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PROPOSED SECONDARY BEAMS FOR COUNTER EXPERIMENTS IN THE SPS WEST HALL

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In this progress report we describe a system of beams which have evolved from attempts to combine the requirements of potential users, as far as known, with the objective possibilities of the West Area.

This layout allows the simultaneous running of as many beams as can reasonably be contained in the West Area with full independence from one another.

We draw attention to the following points :

i) The West Area complex is limited in size, allowing for secondary beam lengths of only about 250 m. This should be compared to the NAL Meson Laboratory beams which are about 500 m in length.

ii) The targets in the three branches of the split proton beam can only be separated transversely by about 60 cm. The freedom in the design of secondary beam is therefore limited by the spacial interdependence of the first beam elements. Furthermore this limits the number of beams which can be obtained from the targets.

iii) The highly dense arrangement of beam elements in the section following the target can be seen in Fig. 1. This has the immediate consequence of high activation levels in this area which will require special facilities in order to make maintenance possible.

Some of these facilities, such as semi-automatic release and alignment, are presently under study. It should, however, be realized that human intervention, if at all possible, must at least be minimized. Actual realization of the proposed beam layout will therefore depend, to a large extent, on solving the maintenance problem in this area.

iv) In the West Hall, the primary targets, the secondary beams and the experiments are above ground and are all contained in the same horizontal plane. First rough estimates have shown that important shielding quantities will be needed in order :

a) to reduce the μ background at the experimental positions to a tolerable level, and

b) to reduce the μ flux at the CERN limits, only about 200 m behind the West Area, to $\lesssim 1\ \mu/cm^2$ per pulse, which corresponds to a dose level recommended by the ICRP and accepted by France.

The feasibility of the present layout will therefore depend to some extent on the result of more detailed evaluations of the required μ-shielding.

v) Finally, we would like to mention that the proposed layout makes use of practically all the beam elements which can be recuperated from the present 25 GeV layout in addition to what has already been ordered by the end of 1973.

1. DESCRIPTION OF THE LAYOUT (see Fig. 2)

i) Beams to Omega

Omega can be exposed to hadrons (separated or unseparated) or electrons. This is achieved by constructing two beams, namely S1, an r.f. separated beam for hadrons, and E1/H1, an electron/hadron beam (for discussion on this see SPSC/73-10, D. Treille, 31.10.1973).

ii) Other charged secondary beams

Two further experimental areas can be served by charged secondary beams :

E1/H1 The front end of this beam is identical to the Omega beam referred to above. However, it can be switched, midway down the hall, to an alternative experimental area north of Omega.

H3 This beam is presently foreseen to be a high-energy, high-resolution beam, and is obtained from T5.

iii) Special beams

Non-interacting protons are recuperated after traversal of T1 and can then be used to generate special beams as, for example, the hyperon beam. Intensities of P1 within the range 10^{8} - 10^{11} ppp will be possible.

iv) Neutral beams

A neutral beam can in principle be obtained at 0° from any of the three targets. (The beam N3 in Figs. 1 and 2 has been drawn from T5). A neutral beam at an angle different from 0° and obtained from targets 1, 3 or 5, must be able to pass between the vacuum chamber and coil of the quadrupoles, which are the first elements in all the charged particle beams, and furthermore should not encounter obstacles further downstream. With this limitation in mind, only T5 is suitable for deriving a neutral beam with a maximum production angle of 4 mrad.

2. OPERATION

The following beams can in principle be used simultaneously :

S1 in Ω		E1/H1 in Ω
E1/H1		P1
P1	or	N3
N3		H3
H3		

3. BEAM CHARACTERISTICS

The proposed beam characteristics are given in Table 1.

FIGURE CAPTIONS

Fig. 1 is a plan of the region following the targets. The shaded parts indicate the approximate extremes of the cone swept by non-interacting protons from targets 3 and 5 for all possible secondary momenta.

Fig. 2 sketches the beam lines for the proposed layout. The shaded areas at the end of each beam (8×50 m^2), indicate the size of a hypothetical experimental area.

TABLE 3 CHARACTERISTICS OF PROPOSED WEST AREA BEAMS

Beam Code	Description	Max. Momentum (GeV/c)	Prod. Angle (mrad)	Angular Acceptance (μstr)	Momentum Resolution (slits)%	Flux at Detector* (for 10^{12} interacting protons)	
						Particle	At Max. Momentum
S1	R.F. separated beam to omega	40	0	56	± 0.8	π^+ K^+ p π^- K^- $\bar{p}$	10^9 7.10^7 4.10^8 10^9 4.10^7 2.10^7 } unseparated
E1/H1	Electron/hadron beam	80(omega branch) 100 (to area north of omega)	0	12	± 0.2	e^+ π^+ K^+ p π^- K^- $\bar{p}$	$\sim 10^7$ 5.10^8 3.10^7 8.10^8 2.10^8 4.10^6 10^6 } at 80 GeV
H3	High-energy high-resolution beam	150	0	7.5	± 0.2	π^+ K^+ p π^- K^- $\bar{p}$	4.10^7 8.10^6 3.10^9 10^7 4.10^4 4.10^3
P1	Attenuated proton beam	200	0	-	-	p	$10^8 - 10^{11}$
N3	Neutral beam	-	0	-	-	n	$\sim 1.8\ 10^7$;for 10^{-8} str $120 \leq p \leq 150$ GeV/c**
	(long lived)	-	4	$\sim 10^{-2}$		K^0	$\sim 10^5$; $90 \leq p \leq 110$ GeV/c***

* These fluxes are calculated from the thermodynamical model (using up-dated "ISR constants") assuming 10^{12} protons interacting in a hydrogen target, taking into account $K^{\pm}$ decay and using the entire angular and momentum acceptance. The model gives an incorrectly high value for the π^-/π^+ ratio at low energies. No attempt has been made here to correct for this deficiency.

** See CERN/ ECFA/72-4, Vol. 1, page 267.

*** Intensity at production target.