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Pattern formation in colloidal explosions: Theory and experiment ARTHUR STRAUBE[1], Humboldt University of Berlin, Germany, ARD LOUIS COLLABORATION[2], JÖRG BAUMGARTL, CLEMENS BECHINGER COLLABORATION[3], ROEL DULLENS COLLABORATION[4] — We study the nonequilibrium pattern formation that emerges when magnetically repelling colloids, trapped by optical tweezers, are abruptly released, forming colloidal explosions [EPL 94, 48008 (2011)]. For multiple colloids in a single trap, we observe a pattern of expanding concentric rings. For colloids individually trapped in a line, we observe explosions with a zigzag pattern that persists even when magnetic interactions are much weaker than those that break the linear symmetry in equilibrium. Theory and computer simulations quantitatively describe these phenomena both in and out of equilibrium. An analysis of the mode spectrum allows us to accurately quantify the nonharmonic nature of the optical traps. Colloidal explosions provide a new way to generate well-characterized nonequilibrium behavior in colloidal systems.

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