



Simple Holography Kit

P2-7005

Welcome to Simple Holography! Finally, anyone can create beautiful holograms with a simple process. Even middle school students can now do holography. Holography is done in the dark. It is very important to read and understand the entire procedure before you begin.

GOAL:

To use an inexpensive laser to produce a quality reflection hologram that can be viewed with a point source of incandescent light.

MATERIALS:

Arbor Scientific Holography Laser
11" x 22" Holography Table
Safelight
3 Developing trays
Pewter Object

Film plate holder
White card (2.5" x 2.5")
Black shutter (3" x 5")
Laser-leveling Wedge
Directions

YOU ALSO NEED:

Short Exposure Film Plates
Short Exposure Chemicals

CHEMISTRY SUPPLIES:

Distilled Water
Graduated Cylinder
3 One Liter Storage Containers
1 500 mL Storage Container

SAFETY:

Do not look directly into the laser. A non-collimated laser is much less intense than a normal, collimated laser. Its intensity is comparable to that of the laser in a grocery checkout scanner. Students should be reminded, however, not to look into the laser or shine it in the eyes of others.

The laser operates on four AA batteries. To change the batteries, remove the base of the laser. Remove the padding and pull out the battery case. Do not attempt to adjust the potentiometer on the laser module (inside the case).

PREPARATION OF LASER:

The laser is provided with a collimating lens. To produce holograms, this lens must be removed from the laser. Simply unscrew the lens to remove it. The lens may then be discarded or used to cover the laser when not in use.

PREPARATION OF DEVELOPING CHEMICALS:

Carefully follow the directions for preparing the JD-4 Holography Processing Kit. Safety precautions are extremely important when working with the developing chemicals. An adult should closely assist younger students with the preparation and development processes.

PROCEDURE:

1. Setup

Set up the system on a holography table to isolate it from vibrations. If possible, do your project on the floor of the lowest floor of the building. Even the slightest movement can cause the image to be dim. If there is air movement or too much light, a black box should be placed over the entire system.

2. Lighting

Holography film is most sensitive to red light. You must expose the film in a dark room. Use a green safelight to provide just enough ambient light for minimal visibility after dark adaptation. Do not shine the green light directly on the film.

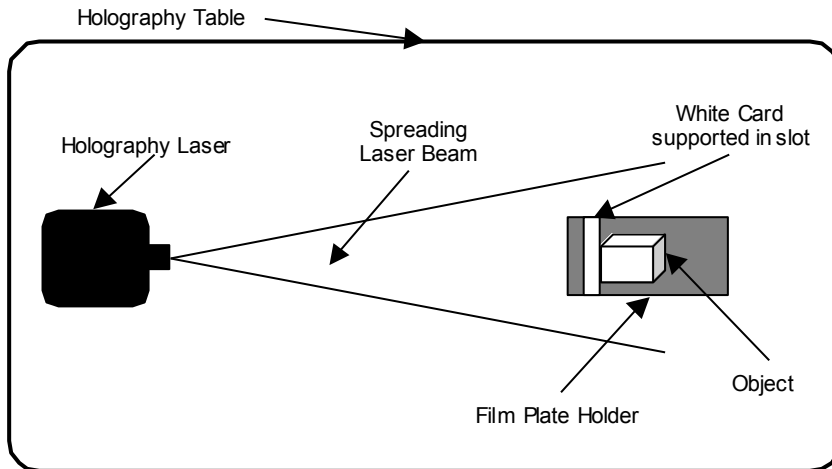
3. Warm up the laser

The Arbor Scientific Holography Laser has been specifically designed for the purpose of producing holograms. Allow the laser to warm up for five minutes. It will then produce light with a constant wavelength. Make sure the collimating lens has been removed from the laser.

4. Arrange the object

Insert the 2.5" square white card into the film holder. This will approximate the position of the film plate. Place the object behind the card, so that the card leans back a little and rests on the object. With the elliptical beam in a horizontal orientation, arrange the system so that the object is about 40 cm away from the laser, and the white card is illuminated as evenly as possible.

You may have to use the wedge to tilt the laser so that it is aimed squarely at the card.



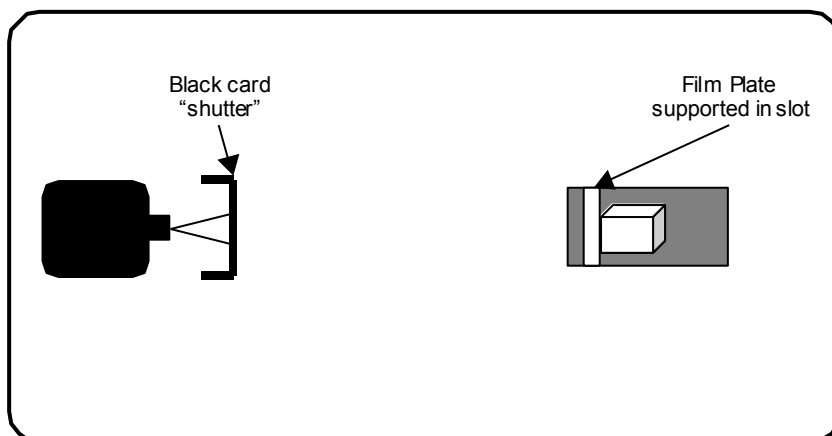
5. Block the beam

Fold the ends of the black card so it will stand on its own. Place the black card in front of the laser to block the laser beam. This card acts as a “shutter” for turning the laser on and off.

6. Arrange the film plate

In the dark room, open your box of film plates. One side of each plate is treated with an emulsion. The best way to determine which side is treated is to gently place the edge of the plate between your lips. The side that sticks is the emulsion side.

Replace the white card with the film plate, with the emulsion (sticky) side touching the object. Make sure that the film will not move during the exposure.



7. Exposure

Allow the system to settle for 30-60 seconds. Make sure the room is quiet. Lift the shutter slightly (still blocking the beam). Wait a few more seconds, assuring that nothing touches the table and there is no unnecessary motion or sound.

Expose the film by lifting the “shutter” for 5 seconds. Block the beam again by lowering the shutter. (Note: Exposure times may vary. If your first attempt does not produce an image at all, increase the exposure time to 20 or 30 seconds and try again.)

8. Developing

Develop the film according to the instructions in the chemical kit. The JD-4 chemical kit is less toxic than previous holography developing chemicals, but you should still wear gloves, goggles, and an apron while developing.

VIEWING:

The dried hologram can be viewed with a pen flashlight or any incandescent point source. Unfrosted light bulbs or the sun will work. To view the hologram, hold the emulsion side away from you. Make sure the light strikes the plate at the same angle that the laser beam struck it.

When the hologram is dry, you may paint the emulsion side flat black to make the image stand out.

KEYS TO SUCCESS:

1. **Stability:** If the object or film moves even a micrometer during the exposure, the hologram will not be clear. See *Stabilizing Spheres* in *Additional Supplies*.
2. **Quiet:** Sound is a vibration, and vibrations can cause the film or object to move during the exposure.
3. **Object choice:** The best objects are hard and light-colored. Pewter works well. Small metal models, seashells, and porcelain figurines are also good choices. Biological objects (plants, animals, classmates) are prone to movement, and do not make good subjects.
4. **Darkness:** Don't expose the film to light until after developing.
5. **Follow directions:** Follow the development directions carefully. Be sure to use distilled water for the chemistry.

ACKNOWLEDGEMENTS:

This process was developed by Dr. Tung H. Jeong, et. al., of Lake Forest College.

ADDITIONAL SUPPLIES:

Stabilizing Spheres (P6-1000-03, pkg. 15) will isolate your holography project from unwanted vibration.

Pack of 30 PFG-03 Film Plates (2.5" x 2.5") (P2-7085) Make 30 more holograms.

JD-4 Developing Chemicals (P2-7027) to develop 45-60 exposed plates (needed for this).

