

CERN/SPSC-2008-005  
SPSC-084  
04-05 December 2007

**MINUTES** of the 84th Meeting of the SPSC  
Held on Tuesday and Wednesday 4th and 5<sup>th</sup> December 2007

**OPEN SESSION:**

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|----------------------------|-------------|
| 1. Status Report NA62/P326 | A. Ceccucci |
| 2. Status Report on OSQAR  | P. Pugat    |

**CLOSED SESSION**

Present:

H. Abramowicz, S. Baird, J.J. Blaising, B. Bloch-Devau, T. Carli, J.B. Dainton (Chair), M. Doser, I. Efthymiopoulos (part time), J. Engelen (part time), M. Erdmann, A. Ereditato, L. Gatignon, L. Kluberg, B. Panzer for J. Knobloch, P. Kooijman, M. Mannelli (Secretary), P. Marage, P. Newman, E. Perez, C. Rembser, G. Ridolfi, P. Schleper (part time), U. Wiedemann

Apologies: J. Fuster-Verdu, D. Wark

1. MINUTES OF THE 83rd MEETING OF THE SPSC, HELD ON OCTOBER 4<sup>th</sup> and 5<sup>th</sup>, 2007

The Minutes were approved.

2. REPORT FROM THE CHAIRMAN

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

- 2.1 the appreciation of the SPSC for the unusually good beam delivery to all running experiments in 2007;

- 2.2 the achievement of high intensity ( $1.84 \times 10^{13}$  pot, about  $2/3$  nominal) and the detection of CC neutrino events in the OPERA target;
- 2.3 the great progress made in OPERA brick assembly, indicating that enough target mass would be in place for data-taking in 2008;
- 2.4 the need to clarify the challenges which the proposed, but not yet fully approved, FT ion experiment NA61 poses for the delivery of S-ions in 2009/10
- 2.5 the continuing output of results from the ion experiments NA49 and NA60 and their importance for heavy ion physics;
- 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  $\nu$  and air shower physics, and intends to complete its comparisons of HARP data analysis at the forthcoming meeting SPSC84;
- 2.7 the impressive work on ILC calorimetry (CALICE) using CERN test beams;
- 2.8 the on-going scrutiny of the AEGIS proposal for physics at the CERN AD.

The Research Board noted the points in 2.1, 2.2, 2.3, 2.5, 2.7, and 2.8 above. There was further discussion of 2.4 above concerning the compatibility of the requests for data-taking with particular ion species and the LHC programme. It was agreed that the level of resources from CERN which would be necessary was substantial, and thus it was very unlikely that it would be possible to consider the possibility of heavy ion FT data taking which was incompatible with maintaining the LHC physics programme at the highest priority. Further consideration of what, if anything, would be possible is a matter for experiments (initially NA61) to discuss directly with the CERN management. 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.

### 3. STATUS OF ACCELERATORS

S. Baird summarised the 2007 operation of the Accelerator Complex, and reviewed the issues which will be addressed in the forthcoming ATC/ABOC days.

The operational statistics for the 2007 run were presented and show an improvement over the 2006 accelerator numbers.

The highlights of accelerator operation since the last SPSC were:

- a) The successful completion of the MERIT program at the PS. MERIT is a test of a mercury jet target for possible neutrino production, which was installed in the nTOF facility.
- b) The completion of the commissioning of the "early" LHC Lead ion beam in the SPS.

The major issues affecting accelerator operation since the last SPSC were:

- a) Problems with the 18kV connection between BA6 and & at the SPS
- b) Repeated failures of the High Voltage cable supplying PS extraction septum SEH31
- c) A vacuum leak on the PS Internal beam dump.

These issues will be dealt during the shutdown, either as part of the regular accelerator maintenance activities or as part of the Accelerator Consolidation program.

The ATC/ABOC Days in January, which is organised by the AB, AT & TS departments, will cover the following themes:-

- a) 2007 machine operation review: main events & lessons learned
- b) Operation in 2008 at high intensity: radiation issues
- c) Situation of high radiation facilities (Isolde, nTOF, Merit,...)
- d) MTTR and spare policy for the LHC injectors and experimental areas
- e) Safety issues
- f) Control issues for LHC injection (FE's, software, performance)

**The SPSC congratulates** the Accelerator team for the excellent efficiency and quality of the delivered beams during the 2007 operation of the CERN Accelerator Complex.

#### 4. CNGS OPERATION IN 2007 AND 2008 SHUTDOWN ACTIVITIES

I. Efthymiopoulos reported on CNGS operation in 2007, and on the program of work during the present shutdown, to address the issues raised during the 2007 run.

The main new issue is the failure of the ventilation controls system, due to excessive radiation exposure, and the steps taken to rectify this.

**The SPSC appreciates** the intensive program of work to repair the faults revealed during the CNGS commissioning, **and underlines the importance** of consolidating the facility for reliable long-term operation at full intensity for 2008 and beyond.

## 5. STATUS OF EXPERIMENTAL AREAS

L. Gatignon reported on the operations of the Experimental areas in 2007.

### East Area

All East Area beam lines have been heavily exploited since the previous meeting. The users have profited from smooth running conditions. Scintillators have been installed at the end of each beam line and more instrumentation is in preparation to improve their ease of operation. The only major interruption was a five-day stop of the DIRAC experiment due to a water leak in its spectrometer magnet, which appeared on Friday evening 12<sup>th</sup> of October. Spare parts had to be manufactured in industry and could only be installed on the 17<sup>th</sup> of October. A failure of the ventilation system occurred in parallel and was repaired in the shadow of the magnet problem on the 15<sup>th</sup> of October.

Advantage was taken of this stop to reinforce the shielding behind the DIRAC dump. Since 2004 DIRAC has more than doubled its beam intensity per PS cycle and at the same time the radiation limits have come down by more than a factor of three. As a consequence the DIRAC flux had become radiation limited. The extra shielding has reduced the radiation dose behind the dump by a factor of about 7 for the same proton flux, thus allowing DIRAC to run comfortably below the new radiation limits and even to increase the intensity further.

For next year the East Area will continue to be operated with a MCB magnet replacing the broken MNP23-type dipole magnet in the switch-yard. This operation has been very smooth, but as it is somewhat less efficient in sharing the PS beams over all users, there was a shortfall of PS cycles in the last weeks of the run, when additional PS cycles had to be allocated to the MERIT experiment.

### North Area

Stable running conditions have been provided for the COMPASS experiment, which shared the last period of the run between runs with longitudinally and transversely polarized target. On the last day of the run the beam was switched to secondary hadron mode with intensities of  $2.2 \cdot 10^7$  particles per spill incident on the thick polarised target, normally used only for muon beam operation. No radiation problems were observed.

The P42+K12 beams to ECN3 were exploited by P326 for tests of straw detector prototypes with different types of hadron and muon beams and of the RICH prototype with 200 GeV/c  $\pi$  beams and lower energy positron beams. The integration of the detectors into the beam line, including the integration of the straw prototype into the beam vacuum system, went very smoothly, and also the beam delivery was very efficient.

The NA61 experiment has been running smoothly with muon beams for calibration and hadron beams of various energies for data-taking, once initial instabilities of one rectifier at very low currents were resolved.

Both the NA63 and RD22 experiments succeeded very quickly to align their respective crystals with the highly parallel beams that were set up successfully.

In parallel an intensive program of tests was executed in EHN1, with as main interruption a three day stop from the 3<sup>rd</sup> to the 5<sup>th</sup> of November due to a big water leak on a quadrupole in the TT20 primary proton transfer line from the SPS to the North Area targets.

## AD

The AD run terminated quite successfully in spite of a small water leak on a main quadrupole in the AD ring, which fortunately did not deteriorate. This quadrupole is unique and no spare exists. During the shutdown it will be dismantled and repaired in the lab. This implies cutting the vacuum tubes in the sector concerned, followed by a bake-out. The vacuum will also be cut and hence a bake-out will be required in two other sectors for the modification of two ionisation profile monitors. A shutdown planning for these and many smaller interventions has been made. The instabilities at low energies have now been diagnosed to a ripple on the rectifier for corrector dipole DHZ2908. This problem has been cured in the meantime.

The overall up time of the AD machine itself has increased from 76% in 2006 to 81% this year, suggesting that the increased consolidation effort starts to bear its fruits.

**The SPSC congratulates** the Accelerator Areas team for their excellent work, which allowed the experiments to fully benefit from the available beams throughout 2007.

## 6. PS AND SPS SCHEDULES

C. Rembser summarized the results for the 2007 run which finished on November 12, and the presented an outlook for the 2008 Accelerator and PS/SPS Users schedule.

The integrated proton flux delivered in 2007 by the SPS, about  $11 \times 10^{18}$  protons, is among the highest ever since the end of the West Area Neutrino Program. More than  $7.2 \times 10^{18}$  protons were delivered to the COMPASS experiment. For the SPS, efficiency for physics greater than 80% was achieved, in spite of the dense program of machine development to prepare the injectors for the LHC. All experiments at the PS, AD and the SPS reached their physics goals for 2007, except for the OPERA experiment.

The 2008 PS and SPS (injector) accelerator schedule is very similar to the 2007 schedule and foresees 25.5 weeks of East Area physics, 24 weeks of North Area/CNGS physics and 20 weeks for AD physics. When operating the injectors for LHC, CNGS and the North Area in parallel, the operation mode that maximizes the number of protons for all three users is a long Super Cycle consisting of 1 LHC pilot cycle, 3 CNGS cycles and one fixed-target cycle with long flat-top. Operating with this Super Cycle over the entire 2008 run, the expectation is for  $2.9 \times 10^{19}$  protons on target (p.o.t.) for CNGS (at  $4.5 \times 10^{13}$  protons per puls ppp) and  $5 \times 10^{18}$  p.o.t. (at  $1.4 \times 10^{13}$  ppp) for COMPASS, assuming an 80% efficiency of the SPS.

For the 2008 PS and SPS physics run, the users request more than 70% of the available PS physics time and about 100% of the SPS physics time.

**The SPSC thanks and congratulates** C. Rembser for his excellent work as PS and SPS coordinator, **and welcomes** E. Perez as his replacement.

## 7. FOLLOW UP ON LNGS EXPERIMENTS

### 7.1 CNGS1-OPERA

OPERA collected 38 neutrino interactions in the Bricks. **The SPSC notes with appreciation** that, with this event sample, OPERA has successfully exercised their full analysis chain.

OPERA has completed about 77'000 of the final set of 160'000 bricks. The Brick Assembly Machine line has established a consistent rate of 700 bricks/day (3 Drums/day). Assuming this rate is sustained, the production of the 160'000 bricks would be completed in early June 2008.

**The SPSC urges** the OPERA collaboration to make every effort in order to meet this schedule.

### 7.2 ICARUS

**The SPSC notes** the continuing work on the installation of the T600 detector at LNGS, **and continues to look forward** to a timely completion of these activities and to the commissioning of the detector in time for the start-up of the 2008 CNGS run.

## 8. DISCUSSION OF THE OPEN SESSION

### 8.1 NA62/P326

The NA62 experiment had a successful run in 2007, to measure the ratio of the decays  $K \rightarrow e\nu / K \rightarrow \mu\nu$ . Preliminary analysis of the data taken indicate that the required precision for the measurement can be reached. These data will also be useful in order to study a number of issues relevant to the P326  $K \rightarrow \pi\nu\nu$  proposal.

The detector design for the P326 proposal has evolved and matured. A number of important Milestones have been achieved, to finalize and validate key aspects of the P326 detector design.

A new design of the photon Veto Counters, using the OPAL Lead Glass modules, provides a cost effective solution, and completes the conceptual design of the proposed experiment.

A viable technology for Straw Tube Chambers, able to operate in vacuum, has been successfully demonstrated; a prototype RICH counter has achieved the required time resolution and performance; and a prototype Pixel chip, in  $0.13\mu\text{m}$  technology has achieved the required timing resolution for the crucial Giga-Tracker.

The P326 Collaboration continues to attract new collaborators, and the achievements of the past two years attest to the strength of the Collaboration.

**The SPSC recommends support** for the construction of a realistic prototype Giga-Tracker module for tests in the SPS beam, in view of completing the series of Milestones required for approval of the P326 proposal.

Finally, **the SPSC notes with pleasure** the continued publication of high quality results from NA48-1 and NA48-2.

### 8.2 OSQAR

**The SPSC congratulates** the OSQAR collaboration for a first successful data taking in 2007, and for timely publication of preliminary results, which helped to clarify the status of the PVLAS measurement. **The SPSC looks forward** to the final publication of those results.

**The SPSC recommends approval** of the proposed program for 2008, aiming at improved laboratory constraints on axion production. The SPSC encourages the collaboration to make best use the experimental setup in order to prepare for a competitive VMB measurement.

**The SPSC encourages** the collaboration for seek the funding necessary for the measurement of VMB, which the SPSC considers of fundamental interest.

## 9. FOLLOW UP ON EXPERIMENTS AND PROPOSALS

### 9.1 COMPASS

**The SPSC notes with pleasure** the successful high statistics data taking to complete the COMPASS muon program.

**The SPSC would welcome** timely indication of the quality of the data taken, and of projected sensitivity with the new data set.

**The SPSC notes receipt** of an Addendum, further developing the application of partial-wave analysis tools to resolve the quantum number of exotic states, targeted by the COMPASS Hadron beam physics program.

In addition, a detailed beam request for 2008 has been submitted, together with a corresponding set of goals and milestones.

### 9.2 NA61/SHINE

Following the conditional recommendation by the SPSC of the NA61 Heavy Ion program, **the SPSC took note** of the difficulties presented by some of the proposed scenarios for delivering light ion beams.

In view of the importance of the physics program, **the SPSC recommends** that alternative scenarios for preparing Sulphur ion beams for fixed target SPS operation be studied, in concertation with the NA61 collaboration.

### 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 significant 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).

#### 9.4 ELENA at AD

**The SPSC notes reception** of an Expression of Interest from the Cockcroft Institute of Accelerator Science and Technology, to participate in the design and construction of the ELENA upgrade for the CERN AD facility.

#### 9.5 AEGIS Proposal

Scrutiny of the Proposal is ongoing: a number of questions have been clarified and critical Milestones, to be met before obtaining anti-protons, have been developed.

#### 9.6 DIRAC

**The SPSC notes** the successful commissioning of the upgraded DIRAC detector, and the start of physics data taking in 2007.

## 9.7 CAST

**The SPSC welcomes** the addition of new collaborators to pursue photon detection in the visible part of the spectrum, to search for low energy solar axions, and looks forward to presentation of these results.

**The SPSC notes** a series of technical problems encountered in the preparation for the He3 run, and the efforts of the collaboration to both solve these problems and make best use of the time, which would otherwise be lost.

**The SPSC is concerned** by the implication of these delays on the schedule of the CAST He3 program.

**The SPSC expresses its condolences** at the recent tragic death of three CAST collaborators.

## 9.8 NA63/EM processes in High Crystalline Fields

**The SPSC notes the good progress** achieved in the 2007 run.

The LPM effect in pair production, Trident production and formation length effects with Sandwich targets were all successfully established. The effect of undulating fields, induced with periodic distortions of the target crystal, on stimulated emission will require further study.

**The SPSC is concerned**, that funding restrictions may delay the successful completion of this program.

## OTHERS

### 9.9 Anti Matter Free Fall Experiment, I-237)

**The SPSC notes receipt** of a New Letter of Intent on Antimatter gravitation CERN-SPSC-2007-038, SPSC-I-237.

## 10. DOCUMENTS RECEIVED

- Minutes of the 83rd Meeting of the SPSC, held on Thursday and Friday 4th and 5th October 2007; CERN-SPSC-2007-034, SPSC-083.
- NA60 Status Report; CERN-SPSC-2007-032/ SPSC-SR-026.

- Report from the NA61/SHINE pilot run performed in October 2007; CERN-SPSC-2007-033, SPSC-P-330 Add.3.
- NA62/P-326 Status Report; CERN-SPSC-2007-035/SPSC-M-760.
- Spectroscopy with Hadrons Beams at COMPASS; CERN-SPSC-2007-037, SPSC-M-761.
- Letter of Intent: A new path to measure antimatter free fall; CERN-SPSC-2007-038, SPSC-I-237.
- Summary of OSQAR First Achievements and Main Requests for 2008; SPSC-2007-039, SPSC-M-762.