A NVIS Refresher

by

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Scheduled high frequency radio nets over large areas with only one frequency should be recognized as being generally unrealistic. Propagation may dictate that more than one frequency is necessary. Conditions over which the Net Control Station may have no control often can ruin a net. This is particularly true on Amateur Radio Bands.

The main reason a statewide HF net is unrealistic over an area as large as California, for example, is that the typical emergency involves only one location or area. Thus, the best frequency dictated by propagation characteristics is selected. The requirement is to communicate between Point A and Point B -- not the entire state.

This is why station operators shouldn't be too upset about poor conditions between other stations and excellent results between others. All too often it is simply the laws of marginal propagation being in charge.

If wide area nets are really necessary to disseminate information or assure total station participation, sub-nets are necessary. This means breaking the larger area into perhaps two areas and changing to a more appropriate frequency to do so.

Antennas for DX serve no purpose in our (state emergency) nets. Near Vertical Incidence Skywave - or NVIS - antennas will improve your nets more than any other step. The NVIS antenna is just a few feet off the ground. A fixed station NVIS antenna is always horizontal and is installed, for practical purposes, anywhere between 7 and 25 feet (no more) above the ground. The same is true of a mobile HF antenna; it is always horizontal and never vertical. Now doesn't that make your garage happy?

The horizontal antenna is a dipole cut to the lowest operating frequency. If it must operate on more than one frequency (and I don't know a service that can), it must either be a broadband dipole designed for this service (B&W is notable) or a single wire dipole connected to an external automatic antenna tuner (SGC, Motorola and perhaps others). Antenna tuners built into the HF transceivers do not qualify to do the job. The feedline required is beyond the scope of this brief paper.

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This summary is based upon the assumption that the reader has some familiarity with the subject of Near Vertical Incidence Skywave HF-SSB propagation for communications between 1.8 MHz and around 10 MHz. NVIS is essential to anyone requiring reliable HF communication from one to 400 miles. Such users include the RACES, Operation SECURE, the Civil Air Patrol, FEMA, the U.S. Forest Service, MARS and others. This information is not found in conventional technical publications and least of all in the field of Amateur Radio. Having said that, here again are the highlights of NVIS (pronounced "niviss").

For practical communications plans and operations, NVIS functions between 1.8 MHz to 10 MHz. Much above that and the signal penetrates the ionospheric layer instead of the desired reflection back to earth.

Using a "NVIS antenna," provides total coverage for a radius of 300 to 400 miles from any such station.

A NVIS antenna is always horizontal. A vertical antenna can never be used, including mobiles.

A NVIS antenna has omnidirectional radiation; in other words, it makes no difference how you orient your antenna.

A NVIS antenna is low; it MUST be low. Attempt to keep it no more than twenty feet above electrical or earth ground.

A muli-frequency NVIS antenna requires a remote and automatic antenna tuner at the end of the coaxial cable and before the antenna system.

If you use a dipole antenna with an automatic antenna tuner to operate on more than one frequency, cut the dipole to the lowest frequency to be used with the conventional formula.

An existing dipole antenna over twenty feet high can be expediently modified to obtain a degree of NVIS performance. This is done by allowing the feedpoint to stay ten to fifteen feet below the ends of the antenna.

A horizontal broadband antenna may be used without an automatic antenna (tuner,) for a base station.

End-fed long wire antennas are NOT recommended. Unbalanced antennas are prone to creating interference to telephones and other electronic systems in the vicinity.

When the user has a choice of several frequencies, the best choice is generally ten percent below the MUF or Maximum Usable Frequency obtained from propagation programs.

Now, and for the next several years, solar activity will affect HF communicators in a manner to which most are not accustomed. Amateur Radio operators will find that 80 Meters will often work better in the daytime than 40 Meters and that 160 will be better than 80 at night. The Civil Air Patrol will find that it must use 2347 kHz at night instead of 4585 for more reliable communications. Remember, we are talking about communications necessary up to about 400 miles away. This may mean some necessary equipment and antenna changes. One thing is certain - this condition will be with us for several years and justify the expense.

In summation, HF-SSB and NVIS will climb out of the deepest canyons, hop the highest mountains, never require any repeaters or other intermediate relays. And some thought high frequency radio was an ancient art! -- *Reprinted from World Radio magazine, January 1995 (by permission)*