



IAEA FEC 2014

Contribution ID: 288

Type: Oral

Interaction between Neoclassical Tearing Modes and Non-Local Transport in HL-2A

Thursday, October 16, 2014 3:20 PM (20 minutes)

Scaling laws for the prediction of neoclassical tearing modes (NTMs) onset in next generation fusion devices such as ITER have been carried out. However, it is difficult to extrapolate current island width thresholds for the NTM onset to ITER due to the uncertainty physics behind the threshold mechanisms. And some events can also influence the mode onset, such as the large sawtooth period and pellet injection. In the HL-2A tokamak, NTMs driven unstable by the transient perturbation of local electron temperature induced by non-local transport (NLT) phenomenon have been observed in low beta plasmas for the first time. In HL-2A, the onset of $m/n=3/2$ NTMs during NLT phenomenon induced by supersonic molecular beam injection (SMBI) has been observed in low beta plasmas with electron cyclotron resonance heating (ECRH). The inversion surface of electron temperature perturbation (δT_e) due to NLT effect is near the $q=3/2$ surface, which is determined by the peak of $3/2$ mode amplitudes measured by the ECE diagnostics. Compared with $3/2$ NTMs triggered by sawtooth activities in HL-2A, the transient perturbation of local T_e gradient induced by non-local effect plays a crucial role on changing NTM threshold, which dramatically reduces the critical β onset of $3/2$ NTMs. In spontaneous $3/2$ NTMs without detected core and edge MHD instabilities are observed during strong NLT effect. After the onset of NTM during NLT phenomenon induced by SMBI, additional molecular beam pulses are injected to study the interaction of magnetic islands with NLT effect. The non-local effect still exists with the small $3/2$ island, island width $w_{3/2}/a \sim 0.06$. In the case of large $2/1$ magnetic islands, $w_{2/1}/a \sim 0.15$, the effect of NLT is almost suppressed. By the way, the collapse of the central electron temperature with an increase in the edge electron temperature is observed.

Paper Number

EX/6-4

Country or International Organisation

China

Primary author: Mr JI, Xiaoquan (China)

Co-authors: Prof. YUAN, Baoshan (Southwestern Institute of Physics); Prof. FENG, Beibin (Southwestern Institute of Physics); Dr WEI, Lai (Dalian University of Technology); JIANG, Min (Southwestern Institute of Physics); Prof. YANG, Qingwei (Southwestern Institute of Physics); Mr SUN, Tengfei (Southwestern Institute of Physics); Dr DENG, Wei (Southwestern Institute of Physics); Prof. LIU, Yi (southwestern institute of physics); Ms XU, Yuan (Southwestern Institute of Physics); Dr DONG, Yunbo (Southwestern Institute of Physics); Dr SHI, Zhongbing (Southwestern Institute of Physics); Prof. WANG, zhengxiong (Dalian University of Technology)

Presenter: Mr JI, Xiaoquan (China)

Session Classification: Transport & MHD