

Look-see at pilot data for Run 3 at ALICE

Miles Kidson

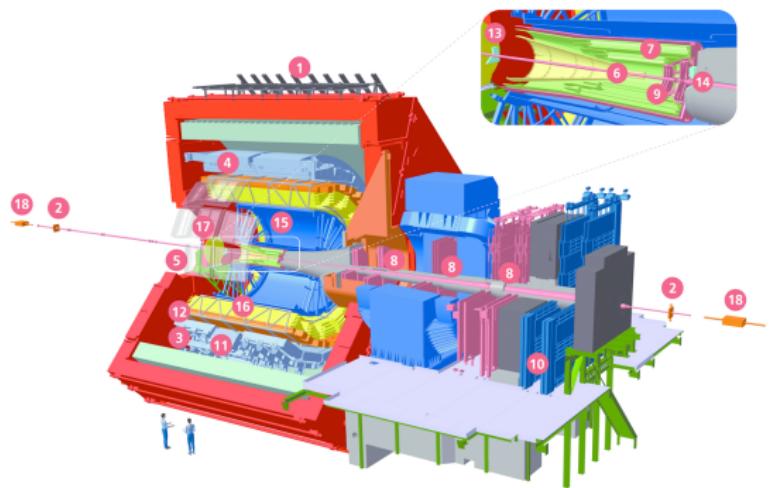
Supervisors: Prof. Zinhle Buthelezi Dr. SV Fortsch Prof. Tom Dietel
Assisted By Dr. B Naik (Postdoctoral fellow)

University of Cape Town
kdsmil001@myuct.ac.za

Honour's Research Project
2022



ALICE Run 3 Detector Array



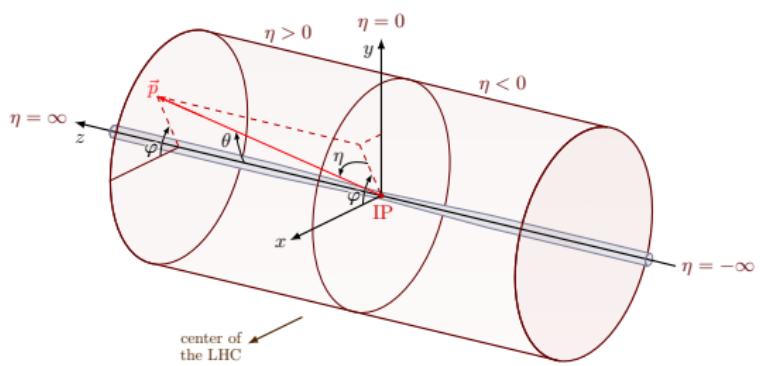
- Configuration of the detector used for Run 3.
- Run 3 added the MFT and upgraded the ITS, as well us upgrading the readout electronics for many detectors.
- The MFT (9), ITS (6, 7), and Muon Spectrometer (8) are of interest to us.



ALICE

Coordinate System

- φ : Azimuthal angle around beam axis
- Z : Distance along Z -axis (cm)
- θ : Polar angle



- p_T : Transverse momentum (GeV/c)

$$p_T = \sqrt{p_x^2 + p_y^2}$$

- y : Rapidity

$$y = \frac{1}{2} \ln \frac{E + p_z}{E - p_z}$$

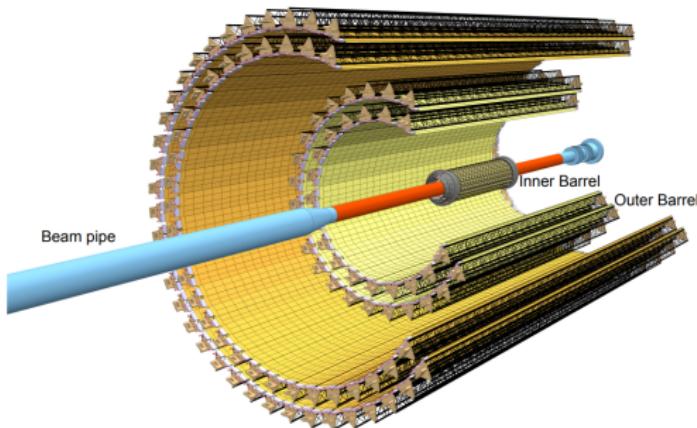
- η : Pseudorapidity

$$\eta = -\ln \tan \frac{\theta}{2}$$



Inner Tracking System (ITS)

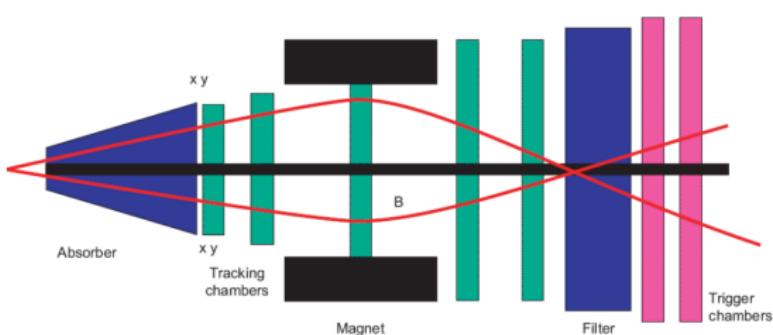
- Upgraded for Run 3
- Innermost layer half the distance from the IP compared to previous ITS
- Si-based tracking detector. Determines primary vertex for an interaction
- 22.4 mm to 391.8 mm radial extension from IP
- Covers $|\eta| < 1.22$



ALICE

Muon Spectrometer

- Used to study heavy quarkonia (J/Ψ , Ψ' , Υ , Υ' , Υ'') via their $\mu^+\mu^-$ decay channel, Z^0 bosons via high p_T dimuon decays, and single muon decays from quarks and W^+ bosons



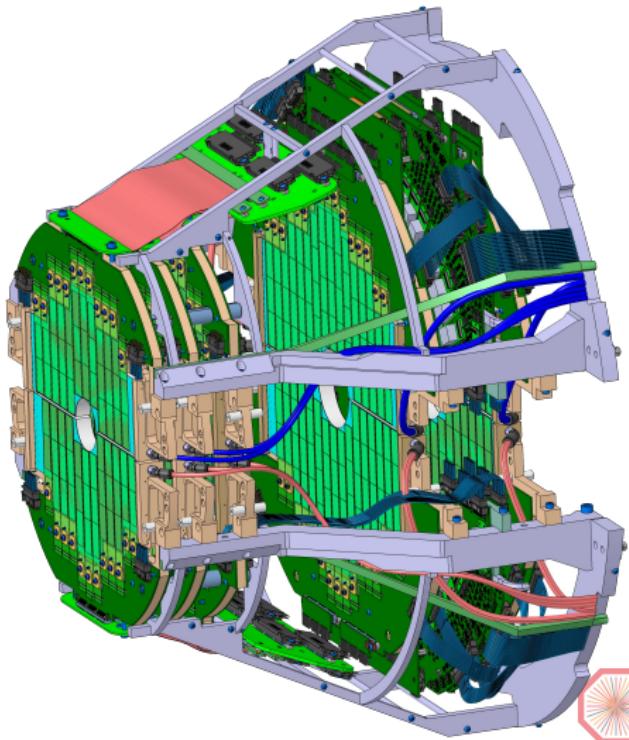
- Covers $-4 \leq \eta \leq -2.5$
- Outside the range of the ITS so in Run 2 had to perform its own tracking and vertexing
- Run 3 added the MFT before the absorber to fill this role



ALICE

Muon Forward Tracker (MFT)

- High resolution Si-based tracking detector added for Run 3
- Uses the same pixel detector technology as the ITS in a better-suited geometry
- Sits before the hadronic absorber, with 5 double-sided layers between -46 cm and -76.8 cm
- Covers $-3.6 \leq \eta \leq -2.45$



ALICE