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USING A TIME PROJECTION CHAMBER***

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We have built a set of three TPC modules for the study of high multiplicity events in Heavy Ion collisions at the BNL AGS. Each module has an active volume of 60 cm H $\times$ 60 cm W $\times$ 50 cm L. A front view of a module is shown in Fig. 1. Note that the ion beam passes through the center of the active volume. The readout is via rows of short

Figure 1

anode wires each spaced at 10/inch. The magnetic field is 5 kG. The TPC gas is argon/ isobutane/methylal, which is stable at high gain, permitting the use of inexpensive electronics, and has relatively low diffusion, which improves the two-track resolution.

Good gating is essential, as in all TPC's. The electrode structure near the anodes is shown in Fig. 2. Normally the gate is closed, with 400 volts between

Figure 2

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adjacent wires in the gate grid. When a trigger is received the gate voltage is pulsed to 0 volts for 40 usec, allowing

drifting electrons to reach the anode area. One should note that, because they drift slowly, the large number of positive ions produced in the amplification process do not reach the gate grid while the gate is open, thus minimizing positive ion feedback to the drift region. A spatial resolution of $\approx 1 \text{ mm}$ is obtained, with an effective pixel size of $\approx (5 \text{ mm})^2$. The readout is via custom hybrids mounted directly on the anode plane. Figure 3 shows the contents of the hybrid package. Note that only time information (not

Figure 3

dE/dx) is recorded. A FASTBUS data acquisition system collects the data, suppressing zeros at the digitizing level. A VAX 3100 is used for on-line monitoring and a 30 node ACP farm is used for off-line processing.

Two trigger elements are used; a counter in the beam downstream is used to measure ΣZ^2 , rejecting events with heavy fragments and a pair of counters above and below the beam just upstream of the first TPC are used to determine that the interaction took place near the target.

Figure 4 shows an event from Si ions at $14.5 \times A \text{ GeV/c}$ on a Pb target. 91 tracks were found. In order to assess the effectiveness of the " Z^2 " trigger, runs were taken with the upstream counters removed from the trigger and a low threshold on the beam veto. Analysis of the data showed that the mean multiplicity increased monotonically as the pulse height decreased; this indicates that the pulse height is a measure of the number of interacting nucleons, or the "central" nature of the events.

In a first search for "physics" signals we have studied Λ production. The $\pi^+\pi^-$ effective mass spectrum is shown in Fig. 5. A clear Λ signal is obtained. Studies of the acceptance are proceeding.

Figure 4
SILICON ON LEAD

Figure 5

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