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Imaging of single Ba atoms and ions in solid xenon for barium tagging in nEXO

The identification, or “tagging”, of the barium-136 daughter atom that results from double beta decay of xenon-136 provides a promising technique for elimination of all backgrounds except 2-neutrino double beta decay in future xenon-136 neutrinoless double beta decay experiments. We have demonstrated that individual Barium atoms can be imaged and counted in two matrix sites in solid xenon. We report new progress towards single Ba+ imaging in its one favored matrix site. The Ba tagging scheme in development utilizes a cryogenic probe to trap the barium-136 daughter atom in solid xenon and extract it from a liquid xenon time projection chamber, such as nEXO. The barium atom is then tagged via fluorescence imaging. An important feature of the method is that any residual Ba atoms on the probe surface do not create an observable signal, only those captured in the solid xenon.

Mini-abstract

Results of single barium atom and ion imaging for nEXO

Experiment/Collaboration

nEXO

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