

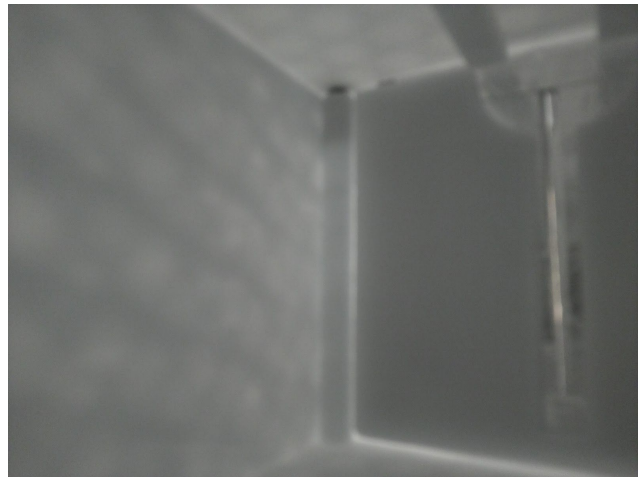
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July 20, 2018

Prototype Spectrometer Testing with Picam v2

Below is a list of my notes regarding both the design of the spectrometer as well as the Pi camera used to take images. This particular prototype did not include the desired baffle structure nor did it have an adequate slit to be inserted. Both of these variables impede further detailed testing but there is a few things worth mentioning regardless.

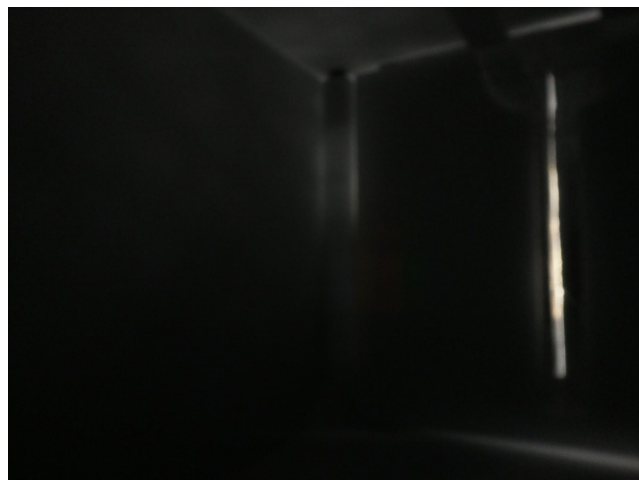
First functional image:

Using a white light source directed solely towards the front of the spectrometer, we can see a large amount of light bleed directly through the walls of the spectrometer. Perhaps the material isn't dense enough or there is a large amount coming through the slit and illuminating the interior.



Second Image:

After wrapping the apparatus, on five sides, in a cotton shirt and adding a few layers of electrical tape the the front face, we confirmed that light is indeed coming through the walls of the structure. We can also see that the edge lines and the screw mounts are still more illuminated than the walls themselves.



Third Image:

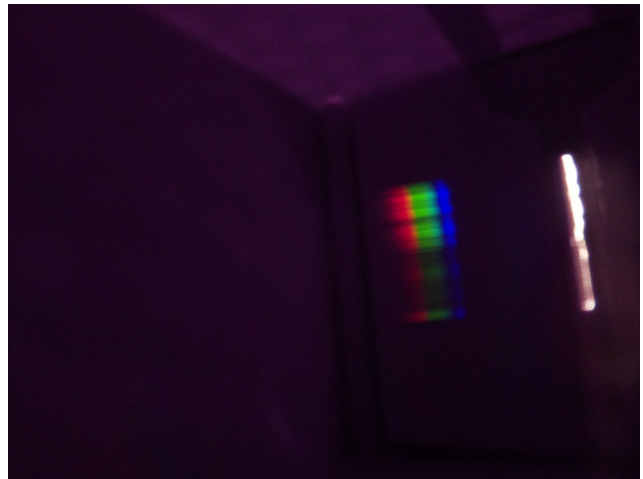
Covering, now, even the corners and edges of the outside structure with electrical tape we eliminated light bleed through everything except the slit. (Some the the tape was used to reduce the size of the slit to removed the possibility of it being excess light through the slit).



As you can see from the previous images, there is hardly any visible spectrum. At first, we believed it was due to the intensity of the excess light. Moving forward, we put the light at approximately a 20 degree angle to the slit and found much better results.

Fourth Image:

Removed excess tape over slit, but keeping it as a cover for the outside we can see the background is quite purple; suggesting it is merely reflected light from the inside. Including the baffle should eliminate this excess. Also with the light source at a better angle we can finally get a view of the spectrum we are looking for. The black blotches through the middle are indicative of the imperfections on the opening since we do not yet have a functional slit to insert into the device.



Fifth Image:

Although not the brightest, we believe this is the best image we were able to capture. We made small changes, using tape, to the slit to reduce the amount of light to make the spectrum clearer (however it is far from perfect).



Final image:

Using the Region of Interest option with the camera, we could successfully zoom in to a small portion of the image; capturing just the spectrum.

For all of these images, the camera was only attached with scotch tape so there is a tilt on the images. But another issue is the focus of the image.

According to the pi camera data sheets, the pi cam is a fixed focus camera that has a minimum distance of 1m. The focal length is 3.04 mm. Looking through online sources, there is ways of refocusing the camera that require unscrewing the lens and consequently voiding the warranty on the camera. This issue may require a closer look and a clever solution.

