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Rotational modes studies using NIMROD and HYM codes ALES NECAS, DAN BARNES, Tri Alpha Energy, Inc., Rancho Santa Margarita, CA 92688, RICHARD MILROY, PSI Center, University of Washington, Seattle, WA 98195, ELENA BELOVA, Princeton Plasma Physics Laboratory, Princeton, NJ 08540, USA — Gyroviscous (GV) stress for weakly magnetized plasma has been implemented in the NIMROD code [1] to study Hall and FLR effects on FRC stability with emphasis on the rotational modes n=>2. For the n=2 mode a 50% reduction of the MHD growth rate is shown. Parallel study of the same rotational modes has been performed with a 3D hybrid code – HYM [2]. Firstly, the effects of minority fast ions (beam ions) on the FRC rotational stability are investigated. It is found that beam ions either stabilize or destabilize rotational modes depending on equilibrium, mode number, and numerous beam parameters. Secondly, HYM and NIMROD codes are applied to the study of end-biasing effects on the rotational modes. Experimentally applied bias voltages are used to modify the end boundary conditions in the simulations. The resulting electric potential is a flux quantity. By controlling the bias voltage, the open-field plasma rotation can be modified and coupled to the core plasma, thus controlling the spin-up. Both studies (beam and end-biasing) are extensively compared with experimental results.

[1] D. C. Barnes, Phys. Plasmas, **20**, 014504 (2013)
[2] E.V. Belova, S. C. Jardin, H. Ji, M. Yamada, and R. M. Kulsrud, Phys. Plasmas **7**, 4996 (2000).

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