24. Image Simulation

Problems

24.1. An FFT from a high-resolution image of an amorphous material taken at 200 KeV with an objective lens spherical aberration coefficient of $C_s = 2.040$ mm has an intensity minimum at $u_n = 2.12$ nm^{-1}. The next minimum occurs at $u_{n+1} = 2.73$ nm^{-1}. Find the defocus Δf of the objective lens (in nm).

24.2. In a 1-D sample, the wave function transmitted through the top slice (slice 0) of a sample is:

$$f_1(x)\psi_0(x) = \delta(x-a)\cdot e^{-[(x-a)/b]^2},$$

The wave then propagates through vacuum of for a distance $\Delta z = 2\lambda$ before reaching the next slice (slice 1). The 1-D propagator is given by:

$$p(x,\Delta z) = \frac{e^{i\pi/4}\cdot e^{\pi i x^2/(\lambda\cdot\Delta z)}}{\sqrt{\lambda\cdot\Delta z}}$$

Find an expression for the wave function $\psi_1(x)$ at the entrance to slice 1.