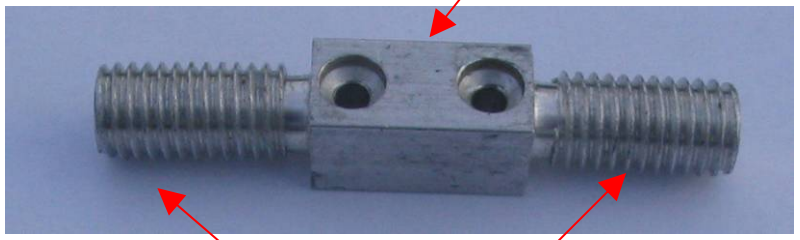
Long ago, I used to build 4m antennas using ‘fishplates’ to mount ½” diameter elements onto a 1” round boom. The fishplates were sheet aluminium pressings made by a local distributor of broadcast radio & TV antennas. They used them for their Band II (88-108MHz) antennas. They stopped making their own antennas, so the fishplates were no longer obtainable.

The fishplate system was fine for fixed station use but was rather difficult for rapid assembly in bad weather on hilltops for portable operation (it was easy to drop screws etc.!)
So when I wanted a 12 over 12 4m beam to use on Croghan Mountain in Ireland, I developed a system for very quick assembly using 1” square booms.

One inch of square section to attach to the boom



One inch length of M12 thread

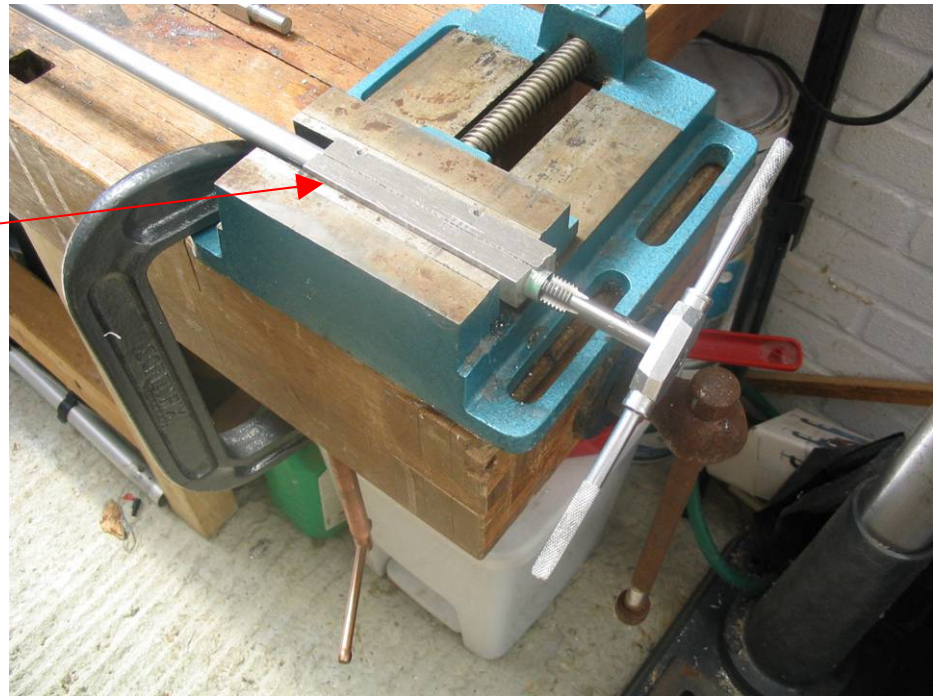
I found I could make it even faster to assemble if I machined away most of the thread, like this:

To attach the elements to these mountings, I cut an internal M12 thread in the tube ends, so the ends of the tube look like this:

Tape colours match markings on the boom for easy identification when assembling in the field

It is not at all difficult to cut an internal M12 thread. All you really need is an M12 tap and a tap wrench. Some lubricant on the tap is very helpful.

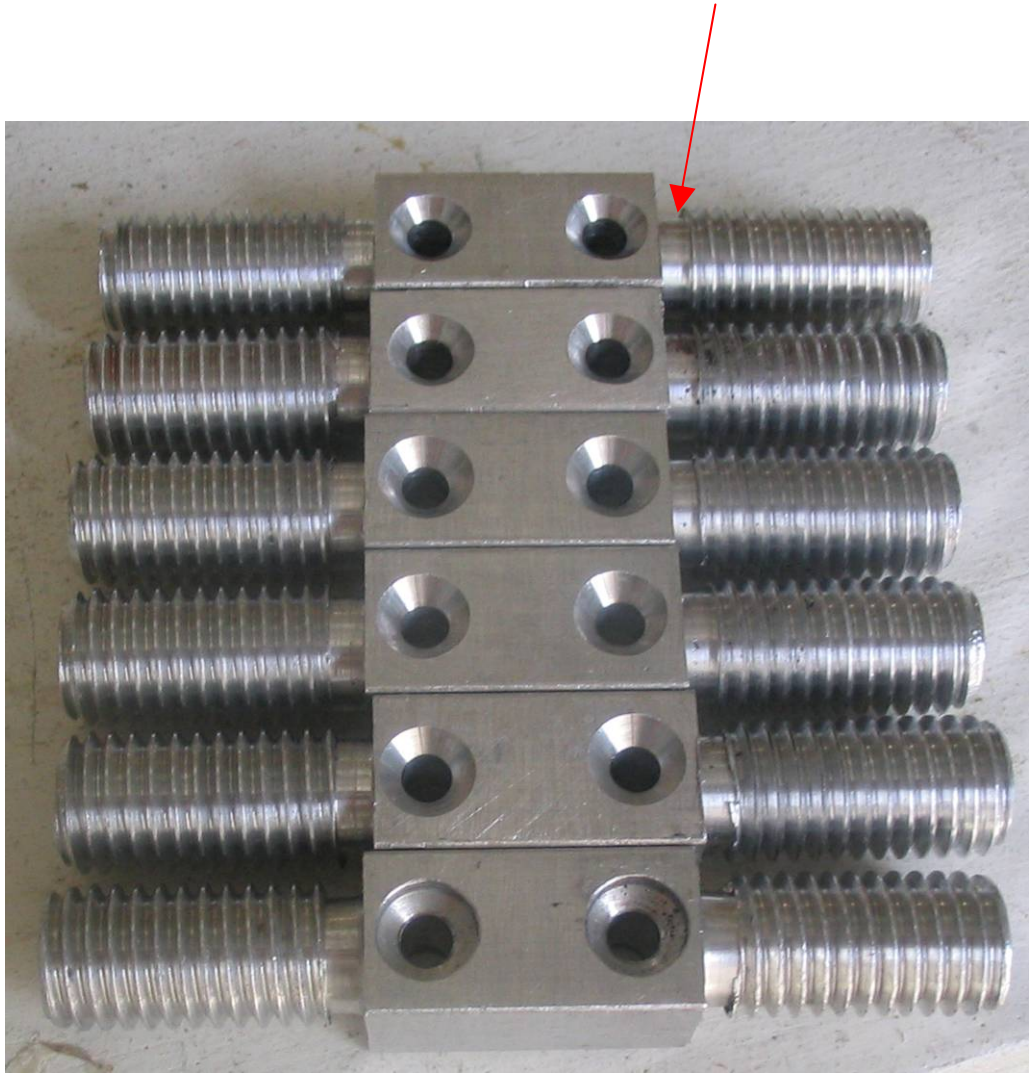
I started off gripping the pieces of tube with Jubilee clips but found that a split clamp like this was much better



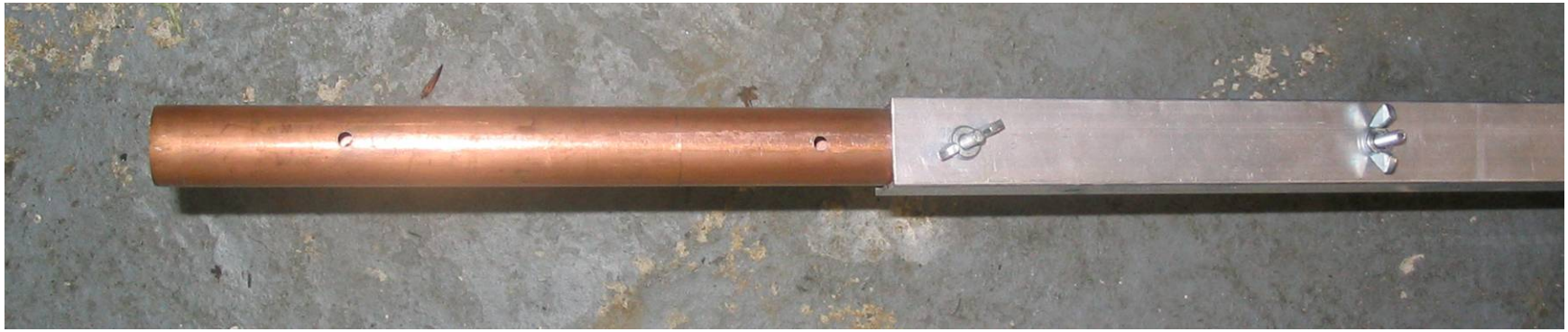
It is best to use quite thin-walled tube (e.g. 22SWG). It is possible to use thicker walled tube but it makes the thread cutting hard work!

The mounts are attached to the boom, which is 1” square, 1/16th inch wall, aluminium tube, with two M4 X 40 CSK stainless steel screws

I put a small undercut in the thread so the tube ends butt cleanly against the faces of the centre square section of the mounting piece.



1” square tube with 1/16th in wall is particularly easy to join. 22mm copper water pipe is a sliding fit inside it



So, I have made 6 ele beams (about 5m boom length) with the boom in two halves for easy transportation. I’ve used a piece of 22mm copper about 16” long, so 8” is inside each half. I secure half the copper (the fixed half) with ordinary nuts and the ‘do up on site’ half with wing nuts. The screws are M4 x 40.

NB for anything much bigger than 5m long, the 1” square boom gets a bit ‘droopy’ and needs support from above.

Example of long booms braced by ropes

This was my 12 over 12 for EI. They were built to the design method published in the ‘NBS’ 1976 paper. The booms were 8.8m (29’)

It was quite windy on Croghan mountain. When someone in the tent shouted “Which way are we beaming” The answer was “It depends which end of the beams you mean”!

I built four of these 6 eles for portable use

Cynr-y-brain (North Wales) 2004

Isle of Islay 2003

The NBS design is 30 years old and uses constant element spacing, so I am sure than modern designs are more highly optimised. Also, I have always used gamma matches to feed them. This has worked well but I think there is a risk of losses from contact resistances, so I wanted to get away from them.

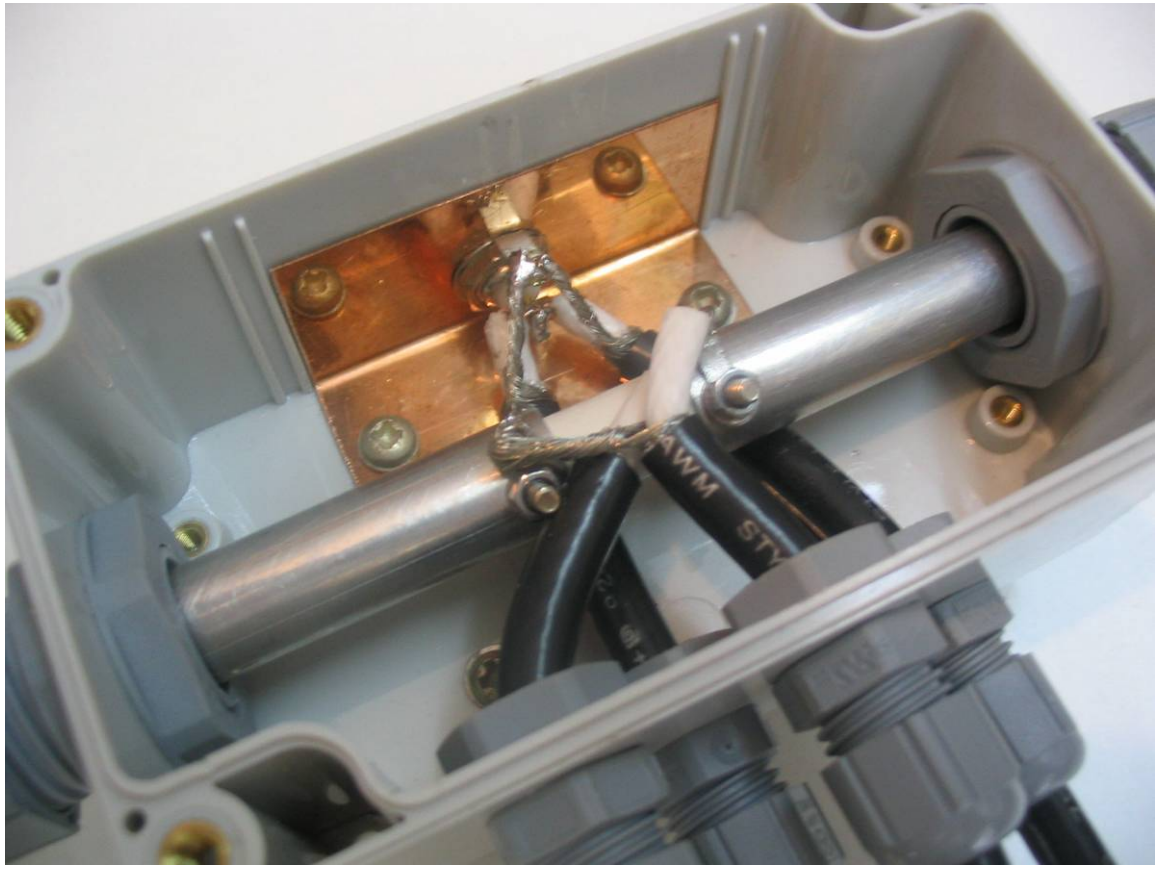
I ran lots of models using MMANA but I decided to use DK7ZB's 28 Ω design. This uses a coax balun and calls for the driven element to be insulated

I used Belden 9248 (75 Ω) cable (two pieces in parallel) for the matching section and cable glands to support the element and the matching section cable

The whole driven element, with the matching box in the middle, would be a gangly thing to pack and transport, so I made the main part of the two elements 'screw on'.

This is a close view of the inside of the box.

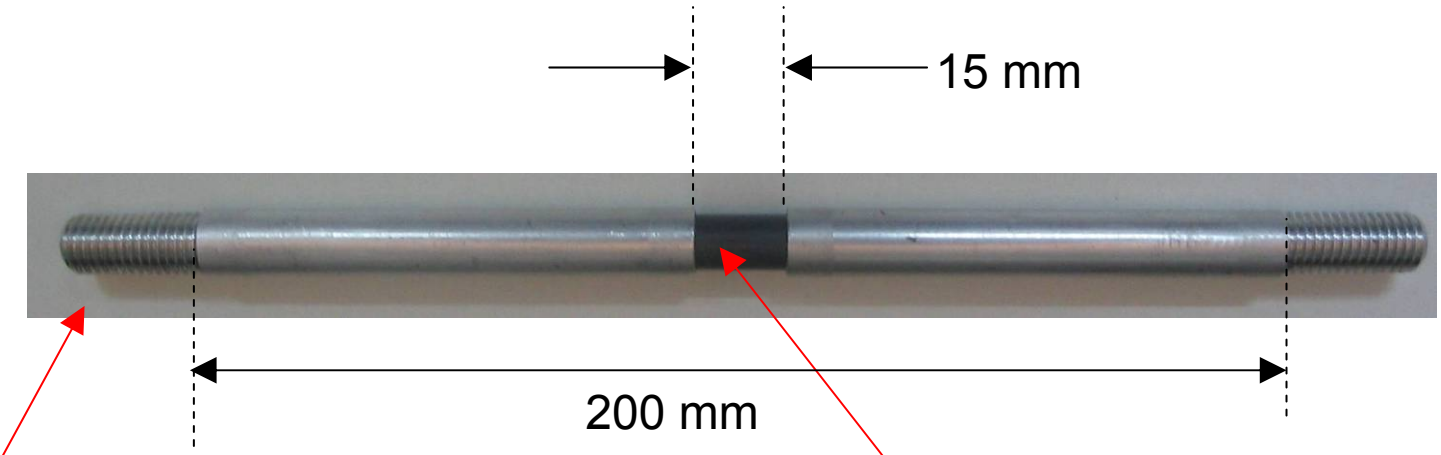
The box is 120 X 60 X 65 polycarbonate (Farnell 408-0830) Cheaper ABS boxes do not stand up to the weather. The 4 glands for the λ/4 matching section are Farnell 117-8868 with 303-5025 nuts



Belden 9248 has an unusually high velocity factor. A λ/4 at 70.2MHz is 833 mm.

A piece of thin sheet copper is used to ensure the outer of the BNC is grounded to the boom

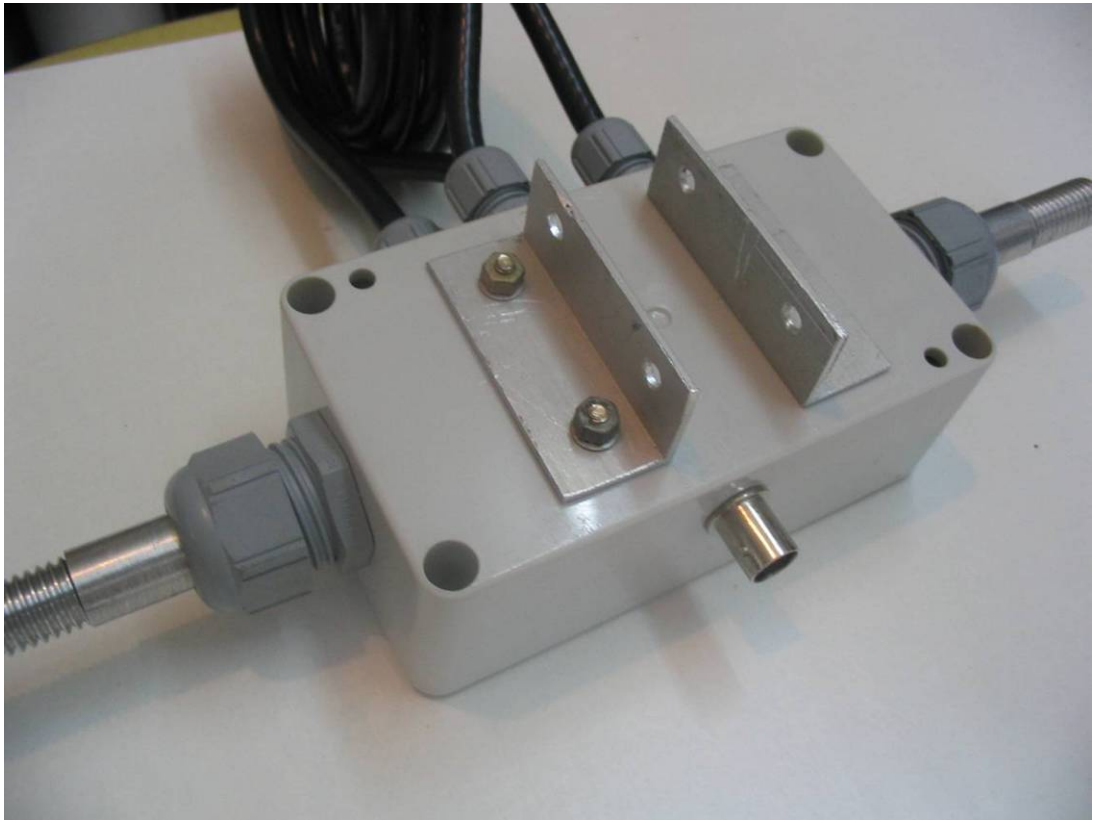
Driven element centre section



RS 680-707 10mm dia PVC bar

50mm long pieces of Al
bar cut with M12 thread

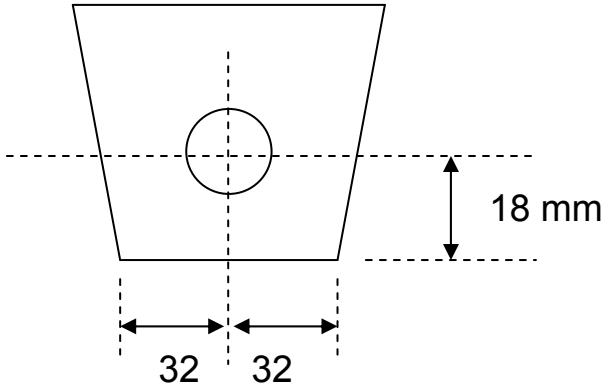
This is the underside of the box, to show how it is attached to the boom
(Two lengths of ¾” al. angle and more M4 X 40 screws and nuts)

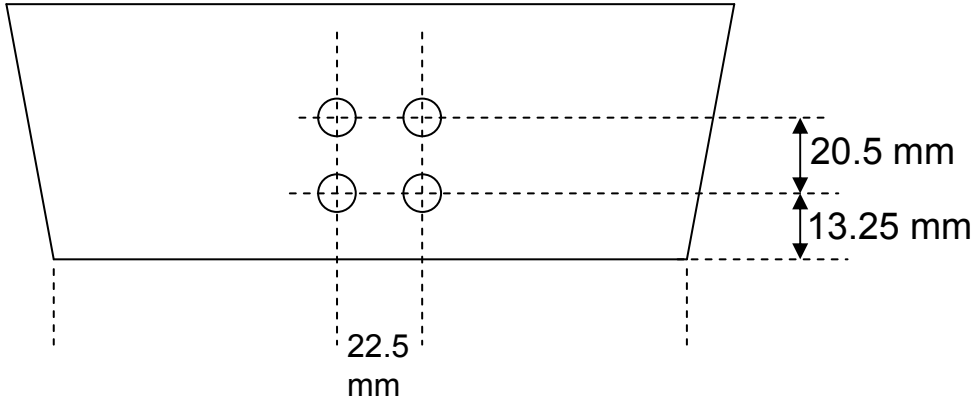


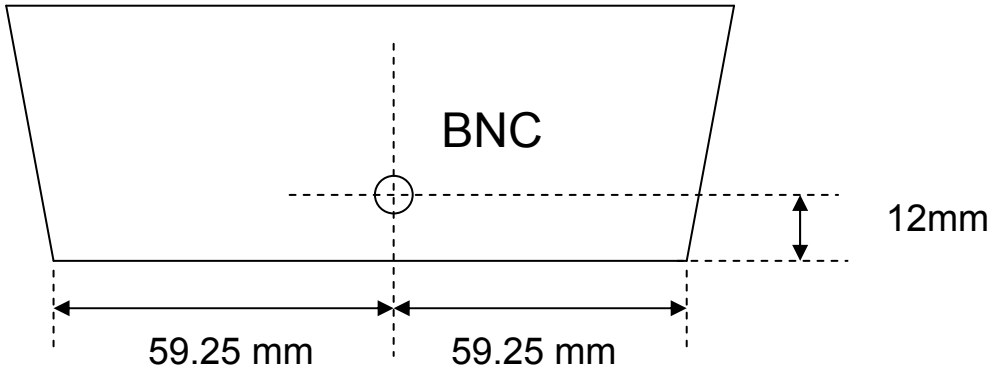
The cable glands that fix the ½” tube at each end of the box are Farnell 1178870 with nuts 3035049

Drilling the box

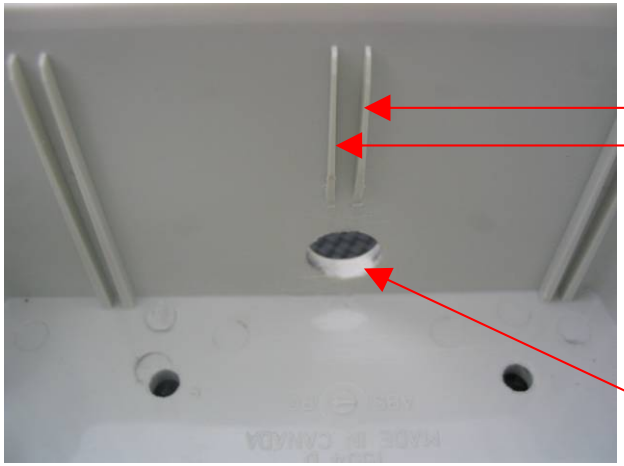
- I used flat wood drills, 13mm for the cable gland holes and 20mm for the element glands and a regular 10mm twist drill for the BNC hole.
- These boxes are an awkward shape to mark out. The sides are not square to the bottom. I have exaggerated this in the sketches below





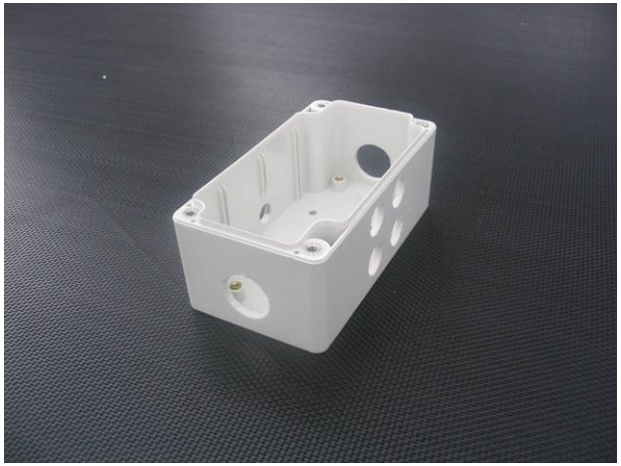


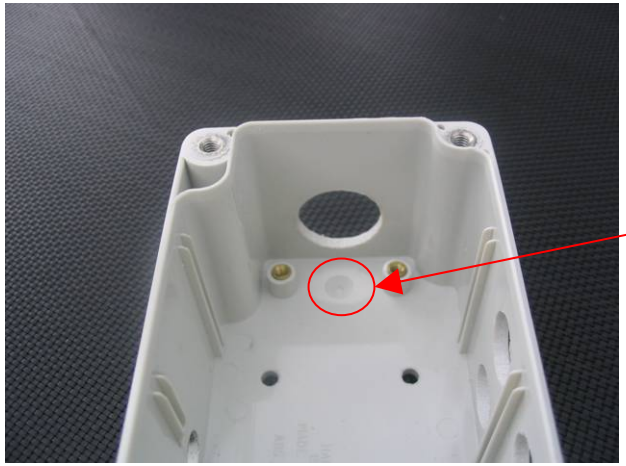
Drilled box



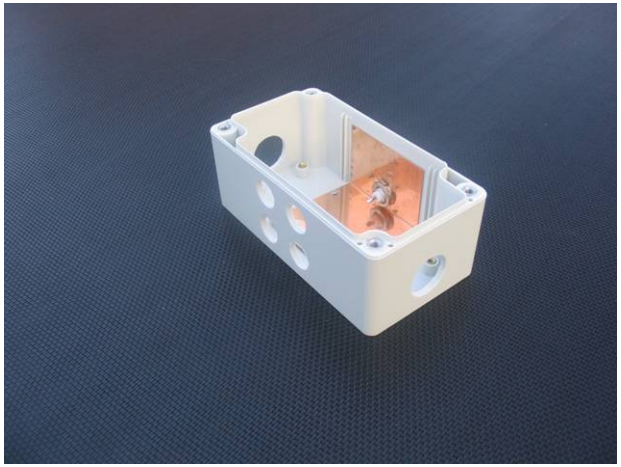
These ribs need to be carved away (I used a wood chisel)

Hole for BNC



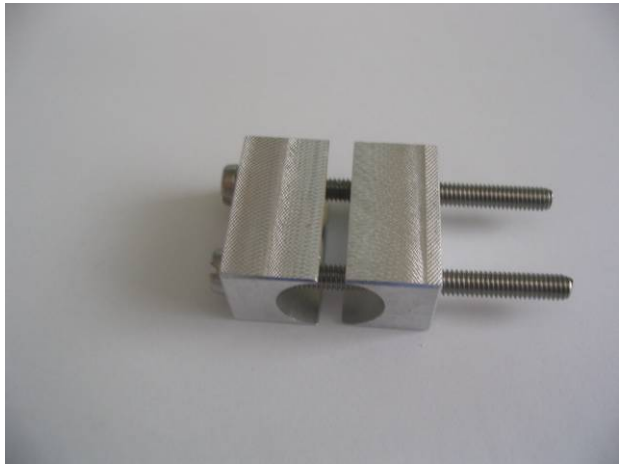


There is a boss here at each end that needs to be drilled away.



Next generation of element mounting

- The M12 screw-on elements are fine for portable use but they are not ideal for ‘permanent’ fixed station use because cutting the thread reduces the tube wall thickness and weakens the tube.
- Also, it would be good to have the parasitic elements in one piece (‘tip to tip’) so there can be no contact resistance issues.
- The elements each have two holes drilled through them for the M4 X 60 screws.
- This gave rise to this new element clamp:



DK7ZB antenna now in use at G3TCU

View of the matching box at the driven element (BNC connector on the front)

Element spacing is nothing like constant!