



## Alfvén eigenmodes in toroidal laboratory plasmas

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Superthermal ions and electrons often drive shear Alfvén waves unstable in magnetically confined plasmas. Because of rapid dispersion, shear Alfvén waves that are part of the continuous spectrum are rarely destabilized. However, when the index of refraction is periodic, gaps appear in the continuous spectrum. At spatial locations where the radial group velocity vanishes, weakly damped discrete modes appear in these gaps. Different types of these Alfvén

eigenmodes are driven unstable by wave-particle resonances. A wide variety of nonlinear dynamics is observed, ranging from steady modes that gradually saturate, to bursting behavior reminiscent of relaxation oscillations, to rapid frequency chirping. Convective energetic-particle transport by a single mode occurs in some cases, while stochastic transport by many small amplitude waves occurs in others.