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Shear Alfvén spectrum and mode structures for 3D configurations[1] D.A. SPONG, Oak Ridge National Laboratory, Y. TODO, National Institute for Fusion Sciences — Energetic particle destabilized Alfvén modes are observed in a wide range of stellarator experiments. We have developed a code (AE3D) to calculate the full shear Alfvén frequency spectrum and associated mode structures for arbitrary stellarator equilibria. This is based on a Galerkin approach using a combined Fourier mode (poloidal/toroidal angle) finite element (radial) representation. It has been applied to an LHD case where Alfvén activity and enhanced ion losses were seen. Applications also are underway to other experiments, such as HSX, where ECH-driven Alfvén modes were observed. This model can form the basis for stellarator optimization targets, synthetic diagnostics, and reduced linear/nonlinear stability models. It is also applicable to tokamaks with symmetry-breaking effects. By matching observed frequencies with calculated mode structures, improved understanding of the physics mechanisms of AE modes, such as sideband coupling, damping, and enhanced fast particle losses can be developed.

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