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

J.J. Szymanski
Indiana University Cyclotron Facility, Bloomington, Indiana 47408

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 is still the second-level trigger system, which reduces the number of background events such as $K^-p \rightarrow K^-p$ and $K^-p \rightarrow K\pi p$ that are accepted by the data-acquisition system. We are using time-of-flight to differentiate protons from kaons.

Several changes were made to the second-level trigger algorithm for the summer, 1992 run. The second-level trigger was used throughout the 1992 run to follow the main data stream.

The 1992 data has been reduced and preliminary neutron energy spectra have been produced. In this experiment, the reactions $K^-p \rightarrow K^+\Xi^-$, $\Xi^-d \rightarrow Hn$ are used to produce and tag the H particle. If the H particle exists, there will be a peak in the neutron energy spectrum. The experimental goal was to run for 10^{12} K^- particles on target, and 1992 data was taken for $\sim 1/3 \times 10^{12}$ K^- on target. At this point, the experiment is not yet sensitive enough to verify or disprove the existence of the H particle. More statistics are needed, and the analysis codes need to be refined for greater efficiency. We are investigating whether the target can be reconfigured to increase the fraction of Ξ^- particles that stop and absorb on deuterium. With these improvements and more data acquisition, the experiment will be able to reach a significant sensitivity.

The experiment is slated to receive 7 weeks of beam during June and July, 1993. This time will be divided between more $p(K^-, K^+)\Xi^-$ data collection, test running for the ${}_{\Lambda\Lambda}^{6}He$ experiment (E885) and 'calibration' reaction studies. The 'calibration' reactions enable us to measure the stopping fraction for hyperons and the acceptance of our neutron counter arrays. The details are yet to be determined, but one possible reaction is $\pi^-p \rightarrow \Sigma^-K^+$, $\Sigma^-p \rightarrow \Lambda n$, where the neutron has 43 MeV and can be seen in our neutron detectors.

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