

Fast Wave Current Drive in Low Aspect Ratio Tokamaks

S.C. Chiu, V.S. Chan, R.L. Miller, Y.R. Lin-Liu,
and T.K. Mau*

*General Atomics, P.O. Box 85608,
San Diego, California 92186-5608, U.S.A.*

Abstract

The magnetic field of a low aspect ratio tokamak (LAT) deviates rather significantly from the approximately $1/R$ dependence of the conventional tokamaks. The parametrization of current drive efficiency based on the conventional large aspect ratio tokamak becomes inaccurate. In this paper, the physics of high harmonic ion cyclotron fast wave current drive and low frequency fast wave current drive in LATs is examined using exact evaluations of the current drive efficiencies from the adjoint technique. The results indicate that the high harmonic ion-cyclotron scheme cannot penetrate to the plasma core at high beta values typical of LAT reactors, and hence may only be applicable for off-axis steady state current drive, while the low frequency scheme penetrates well into the plasma core and is appropriate for on axis current profile control. The implications for advanced scenarios of LAT is discussed.

*University of California, San Diego, 500 Gilman Dr., La Jolla, California 92093, U.S.A.