Stuttgarter Physikalisches Kolloquium

Fachbereich Physik, Universität Stuttgart
Max-Planck-Institut für Festkörperforschung
Max-Planck-Institut für Intelligente Systeme

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Login data will be announced by e-mail and on the colloquia webpage

Dienstag, 13. Juli 2021	16:15 Uhr	Online-Vortrag

Universität Stuttgart, Pfaffenwaldring 57, 70569 Stuttgart-Vaihingen

Gastgeber: Prof. Dr. Peter Michler, Universität Stuttgart, Telefon: 0711 - 685-64660

Quantum light source engineering for quantum supremacy

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Abstract

The main challenge for scaling up photonic quantum technologies is the lack of perfect quantum light sources. In this talk, I will report progress in developing high-performance single photons, entangled photons, and squeezed light. We have pushed the parametric down-conversion to its physical limit and produce two-photon source with simultaneously a collection efficiency of 97% and an indistinguishability of 96% between independent photons. Using a single quantum dot in microcavities, we have produced on-demand single photons with high purity (>99%), near-unity indistinguishability, and high extraction efficiency—all combined in a single device compatibly and simultaneously. Based on the high-performance quantum light sources, we have implemented boson sampling—which is an intermediate model of quantum computing, a strong candidate for demonstrating quantum computational advantage and refuting Extended Church Turing Thesis—with up to 76 photon clicks after a 100-mode interferometer. The photonic quantum computer, Jiuzhang, yields an output state space dimension of 10^30 and a sampling rate that is 10^14 faster using the state-of-the-art simulation strategy on supercomputers. This special-purpose photonic platform will be further used to investigate practical applications linked to the Gaussian boson sampling.
Reference: see http://staff.ustc.edu.cn/~cylu