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The Discone: *A Wideband Omnidirectional Antenna*

"The discone and its variants are the most commonly used low-gain wide-band base-station antennas." This quotation comes from possibly the most comprehensive antenna engineering manual ever written.[1] So, if you've never tried a discone antenna, such a statement in such an impressive manual might just make you wonder what you're missing!

First, don't let the term "low-gain" scare you off. "Low-gain" means that the discone has somewhat less gain than our standard-of-reference, the half-wave dipole. However, the discone has gain comparable to the respected and popular groundplane antenna.

And, also like the groundplane, the discone has a nondirectional response to signals in the horizontal plane. Thus it gives good all-around coverage so desirable at a base station.

Why would we choose the discone over a groundplane antenna at times?

Well, whereas the groundplane is a resonant one-band antenna in its basic design, the construction of the discone gives it one of the widest bandwidths of any antenna: up to a 10 to 1 frequency spread. This means that a discone can be designed to cover a chunk of RF spectrum such as 100 MHz to 1000 MHz. We're talking real bandwidth here!

So, if you want a base-station antenna with good all-around coverage and a super bandwidth, maybe you should consider building this month's antenna: a discone designed to cover from just above the FM broadcast band (110 MHz) well on up into the UHF band.

Just how high in frequency this antenna will function effectively depends on the care you use in making it. I suspect that most readers will be able to construct this antenna to function to at least 500 MHz, and possibly higher.

For the hams among us, that means that it should also give good service on the 2 meter, 220 MHz, and 440 MHz ham bands.

Let's make a super-wide-band antenna ...

To construct this antenna, we need a ten foot length of three foot wide, small mesh (1/2 inch mesh or smaller) hardware cloth. Hardware cloth is a type of screening wire, and yes, you get it at the hardware store! You also need a tin can lid three or more inches in diameter (make sure it is bright tin, so that you can easily solder to it), and an SO-239 coaxial cable female socket.

To begin, lay out and cut the parts of the antenna from the hardware cloth as shown in Figure 1. Be prepared to use patience on this job, it is tedious. A magic marker on a length of string makes a good compass for drawing the curves.

Next, join the small piece-of-pie-shaped wedge to the half-circle piece to make the completed cone-piece as shown in Figure 1. The cut wire ends of the hardware cloth are sharp, and the help of a friend to handle the wire would be nice.

The overlapped junction of the two pieces overlaps two inches. You may bolt, tie, or solder these pieces together, as the electrical conductivity important to the cone is down the cone, not across it.

Next, shape the completed cone-piece into a cone shape. Overlap the joining edges two inches and then bolt, tie, or solder this joint together permanently.

You are now ready to mount the coax socket in the tip of the cone. Cut the tip of the cone off so that the flange of the socket just fits snugly inside and can be soldered in place. Mount this connector with its threaded portion downward into the cone, and the axis of the connector-body vertical.

The connection between the socket-skirt and the cone-tip should be soldered well at as many places around the connector skirt as possible.

Now take the tin-can lid and put a small hole in its center. Make the hole so that the center-connector of the socket fits snugly in it. Solder up (fill with solder) the hole in the lid, and "tin" the coax center-connector (cover it with solder preparatory to mounting the disc on it).

This gets these two parts ready for soldering them together. Solder the lid in place, being careful that it is in a horizontal position.

Take care to make the height of the disc above the cone tip (socket base) correct. I know we can't judge .44 inch accurately, but make sure that the height is

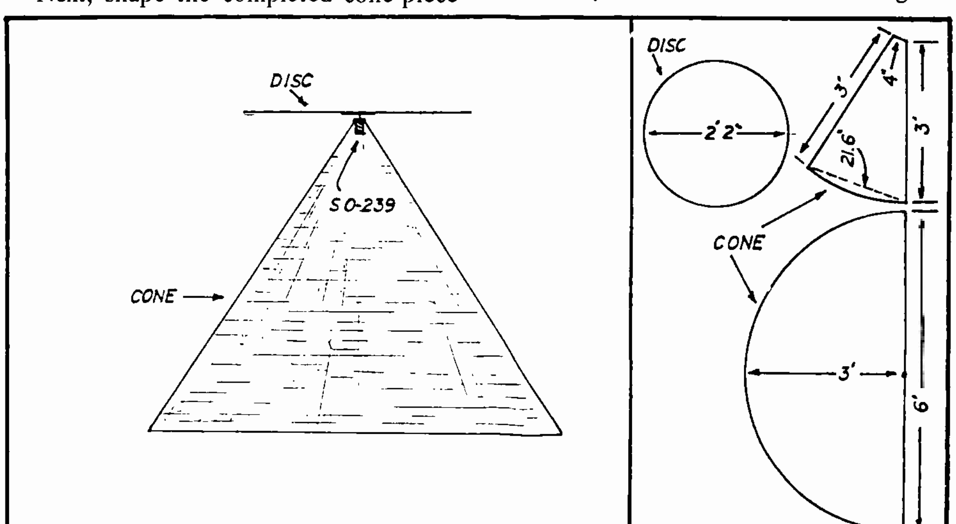

FIG. 1. DISCONE ANTENNA AND ITS COMPONENT PARTS.

just a wee bit less than .5 inch. To get the proper spacing on mine, I had to mount the lid out on the end of the socket center-connector.

Now lay the disc on the lid with the disc-center directly over the hole in the lid. Solder the disc to the lid in as many places as is practical around the edge of the lid. This soldering is for both electrical conductivity and for mechanical strength.

Your antenna is now ready to use!

Using the antenna:

Although you can mount this antenna outside, it will need to be protected from the weather in some way if you do. Mounting it indoors is the preferred mode. It can be put in an attic, crawl-space, or even in your operating room.

An enclosure of fiberglass or box frame covered with sheet plastic should be OK for outdoor mounting. Commercial models are sometimes covered with a fiberglass or plastic dome.

As always, if your building has a lot of metal in its construction, you may find that indoor mounting is not too effective. And the old antenna rule of "the higher the better" should be kept in mind. I used mine sitting on the floor of my second-story operating room with good results, but better results were had with it in the attic.

RADIO RIDDLES

Last month we discussed a rabbit-ear antenna, and then I asked if you had ". . . ever heard of the 'big ear' antenna? What is it, and who made it famous?"

Well, the "big ear" was the work of John Kraus, who is responsible for so many other antenna designs which we now happily enjoy. The "big ear" was a radiotelescope antenna which Kraus used in much of his early work in radio astronomy.

"The Big Ear"[2] is also the name of Kraus's autobiography, which makes very interesting reading for anyone interested in the development of radio or radioastronomy, antennas in particular.

Kraus is also the author of perhaps the most widely-read engineering antenna text published.[3] Coincidentally, most of the equations used in designing this month's discone came from this very useful book.

This month's riddle: What is a "volcano smoke" antenna, and how does an antenna get such a name?

Find the answer to this month's riddle, and much more, next month in your copy of *Monitoring Times*. Till then, Peace, DX, and 73.

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REFERENCES

1. *Antenna Engineering Handbook*, Richard C. Johnson and Henry Jasik. 1984, McGraw-Hill Book Company, New York, Pp 27-13.
2. *The Big Ear*. John Kraus, Cygnus-Quasar Books, 1976, Powell, Ohio.
3. *Antennas*. John Kraus, 1950, McGraw-Hill Book Company, New York.

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