Occupancy studies for the ALICE 3 timing layer

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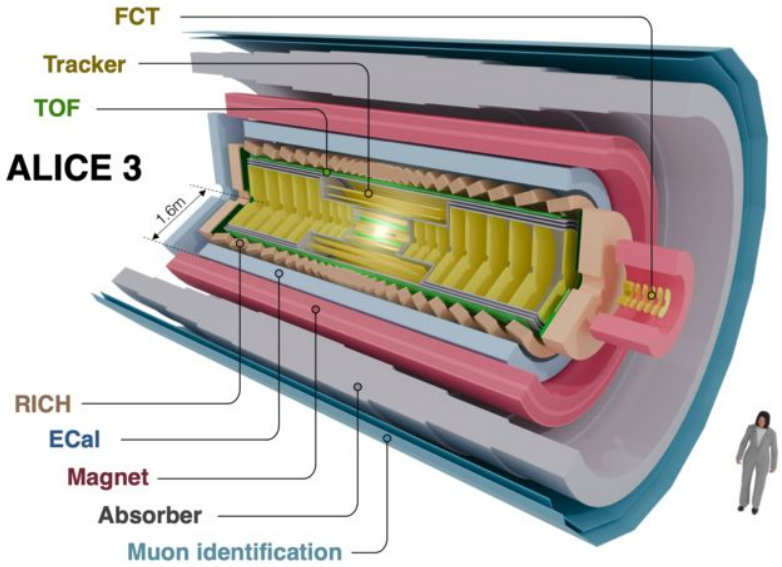
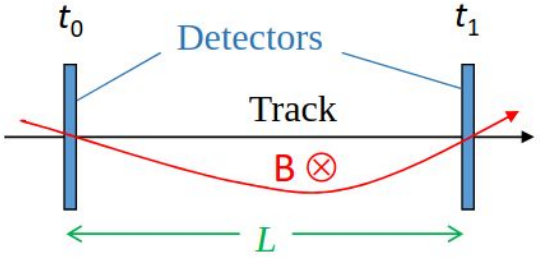
Introduction

- The ALICE 3 experiment
  - Planned to replace current ALICE detector in LHC's Run 5
  - The proposed detector is conceived for studies of pp, pA and AA collisions at luminosities a factor of 20 to 50 times higher than possible with the current ALICE detector



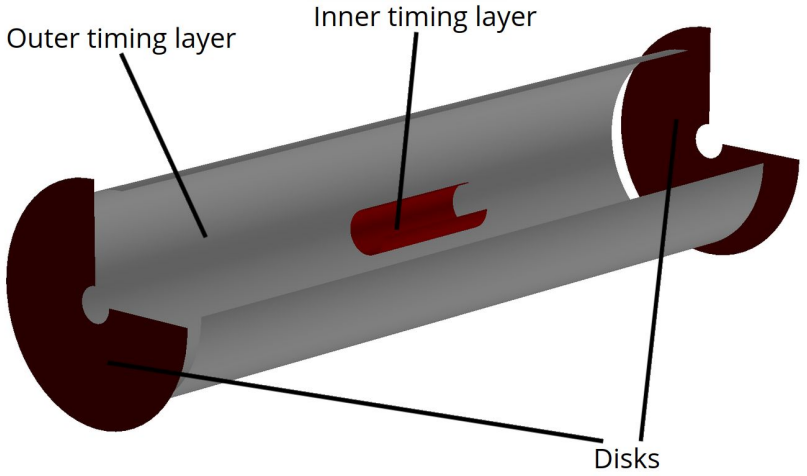
Introduction

- Time-of-flight layers
  - particle identification



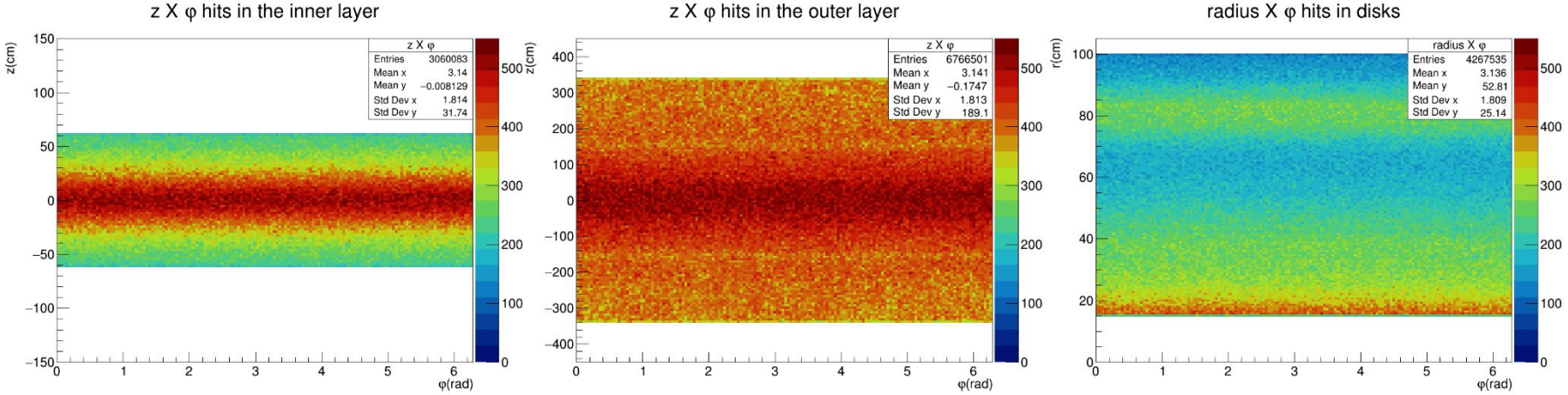
$$m^2 = \frac{p^2}{c^2}\left(\frac{c^2 t^2}{L^2} - 1\right)$$

- ALICE 3 timing layers
  - Silicon layers
  - Occupancy
  - Optimal configuration for pad sizes



Simulations

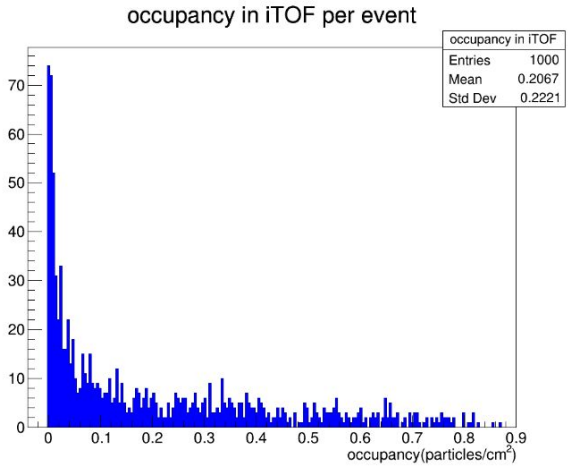
- 1000 PbPb events generated by Pythia8 5.52 TeV within O² framework

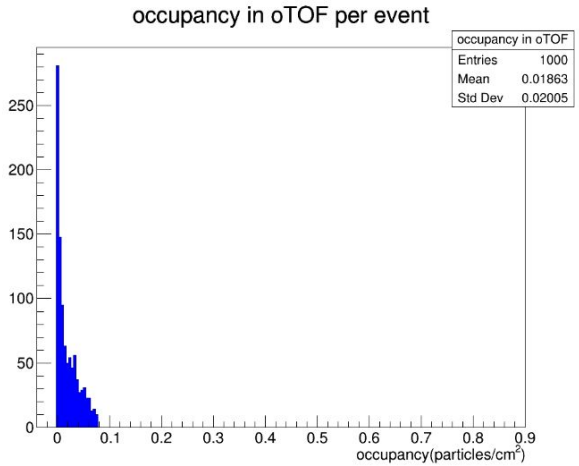


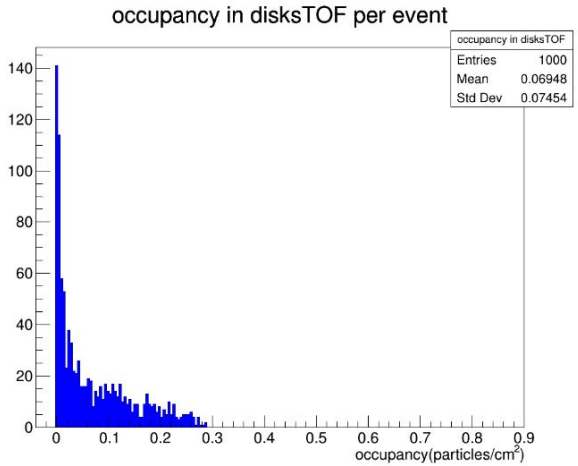
- Coordinates histogram for all hits displayed above
- Thickness of TOF chip altered to 50 microns (Tracker unaltered)

Occupancy

- Computing the occupancy for each event simulated

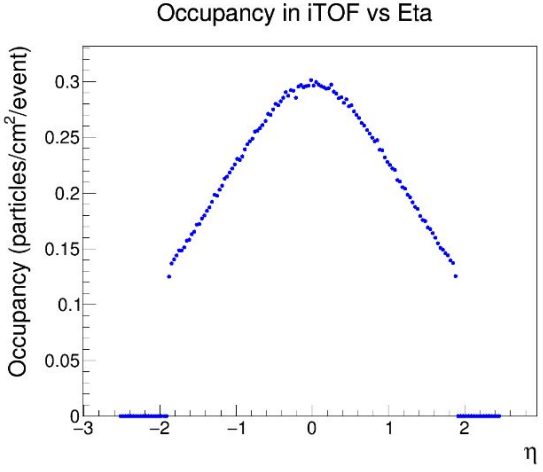


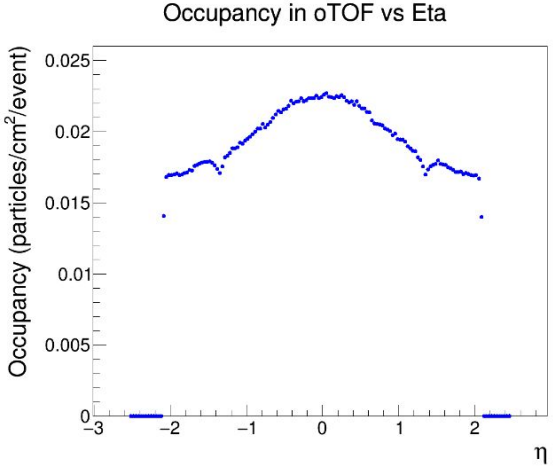


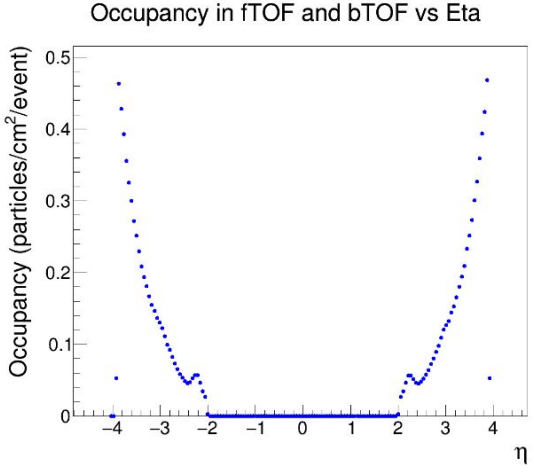


Occupancy

- Occupancy as a function of pseudorapidity
  - Pseudorapidity range is divided in slices of equal size, hits from all events that incide in the slice are counted and divided by its area and the total number of events



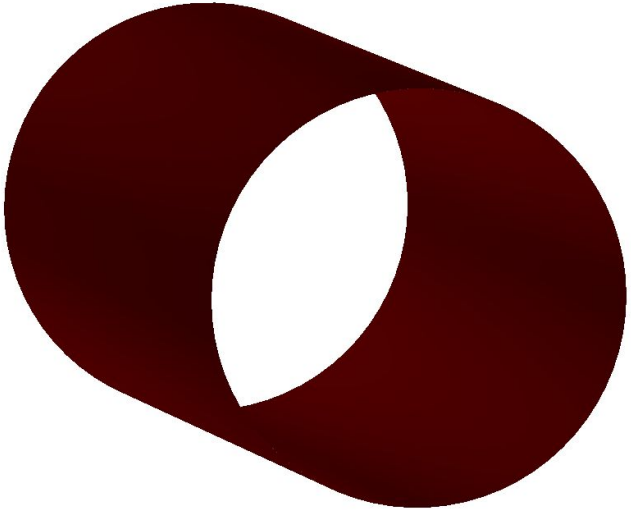


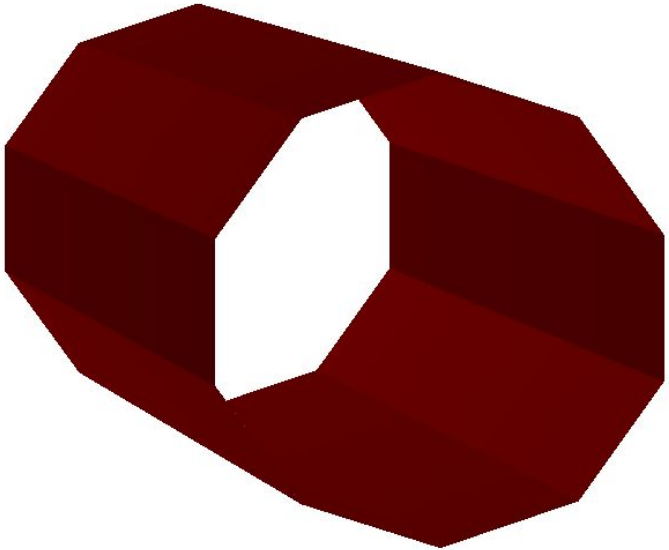


  - Strange behaviour near the interval $1 < |\eta| < 3$

TOF geometry

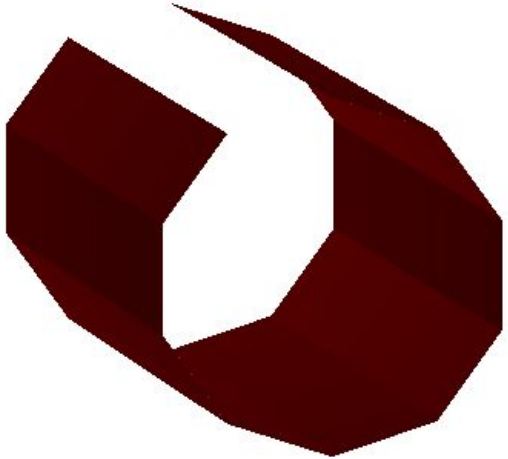
- Current TOF geometry within O2

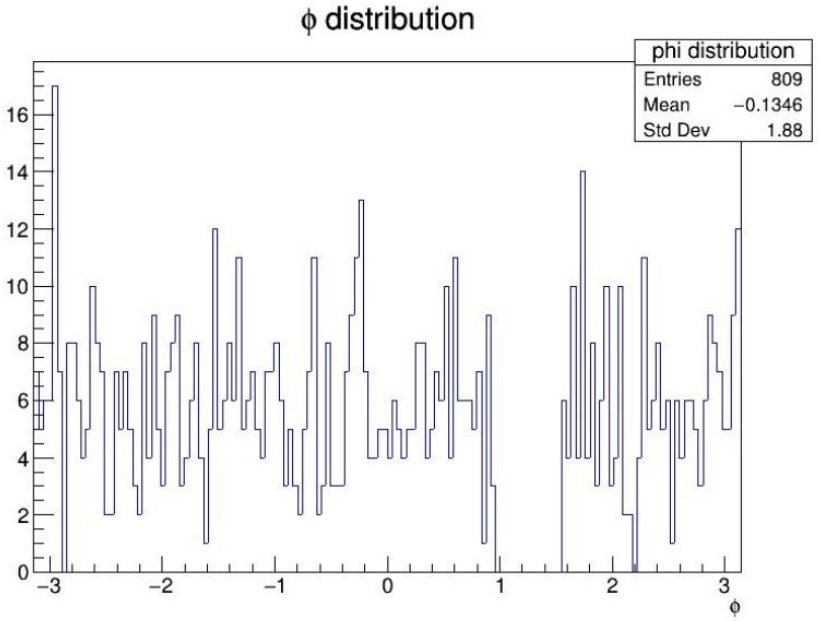




TOF geometry

- Quality control





Tracking

- Reconstruct tracks is necessary for next steps
  - O2 implementations seems impractical in the short term
  - ACTS is a possibility
- ACTS
  - Used in other experiments (ATLAS, sPHENIX, FASER etc)
  - Ready-to-use reconstruction tool
  - Use just O2 geometry as input, performs simulation and reconstruction