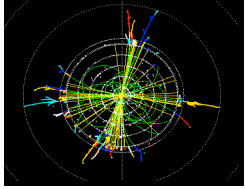


ILC Detector Program



Repeated High Evaluation of Physics Importance of ILC

In USA

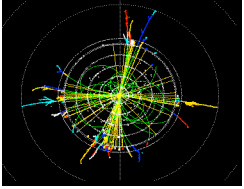
**2001 - Barish-Bagger HEPAP Subpanel Report
pushed Linear Collider**

**2003 - Linear Collider designated as highest priority mid-term
future facility for DOE Office of Science**

**2006 - EPP 2010 - gave high priority to the ILC
after LHC, recommendations 2 & 3**

**2006 - Seiden P5 - strong support for ILC, including explicitly
Detector R&D**

also in Asia and Europe



ILC Detector R&D

Many years of planning and R&D have guided the evolution of our effort

1998 - *World Wide Study of Physics and Detector for Future electron-positron Linear Colliders* formed at Vancouver ICHEP

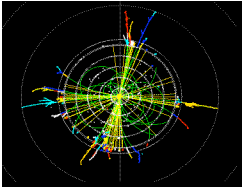
2002 - in N.Am. ALCPG formed to coordinate US efforts on physics and detectors

2002 - UCLC and LCRD organize for DOE/NSF detector R&D proposals

**2005 - first year of LCDRD (jointly funded by DOE/NSF)
-umbrella grant**

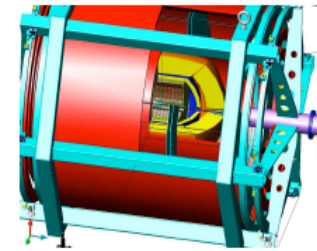
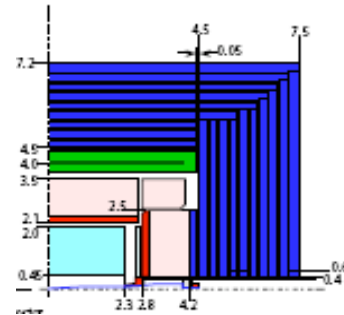
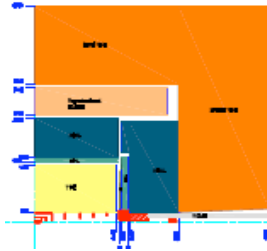
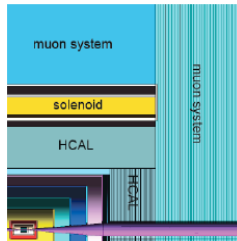
2005 - GDE formed and WWS efforts synchronized to machine

2007 - ILC Research Director appointed to lead exp. Program

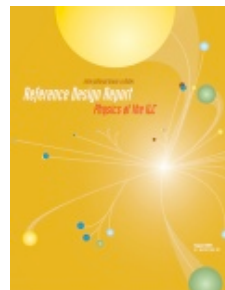
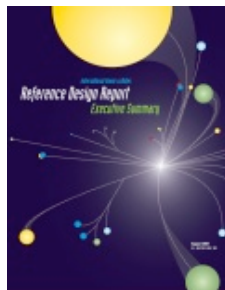


Significant Progress

- R&D advances
- Detector Concepts

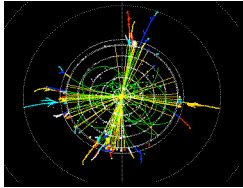


- Reference Design Report - 2007



Physics

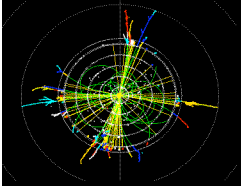
Detectors



LCDRD Program



Topic	FY05		FY06		FY07	
	\$0.817M		\$1.348M		\$2.175M	
LEP	5	15%	6	13%	6	13%
VXD	1	9%	4	13%	4	14%
TRK	8	32%	8	22%	9	18%
CAL	9	41%	13	45%	11	49%
PID(mu)	2	4%	2	6%	3	6%
projects	25		33		33	
NSF	\$0.117M		\$0.300M		\$0.375M	
DOE	\$0.700M		\$1.048M		\$1.800 M	
UO umbrella	\$0.797M		\$1.257M		\$1.833M	
direct to labs	\$0.020M		\$0.091M		\$0.342M	



Linear Collider Detector R&D – FY07



Luminosity, Energy, Polarization

3.4 Eric Torrence
3.5 Mike Hildreth
3.6 Yasar Onel
3.7 William Oliver
3.8 Gio. Bonvicini
3.9 Bill Morse

Extraction Line Energy Spectrometer
BPM-Based Energy Spectrometer
Polarimetry
Compton polarimeter backgrounds
Incoherent and coherent beamstrahlung
BeamCal and GamCal

} (also suppl. funding)

Vertex

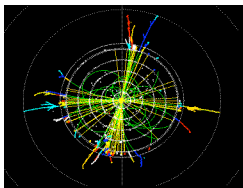
4.1 Charlie Baltay
4.2 Marco Battaglia
4.4 Henry Lubatti
4.5 Gary Varner

Pixel Vertex Detector (**also suppl. funding**)
Monolithic Pixel Detector Module
Vertex Detector Mech. Structures
Pixel-level Sampling CMOS VxDet (**also suppl. funding**)

Tracking

5.2 Lee Sawyer
5.7 Dan Peterson
5.8 Keith Riles
5.10 Bruce Schumm
5.13 Stephen Wagner
5.15 Eckh. von Toerne
5.17 Dan. Bortoletto
5.19 Dan Peterson
5.21 Richard Partridge

GEM-based Forward Tracking
MPGD Readout for a TPC (**also suppl. funding**)
Tracker Simulation and Alignment Sys.
Long Shaping-Time Silicon Strip (**also suppl. funding**)
Reconstruction Studies for SiD Trk
Calor-based Tracking-Long-lived Part.
Thin silicon sensors
TPC signal digitization
2-D Readout of Silicon Strip Detectors



Linear Collider Detector R&D – FY07 (cont.)



Calorimetry

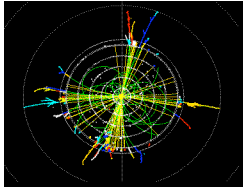
6.1 Vishnu Zutshi
6.2 Uriel Nauenberg
6.4 Usha Mallik
6.5 Raymond Frey
6.6 Andy White
6.9 Dhi. Chakraborty
6.10 Graham Wilson
6.14 José Repond
6.18 John Hauptman
6.19 A.J.S. Smith
6.20 Tianchi Zhao

Scintillator-based Hadron Calorimeter
Scintillator Had Cal w/ SiPDs
Particle Flow Studies
Silicon-tungsten EM calorimeter (**also suppl. funding**)
Digital Hadron Calorimetry w/ GEMs
Particle-Flow Algorithms and Sim.
ECAL Concepts for Particle Flow
Had Cal with Digital Readout (RPCs) (**also suppl. funding**)
4th Concept Detector
Calorimeter and Muon ID
Scint/Cheren Rad Plates Cal w/ SiPMs

Muon

7.2 Paul Karchin
7.5 Robert Wilson
7.8 Henry Band

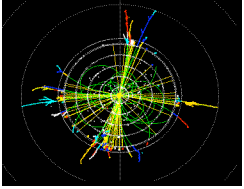
Scintillator Based Muon System (**also suppl. funding**)
Geiger-Mode APDs for Muon Sys.
RPC and Muon System Studies



2007 DOE/NSF Review of US Detector R&D Program

Review of US detector program - June, 2007

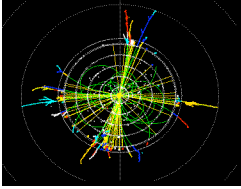
- DOE/NSF Review chaired by Jim Whitmore
 - <http://physics.uoregon.edu/~lc/lcdrd/review-07/>
- Report from external panel w/ 12 recommendations
 - http://physics.uoregon.edu/~lc/lcdrd/review-07/Review_report_Final_Version.doc
 - Excellent program
 - Increase support needed and recommended
 - “The committee was very pleased with the many advances made to date, despite the less than optimal funding available. The committee strongly encourages the funding agencies to increase the level of support substantially so as to position the US groups to be major players in the development of the ILC detectors.”
 - Agencies were planning increased support for linear collider detector R&D



World wide reviews of Detector R&D

organized by World Wide Study R&D Panel

- Beijing (Feb, 2007)--tracking
- DESY (LCWS) (June 2007)--calorimetry
- Fermilab (Oct. 2007)--vertexing
- <http://physics.uoregon.edu/~lc/wwstudy/detrdrev.html>



Research Director

- Last fall, ILCSC recruited Sakue Yamada to serve as Research Director
- Charge written by ILCSC



CHARGE

The RD will be responsible for the development of the experimental program of the ILC. In particular, the RD will be responsible for

1. devising the procedures that will result in two contrasting and complementary detector designs proposed by groups that are capable of completing detector engineering design reports (EDRs),
2. helping to secure the resources which are required by interacting with lab directors, funding agencies, and universities,
3. endorsing major technical decisions by the collaborations,
4. guiding the global detector R&D activities, as long as such management is required,
5. promoting the ILC project together with ILCSC and GDE.

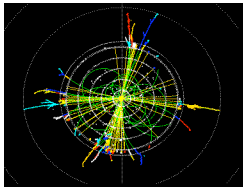
In order to perform these tasks, the RD will

1. form a management structure under him/her to execute these tasks,
2. appoint a detector advisory group, the IDAG (International Detector Advisory Group), with the approval of the membership by the ILCSC.

The IDAG will

1. advise the Research Director on ILC experimental program issues
2. make recommendations to the Research Director on the choice of two detectors for the engineering design effort based on detector Letters of Intent. The Research Director will present these recommendations to the ILCSC for approval.

<http://www.fnal.gov/directorate/icfa/Charge%20for%20the%20ILC%20Research%20Director.pdf>



Detector Roadmap

ILCSC has approved RD Yamada's nominations of 16 members for the International Detector Advisory Group (IDAG)

- members based on input from each of the regional steering groups
- include detector and experimental specialists, phenomenologists, and accelerator experts
- mostly from outside ILC community

IDAG members now being approached

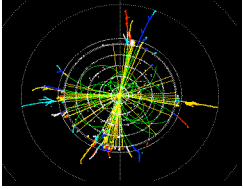
- invite to TILC08 in Sendai for first meeting (?)



Yamada has designed the organizational structure

- regional steering committees endorsed his request that WWS co-chairs serve as initial members of the executive committee

J. Brau, F. Richard, H. Yamamoto



Impact of US/UK funding trouble on RD planning

- slow down detector process in accordance with the GDE stretch out
- drop engineering design and confine effort to technical design
- keep the LOI process, but have them due later, if that is the desire of the LOI groups, which we can anticipate to be so
- IDAG will validate LOIs, with possible reduction in number of concrete designs to be studied for MDI with GDE



Yamada – ILC Detector RD

Detector community

We wish to keep the present momentum.

1. The physics case remains valid.
2. We should move from the present R&D phase to a more technical phase where sub-detector integration is thoroughly studied.
3. It is essential to improve on Machine Detector Interface aspects as recognized in the last FALC meeting.
4. We began a process (LOI call by ILCSC) for the detector groups to work out the MDI systematically with the accelerator team for detailed technical design.

*The detector community requires a long time to get organized.
Once paused, it will cause much delay and even loss of interest.*

We will receive LOIs.

The effect of the budget cut on the Detector Groups

- The effect may be different for each group.
 - Some group may appreciate additional preparation time.
- Details should be consulted each LOI group.

The result will be reported to ILCSC.

We might ask ILCSC to postpone the due date
by several months, till sometime in early 2009.

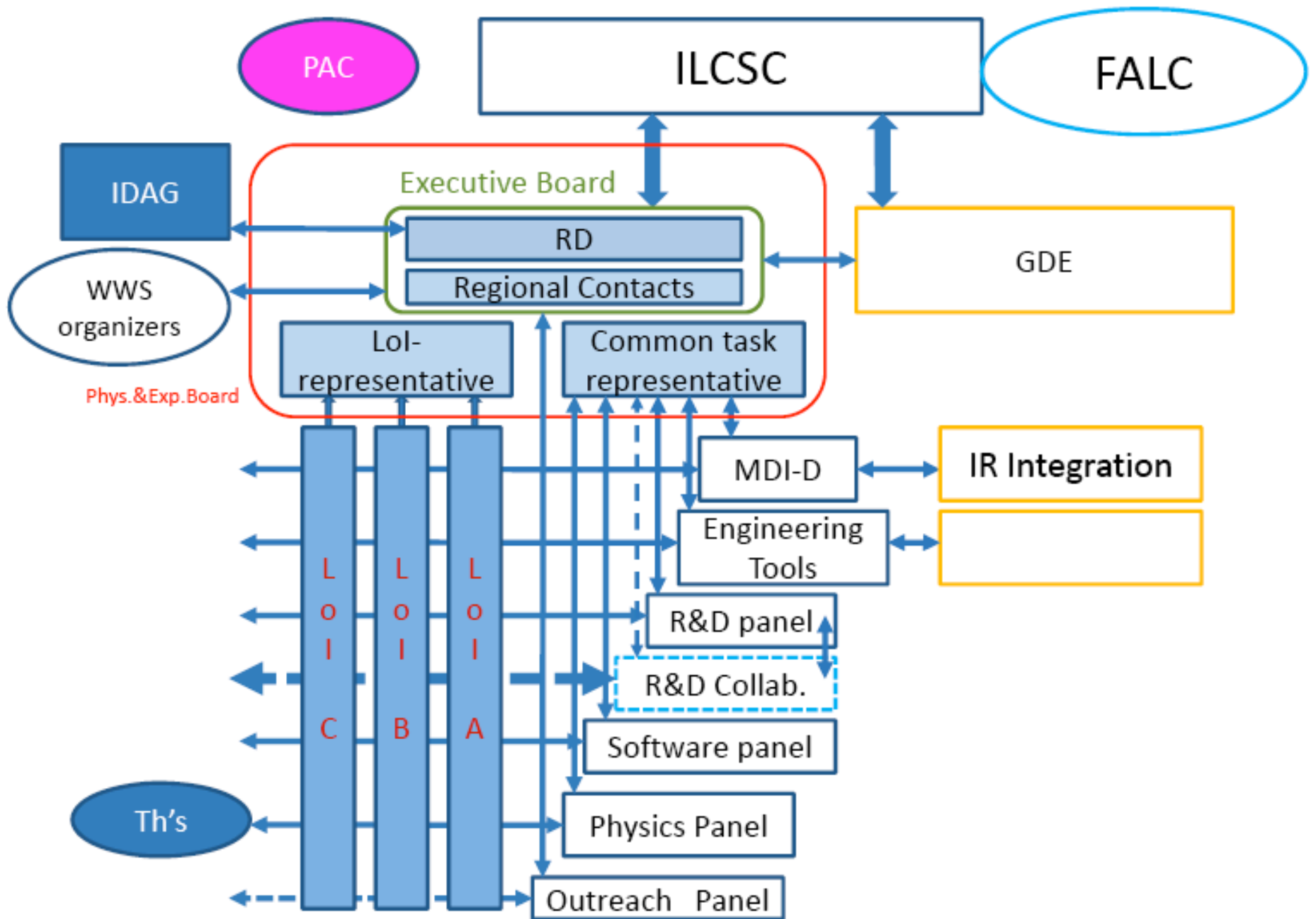
The LOIs will be reviewed by the IDAG to choose 2 detectors.

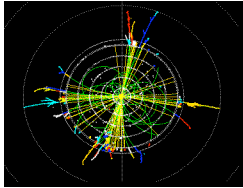
Our IDAG nomination was approved by ILCSC.

The organization to conduct this process is formed.

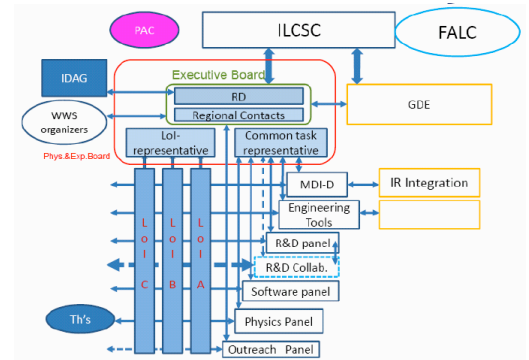
*The technical design effort, which begins in 2009, will lead
eventually to full technical designs by about 2011.*

Jan.09,2008

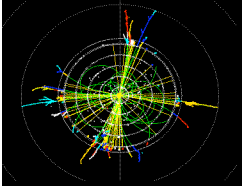




RD's Management Structure



- It must have a good **communication** link both to the physicist community of the world and to GDE
- It should also facilitate smooth **collaboration** among LOI groups for detector or software development
- The central part is **Executive Board** consisting of RD and three regional contacts (the co-chairs)
- After identifying LOI groups several **common task** groups will be formed, where all LOI groups will join to work together
- The representatives of LOI groups and the chairs of common tasks will form **Physics and Experiment Board**

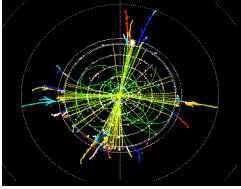


RD's Timeline

Under Discussion

- Lol's early in 2009, perhaps April
- Detector Design Phase I - through 2010
 - (preconceptual in US)
- Detector Design Phase II - through 2012
 - (preconceptual in US)

Two phases linked to GDE replan



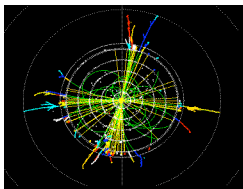
Letters of Intent for Detector Design Study - 2009

- Lol includes
 - description of detector
 - identify critical R&D areas
 - list of participants
 - explanation of resources
 - simulated demonstration of physics performance (benchmarks)
 - plan for completion of technical design
- LOI leads to validation of performance by IDAG
- machine detector interface efforts intensified
- IDAG reviews Lols, with aim to validate detector designs for advanced development

Under Discussion

-To be presented at
ILCSC Meeting Feb 11

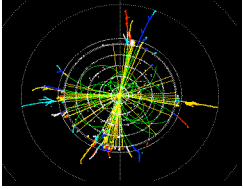
(this is explicitly not a choice for the collider, but for the Detector Design Phase)



Detector Design Phase I - to 2010

- Focus R&D on prioritized areas and critical elements of detector designs
- Complete validated detector specification and initiate technical design work on validated detectors
- Update of physics performance
- Complete phase 1 of Machine Detector Interface design
- Prepare for reaction to LHC results

Under Discussion
-To be presented at
ILCSC Meeting Feb 11



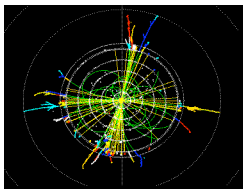
Detector Design Phase II - to 2012

- React to LHC results
- Complete technical design and R&D needed for project proposal (exceptions*)
- Documented design
- Final confirmation of physics performance
- Complete Machine Detector Interface technical design
- Complete reliable cost roll up
- Prepare international financial plan

Under Discussion

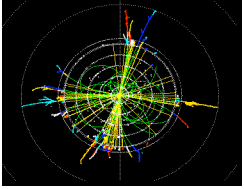
-To be presented at
ILCSC Meeting Feb 11

(*design work expected to be preconceptual in US)



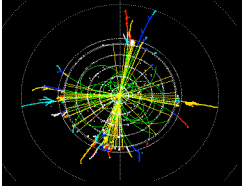
P5

- DOE and NSF have reconstituted P5, and asked for a long range plan for the field
- Everything is on the table
- Important for everyone to express views to P5
 - Fermilab, Jan 31-Feb 2
 - Town meeting Feb 1, 3:30 - be there and speak up
 - SLAC, Feb 21-23
 - Town meeting - ditto
 - BNL, Mar 6-8
 - Town meeting - ditto



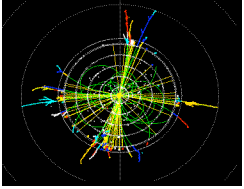
Future Meetings

- Sendai - TILC08 - ACFA LC Workshop
– March 3-6
- Warsaw - ECFA LC Workshop
– June 9-12
- Chicago - LCWS08
– November 16-20



ILC/CLIC joint R&D

- Meeting at CERN, Feb 8
- Common interests
 - Simulation
 - Tracking
 - Calorimetry
 - MDI



Final Remarks

- We have been working hard toward our goals for many years (~one decade)
- Our fundamental scientific goals remain compelling
- Year-to-year funding difficulties are inevitable in the US system
 - This is true for any project
- R&D must be focused and prioritized to prepare for opportunity which could come with LHC results
- We must obtain support of FALC, ILCSC, and ICFA
- Please comment on RD's timeline