

On a stationary dust grain in a flowing plasma

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A dust grain in a plasma collects both ions and electrons, and in the steady state charges to a negative potential to balance these currents. Such grains are typically much smaller than the electron Debye distance, a property that we exploit using the technique of matched asymptotic expansions. We study analytically the electric and velocity potentials in the case of a uniform plasma flow past the grain. At large distances from the grain the electric potential has a strong dipole component and a lesser contribution due to a small space charge. For plasma flow above a certain threshold numerical work is required in order to obtain the complete solution to the problem.