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Barium Tagging in Solid Xenon for nEXO Neutrinoless Double Beta Decay[1] TIM WALTON, CHRIS CHAMBERS, ADAM CRAYCRAFT, WILLIAM FAIRBANK, Colorado State University, NEXO COLLABORATION — nEXO is a next-generation experiment designed to search for neutrinoless double beta decay of the isotope Xe136 in a liquid xenon time projection chamber. Positive observation of this decay would determine the nature of the neutrino to be a Majorana particle. Since the daughter of this decay is barium (Ba136), detecting the presence of Ba136 at a decay site (called "barium tagging") would provide strong rejection of backgrounds in the search for this decay. This would involve detecting a single barium ion from within a macroscopic volume of liquid xenon. This technique may be available for a second phase of the nEXO detector and sensitivity beyond the inverted hierarchy to neutrino oscillations. Several methods of barium tagging are being explored by the nEXO collaboration, but here we present a method of trapping the barium ion/atom (it may neutralize) in solid xenon (SXe) at the end of a cold probe, and then detecting the ion/atom by its fluorescence in the SXe. Our group at CSU has been studying the fluorescence of Ba in SXe by laser excitation, in order to ultimately detect a single Ba+/Ba in a SXe sample. We present studies of fluorescence signals, as well as recent results on imaging small numbers of Ba atoms in SXe, in a focused laser region.

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