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Coherent Matterwave Emission from an Atomtronic Transistor CAMERON STRAATSMA, DANA ANDERSON, JILA/Univ of Colorado - Boulder — We investigate matterwave emission from a triple-well "transistor" atomic potential consisting of a "source" well treated as a reservoir having fixed chemical potential and temperature, a narrow "gate" well, and a "drain" well coupled to the vacuum. The ground state of the gate well is occupied by a Bose-Einstein condensate having large chemical potential along with the first excited state of the potential. These lower states are coupled to the two highest lying bound states lying near the top of the barriers separating the gate from the other two wells. We show that the energy level separations of the two lower states and the two upper states can be made degenerate by design of the Gaussian barrier widths and separation. When degenerate, the two pairs of states are strongly coupled by phonon exchange. We seek a self-consistent solution for the coupling between the high-lying states and the ground state pair, which occurs due to stimulated absorption and emission of phonons. In steady-state, coupling of the upper states leads to matter wave emission such that the emission of the two states is mutually coherent. The output from the transistor is thus an intensity-modulated matterwave whose frequency is approximately equal to the ground-state trap frequency.

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