

EMC TEST REPORT

for

WACOM Co., Ltd.

2-510-1, Toyonodai, Otone-machi,
Kitasaitama-gun, Saitama 349-1148, Japan

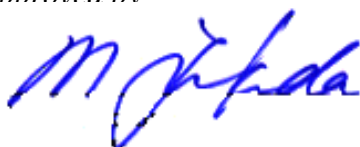
Equipment Under Test: Digitizer
Model Name : XD-0405-U

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

Tokin Report No.: T7L014346

Date of Issue: May 14, 2001

Approved by



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

-- ATTENTION --

The test results in this report relate only to the following EUTs, and this report shall not be reproduced except in full, without the written approval of the laboratory. This test report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.



Contents

	<i>Page</i>
1 DESCRIPTION OF DEVICE	1
2 TEST FACILITY	2
3 SUMMARY OF RESULTS	
3.1 Electromagnetic Emission	2
3.2 Modification to The EUT.....	2
4 TESTED SYSTEM DETAILS	
4.1 Peripherals and Others	3
4.2 Type of Used Cables	3
5 TECHNICAL COUNTERMEASURE	3
6 TEST RESULTS	
6.1 RFI Voltage Measurement	
6.1.1 Measurement Instrumentation Used	4
6.1.2 Measurement Procedure.....	4
6.1.3 Measurement Uncertainty	4
6.1.4 Test Data	5 ~ 6
6.2 RFI Field Strength Measurement	
6.2.1 Measurement Instrumentation Used	7
6.2.2 Measurement Procedure.....	8
6.2.3 Measurement Uncertainty	8
6.2.4 Test Data	9 ~ 12
6.3 Minimum Margin.....	13
6.4 Sample Calculation	13
7 MEASUREMENT PHOTOS	
Photo 7.1 Setup with the Maximized RFI Voltage Emission Level.....	14
Photo 7.2 Setup with the Maximized RFI Field Strength Emission Level	15 ~ 16

1 DESCRIPTION OF DEVICE

A) Kind of Equipment :	Digitizer
B) FCC ID :	None
C) Model Name :	XD-0405-U
D) Serial No. :	1DJS00001
E) Type of Sample Tested :	Pre-production
F) High Frequency Used :	6MHz (Main) 571.43kHz, 666.6kHz (Tablet)
G) Rating Power Supply :	DC5V, 0.1A
H) Tested Power Supply :	1phase AC120V, 60Hz
I) Date of Manufacture :	April 2001
J) Manufacturer :	WACOM Co., Ltd. 2-510-1 Toyonodai, Otone-machi, Kitasaitama-gun, Saitama 349-1148, Japan
K) Attachment option:	XP-110 (Inking pen)
L) Description of Operating :	USB Communication
M) Date of Sample Received :	April 19, 2001
N) Test Engineer :	Yutaka Takeuchi

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 Mar.20,2001, that was submitted to the FCC. And we had accepted in a letter dated Mar.26,2001 (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.7 and Shielded Room No.1

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	EV500A	15017F019434	Gateway	BEJCB575B
PC	GP7JP3YR/FDKER	01480592	Gateway	DoC
Mouse	M-S34	None	COMPAQ	DZL211029
Printer	AP-550EX	OSR0000457	EPSON	None
Keyboard	CMI-6D1Z1C	B2080G39F40AB	COMPAQ	AQ6-MTN4C15
USB Mouse	M4848	None	Apple	DoC
Mouse	TB-3PS	91100373	SANWA SUPPLY	DoC

4.2 Type of Used Cables :

Description	Length	Type of shield	Model name	Manufacturer
Display AC cable	2.0m	Non-shielded	None	---
PC AC cable	1.8m	Non-shielded	None	---
Printer I/F cable	1.8m	Shielded	None	EPSON

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(FCKL1528/134/Schwarzbeck/RE041/30 Nov.'00/Nov.'01)

L.I.S.N.(KNW-407/8-515-20/Kyoritsu/LI010/28 Aug.'00/Aug.'01)

2nd L.I.S.N.....(PN-T22/9401/Tokin/LI064/17 Feb.'01/Feb.'02)

Spectrum analyzer(R3131/81781091/Advantest/SP040/22 Mar.'01/Mar.'02)

Coaxial cable.....(---/---/---/DK125/28 Feb.'01/Feb.'02)

Data entry system.....(TEPTO-REP Ver. 2.20/---/TSJ/---/---/---)

Software(EP5/CE Ver. 1.30/---/TOYO/---/---/---)

Shielded Room.....(Tsukuba No.1-S/---/Tokin/SA016/---/---)

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.1 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

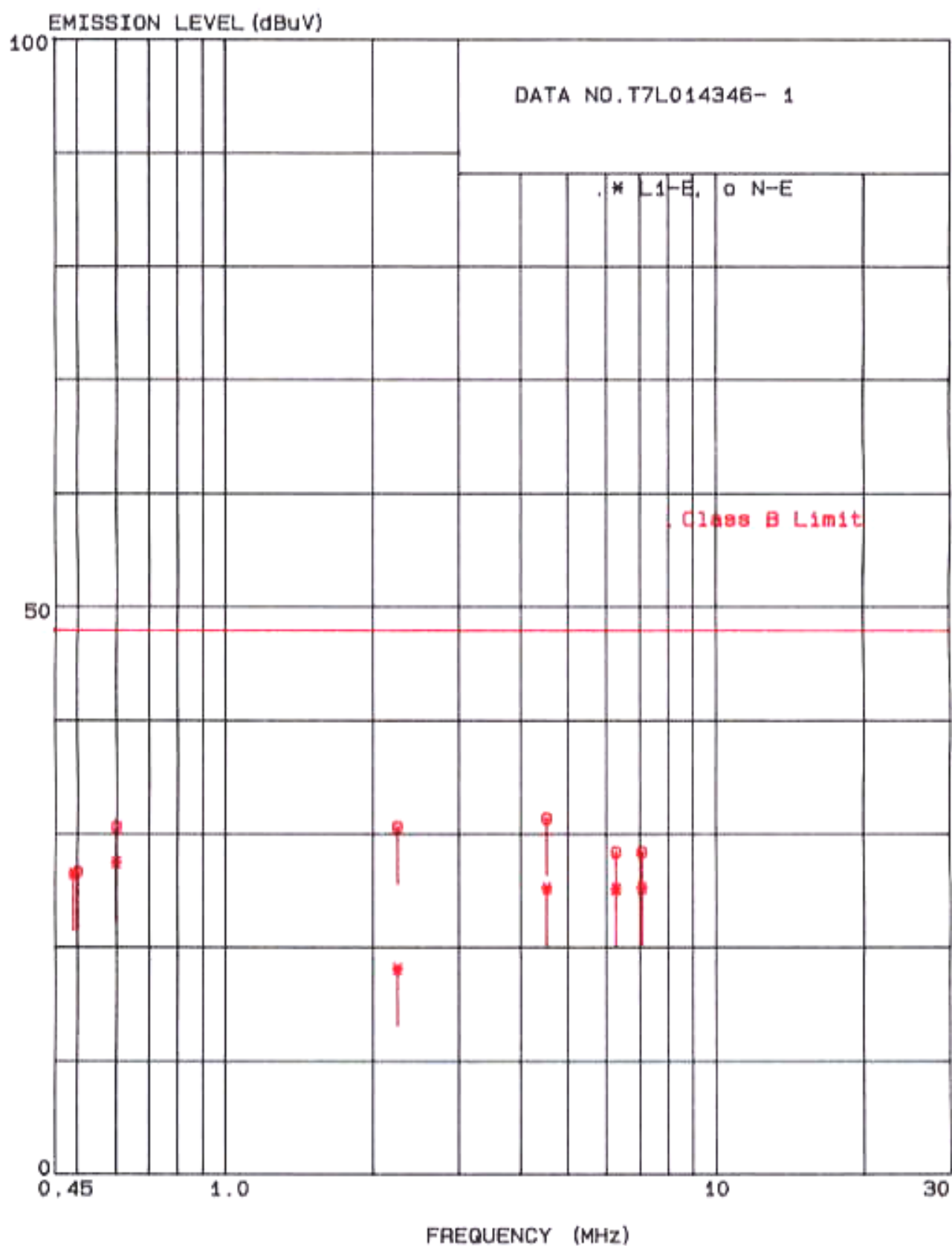
Measurement uncertainty of RFI Voltage Measurement test was estimated at $\pm 0.6\text{dB}(k=2)$.

6.1.4 Test Data**Table 6.1-1** RFI Voltage Measurement Results (Q-Peak Measurement)

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

Date of measurement: April 23, 2001
 Temperature: 22 degree C
 Humidity: 50 %

	Frequency (MHz)	Level (dB μ V)	Total Factor(dB)	Result (dB μ V)	Result (μ V)	Limit (μ V)	Margin (dB)
L1-E	0.492	26.5	0.0	26.5	21.13	250	21.5
	0.600	27.5	0.0	27.5	23.71	250	20.5
	2.244	18.0	0.1	18.1	8.04	250	29.9
	4.520	25.0	0.2	25.2	18.20	250	22.8
	6.260	25.0	0.2	25.2	18.20	250	22.8
	7.090	25.0	0.2	25.2	18.20	250	22.8
N-E	0.502	26.5	0.2	26.7	21.63	250	21.3
	0.600	30.5	0.2	30.7	34.28	250	17.3
	2.244	30.5	0.2	30.7	34.28	250	17.3
	4.520	31.0	0.4	31.4	37.15	250	16.6
	6.260	28.0	0.4	28.4	26.30	250	19.6
	7.090	28.0	0.4	28.4	26.30	250	19.6

**Figure 6.1-1** 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*)

< 0.009MHz ~ 30MHz >

Loop antenna..... (HFH2-Z2/FNR881057-5/Rohde&Schwarz/AN006/07 Mar. '01/Mar '02)
 Spectrum analyzer (R3261A/91720435/Advantest/SP007/04 Oct.'00/Oct.'01)
 Field strength meter (FCKL1528/134/Schwarzbeck/RE041/30 Nov.'00/Nov.'01)
 Spectrum analyzer (R3131/81781091/Advantest/SP040/22 Mar.'01/Mar.'02)
 Coaxial cable..... (---/---/---/---/07 Mar.'01/Mar.'02)
 Shielded Room..... (Tsukuba No.1-S/---/Tokin/SA016/---/---)

<30MHz to 1000MHz>

Field strength meter (FCVU1534/131/Schwarzbeck/RE046/04 Oct.'00/Oct.'01)
 Biconical antenna (BBA9106/TB007/Schwarzbeck/TB007/10 Aug.'00/Aug.'01)
 Logperiodic antenna (UHALP9108-A/0114/Schwarzbeck/TL017/10 Aug.'00/Aug.'01)
 Pre-amplifier (8447D/2648A04832/Hewlett Packard/AM007/20 Apr.'01/Apr.'02)
 Spectrum analyzer (R3261A/91720435/Advantest/SP007/04 Oct.'00/Oct.'01)
 Coaxial cable (5D-2W/---/---/DK182/12 Dec.'00/Dec.'01)
 Coaxial cable (5D-2W/---/---/DK191/25 Jan.'01/Jan.'02)
 Coaxial cable (---/CL7/---/DK091/21 Oct.'00/Oct.'01)
 Data entry system (TEPTO-REP Ver. 2.20/---/TSJ/---/---/---)
 Open field test site (Tsukuba No.7/---/Tokin/SA007/28 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 shielded room No.1 (0.009 to 30MHz), open field test site No.7 (30 to 1000MHz). 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 3meters. 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)
(0.009MHz ~ 30MHz)

Operating mode: USB Communication

Date of measurement: April 23, 2001

Test procedure: ANSI C63.4-1992

Temperature: 22 degree C

Humidity: 50 %

Frequency (MHz)	Level Ver. Hor. (dBμV)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp. Gain (dB)	Result Ver. Hor. (dBμV/m)	Result Ver. Hor. (μV/m)	3 Meter Limit (μV/m)	Margin Ver. Hor. (dB)
--------------------	------------------------------	--------------------------	-----------------------	----------------------	---------------------------------	-------------------------------	----------------------------	-----------------------------

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

Radiated Emission – 3 meter distance

Frequency (MHz)	dBμV/m	μV/m
0.009 ~ 0.490	88.5 ~ 53.8	2400/F(kHz) +40
0.490 ~ 1.705	53.8 ~ 43.0	24000/F(kHz) +20
1.705 ~ 30	29.5	30

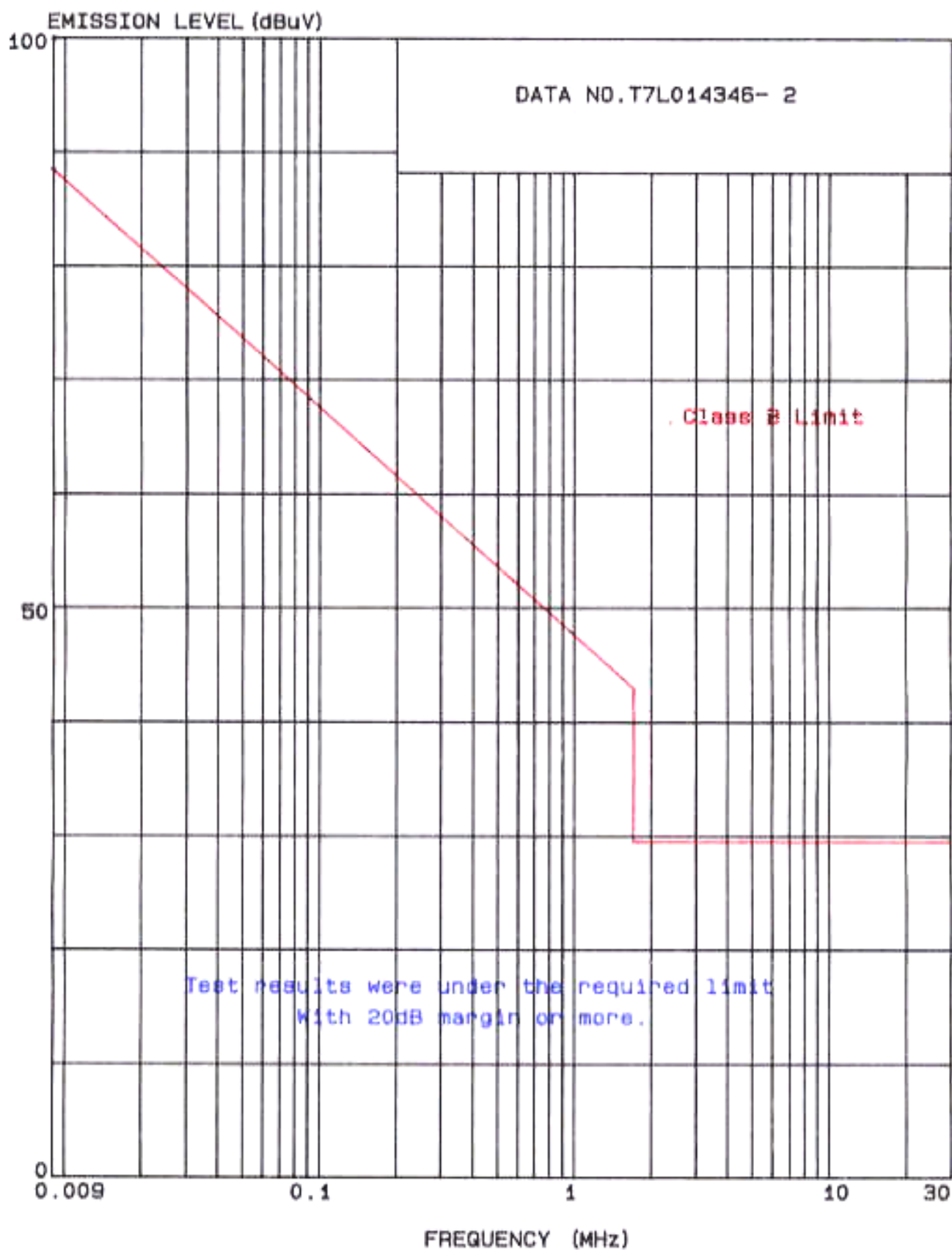
**Figure 6.2-1** RFI Field Strength Measurement Results

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

Operating mode: USB Communication

Date of measurement: April 19, 2001

Test procedure: ANSI C63.4-1992

Temperature: 20 degree C

Humidity: 74 %

Frequency (MHz)	Level		Ant. Factor (dB/m)	Cable Loss (dB)	Amp. Gain (dB)	Result		Result		3 Meter Limit (μV/m)	Margin	
	Ver.	Hor.				Ver.	Hor.	Ver.	Hor.		Ver.	Hor.
	(dBμV)					(dBμV/m)		(μV/m)			(dB)	
67.50	45.5	39.0	6.1	1.7	28.8	24.5	18.0	16.79	7.94	100	15.5	22.0
71.20	45.5	-	6.1	1.7	28.9	24.4	-	16.60	-	100	15.6	-
144.00	31.5	30.5	14.0	2.5	28.6	19.4	18.4	9.33	8.32	150	24.1	25.1
199.51	34.0	-	16.2	3.0	28.2	25.0	-	17.78	-	150	18.5	-
241.45	29.0	33.0	16.9	3.2	28.2	20.9	24.9	11.09	17.58	200	25.1	21.1
262.58	29.5	37.0	18.6	3.3	28.0	23.4	30.9	14.79	35.08	200	22.6	15.1
268.62	30.0	36.0	19.3	3.4	28.0	24.7	30.7	17.18	34.28	200	21.3	15.3
295.78	-	31.0	21.3	3.5	28.0	-	27.8	-	24.55	200	-	18.2
316.88	28.0	34.0	16.4	3.6	28.1	19.9	25.9	9.89	19.72	200	26.1	20.1
365.18	30.0	33.5	17.0	3.9	28.3	22.6	26.1	13.49	20.18	200	23.4	19.9

Class B limit

Radiated Emission – 3 meter distance

Frequency (MHz)	dBμV/m	μV/m
30 - 88	40.0	100
88 - 216	43.5	150
216 - 960	46.0	200
> 960	54.0	500

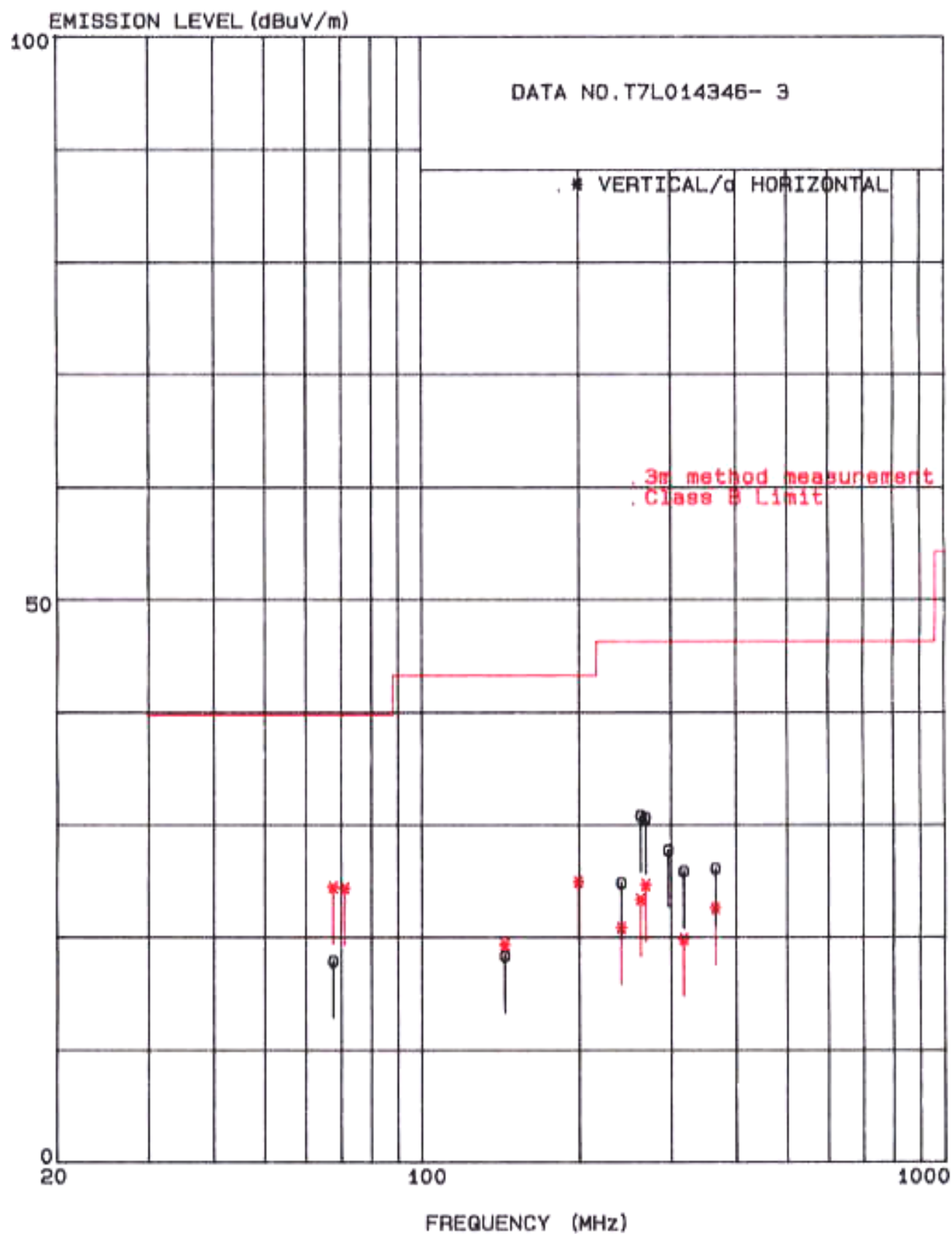


Figure 6.2-2 RFI Field Strength Measurement Results

6.3 Minimum Margin

Table 6.3-1 Minimum Margin

<u>Conducted emission</u>			
USB Communication	mode	4.520 MHz,	16.6 dB
<u>Radiated emission</u>			
USB Communication	mode	262.58 MHz,	15.1 dB

6.4 Sample Calculation

Table 6.4-1 Sample Calculation

The maximum radiating emission can be obtained at the frequency of 262.58 MHz,			
Horizontal	polarization on	USB Communication	mode.
Each value at frequency is as follows;			
R :	Field strength meter reading	=	37.0 (dBμV)
A :	Antenna factor	=	18.6 (dB/m)
C :	Cable loss	=	3.3 (dB)
G :	Amplifier gain	=	28.0 (dB)
Then radiated emission E(dBμV/m) is ;			
$E = R + A + C - G$			
Therefore, the maximum radiated emission is ;			
			30.9 (dBμV/m)
