2 Calculate the f/number of a camera lens system required to match 24 μm pixels to $0.2''$ on the sky for a 10 m telescope. Comment on whether or not this would be challenging. What is the field of view for a $1{,}024 \times 1{,}024$ pixel detector?

- pixel scale $= 0.2(''/\text{pixel})$
- pixel size $= 24(\mu\text{m})$
  →plate scale$= \frac{\text{pixel scale}}{\text{pixel size}} = \frac{0.2}{24} = 0.0083(''/\mu\text{m}) = 8.3(''/\text{mm})$
- plate scale $(''/\text{mm}) = \frac{206265}{\text{focal length(mm)}}$
  →focal length$= \frac{206265}{8.3} = 2.5\times10^4(\text{mm}) = 25(\text{m})$
  →f/number$= \frac{focal\ length}{diameter} = \frac{25(\text{m})}{10(\text{m})} = 2.5$
  →not challenging (be able to make the lens that have this f/number)
- FoV for 1024×1024 pixel detector
  $\rightarrow(1024\times0.2)''\times(1024\times0.2)''\rightarrow204.8''\times204.8''$
  $\rightarrow3.41'\times3.41'$

8 What is the required scan length of an FTS working at a wavelength of 10 μm in the mid-infrared if the required resolving power is $R = 100{,}000$?

scan length : Δx(cm)

wavelength : λ =10um

resolving power : $R = 4\Delta x/\lambda = 100{,}000$

$\rightarrow \Delta x = R\lambda/4 = 100{,}000 \times 10(\text{um})/4 = 25(\text{cm})$