

Popular science summary of the PhD thesis

PhD student	Yi Dou
Title of the PhD thesis	Modelling and Design in Advanced Mega-Hertz Range Wireless Power Transfer Systems
PhD school/Department	DTU Elektro

Science summary

* Please give a short popular summary in Danish or English (approximately half a page) suited for the publication of the title, main content, results and innovations of the PhD thesis also including prospective utilizations hereof. The summary should be written for the general public interested in science and technology. Before the thesis defence, the summary is sent to DTU's Office for Communication and Media and to the media *Ingeniøren*:

The wireless power transfer (WPT) systems in megahertz (MHz) range operational frequency are expected to be applied in much broader applications after intentional and strategical design and optimization. The potential applications includes autonomous mobile robots, inspection drones and implanted medical devices. With higher operational frequency, the substantial improvement of the WPT system contributes to a higher power transfer efficiency and more compact systems achieved.

The main focus of the thesis is thus, to propose, investigate and technically demonstrate novel solutions in advanced megahertz range wireless power transfer systems with mathematical modelling and optimization design. First, the novel circuit topologies are proposed and investigated to improve the overall efficiency of the system. The proposed topologies can achieve the near-/pure- resistive impedance with two novel solutions during all load range under MHz-range operation frequency. In addition, the modelling and design method for the inductive coupler is investigated, which dedicate to an improved position tolerance. Finally, the system design framework is proposed and demonstrated in a case study by applying the topologies mentioned above and the design algorithm for the inductive coupler. An analytical power loss model for the air-core inductors and coils in the system is presented and integrated into the advanced optimization algorithm for the system's performance estimation.

The theoretical analysis and the technical demonstrations fill the current knowledge gap for power converter design and validate the MHz-range WPT systems' advanced performance for future industrial applications.



Please email the summary to the PhD secretary at the department