

23. High-Resolution Imaging

Problems

23.1. The object wave function below a sample is:

$$F(x) = 1 - iB \cdot \sin(2\pi gx).$$

The microscope transfer function in reciprocal space is given by $H(u) = A(u) \cdot e^{-i\chi(u)}$.

Find the image wave function $G(x)$ in direct space for the following cases:

$$\begin{array}{l} \text{a) } A(u) = \begin{cases} 1, & |u| \leq g/2 \\ 0, & g/2 < |u| \end{cases}, \quad \chi(u) = \begin{cases} 0, & |u| \leq g/2 \\ \pi/2, & g/2 < |u| \end{cases} \\ \text{b) } A(u) = \begin{cases} 1, & |u| \leq 3g/2 \\ 0, & 3g/2 < |u| \end{cases}, \quad \chi(u) = \begin{cases} 0, & |u| \leq g/2 \\ \pi/2, & g/2 < |u| \end{cases} \\ \text{c) } A(u) = \begin{cases} 1, & |u - g/2| \leq g \\ 0, & g < |u - g/2| \end{cases}, \quad \chi(u) = \begin{cases} 0, & |u| \leq g/2 \\ \pi, & g/2 < |u| \end{cases} \end{array}$$
