Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Modeling and Simulation of Fault Tolerant Quantum-dot Cellular Automata Devices BENJAMIN PADGETT, Ball State University, GABRIEL ANDUWAN, Papua New Guinea University of Technology, MICHAEL KUNTZMAN, University of Texas, IOAN STURZU, Texas A&M University , MAHFUZA KHATUN, Ball State University — We present a theoretical study of fault tolerant properties in Quantum-dot Cellular Automata (QCA) Devices. The study consists of modeling and simulation of various possible manufacturing, fabrication and operational defects. We will present specifically the effects of temperature and manufacturing defects at the cell level and array level of various QCA devices. Results of simple devices such as quantum wire, logical gates, inverter, cross-over and XOR will be presented. The cell defects would include displaced dots and missing dots. A Hubbard-type Hamiltonian and the Inter-cellular Hartree approximation have been used for modeling the QCA devices. Various techniques such as normal, uniform and random distributions have been used for defect simulations. In order to show the operational limit of a device, defect parameters have been defined and calculated. Results show fault tolerance of a device is strongly dependent on the temperature as well as on the manufacturing defects.

Mahfuza Khatun
Ball State University

Date submitted: 23 Nov 2008 Electronic form version 1.4