Update on the negative ion results

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Lepcol meeting

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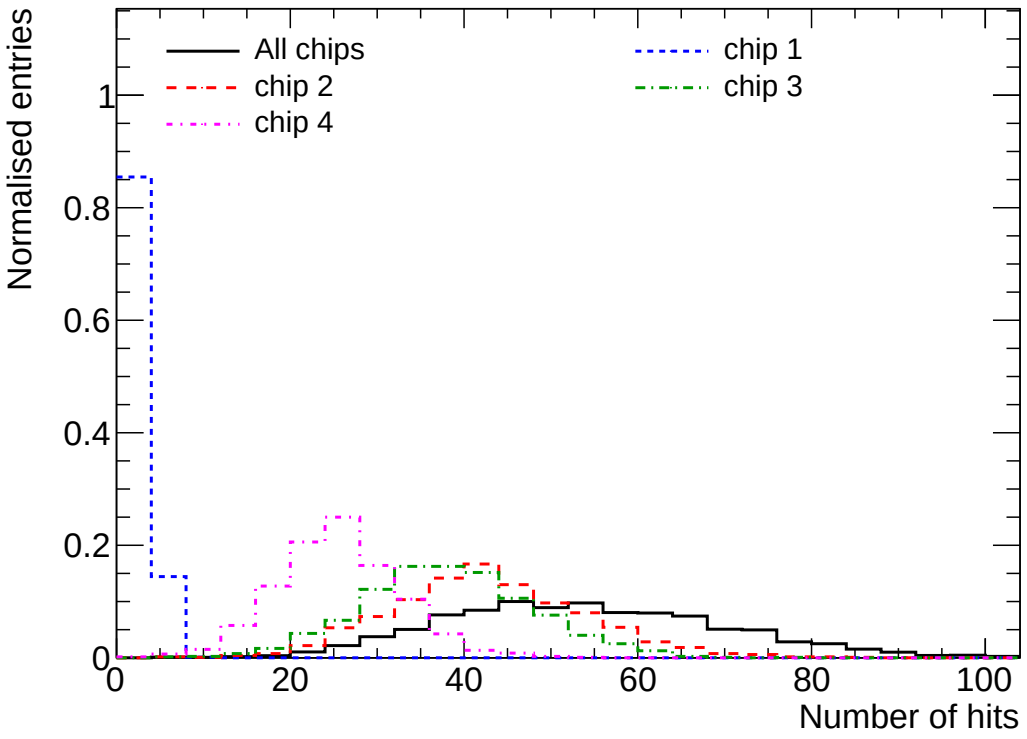
Run parameters

Number of runs	9
Run duration	17 minutes
E_{drift}	100 – 500 V/cm
V_{grid}	$-380\,\text{V}$
Threshold	$515\,\text{e}^-$
Temperature	295.9 – 297.0 K
Pressure	1030 – 1029 mbar
Oxygen concentration	654 – 1133 ppm
Water vapor concentration	$\sim 4000\,\text{ppm}$

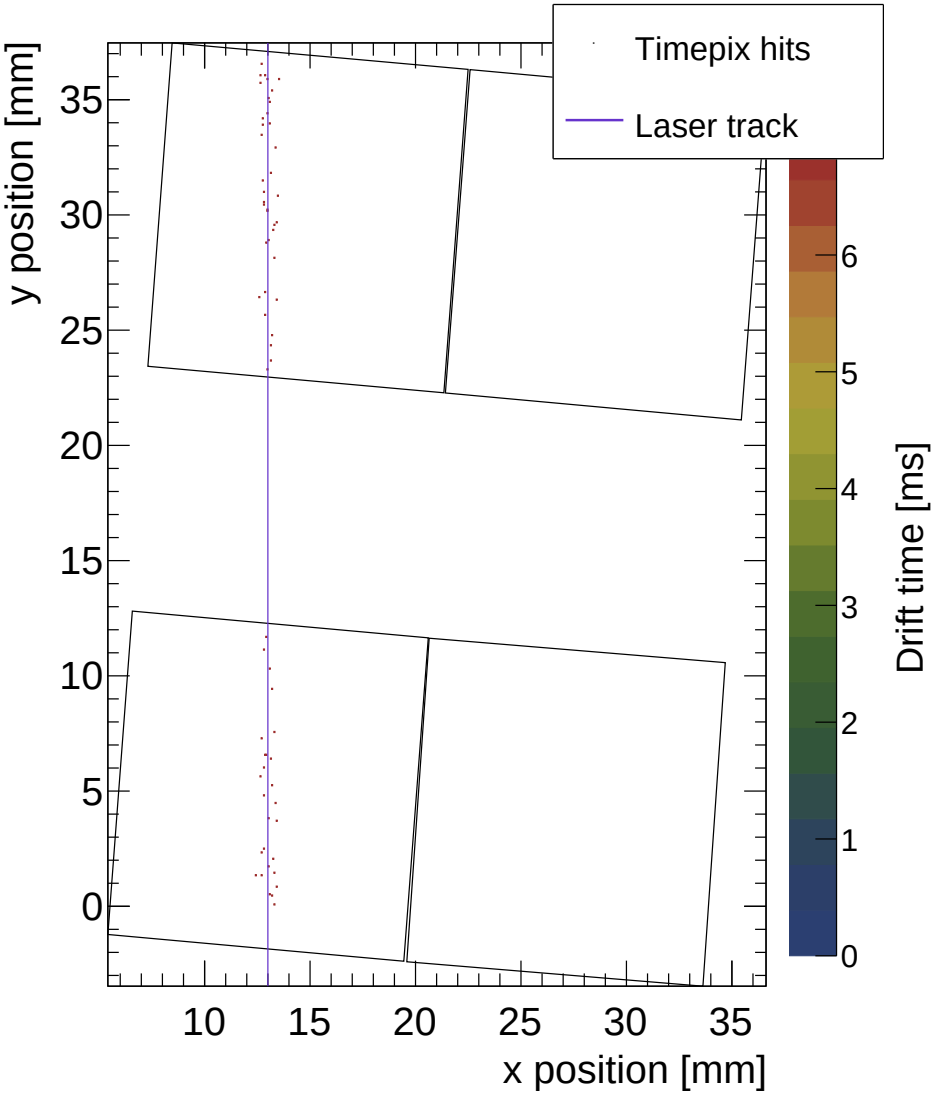
Number of hits

Run 1069



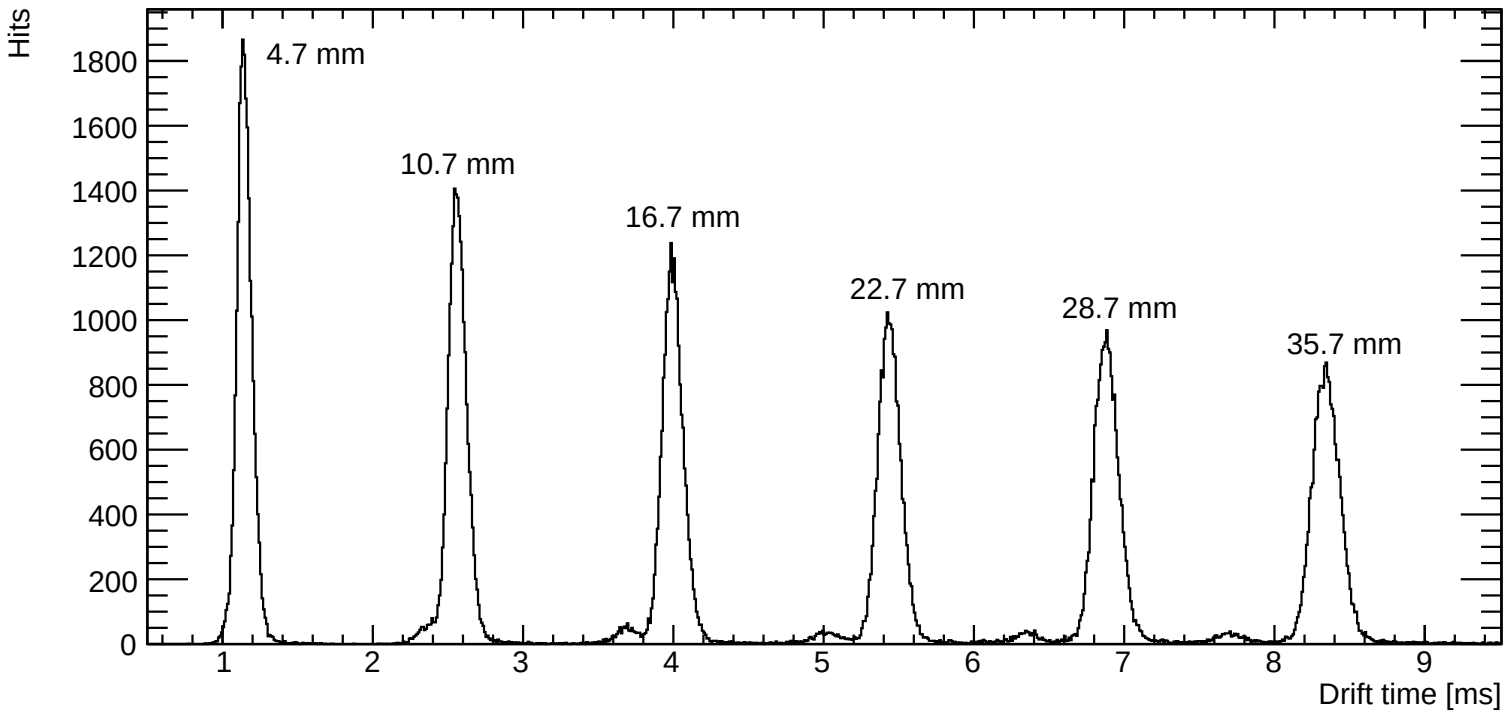
Event display

Run 1070



Drift time

Run 1069



Analysis

Global fit:

$$c_1 \exp\left(\frac{(z-\mu_1)^2}{2\sigma_1^2}\right) + f_2 c_1 \exp\left(\frac{(z-r_2\mu_1)^2}{2\sigma_2^2}\right) + c_{\text{noise}} \tag{1}$$

fit per run:

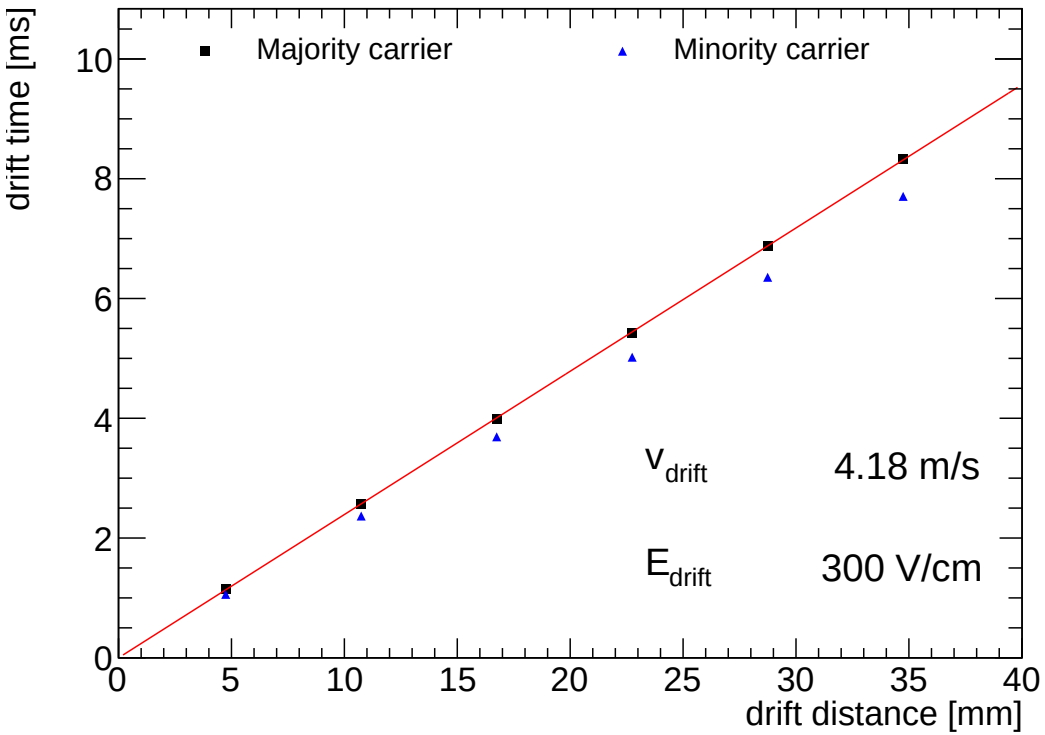
- ratio of Gaussian constants f_2)
- ratio of mobility r_2

Per slice:

- standard deviations σ_1 and σ_2
- mean μ_1
- constant c_1
- offset c_{noise}

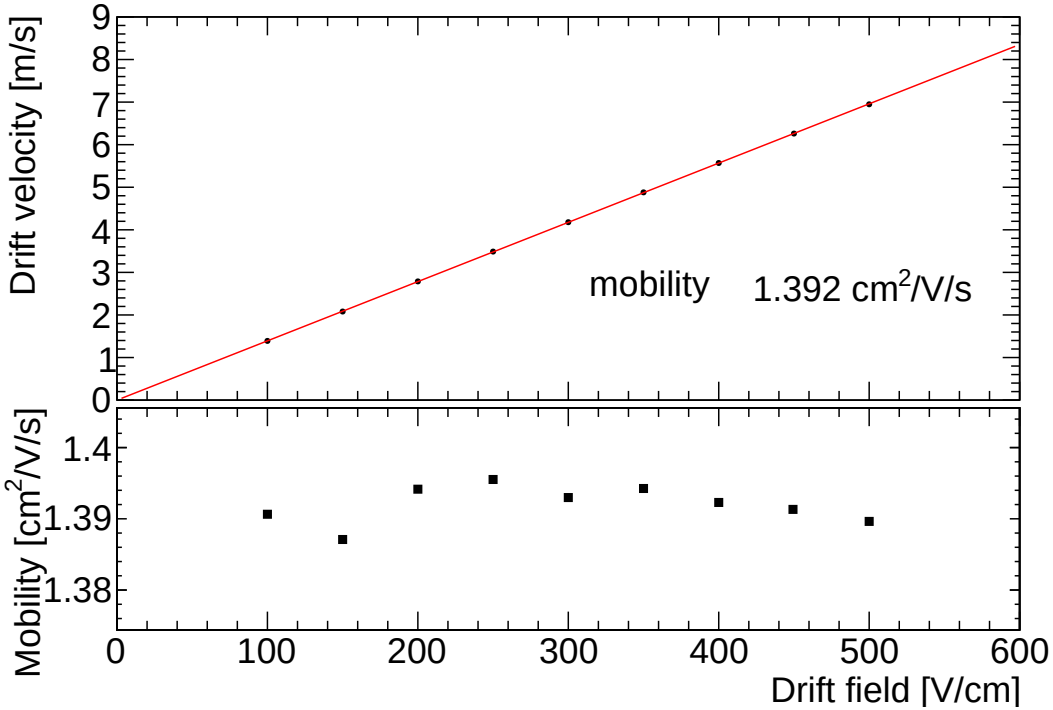
Drift velocity

Run 1069

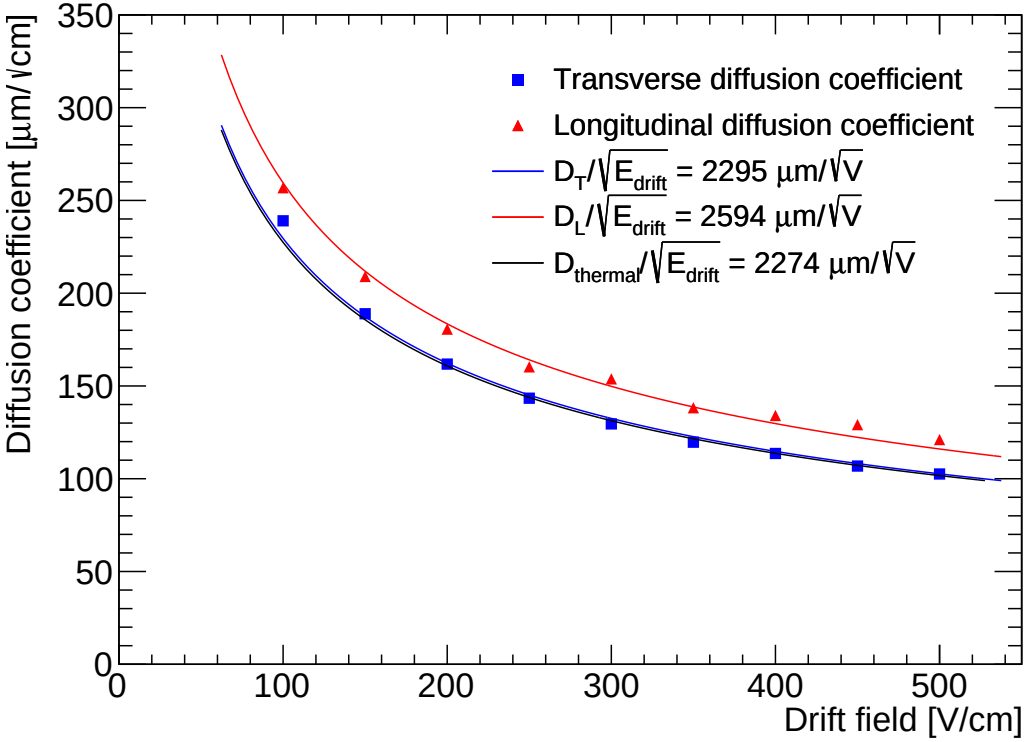


Mobility

Run 1065 – 1073



Diffusion coefficients



$$D_{\text{thermal}} = \sqrt{\frac{2k_B T}{eE}}, \tag{2}$$

Fiducialisation

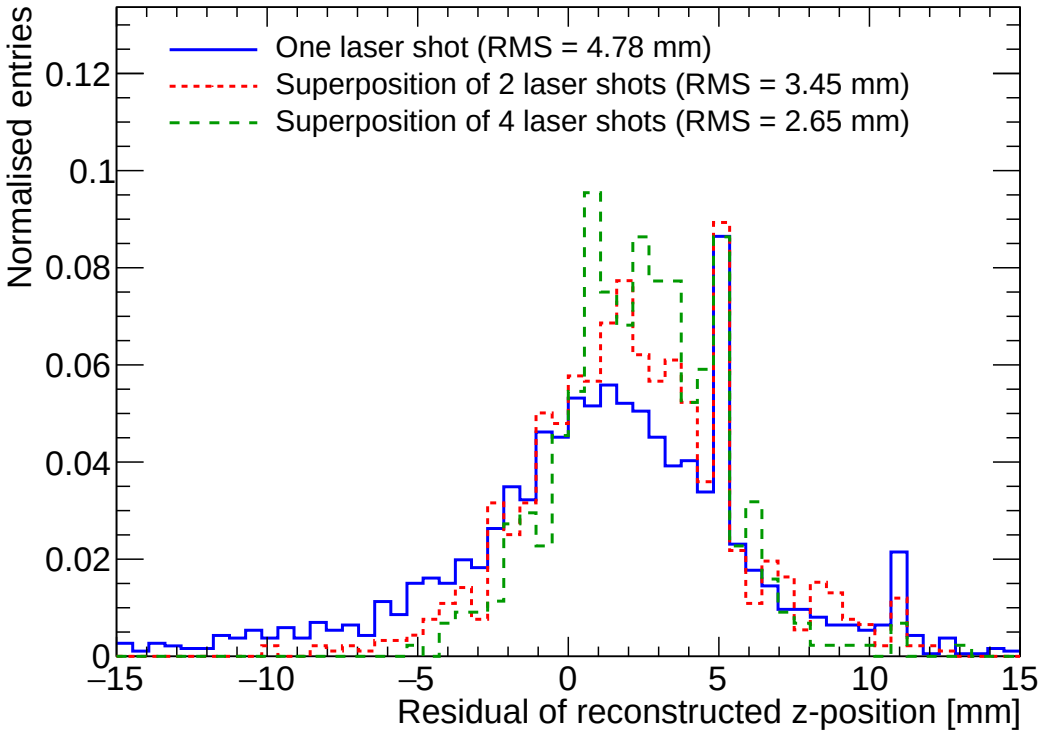
4.3% of the hits in second peak at 500 V/cm
Perform maximum likelihood fit using:

$$c_1 \exp\left(\frac{z^2}{2(\sigma_0^2 + zD_L^2)}\right) + f_2 c_1 \exp\left(\frac{(zr_2)^2}{2(\sigma_0^2 + zD_L^2)}\right) \tag{3}$$

With values $f_2 = 0.9258$, $r_2 = 0.0431$, $\sigma_0 = 0.159\,\mathrm{mm}$, $D_L = 119\,\mu\mathrm{m}/\sqrt{\mathrm{cm}}$ fixed and fit c_1 and z

Fiducialisation

Run 1073

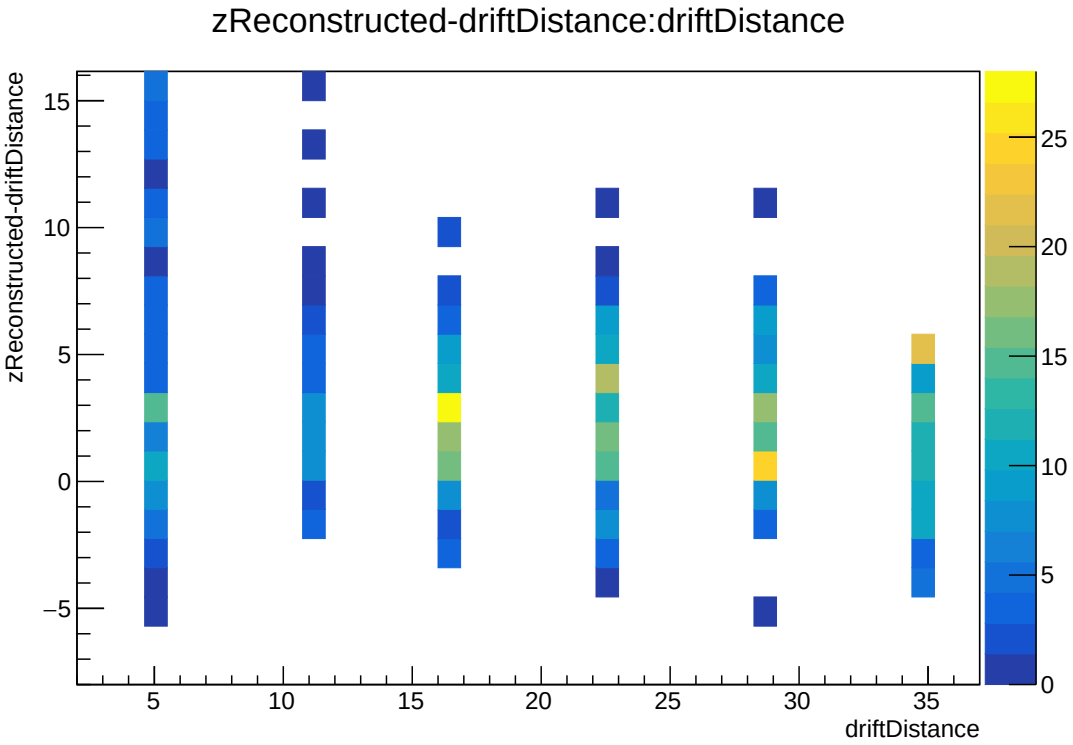


Reconstructed z resolution depends on the number of hits

Clear bias which needs to be investigated

Fiducialisation

Run 1073



Resolution is poorer for the shortest drift drift distance of 5 mm because the peaks overlap