The Beverage Antenna: Excellent Directional Monitoring

Ever hear of Harold Beverage? He was a pioneer radio engineer who was instrumental in developing space-diversity receiving. Space diversity combats signal fading through the use of several antennas spaced far apart. As the signal fades out on one antenna, the system automatically seeks another antenna with a stronger signal, and overall fading at the receiver's audio output is much reduced.

Actually, Beverage is remembered these days primarily for an antenna that he designed which is sometimes called a "wave" antenna, but more often simply known as the "Beverage." This antenna is one of the best directional receiving antennas ever, very wideband in its response.

Although it requires a few hundred feet (to a few miles!) of wire to put it up, don't give up if you have only a small lot. You can still put up a Beverage—or the shorter version described below—when on a vacation to the countryside, and enjoy some real DXing. It only takes a few minutes to erect if you have all the parts ready. And, because it is only 12 to 15 ft high, it is an easy one-person job. Sorry, but a Beverage won't work as well on the beach; this antenna needs relatively dry soil to function properly.

The basic Beverage is bidirectional, but can be made unidirectional with the addition of a terminating resistor (fig. 1). It has very low gain, and yet gives excellent results because of its high signal-to-noise ratio (S/N). That is, it ignores interference and noise from all but its favored direction(s), and, of course, responds maximally to signals from its favored direction(s). It is a good performer from LF on through the lower end of the HF band, sometimes as high as 5 or even 10 MHz.

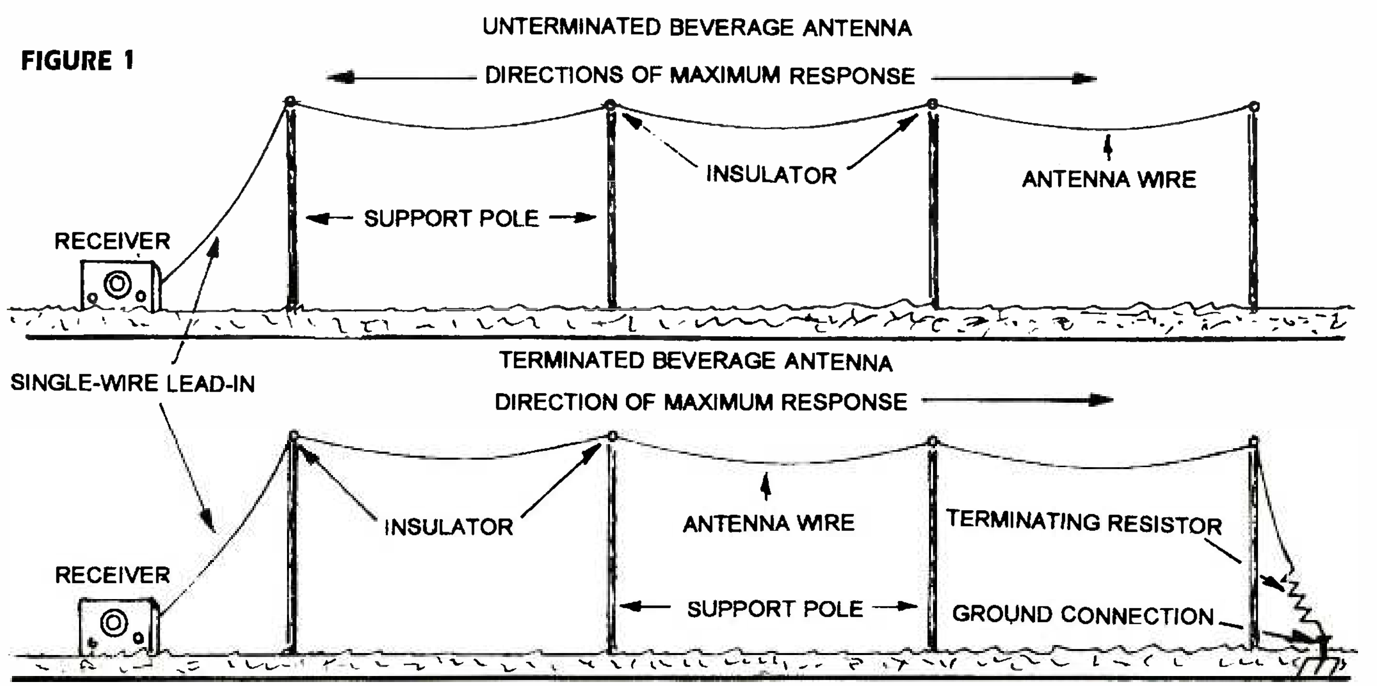
A Beverage receiving antenna was used by Paul Godley many decades ago in Scotland to log the first trans-Atlantic ham radio communications. BCB DXers find the Beverage an outstanding antenna to bring in that station covered up by other stations on the same frequency. Hams use it on the 160 meter band to dig weak signals out of the horrendous noise for which that band is famous.

Making Your Beverage

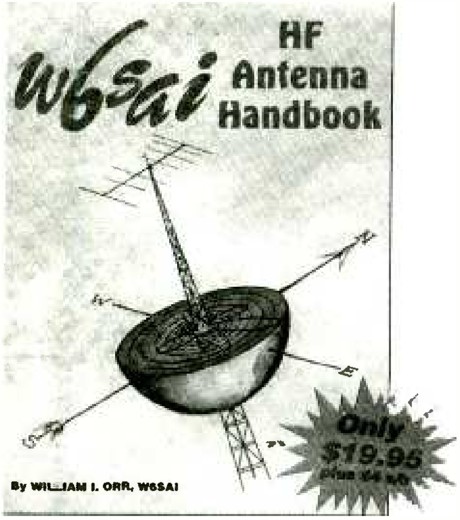
Beverage's original wave antenna was two miles long, and one he later built for RCA was six miles long! Most are not so long as that, although to qualify as a real Beverage the antenna should be at least one wavelength long at its operating frequency. A wavelength at 3 MHz is over 300 feet long, and a wavelength at 500 kHz is almost 2000 feet long. Nevertheless, I used a Beverage configuration with a wire only 200 feet long on the AM broadcast band with excellent results. Maybe it wasn't a real Beverage, but it had the high directivity and excellent S/N which I had hoped for.

To make yours, just string the wire over tree branches, bushes, or poles in the direction of the station you want to receive. Just about any wire is OK; it should be insulated from its supports, and elevated 10 to 15 feet above the ground. Make it relatively straight, and *as long as you*

FIGURE 1



Two configurations of the basic Beverage-antenna design.



can make it. Because the antenna is very directive be sure that the far end (the end opposite the end to which the receiver is connected) really points toward the station you want to hear.

The antenna can be made unidirectional by adding a terminating resistor of 400 to 600 ohms as shown in figure 1. The resistor should be non-inductive (i.e., carbon, not wirewound), and can be adjusted in value for maximum rejection of signals in the suppressed direction by adjusting its resistance during listening tests.

There are variations on the Beverage design; one that could be of considerable interest to monitoring buffs is the two-wire beverage with steerable-null capabilities as covered in the 17th edition of the *ARRL Antenna Book*.

An Excellent New Antenna Book

I've mentioned Bill Orr's excellent series of antenna books before, especially the Orr and Cowan *Antenna Handbook*. These books are hard to beat for down-to-earth information and advice on a wide variety of antennas. Orr's latest, the *W6SAI HF Antenna Handbook*, will be of interest to persons interested in antennas in general, and particularly to the hams among us. The book is based primarily on his past (and popular) monthly column in *CQ Magazine*.

He has reworked and added to this material, and arranged it into chapters on such topics as feedlines, single wire antennas, multiband dipoles, transmitting and receiving loops, 160-meter antennas, and beam antennas. Also included is material on such important topics as ground loss, antenna height, radiation resistance, antenna instrumentation, tuners, baluns, and the use of antenna analysis computer programs. A feature of interest to those who know Orr through his writings, is a short biographical sketch of his experiences in radio.

Packed with wisdom gleaned in his long and continuing career in radio, this book will make a great addition to your antenna library. You don't have an antenna library? Shame on you! Start one with the Orr and Cowan *Antenna Handbook* mentioned above, and add Orr's new handbook in the near future. They're available from CQ Communications, 76 N. Broadway, Hicksville, NY 11801; (800) 853-9797.

RADIO RIDDLES

Last Month:

I asked: "Why ... is it usually useful to increase the strength of received VHF or higher frequency signals by making a receiving antenna resonant, but often not useful at HF or lower frequencies?" I also gave the hint that HF and lower frequencies usually have more received noise than VHF or higher frequencies. Let's see what this has to do with it.

Because there is usually a high received-noise level on the HF band and the lower frequencies, the signal which you want to receive can get buried in the noise and interference found there. As a matter of fact there is usually much more received noise on HF than there is noise generated in your HF-receiver circuits. Thus received noise is the noise of concern in determining the signal to noise (S/N) ratio.

Received noise is a genuine radio signal just as much as is the signal you want to hear. So, because both the desired signal and the received noise are increased to the same extent by making the antenna resonant, the S/N is not improved. Reception quality remains essentially the same even with the higher signal output from the resonant antenna.

Contrary to the situation on HF, at VHF and higher frequencies there is little received noise. With a very low received-noise level, the noise generated within the receiver circuits becomes the noise of concern in determing the S/N. Making an antenna resonant does not affect the level of receiver-generated noise. So increasing the desired-signal strength by making the antenna resonant raises the desired-signal level in relation to the receiver-generated noise, and the S/N improves. This, of course, improves reception.

This Month:

Speaking of resonant antennas, how many *non-resonant* antenna designs can you name? Hint A: Don't include "dipole," "groundplane," or "Yagi-Uda" in your choices. Hint B: If an antenna isn't resonant, will it likely be broad, or will it be narrow in its bandwidth? Hint C: Don't include "log-periodic array" in your choices.

You'll find an answer for this month's riddle, and much more, in next month's issue of *Monitoring Times*. 'Til then Peace, DX, and 73.

Request for information: Can anyone give me a definition of an "irrational beam," or better yet, the source of some references to this term? If so please drop me a line at *MT*.

***Note on advertisement below:** As of 4/26/94 it became unlawful to market cellular-capable receivers in the US. Atlantic Ham Radio assures us that it will give a full refund and hold customers harmless from shipping expenses if a purchased unit is returned to the vendor by US Customs.*