



Ciências
ULisboa

Study of hadron properties through their interactions at the AMBER experiment

LIP Internship program 2020

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11/09/2020

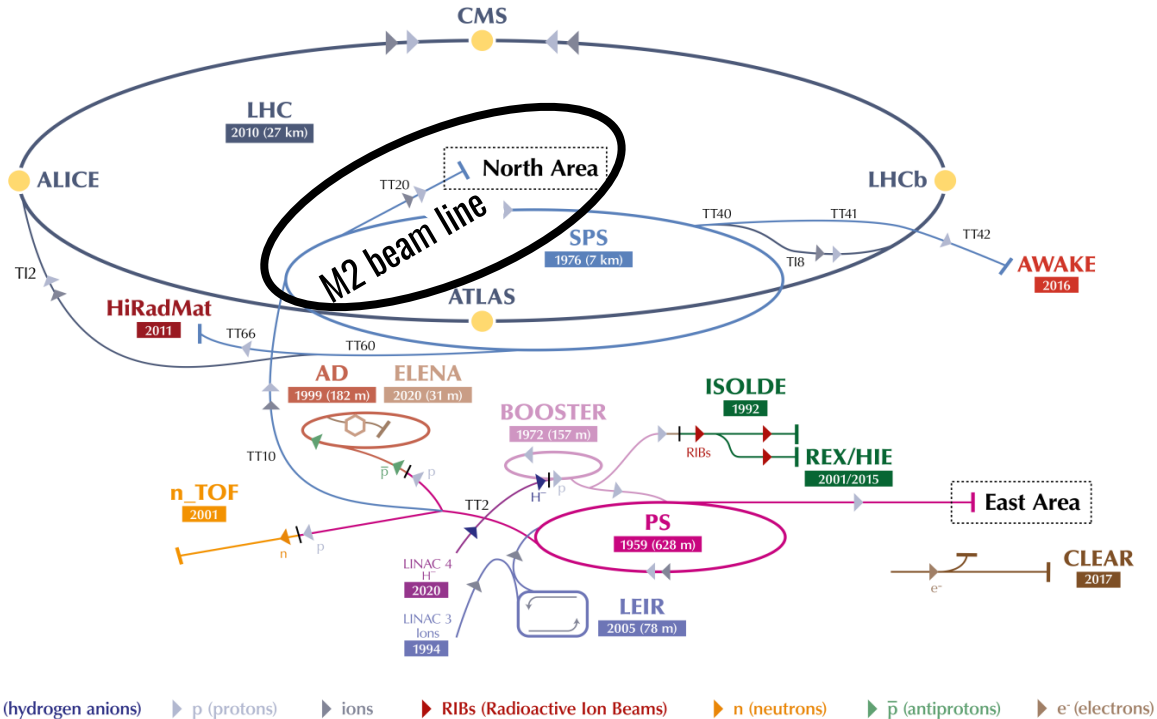
Supervisors:

Márcia Quaresma

Catarina Quintans

The CERN accelerator complex

Complexe des accélérateurs du CERN

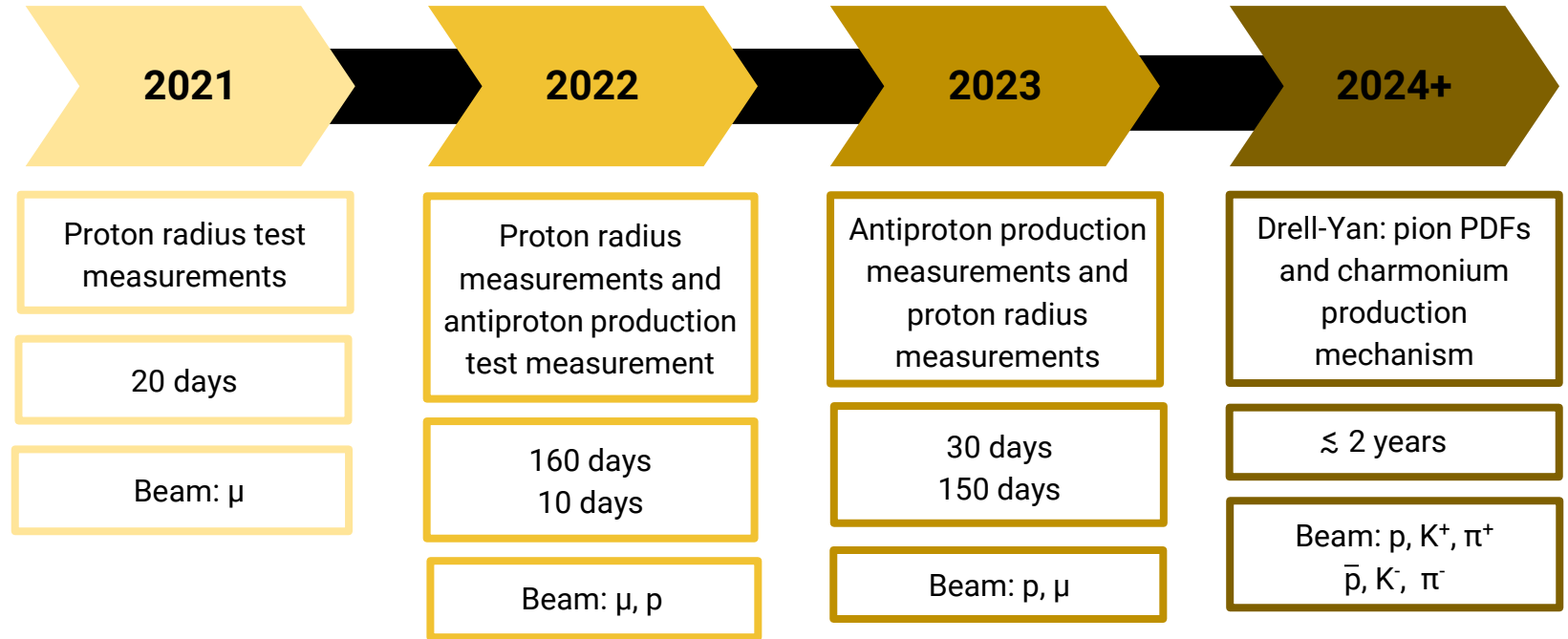


AMBER

A new QCD Facility at the M2 beam line of the CERN SPS

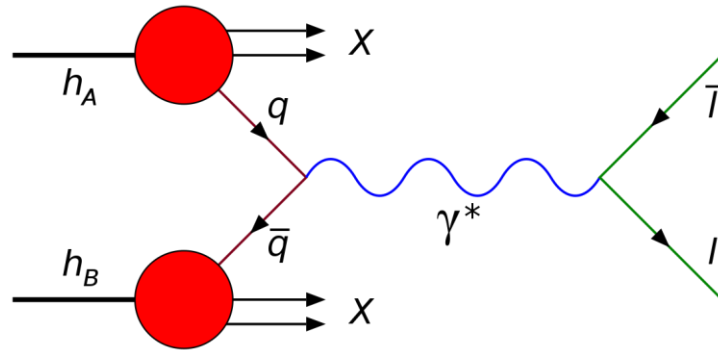
LHC - Large Hadron Collider // SPS - Super Proton Synchrotron // PS - Proton Synchrotron // AD - Antiproton Decelerator // CLEAR - CERN Linear Electron Accelerator for Research // AWAKE - Advanced WAKEfield Experiment // ISOLDE - Isotope Separator OnLine // REX/HIE - Radioactive Experiment/High Intensity and Energy ISOLDE // LEIR - Low Energy Ion Ring // LINAC - LINear ACcelerator // n_TOF - Neutrons Time Of Flight // HiRadMat - High-Radiation to Materials

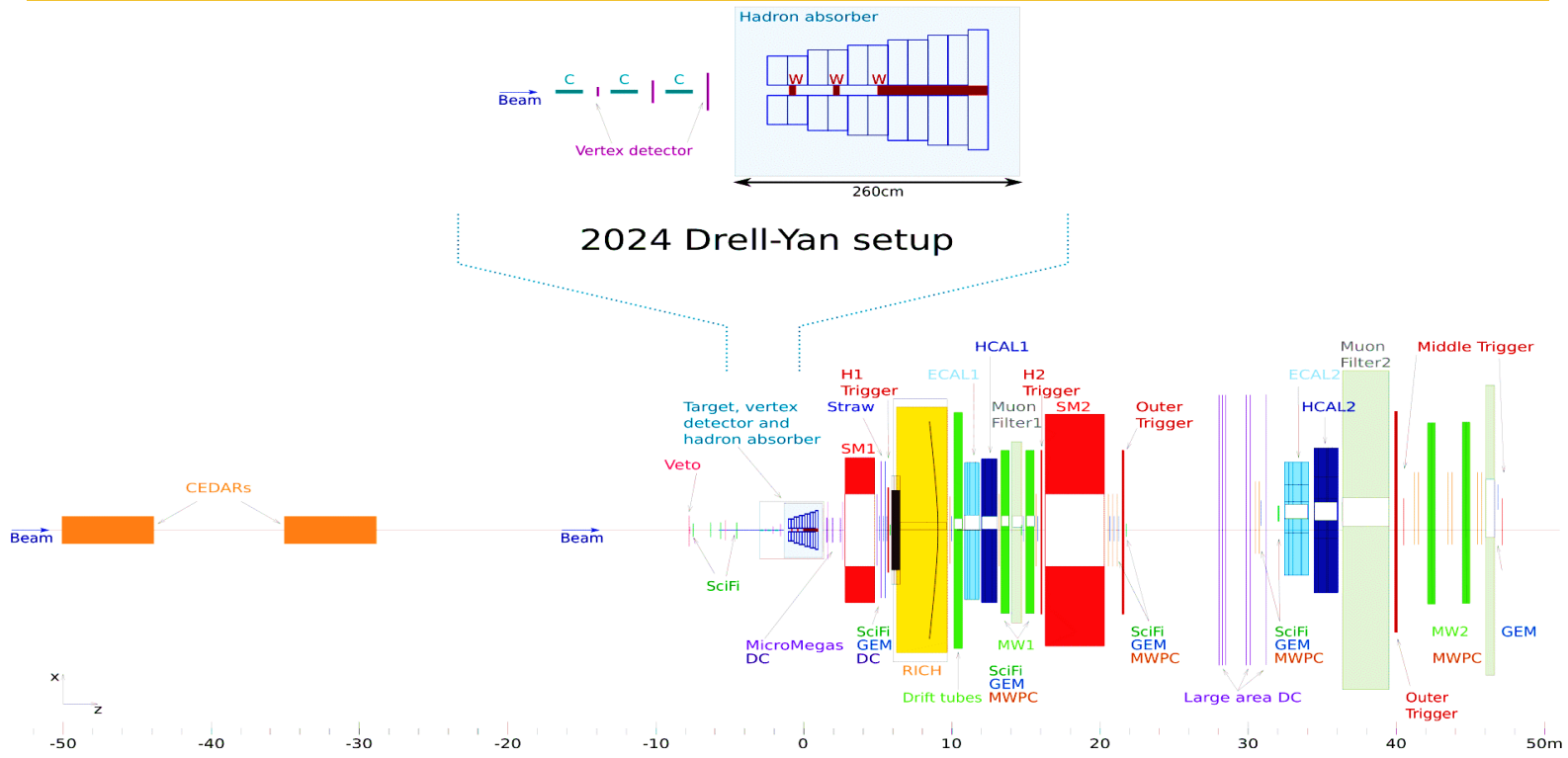
TIMELINE: AMBER



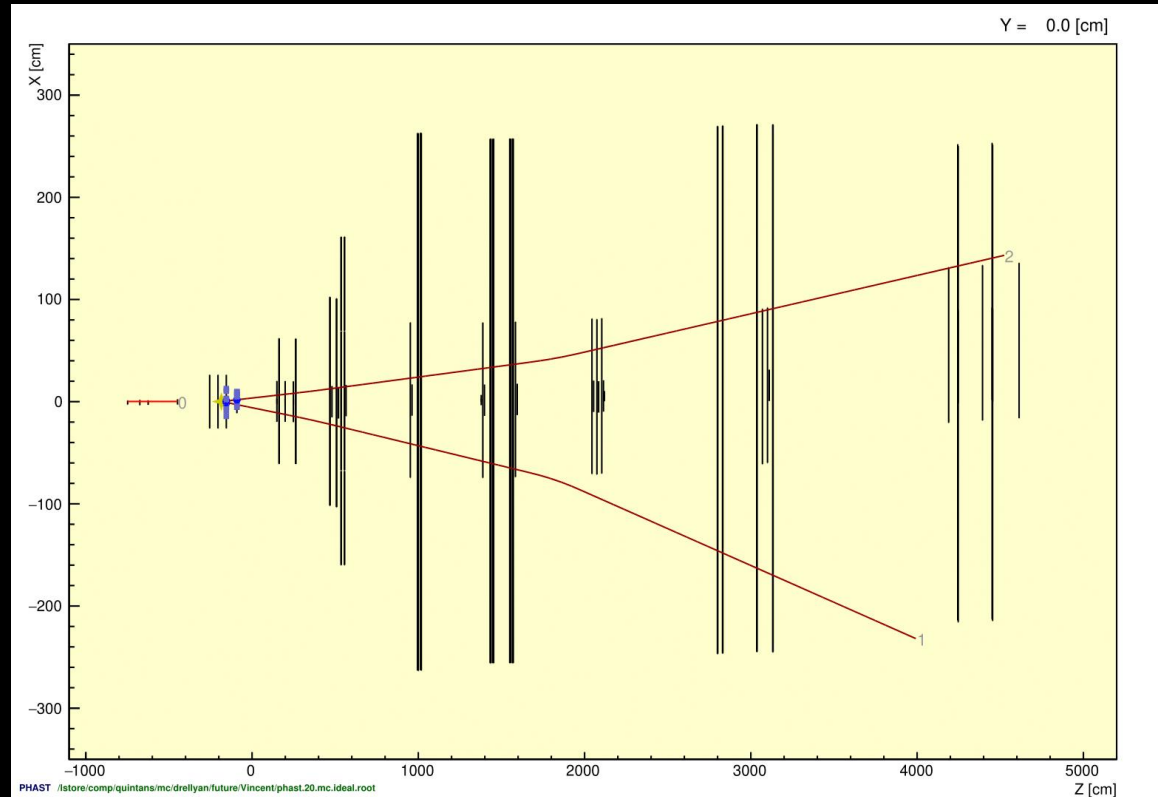
DRELL-YAN PROCESS

Quark + Antiquark \gg Virtual Photon \gg Positive Lepton + Negative Lepton





INTERACTIVE PHAST



Select Best Coral
Primary Vertex

Fill a tree with the parameters
of the pair and of each muon

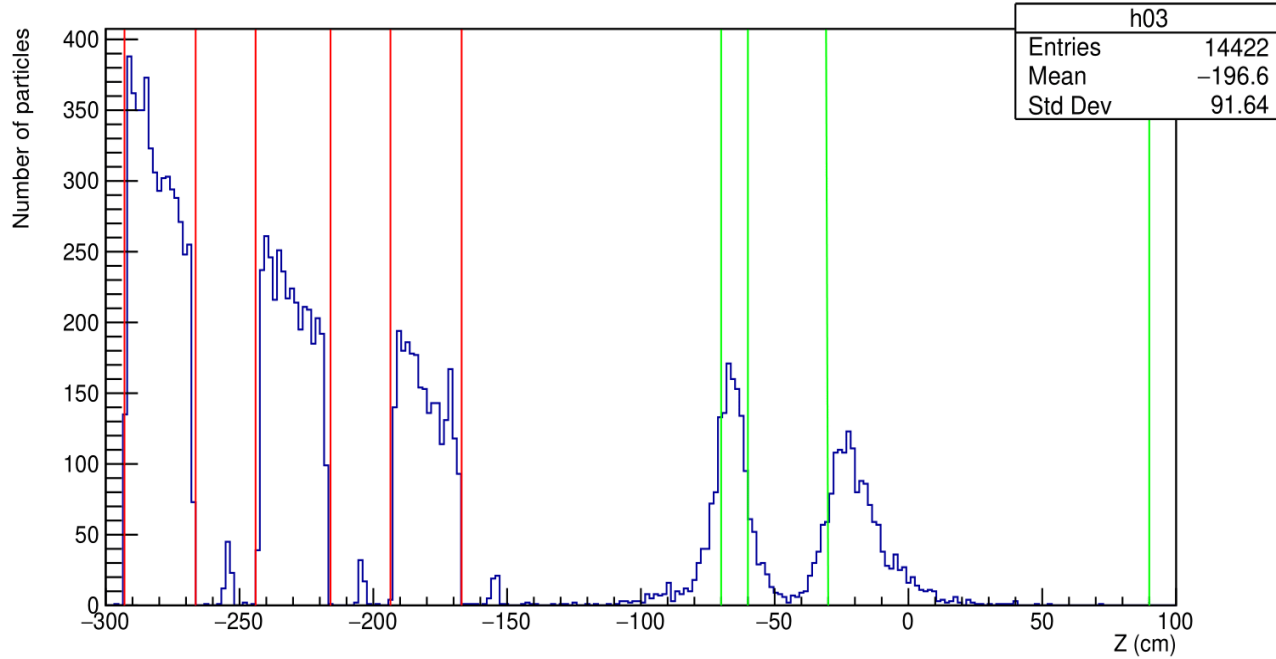


Choose events with two
opposite charged muons
by their PID

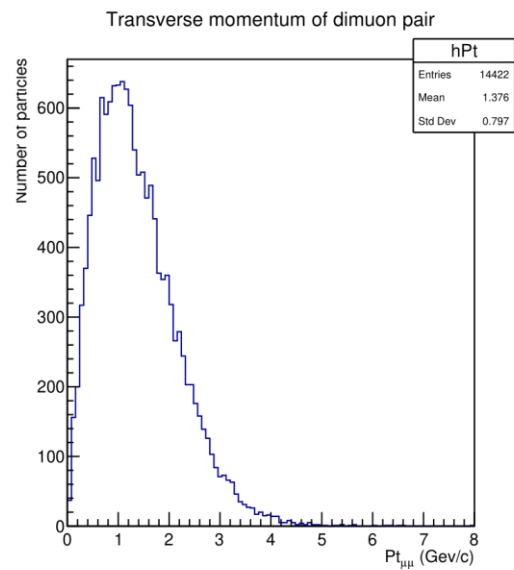
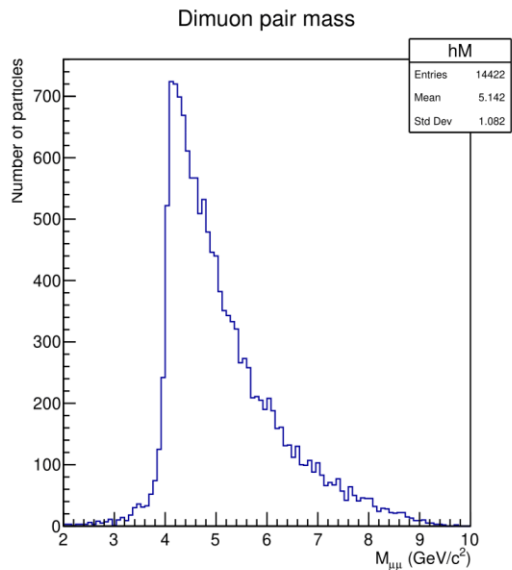
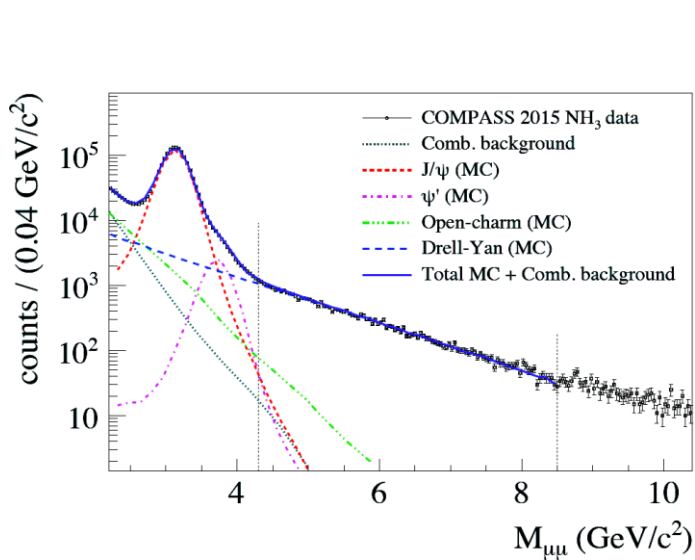
- Vertex Position
- Number of Hits in each Hodoscope
- Trigger
- Mass
- Phi and Theta Angles
- Momentum
- Particles' Mean Time
- χ^2 and Number of Degrees of Freedom
- ...

TARGET

Z vertex position

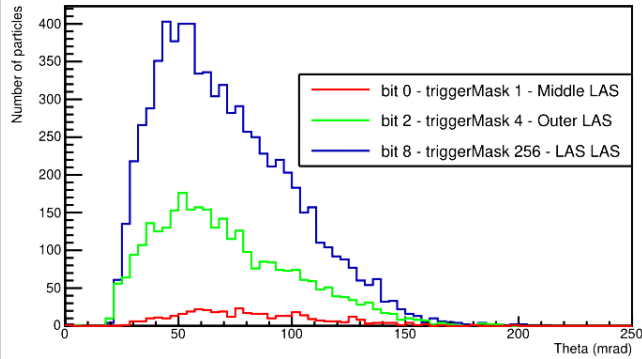


DIMUON PAIR

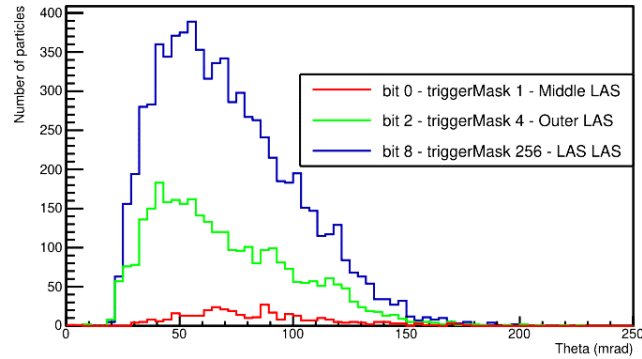


ANGULAR COVERAGE

Theta angle of μ^+ (LAS)

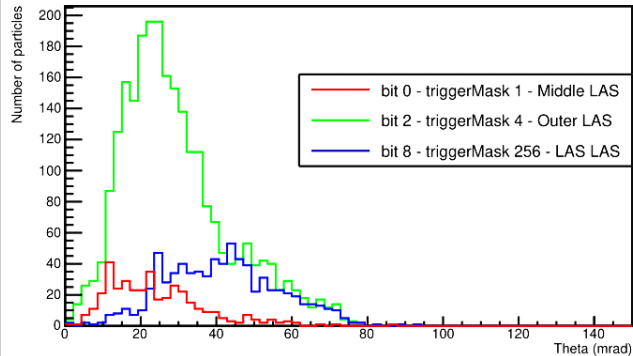


Theta angle of μ^- (LAS)

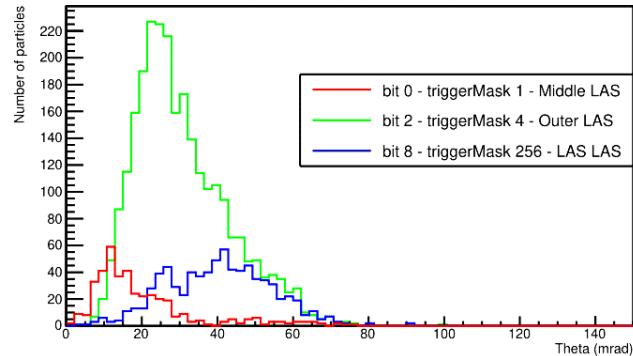


Large Angle Spectrometer
 $35 \text{ mrad} < \theta < 200 \text{ mrad}$

Theta angle of μ^+ (SAS)



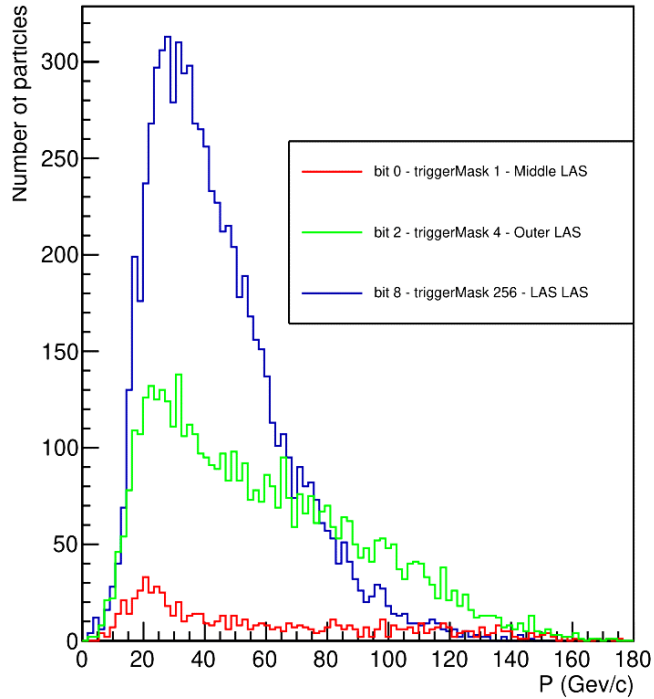
Theta angle of μ^- (SAS)



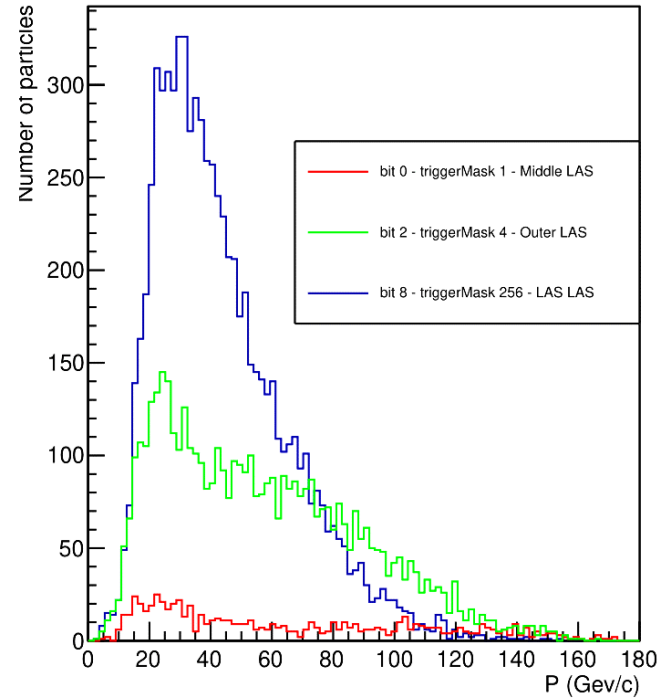
Small Angle Spectrometer
 $\theta < 70 \text{ mrad}$

MOMENTUM

Total momentum of μ^+



Total momentum of μ^-



THE NEXT STEP...

INTERNSHIP

Develop a parallel code
for Monte Carlo Truth



Resolution
Reconstruction efficiency

AMBER

Optimizing the experiment



Position and size of the target cells?
More detectors?
The same trigger as COMPASS?

...