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Title:Studies on the mechanisms of powerful terahertz radiations from laser plasmas
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Abstract:A survey on the mechanisms of powerful terahertz (THz) radiation from laser plasmas is presented. Firstly, an analytical model is described, showing that a transverse net current formed in a plasma can be converted into THz radiations at the plasma oscillation frequency. This theory is applied to explain THz generation in a gas driven by two-color laser pulses. It is also applied to THz generation in a tenuous plasma driven by a chirped laser pulse, a few-cycle laser pulse, a DC/AC bias electric field. These are well verified by particle-in-cell simulations, demonstrating that THz radiations produced in these approaches are nearly single-cycles and linear polarized. In the chirped laser scheme and the few-cycle laser scheme, THz radiations with the peak field strength of tens of MV/cm and the peak power of gigawatt can be achieved with the incident laser intensity less than 1017 W/cm2.
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