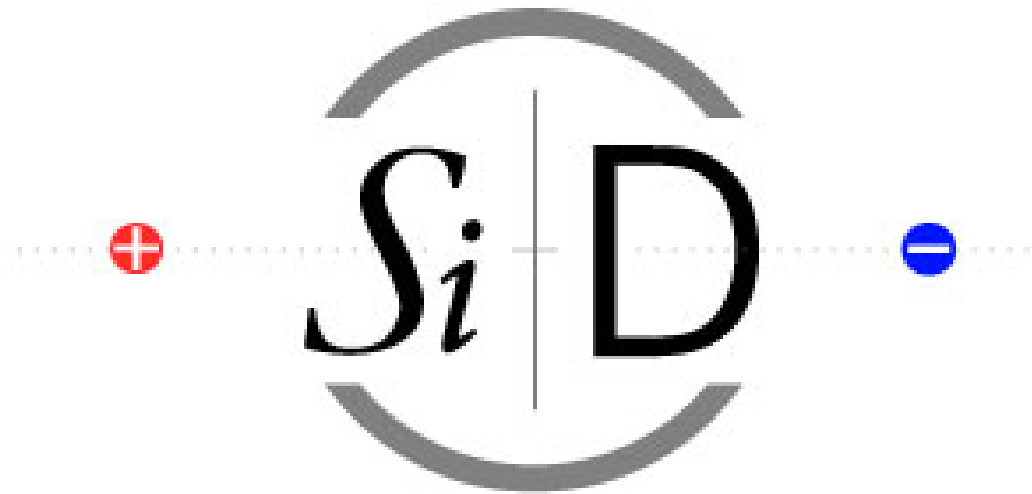


SiD Workshop Highlights



May 8, 2007

John Jaros

Keeping up with Machine: Motivation for Roadmap

- progress on machine side must be followed by detectors
 - 2004 - technology decision
 - 2005 - GDE formed
 - 2005 - baseline configuration
 - 2007 - reference design
 - 2009
or so - engineering design
- similar engineering effort is only possible if support is combined to two efforts, rather than addressing >2 engineering designs

Shin-ichi Kurokawa, ILCSC Chair

Albrecht Wagner, ICFA Chair

Subject: Letter to WWS Co-Chairs

- 26 February 2007
- To: Co-Chairs of the WWS International Organizing Committee
- From: ILCSC
- The realization of the International Linear Collider has taken major steps forward in recent years. This could not have happened without the leadership taken coherently by the particle physics community, within the framework of ICFA. Unprecedented collaborative steps have been necessary, and the community has adapted successfully to what, in some regions, required major redirections of traditional accelerator R&D effort.
- Two major milestones, the selection of the main-linac RF technology and the GDE's announcement of the RDR budget and associated design choices, keep the GDE on pace to complete a construction-ready engineering design for the ILC accelerator-complex by 2010.
- Maintaining this momentum requires also that the equivalent strategic decisions and the level of technical maturity for the two ILC detector proposals keep pace with the accelerator schedule. Major progress in this regard is ongoing under the auspices of WWS. In addition, a definite plan together with milestones is needed to have detector designs of a maturity similar to that of the accelerator by 2010. This needs an enhanced effort by the community. ILCSC will support the formation of an International Detector Advisory Group to assist this effort. ICFA looks forward to receiving such a plan from WWS at the June 1, 2007 ILCSC meeting at DESY.

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.

Calorimetry, Calorimetry, Calorimetry

Old and outstanding questions addressed in this Workshop:

1. What Jet Energy Resolution do we really need? $30\%/ \sqrt{E}$?

Tim Barklow: $60\%/ \sqrt{E} \rightarrow 30\%/ \sqrt{E}$ buys 40% luminosity

Bill Morse: $\delta m_{\text{dijet}}/m_{\text{dijet}} \sim \delta E_{\text{jet}}/E_{\text{jet}}$ so don't need $30\%/ \sqrt{E}$,
 $\delta E_{\text{jet}}/E_{\text{jet}} = 3-4\%$ 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.

w/o gluon rad

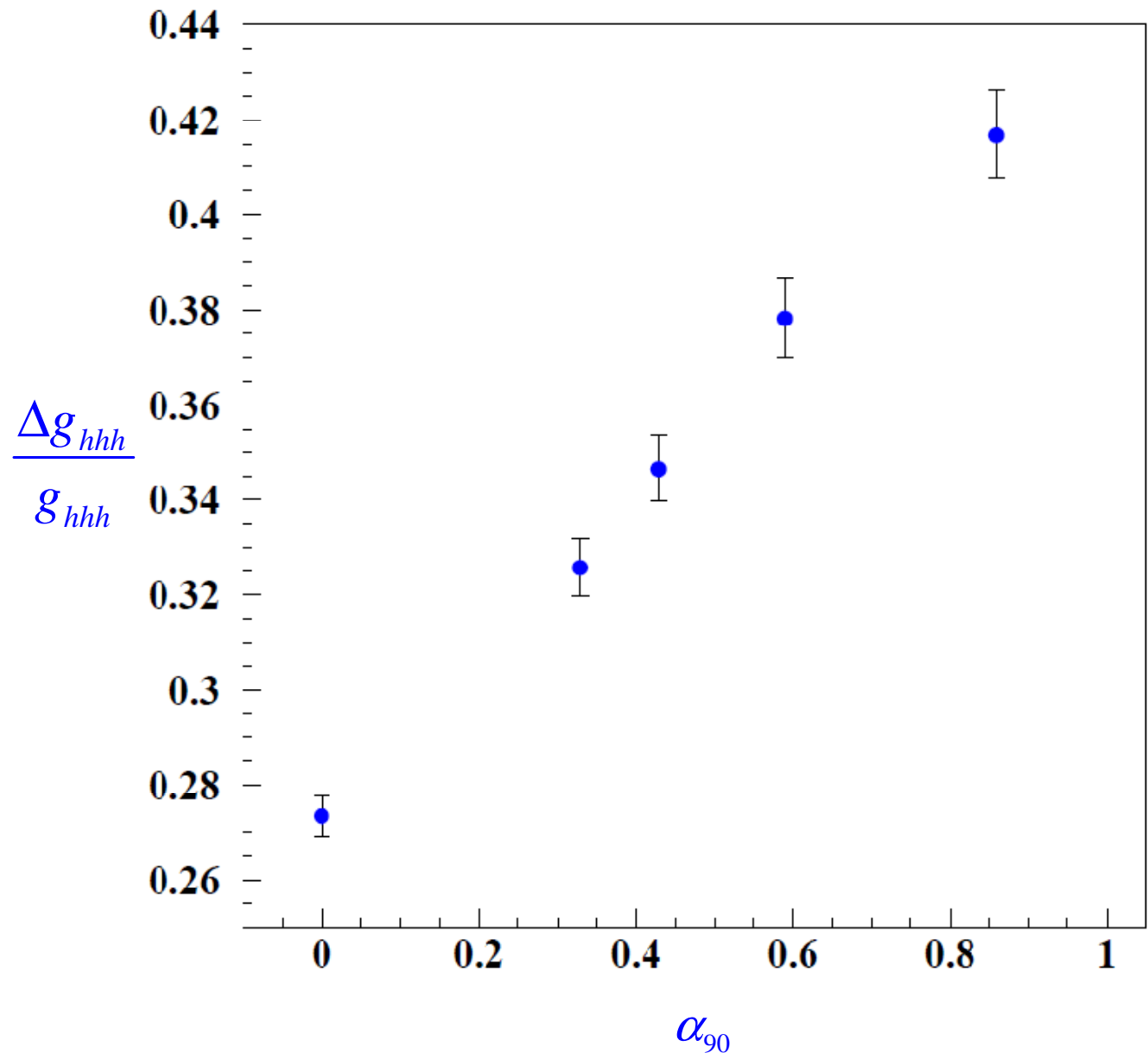
$$\text{BR}(H \rightarrow b\bar{b})=0.678$$

$$e^+e^- \rightarrow ZHH \\ \rightarrow qq\bar{b}\bar{b}$$

$$\sqrt{s} = 500 \text{ GeV}$$

$$L = 2000 \text{ fb}^{-1}$$

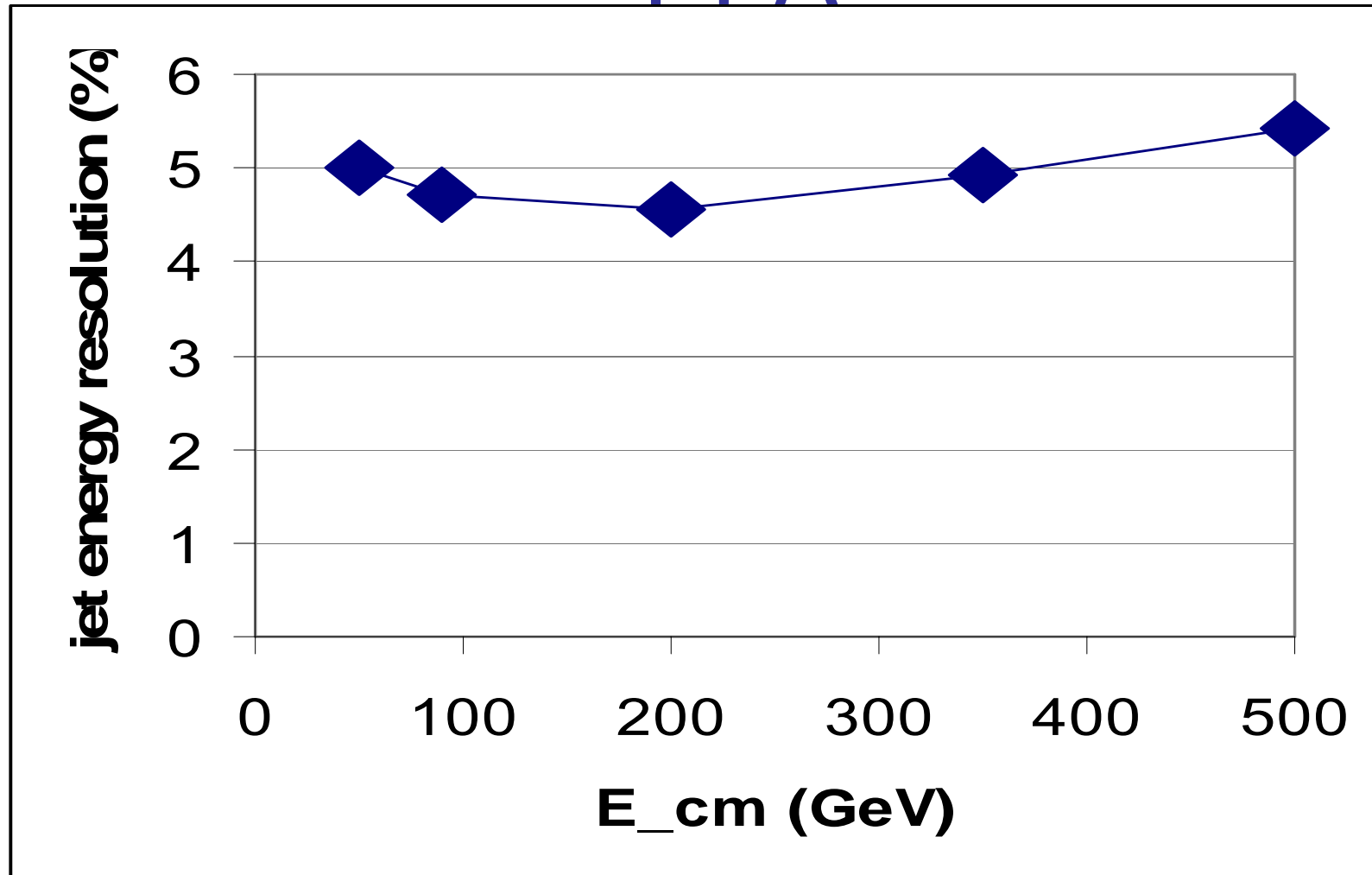
$\Delta E/\sqrt{E} = 60\% \rightarrow 30\%$
equiv to $1.4 \times \text{Lumi}$



Need to be guided by analytical calculations!

- Effective mass resolution:
- $M^2 \approx E_1 E_2 (1 - \cos\theta_{12})$
- $dM_{12}/M_{12} \approx \frac{1}{2}(dE_1/E_1 + dE_2/E_2 + \dots)$
- Elementary considerations show:
- 3-4% jet energy resolution required
- NOT $dE/E = 30\%/\sqrt{E}$
- Physics simulations needed to more accurately specify x : $dE/E=x$

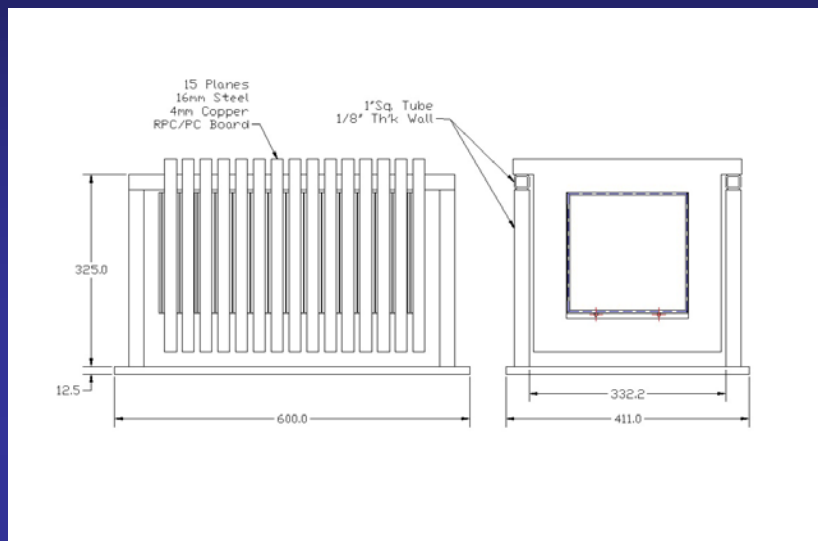
Light quark jets $ee \rightarrow qq$ GLD-PFA



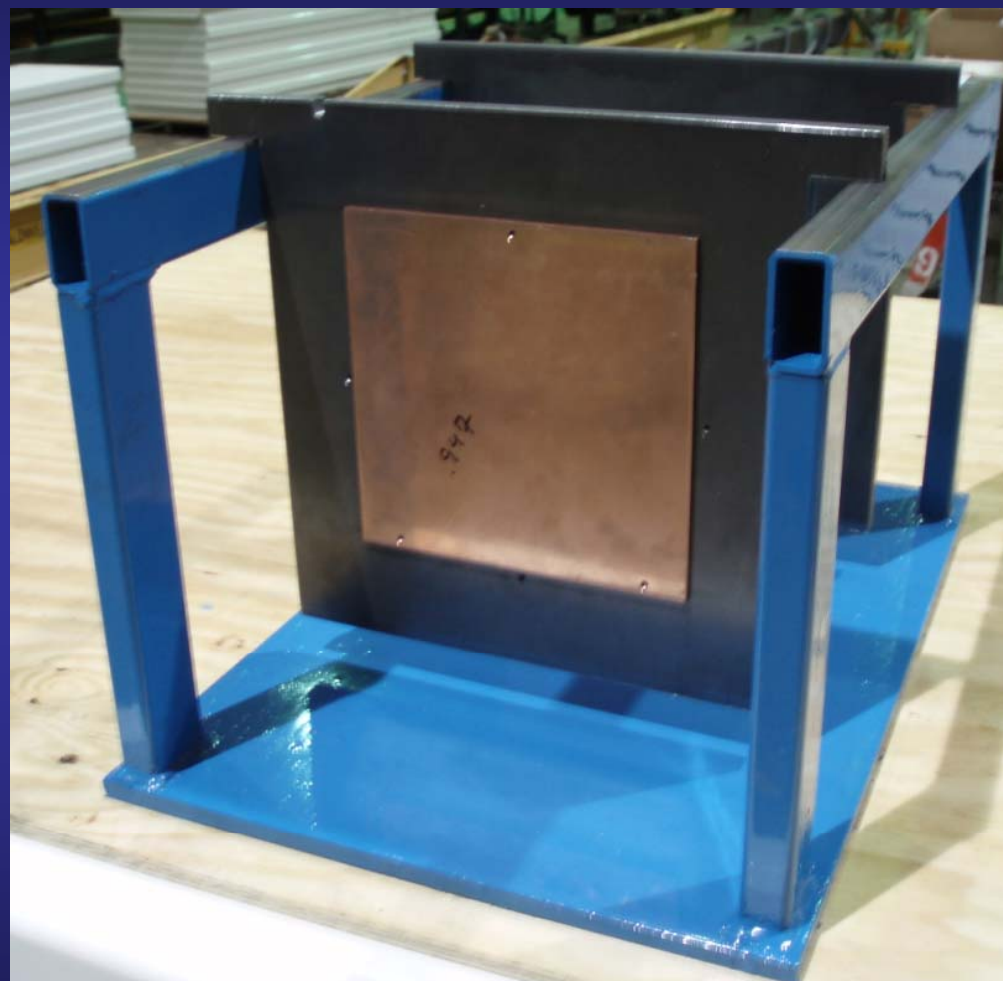
Conclusions

- We need ILC jet energy resolution of $dE/E \approx 3 - 4\%$
- Need physics simulations to give a more accurate number
- Present state of the art with PFA is $dE/E \approx 4.5 - 5.5\%$.

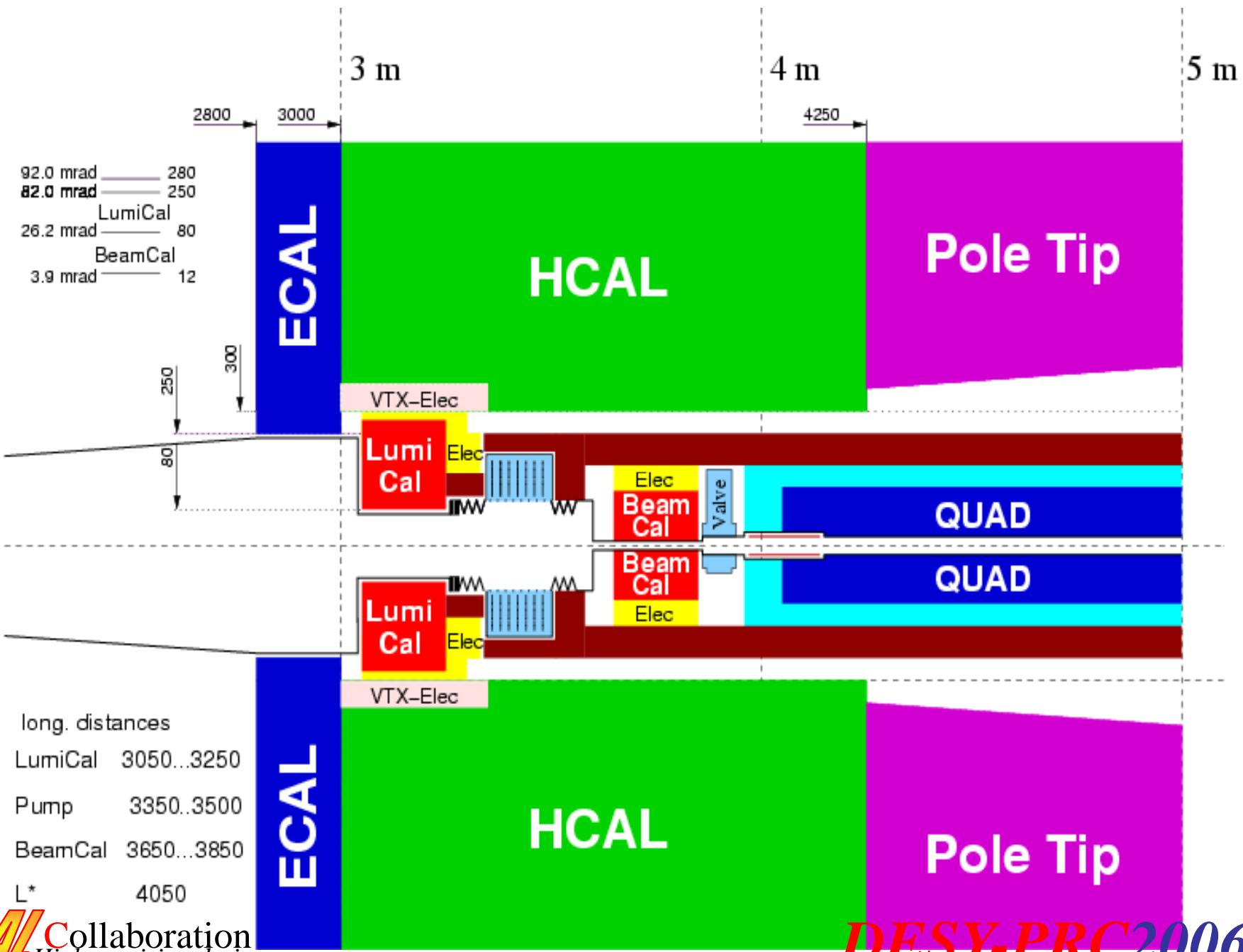
Mechanical: Stack for Vertical Slice Test



Stack is assembled



Design accommodates 20 x 20 cm² RPCs as well as 30 x 30 cm² GEMs



U.S. Forward (SiD)

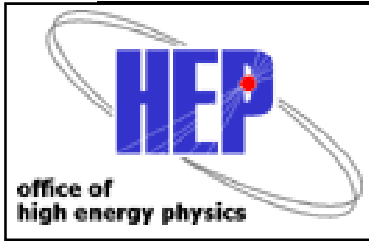
- G. Haller, A. Abusleme, M. Breidenbach, D. Freytag ([SLAC](#)): BeamCal readout design
- Z. Li ([BNL](#)): BeamCal radiation damage issues
- B. Parker ([BNL](#)): machine interface issues
- M. Zeller, G. Atoian, V. Issakov, A. Poblaguev ([Yale](#)): GamCal design issues
- Y. Nosochkov ([SLAC](#)): Extraction line issues
- U. Nauenberg ([Colorado](#)): SUSY studies



Tracking Review at Beijing Post-Mortem

**SiD Workshop
April 11, 2007
Fermilab**

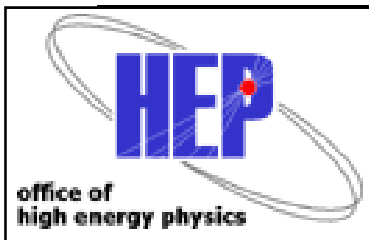
Rich Partridge, Marcel Demarteau
for the Tracking Group



Summary



- ❖ The ILC is still at the top of the priority list for DOE.
- ❖ FY2007 will bring modest increase for detector R&D.
- ❖ The June Review will be important for making the case that the US R&D program is well planned.
- ❖ We need to evolve the structure of the worldwide detector program.



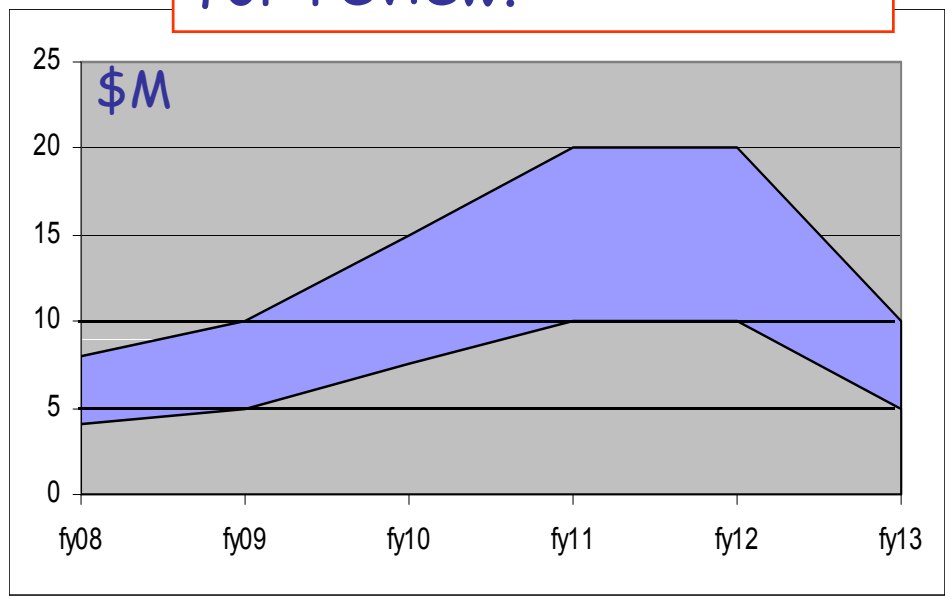
Detector R&D Review



Consultants:

- Tim Bolton (Kansas State)
- David Cassel (Cornell)
- Gary Feldman (Harvard)
- Meenakshi Narain (Brown)
- Regina Rameika (FNAL)
- Michael Rijssenbeek (Stony Brook)
- Bing Zhou (Michigan)

DOE budget guidance for review.



Not all possible R&D topics likely affordable in US (also true for ILC accelerator), so critical evaluation of work in other regions is needed.

This guidance is only advisory - funding levels are always subject to change!