

Abstract Submitted  
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**Discharge Evolution Control via 3D Field ELM Pacing in NSTX<sup>1</sup>**

A.C. SONTAG, J.M. CANIK, R. MAINGI, ORNL, D.A. GATES, S.P. GERHARDT, PPPL, V.A. SOUKHANOVSKII, LLNL — ELMs triggered by externally applied 3D magnetic perturbations in conjunction with fueling optimization have been used to prevent the uncontrolled rise in density, radiated power and impurity accumulation observed in otherwise ELM-free NSTX discharges. The frequency of n=3 perturbations was scanned from 10 to 80 Hz with 100% ELM triggering achieved up to 60 Hz. Triggered ELMs arrested the rise in radiated power with only a 10% decrease in the total stored energy. Gas fueling optimization by replacing the typical single-pulse high field side fueling with pulsed supersonic gas injection resulted in elimination of the secular density rise during the discharge. Density remained below  $5 \times 10^{19} m^{-3}$  for the first time throughout the length of a high-performance discharge. Negative amplitude current pulses in the n=3 coils subsequent to the triggering pulses were successful in minimizing the duration of the n=3 perturbations at the surface of the plasma. This resulted in less rotation braking and delayed the appearance of deleterious MHD.

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