



**Southeastern Michigan Section
“Chapter IV (Trident)” Speaker Series
Tue., Nov. 1, 2011, 5:00pm – 6:00pm
Appetizers and Networking at 4:30 pm
Room #1005, EECS Bldg,
North Campus, University of Michigan
1301 Beal Ave, Ann Arbor, MI**



“RF MEMS Resonator and Applications in Filter and Low Phase Noise Oscillators”

Amy Duwel

Leader of the Micro Electrical Mechanical Sensors Group, Charles Stark Draper Laboratory

Abstract:

Micro-electro-mechanical system (MEMS) based resonators offer a combination of ultra low energy loss and chip-scale integration compatibility, motivating enthusiastic efforts to mature this technology for applications in RF electronics systems. Particularly high impact applications include RF filters and oscillators. In both cases, game-changing system designs will be enabled by development of resonators with low loss (high quality factor, or Q). In addition, recent research has shown that both high Q and tailored nonlinearities can produce unprecedented phase noise performance.

This talk will discuss the two grand challenges associated with RF filters and oscillators – energy loss and oscillator phase noise dynamics. The first part of this talk will review the tremendous progress in the MEMS community over the past decade towards high Q devices. The fundamental physical limits on energy loss and the path forward to reach these limits will be described. The second part of this talk will discuss phase noise in oscillators, with particular emphasis on the role of the mechanical resonator performance. Though the impact of Q on phase noise is well known through Lesson’s model, a generalization of this theory will be introduced so that the role of mechanical nonlinearities can be better understood. The surprising result that nonlinear mechanical devices can be designed to improve phase noise will be discussed.

Speaker’s Biography:

Amy Duwel is the Group Leader for Draper Laboratory’s RF and Communications Group. This position was preceded by an eight-year tenure leading the MEMS (Micro-Electro-Mechanical Systems) at Draper. Dr. Duwel serves as a champion for the growth of new technologies and a leader in business development for the group. Dr. Duwel focuses her own work on novel components at the intersection of MEMS and RF systems. She leads the development of ultra-low loss MEMS resonators for filters and oscillators, and novel MEMS-enabled reconfigurable RF components. In addition, Dr. Duwel has contributed to a deeper fundamental understanding of micro-scale energy transport phenomena and dynamics of MEMS resonators for RF filters, oscillators, and inertial sensors. She received a BA in physics from the Johns Hopkins University in 1993. Her MS (1995) and PhD (1999) are in Electrical Engineering and Computer Science from the Massachusetts Institute of Technology.

**Cosponsors: Radiation Laboratory, University of Michigan
Solid-State Electronics Laboratory, University of Michigan**

Public Invited

Appetizers and Networking at 4:30 pm

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