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Abstract : Giant diffusion of nanomechanical rotors in a tilted washboard potential

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We present an experimental realization of a biased optical periodic potential in the low friction limit. The noise-induced bistability between locked (torsional) and running (spinning) states in the rotational motion of a nanodumbbell is driven by an elliptically polarized light beam tilting the angular potential. By varying the gas pressure around the point of maximum intermittency, the rotational effective diffusion coefficient increases by more than 3 orders of magnitude over freespace diffusion. These experimental results are in agreement with a simple two-state model that is derived from the Langevin equation through using timescale separation. Our work provides a new experimental platform to study the weak thermal noise limit for diffusion in this system.