FDC timing calibration

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Daily SRC/CT Analysis Meeting

How to get t_0

t_0

What Millepede does

Alignment is an optimization problem. The objective function to be minimized is:

$$\chi^2(\mathbf{p}, \mathbf{q}) = \sum \left(\frac{\text{residual}(\mathbf{p}, \mathbf{q})}{\text{error}} \right)^2$$

alignment parameters **track parameters**

What we need to minimize this function:

$$\frac{\partial \text{residual}(\mathbf{p}, \mathbf{q})}{\partial(\mathbf{p}, \mathbf{q})}$$

How the residual change when we shift parameters.

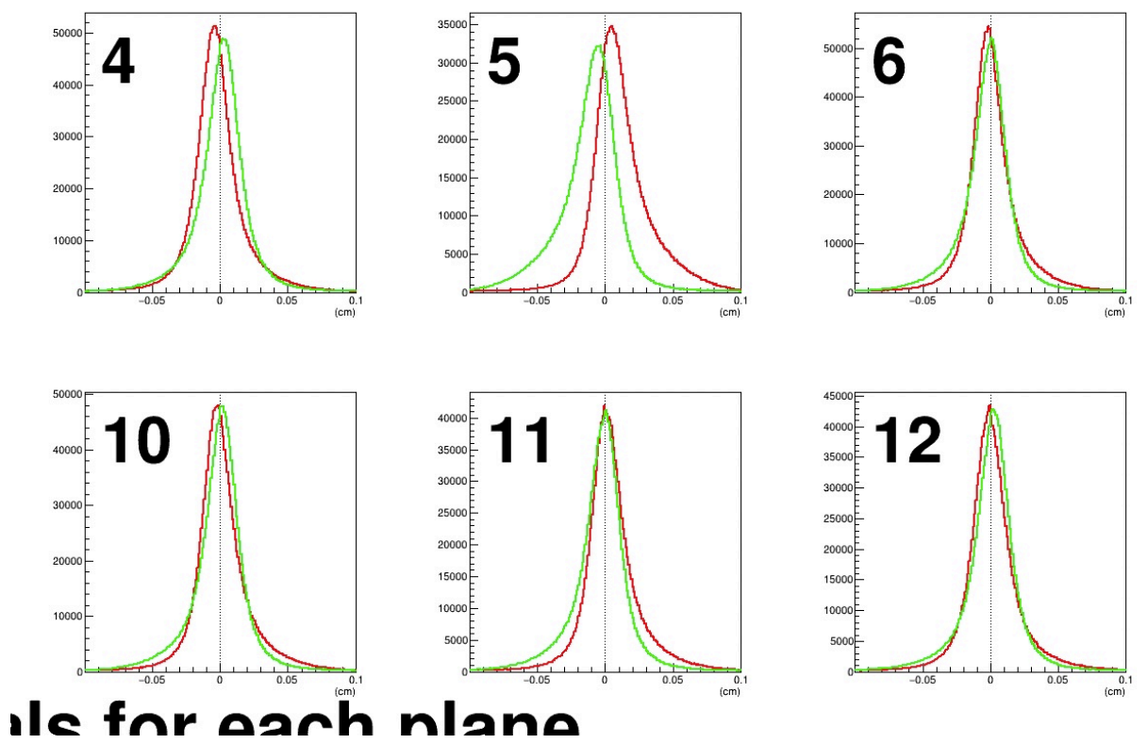
Millepede

Returns optimized $\mathbf{p}$.

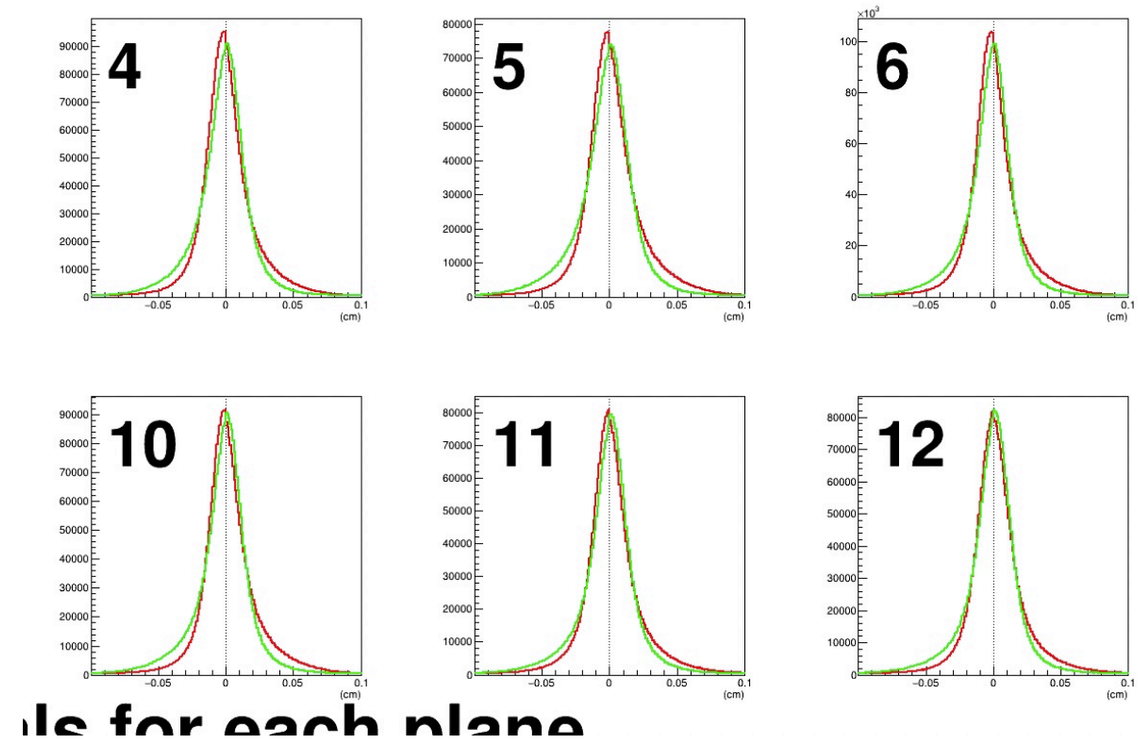
Determines timing offset parameter t_0
so that the tracking chi2 is minimized.

Wire Residuals

R90207 before calibration

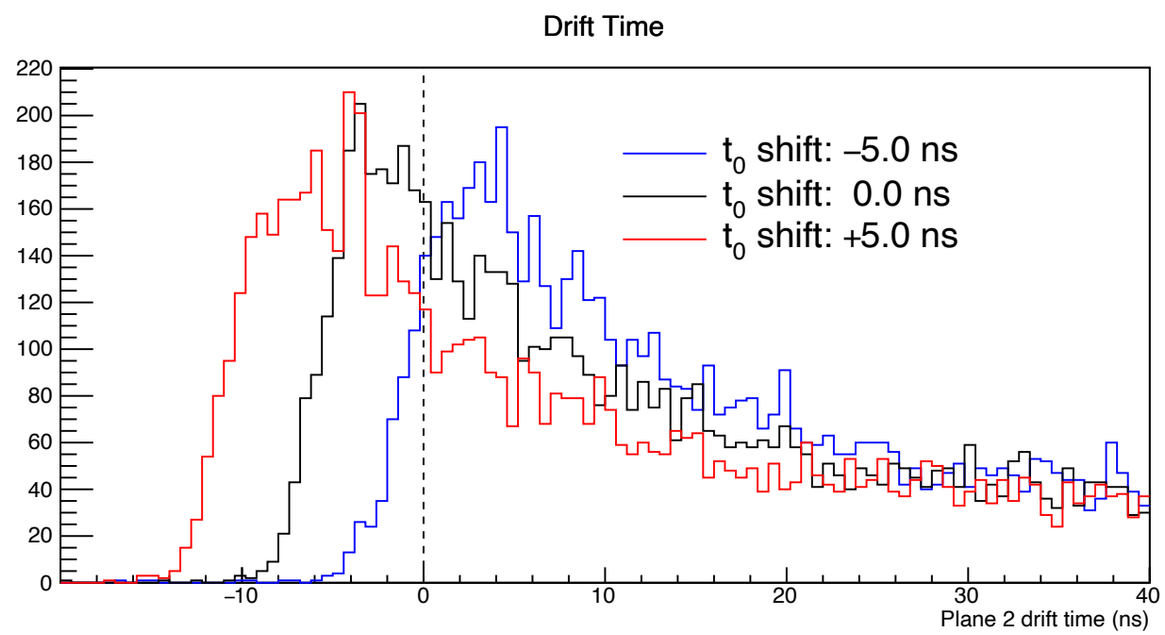


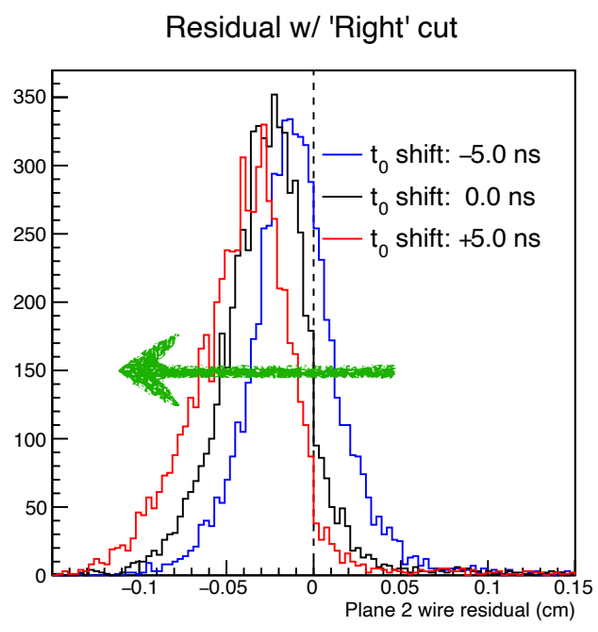
R90208 after calibration

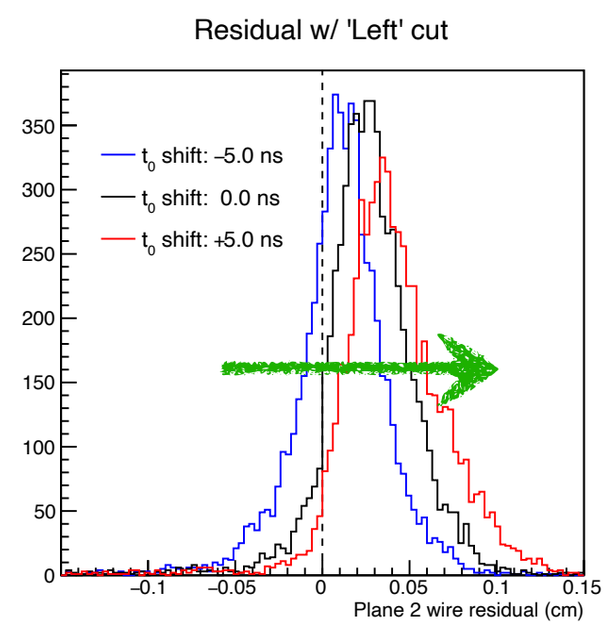


Red: Residuals for hits which sit in the right side of the wire
Green: Residuals for hits which sit in the left side of the wire
(left/right is determined by the reconstructed track)

t_0 shifts

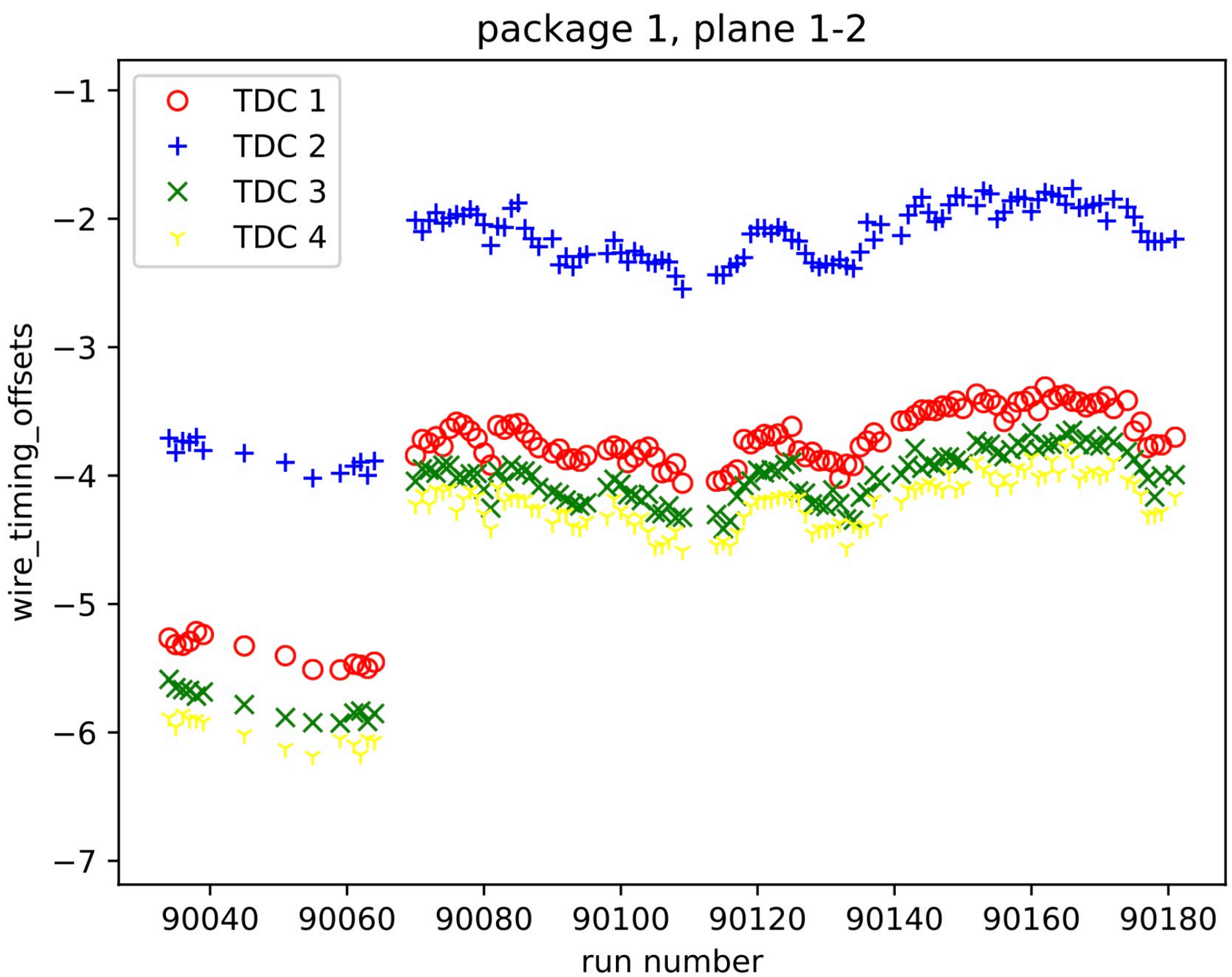






The left/right residuals are sensitive to validate timing parameters.

Run dependence



Stable within ~1 sec.