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Barium Tagging for the NEXT Neutrinoless Double Beta Decay Program

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The NEXT collaboration is pursuing a phased program to search for neutrinoless double beta decay (0nubb) using high pressure xenon gas time projection chambers. The power of electroluminescent xenon gas TPCs for 0nubb derives from their excellent energy resolution (<1%FWHM), and the topological classification of two electron events, unique among scalable 0nubb technologies. Xenon gas detectors also also offer a further opportunity: the plausible implementation of single barium daughter ion tagging, an approach that may reduce radiogenic and cosmogenic backgrounds by orders of magnitude and unlock sensitivities that extend beyond the inverted neutrino mass ordering. In this talk I will present recent major advances in the development of single ion barium tagging for high pressure xenon gas detectors, as well as on detector concepts that may allow integration of single ion barium sensors within the time projection chambers of the NEXT program. Topics to be covered will include advances in single ion microscopy in high pressure gas, molecular sensor development including color-shifting and turn-on barium chemosensors, methods for concentrating ions to sensors and/or actuating sensors to ions, and plans for demonstrator phases that aim to prove barium tagging in-situ, on a 3-5 year timescale.

Reference to paper (DOI or arXiv)

Your gender (free text)

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