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Technische Universität Wien
Atominstitut
Vienna University of Technology
Institute of Atomic and Subatomic Physics
Stadionallee 2, 1020 Wien, Austria



Call for a PhD Project in experimental quantum physics (3 years)

Laser spectroscopy of a nuclear transition

The radio isotope ²²⁹Th shows a remarkable and unique property: it possesses an extremely low-energy excited state of the nucleus which is expected around 7.6 eV. It might hence be possible to **directly excite the atomic nucleus with UV (laser) radiation**, creating a bridge between atomic and nuclear physics. The narrow line width of the transition makes it a promising candidate for a new frequency standard. The excellent shielding of the nuclear transition by the electron shell allows to implant ²²⁹Th into UV transparent crystals and hence the realization of a solid state “**nuclear atomic clock**”. Furthermore, the nuclear transition shows a dramatic sensitivity to the exact value of the fine structure constant. A high precision measurement of the transition may therefore provide new constraints on possible **drifts of fundamental constants**.

*The main aim of this PhD thesis is to directly excite a nuclear transition with UV light and determine its exact wavelength and lifetime. This will be the first time that man (or woman!) has **full coherent control over the quantum physics of a nucleus**.*

The Ph.D. thesis will be carried out at the Institute for Atomic and Subatomic Physics (Atominstitut, TU Vienna) in the **START group of Dr. Thorsten Schumm**, in close collaboration with the research group of Prof. Jörg Schmiedmayer. The project is **highly interdisciplinary** and touches different research fields, ranging from atomic quantum physics and quantum optics over precision metrology to nuclear physics. The student will acquire hands-on experience in these fields and learn key technologies that will qualify him/her for a further career in academia or industry. In this context the student will have the possibility to travel and collaborate with various research partners (mainly US and Germany) to acquire knowledge and technology.

We offer a highly dynamic and creative environment where the students have a large degree of freedom to explore their own ideas. The framework of the dedicated Graduate School on Complex Quantum Systems provides a tight link to other world-class quantum physics groups in Vienna and provides dedicated courses, invited guest lectures and seminars, soft-skill training and an international thesis advisory committee.

We offer full-time employment as a doctoral student. This includes health and social insurance, etc. associated with normal employments in Austria. Formal requirement: The candidate must hold a **Master's degree** or equivalent, and is expected to pass the admission criteria of the Graduate School on Complex Quantum Systems (www.coqus.at). A background in (crystal) solid state physics, nuclear physics, spectroscopy, or radio chemistry will be beneficial but not mandatory.

Starting date: from March 2010 on...(flexible)

If you are interested or have any questions, please contact Thorsten Schumm (Schumm@atomchip.org)