Excitation of beta-induced Alfven eigenmodes by the coupling between Geodesic acoustic mode and magnetic island

Huishan Cai[1], Baofeng Gao[1], Ming Xu[2], Adi Liu[1], Defeng Kong[2]

[1]CAS Key Laboratory of Geospace Environment, School of Physical Science, University of Science and Technology of China, Hefei 230026, P. R. China,
[2]Institute of Plasma Physics, CAS, Hefei 230031, P. R. China

The mechanism of excitation of beta-induced Alfven eigenmodes (BAEs) with magnetic island larger than a threshold without energetic ions is studied. It is found that the nonlinear coupling between Geodesic acoustic mode and magnetic island can drive the pair of BAEs. It is found that the phase of BAEs to island should be $\pi/2$ to excite the BAEs and the magnetic island is larger than a threshold. The results are consistent with the experimental results shown in EAST(#86309). It implies that similar experimental results in other tokamaks, that BAEs excitation by magnetic island without energetic ions, may be from the nonlinear coupling between island and waves. It also implies that the exist of magnetic island can make the excitation of BAEs easier in plasma with energetic ions, since magnetic island can also increase the pressure gradient of energetic ions near the island separatrix. This predicts that BAEs may appear more frequently in the presence of magnetic island in ITER.