Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

A single Jahn-Teller active electron as a multi-throw multipolar conductance switch[1] LAURA RIOS, JOONHEE LEE, NICHOLAS TALLARIDA, V. ARA APKARIAN, University of California, Irvine — The final limit in miniaturization of molecular electronics may be regarded as functionality attained through the manipulation of a single electron and no other moving parts. We demonstrate this limit, in the form of a three-throw, bipolar, bistable conductance switch realized by manipulating a Jahn-Teller (JT) active electron on a single zinc etioporphyrin radical anion (ZnEtio-) molecule at the double barrier junction of a cryogenic scanning tunneling microscope (STM). The vibronic JT potential determines the anisotropy of the topography. At resonance, the topography undergoes bistable switching and electroluminescence. Their difference map yields the wiring diagram of the conductance switch; and the spatially-resolved switching kinetics within the molecule yields functional maps for controlling the frequency/amplitude of the switch. Through detailed balance of spontaneous on/off rates, the energy difference between the states leading to the observed bistability is determined as $\sim$ 1 meV. We obtain a consistent interpretation of all observations by assigning the two states to Kramer's pair, with degeneracy broken due to pseudo-rotation on the JT vector potential, where the switching is understood as spin-flipping driven by scattering of tunneling electrons at resonance.

[1]Funding by NSF CCI Chemistry at the Space-Time Limit, CHE-082913

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Date submitted: 10 Jan 2014 Electronic form version 1.4