



A crucial ingredient for realizing various phases of matter is the availability of interactions with different range and strength. Atoms excited to Rydberg states exhibit long-range, switchable, interactions that are many orders of magnitude stronger than the typically short-range interactions between ground-state neutral atoms. In addition, relaxation and dissipation can be introduced in this system in a controlled way. Such systems are thus uniquely suited to simulate and study coherent and dissipative quantum dynamics of strongly-interacting many-body systems. The aim of this Workshop is to bring together renown experts, senior and junior researchers, for a productive and inspiring discussion on the recent progress and future directions of research on open many-body quantum systems using Rydberg atoms and photons.

Topics of the workshop:

- Nonlinear quantum optics with Rydberg EIT and related effects
- Interfacing and hybridizing Rydberg atoms with other systems
- Resonant and non-resonant excitation of strongly interacting Rydberg lattice gases
- Dissipative preparation of correlated photonic and atomic states
- Molecules of Rydberg atoms

URL: <http://www.iesl.forth.gr/conferences/Rydberg>



Funding:



Alexander von Humboldt
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Sunday, 30 Sep.	Monday, 1 Oct.
15:00- : Arrival	9:00 Opening 9:10-9:50 Matthias Weidemüller 9:50-10:30 Thomas Pohl 10:30-10:50 Vasiliy Entin Coffee Break 11:20-12:00 Christian Gross 12:00-12:40 Hannes Pichler
	<i>Lunch</i>
	15:00-15:40 Tilman Pfau 15:40-16:10 Jonathan Pritchard 16:10-16:40 Gershon Kurizki 16:40-17:00 Adam Stokes Coffee Break 17:30-18-10 Igor Lesanovsky 18:10-18:30 Matteo Archimi 18:30-19:00 Shannon Whitlock
19:30-: Dinner at the hotel	19:30 Poster Session with snacks and drinks

Tuesday, 2 Oct.	Wednesday, 3 Oct.
9:00 Bus to FORTH	9:00-9:30 Tom Gallagher 9:30-10:10 Klaus Mølmer 10:10-10:50 Charles Adams Coffee Break 11:20-11:40 Kevin Kleinbeck 11:40-12:00 Lucy Downes 12:00-12:20 Dushmanta Kara
9:30-10:10 Guido Pupillo 10:10-10:50 Herwig Ott Coffee Break 11:10-11:40 Johannes Hecker Denschlag 11:40-12:00 Arezoo Mokhberi 12:00-12:20 Gerard Higgins	
<i>Lunch</i>	<i>Lunch</i>
13:00 Bus from FORTH <i>Excursion:</i> Guided Tour to Knossos Palace and Heraklion Archeological Museum	Departure
19:30 Dinner at Kouζεινερί Restaurant	

Program

Sunday, 30 September

15:00– *Arrival at the Hotel*

19:30–21:00 *Dinner*

Monday, 1 October

Morning Session

- 9:00 *Opening*
Michael Fleischhauer, University of Kaiserslautern
David Petrosyan, FORTH
- 9:10-9:50 *Universal Non-Equilibrium Dynamics in a Disordered Rydberg Spin System*
Matthias Weidemüller, Heidelberg University
- 9:50-10:30 *Rydberg physics with excitons*
Thomas Pohl, Aarhus University
- 10:30-10:50 *Coherence of the three-body Förster resonances in the interacting Rb Rydberg atoms*
Vasiliy Entin, Rzhhanov Institute of Semiconductor Physics SB RAS

Coffee Break

- 11:20-12:00 *Microscopy of ultracold Rydberg macrodimers*
Christian Gross, Max-Planck Institute for Quantum Optics
- 12:00-12:40 *From many-body physics to quantum optimization with Rydberg atoms*
Hannes Pichler, Harvard University

Lunch

Monday, 1 October

Afternoon Session

- 15:00-15:40 *Novel quantum devices based on atomic vapor cells*
Tilman Pfau, Stuttgart University
- 15:40-16:10 *A hybrid atom-superconductor quantum interface*
Jonathan Pritchard, University of Strathclyde
- 16:10-16:40 *Long-range optical interactions*
Gershon Kurizki, Weizmann Institute of Science
- 16:40-17:00 *A master equation for strongly interacting dipoles*
Adam Stokes, University of Manchester

Coffee Break

- 17:30-18:10 *Quantum Spin Systems far from equilibrium:
Theory and applications*
Igor Lesanovsky, University of Nottingham
- 18:10-18:30 *Driven dissipative dynamics in an open many body quantum system*
Matteo Archimi, University of Pisa
- 18:30-19:00 *Self-organisation and universal non-equilibrium dynamics
in driven Rydberg gases*
Shannon Whitlock, University of Strasbourg

Monday, 1 October

Evening Poster Session with snacks and drinks

Rydberg spectroscopy in an atom-ion hybrid trap
Markus Deiss, Ulm University

Adiabatic flux insertion and growing of Laughlin states of cavity Rydberg polaritons
Michael Fleischhauer, University of Kaiserslautern

Coupling Rydberg atoms and superconducting resonators
Jens Grimm, University of Tübingen

Excitation blockade in strongly Stark-shifted Rydberg systems
Andreas Günther, University of Tübingen

Dynamics of exciton-polaritons in a double-well potential
Panayotis Kalozoumis, University of Patras

Variational cooling
Viacheslav Kuzmin, IQOQI Innsbruck

Experimental realization of an optical Feshbach resonance using ultra-long range Rydberg molecules
Carsten Lippe, University of Kaiserslautern

Rydberg Dressed Quantum Many-Body Systems
Nikolaus Lorenz, Max Planck Institute of Quantum Optics

Numerical study of Bose-Hubbard Models with finite-range interactions
Guido Masella, University of Strasbourg

Photon-assisted quantum state transfer and entanglement generation in spin chains
Georgios Nikolopoulos, Foundation for Research and Technology - Hellas

Quantum simulators for open quantum systems using quantum Zeno dynamics
Sabrina Patsch, University of Kassel

Simulating spin-lattice models with cold Rydberg atoms
David Petrosyan, Foundation for Research and Technology - Hellas

Mirrorless optical parametric oscillator inside an all-optical waveguide
Sushree Subhadarshinee Sahoo, NISER BHUBANESWAR

Faithful state transfer between two-level systems via an actively cooled finite-temperature cavity

Lorinc Sarkany, University of Tübingen

Excitation of Strongly Interacting Moving Rydberg Atoms by Photon Recoil Momentum

Razmik Unanyan, University of Kaiserslautern

Long-range interactions and symmetry-breaking in quantum gases through optical feedback

Yongchang Zhang, Aarhus University

Tuesday, 2 October

9:00 Bus transfer from Hotel to FORTH

Mornign Session

9:30-10:10 *Algebraic localization of long-range quantum models*
Guido Pupillo, University of Strasbourg

10:10-10:50 *Rydberg Physics Meets Ultracold Quantum Gases*
Herwig Ott, University of Kaiserslautern

Coffee Break

11:10-11:40 *Probing cold long-range collisions within an ion trap*
Johannes Hecker Denschlag, University of Ulm

11:40-12:00 *Rydberg excitation of cold, trapped ions*
Arezoo Mokhberi, Johannes Gutenberg University Mainz

12:00-12:20 *Interacting Rydberg Ions*
Gerard Higgins, Stockholm University

Lunch

13:00-18:00 Excursion to Knossos Palace and
Heraklion Archeological Museum

Free time in Heraklion

19:30-22:00 Dinner at [Κουζινερί Restaurant](#) (Marineli 11, GR-71201 Heraklion)

22:00 Bus Transfer from Heraklion to the Hotel

Wednesday, 3 October

Morning Session

- 9:00-9:30 *Microwave Spectroscopy of double Rydberg molecules*
Thomas F. Gallagher, University of Virginia
- 9:30-10:10 *A Rydberg amplifier for cavity QED*
Klaus Mølmer, Aarhus Universtiy
- 10:10-10:50 *Engineering collective light-matter interactions*
Charles Adams, Durham University

Coffee Break

- 11:20-11:40 *Observation of three-body correlations for photons coupled to a Rydberg superatom*
Kevin Kleinbeck, Stuttgart University
- 11:40-12:00 *Thermal Rydberg Vapours for Terahertz Sensing and Imaging*
Lucy Downes, Durham University
- 12:00-12:20 *Study of Rydberg blockade in thermal vapor*
Dushmanta Kara, NISER Bhubaneswar

Lunch

END

Participants

Charles Adams (c.s.adams@durham.ac.uk) Durham University, UK
Matteo Archimi (matteo.archimi@df.unipi.it) University of Pisa, Italy
Markus Deiss (markus.deiss@uni-ulm.de) University of Ulm, Germany
Johannes Hecker Denschlag (johannes.denschlag@uni-ulm.de) University of Ulm, Germany
Lucy Downes (lucy.downes@durham.ac.uk) Durham University, UK
Vasiliy Entin (ventin@isp.nsc.ru) Rzhanov Institute of Semiconductor Physics SB RAS, Russia
Michael Fleischhauer (mfleisch@physik.uni-kl.de) University of Kaiserslautern, Germany
József Fortágh (fortagh@uni-tuebingen.de) University of Tübingen, Germany
Thomas Gallagher (tfg@virginia.edu) University of Virginia, USA
Jens Grimmel (jens.grimmel@uni-tuebingen.de) University of Tübingen, Germany
Christian Gross (christian.gross@mpq.mpg.de) Max-Planck Institute for Quantum Optics, Germany
Andreas Günther (a.guenther@uni-tuebingen.de) University of Tübingen, Germany
Gerard Higgins (gerard.higgins@fysik.su.se) Stockholm University, Sweden
Nikolaj Joergensen (nikolajsj@phys.au.dk) Aarhus University, Denmark
Panayotis Kalozoumis (panayotis.kalozoumis@gmail.com) University of Patra, Greece
Dushmanta Kara (dushmantakara1@niser.ac.in), NISER Bhubaneswar, India
Kevin Kleinbeck (kleinbeck@itp3.uni-stuttgart.de) Stuttgart University, Germany
Gershon Kurizki (gershon.kurizki@weizmann.ac.il) Weizmann Institute of Science, Israel
Viacheslav Kuzmin (viacheslav.kuzmin@uibk.ac.at) University of Innsbruck, Austria
Igor Lesanovsky (igor.lesanovsky@gmail.com) University of Nottingham, UK
Carsten Lippe (lippe@physik.uni-kl.de) University of Kaiserslautern, Germany
Nikolaus Lorenz (nikolaus.lorenz@mpq.mpg.de) Max-Planck Institute for Quantum Optics, Germany
Guido Masella (masella@unistra.fr) University of Strasbourg, France
Arezo Mokhberi (arezo.mokhberi@uni-mainz.de) Johannes Gutenberg University Mainz, Germany
Klaus Mølmer (moelmer@phys.au.dk) Aarhus University, Denmark
George Nikolopoulos (nikolg@iesl.forth.gr) Foundation for Research and Technology – Hellas
Herwig Ott (ott@physik.uni-kl.de) University of Kaiserslautern, Germany
Sabrina Patsch (sabrinapatsch@web.de) University of Kassel, Germany
David Petrosyan (dap@iesl.forth.gr) Foundation for Research and Technology – Hellas
Tilman Pfau (t.pfau@physik.uni-stuttgart.de) Stuttgart University, Germany
Hannes Pichler (hannes.pichler@cfa.harvard.edu) Harvard University, USA
Thomas Pohl (pohl@phys.au.dk) Aarhus University, Denmark
Jonathan Pritchard (jonathan.pritchard@strath.ac.uk) University of Strathclyde, UK
Guido Pupillo (guido.pupillo@gmail.com) University of Strasbourg, France
Sushree Subhadarshinee Sahoo (sushree.ss@niser.ac.in) NISER Bhubaneswar, India
Lorinc Sarkany (loerinc.sarkany@uni-tuebingen.de) University of Tübingen, Germany
Konstantinos Sfairopoulos (kosfairo@physics.auth.gr) Heidelberg University, Germany
Adam Stokes (adamstokes8@gmail.com) University of Manchester, UK
Razmik Unanyan (unanyan@physik.uni-kl.de) University of Kaiserslautern, Germany
Matthias Weidemüller (weidemueller@uni-heidelberg.de) Heidelberg University, Germany
Shannon Whitlock (whitlock@ipcms.unistra.fr) University of Strasbourg, France
Martin Will (willm@rhrk.uni-kl.de) University of Kaiserslautern, Germany
Yongchang Zhang (yczhang@phys.au.dk) Aarhus University, Denmark