








|   |  |  |   |
|---|--|--|---|
|  | <b>ESTECH Co., Ltd.</b><br>Rm. 1015, World Venture Center II,<br>426-5 Gasan-dong, Guncheon-gu,<br>Seoul, 158-803, Korea |     | <b>Electromagnetic<br/>Interference<br/>Test Report</b> |
|   |  |  |   |

Compliance Test Report for FCC

|   |  |   |   |              |    |
|---|--|---|---|--------------|----|
| Report Number   |  | ESTF150504-004  |   |              |    |
| Applicant   | Company name   | Elesign Inc.  |   |              |    |
|   | Address  | #403, KOLON Techno-valley, 60-4, Kasan-dong, Kumcheon-gu, Seoul, 153-801, R.O.Korea |   |              |    |
|   | Telephone  | 82-2-866-6190   |   |              |    |
| Product   | Product name   | Residential Gateway   |   |              |    |
|   | Model No.  | ESC-2420  | Manufacturer  | Elesign Inc. |    |
|   | Serial No.   | 0004B00043F4  | Country of origin   | KOREA        |    |
| Test date   | 2005-03-21 ~2005-04-14   |   | Date of issue   | 2005-04-14   |    |
| Testing location  | ESTECH. Co., Ltd.<br>97-1 Hoiuk-Ri Majang-Myon, Icheon-city, KyungKi-Do, Korea |   |   |              |    |
| Standard  | FCC PART 15 2002 , ANSI C 63.4 2001  |   |   |              |    |
| Test item   | <input checked="" type="checkbox"/> Conducted Emission                         | <input type="checkbox"/> Class A  | <input checked="" type="checkbox"/> Class B   | Test result  | OK |
|   | <input checked="" type="checkbox"/> Radiated Emission                          | <input type="checkbox"/> Class A  | <input checked="" type="checkbox"/> Class B   | Test result  | OK |
| Measurement facility registration number  |  | 94696   |   |              |    |
| Tested by   | Senior Engineer J.M. Yang  |   | (Signature)  |              |    |
| Reviewed by   | Director T.K. Lee  |   | (Signature)  |              |    |
| Abbreviation  | OK, Pass = Passed, Fail = Failed, N/A = not applicable                         |   |   |              |    |
| * Note<br>- This test report is not permitted to copy partly without our permission<br>- This test result is dependent on only equipment to be used<br>- This test result based on a single evaluation of one sample of the above mentioned |  |   |   |              |    |

## Contents

|  |    |
|--|----|
| 1. Laboratory Information .....            | 3  |
| 2. Description of EUT .....                | 4  |
| 3. Test Standards .....                    | 5  |
| 4. Measurement condition .....             | 6  |
| 5. Measurement of radiated emission .....  | 8  |
| 5.1 Measurement equipment .....            | 8  |
| 5.2 Environmental conditions .....         | 8  |
| 5.3 Test data .....                        | 9  |
| 6. Measurement of conducted emission ..... | 10 |
| 6.1 Measurement equipment .....            | 10 |
| 6.2 Environmental conditions .....         | 10 |
| 6.3 Test data .....                        | 11 |
| 7. Photographs of test setup .....         | 12 |
| 8. Photographs of EUT .....                | 14 |

Appendix 1. Spectral diagram

Appendix 2. Photographs of EUT in side PCB

Appendix 3. Block diagram of EUT

Appendix 4. Circuit Diagram

## 1. Laboratory Information

### 1.1 General

This EUT (Equipment Under Test) has been shown to be capable of compliance with the applicable technical standards and is tested in accordance with the measurement procedures as indicated in this report.

ESTECH Lab attests to accuracy of test data. All measurement reported herein were performed by ESTECH Co., Ltd.

ESTECH Lab assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

### 1.2 Test Lab.

Corporation Name : ESTECH Co. Ltd

Head Office : Rm 1015, World Venture Center II, 426-5, Gasan-dong, Geumcheon-gu, Seoul, Korea  
(Safety & Telecom. Test Lab)

EMC Test Lab : 58-1 Osan-Ri, GaNam-Myon, YeoJoo-Gun, KyungKi-Do, Korea  
97-1 Hoiuk-Ri Majang-Myon, Icheon-city, KyungKi-Do, Korea

### 1.3 Official Qualification(s)

MIC : Granted Accreditation from Ministry of Information & Communication for EMC, Safety and Telecommunication

KOLAS : Accredited Lab By Korea Laboratory Accreditation Schema base on CENELEC requirements

FCC : Filed Laboratory at Federal Communications Commission

VCCI : Granted Accreditation from Voluntary Control Council for Interference from ITE

## 2. Description of EUT

### 2.1 Summary of Equipment Under Test

NONE : Residential Gateway  
 Model Number : ESC-2420  
 Serial Number : 0004B00043F4  
 Manufacturer : Elesign Inc.  
 Country of origin : KOREA  
 Rating : INPUT:AC120V / 60Hz  
 Receipt Date : 2005-03-21

### 2.2 General descriptions of EUT

| Item                                |              | Specification                         |
|-------------------------------------|--------------|---------------------------------------|
| Adapter<br>(Input/output/frequency) |              | 120VA / 12VDC / 60Hz                  |
| Port                                | WAN          | RJ-45 for LAN (10/100baseT)           |
|                                     | LAN          | RJ-45 for PC (10/100baseT)            |
|                                     | Serial       | RJ-45 for Serial Connector            |
|                                     | Phone        | 2 RJ-1 for Telephone                  |
|                                     | Line         | 1 RJ-11 for PSTN                      |
|                                     | Reset Switch | System Reset                          |
| Optional Features                   |              | Use with PBX & Key phone, Fax Support |
| Power Consumption                   |              | 2.8W / 3.6W                           |
| Operating Temperature               |              | 0~60℃                                 |
| Relative Humidity                   |              | 5~95%                                 |
| Volume                              |              | 160mm(W) x 200mm(L) x 33mm(H)         |
| Weight                              |              | 355g                                  |

Using Freq. :25MHz/10MHz/12.288MHz

### 3. Test Standards

#### Test Standard : FCC PART 15 (2002)

This Standard sets out the regulations under which an intentional, unintentional, or incidental radiator may be operated without an individual license. It also contains the technical specifications, administrative requirements and other conditions relating to the marketing of Part 15 devices.

#### Test Method : ANSI C 63.4 (2001)

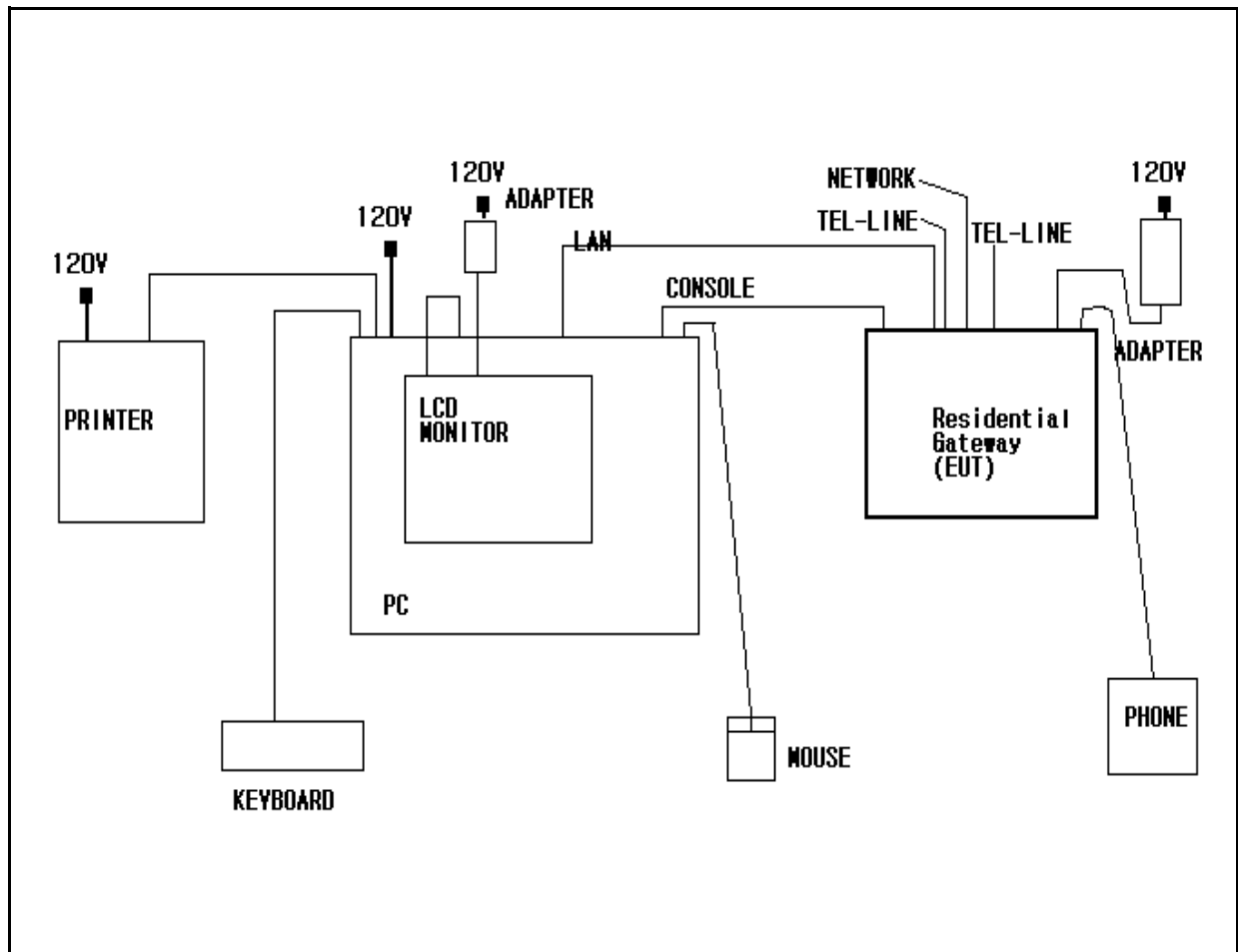
This standard sets forth uniform methods of measurement of radio-frequency (RF) signals and noise emitted from both unintentional and intentional emitters of RF energy in the frequency range 9 kHz to 40 GHz. Methods for the measurement of radiated and AC power-line conducted radio noise are covered and may be applied to any such equipment unless otherwise specified by individual equipment requirements. These methods cover measurement of certain devices that deliberately radiate energy, such as intentional emitters, but does not cover licensed transmitters. This standard is not intended for certification/approval of avionic equipment or for industrial, scientific, and medical (ISM) equipment. These methods apply to the measurement of individual units or systems comprised of multiple units.

## 4. Measurement Condition

### 4.1 EUT Operation.

- \* The EUT was in the following operation mode during all testing
- \* The operational conditions of the EUT was determined by the manufacturer according to the typical use of the EUT with respect to the expected highest level of emission
- \* Using ping command between external Network, Transmission and Receiving test at between external Network

### 4.2 Configuration and Peripherals



#### 4.3 EUT and Support equipment

| Equipment Name      | Model Name    | S/N             | Manufacturer                        | Remark (FCC ID) |
|---------------------|---------------|-----------------|-------------------------------------|-----------------|
| Residential Gateway | ESC-2420      | 004B00043F4     | Elesign Inc.                        | EUT             |
| ADAPTER             | TL-1212U      | NONE            | TAELEM ELECTRONICS Co., Ltd.        | -               |
| PC                  | Optiplex GX50 | NONE            | DELL                                | -               |
| KEYBOARD            | SEM-DT35      | 32006557        | Samsung Electro-mechanics Co., Ltd. | -               |
| MOUSE               | M-S48a        | HCA 11804896    | LOGITECH                            | -               |
| PRINTER             | LQ-570H+      | B1021095782     | TRIGEM                              | -               |
| LCD MONITOR         | KD17NS        | N433H4KX300852K | Samsung Electronics Co., Ltd.       | -               |
| ADAPTER             | AP04914-UV    | 0401011616AC    | AnamInstruments Co., Ltd.           | -               |
| PHONE               | GS-460F       | 010KC14351      | LG SRITHAI ELECTRONICS Co., Ltd.    | -               |

#### 4.4 Cable Connecting

| Start Equipment     |               | End Equipment     |               | Cable Standard |          | Remark |
|---------------------|---------------|-------------------|---------------|----------------|----------|--------|
| Name                | I/O port      | Name              | I/O port      | Length         | Shielded |        |
| Residential Gateway | Console       | PC                | SERIAL        | 2              | N        | -      |
| Residential Gateway | LAN           | PC                | LAN           | 2              | N        | -      |
| Residential Gateway | WAN           | EXTERNAL NETWORK  | WAN           | 25             | N        | -      |
| Residential Gateway | TEL-LINE      | EXTERNAL TEL-LINE | TEL-LINE      | 25             | N        | -      |
| Residential Gateway | TEL-LINE      | PHONE             | TEL-LINE      | 2              | N        | -      |
| Residential Gateway | TEL-LINE      | -                 | TEL-LINE      | 2              | N        | -      |
| Residential Gateway | POWER         | ADAPTER           | POWER         | 2              | N        | -      |
| PC                  | VIDEO         | LCD MONITOR       | VIDEO         | 2              | Y        | -      |
| PC                  | PS/2 KEYBOARD | MOUSE             | PS/2 KEYBOARD | 2              | N        | -      |
| PC                  | PS/2 MOUSE    | KEYBOARD          | PS/2 MOUSE    | 2              | N        | -      |
| PC                  | PARALLEL      | PRINTER           | PARALLEL      | 2              | Y        | -      |
| LCD MONITOR         | POWER         | ADAPTER           | POWER         | 2              | N        | -      |
|                     |               |                   |               |                |          | -      |
|                     |               |                   |               |                |          | -      |
|                     |               |                   |               |                |          | -      |

## 5. Measurement of radiated disturbance

Above 30 MHz Electric Field strength was measured in accordance with FCC Part 15 (2002) & ANSI C 63.4 (2001). The test setup was made according to FCC Part 15 (2002) & ANSI C 63.4 (2001) on an open test site, which allows a 3m distance measurement. The EUT was placed in the center of wooden turntable. The height of this table was 0.8m. The measurement was conducted with both horizontal and vertical antenna polarization. The turntable has fully rotated. For further description of the configuration refer to the picture of the test set-up.

### 5.1 Measurement equipments

| Equipment Name        | Type        | Manufacturer    | Serial No. | Next Calibration date |
|-----------------------|-------------|-----------------|------------|-----------------------|
| TEST Receive          | ESPI7       | Rohde & Schwarz | 100185     | 2005. 8. 20           |
| Spectrum Analyzer     | R3261C      | ADVANTEST       | 61720116   | 2005. 4.14            |
| LogBicon Antenna      | VULB 9160   | S/B             | 3142       | 2005.7.06             |
| Horn Antenna          | BBHA 9120 D | SCHWARZBECK     | 352        | 2006.4.06             |
| Turn Table            | 2087        | EMCO            | 2129       | –                     |
| Antenna Mast          | 2070-01     | EMCO            | 9702-203   | –                     |
| ANT Mast Controller   | 2090        | EMCO            | 1535       | –                     |
| Turn Table Controller | 2090        | EMCO            | 1535       | –                     |

### 5.2 Environmental Condition

Test Place : Open site(3m)  
 Temperature (°C) : 8 °C  
 Humidity (%) : 59 %



### 5.3 Test data

Measurement Distance : 3 m

| Frequency<br>(MHz) | Reading<br>(dB $\mu$ V)      | Position<br>(V/H) | Height<br>(m) | Correction Factor  |               | Result Value            |                          |                          |
|--------------------|------------------------------|-------------------|---------------|--------------------|---------------|-------------------------|--------------------------|--------------------------|
|                    |                              |                   |               | Ant Factor<br>(dB) | Cable<br>(dB) | Limit<br>(dB $\mu$ V/m) | Result<br>(dB $\mu$ V/m) | Margin<br>(dB $\mu$ V/m) |
| 66.28              | 18.20                        | V                 | 1.0           | 12.35              | 1.2           | 40.0                    | 31.76                    | -8.24                    |
| 82.85              | 19.60                        | H                 | 2.9           | 8.83               | 1.3           | 40.0                    | 29.76                    | -10.24                   |
| 92.43              | 18.90                        | H                 | 2.6           | 9.35               | 1.5           | 43.5                    | 29.73                    | -13.77                   |
| 125.02             | 25.70                        | V                 | 1.0           | 12.10              | 1.7           | 43.5                    | 39.50                    | -4.00                    |
| 150.03             | 12.70                        | H                 | 1.9           | 13.90              | 1.9           | 43.5                    | 28.48                    | -15.02                   |
| 200.02             | 16.70                        | H                 | 1.6           | 10.38              | 2.2           | 43.5                    | 29.26                    | -14.24                   |
| 214.79             | 14.20                        | V                 | 1.0           | 10.69              | 2.3           | 43.5                    | 27.16                    | -16.34                   |
| 250.05             | 21.50                        | H                 | 1.3           | 11.92              | 2.4           | 46.0                    | 35.79                    | -10.21                   |
| 300.05             | 14.60                        | H                 | 1.1           | 13.19              | 2.7           | 46.0                    | 30.49                    | -15.51                   |
| 375.05             | 20.70                        | H                 | 1.0           | 14.73              | 3.1           | 46.0                    | 38.48                    | -7.52                    |
| 400.06             | 17.50                        | H                 | 1.0           | 15.32              | 3.2           | 46.0                    | 35.97                    | -10.03                   |
| 500.06             | 20.10                        | H                 | 1.0           | 17.06              | 3.6           | 46.0                    | 40.71                    | -5.29                    |
| 625.08             | 18.60                        | V                 | 1.0           | 19.28              | 4.0           | 46.0                    | 41.89                    | -4.11                    |
| 750.12             | 11.60                        | H                 | 1.0           | 21.20              | 4.4           | 46.0                    | 37.21                    | -8.79                    |
| 875.10             | 12.60                        | H                 | 1.0           | 22.28              | 4.8           | 46.0                    | 39.69                    | -6.31                    |
|                    |                              |                   |               |                    |               |                         |                          |                          |
|                    |                              |                   |               |                    |               |                         |                          |                          |
|                    |                              |                   |               |                    |               |                         |                          |                          |
|                    |                              |                   |               |                    |               |                         |                          |                          |
|                    |                              |                   |               |                    |               |                         |                          |                          |
|                    |                              |                   |               |                    |               |                         |                          |                          |
|                    |                              |                   |               |                    |               |                         |                          |                          |
| Remark             | H : Horizontal, V : Vertical |                   |               |                    |               |                         |                          |                          |

## 6. Measurement of conducted disturbance

The continuous disturbance voltage of AC Mains in the frequency from 0.15 to 30 MHz was measured in accordance to FCC Part 15 (2002) & ANSI C 63.4 (2001). The test setup was made according to FCC Part 15 (2002) & ANSI C 63.4 (2001) in a shielded. The EUT was placed on a non-conductive table at least 80 above the ground plane. A grounded vertical reference plane was positioned in a distance of 40cm from the EUT. The distance from the EUT to other metal surfaces was at least 0.8m. The EUT was only earthen by its power cord through the line impedance stabilizing network. The power cord has been bundled to a length of 1.0m.. The test receiver with Quasi Peak detector complies with CISPR 16.

### 6.1 Measurement equipments

| Equipment Name | Type      | Manufacturer    | Serial No. | Next Calibration date |
|----------------|-----------|-----------------|------------|-----------------------|
| LISN           | ESH3-Z5   | Rohde & Schwarz | 838979/010 | 2006. 2. 18           |
| LISN           | NNLA8120A | Schwarzbeck     | NONE       | 2006. 2. 18           |
| TEST Receive   | ESPI7     | Rohde & Schwarz | 100185     | 2005. 8. 20           |
| Pulse Limiter  | ESH3Z2    | Rohde & Schwarz | NONE       | 2005. 6. 15           |

### 6.2 Environmental Condition

Test Place : Shield Room  
 Temperature (°C) : 19 °C  
 Humidity (%) : 46 %

### 6.3 Test data

| Frequency<br>(MHz) | Correction Factor              |               | Line<br>(H/N) | Quasi-peak Value      |                         |                        | Average Value         |                         |                        |
|--------------------|--------------------------------|---------------|---------------|-----------------------|-------------------------|------------------------|-----------------------|-------------------------|------------------------|
|                    | Lisn<br>(dB)                   | Cable<br>(dB) |               | Limit<br>(dB $\mu$ V) | Reading<br>(dB $\mu$ V) | Result<br>(dB $\mu$ V) | Limit<br>(dB $\mu$ V) | Reading<br>(dB $\mu$ V) | Result<br>(dB $\mu$ V) |
| 0.15               | 0.07                           | 0.0           | H             | 66.00                 | 39.68                   | 39.75                  | 56.00                 |                         |                        |
| 0.20               | 0.07                           | 0.0           | H             | 63.74                 | 31.29                   | 31.39                  | 53.74                 | 20.89                   | 20.99                  |
| 0.24               | 0.07                           | 0.1           | H             | 62.20                 | 26.28                   | 26.41                  | 52.20                 |                         |                        |
| 0.30               | 0.07                           | 0.1           | H             | 60.24                 | 22.61                   | 22.78                  | 50.24                 |                         |                        |
| 0.34               | 0.07                           | 0.1           | N             | 59.15                 | 22.05                   | 22.24                  | 49.15                 |                         |                        |
| 0.36               | 0.07                           | 0.1           | N             | 58.73                 | 21.75                   | 21.95                  | 48.73                 |                         |                        |
| 0.77               | 0.09                           | 0.2           | H             | 56.00                 | 24.82                   | 25.11                  | 46.00                 | 21.67                   | 21.96                  |
| 1.10               | 0.09                           | 0.2           | H             | 56.00                 | 23.15                   | 23.45                  | 46.00                 |                         |                        |
| 1.26               | 0.10                           | 0.2           | N             | 56.00                 | 23.89                   | 24.21                  | 46.00                 |                         |                        |
| 1.34               | 0.10                           | 0.2           | H             | 56.00                 | 24.26                   | 24.59                  | 46.00                 |                         |                        |
| 4.38               | 0.18                           | 0.3           | N             | 56.00                 | 23.02                   | 23.50                  | 46.00                 | 20.63                   | 21.11                  |
| 4.64               | 0.19                           | 0.3           | N             | 56.00                 | 25.91                   | 26.40                  | 46.00                 |                         |                        |
| 6.76               | 0.27                           | 0.4           | N             | 60.00                 | 31.11                   | 31.77                  | 50.00                 | 29.07                   | 29.73                  |
| 6.89               | 0.28                           | 0.4           | N             | 60.00                 | 29.81                   | 30.48                  | 50.00                 |                         |                        |
| 18.24              | 0.67                           | 0.8           | N             | 60.00                 | 29.41                   | 30.88                  | 50.00                 | 26.34                   | 27.81                  |
| 20.57              | 0.71                           | 0.8           | N             | 60.00                 | 34.35                   | 35.87                  | 50.00                 |                         |                        |
| 20.65              | 0.72                           | 0.8           | H             | 60.00                 | 29.94                   | 31.47                  | 50.00                 |                         |                        |
| 24.72              | 0.81                           | 0.9           | N             | 60.00                 | 27.99                   | 29.70                  | 50.00                 |                         |                        |
|                    |                                |               |               |                       |                         |                        |                       |                         |                        |
| Remark             | H : Hot Line, N : Neutral Line |               |               |                       |                         |                        |                       |                         |                        |



**ESTECH Co., Ltd.**

Rm 1015, World Venture Center II,  
426-5 Gasan-dong, Guncheon-gu,  
Seoul, 158-803, Korea



**Electromagnetic  
Interference  
Test Report**

## 7. Photographs of test setup

### 7.1 Setup for Radiated Test : 30 ~ 1000 MHz

[ Front ]



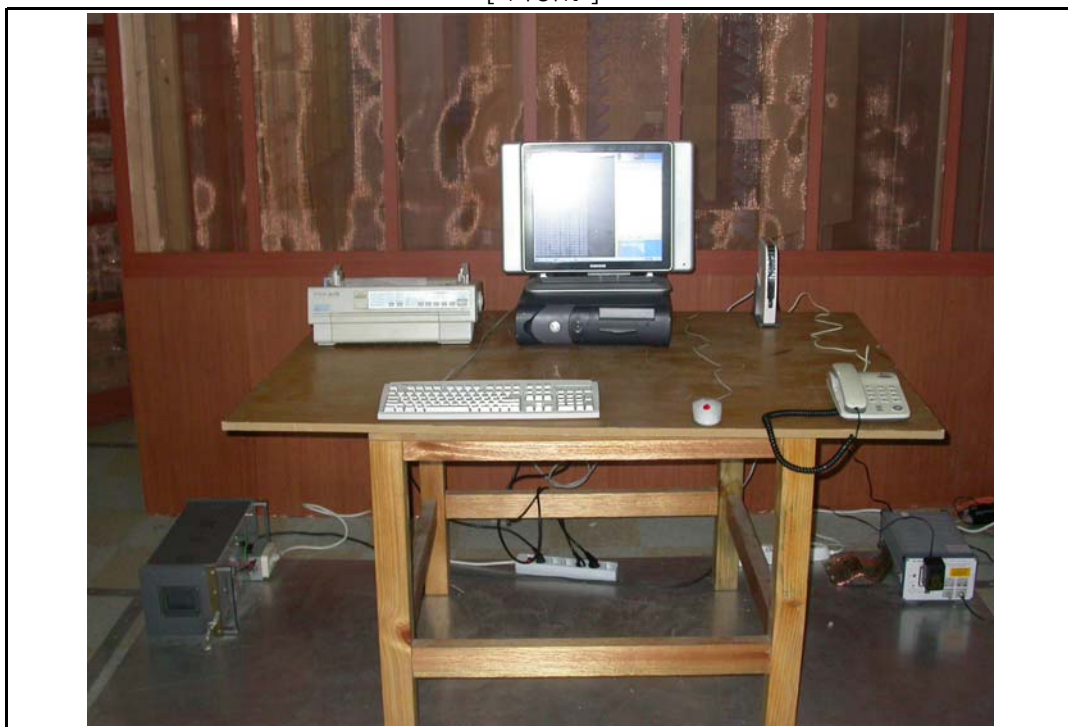
[ Rear ]



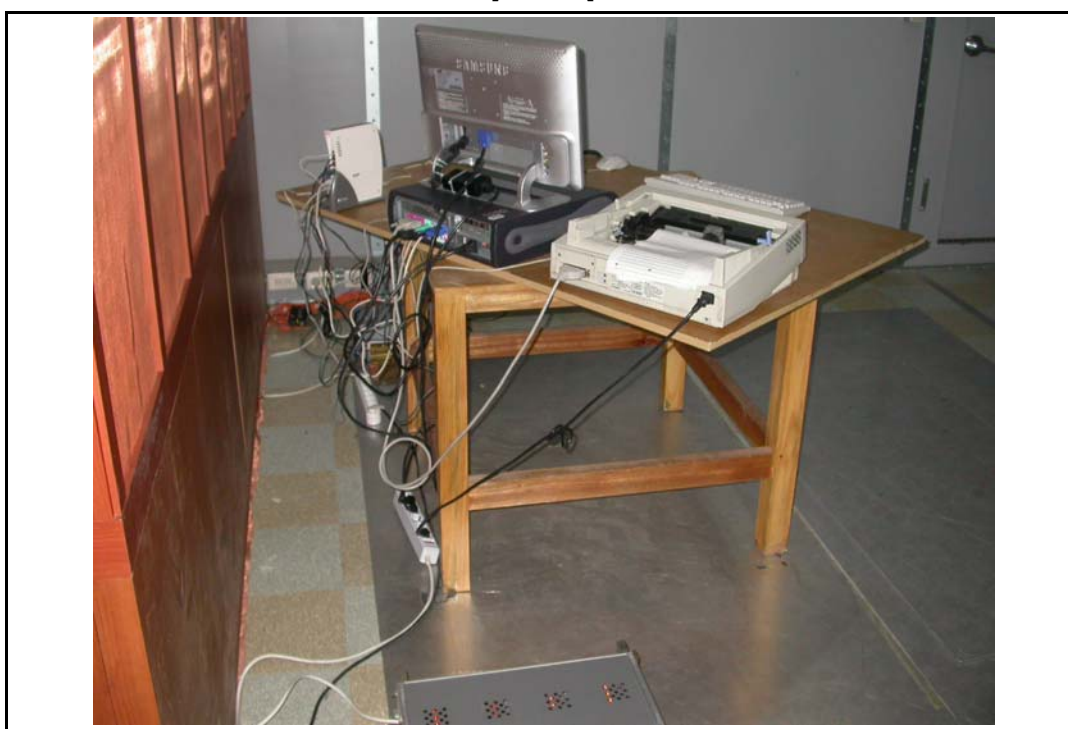


## 7.2 Setup for Conducted Test : 0.15 ~ 30 MHz

[ Front ]



[ Rear ]



## 8. Photographs of EUT

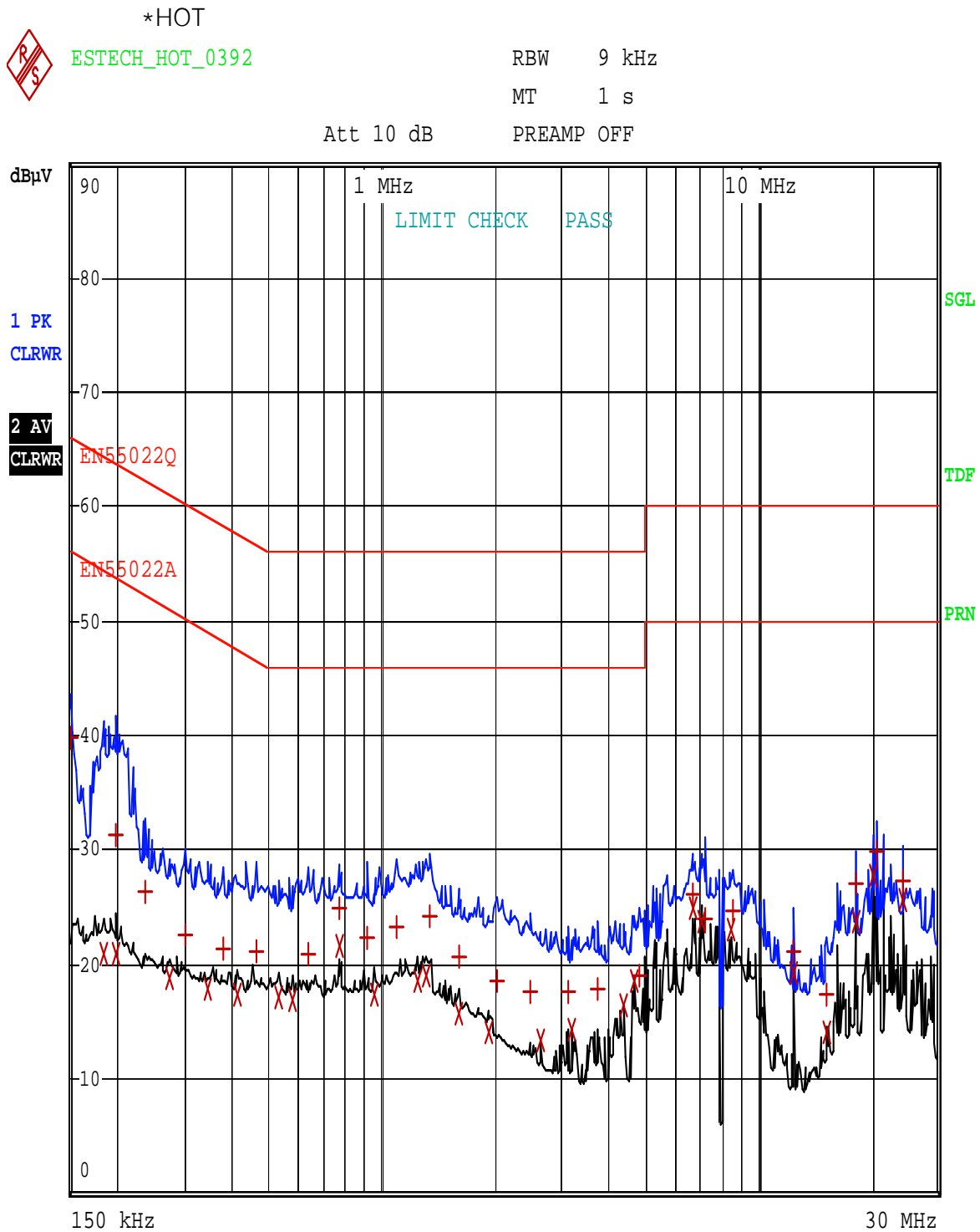
[ Front ]



[ Rear ]



## Appendix 1. Spectral diagram



Comment: Elesign Inc ESC-2420 HOT

Date: 24.MAR.2005 16:42:13

\*NEUTRAL



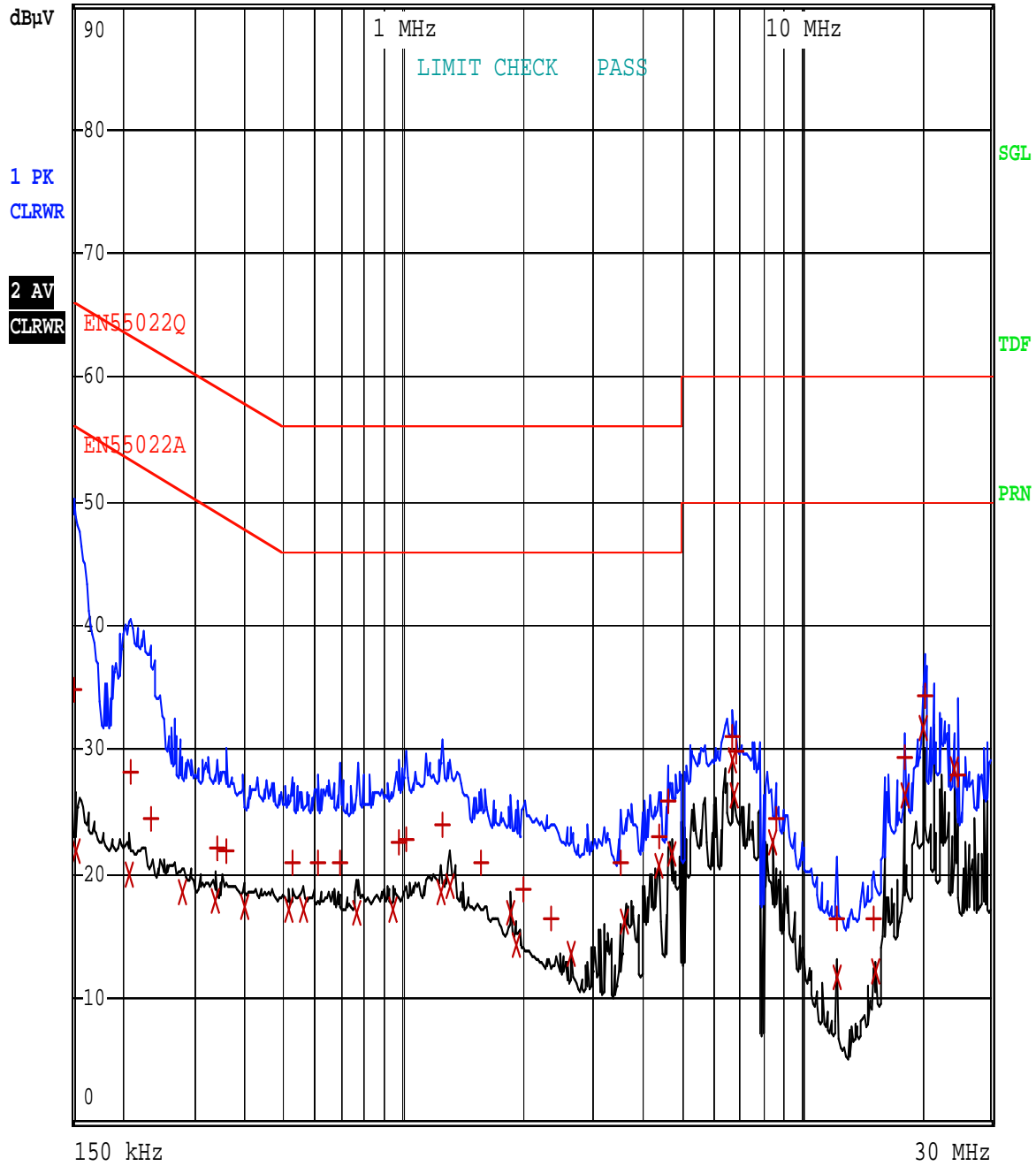
ESTECH\_NEUTRAL\_0392

RBW 9 kHz

MT 1 s

Att 10 dB

PREAMP OFF

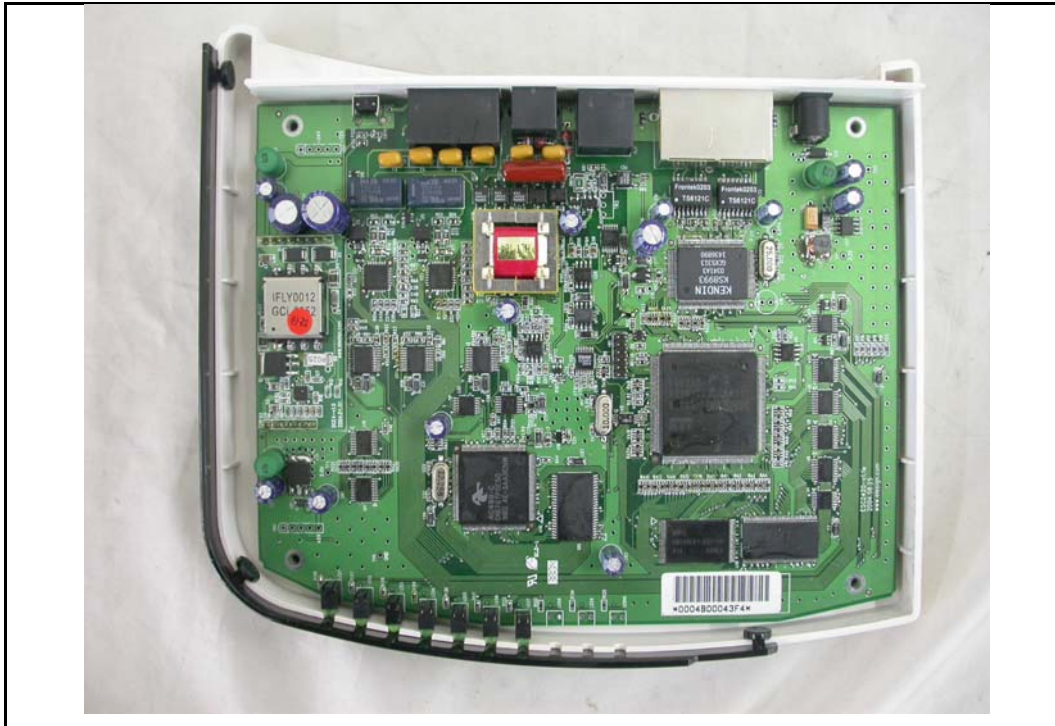


Comment: Elesign Inc ESC-2420 NEUTRAL

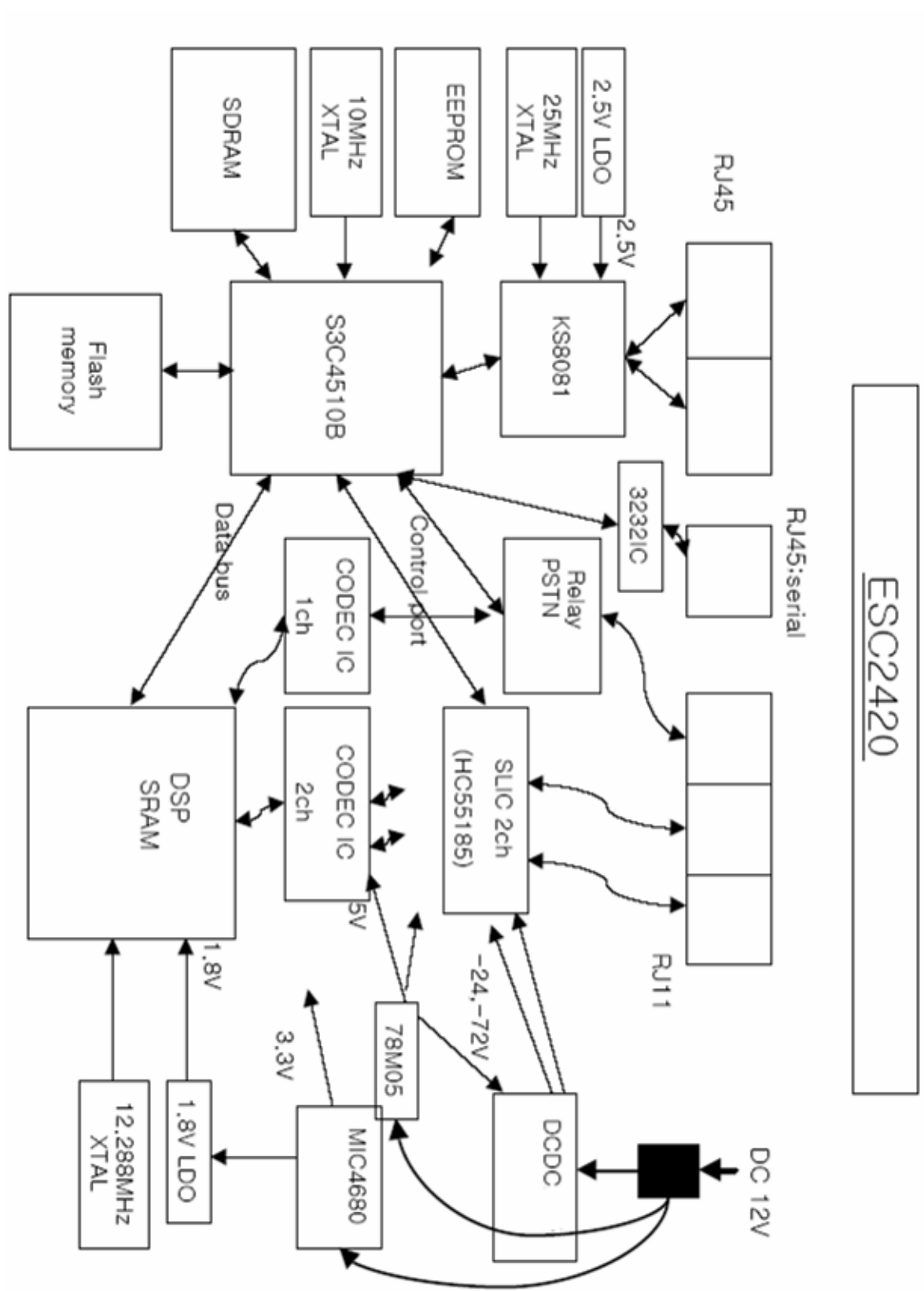
Date: 24.MAR.2005 16:50:01



## Appendix 2. Photographs of EUT in side PCB



Appendix 3. Block diagram of EUT



Appendix 4. Circuit Diagram