Introduction to Planar Antenna Design and Optimization

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Abstract:
This presentation introduces the fundamental concepts of planar antenna design, focusing on practical techniques for modeling, analyzing, and optimizing antennas using MATLAB Antenna Toolbox. Planar antennas, such as microstrip patch antennas, are widely used in modern wireless communication due to their low profile, ease of fabrication, and integration capabilities.

We begin by exploring the theoretical foundations of planar antennas, including resonant frequency determination, substrate selection, and radiation pattern analysis. The session then transitions to hands-on demonstrations using Antenna Toolbox, where participants learn to create, visualize, and analyze planar antenna structures. Using toolbox functions, we will define the antenna geometry, specify substrate properties, and simulate the far-field radiation pattern. Participants will observe how design parameters—such as patch length, width, and substrate height—affect antenna performance metrics like gain, bandwidth, and efficiency.

The lecture further covers optimization techniques to fine-tune the antenna design for specific objectives, such as maximizing gain, achieving a desired impedance bandwidth, or minimizing the antenna's size. Attendees will engage in a guided exercise to understand the fundamentals of planar antenna design, using apps and scripts to automate the process and visualize the impact of parameter changes in real-time.

By the end of this session, participants will have a foundational understanding of planar antenna design and practical experience for simulation and optimization tasks.

Bio:
Giorgia Zucchelli is the product manager for RF and mixed-signal at MathWorks. Before moving to this role in 2013, she was an application engineer focusing on signal processing and communications systems and specializing in analog simulation. Before joining MathWorks in 2009, Giorgia worked at NXP Semiconductors on mixed-signal verification methodologies and at Philips Research developing system-level models for innovative communications systems. Giorgia has a master's degree in electrical engineering and a doctorate in electronics for telecommunications from the University of Bologna.