6.1: What you should know and be able to do after studying this chapter

- Understand when the scalar wave equation can be used to propagate fields.
- Be able to derive the angular spectrum decomposition, starting from the scalar wave equation. Be able to interpret the angular spectrum method (also known as the plane wave expansion).
- Know the Rayleigh-Sommerfeld formula; in particular be able to write down the integral over spherical waves with amplitudes proportional to the field in the starting plane.
- Know how to deduce the Fresnel and Fraunhofer approximation of the RayleighSommerfeld integral.
- Understand intuitively in what sense the Fourier transform is linked to resolution.
- Understand why propagation of light leads to loss of resolution (i.e. the evanescent waves disappear).
- Know how the Fresnel and Fraunhofer propagation integrals relate to Fourier transforms.
- Understand why propagation to the far field corresponds to taking the Fourier transform.
- Understand why propagation to the focal plane of a lens corresponds to taking the Fourier transform.
- Understand why the Numerical Aperture (NA) of a lens ultimately determines the resolution of images.
- Understand how a lens can be used for Fourier filtering.