$Upcon_{data} :=$

	0	1
0	76	-3999
1	80	-3926
2	103	...

$(vx \ \ vy) := \left(Upcon_{data}^{\langle 1\rangle} \ \ Upcon_{data}^{\langle 0\rangle}\right)$

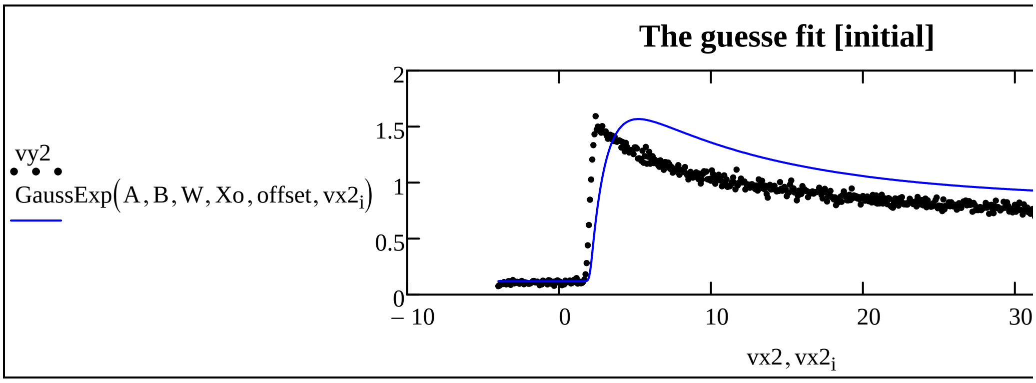
$(vx2 \ \ vy2) := \left(\frac{vx}{1000} \ \ \frac{vy}{1000}\right)$

$(X \ \ Y) := \left(\frac{vx}{1000} \ \ \frac{vy}{1000}\right)$ $\qquad i := 0 .. last(vx)$

This curve fitting (as well most curve fitting models) requires to guess wisely. The guesses at right are hand guesses. Although the PW_Minerr is much less sensitive than the MinerrSSE, better target the shape! MinerrSSE may require an arsenal of constraints to have it work properly. Many models may not be obvious in suggesting appropriate constraints.
Unlike the MinerrSSE, the PW_Minerr requires no constraints, however, it might fail ... few new trial guesses should succeed.
In the "art of curve fitting" there is a devil ...explain!
Many models exhibit "coefficients reflection", i.e: we may obtain a fit from given guesses, other guesses may provide better/worse fit. For disclosing such a model case, explore on your own .

$\begin{pmatrix} A \\ B \\ W \\ Xo \\ offse \end{pmatrix}$

$$GaussExp(A,B,W,Xo,offset,x) := \sum_{i=0}^{2}\left[\frac{1}{2}\cdot A_i\cdot\left[1+erf\left[\frac{1}{4}\cdot\frac{\left[8\cdot(x-Xo)\cdot\ln(2)-B_i\cdot W^2\right]}{W\cdot\ln(2)^{\frac{1}{2}}}\right]\right]\cdot exp\right.$$



The PW_Minerr

$i := 0 .. last(vx)$

$$F(A,B,W,Xo,offset,X) := \left| \begin{array}{l} \text{for } i \in 0 .. last(X) \\ \quad Y_i \leftarrow GaussExp(A,B,W,Xo,offset,X_i) \\ Y \end{array} \right.$$

Given

$$F(A,B,W,Xo,offset,X) - Y = 0$$

$$\begin{pmatrix} A \\ B \\ W \\ Xo \\ offset \end{pmatrix} := Minerr(A,B,W,Xo,offset)$$

$$\begin{pmatrix} A \\ B \\ W \\ Xo \\ offset \end{pmatrix} = \begin{bmatrix} \begin{pmatrix} 0.516 \\ 0.921 \\ 0.651 \end{pmatrix} \\ \begin{pmatrix} 0.214 \\ 0.012 \\ 10.232 \end{pmatrix} \\ 0.48 \\ 2.052 \\ 0.107 \end{bmatrix} \quad \begin{bmatrix} \begin{pmatrix} 0.536 \\ 0.927 \\ -3.757 \end{pmatrix} \\ \begin{pmatrix} 0.221 \\ 0.012 \\ 24.941 \end{pmatrix} \\ 0.457 \\ 1.914 \\ 0.108 \end{bmatrix}$$

$$A := A \cdot 1000 \qquad B := \frac{B}{1000} \qquad W := W \cdot 1000 \qquad Xo := Xo \cdot 1000 \qquad offset := offset \cdot 1000$$

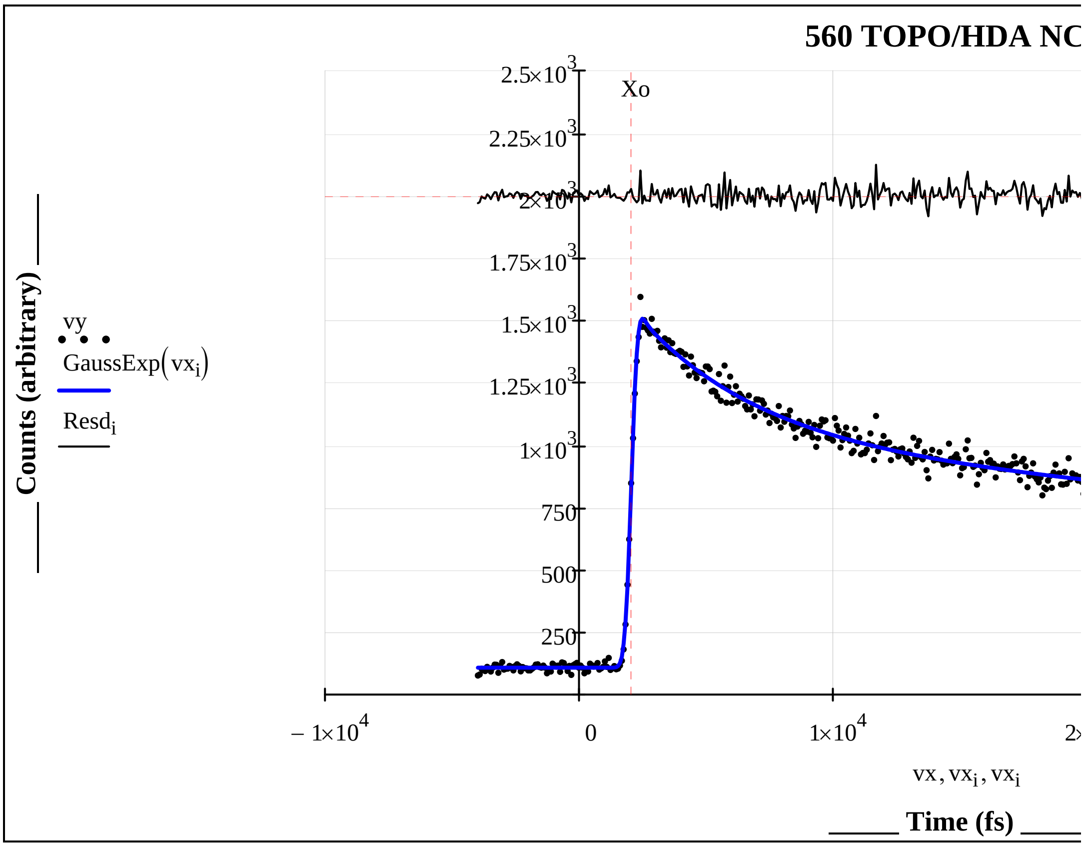
$$\begin{pmatrix} A \\ B \\ W \\ Xo \\ offset \end{pmatrix} = \begin{bmatrix} \begin{pmatrix} 515.8 \\ 921.398 \\ 650.924 \end{pmatrix} \\ \begin{pmatrix} 2.14 \times 10^{-4} \\ 1.219 \times 10^{-5} \\ 0.01 \end{pmatrix} \\ 479.967 \\ 2.052 \times 10^{3} \\ 107.413 \end{bmatrix}$$

QED (Quod Errat Demonstrandum):
Ref: coefficients (images) and plots below.
1. in the crucial part, the PW_Minerr is superior to Minerr
2. watch the "coefficients reflection"
3. PW_Minerr takes few seconds vs minutes MinerrSSE.
4. No constraints applied to PW_Minerr !

$$GaussExp(x) := GaussExp(A,B,W,Xo,offset,x)$$

Raw absolute residuals

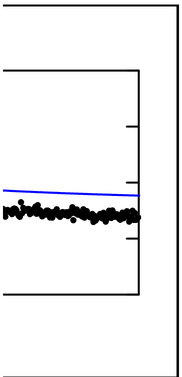
$$Resd_i := vy_i - GaussExp(vx_i) + 2000$$



560 TOPO/HDA NC
Counts (arbitrary)
vy
GaussExp(vx_i)
Resd_i
Xo
2.5×10^3
2.25×10^3
2×10^3
1.75×10^3
1.5×10^3
1.25×10^3
1×10^3
750
500
250
− 1×10^4
0
1×10^4
2×
vx, vx_i, vx_i
Time (fs)

$$ \ldots t) := \begin{bmatrix} \begin{pmatrix} 1 \\ 0.8 \\ -1.8 \end{pmatrix} \\ \begin{pmatrix} .1 \\ .002 \\ 1 \end{pmatrix} \\ .250 \\ 2 \\ .120 \end{bmatrix} \qquad \begin{bmatrix} \begin{pmatrix} 1.5 \\ .8 \\ -1.8 \end{pmatrix} \\ \begin{pmatrix} .1 \\ .002 \\ 1 \end{pmatrix} \\ .250 \\ 2 \\ .120 \end{bmatrix} $$

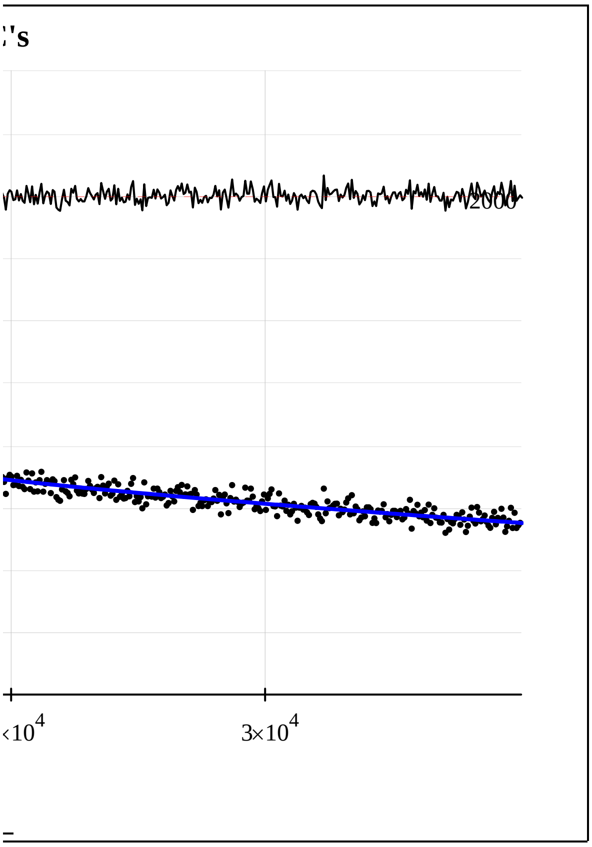
$$ \ldots \frac{-1}{16}\cdot B_i\cdot \frac{16\cdot(x - Xo)\cdot \ln(2) - B_i\cdot W^2}{\ln(2)} \Bigg]\Bigg] + \text{offset} $$



$sec := 1$ $t0 := time(1)$

time(1) − t0 = 25 sec

SSE.



's
2000
×10^4
3×10^4