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A large mode optical resonator for enhanced atom interferometry[1] RANJITA CHANU SAPAM, NICOLAS MIELEC, LNE-SYRTE, Observatoire de Paris, PSL Research Univ., CNRS, Sorbonne Univ., ISABELLE RIOU, BENJAMIN CANUEL, LP2N, Universities Bordeaux-IOGS-CNRS, DAVID HOLLEVILLE, LNE-SYRTE, Observatoire de Paris, PSL Research Univ., CNRS, Sorbonne Univ., BESS FANG, LP2N, Universities Bordeaux-IOGS-CNRS, ARNAUD LANDRAGIN, REMI GEIGER, LNE-SYRTE, Observatoire de Paris, PSL Research Univ., CNRS, Sorbonne Univ. —
The development of atom interferometry in the last few decades has led to high precision measurements of inertial effects and tests of fundamental physics. New methods for higher sensitivity atom interferometers (AIs) are being explored, particularly the interrogation of atoms with optical cavities[2]. Its benefits would be higher optical power allowing large momentum transfer beam splitters, and possibly cleaner and controlled phase profiles. However high sensitivity AIs require long interrogation times, which combined with cold atom expansion, bring the challenges of large waists in cavities. We propose an optical resonator composed of a convergent lens with two flat mirrors at its focal planes[3]. This cavity is marginally stable and exhibits half degenerate behaviour. A numerical study of its behaviour, using an ABCD transfer matrix formalism, showed that typical controllable misalignments of a few micrometres would not be critical for atom interrogation. We realise this cavity with a 200 mm lens and an 8 μm input waist and a 7 mm waist Gaussian beam inside the cavity.

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[2]P. Hamilton et al, **Phys. Rev. Lett** 114, 100405 (2015)
[3]I. Riou , N. Mielec et al, **arXiv** 1701.01473 (2017)

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