

Lab Notes

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Q: I'm just getting started on VHF and UHF FM and I want to set up a station in my home. What kind of antennas should I use?

A: That depends. There are many different things you need to consider when selecting a 6-meter, 2-meter, 222-MHz or 70-cm antenna for FM use. The types of operating you want to do and your local terrain often set many of the performance requirements for your antenna. For example, the antennas used by FM repeaters and FM stations in general are usually *vertically polarized*. If your antenna is horizontally polarized, the polarization mismatch will result in a considerable loss in received signal strength. You probably wouldn't notice this if you were working strong local stations, but you'd definitely hear the difference on distant contacts.

Many FM operators prefer omnidirectional antennas. These antennas radiate signals in every direction—more or less, depending on the design. They're ideal when you need to talk to stations in widely varying locations. Omnidirectional antennas generally don't have as much gain as large beams, for example, but some of them can give appreciable gain. This gain is accomplished by concentrating the signal at the horizon, toward the distant repeater or station you want to work. Most VHF/UHF omnidirectional designs are vertically polarized.

Directional antennas such as quads and Yagis are often lumped together under the label "beams." As the name implies, they focus RF power in a particular direction. Beams are the antennas of choice when you need to cover greater distances. The problem with beams is that you must have a means of turning them if you want to be able to work distant stations in all directions. In home installations, this means an antenna rotator on the roof and a control box beside your radio. Beams can be either horizontally or vertically polarized, depending on how they are designed and/or installed.

There are a number of other factors you may need to consider when selecting an antenna. These include cost, ease of construction, durability, portability and convenience of installation. Finally, you must decide whether you want to purchase a commercial antenna, or try making your own.

Q: I've never built my own antenna before. What options do I have for commercial antennas?

A: Although a number of designs are found as both commercial and home-built antennas, there are a few that are uniquely commercial. For example, the "Isopole," manufactured by Advanced Electronic Applications, uses a pair of conical couplers that would be difficult to duplicate in a home workshop. The advantage of this design is that it is very broadband, covering the entire 2-meter band with a low SWR. Another example is Cushcraft's "Ringo Ranger" design. This type of antenna uses a compact, easy-to-adjust matching system.

Another type usually only available in commercial form is the *collinear* antenna. By stacking several radiators in the same vertical line, you achieve gain over a standard 1/4-wavelength ground plane. The trade-off here is a narrower radiation pattern (picture a round ball squashed by a weight placed on top).

Hand-held transceivers have their share of options as well. Rubber-duckie style antennas are available in a number of different sizes and electrical lengths, each designed to improve on the rig's original antenna. Some hams opt for a full-sized telescoping antenna for their H-T, trading-off compactness and convenience for improved performance.

Q: Well, I will probably start with something commercial, but what if I want to experiment with home-made antennas

later on? What types of VHF FM antennas are easy to home brew?

A: For the folks who like to scratch build, the options are also wide and varied, but there are a few designs that are not duplicated by commercial equivalents. In addition, because you supply the design know-how and construction labor, you can build your own antennas at a reasonable cost.

Although dipoles are very common on HF bands, they are somewhat rare on VHF. They are a good choice for a first antenna, however, and can be built in very little time and conveniently mounted to any nearby wall or tree. Dipoles are especially good choices for 6-meter FM work.

The 1/4-wavelength ground plane, like the dipole, is a simple antenna that is physically small, easy to construct and has a broad radiation pattern (see Figure 1). This is a good antenna to choose if you are not certain of the locations of the other stations you wish to reach. A ground plane is easy to construct and you can use it from home or portable to talk to nearby repeaters or packet stations and talk simplex to mobile stations traveling in the vicinity.

For a permanent installation, a J-pole constructed with copper pipe is a good choice for a general-purpose home-station omnidirectional antenna. The J-pole will cover an entire VHF band and is fairly easy to construct. Plus, all of the parts are available at your local plumbing supply store! A copper-pipe J-pole is described in *The ARRL Antenna Compendium Volume 4*. (See the *ARRL Publications Catalog* elsewhere in this issue.)

You can also build a portable J-pole using twin lead. This is handy to bring along on a trip. It can be rolled up and packed into the suitcase right next to your socks. Once you reach your destination, it can be taped to a window pane or hung from a curtain rod using string. Be sure to use a ferrite bead balun to help prevent detuning from nearby metal objects. See "Build a Weatherproof PVC J-Pole Antenna" elsewhere in this issue for construction details.

Another design is the *coaxial collinear* antenna, which is built using only coax for most of its length. This type of antenna is very portable. It's handy for backpacking or emergency use, and it still offers a fair amount of gain. The performance of this antenna is similar to the commercial collinear ground plane designs.

Q: Getting back to my home shack, I want to make something for my dual-band rig and my 222-MHz radio. Can I build one antenna that will cover all of these bands?

A: Certainly! Although it is a design that is used mostly for receiving, a *discone* antenna can be used to transmit on all of the VHF bands. Because it has many elements, it takes a bit of work to build one.

If you want a broadband antenna with some directionality, a log-periodic dipole array may fit the bill. Although it does not offer a large amount of forward gain, the log antenna will give you the ability to work many bands with one antenna and reach stations that are out of range for an omnidirectional design.

Q: There is a popular packet system in my area, but I can't seem to stay connected to it. What sort of antenna will help?

A: Two good alternatives are a Yagi and a quad. Either of these will give you the extra gain and directionality needed to easily reach a station on the edge of your omni antenna's range. For an excellent quad antenna that you can build yourself, see "A Five-Element Quad Antenna for 2 Meters" by Jim Reynante, KD6GLF, in the January 1995 QST. If you want detailed information about all sorts of antenna designs, it's hard to beat *The ARRL Antenna Book* (it even comes with software!). Contact your favorite dealer, or see the *ARRL Publications Catalog* elsewhere in this issue.

Q: My club is having a fox hunt next month, but I can't seem to find a suitable antenna at my local store. Does this mean that I'm out of luck?

A: Not at all. With very few exceptions, designs for fox hunting (also called radio direction finding, or *RDF*) are usually home built. To be competitive, RDF enthusiasts need to optimize their antenna designs according to the hunting terrain and transmitter power. This presents a challenge that naturally leads fox hunters to experiment with many different antenna designs, often resulting in some unique creations. You'll find RDF antenna designs in *The 1995 ARRL Handbook* and *Transmitter Hunting: Radio Direction Finding Simplified*. Both books are available from

the ARRL. (See the *Publication Catalog* in this issue.)

Q: My family is going on vacation soon. What can I do if I want to get on the air from my hotel room?

A: Many of the antennas we just described are quite portable. Fortunately, VHF and UHF antennas are small and can be easily packed on a trip and set up in a hotel room. A ground plane can be constructed to be easily assembled and disassembled, a vertical dipole can be easily taped to a window. A twin-lead J-pole can go nearly anywhere.

Any indoor antenna will work better if it is near a window, or used outside on a balcony or from the hotel garden. However, don't let a poor location stop you! You can often work local repeaters from the worst of locations.

We welcome your suggestions for topics to be discussed in Lab Notes, but we are unable to answer individual questions. Please send your comments or suggestions to Lab Notes, ARRL, 225 Main St, Newington, CT 06111.



Pete Budnik, KB1HY, checks out a VHF/UHF discone antenna. This design offers omnidirectional, multiband performance.



Jim Bryant, N5ZAV, uses this RDF antenna to get a bearing during a hidden transmitter hunt in Denton, Texas.



This five-element quad beam provides a directional signal pattern, and all the gain that goes with it! Construction details appeared in January 1995 QST.

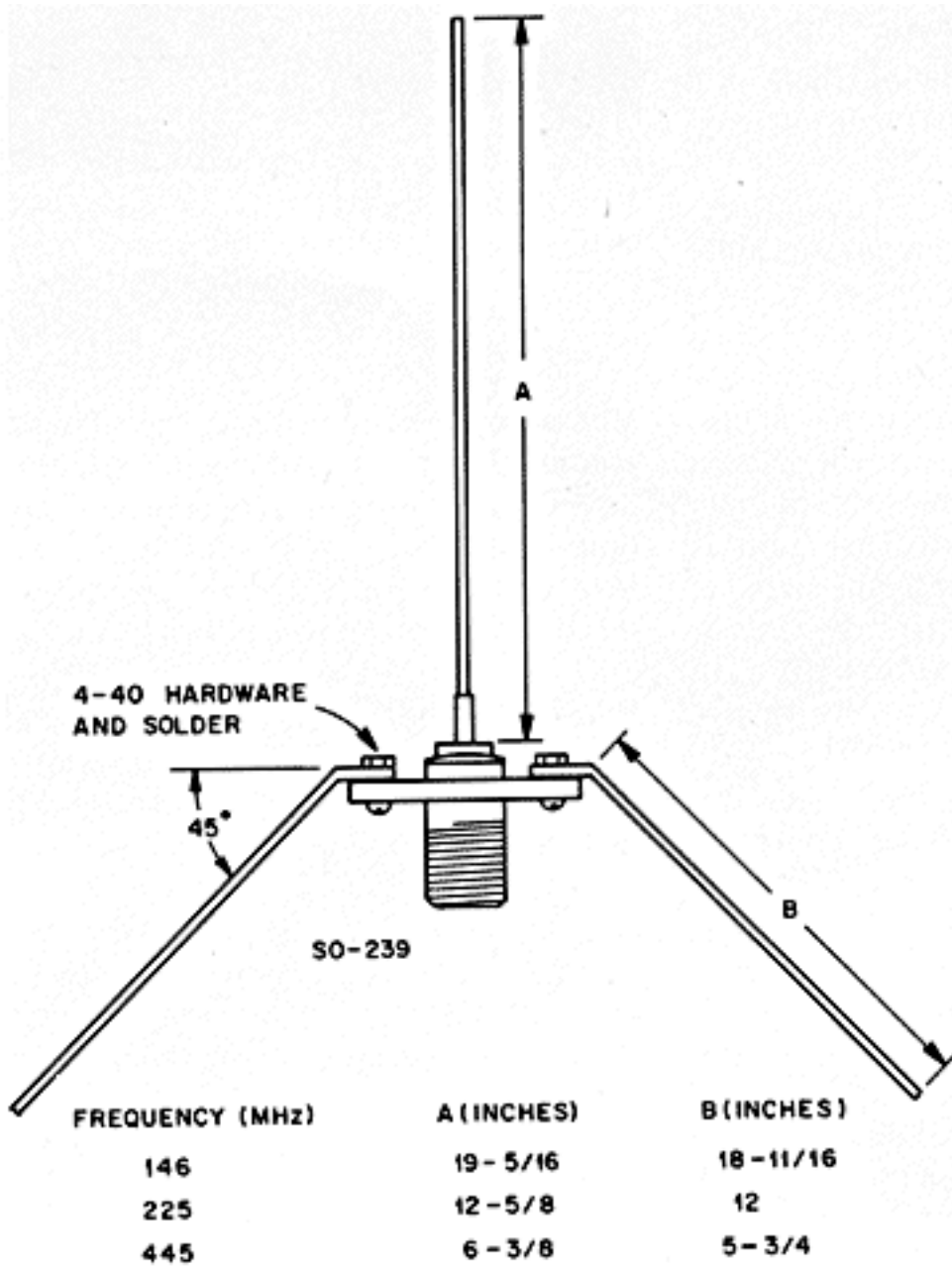


Figure 1—A simple ground-plane antenna for the 144, 222 or 440-MHz bands.