LAr R&D Progress Updates

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1/28/25

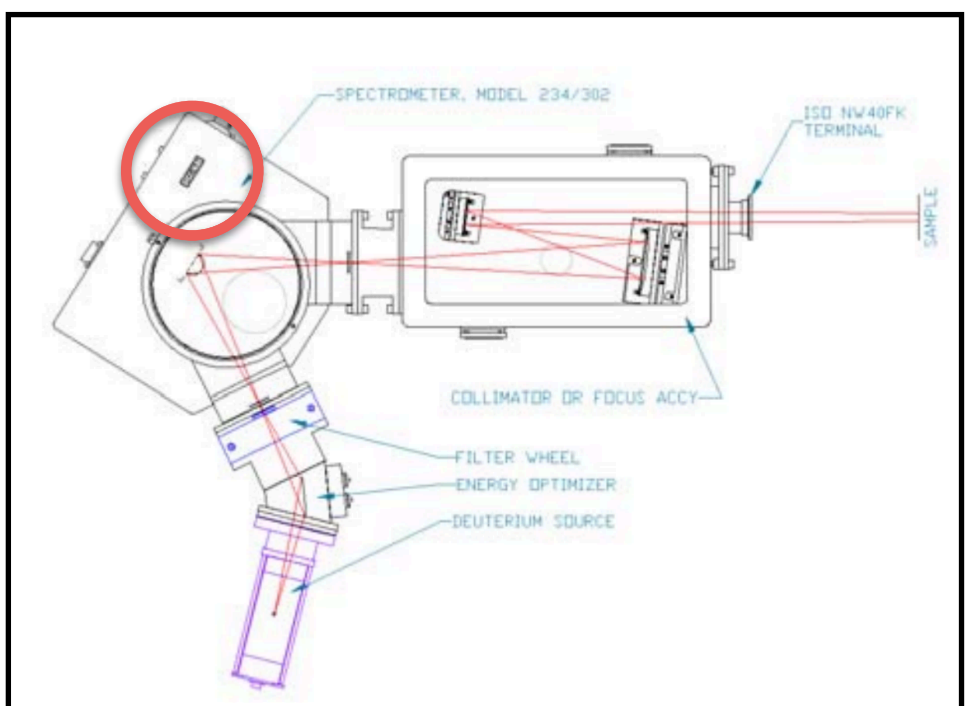
BROOKHAVEN
NATIONAL LABORATORY

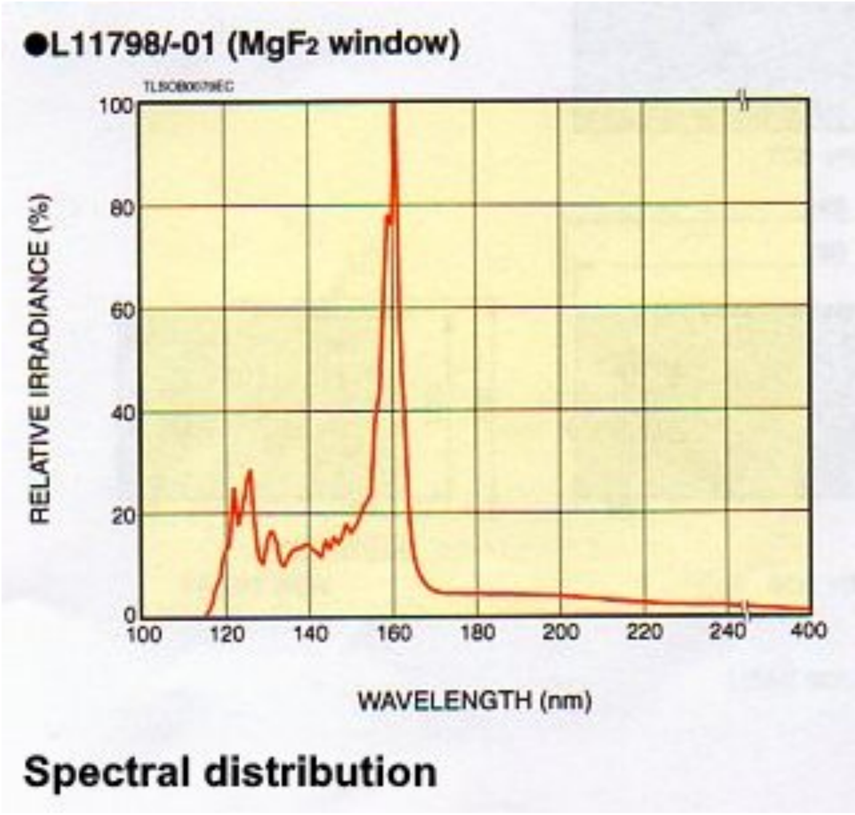
Lab Safety and Space Management

- **Slipper Conditions on the ground outside highbay**
  - Slipper conditions still exist on the north side of highbay lab
  - Please be careful when you pass the area
- **EEI Inspector JPM**
  - JPM on last friend with Joel was called off at the last minute
  - It was found the requirement is to do 3 JPMs with two approved EEIs, I’ve already done two with Joel
  - Lab electrical safety helped to coordinate with the light source to finish the last one this week
  - Last JPM before EEI approval for me

Spectrometer Alignment Confirmation Test

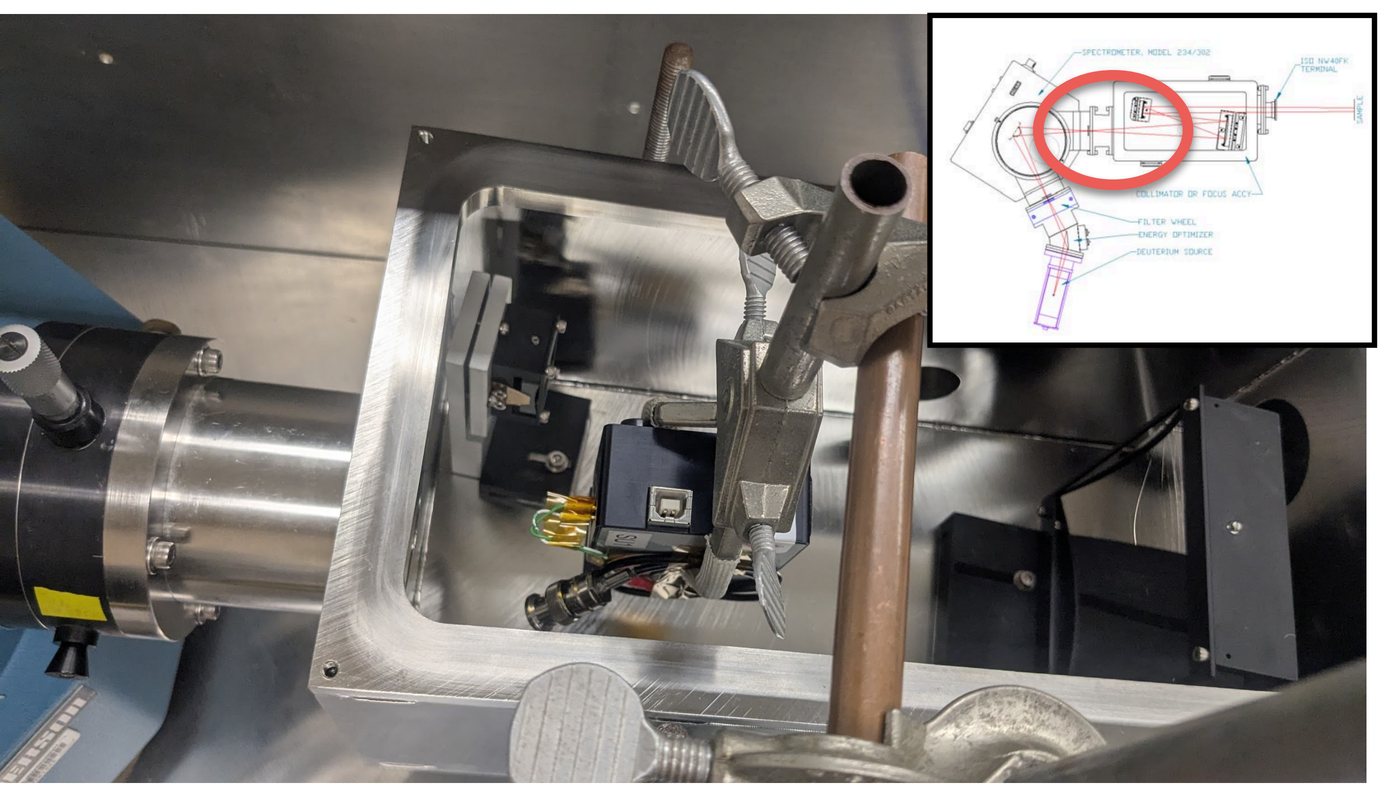
- **Introduction**
  - The spectrometer has an optical grating on a rotational base
  - By the controller, the wavelength can be selected with a numerical indicator on the spectrometer
  - The spectrometer was factory-aligned decades ago, we need to validate the wavelength selection
  - The Deuterium lamp we have has VUV emission spectrum starting from 120nm, data sheet stops at 400 nm
  - The wavelength detector(use the term to avoid confusion with McPherson spectrometer) we were able to get from Thomas has a spectrum of 345nm-1050nm
  - We hoped to get sufficient emissions at the high wavelength region

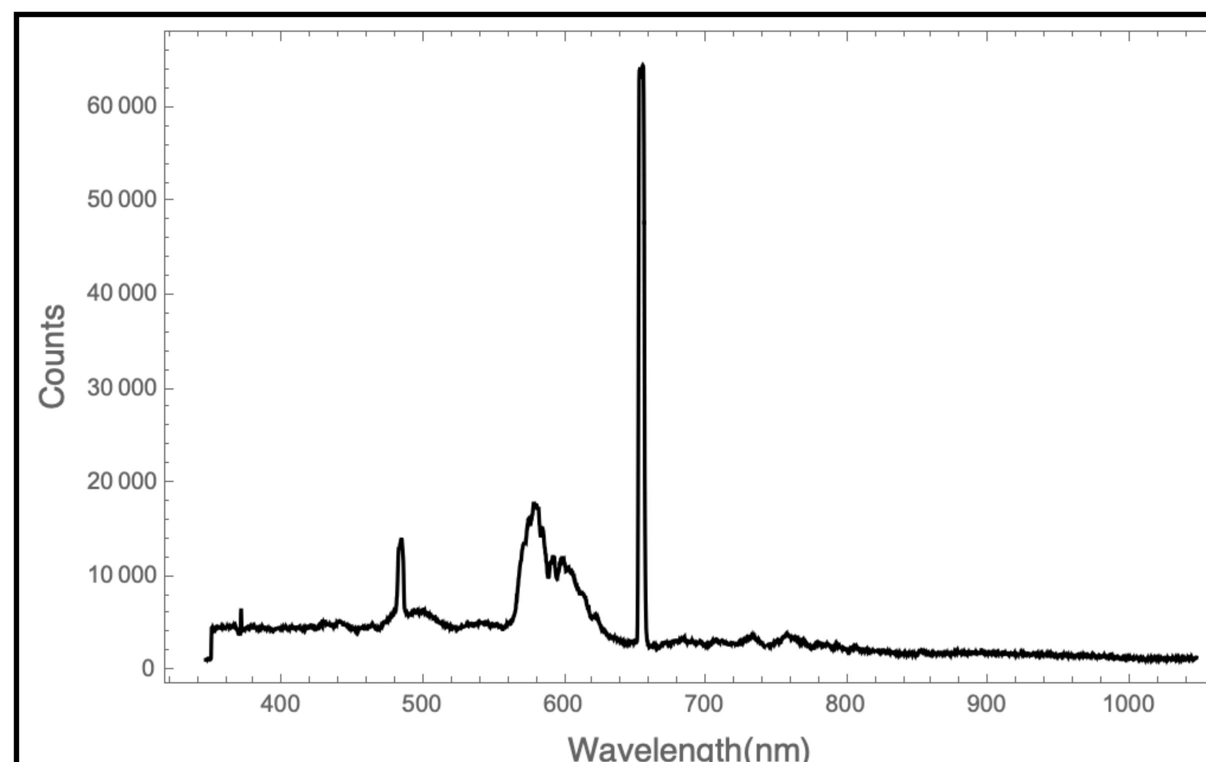




Spectrometer Alignment Confirmation Test

- **Setup**
  - HR 400 installed at the exit of the spectrometer after the second slit
  - Direct coupling in GAr (The optical component with continuous GAr flow)
  - Use very low-intensity output from the Deuterium lamp first for full spectrum without wavelength selection
  - Sufficient emission above 400nm within the wavelength range of the wavelength detector(345-1050nm)

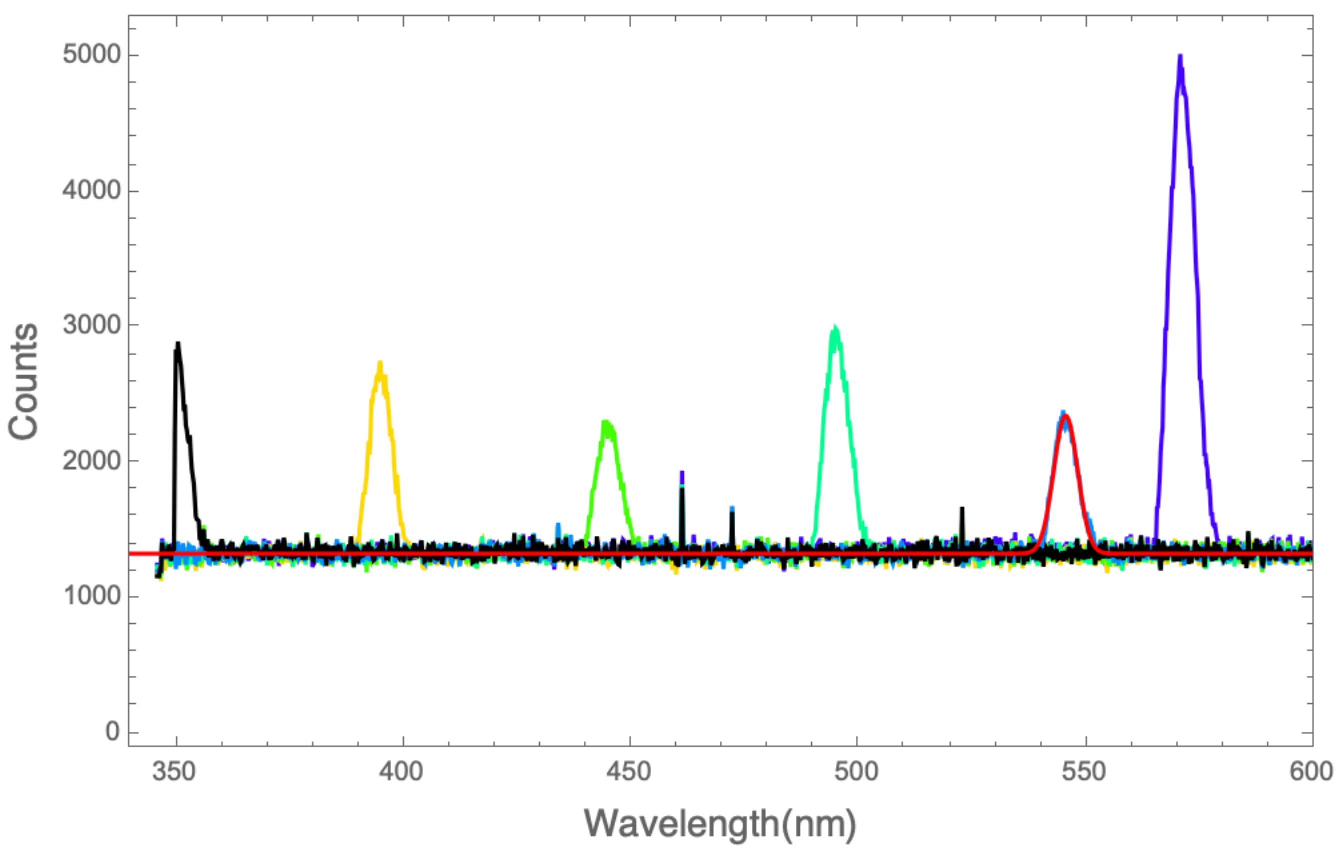


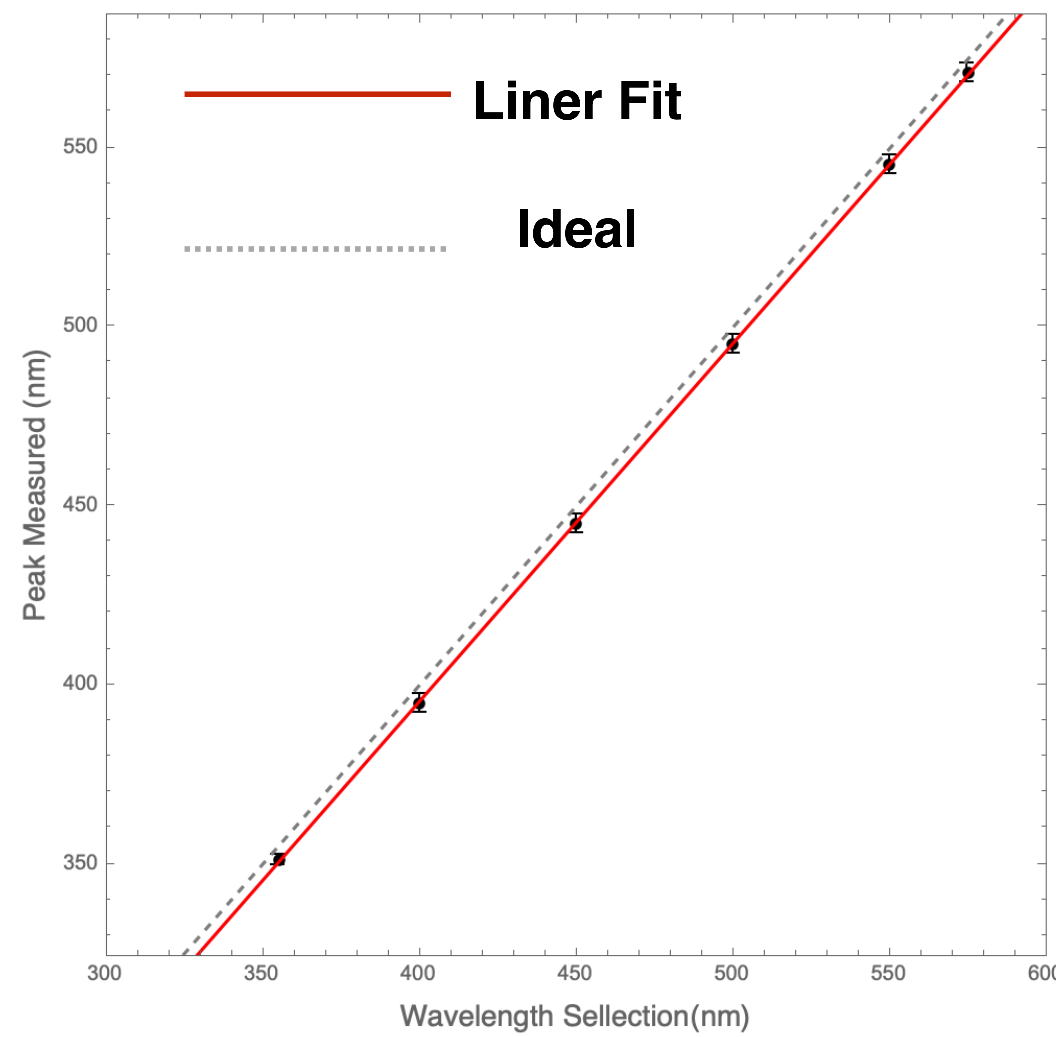


Full spectrum from D2 lamp

Spectrometer Alignment Confirmation Test

- **Wavelength Selection Calibration**
  - Conducted wavelength selection from 345nm up to 575 nm wavelength range
  - Spectra scanned for wavelength selection at 355nm, 400, 450,500, 550, 575 nm
  - Low limit of 345 nm due to wavelength detector range
  - Upper limit 575 nm determined by the spectrometer
  - A constant offset of ~5nm was observed for each wavelength setting





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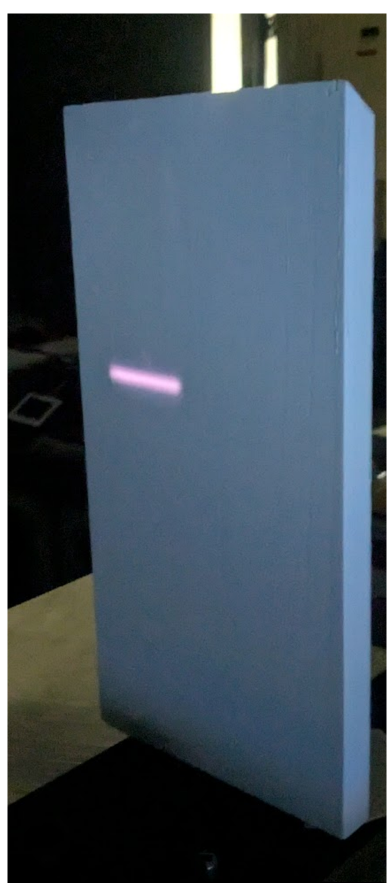
Spectrometer Alignment Confirmation Test

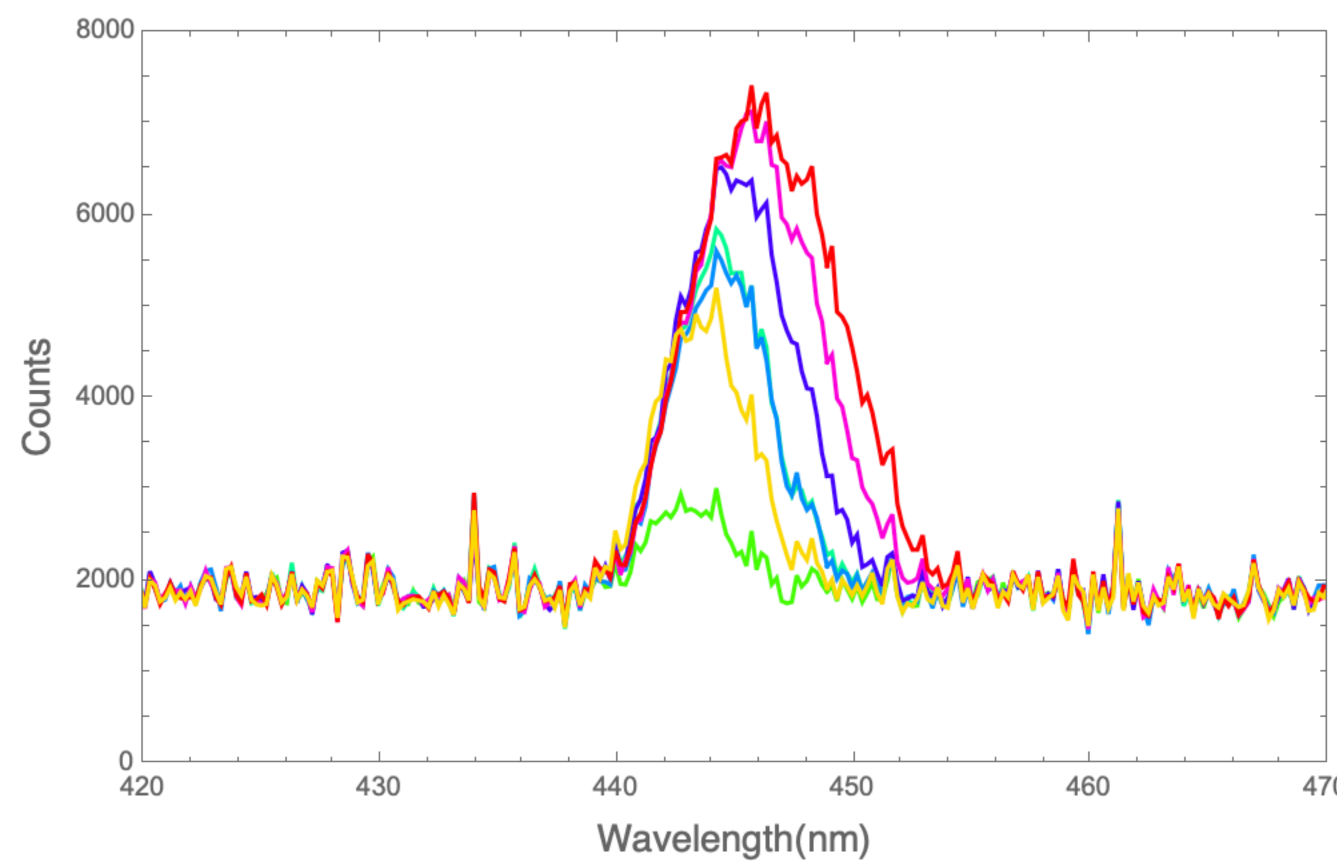
- **Wavelength Selection Calibration**

  - Check the spectrometer exit slit performance at 450 nm selection from Min. To Max. Aperture
  - It changes the selection band of the peak, resulting
    - change of light spot shape/size
    - Wavelength selection width/peak width
  - The performance of exit slit validated

Min. Aperture

Max. Aperture





Spectrometer Refurbishment

- **To do list**
  - VUV spectrometers are expected from different sources later this week and next week
    - Conduct a similar calibration at the emission peak range of the Deuterium lamp
  - Currently using the old grating and collimator mirrors to be cautious
    - Install the new grating and mirrors
    - Alignment of the optical path
    - Check the wavelength selection
    - Bob is contacting McPherson about the alignment for the offset we observed
  - Light spot size measurement to determine the adapter for the optical chamber