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NIMROD Modeling of Sawtooth Modes Using Hot-Particle Closures[1] SCOTT KRUGER, T.G. JENKINS, Tech-X Corporation, E.D. HELD, Utah State University, J.R. KING, Tech-X Corporation — In DIII-D shot 96043, RF heating gives rise to an energetic ion population that alters the sawtooth stability boundary, replacing conventional sawtooth cycles by longer-period, larger-amplitude 'giant sawtooth' oscillations. We explore the use of particle-in-cell closures within the NIMROD code to numerically represent the RF-induced hot-particle distribution, and investigate the role of this distribution in determining the altered mode onset threshold and subsequent nonlinear evolution. Equilibrium reconstructions from the experimental data are used to enable these detailed validation studies. Effects of other parameters on the sawtooth behavior, such as the plasma Lundquist number and hot-particle beta-fraction, are also considered. The fast energetic particles present many challenges for the PIC closure. We review new algorithm and performance improvements to address these challenges, and provide a preliminary assessment of the efficacy of the PIC closure versus a continuum model for energetic particle modeling. We also compare our results with those of Choi *et al.* [Phys. Plasmas **14**, 112517 (2007)], and discuss plans for a more complete validation campaign for this discharge.

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