Abstract Submitted
for the NWS15 Meeting of
The American Physical Society

Particle Transport in 1D Lattices with Weakly Coupled Overlap Impurities EVAN JOHNSON, BRANDON PEDEN, SETH RITTENHOUSE, Western Washington University — We examine the transport properties of short molecular wires containing an atomic orbital overlap impurity that is weakly coupled to two electron reservoirs by two methods, a single-particle scattering model and a quantum master equation many-body approach. The two approaches agree qualitatively on the predicted electronic current. For certain parameter regimes, the current is dramatically changed due to the presence of an interference minimum in the transmission coefficient. This minimum manifests itself in the steady-state solutions to the quantum master equation as a dark state which is decoupled from the electronic reservoirs. In both cases, the effects are due to long-range hopping from the overlap impurity. We conclude that each model sufficiently captures the underlying physics of the system and that the interference behavior in the single particle transmission coefficient is well described by a quantum master equation with long-range system reservoir coupling.

Evan Johnson
Western Washington University

Date submitted: 27 Mar 2015 Electronic form version 1.4