

Longwire

Longwire (or random wire) antenna is one of the simplest radio antennas: piece of wire as high as possible. Long horizontal part and some vertical part from transmitter to the wire. It is usually used as temporary installations, specially as field day antennas. It is fast to build and presents wide frequency range and some gain with long wire lengths. Antenna type usually needs an antenna tuner (ATU), if used with transmitter.

Impedance

Wire impedance at open wire end is complex: half wavelength wire is of high impedance and quarter wavelength is of low impedance. Usually we select the wire length to be more than quarter the wave length of the lowest frequency we use. Then the low side band is handled with ATU and the high side band impedance stays rather smooth. Typical wire impedance varies by frequency from hundreds to thousands ohms.

Radiation patterns

Vertical radiation pattern depends on the horizontal wire height. With heights of some meters (2-5m) we get high radiation angle suitable for NVIS communication. Also the SWR of the antenna is rather low and the SWR curve is smooth.

With medium heights (5-20m) the the vertical radiation angle is lower and the antenna suits better for long range communication.

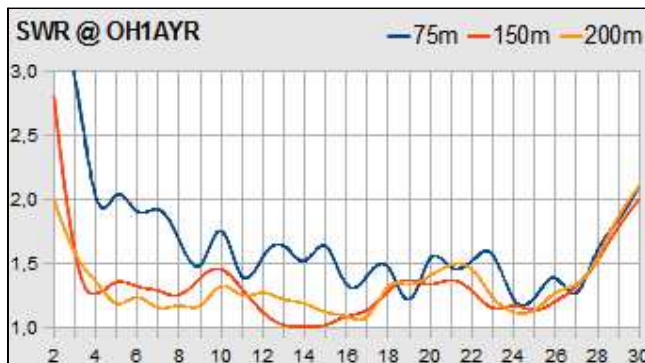
Horizontal pattern is complex and depends on wire length. Typically the horizontal antenna length is about one wavelength of the lowest frequency. Then the pattern is near round on low frequencies (4Mhz) and highly elliptical on highest frequencies (28MHz), with several minor lobes. The peak gain is close to the line of the wire (to open end). The maximum gain is less than 10dBi on long antennas. The minimal noticeable gain 1.3dBd is on antenna lengths of two to four wavelengths. On eight wavelengths the gain is near 6dBd. Some pattern models on appendix.

Grounding

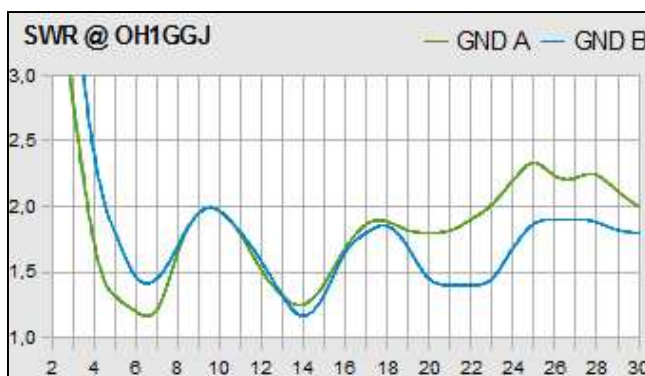
Longwire antenna needs a proper grounding at the feed point. If the traditional low-ohmic grounding is hard to get working, also counterpoise wires below the antenna wire work well. This artificial ground may be single wire, as long as the horizontal antenna wire itself. It may also be a set of quarter-wave wires, one for each band used.

Matching

Longwire is usually matched with ATU. This may cause troubles with high power transmitters: the local RF radiation field may be rather high near the wire end, near the operator. Common practice is to feed the antenna with **1:9 unun** (50 to 450 Ω), located near the antenna feed point. With coaxial feed we get the highest radiation field far from the operator. Also the grounding may become easier. Details of suitable unun on appendix.



Auvo **OH1AYR** tested the SWR's over near perfect ground. Variable length wire height was about 2,5m.

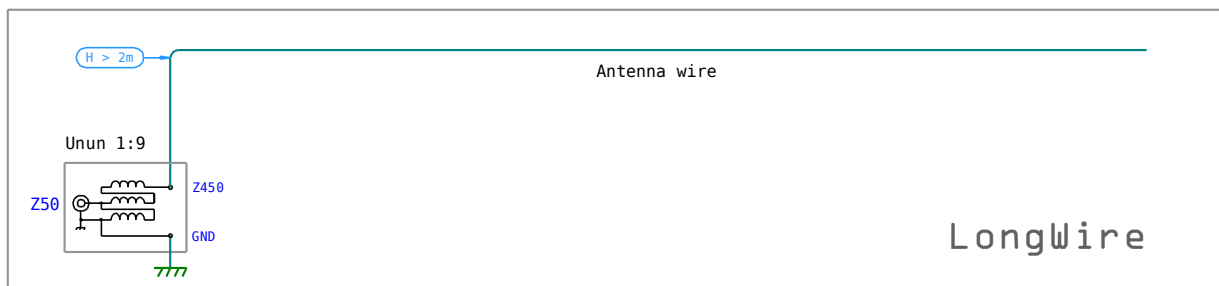


Jouko **OH1GGJ** tested the 2,5/125m LW with various grounds:
 - GND A (green), normal low-resistance grounding.
 - GND B (blue), grounding only with 125m counterpoise wire.

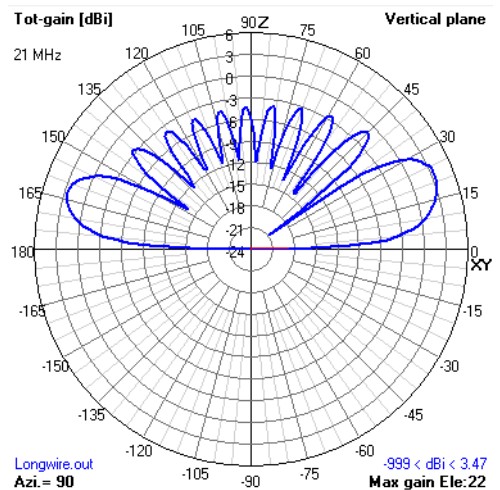
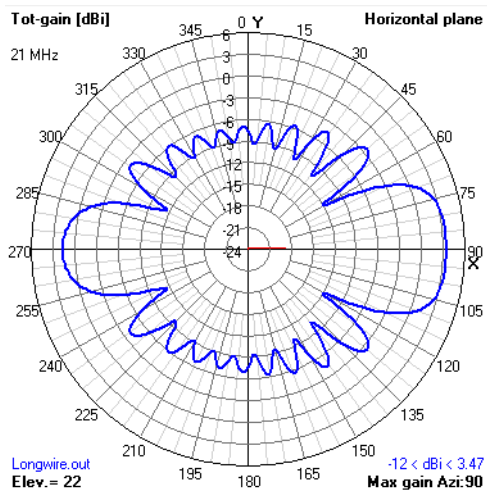
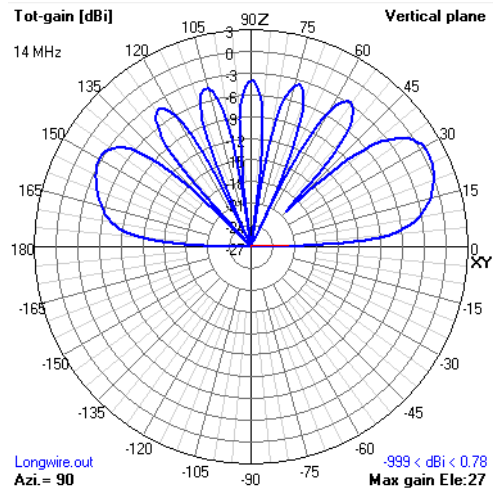
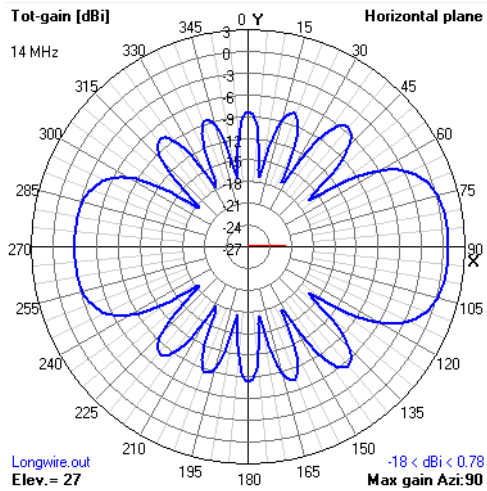
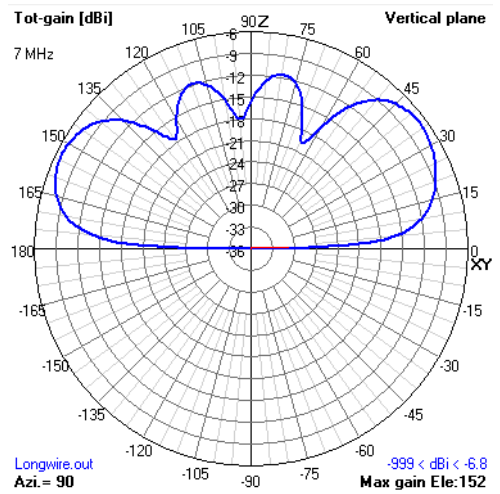
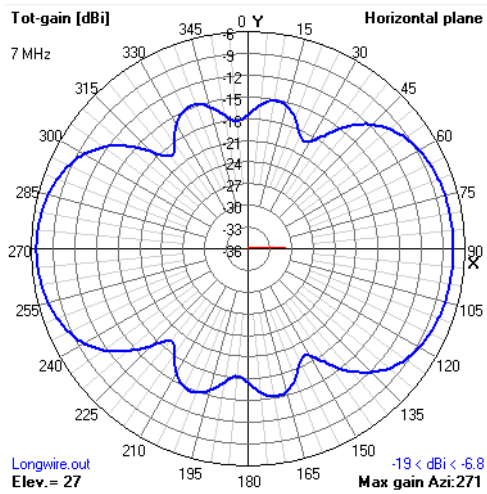
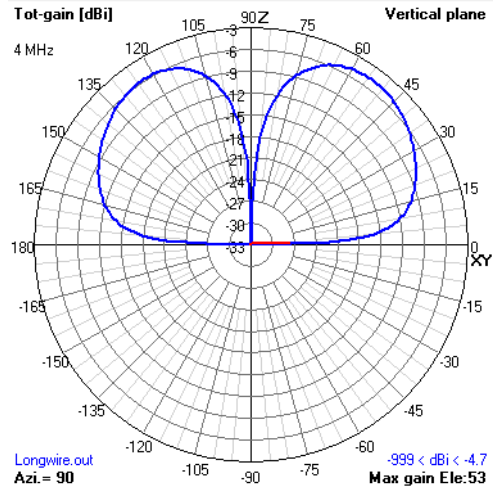
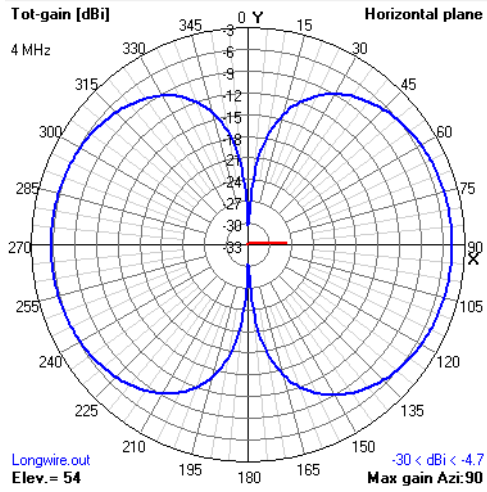
Simulated patterns

On the appendix you find some NEC2 simulated radiation patterns:

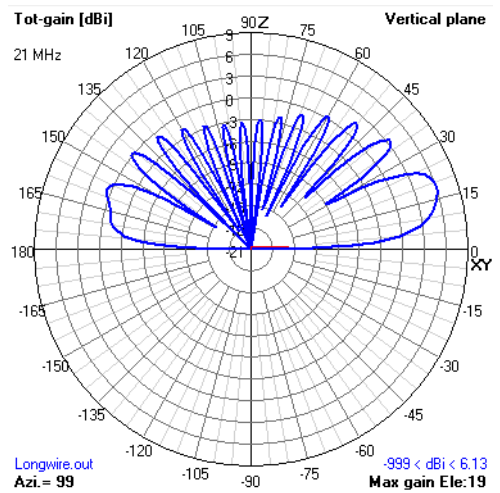
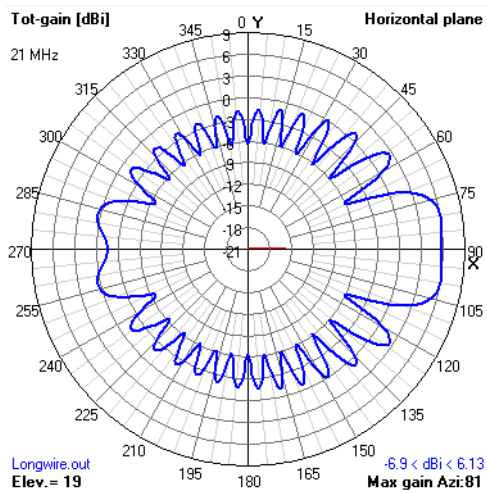
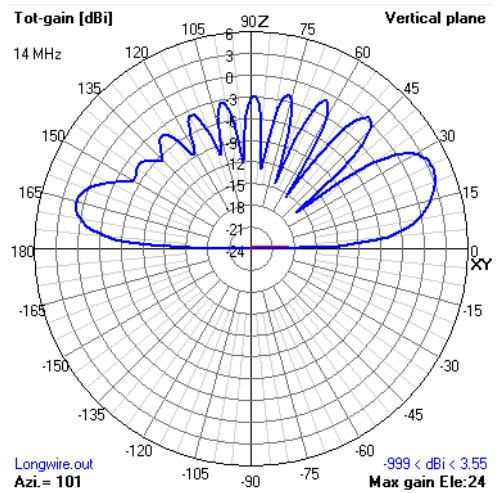
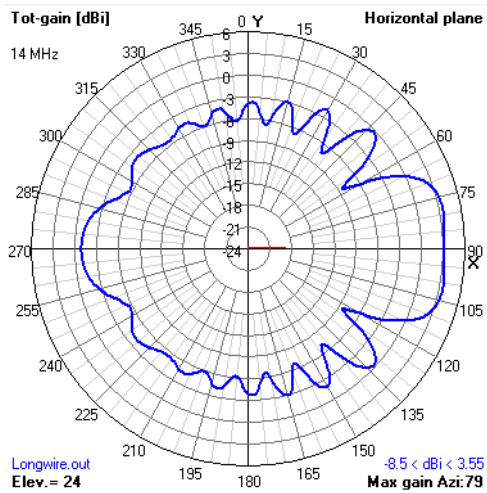
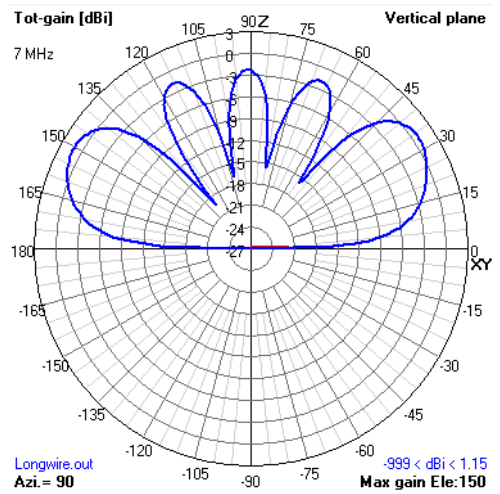
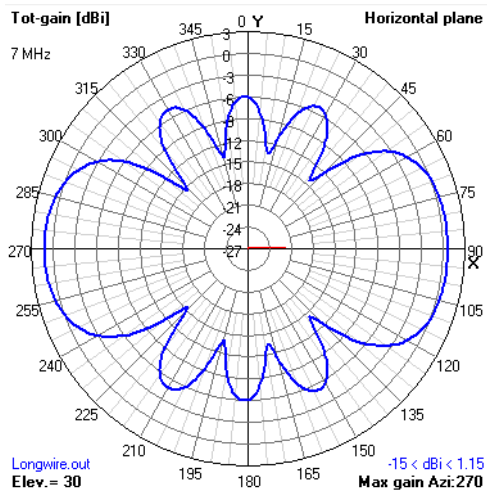
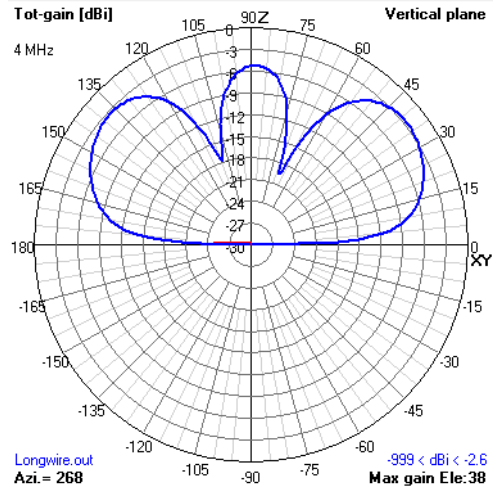
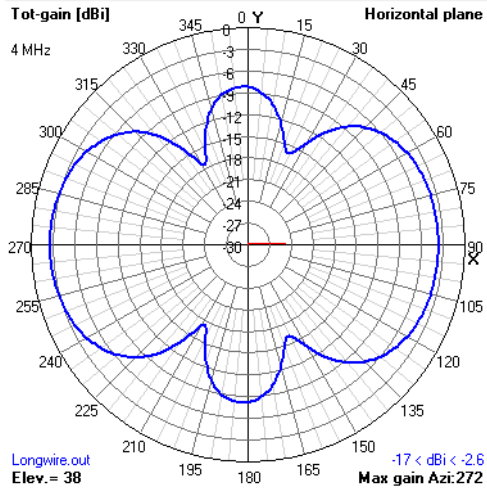
1. 75m long LW, height 2,5m, NVIS, elliptical.
2. 100m long LW, height 5m, elliptical, better gain.
3. 75m long LW, height 7m, more circular, max. gain 7-21 MHz,.



Longwire H2,5 L75



Longwire H5 L100



Longwire H7 L75

