Low-frequency (<5 kHz) MHD is sometimes observed on magnetic pickup loops (shown above) and soft x-ray arrays during high-power LHRF in Alcator C-Mod. The onset occurs just before 1.2 s in the discharge shown.

Low-frequency MHD instabilities sometimes, but not always, results in a reduction in LH current-drive efficiency. The shaded region indicates the onset of low frequency MHD instability in this discharge.

The probability of deleterious MHD generally increases as the LHRF power normalized to line average density increases. Green triangles represent stable discharges. Solid red circles represent unstable discharges prior to onset of instability, and open red circles represent unstable discharges following onset of instability.

Abstract. The lower hybrid current drive (LHCD) system on Alcator C-Mod is capable of sustaining fully non-inductive discharges for multiple current relaxation times (tcr ~ 200 ms) at line averaged densities in the range of 5x1019 m-3. Some of these non-inductive discharges develop unstable MHD modes that can greatly reduce current drive performance, particularly in discharges with plasma current of 0.5 MA or less [1,2]. Avoiding these unstable MHD modes motivated an experiment to test if the stable current profile shape of a higher current non-inductive discharge could be achieved in a lower current discharge. Starting from a discharge at 0.8 MA, the plasma current was ramped down to 0.5 MA over 200 ms. The surface voltage of the plasma swings negative during the ramp, with the loop voltage reversal impacting the edge fast electron measurements immediately. Little change can be seen during the Ip ramp in the core fast electron measurements, indicating that the loop voltage reversal does not penetrate fully to the magnetic axis on the timescale of the current ramp. The resulting discharge did not exhibit deleterious MHD instabilities, however the existence of this one discharge does not necessarily represent a robust solution to the problem.

The probability of deleterious MHD generally increases as the LHRF power normalized to line average density increases. Green triangles represent stable discharges. Solid red circles represent unstable discharges prior to onset of instability, and open red circles represent unstable discharges following onset of instability.