



Computational Science:  
Computational Methods in Engineering

## Design of Kinoforms



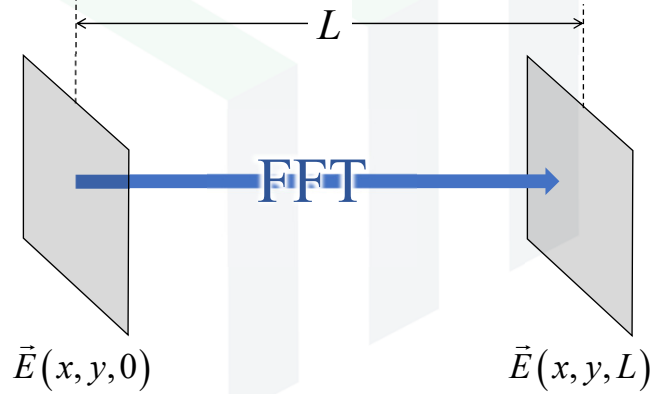
### What is a Kinoform?

A kinoform is a diffraction grating that forms a patterned image when a coherent beam of light is shined through it.

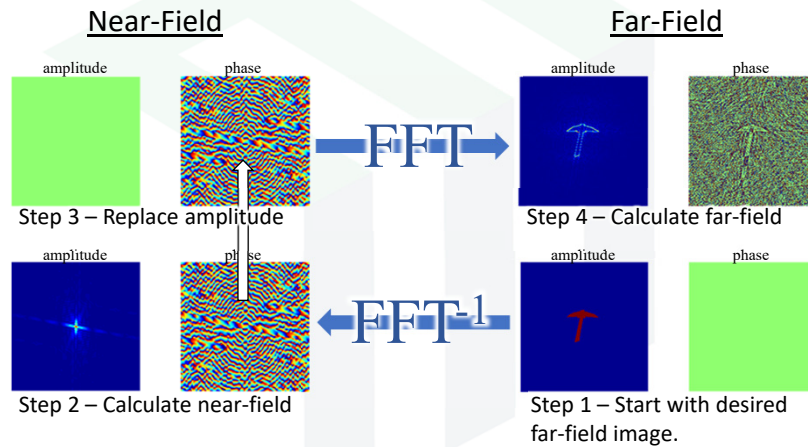


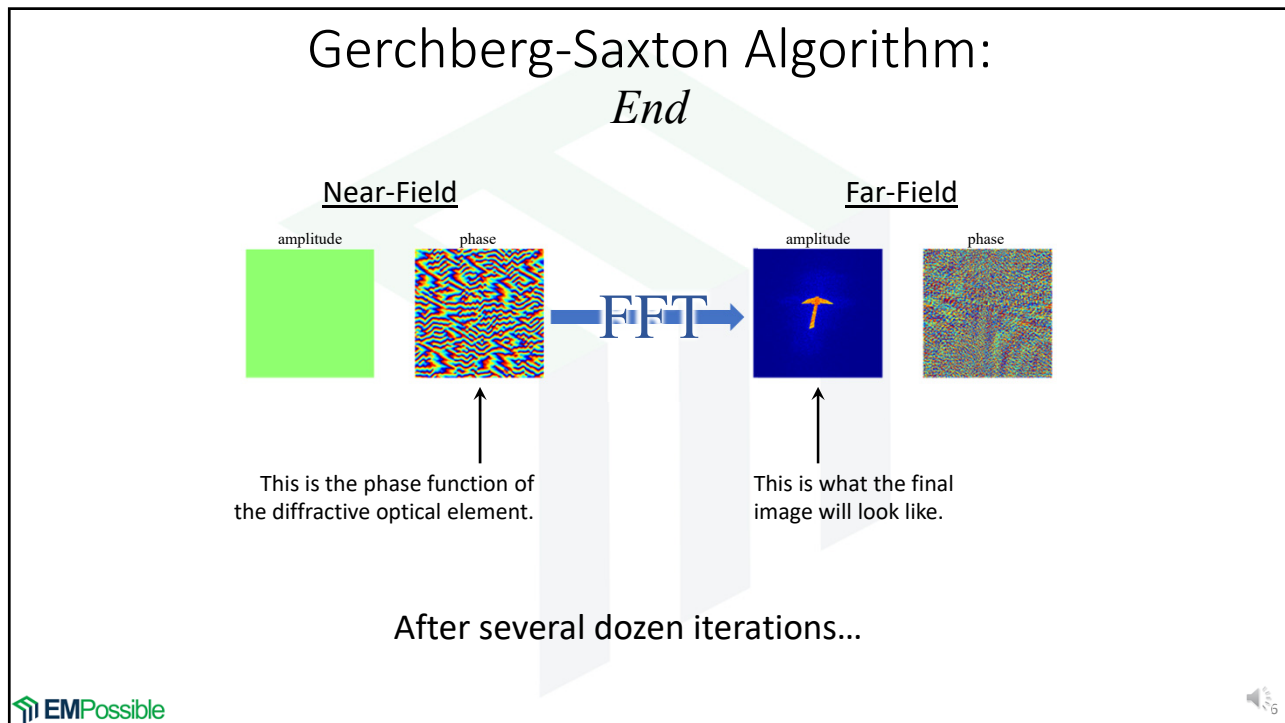
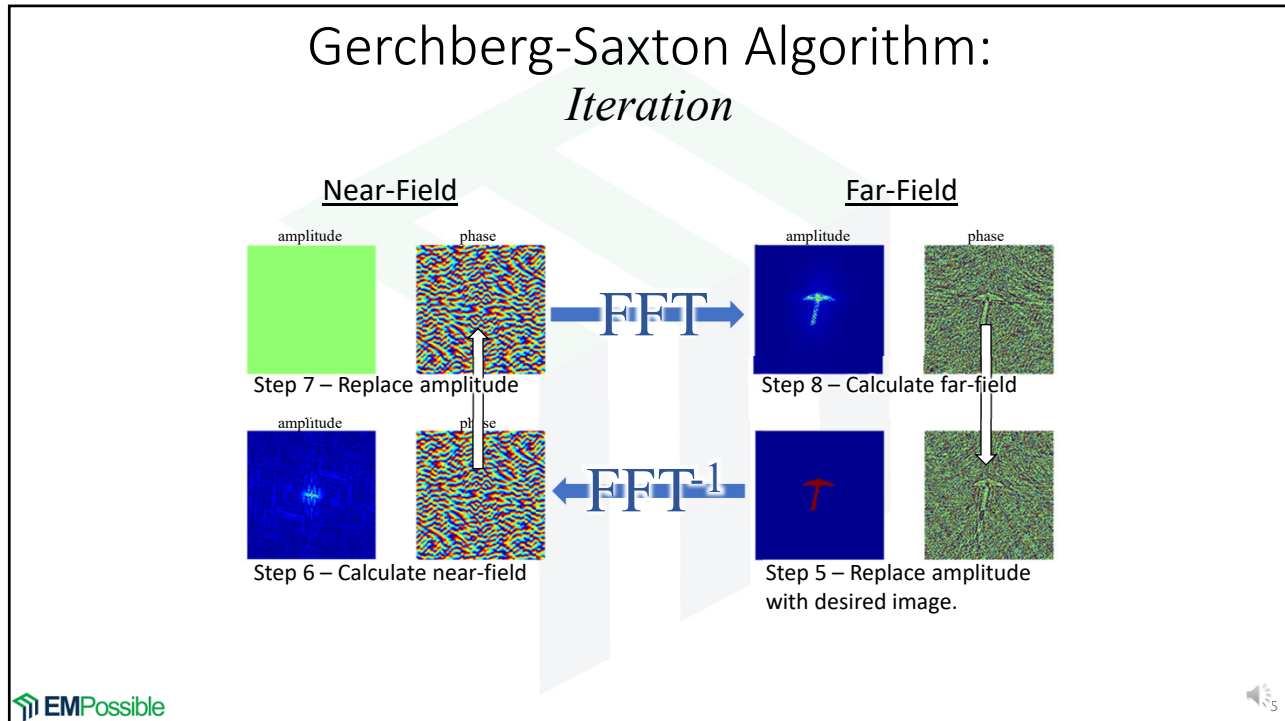
## Near-Field to Far-Field

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

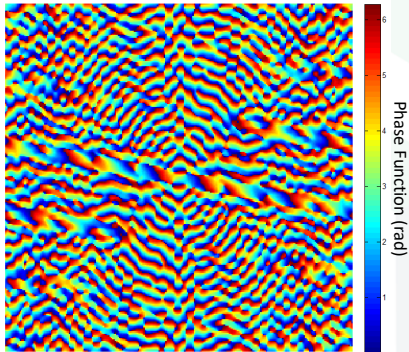


## Gerchberg-Saxton Algorithm: *Initialization*

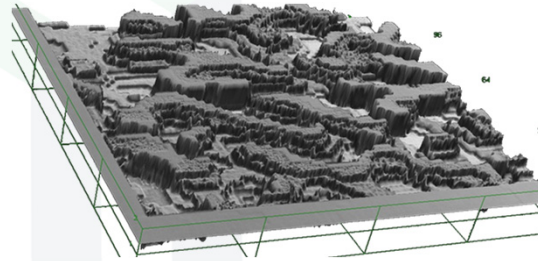




## The Final Kinoform



Phase function as calculated by the Gerchbert-Saxton algorithm.



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.

## MATLAB Code

```

% SHIFT IMAGE FOR FFT
B = fftshift(B);

% SETUP FIRST ITERATION
NF = ifft2(B);
NF = exp(1i*angle(NF));

% calculate near-field pattern
% replace amplitude with all ones

% ITERATE
for n = 1 : N
    FF = fft2(NF);
    FF = abs(B).*exp(1i*angle(FF));
    % calculate far-field pattern
    % replace amplitude with image
    NF = ifft2(FF);
    % calculate near-field pattern
    % replace amplitude with all ones
    NF = exp(1i*angle(NF));
end

% RETRIEVE FINAL PHASE
PH = angle(NF);

```