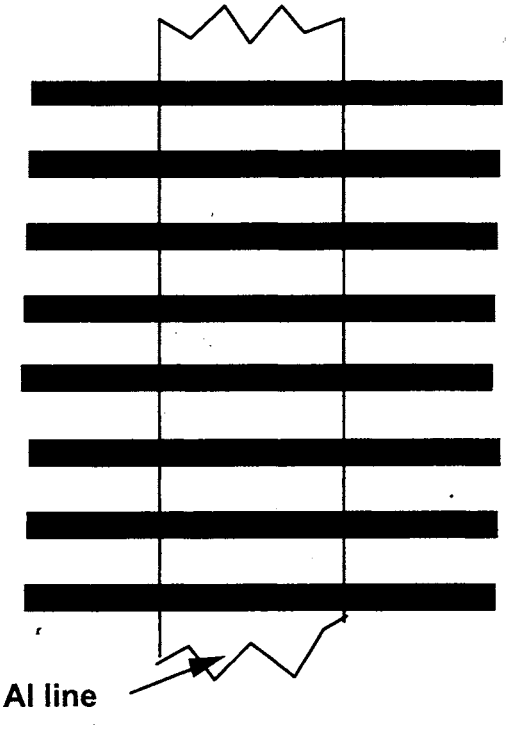
6.781
Submicron Structures Technology
Homework Set #6

23. The purpose of this problem is to get you to think about coherence length and its impact in interferometry.

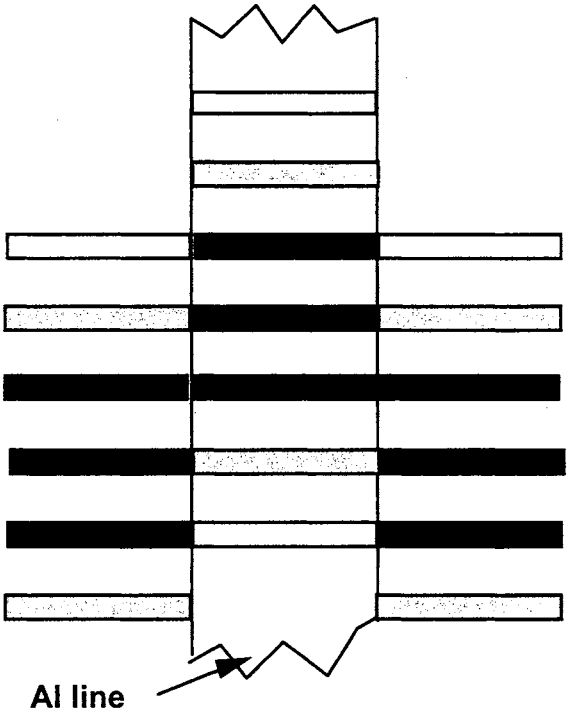
Suppose one wants to measure the thickness of an Al line on a Si substrate using an interferometer. With a monochromatic source (λ = 600 nm) we get the fringe pattern shown at the left below. There is no way to interpret the meaning of this pattern unambiguously. However, with a white light source we can remove this ambiguity: we get the fringe pattern shown at the right below: a black fringe with colored fringes on either side of it, displaced as shown.

What is the thickness of the Al line?

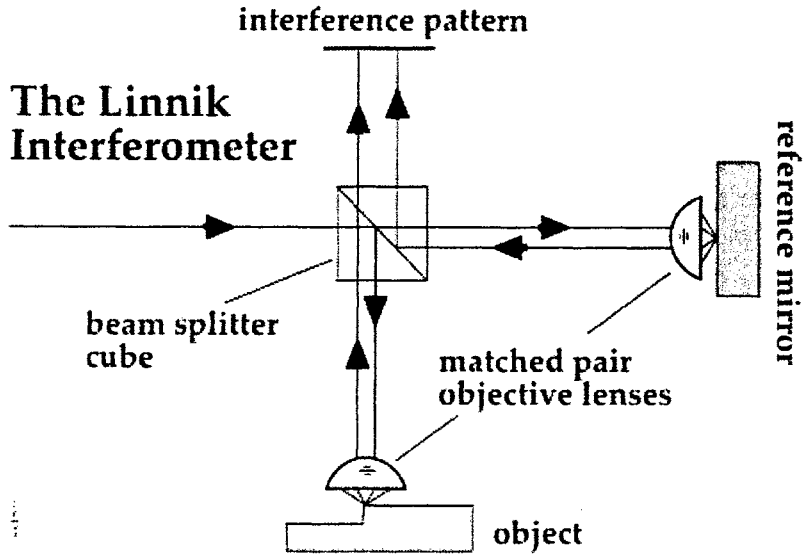
fringe pattern
using λ = 6000Å



fringe pattern using
using white light



24. For a Linnik interferometer, using a "white light" source with significant intensity only in the band 400 nm < λ < 600 nm what is the maximum value of $|L_2 - L_1|$, approximately.



25. Read the attached article from Physics Today, May 1994, entitled "Near-field optical microscopes take a close look at individual molecules"

a) Does this microscope spatially "resolve" individual molecules in the sense that we use that term in this course.
b) Has the passage of time changed the situation significantly?

References

Problem 25

Collins, Graham P. "Near-Field Optical Microscopes Take a Closer Look at Individual Molecules." *Physics Today* (May 1994): 17-20.