The All-Around Dipole

BY JOHN SCHULTZ, W2EEY/1

Any amateur who uses a dipole elevated at least a half wavelength soon notices its directional characteristics. If one swears by a dipole, he is inclined sometimes to swear at it wanting to work someone located "off the ends." A vertical antenna (dipole, ground plane, etc.) would solve the directional problem, of course, but if frequently happens that one can place a diploe at a reasonably good elevation using available supports but erection of a vertical antenna would be mechancially complicated. The dipole pattern can be distorted by bending it into a V shape to give more omnidirectional response but at the expense of reduced radiation in the main direction.

The problem of a horizontally polarized omnidirectional antenna for v.h.f. usually takes the form of a turnstile antenna (crossed dipoles properly phased) or a formed dipole (ring dipole or halo). Both forms are somewhat impractical at the lower frequencies; the formed dipole because of constructional difficulties due to size and the turnstile because of the four end support points needed plus the phasing line. Oddly enough, I came across a design for a v.h.f. omnidirectional horizontally antenna which is rarely used because other types have better structural forms, but which is easily adapted for h.f. use.

Construction

The dimensions of the antenna are shown in fig. 1. Since I could find no name for the configuration, I simply called it the all-around dipole. Unfortunately, I could also not find any feed-point impedance figures for the antenna and so I performed a few trail-error tests to determine the optimum matching conditions.

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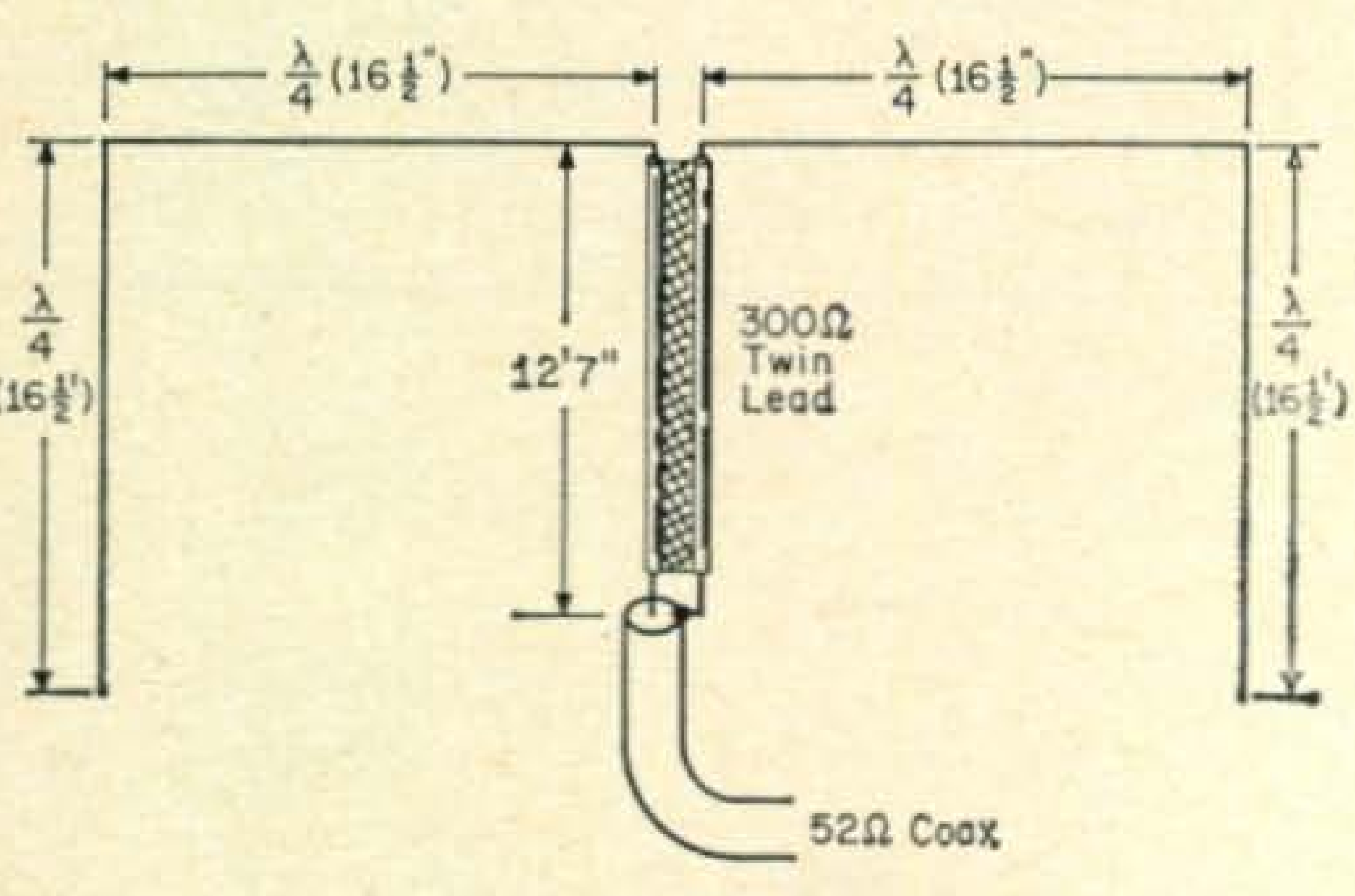

Fig. 1—Basic dimensions of the 20 meter All-Around Dipole. The lengths of the elements are calculated from $L = 468/f_{mc}$. The 300 ohm ribbon matching section should be 0.77 of the quarter wavelength to allow for the velocity factor. A balun with a 1:1 impedance transformation can be used between the coax and 300 ohm line as explained in the text.

According to the wire size (7×20) I used to construct a 20 meter version of the antenna, the center impedance, if the end sections were horizontal (making it a double Zepp), would be in the order of 5,000 ohms. Working on this basis I constructed a matching system to suit but found the s.w.r. to be too high. By cut-and-try I finally arrived at the very simple matching system shown also in fig. 1. Apparently folding the ends of the antenna had just lowered the center impedance enough to make a near perfect match using 300 ohm line as a quarter-wave transformer from 52 ohm coax. On the 20 meter model, I measured a maximum s.w.r. of 1.6 to 1 at the band ends with this matching system.

It would be preferable to join the coax to the 300 ohm line with some sort of unbalanced-to-balanced transformer such as a 1:1 balun to avoid pattern distortion from feedline radiation. However, it is not *absolutely* necessary, any more than with an ordinary dipole, but preferable. The radiation pattern, as best as I could determine, looks like fig. 2. The pattern is very similar to a turnstile antenna. The radiation is somewhat less off the ends than broadside but certainly enough to permit working stations that were impossible to work with the ordinary dipole.

Hints

The only construction points to remember are to keep feedline at right angles to the antenna for at least a quarter wavelength and to keep the vertical quarter wavelength ends aligned both horizontally and vertically. The latter is especially important to secure good radiation in the direction in line with the antenna (the reason for constructing the antenna in the first place). In actual construction, the end wires should be tied to the ground by means of an insulated line such as thin plastic clothes line. ■

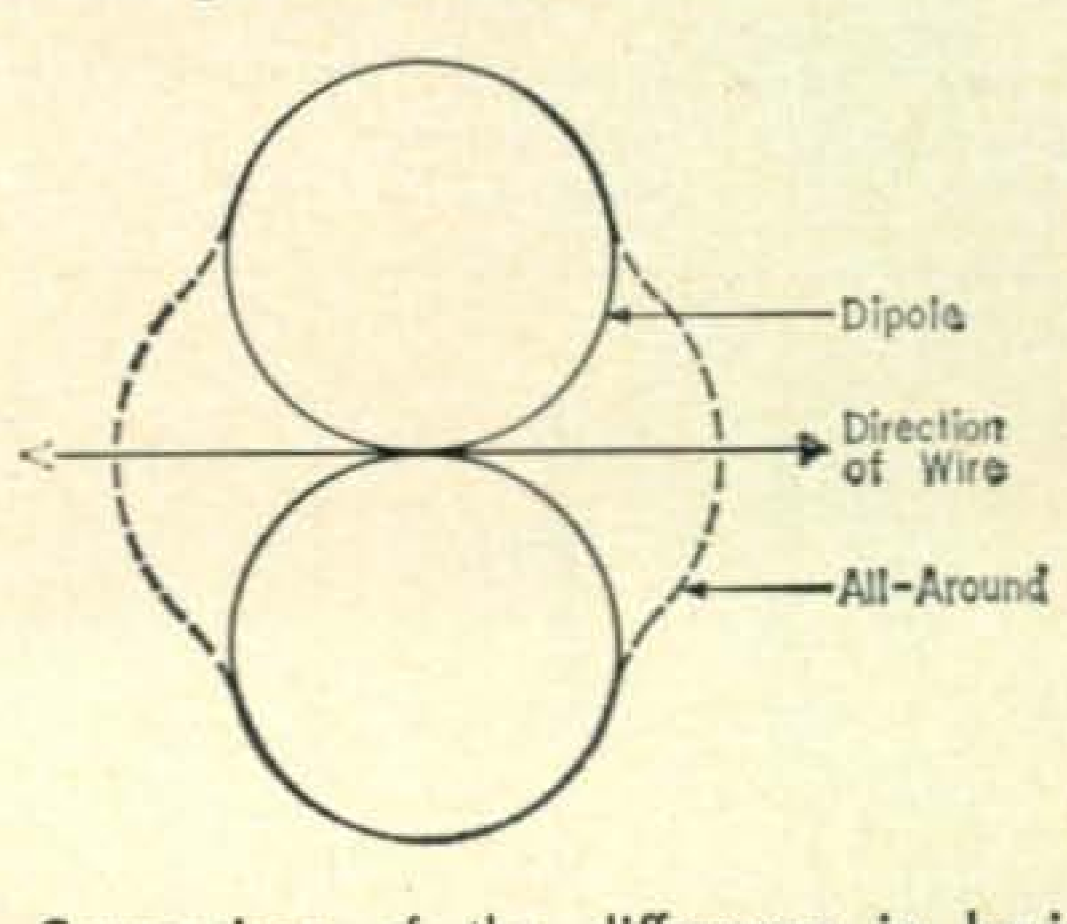

Fig. 2—Comparison of the difference in horizontal radiation pattern of a conventional dipole (dotted line) and the All-Around dipole (solid line). Radiation from the ends, almost nonexistent in the dipole is about 6 db down from the broadside radiation. The flap top portion of the antenna should be λ/2 high for best results.