***EE 4910 WEEKLY REPORT: 8***

***4/7/2026 - 4/20/2026***

***Group number:* 06**

***Project title:* Developing a Cost Effective NIR VIS Spectrometer**

***Client &/Advisor:* Avishek Das & Manojit Pramanik**

***Team Members/Role:* Ryan Majstorovic, Evan Tamer, Dawson Posekany, Samar Gill**

## Weekly Summary

Over the past two weeks, the team made meaningful progress across both the hardware calibration system and the desktop GUI.

On the hardware side, we began the period by resoldering the CCD and ordering laser diodes for a multi-wavelength calibration device. This device will combine multiple wavelengths into a single beam, allowing pixel mapping to be completed in one run, reducing repeated operations and improving the overall user experience. The diodes arrived in Week 2 and setup is now underway.

In parallel, we started development on the desktop interface. We selected Kivy as our GUI framework due to its ability to support future mobile integration without requiring a full rebuild. The application is in a solid state, with two calibration routines already implemented: dark and bias term correction, and pixel mapping. Performance is progressing but still short of the 125 fps target. The GUI currently renders at approximately 31 fps and streams data to CSV at approximately 80 fps. Further optimization is planned to close this gap.

## Past week accomplishments

Samar: Initial setup of the microcontroller was working. Timers still need to be adjusted (see Pending Issues).

Evan: Began soldering laser diodes and looked into timer code.

Ryan: Started development on the python GUI computer interface using Kivy as the gui app.

Dawson: Reviewed and tested GUI code made by Ryan. Updated project website and documents.

## Pending issues

1. Microcontroller timers still need to be adjusted and finalized.

**Individual contributions**

| NAME | Individual Contributions | Hours this week | HOURS cumulative |
|---|---|---|---|
| Ryan Majstorovic | Developed the desktop interface app | 8+12 | 62 |
| Dawson Posekany | GUI testing, website + documentation | 7+5 | 49 |
| Samar Gill | Initial microcontroller setup working; timers still need adjustment. | 6+3 | 39 |
| Evan Tamer | Soldering laser diodes and timer research | 5+5 | 47 |

**Comments and extended discussion**

We need to investigate software acquisition for 3DOptix software it seems the cost for a student plan is ~$35 a month we need at least one month and then possibly needing more during the second semester.

- Update: We did not look into this any further we have shelved the optics design for the CCD to be semester 2 along with any additional improvements.

Planned Tasks for the next couple of weeks:

1. ~~4/7/26 Begin optics testing with components available in the lab.~~
   ~~4/7/26 Continue working on microcontroller timers.~~
2. ~~4/13/26 – Begin testing with optical housing once delivered. Continue software and timer refinement.~~
3. 4/20/26 – Full optics bench testing with delivered housing. Continue calibration and software refinement.
   a. Update: Unfortunately we weren't able to do bench testing due to desktop interface design review and building the calibration device.
4. 4/27/2026

**Plans for the upcoming week**

Samar: Configure the timers given the design specifications on the github.

Evan: Continue putting together calibration device and working on timer setup.

Ryan: Work on preparation for the end of semester presentation, which includes cleaning up the presentation, updating the website, and practice runs of the presentation with the group. Potentially continue rapid prototyping on the desktop interface, otherwise shelve the development for the semester.

Begin optics testing with components in the lab while waiting for the ordered housing to arrive.

Dawson: Continue GUI Testing and Optimization research. Preparing documentation for end-of-semester presentation.

Samar, Evan, Ryan & Dawson: The full team will begin optics testing using components already available in the lab. The team will also continue refining the microcontroller timers while waiting for the ordered optical housing to arrive.

The team will use the time waiting for the optical housing delivery to make progress on timer adjustments and conduct preliminary optics tests with available lab components.

## Appendix:

**Main Dashboard:** This is the primary interface that the user interacts with. Along the left side is various controls for the interface which are separated based on function type like connection management, session management, Frame Data, and additional tools that will open a new main window. The live spectrum is the default view but there is also a spectrogram view that plots the intensity of the pixels over time which is configureable.

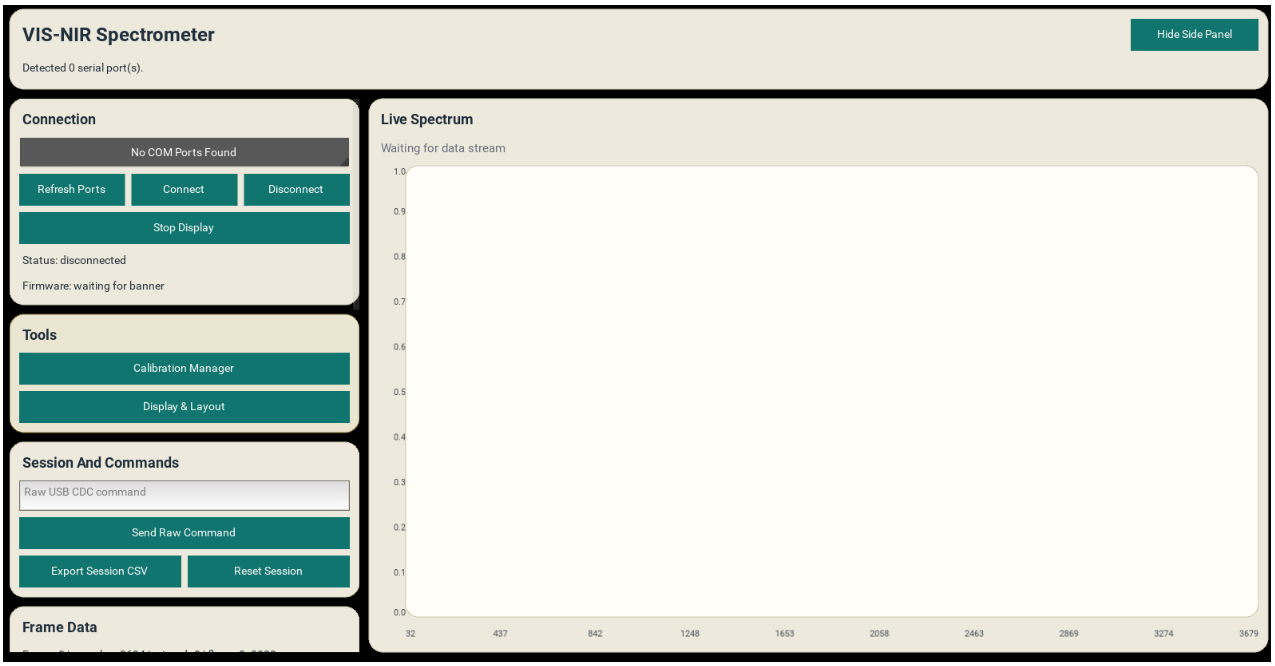



*Figure 1 Main dashboard of the desktop interface which includes the live spectrum and controls on the left side of the view.*

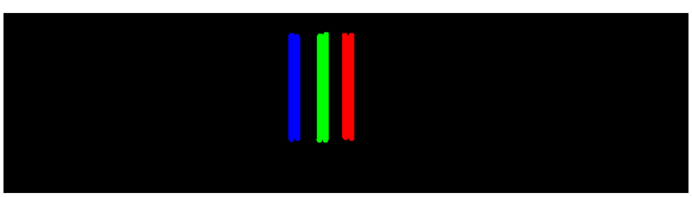


*Figure 2 Testing image used on OLED monitor to view basic response without the optics subsystem.*

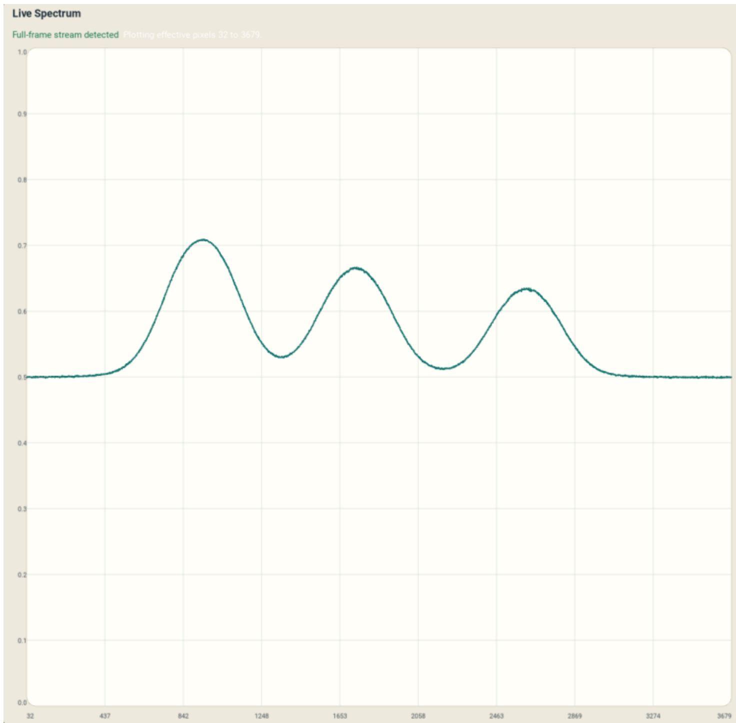



*Figure 3 Live spectrum plot from the test image.*

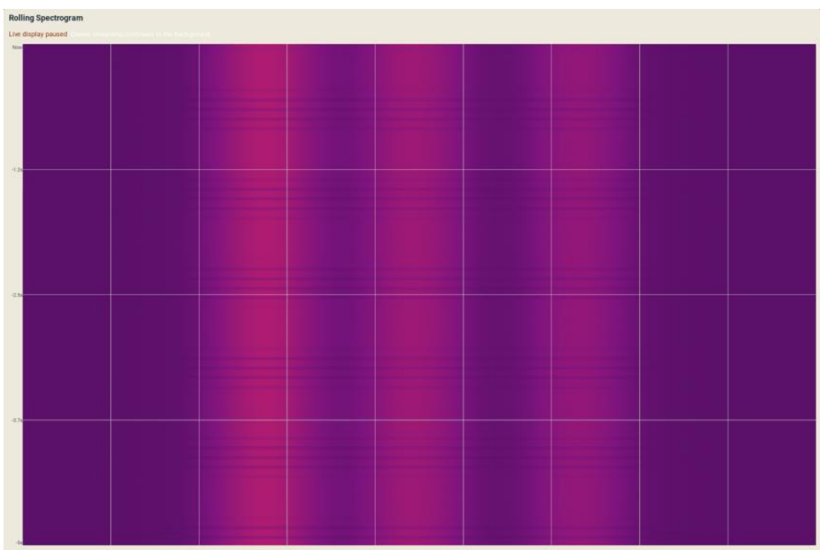
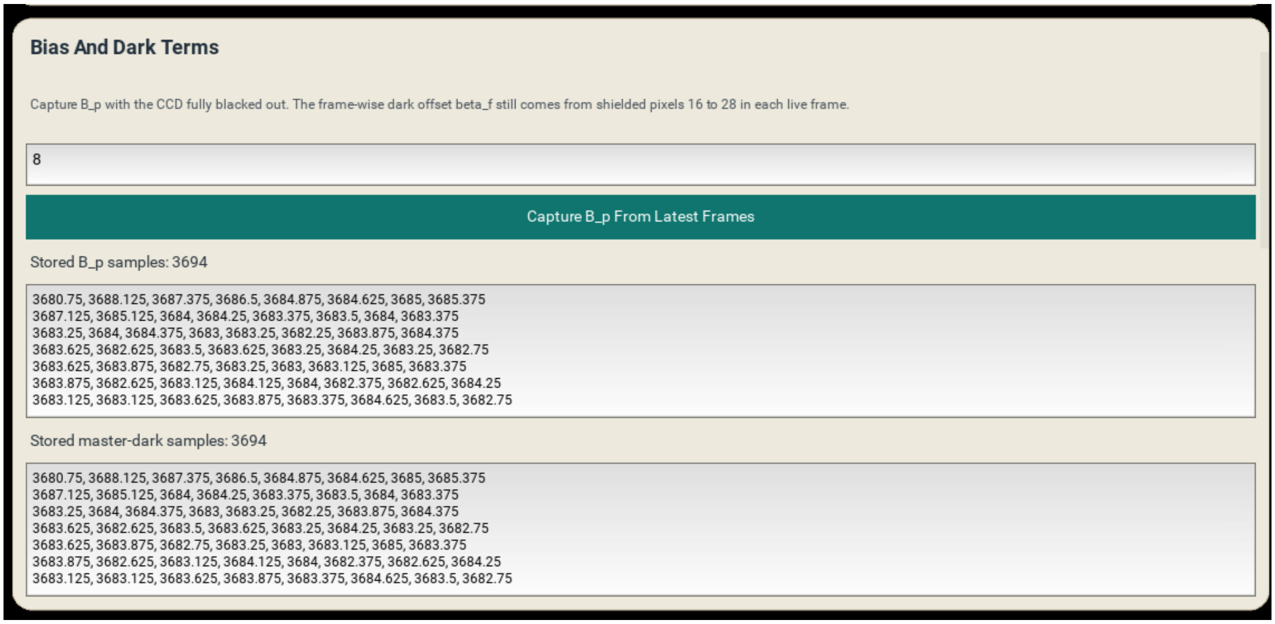



*Figure 4 Spectrogram of the same test image the verticle lines are the intensities and the horizontal lines are dips in intensaity from the refresh rate of the monitor.*

**Bias and Dark Term calibration:** This calibration routine shall allow the user to reduce the effect of dark pixels and electrical biases per pixel. This is done by covering the ccd to ensure full black pixels and then capturing the last few frames this is then taken into account for the normalization function by reducing the full range of that specific pixel.



**Pixel Mapping Calibration:** This calibration routine shall allow the user to map the pixels across the ccd to specific wavelengths. This is done by shining a set of known wavelengths and fitting a third order polynomial to those pixel positions. This polynomial method has been described by multiple sources including the International Commission on Illumination.