

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

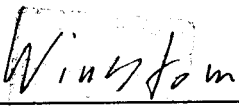
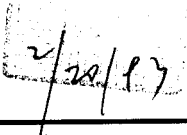
PART NAME: RF Antenna Assembly

PART NO.:

REVISION:

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

REV.: X1

	MANUFACTURER SIGNATURE	CUSTOMER SIGNATURE
APPROVED BY :		
DATE :		

WHA YU GROUP

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RF Antenna Cable Assembly

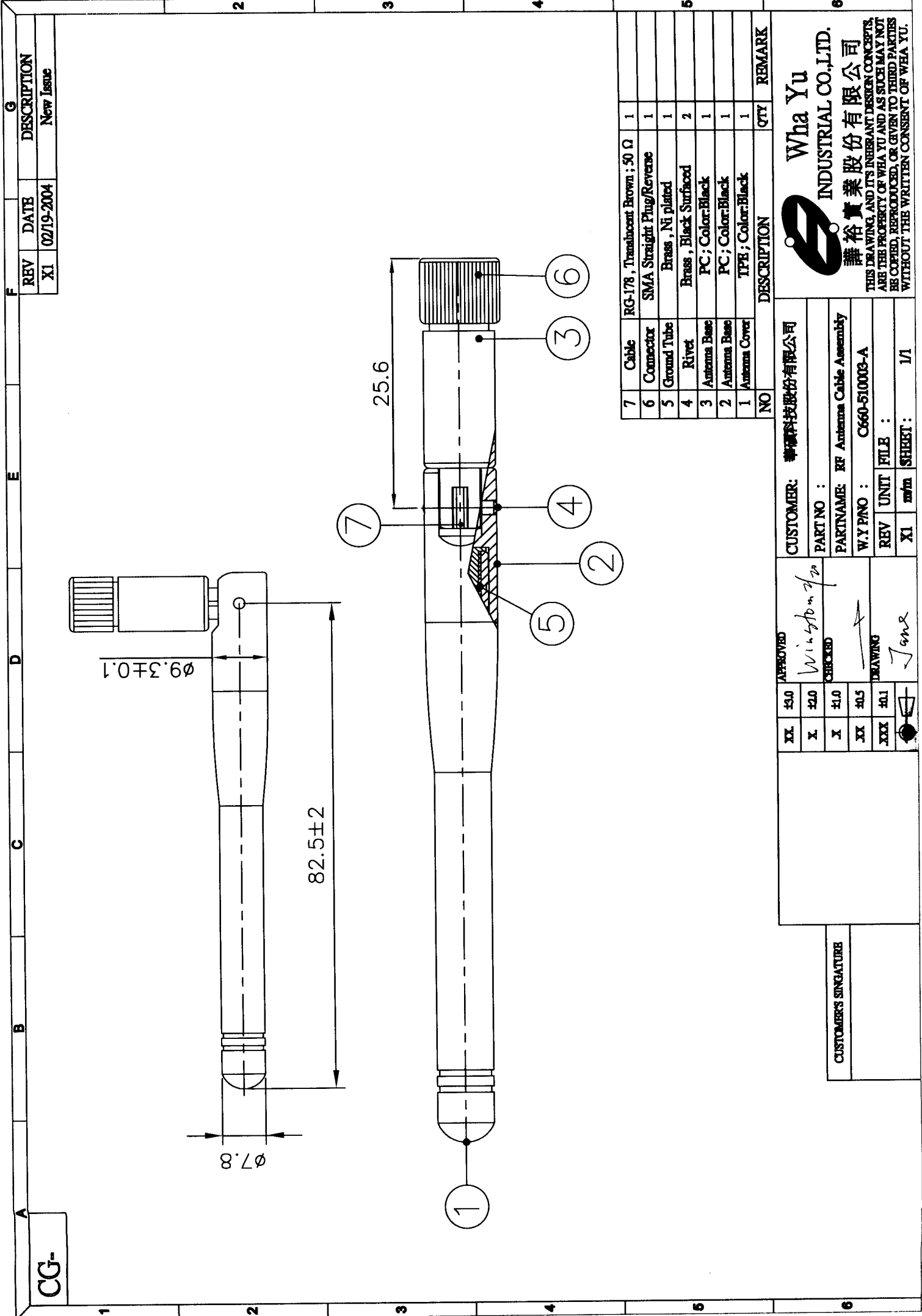
Specification

1. Electrical Properties :

- 1.1 Frequency Rang..... 2.4GHz ~ 2.5GHz
- 1.2 Impedance 50 Ω 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 $^{\circ}$ C ~ +65 $^{\circ}$ C
- 2.5 Storage Temp. -30 $^{\circ}$ C ~ +75 $^{\circ}$ C
- 2.6 Color Black
- 2.7 Connector..... SMA Plug Reverse



REV	DATE	DESCRIPTION
X1	02/19-2004	New Issue

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, 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: 華研科技股份有限公司	
PART NO :	
PARTNAME: RF Antenna Cable Assembly	
W.Y.P/NO : C660-510009-A	
REV	UNIT FILE :
X1	mm SHEET: 1/1

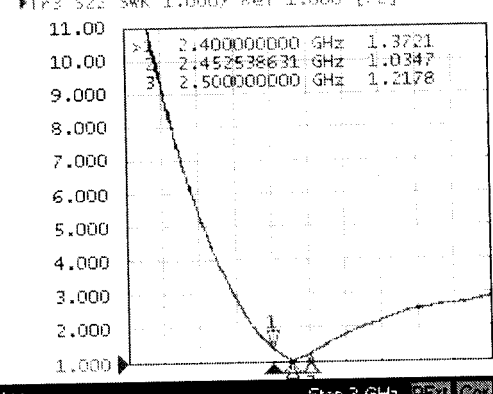
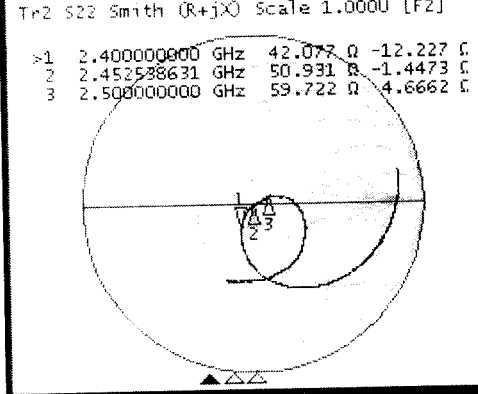
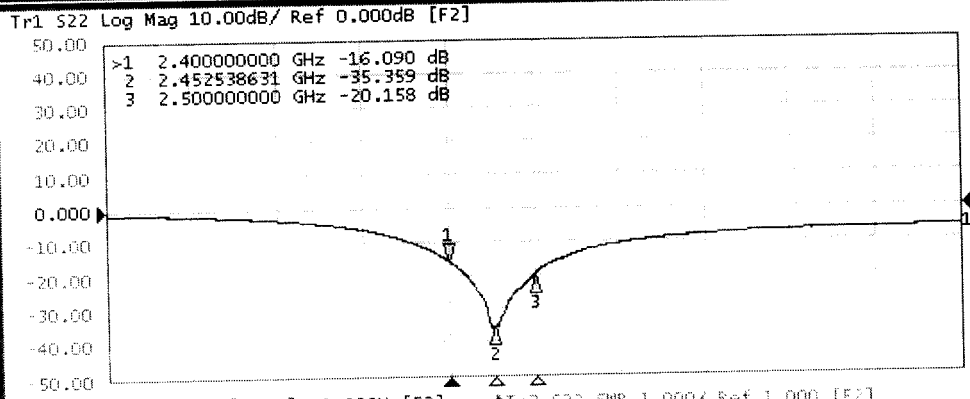
APPROVED	Wingston
CHECKED	
DRAWING	Jane

CUSTOMER'S SIGNATURE

Wha Yu
INDUSTRIAL CO.,LTD.
講裕實業股份有限公司

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CG-



Display

Data -> Mem

Edit Title Label

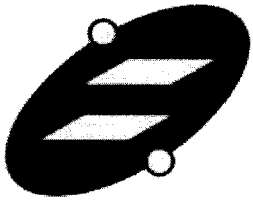
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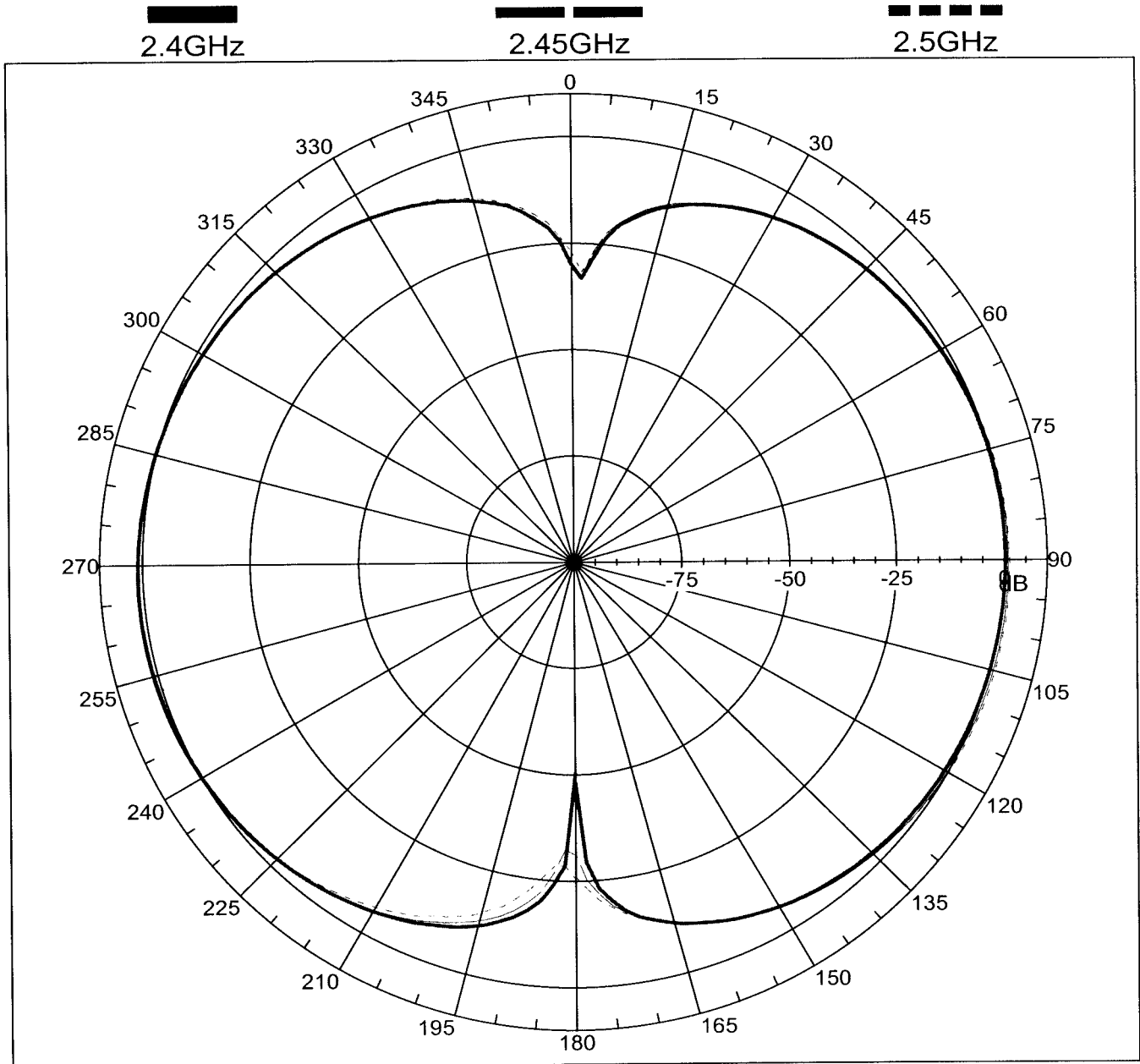
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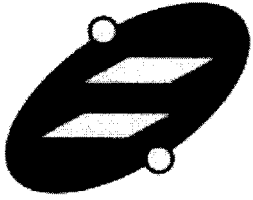


譚裕實業股份有限公司

WHA YU INDUSTRIAL CO., LTD

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



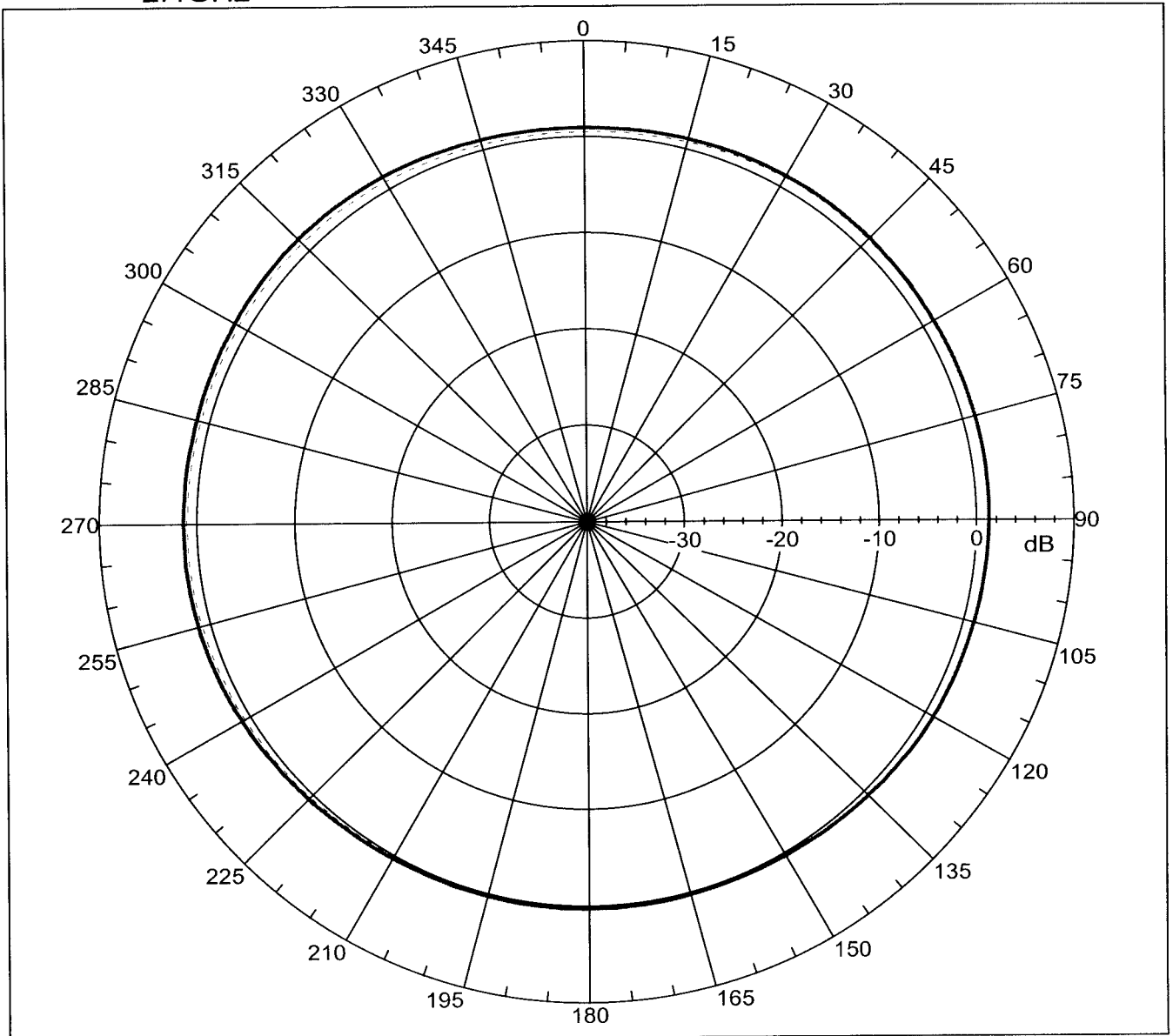


譚裕實業股份有限公司

WHA YU INDUSTRIAL CO., LTD

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

2.4GHz 2.45GHz 2.5GHz



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

Mil-C-17 Coaxial Cable

QPL Approved

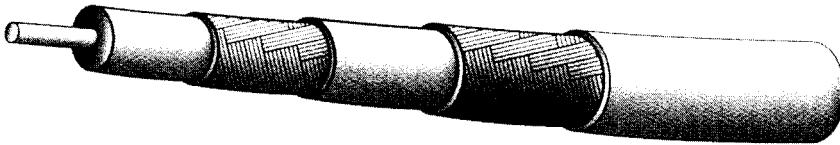
Single braid



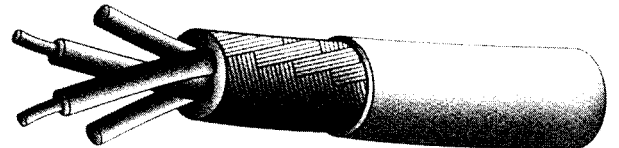
Double braid



Triax



Twinax



Harbour supplies a complete line of high temperature, high performance QPL approved MIL-C-17 coax cables for the military, commercial and industrial applications. The specific M17 constructions referenced are manufactured in accordance with the most recent revision of the MIL-C-17 specification. The MIL-C-17 specification defines complete physical and electrical characteristics for each M17 part number, including dimensional parameters, dielectric materials, shield construction, maximum attenuation, and VSWR levels.

▼ *VSWR Sweep Testing*

When selecting a 50 ohm coaxial cable, constructions with VSWR requirements are recommended. Manufacturing and sweep testing cables with concern for VSWR ensures a quality cable free of spikes over the referenced frequency range. (Note the test frequencies specified in the electrical characteristics section.)

Precision PTFE Dielectrics

All of the high temperature, high performance coax cables listed have PTFE dielectrics with high dielectric strength and low capacitance in proportion to the dielectric constant. All PTFE dielectrics are manufactured with tolerances tighter than the MIL-C-17 specification to ensure uniformity of electrical characteristics, especially impedance, attenuation and VSWR.

Tape wrapped PTFE Constructions

Harbour also manufactures PTFE tape wrapped cables to a previous revision of the MIL-C-17 specification. These constructions can withstand operating temperatures up to 250° C. versus 200° C. for FEP jacketed cables. Also, PTFE tape wrapped cables are generally more flexible than their FEP jacketed counterparts.

UL Approvals

All of Harbour's M17 part numbers manufactured to the MIL-C-17 specification may be ordered with UL and FT4 approvals.

Mil-C-17 Coaxial Cables

Physical Characteristics:

M17 Number	Center Conductor	PTFE Dielectric Diameter	Shield	Jacket	Overall Diameter	Minimum Recommended Bend Radius	Operating Temp. (%C)	Weight (lbs./MFT)	Comments
M17/60-RG142	.037" SCCS	.116"	SPC(2)	FEP	.195"	1.0"	-55 +200	43.0	
M17/93-RG178	.0120"(7/.004")SCCS	.033"	SPC	FEP	.071"	0.4"	-55 +200	6.3	
M17/93-00001	.0120"(7/.004")SCCS	.033"	SPC	PFA	.071"	0.4"	-55 +230	6.3	M17/93-RG178 w/extended temp. rat
M17/94-RG179	.0120"(7/.004")SCCS	.063"	SPC	FEP	.100"	0.4"	-55 +200	10.8	
M17/95-RG180	.0120"(7/.004")SCCS	.102"	SPC	FEP	.141"	0.7"	-55 +200	19.8	
M17/110-RG302	.0253"SCCS	.146"	SPC	FEP	.202"	1.0"	-55 +200	40.0	
M17/111-RG303	.037"SCCS	.116"	SPC	FEP	.170"	0.9"	-55 +200	31.0	
M17/112-RG304	.059" SCCS	.185"	SPC(2)	FEP	.280"	1.4"	-55 +200	94.0	
M17/113-RG316	.0201"(7/.0067")SCCS	.060"	SPC	FEP	.098"	0.5"	-55 +200	12.2	
M17/127-RG393	.094"(7/.0312")SC	.285"	SPC(2)	FEP	.390"	2.0"	-55 +200	165.0	
M17/128-RG400	.0384"(19/.008")SC	.116"	SPC(2)	FEP	.195"	1.0"	-55 +200	50.0	
M17/131-RG403	.0120"(7/.004")SCCS	.033"	SPC(2)	FEP(2)	.116"	0.6"	-55 +200	15.0	Triaxial M17/93-RG
M17/152-00001	.0201"(7/.0067")SCCS	.060"	SPC(2)	FEP	.114"	0.6"	-55 +200	18.5	Double shielded M17/113-RG316
M17/158-00001	.037"SCCS	.116"	SPC(2)	FEP	.195"	1.0"	-55 +200	56.0	Unswept M17/60-RG
M17/169-00001	.0120"(7/.004")SCCS	.033"	SPC	FEP	.071"	0.4"	-55 +200	6.3	Unswept M17/93-RG
M17/170-00001	.037"SCCS	.116"	SPC	FEP	.170"	0.9"	-55 +200	39.0	Unswept M17/111-RG
M17/172-00001	.0201"(7/.0067")SCCS	.060"	SPC	FEP	.098"	0.5"	-55 +200	11.5	Unswept M17/113-RG
M17/174-00001	.094"(7/.0312")SCCS	.285"	SPC(2)	FEP	.390"	2.0"	-55 +200	175.0	Unswept M17/127-RG
M17/175-00001	.0384"(19/.008")SC	.116"	SPC(2)	FEP	.390"	1.0"	-55 +200	50.0	Unswept M17/128-RG
M17/176-00002	.0235"(19/.005")SPA(2)	.042"	SPA	PFA	.129"	0.6"	-55 +230	18.0	Controlled impedar twinax
PTFE Tape Wrap Jacketed RG Cables									
RG 187 A/U	.0120"(7/.004)SCCS	.063	SPC	PTFE	.100"	0.5"	-55 +250	10.0	Flexible, 250° C. rat
RG 188 A/U	.0201"(7/.0067)SCCS	.060	SPC	PTFE	.100"	0.5"	-55 +250	11.0	Flexible, 250° C. rat
RG 195 A/U	.0120"(7/.004)SCCS	.102	SPC	PTFE	.141"	0.7"	-55 +250	18.0	Flexible, 250° C. rat
RG 196 A/U	.0120"(7/.004)SCCS	.034	SPC	PTFE	.067"	0.4"	-55 +250	6.0	Flexible, 250° C. rat

Electrical Characteristics:

M17 Number	Impedance (ohms)	Capacitance (pF/ft)	Max. Operating Voltage (RMS)	Maximum attenuation (dB/100ft) @						Max Frequency (GHz)
				100 MHz	400 MHz	1 GHz	3 GHz	5 GHz	10 GHz	
M17/60-RG142	50 +/- 2	29.4	1900	5.5	11.7	19.0	35.0	48.0	-	17.4
M17/93-RG178	50 +/- 2	29.4	1000	16.0	33.0	52.0	94.0	-	-	3.0
M17/93-00001	50 +/- 2	29.4	1000	16.0	33.0	52.0	94.0	-	-	3.0
M17/94-RG179	75 +/- 3	19.4	1200	-	21.0	-	-	-	-	-
M17/95-RG180	95 +/- 5	16.4	1500	-	17.0	-	-	-	-	-
M17/110-RG302	75 +/- 3	19.4	2300	-	8.0	-	26.0	-	-	-
M17/111-RG303	50 +/- 2	29.4	1900	3.9	8.0	15.0	28.0	-	-	-
M17/112-RG304	50 +/- 3	29.4	3000	2.7	6.4	11.1	22.0	30.0	-	8.0
M17/113-RG316	50 +/- 2	29.4	1200	11.0	21.0	38.0	58.0	-	-	3.0
M17/127-RG393	50 +/- 2	29.4	2500	2.4	5.0	8.8	18.0	24.6	37.0	11.0
M17/128-RG400	50 +/- 2	29.4	1900	4.5	10.5	17.0	38.0	50.0	78.0	12.4
M17/131-RG403	50 +/- 2	29.4	1000	-	37.0	-	-	-	-	10.0
M17/152-00001	50 +/- 2	29.4	1200	11.5	24.0	40.0	75.0	110.0	170.0	12.4
M17/158-00001	50 +/- 2	29.4	1900	-	9.5	-	-	-	-	-
M17/169-00001	50 +/- 2	29.4	1000	-	29.0	-	-	-	-	-
M17/170-00001	50 +/- 2	29.4	1900	-	8.6	-	-	-	-	-
M17/172-00001	50 +/- 2	29.4	1200	-	21.0	-	-	-	-	-
M17/174-00001	50 +/- 2	29.4	2500	-	5.0	-	-	-	-	-
M17/175-00001	50 +/- 2	29.4	1900	-	10.5	-	-	-	-	-
M17/176-00001	77 +/- 7	19.0	1000	-	-	-	-	-	-	-
PTFE Tape Wrap Jacketed RG Cables										
RG 187 A/U	75 +/- 3	19.4	1200	-	21.0	-	-	-	-	3
RG 188 A/U	50 +/- 2	29.4	1200	11.0	21.0	38.0	58.0	-	-	3
RG 195 A/U	95 +/- 5	15.4	1500	-	17.0	-	-	-	-	3
RG 196 A/U	50 +/- 2	29.4	1000	-	29.0	-	-	-	-	-

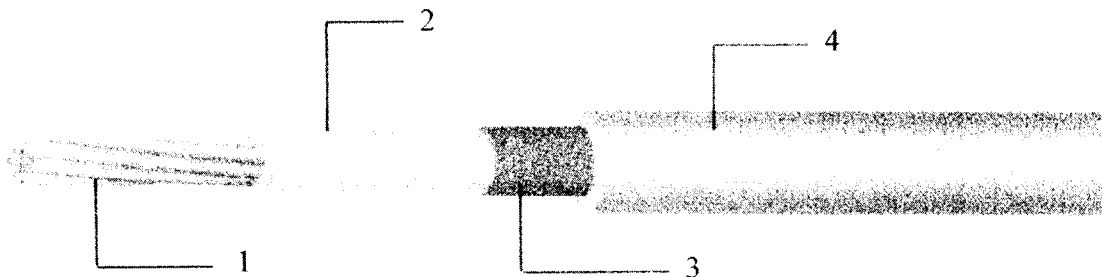
Maximum frequencies are those as referenced on individual slant sheets of the MIL-C-17 specification. No values are given for unswept construction as the specification recommends these cables should not be used above 400 MHz. (All figures referenced above are nominal unless otherwise specified.)

A3132PS001	FEP INSULATED HIGH-FREQUENCY COAXIAL CABLE	PAGE	1 / 2
PRODUCT STANDARD		ISSUED	21. Oct. 2003
		REVISED	

I - Scope

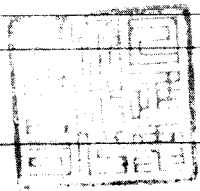
This specification presents a FEP insulated high-frequency coaxial cable AWG 32, 1.13 mm O.D. for internal wiring of electronic equipment, such as Computer / Notebook with wireless communication systems.

II - Construction



Item		Unit	Details
1. Inner Conductor	Material	---	Silver coated copper
	Composition	No./mm	AWG 32 or 7 × 0.08
	Dia. (approx.)	mm	0.24
2. Dielectric	Material	---	Extruded FEP
	Thickness	mm	0.22
	Nom. O.D.	mm	0.68 ± 0.02
	Color	---	Natural
3. Outer Conductor	Material	---	Silver coated copper
	Composition	---	Braided (16 / 4 / 0.05)
	Dia. (approx)	mm	0.90 ± 0.03
4. Jacket	Material	---	Extruded FEP
	Thickness	mm	0.10
	Dia.	mm	1.13 + 0.05 / -0.08
	Color	---	Standard colors are Light Grey, Black, Dark Grey

Note :



MADE BY

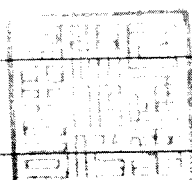
APPROVALS

Shen Bin Chao

A3132PS001	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	200	
Voltage Lasting	V	250	
Dielectric strength	—	Dielectric core: No breakdown at AC 1.5 kV for 0.15 sec.	Spark test
		Jacket: No breakdown at AC 1.5 kV for 0.15 sec.	Spark test
		No breakdown at AC 500V for 1 min.	Outer conductor to inner conductor
Inner conductor resistance	Ω / km	525	at 20°C
Insulation resistance	MΩ / km	Min. 1500	at 20°C
Characteristic Impedance	Ω	50 ± 2	TDR method
Capacitance	pF / m	98	at 1 kHz
Attenuation. (nom.)	dB / m	2.0	1.0 GHz
		2.9	2.0 GHz
		3.6	3.0 GHz
		4.2	4.0 GHz
		4.7	5.0 GHz
		5.2	6.0 GHz
Approx. Weight	g / m	3.15	

Note :		MADE BY	<i>Shen Bin</i>
		APPROVALS	<i>Shen Bin</i>

亞 驪 企 業 股 份 有 限 公 司
ARISTOTLE ENTERPRISES

承 認 申 請 書

客戶名稱: 華碩電腦股份有限公司
Customer
廠商料號: RFA-02-C2M2-03
Part No.
品名: 2.4GHz
Description
圖號: RFA-02- C2M2-03.DWG
Drawing No.
客戶料號:
Drawing No.

出廠簽章:

檢 查 TEST BY	核 對 CHECK BY	承 認 APPROVE BY

承認簽章:

檢 查 TEST BY	核 對 CHECK BY	承 認 APPROVE BY

地址:台北縣中和市莒光路 63 號 8 樓

電話:02-2225-8209

傳真:02-2225-7523

I N D E X

RFA-02-C2M2-03

14G151028020

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		<table border="1"> <tr> <td colspan="2"> ARISTOTLE ENTERPRISES INC. </td> <td colspan="2"> 亞馬遜企業股份有限公司 </td> </tr> <tr> <td>PROJECTION</td> <td>UNITS</td> <td>mm</td> <td>TITLE</td> </tr> <tr> <td></td> <td>SCALE</td> <td>1/1</td> <td>RFA-02-C2M2-03</td> </tr> <tr> <td>APPD.</td> <td>PAPER</td> <td>A4</td> <td>DWG NO.</td> </tr> <tr> <td>CHKD.</td> <td></td> <td></td> <td>RFA-02-C2M2-03.DWG</td> </tr> <tr> <td>DESIGN</td> <td></td> <td></td> <td>REV. B</td> </tr> <tr> <td>DRAW</td> <td colspan="2"> J.w.Lee 94/07/29 </td> <td></td> </tr> </table>			ARISTOTLE ENTERPRISES INC.		亞馬遜企業股份有限公司		PROJECTION	UNITS	mm	TITLE		SCALE	1/1	RFA-02-C2M2-03	APPD.	PAPER	A4	DWG NO.	CHKD.			RFA-02-C2M2-03.DWG	DESIGN			REV. B	DRAW	J.w.Lee 94/07/29		
ARISTOTLE ENTERPRISES INC.		亞馬遜企業股份有限公司																														
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1.																																
REV	ECN	NAME	DATE																													
1	2	3	4	5																												
A	B	C	D																													

1. Antenna specification & testing results

Description: Dipole antenna

1-1 Antenna Electrical specification

1. Frequency range: 2400 – 2500MHz
2. Gain: 2.0dBi Omni, Average gain
3. VSWR: 2.0
4. Polarization: Linear, vertical
5. Impedance: 50 Ohm
6. Connector: RP-SMA plug

(Reverse Polarity meets FCC part 15. 203 Requirement)



RFA-02-C2M2

2. Antenna Mechanical Testing Results

Condition Non operating during test.

2-1 Endurance test result:

1. Number of connection/disconnection of the connector **500 cycles**
2. Number of 360° rotation of the connector **1000 cycles**

Mandatory Guaranty of functionalities after test.

2-2 Resistance test result: (tests are applicable to all parts and both sides.)

2-2-1 Traction test result:

1. Traction force applied 3 times on plugs during 15 second **1 kg**

Mandatory No mechanical damage tolerated. Guaranty of functionalities after testing.

2-2-2 Bending force test result:

1. Number of 90° at the hinge parts and bending on one direction with 1 lbs force: **1000 cycles.**
2. Bending at the antenna hinge parts reversely guaranteed the quality under **1 kgw** force.

2-2-3 Top cover & joint Tensility test result

Test equipment: IMADA FB-50K

1. Minimum pull test force: 8kgw
2. Maximum pull test force: 15.5kgw
3. Average pull test force over 10kgw

Testing items	1	2	3	4
Reference force specification	8kg			
Torsion test data	15.5kg	10.5kg	12kg	15kg
Decision (Result)	OK	OK	OK	OK

Mandatory No mechanical damage tolerated. Guaranty of functionalities after testing.

3. Environmental Testing Results

3-1 Storage test results

Condition% Non operating during test.

Cold: -40'C during 72h (IEC 68-2-1 standard Ab/Ad test)

Dry heat: +60'C during 96h (IEC 68-2-2 standard Bb/Bd test)

Humidity: +25'C at 95%R.H. during 4 days (IEC 68-2-56 standard Cb test)

Mandatory% No mechanical or visible damage tolerated. Guaranty of functionalities after test

3-2 Operation test results

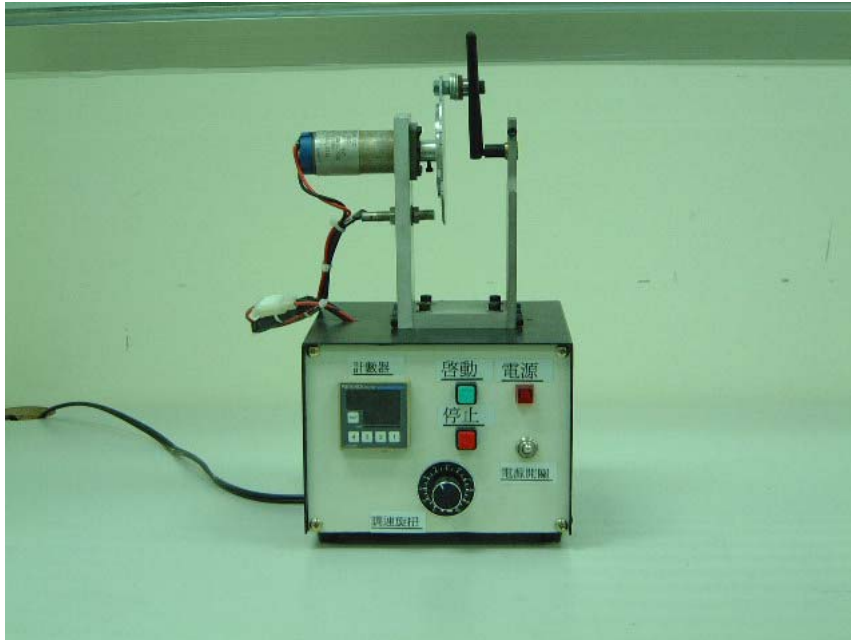
Condition% Operating during test.

Cold: -10'C during 48h (IEC 68-2-1 standard Ab/Ad test)

Dry heat: +55'C during 48h (IEC 68-2-2 standard Bb/Bd test)

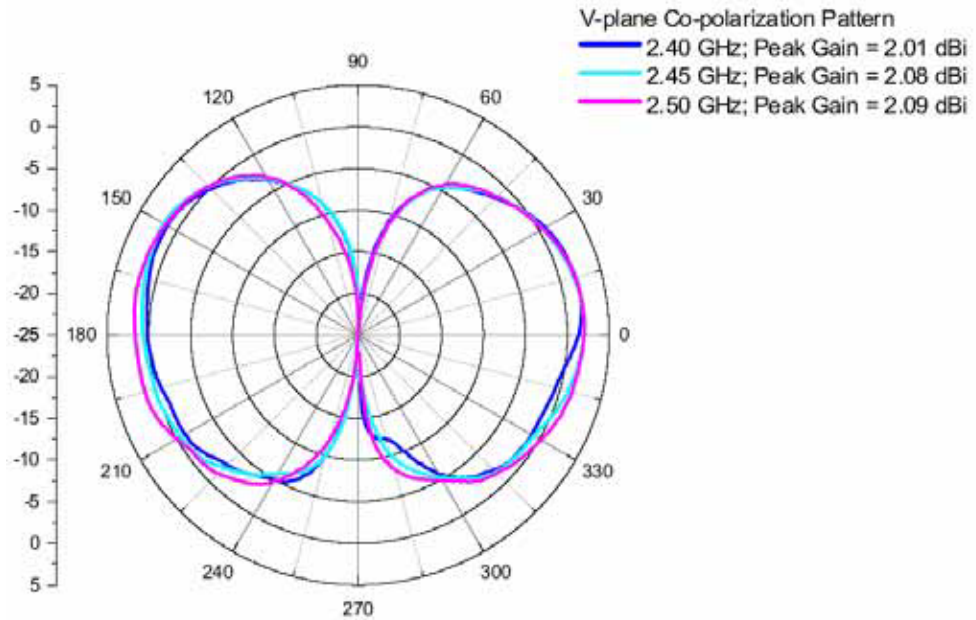
Composite: -10'C to +55'C 95%R.H 4 cycles(IEC 68-2-30 standard Nb test)

Mandatory% No mechanical or visible damage tolerated. Guaranty of functionalities during and after test

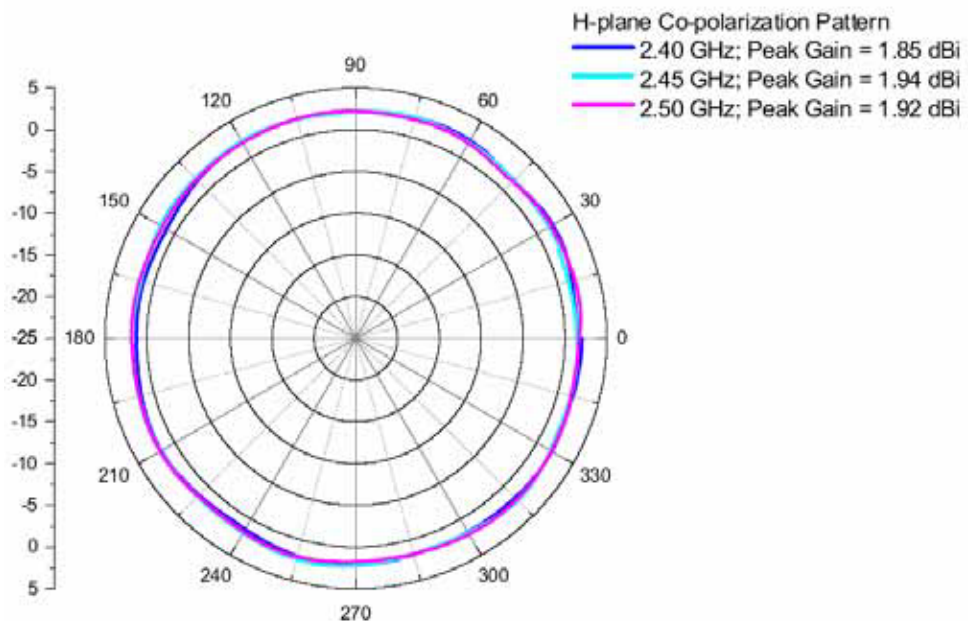


Antenna Radiation Patterns

11b dipole Antenna Radiation Pattern : E-Plane

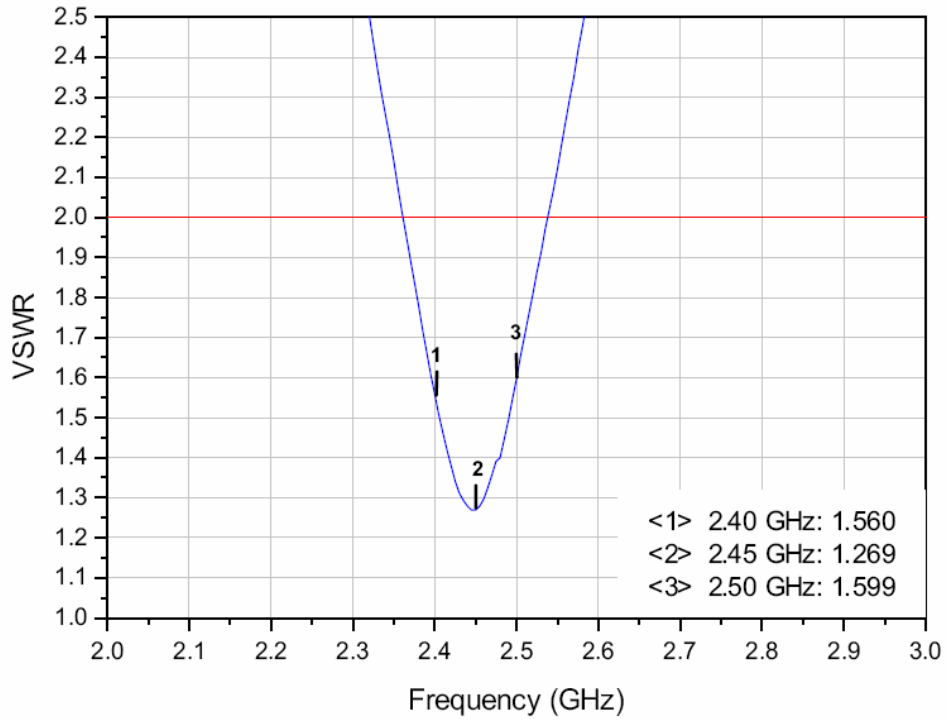


11b dipole Antenna Radiation Pattern : H-Plane



Antenna VSWR / Return Loss

11b Antenna dipole VSWR



11b Antenna Return Loss

