Update on quad beam test analysis

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Lepcol meeting

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Updated event/hit selection

Hit selection
$-500\,\text{ns} < t_{\text{hit}} - t_{\text{trigger}} < 500\,\text{ns}$
First hit readout $< 5{\times}409.6\,\mu\text{s}$
Average hit readout $< 150{\times}409.6\,\mu\text{s}$
Max hit readout $< 200{\times}409.6\,\mu\text{s}$
Hit ToT $> 0.15\,\mu\text{s}$
Reject outliers ($r_x < 2\sigma_x, r_z < 3\sigma_z$)
Reject outliers ($r_x < 1.5\,\text{mm}, r_z < 2\,\text{mm}$)

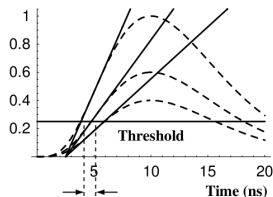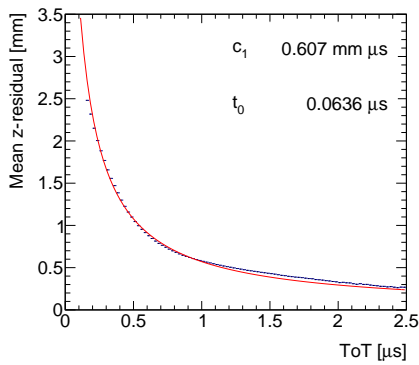| Event Selection |
| :---: |
| $N_{\text{hits}} > 20$ |
| $(N_{r_x<1.5\text{mm}} \,/\, N_{r_x<5\text{mm}}) > 0.8$ |
| $x_{\text{timepix}} - x_{\text{telescope}} < 0.3\,\text{mm}$ |
| $z_{\text{timepix}} - z_{\text{telescope}} < 0.3\,\text{mm}$ |

Time walk correction

- Time walk occurs when the apparent time of arrival depends on the signal amplitude
- With Timepix3 the time walk can be corrected for using the Time over Threshold (ToT) as measure of signal strength:

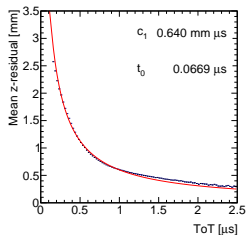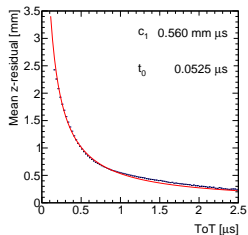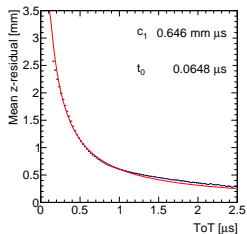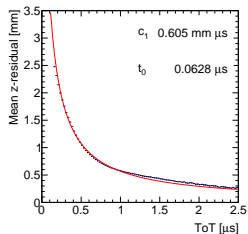$$\delta z_{\text{timewalk}} = \frac{c_1}{t_{\text{ToT}} + t_0} + z_0$$
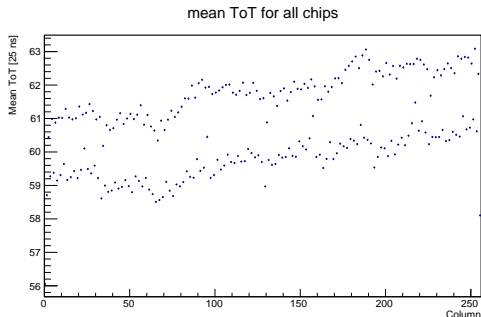

c_1 0.607 mm µs

t_0 0.0636 µs

Time walk per chip

ToT per column correction from test pulses

mean ToT for all chips
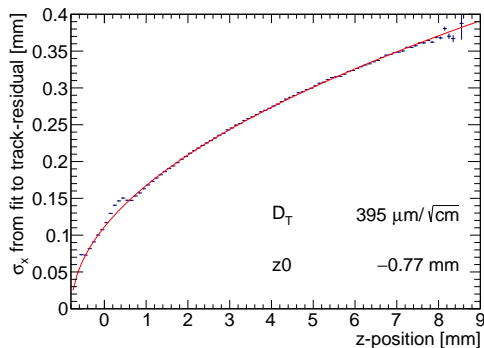

mean ToT for all chips
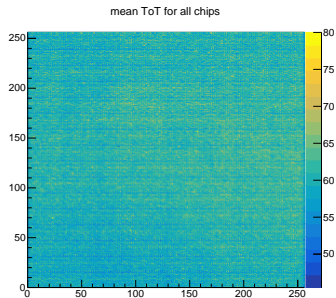
ToA deformations per pixel
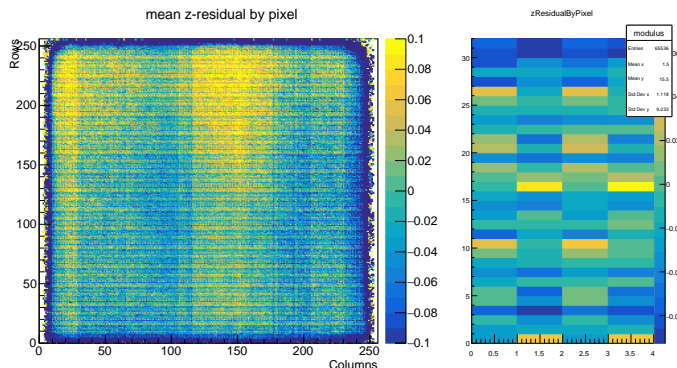
Contains checkerboard pattern with 2×16 unit cell

Correct remaining deformation by per column, and per row correction
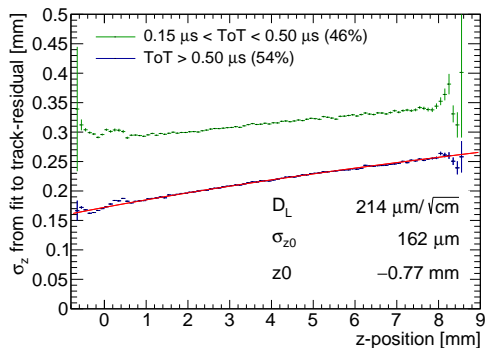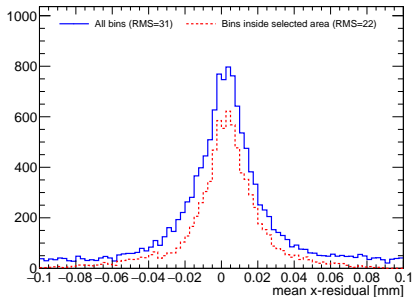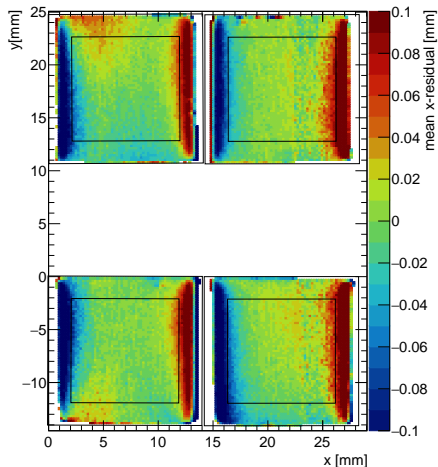
Diffusion in drift direction

Residual as function of drift distance is fitted with

$$\sigma_x = \sqrt{\sigma_{x0}^2 + D_T^2(z - z_0)}$$

Longitudinal diffusion
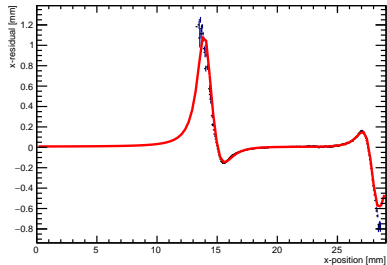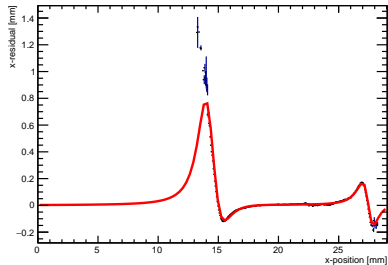

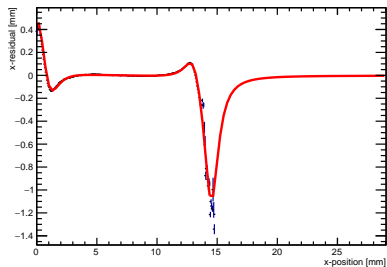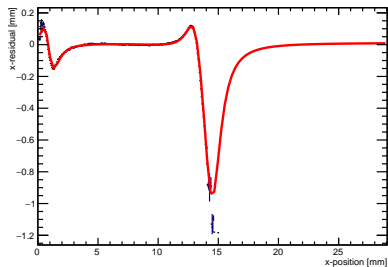Residual as function of drift distance is fitted with
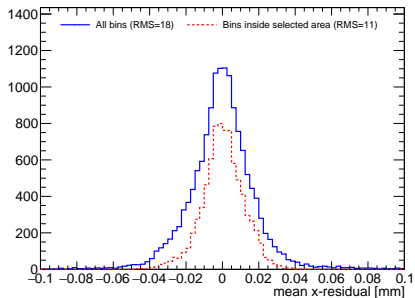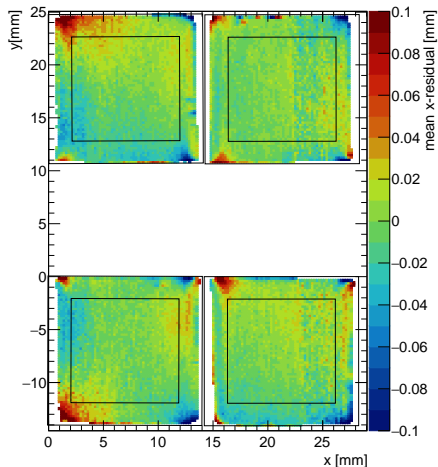
$$\sigma_z = \sqrt{\sigma_{z0}^2 + D_L^2(z - z_0)}$$

Deformation in pixel plane
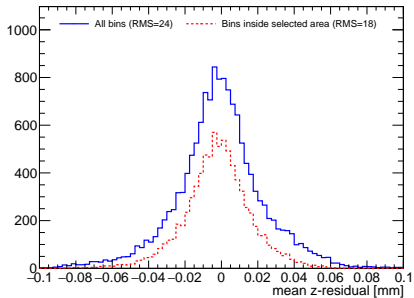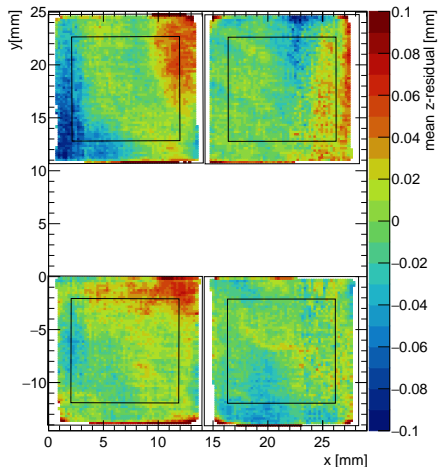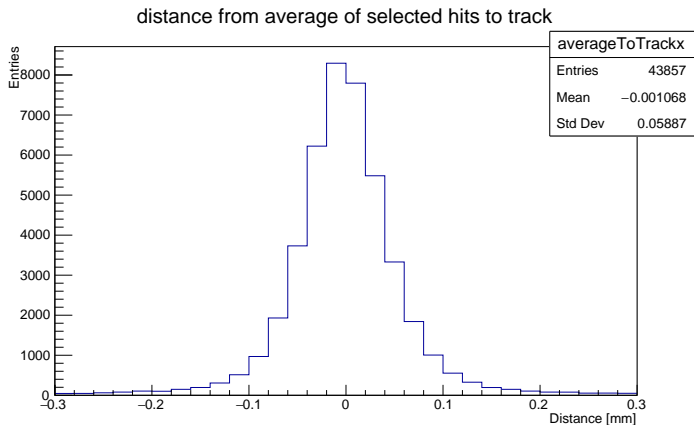
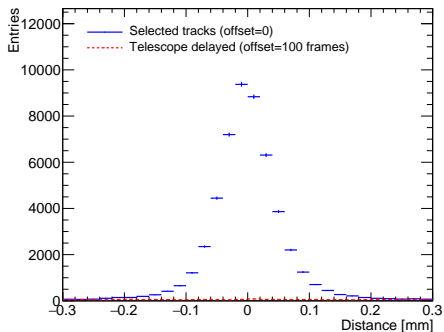# Correction of electric field deformations

Deformation in pixel plane

Deformation in drift direction

Distance to track of average of all hits

distance from average of selected hits to track

averageToTrackx	
Entries	43857
Mean	−0.001068
Std Dev	0.05887

Background from synchronisation problems

Background from coincidental tracks is approximetely 3%