Research Director's Report

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François Richard

Preparing future detector R&D at testbeams

This month's Research Director's Report was written by François Richard, co–chair of the Worldwide Study, regional detector contact for Europe

Testbeams are the first occasion for detector concepts to face the truth about their design, and an optimal opportunity to train young physicist on real data. Recently, 40 experts (two from Asia, five from North America and the rest from Europe) met at the Laboratoire de l'Accélérateur Linéaire (LAL) at Orsay to review the needs for testbeams for the R&D on detectors in the future. The goal of this workshop was to collect the needs and to coordinate the activities of the various collaborations active in the field: CALICE, FCAL and SiD groups on calorimetry, LCTPC on gaseous tracking as well as SiLC for the various silicon tracking devices. Representatives of the current major test beam facilities, CERN, DESY and Fermilab, presented their sites and actively took part in the discussions. Many other facilities available in the world were discussed: J–Parc, IHEP Bejing, Tohoku, KEK in Asia, IHEP/Protvino, Dubna in Russia, and it was noticed that SLAC would restore test beams and create a new facility in its end station A by 2010. The successful testbeam efforts prior to the Letters of Intent (LOI) for detectors were reviewed followed by vivid discussions on what is needed to improve these testbeams for the next phase.

Logo of the 2nd Linear Collider Testbeam Workshop.

New detector prototypes are currently being constructed, for example a large time projection chamber (TPC) prototype inside a solenoidal field, or calorimeter modules which fully integrate the read–out electronics within the detector layers. It has to be noted that all these prototypes will be close in size to final detector components and will be available starting in 2011. One of the aims of this meeting was to prepare the optimal exploitation of the test beam facilities, for example it might be envisaged to establish beam lines which can be shared by several detector projects. Arguments were exchanged searching to define precisely the most urgent answers needed for the detailed reports in preparation by ILD and SiD for the end of 2012, keeping in mind that the R&D activity will continue well beyond this date. The electronics of the ILC detectors will be adapted to the time structure of the ILC beam, i.e. a train of bunches of particles with a duration of 1 millisecond, separated by 200 milliseconds and with a few hundred nanoseconds distance between bunches. An important issue is whether or not the testbeams should be able to emulate the ILC time structure. As this is not trivial for testbeam sites to establish, the linear collider detector community will formulate a coherent request until the LCWS meeting in March 2010.

Data acquisition (DAQ) aspects were reviewed, showing a very good level of coordination between detector groups and DAQ developers but also a high degree of interoperability between different DAQ systems. Software offers the largest potential of collaboration among detector boundaries, and a good software system allows for facilitating the migration between detector studies and full simulation physics studies. The detector R&D groups have identified the Grid as their tool for data management. Care has to be taken, however, that the IT centres will provide corresponding support, particularly in the view of the demanding LHC start up.

Available and foreseeable resources for these activities were reviewed showing some unbalance between regions. While it is hoped that the EU will provide a successor to the EUDET programme, which has very successfully supported R&D in Europe, the situation seems more uncertain in Asia and in North America. It was however underlined that in spite of this, all regions work very well together and are highly motivated in continuing to conduct the detector R&D. The conclusions of the workshop will be summarised in a document which will be presented at LCWS2010 and be made publicly available shortly after that.

-- François Richard

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Picture showing Roman Poeschl, organiser of the testbeam workshop, in a training session with future ILC users