Fermilab Proposal No. 428

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400 GeV proton interactions in Nuclear Emulsion

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400 GeV proton interactions in the nuclear emulsion

J. Hébert (Spokesman)

In previous experiments (project NAL #116 & 233) we have studied the interaction of 200 and 300 GeV protons in the nuclear emulsion. In this proposal we are planning to expand this work to the 400 GeV region in order to observe any trend in the parameters (n_s, R_A, θ) measured over this energy range.

The main features of this experiment will be:

1- Measure the average charged multiplicity and the average star-size.

2- Verify the energy dependence of the Landau ratio R_A for (CNO) & (Ag,Br) groups.

3- Measure the angular distribution of the shower particles

4- Study the two particle correlation

5- Look for charged charmed particles that would decay ≲1 mm from the primary event.

Emulsion stacks preparation & processing

Ilford K-5 emulsion will be used. The preparation & milling of the stacks will be done in Strasbourg. After exposure, the horizontally exposed stacks will be processed in Lund & Strasbourg and the vertically exposed will be processed in Ottawa.

Emulsion dimensions & flux requirements :

1- Horizontal exposure: Flux ($\sim 3 \times 10^4 p/cm^2$/stack)
   3 stacks of 40 pellicles (7.5 cm X 10 cm X 600μ)
   1 stack of 24 plates (7.5 cm X 10 cm X 600 μ)

2- Vertical exposure: Flux ($\sim 10^6 p/cm^2$/stack)
   3 stacks of 12 pellicles (5 cm X 5 cm X 600 μ)
   2 stacks of 6 plates (5 cm X 5 cm X 600 μ)

Beam characteristics

The same beam could be used in both types of exposure, the vertically exposed stacks taking approximately 30 X times longer.

The beam should be as flat as possible over the central region where the flux measurements will be made. One could expect this region to extend over 2 to 3 cm.

List of publications of the
International Collaboration
using Nuclear Emulsion

J. Hébert, Spokesman

1- J. Hébert et al., "200 GeV Proton Interactions in Nuclear Emulsion", AIP Conference Proceedings #12 pp. 131-141, 1973.

2- I. Otterlund et al. "Study of Nuclear Interactions of 200 GeV Protons in Emulsion" 5th Int. Conf. High. En. Phys. Nucl. Struct. (Uppsala) 427-431 1973.

3- J. Hébert et al., "Nuclear Interactions of 200 GeV Protons in Emulsion". Physics Letters, Vol. 48B, No. 5, 467, 1974.

4- E.M. Friedlander "An Interpretation of Recent Data on Photon-Nucleus Collision at Very High Energies". Publication #HE-84-1974, Institut de Physique Atomique, Bucharest.

5- E.M. Friedlander, M. Marcu and R. Nitu "Energy Dependence of Charged Multiplicity in Proton-Nucleus Collision and 'Nuclear' Multiplicity Scaling" Institut de Physique Atomique, Bucharest, Publication #HE-85-1974.

6- E.M. Friedlander and A.A. Marin "Evidence for'Nuclear Multiplicity Scaling' above 200 GeV". Institut de Physique Atomique, Bucharest, Publication #HE-86-1974.

7- J.I. Cohen, E.M. Friedlander, M. Marcu, A.A. Marin and R. Nitu "Unexpected Apparent Transparence of Nuclear Matter for High-Energy Hadrons, Observed in p-Nucleus". Institut de Physique Atomique, Publication #HE-87-1974, Bucharest.

8- I. Otterlund et al. "Multiplicity, Multiplicity Moments and Angular Distributions in Proton-Nucleus Interactions ar Very High Energy". Topical Meeting on High Energy Physics, Trieste, 1974.

9- J. Hébert et al. "Some trends in High-Energy Proton-Nucleus Interactions in Nuclear Emulsion" Proc. of the 14th Int. Cosmic Ray Conf. HE 2-5, 1975 (Munich).

10- G. Baroni et al "Two-particle Rapidity Correlations in Proton-Nucleus Interactions at 300 GeV. (submitted to Phys. Lett.).