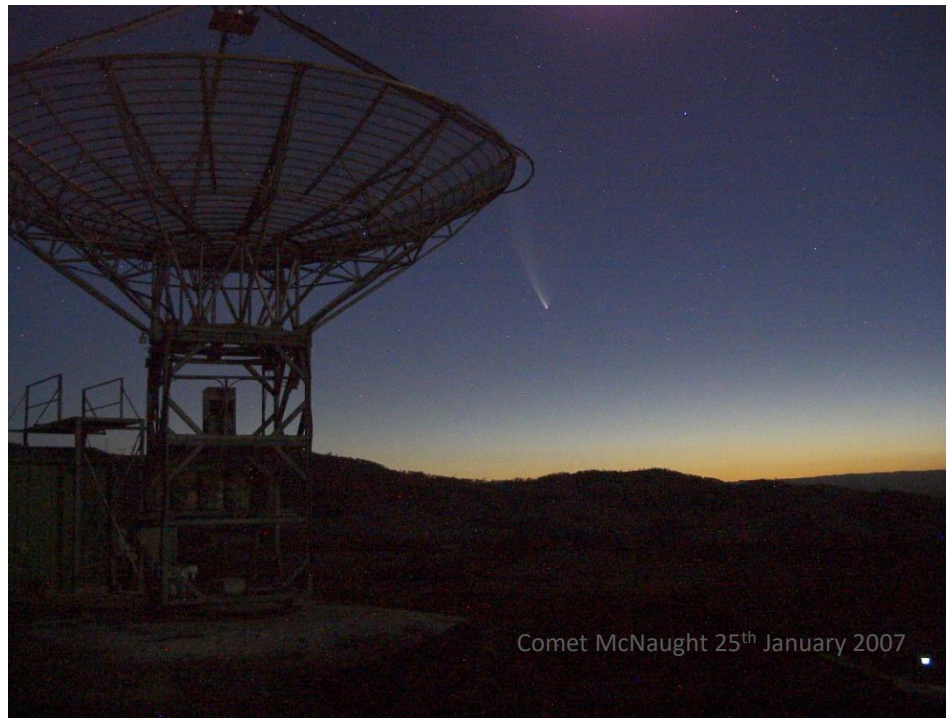


Inaccuracies that will lead to a deficiency in your system's performance

or

Why the other guy seems to do better than yourself!

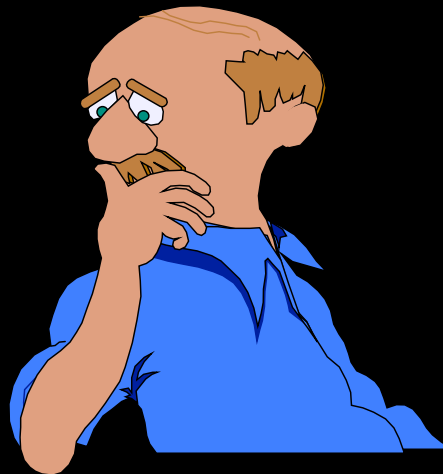


Comet McNaught 25th January 2007

Doug McArthur VK3UM
15th International Conference Cambridge 2012

**How often have you heard it said
“conditions were terrible?”**

**Do not blame “conditions”, there could be
“stuff you may have missed”!**



Given the time constraints I will try to address some of the common problems that can lead to “deficiencies in your performance”.

talking about EME of course

For some delegates here today it may appear a tad basic, but for others I hope you will gain knowledge from one who has made the mistakes himself.

Let’s treat this as a refresher !

Please refer to my Conference paper for more detailed information.

I will address

Dish antennae

choosing the right feed
aligning the feed

Yagi antennae

feed losses

Low Noise Amplifiers

avoiding losses

Operating techniques

the good bad and the ugly



Dishes

Polar or azimuth or elevation mount ?

Choosing the best f/D and mesh size.

Low noise or high gain?

Matching your f/D with a feed type.

Dual mode horn or Kumar type ?

ease of construction ?

A simple way of choosing you feed to match your dish, predetermine its performance without before entering the workshop or spending a quid. (read dollar or euro)

The VK3UM EME Calculator

W2IMU dual-mode

Spill = 6 % Effic = 70 % focal length = 3.679 m
Spill = 13 °K Dish = 39.03 dBi Echo = 24.3 dB Sun Y = 21.9 dB

Parabolic Reflector Feed Type W2IMU dual-mode Linear Pol. Circular Pol.
Focal Length 3.68 m
Diameter Size f / D Efficiency Beam Width Gain Dish Gain
8.56 m Metric 0.43 59% 1.89° 8013 36.88 dBd 39.03 dBi
37.0 Lambda

W2IMU dual-mode

Spill = 15 % Effic = 77 % focal length = 4.962 m
Spill = 33 °K Dish = 39.44 dBi Echo = 24.1 dB Sun Y = 21.0 dB

Parabolic Reflector Feed Type W2IMU dual-mode Linear Pol. Circular Pol.
Focal Length 4.96 m
Diameter Size f / D Efficiency Beam Width Gain Dish Gain
8.56 m Metric 0.58 65% 1.89° 8797 37.29 dBd 39.44 dBi
37.0 Lambda

You will see that by increasing the f/D the efficiency has increased to 77% and the gain has also increased.

However the spillover has increased to 15% (33°K) and both Sun and echoes have decreased.

The former f/D (0.43) with the W2IMU dual mode horn is a better choice as it reduces spill over and is thus a 'quieter dish'.

Feed Types .. Prime Focus .. Linear .. Offset and Cassegrain for a Home Station

- W2IMU dual-mode
- VE4MA (Super .71L)
- VE4MA (Original -0.15L rim)
- VE4MA (Small flush rim)
- Septum (with choke ring)
- Septum (without choke ring)
- Chaparral (with 3 rings)
- Optimum dual-mode, flare 2L x 3.10L long
- Optimum dual-mode, flare 3L x 4.85L long
- Optimum dual-mode, flare 4L x 6.55L long
- Optimum dual-mode, flare 5L x 8.25L long
- Optimum dual-mode, flare 6L x 10.0L long
-
- 432 SM6FHZ BFR Loop

The above are just some of the feed types available in the EME Calculator

VE4MA (Super)

Spill = 6 % Effic = 74 % focal length = 2.567 m
Spill = 13 °K Dish = 39.29 dBi Echo = 24.8 dB Sun Y = 22.1 dB

Parabolic Reflector Feed Type VE4MA (Super) Linear Pol. Circular Pol.

Focal Length 2.57 m
Diameter Size

8.56 m	Metric	f / D	Efficiency	Beam Width	Gain	Dish Gain
		0.30	63%	1.89°	8502	37.14 dBd 39.29 dBi

37.0 Lambda

If you chose a VE4MA (super) feed, then for maximum efficiency and equivalent spill over you would need a f/D of 0.30

Using the VK3UM EME Calculator you can play with all the design values before committing to build .. and you will know the performance of your finished product!

Aligning the feed in the dish

Use the Sun's shadow



Well that's a start but here is more stuff you may have missed !

In my example, although the shadow appears perfectly central in the dish and my Az El indicators are corresponding to the Sun's position, the alignment may not in fact be true.

Now peak your dish on Sun noise.

It may not correspond exactly. Why ?

The feed is not perfectly aligned in the dish, something that is most difficult to see by eye from the shadow it is creating.

Well how do I align it ?

With great difficulty and with considerable patience !



Remove the “end cap” of the feed, attach a laser pointer and shine onto the dish surface. Adjust your support arms so the feed is perfectly upright to the surface. I did mine at dusk when I had some light .. That’s the easy bit!

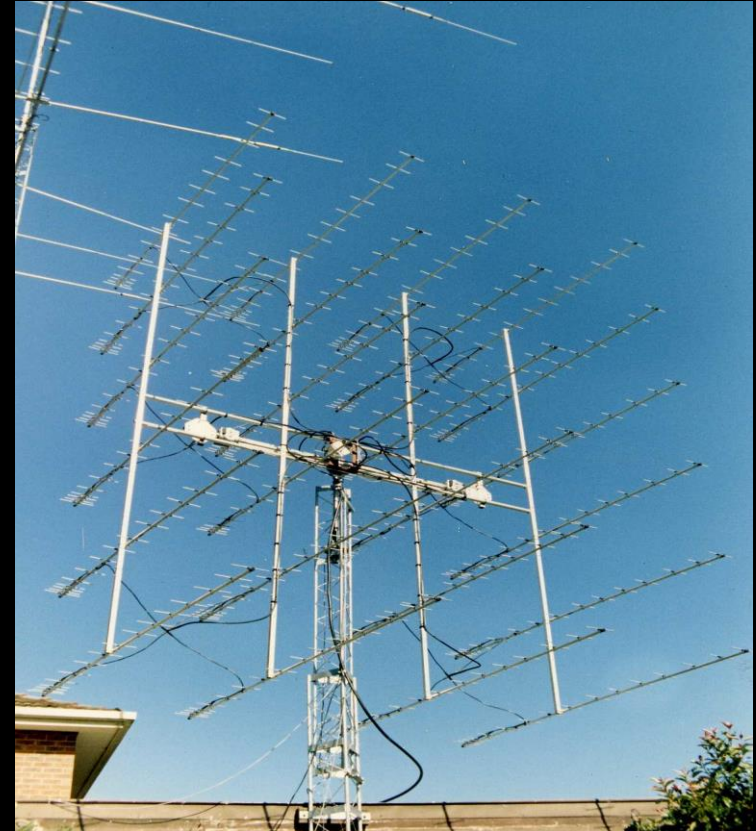
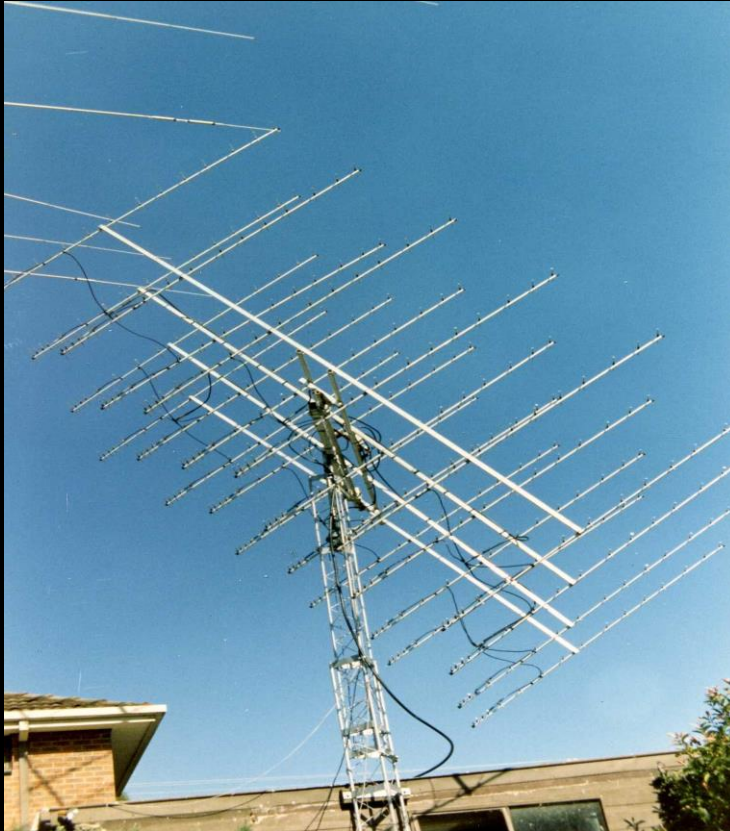
Next adjust with the “feed distance” mechanism for maximum Sun noise. Easy to say but a brute to do!

Finally recheck the alignment with the laser pointer.

It’s frustrating, time consuming and sure to try your patience, but when you get it right it is one of the most beneficial adjustments you will make to improve your system’s performance.

YAGI Antennae

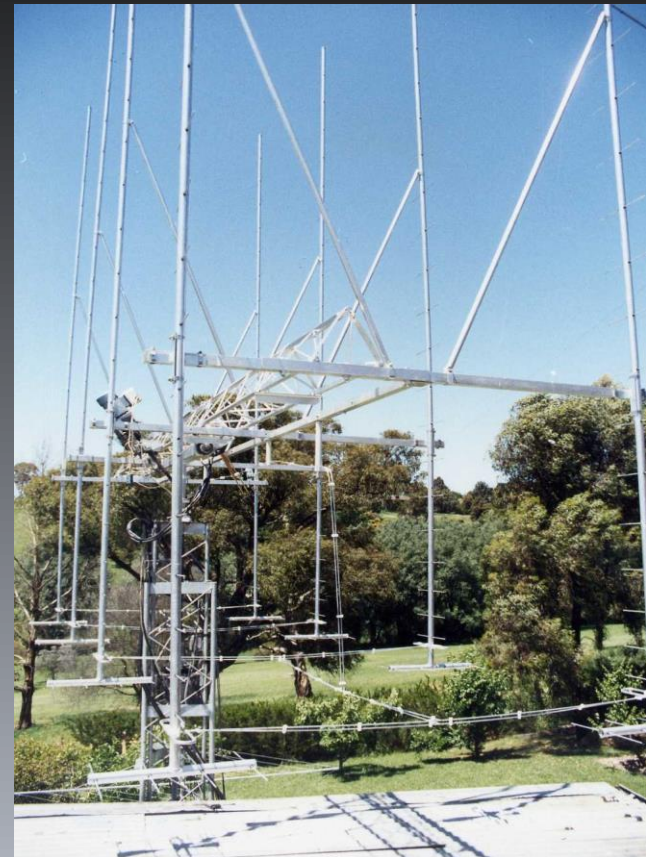
The wrong way



Too much coax, too many baluns, too much loss, a noisy antennae.
Excellent forward gain on transmit .. A perfect "Alligator" antennae.

YAGI Antennae

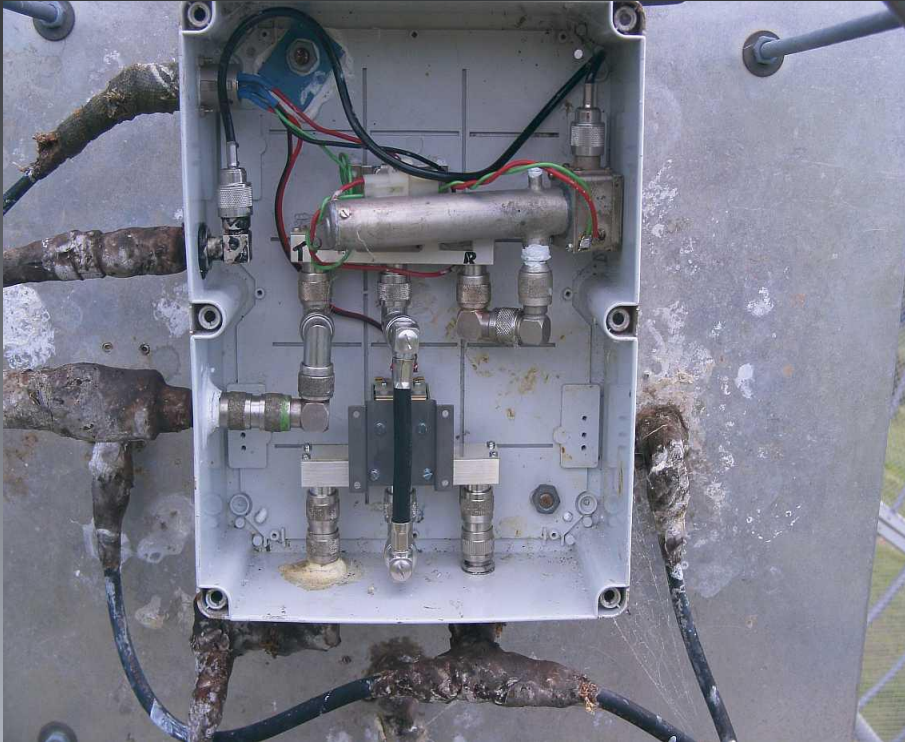
Right way



Low loss feed system with tube transmission lines with single double ended balun. Insulated dipoles and quadruple reflectors.

Low Noise Amplifiers avoiding losses

The wrong way .. Avoid connectors or any cable loss from radiator to LNA



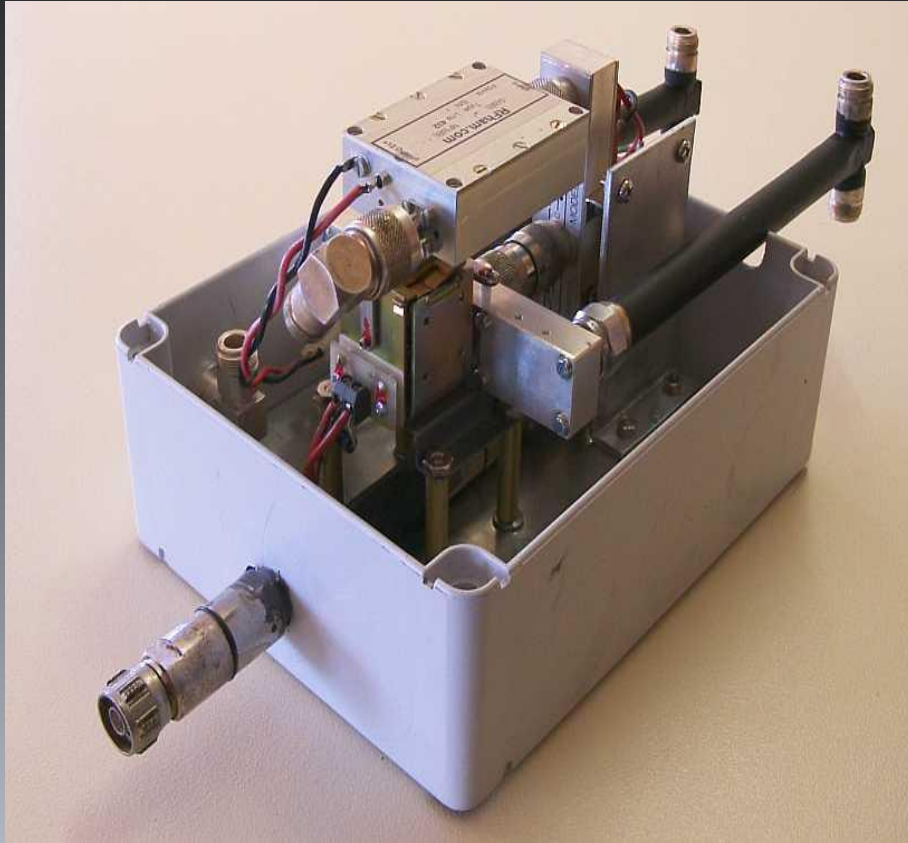
Early 70cm LNA and Tx Rx and Pol c/o



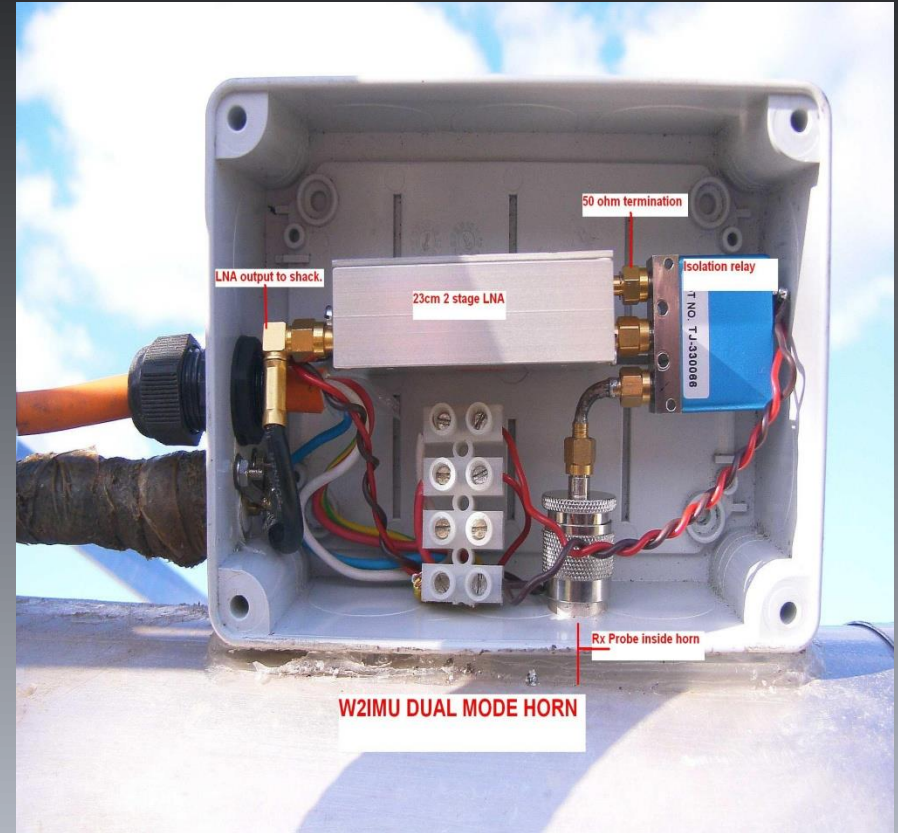
Reclaimed connectors after redesign !

Low Noise Amplifiers avoiding losses

The right way .. Minimum loss between radiator to LNA



No connectors .. Direct connection to relays with preamp to antennae as direct as possible.



The 23cm LNA. Direct connection to the Rx probe via an isolation relay with termination.

Operating techniques

the good bad and the ugly

- **The first key to success is to listen to the other station and follow his lead. Try to match his sending speed and timing. He may be following a timing sequence and sending fast or slow to match Faraday or Libration conditions.**
- **Use the recognised codes**
 - YYY means sending only your Call Sign as he has yours.
 - VVV KKK 333 UUU MMM means repeat each character in your Call Sign three times.
- **Always use an exaggerated space between the start and end of all Call Signs.**
- In a pile up try not to zero beat. Even move off a kHz as most experienced operators will tune looking for a fast QSO with an 'in the clear' station.
- **Do the right thing and don't call the station worked on his frequency. Move to the side giving sufficient elbow room and call there.**
- If you are a 'weak station' listen for such calls first and then if there are none move to the designated weak signal area and call CQ there. You most likely be rewarded by some one that was listening on the previous frequency.

- Beware the ground noise interference situation. Often you may, on your Moon rise, be tempted to call CQ before you lose ground noise which may well be masking an existing QSO. Look for someone calling CQ or is in QSO during that time whilst your maximum sensitivity is masked by ground noise.
- Try not to become an Alligator. A station with a big mouth and small ears. Match your transmitted power with your receiver sensitivity. Going over the top with excessive power will not enhance your reputation and only harm others on the band.
- Switching to SSB during a CW contest in the middle of the active portion of the band will certainly do you no good either. Be thoughtful to others, nothing worse than 'Willie wagers'.
- Don't assume the other station is copying you as well as you are copying him.

And finally

Remember the safety of your family, your neighbours and yourself. Know your own Electromagnetic Radiation (EMR) safe working distance and always keep within its bounds. No EME (or terrestrial QSO for that matter) is worth endangering person's lives.



ANY QUESTIONS PLEASE ?