Antennas: VHF/UHF

On-Air Training
Idaho Falls Bishops' Storehouse
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Tonight we're going to begin our discussion of antennas. The goal is to give us a pretty good picture of what types of antennas work well in various circumstances in our area.

There is a lot of information to cover. In order to make this more helpful and to allow for questions and comments, I'm going to split this discussion up over three, maybe four weeks depending on how things go. Tonight I'll summarize the results of the survey and then we'll begin our discussion with VHF vertical antennas. Next week we'll cover J-poles and beam antennas. This is a change from what I had previously indicated to some of tonight's presenters. I hope that I haven't thrown too big of a wrench into the cogs.

Survey Summary

Let me cover the results of the survey. (By the way, I'm working on getting the complete results posted somewhere for everyone to see.)

To all of you that submitted a response, Thank you! Using the ERC mail system, I sent 496 emails to 475 operators. There were 58 responses within the first 24 hours. As of this morning, there were a total of 142 responses.

Those that responded were pretty evening distributed across the license classes—a relatively equal number of Technicians, Generals and Extras.

I asked what VHF antenna you use most often and why you selected that particular antenna. I'll get to the "what antenna" later, but the answers to the "why question" were all over the board. 24% said because of a recommendation by a local ham and 27% were based on online recommendations.

Half of you have VHF antennas permanently mounted on a roof or tower. On a scale of 1 to 5, 108 of you rated your VHF antenna either a 4 or 5. 23 gave it a 3.

So here is a question for the net. It might sound a little simplistic, but play along with me here. What is the purpose of a VHF antenna? If you'd like to respond, please come now with your call sign.
[Possible responses: radiate a signal; communicate with a repeater; communicate with other hams in my area.]

We are not going to attach our handheld radio to 2 meter antenna and talk to Madagascar. No. The purpose of our VHF or UHF antenna is to talk with other operators in our general area. Given enough height and power, maybe 30 to 40 miles reliably.

When selecting a VHF antenna, what are some criteria that should be considered? If you've got a suggestion, please call now.
[Possible responses: cost, deployment location (attic, car, roof, tower, go-bag), physical size, gain, function]
You probably don't want to buy an omni-directional antenna for a fox hunt, but if the ONLY thing you want to do is have a crystal clear signal into the repeater, then a beam antenna pointed right at it might be just what you're looking for.

As I mentioned before, we're going to break the VHF discussion into 3 distinct sections. We'll talk about verticals first, then J-Poles, and finally beams and Yagis. I don't think we'll get to everything tonight. That will really be up to you and how much participation we have.

Omnidirectionals

Before we dive into these specific designs, let me say a word about omnidirectional antennas. A powerful clue to the nature of an omnidirectional antenna is found in its prefix: omni, meaning "all". An ideal omnidirectional antenna receives and transmits in all directions. Its radiation pattern looks like a smooth bubble. In the real world, however, many omnidirectional antennas exhibit radiation patterns that are far from uniform. Even so, there is enough uniformity to consider them omnidirectional for all intents and purposes.

The benefit of an omnidirectional antenna is found in the fact that you don't need to rotate it. You simply install the antenna and start operating; you don't need to be concerned about which way it is pointing. On the other hand, its omnidirectional nature is also its weakness. An omnidirectional antenna can't focus signal energy to bridge the communication gaps between distant points.

Verticals

Let's start with ground-plane antennas. The ground-pane is one of the classic omnidirectional antennas for FM use. It's vertically polarized, lightweight, and easy to assemble. We have a sensitive repeater close by—this repeater. You can put a vertical antenna on a short mast in your yard and it will perform admirably. However, if you can get it to a higher elevation, on your roof perhaps, you'll notice a world of difference. Increase the altitude of the antenna from, say, seven feet to 15 or 20 feet, and you'll be pleasantly surprised at the improvement.

The ground-plane antenna is one-half of a dipole with the missing portion made up by an electrical mirror, called the ground plane. The ground plane can be made from sheet metal or a screen of radial wires. The basic ground-plane antenna is ¼-wavelength long with the feed point at the junction of the antenna and the ground plane. Ground-planes are often called verticals because that is the usual way of constructing and installing them.

The simplest ground plane or vertical antenna can be constructed be attaching a radiating element of some kind such as a low-gauge wire or a brass rod to the center conductor of a piece of coax and then attach four equal length elements, or radials, to the outer shield of the coax. The radials are sloped downward at about a 30 degree angle. You can modify the angle as needed to adjust for the lowest SWR.

In the survey, many of you mentioned mag-mounts, mostly for their versatility, ability to move from vehicle to vehicle, etc. Some of you just mentioned "vertical", but many of you called out the Diamond or Comet antennas. The Diamond 510 and Comet GP-6 both were mentioned by name.

I use a MFJ-1729 vertical mag-mount antenna attached to the mobile radio in my truck. The metal vehicle acts as the ground plane or the RF mirror for the vertical radiator of the antenna.

Larry Lovell uses a vertical antenna on his base station. Larry N7RGW, tells us a little about it.

Larry Lovell (larry.lovell76@gmail.com)
I have a simple dual band vertical for UHF/VHF. It is similar to: a Comet CX-333, but I don't remember the actual model.
I am using two 10 foot TV poles that I bought from Radio Shack. My previous antenna was a Ringo Ranger, but that was VHF only.

I also have a cheap MFJ-1754 for use with packet.

I conducted my own informal, non-scientific experiment this week. I assembled a VERY simple two meter dipole consisting of an SO-239 connector with two 19.5 inch wires, one soldered to the center conductor and the other bolted to the connector chassis. I then attach a 10' length of RG58 coax and hung it in the window of my shack….hey, I warned you that it was non-scientific.

I attached the other end of the coax to my packet station. The Madison memorial Hospital node is located 3-tenths of a mile from my house. I could connect to it no problem. I could connect to the BYU-Idaho node, 1.2 miles, no problem. Frankly, I was surprised it was working at all. However, I could not get to the Rex node on the Butte or KB7ITU in Plano.

Next, I assembled a 2 meter ground plane vertical. The length of the radiator connected to the center pin does not change. Still 19.5 inches. The one leg of the dipole remains where it is, but in the new ground plane antenna, it becomes one of the radials. I attached three more radials and position them at about a 30 degree down tilt. I didn't use a protractor or anything. I just eye'd it.

I then hung the whole contraption from the light fixture in the middle of my shack, used the same RG58 coax and fired up the packet station. For a sanity check, I connected to both the hospital node and K7BYI just to be certain things were still working at least as well. Check. No problems.

Then I attempted a connection to the Rex node on the Butte, 10.9 miles. It connected immediately. No retries. Awesome. I then attempted a connection to KB7ITU in Plano, 7.7 miles. Again, his node responded immediately with a "Connected" message. I tried W7RAC on Relay Ridge. This node is 20.8 miles from my shack and I have to get over a 60 foot hill in my back yard. No joy. I could not reach it.

Now for a real test. I fired up RMS Express, drafted an email, and then sent the Winlink message directly to KB7ITU's node. I couldn't believe how quick the transfer was. Within seconds, I had a shiny new email message in my Yahoo account.

The point behind this tail, at least for me, is that – in a non-scientific way – the ground plane vertical out-performed the dipole.

Any comments or questions about verticals before we move on? Please come now with your call sign.

We are getting down to that time of the evening. That's probably enough for one now. Next week we'll continue this discussion with J-Poles and beam or directional antennas. Thank you for your participation this evening. Great comments. I hope this has been helpful. This is N7TMS, back to net control.