

## 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:



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**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.

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#### EMISSION TEST

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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:

<b>Processor</b>	Intel Pentium4 1.5 GHz, 400 MHz FSB, Socket478
<b>Cache Memory</b>	256 KB Level 2 (on-die, full speed)
<b>Memory</b>	DDR400 128 MB PC2100 Expandable up to 1 GB
<b>Mainboard</b>	Intel845 Chipset, Socket478, 400 MHz FSB, AGP4X, ATA100
<b>Hard Disk</b>	40 GB, Ultra ATA100, 5400rpm
<b>Floppy Disk Drive</b>	Standard 3.5" 1.44 MB
<b>Optical Drive</b>	52X Speed CD-ROM Drive
<b>Monitor</b>	15" CRT Monitor, 1280x1024 Resolution, MPR-II
<b>VGA</b>	AGP4X Card SIS315E with 32 MB Memory
<b>Sound</b>	AC97 Audio (3D 16-bit Full Duplex)
<b>Case</b>	Tower ATX with Power Supply 300 Watts & Cooling Fans
<b>Expansion Slot</b>	3 PCI, 1 AGP4X
<b>I/O Port</b>	2 Serial, 1 Parallel, 2 PS/2, 2 USB
<b>Mouse</b>	PS/2 Scroll Mouse & Mouse Pad
<b>Keyboard</b>	PS/2 Thai&Eng 107 Keys
<b>LAN</b>	Fast Ethernet 10/100 Mbps
<b>OS Supported</b>	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 considered in this test report.

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



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**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 : 1.5 GHz  
frequencies/highest  
operating frequency:



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## 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 scrolling pattern. All available ports are terminated with 50 ohms devices. Loud 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 scrolling pattern. All available ports are terminated with 50 ohms devices. Loud 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

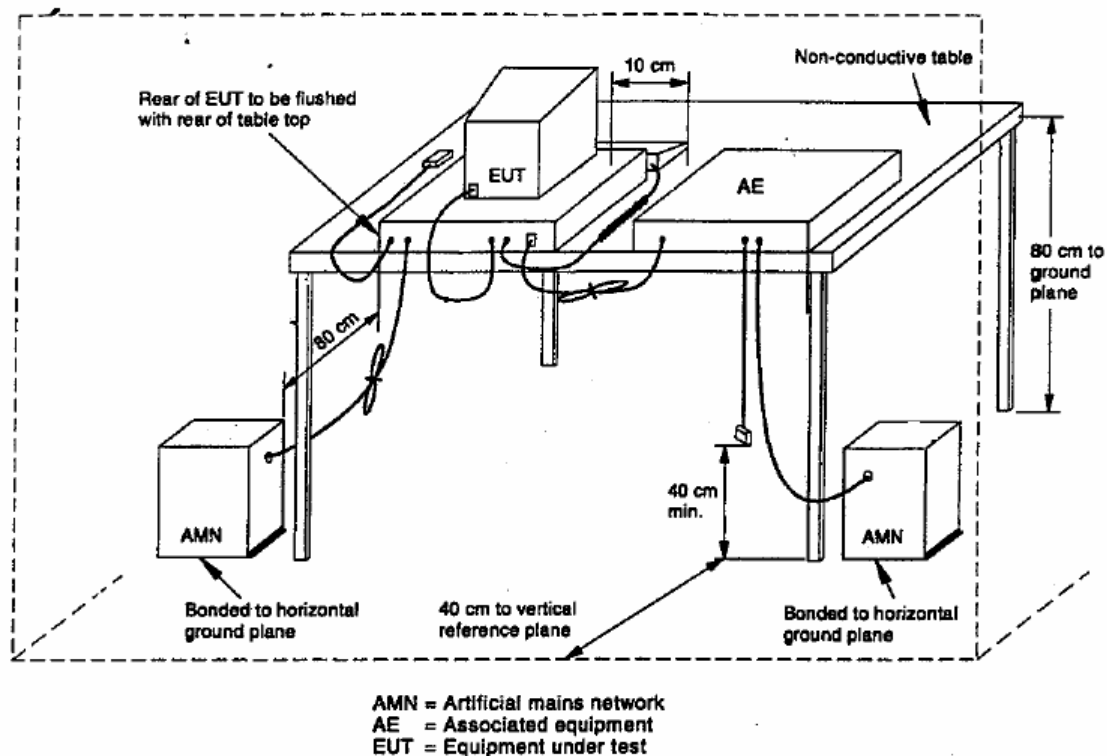


Figure 1-Drawing of Conducted Emission Measurement

### 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.	

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### 3.2 Test result

#### 3.2.1 Test Environment

Temperature: 23.7 °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 $\mu$ V	QP Limit dB $\mu$ V	AV result dB $\mu$ V	AV Limit dB $\mu$ V	Margin to QP Limit dB $\mu$ V	Margin to AV Limit dB $\mu$ V
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 $\mu$ V	QP Limit dB $\mu$ V	AV result dB $\mu$ V	AV Limit dB $\mu$ V	Margin to QP Limit dB $\mu$ V	Margin to AV Limit dB $\mu$ V
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



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### 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



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**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 scrolling pattern. All available ports are terminated with 50 ohms devices. Loud 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 (0-360°) 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.



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#### 4.1.1 Test Equipment

Equipment	Type	Manu.	Serials number	Cal. Date
EMI Receiver	8572A	HP	3221A014 30	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 <sup>1</sup>	EMCO 3115	EMCO	-	14/02/98

#### 4.1.2 Test Set up

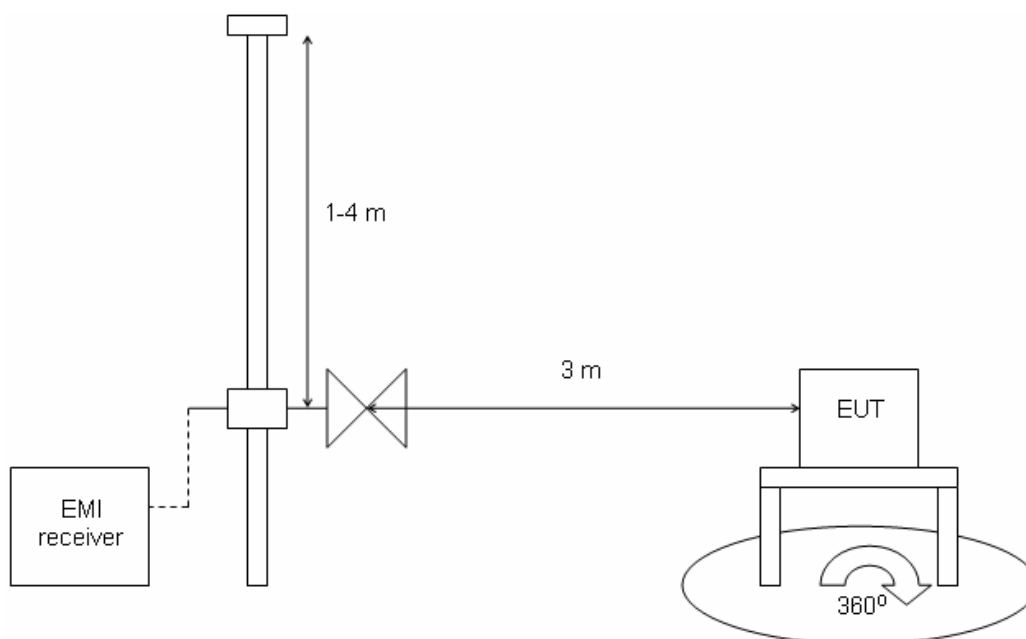


Figure 2-Drawing of Radiated Emission Measurement



<sup>1</sup> This equipment is verified before use every time.

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#### 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.



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## 4.2 Test result

### 4.2.1 Test Environment

Temperature: 22.3 °C

Humidity

51.1 %Rh

### 4.2.2 Radiated emission measurement (30MHz – 1GHz)

Final measurement result with Bilog Antenna

Frequency MHz	Result dB $\mu$ V/m	Limit dB $\mu$ V/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 $\mu$ V/m	Limit dB $\mu$ V/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).



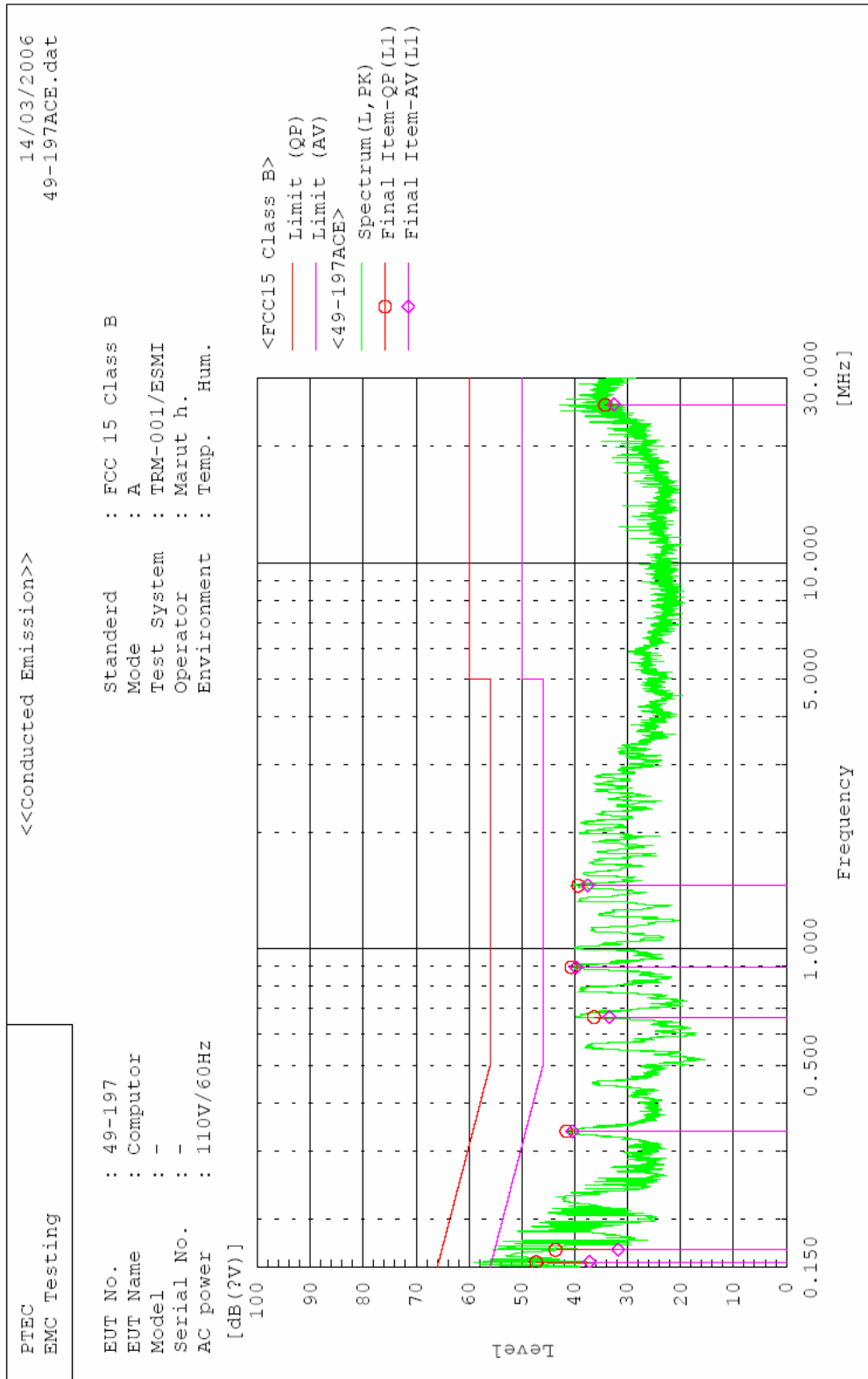


Figure A1.1 Emission Spectrum of Conducted Emission Measurement in topic 3.2.2 a)

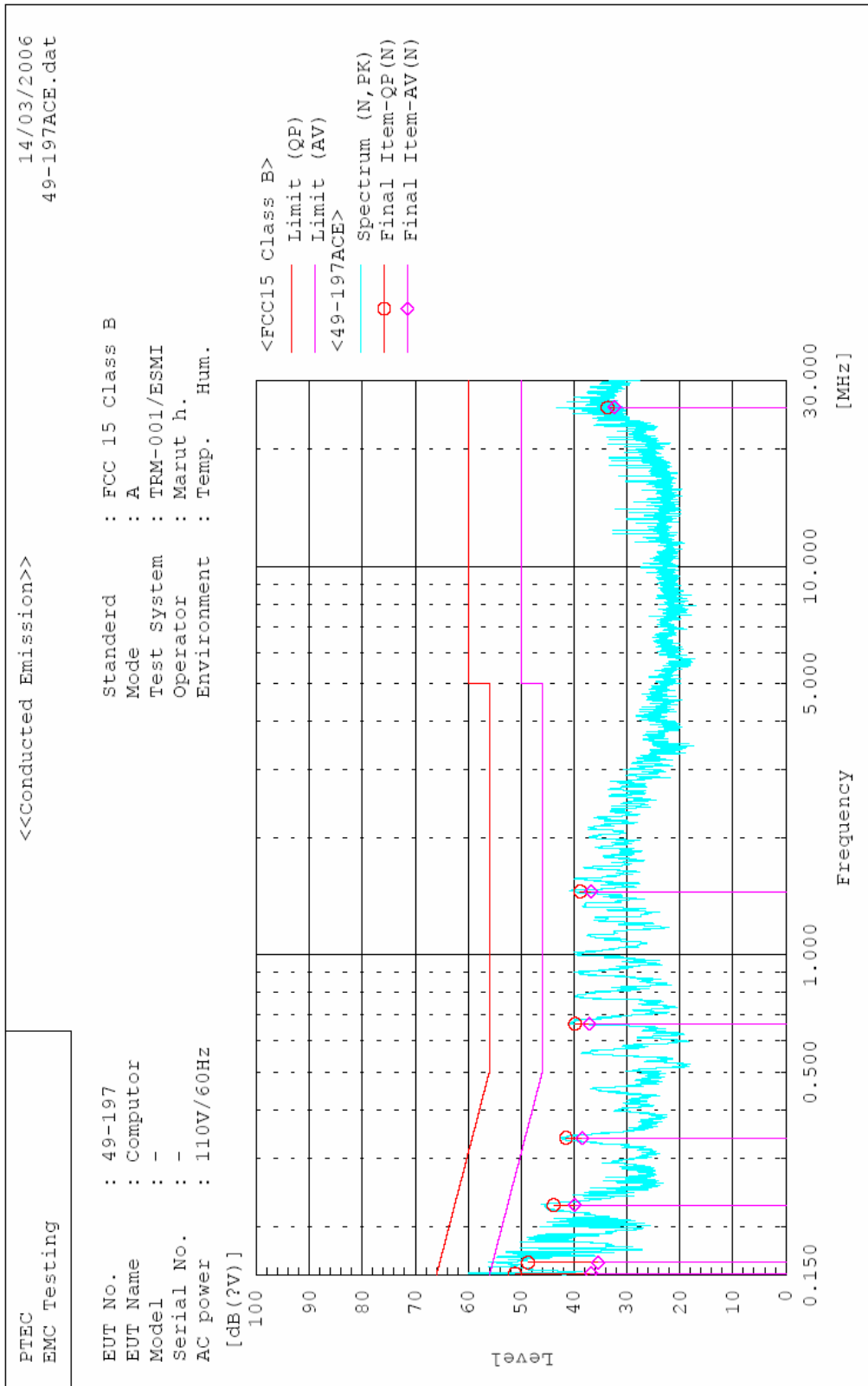


Figure A1.2 Emission Spectrum of Conducted Emission Measurement in topic 3.2.2 b)

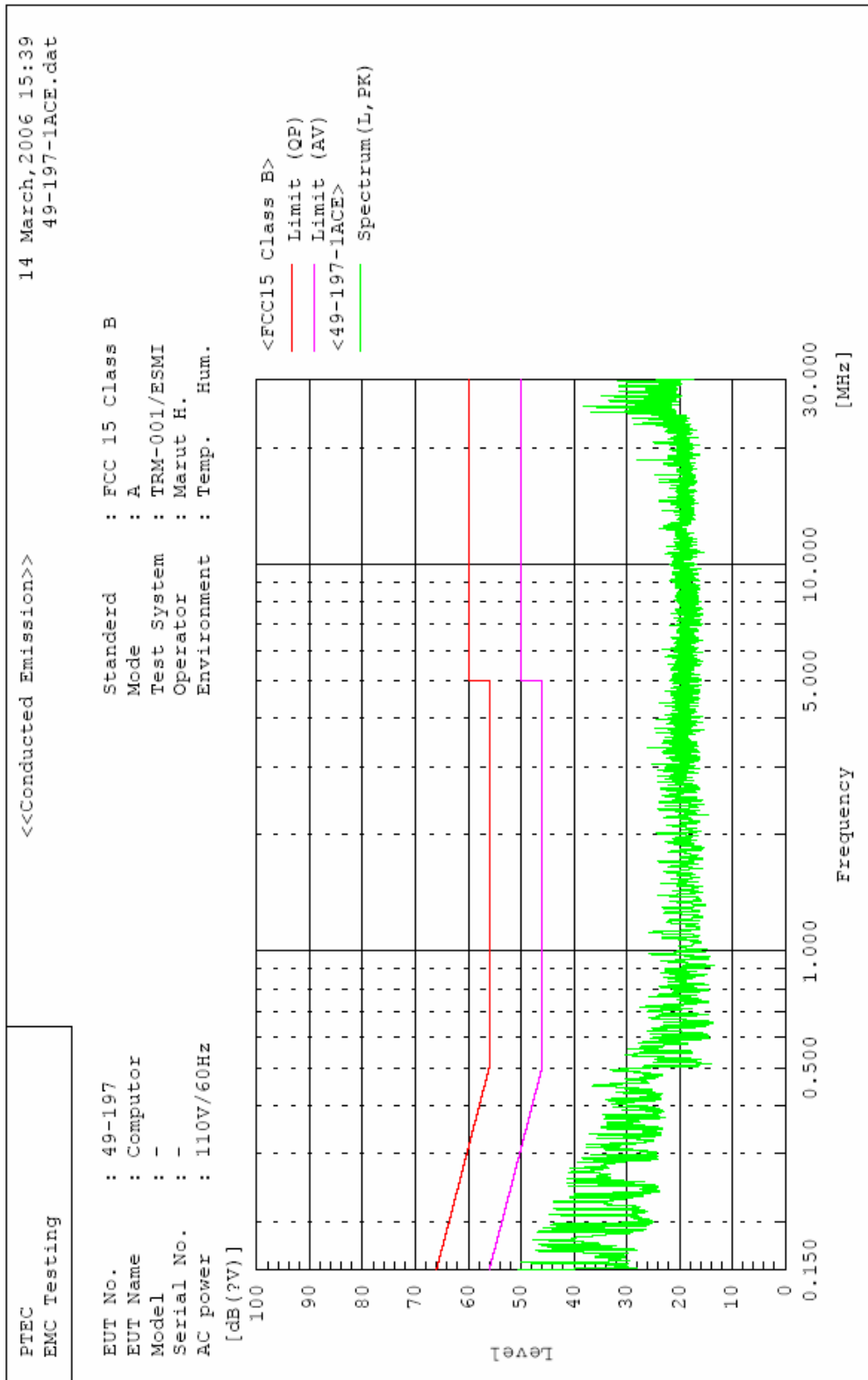


Figure A1.3 Emission Spectrum of Conducted Emission Measurement in topic 3.2.3 a)

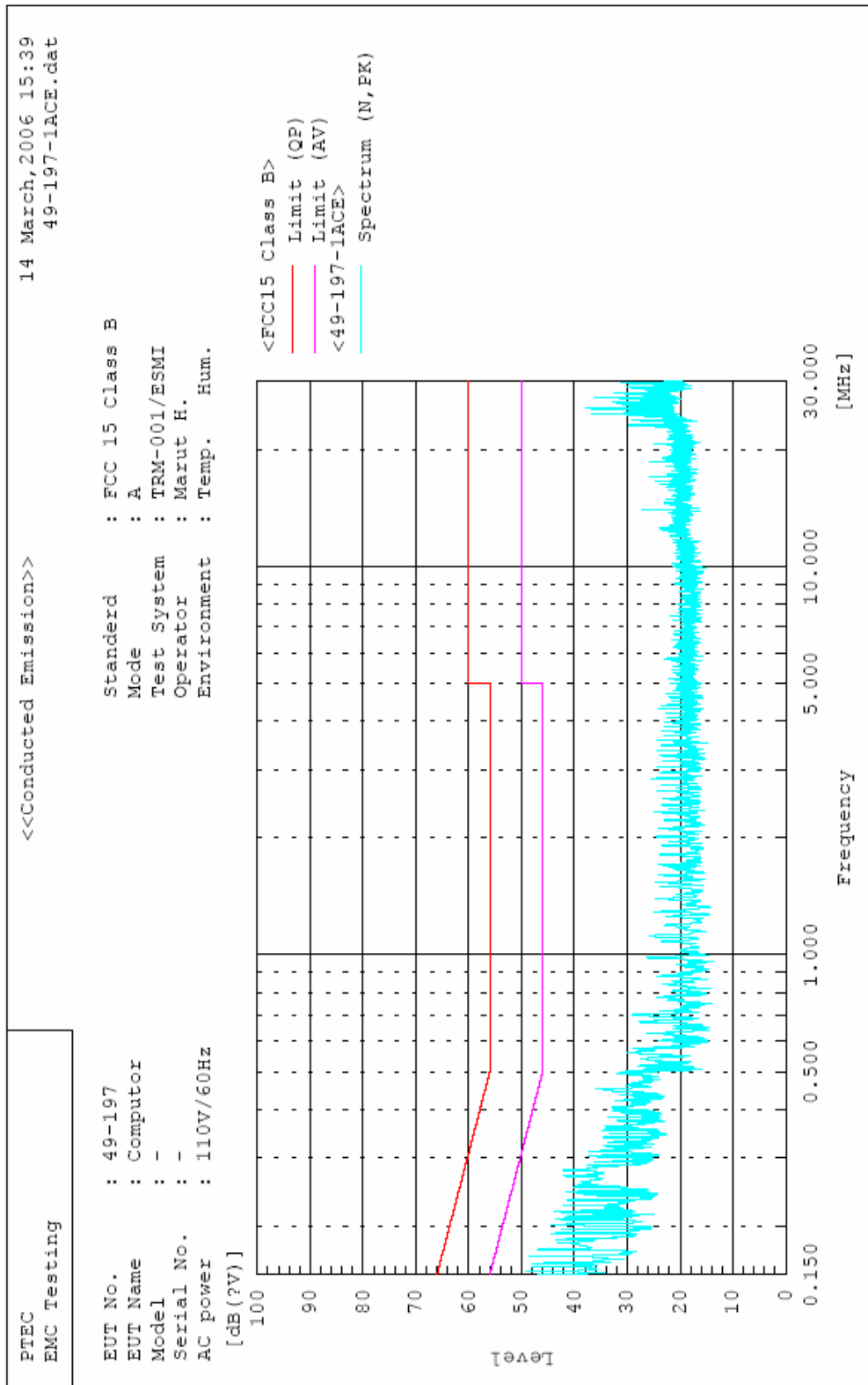


Figure A1.4 Emission Spectrum of Conducted Emission Measurement in topic 3.2.3 b)

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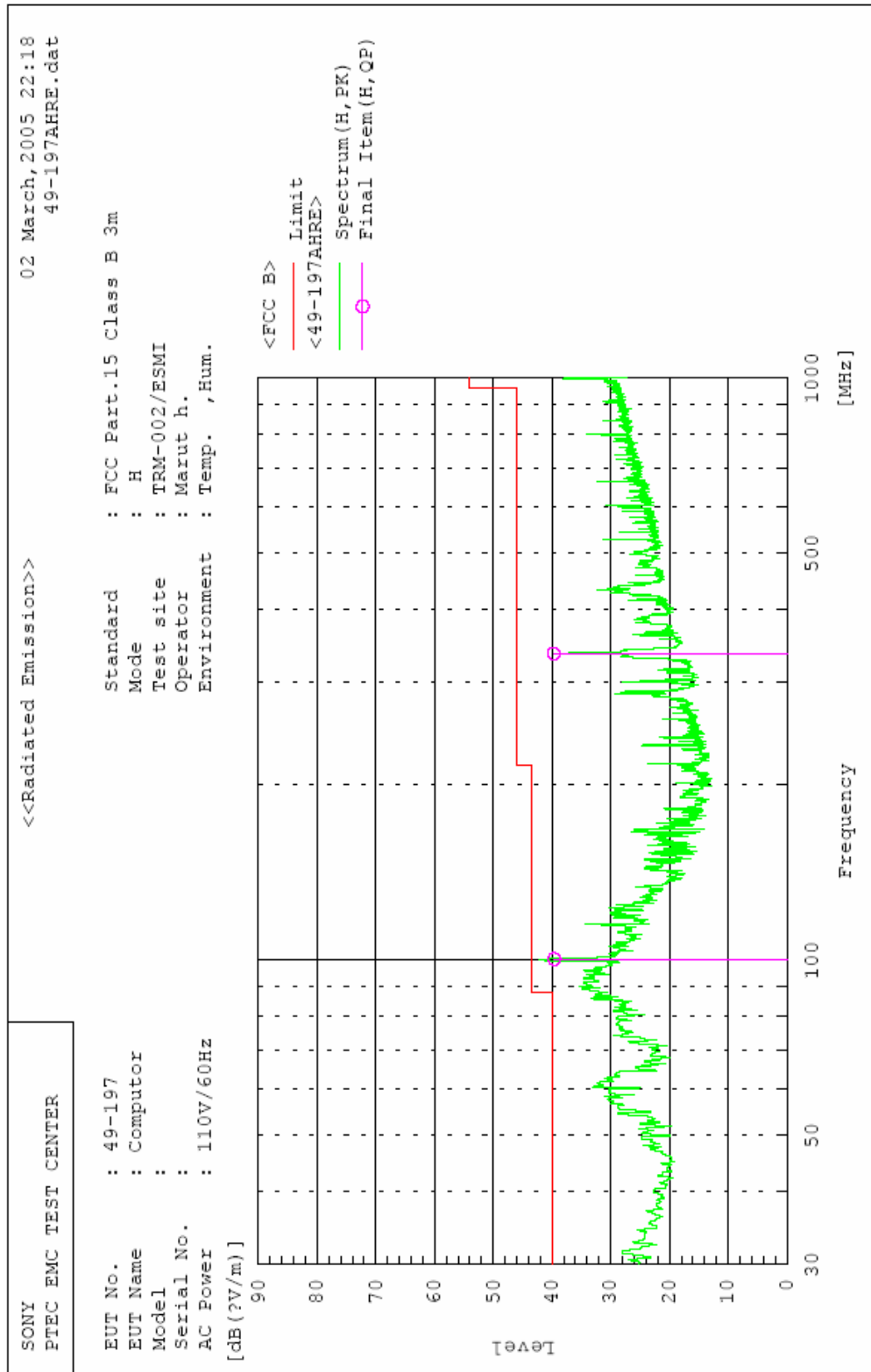


Figure A1.5 Emission Spectrum of Radiated Emission Measurement in Horizontal Polarization of Antenna

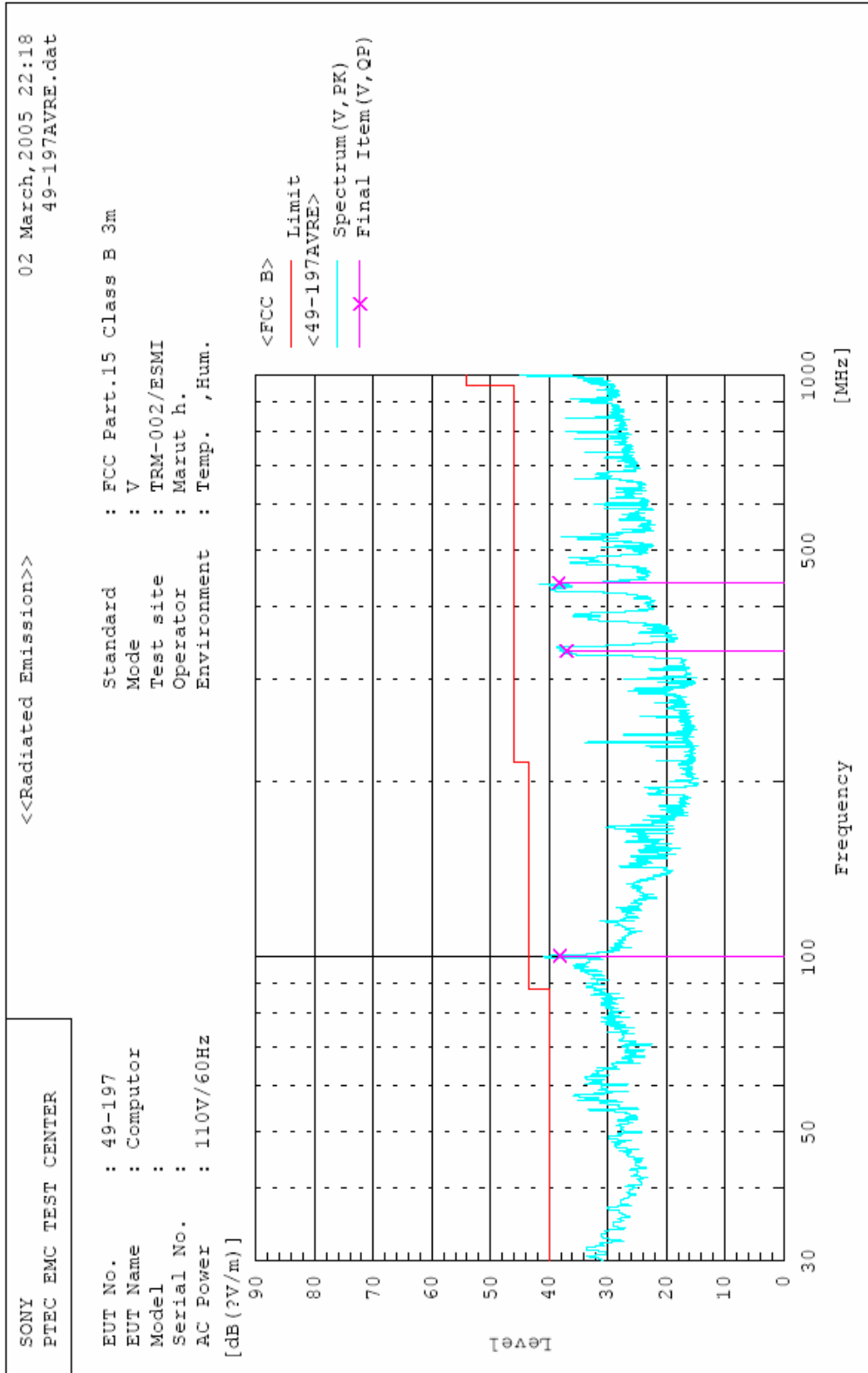


Figure AI.6 Emission Spectrum of Radiated Emission Measurement in Vertical Polarization of Antenna

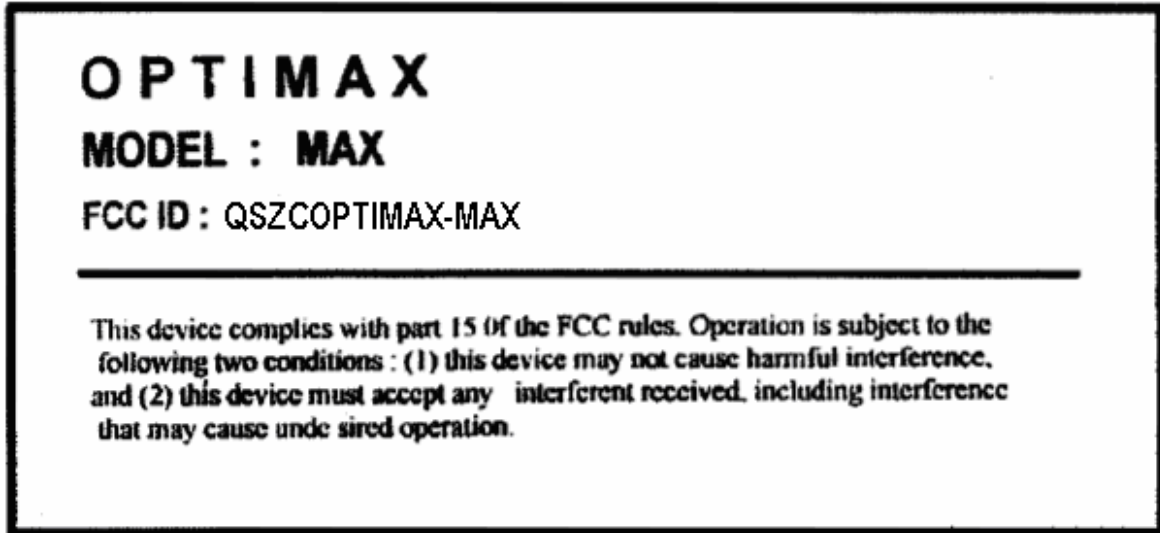
**APPENDIX II: FCC ID LABEL & LOCATION**

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)

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a) Front



b) Rear



c) Left



d) Right

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



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Figure AIII.3-Mouse



Figure AIII.4-Keyboard

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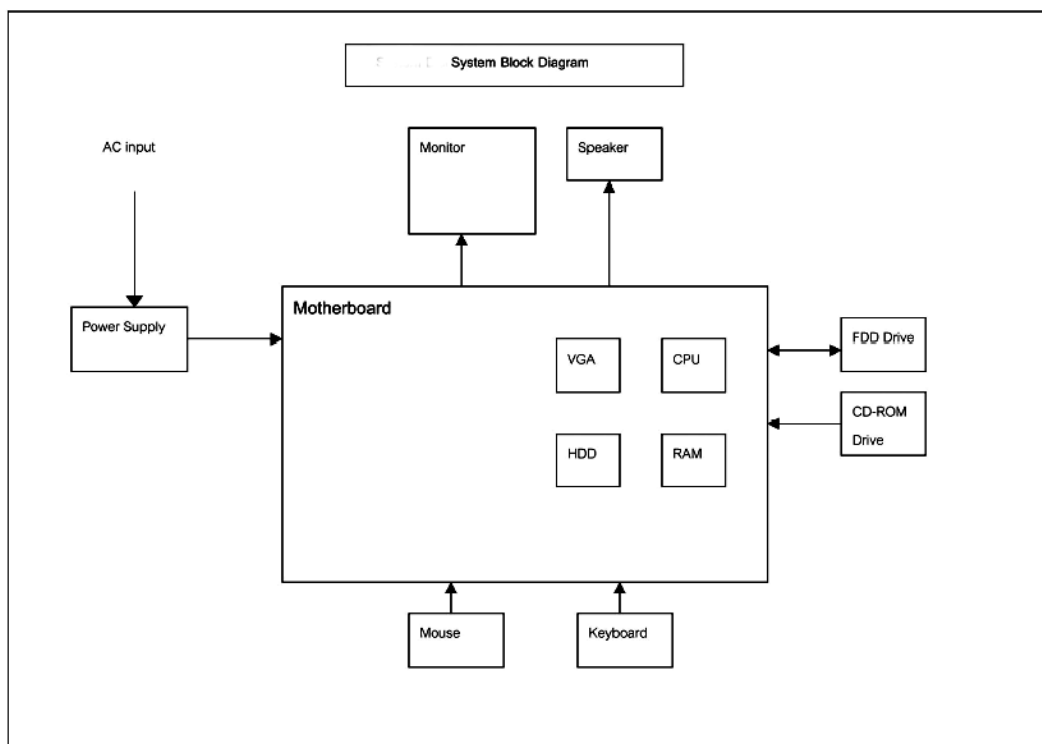


Figure AIII.5-EUT Block Diagram



Figure AIII.6-Internal Photographs (CPU case)

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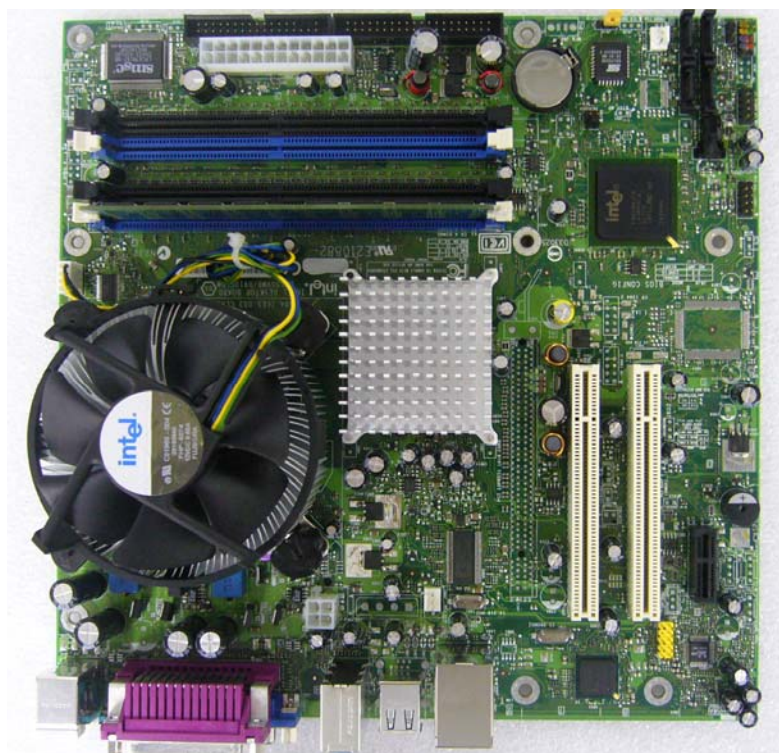


Figure AIII.7-Power Supply

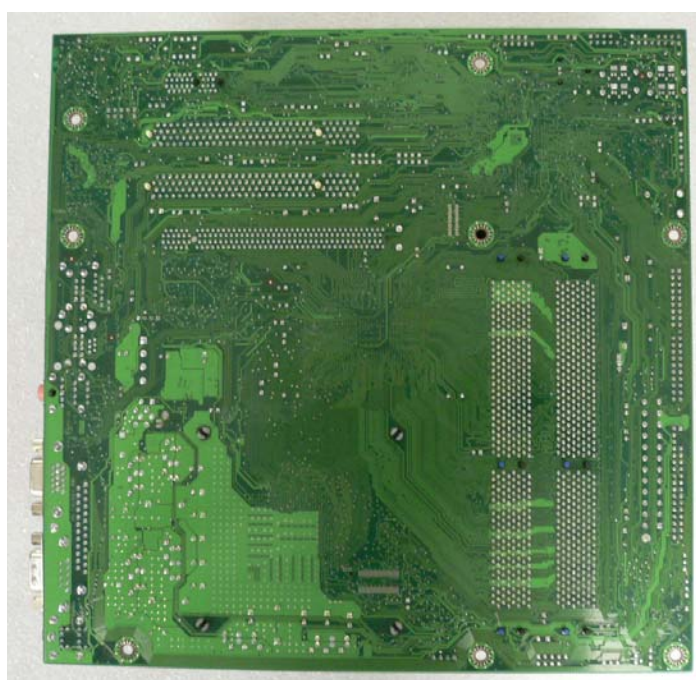


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a) Top



b) Bottom

Figure AIII.8-Motherboard

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Figure AIII.9-Floppy Disk Drive

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a) Top



b) Bottom

Figure AIII.10-Hard Disk Drive

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Figure AIII.11-CD-ROM Drive