



## 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 : PSTN Router / Hub  
Model : Prestige 128MH-T  
Data Applies To : Prestige 100MH-T  
Date Received : JUL. 15, 1998  
Date Tested : JUL. 21, 1998

### MEASUREMENT PROCEDURE USED :

CISPR 22, CLASS B, 1996

FCC RULE PART 15, 1996

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	Aug. 05, 1998
Approving Manager	Paul Y. Liao/NVLAP	Paul Y. Liao	Aug. 06, 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 test, and is invalid as separately used.
3. This report is invalid without 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 US government.



---

## TABLE OF CONTENTS

TITLE	PAGE NO.
<b>1. GENERAL INFORMATION.....</b>	<b>3</b>
1.1 DESCRIPTION OF EUT .....	3
1.2 DESCRIPTION OF PERIPHERALS.....	4-5
1.3 EUT & PERIPHERALS SETUP DIAGRAM.....	6
1.4 EUT OPERATING CONDITION.....	7
1.5 DESCRIPTION OF TEST SITE .....	7
<b>2. CONDUCTED POWERLINE TEST .....</b>	<b>8</b>
2.1 TEST EQUIPMENTS .....	8
2.2 TEST SETUP.....	8
2.3 CONDUCTED POWER LINE EMISSION LIMIT.....	9
2.4 TEST PROCEDURE .....	9
2.5 UNCERTAINTY OF CONDUCTED EMISSION .....	9
2.6 LINE CONDUCTED RF VOLTAGE MEASUREMENT .....	10
2.7 PHOTOS OF CONDUCTION TEST.....	11
<b>3. RADIATED EMISSION TEST.....</b>	<b>12</b>
3.1 TEST EQUIPMENTS .....	12
3.2 TEST SETUP.....	12
3.3 RADIATION LIMIT .....	13
3.4 TEST PROCEDURE .....	13
3.5 UNCERTAINTY OF RADIATED EMISSION.....	13
3.6 RADIATED RF NOISE MEASUREMENT .....	14
3.7 PHOTOS OF OPEN SITE.....	15-16



## **1. GENERAL INFORMATION**

### **1.1 DESCRIPTION OF EUT**

MANUFACTURER : ZyXEL COMMUNICATIONS CORPORATION.

SAMPLE NAME : PSTN Router / Hub

MODEL NUMBER : Prestige 128MH-T

SERIAL NO. : -----

POWER SUPPLY : 16VAC(From Power Adaptor)



## **1.2 DESCRIPTION OF PERIPHERALS**

### **(1) PC**

MODEL NUMBER : POWERMATE 486SX/25e  
SERIAL NUMBER : -----  
MANUFACTURER : NEC CORP.  
F.C.C. ID : B7ZA72  
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 : RT101  
SERIAL NUMBER : 61030863  
MANUFACTURER : NEC CORP.  
F.C.C. ID : AQ6ZG-RT687XT  
POWER CABLE : +5VDC ( From PC )

### **(4) PRINTER**

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



**(5) WAN Router**

MODEL NUMBER : Prestige 153X  
SERIAL NUMBER : R2P00I000ZZ  
MANUFACTURER : ZyXEL Communications Corp.  
FCC ID : I88PRESTIGE153X  
POWER SOURCE : 16VAC(from Power Adapter)

**(6) PSTN HUB Router**

MODEL NUMBER : Prestige 100MH  
SERIAL NUMBER : R2P00I000ZZ  
MANUFACTURER : ZyXEL Communications Corp.  
FCC ID : I88PRESTIGE100MH  
POWER SOURCE : 16VAC(from Power Adapter)

**(7) Telephone Line Emulator**

MODEL NUMBER : TLE101-II  
SERIAL NUMBER : -----  
MANUFACTURER : ASCII Corp.  
FCC ID : -----

**(8) Cable**

NO.	TYPE	Connector	Shielded	Length
A	D Type	RS232, metal	Yes	1.5m
B	WAN cable	RJ-45, plastic	No	10m
C	LAN cable	RJ-45, plastic	No	10m
D	Line cable	RJ-11, plastic	No	10m



The diagram illustrates the Prestige 128MH-T (EUT) system configuration. The central unit, Prestige 128MH-T (EUT), is connected to various peripherals and networks. It features multiple ports including Line #2, Line #1, WAN, Ethernet #1, #2, #3, #4, ConSole, and Power. The system is powered by a 110VAC/60Hz source connected to a Telephone Line Emulator TLE101-II (7), which provides ASCII output. The EUT is also connected to a Power Adapter (120VAC/60Hz). The system includes a Prestige 153X (Terminal) (5) connected via LAN (UTP) and WAN, and a Prestige 100MH (Terminal) (6) connected via Ethernet. The EUT is also connected to a NEC PC (1) which is further connected to a NEC MONITOR (2), a NEC KEYBOARD (3), and an IBM Printer (4). The system is also connected to a Power Adapter (120VAC/60Hz) and a Power Adapter (120VAC/60Hz).

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



## 1.4 EUT OPERATING CONDITION

1. Turned on EUT's power.
2. EUT will send/receive pockets to/from Terminal via WAN cable.
3. EUT will send/receive pockets to/from Terminal via Ethernet#1 cable.
4. EUT will send/receive pockets to/from Terminal via Ethernet#2 cable.
5. EUT will send/receive pockets to/from Terminal via Ethernet#3 cable.
6. EUT will send/receive pockets to/from Terminal via Ethernet#4 cable.
7. EUT will send/receive pockets to/from Line#1 via Telephone Line Emulator.
8. EUT will send/receive pockets to/from Line#2 via Telephone Line Emulator.
9. EUT will show statistics message to PC via RS-232 cable.
10. Repeat step 2~6.

## 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-706, 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.



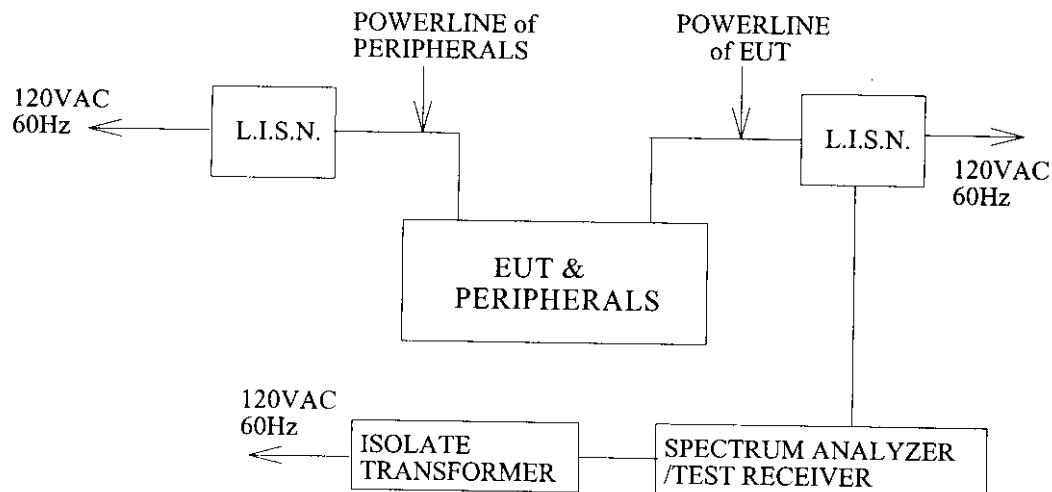
## 2. CONDUCTED POWERLINE TEST

### 2.1 TEST EQUIPMENTS

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

MANUFACTURER OR TYPE	MODEL No	SERIAL NO.	DATE OF CALIBRATION
SPECTRUM ANALYZER & DISPLAY	HP 8568A	2235A02320	MAR. 05, 1998
QUASI-PEAK ADAPTER	HP 85650 A	2341A00672	MAR. 05, 1998
ISOLATION TRANSFORMER	SOLAR 7032-1	N/A	N/A
L.I.S.N.	EMCO 3850/2	9311-1025 9401-1028	MAR. 24. 1998
TEST RECEIVER	R/S ESH3	8720791118	MAR. 13, 1998
SHIELDED ROOM	KEENE 5983	N/A	N/A

### 2.2 TEST SETUP







## 2.3 CONDUCTED POWER LINE EMISSION LIMIT

FREQUENCY (MHz)	MAXIMUM RF LINE VOLTAGE (dB $\mu$ V)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15-0.50	79	66	66-56	56-46
0.50-5.00	73	60	56	46
5.00-30.0	73	60	60	50

## 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  $\pm 1.36$ dB.



## 2.6 LINE CONDUCTED RF VOLTAGE MEASUREMENT

The frequency spectrum from 0.15 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 : 23 °C

Humidity : 56 % RH

FREQUENCY  (MHz)	READING(dB $\mu$ V)				LIMITS (dB $\mu$ V)	
	ONE END & GRD'D		THE OTHER END & GRD'D			
	Q.P.	Ave.	Q.P.	Ave.	Q.P.	Ave.
0.150	*	*	*	*	66.00	56.00
0.166	39.45	*	*	*	65.16	55.16
0.167	*	*	37.15	*	65.12	55.12
4.797	39.41	*	*	*	56.00	46.00
5.005	42.81	*	43.21	*	60.00	50.00
5.505	*	*	35.42	*	60.00	50.00
5.744	33.92	*	*	*	60.00	50.00
6.592	*	*	38.53	*	60.00	50.00
6.988	41.53	*	43.13	*	60.00	50.00
7.368	*	*	45.13	*	60.00	50.00
7.407	43.63	*	*	*	60.00	50.00
8.020	*	*	42.54	*	60.00	50.00
10.072	41.35	*	*	*	60.00	50.00
20.056	44.98	*	*	*	60.00	50.00
30.000	*	*	*	*	60.00	50.00

REMARKS : 1. \* Undetectable or the Q.P. value is lower than Ave. limit.



### 3. RADIATED EMISSION TEST

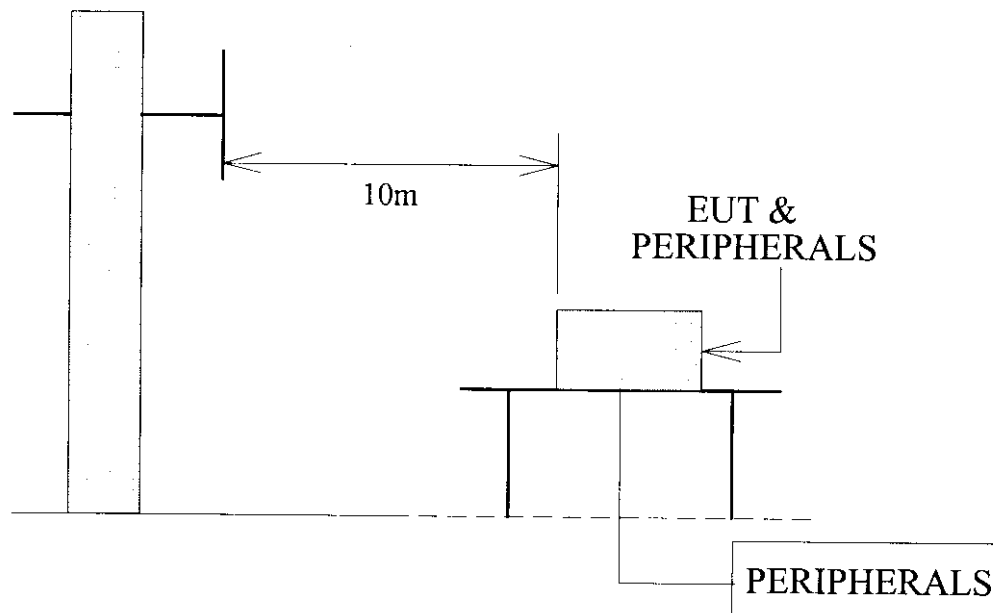
#### 3.1 TEST EQUIPMENTS

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

MANUFACTURER OR TYPE	MODEL NO	SERIAL NO	DATE OF CALIBRATION
CHASE BI-LOG ANTENNA	CBL6111A	1546	MAY.23, 1998
R/S TEST RECEIVER	ESMI	842088/005 841978/008	MAY.29, 1998
OPEN SITE	-----	No.2	AUG. 23, 1997

#### 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)	DISTANCE (METERS)	FIELD STRENGTHS(dB $\mu$ V/M)	
		CLASS A	CLASS B
30—230	10	40	30
230—1000	10	47	37

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  $\pm 2.72$ 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 : 35 °C

Humidity : 70% RH

FREQ- UENCY (MHz)	ANTENNA FACTOR (dB)	CABLE LOSS (dB)	METER READING AT10m (dB $\mu$ V/M)		LIMITS (dB $\mu$ V/M)	EMISSION LEVEL AT10m (dB $\mu$ V/M)	
			HORIZON- TAL	VERTICAL		HORIZON- TAL	VERTICAL
30.00	*	*	*	*	30.00	*	*
44.15	10.98	1.58	8.28	*	30.00	20.84	*
61.44	5.49	1.82	7.16	18.64	30.00	14.47	25.95
168.25	9.98	3.11	10.24	*	30.00	23.33	*
180.00	8.94	3.20	10.24	13.60	30.00	22.38	25.74
184.33	8.92	3.24	*	5.48	30.00	*	17.64
200.00	8.85	3.40	11.36	*	30.00	23.61	*
200.51	8.92	3.41	*	6.88	30.00	*	19.21
229.10	10.80	3.63	*	6.32	30.00	*	20.75
240.00	11.55	3.72	7.72	*	37.00	22.99	*
300.00	12.81	4.20	9.12	8.56	37.00	26.13	25.57
1000.00	*	*	*	*	37.00	*	*

REMARKS : 1. \* Undetectable

2. Emission level (dB  $\mu$  V/M) = Antenna Factor (dB) + Cable loss (dB)  
+ Meter Reading (dB  $\mu$  V/M).