A LASER-COOLED ELECTRON SOURCE FOR ULTRAFAST ELECTRON DIFFRACTION

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Abstract

Ultrafast electron diffraction (UED) enables single-shot studies of structural dynamics at atomic length and time scales, i.e. 0.1 nm and 0.1 ps. At present UED experiments are based on femtosecond laser photoemission from solid state cathodes. We propose a new type of electron source, based on near-threshold photoionization of a laser-cooled and trapped atomic gas. The electron temperature of these sources can be as low as 10 K. This implies an increase in brightness by orders of magnitude and enables single-shot studies of, e.g., biomolecular samples. In this contribution we numerically investigate the performance of a laser-cooled electron source by GPT tracking simulations with realistic fields and all pairwise Coulomb interactions.

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