Computational Science:
Computational Methods in Engineering

Design of Kinoforms

What is a Kinoform?

A kinoform is a diffraction grating that forms a patterned image when a coherent beam of light is shined through it.
Near-Field to Far-Field

After propagating a long distance, the field within a plane tends toward the Fourier transform of the initial field.

\[ \tilde{E}(x, y, 0) \rightarrow \tilde{E}(x, y, L) \]

Gerchberg-Saxton Algorithm:

Initialization

Step 1 – Start with desired far-field image.

Step 2 – Calculate near-field.

Step 3 – Replace amplitude.

Step 4 – Calculate far-field.
Gerchberg-Saxton Algorithm:

**Iteration**

- **Near-Field**
  - Step 6 – Calculate near-field
  - FFT

- **Far-Field**
  - Step 7 – Replace amplitude
  - Amplitude
  - Step 8 – Calculate far-field
  - FFT

**End**

- **Near-Field**
  - This is the phase function of the diffractive optical element.

- **Far-Field**
  - This is what the final image will look like.

After several dozen iterations...
A surface relief pattern is etched into glass to induce the phase function onto the beam of light.

This can also be accomplished with an amplitude mask fabricated in a high-resolution laser printer.