

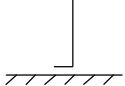
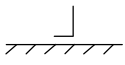
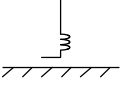
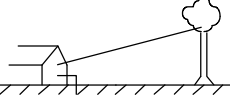

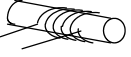



# Antenna Examples

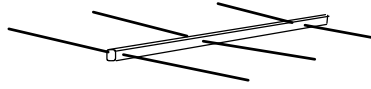
Antennas come in a nearly infinite number of shapes and sizes. Here are a few of the more common ones. Note that many other designs are variations of others.

## “Non-directional” Types

Antenna	Impedance	Features
1) Halfwave Dipole	 73+j0 Ohms	Relatively isotropic, simple construction
2) Folded (halfwave) Dipole	 300 + j0 Ohms	Similar to dipole. Higher impedance. Sometimes used in simple vertical arrays.
3) Quarterwave Monopole	 36+j0 Ohms	Similar to dipole. Ground-plane often abbreviated (e.g. case of cell-phone is ground plane)
4) Short Monopole	 $R - j X$ $R \ll 36, X \text{ large}$	Physically shorter than quarterwave monopole, but requires resonating coil and/or matching network.
5) Loaded monopole	 $R + j0$	Similar to short monopole, but resistive input impedance. Can be engineered to be nominally 50 Ohms.
6) Simple longwire	 Varies Widely	Simple useful design at low freq (e.g. < 30 MHz). Often used for shortwave receivers.
7) Simple large loop or smaller resonant loop	 Varies Widely	Simple, low-cost. Popular for indoor UHF TV antennas in "the old days".. Resonant loop used in KeyFobs today.
8) Small ferrite-core loop	 $R + jX$	Physically small with large effective aperture. Used in portable AM broadcast receivers and other LF to HF products.
9) Microstrip patch	 50 Ohms	Simple, low-cost. Useful mainly at high frequency (e.g. good for GPS).
10) Other	Inverted F, small loaded patches, etc. 50 Ohms	Simple, low-cost designs for PC boards. May use high-K dielectrics to make antenna much smaller than a wavelength.

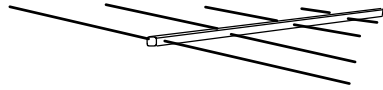
## Directional Designs

1) Yagi-Uda



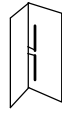
Moderate gain (10 dB)  
Good front-to-back ratio.  
Relatively simple construction.

2) Log-Periodic



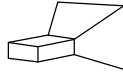
Similar to Yagi-Uda, but  
broadband. Lower gain  
and less directivity.

3) Corner Reflector



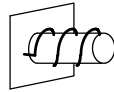
Good "sector-coverage" (i.e.  
beamwidth of 90 to 120 degrees  
with excellent front/back ratio).  
Often used in cell-towers.

4) Horn



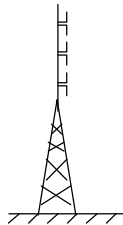
Gains to about 12 dB. Good  
illumination pattern for dish  
antennas.

5) Helix



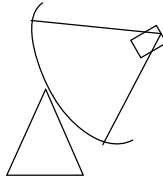
Circular polarization. Moderate  
gain, and good illumination for  
dish antenna.

6) Linear, vertical array  
(tower-mounted dipoles)



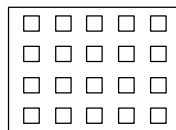
Concentrates power toward  
horizon for max range. Used  
in public-safety (police/fire/etc.)  
Used in cell-towers when array  
embdded in corner reflector.

7) Parabolic dish



High-gain, narrow-beamwidth.  
Simple, low-cost construction.

8) 2-D Phased-array



High-gain, narrow-beamwidth,  
rapid-steering. Relatively high  
cost.