section2_Ex.5

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M1 Kensho Tanaka

(1) What is the expected value of the Fried parameter at a wavelength of 500nm if the observed seeing is 0.5 arcsec?

- Since seeing size is represented by λ/r_0,

$$\frac{\lambda}{r_0} = 0.5\ arcsec$$

$$r_0 = \frac{500nm}{0.5arcsec} = 21cm$$

(2) What is the corresponding value of r0 at 1.65 microns in the infrared assuming Kolmogorov turbulence?

- assuming Kolmogorov turbulence, Fried parameter r_0 is proportional to $\lambda^{6/5}$.

$$r_0 = 21cm \times \left(\frac{1.65\mu m}{0.5\mu m}\right)^{6/5} = 86cm$$

(3) For a 10m telescope, how many sub-apertures does this imply for infrared observations?

- D = 10m
- x : sub-aperture size
- y^2 : the total number of sub-aperture
- m : magnification

$$m = \frac{D}{xy}$$

- xy means the total size on a side.

(3) For a 10m telescope, how many sub-apertures does this imply for infrared observations?

- D = 10m
- x : sub-aperture size
- y^2 : the total number of sub-aperture
- assuming the sub-aperture size on the primary mirror corresponds the Fried parameter r_0,

$$m \times x = r_0$$

so,

$$y = \frac{D}{r_0} = \frac{10m}{86cm} = 11.6$$

- That means the total number of sub-apertures is y^2 = 121