

Antenna Description

The Sapling Company, Inc.

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The quarter wave monopole antenna is a single element antenna fed at one end, that behaves as a dipole antenna. It is formed by a conductor $\frac{1}{4}$ in length. It is fed in the lower end, which is near a conductive surface which works as a reflector. The current in the reflected image has the same direction and phase as the current in the real antenna. The quarter-wave conductor and its image together form a half-wave dipole that radiates only in the upper half of space.

In this upper side of space the emitted field has the same amplitude of the field radiated by a half-wave dipole fed with the same current. Therefore, the total emitted power is one-half the emitted power of a half-wave dipole fed with the same current. As the current is the same, the radiation resistance (real part of series impedance) will be one-half of the series impedance of a half-wave dipole. As the reactive part is also divided by 2, the impedance of a quarter wave antenna is $(73 + i43) / 2 = (36 + i21)$ ohms. Since the fields above ground are the same as for the dipole, but only half the power is applied, the gain is twice (3dB over) that for a half-wave dipole $\frac{1}{2}$, that is 5.14 dBi.