



Presents the Spring 2013 EECS Seminar Series
Dr. Reza Abdolvand
Oklahoma State University

**“Thin Film Piezoelectric-on-Substrate Resonant MEMS:
State of the Art and Future Directions”**
Wednesday, April 24, 2013 • 3:00 p.m. • HEC 450

ABSTRACT

Micro-Electro-Mechanical resonant devices (also known as MEMS resonators) have come a long way from their early days of development and have finally found their way to the timing market during the past few years. The main drives for application of MEMS resonators in oscillators and clock generators are their small size and their compatibility with the micro-fabrication processes that are developed for manufacturing integrated circuits. However, these resonators compete against the very mature quartz crystal devices that are crafted over many decades to offer high performance at a very reasonable cost.

In this presentation, I present a MEMS resonator platform coined as thin-film piezoelectric-on-substrate (TPoS) on which I hold 10 issued patents. This technology is exclusively licensed by Integrated Device Technology, Inc., and is the basis for the recently announced pMEMS oscillator product line. The TPoS technology is unique in offering a very compact, low noise, low power, and robust solution for the demanding requirements of today’s timing applications. I will specifically describe techniques developed by my research group to enhance the quality factor, temperature stability, tuning range, and the power handling of TPoS resonators through the optimization of the design and manipulation of the material properties. Furthermore, I will discuss our ongoing research on introducing new ultrasonic sensors based on TPoS resonators that have application in bio-sensing and point-of-care health monitoring systems.

BIOGRAPHY

Reza Abdolvand is an assistant professor and the director of the Dynamic Microsystems Lab (<http://microsystems.okstate.edu/>) in the School of Electrical and Computer Engineering at the Oklahoma State University, where he joined in 2007. He received his B.S. and M.S. degrees in electrical engineering from Sharif University of Technology, Tehran, Iran, in 1999 and 2001, respectively, and the Ph.D. degree from the School of Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta, GA in 2008. His research interests lie in the area of micro/nanoelectromechanical systems with a special focus on design, fabrication, and characterization of micro-resonators with applications in radiofrequency circuits and resonant sensors including bio-sensors.

Dr. Abdolvand has authored and co-authored more than 60 peer-reviewed journal and conference articles in his field of expertise. He has been awarded 12 US patents and has been inducted into the National Academy of Inventors in 2013. He was also a recipient of the National Aeronautics and Space Administration (NASA) Patent Application Award in 2009.