

Abstract Submitted
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Atomtronics: Realizing the behavior of electronic components in ultracold atomic systems¹ RON PEPINO, JILA and University of Colorado, J. COOPER COLLABORATION, B.T. SEAMAN COLLABORATION, D. ANDERSON COLLABORATION, M.J. HOLLAND COLLABORATION² — Atomtronics focuses on creating an analogy of electronic devices and circuits with ultracold atoms. Such an analogy can come from the highly tunable band structure of ultracold neutral atoms trapped in optical lattices. Solely by tuning the parameters of the optical lattice, we demonstrate that conditions can be created that cause atoms in lattices to exhibit the same behavior as electrons moving through solid state media. We present our model and show how the atomtronic diode, field effect transistor, and bipolar junction transistor can all be realized. Our analogs of these fundamental components exhibit precisely-controlled atomic signal amplification, trimming, and switching (on/off) characteristics. In addition, the evolution of dynamics of the superfluid atomic currents within these systems is completely reversible. This implies a possible use of atomtronic systems in the development of quantum computational devices.

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