Near Vertical Incident Skywave Communications in a Nutshell

by WB0VQP

NVIS Communications is different from DX communications in that for DX Communications, one desires a Low Angle of Radiation. With NVIS Communications, one desires a High Angle of Radiation, in fact the desired goal is to send most of the signal straight up to the Ionosphere.

This concept has been used and perfected by almost all military units in every conflict since World War II.

The concept has successfully been adapted to planes, trains and automobiles as well as other vehicles.

The concept is that a signal sent straight up to the Ionosphere comes back down much like the droplets of water from a garden hose would if the hose was set to spray a fog of droplets straight up into the air.

This concept works primarily on the 75 and 40 meter band, although also has been used on the 160 meter band, and if the FCC allocates the new band proposed at 5.25 mHz, it would also work on that band.

It works best on 40 meters during the day, and 80 meters at night, although if 80 meters goes “Long” at night 160 meters works as well.

This type of operation insures reliable communications out to approximately 350 miles under most condition, although reliable communications have been experienced at distances over 1000 miles.

How do you achieve this? By LOWERING your antenna height!

An article entitled “The NVIS-A Low Antenna for Regional Communications” by Albert Pion- KK7XO in the June 2002 edition of “QST” states that you can use the same old dipole,G5RV, or loop antenna you have by lowering it’s height to 1/8 wavelength above ground.

This distance is as follows for the bands:

160 meters- 32.5 feet
80 meters- 15 feet
40 meters- 8 feet
(for the proposed 5.25 mHz band- 11 feet)

Others who have done considerable research and testing on the concept Bonnie, believe the antenna should be higher at .25 to .35 wavelength above ground.

Here are the distances calculated at .25 wavelength:

160 meters- 61.6 feet
80 meters- 30 feet
40 meters- 16.25 feet
(for the proposed 5.25 mHz band- 22.3 feet

Lowering the antenna height will not only change the radiation pattern, it also will change the resonant length of the antenna and SWR. You would best use an antenna Tuner and could feed the antenna with open wire feeders, twinlead, or coaxial cable if you must.

If you desire, you can install a "reflector element" .15 wavelength BELOW the driven element. If you chose to do this, the antenna would have to be at least .25 wavelenth above ground. The reflector element under should be one unbroken conductor with no center insulator, and should be cut 5% longer than the driven element. Some researchers doubt whether this additional element is necessary or worth the effort necessary to incorporate it.

Loops fed with open wire feeders or twin-lead-type feedline and a tuner also work very well for NVIS-type propagation. The formula for low level horizontal loop that many use is:

L=900/freq in mHz.
(The conventional loop length formula is L=1005/freq in mHz.)

For Mobile use, antennas have been fabricated from strips of metal above and running parallel to the roof of the vehicle through an antenna tuner unit. Conventional whips also can be folded over parallel to the roof of the vehicle to achieve a similar performance.

The concepts I have described would best work in emergency situations where communications coverage beyond the range of VHF is needed.

Further ideas and studies can be obtained by reading the extensive research done by LTC David Fielder, and MAJ Edward Farmer of the NJ National Guard. This book is entitled Near Vertical Incidence Skywave Communication, and is available from Worldradio Books at a cost of $14.00 plus shipping. I would highly recommend this book for anyone wanting a wealth of information on this topic.

There is an Internet Yahoo Group entitled NVIS that one can join and participate in at no charge. The web address of this group is:

http://groups.yahoo.com/group/NVIS/

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