

Ion extraction for Ba tagging

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The observation of neutrinoless double-beta decay ($0\nu\beta\beta$) would shed light on neutrino properties beyond the Standard Model, such as absolute mass scale ordering and its Majorana nature. The nEXO experiment aims to search for this process in 5 tonnes of LXe, with half-life sensitivity 10^{28} years. Identification of a Barium-ion daughter ('Ba-tagging') is considered the ultimate background rejection technique, as it rules out all non-double-beta decay events. The Ba-tagging setup in development at Carleton comprises a thin capillary probe that is driven to the decay site using a mechanical displacement device and sucks the ion through to a detector chamber, where a PIPS detector identifies the ion by its decay energy. As a proof of concept, we currently aim to accomplish an untargeted extraction, where the TPC is flooded with ions and the capillary probe's transport ability is tested. To better understand what results are expected, a Monte Carlo simulation of the process has been developed. This talk will discuss the design considerations and experimental apparatus & procedure, as well as compare results from experiments and simulations of the project.