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Spatial Wavefunction Switched (SWS) Field-Effect Transistors: Computing Using More Than Few Electrons[1] FAQUIR JAIN, U. Connecticut, EVAN HELLER, RSoft Design Group, JOHN CHANDY, U. Connecticut — Spatial Wavefunction Switched (SWS) Field-Effect Transistors (FETs), comprising two or more vertically-stacked asymmetric coupled-quantum wells (QWs), function as having multiple inversion channels, where the spatial location of the carrier ensemble wavefunction determines the state of the device [1]; e.g. electrons in well W2 (01), in W1 (10), in both (11), in neither (00). Carriers can be transferred within a FET vertically from one channel to the other or laterally to the channels of adjacent SWSFET devices by the manipulation of the gate voltages (V_g). This vertical and lateral manipulation of carrier location enables processing of 2 or more bits simultaneously, which results in reduced power, delay and device count. The wavefunction transfer to an upper well has been experimentally verified in an InGaAs SWS device. SWS-FET structures have been simulated to realize 3 bits or 8 states in three QW channels. Additional states can be implemented in SWS-FETs configured as quantum dots (QDs). SWS-QD structures, processing more than few electrons than Coulomb blockade devices [2], provide an alternate path to quasi-quantum computing. 1. F. Jain and E. Heller, Am. Phys. Soc. Proc., March 20, 2009 (Y28-8). 2. N. Shaji *et al.*, Nature Physics, 4, p.540, 2008.

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