

EE CprE SE 4920 Weekly Report 3

09/22/2026 – 10/05/2026

Group number: sddec26-06

Project title: VIS-NIR Spectrometer

Client and Advisor: Avishek Das & Dr. Manojit Pramanik

Team Members and Roles:

Samar Gill – Optics & Documentation

Ryan Majstorovic – Embedded Systems & Hardware

Dawson Posekany – Embedded Systems & Optics

Even Tamer – Optics & Hardware

○ **Report Period Summary**

During the weeks of September 21st and September 28th, the team focused on refining the calibration device and advancing optical modeling. Testing of the first printed calibration housing showed that the lenses did not fit smoothly, so the team began a second version with added clearance for the lenses and tilt adjustment for the laser diodes. Because of the reprint, wavelength calibration has not yet been run. The team also received the connectors it had been waiting on from ETG, which completes the optical hardware needed for the next testing phase.

In parallel, the team made progress in 3D Optics by loading the chosen diffraction grating into the model and beginning simulations, with an initial focus on second-order diffraction, the primary reason the software was adopted. The team will continue refining the model and then move to tabletop testing, with the calibration device reprint and wavelength calibration as the immediate next steps.

○ **Recent accomplishments**

The calibration device has been further developed, with a redesign to make test LED alignment much easier in the works. Initial readings of our calibration LED's were recorded as a basis for future calibration and slit design efforts. We have acquired a subscription to an optics software to begin the modeling of our optical system. The team is making progress in line with the milestones set out in our Gannt chart.

○ **Pending issues:**

Optical

- ~~Order the fiber optic input required for the existing spectrometer housing~~
- ~~Fabricate the CCD adapter plate for the existing housing~~
- Rebuild the laser-based calibration source and beam-combining assembly
- Characterize the existing optical module for wavelength coverage, harmonic response, discontinuities, and other limitations

- Define the filtering strategy to mitigate harmonic/order overlap across the VIS-NIR range
- Define the final physical integration of the optics, PCB, MCU, and enclosure

Embedded

- Implement and verify external trigger functionality
- Implement and verify adjustable integration-time control
- Verify and refine background/dark-signal subtraction
- Evaluate and improve the PCB-to-MCU interconnect – remanufacturing of the boards may be necessary as benefits can be gained. These include additional precision from the ADC due to the current board running at the incorrect supply level, MCU integration into the board, and simpler installation.
- Evaluate whether MCU or supporting electronics upgrades are necessary

○ **Individual contributions**

<u>Name</u>	<u>Individual Contributions</u> <i>Quick list of contributions</i>	<u>Hours this report cycle</u>	<u>Hours cumulative 4920</u>
Evan Tamer	Worked on redesign of calibration device	7	24
Ryan Majstorovic	Supporting design for rebuilding the calibration device and the 3D optix software	7	23
Samar Gill	Looking into solutions for the harmonics of the incident light and planning optical component placement within housing	8	24
Dawson Posekany	Review of data conditioning pipeline to make educated decision on redesign surrounded on 4 volts CCD supply.	10	26

○ **Plans for the upcoming report period:**

- Evan: Finish 3D model and reprint the calibration device. Start working with Samar to design housing
- Dawson: Continue researching new hardware architecture ideas/plans.
- Ryan: Implement HIL environment for testing of the GUI through simulation of data.
- Samar: Have an initial model of the optics which accounts for the device dimensions for October 9th meeting to review with team.

- **Summary of weekly advisor meetings:**

9/24:

This meeting focused on troubleshooting the calibration fixture and discussing plans for the enclosure of the device. Plans were made to simulate our optics in 3doptix so that a preliminary 3d print of our enclosure can be developed.

10/1:

This meeting was cancelled due to schedules conflicts of most team members. The team supplemented this time by planning to meet for extra time over the weekend in the future.