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Plume splitting and oscillatory behavior in transient plasmas generated by high-fluence laser ablation in vacuum

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Highlights

- Review of plume splitting and oscillatory effects in laser-produced plasmas
- Link between plume splitting, two-electron-temperature, double-layer, oscillations
- Novel theoretical approaches to account for the peculiar experimental observations

Abstract

We present a short overview of studies performed in our research groups over the last decade on the characterization of transient plasma plumes generated by laser ablation in various temporal regimes, from nanosecond to femtosecond. New results are also presented along with this overview, both being placed in the context of similar studies performed by other investigators. Optical (fast gate intensified CCD camera imaging and space- and time-resolved emission spectroscopy) and electrical (mainly Langmuir probe) methods have been applied to experimentally explore the dynamics of the plasma plume and its constituents. Peculiar effects as plume splitting and sharpening or oscillations onset have been evidenced *in vacuum* at high laser fluence. New theoretical approaches have been developed to account for the experimental observations.

Keywords: laser ablation, transient plasma dynamics, plasma oscillations, Langmuir probe, optical emission spectroscopy, plasma simulation