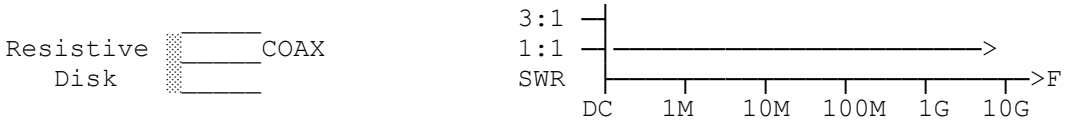
QRO Dummy Loads

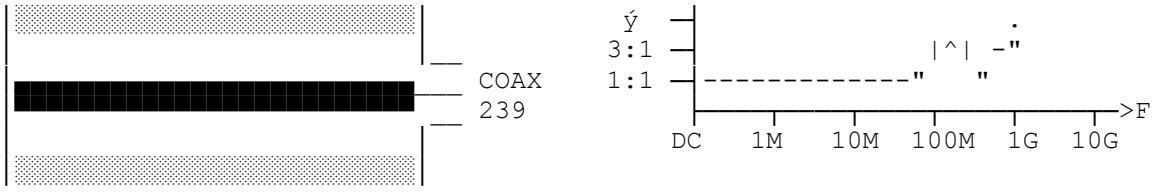
By G8MNY (Corrections Jul 09)
(8 Bit ASCII Graphics use code page 437 or 850)

PRINCIPLES

1/ Ideally for a perfect match at all frequencies a dummy load should be a resistive disk on the end of the coax. Drawback is the low dissipation, but it is used in low power RF test probes at UHF/SHF.

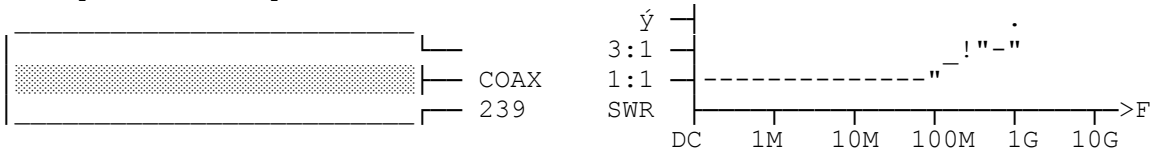


2/ More practical approach is to make the coax outer the resistive element. This gives high surface area & relatively high dissipation. Elements are made for 25W to 1kW. The Z is controlled by the coax inner to outer ratio as in normal coax (e.g. 2.3 in air for 50Û), plus the element resistance must equal the load Z.

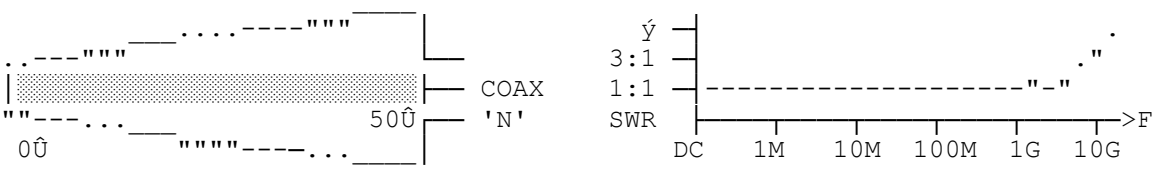


But they do suffer from 2 problems. They radiate at higher frequencies as the voltage on the outer is seen as a 1/4 wave & a good aerial, this also mucks up the load match. An outer cage reduces some of the radiation but does not help with the SWR.

3/ Put the resistive rod inside a tube. This works just like 2/ but it has no radiation. However it still suffers from miss match as the element becomes close to 1/4 wave. And with the smaller thermally screened load power dissipation is a problem.

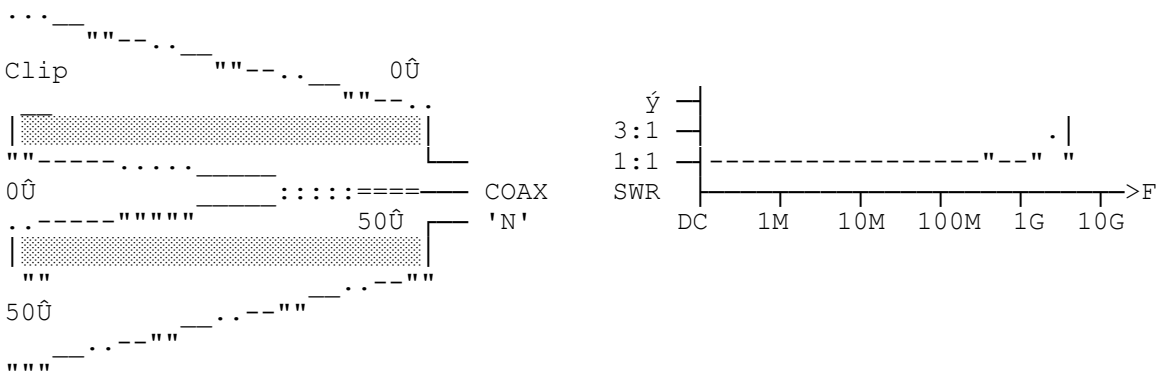


4/ By putting the resistive element rod into a conical box, the match can be maintained to much higher frequencies & the 1/4 wave problem goes away. UHF 100W loads are made this way.



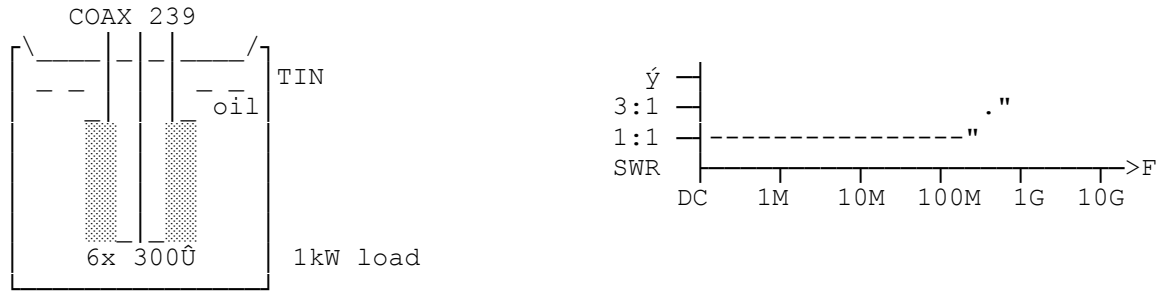
The internal load to conical box forms a coax, of the same Z as the load resistance element has left to go. The cone starting diameter is 2.3 (for 50Û in air) times the rod diameter, tapering to the same diameters at 0Û. The outer case may be a heatsink, but the hot resistance inside can easily be damaged by overloads.

5/ By using the same principle as 4/ for the outer mesh cage cone & inner coax centre rod cone with a large high power ceramic HF tube load, can made to work OK at UHF! I made one that stands 1kW intermittently at 432MHz & is still a good load @ 1296MHz.



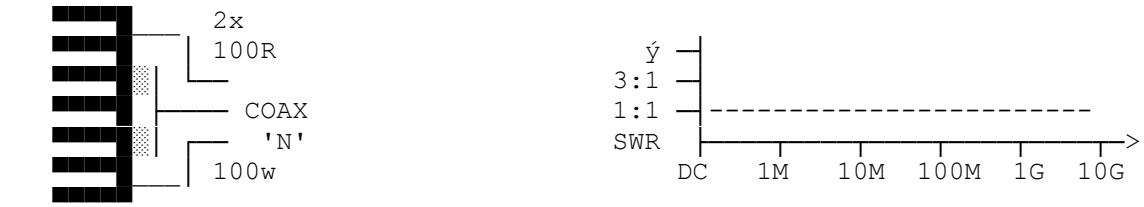
The inner cone is made from large coax braid soldered to a thick wire to the 'N' connector, & a clip holds the braid attached on to the outer of the ceramic tube end. The outer galvanised mesh (1cm holes) cone is bolted to the plate that has the 'N' socket bolted to it. The tube ground is by soldered on tags. There is some radiation with a mesh outer but dissipation is OK.

6/ Some designs use overrun load resisters in transformer oil or other cooling system. Submersed in freely flowing Oil, some resistors improve dissipation 20 times. So small resistors can be used & often several are placed in parallel to make the load.



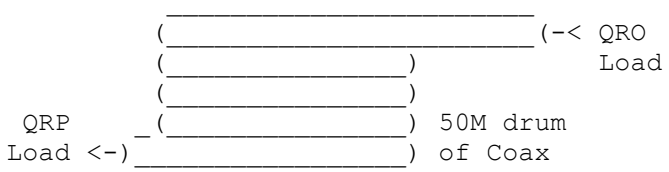
SWR limited to internal leads & large resistor size.
Main problem with these is loss of oil through seals, or upturned tin etc.

7/ Or you can use modern small Metal Film resistors on low thermal resistance ceramic material, with thermal conducting past, on a large heatsink.



The advantage is the small load size permits good frequency response & fairly high powers, but over power surges will destroy them.

8/ And finally don't forget that long reel of coax, these also make good dummy load if the coax loss is high enough & the first few metres are unwound to dissipate the heat.



I have run >400W on 70cms on test this way without a QRO dummy load. The first few metres of UR67 coax did get quite hot though & there was some radiation, but the SWR was as good as you can expect from coax!

On say 13cms, 2m of UR43 may be OK for 50W without a QRP load, as the cable loss is so high SWR < 1.2, Radiation ??

Why Don't U send an interesting bul?

73 De John, G8MNY @ GB7CIP