Central Collisions

- Truly many-body dynamics.
- Initial state destroyed, matter compressed and excited, change in density tied to temperature increase.
- System approaches thermal equilibrium over time.
- Different time scales play a role: fast population of central rapidities & slower population of target/projectile regions.
- Strong collective motion develops (≈ 50% of transverse energy may appear in collective form).
- Large yields of intermediate-mass-fragments.
\( y - p^\perp / m \) Distributions

Early emission from midrapidity source

Late emission from projectile/target sources
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Generation of Directed Collective Motion
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Theoretical Approaches

• Boltzmann equation (B.-A. Li)
  Limitations: lack of fluctuations & intermediate-mass-fragments (IMF)
  Advantages: intrinsic consistency, reduction to Thomas-Fermi f/ground state

• Molecular dynamics (A. Ono)
  Limitations: uncontrolled magnitude of fluctuations, light-fragment production
  Advantages: fluctuations, IMF production, reduction to a cluster model f/ground state

• Statistical models
  Limitation: no dynamics
  Advantage: relatively simple
Bulk Nuclear Properties

- EOS of symmetric matter away from $\rho_0$
- Symmetry energy
- Liquid-gas phase-transition
- Nucleonic potentials away from $\rho_0$
- Transport coefficients