Coulomb Breakup as a novel spectroscopic tool to probe directly the quantum numbers of valence nucleon of the exotic nuclei

Ushasi Datta Pramanik

Saha Institute Of Nuclear Physics, Kolkata , India

100 years after discovery of the nucleus by Rutherford, the limits of the existence of the nuclei are still uncertain. Study of nuclear shell structure around the drip line and validation of the theoretical predictions with the experimental data may provide important information on nucleon-nucleon interactions. This may play key role in understanding of the limits of existence of the nuclei i.e. drip line. To probe the nuclear shell structure of loosely bound nuclei, a number of experimental methods with different reaction mechanisms are being used. However, very few methods can probe directly the ground state configuration of loosely bound nuclei. These methods are Coulomb Breakup, knockout, transfer reaction etc. with certain limitations. Coulomb breakup is an exclusive tool for probing valence nucleon quantum states of the loosely bound nuclei, directly. This method also solve many contradictory results of other methods. I shall discuss our recent experimental results using this method to explore ground state configurations of the neutron-rich nuclei with direct evidences of break-down of traditional 'magic numbers' (N~20 and ~ 28). In addition, I would like to discuss also, about our recent experimental evidences of unique deformed halo nucleus.

The limitation of this method is that the sensitivity of tail part of the wave function of valence nucleon. Hence this method is useful for valence nucleon occupying low-l orbital of loosely bound nuclei. It has been observed that for more deeply bound nuclei, final state of interactions are important. In this presentation, I want to discuss about this novel method and using this method what we have achieved in past and present new exciting results and what we can do in future using next generation RIB facilities.