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Entangling the optical frequency comb into multiple continuous-variable cluster states[1] OLIVIER PFISTER, HUSSAIN ZAIDI, University of Virginia, NICOLAS MENICUCCI, Princeton University and the University of Queensland, STEVEN FLAMMIA, Perimeter Institute for Theoretical Physics, RUSSELL BLOOMER, MATTHEW PYSHER, University of Virginia — A single multimode optical parametric oscillator (OPO) can be designed so that its nonlinear gain medium (typically a two-photon parametric amplifier) generates a particular network of entangling interactions between the eigenmodes of its optical cavity. We show how this can be formulated using nonstandard graph states and how these are related to the usual graph states, an example of which is the cluster state for one-way quantum computing. We also report on the progress of our very compact experimental implementation, in a single OPO with a single pump field, of a parallel quantum register comprising several independent quadripartite cluster states.

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Olivier Pfister
University of Virginia

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