



FIRST ANNOUNCEMENT OF INTERNATIONAL WORKSHOP

"FROM STATIC TO DYNAMIC GAUGE FIELDS WITH ULTRACOLD ATOMS"

**GGI Galileo Galilei Institute for Theoretical Physics
Firenze (Italy), 22/05/17 – 23/06/17**

Registration deadline: 31/01/17

Workshop website: <http://ggi-www.fi.infn.it>

AIM OF THE WORKSHOP

Gauge fields play a fundamental role in our understanding of complex natural phenomena. Static gauge fields, such as magnetic fields and spin orbit coupling, are responsible for most of the topological effects found in solid state materials, while dynamical gauge fields are the backbone of the standard model in particle physics, and are instrumental in describing quantum magnetism.

In recent years, quantum technologies have emerged as a novel, complementary approach to investigate paradigms of strongly correlated quantum matter related to gauge fields. On the one hand, cold atom systems, owing to their unparalleled degree of control and versatility, represent an ideal experimental platform for the investigation of both static and dynamical gauge fields. From the other hand, novel numerical quantum information tools have been put forward as complementary methods to access regimes where Monte Carlo simulations are affected by the sign problem.

The purpose of this workshop is to bring together researches in the fields of cold atoms, high-energy, and condensed matter physics, to discuss state-of-the-art perspectives and challenges in the field of synthetic gauge fields and related areas. Within this activity, we expect that the growing interdisciplinary field involving the aforementioned fields will be given a strong boost, paving the way toward the realization of quantum simulation platforms for gauge theories and exotic superfluid and insulating states of matter.

LIST OF TOPICS

- Spin-orbit-coupled Bose and Fermi gases
- Synthetic gauge fields in optical lattices
- Dynamical gauge fields and lattice gauge theories with ultracold atoms
- Matrix-product states and tensor network methods for lattice gauge theories
- Quantum gases with $SU(N)$ symmetry
- Quantum magnetism and long-range interactions
- Unitary Fermi gases and exotic (color, FFLO) Fermi superfluids

ORGANIZERS

- Marcello Dalmonte (ICTP, Trieste, Italy)
- Leonardo Fallani (Università di Firenze, Italy)
- Massimo Inguscio (Università di Firenze & CNR, Italy)
- Guido Martinelli (Università la Sapienza, Roma)
- Simone Montangero (University of Ulm, Germany)
- Ian Spielman (NIST & JQI, USA)
- Sandro Stringari (Università di Trento, Italy)
- Uwe-Jens Wiese (University of Bern, Swiss)

FEATURES AND EVENTS

The workshop will take place at the Galileo Galilei Institute for Theoretical Physics (GGI), located on the beautiful hill of Arcetri, just a few km away from the historical center of Florence. The aim of the workshop is to promote exchange and collaborations among participants, so there will be plenty of time for informal discussions and only a limited number of scheduled talks per day. All the participants to the workshop will be provided with office space.

The workshop will feature a conference week and two focus weeks on specific research topics:

- 22/05/17 – 26/05/17
FOCUS WEEK "Advances in gauge fields implementations in atomic systems"
- 29/05/17 – 02/06/17
INTERNATIONAL CONFERENCE "Quantum science approaches to strongly correlated systems: from ultracold atoms to high-energy and condensed matter physics"
- 05/06/17 – 09/06/17
FOCUS WEEK "Tensor networks for lattice gauge theories"

Invited speakers to the conference and to the focus weeks will be announced shortly.

APPLICATIONS (DEADLINE: 31/01/17)

Applications are open and can be submitted by filling the form at the website <http://www.ggi.fi.infn.it/index.php?page=workshops.inc&id=239>

In the application form please indicate your preferred period of stay and whether you ask for financial support. Please note that the participation to two or more weeks is strongly encouraged and will be considered as preferential during the selection of the applications. Acceptance of the applications will be notified in February 2017.

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