Strong Electron Emission Could Enable a New Plasma-Surface Interaction Regime in Divertors
M. D. Campanell and M. V. Umansky (LLNL)

• It was recently shown that when the emission coefficient exceeds unity, the sheath potential must be positive valued. In this “inverse” sheath regime, the presheath is also fundamentally restructured [1].

• In the inverse regime, ions do not get accelerated towards the boundaries. Also, a high density cloud of cold (< 1 eV) electrons dominates the quasineutral plasma near the boundaries.

![Simulations show a sharp difference of the particle distribution functions \( f_e(x,v) \) when the emission coefficient \( \gamma \) is below unity (left) compared to above (right). Note the lack of ion acceleration in the inverse \( f_i \).](image)

This result opens a possibility that thermionic emission from heated tungsten divertor tiles could be used to mitigate the plasma-wall interaction:

• In the inverse regime, ion impact energies would be reduced by a few \( T_e \) compared to the conventional regime [2], drastically reducing physical sputtering from PFC’s such as W.

• A cloud of cold electrons near the plasma boundary could aid with achieving detachment conditions.