NVIS: The Ultimate Fallback Emcomm Resource – Key Points

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Near Vertical-Incidence Skywave (NVIS) is a method of regional communication that does not rely on infrastructure, is immune to terrain and other obstructions and supports multiple simultaneous, independent users. Repeaters, while helpful, are subject to many limitations: site power disruption, surge damage, antenna and building damage, inaccessibility for repair (road closures due to snow, fire or mudslide), intentional interference (jammer) or unintentional interference (other users). They support only one communication at a time, and terrain can leave areas without coverage

We want to "spray" an area hundreds of miles across with RF. Surface and direct waves won't cover such distances; sky waves will. The ionosphere refracts (think "reflects") RF; distance depends on angle of incidence. Low angles (closer to the horizon) result in signals traveling thousands of miles but leave a skip zone (no signal) in between. Signals launched at high angles return closer to the point of origin, eliminating the skip zone. There are limitations:

- Above the **critical angle**, no refraction occurs; signals go off into space
- Critical angle varies with frequency; higher frequencies = lower critical angles
- Bands above 10 MHz are seldom useful for NVIS, especially with low sunspots

Critical frequency (foF2) is the highest one that will be reflected straight down. It varies by time of day, time of year and solar activity level. During sunspot peaks, foF2 may be 10 MHz during the day (NVIS on 40m) and 5 MHz at night (NVIS on 80m). During sunspot minimums, foF2 may only get to 5 MHz in the daytime (NVIS on 80m) and 2 MHz at night (NVIS on 160m).

The lowest bands get the most reliable refraction, but the ionosphere's D-layer (energized by the sun during daylight and dissipating at night) absorbs lower frequencies, severely attenuating signals on the lower bands. <u>Proper band selection is a key to successful NVIS operation.</u>

Low signal launch angles work DX but not locally. High angles provide desired local coverage. Launch angles depend on antenna orientation and height. Verticals favor low-angle signals and have a null overhead, so they're bad for NVIS. Horizontal antennas will support NVIS if they Re kept low enough (3/8 wavelength or less). Lower antennas also pick up less interference from distant stations and less noise from distant sources (e.g., Caribbean thunderstorms), but the efficiency drops as they get closer to the ground.

Usable NVIS antennas include dipoles, doublets, horizontal loops, off-center-fed wires and bent-over mobile whips. Supports can be trees, vehicles, outbuildings, fences, even traffic cones!

For Emcomm operations, a good strategy would be to have an efficient gain antenna, such as a loop with a one-wavelength-square ground screen, at the EOC, command post or net control location to compensate for less efficient, hastily erected field antennas.

Read more in QST (January 1995, June 2002 and December 2005), QEX (May / June 2007) and at www.cebik.com.

Try your NVIS set-up on these weekend HF nets

Saturdays (all times Pacific)

- 07:00 on 3.965 Nevada ARES Net (08:00 winter)
- 07:30 on 3.965 Rural Am. Radio Assn Net (08:30 winter)

Sundays (all times Pacific)

- 07:30 on 3.990 Southern AZ RACES Net (06:30 winter)
- 08:00 on 3.965 ARRL SW Div Section Managers Net
- 08:00 on 3.950 Bishop ARC Net (0830 winter; early check-ins from 07:30)
- 08:30 on 3.933 Imperial County RACES
- 08:30 on 3.945 Riverside County RACES
- 08:45 on 3.860 or 7.283 Los Angeles ARES Net
- 09:00 on 3.965 Orange County ARES Net