

# Cold Kaons from Hot Fireballs \*

Volker Koch

We have studied the effect of an attractive mean field potential on the low  $p_t$  behavior of particle spectra. Specifically, we concentrate on kaons in order to compare with preliminary data of the E-814 collaboration [1]. An attractive kaon potential would be conceivable in the framework of chiral perturbation theory if one allows for a considerable drop in the vector meson coupling above  $T_c$ , as suggested by lattice gauge calculations. We have used a relativistic transport model in order to simulate the expansion dynamics, since this approach also allow to include the effect of rescattering of the kaons. For the kaons, we take a potential of the form

$$U_K(r) = U_0 \frac{\rho_s}{\rho_0} \quad (1)$$

where the density  $\rho_s$  is the scalar density  $\langle \bar{\psi}\psi \rangle$ . Using a kaon potential of  $U_0 \simeq -50$  MeV and a reduced vector coupling for the nuclear mean field of  $g_v = 5.5$ , which leads to an expansion velocity of the fireball of  $V_{exp} \simeq 0.1c$  we obtain a slope parameter as low as 15 MeV for the low momentum kaons. Slow expansion is expected if the system is close to the chiral phase transition, where the expansion parameter  $p/\epsilon$  is close to zero. If we, on the other hand, do not reduce the vector mean field coupling, the expansion velocity is  $v_{exp} \simeq 0.3c$  and no soft component in the spectrum is seen.

A similar sensitivity is seen if one considers the coulomb interaction of the positively charge kaons (see. figure 1) with the charged fireball. If slow expansion is assumed the low  $p_t$  kaons are pushed away leading to an observable dip in the spectrum (dashed curve). For fast expansion, on the other hand, the potential has disappeared before the kaons have been shifted to

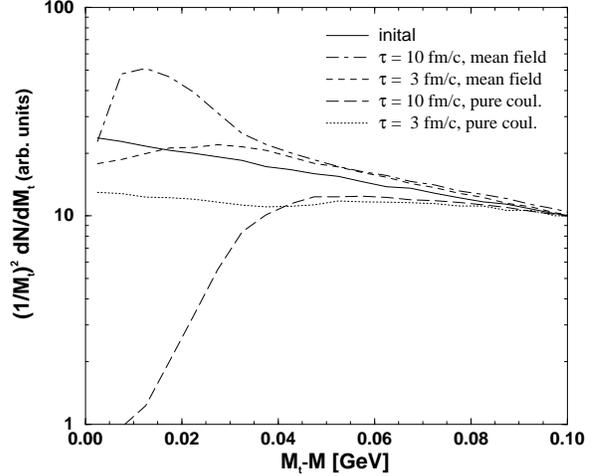


Figure 1: Initial and final kaon spectra for different expansion times  $\tau$  including the coulomb interaction. The initial value for the kaon mean field has been taken to be  $U_0 = -100$  MeV. All spectra are normalized at  $m_t - m = 100$  MeV.

higher momenta resulting in no change of the slope (dotted curve). Similarly the low  $p_t$  spectrum of negative kaons will be enhanced. Therefore, a careful measurement of the ratio of positive to negative charge particles may reveal at low transverse momenta may reveal important information about the expansion velocity of the fireball.

[1] J. Stachel, Nucl. Phys. A566 (1994) 183c.

\* LBNL-36961: Nucl. Phys. A590 (1995) 531c.