

5.13: Pentagram Diffraction Pattern

Establish mask geometry:

$$R = 2 \quad m = 1..5 \quad \Theta_m = \frac{2\pi m}{5} \quad x_m = R \sin(\Theta_m) \quad y_m = R \cos(\Theta_m)$$

$$R = 0.75 \quad m = 6..10 \quad \Theta_m = \frac{2\pi(m-0.5)}{5} \quad x_m = R \sin(\Theta_m) \quad y_m = R \cos(\Theta_m)$$

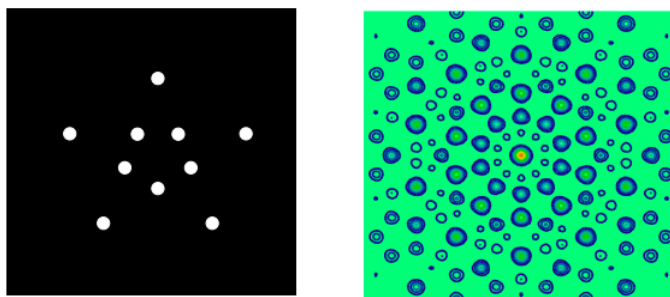
Fourier transform of position wave function (mask geometry) into the momentum representation: $m = 1..10$

$$d = .15 \quad \Phi(p_x, p_y) = \frac{1}{2\pi d\sqrt{10}} \left[\sum_{m=1}^{10} \left(\int_{x_m - \frac{d}{2}}^{x_m + \frac{d}{2}} \exp(-ip_x x) dx \int_{y_m - \frac{d}{2}}^{y_m + \frac{d}{2}} \exp(-ip_y y) dy \right) \right]$$

Display mask geometry and diffraction pattern:

$$N = 100 \quad \Delta p = 20 \quad j = 0..N \quad k = 0..N \quad px_j = -\Delta + \frac{2\Delta p j}{N} \quad py_k = -\Delta + \frac{2\Delta p k}{N}$$

$$\text{Diffraction pattern}_{j,k} = (|\Phi(px_j, py_k)|)^2$$



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