The Abdus Salam International Centre for Theoretical Physics

# Summer School on Novel Quantum Phases and Non-equilibrium Phenomena in Cold Atomic Gases

Organizer(s): M. Cazalilla, J.M.F. Gunn, A.F.C.K. Ho, W. Zwerger
Trieste - Italy, 27 August 2007 - 7 September 2007

**Venue: Main Building Main Lecture Hall**

## Final programme

**DAY 1 - MONDAY (WEEK I)** (Room:Main Building Main Lecture Hall)

**27 August 2007**

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|---|---|
| **08:30 - 10:15** | --- REGISTRATION AT MAIN BUILDING LOBBY - ADMINISTRATIVE FORMALITIES --- |
| **10:15 - 10:30** | **Opening remarks** |
| **10:30 - 11:30** | **I. Bloch** / *University of Mainz*<br>**Introduction to experiments in optical lattices (I)** |
| **11:30 - 12:30** | **T. Giamarchi** / *University of Geneva*<br>**Introduction to the physics of low dimensional systems (I)** |
| **12:30 - 14:30** | --- Lunch break --- |
| **14:30 - 15:30** | **S. Stringari** / *University of Trento*<br>**Collective excitations in Bose and Fermi gases** |
| **15:30 - 16:30** | **T. Giamarchi** / *University of Geneva*<br>**Introduction to the physics of low dimensional systems (II)** |
| **19:30 - 21:30** | (Room: Adriatico Guest House (Terrace))<br>--- Get-together reception --- |

**DAY 2 - TUESDAY (WEEK I)** (Room:Main Building Main Lecture Hall)

**28 August 2007**

**09:00 - 10:00** **A. Aspect** / *University of Paris XI - Sud*
**Atom-atom correlation measurements: a fundamental tool for quantum atom optics**

**10:00 - 11:00** **I. Bloch** / *University of Mainz*
**Introduction to experiments in optical lattices (II)**

**11:00 - 11:30** --- Coffee break ---

**11:30 - 12:30** **A. Aspect** / *University of Paris XI - Sud*
**Laser speckle: a wonderful tool for quantum gases in disordered potential (I)**

**12:30 - 14:30** --- Lunch break ---

**14:30 - 15:30** **E. Altman** / *Weizmann Institute of Science, Rehovot*
**Quantum noise and other probes of strong correlations in ultracold atom systems**

**15:30 - 16:15** **E. Orignac** / *ENS Lyon*
**Luttinger liquid state in the 1D dipolar gas**

**16:25 - 17:10** **A. Aspect** / *University of Paris XI - Sud*
**Laser speckle: a wonderful tool for quantum gases in disordered potential (II)**

**DAY 3 - WEDNESDAY (WEEK I)** (Room:Main Building Main Lecture Hall)

**29 August 2007**

**09:00 - 10:00** **I. Bloch** / *University of Mainz*
**Introduction to experiments in optical lattices (III)**

**10:00 - 11:00** **E. Demler** / *Harvard University*
**Strongly correlated systems: from electronic materials to cold atoms to photons (I)**

**11:00 - 11:30** --- Coffee break ---

**11:30 - 12:30** **H. Moritz** / *ETH ZÃ¼rich*
**Fermions in optical lattices**

**12:30 - 14:30** --- Lunch break ---

**14:30 - 15:30** **W. Hofstetter** / *J.W.Goethe University of Frankfurt*
**Disorder versus interaction in multicomponent cold atoms**

**15:30 - 16:30** **E. Demler** / *Harvard University*
**Strongly correlated systems: from electronic materials to cold atoms to photons (II)**

**17:00 - 19:30** (Room: Main Building Poster Gallery, Lobby)
**Poster session (I)**

**DAY 4 - THURSDAY (WEEK I)** (Room:Main Building Main Lecture Hall)

**30 August 2007**

**09:00 - 10:00** **E. Demler** / *Harvard University*
**Strongly correlated systems: from electronic materials to cold atoms to photons (III)**

**10:00 - 11:00** **Q. Niu** / *University of Texas at Austin*
**Transport in cold atomic systems: theory and experiments**

**11:00 - 11:30** --- Coffee break ---

**11:30 - 12:30** **M. Rigol** / *University of California at Santa Cruz*
**Thermalization and its mechanism for generic isolated quantum systems**

**12:30 - 14:30** --- Lunch break ---

**14:30 - 15:30** **U. Schollwoeck** / *RWTH Aachen*
**Non-equilibrium phenomena in cold atomic gases**

**15:30 - 16:15** **A. Iucci** / *University of Geneva*
**Anaytical models of out of equilibrium phenomena in ultracold atoms**

## **DAY 5 - FRIDAY (WEEK I)** (Room:Main Building Main Lecture Hall)

**31 August 2007**

**09:00 - 10:00** **M. Lewenstein** / *ICFO Barcelona*
**Introduction to disordered ultracold quantum gases**

**10:00 - 11:00** **Q. Niu** / *University of Texas at Austin*
**Nonlinear Quantum Dynamics of BEC**

**11:00 - 11:30** --- Coffee break ---

**11:30 - 12:30** **B. DeMarco** / *University of Illinois at Urbana-Champaign*
**Experiments on transport and disorder in the Bose-Hubbard model**

**12:30 - 14:30** --- Lunch break and FREE AFTERNOON ---

## **DAY 6 - MONDAY (WEEK II)** (Room:Main Building Main Lecture Hall)

**3 September 2007**

**09:00 - 10:00** **M. Inguscio** / *LENS University of Florence*
**Quantum degenerate mixtures and disorder in optical lattices**

**10:00 - 11:00** **J. Dalibard** / *ENS Paris*
**From laser cooling to quantum gases: Laser manipulation of atoms**
Lecture notes refer to the three lectures given during the Summer School

**11:00 - 11:30** --- Coffee break ---

**11:30 - 12:30** **G. Shlyapnikov** / *LPTMS University Paris Sud*
**From few-body to many-body physics in cold Fermi gases (I)**

**12:30 - 14:00** --- Lunch break ---

**14:00 - 15:00** **J. Dalibard** / *ENS Paris*
**From laser cooling to quantum gases: Rotating condensates**

**15:00 - 16:00** **U. Schollwoeck** / *RWTH Aachen*
**Tutorial on DMRG**

**16:00 - 16:30** --- Coffee break ---

**16:30 - 17:30** **V.E. Kravtsov** / *the Abdus Salam International Centre for Theoretical Physics*
**Superconducting instability near Anderson localization transition**

## **DAY 7 - TUESDAY (WEEK II)** (Room:Main Building Main Lecture Hall)

**4 September 2007**

**09:00 - 10:00** **J. Dalibard** / *ENS Paris*
**From laser cooling to quantum gases: Cold atoms in Flatland**

**10:00 - 11:00** **G. Shlyapnikov** / *LPTMS University Paris Sud*
**From few-body to many-body physics in cold Fermi gases (II)**

**11:00 - 11:30** --- Coffee break ---

**11:30 - 12:30** **F. Schreck** / *IQOQI Innsbruck*
**Experiments with an ultracold 6Li-40K mixture**

**12:30 - 14:30** --- Lunch break ---

**14:30 - 15:30** **L. Amico** / *University of Catania*
**Pairwise entanglement in 1D spin chains**

**15:30 - 16:30** **Discussion session**

**17:00 - 19:30** (Room: Main Building Gallery, Lobby)
**Poster session (II)**

## **DAY 8 - WEDNESDAY (WEEK II)** (Room:Main Building Main Lecture Hall)

**5 September 2007**

**09:00 - 10:00** **M. Chapman** / *Georgia Institute of Technology, Atlanta*
**Experiments with spinor condensates**

**10:00 - 11:00** **M. Ueda** / *Tokyo Institute of Technology*
**Fundamentals of spinor Bose-Einstein Condensates**

**11:00 - 11:30** --- Coffee break ---

**11:30 - 12:30** **L. Santos** / *University of Hannover*
**Theory of dipolar gases**

**12:30 - 14:00** --- Lunch break ---

**14:00 - 15:00** **T. Lahaye** / *University of Stuttgart*
**Experiments with dipolar gases**

**15:00 - 15:45** **Y. Kawaguchi** / *Tokyo Institute of Technology*
**Dipolar BECs with spin degrees of freedom**

**15:45 - 16:15** --- Coffee break ---

**16:15 - 17:00** **H.P. Buechler** / *University of Innsbruck*
**Engineering interactions with polar molecules**

**19:30 - 21:30** (Room: Adriatico Guest House (Terrace))
--- Buffet dinner ---

## **DAY 9 - THURSDAY (WEEK II)** (Room:Main Building Main Lecture Hall)

**6 September 2007**

**09:00 - 10:00** **W. Zwerger** / *Technical University of Munich*
**Introduction to the theory of the BEC/BCS crossover (I)**

**10:00 - 11:00** **R. Hulet** / *Rice University, Houston*
**Experiments with Fermi gases in the BEC/BCS crossover (I)**

**11:00 - 11:30** --- Coffee break ---

**11:30 - 12:30** **R. Hulet** / *Rice University, Houston*
**Experiments with Fermi gases in the BEC/BCS crossover (II)**

**12:30 - 14:30** --- Lunch break ---

**14:30 - 15:30** **W. Zwerger** / *Technical University of Munich*
**Introduction to the theory of the BEC/BCS crossover (II)**

**15:30 - 16:30** **V. Gurarie** / *University of Colorado at Boulder*
**Theory of BEC/BCS crossover with p-wave Feshbach resonances**

## **DAY 10 - FRIDAY (WEEK II)** (Room:Main Building Main Lecture Hall)

**7 September 2007**

**09:00 - 10:00** **N. Cooper** / *University of Cambridge*
**Rapidly rotating atomic gases**

**10:00 - 11:00** **R. Barankov** / *Boston University*
**Dissipationless Higgs Boson in Fermionic condensates**

**11:00 - 11:30** --- Coffee break ---

**11:30 - 12:15** **C. Lobo** / *University of Trento*
**The normal state of the polarized Fermi gas at unitarity**

**12:15 - 12:45** **Closing remarks**