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	:	MSQWL500B
Product name	:	Wireless Router
Model name	:	WL-500b
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	:	Powered by Switching Power Adaptor Manufacturer: DVE Model: DSA-0101F-05 A I/P: AC 100-240V, 50-60Hz, 0.3A, 10VA O/P: +5VDC, 2A, 10W
Power Cable	:	185cm long, non-shielded, incorporates a ferrite core

3. Limits for *Maximum Permissible Exposure (MPE)*

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Filed Strength (H) (A/m)	Power Density (S) (mW/cm2)	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: $S = \frac{PG}{4pR^2} = \frac{46.238 \times 2.249}{4p(20)^2} = 2.069 \times 10^{-2}\, mW/cm^2$

Estimated safe separation: $R = \sqrt{\frac{PG}{4p}} = \sqrt{\frac{46.238 \times 2.249}{4p}} = 2.877 cm$

Remarks: "The safe estimated separation that the user must maintain from the antenna is at least 2.877 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 = Log $^{-1}$ (***dBi*** antenna gain / 10)

G = Log $^{-1}$ (3.52 / 10) = 2.249

NInput Output Enterprise Corp.	PRODUCT SPECIFICATION	DOC. No: WL-TL-17 DATE: 25-MAR-02 REV. : C

PRODUCT NAME

2.4G ANTENNA WITH RP SMA

PART NUMBER

☐ W201-108-D2

Signed By Customers

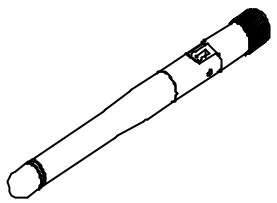
Approved By:

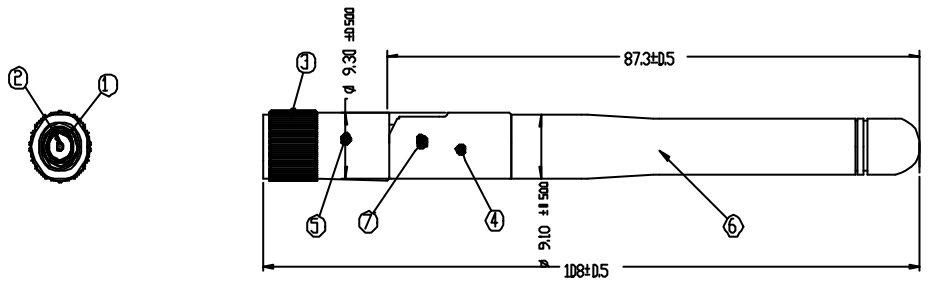
供應商: 垠 旺 精 密 股 份 有 限 公 司

TEL:02-2917-7528;FAX:02-2912-1659

台北縣新店市寶興路 37 號 3 樓

NInput Output Enterprise Corp.	**PRODUCT SPECIFICATION** 2.4 G ANTENNA WITH RP-SMA PLUG	DOC. No: WL-TL-17 DATE: 25-MAR-02 REV. : C





ITEM	DESCRIPTION	MATERIALS	FINISHED
7	銷子	Brass	鍍鎳
6	帽套	TPR	Black
5	底座	ABS	Black
4	天線座	ABS	Black
3	RP SMA 扭殼	Brass	鍍黑鉻
2	Contacter 端子	Be.Copper	鍍金30u"
1	RP SMA 主體	Brass	鍍金4u"

ELECTRICAL PERFORMANCE :
1.Impedance : 50 ohms
2.Frequency Range : 2.4--2.5 GHz
3.VSWR : 2.0 maximum
4.Gain:1.5dbi

REV.	DESCRIPTION	ECN	DRAWN	DATE
A				
1	Sample		Yang	07/30/2002

REVISIONS

TITLE: RP SMA 2.4--2.5GHz Antenna			
DESIGNED: Yang	DRAWN: Yang	SIZE: 1F	SCALE: 1.5/1
DWG NO.: W201-108-D2			
CHECKED:	APPROVAL:	DATE:	REV.: 1

INPUT OUTPUT

P/NO.: W201-108-D2

NInput Output Enterprise Corp.	**PRODUCT SPECIFICATION** RP-SMA R/A JACK PCB RECEPTACLE	DOC. No: WL-TL-17 DATE: 25-MAR-02 REV. : C

HILTRON

360 NETWORK ANALYZER

MODEL: W201_108_D2 DATE: 07/30/2002 Page 1
DEVICE ID: OPERATOR:

SWEEP DATA

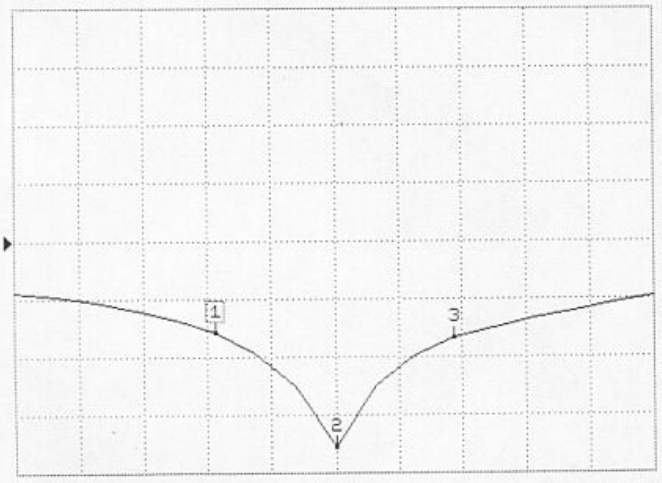
START:	2.3080 GHz	GATE START:	-	ERROR CORR:	REFL ONLY
STOP:	2.5960 GHz	GATE STOP:	-	AVERAGING:	1 PTS
STEP:	0.0180 GHz	GATE:	-	IF BNDWDTH:	REDUCED
		WINDOW:	-		

----------CH1----------

PARAMETER: S11
NORMALIZATION: OFF
REFERENCE PLANE: 0.0000 mm
SMOOTHING: 0.0 PERCENT
DELAY APERTURE: -

S11 FORWARD REFLECTION

LOG MAG. ▶REF=0.000dB 10.000dB/DIV



2.3080 GHz 2.5960

CH 1 - S11
REF. PLANE
0.0000 mm

▶MARKER 1
2.3980 GHz
-15.709 dB

MARKER TO MAX
MARKER TO MIN

2 2.4520 GHz
↓ -35.396 dB

3 2.5060 GHz
↓ -16.577 dB

W201-108-D2 2.4G ANTENNA

SPECIFICATION

1. Electrical Properties

1-1 Frequency Range ……2.4~2.5GHz

1-2 Impedance ……50 Ohms nominal

1-3 V.S.W.R ……2.0 (Max.)

1-4 Return Loss …… …-10.0 dB(Max.)

1-5 Max. Gain ……3.52dBi

1-6 Polarization …… Vertical

1-7 Admitted Power ……1 W

1-8 Electrical Wave ……1/4 â Dipole

2. Mechanical Properties

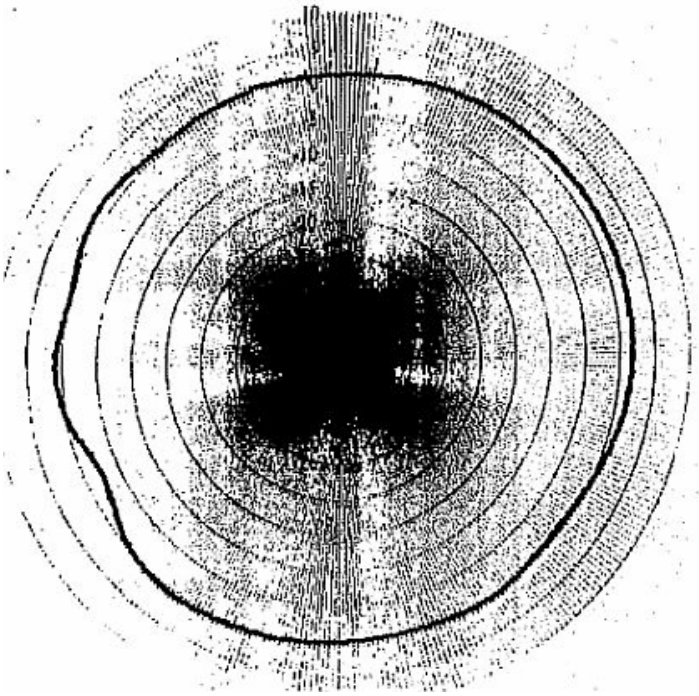
2-1 Connector ……Reverse SMA Plug

Cable ……RG178

2-3 Antenna Body ……T.P.R.

2-4 Operating Temperature Range.. ……-20℃ ~ +50℃

2-5 Storage Temperature Range …… -20℃ ~ +50℃



IO ANTENNA PATTEM

ANTENNA TEST NO. -

TEST DATE: [illegible]

TEST FREQUECY:2450GHz

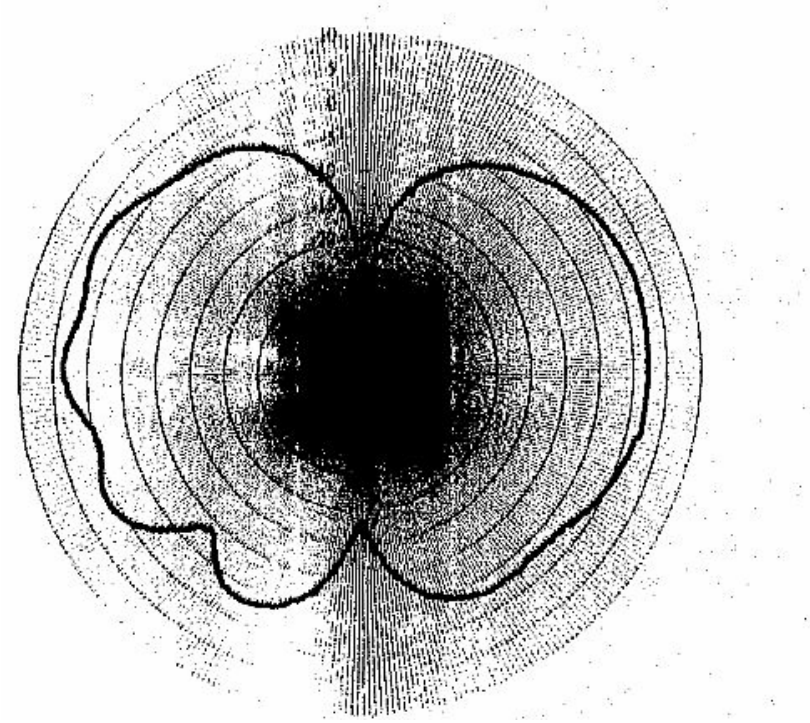
TEST POLARIZATION:VERTICAL
(H-PLANE)

TEST ANTENNA:HORN ANTENNA

TEST CHAMBER:RF CHAMBER

TEST PERSONNEL: Yang

MAX GAIN:	1.93	dBi
MIN GAIN:	-2.54	dBi
AVE GAIN:	0.64	dBi



IO ANTENNA PATTEM

ANTENNA TEST NO.

TEST DATE:2002/06/20

TEST FREQUECY:2450MHz

TEST POLARIZATION:HORIZTAL
(E-PLANE)

TEST ANTENNA:HORN ANTENNA

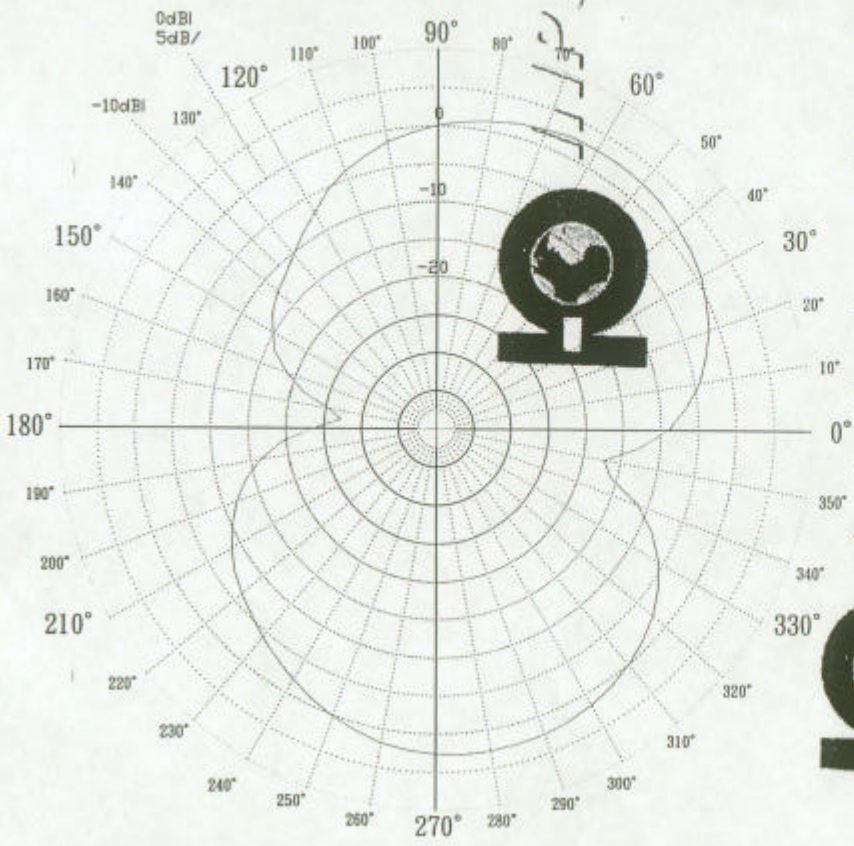
TEST CHAMBER:RF CHAMBER

TEST PERSONNEL: Yang

MAX GAIN:	3.52	dBi
MIN GAIN:	-35.06	dBi
AVE GAIN:	-3.38	dBi

1 (1652x2338x16M jpeg)

Magnitude (dB)/(Deg)

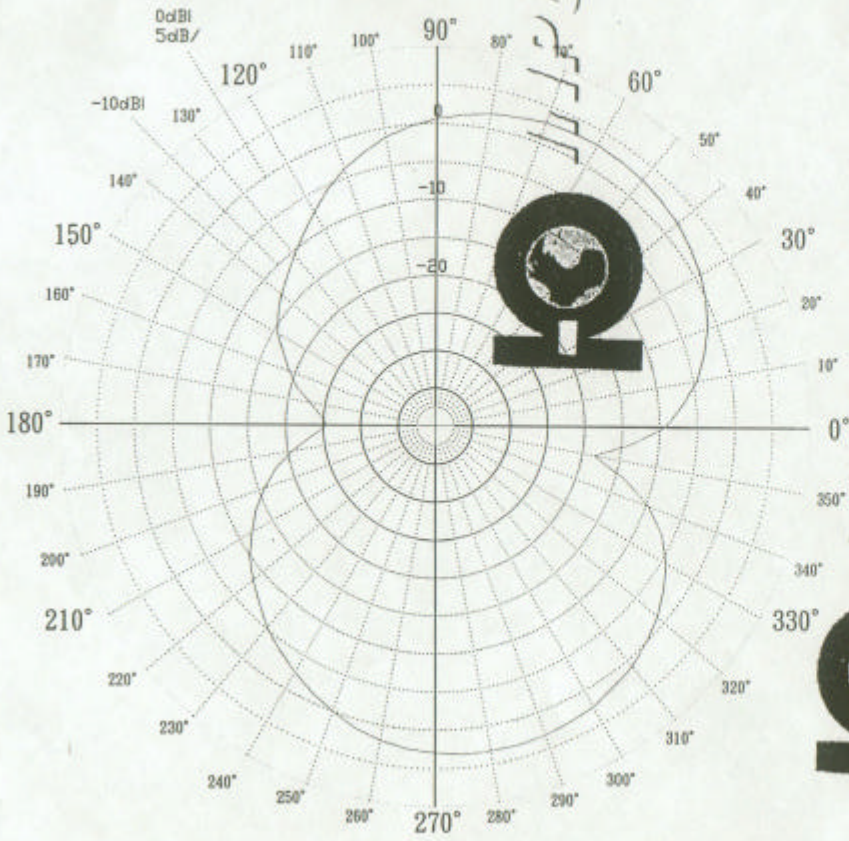


ENTERPRISE CORPORATION

*MA
File:W200-2E.ANT Freq: 2450 MHz
Date:03-28-2000 Time:11:05:47
Operator:Whaiki Ma
E Plane Pattern
GAIN= 2.83 dBi(275 °)

2 (1652x2338x16M jpeg)

Magnitude (dB)/(Deg)

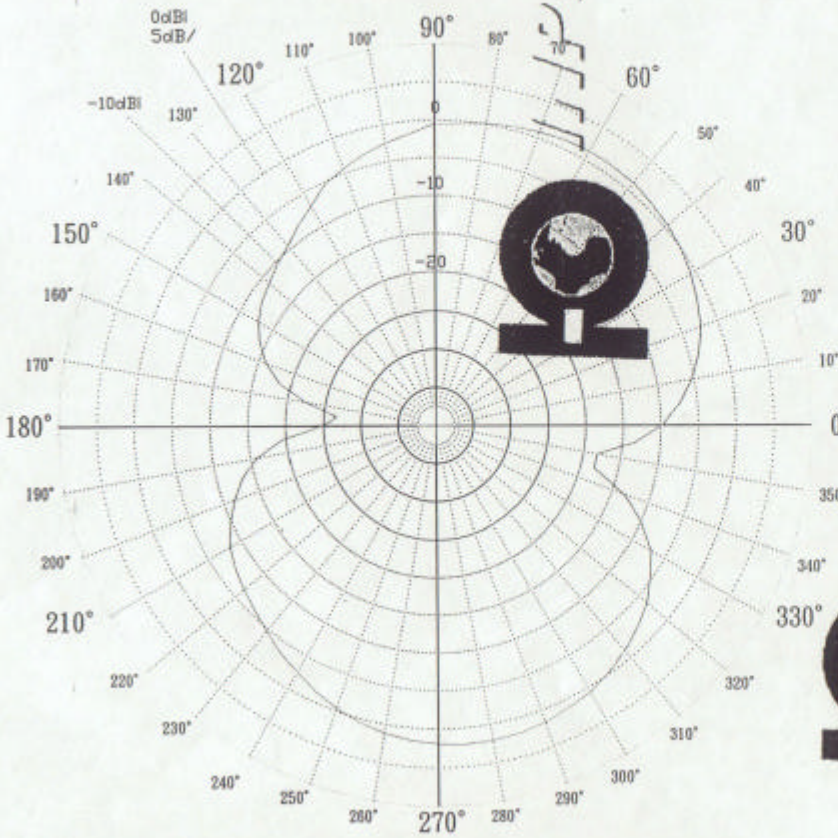


ENTERPRISE CORPORATIO

*MA
File:W200-3E.ANT Freq: 2500 MHz
Date: Time:11:58:31
Operator:Whaiki Ma
E Plane Pattern
GAIN= 3.34 dBi(275 °)

3 (1652x2338x16M jpeg)

Magnitude (dB)/(Deg)

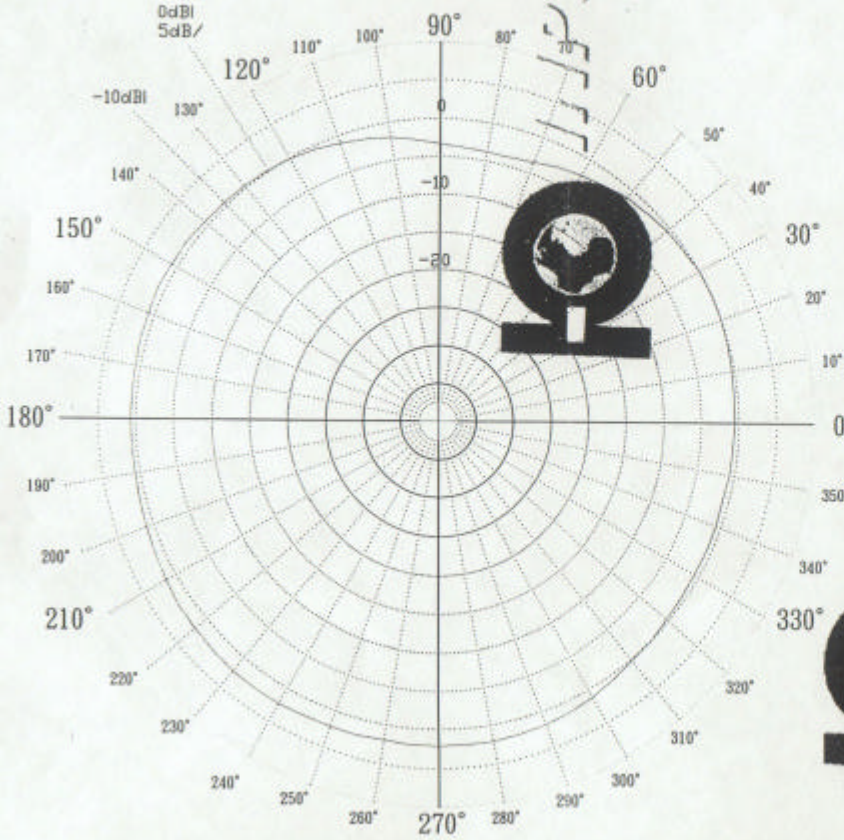


ENTERPRISE CORPORATION

* MA
File:W200-1E.ANT Freq: 2400 MHz
Date: Time:10:21:18
Operator:Whaiki Ma
E Plane Pattern
GAIN= 2.17 dBi(275 °)

4 (1652x2338x16M jpeg)

Magnitude (dB)/(Deg)



ENTERPRISE CORPORATIO

* MA

File:W200-3H.ANT Freq: 2500 MHz

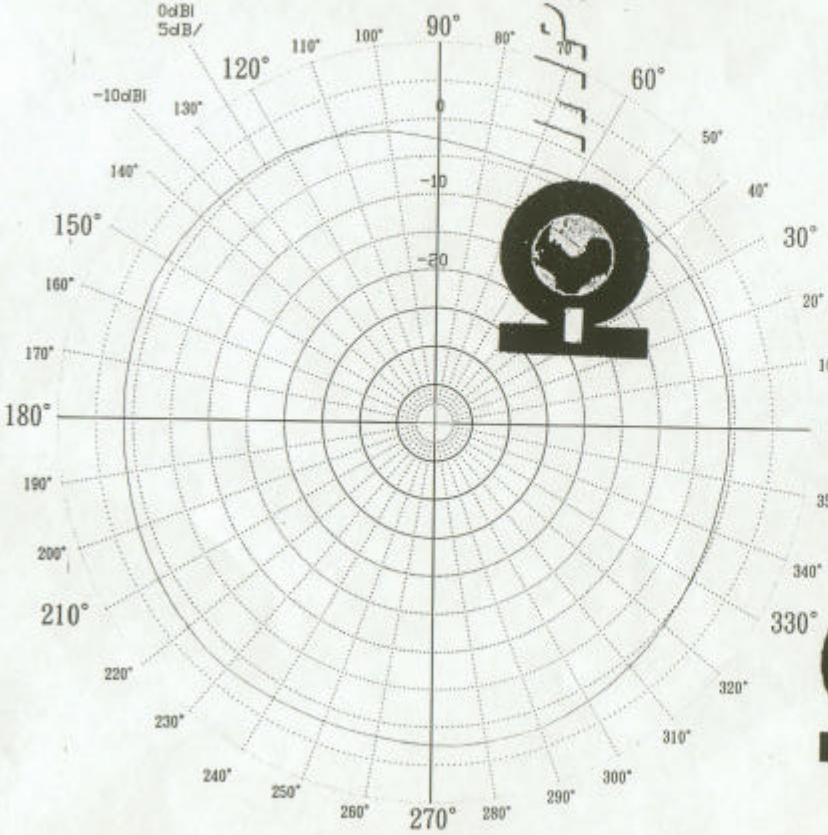
Date: Time:14:42:39

Operator:Whaiki Ma

H Plane Pattern

GAIN= 1.92 dBi(230 °)

Magnitude (dB)/(Deg)



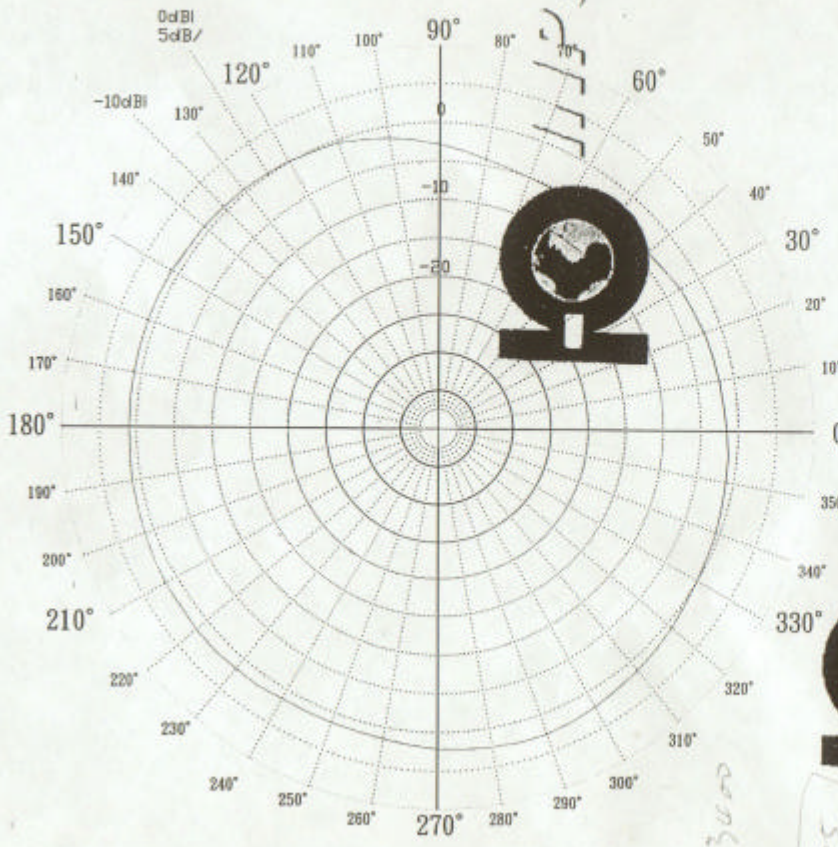
ENTERPRISE CORPORATION

* MA
File:W200-2H.ANT Freq: 2450 MHz
Date: Time:14:10:55
Operator:Whaiki Ma
H Plane Pattern
GAIN= 1.93 dBi(225 °)

5 (1652x2338x16M jpeg)

6 (1652x2338x16M jpeg)

Magnitude (dB)/(Deg)



ENTERPRISE CORPORATION

*MA
File:W200-1H.ANT Freq: 2400 MHz
Date: Time:13:12:11
Operator:Whaiki Ma
H Plane Pattern
GAIN= 1.98 dBi(285 °)