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Talk title: Hubble Friction and Amplification in Expanding Ring Condensates: An expanding (or contracting) universe in the lab

Abstract: The massive scale of the universe makes the experimental study of cosmological inflation difficult. This has led to an interest in developing analogous systems using table top experiments. One possible system for such simulations is an expanding atomic quantum gas. In recent experiments, we have modeled the basic features of an expanding universe by drawing parallels with both expanding and contracting ring-shaped Bose Einstein Condensate (BEC). In the theoretical models of the expanding universe, relativistic scalar fields are attenuated by “Hubble friction”, which results from the dilation of the underlying metric. By contrast, in a contracting universe this pseudo-friction leads to amplification. In recent experiments, we experimentally measured both Hubble attenuation and amplification in expanding and contracting ring-shaped Bose-Einstein condensates, in which phonons are analogous to cosmological scalar fields.