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Analytical Investigation of Electron Trajectories in Vacuum Arc Ignition Under Static Electric and Magnetic Fields

Vacuum arcs have been studied for over a century due to their relevance in high-voltage engineering, accelerator science, and power switching. In applications such as muon colliders and vacuum interrupters, magnetic fields are present and may influence the early stages of plasma formation in vacuum arcs. In this study, we explore electron trajectories during the ignition phase of a vacuum arc under the influence of static electric and magnetic fields with different co-orientations. Our approach is based on a system of differential equations governed by the Lorentz force, where trajectory equations are parameterized by the relevant field components.

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Modeling and simulations

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