

Optics 505

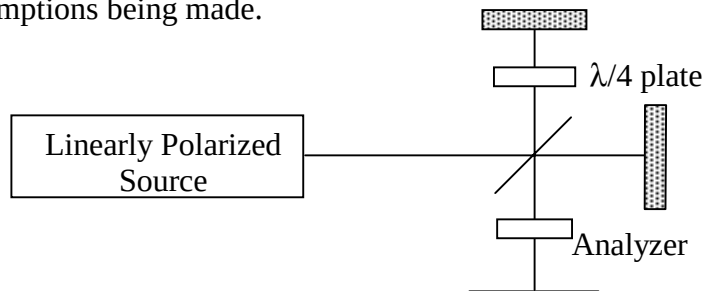
Exam #1

March 4, 1997

1) (25 Pts) A linearly polarized source is used with a Twyman-Green interferometer. A quarter-wave plate is placed in one arm of the interferometer. The fast axis of the quarter-wave plate makes an angle θ with respect to the direction of polarization of the light incident upon the quarter-wave plate. A perfect analyzer is placed in the output of the interferometer. The transmission axis of the analyzer is in the direction of polarization of the light coming from the interferometer arm not having the quarter-wave plate. The interferometer is adjusted to give 4 straight vertical fringes.

What is the fringe visibility as a function of θ ?

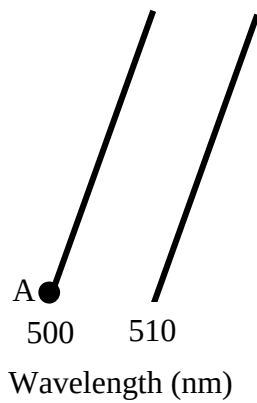
State any assumptions being made.



- 2) White light fringes are observed using a two-beam Michelson interferometer.
- (5 Pts) Sketch the interferometer. How is the interferometer adjusted to give white light fringes? What is the purpose of the compensator plate?
 - (10 Pts) Where are the fringes localized? What is the shape of the fringes?
 - (10 Pts) Let the source have two wavelengths, 550 and 560 nm. How many bright fringes do we have for the 550 nm wavelength before the fringe visibility drops to zero?
- 3) A Michelson Stellar Interferometer working at a wavelength of 500 nm is used to measure the separation of binary stars.
- (5 Pts) Sketch the interferometer.
 - (15 Pts) What is the star separation, in seconds of arc, if the minimum mirror separation for zero fringe visibility is 0.5 m?
 - (5 Pts) Sketch a setup of the Hanbury-Brown Twiss system for resolving the same binary stars.

4) The following interferogram is obtained using a FECO interferometer to test a 5 cm x 5 cm square flat mirror.

- a) (5 Pts) Sketch the interferometer.
- b) (10 Pts) For point A, what is the separation between the sample being measured and the reference surface?
- c) (10 Pts) What is the wedge angle between the sample being measured and the reference surface?



State any assumptions you are making.