

Abstract Submitted
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Entanglement of a Laguerre-Gaussian cavity mode with a rotating mirror P.-L. GISCARD, M. BHATTACHARYA, P. MEYSTRE, B2 Institute, Department of Physics and College of Optical Sciences, The University of Arizona, Tucson, AZ 85721, USA — It is known that the exchange of linear momentum between an optical cavity field mode and a vibrating mirror can entangle them together [1]. We consider here the rotational analog of this situation and show that radiation torque can entangle a Laguerre-Gaussian cavity field mode with a rotating mirror [2]. We present the arrangement used to generate the entanglement and study its robustness against temperature, showing that it persists up to 100K for experimentally accessible parameters. We further study the dependence of the entanglement with angular momentum and the detuning from the cavity resonance. Finally we observe a strong correlation between the behavior of the entanglement at low temperature and the mean number of thermal phonons at the mirror rotation frequency, a consequence of the black-body law for the phonons.

[1] D. Vitali *et al.*, Phys. Rev. Lett. **98**, 030405 (2007).

[2] M. Bhattacharya, P. -L. Giscard, P. Meystre, Phys. Rev. A **77**, 013827 (2008).

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