Investigation of Alfvénic instabilities and its Effect on Runaway Formation during Disruption on HL-2A

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Significant experimental advances have been made on HL-2A tokamak in the 2015 experimental campaign. New experimental apparatus such as a 170GHz gyrotron system, a 3.7GHz lower hybrid current drive (LHCD) system with Passive-Active Multijunction (PAM) concept antenna and a sample RMP coil system were operational. Diagnostic system such as Thomsons scattering system, MSE, and multichannel interferometer system produced critical profile parameters, FILD and ECEI system provided information about fast ion losses and interesting electron temperature fluctuation images respectively. These advanced preparations combined with related diagnostics have enabled HL-2A to deal with up-to-dated topics such as energetic particle physics and other studies. The HL-2A team has made considerable progress in the research field of energetic particle drive instabilities, such as TAE, BAE, BAAE [1, 2，3] and their effects on fast ion radial transport, as reported in this presentation. Time resolved energy and pitch angle measurements of FILD correlated in frequency and phase with low-frequency (e.g., NTMs) and high-frequency (e.g., fishbone and TAEs) MHD instabilities have been obtained with a scintillator based detector [4]. A detailed analysis has revealed the important role of fishbone in triggering L-H transition [5]. Furthermore, dedicated experiments of runaway mitigation with Supersonic Molecular Beam Injection (SMBI), as well as the observation of TAE mode during disruption and its role in scattering of RE beam were also reported [6]. A toroidal alfvén eignmode (TAE) was observed during the disruption phase, which plays a favorable role in scattering runaway electrons, and hence, limiting the strength of runaway beam. On the fast particle diagnostic side, developments of new diagnostics for further explore the energetic particle physics on HL-2A are introduced, including FIDA, ssNPA, neutron camera and neutron energy spectrometer.

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