

## ***Measurement of MPE***

### **1. Foreword**

In adopt with the Human Exposure IEEE C95.1, and according to the FCC 1.1310. The *Maximum Permissible Exposure (MPE)* is obligated to measure in order to prove the safety of radiation harmfulness to the human body.

The *Gain* of the antenna used is measured in an *Anechoic chamber*. The *maximum total power to the antenna* is to be recorded. By adopting the ***Friis Transmission Formula*** and the *power gain of the antenna*, we can find the distance right away from the product, where the limit of the MPE is.

### **2. Description of EUT**

|                          |   |                                                                                                                                                                                                                                                            |
|--------------------------|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Granted FCC ID</b>    | : | NDD9571260303                                                                                                                                                                                                                                              |
| <b>Product name</b>      | : | Wireless LAN PCI Card                                                                                                                                                                                                                                      |
| <b>Model name</b>        | : | EW-7126; GWA-E16; DN-7006                                                                                                                                                                                                                                  |
| <b>Classification</b>    | : | Mobile Device<br>(i) Under normal use condition, the antenna is at least 20cm away from the user;<br>(ii) Warning statement for keeping 20cm separation distance and the prohibition of operating next to the person has been printed in the user's manual |
| <b>Frequency Range</b>   | : | 2.412 GHz ~ 2.462GHz                                                                                                                                                                                                                                       |
| <b>Supported Channel</b> | : | 11 Channel                                                                                                                                                                                                                                                 |
| <b>Modulation Skill</b>  | : | DBPSK, DQPSK, CCK                                                                                                                                                                                                                                          |
| <b>Power Type</b>        | : | by the PCI interface of computer                                                                                                                                                                                                                           |

### 3. Limits for Maximum Permissible Exposure (MPE)

| Frequency Range (MHz)                                          | Electric Field Strength (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/cm <sup>2</sup> ) | Averaging Time  E  <sup>2</sup> ,  H  <sup>2</sup> or S (minutes) |
|----------------------------------------------------------------|-------------------------------|-----------------------------------|-----------------------------------------|-------------------------------------------------------------------|
| <b>(A) Limits for Occupational/Controlled Exposure</b>         |                               |                                   |                                         |                                                                   |
| 0.3-3.0                                                        | 614                           | 1.63                              | 100                                     | 6                                                                 |
| 3.0-30                                                         | 1842/f                        | 4.89/f                            | 900/f <sup>2</sup>                      | 6                                                                 |
| 30-300                                                         | 61.4                          | 0.163                             | 1.0                                     | 6                                                                 |
| 300-1500                                                       | --                            | --                                | f/300                                   | 6                                                                 |
| 1500-100,000                                                   | --                            | --                                | 5                                       | 6                                                                 |
| <b>(B) Limits for General Population/Uncontrolled Exposure</b> |                               |                                   |                                         |                                                                   |
| 0.3-1.34                                                       | 614                           | 1.63                              | 100                                     | 30                                                                |
| 1.34-30                                                        | 824/f                         | 2.19/f                            | 180/f <sup>2</sup>                      | 30                                                                |
| 30-300                                                         | 27.5                          | 0.073                             | 0.2                                     | 30                                                                |
| 300-1500                                                       | --                            | --                                | f/1500                                  | 30                                                                |
| 1500-100,000                                                   | --                            | --                                | 1.0                                     | 30                                                                |

[The EUT is tested in transmit and receive modes and in the first, middle and the last channel separately. The following shows only our observation have the greatest emissions.]

According to OET BULLETIN 56 Fourth Edition / August 1999, Equation for Predicting RF Fields:

**Friis Transmission Formula:** 
$$S = \frac{PG}{4\pi R^2} = \frac{74.989 \times 1.122}{4\pi (20)^2} = 1.674 \times 10^{-2} \text{ mW/cm}^2$$

**Estimated safe separation:** 
$$R = \sqrt{\frac{PG}{4\pi}} = \sqrt{\frac{74.989 \times 1.122}{4\pi}} = 2.587 \text{ cm}$$

Remarks: "The safe estimated separation that the user must maintain from the antenna is at least 2.587 cm."

Where: S = power density (in appropriate units, e.g. mW/cm<sup>2</sup>)

P = power input to the antenna (in appropriate units, e.g., mW)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

The Numeric gain G of antenna with a gain specified in dB is determined by:

$$G = \text{Log}^{-1} (\text{dB antenna gain} / 10)$$

$$G = \text{Log}^{-1} (0.5 / 10) = 1.122$$

|                                          |                                  |                                                  |
|------------------------------------------|----------------------------------|--------------------------------------------------|
| <b>NInput Output</b><br>Enterprise Corp. | <b>PRODUCT<br/>SPECIFICATION</b> | DOC. No: WL-TL-17<br>DATE: 25-MAR-02<br>REV. : C |
|------------------------------------------|----------------------------------|--------------------------------------------------|

PRODUCT NAME

2.4G ANTENNA WITH RP SMA

PART NUMBER



W111-094-D200

**Signed By Customers**

Approved By:

供應商： 垠 旺 精 密 股 份 有 限 公 司

TEL:02-2917-7528;FAX:02-2912-1659

台北縣新店市寶興路 37 號 3 樓

# W111-094-D200 2.4G ANTENNA

## SPECIFICATION

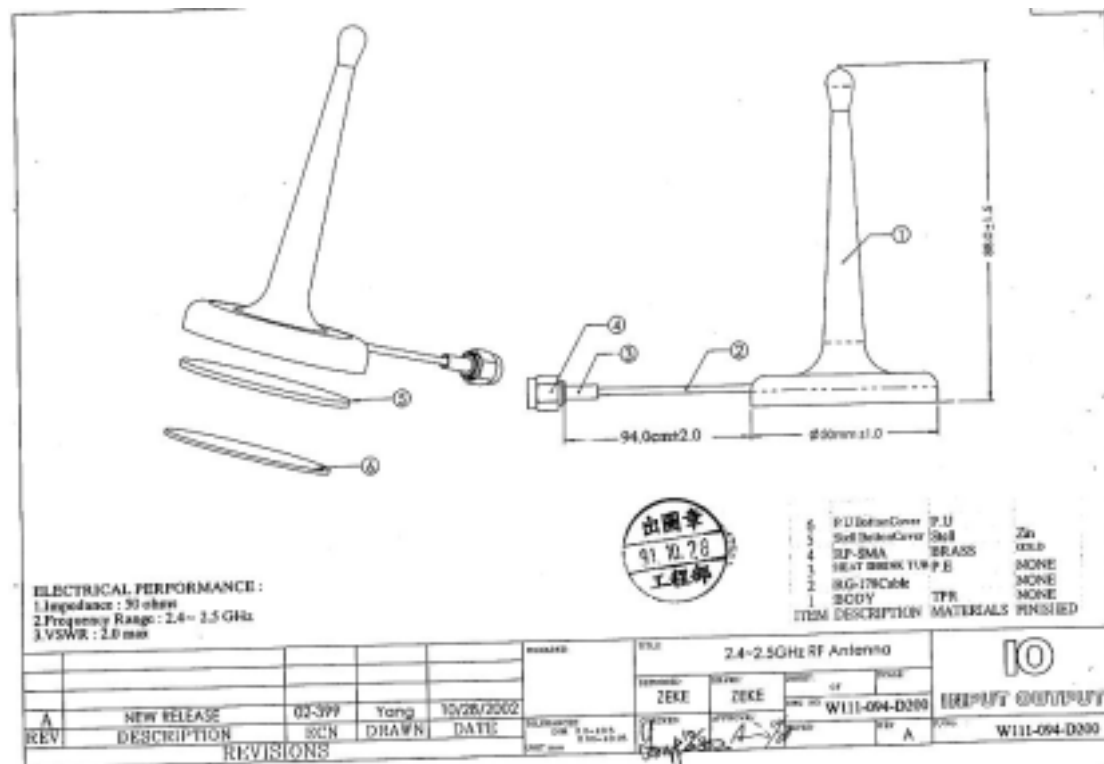
### 1. Electrical Properties

- 1-1 Frequency Range .....2.4~2.5GHz
- 1-2 Impedance.....50 Ohms nominal
- 1-3 V.S.W.R.....2.0 (Max.)
- 1-4 Return Loss.....-10.0 dB(Min.)
- 1-5 Max. Gain .....0.5dBi
- 1-6 Polarization..... Vertical
- 1-7 Admitted Power.....1W
- 1-8 Electrical Wave.....1/4 λ Dipole

### 2. Mechanical Properties

- 2-1 Connector.....Reverse SMA Plug Straight
- 2-2 Cable.....RG178
- 2-3 Antenna Body.....T.P.R.
- 2-4 Operating Temperature Range.....-20 ~ +50
- 2-5 Storage Temperature Range..... -20 ~ +50

# 工程成品圖



**WILTRON**

360 NETWORK ANALYZER

MODEL: W111-094-d200  
DEVICE ID:

DATE:  
OPERATOR:

Page

**SWEEP DATA**

START: 2.3080 GHz  
STOP: 2.5960 GHz  
STEP: 0.0180 GHz

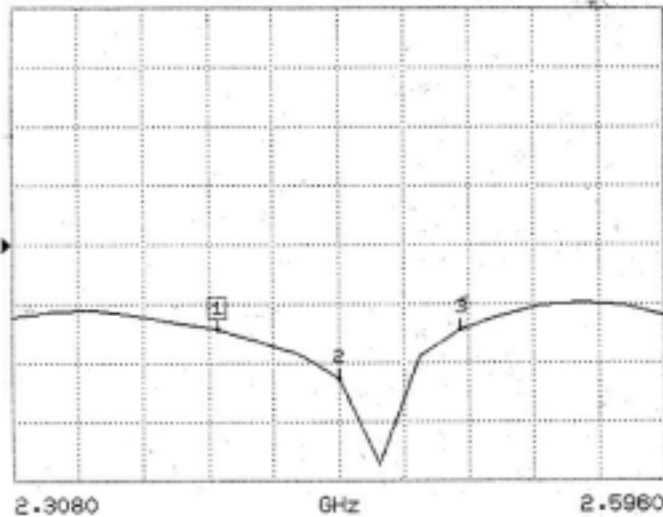
GATE START: -  
GATE STOP: -  
GATE: -  
WINDOW: -

ERROR CORR: REFL ONLY  
AVERAGING: 1 PTS  
IF BNDWIDTH: REDUCED

-----CH1-----  
PARAMETER: S11  
NORMALIZATION: OFF  
REFERENCE PLANE: 0.0000 mm  
SMOOTHING: 0.0 PERCENT  
DELAY APERTURE:

**S11 FORWARD REFLECTION**

LOG MAG. REF=0.000dB 10.000dB/DIV



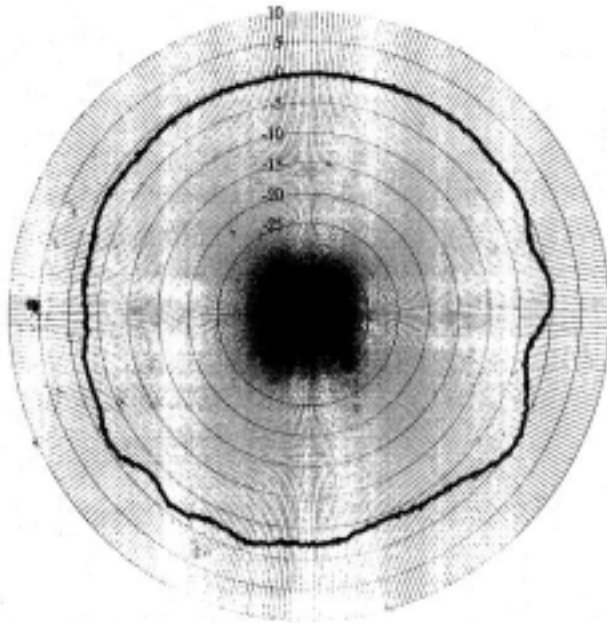
CH 1 - S11  
REF. PLANE  
0.0000 mm

MARKER 1  
2.3980 GHz  
-14.366 dB

MARKER TO MAX  
MARKER TO MIN

2 2.4520 GHz  
-22.720 dB

3 2.5060 GHz  
-14.315 dB



## IO ANTENNA PATTEM

ANTENNA TEST NO: W111-094-d200

TEST DATE: 2002/09/13

TEST FREQUENCY: 2450MHz

TEST POLARIZATION: VERTICAL  
(H-PLANE)

TEST ANTENNA: HORN ANTENNA

TEST CHAMBER: RF CHAMBER

TEST PERSONNEL: Yang

MAX GAIN: 0.55 dBi

MIN GAIN: -4.21 dBi

AVE GAIN: -1.47 dBi

**CABLE SPECIFICATION**

|                            |
|----------------------------|
| SPECIFICATION FOR APPROVAL |
|----------------------------|

DOCUMENT: A30178B001

STYLE : 200 30V  
RG-178B/U

SIZE: 7/0.102 SCCS

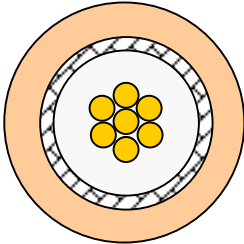
RECOGNIZED:

|                              |
|------------------------------|
| WONDERFUL WIRE CABLE CO.,LTD |
|------------------------------|

**WONDERFUL WIRE CABLE CO.,  
LTD**

**SPECIFICATION**

|                     |                    |                                 |                                       |
|---------------------|--------------------|---------------------------------|---------------------------------------|
| STYLE               | 200 30V<br>COAXIAL | DOCUMENT NO :<br>A30178B001     |                                       |
| SIZE                | RG-178B/U          | ESTABLISHED DATE:<br>2000/06/29 |                                       |
| STANDARD : MIL-C-17 |                    |                                 |                                       |
| Conductor           | Size               | AWG                             | 30                                    |
|                     | Material           | ----                            | Silver-Coated<br>Copper<br>Clad Steel |
|                     | Conductors No.     | ----                            | 7                                     |
|                     | Conductors Size    | mm                              | 0.102                                 |
|                     | O.D.               | mm                              | 0.30                                  |
| Insulation          | Average Thickness  | mm                              | 0.28                                  |
|                     | Diameter           | mm                              | 0.86                                  |

|         |                                                                                      |      |                         |
|---------|--------------------------------------------------------------------------------------|------|-------------------------|
|         | Material                                                                             | ---- | FEP                     |
|         | Color                                                                                | ---- | Clear                   |
| Braid   | Material                                                                             | ---- | Silver-Coated<br>Copper |
|         | Construction                                                                         | mm   | 16 / 3 / 0.10           |
|         | Coverage                                                                             | %    | 95                      |
| Jacket  | Average Thickness                                                                    | mm   | 0.25                    |
|         | Diameter                                                                             | mm   | 1.80 ±0.05              |
|         | Material                                                                             | ---- | FEP                     |
|         | Color                                                                                | ---- |                         |
| Marking | M17/93-RG178B/U WONDERFUL                                                            |      |                         |
| Drawing |  |      |                         |

AK001/210X297/1.0

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EDITION : 1.0

MAKER :

CONFIRM :

REVISED DATE :

APPROVAL :

# WONDERFUL WIRE CABLE CO., LTD

## SPECIFICATION

| Electrical & Physical Properties |        |                  |                                            |        |        |      |
|----------------------------------|--------|------------------|--------------------------------------------|--------|--------|------|
| Item                             |        |                  | RG-178B/U                                  |        |        |      |
| Rating Temp Voltage              |        |                  | 200      30V                               |        |        |      |
| Conductor Resistance             |        |                  | 838.0      OHM/KM/20<br>MAX                |        |        |      |
| Insulation Resistance            |        |                  | 100 MEGA OHM/KM MIN.                       |        |        |      |
| Dielectric Strength              |        |                  | AC 1.0 KV/Minute                           |        |        |      |
| Spark Test                       |        |                  | 0.5 KV                                     |        |        |      |
| Insulation                       | Unaged | Tensile Strength | 2500 PSI MIN.( 1.76 Kg / mm <sup>2</sup> ) |        |        |      |
|                                  |        | Elongation       | 200% MIN.                                  |        |        |      |
|                                  | Aged   | Tensile Strength | UNAGED<br>MIN 75%(168HRS×232 )             |        |        |      |
|                                  |        | Elongation       | UNAGED<br>MIN 75%(168HRS×232 )             |        |        |      |
| Jacket                           | Unaged | Tensile Strength | 2500 PSI MIN.( 1.76 Kg / mm <sup>2</sup> ) |        |        |      |
|                                  |        | Elongation       | 200% MIN.                                  |        |        |      |
|                                  | Aged   | Tensile Strength | UNAGED<br>MIN 75%(168HRS×232 )             |        |        |      |
|                                  |        | Elongation       | UNAGED<br>MIN 75%(168HRS×232 )             |        |        |      |
| Nom. Impedance                   |        |                  | 50 Ohms                                    |        |        |      |
| VSWR                             |        |                  | MAX. 1.3 at 0.4G~3GHz                      |        |        |      |
| Nom. Vel. of Prop.               |        |                  | 69.5%                                      |        |        |      |
| Flame Test                       |        |                  | VW-1 OK                                    |        |        |      |
| Attenuation (dB/100m)            | 50MHz  | 100MHz           | 400MHz                                     | 900MHz | 1.8GHz | 3GHz |

|  |      |      |      |       |       |       |
|--|------|------|------|-------|-------|-------|
|  | 34.4 | 45.9 | 91.8 | 139.4 | 207.5 | 308.2 |
|--|------|------|------|-------|-------|-------|

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