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Antiproton-induced nuclear fragmentation

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One of the compelling areas of focus in nuclear and atomic physics are isotopes and isomers of different atoms. Many different isotopes are highly desired for experimental studies; however, accessing them is challenging with existing methods. A novel method that involves antiprotonic atoms has been suggested in [1]. In this method, the creation of isotopes is achieved by forcing the annihilation of the antiproton ($\bar{p}$) inside the antiprotonic atom [2]. The annihilation of $\bar{p}$ with one of the nucleons inside the nuclei produces mainly pions, from which some are captured by the remainder nucleus, leading to nuclear fragmentation.
This production path provides a significant yield of short-lived isotopes. Furthermore, the method requires the entire process to be executed directly inside an ultra-high vacuum system within an electromagnetic trap, allowing for the possibility of re-trapping previously unavailable atomic species, immediately upon their production with ns time precision.
The focus of this contribution is a further study conducted of the GEANT4 simulation data. We suggest a better assessment of the trappable fragments from the antiproton-induced fission. We also propose an advanced technique for obtaining access to some of the most intangible isotopes of interest and their isomers.

References:
[1] G. Kornakov et al. "Synthesis of cold and trappable fully stripped highly charged ions via antiproton-induced nuclear fragmentation in traps". In: Physical Review C 107.3 (Mar. 2023). Publisher: American Physical Society, p. 034314. doi: 10.1103/PhysRevC.107.034314. url: https://link.aps.org/doi/10.1103/PhysRevC.107.034314
[2] James S. Cohen. "Capture of antiprotons by some radioactive atoms and ions". In: Phys. Rev. A 69(2 Feb. 2004), p. 022501. doi: 10.1103/PhysRevA.69.022501. url: https://link.aps.org/doi/10.1103/PhysRevA.69.022501

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