Workshop on Frontiers in Quantum Materials

September 1 – 5, 2025

ICTP-SAIFR, São Paulo, Brazil

Venue: Principia Institute

ID: 862 8678 4162
Password: quantum

GROUP 1 (Monday and Thursday)

- **Villanueva Filho, Orion De Macedo Xavier** (Institute of Physics of São Carlos at the University of São Paulo (IFSC/USP), Brazil): *Approximations for the quantum work extracted from a correlated fermion system*

The present project is inspired by the idea of approximating the work extracted in a quantum interacting system using Density Functional Theory (DFT). One of the key elements in DFT is the Kohn-Sham formulation, which converts the many-body problem in an effective non-interacting one by means of the so-called exchange-correlation functional. It has been shown that dealing with systems at finite temperature by means of DFT approximations built at previous works could produce accurate results up to a characteristic temperature. While in the previous studies for the quantum thermodynamics of the Hubbard model aforementioned the DFT approximations considered the exchange-correlation potential as that for the ground-state, an interesting route to improve their accuracy would be employing approximations constructed in the thermal DFT framework. In this project, we propose to study the extracted quantum work in the driven Hubbard model using density functional approximations. Our goal is to identify strategies for designing reliable approximations for quantities of interest of Quantum Thermodynamics in various correlation regimes and thermal ranges.