Contribution ID: **18** Type: **Poster**

Coherent population transfer techniques for the ^{229}Th nuclear clock candidate

Monday, 2 May 2022 20:10 (20 minutes)

The ^{229}Th nucleus posses a metastable first excited state, i.e., an isomer, at around 8.19 eV. This state should be accessible via VUV light and presents a radiative lifetime of a few hours. These unique properties make ^{229}Th a promising candidate for a nuclear clock with excellent accuracy [1]. However, due to the relatively large uncertainty on the isomeric state energy, efficient laser manipulation with VUV light has proven cumbersome so far.

Here, we investigate theoretically an alternative to populate the isomeric state by indirect excitation via the second excited nuclear state at 29.19 keV. We make use of
quantum optics schemes to achieve the population transfer via
Stimulated Raman adiabatic passage (STIRAP) or two π-pulses.
The coherent x-ray pulses that we consider are generated by x-ray lasers or using UV pulses at the Gamma Factory in combination with relativistic acceleration of the nuclei in a storage ring. The two scenarios are discussed in view of experimental feasibility.

[1] E. Peik *et al.*, Quantum Sci. Technol. **6**, 034002 (2021).

Primary authors: KIRSCHBAUM, Tobias (Friedrich-Alexander-Universität Erlangen-Nürnberg); Dr PALFFY, Adriana (Friedrich-Alexander-Universität Erlangen-Nürnberg)

Presenter: KIRSCHBAUM, Tobias (Friedrich-Alexander-Universität Erlangen-Nürnberg)

Session Classification: Poster Session On Site