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EX/P4-25: Triggering of Neoclassical Tearing Modes by Mode Coupling in HL-2A

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The onset of neoclassical tearing modes (NTMs) for previous theories requires a seed island, whose width need exceed the critical value. Such seed islands are often provided by sawtooth activities, fishbones, or edge localized modes (ELMs). However, the mechanism for seed island formation is not well understood up to now. In this paper, NTMs triggered by two mode toroidal coupling and preliminary modeling results on HL-2A are presented.

In HL-2A, the m/n NTMs can be driven unstable by toroidal mode coupling with the central MHD activities ($m-1/n$) and also the external classical tearing modes ($m+1/n$). For understanding the experimental results, preliminary modeling has been carried out based on the forced reconnection by toroidal mode coupling. In toroidal geometry, a perturbation with the mode number m/n , have the $m\pm 1/n$ components. Which can induce the forced reconnection on the $q=m\pm 1/n$ rational surface, and provide seed island for metastable $q=m\pm 1/n$ NTM. In HL-2A, $2/1$ coupled with $1/1$, $3/2$ coupled with $2/1$ or $4/2$ have been experimentally observed. Considering this driven effect, we calculate the temporal evolution of the NTM island. It is found that the results are in good agreements with the experiment data.

Country or International Organization of Primary Author

China

Primary author: Mr JI, Xiaoquan (China)

Co-authors: Prof. YUAN, Baoshan (Southwestern Institute of Physics); Prof. FENG, Beibin (Southwestern Institute of Physics); Dr WANG, Jia Qi (Sichuan University); Prof. YANG, Qingwei (Southwestern Institute of Physics, Chengdu, China); Mr SUN, Tengfei (Southwestern Institute of Physics); Dr CHEN, Wei (Southwestern Institute of Physics); Mrs DENG, Wei (Southwestern Institute of Physics); Prof. WANG, Xiaogang (Peking University); Prof. LIU, Yi (Southwestern Institute of Physics, Chengdu, China); Mrs XU, Yuan (Southwestern Institute of Physics); Dr DONG, Yunbo (Southwestern Institute of Physics)

Presenter: Mr JI, Xiaoquan (China)

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