

EMC TEST REPORT

- FOR CERTIFICATION -

for

SAMSUNG ELECTRONICS CO., LTD.

416, Maetan-3Dong, Paldal-Gu, Suwon City, Kyungki-Do, Korea

Equipment Under Test: CD-R/W Drive
Model Name : SW-216 (Brand Name: SAMSUNG)
<OEM Model : MP7163A, RW7163A / OEM Brand: RICOH >
<OEM Model: RW1650E / OEM Brand: CREATIVE>

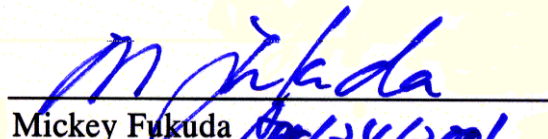
FCC ID: A3LSW216

Category: FCC Part 15 Sub.part B Class B Digital Device

Tokin Report No.: T7E014211

Date of Issue: April 23, 2001

Approved by


Mickey Fukuda
Assistant Manager, Tsukuba Testing Lab.
Tokin EMC Engineering Co., Ltd.

-- ATTENTION --

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1 DESCRIPTION OF DEVICE

A) Kind of Equipment : CD-R/W Drive

B) FCC ID : A3LSW216

5 Model Name : SW-216 (Brand Name: SAMSUNG)
<OEM Model : MP7163A, RW7163A / OEM Brand: RICOH>
<OEM Model: RW1650E / OEM Brand: CREATIVE>

D) Serial No. : None

E) Type of Sample Tested : Pre-production

F) High Frequency Used : 33.86MHz (Endec clock)
18MHz (Micom clock)
270MHz (Pick-up clock)

G) Rating Power Supply : DC5/12V, 1.0/2.0A

H) Tested Power Supply : 1phase AC120V, 60Hz

I) Date of Manufacture : March 2001

5 Manufacturer : SAMSUNG ELECTRONICS CO., LTD.
416, Maetan-3Dong, Paldal-Gu, Suwon City,
Kyungki-Do, Korea

K) Description of Operating : · CD Land Mode (Read Mode)
· Write Mode

L) Date of Sample Received : April 10, 2001

5 Test Engineer : Yasuhiro Umano
Kazunori Maeshima

2 TEST FACILITY

The open field test site and conducted measurement facility are used for these testing, where are located following address. This site was fully described in a report dated Feb.12,1998, that was submitted to the FCC. And we had accepted in a letter dated Mar.30,1998 (31040/SIT). This laboratory is accredited by NVLAP for NVLAP Lab. Code : 200221-0.

Tokin EMC Engineering Co., Ltd.

Tsukuba Testing Laboratory, Open Field Test Site No.1 and Shielded Room No.2

Address ; 28-1, Kitahara-aza, Hanashimashinden-ohaza, Tsukuba-city, Ibaragi 305-0875, Japan

3 SUMMARY OF RESULTS

3.1 Electromagnetic Emission

RFI Voltage Measurement**PASS**

RFI Field Strength Measurement**PASS**

Although the measured emissions indicate that the EUT complies with the required limits, some measurements are close to these limits. When the uncertainty of measurement is considered, there is some possibility that the EUT may not be compliant.

Test results are traceable to JQA, TELEC and NML/CISRO.

3.2 Modifications to The EUT : None

4 TESTED SYSTEM DETAILS

4.1 Peripherals and Others :

Description	Model Name	Serial No.	Manufacturer	FCC ID
Monitor	500-069EV	15025E025537	Gateway	BEJCS592
Keyboard	RT106	A2040643	EPSON	AQ6ZG-RT687XT
Mouse	IntelliMouse 1.1A	0446905-10000	Microsoft	DoC
Printer	3630A	2728A18693	Hewlett Packard	BSD853336030A
Adapter for Printer	3301D	104376603	AT&T Technologies	DoC
Modem	Modem 1414	9068682	ACEEX	IFAXDM1414
Adapter for Modem	SCP41-91000A	None	ACEEX	DoC
USB Game Pad 1	PK-GP101	8500055S	NEC	DoC
USB Game Pad 2	PK-GP101	8500054S	NEC	DoC
Headphone	None	None	SONY	DoC
Microphone 1	None	None	TELEX	DoC
Microphone 2	None	None	None	DoC
Speaker	GL-600	None	None	None

4.2 Type of Used Cables :

Description	Length	Type of shield	Model name	Manufacturer
PC AC cable	2.0m	Non-shielded	None	---
Monitor AC cable	2.0m	Non-shielded	None	---
Modem I/F cable	1.5m	Shielded	None	---
Modem Modular cable	1.0m × 2	Non-shielded	None	---
Printer I/F cable	1.5m	Shielded	None	---

5 TECHNICAL COUNTERMEASURE: None

6 TEST RESULTS

6.1 RFI Voltage Measurement

6.1.1 Measurement Instrumentation Used

(model/serial no./manufacturer/Tokin control no./last calibration/next calibration)

Field strength meter(FCKL1528/1528124/Schwarzbeck/RE039/04 Oct.'00/Oct.'01)
 L.I.S.N.(KNW-407/8-578-14/Kyoritsu/LI012/28 Aug.'00/Aug.'01)
 2nd L.I.S.N(PN-T22/9401/Tokin/LI064/17 Feb.'01/Feb.'02)
 Spectrum analyzer(R3131/81781094/Advantest/SP041/29 Sep.'00/Sep.'01)
 Coaxial cable(---/---/---/DK124/28 Feb.'01/Feb.'02)
 Data entry system.....(TEPTO-REP Ver. 2.20/---/TSJ/---/---/---)
 Software(EP5/CE Ver. 1.30/---/TOYO/---/---/---)
 Shielded Room.....(Tsukuba No.2-S/---/Tokin/SA017/---/---)

These measurement instrumentation are calibrated according to Quality Manual.

6.1.2 Measurement Procedure

The power line conducted interference measurements were performed according to ANSI C63.4-1992 in a shielded enclosure No.2 with peripherals placed on a table, 0.8m high over a metal floor. It was located more than required distance away from the shielded enclosure wall. There are no deviations from the standard.

The EUT was plugged into the LISN and the frequency range of interest scanned.

Reported are maximized emission levels.

These tests were performed at 9kHz of 6dB bandwidth.

Test results had obtained from following equation.

$$\text{Result (dB}\mu\text{V)} = \text{Level (dB}\mu\text{V)} + \text{Total Factor (dB)}$$

<Decision to Pass or Fail>

To judge pass or fail of the test result, it was added “uncertainty” to the obtained data and then subtracted it from the limit value. If all the values are +(plus), it will be passed, and if there is –(minus), it will be failed.

6.1.3 Measurement Uncertainty

Measurement uncertainty of RFI Voltage Measurement test was estimated at $\pm 0.6\text{dB}(k=2)$.

6.1.4 Test Data

Table 6.1-1a RFI Voltage Measurement Results (Q-Peak Measurement)

Operating mode: CD Land Mode (Read Mode) Date of measurement: April 13, 2001
Test procedure: ANSI C63.4-1992 Temperature: 21 degree C
Humidity: 52 %

	Frequency (MHz)	Level (dBmV)	Total Factor(dB)	Result (dBmV)	Limit (dBmV)	Margin (dB)
L1-E	0.213	46.0	0.0	46.0	63.1	17.1
	0.321	36.0	0.0	36.0	59.7	23.7
	0.535	36.0	0.1	36.1	56.0	19.9
	4.182	38.0	0.3	38.3	56.0	17.7
	13.293	41.0	0.5	41.5	60.0	18.5
	27.646	33.0	0.9	33.9	60.0	26.1
N-E	0.213	48.0	0.0	48.0	63.1	15.1
	0.321	35.0	0.0	35.0	59.7	24.7
	0.535	27.0	0.1	27.1	56.0	28.9
	4.182	30.0	0.3	30.3	56.0	25.7
	13.293	41.0	0.5	41.5	60.0	18.5
	27.646	39.0	0.9	39.9	60.0	20.1

Table 6.1-1b RFI Voltage Measurement Results (Average Measurement)

Operating mode: CD Land Mode (Read Mode) Date of measurement: April 13, 2001
Test procedure: ANSI C63.4-1992 Temperature: 21 degree C
Humidity: 52 %

	Frequency (MHz)	Level (dBmV)	Total Factor(dB)	Result (dBmV)	Limit (dBmV)	Margin (dB)
L1-E	0.213	44.5	0.0	44.5	53.1	8.6
	0.321	34.0	0.0	34.0	49.7	15.7
	0.535	35.5	0.1	35.6	46.0	10.4
	4.182	33.5	0.3	33.8	46.0	12.2
	13.293	31.0	0.5	31.5	50.0	18.5
	27.646	27.0	0.9	27.9	50.0	22.1
N-E	0.213	40.0	0.0	40.0	53.1	13.1
	0.321	25.0	0.0	25.0	49.7	24.7
	0.535	25.0	0.1	25.1	46.0	20.9
	4.182	30.0	0.3	30.3	46.0	15.7
	13.293	33.0	0.5	33.5	50.0	16.5
	27.646	33.0	0.9	33.9	50.0	16.1

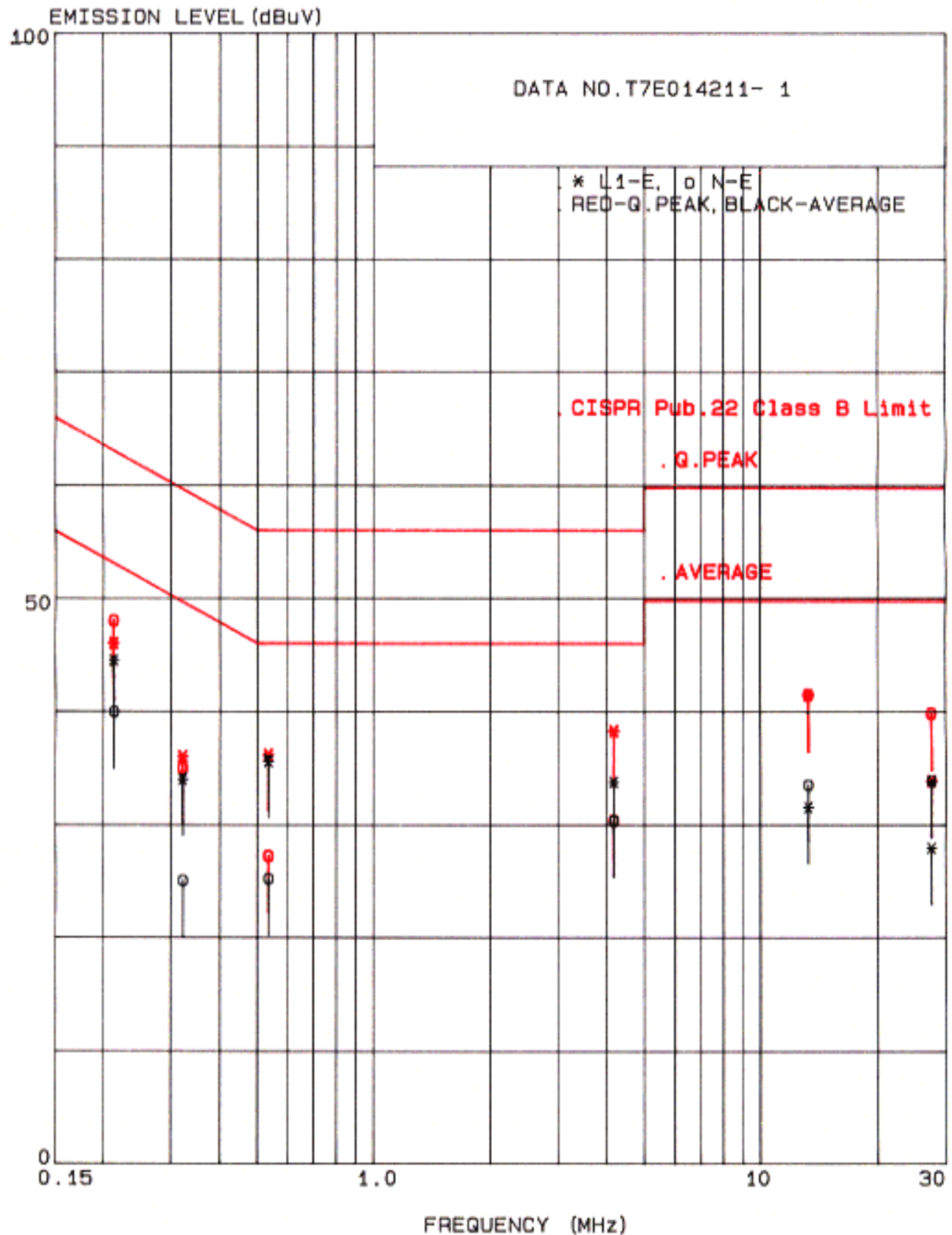


Figure 6.1-1 RFI Voltage Measurement Results

Table 6.1-2a RFI Voltage Measurement Results (Q-Peak Measurement)

Operating mode: Write Mode

Date of measurement: April 13, 2001

Test procedure: ANSI C63.4-1992

Temperature: 21 degree C

Humidity: 52 %

	Frequency (MHz)	Level (dBmV)	Total Factor(dB)	Result (dBmV)	Limit (dBmV)	Margin (dB)
L1-E	0.213	46.0	0.0	46.0	63.1	17.1
	0.320	36.0	0.0	36.0	59.7	23.7
	0.535	35.0	0.1	35.1	56.0	20.9
	4.182	39.0	0.3	39.3	56.0	16.7
	13.293	41.0	0.5	41.5	60.0	18.5
	27.646	33.0	0.9	33.9	60.0	26.1
N-E	0.213	47.5	0.0	47.5	63.1	15.6
	0.320	35.0	0.0	35.0	59.7	24.7
	0.535	35.0	0.1	35.1	56.0	20.9
	4.182	30.0	0.3	30.3	56.0	25.7
	13.293	41.5	0.4	41.9	60.0	18.1
	27.646	39.0	0.9	39.9	60.0	20.1

Table 6.1-2b RFI Voltage Measurement Results (Average Measurement)

Operating mode: Write Mode

Date of measurement: April 13, 2001

Test procedure: ANSI C63.4-1992

Temperature: 21 degree C

Humidity: 52 %

	Frequency (MHz)	Level (dBmV)	Total Factor(dB)	Result (dBmV)	Limit (dBmV)	Margin (dB)
L1-E	0.213	45.0	0.0	45.0	53.1	8.1
	0.320	35.0	0.0	35.0	49.7	14.7
	0.535	30.0	0.1	30.1	46.0	15.9
	4.182	34.0	0.3	34.3	46.0	11.7
	13.293	31.0	0.5	31.5	50.0	18.5
	27.646	27.0	0.9	27.9	50.0	22.1
N-E	0.213	41.0	0.0	41.0	53.1	12.1
	0.320	26.0	0.0	26.0	49.7	23.7
	0.535	31.0	0.1	31.1	46.0	14.9
	4.182	30.0	0.3	30.3	46.0	15.7
	13.293	33.0	0.4	33.4	50.0	16.6
	27.646	33.0	0.9	33.9	50.0	16.1

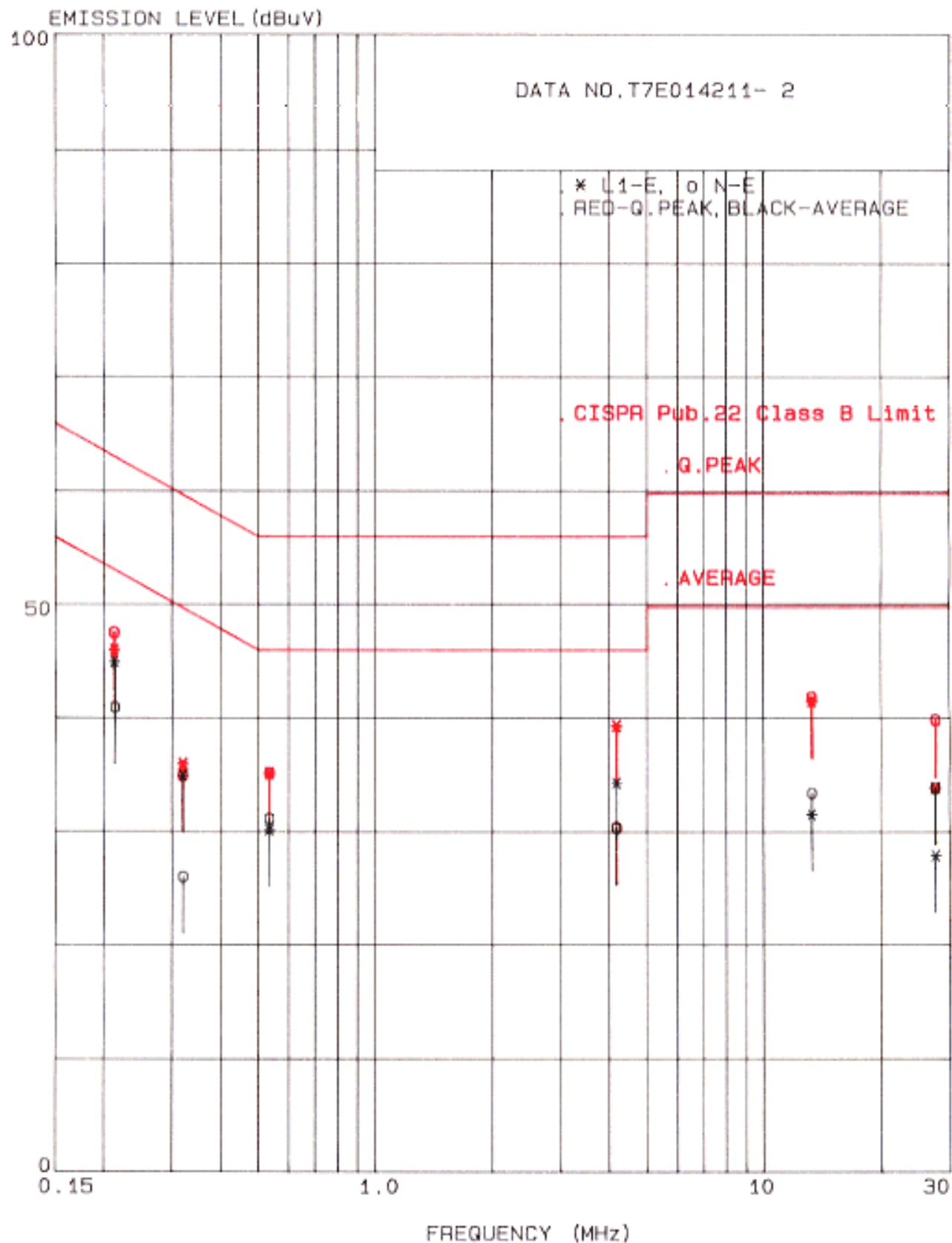


Figure 6.1-2 RFI Voltage Measurement Results

6.2 RFI Field Strength Measurement

6.2.1 Measurement Instrumentation Used

(model/serial no./manufacturer/Tokin control no./last calibration/next calibration)

<30MHz ~ 1000MHz>

Field strength meter (FCVU1534/130/Schwarzbeck/RE047/25 Dec.'00/Dec.'01)
 Biconical antenna..... (BBA9106/---/Schwarzbeck/TB003/11 Aug.'00/Aug.'01)
 Logperiodic antenna (UHALP9108-A/0109/Schwarzbeck/TL018/10 Aug.'00/Aug.'01)
 Pre-amplifier (8447D/2727A05897/Hewlett Packard/AM001/25 Sep.'00/Sep.'01)
 Spectrum analyzer (R3261A/01720142/Advantest/SP012/10 Jan.'01/Jan.'02)
 Coaxial switch unit (MP59B/M95585/Anritsu/ME029/21 Sep.'00/Sep.'01)
 Coaxial cable (---/CL1/---/DK085/24 Jul. '00/Jul.'01)
 Data entry system (TEPTO-REP Ver. 2.20/---/TSJ/---/---/---)
 Open Field Test Site..... (Tsukuba No.1/---/Tokin/SA001/28 Jun.'00/Jun.'01)

< 1000MHz ~ 2000MHz >

Pre-amplifier (8449B/3008A00681/Hewlett Packard/rental/22 Nov.'00/Nov.'01)
 Double ridge
 guide horn antenna..... (3115/90053420/EMCO/AN003/19 Mar.'01/Mar.'02)
 Spectrum analyzer (8563E/3450A02894/Hewlett Packard/SP036/20 Sep.'00/Sep.'01)
 Coaxial cable (SUCOFLEX 104/144326-4/SUCOFLEX/DK176/26 Apr.'00/Apr.'01)
 Coaxial cable (SUCOFLEX 104/147075-4/SUCOFLEX/DK177/26 Apr.'00/Apr.'01)
 Coaxial cable (SUCOFLEX 104/149621-4/SUCOFLEX/DK178/26 Apr.'00/Apr.'01)
 Open Field Test Site..... (Tsukuba No.1/---/Tokin/SA001/28 Jun.'00/Jun.'01)

These measurement instrumentation are calibrated according to Quality Manual.

6.2.2 Measurement Procedure

Final test was performed according to ANSI C63.4-1992 at the open field test site No.1. There are no deviations from the standard.

The EUT was placed in a 0.8m high table along with the peripherals. The turn table was separated from the antenna distance 10meters. Cables were placed in a position to produce maximum emissions as determined by experimentation, and operation mode was selected for maximum.

The frequencies and amplitudes of maximum emission were measured at varying azimuths, antenna heights and antenna polarities. Reported are maximized emission levels.

These tests were performed at 120kHz of 6dB bandwidth.

Test results had obtained from following equation.

$$\text{Result (dB}\mu\text{V/m)} = \text{Level (dB}\mu\text{V)} + \text{Ant. Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Amp. Gain (dB)}$$

<Decision to Pass or Fail>

To judge pass or fail of the test result, it was added “Uncertainty” to the obtained data and then subtracted it from the limit value. If all the values are +(plus), it will be passed and if there is –(minus), it will be failed.

6.2.3 Measurement Uncertainty

Measurement uncertainty of RFI Field Strength Measurement test was estimated at $\pm 2.8\text{dB}(k=2)$.

6.2.4 Test Data

Table 6.2-1 RFI Field Strength Measurement Results (Q-Peak Measurement)

Operating mode: CD Land Mode (Read Mode)
Test procedure: ANSI 63.4-1992

Date of measurement: April 12, 2001
Temperature: 24 degree C
Humidity: 58 %

Frequency (MHz)	Level		Ant. Factor (dB/m)	Cable Loss (dB)	Amp. Gain (dB)	Result		10 Meter Limit (dBmV/m)	Margin	
	Ver. (dBmV)	Hor. (dBmV)				Ver. (dBmV/m)	Hor. (dBmV/m)		Ver. (dB)	Hor. (dB)
45.00	38.0	34.5	11.6	1.2	26.3	24.5	21.0	30.0	5.5	9.0
99.93	37.5	36.0	10.3	1.9	26.1	23.6	22.1	30.0	6.4	7.9
180.25	29.0	32.5	15.5	2.5	25.8	21.2	24.7	30.0	8.8	5.3
317.00	39.0	35.0	15.1	3.5	25.5	32.1	28.1	37.0	4.9	8.9
480.14	36.5	38.0	16.7	4.4	26.6	31.0	32.5	37.0	6.0	4.5
729.26	32.0	32.5	18.8	5.7	27.1	29.4	29.9	37.0	7.6	7.1

1000.00

Test results were under the required limit with 20dB margin or more.

2000.00

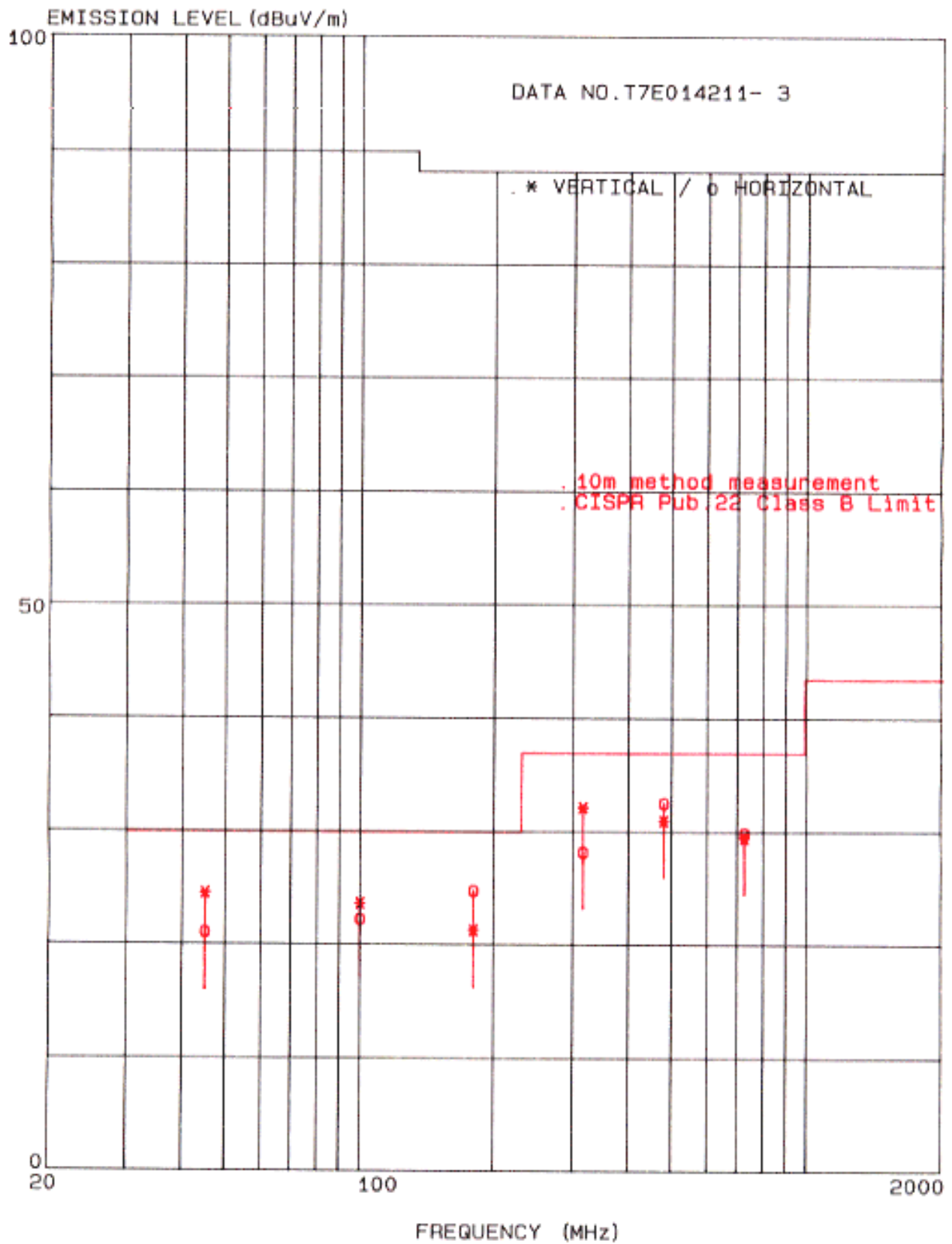


Figure 6.2-1 RFI Field Strength Measurement Results

Table 6.2-2 RFI Field Strength Measurement Results (Q-Peak Measurement)

Operating mode: Write Mode

Date of measurement: April 12, 2001

Test procedure: ANSI C63.4-1992

Temperature: 24 degree C

Humidity: 58 %

Frequency (MHz)	Level		Ant. Factor (dB/m)	Cable Loss (dB)	Amp. Gain (dB)	Result		10 Meter Limit (dBmV/m)	Margin	
	Ver. (dBmV)	Hor. (dBmV)				Ver. (dBmV/m)	Hor. (dBmV/m)		Ver. (dB)	Hor. (dB)
45.00	38.0	35.0	11.6	1.2	26.3	24.5	21.5	30.0	5.5	8.5
99.93	37.0	36.0	10.3	1.9	26.1	23.1	22.1	30.0	6.9	7.9
347.00	39.0	35.0	15.5	3.6	25.8	32.3	28.3	37.0	4.7	8.7
480.14	36.0	39.0	16.7	4.4	26.6	30.5	33.5	37.0	6.5	3.5
598.55	33.0	32.0	17.4	5.1	27.2	28.3	27.3	37.0	8.7	9.7
729.26	32.0	32.5	18.8	5.7	27.1	29.4	29.9	37.0	7.6	7.1

1000.00

Test results were under the required limit with 20dB margin or more.

2000.00

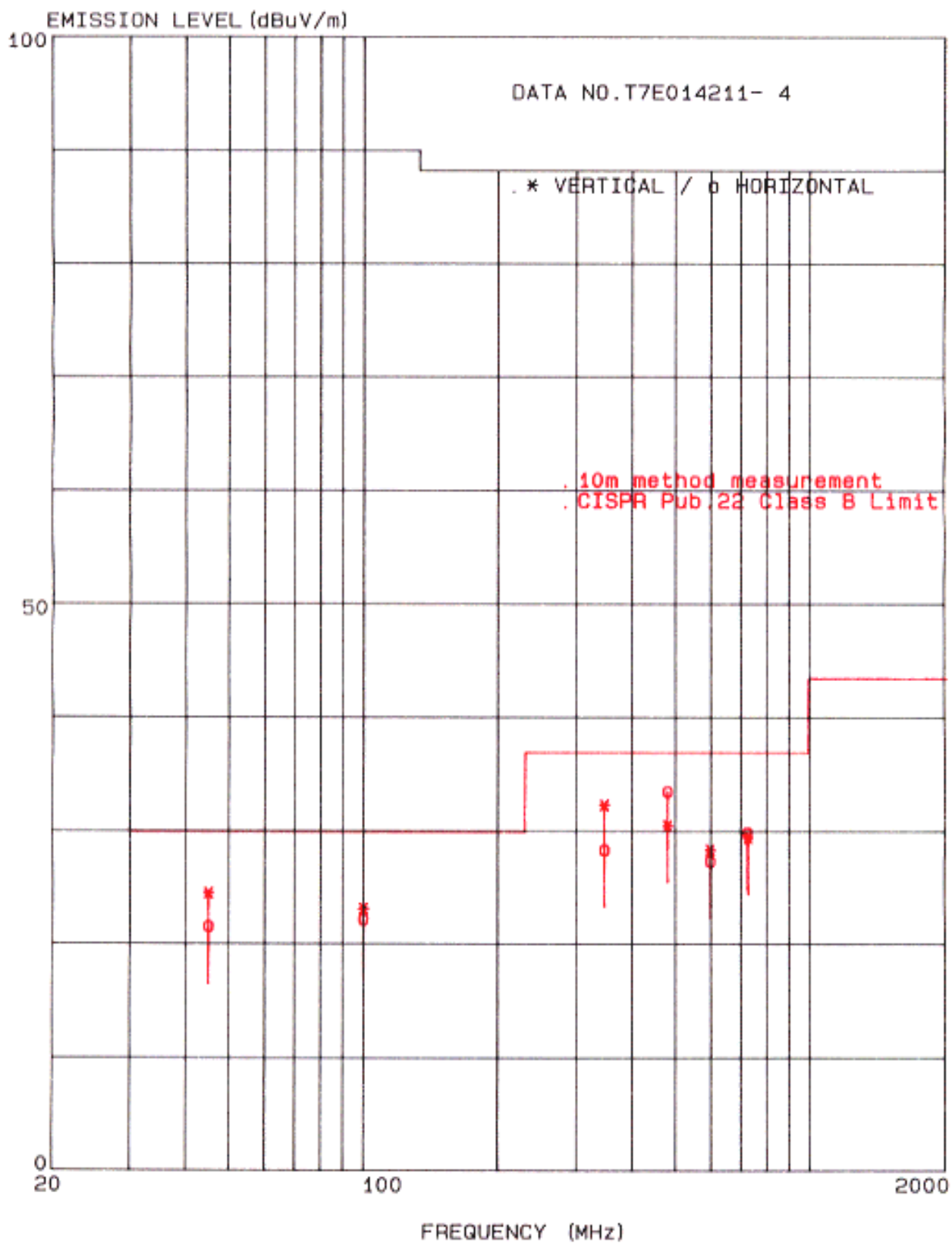


Figure 6.2-2 RFI Field Strength Measurement Results

6.3 Minimum Margin

Table 6.3-1 Minimum Margin

<u>Conducted emission</u>					
Write	operation mode	0.213	MHz,	8.1	dB
<u>Radiated emission</u>					
Write	operation mode	480.14	MHz,	3.5	dB

6.4 Sample Calculation

Table 6.4-1 Sample Calculation

The maximum radiating emission can be obtained at the frequency of **480.14** MHz,
Horizontal polarization on **Write** operation mode.

Each value at frequency is as follows;

R :	Field strength meter reading	=	39.0	(dBμV)
A :	Antenna factor	=	16.7	(dB/m)
C :	Cable loss	=	4.4	(dB)
G :	Amplifier gain	=	26.6	(dB)

Then radiated emission E(dBμV/m) is ;

$$E = R + A + C - G$$

Therefore, the maximum radiated emission is ;

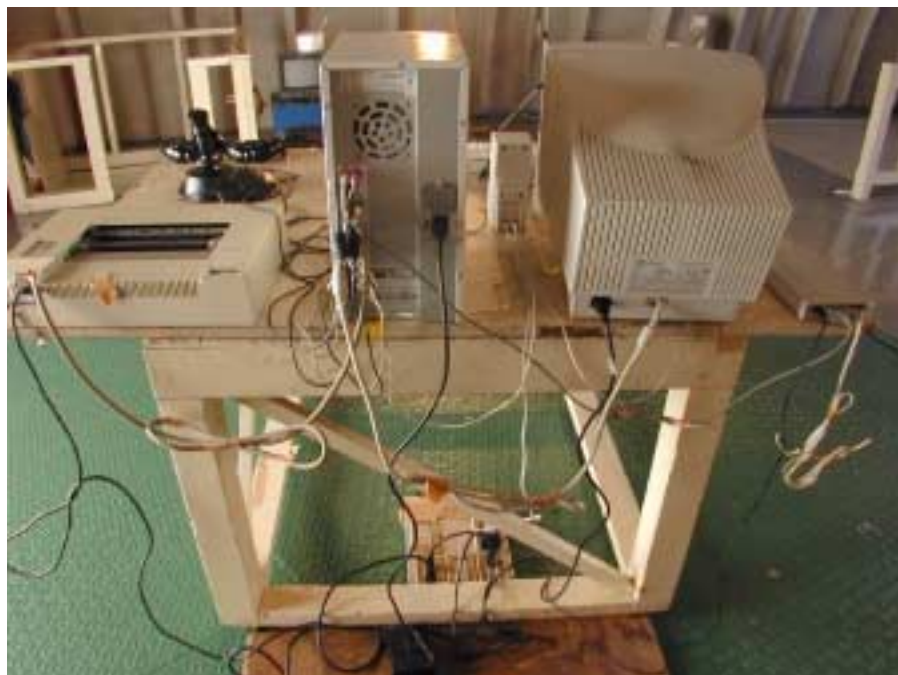
33.5 (dBμV/m)

7 MEASUREMENT PHOTOS

Photo 7.1 Setup with the Maximized RFI Voltage Emission Level



Photo 7.2 Setup with the Maximized RFI Field Strength Emission Level



1. The first step in the process is to identify the problem or issue that needs to be addressed.

2. The second step is to gather information and data related to the problem.

3. The third step is to analyze the information and data to identify the root cause of the problem.

4. The fourth step is to develop a plan of action to address the problem.

5. The fifth step is to implement the plan of action and monitor the results.

6. The sixth step is to evaluate the results and make adjustments as needed.

7. The seventh step is to document the process and results for future reference.

8. The eighth step is to communicate the results to the relevant stakeholders.

9. The ninth step is to review the process and make improvements as needed.

10. The tenth step is to ensure that the problem is resolved and the process is completed.

APPENDIX Photograph of EUT

