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Dielectric Antenna for 3cm

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Dielectric antennas provide a simple means of achieving reasonable directional gain in a compact unit. They operate on the principle of refraction, but I shall not bore you with all the theory, its a little heavy and to be honest my middle-aged brain is unable to get around it as well as I could in my student days.

The design provides a gain of app. 20dB, with a match of better than 1.2:1 over the whole 3cm band.

The waveguide is 22mm copper pipe (the standard plumbing variety) and has a transition to WG16. The polarisation is the same as the feeding waveguide.
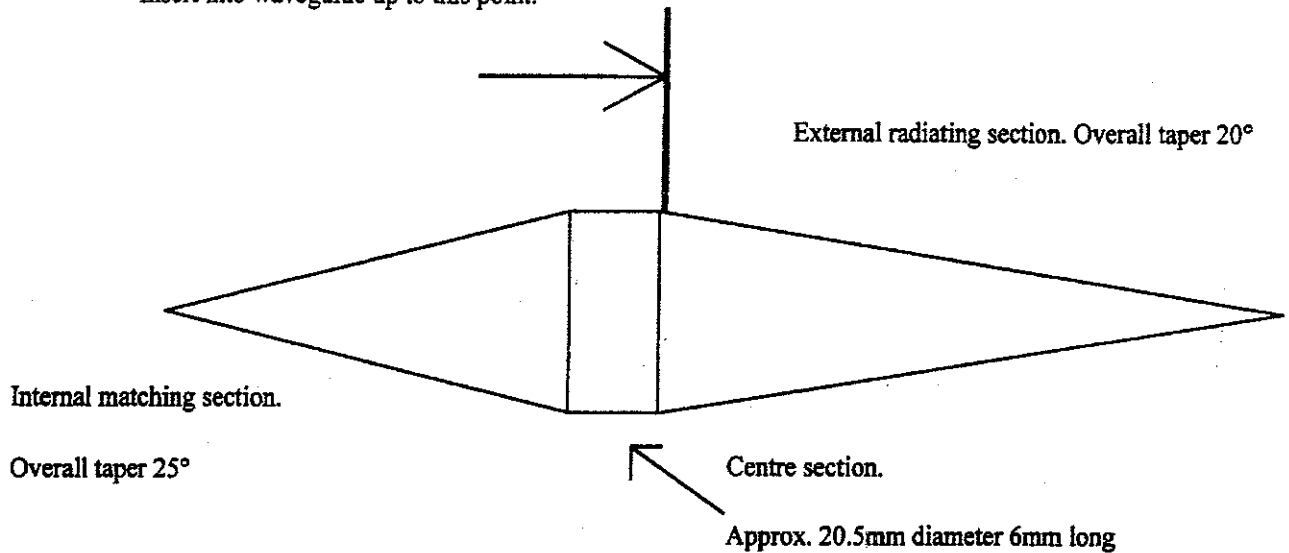
The material should be Nylon 66, PTFE may be used, it is more difficult to machine but provides improved performance. Nylon 66 is available from good engineering suppliers or RS Components and possibly Farnell.

Machine on a lathe very carefully with a sharp tool. Nylon 66 is naturally slippy. This means that it will not grip very well in the chuck. Also, as it is flexible it can grab, digging the cutting tool into the job, ripping it out of the chuck and throwing it across the workshop. I know from experience. A chuck rotation speed of 600 rpm is recommended, also clear the swarf away regularly whilst machining.

The parallel section should be a tight fit into the 22mm pipe, which will keep moisture out. As there can be a variance in the dimensions of copper pipe it is

Insert into waveguide up to this point.

External radiating section. Overall taper 20°

Internal matching section.

Overall taper 25°

Centre section.

Approx. 20.5mm diameter 6mm long

Dielectric Antenna with app. 20dB Gain

best to measure the internal diameter accurately before machining. There is no point in trying to glue the unit into the pipe as glues do not stick to Nylon 66.

To convert the 22mm pipe to the standard WG16 waveguide requires a transition. These are relatively simple to construct.

Approximately 120mm of 22mm copper tube should be annealed for app. half its length, by heating it to dull red and allowing it to cool naturally. Cut a 75 to 100mm long piece of hard wood to a rectangular section of 23mm by 10.75mm. Then, 50mm from one end of this piece of wood shave it down to a section of 6mm square.

The wooden former is the swaged (aka hammered!) into the annealed end of the pipe. As this is done gently hammer the out-

side to form the correct size and shape to fit a WG16 flange. Clean the pipe well before soldering into the flange. The other end of the pipe may need trimming back if damaged during swageing.