

CONSEQUENCES OF SUB-ZEPTOSECOND LIFETIMES IN NEAR-BARRIER REACTION DYNAMICS

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Nuclear reaction dynamics at energies near the fusion barrier is sensitive to the quantum structure of colliding nuclei. For reactions involving weakly bound nuclei, the presence of low lying unbound states, which can lead to breakup of nuclei, must also be considered. Very interesting consequences arise if the states have decay lifetimes comparable to the collision timescale. The reaction outcome then depends crucially on the location of the decay with respect to the collision partner. This talk will discuss the results of recent experiments at the Australian National University on disintegration of ${}^6\text{Li}$, ${}^7\text{Li}$ and ${}^9\text{Be}$ in interactions with a wide range of targets. Helped by breakup simulations, experimental observables have been identified that can distinguish breakup occurring close to the target from asymptotic breakup; sensitivity to lifetimes even for sub-zeptosecond decays is observed. These results provide unique insights into near-barrier reaction dynamics of weakly bound nuclei.