I - Mode physics with increase stability and low noise inside Separatrix

Non-neutralized electrons confined in closed field line repel each other giving a linked spring model of stabilizing
The repulsion between electrons leads to an hoop forces -- similar to the thermal pressure electric potential.
The effective pressure gradient in model Shrinks the Unstable domain in the MHD Balloong mode stability equation

\[ f_e(x, p||, p^*, t) \]

distribution has \( T_{||} \gg T_e \)
Validated by X-ray spect

LHCD shown as an effective method to maintain stable control tokamak current profiles is in a stable steady-state. Ref.2 With properties:

- Efficient and Synergistic steady-state heating and current control current penetration aided by ETG plasma density fluctuations
- ETG turbulence modified by the RF driven three-component electron phase space density function \( f_{3T}(p||, p, r, t; P_{RF}) \) from RF power \( P_{RF}(t) \).
  (i) Radial gradients of the moments \( J_{||}(r), T_{e||}(r), T_e(r) \) and \( q_{||}(r) \) change the complex stability problem for the low frequency electromagnetic turbulence and the associated transport.
  (ii) Turbulent pitch-angle scattering from magnetic turbulence weakens the current drive efficiency but provides stability against the runaway currents of induction driven toroidal currents.


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Non-neutralized electron effects

- Non-neutralized electrons confined in closed field line repulse each other and behave as if a linked spring system (Fig. 2a).
- The repulsion between electrons leads to an outward hoop force. This is similar to the thermal pressure (Fig. 2b).
- This repulsive force differs from surface to surface, that affects the system magnetic well (Fig. 3).

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