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Non-equilibrium Spin Domains in Quenched Sodium Spinor Bose-Einstein condensates[1] ANSHUMAN VINIT, EVA BOOKJANS, CHANDRA RAMAN, Georgia Institute of Technology — We report spontaneous spin domain formation in sodium Bose-Einstein condensates that are quenched, i.e. rapidly tuned, through a quantum phase transition from polar to antiferromagnetic phases. A microwave "dressing" field globally shifts the energy of the $m_F = 0$ level below the average of the $m_F = \pm 1$ energy levels, inducing a dynamical instability recently uncovered by our group [1]. We use local spin measurements to quantify the spatial ordering kinetics in the vicinity of the phase transition. For an elongated BEC, the instability nucleates small antiferromagnetic domains near the center of the polar condensate that grow in time along one spatial dimension. After a rapid nucleation and coarsening phase, the system exhibits long timescale non-equilibrium dynamics without relaxing to a uniform antiferromagnetic phase.

[1] E. M. Bookjans, A. Vinit, and C. Raman, Phys. Rev. Lett. 107, 195306 (2011).

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