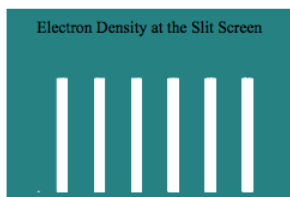# 5.20: Electron Diffraction at Multiple Slits

The American Journal of Physics published a translation of Claus Jonsson's paper "Electron Diffraction at Multiple Slits" in *American Journal of Physics* **42**, 4-11 (1974). The following calculations are in agreement with the diffraction patterns reported by Jonsson.

$$\text{Number of slits:} \quad n = 6 \quad \text{Slit width:} \quad w = .5$$

$$\text{Slit locations:} \quad s_1 = 0 \quad s_2 = 2 \quad s_3 = 4 \quad s_4 = 6 \quad s_5 = 8 \quad s_6 = 10$$
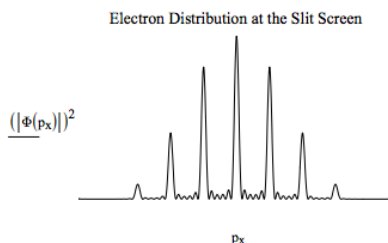
Normalized coordinate-space wave function at the slit screen:

$$\Psi(x) = \frac{1}{\sqrt{N}} \left| \begin{matrix} \frac{1}{\sqrt{w}} \text{ if } \sum_{j=1}^{n} \left[(x \geq -s_j)(x \leq s_j + w) \right] \\ 0 \text{ otherwise} \end{matrix} \right.$$

Electron Density at the Slit Screen

Fourier transform the position wave function into the momentum representation:

$$\Phi(p_x) = \frac{1}{\sqrt{2\pi}} \int_0^{s_n + w} exp(-ip_x x)\Psi(x)dx$$

Electron Distribution at the Slit Screen

$(|\Phi(p_x)|)^2$

Px

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