# Experimental Study of Reversed Shear Alfvén Eigenmodes During ICRF Minority Heating and Relationship to Sawtooth Crash Phenomena in Alcator C-Mod*

E.M. Edlund, **M. Porkolab**, L. Lin, S.J. Wukitch, MIT Plasma Science and Fusion Center, and G.J. Kramer, Princeton Plasma Physics Laboratory

The phase contrast imaging (PCI) diagnostic has been used for extensive study of reversed shear Alfvén eigenmodes (RSAEs) and toroidicity induced Alfvén eigenmodes (TAEs) in Alcator C-Mod [1,2]. The modes are excited by the energetic minority hydrogen ions in the presence of intense ICRF heating in the majority deuterium plasma during current ramp. The large radial extent of the vertically viewing PCI laser beam, approximately 30% of the midplane width, allows for detailed measurements of the structure of core-localized Alfvén modes. Of primary importance is the finding of the correlation between the radial structure of the RSAEs measured by PCI and the radial position of the minimum of the q-profile ($q_{min}$). This correlation can be quantified through a "synthetic PCI" program developed for use with the ideal MHD code NOVA [3]. These techniques have been quantified under the well documented conditions found in the plasma current ramp phase and are now being applied to RSAEs observed during the sawtooth cycle in the flattop current phase. The sawtooth crash, also internal disruption, is an abrupt and periodic redistribution of the internal plasma equilibrium, in particular the plasma current and pressure profile. The existence of RSAEs between sawtooth crash events is a significant recent discovery as it enables us to further diagnose properties of the internal magnetic configuration and current profile following the sawtooth crash. Furthermore, their very existence strongly suggests that some amount of reversed shear is present following the sawtooth crash, a feature not frequently recognized in related theories. We shall present a comparison of these results with the NOVA code predictions and with available theoretical models.

**References**.

1. E. Edlund, M. Porkolab, L. Lin, et al, Bull. Am. Phys. Soc **52,** 216 (2007).
2. E. Edlund, M. Porkolab, L. Lin, et al, to be published.
3. C.Z. Cheng and M.S. Chance, J. of Comp. Phys. **71**, 124 (1987).

*****Work supported by U.S. DOE under DE-FG02-94-ER54235 and DE-FC02-99-ER54512