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Title: High frequency (MHz) , High Power (10kW), and Long Distance (1m) Wireless Power Transfer

Abstract

Wireless power transfer (WPT) is entering a new phase in which higher power levels and longer transmission distances are increasingly required for next-generation mobility and distributed energy systems. While 85-kHz WPT technologies have already reached the stage of field demonstrations, their deployment still demands substantial infrastructure and careful alignment. To address these limitations, this keynote introduces a MHz-band WPT architecture designed to deliver **10 kW over a distance of 1 meter**, aiming to significantly reduce installation constraints and expand the practical applicability of WPT in real environments.

Operating in the MHz range opens new opportunities for long-distance energy transfer due to higher resonant quality factors and more flexible coupler geometries. However, it also introduces several technical challenges that must be overcome for high-power operation. This presentation highlights two key development areas: (1) **MHz high-power inverter design**, including strategies to suppress ringing and ensure stable switching under large reactive currents; and (2) **high-frequency transmitter/receiver coupler engineering**, where skin effect, proximity effect, and parasitic components become dominant and must be carefully managed to maintain efficiency.

By addressing these challenges, MHz-band WPT can evolve into a practical and scalable solution for electric vehicles, robotics, logistics systems, and future smart infrastructure. The keynote will discuss the design principles, experimental insights, and remaining research directions toward realizing robust long-distance, high-power wireless energy transfer.