

LAr R&D Progress Updates

05/28/26

Yichen



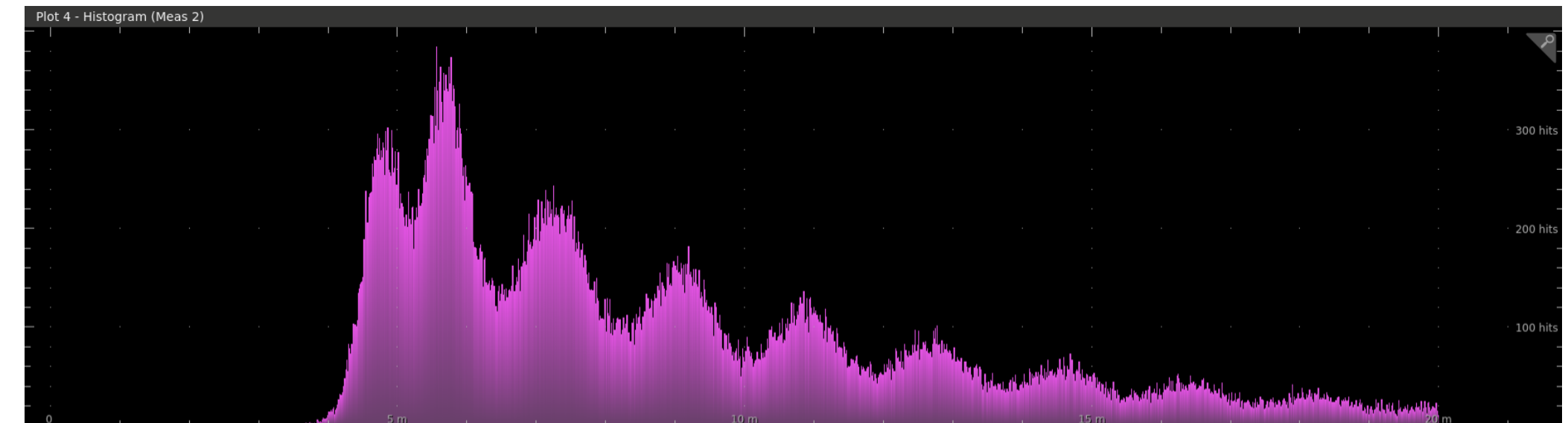
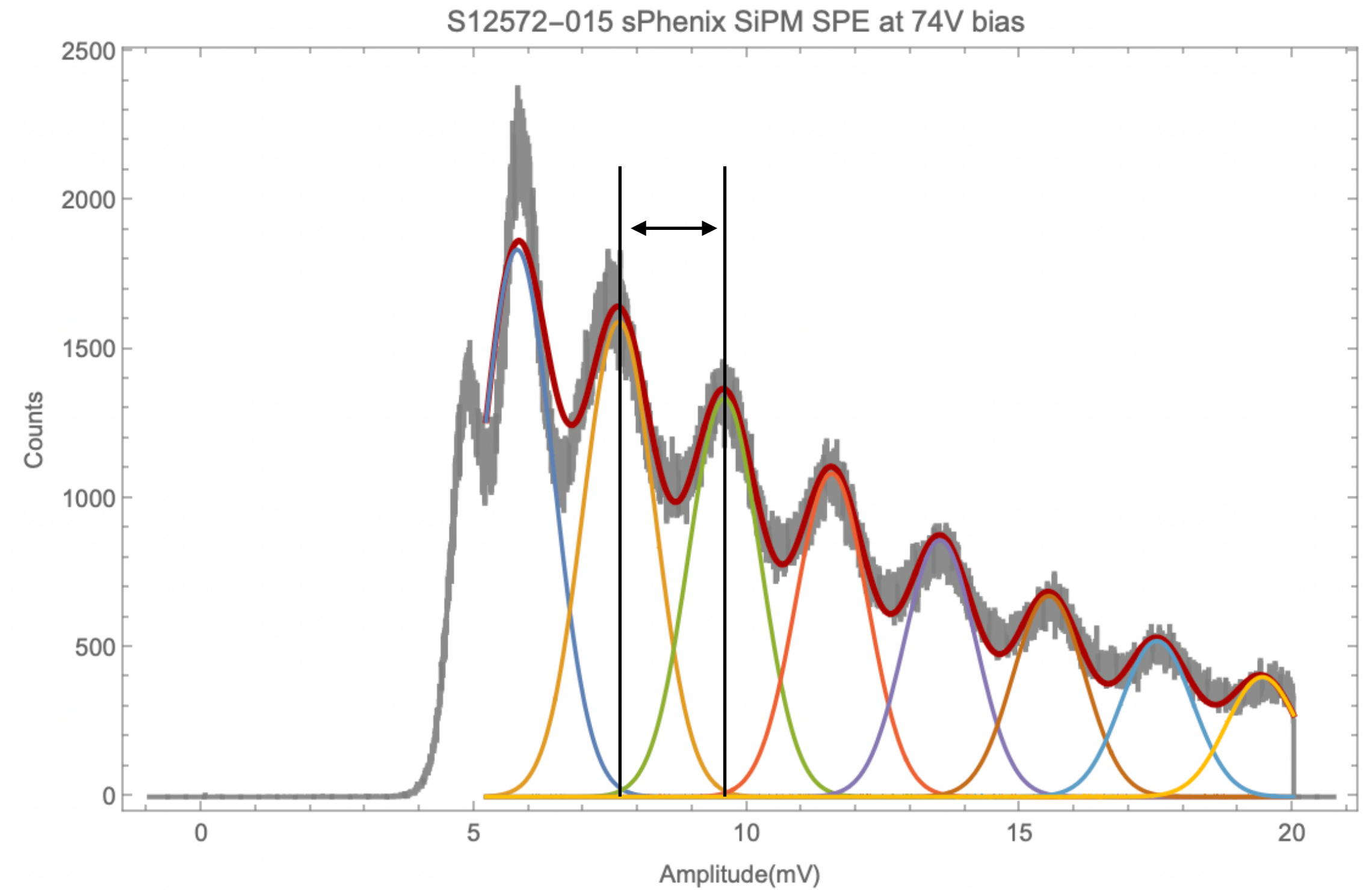
Lab Safety and Space Management

- High Bay clean up
 - West side of the highbay needs to be cleaned up for EIC electronics work
 - We have a few crates on the boundary(480V power panel)
 - All cleaned up now



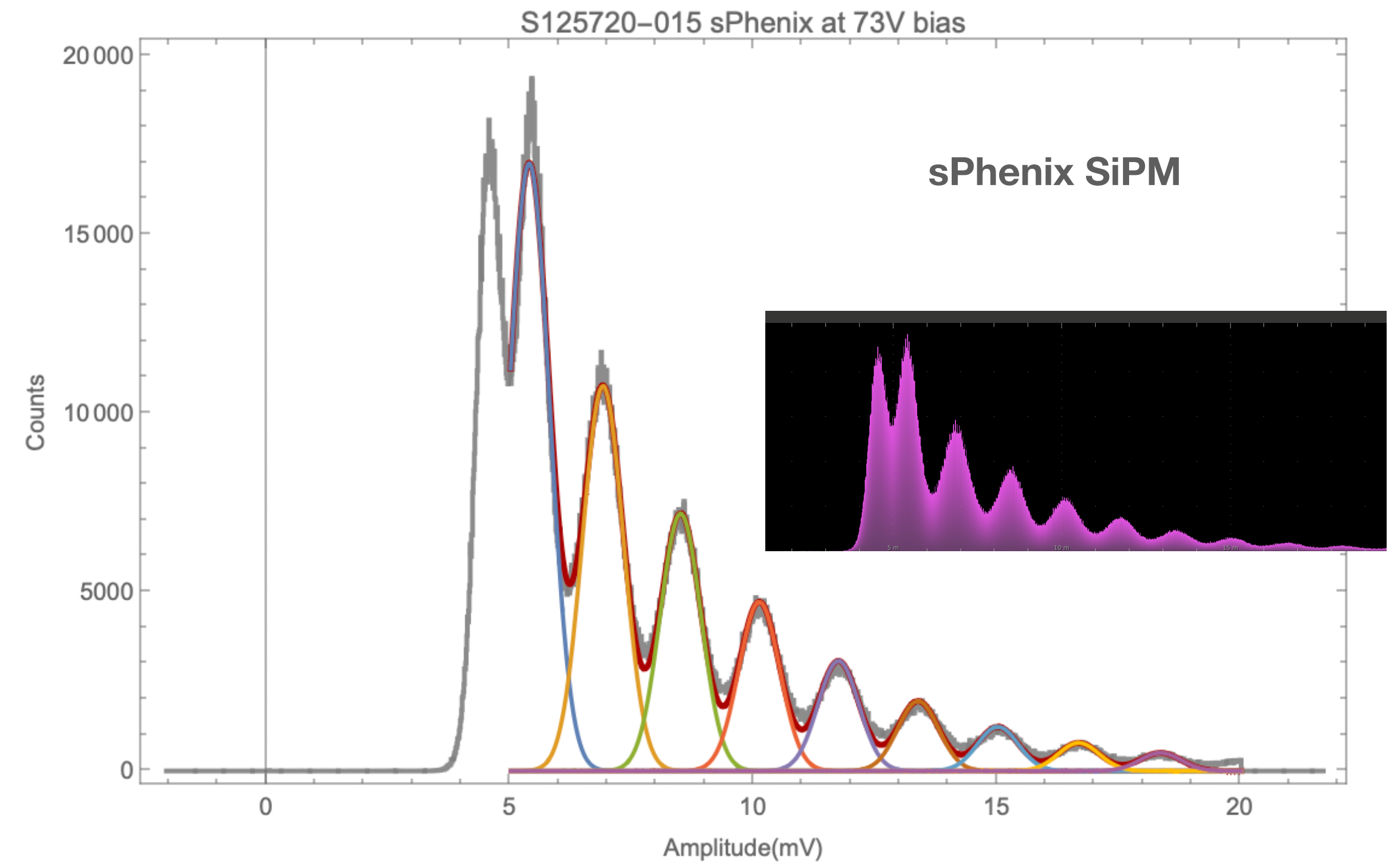
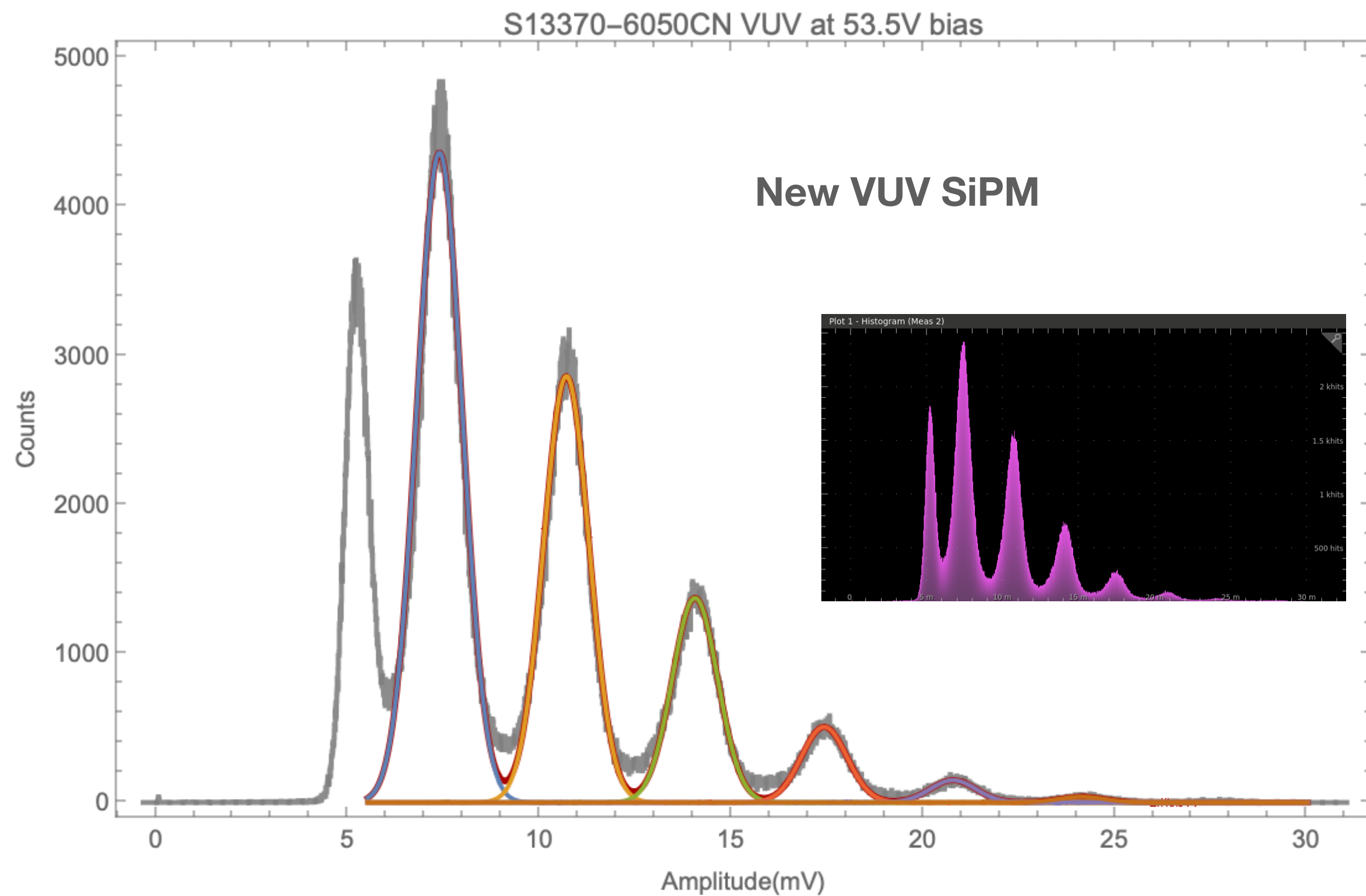
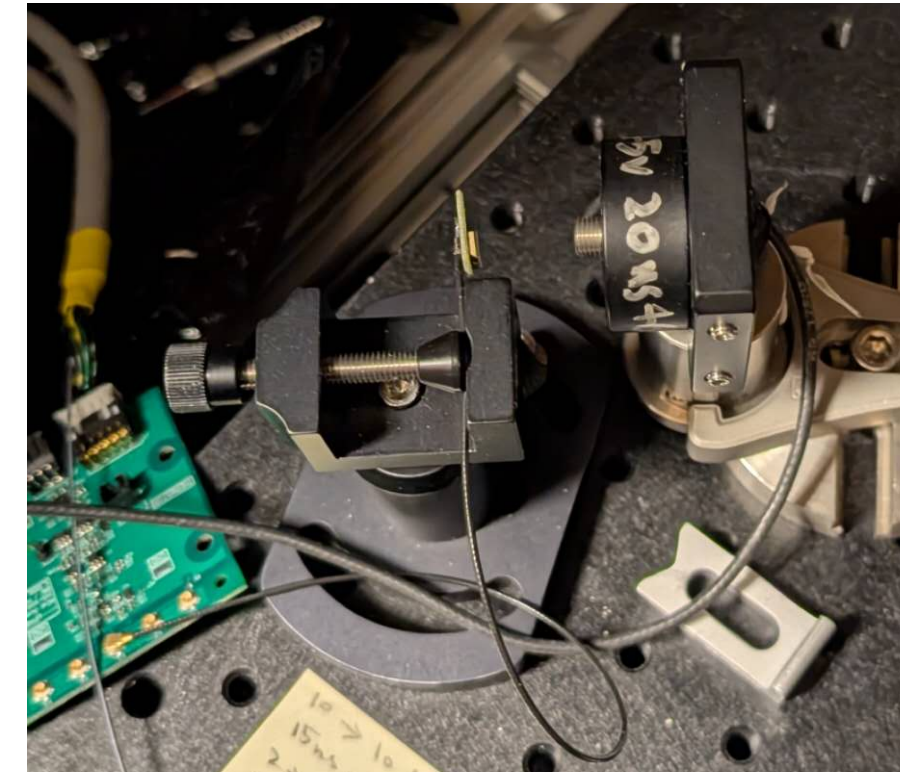
SiPM calibration(**Last Week**)

- The calibration can be done with the SPE spectrum
 - Just started with different overbias voltages
 - The SPE with 74 Volt bias shown here with multiple peak fits, showing about 1.93mV/p.e.
 - With go through a few more overbias voltages
 - Next is to repeat with the S13370-6050CN VUV SiPMs
 - The calibration will be completed this week



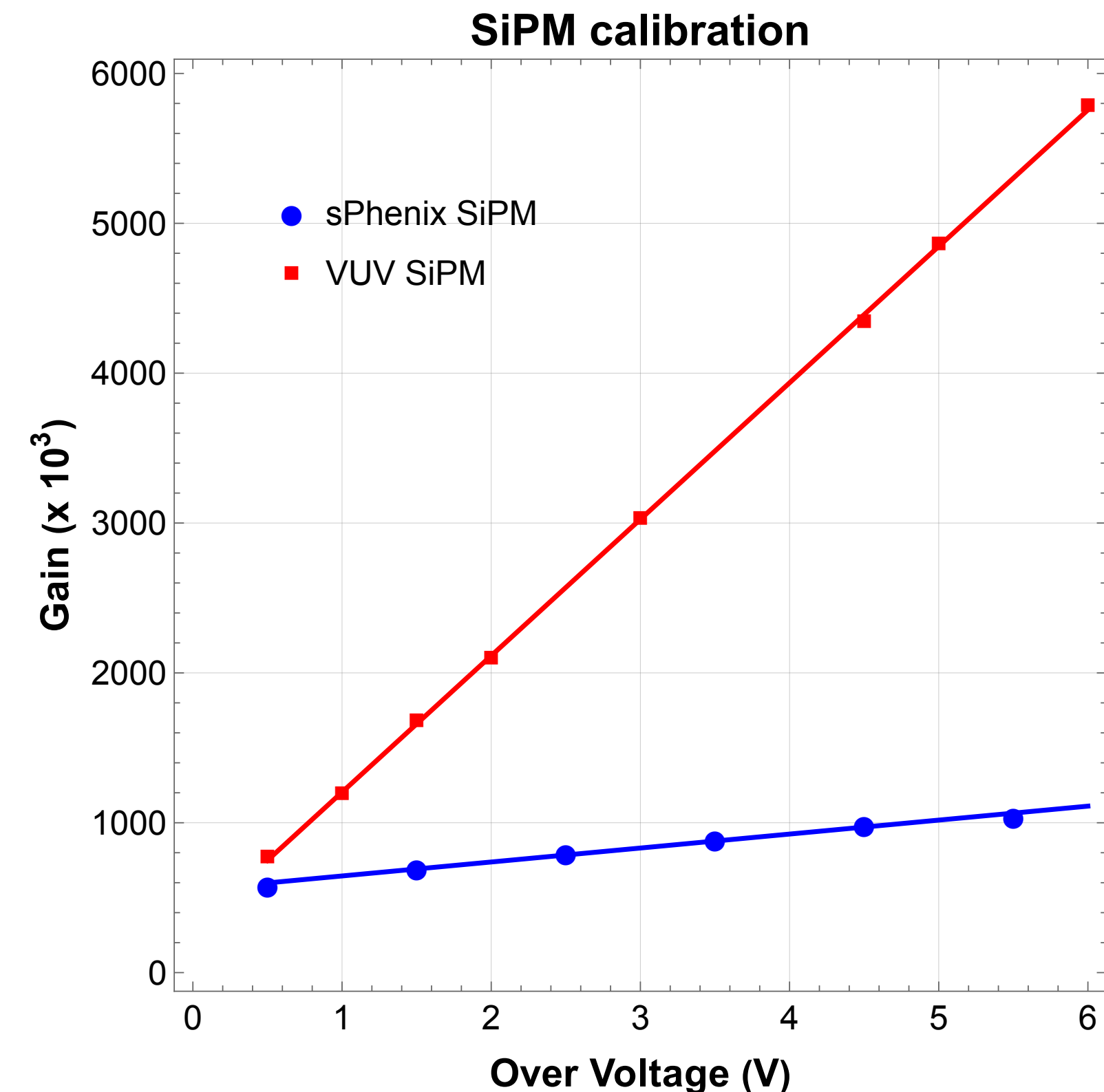
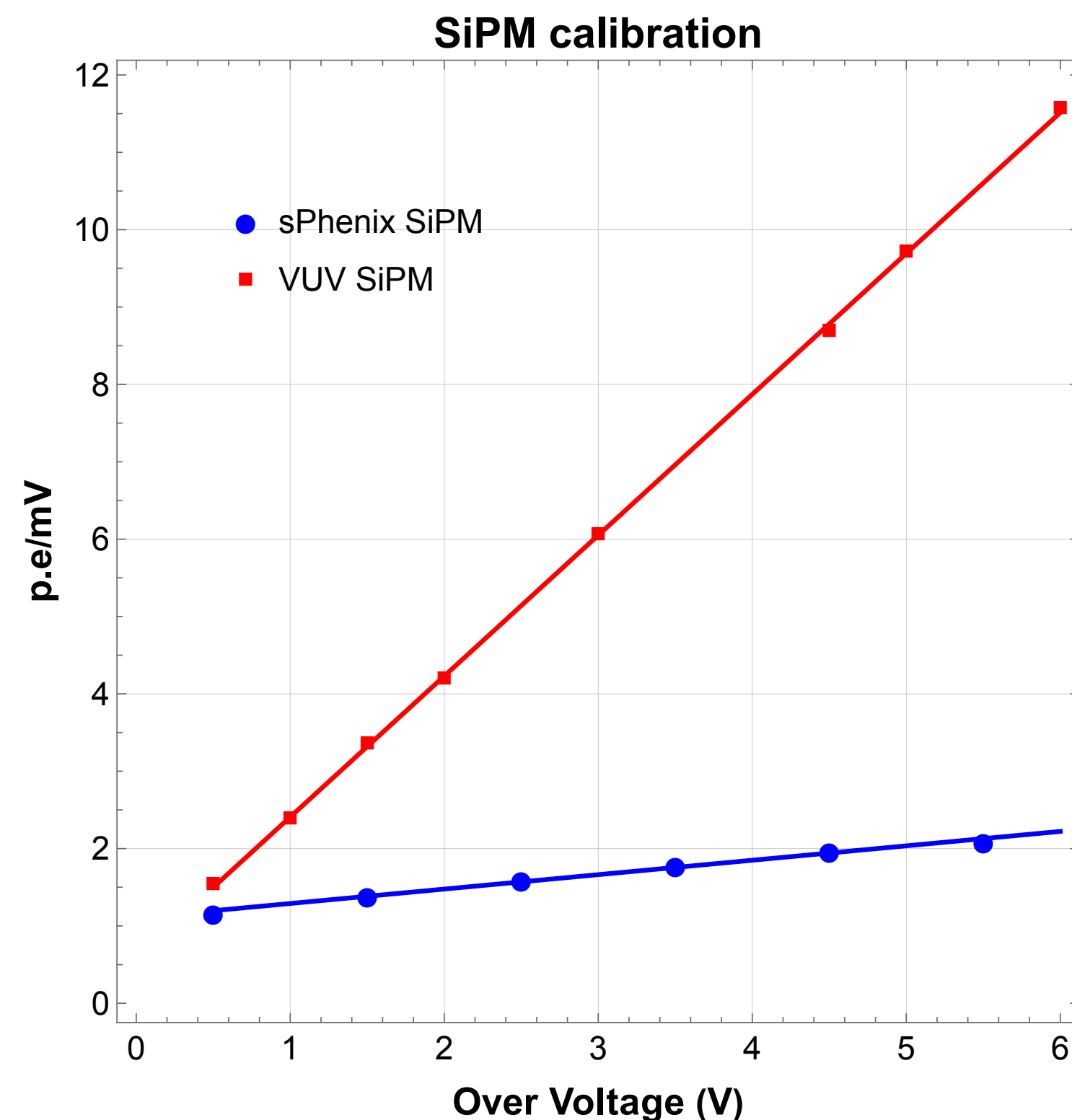
SiPM calibration for both SiPMs

- SPE measurement conducted with scanning of bias voltage starting from breakdown voltage on both SiPM
 - The LED bias conditions kept the same
 - Replacement of the SiPM with about the same distance, acceptance changed slightly
 - New VUV SiPM show best performance in gain and resolution
 - Each scan takes at least 1 hour, a few taken overnight for better statistics



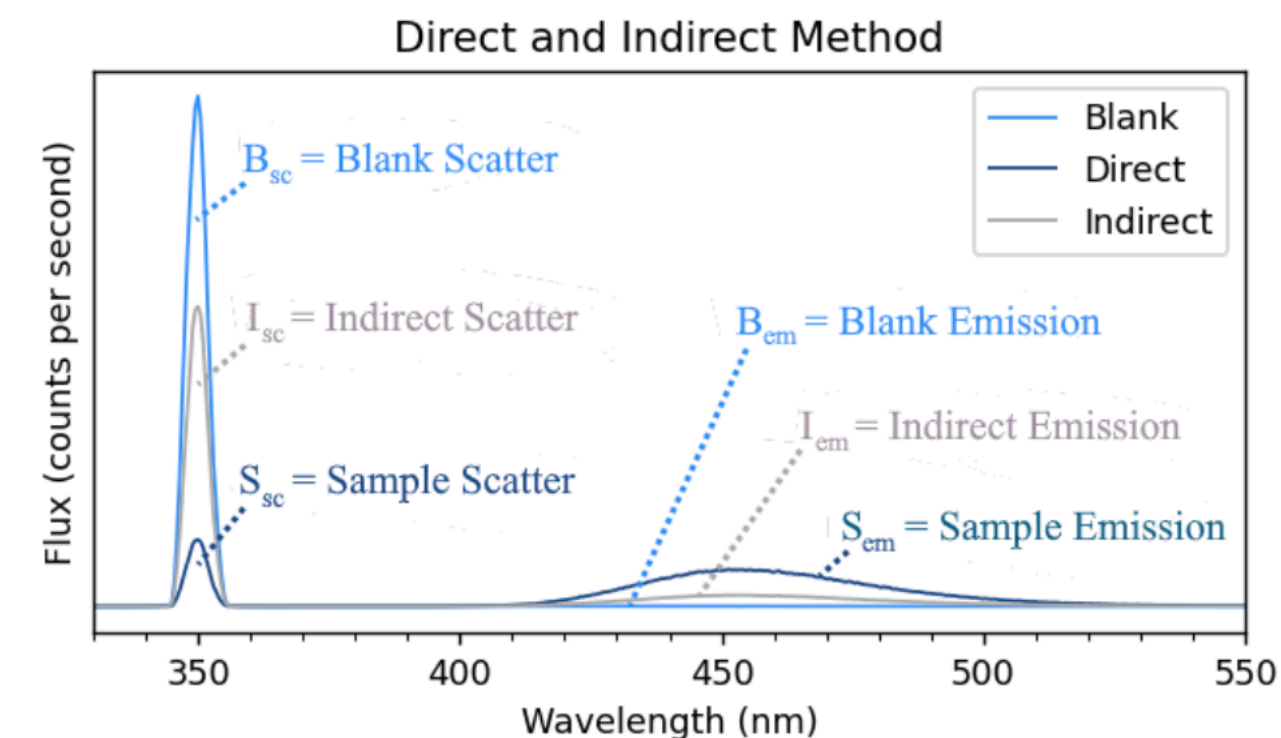
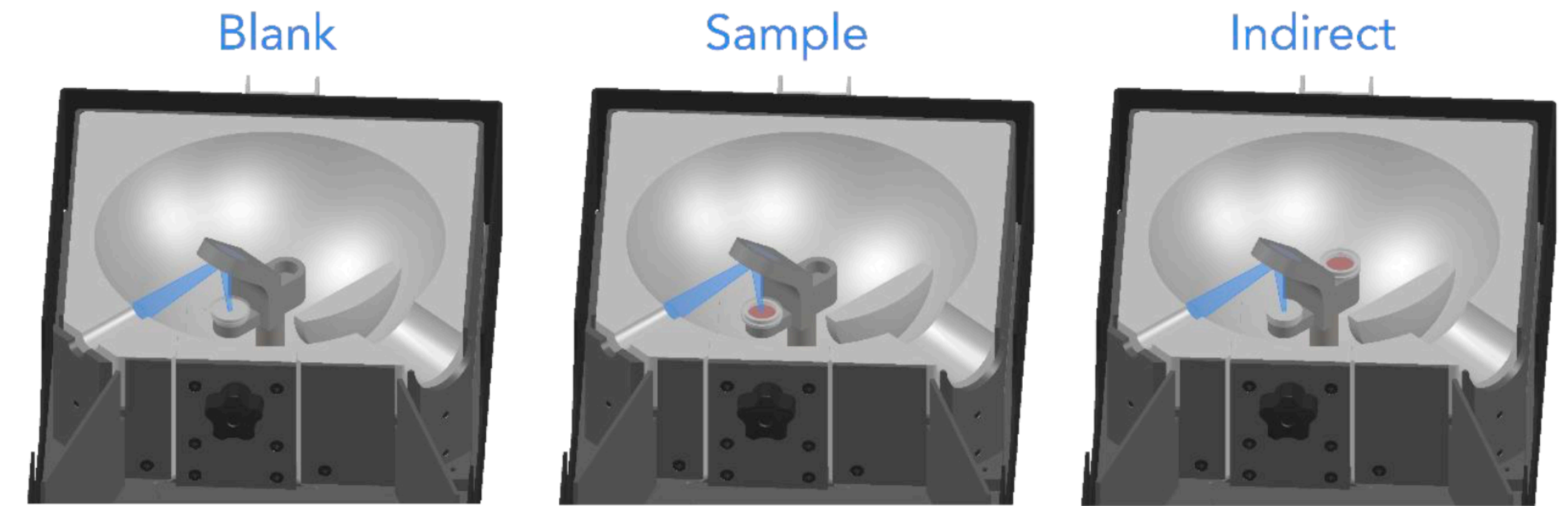
SiPM calibration for both SiPMs results

- The SiPM calibration
 - The single peak separation with over voltage established up to the maximum over bias
 - In need of electronics gain for absolute gain calibration, inquired with John, currently assuming in high gain mode with x32 gain factor, approximately agrees with data sheet
- New VUV SiPM shows much higher gain



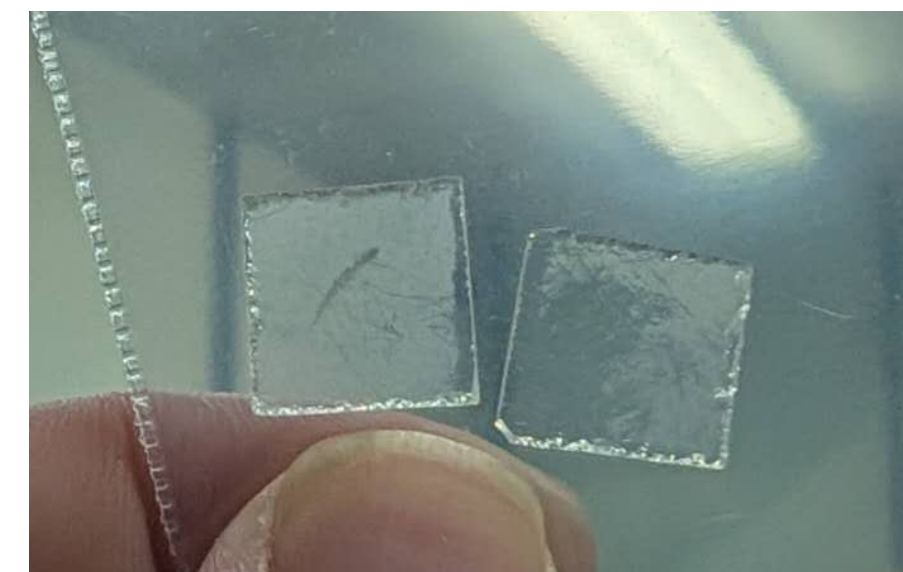
Quantum Yield Measurement at Chemistry

- Sample preparation
 - Still no further instructions received from the vendor, so we proceed with sample cutting
 - S53 was further trimmed down 1.4cm x 1.4cm to fit the sample holder of the integrated sphere sample holder
- Two cut down sample made
 - One with significant coating removed, the other one is good and used for the measurement
- The device provides two methods
 - Two scan / three scanned
 - Three scan measure was selected with better accuracy



$$\phi = \frac{S_{sc}(I_{em} - B_{em}) - I_{sc}(S_{em} - B_{em})}{B_{sc}(S_{sc} - I_{sc})}$$

Beam paths and emission spectra of the three measurements required for the direct and indirect excitation method.

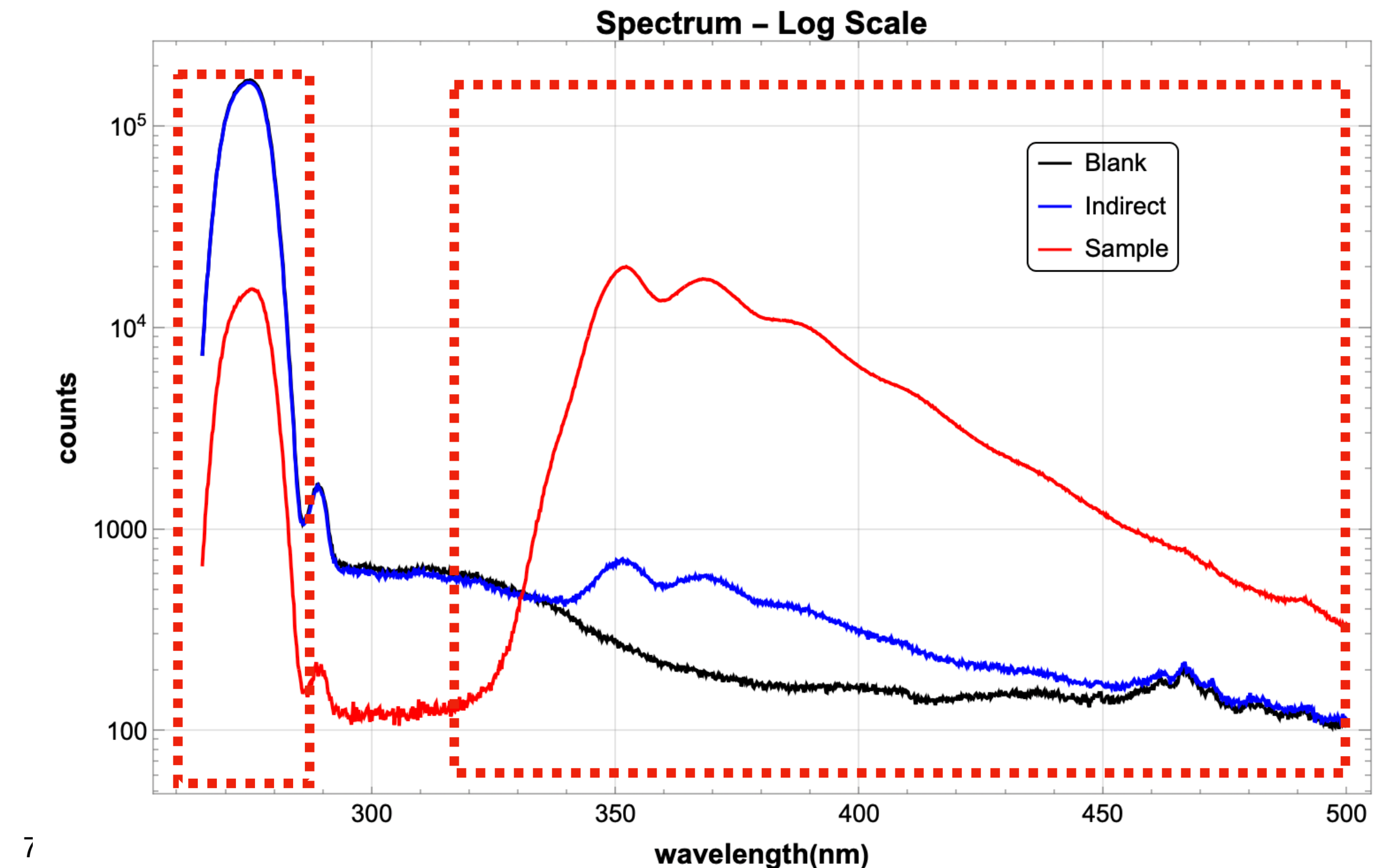
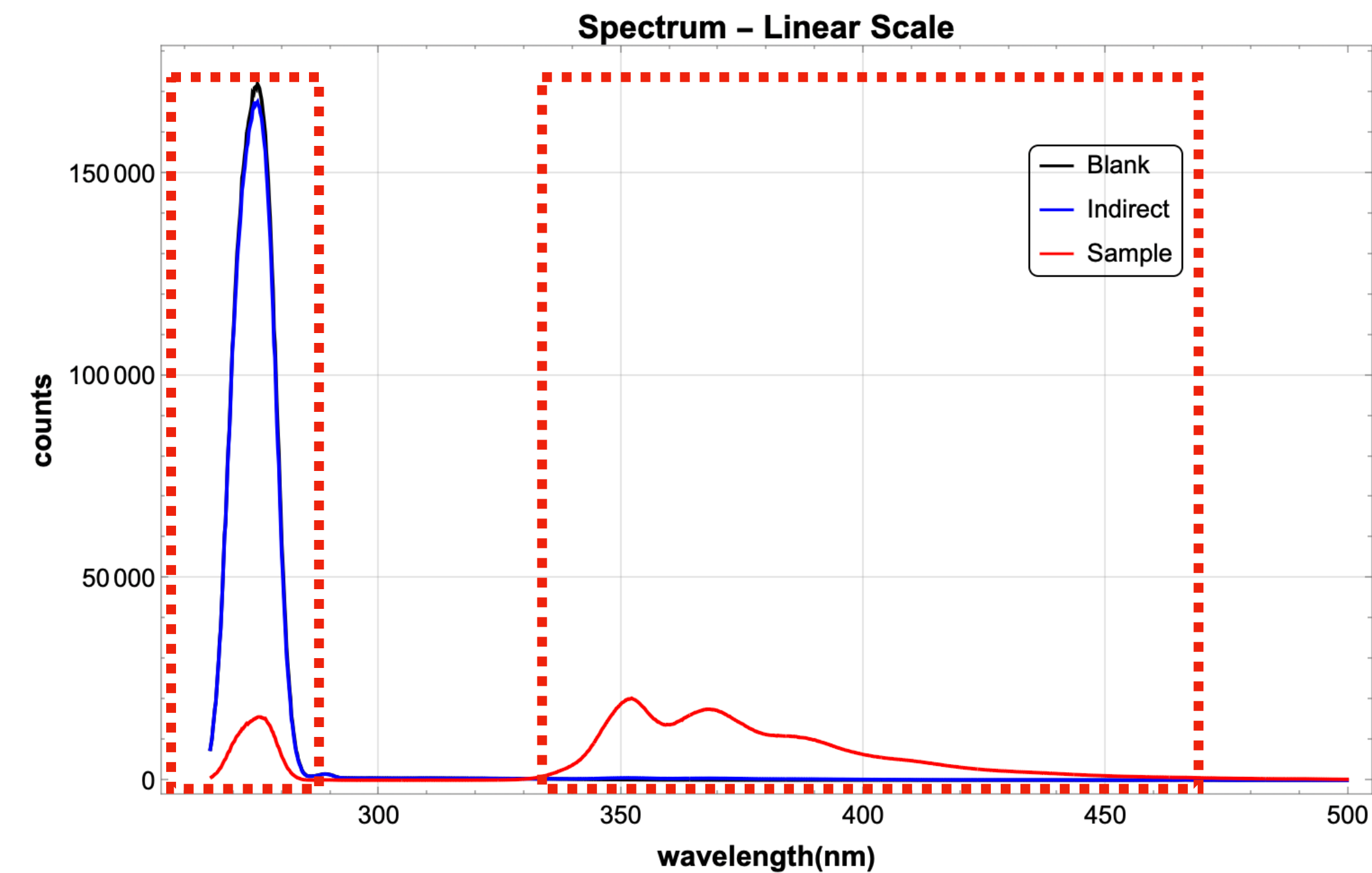
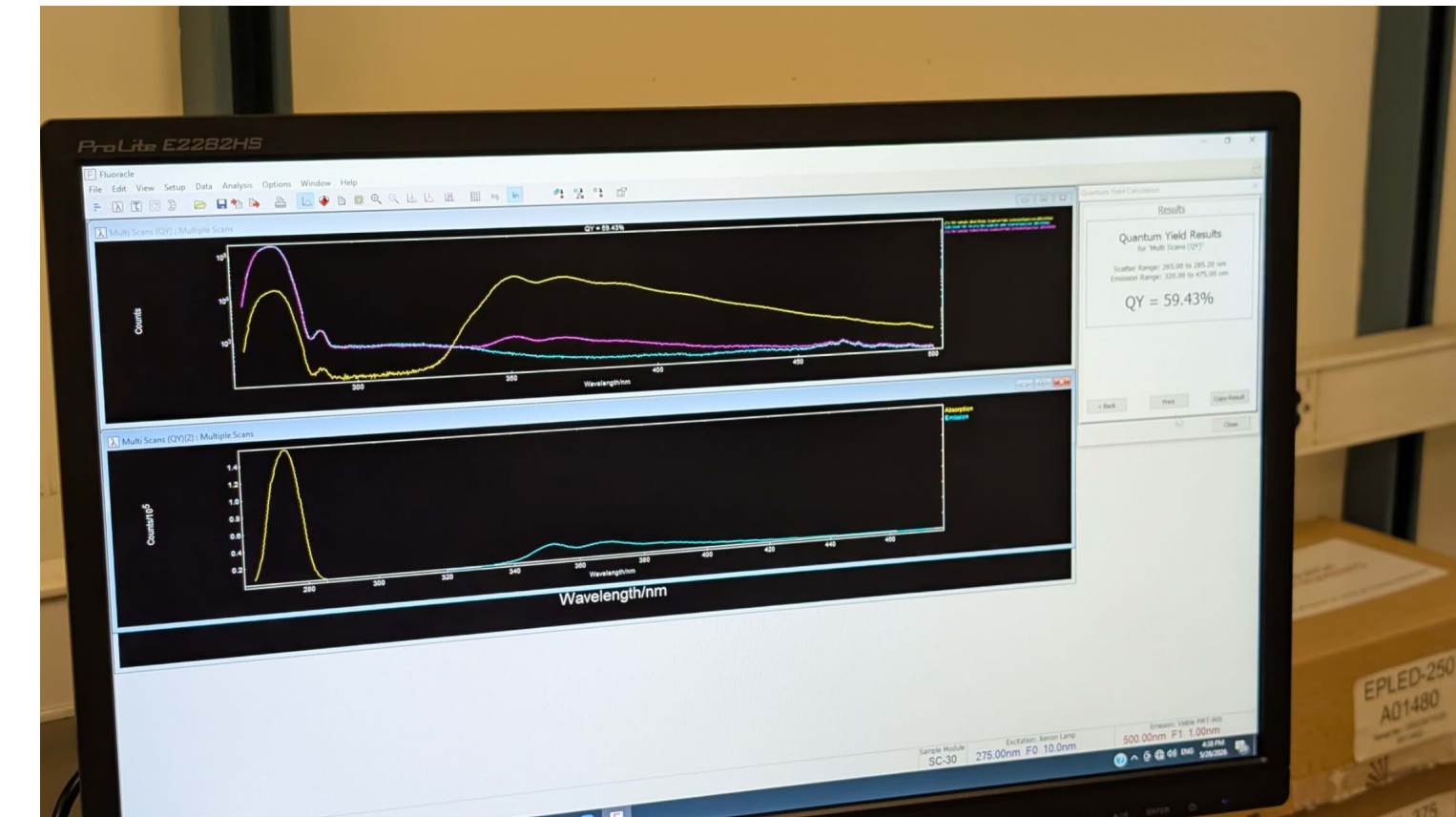


Quantum Yield Results

- The Quantum Yield defined as

$$\varphi = \frac{\text{number of photons emitted}}{\text{number of photons absorbed}} = \frac{N_{em}}{N_{abs}} \quad \varphi = \frac{S_{sc}(I_{em} - B_{em}) - I_{sc}(S_{em} - B_{em})}{B_{sc}(S_{sc} - I_{sc})}$$

- It takes three measurement get the full dataset
- The QY is calculated by the software with manually selected window for excitation and emission
- The QY efficiency is **59.43%** for the sample



Measurement for the rest of the week

- Filter transmission measurement with the device, different chamber
 - The measurement requires a sample fits in the holder
 - The residual piece after cutting the small pieces for QY measurement is just the right size
 - Will conduct the measurement tomorrow with Sasmit in the morning
- SBU sample thickness measurement
 - Abdul confirmed the availability of the profilometer and functionality
 - Rado will come to the lab tomorrow to conduct the measurement with me tomorrow afternoon
 - SBU provide 3 samples