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Rapidly expanding BEC ring: analog cosmology in a lab

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I will describe an experiment and some theory of an expanding, ring-shaped Bose-Einstein condensate. The expansion redshifts and damps long-wavelength excitations, as in an expanding universe. After expansion, energy in the radial mode leads to the production of bulk topological excitations—solitons and vortices—driving the production of a large number of azimuthal phonons and, at late times, causing stochastic persistent currents. These complex nonlinear dynamics, fueled by the energy stored coherently in one mode, are reminiscent of a type of “preheating” that may have taken place at the end of inflation.

Based on <https://arxiv.org/abs/1710.05800>

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