

## **Nuclear Physics with a laser – the story of Thorium-229**

Prof. Dr. Thorsten Schumm

*Quantum Metrology group, Atominstitut, TU Wien*

Among all known isotopes, Thorium-229 has the lowest nuclear excited state, only 8.4 eV above the ground state. This so-called “isomer” is accessible to VUV laser excitation and a multitude of applications at the interface of atomic and nuclear physics have been proposed, including a nuclear clock, a gamma laser and a sensitive detector for variations of fundamental constants. After decades of attempts to determine the exact isomer energy and other nuclear properties, we report on two experiments which resonantly excite the isomer by lasers and spectroscopically resolve the nuclear quadrupole splitting in a single crystal environment. This allows us to determine the sensitivity of the nuclear clock transition to variations of the fine structure constant, which exceeds all schemes involving electron shell transitions by 3 orders of magnitude.