Observation of parametric instabilities in the lower hybrid range of frequencies in the Alcator C tokamak

Y. Takase, M. Porkolab, J. J. Schuss, a) R. L. Watterson, and C. L. Fiore

Plasma Fusion Center, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139

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Parametric decay processes have been studied using rf probes and CO2 laser scattering during the lower-hybrid wave heating and current drive experiments in the Alcator C tokamak. The most important process is believed to be the nonresonant decay into ion-cyclotron quasimodes and/or that into electron-Landau quasimodes. At lower densities $\omega_0/\omega_{LH}(0) > 2$ [where $\omega_0$ is the frequency of the injected pump wave and $\omega_{LH}(0)$ is the lower-hybrid frequency evaluated at the plasma center], where efficient current drive and electron heating are obtained, parametric decay is absent or very weak. At higher densities $|\omega_0/\omega_{LH}(0)| \lesssim 2$ strong parametric decay is observed which correlates well with ion tail formation near the plasma edge. At these high densities no significant heating or current drive have been observed. Parametric decay may be, at least partially, responsible for loss of wave power near the plasma periphery.

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1