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An atomtronic dumbell circuit[1] AIJUN LI, N. MURRAY, C. LANIER, Georgia Southern University, Y.-H. WANG, C.W. CLARK, Joint Quantum Institute, M. EDWARDS, Georgia Southern University — We report on simulations of the behavior of a Bose-Einstein condensate formed in the left well of a "dumbell" circuit potential. This quasi-2d potential takes the form of the combination of strong harmonic vertical confinement along with a horizontal-plane potential having dumbell shape. The dumbell consists of two circular wells connected by a channel. We assume that the condensate is initially formed in one of the wells and then is released and allowed to flow down the channel into the other well and possibly back again. We first simulated the behavior of the BEC in this potential using a variational mean-field version of the 3D Gross-Pitaevskii equation (GPE) at zero temperature for dumbell potentials having a range of different channel lengths and widths. We used these results to indentify equivalent "atomtronic" circuits such as an RCL circuit with DC battery. We also investigated the effects of finite temperature on the behavior of the condensate in the dumbell potential using the Zaremba-Nikuni-Griffin (ZNG) theory. These results were used to identify the effects of a thermal cloud on the atomtronic circuit operation.

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