DESY PRC 64 Recommendations

1. News from the Laboratory

The PRC congratulates the laboratory for a number of achievements reported by Rolf Heuer. These include the successful running for HERA and its three experiments, the smooth and efficient transition to the HERA low-energy running modes, the rapid progress on dismantling PETRA3 and HERA detectors, and the DESY groups' significant contributions to the ATLAS and CMS experiments and ILC detector R&D. The midterm evaluation of the Helmholtz Senate recommendations relevant to DESY's particle and astrophysics programs appears to be very positive and the laboratory expects the final endorsement of the evaluation by the Scientific Council in two weeks. DESY's next five-year planning for the period between January 2010 and December 2014 will be submitted by summer 2008 and its preparation will begin early next year. The next PRC meeting will be held earlier than usual in order to provide timely advice for this preparation.

2. HERA

- **HERA Machine**

  The PRC is greatly impressed by the excellent performance of HERA in the remarkable 460 GeV low-energy run and the rapid transition to a third energy (560 GeV) run in June followed by a 15 hour rapid start-up of HERA operations. We note that HERA delivered a total luminosity of 16 pb^{-1} at 460 GeV and 8 pb^{-1} at 560 GeV, and that beam polarization of ~50% was quickly achieved with low energy proton beams. The HERA team's dedication should be commended. On June 30, 2007, the HERA machine was shut down, after having delivered 0.9 fb^{-1} of e-p collisions. It has been a remarkable 15-year journey of continuous improvement. This required constant effort and a wonderful collaboration developed with growing mutual trust and understanding between the laboratory management, the machine team and the experiments. We applaud the entire laboratory and all the collaborations for this effort.

- **Beam Polarization**

  The PRC is gratified to see that a quality set of TPOL, LPOL and cavity POL data was acquired in the final weeks of HERA operations. The statistical precision of the cavity polarimeter is excellent, and LPOL and cavity results appear to be consistent. With a very systematic analysis, impressive progress has been made resulting in a beam-polarization uncertainty of about 3.5%. All signs are encouraging that a significant decrease in this uncertainty can be achieved. Given the importance of accurate polarization measurements and high-quality data in hand, the PRC recommends that the team should complete the TPOL and LPOL data analysis and the cavity analysis, and should integrate the cavity results into the final polarimeter analysis. The PRC is concerned that the analysis effort still lacks personnel resources for a timely conclusion of the final uncertainties.

- **H1 and ZEUS**

The PRC congratulates the H1 and ZEUS collaborations for the successful completion of data taking at two low energies, acquiring about 20 pb^{-1} in each experiment. The ZEUS collaboration made rapid progress on their low energy analysis and presented some of these results at PRC64. Both collaborations are currently in the process of producing low-energy results. The PRC is extremely pleased with the two collaborations' significant effort to combine their results, leading to 7 joint working groups. The committee is satisfied that both collaborations have good plans for defining priorities for physics analyses and publishing high priority analyses by 2010/11, and strongly supports their plans. We recommend that the laboratory continue the high level of support for the collaborations to guarantee excellent physics results and publications in the coming years. The PRC recommends that the laboratory support H1's efforts to secure sufficient Grid computing resources for Monte Carlo production, especially in 2008/9. Although the physicist resources to complete important physics analyses appear to be sufficient, the PRC notes that this picture could change when the LHC turns on. The PRC therefore recommends that the experiments and the laboratory pay special attention to the physicist resources.

- **HERMES**

The PRC congratulates the HERMES collaboration for a very successful and efficient end to data taking in which they acquired ~47 million DIS events with the recoil detector. We commend the steady stream of high-quality physics results. We are extremely pleased with the collaboration for establishing a plan for their management and clear analysis and publication priorities for the next few years. The PRC recommends that the collaboration's focus be on analysis of recoil data and that the laboratory continue the high level of support for the collaboration in order to guarantee excellent physics results and publications in the coming years.

3. LHC Experiments

- **ATLAS and CMS**

The PRC notes that DESY has many excellent opportunities with the LHC experiments including involvement in physics analysis, high-level trigger and data-acquisition systems, software, commissioning and technical coordination, forward detectors and their physics, computing with a Tier-2 center, and the SLHC detector upgrades. Both the ATLAS and CMS groups at DESY have grown substantially and have been making a real difference to the experiments. They are well respected by the collaborations. Both groups receive adequate support from the laboratory. With a close collaboration with the Humboldt University group and an assistant professor at University of Hamburg, the DESY ATLAS group focuses on high Pt physics, computing infrastructure, high-level trigger, fast shower simulation, generator interfaces and physics validation. With a close collaboration with Hamburg University, the DESY CMS group focuses on software development for high-level trigger, data quality monitoring, technical coordination and integration at CERN such as beam radiation monitors, computing coordinator at CERN, tracker alignment, high Pt physics analysis, and a very forward calorimeter, Castor. The PRC supports DESY's plan of setting up a ROC (Remote Operations Center) at DESY. Our committee acknowledges successful progress on computing with Tier-2 centers and the needs for 3rd party funding for GRID.

The PRC is concerned that not enough resources are set aside for analyzing Monte Carlo event samples. We recommend that both experiments focus on their currently committed areas and do not expand these further.

4. ILC

- **Overview of DESY Activities**

The PRC notes that DESY has been actively involved in ILC detector R&D and their activities include vertex detector, TPC developments, calorimeter developments, forward calorimetry, and polarization. DESY had primarily been involved in one of four detector concepts, LDC, that had evolved from the TESLA detector. Since the summer of 2007, LDC joined forces with the Asian detector concept GLD and created a new detector concept ILD. We commend DESY's active and leading role in ILC detector R&D. DESY activities on the ILC are funded from many sources and we congratulate DESY management for successfully securing 3rd party funding.

- **CALICE**

The PRC congratulates the CALICE collaboration on constituting an impressive world-wide effort towards ILC calorimetry. We commend the successful exercise in prototype detector integration and their openness to test various technologies in a common framework. The PRC recommends that the DESY contribution to CALICE (analog HCAL, test beam infrastructure, coordination, analysis and simulation) be continued. The PRC supports increase in the effort towards the technical prototypes, and the test beam program at Fermilab in 2008 and 2009. The PRC recommends the hadron test beam results be fed back to shower simulation modellers. The PRC recognizes that the application of ILC detector technologies to other scientific fields could be beneficial. In order to achieve the final goals, the PRC recommends that DESY continue their support of these efforts. The PRC notes that setting clear goals and milestones in the next few years towards completing EDR successfully will be critical.

- **FCAL**

The PRC acknowledges that FCAL is a challenging project, yet is very important for the whole ILC experiment. The PRC is impressed by the written report of their activities, where both physics requirements and the technical implications were clearly stated. The FCAL group is an active collaboration, and made progress in many areas. There is significant work left for the goal of prototypes in 2010. The PRC commends that the FCAL group brings together the community from a broad area. This effort is well appreciated by the World-Wide Study Group and indicates a strong leadership by the Zeuthen group. The PRC also commends that the FCAL group is well connected to the two prominent ILC detector concepts; ILD and SiD, and is working to develop LoIs by Oct. 1, 2008. The PRC notes that FCAL effort could be useful beyond the ILC detector, for example, for SLHC detectors. We recommend that the FCAL group continue to communicate with the machine group closely. The PRC recommends DESY to continue their support.

5. Particle Astrophysics

- **IceCube**

  The PRC acknowledges that the IceCube project is running well. The very low failure rate of DOMs is a great success. The commissioning of the detector is rapid and profits from experience gained with Amanda. The DESY group contributes significantly to the physics analysis and is leading in multi-messenger investigations, especially by the close collaboration with gamma ray experiments. The deployment of acoustic sensors in the last season allowed first insight into the acoustic properties of the South Pole ice. Further evaluation will employ components to be deployed in the next season. The set-up should then enable the determination of the attenuation length and the absolute noise level in the ice. Different so called "end-game options" for the implementation of the last IceCube strings have been presented. The PRC recommends that the decision on these options be prepared in the IceCube collaboration and the participation of DESY be discussed at the next PRC meeting. Similarly, the PRC acknowledges the DESY contributions to the design study of a next generation gamma ray experiment (CTA) and recommends that the level of further engagement in this field be discussed together with the application for the next POF period on the next meeting.

6. Other Experiments

- **Internal Target Experiment at DORIS**

  The PRC formed an external referee group to review the proposal of a possible new experiment at DORIS using the available MIT-BLAST detector and an unpolarized hydrogen gas target. The goal of the experiment is to determine the contribution of multiple photon exchange processes and to resolve the existing discrepancy in lepton-nucleon scattering data. Dedicated data taking for one month per year for several years would be sufficient to carry out the experiment. The external referees strongly support the physics case. The PRC thus recommends that the DESY management discuss this new experimental opportunity with the accelerator group.

- ALPS

  The PRC reviewed the ALPS proposal in Feb. 2007 and recommended that it proceed. Since then a sign error in theoretical calculations led to a modified proposal. Despite a lower sensitivity due to this error, the PRC in May 2007 recommended proceeding since the main goal of checking the PVLAS signal remained achievable. The current situation is that the axion-like signal reported by PVLAS is no longer reproduced by PVLAS and is also excluded by GammeV at Fermilab and BMV at Toulouse. Due to these facts and due to some time delays in the setting up of ALPS, the experiment has modified its plans and will improve their sensitivity beyond the existing experiments before April 2008. The PRC recommends completion of the experiment with this existing set-up according to the plans presented as soon as possible, and will review the next steps pending the outcome of the experiment and the international situation. The PRC recommends authors should continue their close contact with the DESY management.