EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

CERN/SCC/78-7
CERN/PSC/78-10
February 17, 1978

MINUTES OF THE SECOND JOINT MEETING OF THE PS COMMITTEE AND OF THE SC COMMITTEE, HELD AT CERN ON 15 FEBRUARY 1978

Present: B.W. Allardyce, A. Astbury, J. Bailey, P. Bareyre, A. Bertin, R. Bizzarri, J. Domingo, T.E.O. Ericson, P. Falk-Vairant, M. Fidecaro, E. Gabathuler, L. Grenacs, P.G. Hansen, L. Hoffmann, B. Hyams, R. Klapisch, E. Lorenz, G.L. Munday, B. Povh, M. Rho, V. Soergel, G. Tibell, L. Van Hove

Apologies received from T. Bressani and L. Simons

1. INTRODUCTION

V. Soergel announced that Alan Astbury would arrive around noon, and therefore the SC matters should be discussed first.

The minutes of the first joint meeting held on 21 November 1977 were approved (CERN/SCC/77-30 PSC/77-45).

2. DISCUSSION ON THE "NEAR FUTURE" DEVELOPMENT AROUND THE SC

2.1 An "Arizona"-type muon beam

B. Allardyce reported on the study for a beam to be derived from the production target in the SC hall, used for the Omicron beam (Ref. B. Allardyce, PS COP/jm/1653).

The committee was informed that the simple solution without lenses in the shielding wall would be of little interest to the groups concerned, as the intensity expected is too low.

The physics case for an Arizona-type beam for the solid-state physics was given in the note: Solid-state physics with "Arizona" muons, by E. Karlsson and L.O. Norlin.

J. Domingo outlined the situation at SIN. There, an existing beam will be converted into an Arizona-type beam by the autumn of 1978, with an expected flux of 8×10^6 μ^+ per sec, and it is planned to instal two new beams of this type in 1980.

After discussion, the joint committee felt that the beam project was not in an advanced enough stage, nor was the physics potential of a solution possible at the SC well enough stated, to allow a recommendation now.

In conclusion, the committee agreed that:

i) the PS division should be asked to work out a beam project for the higher intensity version, including a separator, with realistic cost estimates by April, 1978;

ii) the groups interested in the beam (CERN-Uppsala; Parma) should be invited to give the research programme envisaged with the Arizona-type beam in the forthcoming years, also stating the techniques to be applied for the low-momentum μ's, and to indicate at the same time what their programme would be if the Arizona-type beam could not be installed.

The matter will then be discussed again by the SC Committee.

2.2 Acceleration of $^{12}C^{4+}$ ions in the SC

G. Munday reported on the work so far undertaken by the PS Division. Carbon-12 acceleration appears to be technically possible with an intensity of $\sim 10^{11}$ $^{12}C^{4+}$ ions per sec. Some work is still needed before a decision can be made regarding the optimum solution (Ref. A. Fiebig et al., PS-CD/D.1/701/jm).

In the discussion, the physics interest was expressed by several members for a pilot experiment with $^{12}C^{4+}$ ions in an energy range which for some years to come will not be accessible to any other machine accelerating heavy ions. It was stressed that the programme should be limited to ^{12}C and not be extended to other ions, which would technically be feasible but require more work.

After discussion, the committee agreed that here also the situation was not ready for a recommendation.

The PS division is asked to continue the technical study. The physicists interested in the experiment are invited to present a proposal or letter of intent, giving the scope of the work envisaged, if possible to the March meeting of the SC Committee.

Points 2.1 and 2.2 will then be discussed jointly by the SC Committee, and a recommendation with priorities will be given to the Research Board.

2.3 Extension of the ISOLDE facility by a second target station

The committee discussed the paper: On the possibility of extending the ISOLDE operations: physics gains and possible technical solutions, by P.G. Hansen and R. Klapisch, CERN/SCC/78-3/SCC P-2. In view of the facts that Omicron will be located in the proton room for at least two more years and that CERN does not accept commitments on the SC beyond 1982-83, the committee saw no way of recommending the proposed second ISOLDE.

The possibility of installing such a second ISOLDE at SIN was mentioned and the suggestion was made that it could be investigated by the ISOLDE Collaboration.

3, DISCUSSION ON THE DEVELOPMENT AROUND THE PS

Physics with low-momentum antiprotons received considerable discussion at the Workshop and at the joint meeting of the PSC/SCC (SCC/77-30 PSC/77-45), when it was agreed that short-term and long-term improvements to the existing beam situation should be presented at this meeting.

3.1 Short-term improvements

These were presented by L. Hoffmann and B. Povh and took the form of three possible steps:

i) An increase of intensity by a factor of 2 in primary protons on the production target (3-4 $\times$ 10^{12} ppp). This could be achieved at modest cost on a short time scale (beginning 1979).

A larger intensity by a factor 5-6 ($\sim 10^{13}$ ppp) would imply a new philosophy of use, a single user facility, and require new radiation hard elements. The time scale for these developments could overlap with that of a future possible bigger increase in intensity using a low-energy $\bar{p}$ facility -- discussed below under the long-term improvements.

The PSC/SCC therefore recommends the implementation of the factor of 2 increase at this time.

ii) The increased intensity could feed a larger-aperture conventional beam with good separation and momentum definition producing an over-all gain of $\times 5$ in intensity.

iii) An unconventional beam may be constructed with poor momentum resolution, large solid angle, and low separation. This beam would demand a measurement of the momentum of individual antiprotons incident on the experimental target, if good mass resolution were required, and the ability to work with high pion backgrounds.

The choice of step (ii) or (iii) depends on the specific experiment proposed; however, both may include the expense of new magnetic elements, e.g. three large-aperture quadrupoles.

A recommendation on the choice is deferred until an experimental proposal is received.

3.2 Long-term improvements

The physics case for a low-energy antiproton facility based on deceleration of cooled antiprotons was submitted to the joint committees (Ref. SCC/78-4 PSC/78-8). In the discussion, the emphasis was given to the possibility of exploring baryonium spectroscopy. At present there exist indications of possible states, and it was felt that the gains offered by the facility ($\sim 10^3$-10^4 intensity gain, $\Delta p/p \lesssim \sim 10^{-3}$, and zero background) may be necessary to confirm their existence, and would certainly be needed to explore the properties of any new states. In particular there may be a need to study in detail the elastic channel using gas jet targets, unpolarized and polarized.

In addition, it was emphasized that enormous gains can be made in extrapolations of existing experiments in $\bar{p}$ X-rays from nuclear targets, the p-$\bar{p}$ protonium system using gas targets (gain $\sim 10^6$ from increased intensity and small $\Delta p/p$), $p\bar{p} \rightarrow e^+e^-$ where a study of the electromagnetic form factor of the proton may be made over a significant part of the time-like region, and a possible exploration of vector-meson states using $p\bar{p} \rightarrow$ $\rightarrow V + m\pi^0$ ($V \rightarrow e^+e^-$).

Some reservations were expressed on the study of high-mass states using colliding beams of p and $\bar{p}$ at a luminosity $\sim 10^{30}$ cm^{-2} sec^{-1}, e.g. the charmonium spectrum including the states with quantum numbers different from 1^-. However, it was agreed that such a colliding beam facility -- with electron cooling such that $\Delta p/p \sim 0.4 \times 10^{-4}$, corresponding to $\Delta M \sim$ $\sim$ 100 keV -- could provide the only means of making a direct measurement of the widths of the X states.

In conclusion it was felt that the physics case was strong, and that since experiments performed at CERN hold the initiative in many of the fields discussed, the possible implementation of such a low-momentum $\bar{p}$ facility should definitely be pursued. To this end it is recommended that the group of people, already involved in the implementation study, continue, possibly enlarged by outside physicists. The aim should be to consider the machine

physics problems of the utilization of the PS as a decelerator, the possible use of ICE as a stretcher ring, and the problem of the provision of slow extraction. Other possibilities should also be considered, e.g. a completely new stretcher ring, and the possibility of p-$\bar{p}$ collisions.

The aim of such a study should be a project document providing a realistic costing of the features and their feasibility so that at a future date a balanced discussion could be held and a decision reached in the form of physics return against cost to CERN.