

1 Excerpts on HARP in SPSC minutes

1.1 SPSC-89 meeting held on 5–6 November, 2008

OPEN SESSION

...

5. HARP: Results from the HARP CDP Group

I. Nefedov

CLOSED SESSION

...

6.4 HARP

The SPSC notes the refusal of the HARP collaboration to participate fully in the Open Session as requested as part of their Annual Review. The SPSC asks its Chair to communicate its displeasure to the collaboration.

The SPSC is critical of the publication of several results based on one of the two analyses of the HARP large angle data, given that significant discrepancies remain with the second analysis of those data.

It is now manifest that **unfortunately the parties involved have failed to resolve these issues internally to HARP**, as would normally be expected of a functional collaboration, and that the results of these two analyses will be published independently of each other.

Comparisons of the π^+/π^- production cross-sections from the two analyses have been reported to the SPSC. A substantial π^+/π^- production asymmetry is observed in the published analysis, which is not present in the second analysis. The authors of the second analysis point out that, such an asymmetry could at least in part be attributed to the P_t bias found by the Review Committee called by the main Funding Agencies, CERN and INFN. This effect alone, however, most likely cannot fully account for the discrepancies in the two sets of results, and to do so a more detailed and common evaluation by the collaboration would be required.

The SPSC considers its review process for the HARP experiment to be concluded.

1.2 SPSC-87 meeting held on 15–16 July, 2008

7.3 HARP

The SPSC continues to encourage the HARP collaboration to clarify the differences, which appeared in the comparison of the two large angle data analyses requested by the funding agencies and concluded by the SPSC.

1.3 SPSC-84 meeting held on 4–5 December, 2007

The Chairman reported on the Research Board meeting, RB182. The following points were presented and, where necessary, discussed:

...

2.6 the status of the HARP experiment, with results becoming available using small angle data, and with the SPSC's continuing concern that results from analysis of large angle data are reaching the public domain despite continuing evidence of flaws in the analysis procedures; the SPSC continues to recommend strongly to the HARP collaboration that until the evidence for such flaws is understood and any flaws removed, the publication of these results should not take place; the SPSC notes that results from HARP have some impact on ν and air shower physics, and intends to complete its comparisons of HARP data analysis at the forthcoming meeting SPSC84;

...

The RB endorsed again the continuing recommendation of the SPSC concerning publication of results from the HARP wide angle data, and noted the status of the experiment and the intention to conclude the evaluation of the comparison of data samples from the HARP analyses at SPSC84.

...

9.3 HARP

The SPSC has completed the comparison of the two HARP large angle data analyses, requested by CERN and INFN.

The results of this comparison are detailed in xxx, and are summarised below. **The SPSC notes that**, only a subset of the data was made available for one analysis (a), whereas the full data set requested for the comparison was supplied for the second analysis (b).

The data available allowed comparisons of the P and Pt for single pion events, from protons on a Beryllium target, and of the corresponding differential production cross-sections.

From the track-by-track comparison of the Pt measurements of the two analyses, it emerges clearly that there is large systematic discrepancy between the two. The amplitude of this discrepancy, about 15% at 400MeV, is substantially larger than the quoted systematic errors of 2% and 3% for the two analyses respectively.

In addition, there are very large fluctuations in the difference between the momentum reconstructed for the same track in the two analyses, which are well above any plausible resolution effect.

The consistency of the momentum measurement with the kinematical constraints was examined for analysis (b), for which the proton on hydrogen data was provided, and found to be within the systematic uncertainty quoted.

These results are consistent with the findings of a previous report, commissioned by CERN and the INFN, which concluded that there is evidence for a systematic bias of about 15% at 600MeV for one of the two analyses (a), while also finding no evidence for such a bias in the other analysis (b).

Comparison of the differential single pion production cross-sections also shows very signifi-

cant differences between the two analyses, which clearly give incompatible results.

This calls into question the validity of the results in recent publications by the HARP collaboration of their large angle data, based on analysis (a).

1.4 SPSC-83 meeting held on 4–5 October, 2007

OPEN SESSION

- ... 3. Status Report on HARP i) A. Blondel
- 4. Status Report on HARP ii) I. Nefedov
- ...

CLOSED SESSION

The Chairman reported on the Research Board meeting, RB181. The following points were presented and, where necessary, discussed:

- ...
- viii. the concern of the SPSC that recent publications by HARP may include results in which a systematic bias in particle momentum may not yet be properly understood and for which clarification may be available at the annual review of the experiment at SPSC83,
- ...

8.3 HARP

The HARP Collaboration reported on progress with both the Small Angle and Large Angle data analyses.

SMALL ANGLE DATA ANALYSIS:

The SPSC notes the publication of results, using the forward acceptance part of the experiment, on small angle positive pion production from proton beams on Aluminum and Beryllium targets. These results are important input for the K2K and MiniBoone neutrino experiments, and are being used by these collaborations to reduce the corresponding systematic uncertainties.

Further publications are underway, for negative pion small angle production on an Aluminum target as input to MiniBoone, and charged pion small angle production on a Carbon target, as input to cosmic air shower and atmospheric flux calculations.

LARGE ANGLE DATA ANALYSIS:

It has long been established, that track reconstruction using the HARP TPC suffers from very large biases, both static and dynamic, which require correspondingly large corrections.

There are two independent analyses of the large angle data, each of which has taken a different approach to derive these corrections.

The SPSC takes note of the updated results from the two analyses, which were shown in

the Open Session.

In view of the very large corrections required in the TPC, in light of the report by the CERN/INFN Review Committee, and given the apparent discrepancies between the two independent analyses, **the SPSC recommends** that publication of large angle results remains on hold, until these discrepancies are understood and the validity of the results can be reliably assessed.

The SPSC continues to strongly encourage the HARP Collaboration to resolve these issues internally as a matter of utmost importance, and ensure convergence of the two analyses for final results.

Meanwhile, the SPSC, working with the Collaboration and at the request of the Funding Agencies, is currently engaged in a detailed comparison of the two independent analyses of the HARP large angle data. The full data sets requested have been provided for one analysis, while only partial information has so far been provided for the other analysis, and the SPSC looks forward to receiving the remaining information in a timely fashion. This comparison will be concluded in advance of the next meeting of the SPSC in December, on the basis of the information made available by then.

1.5 SPSC-81 meeting held on 26–27 June, 2007

7.3 HARP

The SPSC expresses its concern that HARP results, which could be affected by the TPC momentum bias pointed out by the recent Review Committee initiated by CERN and the INFN, are nevertheless in the process of being published.

In view of the forthcoming Annual Review of the HARP experiment, **the SPSC looks forward to detailed comparison of results**, based on the two independent analyses of the large angle HARP data.

1.6 SPSC-81 meeting held on 17–18 April, 2007

6.4 HARP

The SPSC has received a copy of a report, commissioned by CERN and by the major funding agencies of HARP, into issues related to the analysis and publication of HARP data. Two members of the SPSC, T. Carli and J. Fuster, who are lead SPSC referees for HARP, were members of the committee which carried out the investigation of the status of the HARP data analysis, and which produced the report.

The SPSC wishes to put on record its thanks to the funding agencies for initiating the report and for supplying a copy to the SPSC for its consideration. The SPSC also wishes to express its thanks and appreciation to all members of the review committee for the substantial time and effort, which has so clearly been necessary for them to complete their valuable work.

After due consideration of submitted information, and after exhaustive discussion with members of the collaboration, the review committee concludes in its report that there is most likely a bias, due to distortions in HARP TPC data, in reconstructed momentum beyond the quoted systematic uncertainties in one of the two independent analyses of the “large angle data” currently underway.

The SPSC HARP referees also reported that, following the completion of the report by the HARP review committee and its submission to the funding agencies, those members of the HARP collaboration, whose analysis was considered to suffer from the momentum bias quoted above, now find themselves in disagreement with the conclusions of the report.

On the basis of the evidence which is considered by the review committee, and which is recorded in the report, **the SPSC endorses the conclusions of the report. It therefore strongly recommends that the HARP collaboration takes advantage from the work of the review committee**, recorded throughout the report in its findings, **to progress as expeditiously as possible the analysis of all its data to a reliable conclusion, and thence to publication.** The SPSC will follow progress to this end, with the conclusions of the report in mind.

1.7 SPSC-80 meeting held on 6–7 February, 2007

7.3 HARP

The status of the ongoing review of the HARP analysis, initiated by CERN and with the participation of representatives of the major Funding Agencies involved, was discussed.

The SPSC looks forward to a full report for its next meeting in April.

1.8 SPSC-79 meeting held on 21–22 November, 2006

7.3 HARP

A review, initiated by the CERN management, of the HARP analysis work is ongoing, with the participation of representatives from the major funding agencies involved, including CERN, and with the participation of the SPSC HARP referees.

1.9 SPSC-77 meeting held on 11 July, 2006

7.4 HARP

The annual review of the HARP experiment is further postponed to a later session of the SPSC.

1.10 SPSC-72 meeting held on 5 July, 2005

9. STATUS REPORT OF HARP

In view of the ongoing discussions within the HARP collaboration concerning in particular different approaches to the analysis of data from the large angle spectrometer, the collaboration was requested to present its present results to the closed session of the SPSC, rather than to the Open session.

J.J. Gomez-Cadenas presented first detailed results from the HARP small angle analysis, which is now close to being published. This analysis, which is carried out specifically for the Aluminum target, sets the stage for the analysis of data from the full set of targets. **The SPSC encourages** the collaboration to complete this analysis as quickly as possible, and **looks forward to the publication** of the full small angle results in a timely manner.

In addition, J.J. Gomez-Cadenas presented preliminary results for elastic scattering with the large angle spectrometer, with particular emphasis on checking the performance of the TPC. In this analysis, only the first 10 to 20

I. Boiko presented the results of an ongoing analysis for the large angle spectrometer, performed by a CERN-Dubna-Protvino group within HARP. This analysis is built on a careful, and detailed, understanding of distortions, both static and dynamic, in terms of the physics of TPC operation and in terms of the RPC timing response, such that corrections can then be made. For the TPC in particular, the measured distortions, if uncorrected, give rise to systematic errors which are significantly larger than the intrinsic detector resolution. When the corrections are included, it is possible to foresee the use of TPC data from the whole of the beam spill.

The SPSC looks forward to large angle physics results from HARP in which best use is made of the available data, based on a robust understanding of systematic errors.

1.11 SPSC-70 meeting held on 25 January, 2005

10. HARP

The SPSC took this first opportunity to follow up on one outstanding issue from the annual review of HARP at SPSC68. The SPSC is **disappointed** that the results for the small angle production cross-section are still not complete as intended. The SPSC is **concerned** that further delays in the data analysis will accrue, thereby jeopardizing the value and impact of the results of HARP for neutrino experiments presently underway, and urges the collaboration to make every effort to avoid such a situation developing.

1.12 SPSC-68 meeting held on 6 July, 2004

9. STATUS REPORT FROM PS214 / HARP

The referee reminded the SPSC of the aim of the experiment and of the experimental set-

up. He summarized the progress since the last status report and outlined the difficulties encountered with the detector calibration and data analysis.

The SPSC **congratulates** the Collaboration on its progress, which includes substantial achievements in calibration of detectors and the first presentation of physics results. The SPSC **looks forward** to the completion of the ‘forward data’ analysis, to the completion of the challenging work on the precision calibration of the TPC, and to the physics results with the large angle data. It **urges** the CERN management to continue to support as strongly as possible the CERN group in all its important work in the collaboration, and it **urges** the outside groups to maintain, and if possible enhance, their commitment to the completion of the experiment.

The SPSC **reaffirms its encouragement** to the collaboration to work rapidly towards the publication of physics results, which it considers to be of great importance for neutrino physics globally. It anticipates hearing from the referee at SPSC69 on progress towards cross section measurements.

1.13 SPSC-64 meeting held on 26 August, 2003

11. STATUS OF PS214/HARP

The referee explained the progress in the alignment and calibration of the detector. The small angle spectrometer is essentially aligned and calibrated. Physics analysis can start soon and the expected results should greatly improve the impact of the K2K and MiniBooNE experiments. Close collaboration has been established with these two groups. For the large angle region, work is concentrated on the understanding of the TPC. Substantial improvements have already been achieved in the corrections of several TPC distortions. Further work on the reconstruction software is needed. The referee would like to see an enlargement of the analysis group.

The Committee **acknowledged** the good progress made in the understanding of the sub-detector performance. The Committee is **concerned** about the size of the analysis team and, through its referee, will follow carefully progress in forthcoming months. The Committee **supported** the Collaboration in the choice of the analysis strategy, and **urged** the Collaboration to publish results as soon as possible in view of their importance for neutrino physics results.

1.14 SPSC-58 meeting held on 21 May, 2002

7 STATUS OF THE PS AND SPS EXPERIMENTS

M.Hauschild commented mainly on the PS experiments. HARP had a very fast start and runs with an improved set-up. With the temporary repair of a transformer and its full repair in July HARP will lose about 5% of the expected data.

11 PROGRESS REPORT OF HARP

The Research Board had asked a three person review panel to ascertain the 2001 data quality

and investigate the potential 2002 data quality of HARP. The chairman of the review group gave a summary of the report; the written version will be distributed shortly. He recalled briefly the commissioning and data taking in 2001. Many subdetectors work well: RPCs, Cherenkov, TOF, and calorimeter. The cryogenic targets for 2002 are commissioned. The few problems with the beam in 2001 have been corrected. Some problems with the TPC have been solved, like broken cables and noisy pads. The superfluous headers of the TPC data cannot be suppressed and will continue to inflate the data volume. The cross talk between TPC channels is inherent to the frontend motherboard and cannot be solved hardware wise. Its final influence on spatial and dE/dx resolution is not clear yet. It has and will require a big software effort to limit its adverse effect on the data. The drift chambers work with a somewhat limited efficiency and still need a better alignment. Improvements in the trigger should reduce substantially the number of spurious triggers recorded in 2001. A problem with scaling of beam events has been solved. In 2001 about 25% of the total, envisaged data set has been collected. The data analysis is still in early stages and it is difficult to assess fully their quality. However, the first signs are good. The improvements of the setup during the shut down promise increased data quality and quantity in 2002. The collaboration should be able to collect the envisaged data sets, but there is no margin.

The chairman **thanked** the review committee for its work. The SPSC **appreciated** the large amount of work done by HARP to improve the hardware performance. The Committee **hopes** that the remaining hardware problems, in particular the cross-talk in the TPC, can be overcome by software treatment. The Committee **is convinced** that the data quantity and quality will allow for a substantial improvement in the knowledge of cross-sections for ν -factories and atmospheric ν -interactions. The Committee **stressed** that data taking cannot continue in 2003.

1.15 SPSC-57 meeting held on 26 March, 2002

9. STATUS OF PS214/HARP

The referee recalled the various hardware problems, which had delayed the data taking last year. Noise and cross-talk in the TPC and trigger problems have further reduced the data rate compared to expectations. Data samples have been taken at about 35 settings corresponding to roughly a third of the programme. So far the Collaboration has concentrated its efforts on the analysis of the TPC data. However, no physics results have been presented and it is difficult to judge the quality of the data taken. The schedule for 2002 is tight.

The Committee **took note** of the status of the hardware and the progress in the reconstruction and analysis of the data from the 2001 run. The Committee asks for a progress report on the data quality and analysis by its May meeting. The Committee urges the Collaboration to ascertain good data quality in 2002.

1.16 SPSC-55 meeting held on 30 October, 2001

7. STATUS OF PS214/HARP

The referees recalled the history of the experiment. An enormous amount of work has been accomplished in commissioning the experiment. Problems with the TPC and the Cherenkov counter delayed the start of physics data taking till mid August. The Committee would appreciate a clearer picture of the amount of data collected and their quality in order to access the capabilities for accurate cross section measurements.

The Committee **appreciated** the impressive setting up of the including the software preparations for the first run in 2001. In reduced data-taking period in 2001 the Committee **asks** for its meeting for an update on the data collected in 2001 and the strategy for the 2002 run. experiment view of the March 2002 data taking

The Committee **took note** of HARP's problems with fast data access and **recognized** the importance for all experiments to have fast data turnaround.

1.17 SPSC-54 meeting held on 4 September, 2001

Beam request by PS 214, HARP

The Committee briefly discussed the status of PS214, HARP and the programme in the PS East Hall in 2002.

The Committee strongly **recommends** for approval 20 weeks of beam time for PS214, HARP in 2002.

1.18 SPSC-53 meeting held on 22 May, 2001

(OPEN SESSION)

1. Addendum 1 to PS214/HARP: F. Dydak

(CLOSED SESSION)

HARP has done an impressive amount of installation and commissioning work. The beam steering has been improved substantially. However, the TPC is not yet installed and the Cherenkov counter is not yet operational. Data taking with the full detector is expected to start mid-June. In view of this delay the collaboration would like to have additional spills which have to come from the DIRAC allocation. The SPS coordinator asked for advice on the allocation of protons to the different experiments. This is discussed under Item 7.

7. ADDENDUM TO PS214 / HARP

The referee recalled the different stages mentioned in the original proposal and commented on the status of the approved programme for HARP. He explained the physics issues addressed by addendum 1. The Committee discussed the impact, reach and accuracy of the proposed measurements. It considered the implications of He running for other users of the PS.

The Committee does not see a big interest in Helium data on Carbon/Oxygen at such low momenta as available in the T9 beam line. The collaboration should rather concentrate all its efforts on taking proton data with the very best accuracy and systematics. Thus the

Committee **does not recommend** the proposal for approval.

The Committee, however, recognizes the interest of HARP in having a second spill during day time, once data taking has commenced. Their request is thus **granted**.

1.19 SPSC-50 meeting held on 31 October, 2000

6. DISCUSSION ON HARP

The referee recalled the physics aim of the experiment, the set up and time scale. An impressive amount of work has been done in a short time to be ready for the technical run.

Not all components were available or complete for the technical run. Problems with the drift chamber readout were encountered during the run. The schedule for the TPC is very tight. The collaboration has increased in size, is very motivated and has an ambitious programme for the available time frame.

The Committee **congratulates** the collaboration on the impressive progress with the installation of the detector and the achievements of the technical run. The Committee anticipates a successful data taking in 2001.

1.20 SPSC-48 meeting held on 23 May, 2000

9. MEMORANDUM FROM PS214 / HARP

The Committee took note of the letter addressed to the Chairman by the HARP Collaboration (PS214) on the considered use of the NA49 detector.

11. HARP physics

A.Magnon reported on a thesis by A.G.Gharibi from the CAPRICE experiment, a cosmic ray balloon experiment. The thesis parameterizes π^+ and π^- production in pA collisions in order to simulate the flux ratio μ^+/μ^- in the atmosphere at 38 km altitude. Data and simulation agree at the given altitude. It is not clear what level of agreement can be reached at different atmospheric depths.

The Committee appreciated the information on hadron production measured in a balloon experiment. The Committee considers available production measurements still insufficient for the design of a ν -factory and the understanding of the atmospheric ν -problem.

Therefore the Committee considers the proposed HARP measurements as essential.

1.21 SPSC-46 meeting held on 25 January, 2000

3. REPORTS FROM THE 143rd and 144th MEETINGS OF THE RESEARCH BOARD

The Chairman presented proposal P315 which wants to study hadron production relevant to a neutrino factory and to atmospheric neutrino flux predictions. The SPSC recommended

approval of the first phase of the experiment at the PS, subject to clarifications on funding. The Research Board **strongly encouraged** the experiment to carry out the measurements and will be ready to approve the experiment after clarification of funding, space and personnel issues.

1.22 SPSC-45 meeting held on 1 December, 1999

(OPEN SESSION)

4. Proposal to Study Hadron Production for the Neutrino Factory and for the Atmospheric Neutrino Flux (SPSC 99-35/P315): F. Dydak

(CLOSED SESSION)

7.4 PROPOSAL SPSC 99-35 / P315:

The Committee heard a report on the proposal to measure secondary hadrons produced on various targets by using proton beams at the PS East Hall. The Committee **recognises** the interest of studying the hadron production as it has important applications in the field of neutrino physics: to optimise the design of an intense neutrino source based on muon decay in a muon storage ring (as part of a neutrino factory) and to improve the atmospheric neutrino flux calculations. Moreover, the Committee considers that the proposed experimental design is sound. The SPSC **recommends** Stage I (proton and pion beams in the range 2 to 15 GeV/c) of P315 for approval to the Research Board, subject to the clarification of the funding of the experiment.

2 Excerpts on HARP in RB minutes

2.1 RB-187 meeting held on 4 March, 2009

1. PROCEDURE

1.5 In item 4.1 of the minutes it was stated that the SPSC considers that its review procedures for HARP are now concluded. R. Heuer confirmed that the Directorate considers that the onus is now on the scientific journals to referee any papers submitted for publication by groups of authors from the experiment. A procedure for the approval of future publications from CERN experiments, in particular those of the LHC, was under discussion with the PH Department.

2.2 RB-186 meeting held on 5 December, 2008

4. REPORT FROM THE SPSC MEETINGS OF 4-5 SEPTEMBER AND 15-16 NOVEMBER 2008

4.1 J. Dainton presented the report from the latest meeting of the SPSC, including the annual reviews of NA62, NA60, OSQAR and HARP...Concerning HARP, the SPSC is critical of the publication of several results while significant discrepancies remain with a second analysis of the same data. The committee considers that its review procedures for HARP are now concluded. **The Research Board took note.**

2.3 RB-182 meeting held on 28 November, 2007

3. REPORT FROM THE SPSC MEETING OF 4-5 OCTOBER 2007

3.1 J. Dainton presented the report from the latest SPSC meeting, including the annual reviews of NA49, NA60 and HARP...

3.2 **Concerning HARP, the Research Board takes note of the ongoing disagreement within the collaboration concerning the analysis of the large-angle data in their TPC, and endorses the procedure being followed by the SPSC to reach a conclusion on this issue.**

2.4 RB-180 meeting held on 7 June, 2007

4. REPORT FROM THE SPSC MEETING OF 17-18 APRIL 2007

4.1 ... The SPSC endorses the conclusions of the recent report commissioned by CERN and the major funding agencies into issues related to the analysis of data from the HARP experiment. **The Research Board took note.**

2.5 RB-165 meeting held on 4 September, 2003

J. Dainton then discussed the other two experiments that had reported at the open session of the SPSC, NA60 and HARP/PS214 ... **HARP** have completed their data taking, and are concentrating on understanding the calibration of their apparatus, in particular the TPC. The committee encouraged them to publish results promptly in view of their importance for neutrino experiments such as K2K and MiniBooNE. Responding to a question from J. May, J. Dainton commented that the committee feels it is important the results should be published rather than provided as private communication.

2.6 RB-159 meeting held on 30 May, 2002

Königsmann then went on to present the HARP status report ... and the conclusions of the three-person review panel set up to assess the quality of the data collected by HARP in 2001 and investigate its potential for 2002. About 25% of the envisaged data was collected in 2001 due to a delayed start up itself caused by the time needed to fix hardware problems in the TPC and Cherenkov counter. The run was affected by an unexpectedly high trigger

rate caused by non-interacting particles, an instability in the trigger down-scaling, a high data volume due to headers in the TPC data and cross talk between TPC channels.

The analysis of the 2001 data is still in its early stages and it is hard to assess its quality. The forward spectrometer drift chambers have a somewhat limited efficiency and are in need of a better alignment. Nonetheless first indications are promising.

For 2002 the trigger selectivity has been improved and all hardware problems have been solved except for the cross talk in the TPC which is inherent to the motherboard. It is expected that the effect of this cross talk can be minimized through software corrections which however will be time consuming. The SPSC concluded that the 2002 data will be of much improved quality and will allow measurements of particle production cross sections with much improved precision. These cross sections will be useful for the calculation of atmospheric neutrinos and for beam intensities at neutrino factories.

In the ensuing discussion Delfino expressed concern over the computing resources needed to address the cross talk problem. The Research Board stressed that since the helium run originally requested to understand the atmospheric neutrino yields was not approved, a complete understanding of these yields using HARP data is no longer possible. Therefore, given the impossibility to extend the HARP run in 2003, priority must be given by HARP to the collection of data with targets relevant to neutrino factories. The exposure of cryogenics targets needed to understand the atmospheric neutrino flux must come only after the neutrino factory measurement programme. Hauschild pointed some difficulty in following this approach due to the limited availability of some cryogenic target technicians.

2.7 RB-158 meeting held on 11 April, 2002

HARP (PS214) submitted a status report ... to the SPSC. The experiment was designed and installed in just 17 months. Data taking was delayed because of a leak in a Cerenkov counter and of soldering problems in the TPC readout. Data samples have been collected at 35 settings, amounting to about one third of the projected programme. However the data has been affected by some instability in the trigger downscaling, by noise in some TPC channels which reduced the trigger rate (fixed during the run) and by cross talk in about half of the TPC channels. In addition half of the triggers were due to noninteracting particles. The plans of the Collaboration for 2002 are to improve the selectivity and rate of the trigger, to complete the solid target programme, including K2K and MiniBooNE targets and to use cryogenic targets. No physics results were presented in their status report and it is therefore hard to judge the quality of the data. Therefore, the SPSC has asked them to submit a progress report on the data quality by their May meeting and to ascertain the good quality of their data in 2002. A panel of three referees, including a TPC expert, has been appointed to scrutinize the experiment and to ensure that they can achieve their goal this year. In the ensuing discussion Dtraz informed the Research Board that whereas the experiment, as a whole, was built within the foreseen financial envelope, CERN has spent, for its part, considerably more than anticipated and has asked for the reimbursement of its over expenditure. It is also difficult to find the necessary funds within EP for the operation of HARP. Delfino pointed out the heavy computing load of this experiment arising from the fact that all events are useful. Originally it had been anticipated that HARP would be

a short time scale experiment and the technological solution suggested to them was based on an LHC option which has since been discarded. Their request that accessibility to the data should now be ensured for five years may entail switching to a different technology. The Research Board took note of the above and stressed that the experiment **cannot run beyond 2002**.

2.8 RB-155 meeting held on 15 November, 2001

HARP has run in 2001 and, because of a late commissioning of some of its components, has been approved for a further 20-week run in 2002. The Committee has requested an update on the data collected.

2.9 RB-154 meeting held on 13 September, 2001

The Chairman of the SPSC then described the status of HARP. Only two sub-detectors were not ready for commissioning in April 2001. The TPC was delayed because of problems in soldering of their microflex signal cables and the gas Cerenkov counter was delayed because of severe leaks. They are now in place but whereas the experiment was approved for 200 days, given the above problems, only 63 days of full detector running can be achieved this year. The SPSC **recommends** that the HARP request ... to run for 140 days in 2002 be approved. Delfino pointed out that the experiment introduces a significant computing load because of its very large amount of data but that HARP has been cooperative. It would not be cost-free to extend them into next year. Having confirmed that this extension would not conflict with LHCb space requirements, the Research Board concurred with the SPSC recommendation.

2.10 RB-153 meeting held on 7 June, 2001

HARP has made impressive progress in installing its detector. The whole detector is in place except for the TPC. However the Cerenkov counter will have to be taken out again in order to repair major gas leaks. The TPC is slightly delayed because of problems in soldering cables to the mother boards. These combined delays lead to expect, at this time, that 31 out of an allocation of 173 days will be lost. The SPSC recommended the allocation of an extra spill to the experiment in order to reduce this loss to 7%.

2.11 RB-145 meeting held on 17 February, 2000

P315 (HARP):

Funding requests totalling the 1.5 MCHF not provided by CERN have been made to various European funding bodies. Very positive replies have been received. Several strong institutes are involved and the manpower is therefore available. Finally the East Hall space requested by the collaboration will not be needed by LHCb until 2002. The Research Board therefore

approved P315 for their phase 1 programme on the understanding that their running must be completed by the end of 2001. The new experiment will be known as **PS214**.

2.12 RB-144 meeting held on 9 December, 1999

P315,

a proposal to study hadron production for the neutrino factory and for the atmospheric neutrino flux ..., was presented next. This experiment intends to study the pion and kaon production differential cross sections in beams of 2-15 GeV/c protons incident on thin and thick targets in order to optimize the design of the target to be used for a neutrino factory and stopped muon source. The design of this target is of great importance as it can lead to substantial savings on the corresponding proton accelerator to be used. The experiment also intends to reduce the uncertainty on the atmospheric neutrino flux by studying particle production at higher energies with proton and, possibly, alpha particle beams incident on a variety of targets including oxygen and nitrogen. The experiment proposes to reuse a large amount of existing equipment thus minimizing cost and needed resources. The SPSC recognized the interest of these studies and the soundness of the technique to be used and recommended approval of the first stage (2-15 GeV/c beams at the PS) subject to clarification of funding issues. The Research Board **strongly encourages** the experiment to perform these strategically important measurements and will be ready to approve the experiment if the funding, space and personnel issues have been clarified.