

# US R&D for the Si Vertex Tracker

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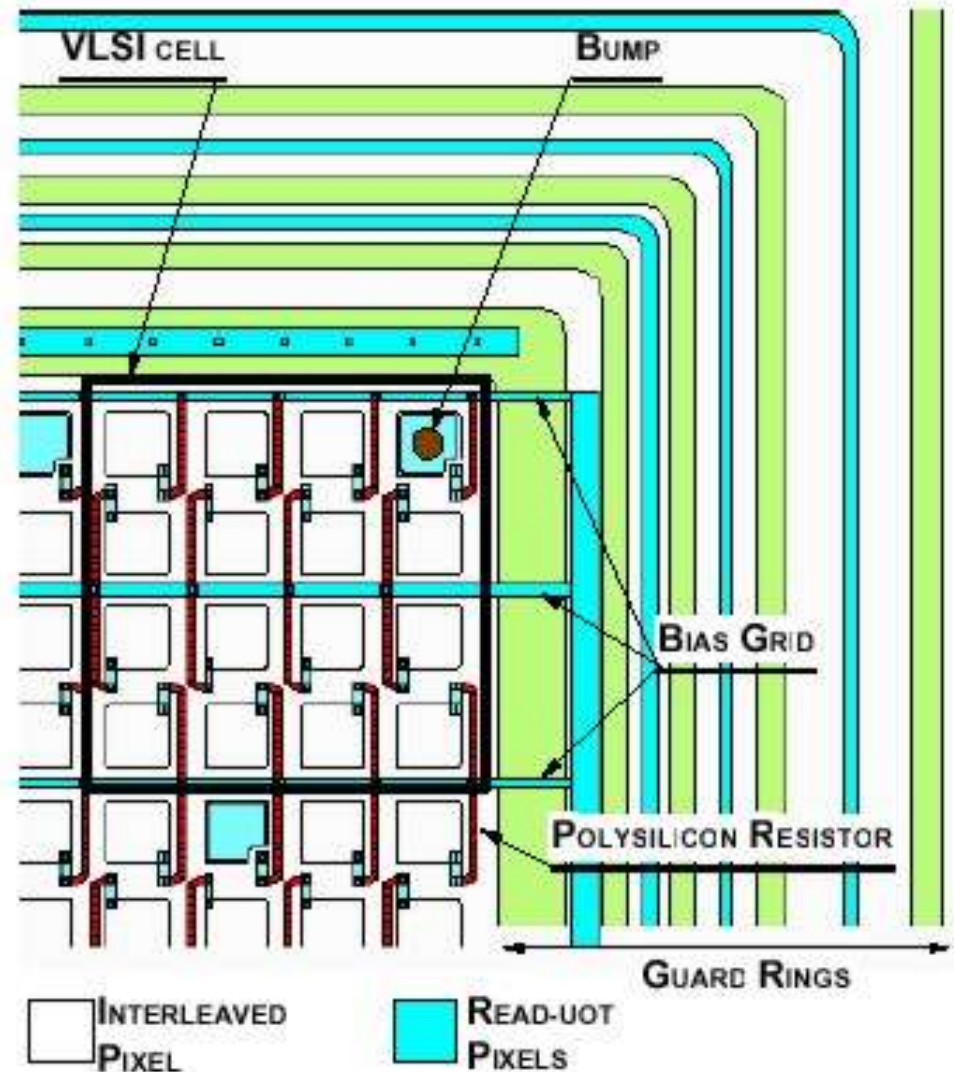
# Current Projects

<http://www.hep.uiuc.edu/LCRD>

- CCD R&D at Oregon and Yale U
- Hybrid Pixel R&D at Purdue U
- R/O R&D at Bostn and Oklahoma U
- Physics Benchmarks for the VTX

# Hybrid Pixel Sensors

- Adapt HPS to LC applications
- Interleaved pixel scheme allows in principle point resolutions of  $O(5 \text{ microns})$
- LHC Pixels have 1.7% X/layer
- Improve to 0.2% X/layer by thinning to 100+50 microns Sensor+VLSI
- Applications in Vertex Tracker but also Fwd Disks



# R&D at Purdue U.

- Cross feed with SLHC R&D on Pixel sensors
- Produce and test HPS test structures matching CMS Pixel chip
- Investigations of techniques for production and mechanical support of thin silicon sensors
- Development of bump bonding of thin Si (100microns) to thinned VLSI chip (50 microns) sensor production and bump bonding equipment at Micron
- First thin sensors delivered in 2004 for electrical characterisation at Purdue
- FEA study of mechanical stability at Fermilab
- Lab and beam tests to assess potential of thin HPS with interleaved pixels.

# ASIC Development for CCD Readout

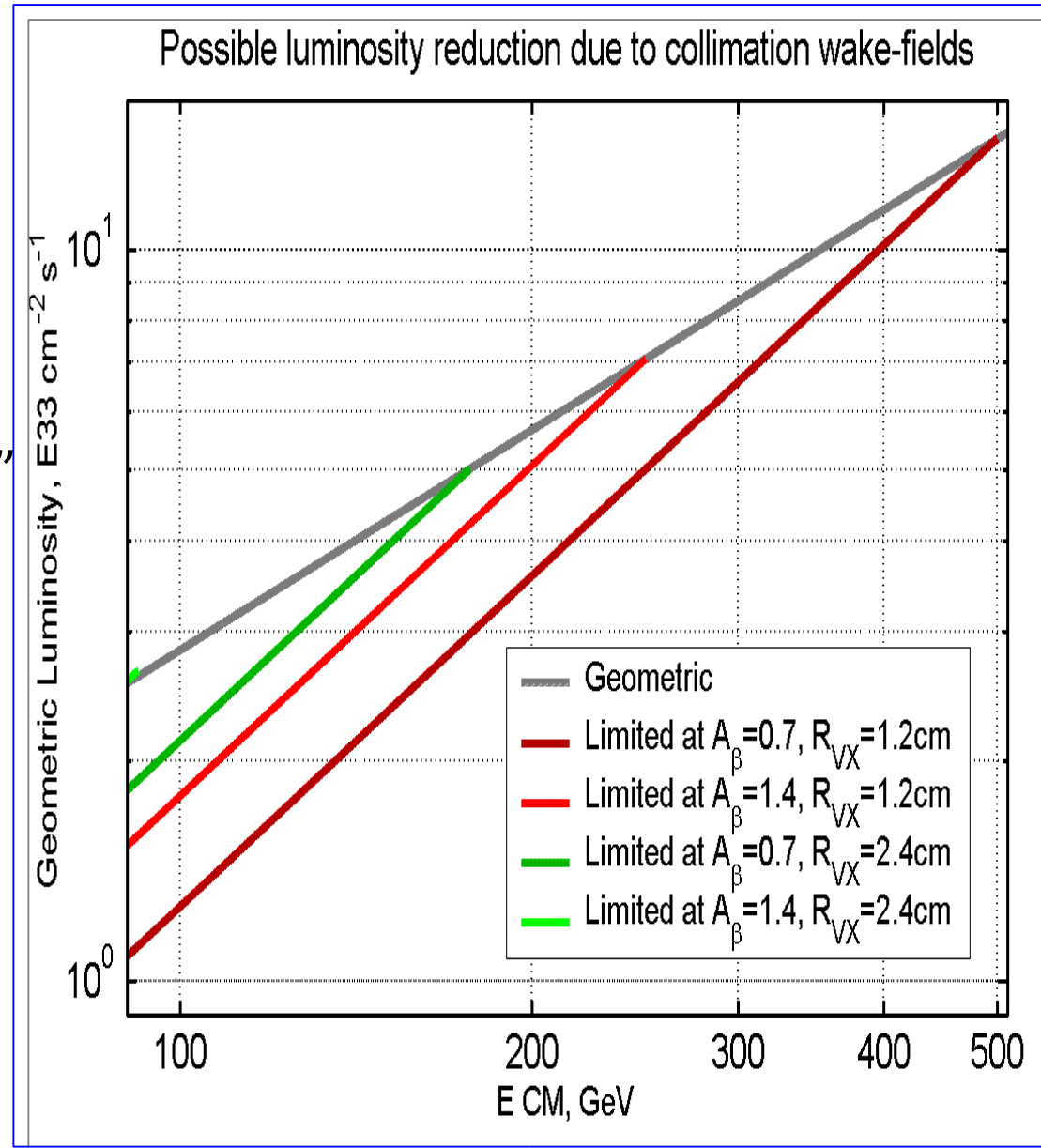
- Boston and Oklahoma U. plan to start a program to develop, produce and test a readout chip for CCD sensors for LC applications
- The first phase should consists in the definition of specs and set-up groups at labs.
- In a second phase a data acquisition system should be built starting from existing modules from Fermilab and a prototype chip developed
- The goal of this R&D is to obtain a functional design for a readout chip to serve as starting point of a production design

# Physics Benchmarks

- Detailed studies of Physics benchmarks for the Vertex Tracker are needed to support and guide sensor R&D, engineering studies and conceptual design
- Higgs Branching Fractions  $cc/bb$  are a very useful process but studies need to be developed beyond that
- Tau lepton decays may be an important part of physics signatures of new processes and offer interesting complementarity of i.p. offsets and vertexing for their reconstruction and should be more actively studied
- Need to define a set of processes and have close interaction with physics and simulation groups.

# The VTX Inner Radius

- Need to justify VTX inner radius in view of possible SRcollimation constraints;
- Benchmark physics capabilities beyond well known “as close as possible”
- Interplay with machine induced backgrounds is important
- $H \rightarrow cc/bb$  analysis relying on vertexing may not offer best picture of Inner Radius benefits



# The Vertex Tracker and the RF Technology Choice

- It is time to identify issues in the Vertex Tracker design / response which may depend on the accelerator technology (backgrounds, cooling, RF pick-up, innermost layer radius, ...)
- A comprehensive review, extending over the different detector components may prove a valuable input to the present technology choice process
- Discussion will be started at the ALCPG Meeting, SLAC, January 7-10, 2004