EMC TEST REPORT

Report No.	:	EE-06036959
Issue Date	:	15 March 2006
EUT Number	:	EE-06-0163(1/1)
Product Description	:	Personal Computer
Trade Name	:	OPTIMAX
Tested Model	:	MAX
Manufacturer	:	Worldnet Integrator Co., Ltd.
Address	:	57 Moo1 Sookprayoon Rd., Donhuaroh, Muang, Chonburi 20000, Thailand.
Test Conclusion	:	☒ Comply ☐ Non-comply

SUMMARY

The equipment comply with the requirements according to the following standards/rules:
FCC part 15 subpart B: Section 15.109

Prepared & Checked By:

Mr. Narong Traguldusitporn

Test Engineer, EMC Laboratory

Approved By:

Ms. Pornpimon Ratanawichien

Manager, EMC Laboratory

Test result reported in this test report shall refer only for the tested sample. This report shall not be reproduced, except in full, without the written approval from Intertek Testing Services (Thailand) Ltd., ETL SEMKO.

Intertek Testing Services (Thailand) Limited.
Univest Complex No.546, 4-5th Floor, Ratchadapisek Road, Lardyao, Chatuchak, Bangkok 10900
Tel : (662) 938-1990 Fax : (662) 938-1921, 938-1923, 938-1925
Website : http://www.thailand.intertek-etlsemko.com

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1. GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

EUT : Personal Computer

Description of EUT:

The products subjected to test are the personal computer for residential and commercial environmental (Class B product). OPTIMAX model name MAX has been granted in year 2003 in the FCC ID: QSZOPTIMAX-MAX. The components are as shown in the block diagram in Appendix III. The standard features of this EUT is as followed and the picture of internal construction can be found in Appendix III:

Processor	Intel Pentium4 1.5 GHz, 400 MHz FSB, Socket478
Cache Memory	256 KB Level 2 (on-die, full speed)
Memory	DDRRAM 128 MB PC2100 Expandable up to 1 GB
Mainboard	Intel845 Chipset, Socket478, 400 MHz FSB, AGP4X, ATA100
Hard Disk	40 GB, Ultra ATA100, 5400rpm
Floppy Disk Drive	Standard 3.5" 1.44 MB
Optical Drive	52X Speed CD-ROM Drive
Monitor	15" CRT Monitor, 1280x1024 Resolution, MPR-II
VGA	AGP4X Card SIS315E with 32 MB Memory
Sound	AC97 Audio (3D 16-bit Full Duplex)
Case	Tower ATX with Power Supply 300 Watts & Cooling Fans
Expansion Slot	3 PCI, 1 AGP4X
I/O Port	2 Serial, 1 Parallel, 2 PS/2, 2 USB
Mouse	PS/2 Scroll Mouse & Mouse Pad
Keyboard	PS/2 Thai&Eng 107 Keys
LAN	Fast Ethernet 10/100 Mbps
OS Supported	MS Windows98/ME/2000/XP

Personal Computer (hereafter PC) shall supplied by using 2 separate mains terminal supply cord; CPU case and LCD monitor. Both parts are a system of EUT considerred in this test report.

Trade Name OPTIMAX
Model number : MAX
Rating : 110V, 220-240V
50/60 Hz
Main Lead : 1.8 m, unshielded, nondetachable

1.2 Description of Client

Applicant	:	Worldnet Integrator Co., Ltd.
Address	:	57 Moo1 Sookprayoon Rd., Donhuaroh, Muang, Chonburi 20000, Thailand.
Contact person	:	Mr. Soontorn Suthon
Telephone	:	(66 2) 733 6655
Fax	:	(66 2) 733 6644
Manufacturer	:	Worldnet Integrator Co., Ltd.
Address	:	57 Moo1 Sookprayoon Rd., Donhuaroh, Muang, Chonburi 20000, Thailand.

1.3 Description of Test

Sample received date	:	13 March 2006
Test date	:	14 March 2006
Test Facility	:	Electrical and Electronic Products Testing Center PTEC Building, King Mongkut's Institute of Technology Ladkrabang Chalongkrung Road, Ladkrabang, Bangkok, Thailand 10520. I
Test Engineer	:	Ms. Pornpimon Ratanawichien Mr. Narong Traguldusitporn
Reference Standard	:	FCC part 15 subpart B: Section 15.109
Internal clock frequencies/highest operating frequency:	:	1.5 GHz

2. TEST SPECIFICATIONS

2.1 Standards

FCC part 15 subpart B: Section 15.109;

Test according to the test method in ANSI C63.4-2003.

2.2 Mode of operation during the test / Test peripherals used

Within this test report, EUT was tested under all available operation mode (EUT operated by using software "Burnin test" to activate all available parts, graphic mode both 3 dimensions and H schrolling pattern. All available ports are terminated with 50 ohms devices. Lound speakers are connected as one of the EUT peripherals monitoring it's sound function.). Tested is carried out under A.C 110V, 60Hz.

2.3 Test Summary

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TEST ITEM	RESULT
Conducted emission measurement	Pass
Radiated emission measurement	Pass

EUT Modification

Nil

EMISSION TEST

FCC part 15, subpart B (15.109)

3. Conducted emission measurement

Test conclusion: ☒ Pass ☐ Fail

Operating Condition: EUT operated by using software "Burnin test" to activate all available parts, graphic mode both 3 dimensions and H schrolling pattern. All available ports are terminated with 50 ohms devices. Lound speakers are connected as one of the EUT peripherals monitoring it's sound function.

3.1 Test Method

- ❑ Test is done according to the method specified in ANSI C 63.4-2003.
- ❑ Test equipment as shown in the table in topic 3.1.1 is connected as shown in figure 1 topic 3.1.2 to measurement terminal continuous disturbance voltage.
- ❑ EUT is configured by follow the particular requirement in the reference standards, if available. If the particular requirements are not specified, EUT shall be configured with appropriate load to maximize the disturbance signal.
- ❑ Mains terminal disturbance is measure at line to earth and neutral to earth.
- ❑ Pre-scan shall be done over the whole range of frequency as specified by the standard.
- ❑ At least 6 worst peaks which are closet to the limit(s) shall be selected to do the Final scan.
- ❑ Final scan shall be done by reduce the span zooming in to the selected peak and fine tune to the exact frequency which give the highest disturbance value. Re-measure at that frequency with peak detector and other detector according to the limit(s) applied.

3.1.1 Test Equipment

Equipment	Type	Manu.	Serials number	Cal. Date
EMI Receiver	8572A	HP	3221A01430	15/04/05
LISN	ESH2-Z5	R&S	831886/009	16/02/06
LISN	LS16C	AFJ	16010030095	27/12/05

3.1.2 Test Set up

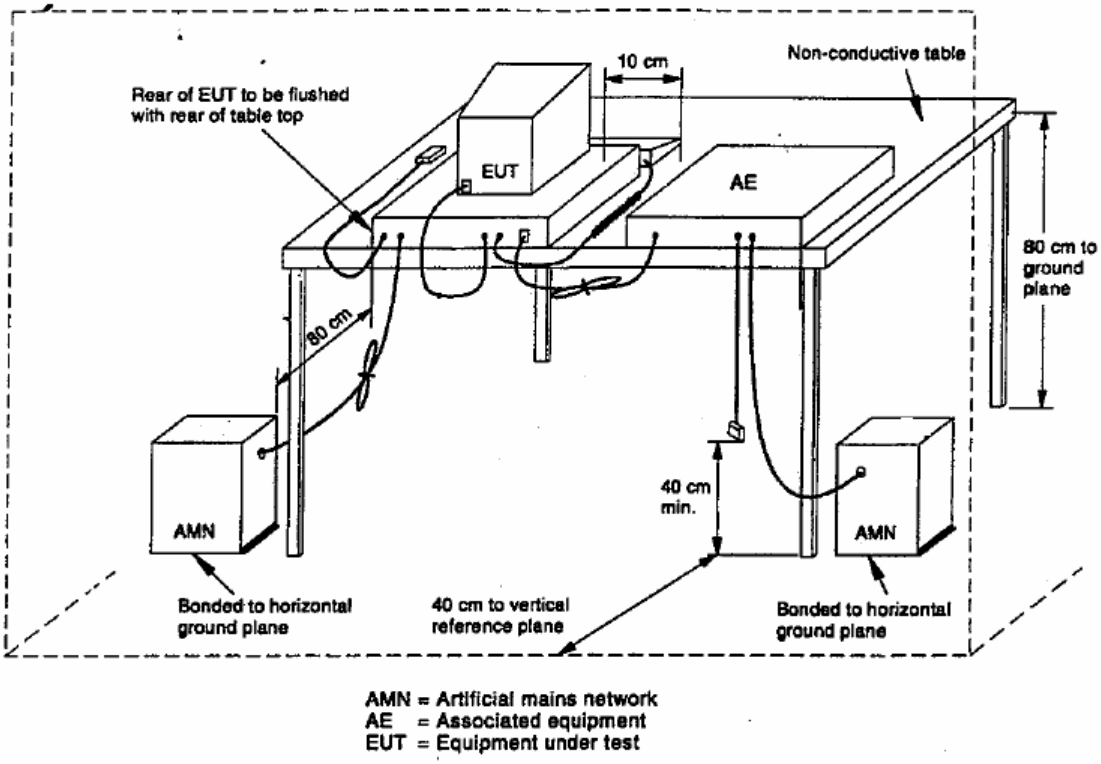


Figure 1-Drawing of Conducted Emission Measurement

3.1.3 Limit

Table 1 Limit FCC part 15 subpart B for class B device

Frequency range	Main terminals Limits	
(MHz)	*dB(uv)*	
	Quasi-peak	Average
0.15 ~ 0.5	66 - 56 *	56 ~ 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50
Note :	1. * means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.	
	2. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.	

3.2 Test result

3.2.1 Test Environment

Temperature: 23.7 ^{O}C Humidity 54.1 %Rh

3.2.2 Conducted emission at Main Terminal (CPU Case)

a) Line – Ground

Final result

Frequency *MHz*	QP result *dB μV*	QP Limit *dB μV*	AV result *dB μV*	AV Limit *dB μV*	Margin to QP Limit *dB μV*	Margin to AV Limit *dB μV*
0.8956	40.7	56.0	39.80	46.00	-15.3	-6.2
1.4584	39.4	56.0	37.60	46.00	-16.6	-8.4
0.3373	41.6	59.3	40.50	49.30	-17.7	-8.8
0.6657	36.4	56.00	33.5	46.00	-19.6	-12.5
25.6152	34.3	60.00	32.6	50.00	-25.7	-17.4
0.1546	47.3	65.70	37.3	55.70	-18.4	-18.4

The emission spectrum of the above result is shown in Appendix I.1 figure A I.1

b) Neutral-Ground

Final result

Frequency *MHz*	QP result *dB μV*	QP Limit *dB μV*	AV result *dB μV*	AV Limit *dB μV*	Margin to QP Limit *dB μV*	Margin to AV Limit *dB μV*
0.6651	39.8	56.00	37.1	46.00	-16.2	-8.9
1.4564	38.8	56.00	36.8	46.00	-17.2	-9.2
0.3384	41.5	59.20	38.4	49.20	-17.7	-10.8
0.2272	43.9	62.60	39.9	52.60	-18.7	-12.7
25.6146	33.6	60.00	32.4	50.00	-26.4	-17.6
0.1514	51.2	65.90	36.8	55.90	-14.7	-19.1

The emission spectrum of the above result is shown in Appendix I figure AI.2

3.2.3 Conducted emission at Main Terminal (LCD Monitor)

Scanning trace and Final measurement

a) Line – Ground

Final result:

There is no final measurement with QP and AV detector due to all peaks are lower than the limits more than 6 dB.

The emission spectrum of the above result is shown in Appendix I, figure A I.3

b) Neutral-Ground

Final result:

There is no final measurement with QP and AV detector due to all peaks are lower than the limits more than 6 dB

The emission spectrum of the above result is shown in Appendix I, figure A I.4

4. Radiated emission measurement (30 MHz-1GHz)

Test conclusion: ☒ Pass ☐ Fail

Operating Condition: EUT operated by using software "Burnin test" to activate all available parts, graphic mode both 3 dimensions and H schrolling pattern. All available ports are terminated with 50 ohms devices. Lound speakers are connected as one of the EUT peripherals monitoring it's sound function.

4.1 Test Method

- Test is done according to the method specified in ANSI C 63.4-2003.
- Test equipment as shown in the table in topic 4.1.1 is connected as shown in figure 2 topic 4.1.2 to measure radiated emission in the semi anechoic chamber.
- EUT is configured by follow the particular requirement in the reference standards. EUT shall be configured with appropriate load and exercise for function as much as possible.
- Radiated emission from the EUT shall be investigated by rotating the turntable ($0\text{-}360^{O}$) and scanning the antenna up and down (1-4m).
- Pre-scan shall be done with Peak detector for the whole range of frequency as specified by the standard.
- At least 6 worst peaks which are closet to the limit(s) shall be selected to do the Final scan.
- Final scan shall be done by maximizing the suspect signal to find the exact frequency, angle of turn table, antenna polarization and height respectively. If the peak of the final result higher than QP limit, QP detector shall be used to find the QP result and compare with the limit as shown in table 2.

4.1.1 Test Equipment

Equipment	Type	Manu.	Serials number	Cal. Date
EMI Receiver	8572A	HP	3221A01430	15/04/05
Bilog Antenna	CBL6141A	Schaffner	4148	23/09/05
RF Pre-amplifier	8449B OPT H02	HP	-	15/10/05
Double Ridge Horn Antenna[1]	EMCO 3115	EMCO	-	14/02/98

4.1.2 Test Set up

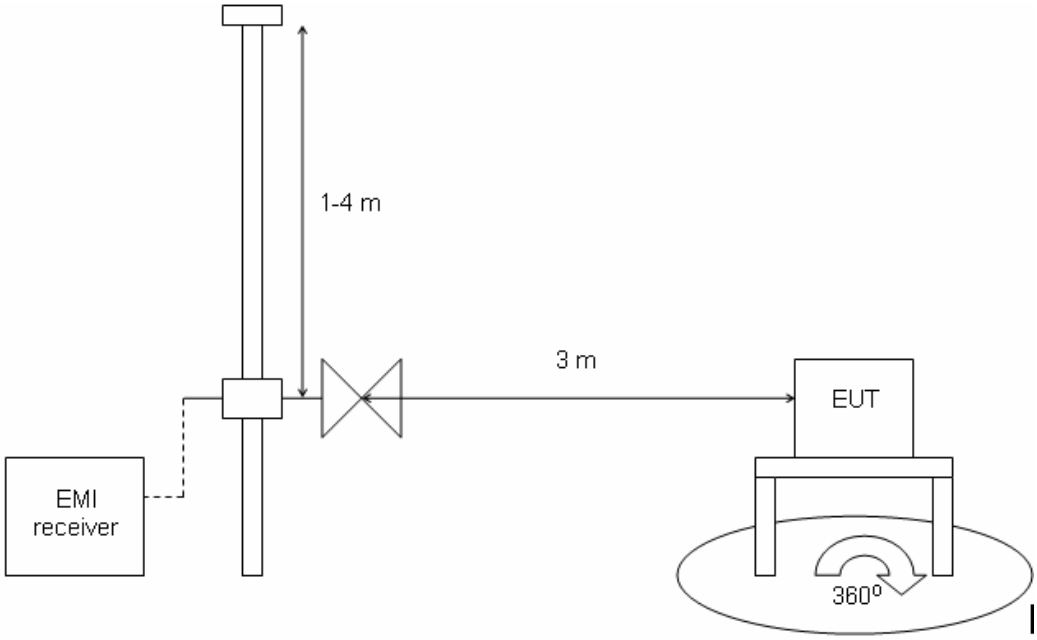


Figure 2-Drawing of Radiated Emission Measurement

[1] This equipment is verified before use every time.

4.1.3 Limit

For unintentional radiator, spectrum shall be investigated from 30MHz to the frequency shown in table 2.

Table 2 – Frequency of radiated emission measurement

Highest frequency generated or used in the device or on which the device operates or tunes	**upper frequency of measurement range**
MHz	***MHz***
< 1.705	30
1.705-108	1000
108-500	2000
500-1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

Table 3- Radiated emission limits

Frequency of Emission	**Field Strength**	**Field Strength**
(MHz)	**microvolt/meter**	**dBμV/m**
30-88	100	40.00
88-216	150	43.52
216-960	200	46.02
above 960	500	53.98

Note:
If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement with the receiver with average detector need not be carried out.

4.2 Test result

4.2.1 Test Environment

Temperature: 22.3 ^{O}C Humidity 51.1 %Rh

4.2.2 Radiated emission measurement (30MHz – 1GHz)

Final measurement result with Bilog Antenna

Frequency *MHz*	Result *dB μV/m*	Limit *dB μV/m*	Margin to Limit *dB*	Polarization	Angle *Degree*	Height *cm*
100.3570	39.6	43.50	-3.9	H	86.00	287.00
100.3750	38.2	43.50	-5.3	V	41.00	100.00
335.9980	39.7	46.00	-6.3	H	66.00	364.00
439.9640	38.4	46.00	-7.6	V	0.00	100.00
335.9990	37.0	46.00	-9.0	V	167.00	126.00

The emission spectrum of the above result is shown in Appendix I, figure A I.5 and A I.6.

4.2.3 Radiated emission measurement (Above 1GHz)

Final measurement result with Double Ridge Horn Antenna

Frequency *MHz*	Result *dB μV/m*	Limit *dB μV/m*	Polarization	Margin to Limit *dB*
1.507	38	53.98	V	-15.98
1.507	31.53	53.98	H	-22.45
3.005	37.14	53.98	V	-16.84
3.005	35.07	53.98	H	-18.91
4.503	41.22	53.98	V	-12.76
4.503	38.2	53.98	H	-15.78
4.573	31.72	53.98	V	-22.26

APPENDIX I: EMISSION SPECTRUM

The following pages 15-20 have shown the emission spectrum resulting from conducted emission measurement in topic 3 (figure AI.1-figure AI.4) and radiated emission measurement in topic 4 (figure AI.5-AI.6).

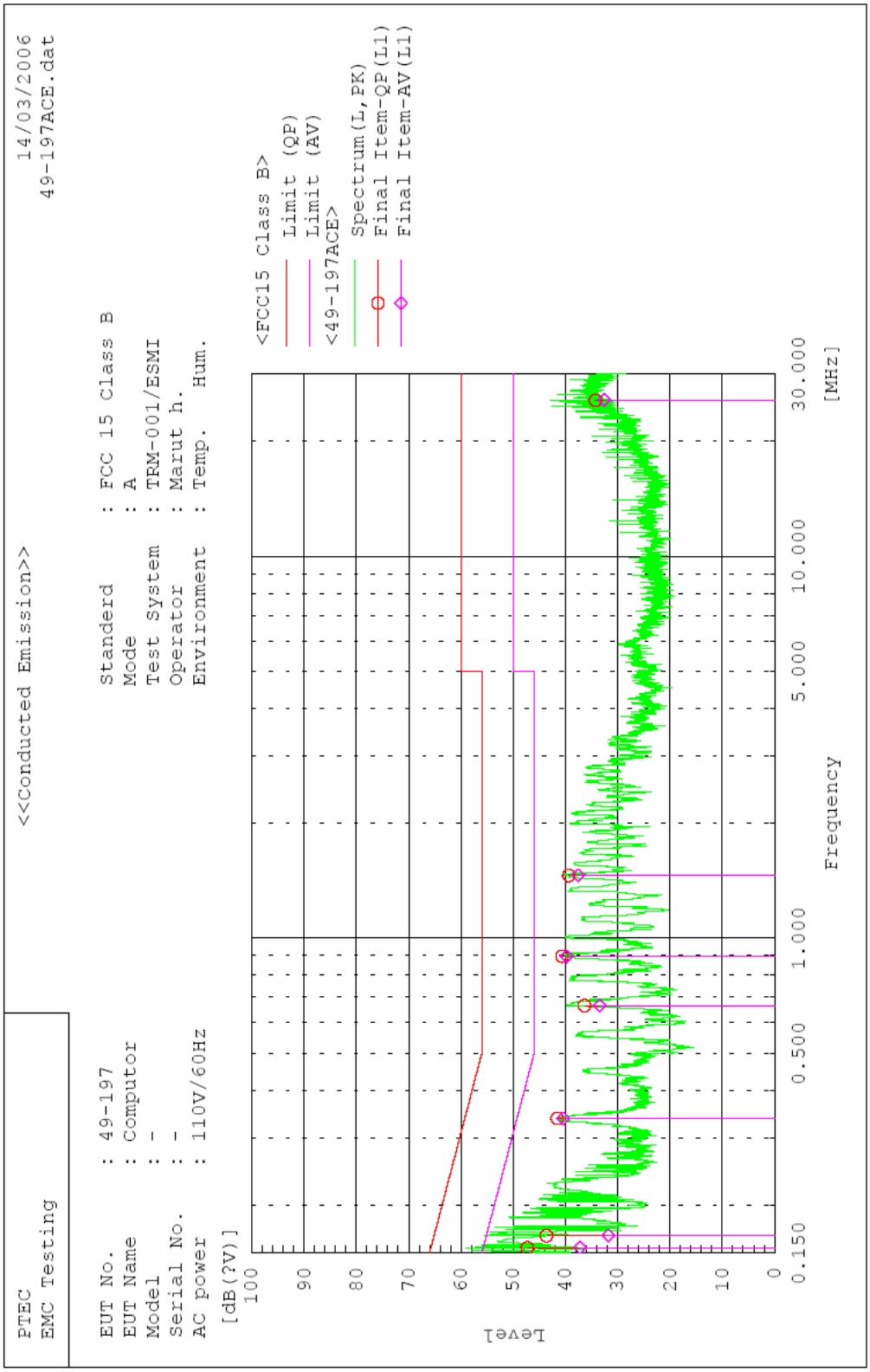


Figure AI.1 Emission Spectrum of Conducted Emission Measurement in topic 3.2.2 a)

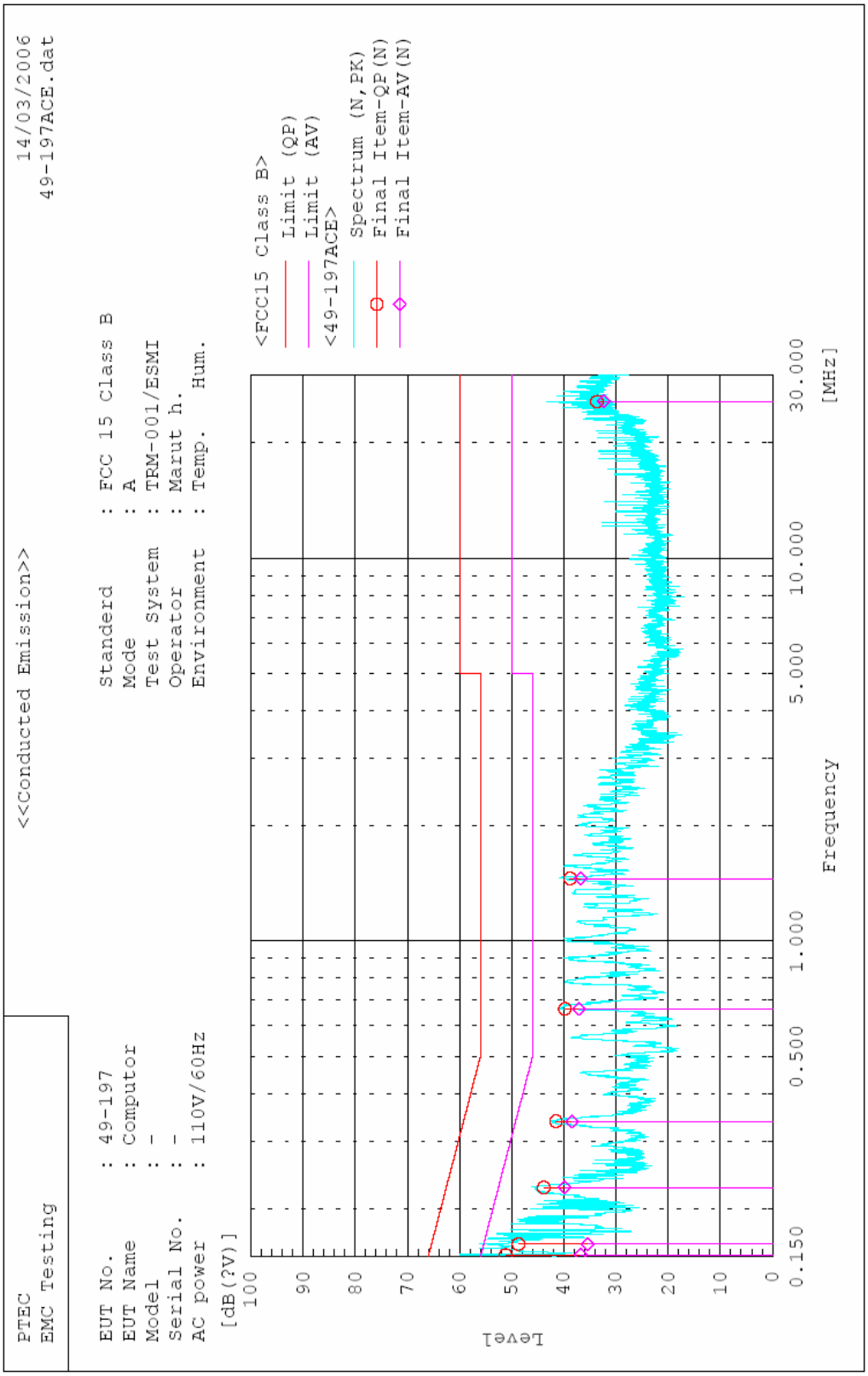


Figure AI.2 Emission Spectrum of Conducted Emission Measurement in topic 3.2.2 b)

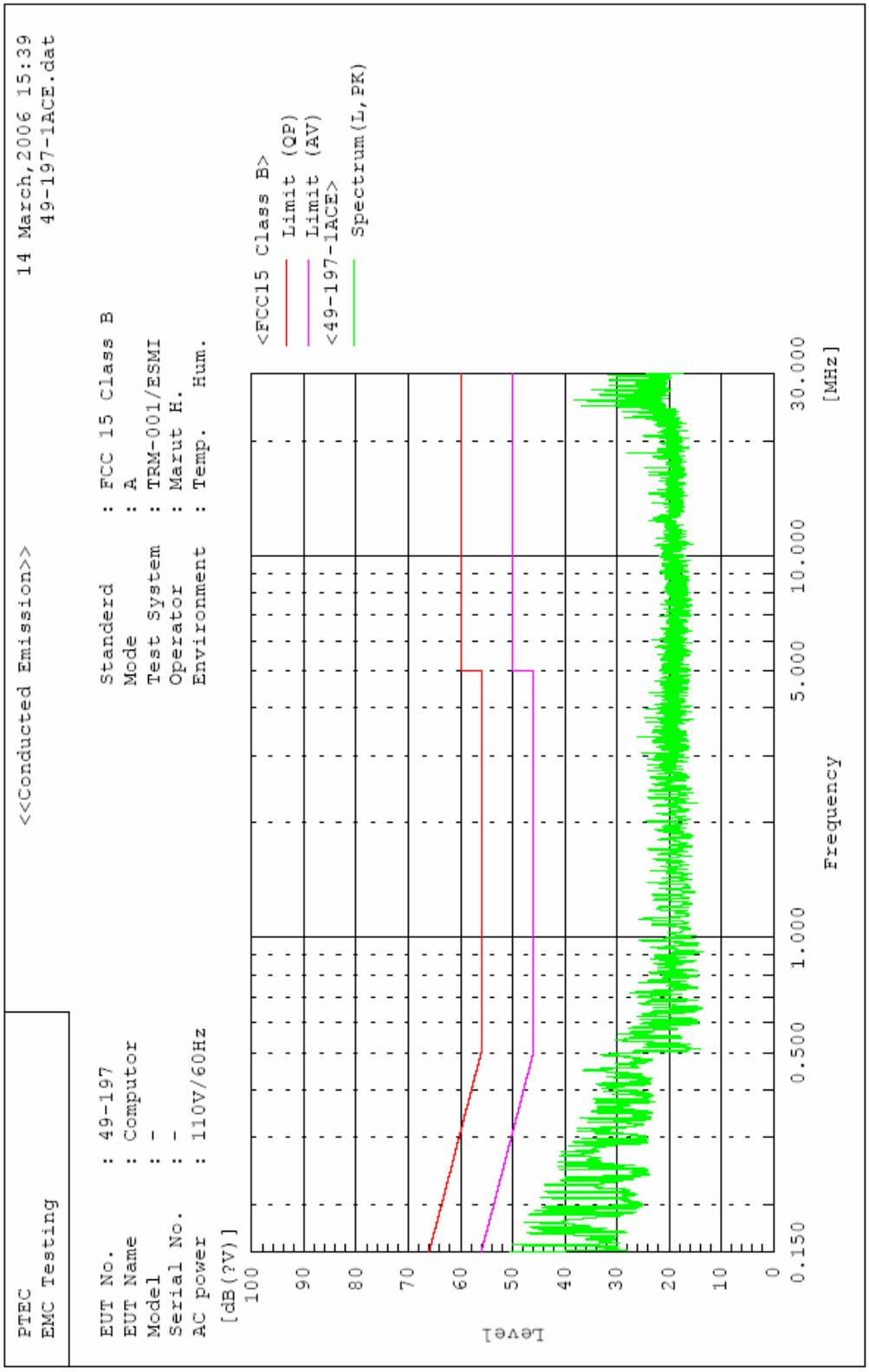


Figure AI.3 Emission Spectrum of Conducted Emission Measurement in topic 3.2.3 a)

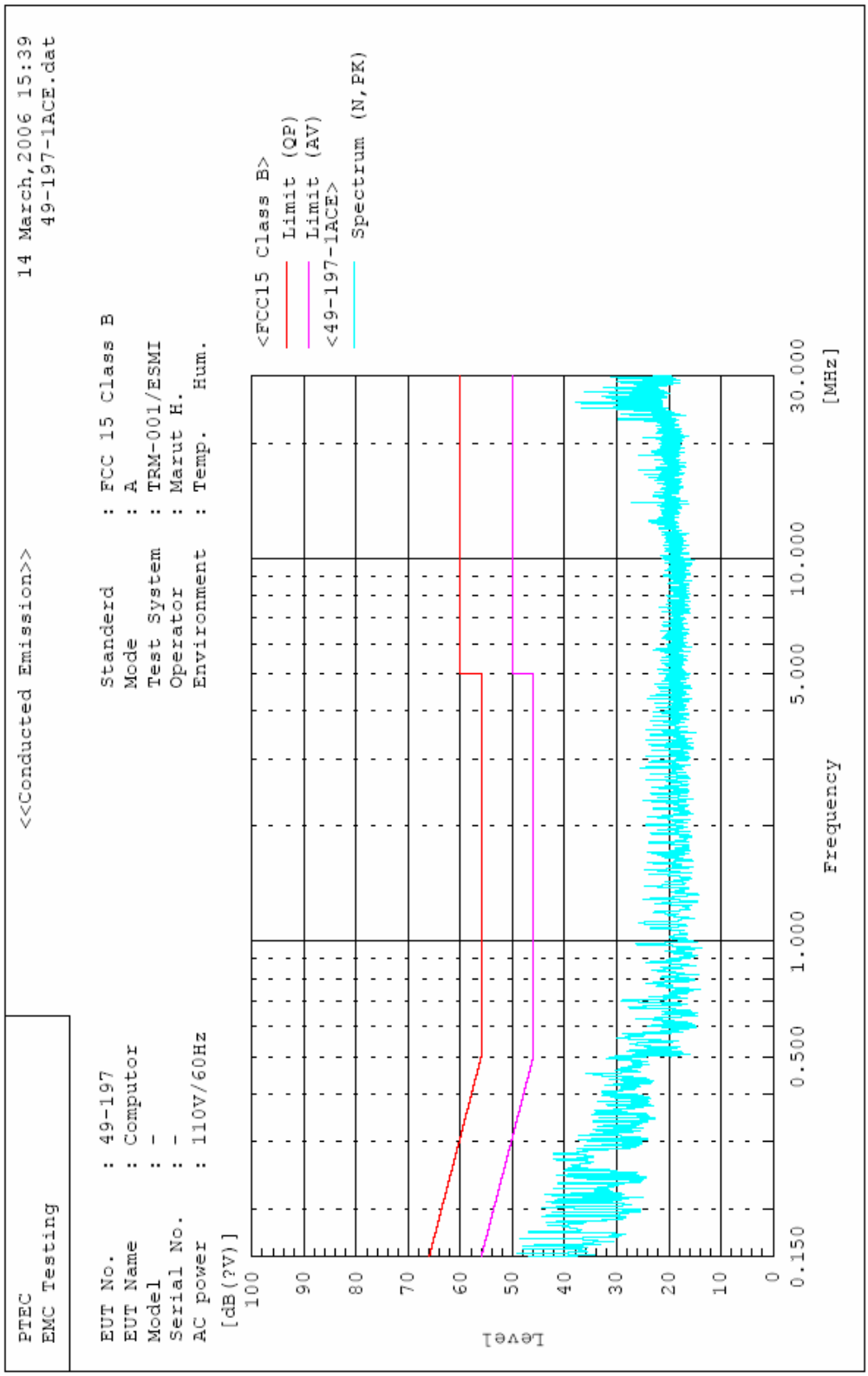


Figure AI.4 Emission Spectrum of Conducted Emission Measurement in topic 3.2.3 b)

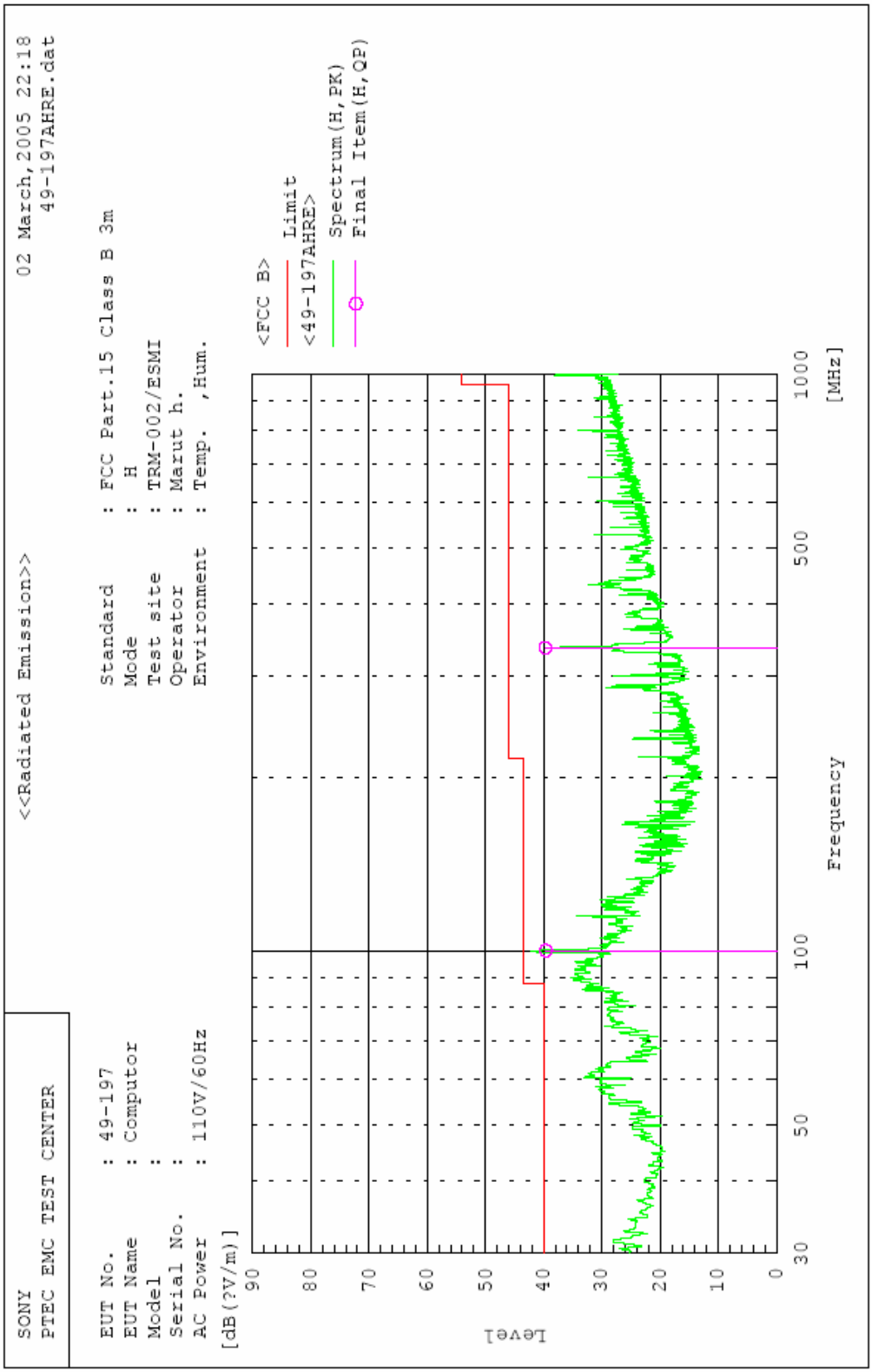


Figure AI.5 Emission Spectrum of Radiated Emission Measurement in Horizontal Polarization of Antenna

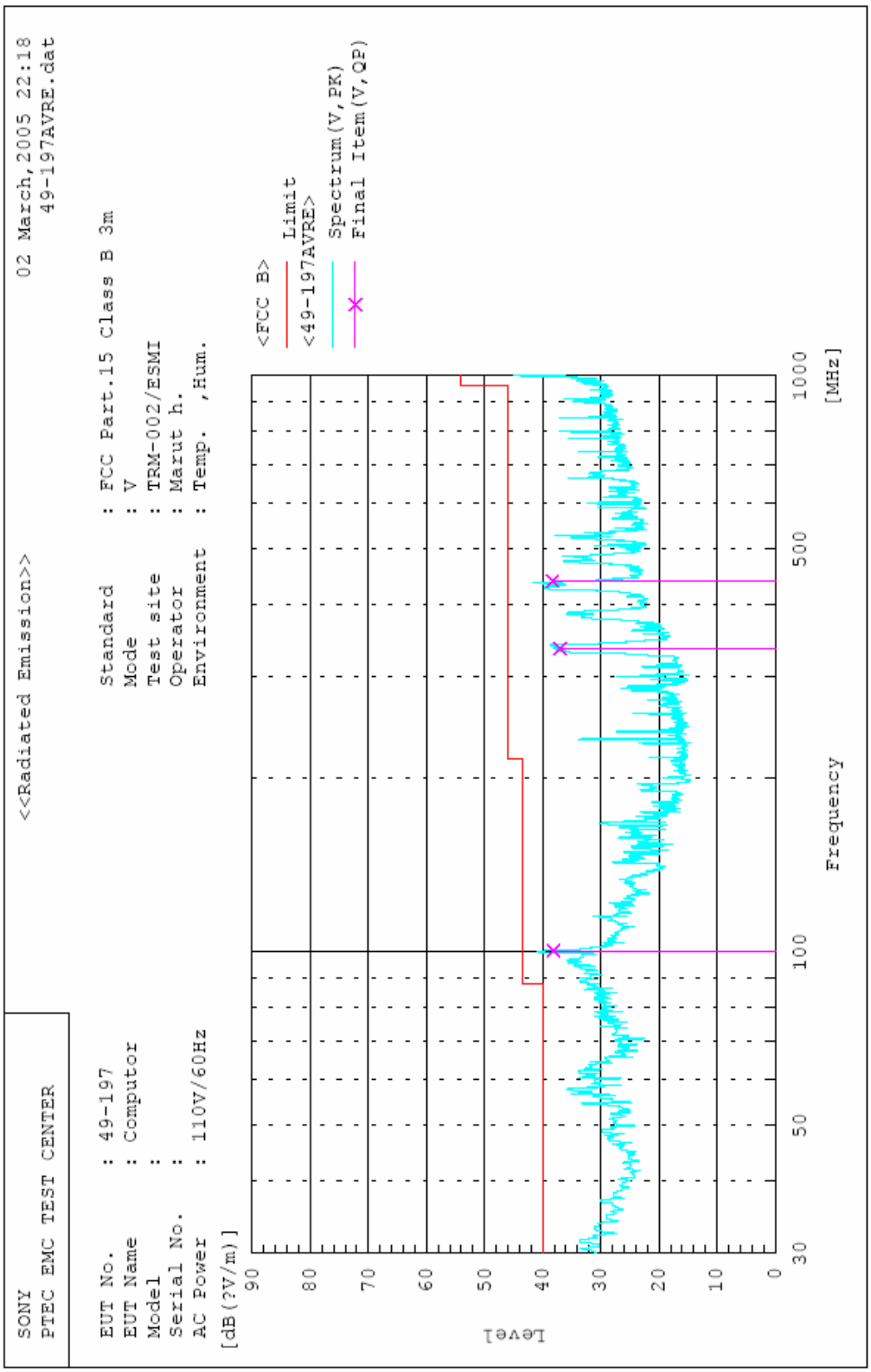


Figure AI.6 Emission Spectrum of Radiated Emission Measurement in Vertical Polarization of Antenna

APPENDIX II: FCC ID LABEL & LOCATION

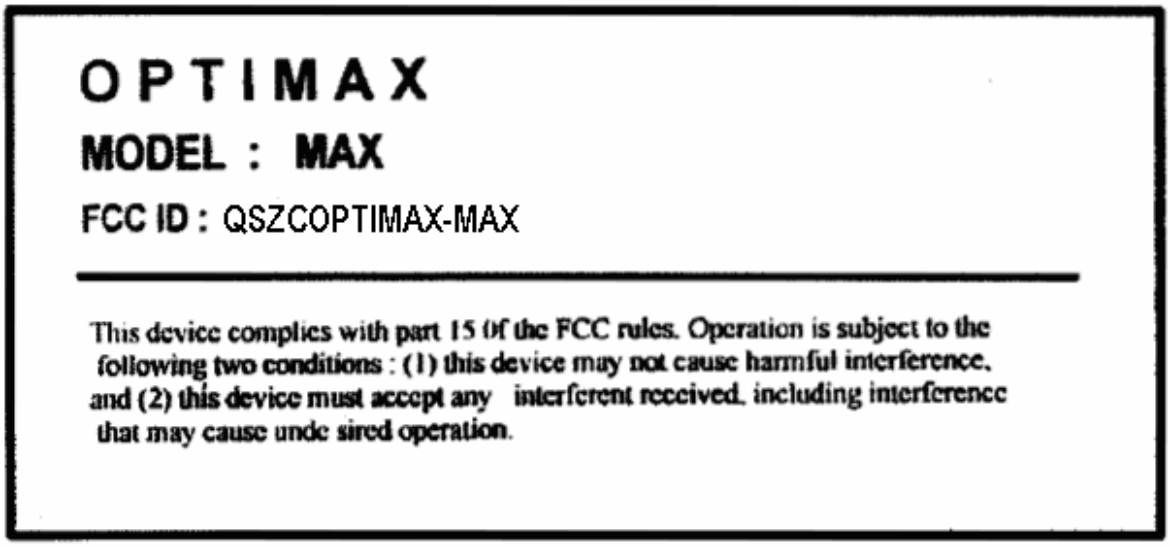


Figure AII.1 FCC ID Label

Figure AII.1 FCC ID Label located at the right-hand side of the CPU case

APPENDIX III: EUT PHOTOGRAPHS

a) Front

b) Rear

c) Right

d) Left

Figure AIII.1- External Photographs (CPU case)

a) Front

b) Rear

c) Left

d) Right

Figure AIII.2- External Photographs (Monitor front view)

Figure AIII.3-Mouse

Figure AIII.4-Keyboard

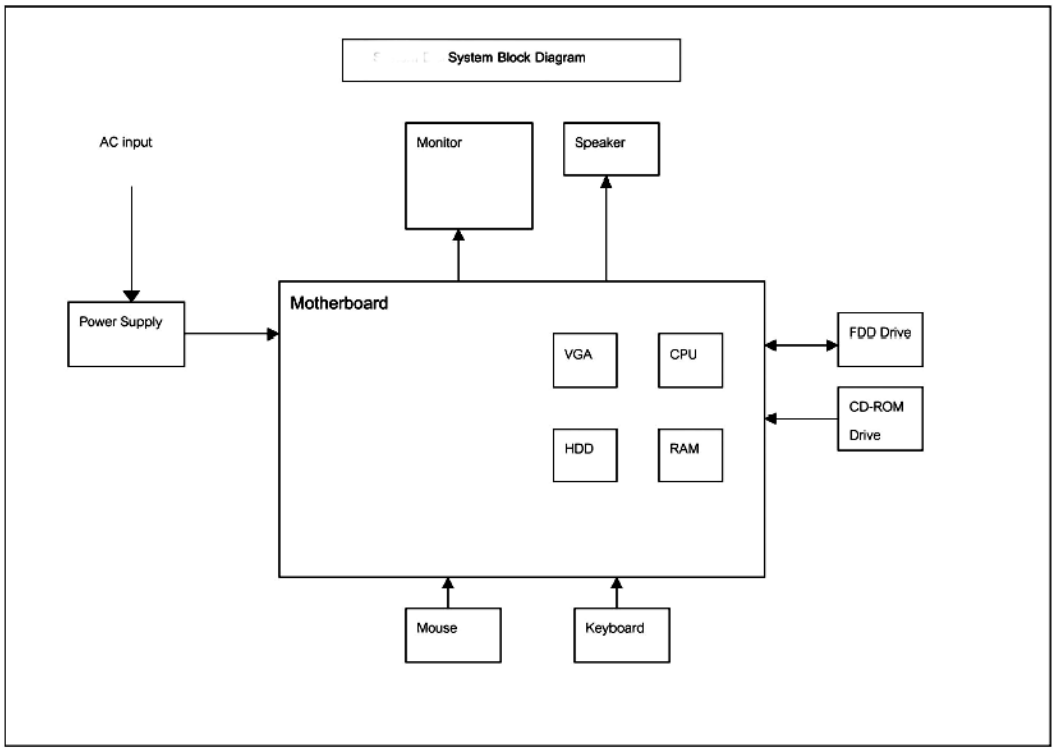
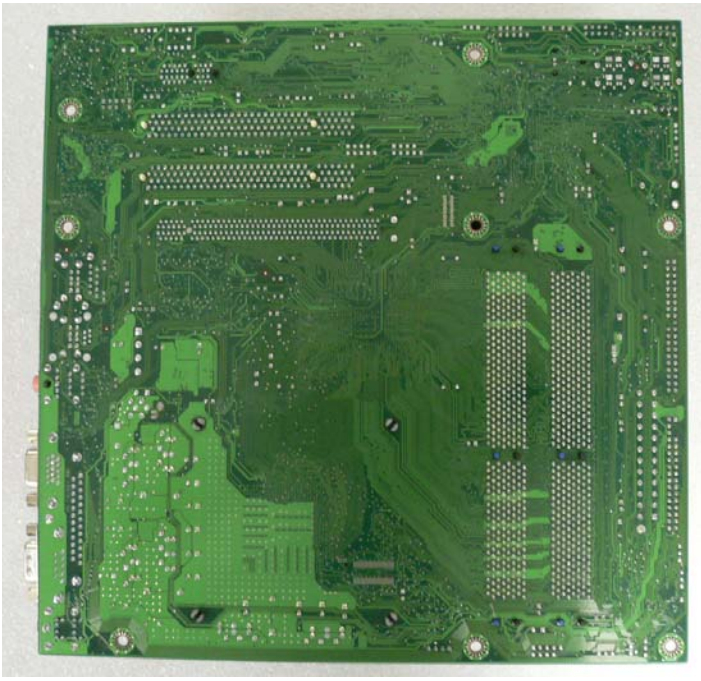


Figure AIII.5-EUT Block Diagram

Figure AIII.6-Internal Photographs (CPU case)

Figure AIII.7-Power Supply

a) Top



b) Bottom

Figure AIII.8-Motherboard

Figure AIII.9-Floppy Disk Drive

a) Top

b) Bottom

Figure AIII.10-Hard Disk Drive

Figure AIII.11-CD-ROM Drive