pre Amplifier       | Anritsu         | MH648A      | AP2         | February 18, 1998 |
| <input type="checkbox"/> Pre Amplifier                  | Anritsu         | MH648A      | AP3         | July 6, 1998      |
| <input checked="" type="checkbox"/> Biconical Antenna   | Schwarzbeck     | BBA9106     | BA1         | April 23, 1998    |
| <input type="checkbox"/> Biconical Antenna              | Schwarzbeck     | BBA9106     | BA2         | July 19, 1998     |
| <input type="checkbox"/> Biconical Antenna              | Schwarzbeck     | BBA9106     | BA3         | May 10, 1998      |
| <input type="checkbox"/> Bilog Antenna                  | Chase           | CBL6111     | BL1         | July 19, 1998     |
| <input type="checkbox"/> Dipole Antenna                 | Schwarzbeck     | VHA9103     | DA5         | April 23, 1998    |
| <input checked="" type="checkbox"/> Logperiodic Antenna | Schwarzbeck     | UHALP9108A  | LA5         | July 19, 1998     |
| <input type="checkbox"/> Logperiodic Antenna            | Schwarzbeck     | UKLP9104- A | LA7         | May 3, 1998       |
| <input checked="" type="checkbox"/> Loop Antenna        | Rohde & Schwarz | HFH2-Z2     | LP1         | September 3, 1998 |
| <input type="checkbox"/> LISN                           | Rohde & Schwarz | ESH2-Z5     | LS1         | July 6, 1998      |
| <input type="checkbox"/> LISN                           | Rohde & Schwarz | ESH3-Z5     | LS2         | July 6, 1998      |
| <input type="checkbox"/> LISN                           | Schwarzbeck     | NSLK8127    | LS3         | July 6, 1998      |
| <input type="checkbox"/> LISN                           | Rohde & Schwarz | ESH3-Z5     | LS4         | July 6, 1998      |
| <input type="checkbox"/> LISN                           | Schwarzbeck     | NNLK8121    | LS5         | July 6, 1998      |
| <input type="checkbox"/> LISN                           | Rolf Heine      | NNB-4/200   | LS6         | July 6, 1998      |
| <input type="checkbox"/> LISN                           | Schwarzbeck     | NSLK8127    | LS7         | July 6, 1998      |
| <input checked="" type="checkbox"/> Spectrum Analyzer   | Hewlett Packard | 8567A       | SA1         | February 19, 1998 |
| <input type="checkbox"/> Spectrum Analyzer              | Hewlett Packard | 8567A       | SA3         | February 19, 1998 |
| <input type="checkbox"/> Spectrum Analyzer              | Hewlett Packard | 8567A       | SA4         | February 19, 1998 |
| <input checked="" type="checkbox"/> Test Receiver       | Rohde & Schwarz | ESHS-20     | TR1         | April 24, 1998    |
| <input checked="" type="checkbox"/> Test Receiver       | Rohde & Schwarz | ESVS-30     | TR2         | July 8, 1998      |
| <input type="checkbox"/> Test Receiver                  | Rohde & Schwarz | ESHS-30     | TR3         | July 27, 1998     |
| <input type="checkbox"/> Test Receiver                  | Rohde & Schwarz | ESVS-10     | TR4         | July 17, 1998     |
| <input type="checkbox"/> Test Receiver                  | Rohde & Schwarz | ESHS-10     | TR5         | October 14, 1998  |
| <input type="checkbox"/> Test Receiver                  | Rohde & Schwarz | ESVS-10     | TR6         | October 14, 1998  |
| <input type="checkbox"/> Horn Antenna                   | AH System, Inc. | SAS-200/571 | YTHA2       | —                 |

☒ indicates EMI Test Equipment used.

☒ All measurement equipment is traceable to national standard

Test report  
FCC ID :  
Our reference : 17A0046-02I-1  
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Issued date : 98-02-12

## **APPENDIX**

### **Test Data**

Radiated emissions

A 1 - A 3

# DATA OF RADIATION TEST

A - P E X INTERNATIONAL CO., LTD.  
YOKOWA NO.1 SITE

COMPANY : OMRON CORPORATION  
TRADE NAME : OMRON  
EQUIPMENT : ID System  
MODEL : V700-H01  
POWER : DC24V  
DESCRIPTION : RUNNING  
REMARKS :  
DATE : 01/29/1998

REPORT NO. : 17A0046-02I-1  
REGULATION : FCC Part 15 Subpart C  
CLASS : NONE  
TEST DISTANCE : 3m  
ATTENUATOR : 6dB  
FCC ID :

*O. Watatani*  
ENGINEER : OSAMU.WATATANI

| No | FREQ<br>[MHz] | ANT<br>TYPE | READING                   |                           | ANT<br>FACTOR<br>[dB] | CABLE<br>LOSS<br>[dB] | AMP<br>GAIN<br>[dB] | RESULT                      |                             | FCC<br>LIMITS<br>[dB $\mu$ V/m]<br>3m | MARGIN      |             |
|----|---------------|-------------|---------------------------|---------------------------|-----------------------|-----------------------|---------------------|-----------------------------|-----------------------------|---------------------------------------|-------------|-------------|
|    |               |             | HOR<br>[dB $\mu$ V]<br>3m | VER<br>[dB $\mu$ V]<br>3m |                       |                       |                     | HOR<br>[dB $\mu$ V/m]<br>3m | VER<br>[dB $\mu$ V/m]<br>3m |                                       | HOR<br>[dB] | VER<br>[dB] |
| 1  | 40.75         | BC          | 32.9                      | 43.5                      | 13.7                  | 2.0                   | 29.8                | 24.8                        | 35.4                        | 40.0                                  | 15.2        | 4.6         |
| 2  | 50.83         | BC          | 39.9                      | 41.1                      | 10.5                  | 2.1                   | 29.8                | 28.7                        | 29.9                        | 40.0                                  | 11.3        | 10.1        |
| 3  | 64.65         | BC          | 40.2                      | 48.7                      | 6.4                   | 2.5                   | 29.8                | 25.3                        | 33.8                        | 40.0                                  | 14.7        | 6.2         |
| 4  | 75.95         | BC          | 46.3                      | 52.0                      | 5.5                   | 2.8                   | 29.8                | 30.8                        | 36.5                        | 40.0                                  | 9.2         | 3.5         |
| 5  | 88.00         | BC          | 44.8                      | 43.4                      | 7.5                   | 2.9                   | 29.8                | 31.4                        | 30.0                        | 40.0                                  | 8.6         | 10.0        |
| 6  | 124.95        | BC          | 33.3                      | 38.1                      | 12.3                  | 3.5                   | 29.8                | 25.3                        | 30.1                        | 43.5                                  | 18.2        | 13.4        |
| 7  | 140.00        | BC          | 34.7                      | 41.4                      | 13.6                  | 3.7                   | 29.8                | 28.2                        | 34.9                        | 43.5                                  | 15.3        | 8.6         |
| 8  | 150.00        | BC          | 30.5                      | 41.5                      | 14.5                  | 3.8                   | 29.8                | 25.0                        | 36.0                        | 43.5                                  | 18.5        | 7.5         |
| 9  | 170.00        | BC          | 35.3                      | 36.4                      | 15.6                  | 4.2                   | 29.8                | 31.3                        | 32.4                        | 43.5                                  | 12.2        | 11.1        |
| 10 | 176.00        | BC          | 34.2                      | 36.9                      | 16.0                  | 4.1                   | 29.8                | 30.5                        | 33.2                        | 43.5                                  | 13.0        | 10.3        |
| 11 | 244.96        | BC          | 29.4                      | 31.2                      | 17.4                  | 4.9                   | 29.8                | 27.9                        | 29.7                        | 46.0                                  | 18.1        | 16.3        |
| 12 | 379.99        | LP          | 28.6                      | 29.4                      | 14.8                  | 5.9                   | 30.0                | 25.3                        | 26.1                        | 46.0                                  | 20.7        | 19.9        |
| 13 | 400.00        | LP          | 29.0                      | 29.9                      | 15.3                  | 6.2                   | 30.0                | 26.5                        | 27.4                        | 46.0                                  | 19.5        | 18.6        |
| 14 | 450.00        | LP          | 31.6                      | 32.0                      | 16.4                  | 6.5                   | 30.0                | 30.5                        | 30.9                        | 46.0                                  | 15.5        | 15.1        |
| 15 | 480.00        | LP          | 29.8                      | 27.3                      | 16.8                  | 7.0                   | 29.9                | 29.7                        | 27.2                        | 55.6                                  | 25.9        | 28.4        |

## SAMPLE CALCULATION :

RESULT = READING + ANT.FACTOR + CABLE LOSS - AMP.GAIN + ATTEN.

Except for the above table : more than 10dB below the limits.

# RADIATION TEST

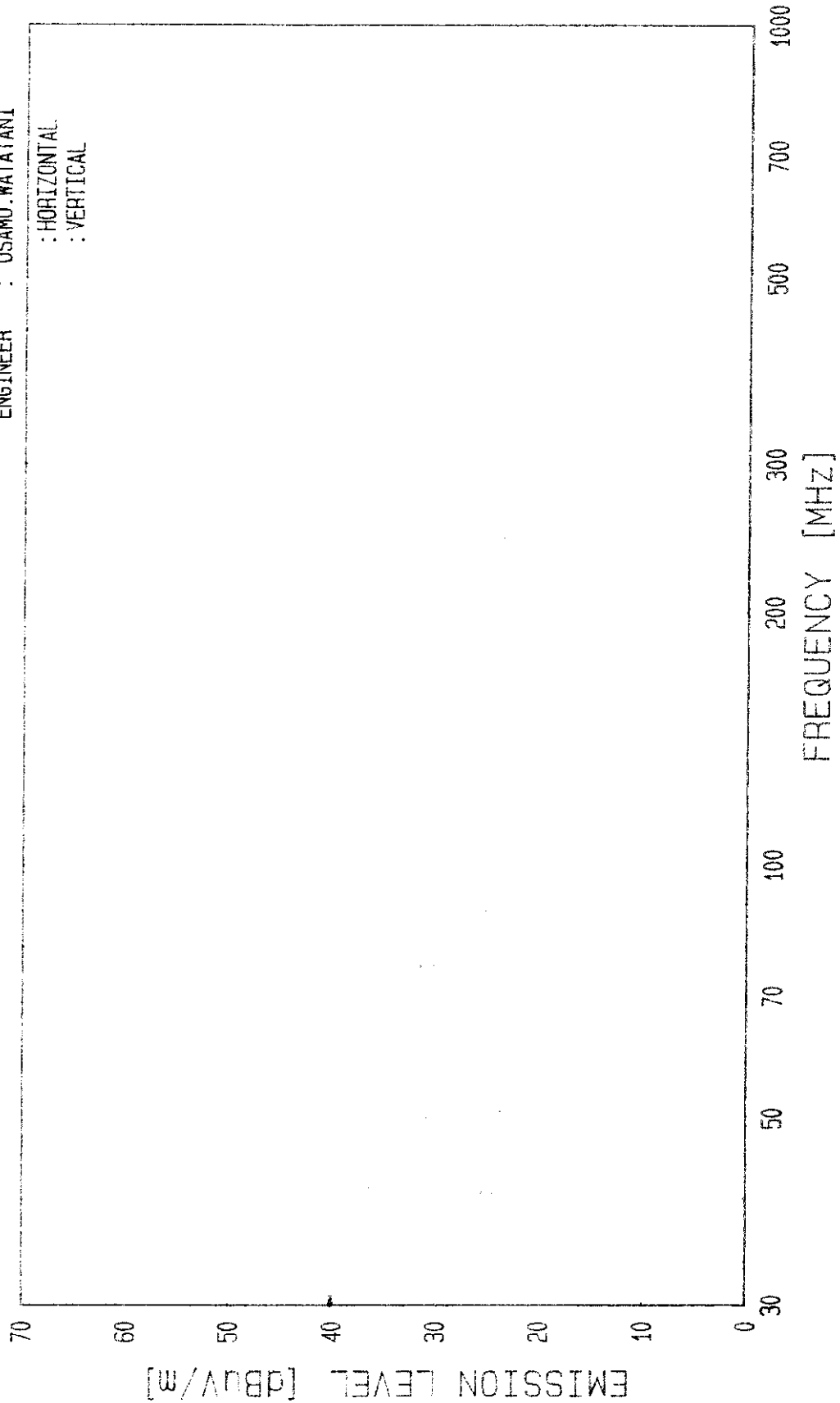
COMPANY : OMRON CORPORATION  
 TRADE NAME : OMRON  
 EQUIPMENT : ID System  
 MODEL : V700-H01  
 POWER : DC24V  
 DESCRIPTION : RUNNING  
 REMARKS :

REPORT No. : 17A0046-021-1  
 DATE : 01/29/1998  
 REGULATION : FCC Part 15 Subpart C  
 CLASS : NONE  
 DISTANCE : 3m  
 FCC ID :

ENGINEER : OSAMU.WATATANI

*Osamu Watatani*

: HORIZONTAL  
 : VERTICAL



## DATA OF RADIATION TEST

A-PEX INTERNATIONAL CO., LTD.  
YOKOWA NO.1 SITE

COMPANY : OMRON CORPORATION  
EQUIPMENT : ID System  
MODEL No. : V700-H01  
DESCRIPTION : RUNNING  
TEST DISTANCE : 10/30m  
DATE : 01/29/1998

REPORT No. : 17A0046-02I-1  
REGULATION : FCC Part15 Subpart C

*O. Watatani*  
ENGINEER : OSAMU.WATATANI

| No | FREQ<br>[MHz] | ANT<br>TYPE | READING<br>[dB $\mu$ V]<br>10m | READING<br>[dB $\mu$ V]<br>30m | RESULTS<br>[dB $\mu$ V/m] | LIMIT<br>[dB $\mu$ V/m]<br>30m | LIMIT<br>[dB $\mu$ V/m]<br>300m | MARGIN<br>[dB] |
|----|---------------|-------------|--------------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------------|----------------|
| 1  | 0.1250        | LA          | 95.4 (AV)                      | 66.6 (AV)                      | 6.4                       | -                              | 25.6                            | 19.2           |
| 2  | 0.2500        | LA          | 53.6 (AV)                      | -                              | -35.4                     | -                              | 19.6                            | 55.0           |
| 3  | 0.3750        | LA          | 47.2 (AV)                      | -                              | -41.8                     | -                              | 16.1                            | 57.9           |
| 4  | 0.5050        | LA          | 52.5                           | -                              | 23.8                      | 33.6                           | -                               | 9.8            |
| 5  | 0.6246        | LA          | 54.8                           | -                              | 26.1                      | 31.6                           | -                               | 5.5            |

SAMPLE CALCULATION :

RESULT=READING + ANT.FACTOR[20dB] - AMP.GAIN[20dB] - PROPER EXTRAPOLATION FACTOR

PROPER EXTRAPOLATION FACTOR :

$(95.4-66.6)/\log(30/10)=60.3[\text{dB/decade}]$

300-10[m] FACTOR :  $60.3 \times \log(300/10)=89.0[\text{dB}]$

30-10[m] FACTOR :  $60.3 \times \log(30/10)=28.7[\text{dB}]$