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Relaxation of multi-ion plasmas in an internal conductor

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The possibility of the formation and characteristics of the relaxed structures in the multi-ion magnetized plasmas consisting of heavy ions, light ions, and inertia-less electrons have been explored. Using the vortex dynamic equations with the current density, the system is relaxed to triple Beltrami states. Solutions of the relaxed states are determined in two different cases: (i) simple slab geometry and (ii) slab geometry with an internal conductor. The impact of Beltrami parameters and density ratios of the plasma components on the formation of equilibrium structures in both geometries has been studied. Moreover, we also highlight the equivalences of both geometries (simple slab geometry and a slab geometry with an internal conductor). This investigation will be useful for studying and understanding the relaxed structures in different astrophysical objects such as solar wind, Earth's ionosphere, near-Earth plasmasheet, upper ionosphere, and Saturn in the the laboratory plasmas having two positively charged ions of different masses. Moreover, this work will be helpful in describing the underlying physics of the relaxed structures. These structures are developed in different astrophysical bodies that revolve around the planet such as Jupiter magnetosphere

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