

Boundary conditions for
the outer radius ($\rho = L_\rho$)

Boundary conditions for
the stagnation point ($z = 0$)

$$\begin{aligned}\partial_{\parallel} n &= 0 \\ u_{e,\parallel} &= 0 \\ u_{i,\parallel} &= 0 \\ \partial_{\parallel} \Omega &= 0 \\ \phi &\text{ is extrapolated}\end{aligned}$$

$$\begin{aligned}\partial_{\rho} n &= 0 \\ \partial_{\rho} u_{e,\parallel} &= 0 \\ \partial_{\rho} u_{i,\parallel} &= 0 \\ \partial_{\rho} \Omega &= 0 \\ \phi &= 0\end{aligned}$$

Boundary conditions for
the sheath entrance ($z = L_z$)

$$\begin{aligned}\partial_{\parallel} n &= 0 \\ u_{e,\parallel} &= c_s e^{\left(\Lambda + \frac{e[\phi_0 + \phi]}{T_e}\right)} \\ u_{i,\parallel} &= c_s \\ \partial_{\parallel} \Omega &= 0 \\ \phi &\text{ is extrapolated}\end{aligned}$$