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*of Engineering the Future*

## IEEE NEWS FOR DECEMBER 2009

**Jacob Z. Schanker, P.E., Newsletter Chair**  
Rochester IEEE home page at: <http://rochester.r1.ieee.org>

(Always check the web PDF edition for late changes and additions)

### Rochester Section Meeting and Elections - Tuesday, December 1, 2009

The next Rochester Section business meeting is on Tuesday, December 1, 2009 at Noon, at the Shanghai Restaurant, 2920 West Henrietta Road, just south of the intersection with Brighton-Henrietta Town Line Road.

The elections for Section officers for 2010 will take place at this meeting. No petitions having been received for candidates, the slate of candidates nominated by the Nominations Committee, and printed in the November issue of the Rochester Engineer, will stand for election by voice vote. These candidates are:

**Chair:** Alexander (Alex) Loui, Eastman Kodak

**Vice-Chair:** Greg Gdowski, University of Rochester

**Secretary:** John Kerekes, Rochester Institute of Technology

**Treasurer:** William (Bill) Fowlkes, Eastman Kodak

**Development & Awards Chair:** Sean Garner, Corning

Any IEEE member is welcome to attend and to participate, or just to observe. Lunch is only \$3 for IEEE members. No reservations or RSVP is needed, just show up.

### IEEE Technology Management Council meets Dec. 11

The IEEE Rochester Section, Technology Management Council, will have a meeting to review the year's activities (primarily the 11/5/09 Entrepreneurship Workshop), discuss plans for 2010, and not incidentally select 2010 officers.

Please join other interested members at Panera Bread, 12 Corners Brighton, on Friday, Dec 11 at 6 PM. For details contact: [acopper@rochester.rr.com](mailto:acopper@rochester.rr.com), or [tr.pian@ieee.org](mailto:tr.pian@ieee.org)

## **IEEE Computer Society – Python Tutorial**

The RIT Computer Society Student Chapter and the Rochester Chapter of the IEEE Computer Society are hosting a Python Tutorial presented by Prof. James Heliotis. The tutorial takes place from 5 – 7 PM on Friday, December 4, at the Xerox Auditorium (second floor of building 9) at R.I.T. Pizza, soda, cookies and more will be provided. Laptops are recommended but not required.

The event is free to IEEE student members, \$2 for student non-members, \$5 for IEEE non-student members, and \$10 for other professionals. RSVP to [ieee.cs.rit@gmail.com](mailto:ieee.cs.rit@gmail.com)

## **IEEE Microwave Theory & Techniques Society Chapter – Dec 17**

The Rochester Chapter of the MTT Society will have a meeting on Thursday, December 17 at 4:00 PM. The full details of this meeting are on the next page.



# IEEE Rochester Section

## Microwave Theory and Techniques Society

December 17, 2009, 4:00pm – 5:00pm

Kate Gleason College of Engineering, Gleason Building 09-1139  
Rochester Institute of Technology, Rochester, NY

## *Overview of Software-Defined Radio Transceivers*

By

**Dr. Gregory Pettis**

**Harris Corporation, Rochester, New York, 14610**

**Abstract:** Today, the handset is ubiquitous. Its omnipresence has been accelerated by the integration of transceiver components into application specific integrated circuits (ASICs). This miniaturization effort has enabled the unit cost and physical size reduction of handsets. Ultimately, these two benefits have increased the demand for the devices. As demand has increased, so has the customer's desire for more feature rich content. Furthermore, it is expected that the device will remain operable throughout many geographic regions (a.k.a. can you hear me now!). This has led to the development of dual- and multi-band transceivers. Ideally, the user is oblivious to the communications protocol and the underlying physical layer hardware in use during any given session. However, for communications engineers, radio frequency (RF) engineers, and microwave engineers, these demands translate directly into potentially conflicting requirements on power efficiency, processing power, spectral efficiency, and RF bandwidth.

The software defined radio – typified by the Joint Tactical Radio System (JTRS) – pushes these requirements to an extreme. Specifically, the JTRS software defined radio architecture must support multimode, multiband communications. The signal bandwidths range from a few kHz up to tens of MHz. The frequency coverage extends from HF (2 – 30 MHz) into S band (2 – 4 GHz). Furthermore, the waveforms supported can be constant envelope as well as those with high peak-to-average ratios, and the radios must operate for a minimum number of hours on a single battery. Finally, the radios must be able to communicate with other radio equipment over various terrain profiles as well as be capable of forming mobile ad-hoc networks on the battlefield.

In this lecture, we shall discuss transceiver architectures, present in most software defined radios, that attempt to satisfy the requirements listed above. We shall quickly compare and contrast a few architectures, and then proceed to describe various subcircuits. The focus will be on identifying components that lead to either distortions in transmitted and received waveforms or degradation in system performance. In particular, we shall investigate the cause and effects of synthesizer phase noise, I/Q modulator gain and phase imbalance, and intermodulation distortion. Finally, we shall identify some techniques – both in hardware and software – used to mitigate the effects.

### **Biography:**

Dr. Gregory Pettis is a lead RF engineer at Harris Corporation in Rochester, NY, USA. He received his B.S. and M.S. degrees in electrical engineering from R.I.T., respectively, in 1996 and 2000. He completed his Ph.D. in electrical engineering at Syracuse University in 2008 with a focus on numerical and theoretical electromagnetics. His research interests include electromagnetics and signal processing. Furthermore, he was the recipient of the outstanding part-time graduate student award from Syracuse University in 2008.