Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Alfvén instabilities and energetic particle physics in stellarators[1]
DON SPONG, Oak Ridge National Laboratory — Stellarators, helical RFPs and 3D tokamaks introduce symmetry-breaking effects that alter the structure of Alfvén instabilities and their impact on energetic particle confinement. Loss of symmetry precludes an ignorable coordinate and requires taking into account both poloidal and toroidal couplings. New techniques for near term progress in 3D EP modeling have been developed, such as scalable algorithms (e.g., perturbative particle methods and windowed frequency solvers) and reduced-dimensionality models (e.g., gyro-Landau fluid). These methods have been developed for a range of 3D (tokamak/stellarator/RFP) configurations and have been compared with experimental measurements on LHD, TJ-II, HSX and RFX. Both modes with weak 3D couplings (TAE's in LHD) and strong 3D couplings (HAE's in TJ-II) will be discussed. Also, code-benchmarking activities have been started and will be described. In addition to their impact on fast ion confinement, the coherent frequencies of these AE modes (directly related to iota) can be useful markers for 3D equilibrium reconstruction.

[1]Research sponsored by the U.S. Department of Energy under Contract DE-AC05-00OR22725 with UT-Battelle, LLC.

Don Spong
Oak Ridge National Laboratory

Date submitted: 15 Jul 2011 Electronic form version 1.4