

MAS 450/854 Holographic Imaging: Lab Notes

#10: OFF-AXIS REFLECTION HOLOGRAMS - Full Aperture Transfer

Introduction:

Although there are many tens of millions more rainbow holograms in the world, full-aperture-transfer off-axis reflection holograms are usually the preferred medium for small-scale commercial production. They can be mounted on solid surfaces, lit with simple spotlights, and present a viewing zone that can be quite tall; they have more of the “look and feel” of conventional photographs. Of course, they are not as bright, sharp, and deep as rainbow holograms; indeed, it can be quite difficult to produce a reflection hologram that is bright at all!

In principle, the difference between a full-aperture reflection and transmission transfer exposure is only that the reference beam is introduced through the back of the H2 plate in the reflection case. In practice, many small details have to be paid careful attention to! First, the setup tends to sprawl over more table space, especially if no big mirrors are used, which makes stability more of a problem. Second, the H2 plate is much more vulnerable to motion darkening because the interference fringes are so much finer. Third, it is more difficult to avoid wood-grain fringes in the H2. And fourth, processing is a more complex problem because shrinkage, brightness, and scatter have to be managed simultaneously.

For this lab, you will use your familiar transmission master hologram from several labs ago, but the table layout will be quite different. You are asked to design a table layout yourself. Your TA will outline the constraints, which include: no extra mirrors in the reference beam! Setting up will take a while, so you should figure on making only one or two transfer holograms.

Experimental Procedure

- 1) **Design** and assemble a reflection transfer “camera.” You should design a setup on your own before your lab, and be prepared to discuss any advantages and disadvantages of your proposal with your lab-mates and your TA.
- 2) Use the gray-glass H2 holder to avoid “wood grain” fringes in the plate. Meter for the exposure as necessary. Beam ratios as low as 3:1 are OK in reflection holography.
- 3) Use a pre-swelled plate in order to get a green or blue reconstruction.
- 4) Use the Ilford developer and EDTA bleach system, unless your TA suggests otherwise.
- 4) Alcohol dry, and spin dry to get the plate out as quickly as possible (reflection holograms can take quite a while to stabilize).