

EMC TEST REPORT

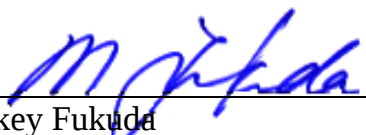
for

Hitachi Maxell, Ltd.

6139-1 Ohnogo, Mitsukaido-shi, Ibaraki-ken,
300-2595 Japan

Equipment Under Test: Digital Pen
Model Name : DP-101U
Category: FCC Part 15 Sub.part B Class B Digital Device
Token Report No.: TAE036054
Date of Issue: June 27, 2003

Approved by


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

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1 DESCRIPTION OF DEVICE

- A) Kind of Equipment : Digital Pen
- B) FCC ID : None
- C) Model Name : DP-101U
- D) Serial No. : None
- E) Type of Sample Tested : Pre-production
- F) High Frequency Used : 32.768kHz (Real Time Clock)
12MHz (USB Clock)
12MHz (Micom Clock)
- G) Rating Power Supply : DC 3.7V, 180mAh
- H) Tested Power Supply : 1phase AC120V, 60Hz
- I) Date of Manufacture : April 2003
- J) Manufacturer : Hitachi Maxell, Ltd.
6139-1 Ohnogo, Mitsukaido-shi, Ibaraki-ken,
300-2595 Japan

K) Options :

Description	Type of shield	Model Name	Length	Manufacturer
USB Cable	---	C17-004-5027F	1.5m	MITSUMI ELECTRIC CO., LTD.
AC Adapter	---	PS-DP1	---	HOSIDEN CORPORATION
AC Cable	---	C1-0426AAK	1.8m	TESCOM CO., LTD.

- L) Description of Operating : Communication mode
Battery Charge mode
- M) Date of Sample Received : June 3, 2003
- N) Test Engineer : Kazunori Maeshima

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2 TEST FACILITY

The semi anechoic chamber and conducted measurement facility are used for these testing, where are located following address. This chamber was fully described in a report dated Dec.24,1999, that was submitted to the FCC. And we had accepted in a letter dated Feb.7,2000 (31040/SIT). This laboratory is accredited by NVLAP for NVLAP Lab. Code : 200221-0.

Tokin EMC Engineering Co., Ltd.

Tsukuba Testing Laboratory, Semi Anechoic Chamber and Shielded Room No.2

Address ; 28-1, Kitahara-aza, Hanashimashinden-ohaza, Tsukuba-city, Ibaraki 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 and NML/CISRO.

3.2 Modifications to The EUT : None

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4 TESTED SYSTEM DETAILS

4.1 Peripherals and Others :

< Communication mode >

Description	Model Name	Serial No.	Manufacturer	FCC ID
Personal Computer	DHM	FKBY21X	Dell	DoC
Monitor	570STFT	CN15LSSN/XSJ	Samsung	DoC
Monitor AC Adapter	PSCV360104A	C010801969	Samsung	None
PS/2 Keyboard	SK-8100	CN-08C668-38844-1 90-J393	Dell	DoC
PS/2 Mouse	IntelliMouse 1.3A	None	Microsoft	DoC
Modem	1414	9068680	ACEEX	IFAXDM1414
Modem AC Adapter	AA121	None	OEM	None
Printer	BJC-50V	None	Canon	DoC
Printer AC Adapter	AD-360U	00028246	Canon	None

< Battery Charge mode >

Description	Model Name	Serial No.	Manufacturer	FCC ID
EUT AC Adapter	PS-DP1	None	HOSHIDEN	None

4.2 Type of Used Cables :

< Communication mode >

Description	Length	Type of shield	Model name	Manufacturer
PC AC Cable (PC~AC)	2.1m	Non-shielded	None	None
EUT USB Cable (EUT~PC)	1.8m	Shielded	C17-004-5027F	MITSUMI ELECTRIC CO., LTD.
Monitor I/F Cable (Monitor~PC)	1.8m	Shielded	None	None
Monitor AC Cable (Adapter~AC)	2.5m	Non-shielded	None	None
Monitor DC Cable (Adapter~Monitor)	1.8m	Non-shielded	None	None
Keyboard Cable (Keyboard~PC)	1.8m	Shielded	None	None
Mouse Cable (Mouse~PC)	1.8m	Shielded	None	None

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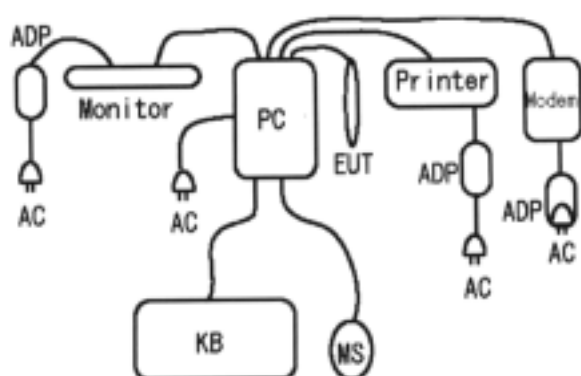

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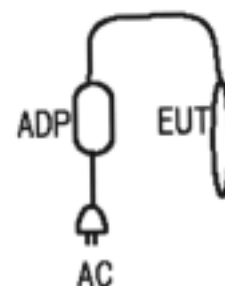
Description	Length	Type of shield	Model name	Manufacturer
Modem I/F Cable (Modem~PC)	1.5m	Shielded	None	None
Modem DC Cable (Adapter~Modem)	1.8m	Non-shielded	None	None
Printer I/F Cable (Printer~PC)	1.5m	Shielded	None	None
Printer AC Cable (Printer Adapter~AC)	1.0m	Non-shielded	None	None

< **Battery Charge mode** >

Description	Length	Type of shield	Model name	Manufacturer
AC Cable (AC Adapter~AC)	1.8m	Non-shielded	C1-0426AAK	TESCOM CO., LTD.
EUT USB Cable (EUT~PC)	1.8m	Shielded	C17-004-5027F	MITSUMI ELECTRIC CO., LTD.



Communication mode



Battery Charge mode

Figure 4-1 System Configuration Diagram

5 TECHNICAL COUNTERMEASURE:

None

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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.'01/Sep.'03)
 L.I.S.N..... (KNW-407/8-578-14/Kyoritsu/LI012/22 Oct.'02/Oct.'03)
 2nd L.I.S.N..... (PN-T22/9403/Tokin/LI065/25 Oct.'02/Oct.'03)
 Spectrum analyzer..... (8563E/3450A02894/Hewlett Packard/SP036/08 Dec.'02/Dec.'03)
 Coaxial cable..... (RG-55U/---/---/DK194/12 Sep.'02/Sep.'03)
 Data entry system..... (EMC Data Order Program Ver 1.06/---/---/---/---)
 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 0.4m distance away from the shielded enclosure wall. There are no deviations from the standard. The standard limit adopted CISPR Pub.22:1997 Class B.

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 Deviation from the specification: None

6.1.4 Measurement Uncertainty

The data that was tested are including uncertainty.

Measurement uncertainty is $\pm 1.50\text{dB}(k=2)$ and it had estimated for decision to PASS and FAIL.

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6.1.5 Test Data

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

Operating mode: Communication mode

Date of measurement: June 4, 2003

Test procedure: ANSI C63.4-1992

Temperature: 17 degree C

Humidity: 63 %

	Frequency (MHz)	Level (dBμV)	Total Factor(dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)
N-E	0.174	40.0	0.0	40.0	64.8	24.8
	1.041	33.0	0.1	33.1	56.0	22.9
	2.082	35.0	0.1	35.1	56.0	20.9
	3.648	32.0	0.2	32.2	56.0	23.8
	4.690	34.0	0.2	34.2	56.0	21.8
	18.242	26.0	0.6	26.6	60.0	33.4
L1-E	0.174	43.0	0.0	43.0	64.8	21.8
	1.041	34.0	0.1	34.1	56.0	21.9
	2.082	34.0	0.1	34.1	56.0	21.9
	3.648	34.0	0.2	34.2	56.0	21.8
	4.690	31.0	0.2	31.2	56.0	24.8
	18.242	25.0	0.6	25.6	60.0	34.4

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

Operating mode: Communication mode

Date of measurement: June 4, 2003

Test procedure: ANSI C63.4-1992

Temperature: 17 degree C

Humidity: 63 %

	Frequency (MHz)	Level (dBμV)	Total Factor(dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)
N-E	0.174	40.0	0.0	40.0	54.8	14.8
	1.041	33.0	0.1	33.1	46.0	12.9
	2.082	30.0	0.1	30.1	46.0	15.9
	3.648	31.0	0.2	31.2	46.0	14.8
	4.690	31.0	0.2	31.2	46.0	14.8
	18.242	21.0	0.6	21.6	50.0	28.4
L1-E	0.174	43.0	0.0	43.0	54.8	11.8
	1.041	34.0	0.1	34.1	46.0	11.9
	2.082	28.0	0.1	28.1	46.0	17.9
	3.648	33.0	0.2	33.2	46.0	12.8
	4.690	27.0	0.2	27.2	46.0	18.8
	18.242	20.0	0.6	20.6	50.0	29.4

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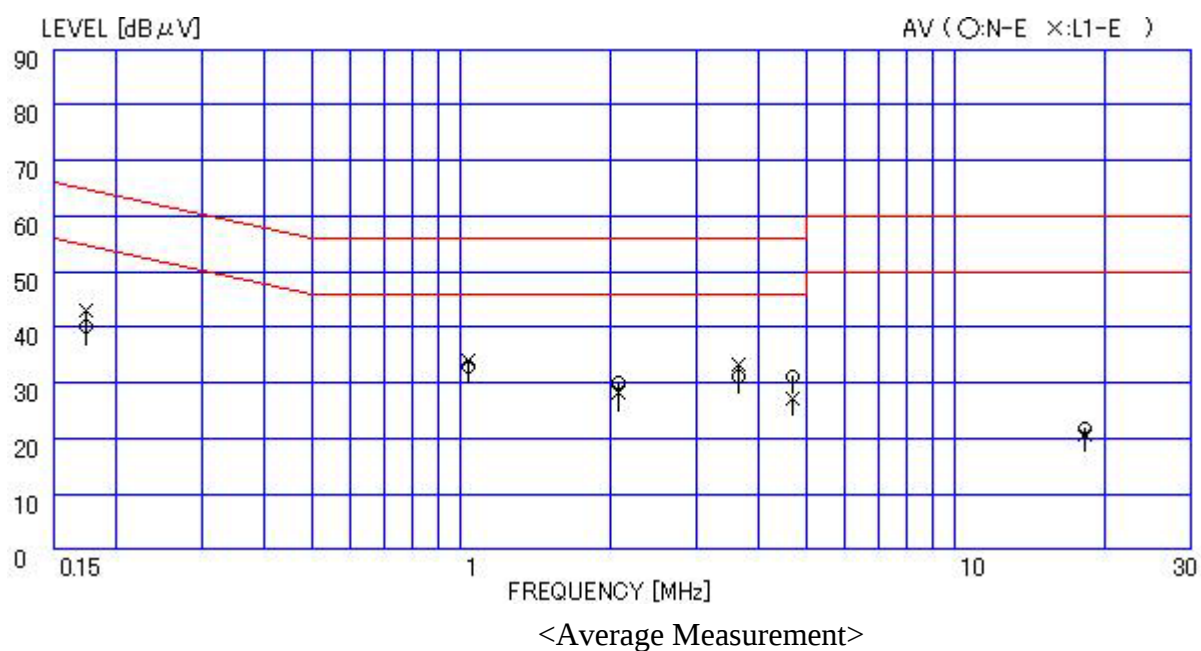
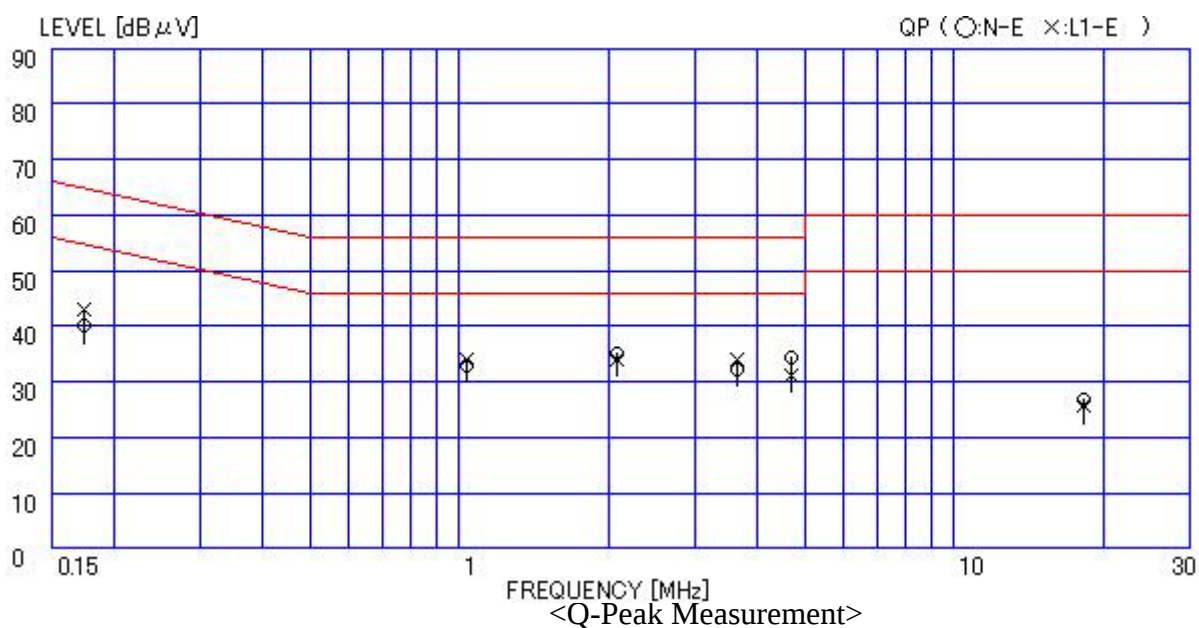


Figure 6.1-1 RFI Voltage Measurement Results

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

Operating mode: Battery Charge mode
Test procedure: ANSI C63.4-1992

Date of measurement: June 4, 2003
Temperature: 17 degree C
Humidity: 63 %

	Frequency (MHz)	Level (dBμV)	Total Factor(dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)
N-E	0.172	52.0	0.0	52.0	64.9	12.9
	0.207	49.5	0.0	49.5	63.3	13.8
	0.449	41.5	0.0	41.5	56.9	15.4
	0.968	30.0	0.1	30.1	56.0	25.9
	2.522	26.0	0.1	26.1	56.0	29.9
	12.436	31.0	0.4	31.4	60.0	28.6
L1-E	0.172	52.0	0.0	52.0	64.9	12.9
	0.207	49.5	0.0	49.5	63.3	13.8
	0.449	42.0	0.0	42.0	56.9	14.9
	0.968	33.0	0.1	33.1	56.0	22.9
	2.454	31.0	0.1	31.1	56.0	24.9
	12.436	32.0	0.4	32.4	60.0	27.6

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

Operating mode: Battery charge mode
Test procedure: ANSI C63.4-1992

Date of measurement: June 4, 2003
Temperature: 17 degree C
Humidity: 63 %

	Frequency (MHz)	Level (dBμV)	Total Factor(dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)
N-E	0.172	36.0	0.0	36.0	54.9	18.9
	0.207	34.0	0.0	34.0	53.3	19.3
	0.449	32.0	0.0	32.0	46.9	14.9
	0.968	22.5	0.1	22.6	46.0	23.4
	2.522	21.0	0.1	21.1	46.0	24.9
	12.436	23.0	0.4	23.4	50.0	26.6
L1-E	0.172	37.0	0.0	37.0	54.9	17.9
	0.207	35.0	0.0	35.0	53.3	18.3
	0.449	35.0	0.0	35.0	46.9	11.9
	0.968	26.0	0.1	26.1	46.0	19.9
	2.454	22.0	0.1	22.1	46.0	23.9
	12.436	25.0	0.4	25.4	50.0	24.6

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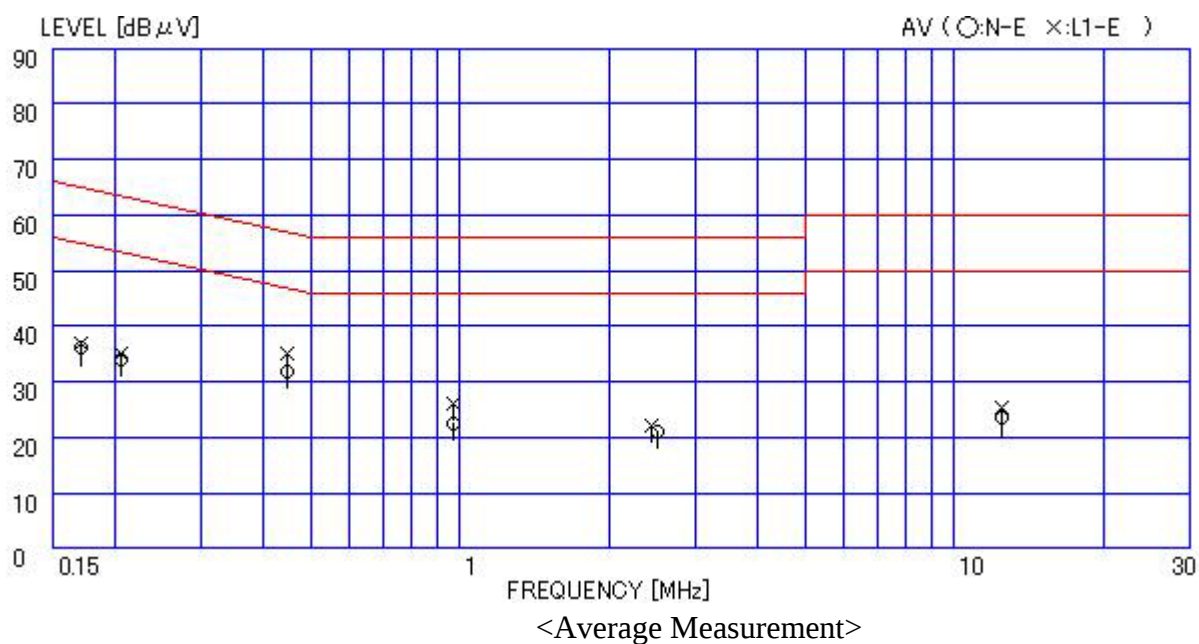
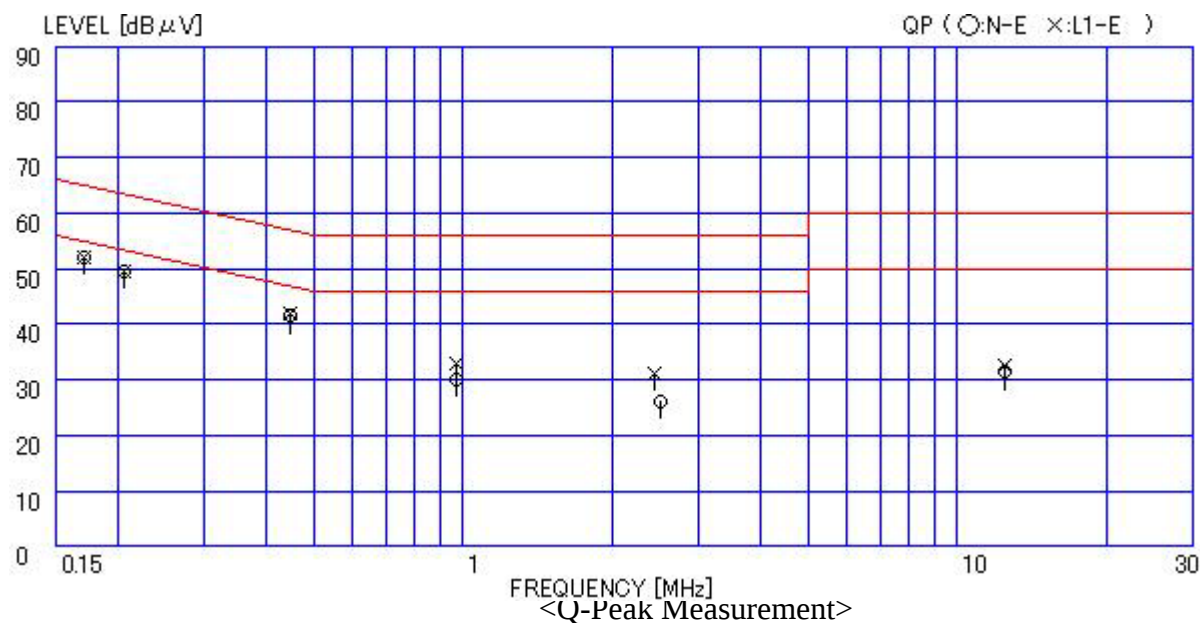


Figure 6.1-2 RFI Voltage Measurement Results

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6.2 RFI Field Strength Measurement

6.2.1 Measurement Instrumentation Used

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

Field strength meter (FCVU1534/132/Schwarzbeck/RE048/28 Apr.'03/Apr.'04)
 Bi-Log antenna (CBL6111/1154/Chase/TB018/01 Mar.'03/Feb.'04)
 Pre-amplifier (8447D/2727A05358/Hewlett Packard/AM00A/27 Sep.'02/Sep.'03)
 Spectrum analyzer (8566B/2139A01073/Hewlett Packard/SP00A/08 Dec.'02/Dec.'03)
 Quasi-peak adaptor (85650A/2430A00566/Hewlett Packard/SP022/08 Dec.'02/Dec.'03)
 Preselector (85685A/2645A00366/Hewlett Packard/SP023/08 Dec.'02/Dec.'03)
 Coaxial switch unit (MP59B/6100175602/Anritsu/ME265/04 Apr.'03/Apr.'04)
 Site establishment cable..... (---/---/---/DKT11/14 Apr.'03/Apr.'04)
 Data entry system (EMC Data Order Program Ver 1.06/---/---/---/---/---)
 Semi anechoic chamber (Tsukuba AC/---/Tokin/SA012/12 May'03/May'04)

These measurement instrumentation are calibrated according to Quality Manual.

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6.2.2 Measurement Procedure

Final test was performed according to ANSI C63.4-1992 at Semi anechoic chamber. There are no deviations from the standard. The standard limit adopted CISPR Pub.22:1997 Class B.

The EUT was placed in a 0.8m high table along with the peripherals placed on a turn table. 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 Deviation from the specification: None

6.2.4 Measurement Uncertainty

Measurement uncertainty of 30MHz to 300MHz is $\pm 2.90\text{dB}(k=2)$, 300MHz to 1000MHz is $\pm 3.32\text{dB}(k=2)$ and it had estimated for decision to PASS or FAIL.

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6.2.5 Test Data

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

Operating mode: Communication mode
Test procedure: ANSI C63.4-1992

Date of measurement: June 3, 2003
Temperature: 24 degree C
Humidity: 63 %

Frequency (MHz)	Level		Cable Loss (dB)	Amp. Gain (dB)	Ant. Factor (dB/m)	Result		10 Meter Limit (dBμV/m)	Margin	
	Ver. (dBμV)	Hor. (dBμV)				Ver. (dBμV/m)	Hor. (dBμV/m)		Ver. (dB)	Hor. (dB)
45.35	40.0	32.0	1.6	-27.7	9.2	26.1	15.1	30.0	3.9	14.9
96.00	37.0	36.0	2.3	-27.8	10.3	21.8	20.8	30.0	8.2	9.2
120.00	41.0	37.0	2.9	-27.8	11.8	27.9	23.9	30.0	2.1	6.1
132.59	37.0	36.0	3.0	-27.6	11.3	23.7	22.7	30.0	6.3	7.3
144.00	36.0	39.5	3.1	-27.5	11.3	22.9	26.4	30.0	7.1	3.6
156.00	36.0	32.0	3.2	-27.4	10.7	22.5	18.5	30.0	7.5	11.5
365.90	33.0	30.0	5.7	-27.5	15.1	26.3	23.3	37.0	10.7	13.7

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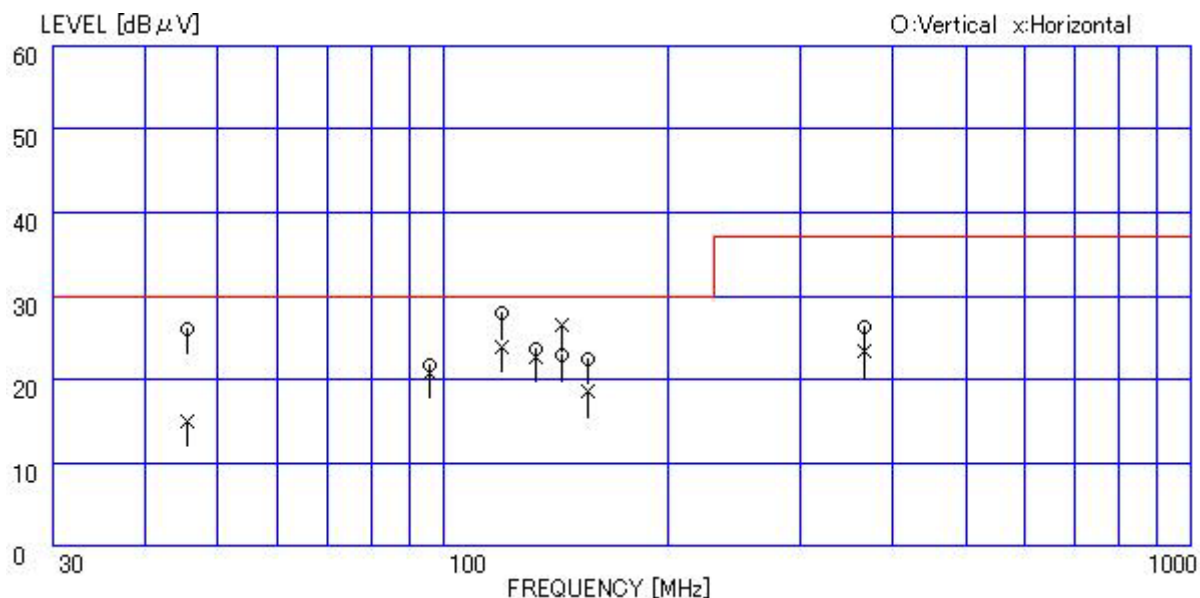


Figure 6.2-1 RFI Field Strength Measurement Results

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

Operating mode: Battery Charge mode

Date of measurement: June 3, 2003

Test procedure: ANSI C63.4-1992

Temperature: 24 degree C

Humidity: 63 %

Frequency (MHz)	Level		Cable Loss (dB)	Amp. Gain (dB)	Ant. Factor (dB/m)	Result		10 Meter Limit (dBμV/m)	Margin	
	Ver. (dBμV)	Hor. (dBμV)				Ver. (dBμV/m)	Hor. (dBμV/m)		Ver. (dB)	Hor. (dB)
45.00	35.5	-	1.6	-27.7	9.4	18.8	-	30.0	11.2	-
48.00	39.5	29.0	1.6	-27.6	7.9	21.4	10.9	30.0	8.6	19.1
85.75	32.0	21.0	2.2	-27.8	8.7	15.1	4.1	30.0	14.9	25.9
103.30	31.0	-	2.5	-27.7	11.7	17.5	-	30.0	12.5	-
108.00	36.0	24.0	2.6	-27.8	12.1	22.9	10.9	30.0	7.1	19.1
144.00	-	26.0	3.1	-27.5	11.3	-	12.9	30.0	-	17.1
207.00	31.0	-	4.0	-27.2	9.1	16.9	-	30.0	13.1	-
279.98	31.5	30.0	4.7	-27.0	13.6	22.8	21.3	37.0	14.2	15.7
431.98	28.0	29.0	6.5	-28.0	17.3	23.8	24.8	37.0	13.2	12.2

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CISPR Pub.22:1997 Class B Limit

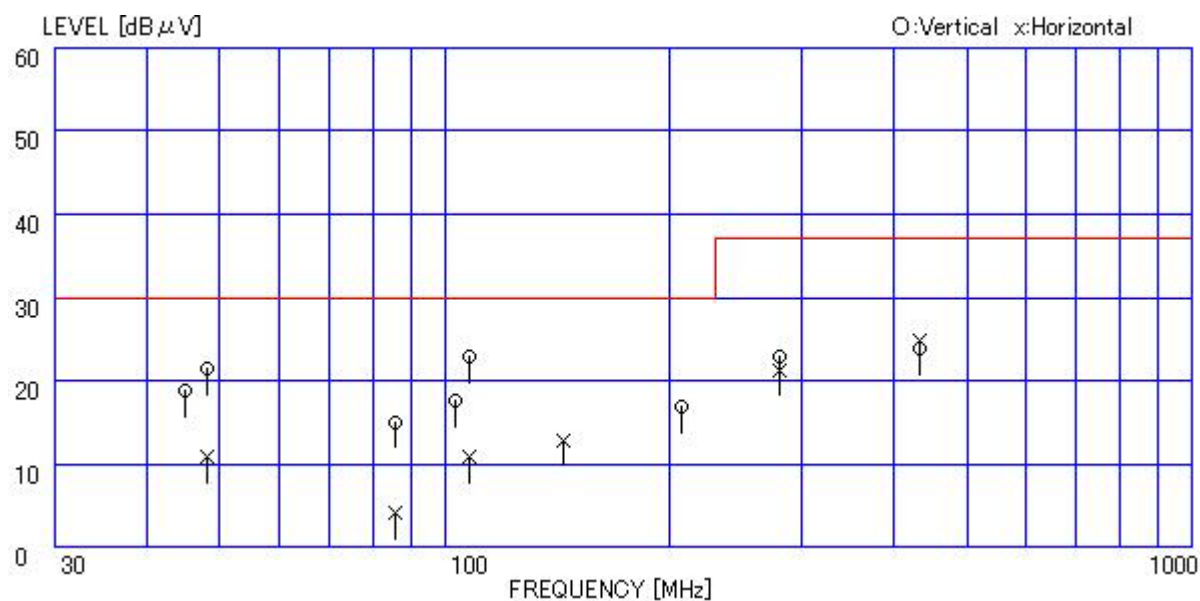


Figure 6.2-2 RFI Field Strength Measurement Results

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Kazunori Maeshima Engineer

6.3 Minimum Margin

Table 6.3-1 Minimum Margin

<u>Conducted emission</u>					
Communication	operation mode	0.174	MHz,	11.8	dB
<u>Radiated emission</u>					
Communication	operation mode	120.00	MHz,	2.1	dB

6.4 Sample Calculation

Table 6.4-1 Sample Calculation

The maximum radiating emission can be obtained at the frequency of 120.00 MHz,
Vertical polarization on Communication operation mode.

Each value at frequency is as follows;

R :	Field strength meter reading	=	41.0	(dBμV)
A :	Antenna factor	=	11.8	(dB/m)
C :	Cable loss	=	2.9	(dB)
G :	Amplifier gain	=	27.8	(dB)

Then radiated emission E(dBμV/m) is ;

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

Therefore, the maximum radiated emission is ; 27.9
(dBμV/m)

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7 MEASUREMENT PHOTOS

Photo 7.1a Setup with the Maximized RFI Voltage Emission Level
< *Communication mode* >



Photo 7.1b Setup with the Maximized RFI Voltage Emission Level
< Battery Charge mode >



Photo 7.2a Setup with the Maximized RFI Field Strength Emission Level
< Communication mode >



Photo 7.2b Setup with the Maximized RFI Field Strength Emission Level
< *Communication mode* >



Photo 7.2c Setup with the Maximized RFI Field Strength Emission Level
< Battery Charge mode >

