rgB - meeting

ϕ electroproduction analysis : K^+ K^- channel

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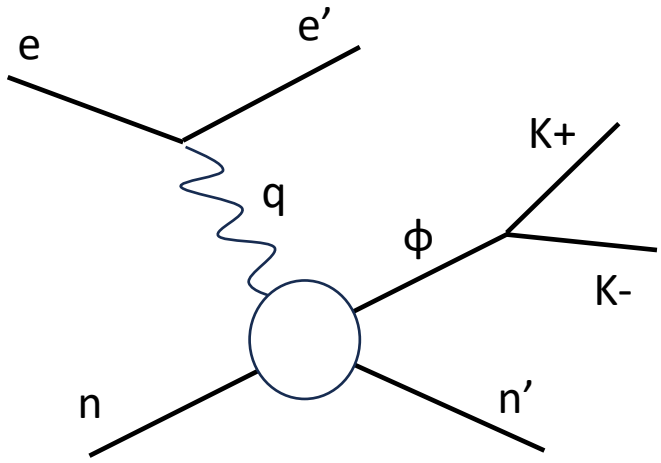
Introduction

Analysis objective :

- Measurement of the cross section and differential cross section of the electroproduction of ϕ in the K^+ K^- channel with **rgB** data (deuterium target). 3 analysis are possible :



e **n** → e **n'** K^+ K^- → Acces of gluons GPDs of the **neutron**

e **p** → e **p'** K^+ K^- → Acces of gluons GPDs of the **proton** and compare with results on rgA

(e **d** → e **d'** K^+ K^-) → Maybe possible : acces on gluons GPDs of the **deuterium**

Introduction

Analysis :

e **n** → e **n'** K^+ K^-

Datas :

sidisdvcs **RG-B outbending fall 2019**
+ spring 2019 and spring 2020 inbending

Cuts :

→ Selection of events with one e^- , K^+ , K^- , more than 1 neutron and 0 proton (select the best neutron wich minimize the angle between the missing nucleon and the neutron)

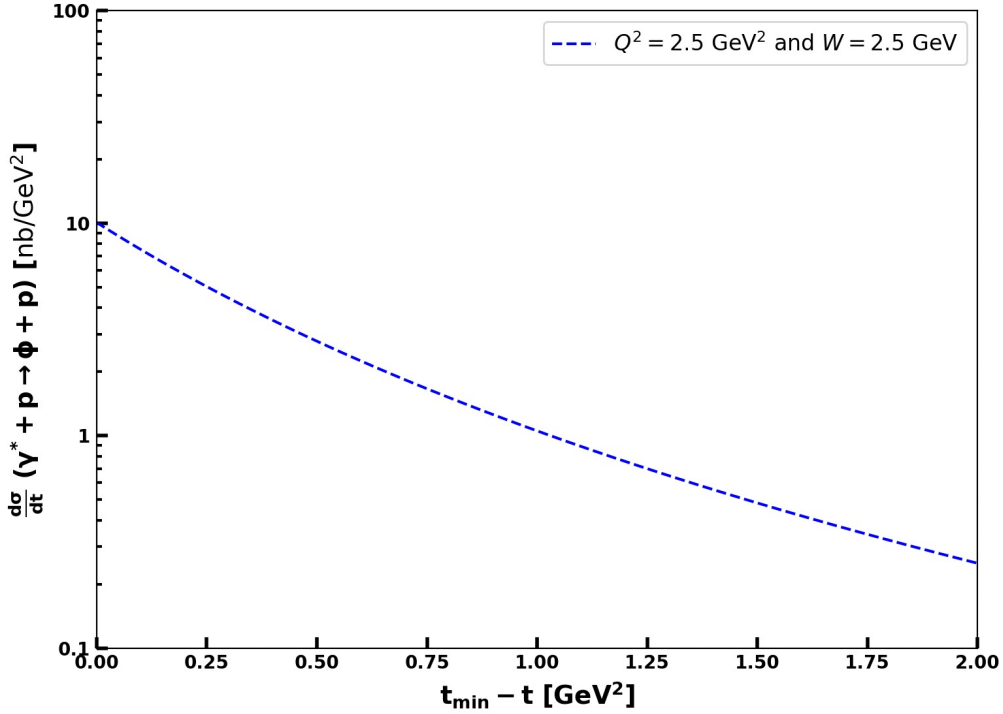
→ $Q^2 > 1.0$ GeV , $P_{electron} > 2$ GeV , $\theta_{neutron} > 4°$ and $P_{neutron} > 0.25$ GeV

→ Cut on the angle between the missing nucleon and the neutron

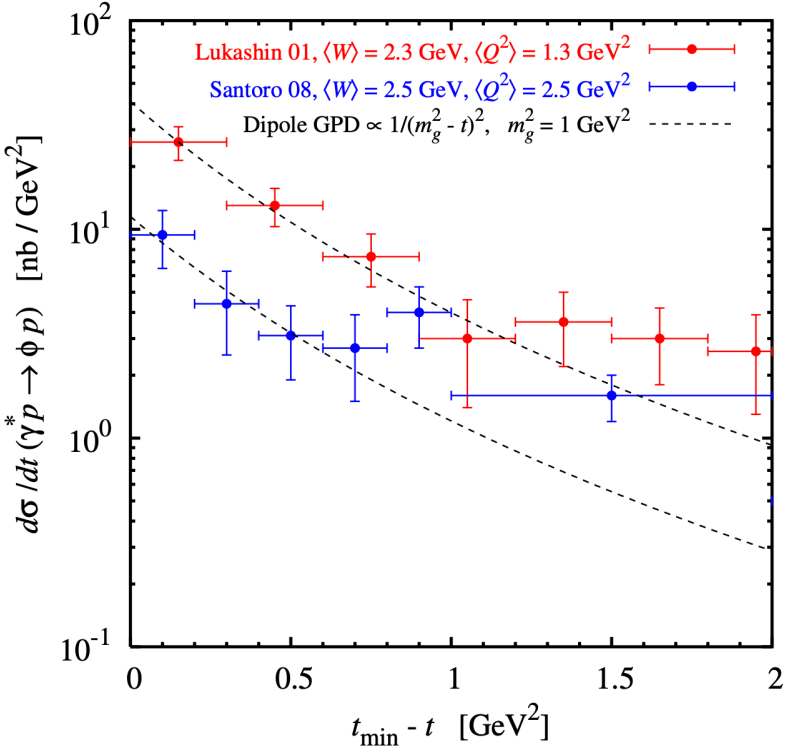
→ Cut on $-0.5 < MissingMass_{tot}^2 < 0.5$ GeV ^{2}

→ Cut on status of K^+ and K^- (keep event with both kaons in FD)

ϕ generator



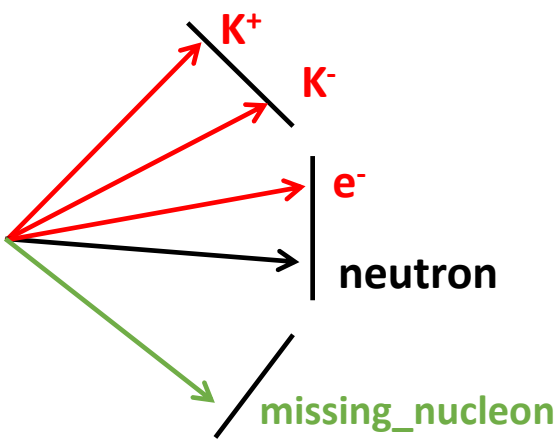
Implemented in the generator



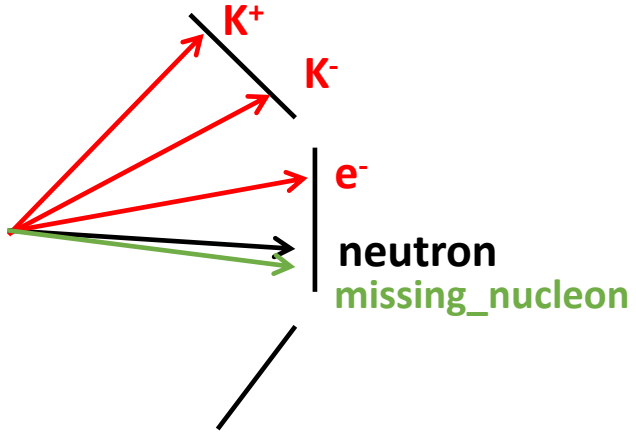
From Proposal to Jefferson Lab PAC39

Details on cuts : angle between miss nucleon and detected neutron

Missing_nucleon = beam + target - e' - K^+ - K^- (the missing particle of this reaction : e n ⟶ e' K^+ K^- X)



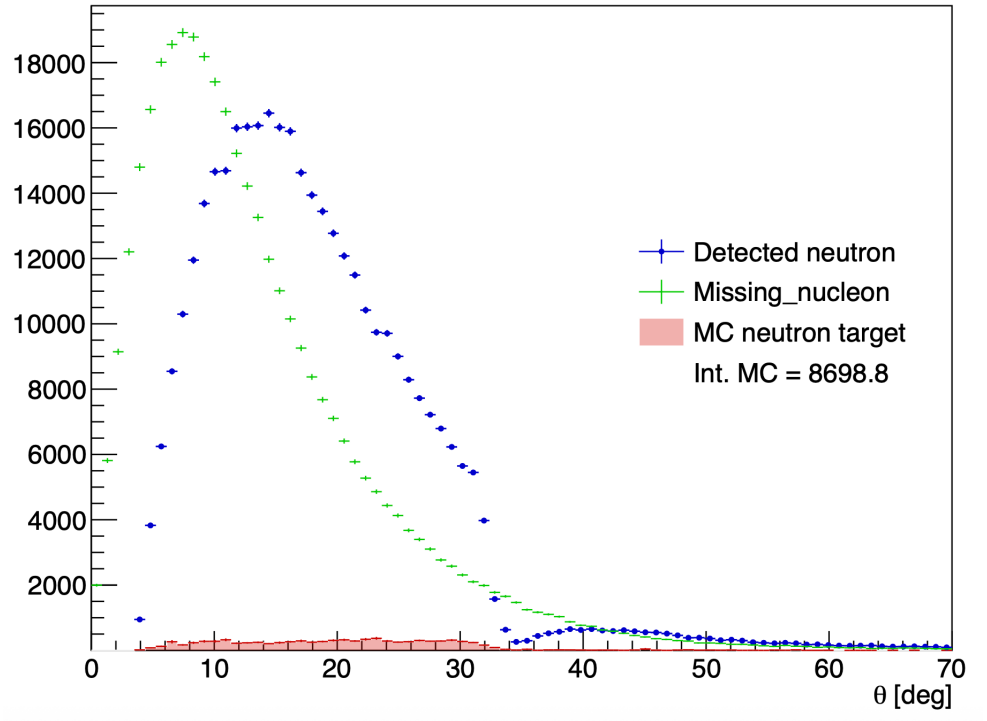
Not a good event



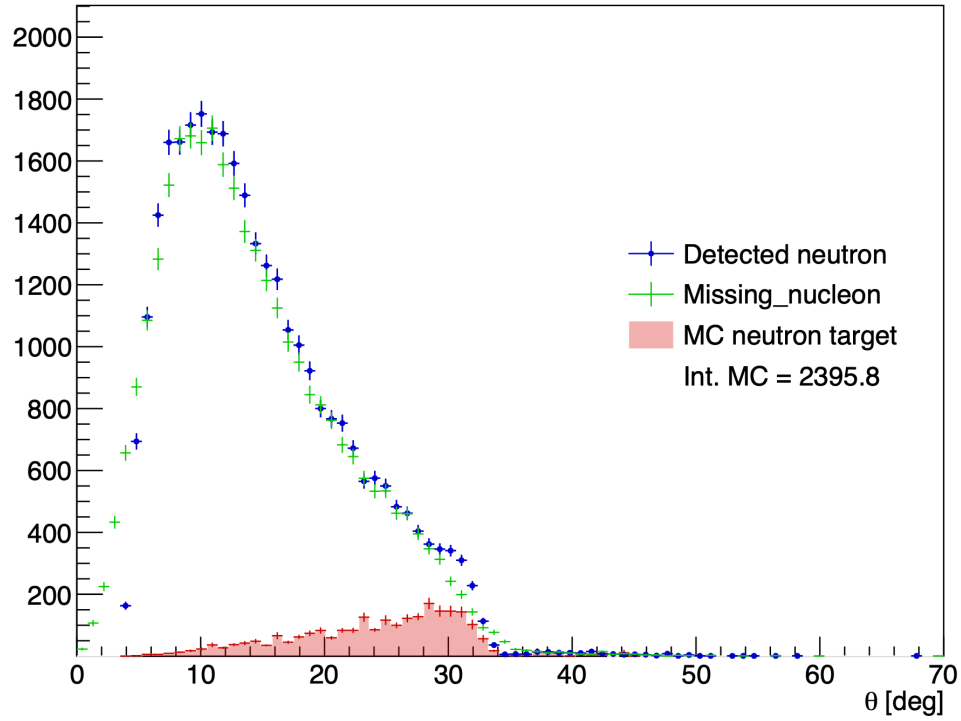
Good event

⟶ Cut on the angle between the missing nucleon and the neutron **< 5 °**

Details on cuts : angle between missing nucleon and detected neutron

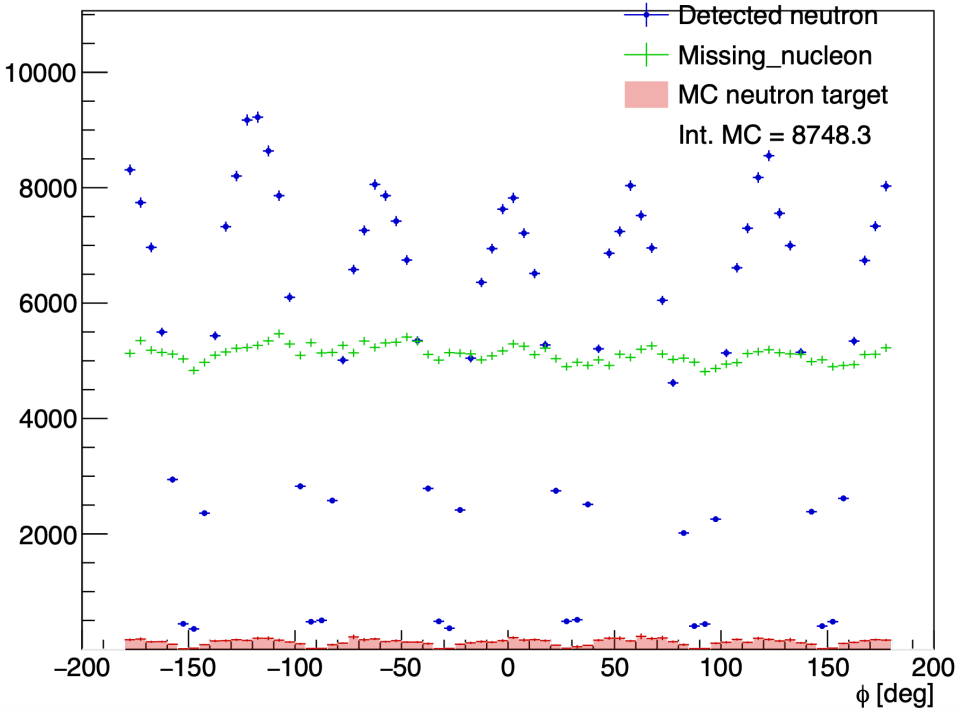


Without the angle cut

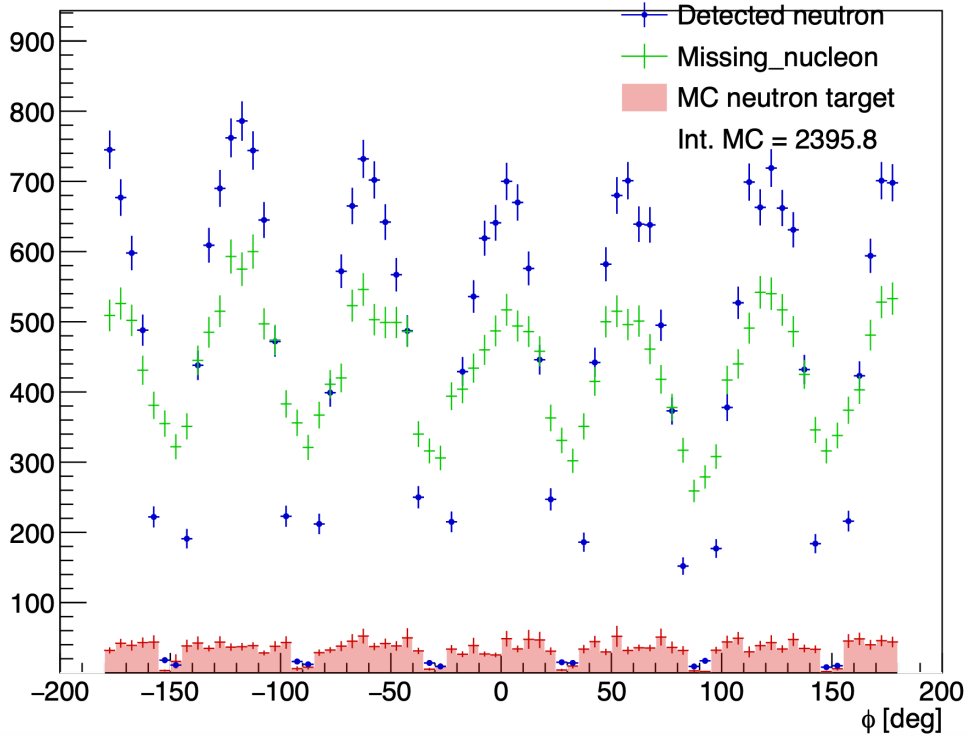


With the angle cut

Details on cuts : angle between missing nucleon and detected neutron

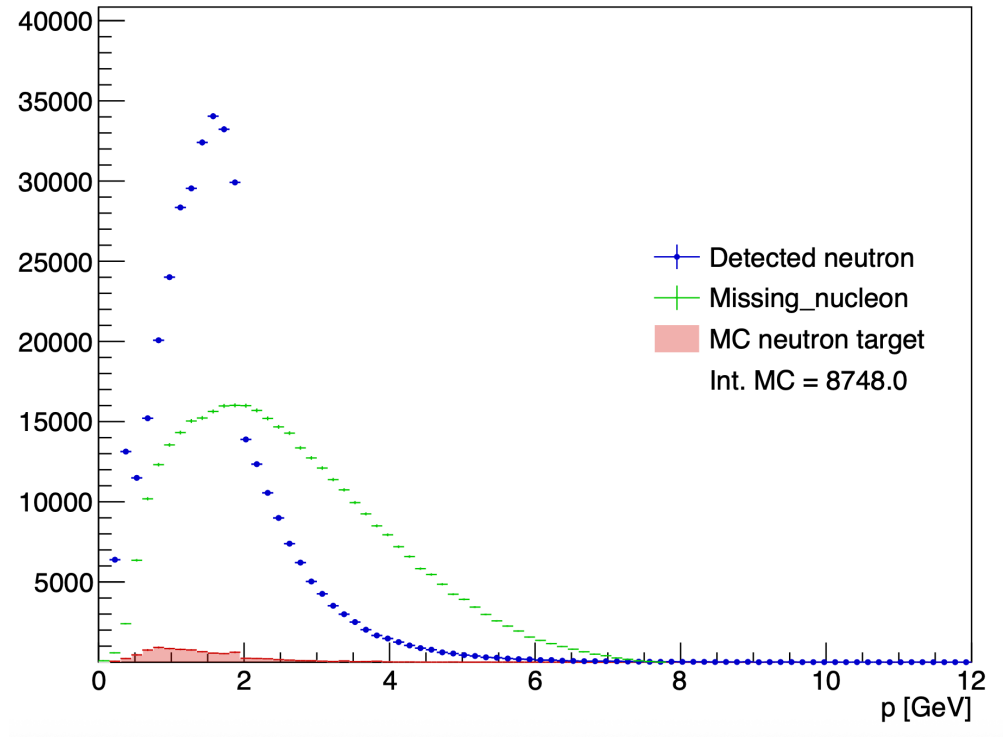


Without the angle cut

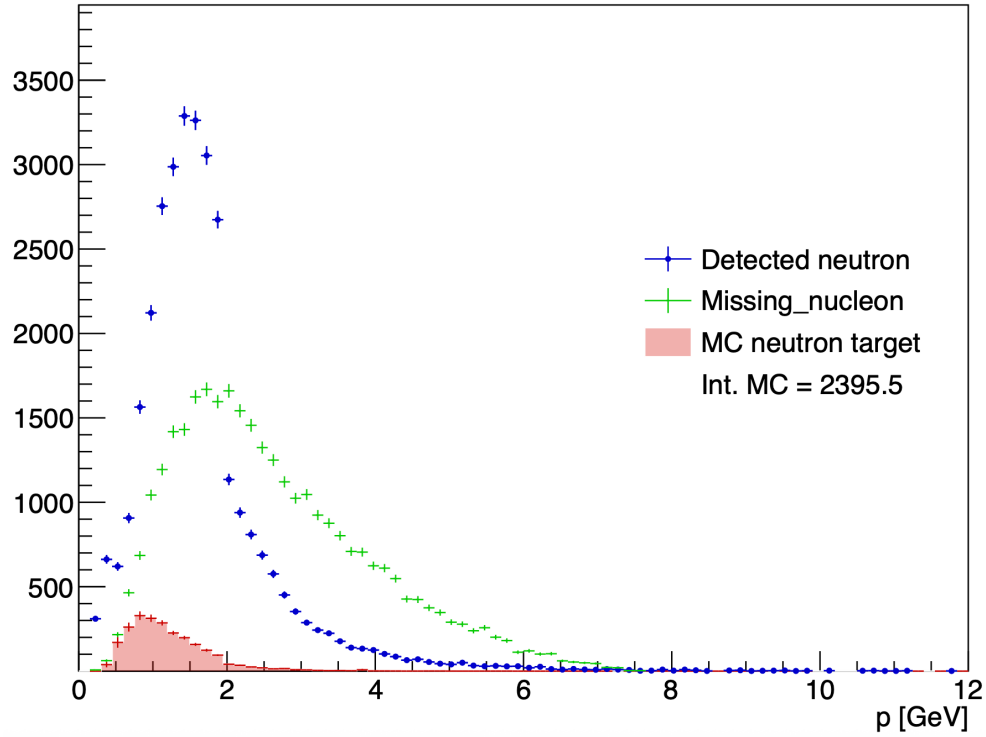


With the angle cut

Details on cuts : angle between missing nucleon and detected neutron



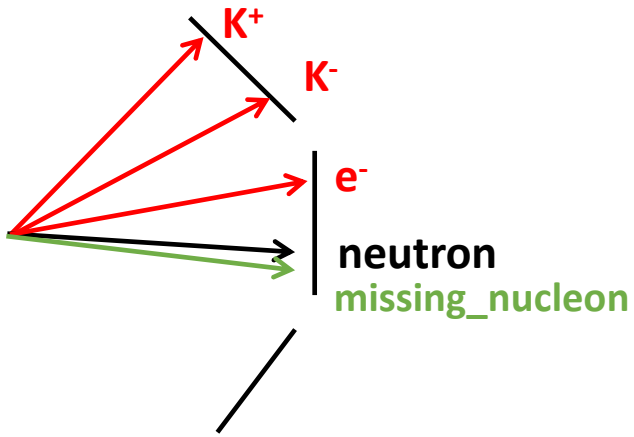
Without the angle cut



With the angle cut

Proton contamination

Missing_nucleon = beam + target - e' - K^+ - K^- (the missing particle of this reaction : e n ⟶ e' K^+ K^- X)

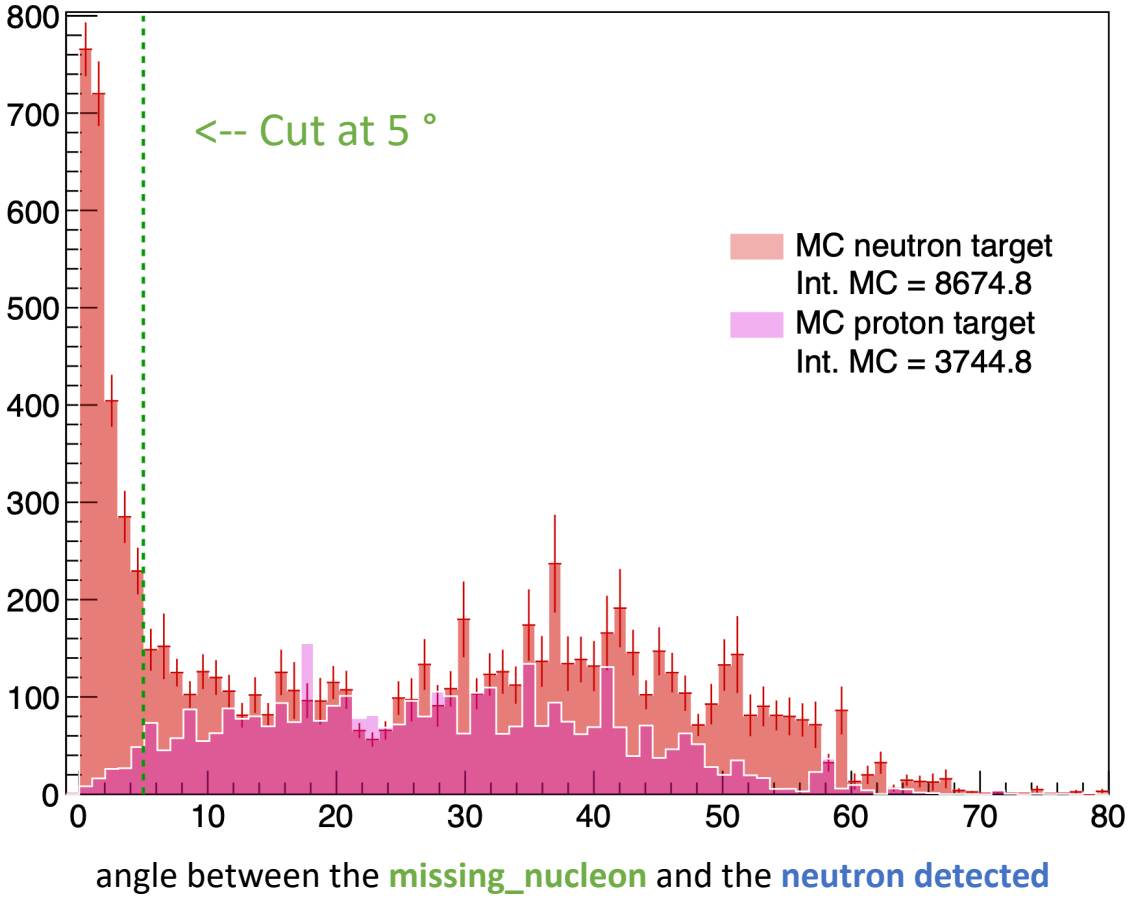


There is always a contamination when the missing_nucleon is a non detected proton and there is a **fake signal neutron** who pass the cut on the angle

⟶ Evaluate the contamination with simulation on proton target and apply the cuts of **neutron analysis** and see how many events pass the cuts

Keep event with the angle between the missing nucleon and the neutron **< 5 °**

Proton contamination : prediction of MC

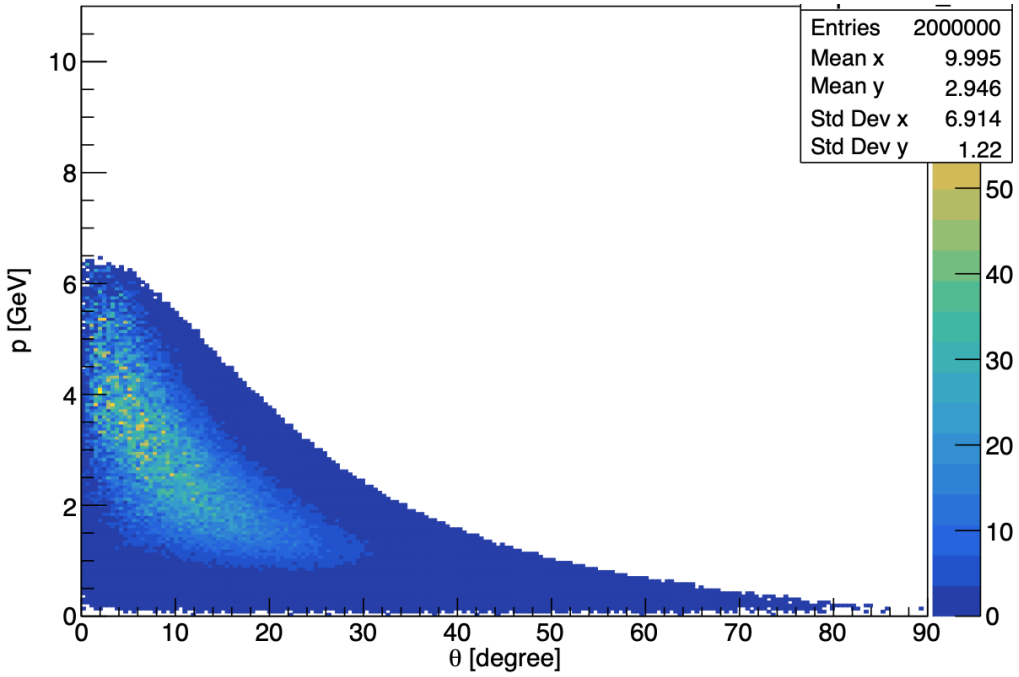


Details on cuts : keep K+ K- in FD

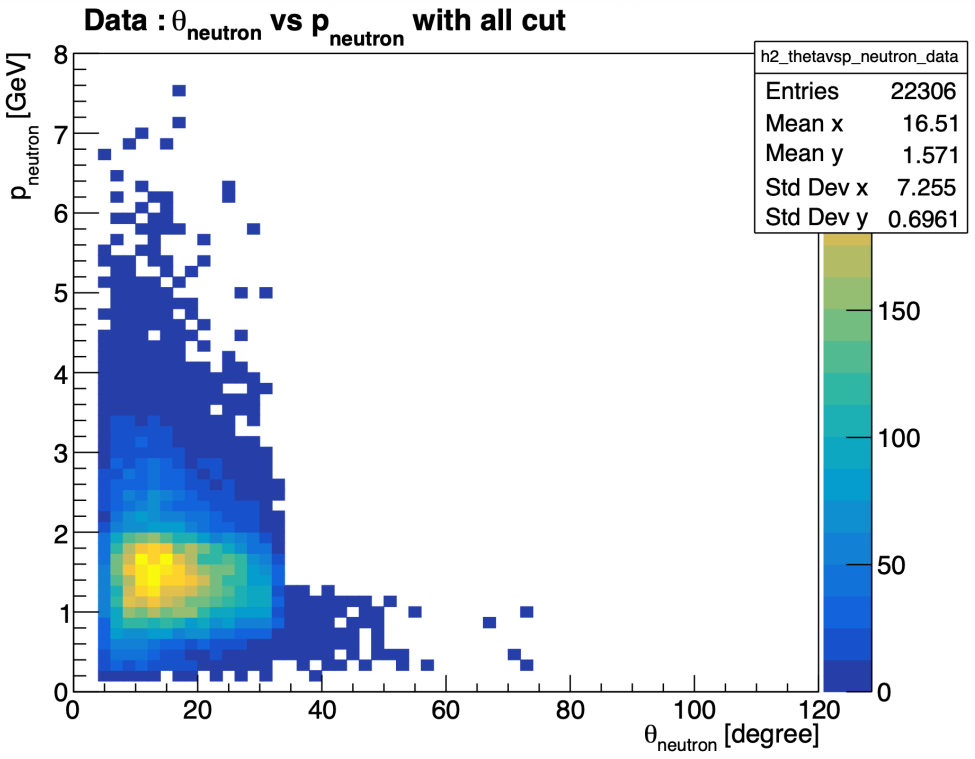
Two argument to cut K+ K- in CD :

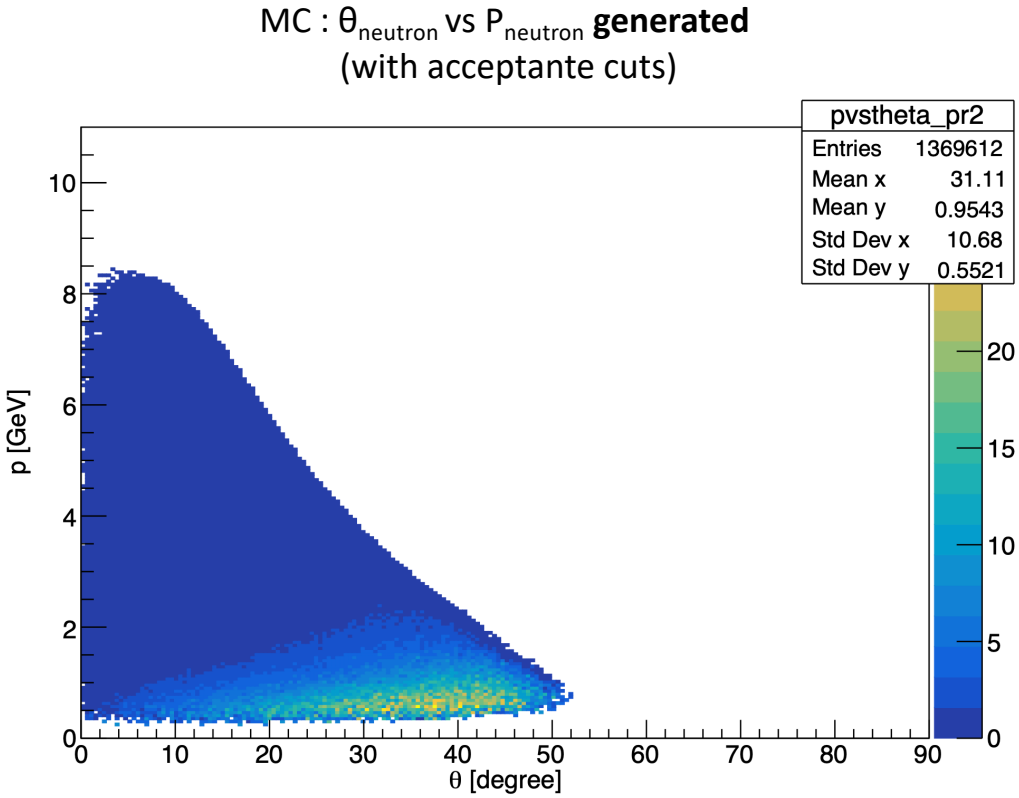
- Reconstruction of kaons in the CD is less good than in the FD
- The generator predict few events in the CD

Generated event : p vs theta for K^{+-}

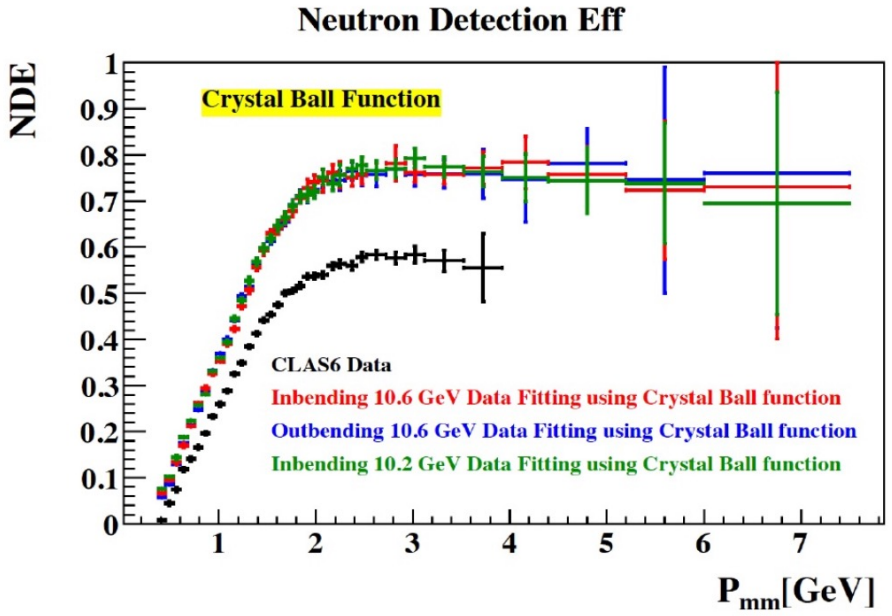


Neutron phasespace :

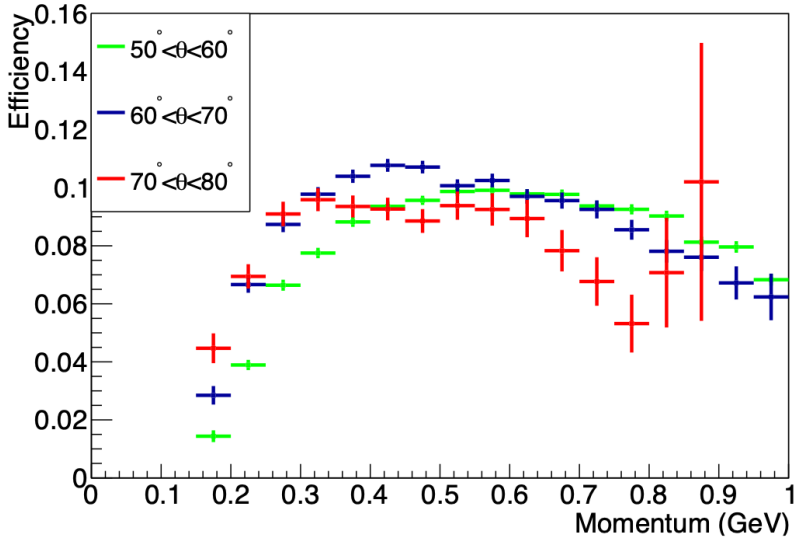




Neutron phasespace :



Neutron detection efficiency in the FD



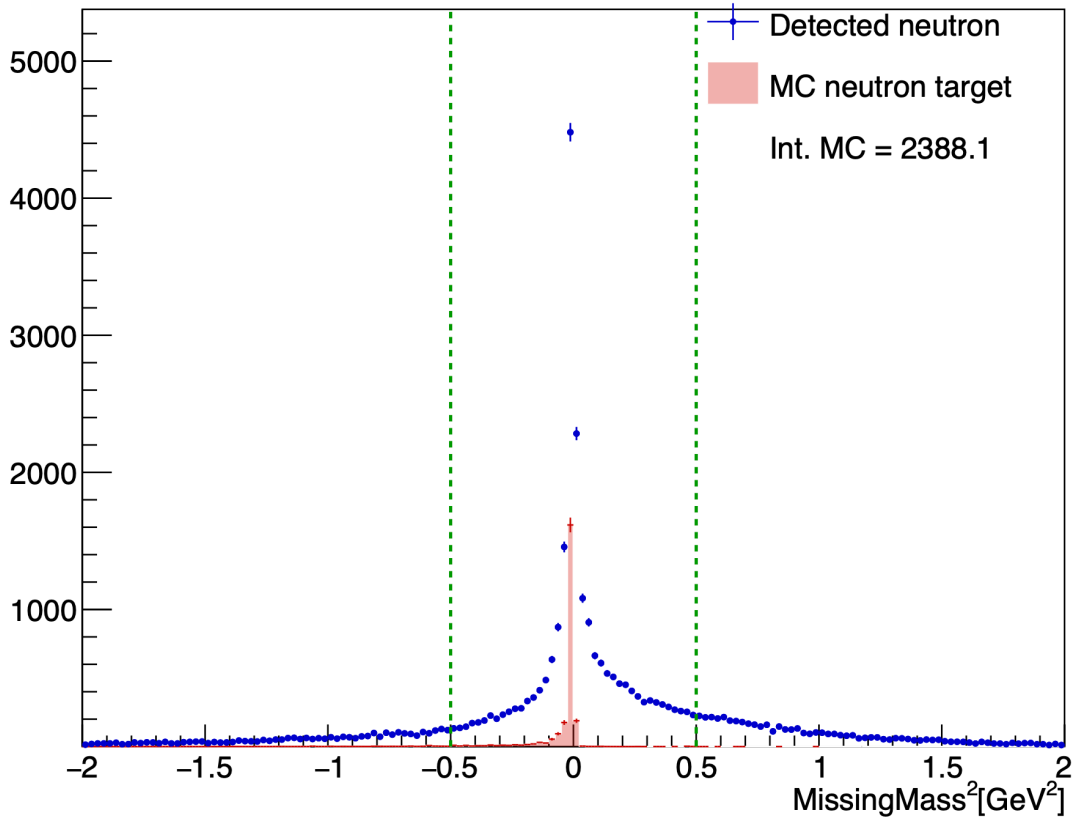
P. Chatagnon's plot

Neutron detection efficiency in the CND

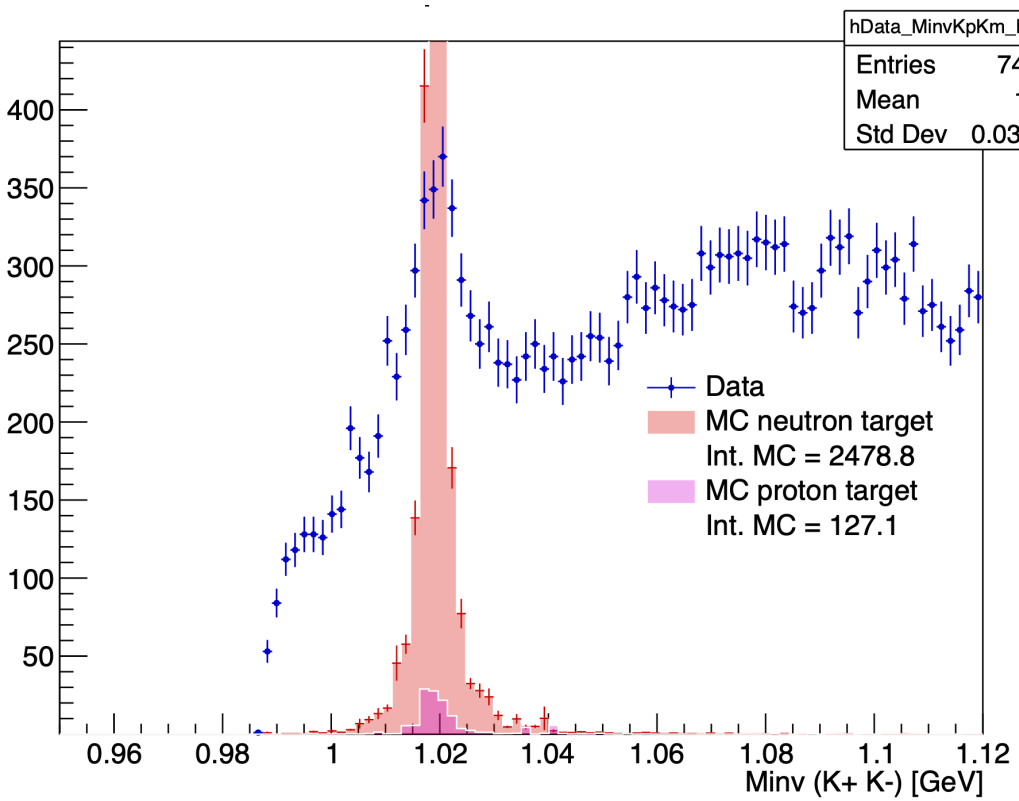
Details on cuts : Total missing mass

Total missing mass e n → e' n' K^+ K^- X
(after all the previous cut)

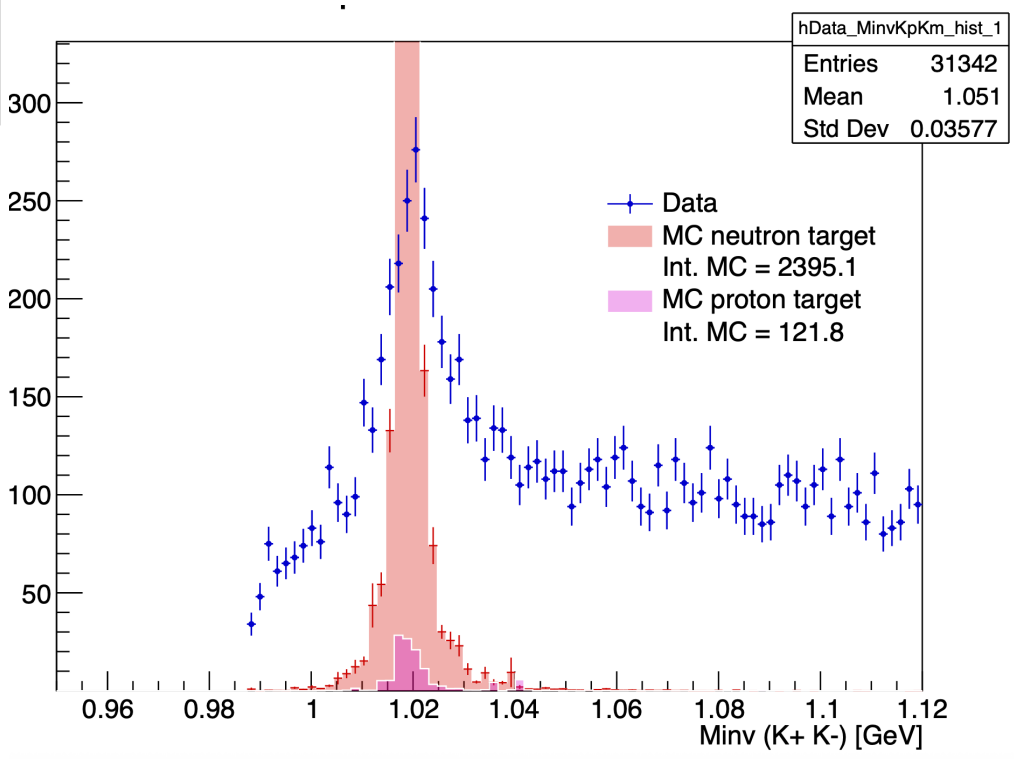
$-0.5 < \text{MissingMass}_{tot}^{\ 2} < 0.5\ \text{GeV}^2$



Invariant mass $K^+ K^-$:

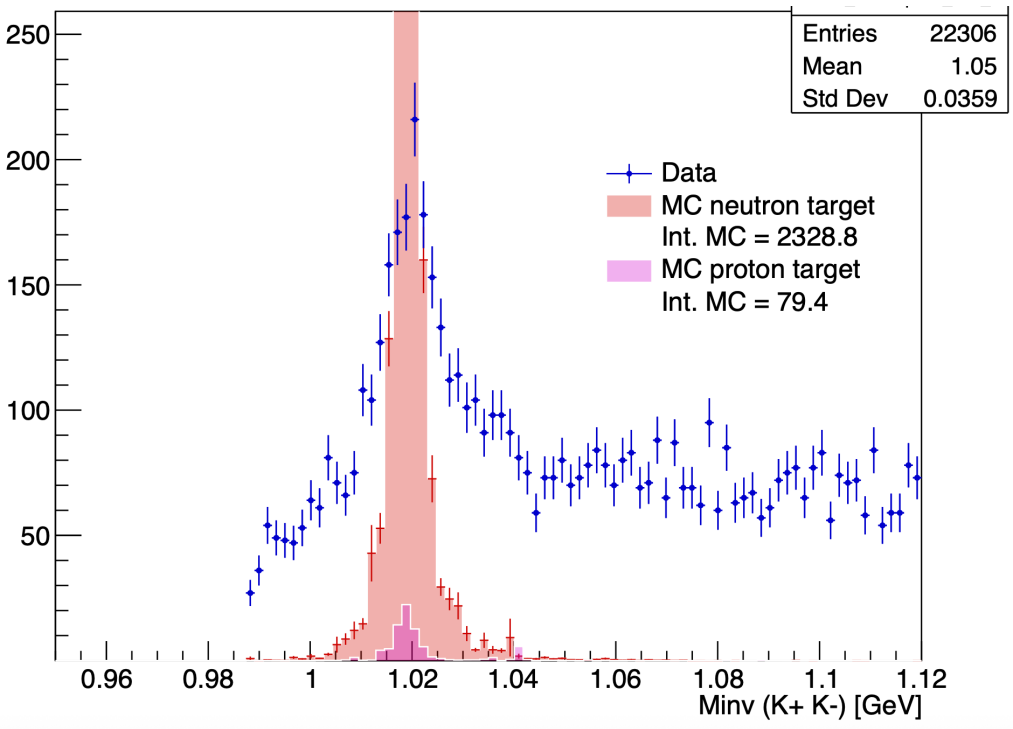


With angle cut

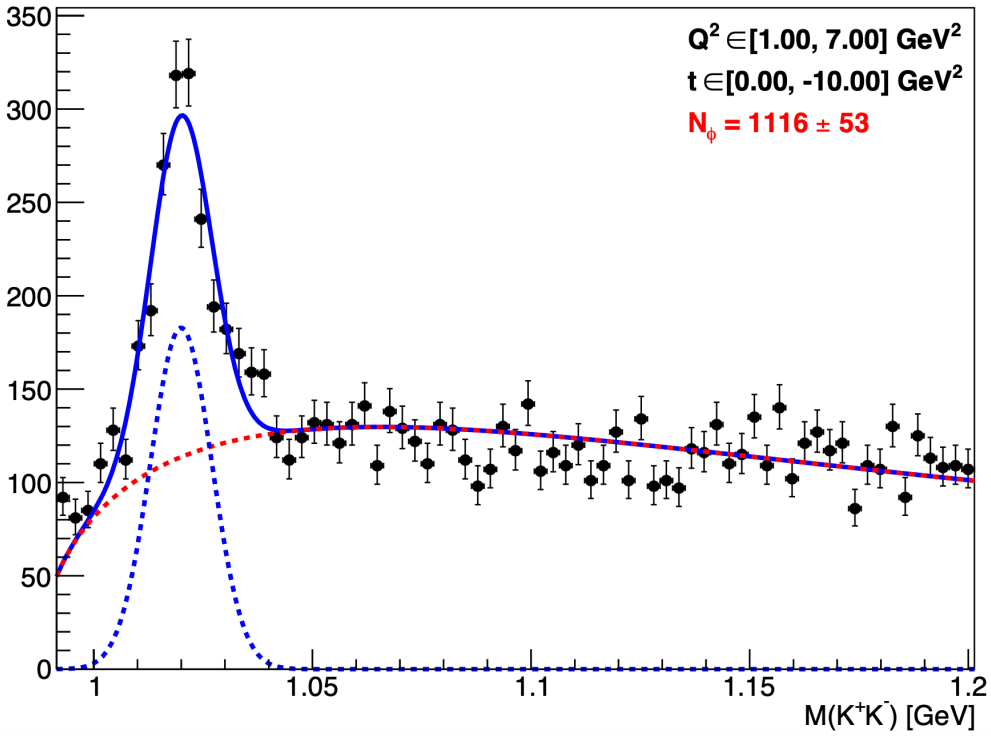


With angle cut and K+ K- in FD

Invariant mass $K^+ K^-$:

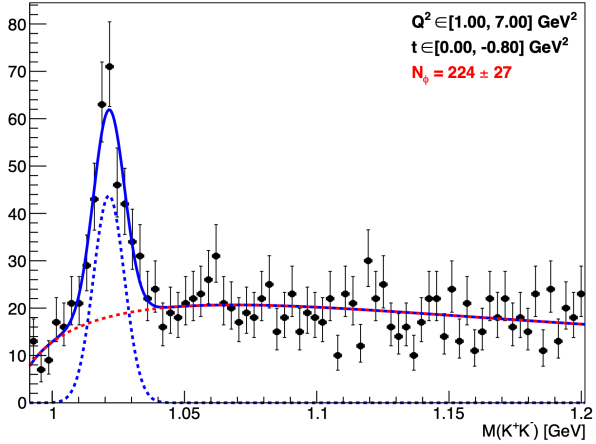


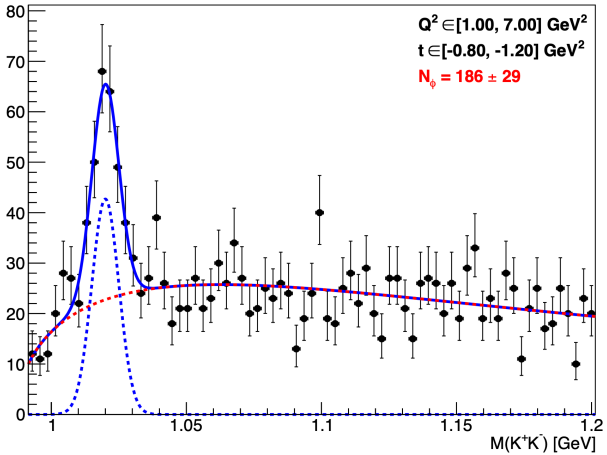
With angle cut, K+ K- in FD, and cut on MissingMass

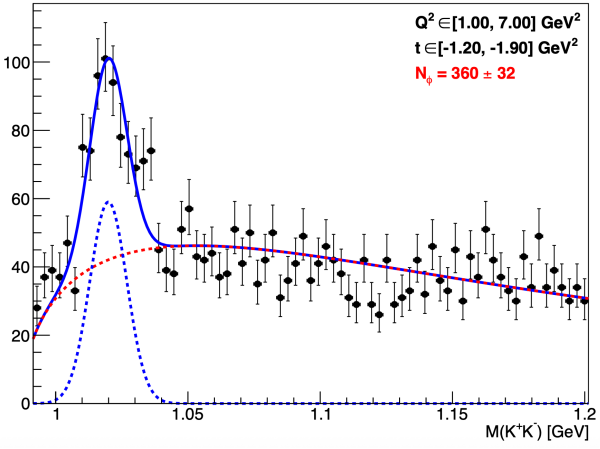


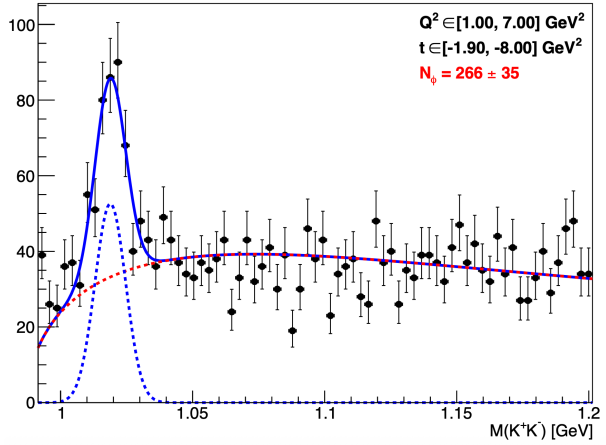
Fit all fall2019 outbending data

Invariant mass $K^+ K^-$: Fit per bins









Conclusion

Next steps :

- Improve fits for signal and background
- Evaluate the acceptance
- Run the code with the other data set

Thanks!