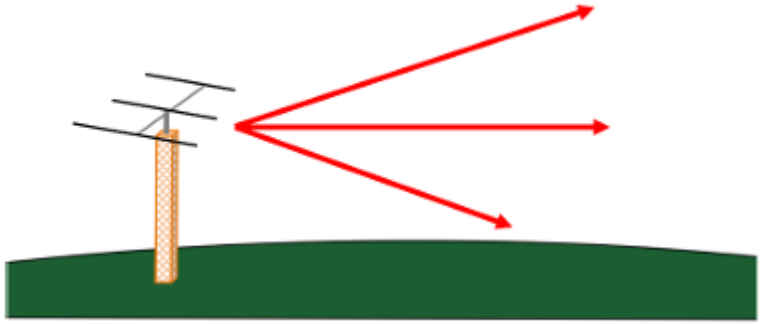
Understanding
Near Vertical Incidence Skywave
NVIS

Calvert AUXCOMM

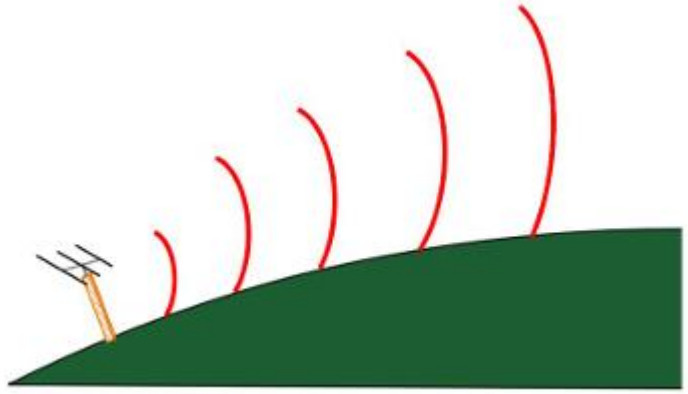
March 2026

Info herein taken from Rohde & Schwarz Application Note

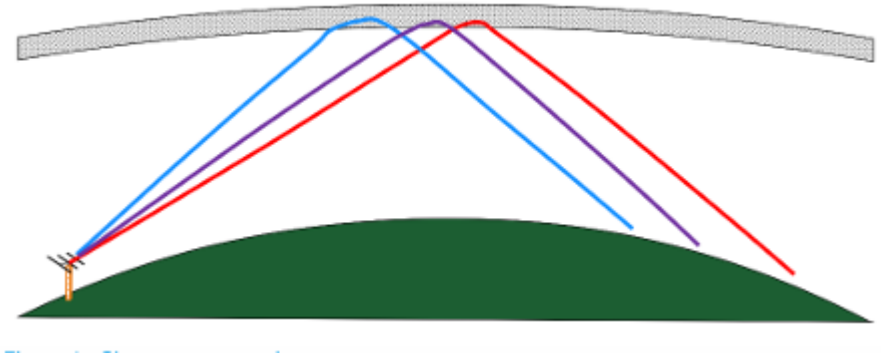
Propagation Modes



Line of Sight

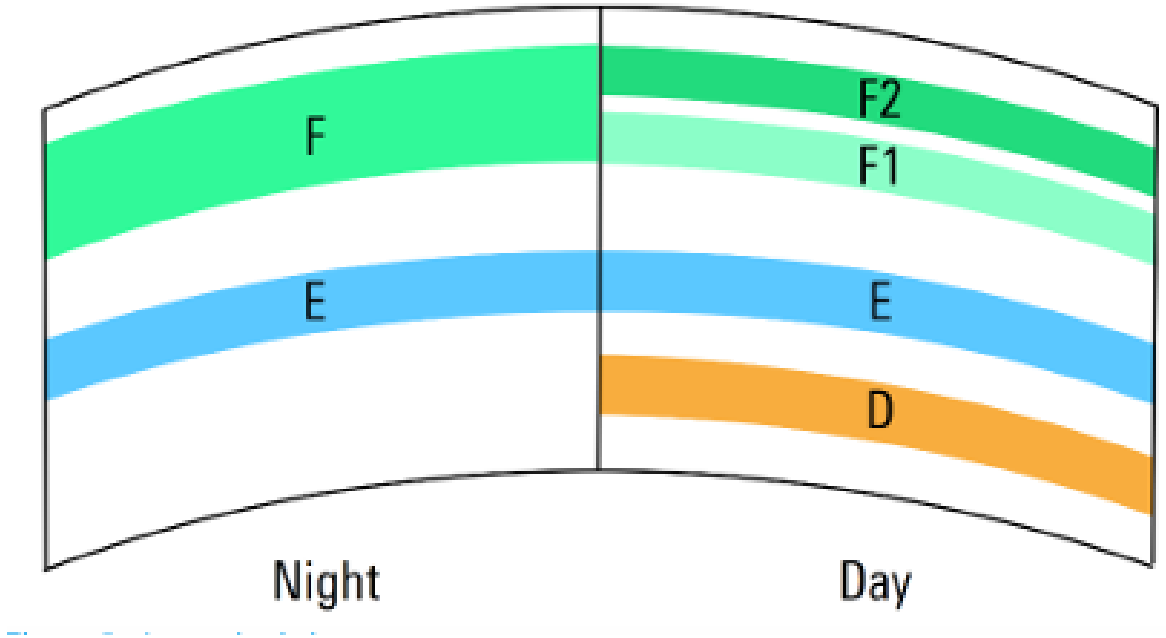


Groundwave



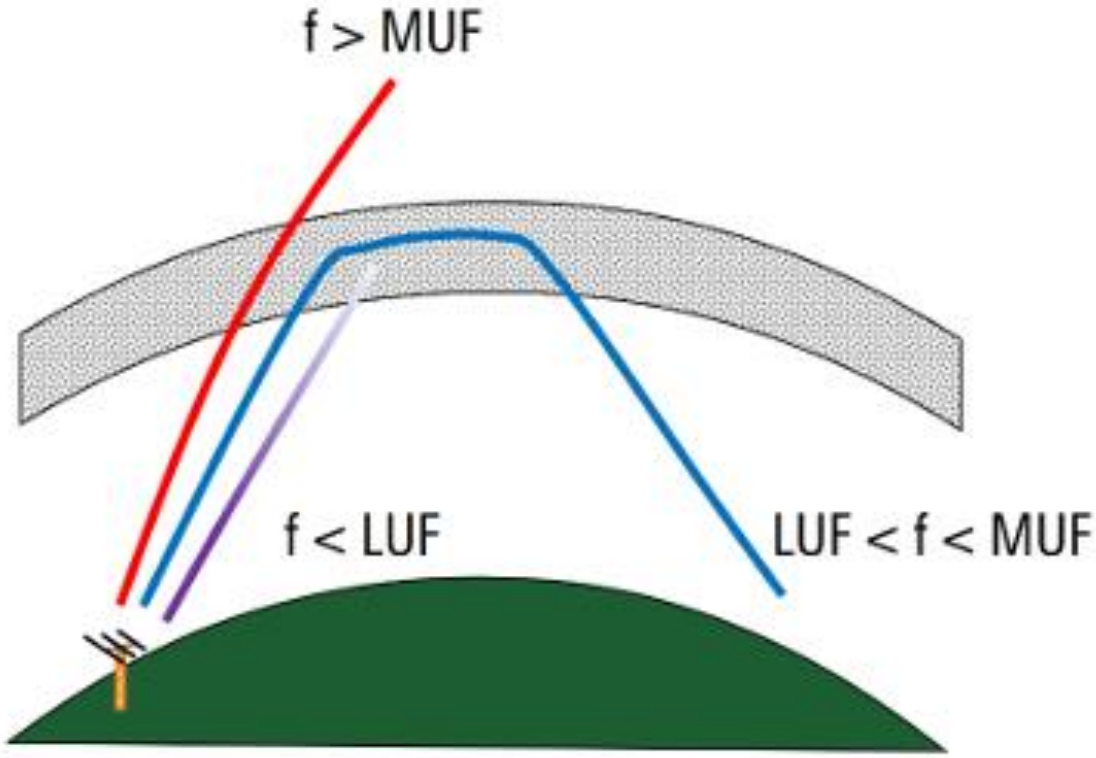
Skywave

Ionosphere



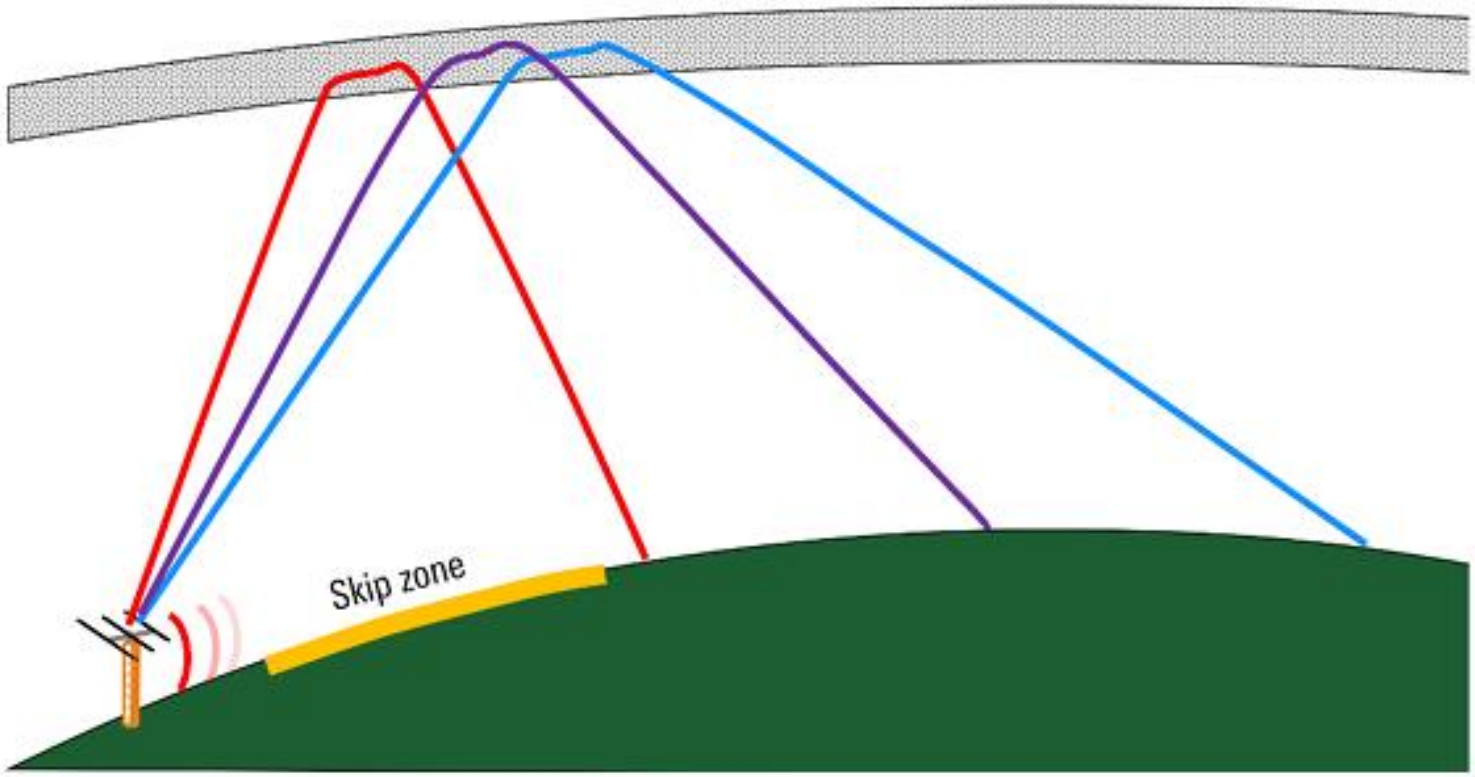
D-layer, from 60 to 100 km; the E-layer, from 100 to 125 km; and the F-layer, or layers, from about 200 to 275 km.

Maximum Usable Frequency (MUF)



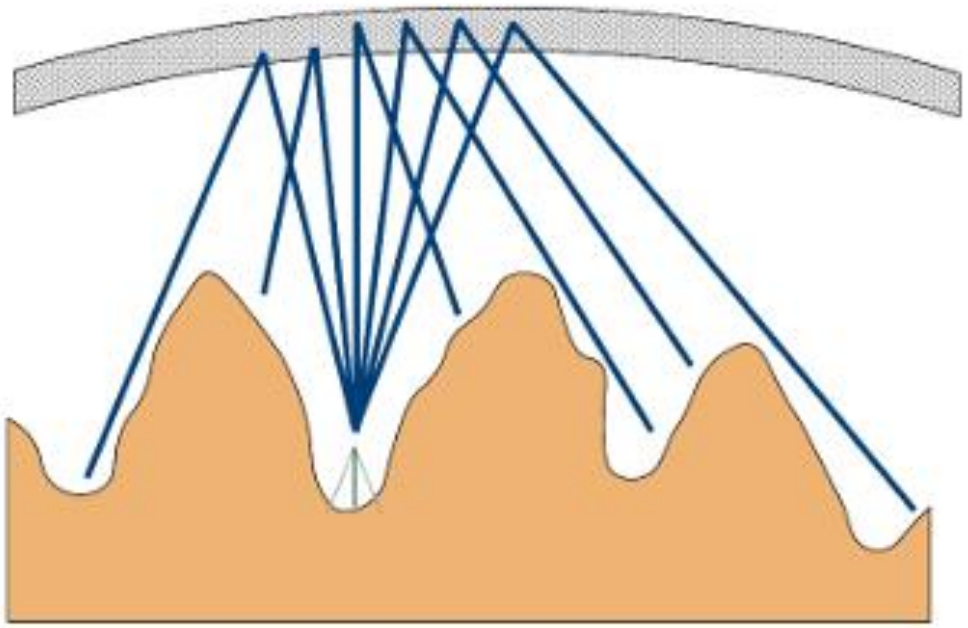
If a signal is aimed straight up, once a certain frequency is reached, RF is no longer returned by the ionosphere and instead continue on into space – this is the critical frequency. Critical frequency is a function of both the current ionization level as well as the measurement location:

Incidence Angle



One way to provide coverage within a skip zone is the use of higher incidence angle signals, since a very high incident angle causes signal to be returned to Earth closer to the transmitter.

NVIS Communications

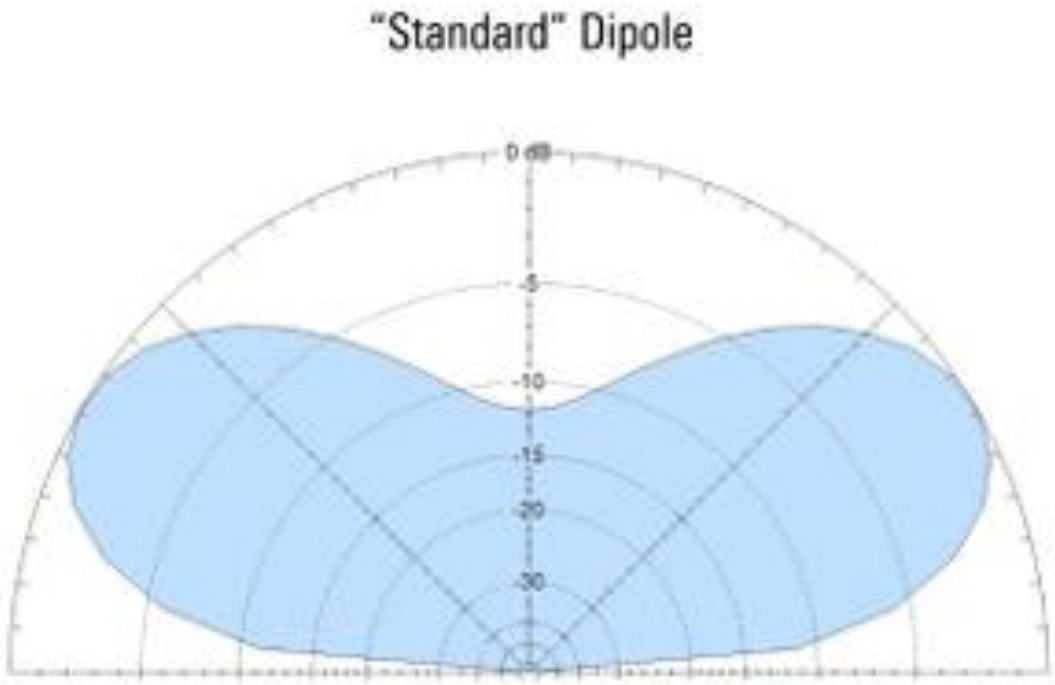


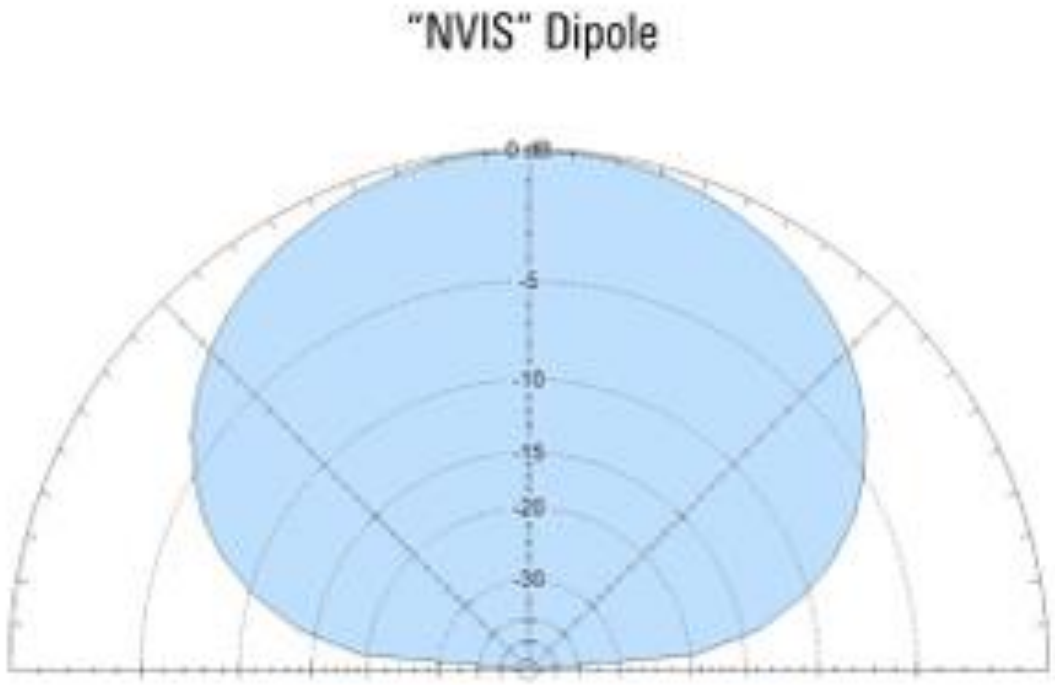
NVIS is implemented using an antenna with a very high take-off angle, typically 75° or more, with transmission taking place on lower HF frequencies to ensure that signals are returned from ionosphere. The nearly-vertical take-off angle of these signals cause them to be returned to Earth relatively close to the transmitter. Coverage is often fairly uniform within a radius of up to several hundred kilometers from the transmitter.

Advantages/Disadvantages

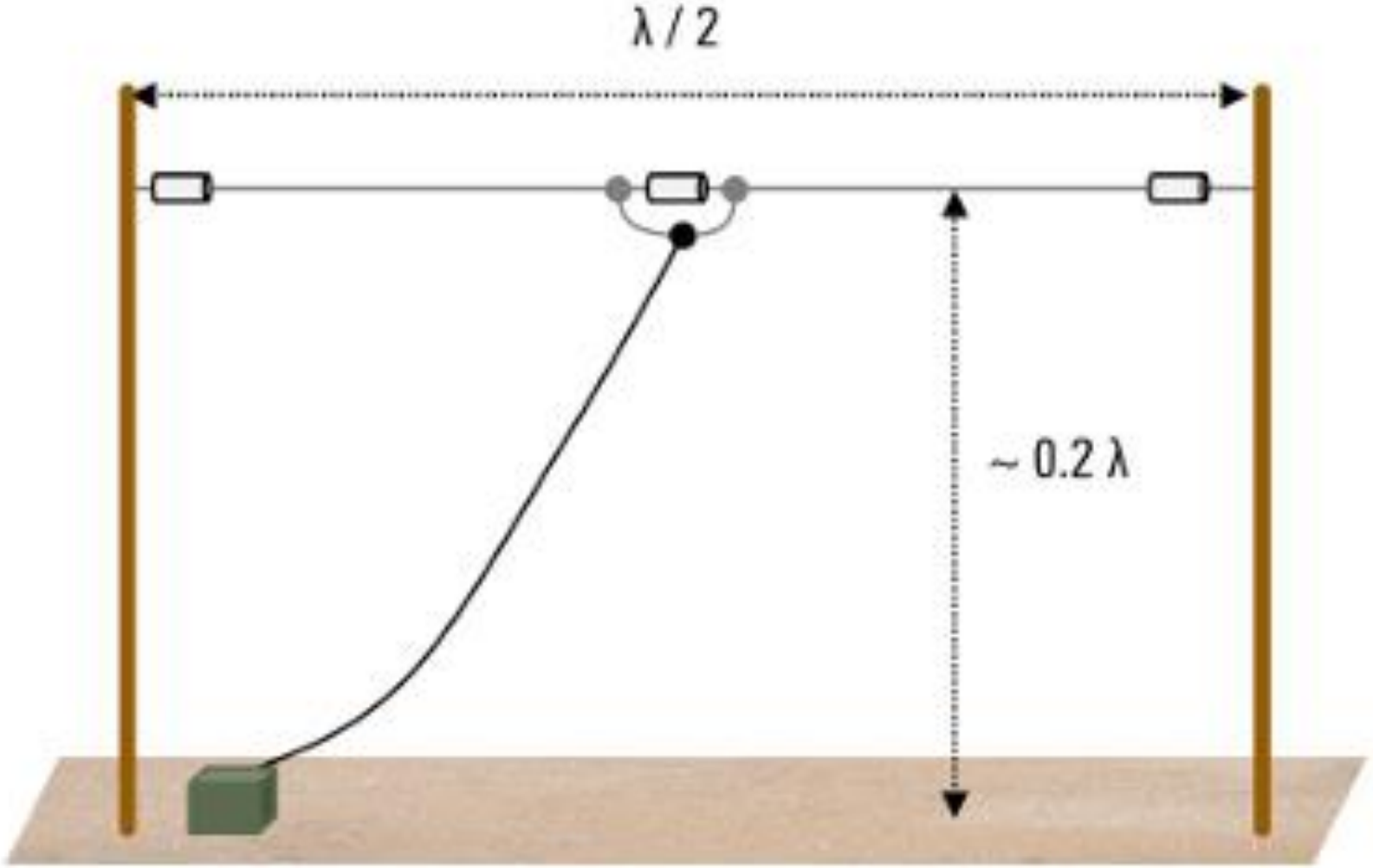
- Advantages
  - More resistant to fading
  - Shorter path through the D-layer and therefore less D-layer absorption
  - “Line of sight” propagation between the transmitter and the ionosphere as well as between the ionosphere and the receiver(s).
- Disadvantages
  - NVIS only works at lower frequencies
    - Signals with too high of a frequency will simply pass through the F-layer into space
    - BUT…NVIS requires the use of frequencies that are high enough to avoid excessive D-layer attenuation. D-layer absorption is higher for lower frequency signals.
    - NVIS frequencies range from 4 to 8 MHz during the day and from 2 to 4 MHz at night.

NVIS Antennas



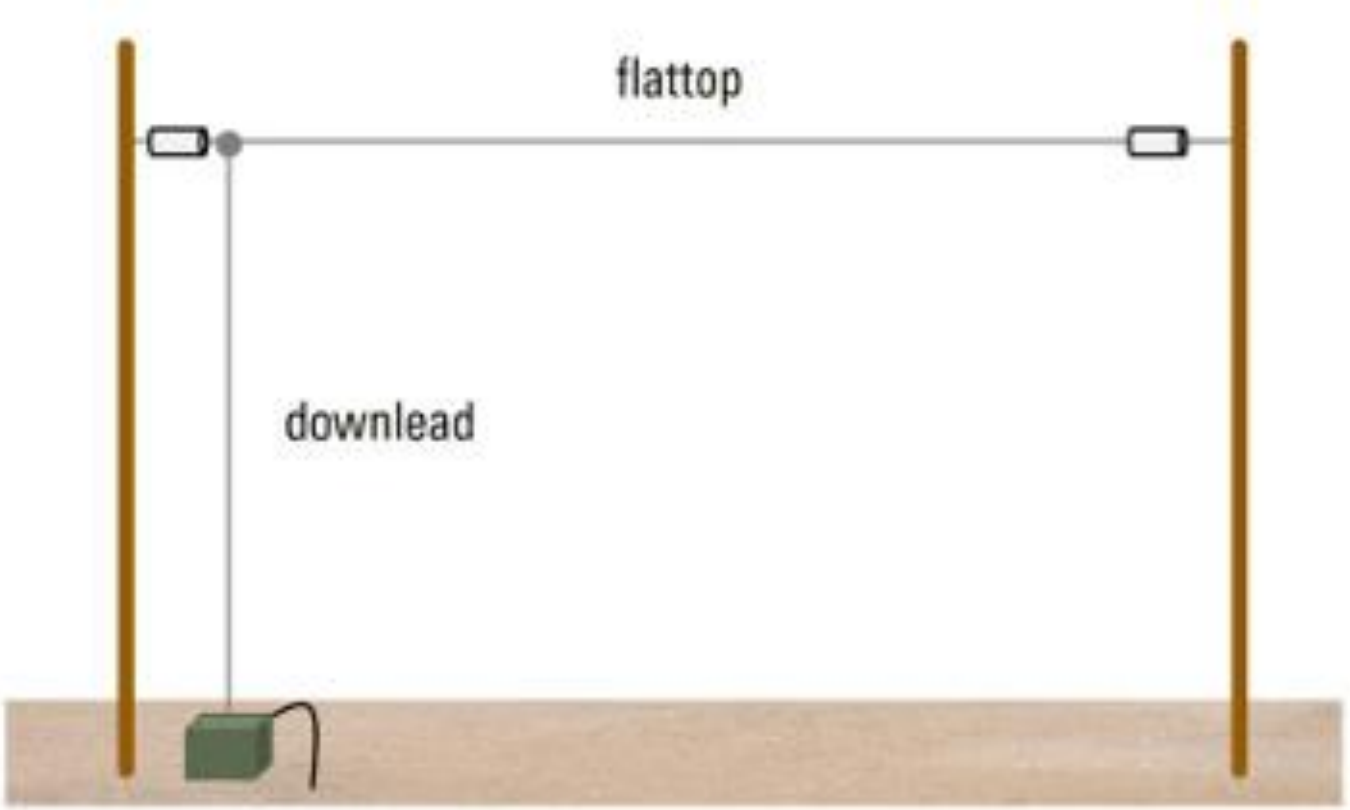


NVIS Dipole



Low Inverted V

Inverted l



Needs a good ground or a counterpoise

Loop Antennas Including Mag Loops

Calvert AUXCOMM Plans

- Participate in “NVIS Day” sponsored by Ohio ARES
  - April 25 10 am to 4 pm
  - 3902 LSB
  - 7240 LSB
  - DMR ARES Talkgroup 31395 (if feasible)
  - https://arrl-ohio.org/nvis/
- Set up multiple NVIS stations around the county/tri-county area.
  - Single op or team
  - Use your own callsign
- K3CAL will set up outdoors near the PSB EOC
- Check local coverage as well as contacts with Ohio stations
- Rain date May 2nd (Calvert Only)

Questions