

Minutes of the 54th Meeting of the PRC

DESY 30-31st October 2002

PRC members present:

M.Albrow (FNAL), S.Bertolucci (INFN-Frascati), R.Cashmore (CERN),
R.Forty (CERN), U.Gensch (DESY-Zeuthen), E.Hughes (Caltech), K.Jakobs (Mainz),
R.Klanner (DESY), J.Mnich (Aachen), L.Rolandi (CERN,chairman), D.Trines (DESY),
B.Spaan (TU Dresden), A.Wagner (DESY),
K.Borras (DESY,secretary), U.Schneekloth (DESY,HERA experiment coordinator).

Non PRC members attending closed session items:

POL2000 S.Schmitt (Zurich), M.Jacquet(Orsay), N.Meyners(DESY),
C.Pascaud (Orsay), P.Schüler(DESY), B.Zihlmann(NIKHEF).
HERA B.Holzer (DESY),M.Bieler (DESY),J.Keil (DESY), F.Willeke (DESY)
and representatives from the experiments.
H1 M. Klein (DESY), T.Greenshaw (Liverpool), D.Pitzl (DESY),
P.Newman (Birmingham), B.List(Zurich).
ZEUS B.Foster (Bristol), M.Kuze (KEK), W.Zeuner (DESY),
R.Yoshida (ANL), E.Tassi (NIKHEF).
HERA-B M.Medinnis (DESY), B.Schmidt(DESY),
A.Zoccoli (Bologna), J. Spengler (MPI Heidelberg).
HERMES D.Ryckbosch(Gent), E.Aschenauer (DESY),
M.Amarian (DESY), M.Bouwhuis (Illinois).
AMANDA & IceCube
C.Spiering (DESY)
R&D for TESLA Detectors
F.Sefkow(DESY), P.Checchia (Padova), M.Margoni (Padova),
P.Dauncy (London), J.Cvach(Prague), V.Korbel (DESY), R.Yoshida (ANL),
W.Lohmann (DESY-Zeuthen), A.Stahl(DESY-Zeuthen), N.Choumeiko (Minsk),
D.Pitzl (DESY), J.Gayler (DESY).

The PRC received the following documents:

PRC 02/01 R&D for the TESLA Detector: Instrumentation of the very forward region

Agenda:

Open session. May 16th 2002, Main Auditorium

TESLA Detector R&D:

LAT/LCAL – A.Stahl (DESY),
LCCAL – M.Margoni (Padova),
CALICE – P.Dauncy (IC London).

HERA – F.Willecke (DESY).

ZEUS – E.Tassi (NIKHEF).

H1 – B.List (ETH Zurich).

HERA-B – B.Schmidt (DESY).

HERMES – E.Aschenauer (DESY).

Closed sessions: May 16-17th 2002

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

Item 2. News from the Lab.

Item 4. Review of POL2000.

Item 3. Review of HERA.

Item 5. Review of ZEUS.

Item 6. Review of HERA-B.

Item 7. Review of H1.

Item 8. Review of Amanda/IceCube.

Item 9. Review of HERMES.

Item 10. Review of R&D for TESLA Detectors.

Item 11. Miscellaneous.

Item 1. Approval of the minutes and matters arising.

The chairman opened the 54th session by welcoming all PRC members. The chairman thanked the retiring members: M.Albrow, J.Arviex, J.J.Aubert, A.Buras, E.Hughes for their commitment and contributions to the PRC.

J.Arviex, J.J.Aubert, A.Buras and E.Reya were unable to attend the meeting.

The minutes of the 53rd PRC were accepted without changes.

Item 2. News from the Lab.

In his report A.Wagner concentrated on two issues: the status of HERA and the status of TESLA.

Concerning HERA, the strategy from the last meeting had helped enormously to understand where the problems are and to study them. A rough guideline for the future running of HERA has been developed. Running time is divided into four periods which should deliver similar number of events from e+ and e- with the two different polarizations.

In the area of TESLA A.Wagner emphasized the excitement in the community for this project. The recommendation of the German Scientific Council required the laboratory to provide: for the linear collider a more precise plan for financing the project within a world wide collaboration and for the FEL a technical design report with an accelerator separate from the linear collider. The outcome of the discussion is not yet clear, a decision is expected by spring 2003.

The TTF has been running since August with good performance. One module has been pushed to the design goal and as mentioned during the last meeting now four modules are available. The TTF1 is being disassembled and modified to TTF2 by spring 2003. The start of commissioning is planned for the middle of year 2003.

DESY is in close contact with SLAC for laser developments and A.Wagner will sign a Memorandum of Understanding. The aim of the collaboration is to investigate and produce short pulse and high intensity operation. Within the international community the technical review of TESLA with 500 GeV is acknowledged, TESLA operation with 800 GeV is now feasible using higher performance cavities. Meanwhile Spain joined the international organization. The international Committee for a linear collider, established in spring 2002, has started to work on specifying machine developments and performance and studied organizational issues.

In the ensuing discussion it was noted that the framework for the government decision in 2003 is surprising regarding the present finance problems. A.Wagner emphasized that two issues have to be kept separate: participation in the project with agreement of a worldwide collaboration and financing. In this connection the situation in the US was discussed and the visit of Ray Orbach, the head of the office of Finance and Technology of the DOE, to DESY was taken as a positive sign regarding DOE strategy.

The PRC acknowledges the large amount of progress visible in the area of the TESLA collaboration and congratulates DESY on the achievements being made.

Item 3. Review of POL 2000.

In his report S.Schmitt briefly summarized the status of the polarimeters. LPOL measurements with currents smaller than 10mA have turned out to be difficult. The hardware of LPOL needed no changes since the running in 2002, but the laser support ends after 2003 when the POLCA project is ready to step in with the LPOL cavity. The new

ADC and readout are working well for TPOL. Off-line analysis confirms the correctness of online results. The analysis of the silicon detector data for calibration purposes is in progress. Planned work on the silicon detector during the shut-down include the addition of cooling, HERA clock synchronization and replacement of silicon detectors. For the cross-calibration of LPOL and TPOL a polarization of $> 30\%$ with stable beam of $I > 15\text{mA}$ for several hours is needed.

M.Jacquet reported on the status of the POLCA project. For the test cavity the alignment locking works well. According to the presented scheme the final cavity is planned to be ready by mid November 2003. With better mirrors and an improved alignment the expected design value for the gain should be achieved in the final cavity. Its installation will take about 6 weeks. Calibration of the optical elements and diode signals are important for a per mille precision measurement of polarization. Work on the temperature stabilisation of the p-diodes and the electronics using Peltier modules with $\Delta T < 0.1^\circ$ is in progress.

E.Hughes gave the referee report. He commended the group for the tremendous progress and noted that the manpower situation looks good. The group should be able to finish the installation within 6 weeks. Some caution should be taken with the time estimates for commissioning the Compton polarimeter. He encouraged the group to move the project to DESY as soon as possible to gain experiences with the situation in the tunnel, for example with the temperatures. Since the group is dealing with a new device they need early beam tests and should run with e^+/e^- at 12 GeV.

In the ensuing discussion those tasks requiring beam during installation and commissioning were identified. The installation of an orbit feedback system, as used for H1 and ZEUS, was proposed to ease the beam steering at the startup of the measurements.

The PRC congratulates the polarization team for the results shown on the first polarization measurement at HERAII, and for the progress in the construction of the cavity. It encourages the team to install the cavity at the beginning of the spring 2003 shutdown and takes note that some dedicated runs for commissioning will be needed.

Item 4. Review of HERA.

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

The following discussion concentrated on the vacuum situation. Carbon production at the pumps has been observed. The measured Methane gas pressure increases during beam operation and decreases when beam is dumped. The list of items to study for solving the problems is long and detailed. Additional items like malfunctioning bellows with damaged RF-fingers, which caused sudden beam losses in 2000, could worsen the vacuum locally and have to be taken into account.

A.Miller summarized the results of the HERA background review. The recommendations include the following items:

- progress towards a better understanding of all the problems will be best served by giving highest priority to developing and refining routine and reliable HERA two-beam operations at ever higher beam currents, with emphasis on the lepton current for vacuum surface processing.
- Further background studies should be integrated with developing luminosity operation using e.g. isolated pilot bunches in both beams.
- Two-beam operation could include collisions provided that this does not seriously impede the study of surface processing, machine development and parasitic background.
- All possible efforts should be devoted understanding fully the present vacuum limitations in the relevant region $0 < z < -20\text{m}$. Several suggestions were listed.

In his outlook A.Miller concluded:

- contributions to the p-gas problem are not fully understood, but progress is being made.
- Much more work and better understanding is needed before HERA will be ready to proceed with a several-month shutdown to correct the remaining problems.
- Studies with beam polarization should be given lower priority in order to pursue solutions for urgent known problems.
- The committee may reconvene in mid-January 2003 to review the situation.

The discussion continued on the need of a feasibility study to install additional ion pumps. It was emphasized that the vacuum condition will improve further with continuous running. The date of the interlock tests was a discussion item. Balancing the legal requirements against beam operation lead to scheduling the tests during early March 2003. The lower priority for polarization was debated. Uncertainties exist in the ability to achieve polarization and whether it can be produced under final luminosity conditions. If problems exist a longer study program would be needed. Another review of the situation is envisaged for early 2003.

The PRC congratulates the HERA team for the progress achieved in the operation of the machine and acknowledges the efforts to understand the background. It strongly recommends that a long shutdown should only be undertaken when the measurements needed to reduce the dynamic increase of the vacuum and the related proton-gas background are understood. The PRC thanks the background committee for its thorough review and takes note that a new meeting of this committee will take place before the long shutdown in order to study the validity of the proposed changes. The PRC agrees with

the strategy that the understanding of the background has priority over polarization tuning and the running of the experiments.

Item 5. Review of ZEUS.

The chairman congratulated the speaker of the open session on his presentation and on the progress visible for the computer farm.

In his report B.Foster announced a new group in ZEUS: Louvain. While the number of authors and non-students in ZEUS is continuously decreasing the number of students stays constant. All elements of the luminosity detectors are now installed and working, including the 6m tagger and the new electronic system. Radiation damage of the 6m tagger is visible and it may be necessary to replace the scintillator fibres during the shut-down. The lifetime should be ok when the background problems are fixed. A great deal of experiences with the Micro-Vertex-Detector (MVD) has been accumulated over the past few months of running despite the difficult background situation. Presently there is no evidence for radiation damage although the diode dose is about 80 kRad. The MVD itself may have received less radiation. With improved tracking software the examination of the capability of the dE/dx measurements prove the readiness of the MVD to perform physics studies. One major physics goal from the next period is to get enough good tracks for the MVD alignment from data. After commissioning the Global-Track-Trigger gives encouraging results and its implementation at the SLT is progressing, two triggers have been defined for tests.

Since the last PRC a variety of problems with the Straw-Tube-Tracker(STT) have surfaced, which seriously compromise its operation. The STT problems concern Tantalum capacitors mounted with wrong polarity, fuses breaking at different locations, the observation of substantial cross-talk and the occurrence of HV problems. A review committee with ZEUS internal and external experts has been appointed to look into these problems and their suggested solutions. On the basis of a positive review the ZEUS collaboration requests the PRC's approval to repair this device during the next shut-down.

Software and computing issues have been mentioned in the public presentation. The great success of the new OO/C++ event display including now most of the components was emphasized. The lack of e- beams running was faulted. As soon as a reasonable amount of e+ data has been obtained after the shut-down the ZEUS collaboration strongly wishes to switch to e- around Christmas 2003.

B.Spaan gave the referee's report. The referees are pleased with the copious high quality physics results. Concerns were raised as the luminosity monitors are not yet fully operational and their integration into the data acquisition system still needs considerable effort. The comparison between the two systems is not very conclusive and the design precision far from being reached. Problems have been identified and are being addressed including the radiation damage of the 6m tagger. The radiation level due to background is too high and approximately 80 kRad of the 300 kRad tolerable dose for the MVD is eaten up according to the installed diodes.

While it seems that the rest of the detector is in good shape severe problems for the STT were listed, which make the STT unusable for physics. Extensive repair work with removal of the STT is required during the shut down. The referees recommend a review addressing all major issues in technical questions, manpower and time-scales. ZEUS has already asked for a review whose first meeting will be on the 15th of November. The referees hope that the synchrotron radiation simulations are now reliable and the masks are properly designed and positioned.

The problems of the STT were further discussed. Temperatures in the detector are known to a few degrees and tests with varying temperatures in the laboratory did not show any hint to the problems. The suggestion was made of looking into possible consequences of gas leaks. The performance of the Central-Tracker-Detector (CTD) under the high background conditions was the next item. There is no reason to believe that radiation damage occurred to the CTD. The lowering of the HV to 90% means a factor four in gain, which does not affect the resolution but the trigger. At 95% the loss in gain is about a factor of two. The synchrotron radiation hitting the detector is dangerous and needs to be improved. The wish to go to higher currents mean certainly a higher risk. The alignment of the MVD needs more data. It will not change during the shut-down, since it is not foreseen to move the MVD.

The committee continued its discussion in closed session.

The PRC acknowledges the physics results which were presented and congratulates the collaboration for the many contributions submitted to the summer conferences. The PRC welcomes the studies done on the background and looks forward to a continuation of these studies especially on the proton background. The PRC takes note of the present status of the STT (Straw Tube Tracker) and agrees with its repair during the next shutdown after the review by the appointed committee and after the schedule for the repair has been agreed with the directorate.

Item 6. Review of HERA-B.

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

M.Medinnis started the review with introductory remarks about the present status of the collaboration. Four key groups have announced that they will not be able to maintain their systems after the shut-down. This will result in the inability to run the experiment. There is still a lot of interest to run the experiment and the collaboration is trying to attract new groups or to strengthen the existing groups for at least three important systems. Meaningful data taking is required for this and the collaboration requests as much target time as possible with stable and continuous running before the shut-down. In this context a delay of the shut-down would be beneficial for HERA-B if this would allow more running.

In the referee's report K.Jakobs concentrated on the status of the detector, trigger and off-line analysis. The HV conditioning of the Inner-Tracker (ITR) has been completed with

tolerable losses and efficiencies above 90%. Large areas of MS10 and MS13 show no hits in the readout. Due to that problem about 25% of all ITR channels are masked at present. The reason is under investigation. Although the coverage and the efficiency of the tracking is still sufficient the loss in acceptance and the impact on the Second-Level-Trigger (SLT) needs to be understood. For the OTR the frequency of HV failures seem to settle at a flat level acceptable for the forthcoming run. All remaining components are working and ready for data taking. Major improvements for the electromagnetic calorimeter (ECAL) operation were achieved. The coherent noise problem was solved and in conjunction with the removal of the magnet chambers the electron identification improved significantly. It is now possible to remove the bremsstrahlung tag in the trigger and the off-line analysis.

In the trigger area the First-Level-Trigger (FLT) is still in the commissioning phase. It is available for routine data taking with low efficiency. The chosen trigger strategy of 1 FLT-Track + 2 pre-triggers delivers a 25 kHz output rate at a 9 MHz target rate. The Second-Level-Trigger (SLT) is in operation for this mode and the observed rates agree roughly with the expectations in the $J/\Psi \rightarrow ee$ channel and is off by a factor of 1.5 in the $\mu\mu$ channel. The dead-time is sizeable and modifications will be made to reduce it. In case of dead-time free running the goal of 1000 J/Ψ per hour can be achieved. Large improvements compared to the previous PRC meeting were achieved in the area of off-line processing and analysis. The referees were quite pleased with the progress in the alignment. The physics goals of the collaboration remain unchanged. With the estimated running time and efficiency many charmonium results become marginal, while the b-cross section measurements seem to be ok.

The referees conclude that the experiment is ready for data taking with a non-optimal but adequate performance. Running of HERA-B after the shut down is questionable and a delay of the shut-down would be preferred.

In the ensuing discussion it was explained that the end of data taking is foreseen for the end of January to provide a time buffer for machine studies needed before the start of the shut-down. The shut-down itself is coupled to DORIS and the strongest constraint comes from the interlock tests of about six weeks for the different accelerators. For HERA-B not only the date of the shut-down is important, but also the duration and the type. A four week stop with a smooth restart would cause no problems for HERA-B.

The sharing of run-time for J/Ψ data taking (~ 350 h) and for minimum bias and calibration (~ 120 h) was further discussed. The sample of about 350k J/Ψ events is approximately 17% of the sample projected in May 2001 and will give 2.4 larger statistical errors resulting in difficulties to distinguish between available models. Efficiencies are sufficiently well known to perform a measurement of the total cross section. The luminosity measurement is still pursued, but several measurements can be done as ratios relative to measurements from other experiments.

The PRC continued its discussion in closed session.

The PRC congratulates the collaboration on the progress made in the preparation of the detector that is considered now in condition to take data for

physics analysis with reasonable efficiency. The PRC asks the collaboration to move now to stable data taking, to focus on the J/Psi trigger and to reduce to the necessary minimum the data taken with minimum bias trigger. The status of the data taking should be reviewed by the PRC referees during the month of December.

Item 7. Review of H1.

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

There were no questions and J.Mnich gave the referee's report with a brief summary of the recent running. In September 2002 1.2pb^{-1} could be collected with 0.7pb^{-1} with the Central Jet Chamber(CJC) on. With detailed studies for the background, possible sources were identified. More studies are needed to find a cure. Some of the 10% dead channels in the Forward Tracker Detector may be fixed during the shut-down. A large increase in track finding efficiency is expected from this device, but software is late and needs effort. Only three out of five layers in the Central Inner Proportional chamber (CIP) are working and the repair and the cooling upgrade during the shut-down will take 16 weeks. The Fast Track Trigger is late by three months, but all hardware is available now. While the complete system is expected to be operational in summer 2003 the commissioning of the analog part must be done before the shut-down. In this area a lot of software has still to be developed. For the Jet Trigger boards are still in production and the trigger is expected for mid of 2003.

The plan for the shut-down includes work on the CIP, replacement of disks in the Backward Silicon Tracker(BST) and the installation of the Very Forward Proton Spectrometer(VFPS). For the latter the detectors and pots are ready, the cryogenic bypass is expected for December 2002. Priorities until the shut-down are first the continuation of the background studies in order to have solutions ready for the shut down. Secondly an attempt to establish polarization should be undertaken, if possible without compromising the background studies. The lowest priority was given to steady running.

In the following discussion it was asked, if radiation damage was observed. Especially after a beam loss radiation damage was seen in the BST. While additional lead shielding should prevent damage, beam loss cannot be helped. The mechanism of the damage in the CIP is understood and this device should function after the repair during the shut-down. The schedule for the repair includes approximately 4 weeks of contingency, since the schedule goes sequentially and time is assigned to each component for separate testing. The installation of the VFPS needs 14 weeks including warming up and cooling down the relevant parts of HERA.

The committee continued its discussion in closed session.

The PRC acknowledges the physics results presented and congratulates the collaboration for the many contributions submitted to the summer conferences. The PRC welcomes the studies done on the background and looks for-

ward to a continuation of these studies especially on the proton background. The PRC takes note that the VFPS will be ready for installation during the shutdown and that the CIP will be repaired during the next shut-down.

Item 8. Review of Amanda/IceCube.

The status of Amanda, Baikal and IceCube were reported by C.Spiering. Several papers using the 1997 data of Amanda were published in 2002 and more drafts including newer data are available and will be completed soon. For data taking in 2002 online filtering is applied at the Pole and monitoring takes place from the Northern Hemisphere. Plans for the season 2002/2003 include the installation of an online supernova trigger, the exchange of remaining pre-amplifier, calibration, detector debugging, work with the Digital Optical Modules (DOM) and especially the upgrade of all channels with FADC's. This should result in a much better performance for the detection of ultra high energetic events. The data from 1998-2000 are fully processed. Analysis started on the 1998 data, initial results are available from the 1999 data and a first publication from 2000 data is close to completion. The 2001 data are in the processing stage, whilst the 2002 data are processed online at the Pole.

Processing of the 1999 data from the Baikal experiment took place in Zeuthen and resulted in 80 atmospheric neutrinos. The limit on the diffuse flux improved by a factor of 2 which is in the same order of magnitude as Amanda and represents a unique external cross check of Amanda as long as Antares is not fully operating and understood.

Another re-iteration of the physics justification for the IceCube experiment resulted in only a small overlap with NUSL and the House Appropriation Committee supports the requested amount of financing for the Fiscal Year 2003. The Administration asked also for the 2004 request. In total the schedule is presently delayed by approximately one year mainly due to funding and to competition with the new South Pole station in respect to transport and logistic limitations. New collaborators have been accepted by IceCube: Chiba/Japan, Imperial College(London), University of Maryland and NIKHEF-Utrecht. Further developments might enhance the performance of the experiment and are presently under study: a new UV transparent Schott glass (Mainz) in conjunction with a new gel with better UV transparency (Berkeley) might increase the gain of photons by 50%. An addition of acoustic detection to the Optical Modules (OM, DESY) might improve the performance for the detection of high energetic cascades.

The production plans for 2003 foresee to complete 200 DOM's by fall 2003. At DESY Zeuthen the full production and test line should be ready in autumn 2002 and first modules will be ready at the end of 2003. Mass production starts in 2004.

The committee continued its discussion in closed session.

The PRC congratulates the collaboration for the progress in the on-line monitoring of the experiment, in the analysis and in the publications of Amanda data and for the successful NRC review. The PRC takes note of the production plans for the 2003 and agrees with the preparation for the start of the production in Zeuthen once the funding in the US has been approved.

Item 9. Review of HERMES.

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

D.Rykbosch reported on the status of the experiment. While the target and the spectrometer are ready for data taking with transversely polarized H target, the Lambda Wheels cannot run with the transverse target magnetic field. The necessary change of 48 transformers needs approximately one month and can be accommodated in the shut-down. The new results have been presented in the open session. In respect of publications the collaboration has submitted four papers and three are in the final stage of the editorial process. Contributions to conferences amount to 107 talks until October 2002. Until the shut-down HERMES needs, with the approximated rate of 70 DIS events per mAh, roughly 20 Ah to record 1.4 Million DIS events for achieving the necessary data quality. The status of the Recoil Detector, approved in May 2002, was presented. The manpower increased as needed to approximately 31. The changes in finances were listed. The time lines shown lead to the readiness of the detector for cosmic tests in March 2004. An internal Review Committee has been set up and a meeting is planned for January 2003.

The ensuing discussion focused on the installation of the Recoil Detector, which will need about three months. In view of its impact on the other HERA experiments the collaboration should make an effort to reduce the length of the installation to a minimum. To ensure a smooth installation a complete mock-up is planned allowing all steps of the installation to be tried in advance.

S.Bertolucci gave the referee's report. He showed the background conditions to be similar in 2000 and the radiation doses relevant for the Si-Detector indicating no big damage. During the 2002 data taking both polarimeters worked stably and reliably. The Recoil Detector project is proceeding smoothly with positive signs for the funding. First TIGRE silicon sensors have been delivered. For the Scintillating Fibre detector the GASIPLEX chip choice is being reconsidered. For the magnet the super-conduction solution and a manufacturer have been chosen. Presently more studies for the stray field and the shielding are under way.

The PRC continued the discussion in closed session.

The PRC acknowledges the physics results presented and congratulates the collaboration for the overall good status of the experiment. The PRC takes note that the on-detector electronics of the Lambda Wheels will be repaired during the next shutdown. The PRC takes note of the progress achieved on the recoil detector and asks the collaboration to take all measures to reduce to a minimum the time needed for the installation of this detector. This may require pre-installations in the next shutdown and a complete assembly and system test before its installation.

Item 10. Review of Calorimeter R&D for a TESLA Detector.

An overview of the R&D activities and developments for a TESLA detector was presented by F.Sefkow. After a summary of the most important challenges for the different detector components as derived from the physics goals, he briefly listed the various studies performed world-wide. Inter-regionally joint efforts on sub-detector level follow different technologies while using common infrastructure from test facilities and mechanical structures. World wide web pages are available, for example: <http://blueox.uoregon.edu/~lc/rand.pdf> or http://www.hep.uiuc.edu/html_files/proposals.html to avoid unnecessary duplication. New international initiatives resulted in annual report meetings and within the Global Detector Network (GDN) discussion on mirror operations started covering aspects like feasibility, requirements, consequences, safety and sociology. In the two working groups per region J.Mnich and V.Vrba represent Europe. In summary the HEP community is meeting the linear collider detector challenge with a new quality of international collaboration and the PRC proposals fit well into the emerging global picture.

In the ensuing discussion the proposal situation was further discussed. The PRC proposals are one part of the activity and come from the European side with most groups organized in collaborations. On the American side mainly smaller groups are active. The 71 proposals submitted to NSF and DOE are predominantly by single groups. The need for coordination for avoiding duplication was emphasized. Test beam availability has to be sorted out. It is expected that the calorimeters will have the largest test beam requirements.

Item 10a. Review of LCCAL.

D.Pitzl gave the referee report for the status of the LCCAL collaboration. First test beam results have been obtained in 2002 with four Lead layers ($2X_0$) combined with $5 \times 5 \times 0.3 \text{cm}^3$ scintillator tiles read out by sigma-tail WLS and clear fibres to the PMT. At least five photo electrons per layer were measured for Minimum Ionizing Particles (MIP). The found $\pm 20\%$ non-uniformity resulting in an energy resolution of $\sigma/E = 0.144/\sqrt{(E)} \oplus 0.016$ instead of the $\sigma/E = 0.109/\sqrt{(E)} \oplus 0.0058$ expected from simulations is under study. The tested silicon detectors consisted of 42 pads, $0.9 \times 0.9 \text{cm}^2$ large and read out by VCSI chips. The signal to noise ratio of 4 was dominated by common mode. At this position the dynamic range was sufficient. The position resolution was measured to be 1.9mm. The prototype has a Tungsten absorber with 45 scintillator layers. Bending of the sigma tail at 60°C prevent light yield degradation. The longitudinal segmentation is four-fold. Three silicon pad layers cover $13 \times 16 \text{cm}^2$. Conductive glue connects the silicon pads to the PCB with the VLSI chip. In 2003 test beam measurements are foreseen in Frascati, DESY and CERN.

The referee was concerned by the light yield: a thicker scintillator, 5mm instead of 3mm, and/or a better reflector, 3M mirror film instead of Tyvek paper, could be considered. The high leakage current shown by the silicon pads at full depletion could be due to a guard ring problem. Common mode noise needs improved shielding and grounding. A

subtraction by software could be studied. Concerning test beam measurements the referee suggested varying the angle of incidence whilst studying the energy resolution. Tests should be made together with a HCAL. In the software area a full ECAL simulation has to be produced, combined with a HCAL, to develop energy flow algorithms, to run benchmark processes and to optimize parameters.

During the ensuing discussion several suggestions were given. In order to improve the energy resolution paper could be inserted, which causes some light losses but improves the uniformity. The conductive glue might show aging effects and should be tested with more beams. The schedule for test beams was discussed. The measurements in Frascati with low energy will be done within a year, for CERN test beams the application is submitted and will need some weeks for response. While hadrons are important the group could also profit from the DESY test beam. Due to the high costs Tungsten could be problematic within the budget. Uranium was raised as one possibility. While this is important for hadron calorimeters, the group will keep this as an option. Instead of the readout with photo-multiplier APD's could be tried and optimized, since they have been shown fitting capabilities. With Silicon photo-multiplier each single fibre could be read out. Magnetic field is not yet a question, since one could go outside with the fibres. A scheme of how to lead out the signal with fibres and cables should be developed using already known solutions from existing experiments or the studied options from the HCAL project. Software studies are within the scope of the community. More data and the study of different configurations are needed to work with energy flow. Necessary informations are provided for a general solution. It was suggested to organize a joint effort with other projects like CALICE.

The PRC continued the discussion in closed session.

The PRC acknowledges the results from the test of the first small prototype and looks forward to the results of the large prototype that will be soon ready to be tested on the beam. The PRC looks forward to the efficient use of these results for validation of the simulations developed for calorimetry at TESLA and asks the collaboration to publish the list of the measurements they are going to provide and discuss this list with the people involved in the simulation. The PRC will review again this project in fall 2003.

Item 10b. Review of CALICE.

D.Pitzl summarized in his referee report the developments for the Si-W ECAL, the Tile HCAL and the digital HCAL projects within the CALICE collaboration. For the Si-W ECAL a first module will be built with three stacks of 30 layers by end of 2003. The $24X_0$ are divided into $10 \times 0.4X_0$, $10 \times 0.8X_0$ and $10 \times 1.2X_0$. The Si sensor production has started with a good yield with a the thickness of $530\mu\text{m}$, a 1mm wide guard ring and a current of $1\text{nA}/\text{cm}^2$. The costs for the 270 sensors through the year 2003 are not yet finally specified. Pre-amplifiers with 18 channels using an ASIC chip are produced. At the single gain stage the range amounts to 12 bits, while 18 bits are finally needed. ADC and DAQ are under development aiming to be ready for mid of 2004. First test beam

measurements are foreseen for 2004. Presently under study is the possibility to read out the signals inside the detector avoiding 1.6m readout lines. Cooling issues and a possible sensitivity of the pre-amplifiers to shower particles are investigated.

In the area of software the energy flow algorithms are being improved and benchmark tests for the different HCAL options are being prepared. For hadronic showers large differences between GEANT3 and GEANT4 simulations were observed, needing test beam measurements for tuning the simulations.

For the Tile HCAL large progress was demonstrated in the technical studies. A light yield of 25 electrons per tile was measured for MIP's. The readout with APD's are under test and will be used in the prototype. Tests in a 4T magnetic field are planned. Three APD post-amplifier designs are under study, the decision planned for spring 2003. The Minical is being assembled and cosmic and test beam measurements are foreseen at DESY. New studies include the development of a new, less expensive scintillator and the possibility to put one Si-PM on each tile instead of summing up into cells, enhancing the granularity to 800k instead of 200k channels for the full HCAL. According to the planning the technical studies will be performed in spring 2003, the production of the one m³ prototype is foreseen for the second half of 2003, expected to be ready for test beams in summer 2004.

For the digital HCAL three options are considered: RPC, GEM and small scintillator tiles. For the RPC solution several groups are performing tests for chambers and readout aiming for a full plane in spring 2003. First studies are underway for the GEM option, especially the gain at a magnet field of 4T will be tested. Also the option with small scintillator tiles is investigated by clarifying the question of a readout with 50M photodetectors. All considered options use common and simple digital readout and are expected to be ready for beam tests in 2005.

The referee concluded his report with the recommendation to proceed towards the 1m³ prototype with all feasible options. Current hadron shower simulations are not accurate, especially in the treatment of the shower tails, as required for the energy flow technique. High quality test beam data taken under various conditions should allow the simulations to improve.

The ensuing discussion started with the organization of pursuing different hardware options within the collaboration, which must have enough strength to do test and analyze the data. It was stated that other countries could contribute, groups from Japan and from the US are interested. It is foreseen to produce one absorber structure and sliding in the modules of the different HCAL option for test measurements. Recently all information for the digital solutions were collected and it is planned to build the structure in summer 2003.

The expected costs for the Si-W ECAL were discussed. Reading out several pads with one chip will not significantly reduce the costs which are dominated by the Silicon and not by the readout. It was suggested that equipping every fourth layer with Silicon might be still enough to achieve the physics requirements.

The coordination of the software development were further clarified. Each algorithm has to be tuned for each hardware option depending on the granularity. A large effort, also for swapping algorithms, is delivered by France. Certainly the algorithm depends also on

the kind of the readout signals: amplitudes or pure digital signals.

The PRC continued the discussion in closed session.

The PRC acknowledges the enlargement of the collaboration and its improved managerial structure. It takes note of the progress achieved and looks forward to the planned tests including the organization of the simulation software, the definition of the tests needed for its validation and to a schedule according to the availability of beams. The PRC suggests that the simulation software should also be tested on the data of already existing calorimeters. The PRC will review again this project in fall 2003.

Item 10c. Review of LAT/LCAL.

There were no questions to the presentation in the public session. J.Gayler summarized in his referee report first the goals to be achieved with the Low Angle Tagger (LAT) and the Luminosity Calorimeter (LCAL). While in the TESLA TDR Silicon-Tungsten sandwich calorimeter were proposed for both, now additional options for the LCAL are under investigation at different institutes: Diamond-Tungsten, ionisation chambers with heavy gas or crystal calorimeter with either fibre readout or ultra-thin photo-triodes. The referee raised different detailed questions for LAT and LCAL, which he had partly already discussed with the proposing group in an earlier meeting.

In summary the referee appreciates the promising activities. With several laboratories having expressed interest and shown potential for calorimeter development and with the designs appearing feasible he recommended supporting the project. A concern for both LAT and LCAL is a lack of criteria which the final design should fulfill. The physics needs have to be translated into calorimetric requirements. The referee strongly supports Monte Carlo simulations for the study of potential performances and confrontation with the requirements besides the development of techniques. The schedule for the decision on the prototypes is tight with all the necessary steps as listed. The schedule has to be updated with the formulation of milestones.

The different hardware option were discussed after the referees report. Due to radiation levels the Silicon option does not look feasible. Monte Carlo simulations have shown that the radiation in the outer region is lower by an order of magnitude and depends on the beam parameters. Some ingredients, for example synchrotron radiation, have still to be added to the study. Diamond could be a good option, an older calorimeter at KEK showed a performance only slightly lower than Silicon. A study at DESY looked promising. A combination of Argon with stainless steel might not have the appropriate Moliere Radius and a combination with Tungsten could be tried.

The group still sees enough time for the study of the different options for about two years and a decision afterwards. They presented a draft milestone schedule for each option. A workshop will take place in November 2002 in Zeuthen for experience transfer from for example the OPAL and the ALEPH luminosity group.

The PRC continued the discussion in closed session.

The PRC takes note of the proposal 02/01 observing that the presented program is large and that its accomplishment in two years is ambitious. The PRC recommends the proposal for approval after a detailed plan including milestones and required and available resources has been discussed with and recommended by the referee, and approved by the directorate. The PRC will review again this project in fall 2003.

Progress since the October 2002 PRC meeting has been demonstrated by submission of a document describing the milestones and information about the status of funding. Due to financial constraints, the DESY participation in the crystal calorimeter project has been reduced.

Addition to the PRC recommendation:

The proponents of the proposal 02/01 have satisfactorily addressed the questions for a detailed plan including milestones as well as for the resources required and available to the collaboration. The referee thus recommends the proposal for approval. The proposed funding is considered essential for a timely completion of the proposed work.

Item 11. Miscellaneous.

The meetings of the PRC in 2003 were scheduled for 7-8th May and 30-31st October.

The current list of PRC referees is:

H1 - M.Albrow and J.Mnich
HERA-B - K.Jakobs and R.Forty
HERMES - S.Bertolucci and J.Arvioux
ZEUS - E.Hughes and B.Spaan
AMANDA/IceCube - J-J.Aubert and L.Rolandi
Polarization 2000 - J.Arvioux

(K.Borras - April 9, 2003)