

Build Yourself an NVIS

If you want to talk to the guy in the next county on HF, of course.

We have all experimented with antennas. At one time or other we played with dipoles, verticals, quads, yagis, and variations of wire antennas. All for the desire of a low-angle signal, which will help us snag DX stations. There have been numerous articles and books on antennas, making us very familiar with the above antenna names. But have you ever heard of the Australian "District Antenna," or the Russian "Zenith Radiation," or what our military calls NVIS (Near Vertical Incidence Skywave)?

This antenna has been around since World War II. The reason most hams have not heard about it is their desire to work faraway stations. When it comes to local communications, VHF/UHF is more common. But there are many cases where the range of VHF is limited, and reliable communications are needed on HF.

In many population centers, there is the desire of many hams to communicate within a 100- to 300-mile radius.

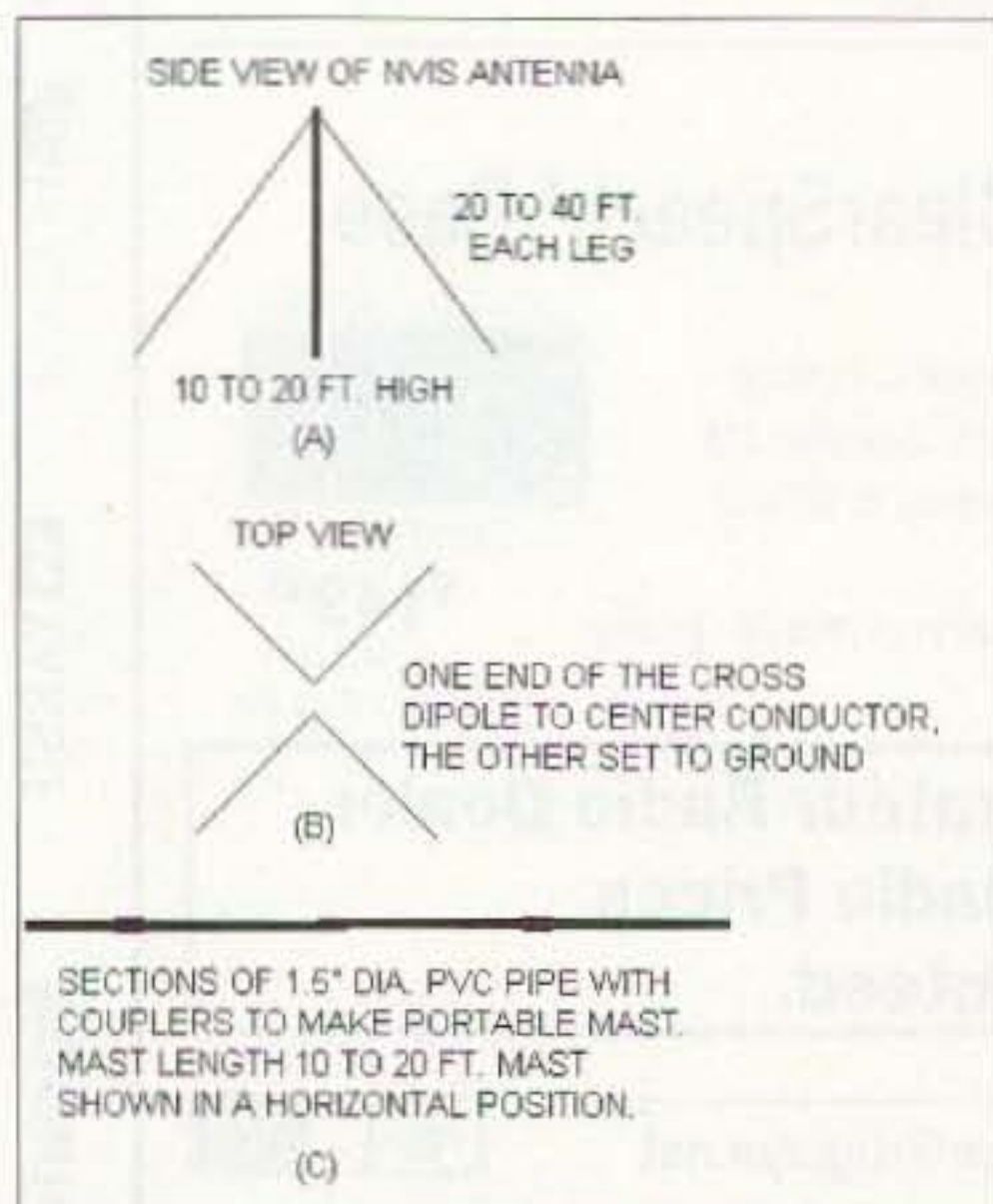


Fig. 1. NVIS antenna details.

In those cases, the known popular antennas might not provide a reliable link. Our military had the same problems, and they found that producing a high angle skywave provided a reliable link, less subject to fading. With a high angle, the surrounding terrain is not an issue.

How to experiment with NVIS

There are many ways an antenna can be made to work in an NVIS mode. The easiest is to run a wire fed with a tuner a few feet from the ground. In most cases, a high-angle skywave will be produced. Stations nearby will be able to communicate.

Another approach is to take your HF mobile antenna and place it in a horizontal position parallel to the ground. You could experiment with the distance between the ground and horizontal antenna. A distance of 3 to 9 feet will work.

When experimenting with NVIS, 80, 40, and 30 meters seem to work best. I tried frequencies between 3.5 and 30 MHz. The factors of working frequencies below the MUF (Maximum Usable Frequency) play a very important role. Power levels of QRP to 100 watts have been used.

Building a simple NVIS antenna

A very simple NVIS antenna can be built, for fixed or portable use. (Please refer to **Fig. 1**.) The basic NVIS antenna is nothing more than two crossed dipoles mounted anywhere from 10 to 20 feet high. The legs of the dipole are sloped and secured to the ground. The crossed dipoles are fed with 50-ohm coax. A tuner, manual or automatic, is required.

A fixed NVIS antenna can be a wooden pole, PVC pipe, or metal mast. The lengths of the wire elements can be anywhere from 20 to 40 feet. For a portable NVIS antenna, a mast could be made from 1.5"-diameter PVC tubing mating with PVC couplers. A piece of coax fed through the mast then feeds the crossed dipoles.

Please make sure that safety concerns are taken into consideration. You do not want anyone to run into the sloping wires, which will be a few feet off the ground. This type of antenna has been made commercially by Telex. It is called the NVIS Antenna, with a model number of AS-2259/1990.

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in great haste to construct a magnetic telegraph from Maine to Texas; but Maine and Texas, it may be, have nothing important to communicate. We are eager to tunnel under the Atlantic and bring the old world some weeks closer to the new; but perchance the first news that will leak through to ... America will be that the Princess Adelaide has the whooping cough."

2. "My dear, you fail to read the scale/ Correct to tenths of a division./ For gentler trade, those eyes were made/ And not for methods of precision."

3. "I, too, am an amateur."

4. "It ain't the things you don't know that get you into trouble. It's the things you know for sure — that ain't so."

Answers:

1. Henry David Thoreau wrote that in his essay "Walden" in about 1850. The first intercity telegraph line, from Washington DC to Baltimore, had been completed in 1844. The first successful "tunnel under the Atlantic" began operation in 1866. I often sigh and think of Thoreau's remark when a ham sends QRU TNX ES 73 on the second transmission. Nothing important to communicate.

2. James Clerk Maxwell, in England, penned those whimsical lines about female students in his physics classes — then called natural philosophy classes. By about 1864, Maxwell had devolved a set of 20 equations (later compacted to four) from which all of electrical and radio science can be derived. Yes, Ohm's Law, the capacitive-reactance formula, all the transmission-line and antenna formulas — all of them are implicit in the four equations of Maxwell. Among other things, Maxwell's equations predicted the existence of radio waves. Heinrich Hertz, in Germany, managed to generate these waves (wavelength about 6 meters) and send them across a room in 1888. Marconi, in Italy, read of Hertz's work, and the rest is well known to history. Aside from a stereotypically Victorian attitude on the "place" of women, Maxwell's lines show that a towering mathematical genius can have a touchingly human side.

3. Guglielmo Marconi said those disarming words to ARRL representative Paul Godley in 1921, when the latter

had come to Great Britain to attempt the first reception of amateur signals across the Atlantic. (He was successful.) I take nothing away from the real achievements of Marconi — they were many and impressive. But the public acclaim that was lavished on him was not accorded to others of equal accomplishment, because they were not "smooth operators." For example, Marconi's claim to have achieved trans-Atlantic communication in 1901 was universally accepted, even though he and his assistant were the only ones to hear the signals. And in 1912, he personally blocked news from the *Titanic's* rescue ship because he had made a lucrative deal with the *New York Times* for an exclusive story. But the public still lionized him.

4. While not original with him, this was the favorite quote of Major Edwin Howard Armstrong, inventor of regeneration (1912), the superheterodyne (1918), and FM radio (about 1935). The triode vacuum tube (1906) was "known" to be a little less sensitive and a lot more troublesome than the crystal detector until Armstrong showed what it could do in a feedback circuit. Heterodyning was known as a curiosity; "The Major" gave us the standard radio receiver circuit by heterodyning to a super-audible frequency. FM had been "proven" by mathematics to have "no advantages whatever," but Armstrong refused to believe it until he had tried it for himself. Commenting on his inventive style, Armstrong said, "Inventions are not made by theoretical musings, but by jackassing storage batteries around the laboratory." Perhaps the day for that kind of stubbornness is over, but a part of me hopes that it is not. 73

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References

NVIS Communications, by David Firdler and Edward Farmer. Available for \$14.00 from World Radio Books, P.O. Box 189490, Sacramento CA 95818. Excellent.

"NVIS Antennas," by Edward Farmer AA6ZM, *QST Magazine*, January 1995.

US Field Manual 24-18, "Single Channel Communications Techniques." Has a section on NVIS antennas.

Net sources

NVIS Antenna Information (excellent Web site for NVIS systems): [www.tactical-link.com].

Construction of an NVIS Antenna, by Dr. Carl O. Jelinek: [www.qsl.net/vcars/carl/nvis.htm].

NVIS community at onelist.com: [www.onelist.com/community/nvis]. 73

QRP Drives Ham Nuts

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NN1G, 80 East Robbins Avenue, Newington CT 06111, [http://www.smallwonderlabs.com/].

Solid State Design for the Radio Amateur, Wes Hayward and Doug DeMaw, ARRL, 3rd printing, 1995; ISBN 08725-90402.

WIFB's Design Notebook, ARRL, 1st Ed., 2nd printing, 1994. ISBN: 08725-93207.

WIFB's QRP Notebook, Doug DeMaw, ARRL, 2nd Edition, 1991, ISBN: 08725-90348. 73

CALENDAR EVENTS

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its 23rd annual Hamfest/Computerfest on March 25th, 8 a.m.–2 p.m., at Madison High School on North Ridge Rd. New and used amateur radio, computer, and other types of electronic equipment will be featured. VE exams will be held for those interested in earning an amateur radio license. Admission \$5. 6 ft. tables \$8 each, 8 ft tables \$10 each. Call Roxanne at (440) 257-0024 to make table reservations.

MONROEVILLE, PA The Two Rivers ARC, Inc. of Greenock PA will hold their 29th annual Hamfest Computer Fair 8:30 a.m.–3 p.m. at the Palace Inn in Monroeville PA, (intersection of Routes 22 and 48, at turnpike). Vendor setup 6 a.m.–8:30 a.m. The registration deadline is March 9th. A confirmation will be sent upon receipt of payment. 6 ft tables including 1 chair, \$20 each, includes one vendor admission per table. 115/60 outlets are \$10 each. Additional vendor passes are \$5 each. Vendors using electrical outlets are responsible for providing multiple breakout strips or extension cords if needed. Food may NOT be sold by vendors.