Introduction

Methods

In this experiment, the color purity of the LEDs within the display of a Google Pixel 3 XL was tested. This involved selecting a single RGB color for the phone to shine upon a fiber optic cable connected to a spectrometer. RGB is a scale that is measured from 0 to 255 for each color that makes up the scale, Red, Green, and Blue. A color is created by choosing a value for each primary color, this can create many colors using combinations. We wanted to focus on pure colors, so we chose Green (0,255,0), Cyan (0,255,255) and Blue (0,0,255). These colors not only would have the best possible purity values, but also fit into our parameters of having wavelengths between 200 and 530 nanometers. With each color we tested them at 3 levels of brightness, 50\%, 75\% and 100\%. Then we tested a built in function in the phone, a blue light filter while the phone was at 100\% brightness. The OceanOptics spectrometer that we were given used OceanView to capture the spectra of light that was shone through the fiber optic cable.

The spectrometer we were given was faulty and would only produce data from 200 to 530 nanometers, which meant that we were not able to get a full picture of the data that was needed for the color purity. We were stuck with using only a few colors that fit within this range, however these colors still were on the edge which may have caused some of the errors that we encountered.

In this experiment, a single RGB color was selected on a Google Pixel 3 XL to shine upon a fiber optic cable. A spectra was then produced as a spectrometer was connected to the phone through the cable. Figure 1 below illustrates the experimental setup

Results

Conclusions

The improper equipment that we were supplied affected our data greatly, so futher experimentation with proper working equipment is necessary for improved data aquisition and results. Our data indicates that the color purity of the Google Pixel 3 XL is above 75%, which indicates decent quality of color. We have determined that color brightness does not affect the color, as all of the colors at each brightness did not change significantly on the color map. However, when the blue light filter was on, it did change the colors significantly by making the colors less blue; which is what a blue light filter should operate like.