A NEW PERSPECTIVE ON THE SPECTATORS

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Within a transport model, the dynamical evolution of the spectators is investigated. The spectator transverse momentum, $\langle P^x/A\rangle$, and the change in the net average momentum per nucleon, $\Delta|\langle \mathbf{P}/A\rangle|$, are found to be sensitive to the nuclear equation of state. Acceleration of the spectator is observed in a heavy system.

Spectator properties have been much investigated in the context of search for the liquid-gas phase transition 1. The result has been a detailed assessment of the statistical decay of the spectators (see 2 for a comprehensive review). A particularly impressive finding was that of the universal behavior of spectator multifragmentation 3. With relatively few exceptions, the neglected aspect of the reactions has been the dynamical evolution of spectators during the violent reaction stage. With that respect, Danielewicz remarked 4 on the formation of a shock wave inside the spectator matter and stressed 5 the importance of the the participant-spectator interaction in the generation of participant elliptic flow. An experimental investigation of the transverse momentum delivered to a spectator was done by Bogdanov et al.6, 7.

In this work, we explore 8 the dynamical development of the spectators, in the context of a nuclear transport model 9. We examine which of the emerging spectator characteristics reflect the violent reaction stage.

Figure 1 shows contour plots of three different quantities within the reaction plane from the transport simulations of a ^{124}Sn + ^{124}Sn reaction, at the beam energy of $T_{\rm lab} = 800$ MeV/nucleon and the impact parameter of $b = 5$ fm, carried out utilizing a soft momentum-dependent (MD) mean field (MF).