

Recommendations of the 75.PRC

24 May 2013

CMS Experiment

Both the LHC and the CMS detector worked very well to the LHC shutdown. The DESY CMS group continues to make strong efforts in physics analysis. The PRC was pleased to note that several papers with strong participation from the DESY CMS group members have been published or accepted for publication. The group also made strong contributions to detector operations and computing during the run. Some of these efforts continue into the shutdown, where appropriate. Tracker alignment with leading contributions from DESY CMS is an example. The DESY CMS group members continue to take prominent leadership roles within CMS. The group maintains a healthy level of PhD students in the group. The PRC understands that the negotiation for the new leading scientist in the CMS group has not yet converged but has good prospects.

The group is making strong contributions and good progress for the phase 1 upgrade projects and is continuing to be very active in R&D for the phase 2 upgrade (see separate recommendations). The funding for the phase 2 upgrade, however, continues to be a concern.

The PRC congratulates the DESY CMS group on their considerable accomplishments. In the future, the PRC would like to hear more about the groups plans and strategies for data analysis in the upcoming 14 TeV run.

ATLAS Experiment

Both the LHC and the ATLAS detector worked very well to the LHC shutdown. The PRC was pleased to note very strong contributions by the DESY ATLAS group to the ATLAS operations, computing and physics analysis--particularly in the Higgs area. DESY ATLAS group members continue to take prominent leadership roles within ATLAS. The group maintains a healthy level of PhD students in the group. The group is making central and leadership contributions to the forward tracking upgrade plans, also in the context of the Petalet project. The funding for the phase 2 upgrade, however, continues to be a concern. Members of the group are also making rather large contributions to the testbeam facility at DESY. The PRC recommends that the lab reevaluates the contribution to the testbeam effort from various groups that benefit from this facility.

The PRC congratulates the DESY ATLAS group on their considerable accomplishments. In the future, the PRC would like to hear more about the group's plans and strategies for data analysis in the upcoming 14 TeV run.

Common Statement on CMS and ATLAS Groups

The PRC notes that there is a small drop in the post-doc personpower. This is likely a fluctuation, but should be watched. Possible changes in the administration of YIGs and how students can come to DESY may be issues that also need to be watched.

LHC Detector Upgrade Projects

The PRC has reviewed the plans of the ATLAS and CMS DESY groups for the phase 2 upgrades to be commissioned in the LHC “LS3” shutdown envisioned in 2022. Both experimental groups joined their collaborations after the construction of their experiments, and hence are expected to play a strategic role in the subsequent upgrade plans of both experiments. The DESY ATLAS and CMS groups are well poised to make significant contributions in the upgrades of the inner tracking systems of their detectors. The ATLAS collaboration has provided a Letter of Intent (LOI) for the phase 2 upgrade of their detector, to which the DESY ATLAS group has strongly contributed. The LOI plans foresee for the DESY ATLAS group to make leading contributions in the module production and full integration of a silicon tracker endcap at DESY. Such a role of the DESY ATLAS group would complement in an excellent manner the contributions of other German ATLAS groups to the phase 2 tracking upgrade and would fulfill a strategic need of the ATLAS collaboration as a whole.

For CMS, plans for the phase 2 upgrade are currently being developed within the collaboration, but it is already clear that the DESY CMS group is expected to contribute in an equally leading manner to the phase 2 upgrade of the CMS tracking system with a similar strategic importance to the experiment. In particular, the prominent role of the DESY CMS group in the phase 1 pixel detector upgrade (to be commissioned in 2016) positions the group very well for such a task. We also note with pleasure that recently the sensor R&D efforts by the DESY CMS group were very positively reviewed.

The PRC commends both experimental groups for nimbly exploiting synergies of their hardware efforts. The PRC strongly supports the groups’ efforts to seek funding for a full-scale tracker upgrade project in semiconductor technology using common infrastructure for both ATLAS and CMS phase 2 activities as a cost-effective way to fulfill their important roles and obligations in the upgrade of both experiments. The PRC looks forward to a cost estimate for both projects including a spending profile over the next 5-10 years as the information becomes available.

Computing

The DESY Grid centers at Hamburg and Zeuthen have more than 9000 job slots and serve many Virtual Organizations. For CMS and ATLAS, it is one of the top Tier2s in the world both in terms of jobs run and efficiency. The resources available now appear to be well matched to the current needs of the experiments.

The National Analysis Facility (NAF) has more than 3500 cores and is designed as a fast-turnaround facility data analysis for Germany. The resources are well utilized but also appear to currently have a healthy reserve to handle peak times. The PRC is pleased to hear the migration from NAF1 to NAF2 is beginning to take place. NAF2 should ease the maintenance burden as well as provide the users with new interactive tools. The PRC is also pleased to hear that the Hamburg will host the full NAF for ATLAS.

The dCache system has been developed at DESY and Fermilab since 2000. It has been open source since 2010. It is one of the leading large scale data storage and access solutions and it

handles ~100PB of data worldwide. It is very widely used, particularly by WLCG, but also has an expanding userbase.

The PRC congratulates the DESY IT group for their many achievements.

OLYMPUS Experiment

The PRC congratulates the collaboration and the DORIS machine group for the extremely successful run. An integrated luminosity of 4.5fb^{-1} was reached, 20% more than originally anticipated. The different luminosity detectors agree in ~1% with each other and first Moeller and Bhabha simulations. The 2nd level trigger performed as anticipated and allowed to run at the design beam currents and target flow. Running DORIS III in top-up mode increased the overall data taking efficiency.

Unfortunately, the original plan to cycle through four different settings (positive magnetic field polarity for positrons and electrons and the same for negative beam polarity) could not be realized, due to high Moeller and Bhabha backgrounds with negative magnetic field polarity. The impact of this on the achievable systematic uncertainty is not yet known.

Since the end of the final data taking 2nd of January 2013, a detailed survey of the apparatus has been performed. The tracking chambers and ToF bars have been calibrated with cosmics and currently a fine mapping of the magnetic field is underway.

A first timeline and milestones to have preliminary results at the time of the next PRC in October 2013 has been presented, currently the analysis is centered at MIT, at DESY a parallel analysis center is starting to be formed, which is considered to be important.

The collaboration is urged to get first fully tracked data as soon as possible and run extensive Monte Carlo simulations to understand the overall trigger efficiencies and the reconstruction efficiencies for different event samples, i.e. events with a radiated photon and without. It is also extremely important to start in parallel to the offline analysis the determination of the systematic uncertainties.

The PRC recommends an additional meeting between now and the next PRC meeting to be briefed on the update on the data analysis with focus on what precision of the cross section can be reached statistically and systematically. A proposed time for such a meeting is the 2nd week of August.

The PRC is looking forward to hear about the preliminary result at the next meeting in October.

BELLE/BELLE II Experiment

The committee is much impressed by rapid advances of the DESY Belle group in both the Belle physics analysis and the Belle-II detector construction efforts since the start of participation last July. The group is also taking important roles for the global data preservation of Belle and acting an analysis center for German collaborators in NAF.

The committee expects the results of the crucial beam test of VXD at DESY in Jan 2014 to be reported in a future PRC.

ILC

We congratulate the ILC group in DESY on its beautiful completion of the Technical Design Report for the accelerator and Detailed Baseline Design reports (DBD) for detector systems after heroic efforts.

The committee recognizes that DESY is expected to keep a leading role of the ILC projects in many aspects like SCRF fabrications, operational experience in FLASH or Detector R&D and considers that the Test facilities and infrastructures in DESY remain highly valuable to keep and enhance.

The committee would like to hear about the plan for the coming several years to participate in the global effort to make the design construction ready in both the accelerator and the detector systems.

H1 Experiment

We congratulate H1 on its efficient and successful publication output, continuing as predicted for the last several years, and for the wealth of preliminary results for DIS2013. For most of the about 20 publications planned for 2013 and 2014 there is secure coverage by typically two persons and only few analyses might suffer from person power problems or delay. H1 is very well setup for the software preservation system (sp-system), developed at DESY and is already its main user. The remaining effort to prepare H1 for the use of central IT resources in its future analysis model is well on its way to be finished by end of 2014. It should be supported by DESY as much as possible to also in future ensure a working data analysis to fully exploit the physics potential of H1.

For the time after 2014 we explicitly acknowledge the readiness of H1 to cover work on experiment-specific tasks in data preservation with existing personnel. This effort should be officially recognized by DESY in order to encourage young scientists to contribute.

ZEUS Experiment

We congratulate ZEUS on its efficient and successful publication output, continuing as predicted for the last several years, and for the wealth of allocated talks at conferences. ZEUS is very well setup for the software preservation system (sp-system) developed at DESY and is already basing most of the publications on the new Common Ntuples

The remaining effort to prepare ZEUS for the use of central IT resources in its future analysis model is well supported by DESY and has to be finished by end of 2014.

In order to ensure a working data analysis and especially Monte Carlo Production after 2014 we encourage ZEUS to seek existing staff part-time working on experiment-specific data preservation tasks. To help fully exploit the physics potential of ZEUS, DESY should officially recognize such work on experiment-specific tasks in data preservation in order to encourage young scientists to contribute.

HERMES Experiment

The HERMES collaboration is congratulated for their continued progress producing high impact results and papers. It is very nice to see that the technical recoil paper is published. The collaboration is making steady progress on the remaining high impact papers, which most should be finished till the end of 2013, which is also when most of the remaining PhD students will finish.

The HERMES data preservation has made nice progress; all the data and Monte Carlo files as well as the data analysis have been moved to BIRD. All the HERMES software is now running under SLD-5. The remaining issue is to implement the sp-system. The collaboration is congratulated for this major progress since the last PRC. DESY is thanked for support for the east guests as well as for Postdocs and PhD students. We ask DESY to please continue this support as it will be critical to finalize the final high impact papers.

Data and software preservation

The international data and software preservation effort for HEP experiments, DPHEP, is in transition from a study group to a collaboration (a draft collaboration agreement exists) and is endorsed by ICFA, encouraging labs to join by mid- to late-2013.

We congratulate DESY on its fully implemented and validated sp-system for software preservation, already receiving considerable outside interest and playing a leading role in DPHEP. This effort is worthwhile and rewarding to further pursue at DESY. The end of HERA funding poses personpower problems for sustaining this effort on both sides, the central DESY IT support and the experiment-specific tasks.

For regular experiment-specific data preservation tasks, HERA experiments should seek fractions of working time of existing (long-term) personnel at DESY, officially supported and recognized by DESY. Dedicated future interface issues of e.g. new MC generators with the sp-system might need additional temporary support, e.g. by summer students.

The experiment specific effort can only be successful with a binding commitment for appropriate support of the sp-system in the DESY IT group. Signing the DPHEP collaboration agreement and establishing an official DPHEP project at DESY would be clearly the most reliable way to ensure such a commitment. Without it, DESY's leading role in the international DPHEP effort, which reaches far beyond the HERA experiments, will be difficult to maintain.

HERAFitter

The PRC congratulates the HERAFitter group on the large achievements that were made. The committee is pleased to see that several new functionalities have been implemented in the recent version that makes HERAFitter to a versatile analysis tool and QCD analysis framework with rapidly increasing usage at the LHC experiments and dedicated fit forums within the ATLAS and CMS collaborations steered by DESY physicists. The DESY IT administration assures a solid infrastructure for maintenance and further evolution of the project and is encouraged to allow developers the use of the batch system for running large scale jobs. The PRC is looking forward to the planned first

stable release in October 2013 and an open session presentation at the upcoming PRC meeting in fall.

Theory

The theory group reported on two new structured initiatives, a Marie Curie Network on Gauge Theories and Integrable Systems, and the interdisciplinary Wolfgang Pauli centre (inauguration on 17 April 2013), both led by DESY. The PRC looks forward to hearing about the further development of the Centre after the inauguration.

Particle Cosmology was reviewed specifically. Highlight results were presented that reflect the diversity of the group's interests. There were no specific problems or items to be discussed as the group is doing well.

Astroparticle Physics

DESY's broad astroparticle physics activities were outlined in two presentations. The PRC acknowledges the significant progress made on various measurements and the clear views on the future of the field at DESY which are very relevant for the PoF III application.

Concerning the neutrino program at IceCube, new results were shown on atmospheric neutrino oscillations with a perspective for better constraints in the future, strongly improved limits on GUT monopoles, and high precision cosmic ray data. Weak signals for diffuse neutrinos were observed in various channels. The results are expected to improve in the near future by better analyses, more data and the combination of various channels. DESY contributes several important analyses (e.g. cascade events, combination of results, etc.) The PRC appreciates the careful approach being taken in this area to ensure that any possible signals are reliable.

Several issues raised at the last PRC were addressed in the closed session. A top candidate for a leading scientist/professorship position has been selected and discussions have started. It is likely that neutrino physics with IceCube will remain a key part of the DESY research program. An analysis that combines various channels for the diffuse neutrino search was developed at DESY and is under discussion in the collaboration.

The meeting came too early to discuss the realistic potential for the envisaged PINGU sub-detector, whose main scientific goal is the determination of the neutrino hierarchy. However, first considerations on the financing and a realistic timeline were presented in the closed session. One PRC member remarked that there is little communication between the "intensity frontier" and the "cosmic frontier" efforts in the U.S. In order to obtain significant U.S. funds it is important to inject the idea in all interested communities. Should it become clear by fall whether PINGU is capable of providing a realistic and defensible way to determine the neutrino hierarchy, the PRC would appreciate learning more details on DESY's plans on future upgrades for IceCube.

The area of high energy gamma rays is in a good situation at DESY with involvement in four operating experiments (Fermi-LAT, H.E.S.S., MAGIC, and VERITAS). The participation by DESY in analyses, as well as detector upgrades and improvements, is strong. The MAGIC involvement will continue, and

H.E.S.S. and VERITAS were recently upgraded and the H.E.S.S. I camera upgrade is on its way. Among the highlights shown were results on active galactic nuclei, pulsar wind nebulae, and binary systems, combined Crab Nebula flare observations by all experiments, electron spectra (MAGIC), as well as on extragalactic background light and the observation of the pion cut-off in several supernova remnants (Fermi-LAT).

DESY plays a big role in CTA, covering many areas of this large scale and complicated effort. A declaration of intent has been signed and the next steps, starting with a preliminary design review, have been defined.

For the next meeting, the PRC would appreciate seeing a general timeline of all activities, including the H.E.S.S.-I camera schedule, the VERITAS and MAGIC operational plan, as well as CTA decision milestones and the CTA ramp up. The point is to see how the various activities fit together and if there are sufficient resources (i.e. personnel) to preserve DESY's strong role in the different projects.

ALPS

After the positive TDR evaluation of the ALPS II experiment in fall 2012 the PRC welcomes the decision of the DESY management to approve the first two stages of the experiment. The PRC congratulates the ALPS II collaborators for their achievements since then on optics, magnets and infrastructure. The committee is particularly pleased to note that the dichroic lock of the regeneration cavity has been successfully demonstrated in a test setup in Hannover.

The PRC notes progress in the ALPS Collaboration's long-lead time R&D and establishing procurement specifications for ALPS-IIc. In particular, there has been good progress in tooling and techniques for the magnet refurbishing and procurements for cryogenic detectors and support hardware. The Collaboration notes the present funding is insufficient, and therefore completing the funding plan for ALPS-IIa & b remains a concern; we look forward to hearing progress on this. The PRC notes the data-taking schedule has slipped by one or two quarters so this will need to be monitored for further slippage. The Collaboration noted a recent reevaluation of the HSP solar flux and its effect on the ALPS HSP search space. However, overall the science case for the ALPS project remains strong and the profile of weakly-coupled particles in the science community has been increasing. ALPS collaborators have given high-profile presentations in the last year, and the ALPS project is well known in the dark-matter and weakly-coupled particle community.

Overall, the ALPS project is progressing well and we look forward to hearing more on the technical progress, budget, schedule and collaboration issues at the next PRC meeting.

Planck Scale Gravity Test at PETRA III

A proposal to test Planck Scale Gravity by measuring space birefringence and/or refractivity in a laser Compton experiment at PETRA III was submitted to the PRC. While this proposal seems to be a very interesting idea, much care has to be taken by properly evaluating the physics case and potential reach of this proposed setup.

The PRC noted that the proposal tests Planck Scale Gravity only if it is Lorentz-violating. The proposal should therefore be regarded as a search for Lorentz violation in the photon dispersion relation, and a measurement of (a lower limit on) the scale of Lorentz violation.

Given the existing tight constraints from astrophysical measurements, the PRC is rather skeptical if this experiment would be competitive with existing limits for both birefringence and refractivity for the standard situation of virtual gravitons. Based on the presented documents the PRC believes that no compelling scientific case has been made for any fundamental theory that would predict a level of effect as being considered by this proposal that is not already ruled out by astrophysical constraints.

The PRC also raised concerns about the presented level to control the systematic uncertainties of the planned setup, in particular on the polarization measurements. There are major doubts that the presented results based on the HERA polarimeter data are conclusive, as the understanding of the systematics of the HERA polarimeters is still controversial, and the experiment may not really improve upon these.