DRAFT Minutes of the 40th Meeting of the PRC

DESY 1st - 2nd July 1996

PRC members present:

S.Bethke (Aachen), W.Buchmüller (DESY), F.Eisele (Heidelberg,Wissenschaftlicher Rat), L.Foá (CERN), D.Froidevaux (CERN), U.Gensch (DESY), G.Heinzelmann (Hamburg) [2nd], J.Jaros (SLAC), M.Kasemann (DESY) [2nd], 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 present:

HERA - R.Bacher (DESY) [1st]
HERMES - R.Milner (MIT), A.Simon (Freiburg), A.Bruell (MPI-Heidelberg). [1st]
HERA-B - A.S.Schwarz (DESY), W.Hofmann (MPI-Heidelberg), W.Schmidt-Parzefall (DESY), P.Krizan (IJS-Ljubljana), R.Schwitters (Texas-Austin), J.Spengler (DESY). [1st]
H1 - R.Eichler (ETH-Zurich), P.Biddulph (Manchester), W.Braunschweig (Aachen), H.-U.Martyn (Aachen). [1st]
ZEUS - R.Klanner (DESY), R.Yoshida (Bristol), A.Caldwell (Columbia). [2nd]
AMANDA - C.Spiering (DESY-IfH Zeuthen). [2nd]

The PRC received the following documents:

PRC 96/05
Proposal for tagging High Energy Photons in the H1 Detector at HERA. H1 collaboration.
PRC 96/06
Technical Proposal to build a Special Spectrometer covering Very Small Momentum Transfers. H1 collaboration.
PRC 96/07
Letter of Intent. AMANDA Upgrade and Feasibility Study for KM3. AMANDA group, DESY-IfH Zeuthen.

Open session. Jan. 16th, 10:00, Main Auditorium

HERA status report. R.Bacher (DESY).

ZEUS status report. R.Yoshida (Bristol)

H1 status report. H.-U.Martyn (Aachen).

HERMES status report. R.Milner (MIT).

HERA-B status report. P.Krizan (IJS-Ljubljana).

AMANDA review. C.Spiering (DESY-IfH Zeuthen).

Closed sessions: Jul. 1st - 2nd, 14:30-18:30 and 9:00-12:00, Sem. Rm. 1

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

2. Review of HERA.
3. Review of HERMES.
4. Review of HERA-B.
5. Review of H1.
6. Review of ZEUS.
7. Review of Cosmic Ray.
8. Miscellaneous.

Item 1. Approval of the minutes and matters arising.

The minutes of the 39^{th} meeting of the PRC were approved subject to minor corrections.

The PRC member F.Barreiro (Madrid) was unable to attend the 40^{th} PRC.

The chairman welcomed S.Bethke (Aachen) as a new member of the PRC with refereeing responsibilities for the ZEUS experiment.

Item 2. Review of HERA.

The chairman thanked the open session speaker for his talk and proposed that the reported status of HERA be discussed.

B.Wiik stated that the technical preparations for installation of the NEG pumps had been completed. The ordering schedule would be reviewed after the August beam planning meeting with the experiments.

F.Eisele highlighted the non reproducibility of injected beam quality. It was stated that no new diagnostic tools are available to provide a quantitative understanding of the problem. The current policy, was therefore, to replace the proton fill after a single luminosity run.

D.Saxon queried whether the reversal of beam polarization required by HERMES would have repercussions on the ep experiments. R. Bacher replied that the preliminary optics calculations had been made and a test reversal was anticipated in September which might require a day of machine studies. Routine polarization reversal should not create problems for the ep experiments.

J.Jaros asked for clarification of the HERA-B vertex tank shield installation and queried whether the electron beam compensation coil field effected polarization. D.Trines replied that the RF wire shield, favoured by HERA-B, could not be installed for the 96 running period due to mirror current induced wire breakage worries. A slotted sleeve shield was being installed. Differences between the calculated and measured HERA-B dipole field can be allowed for and no problems are expected, by the machine group.

D.Froidevaux observed that the vacuum in the HERA-B region was bad and reduced the beam lifetime. It was stated that improvements had been made and that the lifetime, currently 5h was now improving.

The chairman concluded the session by reviewing the status of HERA longterm upgrade plans,

- ep luminosity upgrade to 7-8.0$\times 10^{31}$, i.e. a fivefold increase w.r.t. the design luminosity.

- polarized proton beam. A feasibility design study report would be reviewed in September, thereafter a design project could be initiated.
- heavy nuclei beams. A study should be initialed, possibly in collaboration with GSI-Darmstadt, followed by a physics study in the summer of 97.

These proposals should be reviewed at one of the next PRC meetings.

Item 3. Review of HERMES.

The chairman thanked the HERMES open session speaker and asked the referee, D.Saxon, to present his report.

D.Saxon stated that the operational problems existing one month ago had now been solved and that the priority was now accumulating as much data as possible. The choice of target for 97 would be made by the collaboration during the autumn review of detector running and physics analysis. The experiment requires reversal of the beam polarization to allow measurement of Λ decays which can be used to remove Monte Carlo dependencies. A test reversal is planned, and if successful there would be a request to implement reversals routinely.

A.Wagner noted that the experiment required a monthly rise time measurement of polarization. R.Milner agreed, but as no specific machine tune was required, this could be carried out parasitically.

F.Eisele observed that the systematic errors proposed for HERMES were better than E142, but that this was not seen in the presentation. R.Milner replied that results presented were from spring 96, the final systematic error will improve.

N.Wermes pointed out that two techniques for measuring molecular H contamination to the H target were presented. Did this indicate that the experiment was concerned about contamination and what was the level of contamination. R.Milner replied that the contamination is estimated to be 10%. A 7% measurement can be made in 30 minutes using Bhabha scattering and the degree of polarization will be measured in a duplicate cell in Erlangen.

In reply to B.Wiik, the SLAC schedule was reported to include H and D_2 running for E154. A Li-H target is being prepared and measurements will be made down to x of 0.014.
The x limitation limiting HERMES in the inclusive analysis could be lowered by using semi-inclusive channels; a feasibility study is underway.

The committee had no specific recommendations w.r.t. HERMES.

Item 4. Review of HERA-B.

The chairman thanked the open session speaker for his comprehensive presentation and suggested that the detector development issues be reviewed.

F.Eisele presented the inner tracker MSGC status.

- Ageing and rate problems have been solved using diamond coated glass substrates and gold electrodes.

- Large, 30×30 cm^2, have been produced with good electrode quality over the full surface area. The 50% yield in constructing good chambers is considered sufficient and would be expected to improve with mass production.

- A sparking problem has been observed which led to a loss of 1 anode/hour under test conditions. This was caused by electron avalanches in the region of the anode edge initialized by heavily ionizing particles, and has been observed by other MSGC groups. Two solutions have been proposed: modifying the cathode design at the edge to step down the voltage and grounding the cathode. A solution can be tested by the end of July.

- Mechanical supports for the detector are designed and a prototype is being constructed.

- A prototype 32 channel frontend readout chip is being used. An improved 128 channel chip will be delivered in July, which with the driver board currently being tested will allow full chamber readout in October.

- The foreseen timeschedule is: install a MSGC in HERA in Sept., produce 12 additional chambers in Oct./Nov., complete a full detector plane in Feb. 97 and complete mass production of the 200 chambers required during 97.

W.Hofmann presented the vertex tank status. As previously mentioned a pipe/sleeve RF shield has been installed for the 96 running period instead of the foreseen wire design. Further shield design test will be made at Naples and Monte Carlo calculations at DESY. The experiment request a 24h time window before the final 96 machine studies to install a new shield. Normal vacuum conditions would be reached within 1 week.

R.Schwitters presented the RICH status. Calculations and results of comparative test between TMAE and multi-anode photomultipliers (MAPMTS) have led to the decision to use MAPMTS in the RICH photon detector. The principle advantages are the improved photon detection (30-40γ's/particle) and the stable ageing characteristics ($\sim$ 10 HERA years). Approximately 2-3K MAPMTS with light collectors are required. More precise details of the MAPMT system will be presented at the next PRC.

The HERA-B referees, J.Jaros and D.Froidevaux, presented their report. HERA-B should be congratulated on the progress being made. Major concerns still exist: the compatibility with other experiments and occupancies in the detectors. The referees fully support the move to MAPMTS in the RICH system, the production issues must be clarified before the next PRC. The MSGC status has improved, the discharge problem remains a concern. The referees recommended:

- R.Klanner's cohabitation task force should report its findings.

- The detector occupancy issues must be clarified.

- A full RICH prototype should be completed by Oct. along with a production schedule.

- A final prototype MSGC system should be available by Oct.

- The highest priority should be given to getting the experiment on the floor by 98.

The open discussion of the HERA-B review concentrated on funding and scheduling requirements. The existing cost sharing agreement would be reviewed in August.

The committee agreed with the referee's recomendations. The machine group was requested to clarify the requested time window for replacing the RF shield.

Item 5. Review of H1.

The chairman thanked the open session speaker for his presentations and proposed that additional H1 presentations be made before the committee's discussion of the submitted proposals.

The technical coordinator, P.Biddulph reviewed the detector status. A number of new detectors and upgrades to existing systems have been installed during the shutdown. These are working satisfactoraly although some minor problems exist. The carbon fibre beampipe could not be installed due to hydrocarbon contamination, subsequent cleaning of the pipe will allow installation in the next long shutdown. A number of minor detector problems exit. The CST readout electronics generates a 20 MHz noise signal in other detectors. It may be necessary to run the CST with increased thresholds to avoid this problem.

P.Biddulph reviewed the, Proposal for tagging High Energy Photons in the H1 Detector at HERA, document submitted (PRC 96/05). The tagger is a scintillator based device to be installed 8m from the interaction point in th electron beam direction. The tagger will extent the experiments high y photoproduction acceptance in the range $0.85 \leq y \leq 0.95$. The design requires modification of the beampipe. Manpower and funding exists and the time schedule foresees installation in the 96/97 shutdown.

W.Braunschweig reviewed the, Technical Proposal to build a Special Spectrometer covering Very Small Momentum Transfers, document submitted (PRC 96/07). The VLQ detector is a combined tracker (GaAs) calorimeter (SPACAL,$14\%E^{-1/2}$) detector designed for photoproduction measurements in the range, $0.02 \leq Q^2 \leq 1$ GeV^2. The detector will be installed 3m from the interaction point in the proton beam direction. The design forsees mounting the device of the face of the compensator and requires modification of the beampipe, ideally a moveable beampipe is required although a fixed solution could be used. Manpower and funding exists and the time schedule foresees installation in the 96/97 shutdown. As with the tagger proposal, the readout electronics will reuse existing solutions. Note that the proposed HERA luminosity upgrade might require removal of the VLQ.
D.Trines stated that discussions had been held with the machine group w.r.t. the beampipe changes required. Willeke agrees with the simulation results and no machine problems are expect. The availability of manpower within the vacuum group must be reviewed.

The H1 referee, N.Wermes, presented his report. The physics justification for the proposed tagger and VLQ are well proven. The tagger construction and installation is straightforward.
The VLQ, although more complex, is also straightforward given the in house experience with GaAs (RWTH Aachen) and SPACAL. The principle issues are: it's incompatibilty

w.r.t. HERA upgrades, shadowing of the VLQ by the SPACAL, possible synchrotron radiation backgrounds, availability of test beam and the aggressive time schedule. Realistically an installation in the 97/98 shutdown is possible, in which case is enough time available for the physics targeted ?

The open discussion of the H1 review concentrated on the VLQ proposal.

R.Eichler pointed out that a PRC recommendation was required to allow access to the organized funding.

L.Foá expressed his concern w.r.t. the quality of position measurements, large backscattering rates could fill the detector. W.Braunschweig replied that backscattering had been included in the detector simulations.

D.Froidevaux asked whether the excellent z precision was justified. H.-U.Martyn replied that this provided extra selectivity against beamgas backgrounds.

A.D.Martin asked whether the VLQ improved the x,Q^2 measurement capabilities w.r.t. ZEUS. In reply it was stated that the Q^2 range is increased to lower values and that the x and Q^2 resolutions are improved.

The chairman thanked the H1 members present for their contributions. The committee now discussed its recommendations w.r.t. the proposals made. The following recommendations were made:

- Proposal for tagging High Energy Photons in the H1 Detector at HERA.
  The PRC recommends the approval of the proposed tagger.
- Technical Proposal to build a Special Spectrometer covering Very Small Momentum Transfers.
  The PRC acknowledges the physics case for the VLQ detector. It recommends that the collaboration clarifies a.s.a.p. the following issues before a recommendation is given:
  - interference with the machine (beam pipe related issues),
  - interference with the luminosity upgrade,
  - clarification of the tracker performance and the necessity for it,
  - a review of radiation damage related issues,
  - a review of existing technologies given the short active lifetime, and
  - a test beam program due to the short time available for debugging the detector in situ.

R.Eichler's, H1 lumi requirements for 96, presentation is minuted at the end of the ZEUS review, where the ep lumi requirements were discussed.

Item 6. Review of ZEUS.

The chairman thanked the ZEUS open session speaker for his comprehensive presentation and asked R.Klanner to summarize the detector status.

Analysis of the 95 data is continuing, the data is of excellent quality. In preparing for the 96 running ZEUS has installed or upgraded a number of components.

- 44m tagger (photoproduction $W_{\gamma p}$=65-120GeV) installed and working.
- 8m tagger (high y DIS γp veto and tagged γp $W_{\gamma p}$=280GeV) installed and working.
- BPC (Beam Pipe Calorimeter) the radiation damaged scintillator has been replaced.
- FHES (Forward Hadron Electron separator) 50% of the 10000 Si-diodes are installed and implemented.
- CFLT (Calorimeter First Level Trigger) now has full efficiency at 5GeV energy threshold.
- TLT (Third Level Trigger) moved to FDDI network connectivity.

The development schedule foresees installing the BPRES (Barrel Presampler) in the long 96/97 shutdown. The FPLUG (Forward Plug Calorimeter) proposal has been halted, it is incompatible with the HERA luminosity upgrade. Internal discussion of a microvertex detector is converging and a PRC proposal can be expected by the end of the year. The planned upgrade of the luminosity measurement has been postponed until the HERA luminosity upgrade requirements are clarified. A test program is underway to replace the BPC by a $PbWO_4$ calorimeter and Si-microstrip tracker.

The open discussion of the ZEUS review was started by D.Saxon asking whether FPLUG development would be continued if the HERA luminosity upgrade were to be delayed. R.Klanner replied that the manpower problems in designing the correct beampipe mean that the development would take 2 years. Even if the upgrade is in 99 the FPLUG would not be able to produce physics results.

In reply to N.Wermes it was stated that the Si tracker extension to the replacement BPC would increase the physics capabilities at lower y and Q^2. The backsplash probability is of the order of 5%.

The PRC made no specific recommendations w.r.t. the ZEUS detector.

The H1 and ZEUS running requirements for 96 were presented by R.Eichler and R.Klanner, respectively. While H1 would like to run only at 820 GeV, ZEUS would like to collect 5pb^{-1} at 820 GeV and 3pb^{-1} at 450 GeV in order to make a first measurement of R.

The PRC supports the proposal of the Directorate to postpone the decision about the amount of low energy running until July/August 1996 when more information is available about the HERA performance.

Item 7. Review of Cosmic Ray.

The chairman thanked the open session speaker for his presentation.

The PRC listened with interest to presentation of the status of AMANDA and its future plans:

- Nov. 96 completion of AMANDA-B (a smaller size precursor to AMANDA-II, and the predecessor to AMANDA-A, each with a common centerline).

- Dec. 96 complete the AMANDA-II proposal.
- 97 build 2 AMANDA-II detector strings.
- 97 produce a preliminary KM3 (a cubic km detector) proposal.
- 98/99 complete the AMANDA-II detector.
- 98 complete the KM3 technical proposal.
- 99+ start KM3 construction.

The principle aim of the AMANDA series of detectors is to produce a map of galactic neutrino sources.

D.Froidevaux asked whether any of the detectors on the strings will be upward facing. This would allow information from the two surface (space) arrays to be more easily included into the analysis. It was stated that this was currently being debated by the collaboration, however the photon distribution was fully isotropic after a 50m passage through the ice.

D.Saxon pointed out that the angular resolution of the reconstructed neutrino flight path was currently 6°. In comparison at Baikal a 1-2° measurement was achieved. It would seem reasonable that an improvement in resolution be proven well ahead of major development.

The PRC encorages the group to present a proposal for the AMANDA-II detector in November 96, including a discussion of the physics case. A detailed Monte Carlo optimization of the detector should be carried out. Strong weight should be given to the dfetermination and understanding of the angular resolution which can be achieved by AMANDA.
The ongoing preparations are considered as a preparation for AMANDA-II. A possible approval of AMANDA-II will not prejudice any decision concerning KM3.

Item 8. Miscellaneous.

The next PRC meetings have been scheduled for:
8-9th October 96, 19-20th February 97, 24-25th June 97 and 4-5th November 97.

The current list of PRC referees is:

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

(C.Youngman - 1st September 1996)