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Numerical study of rotational instabilities and beam ion effects in FRC using the HYM code ELENA BELOVA, PPPL, D. BARNES, S. DETTRICK, A. NECAS, Tri Alpha Energy, TAE TEAM TEAM — Numerical study of FRC spin-up and the effects of end-biasing on FRC stability has been performed using a 3D nonlinear hybrid version of the HYM code for TAE FRC experimental parameters. The n=1 tilt mode is found to be weakly unstable in S*=9 FRC, and it saturates nonlinearly at small amplitude. Simulations including the particle loss and periodic BCs show all low-n modes stable for large resistivity. End-shorting results in faster spin-up and instability of n=1 tilt and subsequent growth of the n=2 rotational mode. Depending on value of applied end-biasing electric field, the n=1 wobble or n=2 rotational mode becomes unstable. Hybrid simulations with non-symmetric BCs with/without end-shorting show strongly unstable n=1 radial shift (wobble) mode. The effects of energetic beam ions on FRC stability properties have been also investigated numerically using a hybrid version of the HYM code. Stability properties of co-interchange (kink) modes with different toroidal mode numbers n=1-4 and the beam driven instabilities have been studied for realistic TAE equilibrium and slowing down distribution for the beam ions.

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