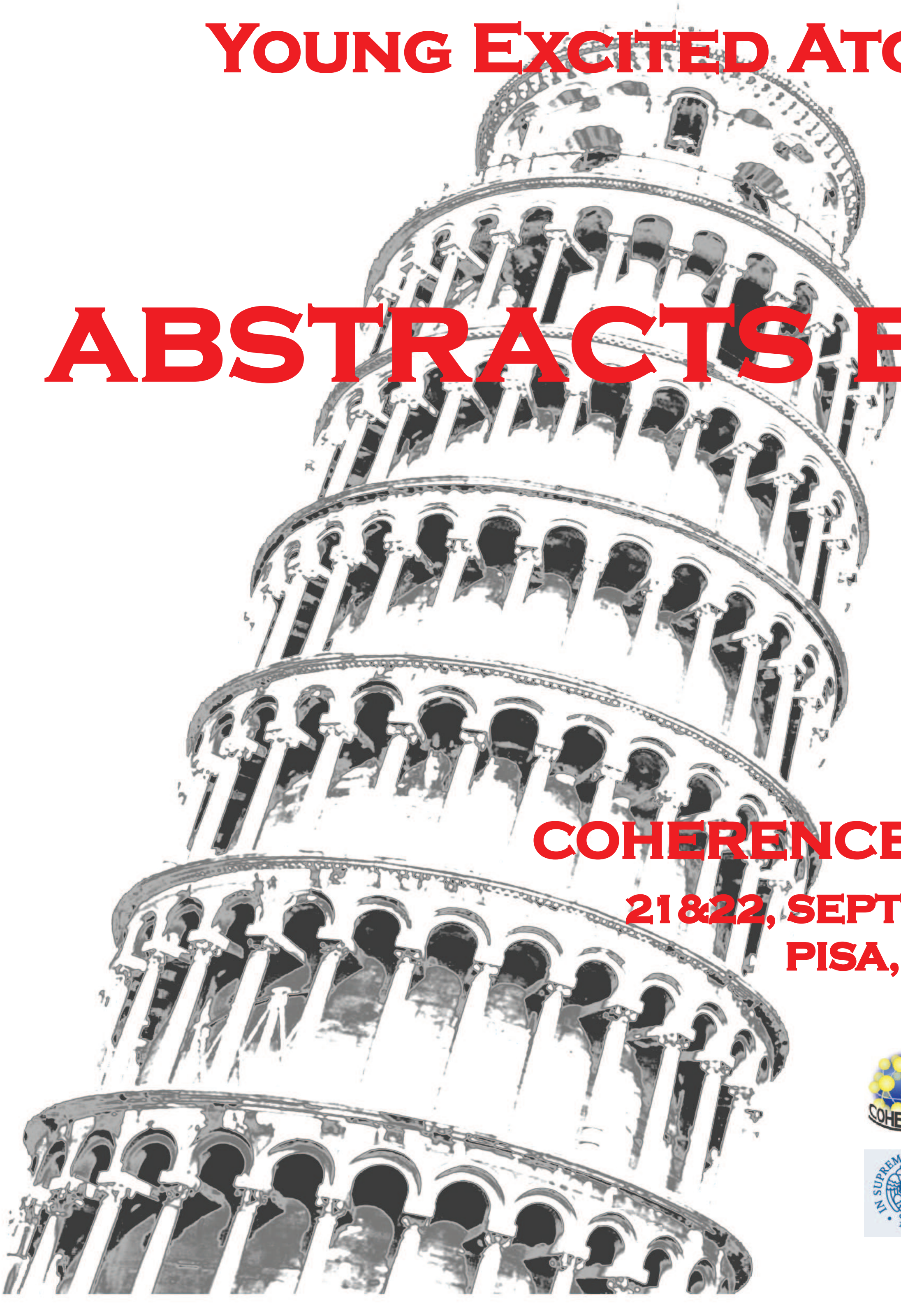
Y.E.A.

Young Excited Atomix



ABSTRACTS BOOK

COHERENCE NETWORK

21&22, SEPTEMBER, 2012
PISA, ITALY

Contents

ORGANIZATION COMMITTEE

Advisory Board

- Prof. Ennio Arimondo, CNR-INO Pisa, Physics Department - University of Pisa.
- Prof. Matthias Weidemüller, Coordinator COHERENCE Network.
- Dr. Wilhelm Kaenders, TOPTICA Photonics.

Local Organizing Committee

- Prof. Maria Allegrini.
- Dr. Donatella Ciampini.
- Dr. Oliver Morsch.
- Ms. Francesca Usala.

YEA Organizing Committee

- Ms. Anita Gaj.
- Mr. Paul Huillery.
- Ms. María Martínez Valado.

PROGRAM

Hotel Fossabanda	***Thursday 20/09***
12.30 - 14.30	*Lunch break*
14.30 - 15.30	**Matthias Weidemüller**
15.30 - 16.30	**Pierre Pillet**
16.30 - 17.00	*Coffee break*
17.00 - 17.30	Jemma Gibbard
17.30 - 18.30	Julian Naber
18.00 - 18.30	Laura Gil
18.30 - 19.00	Karsten Leonhardt

Hotel Fossabanda	***Friday 21/09***
09.00 - 10.00	**Alexander Kuzmich**
10.00 - 10.30	Jake Gulliksen
10.30 - 11.00	*Coffee break*
11.00 - 11.30	Marco Mattioli
11.30 - 11.50	Paul Huillery
11.50 - 12.10	María Martínez Valado
12.10 - 12.30	Alexander Krupp
12.30 - 14.30	*Lunch break*
14.30 - 15.30	**Igor Ryabtsev**
15.30 - 16.00	Hannes Busche
16.00 - 16.30	*Coffee break*
16.30 - 17.00	Heiner Sassmannhausen
17.00 - 17.30	Fotis Mouselimis
17.30 - 18.00	Markus Kurz
18.00 - 18.30	*Closing Ceremony*

ORAL PRESENTATIONS

Seniors

Available soon

Matthias Weidemüller
Univ. Heidelberg
@

Abstract

Properties and dynamics of a cold sample of Rydberg atoms

Pierre Pillet

Laboratoire Aimé Cotton, CNRS, University Paris-Sud, ENS Cachan, Bt. 505, Campus d'Orsay, 91405 Orsay cedex, France

pierre.pillet@u-psud.fr

Cold Rydberg atoms are really interesting and fascinating because they combine both the properties of cold atoms and those of Rydberg atoms. The first studies with cold Rydberg atoms have clearly demonstrated collective behaviors of such excited ensembles, depending on the studying configurations. If the initial conditions of the Rydberg ensemble fix its evolution and its behavior, the interactions between Rydberg atoms are the crucial elementary processes. The control of these interactions is therefore the key to control the evolution of such atomic Rydberg ensembles.

Because of the possibility for Rydberg atoms to acquire huge electric dipolar momentum, the atoms can interact altogether at very large distances. Moreover because of the low temperature of the atomic sample, the behavior of a cold Rydberg ensemble can be considered in a first approximation (first microsecond of the experiment) as a frozen gas with more similarity to an amorphous solid than to a gas of colliding atoms. For dense and cold Rydberg atomic samples, the frozen picture is no longer valid and a very impressive behavior, namely the spontaneous evolution towards neutral ultracold plasmas, has been shown.

The basic processes to manipulate and to control an ensemble of Rydberg atoms will be introduced: Fšrster long-range dipole-dipole interaction, dipole blockade, entanglement through Landau Zener transitions... The main challenges with cold Rydberg atoms will be exposed: many- and a few-body effects, cooperative effects, photoassociation of Rydberg atoms, correlated matter... illustrated by the present state of the art, expanding the domain of quantum matter to ultra-cold plasmas, mesoscopic ensembles and cold phochemistry..

Rydberg spin-wave dephasing and excitation blockade in a mesoscopic atomic ensemble

Alex Kuzmich
Georgia Institute of Technology, Atlanta, GA 30332
alex.kuzmich@physics.gatech.edu

Studies of spin-wave dephasing and excitation blockade mechanisms in interaction of light with Rydberg levels of a cold atomic gas will be presented. The roles of the two mechanisms for generation of single photons, many-body Rabi oscillations, and spatial correlations of atomic spin-waves will be discussed.

Spectroscopy of Rydberg atoms and quantum information

Igor Ryabtsev

Institute of Semiconductor Physics, Pr. Lavrentyeva 13, 630090 Novosibirsk, Russia
ryabtsev@isp.nsc.ru

Highly excited Rydberg atoms have many unique properties compared to low-excited atoms: large electron orbit radius, large dipole moments of transitions between neighboring states, strong long-range interactions, long radiative lifetimes, huge polarizabilities, etc. Laser and microwave spectroscopy of Rydberg atoms can reveal these properties by observing the quantum interference, dephasing, shifts or broadenings of various resonances in single Rydberg atoms. Single Rydberg atoms are detected using the selective field ionization technique. Control of long-range interactions between Rydberg atoms by laser and microwave radiations, as well as by external electric and magnetic fields, forms the basis for quantum information processing with neutral trapped atoms.

In this presentation we will give a review of our experimental and theoretical results on laser and microwave spectroscopy of Rb and Na Rydberg atoms and their connection to quantum information. Among these results there are the Stark and Zeeman effects at microwave and optical transitions [1-3, 5, 8, 9, 13], quantum interferometry of degenerate and non-degenerate Rydberg states [1-3], excitation and detection statistics of Rydberg atoms with single-atom resolution [4, 5, 8, 9], long-range Stark-tuned Förster resonances between a few Rydberg atoms [5, 8, 9, 10], three-photon excitation spectroscopy with pulsed and cw lasers [8, 12, 13], ultracold plasma effects [13], ionization and quenching of Rydberg atoms by blackbody radiation [6, 7], and deterministic single-atom excitation using dipole blockade and chirped laser pulses [11].

This work was supported by RFBR (Grant No. 10-02-00133), by the Russian Academy of Sciences, by the Presidential Grants Nos. MK-7060.2012.2 and MK-3727.2011.2, by the Dynasty Foundation, and by the EU FP7 IRSES Project "COLIMA".

[1] I.I.Ryabtsev et al., Phys. Rev. A **61**, 063414 (2000).
[2] I.I.Ryabtsev et al., Phys. Rev. A **64**, 033413 (2001).
[3] I.I.Ryabtsev et al., J. Phys. B **36**, 297 (2003).
[4] I.I.Ryabtsev et al., J. Phys. B **38**, S421 (2005).
[5] I.I.Ryabtsev et al., Phys. Rev. A **76**, 012722 (2007).
[6] I.I.Beterov et al., New J. Phys. **11**, 013052 (2009).
[7] I.I.Beterov et al., Phys. Rev. A **79**, 052504 (2009).
[8] D.B.Tretyakov et al., JETP **108**, 374 (2009).
[9] I.I.Ryabtsev et al., Phys. Rev. Lett. **104**, 073003 (2010).
[10] I.I.Ryabtsev et al., Phys. Rev. A **82**, 053409 (2010).

[11] I.I.Beterov et al., Phys. Rev. A **84**, 023413 (2011).
[12] I.I.Ryabtsev et al., Phys. Rev. A **84**, 053409 (2011).
[13] D.B.Tretyakov et al., JETP **114**, 14 (2012).

Students

Millimetre-wave spectroscopy on high Rydberg states of ultracold cesium

Heiner Saßmannshausen

ETH Zürich

heiner.sassmannshausen@phys.chem.ethz.ch

Rydberg atoms of high principal quantum number possess unusual physical properties which are at the origin of numerous scientific applications. In recent years, Rydberg excitation of atoms in ultracold dense clouds as made available by the development of laser cooling has broadened the range of applications and led to the observation of ultralong-range van-der-Waals molecules [1,2], of weakly bound molecules arising from the interaction between an atom in a high Rydberg state and an atom in its electronic ground state [3,4], and of the evolution of a frozen Rydberg gas into an ultracold plasma [5]. In relation to quantum information processing, schemes involving Rydberg atoms have been proposed on the basis of blockade effects [6] and first attempts towards an experimental implementation have been successful [7,8].

In this talk I will present an experimental setup developed for high-resolution spectroscopic measurements on cesium Rydberg states. We have combined a cesium magneto-optical trap (MOT) with a frequency-doubled pulsed dye laser and a phase-locked backward-wave oscillator (BWO) as a continous-wave millimetre-wave source [9]. Starting from the $F = 4$ hyperfine component of their $6s$ electronic ground state, the cesium atoms are excited to np Rydberg states (with $45 < n < 150$) using a pulsed UV laser. The fraction of excited np Rydberg atoms serves as starting point for spectroscopic measurements using the millimetre-wave radiation, which selectively drives transitions to either ns or nd Rydberg states. The minimization of both electric and magnetic stray fields below 2 mV/cm and 2 mG, respectively, resulted in observed line widths below 20 kHz in millimetre-wave spectra of Rydberg states around $n = 60$. The high resolution enabled the measurement of the hyperfine structure of ns Rydberg states up to $n = 90$. Moreover, Rydberg states could be resolved up to $n = 270$ under low density conditions.

In the near future, the setup will be used to investigate interactions between cesium Rydberg atoms and ground state cesium atoms. In order to reach the required densities, a dipole trap is currently being installed.

1. C. Boisseau, I. Simbotin, and R. Côté, Phys. Rev. Lett. **88**, 133004 (2002).

2. N. Samboy, Jovica Stanojevic, and R. Côté, Phys. Rev. A **83**, 050501 (2011).

3. C. H. Greene, A. S. Dickinson, H. R. Sadeghpour, Phys. Rev. Lett. **85**, 2458 (2000).

4. V. Bendkowsky, B. Butscher, J. Nipper, J. P. Shaffer, R. Löw, and T. Pfau, Nature (London) **458**, 1005 (2009).

5. M. P. Robinson, B. Laburthe Tolra, M. W. Noel, T. F. Gallagher, and P. Pillet, Phys. Rev. Lett. **85**, 4466 (2000).

6. M. D. Lukin, M. Fleischhauer, R. Cote, L. M. Duan, D. Jaksch, J. I. Cirac, and P. Zoller, Phys. Rev. Lett. **87**, 037901 (2001).

7. A. Gaëtan, Y. Miroshnychenko1, T. Wilk, A. Chotia, M. Viteau,D. Comparat, P. Pillet, A. Browaeys and P. Grangier, Nature Phys. **5**, 115 (2009).

8. X. L. Zhang, L. Isenhower, A. T. Gill, T. G. Walker, and M. Saffman, Rev. Mod. Phys. **82**, 2313 (2010).

9. M. Schäfer, M. Andrist, H. Schmutz, F. Lewen, G. Winnewisser and F. Merkt, J. Phys. B: At. Mol. Opt. Phys. **39**, 831 (2006).

Ultra-cold long-range giant dipole molecules in crossed electric and magnetic fields

Markus Kurz
Hamburg University
mkurz@physnet.uni-hamburg.de

We show the existence of ultra-long-range giant dipole molecules formed by a neutral alkali ground state atom that is bound to the decentered electronic wave function of a giant dipole atom. The adiabatic potential surfaces emerging from the interaction of the ground state atom with the giant dipole electron posses a rich topology depending on the degree of electronic excitation. Binding energies and the vibrational motion in the energetically lowest surfaces are analyzed by means of perturbation theory and exact diagonalization techniques. The resulting molecules are truly giant with internuclear distances up to several ?m. Finally, we demonstrate the existence of intersection manifolds of excited electronic states that potentially lead to a vibrational decay of the ground state atom dynamics.

Rydberg interactions in arrays of magnetic microtraps on atom chips

Julian Naber
Van der Waals-Zeeman Institute, University of Amsterdam
j.b.naber@uva.nl

We present a novel approch for establishing a quantum information platform based on ultracold atoms in magnetic microtraps and the dipole blockade between Rydberg atoms [1]. The Ioffe-Pritchard type microtraps arrays are realized by a patterned permanently magnetized film on a chip made by litographic techniques. These arrays allow individual trap site addressing and optical detection by absorption imaging for a lattice with 22×36 μm unit cell and several hundred ^{87}Rb atoms in each microtrap [2].

The current lattice has a period of only $10\,\mu$m which is comparable to the dipole blockade radius between Rydberg atoms in neighbouring trap sites. So far, we demonstrated spatially resolved and coherent excitation of Rydberg atoms on a chip[3]. The Rydberg atoms were also used as a surface probe. The results suggest that Rydberg excitation should be possible in close proximity to the chip surface (≈ 10 μm). Furthermore, the readout sensitivity of absorption imaging can in principle be enhanced to single-atom detection [4]. With this experimental setup, we want to achieve state-selective readout of ensemble qubits in the trap sites and verify the dipole blockade within the same and between different microtraps.

1. Leung et al, Quantum Inf. Process. **10**, 955-974 (2011).
2. Whitlock et al, New J. Phys. **11**, 023021 (2009).
3. Tauschinsky et al, Phys. Rev. A **81**, 063411 (2010).
4. Ockeloen et al, Phys. Rev. A **82**, 061606 (2010).

Process Characterisation with Wave-Functions

Jake Gulliksen
Aarhus University
kiwi@phys.au.dk

Numerically modelling quantum processes is an important tool to understanding quantum gates and algorithms. Process characterisation, the numerical analogue of experimental process tomography, is shown here to be used efficiently and effectively for a Rydberg mediated CNOT gate. In order to cut back on computational expenses we see how Monte-Carlo wave-functions and quantum parallelisation may be utilised.

Triatomic Rydberg Molecules

Fotios M.Mouselimis
Universidad de Granada
fotis@ugr.es

The triatomic molecule is formed from a Rydberg atom and two ground state atoms. Using first order perturbation theory we derive the adiabatic energy surfaces of the molecular Rydberg states. In particular, we consider the case when the two perturbers are placed on non-symmetric positions with respect to the Rydberg ion. We investigate the properties and structure of these systems in detail.

The Interaction of H Atom Rydberg States and Metallic Surfaces

Jemma Gibbard
University of Oxford
jemma.gibbard@chem.ox.ac.uk

As a Rydberg state approaches a metallic structure its energy levels are perturbed, and at small atom surface seperations surface ionisation can occur. Experimental investigation of the charge transfer dynamics of H atom Rydberg states incident at various surfaces have been carried out. A theoretical Wavepacket Propagation study has been used to further understand these interactions. The effect of electronic confinement on the charge transfer dynamics is currently being investigated by comparing H atom Rydberg sates incident at gold and nanostructured surfaces.

Collective modeling of many-body interactions in a cold Rydberg gas

Paul Huillery

Laboratoire Aimé Cotton, Université Paris-Sud 11, Campus d'Orsay Bat. 505, 91405
paul.huillery1@u-psud.fr

Atoms excited to Rydberg states are highly polarizable and, therefore, can interact strongly with each other at large distances, via dipole or van-der-Waals interactions. These interactions make them attractive candidates for studies of strongly correlated systems and the implementation of quantum logic gates. A key signature of interactions between Rydberg atoms is the suppression of fluctuations of the dipole-blockaded excitations, that we have investigated in a R bMOT. Because a quantum mechanical treatment containing the states of all the atoms in a MOT is not feasible, our results are analysed using an original theoretical model based on the well established Dicke model of quantum optics. The Dicke model is modified by including the van der Waals interactions between the Dicke collective states. This approach leads to a manageable size of the basis set for the simulations. The Dicke state model includes statistical fluctuations and hence gives access to the complete counting statistics, in particular the measured variance of the Rydberg excitations.

Anomalous quantum liquids and cluster states in ultracold Rydberg ensembles

Marco Mattioli

University of Innsbruck, Institute for Quantum Optics and Quantum Information
marco.mattioli@uibk.ac.at

Here, I will discuss about a certain class of short-distance interactions, which can be engineered in ultra-cold weakly dressed Rydberg atoms confined in one-dimensional systems, that may lead to the stabilization of critical quantum liquid phases with qualitatively new features with respect to the Tomonaga-Luttinger liquid paradigm. The nature of these novel quantum phases reflects the complex nature of cluster structures present in the classical limit, and leads to clear signatures on typical experimental observables such as correlation functions and the static structure factor.

Many-body dynamics of Strontium Rydberg lattices

Laura Gil
Max Planck Institute for the Physics of Complex Systems
lgil@pks.mpg.de

We study the dynamics of Strontium atoms confined in an optical lattice, where strong interactions are induced by exciting one valence electron to a high lying Rydberg state. Making use of the extra valence electron, we demonstrate how to control the motional dynamics of the atoms and analyze the performance of our approach. Finally, we show how such a setting can be used to realize substantial spin squeezing, which has direct applications to high precision frequency metrology and could boost the performance of atomic lattice clocks.

Interplay of conical intersections and entanglement transport in two-dimensional flexible Rydberg aggregates

Karsten Leonhardt

Max Planck Institute for the Physics of Complex Systems, Nöthnitzer Strasse 38, 01187 Dresden, Germany

karlo@pks.mpg.de

Transfer of electronic excitations on chains (aggregates) of atoms or molecules is important in many areas of physics, such as photosynthetic light-harvesting [1] or assemblies of Rydberg atoms in optical lattices or other atomic traps. The electromagnetic interactions responsible for excitation propagation also exert mechanical forces on the atoms in the chain, inducing their motion [2]. In such a flexible aggregate, two-dimensional ring geometries exhibit accessible conical intersections [3]and one-dimensional linear geometries possess entanglement transporting modes [4].

Here we combine both features and study two one-dimensional chains of Rydberg atoms, perpendicular to each other. The first chain is prepared such that Newton's cradle type entanglement transport dynamics occurs on it [5].The second chain is placed in such a way relative to the first chain, that when transferring from the first onto the second chain, the entanglement transport pulse splits into two, propagating at a different velocity. We are able to trace back these two dynamics to the system passing through a conical intersection. In our scenario the conical intersection is connected with a very simple geometrical configuration of three atoms [3].

1. R. van Grondelle and V.I. Novoderezhkin, Energy transfer in photosynthesis: experimental insights and quantitative models. Phys. Chem. Chem. Phys. **8**, 793 (2006).

2. C. Ates and A. Eisfeld and J. M. Rost, Motion of Rydberg atoms induced by resonante dipole-dipole interactions, NIP **10**, 045030 (2008).

3. S. Würster and C. Ates and A. Eisfeld and J. M. Rost, Conical intersections in an ultracold gas, PRL **106**, 153002 (2011).

4. S. Würster and C. Ates and A. Eisfeld and J. M. Rost, Newton's cradle and entanglement transport in flexible Rydberg aggregates, PRL **105**, 053004 (2010).

5. S. Möbius and S. Würster and C. Ates and A. Eisfeld and J. M. Rost, Adiabatic entanglement transport in Rydberg aggregates, JPB **44**, 184011 (2011).

Strong photon interactions using Rydberg polaritons

Hannes Busche
Joint Quantum Centre (JQC) Durham-Newcastle, Department of Physics, Durham University, Durham, DH1 3LE, UK
hannes.busche@durham.ac.uk

Photons are ideal carriers of quantum information due to their limited interactions with the environment. However, as photon-photon interactions are weak, it is difficult to perform quantum operations on photonic qubits. In Durham, we exploit the properties of cold atoms in highly excited Rydberg states [1] to induce interactions between photons [2,3]. Using electromagnetically induced transparency [4], the strong dipolar interactions between Rydberg atoms can be mapped onto the optical field. Storing photons in the form of dark state polaritons and using microwaves to control the interactions between them, we have recently observed oscillations in the retrieved photon number that depend on the introduced interactions [5]. In this talk, I will present the underlying concepts, our latest results, and our plans for a new dedicated experimental setup to implement photonic gates.

1. M. D. Lukin *et al.* Dipole Blockade and Quantum Information Processing in Mesoscopic Atomic Ensembles. Phys. Rev. Lett. **87**, 037901 (2001).

2. J. D. Pritchard *et al.* Cooperative Atom-Light Interaction in a Blockaded Rydberg Ensemble. Phys. Rev. Lett. **105**, 193603 (2010).

3. A. V. Gorshkov *et al.* Photon-Photon Interactions via Rydberg Blockade. Phys. Rev. Lett. **107**, 133602 (2011).

4. M. Fleischhauer *et al.* Electromagnetically induced transparency: Optics in coherent media. Rev. Mod. Phys. **77**, 633-673 (2005).

5. D. T. Maxwell *et al.* Coherent control of strongly interacting Rydberg polaritons. arXiv:1207.6007v1 (2012).

Coherence of Förster resonances in Rydberg atoms

Alexander Krupp

5.Physikalisches Institut, Universität Stuttgart Pfaffenwaldring 57, 70569 Stuttgart, Germany
a.krupp@physik.uni-stuttgart.de

Förster resonances in general are formed by the non radiative coupling of a pair of two-level systems, leading to a change in energy and to an interaction between the two systems. This occurs in a wide range of different physical systems. Especially in biochemistry these resonances play a crucial role and describe energy transfer processes in plants involving photosynthesis reactions. This mechanism can also be used as a powerful microscope technique allowing to visualise protein or other biomolecule interactions.

In our work these resonances occur between a pair of Rydberg atoms in weak electric fields creating strong interactions between the atoms. We report on studies of Förster resonances between Rydberg atoms in an ultra-cold atomic cloud of ^{87}Rb. The coherence of the system is investigated in two different time regimes:

- the microsecond timescale where we use a Ramsey-type pair state interferometer to study the interaction between the 'frozen' Rydberg atoms
- the millisecond/second regime where we weakly dress the Rydberg atoms to see a mechanical effect on the Rb atoms in a BEC.

By applying a small electric field we tune dipole coupled pair states into resonance, giving rise to Förster resonances. Via a Ramsey-type interferometer we can resolve several resonances at distinct electric field strengths. We study the coherence of the system at and close to the resonances and observe a change in phase and visibility of the Ramsey fringes on resonance. Furthermore we demonstrate that these Stark tuned Förster resonances allow us to tune and control the sign and strength of the interaction between Rydberg atoms. This can be used to study the mechanical effects of the Rydberg-Rydberg interaction on a macroscopic sample of atoms. Therefore we weakly dress a BEC with Rydberg state in different electric fields looking for a modification of the shape of the BEC on a long (100 ms) timescale.

In summary, we now have a tool to coherently tune interactions between Rydberg atoms. In further studies Rydberg atoms could be used as a model system to simulate energy transfer processes in biomolecules.

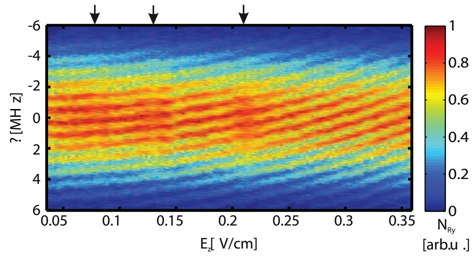


Figure 1: a) Ramsey spectra with varying pulsed electric fields. The arrows indicate a loss in visibility corresponding to the positions of Förster resonances.

1. J. Nipper, J. B. Balewski, A. T. Krupp, B. Butscher, R. Löw, and T. Pfau. Highly resolved measurements of stark-tuned Förster resonances between rydberg atoms. Phys. Rev. Lett. **108**, 113001, Mar (2012).

2. J. Nipper, J. B. Balewski, A. T. Krupp, S. Hofferberth, R. Löw, and T. Pfau. Atomic pair-state interferometer: Controlling and measuring an interaction-induced phase shift in rydberg-atom pairs. Phys. Rev. X, 2:031011, Aug (2012).

Spatial tomography of Rydberg excitations in a MOT

María Martínez Valado

Dipartimento di Fisica "E. Fermi", Università di Pisa. INO-CNR. Largo B. Pontecorvo, 3, 56127. Pisa, Italia

valado@df.unipi.it

The study of atoms with high principal quantum number n - also called Rydberg atoms - and their fascinating physical properties has developed an intense scientifical activity in recent years. Dipole blockade is a consecuence of strong dipole-dipole atomic interactions in an ultracold atom gas which consists of blocking the excitation to the Rydberg state. When two neighboring atoms are in the same excited state, the strong interactions between them produce an energy shift so that only one atom can undergo excitation to the Rydberg state. The dipole blockade effect is characterized by the blockade radius, which is the radius of a sphere where at most one Rydberg excitation can be found. Scanning the position with a very focused laser beam across the MOT we have recorded the Rydberg atoms counting for different states. Comparing these profiles with the profile obtained by directed inonization of the sample, we have observed an evidence of dipole blockade phenomena.

LIST OF POSTERS

- **Rydberg state spatial distributions in a cold strontium gas**
  D. Boddy, G. Lochead, D. P. Sadler, C. S. Adams and M. P. A. Jones

- **High-resolution spectroscopy of ultracold Rydberg atoms**
  Johannes Deiglmayr, Heiner Sassmannshausen, Josef Agner, Hans-Juerg Schmutz and Frederic Merkt

- **Charge Transfer Dynamics of Rydberg Hydrogen atoms at Surfaces**
  Mark Dethlefsen, Eric So, Jemma Gibbard, Sashikesh Ganeshalingam, Xiolin Li and Tim Softley

- **Atomic Rydberg Reservoirs for Polar Molecules**
  Alexander W. Glaetzle, Bo Zhao, Guido Pupillo, Peter Zoller

- **Towards atomic ensemble qubits and magnetic nanoscale lattices**
  A.L. La Rooij, A. Tauschinsky, V.Y.F. Leung, J. B. Naber, G. B. Mulder, D. R. M. Pijn, H. B. van Linden van den Heuvell and R.J.C. Spreeuw

- **Excitation spectrum of supersolids**
  Tommaso Macrì, Fabio Cinti, Fabian Maucher, Thomas Pohl

- **Towards a photonic phase-gate using Rydberg polaritons**
  D. Paredes, H. Busche, D. Maxwell, D. J. Szwer, K.J. Weatherill, M. P. A. Jones, C. S. Adams

- **Continuous measurement on ultracold Bose gases: A Bogoliubov Gaussian state description**

  Andrew Wade, Jacob Sherson, Klaus Mølmer

- **Quantum dynamics in 1d Rydberg lattices**

  Guang Wu

PARTICIPANTS LIST		
Name	***Affiliation***	***Email***
Robert Heck	Ruprecht-Karls-Universität Heidelberg	*heck@physi.uni-heidelberg.de*
Hennig Labuhn	Ruprecht-Karls-Universität Heidelberg	*labuhn@physi.uni-heidelberg.de*
Anita Gaj	Universität Stuttgart	*a.gaj@physik.uni-stuttgart.de*
Hannes Gorniaczyk	Universität Stuttgart	*h.Gorniaczyk@physik.uni-stuttgart.de*
Alexander Krupp	Universität Stuttgart	*a.krupp@physik.uni-stuttgart.de*
Wildan Abdussalam	MPI Dresden	*waedunas9@gmail.com*
Elias Diesen	MPI Dresden	*diesen@pks.mpg.de*
Laura Gil	MPI Dresden	*lgil@pks.mpg.de*
Karsten Leonhardt	MPI Dresden	*karlo@pks.mpg.de*
Tommaso Macrì	MPI Dresden	*macri@pks.mpg.de*
Adrián Sanz Mora	MPI Dresden	*adnsanz@gmail.com*
Hannes Busche	University of Durham	*hannes.busche@durham.ac.uk*
David Paredes	University of Durham	*david.paredes@durham.ac.uk*
Daniel Sadler	University of Durham	*dpsadler@gmail.com*
Jemma Gibbard	University of Oxford	*jemma.gibbard@ccc.ox.ac.uk*
Mike Kohlhoff	University of Oxford	*mikekohlhoff@gmail.com*
Riccardo Faoro	CNRS Paris-Sud	*@*
Paul Huillery	CNRS Paris-Sud	*paul.huillery1@lac.u-psud.fr*
Arthur La Rooij	Universiteit van Amsterdam	*a.l.larooij@uva.nl*
Julian Naber	Universiteit van Amsterdam	*julian.naber@yahoo.com*
Jake Gulliksen	Aarhus Universitet	*mrwade@phys.au.dkl*
Andrew Wade	Aarhus Universitet	*mrwade@phys.au.dkl*
Alexander Glaëzlte	Universität Innsbruck	*Alexander.Glaetzle@uibk.ac.at*
Marco Mattioli	Universität Innsbruck	*Marco.Mattioli@uibk.ac.at*
Heiner Sassmannhausen	ETH Zürich	*heiner.sassmannshausen@phys.chem.ethz.cht*
María Martínez Valado	CNR Universitá di Pisa	*valado@df.unipi.it*
Stefano Scotto	CNR Universitá di Pisa	*ste.scotto88@gmail.com*
Fotis Mouselimis	Universidad de Granada	*fotis@ugr.es*
Markus Kurz	University of Hamburg	*mkurz@physnet.uni-hamburg.de*
Guang Wu	University of Hamburg	*guangwu29@googlemail.com*