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Development of a vacuum ultraviolet laser system for realizing a thorium-229 nuclear clock

The isomeric state of thorium-229 (^{229}Th) can be excited using a vacuum ultraviolet (VUV) laser [1-3] and is expected to facilitate a nuclear clock. The realization of a nuclear clock is expected to have a wide range of applications, from basic physics to practical use in society as a high-precision optical clock. To advance the understanding of ^{229}Th isomer and its properties, we have developed a laser excitation system employing a pulsed VUV laser generated through four-wave mixing (FWM). This presentation provides an overview of the developed VUV laser excitation system and its application in laser excitation experiments on ^{229}Th.

[1] J. Tiedau et al., Phys. Rev. Lett. 132, 182501 (2024)
[2] R. Elwell et al., Phys. Rev. Lett. 133, 013201 (2024)
[3] C. Zhang et al., Nature 633, 63 (2024)

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