

## PHYSICAL COLLOQUIUM

### INVITATION

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Monday, 05.06.2023, 4.15 p.m., Room No. W02 1-148

speaks

**Prof. Dr. Markus Hennrich**  
**Stockholm University**

about

### “Trapped Rydberg ions ”

Trapped Rydberg ions are a novel approach for quantum information processing [1,2]. This idea joins the advanced quantum computing toolbox of trapped ions with strong dipolar interaction between Rydberg atoms. For trapped ions, this method can speed up entangling interactions and enables such fast operations in larger ion crystals.

In this presentation, I will first introduce the quantum computing platform of trapped ions, and present the novel experimental platform of trapped Rydberg ions [2]. I will describe the specific physics involved when exciting ions into Rydberg states, the effects on the trapping potential due to the strong polarizability of Rydberg ions, and the controllable strong interaction between ion and motion. Moreover, I will summarize methods and results in speeding up trapped ion entanglement operations via the strong dipolar Rydberg interaction [3].

#### *References*

- [1] *M. Müller, L. Liang, I. Lesanovsky, and P. Zoller, Trapped Rydberg Ions: From Spin Chains to Fast Quantum Gates, New J. Phys. 10, 093009 (2008).*
- [2] *A. Mokhberi, M. Hennrich, and F. Schmidt-Kaler, Trapped Rydberg Ions: A New Platform for Quantum Information Processing, in Advances In Atomic, Molecular, and Optical Physics, Vol. 69 (Elsevier, 2020), pp. 233–306.*
- [3] *C. Zhang, F. Pokorny, W. Li, G. Higgins, A. Pöschl, I. Lesanovsky, and M. Hennrich, Submicrosecond Entangling Gate between Trapped Ions via Rydberg Interaction, Nature 580, 345 (2020).*

All interested persons are cordially invited.

Prof. Dr. Christian Schneider