

April 21 2010

IDAG report : Beijing meetings (March 27-29 2010)

Attended: M. Danilov, M. Davier (chair), E. Elsen, R. Godbole, P. Grannis, Ch. Grojean, J. Hewett, T. Himel, S.K. Kim, T. Kobayashi, W.G. Li, S. Palestini, N. Toge
Excused: D. Karlen, D. Green, R. Nickerson
Ex-officio: S. Yamada, J. Brau, F. Richard, H. Yamamoto

Agenda

March 27

11:00 Closed session: the role of IDAG from LOI validation to the detailed baseline design report (2010-2012)

- presentation (S. Yamada)
- discussion

12:30 Working lunch (continuation of discussion)

14:00 ILD interview (ILD representatives)

- document: ILD work plan (October 21 2009) + update (February 2010), distributed to IDAG on March 15 2010
- oral presentation (20')
- discussion

14:45 SiD interview (SiD representatives)

- document: SiD work plan (October 23 2009), distributed to IDAG on March 15 2010
- oral presentation (20')
- discussion

15:30 Physics benchmarking (Physics Panel members + ILD/SiD representatives)

- document: Benchmarks for the ILC Physics (Nov. 13 2009), distributed to IDAG on February 22 2010
- discussion

16:15 break

16:30 MDI activities (K. Buesser, P. Burrows, ILD/SiD representatives)

- oral presentation (25')
- discussion

17:15 Closed session

- discussion on previous items
- organisation of the work
- next meeting

18:00 End of the meeting

March 29

12:30-14:30 Working lunch and final report

Objectives of the 2009-2012 phase and general comments

IDAG had a first discussion with the Research Director on the process envisaged to reach a Detailed Baseline Design (DBD) report by the end of 2012. The basic issues are: the time schedule, the nature and structure of the report, the role of IDAG.

First of all we feel that it is extremely important to stick to the 2012 date so that the DBD report is coincident with the machine TDR. Then the full ILC case would be available at the time when first LHC results could reveal evidence for new physics phenomena. Given the limited resources it is then more important to adapt the contents of the report and keep the schedule.

The scope and the audience of the DBD report are still to be more clearly defined. The 2009 LOIs are already very comprehensive documents. The information should be updated and clear baseline designs presented with options. The physics performance part needs to be revisited and enlarged in order to fully document the ILC physics case as demonstrated with realistic detector designs. The emphasis is not on ILD-SiD competition, but on presenting a convincing picture of the unique physics potential. It would be desirable to elaborate on the complementary aspects.

An important point is the costing of detectors which should be done carefully for the 2012 DBD report. That means that common methods should be used (which should mimic those of GDE for the machine, hence a value estimate for M&S and FTE counts for in-house labor) with common unit costs, uncertainties and learning curves for industrialization. IDAG suggests that the Research Director finds a way to ensuring this commonality, for example by forming a common costing group, or appointing a costing czar. The costing must be good enough that the collaborations can establish a ceiling which is not exceeded in later iterations.

Monitoring the progress of ILD and SiD will be done at two levels. IDAG will meet at each ILC workshop, and continue to hear reports from the concept groups and discuss with them in closed sessions. But IDAG will also monitor the activity of the CTGs, providing a cross view of the activities and allowing one to appreciate the level of cooperation toward solving common problems.

ILD and SiD

Both collaborations are making good progress on subdetector R&D, despite serious shortcomings in funding. ILD is carrying somewhat more options and alternates than SiD, but in view of the timeline of the ILC, there is no problem here. In the places where we may expect detector advances (vertex detectors, calorimeter readout devices), the ability to capitalize on future developments is important.

Both collaborations went quite far in demonstrating their performance through the LOI benchmark studies, which also helped develop their software systems. The different

frameworks used by ILD and SiD do tend to make use of the other's developments more cumbersome.

Both suffer from the lack of engineering support to do the system integration, design of support structures, etc, but for SiD this is more acute. However it is very important to verify that the desired goals for material budgets, power dissipation, dead zones, etc. can be met. Such real-life effects can also upset the complex PFA algorithms, again underlining the need to make progress understanding these constraints. We heard some willingness to help solve some of the engineering support problems from the CERN DG together with major labs.

We also understand that the detector concepts being developed for CLIC are based on ILD and SiD and that there is quite good collaboration between the CLIC and ILC detector groups on the ground. Just as for the machine, there are common problems that do not need independent solutions. There are problems that require particular attention in CLIC whose solutions could migrate to ILC -- for example the push-pull methods under more demanding requirements on component stabilization and vertex detector technologies that allow fast time stamping. CLIC and ILC both need benchmark simulations at 1 TeV. Both have similar system integration engineering requirements and solutions may be common. More coordination of CLIC and ILC detector activities would be useful to allow more human resources to be applied to both. The joint working group recently established is a good step, and this group should strive to promote as large a shared range of activities as possible.

Achieving complete DBDs on the GDE 2012 schedule is clearly going to be tough. The collaborations favor keeping the main nine working points requested by the Research Director, but if necessary relaxing the standards to which they are addressed.

Physics benchmarks

IDAG appreciates the efforts from the Physics CTG for quickly completing the list of benchmark processes after the validation phase.

However from the detector standpoint, investing large efforts in benchmarking physics processes may not be terribly productive. Understanding how well important physics topics can be addressed is of course important for its own right, but the LOI benchmark studies generally showed that the proposed detectors can approach the performance suggested by previous MC studies. Those studies that can inform on detector performance in areas not previously tested should however be done. Therefore we favor keeping the list required of the detectors relatively small, since the collaborations have major work to do on R&D, optimization and integration. A portion of the identified manpower shortfall is in young physicists who would carry out the benchmark studies.

The detectors should demonstrate that they can operate without major modification at 1 TeV. For most subsystems this should not be a big issue, but we should understand if

the magnet and calorimetry as designed for 500 GeV will be adequate since those systems would not be rebuilt for higher energy. Thus those benchmarks that probe essential topics at 1 TeV should proceed. The list provided in November 2009 by the Physics CTG appears to be too exhaustive and beyond the capability of the concept groups. We propose that the Physics CTG identifies two processes to illustrate in a convincing way the 1-TeV case. A clear example seems to be the $t\bar{t}H$ study which is important to probe physics with a high multiplicity of jets. Another one high on the list would be the $ee \rightarrow WW$ process, involving the forward detection of jet pairs with rather small opening angles. Of course if the concept groups find more resources they can study more processes.

At lower energies, one would be happy to see a revisit using a simplified analysis to determine the set of Higgs couplings at both the ZH peak cross section and 350 GeV to verify the ability to do this key ILC measurement and to quantify the tradeoff for running at different energies.

The timescale for defining the new benchmarks is close as a substantial amount of time is needed to generate the fully simulated samples and to perform the analyses. Thus this question must be resolved as soon as possible.

Machine-Detector-Interface

We heard nice progress from the MDI CTG. The work here has been greatly simplified since LOI validation. The differences between ILD and SiD push-pull schemes are well identified: detector heights, supports, motion, and interface with the accelerator. A program of studies is underway to resolve these issues on scientific ground. There is a promise of finite element results on vibrations, supplemented by measurements that can inform the platform vs. rolling legs question. The Research Director should keep close contact with these studies to assure that there is convergence on this issue so that GDE can define the machine detector interface.

The MDI guidance document should evolve into an MDI specification document which offers more specific engineering boundary conditions to abide by. The concept groups and the MDI group should set up a specific deadline for circulating such a document.

Next meeting

The next meetings will be held during the ICFA-CLIC-ILC workshop in Geneva/CERN on October 18-22 2010. Besides the usual interviews with the two collaborations, the main horizontal topic will be the R&D status toward the DBD. A report is expected in the meantime from the R&D CTG.