

High Density LHRF Experiments in Alcator C-Mod and Implications for Reactor Scale Devices

EX/P6-17

Background:

Active current drive is essential for steady-state or very long pulses in a tokamak reactor.

Neutral beams are unattractive for reactors. Issues: extension radio nuclide confinement boundary, reduction of TBR, reliability, neutron streaming

Of the RF current drive schemes, lower hybrid current drive is the best developed and most efficient. However, loss of efficiency at high density is an issue needing resolution.

EX/P6-17 key results:

Loss of LHCD efficiency at high density is associated with excitation of Parametric Decay Instabilities.

PDI are excited near the separatrix and onset can be mitigated by modifying conditions in the scrape-off layer.

The most attractive location for LH launchers is on the inner wall. The higher field improves penetration, results in higher efficiency and better current profile control.

In addition, operation with double null equilibria presents a predictable, quiescent edge plasma which can be tailored to optimize coupling, minimize plasma damage to coupler and avoid PDI.

A conceptual design to test this concept has been developed for the ADX proposal (see paper FIP/P7-18)

