

Advances in the Design of Electrically Small Antennas

Steven R. Best
MITRE
202 Burlington Road
M/S S230
Bedford, MA 01730
Steven.best@mitre.org

Optimization of the performance properties of electrically small antennas represents a challenging design problem for the antenna engineer. As wireless devices decrease in size, there is an increasing demand for physically smaller antennas, yet the performance requirements are rarely relaxed.

This ½-day workshop provides a detailed discussion on the theory, challenges and performance trade-offs associated with the design of electrically small antennas. The workshop begins with an overview of the basic theory and concepts associated with electrically small antennas. This segment of the presentation provides an understanding of antenna performance limitations in terms of impedance, radiation patterns, bandwidth, efficiency, and quality factor. Techniques used to design self-resonant electrically small antennas are described and compared. These include dielectric loading, linear loading (increasing wire length), top-loading, and “folded” configurations. The relationship between the antenna’s performance characteristics and its physical properties is discussed. Issues such as the significance of antenna geometry are considered. The performance of the small antenna on small finite ground planes is considered with a particular emphasis on how the antenna’s location on the ground plane affects impedance, pattern and polarization properties. The workshop concludes with a discussion on recent advances made in the design of low profile, conformal and integrated device antennas.