

Diffraction Patterns for Two-dimensional Masks: Two Concentric Circles

Create hole positions:

$$A := 30 \quad R := 1.2 \quad m := 1..15 \quad \Theta_m := \frac{2 \cdot \pi \cdot m}{15} \quad x_m := R \cdot \sin(\Theta_m) \quad y_m := R \cdot \cos(\Theta_m)$$

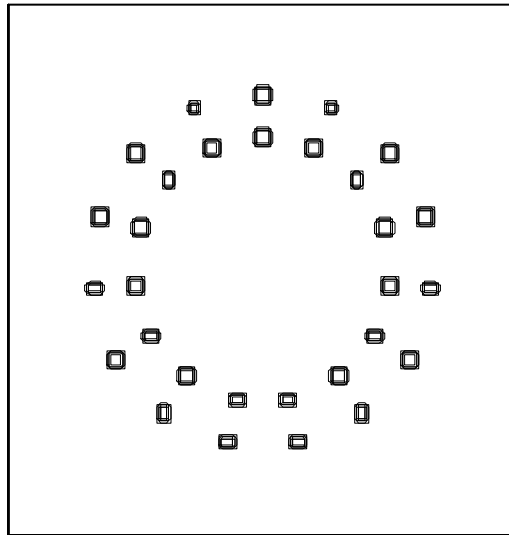
$$R := .9 \quad m := 16..A \quad \Theta_m := \frac{2 \cdot \pi \cdot m}{15} \quad x_m := R \cdot \sin(\Theta_m) \quad y_m := R \cdot \cos(\Theta_m)$$

Set hole dimension: $d := .1$

$$N := 100 \quad j := 0..N \quad xx_j := -2 \cdot R + \frac{4 \cdot R \cdot j}{N} \quad k := 0..N \quad yy_k := -2 \cdot R + \frac{4 \cdot R \cdot k}{N}$$

$$\Psi(xx, yy) := \frac{1}{\sqrt{A}} \cdot \sum_{m=1}^A \text{if} \left[\left[xx \geq \left(x_m - \frac{d}{2} \right) \right] \cdot \left[xx \leq \left(x_m + \frac{d}{2} \right) \right] \cdot \left[yy \geq \left(y_m - \frac{d}{2} \right) \right] \cdot \left[yy \leq \left(y_m + \frac{d}{2} \right) \right], \frac{1}{d}, 0 \right]$$

Display mask: $M_{j,k} := \left(|\Psi(xx_j, yy_k)| \right)^2$



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$$\Delta := 30 \quad N := 200 \quad j := 0..N \quad p_{x_j} := -\Delta + \frac{2 \cdot \Delta \cdot j}{N} \quad k := 0..N \quad p_{y_k} := -\Delta + \frac{2 \cdot \Delta \cdot k}{N}$$

Fourier transform of position wave function into the momentum representation:

$$\Psi(p_x, p_y) := \frac{1}{2 \cdot \pi \cdot d \cdot \sqrt{A}} \cdot \sum_{m=1}^A \int_{x_m - \frac{d}{2}}^{x_m + \frac{d}{2}} \exp(-i \cdot p_x \cdot x) dx \cdot \int_{y_m - \frac{d}{2}}^{y_m + \frac{d}{2}} \exp(-i \cdot p_y \cdot y) dy$$

Display diffraction pattern:

$$P_{j,k} := \left(\left| \Psi(p_{x_j}, p_{y_k}) \right| \right)^2$$

