Contribution ID: **68** Type: **Poster**

Nuclear laser spectroscopy of thorium-229 doped in CaF2

Thursday, 25 September 2025 16:13 (1 minute)

"The thorium-229 nucleus possesses a first excited isomeric state with an excitation energy of 8.36 eV, which is extremely low for an atomic nucleus.
In 2024, laser excitation was achieved using a vacuum ultraviolet (VUV) laser[1][2][3], raising expectations for applications such as high-precision frequency standards.
We performed comprehensive spectroscopy experiments of 229Th-doped CaF2 crystals using a VUV pulsed laser with a linewidth of about 30 MHz and a detector system that can significantly reduce background.
This combination enables us to identify four distinct dopant sites within the CaF2 lattice, each with a characteristic electric field gradient.
In this poster, the VUV laser and the detection system, measured spectra, lifetime measurement, and laser-induced quenching of the isomeric state will be presented.

[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)."

Presenter: HIRAKI, TAKAHIRO (Okayama University)

Session Classification: Poster flash