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Barium Tagging in High Pressure Xenon Gas

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The identification of a single barium ion in coincidence with an energy deposit measured with a precision of 1% in xenon is widely recognized as an unambiguous signature of neutrinoless double beta decay. The detection of single ions in tons of gas or liquid xenon, however, is a major experimental challenge. In this talk I will discuss barium tagging methodologies based on single molecule fluorescence imaging adapted to high pressure xenon gas time projection chambers. Recent advances in ion sensing chemistry and gas phase microscopy will be presented, followed by a discussion of the subsequent R&D steps planned by the NEXT collaboration to enable an ultra-low background, barium tagging neutrinoless double beta decay technology.

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