1st Asia-Pacific Conference on Plasma Physics, 18-22, 09.2017, Chengdu, China

Kinetic Electromagnetic Instabilities in an ITB Plasma with Weak Magnetic Shear

W. Chen[1], D. L. Yu[1], P. W. Shi[1] , Y.Y. Li[2], R. R. Ma[1], L. M. Yu[1], X. T. Ding[1], H. R. Du[3], Z. B. Shi[1], X. Q. Ji[1] , B.S. Yuan[1], Y. G. Li[1], M. Jiang[1], Z. C. Yang[1], W. L. Zhong[1], J. Q. Dong[1], M. Xu[1], Y. H. Xu[1], Q. W. Yang[1], Yi. Liu[1], L. W. Yan[1], X. R. Duan[1] and HL-2A Team

1Southwestern Institute of Physics, P.O. Box 432 Chengdu 610041, China
2Institute for Fusion Theory and Simulation, Zhejiang Univ., Hangzhou 310027, China
3School of Physics and Optoelectronic, DUT, Dalian 116024, China

Kinetic Alfven and pressure gradient driven instabilities are very common in magnetized plasmas both in space and laboratory. In present-day fusion and future burning plasmas, they are easily excited by fast particles and/or pressure gradients. They can not only cause the loss and redistribution of fast particles but also affect plasma confinement and transport. The physics associated with them is an intriguing but complex area of research. In this talk, we will report experimental results in HL-2A NBI ITB plasmas with weak magnetic shears $(s \sim 0)$ and low pressure gradients $(\alpha < 0.3)$. The low-n Alfvenic ITG (AITG) instabilities with $f_{BAE}<f<f_{TAE}$ and n=2-8 are found to be unstable in the NBI plasmas with weak shears and low pressure gradients. The measured results are also consistent with the GFLDR and KBM equation, and the modes are more unstable |s| is smaller in low pressure gradient regions. These modes have possibly opposite effects on the ITB formation. The interaction between AITG/KBM activities and EPs should also be investigated with greater attention in fusion plasmas, such as ITER, since weak magnetic shear amplifies the role of and possible excitation by EP of these fluctuations. It is worth emphasizing that the study of AITG/KBM should be paid more attention because they link to the ITB and H-mode pedestal physics for weak magnetic shears. These results also pave the road to more in depth analyses of similar phenomena in fusion plasmas with non-perturbative EP populations, with suggestive possibility of controlling plasma performance by a careful choice of plasma profiles in the weak shear core region typical of burning fusion plasmas.