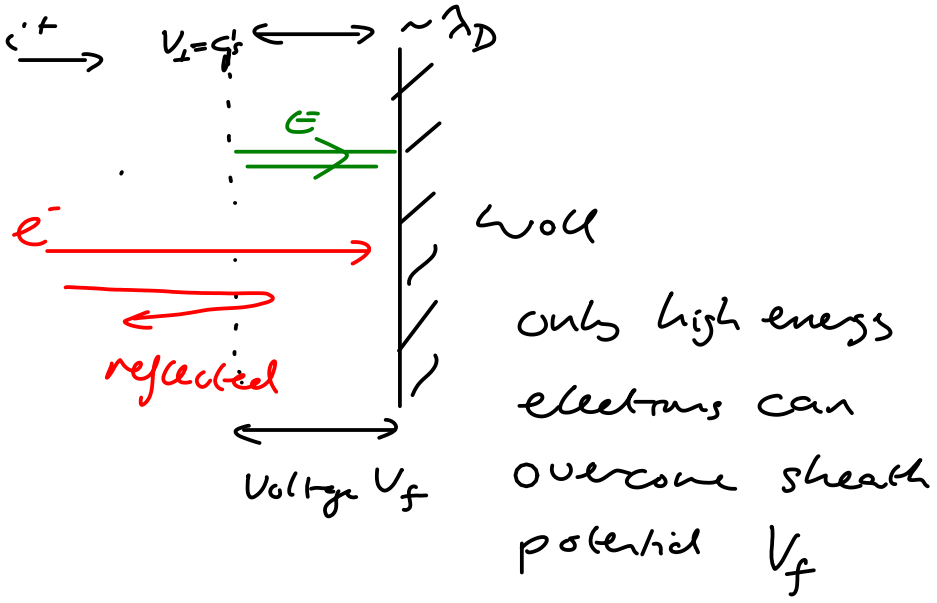
Sheath heat transmission

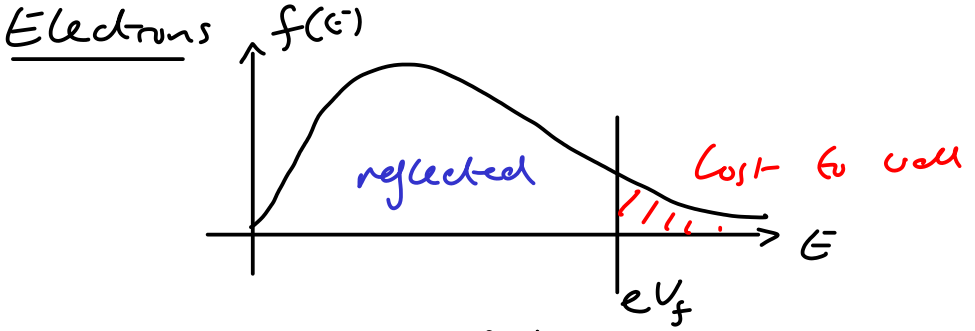
Contents

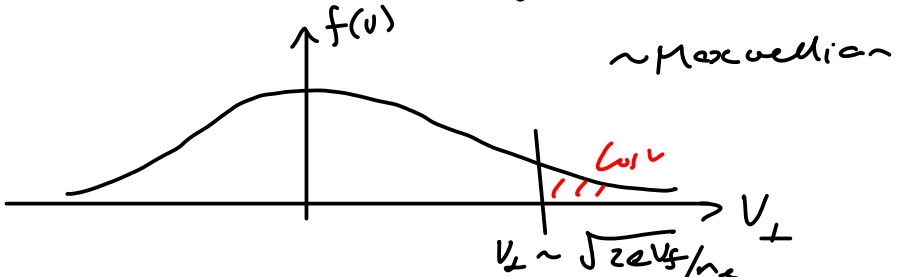
- Ion and electron energy losses
- Transfer of energy from electrons to ions

References

- P.C.Stangeby "The Plasma Boundary of Magnetic Fusion Devices" CRC press (2000)
- D.Tskhakaya PPCF 59 114001 (2017)







Electron heat flux

$$q_{se}^e \simeq (2eT_e + |eV_f|)\Gamma$$

Γ: particles / m²/s at the wall

Sheath entrance

$\sim 3T_e$

$$\simeq \gamma^e e T_e \Gamma$$

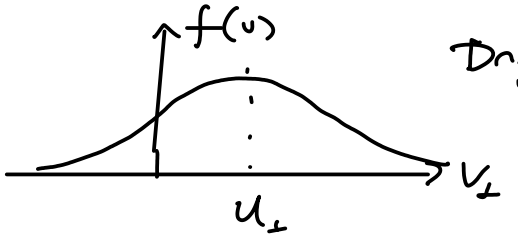
γ^e: sheath heat transmission coefficient

$$\gamma_e \simeq 2 + 3 + \frac{1}{2} \simeq 5.5$$ for electrons

$\frac{1}{2}$: pre-sheath

Ion heat transmission

More difficult to calculate, depends on distribution function. Varies with kinetic effects.



Drifting Maxwellian

$$q_{se}^i \simeq \left(\frac{5}{2}eT_i + \frac{1}{2}m_i u_i^2\right)\Gamma$$

$u_i = c_s$

$$\simeq \gamma^i e T_i \Gamma$$

$$\gamma^i \simeq 7/2$$

Kinetic $\gamma^i \simeq 2$

$T = T_e = T_i$

plasma