Production of TOF-identified $\pi^\pm$, $K^\pm$, $\bar{P}/P$

We report on the analysis of 400,000 mass-identified hadrons with $0.2 < p_T < 1.5$ GeV/c from the first run of a spectrometer system with TOF in the C0 intersection at the Fermilab 1.8 TeV $pp$ collider [1,2]. Distributions $d^2N/d\eta dm_T$ as a function of $m_T = (m^2 + p_T^2)^{1/2}$ are shown in Fig. 1. The distributions for $K$, $\pi$, and at least the high-momentum part of $P$ are approximately exponential. A Boltzmann distribution fit with $T = 230$ MeV is shown "to guide the eye". No single temperature, in fact, fits all three distributions well, which may suggest that transverse flow distorts the $T$ values significantly.

In Fig. 2 we compare $K/\pi$ and $\bar{p}/p^-$ ratios as a function of $m_T$ at $\sqrt{s} = 1.8$ TeV (open circles, this experiment) with UA2 data [3] at $\sqrt{s} = 0.54$ TeV (crosses). The present results agree well with data from lower energy, and no significant dependence of either ratio on $m_T$ is apparent.

Forward-Backward Pseudorapidity Correlations

In an analysis by Sudeshna Banerjee [4], long-range correlations are studied in the same data sample. If $N_F$ = number of forward particles with positive pseudorapidity $\eta$ and $N_B$ = the number of backward...
particles with negative $\eta$, then we parameterize $<N_F> = a + b N_F$, where the slope parameter $b$ measures the strength of the long-range correlation. Fig. 3 shows $<N_F>$ as a function of $N_F$ for different $\eta$ intervals in the forward (incident p beam) and backward (incident p beam) directions. The measured correlation strength $b$ can be parameterized as $b = A + B \ln S$; the present data and results from UA5 [5] for different $\eta$ ranges shown in Fig. 4 are consistent.

Fig. 3 $<N_b> \propto N_F$

Bose-Einstein Correlations for Pion Pairs

Peter Beery [6] has studied Bose-Einstein correlations by determining the ratio $R$ of the distribution of like-sign pion pairs divided by a distribution of unlike-sign pion reference pairs in the same data. Following a similar procedure to that of the UA1 collaboration [7], $R$ is parameterized in terms of the Lorentz-invariant $q_T$, $R(q_{T}^2) = N \left[ 1 + \lambda \exp (-r_{T}^2 q_{T}^2) \right]$, where $\lambda$ is a measure of the degree of coherence, $r_T$ measures the source dimension, and $N$ provides overall normalization. Fig. 5 shows $R(q_{T}^2)$ as a function of $q_T$ for $0.04 < q_T < 1.0 \text{ GeV/c}$, where we exclude data at very low $q_T$ in which spurious pairs may arise from $\delta$-ray misidentification. The data are fit with $\lambda = 0.72 \pm 0.07$ and $r_T = 1.19 \pm 0.12 \text{ fm}$. This measurement is consistent with the dependence of $r_T$ on rapidity density, $\Delta n/\Delta \eta$, seen by UA1, Fig. 6.

References