

# BUILD AN OVERHEAD PROJECTOR SPECTROSCOPE

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### MATERIALS NEEDED:

Manila file folders  
C-Spectra, holographic diffraction grating, 2 ½ inches (6.3 cm) square (Flinn Scientific Co., Catalog no. AP1714)  
Tape  
Clear, colorless acetate film, 3 x 6 inches (7.6 x 15.2 cm)  
Red, blue, and green colored filters  
Scissors  
Ruler or measuring tape  
Pencil

### SAFETY PRECAUTIONS:

There are no chemical hazards in this experiment

### DISPOSAL:

All waste materials can be disposed of in the trash.

### PROCEDURE:

Obtain a manila file folder.

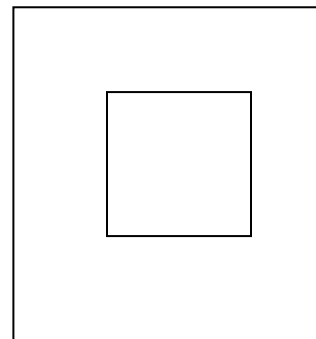
Measure a rectangle ½-inch wide (12 mm) by 8 inches long (20.3 cm), 1½ (3.8 cm) inches from the fold and centered 1 ½ inches (3.8 cm) from the ends. Cut out the rectangle to make a rectangular slit.

Obtain a piece of a manila file folder approximately 6-inches (15.2 cm) square with the fold on one side. This piece should open up like a tent. On one side of the tent, cut an opening 2 ½ inches square (6.3 cm), centered in that side.

Obtain a piece of clear, colorless acetate film, 3 x 6 inches (7.6 x 15.2 cm). Fold the acetate in half to form a pocket. Obtain a piece of C-Spectra, approximately 2 ½ inches (6.3 cm) square, place it in the acetate pocket for protection, and tape it to cover the hole in the 6 inch piece of manila file folder.

Open the large file folder and place it on an overhead projector. With the projector turned on, you should observe a vertical slit projected on a screen or a wall. Open the smaller piece of file folder and place it over the lens on top of the projector. If the piece of C-Spectra is properly oriented, you should observe visible spectra on both sides of the slit. If not, remove the C-Spectra from the acetate pocket, rotate it 90°, and replace it. Once the visible spectra are observed, tape the C-Spectra permanently in place.

To observe absorption bands, place pieces of colored acetate film over the slit on the overhead projector. On the projection screen (or a white wall) you will



observe the color of the filter in the projection of the slit and the absorption bands on the visible spectra. On either side of the slit projection.

Flat sided culture bottles filled with colored solutions of cations will also show absorption bands.

**EXPLANATION:**

This holographic diffraction grating allows for a straight through view of spectra than having a angle of incidence for traditional replica gratings. This results in the ability to project the visible spectrum from an overhead projector. Different brands of holographic gratings will have different dispersions due to the number of lines in the grating.

The colored acetate film filters will absorb opposite colors and transmit light related to the color of the filter. For example, a red acetate film will allow red, yellow, and orange light to be transmitted while absorbing green and blue light.

Colored solutions of compounds such as copper (blue) and nickel (green) can also be used to absorb light.