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Trapping and laser spectroscopy of triply charged thorium-229 for a nuclear clock

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The nuclear transition between the nuclear ground state and the isomer of thorium-229 offers a unique opportunity for direct laser spectroscopy of the atomic nucleus. One of the applications is a high-accuracy nuclear clock based on the resonance frequency of this nuclear transition. We developed an ion trap for triply charged thorium-229 obtained as recoil ions from the ⍰-decay of uranium-233. From uranium-233, we can obtain thorium-229 isomers with a branching ratio of approximately 2%. We developed a nuclear-state-selective laser spectroscopy technique to detect and investigate detailed properties of triply charged thorium-229 isomers in a trap. We will also report our recent activities towards laser cooling of triply charged thorium-229 in a trap.

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