Program SFB Meeting, Innsbruck, July 2013

Thursday July 11, 2013

Conference venue: Viktor-Franz-Hess Haus, HS C
Please hang **posters** (A0, portrait) before the start of the conference in the foyer.

Time	Duration	Speaker	Title	
14:00	45+5	**Markus Arndt**	***Coherent interaction of photons with molecules and molecular clusters***	**Uni Wien**
14:50	35	Poster flash session		
15:25	50	Coffee break + Poster discussions + Lab tours		
16:15	45+5	**Gavin Brennen**	***Measuring topological entanglement entropy in a lattice of bosons***	**Macquarie University, Sydney**
17:05	20+5	Florian Meinert	*Quantum quenches in one-dimensional chains of bosons*	IBK, Nägerl group
17:30		Boarding the shuttle bus to the conference dinner at Arzler Alm		
17:45		Departure shuttle bus		

Lab tours: Meeting point for lab tours is during the coffee break in the foyer.
Conference dinner: There will be a ~30 minute walk uphill to Arzler Alm. Bring a light jacket and flashlight for the way back.

Friday July 12, 2013

Time	Duration	Speaker	Title	
8:30	*60*	*SFB-FoQuS Business Meeting (Project PIs, Co-PIs, and associated members only)*		
9:30	20+5	Michael Trupke	*Arrays of microcavities for large-scale quantum systems*	ATI, Schmiedmayer group
9:55	20+5	Michael Zwerger	*Universal and optimal error thresholds for measurement-based entanglement purification*	IBK, Briegel group
10:20	20+5	Bernardo Casabone	*Heralded entanglement of two ions in an optical cavity*	IBK, Northup group
10:45	30	Coffee break + Poster discussion		
11:15	20+5	Peter Asenbaum	*Cavity cooling of free silicon nanoparticles in high-vacuum*	UNIVIE, Arndt group
11:40	20+5	Tomas Ramos	*Nonlinear Quantum Optomechanics via Individual Intrinsic Two-Level Defects*	IBK, Zoller group
12:05	20+5	Tim Langen	*Local emergence of thermal correlations in an isolated quantum many-body system*	ATI, Schmiedmayer group
12:30		End of meeting		

Trains to Vienna (from Innsbruck main station):

OIC 867 13:03–18:00 **RJ 165 14:09–18:24** OIC 869 15:08–20:08

Coherent interaction of photons with molecules and molecular clusters

Markus Arndt, University of Vienna, Austria

I will review the state of the art in de Broglie interferometry with macromolecules and clusters. Advanced diffraction experiments can reveal the wave-particle duality of fluorescent dyes on the level of single molecules and open a new avenue to matter wave diffraction also on biologically grown nanostructures. Understanding the molecule-wall interaction in such experiments is currently a big challenge and points to a number of new effects which have not been considered (nor needed) in earlier studies with atoms. Optical diffraction gratings circumvent the van der Waals interaction and open the path to quantum interference experiments with massive macromolecules and molecular clusters. We will discuss the current state of the art in Kapitza-Dirac-Talbot-Lau interferometry as well as Quantum interferometry with pulsed ionization gratings in the time domain (OTIMA interferometer).

[1] Juffmann et al. "Real-Time Single-Molecule Imaging of Quantum Interference" Nature Nanotechn. **7**, (2012): 297–300.
[2] Gerlich et al. "Quantum Interference of Large Organic Molecules." Nature Communs **2**, (2011): 263.
[3] Haslinger et al. "A Universal Matter-Wave Interferometer with Optical Ionization Gratings in the Time Domain." Nature Physics **9**, (2013): 144–148.

Measuring topological entanglement entropy in a lattice of bosons

Gavin Brennen, Macquarie University, Australia

A universal signature of topological order is topological entanglement entropy (TEE), which is a correction to area law behaviour of subsystem entropy. Because it depends on the state spectrum, TEE is expected to be extremely difficult to observe, and one typically resorts to other means to reveal topological order such as measuring anyons or non-local string operators. I'll describe a continuous-variable analog to the surface code using quantum harmonic oscillators on a two-dimensional lattice, where the TEE can be extracted simply by quadrature measurements. Though such a model is gapless, the ground state is prepared by measurements on a finitely squeezed and gapped two-dimensional cluster state, which does not have topological order.