

Astronomical Telescopes and Instruments 2010:
Exercises on Optical Design
(Due on 14 January 2011 at 11:00)

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1 The Sun as a star

You own a 5-cm solar telescope with an effective focal length of 1 m. It has a perfect guiding system. You also own a fiber-fed spectrometer with a multimode fiber that has a $500\ \mu\text{m}$ core diameter and an acceptance angle that corresponds to an F/2 beam. How much of the telescope diameter can you use when you build a reimaging system that images the complete solar disk onto the fiber?

What would be the effective diameter of the telescope you could use if you would image a pupil plane at F/2 onto the fiber? Explain the correspondence between both results.

2 Tolerancing on a telescope

What is the tolerance on the radius of curvature of the (parabolic) primary mirror of a 50 cm Newtonian telescope with a focal length of 2 m for it to remain diffraction-limited at the original focus position at 500 nm? How does this number convert to a wavefront error?