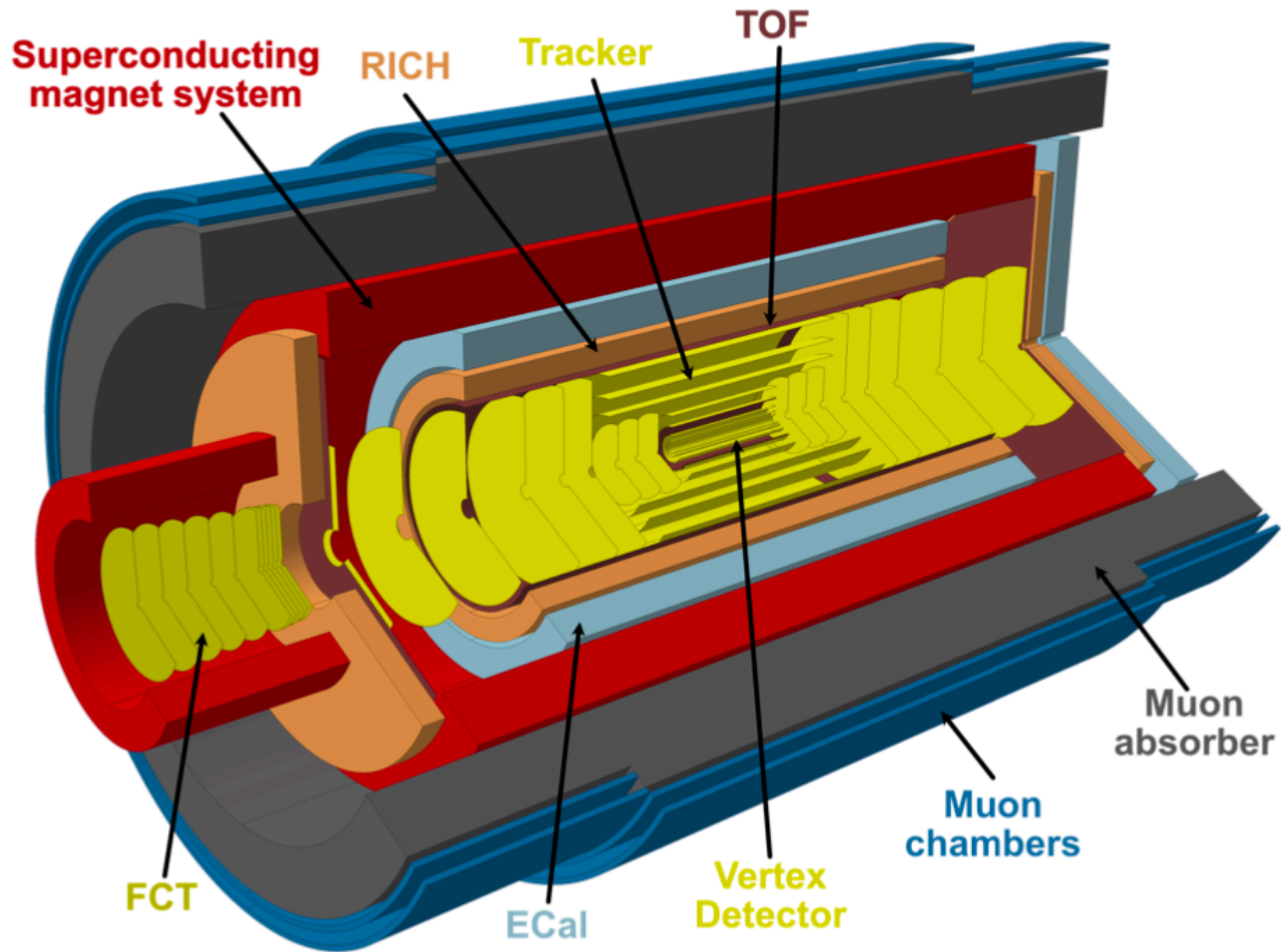


MuonID project

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First MuonID / 16.12.2022





BUAP

Component	Observables	Barrel ($ \eta < 1.75$)	Forward ($1.75 < \eta < 4$)	Detectors
Vertexing	(Multi-)charm baryons, dielectrons	Best possible DCA resolution, $\sigma_{\text{DCA}} \approx 10 \mu\text{m}$ at $p_{\text{T}} = 200 \text{MeV}/c, \eta = 0$	Best possible DCA resolution, $\sigma_{\text{DCA}} \approx 30 \mu\text{m}$ at $p_{\text{T}} = 200 \text{MeV}/c, \eta = 3$	retractable Si-pixel tracker: $\sigma_{\text{pos}} \approx 2.5 \mu\text{m}$, $R_{\text{in}} \approx 5 \text{mm}$, $X/X_0 \approx 0.1 \%$ for first layer
Tracking	(Multi-)charm baryons, dielectrons, photons ...	$\sigma_{p_{\text{T}}}/p_{\text{T}} \approx 1 - -2 \%$		Silicon pixel tracker: $\sigma_{\text{pos}} \approx 10 \mu\text{m}$, $R_{\text{out}} \approx 80 \text{cm}$, $L \approx \pm 4 \text{m}$ $X/X_0 \approx 1 \%$ per layer
Hadron ID	(Multi-)charm baryons	$\pi/K/p$ separation up to a few GeV/c		Time of flight: $\sigma_{\text{tof}} \approx 20 \text{ps}$ RICH: $n \approx 1.006 - 1.03$, $\sigma_{\theta} \approx 1.5 \text{mrad}$
Electron ID	Dielectrons, quarkonia, $\chi_{c1}(3872)$	pion rejection by 1000x up to 2–3 GeV/c		Time of flight: $\sigma_{\text{tof}} \approx 20 \text{ps}$ RICH: $n \approx 1.006 - 1.03$, $\sigma_{\theta} \approx 1.5 \text{mrad}$
Muon ID	Quarkonia, $\chi_{c1}(3872)$	reconstruction of J/ψ at rest, i.e. muons from $p_{\text{T}} \sim 1.5 \text{GeV}/c$ at $\eta = 0$		steel absorber: $L \approx 70 \text{cm}$ muon detectors
ECal	Photons, jets	large acceptance		Pb-Sci sampling calorimeter
ECal	χ_c	high-resolution segment		PbWO ₄ calorimeter
Soft photon detection	Ultra-soft photons	measurement of photons in p_{T} range 1–50 MeV/c		Forward conversion tracker based on silicon pixel tracker



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The goal of MuonID is the reconstruction of quarkonia (mainly charm) down to $p_T = 0$ GeV/c for muons.

MuonID will provide muon tagging for particles reconstructed in the tracker (muon momentum down to 1.5 GeV/c at pseudo rapidity ~ 0)

$\Delta\phi\Delta\eta = 0.02 \times 0.02$ \longrightarrow Granularity for efficient muon identification

charged particle rate of 3 Hz/cm²

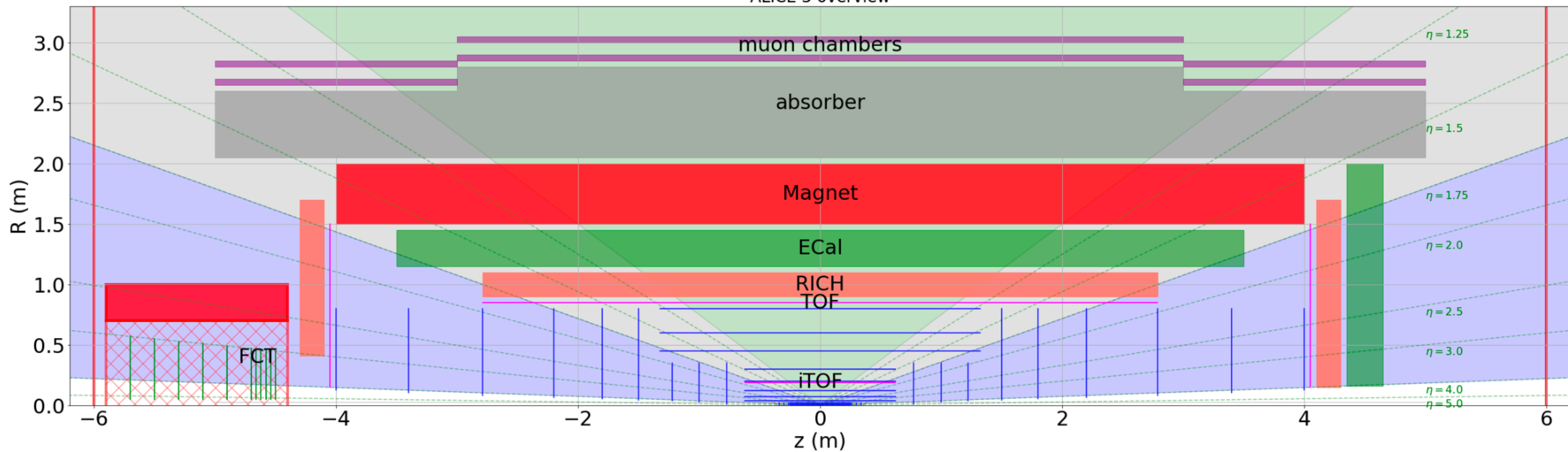
40,000 channels:

- RPC: pads of 50 - 60 mm
- Scintillator bars: 5 cm wide (20 cm gap)



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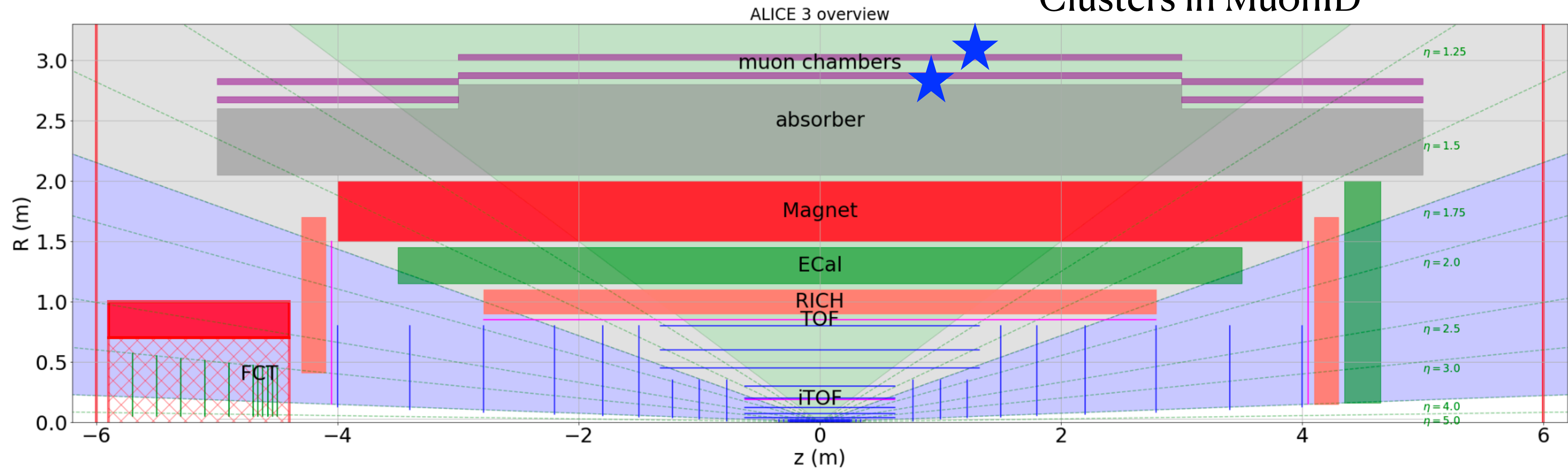
ALICE 3 overview





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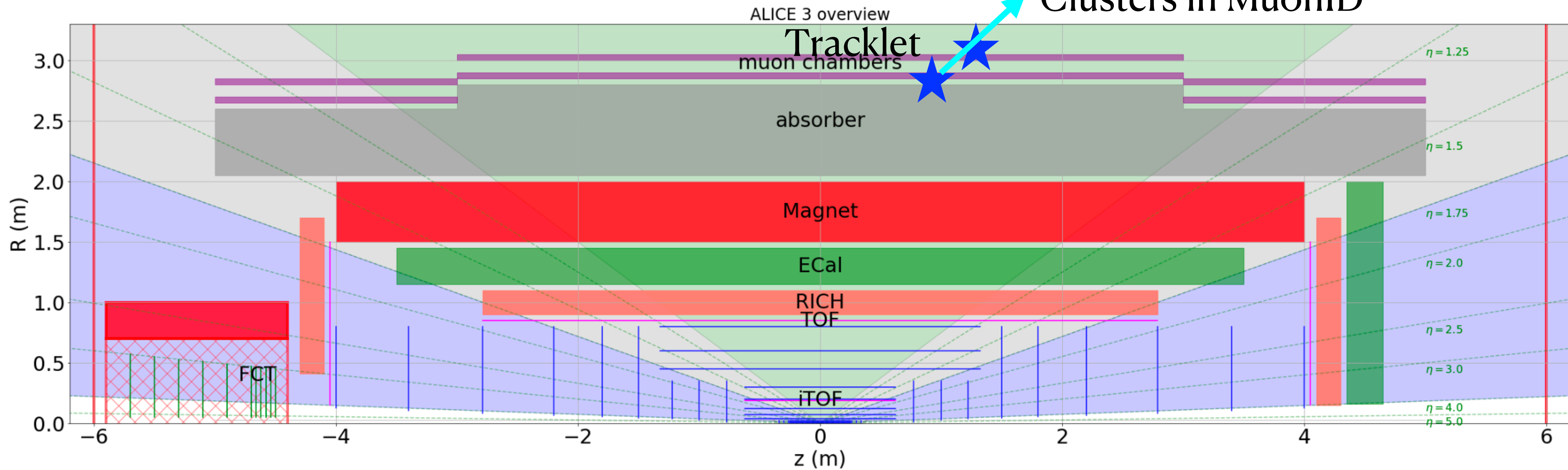
Clusters in MuonID





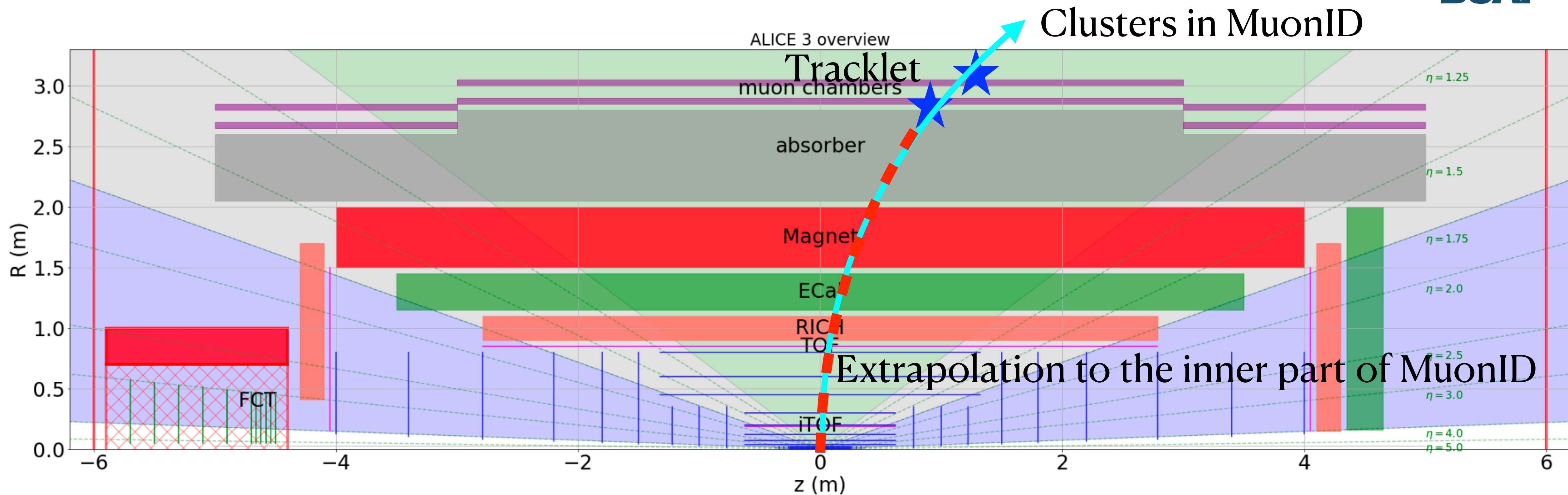
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Clusters in MuonID

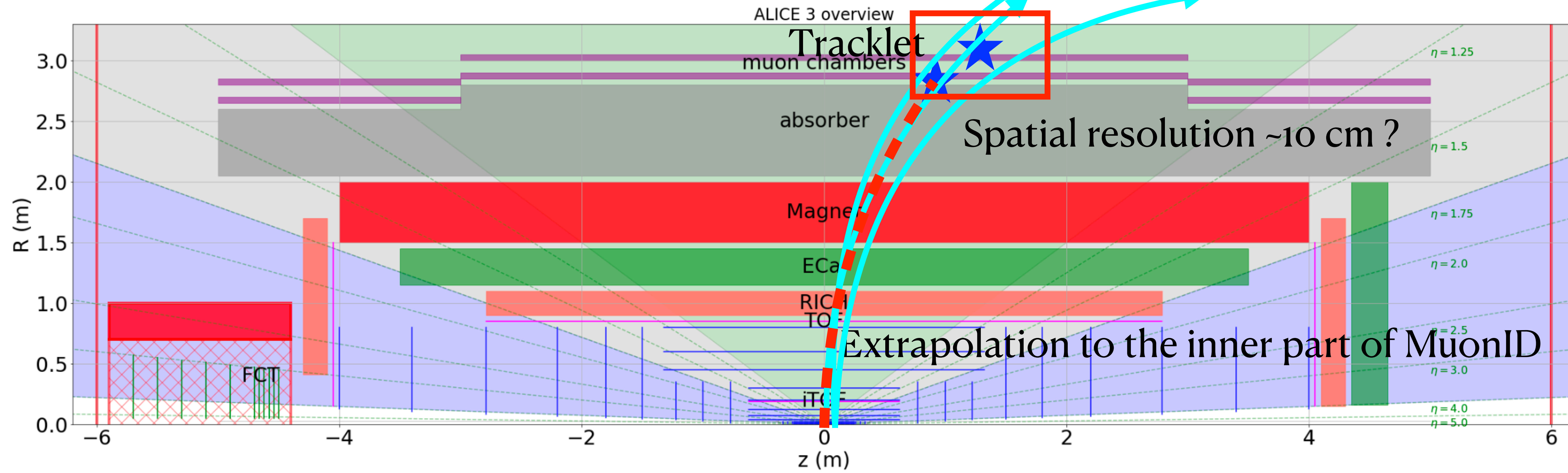




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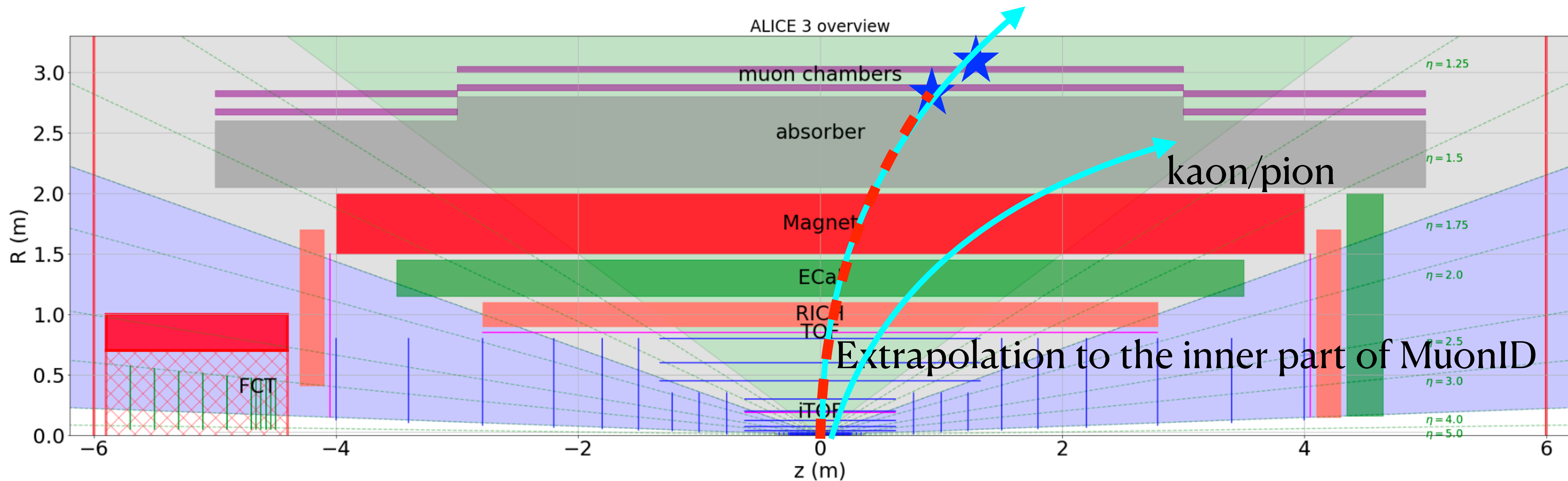
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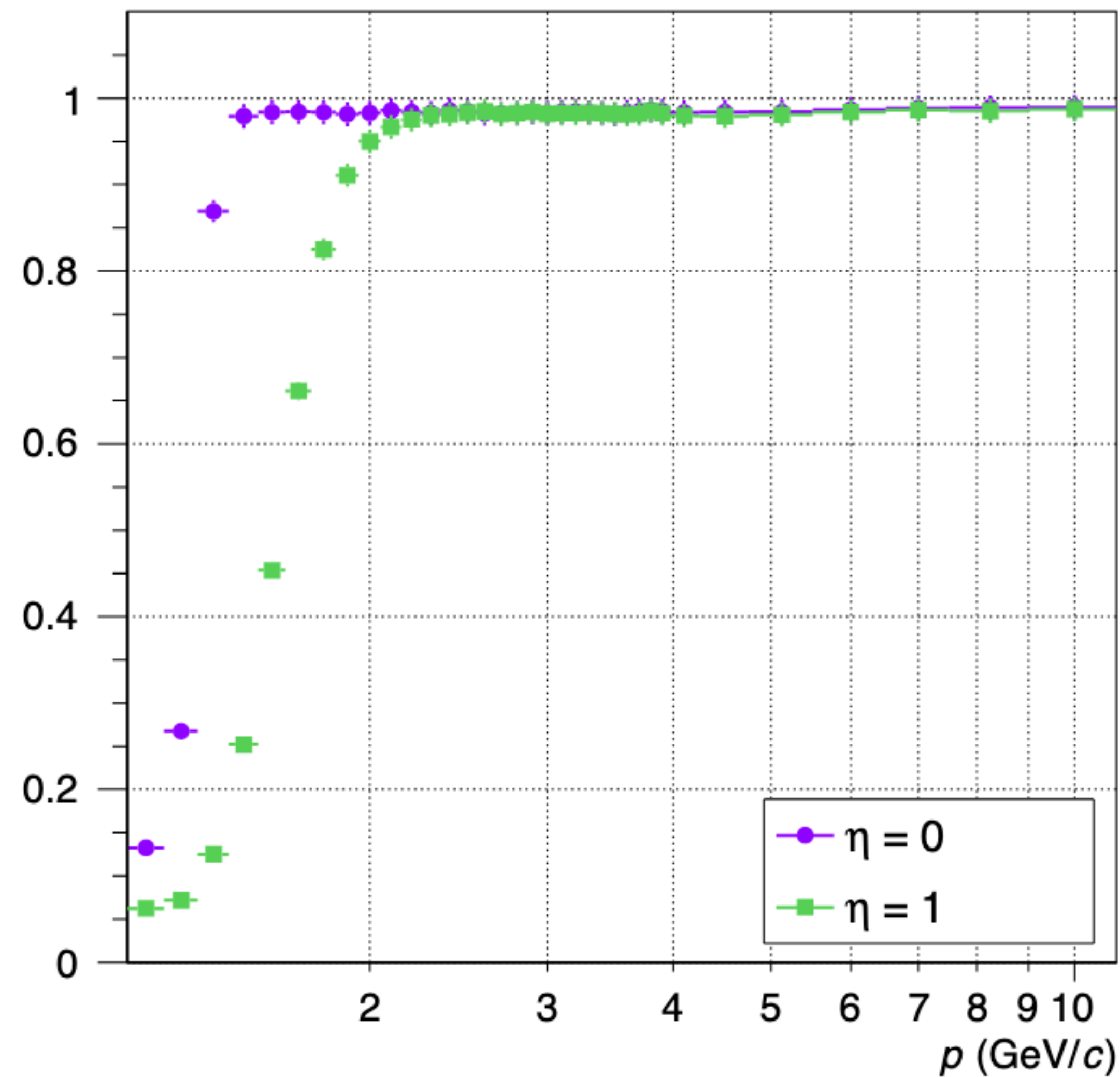
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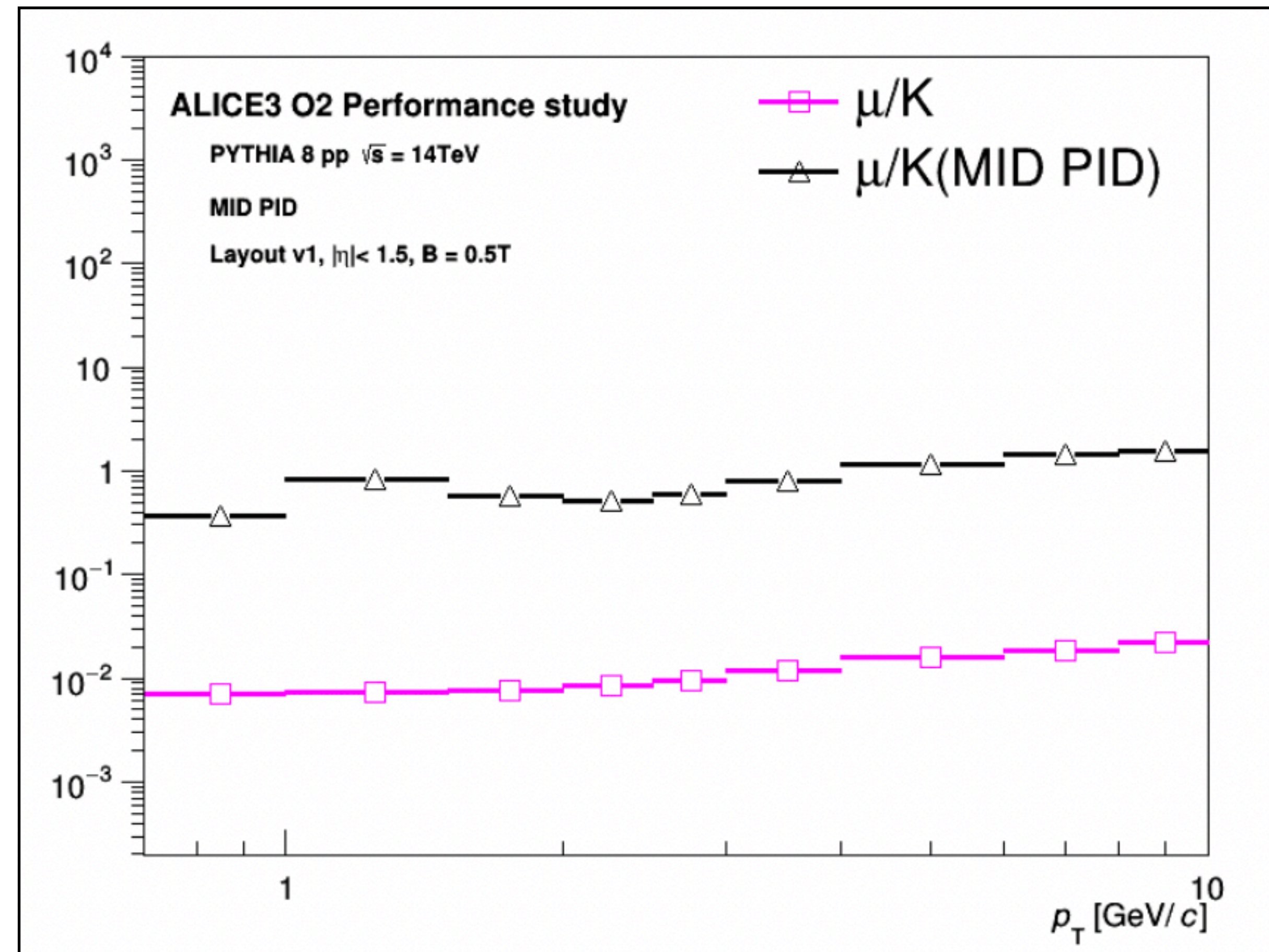
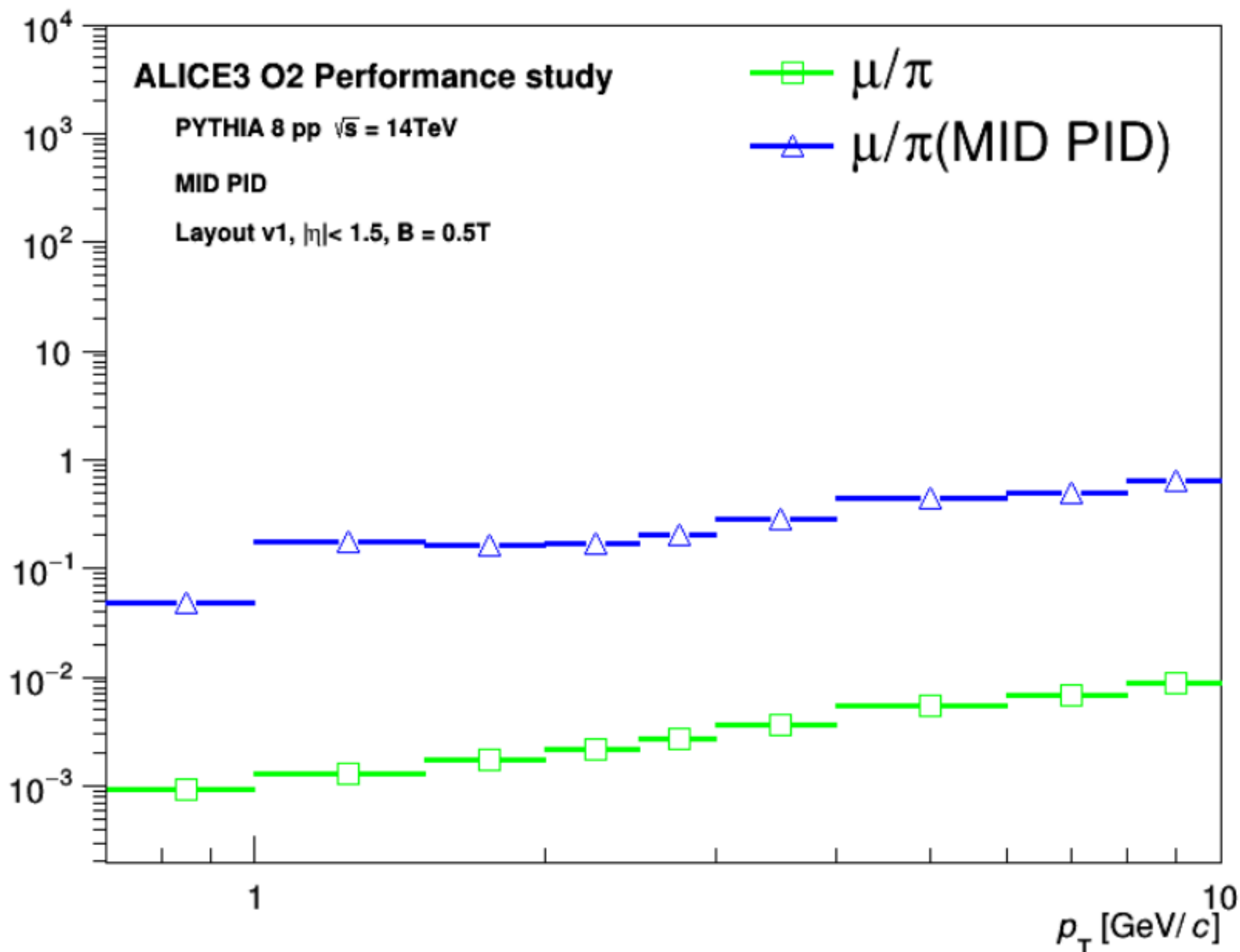
Acc \times Eff \times μ PID for muons



MuonID is found to be 100% efficient in identifying muons starting from $p_T \sim 1.5 \text{ GeV}/c$ at pseudo rapidity ~ 0



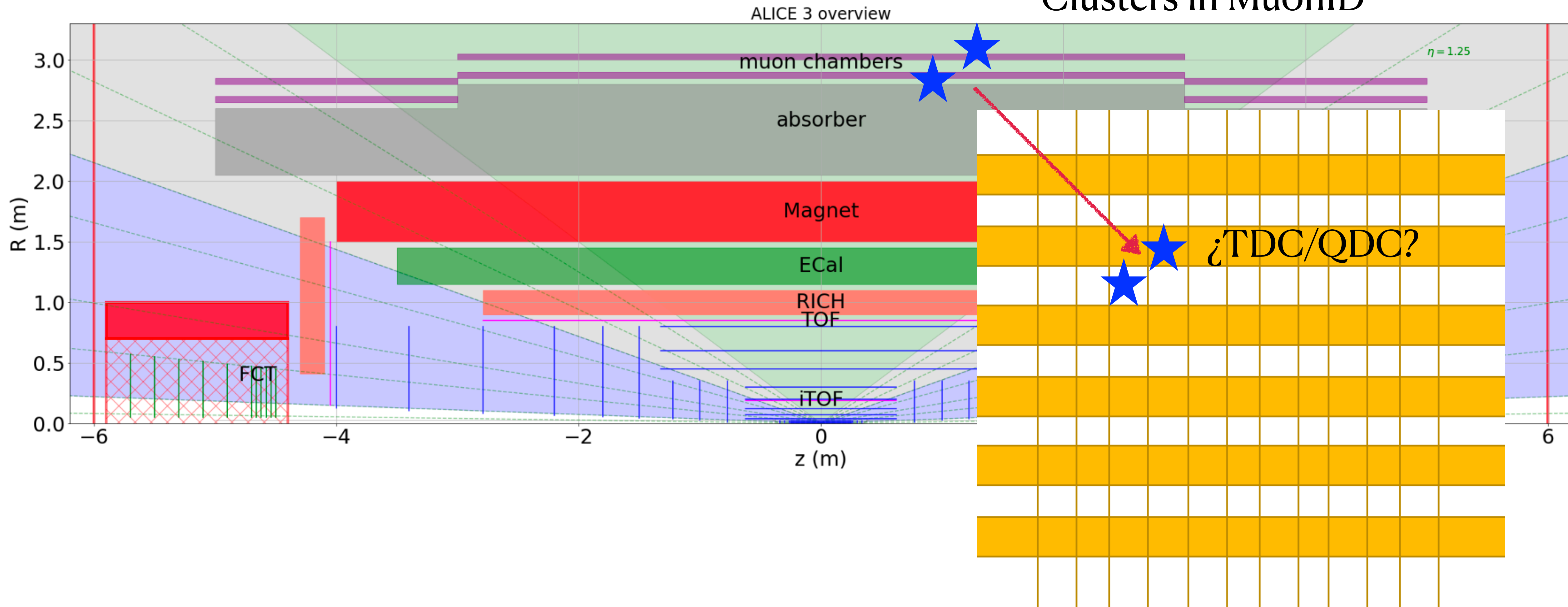
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Clusters in MuonID



Tasks to be assigned

- Simulation: physics performance of MuonID and quarkonia
- Detector development: RPC / scintillator bars
- Detector Control System
- Electronics: FEE and main board
- Offline: O2
- Mechanics

