Methods to Integrate Intensity on CCD

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1 Swath Integration i.e. SwInt

To summarize:
-Export y plot with sw from NFIT.
-Subtract baseline on Origin then integrate area A.
-The intensity is $I = \text{sw} \cdot A$.

The goal is to integrate the intensity order while subtracting the background. This protocol faciliates subtracting a background that varies in the y direction. Mathematically this method works accurately for a background that doesn't change in the x direction. In NFIT when plotting intensities in a direction using a swath width (sw), the intensity plotted is the mean of the sw[1] pixels in the perpendicular direction as shown by Fig. 1. The sw has to be taken small enough. Firstly because backgrounds from some sources have azimuthal symmetry. Secondly since the error due to baseline substraction is multiplied by sw. Also sw is taken large enough so that the entire order with the non-negligeable mosaicity is included. Outermost mosaicity is hard to extract but can be left out as it is usually insignificant (around 1%). One determines in NFIT, an adequate sw. The y plot with sw is exported as text, then loaded in Origin. There one can subtract the baseline. The plot is then integrated around the desired order, giving area A. The intensity of the order is $I = \text{sw} \cdot A$.
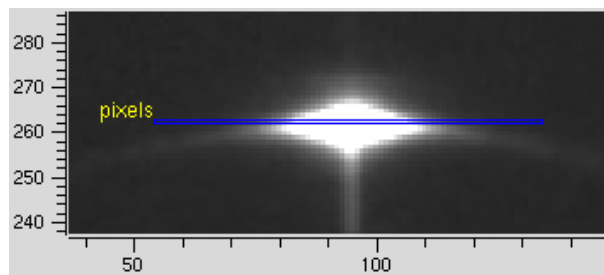

Figure 1: In NFIT a y plot at $x = 94$ with a sw of 81 will give the mean of the 81 pixels in the box as value for $y = 262$.

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[1]In NFIT, one does not specify the sw, but $(\text{sw}-1)/2$, the number of pixels taken at each side.

2 Box Integration

To summarize:
-Subtract a constant background (the mean of the background box).
-Draw a box on NIFT around the desired order.
-Use **stat** to get intensity

The goal is to integrate the reflection spot. The background is considered constant. To subtract it, first make a box near the spot. Sometimes the background changes slithly in y direction. To limit this error, the box should be at the same height y, but not in the mosaicity. In NFIT the function **stat** gives the mean intensity m over this box. Subtract m to the image to subtract the background. The function **stat** can now give the total intensity over a box which contains the spot.

3 Light Background Integration

This method uses the Light Background functionality of NFIT. Two boxes are needed, b1 the innermost box which contains the peak, and a bigger box b2 which contains b1. For each line, NFIT generates a polynomial that best fits the points that are in b2 but not in b1. It then substracts that polynomial to all the points in b2. The degree of the polynomial fit is given by the user. If 0 is specified, it will subtract at every line the average of the points in b2 but not in b1. To integrate, the function **stat** can now give the total intensity over a box which contains the spot. For polynomials of degree higher than zero, it is unstable to extrapolate.