Stability of ideal and non-ideal edge localized infernal mode

G.Q.Dong,[1, a)] Y.Q. Liu,[2, 1, b)] S. Wang,[1] N. Zhang,[1] D.L. Yu,[1] Y. Liu,[1] and Z.R. Wang[3]

[1)] *Southwestern Institute of Physics, Post Office Box 432, Chengdu 610041, China*

[2)] *General Atomics, PO Box 85608, San Diego, CA 92186-5608, USA*

[3)] *Princeton Plasma Physics Laboratory, Princeton, New Jersey 08543, USA*

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Stability of a special class of the infernal mode, i.e. the one which is localized near the plasma edge, is numerically investigated for a toroidal plasma, using the single fluid code MARS-F [Liu et al 2000 Phys. Plasmas 7 3681] and magneto-hydrodynamic-kinetic hybrid code MARS-K [Liu et al 2008 Phys. Plasmas 15 112503]. The local flattening of the safety factor near the plasma edge, due to the large bootstrap current contribution in H-mode plasmas, drives this instability. It is found that the plasma toroidal flow shear in the pedestal region, as well as the plasma resistivity, further drives the edge localized infernal mode. The drift kinetic effects from thermal particles, on the other hand, partially stabilize the mode. The flow shear and the drift kinetic effects also modify the symmetry of the mode spectrum, by enlarging the unstable domain towards higher local $q_{\min}$ value. No substantial modification of the mode eigen-structure is observed by the plasma flow, resistivity, nor the kinetic effects. These results can be relevant to understanding physics of certain quiescent H-mode regimes.

[a)] Electronic mail: donggq@swip.ac.cn

[b)] Electronic mail: liuy@fusion.gat.com