Abstract Submitted
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Electron Steering with a Low-Power Optical Laser[1] PETER BEIERLE, University of Nebraska-Lincoln, WAYNE HUANG, Texas A&M University, ROGER BACH, MARIA BECKER, DEREK RUFFNER, HERMAN BATELAAN, University of Nebraska-Lincoln — As a beam of 4 keV electrons pass by a metallic wall which is illuminated by a laser beam (typically 10 mWatt and 658 nm), the electrons experience a force that deflects the beam's direction by 550 μrad when the electrons are approx. 10 μm from the surface [1]. This "electron switch" has a response time of approximately 6 μs; the deflection of the electron beam is shown to decrease as the beam's distance to the wall increases beyond the laser spot size, giving an observed electron deflection up to 200 μm from the surface.This switching mechanism is shown to be robust, as it is demonstrated for various optical wavelengths and surfaces. This type of electronic-free electron manipulation has potential use in electron beam microscopy (EBM) and electron beam lithography (EBL). In addition, while diffracting a 10keV electron beam through a nanofabricated electron grating, we observe the effects of illuminating the grating with a laser beam, with inconclusive results which seem to depend on the wavelength of the laser and relative angles between the grating and the laser beam & electron beam.

[1] W. Huang, R. Bach, P. Beierle, H. Batelaan,J. Phys. D, "A Low-Power Optical Electron Switch" (accepted, forthcoming in February 2014)

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Peter Beierle
University of Nebraska-Lincoln

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