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Build the FlexTenna for Wideband Reception

By Bob Grove, W8JHD

How would you like to have a high-performance, wideband receiving antenna at virtually no cost and about 15 minutes time? It is capable of monitoring signals from the lowest part of the radio spectrum clear up through at least 2500 MHz (that's the limit of my test equipment).

Although I use mine as the primary receiving antenna here at home, its pre-eminent portability lends itself to camping, DXpeditions, Field Day monitoring, vacation listening and other applications where a high-efficiency, easily-erectable antenna would be ideal.

Wouldn't it be nice to have an antenna that could be rolled up to be conveniently packed into a suitcase or accessory box for transport? It's easy. Even easier, Grove Enterprises has turned this clever design into a low-cost product for those who don't have the tools, time or patience to build one themselves. You can view the full-spectrum FlexTenna at **www.grove-ent.com/grovehvu.html**, and the smaller VHF/UHF-only version at **www.grove-ent.com/grovevu.html**.

But let's review the basics for builders.

❖ A little theory…

Any piece of wire will receive signals, but there are some guidelines. If the antenna wire is too long, it becomes highly directional, and if it's operated at even harmonics of the desired frequency ranges, the high impedances represent a lossy match to the receiver. Plus, the higher the frequency, the more likely the wavelength patterns will oppose an efficient transfer of signal to the transmission line.

However, there is an interesting fix for the impedance problem: If you put two wire elements in parallel and feed them commonly at one end, when one element is a poor match, the other will take over – provided the relative lengths are well chosen!

As to the phasing problem, a good length of wire has a lot of aperture (signal-capture area), compensating for some of the cancellation losses.

❖ …and a lot of experimenting

Hanging a random wire from a tree limb is not a brain-burner; but what length should that wire be? Time-tested experiments have shown that an element 25-40 feet or so in length makes a dandy receiving antenna for the entire shortwave spectrum. In fact, decades ago, the Coast Guard determined that a five-foot whip was adequate if properly impedance-matched.

Still, this antenna should be fed with coax, but what if we simply let the shield float ungrounded at the feedpoint? That certainly would be simpler, but would it have serious consequences in the quality of reception? And what is the best length – or pair of lengths – for modern, sensitive receivers? Those were the two questions to be answered.

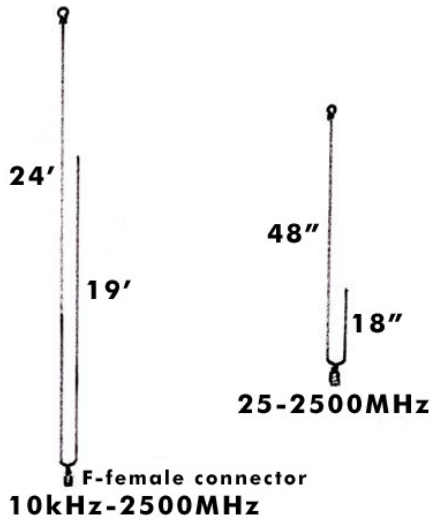
❖ The extremely-wideband (and longer) version

Starting with an assortment of random wire specimens I had around the workshop, I used lengths from 14-35 feet connected to my IFR 1100 spectrum analyzer. As expected, signals were somewhat reduced on the shorter wire, but so was the atmospheric noise, so the signal above the noise remained the same. In other words, the signal sounded just as good on the shorter wire.

Comparing the "FlexTenna" wire to my commercial GAP Titan vertical for HF, the farther below about 7-9 MHz I went, the better the Flex performed. From 10-50 MHz or so, responses were typically within 4-6 dB, with signal propagation sometimes favoring one antenna over the other.

Not surprisingly, since the Titan is an HF antenna, at 150-170 MHz the Flex was about 8 dB better, at 450-470 MHz about 18 dB better, and at 800 MHz 10-20 dB better. The response was roughly equivalent to the popular Grove OMNI scanner antenna.

Eventually, a very satisfactory combination of lengths trimmed from the two wires on a piece of zip cord was found. (Speaker wire with clear vinyl insulation and the heavier lamp cord worked equally well.) It was a 24-foot length with one wire stripped back five feet and cut off, making the pair 24 and 19 feet in length.



❖ Wiring it up for that first real test

With the wire antenna dangling from the tree, I twisted together the two bare wires at the bottom and attached them to the center lead of a length of RG-6/U coax. (Yes, I know, it's 75 ohm, not 50 ohm, but that doesn't hurt a thing; remember, you are using this antenna over an extremely wide frequency range, and no antenna will maintain a constant impedance under those conditions! Even better, RG-6/U has less loss than RG-58/U, especially at the higher frequencies.)

With the indoor end of the coax feedline attached to my AOR AR5000+ receiver, I began tuning through the spectrum. To my amazement, I was hearing ELF signals from the very bottom of the spectrum (18 kHz Navy RTTY) clear up through 2500 MHz (Wi-Fi packets)! It was time to finish up the antenna.

❖ A good, finished product

To duplicate this project, you'll need a 24-foot length of two-conductor zip cord (speaker or lamp cord; I used 18 gauge), a female F connector (They are cheap, easy to mount, very efficient through UHF, and accommodate a host of inter-series adaptors), a few inches of 1/4" and 3/8" heat-shrink tubing (optional; you can even use rubber tape or PVC electrical tape), and a crimp-type ring terminal (16-14 AWG, 1/4" stud); alternatively, a small loop may be made of the last few inches of the wire antenna for support).

Tools will include wire cutters, a soldering gun and rosin-core solder, and a crimper or a pair of pliers for the ring terminal.

(1) Begin by stripping away five feet of one of the 24-foot wires and cut it off, leaving the remaining 19 feet still attached to the molded pair.

(2) Strip away about 1/4" of the insulation from the common (lower) end of the wire pair and twist the leads together; tin them with solder.

(3) Solder the twisted wires to the center pin of your choice of connector.

(4) Wrap a couple of turns of the rubber tape or vinyl electrical tape around the soldered connection and the F-connector base to support the wire connection., then slide a 3/4" piece of the 3/8" heat-shrink tubing over the

antenna wire and down over the base of the connector. Heat and shrink it. Alternatively, you may wish to use rubber tape and anchor it with PVC tape. You may choose the tape option over the heat-shrink tubing for the following steps as well.

(5) Slide a half-inch piece of the 1/4" heat-shrink tubing over the upper end of the short wire and heat and shrink it tightly to the other wire.

(6) Slip another 1/2" piece 1/4" heat-shrink tubing over the upper end of the wire in preparation for covering the ring terminal. Push the insulated wire into the crimp end of the ring terminal and crimp it securely. (It isn't necessary to make electrical contact; it's just a support.)

(7) Slip the tubing over the crimp end of the ring terminal and heat and shrink it.

And now, the VHF/UHF (shorter) version:

If your primary mission is scanning between 25 MHz and 2500 MHz, the project is even easier. You will need only 48 inches of the zip cord, and you will strip back and snip off 30 inches of one of the leads, leaving the shortened wire at 18 inches. The rest of the steps are the same.

❖ A few final notes

It's possible to use the longer model in an elevated, horizontal position (as an end-fed zep) for 10 kHz-30 MHz applications, but for VHF/UHF, vertical suspension is strongly recommended since virtually all signals here will be vertically-polarized. With this in mind, the shorter, VHF/UHF version *must* be suspended vertically for best reception.

With the abundance of electronic appliances every home now has (especially we radio buffs!), it's important to locate the FlexTenna as far from the residence as practical. Mine is about 50 feet away, and still I am occasionally reminded of my equipment!

In some cases, connecting the shield of the coax at the antenna feedpoint to a grounding stake may reduce interference; it won't hurt, so it's worth a try. But first, sling the antenna temporarily and sequentially over a variety of tree limbs and listen across spectrum, making reception and interference notes so you can choose the best, permanent, mounting location.

And finally, if you make any improvements, let me know and we'll share them with other readers.

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