

Hybrid and Resonant Switched-Capacitor Power Converters – Achieving High Power Density in Applications Ranging from Electric Aircrafts to Data Centers

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Refreshments will be served

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, in the form of new circuit topologies, control methods, and integration techniques. I will highlight a few examples of such converters for electric vehicle (car and aircraft) applications, along with some of the challenges associated with their design and operation, and the role that CMOS integration can play to solve them. Finally, I will showcase how resonant switched capacitor converters can yield breakthrough performance in datacenter applications, with results from a 48 to 12 V, 99.0% efficient, 2.5 kW/in³ hardware prototype used as an example.

Biography:



Dr. Robert Pilawa-Podgurski is currently an Associate Professor in the Electrical Engineering and Computer Sciences Department at the University of California, Berkeley. He received his BS, MEng, and PhD degrees from MIT. He performs research in the area of power electronics. His research 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. Since 2014, he serves as Associate Editor for IEEE Transactions on Power Electronics, and for IEEE Journal of Emerging and Selected Topics in Power Electronics. He is co-author of nine IEEE prize papers.