



CHARGE TO THE 2007 LINEAR COLLIDER WORKSHOP

Jim Brau
University of Oregon



DESY

Hamburg

May 30, 2007



History of LCWS



1. Saariselka, Finland - **September 9 - 14, 1991**
2. Hawaii, USA - **April 26 - 30, 1993**
3. Morioka, Japan - **September 8 - 12, 1995**
4. Sitges, Spain - **April 28 - May 5, 1999**
5. Fermilab, USA - **October 24-28, 2000**
6. Jeju Island, Korea - **August 26-30, 2002**
7. Paris, France - **April 19-23, 2004**
8. Stanford, USA - **March 17-23, 2005**
9. Bangalore, India - **March 9-13, 2006**
10. **DESY, Germany - May 30 - June 3, 2007**



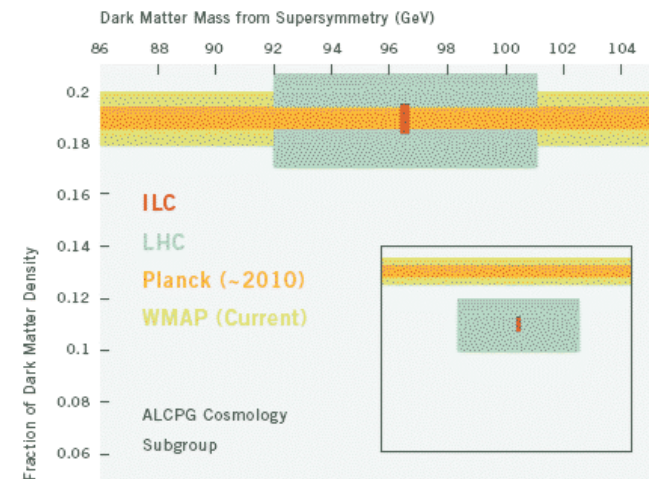
A Compelling Physics Case Has Been Established



- **LHC will open Terascale physics**
 - ✦ Deep significance to fundamental physics
 - ✦ What is nature of EWSB?
 - ✦ Are there new symmetries of space and time?
 - ✦ Are there hidden extra dimensions?
 - ✦ Dark matter particles

- **ILC is needed to explore and elucidate nature of Terascale**
 - ✦ Deeper look into Terascale questions
 - ✦ Precision exploration of new physics

- ✦ **Peter Zerwas** **ILC Physics Case**
- ✦ **Antonio Masiero** **New Physics**
- ✦ **Klaus Desch** **LHC/ILC**





WWS (WorldWide Study on Physics and Detectors for Future Linear Colliders)

Organizes/coordinates international activities on LC Physics/Detector Studies, in particular (as endorsed by ICFA/ILCSC in summer 2004),

- Recognize and coordinate studies on whole **detector concepts**, and work toward interregional detector TDRs.
- **Interface with GDI** (Global Design Initiative), especially on MDI (Machine Detector Interface) issues.
- Keep a register of **R&Ds relevant to LC experimental programs**, identify those that are vital or missing, and ensure peer review of R&D proposals.
- Organize **interregional meetings and workshops**.
- Report to ILCSC and ICFA on the matters above.



WWS Organizing Committee



Co-chairs: J. Brau, F. Richard, H. Yamamoto

Americas

- John Jaros, SLAC (USA)
- Dean Karlen, Victoria (Canada)
- Andreas Kronfeld, Fermilab (USA)
- Mark Oreglia, University of Chicago (USA)
- Ritchie Patterson, Cornell (USA)

Asia

- Atul Gurtu, Tata Institute (India)
- Yee Bob Hsiung, National Taiwan University (Taiwan)
- Wei Guo Li, IHEP Beijing (China)
- Akiya Miyamoto, KEK (Japan)
- Hwanbae Park, Kyungpook National University (Korea)

Europe

- Tiziano Camporesi, CERN
- Michael Danilov, ITEP (Russia)
- Rolf Heuer, U. Hamburg / DESY (Germany)
- David Miller, U. C. London (UK)
- Ron Settles, Munich (Germany)
- Jan Timmermans, NIKHEF (Netherlands)

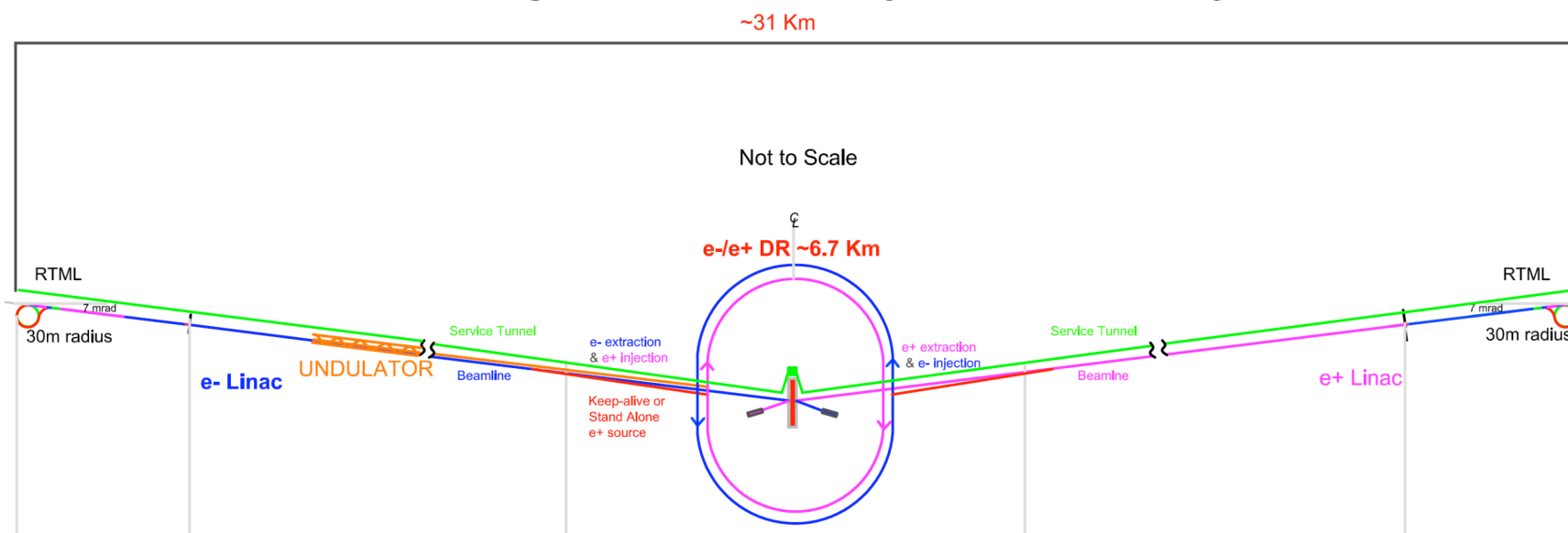
<http://www.physics.uoregon.edu/~lc/wwstudy>



Collider Progress



- **Reference Design with cost released in Beijing in February**
 - ⇒ **Two 11km SC linacs operating at 31.5 MV/m for 500 GeV**
 - ⇒ **Centralized injector**
 - ❖ Circular damping rings for electrons and positrons
 - ❖ Undulator-based positron source
 - ⇒ **Single IR with 14 mrad crossing angle**
 - ⇒ **Dual tunnel configuration for safety and availability**

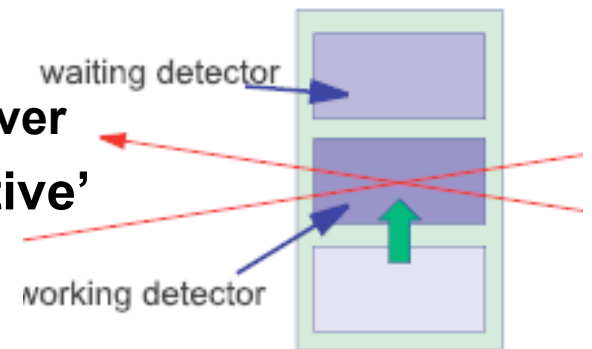
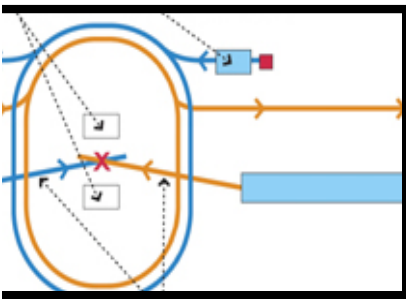




Single IR with Push-Pull Detectors



- Large cost saving compared with 2 IR
 - ↪ ~200 M\$ compared with 2 IR with crossing angles 14/14 mrad
- Push-pull detectors
 - ↪ Task force from WWS and GDE formed
 - ↪ Quick conclusion is
 - ❖ No show-stopper
 - ❖ But need careful design and R&D
 - For example, need quick switch-over
 - ❖ 2 IR should be kept as an 'Alternative'





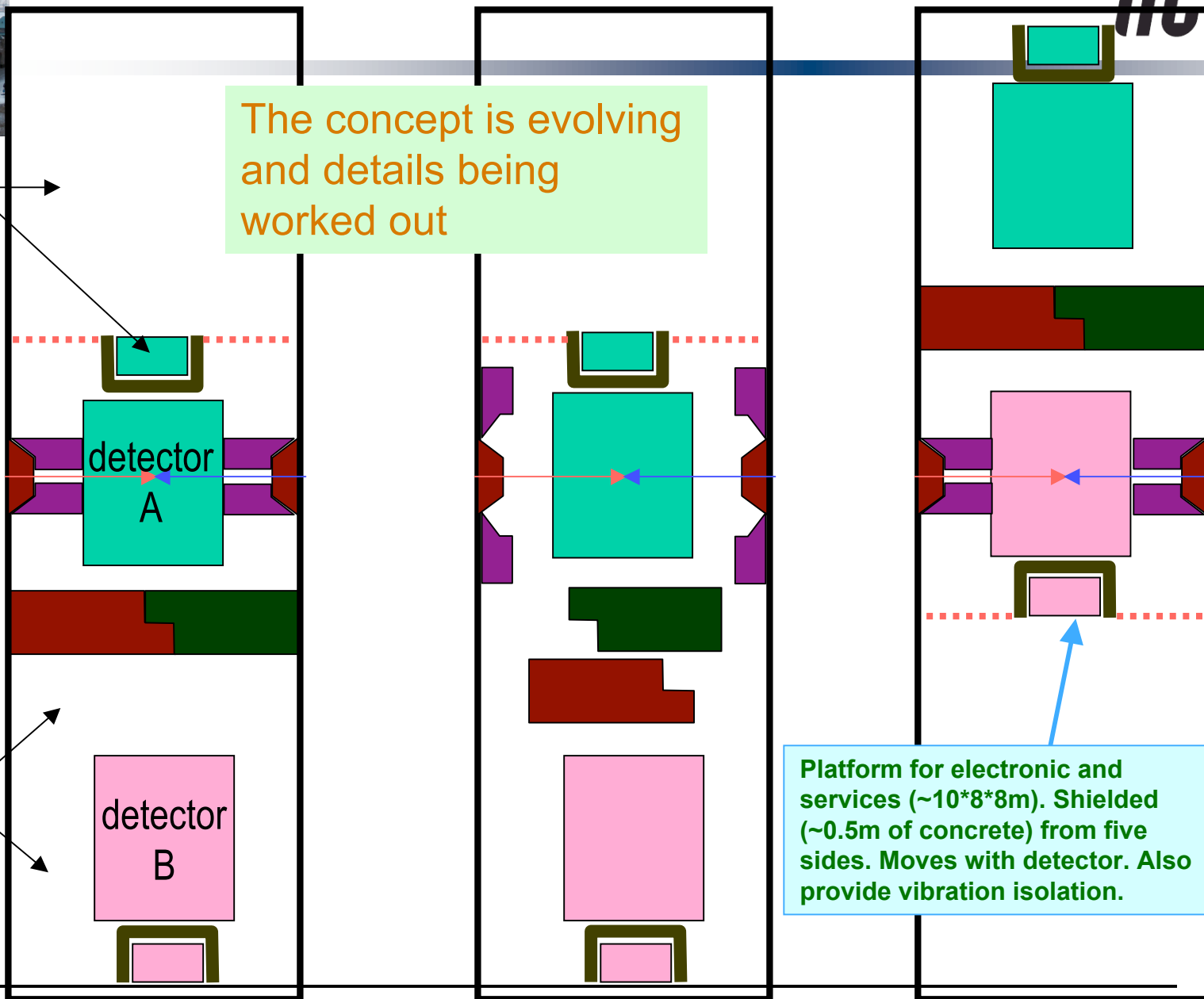
Concept of IR hall with two detectors



may be accessible during run

The concept is evolving and details being worked out

accessible during run



Platform for electronic and services (~10*8*8m). Shielded (~0.5m of concrete) from five sides. Moves with detector. Also provide vibration isolation.



○ WWS Detector R&D Panel

Charge:

- Surveys ILC detector R&D
- Maintains registry of ongoing ILC detector R&D
- Critically reviews the status of ILC detector R&D
- Registers the regional review processes
- Organizes global reviews of ILC detector R&D

Panel Membership:

- Asia: Tohru Takeshita, HonJoo Kim, Yasuhiro Sugimoto
- Europe: Chris Damerell (chair), Jean-Claude Brient, Wolfgang Lohmann
- North America: Dean Karlen, Harry Weerts, Ray Frey



Detector R&D Required



- Performance requirements for ILC Detector exceed state-of-the-art
 - Calorimeters with ~100 million cells being developed for PFA
 - Jet resolution goal ~ 3-4%
 - Pixel Vertex Detector with $\sim 10^9 \leq 20 \mu\text{m}$ pixels
 - Impact parameter resolution $5 \mu\text{m} \oplus 10 \mu\text{m}/(p \sin^{3/2} \theta)$
 - Sensitivity to full 1 msec bunchtrain
 - Tracking resolution $\sigma(1/p) \leq 5 \times 10^{-5} / \text{GeV}$
 - TPC with silicon
 - Silicon microstrips
 - High Field Solenoid up to 5 Tesla
 - High quality forward tracking systems
 - Triggerless readout
- R&D Essential

DISCOVERY OPPORTUNITY IS GREAT

- limited by detector performance
 - small cross sections/significant backgrounds
- advances different from LHC required



○ Global Detector R&D Reviews

✚ Tracking - Beijing (ACFA07), February, 2007

- ❖ Committee of 19
- ❖ 8 external reviewers, 3 regional reps, 5 R&D panel, 2 local, GDE R&D chair
- ❖ Report posted on WWS web page:
<http://physics.uoregon.edu/~lc/wwstudy/detrdrev.html>
and the ILC wiki

✚ Calorimetry - DESY (LCWS07), June, 2007

✚ Vertex Detection - Fermilab (ALCPG07), October, 2007

✚ Reports at LCWS07 by C. Damerell and W. Lohmann

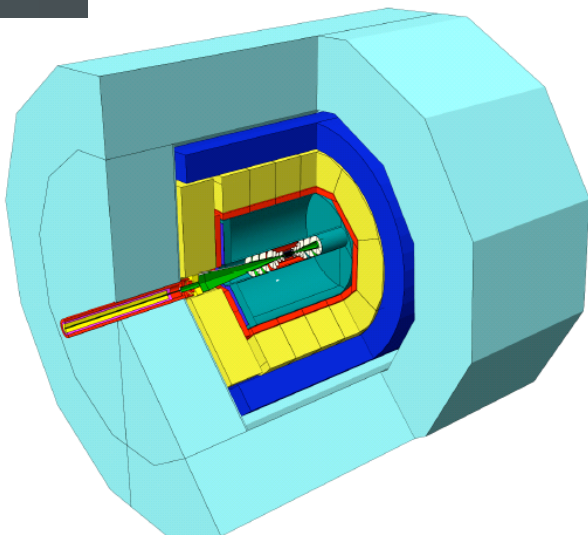
✚ Talk by Jose Repond - progress from CALICE



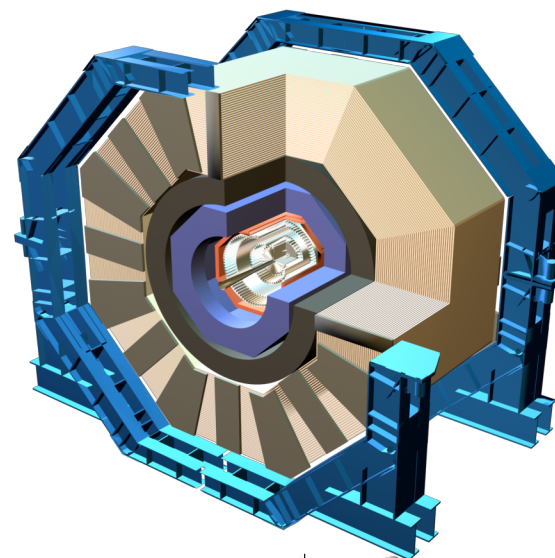
The Concepts



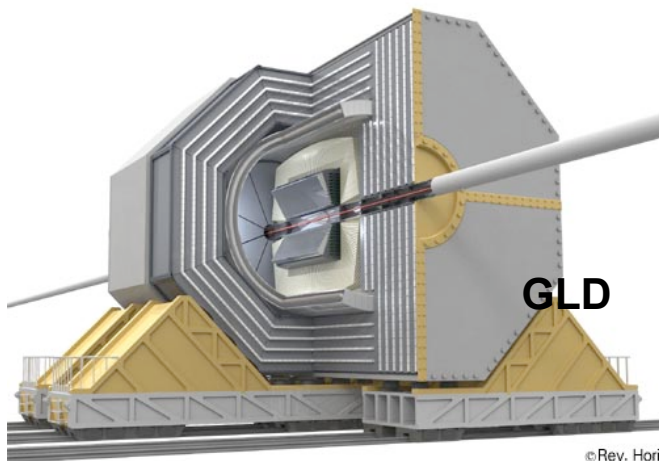
LDC



SiD

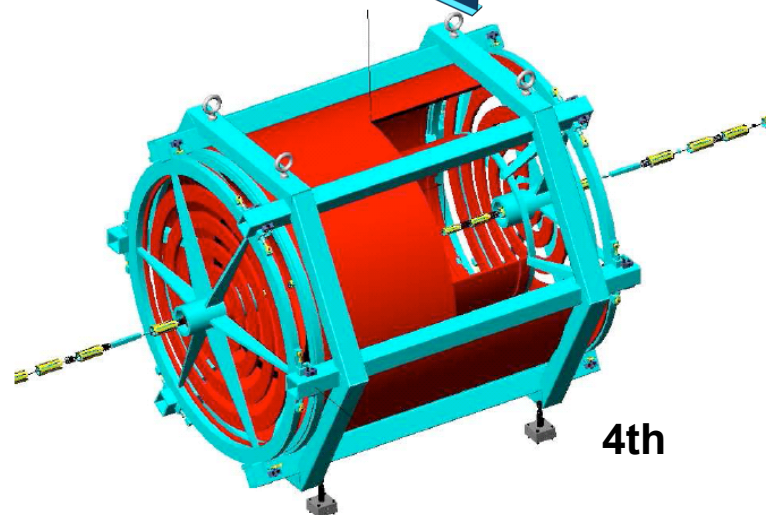


GLD



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4th



See Detector Outline Documents for details - <http://physics.uoregon.edu/~lc/wwstudy/concepts/>



The Concepts



	Tracking	ECal Inner Radius	Solenoid	EM Cal	Hadron Cal	Other
SiD	silicon	1.27 m ↓	5 Tesla ↑	Si/W	Digital (RPC..)	Had cal inside coil
LCD	TPC gaseous	1.68 m ↓	4 Tesla ↑	Si/W	Digital or Analog	Had cal inside coil
GLD	TPC gaseous	2.1 m	3 Tesla	W/ Scin.	Pb/ Scin.	Had cal inside coil
4th	TPC gaseous	1.4 m	3.5/1.5	crystal	Multi- fiber readout	Double Solenoid (open mu)



Detector Concept Report



- **Editors**

Physics: A. Djouadi, J. Lykken, K. Moenig, Y. Okada,
M. Oreglia, S. Yamashita, J. Lykken

Detectors: J. Jaros A. Miyamoto T. Behnke, C. Damerell

- **Drafts**

ILC Wiki

**[http://www.linearcollider.org/wiki/doku.php?
id=dcrdet:dcrdet_home](http://www.linearcollider.org/wiki/doku.php?id=dcrdet:dcrdet_home)**

send comments to editors

formal review (K. Abe, J. Bagger, T. Camporesi, D. Marlow,

T. Matsuda, J. Timmermans, R. Tschirhart, S. Y. Choi, P. Zerwas)

cost review (J.E. Augustin, P. Garbincius, S. Yamada)

- **This morning Akiya Miyamoto reported**



Roadmap



- **GDE plans an Engineering Design Report in 2010**
 - ⇒ Ready for proposal for construction approval
- **Detectors must maintain pace of the machine**
 - ⇒ Synchronize
- **Request from ILCSC**

Shin-ichi Kurokawa, ILCSC Chair
Albrecht Wagner, ICFA Chair

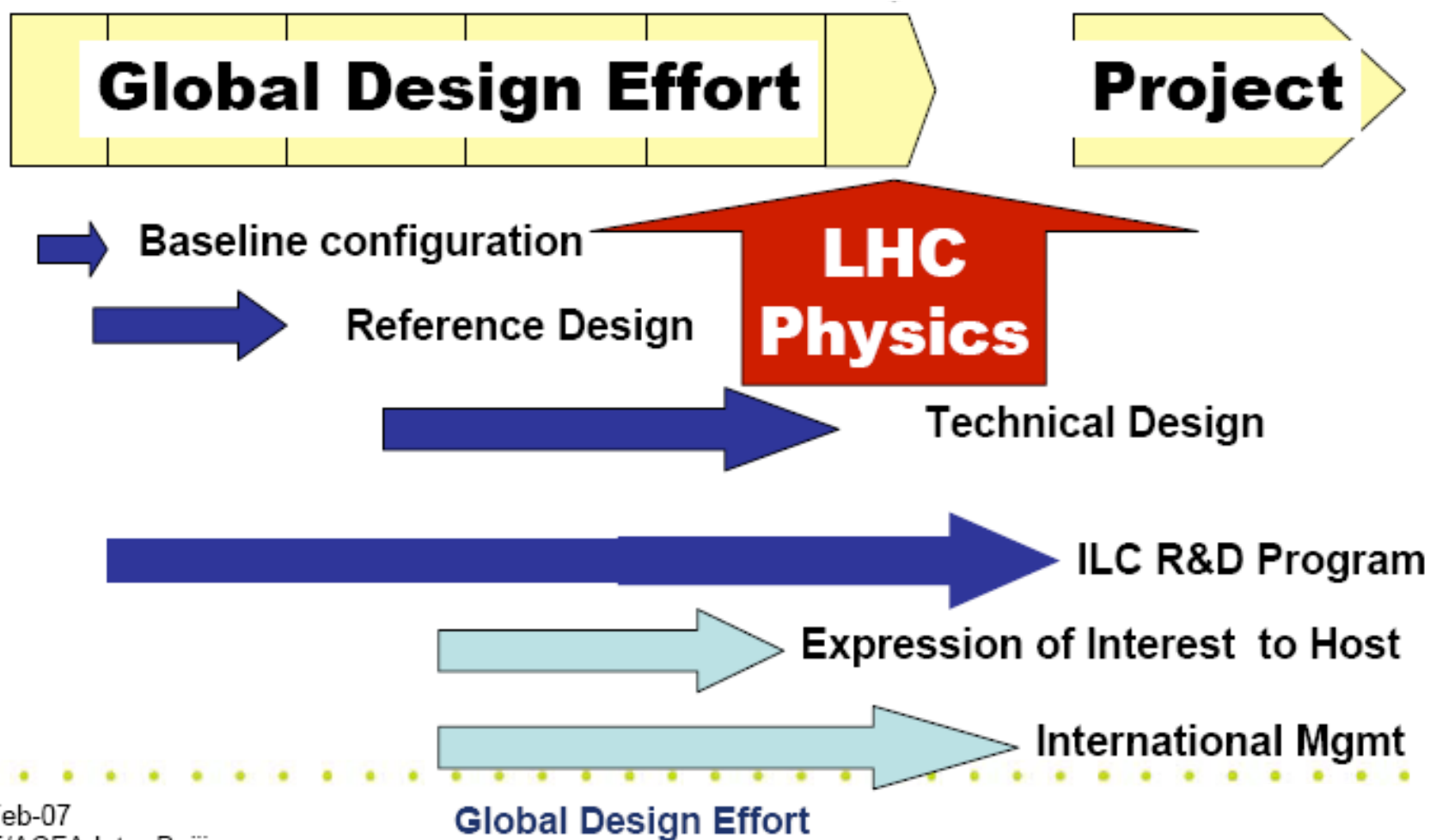
Subject: Letter to WWS Co-Chairs

- 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 GDE Plan and Schedule

2005 2006 2007 2008 2009 2010





Response to Request from ILCSC: Roadmap



- **Series of discussions via telephone**
 - ↳ **WWS co-chairs**
 - ↳ **Two reps from each of the concepts**
 - ↳ **WWS R&D Panel chair**
- **Discussion in the WWS Organizing Committee**
- **Linearcollider Forum**
forum.linearcollider.org
- **Discussion at LCWS07**
Friday, June 1
17:00->18:30 ILC/LCWS common plenary (Main Tent)

Roadmap



- **Research Director**
- **International Detector Advisory Group**
- **Roadmap**

Summer 2007 - ILCSC announces call for Letters of Intent for detector designs for the two engineering designs, due Summer 2008.

Summer 2008 - Detector design teams submit Letters of Intent (backed by design reports) proposing candidates for the two detector designs.

End of 2008 - Two detector designs recognized for development to the engineering design phase.

- Engineering designs completed for two detectors along with collider EDR.



DRAFT response to ILCSC



- **The World Wide Study goal to produce two engineering design reports for the two contrasting and complementary detectors synchronized with collider progress**

- **Research Director**

- ✚ implement the roadmap for the detectors
- ✚ guide and coordinate the global R&D activities
- ✚ encourage the formation of collaborations
- ✚ approve detector decisions which would lead to the definition of detectors suitable for engineering design studies
- ✚ report to the ILCSC

- **The International Detector Advisory Group (IDAG)**

- ✚ charged by the ILCSC to advise on detector efforts
- ✚ refine and facilitate the process
- ✚ critically review the designs and plans
- ✚ guide the process leading to two contrasting and complementary detector designs for engineering design by the end of 2008
- ✚ suggest mechanisms to integrate community into two detector teams
- ✚ review progress toward two detector EDRs

- **Umbrella Organization for ILC and Detectors?**

UNDER DISCUSSION



“Horizontal” Working Groups



- **Simulation and Performance**

- ↪ Talk by Roman Poeschi

- **Particle Flow**

- ↪ Talk by Tamaki Yoshioka

- **Vertex Detector R&D**

- ↪ Talk by Ron Lipton



Future Meetings



ALCPG - Fermilab - October 22-26

<http://ilc.fnal.gov/conf/alcpag07/>

ACFA - Sendai - February 25-28, 2008 (tentative dates)

**Many other special meetings - refer to regional and WWS
web sites for announcements**

next LCWS - North America - late summer/fall 2008



Closing Thoughts



- We've made great progress in the past few years





Closing Thoughts



- We've made great progress in the past few years
- Let's keep it going





Closing Thoughts



- We've made great progress in the past few years
- Let's keep it going



- ↪ “synchronize to machine progress”
- ↪ Prepare for positive decisions
- ↪ Don't miss the opportunity when it comes

DON'T DROP THE BALL

