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Quantum Channels and Conductance Oscillations in Metal/Molecule/Metal Switches FENG MIAO, Department of Physics and Astronomy, University of California, Riverside, CA 92521, DOUGLAS OHLBERG, R. STANLEY WILLIAMS, HP Labs, 1501 Page Mill Rd., Palo Alto, CA 94304 , C. N. LAU, Department of Physics and Astronomy, University of California, Riverside, CA 92521 — We investigate conductance switching in Pt/stearic acid monolayer/Ti devices by pressure-modulated conductance microscopy. For devices with conductance G>>G_Q and G<< G_Q, where G_Q is the conductance quantum, localized pressure-induced conductance peaks are observed, indicating formation of nanoscale conductance pathways on the electrodes. For devices with G$\sim$ 1- 2 G_Q, in addition of conductance peaks, we also observed conductance dips and oscillations in response to localized pressure. These results suggest formation of quantum conductance channels in our devices, and can be satisfactorily modeled by considering interfering electron waves between two partially transmitting electrodes. Moreover, the force dependence of such conductance modulations is fully consistent with this model. Our findings underscore the possible use of these devices as atomic switches.

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