Nemko Korea Co., Ltd.

300-2, Osan-Ri, Mohyun-Myun, Yongin-City, Kyungki-Do, KOREA
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FCC EVALUATION REPORT FOR CERTIFICATION

Manufacturer:

Cardinal Inc.
2F, Ace Techno Tower, 197-17, Kuro-dong,
Kuro-gu, Seoul, 152-050, Korea
Attn : Mr. Oh Dae Sung

Dates of Issue : February 6, 2003
Test Report No. : NK2DE069
Test Site : Nemko Korea Co., Ltd.
EMC site, Korea

FCC ID	***QVXAGM19TK***
Brand Name	***Advan, Stryker***
Applicant	**ADVAN International Corp.** **47456 Fremont Blvd. Fremont CA 94539 U.S.A** **Mr. Kenzo Sudo** **Telephone No. : +510 490 1005**

FCC Rule Part(s):	Part 15 & 2
Classification :	FCC Class B Device
EUT Type:	19” TFT LCD Monitor

The device bearing the brand name and FCC ID specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-1992.
I attest to the accuracy of data and all measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Baek sung hun

Tested By : S. H. Baek
Engineer

Reviewed By : H.H. Kim
Manager & Chief Engineer

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SCOPE

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission under FCC part 15.

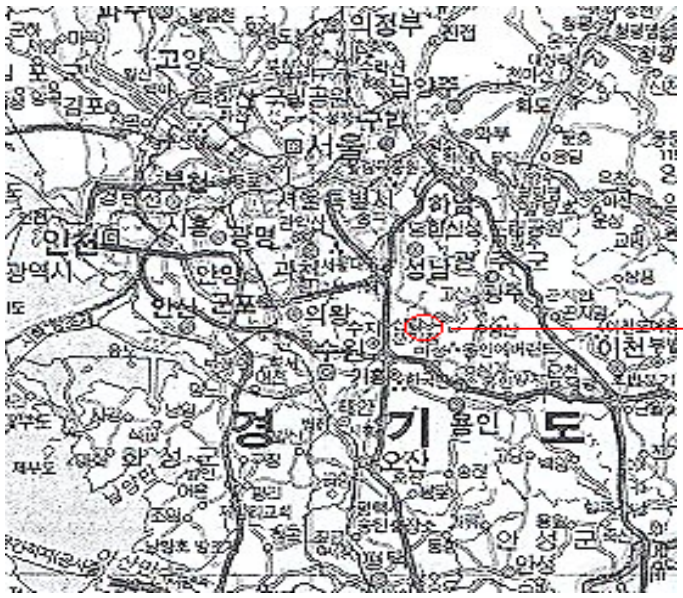
Responsible Party* :	ADVAN International Corp.
Contact Person :	Mr. Kenzo Sudo
	Tel No.: +510 490 1005
Manufacturer :	Cardinal Inc.
	2F, Ace Techno Tower 197-17, Kuro-dong, Kuro-ku
	Seoul, Korea
	Tel No.: +82 2 3443 5190

- FCC ID: QVXAGM19TK
- Brand Name: Advan, Stryker
- EUT Type: 19" TFT LCD Monitor
- Adapter Voltage: Input 100-250V AC 50/60Hz 1.0A
  Output 12V DC 6.67A
- Classification: FCC Class B
- Rule Part(s): FCC Part 15 & Part 2
- Test Procedure(s): ANSI C63.4 (1992)
- Dates of Test: February 4, 2003
- Place of Tests: Nemko Korea Co., Ltd. EMC Site
- Test Report No.: NK2DE069

INTRODUCTION

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-1992) was used in determining radiated and conducted emissions emanating from **ADVAN International Corp.**
FCC ID : **QVXAGM19TK, 19" TFT LCD Monitor.**

These measurement tests were conducted at ***Nemko Korea Co., Ltd. EMC Laboratory*** .
The site address is 300-2, Osan-Ri, Mohyun-Myun, Yongin-City, Kyungki-Do, KOREA
The area of Nemko Korea Corporation LTD. EMC Test Site is located in a mountain area at 50 kilometers (30 miles) southeast and Seoul International Airport (Kimpo Airport), 30 kilometers (18miles) south-southeast from central Seoul.
It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quiet and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures.
The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4 on October 19, 1992.



Nemko Korea Co., Ltd.
OPEN AREA TEST SITE
300-2, Osan-Ri, Mohyun-Myun, Yongin-City Kyungki-Do,KOREA 449-852
Tel)+82-31-322-2333
Fax)+82-31-322-2332

Fig. 1. The map above shows the Seoul in Korea vicinity area.
The map also shows Nemko Korea Corporation Ltd. EMC Lab and Kimpo Airport.

TEST CONDITIONS & EUT INFORMATION

Operating During Test

The EUT was operated by the software. The PC sent “H” pattern to monitor(EUT) and

The monitor displayed “H” pattern on screen. It also sent “H” pattern to printer, then the printer printed it out. This software had above all functions conduct in order.

Support Equipment

PC	Samsung, Model: M6050 1.8m unshielded AC power cable	S/N: 823992ERC00157
Monitor(EUT)	Advan, FCC ID: QVXAGM19TK 1.5m shielded D-sub cable	S/N: N/A
Adapter of EUT	Adult Inc, Model: PW116 1.8m unshielded AC power cable 1.5m unshielded DC cable with 3 ferrite cores	S/N: KA1249F02
Keyboard	HP, Model: SK-2502C 1.8m unshielded Din cable	S/N: C0012069513
Serial Mouse	Logitech , Model: WS-V1-400 1.5m unshielded Din cable	S/N: B050402
USB Mouse	Logitech, Model: M-U48a 1.5m unshielded Din cable	S/N: LZE01702679
PS/2 Mouse	Immanuel , Model: OPM22G 1.5m unshielded Din cable	S/N: N/A

Operating During Test

1. Addition ferrite core to LCD interface cable.
2. Addition ferrite core to inverter interface cable.
3. Shielded the OSD cable with metal foil tape and addition ferrite core to this cable at mainboard end.
4. addition two sponge gasket between LCD panel and main chassis.

EUT Information

Clock	Y1(24.576MHz), Y3(21.6MHz)
Chipset(s)	IC8(SAA7114), IC10(AD9BA4), U4(SIL151)
Horizontal Frequency	68kHz(Max)
Vertical Frequency	85Hz(Max)
LCD Panel	FLC48SXC8V / Fujitsu Display Technologies Corp.
Port(s)	D-sub, DVI, RCA, S-video

Description of Test Modes

The EUT was pre-tested under the following resolutions mode:

For Analogue video interface port(Dsub)

1. 1280 X 1024 (75Hz/ 79kHz), clock frequency 157.5MHz
2. 1024 X 768 (85Hz/ 68.7kHz), clock frequency 94.5MHz
3. 800 X 600 (85Hz/ 53.7kHz), clock frequency 56.25MHz
4. 640 X 480 (85Hz/ 43.3kHz), clock frequency 36MHz

For Digital video interface port(DVI)

1. 1280 X 1024 (75Hz/ 79kHz), clock frequency 157.5MHz
2. 1024 X 768 (85Hz/ 68.7kHz), clock frequency 94.5MHz
3. 800 X 600 (85Hz/ 53.7kHz), clock frequency 56.25MHz
4. 640 X 480 (85Hz/ 43.3kHz), clock frequency 36.0MHz

The worst emission level was found when the EUT was tested under 1280 X 1024 resolution, therefore, the test data this mode was recorded in the report.

DESCRIPTION OF TESTS

Conducted Emissions

The Line conducted emission test facility is located inside a 4 X 7 X 2.5 meter shielded enclosure.
It is manufactured by EM engineering. The shielding effectiveness of the shielded room is in accordance with MIL-STD-285 or NSA 65-6.
A 1mX 1.5M wooden table 0.8m height is placed 0.4m away from the vertical wall and 1.5m away from the side of wall of the shielded room
Rohde & Schwarz LISN and Kyoritsu KNW-407 50ohm/50uH line impedance stabilization network are bonded to the shielded room.
The EUT is powered from the Rohde & Schwarz LISN and the support equipment is powered from the Kyoritsu LISN. Power to the LISN s are filtered by high-current high insertion loss Power line filters. The purpose of filter is to attenuate ambient signal interference and this filter is also bonded to shielded enclosure. All electrical cables are shielded by tinned copper zipper tubing with inner diameter of 1/2".
If DC power device, power will be derived from the source power supply it normally will be powered from and this supply lines will be connected to the LISNs,
All interconnecting cables more than 1 meter were shortened by non inductive bundling (serpentine fashion) to a 1 meter length.
Sufficient time for EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer to determine the frequency producing the maximum EME from the EUT.
The spectrum was scanned from 150KHz to 30MHz with 20msec sweep time.
The frequency producing the maximum level was re-examined using the EMI test receiver. (PMM, PMM9000).
The detector function was set to CISPR quasi-peak mode.
The bandwidth of receiver was set to 9KHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission.
Each emission was maximized by; switching power lines; varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and of support equipment, and powering the monitor from the floor mounted outlet box and computer aux AC outlet, if applicable; which ever determined the worst case emission.

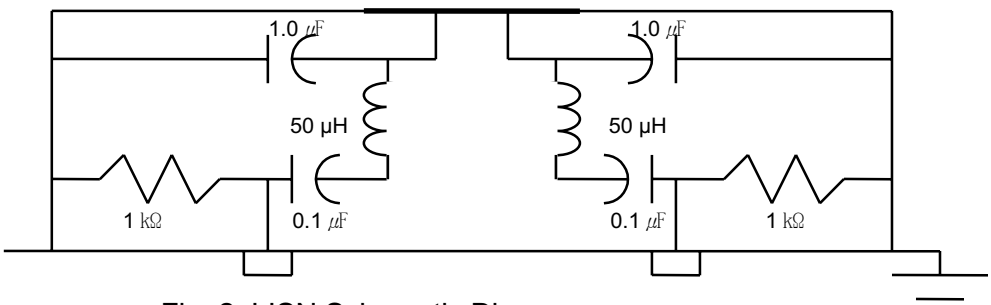


Fig. 2. LISN Schematic Diagram

DESCRIPTION OF TESTS

Radiated Emissions

Preliminary measurement were made indoors at 1 meter using broad band antennas, broadband amplifier, and spectrum analyzer to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The Technology configuration, clock speed, mode of operation or video resolution, turntable azimuth with respect to the antenna was note for each frequency found.
The spectrum was scanned from 30 to 1000MHz using Biconical log Antenna(ARA, LPB-2520/A). Above 1GHz, log periodic antenna (Rohde Schwarz HL025:upto 18GHz) was used.
Final Measurements were made outdoors at 3 or 10m test range using Logbicon Super Antenna(Schwarzbeck, VULB9166) or log periodic antenna.(Rohde Schwarz HL025)
The test equipment was placed on a wooden table.
Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.
Each frequency found during pre-scan measurements was reexamined and investigated using EMI test receiver.(ESCS30)
The detector function was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 120KHz or 1MHz depending on the frequency or type of signal.
The half wave dipole antenna was tuned to the frequency found during preliminary radiated measurements.
The EUT support equipment and interconnecting cables were re configured to the setup producing the maximum emission for the frequency and were placed on top of a 0.8m high non- metallic 1.0X 1.5 meter table.
The EUT, support equipment and interconnecting cables were re-arranged and manipulated to maximize each EME emission.
The turn table containing the Technology was rotated; the antenna height was varied 1 to 4meter and stopped at the azimuth or height producing the maximum emission Each emission was maximized by : switching power lines; varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and of support equipment, and powering the monitor from the floor mounted outlet box and computer aux AC outlet, if applicable; which ever determined the worst case emission.

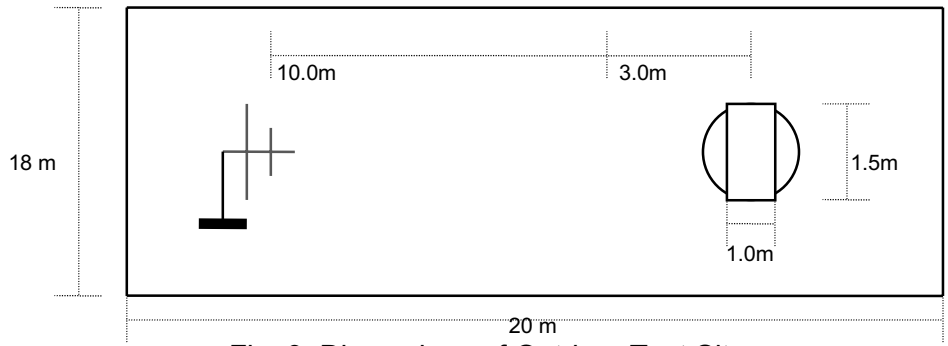


Fig. 3. Dimensions of Outdoor Test Site

TEST DATA

Conducted Emissions

FCC ID : QVXAGM19TK
Video Interface Port : DVI

Frequency (MHz)	Level(dBμV)		Line	Limit(dBμV)		Margin(dBuV)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.15	46.5	35.4	L	66.0	56.0	19.5	20.6
0.21	48.2	46.0	N	63.2	53.2	15.0	7.2
0.42	40.4	40.1	N	57.5	47.5	17.1	7.4
0.73	39.3	39.0	N	56.0	46.0	16.7	7.0
1.25	38.3	37.9	N	56.0	46.0	17.7	8.1
6.46	38.8	34.1	L	60.0	50.0	21.2	15.9

Table 1. Line Conducted Emissions Tabulated Data

NOTES:
1. Measurements using CISPR quasi-peak mode
2. All modes of operation were investigated and the worst -case emission are reported. See attached Plots.
3. The limit for Class B device is on the FCC part section 15.107 (a).
4. LINE : L =Line , N = Neutral

Baek sung Hun

*Tested by **S. H. Baek***

TEST DATA

Conducted Emissions

FCC ID : QVXAGM19TK
Video Interface Port : Analogue

Frequency (MHz)	Level(dBμV)		Line	Limit(dBμV)		Margin(dBuV)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.15	48.2	34.1	L	66.0	56.0	17.8	21.9
0.20	49.0	46.9	N	63.5	53.5	14.5	6.6
0.41	41.4	41.2	N	57.7	47.7	16.3	6.5
0.71	39.8	39.6	N	56.0	46.0	16.2	6.4
1.02	37.2	37.3	N	56.0	46.0	18.8	8.7
6.73	38.2	34.2	L	60.0	50.0	21.8	15.8

Table 2. Line Conducted Emissions Tabulated Data

NOTES:
1. Measurements using CISPR quasi-peak mode
2. All modes of operation were investigated and the worst -case emission are reported. See attached Plots.
4. The limit for Class B device is on the FCC part section 15.107 (a).
5. LINE : L =Line , N = Neutral

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TEST DATA

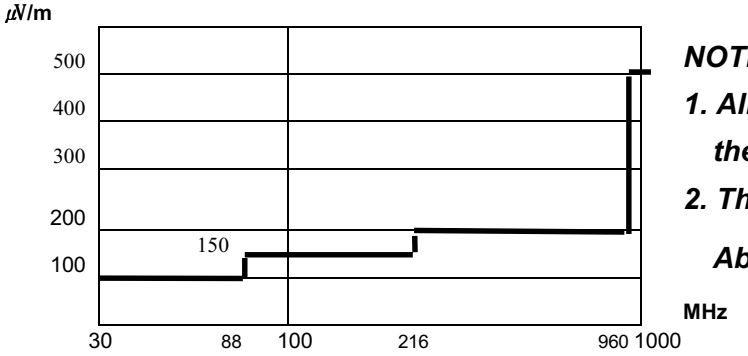
Radiated Emissions

FCC ID : QVXAGM19TK
Video Interface Port : DVI

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
31.39	53.8	V	-22.8	31.0	40.0	9.0
48.01	52.3	H	-21.4	30.9	40.0	9.1
162.03	45.2	H	-12.9	32.3	43.5	11.2
264.19	46.7	H	-12.2	34.5	46.0	11.5
284.97	46.5	H	-11.7	34.8	46.0	11.2
318.17	50.6	H	-10.8	39.8	46.0	6.2

*) No values (above 1GHz)higher than 20dB below the limit was detected during radiated emissions test.

Table 3. Radiated Measurements at 3meters



NOTES:

1. All modes of operation were investigated the worst-case emission are reported.

2. The radiated limits are shown on Figure 4. Above 1GHz the limit is 500 μV/m.

Fig. 4. Limits at 3 meters

NOTES:

1. *Pol. H =Horizontal V=Vertical

2. **AF+CL+Amp. = Antenna Factor + Cable Loss + Amplifier.

3. Measurements using CISPR quasi-peak mode. Above 1GHz, peak detector function mode is used using a resolution bandwidth of 1MHz and a video bandwidth of 1MHz. The peak level complies with the average limit. Peak mode is used with linearly polarized horn antenna and low-loss microwave cable.

Tested by **S. H. Baek**

TEST DATA

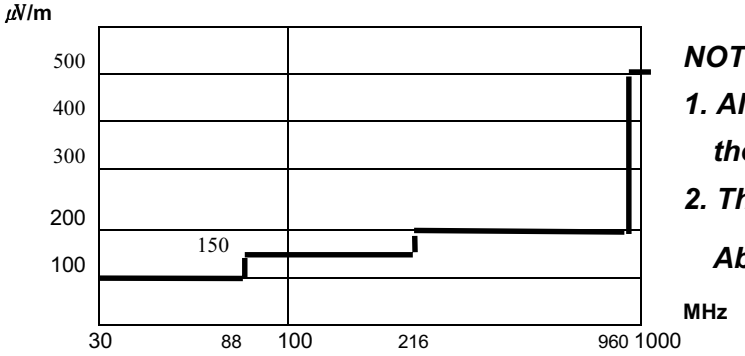
Radiated Emissions

FCC ID : QVXAGM19TK
Video Interface Port : Analogue

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
140.26	41.6	H	-14.1	27.5	43.5	16.0
162.04	45.6	H	-12.9	32.7	43.5	10.8
183.96	45.6	H	-13.4	32.2	43.5	11.3
194.20	47.5	H	-13.6	33.9	43.5	9.6
271.57	43.1	H	-12.0	31.1	46.0	14.9
549.00	42.0	H	-5.0	37.0	46.0	9.0

*) No values (above 1GHz)higher than 20dB below the limit was detected during radiated emissions test.

Table 4. Radiated Measurements at 3meters



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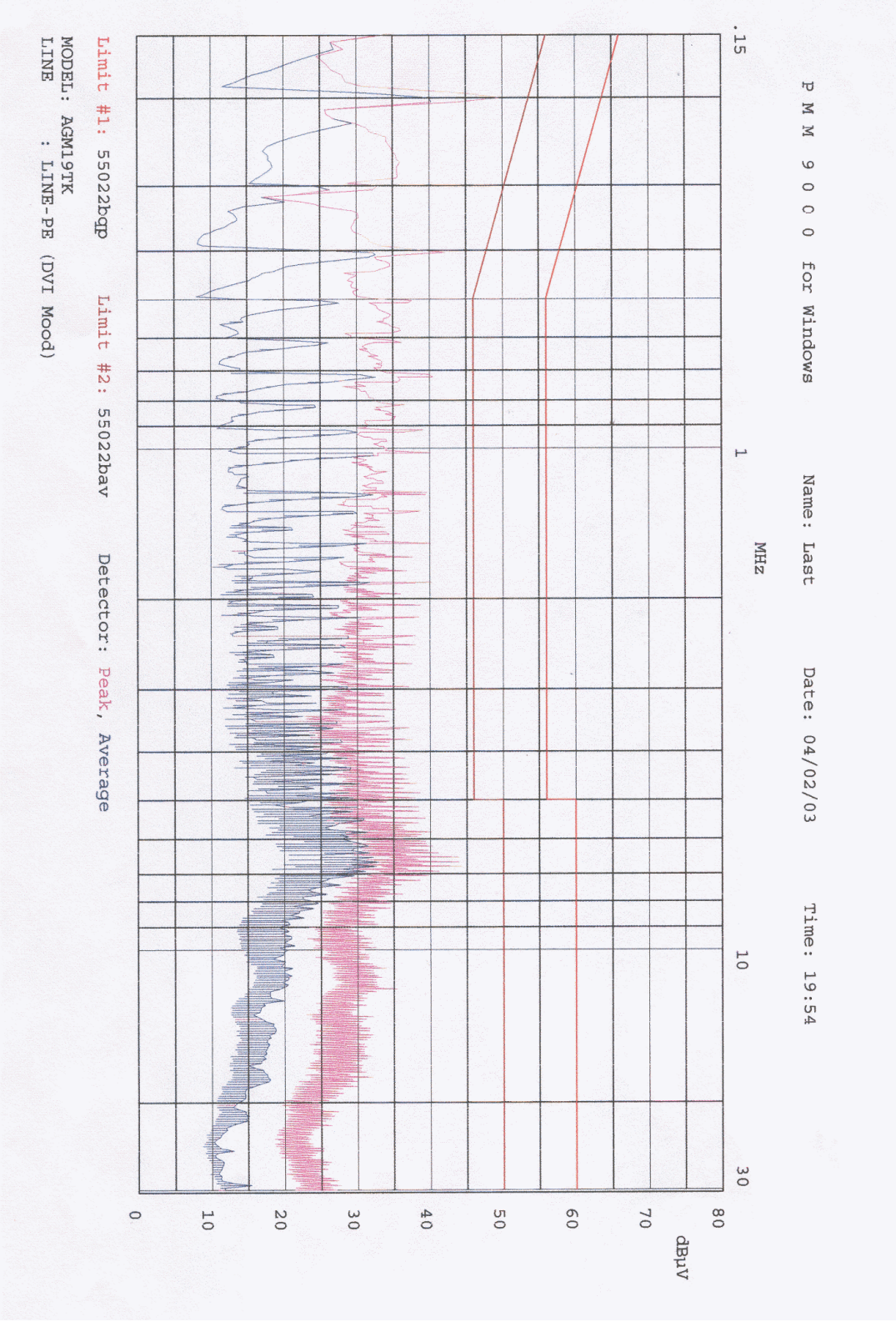
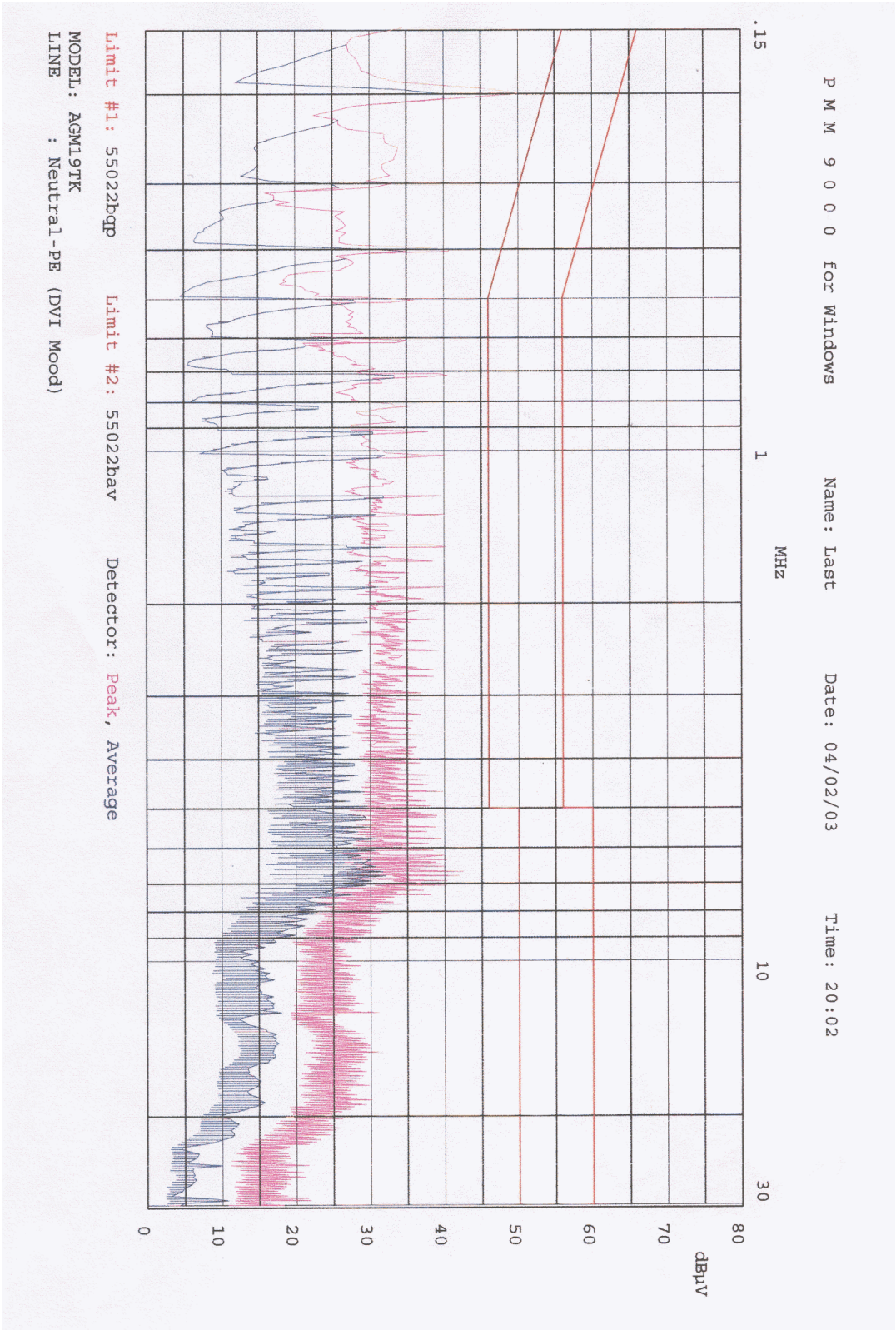
Tested by **S. H. Baek**

PLOTS OF EMISSIONS

- ***Conducted Emission at the Mains port(Line, DVI)***



PLOTS OF EMISSIONS

- ***Conducted Emission at the Mains port(Neutral, DVI)***