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Capacitor-resisitor neutral-atom circuits with Bose-Einstein condensates[1] MARK EDWARDS, NOEL MURRAY, Georgia Southern University, CHARLES W. CLARK, Joint Quantum Institute — Recently the realization of a neutral-atom circuit analogous to an electronic capacitor discharged through a resistor and implemented in a thermal-gas system was reported.[2] We present a theoretical study of this system where the ideal gas is replaced with a Bose–Einstein condensate. The condensate dynamics is assumed to obey the Gross–Pitaevskii equation (GPE) and we assume that the condensate is initially trapped in a ring-shaped potential that fits into one well of a "dumbell"–shaped potential. The dumbell potential consists of two wells connected to each via a rectangular channel. We have investigated the dynamics of the condensate upon its release from the ring–shaped trap. We followed the populations of the right–hand and left–hand wells as functions of time after release. We have carried out these studies for dumbell potentials of various channel lengths and widths. The dynamics were then compared with an analogous electronic circuit model, suggested in Ref. [2], consisting of a capacitor discharging through a resistor. We find good agreement between the circuit model and the GPE dynamics.

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[2]J.G. Lee, et al., *Scientific Reports* **3**, article 1034 (2013).

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