Fast Electron Transport In
Lower-Hybrid Current Drive

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Abstract

We generalize the quasilinear-Fokker-Planck formulation for lower-hybrid current drive to include the wave induced radial transport of fast electrons. Toroidal ray tracing shows that the wave fields in the plasma develop a large poloidal component associated with the upshift in \( k_p \) and the filling of the "spectral gap". These fields lead to an enhanced radial \( E \times B \) drift of resonant electrons. Two types of radial flows are obtained: an outward convective flow driven by the asymmetry in the poloidal wave spectrum, and a diffusive flow proportional to the width of the poloidal spectrum. Simulations of Alcator C and JT60, show that the radial convection velocity has a broad maximum of nearly 1 m/sec and is independent of the amplitude of fields. In both cases, the radial diffusion is found to be highly localized near the magnetic axis. For JT60, the peak of the diffusion profile can be quite large, nearly 1 m²/sec.

PACS Numbers: 52., 52.50.Gj, 52.25.Fi, 52.55.Fa

April 19, 1991