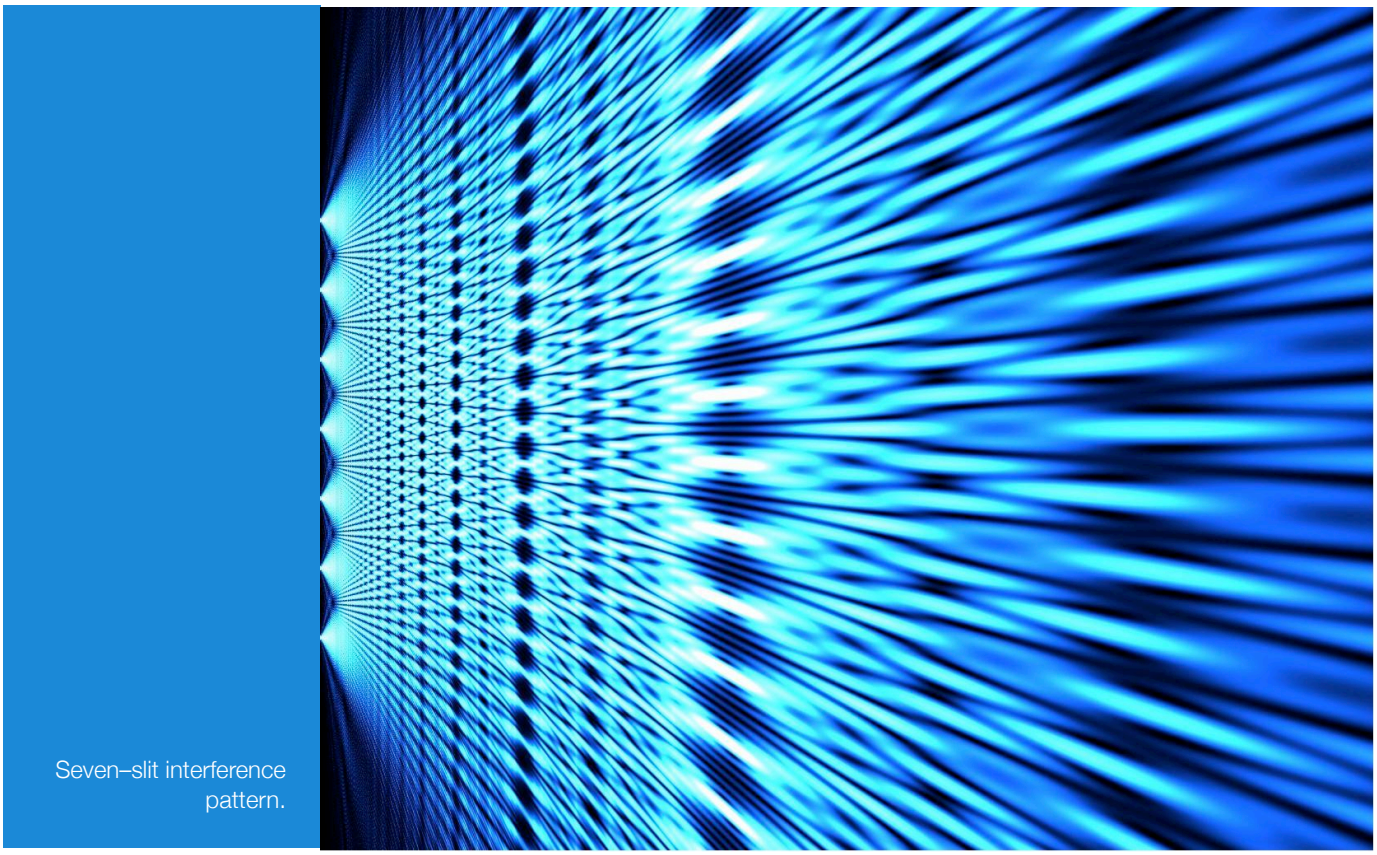
UCA Department of Physics and Astronomy

PHYS 3345: OPTICS



Seven–slit interference pattern.

Assignment 09: Chapter 09 Spring 2008
DUE: April 16, 2008

Work each problem neatly and completely. Unless otherwise noted, each problem is worth **4 points**. You should solve on green engineering paper or blank unruled paper. You must include sufficient demonstration of your problem solving process. If a problem is to be solved by inspection, state this. If graphs or plots are required, you should use an appropriate tool for their construction (there are several respectable options available on the computers in LSC 114).

1. Work through the math to show explicitly (skip no steps) how to get from Equation 9.7 to Equation 9.11.
2. Hecht, Problem 9.9
3. Hecht, Problem 9.27
4. Hecht, Problem 9.37
5. Hecht, Problem 9.47

The *Schaum's Outline: Optics* supplement has many solved problems to assist you. In particular, you will find the following problems useful:

Review Questions

These are not assigned for grading, but they are the sort of conceptual questions that you should be able to address adequately if they were to show up on an exam.

1. For observing and measuring interference, why I not E?
2. From Equation 9.14, discuss the conditions for and consequences of total constructive and total destructive interference.
3. Again from Equation 9.14, why will the clearest interference patterns occur when the amplitudes of the interfering waves have identical, or nearly identical, amplitudes?
4. Distinguish briefly between temporal and spatial coherence.
5. Two coherent $\mathcal{P}$–states. Parallel or orthogonal for interference? Why one and not the other? Why not both?
6. How is a wavefront–splitting interferometer different from an amplitude splitter? Know an example of each type.
7. Know the fundamental geometries for Young's double slit experiment, Lloyd's mirror, and the Michelson interferometer.
8. A thin film of soap ($n_2 \approx 1.3$) is suspended vertically with air ($n_1 \approx 1$) on both sides. Establish the conditions (and film thicknesses) for seeing a magenta fringe when observing at near-normal incidence.
9. If the thin film of soap instead covers a glass ($n_3 \approx 1.5$) substrate, under what conditions and for what film thicknesses will magenta fringes be observed?
10. When observing the colored fringes in a soap bubble, why are you more likely to observe cyan, magenta, or yellow fringes than you are to observe red, green, or blue fringes?