

# **Heralded entanglement generation with indistinguishable particles**

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Heralded entanglement generation, in which successful state preparation is confirmed through measurement outcomes, provides a flexible paradigm for creating entangled states. This talk provides a brief overview of heralded schemes using identical particle systems. I will discuss the general principles underlying heralded protocols in the natural setting of linear optics and interferometry, where postselection on specific measurement patterns can herald the generation of target entangled states.

Two recent developments will serve as concrete examples. The first demonstrates how graph-theoretical methods can be used to systematically discover new schemes for multipartite entanglement generation [1]. The second showcases robust interferometric protocols that leverage particle indistinguishability to achieve resilience against experimental imperfections [2].

These examples illustrate broader trends in the field: the development of systematic design principles for entanglement generation schemes and the exploitation of particle indistinguishability as a resource for quantum information processing [3].

[1] Chin, S., Kim, YS. and Karczewski, M. 2024 npj Quantum Inf 10, 67

[2] Piccolini, M. et al 2025 Quantum Sci. Technol. 10 015013

[3] Forbes, F. et al 2025 Rep. Prog. Phys. 88 086002