Changes in the LCTPC KalDet Geometry

Previous version

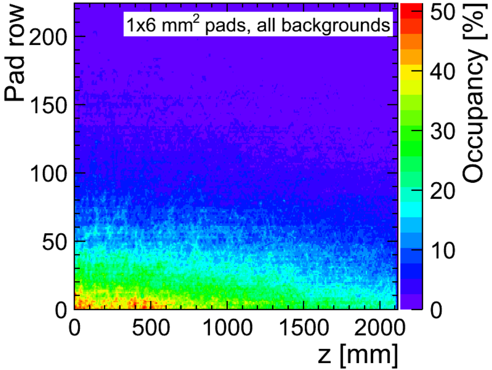
- LP1 geometry hard coded
- Gas properties, drift velocity and B-field hard coded
- Indices of Kalman layers hard coded in user code
- Many implicit assumptions (layers are cylinders, e.g.)

Reimplementation from scratch: GearTPCKalDetector

- Flexible geometry: Everything that can be described with Gear
- Object pointers and indices can be accessed via interface
- Magnetic field, drift velocity, layer resolution read from Gear file
- Backward compatibility layer to run with old code

Processors in MarlinTPC need to be adapted to take advantage of the new flexibility (work in progress).

Occupancy in Dependence on z

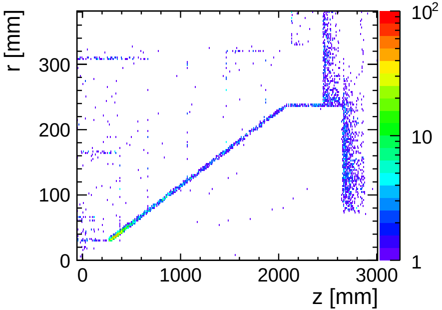


- Occupancy near the IP is up to 50 %
- Near the readout (forward region) occupancy below 20 %

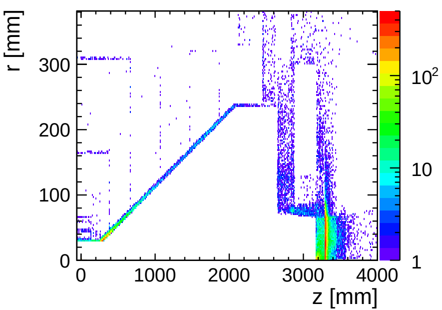
Where do the Particles Come From? (zoomed)

Origins of the MC particles leaving a signal in the TPC

$\gamma\gamma \rightarrow$ hadrons



Incoherent e^+e^- pairs



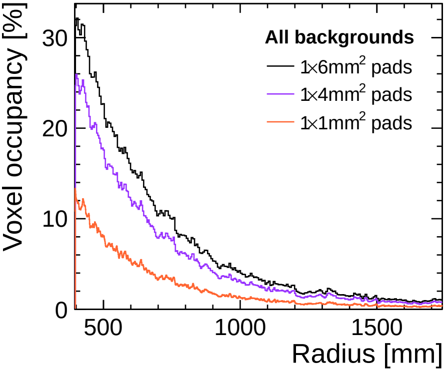
Hot regions:

- Inner region of the pointing beam pipe
- $\sim$25 % directly from the IP (one pixel in the plot)

Hot regions:

- BeamCal (low energetic photons) Can this be optimised with a different design?
- Inner region of the pointing beam pipe

Occupancy for Different Pad Sizes



- 1×1 mm^2 reduces the occupancy to a tolerable level
- 1×1 mm^2 cannot be implemented with current technology
  $\rightarrow$ needs further R&D

Summary and Outlook

Difficult TPC conditions at CLIC

- Occupancy with default pad readout (1×6 mm^2) is up to 30 % in the inner pad rows (ALICE TPC is designed to work up to 40 %)
- Mainly $\gamma\gamma \rightarrow$ hadrons, also micro-curlers from incoherent e^+e^- pairs
- TPC pixel readout is a promising option
  - Occupancy below 3 %
  - Momentum resolution comparable or better than for pad readout
  - dE/dx to be studied
  - Pattern recognition and amount of data have to be addressed