

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

FCC ID : MSQDSL13

Product Name : 802.11n All-in-1 Wireless ADSL2/2+ Home Gateway

Model Name : DSL-N13

Frequency Range : IEEE 802.11b/g/n Draft 1.0 20M: 2.412GHz ~ 2.462GHz
IEEE 802.11n Draft 1.0 40M: 2.422GHz ~ 2.452GHz

Channel Spacing : 5MHz

Support Channel : IEEE 802.11b/g/n Draft 1.0 20M: 11 Channels
IEEE 802.11n Draft 1.0 40M: 7 Channels

Modulation Skill : DBPSK, DQPSK, CCK, OFDM

Power Type : Powered by the switching adapter,
Manufacture: AMIGO
Model: AMS3-1201200FU
I/P: 100 ~ 240VAC ~ 50/60Hz 0.5A
O/P: 12VDC 1.2A.
186cm length, non-shielded, without ferrite core

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:

Friis Transmission Formula:
$$S = \frac{PG}{4\pi R^2} = \frac{406.56 \times 2.34}{4\pi(20)^2} = 0.189mW / cm^2$$

Estimated safe separation:
$$R = \sqrt{\frac{PG}{4\pi}} = \sqrt{\frac{406.56 \times 2.34}{4\pi}} = 8.701cm$$

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/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:

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

$$G = \text{Log}^{-1} (3.70 / 10) = 2.34$$

Appendix

Antenna Specification

產品規格承認書

Specification For Approval

日期： 2007 / 09 / 13

Date

編號： 070913002

File No.

版本： 2.0

Revision

承認廠商： 華碩電腦股份有限公司

Customer

製造廠商： 英碩科技股份有限公司

Manufacturer

型號品名： 2.4GHz AP Antenna

Part Number

Description

INVAX P/N :AN2400-1701BX

廠商審核：

Approved By

Invax

英碩科技股份有限公司

台北市忠孝東路五段 815 號 4 樓

Tel: 886-2-2788-5218 Fax:886-2-2783-1658

Cortec

東莞康捷電子有限公司

廣東省東莞市長安鎮振安路

沙頭段咸西工業區

Tel: 86-769-85388261 Fax: 86-769-85397133

Index:

- 1. Reliability Testing**
- 2. Specification**
- 3. S Parameter Test Data**
- 4. Antenna Radiation Pattern**
- 5. Mechanical Drawing**
- 6. MSDS & SGS Report**



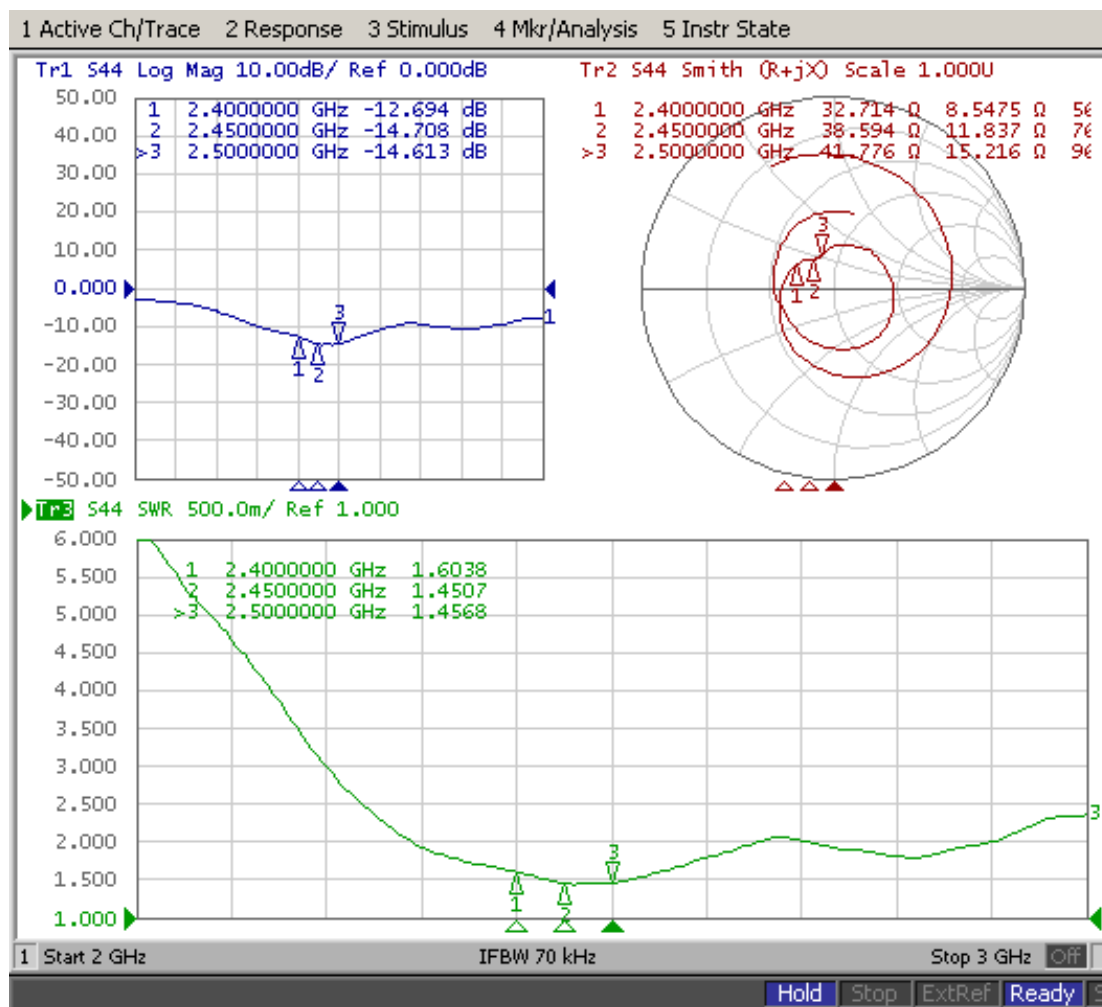
1. Reliability Testing

Test Item	Procedure	Requirement
1. Visual inspection and Dimension Check	Applicable methods using x5 magnification	follow specification
2. Rapid Changing of Temperature	-40°C (30minutes) to 90°C (30minutes); 24 cycles	After 2 hours recovery: 1. no visible damage 2. Freq. Tol.: < ±5%
3. Damp Heat	24 hours at 60°C; 90 ~ 95% RH	After 2 hours recovery: 1. no visible damage 2. Freq. Tol. : < ±5%
4. Endurance	24 hours at 90°C	After 2 hours recovery: 1. no visible damage 2. Freq Tol.: < ±5%

2. Specification

A. Electrical Characteristics	
S.W.R.	≤ 2.0 @ 2400~2500 MHz
Antenna Gain	3.0 ± 0.7 dBi
Impedance	50 Ohm
B. Material	
Material of Radiator	Cu (Plated)
Material of Coaxial Cable	O.D.1.37 / 140 mm
C. Environmental	
Operation Temperature	- 30 °C ~ + 85 °C
Storage Temperature	- 30 °C ~ + 85 °C

3. S Parameter Test data



4. Antenna Radiation Pattern

Testing Equipment Specification:

Antenna Anechoic Chamber Dimension: 8 x 4 x 4 m

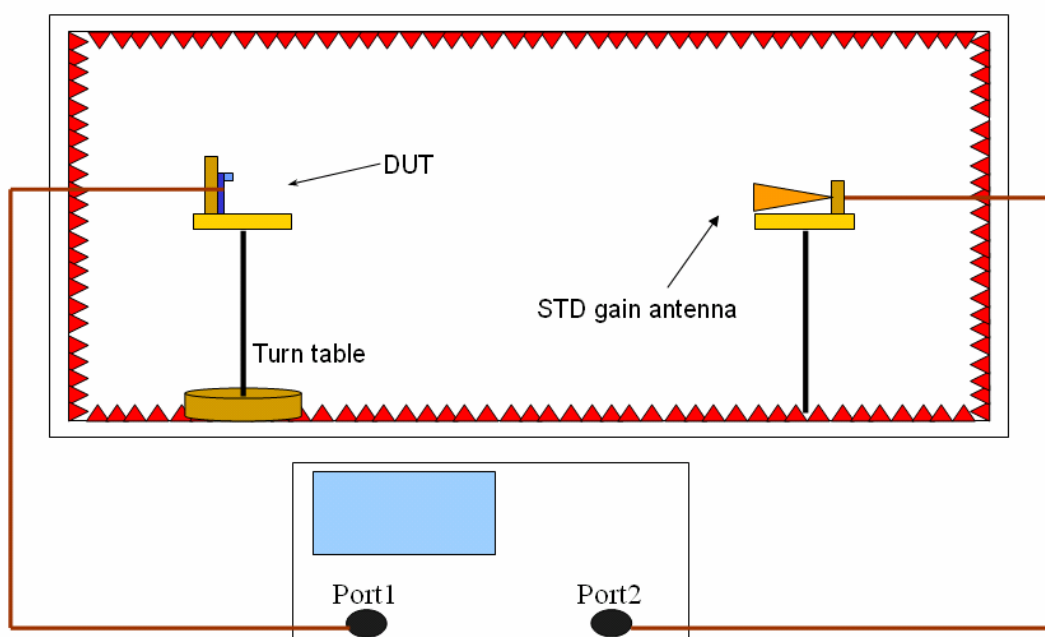
Quiet Zone: 600mm @1 GHz

Isolation: >100dB @ 1 MHz ~ 10 GHz

Testing Equipment: Agilent 5071B

Received Antenna: 0.7 ~ 6.0 GHz for Gain Calibration

Double Ridged Horn Antenna



5. Mechanical Drawing

6. MSDS & SGS Report



Cortec Technology Inc.

广东省东莞市长安镇振安路沙头段咸西工业区

Model : AN2400-1701BX

Remark : H-Plane // Vertical Polarization

Tested by : CORTEC Antenna 3D Chamber // Zhao Yao Rong

Location: Chamber

Date: 2007/9/13

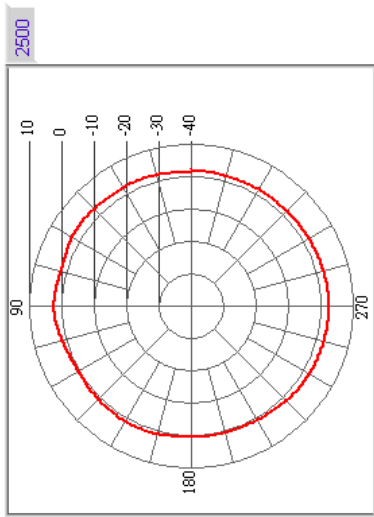
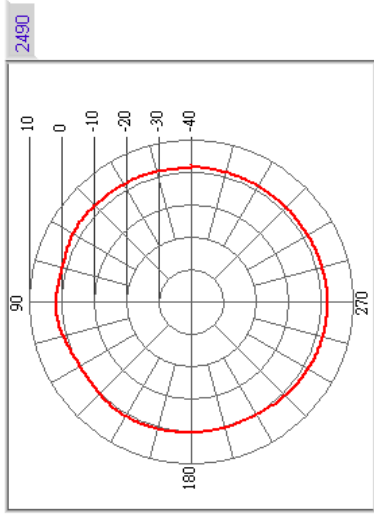
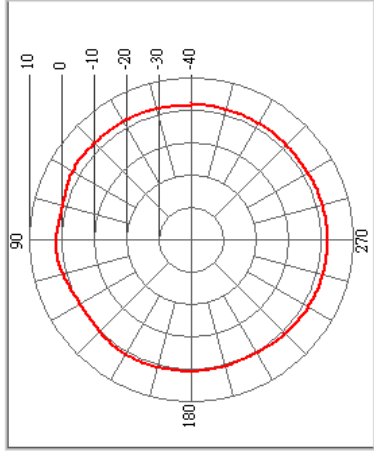
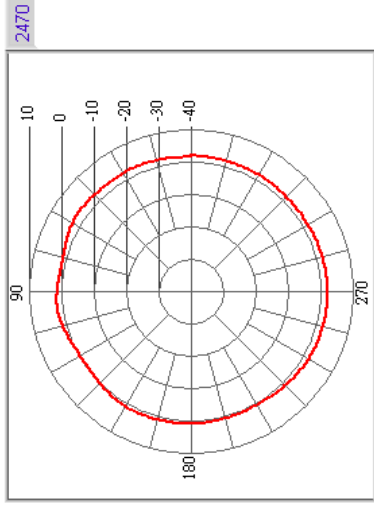
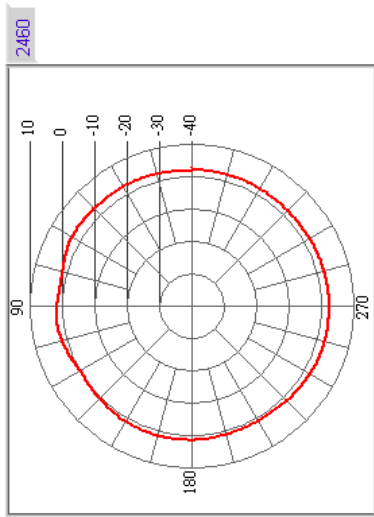
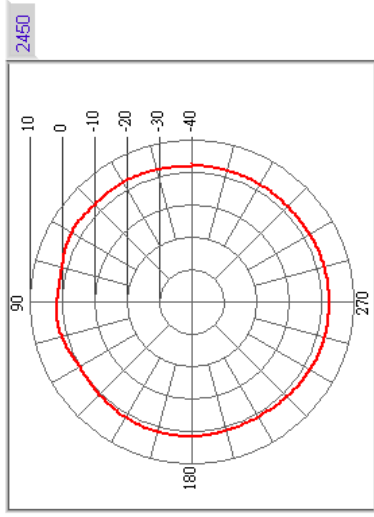
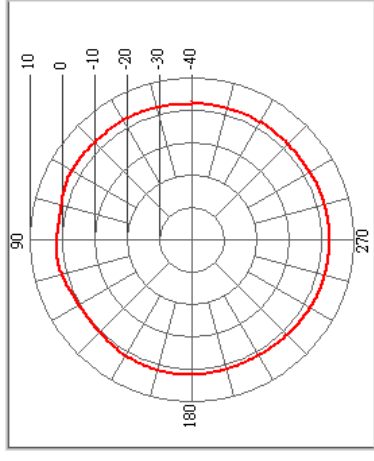
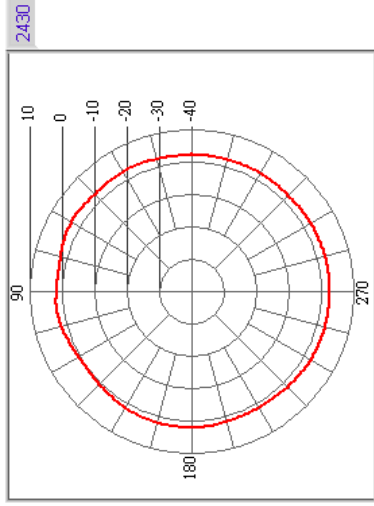
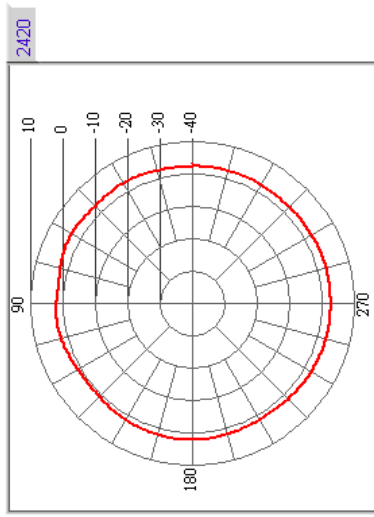
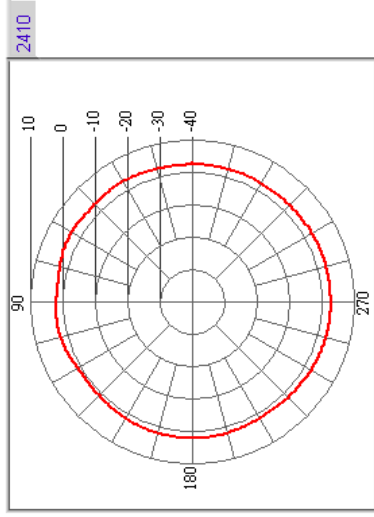
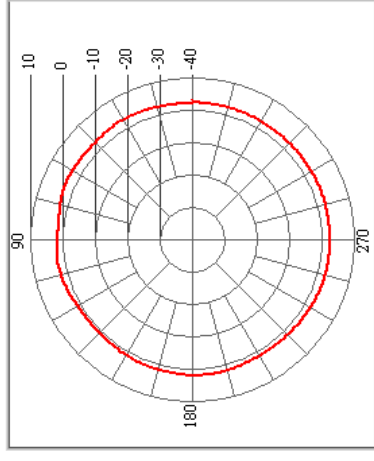
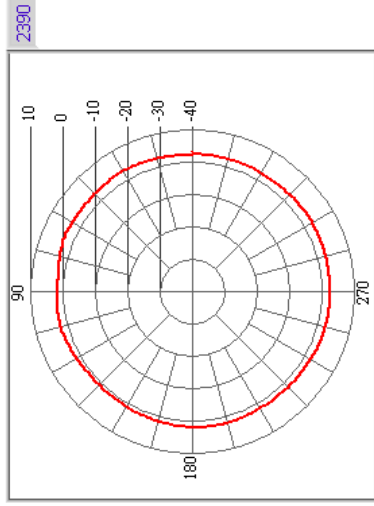
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Temperature (°C): 22.00

Humidity (%): 55.00

Approved by:

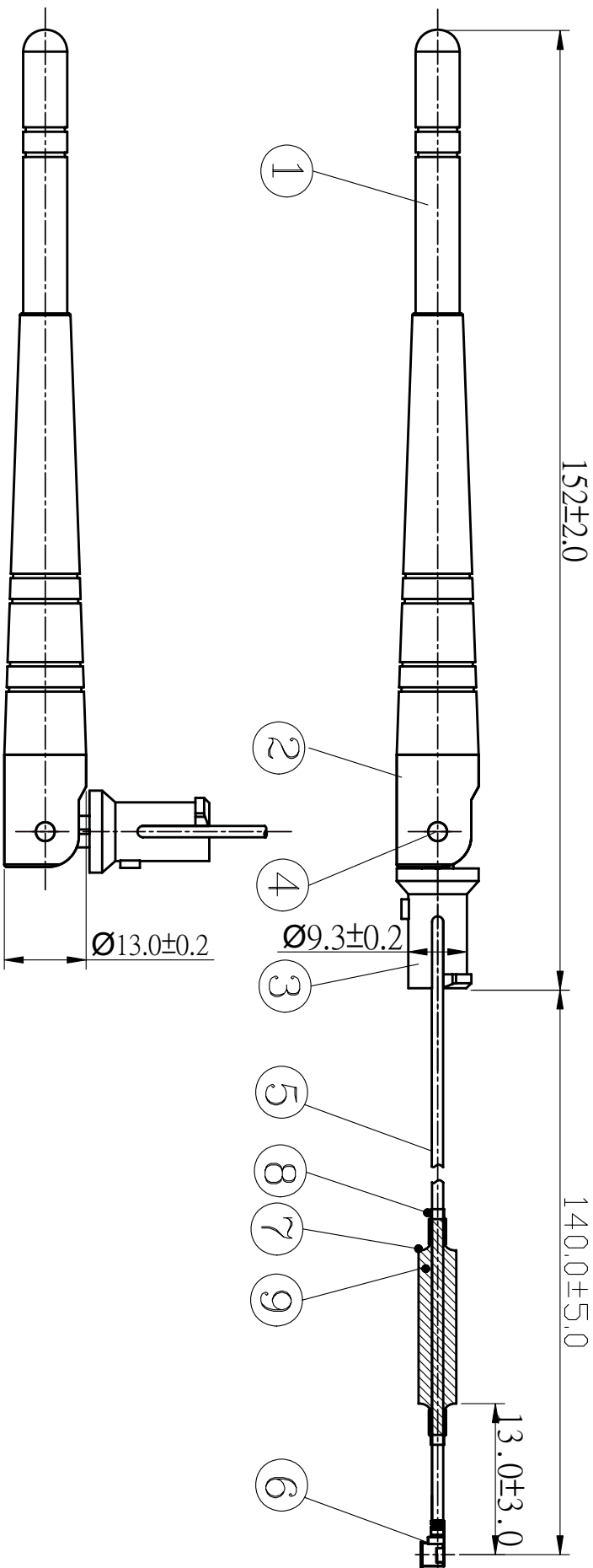
Freq. (MHz)	2390	2400	2410	2420	2430	2440	2450	2460	2470	2480	2490	2500
Peak Gain (dBi)	3.2	3.06	3.17	3.12	3.05	2.98	3.03	2.98	2.64	2.6	2.49	2.88
Peak Degree	31	31	61	60	60	60	55	55	54	54	54	54
AV Gain (dBi)	2.18	2.08	2.26	2.21	2.05	1.9	1.84	1.79	1.44	1.39	1.29	1.65



ROHS

Compatible

SIGN	DATE	DESCRIPTION	APPROVER
△			
△			
△			



No.	Part Number	Description	Material	Finish	Qty
9	R-MFR-04M0115250	Fe ₂ O ₃		Ø4.0*25.0mm	1
8	R-HSTUBE-020N	Hstube		Ø2.0* $L=10$ mm	2
7	R-HSTUBE-035N	Hstube		Ø3.5* $L=38$ mm	1
6	R-CB-TEE113-01	Connector	I-Pex	MHF Catania	1
5	R-CB-137B	Cable	Ø1.37mm	L=208.0mm(Black)	1
4	R-AN03-514CN	Pin	Brass	Nickel Plated	2
3	R-AN2401-01AW	Body 3	PC+ABS	White	1
2	R-AN03-T02AW	Body 2	PC+ABS	White	1
1	R-AN17-01W	Body 1	TPE	White	1

Cortec

Cortec Technology Inc.

TITLE: 2.4GHz-Antenna

PART NO.: AN2400-1701BX

DWG NAME: AN2400-1701BX.dwg

APPROVED BY
Grant
2007/08/31

CHECKED BY
劉泰
2007/08/31

DESIGNED BY
王新鋒
2007/08/31

UNITS: mm
SCALE: 1/1
REVISION: A

Tolerance
X.X ±0.1
X.XX ±0.05
X° ±1°

產品規格承認書

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Customer

製造廠商： 英碩科技股份有限公司

Manufacturer

型號品名： **2.4GHz AP Antenna**

Part Number

Description

INVAX P/N :AN2400-1702BX

廠商審核：

Approved By

Invax

英碩科技股份有限公司

台北市忠孝東路五段 815 號 4 樓

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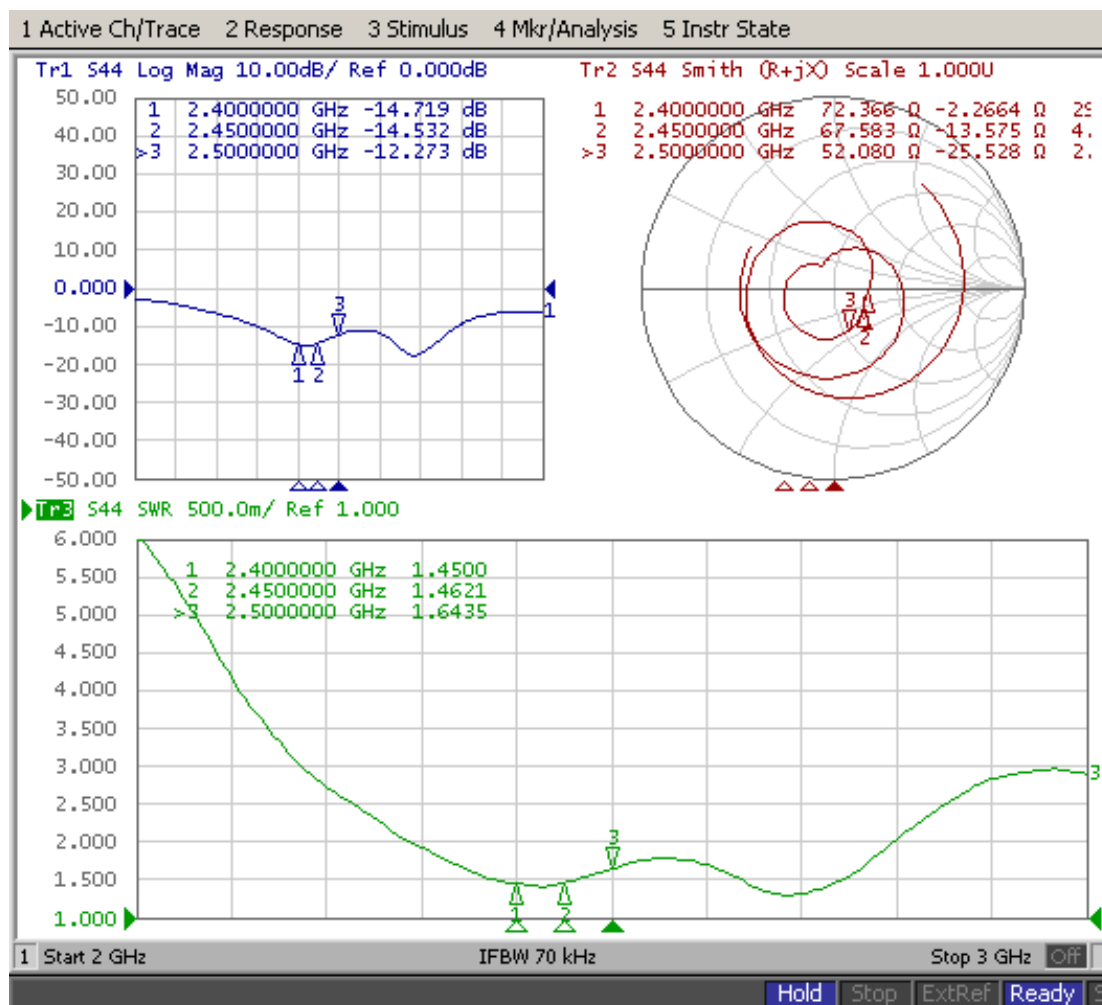
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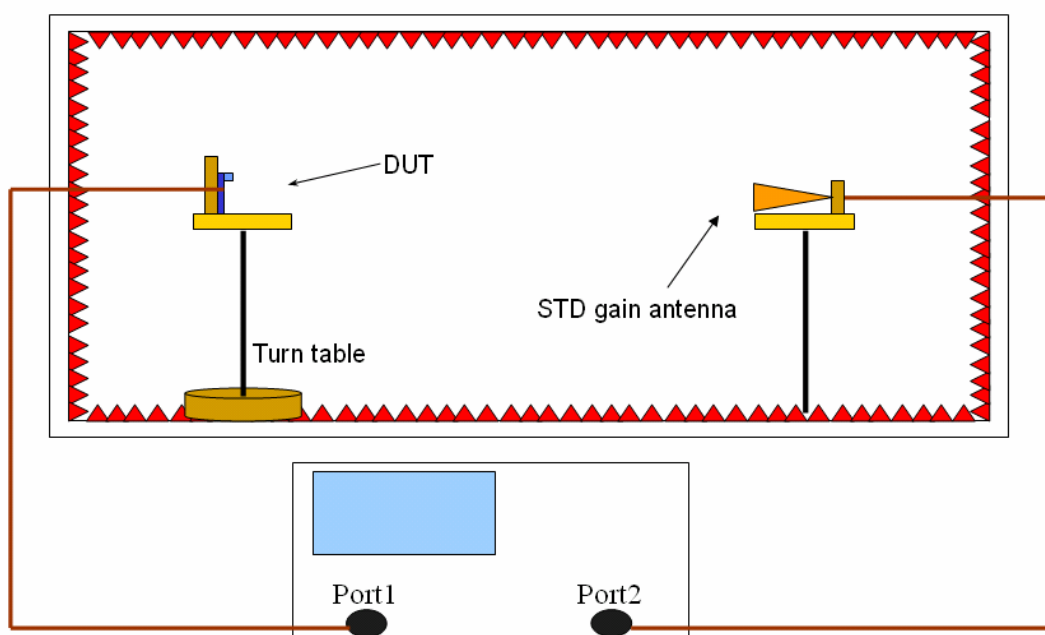
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广东省东莞市长安镇振安路沙头段咸西工业区

Model : AN2400-1702BX

Remark : H-Plane // Vertical Polarization

Tested by : CORTEC Antenna 3D Chamber // Zhao Yao Rong

Location: Chamber

Date: 2007/9/13

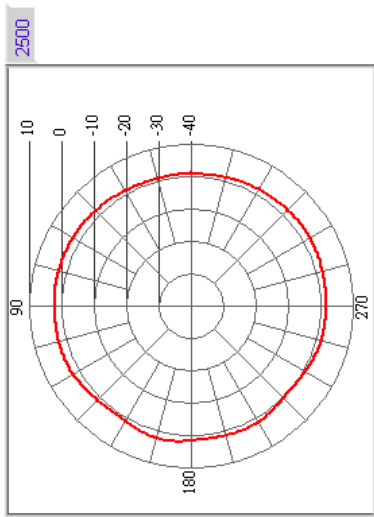
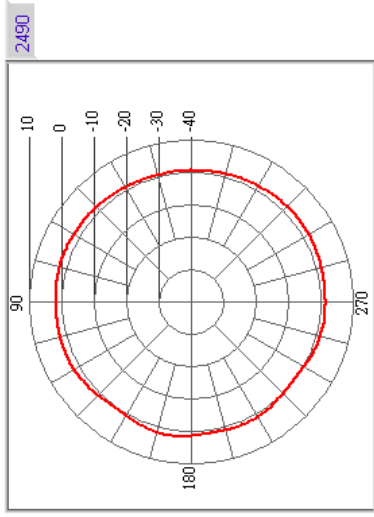
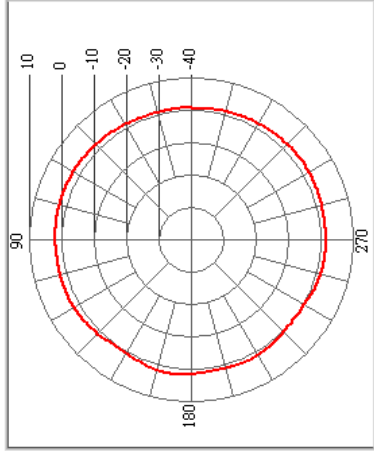
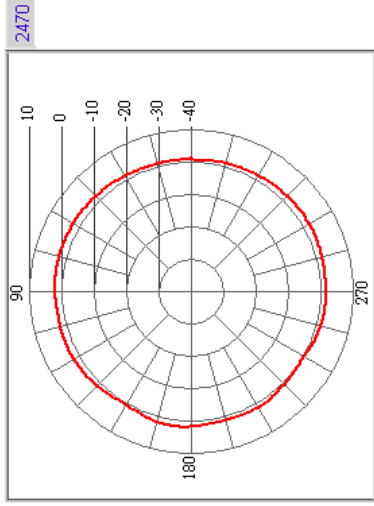
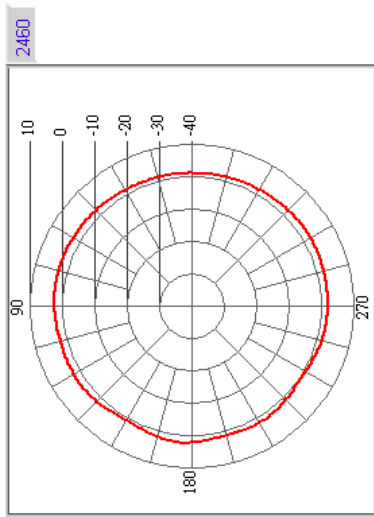
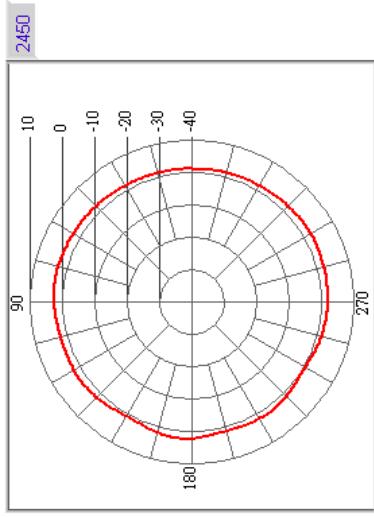
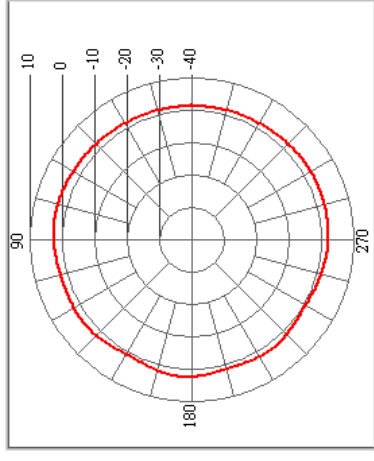
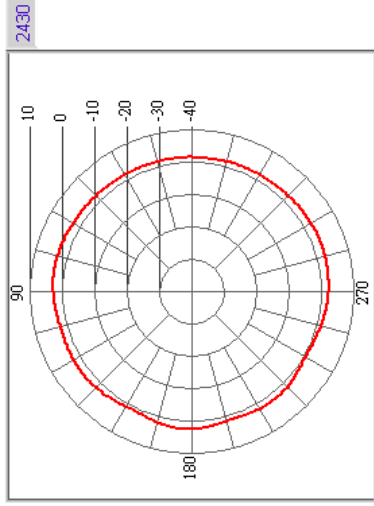
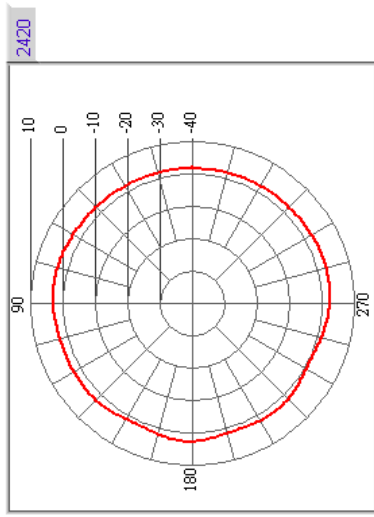
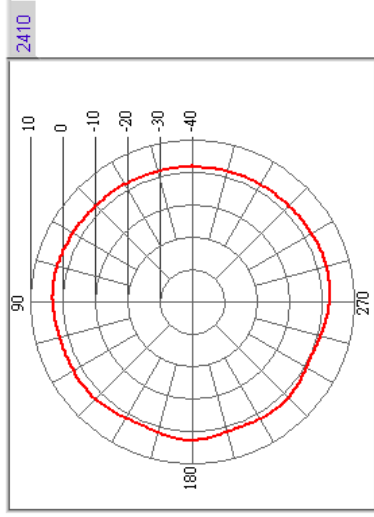
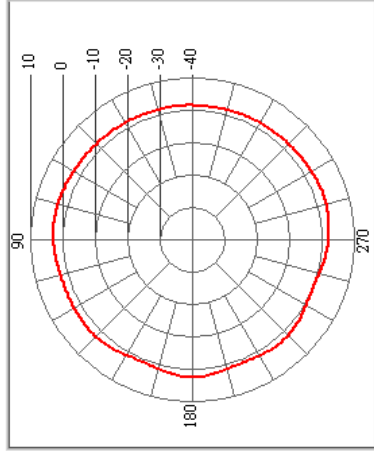
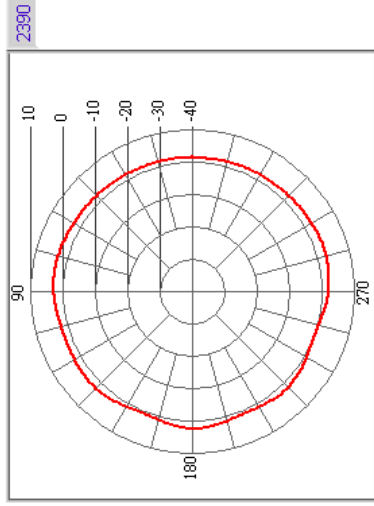
Time: 上午 09:46:03

Temperature (°C): 22.00

Humidity (%): 55.00

Approved by:

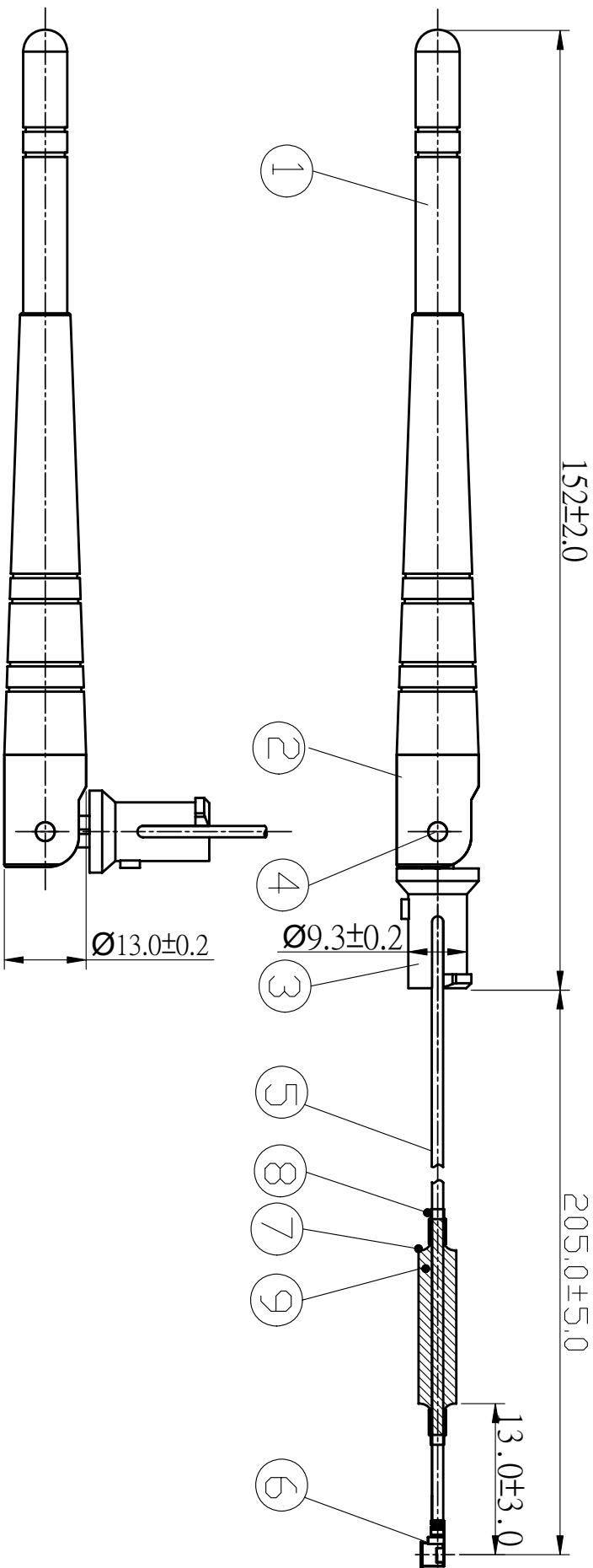
Freq. (MHz)	2390	2400	2410	2420	2430	2440	2450	2460	2470	2480	2490	2500
Peak Gain (dBi)	3.01	3.07	3.25	3.21	3	2.87	2.75	2.65	2.36	2.24	2.11	2.46
Peak Degree	78	78	83	83	78	78	77	72	71	66	71	71
AV Gain (dBi)	1.86	1.92	2.12	2.1	1.94	1.83	1.76	1.74	1.45	1.41	1.29	1.62



ROHS

Compatible

SIGN	DATE	DESCRIPTION	APPROVER
△			
△			
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No.	Part Number	Description	Material	Finish	Qty
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2	R-AN03-T02AW	Body 2	PC+ABS	White	1
1	R-AN17-01W	Body 1	TPE	White	1

Inrax System Group.
Cortec
 Cortec Technology Inc.
 Http://www.inraxsystem.com Tel: 886-2-27889218
 Email:info@inrax.com.tw Fax: 886-2-27831698

TITLE: 2.4GHz-Antenna
 PART NO.: AN2400-1702BX DWG NAME: AN2400-1702BX.dwg

APPROVED BY	CHECKED BY	DESIGNED BY	UNIT: mm	Tolerance
Grant	劉泰	王新鋒	SCALE: 1/1	X.X ±0.1
2007/08/31	2007/08/31	2007/08/31	REVISION: A	X.XX ±0.05
				X° ±1°