

# Micro and Nanomechanical Resonators: From Devices to Systems

By Prof. Farrokh Ayazi

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## ABSTRACT

High-Q Resonators are at the heart of many microsystems that are providing paradigm shifts in sensing, communication, and navigation. The ability to engineer and control the resonator natural frequency and damping to reach very high Q factors (in excess of one million) on-chip offer tremendous opportunity to implement precision sensors and actuators, as well as energy harvesting and frequency selective devices, enabling self- or remotely-powered wireless microsystems. As an example, integrated timing and inertial navigation systems rely on ultra-high-Q micromechanical resonators interfaced with CMOS processing brains to enable chip-scale motion and position processing and deliver unprecedented performance through sensor fusion and self-calibration. This talk will discuss the latest results on tuning, trimming and control of integrated resonators and present a scalable manufacturing platform that enables the co-integration of a wide array of MEMS and NEMS sensors and actuators with CMOS for creation of 3D Integrated Microsystems.

## BIOGRAPHY

Farrokh Ayazi is a professor of Electrical and Computer Engineering and the director of the Center for MEMS and Microsystems Technologies at Georgia Tech. He received the B.S. degree in electrical engineering from the University of Tehran, Iran in 1994 and M.S. and Ph.D. degrees in electrical engineering from the University of Michigan, Ann Arbor, in 1997 and 2000. His main research interest lies in the area of integrated micro and nano electromechanical systems (MEMS and NEMS), with a focus on resonators and inertial sensors. The author of over 200 refereed technical and scientific articles, he and his students have received several best paper awards at international conferences. He is an editor for the IEEE Transactions on Electron Devices and a past editor for the IEEE/ASME Journal of Microelectromechanical Systems. He was the general chair of the IEEE Micro-Electro-Mechanical-Systems (MEMS) conference in 2014. Dr. Ayazi is the co-founder and CTO of Qualtré, a spin-out from his research laboratory that commercializes bulk-acoustic-wave (BAW) silicon gyroscopes and inertial sensors for personal navigation systems. He is a Fellow of the IEEE and holds 42 patents.



## EVENT DETAILS

**DATE:**

Wednesday,  
April 9, 2014

**TIME:**

11:00 AM

**LOCATION:**

Babbio 122  
Stevens Institute of Technology

**ATTENDANCE:**

Public