A SEARCH FOR THE H PARTICLE (BNL EXPTS. E813/836)

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The goal of this experiment is to search for a strangeness -2 dibaryon called the H particle. This state was predicted by Jaffe to have a mass 80 MeV less than the $\Lambda\Lambda$ mass of 2232 MeV.[1] The experimental observation of this state would provide much needed data to help understand the confinement mechanism of quarks. The apparatus and experimental technique were presented in a previous progress report[2] and will not be repeated here.

The main IUCF contribution to this project was originally the second-level trigger system, which separates protons from K^+ particles using time-of-flight. The second-level trigger was moved to a VME-based 68030 processor for the 1993 data-taking run, and IUCF is no longer responsible for maintaining this system.

For the 1993 data-taking run, IUCF contributed detectors and second-level trigger electronics to the experiment. The detectors were four $8\times5\times2.5$ cm^3 scintillator detectors. These detectors were used as targets for the $K^-p\rightarrow \pi^-\Sigma^+$ reaction. The Σ^+ particles are stopped in the same target where they were produced, and subsequently decay via the $\Sigma^+ \rightarrow n\pi^+$ reaction. The 18 MeV neutrons produced in the decay are then detected in the neutron counter array(s). The entire reaction is used to calibrate the efficiency and solid-angle for the neutron counter arrays.

The 1992 and 1993 data sets have been reduced and neutron energy spectra have been produced. In this experiment, the reactions $K^-p\rightarrow K^+\Xi^-$ and $\Xi^-d\rightarrow H\ n$ are used to produce and tag the H particle. If the H particle exists, there will be a peak in the neutron energy spectrum. We now have an integrated flux of 10^{12} K^- particles on target, which was our original goal. The experiment is now sensitive to H particles with a relatively large branching ratio from the Ξ^-d atom. Data analysis is proceeding. The calibration of the Si detectors is an important input to the analysis and will be better measured during the 1994 data-taking run.

The experiment is slated to receive more beam time during May, June and July, 1994. This time will be used primarily for a complementary version of the H search that involves a ^{3}He target and the reaction $K^-\ ^3He\rightarrow K^+H\ n$. There will also be more time devoted to Si detector calibration studies using the $\pi^-p\rightarrow K^+\Sigma^-$, where the Σ^- emulates the Ξ^- in its stopping characteristics.

1. R.L. Jaffe, Phys. Rev. Lett. **38**, 195 (1977); ibid., **38**, 617 (1977).
2. IUCF Sci. and Tech. Rep., May 1991 – April 1992, p. 96.