Diffraction Patterns for Two-dimensional Masks: Finite Hexagon Scatterers

Create hole positions using circumscribed circle as guide:

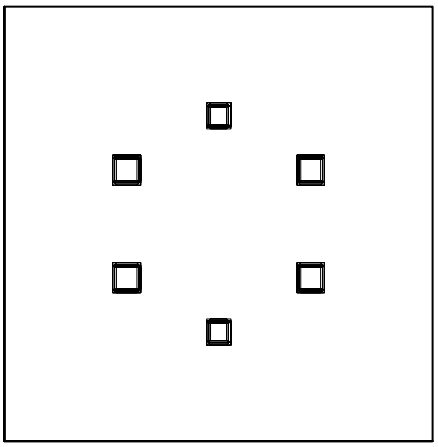
$A := 6 \qquad R := 1.386 \qquad m := 1..A \qquad \Theta_m := \frac{2\cdot\pi\cdot m}{A} \qquad x_m := R\cdot\sin\left(\Theta_m\right) \qquad y_m := R\cdot\cos\left(\Theta_m\right)$

Set hole dimension: $r := .3$

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

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

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



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$\Delta := 15 \qquad N := 100 \qquad j := 0..N \qquad p_{x_j} := -\Delta + \frac{2\cdot\Delta\cdot j}{N} \qquad k := 0..N \qquad p_{y_k} := -\Delta + \frac{2\cdot\Delta\cdot k}{N}$

Fourier transform of position wave function into the momentum representation:

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

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