



Update on μ^+/μ^- ratio

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V Congreso de la Red Mexicana Científica y Tecnológica para ALICE-LHC

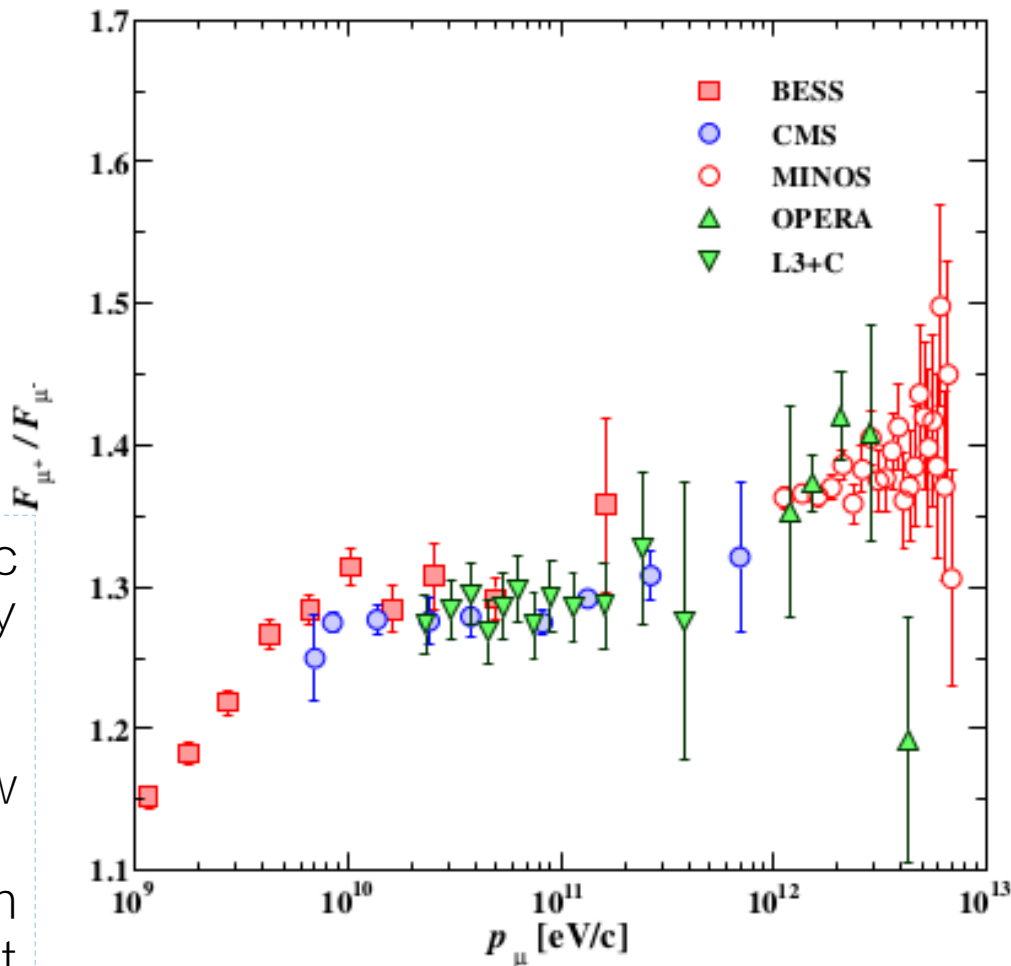
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Introduction

The ratio μ^+/μ^- is defined as the ratio of the number of positively charged muons to the number of negatively charged muons that reach the surface of the Earth.

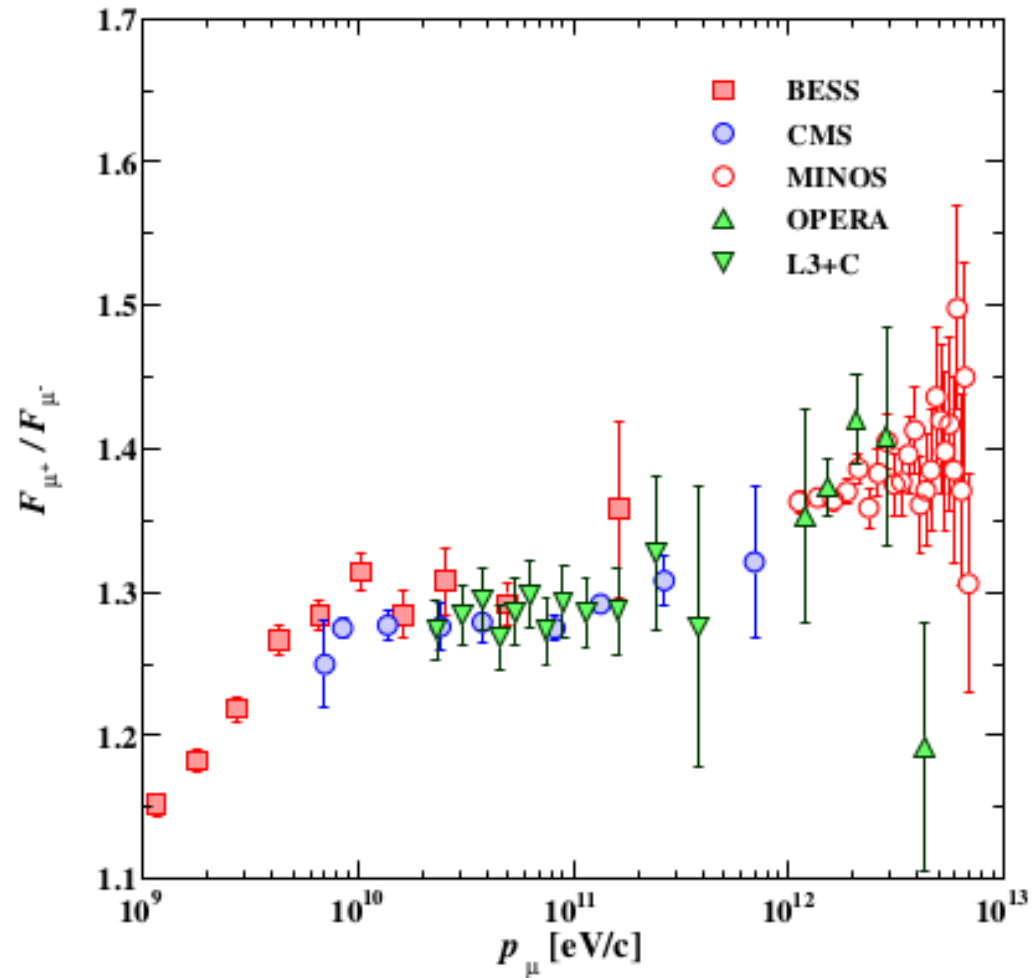
Several contributions

- Composition of the primary cosmic ray (ratio protons over heavy component).
- Hadronic interactions features
- Atmospheric conditions (low energy, below few GeV).
- Contribution of muons from charmed particle decays (prompt muons, very high energy).

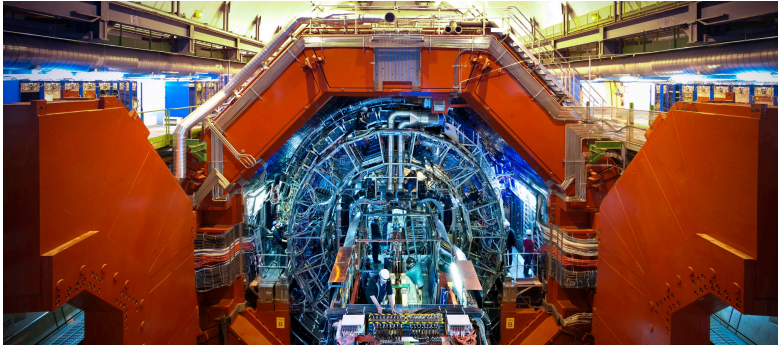


This ratio can be used to:

- Improve the understanding of the mechanism of multiple production of **pions** and **Kaons** in the atmosphere.
- Better understand the features of high energy hadronic interactions in the forward region.
- Improve the Monte Carlo models of hadronic interactions (constrain predictions at higher energies).



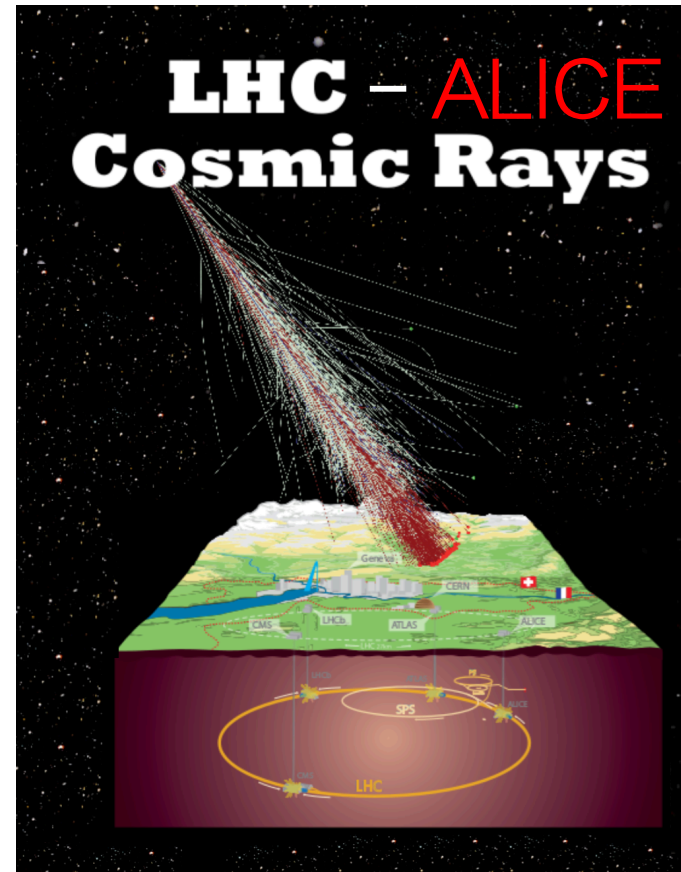
ALICE



- ACORDE: ALICE Cosmic Ray Detector. Trigger system for atmospheric muons.

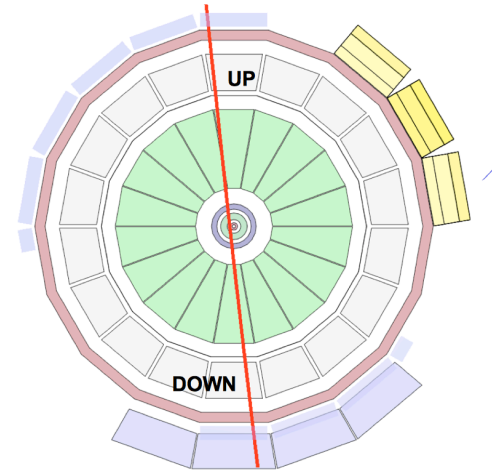
- TOF: Time Of Flight . Is used to calculate the particle mass.

- TPC: Time Projection Chamber. Identification of trajectories



Standard charge selection (previously)

- $\text{upSign} < 0 \ \&\& \ \text{dwSign} > 0 \rightarrow$ positive muon
- $\text{upSign} > 0 \ \&\& \ \text{dwSign} < 0 \rightarrow$ negative muon
- $\text{upSign} < 0 \ \&\& \ \text{dwSign} < 0$
- $\text{upSign} > 0 \ \&\& \ \text{dwSign} > 0 \rightarrow$ undefined muon



Charge selection (new)

- I used a new sample with Ruben's suggestion
- I used a new branch for the charge of the muon \rightarrow Chargecov (*)

Event and track selection

- 1muon
- 2 tracks event
- # TPC clusters > 50
- Distance between matched tracks < 6cms
- Full area
- Small area XZ (150 x 150 cm²)

Description of Data sample

- Momentum range: 10–220 GeV
- Within θ : 0° to 50°

I used a new sample with Ruben's suggestion

LHC15c

Long runs: 216544 216687
216922 217261 218260

Total runs: 5

Total Analyzed events:
356,483

LHC15d

Long runs: 222802 222791
222780 222650 222242

Total runs: 5

Total Analyzed events:
400,297

Magnetic
field $B > 0$

LHC15f

Long runs: 227706 227703
227582 227432 227403

Total runs: 5

Total Analyzed events:
495,706

LHC15m

Long runs: 244226 242224
244217 244209 244205
244198 244139

Total runs: 7

Total Analyzed events:
528,700

LHC15a

Long runs: 214569 214517
214126 212795 212456

Total runs: 5

Total Analyzed events:
444,048

LHC15d

Long runs: 222625 222630

Total runs: 2

Total Analyzed events: 38,581

Magnetic
field $B < 0$

LHC15f

Long runs: 226368 226365
226301 225652 225143

Total runs: 5

Total Analyzed events:
353,533

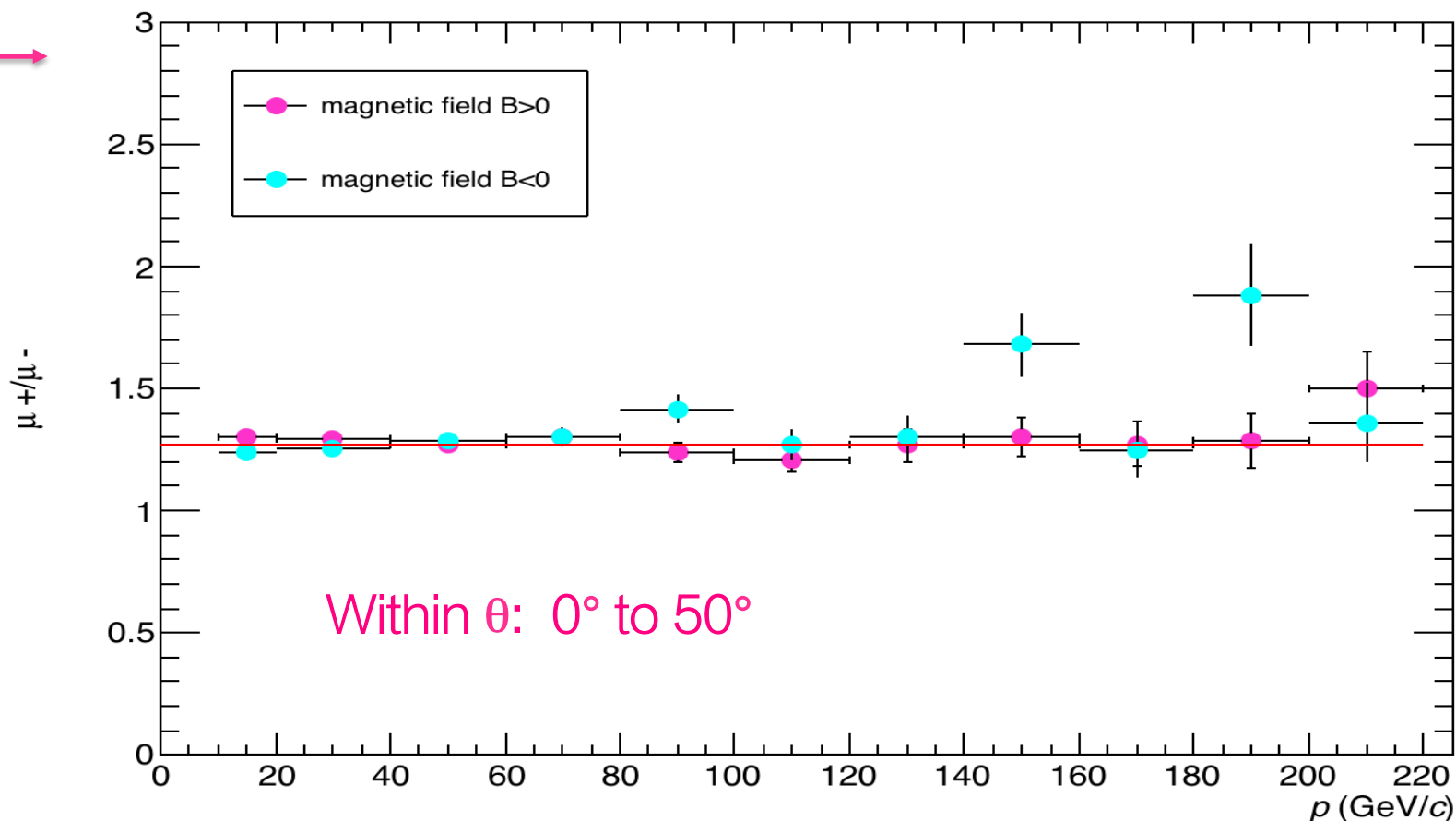
LHC15k

Long runs: 238988 238985
238983 238982 238978
238977

Total runs: 6

Total Analyzed events:
370,132

Muon Charged Ratio



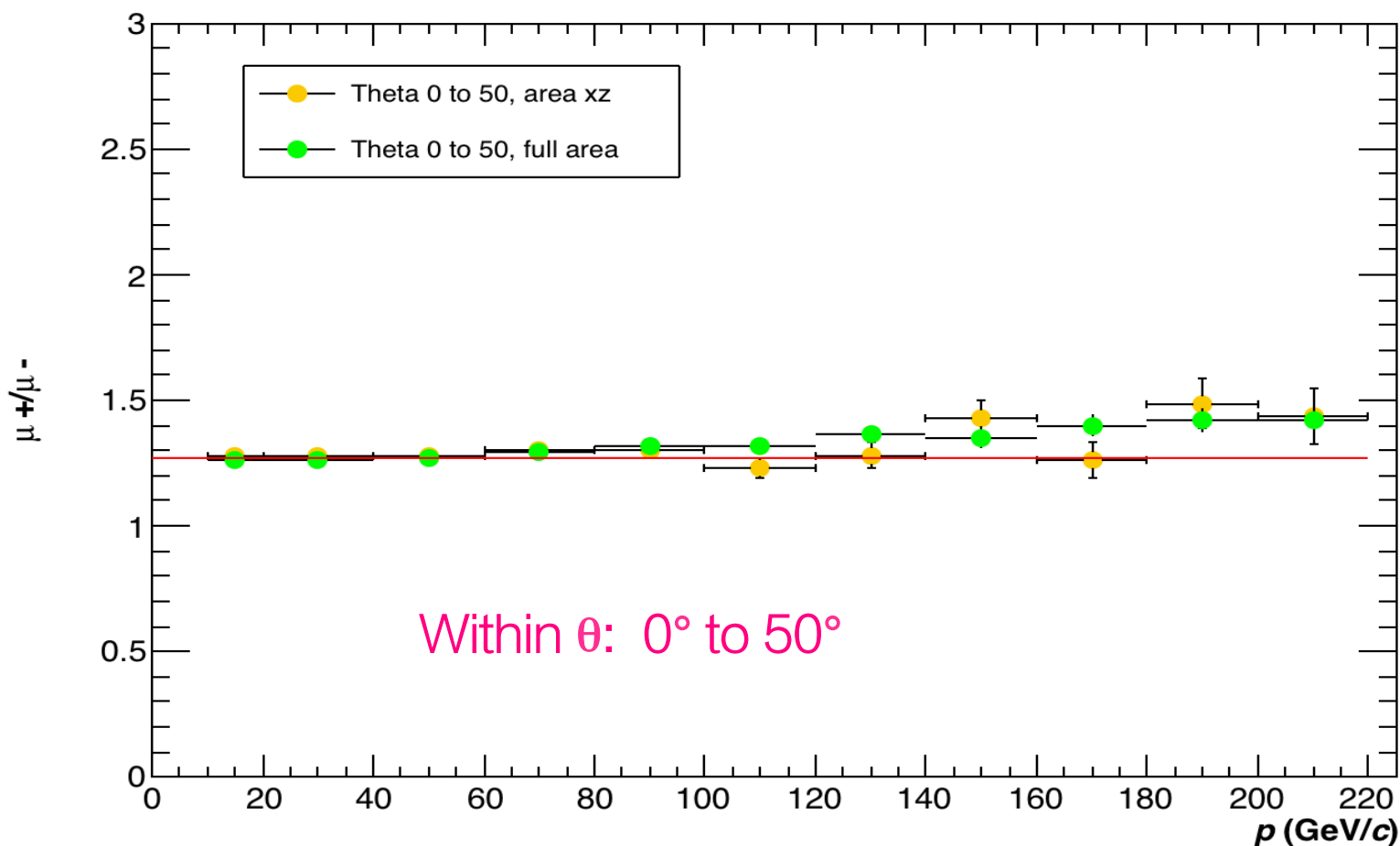
Magnetic field: $B < 0$

Total Analyzed events: 1,206,294

Magnetic field: $B > 0$

Total Analyzed events: 1,781,186

Muon Charged Ratio



Considering θ from 0 to 50, I compared the ratio for the full area and area xz (150 x 150 cm²)

Final comments:

- ✓ I used the longest runs for $B > 0$ and $B < 0$ for theta within 0° to 50° .
- ✓ I compared the ratio with area XZ ($150 \times 150 \text{ cm}^2$) and full area with positive and negative field

Todo list:

- MC studies to correct the measurement of the ratio
- Correction of the charge by the method of the OPERA experiment
- Analysis note (in progress)
- Multi-muon ratio (in progress)



ALICE

Thank You!