

承 認 書  
SPECIFICATION FOR APPROVAL

客 戶  
CUSTOMER

乙辰

日 期  
DATE

2011/6/28

品 名  
DESCRIPTION

WSL025 Mini 1.37 2.4GHz 4dBi Flying Lead  
Antenna L140mm(I-POD White) ANTI-UV 6%

客 戶 料 號  
CUSTOMER P/N

114020400002

成 品 編 號  
Part NO.

RH1WFI0002B 02



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

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# SPECIFICATION

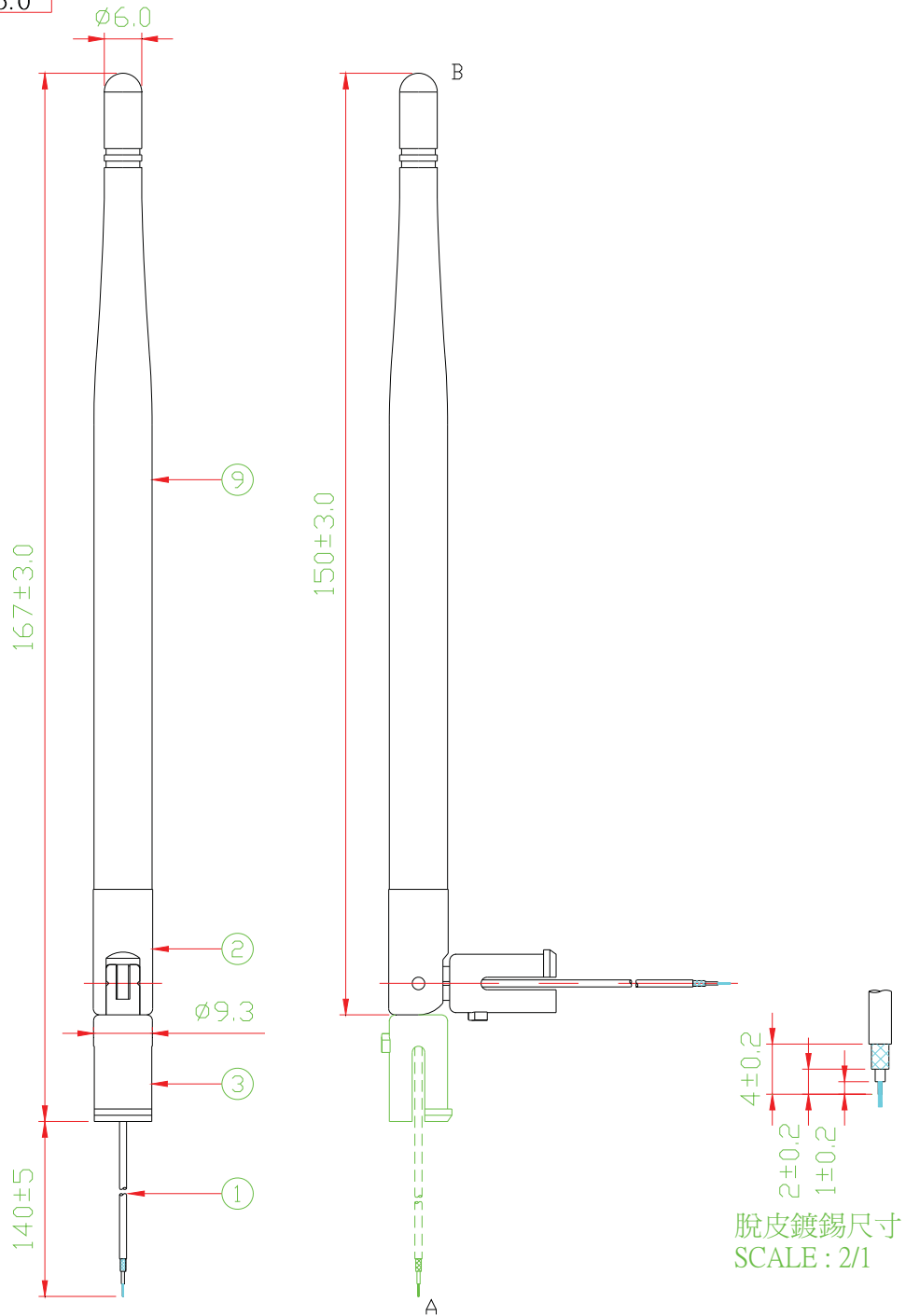
- |                               |                               |
|-------------------------------|-------------------------------|
| 1. Description                | : WSL025 Flying Lead Antenna  |
| 2. Customer                   | : 乙辰                          |
| 3. Model No.                  | : WSL025                      |
| 4. Part No.                   | : RH1WFI0002B 02              |
| 5. Standard                   | : IEEE 802.11b/g Wireless LAN |
| 6. Antenna Profile            | : 167(150) mm (see Drawing)   |
| 7. Color                      | : I-POD White                 |
| 8. Electrical Characteristics |                               |
| Operating Frequency           | : 2.4~2.5GHz                  |
| Antenna Type                  | : Monopole                    |
| Polarization Type             | : Linear                      |
| Type of Radiation             | : Toroidal                    |
| Peak Gain                     | : 4.0 dBi Typical             |
| Impedance                     | : 50 Ohm nominal              |
| V.S.W.R.                      | : 2.0:1 Max.                  |
| 9. Mechanical Characteristics |                               |
| Swivel                        | : 90 degree                   |
| Lead Length                   | : 140mm length                |
| Connector                     | : N/A                         |
| Core                          | : N/A                         |
| 10. Raw Material              |                               |
| Coaxial Cable                 | : Mini 1.37                   |
| Housing                       | : TPE                         |
| Hinge                         | : PC+ALLOY                    |

TOLERANCES:	
X	±0.5
X.X	±0.3
X.XX	±0.1
ANGULAR	±5.0°

Signature  
/ Stamp

Customer  
Approved  
 Unofficial  
Drawing

機構 (技術分類) : WFI  
應用 (業務分類) : NW  
材質 (生管分類) : RFEX







Revise Date: 2011/05/26		Edit Date: 2010/03/02			PART NUMBER	114020400002	
3rd VIEW	APPROVED	CONFIRM	CHECK	DRAWING	PART NAME	WSL025 Mini 1.37 2.4GHz 4dBi Flying Lead Antenna L140mm(I-POD White) ANTI-UV 6%	
UNIT: mm	Jason	C.S.LIU	Emily	Mandy	CATEGORY	<input checked="" type="checkbox"/> A:Product <input type="checkbox"/> B:Sem-Production <input type="checkbox"/> C:Sample	
SCALE:FREE					Engineering NO.	RH1WFI0002B	VERSION 02
衛星廠成品編號 :					文件編號 : FMT-0513-H5		頁次 : 1/2


WANSHIH ELECTRONIC CO., LTD.



TOLERANCES:	
X	±0.5
X.X	±0.3
X.XX	±0.1
ANGULAR	±5.0°

Ver	Date	Drawing	Engineering Change Description
B01	2011/03/17	Mandy	194000180000 => 114020400002
B02	2011/05/26	Mandy	1.13=>1.37 , Housing ANTI-UV , Heat Shrink Tube

9	 Housing	√	WSS025 9.3 φ *130LHousing(I-POD White) ANTI-UV 6%	White		1	or Equivalent
8	 Heat Shrink Tube	√	H-2(CB) φ 5.0	Black	40	1	or Equivalent
7	 Heat Shrink Tube	√	H-2 φ 2.0	Black	10	1	or Equivalent
6	Spring	√	Spring<G>OD5.6 ID3.2_6TURNS	Golden		1	or Equivalent
5	Sleeve	√	5.2 φ *24L(26.5L) FOR RG-178 Sleeve	silver		1	or Equivalent
4	Rivet	√	028922001-8 3.80*1.90 φ Rivet	silver		2	or Equivalent
3	Hinge-Base	√	9.3 φ *24.7L Hinge-Base	White		1	or Equivalent
2	Hinge-Holder	√	9.5 φ *20.0L Hinge-Holder	White		1	or Equivalent
1	 Mini 1.37 Coaxial Cable	√	Mini 1.37 CABLE GY-193	Gray	203	1	or Equivalent
NO	Material	GM	Description	Color	Dim	Q'ty	Remark

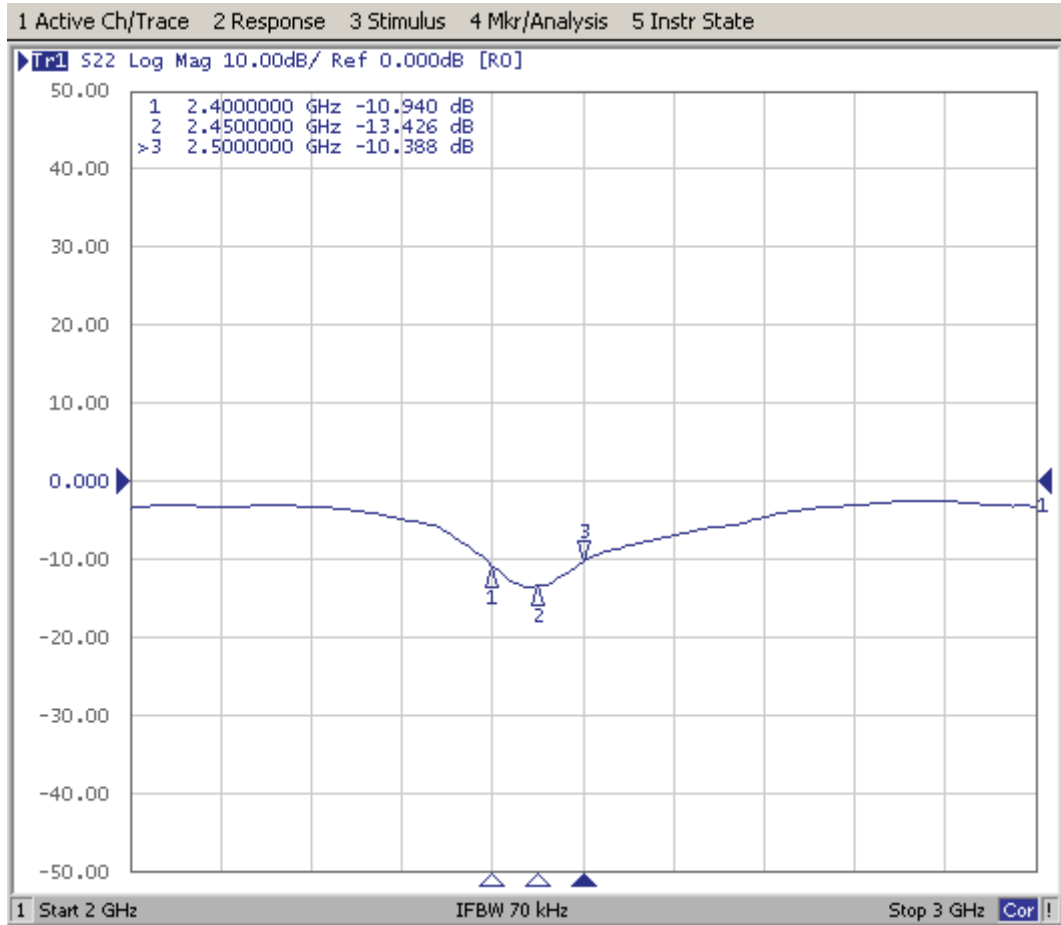
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UNIT: mm	Jason	C.S.LIU	Emily	Mandy	CATEGORY	<input checked="" type="checkbox"/> A-Product <input type="checkbox"/> B-Semi-Production <input type="checkbox"/> C-Sample	
SCALE:FREE					Engineering NO.	RH1WFI0002B	VERSION 02
衛星廠成品編號 :					文件編號 : FMT-0513-H5		頁次: 2/2

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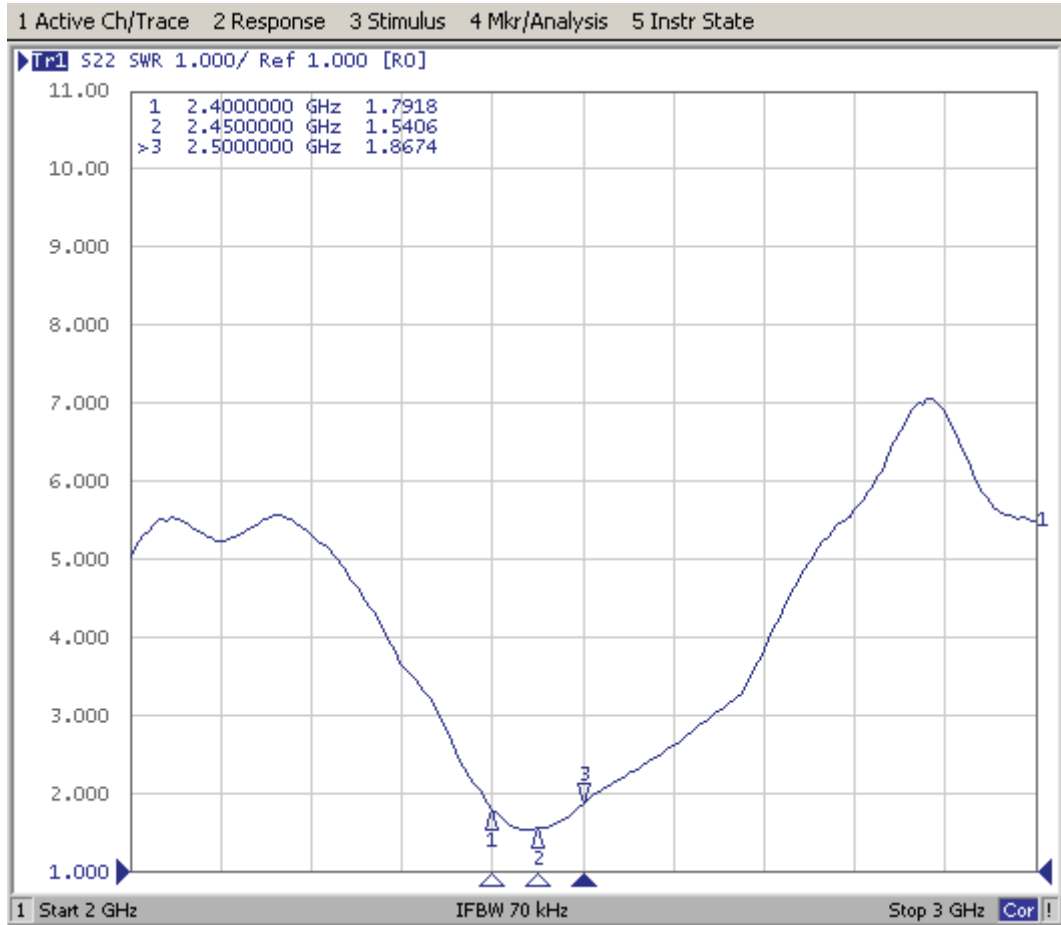
# Electrical Properties

## Return Loss



# Electrical Properties

## V.S.W.R



# Electrical Properties

## Radiation Pattern – H Plane

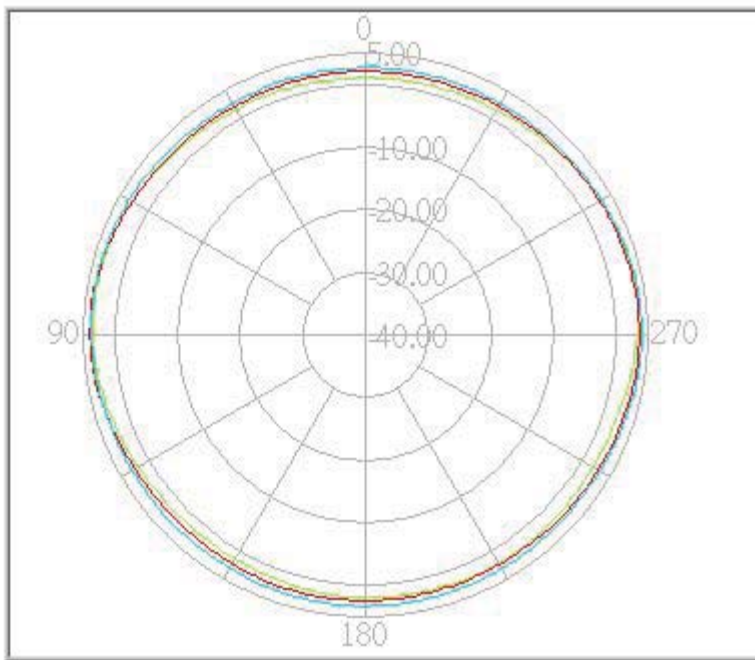


# 萬旭電業股份有限公司

**Model No:** 180

**Antenna Position:** Vertical

**Test Mode:** H-plan



Freq(MHz)	Peak(dBi)	Angle(o)	Avg(dBi)
2400.0	3.85	75.66	2.25
2450.0	3.94	273.36	2.72
2500.0	4.00	86.64	3.19



# Electrical Properties

## Radiation Pattern – E Plane

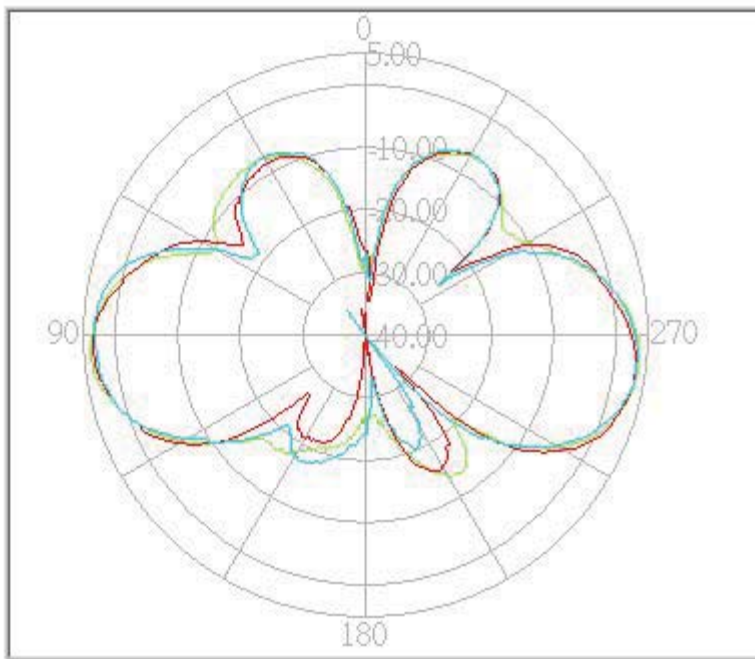


萬旭電業股份有限公司

Model No: 180

Antenna Position: Horizontal

Test Mode: E-plan



Freq(MHz)	Peak(dBi)	Angle(o)	Avg(dBi)
2400.C	3.84	267.25	-3.45
2450.C	3.41	266.03	-3.75
2500.C	3.50	95.19	-3.70

# Material Data Sheet

## Mini-1.37 Coaxial Cable

### SPECIFICATION FOR APPROVAL

DOCUMENT: A3130SP002

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STYLE : COAXIAL CABLE

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SIZE: SP 7/0.102

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RECOGNIZED: UL 1979

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**WONDERFUL HI-TECH CO.,LTD**

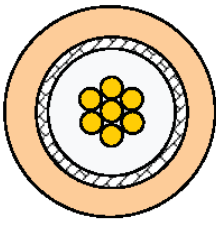
OFFICE : 72WU KONG 6TH ROAD,  
WU KU IND. DISTRICT  
TAIPEI HSIEN,TAIWAN

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 CO., LTD**  
**SPECIFICATION**

STYLE	105°C 30V UL1979	DOCUMENT NO : A3130SP002	
SIZE	30 AWG	ESTABLISHED DATE: 2008/01/08	
STANDARD : MIL-C-17			
Conductor	Size	AWG	30
	Material	----	Silver-Coated Copper
	Conductors No.	----	7
	Conductors Size	mm	0.102
	O.D.	mm	0.31
Insulation	Average Thickness	mm	0.29
	Diameter	mm	0.89 ±0.03
	Material	----	FEP
	Color	----	Clear
Braid	Material	----	Tinned Copper
	Construction	mm	16 / 6 / 0.05
	Coverage	%	97
Jacket	Average Thickness	mm	0.14
	Diameter	mm	1.37 ±0.05
	Material	----	FEP
	Color	----	ACCORDING TO CUSTOM
Marking			
Drawing			

AK001/210X297/1.0

PAGE : 1

EDITION : 1.2

MAKER : *H. C. KUO*

CONFIRM : *C. Y. Chen*

APPROVAL : *W. J. Wang*



## WONDERFUL HI-TECH CO., LTD. SPECIFICATION

Electrical & Physical Properties						
Item		30 AWG				
Rating Temperature		-55°C ~ +200°C				
Conductor Resistance		335 OHM/KM/20°C MAX.				
Insulation Resistance		1000 MEGA OHM-KM MIN.				
Dielectric Strength		AC 1KV/Minute				
Spark Test		2 KV				
Insulation	Unaged	Tensile Strength	2500 PSI MIN.( 1.76 Kg / m m <sup>2</sup> )			
		Elongation	200% MIN.			
	Aged	Tensile Strength	<b>UNAGED MIN 75%(168HRS×232°C)</b>			
		Elongation	<b>UNAGED MIN 75%(168HRS×232°C)</b>			
Jacket	Unaged	Tensile Strength	2500 PSI MIN.( 1.76 Kg / m m <sup>2</sup> )			
		Elongation	200% MIN.			
	Aged	Tensile Strength	<b>UNAGED MIN.75%(168HRS×232°C)</b>			
		Elongation	<b>UNAGED MIN.75%(168HRS×232°C)</b>			
Nom. Impedance		50 Ohms				
Nom. Capacitance		95.8 pF/m				
Nom. Vel. of Prop.		69.5%				
VSWR (0 – 6 GHZ)		Max 1.3				
THERMAL SHOCK		Max 1mm at 232°C /1HR				
BEND RADIUS		Min 9mm				
Attenuation (dB/1M)	2.4GHZ	2.5GHZ	5.15GHZ	5.35GHZ	6.0GHZ	
	2.5	2.6	3.9	4.0	4.3	

Housing Material Data Sheet

- Housing(外套)- TPE



SEHNZHEN GAINSHINE TECHNOLOGY  
CO., LTD

## 材质证明

### TPE SA1551A1 天线料

#### *Product Data Sheet*

#### 产品特性

白色颗粒或本色颗粒，外拌白色色粉.适合注塑成型.

#### 产品用途

各种用途注塑成型天线。

#### 产品物性表

型号 Type				S1551A1
性能 Properties	单位	检测方法	测试条件	测试结果
硬度 Hardness	Shore A	ASTM D2240	-	100±2
密度 Density	g/cm <sup>3</sup>	ASTM D792	-	0.96
拉伸强度 Tensile Strength	MPa	ASTM D638	100mm/min	6.9
断裂伸长率 Tensile Elongation	%	ASTM D638	100mm/min	≥780
熔融指数 Melt Flow Index	g/10min	ASTM D1238	210℃/2.16kg	12.6


**사양승인원**  
**WiFi Dipole Antenna**


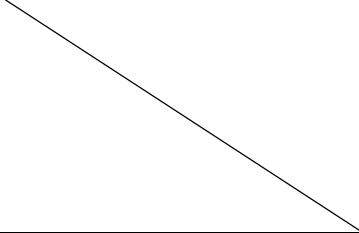

MODEL : W5E-WO-03

**2009. 9. 8**

(주) 위니젠



		제목	안테나 규격서(승인원)	
문서 번호	WAT - 0909 - EX387I		개정	IR
모델명	W5E-WO-03		날짜	2009.9.8
사양	Wireless LAN (IEEE 802.11 b/g/n)		고객	(주)위즈넷
참고				
<p>           (주)위니젠            대전시 유성구 문지동 103-6 한국과학기술원 ICC 진리관 T205            Phone: 042-350-6570            Fax: 042-350-6571         </p>				


	Check	Check	Approval
WINiZEN			

	Check	Check	Check	Approval
Customer				

## - 목차 -

1. 승인원 이력 List
2. 규격
3. 기구 도면
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  - 6-2 Return Loss
  - 6-3 Radiation Pattern
7. QC Process
8. 신뢰성 시험
9. 포장 사양




	Document No. WAT-0909-EX387I	Rev. No. IR	Model Name W5E-WO-03
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## 1. 승인원 이력 List

### 승인원 이력 List

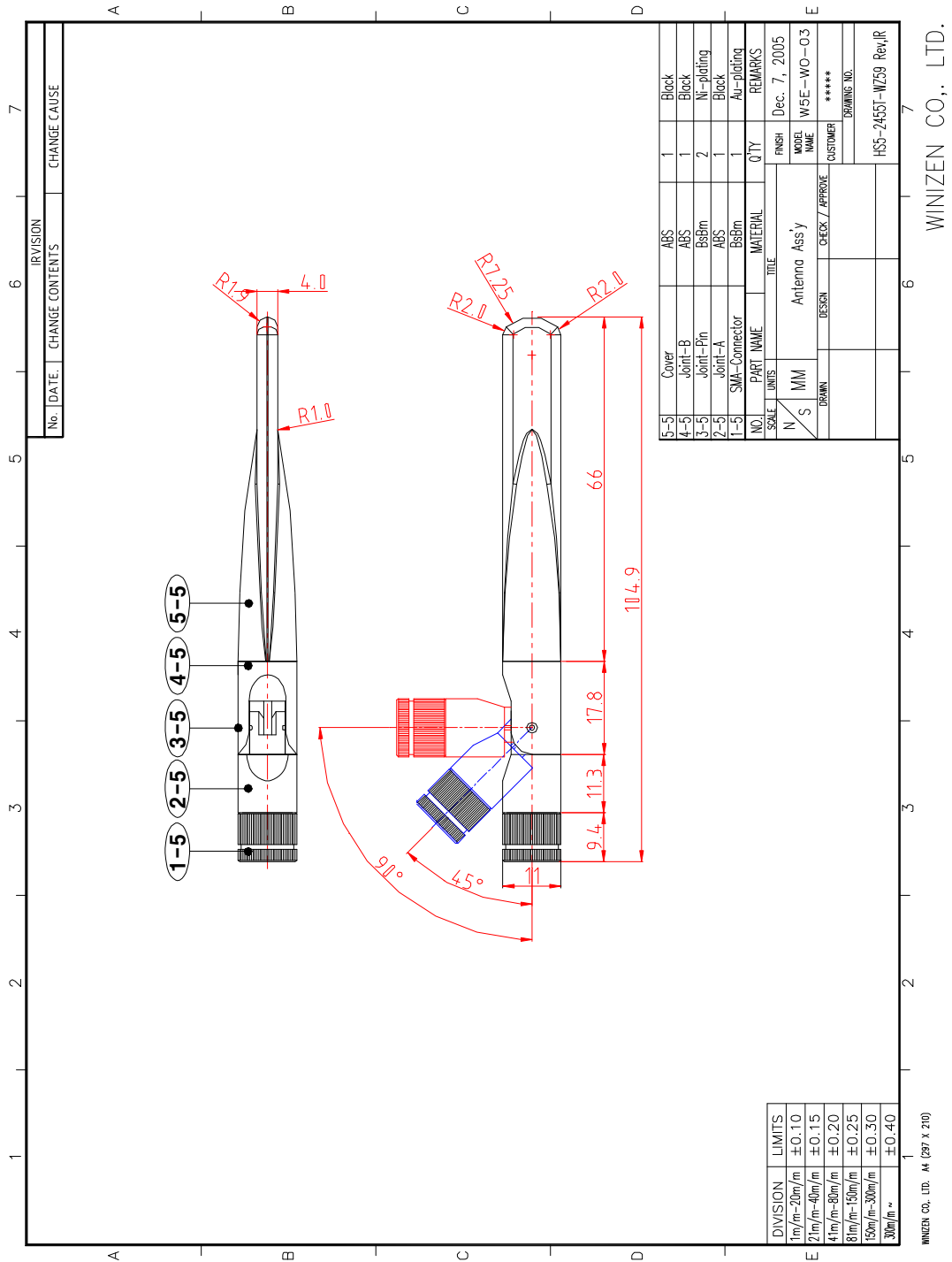
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2					
3					
4					
5					
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	<b>Document No.</b> WAT-0909-EX387I	<b>Rev. No.</b> IR	<b>Model Name</b> W5E-WO-03
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## 2. 규격

<b>Electrical Specifications</b>	
<b>Frequency Range</b>	2400 ~ 2483.5 MHz
<b>Band Width</b>	83.5 (MHz)
<b>V.S.W.R ( Min )</b>	1.9 :1
<b>Gain ( Max )</b>	2.5 ± 1 dBi
<b>Input Impedance</b>	50 (Ω)
<b>Polarization</b>	Linear
<b>Mechanical Specifications</b>	
<b>Antenna Size</b>	See drawing
<b>Connector</b>	SMA Male (Right-handed)
<b>Operation Temperature</b>	-20 ~ 70 (℃)
<b>Operation Humidity</b>	10 ~ 90 (%)
<b>Option</b>	
<b>Others</b>	

### 3. 기구 도면



WINIZEN CO., LTD.

## 4. 측정 기준

### 4-1. 시험 장비


Network Analyzer	HP8753ES
Calibration Kit	HP85033D
High Resistance Meter	HP4277A
Withstanding Voltage Tester	TOS-8750
Adaptor	SMA Type Female ↔ SMA male
Measurement Cable	8120-4779 (Hewlett Packard)

### 4-2. 시험 장비 Setting

Display	Dual Channel : On
	Split Display : On
Menu	Number of Points : 201
	Power : 0 dBm
Measure	Channel 1 : S11
	Channel 2 : S21

### 4-3. Calibration

Calibration- Cal. Kit : 50 Ω  
Calibration menu → Full-2 Port Reflection  
Forward : Open → Short → Load  
Reverse : Open → Short → Load  
Done  
Transmission  
Do Both → FWD + REV  
Done  
Isolation  
Omit Isolation  
Done

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## 5. 시험 절차

### 5-1. VSWR

Step 1.

Antenna를 Adaptor 가 포함된 Cable로 Network Analyzer의 Port1에 연결한다.

Step 2.

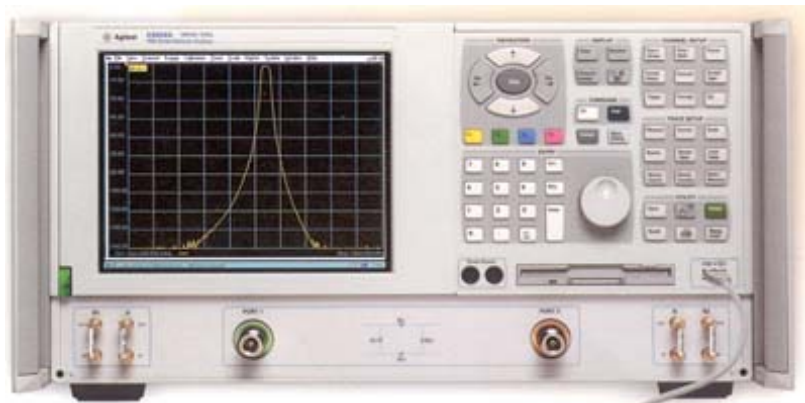
해당 주파수 대역의 Marker Point를 Network Analyzer위에 표시한다.

Step 3.

VSWR이 1.9 이하임을 확인한다.

Step 4.

Data를 측정한다.



## 5-2. 이득 및 방사패턴 측정

### Step 1

Chamber와 주파수대역의 시스템을 Calibration과 동시에 Chamber의 제어를 위한 소프트웨어를 확인한다

### Step 2.

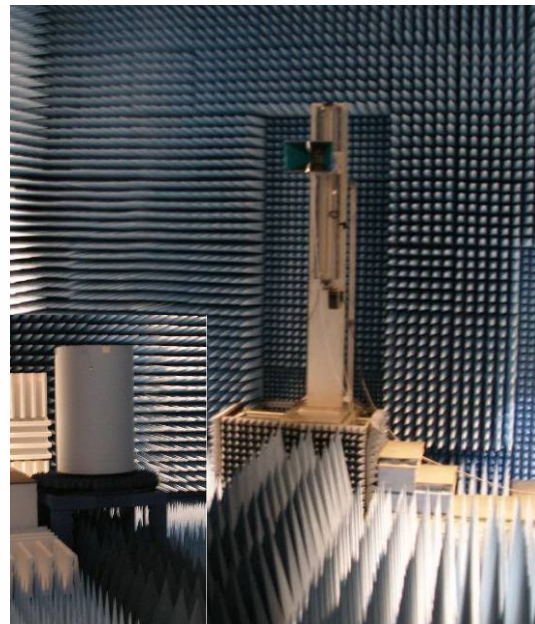
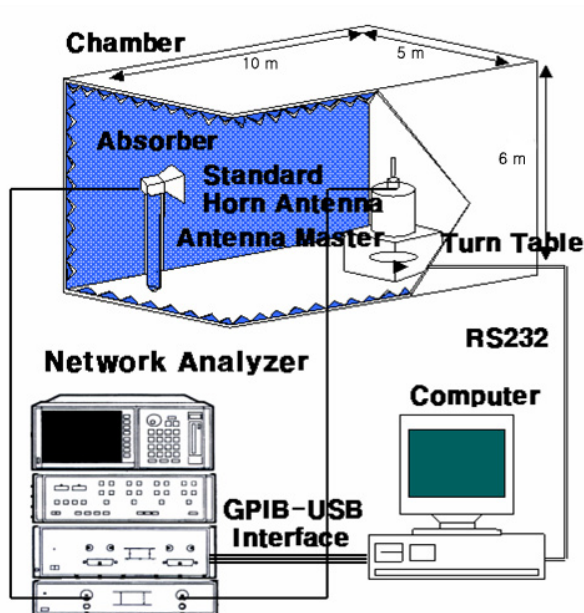
측정할 Antenna를 Chamber 내부의 측정할 위치에 놓는다.


### Step 3.

Chamber의 제어 Program을 작동하여 측정을 시작한다

### Step 4.

Data를 측정한다.



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## 6. 측정 Data

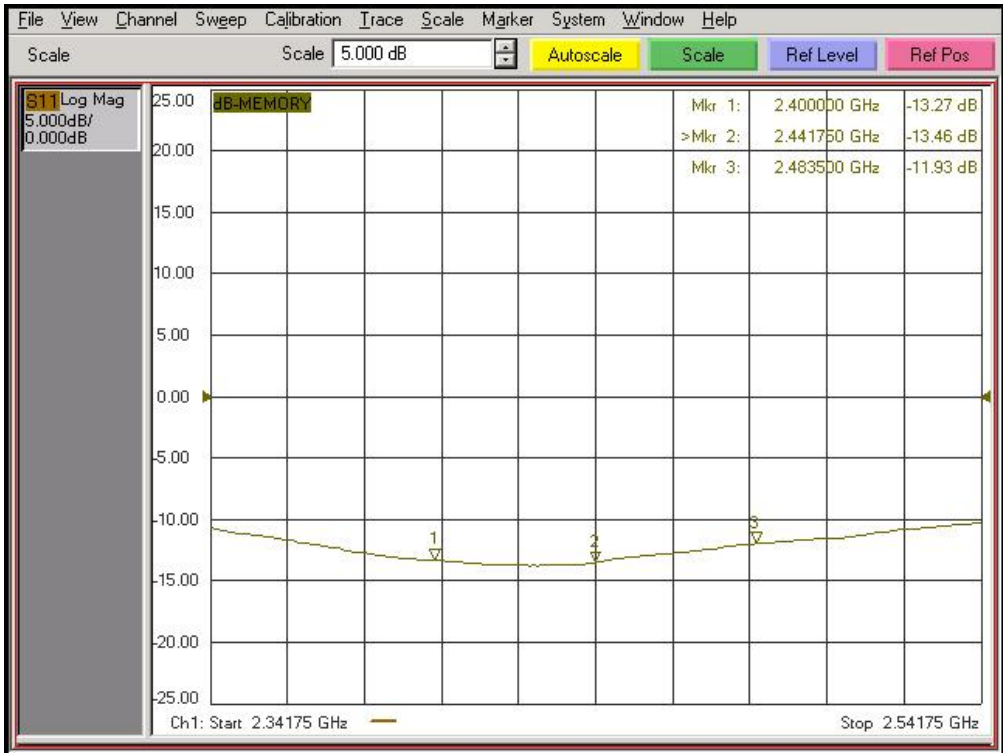
모델명	W5E-WO-03		
회로담당자	곽 원 일		
장 비	(주)위니젠 연구소 Chamber 및 측정 장비		
안테나	WLAN External Antenna		
주파수	2400 MHz ~ 2483.5 MHz		

Items	Spec.	Test Result
Frequency	2400 ~ 2483.5 MHz	OK
VSWR (Min)	< 1.9	OK
Gain (Max)	2.5 ± 1 dBi	OK

### 6-1 VSWR



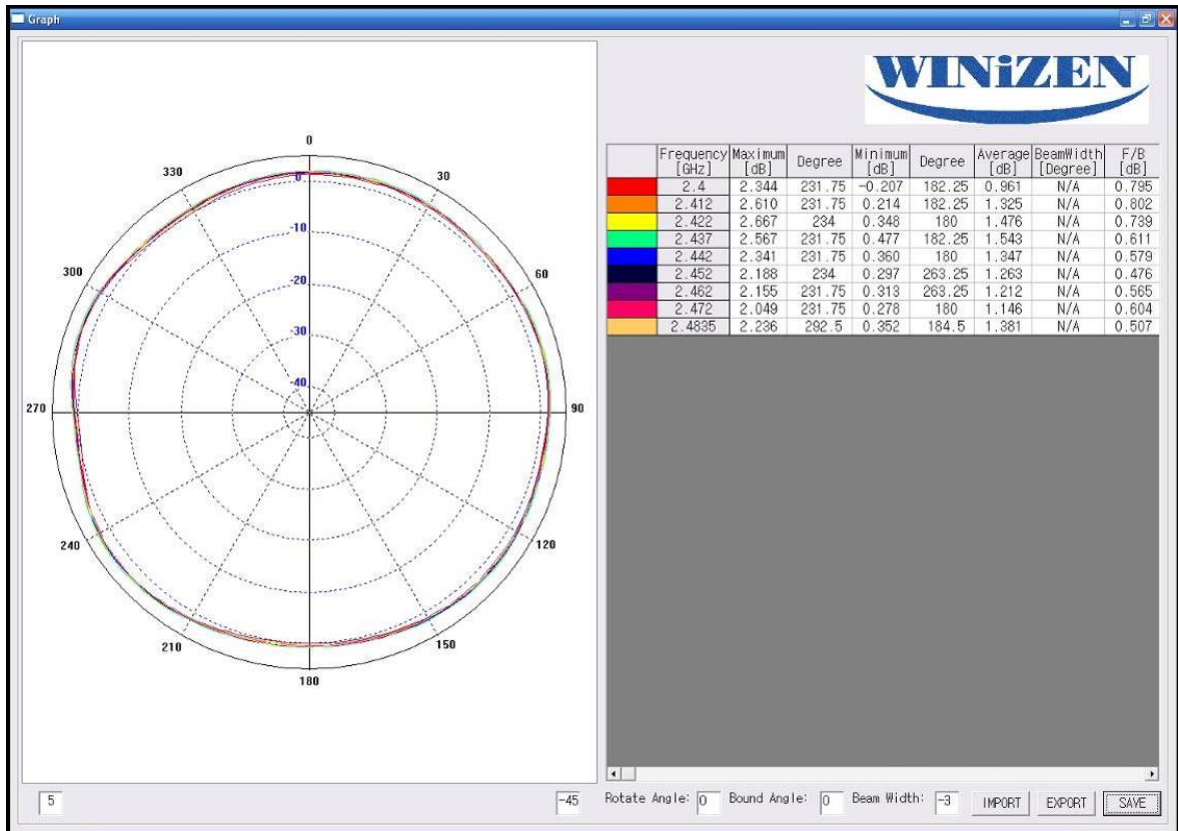
### 6-2 Return Loss



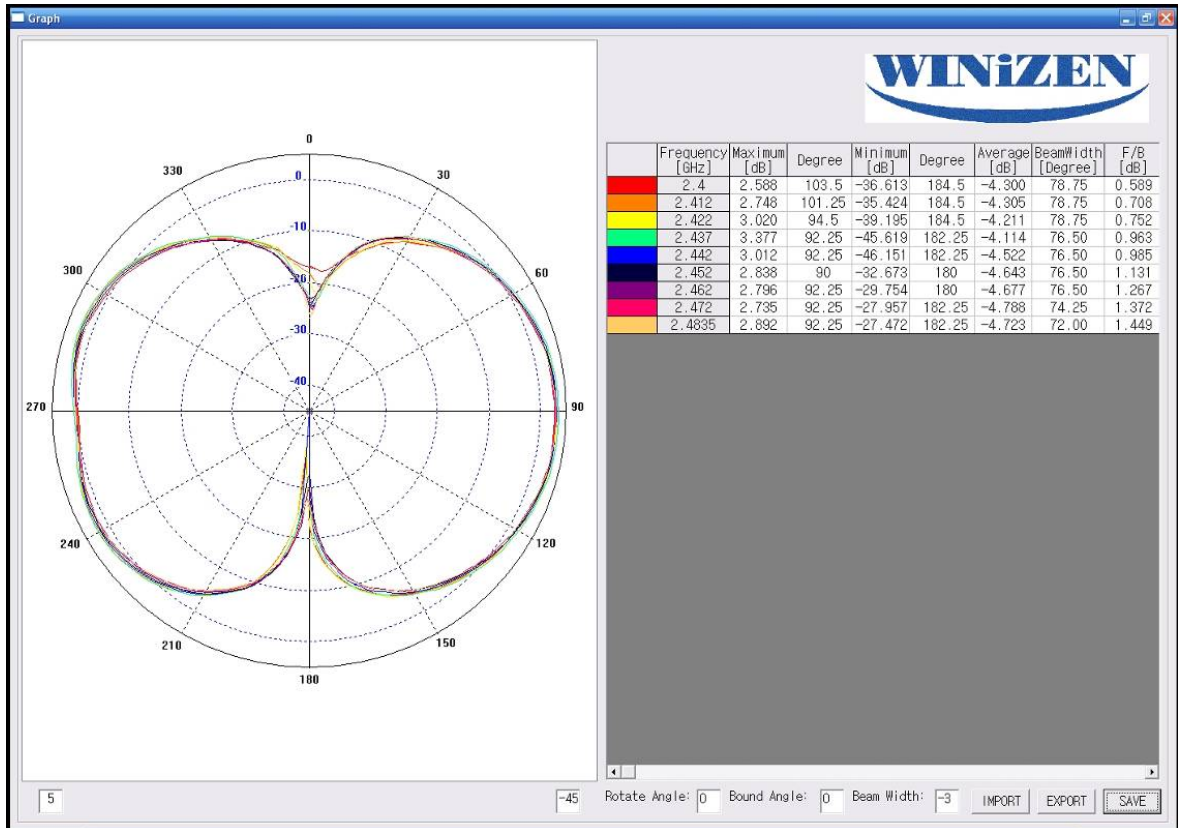


## 6-3 Radiation Pattern

### a. Azimuth Pattern




### c. Elevation Pattern



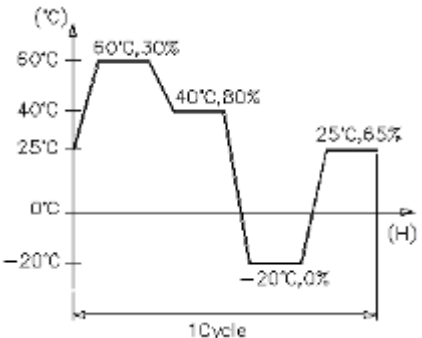
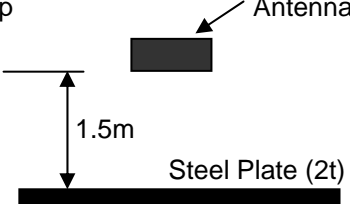
## 7. QC Process

### 제조 및 QC 공정도

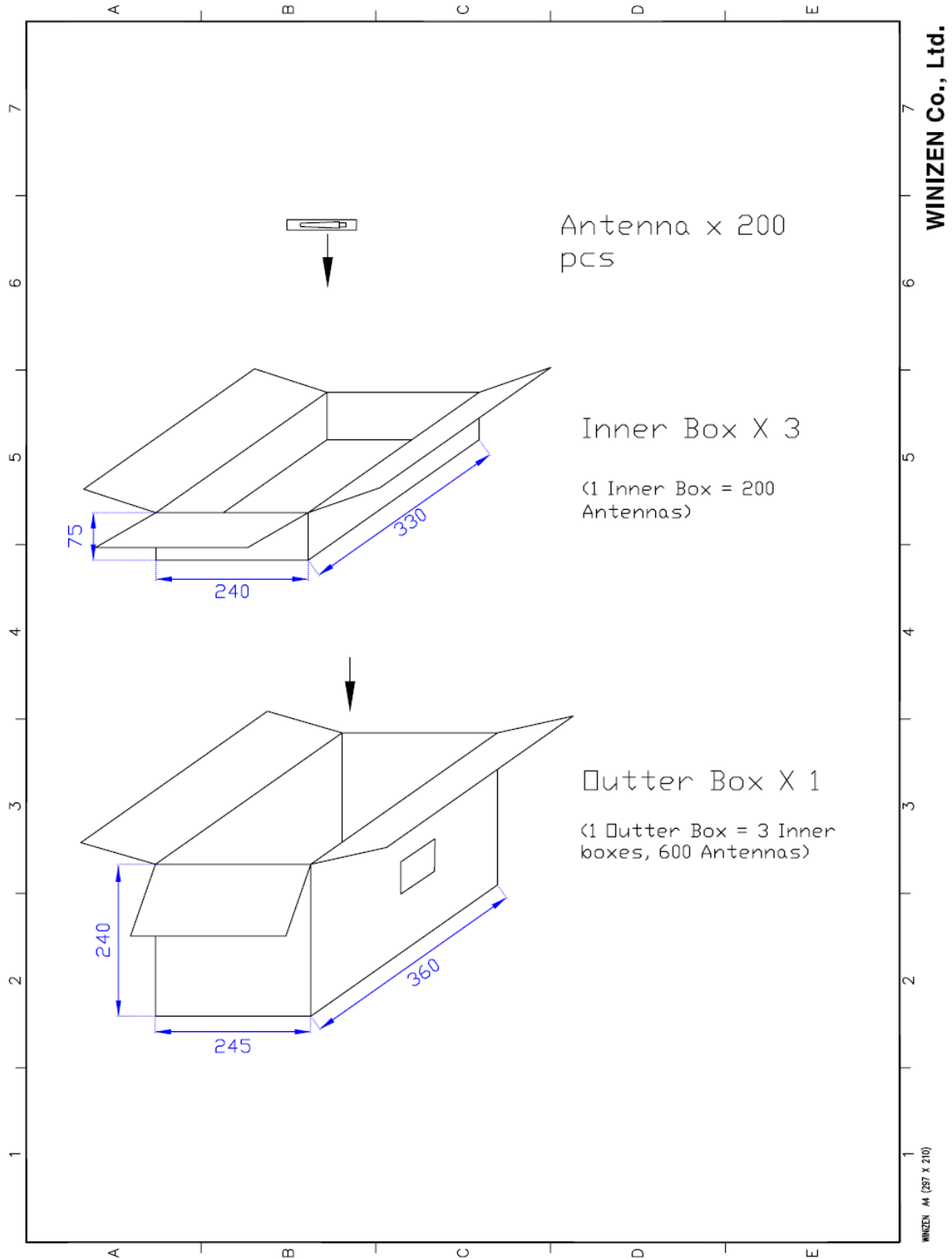
제품/모델		Wireless B/G Antenna, W5E-WO-03		도		J011-24260-010-0		문서번호		WSQP-003		제정일		2005.12.5	
번호	공정명	작업 내용	사용설비/ 계측기	관리항목(방법)	품질기준		주기	비고							
					검사항목	검사기준									
1	소재	• Vendor 확인 • 검사의뢰	• 도면	• Lot 구분(FIFO)											
2	수입검사	• 부품 외관/특성 검사	• Network Analyzer, 버니어캘리퍼스 • 육안	• 외관 • 치수/특성 • Spec.과 일치할 것	• 양호할 것 (색상 불 균, 치수) • Spec.과 일치할 것	Lot									
3	차체	• Item별 분류 (사출물, 커넥터, Cable 등)		• Lot 구분(FIFO)											
4	조립	• 커넥터 어셈블리와 케이블 조립 • 케이블 및 파이프 조립 • 사출물간 조립	• 조립 jig	• 원전조립											
5	외관검사	• Assy 상태를 육안으로 확인	• 육안	• 외관 (사출물, Connector) • 본딩, 조립 상태	• 외관 상태 • 조립 상태 • 양호할 것, 육거나 들어지지 않을 것, 흠 집이 없을 것 • 조립 상태가 견고하 고 양호할 것.	전수									
6	특성검사	• 제품 특성 시험	• Network Analyzer	• 특성치	• 경재파면 (VSWR) (1.9:1 이하)	전수	중장관리항 목 (CTO)								
7	포장	• 비닐백과 박스에 제품을 포장		• 포장 상태, 수량	• 외관 • 양호할 것 • 포장 상태가 견고하 고 파손이 없을 것.	전수									
8	출하검사	• 제품 특성 및 외관, 포장 상태를 확인 • 인	• Network Analyzer, 버니어캘리퍼스	• 외관 검사 • 특성 검사	• 외관 • 특성 • 양호할 것, 수량이 일치할 것	Sampling									
9	출하	• 제품 창고에 입고	• Hand car	• Lot 구분 • 격재상태	• 포장										

	<b>Document No.</b> WAT-0909-EX387I	<b>Rev. No.</b> IR	<b>Model Name</b> W5E-WO-03
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## 8. 신뢰성 시험

Item	Specifications	Conditions	Test Result
Salt-water Resistance	No change of material characteristic	Temperature of 35℃, Concentration of 5%, Let stand for 48 hours	OK
Humidity Resistance	Changeable range of V.S.WR value $\pm 0.5$ No change of material characteristic	Temperature of 40℃, Humidity of 95%, Let stand for 96 hours	OK
Temperature Test  <b>Temperature(° C)</b>  	Changeable range of V.S.WR value $\pm 0.5$ No change of material characteristic	Increasing from +25℃, 65% to +60℃, 30%; 35min / Keeping on +60℃, 30% for 6hour / Decreasing from +60℃, 30% to +40℃, 80%; 20min / Keeping on +40℃, 80% for 8hour / Decreasing from +40℃, 80% to -20℃, 0%; 60min / Keeping on -20℃, 0% for 4hour / Increasing from -20℃, 0% to 25℃, 65%; 45min / Keeping on 25℃ for 3hour / 5Cycle time = 118hour and 20min	OK
Drop  	No disconnection No crack or damage	Drop the antenna at 1.5m height to the steel plate (2t) of ground	OK

## 9. 포장 사양





## Specifications Sheet

<b>Object</b>	Internal Antenna	<b>Page</b>	1 of 6
<b>Customer</b>		<b>Date</b>	February 19, 2010
<b>System</b>	WLAN/ Bluetooth/ Zigbee	<b>Rev.</b>	A
<b>Model Name</b>	W5I-BO-07-F245	<b>Written by</b>	W. I. KWAK

### Electrical Specifications

<b>Frequency Range ( MHz )</b>	2400 ~ 2483.5
<b>Band Width ( MHz )</b>	83.5
<b>V.S.W.R ( Min )</b>	1.9 : 1
<b>Gain ( Max )</b>	2.5 ± 1 ( dBi )
<b>Input Impedance</b>	50 ( Ω )
<b>Polarization</b>	Linear

### Mechanical Specifications

<b>Antenna Size ( Length x Width x Height )</b>	48 × 8 × 1 mm
<b>Weight</b>	N / A
<b>Connector</b>	I-PEX MHF
<b>Cable Length</b>	245 mm
<b>Radiator Material</b>	Copper
<b>Operation Temperature</b>	- 30 ~ 70 ( °C )
<b>Operation Humidity</b>	10 ~ 90 ( % )

<b>Option</b>	
<b>Remarks</b>	Data measured at free-space.

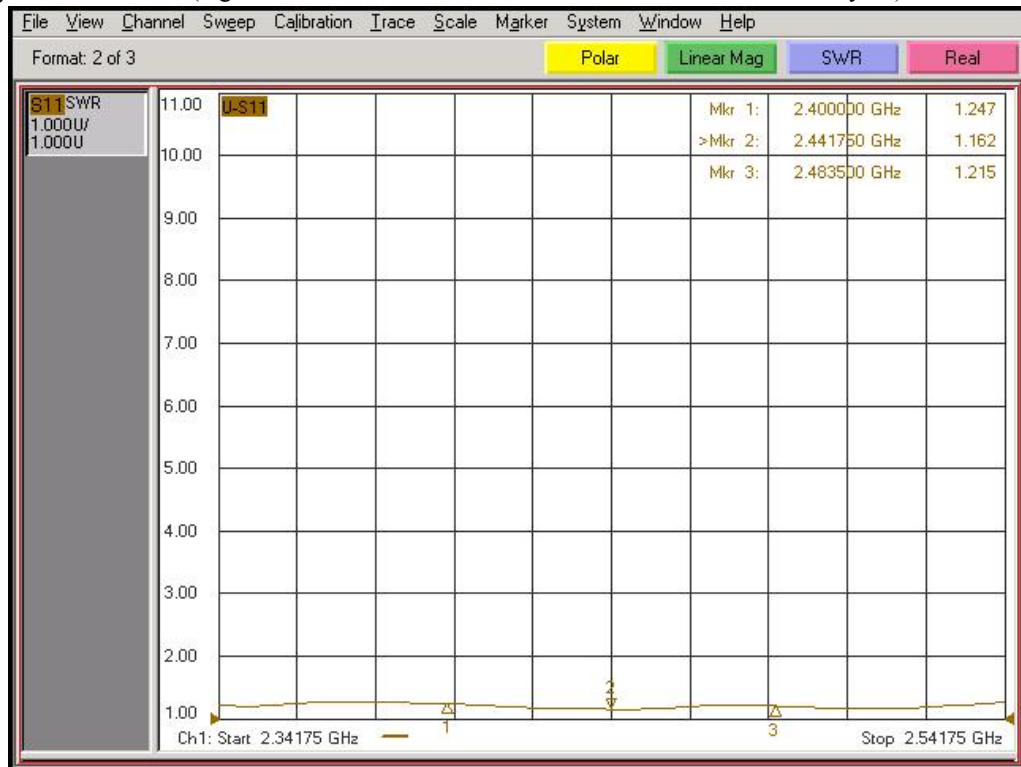
**WINiZEN Co., Ltd.**



**Fig 1. Return Loss** (Agilent E8357A 300KHz~6GHz PNA Series Network Analyzer)



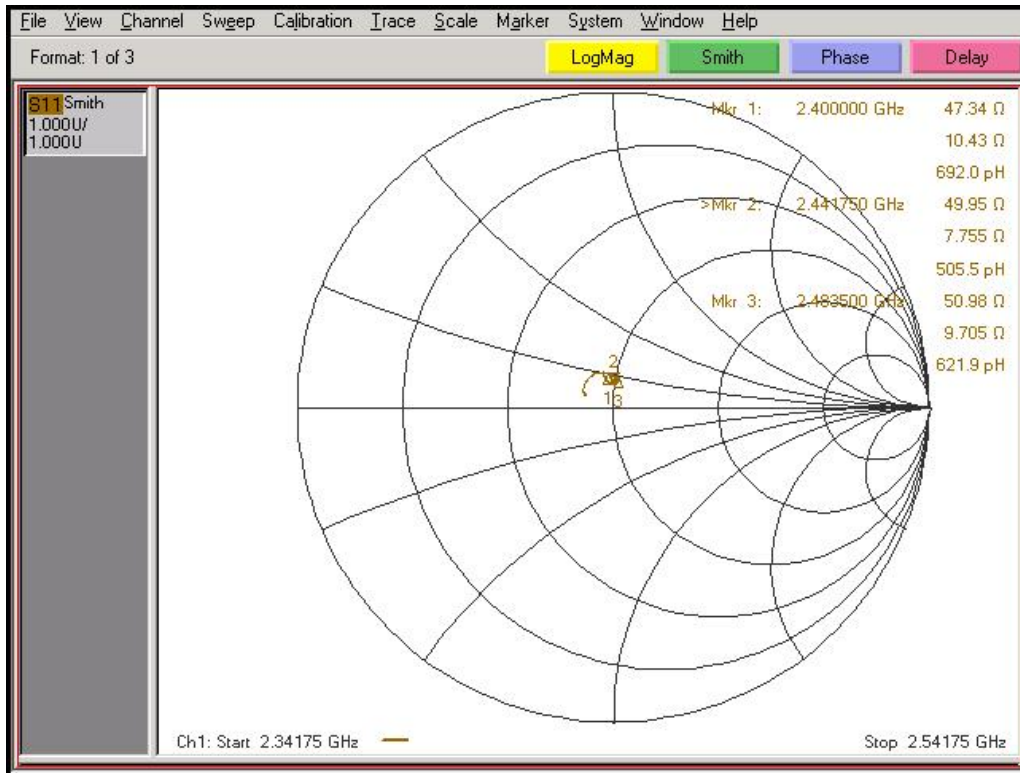
**Fig 2. V.S.W.R** (Agilent E8357A 300KHz~6GHz PNA Series Network Analyzer)



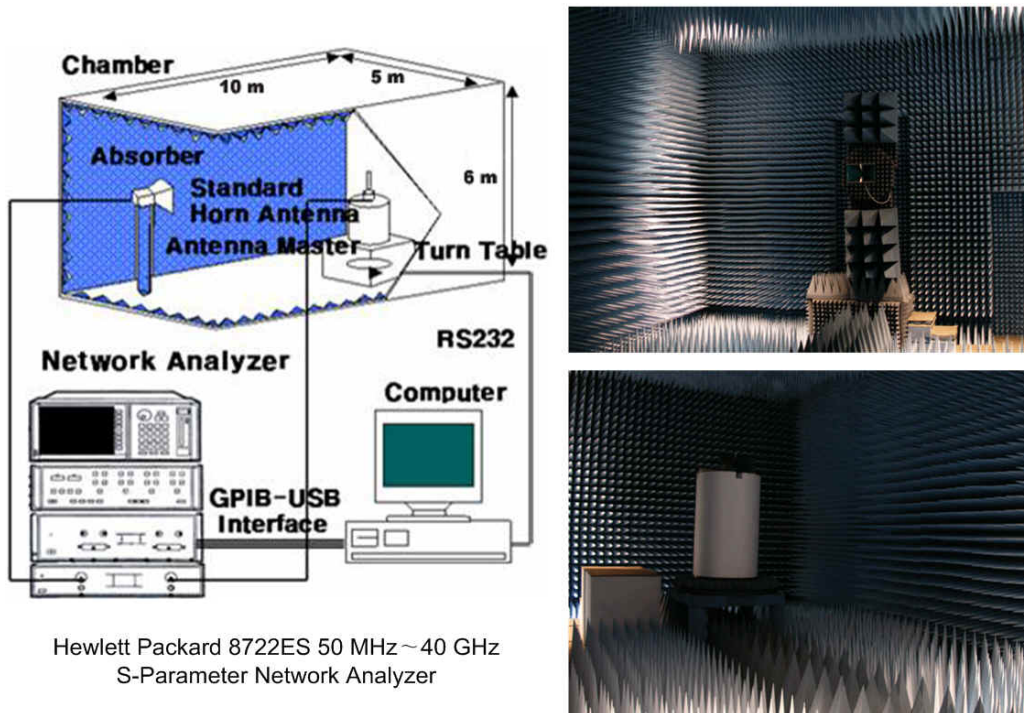


**Fig 3. Smith Chart** (Agilent E8357A 300KHz ~ 6GHz PNA Series Network Analyzer)

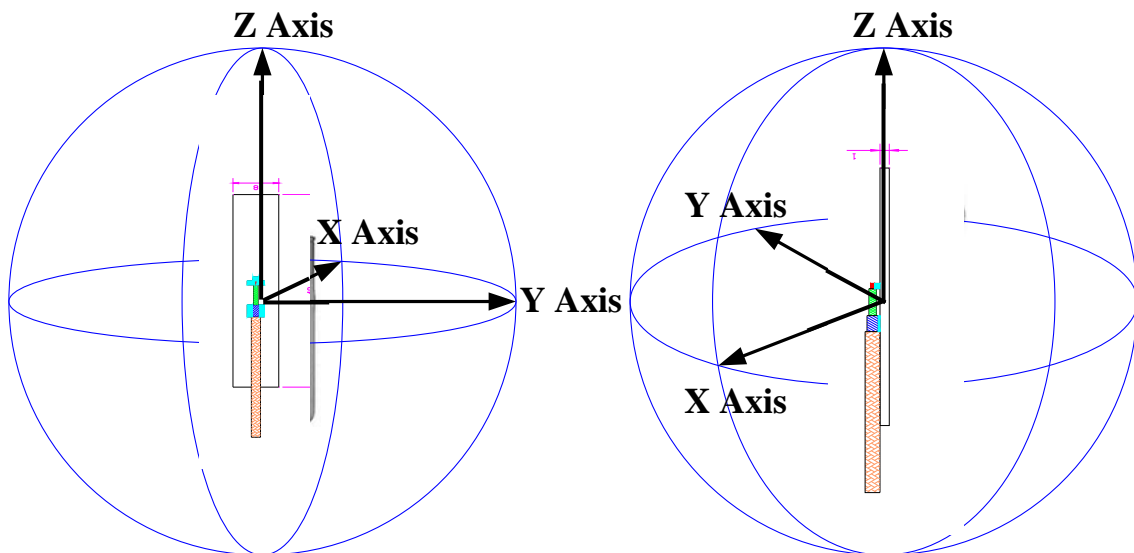
**LEFT**



**Fig 4. Measurement Configuration**



**Fig 5. Axis Definitions (Antenna Center)**

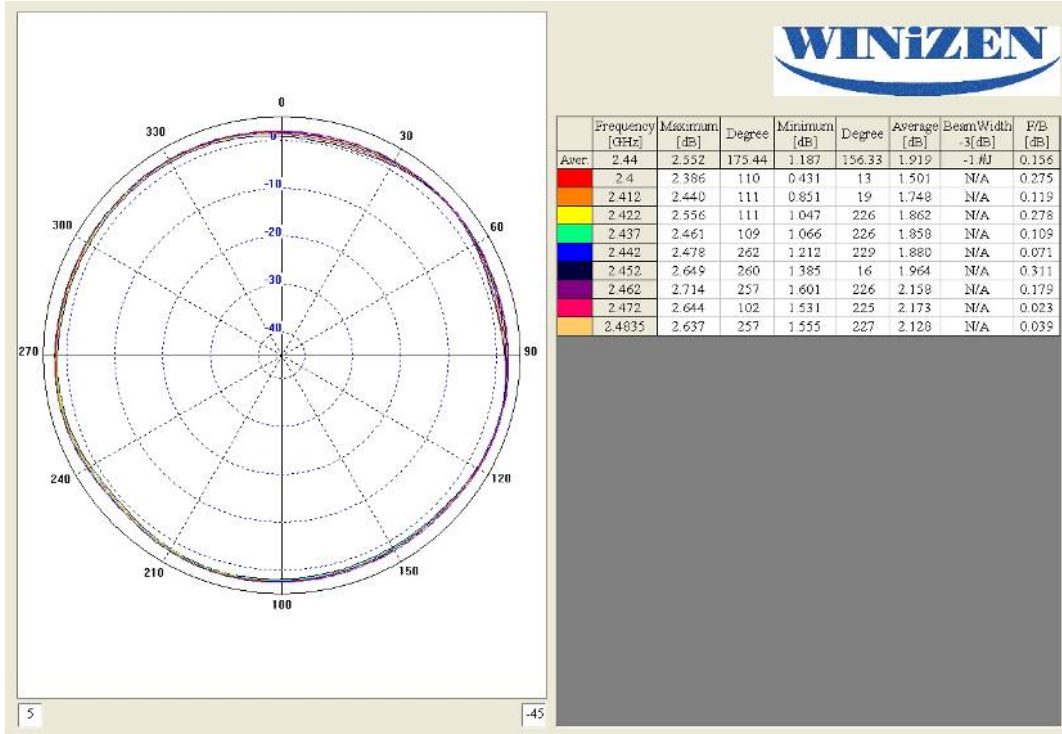


- a. Azimuth Pattern (Co-pol) : XY Plane ; Horn Antenna Polarization : Vertical
- b. Elevation Pattern (Co-pol) : XZ Plane ; Horn Antenna Polarization : Horizontal
- c. Elevation Side Pattern (Co-pol) : YZ Plane ; Horn Antenna Polarization : Horizontal

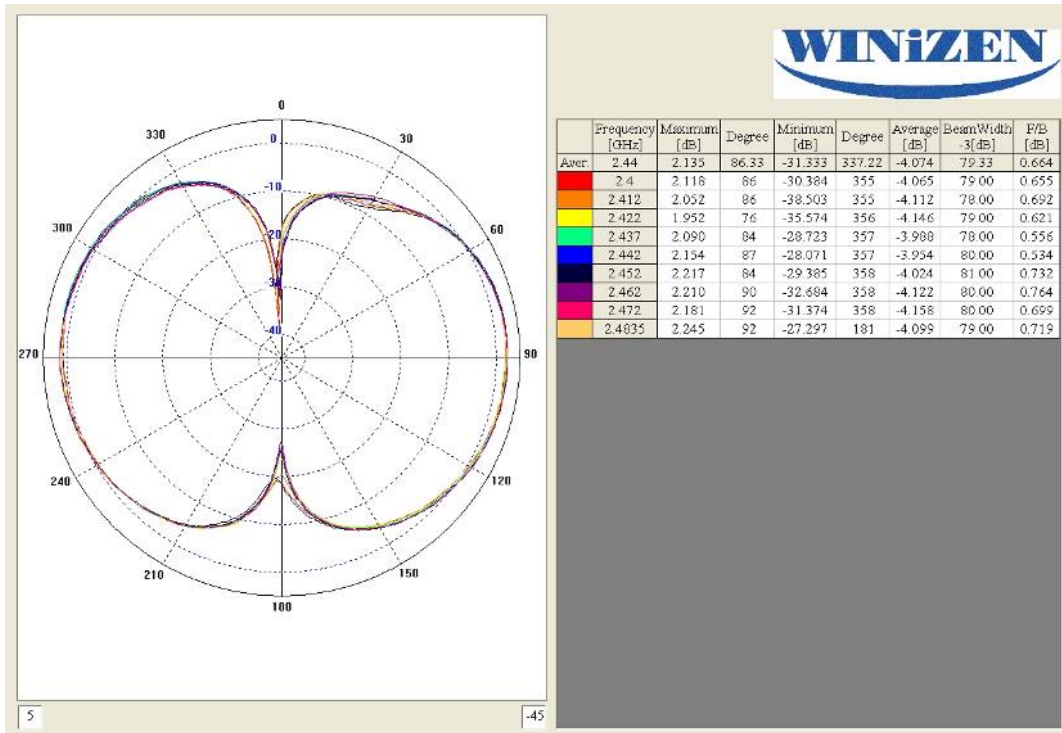


**Fig 6. Gain Patterns**

**a. Azimuth Pattern**



**b. Elevation Pattern**





**Fig 7. Antenna Mechanical**

