

## Garching Maier-Leibnitz-Kolloquium

Donnerstag, 28.07.2022, 16<sup>15</sup> Uhr

Hörsaal der LMU in Garching, Am Coulombwall 1  
Treffen zum gemeinsamen Kaffee 16 Uhr

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### Ultraviolet Spectroscopy of the Actinium-229 beta decay: On the way to the first identification of the <sup>229</sup>Th low-energy isomer

A unique feature of thorium-229 is its isomeric first excited state with an exceptionally low excitation energy, proposed as a candidate for future nuclear optical clocks. The small nuclear moments are expected to outperform the accuracy of current state-of-the-art atomic clocks by about an order of magnitude. The current best values of the excitation energy are 8.28(17) eV and 8.10(17) eV. These were determined using two different measurement techniques whereby the isomer is populated in the alpha decay of uranium-233. The development of an optical clock requires, however, knowledge of the excitation energy by at least an order of magnitude more precise. Spectroscopic experiments searching for a direct signature of the radiative decay have to-date been unsuccessful, partially due to the background induced in the preceding alpha decay. An alternative approach using the beta decay of actinium-229 is studied as a novel method to populate the isomer with high efficiency and in low background conditions. Produced online at the ISOLDE facility, actinium is implanted into a large-bandgap crystal in specific lattice positions, suppressing the electron conversion decay channel of the isomer. A favourable feeding pattern is significantly increasing the population of the isomer compared to uranium-233 and the lower energy deposit of the beta compared to the alpha decay results in a significantly reduced luminescence background.

In this seminar, a brief overview over the topic is given, a dedicated setup developed at KU Leuven for a vacuum-ultraviolet study of an actinium-229 beam implanted into a large-bandgap crystal is presented and preliminary results from a recent experimental campaign at ISOLDE showing for the first time a footprint of the radiative decay of the low-energy thorium isomer are discussed.

*Hybrid online access via ZOOM:*

<https://lmu-munich.zoom.us/j/98457332925?pwd=TWc3V1JkSHpyOTBPQVlMelhuNnZ1dz09>

Meeting ID: 984 5733 2925

Passcode: 979953

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