Mme C. KLEINPETER
(Liste 6 = 3 ex.)

CERN/ISRC/80-32
17th October 1980

EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

MINUTES OF THE NINETY-SECOND MEETING OF THE INTERSECTING STORAGE RINGS COMMITTEE HELD ON 15th OCTOBER, 1980

OPEN SESSION

1. Information from the Research Director General

Professor L. Van Hove opened his remarks by referring to the initial running of the Antiproton Accumulator ring which took place in July shortly after the last open meeting of the ISRC. On the basis of these successful first tests it is expected that the antiproton design intensity will be reached within a factor of two. The Director General reminded the meeting that the project was approved in June 1978 and to have the machine operating two years later was a remarkable achievement.

In reporting on the recent meetings of the Scientific Policy Committee, Finance Committee and Committee of Council, the Director General mentioned that the SPC had reviewed and approved a plan for the future of the CERN computing centre which included the replacement of the second front-end machine of the CDC 7600 and the addition of a third central processor for the IBM computer system. The Finance Committee also approved the construction of an exploration gallery for LEP which will yield valuable geological information necessary for the construction of the part of the LEP tunnel under the Jura mountains.

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2. Requested extension of R 608

The present status of experiment R 608 (Large X hadron physics and correlations with central region phenomena) and the CERN-Clermont Ferrand-Los Angeles-Saclay collaboration's recent request to add equipment at 90° was described by B. Bloch-Devaux. Further details of the new spectrometer including the requested installation schedule and repartition of responsibilities within the collaboration were given by L. Meritet.

3. Status report from experiment R 703 T

J. Rushbrooke described the preliminary tests which were carried out by experiment R 703 T (Evaluation of a large streamer chamber detection system and a study of $\bar{p}p$-pp differences at ISR energies) before the start of the present shutdown and explained the plans of the Bonn-Brussels-Cambridge-CERN-Stockholm collaboration to complete their evaluation of the equipment and to take physics data on pp and $\bar{p}p$ collisions at the ISR before moving to the SPS collider towards the end of April 1981.

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CLOSED SESSION

Present: G. Bellettini (chairman), J-J. Aubert, L. Camilleri, F. Ferger, E. Gabathuler, J. Garvey, G. Jarlskog, E. Kluge, I. Mannelli, A. Minten, S. Pichler, K. Potter, P. Strolin, H. Wahl, G. Wolf.

Invited part-time : D. Möhl

Apologies for absence were received from V.G. Goggi and M. Jacob

1. Minutes of the last meeting

The minutes of the ninety-first meeting of the ISRC, CERN/ISRC/80-28, were approved.

2. Status report from the ISR Coordinator

L. Camilleri presented his status report on the installation and preparation work of the ISR experiments during the present long shutdown. In general the work is progressing as planned but he mentioned that an attempt to cool down the R 110 superconducting solenoid to allow magnetic measurements to be made had failed because of vacuum leaks in the cryostat of the magnet. The leaks have now been sealed and a new cooldown has started. The

installation of equipment in intersection 2 has been delayed because of difficulties with the beam scrapers being installed for the total cross-section experiments (R 210, R211) but is still expected to be completed before the end of the shutdown. Unfortunately, a major problem has appeared with the wire chambers of the SFM Detector where a large number of interrupted wires have been found on about ten chambers. As it will take some considerable time to repair these chambers the future scheduling of the ISR is being rediscussed but it is not intended to extend the present shutdown.

3. Requested extension of experiment R 608

The committee discussed at length the requested extension of experiment R 608 as described in the memorandum, Status of R 608 and request to add equipment at 90°, from the CERN-Clermont Ferrand-Los Angeles-Saclay collaboration (CERN/ISRC/80-29) presented in the open session. After hearing a rapporteur's report the ISRC decided to recommend for approval the addition of this spectrometer at 90° under the assumption that the particle identification provided by the aerogel counters can be made to work as described.

4. Possibilities for polarized protons in the ISR

The chairman of the ISRC invited D. Möhl to give a brief summary of his report at the recent Conference on High Energy Physics with Polarized Beams and Targets at Lausanne, when he suggested that it may be possible to reach luminosities as high as 10^{30} cm^{-2} sec^{-1} with polarized proton beams in the ISR. A more complete explanation of this estimate is attached to these minutes. The committee felt that a general and thorough discussion of a possible physics programme and of the technical problems should take place on a future occasion.

5. Status report from experiment R 703 T

The committee was pleased to hear of the progress of the test installation R 703 T in preparation for the UA5 experiment at the SPS collider and noted with satisfaction that the collaboration confirms its intention to obtain physics results at the ISR.

6. Next Meeting

The next meeting of the ISRC will be held on

Wednesday, 3rd December 1980.

K.M. Potter

23rd October 1980

Estimated Luminosities with Polarized Protons at CERN

D. Möhl

(Answer to a question during the 'Round Table Discussion' at the 1980 Conference on High Energy Physics with Polarized Beams and Targets).

What intensity and luminosity might it be possible to achieve with polarized protons in the CERN PS and ISR?

To answer this question, I shall simply try to update the conclusions of a study[1] made in 1974/75. The results may be summarized by saying that with the progress in polarized ion sources and in injection and beam cooling techniques as well as with the improvements of the optics in the ISR, one could now hope to obtain luminosities of the order of 10^{30} cm^{-2} sec^{-1} for polarized proton against polarized proton collisions in the ISR.

I am not competent to comment on budget and manpower implications of your question, nor on the compatibility of polarized beams with the other CERN programmes. Let me just say that with the work continuing or just starting, it will - in my opinion - be difficult to implement polarized beam acceleration in the near future at CERN.

To conclude, I shall give a few comments on the assumptions (Tables 1 and 2) which have gone into this order of magnitude estimate of the luminosity:

1. Linear addition of all possible improvements (suggesting a gain of 5000 in luminosity) seems over-optimistic. I would rather take an overall improvement factor of 1000.

2. At the PS and its booster, for operation with ordinary protons, little is to be gained by charge-exchange injection. This is because the new 50 MeV linac is already intense enough to fill the machines to their space-charge limit. The situation is different at the Brookhaven AGS where H^- injection will soon become a standard operation.

L. Dick has suggested using the low energy antiproton ring LEAR (scheduled for first operation end 1982) to accept and store polarized protons from an H^- type of source. Since the circumference of LEAR is only 1/8 of the PS, 8 times as many turns would have to be stacked to reach the same intensity. This would then probably require cooling and accumulation in addition to charge-exchange injection.

3. The assumed gain by stochastic cooling in the ISR or by more cooling in LEAR may appear small but the beam intensity is at a level where cooling becomes difficult.

4. Most of the work necessary to avoid depolarization would have to be done at the PS. In the ISR polarized beams could hopefully be stacked at energies half-way between adjacent resonances (the imperfection resonances $\gamma(g-2)/2$ = integer are spaced about 0.5 GeV apart). At energies above about 19 GeV the full momentum acceptance of the ISR cannot be used because the corresponding dispersion in spin precession frequency fills the space between adjacent resonances. In the PS, acceleration to high energies also gets increasingly difficult as the number of spin resonances is large.

5. Looking at the SPS one could hope to accelerate polarized beams there if the 'Siberian snake' techniques hold their promise and if space for the corresponding orbit bump scheme could be found. In this context high energy (25 GeV) transfer PS-SPS would be desirable but would require great care to avoid depolarization in the PS, especially as there are very strong structural resonances around 23 GeV.

D. Möhl

Ref. 1): Proposal for a two-year study on polarized beam and light ion acceleration in the PS, CERN-PS/DL 75-1.

Table 1 : SUMMARY

1974/75 assumptions[1] :

$N = 10^{10}$ polarized ppp in PS

$L_{\uparrow\uparrow} = 10^{27}\ cm^{-2}\ sec^{-1}$ in ISR

New since 1974/75	assumed improvement factor in PS intensity N	ISR luminosity $L_{\uparrow\uparrow}$
1. high current polarized H^- source + charge exchange injection	5 - 10	30 - 100
2. superconducting low-beta optics in ISR	-	5
3. cooling in ISR and/or LEAR as accumulator	2 - 3	3 - 10
overall gain linear addition of optimism	10 - 30	500 - (5000)
assumed value	15	1000

resulting 1980/? dream : $L_{\uparrow\uparrow} \approx 10^{30}\ cm^{-2}\ sec^{-1}$

also new since 1975 : 'snakes' → SPS ?

Table 2 : MORE DETAILS

	1974/1975	1980	
polarized source			
H^+ project	100 μA		500 μA
obtained	20 μA		100 μA
H^- project	(100 nA)	100 μA	
obtained	(10 nA)	10 μA	
No. of turns injected in PS	10	100 (800 in LEAR)	10
intensity in PS	10^{10}	10^{11}	5×10^{10}
ISR luminosity	$\approx 10^{27}$ cm^{-2} sec^{-1}	$\approx 10^{30}$ with cooling	$\approx 5 \times 10^{29}$ with cooling
PS energy hoped for with			
good polarization	12 GeV	12 GeV	
reduced polarization	23 GeV	23 GeV	
SPS	deuterons to $\approx$ 100 GeV	400 GeV?	p↑with snake

Hardware needed:

- source
- H^- injection (PS or LEAR)
- fast Q-jump quadrupoles and pulsed dipoles (in PS)
- very precise magnet alignment (PS, ISR, SPS)
- polarimeters (PS, ISR, SPS)
- 'snake' system (SPS).