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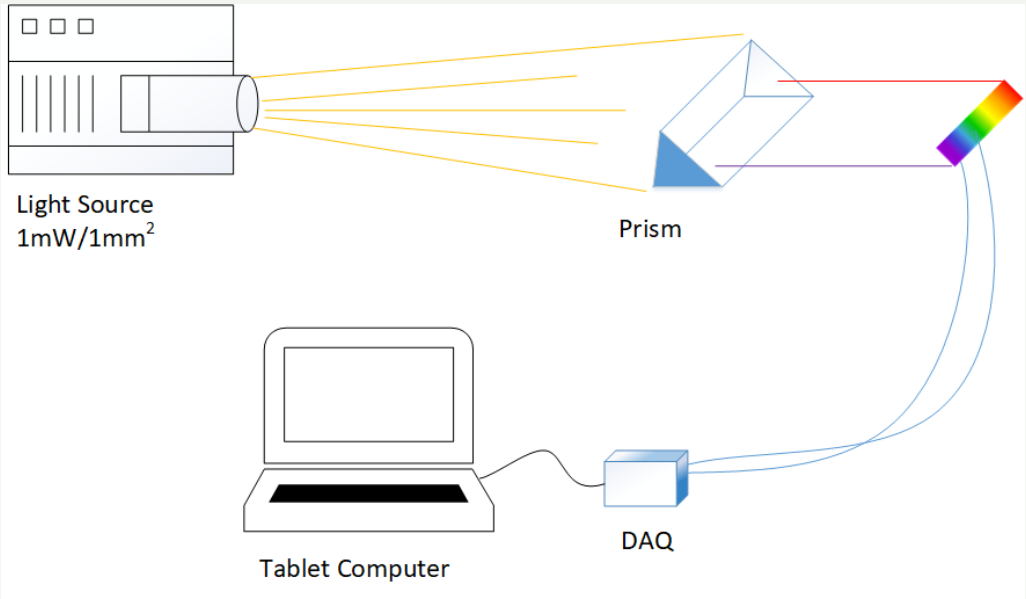
Herschel Experiment



Objective

Hardware

Design and produce user friendly hardware which can split white light into a spectrum using prisms and measure the temperature of different colors.

Software

Program a GUI that graphs and compares the temperature measurements of different colors in real time.

Prototype

Data

Viololet/Blue: 25°C

Green: 25°C

Orange/Yellow: 24°C

Red: 23°C

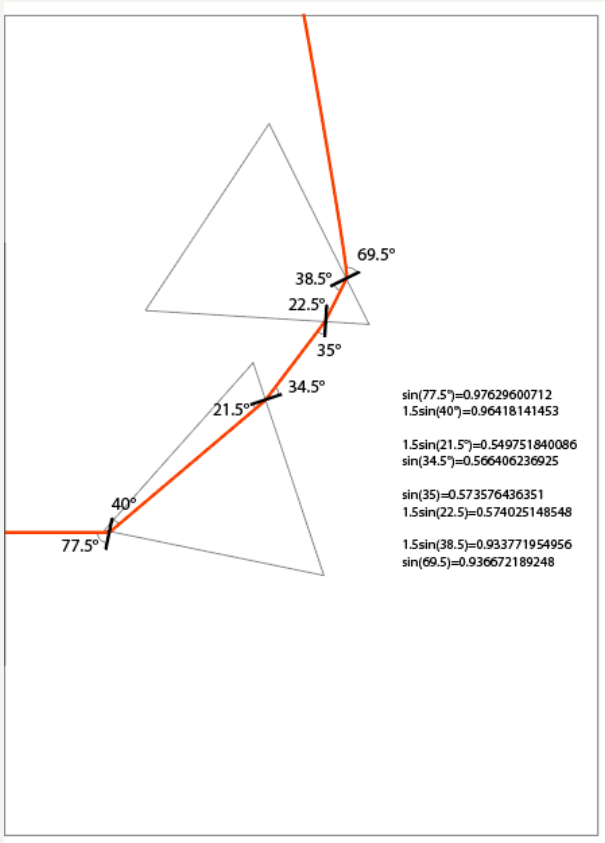
Infrared: 23°C

Ambient Temperature: 21.5°C

We noticed a trend in the temperatures and proceeded to design a device which could measure temperature more accurately and design a GUI which would display and compare the temperatures

Systems and Theory

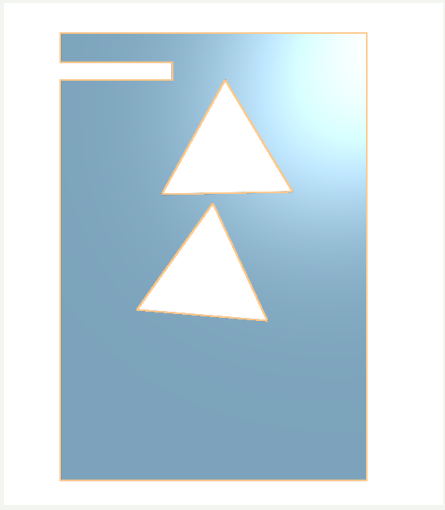
The prisms allow for the white light from the projector to be separated into their individual colors. They also spread the light making it easier to measure the temperature of colors using temperature sensors.



Optical Theorem states that the amplitude and scattering of light can be calculated through the length of a prism.

We calculated the angles using snell's law:

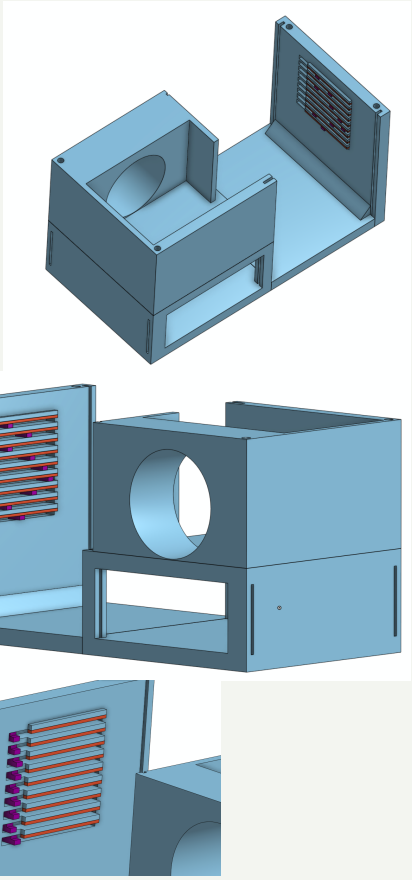
$$n_1 sin\theta_1 = n_2 sin\theta_2$$



Prism Plate

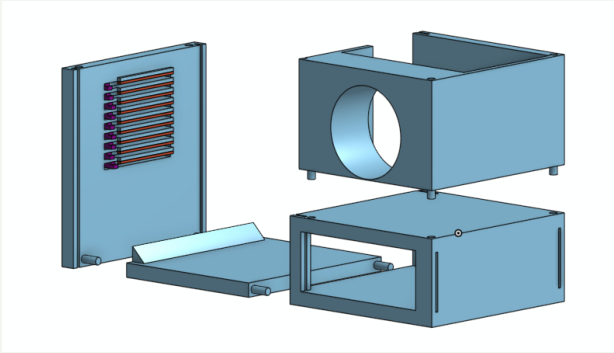
Hardware

The projector holder provides support for the projector and is designed to keep all parts together.



The back wall's purpose is to be able to move the sensors around to measure the temperature of the light. Since the sensors are tiny, designing them to be able to move makes it easier to ensure it's fully covered by

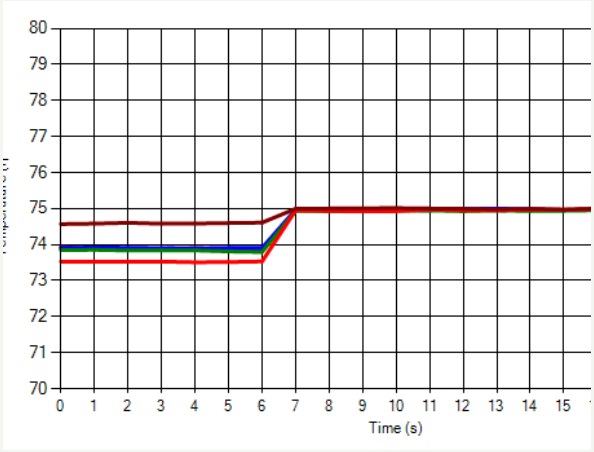
We separated the housing into 4 different parts because it made the 3D printing smoother. We put everything together with the pegs and holes, that we then glued



Software

DAQ converts the analog temperature readings from RTD sensors into digital readings for the computer. These readings are compiled over time into a chart and displayed via a multi-screen program on Visual Studio

For the calibration of the sensors, an offset is applied to each of the sensors before the projector is turned on



Device