



Dr. Dana Weinstein
Massachusetts Institute of Technology

RF Solid-State MEMS Resonators

Monday, October 6, 2014
10:00 a.m.

Birck Nanotechnology Center, Room
1001

Abstract

Semiconductor micro-electromechanical (MEM) resonators, with quality factors (Q) often exceeding 10^4 can provide a high performance, low-power, compact alternative to electrical components in wireless communication and signal processing. The seamless integration of these MEM devices in standard IC technology is particularly attractive due to reduced size, weight, and power, reduced parasitics leading to higher operational frequencies, and relaxed constraints on impedance matching networks. In this talk, I will discuss the design innovations in transduction and acoustic confinement that enabled the demonstration of solid-state MEMS resonators in standard Si CMOS and GaN MMIC technologies. This work has led to the highest $f \cdot Q$ products in both Si and GaN reported to date, to record-breaking resonance frequencies in Si, and to the first monolithic MEMS oscillators in GaN. I will discuss the methods used to achieve this performance, including active electromechanical transduction, 2D and 3D phononic crystal design, and modeling used to optimize these unique structures.

Bio

Dana Weinstein is an Associate Professor in the Department of Electrical Engineering and Computer Science at MIT, and a member of the Microsystems Technology Laboratories. Dana received her B.A. in Physics and Astrophysics from UC Berkeley in 2004, then moved to Cornell University where she completed her Ph.D. in Applied Physics in 2009, working on multi-GHz Micro Electro-Mechanical Systems (MEMS). Her research group at MIT, the HybridMEMS Lab, focuses on the development of novel MEMS-enhanced electron devices and systems for high performance, low power consumption, programmable electromechanical signal processors operating in real time at carrier frequencies. Dana is the recipient of the NSF CAREER Award, the DARPA Young Faculty Award, the Intel Early Career Award, and the IEEE IEDM Roger A. Haken Best Paper Award.