VÄSTKUSTENS MIKROVÅGSGRUPP

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Bulletin nr 1 - 860823

Hej allesammans!

Nu blir väl en del förvånade när det plötsligt dyker upp en bulletin. Men faktiskt hade vi tänkt ha ett möte nu i höst och det är föranlett av att aktiviteten här på Västkusten gått ned till ett minimum med i stort sett bara ESG, HYG, CWM och AFV igång med någonting. Själv har det varit si och så ett par år nu. Men det är saker på gång...

En annan sak som vi ska diskutera är det ständiga problemet med våra fyrar och framförallt då de som inte blivit QRV ännu. För snart fyra år sedan skickade VMG in ansökan om fyrtillstånd på 2320 och 5760 MHz till Televerket, men de har inte ens svarat! För över två år sedan påtalades detta för SSA:s styrelse men inte ens där har det hänt något. Den 16 juli skrev undertecknad till både Televerket och SSA och begärde någon form av svar men i skrivande stund har det inte hörts ett skvatt.
Vad 17 ska vi göra nu?

Vi i VMG kallar till möte i Fjärås den 20 september kl. 1100 och det skall vara i PARABOLIC´s lokaler vid E6:an. 20/9 är en lördag och vi hoppas på stor uppslutning.
Förhoppningsvis kommer både 6DJH och 4DHN att dyka upp och plocka med sig lite godsaker till försäljning och lite 1296-slutsteg mm finns hos oss också. Men framförallt ska vi diskutera den närmaste framtiden på mikrovågsbanden och jag vet att SM6AFV har ett 10GHz fyrprojekt på gång för Kullen. SM6ESG har en färdig fyr på 5760 MHz men tillståndet och QTH saknas. VÄLKOMNA!

Materialet till denna bulletin har jag knyckt ur RSGB´s bulletin samt EME-bulletinen. Som vanligt efterlyser jag material om det ska bli ngt. Alternativet är ju att förse QTC´s spalter med artiklar och konstruktioner, vilket jag också vill rekommendera.

Väldigt många har ringt och bett att få köpa fingerstock under de senaste två åren men tyvärr har varken jag eller DHN haft något kvar. Här är ett tips: (gäller fingerstock till anod etc på 4CX250/2C39. B. Gordon, G4GHP, 44 Valon Rd, Arvorfield, Near Reading, Berks, England och priset är £4 per fot (30.5 cm). Har inte sett detta än men försök!

De flesta har väl nu noterat att SSB Electronics kommit ut med en färdig transverter för 10GHz CW/SSB med 100 eller 200mW output! Vi kan nog se fram emot fler konstruktioner som följd av utvecklingen på satellit-TV sidan. Man kan ju alltid diskutera "the black boxes" men onekligen höjer det aktiviteten och det är ju ingen nackdel. Vi får se vad som händer i höst. I detta sammanhang vill jag be alla som byggt något spännande sista åren att ta med det och visa på vårt möte.

73 Ba SM6CKU

Quick Method for Making Water Cooled 2C39's — See JH3EAO Report.

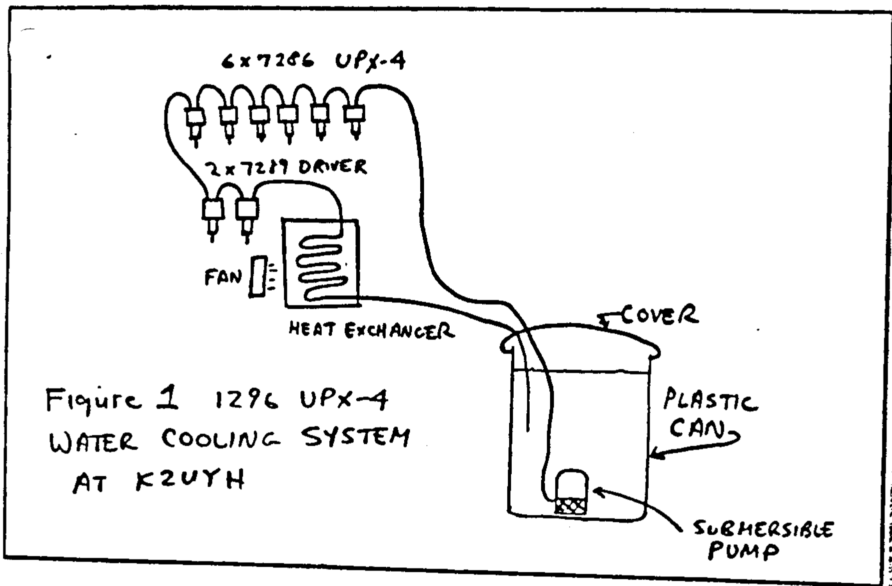
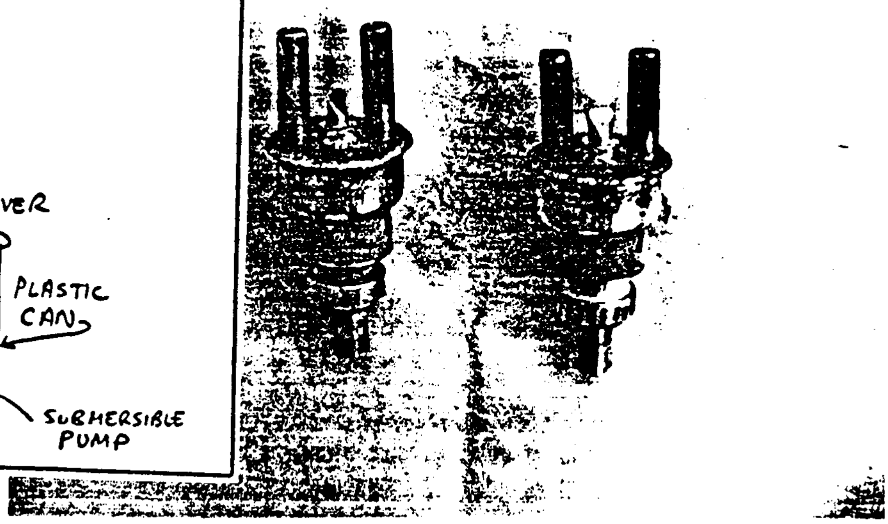
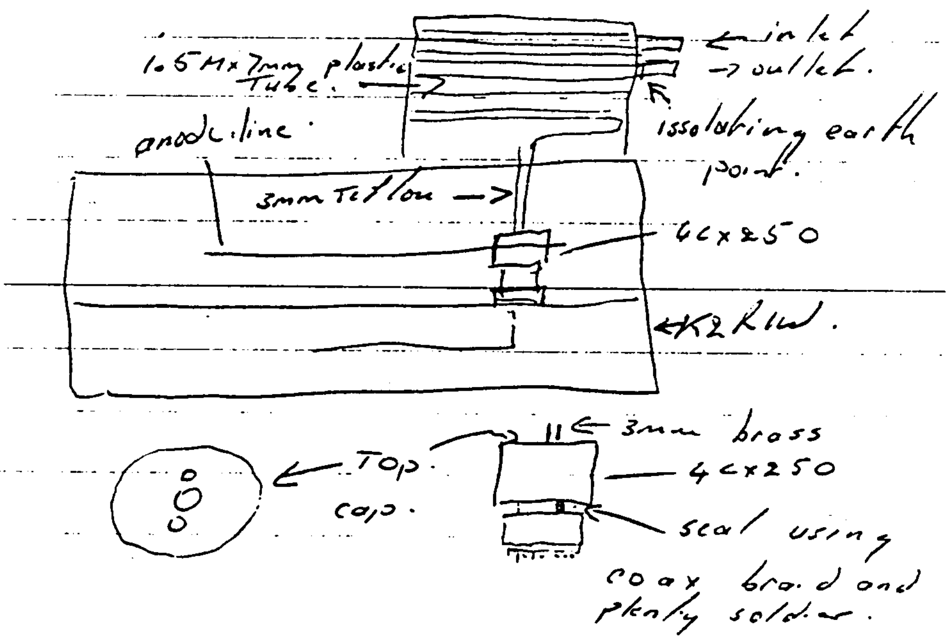


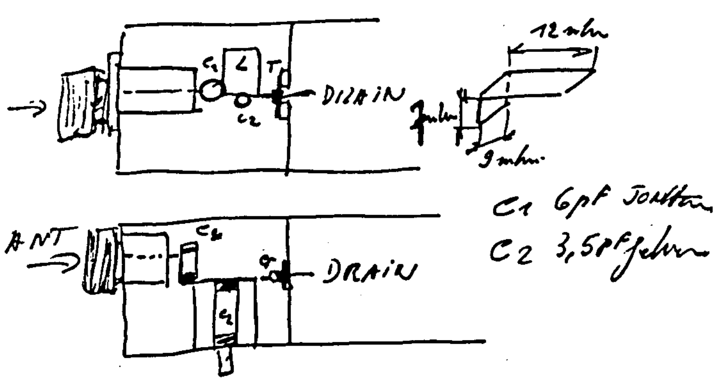
Figure 1 1296 UPX-4 WATER COOLING SYSTEM AT K2UYH





ZL2AQE'S 4CX250 WATER COOLING SYSTEM

Details of F2TU's NE75083 GaAs FET 1296 MHz Preamp - See report last NL. NF=.4dB



C1 6pF Johnson
C2 3,5pF Johnson

TECHNICAL SECTION

DIELECTRIC RESONATORS (DR)

Reported by Sam Jewell, G4DDK

Many microwave enthusiasts will, by now, have heard of dielectric resonators due to their widespread use in satellite TV down converters. These passive disks of high permittivity ceramic material exhibit well defined resonance effects, when used in suitable circuits.

The rf field is well confined by the high dielectric constant, resulting in low radiation losses and hence high Q. Electric and magnetic fields are confined as shown in the diagram. DR's are highly temperature stable, allowing a frequency stability of better than +- 200kHz from -20 to +60 C at 10GHz. These resonators can have unloaded Q values of tens of thousands.

DR's can be used as the resonator in microwave oscillators, or as the coupling element in narrow band filters. Dielectrically stabilized GaAs FET local oscillators in TV downconverters have now become commonplace, even threatening the dominance of Gunn oscillators in wideband amateur transceivers. Low cost oscillator modules are now readily available to the microwave amateur. The best known of these being the range of modules produced by Mitsubishi.

As well as acting as the resonant feedback element in these oscillators, the dielectric resonator can be used to couple two transmission lines together to form a very high Q filter.

The range of DR's (Resomics) produced by Murata cover the frequency range from about 1.6GHz to 25GHz. The higher frequency units tend to have lower Q values, although a Q of 5000 is still high in my books! Murata DR's are available in two configurations. The basic resonator is a round disk, commonly called a "puck". A plain disk resonator can be glued direct to a PCB substrate, but does not give the highest Q because of its proximity to the groundplane. Standing the resonator off the board on a low loss pillar allows the resonator to develop a higher Q and also makes it easier to couple into the electromagnetic field. A cylindrical version of the DR makes mounting easier, since a fixing screw can be placed through the hole, and then through a low loss standoff pillar into the PCB. Interestingly Murata claim that the cylindrical resonators are more stable. Suitable low loss pillars are also available from Murata.

Dielectric resonators would seem to be an answer to the problem of developing completely printed circuit board transverters etc for the microwave bands, thus eliminating (at last) the idea that you need to be a plumber to work at these frequencies. As you will see, however, some metalwork is still needed.

With Q values of thousands it may appear that you would need to specify very accurately what frequency DR to order. This is not the case, however, since each resonator can be tuned over a relatively wide frequency range. For example one unit of interest may be tuned from 9.6 to 10.5 GHz. Tuning is accomplished by varying the spacing of a metal screw from the resonator. It is the mounting arrangement for this screw that requires the metalwork.

One obvious use for the resonator comes immediately to mind when looking at the filter schematic. By providing an input connector to one of the transmission lines , and connecting a detector diode to the other line, the resonator becomes a simple but effective absorption wavemeter. The tuning screw could be replaced by a micrometer stub, allowing the wavemeter to be calibrated to cover the complete range of the DR. This arrangement is capable of higher Q and hence better resolution than many of the better known cavity wavemeters designs.

The filter works by placing the dielectric resonator between the input and output transmission lines. By overlapping the open circuit lines g/4 either side of the DR, the DR is placed at a point of current maximum on the lines. Coupling to the DR electromagnetic field then takes place. If the DR is spaced above the board, then the lines may lie partially under the DR to improve the coupling.

The only design of transverter using DR's that is known to me is one for 10GHz by LA6LCA, presented at the recent Norwegian VHF convention (from whose notes the filter information is also taken). In this design the DR is used in the image rejection filter between the bilateral mixer and the preamplifier/ power amplifier unit. The filter construction is as shown, with a tuning screw allowing the filter to be tuned to 10.368GHz centre frequency. By optimizing the spacing of the resonator to the teflon PCB, the image response at 10.080GHz (144MHz IF) is better than -35dB with an insertion loss of about 2dB.

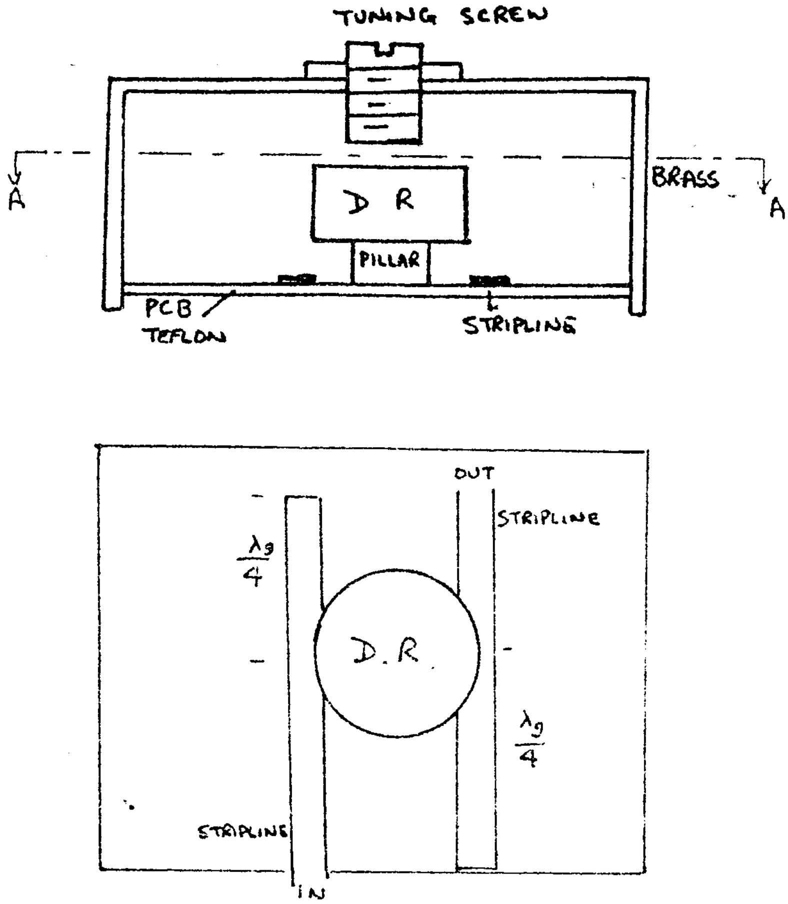
Although not entirely clear from the information I have obtained, it seems possible a second DR is used in the local oscillator chain, where the DR filters the required harmonic from the comb of frequencies generated by a step recovery diode multiplier.

Clearly these devices have a big future in amateur microwave activities. Availability of DR's is currently being investigated. When the situation is known, details will be published in the Newsletter. Grateful thanks are offered to LA6LCA for bringing DR's to the notice of more amateurs and to G4FRE for passing the original information on to me.

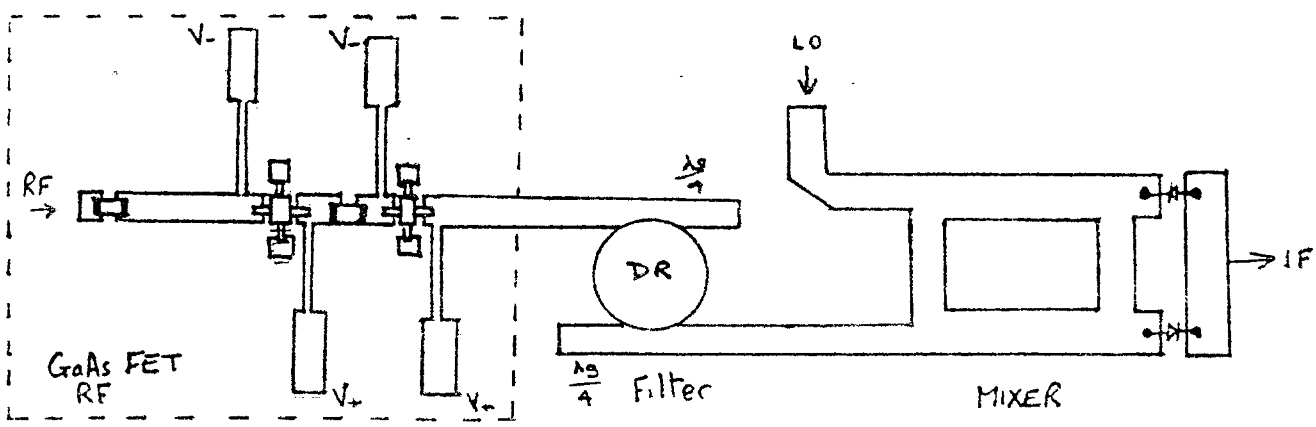
Detta var ett klipp ur RSGB's mikrovågsbulletin och på nästa sida har vi skisser på LA6LCA's förslag. Vi hoppas att det här kan vidareutvecklas och bli lätthanterligt för sändareamatören i gemen.

Vi behöver publicera mycket mer men då måste alla hjälpas åt att skicka in material. Jag har inte alla amatörpublikationer på prenumerationslistan!

SM6CKU



PRACTICAL ARRANGEMENT FOR A DIELECTRIC RESONATOR FILTER...courtesy of LA6LCA



RECEIVER FRONT END FOR 5.7GHz OR 10GHz USING D.R. IMAGE REJECTION FILTER.

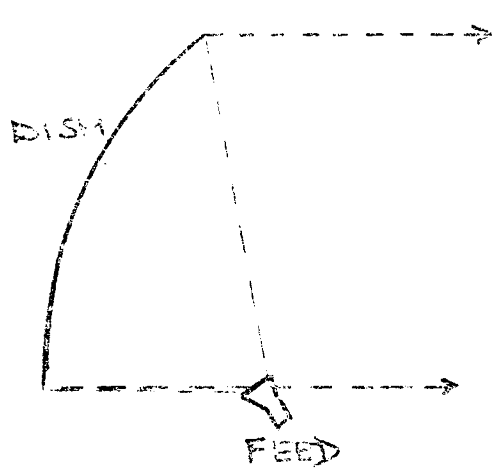
(JUST BEFORE THIS ISSUE WAS TO GO TO PRESS, THIS ARTICLE FROM G3WDG ARRIVED IN THE VERY MUCH DELAYED POST (8 days!) AND WE ARE THEREFORE INCLUDING IT WITH THIS ISSUE....EDS.)

OFFSET DISHES, PENNY FEEDS ETC. by Charlie G3WDG

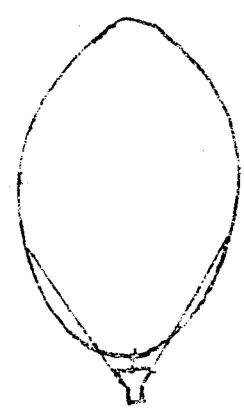
Following on from the notes about offset dishes which appeared in the 02/86 issue of this newsletter, I would like to clarify one or two points from my talk at the VHF Convention which were misinterpreted. The table showing the claimed gains of the different configurations was correct, but the offset dish referred to was not the same dish fed with an offset feed, but another dish of the same size but designed for offset feeding. To restate my results (made on the ECS satellite), I measured about 4.5dB lower gain for a 4ft dish (0.35 f/D ratio) fed with a penny feed designed for the frequency compared to the same dish fed with an optimised cassegrain feed. This agrees well with the predictions made by Barry G8AGN (Microwave Newsletter 01/86). The conclusion is that the penny feed is rather a poor feed for most of the dishes in current use. Its only virtue is that it is relatively easy to make. Of course for many applications this poor performance doesn't matter too much, but it does seem a pity to me to throw away gain that is there for the taking. After all, the windage of a dish is the same whether or not it works well!

However there are some situations where antenna gain is critical. Examples which come to mind are satellite TV, troposcatter, and non line-of-sight paths. Always assuming that your dish is "in shape" ie it has no significant dents, holes or other geometric faults, the route to higher gain lies in the feeding efficiency. Cassegrain systems with a shaped sub-reflector work well (see VHF/UHF manual) but are rather difficult to make. Alternatively the scalar horn type of feed can give quite good results if matched to the particular dish geometry. The 4.5dB improvement over the penny feed only came after quite a lot of work optimising the feed for the maximum signal off the satellite. Other types of feed may also work better than the penny, and it would be very interesting to hear of others' experiences.

I also performed some comparisons between my 4ft dish fed with its good feed and a 4ft offset fed dish. The geometry of the offset dish is shown below.



SIDE VIEW



FRONT VIEW

I must emphasise that this dish is specifically constructed to be fed in this way. The suggestion in the second half of the 02/86 article to try offset feeding an ordinary dish will not yield any improvement in gain, in fact it almost certainly be worse!! The results I obtained showed that the offset dish had about 2dB more gain than the 4ft normal dish with its good feed. The extra gain probably comes from even better feeding efficiency due to the rather flat shape (large f/D ratio) of the offset dish. For satellite TV the 2dB can make the difference between noisy pictures and virtual perfection as you go over the fm threshold!

Offset dishes have some other less obvious but nevertheless useful properties. If the geometry is chosen correctly, the feed may be located out of the beam of the dish, reducing blockage losses to zero. Also, it is much easier to set up the feed because you do not block the beam while making adjustments. Another point is that there is no energy reflected back into the feed from the dish itself, which means that you do not get a change in vswr when the feed is put in front of the dish. It is quite a common mistake with "normal" dishes to set the feed up outside the dish for a good match and then assume that you still have the same good match with the feed in the dish (try it sometime - the effects can be quite startling).

If offset dishes are so good, why isn't everybody using them? Perhaps because they haven't really been promoted for amateur use. They are more difficult to make than a conventional dish, but the prospect of getting as much gain out of say a 2ft offset dish as a 4ft penny fed dish must be attractive! More in a later issue of the newsletter if there is any interest.

-/-

SOME COMMENTS OF THE OFFSET DISH FED DESIGN

Since G3WDG's offset fed dish system was outlined in the March Newsletter a couple of comments have been made to the editors. You can read of G4SNL's successes with the system in this issue (see activity news) but there follows a précis of a letter from G8CLG of Kings Lynn:

The feed taper of 30dB produced by the penny feed is certainly extreme and it was no surprise that G3WDG's test produced +4.6dB by replacing the penny with a scalar feed. However I find it puzzling that the replacement of the scalar by the offset arrangement caused a further 2dB gain. gd+full
From the reference to the 11/12GHz TV band I assume the measurements were taken in the receive mode (yes...eds).
The offset arrangement has halved the physical aperture, hence to acquire +2dB the aperture efficiency has been more than doubled. I appreciate the offset has less aperture blocking and also the effective f/D is about doubled, in the vertical plane at least.
The high value of taper caused by the penny feed would have some small beneficial effects in that it would make a very quiet antenna (the main beam and sidelobes of the feed seeing very little from behind the dish that might bring noise into the receiver). The sidelobes of the main beam of the whole antenna should also be very low, again making unwanted noise less than with other systems.

The Newsletter would be very pleased to receive comments from other readers, particularly from those who have quantitative information in the form of gain measurements using reliable test gear and comparisons against standard penny-feed systems. It would be interesting and very useful to have figures taken from a common dish with interchangeable feeds.

MORE ON THE PENNY FEED -- (some notes made at the VHF Convention, March 1986)

Charlie, G3WDG, was quick to point out in his lecture, "Getting the most from your dish", that the penny feed was most UNsuitable for dishes of the type usually owned by amateurs (i.e. with f/D's between 0.25 and 0.4 or so. He reiterated the information given by G8AGN in last month's Newsletter and came up with some rather interesting findings. Producing a rather battered old dish he had used for gain measurements (f/D around those figures quoted above) he gave the audience his actual findings. Three feeds were used on the dish, a penny feed, a scalar feed and an offset feed. Using the scalar feed as a reference point, the others matched up as follows:

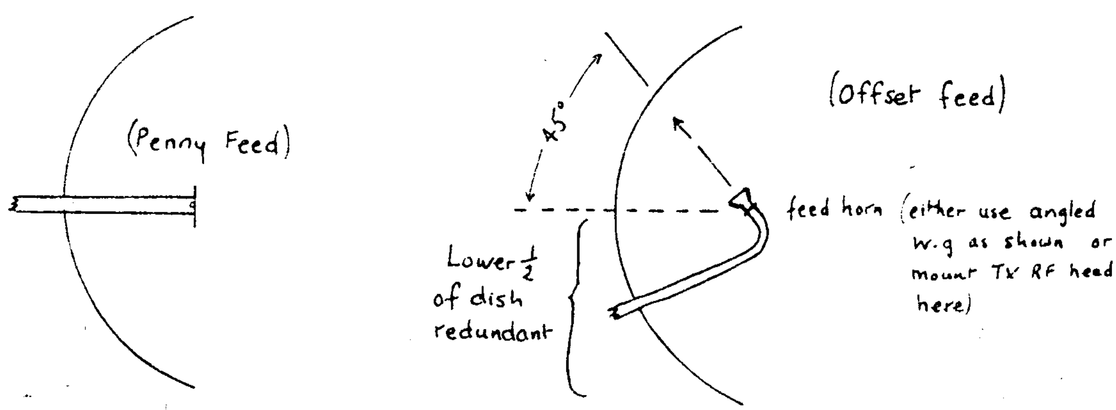
FEED TYPE:	PENNY	SCALAR	OFFSET
GAIN RELATIVE TO THE SCALAR FEED REFERENCE:	- 4.6dB	OdB	+ 2.0dB

While these measurements were taken in the 11/12GHz SAT-TV band they do highlight the very worthwhile gain to be had by changing from the penny feed to something more appropriate.
We are hoping that Charlie will write up his findings for the Newsletter but the following ideas might spur someone to give the offset feed a try in the coming contest season.

The offset feed:

The basic idea here is to remove the penny feed from the low f/D dish in use and to replace it, at the focal point of the dish, by a small horn feed of the type more suitable for say a 0.6 f/D dish and to tilt the feed up from the centre of the dish (towards the top) by an angle of 45 degrees (see diagram below). This has the effect of making the lower half of the dish, and some of the upper portion, redundant. You could, if you felt so inclined, cut away the redundant portions and so make a much more portable affair. The new feed horn can be calculated from G8AGN's information in the preceding article in this Newsletter.

überflüssig



While no "magic" is claimed for this arrangement it seems to us that over 6dB of gain improvement from penny feed to offset feed is not to be sneezed at. We are not guaranteeing that you will necessarily get the same results... you might do even better. Why not give it a try and report back to the Newsletter with your findings? Don't worry about putting a lot of metalwork in front of the lower half of the dish... it does not do any radiating anyway so there will be no blocking effects.