NAL PROPOSAL No. 124

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THE NATURE OF THE MOMENTUM SPECTRUM OF THE SECONDARY PARTICLES FROM HIGH-ENERGY COLLISION

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The purpose of this proposed experiment is to study, with the help of photographic emulsion, the nature of the momentum spectrum of the produced secondary fast particles. This problem had recieved considerable attention both theoretically and experimentally. But prior to the future beam of 300 GeV/C proton of the Betavia acc. no controlled experiment in this high energy was possible.

It is the shape of the momentum spectrum in the laboratory system (L.S.) which is the subject of the present investigation.

The momentum spectrum in the center-of-mass (C.M.) system of the colliding particles appears to rise to a peak around several pion rest masses and then decrease toward higher momenta. It is unclear from the theoretical models whether in fact this peak is independent of the primary energy or not. In the case of collisions induced by several GeV/C primary particles momentum, the L-S momentum spectra of the secondaries may be directly measured. For the 300 GeV/C region however, the standard methods to measure the momenta of the outgoing particles may prove to be very limited.

We intend to utilize the regular behavior of the transverse momentum (P_t) of the secondaries which seems to be the best known feature in the very-high-energy region. The apparent constancy of its average value and independence of both the primary energy and the angle of emission of the secondary particles are the two characteristics which make the transverse

momentum a very useful parameter in the study of high-energy events. We shall therefore use the distribution exhibited by the transverse momentum and the angular distribution of the relativistic secondaries, to be obtained from 300 GeV/C proton collision with light nuclei, to construct the L-S momentum spectrum of the relativistic secondary particles.

This investigation will not be able to differentiate between pions, kaons, nucleons and anti nucleons. But it is hoped that the general features of the momentum spectrum will be obtained.

We like to explore two liters of emulsion to the primary beam of the 400 GeV/C protons.

References

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