

the degree of improvements that can be obtained can only be found with the extended cycling and re-testing. So far all crystals have improved to a greater or lesser extent. It has been reported and observed that the problem does improve on its own over a very long period but I assume this is due to the slower action of a crystal being heated and cooled in its application at a much lower cycling rate. If you have a problem crystal then testing and cycling should reward you with an improved LO note purity.

#### References:

1. <http://www.microwaves.dsl.pipex.com/>
2. <http://www.qsl.net/dl4yh/spectra1.html>

## Focussing of Deep Parabolic Dishes

### By Paul Gaskin, G8AYY

This note is an attempt to show how accurately a deep parabolic dish needs to be focused. Consider the reception of a plane wave front by a focal plane dish ( $f/D = 0.25$ ) which is large compared with the wavelength. At the edge of the dish an incoming wave is reflected through 90 degrees which means that the path length to the feed point will not vary significantly with small errors in axial positioning of the feed point.

In order to focus, there have to be equal path lengths from the front of the dish to the feed point and an axial positioning error of the feed point will give the maximum phase angle error between the waves from the centre and the edge of the focal plane dish.

Loss of gain is related to  $\cosine((\text{phase angle error})/2)$  and a phase angle error of over 30 degrees will give a noticeable loss of gain.

At 10 GHz a feed point positioning error of 5mm (1/5 inch) with a deep parabolic dish will have a phase angle error of up to 60 degrees and serious loss of gain which confirms measurements made by other people. If the feed point error was 2.5 mm (1/10 inch) or less then the loss of gain would be negligible.

Measurement of the path lengths from the front of my 45 cm PW dish ( $f/D = 0.28$ ) to the centre of the disc of the G4ALN 'penny' feed gave a positioning error of only 2 mm (2/25 inch). This dish has a fixed feed point position but works well which confirms the accuracy requirement for the feed point position.

Another 45 cm PW dish was available for direct comparison but did not work so well even after adjustment and requires further investigation. There may be a problem with the dimensions of the G4ALN 'penny' feed.

