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Prospects of precision measurements with thorium ions trapped inside Coulomb crystals of $^{40}Ca^{+}$

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Nuclear properties of thorium offer an opportunity for a number of novel applications, such as direct laser excitation of the nucleus in the case of ^{229}Th, which may serve for the construction of a nuclear clock, and also for testing fundamental symmetries [1-4]. In the framework of the Trapping And Cooling of Thorium Ions with Calcium (TACTICa) collaboration, we present loading and trapping single $^{232}Th^{+}$ ions into a linear Paul trap, with thorium ions being inserted into small crystals of trapped $^{40}Ca^{+}$ ions, which provide sympathetic cooling [5]. Trapped $^{232}Th^{+}$ ions are identified in two ways: non-destructively, from the gaps in the laser-induced calcium fluorescence pattern of the crystal, and from a time-of-flight signal after their extraction from the Paul trap [6]. We further discuss the possibilities for future studies of ^{229m}Th ions and thorium-containing molecules.

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