Preparing for the SiD LoI

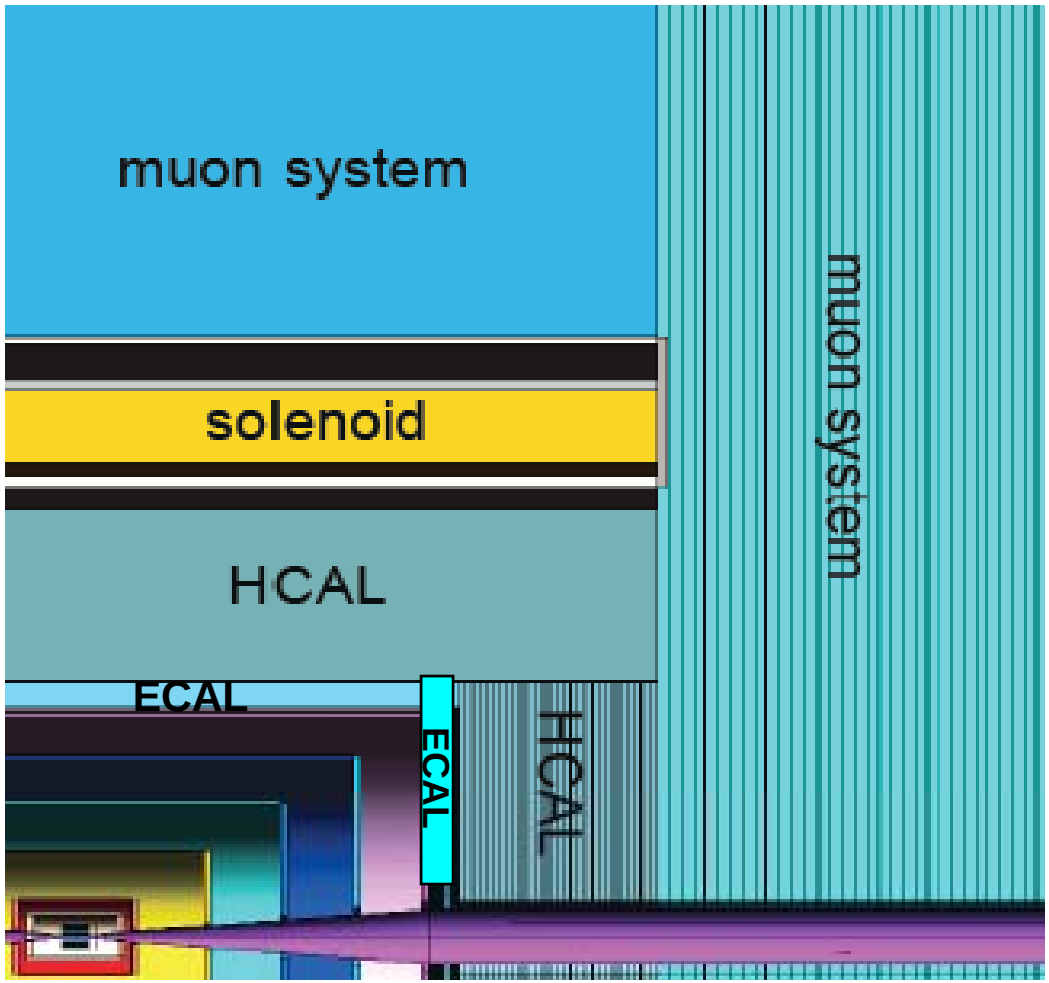
SiD Parallel Session TILC08
March 5, 2008

John Jaros

The Silicon Detector Concept

- 5 layer pixel VXT
- 5 layer Si tracker with endcaps
- Highly segmented Si/W Ecal and Hcal inside the coil
- 5T Solenoid
- Instrumented flux return for muons detection

Compact: 12m x 12m x 12 m



SiD's Highpoints

- **Solenoid 5T. Follows CMS design. Feasible.**
- **VXT** **5T Field allows smallest beam pipe radius, best resolution. Endcap design maximizes Ω, improves resolution for forward tracks.**
- **Tracker** **Si is robust against unwanted beam backgrounds. Si is "live" for only one bunch crossing, which minimizes occupancy and physics backgrounds. Si precision + 5T magnet gives superb momentum resolution.**
- **ECAL** **Si/W has good resolution (ΔE/E~ 17%), superb transverse and longitudinal segmentation.**
- **HCAL** **RPC? GEM? Scint? Moderate resolution (ΔE/E~ 60-80%) excellent segmentation for PFA.**
- **Cost** **Constrained, balanced with physics performance.**

Silicon Detector Design Study

http://silicondetector.org/display/SiD/home

SiD

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SILICON DETECTOR DESIGN STUDY

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  - Org Chart
- Meetings
  - Monthly Collaboration Meeting
  - Weekly Meetings
  - Workshops and Conferences
  - Previous Events
- Documents
- Simulation
  - Detector versions
- Working Groups
- Web Site
  - Recent Updates
  - Index
  - Search
  - Links

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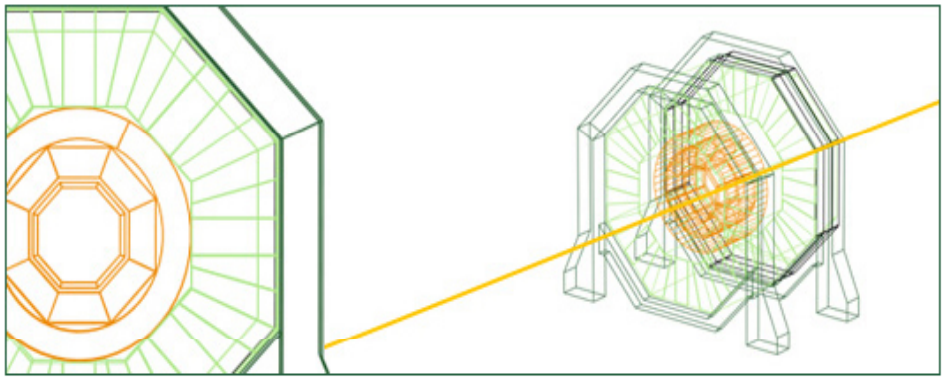


Silicon Detector (SiD) Design Study.

The Silicon Detector Design Study is developing the SiD Detector Concept for the ILC into a detailed, optimized, and fully integrated detector design. The SiD concept incorporates Si/W electromagnetic calorimetry and all-Si tracking in a detector design which attempts to optimize physics performance, constrain costs, and be robust against physics and machine backgrounds.

Optimizing design, benchmarking, doing R&D

Announcements

- SiD Collaboration Phone Meeting on Thursday Dec 6
- Call for Letters of Intent (LOIs)

Upcoming Workshops

- SiD Outreach Meeting Paris Feb 11, 2008
- SiD Meeting, April 14-15, 2008 at RAL

ILC Newsline

- ILC NewsLine - 21 February 2008
- ILC NewsLine - 14 February 2008
- ILC NewsLine - 7 February 2008
- ILC NewsLine - 31 January 2008
- ILC NewsLine - 24 January 2008

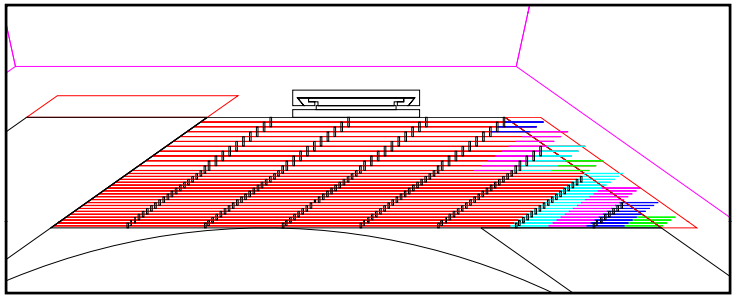
What SiD's Doing Now…

- **Developing a Full Conceptual Engineering Design**
  Realistic conceptual engineering, accounting for supports, assembly, repair/replacement, services, realistic material budget**.**
- **Refining PFA and Track Reconstruction**
- **Evaluating Costs, Updating Global Parameters**
  PFA Performance and cost $\Rightarrow R_{ecal}$, Z_{ecal}, B, λ_{hcal}
- **Updating Sub-Detector Parameters**
  Fully Define SiD subsystems in Geant4
- **Benchmarking SiD's Performance**
- **Advancing sub-detector R&D and Identifying Next Steps**
  KPiX, Si Pixels Sensors, Si μstrip Sensors, Si/W Ecal, RPCs, GEMs, μMegas, Tracker mechanics, VTX Sensors, VTX mechanics,…
- **Designing the interface with ILC**

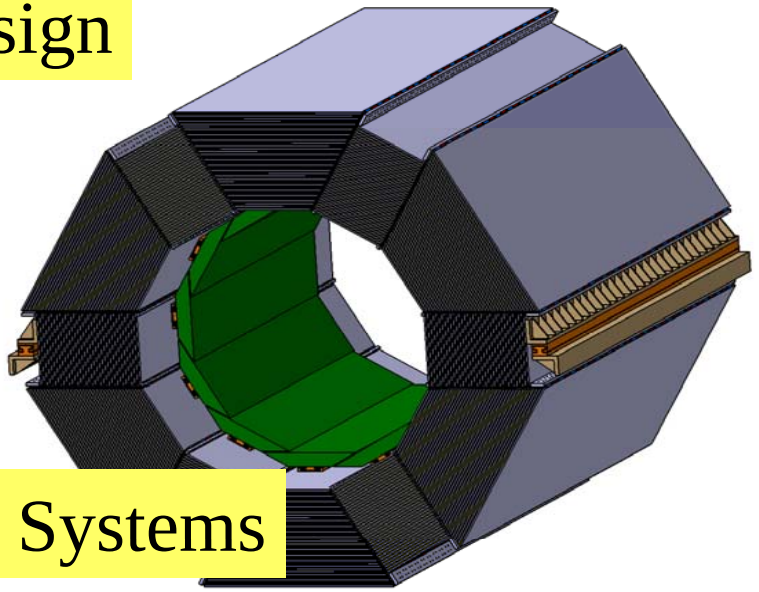
…will lead to SiD LOI

SiD Engineering Group is developing a full Conceptual Design

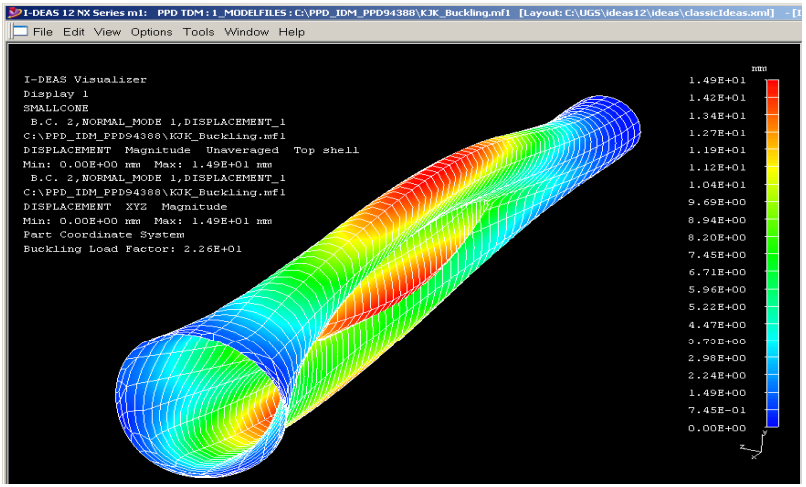
Ecal Modules



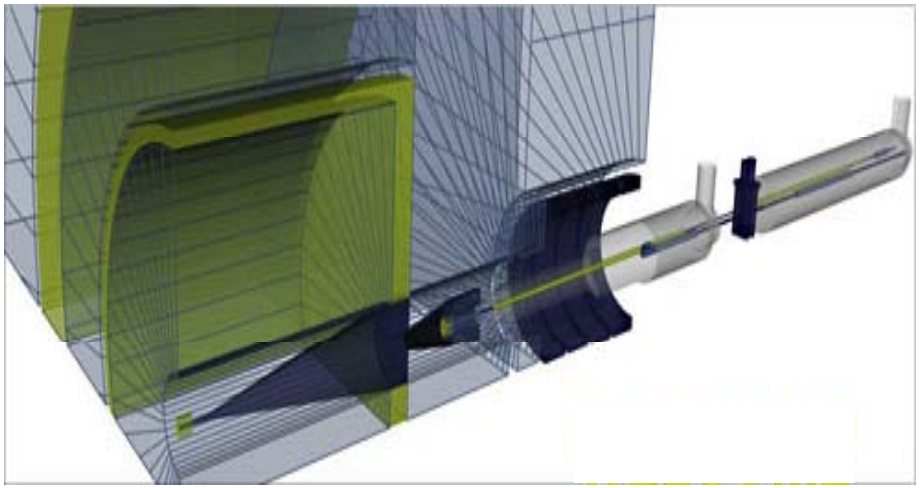
Hcal Design



Beampipe Design

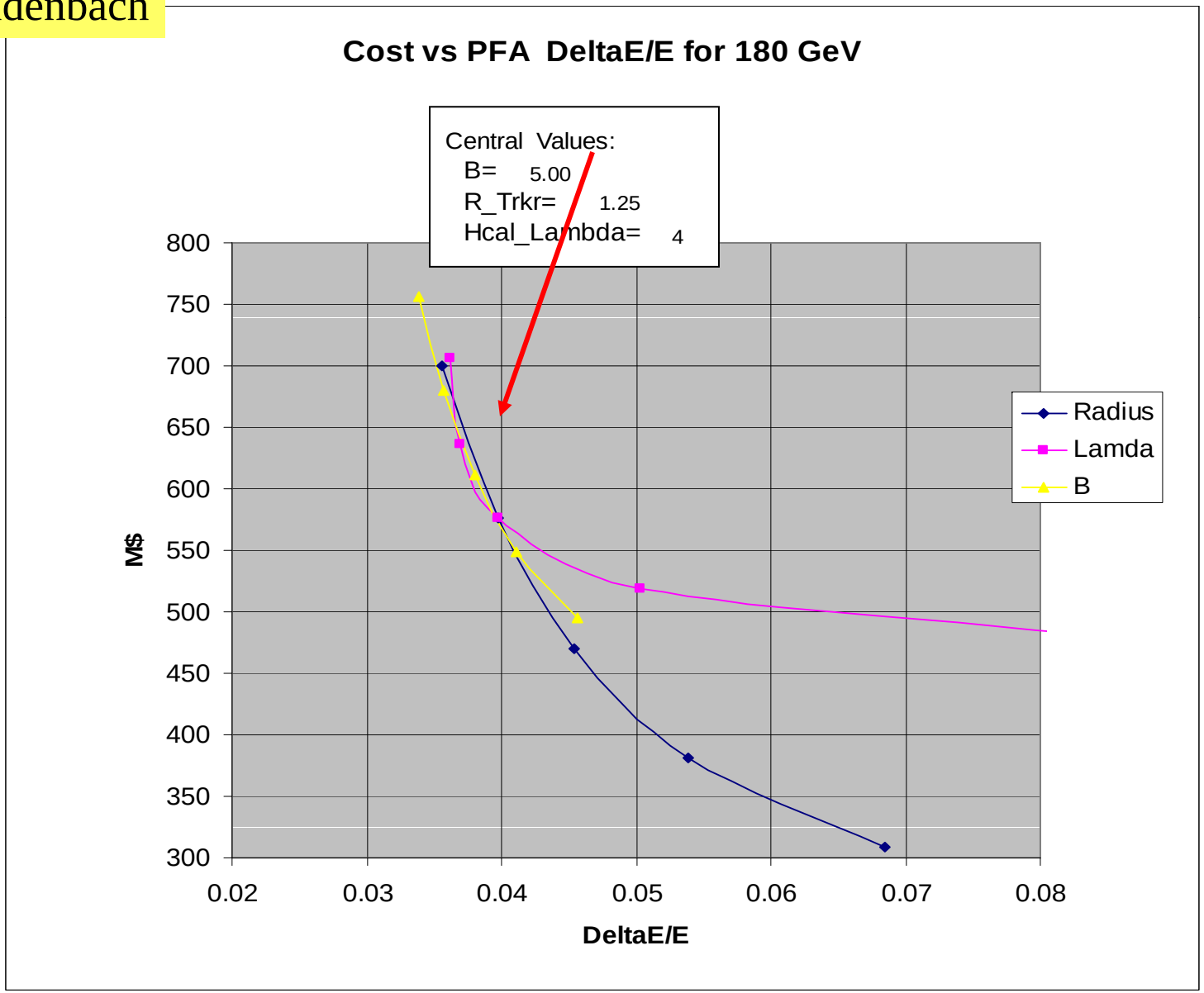


Forward Systems



Optimizing Global Parameters with PFA

M. Breidenbach



Subsystem R&D and Design

See the following talks:

Tracking and Vertexing	Marcel Demarteau
Ecal and KPiX	Marcel Stanitzki
Hcal	Vishnu Zutshi

Simulation, Reconstruction, Benchmarking

See talk following by Norman Graf
- PFA and Track Reconstruction
- Performance Studies
- Physics Benchmarking-SiD Plans for RD's List

Compulsory LOI Benchmarking List

At a Dec 7 meeting between Sakue Yamada and representatives of SiD, ILD, 4th Concept, and the WWS, it was agreed that the following reactions will be used for LOI Physics Benchmarking:

1. $e^+e^- \to Zh, \to \ell^+\ell^- X$, $l - e, \mu$; $m_h -$ 120 GeV at $\sqrt{s}$–0.25 TeV
2. $e^+e^- \to Zh$, $Z \to q\bar{q}, \nu\bar{\nu}$; $h \to c\bar{c}$, $\mu^+\mu^-$; $m_h = 120$ GeV at $\sqrt{s}$=0.25 TeV
3. $e^+e^- \to \tau^+\tau^-$, at $\sqrt{s}$=0.5 TeV
4. $e^+e^- \to t\bar{t}$ at $\sqrt{s}$=0.5 TeV
5. $e^+e^- \to \tilde{\chi}_1^+\tilde{\chi}_1^-/\tilde{\chi}_2^0\tilde{\chi}_2^0 \to W^+W^- \; \tilde{\chi}_1^0\tilde{\chi}_1^0$ / $ZZ\tilde{\chi}_1^0\tilde{\chi}_1^0$ at $\sqrt{s}$=0.5 TeV

N.B.: The physics observables that are to be measured have not yet been determined.

Draft Time Line for the SiD LoI

Date	Milestone	Activities
4/09	**Submit LOI**	
3/09	**Begin Final Edit of LOI**; complete authorlist	
2/09	**Complete LOI Draft** Collaboration Review and Comment	
10/08	**Performance Studies/Benchmarking Results**	At LCWS08?
9/08	**GEANT4 Description Ready** Performance Studies Ready to Go Benchmarking Studies Ready to Go	At ECFA Warsaw?
6/08	**Freeze Detector Design** SubSystems Fully Specified Subsystem Technologies/Alternates Selected Conceptual Designs Ready	At SiD UK meeting
4/08	**Freeze Global Parameters** First Pass Detector Design	
3/08	**First Pass Global Parameters**	
01/08	**Subgroup Plans Defined** Milestones and Deliverables Manpower Resources Needed	

Help Needed

- **SiD needs help to complete work needed for the LoI**
  Detector optimization and performance studies are undermanned.
  More help on physics benchmarking needed.
  Help and collaboration welcome on detector R&D.

- **SiD needs help internationalizing.**
  SiD has Asian and European collaborators, but needs a broader international base. New collaborators needed and welcome.

- **Opportunity exists to impact the SiD Design for the LOI**
  Technology choices, specific designs, and global optimization are all being discussed. There is time to make a difference.

Signing the SiD LoI

- The RD has suggested that most groups should sign only one LOI.
- SiD will ask those signing to commit to furthering the evolution of the SiD Concept and supporting it, with future design work, detector R&D, and/or physics and performance studies.
- Ideally, those signing the SiD LOI will make a contribution which is reflected in the LOI itself.

Let's Talk!

- Please let any of us know if you would like to learn more about SiD or want to explore how to contribute to the SiD LOI.

- SiD is interested in learning what your interests and expertise are and what your group is doing. We would like to explore with you how you might get started on SiD.

- We have set aside time on Friday morning, March 7, to talk to prospective new groups for SiD.

  We are happy to arrange meetings before then, if that is not convenient.

Let us know if you're interested in SiD