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Oscillating bound states for a giant atom[1] ANTON FRISK KOCKUM, Chalmers University of Technology, LINGZHEN GUO, FLORIAN MARQUARDT, Max Planck Institute for the Science of Light, GRAN JOHANSSON, Chalmers University of Technology — We investigate the relaxation dynamics of a single artificial atom interacting, via multiple coupling points, with a continuum of bosonic modes (photons or phonons) in a one-dimensional waveguide. In the non-Markovian regime, where the travelling time of a photon or phonon between the coupling points is sufficiently large compared to the inverse of the bare relaxation rate of the atom, we find that a boson can be trapped and form a stable bound state. More interestingly, if the number of coupling points is more than two, the bound state can oscillate persistently by exchanging energy with the atom despite the presence of the dissipative environment. We propose several realistic experimental schemes to generate such oscillating bound states.

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