

## ***Nemko Korea Co., Ltd.***

300-2, Osan-Ri, Mohyun-Myun, Yongin-City, Kyungki-Do, KOREA

TEL:+82 31 322 2333

FAX:+82 31 322 2332

### **FCC PART 15 Class II Permissive Change**

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**Manufacturer:**

**Hansol Electronics Inc.**

**#27-29, Hanchun-ri, Ducksan-Myun,**

**Jinchun-Kun, Choongbuk, Korea**

**Attn : Mr. S. P. Yang**

**Dates of Issue : December 11, 2002**

**Test Report No. : NK2CE754**

**Test Site : Nemko Korea Co., Ltd.**

**EMC site, Korea**

**FCC ID**

***MSAB17BF***

**Brand Name**

***Hansol***

**Contact Person**

**Hansol Electronics Inc.**

**#27-29, Hanchun-ri, Ducksan-Myun, Jinchun-Kun,**

**Choongbuk, Korea**

**Mr. S. P. Yang**

**Telephone No. : +82 43 530 8503**

FCC Rule Part(s):

Part 15 & 2

Classification :

FCC Class B Device

EUT Type:

LCD Monitor

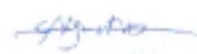
The device bearing the brand name and FCC ID specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-1992.

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.



**Tested By : Y. S. Park**

**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\* :** Hansol Electronics Inc.

**Contact Person :** Mr. S. P. Yang  
Tel No.: +82 43 530 8503

**Manufacturer :** Hansol Electronics Inc.  
#27-29, Hanchun-ri, Ducksan-Myun, Jinchun-Kun,  
Choongbuk, Korea  
Tel No.: +82 43 530 8503

- FCC ID: MSAB17BF
- Model: B17BF
- Brand Name: Hansol
- EUT Type: LCD Monitor
- Classification: FCC Class B
- Rule Part(s): FCC Part 15 & Part 2
- Test Procedure(s): ANSI C63.4 (1992)
- Dates of Test: December 3, 2002
- Place of Tests: Nemko Korea Co., Ltd. EMC Site
- Test Report No.: NK2CE754

Description of the Changes according to FCC part 2.1043

1. Add the LCD Panel(HT17E11-400, Hyundai)

*\* NOTE: Please refer to the duties and responsibilities of the Responsible Party attached.*

## 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 **Hansol Electronics Inc.**

FCC ID : **MSAB17BF, 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           | DELL, Model: Precision 340<br>1.8m unshielded AC power cable                            | S/N: N/A        |
| Monitor(EUT) | Hansol, FCC ID: MSAB17BF<br>1.5m unshielded AC power cable<br>1.8m shielded D-sub cable | S/N: N/A        |
| Keyboard     | Silitek Yet Foundate,<br>Model: SK-8110<br>1.8m shield Din cable                        | S/N: N/A        |
| PS/2 Mouse   | Microsoft Corporation,<br>Model: IntelliMouse<br>1.5m shield Din cable                  | S/N: N/A        |
| Printer      | HP, Model No: C5870K<br>1.5m unshielded AC power cable<br>1.8m Shield D-sub cable       | S/N: SG88R131GW |

**EUT Information**

|                      |                |
|----------------------|----------------|
| Clock                | 14.316MHz(X1)  |
| Chipset(s)           | GM2120, LVDS83 |
| Horizontal Frequency | 79.9kHz(Max)   |
| Vertical Frequency   | 75Hz(Max)      |
| Port(s)              | VGA            |

**Description of Test Modes**

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

1. 1280 X 1024 (75Hz/ 79.976kHz), clock frequency 135MHz
2. 1024 X 768 (84.997Hz/ 68.677kHz), clock frequency 94.5MHz
3. 800 X 600 (85.06Hz/ 53.674kHz), clock frequency 56.25MHz
4. 640 X 480 (85.008Hz/ 43.269kHz), clock frequency 36MHz

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-408 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 450KHz to 30MHz with 20msec sweep time.

The frequency producing the maximum level was re-examined using the EMI test receiver. (Rohde & Schwarz ESCS30).

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.

Each EME reported was calibrated using the R&S signal generator.

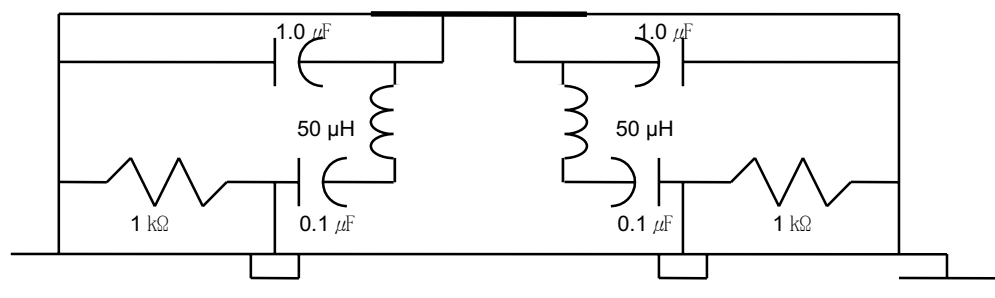


Fig. 2. LISN Schematic Diagram

## 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.

Each EME reported was calibrated using the R/S signal generator.

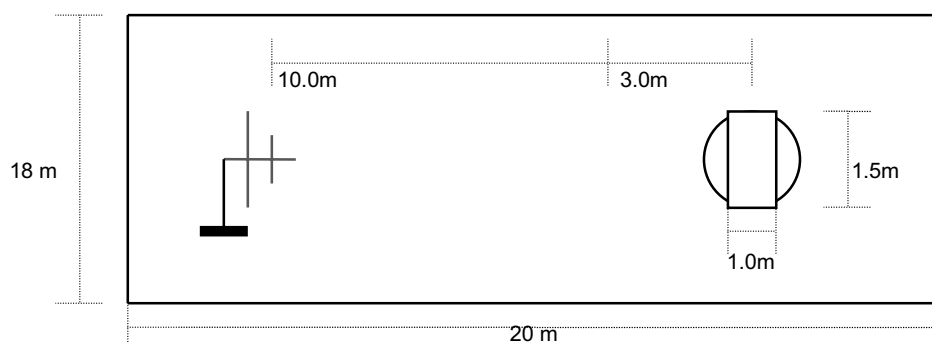


Fig. 3. Dimensions of Outdoor Test Site

**TEST DATA****Conducted Emissions**

FCC ID : MSAB17BF

| FREQ (MHz) | LEVEL(dB $\mu$ V) | LINE | LIMIT( $\mu$ V) | ( $\mu$ V) | MARGIN*(dB) |
|------------|-------------------|------|-----------------|------------|-------------|
| 0.96       | 37.9              | N    | 250             | 78.52      | 10.1        |
| 1.22       | 38.9              | N    | 250             | 88.10      | 9.1         |
| 1.65       | 40.3              | N    | 250             | 103.51     | 7.7         |
| 2.15       | 40.0              | N    | 250             | 100.00     | 8.0         |
| 2.33       | 39.4              | N    | 250             | 93.33      | 8.6         |
| 23.05      | 45.3              | N    | 250             | 184.08     | 2.7         |

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 250  $\mu$ V from 450 kHz to 30MHz.
4. LINE : L =Line , N = Neutral



Tested by Y. S. Park

# TEST DATA

## Radiated Emissions

FCC ID : MSAB17BF

| Frequency<br>(MHz) | Reading<br>(dB $\mu$ V) | Pol*<br>(H/V) | AF+CL+Amp<br>(dB)** | Result<br>(dB $\mu$ V/m) | Limit<br>(dB $\mu$ V/m) | Margin<br>(dB) |
|--------------------|-------------------------|---------------|---------------------|--------------------------|-------------------------|----------------|
| 78.40              | 49.9                    | V             | -20.8               | 29.1                     | 40.0                    | 10.9           |
| 128.60             | 45.6                    | V             | -16.0               | 29.6                     | 43.5                    | 13.9           |
| 139.32             | 48.5                    | V             | -14.3               | 34.2                     | 43.5                    | 9.3            |
| 182.19             | 47.2                    | V             | -13.3               | 33.9                     | 43.5                    | 9.6            |
| 342.94             | 46.9                    | V             | -10.2               | 36.7                     | 46.0                    | 9.3            |
| 750.19             | 41.7                    | H             | 0.4                 | 42.0                     | 46.0                    | 4.0            |

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

Table 2. Radiated Measurements at 3meters

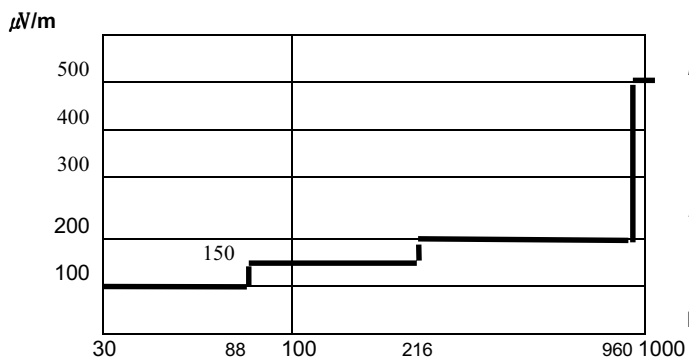


Fig. 3. Limits at 3 meters

**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  $\mu$ V/m.

**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 Y. S. Park*

Tested by Y. S. Park

## PLOTS OF EMISSIONS

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

The emission measured using the peak instrumentation with band 450kHz to 30MHz.

```

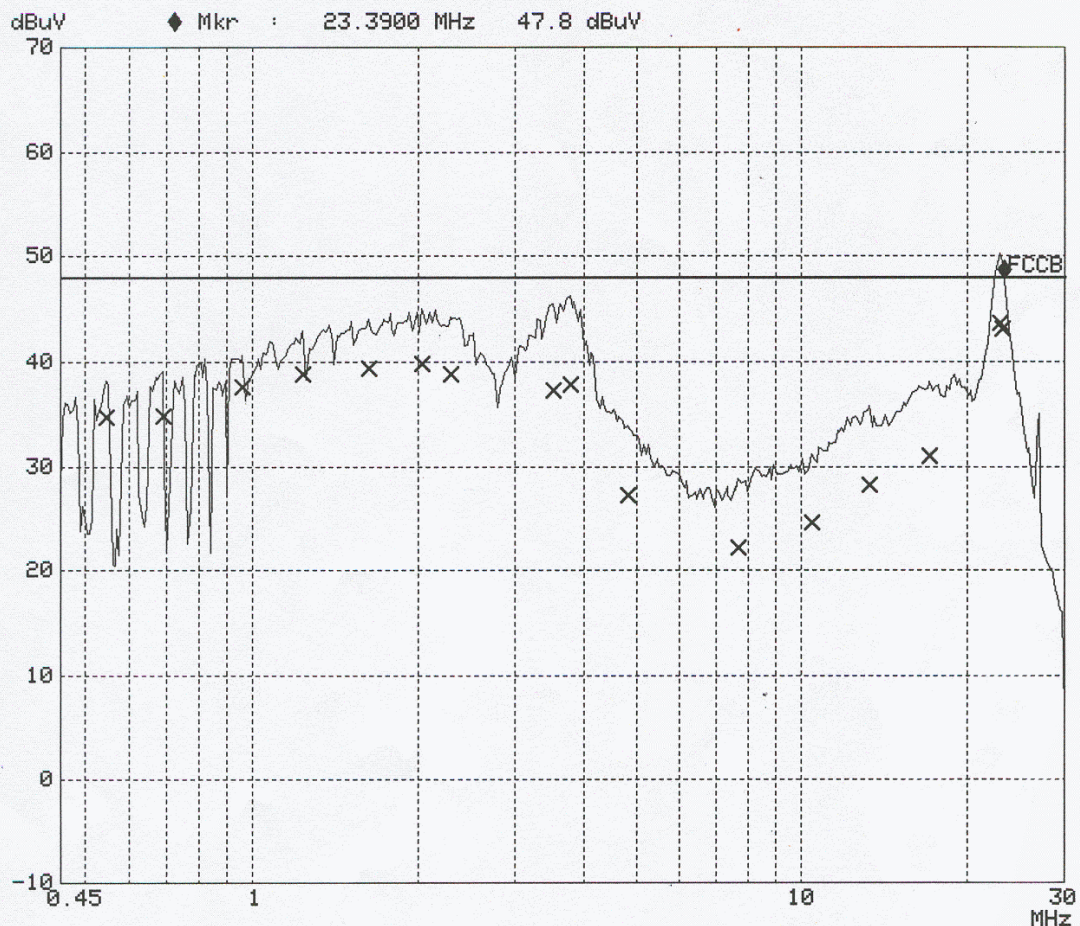
Scan Settings (1 Range)
|----- Frequencies -----| |----- Receiver Settings -----|
  Start      Stop      Step      IF BW  Detector  M-Time  Atten  Preamp
  450k       30M       5k        9k    PK       20ms  AUTO  LN   OFF
  
```

```

Transducer No. Start      Stop      Name
              1  150k      30M      CE_LINE
  
```

```

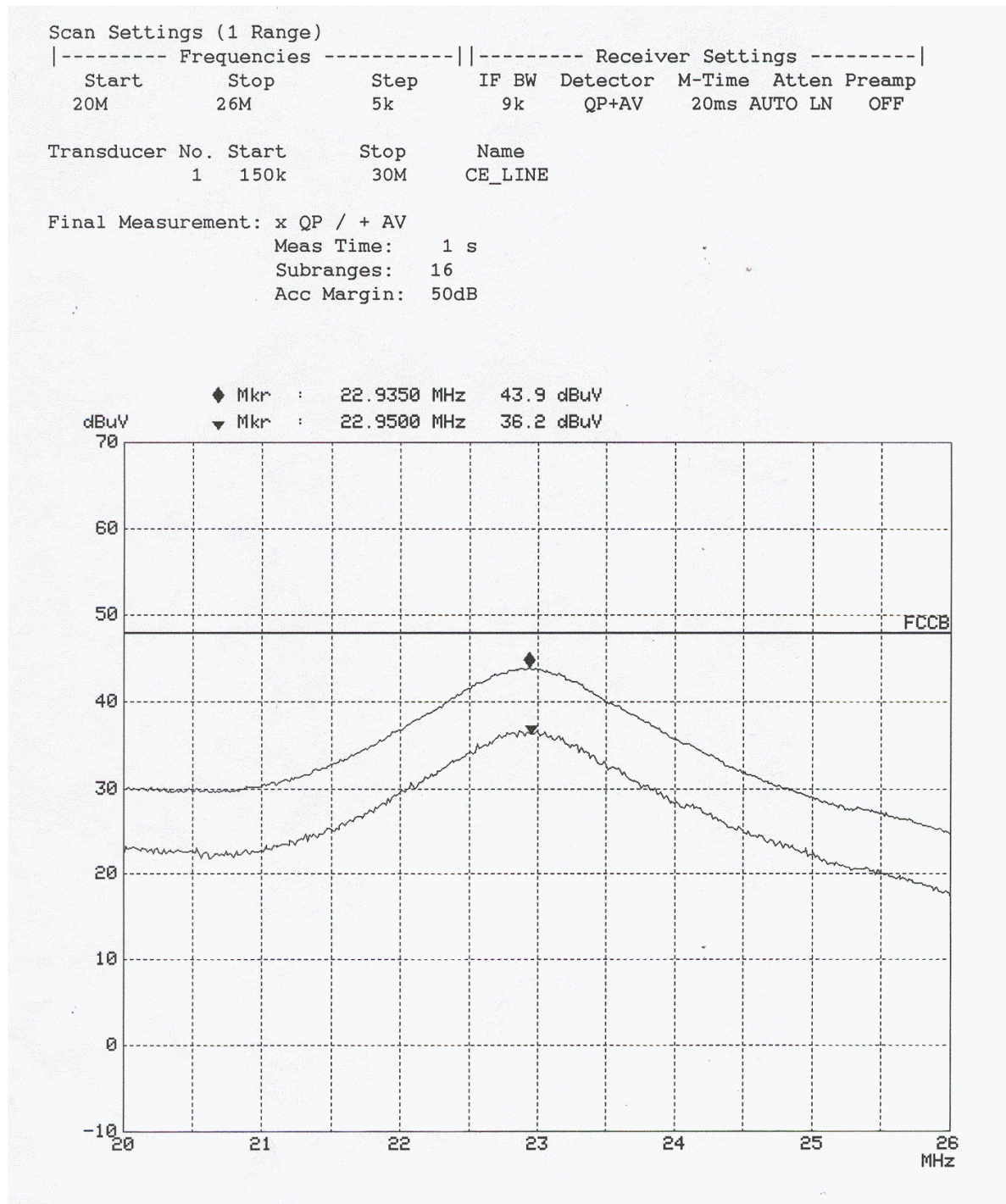
Final Measurement: x QP
                  Meas Time: 1 s
                  Subranges: 16
                  Acc Margin: 50dB
  
```



## PLOTS OF EMISSIONS

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

The emission measured using the quasi-peak instrumentation with band 20MHz to 26MHz didn't exceed the limits.



## PLOTS OF EMISSIONS

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

The emission measured using the peak instrumentation with band 450kHz to 30MHz.

Scan Settings (1 Range)

| Frequencies |      |      | Receiver Settings |          |        |       |        |
|-------------|------|------|-------------------|----------|--------|-------|--------|
| Start       | Stop | Step | IF BW             | Detector | M-Time | Atten | Preamp |
| 450k        | 30M  | 5k   | 9k                | PK       | 20ms   | AUTO  | LN OFF |

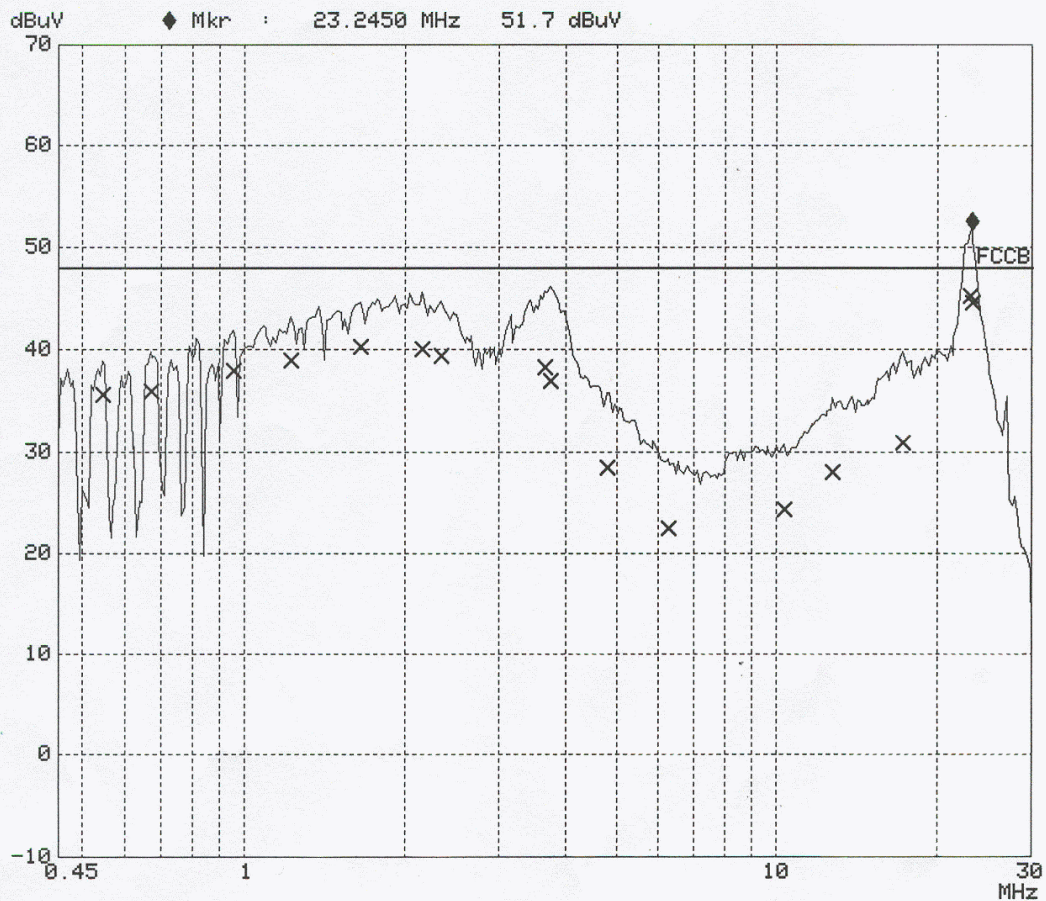
| Transducer No. | Start | Stop | Name     |
|----------------|-------|------|----------|
| 2              | 150k  | 30M  | CE_NEUTL |

Final Measurement: x QP

Meas Time: 1 s

Subranges: 16

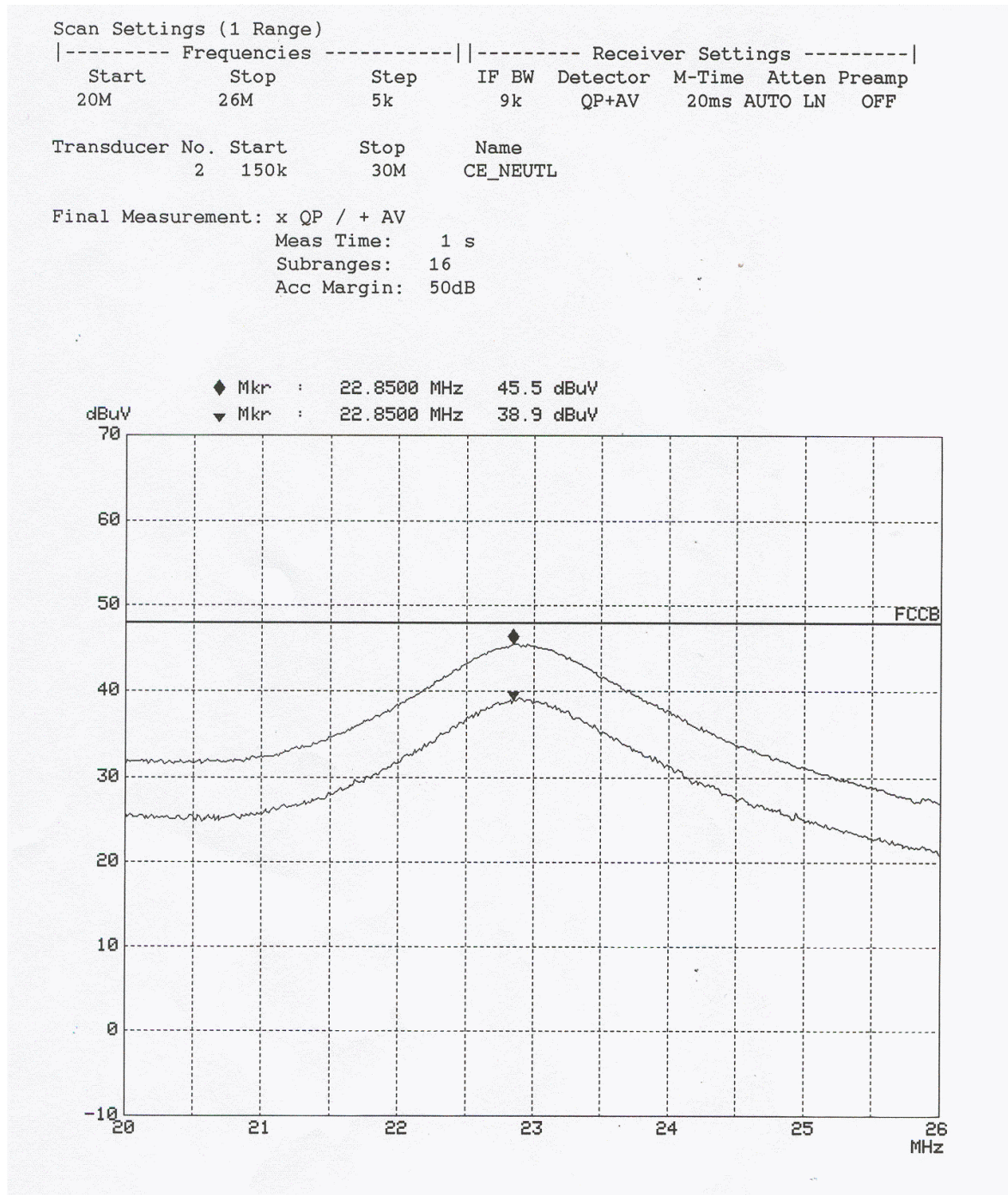
Acc Margin: 50dB



## PLOTS OF EMISSIONS

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

The emission measured using the quasi-peak instrumentation with band 20MHz to 26MHz didn't exceed the limits.



## ***SAMPLE CALCULATIONS***

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$$\text{dB } \mu\text{V} = 20 \log_{10} (\mu\text{V}/\text{m})$$

$$\mu\text{V} = 10^{(\text{dB } \mu\text{V}/20)}$$

### **EX. 1.**

@20.3 MHz

Class B limit = 250  $\mu\text{V}$  = 48.0 dB  $\mu\text{V}$

Reading = 40.8 dB  $\mu\text{V}$  (calibrated level)

$$10^{(40.8/20)} = 109.64 \mu\text{V}$$

$$\text{Margin} = 48.0 - 40.8 = 7.2$$

**7.2 dB below limit**

### **EX. 2.**

@57.7 MHz

Class B limit = 100  $\mu\text{V}/\text{m}$  = 40.0 dB  $\mu\text{V}/\text{m}$

Reading = 19.1 dB  $\mu\text{V}$  (calibrated level)

Antenna factor + Cable Loss = 10.12 dB

Total = 29.22 dB  $\mu\text{V}/\text{m}$

$$\text{Margin} = 40.0 - 29.22 = 10.78$$

**10.78 dB below the limit**

## ACCURACY OF MEASUREMENT

The Measurement Uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 with the confidence level of 95%

### 1. Radiation Uncertainty Calculation

| <i>Contribution</i>                                                                                               | <i>Probability Distribution</i> | <i>Uncertainty(+/-dB)</i> |
|-------------------------------------------------------------------------------------------------------------------|---------------------------------|---------------------------|
| Antenna Factor                                                                                                    | Normal (k=2)                    | $\pm 0.5$                 |
| Cable Loss                                                                                                        | Normal (k=2)                    | $\pm 0.04$                |
| Receiver Specification                                                                                            | Rectangular                     | $\pm 2.0$                 |
| Antenna directivity                                                                                               | Rectangular                     | $\pm 1.0$                 |
| Antenna Factor variation with Height                                                                              |                                 |                           |
| Antenna Phase Center Variation                                                                                    |                                 |                           |
| Antenna Factor Frequency Interpolation                                                                            |                                 |                           |
| Measurement Distance Variation                                                                                    |                                 |                           |
| Site Imperfections                                                                                                | Rectangular                     | $\pm 2.0$                 |
| Mismatch:Receiver VRC $r_i=0.3$<br>Antenna VRC $r_R=0.1(B_i)0.4(L_p)$<br>Uncertainty Limits $20\log(1+/-r_i r_R)$ | U-Shaped                        | $+ 0.25 / - 0.26$         |
| System Repeatability                                                                                              | Std.deviation                   | $\pm 0.05$                |
| Repeatability of EUT                                                                                              | -                               | -                         |
| Combined Standard Uncertainty                                                                                     | Normal                          | $\pm 1.77$                |
| Expanded Uncertainty U                                                                                            | Normal (k=2)                    | $\pm 3.5$                 |

### 2. Conducted Uncertainty Calculation

| <i>Contribution</i>                                                                               | <i>Probability Distribution</i> | <i>Uncertainty(+/-dB)</i> |
|---------------------------------------------------------------------------------------------------|---------------------------------|---------------------------|
| Receiver Specification                                                                            | Normal (k=2)                    | $\pm 2.0$                 |
| LISN coupling spec.                                                                               | Normal (k=2)                    | $\pm 0.4$                 |
| Cable and input attenuator cal.                                                                   | Rectangular                     | $\pm 0.4$                 |
| Mismatch:Receiver VRC $r_i=0.3$<br>LISN vrc $r_g=0.1$<br>Uncertainty Limits $20\log(1+/-r_i r_R)$ | U-Shaped                        | $\pm 0.26$                |
| System Repeatability                                                                              | Std.deviation                   | $\pm 0.68$                |
| Repeatability of EUT                                                                              | -                               | -                         |
| Combined Standard Uncertainty                                                                     | Normal                          | $\pm 1.18$                |
| Expanded Uncertainty U                                                                            | Normal (k=2)                    | $\pm 2.4$                 |

***TEST EQUIPMENT***

| No. | Instrument              | Manufacturer | Model          | Calibration Date |
|-----|-------------------------|--------------|----------------|------------------|
| 1   | *Test Receiver          | R & S        | ESCS 30        | 2002.02          |
| 2   | Test Receiver           | PMM          | PMM9000        | 2002.06          |
| 3   | *Amplifier              | HP           | 8447F          | 2002.09          |
| 4   | *Amplifier              | Agilent      | 8447F          | 2002.07          |
| 5   | *Spectrum Analyzer      | Advantest    | R3265A         | 2002.03          |
| 6   | *Logbicon Super Antenna | Schwarzbeck  | VULB9166       | 2002.05          |
| 7   | Log-Periodic Antenna    | R & S        | HL025          | 2002.01          |
| 8   | Dipole Antenna          | R & S        | VHA9103        | 2002.05          |
| 9   | Dipole Antenna          | R & S        | UHA9105        | 2002.05          |
| 11  | Biconical Log Antenna   | ARA          | LPB-2520/A     | 2002.01          |
| 12  | Absorbing Clamp         | R & S        | MDS21          | 2002.03          |
| 13  | High Voltage Probe      | R & S        | ESH2-Z3        | 2002.09          |
| 14  | Signal Generator        | R & S        | SMP02          | 2001.12          |
| 15  | Matching Pad            | R & S        | RAM358.5414.02 | 2002.05          |
| 16  | *LISN                   | R & S        | ESH3-Z5        | 2002.10          |
| 17  | LISN                    | Kyoritsu     | KNW-407        | 2002.04          |
| 18  | *LISN                   | Kyoritsu     | KNW-408        | 2002.04          |
| 19  | *Position Controller    | EM Eng.      | N/A            | N/A              |
| 20  | *Turn Table             | EM Eng.      | N/A            | N/A              |
| 21  | *Antenna Mast           | EM Eng.      | N/A            | N/A              |
| 22  | *Anechoic Chamber       | EM Eng.      | N/A            | N/A              |
| 23  | *Shielded Room          | EM Eng.      | N/A            | N/A              |

\*) Test equipment used during the test

## ***RECOMMENDATION/CONCLUSION***

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The data collected shows that the **Hansol Electronics Inc.**

FCC ID : **MSAB17BF**, **LCD Monitor**. complies with § 15.107 ,15.109 of the FCC Rules.

The highest emission observed was at **23.05 MHz** for conducted emissions with a margin of **2.7 dB**, at **750.19 MHz** for radiated emissions with a margin of **4.0 dB**.

## Labelling Requirements

# Hansol

Hansol Electronics Inc.  
27-23 Hansol-ro, Ocheon-Won  
Jincheon-gun, Gangwon-do, KOREA

MODEL Name : HT11-01  
MODEL No. : 9176P  
ELECTRICAL RATING  
DC 12V 1771, 3.33mA

For use only with control supply  
MANUFACTURER : Hansol  
MODEL : AP0400A  
MANUFACTURER : Hansol  
MODEL : H13.0-02

**PCC ID : MSA 01076F**

This device complies with part 15 of the FCC Rules.  
Operation is subject to the following two conditions:  
1) This device may not cause harmful interference and  
2) This device must accept any interference received,  
including interference that may cause undesired operation.

**CAUTION**

DO NOT REMOVE ELECTRIC SHOCK. DO NOT REMOVE COVER. NO  
USER-SERVICEABLE PARTS INSIDE. REFER SERVICES TO  
AUTHORIZED PERSONNEL.

**WARRANTY**

ANY OTHER "NOT" BEHIND PRODUCT/REPAIR, we have  
designed + delivered. AVOIDANCE OF REPAIRABLE PART  
LIFESpan + 100,000Hr. FOUR REPRESENTATIVE, APPROX. OR  
REPAIRABLE ISSUE.



LISTED  
ETL, ROHS  
E-20214







Made in KOREA, HJ

922267300061 - 01 ☐ Manufacturer:

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## ***APPENDIX B – CIRCUIT DIAGRAM***

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## ***APPENDIX E – USER’S MANUAL***

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## ***APPENDIX F – SCHEMATIC DIAGRAM***

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