ANTENNA AND WAVE PROPAGATION

Long Wire Antenna

- Long wire or random wire antennas are very simple antennas.
- They can come close to half wave antennas in efficiency, although efficiency decreases as they are made very long or installed closer to earth.
- Technically a true "longwire" needs to be at least one wavelength long, but Hams commonly call any endfed wire a longwire or random wire antenna.

Advantages & Disadvantages

Advantages	Disadvantages
no heavy expensive coaxial feedline hanging from the span	single wire "feeder" and "ground lead" radiate
very simple to install and construct	can be a problem for lightning
excellent stealth antennas	single wire feedline can be burn or shock hazard
inexpensive	require a tuner or matching system

- The antenna itself works just as well as any other wire of similar height and length.
- Any or all problems are in the counterpoise and feed system.
- The difficult problems associated with random wire or longwire antennas are caused by ground currents and radiation from the single wire feeder.

- **Endfed antennas**, or antennas with the single wire feeder brought into the shack, come with a little misconception.

- One commonly repeated myth or "theory" is that halfwave antennas, being resonant, do not require a counterpoise, or that some magical length of antenna will prevent RF in the shack.

- This does not mean the antenna will be worthless and not make contacts, it simply means something else replaces the missing counterpoise area and we also bring RF fields right into the shack.

- The feedline, as well as everything connected to and surrounding the singlewire feedline and counterpoise, becomes part of the radiating system.

This creates three potential problems:

- The feedline, mast, and things around the feedline connect through the antenna into the receiver. This brings noise into the receiver.

- The feedline, mast, and things around the feedline become part of the radiator. This brings voltage (electric fields) and current (magnetic fields) directly into the shack.

- The feedline and grounding affects SWR and tuning.

How the Longwire or Random Wire Antenna Works

- The antenna element works the same as any other antenna. Electromagnetic radiation comes from current flowing over a spatial distance along the wire.

- The single wire feeder not only radiates electromagnetic energy, it has very strong electric and magnetic induction or energy storage fields surrounding the wire for some distance out from the wire.

- In order to force current up into the feed wire and antenna, the matching or feed system has to "push against" something else.
- For every milliampere of current flowing into the feed wire of the longwire antenna, an exactly equal current has to flow into a ground system of some type! In any nonterminated antenna, currents and voltages are transformed along the antenna.
- This transformation is caused by standing waves.
- This means ground lead currents can increase or decrease along the ground wire and everything connected to the ground wire or ground system.

- Voltage changes also along the ground or counterpoise system, just as it does in antennas.
- The voltage caused by antenna return currents, and the return current, will become stronger (more intense) or weaker (less intense) because of standing waves on wiring and equipment cases.
- These ground currents, displacement currents, or common mode currents cause everything connected to the matching system to become "hot" with RF.
- The result is generally all sorts of RF interference to active devices or even physical harm to the operator, such as actual burns or on lower bands like 160meters..... electrical shocks!
- These unwanted but very necessary currents ideally should flow through the lowest impedance path and widest area path we can manage.

Noise from Longwire Antennas

- Radiation and fields surrounding the single wire feed system not only leak out, unwanted noise and signals can also leak in.
- Radiation from the feeder and everything connected to the matching system, as well as common mode currents, also allows common mode noise ingress.
- This deteriorates receiving system noise performance.

FOLDED DIPOLE

- Folded antenna is a single antenna but it consists of two elements.
- First element is fed directly while second one is coupled inductively at its end.
- Radiation pattern of folded dipole is same as that of dipole antenna i.e figure of eight (8).