

# EMI TEST REPORT

According to FCC Part 15 Subpart B/Class B

**Product** : Notebook PC  
**Model No.** : X05, 200ARC

**FCC ID : A3LSX10**

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**Date of test** : April 18, 2003 ~ April 23, 2003`

**Issued Date** : April 25, 2003

**Tested by:**

Choon Kil, KIM / Test Engineer

**Reviewed by:**

No Cheon, PARK / Manager of EMC Lab.

**Authorized by:**

Kyu Baek, CHUNG / Chief of EMC Lab.

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NVLAP Code: 200447

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#### Distribution

This test report has been made available as follows:

|                                             |            |
|---------------------------------------------|------------|
| <b>CS Management Center, EMC Laboratory</b> | 1 original |
| Computer Division                           | 1 copy     |

## 1. General Information

**Applicant** : Samsung Electronics Co., Ltd.

**Full Address** : 416 Maetan 3 Dong, Paldal-Ku,  
Suwon City, Kyungki Do, Korea, 442-742

**Kind of Product** : **Notebook PC**

**FCC ID** : **A3LSX10**

**Project Name** : **Aquula, Aquila-C  
Arcade**

**Model & Variant Names** : **X05, X10** (Brand Name: Samsung)  
**SX05, SX10** (Brand Name: Samsung)  
**200ARC** (Brand Name: Gateway)

**Manufacturer** : Samsung Electronics Co., Ltd.

**Test Report Produced by** : Choon Kil, KIM / Test Engineer

## 1.1 Product Description

### 1) Justification

The system was configured for testing in typical fashion use. Cable were attached to each of the available I/O Ports. Where applicable, peripherals were attached to the I/O cables. The mode of operation utilized for testing was selected to best simulate typical EUT use.

The system was pre-tested using the below additional components, and we found worst emission level for the components, were selected as the final components for the test.

| Component    | Brand and Model Name | Remark     |
|--------------|----------------------|------------|
| CD-ROM Drive | Samsung, SN-124P     |            |
| CD-RW        | Teac, CD-W224E       |            |
| DVD-ROM      | Teac, DV-28EB        |            |
| DVD-ROM      | Toshiba, SD-C2612    |            |
| CD-RW Combo  | Samsung, SN-324B/MMC | Worst Case |
| CD-RW Combo  | Toshiba, SD-R2312    |            |
|              |                      |            |
|              |                      |            |
|              |                      |            |

(A) Banias CPU 1600MHz with Samsung chassis

(B) Banias CPU 1600MHz with Gateway chassis

(C) Banias CPU 1700MHz with Samsung chassis

This report is for above (C) configuration with the worst case component.

So the data of the maximum EUT operation was reported.

Further details of cabling and configuration are shown in the test system configuration.

## **2) Operating Frequency :**

1700MHz(CPU speed), 100MHz(CPU clock), 66MHz for the MCH, AGP, 33MHz for all PCI clocks,  
48 MHz for ICH4-M, 32.768 kHz XTAL for ICH4-M real time clock  
14.318MHz, 24.576MHz XTAL for STA9752 Audio Codec. 25MHz XTAL for 82562EZ LAN Controller.  
24.576MHz XTAL for R5C593 1394/PCMCIA/Memory stick Controller  
10MHz XTAL for MICOM

## **3) Description of Testing operating mode**

The EUT exercise program used during radiated and conducted emissions testing was the Samsung Standardized Emission Test Program for Windows. During the certification test, the LCD panel was open and video signals were simultaneously active on the LCD panel, the S-video output port, and the VGA port simultaneously. All external peripherals were connected to the I/O ports on the advanced port replicator unless specified below. The system was configured for testing in a typical fashion that a customer would normally use, and was tested while in an automated non-attendant mode. The program repetitively sends a screen of H's to the display, reads and writes to the hard drive, and writes to all serial , parallel ports and modem. Music is played from the CD player to the Line-In jack and ported out to the headphones. As the keyboard, microphone, and mouse are strictly input devices, no data was transmitted to them during the performance of the emissions testing. They were however, continuously scanned for data input activity. A hard drive from the remote PC was mapped to the EUT and a data file was read and written over the network connection to provide continuous activity. The EUT was connected to a remote Final testing was performed at 100 Mbps operation.

## **4) Tested Resolution :**

This section provides details of the equipment under test (EUT) and the peripheral assemblies attached during radiated ,conducted emissions and immunity testing.  
For the 14.1" panel the XGA resolution was set to its maximum value of 1024 x 768.  
and VGA Monitor and attached S-VHS television was set to the same resolution of 1024 x 768.

## 6) Assemble Parts

| Item                 | Specification                                                                                                                  | Remark             |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------|--------------------|
| CPU                  | Intel Banias CPU 1700MHz<br>479pin uFCBGA<br>400 MHz system bus<br>On-die 1MB L2 cache                                         |                    |
| Main Memory          | Samsung, M470L6423CK0-CB0<br>direct DDR channel 64bit 512 MB memory X 2EA                                                      | 1 Gbyte Memory     |
| Graphic<br>Contoller | Intel Montara-GM<br>UMA solution<br>Supports 4x AGP, CRT, S-VHS TV Port(CH7011A)                                               |                    |
| Flat Panel<br>Dispay | SEC. 14.1", LTN141XJ-L01<br>Upto 1024x768 Pixels; 18-bit 262k colors                                                           |                    |
| HDD                  | IBM, IC25N030ATCS04-0, 30GB, 2.5"                                                                                              |                    |
| PCMCIA               | SanDisk, 128MB CompactFlash Flash Memory                                                                                       |                    |
| ODD Drive            | Samsung, SN-324B, DVD-CDRW Combo<br>CD 24X, DVD 8X, CDRW 4X Speed                                                              |                    |
| AC Adapter           | SEC, AD-6019A, 60-Watts, 2 pin                                                                                                 |                    |
| MODEM                | SEC, SFM-3200LW, 56KBPS                                                                                                        |                    |
| LAN                  | Integrated PHY 10BASE-T, 100BASE-TX ,<br>LOM(82562EZ)                                                                          |                    |
| Wireless LAN         | Intel, Callexico 802.11b, WM3B2100, 11MBPS                                                                                     | FCC ID:PD9WM3B2100 |
| Input Devices        | Keyboard, 19mm pitch, 2.4mmH travel length<br>Pointing Device, PS/2 Touchpad w/ 2 button, 1 wheel                              |                    |
| Memory Stick         | Sony, MSA-32A(32MB) for X05                                                                                                    |                    |
| Ports                | 2 USB, PS/2, RJ-11, RJ-45, DC IN,EXT. MONITOR,<br>S-VHS TV-out,MIC-IN,HEADPHONE-OUT,<br>SPDIF, Card bus slot. USB Docking, Etc |                    |

## 1.2 Configuration of EUT and peripherals

| Mark | Item            | Model No.       | Serial No.                 | Manufacturer           | FCC ID       |
|------|-----------------|-----------------|----------------------------|------------------------|--------------|
| A    | Notebook PC     | X05, 200ARC     | XXXXXT900002               | Samsung                | A3LSX10      |
| B    | Monitor         | M17D-AN         | N106H4JT100841             | Samsung                | DoC          |
| C    | TV              | TM-2100PN       | 8604097                    | JVC                    | -            |
| D    | Ext. CDRW       | CDRW38402EXT2-B | 4PCD040F1T                 | Iomega                 | DoC          |
| E    | Ext. HDD        | SEV08UP         | HV08J1AT600367             | Samsung                | DoC          |
| F    | Ext. CDRW       | CRX2100U        | 5034697                    | SONY                   | DoC          |
| G    | Optical Speaker | CSW2020         | SM2020204100332<br>3       | Cambridge<br>Sondworks | -            |
| H    | Adapter         | PSCV360103A     | C020381345B                | Samsung                | for Ext. HDD |
| I    | Adapter         | DA-30C01        | 319052552                  | Samsung                | for CDRW     |
| J    | Adapter         | AD-4214N        | C011108527                 | Samsung                | for Monitor  |
| K    | Adapter         | KD-1540         | AD20000001290              | Cambridge<br>Sondworks | for Speaker  |
| L    | Adapter         | AD-6019A        | CNBA4400123ASE<br>382R0018 | Samsung                | for EUT      |
| M    | HeadSet         | N/A             | None                       | Samsung                | -            |
| N    | Adapter         | AC-12V1         | V02036                     | Samsung                | for CDRW     |

### 1.3 Used Cable Description

| No. | Item              | Length[m] | Shielded (Y/N) | Remark          |
|-----|-------------------|-----------|----------------|-----------------|
| 1   | AC Power Cable    | 1.5       | N              | PC              |
| 2   | AC Power Cable    | 1.5       | N              | Monitor         |
| 3   | AC Power Cable    | 1.5       | N              | TV              |
| 4   | AC Power Cable    | 1.5       | N              | CD-RW           |
| 5   | AC Power Cable    | 1.5       | N              | Optical Speaker |
| 6   | AC Power Cable    | 1.5       | N              | HDD             |
| 7   | Earphone Cable    | 1.0       | N              |                 |
| 8   | USB Cable         | 1.7       | Y              |                 |
| 9   | 1394 Cable        | 1.7       | Y              |                 |
| 10  | TV Cable          | 1.2       | N              |                 |
| 11  | Fiber Optic Cable | 2.0       | N              |                 |
| 12  | USB Cable         | 1.7       | Y              |                 |
| 13  | Speaker Cable     | 1         | N              |                 |
| 14  | AC Power Cable    | 1.5       | N              | CD-RW           |



## 2. System Test Configuration

### 2.1 Configuration of Radiated and Conducted Interference Measurement

\* Cabling was taken into consideration and test data was taken under worse case conditions.

#### 1)Conduction(Front View)



#### 2)Conduction(Rear View)



### 3) Radiation(Front View)



### 4) Radiation(Rear View)



## 2.2 Operation Environment

|                     | Conduction    | Radiation   |
|---------------------|---------------|-------------|
| Temperature [ C ] : | 24.4          | 20          |
| Humidity [ % ]      | 43            | 44          |
| Power supply        | : AC120V/60Hz | AC120V/60Hz |

## 2.3 Test Procedure

### 2.3.1 Conducted Emissions

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane. The rear of tabletop was located 40cm to the vertical conducting ground plane.

The rear of EUT, including peripherals was aligned and flush with rear of tabletop. All other surfaces of tabletop was at least 80cm from any other grounded conducting surface. I/O cables and AC cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30cm to 40cm. Each EUT current-carrying power lead, except the ground(safety) lead, were individually connected through a LISN to the input power source.

All unused 50 ohm connectors of the LISN were resistively terminated in 50 ohm when not connected to the measuring equipment.

The EUT was switched on and allowed to warm up to its normal operating condition.

A quick scan, from 150kHz to 30MHz, was made on the L1 & L2 line by LISN.

High peaks, relative to the limit line, over the frequency range were then selected.

The EMI TEST RECEIVER was then tuned to the selected frequencies.

CISPR quasi-peak measurements with a receiver bandwidth setting of 10kHz, were taken.

### 2.3.2 Radiated Emissions

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane.

The rear of EUT, including peripherals was aligned and flush with rear of tabletop. I/O cables that were connected to the peripherals were bundle in center.

They were folded back and forth forming a bundle 30cm to 40cm long and were hanged 40cm height to the ground plane.

The system configuration, clock speed, mode of operation or video resolution, turntable azimuth with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 to 1000 MHz using biconiLog antenna. Also, the EMI TEST RECEIVER was scanned from 1000 to 18000MHz using linearly polarized double ridge horn antennas were used.

Each emission was maximized by: varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and/or support equipment; powering the monitor from the floor mounted outlet box and the computer aux AC outlet if applicable, and changing the polarity of the antenna; whichever determined the worst-case emission.

The explanation of measuring instrument setup when respective function is used in any frequency band is as following:

| Frequency Band [MHz] | Instrument        | Detector fuction | resolution Bandwidth | Video Bandwidth |
|----------------------|-------------------|------------------|----------------------|-----------------|
| 30 to 1000           | Spectrum analyzer | Peak             | 1MHz                 | 1MHz            |
|                      | EMI Test receiver | Quasi-Peak       | 120kHz               | -               |
| Above 1000           | EMI Test receiver | Peak             | 1MHz                 | -               |

### 2.3 Measurement Uncertainty

Measurement Uncertainty according to NAMAS Publication NIS81 is available for a customer's request.

### 3. Conducted Emission Test Data

**O Test Data Sheet**

| Frequency<br><br>[MHz] | Meter reading<br>(a) |      | Total<br>Loss<br>(b)<br><br>[dB] | Results<br>(a) + (b) |      | Limits |      | Margin<br>(Limits-Result) |      |
|------------------------|----------------------|------|----------------------------------|----------------------|------|--------|------|---------------------------|------|
|                        | QP                   | AV   |                                  | QP                   | AV   | QP     | AV   | QP                        | AV   |
|                        | [dBuV]               |      |                                  | [dBuV]               |      | [dBuV] |      | [dB]                      |      |
|                        |                      |      |                                  |                      |      |        |      |                           |      |
| 0.150                  | 26.7                 | 15.1 | 0.6                              | 27.3                 | 15.7 | 66.0   | 56.0 | 38.7                      | 40.3 |
| 0.197                  | 46.7                 | 38.1 | 0.6                              | 47.3                 | 38.7 | 63.7   | 53.7 | 16.5                      | 15.1 |
| 0.263                  | 43.0                 | 37.3 | 0.5                              | 43.5                 | 37.8 | 61.3   | 51.3 | 17.8                      | 13.6 |
| 0.326                  | 35.6                 | 27.1 | 0.5                              | 36.1                 | 27.6 | 59.6   | 49.6 | 23.4                      | 22.0 |
| 0.396                  | 35.9                 | 30.3 | 0.5                              | 36.4                 | 30.8 | 57.9   | 47.9 | 21.5                      | 17.1 |
| 0.459                  | 32.2                 | 27.4 | 0.6                              | 32.8                 | 28.0 | 56.7   | 46.7 | 23.9                      | 18.8 |
| 0.525                  | 35.3                 | 32.9 | 0.6                              | 35.9                 | 33.5 | 56.0   | 46.0 | 20.1                      | 12.6 |
| 1.181                  | 34.8                 | 32.0 | 0.6                              | 35.4                 | 32.6 | 56.0   | 46.0 | 20.6                      | 13.4 |
| 2.033                  | 35.9                 | 31.1 | 0.5                              | 36.4                 | 31.6 | 56.0   | 46.0 | 19.6                      | 14.4 |
| 2.232                  | 34.3                 | 29.4 | 0.5                              | 34.8                 | 29.9 | 56.0   | 46.0 | 21.2                      | 16.1 |
| 2.427                  | 35.4                 | 30.8 | 0.6                              | 36.0                 | 31.4 | 56.0   | 46.0 | 20.0                      | 14.6 |
| 4.330                  | 34.8                 | 27.9 | 0.8                              | 35.6                 | 28.7 | 56.0   | 46.0 | 20.4                      | 17.3 |
| 6.427                  | 31.9                 | 30.2 | 0.8                              | 32.7                 | 31.0 | 60.0   | 50.0 | 27.3                      | 19.1 |
| 6.951                  | 33.4                 | 29.4 | 1.0                              | 34.4                 | 30.4 | 60.0   | 50.0 | 25.6                      | 19.6 |
| 14.150                 | 40.5                 | 36.9 | 0.9                              | 41.4                 | 37.8 | 60.0   | 50.0 | 18.6                      | 12.2 |
| 19.966                 | 36.1                 | 36.0 | 1.4                              | 37.5                 | 37.4 | 60.0   | 50.0 | 22.5                      | 12.6 |
| 21.662                 | 41.1                 | 37.9 | 1.7                              | 42.8                 | 39.6 | 60.0   | 50.0 | 17.2                      | 10.4 |
|                        |                      |      |                                  |                      |      |        |      |                           |      |

\* QP : Quasi-peak, AV: Average

\* Results = Meter Reading(QP or AV) + Total Loss(LISN Insertion loss + Cable loss)

\*\*"-":The Quasi-peak reading value also meets average limit so it is not necessary to measure with Average detector

\* Measurement detector function and bandwidth

Detector function : CISPR quasi-peak

Bandwidth : 10kHz

#### 4. Radiated Emission Test Data

| Frequency Range<br>[MHz] | Tested Frequency<br>[MHz] | ANT Pol. | Meter Reading<br>[A]<br>[dBuV/m] | Total Loss<br>[B]<br>[dB] | Antenna Height<br>[Cm] | Turn table Degree<br>[Deg] | Results<br>[A+B]<br>[dBuV/m] | Limits<br>[dBuV/m] | Margin<br>(Limit-Result)<br>[dB] |
|--------------------------|---------------------------|----------|----------------------------------|---------------------------|------------------------|----------------------------|------------------------------|--------------------|----------------------------------|
| <b>30 - 230</b>          |                           |          |                                  |                           |                        |                            |                              | <b>30.0</b>        |                                  |
|                          | 36.16                     | V        | 7.6                              | 15.9                      | 112                    | 47                         | 23.5                         |                    | 6.5                              |
|                          | 157.88                    | V        | 14.5                             | 11.9                      | 152                    | 0                          | 26.4                         |                    | 3.6                              |
|                          | 162.53                    | V        | 13.1                             | 11.6                      | 100                    | 225                        | 24.7                         |                    | 5.3                              |
|                          | 167.15                    | V        | 12.2                             | 11.2                      | 100                    | 213                        | 23.4                         |                    | 6.6                              |
|                          | 176.43                    | V        | 12.6                             | 11.6                      | 100                    | 30                         | 24.2                         |                    | 5.8                              |
| <b>230 - 1000</b>        |                           |          |                                  |                           |                        |                            |                              | <b>37.0</b>        |                                  |
|                          | 758.96                    | V        | 1.4                              | 25.0                      | 250                    | 149                        | 26.4                         |                    | 10.6                             |
|                          | 893.80                    | H        | 1.6                              | 25.8                      | 400                    | 330                        | 27.4                         |                    | 9.6                              |
|                          | 905.87                    | V        | 3.7                              | 25.9                      | 182                    | 127                        | 29.6                         |                    | 7.4                              |
|                          | 943.99                    | H        | 0.2                              | 26.3                      | 150                    | 89                         | 26.5                         |                    | 10.5                             |
|                          | 9943.65                   | V        | 0.0                              | 26.6                      | 400                    | 330                        | 26.6                         |                    | 10.4                             |
| <b>1000 - 8500</b>       |                           |          |                                  |                           |                        |                            |                              | <b>74.0</b>        |                                  |
|                          | 1729.0                    | V        | 8.6                              | 24.2                      | 100                    | 225                        | 32.8                         |                    | 41.2                             |
|                          | 1862.0                    | V        | 13.0                             | 20.0                      | 100                    | 315                        | 33.0                         |                    | 41.0                             |
|                          | 2128.5                    | H        | 2.3                              | 29.8                      | 100                    | 180                        | 32.1                         |                    | 42.0                             |

\* "<" Means equal or less then 5dB

\* Receiving Antenna Mode : **Horizontal, Vertical**

\* Results = Meter Reading + Total Loss(Antenna factor + Cable loss)

\* Measurement detector function and bandwidth

Detector function : CISPR quasi-peak(Above 1000MHz: Peak)

Resolution Bandwidth : 120kHz(Above 1000MHz: 1MHz)

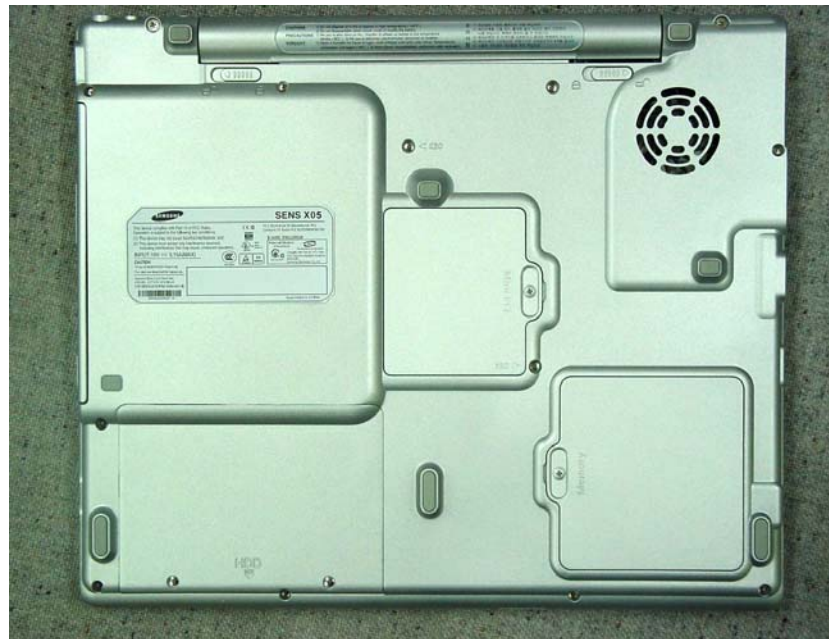
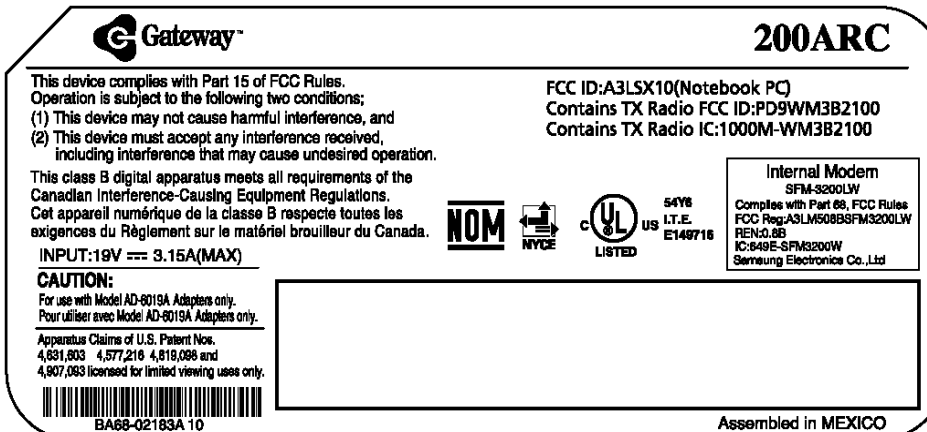
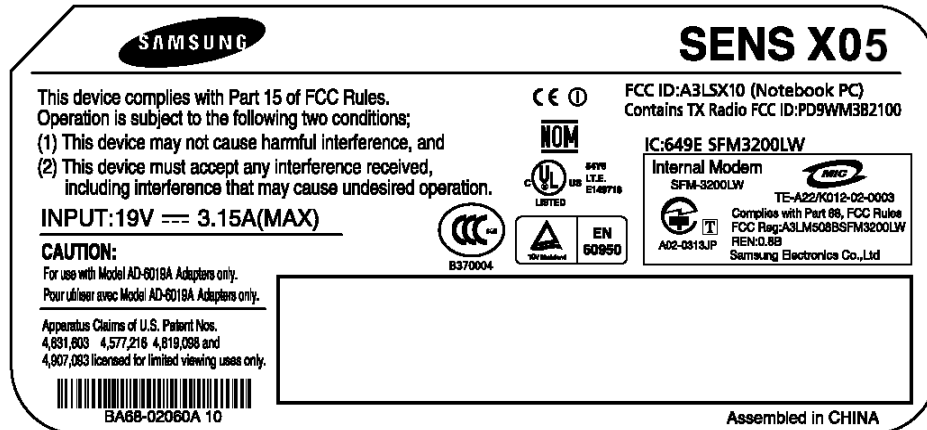
\* Test distance

- Below 1000MHz: 10m(Quasi-peak)

- Above 1000MHz: 3m(Peak)

## 5. FCC Label Configuration and Location

### 5.1, 5.2 Label and Label Location



## 6. Test Equipment Used

| Equipment                   | Model No.                                                  | Serial No   | Makers.   | Next Calibration date |
|-----------------------------|------------------------------------------------------------|-------------|-----------|-----------------------|
| Field strength meter        | ESCS30                                                     | 100104      | R & S     | 2004-01-17            |
|                             | <b>Firmware versions : Main 2.22, OTP 02.01, GRA 02.36</b> |             |           |                       |
| Test Receiver               | ESI26                                                      | 100010      | R&S       | 2003-05-04            |
| L.I.S.N                     | 3810/2NM                                                   | 2251        | EMCO      | 2003-05-07            |
| L.I.S.N                     | ESH3-Z5                                                    | 831887/0004 | R&S       | 2003-11-18            |
| Bi-Log Antenna              | CBL6112B                                                   | 2804        | SCHAFFNER | 2003-04-23            |
| Double Ridged Guide Antenna | HF906                                                      | 100027      | R & S     | 2003-07-26            |