

## Reversed rotation of limit cycle oscillation and dynamics of low-intermediate-high transition

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The dynamics of low-intermediate-high(L-I-H) confinement transition is investigated in detail via the extended three-wave coupling model describing the interaction of turbulence and zonal flow(ZF). Thereinto, turbulence is divided into a positive-frequency (PF) wave and a negative-frequency (NF) one, then the outer energy is input through the gradient of pressure. Firstly, the L-I-H confinement transition is observed for a sufficiently high input energy. The energy transport of PF and NF turbulence, ZF and the pressure gradient during the transition is also illustrated. Moreover, the rotation direction of the limit cycle oscillation (LCO) of PF wave and pressure gradient is found to be reversed during the transition. In L-I transition, it is from anticlockwise to clockwise, while in I-H transition, it is from clockwise back to anticlockwise. The mechanism is illustrated from the point of view of the wave phases. The results presented here is helpful for the experiments on the confinement fusion devices.

### References

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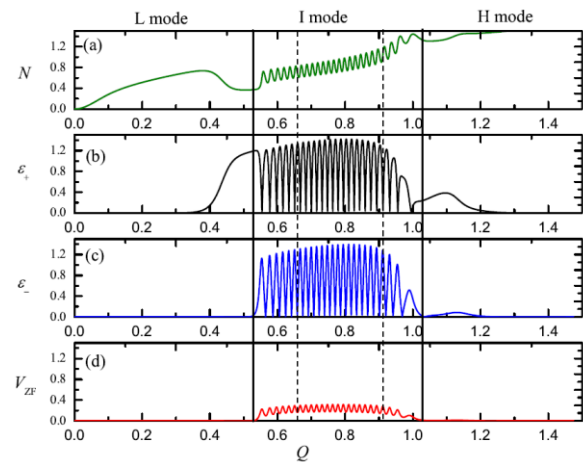


Figure 1

Amplitude evolution of (a)pressure gradient (green line), (b)PF turbulence (black line), (c)NF turbulence (blue line) and (d)zonal flow (red line) with input power  $Q = 0.01t$ .

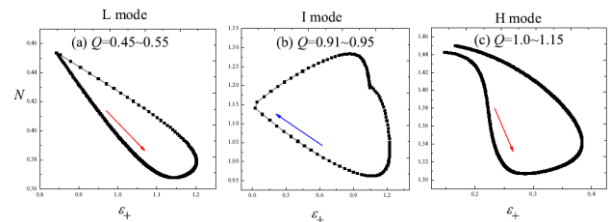


Figure 2

LCOs of PF turbulence  $\epsilon+$  and pressure gradient  $N$  at different stages of L-I-H transition.