



# The Abdus Salam International Centre for Theoretical Physics



## Workshop on Majorana Fermions, Non-Abelian Statistics & Topological Quantum Information Processing

**20 - 24 August 2012**  
(Miramare – Trieste, Italy)

The Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy, will organize the "Workshop on Majorana Fermions, Non-Abelian Statistics & Topological Quantum Information Processing", from 20 - 24 August 2012.

The Workshop will be co-sponsored by the U.S. National Science Foundation I2CAM International Materials Institute Award, Grant DMR-0844115 and the Institute for Quantum Information and Matter (IQIM) at the California Institute of Technology.

Topological quantum computing holds considerable promise, as here one embeds quantum information in a non-local, intrinsically decoherence-free fashion, thus overcoming a primary obstacle towards fabrication of a scalable quantum computer. One of the attractive ideas to achieve topologically protected quantum information processing is based on Majorana fermions, neutral particles which cost no energy and therefore generate a ground-state degeneracy. These Majorana states exhibit non-Abelian braiding statistics: adiabatically exchanging them transforms the system from one ground state to another. As a consequence, quantum information encoded in this ground state space can be controllably manipulated by braiding operations.

Realizing suitable topological phases poses considerable experimental challenges. Over the past few years, several promising routes toward this goal have been proposed, based on topological insulators and superconductors, semiconductor heterostructures, non-centrosymmetric superconductors, and quantum Hall systems. These systems presently attract significant attention of both theorists and experimentalists. This conference will bring together active researchers in the field to discuss its current status, to address challenges, and to foster close collaboration between the theoretical and experimental groups.

### Topics:

- **Non-Abelian quantum Hall states**
- **Majorana states in topological insulators and quantum spin Hall systems**
- **Non-Abelian topological phases and Majorana states in hybrid systems**
- **Non-Abelian states in lattice models**
- **Non-Abelian states in topological superconductors**
- **Topological quantum information processing in various non-Abelian systems**

### PARTICIPATION

Scientists and students from all countries, which are members of the United Nations, UNESCO or IAEA, may attend the Workshop subject to approval by the Workshop Directors. As the Workshop will be conducted in English, participants should have an adequate working knowledge of that language. Although the ICTP main purpose is to help researchers from developing countries, through a programme of training activities within a framework of international cooperation, a limited number of students and post-doctoral scientists from developed countries are also welcome to attend.

As a rule, travel and subsistence expenses of the participants should be borne by the home institution. Every effort should be made by candidates to secure support for their fare (or at least half-fare). However, limited funds are available for some participants, who are nationals of, and working in, a developing country, and who are not more than 45 years old. Such support is available only for those who attend the entire activity. There is no workshop registration fee.

### HOW TO APPLY FOR PARTICIPATION

The application form can be accessed at the activity website <http://agenda.ictp.it/smr.php?2360>

Once in the website, comprehensive instructions will guide you step-by-step, on how to fill out and submit the application form. Closing date for receipt of the applications is: **1 May 2012.**

### DIRECTORS

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(FU Berlin, Germany)

**Yuval Oreg**  
(Weizmann Institute, Israel)

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(Caltech, USA)

**Ady Stern**  
(Weizmann Institute, Israel)

### LOCAL ORGANIZER

**M. Kiselev**  
(ICTP, Trieste, Italy)

### SPEAKERS \*

**Anton Akhmerov** (Leiden)  
**Jason Alicea** (UC Irvine)  
**Carlo Beenakker** (Leiden)  
**Erez Berg** (Harvard)  
**Piet Brouwer** (FU Berlin)  
**Sankar Das Sarma** (Maryland)  
**Rui-Rui Du** (Rice)  
**Jim Eisenstein** (Caltech)  
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**David Hsieh** (Caltech/MIT)  
**Liang Jiang** (Caltech)  
**Woowon Kang** (Chicago)  
**Aharon Kapitulnik** (Stanford)  
**Leo Kouwenhoven** (Delft)  
**Netanel Lindner** (Caltech)  
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**Eran Sela** (Cologne)  
**Steve Simon** (Oxford)  
**Amir Yacoby** (Harvard)  
**Shou-Cheng Zhang** (Stanford)

\* **some to be confirmed**

### DEADLINE

For requesting participation:

**1 May 2012**

**ACTIVITY SECRETARIAT:** Telephone: +39-040-2240-355 Telefax: +39-040-2240-585

E-mail: [smr2360@ictp.it](mailto:smr2360@ictp.it) ICTP Home Page: <http://www.ictp.it/>