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 Filed Strength (H) (A/m)	Power Density (S) (mW/cm2)	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: $S = \frac{PG}{4\pi R^2} = \frac{62.661 \times 1.514}{4\pi (20)^2} = 0.0189 mW/cm^2$

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

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

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

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: $S = \frac{PG}{4\pi R^2} = \frac{67.453 \times 1.514}{4\pi (20)^2} = 0.0203 mW/cm^2$

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

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: $S = \frac{PG}{4\pi R^2} = \frac{118.032 \times 1.514}{4\pi (20)^2} = 0.03555 mW/cm^2$

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

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: $S = \frac{PG}{4\pi R^2} = \frac{127.938 \times 1.514}{4\pi (20)^2} = 0.0385 mW/cm^2$

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

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: $S = \frac{PG}{4\pi R^2} = \frac{125.314 \times 1.514}{4\pi (20)^2} = 0.03774 mW/cm^2$

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

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:

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

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

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

TAI HWA ELECTRONIC CO., LTD.(CHINA)

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 :		

WHA YU GROUP

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譁裕實業股份有限公司

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Fax:+ 886-3-5713853 · + 886-3-5723600

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Fax: + 86-769-5599376

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上海譁裕電子有限公司

Address: Lian Ho Village Bai Ho Town, Qing Pu Country Shanghai, China

Tel: + 86-21-59741348 · + 86-21-59743624

Fax: + 86-21-59741347

RF Antenna Cable Assembly

Specification

1. Electrical Properties :

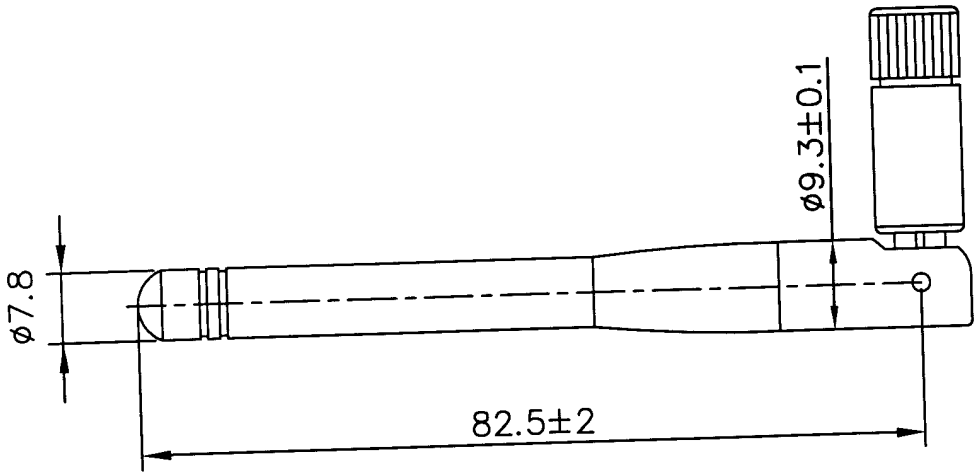
1.1 Frequency Rang..... 2.4GHz ~ 2.5GHz
1.2 Impedance ..... 50Ω Nominal
1.3 VSWR ..... 1.92 Max.
1.4 Return Loss..... -10dB Maximum
1.5 Electrical Wave..... 1/2 λ Diople
1.6 Gain..... 1.8 dBi
1.7 Admitted Power..... 1W

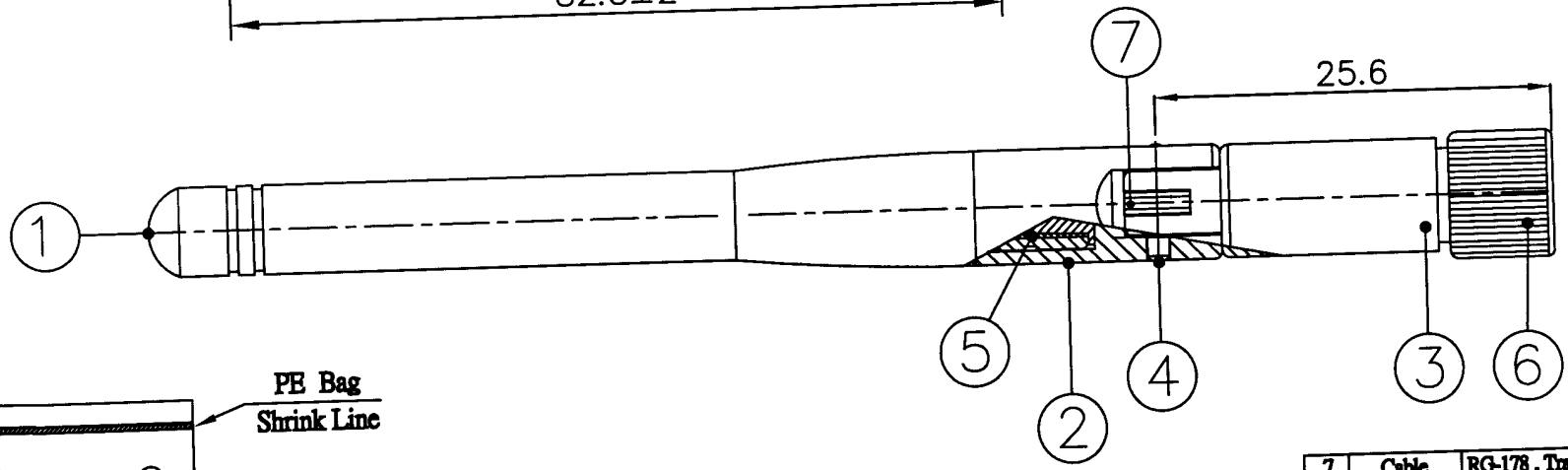
2. Physical Properties :

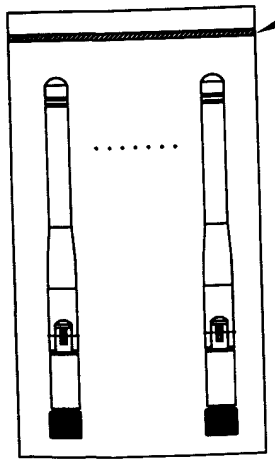
2.1 Cable..... RG-178 Cable
2.2 Antenna Cover..... TPE
2.3 Antenna Base..... PC
2.4 Operating Temp. .....-20℃ ~ +65℃
2.5 Storage Temp. .....-30℃ ~ +75℃
2.6 Color .....Black
2.7 Connector..... SMA Plug Reverse

REV	DATE	DESCRIPTION
X1	11/17-2003	New Issue

CG-







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	

CUSTOMER'S SINGATURE

XX.	±3.0
X.	±2.0
.X	±1.0
.XX	±0.5
.XXX	±0.1

APPROVED: Winston KF 11/19

CHECKED:

DRAWING: Jane

CUSTOMER: 友勤科技股份有限公司

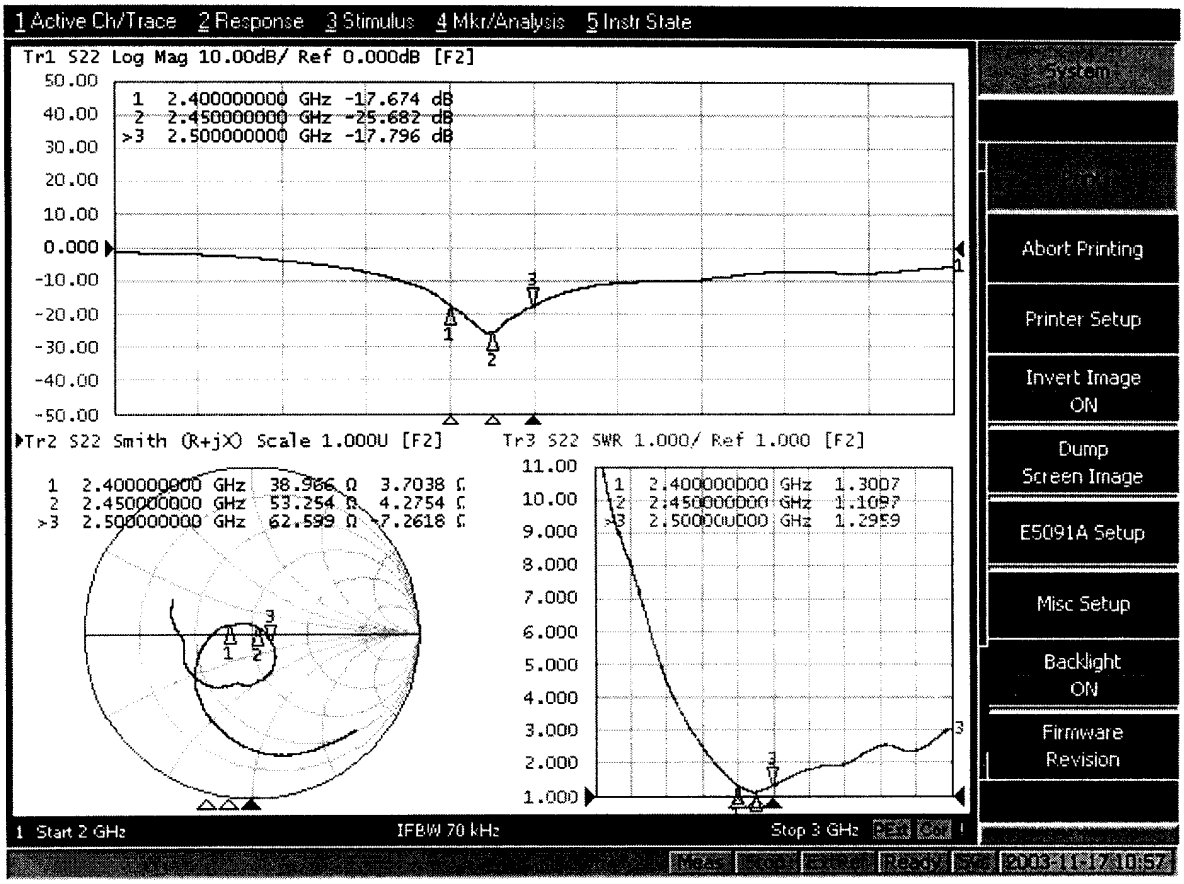
PART NO : 11723B02*317*00

PARTNAME: RF Antenna Assembly

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

REV	UNIT	FILE :
X1	m/m	SHEET : 1/1

Wha Yu
INDUSTRIAL CO.,LTD.
譁裕實業股份有限公司


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
50.00
40.00
30.00
20.00
10.00
0.000
-10.00
-20.00
-30.00
-40.00
-50.00
Tr2 S22 Smith (R+jX) Scale 1.000U [F2]
1 2.400000000 GHz 38.966 Ω 3.7038 Ω
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>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
11.00
10.00
9.000
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
1 Start 2 GHz
IFBW 70 kHz
Stop 3 GHz
System
Abort Printing
Printer Setup
Invert Image ON
Dump Screen Image
E5091A Setup
Misc Setup
Backlight ON
Firmware Revision
Ready

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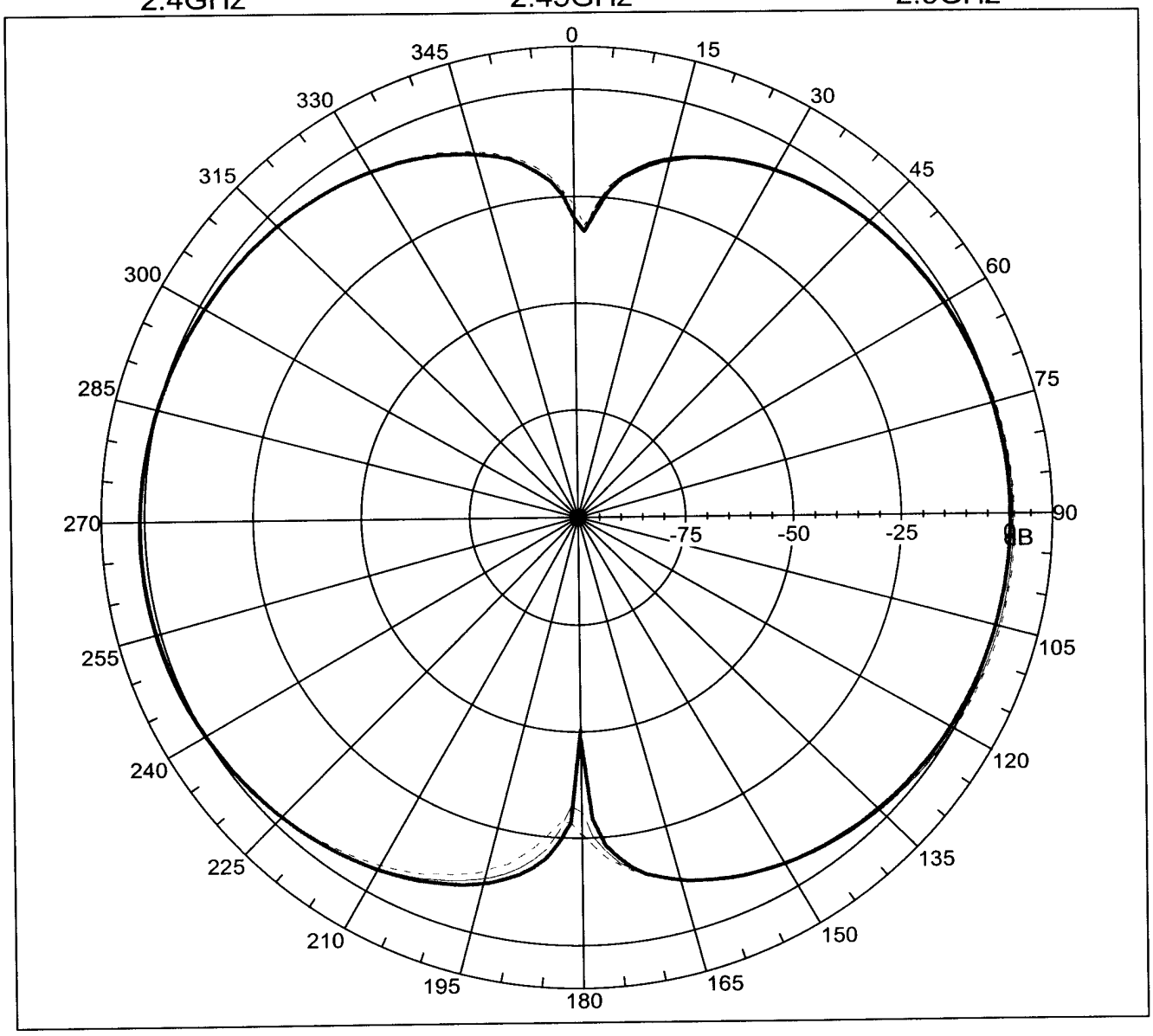
WHA YU INDUSTRIAL CO., LTD

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



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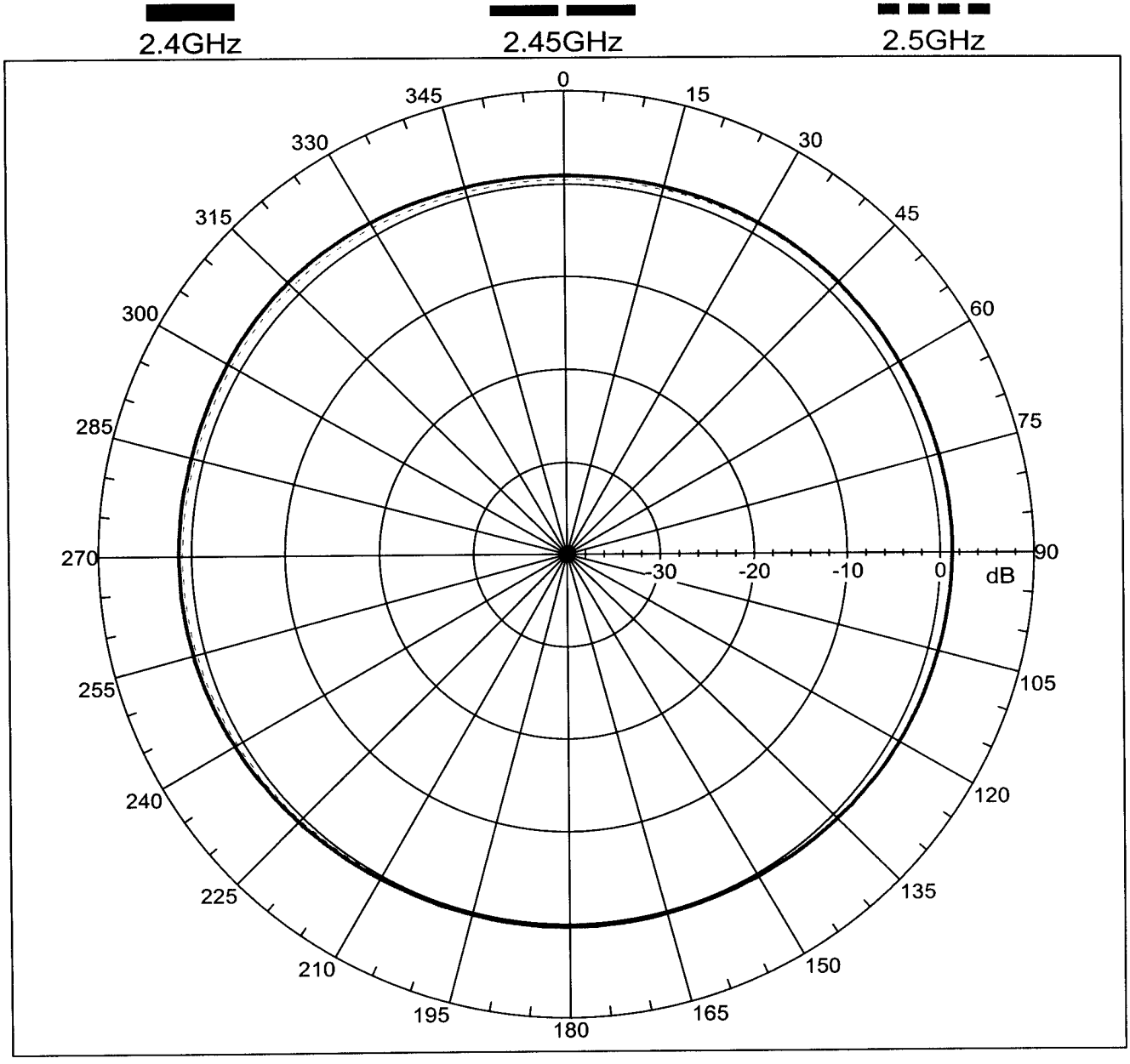
Far-field amplitude of 2.4GHz small dipole antenna-H-plane.nsi



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 Properities :

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

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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APPROVED BY :		
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Specification

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1.2 Impedance ..... 50Ω Nominal
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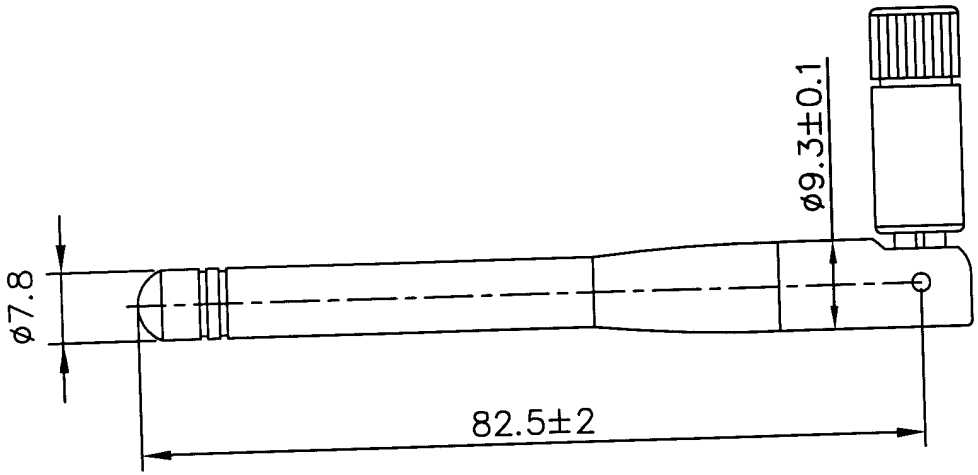

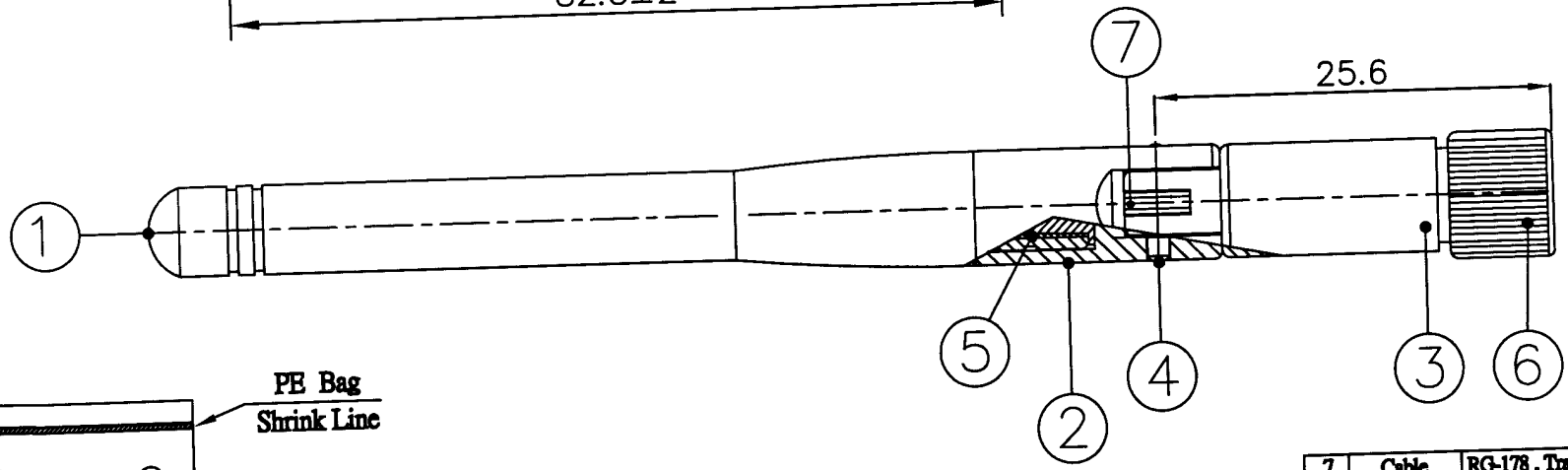

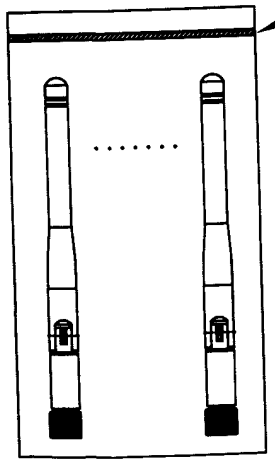

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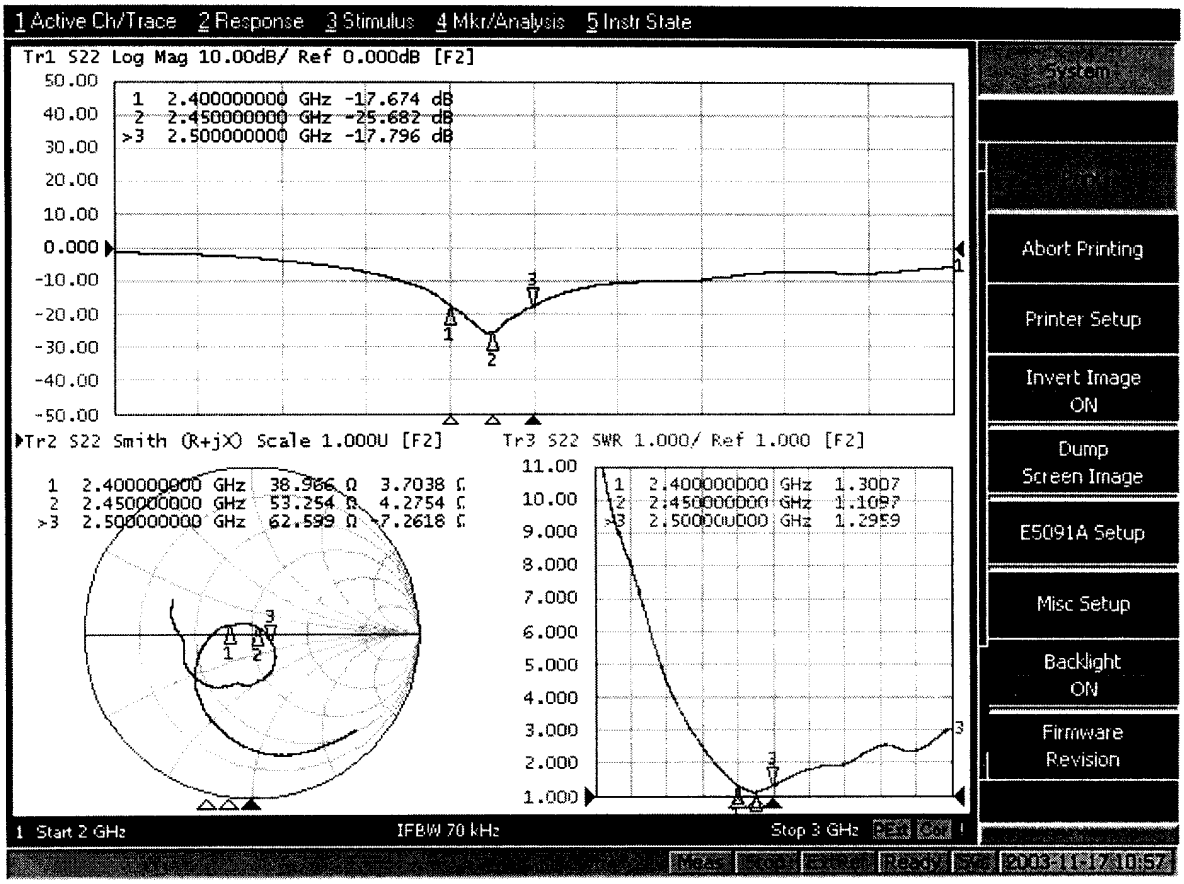
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7.000
6.000
5.000
4.000
3.000
2.000
1.000
1 Start 2 GHz
IFBW 70 kHz
Stop 3 GHz
System
Abort Printing
Printer Setup
Invert Image ON
Dump Screen Image
E5091A Setup
Misc Setup
Backlight ON
Firmware Revision
Ready

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WHA YU INDUSTRIAL CO., LTD

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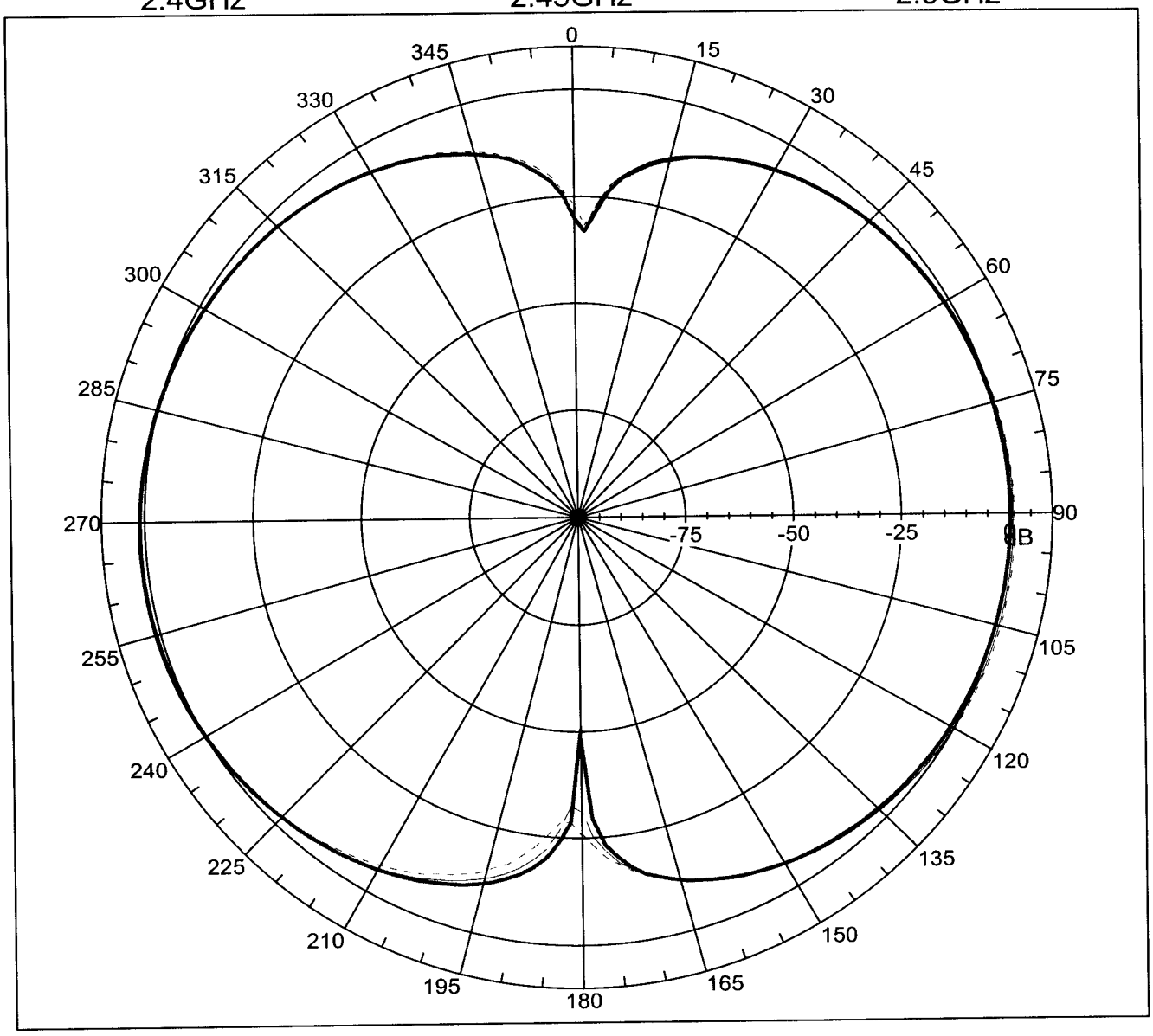

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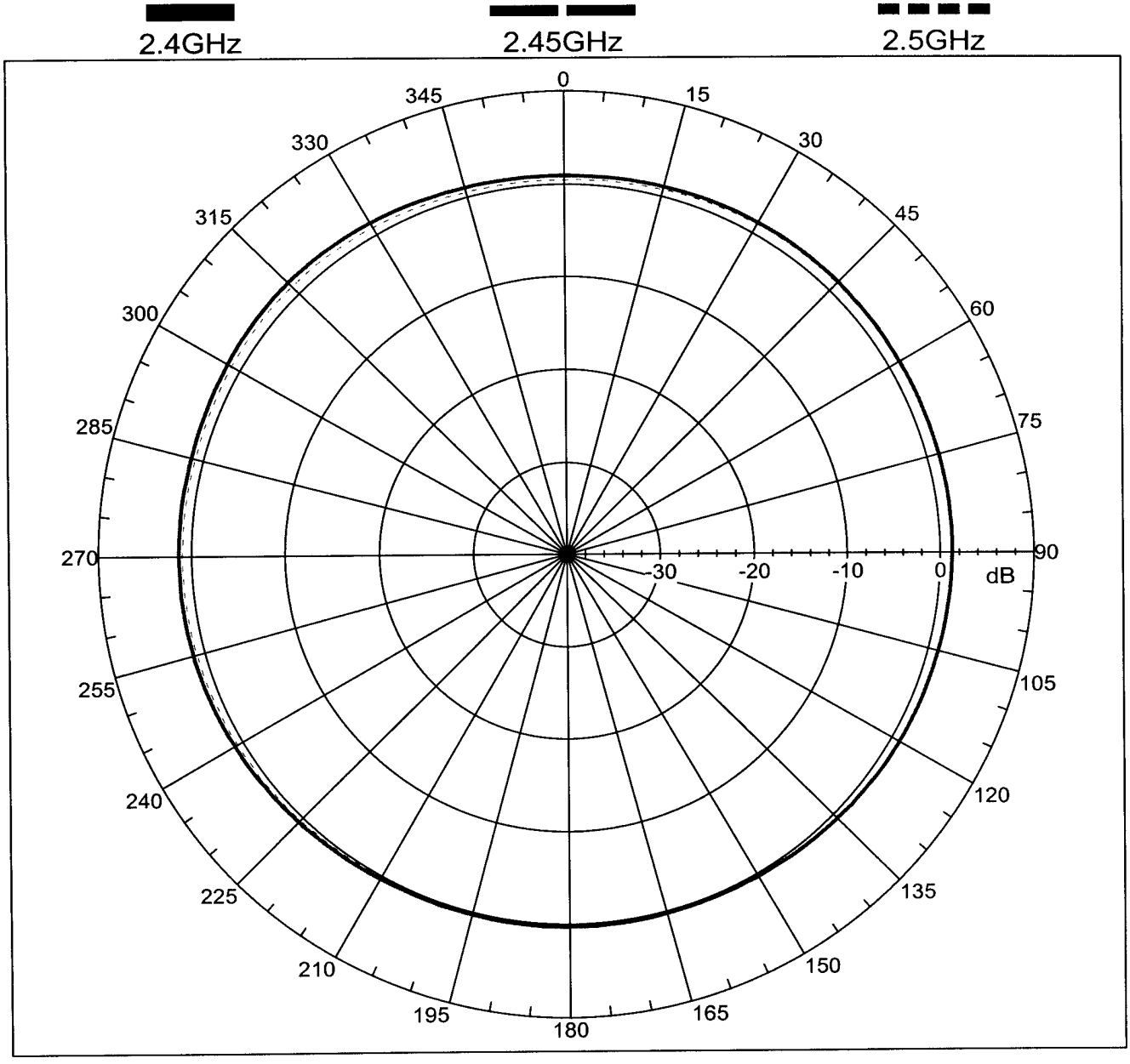

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3	Operating Temperature Range	-55℃~ 200℃

3. Electrical Properities:

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2	Capacitance.....	32 pF/ft Maximum
3	Cut off Frequency.....	116 GHz
4	Attenuation.....	45.0 dB/100ft @ 1GHz
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		79.7 dB/100ft @ 3GHz
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