

Public Lab Desktop Spectrometry Kit 3.0



Instructions 1.0

Getting Started

Calibration and setup

Once you've assembled your spectrometer and are ready to use it, plug it in and visit:

SpectralWorkbench.org

to begin recording data with it. The web-based software works in the Chrome, Firefox and Opera browsers on most computers and Android phones.

Peer Support

Public Lab is not a corporation; we're an open community of DIY environmental science researchers which you have just joined!

The best place to get help is the spectrometry mailing list. The spectrometry mailing list is made up of people like you, who are building and improving open source spectrometry techniques. Ask questions, look for help, and consider helping others too! publiclab.org/lists

You can also post a question on this site; it helps to share some photos or screenshots of what you're trying to do.

Contributing

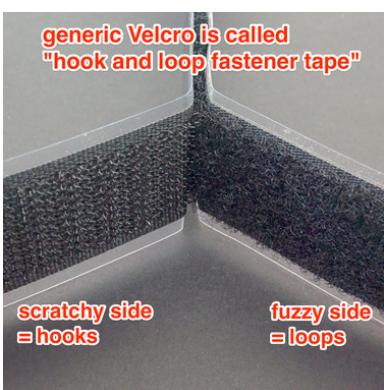
this is Open Hardware released under the CERN OHL (see back cover), please join our community and make contributions to our program and our future kits. Public Lab users contributing to the current kit (as of 2015/02/10):

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| Natalie | wagnerc4 | straylight | jetson | mittler |
| WhiteRabbit | borsacio6 | dmdc | nutandbolt | jeffreyjoy |
| ygzstc | Dongjie | dusjagr | pluharj | |
| eustatic | gbathree | huggo | wiebew | |

Parts List:



Two-piece box



not pictured:
extra paper

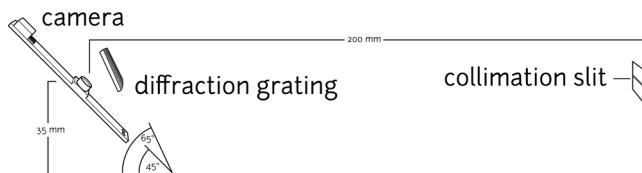


50cm of loop
fastener tape

25cm of hook
fastener tape

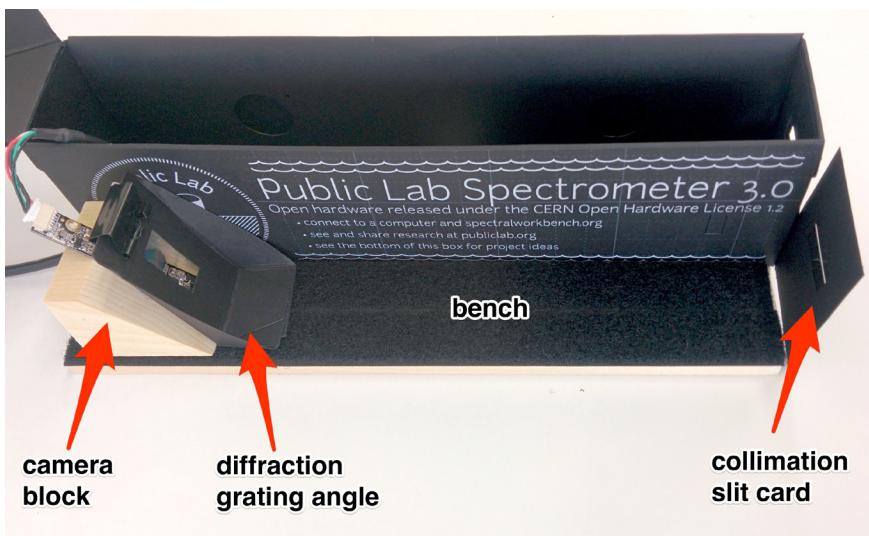
Assembly

Your spectrometer is composed of three functional elements:



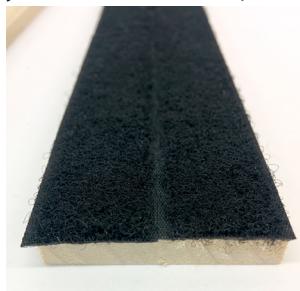
- a collimation slit that works as a lens, only allowing parallel light rays through its aperture
- a diffraction grating that deflects light more the lower the light's wavelength, creating a rainbow diffraction pattern.
- a camera to capture the diffraction pattern, focused on the collimation slit.

These elements are mounted on an adjustable velcro bench in a black paper box.



Bench Assembly

Everything is built up from the bench, an ash board 4cm (1.5 inches) wide. We will cover it with the loop tape (fuzzy side of the velcro).



The velcro loop tape is slightly wider than half the width of the bench, two strips will hang over each edge a bit.

Camera block assembly

You will need the camera, double-sided tape, the block, and the hook side of the velcro tape. Try to hold the camera by its edges, as it can be sensitive to electrical shorts.



camera

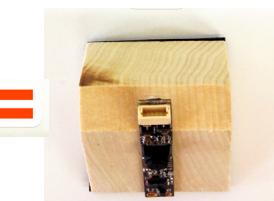
**double
sided tape**



block



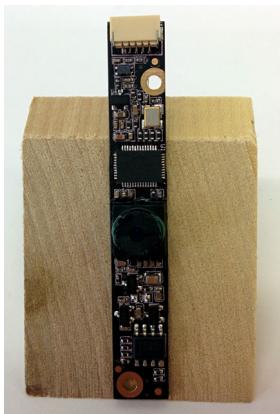
**velcro
hook tape**



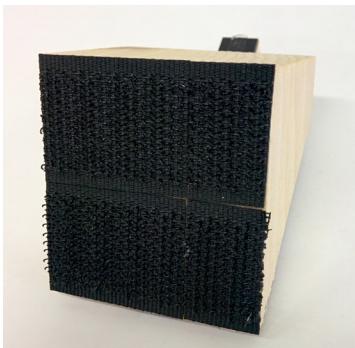
Start by putting a strip of double-sided tape on the back side of the camera:



Remove the pink protective film from the double-sided tape and attach to the center of the block's 45-degree angled side, with the white cable port on top:



On the underside of the block, attach two short strips of the hook tape (the velcro's scratchy side).



OPTIONAL:

Make a Diffraction Grating From a DVD

Do not touch the surface of the DVD, always hold it by the edges, fingerprints will blur this important optical component.

We are going to turn a DVD-R into a diffraction grating, a device for separating light by frequency. An ideal diffraction grating would create a straight rainbow. A DVD produces a curved rainbow, but its rigidity and consistency make it a very good grating. Aligning your diffraction grating will take some tweaking. We've given you extra material to help.

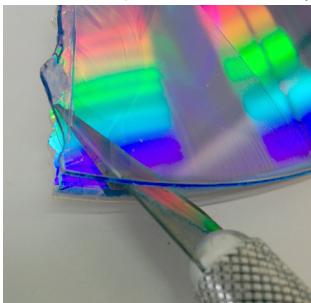
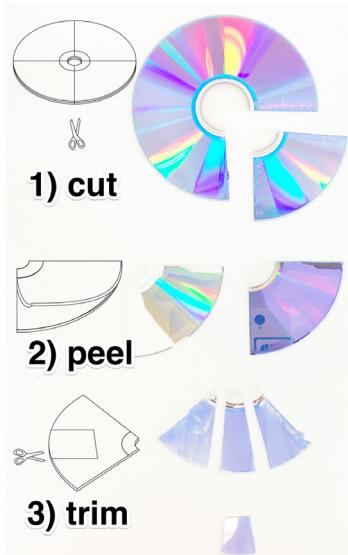


there are three steps,
cutting a quarter of the DVD out,
peeling off the reflective aluminum side,
and trimming to a small piece.

OPTIONAL: Wash the purple ink off of
the DVD fragment for greater light
transmission. see note /n/11515.

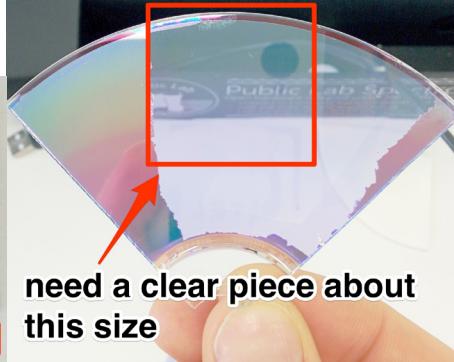
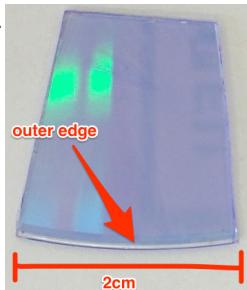
Peeling apart a quarter of the DVD:
Cut out a quarter of the DVD with
scissors. It may take more than one
try to get a good diffraction grating,
so save the rest too.

Use a knife or a fingernail to dig under
the corner of the DVD quarter and peel the two layers apart.



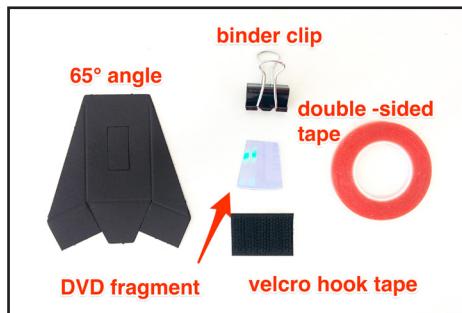
You will get two layers. We are trying to get a transparent purple piece without aluminum stuck to it. If you can't find a good piece you may want to try another quarter DVD. You only need a 2cm (.75") square cut from the outer edge.

Trim down to a small square
with roughly 2cm of the DVD
's outer edge.



Assemble the diffraction grating angle

You will need:



Overview:



punch out the center hole
and pre-fold all folds towards
you.



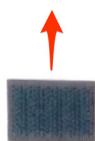
use double-sided tape on the
under side of the center flap,
and stick the bottom flaps
together.



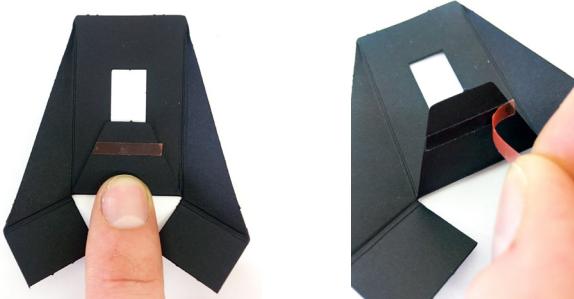
use the binder clip to attach
the DVD diffraction grating to
the top of the angle.



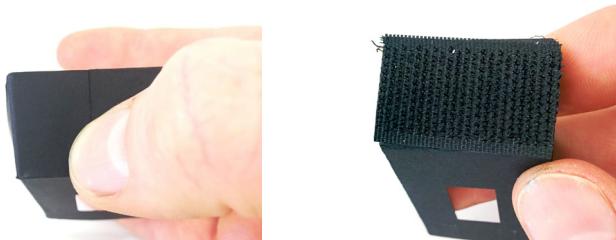
put the outer edge of the
DVD at the mid-point of the
hole.



attach velcro hook tape to bottom



When taping the three flaps together, make sure the bottom flaps are lined up. put hook tape on the bottom.



Put the outer edge of the dvd at the mid-point of the hole, and then remove the handles from the binder clip.



Assemble the slit card

You will need



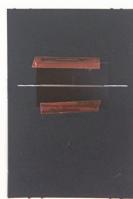
slit card



tape



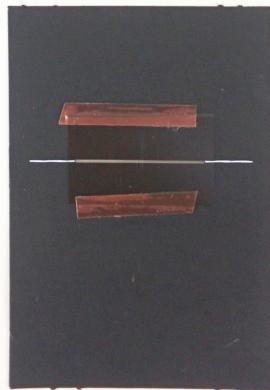
0.2mm
collimation
slit



The collimation slit should be in the DVD sleeve.

We will attach the slit using the tape as single sided tape-- tape it on top and DO NOT remove the backing film.

Line up the collimation slit with the line on the slit card and tape down.

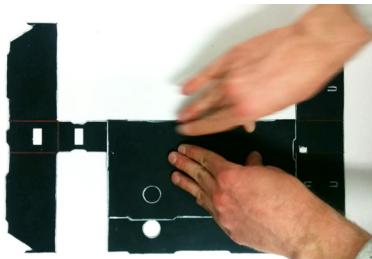


Assemble the box

We strongly recommend watching the box assembly video, which is here:
publiclab.org/n/11533

For the purposes of this instructional I've highlighted the edges of the box in white and used an unprinted box. your box will have a printed and unprinted sides and no white edges.

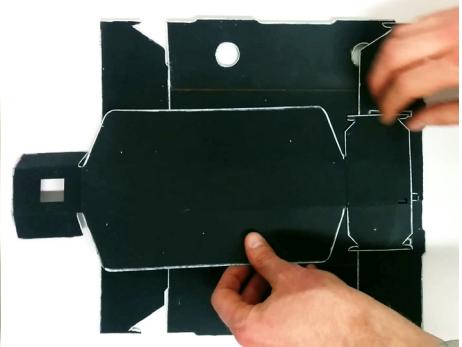
Place the box with the printing facing down. Pre-crease all the creases towards you. crease the box top as well.



Fold the left side of the box (to the left of the narrow spot) over on itself, and insert the hold tab in place.



Fold the right side over to the left

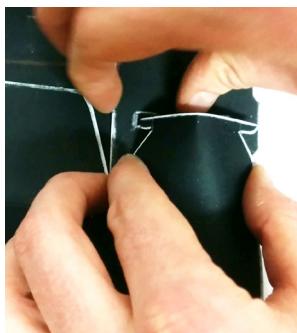


Lay the box top so its tabs line up with the slots in the box bottom's right side

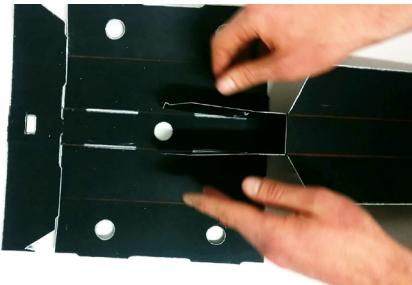


Make sure the small rectangular holes on the top and bottom of the box line up. We will put the webcam cable through that hole later.

Insert the tabs together. The box top will not lay flat-- don't worry- that is extra space for folding.



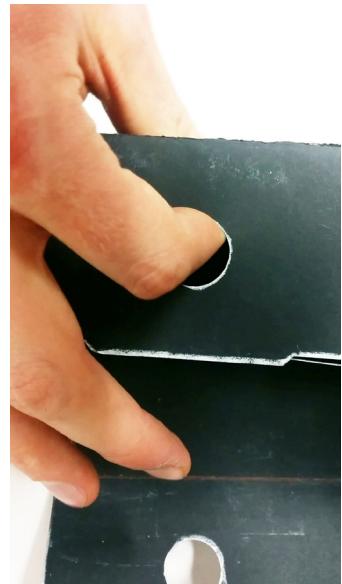
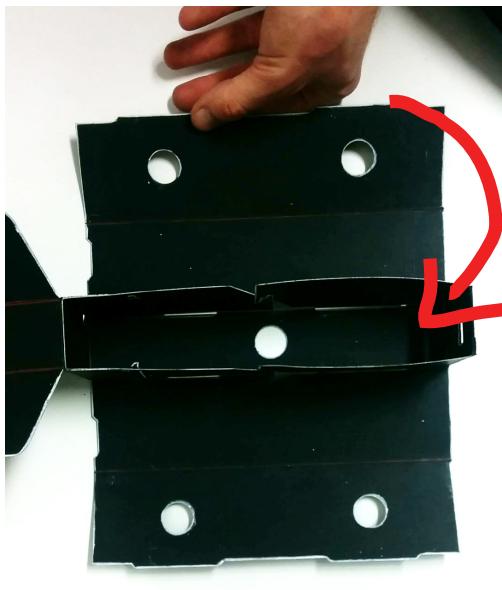
Now open the box back up and fold left and right side flaps to the middle to form the inner walls. They will hook together (see next pg)



The inner walls hook together:



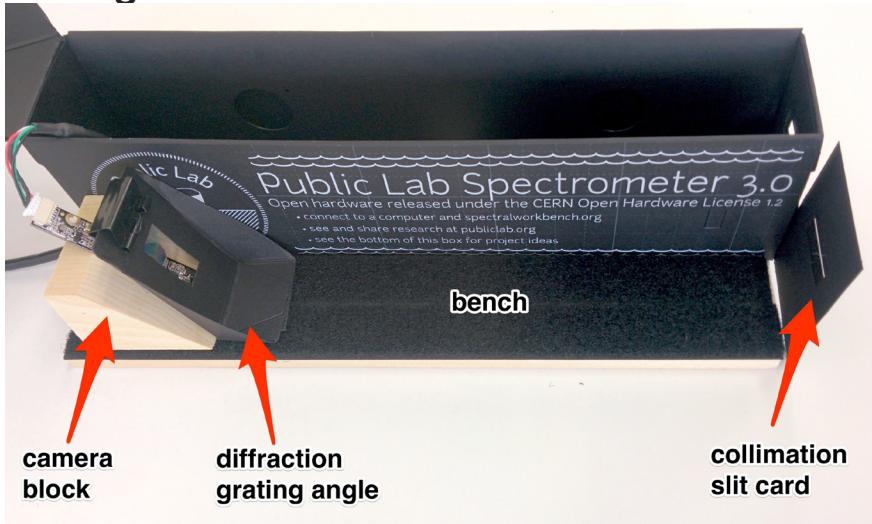
Fold the outer walls up and over the inner walls. Use the two circular holes in the outer walls to position the inner walls while folding the outer wall over.



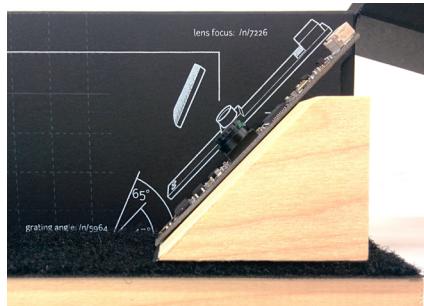
Flip the box upside down and make sure the tabs have all popped out of the bottom of the box. Walk your fingers along the inside of the box and make sure all the tabs are popped out of the bottom.



Putting it all on the bench



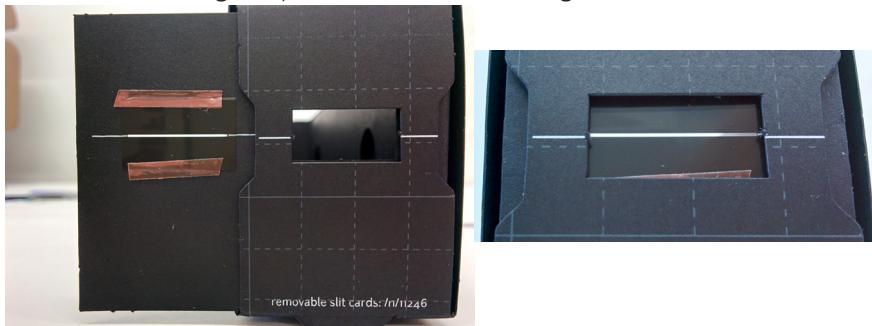
Line up the the bench with the side of the box, and align the camera's lens with the zoommm marker on the side of the box. Press the camera block down firmly.



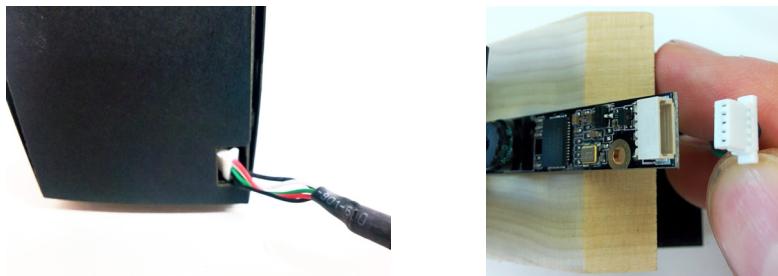
Place the diffraction grating angle directly in front of the camera block and press it down firmly.



Slide the slit card in the front of the box. The printing is slightly off, unfortunately. level the slit card's line just above the box's line. the card should wedge in place on its bottom edge.



Push the camera cable through the cable hole in the back of the box:



Plug it into the camera-- it only fits one way, don't force it.

Slide the bench in at an angle, placing it down by the cable hole, and then pushing it down to the bottom.



Close the lid and you're done! Your computer should recognize your spectrometer as a webcam. go to Spectralworkbench.org to calibrate.

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check the inside cover for an up to date list of contributors.

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