IDENTIFICATION OF π-MESONS AND Σ-HYPERONS IN THE 600 GeV/c BEAM (Experiment E-781)

V.L.Golovtsov, V.T.Grachev, N.P.Kuropatkin, V.A.Milnikov, N.N.Smirnov, N.K.Terentyev, A.A.Vorobyov, P.S.Cooper*, J.Lach*, J.Russ**, M.Foucher***

* Fermilab, Batavia, Illinois, USA
** Carnegie-Mellon University, Pittsburgh, PA, USA
*** Yale University, New Haven, Connecticut, USA

The goals of E-781 experiment are to study modes of decay and production mechanism of charmed baryons [1]. Measurements will be performed in high intensity FNAL hyperon beam. It is proposed to use a hyperon beam at rates up to 10^6 particles per second. The 600 *GeV/c* beam contains 50% Σ-hyperons and 50% π-mesons. A beam transition radiation detector (BTRD) will be used to tag hyperons.

BTRD will consist of 10 identical modules, each containing 200 polypropylen foils of 17 micron thick separated by 0.5 *mm* gap and 3 xenon proportional chambers. All the 3 chambers are made in the same frame and have sensitive area $2 \cdot 2\ cm^2$. The cathodes of the chamber are produced from two side aluminized mylar and anode plane is 15 μm gold-plated tungsten wires spaced at 1 *mm*. The gap between anode and cathode plane was chosen 2 *mm*. This construction more or less permits to satisfy demands that are in contradiction to one another. The proportional chamber has to absorb transition radiation photons with high efficiency, on the other hand the chamber has to be very fast to work satisfactory in the high rate beam. Measurements show us that maximum electron drift time does not exceed 70 *ns*. It is the main part of dead time of the detector and this gives a possibility to use information from the detector in first or second level trigger.

All the wires of each anode plane are connected to an input of a fast low-noise preamplifier. High sensitivity of the preamplifier gives a possibility to work at low gas gain less than 10^4 and to keep the threshold near 6 *keV*. A number of active planes is used as a criteria to identify the sort of a particle. The total length of the detector is 1.5 *m*. BTRD has 4.4% of an interaction length and 8.2% of a radiation length.

The prototype of BTRD consisting of five modules was built in Leningrad Nuclear Physics Institute and tested during E-761 fixed target run on 375 *GeV/c* negative beam. The most part of the beam were pions and there was only 2% Σ-hyperons. BTRD was incorporated in read-out system of E-761 experiment, which gives a possibility to use a set-up and existing code for the analysis of events and incident particles identification.

BTRD plane count distribution for 375 *GeV/c* Σ-hyperons and π-mesons is shown in figures 1,2 (solid line). Dotted line reproduces a result of Monte Carlo simulation program. The very good agreement between the experimental data and Monte Carlo calculation gives one a confidence in prediction of plane count

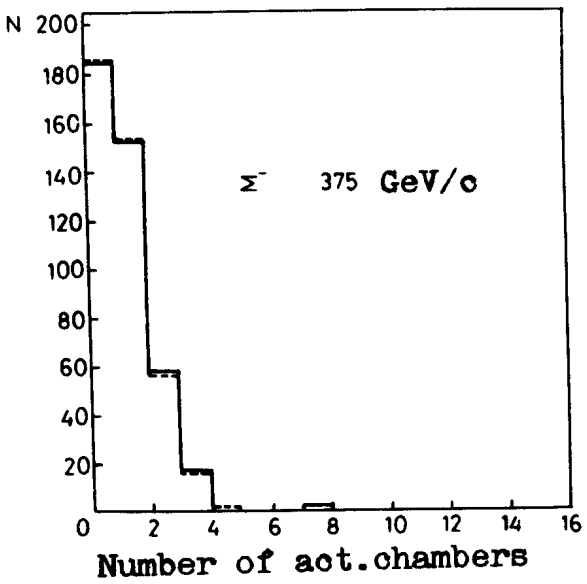

Fig.1. BTRD plane count distribution for 375 *GeV/c* sigma-hyperons. Dashed line represents Monte Carlo calculation result

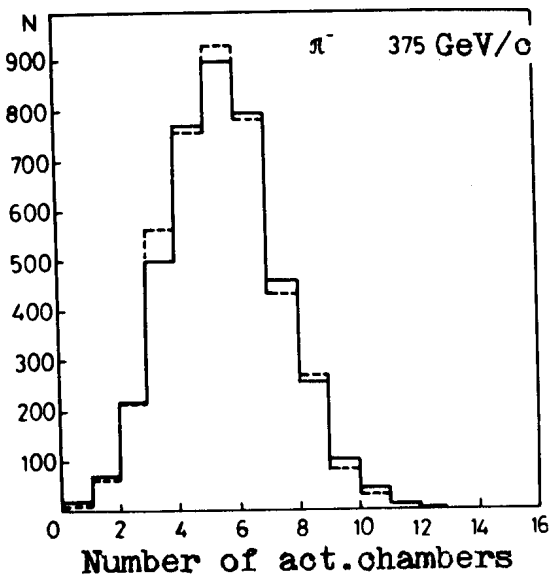

Fig.2. BTRD plane count distribution for 375 *GeV/c* pions. Dashed line represents Monte Carlo calculation result

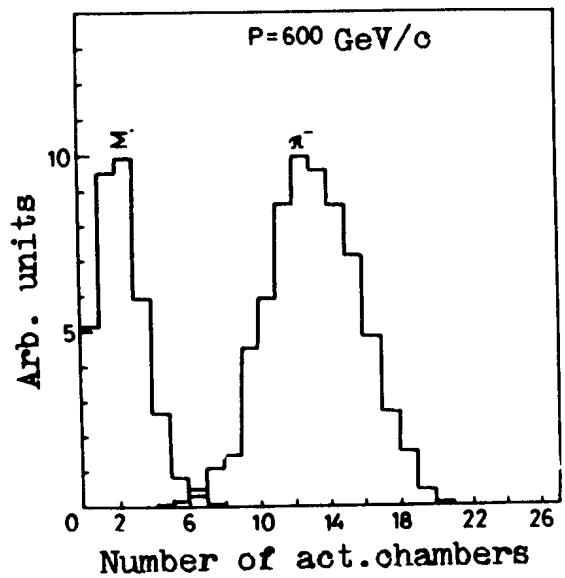

Fig.3. BTRD plane count distribution for 600 *GeV/c* sigma-hyperons and pions. Detector consists of 10 modules. Monte Carlo calculation

distribution for the beam transition radiation detector consisting of 10 modules and working at 600 *GeV/c* beam. Result of Monte Carlo simulation is shown in fig.3. One can calculate that pion rejection factor 300 will be obtained for Σ-hyperon efficiency near 98%.

Reference

FNAL Proposal E781. November 8. 1987.