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LONG-LIVED NEUTRAL BEAMS

R. A. Zdanis
Johns Hopkins University

ABSTRACT

Neutron and K_L^o beams in Target Station 2 are discussed. Provision is made for various intensities, energy spectra, and purities.

The problem of producing beams of neutrons and K_L^o's seems to naturally separate into two distinct problems. First, because of the desire to maximize the energy of the neutrons one would like to be as close to 0° with respect to the external proton beam as possible, and, secondly, to maximize the utilization of the K_L^o beams one would like it to be neutron free. These two problems have been attacked separately.

Neutrons are to be provided down the 2.5 mrad beam line with a solid angle of 0.1 μster. The neutron spectrum expected in this channel is reproduced in Fig. 1 of D. H. White's report (B. 7-68-16) of the 1968 Summer Study. The flux of neutrons expected at 160 GeV/c is 1.2×10^7/GeV/c for 3×10^{12} interacting protons. It has been pointed out[1] that this neutron spectrum peaks fairly low in energy and that it would be desirable to have a neutral beam at 0° for the highest energy neutrons. This facility seems most easily provided via the diffracted proton beam transported in the 2.5-mrad beam, or if the intensity is not sufficient to use the stub to end station 3, to allow access to 0° for the full external proton beam. By not providing a 0° neutral beam from the primary target in end station 2 the interlacing of the 2.5-mrad and 3.5-mrad beams has allowed maximizing the solid angles of these two charged particles beams.

Provision for a K_L^o beam which is relatively neutron free is made in the wide band-pass 3.5 mrad beam.

Details of the spectrum and flux expected in this beam are discussed under the section describing the 3.5-mrad beam and elsewhere in this summer study. If the K^o flux is not sufficient than a neutral channel could be provided from the primary target at about 20 mrad with a solid angle of 0.1 μster. This beam would have a spectrum which would be of lower enregy than the reconstituted K^o beam but would have a flux

of 3×10^3 per GeV/c at 70 BeV/c with 3×10^{12} interacting protons. However the neutron to K ratio at 70 BeV would still be[3] 5×10^3.

REFERENCES

[1]J. H. Smith, Targeting for Neutral Beams, National Accelerator Laboratory 1968 Summer Study Report B. 4-68-106, Vol. II, p. 121.

[2]R. A. Zdanis, A "Neutron-Free" K^0 Beam, National Accelerator Laboratory 1969 Summer Study Report SS-29, Vol. I.

[3]J. H. Smith, K_L^0 Secondary Beam Characteristics, National Accelerator Laboratory 1968 Summer Study Report B. 4-68-17, Vol. II, p. 113.

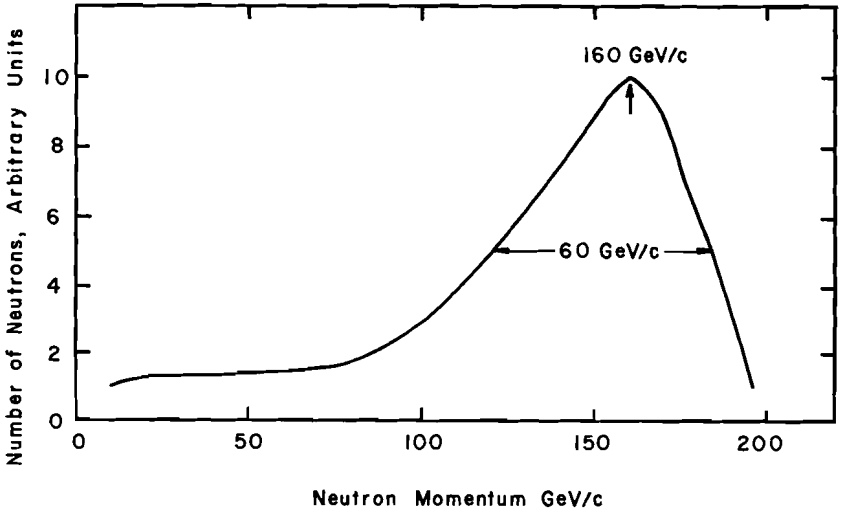

Fig. 1. Neutron spectrum, arbitrary units.