# Cavity QED using atomic mirrors

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Ordered lattices of neutral atoms can exhibit a collective response to light, offering opportunities for enhanced and controlled light-matter interaction. In particular, a planar array with sub-wavelength interatomic spacing can act as an efficient mirror, as demonstrated in experiments. In this work, we theoretically study configurations of two parallel atomic mirrors. With the right design, we predict a sharp cavity mode that can be accessed with high cooperativity by additional impurity atoms suspended between the mirrors, allowing for cavity QED applications. We analyze and optimize the performance of such atomic cavities involving different protocols and cavity regimes, both in the ideal case of fixed atoms and allowing for fluctuations of the atomic positions. Finally, we look into the fundamental differences between these systems and conventional optical cavities, and propose ways to leverage the non-linearity of the atoms for additional applications.

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