Speaker: **Tommaso Faleo, University of Vienna**

Title: **Entanglement-induced collective many-body interference**

Date: **Wednesday, July 10th, 14:00 pm**

Place: **Seminar room 915**

Title: **Entanglement-induced collective many-body interference**

Abstract:

Entanglement and interference are hallmark phenomena of quantum physics, generating rich dynamics when multiple partially distinguishable particles are involved. This study introduces a novel interferometric setting that leverages both entanglement and many-particle interference to exclusively observe N-particle interference, while suppressing lower-order interferences. We experimentally demonstrate this effect in a four-particle interferometer by generating high entanglement fidelity and spectrally pure photons via two spontaneous down-conversion sources. The joint detection of all four photons reveals a highly visible nonlocal interference depending on the collective four-particle phase — a genuine four-body property.
After presenting the scheme and its experimental realization, I will show our results and compare them with theoretical expectations. This approach allows for scaling to larger numbers of input particles with different types of entangled states (Bell and GHZ states) and ensures full interference contrast. This work highlights the role that entanglement can play in many-body interference, especially in combination with partial distinguishability of the involved particles, potentially leading to unexplored phenomena and applications for the advancements of quantum technologies.