

CD spectrometer



A compact disk spectrometer.

Introduction

Use a compact disk to make a spectrometer.

Material

- A compact disk
- A cardboard tube 25 cm long or longer.
- Flat cardboard large enough to cover the end of the tube.
- razor knife e.g. x-acto
- Tape
- Fluorescent light

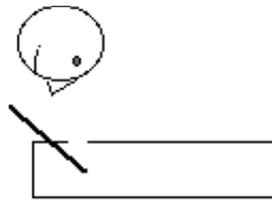
Assembly

Cut a clean slit less than 1 mm wide in the flat cardboard.

Tape the flat cardboard onto one end of the tube.

Place the slit horizontal, on the top of the tube at the far end cut a viewing slot.
The slot should be a centimeter wide and 2 cm long.

Cut a slot into the tube at a 45 degree angle from the vertical and then insert the CD into this slot so that it reflects light coming through the slit into your eye.



Look through the open hole at the light reflected off the compact disk inside the cardboard tube or box.

To Do and Notice

Point the slit at a fluorescent light.

Look through the view slot.

Look for the spectrum of light reflected from the compact disk.

Adjust the angle at which you look through the hole at the compact disk to give the best view of the spectrum.

Notice that the fluorescent light produces a continuous spectrum plus bright lines.

The bright lines are the spectrum of Mercury gas inside the tube, the continuous spectrum comes from the solid phosphor coating on the tube.

What's Going On?

The music on compact disks is digitally recorded.

Circular tracks of ones and zeros are recorded on the mirror surface of the disk. These circular tracks are so close together, that they act as a diffraction grating for light.

The light is spread into a spectrum perpendicular to the tracks.

This is why the slit and the viewing hole are located at right angles.

Each color bends at a particular angle.

This is why you have to adjust the angle of tilt of the disk to bounce the spectrum into your eye.

To see the spectrum it must reflect and diffract off the disk into your eye. therefore you must look at the disk at the right angle to see the spectrum.

Going Further

[Examine the spectra](#) produced by other light sources such as incandescent bulbs, sodium vapor street lights, and neon tubes.

Do not look at the sun, but you may look at sunlight reflected off white clouds, white walls, or white paper.

Optional construction

You can also make a spectroscope from a cereal box.



Two views of a cereal box spectrometer. Click on the image to enlarge.

A slot is cut into the cereal box to allow the compact disk to be inserted at a 45 degree angle. A hole is cut for the eye to look at the compact disk, and also a slit. When the eye peers through the hole at the compact disk it should see a reflected image of the slit.

Tilt the box up and down to see the spectrum.



Here is a person looking through the eye hole. they see the slit reflected in the CD. Light from the fluorescent ceiling fixture passes through the slit and is separated into its colors by diffraction off the CD.