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Title: Bosonic Quantum Information from Superselection Rules
Date: Monday, April 27, 2 pm (s.t.).
Place: Seminar room 915

Abstract: Bosonic Quantum Information from Superselection Rules

Bosonic systems, and in particular photonic platforms, are excellent candidates for implementing quantum information protocols that cannot be efficiently classically simulated. While non-Gaussianity is necessary for this so-called quantum advantage, it is not sufficient, leaving open the question of what truly constitutes a quantum resource in bosonic protocols. This talk addresses this question by treating the phase reference of bosonic states as an explicit quantum system rather than an implicit classical one, as usually done in quantum optics protocols. This perspective reveals that the using an implicit classical phase reference both restricts the accessible state space and effectively fixes a computational basis. By incorporating the phase reference into the quantum formalism and respecting particle-number conservation and superselection rules, a basis-agnostic framework emerges in which the Gaussian/non-Gaussian dichotomy, for instance, appears as a limiting case. This approach clarifies, and permits unifying, the physical and computational resources underlying non-classicality and potential quantum advantage in bosonic systems of any kind.