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Affect of an electrostatic wave on optical pumping[1] FREDERICK SKIFF, Univ of Iowa, FENG CHU, University of Iowa — Extensive information can be obtained on wave-particle interactions and wave fields by direct measurement of perturbed ion distribution functions using laser-induced fluorescence (LIF). For practical purposes, LIF is normally performed on metastable states – here we consider singly ionized Argon in an inductively coupled plasma. Wave detection is best performed using phase-coherent detection, but power spectra can be obtained through correlation functions. If laser intensity is increased to obtain a better LIF signal, then the effects of optical pumping will produce systematic effects depending on the collision rates which control metastable population and lifetime. We simulate the wave-detection process using a Lagrangian model for the LIF signal. This approach separates the classical dynamics of the ion orbits from the quantum-state transitions produced by optical pumping. The two dynamics nevertheless become coupled in the presence of an electrostatic wave. The numerical simulation is compared with experimental data from a CW magnetized plasma discharge with externally launched ion acoustic waves.

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