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Nonlinear Simulations of Global Alfvén Eigenmodes Excitation and Stabilization in NSTX-U.[1] ELENA BELOVA, ERIC FREDRICKSON, JEFF LESTZ, Princeton Plasma Physics Laboratory, NEAL CROCKER, UCLA, NSTX-U TEAM — Nonlinear simulations using the HYM code have been performed to study the excitation and stabilization of GAEs in the NSTX-U right before and shortly after the additional off-axis beam injection. The numerical study has been motivated by the experimental discovery of a strong stabilizing effect that large pitch beam ions from the new beam sources have on these modes. The simulations reproduce experimental finding, namely it is shown that off-axis neutral beam injection reliably and strongly suppresses all unstable GAEs. Before additional beam injection, the simulations show unstable counter-rotating GAEs with toroidal mode numbers and frequencies that match the experimentally observed modes. Additional off-axis beam injection has been modelled by adding beam ions with large pitch, and varying density. The complete stabilization occurs at less than 7% of the total beam ion inventory. New analytic theory of GAE (de)stabilization has also been derived, predicting a range of most unstable mode frequencies, and suggesting a different interpretation for GAE stabilization mechanism compared to previous studies.

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