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Dynamical control of a quantum Kapitza pendulum in a spin-1 BEC THAI HOANG, COREY GERVING, BEN LAND, MARTIN ANQUEZ, CHRIS HAMLEY, MICHAEL CHAPMAN, Georgia Institute of Technology — We demonstrate dynamic stabilization of an unstable strongly interacting quantum many-body system by periodic manipulation of the phase of the collective states. The experiment employs a spin-1 atomic Bose condensate that has spin dynamics analogous to a non-rigid pendulum in the mean-field limit. The condensate spin is initialized to an unstable (hyperbolic) fixed point of the phase space, where subsequent free evolution gives rise to spin-nematic squeezing[1] and quantum spin mixing.[2] To stabilize the system, periodic microwave pulses are applied that manipulate the spin-nematic fluctuations and limit their growth. The range of pulse periods and phase shifts with which the condensate can be stabilized is measured and compares well with a linear stability analysis of the problem.[3]

[1]C.D. Hamley, *et al.*, "Spin-Nematic Squeezed Vacuum in a Quantum Gas," Nature Physics 8, 305-308 (2012).
[2]C.S. Gerving, *et al.*, "Non-equilibrium dynamics of an unstable quantum pendulum explored in a spin-1 Bose-Einstein condensate," Nature Communications 3, 1169 (2012).
[3]T.M. Hoang, *et al.*, "Dynamic stabilization of a quantum many-body system." arXiv:1209.4363 (2012).

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