



The Abdus Salam  
**International Centre  
for Theoretical Physics**



## Frontiers of Nanomechanics

Cosponsor(s): Center for NanoScience (CeNS, Munich, Germany), Nanosystem Initiative Munich (NIM, Munich, Germany) and Initial Training Network - Cavity Quantum Optomechanics (ITN cQOM, Lausanne, Switzerland)  
Organizer(s): M. Blencowe (USA), J. von Delft (Germany), I. Favero (France), K. Lehnert (USA), F. Marquardt (Germany), E. Weig (Germany). ICTP Local Organizer: M. Kiselev  
Trieste - Italy, 09 - 13 September 2013

**Venue: Adriatico Guest House Kastler Lecture Hall**

### Programme

**Monday, 9 September** (Room:Adriatico Guest House Kastler Lecture Hall)

**9 September 2013**

- |                      |   |
|----------------------|---|
| <b>08:00 - 09:00</b> | (Room: Adriatico Guest House (Lower Level 1))<br><b>Registration</b>                              |
| <b>09:00 - 10:30</b> | <b>Florian Marquardt / Erlangen</b><br><b>Opening Remarks and Introduction to Nanomechanics</b>   |
| <b>10:30 - 11:00</b> | (Room: Adriatico Guest House - Kastler Lecture Hall Area (Lower Level 1))<br>--- Coffee break --- |
| <b>11:00 - 11:45</b> | <b>Andrew Cleland / Santa Barbara</b><br><b>A transducer to couple microwaves to light</b>        |
| <b>11:45 - 12:30</b> | <b>Thomas Purdy / JILA, Regal group</b><br><b>Quantum Measurement in an Optomechanical System</b> |
| <b>12:30 - 14:30</b> | --- Lunch break ---   |
| <b>12:30 - 13:00</b> | <b>Lunch with the Masters</b>   |

14:30 - 15:15

**David Vitali / Camerino**

**Nonclassical states and reservoir engineering in cavity optomechanics**

15:15 - 16:00

**Introduction to posters 1**

(2 min per poster; 26 posters)

Probing macroscopic realism via Ramsey correlation measurements (ASADIAN Ali) 02'

Fabrication of C-Pt core-shell composite nanowire resonator with focused ion and electron beam induced chemical vapour deposition (BANERJEE Amit) 02'

Nonlinear cavity optomechanics (BOERKJE Kjetil) 02'

Coupling graphene nanomechanics to a superconducting qubit (BOSMAN Sal Jua) 02'

Investigation of thermal motion responses in micromechanical resonator by mechanical sideband (CHO Sungwan) 02'

Generation of non-classical states and entanglement in quantum nanomechanical systems (CROY Alexander) 02'

Intrinsic mode-coupling and thermalization in nanomechanical graphene drums (CROY Alexander) 02'

Entangled photon pairs from an optomechanical array (DENG Zhijiao) 02'

High-Q Double-disk Optomechanical Oscillators (DE OLIVEIRA LUIZ Gustavo) 02'

Nonlinear phononics study at the single-phonon level in optomechanics (DJORWE PHILIPPE Philippe) 02'

Symmetry breaking in a mechanical resonator made from a carbon nanotube (EICHLER Alexander) 02'

Optomechanics in a Fiber-Cavity (FLOWERS-JACOBS Nathan) 02'

Semiconductor acoustic lasers (sasers) for terahertz acoustics (GLAVIN Boris) 02'

Ultrasensitive force detection with a nanotube mechanical resonator (GUETTINGER Johannes) 02'

Phonon Cooling and Lasing with Nitrogen-Vacancy Centers in Diamond (KEPESIDIS Kosmas) 02'

Strong Optomechanical Coupling in a GaAs/AlAs Microcavity (LANZILLOTTI KIMURA Norberto Daniel) 02'

Synchronization dynamics in arrays of optomechanical oscillators (LAUTER Roland) 02'

Quadratic Optomechanics in a Cryogenic Membrane-in-the-middle System (LEE Donghun) 02'

16:00 - 16:30

(Room: Adriatico Guest House - Kastler Lecture Hall Area (Lower Level 1))

--- Coffee break ---

16:30 - 17:15

**Introduction to posters 2**

(2 min per poster; 26 posters)

Optomechanics on Multiple Mass Scales (LIBSON Adam) 02'

Quantum simulation of the Anderson hamiltonian with a chain of coupled nanoresonators (LOZADA VERA Jhon Jairo) 02'

Investigation of the effects of H<sub>2</sub> physisorption on the Young's modulus of graphene polymer nanocomposites using MD/FE multiscale modeling approach (MONTAZERI HEDESH Abbas) 02'

Effect of thermal noise on "Casimir Nanomachine" (NASIRI ZARANDI Mojtaba) 02'

Nonclassical Mechanical States in a Optomechanical Micromaser Analogue (NATION Paul) 02'

GaAs disk quantum optomechanical resonators in a cryogenic environment (NGUYEN Dac Trung) 02'

Circuit Electromechanics with Non-Metallized Nano-Beams (PERNPEINTNER Matthias Elmar Maria) 02'

Coupling Mechanisms in Cavity Optomechanics with Gain Medium (PRINCEPE Debora) 02'

Single molecule detection of nanomechanical motion (PULLER Vadim) 02'

Graphene hybrid optomechanics (RESERBAT-PLANTEY Antoine) 02'

Mechanical and dielectric manipulation of nanomechanical resonators (SEITNER Maximilian Johann) 02'

Nanostructured Platinum for Advanced Sensing Applications (SERRY Mohamed) 02'

Novel type of resonant magnetopolaronic tunneling of interacting electrons due to vibrations of quantum dot (SKOROBAGATKO Glib Alexandrovich) 02'

Instability of Kondo-shuttling in NEMS (SONG Taegeun) 02'

Two Graphene Mechanical Resonators Coupled by a Nanotube Beam (TSIOUTSIOS Ioannis) 02'

The effects of defects on Gigahertz Carbon Nanotube Oscillators: A Molecular Dynamics Study (VAEZ ALLAEI Seyed Mehdi) 02'

Thermal rectification in carbon-based nanostructures: Molecular dynamics studies (VAEZ ALLAEI Seyed Mehdi) 02'

Quantum synchronization of a driven self-sustained oscillator (WALTER Stefan) 02'

Numerical simulations of optomechanical arrays (WEIß Talitha) 02'

**17:15 - 18:45**      **Poster session**

**19:00 - 20:00**      (Room: Adriatico Guest House Cafeteria)  
--- Welcome reception ---

**Tuesday, 10 September** (Room:Adriatico Guest House Kastler Lecture Hall)

**10 September 2013**

**09:00 - 09:45**      **Jack Harris / Yale**  
**Quadratic optomechanics at 500 mK**

**09:45 - 10:30**      **Michael Hartmann / TUM**  
**Nanomechanical Qubits**

**10:30 - 11:00**      (Room: Adriatico Guest House - Kastler Lecture Hall Area (Lower Level 1))  
--- Coffee break ---

**11:00 - 11:45**      **Peter Rabl / TU Wien**  
**Macroscopic tests of quantum mechanics via Ramsey correlations measurements**

**11:45 - 12:30**      **Sydney Schreppler / Berkeley, Stamper Kurn group**  
**Measuring force sensitivity at the standard quantum limit**

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

**12:30 - 13:00**      **Lunch with the Masters**

**14:30 - 15:15**      **Mikhail Lukin / Harvard**  
**Interfacing nanomechanics with atom-like systems**

**15:15 - 16:00**      **Wolfram Pernice / Karlsruhe**  
**Carbon integrated optomechanical and photonic circuits**

**16:00 - 16:15**      (Room: Adriatico Guest House - Kastler Lecture Hall Area (Lower Level 1))  
--- Coffee break ---

**16:30 - 18:00**      (Room: Leonardo da Vinci Building Main Lecture Hall)  
**Andrew Cleland / Santa Barbara**  
**ICTP Colloquium: Quantum control of electromagnetic and mechanical resonators**

**Wednesday, 11 September** (Room:Adriatico Guest House Kastler Lecture Hall)

**11 September 2013**

**09:00 - 09:45**      **Amir Safavi-Naeini / ETH Zurich**  
**Squeezed light from a silicon micromechanical resonator**

- 09:45 - 10:30**     **Lin Tian / Merced**  
**Noise-resilient quantum information protocols in an optomechanical quantum interface**
- 10:30 - 11:00**     (Room: Adriatico Guest House - Kastler Lecture Hall Area (Lower Level 1))  
 --- Coffee break ---
- 11:00 - 11:45**     **Adrian Bachtold / Barcelona**  
**Mechanical resonators based on nanotubes and graphene**
- 11:45 - 12:30**     **Gary Steele / TU Delft**  
**Carbon mechanical resonators coupled to quantum circuits**
- 12:30 - 14:00**     --- Lunch break ---
- 12:30 - 13:00**     **Lunch with the Masters**
- 14:00 - 18:30**     --- Trip to Skocjanske jame - The Skocjan Caves (Slovenia) ---  
 Full details are on the info board. Those who wish to attend the trip should sign up with the secretary (office no. 3) by 12 noon on Tuesday, 10 September.
- 19:00 - 21:00**     --- Conference dinner ---  
 Those who wish to go to the conference dinner should sign up with the secretary (office no. 3) by 12 noon on Tuesday, 10 September.

**Thursday, 12 September (Room: Adriatico Guest House Kastler Lecture Hall)**

**12 September 2013**

- 09:00 - 09:45**     **Aashish Clerk / McGill**  
**Strongly driven, strongly coupled optomechanical systems**
- 09:45 - 10:30**     **Hiroshi Yamaguchi / NTT**  
**Coherent manipulation and phonon lasing in electromechanical resonators**
- 10:30 - 11:00**     (Room: Adriatico Guest House - Kastler Lecture Hall Area (Lower Level 1))  
 --- Coffee break ---
- 11:00 - 11:45**     **Nicolai Kiesel / Wien, Aspelmeyer group**  
**Cavity Optomechanics with Levitated Nanospheres**
- 11:45 - 12:30**     **Andreas Nunnenkamp / Basel**  
**Nonlinear optomechanics, dissipative coupling, and quantum synchronization**
- 12:30 - 14:30**     --- Lunch break ---
- 12:30 - 13:00**     **Lunch with the Masters**
- 14:30 - 15:15**     **Isabelle Robert / LPN CNRS**  
**Optomechanics with two-dimensional photonic crystals slab mirrors and cavities**
- 15:15 - 16:00**     **Samuel Deleglise / Jussieu, Heidmann group**  
**Cavity optomechanics with micro and nano-mirrors**
- 16:00 - 16:30**     (Room: Adriatico Guest House - Kastler Lecture Hall Area (Lower Level 1))  
 --- Coffee break ---

16:30 - 18:45      **Poster session**

**Friday, 13 September** (Room:Adriatico Guest House Kastler Lecture Hall)

**13 September 2013**

**09:00 - 09:45**      **Olivier Arcizet/Pierre Verlot / Grenoble**  
**Bidimensional nano-optomechanics and topological backaction in a non-conservative radiation force field**

**09:45 - 10:30**      **Menno Poot / Yale, Tang group**  
**Squeezing in a strongly coupled opto-electromechanical resonator**

**10:30 - 11:00**      (Room: Adriatico Guest House - Kastler Lecture Hall Area (Lower Level 1))  
--- Coffee break ---

**11:00 - 11:45**      **Silvan Schmid / DTU, Boisen group**  
**Photothermal analysis with nanomechanical resonators**

**11:45 - 12:30**      **Klemens Hammerer / Hannover**  
**Optomechanical Entanglement: From Curiosity to Operation**

**12:30 - 12:45**      **Closing remarks**

**12:45 - 14:30**      --- Lunch break ---

**12:45 - 13:15**      **Lunch with the Masters**