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A Multi-cell Target for ΛΛ Hypernuclei Searches

(presented by L. Lee[a] for the BNL–E885 Collaboration)

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An experiment (Expt. 885) to search for ΛΛ hypernuclei will be carried out at the Brookhaven AGS 2 GeV (D6) beamline. This experiment will succeed the present H-dibaryon search experiments (Expt. 813 and Expt. 836) on the 2 GeV beamline and will be set up in a similar way, making use of the K^+ spectrometer (see fig. 1). A multi-cell target is being designed to make use of the reactions $K^- + p \rightarrow K^+ + \Xi^-$ and $\Xi^- + ^{A}Z \rightarrow ^{A}_{\Lambda\Lambda} (Z-1) + n$. As illustrated in fig. 2, a Ξ^- is created via the (K^-, K^+) reaction in a primary target (CH_2) and the outgoing K^+ is momentum analyzed using the K^+ spectrometer. The recoiling Ξ^- travels through a gas microstrip chamber (GMSC), slows down in a tungsten degrader, and travels through a thin silicon detector before coming to rest in a secondary target made of ^6LiH or CH (scintillating fiber stack). The stopped Ξ^- can then capture into an atomic state and, a fraction of the time, nuclear absorption of the Ξ^- produces a ΛΛ hypernucleus along with a monoenergetic neutron. Observation of this monoenergetic neutron in one of two large neutron arrays located on either side of the target (see fig. 1), in coincidence with the stopping Ξ^-, identifies the formation of a ΛΛ hypernucleus.

The E885 target is set up with a cellular geometry and consists of a series of approximately 8–10 cells. Each 'cell' is composed of a CH_2 block, followed by a gas microstrip/W-degrader/Si-detector sandwich, followed by a LiH or scintillating fiber block. The Si detector is used to tag the 'stopping Ξ^-' by measuring its dE/dx before it enters the secondary target. The gas microstrip chambers provide 'in-target' tracking for the incoming K^-, the outgoing K^+ and its associated Ξ^-. This allows for a more refined determination of (1) the $K^+ - \Xi^-$ opening angle ; (2) the Ξ^- trajectory ; (3) the (K^-, K^+) vertex ; (4) the K^+ scattering angle ; and (5) the incident K^- momentum. These chambers will present an active area that is thin, low in mass, able to handle high

rates, resistant to radiation damage, and able to provide good spacial resolution. Monte Carlo studies have been carried out and indicate that the microstrip chamber should occupy a volume no thicker than about 1.0 cm, and that a spatial resolution of 0.5 mm in Y will be required. Fig. 3 shows the present layout for the microstrip Y-plane. A prototype for the E885 target is presently being assembled and may receive some test beam in the summer of 1994.

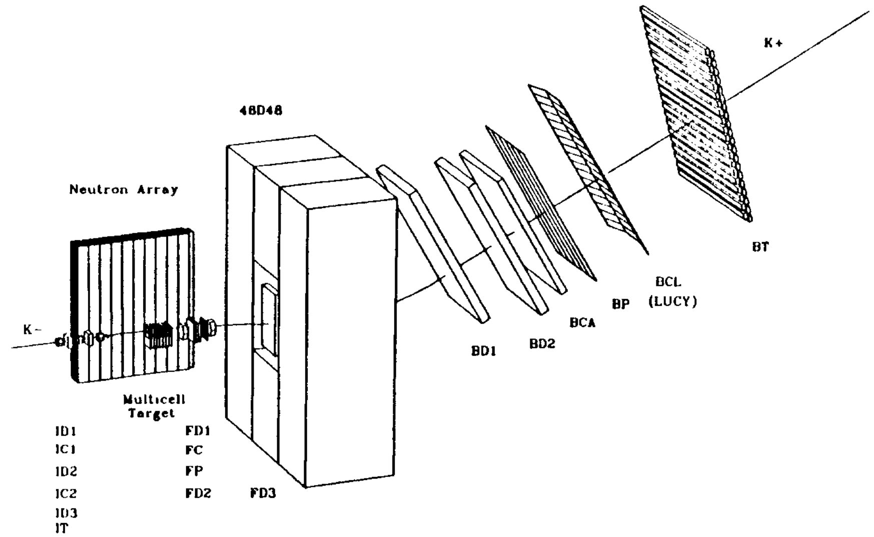

Fig 1. Schematic layout of AGS Expt.885.

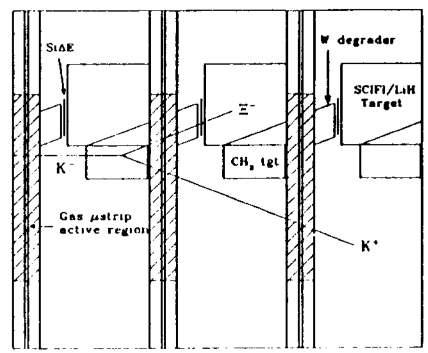

Fig 2 Schematic layout of the E885 Multi-cell target

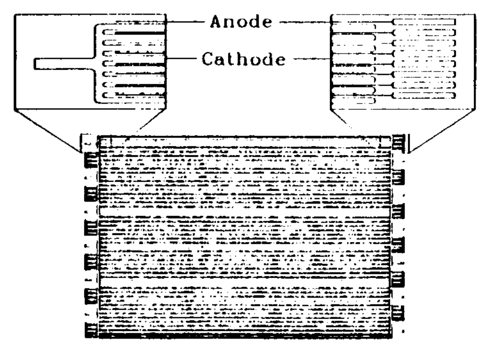

Fig 3 Layout of the microstrip Y plane. The strips are laid at a pitch of 500 μm with the anode and cathode widths at 20 and 280 μm, respectively