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Database study of fast-ion instabilities[1] WILLIAM HEIDBRINK, University of California, Irvine, M. VAN ZEELAND, X. DU, General Atomics
— To understand mode stability, over 1000 discharges have been examined for evidence of ellipticity-induced, toroidal, reversed-shear, and beta-induced Alfven eigenmodes (EAE, TAE, RSAE, BAE), for beta-induced Alfven-acoustic eigenmodes (BAAE), and for energetic-particle geodesic acoustic modes (EGAM) instabilities. The database is limited to the initial two seconds of the discharge, where the evolving q profile facilitates identification of RSAEs and provides an effective scan of the dependence of stability upon q. A combination of electron cyclotron emission, magnetics, beam emission spectroscopy, and interferometer data detect the modes. EAEs occur most often when the elongation exceeds 1.8. TAEs and RSAEs are more common than BAEs and BAAEs. RSAEs occur for poloidal betas below 0.8, while BAEs are more likely to be unstable when the poloidal beta exceeds 0.5 and for particular values of q. BAAEs with a characteristic "Christmas light" pattern of brief instability as q evolves occur in plasmas with relatively high electron temperature but low poloidal beta. EGAMs are more common in plasmas in which counter injection and plasma currents between 0.4-0.85 MA cause a significant loss cone.

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