



Test Report

For

Applicant : ZyXEL Communications Corporation
Equipment Type : LAN Hub Router
Model : PRESTIGE 314
FCC ID : I88PRESTIGE 314

Report No.: 006H057FI



Test Report Certification

Quietek Corporation

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Accredited by NIST(NVLAP), VCCI, BSMI, DNV, TUV

Applicant : ZyXEL Communications Corporation
Address : No.6, Innovation Rd II, Science-Based Industrial Park,
Hsin-Chu, Taiwan, R.O.C.
Equipment Type : LAN Hub Router
Model : PRESTIGE 314
FCC ID. : I88PRESTIGE 314
Measurement Standard : CISPR 22/1985
Measurement Procedure : ANSI C63.4 /1992
Operation Voltage : 120VAC/60Hz
Classification : Class B
Test Result : Complied
Test Date : July 11, 2000
Report No. : 006H057FI



The Test Results relate only to the samples tested.
The test report shall not be reproduced except in full without the written approval of Quietek Corporation.
This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

Documented by: Zoe Lee

Test Engineer: Calien Kang

Approved: Kevin Wang



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1. General Information

1.1 EUT Description

Applicant : ZyXEL Communications Corporation

Address : No.6, Innovation Rd II, Science-Based Industrial Park, Hsin-Chu, Taiwan, R.O.C.

Equipment Type : LAN Hub Router

Model : PRESTIGE 314

FCC ID : I88PRESTIGE 314

Operation Voltage : 120VAC/60Hz

LAN Cable (CROSSOVER) : Shielded, 1.8m, 1pc

LAN Cable (STRAIGHT) : Shielded, 1.8m, 1pc

RS 232 Cable : Non-Shielded, 1.8m, 1pc

Power Adapter : ZyXEL, JAD-121200E
Non-Shielded, 1.8m

Remark :

- 1.This device a LAN Hub Router with 10/100Mbps transmission speed.
- 2.100Mbps transmission speed was selected as test mode.
3. QuieTek had verified the construction and function, then shown in this test report.



1.2 Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

1.2.1 LAN Hub Router (EUT)

Model Number : PRESTIGE 314
Serial Number : N/A
FCC ID :I88PRESTIGE314
Manufacturer : ZyXEL
LAN Cable (CROSSOVER) : Shielded, 1.8m, 1pc
LAN Cable (STRAIGHT) : Shielded, 1.8m, 1pc
RS 232 Cable : Non-Shielded, 1.8m, 1pc
Power Adapter : ZyXEL, JAD-121200E
Non-Shielded, 1.8m

1.2.2 Host Personal Computer

Model Number : P2L97
Serial Number : 92M1Y00768
FCC ID : DoC
Manufacturer : ASUS
Power Cord : Non-Shielded, 1.8m

1.2.3 Monitor

Model Number : CM752ET-311
Serial Number : T8E004443
FCC ID : DoC
Manufacturer : HITACHI
Data Cable : Shielded, 1.5m
Power Cord : Shielded, 1.8m

1.2.4 Modem

Model Number : 1414
Serial Number : 980033035
FCC ID : IFAXDM1414
Manufacturer : ACEEX
Data Cable : Shielded, 1.5m
Power Adapter : ACCEX, SCP41-91000A
Cable Output : Shielded, 1.5m

1.2.5 Printer

Model Number : C2642A
Serial Number : MY75J1D1D2
FCC ID : B94C2642X
Manufacturer : HP
Data Cable : Shielded, 1.2m
Power Adapter : NMB, C2175A
Cable for AC IN: Non-Shielded, 0.7m
Cable for AC Out: Non-Shielded, 1.5m

1.2.6 Mouse

Model Number : M-S34
Serial Number : LZB75078428
FCC ID : DZL211029
Manufacturer : HP
Data Cable : Shielded, 1.8m

1.2.7 Keyboard

Model Number : SK-2502
Serial Number : M971237059
FCC ID : GYUR41SK
Manufacturer : HP

1.2.8 Earphone

Model Number : PH136
Serial Number : N/A
Manufacturer : BSD
Data Cable : Shielded, 1.2m

1.2.9 Joystick

Model Number : JPD110
Serial Number : 9814A15646
FCC ID : DoC
Manufacturer : Maxxtro
Data Cable : Shielded, 1.7m

1.2.10 Video Camera

Model Number : Vcam 3X
Serial Number : N/A
FCC ID : DoC
Manufacturer : Mustek
Data Cable (USB) : Shielded, 1.5m

1.2.11 LAN Cable: Shielded, 1.8m, 3pcs

1.2.12 LAN Cable: Shielded, 10m, 1pc

1.2.13 WAN Cable: Shielded, 10m, 1pc

Partner PC System

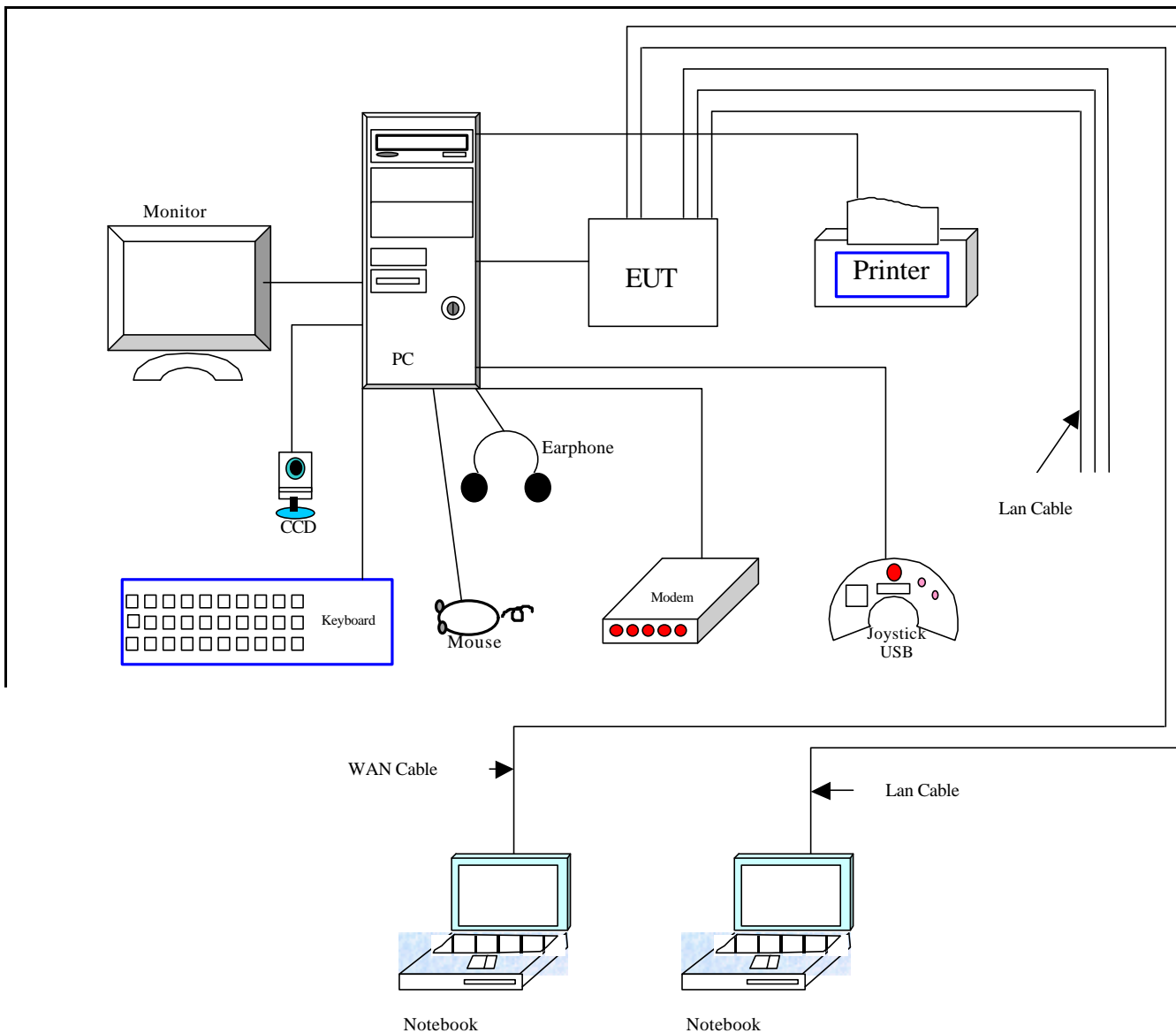
1.2.14 Notebook PC

Model Number : 500
Serial Number : 9145B0160C9100170EM
Manufacturer : ACER
FCC ID : DoC
Power Adapter : DELTA, ADP-45GB
Cable In: Non-shielded, 1.6m
Cable Out: Non-shielded, 1.8m

1.2.15 Notebook PC

Model Number : 500
Serial Number : 9145B0160C91000CF2M
Manufacturer : ACER
FCC ID : DoC
Power Adapter : DELTA, ADP-45GB
Cable In: Non-shielded, 1.6m
Cable Out: Non-shielded, 1.8m

1.3 EUT Configuration



1.4 EUT Exercise Software

The EUT exercise program used during conducted testing was designed to exercise the EUT in a manner similar to a typical use. The exercise sequence is listed as below:

- 1.4.1 Setup the EUT and simulators as shown on 1.3.
- 1.4.2 Turn on the power of all equipment.
- 1.4.3 Boot the PC from Hard Disk .
- 1.4.4 Data will communicate between personal computer and partner notebook personal notebook through LAN Hub Router (EUT).
- 1.4.5 The personal computer's and partner notebook personal notebook monitor will show the transmitting and receiving characteristics when the communication is success.
- 1.4.6 Repeat the above procedure 1.4.4 to 1.4.7

1.5 Test performed

Conducted emissions were investigated over the frequency range from **0.15MHz to 30MHz** using a receiver bandwidth of 9kHz.

Radiated emissions were investigated over the frequency range from **30MHz to 1000MHz** using a receiver bandwidth of 120kHz. Radiated testing was performed at an antenna to EUT distance of 10 meters.

1.6 Test Facility

Ambient conditions in the laboratory:

| Items | Required (IEC 68-1) | Actual |
|----------------------------|---------------------|----------|
| Temperature (°C) | 15-35 | 20-35 |
| Humidity (%RH) | 25-75 | 50-65 |
| Barometric pressure (mbar) | 860-1060 | 950-1000 |

Site Description: November 3, 1998 File on
Federal Communications Commission
FCC Engineering Laboratory
7435 Oakland Mills Road
Columbia, MD 21046
Reference 31040/SIT1300F2



September 30, 1998 Accreditation on NVLAP
NVLAP Lab Code: 200347-0

February 23, 1999 Accreditation on DNV
Statement No.: 413-99-LAB11



December 8, 1998 Registration on VCCI
Registration No. for No.2 Shielded Room C-858
Registration No. for No.1 Open Area Test Site R-823
Registration No. for No.2 Open Area Test Site R-835



January 04, 1999 Accreditation on TÜV Rheinland
Certificate No.: I9865712-9901



Name of firm : QuieTek Corporation

Site location : No.75-1, Wang-Yeh Valley, Yung-Hsing Tsuen,
Chiung-Lin, Hsin-Chu County, Taiwan, R.O.C.

2. Conducted Emission

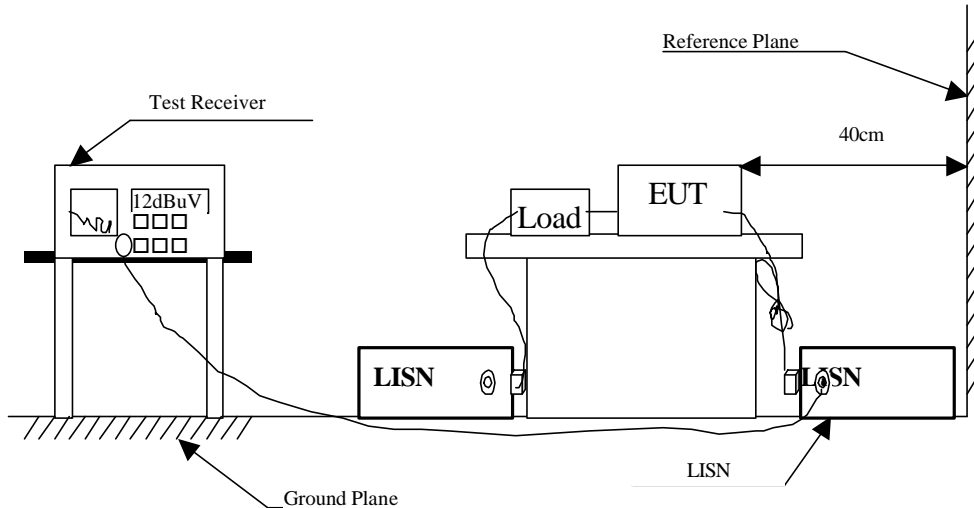
2.1 Test Equipment List

The following test equipment are used during the conducted emission test:

| Item | Instrument | Manufacturer | Type No./Serial No | Last Cal.. | Remark |
|------|--------------------|--------------|--------------------|------------|-------------|
| 1 | Test Receiver | R & S | ESCS 30/825442/17 | May, 2000 | |
| 2 | L.I.S.N. | R & S | ESH3-Z5/825016/6 | May, 2000 | EUT |
| 3 | L.I.S.N. | Kyoritsu | KNW-407/8-1420-3 | May, 2000 | Peripherals |
| 4 | Pulse Limiter | R & S | ESH3-Z2 | N/A | |
| 5 | N0.2 Shielded Room | | | N/A | |

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

2.2 Test Setup



2.3 Limits

| CISPR 22 Limits (dBuV) | | | | | FCC Part 15 Subpart B (dBuV) | | | | |
|------------------------|---------|----|---------|-------|------------------------------|---------|------|---------|------|
| Frequency MHz | Class A | | Class B | | Frequency MHz | Class A | | Class B | |
| | QP | AV | QP | AV | | uV | dBuV | uV | dBuV |
| 0.15 - 0.50 | 79 | 66 | 66-56 | 56-46 | 0.45-1.705 | 1000 | 60.0 | 250 | 48.0 |
| 0.50-5.0 | 73 | 60 | 56 | 46 | 1.705-30 | 3000 | 69.5 | 250 | 48.0 |
| 5.0 - 30 | 73 | 60 | 60 | 50 | | | | | |

Remarks : In the above table, the tighter limit applies at the band edges.

2.4 Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4 /1992 on conducted measurement.

The bandwidth of the field strength meter (R & S Test Receiver ESCS 30) is set at 9kHz.

2.5 Test Results

The conducted emission from the EUT is measured and shown in attachment 1 of test report. The acceptance criterion was met and the EUT passed the test.

3. Radiated Emission

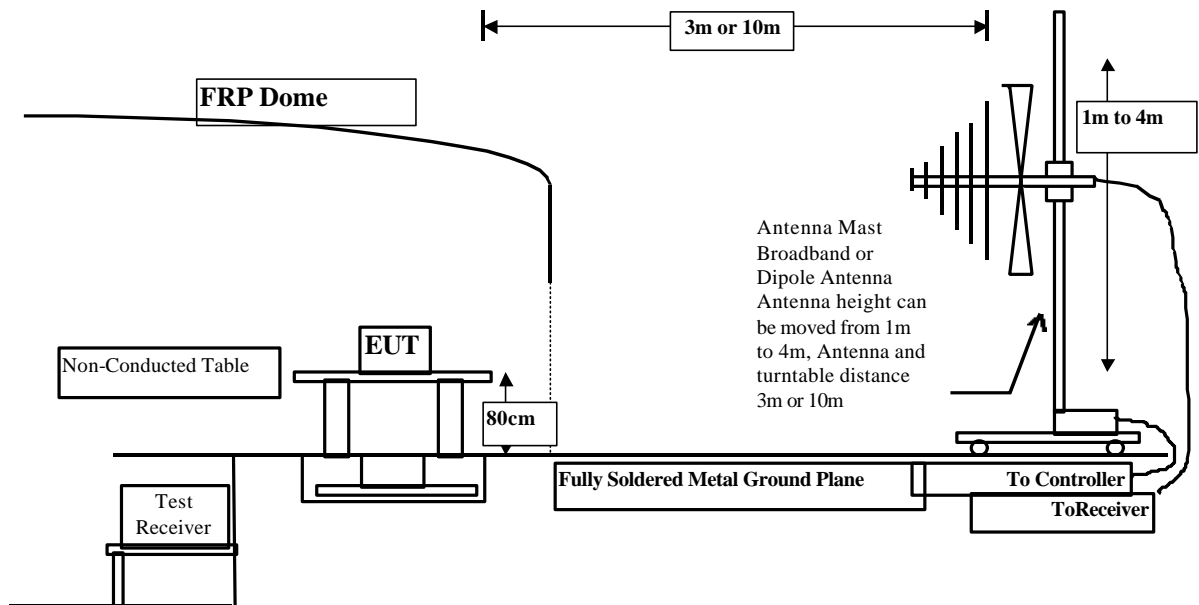
3.1 Test Equipment

The following test equipment are used during the radiated emission test:

| Test Site | | Equipment | Manufacturer | Model No./Serial No. | Last Cal. |
|-----------|---|-------------------|--------------|----------------------|------------|
| Site # 1 | X | Test Receiver | R & S | ESCS 30 / 825442/14 | May, 2000 |
| | | Spectrum Analyzer | Advantest | R3261C / 71720140 | May, 2000 |
| | | Pre-Amplifier | HP | 8447D/3307A01812 | May, 2000 |
| | X | Bilog Antenna | Chase | CBL6112B / 12452 | Sep., 1999 |
| | X | Horn Antenna | EM | EM6917 / 103325 | May, 2000 |
| Site # 2 | X | Test Receiver | R & S | ESCS 30 / 825442/17 | May, 2000 |
| | | Spectrum Analyzer | Advantest | R3261C / 71720609 | May, 2000 |
| | | Pre-Amplifier | HP | 8447D/3307A01814 | May, 2000 |
| | X | Bilog Antenna | Chase | CBL6112B / 2455 | Sep., 1999 |
| | X | Horn Antenna | EM | EM6917 / 103325 | May, 2000 |

- Note:
1. All equipment upon which need to calibrated are with calibration period of 1 year.
 - 2.. Mark "X" test instruments are used to measure the final test results.

3.2 Test Setup



3.3 Limits

| CISPR 22 | | | | | FCC Part 15 Subpart B | | | | |
|------------|--------------|--------|--------------|--------|-----------------------|---------|--------|---------|--------|
| Frequency | Class A | | Class B | | Frequency | Class A | | Class B | |
| MHz | Distance (m) | dBuV/m | Distance (m) | dBuV/m | | UV/m | DBuV/m | UV/m | DBuV/m |
| 30 – 230 | 10 | 40 | 10 | 30 | 30 – 88 | 90 | 39 | 100 | 40.0 |
| 230 – 1000 | 10 | 47 | 10 | 37 | 88 – 216 | 150 | 43.5 | 150 | 43.5 |
| | | | | | 216 – 960 | 210 | 46.5 | 200 | 46.0 |
| | | | | | 960 - 2000 | 300 | 49.5 | 500 | 54.0 |

Remark: 1. The tighter limit shall apply at the edge between two frequency bands.

2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3. RF Line Voltage (dBuV/m) = 20 log RF Line Voltage (uV/m)

3.4 Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 10 meters . The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4 /1992 on radiated measurement.

The bandwidth below 1GHz setting on the field strength meter (R&S Test Receiver ESCS 30) is 120 kHz.

3.5 Test Results

The radiated emission from the EUT is measured and shown in attachment 1 of test report.

The acceptance criterion was met and the EUT passed the test.

4. EMI Reduction Method During Compliance Testing

No modification was made during testing.



5. Attachment

| | |
|--|--------------------|
| Attachment 1: Summary of Test Results | Number of Pages: 5 |
| Attachment 2: EUT Test Photographs | Number of Pages: 2 |
| Attachment 3: EUT Detailed Photographs | Number of Pages: 9 |

Attachment 1 : Summary of Test Results

The test results in the emission and immunity were performed according to the requirements of measurement standard and process. QuieTek Corporation is assumed full responsibility for the accuracy and completeness of these measurements. The test data of the emission and immunity are listed as the attached data.

All the tests were carried out with the EUT in normal operation, which was defined as:

Mode 1: 100Mbps

The EUT passed all the tests.

The uncertainty is calculated in accordance with NAMAS NIS 81, The total uncertainty for this test is as follows:

➤ **Emission Test**

- Uncertainty in the Conducted Emission Test: $< \pm 2.0 \text{ dB}$
- Uncertainty in the field strength measured: $< \pm 4.0 \text{ dB}$

CONDUCTED EMISSION DATA

Date of Test : July 11, 2000 EUT : LAN Hub Router
 Test Mode : Mode 1 Detect Mode : Quasi-Peak & Average

| Frequency | Cable Loss | LISN Factor | Reading Level | Measurement Level | Limits |
|-----------|------------|-------------|---------------|-------------------|--------|
| MHz | dB | dB | Line1 dBuV | Line1 dBuV | dBuV |
| 0.228 | 0.02 | 0.10 | 44.36 | 44.48 | 62.52 |
| 0.271 | 0.03 | 0.10 | 42.50 | 42.63 | 61.08 |
| 0.341 | 0.04 | 0.10 | 38.97 | 39.11 | 59.17 |
| 0.384 | 0.05 | 0.10 | 37.54 | 37.69 | 58.18 |
| 17.694 | 0.34 | 0.41 | 40.39 | 41.14 | 60.00 |
| *21.662 | 0.36 | 0.48 | 42.64 | 43.49 | 60.00 |

Average:

| | | | | | |
|--------|------|------|-------|-------|-------|
| 0.228 | 0.02 | 0.10 | 15.50 | 15.62 | 52.52 |
| 0.271 | 0.03 | 0.10 | 11.70 | 11.83 | 51.08 |
| 0.341 | 0.04 | 0.10 | 8.80 | 8.94 | 49.17 |
| 0.384 | 0.05 | 0.10 | 7.60 | 7.75 | 48.18 |
| 17.694 | 0.34 | 0.41 | 36.20 | 36.95 | 50.00 |
| 21.662 | 0.36 | 0.48 | 40.20 | 41.05 | 50.00 |

Remarks :

1. “ * ” means that this data is the worst emission level.



CONDUCTED EMISSION DATA

Date of Test : July 11, 2000 EUT : LAN Hub Router
 Test Mode : Mode 1 Detect Mode : Quasi-Peak & Average

| Frequency | Cable Loss | LISN Factor | Reading Level | Measurement Level | Limits |
|-----------|------------|-------------|---------------|-------------------|--------|
| MHz | dB | dB | Line2 dBuV | Line2 dBuV | dBuV |
| 0.166 | 0.01 | 0.10 | 48.81 | 48.92 | 65.18 |
| 0.197 | 0.01 | 0.10 | 47.78 | 47.89 | 63.74 |
| 0.255 | 0.03 | 0.10 | 46.08 | 46.21 | 61.58 |
| *0.408 | 0.05 | 0.10 | 43.22 | 43.37 | 57.69 |
| 0.615 | 0.07 | 0.10 | 38.13 | 38.30 | 56.00 |
| 21.663 | 0.36 | 0.48 | 40.08 | 40.93 | 60.00 |

Average:

| | | | | | |
|--------|------|------|-------|-------|-------|
| 0.166 | 0.01 | 0.10 | 17.70 | 17.81 | 55.18 |
| 0.197 | 0.01 | 0.10 | 16.80 | 16.91 | 53.74 |
| 0.255 | 0.03 | 0.10 | 15.60 | 15.73 | 51.58 |
| 0.408 | 0.05 | 0.10 | 12.80 | 12.95 | 47.69 |
| 0.615 | 0.07 | 0.10 | 8.00 | 8.17 | 46.00 |
| 21.663 | 0.36 | 0.48 | 37.30 | 38.15 | 50.00 |

Remarks :

1. “ * ” means that this data is the worst emission level.



RADIATED EMISSION DATA

Date of Test : July 11, 2000 EUT : LAN Hub Router
 Test Mode : Mode 1 Test Site : No.2 Open Test Site

| Freq. | Cable | Probe | PreAMP | Reading | Measurement | Margin | Limit | Ant | Turn |
|-------|-------------|-------|--------|---------|-------------|--------|--------|-----|--------|
| MHz | Loss Factor | dB/m | dB | Level | Horizontal | dBuV | dBuV/m | dB | dBuV/m |
| MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV | dBuV/m | dB | dBuV/m |

| | | | | | | | | | |
|----------|------|-------|------|-------|-------|-------|-------|-----|-----|
| 50.000 | 1.35 | 7.93 | 0.00 | 5.39 | 14.67 | 15.33 | 30.00 | 401 | 110 |
| 64.000 | 1.48 | 5.73 | 0.00 | 0.80 | 8.00 | 22.00 | 30.00 | 401 | 62 |
| *200.000 | 2.78 | 9.30 | 0.00 | 7.75 | 19.83 | 10.17 | 30.00 | 401 | 131 |
| 240.000 | 3.17 | 11.32 | 0.00 | 0.54 | 15.03 | 21.97 | 37.00 | 401 | 24 |
| 350.000 | 4.01 | 14.25 | 0.00 | 0.52 | 18.78 | 18.22 | 37.00 | 401 | 59 |
| 384.073 | 4.19 | 15.11 | 0.00 | 1.61 | 20.91 | 16.09 | 37.00 | 401 | 97 |
| 675.000 | 5.71 | 19.11 | 0.00 | -0.92 | 23.89 | 13.11 | 37.00 | 127 | 202 |

Remarks:

- 1.All Readings below 1GHz are Quasi-Peak, above are average value.
- 2.“ * ”, means this data is the worst emission level.
- 3.Emission Level = Reading Level + Antenna Factor + Cable loss



RADIATED EMISSION DATA

Date of Test : July 11, 2000 EUT : LAN Hub Router
 Test Mode : Mode 1 Test Site : No.2 Open Test Site

| Freq. | Cable | Probe | PreAMP | Reading | Measurement | Margin | Limit | Ant | Turn |
|-------|-------------|-------|--------|---------|-------------|--------|--------|--------|--------|
| MHz | Loss Factor | dB/m | dB | Level | Vertical | dBuV | dBuV/m | dB | dBuV/m |
| MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | dBuV/m | cm deg |

| | | | | | | | | | |
|----------|------|-------|------|------|-------|-------|-------|-----|-----|
| 64.000 | 1.48 | 6.58 | 0.00 | 8.03 | 16.09 | 13.91 | 30.00 | 100 | 202 |
| 80.000 | 1.64 | 7.12 | 0.00 | 6.65 | 15.41 | 14.59 | 30.00 | 100 | 130 |
| 150.000 | 2.31 | 10.43 | 0.00 | 8.26 | 21.00 | 9.00 | 30.00 | 100 | 92 |
| 160.000 | 2.40 | 10.28 | 0.00 | 3.30 | 15.98 | 14.02 | 30.00 | 100 | 27 |
| *200.000 | 2.78 | 9.07 | 0.00 | 9.47 | 21.33 | 8.67 | 30.00 | 100 | 185 |
| 225.000 | 3.03 | 9.68 | 0.00 | 6.94 | 19.64 | 10.36 | 30.00 | 100 | 125 |
| 250.000 | 3.27 | 12.26 | 0.00 | 6.76 | 22.29 | 14.71 | 37.00 | 100 | 15 |

Remarks:

- 1.All Readings below 1GHz are Quasi-Peak, above are average value.
- 2.“ * ”, means this data is the worst emission level.
- 3.Emission Level = Reading Level + Antenna Factor + Cable loss

