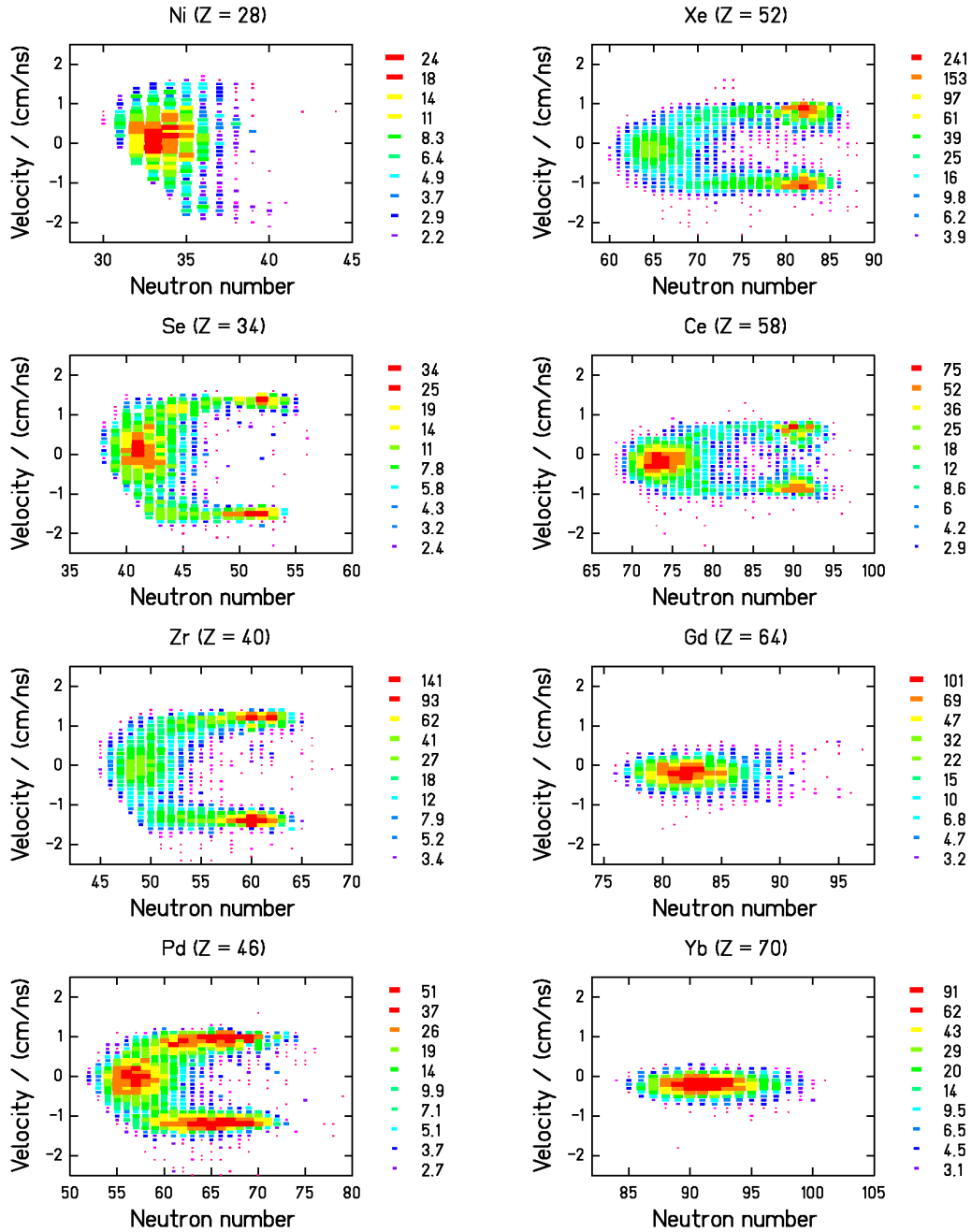


Experimental Indications for the Response of the Spectator to the Participant Blast

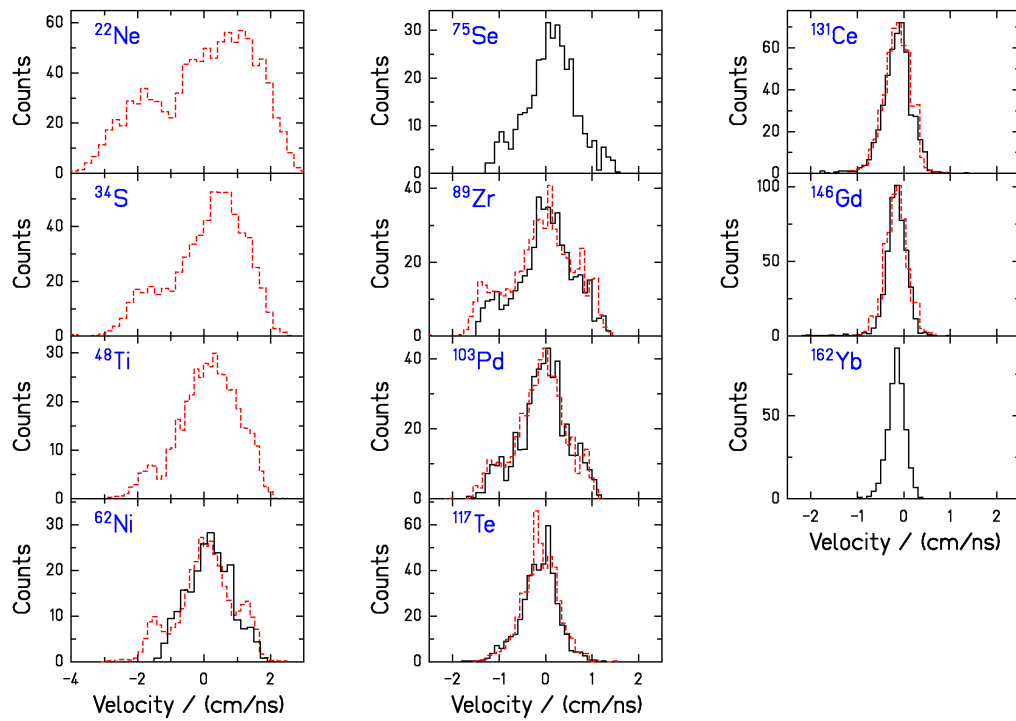
**M. V. Ricciardi, T. Enqvist, J. Pereira,
J. Benlliure, M. Bernas, E. Casarejos,
V. Henzl, A. Kelic, J. Taieb, K.-H. Schmidt**

- **Results of high-precision kinematical measurements of projectile fragments at the FRS.**
- **Theoretical interpretation as the "Spectator Response to the Participant Blast"**
- **Information on the EOS of nuclear matter**
- **Conclusion**

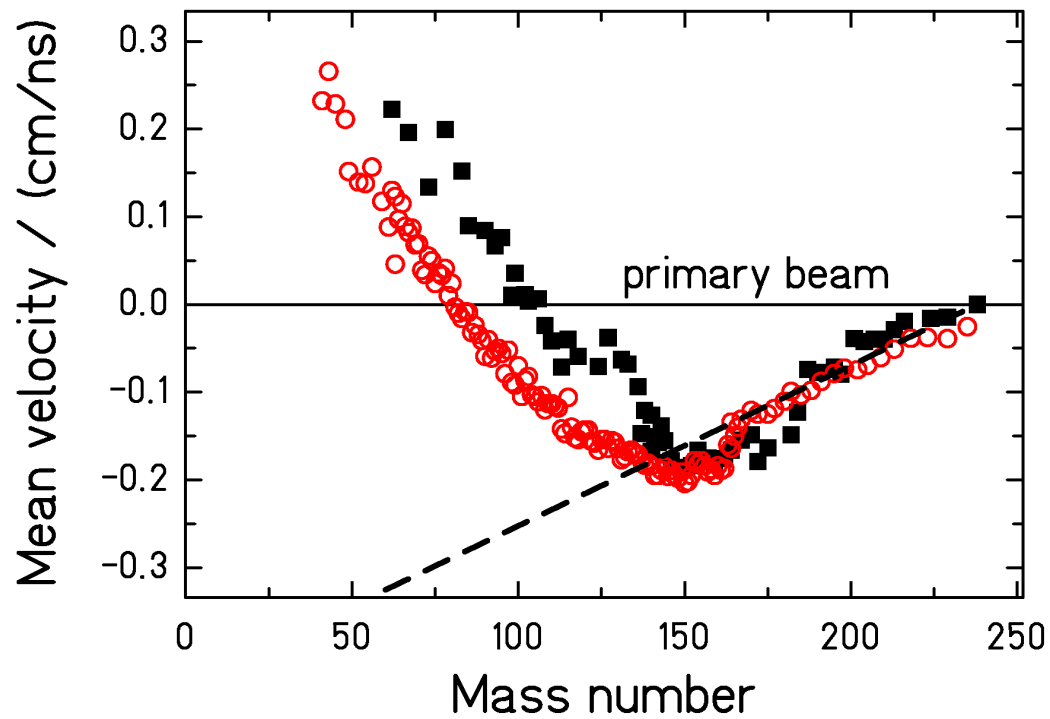


Residual nuclides from $^{238}\text{U} + \text{Pb}$, $E = 1 \text{ A GeV}$
Fission products verify the velocity calibration!

T. Enqvist et al., NPA 658 (1999) 47



**Velocity distributions of (mostly)
fragmentation products in $^{238}\text{U} + \text{Pb}$ and $^{238}\text{U} + \text{Ti}$
at $E = 1 \text{ A GeV}$.**



Mean velocities of fragmentation products from $^{238}\text{U} + \text{Pb}$ and $^{238}\text{U} + \text{Ti}$ ($E = 1 \text{ A GeV}$) compared to the Morrissey systematics (dashed line).

Light projectile fragments are faster than the projectiles!

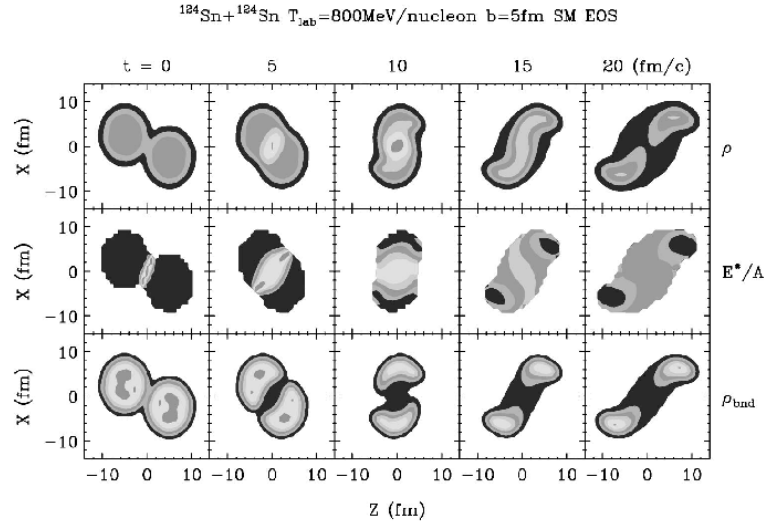


FIG. 2. Contour plots of the system-frame baryon density ρ (top row), local excitation energy E^*/A (middle row), and of the density of bound baryons ρ_{bnd} (bottom row), in the $^{124}\text{Sn} + ^{124}\text{Sn}$ reaction at $T_{lab} = 800$ MeV/nucleon and $b = 5$ fm, at times $t = 0, 5, 10, 15$, and 20 fm/c (columns from left to right). The calculations have been carried out employing the soft momentum-dependent EOS. The contour lines for the densities correspond to the values, relative to the normal density, of ρ from 0.1 to 2.1 with increment of 0.4. The contour lines for ρ_{bnd} are from 0.1 to 1.1 with increment of 0.2. The contour lines for the excitation energy correspond to the values of E^*/A at 5, 20, 40, 80, 120, and 160 MeV. For statistical reasons, contour plots for the energy have been suppressed for the baryon densities $\rho < 0.1\rho_0$. Note,

BUU calculations of mid-peripheral nucleus-nucleus collisions

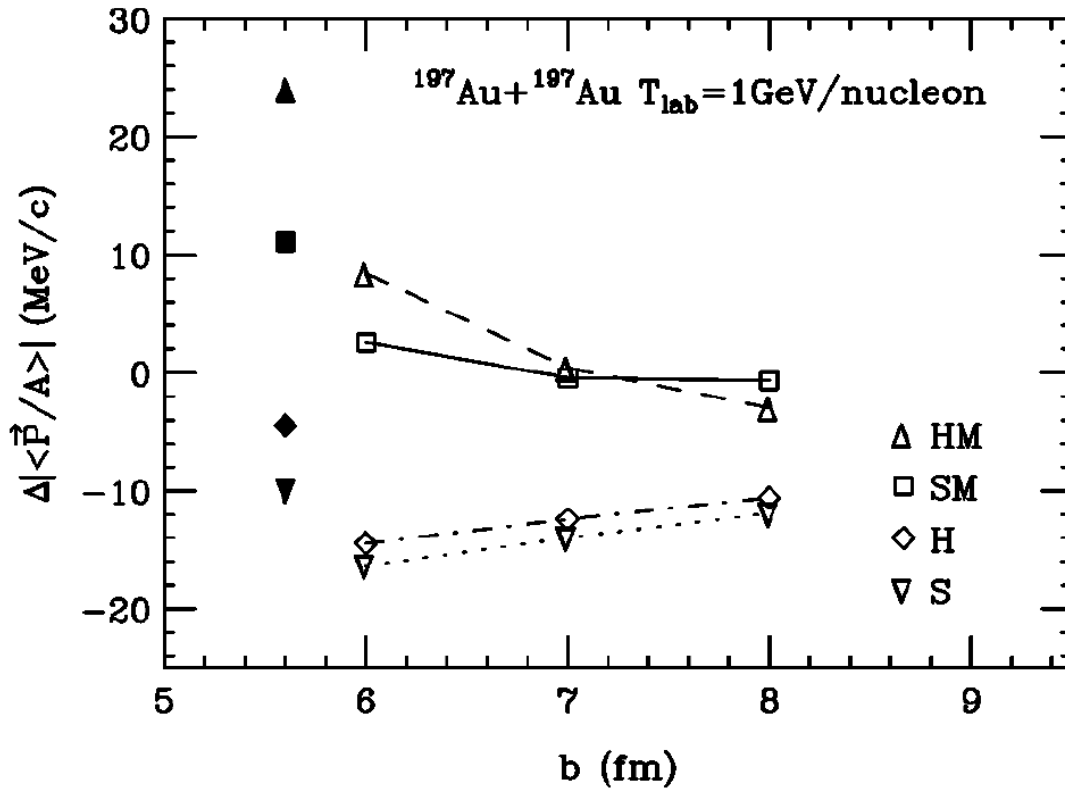


FIG. 9. The change in the net average c.m. momentum per nucleon $\Delta|\langle \mathbf{P}/A \rangle|$ of the spectator in the $^{197}\text{Au} + ^{197}\text{Au}$ system at $T_{\text{lab}} = 1$ GeV/nucleon. Open symbols represent results obtained with reduced in-medium nucleon-nucleon cross sections; filled symbols represent results obtained at $b = 6$ fm with free cross sections. A negative value of $\Delta|\langle \mathbf{P}/A \rangle|$ indicates a spectator deceleration, while a positive value indicates a net acceleration.

L. Shi, P. Danielewicz, R. Lacey, PRC 64 (2001) 034601

H: hard EOS; S: soft EOS

M: momentum-dependent nuclear force

c.m. momentum is selectively sensitive to the momentum dependence of the nuclear force!

Conclusion

- **Indications for the postulated response of the spectators to the participant blast.**
- **Selectively sensitive to the momentum dependence of the nuclear force.**
- **Precise velocity measurement of projectile fragments is a new tool to investigate the EOS of nuclear matter.**