

# ELECTRONICS TESTING CENTER, TAIWAN

NO. 8, LANE 29, WEN-MING RD.,  
LO-SHAN TSUN. KUI-SHAN  
HSIANG, TAOYUAN HSIEN  
333, TAIWAN, R. O. C.

Tel: (03) 3280026  
Fax: (03) 3280034  
TEL: 02-26023052  
FAX: 02-26010910

Dear Mr. Errol Chang,

Sorry for the delay and thank you for your kind help. The requested additional information is ready, please check the attached documentation.

If you have any other instructions, please advise and thank you again.

Wish you with the best and regards,

  
K. C. Chen

ETC/EMC Department

FCC LABORATORY

SEP 14 11 27 AM '99

# RF Maximum Permissible Exposure Measurement Report

of

E.U.T. : Access Point

MODEL : NCF600

for

APPLICANT : NATIONAL DATACOMM CORPORATION

ADDRESS : 2F, NO. 28, INDUSTRY EAST 9TH ROAD, SCIENCE  
PARK, HSINCHU, TAIWAN, R.O.C.

Test Performed by

**ELECTRONICS TESTING CENTER, TAIWAN**  
NO. 8 LANE 29, WENMIMG ROAD,  
LOSHAN TSUN, KWEISHAN HSIANG,  
TAOYUAN, TAIWAN, R.O.C.

Tel:(03)3280026-32

Fax:(03)3280034

Report Number : ET88R-06-017

ETC LABORATORY  
No. 11, Lane 100, Sec. 1, Rd. 100

# TEST REPORT CERTIFICATION

Applicant : NATIONAL DATACOMM CORPORATION  
2F, NO. 28, INDUSTRY EAST 9TH ROAD, SCIENCE PARK,  
HSINCHU, TAIWAN, R.O.C.

Manufacturer : NATIONAL DATACOMM CORPORATION  
2F, NO. 28, INDUSTRY EAST 9TH ROAD, SCIENCE PARK,  
HSINCHU, TAIWAN, R.O.C.

Description of EUT :

- a) Type of EUT : Access Point
- b) Model No. : NCF600
- c) Power Supply : AC Adapter( I/P:120V/60Hz, O/P:5Vdc)

Regulation Applied : IEEE C95.1-1991

I HEREBY CERTIFY THAT: The data shown in this report were made in accordance with the procedures given in IEEE C95.1, and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

- Note: 1. The result of the testing report relates only to the item tested.  
2. The testing report shall not be reproduced expect in full, without the written approval of ETC.

Issued Date : May. 30, 1999

Test Engineer :   
( K. C. Chen )



Approve & Authorized Signer : Will Yau  
Will Yau, Supervisor  
EMI Test Site of ELECTRONICS  
TESTING CENTER, TAIWAN

<b>Table of Contents</b>		<b>Page</b>
<b>1</b>	<b>GENERAL INFORMATION .....</b>	<b>1</b>
1.1	Product Description .....	1
1.2	Characteristics of Device .....	1
1.3	Test Methodology .....	1
1.4	Test Facility.....	1
<b>2</b>	<b>PROVISIONS APPLICABLE.....</b>	<b>2</b>
2.1	Definition .....	2
2.2	Relative Requirement for Compliance.....	3
<b>3</b>	<b>SYSTEM TEST CONFIGURATION.....</b>	<b>4</b>
3.1	Justification.....	4
3.2	Devices for Tested System.....	4
<b>4</b>	<b>MAXIMUM PERMISSIBLE EXPOSURE MEASUREMENT .....</b>	<b>5</b>
4.1	Applicable Standard.....	5
4.2	Measurement Procedure.....	5
4.3	Measurement Instrument.....	6
4.4	Power Density Data.....	6
<b>APPENDIX A</b>	<b>SPECIFICATION OF DEVICE UNDER TEST .....</b>	<b>7</b>

## **1 GENERAL INFORMATION**

### **1.1 Product Description**

- a) Type of EUT : Access Point
- b) Trade Name : InstantWave
- c) Model No. : NCF600
- d) Power Supply : AC Adapter( I/P:120V/60Hz, O/P:5Vdc)

### **1.2 Characteristics of Device**

The Access Point designed with a transmitting method of frequency hopping spread spectrum is for local area network operation, which operates at 2.4 GHz ISM band and data rate up to 2Mbps. For operation of this device, it is asked for maintaining a minimum space of 20 cm from the operator or any bystanding in the user's manual. The on-air protocol and radio characteristic conform to the IEEE 802.11 standard (frequency hopping). The ethernet port is compatible with the IEEE 802.3.3-1993 and uses STP interface. Its nominal rated output power is 20 dBm.

For more details of specification, please see appendix A.

### **1.3 Test Methodology**

The Maximum Permissible Exposure (MPE) was performed according to the procedures illustrated in IEEE C95.1-1991.

### **1.4 Test Facility**

The open area test site and conducted measurement facility used to collect the radiated data is located on the roof top of Building at No.34, 5 Lin, Din Fu Tsun, Lin Kou, Taipei, Taiwan, R.O.C.

This site has been fully described in a report submitted to the FCC, and accepted in a letter dated Feb. 10, 1997.

## 2 PROVISIONS APPLICABLE

### 2.1 Definition

#### **MPE in Controlled Environments:**

For human exposure in controlled environments to electromagnetic energy at radio frequencies from 3 kHz to 300 GHz, the MPE, in terms of rms electric (E) and magnetic (H) field strengths, the equivalent plane-wave freespace power densities (S) and the induced currents (I) in the body that can be associated with exposure to such fields or contact with objects exposed to such fields, is given in Table 1 as a function of frequency. Exposure associated with a controlled environment includes: exposure that may be incurred by persons who are aware of the potential for exposure as a concomitant of employment, exposure of other cognizant individuals, or exposure that is the incidental result of passage through areas where analysis shows the exposure levels may be above those shown in Table 2, but do not exceed those in Table 1, and where the induced currents may exceed the values in Table 2, Part B, but do not exceed the values in Table 1, Part B. of IEEE C95.1

#### **MPE in Uncontrolled Environments:**

For human exposure in uncontrolled environments to electromagnetic energy at radio frequencies from 3 kHz to 300 GHz, the MPE, in terms of rms electric (E) and magnetic (H) field strengths, the equivalent plane-wave free-space power densities (S) and the induced currents (I) in the body that can be associated with exposure to such fields or contact with objects exposed to such fields are given in Table 2 as a function of frequency.

Exposure associated with an uncontrolled environment is the exposure of individuals who have no knowledge or control of their exposure. The exposure may occur in living quarters or workplaces where there are no expectations that the exposure levels may exceed those shown in Table 2, and where the induced currents do not exceed those in Table 2, Part B. Transitory exposures are treated in 4.1.1. of IEEE C95.1

## 2.2 Relative Requirement for Compliance

### (1) MPE for Controlled Enviroments

According to section 4.1.1 of IEEE C95.1 MPE Limits for controlled enviroment are as following:

Frequency Range (MHz)	Power Density (S) E-Field, H-Field (mW/cm <sup>2</sup> )
0.003-0.1	(100, 1000000)
0.1-3.0	(100, 10000/f <sup>2</sup> )
3-30	(900/f <sup>2</sup> , 10000/f <sup>2</sup> )
30-100	(1.0, 10000/f <sup>2</sup> )
100-300	1.0
300-3000	f/300
3000-15000	10
15000-300000	10

### (2) MPE for Uncontrolled Enviroments

According to section 4.1.2 of IEEE C95.1 MPE Limits for uncontrolled enviroment are as following:

Frequency Range (MHz)	Power Density (S) E-Field, H-Field (mW/cm <sup>2</sup> )
0.003 - 0.1	(100, 1000000)
0.1 - 1.34	(100, 10000/f <sup>2</sup> )
1.34 - 3.0	(180/f <sup>2</sup> , 10000/f <sup>2</sup> )
3 - 30	(180/f <sup>2</sup> , 10000/f <sup>2</sup> )
30 - 100	(0.2, 940000/f <sup>3.336</sup> )
100 - 300	1.0
300 - 3000	f/15000
3000 - 15000	f/15000
15000 - 300000	10

### 3. SYSTEM TEST CONFIGURATION

#### 3.1 Justification

The system was configured for testing in a typical fashion as a customer would normally use it. The peripherals other than EUT were connected in normally standing by situation. Measurement was performed under the condition that a computer program was exercised to simulate data communication of EUT, and the transmission rate was set to maximum allowed by EUT. So it could be sure that the measurement was taken on possible maximum radiated power from normal operation.

#### 3.2 Devices for Tested System

<u>Device</u>	<u>Manufacture</u>	<u>Model</u>	<u>Cable Description</u>
Access Point *	NATIONAL DATACOMM CORPORATION	NCF600	10m Shielded RJ-45 Cable AC Adaptor output cord 1.5m 1.8m AC Power Cord

Remark "\*" means device under test.



## 4 Maximum Permissible Exposure Measurement

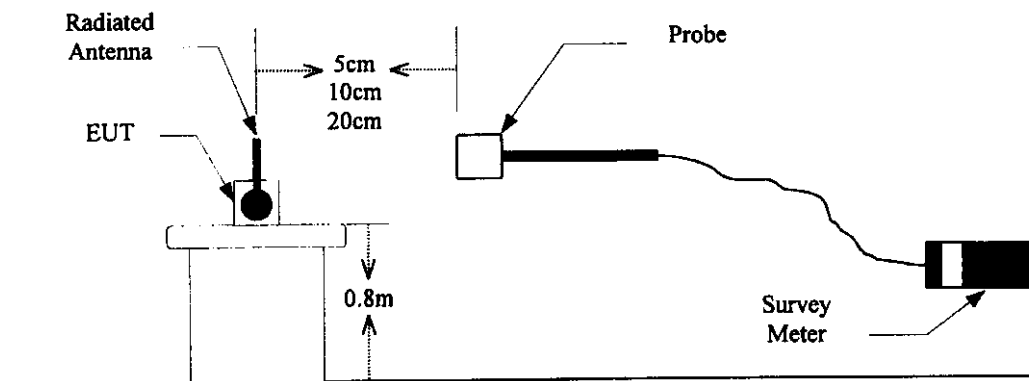
### 4.1 Applicable Standard

For this intentional radiator are used with any possible people, therefore the **Uncontrolled Enviroment Condition** is applied. And the MPE requirement is as descibed in section 2.2 of this test report.

### 4.2 Measurement Procedure

- (1) Set up the device under test (DUT) as its normal using configuration. Please see figure 1.
- (2) Calibrate the probe system so that the meter displays zero, and then power on the DUT.
- (3) Scan the antenna of DUT with a proper spacer of 5 cm in vertical axis and keep vertical scanning around the antenna, and pick up the maximum data with Max. Hold function.
- (4) Repeat step (3) by changing the spacer to 10 cm and then 20 cm till the field from DUT is too weak to be measured.
- (5) Record the maximum value appeared.

Figure 1 : Measurement configuration



### 4.3 Measurement Instrument

The following instrument are used for radiated emissions measurement :

Equipment	Manufacturer	Model No.	Next Cal. Due
Survey Meter	Narda	8712	Jan. 30, 2000
Probe	Narda	8721D	Jan. 30, 2000

### 4.4 Power Density Data

Operation Mode : Maximum Data Transmitting Rate

Transmitting Frequency : 2402 – 2480 MHz

Rated Maximum Output Power : 20 dBm

Test Date : May 12, 1999      Temperature : 25 °C      Humidity : 65%

Measured @ 5cm mW/cm <sup>2</sup>	Measured @ 10cm mW/cm <sup>2</sup>	Measured @ 20cm mW/cm <sup>2</sup>	Limit mW/cm <sup>2</sup>
0.05×0.815=0.04	---	---	1.60

Note :

1. Remark “---” means that the emission level is too low to be measured (the precise accuracy of the measurement system is 0.01 mW/ cm<sup>2</sup>).
2. Value 0.815 is a corrected factor of measurement system.

## **Appendix A Specification of Device Under Test**

### **Product Characteristics**

1. **Operation Frequency:** 2402MHz ~ 2480MHz.
2. **Maximum Output Power:** 20 dBm.
3. **Modulation Scheme:** Frequency Hopping Spread Spectrum.
4. **Antenna Type:** Dipole antenna with gain 2dBi. The detail specification is in the next page
5. **Application field:** Local area network or wide area network for office user or home user.
6. **Warning:** For Notebook PC user, always place the snap-on antenna at least 20 cm away from your body. For Laptop User, in order to comply with the FCC RF exposure limits, it is recommended that the antenna should not be positioned closer than 20 cm from your body or nearby persons for extended periods of time while it is transmitting (or operating). If the antenna is positioned less than 20 cm from the user, it is recommended that the user limit exposure time to reduce RF exposure.

# ANTENNA SPECIFICATION

## TM-15 Wireless LAN Antenna

### 1. Electrical

Frequency band	頻率	2400 - 2500 MHz
Impedance	阻抗	50 Ohms
Gain	增益	0 dBd
VSWR	駐波比	≤ 1.5 :1
Power rating	輸出功率	10 W.
Type of radiation	電波導向	Omni-directional
Electrical length	波長	1/2 λ
Polarization	向位	Vertical Dipole
Antenna length	天線長度	89.5 ± 0.5 mm.
Connector type	接頭規格	MCX male

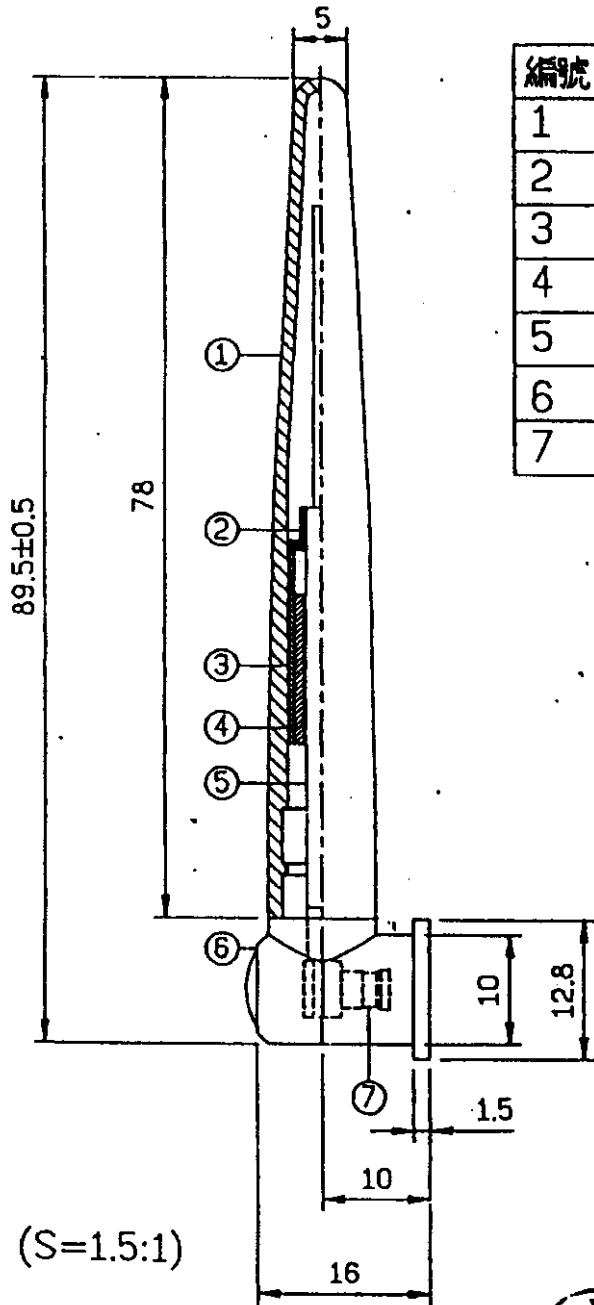
### 2. Mechanical

Pulling force	Antenna tub	Min. 4 KG
---------------	-------------	-----------

### 3. Environment

Temperature range	storage	-30 °C to +70 °C
	operation	-20 °C to +70 °C
Temperature Cycling	No mechanical damage or detonation of performance after 10 cycles -30 °C and +70 °C.	
Salt spray test	5% salt, 144 hours. No rust on surface. -No deterioration of specified data	
Vibration test	after vibration test 20 m/sec (2g) 5 - 100 Hz or ± 0.5 mm. In 2 planes.	
Ozone and UV-resistance	Materials is designed of which are resistant against UV and Ozone.	

Frequency: 2.4~2.5GHz



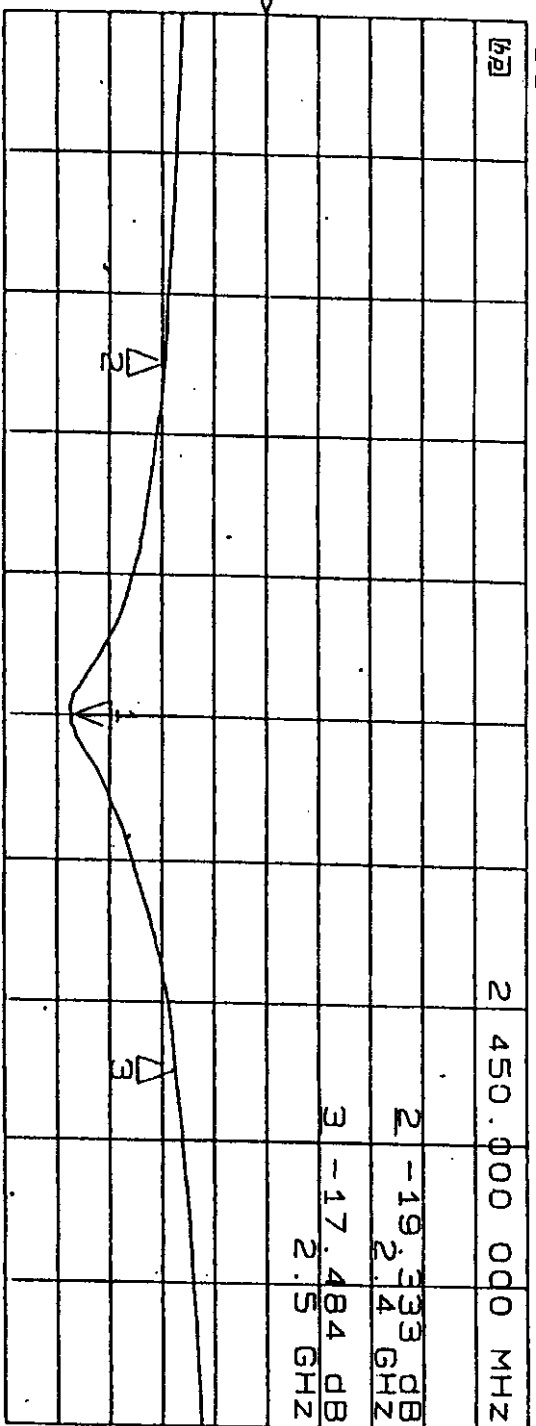
(S=1.5:1)

編號	品名	材質	處理
1	套管	TPE	灰
2	固定柱	Cu	—
3	銅管	Cu	—
4	塑膠管	ABS	黑
5	電線		黑
6	包模組立品	ABS	灰
7	接頭(公)	MCX	Ni



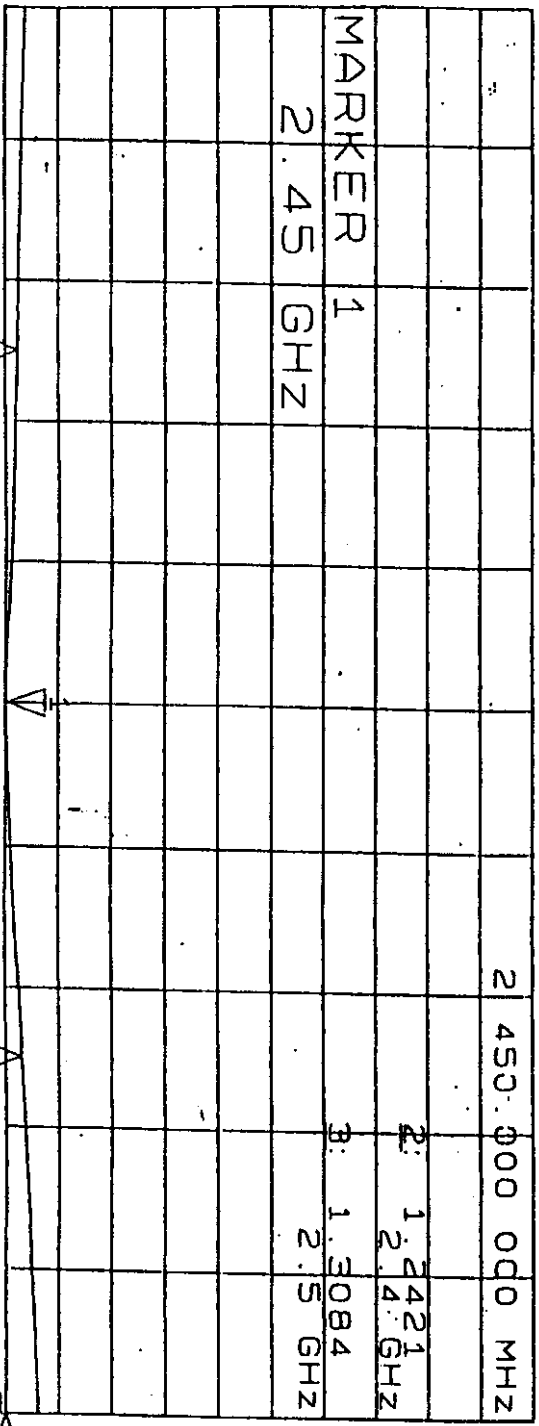
ISSUED	SCALE:
DRAWN: TM-15C-1	
PART NO. TM-15 外觀圖	UNIT: m/m
SHEET OF	SIZE A4

CH1 S11 10g MAG 10 dB/ REF 0 dB 1 -37.075 dB



COR

CH2 S11 SWR 1 / REF 1 1: 1.0284



COR

START 2 350.000 000 MHZ STOP 2 550.000 000 MHZ

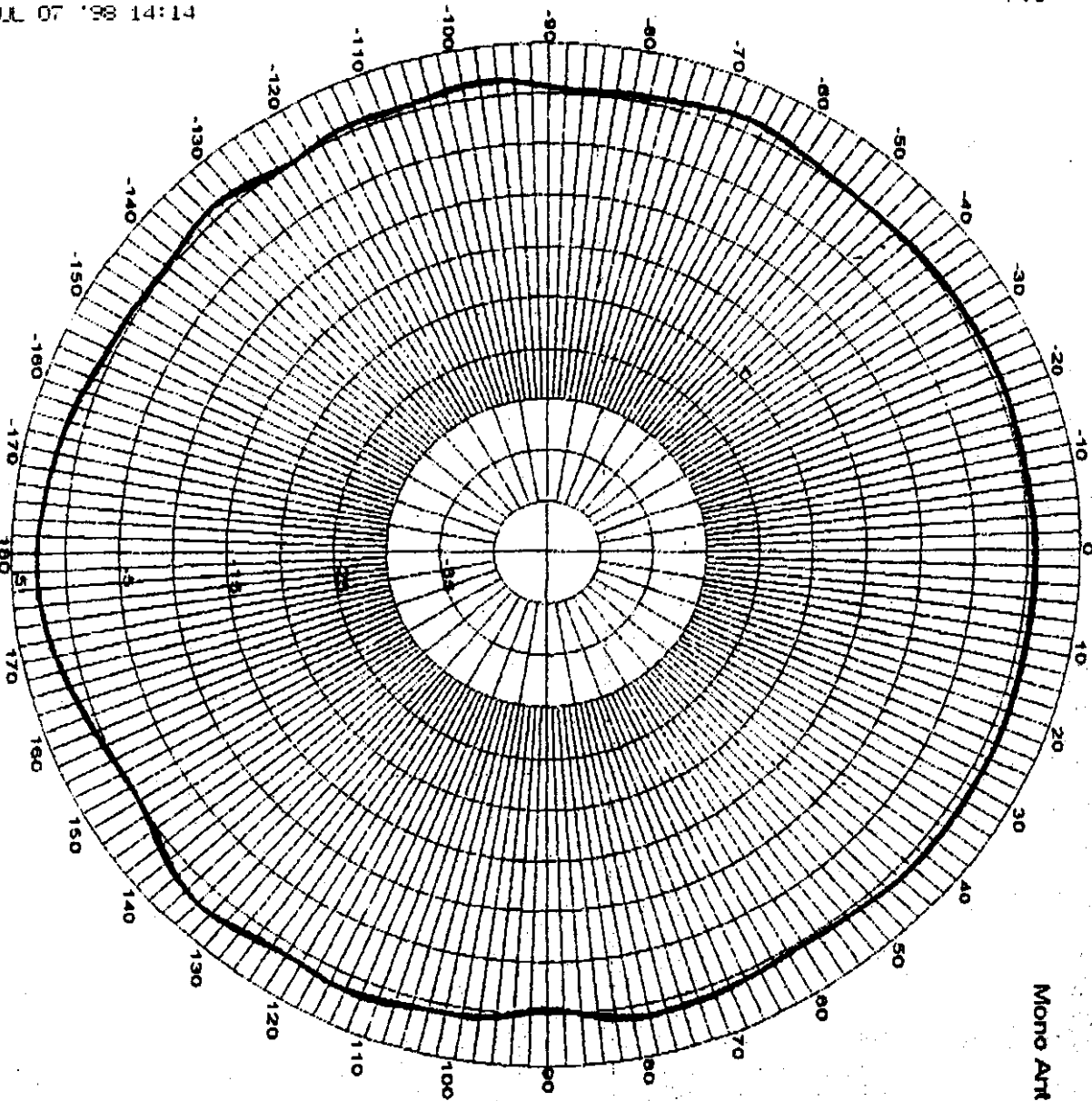
# Magnitude (dB) vs. Az4806 (Deg)

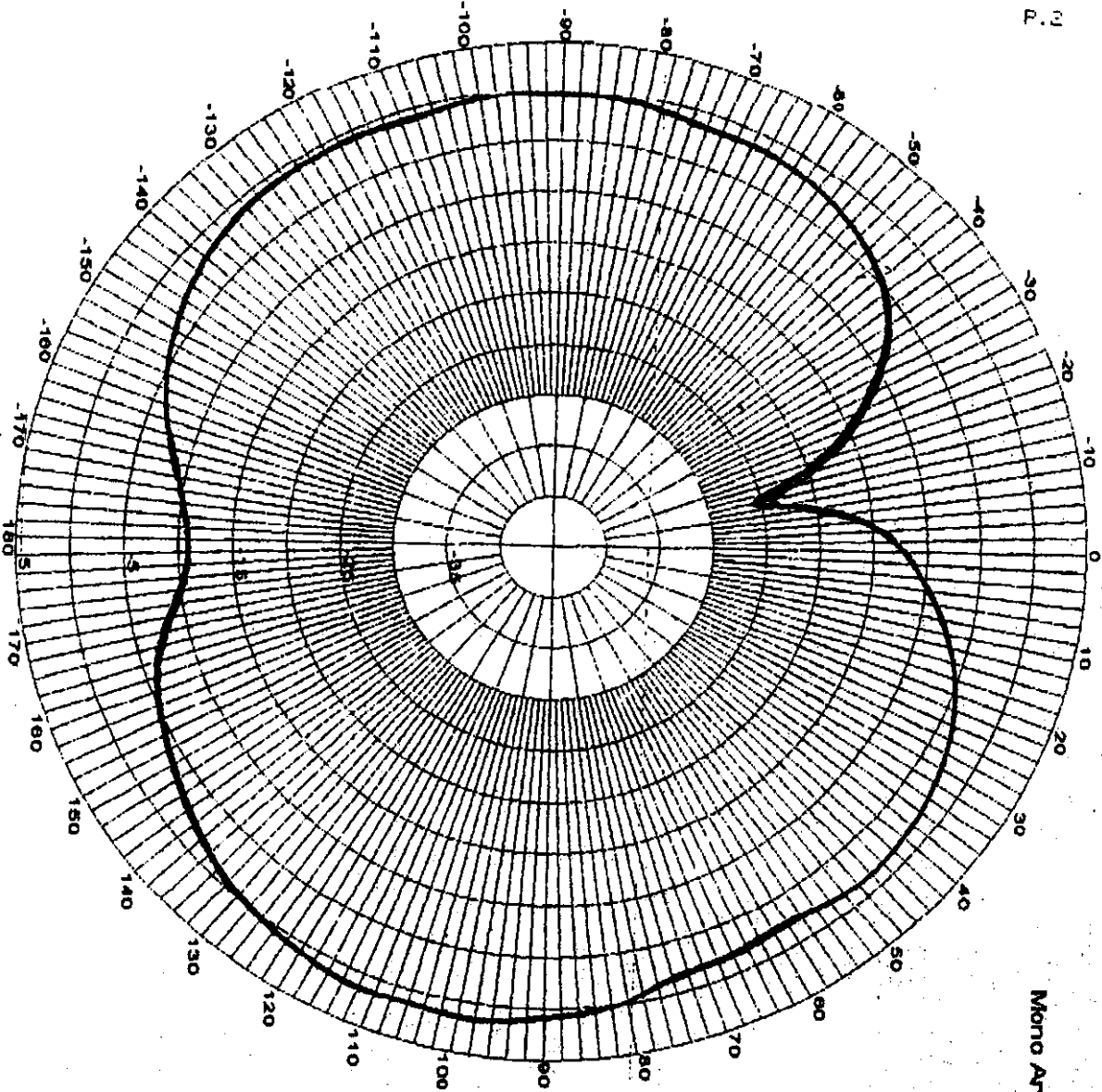
Mono Ant F: 2.41-2.49 GHz H-Plane Test

File: MONO1H.DAT  
 Date: 03-Jul-98  
 Time: 16:15  
 Operator: H C Chen  
 Ser. no.:  
 Channel: Pattern Tx pol: None Rx: None  
 Frequency: See Legend

Calibration status:  
 File: MONO1H.DAT  
 Table: LP1-3  
 Chan.: Pattern  
 Units: dBi

Overlays  
 Freq: 2.440 GHz  
 Freq: 2.450 GHz  
 Freq: 2.460 GHz





Magnitude (dB) vs. Az4806 (Deg)

Mono Ant F: 2.41-2.49 GHz E-Plane Test

File: MONO1E.DAT  
 Date: 03-Jul-98  
 Time: 15:59  
 Operator: H C Chen  
 Ser. no.:  
 Channel: Pattern Tx pol: None Rx: None  
 Frequency: See Legend

Calibration status:  
 File: 'MONO1E.DAT'  
 Table: LP1-3  
 Chan.: Pattern  
 Units: dB

Overlays  
 Freq: 2.440 GHz  
 Freq: 2.450 GHz  
 Freq: 2.460 GHz

