

Abstract Submitted
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Simultaneous observation of ultrafast structural dynamics and transient electrical field by picosecond electron pulses¹ RUN-ZE LI, PENGFEI ZHU, LONG CHEN, JIE CHEN, Key Laboratory for Laser Plasmas and Department of Physics and Astronomy, Shanghai Jiao Tong University, JIANMING CAO, Physics Department and National High Magnetic Field Laboratory, Florida State University, ZHENG-MING SHENG, JIE ZHANG, Key Laboratory for Laser Plasmas and Department of Physics and Astronomy, Shanghai Jiao Tong University — Ultrafast electron diffraction and microscopy are very promising methods to study transient structural dynamics with atomic spatial-temporal resolution. However, in these laser-pump electron-probe studies of structural dynamics, a transient electric field induced by laser excitation of the sample could deflect probing electrons, which may eventually leads to a misinterpretation of the diffraction data. Here, picosecond structural dynamics and transient surface electric field evolution, excited by femtosecond laser interaction with a metallic thin film, have been observed simultaneously in real time by ultrashort electron pulses in a transmission configuration. By tracing time dependent changes of electron diffraction and deflection angles, these two processes are found to be significantly different and distinguishable in their temporal behavior. This observation provides an effective approach to extract the otherwise obscured ultrafast structural dynamics and may help to improve the spatiotemporal resolution in ultrafast electron diffraction and microscopy studies.

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