

Manfred MARK – Curriculum Vitae

Date of Birth	13.09.1977		
Address	University of Innsbruck, Institute of Experimental Physics, Technikerstr. 25, 6020 Innsbruck, Austria Phone: +43 512 507 52430 Email: Manfred.Mark@uibk.ac.at Researcher ID: E-4286-2010		
	Web: www.erbium.at ORCID: 0000-0001-8157-4716		
Professional Experience			
Since 2019	Senior scientist at the Austrian Academy of Sciences – Dipolar Quantum gas group (PI: Prof. Francesca Ferlaino)		
Since 2014	Permanent Research and Teaching Associate (Senior scientist) at the University of Innsbruck – Dipolar Quantum gas group (PI: Prof. Francesca Ferlaino),		
2012-2014	Postdoctoral Fellow – Tunable Quantum gases group (PI: Hanns-Christoph Nägerl), University of Innsbruck		
Educations			
06/2024	Habilitation in Experimental physics at the University of Innsbruck, Austria. Habilitation thesis topic: "Dipolar Quantum Matter"		
01/2008-03/2012	PhD in physics at the University of Innsbruck, Austria. PhD thesis topic: "Experiments with tunable quantum gases in optical lattices". Supervisor: Hanns-Christoph Nägerl		
10/2002-12/2007	Diploma in physics at the University of Innsbruck, Austria. Diploma thesis topic: "Wechselwirkungseffekte eines Cäsium-BECs in eindimensionalen Gittern". Supervisor: Hanns-Christoph Nägerl, Mark: passed with distinction		
Honours, Distinctions and Awards			
2012	"Anerkennungspreis der Jury des Award of Excellence des Bundesministers für Wissenschaft und Forschung"		
2006	"Undergraduate Research Experience & Knowledge Award from the Science Foundation Ireland"		
Scientific Interests			
Research topics	Bose Einstein Condensation • Ultracold Quantum gases • Feshbach resonances • Ultracold molecules • Optical lattice potentials • Strongly correlated systems • Quantum simulation of solid state systems • Dipolar quantum gases • Bose-Hubbard model • Fermi-Hubbard model • Long-Range interactions • Adiabatic state preparation • Quantum quenches across phase transitions • Bloch oscillations • Metastable excited states • Attractive interactions • Narrow-line laser cooling • Stimulated Rapid Adiabatic Passage • Rovibronic groundstate Molecules • One-Dimensional Physics • Confinement-induced Resonances • Extended Hubbard models • Supersolidity • Vortices in dipolar gases • Quantum gas microscopy • Lanthanide Rydberg physics • Tweezer arrays for ultracold atoms • Beyond Mean-field effects		
Main achievements	• First realization of quantum vortices in a supersolid (2024) • First observation of vortices in a dipolar quantum gas (2022) • First experimental realization of a two-dimensional supersolid state (2021) • First observation of long-lived dipolar supersolid states (2019) • Realization of the first degenerate dipolar quantum gas mixtures (2018) • First observation of Roton quasiparticles in dipolar gases (2018) • First observation of a quantum-stabilized dipolar macro droplet (2016) • First experimental preparation of extended Bose-Hubbard models (2016)		

	• First preparation of rovibronic groundstate molecules in an optical lattice (2010) • First experimental realization of the super-Tonks-Girardeau quantum phase in 1D (2009)
Publications overview	My publication track record has in total 61 publications with more than 4900 Citations, including publications in the following journals: 3 Nature, 4 Science, 4 Nature Physics, 4 Phys. Rev. X, 18 Phys. Rev. Lett.. My current h-Index is 32 (Web of Science).

Invited and Plenary Talks at glance

Invited Speaker/Contributed speaker: More than 20 contributions, including MOLEC (2022), Quantum Fluids and Solids (2019), FINES Conference (2022, 2018, 2013) • WE-Heraeus-Seminars, Bad Honnef (2022, 2017, 2016, 2012) • CUI workshop (2016) • APS and SPS Joint meeting (2013) • International Laser Physics Workshop (2010)

Invited lectures: Introductory Course on Ultracold Quantum Gases, Innsbruck (2022, 2019, 2017, 2015) • CUI Graduate days, Hamburg (2014) • Summer school "Low-Dimensional Quantum Many-Body Systems", Trier (2012)

10 most important publications

1. *Observation of vortices in a dipolar supersolid*, E. Casotti, E. Poli, L. Klaus, A. Litvinov, C. Ulm, C. Politi, **M. J. Mark**, T. Bland, F. Ferlaino, Nature, **635**, 327–331, (2024), <http://dx.doi.org/10.1038/s41586-024-08149-7>
2. *Observation of vortices and vortex stripes in a dipolar condensate*, L. Klaus, T. Bland, E. Poli, C. Politi, G. Lamporesi, E. Casotti, R. N. Bisset, **M. J. Mark**, F. Ferlaino, Nature Physics, **18**, 1453–1458, (2022), <https://doi.org/10.1038/s41567-022-01793-8>
3. *Two-dimensional supersolidity in a dipolar quantum gas*, M. A. Norcia, C. Politi, L. Klaus, E. Poli, M. Sohmen, **M. J. Mark**, R. Bisset, L. Santos, F. Ferlaino, Nature, **596**, 357–361 (2021), <http://dx.doi.org/10.1038/s41586-021-03725-7>
4. *Controlling dipolar exchange interactions in a dense three-dimensional array of large-spin fermions*, A. Patscheider, B. Zhu, L. Chomaz, D. Petter, S. Baier, A.-M. Rey, F. Ferlaino, **M. J. Mark**, Phys. Rev. Research, **2**, 023050, (2020), <http://dx.doi.org/10.1103/PhysRevResearch.2.023050>
5. *Long-lived and transient supersolid behaviors in dipolar quantum gases*, L. Chomaz, D. Petter, P. Ilzhöfer, G. Natale, A. Trautmann, C. Politi, G. Durastante, R. M. W. van Bijnen, A. Patscheider, M. Sohmen, **M. J. Mark**, F. Ferlaino, Phys. Rev. X, **9**, 021012 (2019), <https://doi.org/10.1103/PhysRevX.9.021012>
6. *Observation of roton mode population in a dipolar quantum gas*, L. Chomaz, R. M. W. van Bijnen, D. Petter, G. Faraoni, S. Baier, J. H. Becher, **M. J. Mark**, F. Waechtler, L. Santos, F. Ferlaino, Nature Phys. **14**, 442 (2018), <http://dx.doi.org/10.1038/s41567-018-0054-7>
7. *Quantum-fluctuation-driven crossover from a dilute Bose-Einstein condensate to a macro-droplet in a dipolar quantum fluid*, L. Chomaz, S. Baier, D. Petter, **M. J. Mark**, F. Wächtler, L. Santos, F. Ferlaino, Phys. Rev. X **6**, 041039 (2016), <https://doi.org/10.1103/PhysRevX.6.041039>
8. *Extended Bose-Hubbard Models with Ultracold Magnetic Atoms*, S. Baier, **M. J. Mark**, D. Petter, K. Aikawa, L. Chomaz, Z. Cai, M. Baranov, P. Zoller, F. Ferlaino, Science **352**, 201 (2016), <https://doi.org/10.1126/science.aac9812>
9. *Observation of many-body dynamics in long-range tunneling after a quantum quench*, F. Meinert, **M. J. Mark**, E. Kirilov, K. Lauber, P. Weinmann, M. Gröbner, A. J. Daley, and H.-C. Nägerl, Science **344**, 1259–1262 (2014), <https://doi.org/10.1126/science.1248402>
10. *Precision Measurements on a Tunable Mott Insulator of Ultracold Atoms*, **M. J. Mark**, E. Haller, K. Lauber, J. G. Danzl, A. J. Daley, H.-C. Nägerl, Phys. Rev. Lett. **107**, 175301 (2011), <https://doi.org/10.1103/PhysRevLett.107.175301>

Teaching and Mentoring Activities

Teaching	Since 2009: various basic and advanced courses in bachelor and master studies including lecture and proseminars in <i>Mechanics and thermodynamics, basic and advanced lab courses, lab course for electronics, and Atomic and molecular physics and solid-state physics.</i>
Support of Young Researchers	Since my PhD studies, i have Co-supervised several master- and PhD students in the Dipolar Quantum gases group (Ferlaino) and the Strongly correlated Quantum matter group (Nägerl). Additionally, i have supervised several bachelor theses.
Organization of Internships	Several successful applications to the FFG program “Talente” for paid internships of High School students

Membership, Commission of Trust, and referee activities (5 most relevant activities)

Referee activities	Referee for national and international grants Referee for American Physical Society (APS), OSA publishing group, Elsevier/Sciencedirect, Springer/Nature
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Other Activities (most relevant)

Conference organization	Co-Organizer of several international conference and workshops, including the workshop “Long Range interaction” (Naples 2016); International Conference on Quantum Optics (Obergurgl 2013), Frontiers of Matter Wave Optics (Obergurgl 2011)
Committees	Member of search committees for a new Professor Position in Experimental Physics (Berufungskommission 2017), Member of the advice committee for the new physics building in Innsbruck (Haus der Physik)

Funded Projects

<i>Project Title</i>	<i>Funding Organization</i>	<i>Project role</i>	<i>Project Duration</i>	<i>Amount of funding</i>
AQuSim – Austrian Quantum Simulators	FFG	Co-Investigator	2023-2025	€ 430.000
MAQS – Magnetic Atom Quantum Simulator	Quanteria/FWF	Co-Investigator	2020-2024	€ 300.000
DIPVOR – Preparation and Investigation of Vortices in a dipolar quantum gas	ESQ Discovery Programme	Principal Investigator	2019-2020	€ 100.000
Quantum gas Microscope for RARE-earth atoms (MIRARE)	NFRI-Program ÖAW	Co-Investigator	2017-2019	€ 300.000