By Neil Sablatzky,* K8IT

HSMM

Communicating High-Speed Multi-Media via Amateur Radio

A Horizontally Polarized Omni-Directional Antenna You Can Build

As mentioned in the Spring 2003 column, most HSMM communication will be horizontally polarized to minimize interference to ISM Part 15 users, who predominately use vertical polarization. This month we will discuss how to build a very low-cost Alford Slot antenna suitable for HSMM Part 97 stations.

As shown in figure 1A, an Alford Slot antenna is based on a one-half-wavelength vertical slot. By machining a slot into a cylinder (figure 1B), the impedance of the circumference becomes lower than the vertical-slot impedance, which allows current to flow and a set of infinite stack loops to radiate. If the diameter of the cylinder is about one eighth the desired wavelength, the slotted length is adjusted to 0.75 of a wavelength, and the slot width is maintained at 0.02 wavelength, a useful 7–8 dBi horizontally polarized omni-directional pattern results. Figures 2A and 2B illustrate the difference in radiation patterns between the slotted sheet and the cylinder. Empirical testing of several prototypes reveals a stable design.

The antenna consists of a length of slotted tubing as shown in figures 3A and 3B. The width and length of the slot, the wall thickness, and the diameter of tubing are all related and will vary slightly.

For HSMM use, I decided to use 1/2-inch copper water pipe, which has a nominal OD of 0.625 inch. The slot was cut to be 2.5 mm wide and 88 mm long. The slot was centered in a length of 1/2-inch copper water pipe with an overall length of 188 mm.

The slot in the tubing can be cut with a small jeweler's file. You first will need to drill a hole at either end of the vertical slot. Use a 3/32-inch drill bit.

The length of the copper tube above and below the slot is not critical, and the copper tube can be used as a support device. However, you must provide a copper shoprting disk for both the top and bottom end of the vertical slot. Slipping a copper disk in from each end and soldering from the open side around the disk works great.

The feed-point impedance of this antenna is approximately 200 ohms. A convenient method of feeding it from 50-ohm coax is to build a 4:1 balun, which consists of a piece of 0.141-inch (UT141) semi-rigid coax with two slits cut along opposite sides of the outer shield. These slits are 29.3 mm long.

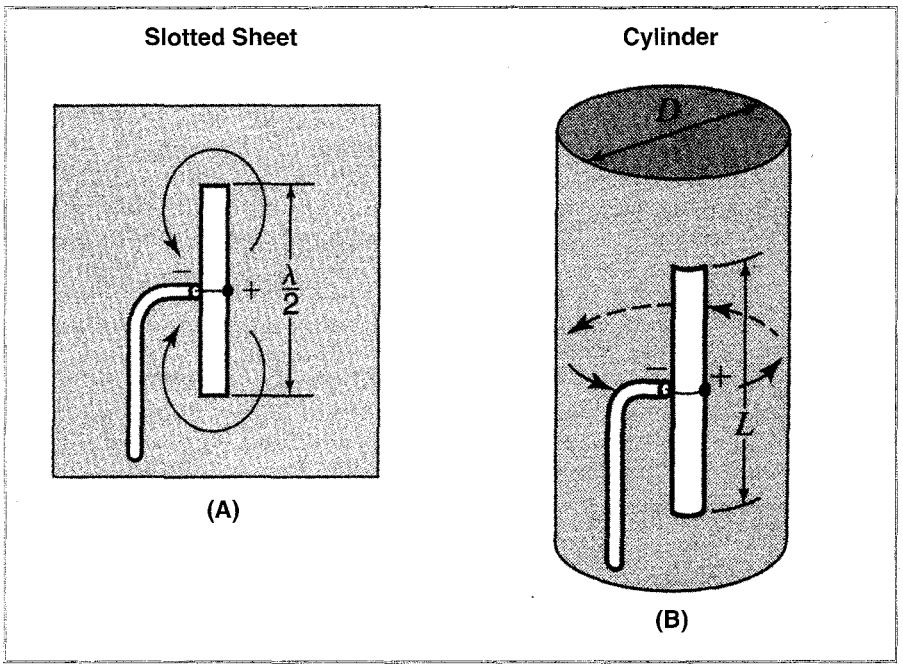

Figure 1. (A) A one-half-wave vertical slot antenna. (B) Vertical slot antenna formed into a cylinder.

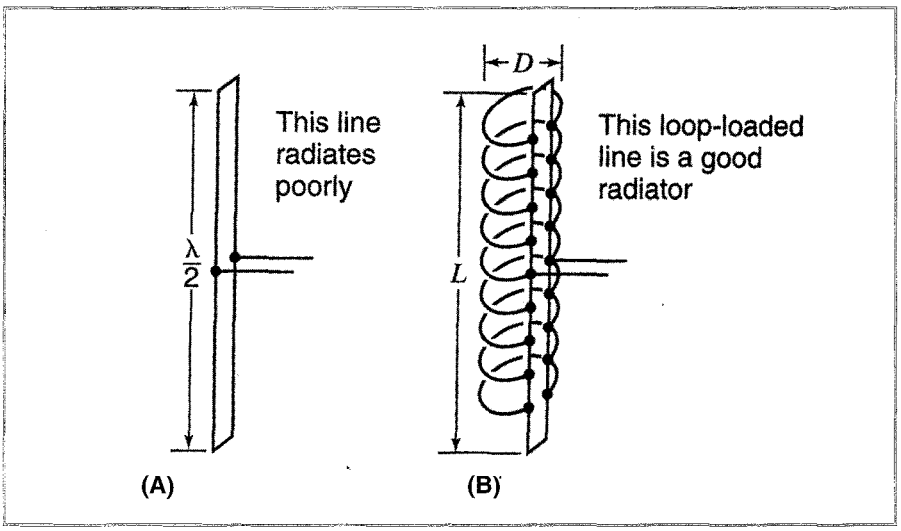

Figure 2. (A) The radiation pattern of a vertical slot antenna. (B) Radiation pattern of a vertical slot antenna formed into a cylinder

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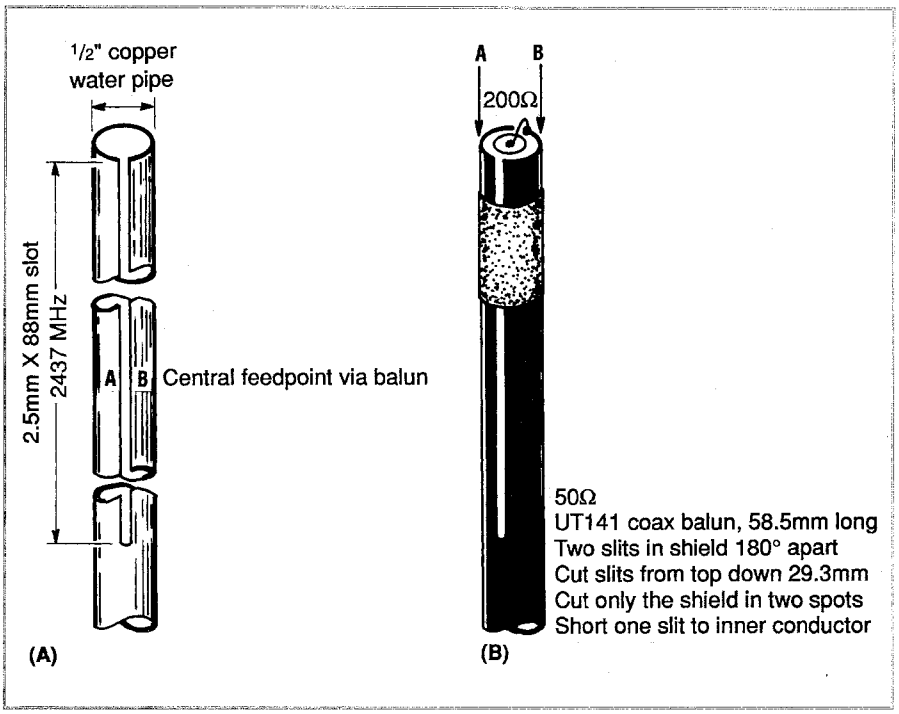

Figure 3. (A) The slits made in the copper-pipe tubing for the creation of the slot antenna. (B) The 4:1 balun needed to match the 200-ohm impedance of the antenna to the 50-ohm impedance of the feedline.

Next short one of the outer shield sides to the inner conductor at the top of one slit and then solder both outer shields to the mid-point of the copper water pipe vertical slot on opposite sides of the copper water pipe vertical slot.

Now route the UT141 coax inside and down the tube along the inside wall opposite the vertical slot. By drilling a small hole in the bottom disk, you can route the coax out the bottom of the length of copper pipe. Finally, terminate the UT141 coax with your favorite UHF RF antenna connector.

Dayton 2003 Highlights

The Dayton Hamvention® included many companies offering HSMM equipment. New products from ICOM, WI-SYS, and RFLYNX were on display.

The ARRL's HSMM Working Group presentation, which was part of the ARRL's Technology Task Force Forum, was well attended by both amateurs and Part 15 users. Favorable feedback was given by several WISP (Wireless Internet Service Provider) owners for the approach the HSMM WG suggested to amateurs with respect to minimizing interference to Part 15 users. The HSMM WG suggests that amateurs first contact their local WISPs to ensure that any operation on their part will not interfere with the local WISP operation.

The HSMM WG also announced plans to develop High Frequency High Speed Multi-Media Network Links on frequencies below 30 MHz. No details were available, except that the development is going to be based on Gerald Youngblood, AC5OG's software-defined radio, the SDR-1000, which is a complete software DSP radio platform. More information on Youngblood's radio can be found at his website: <http://www.flex-radio.com>.

Correspondence

The following was sent to me by John Champa, K8OCL, ARRL Chairman, HSMM Working Group *(also see this issue's "Op Ed" by John—ed.).*

Dear Neil,

The ARRL Technology Task Force High Speed Multimedia (HSMM) Working Group has been encouraging the development of HSMM experimental networks around the United States. Given the relatively low population density of amateur radio stations in some areas of the country, our path analyses sometimes indicated that higher gain antennas, lower noise receive systems, and slightly higher transmit powers are warranted to provide successful links between stations.

Although some off-the-shelf Part 15 equipment in the form of bi-directional amplifiers (BDA) is available, these items tend to be extremely expensive in terms of the typical amateur radio equipment budget. For example, a typical 1-watt BDA can cost as much as $500.

Accordingly, encouraging your more technically oriented readers with home construction capabilities to develop more economical homebrew solutions to this occasional need for the BDA would be appreciated. Simply put, we need construction articles for 4–10 watt bi-directional amplifiers for 2.4 to 2.5 GHz to amplify 13-22 dB IEEE 802.11b/g signals to an output between 4-10 watts. We need receive pre-amplifiers that have 10–20 dB amplification with a noise figure of less than 4.5 dB.

Standard input levels of 10, 17, 25, 50, 100, and 200 mw would be helpful.

The amplifier will be connected to an 802.11b/g WLAN device, so T/R switching done by RF sensing with speeds required to support IEEE 802.11b/g operation would be needed.

Submitted homebrew BDA construction articles could be published in your venue (this column) or on our webpage, <http://www.arrl.org/hsmm>.

Thank you in advance for your support of amateur radio HSMM experimental efforts. *—Very 73, John, K8OCL*

I encourage all readers to send me e-mail with your questions. I will try my best to answer all of them. My e-mail address is <k8it@arrl.net>. I would also like to receive digital photos of HSMM applications. Please identify any people in your photos with names and callsigns and provide a short description of the subject.

73, de Neil, K8IT

HSMM Trivia

Submitted by Darryl Smith, VK2TDS:

There is an antenna that performed the worst in our tests. What is the name of that antenna and what company made the chips for it? (The answer will appear in the next column.)