

Abstract Submitted
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**Multipartite entanglement in the optical frequency comb of a
depleted-pump optical parametric oscillator**

REIHANEH SHAHROKSHAHI, OLIVIER PFISTER — The optical frequency comb (OFC) of a single optical parametric oscillator (OPO) has been shown to be a very interesting candidate for scaling the size of quantum entangled states. In sophisticated OPOs below threshold, square-grid cluster states of very large size can in principle be generated. Here, we study a very simple OPO well above threshold, in the linearized fluctuation approximation, and investigate the effect of pump depletion on multiple, simultaneously resonant, signal-mode pairs. We find that the depleted quantum pump mediates quantum correlations between the signal fields. These correlations lead in turn to inseparability of these fields, as evidenced by the well-known van Loock-Furusawa entanglement criteria. Due to its simplicity and its scalability, this fully inseparable multipartite entangled state could be used as a resource in quantum information protocols.

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