Electron Thermal Distribution Measurement of Above-Threshold Ionized He Plasmas

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Above-threshold ionization (ATI) has been shown to be an effective way to heat a plasma [1]. The quasi-classical theory of tunnel ionization implies that a plasma optically ionized by a circularly polarized pulse can have electrons several times hotter than by a linearly polarized one. Electrons emitted from optically ionized plasmas with high kinetic energy have been measured through experiments [2, 3]. However, the detailed dynamics of ATI heating has not yet been shown experimentally. We propose an experiment to use Thomson scattering to characterize the helium plasma after optical-field ionization by intense femtosecond pulses. The time evolution of plasma electron distribution will be measured using an independently delayed femtosecond probe beam with 5 nm bandwidth. The anisotropic energy distribution from a linearly polarized laser pulse predicted by quasi-classical theory will also be verified.

References

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