Statement on the EUDET development in 2006

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Abstract

The External Scientific Advisory Board is in charge of writing an annual statement about the Project's development and status including its role with respect to developments in the Americas and in Asia

1 Introduction

The EUDET advisory board met two times in 2006: during the Kickoff meeting and during the Annual Meeting of the EUDET project. The present statement on the development of the project is 2006 is based on our observations on the presentations that we attended at the Annual Meeting and on the content of the Annual Report.

EUDET represents an important European organizational instrument in preparations for the design and development of technologies for the ILC particle detectors. EUDET provides vital infrastructures for hardware development and communications, as well as a forum for discussions, sharing of results and propagation of information. It represents a central pillar of the European participation in the global ILC detector development activity, and a complement to the ELAN and EUROTEV activities on the ILC accelerator.

EUDET sponsored infrastructure is also enhancing global collaboration for ILC detector research. This is a very important role for EUDET, since the ILC project has been proposed as a truly international project from the beginning involving physicists from Europe, Asia, and the Americas.

2 JRA1 Test Beam Infrastructure

The goal is to provide a test beam with a large-bore, high-field magnet, and a high-precision, fast beam telescope. The facility is crucial for determining detector component characteristics in a realistic environment. In general progress and accomplishment are excellent. Specifically there are 5 tasks:

Magnet: A magnet has been loaned from KEK for a period of 4 years. The magnet required some refurbishment and re-commissioning work, which was performed at KEK prior to shipping to DESY. Final commissioning was performed in situ at DESY and the nominal B-field was achieved quickly. The magnitude of the stray field meets the relevant DESY safety requirements. Milestone JRA1-A1 has therefore been reached.

Environmental support: Experimental area 24/1 was renovated and prepared for reception of the magnet. The design of the mechanics and cooling of the pixel telescope was started. The main criteria for the telescope setup have been established.

Pixel telescope: The demonstrator pixel sensor technology was chosen and small prototypes were distributed to the partners early in 2006 for evaluation.

Large-area versions were subsequently produced and are being mounted and bonded. Milestone JRA1-C1 has therefore been reached.

Data acquisition and evaluation software: A readout system for the pixel telescope is being developed. The first readout board should be available in the first part of 2007. A trigger logic unit has been developed. DAQ system integration work is ongoing.

Validation of infrastructure: This activity has proceeded much quicker than anticipated in the start-up plan, to the great benefit of the test beam activity.

3 JRA2 Infrastructures for Tracking Detectors

Scope of JRA2 is to provide infrastructures for developing and testing new readout structures for a Time Projection Chamber (TPC) and for silicon based tracking detectors. The activity has started well also exploiting common facilities set up by NA2. The progress and the first results reported on the pixelised readout of the TPC are impressive. During the reporting period all milestones have been achieved and one report and two memos have been posted.

General purpose TPC development facility: the design of the field cage is very advanced including the users requirement on the interface between the cage and the readout structures. We notice that the proposed structure has been carefully studied with FE calculations to minimize the risk of failure to deliver the appropriate high voltage stability. A first prototype of the front-end preamplifier has been designed and the specifications for the digitization electronics have been defined. The Data Acquisition system is under development. This facility will be used by an international collaboration, known as LCTPC, involving physicists from Europe, Asia, and the Americas. The goal of this effort is to demonstrate, for the first time on a large scale prototype, the viability of a MPGD TPC to perform the high precision tracking necessary for the ILC. The groups are finalizing the design of the endplate and readout modules.

Silicon TPC based monitoring facility: the first step toward the ambitious goal of providing a pixelised readout of a TPC has been attained with the test of the TimePix ASICS. The chip has been produced with a good yield, equipped with amplification structures and eventually tested with sources, cosmic rays and beam. The optimization of the integration of the amplification structure with the chip is also progressing well including the test of solutions that can reduce the damage produced by possible discharges on the chip by the amplification structure.

Si-tracking facility : the first steps toward large area silicon tracking structures prototypes have been attained with the development and the delivery of two ASICS for the FE readout, with the design of the front end boards and with the construction of elementary modules. The first test beam was done in November 2006.

4 JRA3 Infrastructures for Calorimeters

Scope of JRA3 is to provide infrastructures for research and development of full-sized, scalable, electromagnetic, hadronic and very-forward calorimeter systems including their DAQ. The activity has started well, the progress and the first results reported are satisfactory. During the reporting period all milestones have been achieved and one report and contributions to international meetings and conferences have been posted

ECAL: the design of the large scale module frame intended to house calorimeter elements ("EUDET module") has been successfully carried out with the help of an engineering office. There is progress also in PCB design. This task is also being covered by the FEE developments.

HCAL: has focused on the analysis of detector behavior, on the formulation of an integrated electro-mechanical detector concept, and on the preparation of test infrastructure for calibration system components. Progress towards improved photo-sensor performance and integration has been achieved. The first milestone to be met by the JRA3 HCAL task was the installation of a test stand for electro-optical components of optical monitoring systems, which was successfully completed.

VFCAL: focus is the development of a laser alignment system for the position-sensitive luminosity measurement, of test beam equipment for radiation monitors, and on the design for specified FE electronics. A first alignment system was completed, albeit with insufficient mechanical stability.

FEE: Focus was the development of two ASICs for the digital HCAL readout and for the Silicon calorimeter. Also, long printed circuit boards to house the ASICSs were designed and fabricated which satisfied one of the milestones.

DAQ: This is in preparation.

The calorimeter research program is organized through an international collaboration known as CALICE, involving physicists from Europe, Asia, and

the Americas. The research infrastructure will be used in test beams in Europe and elsewhere, such as Fermilab in the U.S.

NA2 Detector R&D Network DETNET

Scope of NA2 is to provide the framework for exchange of information and facilities common to the JRAs. The activity has started correctly and after one year one sees the first important networking effects: the EUDET community is now replacing older solutions of less general use with the use of the computer cluster and the provided software infrastructures; a number of ASICS design have been submitted and the web-site is regularly used. During the reporting period all milestones have been achieved and one report and two memos have been posted.

EXCHG: The Organization of the Kickoff meeting and of the Annual meeting was correctly done with well-structured agendas posted on the indico system and with material promptly available to the participants.

WEBINFO: The setting up of the EUDET web information system was quite slow, also due to first start with a content management tool that showed to be not fully adequate for the purpose. The present system – based on ZMS – was eventually put in place. Measures have been taken to recuperate the delay in posting activity related information.

COMP: The first phase of the computer cluster for common data analysis and simulation using grid technology has been set-up in all institutes. These resources are already being used for simulation of detector performance and of beam related backgrounds.

ANALYS: The development of a common test-beam data analysis and simulation infrastructure is tightly integrated with the overall common ILC/LCD software effort. The functionality has been extended for purposed specific to EUDET tasks on request by the user community.

MICELEC: A new contract on the 130 nm CMOS technology has been negotiated after technology validation and already three ASICS designs have been submitted inside the EUDET project. Three training sessions for engineers have been organized.

VALSIM: this more specialized task of simulation of the hadronic interactions has investigated the cause of discrepancies between test beam data and

simulated shower profiles, including benchmarking of neutrons using old experimental data.

5 Transnational access activities

The three proposals submitted to the Transnational Access activity for the use of the DESY test beam were all of excellent scientific quality and were all approved with rank A. Given the small number of proposals there was no competition for the use of the facility.

We acknowledge that the use of this facility has been advertised in the presentations at ILC workshop. However we think that on this point there is room for improvement maintaining a high level of advertisement inside the ILC community and also extending the advertisement to the HEP detector community at large. One possibility is to inform the community through the e-mail lists of the large HEP experiments. The cost effectiveness of advertisement on scientific journals should also be investigated.

6 Conclusions

At one year from its startup the project has advanced well and is in a healthy situation. Redirecting existing manpower has mitigated the difficulties in hiring new personnel and all the objectives that were set for the first year have been attained. We congratulate with the IC and with the steering committee for the management of the project.

We noticed that the feedback from the participating institutes on formal and administrative matters is not as fast as it could be. This attitude increases the workload of the I3 coordinator and of the steering committee and reduces the convergence of the project. We strongly invite these institutes to change their attitude in the future.

We suggest that in future more attention is put on the documentation of the activity. In particular we would like to see a larger rate of Reports and Memos published on the website.

While the preparation of the infrastructures is proceeding well, greater focus should be put on identifying the community of the potential users of the EUDET infrastructures. We see some examples of global collaboration, such as in the TPC and Calorimeter research programs, but we think that this can be expanded. The potential user community is larger than the EUDET community itself and

the question on who and when will use these infrastructures should be addressed soon in a practical way. This question should be asked firstly to the ILC community and also to the HEP community at large.