TPC for ILD

DD4HEP: Point Resolution

Dimitra Tsionou
LCTPC WP meeting, 2-March-2017

HELMHOLTZ ASSOCIATION

DESY

TPC resolution parametrisation

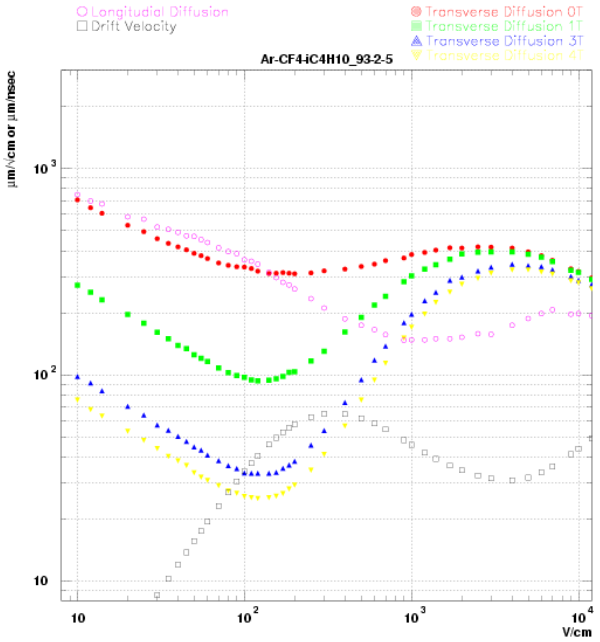
- Looking into the digitisation of TPC
  - Gas parametrisation enters here
- Comparing between current input and gas measurements/simulation

	Current	T2K	TDR
Dt [μm/√cm] 4T	25	27.6	67
Dt [μm/√cm] 3.5 T	25	31.7	75
Dl [μm/√cm]	375	226	276
Neff	22	40	
$\sigma_{r\varphi,0}$ [μm]	50	71	
$\sigma_{z,0}$ [μm]	400	306	

- For T2K gas, the Neff and sigma values come from measurements
  - A Time Projection Chamber with GEM-Based Readout
- T2K and TDR diffusion constant values from simulation provuded by Felix
- Measurments show we can do better in z and similar in rφ

Additional material

- Plot from Ron on input values



- TPC resolution as appears in DBD

TPC $\quad \sigma^2_{r\phi} = (50^2 + 900^2 \sin^2\phi + \left((25^2/22) \times (4T/B)^2 \sin\theta\right)(z/\mathrm{cm}))\,\mu\mathrm{m}^2$

$\sigma^2_z = (400^2 + 80^2 \times (z/\mathrm{cm}))\,\mu\mathrm{m}^2$

where ϕ and θ are the azimuthal and polar angle of the track direction

TPC Digitisation Code

- TPC resolution as actually coded

$$\sigma^2_{r\phi} = \sigma^2_{0,r\phi} + pointResoPadPhi^2 \cdot \sin^2_\phi + \frac{D_t^2}{N_{eff}} \cdot \sin\theta \cdot \frac{6}{pad\ height} \cdot \frac{4}{B} \cdot z \quad (1)$$

$$\sigma^2_z = \sigma^2_{0,z} + \frac{D_l^2}{N_{eff}} \cdot z \quad (2)$$

$$\sigma^2_{r\phi} = 50^2 + 900^2 \sin^2_\phi + \frac{25^2}{22} \sin\theta \frac{6}{pad\ height} \frac{4}{B} \cdot z \quad (3)$$

$$\sigma^2_z = 400^2 + 80^2 \cdot z \quad (4)$$

- TPC resolution as appears in DBD

TPC
$$\sigma^2_{r\phi} = \left(50^2 + 900^2 \sin^2\phi + \left((25^2/22) \times (4T/B)^2 \sin\theta\right)(z/\mathrm{cm})\right)\mu\mathrm{m}^2$$
$$\sigma^2_z = \left(400^2 + 80^2 \times (z/\mathrm{cm})\right)\mu\mathrm{m}^2$$

where ϕ and θ are the azimuthal and polar angle of the track direction

DESY

Back-Up