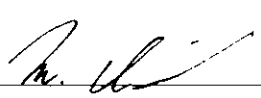
EMISSION TEST REPORT

Test Report No. : 21HE0037-YW-1

Applicant:	**OMRON CORPORATION.**
Type of Equipment:	**Radio Frequency Identification System**
Model No.:	**V670-CD1D (ID Controller)** **V670-H11 (Antenna)**
FCC ID	**E4E6CYCIDV6700101**
Test standard:	**FCC Part 15 Subpart C §15.225**
Test Result:	**Complies**

The results in this report apply only to the sample tested.

Date of test: April 16, 17 and 18, 2001

Tested by: 

Masafumi Inui

Approved by:  Issued date: April 25, 2001

Kazutoyo Nakanishi

Section Manager of EMC section

Testing Laboratory

A-pex International Co., Ltd.

108 Yokowa-cho, Ise-shi Mie-ken 516-1106 JAPAN

Telephone: +81 596 39 1485

Facsimile: +81 596 39 0232

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1 GENERAL INFORMATION

APPLICANT	: OMRON CORPORATION
TRADE NAME	: OMRON
ADDRESS	: 20 Shimokaiinji, Nagaokakyou-shi, Kyoto 617-8510 Japan Tel: +81-75-957-9849 Fax: +81-75-951-5124
REGULATION(S)	: FCC Part 15 Subpart C §15.225
MODEL NUMBER	: V670-CD1D (ID Controller) V670-H11 (Antenna)
FCC ID	: E4E6CYCIDV6700101
SERIAL NUMBER	: Sample No.8
KIND OF EQUIPMENT	: Radio Frequency Identification System
TESTED DATE	: April 16, 17 and 18, 2001
RECEIPT DATE OF SAMPLE	: April 16, 2001
REPORT FILE NUMBER	: 21HE0037YW-1
TEST SITE	: A-PEX Yokowa No.1 and No.2 Open Test Site

1.1 Product Description

Model: V670-CD1F(ID Controller) and V670-H11(Antenna) (referred to as the EUT in this report) is a Radio Frequency Identification System.

The specification is as following:
Carrier Frequency : 13.56MHz.
Operation Voltage : DC24V
Modulation : Amplitude Shift Keying

1.2 Test Specification

Test Specification : FCC Part 15 Subpart C

Title : FCC 47CFR Part15 Radio Frequency Device
Subpart C Intentional Radiators
§15.225 Operation within the Band 13.553 – 13.567MHz

1.3 Methods & Procedures

No.	Item	Test Procedure	Specification	Remarks
1	Electric Field Strength of Fundamental Emission	FCC/ANSI C63.4:1992	§15.225(a)	-
2	Electric Field Strength of Spurious Emission	FCC/ANSI C63.4:1992	§15.225(b)	-
3	Frequency Tolerance	FCC/ANSI C63.4:1992	§15.225(c)	-

1.4 Test Location

A-PEX International Co.,Ltd. Yokowa No.1 and No.2 test site
108 Yokowa-cho, Ise-shi, Mie-ken 516-1106 Japan
Telephone number : +81-596-39-1485
Facsimile number : +81-596-39-0232

This site has been fully described in a report submitted to FCC office, and listed on September 16, 2000(Registration number: 90412/No.1) and October 26, 2000(Registration number: 90411/No.2).

2 SYSTEM TEST CONFIGURATION

2.1 Operation Modes

The EUT exercise program used during radiated testing was designed to exercise the various system components in a manner similar to typical use.

The sequence is used:

Operation Mode : Transmitting

2.2 Justification : The system was configured in typical fashion (as a customer would normally use it) for testing.

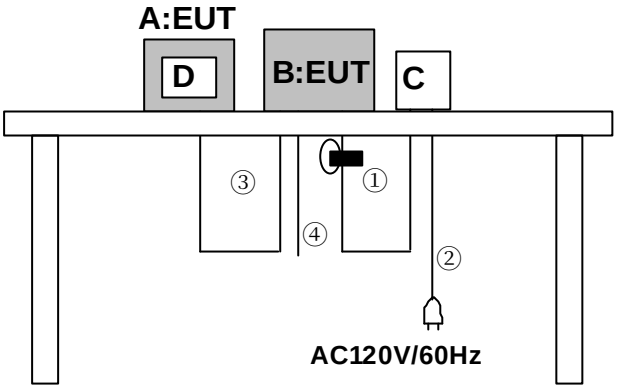
2.3 Test Procedure

Tabletop Equipment Radiated Emissions

EUT was placed on a platform of nominal size, 1.5m by 1m, 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. (above 30MHz)
The measurement distance was 3m.

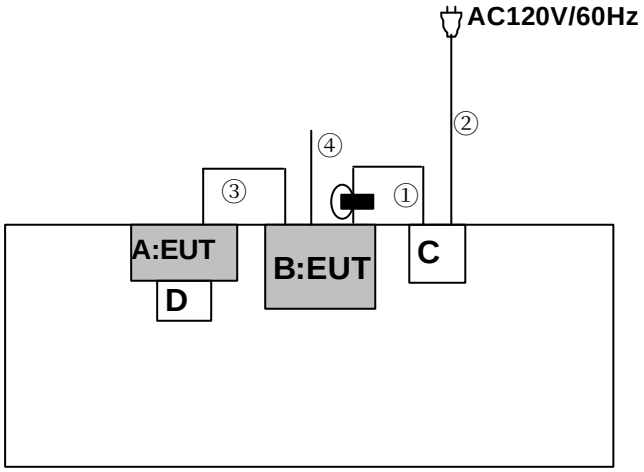
Figure2.1 Configuration of Tested System

Front View



* Test data was taken under worse case conditions.

Top View



*Test data was taken under worse case conditions.

Description of EUT and Support equipment

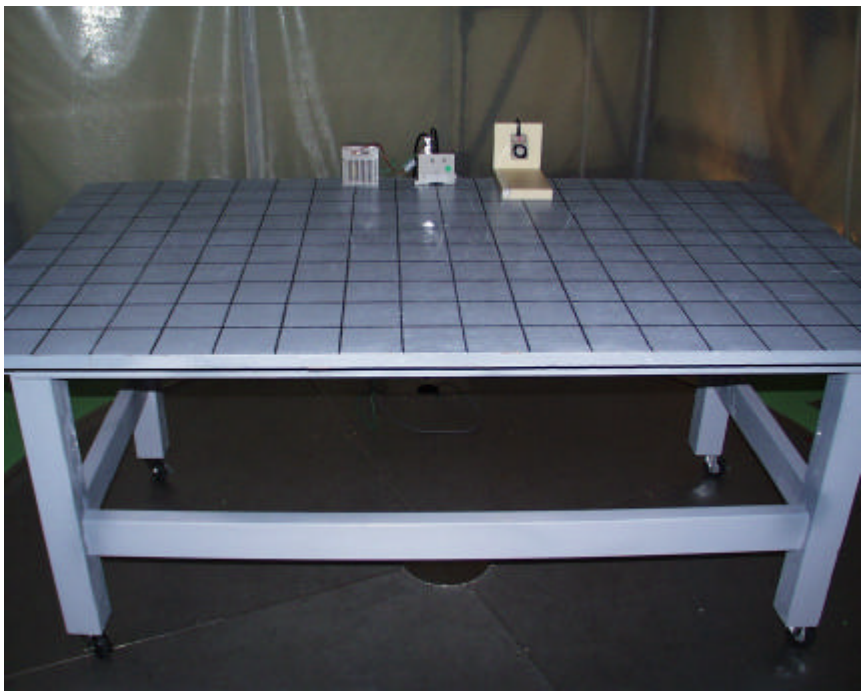
No.	Item	Model number	Serial number	Manufacturer	Remark
A	Antenna	V670-H11	-	OMRON Corporation	EUT
B	ID Controller	V670-CD1D	0931	OMRON Corporation	EUT
C	DC Power Supply	S82K-03024	23690	OMRON Corporation	-
D	ID Tag	V670-D13F03	-	OMRON Corporation	-

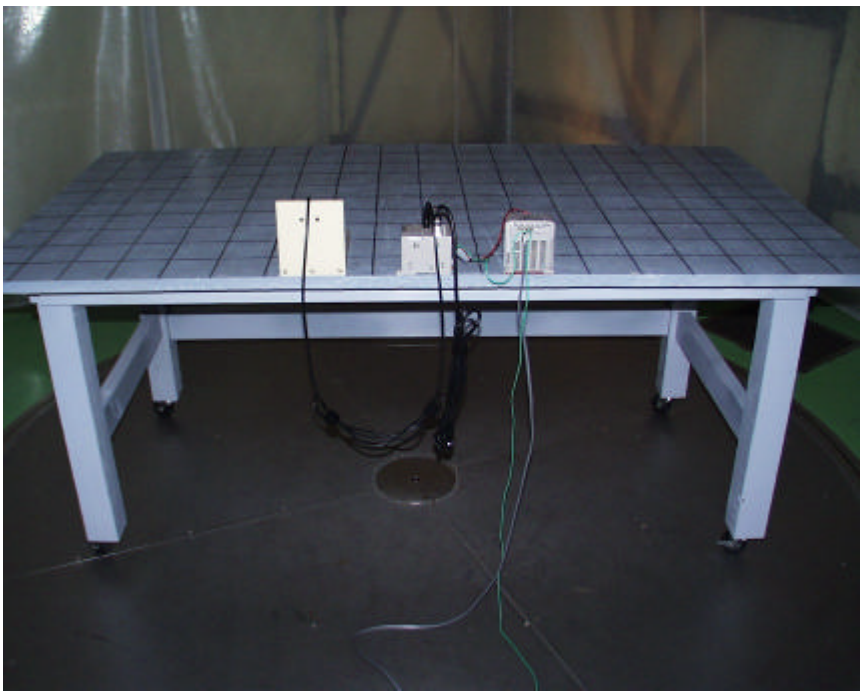
List of cables used

No.	Name	Length (m)	Shield	Remark
①	DC Power Cable	0.35	N	-
②	AC Power Cable	1.5	N	-
③	Antenna Cable	1.9	Y	-
④	RS232C Cable	2.4	Y	-

3 RADIATED MEASUREMENT PHOTOS

Figure 3.1 Radiated Measurement Photos





3.1 Measurement Uncertainty

Radiated Emission Test

The measurement uncertainty (with a 95% confidence level) for this test was ±3.3dB.

■ 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.

4 Summary of test results

4.1 Test results

No.	Item	Test Procedure	Specification	Remarks	Result
1	Electric Field Strength of Fundamental Emission	FCC/ANSI C63.4:1992	FCC Part15 Subpart C §15.225(a)	3m	Complies
2	Electric Field Strength of Spurious Emission	FCC/ANSI C63.4:1992	FCC Part15 Subpart C §15.225(b)	3m	Complies
3	Frequency Tolerance	FCC/ANSI C63.4:1992	FCC Part15 Subpart C §15.225(c)	-	Complies

A-PEX INTERNATIONAL hereby confirms that E.U.T. , in the configuration tested, complies with the specificationsFCC Part15 Subpart C.

4.2 Electric Field Strength Measurement of Fundamental Frequency

The follwing table lists frequency at which emissions were measured using a Quasi-Peak detector and at a test distance of 3m

Frequency (MHz)	Ant.	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
13.56		76.0	-9.1	66.9	120.0	53.1

Note: The limit was calculated using the square of an inverse liear distance extrapolation factor (40dB/decade) .i.e $40\log_{10}(d1/d2)$.

30m Fundamental Emission Limit (10,000 μV/m) = $20\log_{10}(10{,}000)$ = 80dBμV/m
3m Fundamental Emission Limit = 80dBμV/m + $40\log_{10}(30/3)$ = 120dBμV/m

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 :

FS = RA + AF + CF + AT - AG

where FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Factor
AG = Amplifier Gain

Assume a receiver reading of 76.0 dBμV is obtained. The antenna Factor of 20.2 dB and Cable Factor of 0.8 dB is added. The Amplifier Gain of 30.1 dB is subtracted, giving a field strength of 66.9 dBμV/m.
FS = 76.0 + 20.2 + 0.8 – 30.1 = 66.9 dBμV/m

4.3 Electric Field Strength of Spurious Emission

The initial step in collecting radiated data was a spectrum analyzer peak scan of the measurement range (9kHz-1000MHz).
The final data was reported in the worst-case emissions.
The follwing table lists frequency at which emissions were measured using a Quasi-Peak detector and at a test distance of 3m
The minimum margin to the limit is as follows :

Frequency (MHz)	Ant. Pol.	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
325.45	H	47.4	-2.7	44.7	46.0	1.3

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 :

FS = RA + AF + CF + AT - AG

where FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Factor
AT = Antenna Pad
AG = Amplifier Gain

Assume a receiver reading of 47.4 dBμV is obtained. The antenna Factor of 16.9 dB, Cable Factor of 4.3 dB and Antenna Pad of 5.9 dB is added. The Amplifier Gain of 29.8 dB is subtracted, giving a field strength of 44.7 dBμV/m.

FS = 47.4 + 16.9 + 4.3 + 5.9 – 29.8 = 44.7 dBμV/m

4.4 Frequency Tolerance

Measurements were performed to determine the frequecny stability of the fundamental emission from the EUT when subjected to a variation in ambient temperature and a variation of supply voltage.

4.4.1 Variation of Amibent Temperature

The ambient temperature was varied from –20°C to +50°C at normal supply voltage.
During the test, the fundamental frequency of the EUT shall be maintained within ±0.01% of the operating frequency.

Frequency Error Limit: 13.56MHz : ± 0.01%(1.356kHz)
Lower frq Limit =13.55864MHz / Upper frq Limit = 13.56136MHz

Tempearture(°C)	0 minuts	2 minuts	5 minuts	10 minuts	Result
-20	-22Hz	0Hz	0Hz	0Hz	Complied
+50	-14Hz	-14Hz	-14Hz	0Hz	Complied

4.4.2 Variation of Supply Voltage

The supply voltage was varied from 85% to 115% at a temperature of 22°C
During the test, the fundamental frequency of the EUT shall be maintained within ±0.01% of the operating frequency.

Frequency Error Limit: 13.56MHz : ± 0.01%(1.356kHz)
Lower frq Limit =13.55864MHz / Upper frq Limit = 13.56136MHz

Voltage(V)	0 minuts	2 minuts	5 minuts	10 minuts	Result
85%(20.4V)	0Hz	0Hz	0Hz	0Hz	Complied
115%(27.6V)	0Hz	0Hz	0Hz	0Hz	Complied

5 Radiated emission

5.1 Operating environment

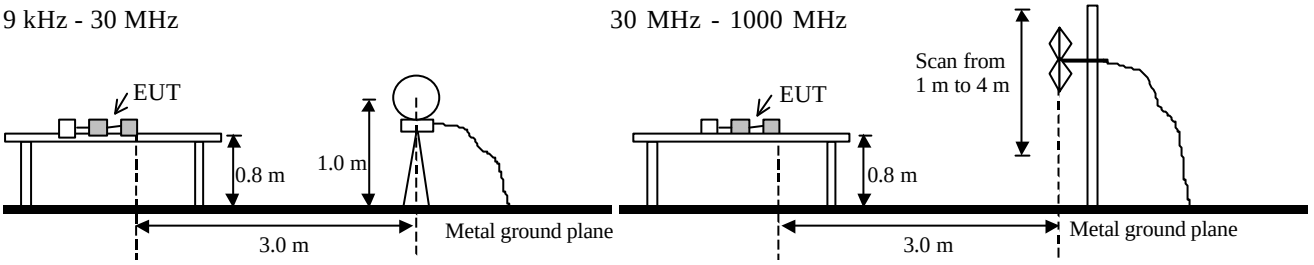
The test was carried out in an open site.

Temperature : See data
Humidity : See data

5.2 Test configuration

EUT was placed on a table of nominal size, 1.0m by 1.5m, raised 80cm above the conducting ground plane.
The rear of EUT, including peripherals was aligned and flush with rear of tabletop.
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 1 Drawing of the test set-up



5.3 Test conditions

Frequency range : 9kHz-30MHz (Loop antenna) / 30MHz-300MHz (biconical antenna) / 300MHz-1000MHz (Log-periodic antenna)
Test distance : 3m
EUT position : Table top

5.4 Test procedure

The Radiated Electric Field Strength intensity has been measured on an open test site with a ground plane at a distance of 3m from the EUT to the antenna.
Pre check measurements were performed in a shielded room or used search coil for ambient noise at high-level, especially from 272MHz to 288MHz.
Measurements were performed with a quasi-peak detector.
The measuring antenna height was varied between 1m to 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.
The measurements were performed for both vertical and horizontal antenna polarization.
The EUT was put into operation at Running mode.

5.5 Results

Summary of the test results: Pass

Date: 2001-04-16,17 and 18 Tested by: M. Inui

6 TEST EQUIPMENT USED

Instrument	Mfr.	Model No.	Control No.	Calibration Until / / Interval
Pre Amplifier	Anritsu	MH648A	AF-02	March 30, 2002 / 1 year
Pre Amplifier	Anritsu	MH648A	AF-03	March 30, 2002 / 1 year
Attenuator	Anritsu	MP721B	AT-04	March 30, 2002 / 1 year
Loop Antenna	Rohde & Schwarz	HFH2-Z2	LP-01	November 3,2002 / 3 year
Biconical Antenna	Schwarzbeck	BBA9106	BA-05	April 30, 2002 / 1 year
Logperiodic Antenna	Schwarzbeck	UKLP9140-A	LA-08	April 30, 2002 / 1 year
Spectrum Analyzer	Hewlett Packard	8567A	SA-03	March 30, 2002 / 1 year
Test Receiver	Rohde & Schwarz	ESHS20	TR-01	April 11, 2002 / 1 year
Test Receiver	Rohde & Schwarz	ESHS30	TR-03	April 23, 2002 / 1 year
Test Receiver	Rohde & Schwarz	ESVS10	TR-04	April 23, 2002 / 1 year
Temperature and Humidity chamber	Tabai Espec Corp.	PL-4KP	CH-01	December 7,2001 / 1 year
Frequency Counter	Agilent	53131A	UC-01	October 29,2001 / 1 year

*All measurement equipment is traceable to national standard.

APPENDIX

A : Test Data

Radiated emissions A1 – A3

Testing Laboratory
A-pex International Co., Ltd. Telephone: +81 596 39 1485
108 Yokowa-cho, Ise-shi Mie-ken 516-1106 JAPAN Facsimile: +81 596 39 0232

DATA OF RADIATION TEST

A-PEX INTERNATIONAL CO., LTD.
YOKOWA No.2 OPEN TEST SITE
Report No. : 21HE0037-YW-1

Applicant : OMRON Corporation
Kind of Equipment : Radio Frequency Idenntification System
Model No. : V670-H11(Antenna)/V670-CD1D(ID Controller)
Serial No. :
Power : DC24V (V670-CD1D Side)
Mode : Transmitting
Remarks : FCC ID : E4E6CYCIDV6700101
Date : 4/17/2001
Test Distance : 3 m
Temperature : 19 ℃
Humidity : 52 %
Regulation : Fcc 15C §15.209(a)

Engineer : Masafumi Inui

No.	FREQ. [MHz]	ANT TYPE	READING HOR [dBμV]	READING VER [dBμV]	ANT FACTOR [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATTEN. [dB]	RESULT HOR [dBμV/m]	RESULT VER [dBμV/m]	LIMITS [dBμV/m]	MARGIN HOR [dB]	MARGIN VER [dB]
1.	40.68	BB	37.1	43.3	14.6	29.8	1.3	5.9	29.1	35.3	40.0	10.9	4.7
2.	54.24	BB	34.3	46.3	10.0	29.9	1.6	5.9	21.9	33.9	40.0	18.1	6.1
3.	67.81	BB	47.5	52.7	7.2	29.8	1.7	5.9	32.5	37.7	40.0	7.5	2.3
4.	81.36	BB	38.1	39.4	6.7	29.8	1.9	5.9	22.8	24.1	40.0	17.2	15.9
5.	87.93	BB	44.0	40.2	8.0	29.9	2.0	5.9	30.0	26.2	40.0	10.0	13.8
6.	94.92	BB	40.8	44.8	9.4	29.9	2.1	5.9	28.3	32.3	43.5	15.2	11.2
7.	108.48	BB	34.9	37.9	11.7	29.8	2.3	5.9	25.0	28.0	43.5	18.5	15.5
8.	122.05	BB	47.5	41.3	13.6	29.8	2.5	5.9	39.7	33.5	43.5	3.8	10.0
9.	135.59	BB	36.3	40.1	14.5	29.8	2.7	5.9	29.6	33.4	43.5	13.9	10.1
10.	149.17	BB	42.1	46.5	15.0	29.8	2.8	5.9	36.0	40.4	43.5	7.5	3.1
11.	162.72	BB	33.7	38.6	15.3	29.7	3.0	5.9	28.2	33.1	43.5	15.3	10.4
12.	165.89	BB	39.7	44.8	15.5	29.7	3.0	5.9	34.4	39.5	43.5	9.1	4.0
13.	171.42	BB	39.9	41.9	15.8	29.7	3.1	5.9	35.0	37.0	43.5	8.5	6.5
14.	176.29	BB	35.7	37.7	16.0	29.7	3.1	5.9	31.0	33.0	43.5	12.5	10.5
15.	189.85	BB	39.5	41.3	16.3	29.7	3.2	6.0	35.3	37.1	43.5	8.2	6.4
16.	203.40	BB	35.0	41.4	16.5	29.6	3.3	5.9	31.1	37.5	43.5	12.4	6.0
17.	216.97	BB	37.0	42.0	16.6	29.7	3.5	5.9	33.3	38.3	46.0	12.7	7.7
18.	230.52	BB	38.6	39.5	16.7	29.7	3.7	6.0	35.3	36.2	46.0	10.7	9.8
19.	244.07	BB	39.4	41.8	16.8	29.7	3.8	5.9	36.2	38.6	46.0	9.8	7.4
20.	257.64	BB	42.6	38.1	17.3	29.7	3.9	5.9	40.0	35.5	46.0	6.0	10.5
21.	271.21	BB	43.3	41.7	18.2	29.7	4.0	6.0	41.8	40.2	46.0	4.2	5.8
22.	311.88	BB	44.3	34.4	16.7	29.8	4.2	5.9	41.3	31.4	46.0	4.7	14.6
23.	325.45	BB	47.4	40.1	16.9	29.8	4.3	5.9	44.7	37.4	46.0	1.3	8.6
24.	447.48	BB	41.9	37.8	18.6	29.9	5.3	5.9	41.8	37.7	46.0	4.2	8.3

CALCULATION: READING + ANT.FACTOR + CABLE LOSS - AMP.GAIN + ATTEN.

All other spurious emissions are more than 20dB below the limits.
ANT.TYPE:30-300MHz Biconical,300-1000MHz Logperiodic

DATA OF RADIATION TEST

A-PEX INTERNATIONAL CO., LTD.
YOKOWA No.2 OPEN TEST SITE
Report No. : 21HE0037-YW-1

Applicant	:	OMRON Corporation
Kind of Equipment	:	Radio Frequency Idenntification System
Model No.	:	V670-H11(Antenna)/V670-CD1D(ID Controller)
Serial No.	:	
Power	:	DC24V (V670-CD1D Side)
Mode	:	Transmitting
Remarks	:	FCC ID : E4E6CYCIDV6700101
Date	:	4/17/2001
Test Distance	:	3 m
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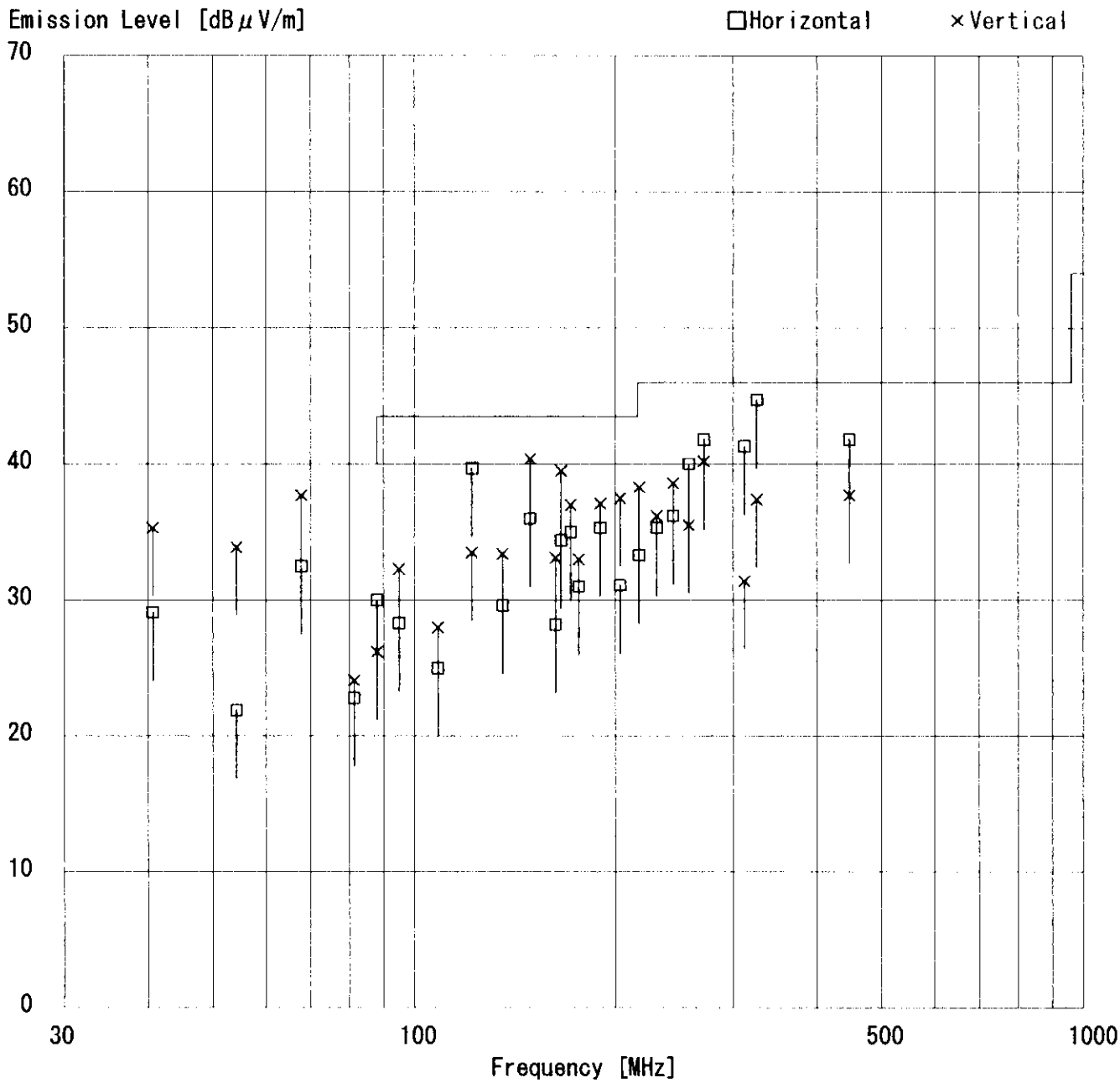
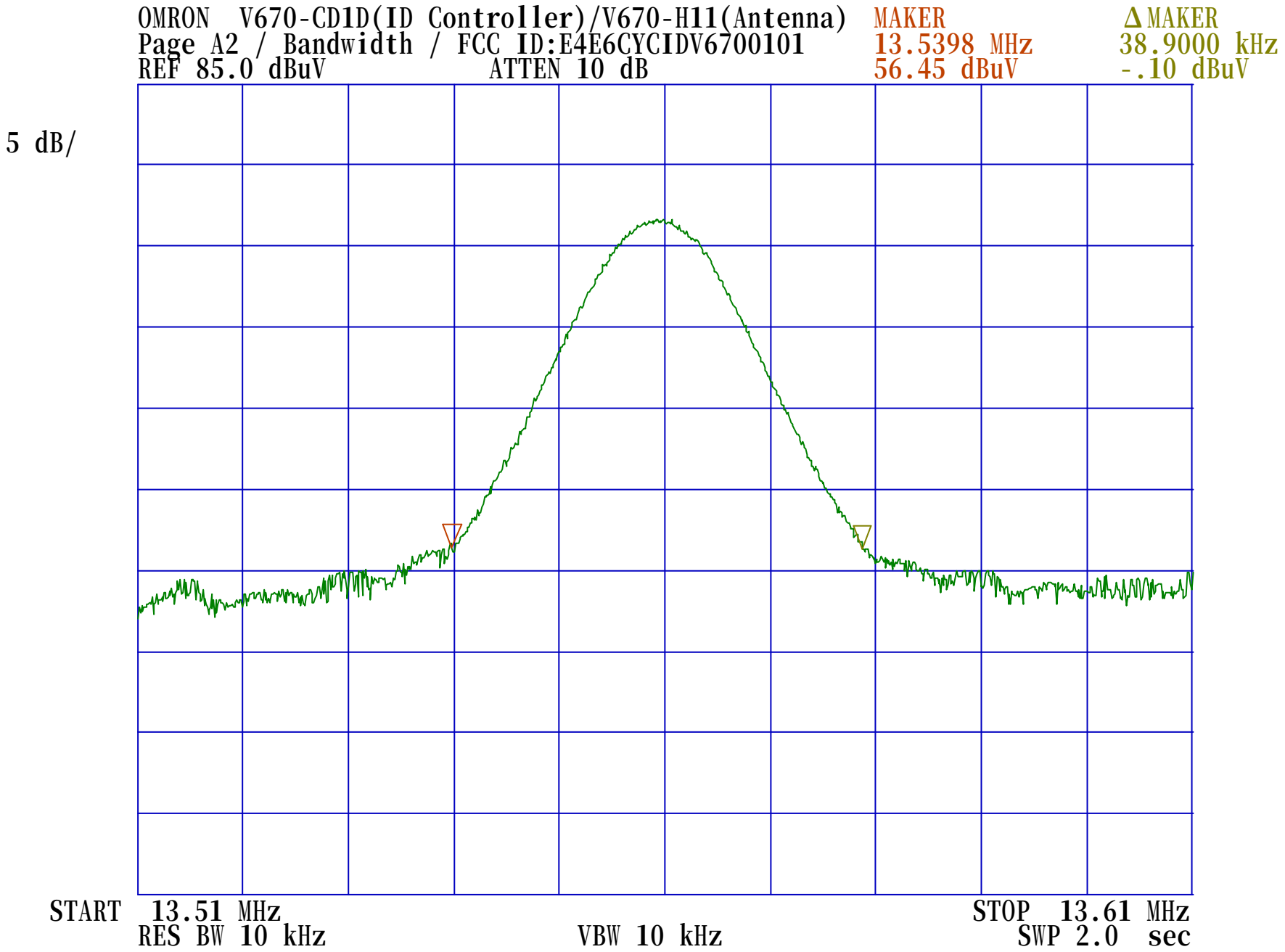
Humidity	:	52 %
Regulation	:	Fcc 15C §15.209(a)

Engineer : Masafumi Inui




OMRON V670-CD1D(ID Controller)/V670-H11(Antenna)
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REF 85.0 dBuV
ATTEN 10 dB
MAKER
13.5398 MHz
56.45 dBuV
ΔMAKER
38.9000 kHz
-.10 dBuV
5 dB/
START 13.51 MHz
RES BW 10 kHz
VBW 10 kHz
STOP 13.61 MHz
SWP 2.0 sec