

NANOELECTROMECHANICAL RESONATORS AT VHF: TOWARDS WEIGHING INDIVIDUAL ATOMS

C. Callegari
Technical University of Graz
Institute for Experimental Physics
Petersgasse 16
A-8010 Graz
Austria

Microelectromechanical systems (MEMS) are now ubiquitous as transducers of physical quantities into an electrical signal. Small size, low power consumption, mass production, cheap price, ruggedness, and versatility are all distinctive qualities of MEMS. The synergy of mechanical and electrical properties and the advanced level reached by fabrication techniques, open up a spectrum of applications previously impossible on a single chip.

Because small size naturally implies great sensitivity, there is a strong driving force towards moving to the sub-micron scale (Nanoelectromechanical systems, NEMS) despite the much greater technical complications.

I will present recent progress made at Caltech on the use of NEMS as mass sensors, illustrating fabrication techniques, as well as schemes for electromechanical transduction and readout. I will introduce some questions of fundamental interest such as intrinsic noise processes and ultimate sensitivity, and explore some applications of these systems. In particular I will show that single-atom sensitivity is within reach.