Mechanisms Behind the Rise and Fall of Sideflow at SIS Energies

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Studies of flow in heavy ion collisions are expected to yield information constraining the nuclear equation of state. As shown in Fig. 1, scaled directed flow observed in Au on Au collisions with the FOPI detector peaks near 400 AMeV. This remarkable rise and fall offers a unique opportunity to study the mechanisms behind this phenomenon. Besides the mean field gradients established in the evolution of the collision, several other factors can influence flow. Two aspects of our recent experimental results are shown here. In the 'rising' part of the flow, we observe a strong correlation with the increasing separation of 'spectator' and 'participant' matter. This is illustrated in Fig. 2 for Z=3 ejectiles from Au on Au collisions at 90 (top panel), 150 and 400 AMeV (the reduced impact parameter is $\hat{b} = 0.3$). In the 'falling' part of the excitation function, we observe a suggestive correlation with the scaled stopping illustrated in Fig. 3 where the observed longitudinal and transverse rapidity distributions of Z=1 ejectiles are shown for central ($\hat{b} \leq 0.15$) collisions of Au on Au at 400, 1000 and 1500 AMeV.

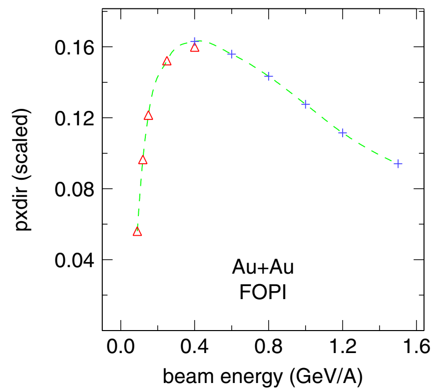

Fig. 1. Scaled directed flow in Au on Au collisions versus beam energy.

Fig. 3. Transverse and longitudinal rapidity distributions for Z=1 ejectiles at 400, 1000 and 1500 AMeV.

We find a remarkable increase of apparent transparency beyond the incident energy of 400 AMeV. Such systematic data will be useful in future confrontations with theoretical simulations.

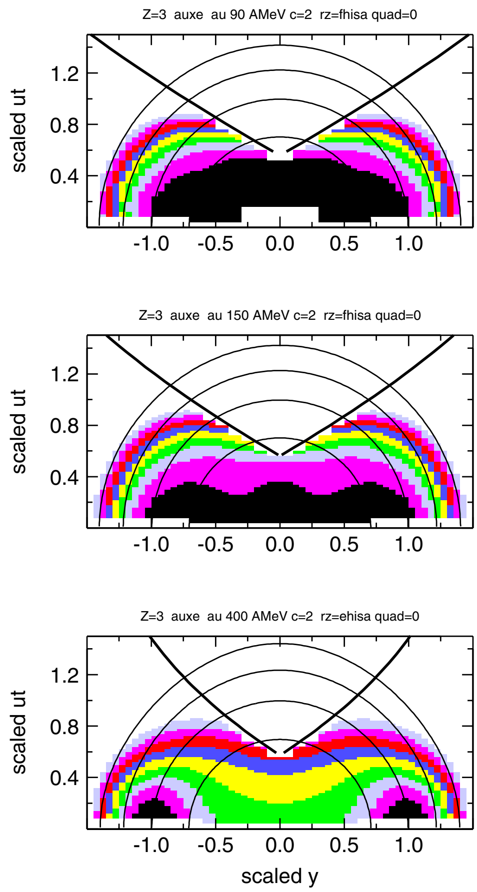

Fig. 2. Transverse 4-velocity vs rapidity contours for Z=3 ejectiles at 90, 150 and 400 AMeV.