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Design of a Multiple-Reflection Time-of-Flight Mass-Spectrometer for Barium-tagging with nEXO (student talk)

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The search for neutrinoless double beta decay requires increasingly advanced methods of background reduction. A bold strategy of solving this problem, in experiments using Xenon, is to extract the daughter Barium ion produced by double beta decay from the experiment vessel. The ion is then identified, which when combined with the corresponding energy deposit in the detector, allows for a virtually background free verification of the neutrinoless double beta decay signal. This is the process of Barium-tagging, in which the Multiple-Reflection Time-of-Flight Mass-Spectrometer (MR TOF) will perform systematic studies of the ion extraction technique, as well as provide further identification of the Barium ion. The MR TOF has been adapted such that it has a quickly adjustable mass-range and resolution. Simulations show that the mass-resolving power reaches a maximum of approximately 70000.

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