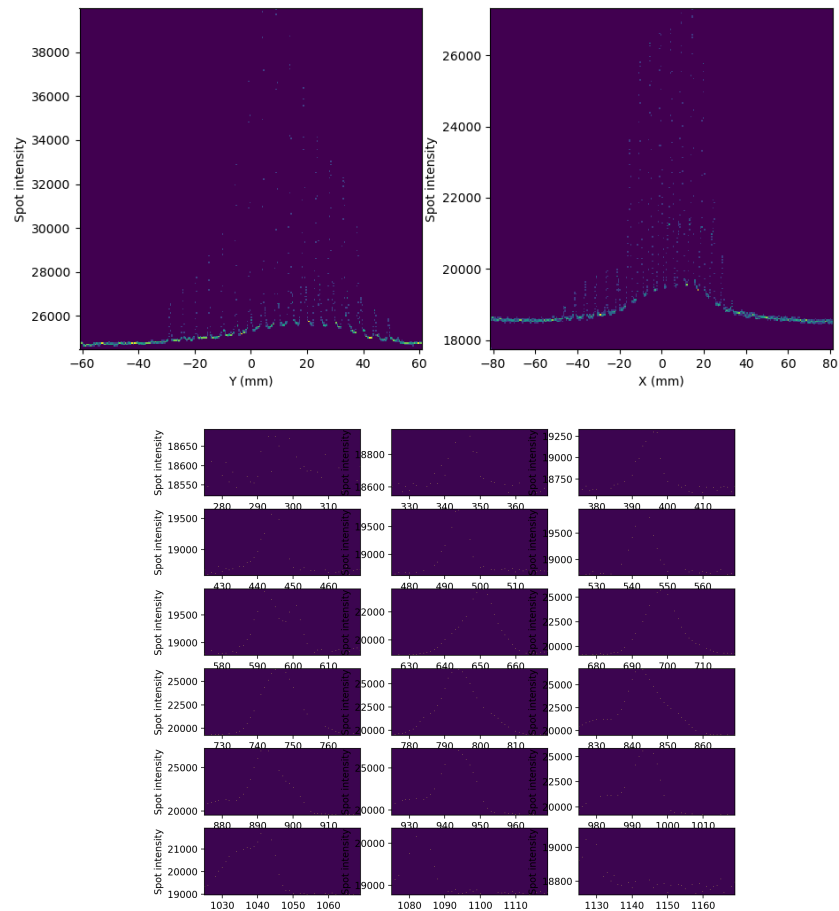
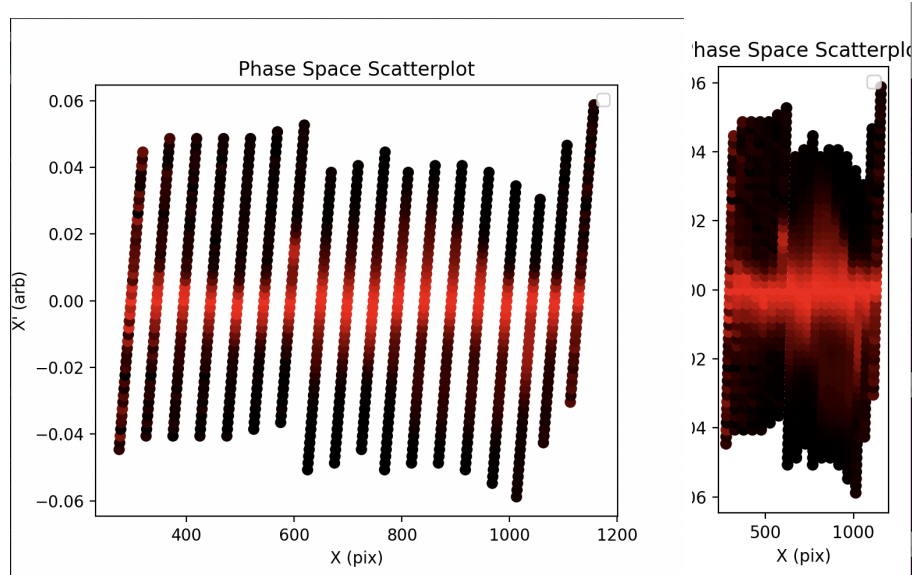


Week of 6-17-24

This week, the entirety of my focus was on creating my own analysis program to be used throughout the rest of the experiment. The program is almost completed, and is essentially meant to calculate the phase space and emittance of a system using a .bmp file as input. The results are promising, but not yet fully realized. I've been able to obtain the first batch of phase space diagrams (after <100 lines of calculations) and have begun work on obtaining values for the emittance but need to clarify some definitions for the quantity for this particular case.



Figs. 3.1, 3.2: a diagram of X and Y versus the spot intensity along the entire other axis at that point (e.g. for X = 60 mm, the intensity is added across all Y values to obtain a total value for that point in space). Zooming in, one can see the Gaussian distributions comprising the larger, underlying distribution.



Figs. 3.3, 3.4: Phase space diagrams produced for testing purposes. These don't look great, but they're sufficient to observe the phase space distribution of the dataset. There's clearly some kind of alignment issue with this histogram at the moment (it seems the maxima aren't all fully in line with each other) but otherwise the distribution shows some promise.

As soon as the phase space diagrams are completed, finding the emittance values will be added (which shouldn't be a particularly difficult task – essentially just a portion of the area shown by the phase space diagrams) and the analysis program will be complete. After this point, a separate program will be written to use this data for some beam parameter optimizations using machine learning (exact methods / quantities TBD).