

## PBT builds a NextG yagi and a dish

### The Dish

Here you go. For those that missed the earlier posts I know this is not strictly speaking a Yagi. My original idea however was to point the whole Perite Yagi back at the dish. Both he and Wahroonga pointed out it only need to be the dipole to function.

I am still working on my Yagi as well.

I dragged the dish up from the tool paddock last night. Have reversed the mount and positioned the dish about where I imagine it will need to be to point at the horizon? Too steep?

And have mocked up where the dipole will be.



Will I need to get it much closer than this?

Wahroonga you might know this of the top of your head is this (our) dish 23.5 or 25 degrees offset?

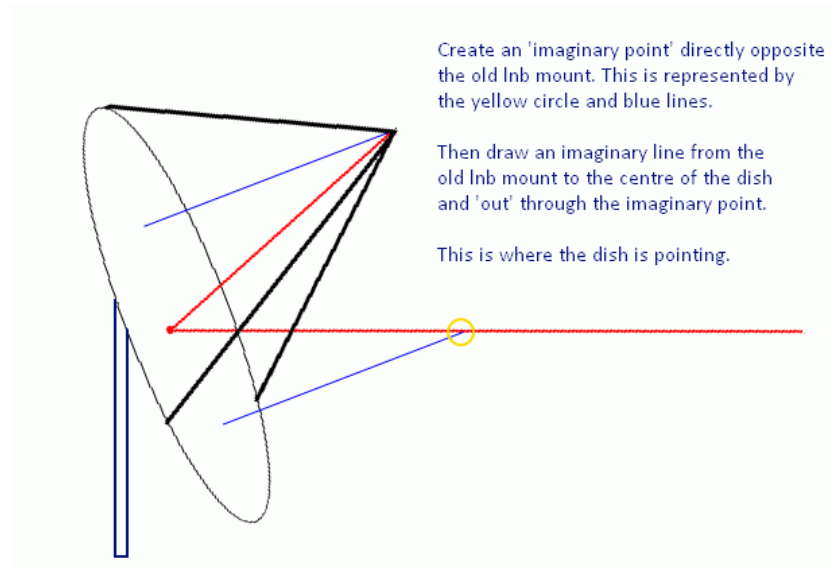
There is conflicting advice on the net. With the mount reversed at 25 deg for example 20deg on the inclinometer would be pointing at the horizon. Right way up it only depresses to ten deg plus the offset.

### WF's dish answer

I did not manage to get hold of the dish specs despite considerable effort many years ago.

It's pretty easy work out where to point it with a spot of 'parabola magic'.

Hopefully a [picture](#) is worth a thousand words. :)



In any case, just point it near enough and use the phone and quality/signal to tweak all the dish 'variables'.

### The Yagi begins

Well as promised some shots of my part finished Yagi.







Heuristics inspired antenna refinement – Yagi or HairY

The idea here was not to spend a zack on the actual antenna if possible but all sourced from the tool paddock.

I have spent \$7.20 on 10mm aluminum tube. But I could have used 12mm which I had.

I've opted for 25mm electrical conduit as it allows me to use the 25mm Plasson compression fitting as a polarization collar (courtesy Wahroonga for the idea). Just twist the tube and lock it.

It's all so articulated behind that to allow for the rare event I need to chase a reflected signal rather than straight to the tower.

The old two inch PVC saddle allows me to run the whole affair up or down the 4m ground mount antenna pole I have welded to an old rim. Just have to plumb it and secure with sand bags. Easy to move.

## Boom and Element Alignment Procedure

Just have to fit the elements to the antenna pole now.

I spent a fair bit of time figuring a process to get the elements themselves better than mm accurate (as Perite advised, I think ) without spending too much time on it.

I have them within .1 – .2 mm of spec. (I believe), so I'm still pondering how to get the PVC antenna pole drilled with enough precision to get the best alignment between the elements.

Am leaning towards a pre drilled piece of light (*steel*) box (*section*); where vertical precision on the drill press is a given. Run the PVC through it and drill away. You could make dozens they'd all be exactly the same.

Just have to find the perfect (*steel square tube*) fit, or worst case shim the best fit I can find.

I think I did warn everyone I was a plodder.

Trouble is now I am in a state of flux about which one to work on (*the yagi*) or the dish. I hate not finishing a job.

Might have to be parallel projects.

### [The yagi jig and FME crimper](#)

Evening all.

Here is my antenna pole with the elements installed, pre the cutting for the install of the driven element. The drilling jig takes a little longer but I'm pretty sure you could build longer 13 element designs using this method with good accuracy. Close enough to factory made as long as the pole mount was cradled.







Shot of the jig with timber shims in place and the ferule set for the FME connector if you don't have or want to buy a crimping tool made using a 3/16 chainsaw file. Nice tight crimp.



[The nut is the anvil](#) the crappy looking set is the die.

Lay the FME shank and ferule in the anvil (nut) and close it up with the set tool.

Seeing is doing I'll try to figure how to 'YouTube it'.





Now for soldering the coax to the driven elements the part I am very bad at. Also how do you solder that impossibly small FME pin to the central conductor on the coaxial cable?

I can barely see it. How is it bloody possible?

### Cutting the elements

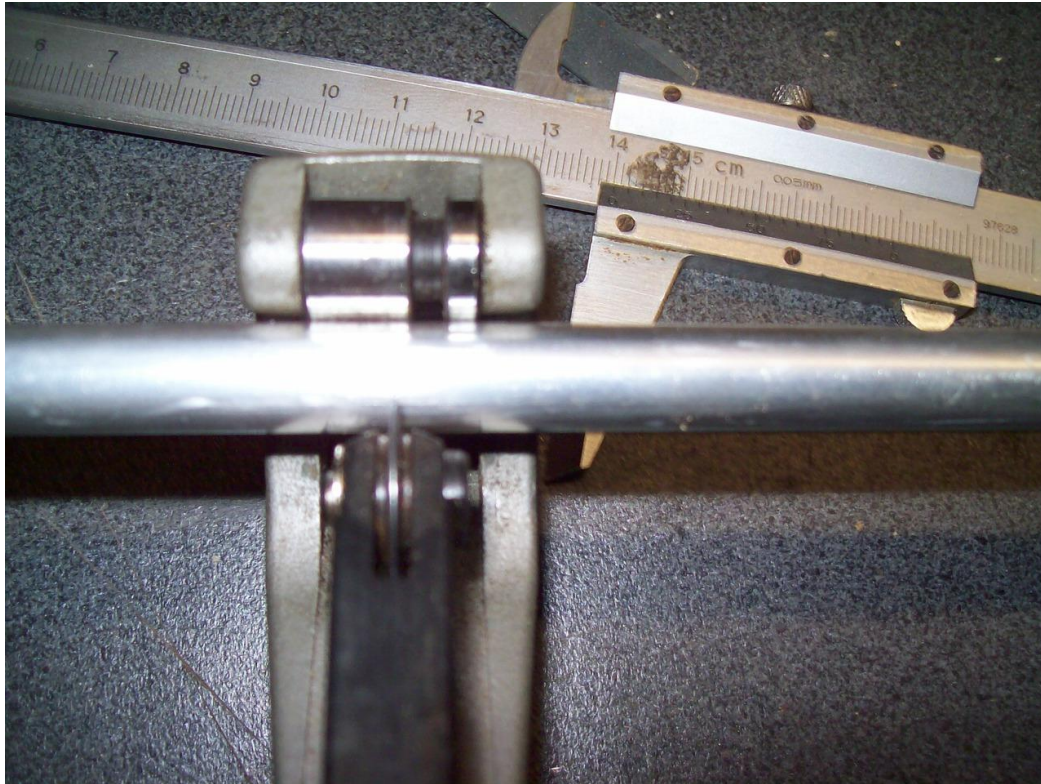
While I'm on a roll and you blokes in the east are clearly resting :) I thought I'd post how I milled my Yagi elements to spec. There are bound to be other ways but it might help someone.

I used a simple budget vernier gauge. Set to the spec marked the tube with an exacto knife.



Cut a 'pooftenth' over length with a pipe cutter and dressed to length with a No2 flat bastard until it gauged up the right length with the vernier as set.





Should get you to within 0.1 mm or better if you're careful; and all low tech.

### Joining the dipole elements

Thanks lads I followed both your builds (*SV and FG*).

No chance of a trip to Bunnings till next week, but followed your lead and managed to find some fiberglass rod from an old tent frame.

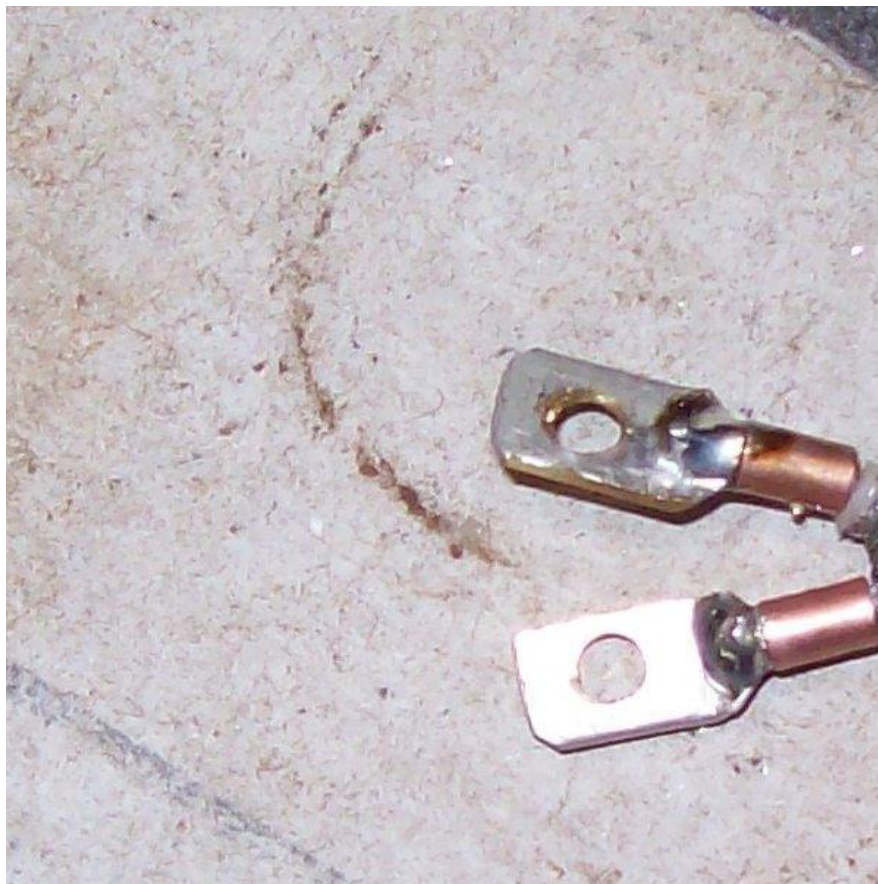
Friction fit right through and its non conductive and drillable.

With some sealer it should make the dipole water tight. Happy days ☺

### Gave myself the morning off. Yagi project finished.

#### **Part 1**

The two halves of the driven element are joined with a lightly sanded down fibre glass tent rod. It keeps them dead straight. It was a pretty snug fit so they will stay where they are put. I had no suitable size ring terminals, but I did have these old spade fittings. So I drilled them out to take the 3/12 stainless fixings I found.





Soldered them to the cable. It was too easy. Must have been 'channeling' someone else; usually I stuff it up.

Then I filed them down a little and placed them as close to the end of the elements as I dared. No easy task for a fumble fingers.

Here is the one in the dish mount a bit fuzzy I know.



Was not sure how close to set the two halves of this split element? They were dressed down by 0.2mm or so after cutting, so I went for twice that and gauged it with a feeler to conserve the overall 154mm length of the dipole as per Perites design spec.

Perite if you're reading this, I notice some Yagi design tools allow for a split dipole separation distance to be set. Is this design sensitive to this?

[Perites answer](#): No, the only thing that counts is the total width of the dipole, as per the design it should be 154mm from outside tip to outside tip (that's what determines the frequency it resonates on).

I squared it all away with some heat shrink and amalgam tape. They sure were close. Shots did not come out, sadly, but it all tested ok with the multi meter.

When I cut my antenna pole to take the split driven element, I picked a saw with a kerf about the same as the 25mm PVC joiner separator, as an attempt to keep the relationship between the dipole and the reflector and directors as close to spec as possible. Mitre box kept it square. I did go to measuring it with a vernier. 'Twas fair to middling close as.



So here it is wired to the cable from my Bigpond supplied omni antenna. I'm posting this via the antenna as shown.



No way of measuring the antennas performance other than empirically, as yet.

By way of a comparison, old RX level with Omni:

```
> sierra show --gstatus
!GSTATUS:
Current Time: 3568 Temperature: 56
Bootup Time: 1 Mode: ONLINE
System mode: WCDMA PS state: Attached
WCDMA band: WCDMA800 GSM band: Unknown
WCDMA channel: 4387 GSM channel: 65535
GMM (PS) state:REGISTERED NORMAL SERVICE
MM (CS) state: IDLE NORMAL SERVICE

WCDMA L1 State:L1M_FACH RRC State: CELL_FACH
RX level (dBm): -75 dBm
```

And now with the antenna up and pointed at Wilyung:

```
> sierra show --gstatus
!GSTATUS:
Current Time: 385 Temperature: 52
Bootup Time: 1 Mode: ONLINE
System mode: WCDMA PS state: Attached
WCDMA band: WCDMA800 GSM band: Unknown
WCDMA channel: 4412 GSM channel: 65535
```

GMM (PS) state:REGISTERED NORMAL SERVICE  
MM (CS) state: IDLE NORMAL SERVICE

WCDMA L1 State:L1M\_PCH\_SLEEP RRC State: DISCONNECTED  
RX level (dBm): **-58** dBm

Hot dog, **17dB gain**. Well I call that progress!

Plus I can be pretty sure I am connected to Wilyung Hill site, as I have never spotted the cell ID I'm on before. I have a choice of three tower sites and plan to redirect to all in turn to see which gives the best performance.

So. Success. This thing cost me the price of the tube (\$7.60) and when it is finally attached, the cable \$36.00 I stumped up for and botched plus 3 x FME connector (\$12.00).

I'm grateful for finding this little community of like minded souls. I have borrowed and adapted ideas from every post and project.

Next step for the Yagi. The plan is to use it as a test rig for experimenting with:

- Polarization
- ground plane effects off the roof
- looking for any reflected signal

just to see if I can tweak it a bit.

\*note may need to buy some test instruments

Well it's been over an hour a rock solid 58dB signal level of 21 which I have never seen .....and it has not handed off to another cell. Part one of the mission looks good.

## [Part 2](#)

I had planned to maybe stack a double-ganger of the Perite Yagi next to this one which is why I made the jig and cut two sets of everything. Mr cockup came to town on one of the poles so I'll keep thinking about it.

Perite is your design stackable and if so what distance for vertical polarization?

[Perites answer](#) *No problems stacking Yagis, normally you'd place two vertically polarised Yagis side by side, joined by a horizontal pipe, with the supporting mast attached to the centre of that pipe.*

*MMANA can duplicate the antenna and calculate stacking distance and gain but I've not done it (yet) for the NextG antenna.*

Can any one point me to a good tutorial for a stacked array feed harness?

[Perites answer](#) *I can certainly look something up for you, I'd need to calculate it for 850MHz.*

*The reason I've not worked on it for myself is because I think it's not worth the effort – too much trouble and expense for next to no return! I've used stacked Yagis of my own for amateur work on 144MHz and 435MHz. But at 850MHz the complications and potential losses via extra connectors and the phasing harness are likely to cancel out any benefit from the extra tiny 3dB.*

*Maybe my time would be better spent modelling some extra directors and getting another couple of dB that way?*

I still have the dish in the shed just waiting on coax and connectors and 76mm ground mount. If it really could deliver 17 dB gain it would be the total answer for my setup maybe.

Also have a commercial Yagi antenna (claims 22dBm but we will see) coming to do some comparison work. As well as 10m of the high end CLF400 cable. Will really see if its any good at all (the antenna).

Things to work on now:

1. Use the Perite Yagi to find best site for antenna farm.
2. Get dish antenna solution up for testing if it tanks go straight to 5 then 6.
3. Establish if Perite Yagi is suited to stacking.
4. Mount commercial Yagi antenna and see how it performs.
5. Trial a simple stacked Yagi.
6. Dick about designing and building my own Bigpond Yagi.
7. Adapt best solution to low loss cable with pig tails.

### [After a bit of Tuning](#)

[Wahroonga Farm writes...](#) *"You're probably best experimenting with location, location, location and you'll surely find 3db."*

Squeezed a bit more just tooling around over lunch.

System mode: WCDMA  
WCDMA band: WCDMA850  
WCDMA channel: 4436  
GMM (PS) state: REGISTERED



MM (CS) state: IDLE  
Signal Strength: **-55** (dBm)

Signal level(RSSI) **22**  
Quality(Ec/Io) **-10.0** dB

It is pretty directional.

Achieved this gain just fiddling with height and direction.

### What about the speed?

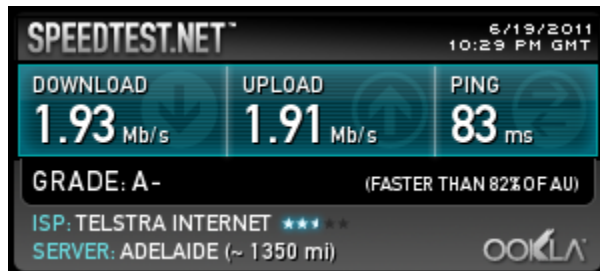
Not expecting to see many gains in speed as my theory is our towers are all very heavily congested. Getting as good a possible signal as I can is part of the test process.

Mirror: Telstra Bigpond  
Data: 3 MB  
Test Time: 18.26 secs

- Your line speed is **1.34 Mbps** (1341 kbps).
- Your download speed is 168 KB/s (0.16 MB/s).

Typical for a Sunday afternoon.

Speed test results for Willyung Hill and the new Perite Yagi.



Monday morning about as out of peak as possible. Best I've seen.

Oddly the first couple were a tad quicker and asynchronous, uploads being much faster.

On with the day, cold, wet and windy.

Been working some night shift.

Here's the way I kept the relative boom position of my dish with a 1" laser clamped in the yoke.



The replacement pvc boom in place with dipole cabled and ready to go.

Just waiting on the FME connectors and time to fix the mount.

Big job with these large heavy Gilat dishes.

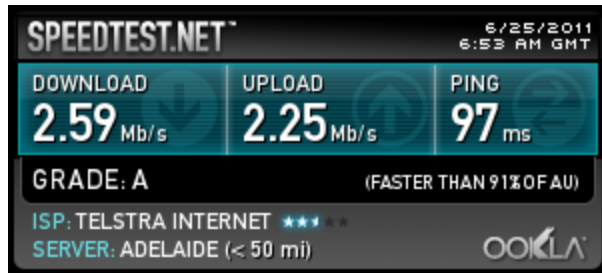
Wind load a big factor and a resource we have plenty of here along the hill.





[Well the dish is up and running.](#) (25 June)





That's pretty fast for a Saturday afternoon.

I'm pointed at Willyung and there is still a small tree trunk in the way of the dish. Have not played much with angles or dipole position but it does not seem all that picky really. Ec/Lo values very much lower in range 7 – 8 if the Sierra wireless chip is to be believed.

Some chainsaw work tomorrow and pointing at some other sites.

I'm wondering if the large aluminum block that was the LNB mount could be having any effect?

First mod might be to go for a non conductive pole mount drilled through the dish. Or would the chance of cutting through the grid lose me more?

Well that's a win :)