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Fault Tolerant Characteristics in Quantum-dot Cellular Automata Devices MAHFUZA KHATUN, BENJAMIN PADGETT, Ball State University — We present analytical results of fault tolerant properties of various quantum-dot cellular automata (QCA) devices. In any electronic computation device such as a computer, one needs digital signals for computation. In this model, the binary numbers are encoded from charge configurations in quantum dots. Data transfer, signal flow, and computations can be performed by electron polarization in the nanostructure. Our main focus is to investigate the functionality of a QCA device by studying the thermal and manufacturing defects. A Hubbard-type Hamiltonian and Inter-cellular Hartree approximation have been used for modeling, and a uniform random distribution has been implemented for the defect simulations. Simple devices such as quantum wire, logical gates, inverter, cross-over, XOR, and Full Adder will be discussed. Results show fault tolerance of a device is strongly dependent on the temperatures as well as on the manufacturing defects.

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