

Questions 1 (parts a and b); 2 (parts a and b).

1. Image Quality (F15 Final Q7)

A 200mm x 300mm monochrome monitor is to be viewed at a distance of 500mm. It's desired that the image quality match the resolution of the eye (angular resolution of the eye $1 \text{ arc min} = \frac{1}{60} \text{ degrees}$). The image was captured on a 10mm x 15mm detector.

The camera is designed using the hyperfocal condition so that objects between 2m and infinity meet the above image quality or blur condition.

- a. What is the approximate resolution of the system in pixels (assume the blur size equals the pixel size)?
- b. What is the required $f/\#$ for the imaging lens given that the focal length of the lens is approximately 15.8mm?

2. Reverse Telephoto Zoom Lens

Design a two-element reverse telephoto zoom lens:

Focal length ranges 30-80mm

Lens configuration Two-element zoom lens

Reverse-telephoto configuration (negative-positive)

Element focal lengths $f_1 = -50mm$, $f_2 = +50mm$

Assume an object at infinity. Both elements are thin lenses in air.

- a. Provide the equations for the element separation and the back focal distance as a function of the system focal length.
- b. Plot the lens positions as a function of the system focal length (between 30mm and 80mm with at least a 10mm interval).