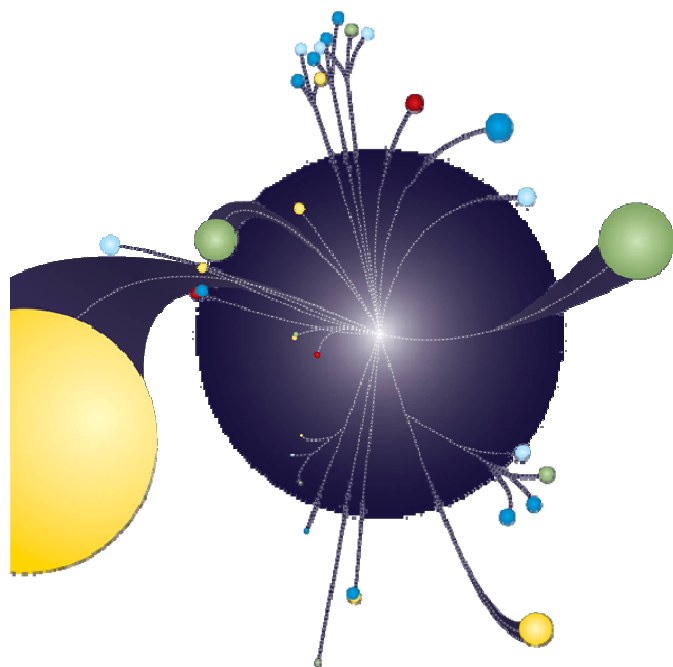

Fermilab Vertex Effort

From a Fermilab Detector R&D Perspective



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Fermilab in Perspective

- Fermilab is large National Laboratory with broad experimental program
- Very strong and sizeable engineering groups -- both electrical and mechanical –
- Long history of successful completion of advanced silicon projects for Fermilab experiments as well as support for other experiments
 - CDF: SVXI, SVXII, Layer-00;
 - Dzero: SVX, F/H-disks, Layer 0
 - BTeV: FPIX, FSSR
 - CMS: TOB, Forward Pixels
 - Trip-t ASIC and readout for T2K experiment, DCAL ASIC for RPC/GEM calorimetry, ...
- In the near future the focus of the laboratory will see a significant shift
 - Tevatron experimental program will come to an end
 - LHC detectors being commissioned; shift toward LHC upgrades
 - Phased program of particle astrophysics with emphasis on focal planes
 - Other new long-term projects
- The laboratory intends to bid to host the ILC
- The laboratory is single-purpose lab

Foci at Fermilab Today

- ***Development of pixel detector technologies***
Based on extensive experience with silicon detectors and their associated readout, focus on the development of new pixel technologies in synergy with the development for LHC replacement and upgrade detectors.
- ***Development of low-mass silicon vertex detectors and trackers***
Based on extensive experience with silicon trackers, focus on the design of low mass mechanical support structures for vertex detectors and trackers and pursue novel sensor technologies with special emphasis on the forward regions. Concurrently develop the tracking software enabling optimization of the detector design
- ***Characterization of Geiger-mode Avalanche Photo Diodes and their application***
Geiger-mode Avalanche Photo Diodes are a new silicon based photon detection technology. Due to their small size they can be highly integrated in the detector design and signal processing is much facilitated. They hold excellent promise for many different applications. Device characterization is pursued together with the development of readout technology and their application in scintillator-based detector readout for scintillator and scintillator leadglass dual readout calorimetry and muon detection.
- ***Test Beam***
Many detector technologies for the ILC are unproven. The beam line at Mtest has been redesigned to accommodate the ILC needs and improvements to the beam line instrumentation and data acquisition are being implemented.
- ***Physics Community Outreach***
Organize and host many workshops with broad ILC perspective

Fermilab Detector R&D Strategy

- Focus on most promising technologies in areas of existing strengths at the laboratory; key word is silicon
 - We identified the SOI and 3D process as a most promising avenue
- Adopt a fully integrated approach to detector development with integration of:
 - Sensor development
 - Associated readout architecture
 - Power delivery
 - Mechanical support structures
 - Software development and benchmarking of new detector development
 - Beam tests
- Balanced approach between generic “Horizontal” detector R&D versus concept driven “Vertical” detector R&D
- The nomenclature “horizontal” versus “vertical” detector R&D originates from the ILC detector community. However, the space has many more dimensions.

Many Dimensions

- Study of the various processes and establishing their viability independent of a project
- Apply process to a specific project -- like the ILC -- and carry out R&D both in a generic ("horizontal") as well as detector specific ("vertical") manner
- Explore and exploit synergies with other projects, in particular LHC replacement detectors and upgrades
- Under our new management contract with the University of Chicago, explore common projects between Argonne National Lab and the University of Chicago
- Explore and establish collaborations with other research institutions, industry and universities
- Take a long-term point of view
- The overarching goal is to maximize the applicability of our efforts to as broad a range of projects that the laboratory is or will be involved in

Concluding Remark

- When evaluating the vertex detector work of the Fermilab group, which will be presented in the following presentation under the umbrella of the ILC, overall environment should be considered
- Emphasis of the Fermilab group is to be seen in broad context of the ILC, LHC replacement detectors, LHC upgrades, applications in collaboration with Argonne and UofC
- All detector R&D is carried out with a long time scale in mind
- With such a large talent pool, the only way we see possible to maintain and grow a healthy detector R&D program, with projects such as the ILC that are on an uncertain time scale, is to work within as broad a context as possible.