

Anti-Deuteron Identification for Absorption Cross-Section measurement in ALICE



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ALICE



Research Experiences
for Undergraduates
National Science Foundation



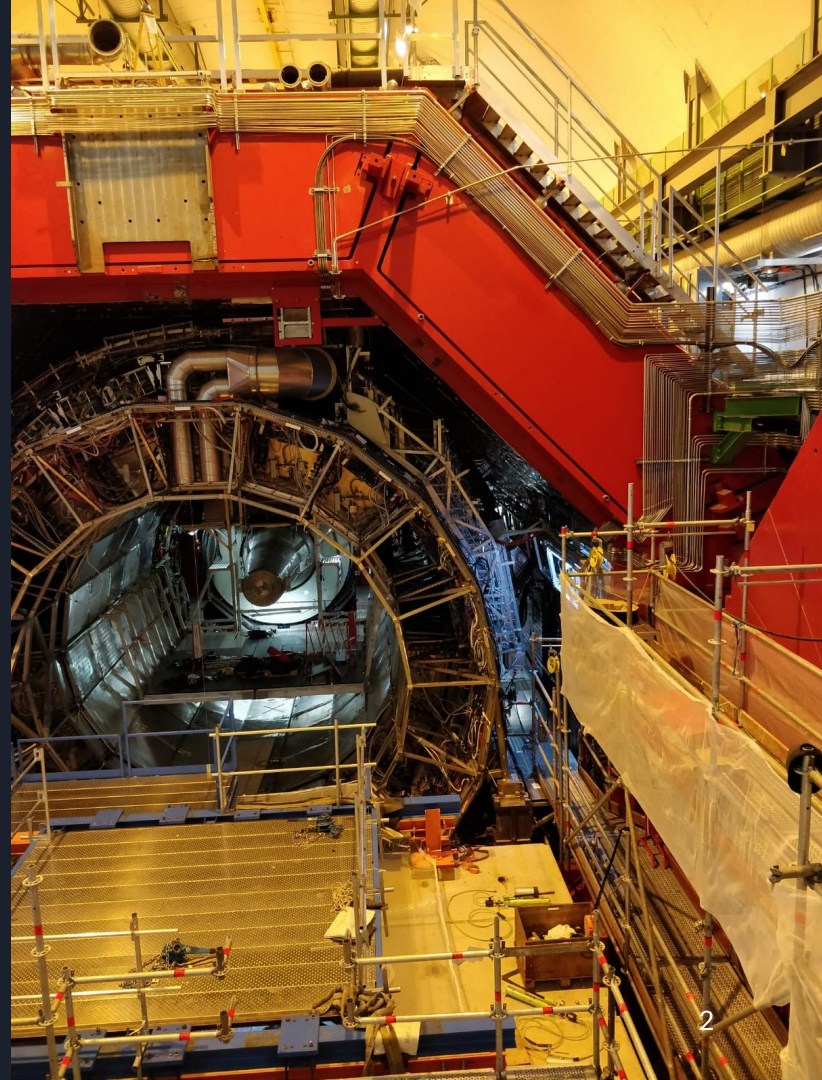
ALICE Overview

A Large Ion Collider Experiment - Explores the nature of quark-gluon plasma

- Mimics conditions of early universe
- Confinement
- Chiral symmetry restoration

Heavy ion collisions in the LHC - partons produced and measured through 18 detector systems

- Optimized for high momentum resolution
- Particle identification



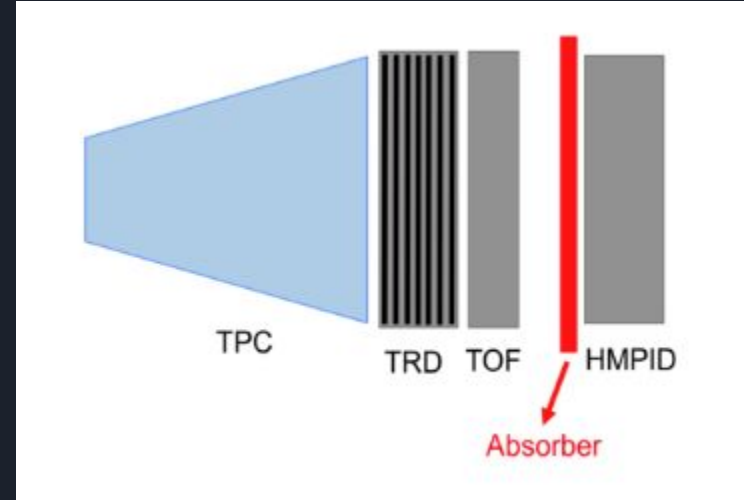
Experimental Setup

Run III update:

- Use HMPID to calculate (Anti-)Deuteron absorption cross section.
- Use the cross-section to limit uncertainties on light nucleus production

Possible absorbers include aluminum, graphite, and silicone

The absorption cross-section has never been measured in this momentum range, and there is no theory which predicts it.



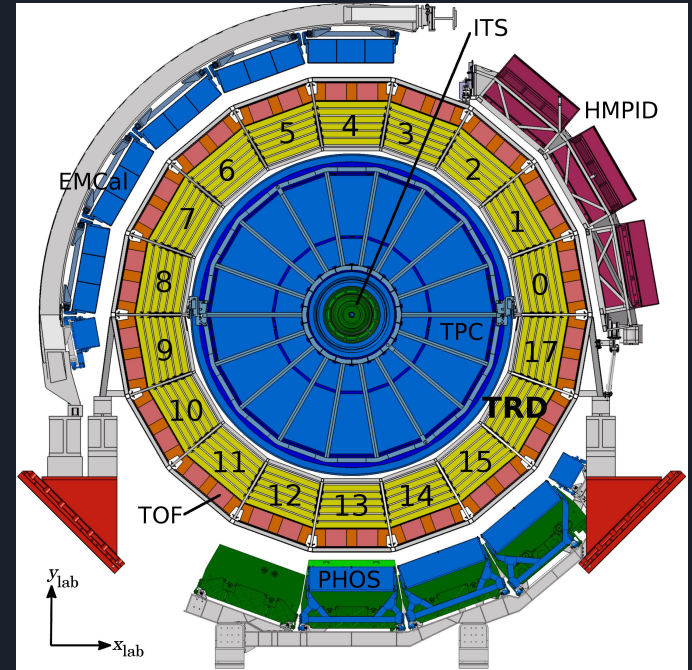
[2]https://indico.cern.ch/event/770604/contributions/3201842/attachments/1746010/2826694/Physics_for_the_HMPID_in_Run3_v3.7.pdf

The High Momentum Particle Identification (HMPID) System

General:

- Ring Imaging Cherenkov Detector
- Identifies high-momentum charged particles
- TPC and TOF are effective at lower momenta

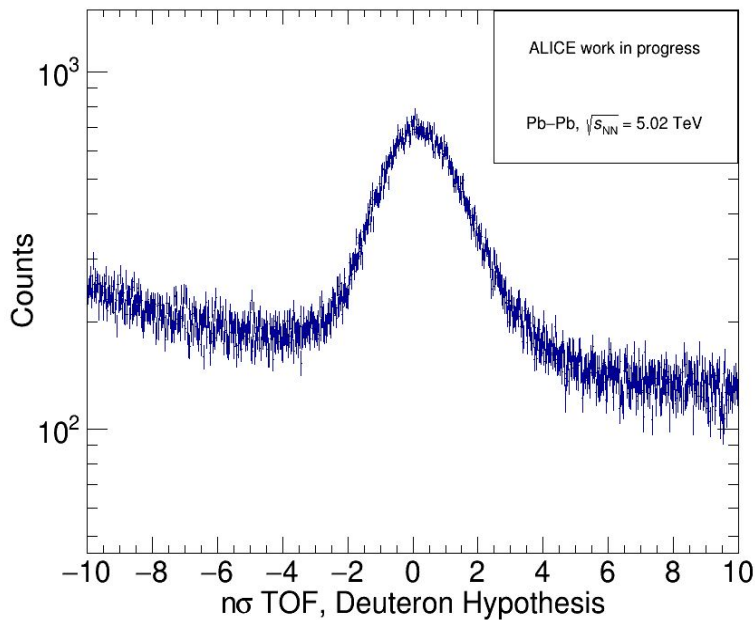
We'll use the multi-wire proportional chamber (MWPC) to match hits to particles identified by the earlier detectors.



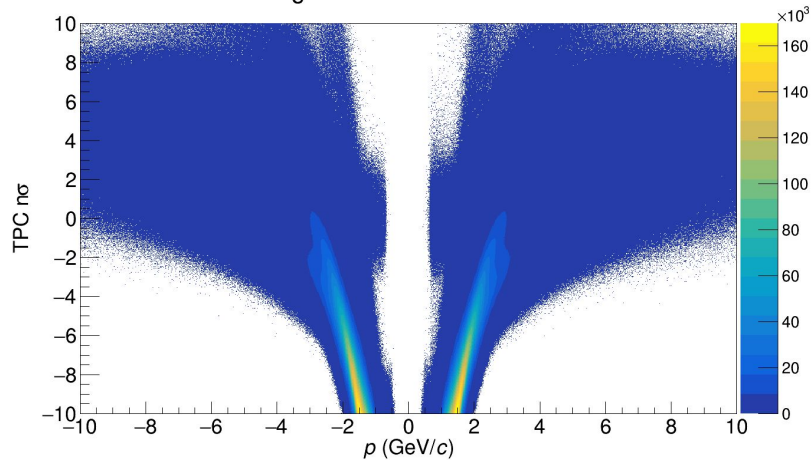
[1] <https://cds.cern.ch/record/2281131/plots>

Anti-Deuteron ID: TPC and TOF

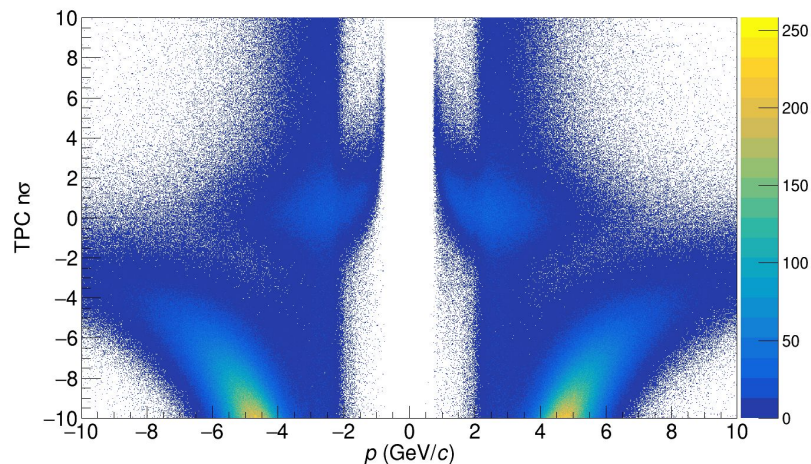
SigmaTOF for 2.5 to 3.0 GeV



Sigma TPC vs Momentum



Sigma TOF vs Momentum

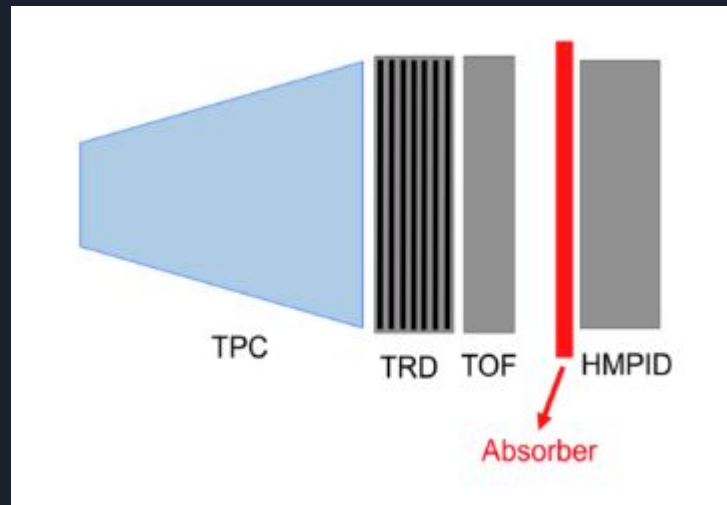


Project Next Steps:

- Fit TPC and TOF response
- Particle identification efficiency
- Simulation: What efficiency do we get on this measurement when accounting for background, fake matches, etc?

The key question:

- Can we identify (anti-)deuterons well enough to calculate an absorption cross-section at low energy, without a theory on which to base the measurement?



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Questions?

