2.3GHz Dish Feed Antenna

I have not been convinced my very old 2.3GHz 44 element Loop Yagi has been working as well as it should do, particularly as the elements have become severely corroded over the years. I decided to see if my 60cm ex-satellite TV dish could be used on 2.3GHz as well as 10GHz. After looking at reference material, in particular W1GHZ's excellent online antenna book (see http://www.qsl.net/n1bwt/preface.htm) I decided that for my Amstrad offset fed dish with an f/D ratio of about 0.65, the dual dipole EIA style feed should give good results. I modified the balun arrangement to make it easier to construct, but otherwise it is a simple job to scale the dimensions from the 432MHz original, which is described in the ARRL UHF/Microwave Experimenters Manual on page 9-34. I used a skeleton reflector to reduce weight and windage.

See figure 1 for details of the reflector and figure 2 for the dual dipoles. I used 1.4mm diameter copper wire extracted from 6mm^2 cooker cable for most of the construction, with 2mm dia wire from 2.5mm^2 mains cable for the outer frame of the reflector. The feed elements are supported on a piece of unetched double sided 1.6mm thick epoxy glass PCB, using UT141/RG402 semi rigid cable for the feed connection and balun. The 2.3GHz feed is mounted offset horizontally from the 10GHz feed which remains at the prime focus. This means that the antenna beam on 2.3GHz is offset from the dish direction by about 10-12 degrees.

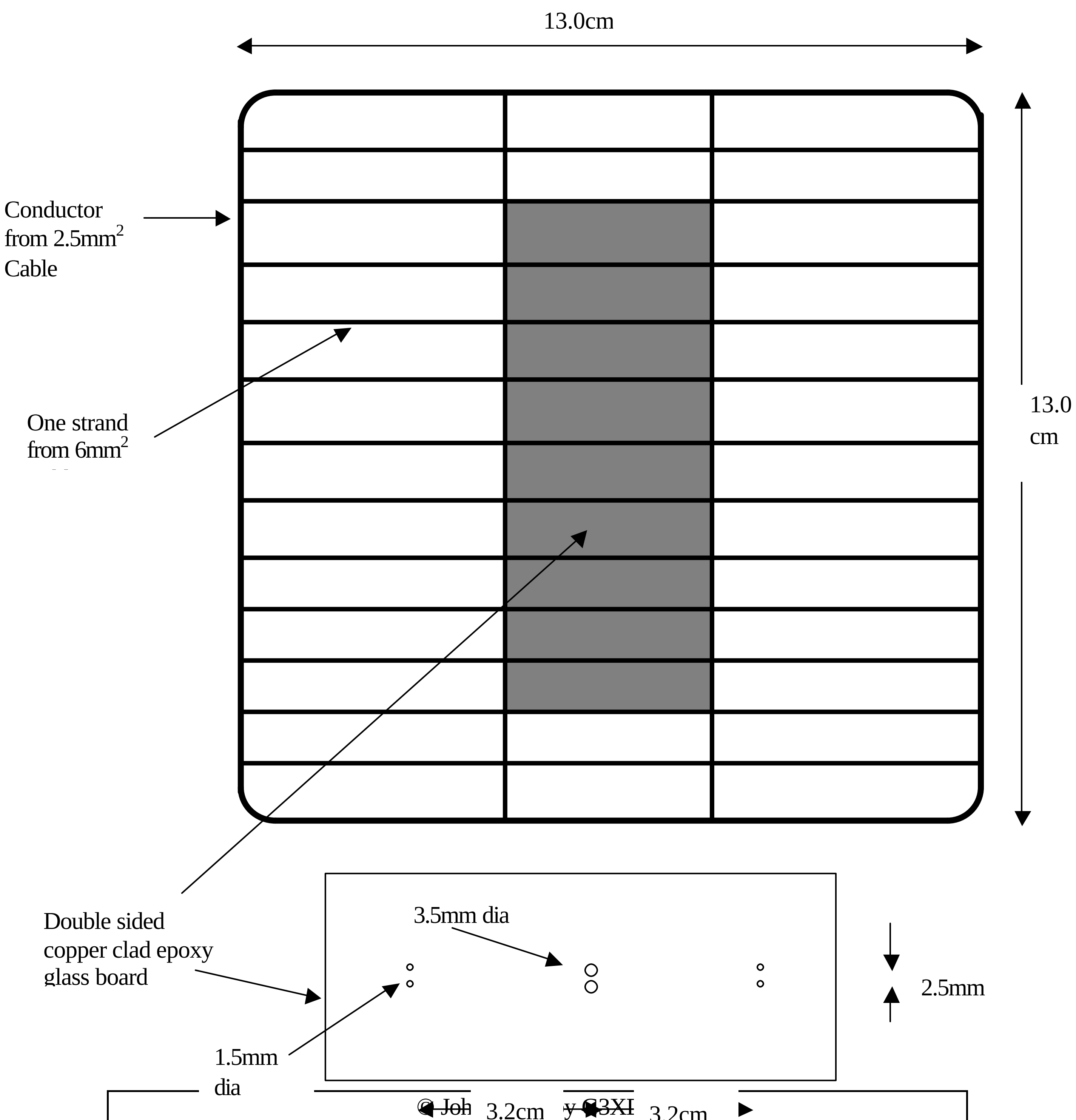
This can either be accounted for by re-setting the antenna heading (OK with digital bearing readout), or some clever engineering with a satellite positioner to move the dish or feed arm relative to the mast. I went for the former approach, but it does mean that talk back on 1.3GHz is more difficult as the antennas need to be swung back and forth. The loss in gain due to the feed being off bore sight is under 1 dB when the dish f/D is 0.6 or more and the offset is about 1 wavelength. Another advantage of the offset fed dish is that there is virtually no blockage by the feed assembly and no interaction between the feeds. A small prime focus dish would suffer from significant blocking by a low frequency feed, which could also result in lots of 10GHz RF getting into the 2.3GHz receiver front end if used on both bands.

The proof of the pudding is in the eating of course, so how did it fare on the air? Initial tests using GB3MHS as a local signal source were encouraging, with the dish showing a 3dB advantage over the Loop Yagi. Listening to the PI7GHG beacon, which is close to the noise level under flat conditions, was less conclusive, but still indicated a marginal improvement using the dish. Results in the May UHF Contest were at least as good as with the Loop Yagi, with comparable numbers of contacts and best DX. On balance I will put up with the need to move the antenna to beam on stations as I now have reduced weight and windage overall and it seems to offer slightly better performance.

A larger offset fed dish would easily outperform Yagi antennas, with an 80cm dish offering almost 3dB more gain than a 60cm version. Since 60cm satellite dishes are readily available either free (as a result of upgrades to digital) or new for a few pounds, a pretty respectable 2.3GHz antenna can be achieved at very low cost.

It should also be fairly straightforward to build a circularly polarised feed for use with AO40 – has anyone tried this?

Figure 1 2.3GHz feed - Reflector Screen



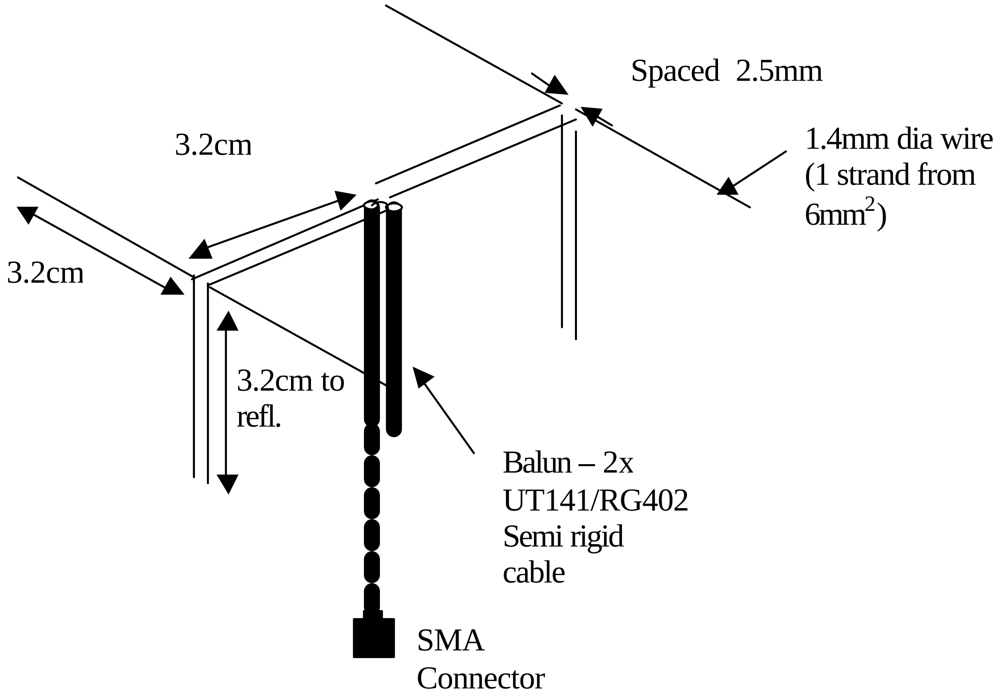


Figure 2 – Dual Dipole Feed