

Measurement of MPE

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	:	KA2DWL-510
Product name	:	IEEE 802.11b Wireless LAN PCI Adaptor
Model name	:	DWL-510
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 Channel
Modulation Skill	:	DBPSK, DQPSK, CCK
Power Type	:	Power by the Protocol Control Information of computer

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

[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:

$$\text{Friis Transmission Formula: } S = \frac{PG}{4pR^2} = \frac{120.226 \times 1.585}{4p(20)^2} = 3.791 \times 10^{-2} \text{ mW / cm}^2$$

$$\text{Estimated safe separation: } R = \sqrt{\frac{PG}{4p}} = \sqrt{\frac{120.226 \times 1.585}{4p}} = 3.894 \text{ cm}$$

Remarks: "The safe estimated separation that the user must maintain from the antenna is at least 3.894 cm."

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:

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

$$G = \text{Log}^{-1} (2 / 10) = 1.585$$

承 認 書
SPECIFICATION FOR APPROVAL

客 戶
CUSTOMER

友勁科技股份有限公司

日 期
DATE

92 年 05 月 22 日

品 名
DESCRIPTION

Swivel Type , 1/4λ Dipole Antenna
(Gray)
Reverse SMA Connector

客 戶 料 號
CUSTOMER P/N



萬旭電業股份有限公司

WANSHIH ELECTRONIC CO., LTD.

台北縣五股鄉五工六路 72 號 3 樓

3F 72 WU KONG 6TH RD., WU KU INDUSTRIAL DISTRICT

TAIPEI HSIEN, TAIWAN, R.O.C.

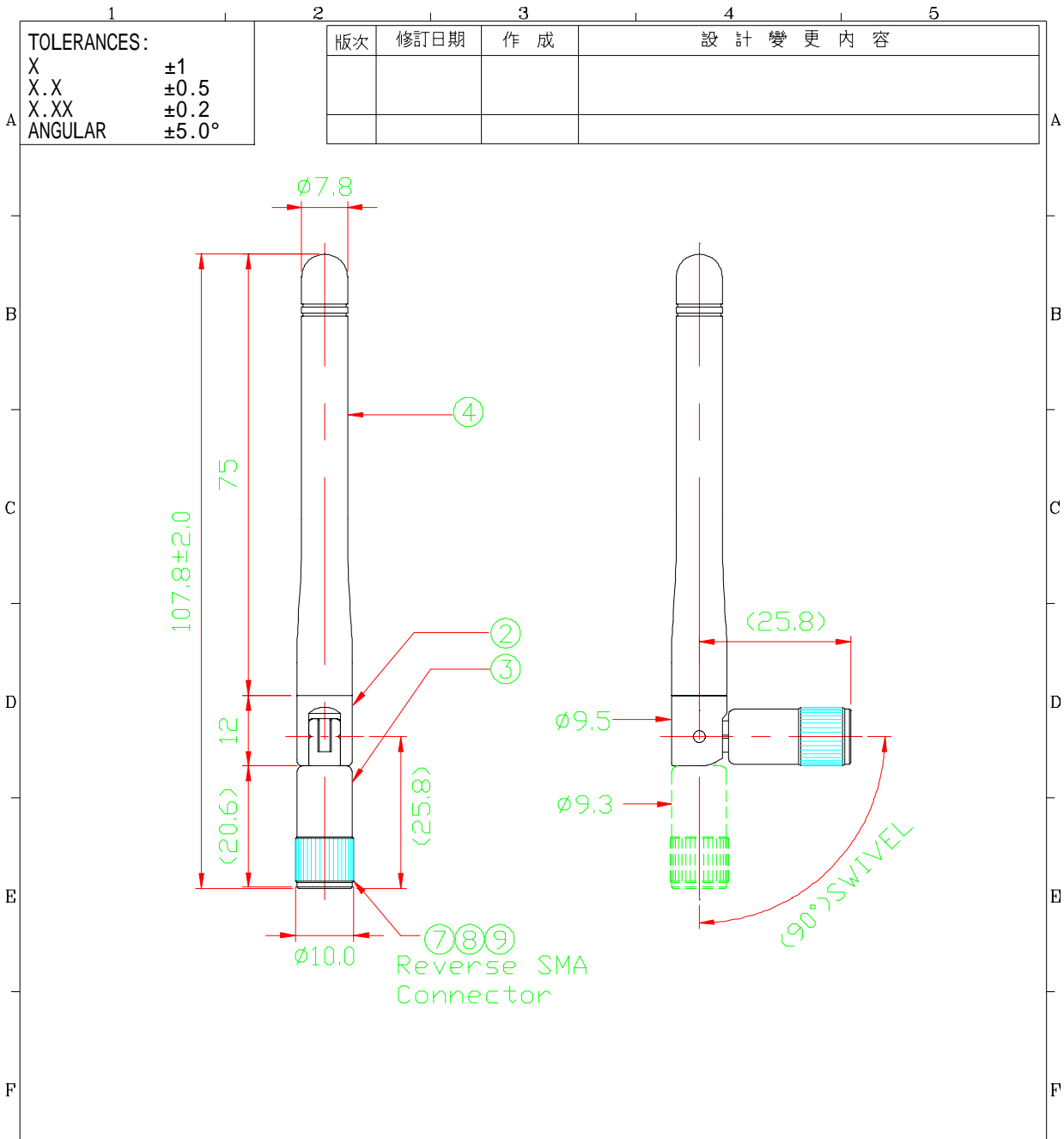
TEL : (02) 22988066 (5 LINE) FAX : (02)22981102

Table of Contents

Table of Contents	1
Specification	2
Drawing	3
Return Loss	4
V.S.W.R	5
H-PLANE	6
E-PLANE	7
Raw Material Data Sheet	
RG178 Cable	8~10
Housing	11
Hinge	12

SPECIFICATION

- | | |
|-------------------------------|---|
| 1. Description | : The antenna is a Swivel Type ,
Dipole Sleeve Antenna |
| 2. Customer | : 友勁科技股份有限公司 |
| 3. Model No. | : WSS002 |
| 4. Part No. | : OAW0001A |
| 5. Standard | : IEEE 802.11b 11Mbps Wireless LAN |
| 6. Antenna Profile | : 108 mm length (see Drawing) |
| 7. Color | : Gray (424U) |
| 8. Electrical Characteristics | |
| Operating Frequency | : 2.4~2.5Ghz |
| Antenna Type | : $1/4\lambda$ Dipole Sleeve |
| Polarization Type | : Linear |
| Type of Radiation | : Toroidal |
| Antenna Gain | : 2.0 dBi Typical |
| Impedance | : 50 Ohm nominal |
| V.S.W.R. | : 2.0:1 Max. |
| 9. Mechanical Characteristics | |
| Action | : Swivel Type |
| Connector | : SMA Reverse Connector |
| Core | : N/A |
| 10. Raw Material | |
| Coaxial Cable | : MIL-C-17 RG-178 B/U |
| Housing | : TPU |
| Hinge | : Polycarbonate |



11	銅線			1.18*L35.5 (天線用)		35.5	1
9	Reverse SMA 10 本體		250062BA1000VD	0062B-A Body Reverse SMA 10 Connector			1
8	Reverse SMA 10 PIN絕緣		250062BB1000VD	0062B-B PIN 絕緣 Reverse SMA 10 Connector			1
7	Reverse SMA 10 連接軸		250062BC1000VD	0062B-C 連接軸 Reverse SMA 10 Connector	金		1
6	銅管			銅管<組合物>			1
5	固定鉚釘		691451938L10YO	23-15-7 固定鉚釘<銅色>	古銅色		2
4	外套<灰>		69950075L080WA	IY072GR000 9.5 *75L 外套<灰>	灰(424U)		1
3	下座<灰>		699300000080WA	IY113GR000 9.3 下座<灰>	灰(424U)		1
2	上座<灰>		699500000080WA	IY114GR000 9.5 上座<灰>	灰(424U)		1
1	RG-178 Coaxial Cable		19RG17800030AE	RG-178 CABLE 105SV(萬泰)	橙色	60	1
NO	材料名稱	環材	電腦編號	零件規格	顏色	切斷尺寸	用量

第三角法	品管	技術單位	承認圖號
單位：mm	確認	審核	品名
比例：1/1			成品編號
日期：92/05/22		Arthur	REV
樣單：			VERSION
			A
			1

萬旭電業股份有限公司

文件編號：FMT-0513-B7

CH2 S22

dB MAG 10 dB/

REF 0 dB

▼3: -19.73 dB

2.5 GHz

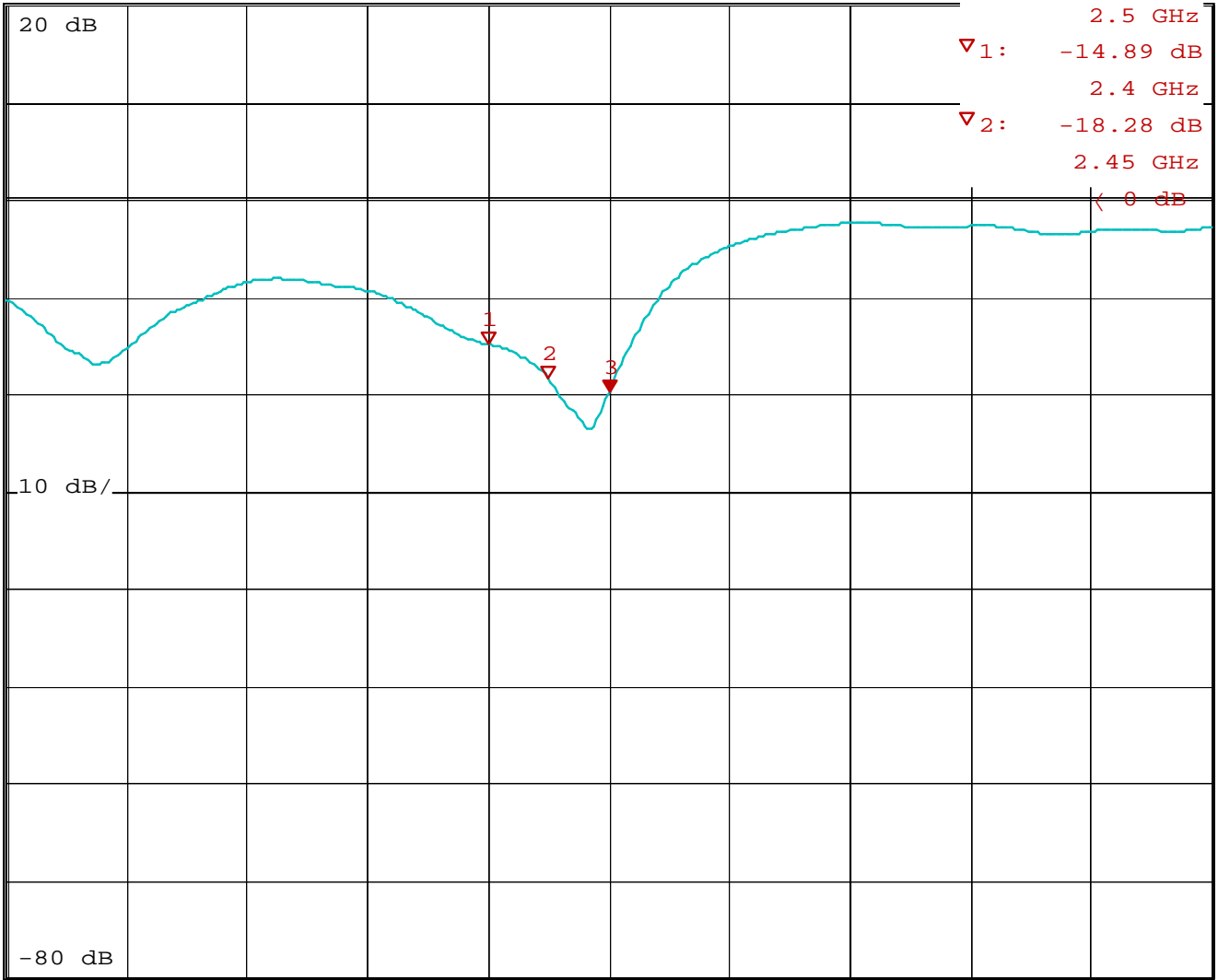
▼1: -14.89 dB

2.4 GHz

▼2: -18.28 dB

2.45 GHz

< 0 dB



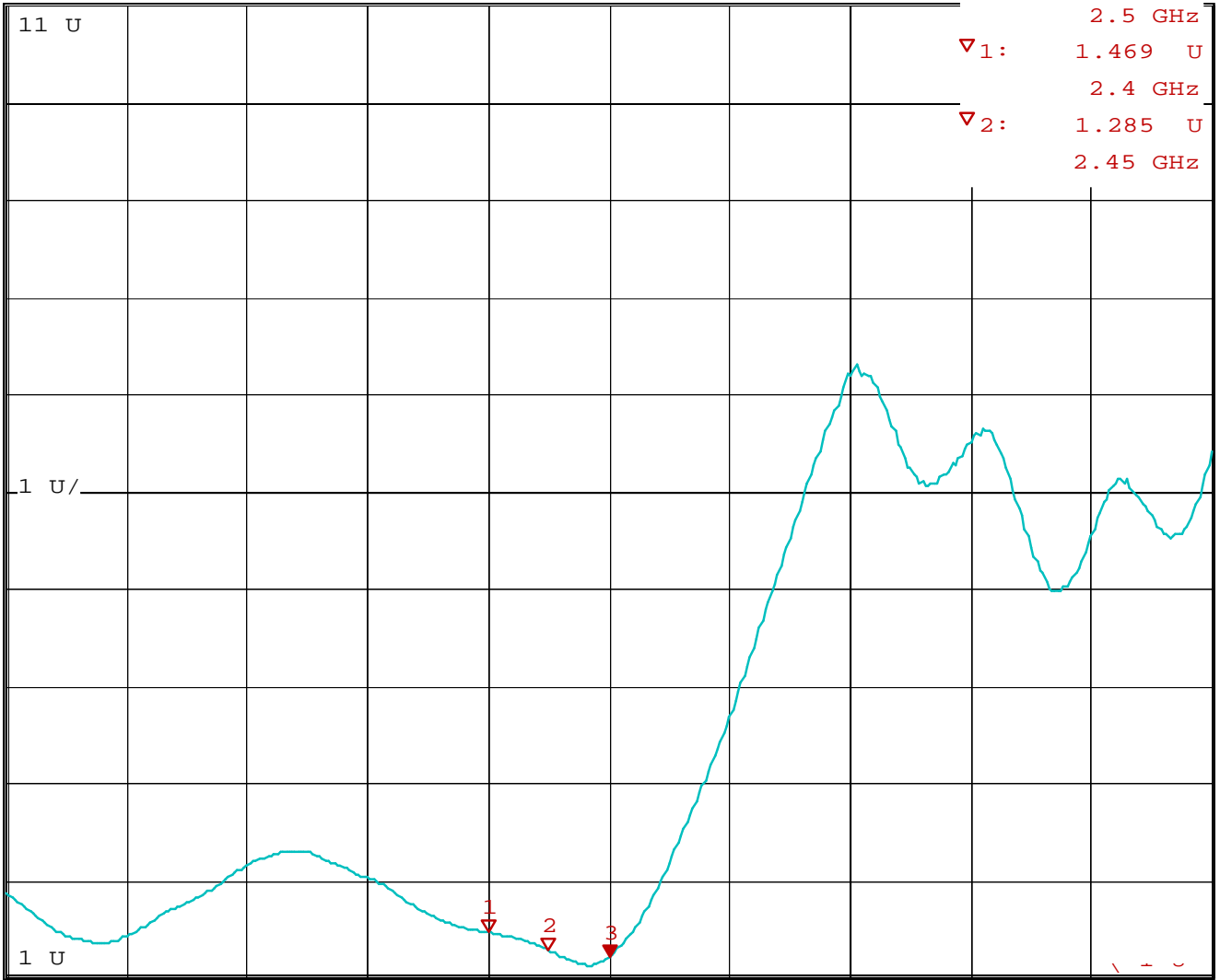
Date: 21.MAY.03 09:13:47

CH2 S22

LIN SWR 1 U/

REF 1 U

▼3: 1.215 U
2.5 GHz
▼1: 1.469 U
2.4 GHz
▼2: 1.285 U
2.45 GHz



START 2 GHz

100 MHz/

STOP 3 GHz

Date: 21.MAY.03 09:14:18

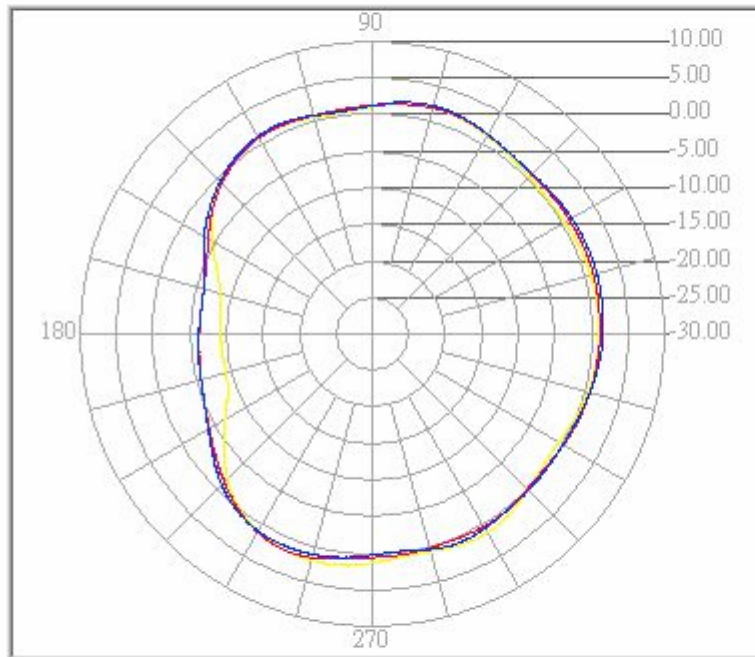


萬旭電業股份有限公司

Model No: NERGEAR

Antenna Position: Vertical

Test Mode: H-PLANE



Freq(MHz)	peak(dBi)	Angle(o)	Avg(dBi)
2400.00	2.16	76.90	-0.03
2450.00	2.04	72.25	0.10
2490.00	2.29	73.80	0.22

Test engineer: _____

Test date: 2003/5/21 at PM 03:12

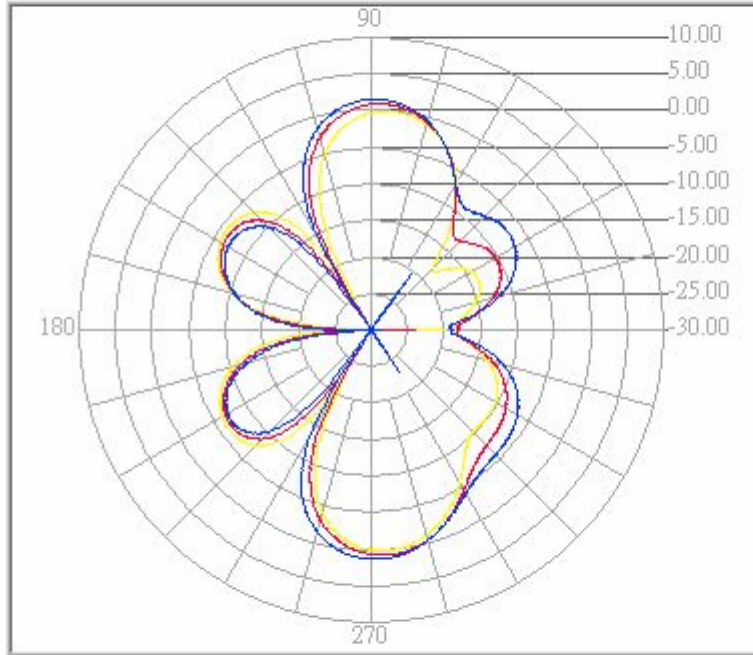


萬旭電業股份有限公司

Model No: OAW0113A

Antenna Position: Horizontal

Test Mode: E-PLANE



Freq(MHz)	peak(dBi)	Angle(o)	Avg(dBi)
2400.00	0.23	274.20	-5.97
2450.00	0.96	86.74	-5.22
2490.00	1.59	88.60	-4.55

Test engineer: _____

Test date: 2003/5/21 at PM 03:11

Material Data Sheet

RG-178 Coaxial Cable

SPECIFICATION FOR APPROVAL

DOCUMENT: A30178B001

STYLE : 200 30V
RG-178B/U

SIZE: 7/0.102 SCCS

RECOGNIZED:

WONDERFUL WIRE CABLE CO.,LTD

OFFICE : 72WU KONG 6TH ROAD,
WU KU IND. DISTRICT
TAIPEI HSIEN,TAIWAN

FACTORY : 17 PEI YUAN ROAD,
CHUNG-LI IND. PARK
TAIWAN, R.O.C.

TEL : (02)22988033

FAX : (02)22988031-2

TEL : (03)4527777

FAX : (03)4517214

WONDERFUL HI-TECH CABLE CO., LTD SPECIFICATION

STYLE	200 30V COAXIAL	DOCUMENT NO : A30178B001	
SIZE	RG-178B/U	ESTABLISHED DATE: 2003/02/13	
STANDARD: MIL-C-17			
Conductor	Size	AWG	30
	Material	----	Silver-Coated Copper Clad Steel
	Conductors No.	----	7
	Conductors Size	mm	0.102
	O.D.	mm	0.30
Insulation	Average Thickness	mm	0.28
	Diameter	mm	0.86
	Material	----	FEP
	Color	----	Clear
Braid	Material	----	Silver-Coated Copper
	Construction	mm	16 / 3 / 0.10
	Coverage	%	95
Jacket	Average Thickness	mm	0.25
	Diameter	mm	1.80 ±0.05
	Material	----	FEP
	Color	----	Brown
Marking			
Drawing			

AK001/210X297/1.0
EDITION : 1.0
MAKER : C.Y.CHEN

CONFIRM : S.N.WONG

PAGE : 1
REVISED DATE :
APPROVAL : W.J.WANG

WONDERFUL HI-TECH CO., LTD

SPECIFICATION

Electrical & Physical Properties						
Item		RG-178B/U				
Rating Temp Voltage		200 30V				
Conductor Resistance		335.0 OHM/KM/20 MAX.				
Insulation Resistance		3000 MEGA OHM/KM MIN.				
Dielectric Strength		AC 1.0 KV/Minute				
Spark Test		2.0 KV				
Insulation	Unaged	Tensile Strength	2500 PSI MIN.(1.76 Kg / m m ²)			
		Elongation	200% MIN.			
	Aged	Tensile Strength	UNAGED MIN.75%(168HRS×232)			
		Elongation	UNAGED MIN.75%(168HRS×232)			
Jacket	Unaged	Tensile Strength	2500 PSI MIN.(1.76 Kg / m m ²)			
		Elongation	200% MIN.			
	Aged	Tensile Strength	UNAGED MIN.75%(168HRS×232)			
		Elongation	UNAGED MIN.75%(168HRS×232)			
Nom. Impedance		50 Ohms				
Nom. Capacitance		95.8 pF/m				
Nom. Vel. of Prop.		69.5%				
VSWR (0-6GHz)		UNDER 1.3				
Attenuation (dB/100m)	100MHz	900MHz	1.8GHz	2.4GHz	5.2GHz	6GHz
	46	155	295	340	505	550

AK001/210X297/1.0

PAGE : 2

EDITION : 1.1

REVISED DATE :

MAKER : C.Y.CHEN

CONFIRM : S.N.WONG

APPROVAL : W.J.WANG

Housing Material Data Sheet

- Housing(外套)- TPU

Elastogran GmbH
Geschäftsbereich TPU-Elastomere



Elastogran GmbH · Postfach 1140 · 49440 Lemförde · Germany
WQJ COMPANY LTD.

P.O. BOX 36 - 431
RC TAOYUAN HSIEN

BASF Gruppe

Date 18.07.2001
No. 62046

Inspection Certificate EN 10 204-3.1 B (DIN 50048)

Product : ES 95 A 50 000 S No.: 15002939
Batch : 207672
Basic-Batch 207673

Property	Test method	Unit	Value
Dichte	DIN 53479	g/cm ³	1,24
Shore-Haerte D	DIN 53505	-	50
Zugfestigkeit	DIN 53504	MPa	53
Reißdehnung	DIN 53504	%	550
Abrieb	DIN 53516	mm ³	22

Dichte = Density/Densité, Shore Härte = Shore hardness/Shore Dureté, Zugfestigkeit = Tensile strength/Resistance traction,
Reißdehnung = Elongation at break/Allongement rupture, Weibenswidestand = Tear strength, Abrieb = Abrasion loss/Abrasion

The stated values are measured from a representative batch (basic-batch) of every product campaign.

Test platters are injection moulded from dry granulate with less than 0,05 % water content. Test platters tempered 20 hrs. at 100 °C,
then cooled to 23 °C / 50 % RH before testing. Test specimen cut from test platters.

We hereby certify, that the material described above complies with the terms of the order contract

Hübner Schoote

Works inspector

The above information is derived from our quality checks. It does not relieve the purchaser from examining the product upon delivery
and gives no assurance of suitability of the product for any particular purpose.

Landwehrweg
49440 Lemförde
Deutschland
Telefon (0 54 43) 12-0
Teletax (0 54 43) 12-25 55

Bankverbindung: Commerzbank AG, Osnabrück
(BLZ 255 400 70) Kto.-Nr. 53 5600100
IBAN: DE 36 2554 0070 0535 6001 00
S.W.I.F.T.-Code: Cobade33
Postbank München
(BLZ 700 100 80) Kto.-Nr. 1532 91 - 803

Sitz der Gesellschaft: 49448 Lemförde
Geschäftsführer:
Gerhard H.-J. Hellmann (Spracher)
Reinhard Leppkes
Registriergericht: Amtsgericht Diepholz
Eintragungsnummer: HRB 2183

- Hinge(上座/下座)- PC

DYNACHEM

TEIJIN POLYCARBONATE SINGAPORE PTE LTD.

152 BEACH ROAD #17-03/04
GATEWAY EAST SINGAPORE 189721

TELEPHONE: 298-8381
FAX : 298-6652

Date: OCT. 28, 2002

Att: To Whom it May Concern

CERTIFICATE OF ANALYSIS

COMMODITY: TEIJIN PANLITE (Polycarbonate Resin)

Grade No: L1250Y
Colour No: NAT
Lot No: S4E02911

ITEM	UNIT	TEST METHOD	TEIJIN POLYCARBONATE QUALITY STANDARD	TEST RESULT
IMPACT STRENGTH (IZOD NOTCHED 3.2mm thick)	K gfm / cm	ASTM D256	280	PASS
FLEXURAL MODULUS	K gf / cm ²	ASTM D790	22,700±1,500	PASS
TENSILE STRENGTH (AT BREAK)	K gf / cm ²	ASTM D638	830±140	PASS

NOTE: ALL FIGURES ENTERED IN THIS LIST ARE SUBJECT TO OUR STANDARD TEST METHOD AND MAY NOT BE APPLICABLE FOR PRODUCTS THAT ARE USED UNDER DIFFERENT CONDITIONS.

Teijin Polycarbonate Pte Ltd

Chris Ling Chen

Y. SUZUKI
LOGISTICS MANAGER (SALES)