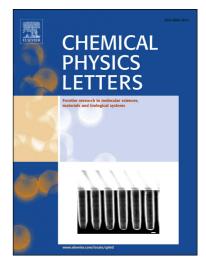
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Research paper

Ultrafast Electron Microscopy: Instrument Response from the Single-Electron toHigh Bunch-Charge Regimes

Dayne A. Plemmons, David J. Flannigan

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ACCEPTED MANUSCRIPT

Ultrafast Electron Microscopy: Instrument Response from the Single-Electron to High Bunch-Charge Regimes

Dayne A. Plemmons and David J. Flannigan*

Department of Chemical Engineering and Materials Science, University of Minnesota, 421 Washington Avenue SE, Minneapolis, MN 55455, USA

Abstract: We determine the instrument response of an ultrafast electron microscope equipped with a conventional thermionic electron gun and absent modifications beyond the optical ports. Using flat, graphite-encircled LaB₆ cathodes, we image space-charge effects as a function of photoelectron-packet population and find that an applied Wehnelt bias has a negligible effect on the threshold levels (>10³ electrons per pulse) but does appear to suppress blurring at the upper limits (~10⁵ electrons). Using plasma lensing, we determine the instrument-response time for 700-fs laser pulses and find that single-electron packets are laser limited (1 ps), while broadening occurs well below the space-charge limit.

*Author to whom correspondence should be addressed. Email: <u>flan0076@umn.edu</u> Office: 612-625-3867 Fax: 612-626-7246 Download English Version:

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