

**Minutes of the 135<sup>th</sup> Meeting of the SPSC  
Held on Tuesday 15 and Wednesday 16 October 2019**

**OPEN SESSION TUESDAY 15 OCTOBER 2019**

- |   |                    |
|---|--------------------|
| 1. Status and plans of the NA61 Experiment: Results for heavy-ion and neutrino physics and detector upgrade | Seweryn Kowalski   |
| 2. Results for cosmic-ray physics with the NA61 Experiment  | Michael Unger      |
| 3. Results on the measurement of the polarisation of antiprotons at the PS (P349)                           | Dieter Grzonka     |
| 4. Results and plans of the DIRAC Experiment  | Leonid Nemenov     |
| 5. Status and Plans of the AWAKE Experiment   | Allen Caldwell     |
| 6. Status and plans of the CAST Experiment  | Giovanni Cantatore |
| 7. Letter of Intent to measure Vacuum Magnetic Birefringence: the VMB@CERN experiment                       | Guido Zavattini    |

**CLOSED SESSION TUESDAY 15 OCTOBER AND WEDNESDAY 16  
OCTOBER 2019**

Present:

D. Boer, M. Brugger, E. Elsen, A. Ferrari, G. Fiorillo, R. Forty, L. Gatignon, K. Helbing, M. Knoop<sup>1)</sup>, S. Malvezzi, A. Milov, J. Nash (Chair), A. Obertelli, B. Panzer-Steindl, R. Steerenberg, C. Rembser (Scientific Secretary), G. Salam, R. Santorelli, G. Schnell, M. Tarbutt, F. Terranova, U. Wiedemann, H. Wilkens

<sup>1)</sup> Present Wednesday 16 October 2019 only

Apologies: M. Krammer, R. Losito, A. Stahl



## 1. DRAFT MINUTES OF THE 134<sup>th</sup> MEETING OF THE SPSC HELD ON 13 JUNE AND 14 JUNE 2019

The minutes of SPSC134 were approved (CERN-SPSC-2019-029, SPSC-134).

## 2. CHAIRMAN'S REPORT

The Chairman thanked Gavin Salam for his contributions to the Committee during the last years. He welcomed Urs Wiedemann, who will replace Gavin as representative of the CERN Theory Department in the SPSC.

The Chairman reported on last Research Board (RB) meeting, RB230. The following points were presented and, where necessary, discussed.

1. The SPSC presented the status of the CLOUD, NA63, and NA64, and COMPASS experiments following their annual reviews;
2. The Committee presented the proposed experiment P360 (AMBER/COMPASS++) and informed the RB that the proposal will be further reviewed along with other proposals which seek to use the EHN2 muon beam.

The Research Board noted points 1 and 2.

## 3. STATUS OF ACCELERATORS

Rende Steerenberg reported on the injector accelerator consolidation and upgrade activities during Long Shutdown LS2.

All works scheduled during the Long Shutdown 2 (LS2) are progressing well. Excellent progress has been achieved for the signal and DC re-cabling at the injector accelerators, the scope of the work has even been extended.

The commissioning of LINAC4 has started, with the goals of re-establishing the improvements made to the machine in earlier tests, of setting up the newly installed transfer lines, of setting up beam in LINAC4 up to the entrance of the PS Booster, and to establish beam quality measurements.

The recommissioning of the injector complex is currently being scheduled.

The individual system tests of each of the injector accelerators require good coordination in view of many co-activities and in view of safety requirements. First hardware commissioning plans have been presented and are being worked out in further detail, as well as beam availability dates are currently being defined. More details on the schedule can be expected in the next SPSC meeting.

At the AD, the Electron Cooler Collector has to be replaced by a newly designed collector. The activity is on a critical path for an in-time restart of the AD in March 2021. As a backup solution, it has been decided to restart with the existing working collector, which would have the risk of less performance and higher failure probability.

At ELENA, there is an issue with the local Ion source because of problems with the HV insulation of a main transformer. The transformer worked well initially, but started sparking again. A non-conformity has been found on the transformer, thus a new transformer has been ordered, which is expected to arrive at CERN by end October 2019. With the presented transformer, pulsed mode operation is possible, however not the default mode. As a back-up solution, it is considered to perform the commissioning with 85kV.

The installation of the new transfer lines is ongoing and well on track for the commissioning in June 2020. The remaining uncertainties are due to the availability of the Beam Profile Monitors. The installation of monitors is critical for the vacuum closure and bake-out of the machine. The monitors currently installed and tested, show an issue with wires not providing a signal. This is currently being investigated.

#### 4. STATUS OF EXPERIMENTAL AREAS

Lau Gatignon reported on the status of the consolidation and upgrade activities during Long Shutdown 2 in the East and North Areas, AD and AWAKE.

The East Area Renovation Project is well on track and the dismantling of old equipment has been completed. The civil engineering works, including the full roof replacement, are finished. The procurement of the new beam line components and services progresses according to schedule. The CLOUD run with cosmic particles is well under way, and after its completion on 29 November 2019, the CLOUD area modifications will start.

In the North Area the NA61 zone modifications are still slowed down due to the approval situation of the experiment.

The modifications of the PPE144 area, initially for the NA64 experiment, are well on track. The extension of the GIF++ facility by about 50m<sup>2</sup> has been completed according to schedule. The dismantling of the old cryostat of the ATLAS Liquid Argon calorimeter prototype is about 80% finished, there is help from the ATLAS collaboration for the work.

In EHN2 the two cranes have been replaced.

It was pointed out that the resource requirements for running MADMAX in the Morpurgo magnet are being studied.

Discussions between the experiments and accelerator experts have started concerning the requirements and priorities for the spill structure as a function of frequency. For NA62, beam studies related to the reduction of background from upstream decays have been started in close collaboration with the experiment. An Engineering Change Request for the required modifications and their resource impact is in preparation. Some urgent consolidation work is taking place already during LS2. A working group is finalising a detailed analysis of the beam instrumentation status and an overview of required consolidation and upgrades. A report will be presented soon to the management.

A Cost and Schedule Review for the North Area Consolidation study is foreseen by the end of 2019.

Preparatory meetings have been held with the AD experiments to clarify infrastructure needs. The installation of the transfer lines is progressing well, but the beam monitors (SEMs) are still causing worries.

The cabling works are on the critical path, but so far on track for a timely restart.

AWAKE started its summer run with laser and electron beams, but no protons, in July after the installation of the new SPS access system. The experiment will run until December 2019, with electron source and beam line studies to benchmark simulations for Run 2, as well as laser propagation studies in the plasma. In parallel the collaboration is aiming at having a baseline design and planning for Run 2 ready in 2020.

## 5. DISCUSSION OF THE OPEN SESSION

### 5.1 DIRAC

The SPSC **congratulates** the DIRAC Collaboration for the publication in Physical Review Letters on the determination of the lifetime of  $2p$  long-lived  $\pi^+ \pi^-$  states. The Committee **looks forward** to the publication on the production of  $K^+ K^-$  atoms.

### 5.2 NA61

The SPSC **notes with pleasure** the progress achieved by the NA61 Collaboration in the studies of Hadron Production in Hadron-Nucleus and Nucleus-Nucleus Collisions, and the multitude of the results presented to the Committee. The Committee **is looking forward** to the publication of these results.

The Committee **also notes with pleasure** the results achieved by NA61 for the neutrino cross section measurements and **is looking forward** to the publication of the results.

The SPSC **notes with satisfaction** the promising results the pilot run with the fragmented ion setup to understand cosmic radiation, and **is looking forward to** further measurements and results with the setup.

### 5.3 P349

The Committee **takes note** of the report by the P349 Collaboration on the data analysis of the previous test runs and the problems encountered during data taking, which prevent a determination of the anti-proton polarisation.

For a future beam time request by the collaboration, the SPSC **would like to see** an addendum to the P349 Proposal, outlining the revised and optimised detector and experimental setup.

### 5.4 AWAKE

The Committee **congratulates** the AWAKE collaboration for the scientific achievements of the AWAKE Run-1 and **notes with pleasure** that the preparations for Run-2 are well underway.

The SPSC **is looking forward to** further details on the plans and request for future running during Run-2.

## 5.5 CAST

The Committee **appreciates** the progress made by CAST in 2019 both in the axion and chameleon programme. The **SPSC is looking forward** to the results of the 2019 run, which will serve as input to the discussion of the CAST data taking in 2020.

## 5.6 SPSC-I-249 (VMB@CERN)

The SPSC **takes note** of the presentation in the Open Session by the VMB@CERN Collaboration to measure the Vacuum Magnetic Birefringence at CERN using an LHC magnet. To move forward with the review, the next step would be additional information provided by the collaboration to the Committee in form of a proposal. The proposal should include a detailed list of milestones and deliverables concerning the test phases outside and at CERN.

## 6. FOLLOW-UP ON EXPERIMENTS AND PROPOSALS

### 6.1 UA9

Following discussions with the CERN accelerator sector, the SPSC **agreed to review** the physics parts of the UA9 programme, while other elements of the programme are reviewed by CERN's LHC Machine Committee (LMC) and/or LHC Injector and Experimental Facilities Committee (IEFC).

### 6.2 OSQAR

The Committee **takes note** of the progress achieved by the OSQAR experiment in analysing the chameleon search data and **encourages** the collaboration to continue its work towards timely publication of the results.

### 6.3 ANSWERS TO CALL FOR PROPOSALS FOR PROJECTS AT THE CERN ANTIPROTON DECELERATOR AFTER LS2 (SPSC-G-035)

The SPSC **received with interest** the submissions SPSC-P-361 (PUMA: antiprotons and radioactive nuclei), SPSC-M-790 (Beyond Antihydrogen: Testing CPT with the Antihydrogen Molecular Ion), SPSC-P-307-ADD-2 (ASACUSA Proposal for ELENA), SPSC-P-362 (Spectroscopic and gravitational measurements on antihydrogen: ALPHA-3, ALPHA-g and beyond), SPSC-P-334-ADD-1 (AEGIS Programme and Physics Prospects from 2020 up to and beyond LS3), SPSC-M-791 (AD-7/GBAR plans after LS2) and SPSC-P-363 (Future Program of the BASE Experiment at the Antiproton Decelerator of CERN) answering the call for proposals for projects at the CERN Antiproton Decelerator after LS2.

The Committee **notes** that no answer to the call has been submitted by the ATRAP Collaboration. The Chair of the Committee **will contact** the ATRAP Collaboration to confirm that the experiment does not wish to continue after LS2.

#### 6.4 NA62

The SPSC **received with interest** the Addendum 1 to the Proposal P326 by the NA62 Collaboration to continue the NA62 physics programme up to Long Shutdown 3 (LS3).

The Committee **recommends** approval of NA62 operation after LS2, with the first year of operation guaranteed, and additional running in the following years to be reviewed by the SPSC with approval contingent on the collaboration demonstrating their projected improvements in single event sensitivity.

#### 6.5 NA64

The SPSC **congratulates** the NA64 collaboration on the publication of its 2016–2018 invisible channel search results.

#### 6.6 CLOUD

To review the plan of a 10-year programme presented by the CLOUD Consortium, the Committee **appointed** an additional referee from the field of atmospheric and climate science.

#### 6.7 SPSC-I-253

The SPSC **received** the letter of Intent SPSC-I-253 for a Gamma Factory Proof-of-Principle Experiment.

The Committee **will further review** the proposed facility.

#### 6.8 SPSC-I-254

The SPSC **received** the letter of Intent SPSC-I-254 for a Water Cherenkov test beam experiment for Hyper-Kamiokande and future large-scale water-based detectors.

The Committee **will further review** the proposed experiment.

#### 7. A.O.B.

The next SPSC meeting, SPSC136, will take place Tuesday and Wednesday, 21 and 22 January 2020. At the meeting, there will be the annual reviews of the AD Experiments as well as the discussion on the submitted proposals following the call for projects at the CERN Antiproton Decelerator after LS2.

The other SPSC meetings in 2020 are scheduled for

- Tuesday and Wednesday 7 and 8 April 2020;
- Thursday and Friday 11 and 12 June 2020;
- Tuesday and Wednesday 13 and 14 October 2020

## 8. DOCUMENTS SUBMITTED

- PUMA: antiprotons and radioactive nuclei), SPSC-P-361;
- Beyond Antihydrogen: Testing CPT with the Antihydrogen Molecular Ion, SPSC-M-790;
- ASACUSA PROPOSAL FOR ELENA, SPSC-P-307-ADD-2;
- Spectroscopic and gravitational measurements on antihydrogen: ALPHA-3, ALPHA-g and beyond, SPSC-P-362;
- AEGIS Program and Physics Prospects from 2020 up to and beyond LS3, SPSC-P-334-ADD-1;
- AD-7/GBAR plans after LS2, SPSC-M-791;
- Future Program of the BASE Experiment at the Antiproton Decelerator of CERN, SPSC-P-363;
- Gamma Factory Proof-of-Principle Experiment, SPSC-I-253;
- DIRAC collaboration status report to SPSC, October 2019, SPSC-SR-257;
- AWAKE Status Report, SPSC-SR-258;
- CAST Proposal/Status report to the CERN SPSC for the 135th Meeting, SPSC-SR-259;
- Addendum I TO P326 Continuation of the physics programme of the NA62 experiment, SPSC-P-326-ADD-1;
- OSQAR Annual Report 2019, SPSC-SR-260;
- Report from the NA61/SHINE experiment at the CERN SPS, SPSC-SR-261;
- Gamma Factory Proof-of-Principle Experiment, SPSC-I-253;
- A Water Cherenkov Test Beam Experiment for Hyper-Kamiokande and Future Large-scale Water-based Detectors, SPSC-I-254;
- UA9 Status Report 2019, SPSC-SR-262;
- Agenda of the 135th Meeting of the SPSC, 15-16 October 2019, SPSC-A-13;
- Minutes of the 134th Meeting of the SPSC, Thursday and Friday, 13-14 June 2019, SPSC-134.

SPSC documents on the CERN Document Server (CDS):

<http://cdsweb.cern.ch/search?sc=1&p=SPSC>

Christoph Rembser

E-mail: [Christoph.Rembser@cern.ch](mailto:Christoph.Rembser@cern.ch)