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Transistor like behavior of a Bose Einstein condensate in triple well potential JAMES STICKNEY, Department of Physics, Worcester Polytechnic Institute, DANA ANDERSON, Department of Physics and JILA, University of Colorado and National Institute of Standards and Technology, ALEX ZOZULYA, Department of Physics, Worcester Polytechnic Institute — The availability of cold atom-based analogs of building blocks of electronic circuits, especially with the ability to integrate them into larger devices, may be extremely valuable in applications. We demonstrate that a device based on a BEC in a triple well potential can show behavior similar to a field effect transistor. The left well is coupled only to the middle and is equivalent to the source in a transistor, the middle is coupled to both the left and right wells and is the equivalent of a gate, and the right well is the drain. The potential is designed so that the chemical potential of the atoms in the empty middle well is sufficiently smaller than in the left or right wells to block tunneling. A small number of atoms placed in the middle well switches the device and enables strong tunneling from the left to the right. This tunneling, controlled by the middle well, is due the atom-atom interactions which increase the chemical potential in the middle well and remove the energy mismatch. We show that the number of atoms tunneling into the right well can be much larger than the number of controlling atoms in the middle well. The three well structure demonstrates both absolute and differential gain. Estimates of the switching time and parameters for the potential are presented.

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