Long Shaping-time Silicon R&D

ALCPG Tracking Meeting

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Background

Build precise, low-mass silicon central tracker via two developments:

- Stretching signal averages out noise ⇒ very long ladders possible; serviced from ends only

- Power-switching to exploit < 1/100 duty cycle of LC designs

Performance competitive with gaseous tracking over full momentum range

May provide very limited forward material profile
**Project Scope**

After receiving approval, SCIPP established the following goals for the development of a prototype front-end ASIC:

- Characterize semiconductor structures at 0.25 \( \mu m \).

- Develop pre-amplifier with ability to record min-\( i \) particles with 2m, 300 \( \mu m \)-thick, 50 \( \mu m \)-pitch sensors.

- Develop readout (analog, digital?) consistent with goal of finding centroid to 7\( \mu m \) or better.

- Develop power-cycling circuitry to suppress IR heating by factor of at least 100.

- Demonstrate noise and power-draw performance with physical 2m-long ladder.
**Pukse Development Simulation**

Major focus of effort so far (Christian Flacco)

Discovery: much of worry about field modelling, inductive coupling, carrier collection is obviated in long shaping-time limit (whew!).

Want to look at pulse-sharing between strips given a number of variables.

- Magnetic field
- Sensor geometry (pitch, thickness)
- Bias/depletion voltage
- Track incidence (angle, location)

Requires accumulation of understanding of Lorentz angle, mobilities, diffusion (all of which depend on magnetic field).

⇒ Dialog with RD50 to get refined numbers
Looking forward

Hope to have some simulation results by Arlington

Should inform front-end electronic design, esp, decision about analog requirements

Will begin development of 2-m ladders with ‘throw-aways’ from GLAST

Will possibly begin association with RD50 group to develop large-area sensors via ‘Czochralski’ process.

Exploring expanded avenues of collaboration with RD50 and through Aurore.

Expecting new post-doc 3/1/03 (Gavin Nesom)