Minutes of the 42^{nd} Meeting of the PRC

DESY 19^{th} Feb. 1997

PRC members present:

F.Barreiro (Madrid), S.Bethke (Aachen), W.Buchmüller (DESY), F.Eisele (Heidelberg,Wissenschaftlicher Rat), L.Foá (CERN), U.Gensch (DESY), G.Heinzelmann (Hamburg), J.Jaros (SLAC), M.Kasemann (DESY), A.D.Martin (Durham), J.Rander (Saclay), D.H.Saxon (Glasgow), P.Söding (DESY-IfH Zeuthen), Y.Toksuka (Tokyo), D.Trines (DESY), A.Wagner (DESY), N.Wermes (Bonn), B.H.Wiik (DESY,chairman), C.Youngman (DESY,secretary)

Non PRC members attending closed session items:

HERA - F.Willeke (DESY).
HERMES - R.Milner (MIT), A.Bruell (MPI-Heidelberg), A.Simon (Freiburg), H.Jackson (Argonne), N.Makins (Illinois), A.Miller (TRIUMF).
H1 - R.Eichler (ETH-Zurich), P.Biddulph (Manchester), K.Rosenbauer (RWTH Aachen), Y.Sirios (Ecole Poly. Paris).
ZEUS - A.Caldwell (Columbia), R.Klanner (DESY), B.Lohr (DESY), R.Carlin (Padua), G.Wolf (DESY), P.Iacobucci (INFN Bologna).
HERA-B - A.S.Schwarz (DESY), C.Padilla (DESY), B.Schmidt (MPI-Heidelberg), W.Hofmann (MPI-Heidelberg), W.Schmidt-Parzefall (DESY), J.Spengler (DESY).

The PRC received the following documents:

PRC 97/01 A Microvertex detector for ZEUS. (ZEUS Collaboration).
PRC 97/02 A Forward Plug Calorimeter for the ZEUS Detector. (ZEUS Collaboration).
PRC 97/03 The HERMES Charm Upgrade Program. A Measurement of the Double Spin Asymmetry in Charm Leptoproduction. (HERMES Collaboration).
PRC 97/04 Proposal for a Dual Radiator RICH for HERMES. (HERMES Collaboration).

Agenda:

Special seminars. Feb. 19^{th}, 9:00, Main Auditorium

Observation of events at very high Q^2 in ep collisions at HERA. H1 collaboration - Y.Sirois (Ecole Poly. Paris)

Comparison of ZEUS data with Standard Model Predictions for $e^+p \rightarrow e^+X$ Scattering at High x and Q^2. ZEUS collaboration - B.Straub (Columbia)

Open session. Feb. 19^{th}, 10:40-12:50, Main Auditorium

HERA status report. F.Willeke (DESY).

HERMES status report. R.Milner (MIT).

H1 status report. K.Rosenbauer (RWTH Aachen).

ZEUS status report. P.Iacobucci (INFN Bologna).

HERA-B status report. C.Padilla (DESY).

Closed sessions: Feb. 19^{th}, 13:45-18:30

1. Approval of the minutes and matters arising from the last meeting.
2. Review of HERA.
3. Review of HERMES.
4. Review of H1.
5. Review of ZEUS.
6. Review of HERA-B.
7. Cohabitation task force report.
8. Miscellaneous.

Item 1. Approval of the minutes and matters arising.

The minutes were approved subject to minor modification and the proposed agenda was accepted.

D.Froidevaux could not attend the PRC meeting.

Item 2. Review of HERA

The chairman thanked the open session speaker for his informative presentation.

D.Saxon asked what electron beam polarization was anticipated in 97. HERMES had seen average polarizations of 53% and 50% for the 95 and 96 running periods, respectively, with a peak 96 value of 70%. F.Willeke replied that the fall in polarization seen during 96 was possibly correlated with the increase in beam emittance seen at higher currents. By reducing the vertical beam size at HERMES it is hoped that higher polarizations can be delivered.

F.Eisele observed that HERMES measure systematic differences in the polarization of the pilot and luminosity bunches during HERA ep luminosity operation. These differences are absent when only electron beam has circulated. F.Willeke stated that the bunches receive a different tune during luminosity running. This is responsible for the observed difference.

J.Jaros asked whether the observed HERA-B vertex detector track coordinate distribution was consistent with expectation. F.Willeke stated that the observed distribution was roughly circular and that this was consistent.

A.Wagner asked whether the monthly polarization reversal requested by HERMES was problematic. F.Willeke replied that experience was required, but problems were not expected.

M.Kasemann pointed out that, in view of the excitement generated by anomalous high x and Q^2 events, an increase in beam energy might be requested. F.Willeke replied that RF energy can be used to accelerate larger currents or provide higher energies. Currently priority is given to increasing the specific luminosity by increasing the beam currents, amongst other things.

J.Jaros observed that the HERA-B luminosity could be increased if the wire target was inserted before positron injection. F.Willeke agreed that positron injection interference with the proton beam is minimal and that early insertion should be tested. Concerns exist about backgrounds caused by the sharp edge of the proton beam which are currently smoothed by interactions with the positron beam.

Item 3. Review of HERMES

The chairman thanked the open session speaker for his excellent presentation and proposed that the experiment's referee, D.Saxon, should report.

The experiment should be congratulated for reaching the publication stage for the 95 data. The statistical error remains larger than those of other experiments, but this will improve with additional data taken with other targets. The experiment requests that the positron beam polarization be reversed every month.
The RICH upgrade can be easily integrated into the experiment. The design approach is conservative: the existing Čerenkov tank will be reused, Aerogel will form the radiator and PMs will be used for photon detection ($24\gamma/(\beta=1$ particle)). Although the additional ($4\rightarrow11\%$) material will degrade the tracking, slightly, the RICH is a natural extension to the HERMES detector.
The charm upgrade specifies components, in additional to the RICH, required to successfully analyse charm production processes. An iron muon filter and chambers, and a Forward Quadrapole Spectrometer, to detect scattered electrons, near the beampipe, are proposed in Phase 1. A Phase 2 upgrade would include additional wide angle muon detection. The charm upgrade requires high luminosity running. Competition can be expected from the CERN COMPASS experiment.

The discussion of the referee's report concentrated on the proposed upgrades.

H.Jackson reported that two variants of RICH costing existed, depending on whether 3/4 or 1/2 inch PMs were used. The funding for the 3/4 inch version was almost complete, but required PRC approval of the project before this could be finalized.

R.Milner pointed out that, of the two submitted proposals, the RICH was, by far, the most resource intensive. The RICH also has the highest priority followed by Phase 1 and 2 of the charm proposal.

D.Saxon asked whether the option existed of instrumenting only one half of the Čerenkov tank. It was stated that such a scenario would be justifiable in terms of the physics gains. Mirrors would be produced for both tanks and it is anticipated that funding would be confirmed making a half RICH installation academic.

H.Jackson reviewed the project planning. Engineering and technical manpower is available. Bari and Zeuthen sites may be involved in the testing of the ca. 6000 PMs required. A visit to a FNAL PM test facility is also planned. P.Söding pointed out that the availability of manpower and resources at Zeuthen has not yet been checked. U.Gensch observed that DESY MEA manpower commitment must be reviewed carefully in view of the HERA luminosity upgrade schedule. B.Wiik stated that the Zeuthen and MEA manpower requirements will be reviewed by the Directorate.

N.Wermes pointed out that 14γ's were expected for fully relativistic particles and asked at what point the RICH performance would be effected by a reduction in the number of γ's produced. N.Makins answered that the threshold turn on was so quick that this could be considered as the cutoff point.

A.Bruell observed that Phase 1 of the charm upgrade proposal required approval for installation in the 97/98 shutdown. The original detector elements would profit from the additional shielding provided. Some concern exists about the usage of the spare DESY quadrupoles. The success of the phase 2 upgrade relies heavily on a higher target density and therefore the success of the ongoing target development.

In view of the physics results expected, B.Wiik asked whether the charm upgrade would be able to compete with COMPASS. A.Bruell replied that the COMPASS turn on would probably be complicated. Their proposal foresees a very high beam intensity and funding is being reviewed. HERMES's sensitivity to $\Delta G/G$ should be 0.15 by using data collected between 98 and 2001 and COMPASS will not immediately improve this.
L.Foá reported that CERN had now approved a modified COMPASS technical proposal, the search for double charmed baryons has been removed. The aim is now to run in 99 and finally measure $\Delta G/G$ to 0.10.
B.Wiik asked whether RHIC would compete on $\Delta G/G$. R.Milner replied that beam polarization would be developed after 2002 and that RHIC had some advantages and disadvantages.
A.Bruell stated that no single experiment could measure the entire x range of the gluon. In this respect the HERMES measurement of charm production near threshold would be interesting.

The PRC now discussed the proposals in closed session.

The PRC recommended the approval of the RICH detector. Funding is secure for the half detector solution, but it is expected that the full detector will be built.

The PRC recommended the approval of the Phase 1 charm upgrade. Phase 2 should be reviewed once a significant improvement of the target density has been achieved.

Item 4. Review of H1

The chairman thanked the open session and special seminar speakers for their informative and exciting presentations.

The H1 technical coordinator, P.Biddulph, reported that the detector was ready for the 97 data taking period. There had been a drop in the gain of the central drift chamber (CJC2) and the gas mixture has now been replaced by the HRS mixture giving higher gain at smaller E field. The CJC2 wires will be replaced during the next shutdown.

The observation of events at very high Q^2 prompted a number of questions. N.Wermes queried whether a smaller, 10 GeV, mass window would have been more appropriate in view of the detector resolution. Y.Sirios replied that the choice of 20 GeV was conservative. A.Martin was interested in the QCD smearing.

The PRC committee had no specific recommendations w.r.t. H1.

5. Review of ZEUS

The chairman thanked the open session and special seminar speakers for their informative and stimulating presentations. A.Caldwell and P.Iacobucci were introduced as the new ZEUS spokesman and deputy spokesman, respectively.

A.Caldwell reported on the ZEUS status and planning issues not already covered in the open session presentation.
The 96 running period had been a very good year for ZEUS, 10.6 of the 17.2pb^{-1} delivered by HERA can be used for analysis. New installations and upgrades of existing components were successfully carried out. A major effort is being made to understand and reduce the Third Level Trigger (TLT) output rates. This is important for reducing offline storage and processing requirements. Due to a water leak the Forward Hadron Electron Separator will not be powered. A full understanding of the leak is required before operation can be safely continued.
The 96/97 short shutdown was used to carry out a number of small upgrades.
An interest (F_L,etc.) still remains for running at lower proton beam energies, but in view of the interest in high x and Q^2 physics it may well be that no low energy running is possible. The request is made for a discussion of this at the May HERA coordination meeting.
The new, longer, HERA luminosity schedule has lead to a reappraisal of the 97-99 computing and storage requirements of the experiment. The new DESY tape robot has sufficient capacity, but 1.4TB of disk storage and 2.3 $\times$ the processing performance will be required.
Good collaboration exists with the HERA groups concerning luminosity upgrade proposals.
The physics case, funding, responsibilities and milestones for the proposed Forward Plug Calorimeter (FPC) and Silicon Micro Vertex Detector (MVXD) were presented.

The chairman proposed that the MVXD proposal be reviewed by J.Rander.

The physics case is evident and justifiable. The foreseen MVXD group is of sufficient quality and is above the critical strength required, which allows currently competing binary and analogue readout designs to be studied. The schedule is well understood in terms of the milestones that must be met.
Some concerns exist. The justification of the third barrel layer of detectors rests on redundancy and the requirement that the MVXD second level trigger provide track (3 layer) and vertex information. The MVXD would give ZEUS an additional charm trigger ready for the HERA luminosity upgrade. A ZEUS prototype frontend system must be ready a.s.a.p. and this is foreseen in the milestones. If this is jepardized, possibly by chip delivery delays, the schedule will slip. The proposal forsees the usage of radiation hard components. Is this required and have enough precautions been taken w.r.t. accidental damage ?

The discussion of the MVXD was opened by A.Caldwell stating that no show stoppers could currently be seen. The component's Second Level Trigger (SLT) implementation is likely to be demanding.

In reply to N.Wermes, it was stated that the amount of additional material introduced into ZEUS was 1.4% of a radiation length.

J.Jaros expressed his surprize that an aggressive design had not been pursued. On paper higher performance MVXD charm taggers could be envisaged. R.Klanner stated that strip pitch and analogue readout were important for precision. Double sided detectors would probably lead to a 1 year delay and double the cost. The aggressive design is thought to involve too many risks.

J.Jaros asked whether the HERA high luminosity beam optics would allow a smaller radius beampipe. A.Caldwell reported that different designs are being discussed. The beampipe will be made from carbon fibre.

N.Wermes elaborated on the delivery and testing delays often incurred when using radiation hard chips. The scheduled replacement of non radiation hard components might avoid this problem.

A.Wagner stated that the HERA luminosity upgrade program must foresee the installation of a controlled electron beam dump. D.Trines replied that this was being considered.

A.D.Martin asked what were the implications of not installing a rear wheel of detectors. J.Rander pointed out that if the rear wheel is not installed then the rear volume could be advantageously used for cabling and piping etc..

The chairman now proposed that the FPC proposal be addressed. S.Bethke gave the referee's report.

The design is well understood and the schedule is possible, in spite of the short period available before installation in the 97/98 shutdown. A number of concerns exist. The 6mm clearance w.r.t. the beampipe when closing the detector should be carefully monitored. The important calibration run at CERN in Aug. 97 cannot be missed. The detector is more highly segmented than is perhaps required.

A.Caldwell stated that the clearance of 6mm had previously applied to the calorimeter and that no problems had occurred. The calibration at CERN is definitely required, but if a disaster were to delay the FPC then a duplicate module could be calibrated and the results applied to the installed FPC. The segmentation matches that of the surrounding depleted-uranium calorimeter (FCAL) and will allow easier analysis of jets spreading between the two.

A.D.Martin asked how closely in angle could a jet approach the beampipe and still be reconstructed. G.Wolf stated that the cutoff would be between 2 and 3 degs.

B.Wiik asked whether there would be appreciable resource interference between the FPC and the MVXD projects. A.Caldwell reported that this had been reviewed in January and was not thought to be a problem.

The PRC now discussed the proposals in closed session.

The PRC acknowledged the physics case for the MVXD and approves the detector subject to receiving a detailed technical proposal.

The PRC recommended approval of the FPC.

6. Review of HERA-B

The chairman thanked the open session speaker for his presentation and asked B.Schmidt to review the current status of the inner detector.

The destruction of the MSGC strip by hadronically induced large ionization discharges remains an insurmountable problem. It is concluded that MSGC cannot currently be used to give fast signals and radiation hardness in hadronic collider environments.
A preliminary investigation of other technologies suggests that Scintillator Fibre

Trackers (SFT) could provide HERA-B with a baseline inner tracker. This detector would have 100K channels and require PM readout. The advantages of SFTs are: robustness (provided radiation damage is moderate), simple operation and access to active components. The disadvantages are: small signals, an increase in the amount of material, expensive readout and the necessity to start development from scratch. The SFT technology will be used to develop a HERA-B inner tracker.

J.Jaros gave the referee's report. The inner tracker developments have been reported. The use of SFT technology should provide a simple, robust detector which could work. The SFT project is being correctly addressed, the work on MSCGs is continued as a possible backup solution. Other technologies (gas chamber) have very large lead in times.
The 96 running gave impressive results and saw the resolution of the background cohabitation issues. The DAQ systems of some of the detectors are now working. The detector occupancies are consistent with the MC simulations. Many subsystems are making progress, but construction, the Silicon and RICH are behind schedule. The First Level Trigger cards (FLT) are still not in production.
The experiment will profit from the continuing effort being made to install detectors into the DAQ environment and the trigger system will be tested in the autumn.
The experiment's software is experiencing a crisis similar to that happening at BABAR. There is a lack of suitably qualified system managers and programmers, consequently planning w.r.t. mass storage, databasing, etc. is not yet being addressed.
Additionally detector alignment, surveying and other engineering tasks are not being addressed with sufficient resources.

B.Wiik stated that DESY was required to reduce its personnel by 2% per annum. It was therefore difficult to provide extra manpower, other than that foreseen by the Post. Doc program and, possibly, from computer center experiment support groups. A.Wagner and U.Gensch stated that the experiments should approach these groups.

U.Gensch asked what computing resources were foreseen. A.Schwarz stated that PC based trigger farm connected via a SHARC driven PCI switch would be used.

It was stated in reply to B.Wiik, that 10-20% of the SFT system could be installed during the 97/98 shutdown, provided no problems occurred. Even, if no inner detector could be installed then certain tests of the experiment's trigger and DAQ systems could be carried out. A complete installation of the SFT would require a 2 month access. Additionally if the light output were too low then the detector thickness would be increased.

N.Wermes asked whether any penalties were incurred at the trigger level due to the use of SFTs. It was stated that there would be some loss of trigger efficiency.

The PRC committee had no specific recommendations w.r.t. HERA-B.

7. Cohabitation task force report

R.Klanner reported the findings of the cohabitation task force. The good collaboration of HERA, HERA-B and the other experiments had allowed cohabitation measurements to be carried out in 96. The results were found to be reproducible and the new collimator system used during 96 has been very effective for background reduction. Those backgrounds seen at ZEUS and HERMES are now understood and can be adjusted to give acceptable running levels. No background problems were observed at H1. Cohabitation has therefore been demonstrated.

The PRC recognized the excellent work carried out by the task force. It recommended that the task force remain active under the coordination of the HERA experiment coordinator, currently M.Kasemann.

Item 8. Miscellaneous

The next meeting of the PRC will be on July 24^{th} 1997. At that meeting a report on the results of the workshop "Future Physics at HERA" will be given, the AMANDA experiment will be reviewed as will the HERA luminosity upgrade plans.

J.Jaros and F.Barriero, having reached the end of their participation on the PRC, were thanked by the chairman. Their replacements will be announced later.

The current list of PRC referees is:

H1 - N.Wermes
HERA-B - D.Froidevaux
HERMES - D.Saxon
ZEUS - J.Rander and S.Bethke
AMANDA - Y.Totsuka and G.Heinzelmann

(C.Youngman - 1^{st} April 1997)