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Producing flow in a "racetrack" Bose–Einstein condensate atomtronic circuit[1] BEN ELLER, BRENNAN COHELEACH, Georgia Southern University, CHARLES CLARK, Joint Quantum Institute, MARK EDWARDS, Georgia Southern University — 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. We used the Gross–Pitaevskii equation to simulate the behavior of the BEC in this potential when stirred by rotating paddles of various shapes including ellipses and rectangles. The paddle energy height and rotation speed were also varied. As part of the study we endeavored to find stirring schedules that would lead to smooth flow of the BEC. In this way a "complete" atomtronic circuit with non–zero current could be produced. We found a rich variety of topological excitations were produced during the stirring. Here we report the type and number of such excitations and effect of racetrack shape on their behavior.

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