Radiative Capture versus Coulomb Dissociation Experiments

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Measurements of the Coulomb dissociation of nuclei have been used to infer the rate of the inverse radiative capture reaction but the results do not always agree with the direct capture measurements. The analysis is based on the idea that the two processes are related by detailed balance. In practice there are corrections and processes that can distort this relation. The Coulomb form factors for the two processes, for example, are not identical for proton halo nuclei. The dynamic polarization in Coulomb dissociation, which is caused by an interplay between first- and second-order E1 and E2 transitions, can also have an effect, and the nuclear induced breakup cannot be ignored completely. All of these mechanisms cause a suppression in the decay energy spectrum at low decay energies compared to the conventional first-order calculation, as we demonstrated in Ref. [1] for the ^{8}B$\rightarrow^7$Be+p reaction on Pb. The Coulomb dissociation of neutron halo nuclei, on the other hand, is much better described by the first-order theory.

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[1] H. Esbensen, G. F. Bertsch, and K. A. Snover, Phys. Rev. Lett. **94**, 042502 (2005).