Shear Alfvén spectra and mode structures of neutral-beam-heated Alfvén eigenmode discharges of CHS

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Interaction between energetic ions and energetic-ion-driven MHD modes is one of the key physics issues in current fusion experiments. In particular, toroidicity-induced Aflvén eigenmodes (TAE) may lead to anomalous loss of energetic alpha particles produced by the deuterium-tritium reaction in a future burning plasma [1]. For this reason, effects of energetic-ion-driven MHD instabilities on fast-ion transport and consequent losses had been intensively studied in the neutral-beam-heated plasmas of CHS [2-5]. TAEs having m/n=~2/1 were often observed when neutral beams were tangentially co-injected into relatively low-density plasmas (n_e~1×10^{19} m^3). Actually, in CHS, anomalous loss of beam ions had been induced by TAEs and the loss rate due to TAEs increased as the mode amplitude increased. In order to increase understanding of TAEs and related phenomena observed in CHS, the AE3D code [6] that calculates shear Alfvén frequency spectrum and associated mode structures for three-dimensional MHD equilibira is applied to CHS discharges where Alfvén activity and enhanced beam ion loss are observed. In this paper, shear Alfvén spectra and mode structures of CHS TAE shots will be discussed in connection with anomalous loss of beam ions caused by TAEs.

References

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