# The Radio Hotel

# Chokes, Baluns and Transmission Line Transformers

**By Rick W5RH**

Most hams, when trying to understand antenna systems, have a bit of a problem in defining the different devices used to control and assist their antenna system in working properly. So, first, a few fundamental definitions, as related to Ham Radio antenna systems.

**A Choke** –is an inductor (L) used in an antenna system to block common mode currents produced due to a system imbalance or by induced antenna radiation currents. It can be as simple as an air wound coil of wire or coax or it can be wound on a ferrite core of some type – a torroid, beads, or a rod.

**A Balun** –is an inductor based passive RF device that converts a **bal**anced signal from an **un**balanced signal. A balun's input and output impedances are typically equal 1:1, but it can also be configured to transform impedance ratios such as 4:1 or 9:1. Common-mode chokes are also used as baluns and work by causing the elimination of common mode currents.

**A Transmission Line Transformer** – is a TL based device used to match different RF impedances. They can be configured to simultaneously provide the transition from unbalanced to balanced or unbalanced to unbalanced. Transmission-line transformers are mandatory at frequencies where traditional magnetic coupling transformers don't operate properly.

**A Trap** – is, typically, a combination of an inductor and a capacitor that blocks/stops the flow of RF energy along the length of an antenna element. Similar to a choke but with the addition of a capacitor it has a resonant "active" frequency, so typically it is related to a narrow band of frequencies. i.e. 20 meter trap.

**A Loading Coil** – is an inductor that is used to provide additional electrical length to an antenna element while keeping the physical length shorter than a resonant, linear element.

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In the transmission line portion of the antenna system, we use coax and twin lead (also called ladder line or open wire line). Coax is an unbalanced type of transmission line and twin lead is balanced. But just what is balanced or unbalanced?

**Unbalanced** cable, i.e. coax, uses the center wire that carries the varying voltage. The second wire or shield, is at ground potential and acts as a reference point.

A **Balanced** transmission line uses two wires, both isolated from ground and both carrying a varying voltage – but the voltage on one of them is phase-shifted by 180°. Hence, minimal radiation from the TL, as the out-of-phase voltages (mostly) cancel.

We can now take these definitions to the next level and find out how these devices are made, how they help us and where to use them. But, I am out of space, so I encourage you to tune in to the BVARC November club meeting where we will have a presentation about **Chokes, Baluns and Transmission Line Transformers.** November 12th 7:00 PM Elections too.

Enjoy your hobby. 73, Rick -- W5RH