



ELECTROMAGNETIC INTERFERENCE TEST REPORT

Company : ZyXEL COMMUNICATIONS CORPORATION.
Address : NO.6, Innovation Rd. II, Science- Based Industrial Park,
Hsin-Chu, Taiwan , R.O.C.
Sample Name : ISDN Router Hub
Model : RH348 (for NETGEAR INC.)
Date Received : MAR. 18, 1998
Date Tested : MAR. 25, 1998

MEASUREMENT PROCEDURE USED :

FCC RULES AND REGULATION PART 15 SUBPART B
CLASS B OCTOBER 1996 AND ANSI C63.4 MAY 1992

WE HEREBY CERTIFY THAT: The measurements shown in the attachment were made in accordance with the procedures indicated, and the energy emitted by the equipment was found to be within the limits applicable. We assume full responsibility for the accuracy and completeness of these measurements and vouch for the qualifications of all persons taking them.

	Name	Signature	Date
Testing Engineer	C.F.Wu/NVLAP	C.F. Wu	APR. 13, 1998
Approving Manager	Paul Y. Liao/NVLAP	Paul Y. Liao	Apr. 13, 1998

Notes :

1. This report will be invalid if duplicated or photocopied in part.
2. This report refers only to the specimen(s) submitted to testing, and be invalid as separately used.
3. This report is invalid with out examination stamp and signature of this institute.
4. The tested specimen(s) will be preserved for thirty days from the date issued.
5. This is a NIST/NVLAP accredited report but not constituted and endorsed by U.S government.



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1. GENERAL INFORMATION

1.1 DESCRIPTION OF EUT

MANUFACTURER : ZyXEL COMMUNICATIONS CORPORATION.

SAMPLE NAME : ISDN Router Hub

MODEL NUMBER : RH348

SERIAL NO. : -----

POWER SUPPLY : 120VAC/60Hz



1.2 DESCRIPTION OF PERIPHERALS

(1) PC

MODEL NUMBER : NetServer LD Pro 6/180
SERIAL NUMBER : SG70100107
MANUFACTURER : HP CORP.
F.C.C. ID : -----
POWER CORD : Unshielded , Detachable , 1.8m

(2) MONITOR

MODEL NUMBER : JC-1404HMA
SERIAL NUMBER : 08D00346
MANUFACTURER : NEC CORP.
F.C.C. ID : A3D5YRJC-1404HMA
POWER CORD : Unshielded , Detachable , 1.8m

(3) KEYBOARD

PRODUCT NUMBER : C1405C#AB0
SERIAL NUMBER : 3625M60145
MANUFACTURER : HP CORP.
F.C.C. ID : B94C1405X

(4) PRINTER

MODEL NUMBER : 5152-002
SERIAL NUMBER : 0754365
MANUFACTURER : IBM CORP.
F.C.C. ID : BKM9A85152002

(5) TELEPHONE(2 sets)

MODEL NUMBER : RS-802F
SERIAL NUMBER : -----
MANUFACTURER : SWEETONE CORP.
FCC ID : -----



(6) PC

MODEL NUMBER : Vectra VE 5/133 series 3

SERIAL NUMBER : SG72200521

MANUFACTURER : HP CORP.

FCC ID : B94VECTRAVE53

(7) MONITOR

MODEL NUMBER : 8515A01

SERIAL NUMBER : -----

MANUFACTURER : IBM CORP.

FCC ID : ANO8515-A01

(8) KEYBOARD

MODEL NUMBER : E03633WLTW-C

SERIAL NUMBER : -----

MANUFACTURER : HP CORP.

FCC ID : CIGE03633

(9) PC

MODEL NUMBER : Vectra VE 5/133 series 3

SERIAL NUMBER : SG72200556

MANUFACTURER : HP CORP.

FCC ID : B94VECTRAVE53

(10) MONITOR

MODEL NUMBER : JC-1571VMA-2

SERIAL NUMBER : 6Z01162EA

MANUFACTURER : NEC CORP.

FCC ID : A3DJC-1571VMA-2

(11) KEYBOARD

MODEL NUMBER : E03633WLTW-C

SERIAL NUMBER : -----

MANUFACTURER : HP CORP.

FCC ID : CIGE03633



(12) Fast Ether Pair

MODEL NUMBER : EN1207-TX

SERIAL NUMBER(1) : 633014578

SERIAL NUMBER(2) : 645017820

MANUFACTURER : ACCTON CORP.

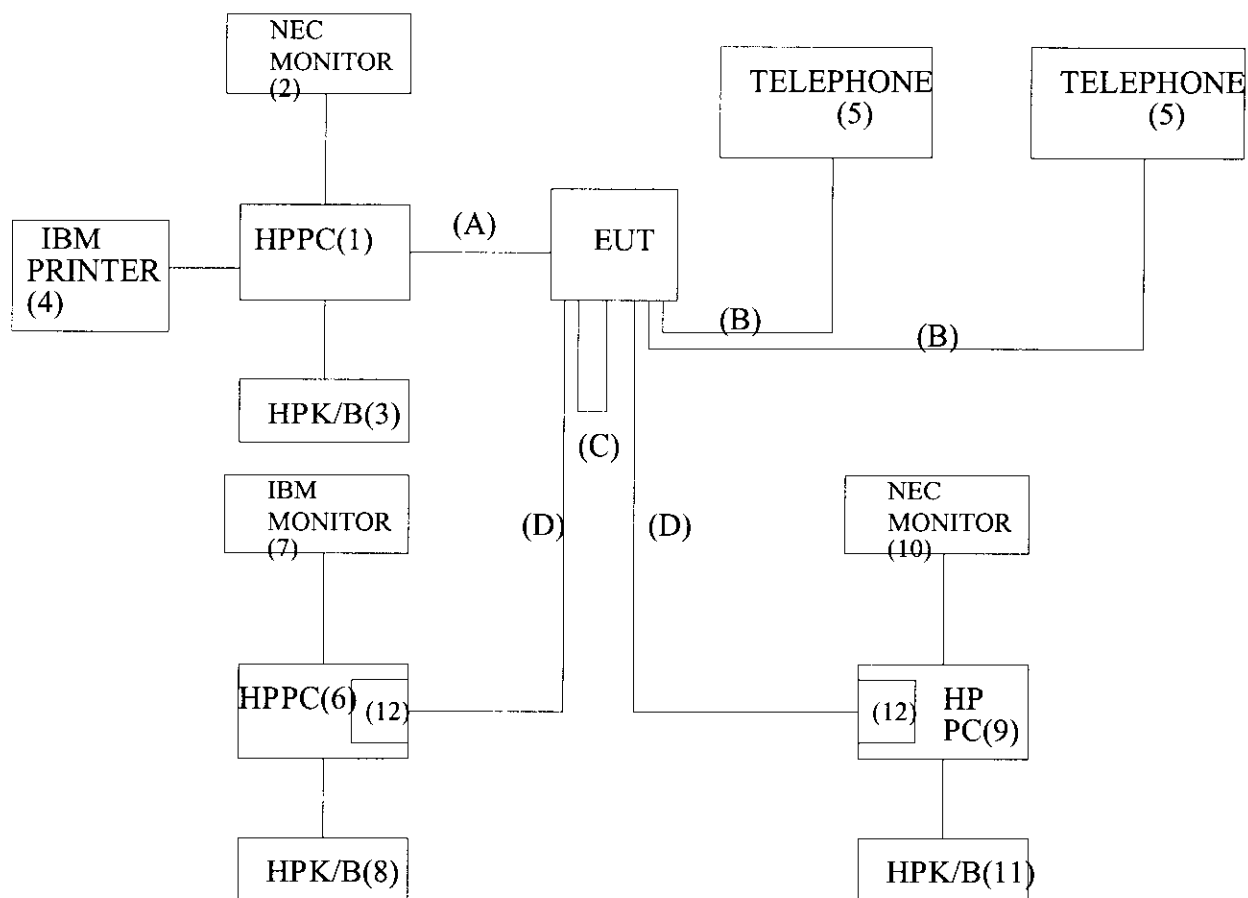
FCC ID : HEDEN1207-TX

(13) Cable

NO.	TYPE	Connector	Shielded	Length
A	D Type	RS232, metal	Yes	1.8m
B	Uncrossover twisted-pair	RJ-11, plastic	No	2m
C	Cross-over twisted-pair	RJ-45, plastic	No	2m
D	Uncross-over twisted-pair	RJ-45, plastic	No	50ft



1.3 EUT & PERIPHERALS SETUP DIAGRAM



The indicated numbers (1)(2)(A)(B)-----please refer to item 1.2.



1.4 EUT OPERATING CONDITION

1. Powered on all equipments.
2. Run software "ACCTEST.EXE" to transmit data packets for two PC's back and forth.
The rest of ports connected to cross-over wire each other to simulate real condition.
3. A D-type connector of EUT connected to HP PC(1), they would transmit data packets each other.
4. Repeated these procedure until test OK.

1.5 DESCRIPTION OF TEST SITE

SITE DESCRIPTION	: FCC certificate NO. :31040/SIT DNV certificate NO. :510-96-1016 TUV certificate NO. : I9664582-9610 Lloyd's certificate NO. :LA003 BCIQ certificate NO. :SL2-IN-E-02 NVLAP Lab code : 200118-0 CNLA certificate NO. : CNLA-ZL97018 VCCI certificate NO. : R-629, C-650
NAME OF SITE	: Electronics Research & Service Organization Industrial Technology Research Institute
SITE LOCATION	: K500, 195-4 , sec. 4, Chung Hsing Rd., Chu-Tung Chen. Hsin-Chu, Taiwan 31015 R.O.C.



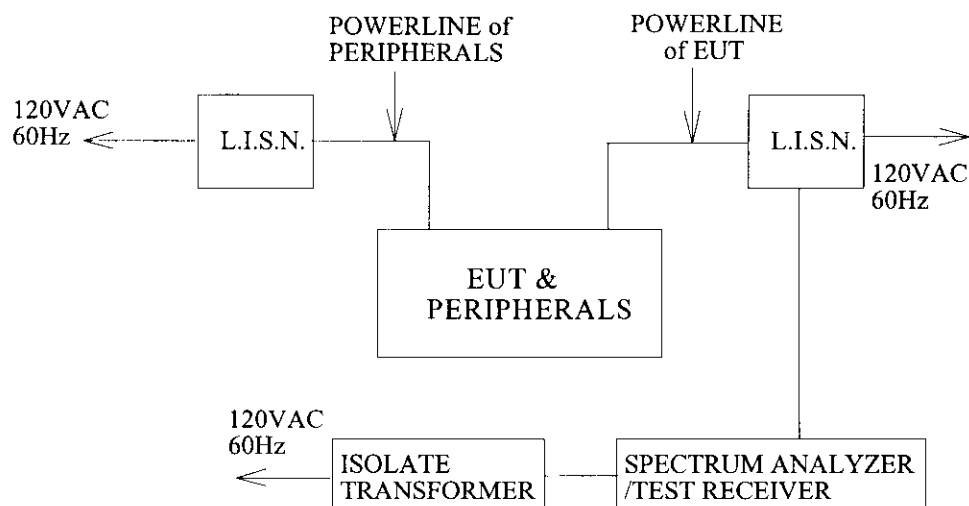
2. CONDUCTED POWERLINE TEST

2.1 TEST EQUIPMENTS

The following test equipments are used during the conducted powerline tests :

MANUFACTURER OR TYPE	MODEL No	DATE OF CALIBRATION
SPECTRUM ANALYZER & DISPLAY	HP 8568 A	MAR. 05, 1998
QUASI-PEAK ADAPTER	HP 85650 A	MAR. 05, 1998
ISOLATION TRANSFORMER	SOLAR 7032-1	N/A
L.I.S.N.	EMCO 3850/2	MAR. 25, 1997
L.I.S.N.	EMCO 3850/2	MAR. 25, 1997
TEST RECEIVER	R/S ESH3	MAR. 13, 1998
SHIELDED ROOM	KEENE 5983	N/A

2.2 TEST SETUP





2.3 CONDUCTED POWER LINE EMISSION LIMIT

FREQUENCY (MHz)	MAXIMUM RF LINE VOLTAGE (dB μ V)	
	CLASS A	CLASS B
0.45 - 1.705	60	48
1.705 - 30.0	69.5	48

2.4 TEST PROCEDURE

The test procedure is performed in a 12ft $\times$ 12ft $\times$ 8ft(L $\times$ W $\times$ H) shielded room.

the EUT along with its peripherals were placed on a 1.0m(W) $\times$ 1.5m(L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chasis ground was bounded to the horizontal ground plane of shielded room. All peripherals were connected to the second LISN and the chasis ground also bounded to the horizontal ground plane of shielded room. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

2.5 UNCERTAINTY OF CONDUCTED EMISSION

The uncertainty of conducted emission is ± 1.36 dB.



2.6 LINE CONDUCTED RF VOLTAGE MEASUREMENT

The frequency spectrum from 0.45 MHz to 30 MHz was investigated. All emissions not reported below are more than 20 dB below the prescribed limits.

All readings are Quasi-peak values.

Temperature : 26 °C

Humidity : 56 % R.H.

FREQUENCY (MHz)	READING(dB μ V)		LIMITS (dB μ V)
	ONE END & GRD'D	THE OTHER END & GRD'D	
0.450	*	*	48.0
0.604	32.91	33.41	48.0
0.686	33.12	*	48.0
5.005	32.21	33.31	48.0
6.557	41.03	*	48.0
6.627	*	39.43	48.0
11.317	37.95	*	48.0
13.267	40.06	*	48.0
13.337	*	38.46	48.0
20.056	*	48.98	48.0
20.162	45.98	*	48.0
30.00	*	*	48.0

REMARKS : * Undetectable



3. RADIATED EMISSION TEST

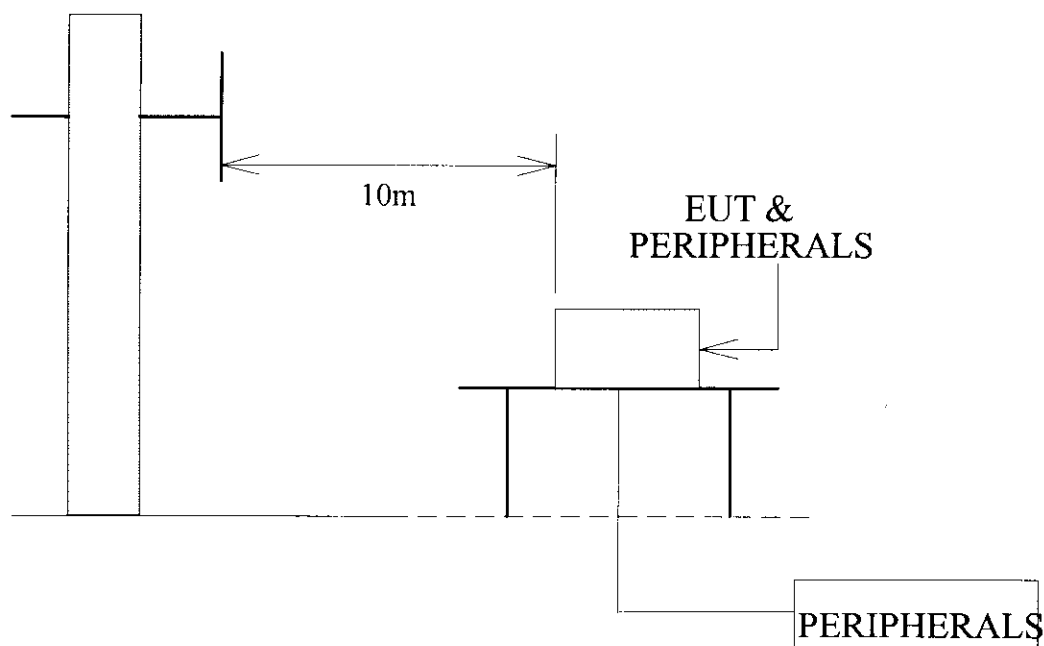
3.1 TEST EQUIPMENTS

The following test equipments are utilized in making the measurements contained in this report.

MANUFACTURER OR TYPE	MODEL NO	DATE OF CALIBRATION
CHASE ANTENNA	CBL6111A	MAY. 26, 1997
R/S TEST RECEIVER	ESMI	MAY. 22, 1997
ANECHOIC/SHIELDED ROOM	KEENE 5981	N/A

3.2 TEST SETUP

The diagram below shows the test setup which is utilized to make these measurements.



Antenna Elevation Variable



3.3 RADIATION LIMIT

All emanation from a class B computing device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified below :

FREQUENCY (MHz)	FIELD STRENGTHS(dB μ V/M)	
	CLASS A(10m)	CLASS B(3m)
30—88	39.0	40.0
88—216	43.5	43.5
216-960	46.4	46.0
960-1000	49.5	54.0

Note : (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 closest point of any part of the device or system.

3.4 TEST PROCEDURE

The devices under test were placed on a rotatable table top 0.8 meter above ground. The table was rotated 360 degrees to determine the position of the highest radiation. EUT is set 10 meters from the interference receiving antenna which is mounted on the top of a variable height mast. The antenna height is varied between one meter and four meters above ground to find the maximum value of the field strength Both horizontal polarization and vertical polarization of the antenna are set to make the measurement.

The bandwidth setting on the E.M.I. meter (R/S TEST RECEIVER ESMI) is 120 KHz.

The levels are quasi peak value readings. The frequency spectrum from 30MHz to 1000MHz was investigated.

3.5 UNCERTAINTY OF RADIATED EMISSION

The uncertainty of radiated emission is ± 2.72 dB.



3.6 RADIATED RF NOISE MEASUREMENT

The frequency spectrum from 30 MHz to 1000 MHz was investigated. All emissions not reported below are more than 20 dB below the prescribed limits.

All readings are quasi-peak values.

Temperature : 28 °C

Humidity : 75% RH

FREQ- UENCY (MHz)	ANTENNA FACTOR (dB)	CABLE LOSS (dB)	METER READING AT10m (dB μ V/M)		LIMITS (dB μ V/M)	EMISSION LEVEL AT3m (dB μ V/M)	
			HORIZON- TAL	VERTICAL		HORIZON- TAL	VERTICAL
30.00	19.71	1.20	*	*	40.00	*	*
110.00	11.17	2.10	2.24	8.68	43.50	25.50	31.94
120.00	9.13	2.20	5.32	9.80	43.50	29.35	33.83
122.88	11.92	2.26	*	5.60	43.50	*	29.78
180.00	5.72	2.70	3.92	*	43.50	25.80	*
184.75	9.13	2.72	*	2.24	43.50	*	24.09
200.00	8.95	2.80	*	9.24	43.50	*	30.99
226.11	10.77	2.96	*	2.24	46.00	*	25.96
1000.00	24.69	5.70	*	*	54.00	*	*

REMARKS : 1. *Undetectable

2. Emission level at 3m (dB μ V/M) =Antenna Factor (dB) + Cable loss (dB)
+ Meter Reading at 10m (dB μ V/M)+10(dB).

3. 10m measured data are transferred to 3m by the formula

$L2=L1(d1/d2) \mu$ V/M from CISPR 22

$20\text{Log}L2=20\text{Log}L1+20\text{Log}(d1/d2)\text{dB } \mu$ V/M

Exhibit C - Measurement Report

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