



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



2026 School on Electron-Phonon Physics and Many-body Perturbation Theory

DESCRIPTION:

This is an advanced school on first-principles methods for electron-phonon physics and excited-state phenomena, featuring theory lectures and hands-on training with [EPW](#), [Quantum ESPRESSO](#), [Wannier90](#), [xARPES](#), [elphbolt](#) and [Abinit](#) on modern HPC systems.

Building on a successful series of electronic-structure schools, this event trains graduate students, postdocs, and researchers in cutting-edge computational methods for transport, optical, and superconducting properties.

Topics include density-functional perturbation theory, GW quasiparticle calculations, and Bethe-Salpeter equation (BSE) approaches, with applications to semiconductors, 2D materials, superconductors, and topological systems.

The program combines morning lectures on advanced theory with afternoon hands-on tutorials using [TACC](#) supercomputers.

More information is available [here](#).

TOPICS:

- Quantum Espresso
- Maximally-localized Wannier functions
- Theory of electron-phonon coupling
- Superconductivity
- Carrier transport
- Spectral function and Koopmans
- ARPES extraction
- Phonon-mediated superconductivity
- Optical spectra including direct and phonon-assisted optical transitions
- Exciton-phonon interactions
- Polarons and self-trapped excitons
- Special displacement method for finite-temperature calculations
- GW quasiparticle band structures
- Excitons and Bethe-Salpeter equation
- GW perturbation theory
- Jupyter Notebooks with EPWpy
- EPW with GPU

Hands-on tutorial sessions will be based on the following open-source codes:

- [Quantum ESPRESSO](#)
- [Wannier90](#)
- [EPW](#)
- [EPWpy](#)
- [xARPES](#)
- [elphboltz](#)
- [Abinit](#)

SPEAKERS:

Á. A. Carrasco Álvarez
Université catholique de Louvain, Belgium
J. Coulter
Flatiron Institute, USA
Z. Dai
The University of Texas at Austin, USA
P. Giannozzi
Università degli Studi di Udine, Italy
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T. P. van Waas
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C. Verdi
University of Queensland, Australia
Y. Xu
Tsinghua University, China
T. Yun Kim
The University of Texas at Austin, USA
M. Zacharias
Université Rennes-I, France
X. Zhang
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15 - 21 June 2026



Trieste, Italy



Applications and deadlines:

1 February 2026

for applicants requesting financial and/or visa support

27 March 2026

for all other applicants

DIRECTORS:

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LOCAL ORGANISERS:

R. Gebauer, ICTP, Italy
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FURTHER INFORMATION:



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Female scientists are encouraged to apply.

GRANTS:

A limited number of grants are available to support the attendance of selected participants, with priority given to participants from developing countries. There is no registration fee.

