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Casimir torque on chains of nanoparticles STEPHEN SANDERS, University of New Mexico, WILTON J. M. KORT-KAMP, DIEGO A. R. DALVIT, Los Alamos National Laboratory, ALEJANDRO MANJAVACAS, University of New Mexico — The fluctuations of the electromagnetic field give rise to interesting phenomena such as Casimir interactions, which can lead to very strong noncontact forces and torques in the nanoscale. Although these interactions produce friction and stiction that may affect the moving parts of nanoscale devices, they also constitute an opportunity to achieve an efficient transfer of momentum at the nanoscale. To that end, here, we explore the dynamics of a chain of rotating nanoparticles mediated by the Casimir torque. We derive an analytical expression describing the angular momentum transfer and show that for angular velocities that are currently achievable, the dynamics of an arbitrary chain can be determined from a set of natural modes and their corresponding decay rates. Exploiting this methodology we study different examples of exotic rotational dynamics. Our results show that Casimir interactions can mediate an efficient transfer of angular momentum at the nanoscale and, therefore, have important implications for the design of nanomechanical devices.

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