

# Mask Diffraction Patterns - Pentagram

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Establish mask geometry:

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

$$R := .75 \quad m := 6..10 \quad \Theta_m := \frac{2 \cdot \pi \cdot (m - .5)}{5} \quad x_m := R \cdot \sin(\Theta_m) \quad y_m := R \cdot \cos(\Theta_m)$$

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

$$d := .15 \quad \Phi(p_x, p_y) := \frac{1}{2 \cdot \pi \cdot d \cdot \sqrt{10}} \cdot \sum_m \left( \int_{x_m - \frac{d}{2}}^{x_m + \frac{d}{2}} \exp(-i \cdot p_x \cdot x) dx \cdot \int_{y_m - \frac{d}{2}}^{y_m + \frac{d}{2}} \exp(-i \cdot p_y \cdot y) dy \right)$$

Display mask geometry and diffraction pattern:

$$N := 100 \quad \Delta p := 20 \quad j := 0..N \quad k := 0..N \quad p_{x_j} := -\Delta p + \frac{2 \cdot \Delta p \cdot j}{N} \quad p_{y_k} := -\Delta p + \frac{2 \cdot \Delta p \cdot k}{N}$$

$$\text{DiffractionPattern}_{j,k} := \left( \left| \Phi(p_{x_j}, p_{y_k}) \right| \right)^2$$

