

# New Physics searches with atomic and nuclear clocks.

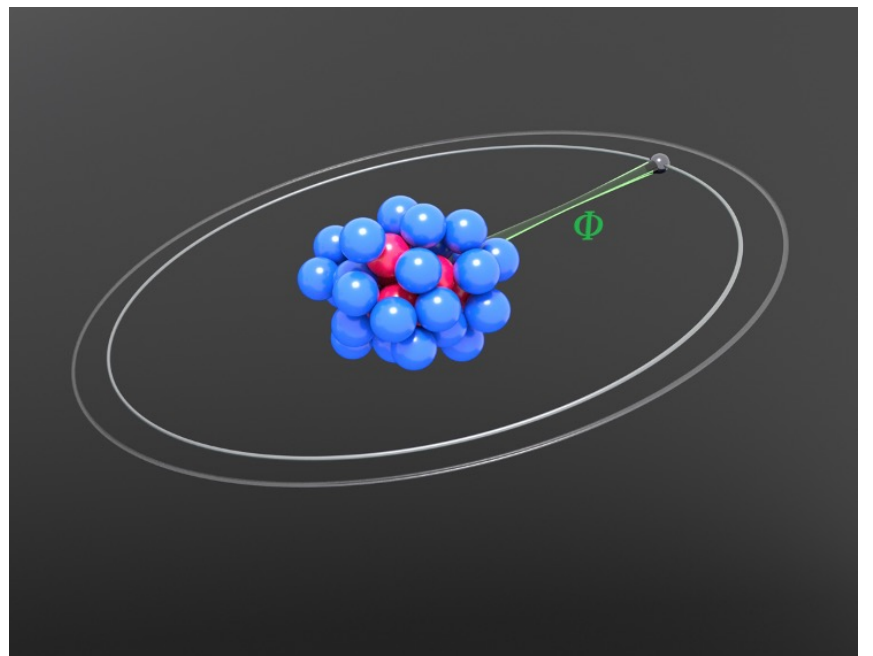
**Tuesday, 24 June 2025**

**Auditorium & Webcast 16:00 h**

**Elina Fuchs (University of Hannover and DESY)**

The extraordinary precision of atomic clocks at the level of  $1:10^{18}$ , has opened up a powerful window to search for feebly interacting light new particles. Cancellations of uncertainties make frequency comparisons between different elements and isotopes very sensitive to ultralight Dark Matter and to mediators between the Standard Model and a dark sector. I will discuss the complementarity of these differential observables to other probes of such new physics scenarios.

In the second part of the talk, I will highlight the implications of the recent breakthrough of the first laser excitation of the thorium nucleus after a 20-year-long hunt for the only known nuclear transition in the optical spectrum. This transition exhibits a highly enhanced sensitivity to the interaction between Dark Matter and the strong sector. I will show how the early line shape data already constrains ultralight Dark Matter and outline the discovery potential of a future optical nuclear clock.



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