Quantum-Dot Cellular Automata On A Hydrogenated Silicon Surface: An Exact Diagonalization Study BURKHARD RITTER, University of Alberta — Quantum-dot cellular automata (QCA) is an alternative computing paradigm for molecular-scale quantum devices. We present results from the first detailed exact diagonalization study of QCA systems using a richly extended Hubbard model. A controlled Hilbert space truncation alleviates the scaling problem and provides access to moderate system sizes. We characterize the static signal transmission for short wires and identify suitable material and system parameters for dangling bonds on a hydrogen-terminated silicon surface, a recent experimental realization. We discuss the challenges for a realistic, working implementation.

Burkhard Ritter
University of Alberta