

Measurement of Maximum Permissible Exposure

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

FCC ID	:	NHPWLG2002
Product name	:	802.11g Wireless Access Point
Classification	:	Mobile Device (i) Under normal use condition, the antenna is at least 20cm away from the user; (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
Frequency Range	:	2.412 GHz ~ 2.462GHz
Supported Channel	:	11 Channels
Modulation Skill	:	DBPSK, DQPSK, CCK, OFDM
Power Type	:	Powered by the adapter

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 ²)	Averaging Time E ² , H ² or S (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	100	6
3.0-30	1842/f	4.89/f	900/f ²	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	100	30
1.34-30	824/f	2.19/f	180/f ²	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:

$$\text{Friis Transmission Formula: } S = \frac{PG}{4pR^2} = \frac{100 \times 1.585}{4p(20)^2} = 0.0315 \text{ mW} / \text{cm}^2$$

$$\text{Estimated safe separation: } R = \sqrt{\frac{PG}{4p}} = \sqrt{\frac{100 \times 1.585}{4p}} = 3.551 \text{ cm}$$

Remarks: "The safe estimated separation that the user must maintain from the antenna is at least 3.551 cm."

Where: S = power density (in appropriate units, e.g. mW/cm²)

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:

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

$$G = \text{Log}^{-1} (2.0 / 10) = 1.585$$

Appendix

Antenna Specification

承 認 書

SPECIFICATION FOR APPROVAL

客戶名稱:友勁科技股份有限公司

客戶料號：11722B028A56*00

品名：Antenna+cable(85MM) 嵌入式天線 2.45G//WLB-2006

製造商料號：CA-245-103

承 認 欄	
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中華民國 92 年 9 月 10 日

公司名稱：福陸林企業有限公司

公司地址：新竹市勝利路 224 號

公司電話：TEL:03-5256038 FAX：03-5244079

E-mail：wavemate@ms45.hinet.net



SPECIFICATION-ELECTRIC

***PART NO. : 友勁件號: 11722B028A56*00**

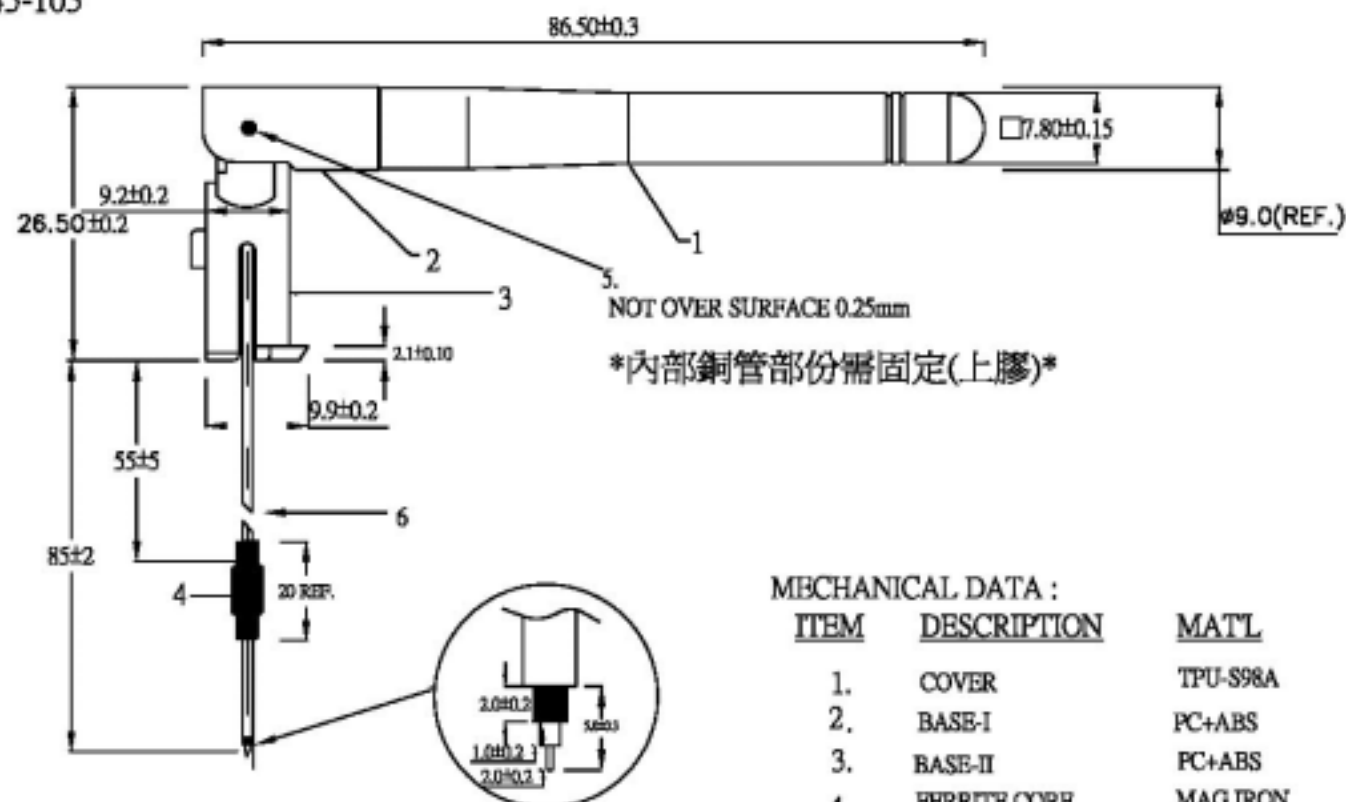
福陸林件號 : CA-245-103

- **CUSTOMER'S NAME : 友勁科技股份有限公司**
- **PART NAME : Antenna+cable(85mm) 嵌式天線 2.45G**
WLB-2006

1.	WORKING FREQUENCY	2.400-2.500GHz
2.	ELECTRIC WAVE	$1/2 \lambda$: DIPOLE
3.	IMPEDANCE	50 Ohm , Nominal
4.	V.S.W.R	2.0 MAX
5.	GAIN	2.0 dBi
6.	RADIATION	Omni
7.	POLARIZATION	VERTICAL
8.	POWER HANDLING	1 W MAX
9.	OPERATING TEMPERATURE	-20°C -- +50°C

友勁料號:11722B028A56*00

福陸林料號:CA-245-103



SOLDER-DIPPED FOR
CENTER-CONTACT
AND GROUND LAYER

MECHANICAL DATA :

ITEM	DESCRIPTION	MATL	FINISH
1.	COVER	TPU-S98A	LIGHT GRAY
2.	BASE-I	PC+ABS	LIGHT GRAY
3.	BASE-II	PC+ABS	LIGHT GRAY
4.	FERRITE CORE	MAG IRON	BLACK
5.	RIVET	BRASS	CR-PLATED
6.	RG178	PEP/BRASS	TINT/BROWN

福陸林企業有限公司 TEL:886-3-5256038			CHECKED : TONY
FLUORORINED PRODUCTS CO.,LTD FAX:886-3-5244079			UNIT: MM
TITLE : 2.45GHZ DIPOLE ANTENNA			TOLERANCE: AS SPEC.
DWG NO. : CA-245-103			MATERIAL : SEE TABLE
DRAWN : PONY	ISSUED : HLANG	DATE : FEB01.2003	FINISH : SEE TABLE

承 認 書

SPECIFICATION FOR APPROVAL

客戶名稱:友勁科技股份有限公司

客戶料號：11722B028A56*01

品名：Antenna+cable(170mm) 嵌入式天線 2.45G//WLB-2006

製造商料號：CA-245-104

承 認 欄	
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中華民國 92 年 9 月 10 日

公司名稱：福陸林企業有限公司

公司地址：新竹市勝利路 224 號

公司電話：TEL:03-5256038 FAX：03-5244079

E-mail：wavemate@ms45.hinet.net



SPECIFICATION-ELECTRIC

***PART NO. : 友勁件號: 11722B028A56*01**

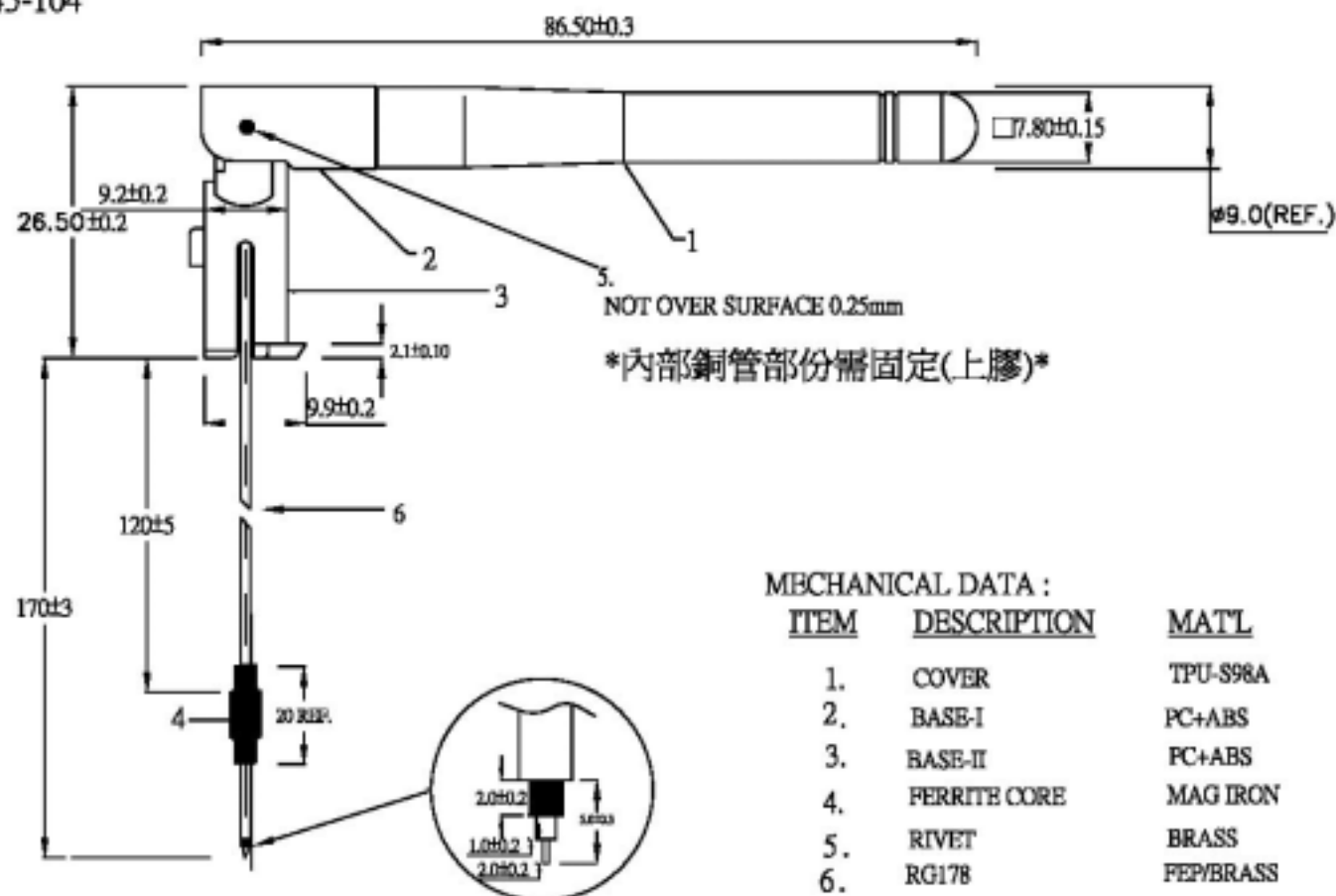
福陸林件號 : CA-245-104

- **CUSTOMER' S NAME : 友勁科技股份有限公司**
- **PART NAME : Antenna+cable(170mm) 嵌式天線 2.45G**
WLB-2006

1.	WORKING FREQUENCY	2.400-2.500GHz
2.	ELECTRIC WAVE	$1/2 \lambda$: DIPOLE
3.	IMPEDANCE	50 Ohm , Nominal
4.	V.S.W.R	2.0 MAX
5.	GAIN	2.0 dBi
6.	RADIATION	Omni
7.	POLARIZATION	VERTICAL
8.	POWER HANDLING	1 W MAX
9.	OPERATING TEMPERATURE	-20°C -- +50°C

友勁料號:11722B028A56*01

福陸林料號:CA-245-104



MECHANICAL DATA :

ITEM	DESCRIPTION	MAT'L	FINISH
1.	COVER	TPU-S98A	LIGHT GRAY
2.	BASE-I	PC+ABS	LIGHT GRAY
3.	BASE-II	PC+ABS	LIGHT GRAY
4.	FERRITE CORE	MAG IRON	BLACK
5.	RIVET	BRASS	CR-PLATED
6.	RG178	PEP/BRASS	TINT/BROWN

SOLDER-DIPPED FOR
CENTER-CONTACT
AND GROUND LAYER

福陸林企業有限公司 TEL:886-3-5256038			CHECKED : TONY
FLUORORINED PRODUCTS CO.,LTD FAX:886-3-5244079			UNIT: MM
TITLE : 2.45GHZ DIPOLE ANTENNA			TOLERANCE: AS SPEC.
DWG NO. : CA-245-104			MATERIAL : SEE TABLE
DRAWN : PONY	ISSUED : HLANG	DATE : FEB01.2003	FINISH : SEE TABLE

承 認 書

SPECIFICATION FOR APPROVAL

客戶名稱:友勁科技股份有限公司

客戶料號：11723B02*356*00

品名：2.45GHz Dipole Antenna //WLB-2007

製造商料號：CA-245-2S1

承 認 欄	
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中華民國 92 年 9 月 10 日

公司名稱：福陸林企業有限公司

公司地址：新竹市勝利路 224 號

公司電話：TEL:03-5256038 FAX：03-5244079

E-mail：wavemate@ms45.hinet.net



SPECIFICATION-ELECTRIC

***PART NO. : 友勁件號: 11723B02*356*00**

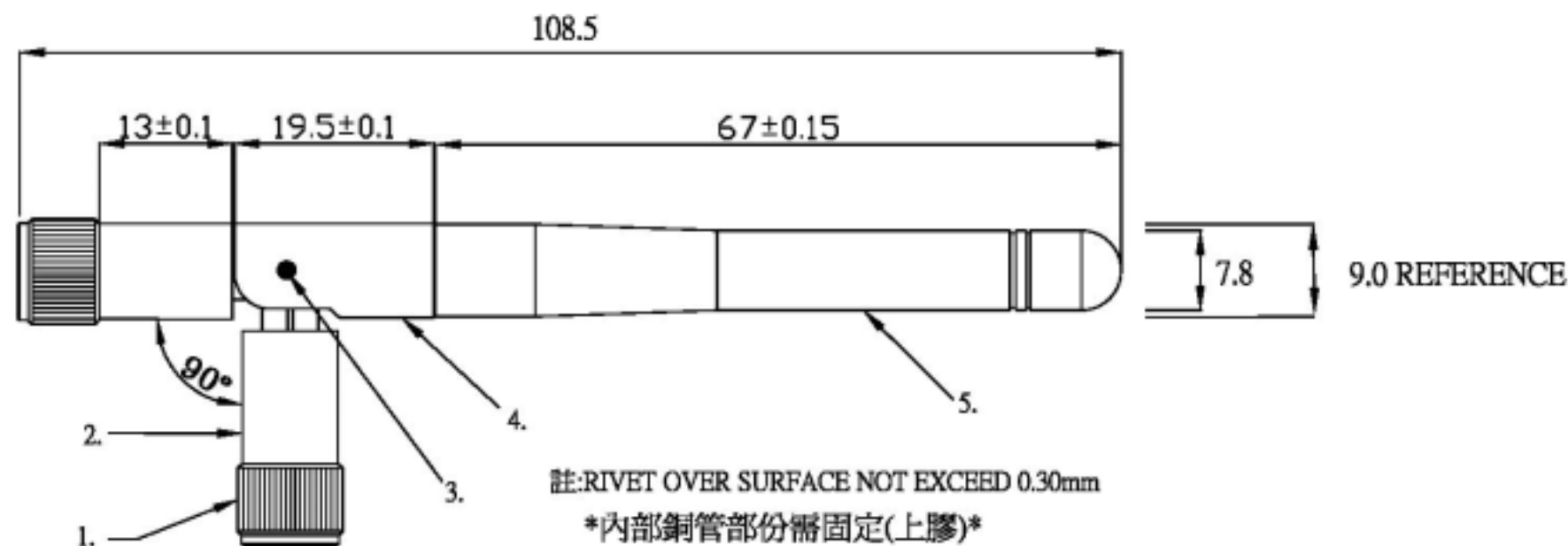
福陸林件號 : CA-245-2S1

- **CUSTOMER'S NAME : 友勁科技股份有限公司**
- **PART NAME : 天線 2.45GHz ; Dipole ; With R.-SMA**

1.	WORKING FREQUENCE	2.400-2.500GHz
2.	ELECTRIC WAVE	$1/2 \lambda$: DIPOLE
3.	IMPEDANCE	50 Ohm , Nominal
4.	V.S.W.R	2.0 MAX
5.	GAIN	2.0 dBi
6.	RADIATION	Omni
7.	POLARIZATION	VERTICAL
8.	POWER HANDLING	1 W MAX
9.	OPERATING TEMPERATURE	-20°C -- +50°C

友勁料號:11723B02*356*00

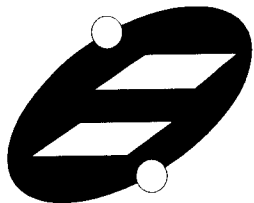
福陸林料號:CA-245-2S1



MECHANICAL DATA :

ITEM	DESCRIPTION	MAT'L	FINISH
1.	SMA CONN. R-P.	BRASS	Gold-Plated
2.	BASE-II	PC+ABS	light Gray
3.	RIVET	BRASS	Cr-Plated
4.	BASE-I	PC+ABS	light Gray
5.	ANT. COVER	TPU	light Gray

福陸林企業有限公司 TEL:886-3-5256038			CHECKED : TONY
FLUORORINED PRODUCTS CO.,LTD FAX:886-3-5244079			UNIT: MM
TITLE : STB 2.45GHz DIPOLE ANT. 30-SWIVEL			TOLERANCE: AS SPEC.
DWG NO. : CA-245-2S1			MATERIAL : SEE TABLE
DRAWN : PONY	ISSUED : HANG	DATE : JUN26/07	FINISH : SEE TABLE



WHA YU INDUSTRIAL CO., LTD. (HEAD OFFICE)
TAI HWA ELECTRONIC CO., LTD.(CHINA)
SHANGHAI HUA YU ELECTRONIC CO., LTD.(CHINA)
AEON TECH CO., LTD. (CHINA)

SPECIFICATION FOR APPROVAL

CUSTOMER: 友勁科技股份有限公司

PART NAME: 2.4G RF Antenna Assembly

PART NO.: 11722B018A57*00

REVISION:

W. Y. P/NO.: C056-510145-A

REV.: X2

	MANUFACTURER SIGNATURE	CUSTOMER SIGNATURE
APPROVED BY :	<i>Wing Lam</i>	
DATE :	<i>3/8/93</i>	

WHA YU GROUP

WHA YU INDUSTRIAL CO., LTD.(HEAD OFFICE)

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HUA HONG INTERNATIONAL LTD.

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Fax: + 86-852-23843747

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Fax: + 86-21-59741347

SU ZHOU AEON TECH CO., LTD. (CHINA)

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Wujiang City, Jiangsu Province, China

Tel: + 86-512-63627980

Fax: + 86-512-63627981

RF Antenna Cable Assembly

Specification

1. Electrical Properties :

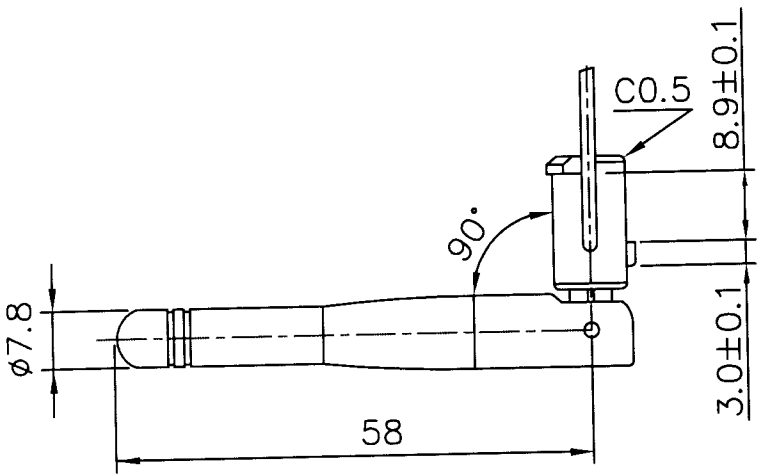
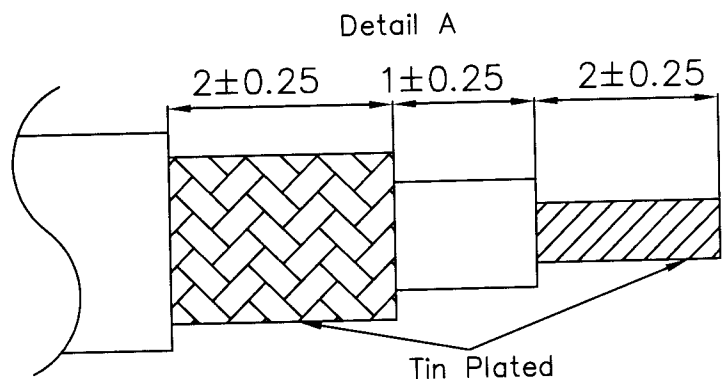
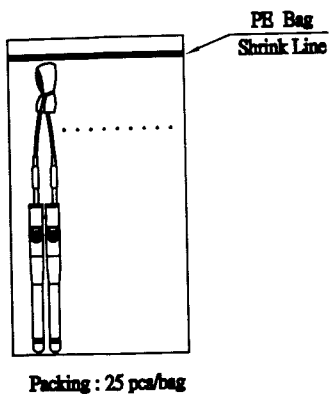
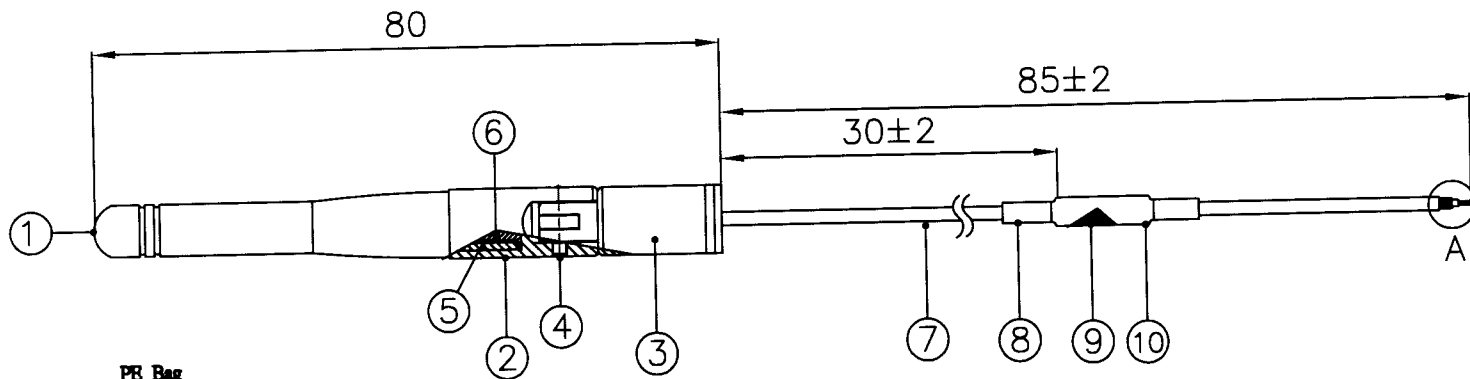
- 1.1 Frequency Rang..... 2.4GHz ~ 2.5GHz
- 1.2 Impedance 50Ω Nominal
- 1.3 VSWR 1.92 Max.
- 1.4 Return Loss..... -10dB Maximum
- 1.5 Electrical Wave..... $1/2 \lambda$ Diople
- 1.6 Gain..... 1.8 dBi
- 1.7 Admitted Power..... 1W

2. Physical Properties :

- 2.1 Cable..... RG-178 Cable
- 2.2 Antenna Cover..... TPE
- 2.3 Antenna Base..... PC
- 2.4 Operating Temp. -20°C ~ +65°C
- 2.5 Storage Temp. -30°C ~ +75°C
- 2.6 Color Cool Gray 4C
- 2.8 Core..... RH 4*10*2

CG-

REV	DATE	DESCRIPTION
X1	03/05-2004	New Issue
X2	03/08-2004	Changed Color



NO	DESCRIPTION	QTY	REMARK
10	Tube	Heat Shrink Tube	1
9	Core	RH 4*10*2	1
8	Tube	Heat Shrink Tube	2
7	Cable	RG-178 Cable	1
6	Insulator	POM, White	1
5	Ground Tube	Brass, Ni Plated	1
4	Rivet	Brass, Cr Plated (NI)	2
3	Antenna Base	PC; Color: Cool Gray 4C	1
2	Antenna Base	PC; Color: Cool Gray 4C	1
1	Antenna Body	TPE; Cool Gray 4C	1

CUSTOMER'S SIGNATURE	XX ±5	APPROVED	CUSTOMER: 友勤科技股份有限公司	
	X ±3.0	CHECKED		PART NO : 11722B018A57*00
	X ±1.0			PARTNAME: 2.4G RF Antenna Assembly
	XX ±0.5			W.Y P/NO : C056-510145-A
	XXX ±0.1	DRAWING		REV UNIT FILE :
		X2 m/m SHEET : 1/1		



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譚裕實業股份有限公司

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TAI HWA ELECTRONIC CO., LTD.(CHINA)
SHANGHAI HUA YU ELECTRONIC CO., LTD.(CHINA)
AEON TECH CO., LTD. (CHINA)

SPECIFICATION FOR APPROVAL

CUSTOMER: 友勁科技股份有限公司

PART NAME: RF Antenna Assembly

PART NO.: 11723B01*317*00 **REVISION:**

W. Y. P/NO.: C056-510170-A **REV.:** X1

	MANUFACTURER SIGNATURE	CUSTOMER SIGNATURE
APPROVED BY :		
DATE :	2004/7/6	

WHA YU GROUP

WHA YU INDUSTRIAL CO., LTD.(HEAD OFFICE)

譚裕實業股份有限公司

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Address:Limin North Road, LiLi Town,LiLi Industrial Park,LinHu Economic Zone

Wujiang City,Jiangsu Province,China

Tel: + 86-512-63627980

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RF Antenna Cable Assembly

Specification

1. Electrical Properties :

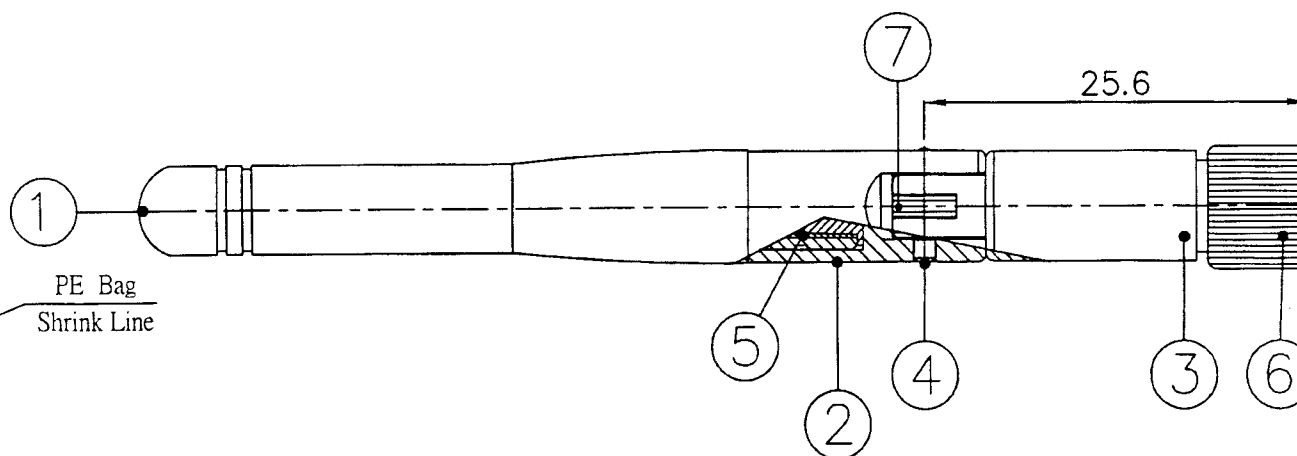
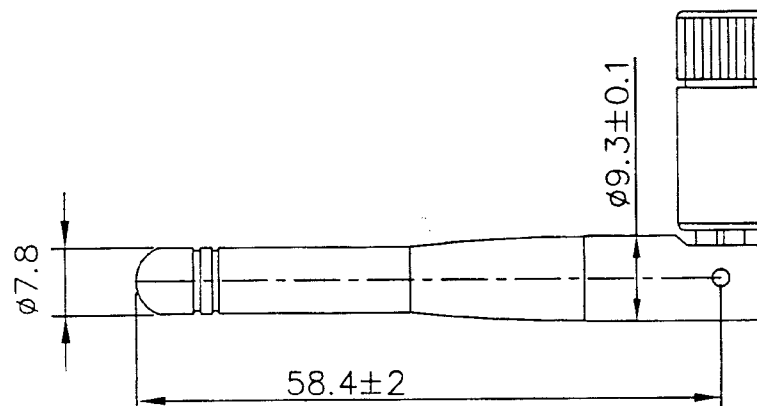
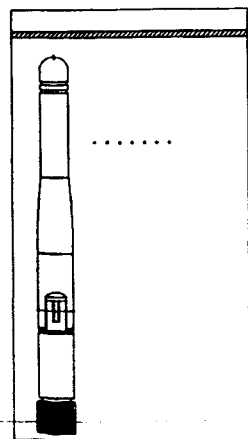
- 1.1 Frequency Rang..... 2.4GHz ~ 2.5GHz
- 1.2 Impedance 50Ω Nominal
- 1.3 VSWR 1.92 Max.
- 1.4 Return Loss..... -10dB Maximum
- 1.5 Electrical Wave..... $1/2 \lambda$ Diople
- 1.6 Gain..... 1.0 dBi
- 1.7 Admitted Power..... 1W

2. Physical Properties :

- 2.1 Cable..... RG-178 Coaxial Cable
- 2.2 Antenna Cover..... TPE
- 2.3 Antenna Base..... PC
- 2.4 Operating Temp. -20°C ~ +65°C
- 2.5 Storage Temp. -30°C ~ +75°C
- 2.6 Color Black
- 2.7 Connector SMA Plug Reverse

CG-

REV	DATE	DESCRIPTION
X1	07/06-2004	New Issue

PE Bag
Shrink Line

Packing : 25 pcs/bag

7	Cable	RG-178 . Translucent Brown : 50 Ω	1	
6	Connector	SMA Straight Plug Reverse (Black)	1	
5	Ground Tube	Brass , Ni plated	1	
4	Rivet	Brass , Cr Plated (Black)	2	
3	Antenna Base	PC ; Color : Black	1	
2	Antenna Base	PC ; Color : Black	1	
1	Antenna Cover	TPE ; Color : Black	1	
NO	DESCRIPTION		QTY	REMARK

XX.	±3.0	APPROVED
X.	±2.0	W.Y. 7/6
.X	±1.0	CHECKED
.XX	±0.5	—
.XXX	±0.1	DRAWING
⊕		昆宏 7/6

CUSTOMER: 友勁科技股份有限公司

PART NO : 11723B01*317*00

PARTNAME: 2.4G RF Antenna Assembly

W.Y P/NO : C056-510170-A

REV UNIT FILE :

X1 m/m SHEET : 1/1

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