

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

Granted FCC ID	:	NHPWLG1200
Product name	:	Wireless PCI Adapter
Model name	:	as Appendix A of Test Report
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 PCI interface of the client' s device

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

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

3.1 IEEE 802.11b, Lowest CH

Friis Transmission Formula:
$$S = \frac{PG}{4\pi R^2} = \frac{62.661 \times 1.514}{4\pi (20)^2} = 0.0189 \text{ mW/cm}^2$$

Estimated safe separation:
$$R = \sqrt{\frac{PG}{4\pi S}} = \sqrt{\frac{62.661 \times 1.514}{4\pi \times 0.0189}} = 2.747 \text{ cm}$$

Remarks: "The safe estimated separation that the user must maintain from the antenna is at least 2.747cm."

3.2 IEEE 802.11b, Middle CH

Friis Transmission Formula:
$$S = \frac{PG}{4\pi R^2} = \frac{69.183 \times 1.514}{4\pi (20)^2} = 0.0385 \text{ mW/cm}^2$$

Estimated safe separation:
$$R = \sqrt{\frac{PG}{4\pi S}} = \sqrt{\frac{69.183 \times 1.514}{4\pi \times 0.0385}} = 2.887 \text{ cm}$$

Remarks: "The safe estimated separation that the user must maintain from the antenna is at least 2.887cm."

3.3 IEEE 802.11b, Highest CH

Friis Transmission Formula: $S = \frac{PG}{4pR^2} = \frac{67.453 \times 1.514}{4p(20)^2} = 0.0203 \text{mW} / \text{cm}^2$

Estimated safe separation: $R = \sqrt{\frac{PG}{4p}} = \sqrt{\frac{67.453 \times 1.514}{4p}} = 2.8507 \text{cm}$

Remarks: "The safe estimated separation that the user must maintain from the antenna is at least 2.851cm."

3.4 IEEE 802.11g, Lowest CH

Friis Transmission Formula: $S = \frac{PG}{4pR^2} = \frac{118.032 \times 1.514}{4p(20)^2} = 0.03555 \text{mW} / \text{cm}^2$

Estimated safe separation: $R = \sqrt{\frac{PG}{4p}} = \sqrt{\frac{118.0328 \times 1.514}{4p}} = 3.771 \text{cm}$

Remarks: "The safe estimated separation that the user must maintain from the antenna is at least 3.771cm."

3.5 IEEE 802.11g, Middle CH

Friis Transmission Formula: $S = \frac{PG}{4pR^2} = \frac{127.938 \times 1.514}{4p(20)^2} = 0.0385 \text{mW} / \text{cm}^2$

Estimated safe separation: $R = \sqrt{\frac{PG}{4p}} = \sqrt{\frac{127.938 \times 1.514}{4p}} = 3.926 \text{cm}$

Remarks: "The safe estimated separation that the user must maintain from the antenna is at least 3.926cm."

3.6 IEEE 802.11g, Highest CH

Friis Transmission Formula: $S = \frac{PG}{4pR^2} = \frac{125.314 \times 1.514}{4p(20)^2} = 0.03774 \text{mW} / \text{cm}^2$

Estimated safe separation: $R = \sqrt{\frac{PG}{4p}} = \sqrt{\frac{125.314 \times 1.514}{4p}} = 3.8856 \text{cm}$

Remarks: "The safe estimated separation that the user must maintain from the antenna is at least 3.886cm."

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:

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

$$G = \text{Log}^{-1} (1.8 / 10) = 1.514$$



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SHANGHAI HUA YU ELECTRONIC CO., LTD.(CHINA)

SPECIFICATION FOR APPROVAL

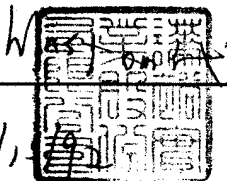
CUSTOMER: 友勁科技股份有限公司

PART NAME: 2.4G RF Antenna Assembly

PART NO: 11723B02*317*00

W. Y. P/NO.: C056-510131-A

REV.: X1

	MANUFACTURER SIGNATURE	CUSTOMER SIGNATURE
APPROVED BY :		
DATE :	11/1	

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RF Antenna Cable Assembly

Specification

1. Electrical Properties :

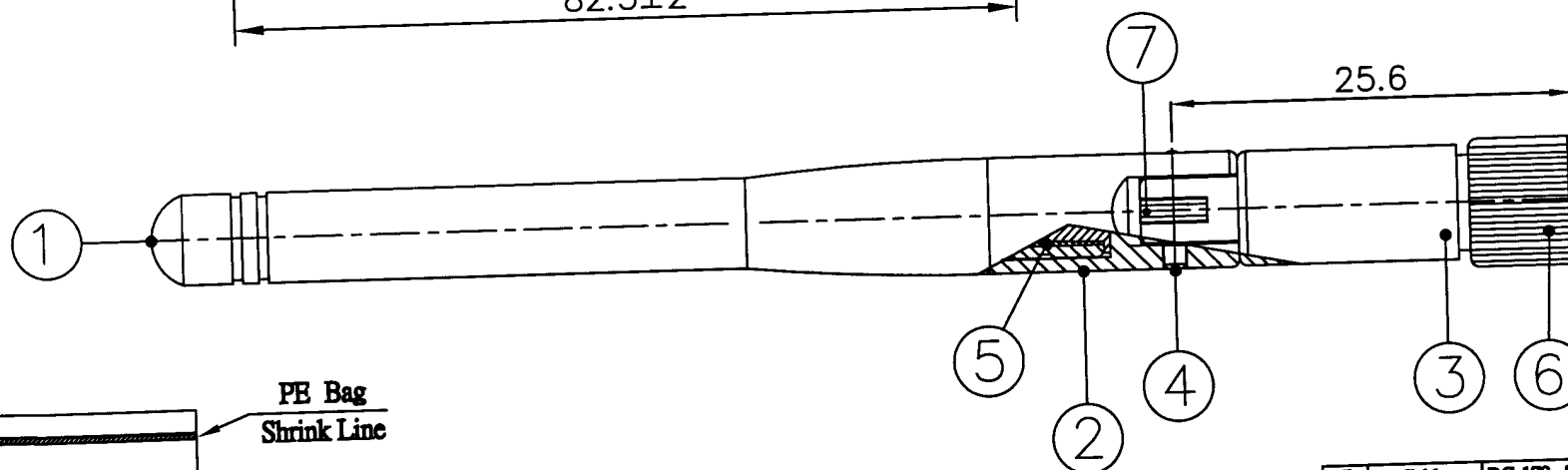
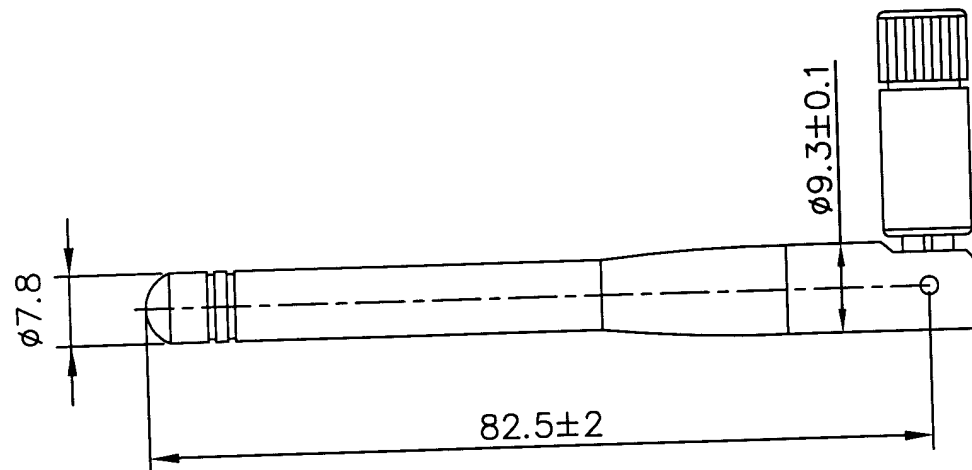
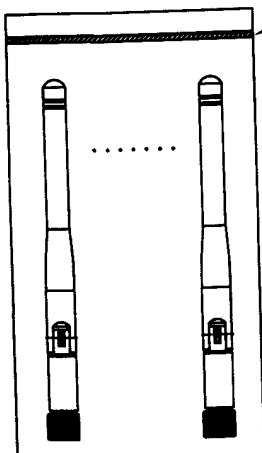
- 1.1 Frequency Rang..... 2.4GHz ~ 2.5GHz
- 1.2 Impedance 50Ω Nominal
- 1.3 VSWR 1.92 Max.
- 1.4 Return Loss..... -10dB Maximum
- 1.5 Electrical Wave..... $1/2 \lambda$ Diople
- 1.6 Gain..... 1.8 dBi
- 1.7 Admitted Power..... 1W

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 Black
- 2.7 Connector..... SMA Plug Reverse

CG-

REV	DATE	DESCRIPTION
X1	11/17-2003	New Issue

PE Bag
Shrink Line

Packing : 25 pcs/bag

NO	DESCRIPTION	QTY	REMARK
7	Cable	RG-178 , Translucent Brown ; 50 Ω	1
6	Connector	SMA Straight Plug/Reverse	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

XX	±3.0	APPROVED
X	±2.0	Checked
X	±1.0	Checked
XX	±0.5	DRAWING
XXX	±0.1	DRAWING
⊕		

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PART NO : 11723B02*317*00

PARTNAME: RF Antenna Assembly

W.Y P/NO : C056-510131-A

REV UNIT FILE :

X1 m/m SHEET : 1/1

CUSTOMER'S SIGNATURE



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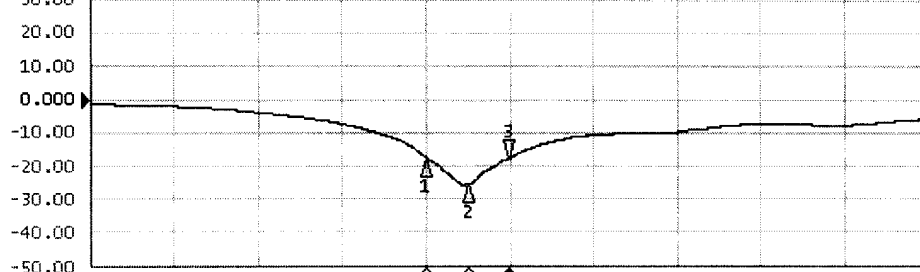
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1 Active Ch/Trace 2 Response 3 Stimulus 4 Mkr/Analysis 5 Instr State

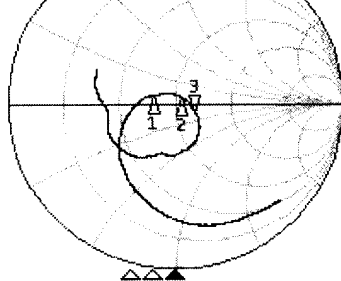
Tr1 S22 Log Mag 10.00dB/ Ref 0.000dB [F2]

1	2.400000000	GHz	-17.674	dB
2	2.450000000	GHz	-25.682	dB
>3	2.500000000	GHz	-17.796	dB



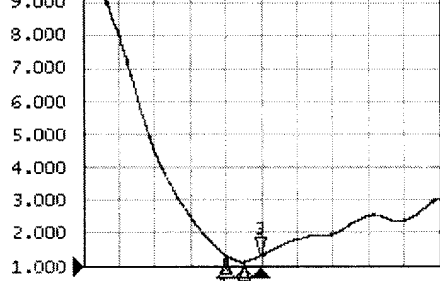
Tr2 S22 Smith (R+jX) Scale 1.000U [F2]

1	2.400000000	GHz	38.986	Ω	3.7038	Ω
2	2.450000000	GHz	53.254	Ω	4.2754	Ω
>3	2.500000000	GHz	62.599	Ω	7.2618	Ω



Tr3 S22 SWR 1.000/ Ref 1.000 [F2]

1	2.400000000	GHz	1.3007
2	2.450000000	GHz	1.1087
>3	2.500000000	GHz	1.2959



1 Start 2 GHz

IFBW 70 kHz

Stop 3 GHz

20.03.17 10:57

System

Abort Printing

Printer Setup

Invert Image
ON

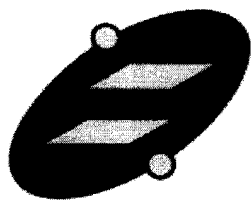
Dump
Screen Image

E5091A Setup

Misc Setup

Backlight
ON

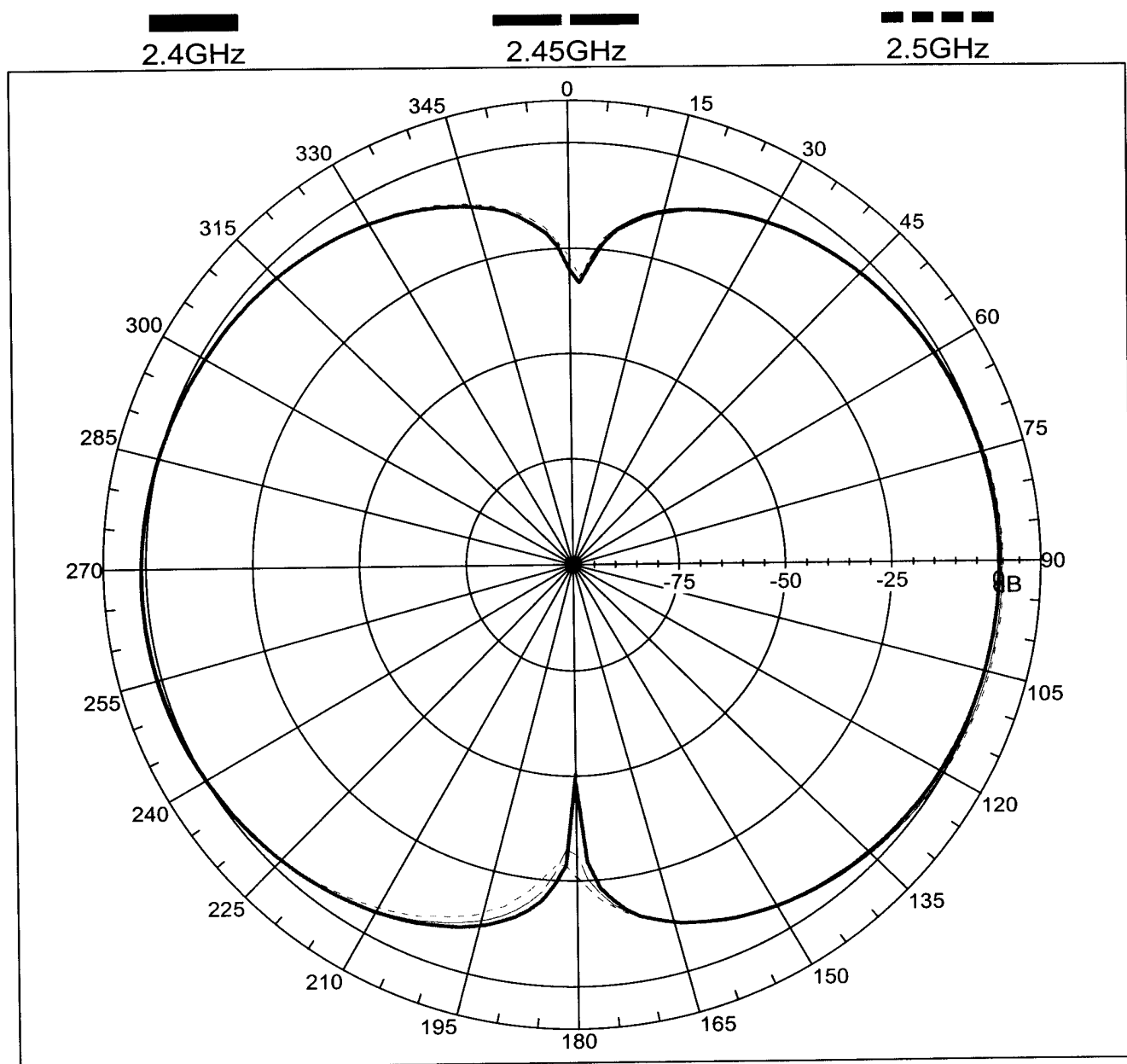
Firmware
Revision

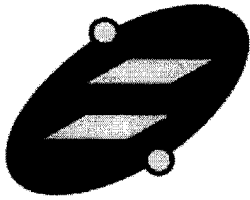


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Far-field amplitude of 2.4GHz small dipole antenna-E-plane.nsi

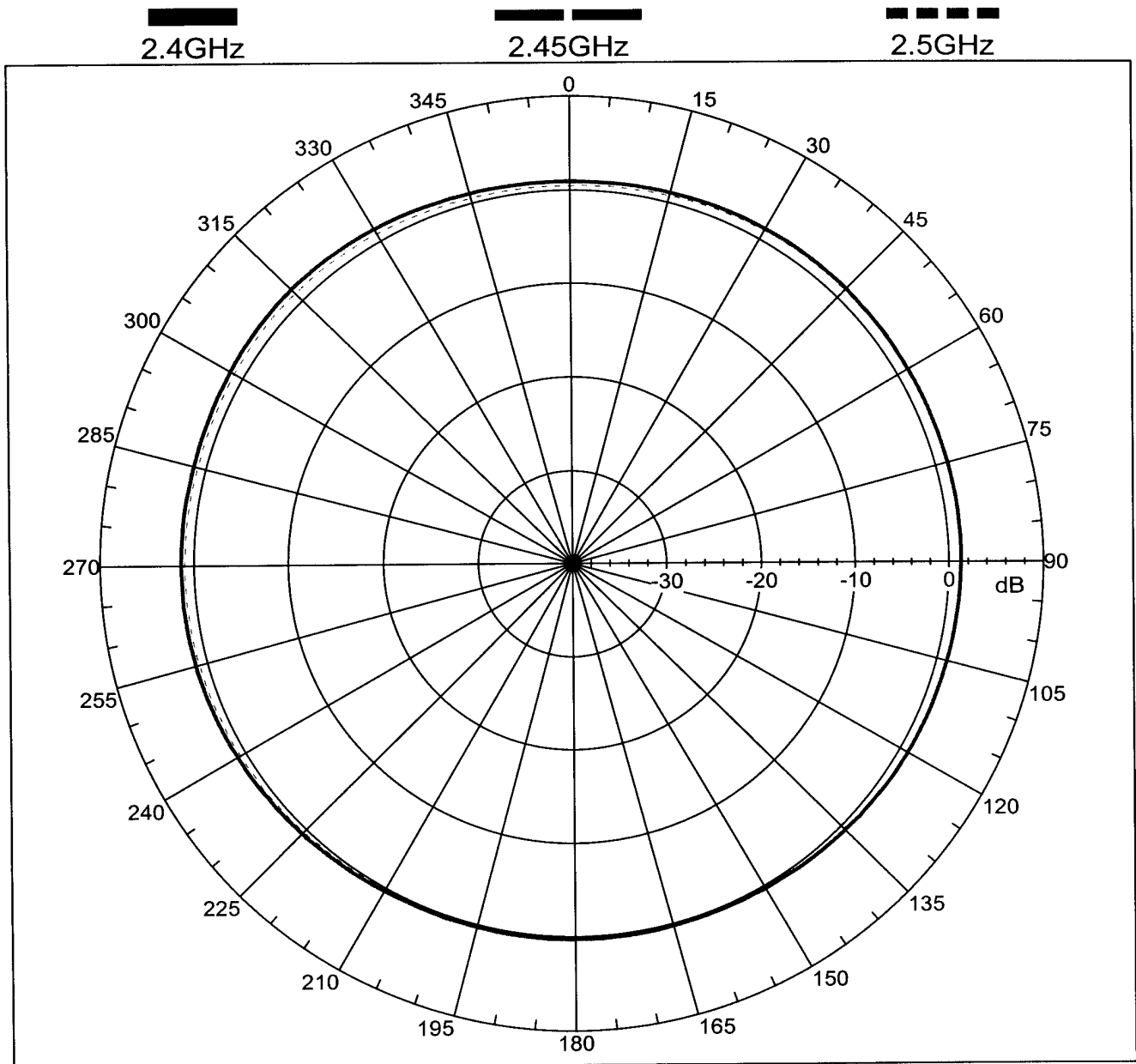




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WHA YU INDUSTRIAL CO., LTD

Far-field amplitude of 2.4GHz small dipole antenna-H-plane.nsi



Cable Specification

Cable : Mil-C-17 Coaxial Cable RG-178

1. Construction :

- 1 Conductor..... 30AWG 7/38 SCCS
- 2 Dielectric..... PTFE OD : 0.033"±0.002"
- 3 Shielded.....38AWG SPC OD : 0.051" Nominal
- 4 Jacket.....FEP OD : 0.071"±0.004"

2. Physical Properties :

- 1 Weight per 1000ft..... 6.3 lbs Maximum
- 2 Bend Radius.....0.35" Mininum
- 3 Operating Temperature Range -55°C ~ 200°C

3. Electrical Properities:

- 1 Impedance..... 50±2 ohms
- 2 Capacitance..... 32 pF/ft Maximum
- 3 Cut off Frequency..... 116 GHz
- 4 Attenuation.....45.0 dB/100ft @ 1GHz
64.4 dB/100ft @ 2GHz
79.7 dB/100ft @ 3GHz
92.7 dB/100ft @ 4GHz
104.3 dB/100ft @ 5GHz
115.0 dB/100ft @ 6GHz



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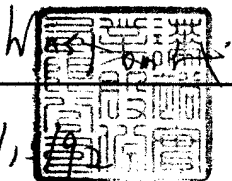
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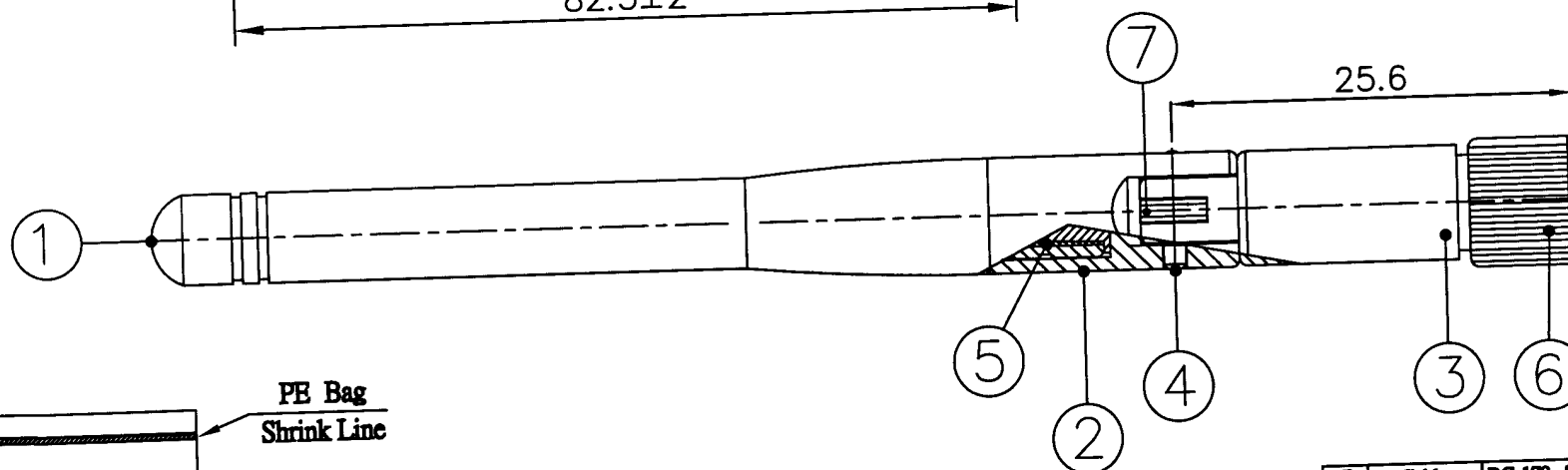
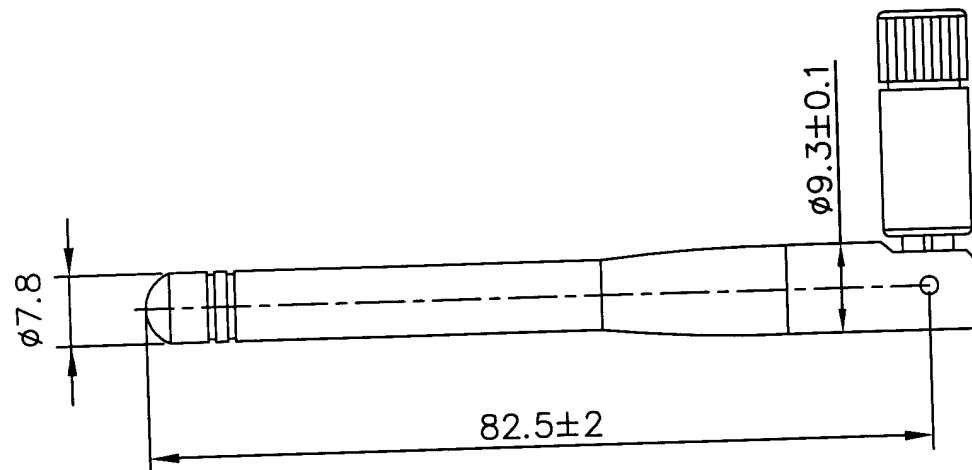
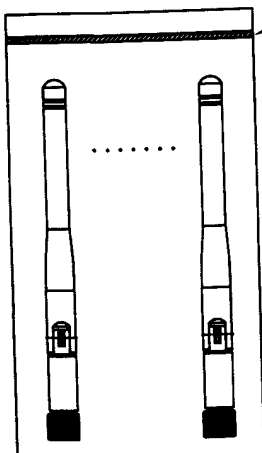
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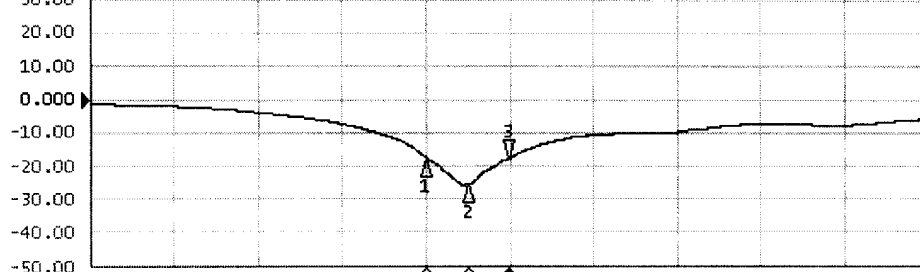
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1 Active Ch/Trace 2 Response 3 Stimulus 4 Mkr/Analysis 5 Instr State

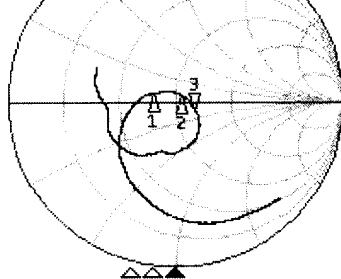
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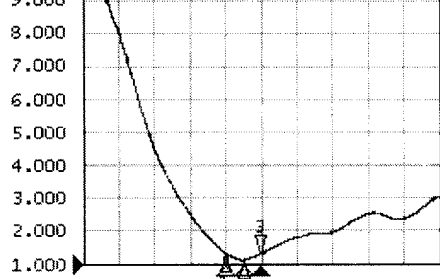
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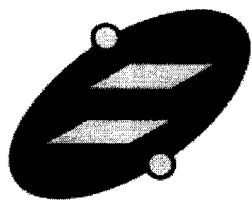
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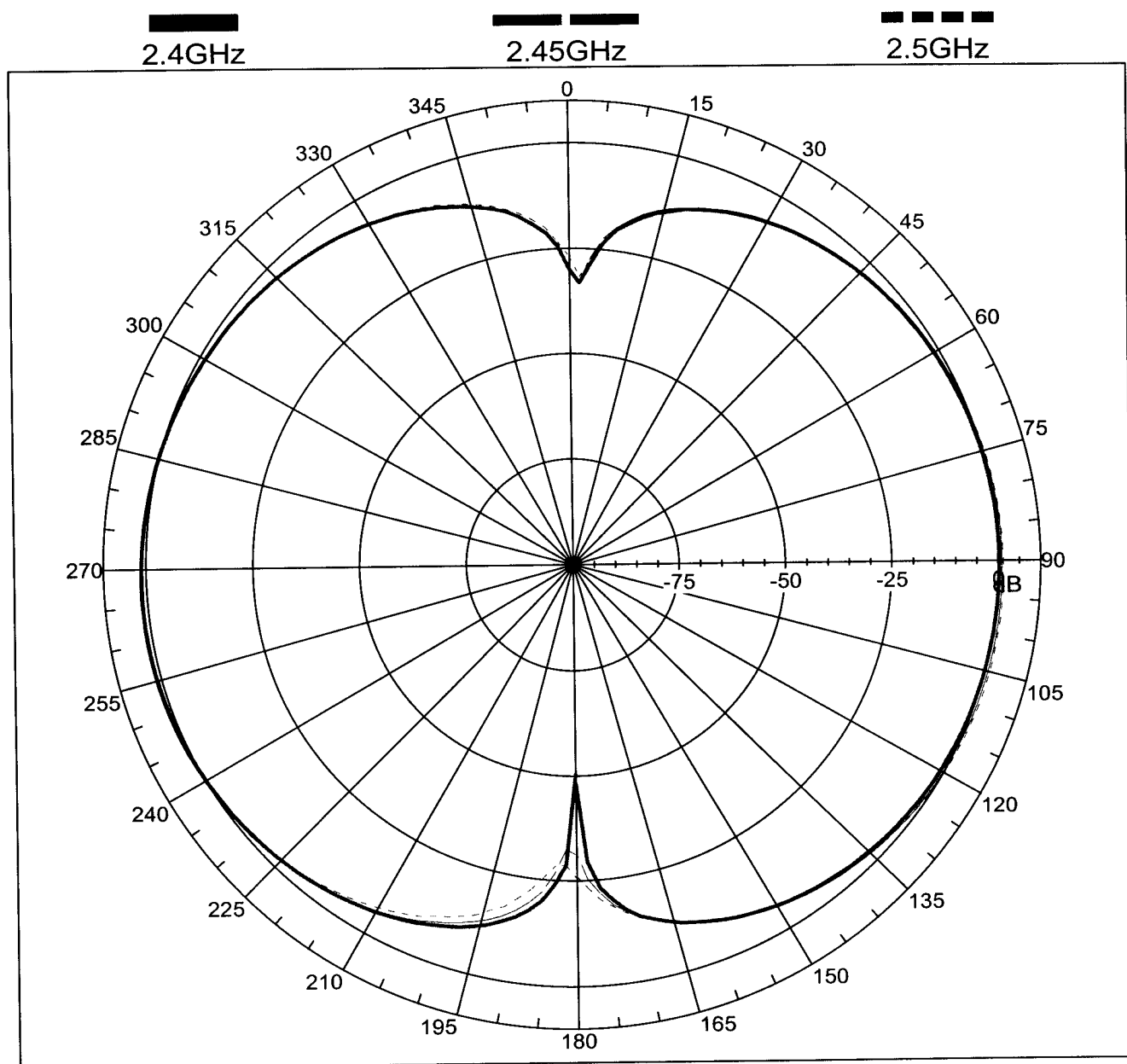
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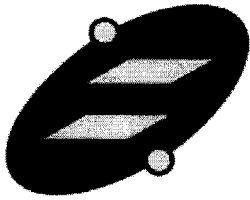


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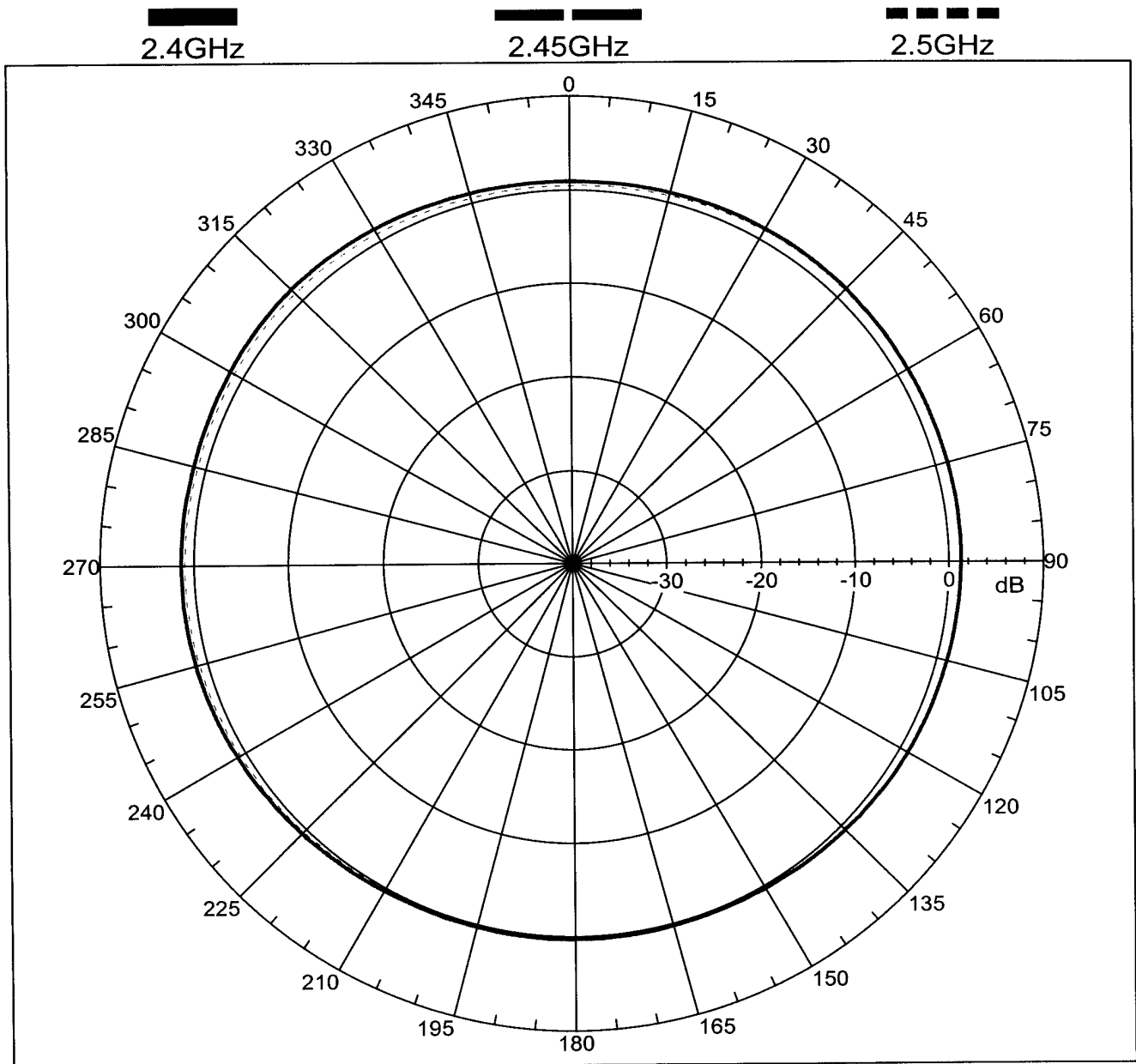




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