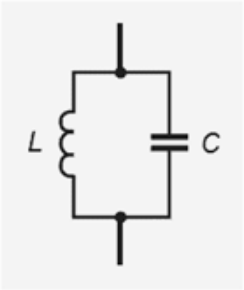
Simple Building and Tuning of Traps

By Martin Steyer, DK7ZB

Traps are useful for multiband operating of all kinds of antennas. It is much easier to build traps as you think and you do not need any special measuring equipment for tuning. Only a transceiver each will be needed and a simple homemade measuring circuit.

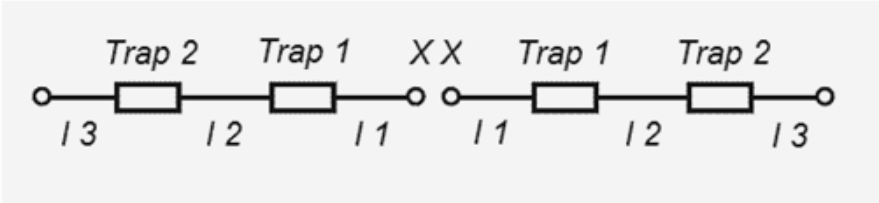
A trap is a parallel circuit of L and C on the frequency you want to close an antenna segment.



For ***n*** working frequencies of an antenna, you need ***n***-1 traps in each part of the antenna. For example a 2-band-dipole needs one trap in each half of the antenna.

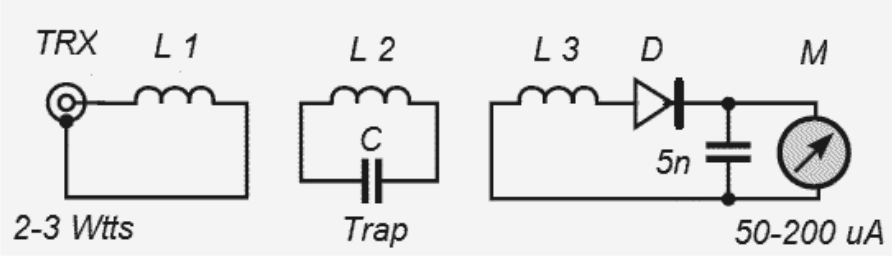
The trap can consist of a coil and a separate HV-capacitor. Another method for building traps with coax-cable will be described further down.

Here we see the principle of a 3-band-dipole. If we need 10m, 15m and 20m, trap 1 will be resonant on 28,5MHz and trap 2 on 21,2 MHz.



How to Tune a Trap?

We need only a simple arrangement of two coils, the trap, a diode, a C of 5nF and a meter for tuning.



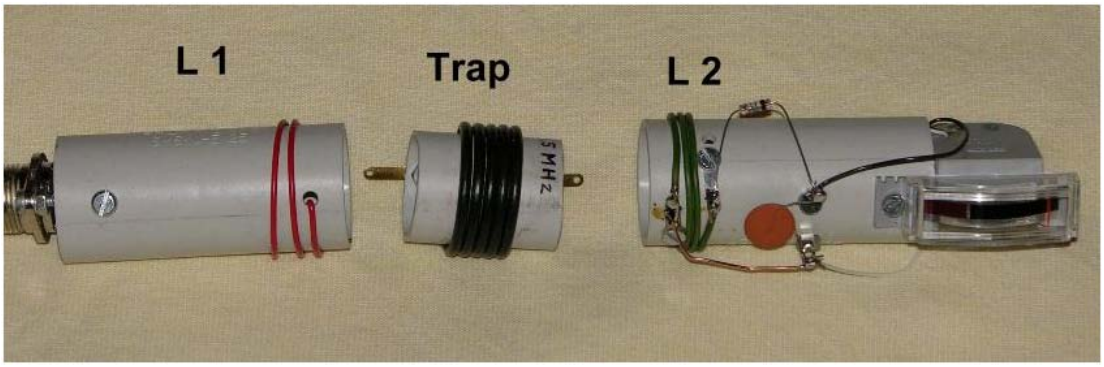
L 1 = 2-3 turns, 25-30mm diameter

L 2+C = trap to tune

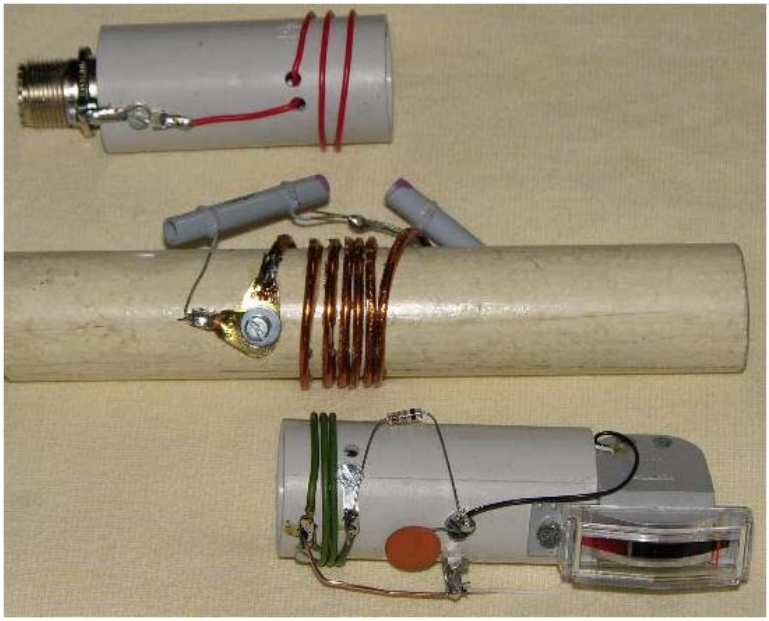
L 3 = 3 turns, 25-30mm diameter

D =1N4148 or similar

The next photo shows how to tune the trap. We couple 2-3watts continuous RF from the transceiver into L 1. When changing the frequency, we will find a clear dip of the meter on the resonant frequency of the trap. In that case the RF is coupled from L1 into the trap and then to L2, where it will be rectified. The dip is very sharp on 10m and we can locate the resonance with an accuracy of +/- 10 kHz!



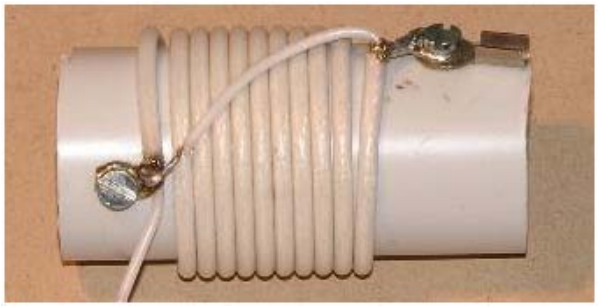
The photo next shows another arrangement of the three coils, you can make the distance between the coils greater for a sharper dip. Here, it is a 28,3MHz-Trap with two 60pF-5KV-ceramic capacitors in series and a coil of enameled copper wire for the vertical sloping dipole described later.



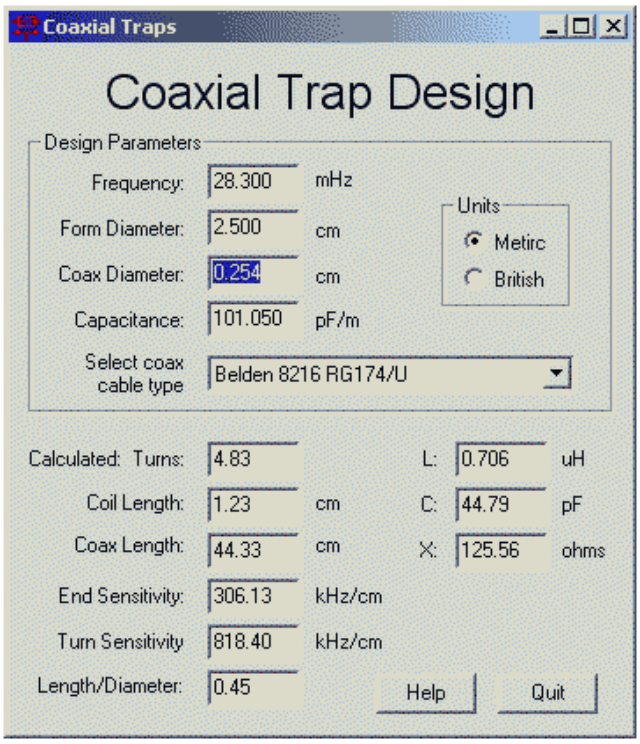
The picture below shows how I tuned a RG-174-coax-cable-trap for a 10/15m-Vertical on 28,300MHz. By changing the distance of the windings, the frequency can be influenced. In the case of this RG-174-trap we come from 27,8MHz to 29 MHz. After tuning the coil will be fixed with some glue.

At the European ham flea-markets you can get very good HV-capacitors from Russian military supplies; here we see two different ones with 15KV and 20KV. With these capacitors we can build traps for more than 1 KW continuous power.

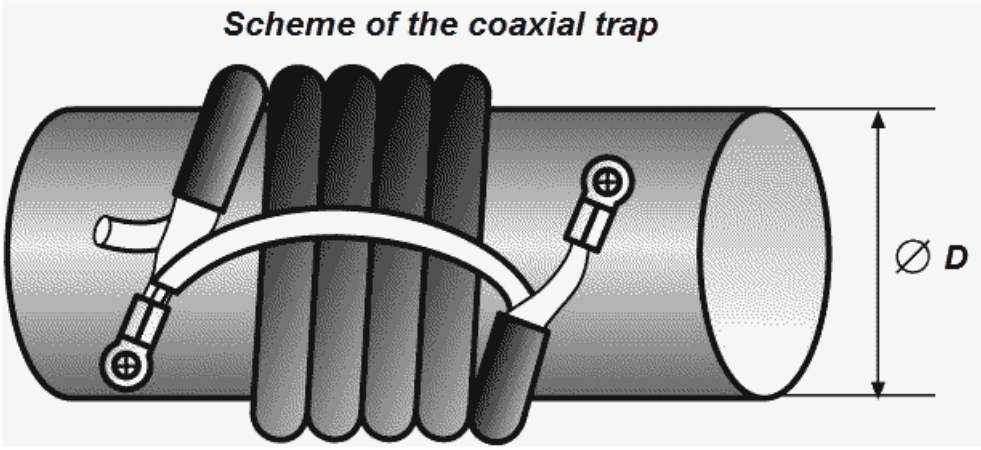
Another way to build traps is to use coax-cables. The inner conductor and the screen form the C, the screen is the inductivity of the trap. The main problem is that we cannot change L and C individually. Coax-cables have a C of 60-100pF/m, see tables with the data of the cables.



The picture shows a 30-m-Trap with PTFE-coax



A very useful tool for coax-traps is a program of Tony, VE6YP named "coaxtrap.exe". You can download the program from his website at www.qsl.net/ve6yp .

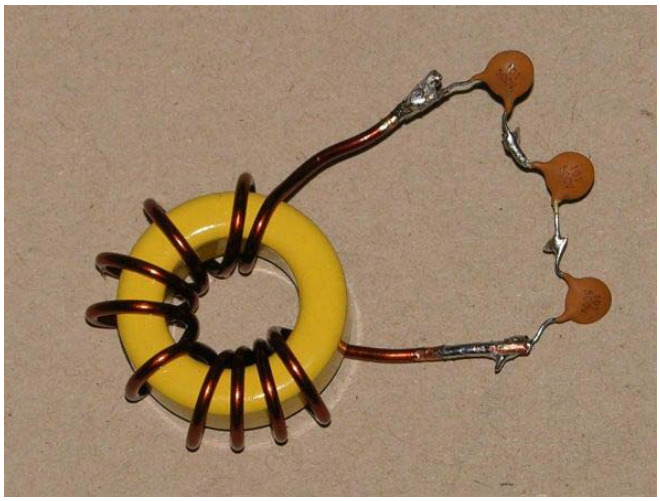


Traps with Toroidal Coils

In the range up to 150 Watts, RF Traps with toroid-coils are simple to build and to tune. A problem could be the parallel capacitor for high Voltage. Experiments show in a load-test that a Voltage of 2-2,5 KV for the C is sufficient for proper working.

If you cannot get such capacitors you can use 4-5 C's with 500 V in series. In a test 3 x 100 pF/500 V in a 10m trap could handle 100 Watts.

For the tests I used the toroid-types T94-6, T94-2 and T106-2. The Table shows the calculated number of turns, in practice the real number is a little bit lower (nice for tuning...).



The above example shows a toroidal trap — 9 1/2 turns of 1,5-mm-CuL and 3x100 pF/500 V in series gives a resonant frequency of 28,4 MHz. This trap handles 100 W RF, but better is a voltage of 2 - 2,5 KV for the capacitor.

For the calculating we need the Thomson-formula
f (Frequency) in ***Hertz***, L (Inductance) in ***Henry***, C (Capacity) in ***Farad***

$$f = \frac{1}{2 \cdot \pi \cdot \sqrt{L \cdot C}}$$

We need **f** in ***MHz***, **L** in ***uH*** and **C** in ***pF***

Here is the modified formula for our purposes:

$$f/\mathrm{MHz} = \frac{159}{\sqrt{L/\mu\mathrm{H} \cdot C/\mathrm{pF}}}$$

$$L/\mu\mathrm{H} = \frac{25\,330}{(f/\mathrm{MHz})^2 \cdot C/\mathrm{pF}}$$

$$C/\mathrm{pF} = \frac{25\,330}{(f/\mathrm{MHz})^2 \cdot L/\mu\mathrm{H}}.$$

The $\mathbf{A_L}$ is a specification of the toroid and gives the Inductance/100 turns in **uH** on the core. **N** means the number of the turns.

$$N = 100 \cdot \sqrt{\frac{L/\mu\mathrm{H}}{A_L/(\mu\mathrm{H}/100\ \mathrm{Wdg.})}}.$$

The calculated number of turns for the Amateur-bands

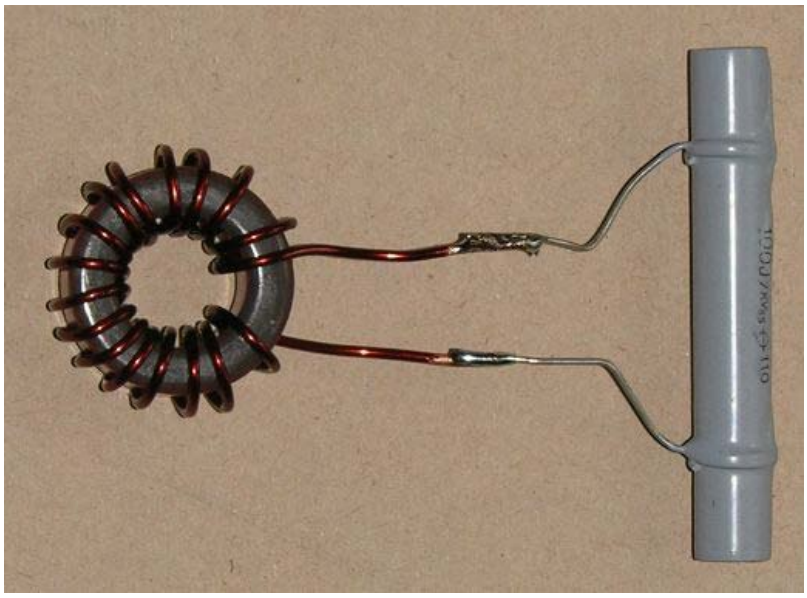
Band	Inductivity	Capacity	Toroid	Turns	
10 m	0,95 uH	33 pF	T94-6 (yellow)	11	1,5-mm-CuL
12 m	0,78 uH	47 pF	T94-6 (yellow)	10	1,5-mm-CuL
15 m	1,2 uH	47 pF	T94-6 (yellow)	13	1,0-mm-CuL
17 m	1,65 uH	47 pF	T94-6 (yellow)	15	1,0-mm-CuL
20 m	1,85 uH	68 pF	T94-6 (yellow)	16	1,0-mm-CuL
30 m	2,47 uH	100 pF	T94-2 (red)	17,5	1,0-mm-CuL
40 m	5,1 uH	100 pF	T94-2 (red)	24,5	1,0-mm-CuL
80 m CW	10,05 uH	200 pF	T106-2 (red)	27	1,0-mm-CuL
80 m SSB	9,25 uH	200 pF	T106-2 (red)	26	1,0-mm-CuL

16 1/2 turns close spaced give an inductivity of 2,8 uH

16 1/2 turns wide spaced give an inductivity of 2,5 uH

The upper pictures show how the inductivity can be influenced by changing the distance between the turns of the coil. Closer turns give a higher inductivity, wider a lower. Tuning is no problem!

Measuring the frequency of a toroidal trap was described earlier above.



Above is the complete trap for 10,12 MHz: 16 1/2 turns on a T96-2 (red) and a capacitor 100 pF, 7 KV. **-30-**

Martin Steyer, DK7ZB

Born in 1946, now retired

First licensed 1969 as DC9BQ, since 1973 DK7ZB ex F0HSE

Favorite bands: 6m + 30m

QSOs 90% in CW!

Equipment Shown:

Shortwave: ICOM-7400, Linear ETO-91b

50MHz: YAESU FT-890 +Transverter

2m/70cm: ICOM-821H

2m-Linears homemade with QQE06/40 (100 W RF), 4CX250B (400W RF)

70cm PA 4CX250B, (350W RF)