

Minutes of the 62nd Meeting of the PRC DESY October 22nd and 23rd 2006

PRC members present:

G. Anton (U Erlangen), J. Brau (Oregon), P. Buchholz (Siegen), R. Forty (CERN), U. Gensch (DESY), R. Heuer (DESY/U Hamburg), W. Hollik (MPI Munich), Y.K. Kim (Chicago), J. Kühn (Karlsruhe), T. Lohse (HU Berlin), G. Quast (Karlsruhe), N. Saito (Kyoto U), S. Riemann (DESY, scientific secretary), D. Pitzl (DESY, HERA experiment coordinator)

R. Milner (MIT) and J. Timmermans (NIKHEF) attended the meeting via phone.
J. Schneider (DESY), D. Trines (DESY) and A. Wagner (DESY) could not attend the meeting.

Non PRC members attending closed session items:

HERA: F. Willeke, (DESY)
Pol2000: S. Baudrand (Orsay), T. Behnke (DESY), W. Deconinck (U Michigan), F. Zomer (Orsay)
Representatives from the Experiments:
H1: O. Behnke (U Heidelberg), G. Eckerlin (DESY), E. Perez (Saclay), C. Vallee (Marseille), D. Pitzl (DESY)
ZEUS: J. Ferrando (U Glasgow), E. Gallo (INFN Firenze), K. Nagano (KEK), U. Schneekloth (DESY), Y. Yamazaki (KEK)
HERMES: EC Aschenauer (DESY), D. Hasch (INFN Frascati), J. Stewart (DESY), B. Zihlmann (DESY), HERA-B:
LHC: V. Gülzow (DESY), M. Ernst (DESY) M. Medinnes (DESY), J. Mnich (DESY), K. Mönig (DESY), P. Wegener (DESY)
IceCube R. Nahnauer (DESY), S. Schlenstedt (DESY), C. Spierung (DESY), M. Walter (DESY)
ILC T. Behnke (DESY), E. Elsen (DESY), J. Mnich (DESY)

No documents were submitted to the PRC.

Agenda

The meeting took place in DESY, Zeuthen.

Open session: October 22nd 2006

HERA	Ferdinand Willeke (DESY)
POL2000	Wouter Deconinck (U Michigan)
HERMES	Delia Hasch (INFN Frascati)
H1	Olaf Behnke (U Heidelberg)

ZEUS
HERA B
IceCube
LHC
Invited talk: Synergy between LHC and ILC

James Ferrando (U Glasgow)
Antonio Zoccoli (U Bologna)
Michael Walter (DESY)
Klaus Mönig (DESY)
Georg Weiglein (IPPP Durham)

Closed Sessions: October 22nd and 23rd

Item 1: Minutes and matters arising since last meeting
Item 2: News from the Laboratory
Item 3: Review of HERA
Item 4: Review of Pol2000
Item 5: Review of HERA Experiments
 5. 1. H1
 5. 2. ZEUS
 5. 3. HERMES
 5.4. HERA-B
Item 6: Review of LHC
Item 7: ILC Project at DESY
Item 8: Review of IceCube
Item 9: AOB

1. Approval of the minutes and matters arising from the last meeting

The minutes of the 61st session were accepted with minor changes.

2. News from the Laboratory

The news from the Laboratory were presented by R. Heuer. HERA has finished successfully its experimental programme with electron-proton collisions in June 2006 and continued with positron-proton collisions. The problems of measuring the polarization of leptons could be fixed. A working group for combining the results of the experiments started its work; first results were presented at the summer conferences.

The last months before the shutdown HERA will run at reduced centre-of-mass energy; a working group with members of the machine department and the three HERA experiments has been built to prepare an efficient switch to low proton energies. DESY has started its contribution to the LHC experiments ATLAS and CMS and has taken on responsibilities for detector installation, computing and physics coordination. A Tier-2 analysis centre is being set up in Grid technology at DESY. DESY continued its central role in the preparatory work towards the ILC. A Reference Design Report (RDR) including the cost estimate will be available in February 2007.

The CERN Council has agreed on the strategy for future particle physics activities in Europe. The DESY priorities, HERA, LHC, ILC, fit very well into this strategy.

The planning and preparatory work for PETRA III continues to progress on schedule.

FLASH is being operated very successfully for users as well as accelerator and FEL process studies. In August the German Federal President H. Köhler visited FLASH.

The European Project Team for the XFEL facility has completed the TDR and major documents on organizational issues. The discussion of administrative and funding aspects were pursued in the International Steering Committee. DESY received the formal approval for its plan to construct and operate the XFEL; it can be built essentially as requested. The Project Team at DESY continues its work, concentrating on the industrialization of major components. R&D activities for detectors required at the XFEL have started.

DESY has submitted a Helmholtz Alliance proposal for enhancing the bidirectional link between German universities and DESY in LHC, ILC, Grid computing, physics analysis and theory.

The PRC takes note of the report presented by R. Heuer. The laboratory plans to have scientific colloquia and a social party next spring to celebrate the completion of HERA running. The PRC welcomes that DESY will host internationally recognized meetings, including the tenth Linear Collider Workshop (LCWS) with the GDE in 2007, an ECRI meeting in 2007, and the Lepton Photon Conference in 2009, the year of DESY's 50th anniversary. The PRC congratulates the laboratory for a number of achievements. These include the successful running of HERA and its three experiments, fixing the major problem in determining the beam polarization, forming H1-ZEUS working groups with initial combined measurements, forming a working group for the low energy run, making significant contributions to the ATLAS and CMS experiments, and for DESY scientists receiving various prizes. The PRC is pleased to note that PETRA3 is on track, and the FEL site planning is complete. The PRC commends the laboratory on the submission of a Helmholtz Alliance proposal for enhancing the link between German universities and DESY in LHC, ILC, Grid computing, Physics Analysis and Theory.

3. Review of HERA Machine

From mid February until end of June (124 days) HERA was running with electrons. The switching to positrons was performed within 5 working days in the shadow of HERMES target and H1 calorimeter repair. After a total shutdown time of 25 days a highly efficient running was achieved yielding an integrated luminosity of 70pb^{-1} . Although e^+p running provided better background conditions, the average integrated luminosity per time was 20% less than for the electron-proton running; the background was less than in the e^+p running in 2004. HERA pursues its improvement program, but some items are delayed and the benefit with regard to the overall HERA luminosity will be small.

The polarization of non-colliding bunches was 55% but 35%-50% for colliding bunches. The anti-correlation between luminosity and polarization continued; and the polarization profited from the slightly lowered luminosity.

The concept for the low energy running of HERA has been completed. After two weeks set-up time the required integrated luminosity of 14.4pb^{-1} (10pb^{-1} on tape assuming a data taking efficiency of 70%) can be accumulated within 72 running days with 200nb^{-1} each. The

preparation of the low proton energy running has progressed. First tests of the new beam optics are planned for the end of 2006.

The PRC is greatly impressed by a remarkable performance of the HERA team in switching from electron to positron beam during the June shutdown, followed by a rapid start-up of HERA operations. The PRC congratulates the HERA staff for this success, which results from their continuing dedication. Although peak luminosities are 20% lower than for the electron run just before the shutdown, the beam polarization increased from 30% to 35-50%. In addition background has been much lower and as a result H1 and ZEUS experiments could take data with higher efficiencies. The PRC endorses the HERA team's plan for increasing the luminosity. This increase is expected to come from technical improvements, in beam optics and orbit stabilization. The PRC commends that through a working group, the HERA team, and the HERMES, H1 and ZEUS collaborations interact closely to identify all the possible difficulties that might be associated with the low energy run. The PRC acknowledges that the conceptual design of the low energy run is complete. The PRC supports tests for low energy beam optics preparation in December 2006/January 2007 and the plan for the start of the low energy run in March or April 2007 after accumulating over 100 pb⁻¹ of high energy positron data. The final decision on the low energy run will be taken in early 2007.

4. Review of HERA Polarization (Pol2000)

T. Behnke summarized the status of the cavity polarimeter. The cavity locking has been stable and laser beam power and polarization are controlled. Since June 2006 data are taken with positron beams. The Likelihood fit has been improved. The statistical uncertainty of the polarization measurement is about 3%/bunch/15s; the systematic uncertainty is about 0.5% per 45s DAQ time and has to be confirmed by longer DAQ periods. The correlation between e⁺ polarization and proton beam current has been measured. For a reduction of the main contribution to the systematic uncertainty the positron beam and the overlap with the laser/e⁻ beam have to be controlled.

P. Buchholz presented the referee's report on POL2000 for R. Milner and himself. The difference between the LPOL and TPOL measurements which reached 10% to 20 % has been understood. During summer shutdown an inverted mirror in the optical beam delivery system of the LPOL was found and after repair the ratio of the LPOL/TPOL measurements came back to unity. During 2006 the LPOL was routinely operated with 95.7% efficiency. The systematic error is well under control and expected to be about 2%. The TPOL was routinely operated with 97.7% efficiency during 2006; both LPOL and TPOL, reached 99.6 % efficiency. Problems with the laser cooling were detected and solved; an improved determination of the analyzing power is in progress. The re-evaluation of the systematic uncertainty for the TPOL is ongoing, about 2% are expected. A problem is the severe lack of shift personnel.

A routinely locking of the cavity LPOL is possible since the winter shutdown, systematic studies are in progress. The cavity LPOL is running about 1.5 h per week but more frequent

and longer data taking is planned. The measurements of TPOL and cavity LPOL are in agreement.

The PRC congratulates the polarization group for fixing the major problem in polarization, namely the ~10% discrepancy between two polarization measurements by TPOL and LPOL. The PRC acknowledges the significantly increased efforts (despite small resources) to understand the systematics of the polarimeters and their successful running with extremely high efficiency. However, reaching the systematic uncertainty at the 1-2% level requires further efforts. Certainly the current running time (1.5 hours per week) of the cavity LPOL is not sufficient to cross-check and understand the systematic uncertainties of LPOL and TPOL at this level. The PRC recommends that the polarization group, with endorsement of the HERA experiments, comes up with a detailed plan for the frequency and the length of the cavity LPOL run to achieve the goal of this precision.

5. Review of HERA Experiments

5.1. H1

There was no presentation by the H1 experiment in the closed session. The H1 detector is in excellent shape. Physics highlights are new isolated lepton events in e^+p data but more data are needed to clarify the excess. Searches limits for new physics have been improved with e^-p data; the physics output is continuously published. The final analysis of the full HERA data set 1992-2007 will require computing power at highest level for several years. Intense efforts are ongoing to secure the supplies; a detailed strategy document for the period 2006-2010 has been prepared for funding agencies. The preparation of the low energy running in spring 2007 is ongoing.

T. Lohse presented the referee report of the H1 experiment for P. Buchholz and himself. With high luminosity and low background H1 had a good start of the final e^+p running. The detector is in best shape ever, the H1 physics efficiency is approaching the theoretical optimum. Less HV trips are due to good beams and new trip electronics. The final optimization of the trigger mix is ongoing as well as some tuning of the DAQ efficiency. All subdetectors are in good shape; FST/BST started full operation just after last PRC. Average efficiencies of 92-98% are reached, the resolutions are close to $10\mu\text{m}$, and optimization of the alignment and global reconstruction with other subdetectors are ongoing. The Fast Track Trigger LVL 3 has been activated; some more trigger channels will be added. The Very Forward Proton Spectrometer has a 70% data taking efficiency. Some unexpected limitation of phase space is possibly related to HERA dispersion; further investigation is recommended if feasible.

The present level of manpower must be kept for the preparation of final analysis. The number of post-docs in the collaboration is decreasing reasonably slowly, new students have started and new groups joined H1. Manpower from Eastern Europe (financed by DESY) is getting more and more important, the continued DESY support for visiting scientists is vital.

H1 has excellent physics output; H1//ZEUS working groups yielding significant improvements of HERA results. This effort should be continued and extended.

The computing will need support by skilled manpower at adequate level, strategies for physics analyses have to be worked out.

The low energy run task force is active, but H1 wishes to wait for a decision on a formal request early 2007.

5. 2. ZEUS

E. Gallo summarized the status of ZEUS. The background conditions in the e^+p running are excellent, the HERA efficiency is high but the specific luminosity is low. However, about 50 pb^{-1} are recorded on tape and until March 2007 100 pb^{-1} are expected.

The combined H1/ZEUS group is working now regularly, first results were sent to the ICHEP06. Isolated leptons and di-electrons are in agreement with the Standard Model.

The preparation of the low energy running is in progress, the team is motivated. A task force (ZEUS experts from physics, detector, HERA and trigger) is working with the HERA machine, H1 and HERMES. A plan for the dismantling of the ZEUS detector has been prepared.

A computing model has been developed to cover the data processing and analyses for the next years. The model is well inside the present foreseen budget.

A new collaborator (Panjab University) has been approved.

G. Quast presented the referee's report for Y. Kim and himself. The referees are pleased with the efficient data taking in 2006. High quality physics results have been published and were presented at the ICHEP06, more papers will be published. Apparently the person power is stabilizing - at least the number of students. Progress has been made on the common analysis format and the strategy for final analyses. A common H1/ZEUS working group is active.

Preparations for the low energy run are ongoing. The referees express their concern regarding person power for final results and publications, the strategy for prioritization and organization of work and an adequate appreciation of the physics results at conferences.

The PRC congratulates the H1 and ZEUS collaborations on reaching their best performance ever, successfully finalizing many upgrades and repairs, and their high quality physics results. The PRC is pleased with five H1-ZEUS working groups formed to combine their experimental results. Initial efforts yielded significant improvements of HERA results, and the PRC looks forward to a continuation and extension of this combining effort. The PRC commends that H1 and ZEUS are prepared for the final high luminosity run. The PRC acknowledges H1's request for the final decision on the low energy run to be taken in early 2007, based on the results of the current high energy run. The PRC urges H1 and ZEUS to regularly combine their results on isolated leptons and multileptons as input for this decision. The PRC recommends the laboratory to continue the high level of support for the experiments to guarantee the maximum physics output from the last phase of data taking. Sufficient support should be given to the important preparations for the physics analysis after the HERA shutdown.

5. 3. HERMES

The status of HERMES was summarized by E. Aschenauer. The data taking efficiency is larger than 98%, the polarization around 30%. After the serious damage of the HERMES target cell

and adjacent detectors (discussed at the PRC meeting in October 2006) a new target cell with thicker walls and improved cooling has been constructed, mounted and taken into operation. The Recoil Detector has been repaired and RF shielding installed. Since July data are taken with all recoil components, since September the recoil detector is fully commissioned. In August a timing error in the Photon Detector was found and corrected. The Scintillating Fiber Detector is working well and stable. Studies were performed to determine the SciFi track resolution, 8mrad are expected. The alignment will be finalized. One module side of the silicon detector was found to be broken; this corresponds to 1/16th of the detector and cannot be fixed. Detailed systematic studies have started.

Many exciting physics results are published, submitted and presented on conferences. Substantial changes are going on in the HERMES management; it will be reorganized and reduced to 3 people in 2007.

N. Saito presented the referee's report for R. Milner and himself. Since the last PRC meeting HERMES has produced many high quality results which are reflected to many presentations at Spin 2006 in Kyoto. HERMES is getting close to complete commissioning of the Recoil Detector. Data taken since September indicate that the system is working properly. The data taking efficiency is excellent, at least 98%. Combined analyses of Forward and Recoil Spectrometer were reasonably done. Significant changes in the management of HERMES will happen next time; reasonable solutions are identified but additional commitment is desirable to minimize the impact of changes with smooth transitions of responsibilities.

The PRC congratulates the HERMES collaboration for successful recovery from the target cell and recoil detector problems. A new target cell with thicker walls was installed and the collaboration has recovered from recoil and silicon detector problems during the shutdown. The PRC is pleased with many exciting physics results produced by HERMES. The PRC commends that the collaboration completes the calibration of the recoil detector and the tracking software, and continues with its efficient data taking. The PRC is however concerned about the impact of changes in the management of the collaboration, due to loss of personnel, although a reasonable near term solution has been identified.

5. 4. HERA-B

HERA-B was installed in 2000, followed by a detector upgrade in 2001-2003 and an update of the physics programme. Data were taken only 4 months from November 2002 to February 2003. The physics programme was limited by the statistics but provided interesting results (e.g. for the QGP community). HERA-B analysis activities are now coming to an end, the last results are being prepared for publication. All topics (and more) outlined in the HERA-B report to the PRC in May 2001 are achieved.

The HERA-B experiment was finally reviewed by R. Forty. The orderly completion of the experiment has proceeded successfully although somewhat slower than originally foreseen. Until the PRC meeting 8 publications were finished using the high quality data from the 2002/3 run and 3 publications from first run in 2000. Almost all students have finished now, remaining analyses and publications are being done by permanent staff, slowing due to other

commitments. HERA-B also provided an excellent training ground for students: over 89 PhD theses and 79 Diploma theses were written.

The original aim of the experiment – the first observation of CP violation in B system - was always extremely challenging. The important lessons have been incorporated in the design of the next generation B physics experiment at a hadron machine. LHCb is indebted to HERA-B, and will hopefully profit from the much higher signal-to-background ratio expected at the LHC.

The PRC congratulates the HERA-B collaboration for their continuing output of publications, and looks forward to the timely completion of the remaining analyses, including the study of the A-dependence of J/ψ production. The initial goal of HERA-B was extremely challenging, to make the first measurement of CP violation in the B system, and although that challenge could not be met, the experiment has produced publications on a wide variety of other topics, acted as an excellent training ground for students, and provided important input to the design of future B physics experiments at hadron machines.

6. Review of LHC

There was no presentation by the LHC groups in the closed session.

J. Brau presented the referee's report for himself and J. Timmermans. DESY participates in ATLAS and CMS; the effort for ATLAS is based at Hamburg and Zeuthen, for CMS in Hamburg.

The DESY-ATLAS group consists currently of 7 physicists, 2 postdocs, and 4 PhD student. The group collaborates closely with the IT group in Hamburg and the DV group in Zeuthen, with the University Hamburg and the Humboldt University Berlin. DESY tasks in ATLAS concern the trigger; its configuration, the simulation of the level 1 central trigger processor, the trigger monitoring and the event filter for minimum bias events. Contributions to the ATLAS software are related to the fast shower simulation, the coordination of event graphics and contributions to core software. The physics interests of the group include Supersymmetry, b-physics, QCD and forward physics.

The DESY CMS group consists of 5 physicists, 1 software engineer, and 3 PhD students and works in close collaboration with the University Hamburg group, a CMS member for a couple of years. The DESY tasks in CMS are the higher level trigger, computing and technical coordination. The physics focus is the Standard Model, emphasizing top pair production. An average size TIER 2 centre for ATLAS and CMS will be the main DESY hardware contribution to the experiments. DESY computing resources are already contributing well to the LHC effort.

The PRC congratulates the DESY group for making a good start on their ATLAS and CMS efforts. The HEP vitality of the lab following the HERA running, and leading up to the ILC period, depends on the success of the establishment of very active participation at DESY in the LHC experiments. The PRC welcomes as appropriate the strong support by the laboratory for on-site active participation in CMS and ATLAS. A strong involvement of the theory group in support of LHC physics analyses will be a great asset for a high visibility of the DESY participation in the LHC program. The PRC acknowledges that it

is very important for DESY to be seen and used by the German groups as a major resource for the LHC experiments, and one important element of this is the Tier 2 computing facility at DESY. The PRC recommends that the laboratory management ensures that this effort is a major success, recognized and used by the German community, as well as finding other ways for the laboratory to support the German groups' efforts on the LHC experiments.

7. ILC Project at DESY

DESY plays a leading role in the activities for the ILC: in EUDET, the EU funded project for ILC detector R&D efforts, and in the EUROTeV project for ILC accelerator R&D efforts.

J. Mnich summarized the EUDET structure and tasks. EUDET is an Integrated Infrastructure Initiative (I3) for ILC detector R&D. EUDET started in January 2006 and will last until end 2009. The budget is 21 M€ in total (including approximately 57 FTE); the EU contributes 7 M€ EU (including approximately 17 FTE). 31 partner institutes and 23 associated institutes joined the project. The EUDET activities are embedded in the detector R&D collaborations CALICE, LCTPC, SiLC, and LCFI. The EUDET activities split up into several tasks – Detector R&D network, test beam infrastructure, tracking detectors and calorimeters. The project is in a good shape; all 2006 milestones will be reached.

E. Elsen presented an overview on the ILC activities at DESY. Base programme is the development of SC RF. DESY is well positioned in the Global design Effort (GDE) for the ILC. Recent discussions have shown a strengthening of connections between GDE and TTC (TESLA Technology Collaboration) which provides a framework for exchange of knowledge and expertise on SC RF cavities. In the future DESY will be fully committed to the ILC and trying to make SCRF available for the ILC.

The PRC acknowledges that DESY is playing a leading role in ILC detector and accelerator R&D for the European community. DESY coordinates both EUDET for ILC detector R&D efforts, and EUROTeV for ILC accelerator R&D efforts. Activities are well embedded in the ILC R&D collaborations. The PRC welcomes that DESY is fully committed to the ILC and is trying to make superconducting RF available for the ILC. DESY facilities should become available when the XFEL demands have been met, and more experts from Research Division should become available once HERA operation has ended. Taking the LHC and ILC efforts together, DESY should become the German hub for Physics at the Terascale. The PRC strongly supports a continuation of the ILC effort, and to keep DESY a partner for other European labs to participate in the ILC.

8. Review of IceCube

S. Schlenstedt summarized the structure of the astroparticle group and the topics and tasks of the group members.

C. Spiering presented the achievements at the South Pole. The past season demonstrated the ability to deploy more than 12 strings per season. Starting with the next season 14 strings per year should be deployed and in 2011 the full instrumentation in 1km^3 reached.

The data taking starts immediately after the string deployment, 98% of the DOMs (Digital Optical Modules) are operational; with timing properties better than the design value and low noise an improved reconstruction and excellent performance is given. The analyses of AMANDA data improved astrophysical flux limits from underground detectors by 1-2 orders and improved also search limits (magnetic monopoles, WIMPs). The physics analyses of Amanda will be finished in 2007, the engagement of the DESY group in Baikal will finish in 2008. With the continuously growing IceCube detector the main activities will cover in 2008-2012 mainly the steady and afterwards the transient sources.

In-kind funding contribution from DESY is mostly computing; common funding corresponds to 7 K€ per graduated physicist.

Basic construction work on IceCube will be finished in 2009; possible options to extend IceCube or to participate in Gamma Ray Astronomy are starting to be thought about.

Within the Helmholtz Alliances projects like multi-messenger studies of cosmic particles and dark matter and cosmological physics are applied for.

The review on the astroparticle physics projects was presented by G. Anton. The DESY group in Zeuthen is committed to produce 1300 DOMs in total, 260 have been produced in 2006. The Zeuthen group gives strong contributions to the physics analysis and could further strengthen this contribution by the involvement of a HGF young investigator group.

The Zeuthen group is active in the investigation of acoustic neutrino detection for future telescopes. A test set-up will be deployed at the IceCube site or the evaluation of acoustic parameters and of background conditions.

Multi-messenger studies with gamma- and neutrino-telescopes have been started. The active involvement of the Zeuthen group in future gamma telescope projects is being considered.

The PRC acknowledges the efficient deployment of IceCube strings and the impressively large fraction of running DOMs. The DOM production in Zeuthen is running smoothly with great success, and analysis of IceCube data has already started. The involvement of Elisa Bernardini and her HGF young investigator group is appreciated especially concerning the multi-messenger approach in collaboration with the gamma telescope MAGIC. For the acoustic neutrino detector R&D the Zeuthen group should be kept in a position to continue its leading role in this explorative research. Considerations of future participation in gamma telescopes are scientifically straight forward and seem promising.

9. AOB

The final decision to run HERA with low energy protons will be taken early in 2007. The PRC plans a phone meeting in January/February to discuss the decision.

The current list of PRC referees is:

P. Buchholz, T. Lohse:	H1
R. Forty:	HERA-B
R. Milner, N. Saito:	HERMES
Y.-K. Kim, G. Quast	ZEUS
G. Anton:	AMANDA/IceCube
P. Buchholz, R. Milner:	POL2000
J. Brau, J. Timmermans:	R&D for the ILC
W. Hollik, J. Kühn:	Theory
J. Brau, J. Timmermans	LHC
W. Hollik, J. Kühn, T. Lohse, G. Quast	Low Energy HERA Running

(S. Riemann – May 2007)