Nemko Korea CO., Ltd.

300-2, Osan-Ri, Mohyun-Myun, Yongin-City, Kyungki-Do, KOREA
TEL:+82 31 322 2333 FAX:+82 31 322 2332

FCC EVALUATION REPORT FOR CERTIFICATION

Manufacturer:

XENON Telecommunications Co., Ltd.
Kayang Techno Town 203, Kayang-3Dong,
1487, Kangsea-Ku, Seoul, Korea
Attn : Mr. J. G. Jung

Dates of Issue : May 22, 2001
Test Report No. : NK2BE231
Test Site : Nemko Korea Co., Ltd.
EMC site, Korea

FCC ID	***PNAXEN-1510P***
Brand Name	***DIGILUX***
CONTACT PERSON	**XENON Telecommunications Co., Ltd.** **Kayang Techno Town 203, Kayang-3Dong, 1487,** **Kangsea-Ku, Seoul, Korea** **Mr. J. G. Jung** **Telephone No. : +82 2 3665 9551**

FCC Rule Part(s): Part 15 & 2
Classification : FCC Class B Device
EUT Type: TFT LCD Monitor

The device bearing the trade name and model specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-1992.

I attest to the accuracy of data and all measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Tested By : C. S. Choi
Engineer

Reviewed By : H.H. Kim
Manager & Chief Engineer

TABLE OF CONTENTS

SCOPE

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission under FCC part 15 verification.

Responsible Party* :	XENON Telecommunications Co., Ltd.
Contact Person :	Mr. J. G. Jung
	Tel No.: +82 2 3665 9551
Manufacturer :	XENON Telecommunications Co., Ltd.
	Kayang Techno Town 203, Kayang-3Dong, 1487,
	Kangsea-Ku, Seoul, Korea
	Tel No.: +82 2 3665 9551

- FCC ID: PNAXEN-1510P
- Model: XEN-1510P
- *)Alternate Model: XEN-1510SP, SYS-1510P, LCD-1510P
  **) Same except for front design*
- Brand Name: DIGILUX, SYS, DAYTEK
- EUT Type: TFT LCD Monitor
- Adapter: Input: 100 - 240V AC 50/60Hz, 1.2A
  Output: 12.0V DC, 3.5A

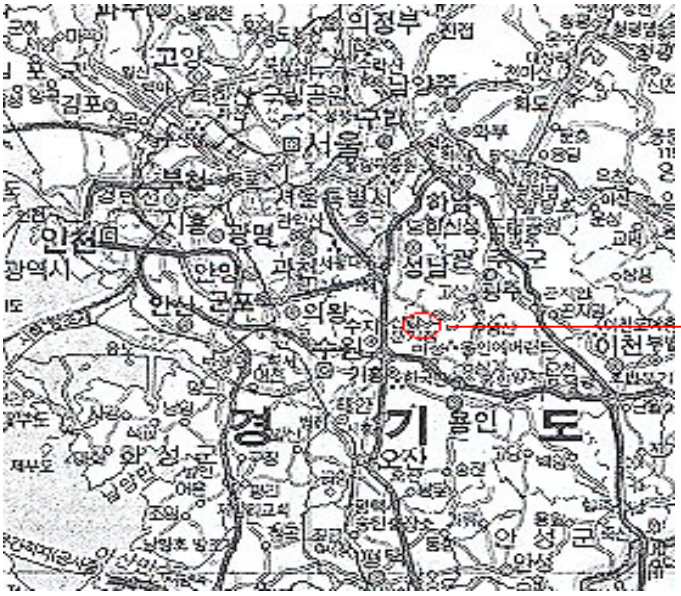
- Classification: FCC Class B
- Rule Part(s): FCC Part 15 & Part 2
- Test Procedure(s): ANSI C63.4 (1992)
- Dates of Test: May 21, 2001
- Place of Tests: Nemko Korea Co., Ltd. EMC Site
- Test Report No.: NK2BE231

** NOTE: Please refer to the duties and responsibilities of the Responsible Party attached.*

INTRODUCTION

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-1992) was used in determining radiated and conducted emissions emanating from **XENON Telecommunications Co., Ltd.**
FCC ID : **PNAXEN-1510P, TFT LCD Monitor.**

These measurement tests were conducted at ***Nemko Korea Co., Ltd. EMC Laboratory*** .
The site address is 300-2, Osan-Ri, Mohyun-Myun, Yongin-City, Kyungki-Do, KOREA
The area of Nemko Korea Corporation LTD. EMC Test Site is located in a mountain area at 50 kilometers (30 miles) southeast and Seoul International Airport (Kimpo Airport), 30 kilometers (18miles) south-southeast from central Seoul.
It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quiet and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures.
The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4 on October 19, 1992.



Nemko Korea Co., Ltd.
OPEN AREA TEST SITE
300-2, Osan-Ri, Mohyun-Myun, Yongin-City Kyungki-Do,KOREA 449-852
Tel)+82-31-322-2333
Fax)+82-31-322-2332

Fig. 1. The map above shows the Seoul in Korea vicinity area.
The map also shows Nemko Korea Corporation Ltd. EMC Lab and Kimpo Airport.

TEST CONDITIONS & EUT INFORMATION

Operating During Test

The EUT was connected to PC and the monitor was displayed “H” pattern on the screen. And the EUT was set to video resolution 1024*768(worst case), vertical refresh rate 75Hz.

Support Equipment

Adapter	ILAN Electronics, Model: F1650K 1.8m unshielded AC power cable 1.2m shielded DC power cable	S/N: N/A
PC	Maxdata, Model: PCMD/63113 1.8m unshielded AC power cable	S/N: 30073880044
Monitor	XENON, FCC ID: PNAXEN-1510P 1.8m unshielded AC power cord 1.2m shielded D-sub cable	S/N: N/A
Keyboard	Samsung, Model: SDM4500P 1.8m shield Din cable	S/N: N/A
PS/2 Mouse	A4 Tech, Model: OK-720 1.5m shield Din cable	S/N: N/A
Printer	HP, Model No: C4562K 1.8m unshielded AC power cord 1.2m Shield D-sub cable	S/N: SG74T1C206

EUT Information

Clock	14.31818MHz(Y1), 12MHz(X1)
Chipset(s)	0035A018(U5), AD9884A(U10)
LCD Panel	LM151X2(C2TH) / LG.Philips LCD
Horizontal Frequency	31 – 60 kHz
Vertical Frequency	56 – 75 Hz
Port(s)	USB, VGA

DESCRIPTION OF TESTS

Conducted Emissions

The Line conducted emission test facility is located inside a 4 X 7 X 2.5 meter shielded enclosure.
It is manufactured by EM engineering. The shielding effectiveness of the shielded room is in accordance with MIL-STD-285 or NSA 65-6.
A 1mX 1.5M wooden table 0.8m height is placed 0.4m away from the vertical wall and 1.5m away from the side of wall of the shielded room
Rohde & Schwarz LISN and PMM LISN L3-32 50ohm/50uH line impedance stabilization network are bonded to the shielded room.
The EUT is powered from the Rohde & Schwarz LISN and the support equipment is powered from the PMM LISN. Power to the LISN s are filtered by high-current high insertion loss Power line filters. The purpose of filter is to attenuate ambient signal interference and this filter is also bonded to shielded enclosure. All electrical cables are shielded by tinned copper zipper tubing with inner diameter of 1/2".
If DC power device, power will be derived from the source power supply it normally will be powered from and this supply lines will be connected to the LISNs,
All interconnecting cables more than 1 meter were shortened by non inductive bundling (serpentine fashion) to a 1 meter length.
Sufficient time for EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer to determine the frequency producing the maximum EME from the EUT.
The spectrum was scanned from 450KHz to 30MHz with 20msec sweep time.
The frequency producing the maximum level was re-examined using the EMI test receiver. (Rohde & Schwarz ESCS30).
The detector function was set to CISPR quasi-peak mode.
The bandwidth of receiver was set to 9KHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission.
Each emission was maximized by; switching power lines; varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and of support equipment, and powering the monitor from the floor mounted outlet box and computer aux AC outlet, if applicable; which ever determined the worst case emission.
Each EME reported was calibrated using the R&S signal generator.

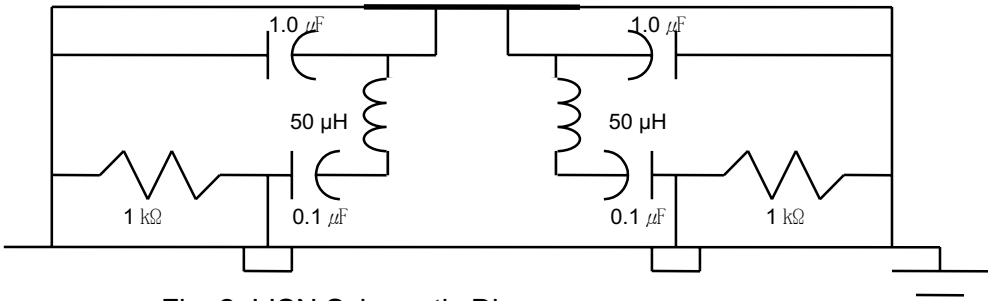


Fig. 2. LISN Schematic Diagram

DESCRIPTION OF TESTS

Radiated Emissions

Preliminary measurement were made indoors at 1 meter using broad band antennas, broadband amplifier, and spectrum analyzer to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The Technology configuration, clock speed, mode of operation or video resolution, turntable azimuth with respect to the antenna was note for each frequency found.
The spectrum was scanned from 30 to 1000MHz using Biconical log Antenna(ARA, LPB-2520/A). Above 1GHz, log periodic antenna (Rohde Schwarz HL025:upto 18GHz) was used.
Final Measurements were made outdoors at 3 or 10m test range using Logbicon Super Antenna(Schwarzbeck, VULB9166) or log periodic antenna.(Rohde Schwarz HL025)
The test equipment was placed on a wooden table.
Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.
Each frequency found during pre-scan measurements was reexamined and investigated using EMI test receiver.(ESCS30)
The detector function was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 120KHz or 1MHz depending on the frequency or type of signal.
The half wave dipole antenna was tuned to the frequency found during preliminary radiated measurements.
The EUT support equipment and interconnecting cables were re configured to the setup producing the maximum emission for the frequency and were placed on top of a 0.8m high non- metallic 1.0X 1.5 meter table.
The EUT, support equipment and interconnecting cables were re-arranged and manipulated to maximize each EME emission.
The turn table containing the Technology was rotated; the antenna height was varied 1 to 4meter and stopped at the azimuth or height producing the maximum emission Each emission was maximized by : switching power lines; varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and of support equipment, and powering the monitor from the floor mounted outlet box and computer aux AC outlet, if applicable; which ever determined the worst case emission.
Each EME reported was calibrated using the R/S signal generator.

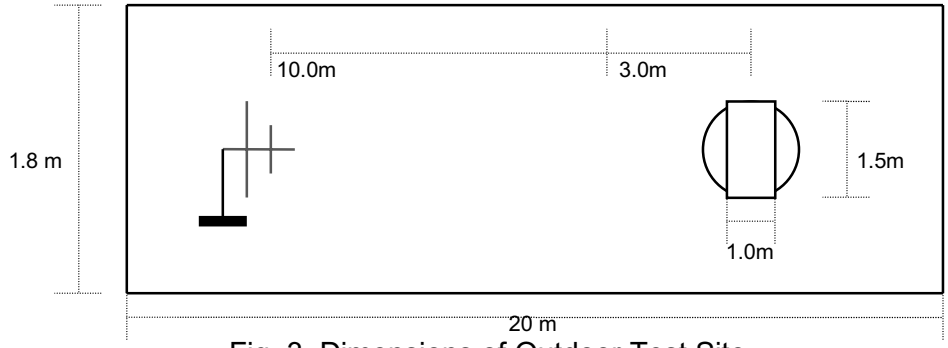


Fig. 3. Dimensions of Outdoor Test Site

TEST DATA

Conducted Emissions

FCC ID : PNAXEN-1510P
Test Mode : Display "H" pattern on the screen
(video resolution 1024*768, vertical refresh rate 75Hz)

FREQ (MHz)	LEVEL(dBμV)	LINE	LIMIT(μV)	(μV)	MARGIN*(dB)
0.46	43.8	N	250	154.88	4.2
0.77	43.3	N	250	146.22	4.7
1.93	40.4	N	250	104.71	7.6
3.55	40.1	L	250	101.16	7.9
4.33	39.8	L	250	97.72	8.2
6.46	34.6	L	250	53.70	13.4

Table 1. Line Conducted Emissions Tabulated Data

NOTES:
1. Measurements using CISPR quasi-peak mode
2. All modes of operation were investigated and the worst -case emission are reported. See attached Plots.
3.The limit for Class B device is 250 μV from 450 kHz to 30MHz.
4.Line H = Hot Line N = Neutral

Tested by **C. S. Choi**

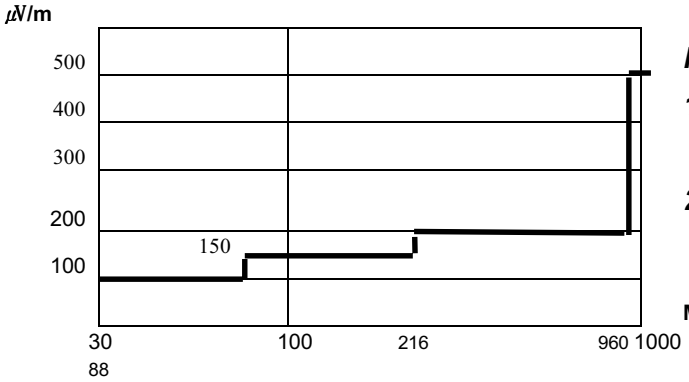
TEST DATA

Radiated Emissions

FCC ID : PNAXEN-1510P
Test Mode : Display "H" pattern on the screen
(video resolution 1024*768, vertical refresh rate 75Hz)

Frequency (MHz)	Reading (dBμN)	Pol* (H/V)	AF+CL+Amp (dB)**	Result (dBμN/m)	Limit (dBμN/m)	Margin (dB)
159.90	49.8	V	-12.8	37.0	43.5	6.5
171.83	50.1	V	-13.1	37.0	43.5	6.5
174.23	50.6	V	-13.1	37.5	43.5	6.0
338.90	41.8	V	-10.3	31.5	46.0	14.5
353.22	49.4	V	-9.9	39.5	46.0	6.5

Table 2. Radiated Measurements at 3meters



NOTES:

1. All modes of operation were investigated the worst-case emission are reported.

2. The radiated limits are shown on Figure 4. Above 1GHz the limit is 500 μV/m.

Fig. 6. Limits at 3 meters

NOTES:

1. *Pol. H =Horizontal V=Vertical

2. **AF+CL+Amp. = Antenna Factor + Cable Loss + Amplifier.

3. Measurements using CISPR quasi-peak mode. Above 1GHz, peak detector function mode is used using a resolution bandwidth of 1MHz and a video bandwidth of 1MHz. The peak level complies with the average limit. Peak mode is used with linearly polarized horn antenna and low-loss microwave cable.

Tested by ***C. S. Choi***

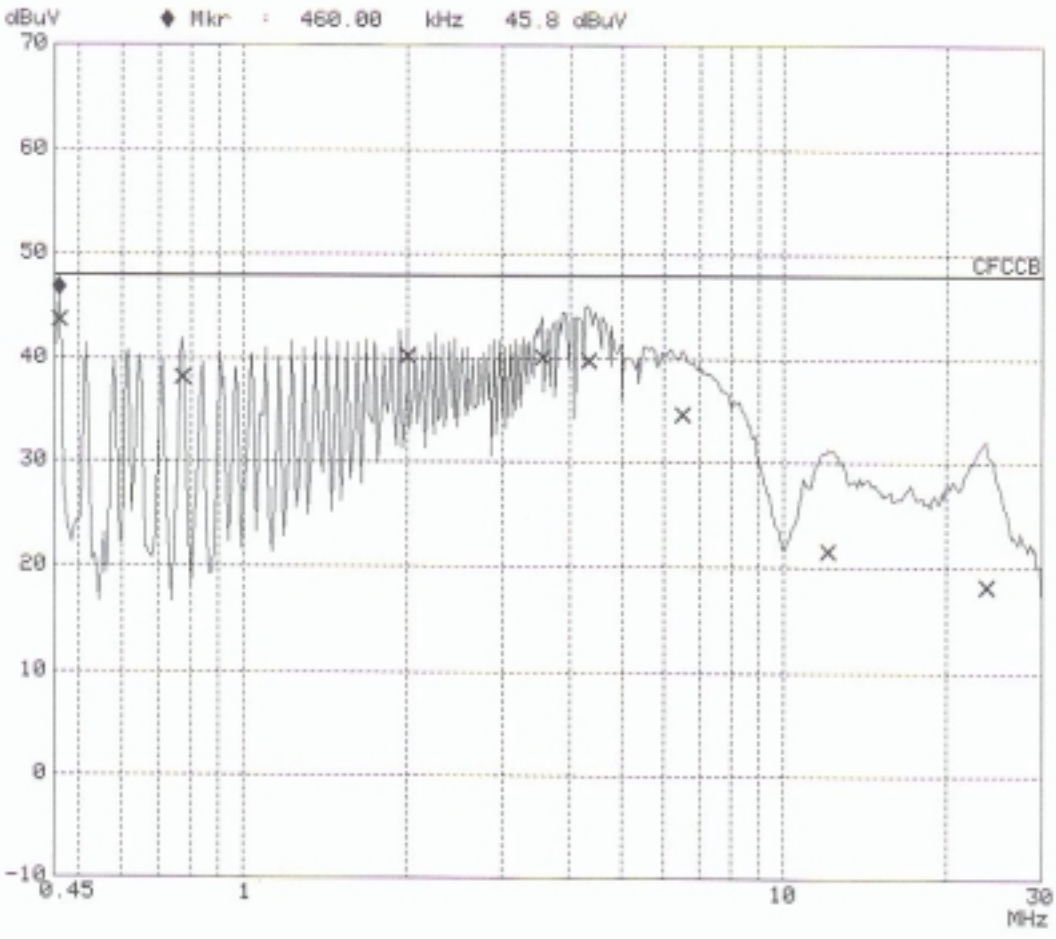
PLOTS OF EMISSIONS

- ***Conducted Emission at the Mains port(Line)***

```
Scan Settings (1 Range)
|--------- Frequencies ----------||--------- Receiver Settings ---------|
   Start       Stop        Step      IF BW  Detector  M-Time  Atten Preamp
 450k         30M          5k         9k       PK      20ms  10dBLN   OFF

Transducer No. Start      Stop       Name
             5   150k      30M       NLOSS

Final Measurement: x QP
                   Meas Time:    1 s
                   Subranges:    8
                   Acc Margin:  50dB
```



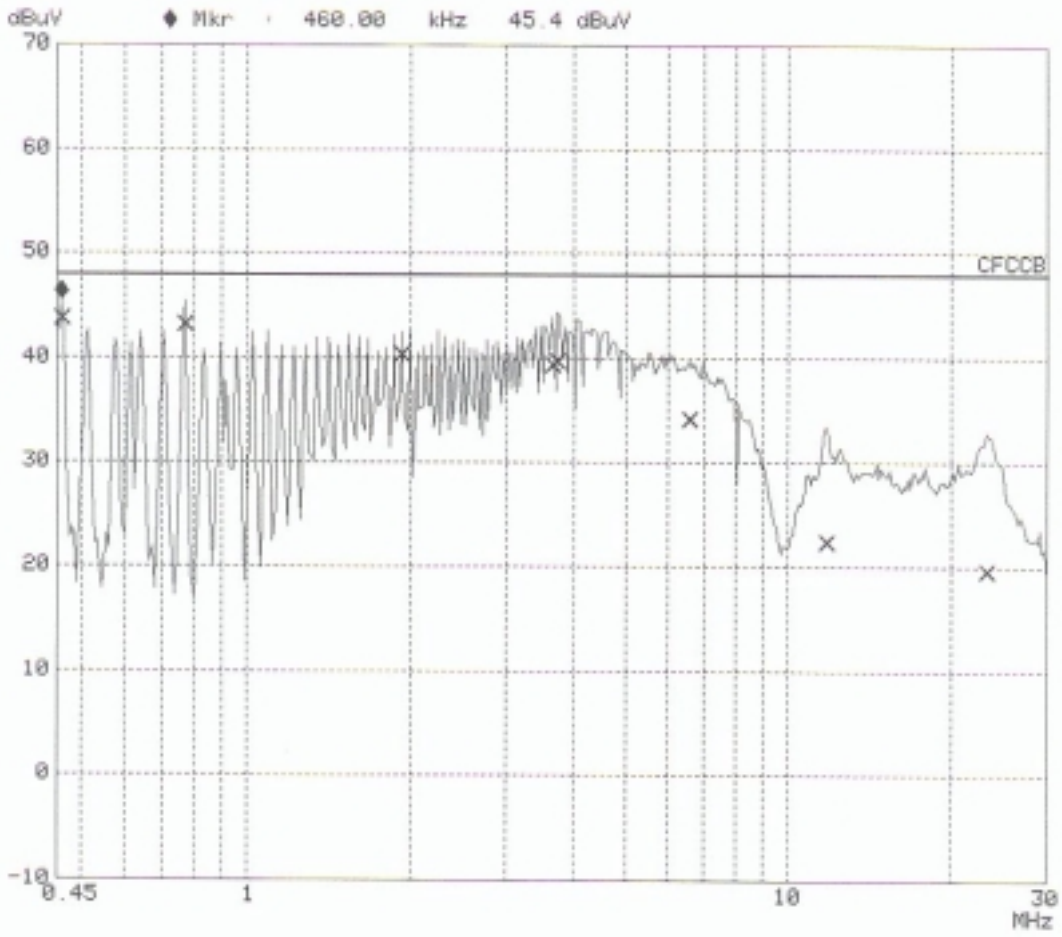
PLOTS OF EMISSIONS

- ***Conducted Emission at the Mains port(Neutral)***

```
Scan Settings (1 Range)
|--------- Frequencies ----------||--------- Receiver Settings ---------|
   Start       Stop        Step      IP BW  Detector  M-Time  Atten Preamp
 450k         30M          5k          9k       PK      20ms  10dBLN   OFF

Transducer No. Start      Stop      Name
             5   150k      30M      NLOSS

Final Measurement: x QP
                   Meas Time:     1 s
                   Subranges:     8
                   Acc Margin:  50dB
```



SAMPLE CALCULATIONS

$$\text{dB}\,\mu V = 20 \log_{10}(\mu V/\text{m})$$

$$\mu V = 10^{(\text{dB}\,\mu V/20)}$$

EX. 1.

@20.3 MHz Class B limit = 250 μV = 48.0 dB μV

Reading = 40.8 dB μV (calibrated level)
$10^{(40.8/20)}$ = 109.64 μV
Margin = 48.0 - 40.8 = 7.2
7.2 dB below limit

EX. 2.

@57.7 MHz Class B limit = 100 μV/m = 40.0 dB μV/m

Reading = 19.1 dB μV(calibrated level)
Antenna factor + Cable Loss = 10.12 dB
Total = 29.22 dB μV/m
Margin = 40.0 - 29.22 = 10.78
10.78 dB below the limit

ACCURACY OF MEASUREMENT

The Measurement Uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 with the confidence level of 95%

1. Radiation Uncertainty Calculation

Contribution	*Probability Distribution*	*Uncertainty(+/-dB)*
Antenna Factor	Normal (k=2)	± 0.5
Cable Loss	Normal (k=2)	± 0.04
Receiver Specification	Rectangular	± 2.0
Antenna directivity	Rectangular	± 1.0
Antenna Factor variation with Height		
Antenna Phase Center Variation		
Antenna Factor Frequency Interpolation		
Measurement Distance Variation		
Site Inperfections	Rectangular	± 2.0
Mismatch:Receiver VRC ri=0.3 Antenna VRC rR=0.1(Bi)0.4(Lp) Uncertainty Limits 20Log(1+/-ri rR)	U-Shaped	+ 0.25 / - 0.26
System Repeatibilty	Std.deviation	± 0.05
Repeatability of EUT	-	-
Combined Standard Uncertainty	Normal	± 1.77
Expended Uncertainty U	Normal (k=2)	± 3.5

2. Conducted Uncertainty Calculation

Contribution	*Probability Distribution*	*Uncertainty(+/-dB)*
Receiver Specification	Normal (k=2)	± 2.0
LISN coupling spec.	Normal (k=2)	± 0.4
Cable and input attenuator cal.	Rectangular	± 0.4
Mismatch:Receiver VRC ri=0.3 LISN vrc rg=0.1 Uncertainty Limits 20Log(1+/-ri rR)	U-Shaped	± 0.26
System Repeatibilty	Std.deviation	± 0.68
Repeatability of EUT	-	-
Combined Standard Uncertainty	Normal	± 1.18
Expended Uncertainty U	Normal (k=2)	± 2.4

TEST EQUIPMENT

No.	Instrument	Manufacturer	Model	Calibration Date
1	*Test Receiver	R & S	ESCS 30	2001.01
2	Test Receiver	PMM	PMM9000	2001.04
3	*Amplifier	HP	8447F	2000.08
4	*Amplifier	HP	8447F	2000.08
5	Spectrum Analyzer	Advantest	R4136	2000.12
6	*Logbicon Super Antenna	Schwarzbeck	VULB9166	2001.01
7	Log-Periodic Antenna	R & S	HL025	2001.01
8	Dipole Antenna	R & S	VHA9103	2001.01
9	Dipole Antenna	R & S	UHA9105	2001.01
10	Biconical Antenna	Schwarzbeck	VHA9103	2001.01
11	Biconical Log Antenna	ARA	LPB-2520/A	2001.01
12	Asorbing Clamp	R & S	MDS21	2001.01
13	High Voltage Probe	R & S	ESH2-Z3	2001.02
14	Signal Generater	R & S	SMP02	2001.01
15	Matching Pad	R & S	RAM358.5414.02	2000.05
16	LISN	R & S	ESH3-Z5	2001.02
17	LISN	PMM	L3-9103	2001.04
18	*Position Controller	EM Eng.	N/A	N/A
19	*Turn Table	EM Eng.	N/A	N/A
20	*Antenna Mast	EM Eng.	N/A	N/A
21	*Anechoic Chamber	EM Eng.	N/A	N/A
22	*Shielded Room	EM Eng.	N/A	N/A

***) Test equipment used during the test**

RECOMMENDATION/CONCLUSION

The data collected shows that the **XENON Telecommunications Co., Ltd.** FCC ID : **PNAXEN-1510P, TFT LCD Monitor.** complies with § 15.107 ,15.109 of the FCC Rules.

The highest emission observed was at **0.46 MHz** for conducted emissions with a margin of **4.2 dB,** at **174.23 MHz** for radiated emissions with a margin of **6.0 dB.**

APPENDIX A – SAMPLE LABEL

Labelling Requirements

The sample label shown shall be *permanently affixed* at a conspicuous location on the device and be readily visible to the user at the time of purchase.

FCC ID: PNAXEN-1510P
Trade Name: DIGILUX
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

- **FCC ID Location of EUT**

APPENDIX B – CIRCUIT DIAGRAM

APPENDIX E – USER'S MANUAL

APPENDIX F – Schematic Diagrams