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The Multipole Plasma Trap—PIC Modeling Results[1] NATHANIEL HICKS, AMANDA BOWMAN, KATARINA GODDEN, University of Alaska Anchorage — A radio-frequency (RF) multipole structure is studied via particle-in-cell computer modeling, to assess the response of quasi-neutral plasma to the imposed RF fields. Several regimes, such as pair plasma, antimatter plasma, and conventional (ion-electron) plasma are considered. In the case of equal charge-to-mass ratio of plasma species, the effects of the multipole field are symmetric between positive and negative particles. In the case of a charge-to-mass disparity, the multipole RF parameters (frequency, voltage, structure size) may be chosen such that the light species (e.g. electrons) is strongly confined, while the heavy species (e.g. positive ions) does not respond to the RF field. In this case, the trapped negative space charge creates a potential well that then traps the positive species. 2D and 3D particle-in-cell simulations of this concept are presented, to assess plasma response and trapping dependences on multipole order, consequences of the formation of an RF plasma sheath, and the effects of an axial magnetic field. The scalings of trapped plasma parameters are explored in each of the mentioned regimes, to guide the design of prospective experiments investigating each.

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