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STUDY OF THE MECHANISM OF MULTIPARTICLE PRODUCTION IN EMULSION NUCLEI AT 800 GeV PROTONS

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We propose an irradiation of 800 GeV proton beams to emulsion stacks.

A) Physics Aims

The purpose of the experiment is to study particle production mechanisms of two different processes, one of which produces relativistic particles and the other non-relativistic particles. Comparison between the properties of particles produced via these two different processes will reveal multiparticle production mechanisms, and will give us some informations on the behavior of quarks and mesons inside a nucleus.

B) Detectors

Two emulsion stacks(NO.1 and NO.2) are detectors of this experiment. Each stack consists of 24 plates of 70μm thick polystyrene coated on both sides with 330μm of Fuji ET-7B emulsion. Size of each plate is 120 mm x 95 mm x 0.73 mm, therefore, size of emulsion stack is 120 mm x 95 mm x 17.5 mm.

C) Experimental Conditions

The experiment will be conducted by Drs. K.Hoshino and M.Miyanishi who are visitors from Nagoya University, presently staying at Fermilab.

As much as possible, less materials in upper stream of the stacks are desirable. Less beam angle divergence and uniform exposure over the emulsion plates are also desirable.

1) For the emulsion stack NO.1
Beams are exposed perpendicularly to the plane of 120 mm x 95 mm of the stack with intensity of 3×10^4 particles/cm^2

2) For the emulsion stack NO.2
Beams are exposed same as the stack NO.1.
Furthermore, an additional exposure of the beams parallel to the plane of 120 mm x 95 mm of the stack with intensity of 3×10^3 particles/cm^2 is required. This facilitates the calibration of grain density of tracks in the emulsion.

D) Method of Analysis

The semiautomatic emulsion scanning and measuring system developed by Nagoya group and already used in Fermilab experiment make it possible to scan and measure numbers of events without bias quickly.

This system consists of a microscope with moving objective lens controlled by CPU, a moving stage driven by CPU, a CCD video camera and a console with CRT. Three dimensional coordinates are measured semiautomatically.

At first, the coordinates of primary beam tracks are measured at the most upstream plate and registered. Next, these beam tracks are scanned at the most downstream plate. If a beam track is not found, it should interact inside the emulsion stack. We follow the beam track by changing plates. In this way, we can find interactions without bias. Once interactions are found, the events are measured quickly by means of a semiautomatic measuring system.

E) Measured Quantities

The following are quantities which can be measured.

1) Mean free path of 800 GeV protons in the emulsion
2) Multiplicities of shower, grey, and black track particles
3) Emitting angles of shower, grey, and black track particles
4) Energies of black track particles

F) Contactmen

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