IDAG Report

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IDAG mandates and actions

- (1) IDAG appointed by ILCSC (end 2007) to advise RD on ILC experimental program
- (2) main purpose of IDAG: validation of detector concepts
- (3) IDAG validated 2 concepts (ILD, SiD) out of the 3 LOIs (August 2009); accepted by RD and ILCSC
- (4) ILCSC extended IDAG mandate after validation in order to monitor the progress of the 2 concepts towards a detailed baseline document (DBD) to be ready simultaneously with the GDE technical design REPORT end 2012
- (5) The monitoring process Is now completed:
  - progress of both detector concepts reviewed twice a year
  - activities of the Common Task Groups (CTGs set up by RD) monitored
  - broader view of the activities of the R&D collaborations
- (6) Although not initially foreseen IDAG reviewed the actual writing of the DBD

Recent IDAG meetings

- at all meetings: discussions with RD, interviews of ILD and SiD, reviews of common technical group activities

- Eugene meeting (March 2011)
  review preparation of DBD (1)

- Granada meeting (Sept. 2011)
  review preparation of DBD (2); outlines

- Daegu meeting (April 2012)
  detailed outlines; recommendations

- Arlington meeting (Oct. 2012)
  drafts #1 of reports (physics, common section, ILD, SiD);
  request drafts #2 Nov. 30, in time for the PAC review

Recall 2009 DBD guidelines

http://www.linearcollider.org/physics-detectors/Research-Director%27s-report/2009/20-August-2009---Planning-for-the-next-steps

1. Demonstrate proof of principle on critical components.
   When there are options, at least one option for each subsystem will reach a?level of maturity which verifies feasibility.
2. Define a feasible baseline design.
   While a baseline will be specified, options may also be considered.
3. Complete basic mechanical integration of the baseline design accounting for insensitive zones such as the beam holes, support structure, cables, gaps or inner detector material.
4. Develop a realistic simulation model of the baseline design, including the identified faults and limitations.
5. Develop a push-pull mechanism, working out the movement procedure, time scale, alignment and calibration schemes in cooperation with relevant groups.
6. Develop a realistic concept of integration with the accelerator including the IR design.
7. Simulate and analyse updated benchmark reactions with the realistic detector model. Include the impact of detector dead zones and updated background conditions.
8. Simulate and study some reactions at 1 TeV, including realistic higher-energy backgrounds, demonstrating the detector performance.
9. Develop an improved cost estimate.

All these recommendations have been followed (some more or less)

IDAG views in 2010-11 on DBD goals

- DBD is intended for ILCSC and the HEP community to document the feasibility of ILC physics with realistic detector designs
- Initial guidance of 100 pages may be too restrictive, but should not exceed 150 pages/detector
- IDAG is not supposed to formally review the DBD, like it was done for the LOIs
- IDAG will provide comments and advice on the DBD drafts to the RD
- IDAG would like to monitor progress in reaching the goals well ahead of delivery date
- For next Daegu workshop 23-26 April 2011, IDAG has requested the two concepts to present their detailed DBD outlines (basically first rough draft)
- First version of final draft requested for Fall meeting in time for comments

IDAG views in 2010-11 on DBD goals

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- IDAG is not supposed to formally review the DBD, like it was done for the LOIs IN FACT WE DID
- IDAG will provide comments and advice on the DBD drafts to the RD
- IDAG would like to monitor progress in reaching the goals well ahead of delivery date WISHFUL THINKING
- For the Daegu workshop in April 2011, IDAG requested the concepts to present a detailed DBD outline (basically first rough draft) ONLY DETAILED OUTLINE
- First version of final drafts requested for Fall meeting in time for comments WE GOT THEM IN FALL 2012

Guidance from IDAG in Daegu April 2012

(P.Grannis chair)

- *Complementary approaches taken by ILD and SiD to the physics goals to be stressed. Tabular presentations useful.*
- *Stress importance of ILC R&D migrated to other projects.*
- *Common topics affecting both SiD and ILD could possibly be expanded. Besides backgrounds, push-pull and MDI cost methodology, common treatment of power pulsing of on-board electronics, future R&D needs, forward calorimetry, radiation shielding and stray magnetic fields.*
- *Primary focus of the TDR/DBD is to achieve a robust design for 500 GeV physics, the previous benchmarking studies done for the LOI should be summarized. DBD should strive to be self-contained.*

IDAG review in Arlington October 2012

- Except for Physics chapter (draft in July) DBD draft only available in September; big IDAG effort to review ~700 pages.
- Very extensive documents summarizing 3 years of work on R&D and integration studies
- Important milestone reached by the 2 concept groups
- However benchmarking of detector designs with assigned process (crucial information) was not yet ready
- Costing not available for ILD
- Need for a thorough editing (uneven collection of parts)
- Many questions and suggestions from IDAG
- Calendar defined for the next iteration fixed by PAC and soon availability of machine TDR: next version requested for November 30 for PAC review. Some final numbers may be missing, but no new material allowed after PAC.

Review of new DBD version for PAC

- Little time available for a real review; concentrate on changes since Arlington
- General improvement in document organization and balance; still a lot of editing needed
- Benchmarking now included with results in most cases, and some will come shortly
- New results on the Yukawa top coupling (t tbar H), precision comparable for ILD/SiD
- Some unbelievable results (accuracy of Higgs BR from SiD, one of the most important selling arguments for ILC), discrepancies between ILD and SiD (masses obtained for charginos and neutralinos)
- Results need serious crosschecking by the 2 groups

General assessment of DBD (1)

- The physics case of ILC is strongly documented in the excellent physics chapter
- Discovery of the 126 GeV boson gives a solid boost for going beyond the LHC, both in terms of precision of couplings and masses and for accessing new observables
- The 2 validated detector concepts have demonstrated through benchmarking with a realistic detector simulation that the physics goals can be met (compensation of degradation with improvements in analysis software).
- .The studied processes encompass the full range of ILC operation, from 250 GeV to 1 TeV with the same detector designs (also down to Z and WW regions).

General assessment of DBD (2)

- The vigourous R&D programs carried out have validated the considered solutions for subsystems. Still different options remain in some cases which is reasonable at this stage.
- R&D should continue, in addition many spin-offs.
- Ambitious detector designs (resolution, granularity, hermeticity, integration) have met the challenge of addressing the unique possibilities of the ILC.
- Many of the results rely on the powerful technique of particle flow (PFA) which drives the designs and is essential to reach the goals. ILD and SiD are optimized differently which is an asset for crosschecking results. This is the most important complementarity issue.

A few caveats

- Serious editing is required to improve hurried last-minute writing.
- Benchmarking results should be validated through crosschecking and understanding irreducible differences.
- ILD costing is still very crude (need a baseline).
- Are there some remaining/unasessed risks in order to achieve the foreseen performance?

  - power-pulsing of on-board electronics is mandatory for achieving granularity, resolution and keep low material budget. It is basically untested with prototypes (mechanical effects in magnetic fields).

  - large solenoids: SiD comparable in size to CMS but 5T instead of 4, ILD larger than CMS but same field

IDAG has completed its job and looking forward to see the final version of the DBD.

Thanks to the ILD and SiD groups for their achievements under limited resources.

Thanks to the RD directorate for the fruitful collaboration.

We hope these detectors will become real in the near future.

IDAG Membership

• M. Danilov (ITEP, Russia)	exp	
• M. Davier (LAL-Orsay, France)	exp	Chair
• C. Grojean (CERN, France)	th	
• E. Elsen (DESY, Germany)	acc	
• P. Grannis (Stony Brook, US)	exp	
• R. Godbole (IIS, India)	th	
• D. Green (FNAL, US)	exp	
• J. A. Hewett (SLAC, US)	th	
• T. Himel (SLAC, US)	acc	
• D. Karlen (Victoria, Canada)	exp	
• S. K. Kim (SNU, Korea)	exp	
• T. Kobayashi (ICEPP, Japan)	exp	
• W. G. Li (IHEP, China)	exp	
• R. Nickerson (Oxford, UK)	exp	
• S. Palestini (CERN, Italy)	exp	
• N. Toge (KEK, Japan)	acc	

- Ex officio: S. Yamada, J. Brau, J. Fuster, H. Yamamoto