Beta induced Alfvén Eigenmode Driven by Energetic Ions on HL-2A

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Beta induced Alfvén eigenmode (BAE) has become a major concern since the first observation on DIII-D [1]. Those weak damping modes often enhance transports and cause substantial reductions of EPs [2]. To better understand the instabilities, more experimental evidences should be needed. In the present paper, the energetic ions induced BAEs (i-BAEs) on HL-2A will be given. The i-BAEs are driven by the passing particles with energy of 15-45keV and the mode frequencies are about 60-90kHz. A typical example is shown as Fig.1(a). The radial mode structure can be measured by the microwave reflectometer with working frequency of 34-48GHz and it is localized in the region of $\rho = 0.1 - 0.25$. The i-BAE has been finally confirmed by the Alfvén mode code (AMC) [3]: the eigenfrequency of 90kHz is in accordance with the experimental observation and the mode structure agrees well with that measured by the microwave reflectometer. The i-BAEs can be excited more easily in low electron density discharges because ion Landau damping is relatively weak in those cases. Both stationary and non-stationary i-BAEs can be observed during NBI heating. The ion temperature and neutron count decline obviously when the non-stationary i-BAEs appear, which suggests a badly deterioration of the plasma confinement. Finally, the mode frequency is found to be modulated by electron cyclotron resonance heating (ECRH), which indicates the ECRH may be an effective candidate for the suppression of i-BAEs.

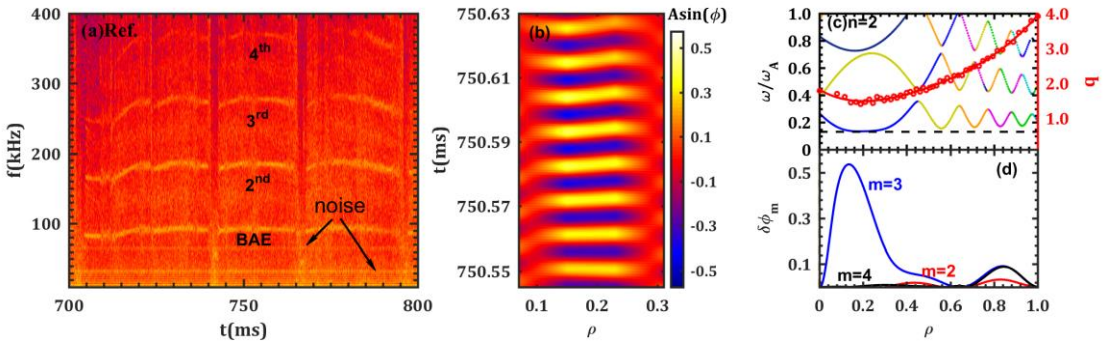

Fig.1 (a) Stationary i-BAE and (b) the corresponding mode structure detected by microwave reflectometer. (c)The q profile and Alfvén continuum for stationary i-BAE with n=2. (d) The radial mode structure given by the AMC.

Reference

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