

# Resolution limits in microscopy with entangled photon pairs

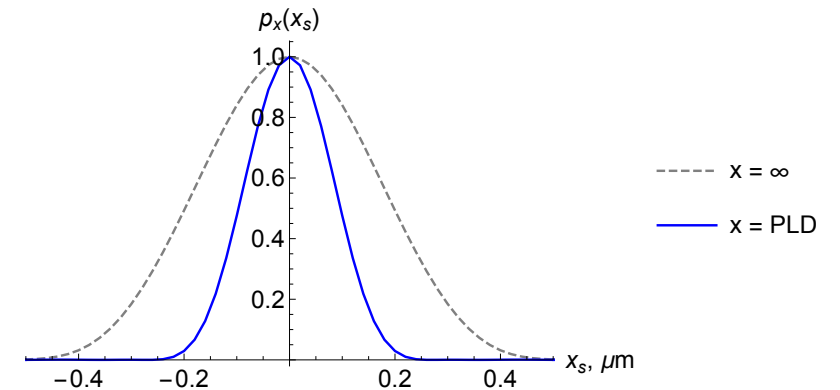
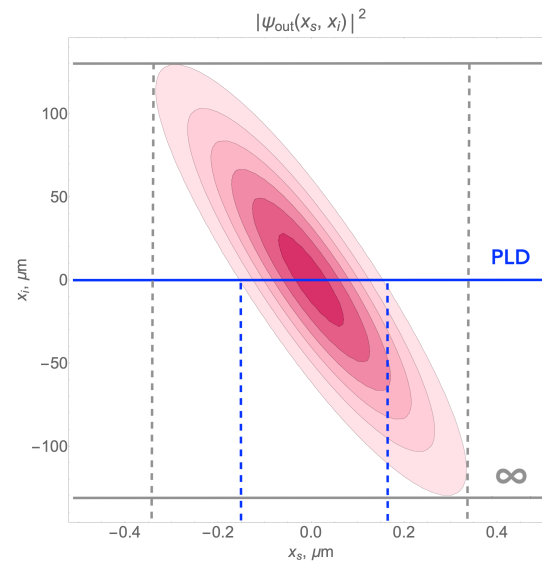
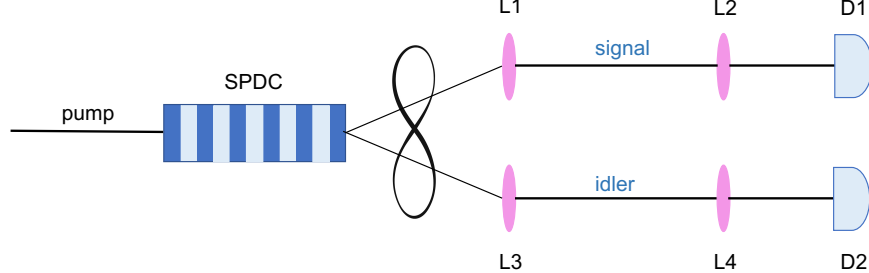
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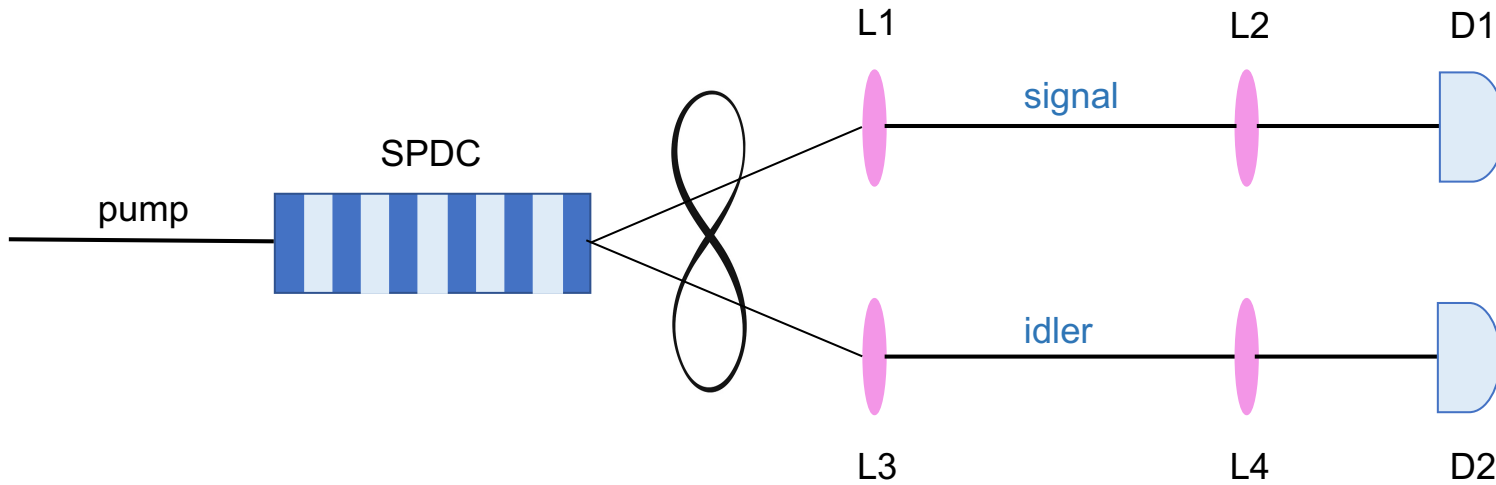
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# Framework

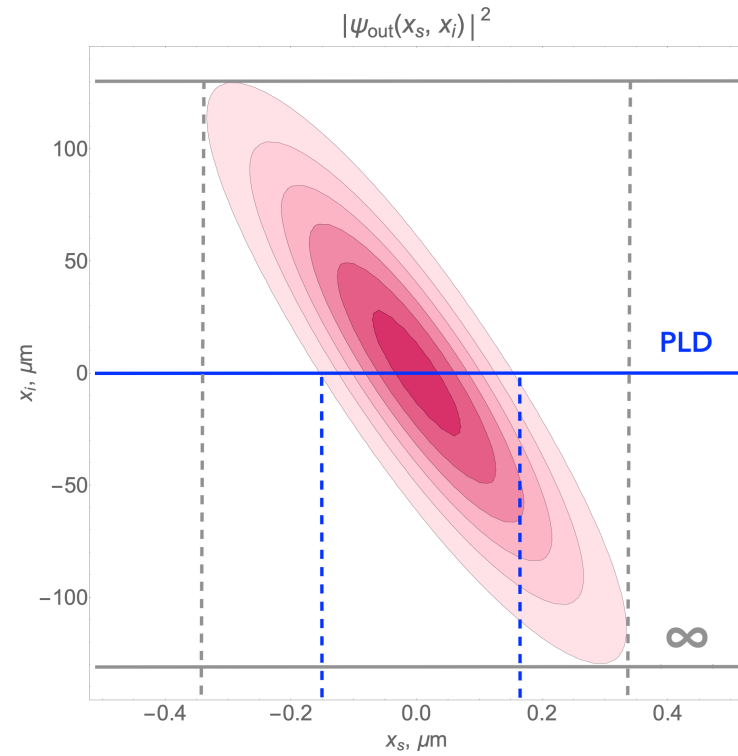


$$\tilde{\psi}_{in}(\kappa_s, \kappa_i) \propto e^{-\frac{1}{4} \left( \frac{\kappa_s^2}{\delta_s^2} + \frac{\kappa_i^2}{\delta_i^2} - \frac{2\rho\kappa_s\kappa_i}{\delta_s\delta_i} \right)}$$

$$\psi_{out}(x_s, x_i) = \int_{-\infty}^{\infty} dx'_s \int_{-\infty}^{\infty} dx'_i G(x'_s, x'_i, x_s, x_i, \vec{p}) \times \psi_{in}(x_s, x_i)$$

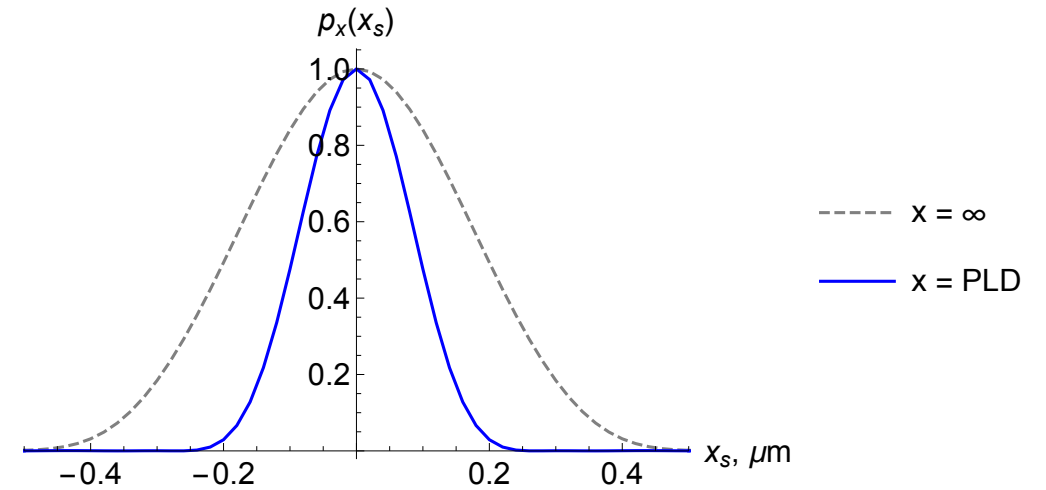
$$S_x(x', x, d) = e^{-\frac{i\pi(x'-x)^2}{d\lambda}}, \quad L(x, f) = e^{\frac{i\pi x^2}{\lambda f}}$$

# Results

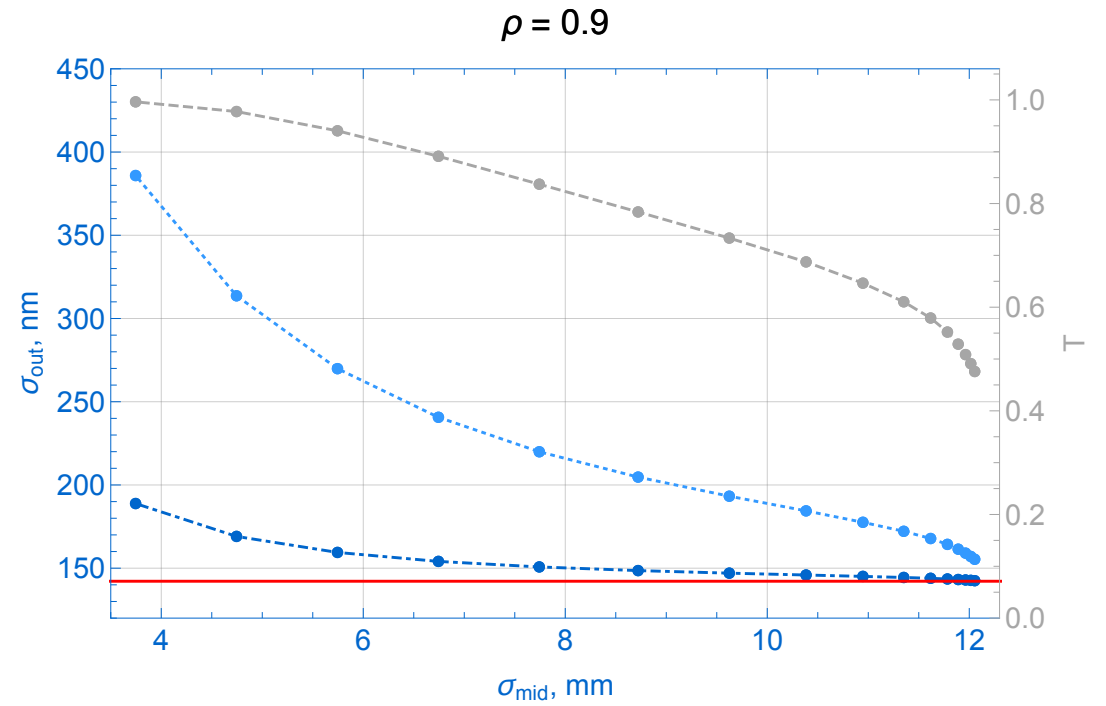
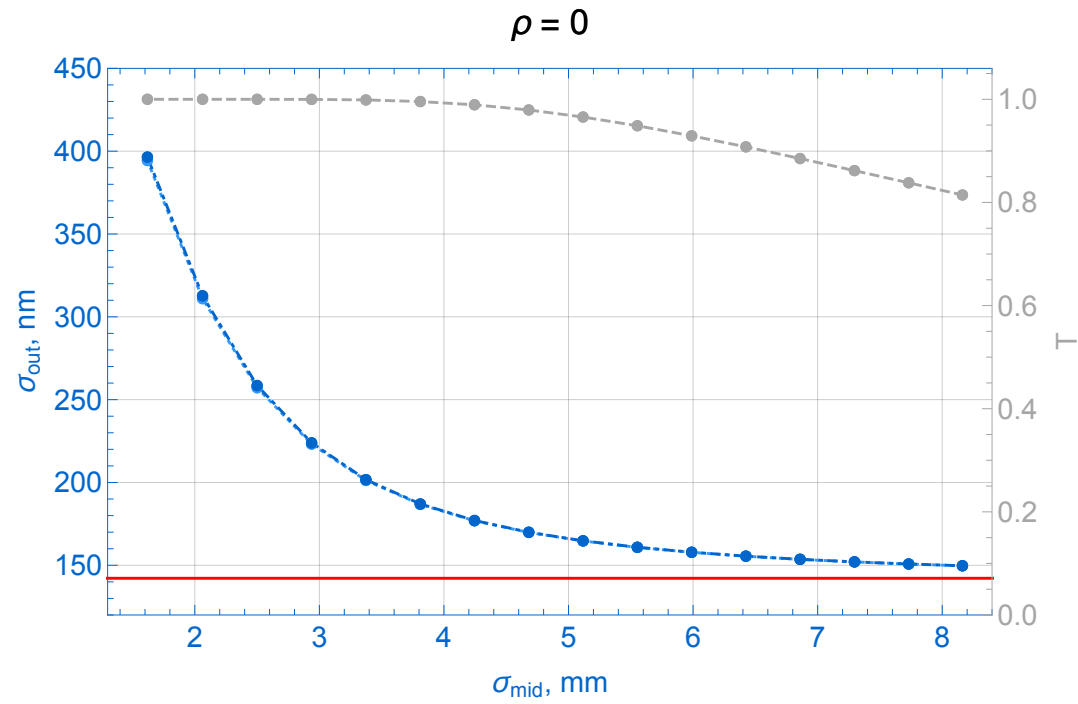


$$p_{\infty}(x_s) = \int_{-\infty}^{\infty} dx_i |\psi_{out}(x_s, x_i)|^2$$
$$p_{PLD}(x_s; x_{iC}) = |\psi_{out}(x_s, x_{iC})|^2$$

## Entanglement Assisted Wavepacket Narrowing



# Results



# Summary

- **Entanglement assisted wavepacket narrowing** however, diffraction limit cannot be beaten using this method
- Width and **phase correlations** of the light entering a lens influence the diffraction limit