Shear Alfvén Wave Spectra in a Periodic Magnetic Mirror Array

Y. Zhang, W.W. Heidbrink, H. Boehmer, R. McWilliams
Department of Physics and Astronomy, University of California, Irvine, California 92697
Guangye Chen
Department of Aerospace Engineering and Engineering Mechanics,
The University of Texas, Austin, Texas 78712
Boris N. Breizman
Institute for Fusion Studies, The University of Texas, Austin, Texas 78712
T. Carter, S. Vincena, D. Leneman, B. Brugman, W. Gekelman
Department of Physics and Astronomy, University of California, Los Angeles, California 90095

Abstract

Mirror-induced gaps (eigenmodes) of Shear Alfvén Wave (SAW) spectrum are observed in a finite magnetic mirror array (4 to 5 mirror sections, each ~ 4 m long) created by modulating ten sets of magnet coils individually on the LArge Plasma Device (LAPD)[1]. SAW ($f < 0.95\ f_{ci}$, $\delta B / B \sim 0.001\%$) are launched through a number of antennae including: a field-aligned copper cylinder, a small semi-transparent copper disk and a simple loop antenna. The periodicities of the magnetic field and plasma density modulate SAW propagation in both parallel and perpendicular directions. SAW spectral gaps and eigenmodes are characterized for various mirror configurations and plasma conditions. A finite-difference code[2] modeled in a finite cylindrical geometry shows similar spectral features. Mirror-induced Alfvén Eigenmodes are observed in the simulation by setting a negligible wave damping rate.

1 W. Gekelman, H. Pfister, Z. Lucky, J. Bamber, D. Leneman, and J. Maggs, Rev. Sci. Instrum. **62**, 2875 (1991)

2 G. Chen et. al., Phys. Plasmas **13**, 123507 (2006)