

Advances in the Design of Electrically Small Antennas

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Optimization of the performance properties of electrically small antennas represents one of the most challenging design problems for the antenna engineer. As electronic components and devices rapidly decrease in size, there is an increasing demand for physically smaller antennas. At some frequencies, the requirement for a physically small antenna does not necessarily translate into a requirement for an electrically small antenna. However, with decreasing physical size at any frequency, the design challenge increases because 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. Many electrically small antenna designs are presented with a specific focus on recent advances made in this field, particularly those related to device integrated 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.

The workshop continues with a detailed discussion of recent advances made in the field of electrically small antenna design. Numerous techniques used to design self-resonant electrically small antennas are described and compared. Techniques discussed include dielectric loading, impedance loading, linear loading (increasing wire length), top-loading, and folded configurations. The resonant performance properties of numerous antenna configurations and types are presented and compared. The relationship between the antenna's performance characteristics and its physical properties is discussed. Issues such as the significance of antenna geometry and current vector alignment in establishing the resonant properties of an antenna 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 in the design of low profile, conformal and integrated device antennas.