Very Short 160-meter Inverted-V

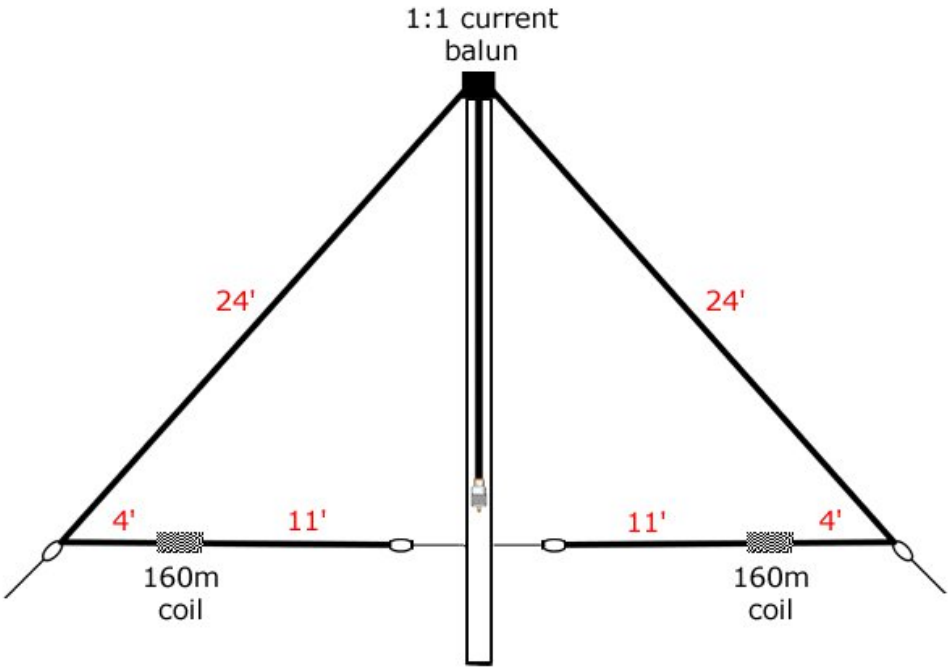
Using Near Vertical Incidence Skywave (NVIS)

Larry Nelson - K5IJB

Constructing a dipole for 160 meters with a length of approximately 254 feet and a height of 50 feet or higher will produce a low angle of radiation. The antenna configuration in this article produces a high angle of radiation, consists of a loading coil in each leg resulting in narrow bandwidth, and is only 18 feet at its apex. It will easily fit in most backyards permitting 160-meter NVIS operation.

WB5UDE describes Near Vertical Incidence Skywave (NVIS) as a radio propagation mode which involves the use of antennas with a very high radiation angle, approaching or reaching 90 degrees (straight up). This propagation path provides usable signals in the range between groundwave and conventional skywave distances — usually 30 to 300 miles.

This NVIS antenna configuration for 160 meters is described below. Notice that it resembles an inverted-V with the ends bent back toward the supporting pole. I have previously used this method when building full-size 40 and 80 meter dipoles for tight spaces.



Details

- 1:1 current balun
- Each leg length 39 feet
- RG-8X coax length 50 feet
- Narrow bandwidth - 15-20 kHz
- 18-foot pole - maximum height for NVIS
- Bottom horizontal legs only 6 feet above ground
- Loading coils placed at 70% for maximum current flow

Loading Coil Placement

VK8DA mentions that the placement of the loading coil will play a large part in the overall efficiency of the shortened antenna.

- If the coil is placed too close to the feed point, the loading coil will carry high current and losses will be high.
- If it is placed too far out, the required inductance to resonate the antenna will be very large and losses due to low Q will result.

The 160-meter loading coils Hy Power LC1682 are placed at the 70% point following the design by Hy Power for their 82-foot horizontal 160-meter antenna. Since each leg was originally 40 feet long, the loading coils were placed at the 28-foot position. The antenna was tuned for 1840 kHz to maximize FT8 digital mode operation.

Earlier experiments with a 160-meter coil consisted of an end-fed 37-foot rain gutter antenna shown on the next page. The 160-meter coil plus an 80-meter mobile antenna were placed at the far end opposite the feed point. Good grounding was a constant problem at my QTH, so an Inverted-V using both coils was eventually constructed.

Operating 160-meter NVIS

Tuning for lowest SWR was accomplished using the cut-n-try method. An SWR of 2:1 or better was obtained from 1836 kHz to 1853 kHz without the need of an antenna tuner. Bandwidth varies from 15-20 kHz depending upon ground dampness. SWR appeared to be lower after sunset and slightly higher after sunrise.

Since the antenna is too short for operating CW around 1820 kHz, alligator clips are used to add 3 inches to each end. Most of the CW portion can then be worked with an SWR of 2:1 or better.

The efficiency of this antenna configuration is probably only 10-15%, but it does permit operating on 160 meters. Medium range has been 575 miles using FT8 digital mode.

The first 100 contacts on 160 meters have ranged from 81 to 1,500 miles depending upon noise and propagation. Contacts beyond 1,000 miles are really DX with this configuration.

Not every call or CQ is answered, but this very short antenna does permit 160-meter operation.

NVIS Rain Gutter Antenna

An end-fed 160-meter antenna experiment

Larry Nelson - K5IJB