

IEEE Components, Packaging and Manufacturing Technology Society Phoenix Chapter

Wednesday, May 10, 2017: 5:30 PM

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Challenges and Approaches to Inductively Powering Integrated Passive Single-Chip RFID/Sensor Systems

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ABSTRACT

The design of fully integrated RFID/Sensor Systems, ones in which the antenna, the RFID circuitry, and the sensor circuitry are all fabricated on the same integrated circuit substrate, is challenging because the small size of the antenna and its proximity to a resistive ground plane (the integrated circuit substrate) both decrease the RF energy that can be harvested to operate the passive sensor system. This presentation will present simplifying approximations in order to develop basic equations framing the challenges faced by fully integrated RFID/sensor systems in terms of harvesting energy posed by the size and geometry of the antenna and its proximity to the conductive silicon substrate. These near-field equations will be validated for a practical design example with electromagnetic field simulations and strategies for improving energy harvesting performance will be discussed. Finally, the presentation will examine the challenging issue of matching the antenna to the on-chip electronics and efficiently converting it to a voltage that can power on-chip circuitry. The presentation will end with a brief discussion of some potential applications of this new technology.

BIOGRAPHY



L. Richard Carley (S'74-M'84-SM'90-F'97) received an S.B. in 1976, an M.S. in 1978, and a Ph.D. in 1984, all from the Massachusetts Institute of Technology. He joined the Electrical and Computer Engineering Department at Carnegie Mellon University (CMU) in Pittsburgh Pennsylvania in 1984, and in March 2001, he became the STMicroelectronics Professor of Engineering at CMU. Dr. Carley's research interests include analog and RF integrated circuit design in deeply scaled CMOS technologies, and novel micro-electro-mechanical and nano-electro-mechanical device design and fabrication. For the past several years, Dr. Carley has studied the design of efficient RF energy harvesting devices in sub-millimeter RFID scenarios. Dr. Carley has been granted 24 patents, authored or co-authored over 200 technical papers, and authored or co-authored over 20 books and/or book chapters. He has won numerous awards including Best Technical Paper Awards at both the 1987 and the 2002 Design Automation Conference (DAC), a "Most Influential Paper" award from DAC, and the "Best Panel Session" award at ISSCC in 1993. In 1997, Dr. Carley co-founded the analog electronic design automation startup, Neoliner, which was acquired by Cadence in 2004. Dr. Carley has served on various conference program committees (e.g., CICC, ISLPED, and TMRC), was Associate Editor of IEEE Transactions on Circuits and Systems from 1993-1996, and was the General Chairman for RFID-TA 2016 in Shunde, China. Dr. Carley is currently a Distinguished Lecturer for the IEEE Council on RFID.

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Location:

**Meeting Room B
Tempe Public Library
3500 S. Rural Road, Tempe, AZ 85282
(S-W corner of Rural & Southern Ave.)**

<https://www.google.com/maps/dir/'/tempe+library/>

Agenda: 5:30–6:00 PM: Networking & Refreshments,
6:00–7:00 PM: Presentation,
7:00 – 7:30 PM Questions & Answers

(Snacks and Soda will be provided by the IEEE Phoenix Section, CPMT Society Chapter)

IEEE members and non-members are all welcome to attend. The presentation promptly starts at 6:00 PM.

For more information, please contact any of the following CPMT officers:

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