

Destabilization of beta-induced Alfvén eigenmodes in the HL-2A tokamak

W. Chen, X.T. Ding, Yi. Liu, Q.W. Yang, X.Q. Ji, G.L. Yuan,
Y.P. Zhang, M. Isobe¹, Y.B. Dong, Y. Huang, J. Zhou, Y. Zhou,
W. Li, B.B. Feng, X.M. Song, J.Q. Dong, Z.B. Shi, X.R. Duan and
HL-2A Team

Southwestern Institute of Physics, PO Box 432, Chengdu 610041, People's Republic of China

¹ National Institute for Fusion Science, 322-6 Oroshi-cho, Toki-shi 509-5292, Japan

E-mail: Chenw@swip.ac.cn

Received 3 December 2010, accepted for publication 29 March 2011

Published 10 May 2011

Online at stacks.iop.org/NF/51/063010

Abstract

Beta-induced Alfvén eigenmode (BAE) during a strong tearing mode activity (termed as m-BAE) has been observed and investigated in HL-2A. BAE excited by energetic electrons (termed as e-BAE) has been identified both in the Ohmic and ECRH plasma. The hard x-ray spectrum detected by cadmium telluride and the non-thermal radiation measured by electron cyclotron emission are used to analyse the behaviour of the energetic electrons. Experimental results show that the e-BAE is related not only to the populations of the energetic electrons, but also their energy distribution. An interesting result about the BAEs modulated by a supersonic molecular beam and gas puffing is presented. In addition, BAEs during a sawtooth cycle are described in this paper. To assess the identification of the e-BAE and m-BAE, the generalized fishbone-like dispersion relation and magnetic-island-induced BAE dispersion relation are solved near marginal stability, respectively. Compared with experimental results, the calculation analysis shows that the observed frequencies are all close to the theoretical results.

(Some figures in this article are in colour only in the electronic version)