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Decoherence Assisted Single Electron Trapping at Room Temperature AHMED ELHALAWANY, MICHAEL LEUENBERGER, University of Central Florida — In this work, we theoretically investigate electron transport in heterostructure semiconductor nanowire (NW). We develop a new mechanism to trap an electron in a quantum dot (QD) by means of decoherence. There are six QDs in the NW. Bias voltage (Vb) is applied across the NW and gate voltage (Vg) is applied to the auxiliary QD to control single charge tunneling. The single electron dynamics along the NW is calculated by means of the generalized master equation based on the tight binding model taking into account electron LO phonon interaction (ELOPI) and thermal broadening inside the QDs. It is shown that the decoherence, which is in the pico-second (ps) regime, speeds up the trapping of the electron in the central QD with probability of 70% in less than 2 ps. Our results can be used for the implementation of high temperature single photon source (SPS) or single electron transistor (SET). We acknowledge support from NSF (Grant No. ECCS-0725514), DARPA/MTO (Grant No. HR0011-08-1-0059), NSF (Grant No. ECCS-0901784), AFOSR (Grant No. FA9550-09-1-0450), and NSF (Grant No. ECCS-1128597).

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