MPS/MU-NOTE/EP 72-11
GLM/ld - 17. 8.1972

FUTURE OF 25 GeV PHYSICS

(Résumé)

Whatever the details of the future facilities for 25 GeV Physics at the PS may be (i.e. South Hall open or closed, repetition time vs 300 GeV machine, etc.), the main interest in this enquiry has been how to use the East Hall slow ejection system to its maximum potentialities and which will be able to go up to 10^{13} p/pulse. It is assumed that the 2 m Hydrogen Bubble Chamber remains in operation and takes two or three pictures per PS pulse, but in general one "heavy" bunch per picture - thus for this purpose it is a low intensity instrument.

The possible high intensity users are the electronic experiments in which must be included those using enriched or partially separated beams such as are now in use with restricted intensity ($\sim<10^{12}$ p/p) in the South Hall.

Thus the exercise has been to create space in the hall for electronic experiments at the expense of the 2 m Hydrogen Chamber.

Two solutions are envisaged, both of which have their merits in particular cases, a displacement of the chamber of either 6.50 or 13 m to the North of its present position; see P. Lazeyras' comments.

With these solutions the slow ejected beam can be divided into three branches and the optics developed so that there is sufficient space for shielding and that the hall is used effectively.

The secondary beams developed from these three proton sources is a matter of speculation, following the needs of the physics of the moment (see G. Petrucci's comments).

The financial implications of the changes envisaged have not been looked at. However, note : the move of the 2 m HBC is not a capital investment. Shielding for "high intensity" will cost money. Beam transport and power supplies are to be looked at.

It has been noted that the "Physics III Community" might be interested in the PS, in particular for ISOLDE. This facility could possibly be accommodated for comparatively small cost in the Gargamelle Hall, assuming that the Heavy Liquid Chamber had left for the 300 GeV or had stopped. However, the details of this remain vague as there is little defined input data.

In our thinking so far we do not see any reason for major modification to the PS machine, e.g. in the position of ejection systems.

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11.8.1972

NEW POSSIBLE LAYOUTS FOR THE EAST AREA

1. Displacement of the 2 m HBC by 13 m to the North.

   a) Low energy beams : no problem. The lowest energy beam, k_8 is probably better because the angles in the beam are smaller.

   b) RF separated beam : shorter, about 150 m against 180 m. Limited to 15 GeV/c, separated as well as unseparated. Lowest momentum about 5 GeV/c instead of about 6 GeV/c. Muon contamination could be 10 o/o higher than now, but will probably be unchanged.

2. Displacement by 6.5 m to the North.

   Practically no difference with the previous layout. The RF beam is in principle somewhat worse, because the deflection angles are somewhat smaller.

P. Lazeyras

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GP/ld - 21.8.1972

COUNTER BEAMS AT THE PS NOW AND THEIR POSSIBLE FUTURE IMPROVEMENTS

G. Petrucci

The present situation of counter beams around the PS is still rather well described in NP Internal Report 71-5, where a table, in page 2, gives the significant number of the beams existing at the beginning of 1972.

Since then , beam k_{17} (1 GeV/c max. momentum, $\cong$ 2 msterad angular acceptance, electrostatically separated) has replaced beam q_{10} in the South Hall, and beams p_8 and p_{13} have replaced respectively beams p_4 and p_5 in the East Hall (p_8 and p_{13} having basically the same performance as beams p_4 and p_5). Furthermore, beam p_9 (17 GeV/c max. momentum, 0.1 msterad angular acceptance) has been installed in the West Hall for the Omega experiments and, at the end of 1973, the fast spill 3.2 GeV/c beam for g-2 experiment will be installed in the South-East Area.

Summarizing the present situation, we have (the maximum momentum of charged beams is indicated in brackets) :

In the South Hall :

a) From internal Target T 1 : b_{16}, $d_{30}^{*)}$ (12 GeV/c), m_7 (3 GeV/c), m_{11} (2 GeV/c), t_1 (1 GeV/c, test only)

b) From internal Target T 8 : m_9 (5 GeV/c), k_{17} (1 GeV/c)

In the East Hall :

c) From e_{9N} : y_1 (20 GeV/c)

d) From e_9 : p_8 (18 GeV/c), p_{13} (20 GeV/c), k_{12} (0.6 GeV/c)

e) From e_{9S} : b_{19}

In the West Hall

f) From e_{11} : p_9 (17 GeV/c), t_3 (1 GeV/c, test only)

In the South-East Area

g) From the Gargamelle fast extracted beam : q type$^{**)}$ (3.2 GeV/c)

*) On this beam two users might be installed.

**) Installation foreseen by end 1973.

In the South Hall four beams (m_7, m_{11}, m_9, k_{17}) are "enriched" by means of electrostatic separators; they cover altogether a momentum range from 0.6 up to about 5 GeV/c.

In the East Hall there are no separated beams and the only low energy existing one (k_{12}) is enriched by means of differential absorption at the momentum slit. All the other beams in the East Hall are of high energy.

The difference in the beams quality between the two areas depends on the sizes of the possible production targets and on the size and orientation of the experimental area with respect to the primary proton lines. Actually internal targets are much smaller than external ones (typically : 1(V)x2(H)x10(L) mm^3 for internal targets, 5x5x70 mm^3 for external ones). This fact makes easier the "separation" for

beams generated from internal targets, even at a large production angle. On the other point, the space available for counter beams in the East Hall is much narrower than the one in the South Hall and, furthermore, it is crossed longitudinally by the proton line; the secondary beams must lay rather close to the primary beam line and there is not enough space for the large deflections generally required by m-type beams. For this reason also, the background is higher in the East Hall than in the South Hall.

If we wonder what kind of future improvements, in a frame of limited costs, can be envisaged for the different areas (excluding the West Area which will be transformed for 200 GeV physics and the South-East Area, only suitable for fast spill), we can state that the South Hall is already fully exploited and little improvement can be foreseen for the beams there. The intensity available is already corresponding to a maximum number of protons impinging to the targets, which cannot be overcome without producing a too rapid deterioration by radiations of the machine. The background situation is good with maybe the only exception of the d_{30} area. In case of suppression of target 8 and b_{16} it could be conceivable to install from target 1 a scattered proton beam, all other beams being unchanged.

The East Hall layout, on the contrary, might be considerably improved, mainly taking advantage of the high intensity which will be available with the Booster and of the larger space that might be made available if the 2 m HBC is moved by 13 m to the North. The splitting of the protons in three branches should remain, but the optics of the proton line should be redesigned so as to move the target as up-stream as possible (for instance, mounting the two splitter magnets one after the other without intermediate optics, one might gain 20 metres in longitudinal space). Stronger deflections should be made on the p-type beams in order to reduce the background, and the shielding should be redesigned so as to cope with the higher intensity. The considerable extra space made free by the moving of the HBC might permit the installation of one (maybe two) extra conventional beam, beside the larger fanning out of the other ones.

One, or at a maximum two m-type beams (equipped with electrostatic separators) might then be mounted, if so required, but only at very small production angle and with production targets smaller in cross-section than the present ones. (Fortunately the splitting in the vertical plane of the EPB should allow for a small vertical spot of the EPB at the target). One can thus envisage in the East Hall : three p-type beams (instead of the present two p-type beams plus the y_1), and one m-type beam (instead of the present b_{16}), or two p-type beams and two m-type beams, all of them with higher intensities, better resolution and, maybe, lower background than in the present case.