Creating multi-atom entanglement in optical fiber microcavities

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Abstract

Entanglement has grown from a quantum curiosity into a cornerstone of modern quantum theory, and acts as a resource in new applications currently under development, such as quantum metrology. I will discuss a series of experiments where multiparticle entangled states are created in an ensemble of _˜40 atoms using optical fiber microcavities and atom chips. The cavity is used both for entanglement creation and for its analysis. It enables us to perform a direct measurement of the Husimi-Q distribution of the atomic state, with a resolution at the single-particle level. In collaboration with the French time-frequency metrology laboratory SYRTE, we are also testing the application of these tools to atomic clocks at the 10^{-13} $s^{-1/2}$ fractional stability level.

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