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Precision lifetime measurements in light exotic nuclei[1]

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A new generation of ab-initio calculations, based on realistic two- and three-body forces have had a profound impact on our understanding of nuclei. They have shed light on topics such as the origin of effective forces (like spin-orbit and tensor interactions) and the mechanisms behind cluster and pairing correlations. New precise data are required to both better parameterize the three body forces and to improve numerical methods. A sensitive probe of the structure of light nuclei comes from their electromagnetic transition rates. A refined Doppler Shift Attenuation Method (DSAM) will be outlined which is used to precisely measure lifetimes in light nuclei and helps to reduce and quantity systematic uncertainties in the measurement. Using this careful DSAM, we have made a series of precise measurements of electromagnetic transition strengths in Li isotopes, A=10 nuclei, and the exotic halo nucleus, ^{12}Be. Various phenomena, such as alpha clustering and meson-exchange currents, can be investigated in these seemingly simple systems, while the collection of data spanning stable to neutron-rich, allows us to probe the influence of additional valence neutrons. This talk will report on what has been learned, and the challenges that lie in the future, both in experiment and theory, as we push to describing and measuring even more exotic systems.

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