Antennas

RANDOM LENGTH ANTENNAS by Bruce Portzer

Most medium wave DXers have used the random-length antenna at one time or another. This type of antenna has a number of advantages and disadvantages when its performance is compared to that of the more popular loop antenna. These characteristics will be outlined in the following paragraphs.

In this article, I will use the term random-length antenna instead of the more commonly used term "longwire". While the word longwire is used almost universally by hams, SWLs, and MW DXers, a true longwire is actually an antenna that is long compared to the wavelength of the received signal. A Beverage antenna is a good example of a true longwire for MW. This article deals with antennas much shorter than one wavelength. At medium wave frequencies, 540-1600 kHz, this translates into lengths less than a few hundred feet.

Directional effects: Most DXers believe that random length antennas are non directional. In reality, they exhibit some directional characteristics, even with lengths of less than 50 feet. In theory, the pattern is a figure 8 with "nulls" off the ends of the antenna and maximum pick-up broadside to the antenna. In reality, the antenna lead in, ground effects, and nearby objects (buildings, etc.) will cause the pattern to be more of a peanut shape. Still, the effects are noticeable. I have two wire antennas 35 feet long with unshielded vertical leadins 15 feet long. Frequently, at my Seattle home, KDON in Salinas, CA dominates 1460 kHz on the east-west antenna, while KHWX in Yakima, WA dominates on the north-south antenna. Similarly, I can sometimes have CHQR in Calgary dominate 810 on the north-south antenna and KGO in San Francisco on top using the East-West wire.

Experiments made on groundwave signals have shown the front-to-side ration to be about two S-units (10-15 dB) on my 35 foot wires. This is nowhere near as good a null as can be obtained with a loop, but it can make a difference in which station dominates a channel. It can also make a difference in the amount of interference received from local signals and power lines. However, keep in mind that as a random-length wire becomes shorter, it does tend to become omni-directional.

Vertical gain: Few DXers realize it, but a random length wire antenna has a vertical pickup pattern which tends to favor skywave signals and reject groundwave signals. A typical vertical pattern is shown in figure 1. The pattern is applicable for antennas less than ½ wavelength, very close to ground ("very close" in comparison with the wavelength of a MW signal). The pattern gets "slimmer" (more of it directed upwards) as the antenna is placed closer to ground or as antenna length becomes a smaller fraction of a wavelength.

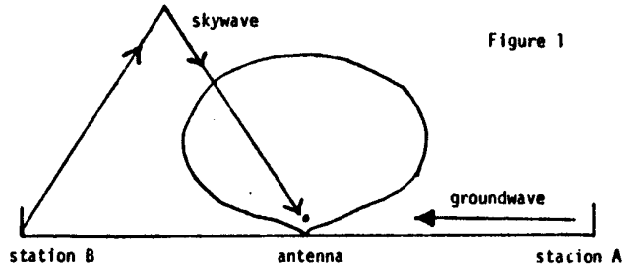

Figure 1

This property can sometimes be useful when trying to receive a distant signal on the same frequency as a nearby signal. For example, I can often hear KERN, Bakersfield, CA mixing with CFUN, Vancouver BC on 1410 kHz using either longwire, when only CFUN is audible on the loop. The longwire can reject more of CFUN's groundwave signal than can the loop, thus permitting some of KERN's signal to get through

Gain: As a general rule, a random length antenna will have more gain the higher and longer it is. For most receivers, maximum signal transfer from the antenna to the receiver is made if the antenna is about one half the received wavelength. However, since the AM broadcast band spans a three to one wavelength range, it's not possible to achieve optimal results throughout the entire band. However, you can come close by using an antenna coupler to match the antenna to the receiver. Plans for antenna couplers are included on p. 49 and p. 50 of this book. The shorter an antenna is, the more difficult it becomes to match to a receiver. So make it as long as space permits.

Noise and Interference: A random length antenna does a much better job of picking up electrical noise than a loop does. If you're in a high-noise area it may not be possible to use one of these antennas for serious DXing.

Random length antennas are much more "broad-banded" than loops, meaning that local stations on nearby frequencies will be more likely to overload a receiver, causing all sorts of spurious signals to appear. An antenna coupler will help reduce this problem somewhat. However, in an urban area with many strong local stations, you're probably better off with a loop, unless your receiver has good strong signal handling capabilities.

Grounding: A receiver used with a random length antenna should be well grounded. There are two reasons for grounding---performance and safety. A random length antenna will have more signal pickup on medium wave if the receiver is grounded; a ground will tend to drain away some electrical noise as well. In addition, a lightning strike or even a nearby severe electrical storm can damage your receiver if the antenna is not grounded. If you have an outside antenna, install a single pole double throw (SPDT) knife switch on the outside of the house; connect one side to the receiver, one side to the ground, and the center to the antenna, as shown in figure 2.

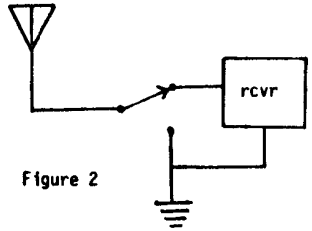

Figure 2

There are two types of grounds which are considered acceptable:

1. A cold water pipe made of copper or iron.
2. A copper pipe or rod driven at least six feet into the ground.

Opinions vary as to which of the two is better. Usually the choice is determined by the proximity of the nearest cold water pipe or window. The ground connection should be made by running a heavy guage wire from the receiver ground terminal to the pipe or rod, to which it is secured with a clamp (rather than soldered).

Summary: For most MW DX listeners, a loop will usually perform better than a random length antenna. However, at times the latter can offer better performance. A random length antenna usually has better signal pickup than a loop, and consequently is preferred by many DXers in rural locations. City dwellers generally prefer loops because they don't take up the real estate that wire antennas do, and are better at eliminating interference from strong locals. Most BCB DXers need both antennas for optimal results.