

Simulations from a gyro-fluid extension of the BOUT++ code shows strong FLR stabilizing effect on type-I ELMs

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The large ELMs with low-to-intermediate- n peeling-ballooning (P-B) modes are significantly suppressed when ion temperature increases due to finite Larmor radius (FLR) effects. This is a good news in extrapolating tokamak/ST in support of ITER & next steps.

✓ Fig.1 shows the influence of the FLR physics on the linear growth rate of P-B modes versus

- toroidal mode number n (bottom)
- or poloidal wavelength normalized to ion Larmor radius $k_\theta \rho_i$ (top, calculated with $T_0=1\text{keV}$)

- ideal MHD P-B mode (black),
- two-fluid diamagnetic drift stabilization (red),
- gyro-fluid full FLR effects for different plasma temperature T_i (blue).

✓ Fig.2 shows the influence of the FLR physics on the ELM size, the ratio of the ELM energy loss (ΔW_{ped}) to the pedestal stored energy W_{ped} , the ELM size is calculated from each nonlinear gyro-fluid simulation.

