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Quantum turbulence in a "racetrack" atomtronic circuit[1] MARK EDWARDS, BENJAMIN ELLER, OLETUNDE OLADEHIN, Georgia Southern University, CHARLES CLARK, Joint Quantum Institute — We have studied the flow produced by stirring an ultracold atomtronic system consisting of a gaseous Bose–Einstein condensate (BEC) confined in a "racetrack" potential. The BEC is assumed to be strongly confined in a horizontal plane by a vertical harmonic trap and, within this plane, subjected to an arbitrary two–dimensional potential. The racetrack potential is made up of two straight parallel channels connected on both ends by semicircular channels of the same width and (energy) depth as the straightaways. The Gross–Pitaevskii equation was used to simulate the behavior of the BEC in this potential when stirred by rotating paddles of various shapes including ellipses and rectangles. The rich variety of topological excitations produced during the stirring was studied by looking at the optical density, momentum distribution, velocity field and the vorticity. The momentum spectrum was studied for the development and presence of scalings indicative of quantum turbulence. Here we also report the type and number of excitations and effect of racetrack shape on their behavior.

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Mark Edwards
Georgia Southern University

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