Generation and detection of genuine multipartite entanglement in boson sampling systems
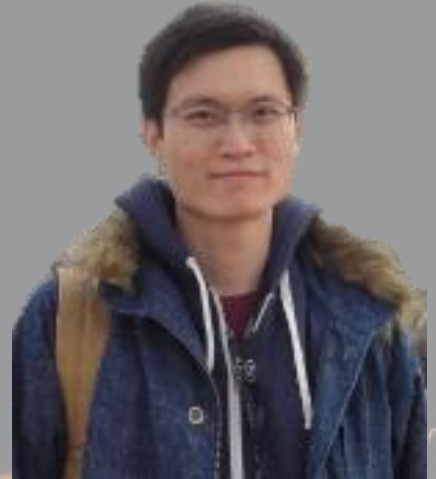
吳俊毅 助理教授
淡江大學物理系
Prof. Jun-Yi Wu
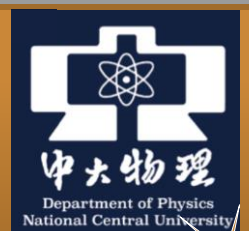**Department of Physics**
Tamkang University

A linear optics network is a multimode interferometer system, where indistinguishable photon inputs can create nonclassical interference that can not be simulated with classical computers. Such nonclassical interference implies the existence of entanglement among its subsystems, if we divide its modes into different parties. Entanglement in such systems is naturally encoded in multi-rail (multi-mode) quantum registers. For bipartite entanglement, a generation and detection scheme with multi-rail encoding has been theoretically proposed [NJP 19(10):103032, 2017] and experimentally realized [Optica, 7(11):1517, 2020]. In this talk, we extend this method to multipartite systems. We will show how to generate and detect multi-rail-encoded genuine multipartite entanglement (GME) in fixed local-photon-number subspaces of linear optics networks. This scheme allows us to reveal the discrete-variable GME in continuous-variable systems.

Date : 2022/11/08 (Tue)
Place : S4-625
Time : 14:00-15:00

Department of Physics
National Central University
中大物理

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