Statement on the EUDET development in 2009

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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 present statement on the development of the project in 2009 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 future 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.

EUDET sponsored infrastructure has been enhancing global collaboration for ILC detector research. The setup of the infrastructure is now been completed and the focus has shifted towards large scale production of detector prototypes, their commissioning and their test.

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. All milestones and deliverables foreseen in 2009 have been accomplished. Specifically:

The JRA1 magnet infrastructure is now available to the community since some time and was regularly used by different groups. No further developments were necessary in 2009. Within the test beam infrastructure activity, the final sensors for the pixel telescope were produced and integrated into the final telescope. The demonstrator was the most demanded infrastructure in the project, with requests from within and outside the ILC community. The performance of the devices, as well as their DAQ system and reconstruction software, was validated in a series of test beam campaigns at DESY and CERN, and found to match expectations well. The activities within JRA1 were concentrated on the support of these groups while using the device at the DESY and CERN test beam.

The digital telescope chip was available on time, but on the users request it was only implemented in the infrastructure in September 2009 to avoid a long down-time at the start of the test beam season. As all the changes to the system were already prepared in the previous year, a smooth change to the final telescope was done. Three user groups already used the final telescope.

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. Though some further delays have been accumulated with respect to the schedule that was revisited one year ago, the large part of the system is now in operation.

In JRA2 all of the milestones have now been reached. The TPC fieldcage, produced in August 2008 and complemented with an endplate equipped with several gas amplification modules of different type, has been in operation for a total of 14 weeks at the DESY testbeam T24. Micromegas modules (with ~1800 channels of AFTER electronics), double-GEM modules (with ~3300 channels of ALTRO electronics) and one triple-GEM module with Timepix readout (SiTPC task) were successfully tested. The analysis of the data is still ongoing. Another endplate module with Timepix + integrated gas multiplication grid (Ingrid) is in preparation. The readout board and readout controller for the compact Time-to-Digital-Converter readout is available, as well as the design of a compact version of the full ALTRO electronics chain. The Silicon Envelope detector developed in the framework of the SiTRA task was installed in the TPC infrastructure and combined data taking with Micromegas endplate modules took place in November 2009. Several other SiTRA test beam infrastructures were developed during 2009 and used in test beam at CERN together with the EUDET beam telescope.

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 in the past two years is very good. The JRA3 "Calorimeter" has passed several of their most important milestones in 2009. Both the ECAL and the HCAL prototype structures were completed. The compact mechanical structures demonstrated the required precision, and the integration of the FEE ASICs was completed and moved to the commissioning and testing phase, with sensor devices from user integrated as well. All components of the common DAQ system were completed, and their functionality and interconnection tested. While commissioning of the full readout chain is ongoing, mass production of the components is in progress to provide sufficient equipment for several parallel test beam campaigns.

5 NA2 Detector R&D Network DETNET

The scope of NA2 is to provide the framework for the exchange of information and facilities common to the JRAs for detector R&D. The milestones were already met in 2008 for five of the six tasks, namely (A) computing infrastructure, (B) analysis software framework, (C) web-based information system, (D) hadronic shower simulation, and (E) deep sub-micron foundry access. The final task, (F) exchange of information and collaboration, has a milestone each year: the organization of the annual scientific workshop and preparation of the workshop proceedings. The focus of the NA2 activities in 2009 has been on improving the frameworks already in place. A brief summary of progress follows.

The computing infrastructure is based on standard Grid middleware. DESY, TAU, and UBONN have contributed computing resources to this task and are used along with other ILC Grid resources to provide seamless access to the large datasets produced with EUDET infrastructure. This essential infrastructure is working well.

The analysis software framework continues to evolve and improve. It is modular in design and designed to be Grid compatible from the start. All JRAs use the framework for their data analysis. Groups involved in related detector R&D for a multi-TeV linear collider are also now using the framework. A new production system capable of dealing with millions of files associated with jobs running on thousands of computers is under development.

The web-based information system is well designed and well utilized. In 2009, functionality for facilitating transnational access was incorporated into the website.

The hadronic shower simulation task group continued to improve the modelling of showers in fine-grained calorimeters. A number of different models have been investigated, and a careful tuning and combination of them has been developed. In 2009, a new version of GEANT4 was released, which includes improvements developed in this task group.

Foundry access for deep sub-micron technology continued to be facilitated through CERN. A number of microelectronics projects related to EUDET continue to take advantage of this.

The 2009 annual scientific workshop was held in Geneva and was successful in bringing together about 100 participants in the EUDET program to exchange information and ideas.

6 Transnational access activities

During 2009 the Transnational Access activities were regularly advertised on the EUDET web site and at several conferences to communities working on detector R&D. The web site was also refurbished taking into account suggestions from the users.

In 2009 only three TA1 proposals to get support performing studies at test beams were submitted, all received rank A. The low number of TA1 proposals is due to the fact that now all EUDET infrastructures are available and most groups coming to DESY use the existing infrastructure. Also, nine proposals for support of various R/D programs in pixel and silicon strip technology, TPC and calorimetry have been submitted. They alll received high rank approvals and could be honored.

7 Conclusions

Now in the fourth year of life, the project is close to completion. We congratulate the IC and the steering committee for the management of the project. Structural changes to the management were implemented well. The infrastructure erected by EUDET was widely appreciated by the community and enabled the development of novel and mature detector prototypes. EUDET has obtained wide recognition.

In JRA1 the magnet has delivered a very performing prototype beam telescope, and it was a pleasure to see some requests of transnational access also from non ILC related groups.

The scope of EUDET is to build “infrastructures” for the R&D of detectors for the ILC. The relevance of these infrastructures is measured by how much are they used: i.e. the Transnational Access. Since 2008 we had an important increase in TA, due to the pixel telescope, and we look forward to their further exploitation in 2010.

The scientific output of the project in 2009 was kept on the same level achieved in the previous years, which among others is demonstrated by the large number of written reports about EUDET activities.