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Superthermal Electron Produced in Relativistic Laser-Plasma Interaction

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Abstract: The dynamics of a relativistic electron submitted to an intense, plane wave, linearly polarized laser field is reviewed. Based on the dynamics, the temperature of the electron in the laser field is defined and calculated. It is found that the calculated temperature fits the first temperature observed in the experiment by Malka et al. A model to evaluate the electron temperature by taking the electron-ion scattering into account is proposed. It is found that when $I \geqslant 4.0 \times 10^{18}$ W/cm^2 the electron temperature by considering the scattering, T_h^s, is evidently larger than the electron temperature without considering the scattering, T_h. This result is in favor of explaining the two-temperature distribution of the electron energy observed in the experiment by Malka et al.

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Key words: two-temperature distribution of superthermal electron energy, dynamics of a relativistic electron, relativistic laser-plasma interaction

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