Conducting the trace of the grism involves determining the location of the spectrum on the detector, with the source being at a given pixel. It essentially consists of carefully tracing the spectrum of the source and keeping track of the centroid, in the y direction, of the spectrum and tracking the measured y offset between the spectrum and the source for increasing values of x.

To account for proper sampling, we are reprocessing all archival ACS grism data that has bright stars in the ACS FoV. Different colors (shapes) denote different programs (images). With many stars over the ACS FoV and with each star having 150+ orders because they fall outside the ACS FoV. This field dependence is parameterized by allowing \( \{a\} \) to itself be a 2D polynomial and a function of the position of the reference pixel \((X_0,Y_0)\) as shown in Equation 2.

\[
\Delta y(\Delta x) = a_1 \times \Delta x + a_2 \times \Delta x^2 + \ldots + a_{2n} \times \Delta x^n
\]

(1)

If ACS had no field dependence, then coefficients \( \{a\} \) would be constants but because of geometric distortion there is a significant amount of field dependence. This field dependence is parameterized by allowing \( \{a\} \) to itself be a 2D polynomial and a function of the position of the reference pixel \((X_0,Y_0)\) as shown in Equation 2.

\[
a_0(x_0,y_0) = b_{0,0} + b_{1,0} \times x_0 + b_{0,1} \times y_0 + b_{2,0} \times x_0^2 + b_{1,1} \times x_0 \times y_0 + b_{0,2} \times y_0^2
\]

(2)

For simple linear dispersion \((n=1)\), substituting Equation 1 into Equation 2 gives Equation 3.

\[
\Delta y(x_0,y_0,\Delta x) = -(b_{1,0} + b_{2,0}) \times x_0 + b_{1,0} \times x_0 + b_{2,0} \times y_0 + b_{2,2} \times y_0^2 + \Delta x^2 \times (b_{1,1} + b_{2,1} \times x_0 + b_{0,2} \times y_0 + b_{2,2} \times y_0^2)
\]

(3)

Example trace measurements are shown on the left. Top-left is -1st order, top-right is +1st order, bottom-left is -2nd order and bottom-right is +2nd order. Spectral tilt measurements (about -2 deg) are consistent with Pasquali+ 2003, 2006.