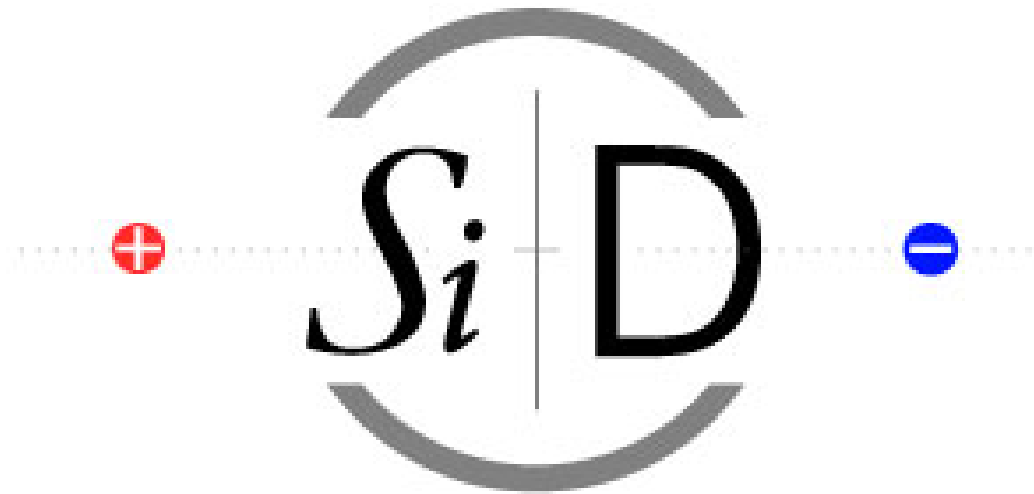# Getting to a SiD Conceptual Design

SiD Fermilab Workshop

April 9, 2007

John Jaros

DOD, DCR, C&EDRs

SiD is participating in WWS detector concept development:

- **D**etector **O**utline **D**ocument (4/06). System by system description of SiD starting point.

- **D**etector **C**oncept **R**eport (4/11/07). Companion to RDR. Makes the case for ILC physics and detectors based on DODs.
  Draft goes public April 11.
  Please read, comment, and sign. See ILC wiki:
  http://www.linearcollider.org/wiki/doku.php?id=dcrdet:dcrdet_home

- **R**&**D** **R**eviews (began 2/07, continuing)
  Require writeups of subsystem R&D status, plans, milestones, schedules

- **WWS R**oadmap
  Moving toward detector collaborations and proposals.

The WWS Roadmap

WWS Roadmap calls for 2 Detector Engineering Design Reports (EDRs) when the Machine EDR is complete (2010). This is a make or break time for the ILC. The machine and the detectors need to be ready for it.

Working back, that means (my interpretation):

- Two international, complementary Detector Designs must be defined by 2008

- The four extant, regional Detector Concepts in 2007 need to coalesce spontaneously into two (mine and a combination of the others)

  or

- Two of the four extant, regional Detector Concepts in 2007 must be selected, and the appropriate marriages arranged to preserve the ILC community and international balance.

  or

- ???

How Should SiD Respond to WWS Roadmap?

An uncertain world! What should SiD do?

- **Play Ball.**
  Participate in WWS Roadmap Process, the Inter-Concept Jet Reconstruction Working Group, and the ongoing subsystem R&D reviews.

- **Internationalize SiD**
  Recruit new collaborators, especially Asian and Europeans, to help with optimizing the SiD design.

- **Get moving on the SiD Conceptual Design Report**
  We need to understand, optimize, and complete our design.

Why SiD needs a CDR

- **Optimize the global parameters already.**
  This has been our goal from the start; we are close to being able to do it. We are being prodded to do it.

- **Detail and Integrate the Subsystem Designs.**
  Engineer the design. Specify all parameters, flesh out the designs, evaluate the costs, choose the subsystem technologies.

- **Benchmark SiD's Performance.**
  Simulate a Realistic Detector. Benchmark it's performance subsystem by subsystem. Benchmark its integrated physics performance. Does SiD really work?

- **Chance to engage new collaborators.**
  Lots to do for the CDR and help is needed. Designs are in flux. A good time to join and a good time to contribute.

- **Be ready for the competition. Be ready to move to an EDR.**

- **SiD CDR is our proposal to the agencies to support the work required for an EDR.**

Calorimetry, Calorimetry, Calorimetry

Old and outstanding questions addressed in this Workshop:

1. **What Jet Energy Resolution do we really need? 30%/√E ?**
   Tim Barklow: 60%/√E →30%/√E buys 40% luminosity
   Bill Morse: $\delta m_{dijet}/m_{dijet} \sim \delta E_{jet}/E_{jet}$ so don't need 30%/√E,
                   $\delta E_{jet}/E_{jet}$ = 3-4 % is OK.

2. **What Jet Energy Resolution can we get?**
   Steve Magill: Progress with PFAs
   Ron Cassell: Progress without PFAs.

3. **What Hcal do we want?**
   Jerry Blazey: Hcal R&D Plan

4. **Pure PFA? Hybrid PFA/Traditional Cal? EFA?**

WWS has initiated 'Jet Reconstruction Working Group' to address these questions across concepts.

Some Prereqs
Nearly there, but need to finish up.

- ## Tools Ready
  PFA's ready for global optimization
  Tracker pattern recognition code ready

- ## New level of detail in SiD Simulation
  e.g. Digitization and Tracker Module Tiling
  More realistic geometry for calorimeters

- ## Full MC Physics Analyses running

You want it *when*?

- ## July 07
  Tools Ready; Simulation Ready; Studies Defined;
  Engineering started

- ## SiD Fall 07 Workshop (@ALCPG?)
  Full simulation studies reported
  Optimization studies reported
  Conceptual Designs and Costs--Pass 1

- ## SiD Spring 08 Workshop
  Global and Subsystem Parameters set
  Designs ready; technologies chosen; Simulation updated
  Performance benchmarked
  Writer's block eliminated

- ## Summer 08
  Draft SiD CDR complete

SiD's Homework

- **Subgroups prepare R&D Plans**
  (HCal and Tracking Groups have done so. WWS
  Detector Reviews need this too.)

- **Get SiD Engineering Started.**
  (Engineers coming on board at Argonne, Fermilab,
  and SLAC soon)

- **Recruit Help for Sim Studies**
  (SiD is manpower short. We need more help.)

Waiting for GODOT
Global Overarching Detector Optimization Tools

- **We've made impressive progress with tools:**
  - Sim framework for full digitization and sensor description prepared

    PFAs have improved performance
    Full MC physics analysis has been demonstrated
    Tracking recon code available in lcsim.org

- **It's time to finish making these tools workable, and start applying them.**

- **It doesn't have to be perfect. It only has to be right.**

Special this Meeting

- **Calorimetry**

- **Choosing technologies** on a rushed schedule is tough. Best effort required. Alternatives necessary when a rational decision is impossible. R&D Plans discussed.

- **SiD Town Meeting**. Discussion of our plans there.

- **How to get more international help on SiD?**