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The aero-optical performance of inductively-coupled plasma adaptive lenses[1] JAVIER URZAY, MILAD MORTAZAVI, ALI MANI, Center for Turbulence Research, Stanford University — In this presentation, we address the optical performance of a plasma adaptive lens for ground-surveillance applications by using three-dimensional numerical simulations and scaling analyses. The principle of operation of a plasma lens consists of controlling the refractive-index distribution, or equivalently, the electron-density field in an ionized-gas environment. A closed cylindrical chamber filled with Argon plasma is used as a model lens. In principle, scaling analyses show that increasing the input electric power increases the optical performance of the plasma lens. However, the numerical simulations reveal that this design shift makes the plasma lens more susceptible to buoyant and centrifugal hydrodynamic instabilities, which are caused by gravity-driven thermal convection and cycle-averaged Lorentz forces. This destabilization effect, in turn, breaks the initial axisymmetry and leads to the occurrence of discrete electron-rich spots, which degrade the optical performance of the plasma lens.

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