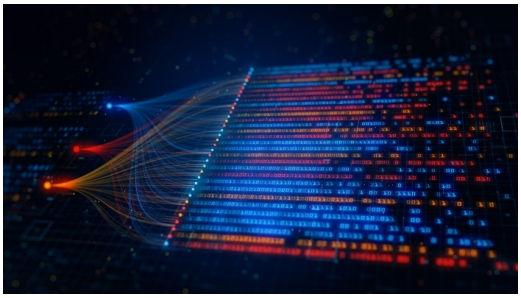
Numerical Methods for Quantum Matter: From Nanographenes to Moiré Materials (NM4QM)



13.oct - 16.oct 2026

Cod. Z68-26

Modalité:
En personne

Édition
2026

Type d'activité
Workshop

Date
13.oct - 16.oct 2026

Location
Donostia International Physics Center

Langues
Anglais

Reconnaissance officielle par l'État
40 heures

Comité d'organisation

Description

In recent years, powerful numerical techniques have been developed to tackle various two-dimensional materials on the atomic level including quantum many-body systems. With the advent of machine learning, quantum simulations and tensor networks, the tool-box has been considerably extended which can now complement more traditional methods such as First-Principle and Density Functional, Dynamical Mean-Field or atomistic Hartree-Fock theories. The aim of the conference is to address new developments of these numerical methods when applied to large-scale atomistic two-dimensional systems which also include quasi three-dimensional moiré systems or non-commensurate quasicrystals. Implications on quantum transport, unconventional superconductivity, magnetic ordering and many-body ground states shall also be discussed.

This workshop brings together researchers developing and applying advanced numerical methods to study the rich physics of carbon-based systems. Topics will span moiré systems, van der Waals heterostructures, low-dimensional nanocarbons, and charge and heat transport in complex carbon architectures. Emphasis will be placed on method development, including electronic structure, many-body approaches, machine learning and multiscale modeling techniques.

With a particular focus on numerical techniques, the meeting will span 2.5 days of scientific talks followed by half a day of hands-on sessions and a loosely organized 1 day hackathon. Participants are encouraged not only to present their latest results, but also to showcase their code developments and numerical tools, offering others the opportunity to explore and use publicly available software.

ORGANIZING COMMITTEE:

B. Andrei Bernevig (Princeton, DIPC)
Tobias Stauber (CSIC)
Thomas Frederiksen (DIPC, Ikerbasque)

Objectifs

The workshop aims to foster collaboration across communities working on graphene, carbon nanotubes, twisted bilayers, and related quantum materials.

By combining presentations, discussions, and interactive sessions, the workshop seeks for knowledge exchange, and the dissemination of open computational methods across the community.

Collaborateurs spécifiques au cours

Donostia International Physics Center

CSIC icmm

Directed by

Thomas Frederiksen

Donostia International Physics Center and Ikerbasque

Thomas Frederiksen (TF) obtained his PhD in physics in 2007 from the Technical University of Denmark on the topic of inelastic transport theory for nanoscale systems. In 2008 he was awarded a 5-year Gipuzkoa Fellowship to carry out research at the Donostia International Physics Center (DIPC) and abroad. In 2012 he was appointed Ikerbasque Research Professor at the DIPC where he leads a research group on Nanoelectronics. TF is one of the main developers of the DFT-NEGF code "Inelastica" to perform atomistic simulations of inelastic electron transport and local heating in nanoscale devices.

Professeurs

Anton Akhmerov

Delft University of Technology

YUE BAN

Mads Brandbyge Brandbyge

Tech. Univ. of Denmark

Fabian Jaroslav

Univeristy of Regensburg

Jaroslav Fabian (PhD 1997, SUNY Stony Brook) is a professor of theoretical physics at the University of Regensburg where he heads the Spintronics Group since 2004. Prior to that Jaroslav Fabian was on the faculty at the Karl-Franzens University in Graz, and a research associate in University of Maryland at College Park, and Max-Planck Institute for Complex Systems in Dresden. Research activities of Jaroslav Fabian span a wide spectrum of theoretical and computational solid state physics, but are particularly focused on the physics of 2D materials and on the field of spintronics. He is a member of Graphene

Flagship, and several collaborative research initiatives. Recently, he has been excited about the art of creating novel electronic and magnetic properties by proximity effects in stacks of 2D materials.

Nicolas Leconte

Nicolás Lorente Palacios

Jedediah Pixley Pixley

Rutgers, The State University of New Jersey

Nicolas Regnault

Ecole Normale Superieure-CNRS, Research director

Ivo Saldanha Souza

Centro de Física de Materiales

Ulrich Schollwoeck

LMU Munich

Maria-Roser Valenti Vall

University of Frankfurt

Tim Wehling

Hong Yao

Tsinghua University

Zeila Zanolli

Utrecht University

Tarifs inscription

REGISTRATION FEES	JUSQU'AU 05-10-2026
Fee Waiver	0 EUR
Regular Attendant	250,00 EUR

Lieu

Gipuzkoa