

# Antenna design

The important parameters in antenna design are:

- Gain/directivity
- Frequency
- Bandwidth
- Efficiency
- Radiation resistance ( $Z_{\text{antenna}}$ )

## Efficiency

The losses in an antenna can be modeled as a series resistance with the radiation resistance. The sources of losses are:

- Resistive losses
- Resonance - energy can be trapped in a parasitic LC tank circuit and dissipate through resistances.
- Substrate losses - if the thickness of the substrate is comparable to the  $\frac{\lambda}{2}$ , or half of the wavelength, some of the signal can travel through the substrate.

## Design and simulation

The ANSYS HFSS suite can be used to design and simulate antennas.

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