Hosing theory

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Laser hosing

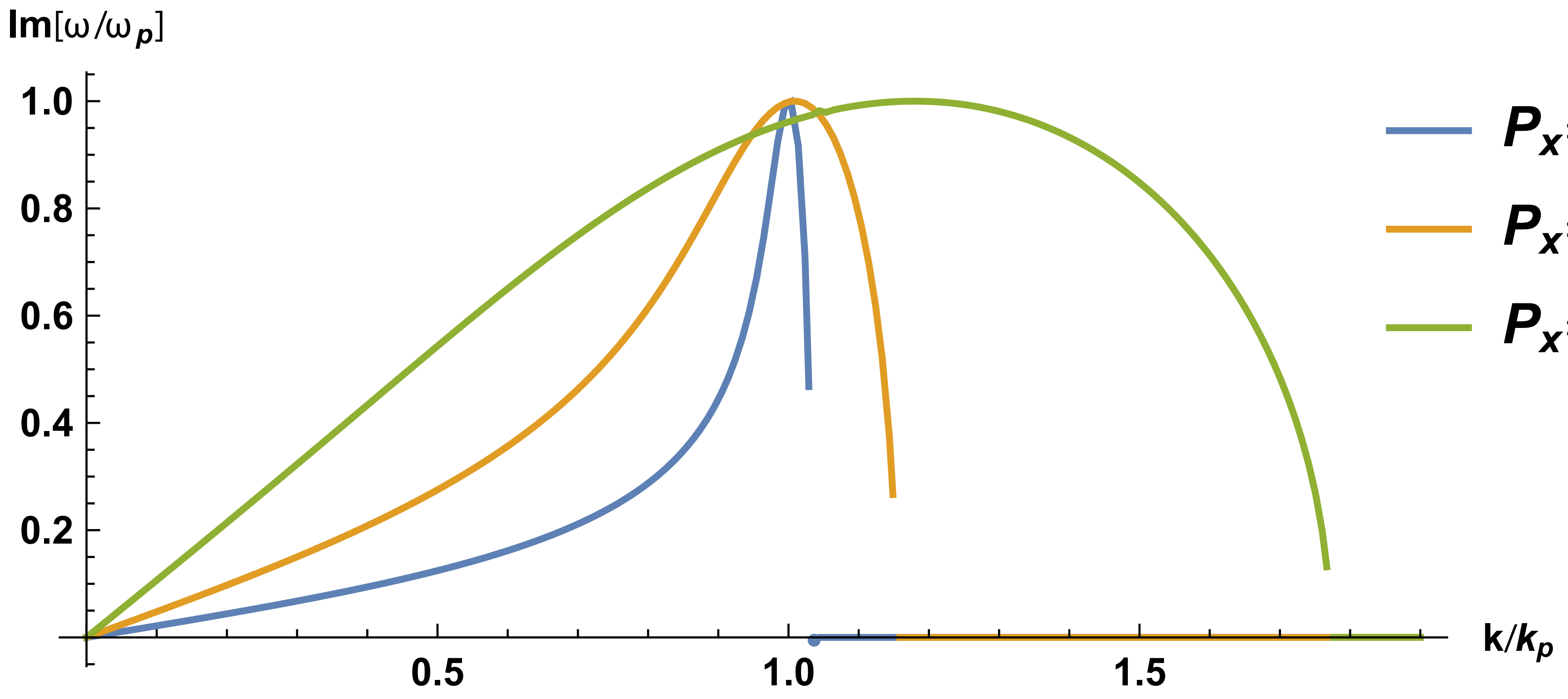
$$\left(\frac{1}{c^2}\partial_t^2 + \frac{2}{c}\partial_t\partial_z + \partial_z^2 + P_x\right) y_a = P_x \; y_\phi$$

$$\left(\partial_t^2 + \omega_p^2\right) y_\phi = \omega_p^2 \; y_a$$

$$P_x = \frac{g}{\hat{x}_R^2}\frac{P}{P_c}$$

$$\left(\hat{\omega} - \hat{k}\right)^2 \left(\hat{\omega}^2 - 1\right) - P_x \; \hat{\omega}^2 = 0$$

Growth rate (laser hosing)



Beam hosing

$$\left(\frac{1}{c^2}\partial_t^2 + \frac{2}{c}\partial_t\partial_z + \partial_z^2 + k_\beta^2\ \delta n(t)\right) x_c = k_\beta^2\ x_w$$

$$\left(\partial_t^2 + \omega_p^2\right) x_w = \omega_p^2\ n_{||}(t)\ x_c$$

$$n_{||}(t) = \frac{r_{b0}^2}{r_b^2(t)}$$

$$\left(\partial_t^2 + \omega_p^2\right) \delta n(t) = \omega_p^2\ n_{||}(t)$$

$$\delta n(t) = \int_t^\infty \sin\left[\omega_p(t' - t)\right] n_{||}(t')\mathrm{d}t'$$

for a narrow beam

Beam hosing

$$\left(\hat{\omega} - \hat{k}\right)^2 \left(\hat{\omega}^2 - 1\right) Q + \delta n(t) \ \left(1 - \hat{\omega}^2\right) = n_{||}(t)$$

$$Q = \frac{k_p^2}{k_\beta^2} = 2\gamma \frac{n_0}{n_{b0}} \frac{e^2}{q_b^2} \frac{M_b}{m_e}$$

for a narrow beam

Growth rate
(beam hosing, narrow beam)