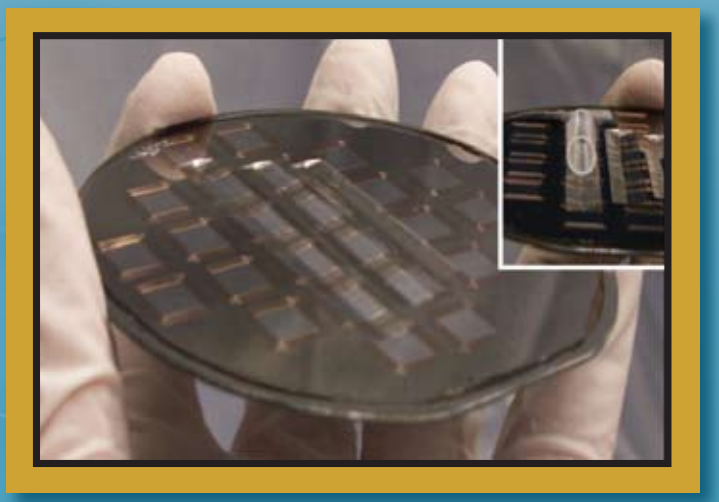
Advanced Instrumentation Seminars

May 13, 2009
1:30 pm, 1st Floor
KAVLI Auditorium

Micro-machined Silicon Detectors

Guest Speaker –
Marc Christophersen
Naval Research Laboratory



This talk will present two novel detectors which are enabled by modern micro-machining techniques. The potential of micro-machined silicon as a radiation detector was first introduced by S. Parker et al. as radiation-hard detectors, often called 3-D detectors. We present a curved radiation detector. As vertex detectors for smaller inner beam pipe diameters are required; the planar nature of the detector becomes more and more of a problem. Both strip detectors and pixel arrays have been realized on a curved topography. We have demonstrated low-noise performance by successfully detecting low-energy gamma-rays with a curved strip detector. In addition to the curved detectors, we present 3-D detectors for use as thick gamma-ray detectors. Current room- temperature gamma-ray detectors are built in planar device architecture. We use micro-machining techniques to introduce vertical electrodes, which allow lateral charge collection, decoupling thickness and charge collection properties. The ultimate goal is the ability to form cm thick gamma-ray detectors. The vertical electrodes are micro-machined trenches with depth up to 1.7 mm in silicon. We present the basic detector structure, finite element simulations, and radiation measurements.

http://www-group.slac.stanford.edu/ais

SLAC
NATIONAL ACCELERATOR LABORATORY