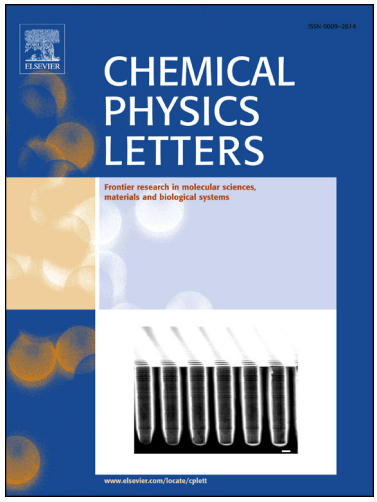

Research paper

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

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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 LaB_6 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 ($>10^3$ electrons per pulse) but does appear to suppress blurring at the upper limits ($\sim10^5$ 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.

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