DESY PRC 68 Recommendations
Final Version

December 07, 2009

HERA Experiments (HERMES, H1, ZEUS), and POL2000

HERA Experiments (HERMES, H1, ZEUS)

The H1, ZEUS and HERMES experiments continue to be productive in harvesting physics from the HERA data. The collaborations are fully committed to complete their physics programs. With higher statistics and the involvement of new analysis techniques, HERA results are visible and valuable to other communities, especially LHC. Some of them are legacy measurements and the community expects these to be the best results for a long time. The PRC congratulates H1 and ZEUS collaborations for timely publication of these high quality physics results in accordance with their publication schedules. The PRC also congratulates the H1 and ZEUS collaborations for their efforts in combining analysis results to exploit the full potential of the HERA data. This effort started about 3 years ago and now both experiments are fully committed in this effort.

While simulation and analysis software are still being improved, H1 and ZEUS data are final. Regarding long term plans, the collaborations are leading the effort to preserve the data together with the international high energy physics community. The collaborations contribute and profit from this initiative on data preservation. The PRC supports the active contribution of HERA experiments to this development.

H1 and ZEUS are progressing well in physics analysis and publication of results following closely the plan previously presented to the PRC.

Although the analysis of the HERMES data with the recoil detector is progressing well, there is still concern that the final data productions become available relatively late and decreasing person-power might hinder the complete harvesting of the physics results of this dataset. The PRC is pleased that significant progress has been made in publishing technical papers on the recoil detector.

Support by DESY and by HERMES, H1, and ZEUS collaborating institutes remain vital for a successful completion of HERA physics programs. DESY should motivate collaborating institutes to remain involved in finalizing HERA analyses. The PRC thanks the laboratory for its high level of support for the collaborations to guarantee excellent physics results and publications, and recommends their continuous support in the coming years.

The PRC encourages HERMES, H1, ZEUS, and the DESY theory group to enhance efforts towards a global analysis of all the HERA data.

POL2000

The PRC notes that the polarimeters were operated quite successfully by a rather small group, which left little time for analysis; thus it took quite some time to organize the data for analysis after data taking. Since the last PRC meeting significant progress has been made by the task force, supported by all three collaborations, studying the data of all three polarimeters, and understanding in detail systematics. Corrections to the TPOL have to be applied, even if the discrepancy of the LPOL and TPOL measurements will be fully resolved. The PRC acknowledges the dedicated effort of the task force since the last PRC meeting. Spring 2010 is the final deadline for a well understood central value and its uncertainty because these results will be needed for the publication of high priority publications. The collaborations, whose analyses depend on these values, should support the currently existing task force during the coming six months. It is important for the final scientific results as well as to finish a long, sometimes painful, effort in a satisfying way.

LHC

LHC is expected to have beam circulation in the week of November 16 and the first collisions at the center-of-mass energy of 0.9 TeV at the end of November, followed by collisions at ~2 TeV mid December. Both ATLAS and CMS experiments are in excellent shape for taking data – detectors are installed and aligned and computing is ready. The ATLAS and CMS groups at DESY are well represented in various key activities including the management and in upgrade projects. In particular, the PRC congratulates the DESY CMS group for the timely installation of CASTOR and the DESY ATLAS group for its visible contributions to the trigger and offline software.

The PRC notes the reinforced workforce in important areas for both ATLAS and CMS groups. The PRC also notes that physics activities have been strengthened and the preparation of physics analyses is well on track. Both groups have started to use the NAF resources. The ATLAS group provides strong, excellent support to the NAF. An optimal usage of NAF will be a big plus for the German groups, and the PRC recommends that this support continues.

CMS detector upgrade activities at DESY include the tracker upgrade and BCM upgrade with radiation hard sensors where there is a synergy between ILC and LHC. The ATLAS detector upgrade activities at DESY include R&D on a pixel vertex detector. The PRC strongly encourages the commitment of the DESY groups to these upgrade projects.

At the next meeting, the PRC expects the DESY LHC groups to present first results from detector performance studies emphasizing their contributions to the analysis. The PRC would like to see the impact of NAF and the Analysis Center on these results.

Analysis Center, NAF and Grid

NAF is a national computing resource serving the needs of physics analysis by members of the Helmholtz alliance. NAF is used and well accepted by the whole German

community (ATLAS, CMS, LHCb, ILC) with 75% of the users not affiliated with DESY. The NAF and its services are unique in Germany and the PRC recommends that it be developed and preserved in close collaboration with physics groups in Germany.

The mission of the Helmholtz Alliance analysis center is to enhance the physics potential of the German LHC/ILC community by providing analysis infrastructure and by supporting topics of general relevance such as education, training, basic research, tools development, LHC/ILC analysis support, and networking. It will become the focus of LHC/ILC analysis at DESY and it aims at having major impact on important projects and programs. The analysis centre already plays an important role in stimulating cooperation between analysis groups in Germany. The promising road taken should be followed further and possibilities for closer collaboration with institutes are to be explored. The PRC recommends that the indispensable support by DESY for the analysis centre be complemented by the collaborating institutes.

DESY support for Tier2 is a firm promise to the German LHC community and the PRC recommends that sustained funding be secured.

ILC

The PRC recommends that the individual projects seek possible areas of collaborations to avoid duplicated efforts. The PRC is pleased that some of ILC detector technologies have been used for other experiments and the PRC encourages detector groups to explore potential applications to future experiments in particle physics and beyond.

The PRC would like to see a comprehensive list of ILC detector technologies already applied and/or applicable to other projects inside and outside particle physics. The committee would like to hear the status of ILC detector concepts and the future detector R&D plans at the next PRC meeting.

Calorimeters

CALICE

The PRC applauds the success of the CALICE collaboration and endorses the broad scope of calorimeter development of future PFA (particle flow algorithm) calorimetry. The PRC congratulates CALICE on its successful test beam campaigns at CERN and Fermilab and supports their continuation with prototypes as realistic components of future ILC detectors. The PRC asks for early publication of test beam results, making data available for the development of shower models. The PRC supports the proposed schedule for the development of fully featured technical prototypes in time for the ILC Detailed Baseline Design report in 2012.

The PRC notes the challenges associated with the provision of adequate test beam time, and the funding necessary to carry out the proposed program. The PRC recommends that DESY continues support for necessary modifications to test beam fixtures, test beam

campaigns at CERN and Fermilab, continuation of electronics integration development, mechanical and electrical engineering, and provision of computing resources.

The PRC requests CALICE to make a brief report at the next PRC meeting of progress towards publication of results from the first round of test beam campaigns. A full progress report is expected in one year's time towards completion of the physics prototypes, and the progress towards the realization of the technical prototypes.

FCAL

The PRC congratulates the FCAL collaboration on achieving significant progress since the last report and on drawing together resources from a broad community.

The PRC recognizes many developments of FCAL tied to LC and LHC detectors, and other future experiments.

The PRC recommends that the collaboration establishes an overall schedule and a central organization which monitors progress.

Vertex Detectors

MAPS (CMOS sensor based Vertex Detector)

The PRC recognizes that the MAPS activities are very broad and consist of well focused R&D efforts with very good progress, which follow approximately the schedule of 2007. The current M26 sensor approaches the specifications for resolution and read out time for a sensor in the outer layers of an ILC vertex detector. Running experience has been gained as part of the EUDET telescope and at STAR at RHIC/BNL and plans exist for new detectors at STAR and at CBM at FAIR/GSI. The EUDET telescope is being used for various test beam experiments at CERN and DESY.

The PRC notes that a collaboration at system integration level has started (PLUME). The PRC recommends that Mimosa MAPS R&D program should be continued at full support.

ISIS (In-Situ Image Storage)

ISIS is a unique approach for vertex detectors at the ILC. At the system level it is insensitive to EM interference from the beam and avoids power pulsing in a 4T field. ISIS2 has demonstrated the buried channel CCD concept in a deep submicron CMOS process with good charge transfer efficiency. Tests of the design readout speed requires an ISIS2-production with doped polysilicon gates. Irradiation hardness should be studied. The ISIS3 device would add multiplexing, digitization, and serial readout as required for the ILC. Positive results from these prototypes would make the ISIS concept a convincing option for the ILC. The PRC recommends that this R&D effort should be continued.

SPiDeR R&D

FORTIS and TPAC sensors are new and innovative concepts which have been successfully proven. As a new and innovative approach CHERWELL fits well into the target of SPiDeR. The collaboration has successfully shown the potential of the concept for particle detectors. Enough human resources need to be made available for full testing of test devices. Many things remain to be learned from them. Building a full DECAL (Tera-Pixel Active Calorimeter) prototype detector is a good test for all system aspects. The SPiDeR collaboration is encouraged to try to find collaborations to share this significant and conceptually different task, so as to keep enough resources available to work on the generic silicon pixel concepts. The PRC recommends that the SPiDeR R&D activity should be continued.

Astroparticle physics

The PRC congratulates the IceCube collaboration for the timely installation of the detector and for the efficient detector operation. DESY is a strong contributor to the physics results. The PRC encourages the DESY group to keep the present level of involvement. The committee asks the group to present at the next meeting the status and the plans for the IceCube analysis activities.

The SPATS experiment has pioneered the R&D on acoustic neutrino detection in ice. The PRC especially acknowledges the first systematically solid measurement of acoustic attenuation lengths in ice achieved in the last pinger campaign. The PRC recommends to evaluate the consequences of the results for future radio/acoustic detectors and to give a detailed presentation at the next PRC meeting.

DESY is playing a leading role in CTA (Cherenkov Telescope Array). The already broad activities, mostly in hardware, operation and computing, have been significantly strengthened on the physics preparation side by the installation of a Helmholtz-YIG and a DESY-professorship in Potsdam.

All of these astroparticle physics activities are well aligned with the plan and the PRC recommends to vigorously pursue these activities.

Theory

The PRC highly welcomes the appointment of Georg Weiglein to lead the phenomenology/collider physics effort at DESY site Hamburg. We encourage the DESY directorate to secure support for reestablishing the phenomenology group at Hamburg.

The PRC encourages close interaction of the theory group with the DESY analysis center to promote collaborations among theorists and experimentalists, in particular with the HERA and LHC groups.

The Hamburg Excellence cluster has a strong program with expertise in a broad range of topics that are main stream in the fields of particle physics phenomenology, cosmology, string theory and mathematical physics. On the experimental side it is well balanced with a strong program on colliders, accelerators and detectors. This cluster in Hamburg opens the opportunity for a continuing outstanding program in the cosmology and particle physics frontiers, which will further strengthen the DESY theory group leadership in the German physics community.

ALPS

The PRC congratulates the ALPS collaboration for the world-best results on WISP couplings obtained in a light-shining-through-a-wall experiment. The limits obtained with an optical resonator are significantly better than all previous results. The PRC recommends speedy publication of the experimental method and the results. The PRC recommends that ideas for future experiments are carefully elaborated. These considerations include physics versus cost and DESY's role.

OLYMPUS

The PRC congratulates for the great progress in realizing the OLYMPUS experiment. The scientific motivation is very strong. The quality of the collaborators is high and the collaboration has the necessary expertise.

The concerns have so far been related to whether the collaboration has enough personnel dedicated to OLYMPUS over the next three years. The PRC acknowledges that the dedicated team has been growing steadily. However, funding from the US and the firm commitment from the collaboration, in particular, the commitment from German groups who received partial funds so far, is still critical. We expect that the dedicated team will only be sufficient with scientists and technical staff hired through these funds.

The timeline of the experiment is very tight and any significant slippage in time must be avoided. It is not necessary that OLYMPUS pushes detector performance to its limit but that it be adequate for the measurement. Therefore, the PRC recommends that the collaboration should determine the minimum resources required to realize the detector, in particular the GEM luminosity monitor and the GEM tracker upgrade. The PRC is pleased to see that the collaboration identified a backup solution for the GEM luminosity monitor.

The collaboration is in the process of forming the project team including a Project Manager, sub detector system coordinators, simulation and analysis coordinators. The PRC requests the collaboration to formulate a resource-loaded schedule (including both the detector and the accelerator) with clear milestones at latest before the end of the year and to present it at the next PRC meeting.