160m 7 Ferrite Rod Aerial

By G8MNY (Updated Oct 10)
(8 Bit ASCII graphics use code page 437 or 850, Terminal Font)

This is a design used in a local club construction project to make a small 160m aerial that can be used on low power Tx.

To get the signal level up on Rx & Tx it uses 7 large ferrite rods to form a large bundle.

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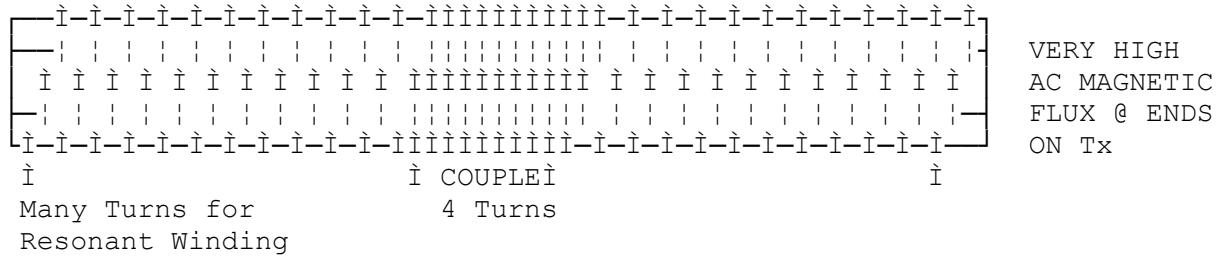
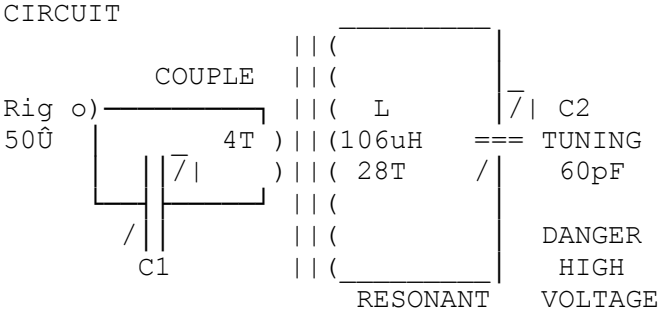
These are covered with a heat shrink tube or tape to form the tight tight strong bundle. Two windings are then wound on them, the high Q resonant winding is spaced out, & the 4 turn coupling winding is put on in between them.

THE COILS

The resonant winding covers most of the ferrite with a spaced out thick (10A) well insulated wire.



CIRCUIT



CAP VALUES

C1 is 150-250pF & can be made up with fixed 150pF 500V capacitor & a variable 100pF in parallel.

C2 is a large air spaced capacitor that has to handle the power you want to put in. It has to resonate the L you have wound & have a large insulated knob to keep it balanced when your hand is on it tuning. Values of 2x 500pF @ 500V for an L of 10 turns, down to 60pF @ 7kV for 28 Turns are suitable for about 30W.

I reassembled an old large bolt up type 180pF variable capacitor, doubling the spacers between plates to give 8-60pF with 2mm air space. I then needed 28 turns on the ferrites, to just resonate it @ 1.8MHz @ maximum capacitance. This gave the maximum power handling for that capacitor.

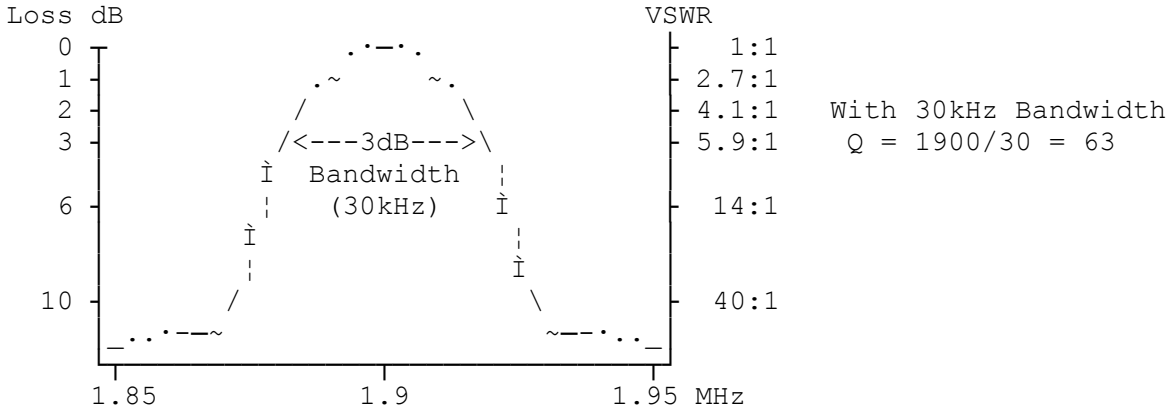
Because of the balanced high voltage is on the capacitor, the shaft will be at high voltage so a very well insulated large plastic knob is needed!

In theory the peak voltage could be as high is this..

$$\text{Peak Voltage} = Q * 1.4 * \sqrt{\text{Watts} * Xc} \quad (= Q * 223V \text{ for } 30W)$$

Where Xc = 834Û for a C2 in mesh of 100 pF @ 1.9MHz.
& Q = the gain, less the wanted radiation loss.

The Q can be estimated be the Rx bandwidth/F for a -3dB drop or Tx SWR 5.9



BANDWIDTH
As with magnetic loop aerials the Rx is well protected from most of the band noise & strong out of band signals due to the high Q, & with poor or broadband front end Rx, this type of aerial can be a great advantage over all the signals a long wire present to the Rx.

ARCING
At resonance on Tx there is very high voltage across the tuning capacitor & it is liable to arc over if there are any imperfections like dirt or plates bent too close (corners arc first). Dielectric caps (other than mica) are generally not suitable for Tx, as the losses cause heating & melting of the dielectric.

On test in CW/FM mode, once it starts arcing you get a Jacobs ladder effect & the arc will be maintained following an airborne dust strike (turn Tx off!), but this is not a problem for SSB & the same peak RF generally will NOT cause an arc.

SATURATION
The ferrite may start to saturate (in the middle) after about 10 Watts, but C1 can be adjusted to improve the match at the higher powers. Heating is only very slight for a 30W carrier after several minutes. (do not touch it with Tx RF on as U may get a deep RF burn!)

STRONG RF FIELDS
When used for Tx, the AC magnetic flux of the end of the rods is EVERY HIGH & can easily damage nearby electronics if too close, so keep ICs, /M phones, & Heart pacemakers, well away!

IN USE
It is quite directional & very selective, with a sensitive Rx (preamp on), the normal band noise floor can be heard. A single topband QRM source can often be nulled out enabling quite good Rx.

But the gain on Tx of course will be 30dB or so down compared to a proper matched long wire aerial or dipole, so only locals can contacted with it, & being so directional limits the usefulness on ham nets I have found.

Why Don't U send an interesting bul?

73 De John, G8MNY @ GB7CIP