

ILD Software baseline

For the baseline design report at the end of 2012 ILD has been asked to sharpen the studies of the physics potential of the ILC and ILD, add some new physics channels, and, in particular, study the behavior at 1 TeV. Fulfilling these requests does require a fairly significant generation, simulation and reconstruction of events, to allow meaningful analyses to take place.

ILD is an open concept, which actively encourages a variety of different options for different subdetectors. Based on a close cooperation with the R&D collaborations, within ILD a number of interesting and complementary technical solutions for most of the subdetectors have been developed. This philosophy could create some conflicts, since it is impossible for reasons of manpower and computing power to simulate and reconstruct events for every possible combination of options. ILD therefore has introduced the concept of a software baseline about 2 years ago, to react to this problem. In this software baseline the number of different configurations is reduced to a manageable level.

In the recent ILD meeting at Paris ILD approved of this strategy, and charged the physics group with developing a strategy on how a meaningful production of fully simulated and reconstructed events would be possible for a baseline detector which includes a limited number of options.

The main alternative technologies currently under consideration are found in the hadronic calorimeter. Here two rather different concepts are studied: The more traditional option is the one of a tile calorimeter, with individual tile readout, recording the charge of the tile hit (analogue HCAL, AHCAL). Individual tile readout is possible due to the use of Silicon based photomultipliers, which are directly embedded into each tile. Over the last years an alternative has been developed, based on a digital ansatz. In this scheme the cells are about one order of magnitude smaller. The information per cell is reduced to recording whether or not the cell has been hit. No amplitude information is available (digital HCAL, DHCAL). In a variant, limited amplitude information (e.g. 2 bit per channel) is recorded as well (so called semi-digital HCAL, SDHCAL). With this simplified readout a much finer granularity is possible, moving more in the direction of a true calorimeter-tracker.

Both options are studied intensely by the CALICE collaboration, and both are proposed as candidates for the hadronic calorimeter in ILD. At the Paris ILD meeting a consensus was reached that both options will be an equal part of the simulation baseline. The software group together with the subdetector groups will work to develop a complete simulation and reconstruction chain for the two detector variants, one using the semi-digital hadronic calorimeter, one based on the analogue hadronic calorimeter. The analysis group will develop a proposal how adequate and significant data sets can be produced for at least these two options (see <http://ilcagenda.linearcollider.org/conferenceDisplay.py?confId=5093> for the most recent proposal).

Options exist for other subdetectors as well, most notably for the vertex detector, and for the electromagnetic calorimeter. In both cases the working groups are proposing a common solution which could serve both options.

The goal of ILD is to provide data sets which can be used to demonstrate the power of the different options, to study their behavior, and to understand possible problems. It is not the purpose of the DBD to make a comparison of the two options with the goal of making a selection.