Laser-generated toroidal helium plasmas

Kooij, V.L.

Author: Kooij, V.L.
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Stellingen

Behorend bij het proefschrift
"Laser-generated toroidal helium plasmas"

1. The enhanced strength of a shock wave due to a Mach reflection, used to determine the optimum height of burst of an atomic bomb, can also be used to explain the generation of a toroidal plasma in laser-induced breakdown experiments.
   Chapter 3 of this dissertation.

2. The development of laser-generated toroidal plasmas can be explained solely from fluid dynamical arguments.
   Chapter 2 of this dissertation.

3. Laser-induced plasmas can be used as a high-speed imaging technique for shock-front propagation.
   Chapter 3 of this dissertation.

4. Combining finite-element calculations with microwave transmission measurements is a promising method to obtain the electron density of small, fast changing plasmas. Further improvements can be made by using optical plasma images as a basis for the finite-element calculations.
   Chapter 4 of this dissertation.

5. Microwave excitation of a laser-generated toroidal plasma using the fundamental mode of a microwave cavity does not lead to reheating of the toroidal plasma, but instead to the generation of an additional plasma.
   Chapter 5 of this dissertation.

6. The assumption by Harilal et al. that the back reflection of a shock wave is responsible for halting the expansion of a laser-generated plasma is incorrect.
   Harilal et al., Phys. Plasmas 22, 063301 (2015).

7. Although the simulations of laser-induced air breakdown by Alberti et al. reveal a shock wave with enhanced strength, they fail to recognise it as a Mach reflection.
   Alberti et al., AIAA Scitech 2019 Forum, 1250 (2019).

8. The claim by Nedanovska et al. that the expansion of their laser-induced, atmospheric, helium plasma conforms to a non-radiative spherical blast wave is questionable.
   Nedanovska et al., J. Appl. Phys. 117, 013302 (2015).

9. The topological model of ball lightning as a knot of linked streamers by Rañada et al. can be verified experimentally by a suitable set of conductors whose spatial distribution is dictated by Paschen's law and the knot's equilateral stick number.
   Rañada et al., Phys. Rev. E 62, 7181 (2000).

Vincent Kooij
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