Abstract Submitted
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Spatial Wavefunction Switched Field-Effect Transistors (SWS-FETs): A Novel Device with Multiple States and Functionality FAQUIR JAIN, EVAN HELLER[1], University of Connecticut — An asymmetric coupled quantum well transport channel FET is shown to confine carriers in either the lower of the two wells, both wells, or upper well (adjacent to the gate insulator) depending on the gate voltage. That is, as the gate voltage is increased above threshold in n-channel FET, the electron wavefunction is spatially switched, which in turn change the operating characteristics. A Spatial Wavefunction Switched (SWS) FET, having two coupled wells in the channel, provides four states 00, 01, 10, 11 corresponding to wavefunction location. No wavefunction being the OFF (00 state), electrons in well W2 (01 state), in well W1 (10 state), and both Wells W1-W2 (11 state). Simulation has verified the spatial switching in SiGe as well as InGaAs coupled well FET structures. The wavefunctions/carrier locations get more pronounced and result in additional states when the transport channel is configured as a quantum dot (QD) channel. Preliminary simulation of quantum dot gate 3-state structures [1], configured as SWS-QD channel FET, will also be presented. [1]. F.C. Jain, E. Heller, S. Karmakar, and J. Chandy, Device and Circuit Modeling using Novel 3-State Quantum Dot Gate FETs, ISDRS Proc 2007. *Supported in part by ONR Contract N00014-06-1-0016 and NSF ECS 0622068 grant.

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