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Ion Collection by a Sphere in a Magnetized Collisional Plasma¹

CHRISTIAN BERNT HAAKONSEN, IAN H. HUTCHINSON, MIT PSFC — Ion collection by dust grains and probes in plasmas with a neutral background are of relevance to both space and terrestrial plasmas. It has recently been shown that moderate charge-exchange collisionality can enhance the ion current to a collecting sphere beyond that given by orbital motion limited (OML) theory. In the collisionless case a background magnetic field reduces ion collection, but how a magnetic field affects the collisional current enhancement remains unknown. The hybrid particle-in-cell (PIC) code sceptic3D is used to study collisional current enhancement in the presence of a magnetic field. Figures are presented showing the dependence of the collected current on both magnetic field strength and collisionality, and illustrative examples are used to provide physical insight into the magnetic field and collisional effects on ion collection. Further, a preview is given of future work on the fully 3D problem of ion collection in drifting magnetized plasmas.

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