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The 75m DX Chaser Antenna

—5/8λ works on 75m as well as 2m

Recently, I constructed a 1/4-wave vertical wire antenna for 75 meter DX work. The antenna worked fairly well, compared to my inverted vee at 50 feet, occasionally outperforming it on DX and generally falling far short on close stations (as would be expected).

My original 1/4-wave had 12 ground radials 60 feet long under it, as well as two ground rods separated by 40 feet and connected with a buried wire. I thought my ground-radial system was working well as a ground plane for the vertical radiator (a 61-foot wire suspended from a rope that hangs between two enormous pine trees).

On-the-air discussions of my antenna with 75 meter DX enthusiasts brought several snickers about my poor ground. It seems that serious 75 meter vertical users believe in well over 30 radials to lower the ground connection losses. One individual even startled me by saying that, even with 30 radials, I would have over 25 percent signal loss to the ground system.

Having already dulled one ax head down to a nub burying only 12 radials, I started searching for an easier way out to improve its performance. Digging around in old antenna books (the kind that talk about rhombics, windoms, and Zepps) turned up some interesting facts that led to what I have up in the trees now—a 5/8-wave top-loaded vertical.

Theory

The 1/2-wave dipole antenna carries maximum current at the center insulator if it is centerfed. The center is the minimum voltage point, which is why you can use practically anything for a center insulator. A 1/4-wave vertical is just half of a dipole, with the ground plane making up the missing half. Where current flow is highest in a wire antenna, maximum radiation occurs. Just as the center of a dipole does the most radiating, so does the bottom portion of a 1/4-wave vertical do the

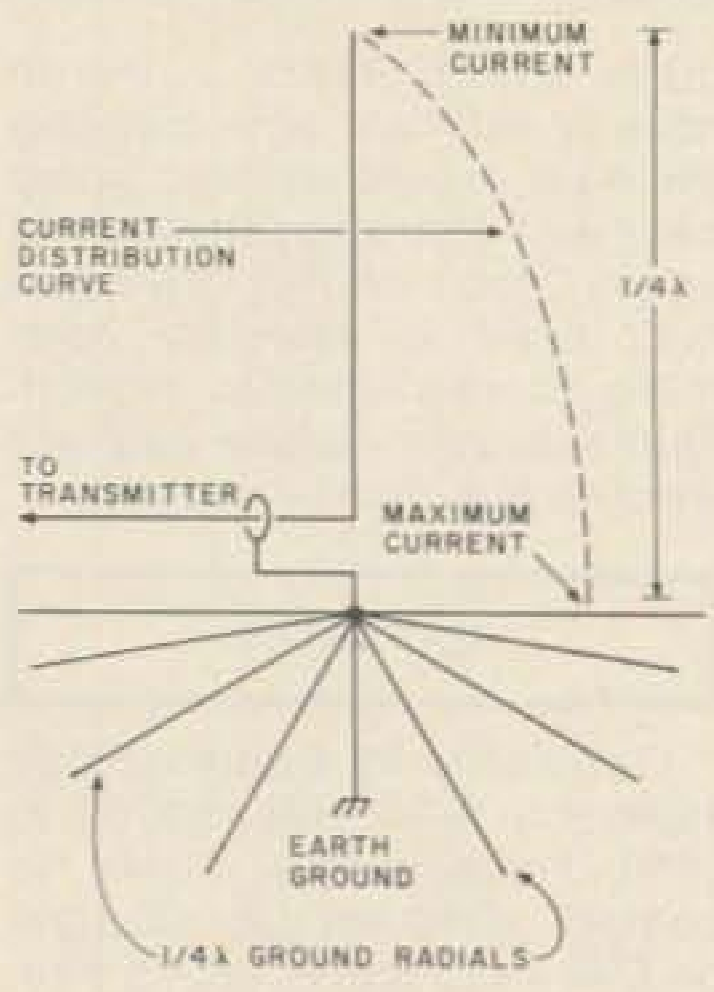

Fig. 1.

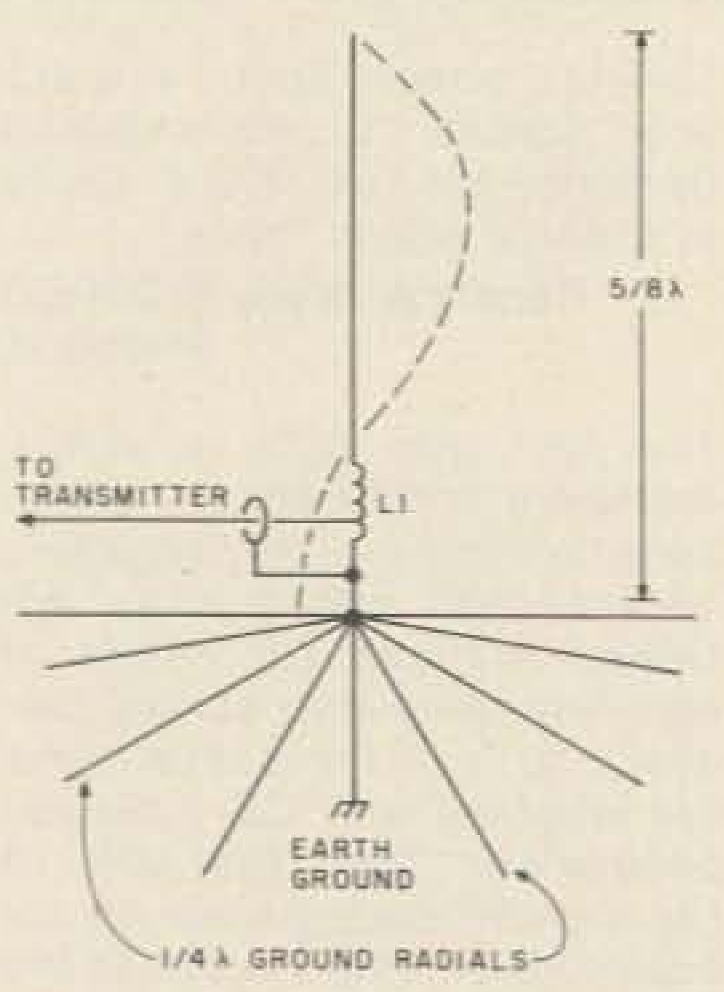

Fig. 2.

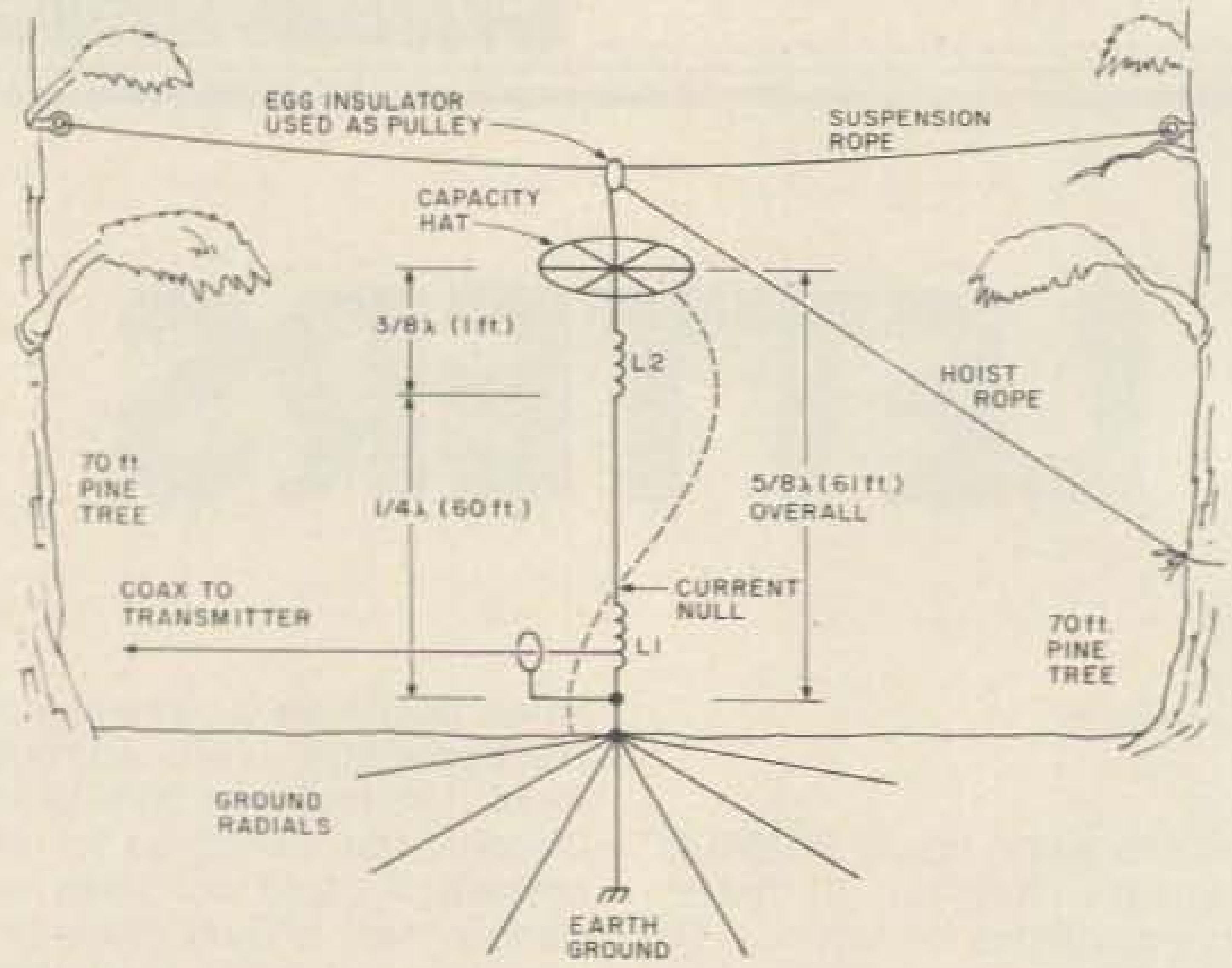

Fig. 3.

most radiating.

All that leads to the fact that the bottom of my vertical was doing most of the work down where ground losses were the highest. See Fig. 1. The idea, therefore, was to get the high current flowing at a point up higher in the wire, as in Fig. 2. That would make the radiating part of the wire further from ground and therefore reduce ground losses. This is an age-old idea hams have been using for years with 160 meter antennas where is is practically impossible to get a full-size vertical in the air.

Electrically lengthening low-frequency vertical wires is usually accomplished by the old "capacity-hat" and loading-coil method. Articles on this method tell you to stick the mess on top of a wire, and it becomes longer than a 1/4 wavelength and more efficient for the previously mentioned reasons. But how long is it and does it really matter?

I hated to just randomly toss up some top loading and hope that it was an improvement. Feeling a specific length would be preferable, I settled on 5/8-wave electrical length, since it would theoretically give some gain. My research turned up the fact that a 5/8-wave vertical is actually half of a "double-extended Zepp" (remember that antenna?) operated against ground.

Since no one can give you exact values for loading a shortened wire in any given situation, the following ideas show how I arrived at the values for my antenna. I feel confident that the mess in my backyard is a 5/8-wave vertical. My method doesn't require any sophisticated instruments, only an swr bridge and a cheap grid-dip meter.

A 1/4-wave grounded vertical is resonant (has a low impedance feedpoint). Therefore, a grid-dip meter will show a dip at the resonant frequency if the coax is removed and the antenna temporarily attached to the ground system. Sure enough, my grid-dip meter said that my vertical was resonant at 3.8 MHz. A little one-turn loop was twisted into the vertical wire in order to get sufficient coupling for the grid-dip meter.

I lowered the wire and placed a "capacity hat" (see Fig. 5) on top and hoisted it back up. Now my grid-dip meter said my vertical was resonant at 2.8 MHz. With success just around the corner, I then placed an inductance (see Fig. 3) between the wire and the capacity hat. Suddenly, I could not find the resonant point. I figured it had gone out of the low-end range of the meter (1.9 MHz). But I did find a dip at 5.4 MHz, which turned out to be the 3/4-wave point. Multiples of 1/4-wavelength vertical are resonant also, so, from this point on, I relied on the 3/4-wave dip to make my adjustments.

Parts List

- L 1 — 12 turns no. 14 solid copper wound on 2½-inch form. Tapped 4 turns from bottom for coax feedline. Space wound to allow moving tap for minimum swr.
- L 2 — 35 turns no. 14 solid copper wound on 4½-inch form. Space wound over entire length. A Tupperware™ juice container is satisfactory for form.
- C 1 — (if needed) 365 pF per section broadcast-type variable. All sections may need to be paralleled for maximum capacitance if resonance is not obtained with 1 or 2 sections.
- C 2 — (if needed) 10 pF to 250 pF wide-spaced variable.
- Ground radials — Each radial approximately 60 feet long, buried about 1 inch underground in a furrow cut with an ax. All radials are brought together and soldered to a piece of copper strip. The radials do not necessarily have to be in perfect "spokes-of-a-wheel" configuration, but may be bent to fit available space.

A few more turns of wire added to the inductor and I had a good 3/4-wave resonant dip at 4.5 MHz. Now I had what I was looking for. If the antenna was 3/4 wavelengths long at 4.5 MHz, then, by applying the usual formulas, I found my antenna was 1/4-wavelength long at 1.5 MHz and 5/8-wavelength long at 3.8 MHz.

Just to test my theory, I ungrounded the antenna and found a dip at 3.0 MHz. That would be the 1/2-wave point, and, since ungrounded half-waves are resonant (dipoles, if you please), I had done everything correctly up to this point.

A 5/8-wave vertical being nonresonant (not presenting a low-impedance feedpoint), I had to put a little matching coil at the bottom and tap up the coil to get a suitable swr. My final results showed an swr of 1.4:1 at 3.8 MHz. (See Fig. 4.)

In some cases, it may be necessary to put a variable capacitor in parallel with the base coil and possibly even another in series with the center of the coax line. (See Fig. 4.)

Results

This was definitely the way to go! The antenna now should exhibit a little gain over the original 1/4-wave vertical. More importantly, the radiating part of the wire (the portion with the most current flowing in it) is up around the top instead of down on the ground. This makes the ground system not as important as when the current is near the bottom. There's no need to dig yourself to death burying

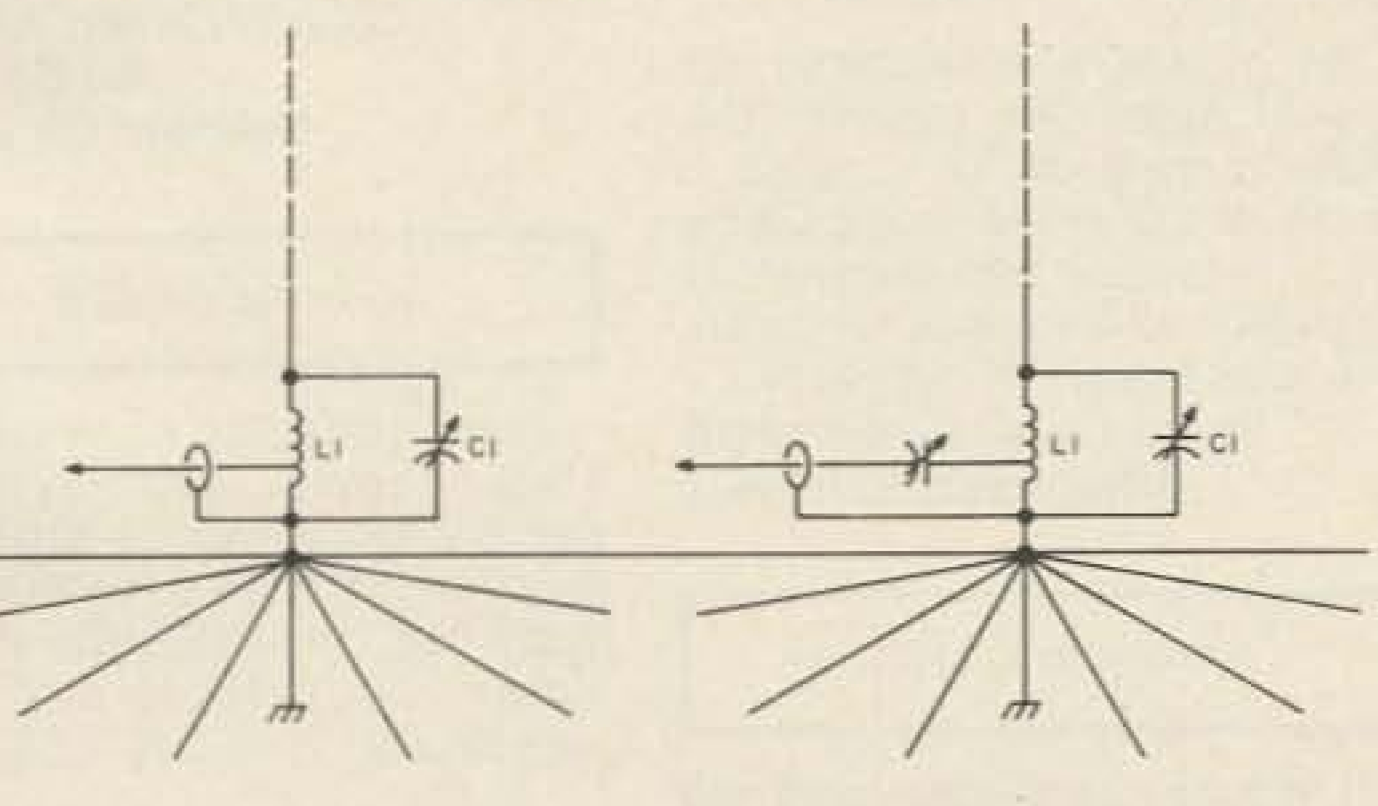

Fig. 4. Alternate feeding methods.

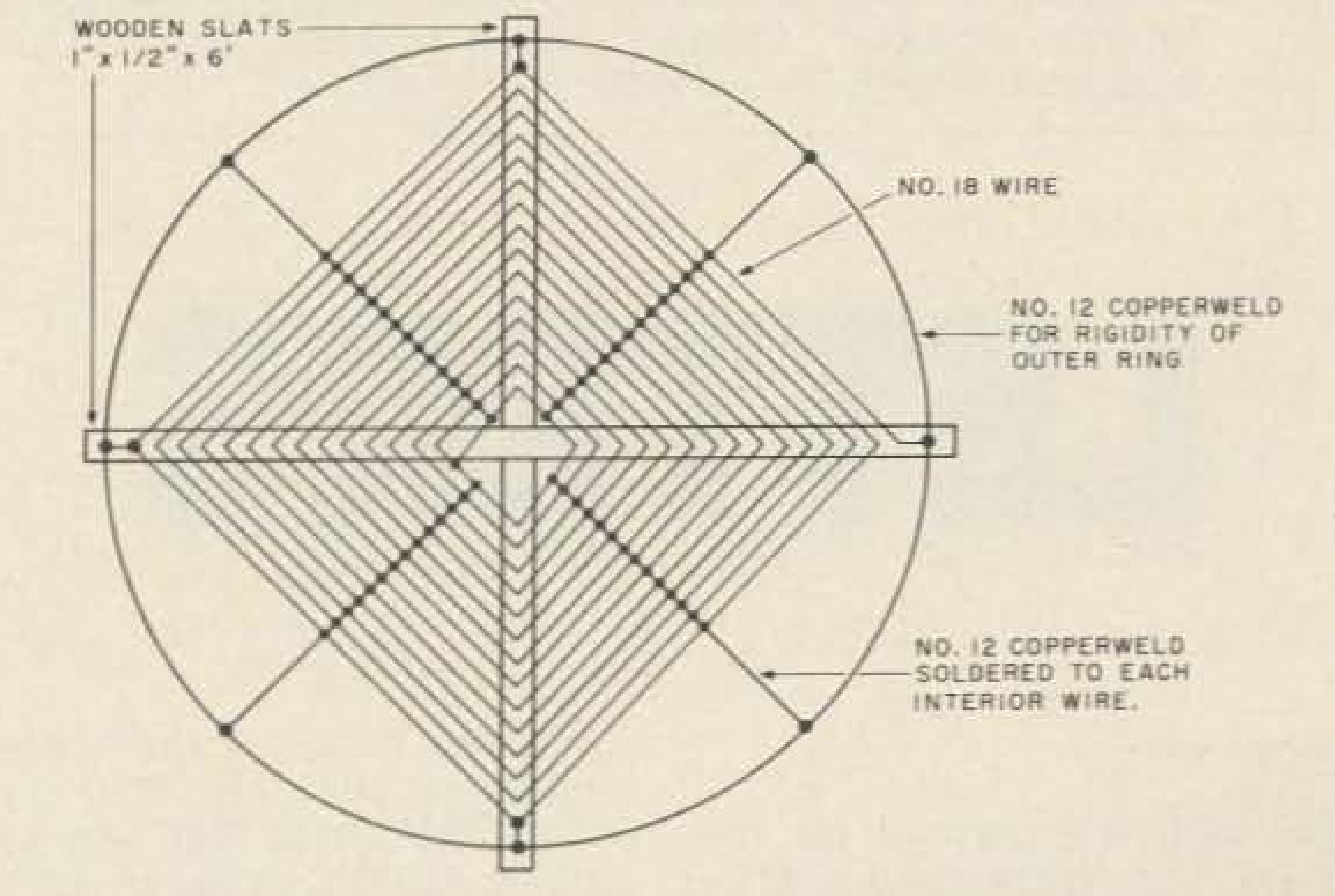

Fig. 5. Capacity hat. Tacks placed on wooden cross-members act as points to wind wire. Connect wire to loading (which hangs under capacity hat) near the center.

wire all around the yard and offending your dog.

Let me emphasize that I still believe that the ground system must be good for any vertical to be a good low-angle radiator. The radials should be no shorter than 1/4 wavelength. No 4-foot ground rods or cold-water pipes for this antenna, please!

An unexpected advantage is that the 5/8-wave isn't as prone to noise pickup as a 1/4-wave, since the 5/8-wave is physically grounded. The lower atmospheric noise level makes copy a lot easier on weak signals.

There's one minor disadvantage – it is fairly narrow on frequency bandwidth. My usable range of frequencies is only from 3.75 to 3.85 MHz. However, this is where all the SSB DX is located, so who cares?

I have also found that this antenna works better than the old antenna when it comes to working nearby stations that are using antennas which transmit in the horizontal plane. Evidently, the capacity hat and loading coil have some pickup horizontally and help make this an all-around better choice than the 1/4-wave vertical.

The same principles can be applied to make a high-efficiency vertical for any LF band. Even on 160 meters, it would not be difficult to get enough loading to make it a 5/8-wave at 1.8 MHz. From my figures, you can see it didn't take much work to get an electrical 1/4-wave at 1.8 MHz while I was working my way down to a 1/4-wave at 1.5 MHz (which is what my 5/8-wave really is).

First on-the-air test on 75 meter SSB yielded a 5 by 8 plus 5 over S-9 report from G3KFT, and DJ6TK broke in to say I was 5 by 9.

Eureka, it works! ■

LETTERS

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ple who are grateful for the QSO. They often send a letter with their card, and are always asking for mine. Sometimes it is their first overseas or first OK contact.

I know most of them are beginners who are working 21100-21150 kHz. Their way of calling CQ is usually quite wrong, and we lose much time waiting for them. It seems like an eternity when you hear CQ or CQ DX 20 times or more and then a callsign twice at the end. When there is QRM—and there always is—we miss their call very easily.

So, please, a reminder to our young American friends: CQ (three times) de W... (also 3 times) or CQ (three times) DX de W..., etc., for two minutes is enough—when you don't do so, you lose many DX contacts.

Vlada Lausman OK2PDD
Brno, Czechoslovakia

ATTENTION, ANITA!

I would like to increase the membership of the newly-formed 40m gay CW net. We already have 58 members. Gay CW ops, please write for info.

Don Richman AA6GA
PO Box 384
Belmont CA 94002

PLAYING GAMES

I am writing to comment on Mark Herro's neat computer game, "The Klingons Are Coming!" (Apr., '78). To run this program on the TRS-80, a few small modifications are necessary: Line 210 LET Y =

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