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Merging of independent condensates: disentangling the Kibble-Zurek mechanism JEAN-LOUP VILLE, MONIKA AIDELSBURGER, RAPHAEL SAINT-JALM, SYLVAIN NASCIMBENE, JEROME BEUGNON, JEAN DALIBARD, Laboratoire Kastler Brossel, College de France, CNRS, ENS-PSL Research University, UPMC-Sorbonne Universites — An important step in the study of out-of-equilibrium physics is the Kibble-Zurek theory which describes a system after a quench through a second-order phase transition. This was studied in our group with a temperature quench across the normal-to-superfluid phase transition in an annular trap geometry, inducing the formation of supercurrents. Their magnitude and direction were detected by measuring spiral patterns resulting from the interference of the ring-shaped condensate with a central reference disk. According to the KZ mechanism domains of phase are created during the quench, with a characteristic size depending of its duration. In our case this results in a stochastic formation of supercurrents depending on the relative phases of the domains. As a next step of this study, we now design ourselves the patches thanks to our tunable trapping potential. We control both the number of condensates to be merged (from one to twelve) and their merging time. We report an increase of the vorticity in the ring for an increased number of patches compatible with a random phase model. We further investigate the time required by the phase to homogenize between two condensates.

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