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ANNUAL PROGRESS REPORT

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By Joseph H. Klem
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ABSTRACT

Measurements of the 100 GeV π^+p and pp film were finished. Two Physical Review Letters on this work were published and a Comment submitted to PRL. A paper describing the V^0 's and γ 's was also submitted. Δ^{++} production in these data was reported at the Anaheim APS meeting, as were our multiplicity distributions for 200 GeV π^+p interactions and 200 GeV π^-d interactions. A charm search is underway in the π^-d film using data from muon counters installed by UCD behind the bubble chamber. Inclusive production of K^{*0} , K^{*+} , and ϕ^0 in 12 GeV K^+p interactions has been studied and an abstract submitted for the Washington, D.C. APS meeting. A calorimeter was built and calibrated for use in a charm search and high P_T experiment at FNAL. A proposal to study hadronic interactions in the FNAL 15-foot bubble chamber was approved.

During the period May 1, 1974 - January 31, 1975, the following progress has been made:

The 100 GeV/c π^+ p and 100 GeV/c pp film has all been scanned and measured. Two Physical Review Letters have been published this year, and one last contract year. The latter demonstrated that the distributions in multiplicity of the negative tracks are consistent with a two component model in which the higher multiplicity component is Poisson like. This statement continues to hold for other published FNAL bubble chamber data up to 400 GeV, which we have analyzed recently in the same way as our own data. A Comment to Physical Review Letters has been submitted on this latter point.

The first of the two Letters this year was a detailed test of Regge-Mueller factorization that compared the backward (in CM) production of particles in π^+ p and pp collisions. Since our experiment contained approximately equal amounts of π^+ and p beam, we could make a direct comparison with a minimum of experimental bias. The target proton was found to 'fragment' in the identical manner whether bombarded with π^+ or p, as judged from the backward fragments.

The second Letter this year demonstrated that there are no correlations among negative pions in the central rapidity region. Apart from the end regions of rapidity, where diffractive production should come into play, the negative pions are produced independently. These results are consistent with the multiplicity results above.

A paper reporting our observations on V^0 's produced in π^+ p and pp interactions at 100 GeV has been submitted for publication.

By invitation, a review of world data on high multiplicity interactions was prepared by a member of the Davis group and delivered at the London conference.

A talk reporting our observations on Δ^{++} production at 100 GeV/c was delivered at the Anaheim meeting. The data are consistent with a one pion exchange process.

We have been extracting data on inclusive K^{*0} , K^{*+} and ϕ production in the large sample of 12 GeV/c K^+p data (30 events/ μ b). A paper on these results is being drafted, and a talk has been contributed in abstract to the April APS meeting in Washington, D.C.

We have taken, in collaboration with groups at Seattle, Kracow and Warsaw, 70,000 photos of 200 GeV/c π^-d interactions in the FNAL 30-inch bubble chamber. Three-fourths of the photos have been scanned, and a talk was given at the Anaheim meeting of the APS.

The preliminary results show an enhancement (relative to π^+p interactions) in the high multiplicity cross section for even prongs, but not for odd prongs. This effect is expected from rescattering of the secondary particles by the other nucleon in the deuteron. We are pursuing this work in an attempt to measure the rescattering cross section and determine what are the characteristics of the rescattered part.

Scanning of our 200 GeV π^+p photos has been completed, and charged particle multiplicity data have been reported in a talk at the Anaheim APS. Measurements on the LBL spiral reader will take place this year.

A set of scintillator counters covering an area about 4 feet by 4 feet was built at UCD and placed behind absorber blocks downstream of the FNAL 30-inch bubble chamber during the π^-d run. These scintillators registered muons, either from the beam or from interactions in the chamber. The data were fed to computer tape. We are scanning these tagged muon interactions to search for evidence of "charmed" particles.

A calorimeter consisting of 24 2-inch thick scintillators and 24

iron plates $18 \times 24 \times 1\frac{1}{2}$ in³ has been constructed at UCD. The device was taken to SLAC and calibrated and now will be sent to FNAL for use in a charm search to be done in conjunction with E86A.

The UCD group, in collaboration with the Ely group at LBL, was selected as one of four groups to do the first pilot experiments with hadron beams in the 15-foot bubble chamber at FNAL. Techniques for measuring and analyzing this kind of film will be developed during the coming contract year.

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