

12 February 1962

M e m o r a n d u m

To : The Members of the Nuclear Physics Research Committee

From : P. Preiswerk

Re : The programme for counter experiments at the PS machine during the period 1-5-1962 to 1-10-1962 (Period II)

In this memorandum an account is given of the developments in the proposed counter experimental programme for Period II at the PS machine since the Nuclear Physics Research Committee meeting of 10-1-1962.

A revised list of counter experiments proposed at the PS is attached to this memorandum. This list contains two parts:

- a) Experiments for which machine time is asked in Period II.
- b) Counter experiments for which machine time is asked in a later period.

I. Beams available for counter experiments in period II

Final decisions on the beam situation in period II were taken at the NPRC meeting of 10-1-1962. The following beams will be available:

1. c_3 , a 25 GeV/c proton beam with an intensity of 10^7 p/burst in the SH.
2. d_9 , a 10-20 GeV/c π beam in the South Hall (SH), almost identical to the earlier beam d_7 .
3. a_2 , a high intensity 1-2 GeV/c $\pi - K$ beam in the North Hall (NH), which will be installed during the 3 weeks shut down starting 7 May, 1962.
4. q_1 , a 1-1.5 GeV/c π beam in the SH. This beam is now installed.
5. A simple test beam next to q_1 , in the SH.

A O^0 neutral beam from target 1 may be required after 1 September, 1962.

II. Machine time available

The earlier estimate of 60 shifts available for counter experiments in Period II is still valid. This figure includes 10 shifts definitely allocated to the neutrino experiment at the NPRC meeting of 10-1-1962.

For most of the remaining shifts experiments in beams d₉, q₁, c₃ and a₂ can probably run in parallel, except for 15 shifts when beam a₂ is probably not available.

III. Development in the status of the counter experiments proposed for period II

Beam c₃ Ny²₄ Beam survey

The Taylor group proposes to measure the π^- production at small angles ($< 5^\circ$) when a Be or H₂ target is bombarded by high energy protons. This experiment could be done with the set-up of experiment S8 and might possibly be considered as part of the beam survey measurements.

Beam d₉ S₁ $\pi - p$ elastic scattering at 12 and 18 GeV

and

S₂ Peripheral processes + N $\begin{matrix} \nearrow 2\pi \\ \searrow 2K \end{matrix}$

The group has decided to start with experiment S₂, because no π^+ beam is available before 1 September, 1962. The time requested is 30 shifts for S₁ and 10-20 shifts for S₂ in Period II.

C₅ $\pi - p$ diffraction scattering

The group definitely asks no machine time in period II, because the π beam is not sufficiently intense.

S_{4,5} Peripheral proton production

If the first tests in Period I are successful, 15 shifts in Period II are requested.

S₉ Test of special relativity

The physical background of this experiment is still being studied by a working party. The group asks for 12 shifts in Period II, preferably parasiting on a BC run as a short machine burst is required.

Beam a₂ S₇ Measurement of $\Sigma - \Lambda$ parity by the Argonne Group

As the group has to leave before 1 September 1962, 50 shifts are requested before 15 July, divided up as follows:

March - 10 shifts for tests
April-May - 15-20 shifts
June-July 15-20 shifts

Beam q₁ S₆ Measurement of $\Sigma - \Lambda$ parity by Cork-Fidecaro group

The request for machine time has been modified to 10-15 shifts for the Σ polarization measured and 30 shifts for the measurement of the $\Sigma - \Lambda$ parity. For 15 of these shifts the group asks to be main user.

Neutrino N_{3,5} Neutrino experiment
beam

The machine time request for period II is 15 shifts, as originally asked for.

Neutral S₁₅ Charge exchange scattering
beam

The 10 shifts requested are required for the end of period II or beginning of period III.

IV. Conclusions

1. No difficulties are expected if the parallel running will work in beams d₉, c₃ and q₁. All experiments for which machine time is asked in these three beams can be scheduled.
2. In beam a₂ no machine time will be available before 15 July, 1962, except for the Argonne group.
3. Any additional machine time allocated to the neutrino group must be subtracted from the time available in beams d₉, c₃, q (and possibly a₂).

LIST OF PROPOSED EXPERIMENTS REQUIRING MACHINE

TIME IN PERIOD II (1-5-62 to 1-10-62)

A. Experiments requiring a high-energy external proton beam with an intensity of about 10^7 p/burst (c_3)

These experiments are all compatible with the c_3 (Berne) beam, but require one set of quadrupoles and one or two bending magnets in the South Hall.

Symbol	Name	Title	No. of shifts required in Period II
S_8	Taylor	Deuteron production in p-p collision, in particular $p + p \rightarrow d + \pi^+$	20
(N_4)	Taylor	π^- production at small angles	10

Remarks

S_8 : 25 GeV/c proton beam of 3×10^7 p/burst is required. At least 20 shifts are required, of which 10 shifts are needed for a preliminary experiment. Apparatus will be ready on 1 February 1962.

(N_4) : It has to be decided whether the proposed experiments can really be considered as part of the beam survey.

B. Experiments requiring a π -meson beam of an energy between 10 and 18 GeV/c (d_9)

Beam d_9 will probably be installed around 1 April 1962.

Symbol	Name	Title	No. of shifts required in Period II
S_1	Jones	Elastic π -p scattering	10
S_2	Caldwell	Peripheral processes $\pi + N \begin{cases} \rightarrow 2\pi \\ \rightarrow 2K \end{cases}$	30

Symbol	Name	Title	No. of shifts required in Period II
S _{4,5}	(Zavattini (Hyams	Peripheral photon production	15
S ₉	von Dardel	Relation between momentum and velocity for relativistic π mesons	12
S ₁₄	Citron	μ -p scattering (tests)	(10)

Remarks

S₁) : Beam requirements: 12 GeV/c π^- 3×10^4 /burst 12 GeV/c π^+ 10^4 /burst
 S₂) : 12 - 18 GeV/c π^- 3×10^4 /burst.

In these experiments the same spark chambers will be used. The change from S₁ to S₂ takes about two weeks. It is the intention to start with experiment S₂, for which the apparatus can be ready on 1 April 1962.

S_{4,5} : The shifts are only required if a test run in period I is successful.

S₉ : 10 - 15 GeV/c π beam is required of fairly low intensity. A short burst is preferred and the experiment could run in parallel with a bubble chamber.

S₁₄ : The 10 shifts in this beam are required for testing equipment. The beam transmitted by the experiment S_{1,2} can be used, in which case no actual machine time need be allocated.

C. Experiments requiring a 1-2 GeV/c π^- or K-meson beam of high intensity (a₂)

The beam a₂ will be installed during the 3 week shut down starting 7-5-1962.

Symbol	Name	Title	No. of shifts required in Period II
A ₂	Lundby	Setting up of a new K beam of higher intensity (a ₂)	15
S ₁₃ -L ₂	Lundby	Strange particle physics	15

<u>Symbol</u>	<u>Name</u>	<u>Title</u>	<u>No. of shifts required in Period II</u>
S ₁₁	Conversi	\bar{p} -p annihilation of electron pair	> 10
S ₇	Roberts	Σ -A parity	30 - 40

Remarks

- A₂ : For this project new magnets are needed which will be available before the end of February.
- S₁₃-L₂ : The apparatus for these experiments is available.
- S₁₁ : A number of 10 - 15 shifts is needed as early as possible to obtain an estimate of the cross-section.
- S₇ : The group has to leave before 1 September 1962. The 30 - 40 shifts are therefore required before 15 July 1962 to finish the experiment.

D. Other Experiments

<u>Symbol</u>	<u>Name</u>	<u>Title</u>	<u>No. of shifts required in Period II</u>
S ₆	Cork	Σ -A parity	15 + 30
N _{3,5}	Faissner	Neutrino	15
S ₁₅	Wetheroll	Charge exchange scattering	10

Remarks

- S₆ : This experiment needs a special beam Q1, which is now available. The 15 shifts are requested for a measurement of the Σ polarization.
- N_{3,5} : 15 shifts are needed for background measurements.
- S₁₅ : For this experiment a 0° neutral beam from target 1 is needed. The machine time is only required after 1 September 1962.

LIST OF PROPOSED EXPERIMENTS REQUIRING MACHINE

TIME NOT EARLIER THAN PERIOD III

<u>Symbol</u>	<u>Name</u>	<u>Title</u>	<u>Beam required</u>
C ₅	Taylor	π -p diffraction scattering	12 GeV/c π^- 10^6 π /burst
S ₁₄	Citron	μ -p scattering	High intensity 4 - 5 GeV/c π^- beam
S ₁₆	University College London	p polarization in π -p scattering	0.7 - 1.1 GeV/c π^- 5×10^5 π /burst

The experiments L₅ and S₁₂, which appeared in the previous list, are for the present withdrawn by the authors.

