

# DESY PRC 69 Recommendations

## LHC experiments:

### **CMS:**

The PRC congratulates the DESY CMS group for its very visible contributions to key areas in the management and operation of the CMS experiment, and welcomes the strengthened involvement of the group in physics analyses, as shown by the important role that the group is playing in the analysis of the first data.

For the phase-1 LHC upgrade, the CMS experiment considers the replacement of its pixel detector (barrel region), which will be limited by dead-time at high LHC luminosities. The current design, which is very flexible in order to best accommodate possible changes in the upgrade plans, foresees a four-layer detector and a much reduced material budget. The DESY group proposes to build, together with German university groups, the fourth layer of this detector. The PRC strongly supports this proposal. We encourage the group to carry out further simulations showing how the physics potential and the selectivity of the High Level Trigger would be increased by the improved performance of that detector, therefore justifying that the detector should be installed as soon as possible. We also encourage the involvement of the group in the operation of the current pixel detector.

The CMS group is also interested in participating in the upgrade of the hadron calorimeter via the replacement of the presently used Hybrid Photo Diodes (HPDs) by Silicon Photo Multipliers (SiPMs). The PRC supports this activity provided that external funding is obtained, and encourages the group to submit an application for a Helmholtz-Russian Joint Research Group (HRJRG).

### **ATLAS:**

The DESY ATLAS group has made major contributions to the first ATLAS physics paper which was recently published. Also preparations and plans are well underway in order to exploit the 7 TeV data to be accumulated in 2010. The PRC congratulates the group for a very impressive start on the ATLAS physics analyses.

The ATLAS experiment plans to replace the inner detector in the "phase 2" LHC upgrade. The experiment has asked that DESY consider becoming one of the "macro-assembly" sites for one of the endcaps. There has been extensive discussion with the ATLAS management as well as other German ATLAS institutes, and there is general consensus that such a project is very well suited for DESY. The current proposal (PETAL 2014) by the DESY ATLAS group has the goal to demonstrate the feasibility of the project, to prepare for mass production, and to build prototypes, leading to one working endcap detector module (petal) prototype by 2014. This is a major project requiring up to 14 FTEs and significant infrastructure resources.

The PRC strongly endorses the DESY involvement in the ATLAS inner detector upgrade and the PETAL 2014 proposal in particular. This is a major part of the ATLAS upgrade

and is very important for ATLAS physics. It is a very good fit for DESY from the point of view of its own capabilities as well as those of its established partner institutes. The PRC recommends that care should be taken that the project has adequate manpower.

A second upgrade project, the implementation of topological information in the first trigger level, is still in early stages. It is proposed that the DESY group studies the physics gain of the topological trigger for multi-muon final states. The Monte Carlo studies should be completed by end of the year. If studies are positive, this may lead to additional hardware projects in the Level 1 trigger for the ATLAS upgrade.

**General CMS/ATLAS:**

The PRC notes that the CMS and ATLAS upgrade plans in the silicon detector area are well aligned. Sharing of resources for and exploiting synergies of the activities will require common planning and continuous exchange of knowledge and experience.

**NAF:**

The NAF is strongly used and very well accepted by the German particle physics community. However, the PRC is worried that the NAF might saturate in the future with increasing computing requirements from the LHC. For the next meeting, the PRC would like to see estimates for the future resource-requirements and an evaluation of the current load from different use-cases, like Monte Carlo production and data analysis.

**HERA:**

**ZEUS:**

The ZEUS experiment is following its physics program as previously presented to the PRC. There is still a high demand on computing resources and person power for MC production. A very complete plan on data preservation has also been presented. Central computing support by the ZEUS collaboration is presently foreseen to end in December 2011, forcing the schedule for data preservation to be aggressive.

There will be a change of the ZEUS management leading to a replacement of Physics Coordinators and the Spokesman. The prime task will be to finalize the core analyses and to define an adequate management structure and publication policy for the collaboration for the time after 2011, when some PhD theses and publications will still need to be finalized. The capability to produce high-quality publications after 2011 must be ensured.

The PRC thanks the laboratory for its high level of support, and recommends continued support in the coming years. The PRC in particular recommends strong support of the data preservation project.

**H1:**

The PRC congratulates the H1 collaboration for their dedication to the physics analysis leading to many new results and conference contributions. The publication plans are clear and realistic and are continuously monitored by the collaboration. Changes in the

management have been decided on and a transition to a new flexible management structure beyond the end of the present H1 collaboration is under discussion.

The PRC thanks the laboratory for its high level of support, and recommends continued support in the coming years. Since physics analysis in H1 is now driven by individuals rather than groups, the PRC asks DESY for flexibility if contracts have to be extended to allow for finalization of important analyses.

**H1/ZEUS:**

The PRC congratulates the H1 and ZEUS collaborations for the results of their working groups for combining H1 and ZEUS results which are highly acknowledged by the particle physics community, especially at the LHC. The PRC encourages the collaborations to continue their engagement in these groups since a large number of key results is still not finalized and should enter the combined analyses.

With LHC data taking starting, H1 and ZEUS will need full support by the lab to keep visibility at conferences, and to be given adequate possibilities for presentations including plenary talks.

The PRC is pleased to see a common strategy of ZEUS, H1 and DESY IT towards data preservation and is awaiting estimates of the required resources, especially in person-power. The PRC stresses that a rapid consolidation of the plans is necessary if central computing support for ZEUS is to be terminated at the end of 2011.

**HERMES:**

The collaboration is making steady progress in physics analysis. There are five papers published, two papers submitted for publication, and six new physics results have been released and presented at conferences. In addition, first results from high statistics 2006/2007 data sets are released. The analysis of the data with the recoil detector is progressing, but still requires some time to come to physics results. Person-power stays on a stable level.

The PRC congratulates the HERMES collaboration for steady progress in analyzing the data and publishing the results. To ensure that the results from the recoil detector will be fully harvested and published, the PRC asks the collaboration to concentrate on finishing (at least) one analysis and present the physics result at the next PRC.

The PRC thanks DESY for the high level of support for HERMES and stresses that continued support from the lab for the visitors is critical to maintaining the current productivity. The PRC notes that a participation of HERMES in the HERA data preservation activities would be desirable but would require additional manpower specialized in this field.

**Polarization:**

The PRC acknowledges significant progress made by the groups working on polarization measurements at HERA. The LPOL analysis is finalized; the cavity measurements – covering a small fraction of the HERA running time - reached a systematic precision of 1.1%. The understanding of systematics in the TPOL analysis was significantly improved by a large scale Monte Carlo production taking into account HERA optics and orbit parameters. A blinding strategy was employed for the study in order to avoid biases in the improved corrections. The effect of the corrections was therefore unknown at the time of the PRC review.

The PRC urges the group to apply the new corrections as soon as possible and produce new central values and errors for the polarization measurement. Electroweak results of H1 and ZEUS can still profit from the new results if they are available and can be cited by the time of the summer conferences. The PRC would like to receive a short Memo on the improved TPOL measurements before mid of June 2010. The PRC would like to discuss the results with the TPOL group in a phone conference.

**ILC:**

**CALICE Publication status**

Felix Sefkow reported on the status of results reporting in terms of refereed publications, analysis notes, and conference proceedings.

Felix distinguished between the various levels of CALICE “publications”: the regular journal papers signed by most of the CALICE collaboration, limited authorship papers from mid-scale prototype endeavors, and reports on generic/small scale testing typically carried out by a limited number of researchers. A perspective was given on the past, present and proposed major test-beam campaigns. So far there have been approximately 15 CALICE journal papers (with more in preparation/expected), 20 analysis notes (with 6 more in preparation for upcoming conferences). In addition, there have been over 200 CALICE presentations at conferences in the past two years, and more than 10 Ph.D. theses written on CALICE research, with many more in process. Finally, Felix showed some preliminary results from ECal and HCal in combination.

The PRC congratulates the CALICE collaboration on a strong record of research productivity and publications, and, while recognizing the issues involved in understanding and interpreting results from new techniques/prototypes, urges CALICE to keep publishing results in a timely manner.

CALICE has asked to make its next major presentation to the PRC in Spring 2011. This was agreed.

### **Status and plans of IDAG**

Michel Davier, Chair of the International Detector Advisory Group (IDAG), had made a presentation on the recent work of the IDAG at the previous day's PRC Open Session. He and Sakue Yamada, ILC research director, joined the PRC for this section of the closed session (Sakue via WebEx).

Sakue Yamada presented his thoughts on the preparation of the Detailed Baseline Designs (DBD) for the SiD and ILD detector concepts. In this connection, Sakue described the interactions at the recent LCWS10 (Beijing) meeting between the IDAG and representatives of the two validated detector concepts. Concerns had been expressed about the proposed scope and timeline of the DBD's. Sakue acknowledged that we can not be too ambitious given the limited time and human resources. However, it is important to hold to the 2012 timeline to be synchronized with the GDE. The starting point for the DBD is the LOI from last year. Sakue stated that the LOI's are very substantial documents and the DBD's need not repeat all the same material. However, certain items need to be put on a much more solid basis: detector performance, stability requirements, integration, and a limited number of additional physics benchmarks. Costing would also be required from the concepts, on the basis of a common effort/definition.

Sakue also raised the issue of to whom the DBD's would be addressed. This includes ourselves (being a useful internal exercise), the accelerator community (GDE), particle physicists in other areas, physicists outside HEP, and governments and funding agencies.

Sakue stressed the importance of DESY's contributions to ILC detector development and thanked the DESY management for their continued support.

The next major interaction between the IDAG and the detector concepts will be at the ECFA-ILC-CLIC meeting at CERN in October 2010.

The PRC thanked Sakue and Michel for their efforts to inform the PRC on the status of ILC detector design preparations.

### **ECFA matters**

Joachim Mnich described discussions related to promoting detector review processes in Europe. This is being considered in the ECFA context and may lead to a higher level review body under ECFA for those projects that have no specific host laboratory. Reports from such a body could have higher value to funding agencies in Europe and beyond. It has been suggested that this new body should be attached to a laboratory, with DESY a potential choice. This, in turn, could also have the effect of enhancing particle physics at DESY.

## **Astroparticle Physics:**

### **IceCube**

The construction of IceCube is proceeding according to plans and will be completed next season. The detector has been operated with an excellent up-time for data taking. The analyses have reached a high level of accuracy. Neither steady point sources nor transient sources have been observed so far. Analysis strategies are being developed to extend the detector sensitivity to the southern sky, or to reconstruct cascades induced by electron-neutrinos. Searches for multi-messenger events triggered by other instruments or triggering other instruments have been set-up. Some publications already exist based on early IceCube data. DESY is strongly involved in the analysis work.

The PRC congratulates the IceCube group for their leading role in physics analysis and is pleased to hear that the group will be strengthened by the lab in order to guarantee a strong role of DESY in the coming years which is expected to be the discovery phase of the experiment.

### **CTA**

CTA is a very highly acknowledged project in astroparticle physics. The DESY group contributes significantly in several important areas (mid size telescope design, prototyping, mechanics, dish, stability simulation, high voltage electronics for PMTs, trigger electronics, array control, sensitivity studies), achieving high visibility. DESY is also preparing to participate in the physics analysis through the newly installed YIG of Gernot Maier and the joint appointment by DESY and the University of Potsdam of Martin Pohl as leader of an astroparticle theory group.

The PRC congratulates the CTA group for their important contributions to the project. The activities of the group are wide spread. Therefore, the PRC is pleased to hear that the group will be strengthened by the lab to allow for a critical mass in all sectors.

### **IceCube acoustics**

The status and future of acoustic neutrino detection in ice were discussed in a special review prior to the PRC meeting. The review committee was composed of PRC members and external experts on the fields of acoustic neutrino detection, radio detection of neutrinos in ice, and from theory. The findings and recommendations of the committee (presented in a separate document) are endorsed by the PRC.

## **OLYMPUS:**

The collaboration should be congratulated for the impressive progress since the last PRC. All the points raised during the review have been addressed, or are being addressed. The US funding and all other funding except that for German groups is secured. This allows the collaboration to start hiring personnel and to start the shipping of the BLAST detector to DESY, as well as working on critical items, in particular the target.

The Collaboration has planned a lot of work over the summer and in autumn to prepare the installation of the target, collimator system and first detectors over the winter shutdown. This is extremely critical to succeed with the planned test experiment in summer 2011.

The collaboration has taken several conservative decisions since the last PRC, such as restringing the wire chambers, using already existing readout technologies, introducing high redundancy in the detector design. The PRC welcomes these decisions. The PRC further notes that, - because of the tight time scale of the experiment - it seems important to limit the number of different technologies to a minimum.

Because of the tight schedule the PRC suggests applying an earned-value-management-system with tracking of the progress of all subsystems on a monthly basis to be able to act quickly on delays.

Before the next PRC the manpower needs should be revisited to ensure there are no holes and enough redundancy in all the subsystems. The collaboration is encouraged to also start work on the analysis software while the hardware is being prepared. This aspect is very important for being able to analyze data in parallel to the data taking, and to ensure a high data quality.

The PRC recommends continued support from the lab, including housing help for external scientists, students and technicians visiting DESY for hardware preparation.

### **ALPS:**

The PRC congratulates ALPS I on achieving the promised improvements and on having the most sensitive results for WISP searches at a laboratory. It recognizes the very fruitful and beneficial collaboration between the theoretical and experimental particle physics communities and the laser physicists from the gravitational wave detector community.

The PRC is willing to consider the possibility of a future ALPS II experiment at DESY. It invites a TDR at the end of 2011 and a status report on the preparatory work in spring 2011. Since the ALPS II experiment will be much more complex than ALPS I, the PRC recommends strongly enlarging the collaboration and finding additional funding sources.

In order to evaluate the TDR, the PRC intends to ask for help from an external reviewer with expertise in laser physics.

## **Theory:**

The PRC welcomes the broadness of the DESY theoretical physics research and its engagement in organizing workshops and educational activities that enrich the German high energy physics community as a whole.

In this report the PRC was specifically asked to review the lattice activities. The PRC is impressed by the diverse physics programme of the DESY lattice gauge theory group and their careful and systematic approach to error control. It recognizes the leading role of the group in the German lattice community on results central to high-energy particle physics. The DESY lattice group is now taking the decisive step to realistic simulations with 2+1+1 flavours, small pion masses and a controlled continuum limit with important physics results to be expected.

The PRC strongly supports the lattice program at DESY site Zeuthen and its close collaboration with Humboldt University Berlin, as well as the partnership with other German Universities. The PRC encourages the DESY lattice group to move as rapidly as possible to harvest results in the physical limit for fundamental QCD parameters and those relevant for the search for new physics within the flavor sector. The PRC encourages the DESY directorate to sustain support for the DESY based lattice gauge theory program. In this context, the PRC also emphasizes the important role of the simulation lab in Zeuthen which represents an interface between lattice physics and computing hardware for the lattice gauge theory group.