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FEASIBILITY OF A SURVEY OF NEGATIVE HYPERON INTENSITIES IN A BEAM OF MODERATE LENGTH

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ABSTRACT

This note points out that negative hyperon yields could be measured by minor modification of the forward-angle beam-survey Proposal 64.

NAL Proposals 8 and 69 discuss the construction of a hyperon beam using a special steel shield only six meters to eight meters long. Proposal 64, on the other hand, discusses forward-angle beam surveys in Area 2 using a DISC differential gas Cerenkov counter in a spectrometer system about 240 meters long. The purpose of this note is to point out that detectable fluxes of negative hyperons could be observed in this forward angle beam survey if the DISC counter were to be placed about 30 meters from the production target. In this manner the hyperon yields could be measured, and the beam length would be sufficient for adequate shielding, although the hyperon intensities would be too low for experiments. The proposed modifications to the configuration are shown in Fig. 1. Quadrupoles Q_1 and Q_2 and bending magnet B1 would be in the same position as discussed in Proposal 64, but quadrupole Q_3 would be shifted downstream to allow the insertion of a 5-meter long DISC counter. Quadrupoles Q_1 and Q_2 would furnish a parallel beam at 150 GeV/c, and B1 would be set to deflect negative particles of this momentum through 20 mrad. The solid angle would be 4.5 μsr, while the momentum bite would, in fact, be defined by the DISC. A 5-meter DISC with 25-mrad Cerenkov angle would result in $\Delta p/p \sim 0.025$ for Σ^- hyperons. Using this information

together with the Hagedorn-Ranft yield predictions, which are perhaps optimistic, the expected rates were calculated and are shown in Table I. Both Σ^- and Ξ^- hyperons should be present in measurable amounts in the beam, and all of the masses should be resolvable by the DISC counter without difficulty.

Table I. 150 GeV/c Negative Fluxes Seen by a DISC Cerenkov Counter 30 m From the Production Target.

Particle	Hagedorn-Ranft 0-mrad Yield	Flux at 30 m	$(1 - \beta) \times 10^5$
π^-	1.6×10^5[a]	1.6×10^5	0.04
$\bar{p}$	150	150	1.95
Σ^-	1.6×10^5	1000	3.05
Ξ^-	4000	24	3.8
Ω^-	140	0.02	6.0
$\bar{d}$	0.1	0.1	7.6

[a]Yield at target per 10^{10} interacting 200-GeV protons into $\Delta\Omega$ = 4.5 μsr and Δp = 3.7 GeV/c.

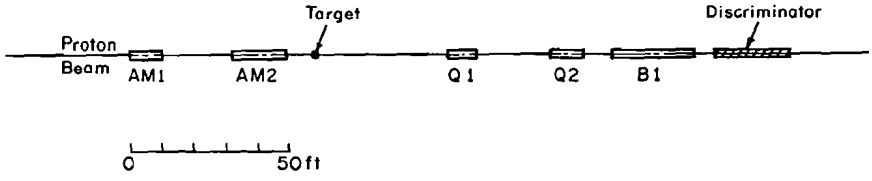

Fig. 1. Modified front end of the spectrometer beam in Proposal 64. AM1 and 2 are proton-beam steering magnets. Q1 and Q2 form a parallel beam for the DISC.