

## A thin fully-depleted monolithic pixel sensor in Silicon On Insulator technology

*Tuesday 4 September 2012 14:20 (20 minutes)*

The Silicon On Insulator (SOI) technology allows the integration of CMOS electronics on a thin silicon layer which is electrically insulated from the wafer substrate by means of a thin buried-oxide layer (BOX). Monolithic pixel sensors can be built in SOI technology by contacting a high-resistivity handle wafer substrate through the BOX. A commercial deep-submicron SOI CMOS process by LAPIS, coupled with high-resistivity silicon substrates, is made available through KEK. A full CMOS circuitry can be integrated in a 40nm thick layer on top of each pixel, and the 250um thick substrate can be reverse biased and depleted to improve charge collection. In the framework of an international collaboration between the Lawrence Berkeley National Laboratory (LBNL), INFN and UC Santa Cruz, since 2006 we have designed, produced and characterized different prototypes of monolithic pixel detectors in SOI technology, both for charged particle detection and for imaging applications. SOI monolithic pixel detectors can provide high resolution vertex tracking with a limited material budget (if compared to hybrid pixels) for future experiments in which the radiation levels are moderate (SuperKEKB, SuperB b-factories).

In this contribution we will review the latest chip produced, a matrix of 256×256 analog pixels in a 0.20um SOI technology, arrayed in 8 different sectors, thinned to 50um and back-processed to allow full depletion. The chip has been successfully tested with soft X-ray photons in back-illumination at the Advanced Light Source (ALS) of LBNL and with 300GeV pion- at the CERN SPS. These results show that a thin fully-depleted SOI pixel provides charged particle detection capability with large signal-to-noise ratio and detection efficiency and achieves a single point resolution of the order of 1um.

The design of a new, larger chip has been submitted at the end of 2011 and will be tested with high momentum particles at a beam test at CERN scheduled for July 2012. Results of this work will be shown as well.

**Primary author:** MATTIAZZO, Serena (Università e INFN Padova (IT))

**Co-authors:** BISELLO, Dario (Università e INFN Padova (IT)); CONTARATO, Devis (Lawrence Berkeley National Laboratory); PANTANO, Devis (Università e INFN Padova); BATTAGLIA, Marco (University of California, Santa Cruz (US)); DENES, Peter (Lawrence Berkeley National Laboratory); GIUBILATO, Piero (Università di Padova (IT))

**Presenter:** MATTIAZZO, Serena (Università e INFN Padova (IT))

**Session Classification:** Session4

**Track Classification:** Pixel technologies - Monolithic detectors