ENVELOPE EQUATION

$$\sigma''(z) + \left(K_\beta^2 - \frac{\varepsilon_g^2}{\sigma^4(z)} \right) \sigma(z) = 0$$
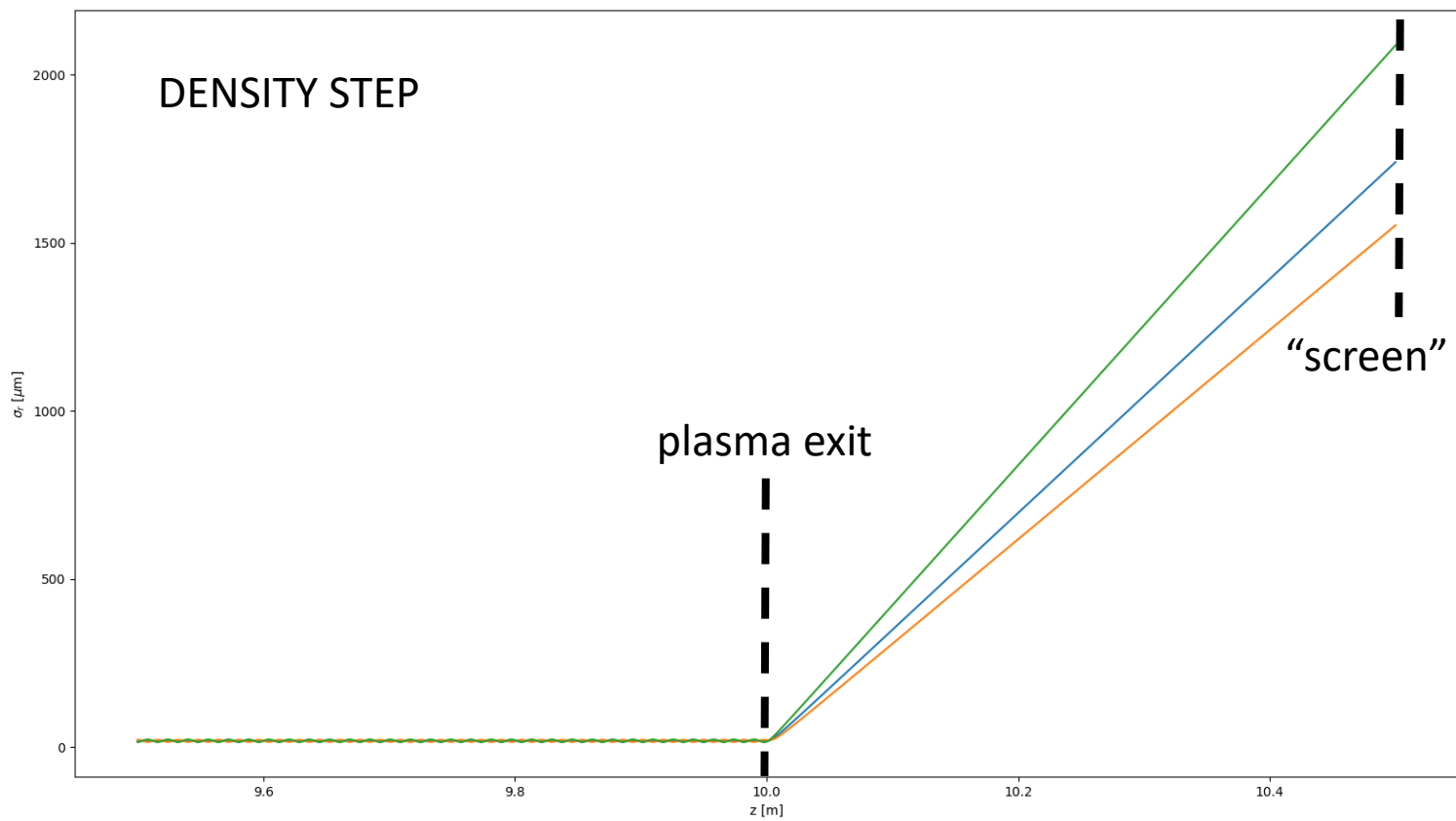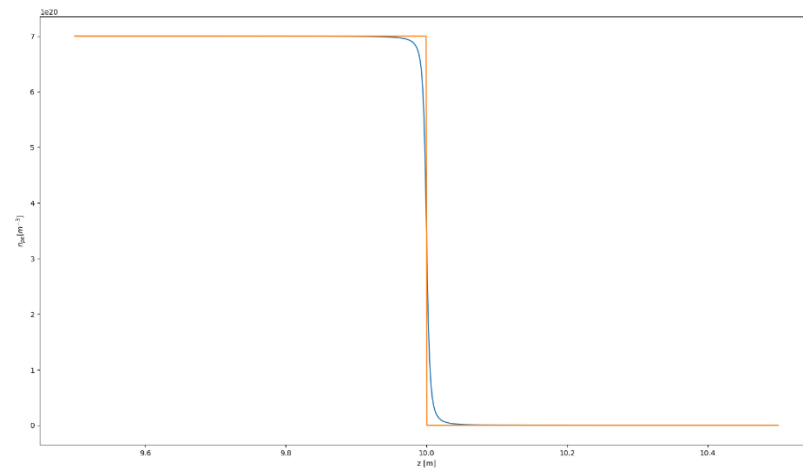
$$\underbrace{\frac{q^2}{2m_e\epsilon_0 c^2} \cdot n_{pe}(z)}_{} \; - \; \frac{\varepsilon_N^2}{\gamma(z)\sigma^4(z)} = 0$$
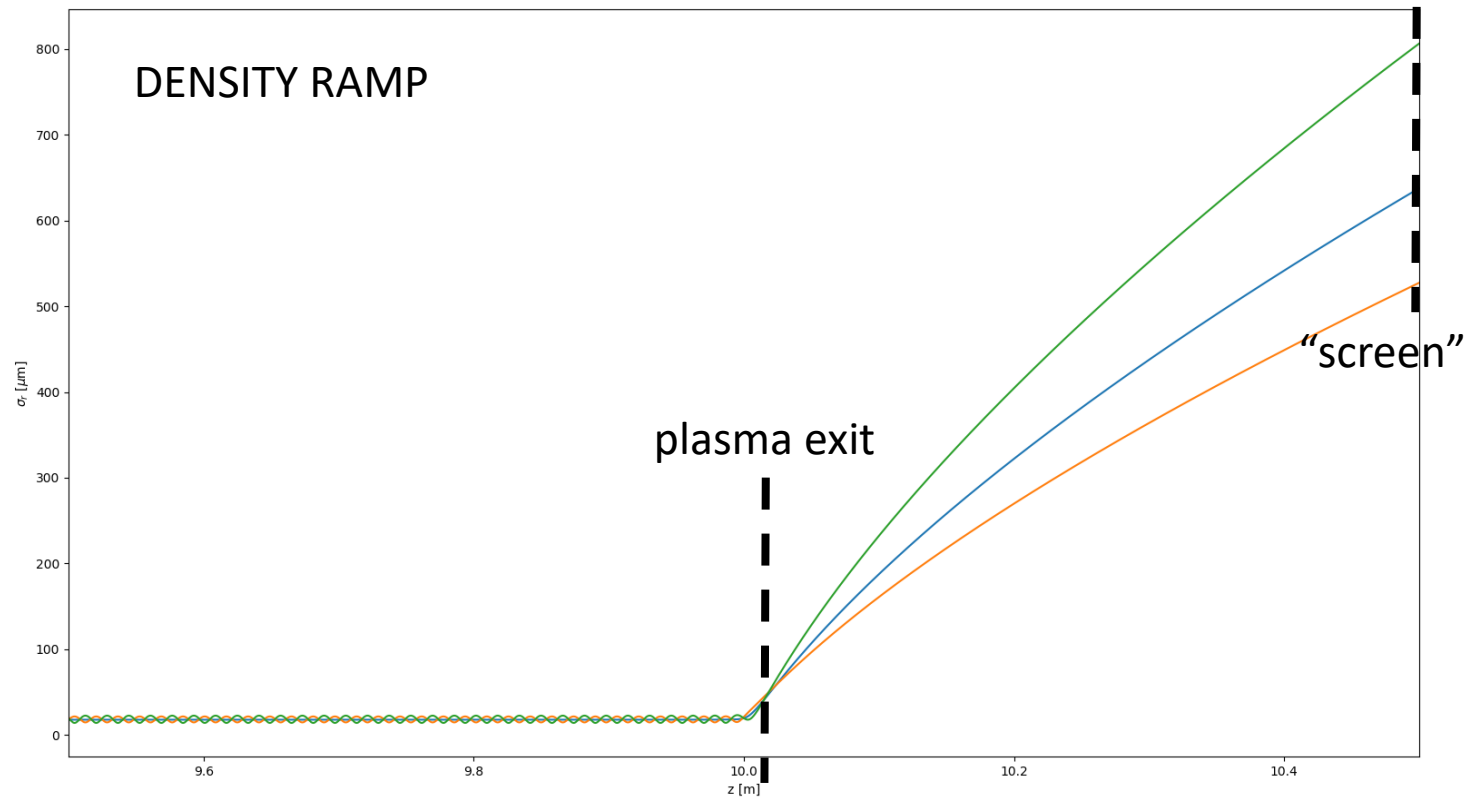
matching condition

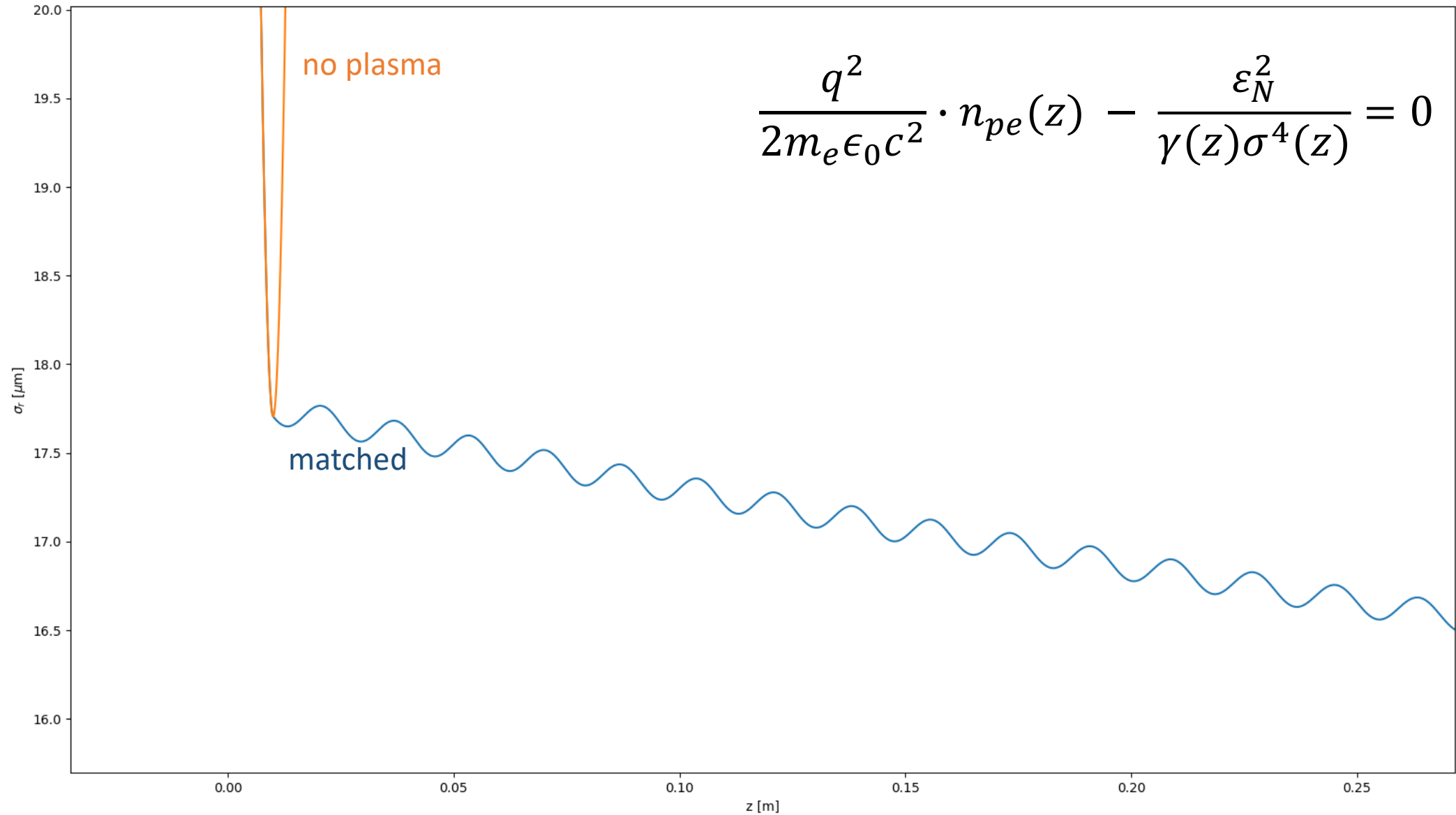focusing term ion column
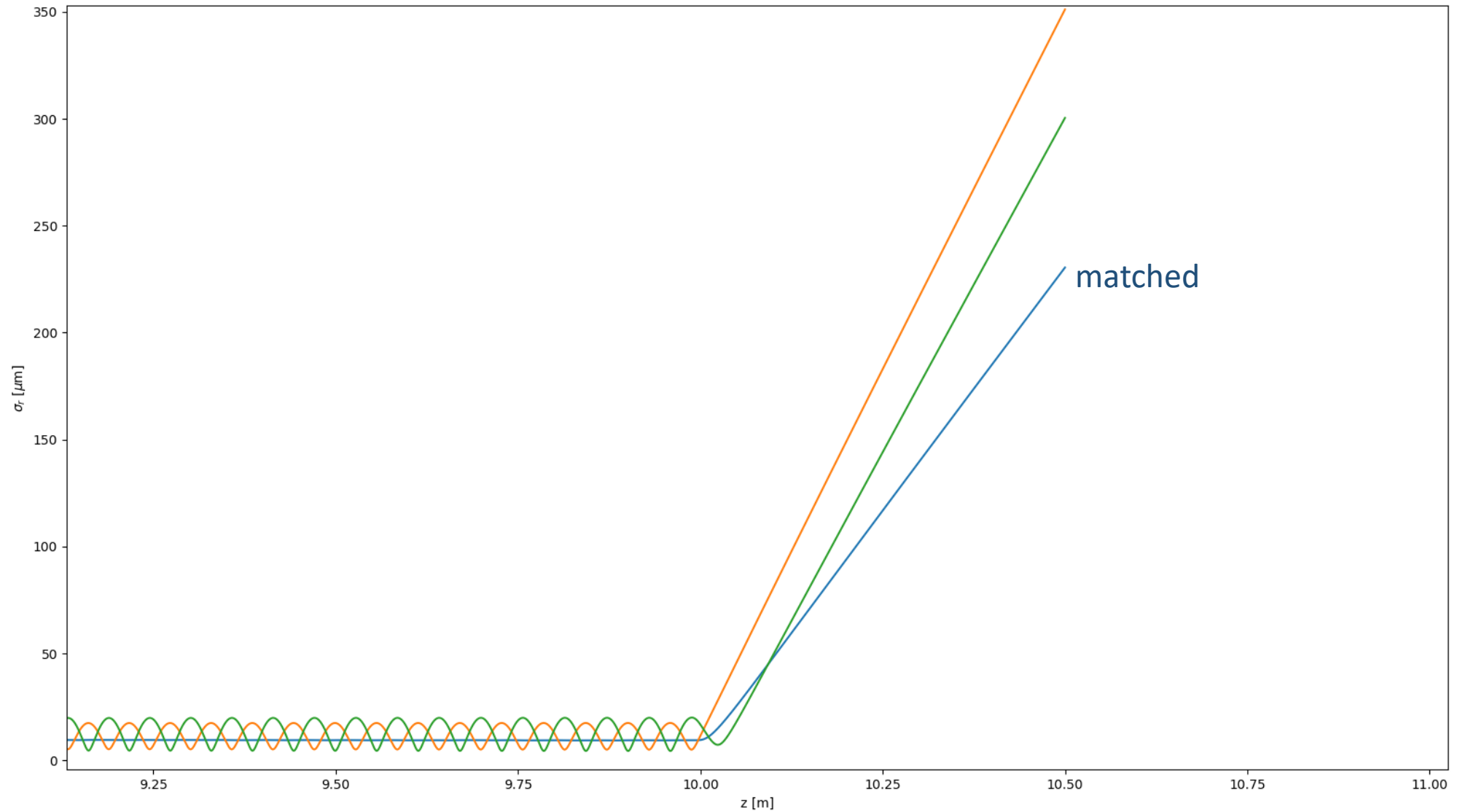
defocusing term (divergence)

PLASMA EXIT

DENSITY STEP

plasma exit

"screen"

PLASMA EXIT

$$\frac{q^2}{2m_e\epsilon_0 c^2} \cdot n_{pe}(z) \ - \ \frac{\varepsilon_N^2}{\gamma(z)\sigma^4(z)} = 0$$

EFFECT OF ACCELERATION (no energy spread)

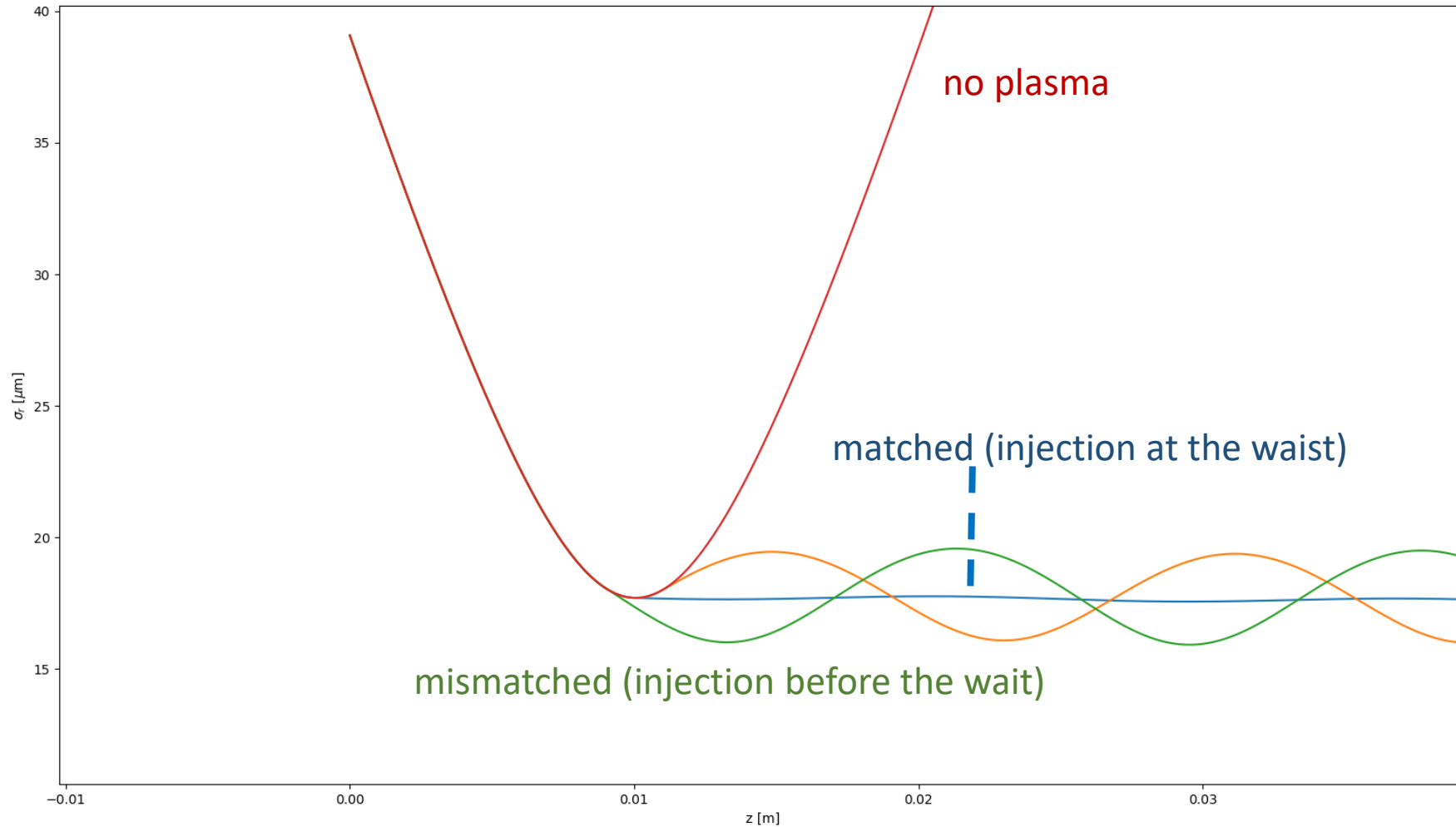$$\frac{q^2}{2m_e\epsilon_0 c^2} \cdot n_{pe}(z) \ - \ \frac{\varepsilon_N^2}{\gamma(z)\sigma^4(z)} = 0$$

EFFECT OF ACCELERATION (no energy spread)

PLASMA ENTRANCE

laser pulse – electron beam time misalignment may cause mismatch → beam is not injected at the waist: σ' (z_0) ≠ 0

PLASMA ENTRANCE