Abstract Submitted
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Transport and linear stability studies for PPCD optimization in RFPS GIAN LUCA DELZANNO, JOHN M. FINN, LANL, JOHN SARFF, U. Wisconsin — We have combined 1D transport simulations of pulsed poloidal current drive (PPCD) together with linear stability studies for a wide spectrum of m=1 and m=0 modes. The present model assumes zero beta and a specified form of resistivity increasing near the edge. The model includes a "dynamo" term in Ohm's law which is gradually decreased to zero during the early part of the PPCD cycle, simulating the decrease in tearing mode activity as PPCD progresses. We present several initial studies with ad-hoc waveforms in time for the wall electric field, and measure the fraction of time over which m=1, m=0 stability is achieved. We have also developed a more systematic scheme by which we decrease the toroidal electric field at the wall and determine the poloidal electric field there by requiring the parallel electric field to be zero there. (This ensures zero helicity dissipation at the edge.) This programming is designed to match at a specific time a self-similar rampdown (SSRD) state [1]. After this time the wall electric field components are then programmed to decay exponentially. We have mapped out the full parameter space of these SSRD states and their linear stability to m=1 and m=0 modes. A PPCD scenario is considered optimal if it has a slow decay rate and develops into a SSRD state well inside the stable SSRD regime.

[1] R. Nebel, D. Schnack, and T. Gianakon, Phys. Plasmas 9, 4968 (2002).

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