

I want to see farther



*XFocus Team*

*[www.xfocus.org](http://www.xfocus.org)*

*[www.xfocus.net](http://www.xfocus.net)*

 **X'con 2005**

# Something you needed

## ✦ Devices

- ✦ Wifi Card
- ✦ Bluetooth Doggle

## ✦ Antennas

- ✦ Beam Antenna
- ✦ Omni Antenna

## ✦ Pigtail



# Chose your wifi card

## ✦ Chipset & Compatibility

- ✦ Support monitor/master mode ?
- ✦ Support packet injection?
- ✦ Support linux ?
  - ✦ Ndiswrapper is great, but it s no help for us.
- ✦ Support Wireless Extensions ?





# Chose your wifi card

```
[root@TOMB tk]# iwlist wifi0 scanning
wifi0    Scan completed :
          Cell 01 - Address: 00:11:22:33:44:55
            ESSID:"research"
            Mode:Master
            Frequency:2.462 GHz (Channel 11)
            Quality:0/70  Signal level:-53 dBm  Noise level:-86 dBm

[root@TOMB tk]# iwlist eth1 scanning
eth1     Interface doesn't support scanning : Operation not supported
```



# Chose your wifi card

- ✦ Transmit Power
- ✦ Receiver Sensitivity
- ✦ Connector included ?
  - ✦ Easy to modify



# Chose your wifi card

## ✦ 802.11b

### ✦ Prism Chipset

✦ Senao SL-2511CD PLUS EXT2

✦ ASUS WL100

### ✦ Realtek RT8180 Chipset

## ✦ 802.11g

### ✦ Atheros Chipset

### ✦ Ralink RT2500 Chipset





# Chose your wifi card

- ✦ Lucent Family
  - ✦ Agere(ORiNICO) & Avaya
  - ✦ OEMs
- ✦ Cisco Air-LMC350 Series
  - ✦ Air-LMC352
- ✦ Broadcom & TI Chipset



# Trap !

✦ Pay attention to Hardware Rev !

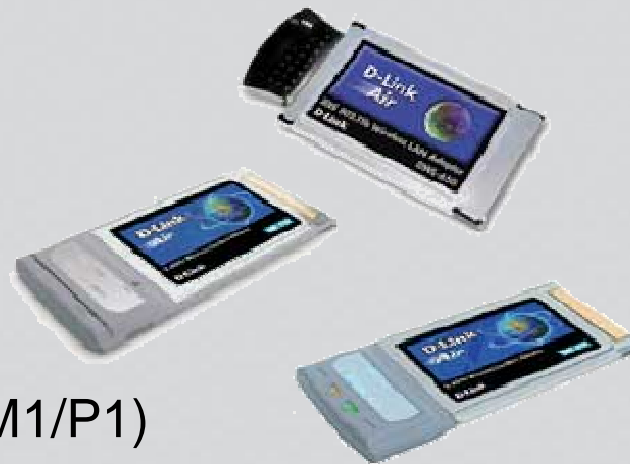
✦ eg: D-Link DWL-650

✦ DWL-650(A1-J3)

✦ DWL-650(K1)

✦ DWL-650(L1/L2/M1/P1)

✦ LinkSys WPC11 ! SMC 2632W !!





# Chose your bluetooth

✦ Easy to modify

✦ Transmit Power

✦ Class I	100mW(+20dBm)	100m
✦ Class II	2.5mW(+4dBm)	10m
✦ Class III	1mW(+0dBm)	1m

✦ Receiver Sensitivity

Power	Model	Manufacturer	Sensitivity
Class I	MS-6967	MSI	-90 dBm
Class I	BT3030	TECOM	-76 dBm
Class I	F8T001	Belkin	-80 dBm
Class I	BT-700	Acer	-70 dBm
Class I	USBBT100	LinkSys	-80 dBm
Class I	USBBTC1A	Billionton	-80 dBm



# Chose your bluetooth

## ✦ Compatibility

✦ CSR

✦ BroadCom

```
[tk@TOMB ~]$ sudo hciconfig hci0 features
```

```
hci0: Type: USB
```

```
BD Address: 00:11:12:33:44:55 ACL MTU: 128:8 SCO MTU: 64:8
```

```
Features: 0xff 0xff 0x05 0x00 0x00 0x00 0x00 0x00
```

```
<3-slot packets> <5-slot packets> <encryption> <slot offset>
```

```
<timing accuracy> <role switch> <hold mode> <sniff mode>
```

```
<park state> <RSSI> <channel quality> <SCO link> <HV2 packets>
```

```
<HV3 packets> <u-law log> <A-law log> <CVSD> <power control>
```



# Chose your antenna

## Enough gain

Gain (Sender)	Gain (Receiver)				
	18dBi	14dBi	8dBi	6dBi	5dBi
18dBi	3.4 miles	2.5 miles	1 mile	1100 yards	656 yards
14dBi	1.5 miles	1.5 miles	1 mile	874yards	656 yards
8dBi	1100 yards	1100 yards	1100 yards	874 yards	656 yards
6dBi	874 yards	874 yards	874 yards	874 yards	656 yards
5dBi	656 yards	656 yards	656 yards	656 yards	656 yards





# Chose your antenna

- ✦ Easy to take  
Easy to find
- ✦ Proper size  
Proper price



Arecibo, 305m



# Chose your antenna

- ❖ Hertz antenna
  - ❖ Half-Wave Dipole
- ❖ Marconi antenna
  - ❖ Quarter-Wave Monopole





# Chose your antenna

- ✦ Yagi Antenna
  - ✦ 10 dBi ~ 16 dBi
- ✦ "Flat Panel Antenna #
  - ✦ 5 dBi ~ 24 dBi
- ✦ Homemade Antenna
  - ✦ Good pastime
  - ✦ No bad gain





# Yagi Antenna

- ✦ Hidetsugu Yagi & Shintaro Uda

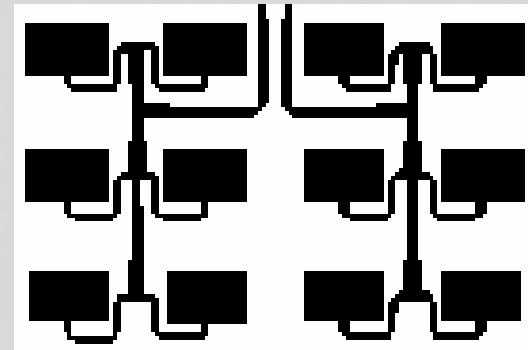
- ✦ Cheap price  
Acceptable size

- ✦ Medium gain

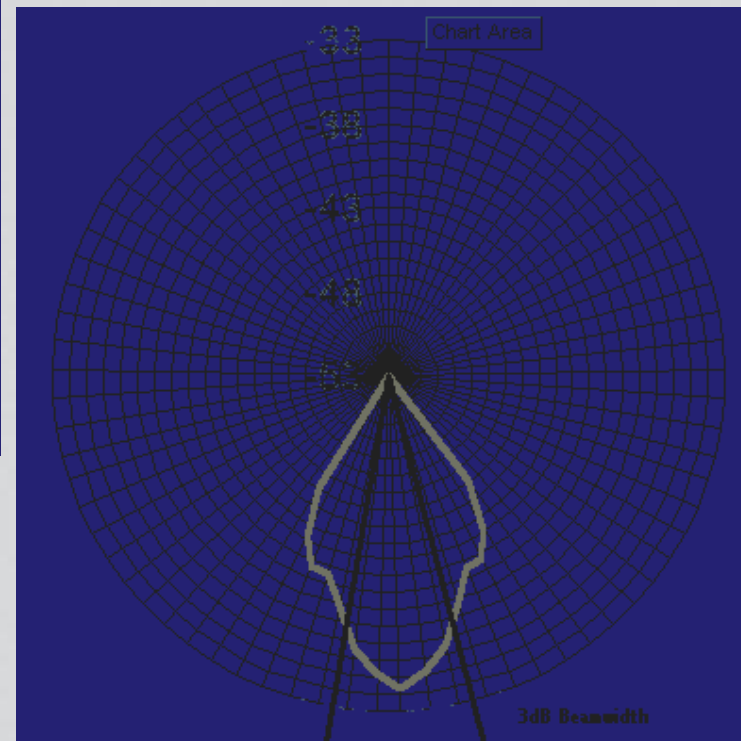
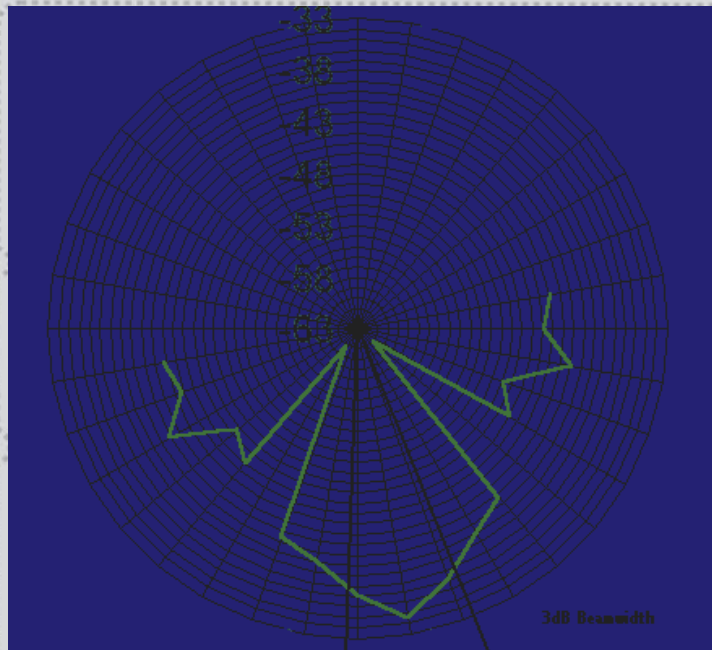


# "Flat Panel Antenna"

- ✦ Could more than 20dBi
- ✦ Portable
- ✦ Maybe expensive



# Homemade Antenna

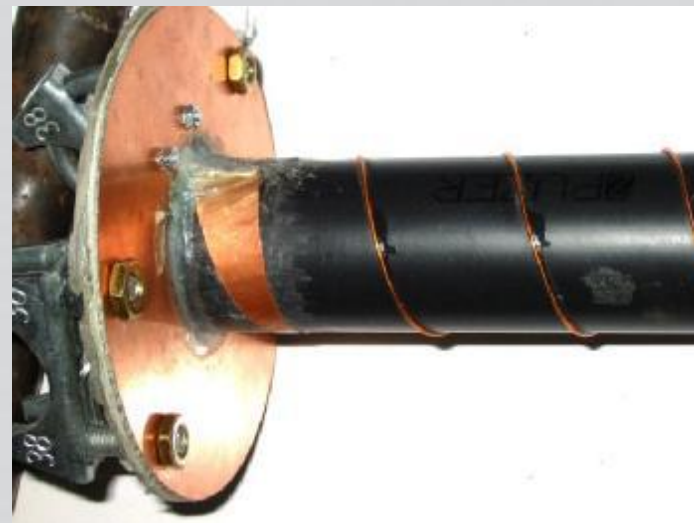
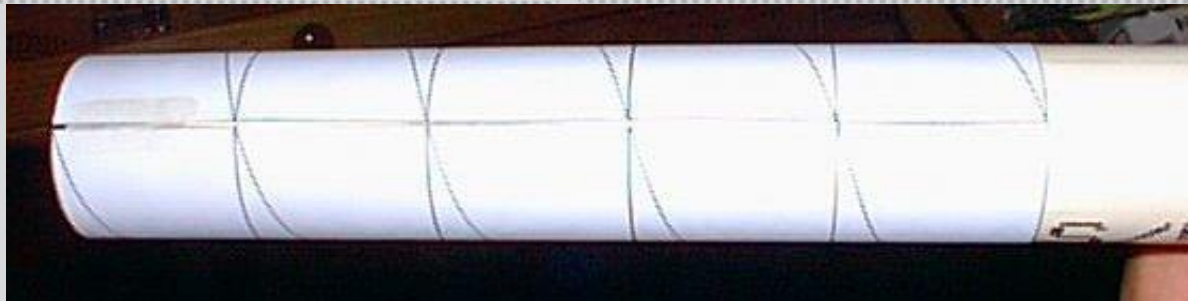




# Homemade Antenna

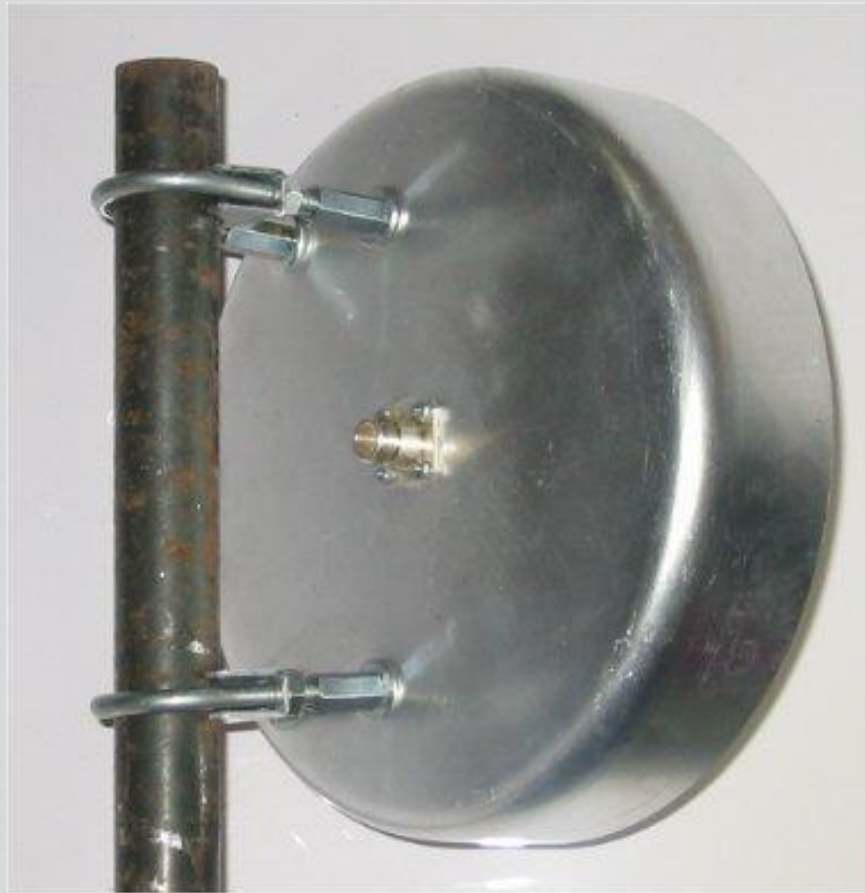


# Homemade Antenna





# Homemade Antenna





# Homemade Antenna



# Homemade Antenna





# Homemade Antenna





# Homemade Antenna



# Homemade Antenna



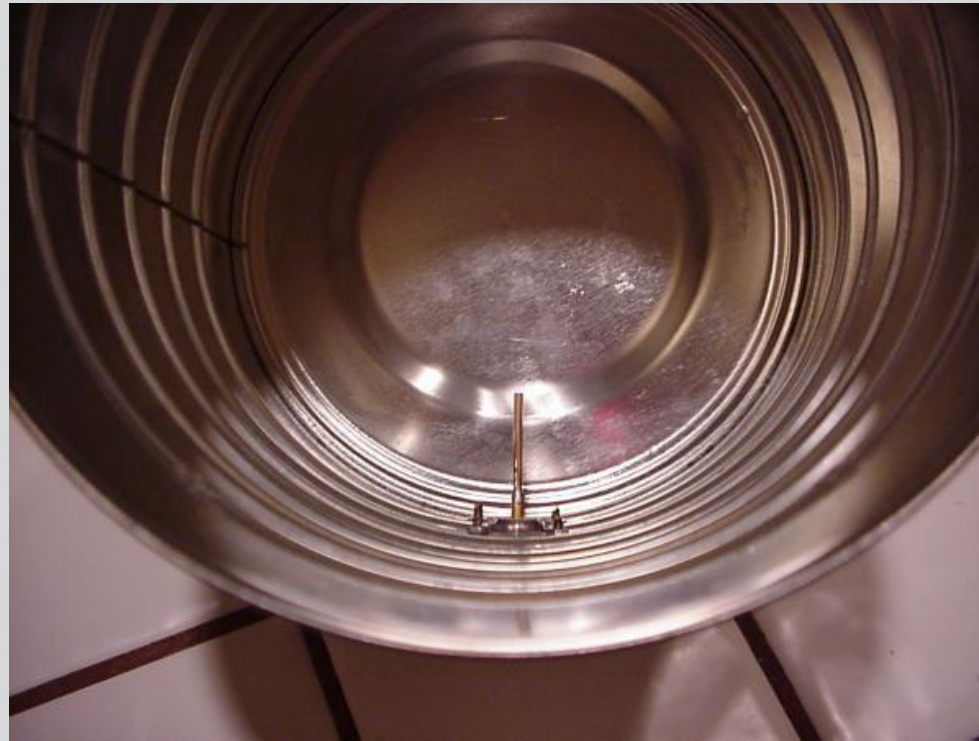


# Homemade Antenna





# Homemade Antenna



# Homemade Antenna

Minim - certainly cost effective - NZ\$8 ! A 300mm diam (12") Chinese cooking vat scoop that closely approximates a shallow parabola. It's mesh holes (~5mm) are well under the min. .1 wavelength at 2.4GHz (1 wave= 125mm) & it gives little wind resistance & rust.

Diam = 300 mm, with 60mm depth  
(D) (c) to centre

$$f = \frac{D^2}{16c}$$

$$= \frac{300 \times 300}{16 \times 60}$$

$$= \frac{1500}{16}$$

So focus ~94mm out  
which is beyond most can & may give weak signal pickup from sources not being looked at

f/D ratio desirably  
0.25-0.55 for such  
2.4GHz parabolas

Here = 94/300 = 0.31

This setup could look very professional spray painted black & maybe mounted on a simple photographic tripod

Suitable support for the USB  
WiFi adaptor (here a ~US\$40  
"ZyDAS ED 1201" sold in NZ by  
DSE) will of course be needed,  
maybe fed thru the mesh from the back ?  
USB dongle then can be removed until needed

Parabolic reflective performance of similar  
"appropriate technology" dishes can be  
quickly verified by Al foil curved around the  
mesh to direct the sun or a bright light to a focus

Experiences show mesh  
equiv. to "0.8" of a dish of  
similar size. Hence this  
equates to a solid dish  
0.8 x 300 ~240mm  
& is likely to have  
gain ~15dB  
(A total wanted >12dB)

With one at each  
end of a link, the  
30dB system  
gain could give  
>10km LOS

Other simple  
DIY reflectors  
abound - with  
"BBQ grill" style  
likely better  
gain. Doodling  
dish diam gives  
6dB gain &  
doubles range

POOR MANS  
WIFI ?

Cheap & "lossless" long  
run (Cat) USB cables mean  
reception "sweet spots"  
more easily exploited than  
normal costly microwave cable  
& connectors can justify. Over!

Sean Swan - MIU@W - 2nd May 2004  
=> s.t.swan@massey.ac.nz



XFOCUS TEAM

BEIJING.CHINA

2002-2005

X'con



# Homemade Antenna





# Homemade Antenna

Not your usual stir fry ! Here's a cheap wok from NZ's celebrated Warehouse, that's ~parabolic !

s.l.wahne@massey.ac.nz 25th May 04

With diam. 330mm & depth ~90mm it has a verified focal point ~75mm out. Being inside the rim this should gather signals well, & indeed performance looked superior (~17dB ?) beside the Scoop's ~15dB.

A hose mender again provides both USB cable protection & (when internally trimmed to suit) good support & standoff for the USB WiFi adaptor.

A vitamin pill holder neatly fits over the USB adaptor if weather proofing needed



Handles will drill out if desired

The chassis nibbler eases drilling out of the 25mm (1") mount hole. Recommended !



# Homemade Antenna



XFOCUS TEAM

BEIJING.CHINA

2002-2005

