

## *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**

<b>FCC ID</b>	:	MSQDPC2434
<b>Product Name</b>	:	Wireless Cable Modem
<b>Model Name</b>	:	DPC2434
<b>Frequency Range</b>	:	2.412GHz ~ 2.462GHz
<b>Channel Spacing</b>	:	5MHz
<b>Support Channel</b>	:	11 Channels
<b>Modulation Skill</b>	:	DBPSK, DQPSK, CCK, OFDM

**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:** 
$$S = \frac{PG}{4\pi R^2} = \frac{201.84 \times 1.58}{4\pi(20)^2} = 0.063mW / cm^2$$

**Estimated safe separation:** 
$$R = \sqrt{\frac{PG}{4\pi}} = \sqrt{\frac{201.84 \times 1.58}{4\pi}} = 5.038cm$$

**Note: "The safe estimated separation that the user must maintain from the antenna is at least 6.5cm"**

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)

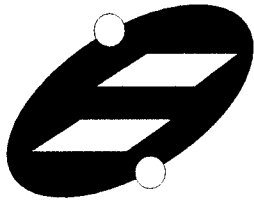
The Numeric gain G of antenna with a gain specified in dB is determined by:

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

$$G = \text{Log}^{-1} (2.00 / 10) = 1.58$$

## *Appendix*

### **Antenna Specification**



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:** 華碩電腦股份有限公司

**PART NAME:** RF Antenna Assembly

**PART NO.:** 14G150001000

**REVISION:**

**W. Y. P/NO.:** C660-510003-A

**REV.:** X2

	MANUFACTURER SIGNATURE	CUSTOMER SIGNATURE
APPROVED BY :		
DATE :		

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# RF Antenna Cable Assembly

## Specification

### 1. Electrical Properties :

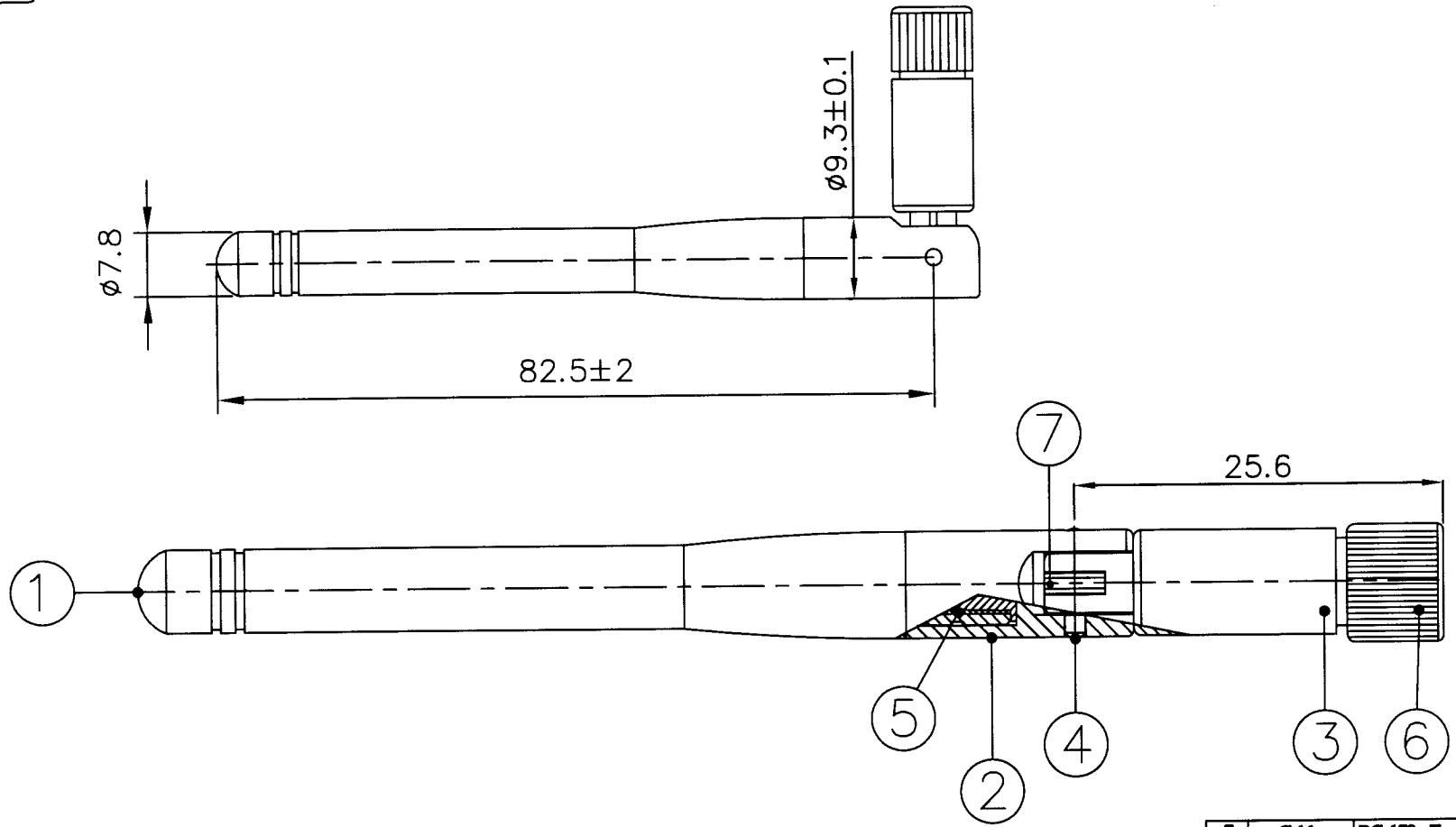
- 1.1 Frequency Rang..... 2.4GHz ~ 2.5GHz
- 1.2 Impedance ..... 50Ω Nominal
- 1.3 VSWR ..... 1.92 Max.
- 1.4 Return Loss..... -10dB Maximum
- 1.5 Electrical Wave..... 1/2 λ Diople
- 1.6 Gain..... 1.8 dBi
- 1.7 Admitted Power..... 1W

### 2. Physical Properties :

- 2.1 Cable..... RG-178 Cable
- 2.2 Antenna Cover..... TPE
- 2.3 Antenna Base..... PC
- 2.4 Operating Temp. .... -20°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	02/19-2004	New Issue



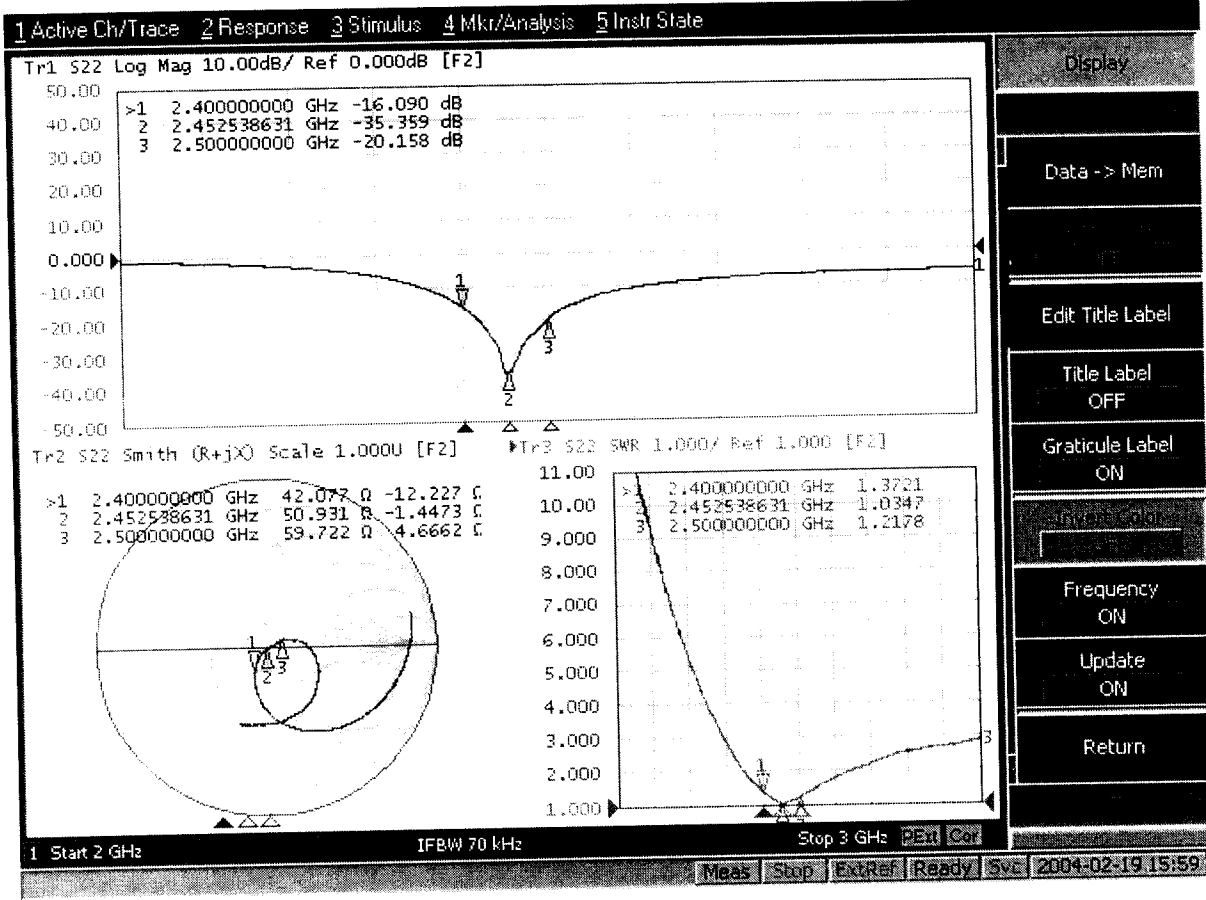
NO	DESCRIPTION	QTY	REMARK
7	Cable	RG-178 , Translucent Brown ; 50 $\Omega$	1
6	Connector	SMA Straight Plug/Reverse	1
5	Ground Tube	Brass , Ni plated	1
4	Rivet	Brass , Black Surfaced	2
3	Antenna Base	PC ; Color:Black	1
2	Antenna Base	PC ; Color:Black	1
1	Antenna Cover	TPE ; Color:Black	1

CUSTOMER'S SIGNATURE	XX	$\pm 3.0$	APPROVED	CUSTOMER: 華碩科技股份有限公司 PART NO : PARTNAME: RF Antenna Cable Assembly W.Y P/NO : C660-510003-A REV UNIT FILE : X1 m/m SHEET : 1/1
	X	$\pm 2.0$	<i>Winston</i>	
	X	$\pm 1.0$	CHECKED	
	XX	$\pm 0.5$	<i>[Signature]</i>	
	XXX	$\pm 0.1$	DRAWING	
			<i>Jan 2</i>	



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Data -> Mem

Edit Title Label

Title Label OFF

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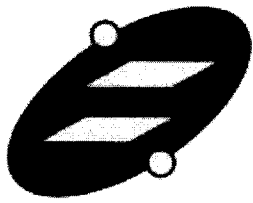
Frequency ON

Update ON

Return



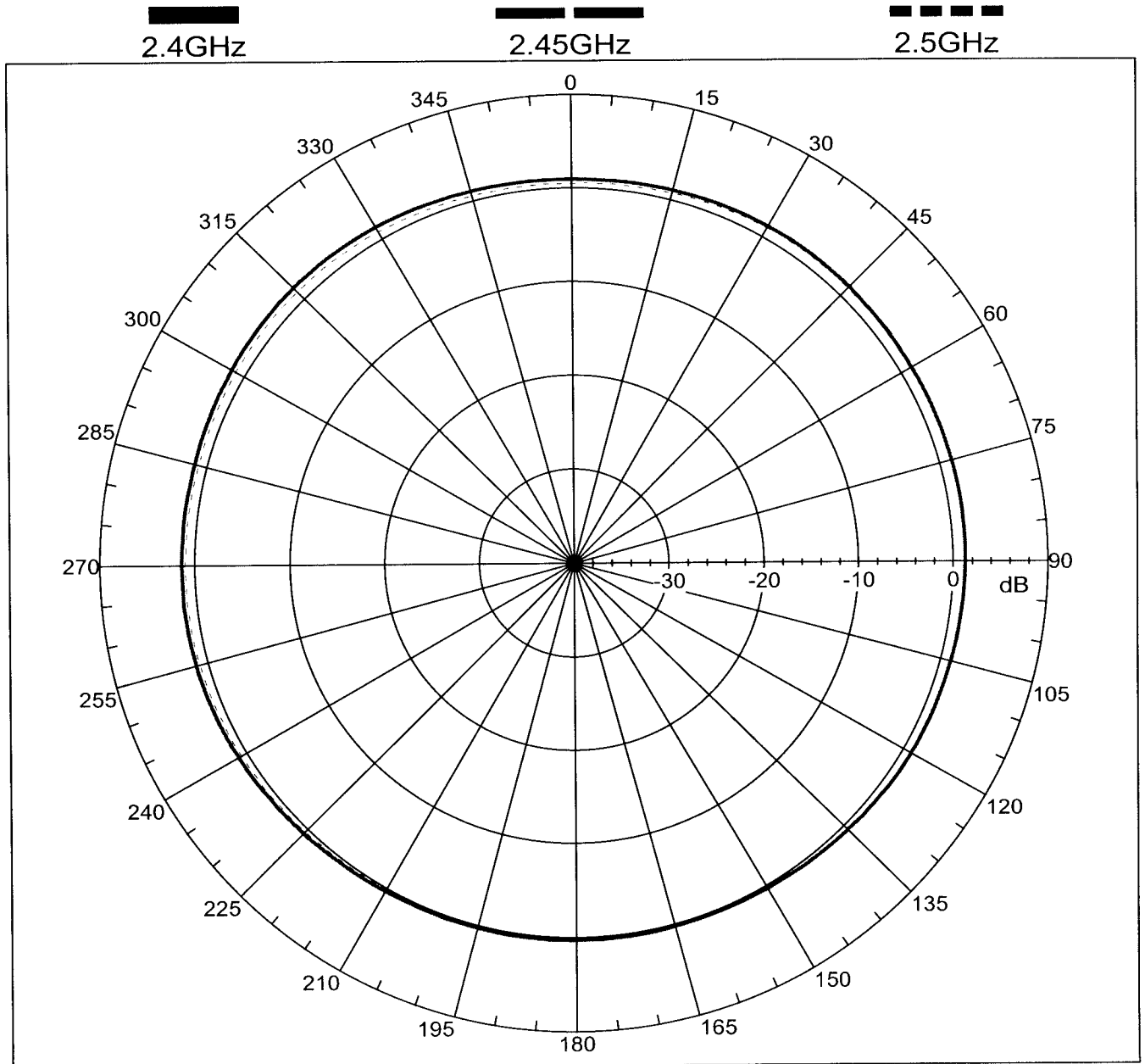


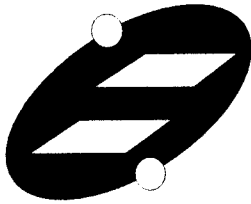


# 譚裕實業股份有限公司

## WHA YU INDUSTRIAL CO., LTD

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





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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:** 華碩科技股份有限公司

**PART NAME:** RF Antenna Cable Assembly

**ASUS PART NO.:** 14G152056000

**REVISION:**

**W. Y. P/NO.:** C660-510019-A

**REV.:** X2

	MANUFACTURER SIGNATURE	CUSTOMER SIGNATURE
APPROVED BY :		
DATE :	6/19/06 	

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# RF Cable Assembly

## Specification

### 1. Electrical Properties :

- 1.1 Frequency Range..... DC~6GHz
- 1.2 Impedance ..... 50 $\Omega$  Nominal
- 1.3 Insertion Loss..... 2GHz-----1.2dB  
3GHz-----1.3dB  
4GHz-----1.4dB  
5GHz-----1.5dB  
6GHz-----1.6dB
- 1.4 VSWR..... 1.5 (max)

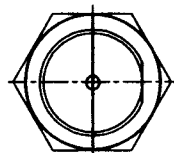
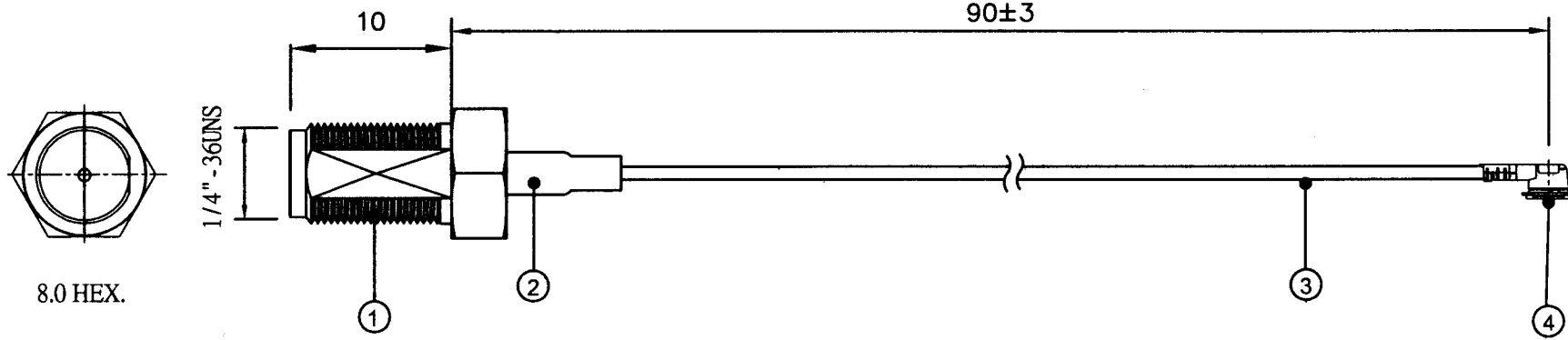
### 2. Physical Properties :

- 2.1 Cable.....  $\phi$  1.13 Coaxial Cable
- 2.2 Operating Temp. .... -20 $^{\circ}$ C ~ +65 $^{\circ}$ C
- 2.3 Storage Temp. .... -30 $^{\circ}$ C ~ +75 $^{\circ}$ C
- 2.4 Connector..... SMA Jack Reverse Connector
- 2.5 Connector..... I-PEX MHF Connector

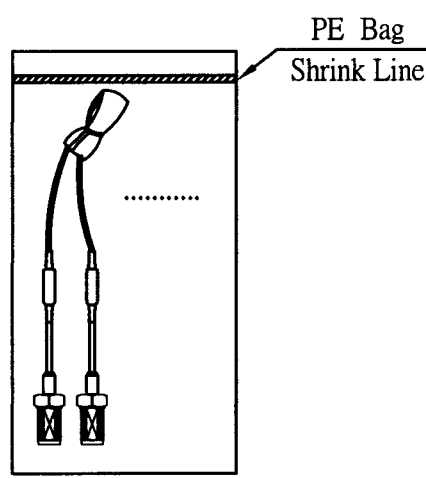
CG-

14G156002600

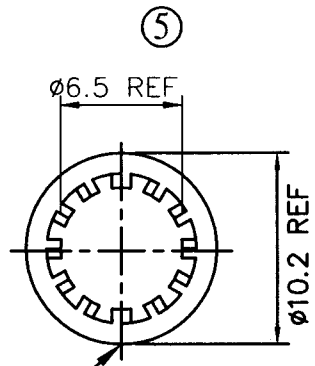
REV	DATE	DESCRIPTION
X1	07/06-2004	New Issue
X2	06/27-2006	Add Part No



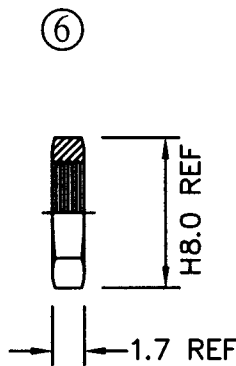
8.0 HEX.



Packing : 25 pcs/bag



Thickness 0.5mm




6	Nut	Brass ; Gold Plated	1	
5	Washer	Brass ; Gold Plated	1	
4	Connector	MHF Connector	1	
3	Cable	Ø1.13 Cable	1	
2	Tube	Heat Shrink Tube	1	
1	Connector	SMA Straight Jack/Reverse	1	
NO	DESCRIPTION		QTY	REMARK

CUSTOMER'S SINGATURE

XX	±3.0	APPROVED	<i>[Signature]</i>
X	±2.0	CHECKED	<i>[Signature]</i>
.X	±1.0		
.XX	±0.5		<i>[Signature]</i>
.XXX	±0.1	DRAWING	<i>[Signature]</i>

CUSTOMER: 華碩科技股份有限公司		
PART NO :	14G152056000	
PARTNAME:	RF Cable Assembly	
W.Y P/NO :	C660-510019-A	
REV	UNIT	FILE :
X2	mm	SHEET : 1/1

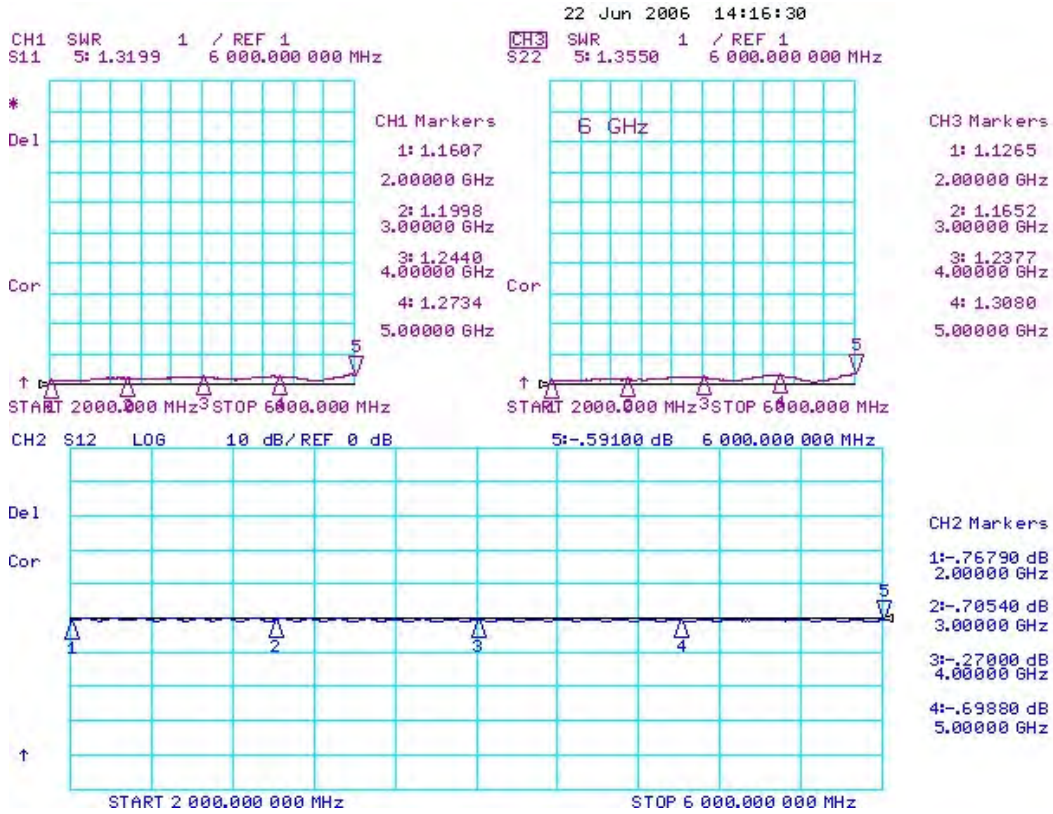

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RF Cable Assembly

P/NO : C660-510019-A SPEC : DC ~ 6GHz

S11 : SMA Jack Reverse

S22 : MHF Connector



6/22/2006



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## SPECIFICATION FOR APPROVAL

**CUSTOMER:** ASUS

**PART NAME:** DPR-2320 Antenna Assembly

**PART NO.:** 14G151037000

**REVISION:**

**W. Y. P/NO.:** C660-520100-A

**REV.:** XI

	MANUFACTURER SIGNATURE	CUSTOMER SIGNATURE
APPROVED BY :		
DATE :	5/5/06	

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5. ....	背膠(3M 467)材質	.....
6. ....	Cable規格	.....
7. ....	Connector材質	.....

# Antenna Assembly

## Specification

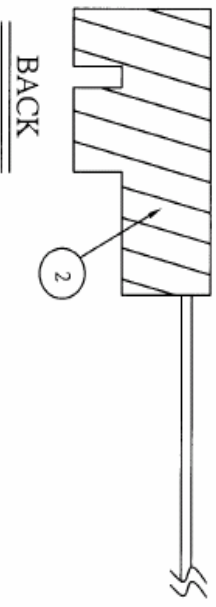
### 1. Electrical Properties :

1.1 Frequency Range.....	2.4~2.5GHz
1.2 Impedance.....	50Ω
1.3 Return Loss.....	<-10dBi
1.4 VSWR.....	1.92 Max.
1.5 Peak Gain.....	<2.0dBi@2.40~2.50GHz
1.6 Average Gain.....	>-3.0dBi@2.40~2.50GHz
1.7 Admitted Power.....	1W

### 2. Physical Properties :

2.1 Operating Temp.....	-10°C ~ +55°C
2.2 Storage Temp.....	-30°C ~ +75°C

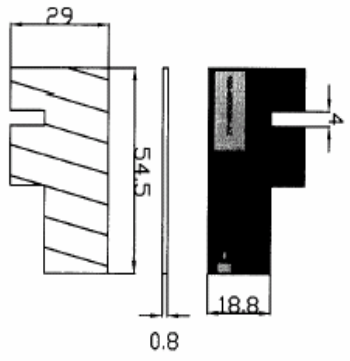
CG-1395



FRONT

2

128±5



BACK

4



FRONT

1

3

Connector朝下

Antenna PCB

Packing : 1sec/bag  
每10袋用釘書機訂起來  
(以方便客戶裝收)



- NOTE :
1. Remove All Burrs.
  2. All Angle Within  $90^\circ \pm 3^\circ$ .
  3. All Corners Within R0.2~R0.5.
  4. Diamter On Common Center And To Be Concentric Within 0.1mm.
  5. [X..]Means Important Dimension.

NO	DESCRIPTION	QTY	REMARK
4	Connector	1	NA
3	Cable Assembly	1	Gray
2	Adhesive	1	3M 467 adhesive
1	WLAN Antenna (FR4(T=0.8mm)平面PCB板)	1	NA

XX	±5	APPROVED	ASUS
X	±10	CHECKED	PART NO. : 14G151037000
XX	±1.5	DRAWING	PARTNAME: DPR-2320 Antenna
XXX	±0.1		W.Y PNO. : C660-520100-A
			REV UNIT FILE :
			A m/m SHEET : 1-1

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### ASUS VOIP Model Small Case Test Report

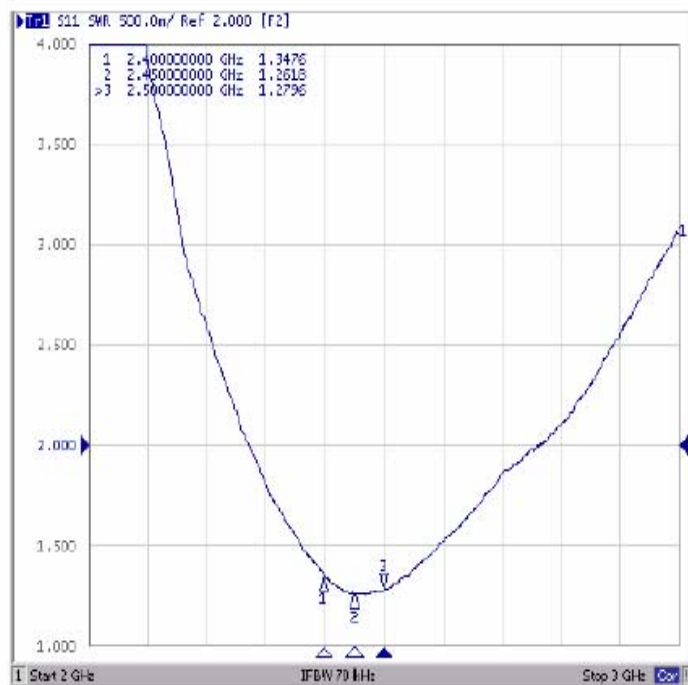
Measurement Time : 2006/01/16

Measurement Instrument :

- 1 - Agilent Technologies E5071A 300K~8.5GHz ENASeries Network Analyzer
- 2 - Chamber : 3.5m(W) \* 3.25m(H) \* 7.12m(L)  
Gain Horn Antenna : SG-430 1.7~2.6GHz

Measurement Frequency : 2.4 GHz ~ 2.5GHz

#### Antenna VSWR



Antenna	VSWR		
	2.4GHz	2.45GHz	2.5GHz
Small Case Side	1.34	1.26	1.27



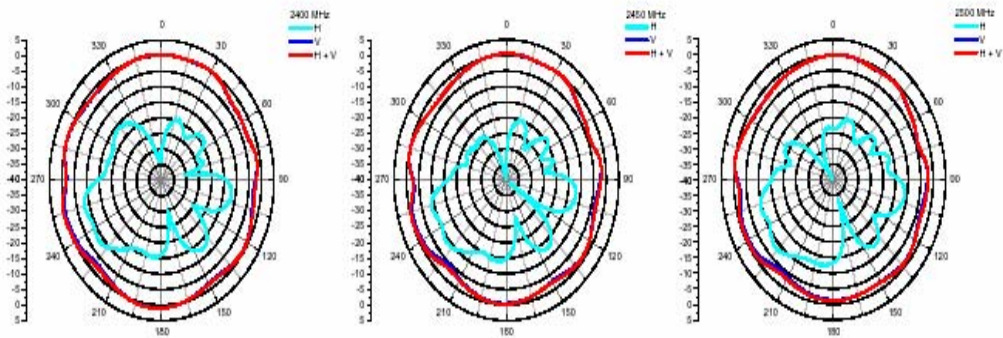
Antenna Peak Gain & Average Gain Test Result

Antenna	Peak Gain (dBi)			Average Gain (dBi)		
	2.4GHz	2.45GHz	2.5GHz	2.4GHz	2.45GHz	2.5GHz
Small Case Side	1.08	0.54	0.15	-0.66	-1.32	-1.45

Antenna Pattern

Small Case Side

2.4GHz~2.5GHz



## NP-150R

Glass cloth base epoxy resin flame retardant copper clad laminate

### FEATURES

- High luminance of epoxy contrast with copper for laser type A.O.I.
- UV solder mask may be applied simultaneously to increase yields.
- High performance epoxy blended to achieve higher resistance than that of FR-4-86
- Thickness 0.8mm capability
- Other properties are similar to NP-140

### PERFORMANCE LIST

Characteristics	Unit	Conditioning	Typical Values	SPEC	
Volume resistivity	MΩcm	C-96/35/90	$5 \times 10^8 \sim 5 \times 10^9$	$10^8 \uparrow$	
Surface resistivity	MΩ	C-96/35/90	$5 \times 10^8 \sim 5 \times 10^7$	$10^4 \uparrow$	
Permittivity 1MHZ	-	C-24/23/50	4.2-4.8	5.4 ↓	
Loss Tangent 1MHZ	-	D-24/23/50	0.010-0.016	0.035 ↓	
Arc resistance	SEC	D-48/50+D-0.5/23	120 ↑	60 ↑	
Dielectric breakdown	KV	D-48/50	60 ↑	40 ↑	
Moisture absorption	%	D-24/23	0.05-0.10	0.35 ↓	
Flammability	-	C-24/23/50+E-24/125	94V0	94V0	
Peel strength 1oz	lb/in	288°C x 10" solder floating	10-14	8 ↑	
Thermal stress	SEC	288°C solder dipping	200 ↑	10 ↑	
Pressure cooker (2 atm 12°C )	1/2hr	SEC	288°C dipping	230	N/A
	1hr	SEC	288°C dipping	220	N/A
	2hr	SEC	288°C dipping	150	N/A
Flexural strength	LW	psi	A	70000-80000	60000 ↑
	CW	psi	A	60000-65000	50000 ↑
Dimensional stability X-Y axis	%	E-0.5/170	0.005-0.030	0.050 ↓	
Coefficient of thermal expansion	in/in/C	TMA	5 x 10 <sup>-5</sup>	N/A	
		Z-axis before Tg			
Z-axis after Tg	in/in/C	TMA	25 x 10 <sup>-5</sup>		
Glass transition temp	°C	DSC	150 ±5	N/A	

Data shown are nominal values for reference only.

#### NOTE:

The average value in the table refers to samples of .062" 1/1.