RGA meeting

ϕ electroproduction analysis : K_s K_L channel

20 Jan 2026

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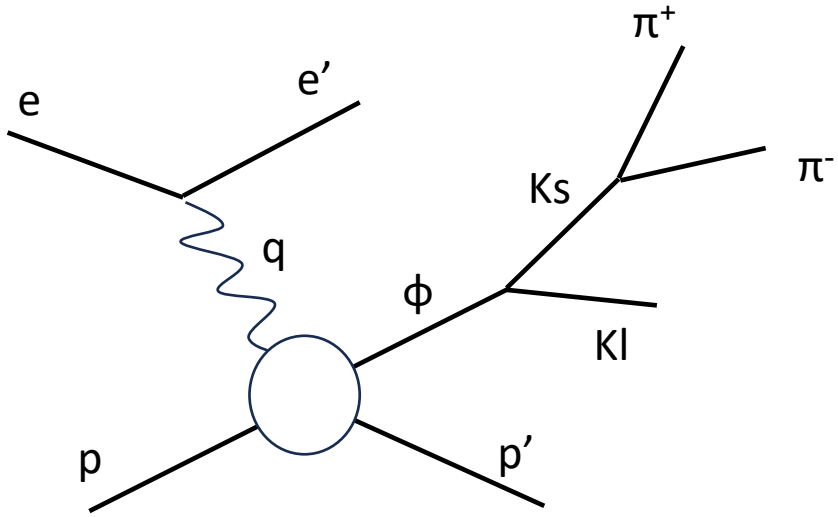
Analysis objective :

- Measurement of the cross section and diferential cross section of the electroproduction of ϕ in the K_s K_L channel

- Datas : nSidis RG-A inbending and outbending fall 2018 + spring 2019



General informations

Datas :

nSidis Rg-A datas : fall2018 inbending
& outbending

Cuts :

→ Selection of events with one
e^- , p , π^+ and π^- in the final state. $\pi^+ \pi^-$ in FD.

→ Cut on invariant mass of $\pi^+\pi^-$ with
$0.4 < M_{inv}(\pi^+\pi^-) < 0.6$ GeV.

→ Cut on Missing Mass in the reaction
e p → e' p' K_s X with $0.4 < M_{issMass} < 0.6$ GeV.

Correction on π^+ π^- vertex :

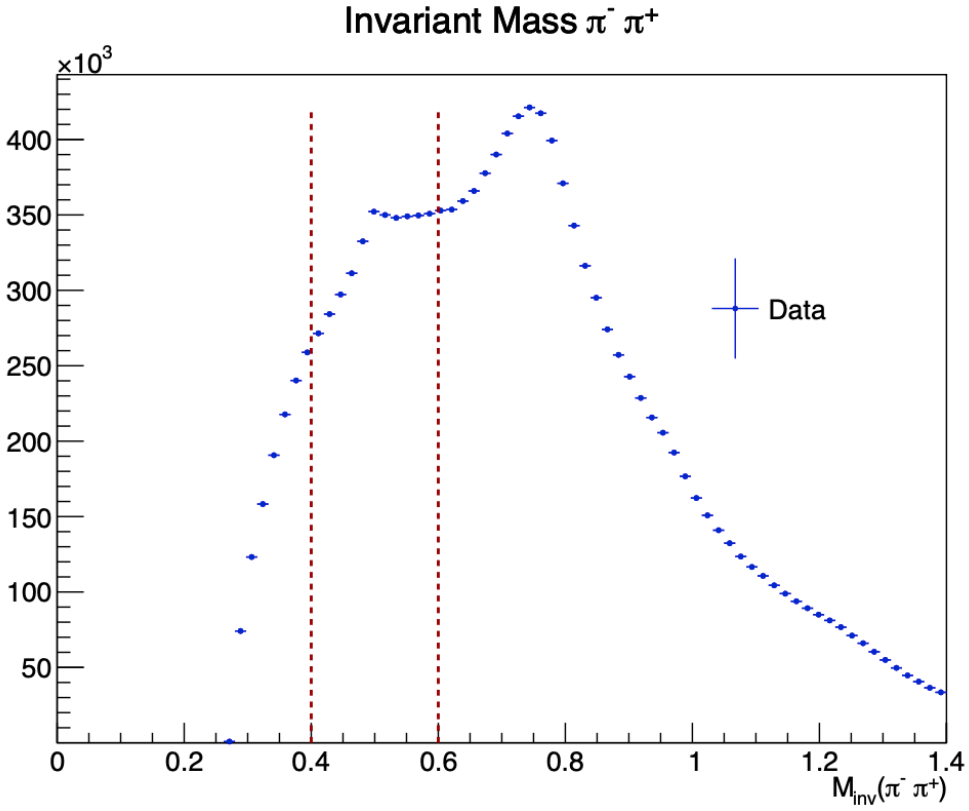
Vertex of π^+ π^- are recalculated with the code of Veronique Ziegler

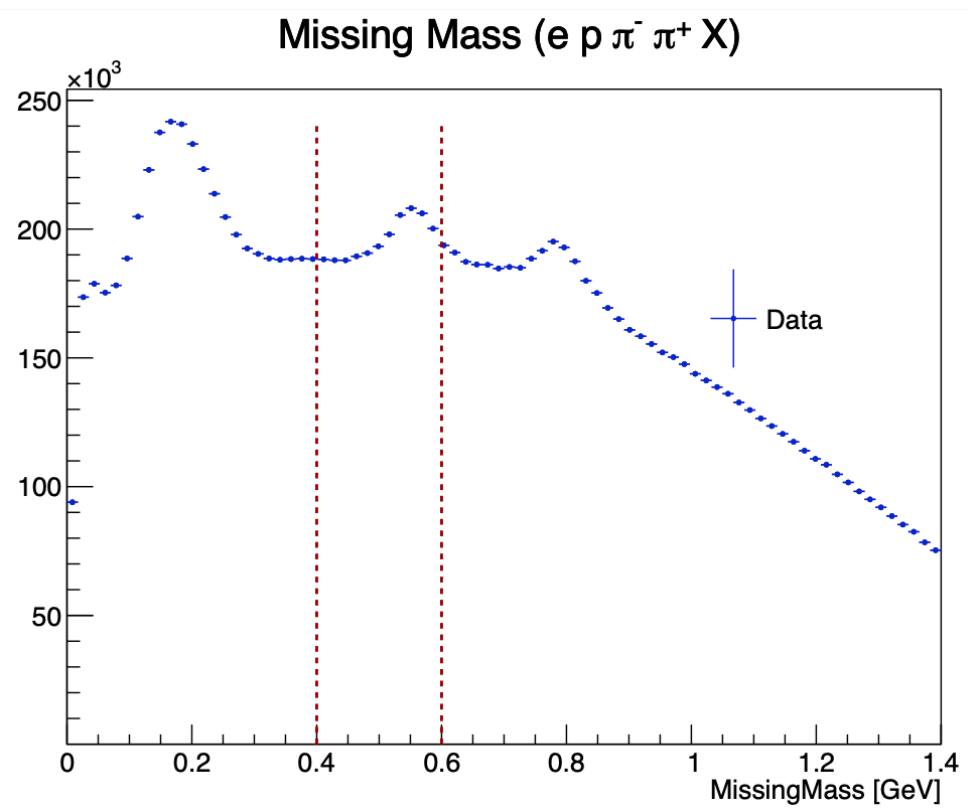
Add some cut on :

→ Distance between vertex of π^+ π^- < 3.5 cm

→ Distance between vertex Ks and e^- :
1.5 < Dist < 7.0 cm
because $c\tau_{Ks}$ = 2.68 cm

Details of cuts on datas





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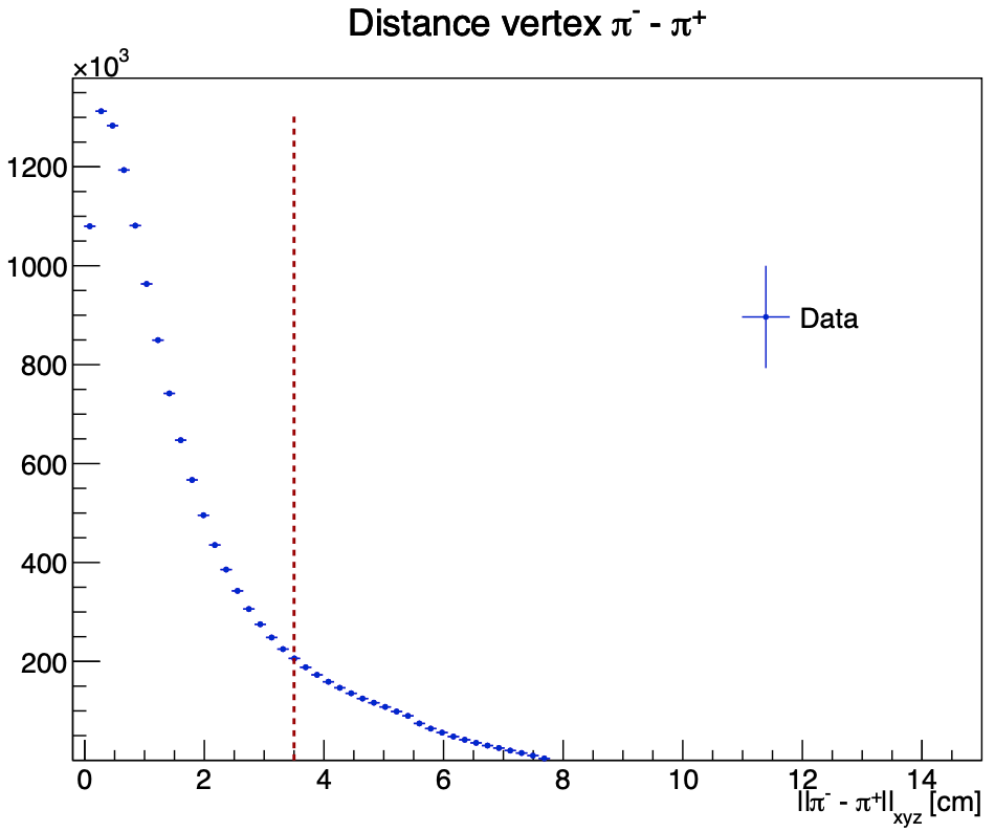
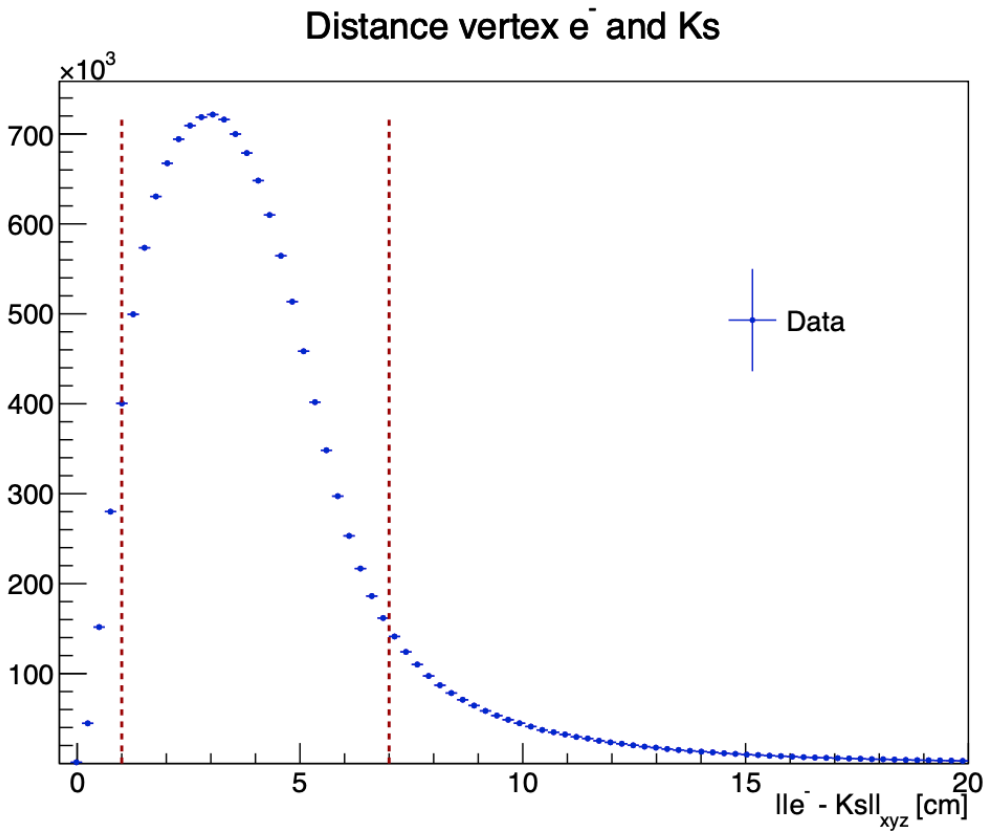
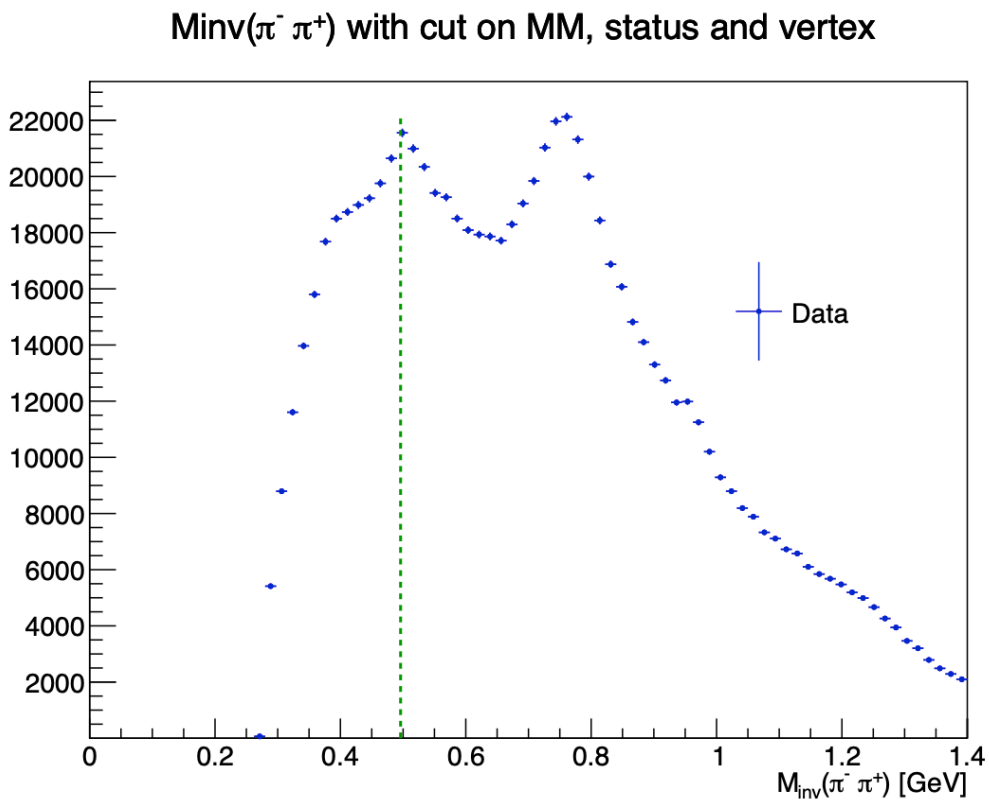
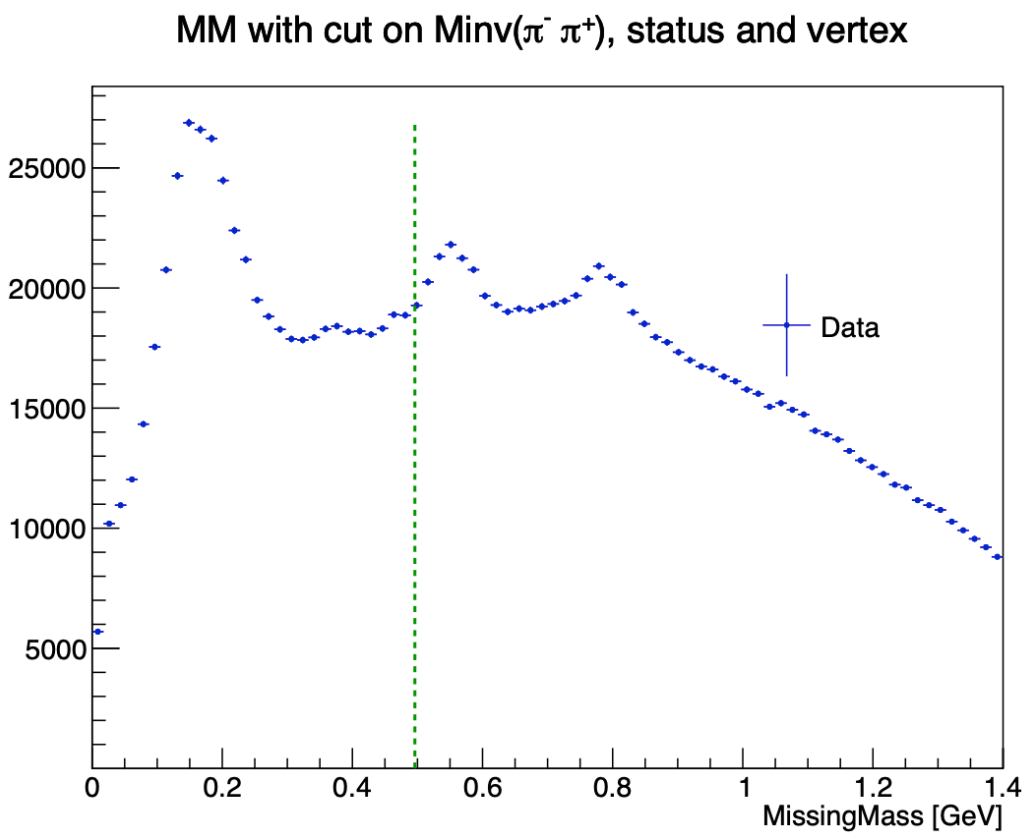


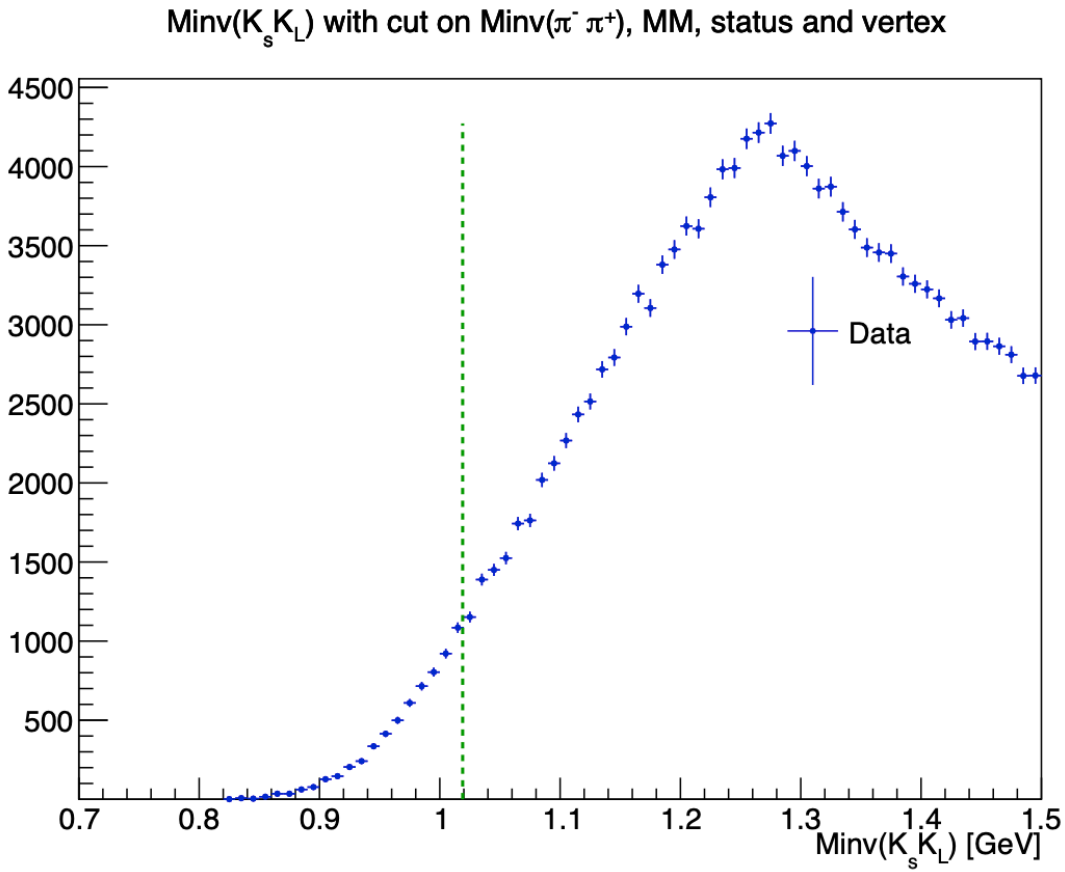


Influence of cuts on datas





Influence of cuts on datas



Simulation Monte Carlo : ϕ generator

$$weight_{PhaseSpace} = |Q^2_{max} - Q^2_{min}| * |xb_{max} - xb_{min}| * |t_{max} - t_{min}|$$

$$\frac{d^3\sigma}{dQ^2 dx_B dt}$$ *From Proposal to Jefferson Lab PAC39 Exclusive Phi Meson Electroproduction with CLAS12*

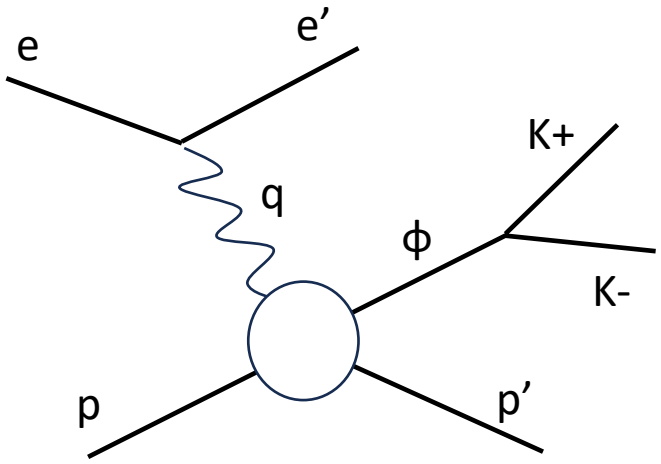
Branching ratio Ks → π^+ π^- = 69%

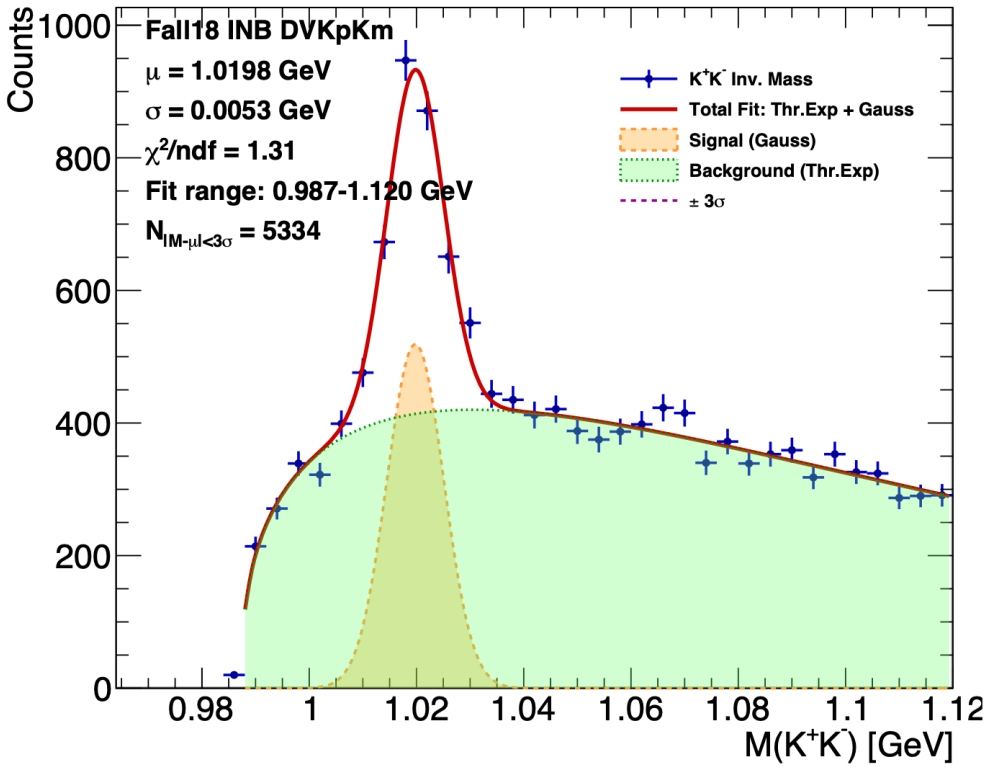
Branching ratio ϕ → Ks Kl = 34%

$$totalweight = weight_{PhaseSpace} * weight_{crosssection} * BR_{KsKl} * BR_{\pi^+\pi^-}$$

Simulation Monte Carlo : Validation with ϕ → K+ K-

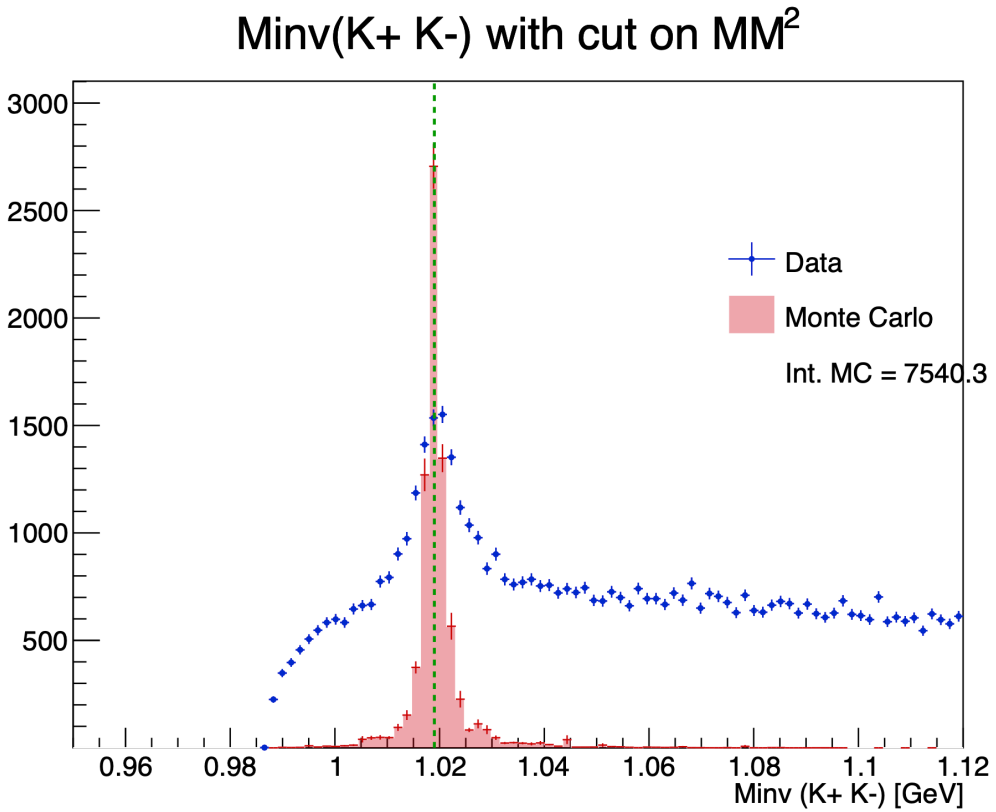
→ Test my Monte Carlo with a ϕ electroproduction channel wich there is a signal : ϕ → K+ K-

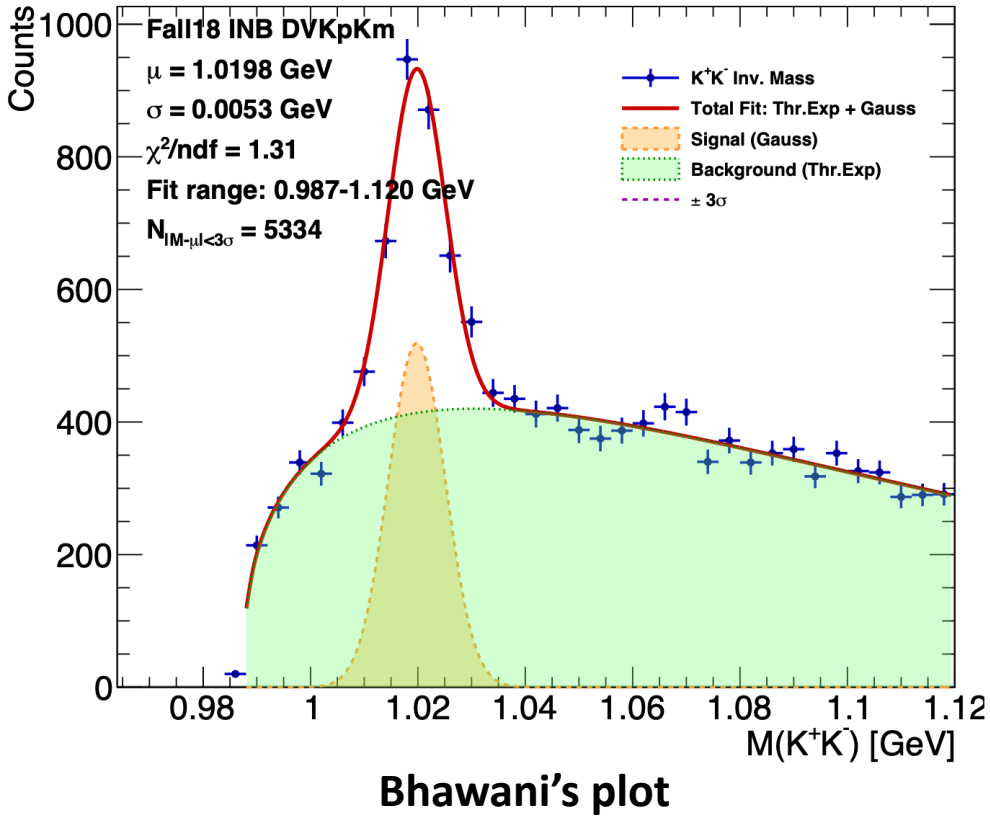




Bhawani’s plot

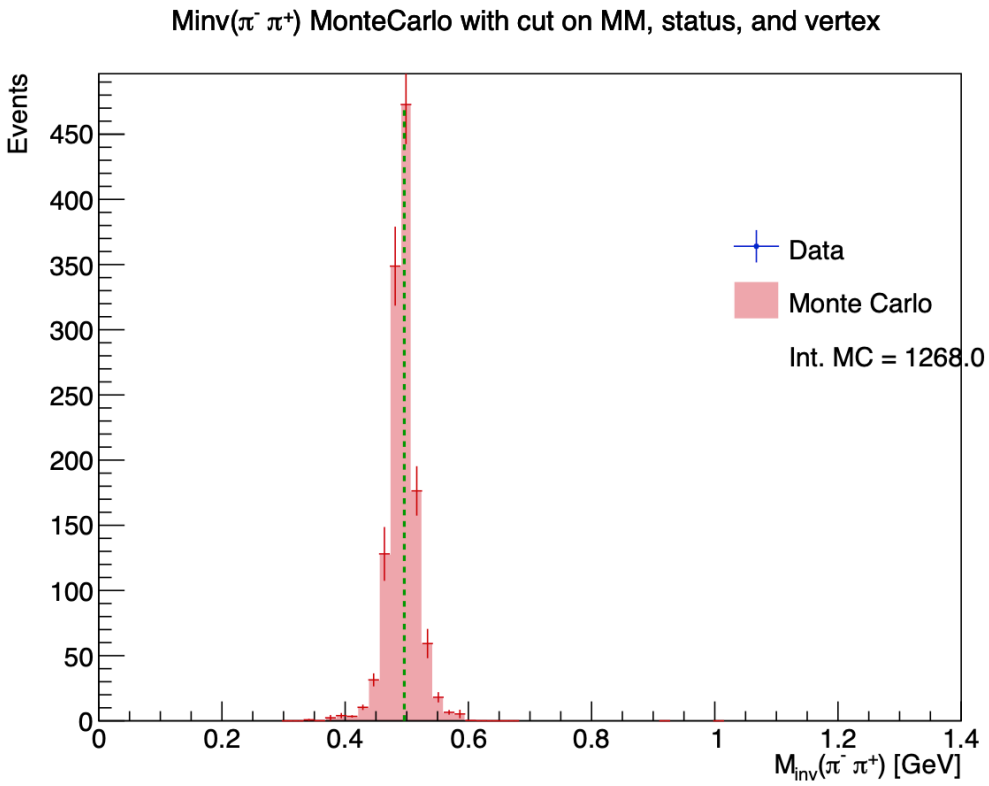
Simulation Monte Carlo : Validation with $\phi \rightarrow K^+ K^-$

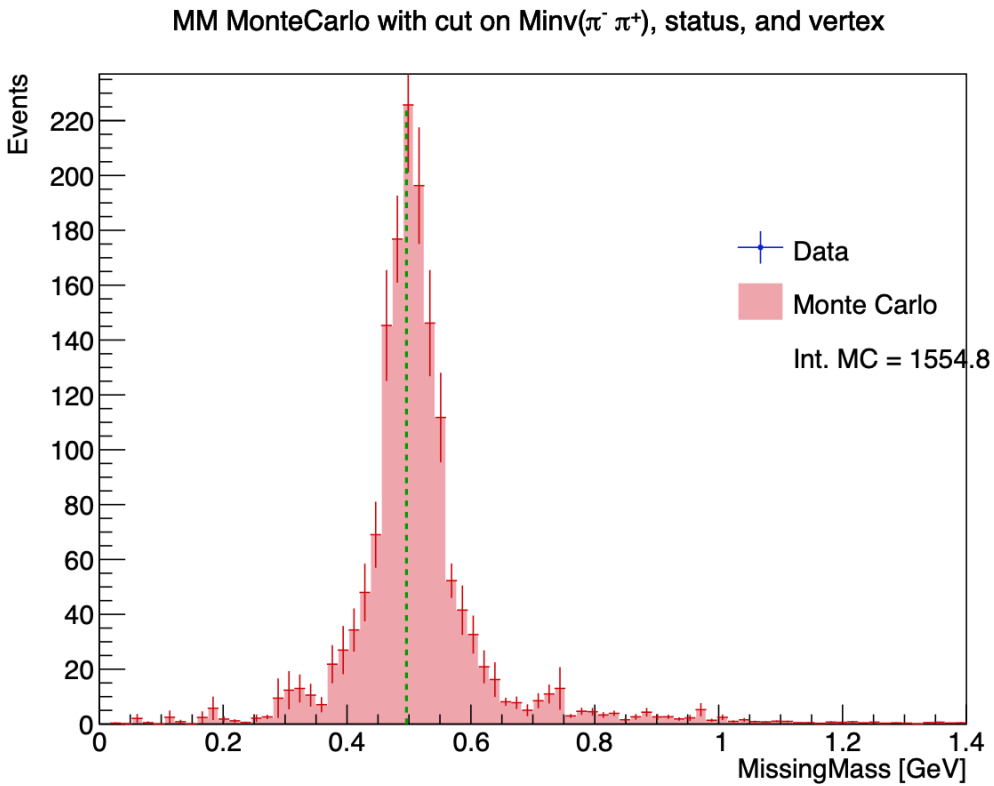




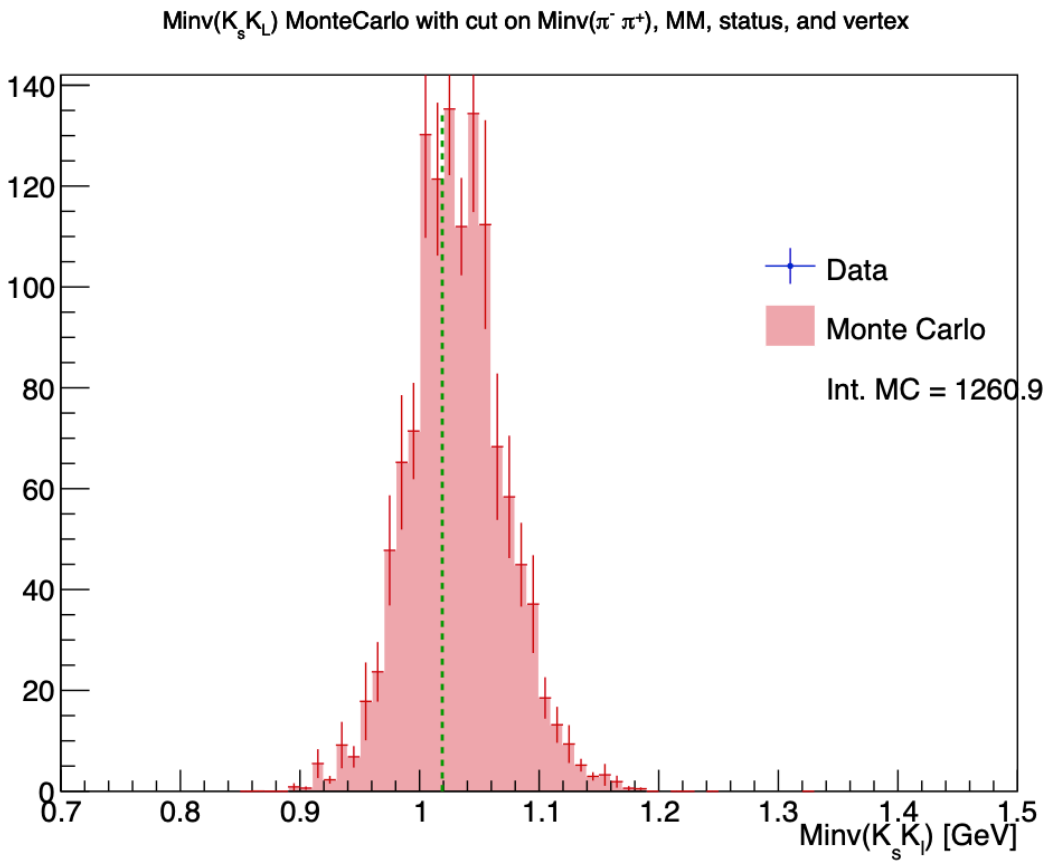
Bhawani's plot

Simulation Monte Carlo : events reconstructed

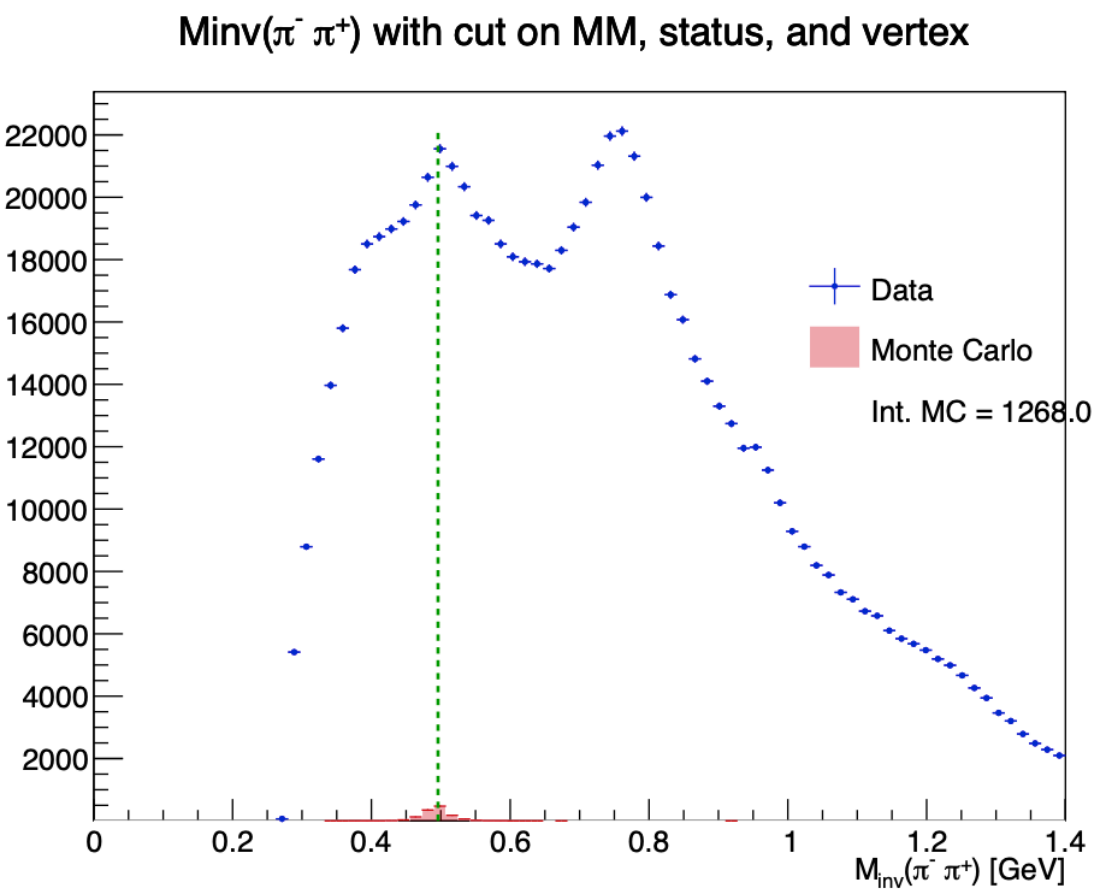


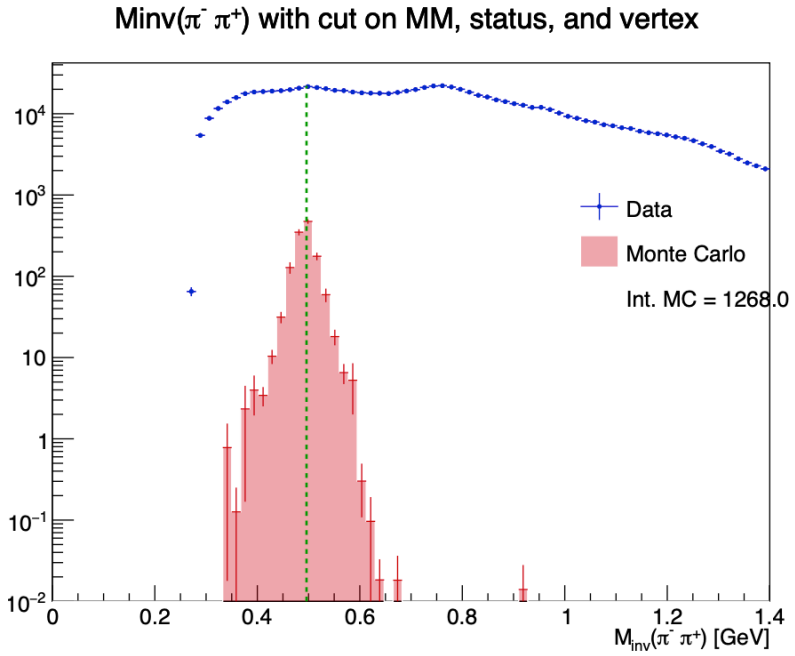


Simulation Monte Carlo : events reconstructed



Simulation Monte Carlo : comparison with datas





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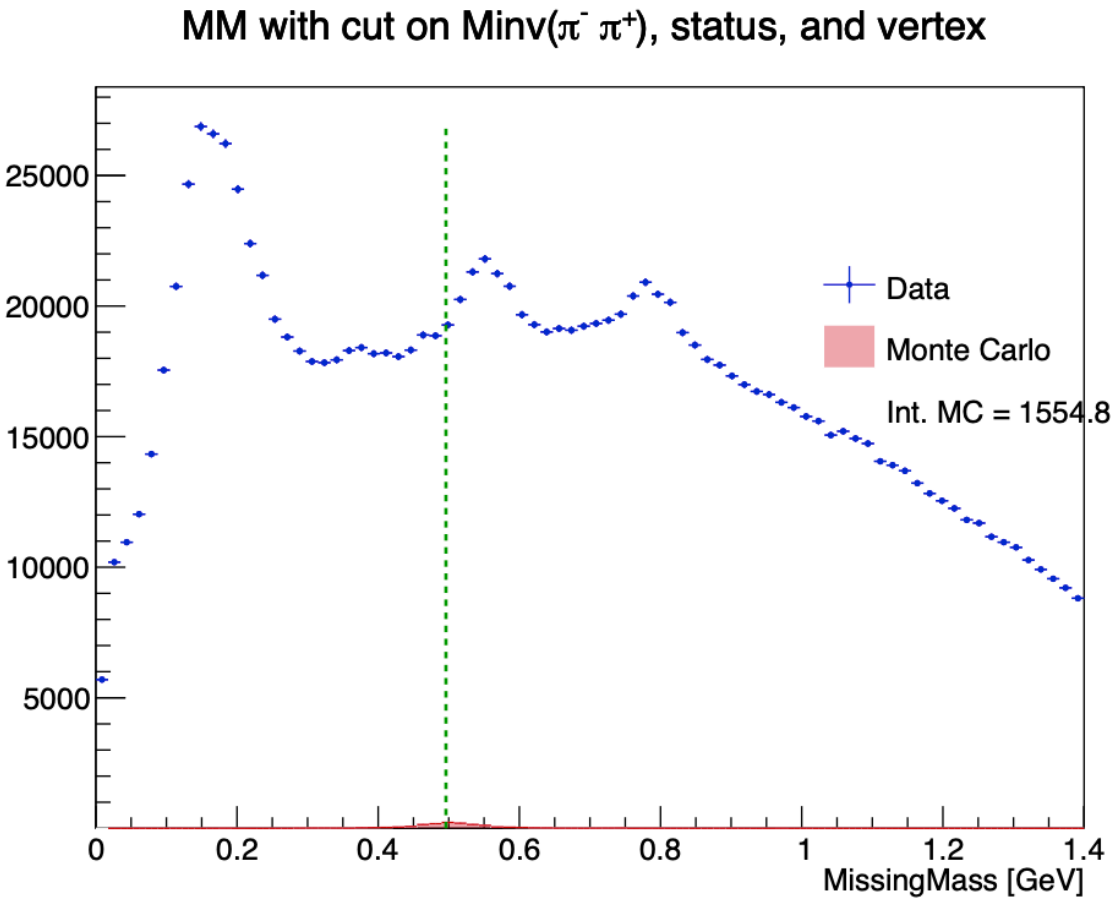
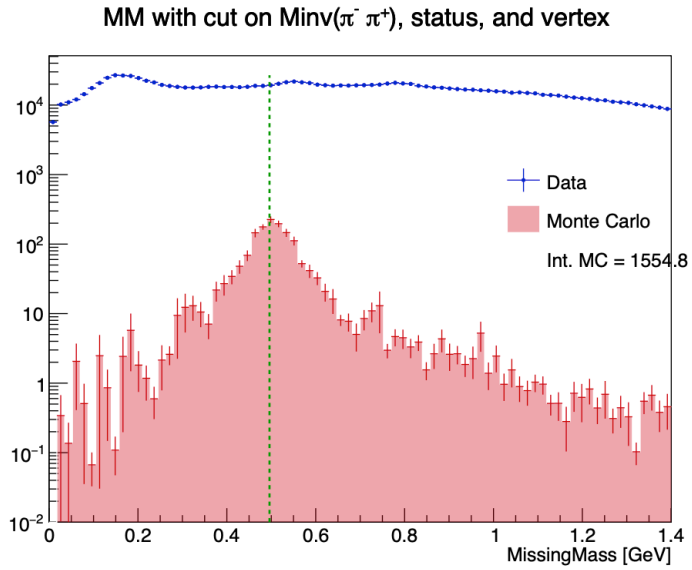
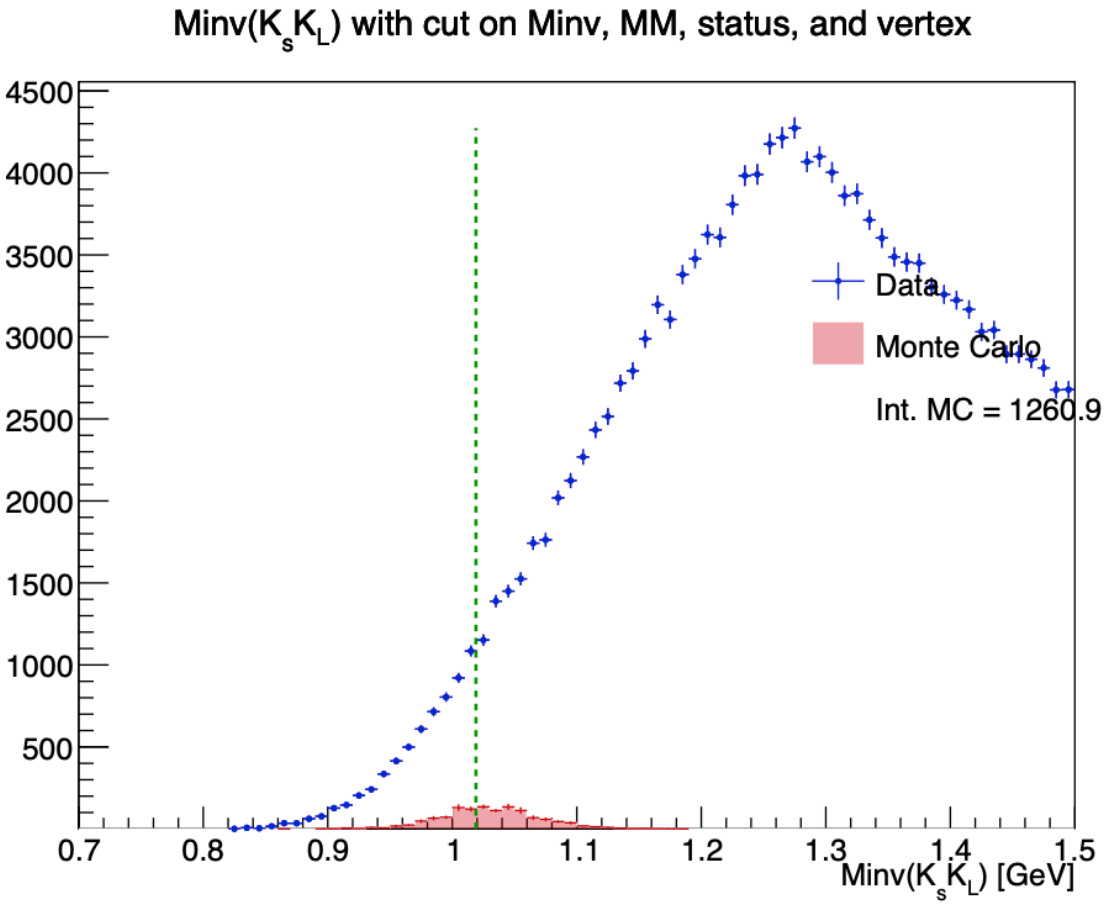
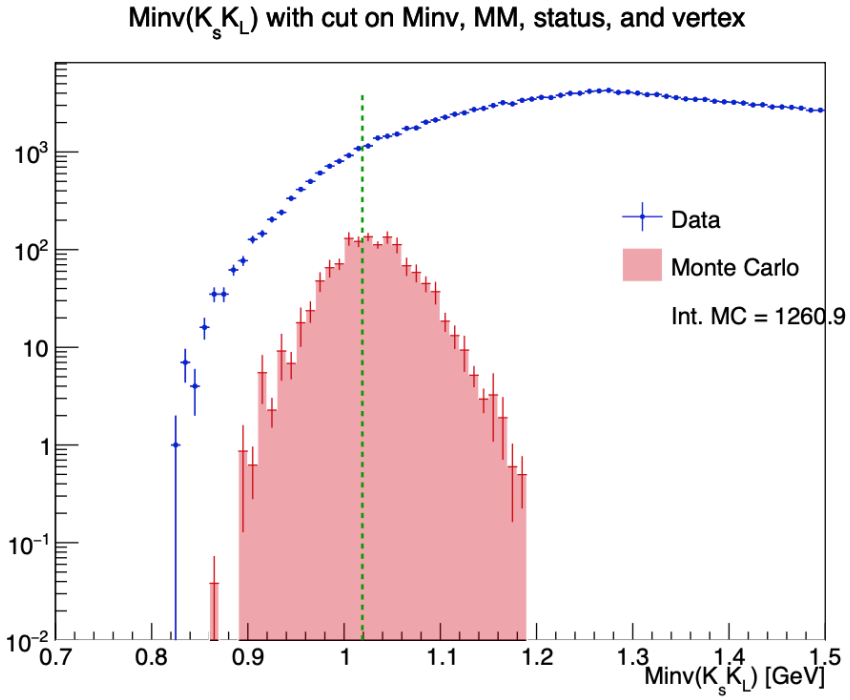


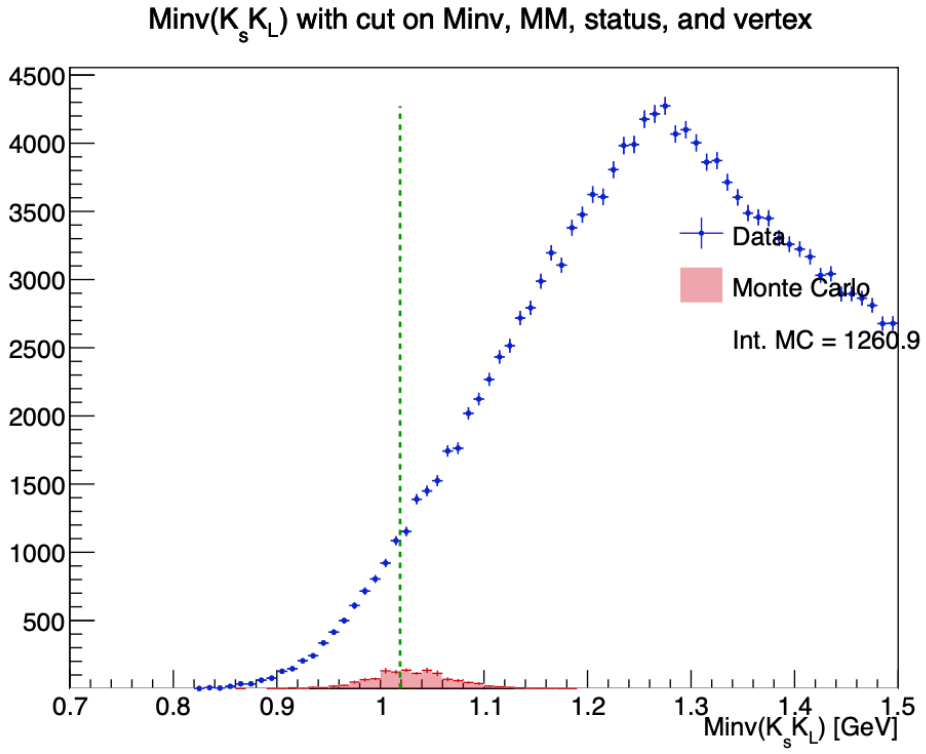


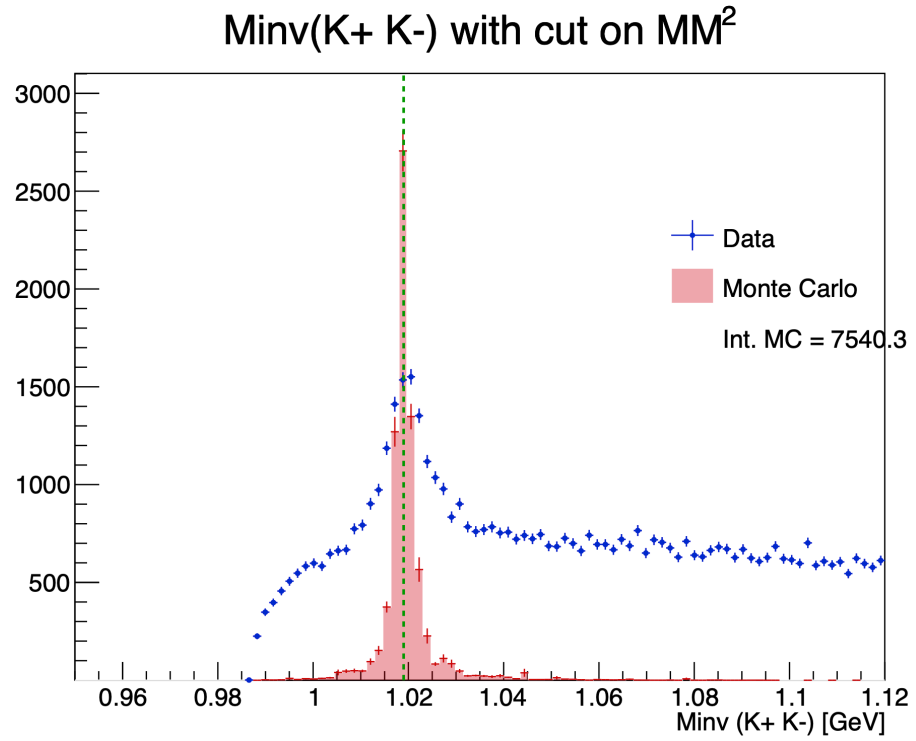
Simulation Monte Carlo : comparison with datas





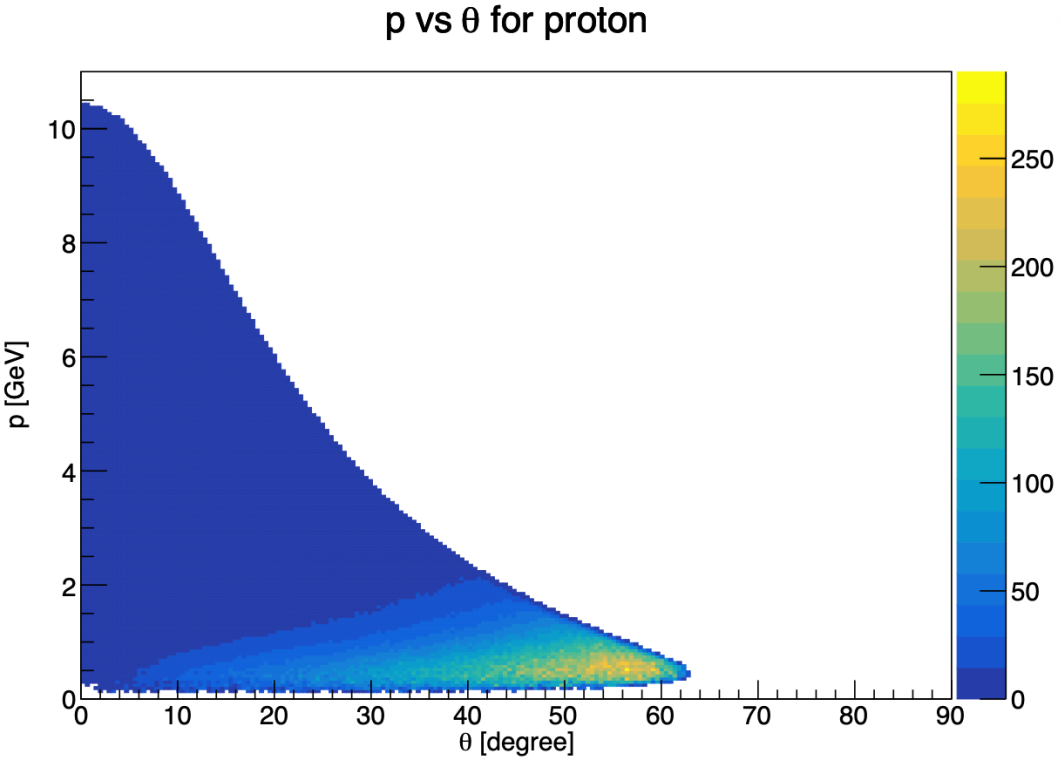
Simulation Monte Carlo : comparison with datas



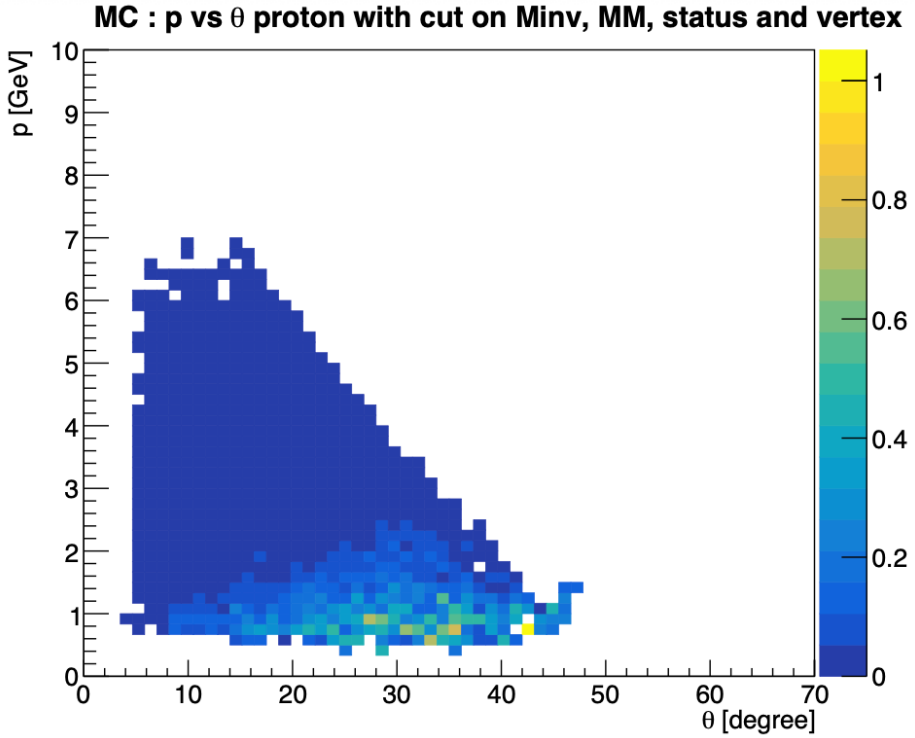


→ MC predicte a problem on acceptance and resolution

Simulation Monte Carlo : comparison generated/reconstructed

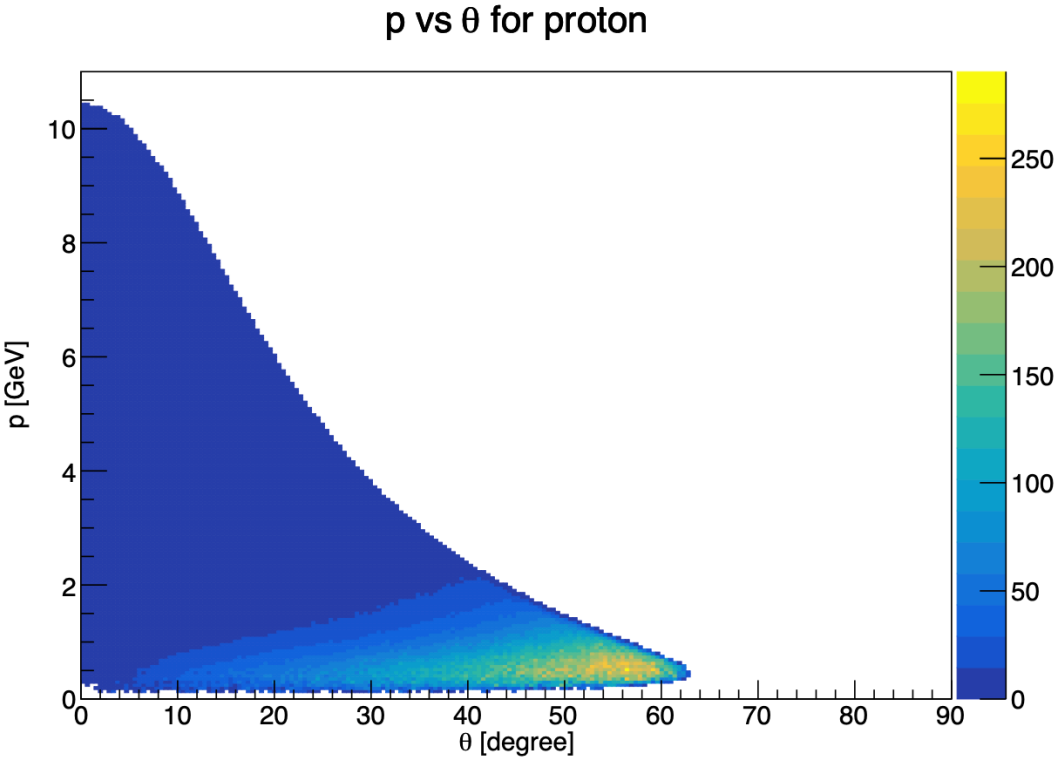


Events generated

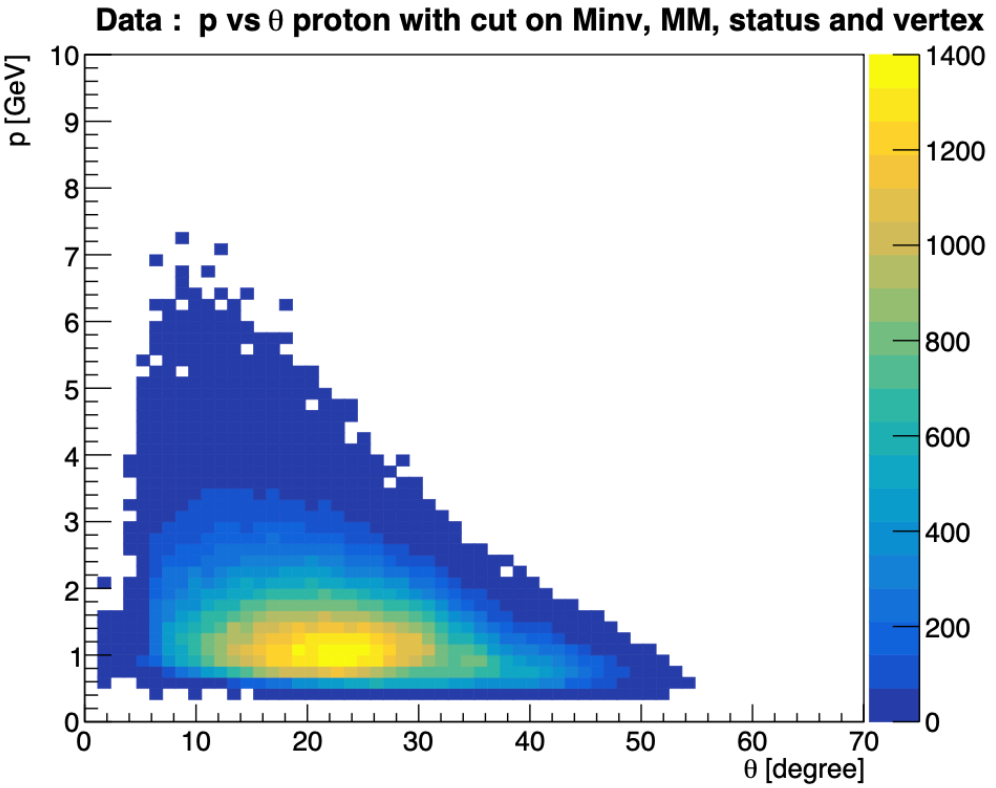


Events MC reconstructed (after cuts)

Simulation Monte Carlo : comparison generated/reconstructed

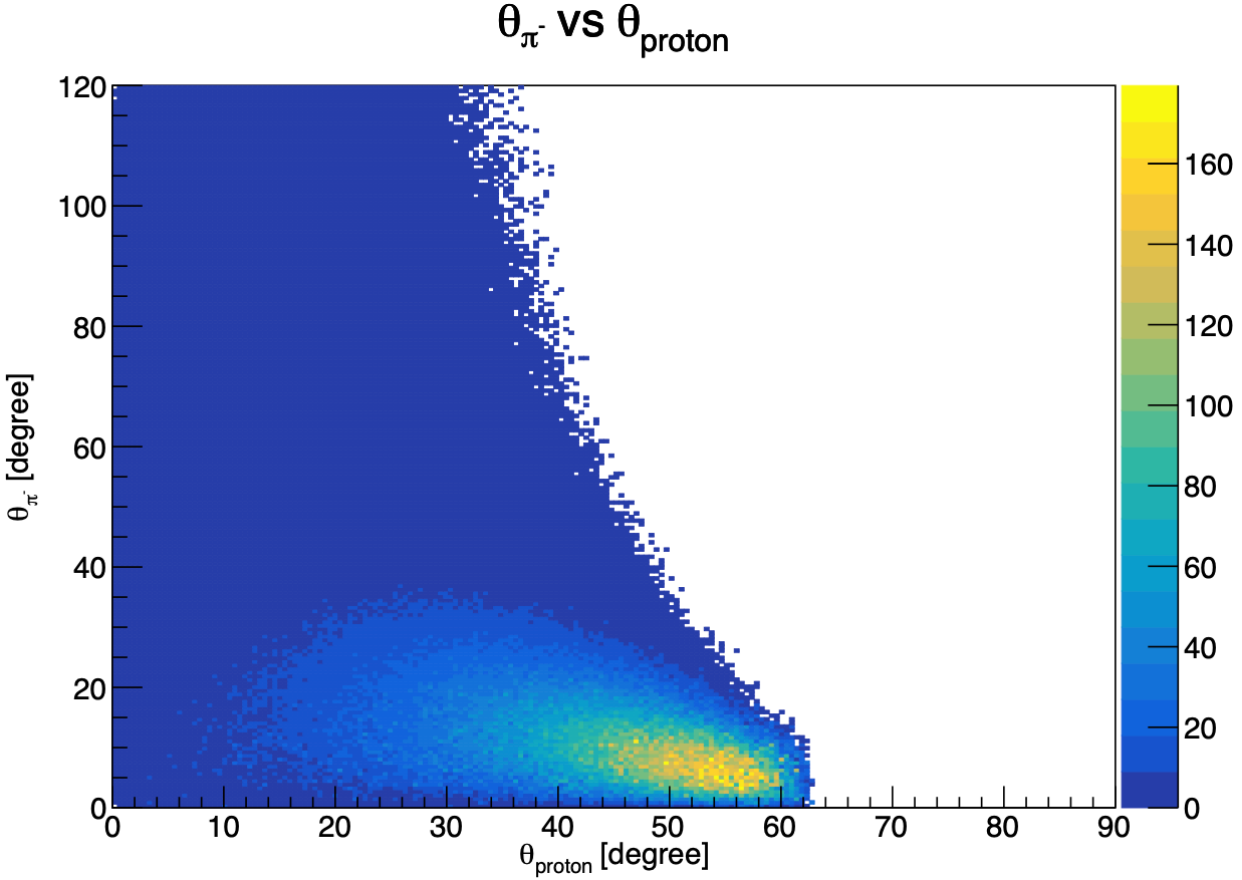


Events generated



Events from data (after cuts)

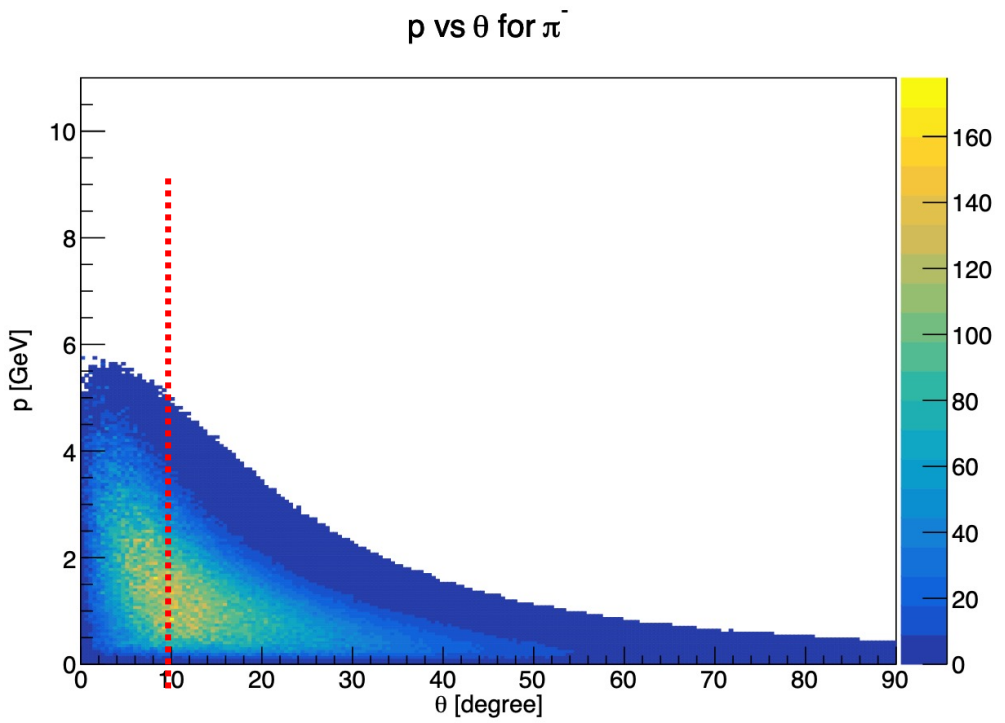
Simulation Monte Carlo : comparison generated/reconstructed

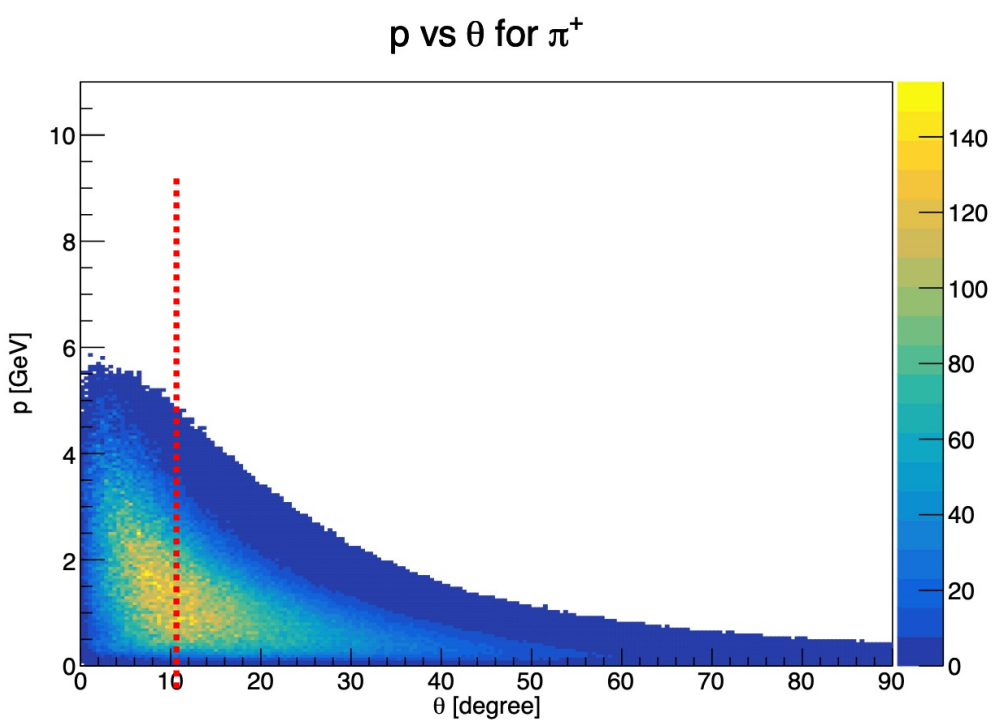


Events generated

(same figure with π^+)

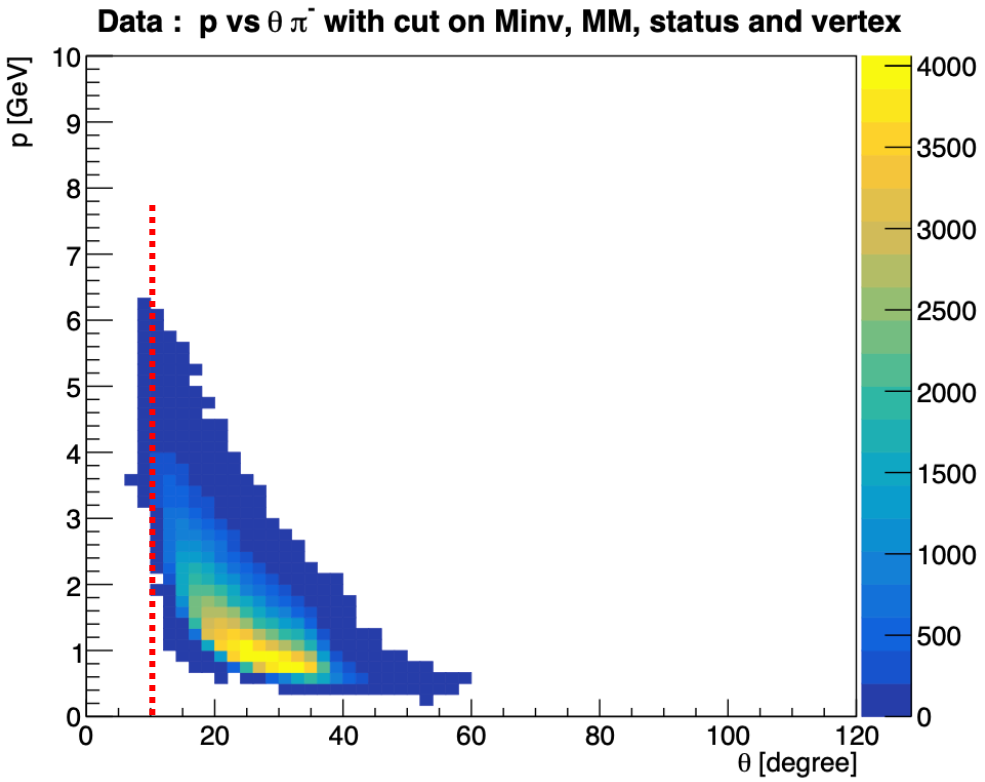
Simulation Monte Carlo : comparison generated/reconstructed

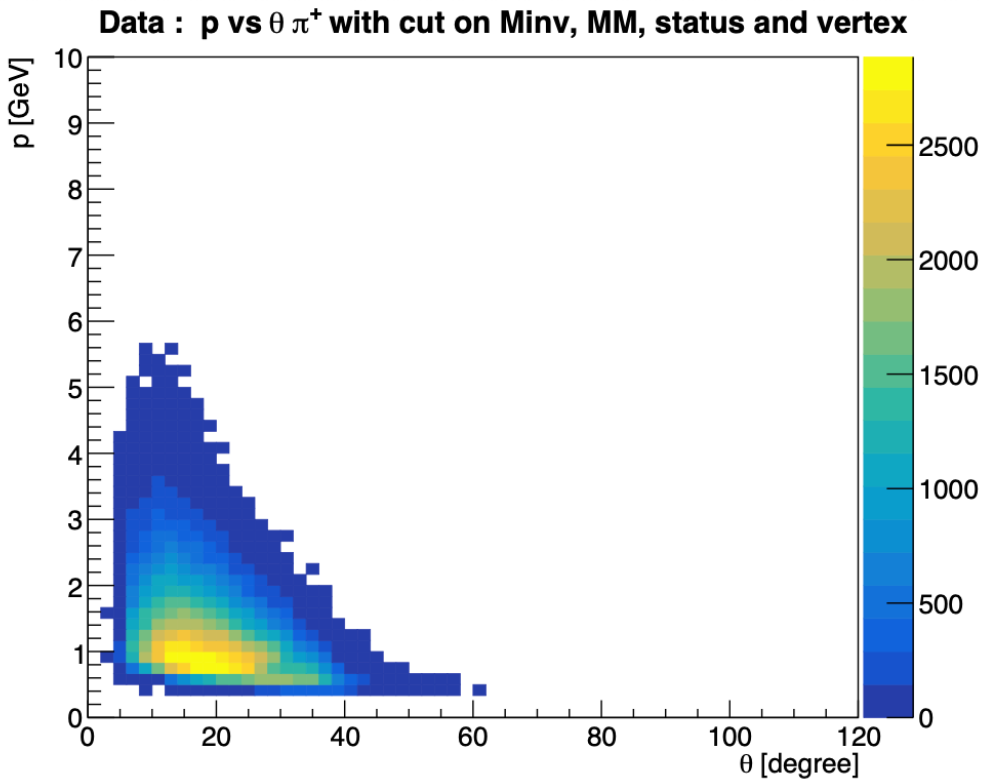




Events generated

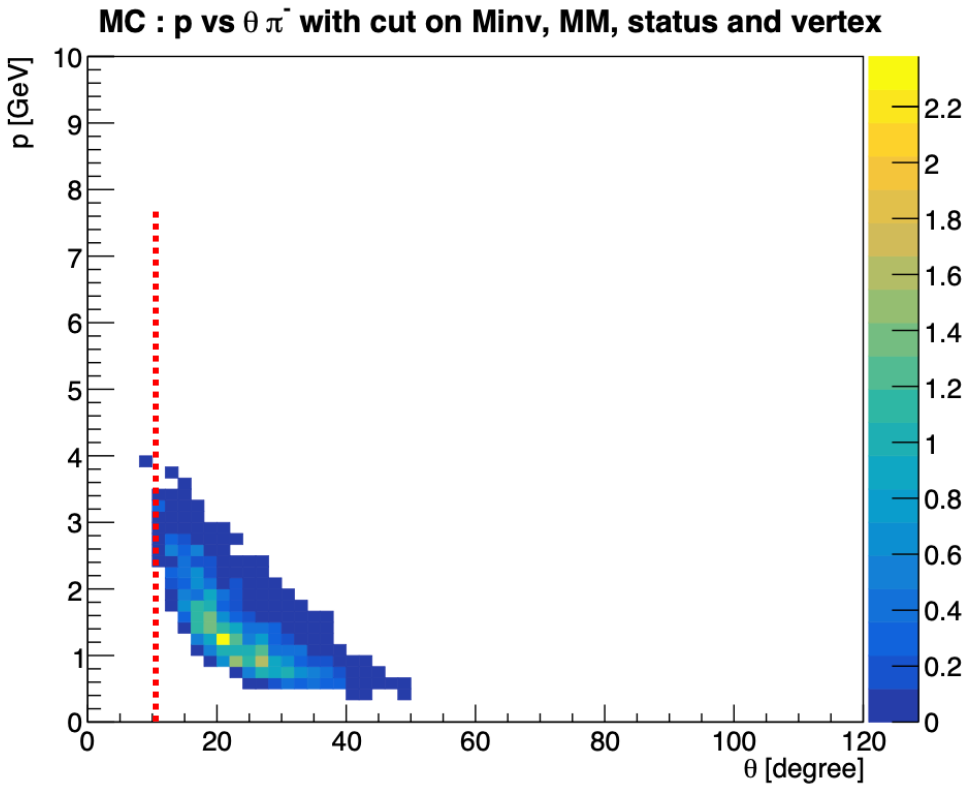
Simulation Monte Carlo : comparison generated/reconstructed

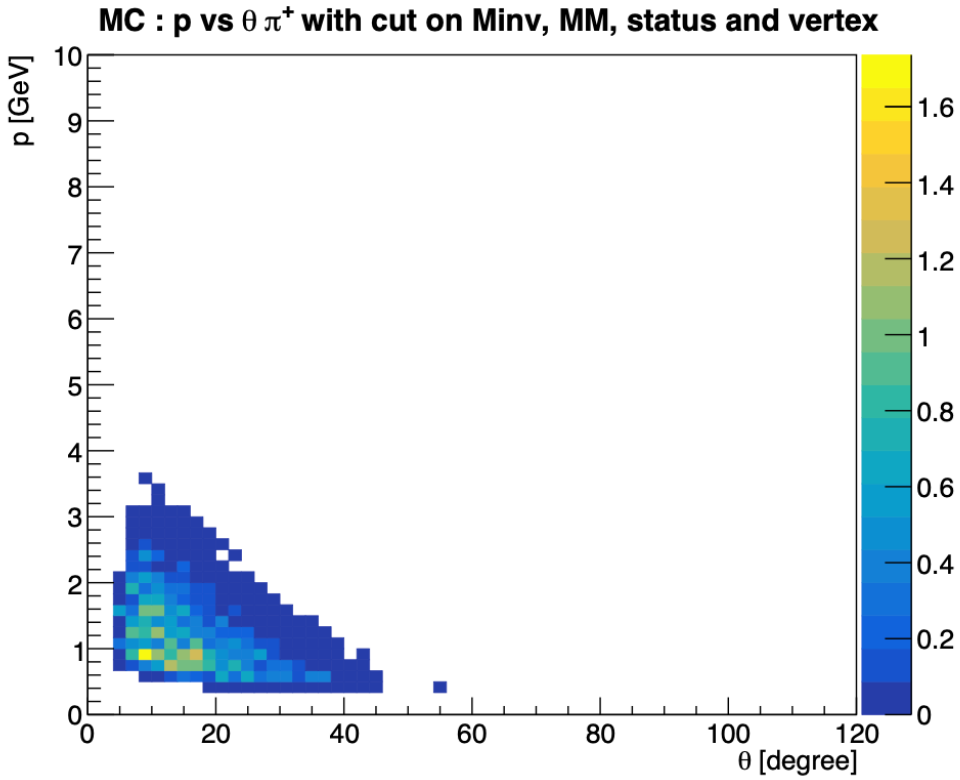




DATA Inbending

Simulation Monte Carlo : comparison generated/reconstructed





MC Inbending

Pions in the FT ?

For inbending : events with 1 proton 1 π^+ and 2 e^-

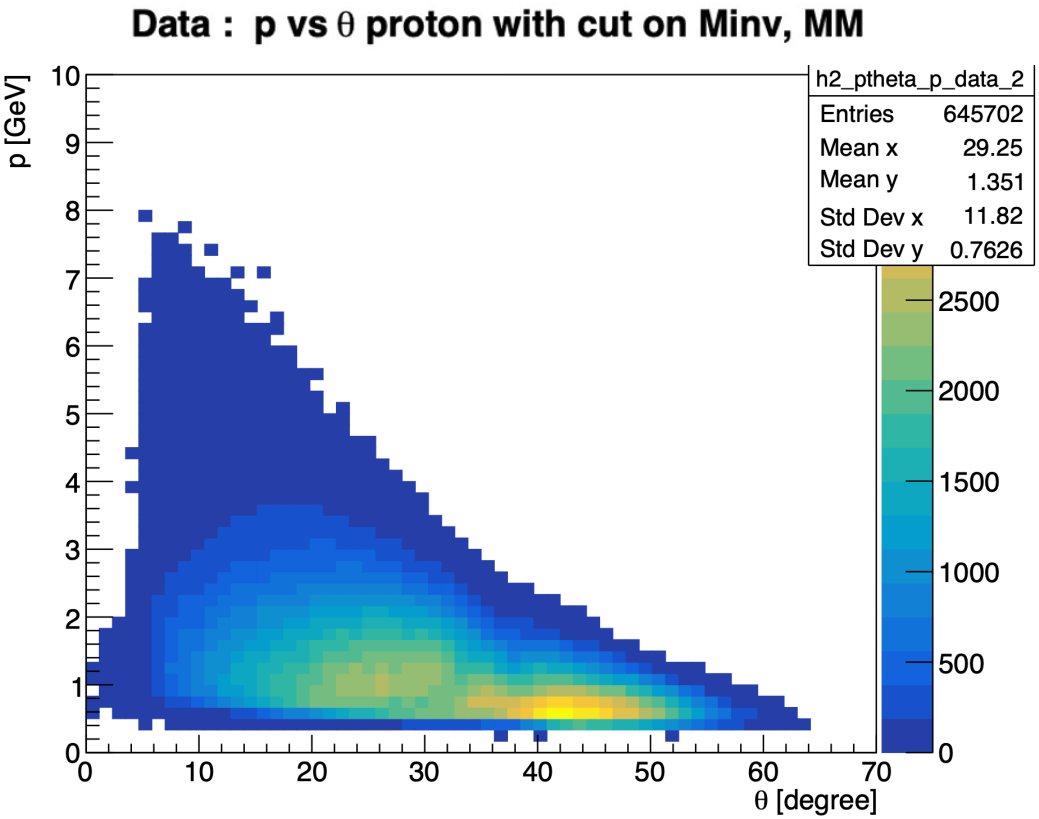
→ one e^- in the FD (real e^-)
→ one e^- in the FT (π^- identified like an e^-)

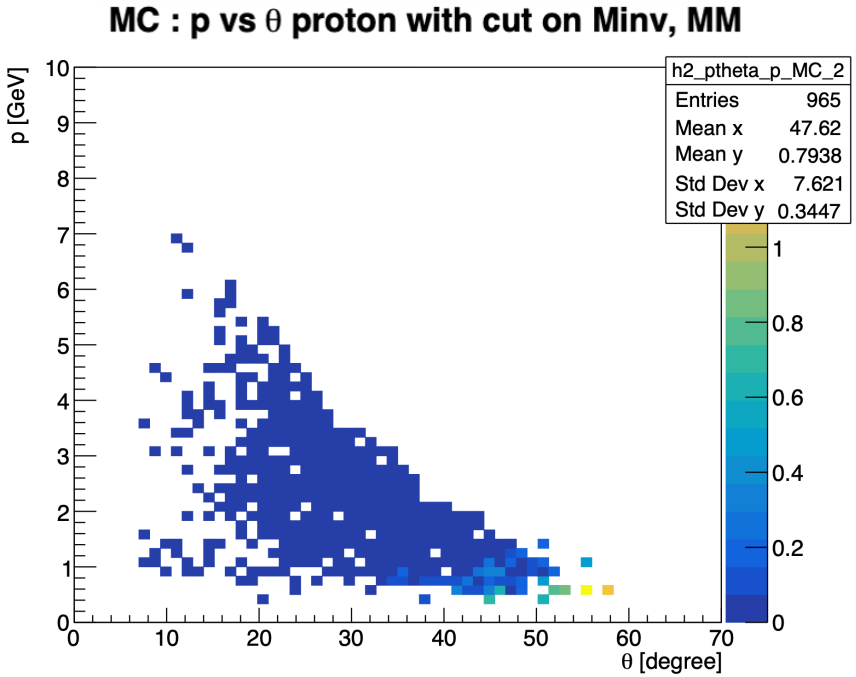
For outbending : events with 1 proton 1 π^- and 2 e^-

→ one e^- in the FD (real e^-)
→ one e^- in the FT (π^+ identified like an e^-)

No correction with veronique zigler code
→ no cuts on vertex

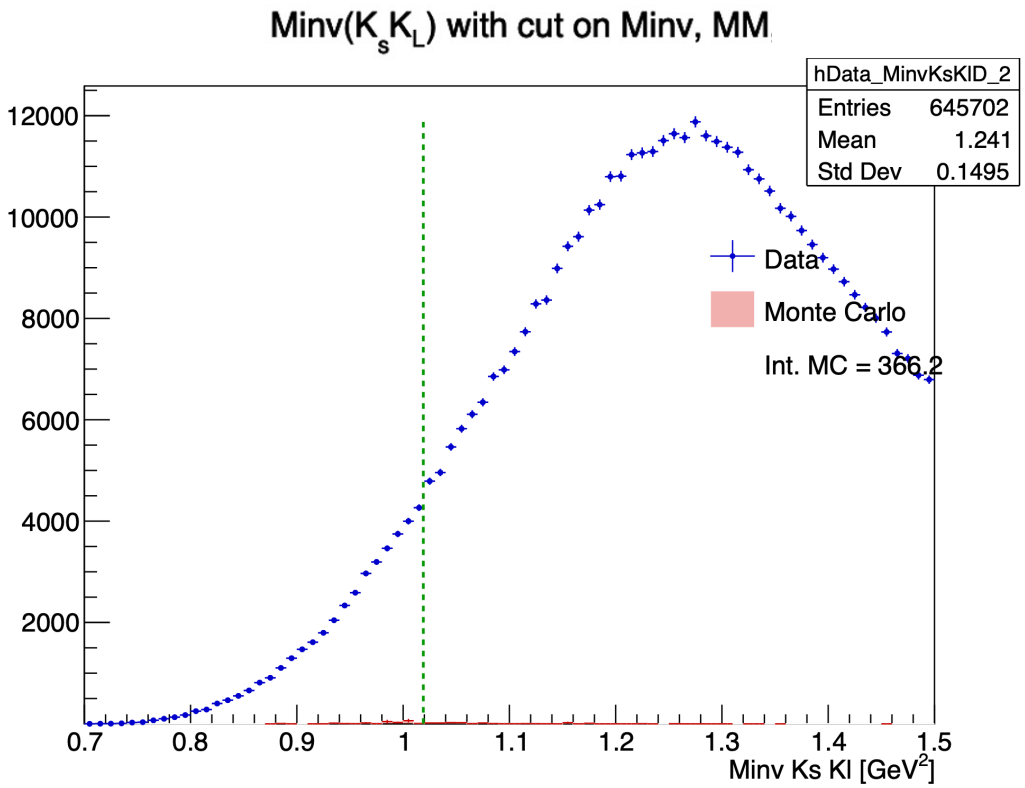
Pions in the FT ?

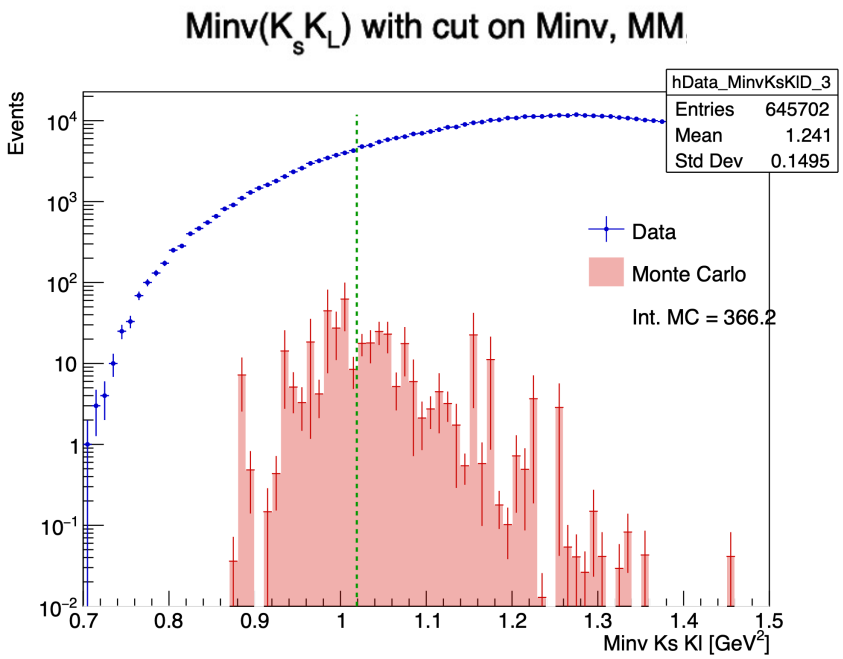




inbending

Pions in the FT ?





inbending

Conclusion

Conclusion :

We don’t see signal in Ks Kl channel because of problems on pions acceptance and process resolution.

→ For the resolution : we can develop a kinematic fitter ?

→ For the acceptance : we try to detect pions in the FT but we have very poor efficiency (maybe because pions don’t depose energy in the FT calorimeter so they are no detected)

Thanks!