The Revival of 9cm EME

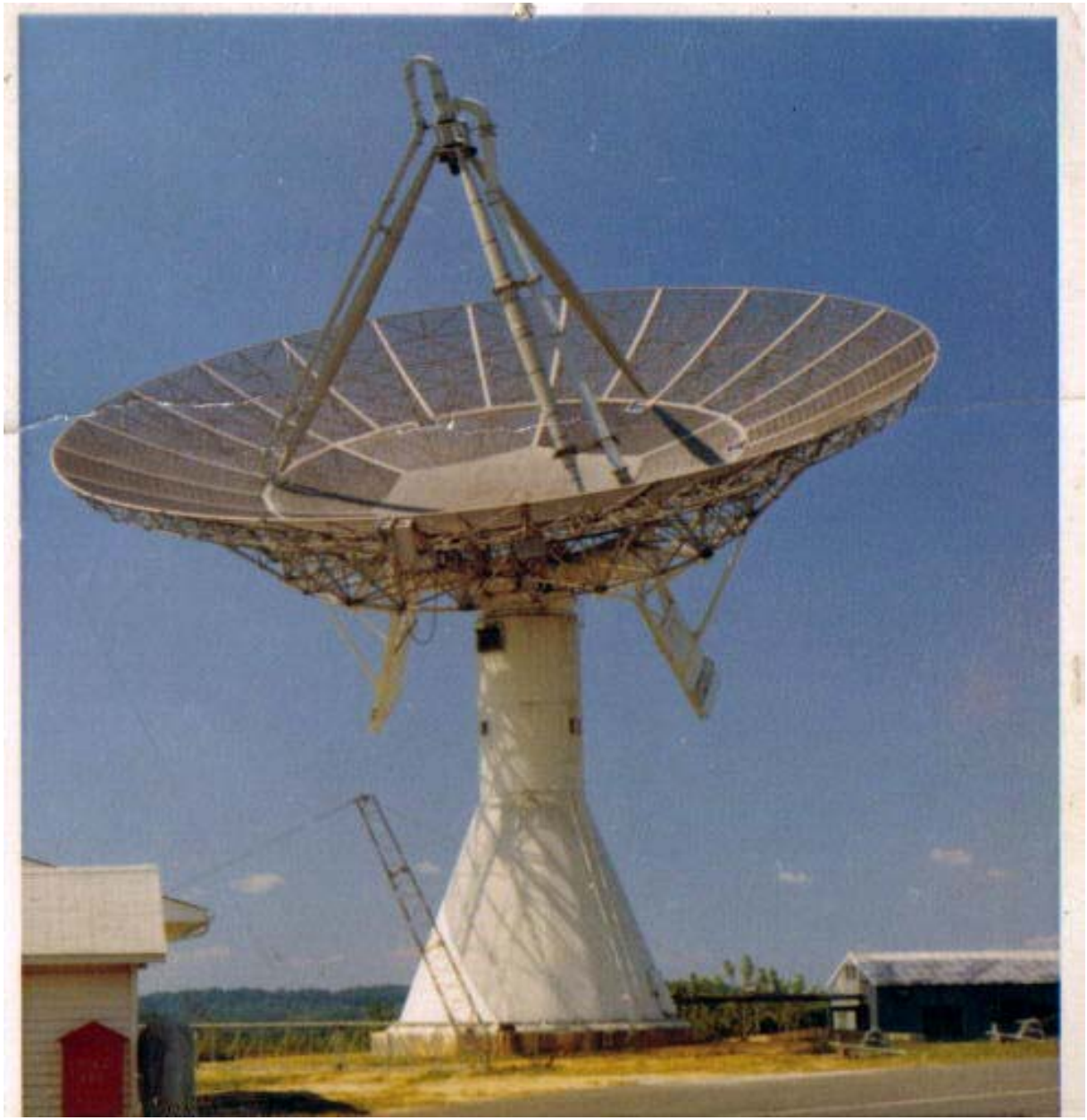
- The first 9cm eme contact was in April 1987
- Low and sporadic activity since that time
- Different frequency allocations around the world
- Use or Lose!
- The Answer...Organise an Activity Weekend (AW) #1 June 2007,#2 July 2007 #3 June 2008

The Early EME AWs

The Basic Ideas

- Set dates and times well ahead
- Anchored around a big dish station that everyone could hear, helped to find the moon and the frequency
- Schedule lists
- Smaller stations hear each other
- Encourages SWLs to build transmitters
- Encouragement to test different system components
- Concept still valid and internet is a big help

The Bell Labs 60ft Holmdel dish used in the first AWs on 432MHz



What's needed for 3.4 GHz EME ?

2.4m (8ft) dish pointing to 1.5 degree accuracy

Circular polarisation is now standard

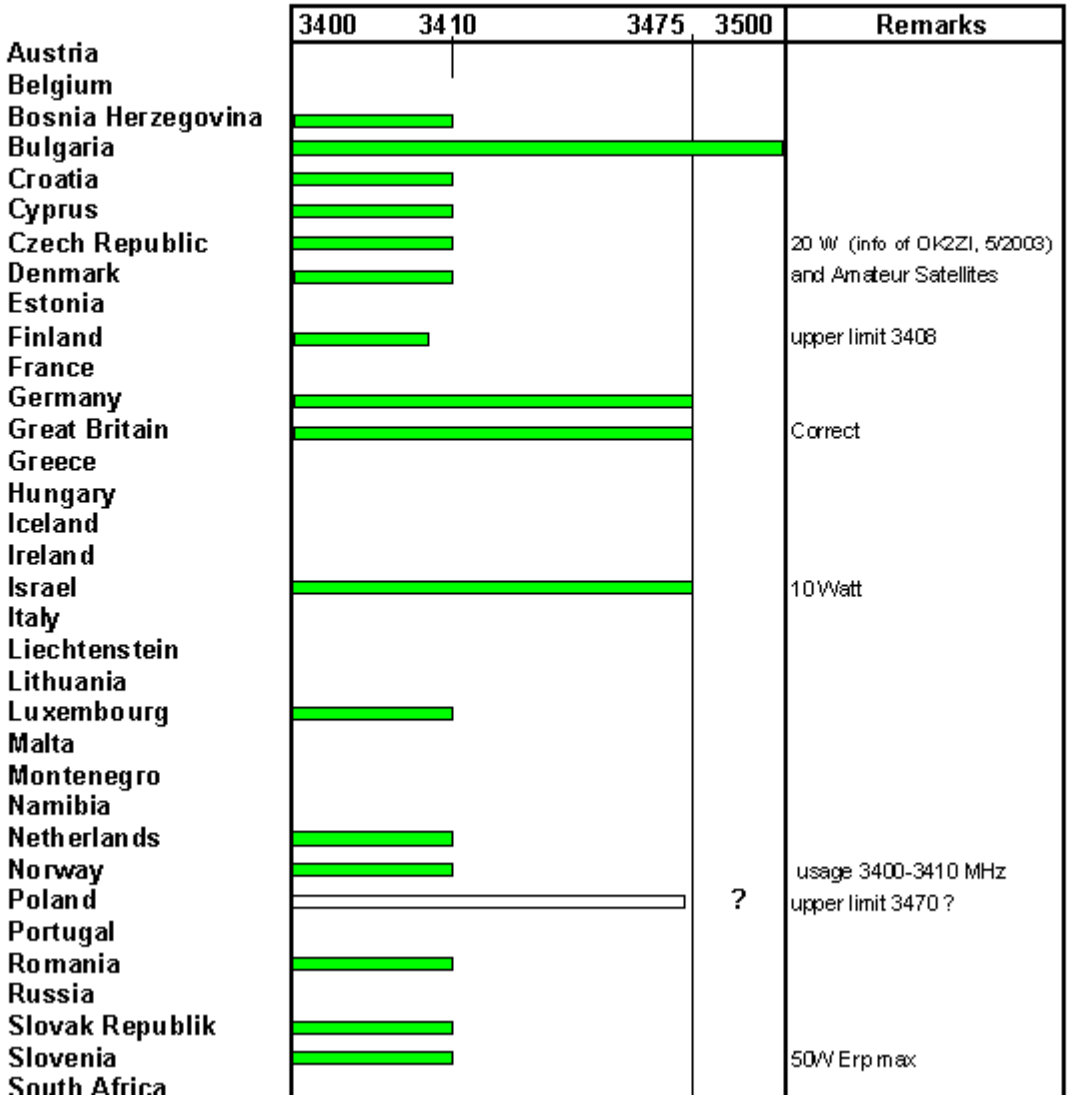
Tx - 40W at the feed

0.5dB NF receiver which will give about 8-9dB sun noise

This will work the bigger stations with about 2dB SNR in 400Hz

Most activity is now on 3400MHz but a few USA stations are on 3456MHz

Frequency allocations,IARU region 1



17 Stations currently active

G3LQR	4.3 m	20 W
G3LTF	6 m	28 W
G4NNS	3.7 m	50 W
GM4ISM	2.7 m	50 W
DL2LAC	4 m	30 W
DL4MEA	4.5 m	50 W
LX1DB	11 m	200 W
N9JIM/6	32 m	80 W
OK1CA	10 m	15 W
OK1KIR	4.5 m	20 W
PA0BAT	3 m	50 W
RW1AW	6 m	150 W
VE4MA	2.4 m	75 W
VE6TA	5.5 m	40 W
W5LUA	5 m	150 W
WD5AGO	2.7 m	40 W
WW2R	3.1 m	40 W

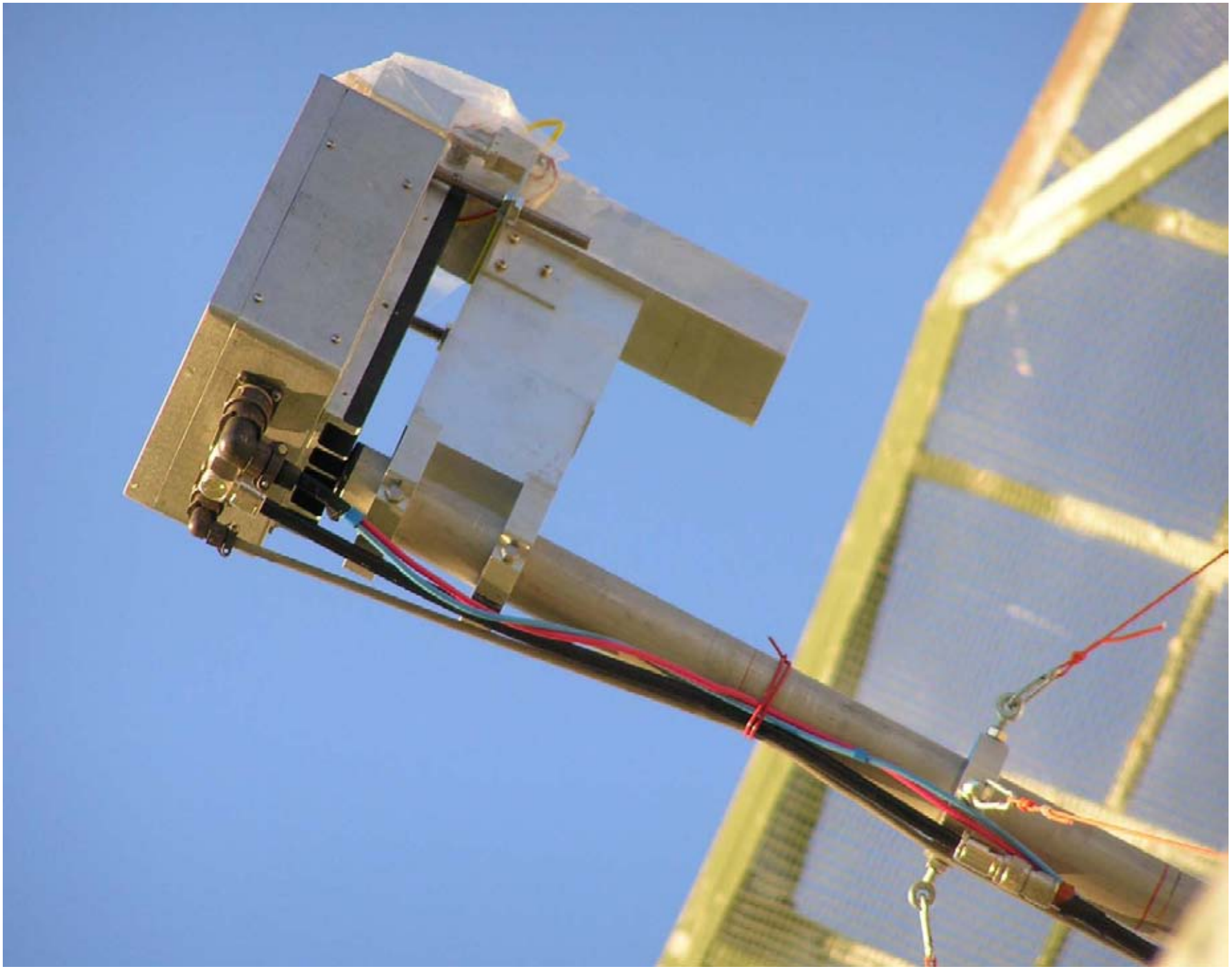
10 other stations active / building

DF6NA	2.4 m	50W	
F2TU	7.8 m		Heard stations
G4DDK	2.5 m	50W	Heard stations
K2DH	5 m	50W	Past QSOs
NA4N	3.7 m	100W	
OE9ERC	8 m	300W	Past QSOs
OK1DFC	10 m	50W	
S52LO	3 m	50W ?	Heard stations
WA9FWD	3.7 m	75W	Past QSOs
WB2BYP	3 m +	50/100W	

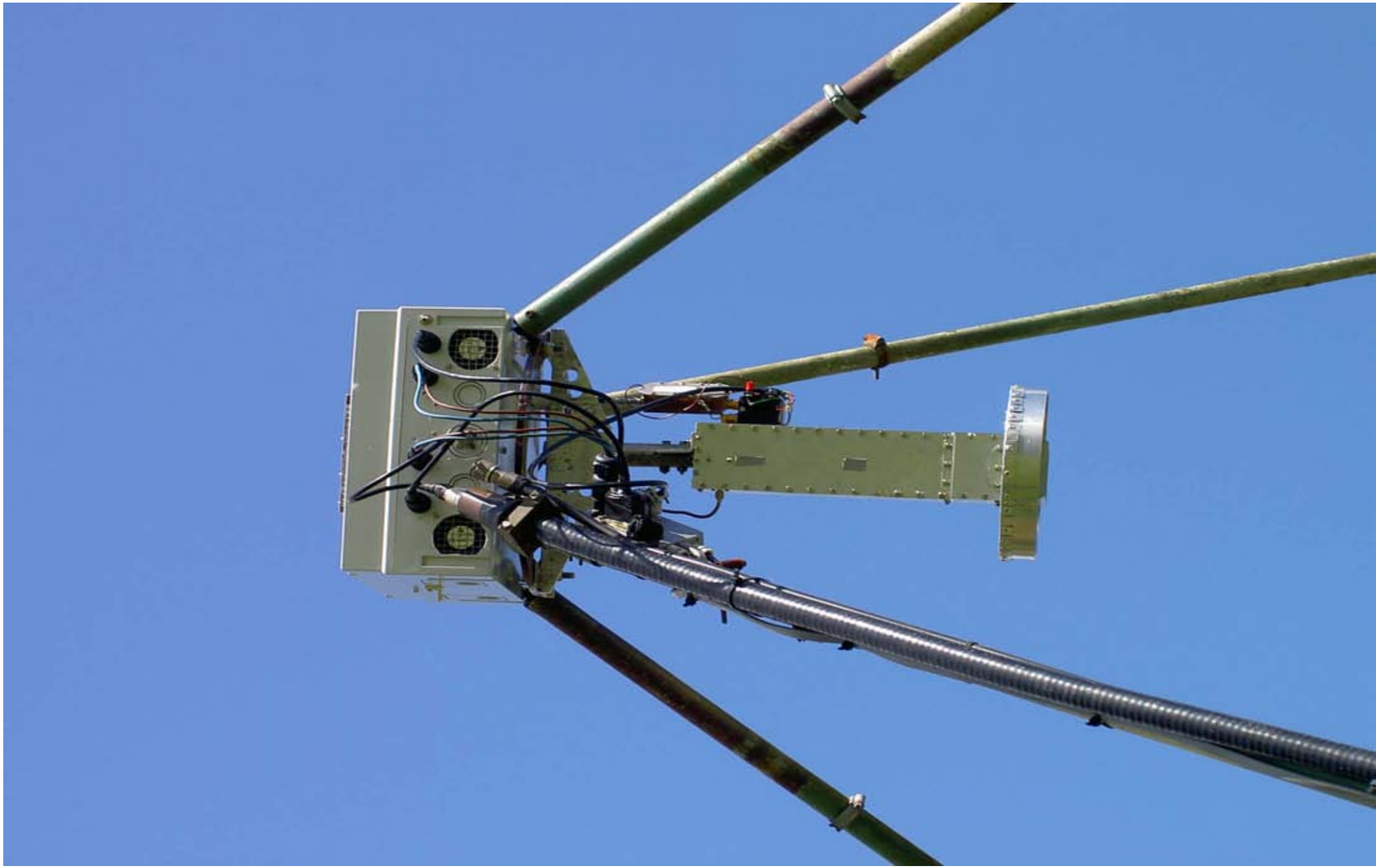
3.4GHz dish feeds

- All stations active now use CP
- Multiple screw polarisers
- Septum Polarisers
- Loss of about 1.0dB in G/T with simple square Septum / choke compared to linear
- RA3AQ design appears to avoid this
- Circular WG with Septum and choke or Chapperal rings

OK1CA Feed system

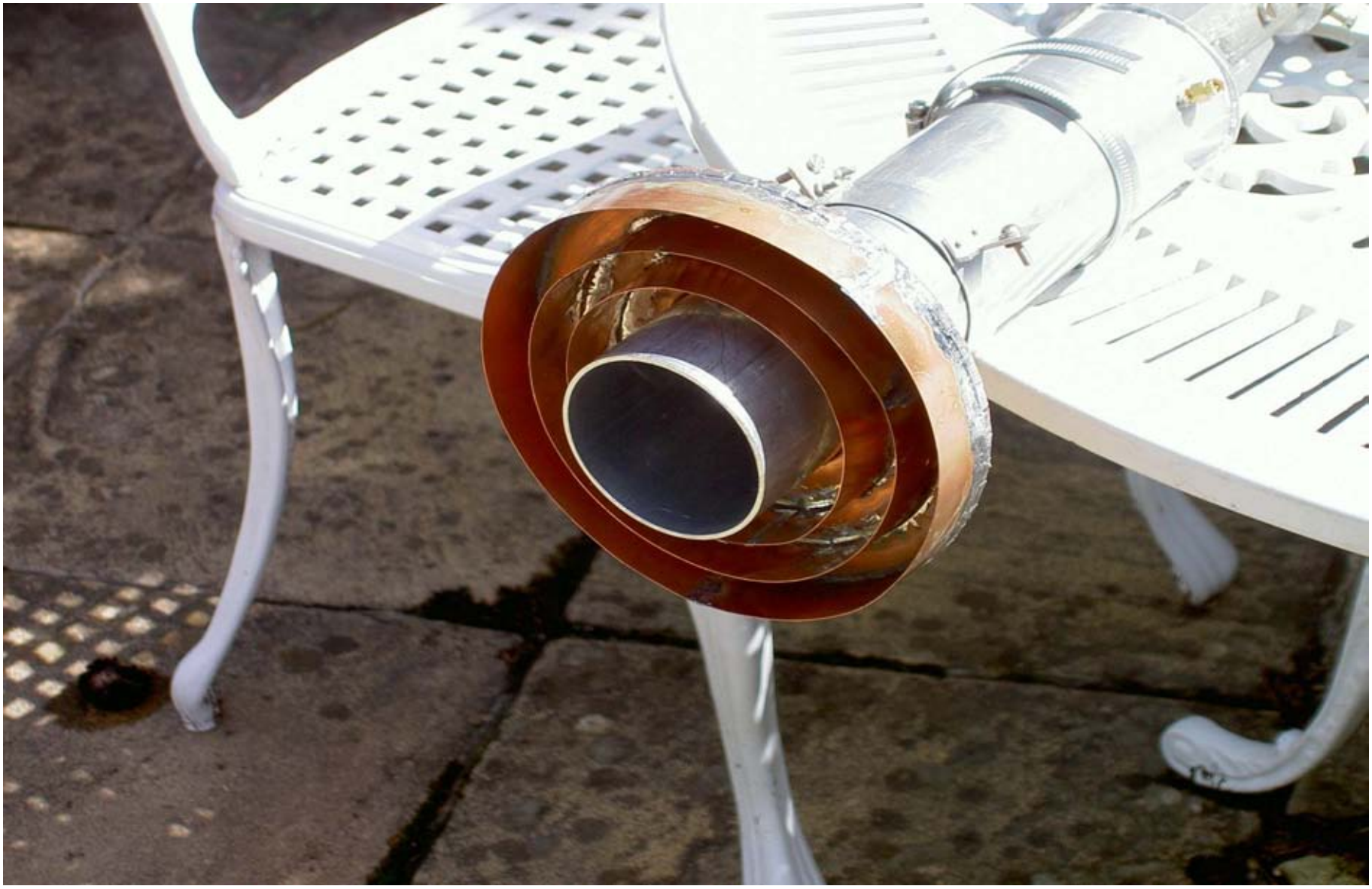


G3LTF Square Septum Feed

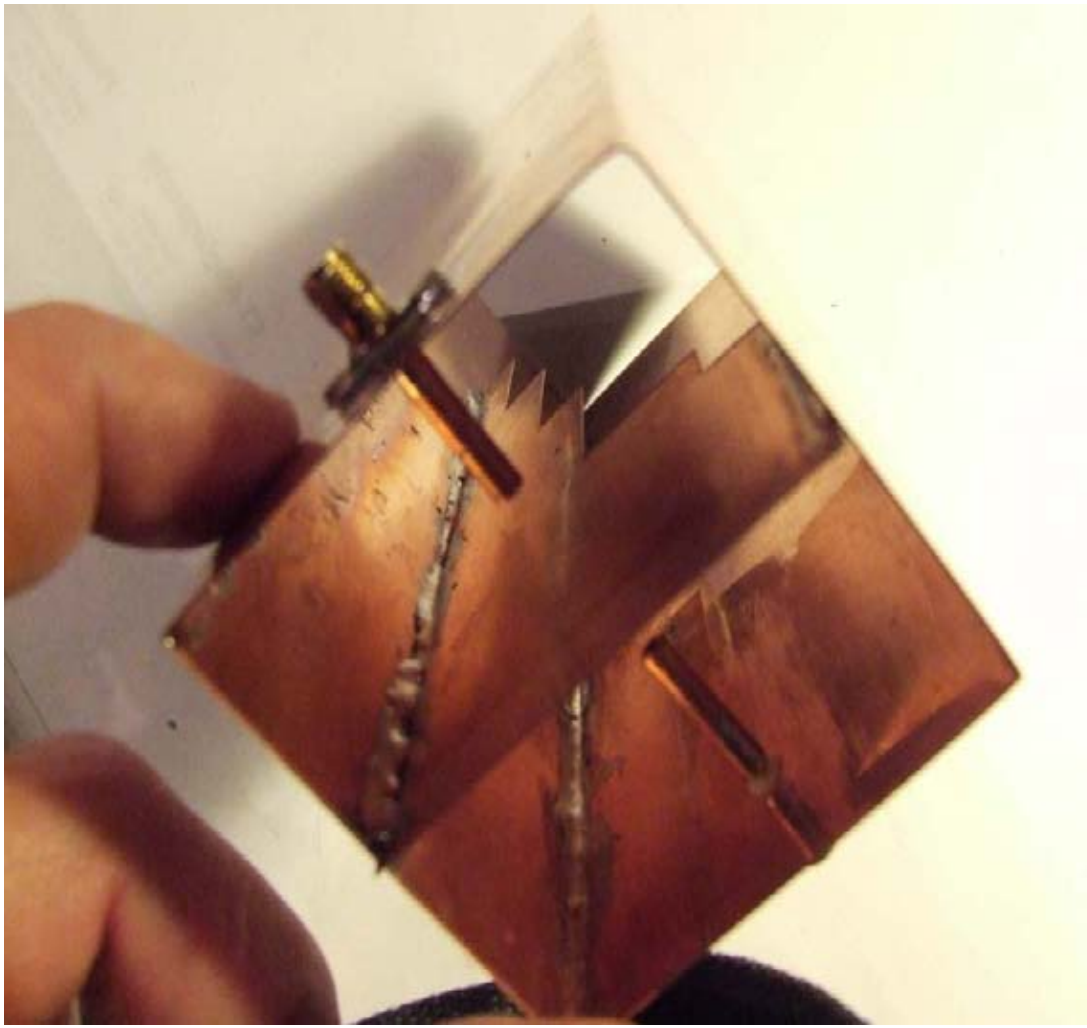


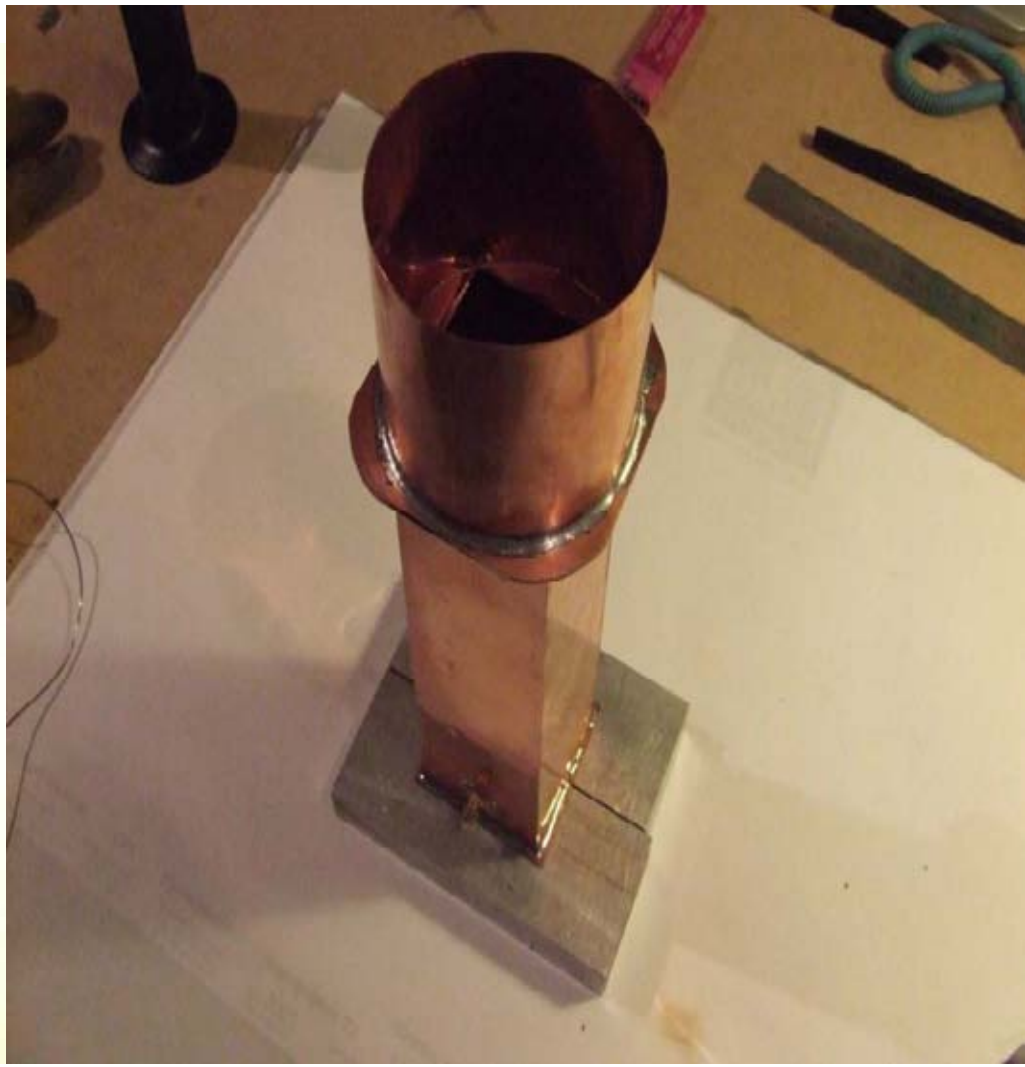
G3LTF circular septum feed

G3LTF 3 ring Chapperal feed



VK3NX Septum feed scaled from RA3AQ design, see www.ok1dfc.com/eme/technic/septum/ra3aq-23cm04fd.pdf





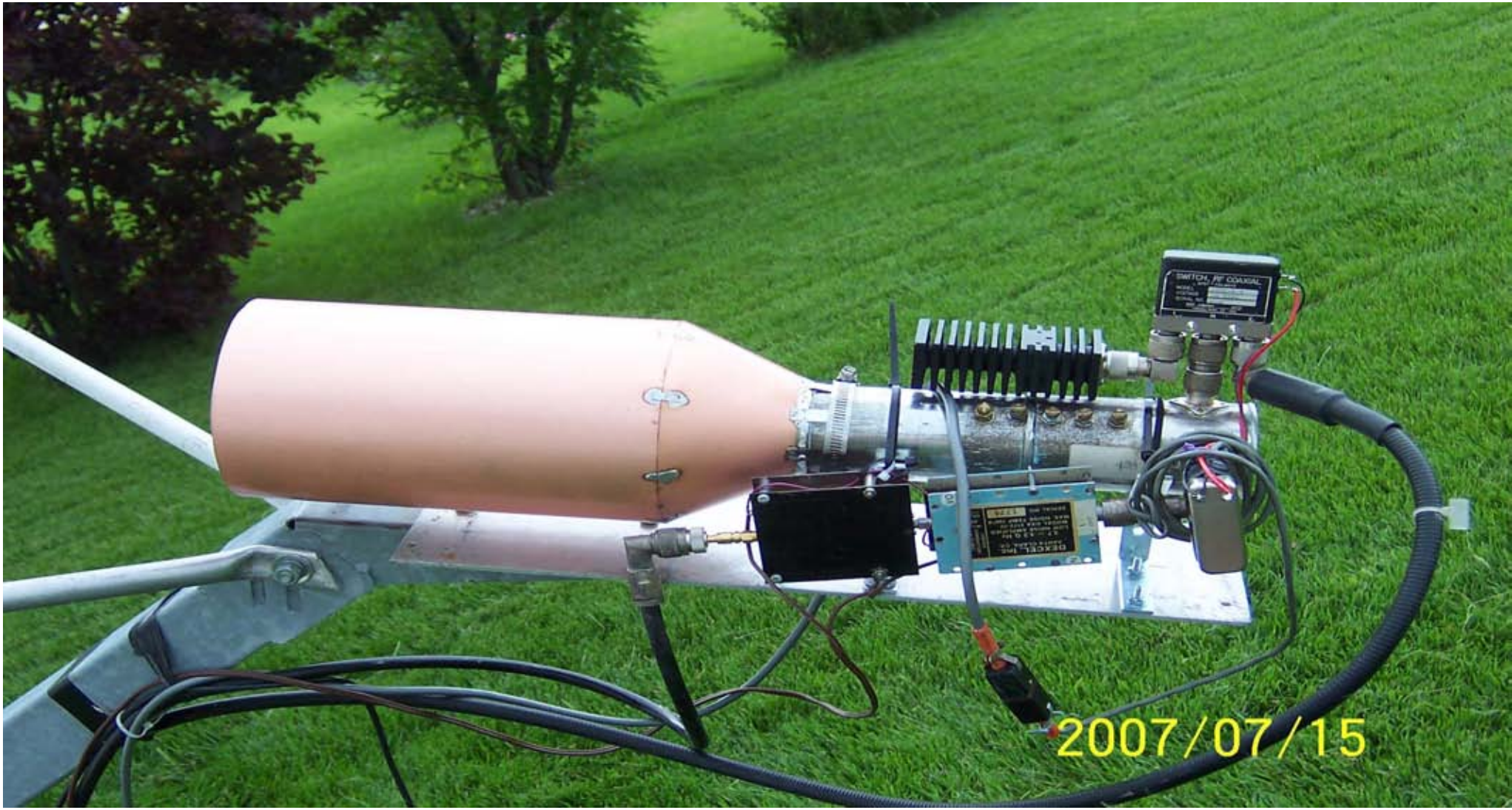
RA3AQ septum feed by VK3NX


WD5AGO 3.4GHz
HB - 5 pole CP
w/ 3 ring, Ag plate

WW2R 3456MHz Feed

Scaled VE4MA 1296MHz feed

VE4MA long W2IMU feed for his offset dish



Dishes

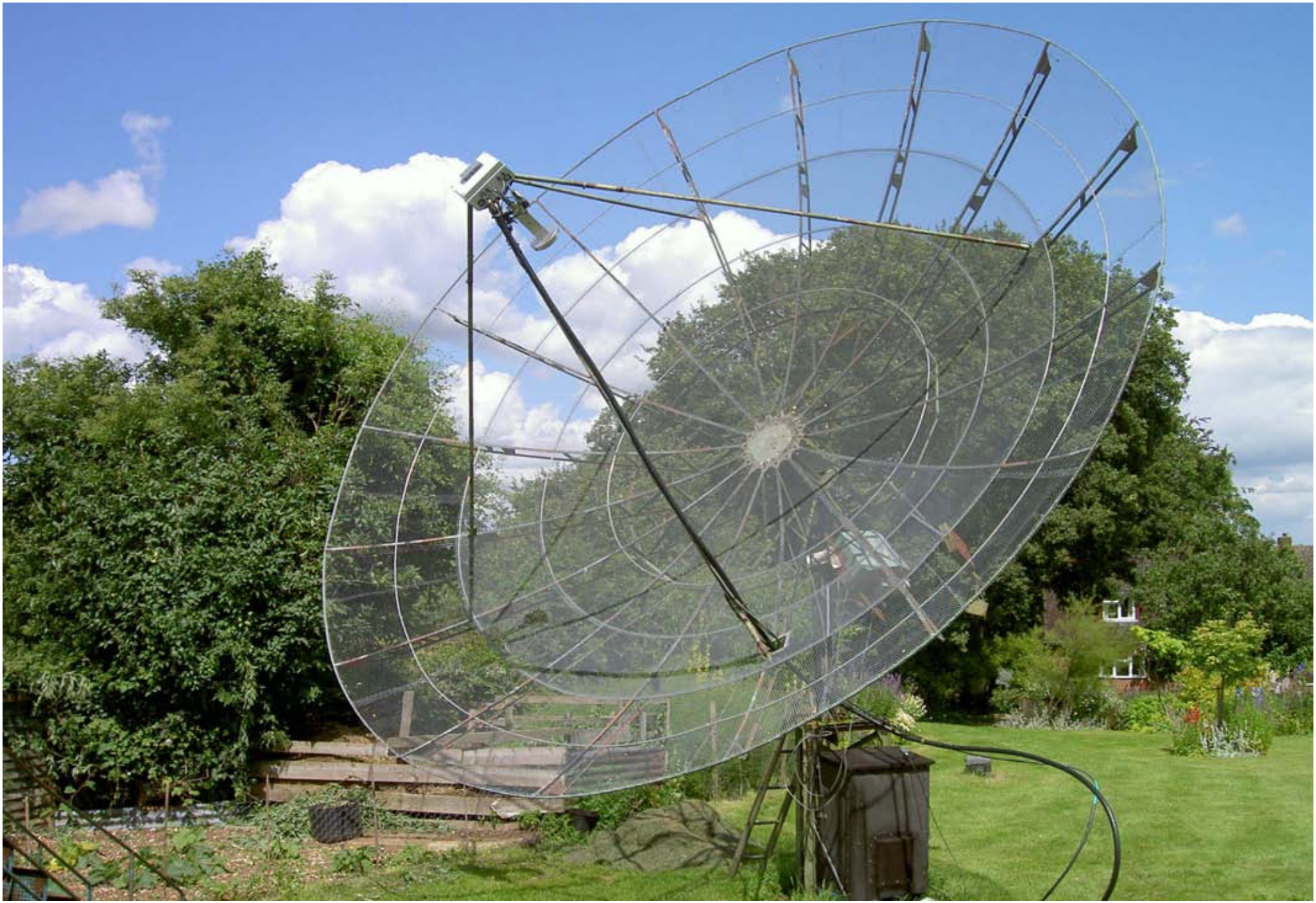
- Wide range of diameters 32m to 2.4m
- Mostly commercial types
- High gain SSPAs allow reduced feeder loss by mounting the PA at the feed (but dont neglect the cooling requirements!)
- Offset dishes perform well
- Moon noise helps the dish aiming process. This needs a wideband receiver

VE4MA offset dish

OK1KIR 4.5m dish

VK3NX 3.7m dish

G3LTF 6m dish on a polar mount



32m Jamesburg Dish, N9JIM/6


WD5AGO 3.4GHz EME
2.7m 0.33 f/D, HB Feed
HB 0.35 n/f LNA, 40W

GM4ISM

RW1AW 6m dish with 3.4GHz feed

How Good is my 3.4GHz System ?

- Sun Noise measurements
- Moon Noise measurements
- How well optimised is my system in comparison with other stations?
- Introducing...a New “Figure of Merit” for EME stations

Station comparisons

The G/T ratio is a commonly used comparator.

$$G/T = \frac{4\pi (R-1)\, 2k}{S\, L^2} \quad \text{.....(1)}$$

G= Dish Gain R= Sun/Cold sky ratio L= Wavelength
S= Sun flux k= Boltzmanns constant

Also, $G = \frac{4\pi A E}{L^2}$ or $\frac{D^2 \pi E}{L^2}$ .....(2)

A=Dish area, D= dish diameter, E= Efficiency of the dish

Sustitute equation (2) in (1) and throw away all the constants and (for a given wavelength) you get :

$$E/T = \frac{(R-1)}{D^2 S}$$

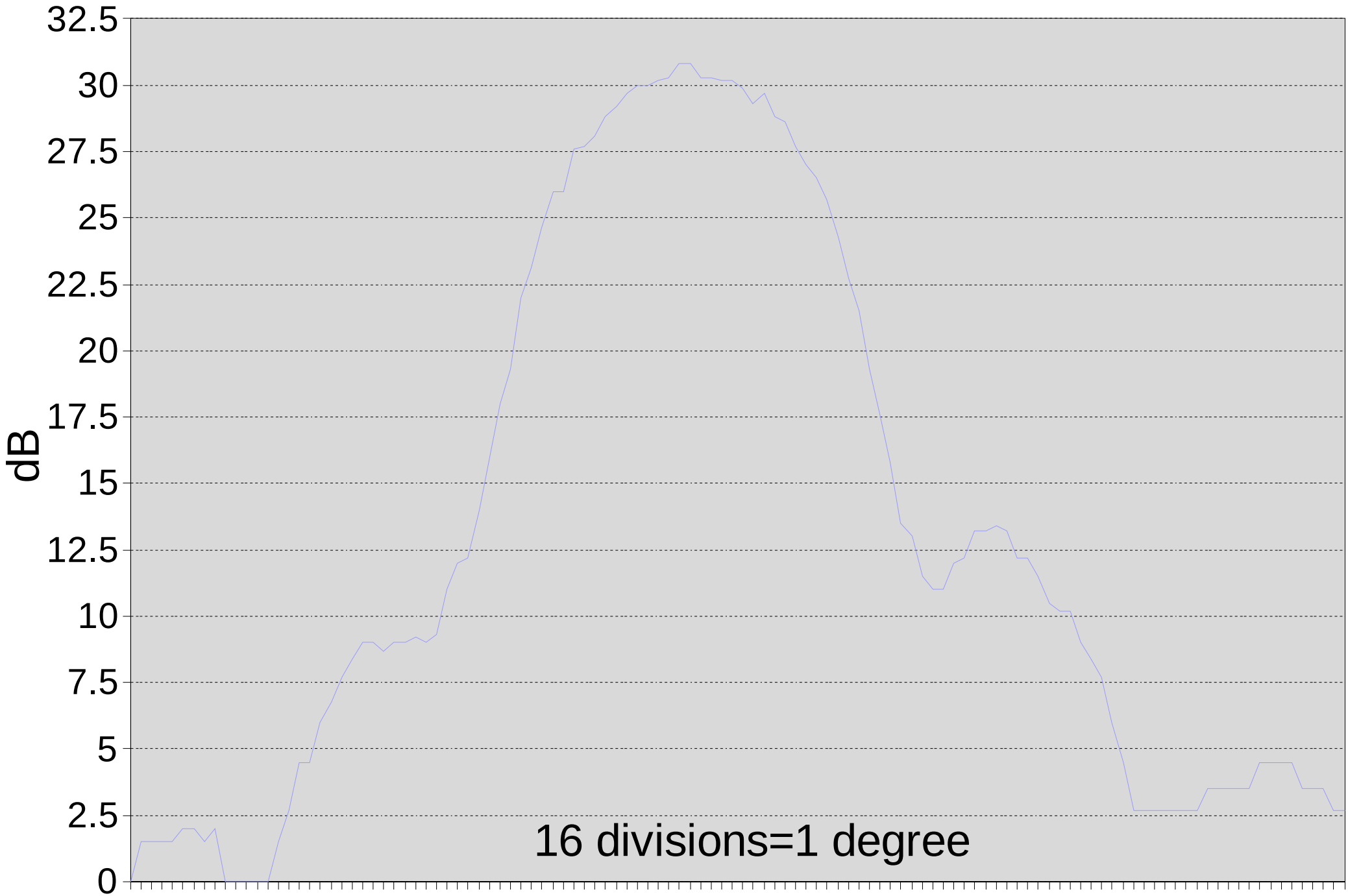
S= 10.7cm SFI (e.g.67) D is in metres

E/T Results

Call	E/T x 1000	Dish diam	f/d and feed data
F2TU	35	7.8m	0.51 RA3AQ
VE4MA	23	2.4 S	0.7? W2IMU+circ screw polr
WD5AGO	18	2.7	0.33 circ screw polr+chapp
W5LUA	16	5 S	0.375 circ screw polr+choke
VK3NX	14.5	3.7	0.4 RA3AQ
G4NNS	14.3	3.7 S	0.43 circ linear VE4MA
WW2R	13.6	3.1	0.4 circ screw polr+choke
OK1KIR	13.5	4.5 S	0.42 square septum
G3LTF	12.5	6	0.38 circ septum+super VE4MA
GM4ISM	11	2.7 S	0.41 sqr septum+horn flare
G3LQR	10.5	4.3	0.4 circ septum+choke
OK1CA	10.0	10	0.3? square septum
DL4MEA	6.7	4.5	0.32 circ septum+chapp

S= solid dish

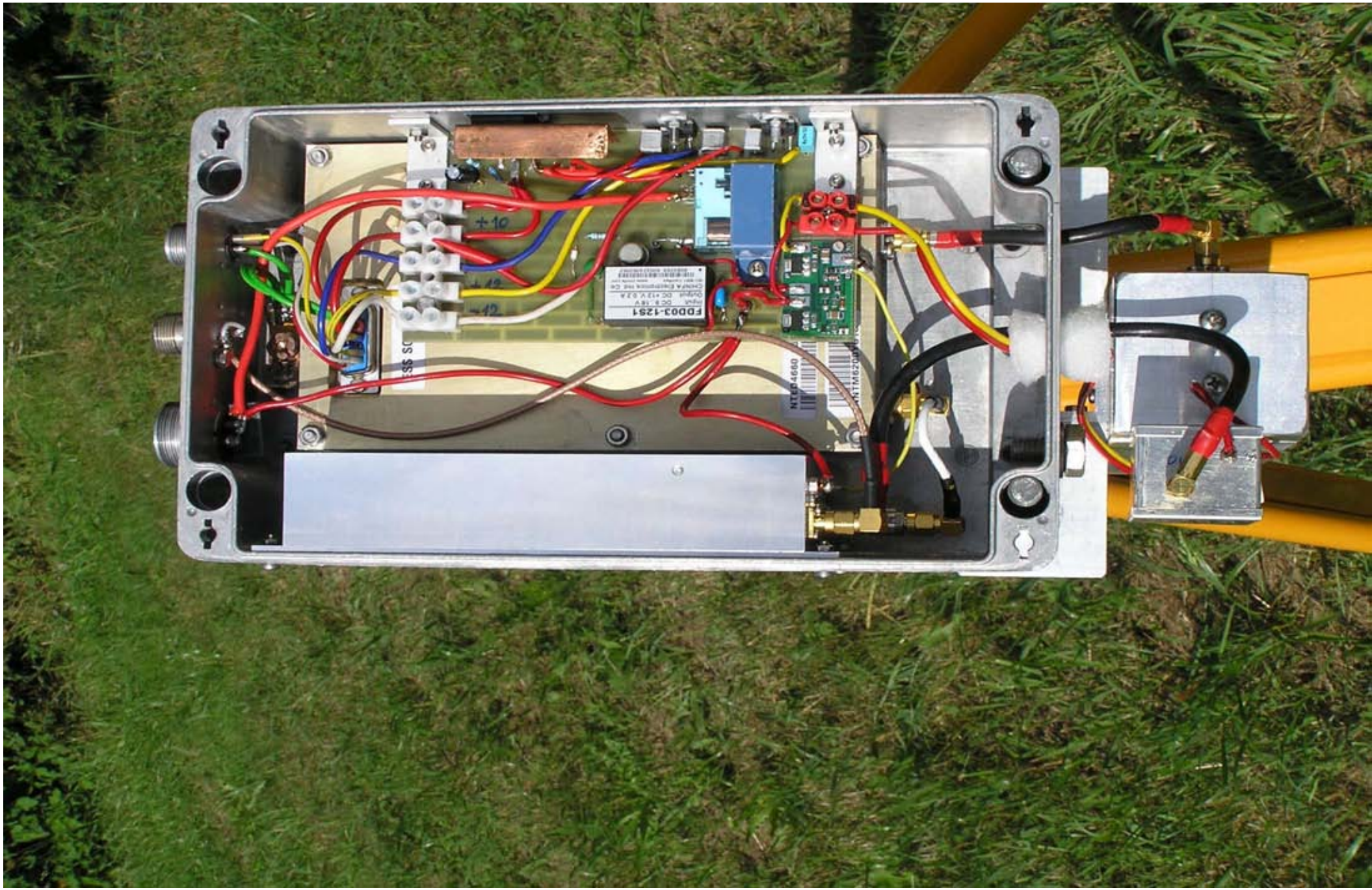
6m dish with septum feed



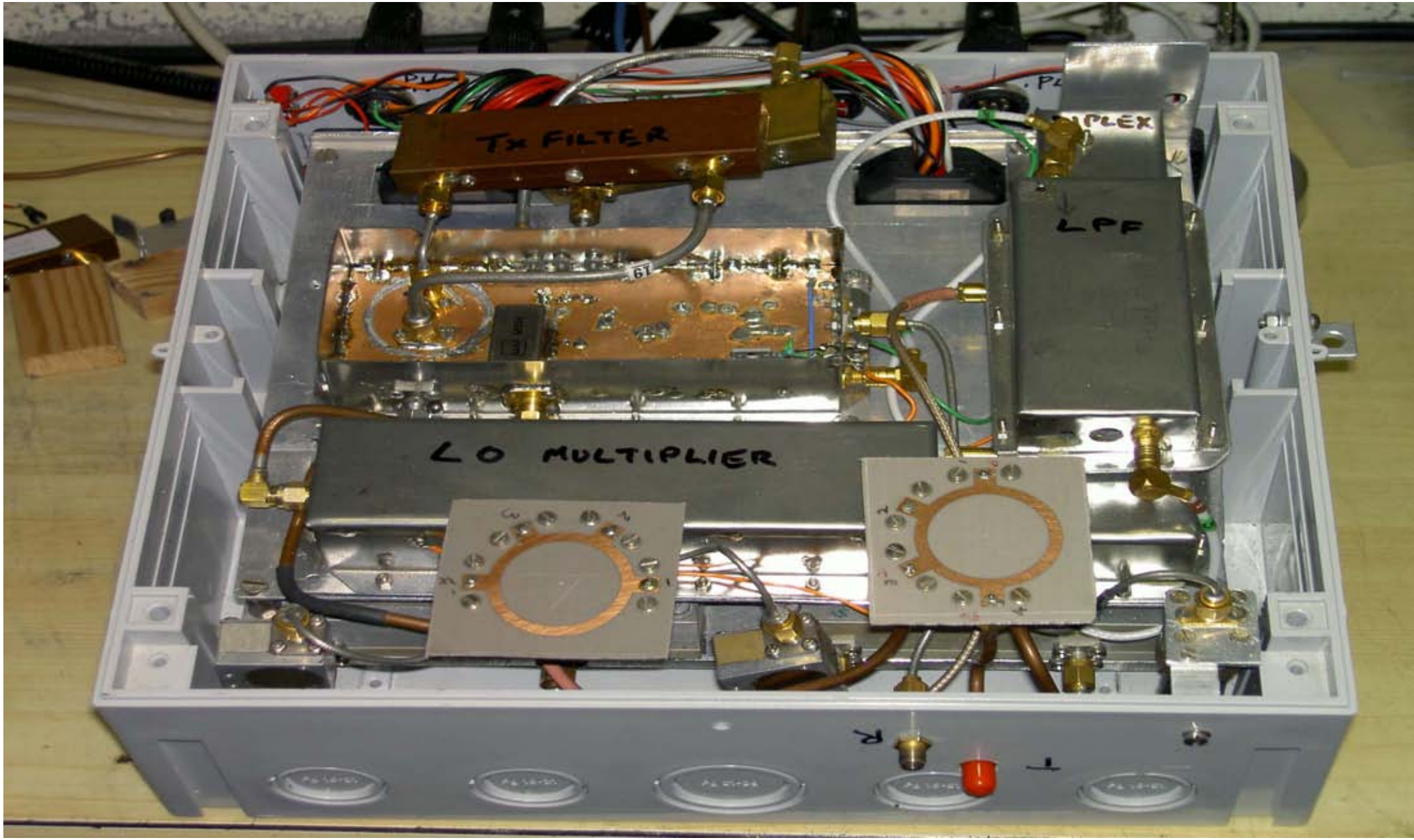
Transmitters

- Ionica PA units, 15-18W, details at GM4ISM www.dc2light.pwp.blueyonder.co.uk/Webpage/
- Toshiba PA units 50W, details at WW2R www.g4fre.com/Toshiba_amp.htm and at VK3NX www.vk3nx.com/9cm.html
- TWTs
- Frequency control by GPS locking or TCXO
- Dual / crossband working by either dual LOs or changing the IF (144/200 MHz)
- This issue will dissappear, we will all use 3400 before long

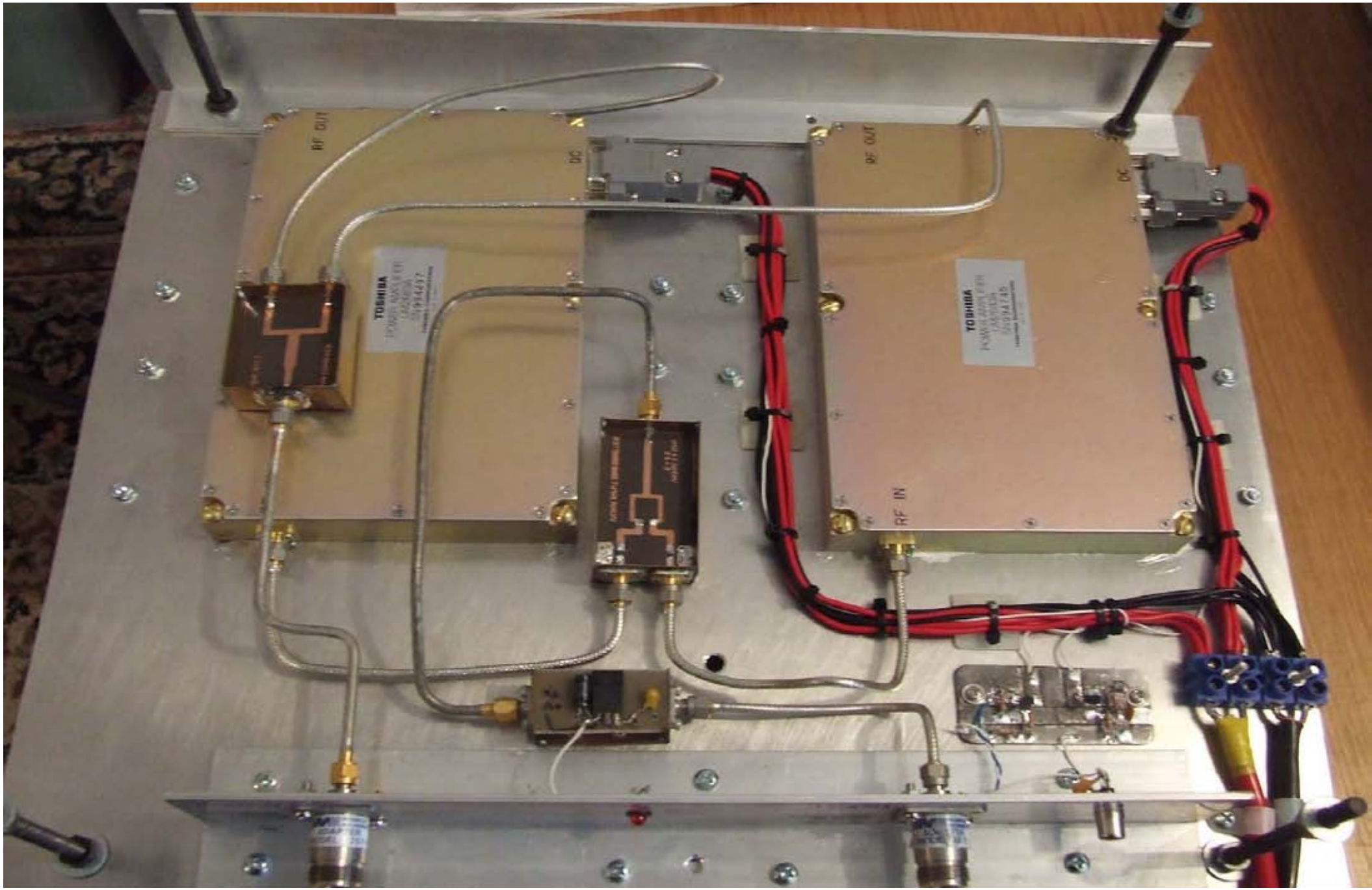
OK1CA Ionica PA unit at feed



G3LTF Transceiver/PA



VK3NX dual Toshiba amplifiers



WW2R Tx in dog kennel

Top: Toshiba Amp

Middle: 3400MHz/144 Xverter. 3456/144MHz xverter

Bottom: 12.6V 20A PSU

Preamplifiers

- Preamplifiers used from DB6NT and DEMI plus homebrews from the published W5LUA DJ9BV and G4DDK designs
- Noise Figures in the range 0.5-0.8dB
- Some transverters at the feed so then no need for multistage units

Conclusions

- The Activity weekend was a success...so we had two in 2007 and another in 2008
- 3400 MHz was used for the first time in many years in the ARRL & DUBUS microwave EME contests
- More new stations are coming on the band
- Get Building! VK3NX built the lot in ~2 months
- 3.4GHz looks like a good back-yard EME band and plenty to experiment with as well.