



CRC 1227
Designed Quantum States of Matter



GUEST LECTURE

Prof. Dr. Stefan Willitsch

Department of Chemistry
at University of Basel
(Guest of Prof. Dr. Piet Schmidt
and Prof. Dr. Klemens Hammerer)

Leibniz Universität Hannover
Welfengarten 1, 30167 Hannover
(building 1101)
Seminar room D326
at the Institute of Quantum Optics
25 January, 2018, 3:30 pm

"New methods for probing the properties and dynamics of molecular quantum systems"

Experimental methods originally developed in the context of atomic physics and the quantum sciences increasingly fertilise new research directions in other disciplines. In this talk, we will give an overview of how cooling and control techniques from the realm of ultracold atoms and ions can be applied to progressively complex molecular systems in order to push the frontiers of molecular and chemical physics [1].

First, we will discuss new types of hybrid experiments for the simultaneous trapping of cold ions and ultracold atoms which enable the investigation of ion-neutral interactions at very low energies. By extending hybrid-trapping techniques to molecular systems, it has recently become possible to probe exotic molecular processes and intermolecular interactions at an unprecedented level of detail [1]. Second, we will highlight a new method to control interactions of complex molecules by isolating distinct molecular geometries and quantum states using electric fields and inducing their collisions with cold trapped ions [2]. Third, we will discuss how single isolated molecules can be controlled on the quantum level which serves as a basis for upcoming molecular quantum technologies [3] and precise measurements of molecular properties and spectra [4]. The presentation will finish with an outlook on ongoing and future developments.

[1] S. Willitsch, Adv. Chem. Phys. 162 (2017), 307

[2] D. Rösch et al., Science 342 (2013), 98

[3] F. Wolf et al., Nature 530 (2016), 457

[4] M. Germann et al., Nat. Phys. 10 (2014), 820

**All DQ-mat members and all interested
are cordially invited to attend.**