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Monte Carlo simulations of gated microchannel plate x-ray detectors CRAIG KRUSCHWITZ, MING WU, JIAMING MORGAN, DANE MORGAN, Bechtel Nevada, Los Alamos Operations — High-speed, gated x-ray detectors based on straight-channel microchannel plates are a powerful diagnostic tool for two-dimensional, time-resolved imaging and time-resolved x-ray spectroscopy in the field of laser-driven inertial confinement fusion and fast z-pinch experiments. For these applications a short high-voltage pulse (typically a few hundred picoseconds) is sent across a microstrip transmission line coated onto the microchannel plate, thus producing the desired gating. The subject of this paper is a Monte Carlo code that we developed to simulate the electron cascade in a microchannel plate under such pulsing. The model includes the effects of space charge and channel wall charging. These contribute to high gain saturation in the microchannel plate. Additionally, elastic reflection of low-energy electrons from the channel wall, which is important at lower voltages, is also included. The model results are compared to measured microchannel plate sensitivities and good agreement is found. The results of simulations of pulsed behavior are presented and ramifications are discussed.

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