# Test Report

Product Name : Secure Outdoor Ethernet Radio Link

Model No.: ExpWave 240B, GateOne 240B

FCC ID.: R3N-GATEONE240B

Applicant : ZyGATE Communications Inc.

Address : 2F No. 48, Lung-Chin Road Lung-Tan, Taoyuan, Taiwan, R.O.C.

Date of Receipt : Apr. 21, 2004

Date of Test : Apr. 29, 2004

Report No. : 044H050FI

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.
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# Test Report Certification

Test Date : Apr. 29, 2004
Report No. : 044H050FI

QuieTek Corporation
**Accredited by NIST (NVLAP)**
NVLAP Lab Code: 200347-0

| | | |
|---|---|---|
| Product Name | : | Secure Outdoor Ethernet Radio Link |
| Applicant | : | ZyGATE Communications Inc. |
| Address | : | 2F No. 48, Lung-Chin Road Lung-Tan, Taoyuan, Taiwan, R.O.C. |
| Manufacturer | : | ZyGATE Communications Inc. |
| Model No. | : | ExpWave 240B, GateOne 240B |
| FCC ID. | : | R3N-GATEONE240B |
| Rated Voltage | : | AC 120V/60Hz |
| Trade Name | : | ZyXEL, ZyGATE |
| Measurement Standard | : | FCC CFR Title 47 Part 15 Subpart C: 2003 |
| Measurement Procedure | : | ANSI C63.4: 2001 |
| Test Result | : | Complied |

NVLAP
NVLAP Lab Code : 200347-0

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Attachment 1: EUT Test Photographs
Attachment 2: EUT Detailed Photographs

# 1. GENERAL INFORMATION

## 1.1. EUT Description

| | | |
|---|---|---|
| Product Name | : | Secure Outdoor Ethernet Radio Link |
| Trade Name | : | ZyXEL, ZyGATE |
| FCC ID. | : | R3N-GATEONE240B |
| Model No. | : | ExpWave 240B, GateOne 240B |
| Frequency Range | : | 2412MHz to 2462MHz |
| Channel Number | : | 11 |
| Type of Modulation | : | Direct Sequence Spread Spectrum |
| Antenna Type | : | Connector (N TYPE male) |
| Data Speed | : | 1 Mbps, 2 Mbps, 5.5 Mbps, 11 Mbps |
| Antenna Gain | : | 8, 12, 16dBi |
| Channel Control | : | Auto |
| Network / Power Injector | : | ZyXEL, NPI-01, 1 Set |
| Omni Antenna (Option)(Mode 1) | : | Procell, OA-02, 8 dBi |
| Flat panel Antenna (Option)(Mode 2) | : | ZyXEL, FP-16, 16 dBi |
| Flat panel Antenna (Option) | : | ZyXEL, FP-12, 12 dBi |
| POE Cable | : | Shielded, 20m |
| RF Cable (Mode 2) | : | Shielded, 2.0m |
| Cat-5 Cable | : | Shielded, 2.0m |
| Grounding Wire | : | Non-shielded, 3.0m |
| Power Adapter | : | DVE, DSA-0151F-09A<br>Cable Out: Shielded, 1.8m |

Frequency of Each Channel:

| Channel | Frequency | Channel | Frequency | Channel | Frequency |
|---|---|---|---|---|---|
| Channel 1: | 2412 MHz | Channel 5: | 2432 MHz | Channel 9: | 2452 MHz |
| Channel 2: | 2417 MHz | Channel 6: | 2437 MHz | Channel 10: | 2457 MHz |
| Channel 3: | 2422 MHz | Channel 7: | 2442 MHz | Channel 11: | 2462 MHz |
| Channel 4: | 2427 MHz | Channel 8: | 2447 MHz | | |

Note:

1. This device is a 2.4GHz Secure Outdoor Ethernet Radio Link included a 2.4GHz receiving function, a 2.4GHz transmitting function.
2. The variation of model number is for different strategy of marketing. The circuit of each model is identical.
3. Regards to the frequency band operation; the highest rate that was included the lowest、middle and highest frequency of channel were selected to perform the test, then shown on this report.
4. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
5. This device is a composite device in accordance with Part 15 regulations. The function receiving was measured and made a test report that the report number is 044H050F under Declaration of Conformity.

   EMI Mode: Mode 1: Secure Outdoor Etherent Radio Link W/Procell Antenna
   Mode 2: Secure Outdoor Etherent Radio Link W/ZyXEL Antenna

## 1.2. Operational Description

EUT is an Secure Outdoor Ethernet Radio Link with 11 channels. This device provided four kind of transmitting speed 1,2,5.5 and 11Mbps. The device of RF carrier is DQPSK, DB PSK and CCK.

The device adapts direct sequence spread spectrum modulation. The Connector antenna was provides diversity function to improve the receiving function.

This Secure Outdoor Ethernet Radio Link is an IEEE 802.11b Wireless LAN adapter. It allows your computer to connect to a wireless network and to share resources, such as files or printers without being bound to the network wires. Operation in 2.4GHz Direst Sequence Spread Spectrum (DSSS) radio transmission, the Secure Outdoor Ethernet Radio Link transfers data at speeds up to 64/128-bit Wired Equivalent Protection (WEP) algorithm is used. In addition, its standard compliance ensures that it can communicate with any 802.11b network.

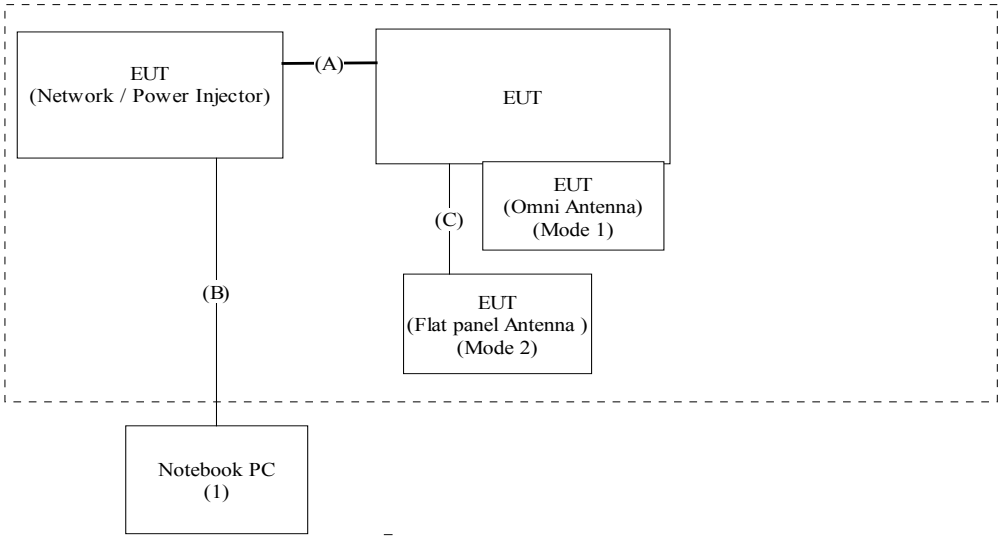
## 1.3. Tested System Datails

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

| Product | | Manufacturer | Model No. | Serial No. | FCC ID | Power Cord |
|---|---|---|---|---|---|---|
| (1) | Notebook PC | IBM | Think Pad 570 | 27L8835 | DoC | Non-shielded, 1.8m, a ferrite core bonded |

| Signal Cable Type | | Signal cable Description |
|---|---|---|
| A. | POE Cable | Shielded, 20m |
| B. | LAN Cable | Non-shielded, 5m |
| C. | RF Cable (Mode 2) | Shielded, 2m |

## 1.4. Configuration of tested System




## 1.5. EUT Exercise Software

(1) Setup the EUT and simulators as shown on 1.4

(2) Turn on the power of all equipment.

(3) Notebook PC reads data from disk.

(4) Data will be transmitting through EUT.

(5) The transmitted status will be shown on the monitor.

(6) Repeat the above procedure 1.5.3 to 1.5.5

## 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: June 22, 2001 File on
Federal Communications Commission
FCC Engineering Laboratory
7435 Oakland Mills Road
Columbia, MD 21046
Reference 31040/SIT1300F2

July 03, 2001 Accreditation on NVLAP
NVLAP Lab Code: 200533-0

0914
ILAC MRA

Site Name: Quietek Corporation

Site Address: No. 5-22, Ruei-Shu Valley, Ruei-Ping Tsuen,
Lin-Kou Shiang, Taipei,
Taiwan, R.O.C.
TEL: 886-2-8601-3788 / FAX : 886-2-8601-3789
E-Mail : service@quietek.com

NVLAP Lab Code: 200533-0

# 2. Conducted Emission

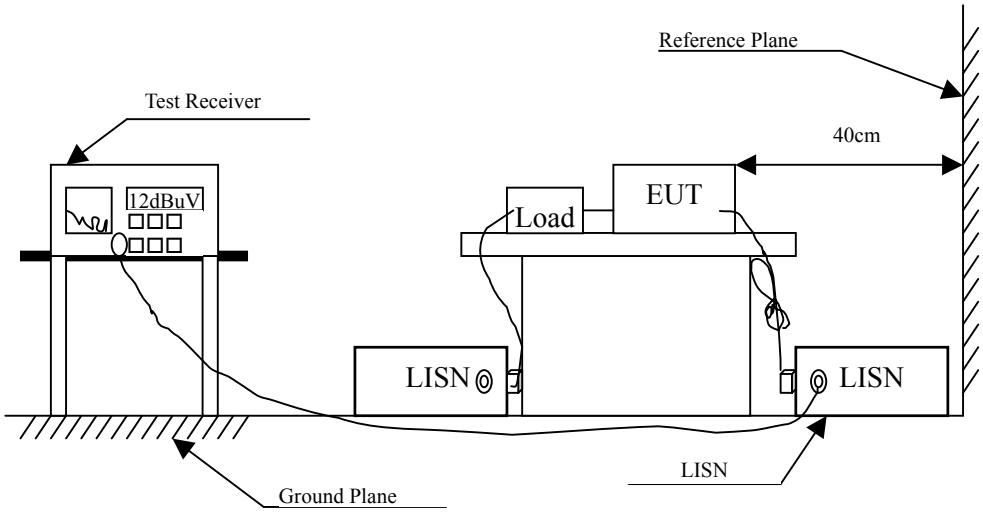
## 2.1. Test Equipment

The following test equipment are used during the test:

| Item | Equipment | Manufacturer | Model No. / Serial No. | Last Cal. | Remark |
|---|---|---|---|---|---|
| 1 | Test Receiver | R & S | ESCS 30 / 825442/018 | Sep., 2003 | |
| 2 | Artificial Mains Network | R & S | ENV4200 / 848411/10 | Feb., 2004 | Peripherals |
| 3 | LISN | R & S | ESH3-Z5 / 825562/002 | Feb., 2004 | EUT |
| 4 | Pulse Limiter | R & S | ESH3-Z2 / 357.8810.52 | Feb., 2004 | |
| 5 | No.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

| FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit | | |
|---|---|---|
| Frequency MHz | Limits | |
| | QP | AV |
| 0.15 - 0.50 | 66-56 | 56-46 |
| 0.50-5.0 | 56 | 46 |
| 5.0 - 30 | 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 refer 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: 2001 on conducted measurement.

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

## 2.5. Test Result of Conducted Emission

Product : Secure Outdoor Ethernet Radio Link
Test Item : Conducted Emission
Power Line : Line 1
Test Mode : Mode 1: Secure Outdoor Etherent Radio Link W/Procell Antenna (Channel 1)

| | Frequency MHz | Cable Loss dB | Probe Factor dB | Reading Level dBuV | Emission Level dBuV | Limits dBuV |
|---|---|---|---|---|---|---|
| **Quasi-Peak** | | | | | | |
| | 0.220 | 0.10 | 0.14 | 35.52 | 35.76 | 62.81 |
| | 0.439 | 0.10 | 0.20 | 32.86 | 33.16 | 57.08 |
| | 0.646 | 0.11 | 0.24 | 34.74 | 35.08 | 56.00 |
| * | 2.400 | 0.13 | 0.36 | 37.09 | 37.58 | 56.00 |
| | 8.716 | 0.21 | 0.48 | 25.86 | 26.56 | 60.00 |
| | 28.685 | 0.48 | 0.60 | 31.81 | 32.89 | 60.00 |
| **Average** | | | | | | |
| | 0.220 | 0.10 | 0.14 | 29.00 | 29.24 | 52.82 |
| | 0.439 | 0.10 | 0.20 | 23.80 | 24.10 | 47.08 |
| | 0.646 | 0.11 | 0.24 | 23.20 | 23.54 | 46.00 |
| | 2.400 | 0.13 | 0.36 | 23.10 | 23.59 | 46.00 |
| | 8.716 | 0.21 | 0.48 | 20.90 | 21.60 | 50.00 |
| * | 28.685 | 0.48 | 0.60 | 28.90 | 29.98 | 50.00 |

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

Product : Secure Outdoor Ethernet Radio Link
Test Item : Conducted Emission
Power Line : Line 2
Test Mode : Mode 1: Secure Outdoor Etherent Radio Link W/Procell Antenna (Channel 1)

| | Frequency MHz | Cable Loss dB | Probe Factor dB | Reading Level dBuV | Emission Level dBuV | Limits dBuV |
|---|---|---|---|---|---|---|
| **Quasi-Peak** | | | | | | |
| | 0.217 | 0.10 | 0.14 | 31.60 | 31.84 | 62.93 |
| | 0.334 | 0.10 | 0.18 | 32.20 | 32.48 | 59.36 |
| | 0.853 | 0.11 | 0.26 | 31.00 | 31.37 | 56.00 |
| * | 2.369 | 0.13 | 0.36 | 34.86 | 35.35 | 56.00 |
| | 4.779 | 0.16 | 0.43 | 28.93 | 29.52 | 56.00 |
| | 28.685 | 0.48 | 0.60 | 31.47 | 32.55 | 60.00 |
| **Average** | | | | | | |
| | 0.217 | 0.10 | 0.14 | 23.40 | 23.64 | 52.93 |
| | 0.334 | 0.10 | 0.18 | 22.20 | 22.48 | 49.35 |
| | 0.853 | 0.11 | 0.26 | 16.80 | 17.17 | 46.00 |
| | 2.369 | 0.13 | 0.36 | 20.50 | 20.99 | 46.00 |
| | 4.779 | 0.16 | 0.43 | 21.90 | 22.49 | 46.00 |
| * | 28.685 | 0.48 | 0.60 | 28.40 | 29.48 | 50.00 |

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

Product : Secure Outdoor Ethernet Radio Link
Test Item : Conducted Emission
Power Line : Line 1
Test Mode : Mode 1: Secure Outdoor Etherent Radio Link W/Procell Antenna (Channel 6)

| | Frequency MHz | Cable Loss dB | Probe Factor dB | Reading Level dBuV | Emission Level dBuV | Limits dBuV |
|---|---|---|---|---|---|---|
| **Quasi-Peak** | | | | | | |
| | 0.219 | 0.10 | 0.14 | 35.38 | 35.62 | 62.85 |
| | 0.310 | 0.10 | 0.17 | 35.89 | 36.16 | 59.97 |
| | 0.638 | 0.11 | 0.24 | 34.28 | 34.62 | 56.00 |
| * | 2.408 | 0.13 | 0.36 | 36.99 | 37.48 | 56.00 |
| | 3.599 | 0.15 | 0.40 | 31.59 | 32.14 | 56.00 |
| | 28.685 | 0.48 | 0.60 | 32.35 | 33.43 | 60.00 |
| **Average** | | | | | | |
| | 0.219 | 0.10 | 0.14 | 28.70 | 28.94 | 52.86 |
| | 0.310 | 0.10 | 0.17 | 27.50 | 27.77 | 49.97 |
| | 0.638 | 0.11 | 0.24 | 22.10 | 22.44 | 46.00 |
| | 2.408 | 0.13 | 0.36 | 23.60 | 24.09 | 46.00 |
| | 3.599 | 0.15 | 0.40 | 22.60 | 23.15 | 46.00 |
| * | 28.685 | 0.48 | 0.60 | 29.10 | 30.18 | 50.00 |

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

Product : Secure Outdoor Ethernet Radio Link
Test Item : Conducted Emission
Power Line : Line 2
Test Mode : Mode 1: Secure Outdoor Etherent Radio Link W/Procell Antenna(Channel 6)

| | Frequency MHz | Cable Loss dB | Probe Factor dB | Reading Level dBuV | Emission Level dBuV | Limits dBuV |
|---|---|---|---|---|---|---|
| **Quasi-Peak** | | | | | | |
| | 0.220 | 0.10 | 0.14 | 31.52 | 31.76 | 62.81 |
| | 0.326 | 0.10 | 0.17 | 32.56 | 32.84 | 59.56 |
| | 0.529 | 0.10 | 0.22 | 31.41 | 31.73 | 56.00 |
| * | 2.400 | 0.13 | 0.36 | 38.14 | 38.63 | 56.00 |
| | 3.599 | 0.15 | 0.40 | 33.52 | 34.07 | 56.00 |
| | 28.685 | 0.48 | 0.60 | 30.80 | 31.88 | 60.00 |
| **Average** | | | | | | |
| | 0.220 | 0.10 | 0.14 | 21.90 | 22.14 | 52.82 |
| | 0.326 | 0.10 | 0.17 | 25.70 | 25.98 | 49.55 |
| | 0.529 | 0.10 | 0.22 | 20.70 | 21.02 | 46.00 |
| * | 2.400 | 0.13 | 0.36 | 26.00 | 26.49 | 46.00 |
| | 3.599 | 0.15 | 0.40 | 24.60 | 25.15 | 46.00 |
| | 28.685 | 0.48 | 0.60 | 28.20 | 29.28 | 50.00 |

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

Product : Secure Outdoor Ethernet Radio Link
Test Item : Conducted Emission
Power Line : Line 1
Test Mode : Mode 1: Secure Outdoor Etherent Radio Link W/Procell Antenna (Channel 11)

| | Frequency MHz | Cable Loss dB | Probe Factor dB | Reading Level dBuV | Emission Level dBuV | Limits dBuV |
|---|---|---|---|---|---|---|
| **Quasi-Peak** | | | | | | |
| | 0.209 | 0.10 | 0.13 | 30.04 | 30.27 | 63.26 |
| | 0.314 | 0.10 | 0.17 | 33.46 | 33.73 | 59.86 |
| | 0.533 | 0.10 | 0.22 | 31.45 | 31.77 | 56.00 |
| * | 2.384 | 0.13 | 0.36 | 38.82 | 39.31 | 56.00 |
| | 8.002 | 0.21 | 0.48 | 29.09 | 29.77 | 60.00 |
| | 29.236 | 0.49 | 0.60 | 30.54 | 31.63 | 60.00 |
| **Average** | | | | | | |
| | 0.209 | 0.10 | 0.13 | 22.10 | 22.33 | 53.24 |
| | 0.314 | 0.10 | 0.17 | 26.20 | 26.47 | 49.86 |
| | 0.533 | 0.10 | 0.22 | 21.00 | 21.32 | 46.00 |
| * | 2.384 | 0.13 | 0.36 | 25.70 | 26.19 | 46.00 |
| | 8.002 | 0.21 | 0.48 | 27.60 | 28.28 | 50.00 |
| | 29.236 | 0.49 | 0.60 | 28.30 | 29.39 | 50.00 |

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

Product : Secure Outdoor Ethernet Radio Link
Test Item : Conducted Emission
Power Line : Line 2
Test Mode : Mode 1: Secure Outdoor Etherent Radio Link W/Procell Antenna (Channel 11)

| | Frequency MHz | Cable Loss dB | Probe Factor dB | Reading Level dBuV | Emission Level dBuV | Limits dBuV |
|---|---|---|---|---|---|---|
| **Quasi-Peak** | | | | | | |
| | 0.224 | 0.10 | 0.14 | 30.49 | 30.73 | 62.66 |
| | 0.314 | 0.10 | 0.17 | 35.71 | 35.98 | 59.86 |
| | 0.627 | 0.11 | 0.24 | 33.07 | 33.41 | 56.00 |
| * | 2.380 | 0.13 | 0.36 | 37.48 | 37.97 | 56.00 |
| | 8.002 | 0.21 | 0.48 | 28.97 | 29.65 | 60.00 |
| | 26.611 | 0.45 | 0.59 | 30.60 | 31.64 | 60.00 |
| **Average** | | | | | | |
| | 0.224 | 0.10 | 0.14 | 20.10 | 20.34 | 52.67 |
| * | 0.314 | 0.10 | 0.17 | 29.50 | 29.77 | 49.86 |
| | 0.627 | 0.11 | 0.24 | 19.40 | 19.74 | 46.00 |
| | 2.380 | 0.13 | 0.36 | 24.50 | 24.99 | 46.00 |
| | 8.002 | 0.21 | 0.48 | 27.20 | 27.88 | 50.00 |
| | 26.611 | 0.45 | 0.59 | 27.40 | 28.44 | 50.00 |

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

Product : Secure Outdoor Ethernet Radio Link
Test Item : Conducted Emission
Power Line : Line 1
Test Mode : Mode 2: Secure Outdoor Etherent Radio Link W/ZyXEL Antenna (Channel 1)

| | Frequency MHz | Cable Loss dB | Probe Factor dB | Reading Level dBuV | Emission Level dBuV | Limits dBuV |
|---|---|---|---|---|---|---|
| **Quasi-Peak** | | | | | | |
| | 0.212 | 0.10 | 0.13 | 33.75 | 33.98 | 63.11 |
| | 0.306 | 0.10 | 0.17 | 36.16 | 36.43 | 60.07 |
| | 0.642 | 0.11 | 0.24 | 33.68 | 34.02 | 56.00 |
| * | 2.373 | 0.13 | 0.36 | 38.24 | 38.73 | 56.00 |
| | 3.431 | 0.14 | 0.40 | 30.88 | 31.42 | 56.00 |
| | 26.490 | 0.45 | 0.59 | 34.07 | 35.11 | 60.00 |
| **Average** | | | | | | |
| | 0.212 | 0.10 | 0.13 | 29.60 | 29.83 | 53.13 |
| | 0.306 | 0.10 | 0.17 | 26.30 | 26.57 | 50.08 |
| | 0.642 | 0.11 | 0.24 | 21.90 | 22.24 | 46.00 |
| | 2.373 | 0.13 | 0.36 | 24.50 | 24.99 | 46.00 |
| | 3.431 | 0.14 | 0.40 | 19.50 | 20.04 | 46.00 |
| * | 26.490 | 0.45 | 0.59 | 31.20 | 32.24 | 50.00 |

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

Product : Secure Outdoor Ethernet Radio Link
Test Item : Conducted Emission
Power Line : Line 2
Test Mode : Mode 2: Secure Outdoor Etherent Radio Link W/ZyXEL Antenna (Channel 1)

| | Frequency MHz | Cable Loss dB | Probe Factor dB | Reading Level dBuV | Emission Level dBuV | Limits dBuV |
|---|---|---|---|---|---|---|
| **Quasi-Peak** | | | | | | |
| | 0.308 | 0.10 | 0.17 | 34.10 | 34.37 | 60.03 |
| | 0.744 | 0.11 | 0.25 | 31.25 | 31.61 | 56.00 |
| | 1.310 | 0.12 | 0.30 | 32.96 | 33.38 | 56.00 |
| * | 2.396 | 0.13 | 0.36 | 38.28 | 38.77 | 56.00 |
| | 3.509 | 0.15 | 0.40 | 33.87 | 34.41 | 56.00 |
| | 24.904 | 0.43 | 0.58 | 32.15 | 33.16 | 60.00 |
| **Average** | | | | | | |
| | 0.308 | 0.10 | 0.17 | 24.80 | 25.07 | 50.02 |
| | 0.744 | 0.11 | 0.25 | 19.20 | 19.56 | 46.00 |
| | 1.310 | 0.12 | 0.30 | 20.30 | 20.72 | 46.00 |
| | 2.396 | 0.13 | 0.36 | 26.50 | 26.99 | 46.00 |
| | 3.509 | 0.15 | 0.40 | 23.10 | 23.64 | 46.00 |
| * | 24.904 | 0.43 | 0.58 | 30.50 | 31.51 | 50.00 |

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

Product : Secure Outdoor Ethernet Radio Link
Test Item : Conducted Emission
Power Line : Line 1
Test Mode : Mode 2: Secure Outdoor Etherent Radio Link W/ZyXEL Antenna (Channel 6)

| | Frequency MHz | Cable Loss dB | Probe Factor dB | Reading Level dBuV | Emission Level dBuV | Limits dBuV |
|---|---|---|---|---|---|---|
| **Quasi-Peak** | | | | | | |
| | 0.216 | 0.10 | 0.13 | 35.50 | 35.74 | 62.96 |
| | 0.314 | 0.10 | 0.17 | 35.79 | 36.06 | 59.86 |
| | 0.630 | 0.11 | 0.24 | 33.60 | 33.94 | 56.00 |
| * | 2.322 | 0.13 | 0.36 | 37.23 | 37.72 | 56.00 |
| | 3.630 | 0.15 | 0.40 | 32.68 | 33.23 | 56.00 |
| | 28.685 | 0.48 | 0.60 | 34.94 | 36.02 | 60.00 |
| **Average** | | | | | | |
| | 0.216 | 0.10 | 0.13 | 28.20 | 28.44 | 52.97 |
| | 0.314 | 0.10 | 0.17 | 29.60 | 29.87 | 49.86 |
| | 0.630 | 0.11 | 0.24 | 21.40 | 21.74 | 46.00 |
| | 2.322 | 0.13 | 0.36 | 22.90 | 23.39 | 46.00 |
| | 3.630 | 0.15 | 0.40 | 23.00 | 23.55 | 46.00 |
| * | 28.685 | 0.48 | 0.60 | 32.70 | 33.78 | 50.00 |

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

Product : Secure Outdoor Ethernet Radio Link
Test Item : Conducted Emission
Power Line : Line 2
Test Mode : Mode 2: Secure Outdoor Etherent Radio Link W/ZyXEL Antenna (Channel 6)

| | Frequency MHz | Cable Loss dB | Probe Factor dB | Reading Level dBuV | Emission Level dBuV | Limits dBuV |
|---|---|---|---|---|---|---|
| **Quasi-Peak** | | | | | | |
| | 0.313 | 0.10 | 0.17 | 32.57 | 32.84 | 59.89 |
| | 0.517 | 0.10 | 0.22 | 31.04 | 31.36 | 56.00 |
| | 1.494 | 0.12 | 0.32 | 32.11 | 32.55 | 56.00 |
| * | 2.134 | 0.13 | 0.35 | 37.95 | 38.43 | 56.00 |
| | 3.443 | 0.14 | 0.40 | 35.55 | 36.09 | 56.00 |
| | 26.611 | 0.45 | 0.59 | 34.44 | 35.48 | 60.00 |
| **Average** | | | | | | |
| | 0.313 | 0.10 | 0.17 | 25.80 | 26.07 | 49.89 |
| | 0.517 | 0.10 | 0.22 | 19.90 | 20.22 | 46.00 |
| | 1.494 | 0.12 | 0.32 | 20.80 | 21.24 | 46.00 |
| | 2.134 | 0.13 | 0.35 | 25.50 | 25.98 | 46.00 |
| | 3.443 | 0.14 | 0.40 | 25.20 | 25.74 | 46.00 |
| * | 26.611 | 0.45 | 0.59 | 31.80 | 32.84 | 50.00 |

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

Product : Secure Outdoor Ethernet Radio Link
Test Item : Conducted Emission
Power Line : Line 1
Test Mode : Mode 2: Secure Outdoor Etherent Radio Link W/ZyXEL Antenna (Channel 11)

| | Frequency MHz | Cable Loss dB | Probe Factor dB | Reading Level dBuV | Emission Level dBuV | Limits dBuV |
|---|---|---|---|---|---|---|
| **Quasi-Peak** | | | | | | |
| | 0.216 | 0.10 | 0.13 | 35.50 | 35.74 | 62.96 |
| | 0.302 | 0.10 | 0.17 | 36.14 | 36.41 | 60.18 |
| | 0.634 | 0.11 | 0.24 | 33.54 | 33.88 | 56.00 |
| * | 2.338 | 0.13 | 0.36 | 37.63 | 38.12 | 56.00 |
| | 3.459 | 0.14 | 0.40 | 34.03 | 34.57 | 56.00 |
| | 26.611 | 0.45 | 0.59 | 35.16 | 36.20 | 60.00 |
| **Average** | | | | | | |
| | 0.216 | 0.10 | 0.13 | 28.40 | 28.64 | 52.97 |
| | 0.302 | 0.10 | 0.17 | 24.70 | 24.97 | 50.19 |
| | 0.634 | 0.11 | 0.24 | 21.60 | 21.94 | 46.00 |
| | 2.338 | 0.13 | 0.36 | 22.90 | 23.39 | 46.00 |
| | 3.459 | 0.14 | 0.40 | 23.50 | 24.04 | 46.00 |
| * | 26.611 | 0.45 | 0.59 | 32.30 | 33.34 | 50.00 |

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

Product : Secure Outdoor Ethernet Radio Link
Test Item : Conducted Emission
Power Line : Line 2
Test Mode : Mode 2: Secure Outdoor Etherent Radio Link W/ZyXEL Antenna (Channel 11)

| | Frequency MHz | Cable Loss dB | Probe Factor dB | Reading Level dBuV | Emission Level dBuV | Limits dBuV |
|---|---|---|---|---|---|---|
| **Quasi-Peak** | | | | | | |
| | 0.216 | 0.10 | 0.13 | 32.88 | 33.12 | 62.96 |
| | 0.306 | 0.10 | 0.17 | 34.03 | 34.30 | 60.07 |
| | 0.736 | 0.11 | 0.25 | 31.15 | 31.51 | 56.00 |
| * | 2.150 | 0.13 | 0.35 | 38.17 | 38.65 | 56.00 |
| | 3.427 | 0.14 | 0.40 | 35.04 | 35.58 | 56.00 |
| | 26.607 | 0.45 | 0.59 | 34.42 | 35.46 | 60.00 |
| **Average** | | | | | | |
| | 0.216 | 0.10 | 0.13 | 23.00 | 23.24 | 52.97 |
| | 0.306 | 0.10 | 0.17 | 26.00 | 26.27 | 50.08 |
| | 0.736 | 0.11 | 0.25 | 19.10 | 19.46 | 46.00 |
| | 2.150 | 0.13 | 0.35 | 26.60 | 27.08 | 46.00 |
| | 3.427 | 0.14 | 0.40 | 25.20 | 25.74 | 46.00 |
| * | 26.607 | 0.45 | 0.59 | 31.40 | 32.44 | 50.00 |

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

# 3. Peak Power Output

## 3.1. Test Equipment

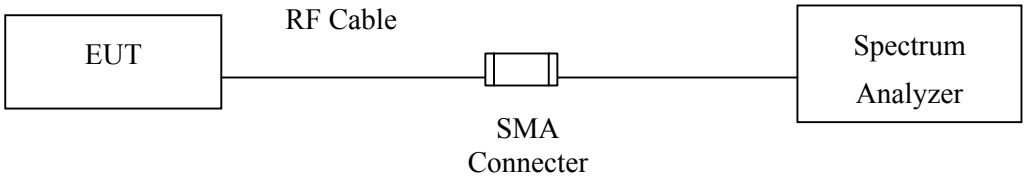
The following test equipment are used during the test:

| Item | Equipment | Manufacturer | Model No. / Serial No. | Last Cal. | Remark |
|---|---|---|---|---|---|
| 1 | Spectrum Analyzer | R & S | FSP / 100561 | Mar., 2004 | |
| 2 | No.1 OATS | | | Sep., 2003 | |

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

## 3.2. Test Setup

**Conduction Power Measurement**




## 3.3. Limits

The maximum peak power shall be less 1 Watt.

## 3.4. Test Result of Peak Power Output

Product : Secure Outdoor Ethernet Radio Link
Test Item : Peak Power Output
Test Site : No.1 OATS
Test Mode : Normal Operation

| Channel No. | Frequency(MHz) | Measurement | Required Limit | Result |
|---|---|---|---|---|
| 1 | 2412.00 | 13.87dBm | 1Watt= 30 dBm | Pass |
| 6 | 2437.00 | 13.54dBm | 1Watt= 30 dBm | Pass |
| 11 | 2462.00 | 13.17dBm | 1Watt= 30 dBm | Pass |

# 4. Radiated Emission

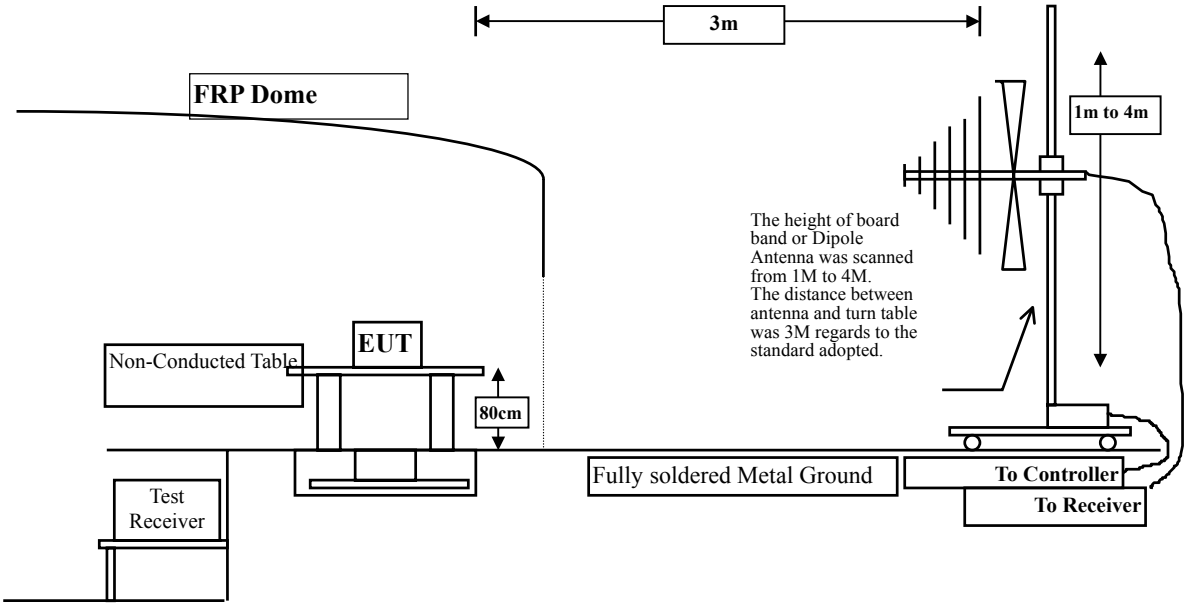
## 4.1. Test Equipment

The following test equipment are used during the test:

| Item | | Equipment | Manufacturer | Model No. / Serial No. | Last Cal. |
|---|---|---|---|---|---|
| 1 | X | Test Receiver | R & S | ESCS 30 / 825442/017 | Jan., 2004 |
| 2 | X | Spectrum Analyzer | Advantest | R3261C / 81720266 | N/A |
| 3 | X | Pre-Amplifier | HP | 8447D / 2944A09276 | N/A |
| 4 | X | Bilog Antenna | Chase | CBL6112B / 2455 | Sep., 2003 |
| 5 | X | Spectrum Analyzer | R & S | FSP40 / 100005 | Aug., 2003 |
| 6 | X | Pre-Amplifier | HP | 8449B / 3008A01123 | Feb., 2004 |
| 7 | X | Horn Antenna | Schwarzbeck | BBHA 9120D / BBHA9120D312 | Jul., 2003 |
| 8 | No.1 OATS | | | | Sep., 2003 |

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

## 4.2. Test Setup



## 4.3. Limits

➢ **General Radiated Emission Limits**

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

| **FCC Part 15 Subpart C Paragraph 15.209 Limits** | | |
|---|---|---|
| Frequency MHz | uV/m @3m | dBuV/m@3m |
| 30-88 | 100 | 40 |
| 88-216 | 150 | 43.5 |
| 216-960 | 200 | 46 |
| Above 960 | 500 | 54 |

Remarks : 1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

## 4.4. 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 3 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: 2001 on radiated measurement.
The additional latch filter below 1GHz was used to measure the level of harmonics radiated emission during field dtrength of harmonics measurement.
The bandwidth below 1GHz setting on the field strength meter (R&S Test Receiver ESCS 30 )is 120 kHz, above 1GHz are 1 MHz.
The frequency range from 30MHz to 10th harminics is checked.

## 4.5. Test Result of Radiated Emission

Product : Secure Outdoor Ethernet Radio Link
Test Item : Harmonic Radiated Emission
Test Site : No.1 OATS
Test Mode : Mode 1: Secure Outdoor Etherent Radio Link W/Procell Antenna (Channel 1)

| Frequency MHz | Cable Loss dB | Probe Factor dB/m | PreAMP dB | Reading Level dBuV | Emission Level dBuV/m | Margin dB | Limit dBuV/m |
|---|---|---|---|---|---|---|---|
| **Horizontal** | | | | | | | |
| **Peak Detector:** | | | | | | | |
| 1256.000 | 2.20 | 24.58 | 31.92 | 31.01 | 25.87 | 48.13 | 74.00 |
| 4824.000 | 4.24 | 31.22 | 31.95 | 30.13 | 33.65 | 40.35 | 74.00 |
| 7236.200 | 5.63 | 35.95 | 32.67 | 29.69 | 38.60 | 35.40 | 74.00 |
| 9648.000 | 7.01 | 38.05 | 31.88 | 28.52 | 41.70 | 32.30 | 74.00 |
| 12060.00 | 8.40 | 38.59 | 31.32 | 28.15 | 43.81 | 30.19 | 74.00 |
| **Vertical** | | | | | | | |
| **Peak Detector:** | | | | | | | |
| 1200.000 | 2.17 | 24.52 | 31.91 | 33.77 | 28.54 | 45.46 | 74.00 |
| 4824.000 | 4.24 | 31.22 | 31.95 | 35.54 | 39.06 | 34.94 | 74.00 |
| 7240.000 | 5.63 | 35.95 | 32.67 | 35.52 | 44.43 | 29.57 | 74.00 |
| 9642.000 | 7.00 | 38.04 | 31.91 | 34.92 | 48.05 | 25.95 | 74.00 |
| 12064.00 | 8.40 | 38.59 | 31.32 | 32.99 | 48.65 | 25.35 | 74.00 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz。
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:30Hz; Span:20MHz。
4. Emission Level = Reading Level + Probe Factor + Cable Loss – PreAMP.
5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Secure Outdoor Ethernet Radio Link
Test Item : Harmonic Radiated Emission
Test Site : No.1 OATS
Test Mode : Mode 1: Secure Outdoor Etherent Radio Link W/Procell Antenna (Channel 6)

| Frequency MHz | Cable Loss dB | Probe Factor dB/m | PreAMP dB | Reading Level dBuV | Emission Level dBuV/m | Margin dB | Limit dBuV/m |
|---|---|---|---|---|---|---|---|
| **Horizontal** | | | | | | | |
| **Peak Detector:** | | | | | | | |
| 4876.000 | 4.27 | 31.32 | 31.95 | 35.55 | 39.19 | 34.81 | 74.00 |
| 7309.000 | 5.67 | 36.09 | 32.60 | 35.22 | 44.37 | 29.63 | 74.00 |
| 9748.000 | 7.07 | 38.07 | 31.66 | 33.90 | 47.38 | 26.62 | 74.00 |
| 12189.00 | 8.47 | 38.51 | 31.21 | 32.86 | 48.62 | 25.38 | 74.00 |
| **Vertical** | | | | | | | |
| **Peak Detector:** | | | | | | | |
| 1214.000 | 2.18 | 24.54 | 31.91 | 39.21 | 34.01 | 39.99 | 74.00 |
| 4874.200 | 4.27 | 31.32 | 31.95 | 35.76 | 39.40 | 34.60 | 74.00 |
| 7310.900 | 5.67 | 36.09 | 32.60 | 34.55 | 43.70 | 30.30 | 74.00 |
| 9748.000 | 7.07 | 38.07 | 31.66 | 33.46 | 46.94 | 27.06 | 74.00 |
| 12185.00 | 8.47 | 38.51 | 31.21 | 32.79 | 48.55 | 25.45 | 74.00 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz。
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:30Hz; Span:20MHz。
4. Emission Level = Reading Level + Probe Factor + Cable Loss – PreAMP.
5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Secure Outdoor Ethernet Radio Link
Test Item : Harmonic Radiated Emission
Test Site : No.1 OATS
Test Mode : Mode 1: Secure Outdoor Etherent Radio Link W/Procell Antenna (Channel 11)

| Frequency MHz | Cable Loss dB | Probe Factor dB/m | PreAMP dB | Reading Level dBuV | Emission Level dBuV/m | Margin dB | Limit dBuV/m |
|---|---|---|---|---|---|---|---|
| **Horizontal** | | | | | | | |
| **Peak Detector:** | | | | | | | |
| 4926.000 | 4.30 | 31.41 | 31.96 | 35.67 | 39.43 | 34.57 | 74.00 |
| 7390.000 | 5.72 | 36.26 | 32.51 | 35.08 | 44.54 | 29.46 | 74.00 |
| 9804.000 | 7.10 | 38.08 | 31.55 | 35.22 | 48.85 | 25.15 | 74.00 |
| 12312.00 | 8.54 | 38.42 | 31.09 | 33.39 | 49.26 | 24.74 | 74.00 |
| **Vertical** | | | | | | | |
| **Peak Detector:** | | | | | | | |
| 4920.000 | 4.30 | 31.41 | 31.96 | 36.18 | 39.94 | 34.06 | 74.00 |
| 7386.000 | 5.72 | 36.26 | 32.51 | 35.19 | 44.65 | 29.35 | 74.00 |
| 9826.000 | 7.12 | 38.09 | 31.48 | 35.50 | 49.23 | 24.77 | 74.00 |
| 12310.00 | 8.53 | 38.43 | 31.10 | 33.19 | 49.05 | 24.95 | 74.00 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz。
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:30Hz; Span:20MHz。
4. Emission Level = Reading Level + Probe Factor + Cable Loss – PreAMP.
5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Secure Outdoor Ethernet Radio Link
Test Item : Harmonic Radiated Emission
Test Site : No.1 OATS
Test Mode : Mode 2: Secure Outdoor Etherent Radio Link W/ZyXEL Antenna (Channel 1)

| Frequency MHz | Cable Loss dB | Probe Factor dB/m | PreAMP dB | Reading Level dBuV | Emission Level dBuV/m | Margin dB | Limit dBuV/m |
|---|---|---|---|---|---|---|---|
| **Horizontal** | | | | | | | |
| **Peak Detector:** | | | | | | | |
| 4824.000 | 4.24 | 31.31 | 31.95 | 36.11 | 39.71 | 34.29 | 74.00 |
| 7236.000 | 5.63 | 36.54 | 32.67 | 36.14 | 45.64 | 28.36 | 74.00 |
| 9647.990 | 7.01 | 37.98 | 31.88 | 35.56 | 48.68 | 25.32 | 74.00 |
| 12059.99 | 8.40 | 38.59 | 31.32 | 32.99 | 48.66 | 25.34 | 74.00 |
| **Vertical** | | | | | | | |
| **Peak Detector:** | | | | | | | |
| 4823.900 | 4.24 | 31.31 | 31.95 | 35.96 | 39.56 | 34.44 | 74.00 |
| 7236.000 | 5.63 | 36.54 | 32.67 | 35.81 | 45.31 | 28.69 | 74.00 |
| 9648.000 | 7.01 | 37.98 | 31.88 | 33.87 | 46.99 | 27.01 | 74.00 |
| 12059.99 | 8.40 | 38.59 | 31.32 | 32.45 | 48.12 | 25.88 | 74.00 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz。
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:30Hz; Span:20MHz。
4. Emission Level = Reading Level + Probe Factor + Cable Loss – PreAMP.
5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Secure Outdoor Ethernet Radio Link
Test Item : Harmonic Radiated Emission
Test Site : No.1 OATS
Test Mode : Mode 2: Secure Outdoor Etherent Radio Link W/ZyXEL Antenna (Channel 6)

| Frequency MHz | Cable Loss dB | Probe Factor dB/m | PreAMP dB | Reading Level dBuV | Emission Level dBuV/m | Margin dB | Limit dBuV/m |
|---|---|---|---|---|---|---|---|
| **Horizontal** | | | | | | | |
| **Peak Detector:** | | | | | | | |
| 1378.000 | 2.27 | 25.11 | 31.93 | 38.72 | 34.17 | 39.83 | 74.00 |
| 4874.000 | 4.27 | 31.37 | 31.95 | 36.30 | 39.99 | 34.01 | 74.00 |
| 7311.000 | 5.67 | 36.56 | 32.60 | 35.20 | 44.83 | 29.17 | 74.00 |
| 9748.300 | 7.07 | 38.13 | 31.66 | 33.20 | 46.74 | 27.26 | 74.00 |
| 12184.89 | 8.47 | 38.51 | 31.21 | 32.30 | 48.06 | 25.94 | 74.00 |
| **Vertical** | | | | | | | |
| **Peak Detector:** | | | | | | | |
| 4874.000 | 4.27 | 31.37 | 31.95 | 35.22 | 38.91 | 35.09 | 74.00 |
| 7311.000 | 5.67 | 36.56 | 32.60 | 36.62 | 46.25 | 27.75 | 74.00 |
| 9748.000 | 7.07 | 38.13 | 31.66 | 34.02 | 47.56 | 26.44 | 74.00 |
| 12185.00 | 8.47 | 38.51 | 31.21 | 33.30 | 49.06 | 24.94 | 74.00 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz。
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:30Hz; Span:20MHz。
4. Emission Level = Reading Level + Probe Factor + Cable Loss – PreAMP.
5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Secure Outdoor Ethernet Radio Link
Test Item : Harmonic Radiated Emission
Test Site : No.1 OATS
Test Mode : Mode 2: Secure Outdoor Etherent Radio Link W/ZyXEL Antenna (Channel 11)

| Frequency MHz | Cable Loss dB | Probe Factor dB/m | PreAMP dB | Reading Level dBuV | Emission Level dBuV/m | Margin dB | Limit dBuV/m |
|---|---|---|---|---|---|---|---|
| **Horizontal** | | | | | | | |
| **Peak Detector:** | | | | | | | |
| 1152.000 | 2.14 | 24.25 | 31.90 | 37.75 | 32.23 | 41.77 | 74.00 |
| 4926.000 | 4.30 | 31.43 | 31.96 | 36.09 | 39.87 | 34.13 | 74.00 |
| 7384.000 | 5.72 | 36.58 | 32.51 | 33.85 | 43.64 | 30.36 | 74.00 |
| 9846.000 | 7.12 | 38.18 | 31.48 | 33.84 | 47.66 | 26.34 | 74.00 |
| 12314.00 | 8.54 | 38.42 | 31.09 | 33.18 | 49.05 | 24.95 | 74.00 |
| **Vertical** | | | | | | | |
| **Peak Detector:** | | | | | | | |
| 1448.000 | 2.30 | 25.03 | 31.94 | 36.71 | 32.10 | 41.90 | 74.00 |
| 4926.000 | 4.30 | 31.43 | 31.96 | 34.73 | 38.51 | 35.49 | 74.00 |
| 7388.000 | 5.72 | 36.58 | 32.51 | 34.80 | 44.59 | 29.41 | 74.00 |
| 9848.000 | 7.12 | 38.18 | 31.48 | 32.40 | 46.22 | 27.78 | 74.00 |
| 12314.00 | 8.54 | 38.42 | 31.09 | 33.70 | 49.57 | 24.43 | 74.00 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz。
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:30Hz; Span:20MHz。
4. Emission Level = Reading Level + Probe Factor + Cable Loss – PreAMP.
5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Secure Outdoor Ethernet Radio Link
Test Item : General Radiated Emission
Test Site : No.1 OATS
Test Mode : Mode 1: Secure Outdoor Etherent Radio Link W/Procell Antenna (Channel 1)

| | Frequency MHz | Cable Loss dB | Probe Factor dB/m | PreAMP dB | Reading Level dBuV | Emission Level dBuV/m | Margin dB | Limit dBuV/m |
|---|---|---|---|---|---|---|---|---|
| **Horizontal** | | | | | | | | |
| | 139.610 | 1.47 | 8.27 | 22.60 | 43.80 | 30.94 | 12.56 | 43.50 |
| * | 299.660 | 2.12 | 13.53 | 22.60 | 47.40 | 40.45 | 5.55 | 46.00 |
| | 497.540 | 2.94 | 17.80 | 22.60 | 37.60 | 35.74 | 10.26 | 46.00 |
| | 597.450 | 3.35 | 21.04 | 22.60 | 36.00 | 37.79 | 8.21 | 46.00 |
| | 697.360 | 3.76 | 17.25 | 22.60 | 35.80 | 34.21 | 11.79 | 46.00 |
| | 895.240 | 4.57 | 24.93 | 22.60 | 32.00 | 38.90 | 7.10 | 46.00 |
| **Vertical** | | | | | | | | |
| * | 103.720 | 1.32 | 15.97 | 22.60 | 44.40 | 39.09 | 4.41 | 43.50 |
| | 146.400 | 1.50 | 15.45 | 22.60 | 39.40 | 33.74 | 9.76 | 43.50 |
| | 299.660 | 2.12 | 17.53 | 22.60 | 35.40 | 32.45 | 13.55 | 46.00 |
| | 498.510 | 2.94 | 16.94 | 22.60 | 32.40 | 29.68 | 16.32 | 46.00 |
| | 697.360 | 3.76 | 18.22 | 22.60 | 33.40 | 32.77 | 13.23 | 46.00 |
| | 895.240 | 4.57 | 22.78 | 22.60 | 34.00 | 38.75 | 7.25 | 46.00 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + Probe Factor + Cable Loss - PreAMP.

Product : Secure Outdoor Ethernet Radio Link
Test Item : General Radiated Emission
Test Site : No.1 OATS
Test Mode : Mode 1: Secure Outdoor Etherent Radio Link W/Procell Antenna Channel 6)

| | Frequency MHz | Cable Loss dB | Probe Factor dB/m | PreAMP dB | Reading Level dBuV | Emission Level dBuV/m | Margin dB | Limit dBuV/m |
|---|---|---|---|---|---|---|---|---|
| **Horizontal** | | | | | | | | |
| | 144.460 | 1.49 | 8.71 | 22.60 | 42.40 | 30.00 | 13.50 | 43.50 |
| * | 299.660 | 2.12 | 13.53 | 22.60 | 47.40 | 40.45 | 5.55 | 46.00 |
| | 497.540 | 2.94 | 17.80 | 22.60 | 37.00 | 35.14 | 10.86 | 46.00 |
| | 598.420 | 3.35 | 21.00 | 22.60 | 35.00 | 36.75 | 9.25 | 46.00 |
| | 695.420 | 3.75 | 17.21 | 22.60 | 35.40 | 33.75 | 12.25 | 46.00 |
| | 895.240 | 4.57 | 24.93 | 22.60 | 31.00 | 37.90 | 8.10 | 46.00 |
| **Vertical** | | | | | | | | |
| * | 103.720 | 1.32 | 15.97 | 22.60 | 43.00 | 37.69 | 5.81 | 43.50 |
| | 299.660 | 2.12 | 17.53 | 22.60 | 35.00 | 32.05 | 13.95 | 46.00 |
| | 498.510 | 2.94 | 16.94 | 22.60 | 31.80 | 29.08 | 16.92 | 46.00 |
| | 598.420 | 3.35 | 17.92 | 22.60 | 30.60 | 29.27 | 16.73 | 46.00 |
| | 695.420 | 3.75 | 18.19 | 22.60 | 33.80 | 33.14 | 12.86 | 46.00 |
| | 895.240 | 4.57 | 22.78 | 22.60 | 35.00 | 39.75 | 6.25 | 46.00 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + Probe Factor + Cable Loss - PreAMP.

Product : Secure Outdoor Ethernet Radio Link
Test Item : General Radiated Emission
Test Site : No.1 OATS
Test Mode : Mode 1: Secure Outdoor Etherent Radio Link W/Procell Antenna (Channel 11)

| | Frequency MHz | Cable Loss dB | Probe Factor dB/m | PreAMP dB | Reading Level dBuV | Emission Level dBuV/m | Margin dB | Limit dBuV/m |
|---|---|---|---|---|---|---|---|---|
| **Horizontal** | | | | | | | | |
| | 139.610 | 1.47 | 8.27 | 22.60 | 43.80 | 30.94 | 12.56 | 43.50 |
| * | 299.660 | 2.12 | 13.53 | 22.60 | 47.40 | 40.45 | 5.55 | 46.00 |
| | 497.540 | 2.94 | 17.80 | 22.60 | 38.00 | 36.14 | 9.86 | 46.00 |
| | 596.480 | 3.34 | 21.08 | 22.60 | 35.20 | 37.02 | 8.98 | 46.00 |
| | 697.360 | 3.76 | 17.25 | 22.60 | 35.40 | 33.81 | 12.19 | 46.00 |
| | 895.240 | 4.57 | 24.93 | 22.60 | 31.40 | 38.30 | 7.70 | 46.00 |
| **Vertical** | | | | | | | | |
| * | 104.690 | 1.32 | 15.49 | 22.60 | 42.80 | 37.01 | 6.49 | 43.50 |
| | 164.830 | 1.57 | 21.10 | 22.60 | 35.40 | 35.47 | 8.03 | 43.50 |
| | 299.660 | 2.12 | 17.53 | 22.60 | 35.00 | 32.05 | 13.95 | 46.00 |
| | 497.540 | 2.94 | 16.88 | 22.60 | 32.20 | 29.42 | 16.58 | 46.00 |
| | 695.420 | 3.75 | 18.19 | 22.60 | 33.80 | 33.14 | 12.86 | 46.00 |
| | 895.240 | 4.57 | 22.78 | 22.60 | 34.60 | 39.35 | 6.65 | 46.00 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + Probe Factor + Cable Loss - PreAMP.

Product : Secure Outdoor Ethernet Radio Link
Test Item : General Radiated Emission
Test Site : No.1 OATS
Test Mode : Mode 2: Secure Outdoor Etherent Radio Link W/ZyXEL Antenna (Channel 1)

| | Frequency MHz | Cable Loss dB | Probe Factor dB/m | PreAMP dB | Reading Level dBuV | Emission Level dBuV/m | Margin dB | Limit dBuV/m |
|---|---|---|---|---|---|---|---|---|
| **Horizontal** | | | | | | | | |
| | 143.490 | 1.48 | 8.62 | 22.60 | 42.80 | 30.31 | 13.19 | 43.50 |
| * | 298.690 | 2.12 | 13.52 | 22.60 | 47.60 | 40.64 | 5.36 | 46.00 |
| | 497.540 | 2.94 | 17.80 | 22.60 | 37.40 | 35.54 | 10.46 | 46.00 |
| | 597.450 | 3.35 | 21.04 | 22.60 | 37.00 | 38.79 | 7.21 | 46.00 |
| | 697.360 | 3.76 | 17.25 | 22.60 | 34.80 | 33.21 | 12.79 | 46.00 |
| | 895.240 | 4.57 | 24.93 | 22.60 | 29.60 | 36.50 | 9.50 | 46.00 |
| **Vertical** | | | | | | | | |
| | 98.870 | 1.30 | 16.77 | 22.60 | 40.60 | 36.07 | 7.43 | 43.50 |
| | 164.830 | 1.57 | 21.10 | 22.60 | 35.20 | 35.27 | 8.23 | 43.50 |
| | 299.660 | 2.12 | 17.53 | 22.60 | 37.20 | 34.25 | 11.75 | 46.00 |
| | 598.420 | 3.35 | 17.92 | 22.60 | 33.40 | 32.07 | 13.93 | 46.00 |
| | 696.390 | 3.75 | 18.20 | 22.60 | 34.20 | 33.56 | 12.44 | 46.00 |
| * | 895.240 | 4.57 | 22.78 | 22.60 | 35.20 | 39.95 | 6.05 | 46.00 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + Probe Factor + Cable Loss - PreAMP.

Product : Secure Outdoor Ethernet Radio Link
Test Item : General Radiated Emission
Test Site : No.1 OATS
Test Mode : Mode 2: Secure Outdoor Etherent Radio Link W/ZyXEL Antenna Channel 6)

| | Frequency MHz | Cable Loss dB | Probe Factor dB/m | PreAMP dB | Reading Level dBuV | Emission Level dBuV/m | Margin dB | Limit dBuV/m |
|---|---|---|---|---|---|---|---|---|
| **Horizontal** | | | | | | | | |
| | 142.520 | 1.48 | 8.53 | 22.60 | 43.40 | 30.81 | 12.69 | 43.50 |
| * | 297.720 | 2.12 | 13.51 | 22.60 | 47.40 | 40.42 | 5.58 | 46.00 |
| | 497.540 | 2.94 | 17.80 | 22.60 | 37.20 | 35.34 | 10.66 | 46.00 |
| | 598.420 | 3.35 | 21.00 | 22.60 | 36.80 | 38.55 | 7.45 | 46.00 |
| | 697.360 | 3.76 | 17.25 | 22.60 | 35.80 | 34.21 | 11.79 | 46.00 |
| | 895.240 | 4.57 | 24.93 | 22.60 | 29.80 | 36.70 | 9.30 | 46.00 |
| **Vertical** | | | | | | | | |
| | 99.840 | 1.30 | 17.11 | 22.60 | 40.40 | 36.21 | 7.29 | 43.50 |
| | 299.660 | 2.12 | 17.53 | 22.60 | 37.60 | 34.65 | 11.35 | 46.00 |
| | 497.540 | 2.94 | 16.88 | 22.60 | 33.40 | 30.62 | 15.38 | 46.00 |
| | 598.420 | 3.35 | 17.92 | 22.60 | 33.40 | 32.07 | 13.93 | 46.00 |
| | 697.360 | 3.76 | 18.22 | 22.60 | 34.40 | 33.77 | 12.23 | 46.00 |
| * | 895.240 | 4.57 | 22.78 | 22.60 | 35.20 | 39.95 | 6.05 | 46.00 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + Probe Factor + Cable Loss - PreAMP.

Product : Secure Outdoor Ethernet Radio Link
Test Item : General Radiated Emission
Test Site : No.1 OATS
Test Mode : Mode 2: Secure Outdoor Etherent Radio Link W/ZyXEL Antenna (Channel 11)

| | Frequency MHz | Cable Loss dB | Probe Factor dB/m | PreAMP dB | Reading Level dBuV | Emission Level dBuV/m | Margin dB | Limit dBuV/m |
|---|---|---|---|---|---|---|---|---|
| **Horizontal** | | | | | | | | |
| | 143.490 | 1.48 | 8.62 | 22.60 | 43.00 | 30.51 | 12.99 | 43.50 |
| * | 298.690 | 2.12 | 13.52 | 22.60 | 47.40 | 40.44 | 5.56 | 46.00 |
| | 497.540 | 2.94 | 17.80 | 22.60 | 37.40 | 35.54 | 10.46 | 46.00 |
| | 597.450 | 3.35 | 21.04 | 22.60 | 36.80 | 38.59 | 7.41 | 46.00 |
| | 697.360 | 3.76 | 17.25 | 22.60 | 35.20 | 33.61 | 12.39 | 46.00 |
| | 895.240 | 4.57 | 24.93 | 22.60 | 29.80 | 36.70 | 9.30 | 46.00 |
| **Vertical** | | | | | | | | |
| | 98.870 | 1.30 | 16.77 | 22.60 | 40.20 | 35.67 | 7.83 | 43.50 |
| | 299.660 | 2.12 | 17.53 | 22.60 | 38.20 | 35.25 | 10.75 | 46.00 |
| | 497.540 | 2.94 | 16.88 | 22.60 | 33.00 | 30.22 | 15.78 | 46.00 |
| | 598.420 | 3.35 | 17.92 | 22.60 | 32.80 | 31.47 | 14.53 | 46.00 |
| | 697.360 | 3.76 | 18.22 | 22.60 | 34.40 | 33.77 | 12.23 | 46.00 |
| * | 895.240 | 4.57 | 22.78 | 22.60 | 35.00 | 39.75 | 6.25 | 46.00 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + Probe Factor + Cable Loss - PreAMP.

# 5. Band Edge

## 5.1. Test Equipment

The following test equipment are used during the test:

RF Conducted Measurement:

| Item | Equipment | Manufacturer | Model No. / Serial No. | Last Cal. | Remark |
|---|---|---|---|---|---|
| 1 | Spectrum Analyzer | R & S | FSP / 100561 | Mar., 2004 | |
| 2 | No.1 OATS | | | Sep., 2003 | |

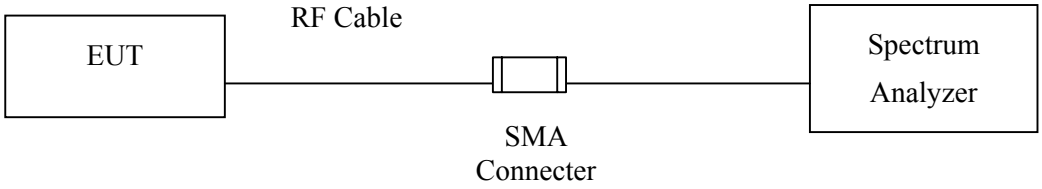
RF Radiated Measurement:

| Item | | Equipment | Manufacturer | Model No. / Serial No. | Last Cal. |
|---|---|---|---|---|---|
| 1 | X | Spectrum Analyzer | R & S | FSP40 / 100005 | Aug., 2003 |
| 2 | | Pre-Amplifier | HP | 8449B / 3008A01123 | Feb., 2004 |
| 3 | | Pre-Amplifier | HP | 8447D / 2944A09276 | N/A |
| 4 | | Loop Antenna | R & S | HFH2-Z2 / 833799/004 | Sep., 2003 |
| 5 | | BiconiLog Antenna | Schwarzbeck | VULB 9166 / 1061 | Sep., 2003 |
| 6 | | Bilog Antenna | Chase | CBL6112B / 2455 | Sep., 2003 |
| 7 | X | Horn Antenna | Schwarzbeck | BBHA 9120D / BBHA9120D312 | Jul., 2003 |
| 8 | No.1 OATS | | | | Sep., 2003 |

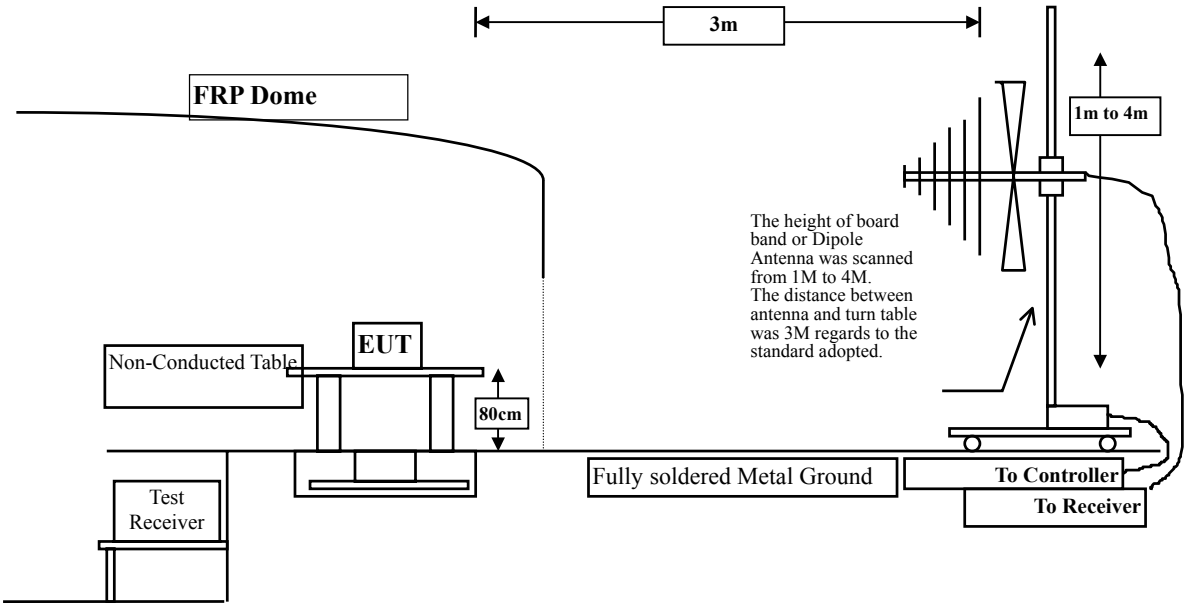
Note: 1. All equipments that need to calibrate are with calibration period of 1 year.
2. Mark “X” test instruments are used to measure the final test results.

## 5.2. Test Setup

**RF Conducted Measurement:**




**RF Radiated Measurement:**



## 5.3. Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

## 5.4. 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 3 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 C63.4:2001 on radiated measurement.
The bandwidth below 1GHz setting on the field strength meter (R&S Test Receiver ESCS 30 )is 120 kHz, above 1GHz are 1 MHz.

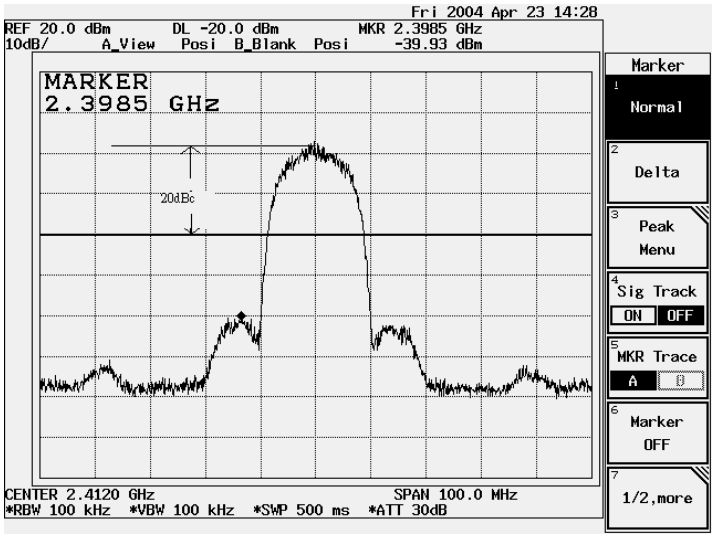
## 5.5. Test Result of Band Edge

Product : Secure Outdoor Ethernet Radio Link
Test Item : Band Edge
Test Site : No.1 OATS
Test Mode : Normal Operation

**RF Conducted Measurement:**

| Channel No. | Frequency (MHz) | Required Limit (dBc) | Result |
|---|---|---|---|
| 1 | <2400 | >20 | Pass |

**Figure Channel 1:**



Product : Secure Outdoor Ethernet Radio Link
Test Item : Band Edge
Test Site : No.1 OATS
Test Mode : Mode 1: Secure Outdoor Etherent Radio Link W/Procell Antenna(Channel 11)

**RF Radiated Measurement: (Peak Detector)**

| Channel No. | Frequency (MHz) | Reading Level (dBuV) | Probe Factor (dB/m) | Cable Loss (dB) | PreAMP (dB) | Emission Level (dBuV/m) | Limit (dBuV/m) | Result |
|---|---|---|---|---|---|---|---|---|
| 11(Horizontal) | 2488.800 | 25.21 | 27.58 | 2.91 | 0.00 | 55.70 | 74 | Pass |
| 11 (Vertical) | 2489.200 | 26.38 | 27.58 | 2.91 | 0.00 | 56.87 | 74 | Pass |

**Figure Channel 11:** (Horizontal)

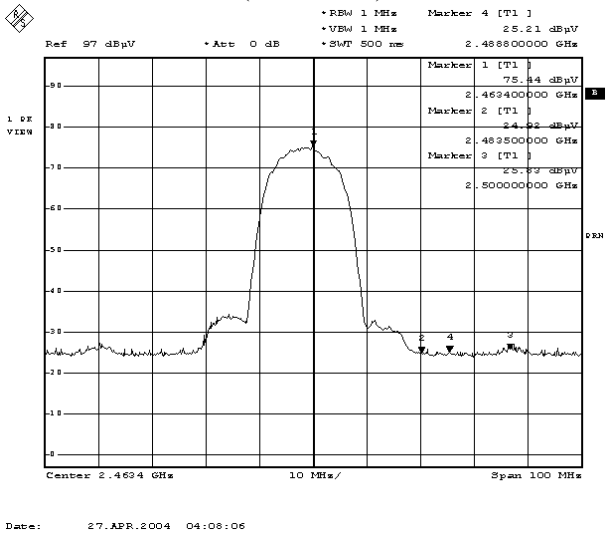
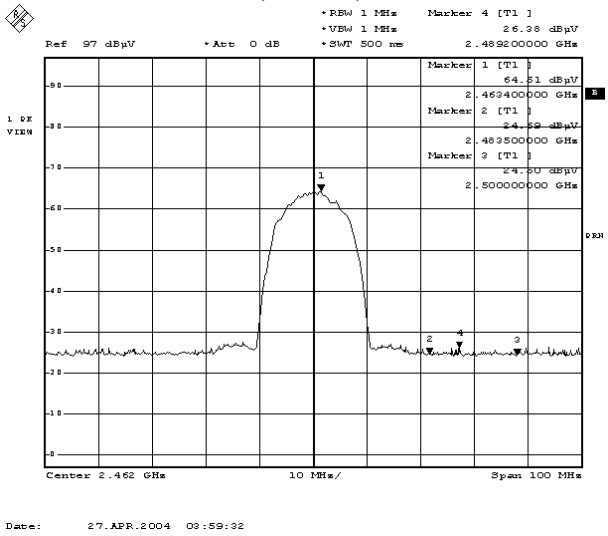



**Figure Channel 11:** (Vertical)




Note: The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Secure Outdoor Ethernet Radio Link
Test Item : Band Edge
Test Site : No.1 OATS
Test Mode : Mode 1: Secure Outdoor Etherent Radio Link W/Procell Antenna (Channel 11)

**RF Radiated Measurement: (Average Detector)**

| Channel No. | Frequency (MHz) | Reading Level (dBuV) | Probe Factor (dB/m) | Cable Loss (dB) | PreAMP (dB) | Emission Level (dBuV/m) | Limit (dBuV/m) | Result |
|---|---|---|---|---|---|---|---|---|
| 11(Horizontal) | 2488.800 | 13.28 | 27.58 | 2.91 | 0.00 | 43.77 | 54 | Pass |
| 11 (Vertical) | 2483.500 | 13.15 | 27.58 | 2.91 | 0.00 | 43.64 | 54 | Pass |

**Figure Channel 11:** (Horizontal)

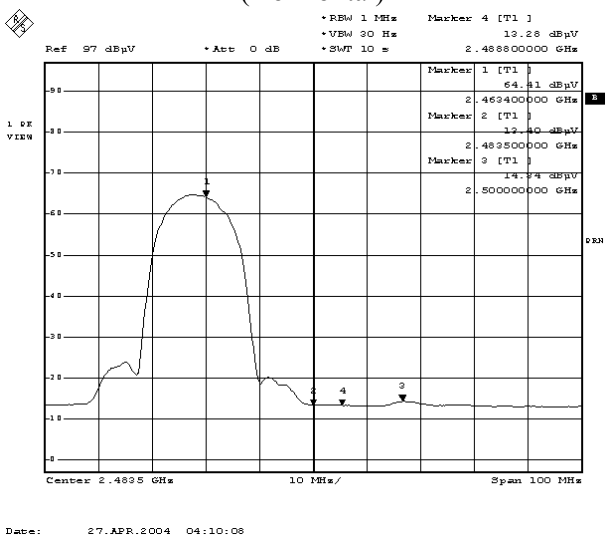
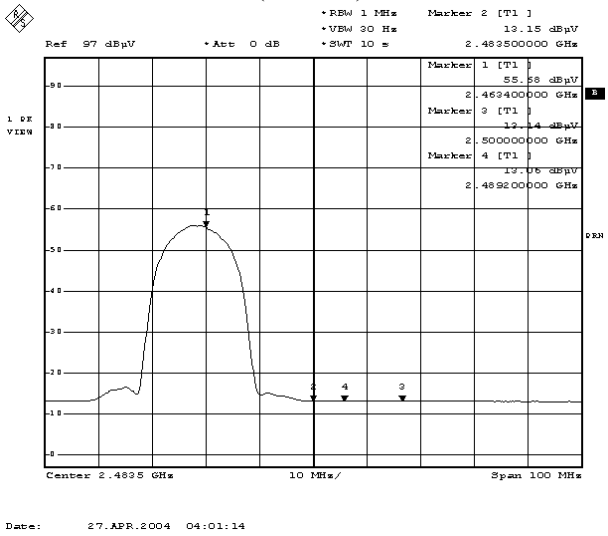



**Figure Channel 11:** (Vertical)




Note: The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Secure Outdoor Ethernet Radio Link
Test Item : Band Edge
Test Site : No.1 OATS
Test Mode : Mode 2: Secure Outdoor Etherent Radio Link W/ZyXEL Antenna (Channel 11)

**RF Radiated Measurement: (Peak Detector)**

| Channel No. | Frequency (MHz) | Reading Level (dBuV) | Probe Factor (dB/m) | Cable Loss (dB) | PreAMP (dB) | Emission Level (dBuV/m) | Limit (dBuV/m) | Result |
|---|---|---|---|---|---|---|---|---|
| 11(Horizontal) | 2492.400 | 22.90 | 27.58 | 2.91 | 0.00 | 53.39 | 74 | Pass |
| 11 (Vertical) | 2492.200 | 25.94 | 27.58 | 2.91 | 0.00 | 56.43 | 74 | Pass |

**Figure Channel 11:** (Horizontal)

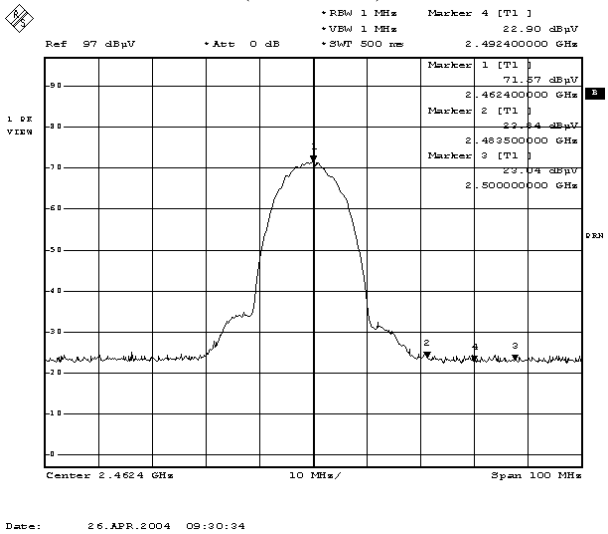
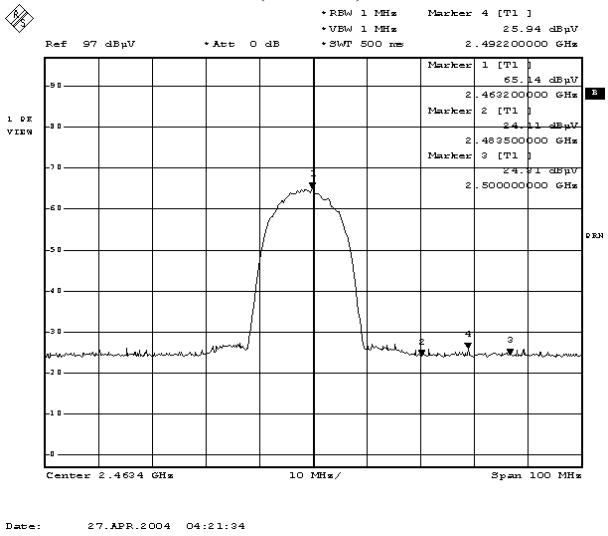



**Figure Channel 11:** (Vertical)



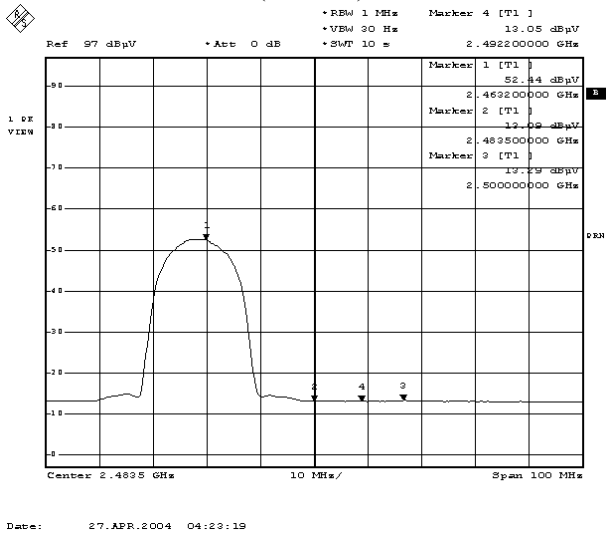

Note: The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Secure Outdoor Ethernet Radio Link
Test Item : Band Edge
Test Site : No.1 OATS
Test Mode : Mode 2: Secure Outdoor Etherent Radio Link W/ZyXEL Antenna (Channel 11)

**RF Radiated Measurement: (Average Detector)**

| Channel No. | Frequency (MHz) | Reading Level (dBuV) | Probe Factor (dB/m) | Cable Loss (dB) | PreAMP (dB) | Emission Level (dBuV/m) | Limit (dBuV/m) | Result |
|---|---|---|---|---|---|---|---|---|
| 11 (Vertical) | 2492.200 | 13.05 | 27.58 | 2.91 | 0.00 | 43.54 | 54 | Pass |

**Figure Channel 11:** (Vertical)




Note: The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

# 6. Occupied Bandwidth

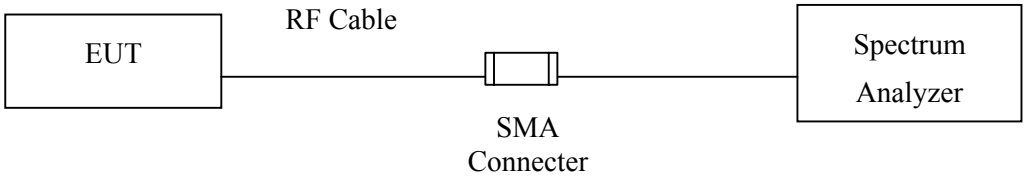
## 6.1. Test Equipment

The following test equipment are used during the test:

| Item | Equipment | Manufacturer | Model No. / Serial No. | Last Cal. | Remark |
|---|---|---|---|---|---|
| 1 | Spectrum Analyzer | R & S | FSP / 100561 | Mar., 2004 | |
| 2 | No.1 OATS | | | Sep., 2003 | |

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

## 6.2. Test Setup




## 6.3. Limits

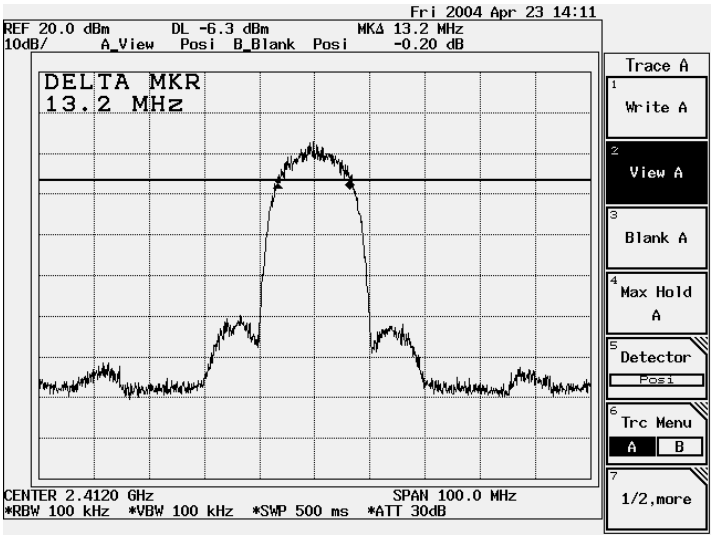
The minimum 6dB bandwidth shall be at least 500kHz.

## 6.4. Test Result of Occupied Bandwidth

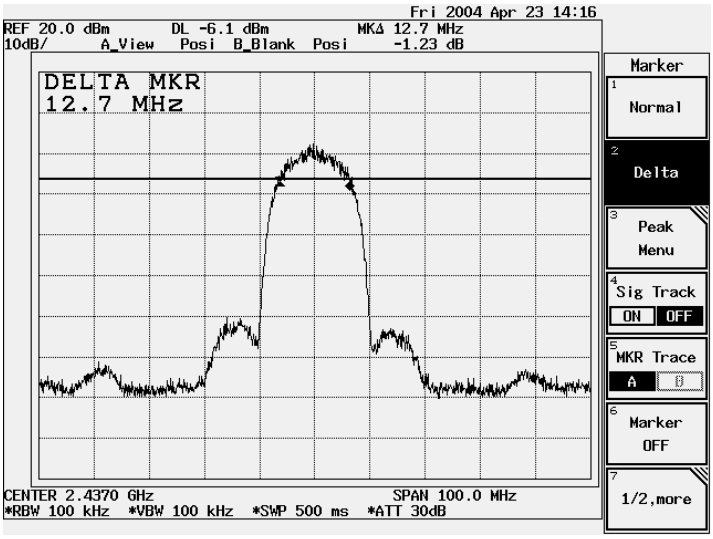
Product : Secure Outdoor Ethernet Radio Link
Test Item : Occupied Bandwidth
Test Site : No.1 OATS
Test Mode : Normal Operation

| Channel No. | Frequency (MHz) | Measurement Level (kHz) | Required Limit (kHz) | Result |
|---|---|---|---|---|
| 1 | 2412 | 13200 | >500 | Pass |
| 6 | 2437 | 12700 | >500 | Pass |
| 11 | 2462 | 12900 | >500 | Pass |

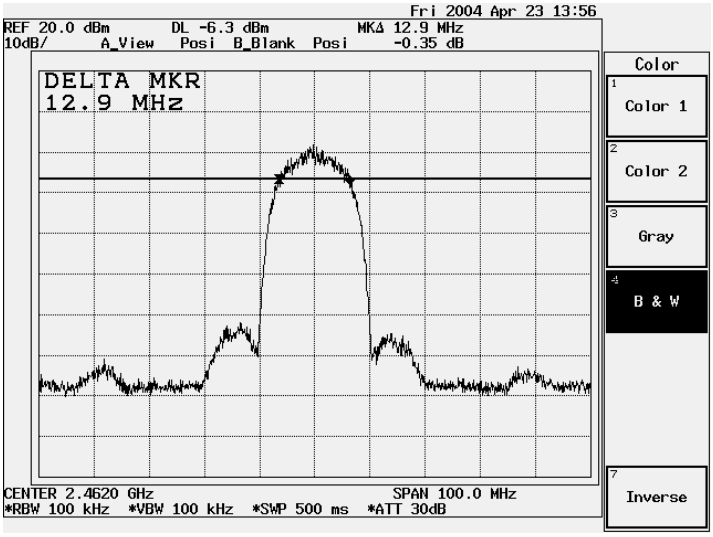
**Channel 1:**




**Channel 6**




**Channel 11:**



# 7. Power Density

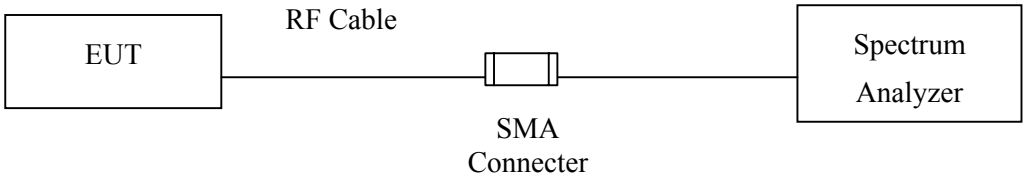
## 7.1. Test Equipment

The following test equipment are used during the test:

| Item | Equipment | Manufacturer | Model No. / Serial No. | Last Cal. | Remark |
|---|---|---|---|---|---|
| 1 | Spectrum Analyzer | R & S | FSP / 100561 | Mar., 2004 | |
| 2 | No.1 OATS | | | Sep., 2003 | |

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

## 7.2. Test Setup




## 7.3. Limits

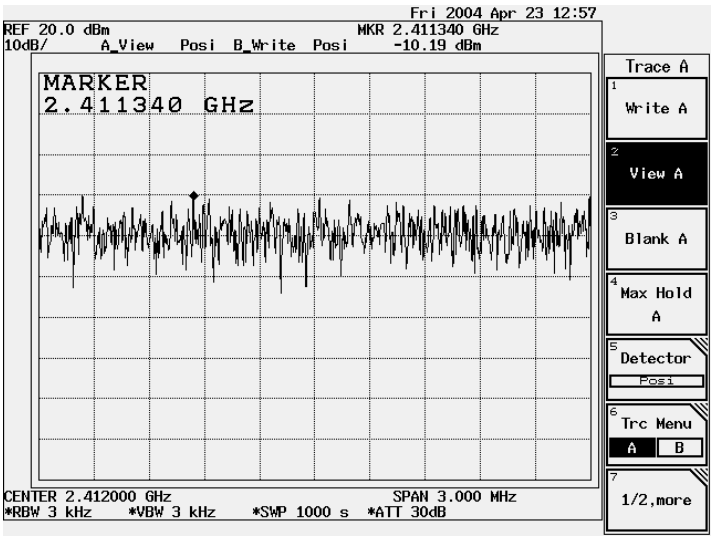
The transmitted power density averaged over any 1 second interval shall not be greater +8dBm in any 3kHz bandwidth.

## 7.4. Test Result of Power Density

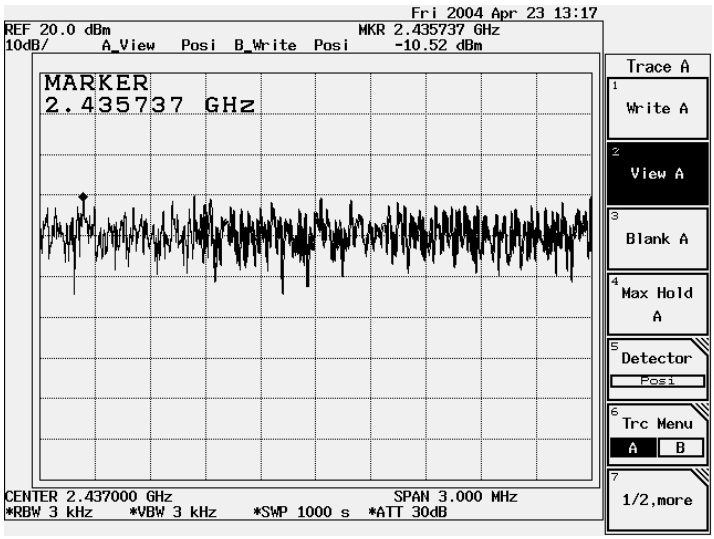
Product : Secure Outdoor Ethernet Radio Link
Test Item : Power Density
Test Site : No.1 OATS
Test Mode : Normal Operation

| Channel No. | Frequency (MHz) | Measurement Level (dBm) | Required Limit (dBm) | Result |
|---|---|---|---|---|
| 1 | 2411.340 | -10.19 | < 8dBm | Pass |
| 6 | 2435.737 | -10.52 | < 8dBm | Pass |
| 11 | 2460.737 | -10.98 | < 8dBm | Pass |

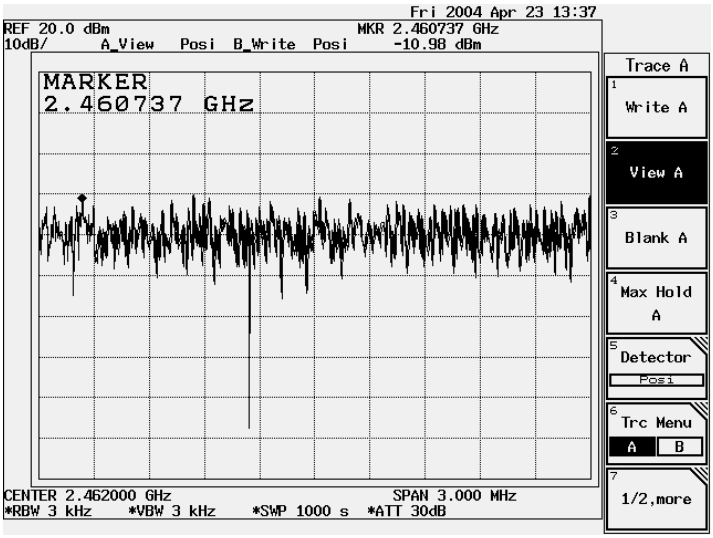
**Channel 1:**




**Channel 6**




**Channel 11:**



## 8. EMI Reduction Method During Compliance Testing

No modification was made during testing.

# Attachment 1: EUT Test Photographs

## Attachment 1: EUT Test Setup Photographs

Front View of Conducted Test (Mode 1)

Back View of Conducted Test (Mode 1)

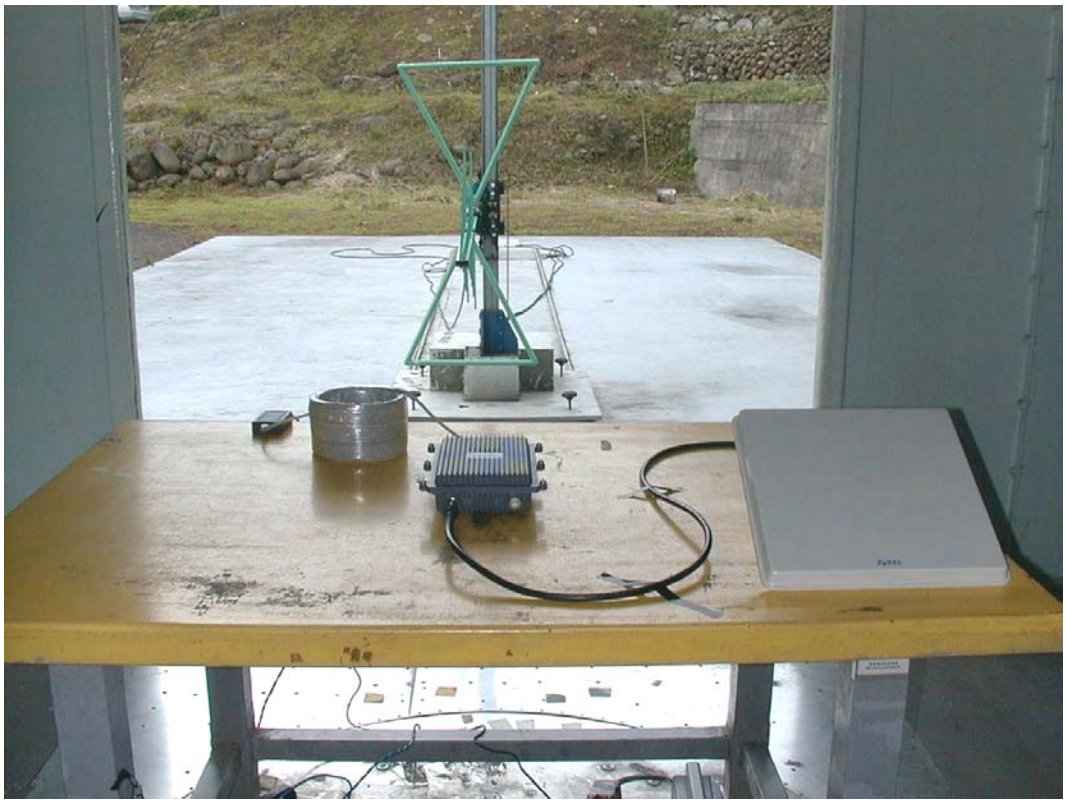
Front View of Conducted Test (Mode 2)

Back View of Conducted Test (Mode 2)

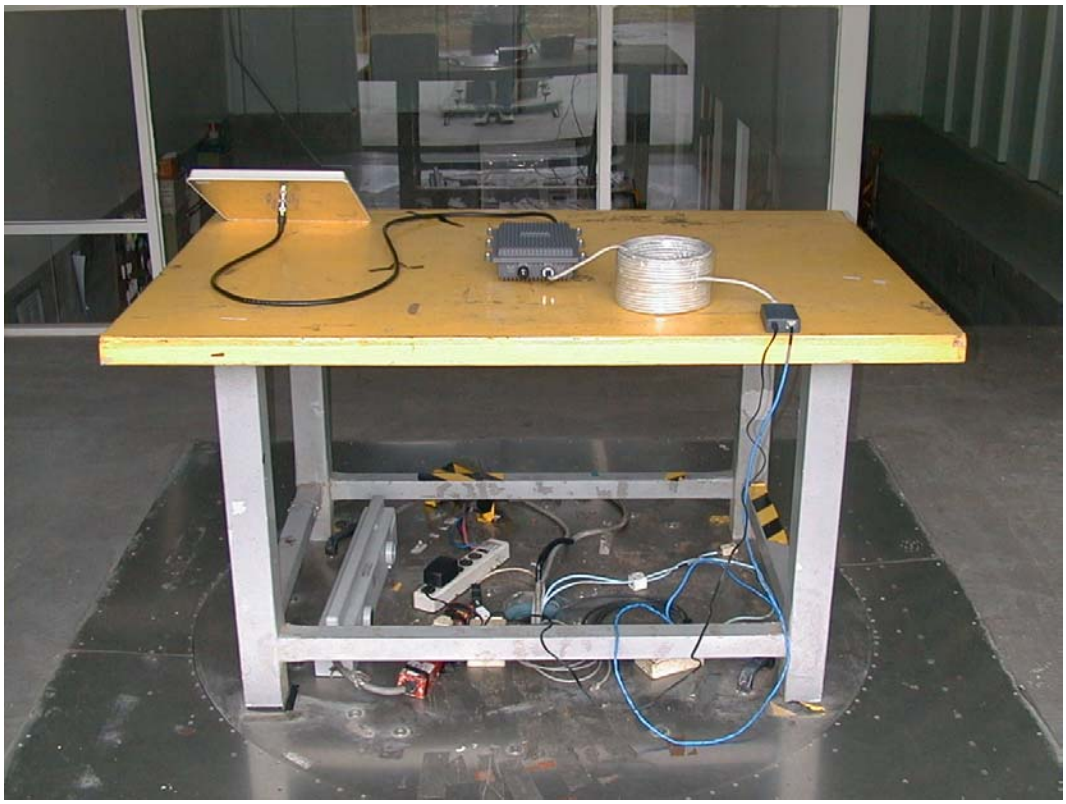
Front View of Radiated Test (Mode 1)

Back View of Radiated Test (Mode 1)

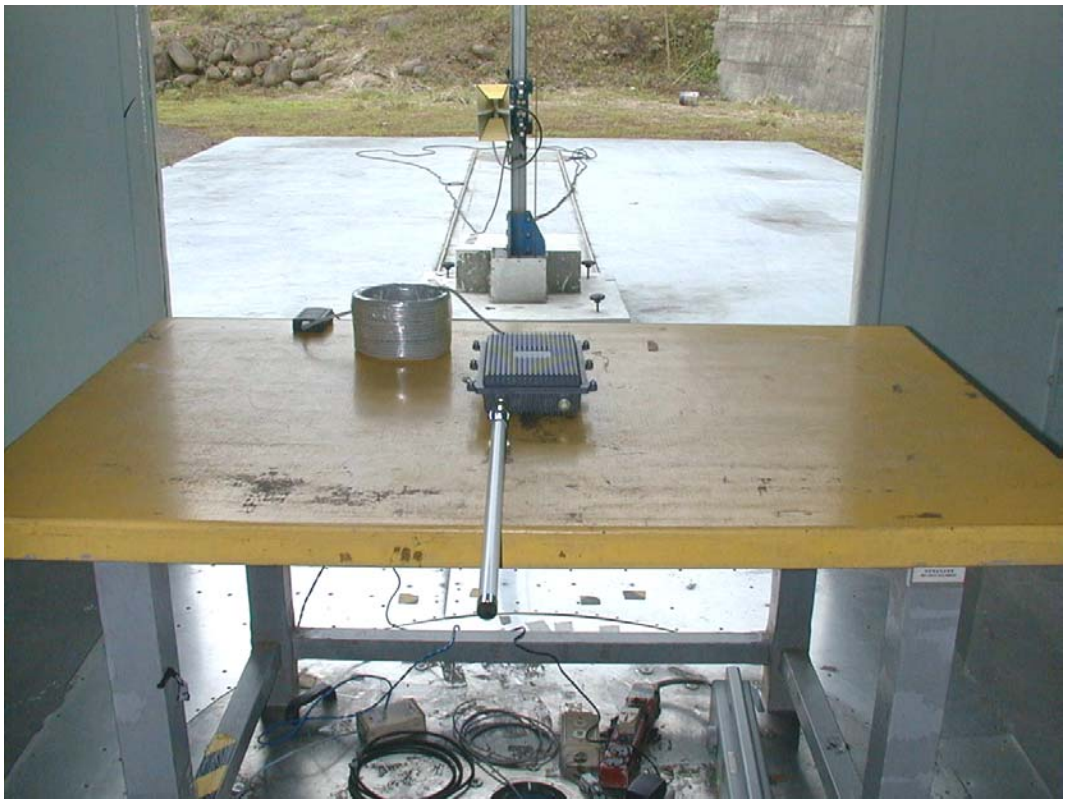
Front View of Radiated Test (Mode 2)



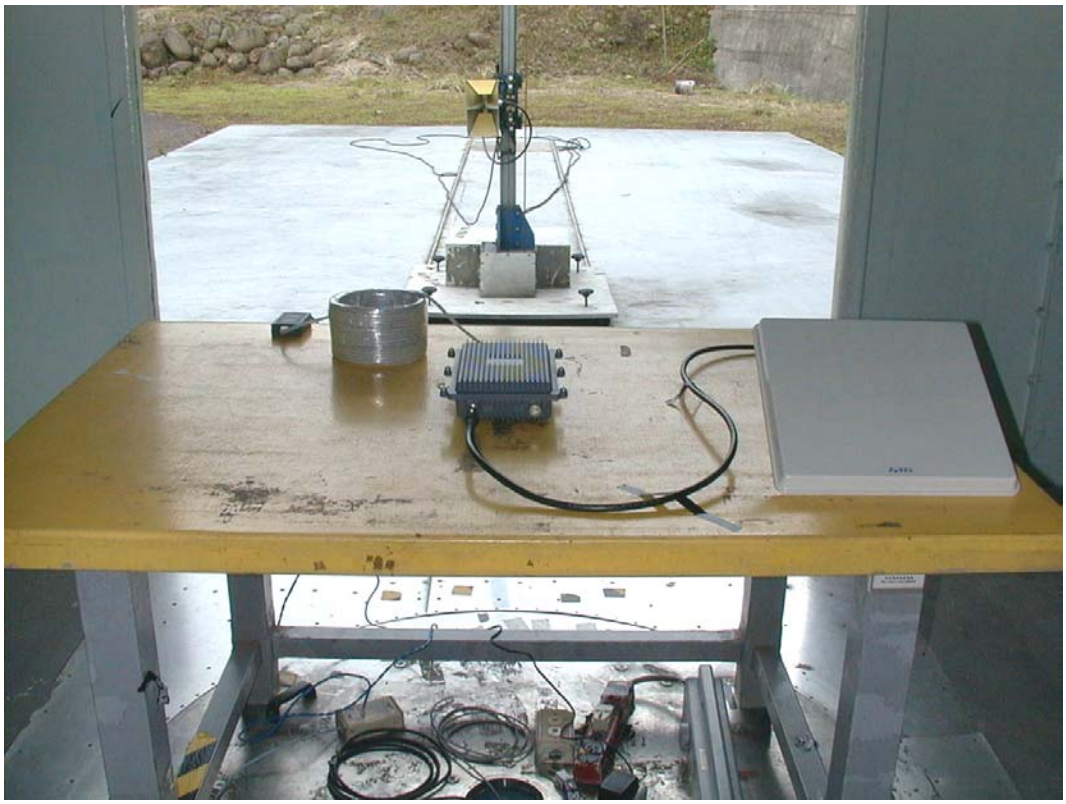
Back View of Radiated Test (Mode 2)



Front View of Radiated Test (Horn) (Mode 1)



Front View of Radiated Test (Horn) (Mode 2)



# Attachment 2: EUT Detailed Photographs

## Attachment 2 : EUT Detailed Photographs

Mode 1: Secure Outdoor Etherent Radio Link W/Procell Antenna (8 dBi)

(1) EUT Photo

(2) EUT Photo

(3) EUT Photo

(4) EUT Photo

Mode 2: Secure Outdoor Etherent Radio Link W/ZyXEL Antenna (16 dBi)
(5) EUT Photo

(6) EUT Photo

(7) EUT Photo

(8) EUT Photo

Secure Outdoor Etherent Radio Link W/ZyXEL Antenna (12 dBi)
(9) EUT Photo

(10) EUT Photo

(11) EUT Photo

(12) EUT Photo

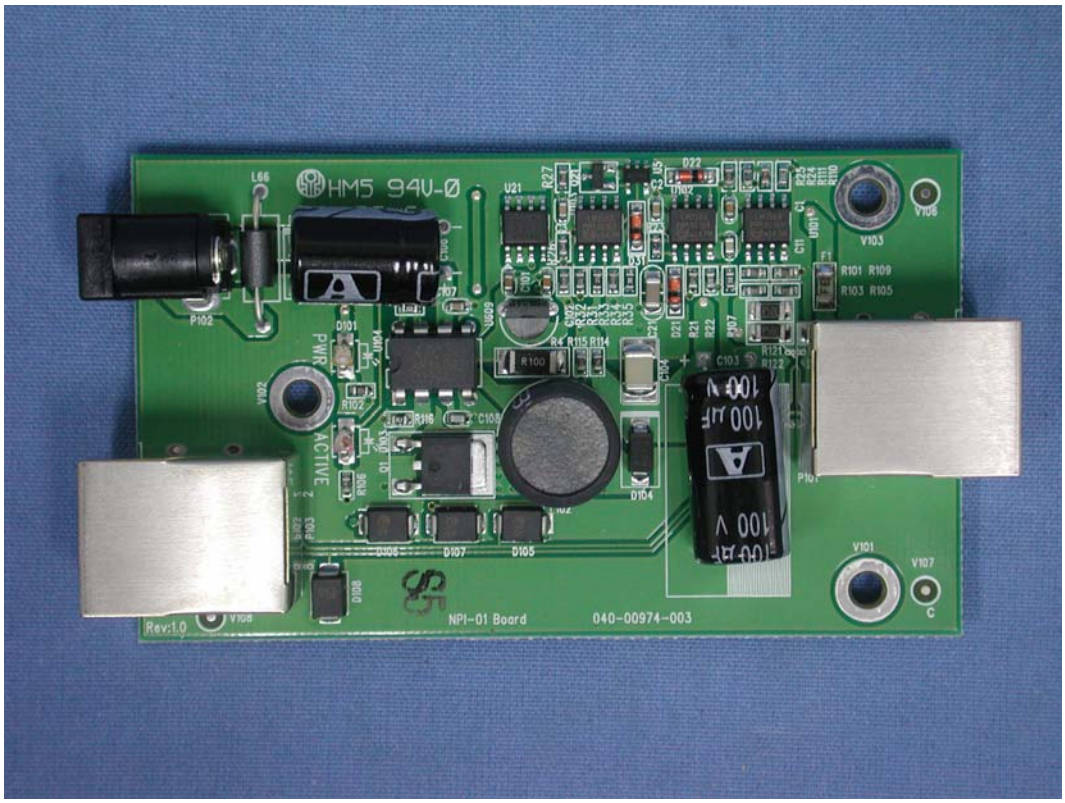
(13) EUT Photo

(14) EUT Photo

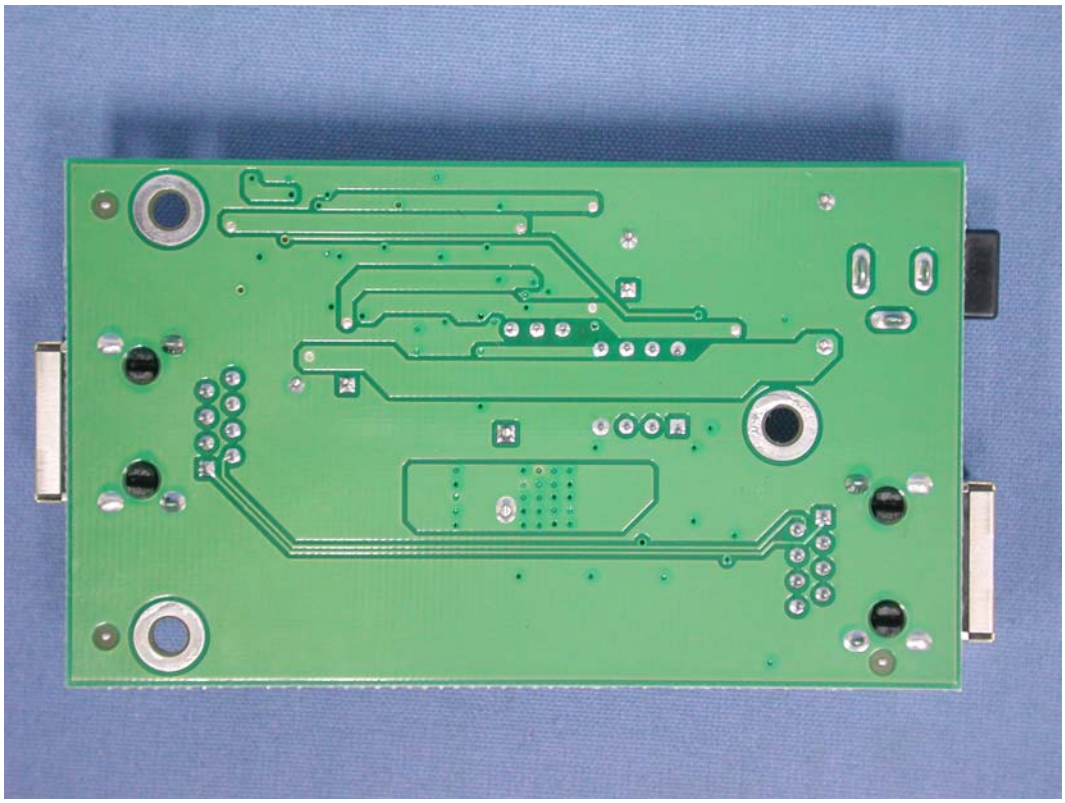
(15) EUT Photo

(16) EUT Photo

(17) EUT Photo



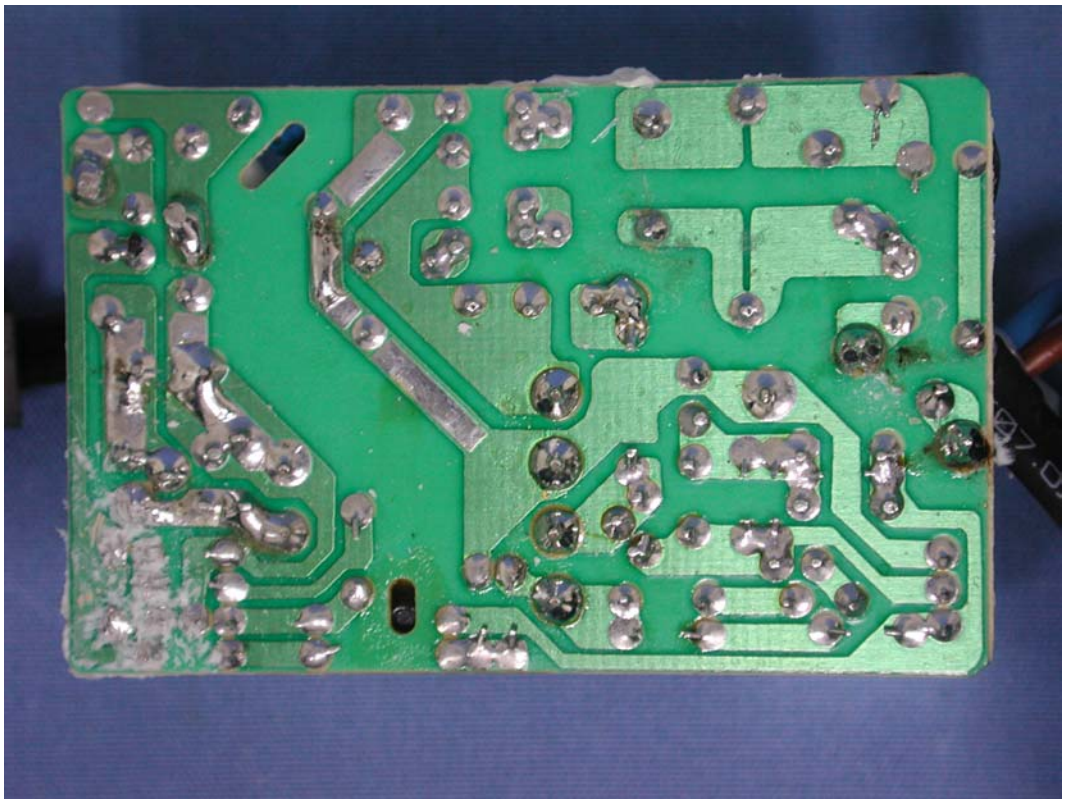

(18) EUT Photo



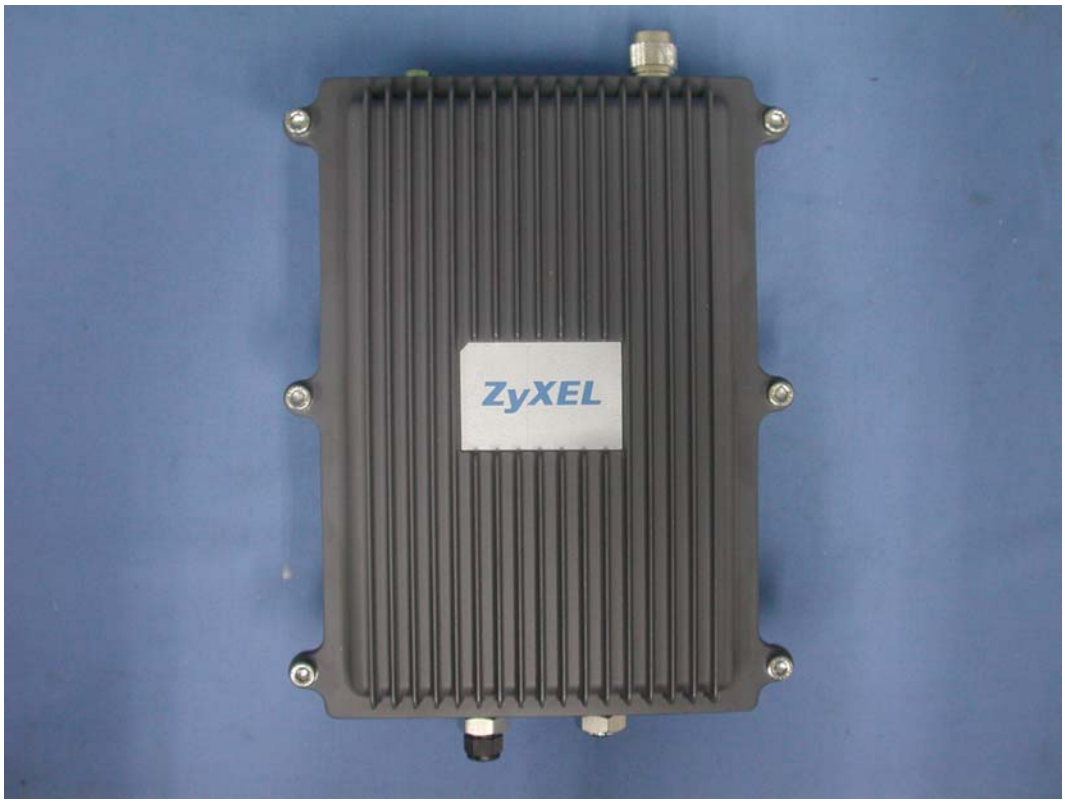
(19) EUT Photo

(20) EUT Photo

(21) EUT Photo

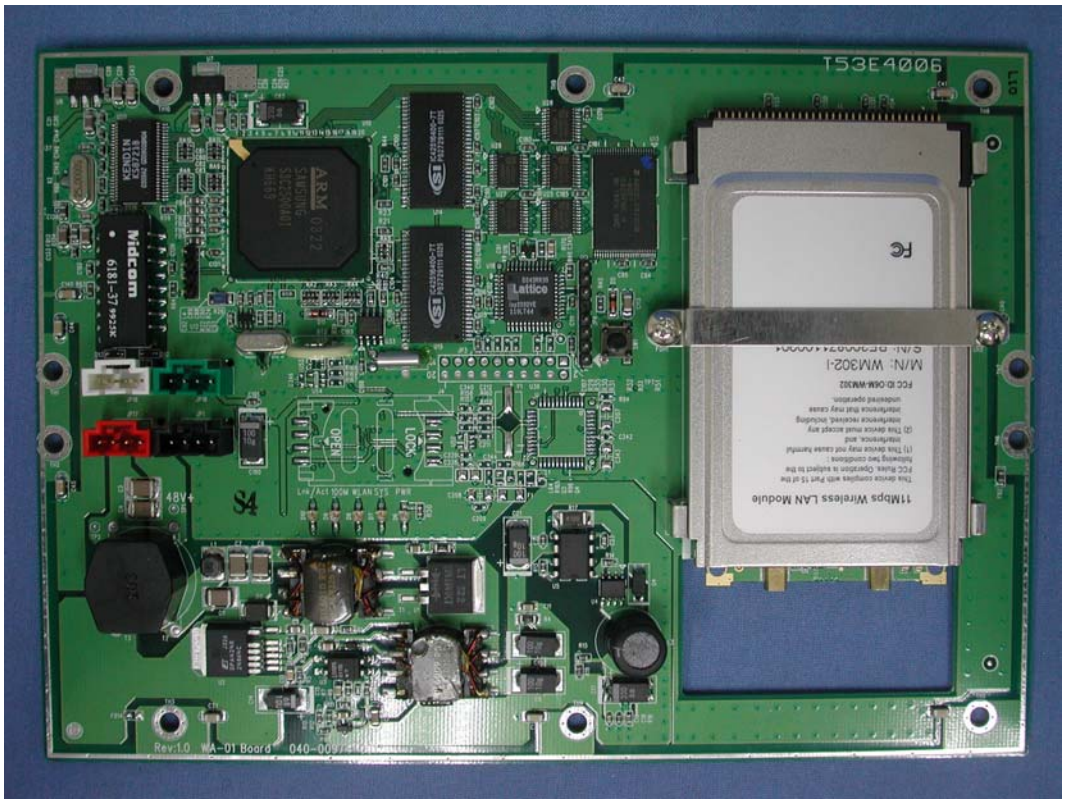


(22) EUT Photo

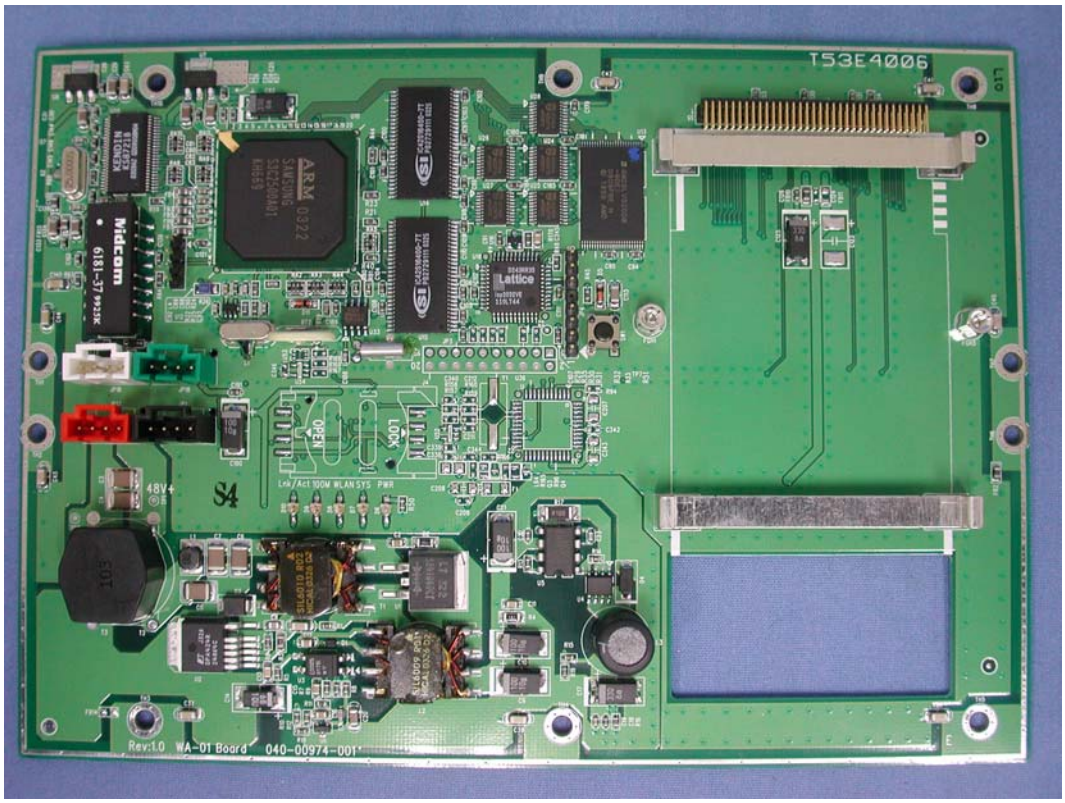


(23) EUT Photo

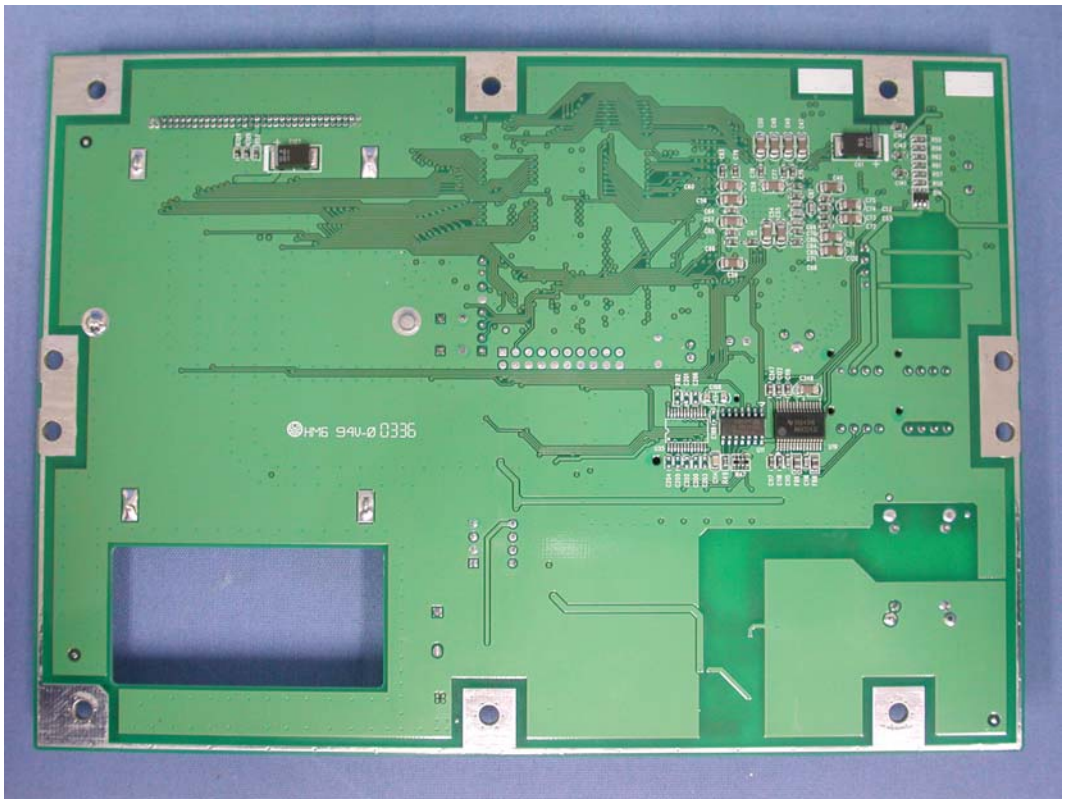
(24) EUT Photo



(25) EUT Photo



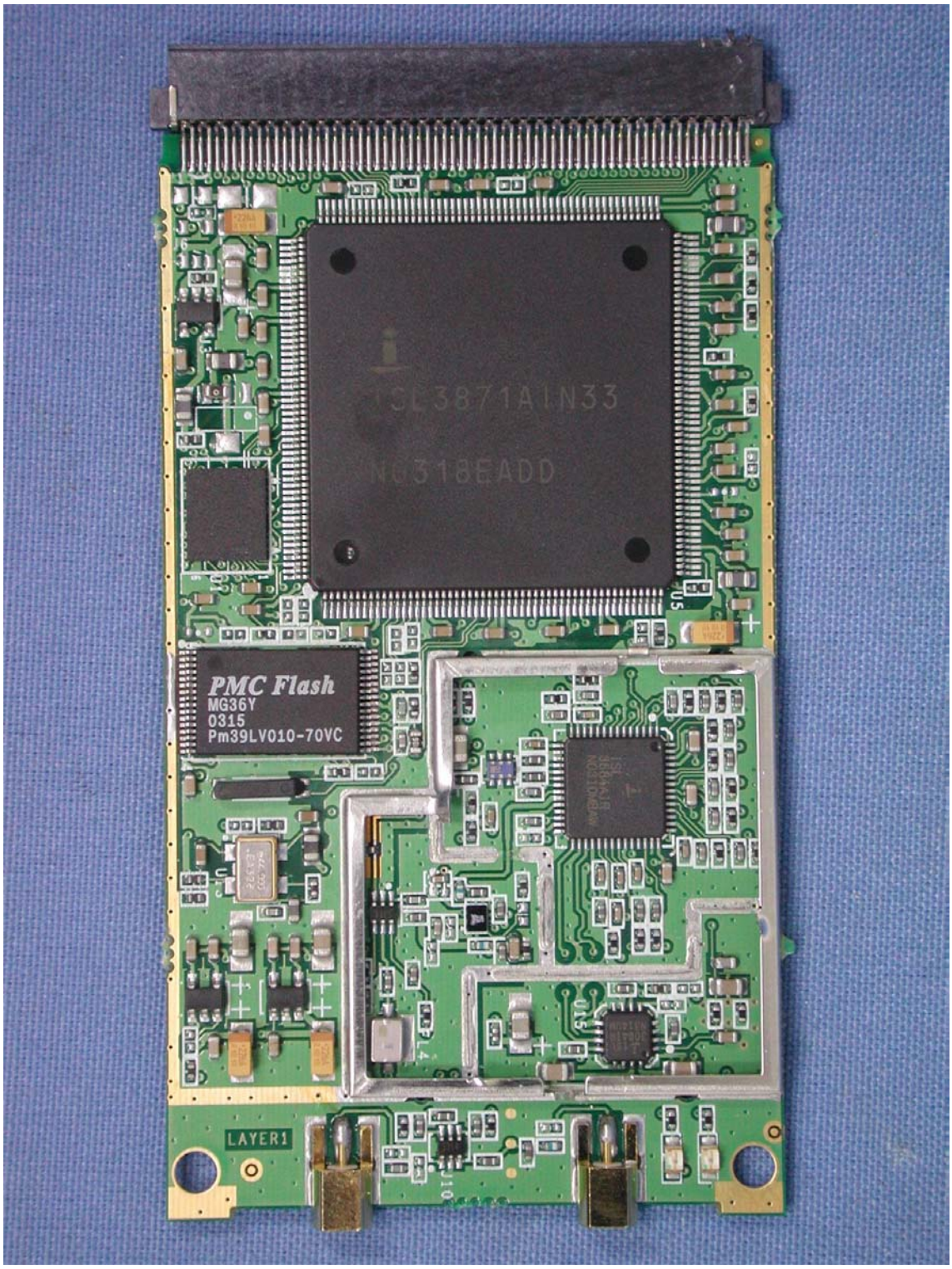

(26) EUT Photo



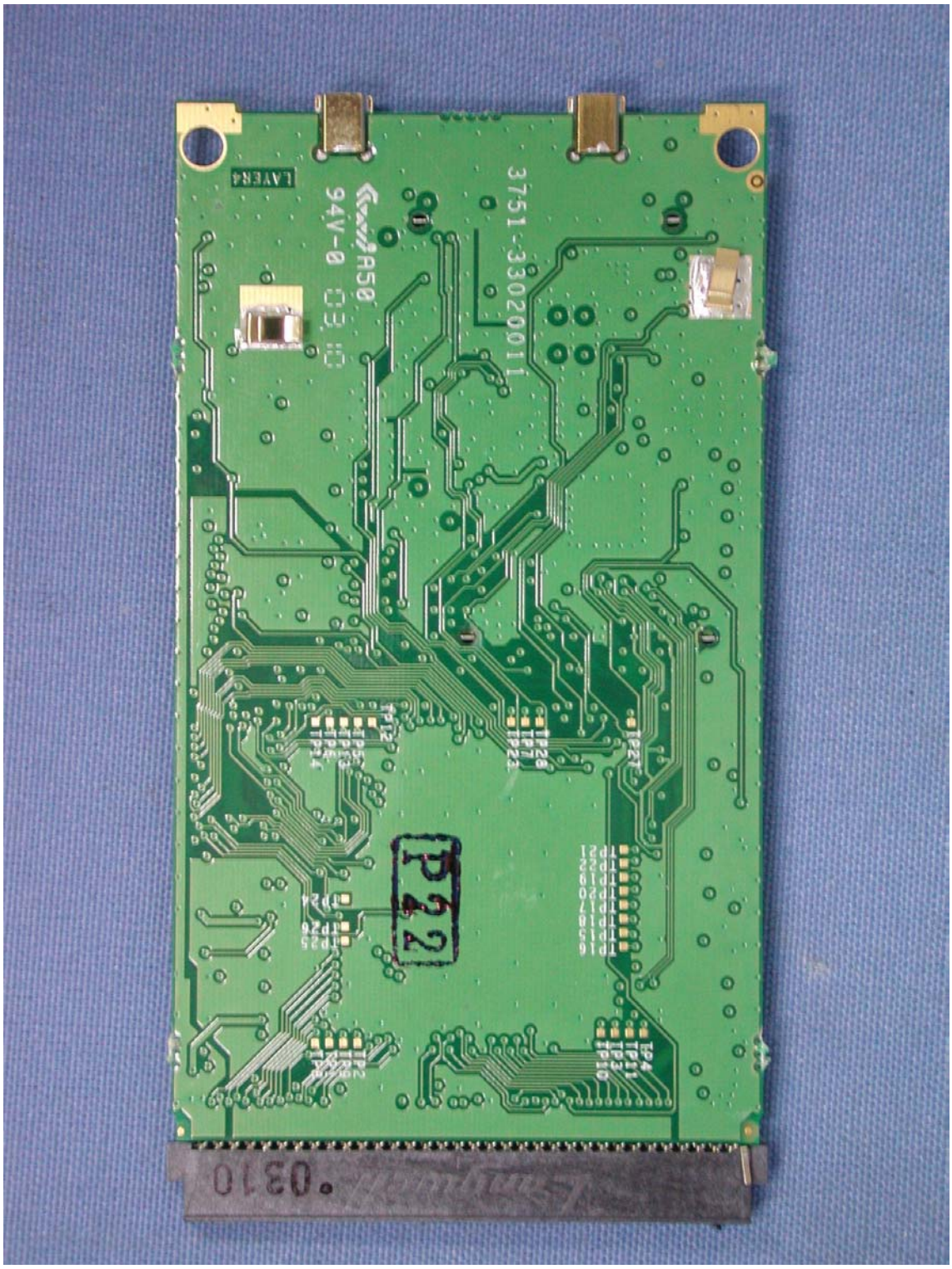
(27) EUT Photo

11Mbps Wireless LAN Module
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:O6M-WM302
M/N: WM302-I
S/N: BF390871100291

(28) EUT Photo



(29) EUT Photo



# RF Exposure Evaluation declaration

Product Name : Secure Outdoor Ethernet Radio Link
Model No.: ExpWave 240B, GateOne 240B
FCC ID.: R3N-GATEONE240B

Applicant : ZyGATE Communications Inc.
Address : 2F No. 48, Lung-Chin Road Lung-Tan, Taoyuan, Taiwan, R.O.C.

Date of Receipt : Apr. 21, 2004
Date of Declaration : Apr. 29, 2004
Report No. : 044H050FI

The declaration results relate only to the samples calculated.
The declaration shall not be reproduced except in full without the written approval of QuieTek Corporation.

# 1. RF Exposure Evaluation

## 1.1. Limits

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)
LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

| Frequency Range (MHz) | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density ($mW/cm^2$) | Average Time (Minutes) |
|---|---|---|---|---|
| (A) Limits for Occupational/ Control Exposures | | | | |
| 300-1500 | -- | -- | F/300 | 6 |
| 1500-100,000 | -- | -- | 5 | 6 |
| (B) Limits for General Population/ Uncontrolled Exposures | | | | |
| 300-1500 | -- | -- | F/1500 | 6 |
| 1500-100,000 | -- | -- | 1 | 30 |

F= Frequency in MHz

Friis Formula
Friis transmission formula: $Pd = (Pout*G)/(4*pi*r^2)$

Where
Pd = power density in $mW/cm^2$
Pout = output power to antenna in mW
G = gain of antenna in linear scale
Pi = 3.1416
R = distance between observation point and center of the radiator in cm

Pd id the limit of MPE, 1 $mW/cm^2$ . If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

## 1.2. Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.
The temperature and related humidity: 18℃and 78％ RH.

## 1.3. Test Result of RF Exposure Evaluation

Product : Secure Outdoor Ethernet Radio Link
Test Item : RF Exposure Evaluation
Test Site : No.1 OATS
Test Mode : Mode 1: Secure Outdoor Etherent Radio Link W/Procell Antenna

**Antenna Gain**

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 8.0dBi or 6.31 in linear scale.

**Output Power Into Antenna & RF Exposure Evaluation Distance:**

| Channel | Channel Frequency (MHz) | Output Power to Antenna (mW) | Power Density at R = 20 cm ($mW/cm^2$) |
|---|---|---|---|
| 1 | 2412.0 | 24.3781 | 0.0306 |
| 6 | 2437.0 | 22.5944 | 0.0284 |
| 11 | 2462.0 | 20.7491 | 0.0260 |

The power density Pd (4th column) at a distance of 20 cm calculated from the Friis transmission formula is far below the limit of 1 $mW/cm^2$.

Product : Secure Outdoor Ethernet Radio Link
Test Item : RF Exposure Evaluation
Test Site : No.1 OATS
Test Mode : Mode 2: Secure Outdoor Etherent Radio Link W/ZyXEL Antenna

**Antenna Gain**

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 16.0dBi or 39.81 in linear scale.

**Output Power Into Antenna & RF Exposure Evaluation Distance:**

| Channel | Channel Frequency (MHz) | Output Power to Antenna (mW) | Power Density at R = 20 cm ($mW/cm^2$) |
|---|---|---|---|
| 1 | 2412.0 | 24.3781 | 0.1931 |
| 6 | 2437.0 | 22.5944 | 0.1789 |
| 11 | 2462.0 | 20.7491 | 0.1643 |

The power density Pd (4th column) at a distance of 20 cm calculated from the Friis transmission formula is far below the limit of 1 $mW/cm^2$.