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Influence of various potentials on fragment production in asymmetric collisions

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The knowledge of nuclear interaction potential is a fundamental theoretical tool in the analysis of heavy ion collisions. It is a key ingredient for constructing the nuclear equation of state (NEOS) [1]. The general trend of using the nucleon-nucleon (n-n) interaction potential is to parameterize this potential as a function of density. While parametrizing the potential, one starts with the basic fundamental interaction i.e. Skyrme interaction and then add other components of potential such as Yukawa, Coulomb, momentum dependent interaction and symmetry potential in the study of symmetric as well as asymmetric collisions [2].

In our study, the relative contribution of various components of n-n interaction potential has been investigated by studying the production of various fragments within different rapidity domains for the various asymmetric reactions at $b = 0$ fm and E_{beam} between 50 and 150 MeV/A by using the isospin-dependent quantum molecular dynamics model [3]. It has been observed that different components of n-n potential play a significant role towards the fragment production in participant region as well as quasi participant rapidity region. The three components namely, Skyrme, Yukawa and Coulomb are sufficient to describe the fragmentation for the central collisions. However, at peripheral colliding geometries, momentum dependent interactions are needed to explain the fragmentation. The competition between different component of potentials show large impact on the production of fragments.

References:

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Primary author: Ms KAUR, Manpreet (Mata Gujri College)

Co-author: Dr KAUR, Varinderjit (Mata Gujri College, Patiala, India)

Presenter: Dr KAUR, Varinderjit (Mata Gujri College, Patiala, India)

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