

Introduce: Claudio GIANNETTI, Università Cattolica del Sacro Cuore

Intervengono:

Rosario LO FRANCO, Engineering Dept., University of Palermo, Italy

SPATIAL INDISTINGUISHABILITY AS A DIRECTLY CONTROLLABLE QUANTUM RESOURCE

The fundamental question whether the indistinguishability of identical particles can be exploitable for quantum information processing has been long debated in the context of quantum entanglement. In this talk, we discuss at an introductory level our most recent results about this purpose and its related practical consequences. In particular, we first explain the original particle-based approach to deal with states of identical particles without resorting to fictitious labels. Then, we describe the operational framework based on spatially localized operations and classical communication (sLOCC), which allows one to quantify quantum traits, such as entanglement, due to a given degree of spatial indistinguishability under generic spatial overlap configurations. The presented results, including recent experiments, make it clearly emerge that spatial indistinguishability, stemming from the spatial overlap of identical particles, constitutes a directly controllable operational quantum resource.

Giacomo ROATI, CNR-INO and LENS, University of Florence, Italy

QUANTUM SIMULATION WITH ULTRACOLD MATTER

Quantum degenerate atomic gases are produced by cooling dilute atomic vapours to ultra-low temperatures (few billionths of kelvin above absolute zero). Under these extreme conditions, the elusive quantum world comes into focus and novel quantum matter-states and non-trivial phase transitions bloom out. The unprecedented degree of controllability and the new advanced diagnostic tools that allow the manipulation at the single-atom level, make these systems ideal analog quantum simulators of complex strongly interacting quantum matter problems, which are inaccessible to even the most advanced supercomputers.

In this seminar, I will review some recent experimental progress in this field, focusing on quantum transport with ultracold matter in structured light potentials that promises to bring great opportunities for understanding fundamental issues in non equilibrium physics and that can represent a new paradigm shift in designing future quantum devices.

Webinar

Venerdì 5 febbraio 2021, ore 14.30

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