

## *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>	:	MSQWL530G
<b>Product name</b>	:	Pocket Wireless Router
<b>Model</b>	:	WL-530G
<b>Classification</b>	:	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
<b>Frequency Range</b>	:	2.412 GHz ~ 2.462GHz
<b>Supported Channel</b>	:	11 Channels
<b>Modulation Skill</b>	:	DBPSK, DQPSK, CCK, OFDM
<b>Power Type</b>	:	Powered by the Switching adapter, I/P: 100-240VAC, 50/60Hz, 0.5A O/P: +5VDC, 2.0A

**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:

$$\text{Friis Transmission Formula: } S = \frac{PG}{4pR^2} = \frac{54.82769 \times 1.58489}{4p(20)^2} = 0.0173 \text{ mW} / \text{cm}^2$$

$$\text{Estimated safe separation: } R = \sqrt{\frac{PG}{4p}} = \sqrt{\frac{54.82769 \times 1.58489}{4p}} = 2.63 \text{ cm}$$

Remarks: "The safe estimated separation that the user must maintain from the antenna is at least 2.63 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)

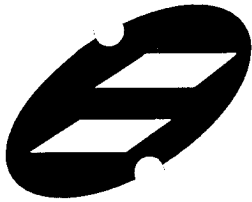
The Numeric gain G of antenna with a gain specified in dB is determined by:

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

$$G = \text{Log}^{-1} (2 / 10) = 1.58489$$

## *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:** 華碩科技股份有限公司

**PART NAME:** RF Antenna Assembly

**PART NO.:**

**REVISION:**

**W. Y. P/NO.:** C660-510013-A

**REV.:** XI

	MANUFACTURER SIGNATURE	CUSTOMER SIGNATURE
APPROVED BY :	<i>Winston</i>	
DATE :	2004/6/29	

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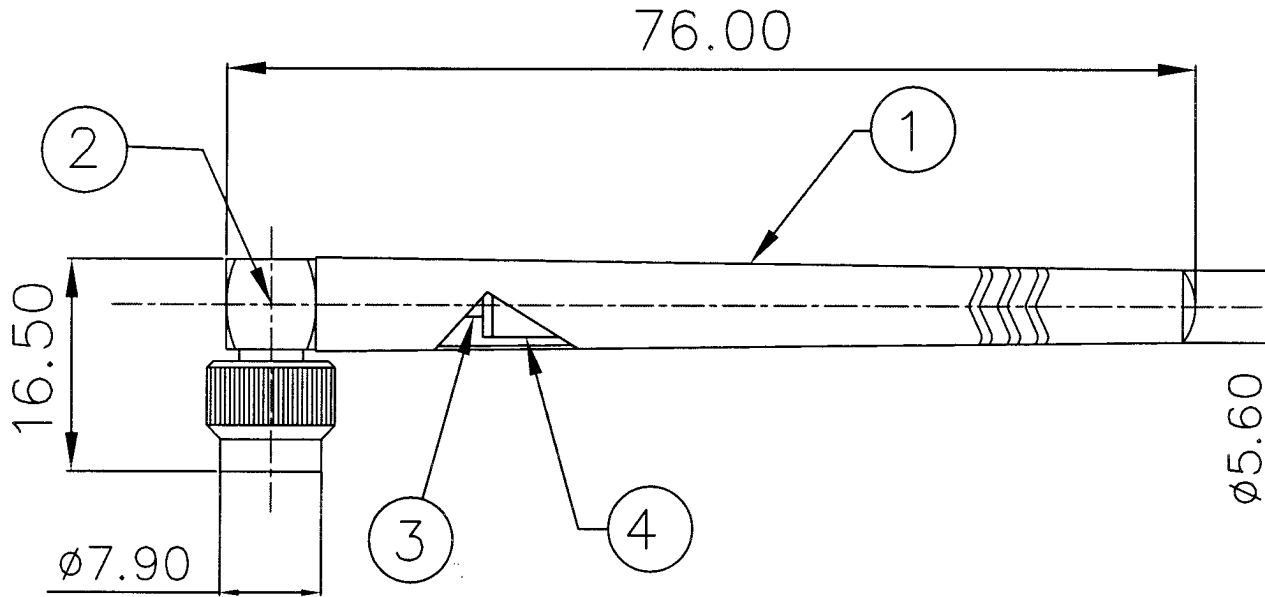
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CG-

REV	DATE	DESCRIPTION
X1	06/29-2004	New Issue



NO	DESCRIPTION	QTY	REMARK
4	Ground Tube	Brass ,Ni Plated	1
3	Cable	RG-178 .50Ω ,Translucent Brown	1
2	Connector	SMA Plug R/A Reverse , Ni Plated	1
1	Antenna Body	TPR TS-95 ; Color : Gray 4C	1

CUSTOMER'S SINGATURE

APPROVED  
*Winston*  
 CHECKED  
*[Signature]*  
 DRAWING  
*Jane*

CUSTOMER: 華碩科技股份有限公司

PART NO :

PARTNAME: SMA RF Antenna

W.Y P/NO : C660-510013-A

REV UNIT FILE :

X1 m/m SHEET : 1/1



Wha Yu  
 INDUSTRIAL CO.,LTD.

華裕實業股份有限公司

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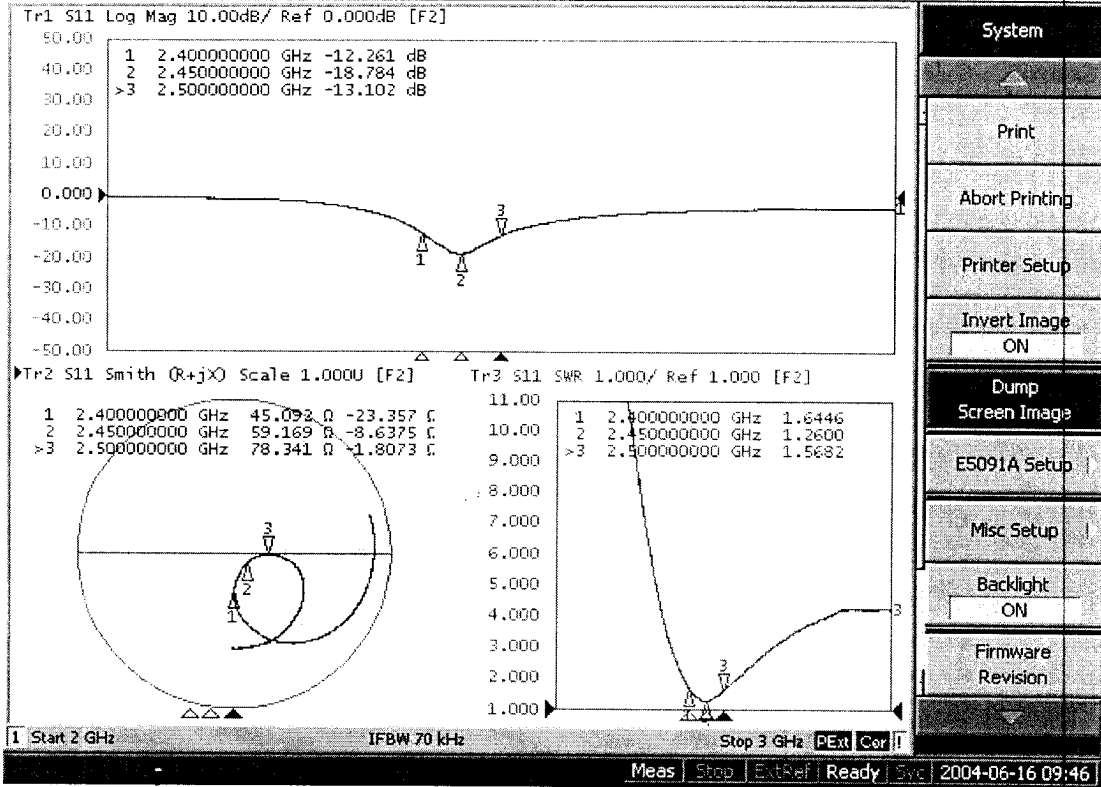
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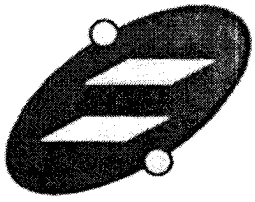
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RF Antenna Assembly

P/NO : C660-510013-A SPEC : 2.4 GHz

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



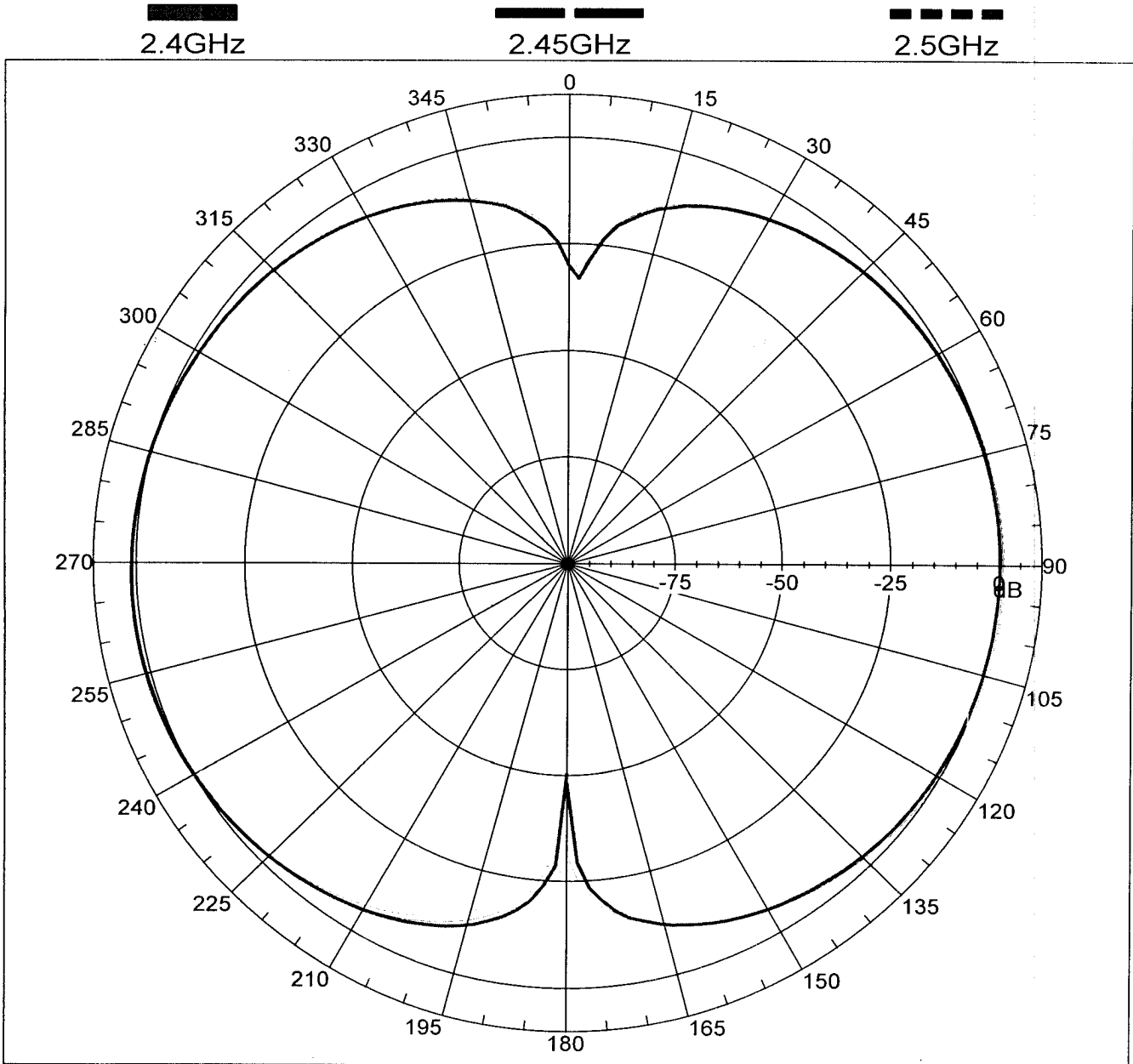


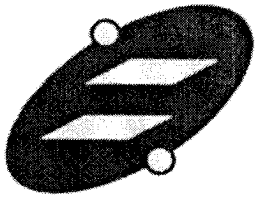
# 譚裕實業股份有限公司

## WHA YU INDUSTRIAL CO., LTD

C660-510013-A

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



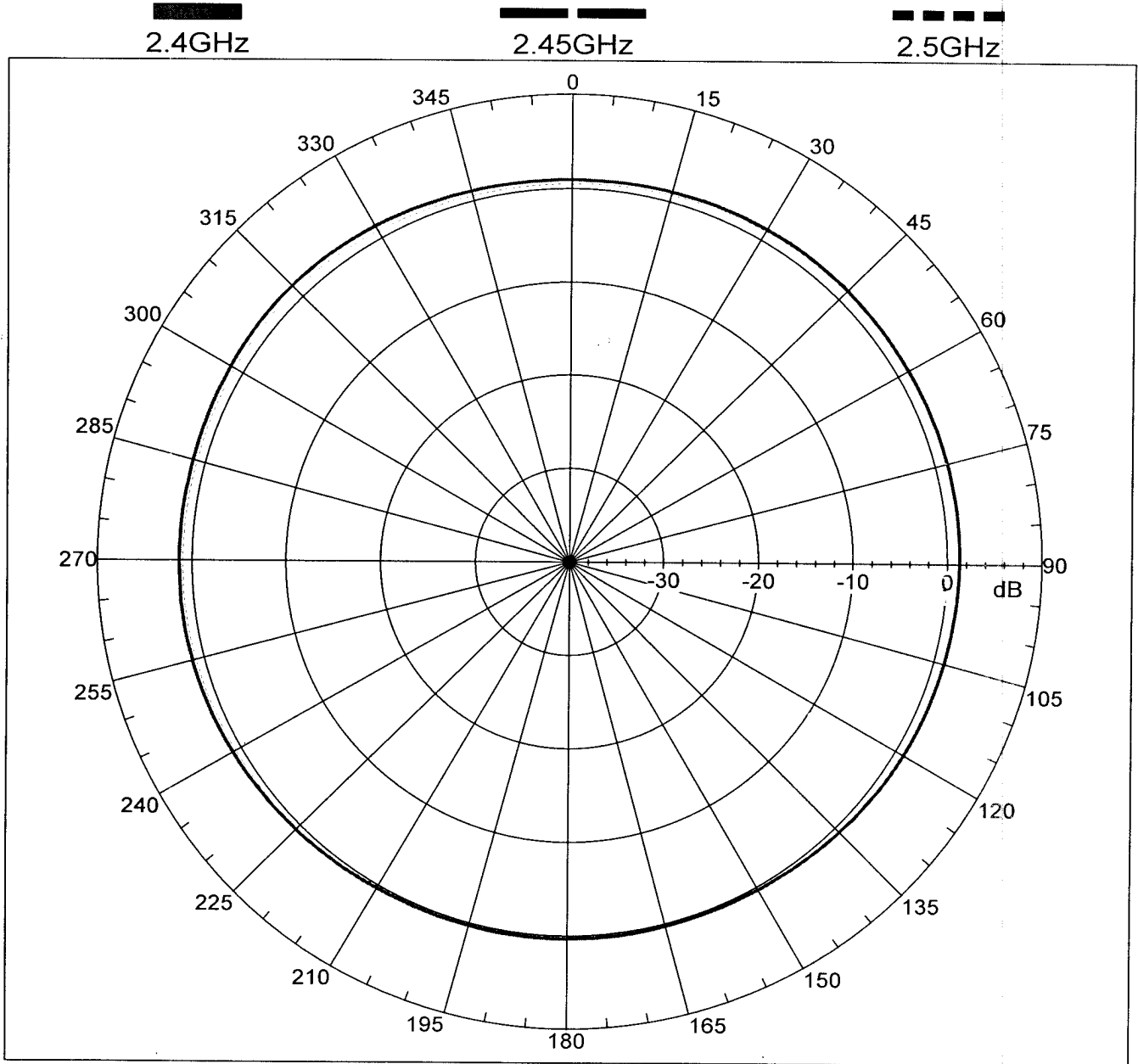


# 華裕實業股份有限公司

## WHA YU INDUSTRIAL CO., LTD

C660-510013-A

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



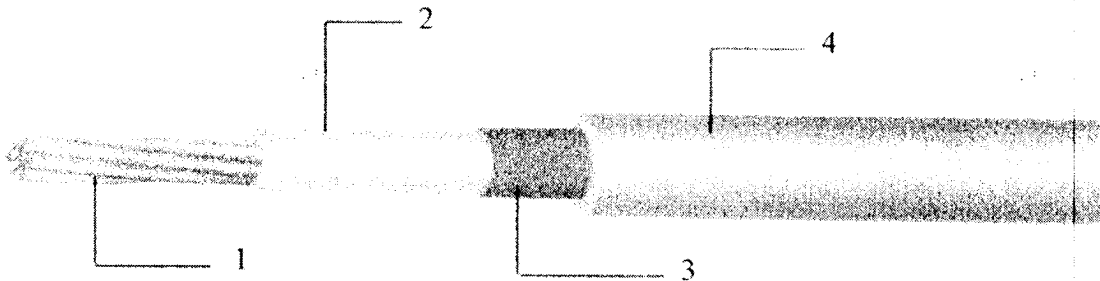


RG 178 B/U	FEP INSULATED HIGH-FREQUENCY COAXIAL CABLE	PAGE	1 / 2
PRODUCT STANDARD		ISSUED	21. Oct. 2003
		REVISED	

**I - Scope**

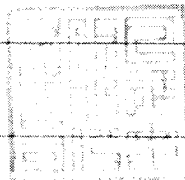
This specification presents a FEP insulated high-frequency coaxial cable AWG 30, 1.8 mm O.D. for internal wiring of electronic equipment, such as Computer / Notebook with wireless communication systems.

**II - Construction**



Item		Unit	Details
1. Inner Conductor	Material	—	CP-AG
	Composition	No./mm	AWG 30 or 7 × 0.1
	Dia. (approx.)	mm	0.305
2. Dielectric	Material	—	Extruded FEP
	Nom. O.D.	mm	0.84 ± 0.05
	Color	—	Natural
3. Outer Conductor	Material	—	Silver coated copper
	Composition	—	Braided (16 / 3 / 0.1)
	Dia. (approx)	mm	1.29 ± 0.07
4. Jacket	Material	—	Extruded FEP
	Dia.	mm	1.80 ± 0.08
	Color	—	Standard color is Light Orange

Note :



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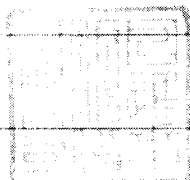
*Shen Bin Ching*

RG 178 B/U	FEP INSULATED HIGH-FREQUENCY COAXIAL CABLE	PAGE	2 / 2
PRODUCT STANDARD		ISSUED	21 Oct. 2003
		REVISED	

**III – Characteristics**

Item	Unit	Specified Value	Note
Temperature Rating	°C	-55 ~ +200	
Voltage Lasting	V	1000	
Dielectric strength	—	Dielectric core: No breakdown at AC 3 kv for 0.2 sec.	Spark test
		Jacket: No breakdown at AC 3 kv for 0.2 sec.	Spark test
Characteristic Impedance	Ω	50 ± 2	TDR method
Capacitance	pF / ft	29.4	
Attenuation. (Max.)	dB/100ft	16.0	100.0 MHz
		33.0	400.0 MHz
		52.0	1.0 GHz
		94.0	3.0 GHz
Approx. Weight	g / m	7.68	

Note :



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# 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" Minimum
- 3 Operating Temperature Range -55°C ~ 200°C

## 3. Electrical Properties:

- 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