COSMOS

MEASUREMENT/TECHNICAL REPORT
FCC PART 15, Class B (ANSI C63.4:1992)

Issued: April 12, 1998

Name and Address of: the Client	Matsushita Electric Industrial Co., Ltd.
Phone / Fax	6-4-1 Tsujidomotomachi, Fujisawa-shi, Kanagawa-ken, 251-0043 Japan
	0466-34-3111 / 0466-35-5557
Test Item:	Digital Color Display
FCC ID:	GSS17029
Identification:	VCDTS21433-**
Serial No.:	FX8220004
Sample No.:	1
Sample Receipt Date:	April 10, 1998
Test Result:	PASS

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Reviewed by: K. SHIBATA — K. Shibata — Date: April. 12. 1998

Note:
1. This report should not be reproduced except in full without the written approval of Cosmos Corporation.
2. This test report is issued by private test house (Cosmos Corp.), therefore NVLAP or US government does not endorse a reliability of this report.
3. All measurement data contained in this report may have uncertainty. A judgement for the Limitation should be taken into the count. Refer to the Appendix for the model calculation.

Table of Contents

1. General Information

1.1 Product Description

The Matsushita Electric Industrial Co., Ltd., Model VCDTS21433-** (referred to as the EUT in this report) is a Digital Color Display.

Rated input voltage is AC 120V.

EUT is featuring a 24 MHz processor.

1.2 Related Submittal(s)/Grant(s)

Related Submittal Grant is not conered in this report.

1.3 Tested System Details

The FCC IDs for all equipment, plus descriptions of all cables used in the tested system(including inserted cards, which have grants) are:

Model No.	Serial No.	FCC ID	Description	Cable Description
VCDTS21433-**	FX8220004	GSS17029 (Doc)	EUT (Digital Color Display)	AC Power Cord 1.8m Unshielded Video I/F Cable 1.8m Shielded 4/2 FERRITE CORES
D3762A (Vectra VL5/100)	SG60901315	HCJVECTRAVL5	Personal Computer	AC Power Cord 1.5m Unshielded
C4565A	SG73I140TZ	B94C4555X	Printer	AC Power Cord 1.8m Unshielded Printer Cable 3.0m Shielded
FKB8720	L1009563	C9SKB8720	Keyboard	Keyboard I/F Cable 1.8m Unshielded
C1413A	3418M13043	B94C1413X	Mouse	Mouse I/F Cable 1.9m Unshielded
C202A	010808	BKM552C202A	Modem	DC Power Cord 1.9m Unshielded Modem I/F Cable 1.0m Shielded
PAC70-2.5	1390048	N/A	Regulated DC Power Supply	AC Power Cord 2.4m Unshielded

1. General Information (Continued)

1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4:1992. Radiated testing was performed at an antenna to EUT distance of 10 meters. Final Result was converted in 3m, using 20 log 10m / 3m.

1.5 Test Facility

The open area test site, Cosmos EMC Lab., and conducted measurement facility used to the radiated data is located at 543 Shimesasu, Watarai-cho, Watarai-gun, Mie-ken, 516-2119, Japan. This site has been fully described in a report dated May 23, 1996 submitted to FCC, and accepted in a letter dated July 10, 1996 (31040/SIT 1300F2).

2. System Test Configuration

2.1 Justification

EUT was measured by max radiation mode user specified.
The measurement was conducted for the resolution 1280×1024 and 640×480.

Following is the worst condition:

Conducted Emission:	1280×1024
	Dot Clock Frequency: 108 MHz
	Horizontal Frequency: 64 kHz
	Vertical Frequency: 60 Hz
Radiated Emission:	1280×1024
	Dot Clock Frequency: 108 MHz
	Horizontal Frequency: 64 kHz
	Vertical Frequency: 60 Hz

2.2 EUT Exercise Software

EUT did not exercise program during radiated and conducted testing.

2.3 Special Accessories

This cable model and part numbers are instructed with their installation manual.

2.4 Equipment Modifications

No equipment modification to achieve compliance to Class B levels was done during test.

2. System Test Configuration (Continued)

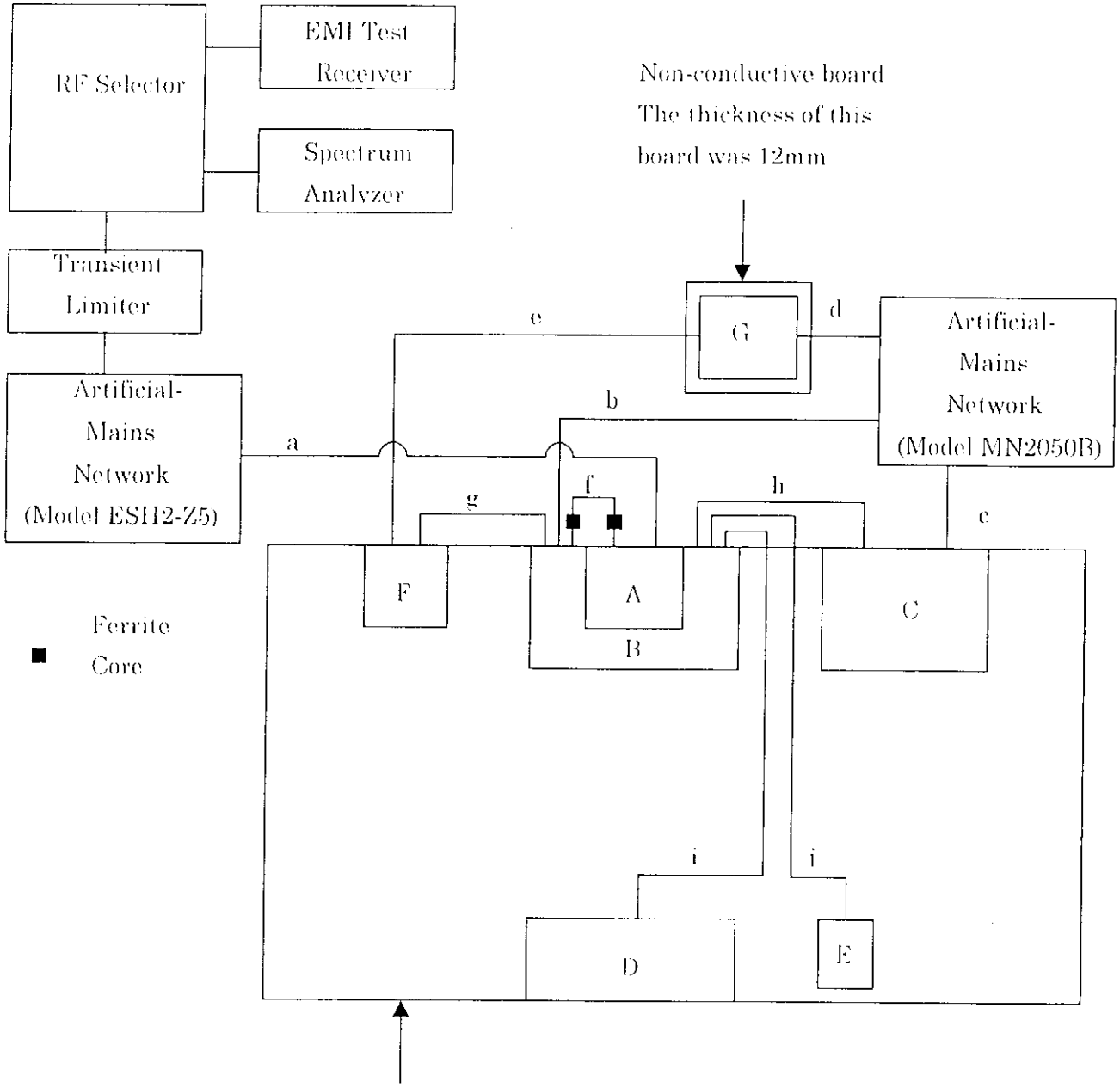
2.5 Configuration of Tested System

	Instrument		Cord / Cable
A)	EUT	a)	AC Power Cord 1.8m Unshielded
B)	Personal Computer	b)	AC Power Cord 1.5m Unshielded
C)	Printer	c)	AC Power Cord 1.8m Unshielded
D)	Keyboard	d)	AC Power Cord 2.4m Unshielded
E)	Mouse	e)	DC Power Cord 1.9m Unshielded
F)	Modem	f)	Video I/F Cable 1.8m Shielded with 2 ferrite cores
G)	Regulated DC Power Supply	g)	Modem I/F Cable 1.0m Shielded
		h)	Printer Cable 3.0m Shielded
		i)	Keyboard I/F Cable 1.8m Unshielded
		j)	Mouse I/F Cable 1.9m Unshielded

2. System Test Configuration (Continued)

2.5 Configuration of Tested System (Continued)

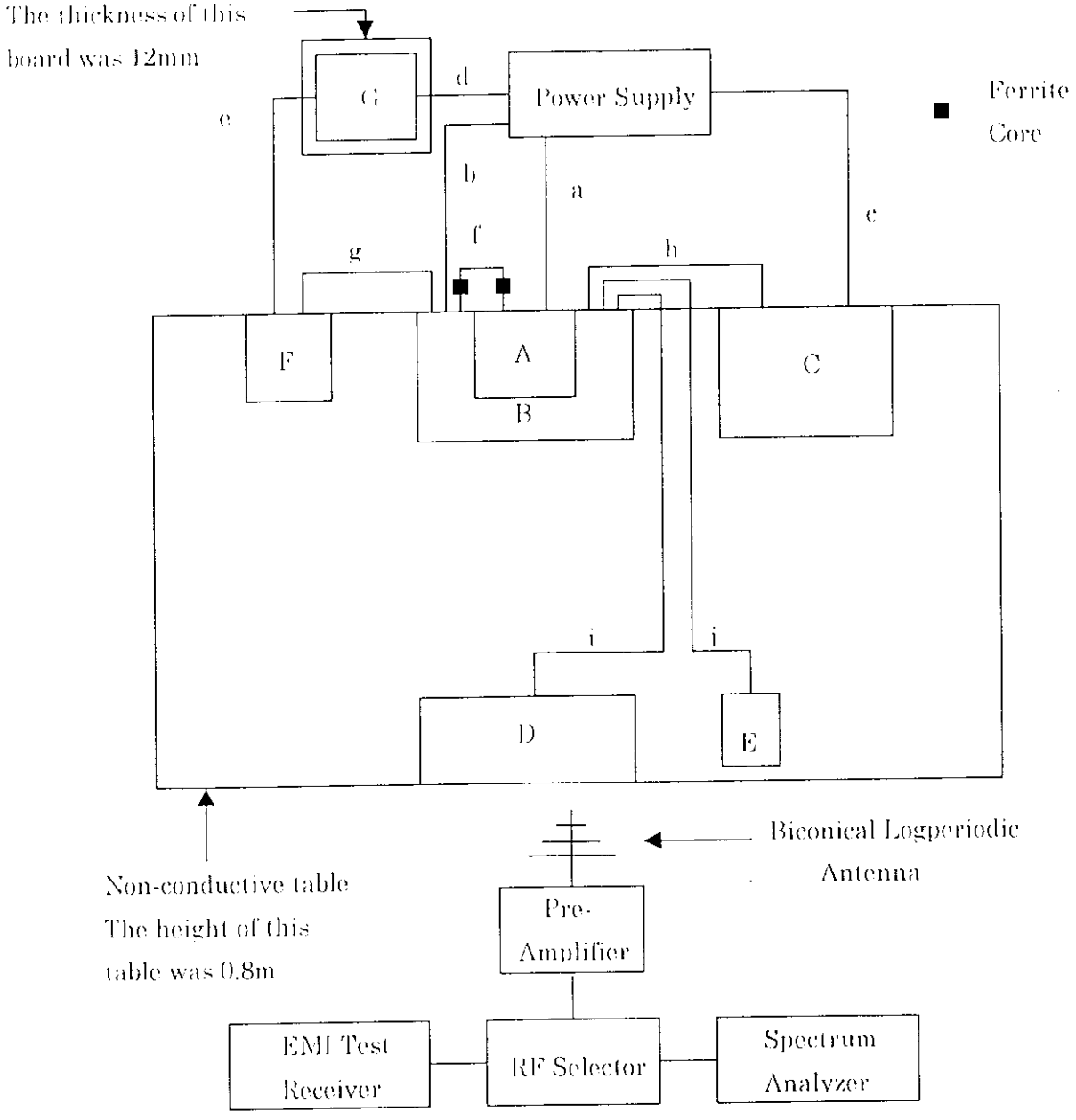
Conducted Emission



2. System Test Configuration (Continued)

2.5 Configuration of Tested System (Continued)

Radiated Emission



2. System Test Configuration (Continued)

2.5 Configuration of Tested System (Continued)

Conducted Emission

1) EUT is put on the Personal Computer.
2) Personal Computer and Modem located at 0.1m intervals.
3) Personal Computer and Printer located at 0.1m intervals.
4) Keyboard and Mouse located at 0.1m intervals.
5) Regulated DC Power Supply is put on the Non-conductive board.
6) EUT is connected to Artificial-Mains Network (Model ESH2-Z5) by the AC Power Cord.
7) Personal Computer is connected to Artificial-Mains Network (Model MN2050B) by the AC Power Cord.
8) Printer is connected to Artificial-Mains Network (Model MN2050B) by the AC Power Cord.
   Extended Cord was folded at the center of Cord by 0.35m length. and the Cord was hung in the middle between ground and table.
9) Regulated DC Power Supply is connected to Artificial-Mains Network (Model MN2050B) by the AC Power Cord.
10) Modem is connected to Regulated DC Power Supply by the DC Power Cord.
    Extended Cord was folded at the center of Cord by 0.3m length. and the Cord was hung in the middle between ground and table.
11) EUT is connected to Personal Computer by the Video I/F Cable.
    Extended Cable was folded at the center of Cable by 0.3m length. and the Cable was hung in the middle between ground and table.
12) Personal Computer is connected to Modem by the Modem I/F Cable.
    The Cable was hung down.
13) Personal Computer is connected to Printer by the Printer Cable.
    Extended Cable was folded at the center of Cable by 0.4m length. and the Cable was hung in the middle between ground and table.
14) Personal Computer is connected to Keyboard by the Keyboard I/F Cable.
15) Personal Computer is connected to Mouse by the Mouse I/F Cable.

2. System Test Configuration (Continued)

2.5 Configuration of Tested System (Continued)

Radiated Emission

1) EUT is put on the Personal Computer.
2) Personal Computer and Modem located at 0.1m intervals.
3) Personal Computer and Printer located at 0.1m intervals.
4) Keyboard and Mouse located at 0.1m intervals.
5) Regulated DC Power Supply is put on the Non-conductive board.
6) EUT is connected to Power Supply by the AC Power Cord.
Extended Cord was folded at the center of Cord by 0.35m length.
and the Cord was hung in the middle between ground and table.
7) Personal Computer is connected to Power Supply by the AC Power Cord.
Extended Cord was folded at the center of Cord by 0.4m length.
and the Cord was hung in the middle between ground and table.
8) Printer is connected to Power Supply by the AC Power Cord.
Extended Cord was folded at the center of Cord by 0.35m length.
and the Cord was hung in the middle between ground and table.
9) Regulated DC Power Supply is connected to Power Supply by the AC Power Cord.
10) Modem is connected to Regulated DC Power Supply by the DC Power Cord.
Extended Cord was folded at the center of Cord by 0.4m length.
and the Cord was hung in the middle between ground and table.
11) EUT is connected to Personal Computer by the Video I/F Cable.
Extended Cable was folded at the center of Cable by 0.3m length.
and the Cable was hung in the middle between ground and table.
12) Personal Computer is connected to Modem by the Modem I/F Cable.
The Cable was hung down.
13) Personal Computer is connected to Printer by the Printer Cable.
Extended Cable was folded at the center of Cable by 0.4m length.
and the Cable was hung in the middle between ground and table.
14) Personal Computer is connected to Keyboard by the Keyboard I/F Cable.
15) Personal Computer is connected to Mouse by the Mouse I/F Cable.

5. Radiated Emission Data (Continued)

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF +CF − AG

where FS = Field Strength

RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier Gain

Assume a receiver reading of 52.5 dBuV is obtained. The Antenna Factor of 7.4 and a Cable Factor of 1.1 is added. The Amplifier Gain of 29 dB is subtracted, giving a field strength of 32 dBuV/m. The 32 dBuV/m value was mathematically converted to its corresponding level in uV/m.

FS = 52.5+ 7.4 + 1.1 - 29 =32 dBuV/m

Level in uV/m = Common Antilogarithm [(32 dBuV/m)/20] = 39.8 uV/m

6. List of Test and Measurement Instruments

Conducted Emission

Manufacturer	Instruments	Model / Type	Serial No.	Calibration Date Next Calibration
ROHDE & SCHWARZ	Spectrum Analyzer	FSB / DISPLAY	838497/005 / 838301/009	May. 1997 May. 1998
ROHDE & SCHWARZ	EMI Test Receiver	ESHS10	842121/012	April. 1997 April. 1998
ROHDE & SCHWARZ	Artificial-Mains Network	ESH2-Z5	842210/010	May. 1997 May. 1998
CHASE ELECTRONICS LIMITED	Artificial-Mains Network	MN2050B	1140	April. 1997 April. 1998

Radiated Emission

Manufacturer	Instruments	Model / Type	Serial No.	Calibration Date Next Calibration
ROHDE & SCHWARZ	Spectrum Analyzer	FSB / DISPLAY	838497/005 / 838301/009	May. 1997 May. 1998
ROHDE & SCHWARZ	EMI Test Receiver	ESVS10	842122/014	April. 1997 April. 1998
CHASE ELECTRONICS LIMITED	Pre-Amplifier	CPA9231	3045	February. 1998 February. 1999
CHASE ELECTRONICS LIMITED	Biconical Logperiodic Antenna	CBL6111B	2051	November. 1997 November. 1998

7. The Treatment of Uncertainty In EMC Measurement

Uncertainty Budget

5. Radiated Emission Data

The following data lists the significant emission frequencies, measured levels, correction factor (includes cable and antenna corrections), the corrected reading, plus the limit. Explanation of the Correction Factor is given in paragraph.

Frequency (MHz)	Polarity (H/V)	Receiver * Reading (dB μ V)	Correction Factor (dB/m)	Corrected Reading (dB μ V/m)	3 Meter Limit (dB μ V/m)
35.094	Vertical	47.7	-13.1	34.6	40.0
40.164	Vertical	52.9	-15.4	37.5	40.0
42.410	Vertical	50.4	-16.7	33.7	40.0
45.619	Vertical	48.9	-18.5	30.4	40.0
145.832	Vertical	52.6	-16.1	36.5	43.5
192.006	Vertical	54.1	-17.9	36.2	43.5

*All readings are quasi-peak unless stated otherwise, with an IF bandwidth of 120 kHz, along with an 1 S sweep time. A video filter was not used.

Environment:

Temperature	29 °C
Humidity	35 %

Tested Personnel:

Tester Signature Hiroshi Nakagawa

7.1 Radiated Emission

Measurement of vertically polarised field strength between 30 dB μ V/m and 60 dB μ V/m over the frequency range 30 MHz to 1 GHz on an open area test site at 10m and 30m

Contribution	Probability Distribution	Uncertainty ± (dB)	
		Biconical Logperiodic Antenna	
		10m	30m
Ambient Signals		-	
Antenna factor calibration	normal (k = 2)	1.0	1.0
Cable loss calibration	normal (k = 2)	0.5	0.8
Receiver specification	rectangular	1.5	1.5
Antenna directivity	rectangular	0.3	0
Antenna factor variation with height	rectangular	2.2	2.2
Antenna phase centre variation	rectangular	0.2	0.1
Antenna factor frequency interpolation	rectangular	0.2	0.2
Measurement distance variation	rectangular	0.4	0.2
Site imperfections	rectangular	1.5	1.5
Mismatch Receiver VRC: Γ_1= 0.2 Antenna VRC: Γ_R=0.67 (Bi) 0.3 (Lp) Uncertainty limits 20Log (1 ± $\Gamma_1 \Gamma_R$)	U-shaped	1.1	1.1
System repeatability (previous assessment of s(q_k) from 5 repeats, 1 reading on EUT)	Std Deviation	0.5	0.5
Repeatability of EUT*			-
Combined standard uncertainty u_c (y)	normal	2.09	2.098
Expanded uncertainty U	normal (k = 2)	4.18	4.197

7.1 Radiated Emission (Continued)

Calculation for 10m biconical Logperiodic antenna, positive value:

$$u_c(y) = \sqrt{\left(\frac{1.0}{2}\right)^2 + \left(\frac{0.5}{2}\right)^2 + \frac{1.5^2 + 0.3^2 + 2.2^2 + 0.2^2 + 0.2^2 + 0.4^2 + 1.5^2}{3} + \frac{1.1^2}{2} + 0.5^2}$$

k=2:

$$U = 2\,u_c(y) = 2 \times \pm 2.09 = \pm 4.18 \text{ dB}$$

7.2 Conducted Emission

Measurement of conducted emissions between 30 dB μ V and 60 dB μ V over the frequency range 9 kHz to 30 MHz .

Contribution	Probability Distribution	Uncertainty (±dB)	
		9 kHz - 150 MHz	150 - 30 MHz
Receiver specification	rectangular	1.3	1.3
LISN coupling specification	rectangular	1.3	1.3
Cable and input attenuator calibration	normal (k = 2)	0.3	0.5
Mismatch Receiver VRC: Γ_1= 0.03 LISN VRC: Γ_g=0.8 (9 kHz) 0.2 (30 MHz) Uncertainty limits 20Log (1± $\Gamma_1 \Gamma_g$)	U-shaped	0.2	0.05
System repeatability (previous assessment of s(q_k) from 10 repeats, 1 reading on EUT)	Standard dev.	0.2	0.35
Repeatability of EUT*			
Combined standard uncertainty u_c (y)	normal	1.12	1.13
Expanded uncertainty U	normal (k = 2)	2.24	2.26

Calculation for 9 kHz to 150 kHz range:

$$u_c(y) = \sqrt{\frac{1.3^2 + 1.3^2}{3} + \left(\frac{0.3}{2}\right)^2 + \frac{0.2^2}{2} + 0.2^2} = \pm 1.12 \text{ dB}$$

k=2:

$$U = 2 \times u_c(y) = 2 \times \pm 1.12 = \pm 2.24 \text{ dB}$$

8. Attachment

- User Manual

4. Conducted Emission Data

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

		Frequency (MHz)	Measured * (dB μ V)	Limit (dB μ V)
Neutral	Line	0.45000	37.1	48.0
Neutral	Line	10.07426	34.3	48.0
Neutral	Line	14.36592	25.2	48.0
Neutral	Line	15.46180	37.7	48.0
Neutral	Line	20.65990	35.7	48.0
Neutral	Line	27.39461	34.3	48.0
L	Line	0.45146	36.5	48.0
L	Line	0.57699	31.4	48.0
L	Line	7.95606	33.7	48.0
L	Line	9.68834	36.5	48.0
L	Line	15.33305	37.3	48.0
L	Line	28.10156	35.9	48.0

* All readings are quasi-peak unless stated otherwise.

Environment:

Temperature 28 °C
Humidity 53 %

Tested Personnel:

Tester Signature Hiroshi Wakabayashi

Typed/Printed Name Hiroshi Wakabayashi