Cavity QED with optically transported atoms

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abstract

Ultracold $^{87}\text{Rb}$ atoms are delivered into a high-finesse optical micro-cavity using a translating optical lattice trap and detected via the cavity field. The atoms are loaded into an optical lattice from a magneto-optic trap (MOT) and transported 1.5 cm into the cavity. Our cavity satisfies the strong-coupling requirements for a single intracavity atom, thus permitting real-time observation of single atoms transported into the cavity. This transport scheme enables us to vary the number of intracavity atoms from 1 to $>100$ corresponding to a maximum atomic cooperativity parameter of 5400, the highest value ever achieved in an atom–cavity system. When many atoms are loaded into the cavity, optical bistability is directly measured in real-time cavity transmission.