

Optical cavities with non-spherical mirrors for enhanced cooperativity

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Many cavity QED and quantum information processing protocols require high atom-photon interaction strength. This can be achieved by operating a cavity in the near-concentric regime minimising the beam waist and enhancing the local electric field, but at the cost of higher clipping losses at the finite-sized mirrors. We demonstrate how this limit can be overcome by moving away from the paradigm of spherical mirrors. Using a range of approaches, e.g. analytical, evolutionary algorithms, or machine learning, we design novel mirror shapes that give rise to improved cavity cooperativity.