Precision measurements of electromagnetic matrix elements in ^{10}Be as a test of ab-initio calculations*

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Recent ab-initio calculations of light nuclei have deepened our understanding of the structure of light nuclei and underlined the importance of three-body forces. Gamma-ray spectroscopy of excited states can test new formulations of the interactions. A particularly interesting case is in ^{10}Be, where the inclusion of three-body forces is found to invert the sequence of excited 2^+ states [1]. This has been attributed to the significant modification of the overall spin-orbit force. Precise (<10%) knowledge of the matrix elements are necessary to challenge the latest calculations, requiring a new generation of improved experiments. ^{10}Be was produced in the ^{7}Li(^{7}Li,α) reaction at 10 MeV. The use of a two-body reaction produced nuclei recoiling zero degrees at uniform high velocity (0.059c) where the stopping powers are well defined so is ideal for Doppler Shift Attenuation Method lifetime measurements. The recoiling ^{10}Be nuclei were detected using the Argonne Fragment Mass Analyzer (FMA), instrumented with a focal plane ion chamber. This arrangement was used to trigger Gammasphere and allowed for the collection of very clean γ-ray spectra, with control of the feeding pattern. These data are ideal for precise determination of lifetimes, branching and mixing ratios. Preliminary results of the experiment will be presented and discussed in terms of recent ab-initio calculations.

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1. S. Pieper, Nucl. Phys. A 751, 516 (2005) and R. Wiringa – private communication.