Simulations of laser-assisted capillary discharges

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Capillary discharges are widely used in many experiments devoted to laser-plasma interaction as a simple tool to obtain suitable plasma. For example, state-of-the-art laser-plasma accelerators (LPA) make use of laser guiding by capillary discharge channels [1]. Laser pulse generates a wake-wave while propagating through the channel. This wave follows the pulse and captures free or injected electrons, thus accelerating them.

In the recent LPA experiments a relatively narrow sub-channel is formed near the capillary axis by additional laser heating. The aim is to mitigate the unwanted interaction of main laser pulse with the capillary walls and improve its guiding [2].

Consistent numerical simulation of both discharge plasma and laser pulse dynamics is required to maintenance such experiments. The MHD code MARPLE [3–5] was improved by taken into account additional heating due to laser radiation for this purpose. Simulation results of the laser-assisted capillary discharge will be presented.

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References

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