Simulation lab work: Imaging in a diffraction formalism

Best use Matlab or Python

In this lab work we want to show that a diffraction formalism can be used to evaluate an imaging system.

Keywords are: Point spread function, resolution limit as defined by the Raleigh criterion, position of the image plane, scale factor, depth of field, focal length.

For the implementation it's probably the best to use the Fresnel approximation in the convolution formulation. Probably using 2^X pixels in each direction of mask and screen speeds up the convolution calculation. In Python use "from scipy.signal import fftconvolve", this is much faster than other versions.

Using a relatively small lens (radius r = 2.5mm) and masking with a black frame that has a minimum width of r/4, gives good results. The point sources should be rather close to each other and they should not be too close to the mask/lens (if not there will be no real image).

The lens is implemented as a flat phase mask. Either make the geometrical calculation for a plano-convex lens or use the ideal lens (parabolic phase shift). Compare to what OSLO gives you for the same system.