

IEEE Seminar on “High Power Density Converter Designs – New Circuit Topologies, Control Techniques, and Packaging to Achieve Extreme Size Reductions in Applications Ranging from Datacenter Power Delivery to Electric Aircrafts.” by Professor Robert Pilawa-Podgurski, UC Berkeley

Date/Time: Thursday Nov 4, 2021, at 15:00-16:30, CET

Location: Hybrid Event at both KTH Campus and Zoom (link will be sent upon registration)

Registration in [vTools](#) latest Nov 1st (refreshments will be served, in case of physical attendance pls inform on any dietary requirements)

Abstract

The continued quest for increased power density and efficiency in power converters has led to development of capacitor-based power converter architectures, which exploit the much higher energy density of capacitors than inductors. In this talk, I will discuss some recent advances in this space, such as new circuit topologies, control methods, and integration techniques. I will highlight examples of such converters for power conversion in space and weight-constrained applications along with challenges associated with their design and operation. The first application is datacenter power delivery, where I will share some recent record-breaking power density and efficiency 48V dc-dc conversion architectures, with power conversion efficiencies exceeding 99%, and power densities above 300 kW/liter. The second application is hybrid and fully electric aircrafts, which have the potential to significantly reduce harmful greenhouse gas emissions associated with the rapidly growing aviation industry. I will present our work on ultra-high-density electric drivetrains in response to targets for efficiency and weight set by NASA studies, with experimental validation of a lightweight 1 kV, 200 kW DC-AC inverter system. Key practical challenges and innovations to achieve efficiency > 98.5%, and power density >20 kW/kg will be addressed, along with digital control architectures to achieve redundancy and scalability.

Bio



Robert Pilawa-Podgurski was born in Hedemora, Sweden. He is currently an Associate Professor in the Electrical Engineering and Computer Sciences Department at the University of California, Berkeley. Previously, he was an Associate Professor in Electrical and Computer Engineering at the University of Illinois Urbana-Champaign. He received his BS, MEng, and PhD degrees from MIT. He performs research in power electronics. His interests include renewable energy applications, electric vehicles, energy harvesting, CMOS power management, high density and high efficiency power converters, and advanced control of power converters. Dr. Pilawa-Podgurski received the 2014 Richard M. Bass Outstanding Young Power Electronics Engineer Award of the IEEE Power Electronics Society, given annually to one individual for outstanding contributions to the field of power electronics before the age of 35. In 2015, he received the Air Force Office of Scientific Research Young Investigator Award, the UIUC Dean’s Award for Excellence in Research in 2016, the UIUC Campus Distinguished Promotion Award in 2017, and the UIUC ECE Ronald W. Pratt Faculty Outstanding Teaching Award in 2017. In 2018 he received the IEEE Education Society Mac E. Van Valkenburg Award, for outstanding contributions to teaching unusually early in his professional career. He is co-author of eleven IEEE prize papers.