



国立研究開発法人理化学研究所 仁科加速器研究センター
第253回 RIBF核物理セミナー
RIKEN Nishina Center for Accelerator Based Science
The 253rd RIBF Nuclear Physics Seminar

Hunting for mysterious ultra-low energy isomer of Thorium-229---
to realize ultimate "nuclear clock"

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Among thousands of nuclei, the isotope Thorium-229 is the only nucleus which has nuclear level of a few electronvolts. The state, if it really exists low-lying and long-lived, could be manipulated with coherent laser optics, which are commonly used in atomic physics. One promising application is the "nuclear clock". Since nuclei are shielded with core electrons, "nuclear clock" is less sensitive to external field and could potentially outperform atomic clock. The transition could also be utilized for many applications, including test of temporal variation of fundamental physics constant and so on.

To utilize the isomeric transition, we should first observe it and determine its energy level precisely enough for laser excitation. Despite many experimental attempts for more than forty years, there has been only one success in direct detection of the transition, which is done by German group using internal conversion electrons in 2016. Mysterious veil are now being removed but neither precise energy information nor direct optical transition are not obtained yet. Aiming at the detection of optical transition, we have been developing the new method using nuclear resonant scattering with synchrotron radiation X-ray. In this seminar, I will introduce recent progress in the Thorium-229 project and its future prospect.

* The talk will be given in English language.

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