

# Biomicroscopy I - Exercise Sheet 14

## Bonus questions

December 16, 2025

### 1 Bonus question: Siemens star in a $4f$ system

Consider a Siemens star as seen in Figure 1a. In the Fourier plane of the  $4f$ -system, you now place the spatial frequency filter shown in Figure 1b.

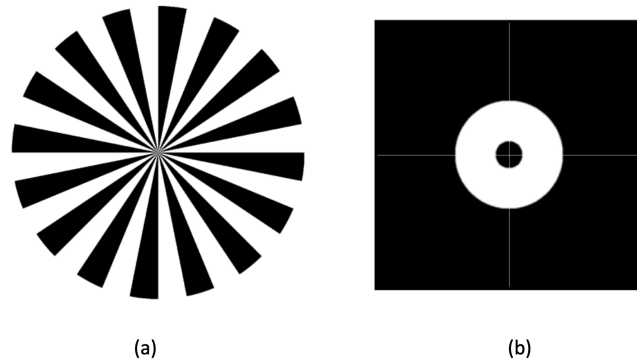


Figure 1: **a)** Siemens star as an input to a  $4f$  system. **b)** Spatial frequency filter placed in the Fourier plane

Which filtered output from Figure 2 do you get using the spatial frequency filter of Figure 1b?

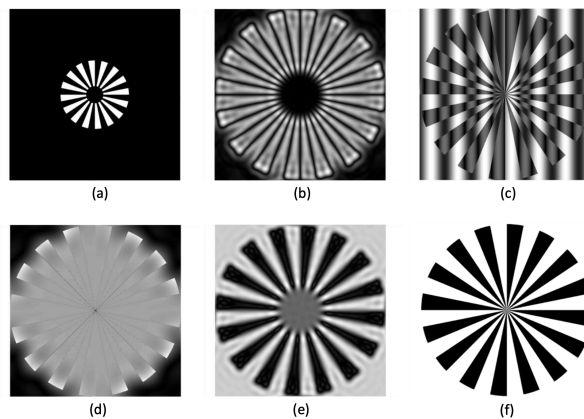


Figure 2: A set of different images at the output of the  $4f$  system

### 2 Bonus question: fluorescence microscopy

A. Name three commonly used illumination sources in fluorescence microscopy.

- B. Name three commonly used detectors in fluorescence microscopy.
- C. Name four commonly used fluorescence markers in fluorescence microscopy.

### 3 Bonus question: diffraction grating

Assume that you put a diffraction grating in the input plane and a screen at the output plane, shown in Figure 3. The screen distance  $L$  is sufficiently large to observe a clear diffraction pattern. Assume that the incident light is coming from a white light source.

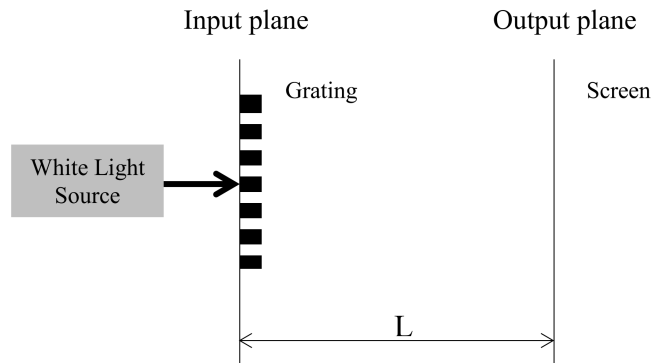


Figure 3: Diffraction grating and white light illumination

Which pattern will you observe on the screen? Choose from Figure 4.

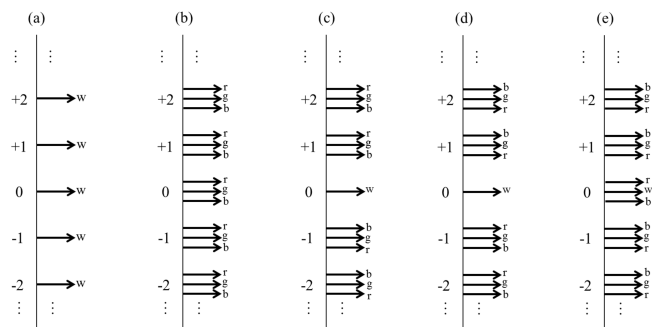


Figure 4: Possible diffraction patterns (w: white; r: red; g: green; b: blue)

### 4 Bonus question: aberrations

Define the type of aberrations presented in the Fig. 5 and explain shortly your choice.

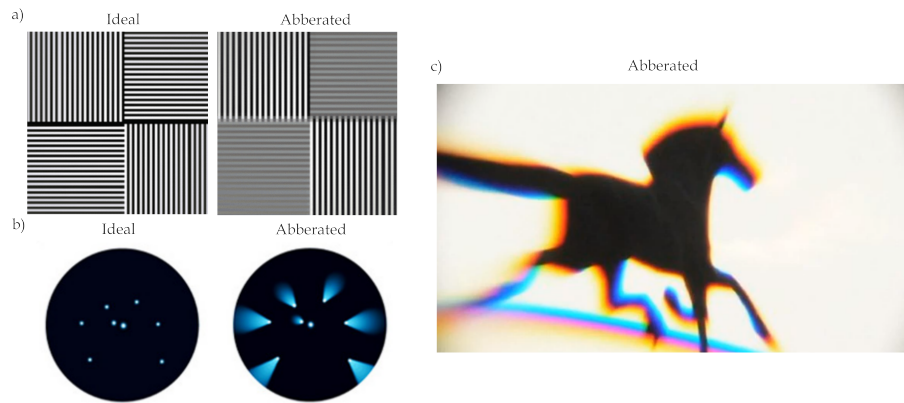


Figure 5: Examples for different types of optical aberrations