

Abstract Submitted
for the DPP08 Meeting of
The American Physical Society

Control of edge localized modes through toroidally asymmetric scrape-off layer current perturbations¹ I. JOSEPH, R.H. COHEN, D.D. RYUTOV, M.V. UMANSKY, X.Q. XU, LLNL — Resonant magnetic perturbations (RMPs) can suppress the edge-localized MHD instabilities (ELMs) that limit the divertor target lifetime of H-mode tokamak fusion reactors. However, efficiently driving RMPs requires placing current carrying conductors as close as possible to the plasma, and engineering issues complicate the design of in-vessel components. We suggest driving the needed current through the scrape-off layer (SOL) plasma itself: current densities as large as $J_{sat} = en_i c_s$ can be driven by several means, including biasing the target to potentials of order T_e . Biasing in a toroidally varying fashion generates an asymmetric current density parallel to field lines in the SOL and a magnetic perturbation that is naturally aligned with field lines near the separatrix. Analytic estimates indicate that the resonant harmonics are larger than the $\delta B/B > 10^{-4}$ criterion required for experimental ELM control. Magnetic island structure inside the separatrix will be investigated using the BOUT code.

¹Work performed under the auspices of the US DOE by LLNL under Contract DE-AC52-07NA27344.

Ilon Joseph
Lawrence Livermore National Laboratory

Date submitted: 21 Jul 2008

Electronic form version 1.4