Opportunities for detailed fission studies using light, charged particle reactions

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Since its discovery in 1939, the nuclear fission process provides much insight into the behavior of nuclei under many different conditions. As part of the nuclear chain reaction, the fission process has had a profound impact on modern society and it has consequently attracted much attention to the field of nuclear physics.

In this talk, I will argue that the time is ripe for a resumption of studies of the fission process induced by light, charged particle reactions. Although nuclear fission can be induced in heavy nuclei by several means, in some cases by forming highly excited nuclei by heavy-ion fusion or multi-nucleon transfer reactions, these methods suffer from the complication that fission can occur at several points during the decay chain thus mixing up contributions from different excitation energies. Using instead light charged particle reactions to excite the nuclei in question, the precise excitation energy from which fission takes place, can be determined. In fact, a number of such studies we carried out previously, and a first set of results on fission barrier heights, mass, energy and angular distributions were obtained.

Applying detection techniques developed over the last decades, will allow researchers to obtain detailed, high-quality data from which to probe and refine our present understanding of the process. In the meantime, more fundamental theories have been developed that will allow for a deeper understanding of the fission process. Based on these observations, I suggest that substantial advances in the study of this process can be achieved by using simple light, charged-particle reactions.

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