

χ_2 production at ILC - $\chi_2 \rightarrow \mu\mu\chi_1$

Start up of the analysis

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Outline

- Description of the kinematics of the signal
- Backgrounds (first look)
- Full detector simulation
- Reconstruction chain

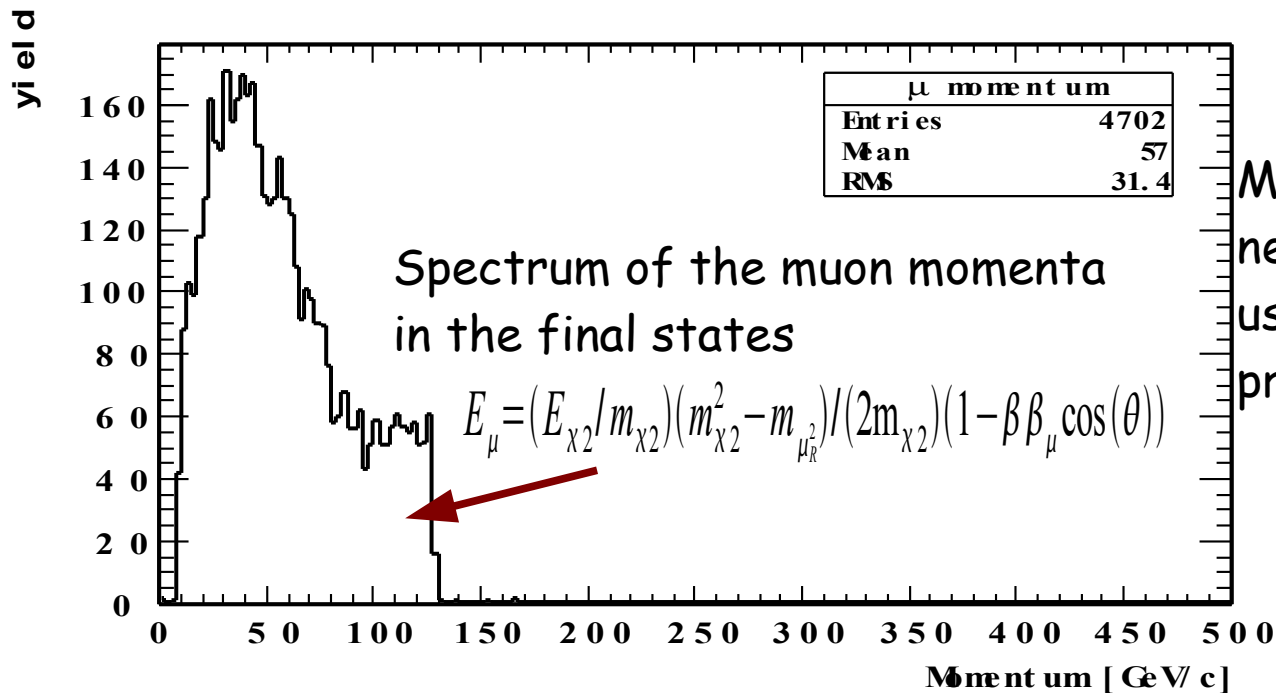
The signal process

$$e^+ e^- \rightarrow \chi_1 \chi_2 \quad 188.1 \text{ fb}$$

$$\chi_2 \rightarrow \mu_R \mu, e_R e \quad 2.5\% \text{ B.R.}$$

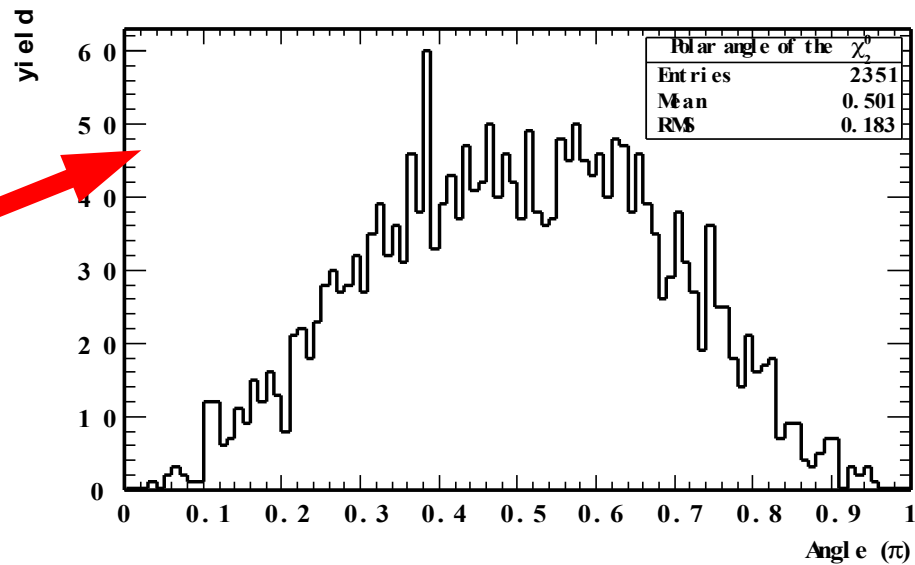
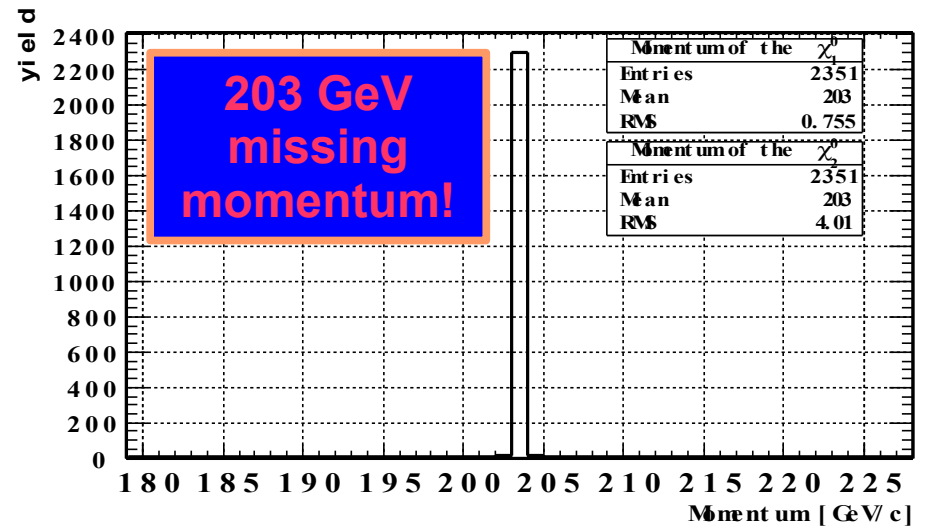
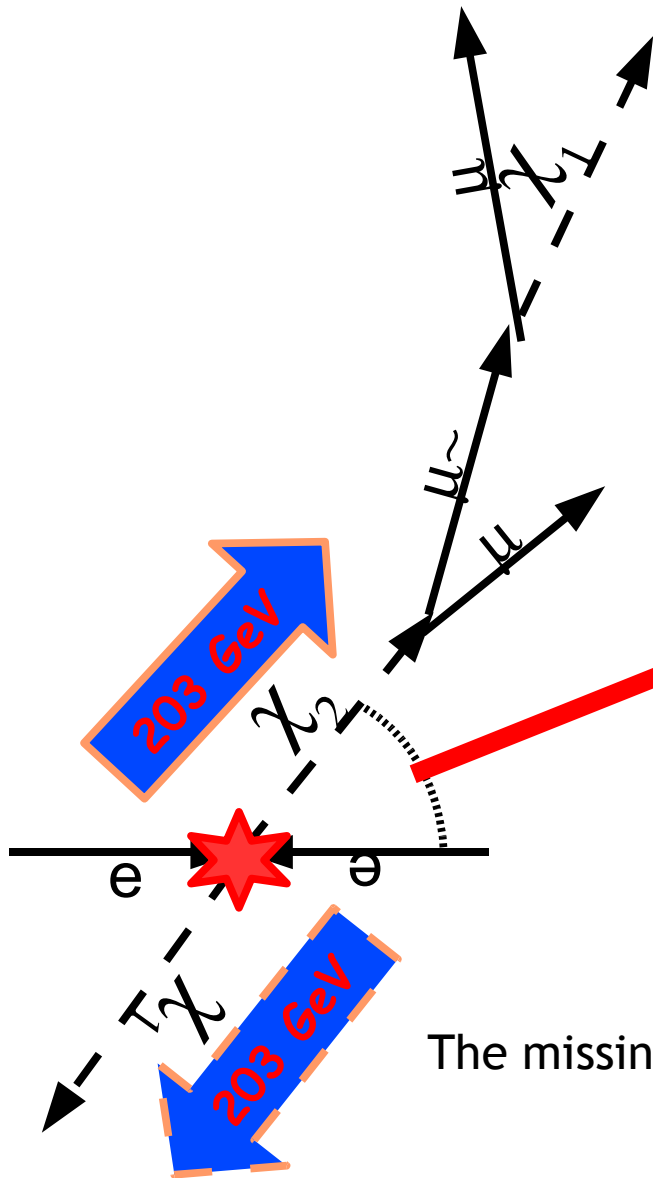
$$\chi_2 \rightarrow \tau_1 \tau \quad 58\% \text{ B.R.}$$

2351 events expected at 500fb^{-1}



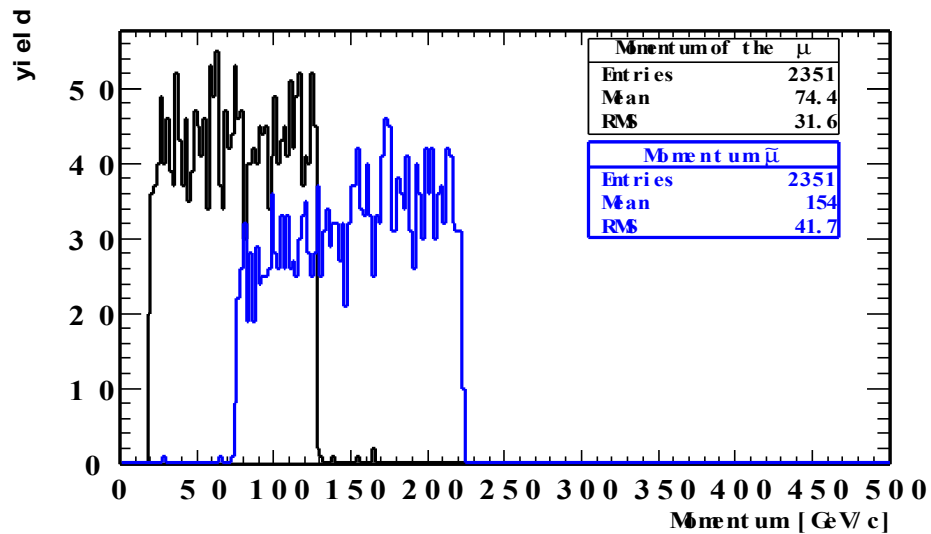
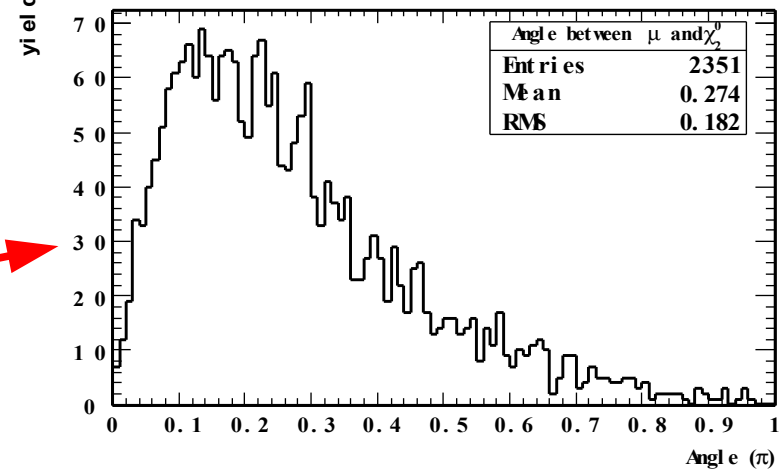
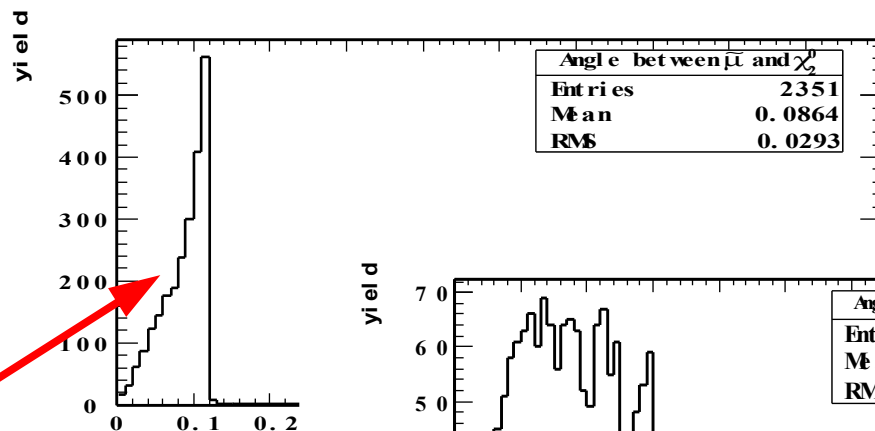
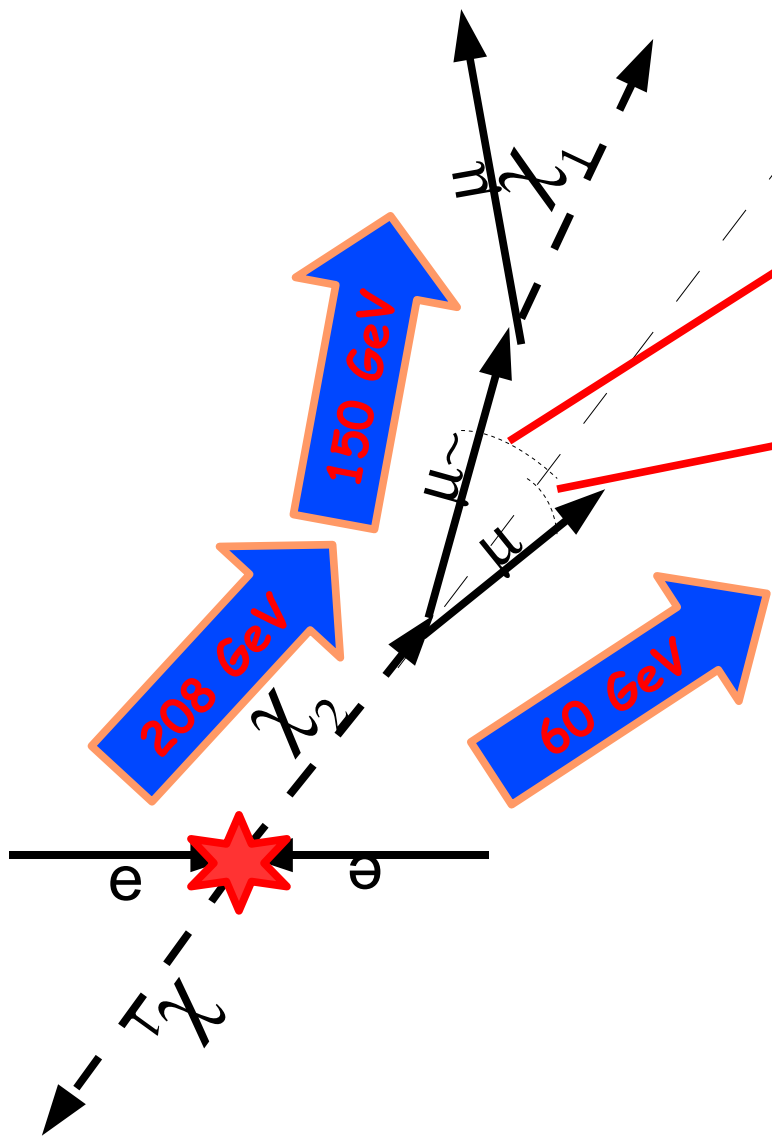
Measurement of the mass of the neutralino2 with good accuracy using the threshold method, providing all the other parameters

Signal kinematics: $\chi_2\chi_1$ production

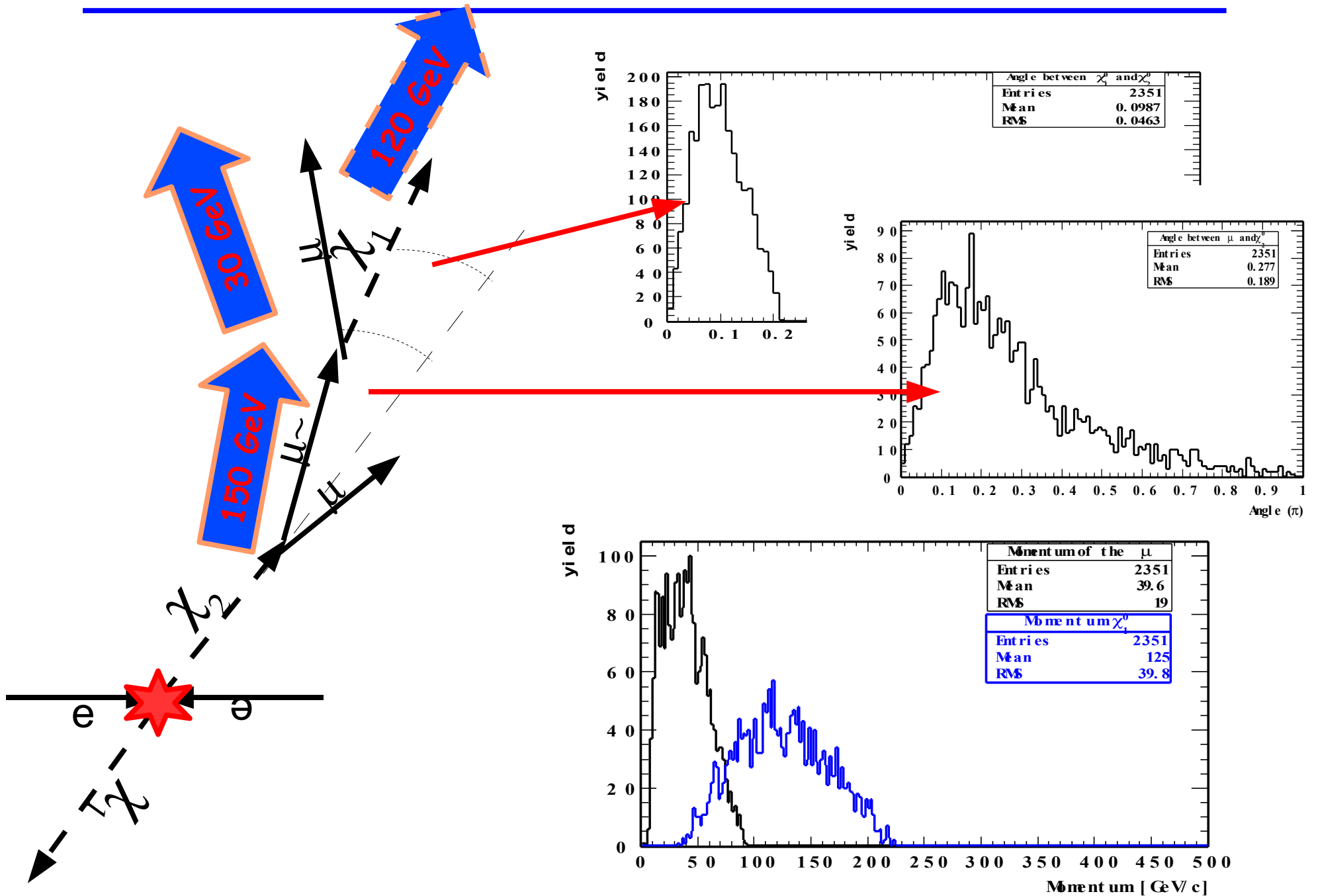


The missing momentum is directed mainly into the barrel.

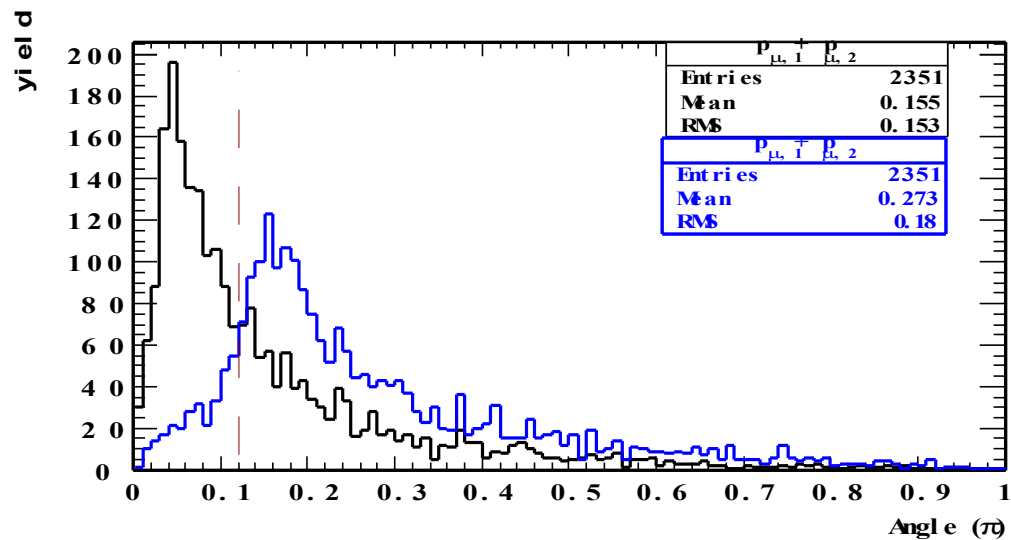
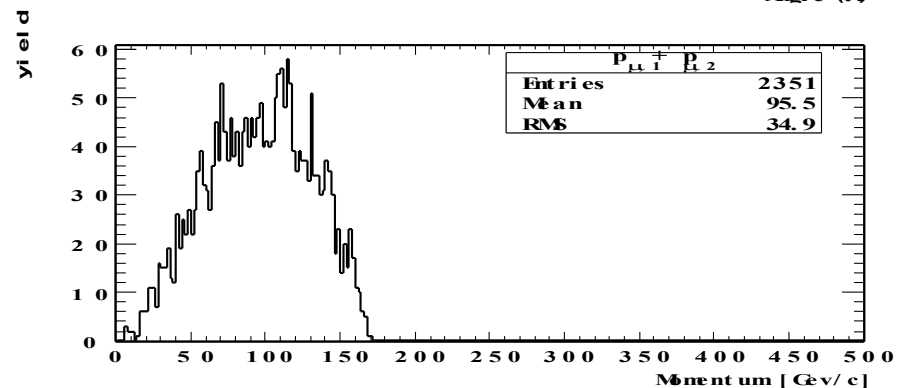
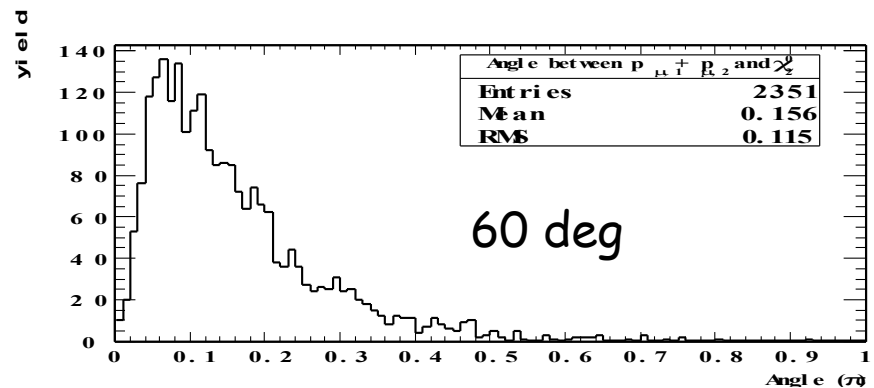
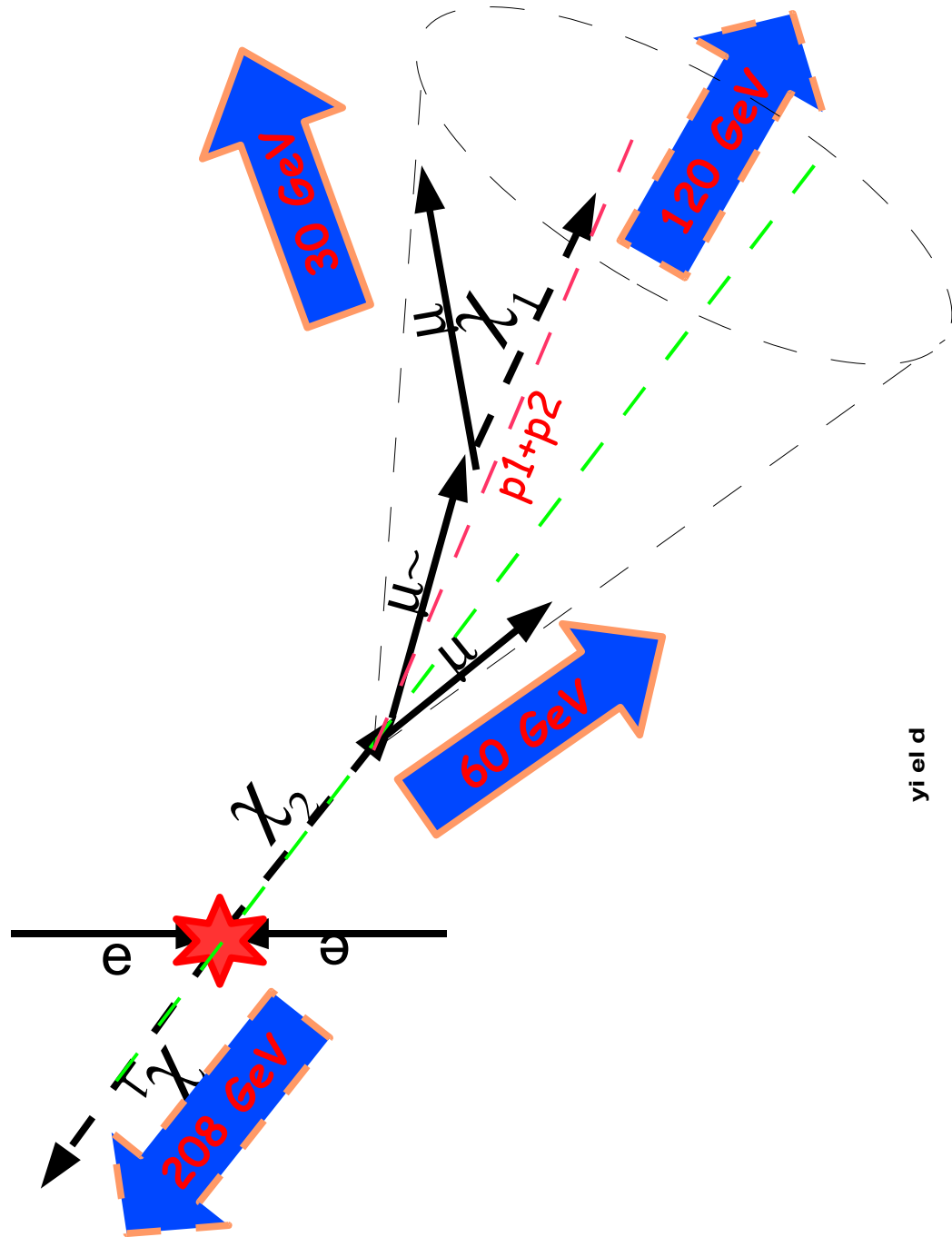
Signal kinematics: $\chi_2 \rightarrow \mu_R \mu$



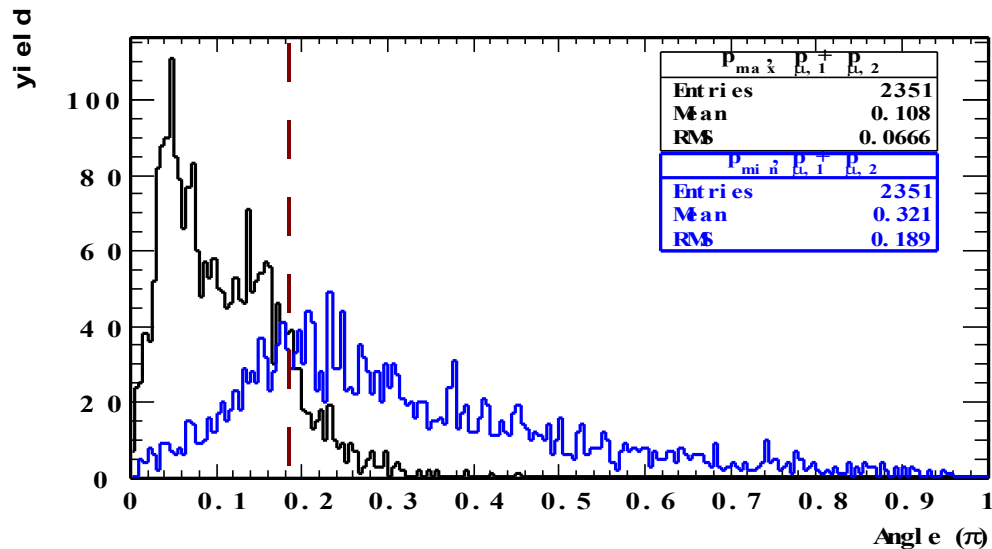
Signal kinematics $\mu_R \rightarrow \mu \chi_1$



Signal kinematics: event axis



Observables in the final state - event axis

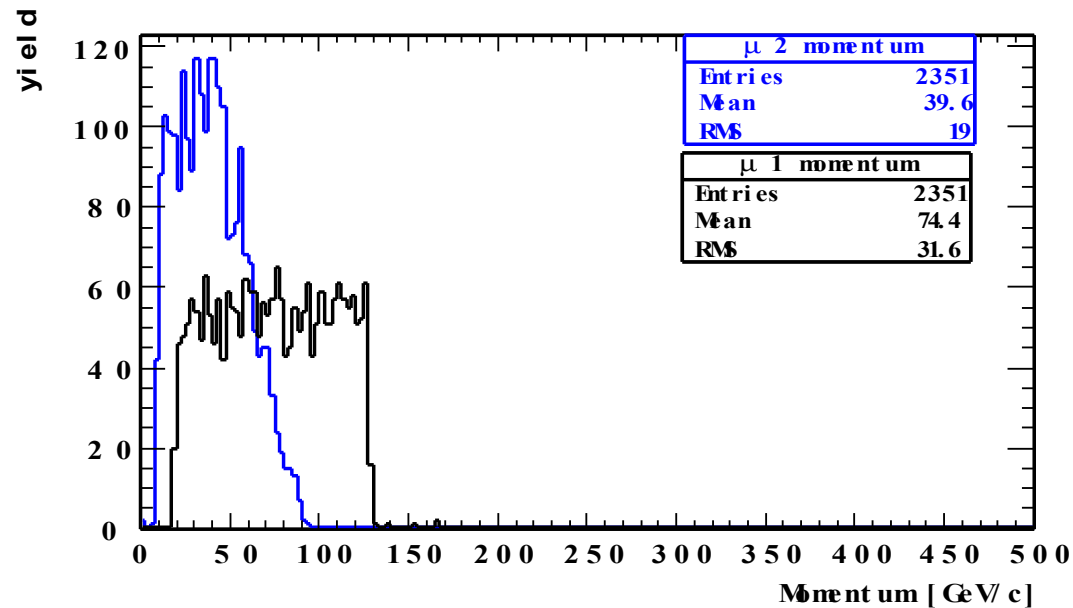


$$\theta_{max} < 0.3$$

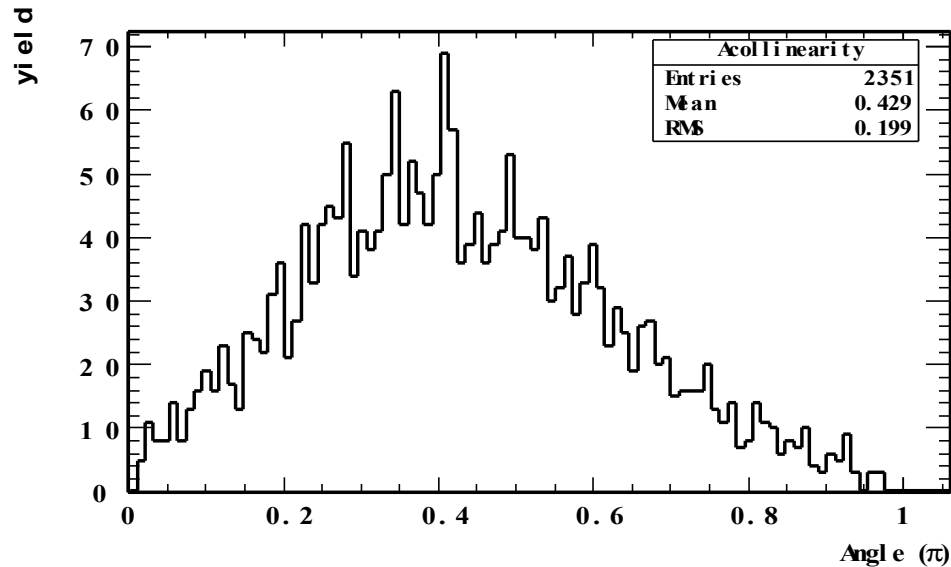
eff. 100%

$$\theta_{max} < 0.17 \ \&\& \ \theta_{min} > 0.17 \quad \text{eff. 60\%}$$

Definition: θ_{min} : angle between pmin and ptot
 θ_{max} : angle between pmax and ptot

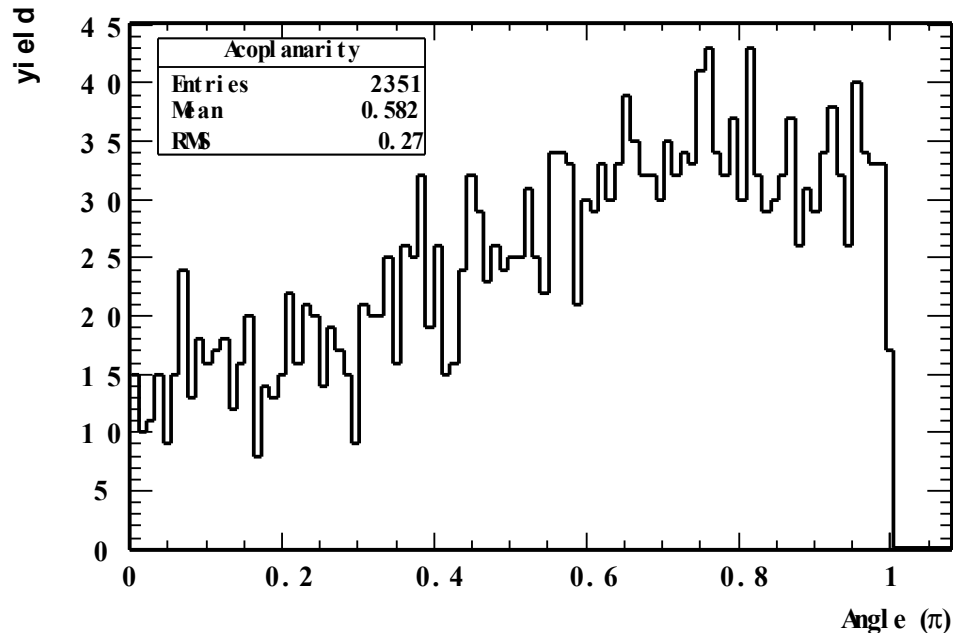


Observables in the final state



$$\theta_{acol} > 18 \text{ deg} \ \&\& \ \theta_{acol} < 144 \text{ deg} \quad \text{eff. 91\%}$$

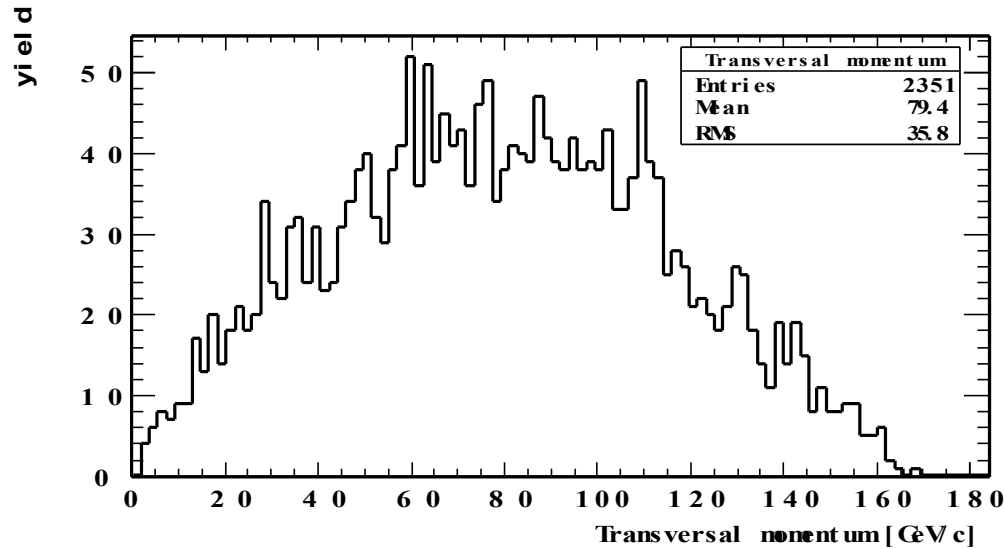
Definition: θ_{acol} : angle between the two muons in the final state



$$\theta_{acop} > 90 \text{ deg} \quad \text{eff. 60\%}$$

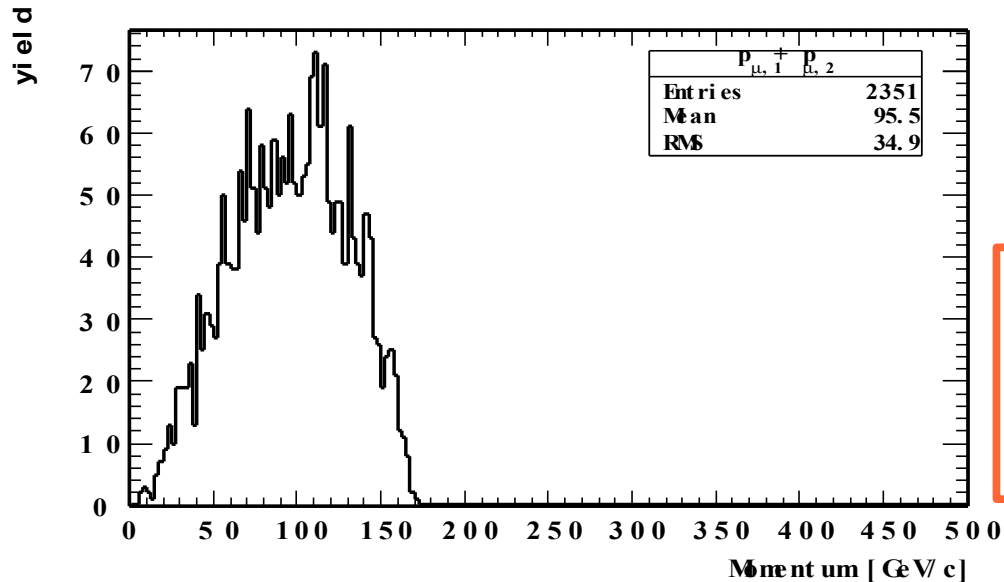
Definition: θ_{acop} : supplement of the angle between the two muons in the plane perpendicular to the beam axis

Observables in the final state



$P_t < 170 \text{ GeV} \ \&\& \ p_t > 2 \text{ GeV}$

Definition: p_t total momentum in the plane perpendicular to the beam

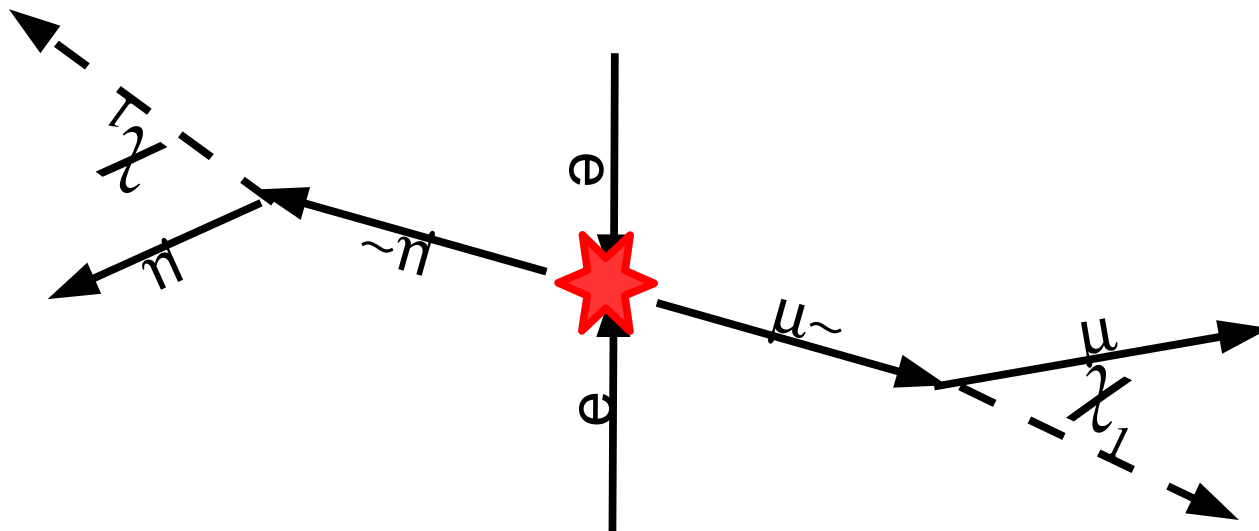


$P_{tot} < 170 \text{ GeV} \ \&\& \ p_{tot} > 5 \text{ GeV}$

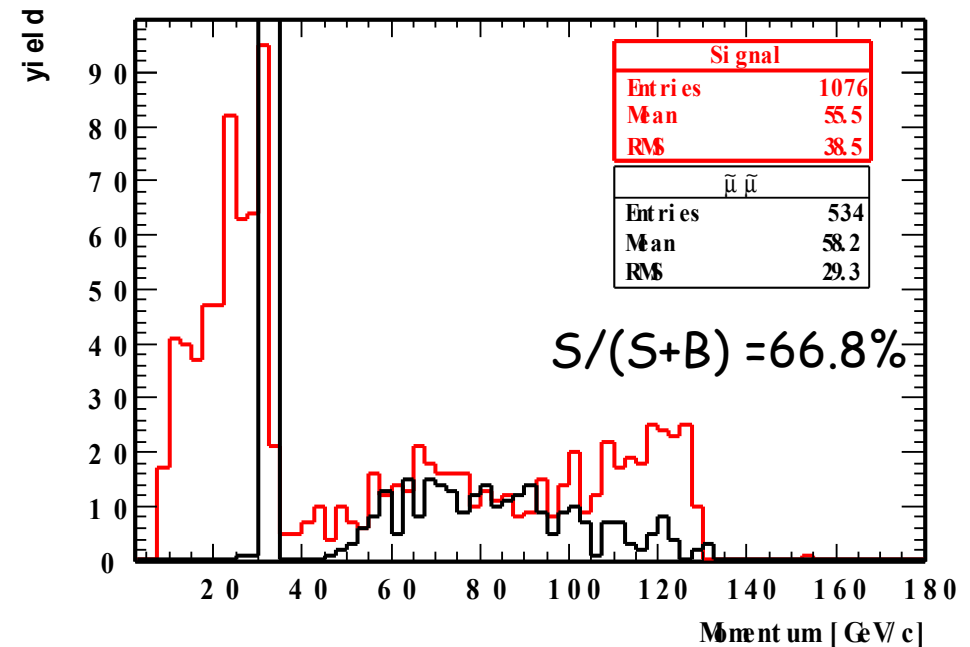
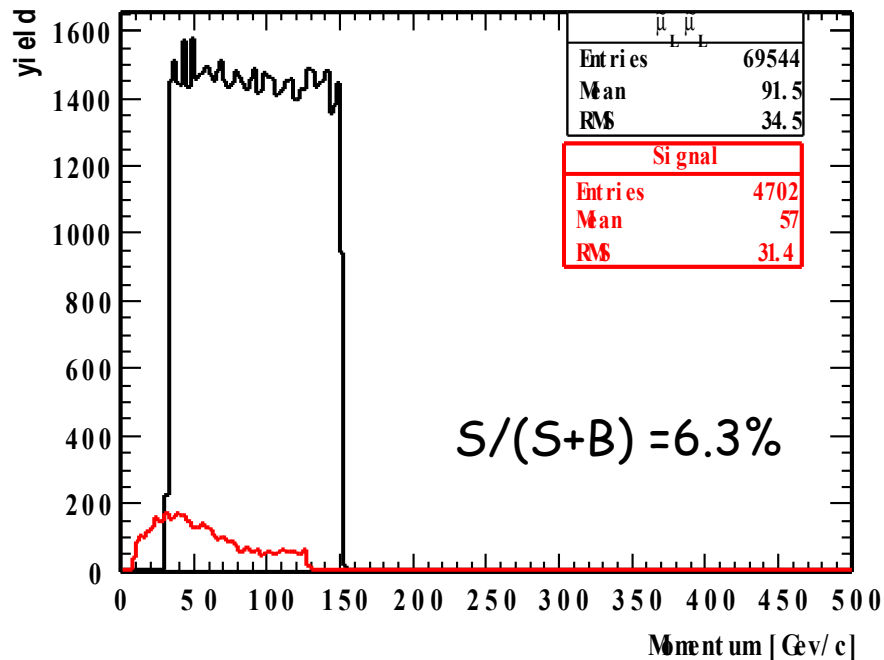
Definition: p_{tot} total momentum

Susy backgrounds

★ $ee \rightarrow \mu_R \mu_R$	42.8 fb	21400
★ $ee \rightarrow \mu_L \mu_L$	69.54 fb	34772
$ee \rightarrow \tau_1 \tau_1 \rightarrow \tau \chi_1 \tau \chi_1 \rightarrow \mu \nu \nu \chi_1 \mu \nu \nu \chi_1$	1.71 fb	855
$ee \rightarrow \tau_2 \tau_2 \rightarrow \tau \chi_1 \tau \chi_1 \rightarrow \mu \nu \nu \chi_1 \mu \nu \nu \chi_1$	1.36 fb	680
$ee \rightarrow \chi_2 \chi_1 \rightarrow \tau_1 \tau \chi_1 \rightarrow \mu \nu \nu \chi_1 \mu \nu \nu \chi_1$	3.19 fb	1595

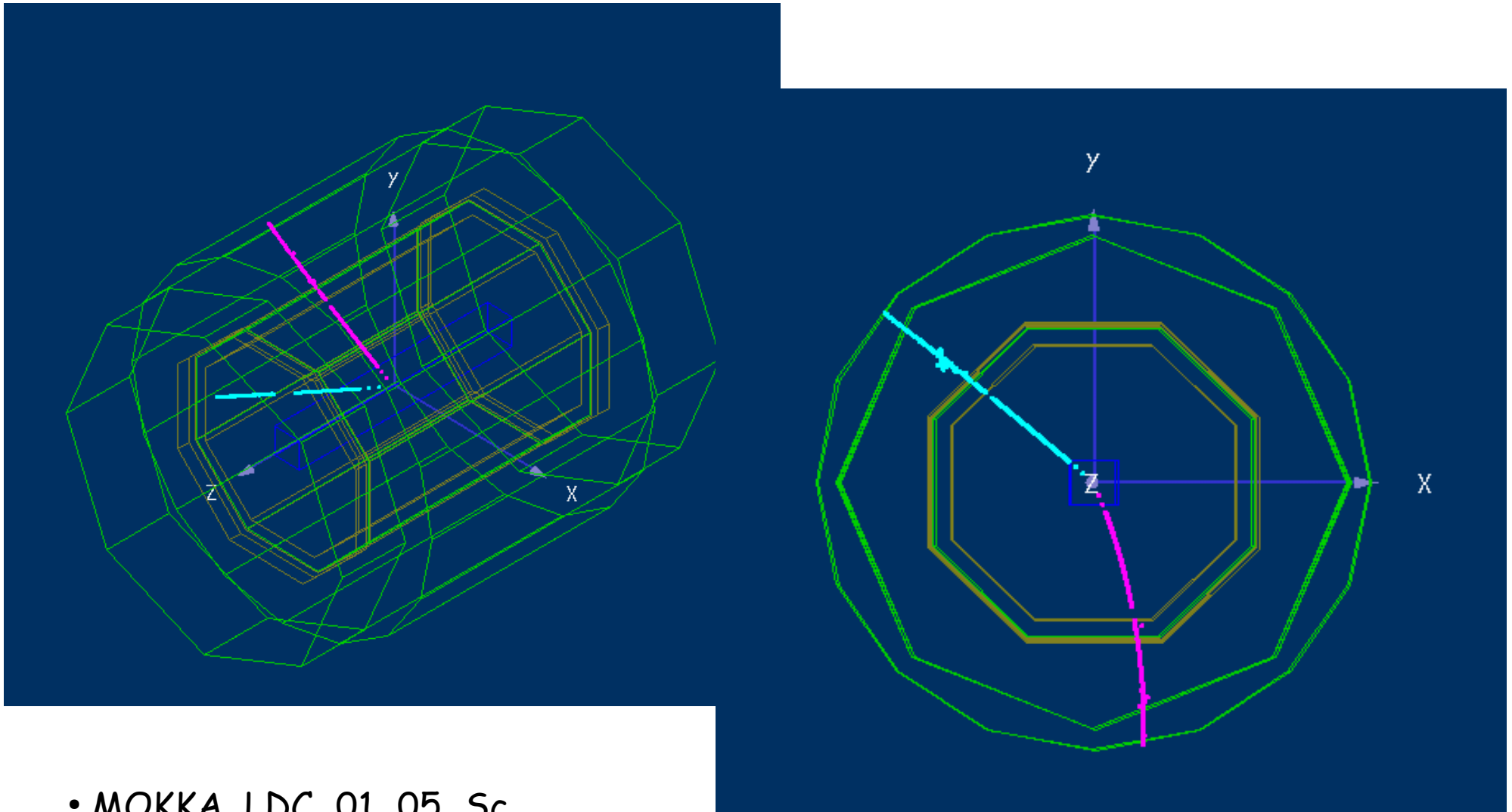


Cuts and backgrounds : right handed smuon



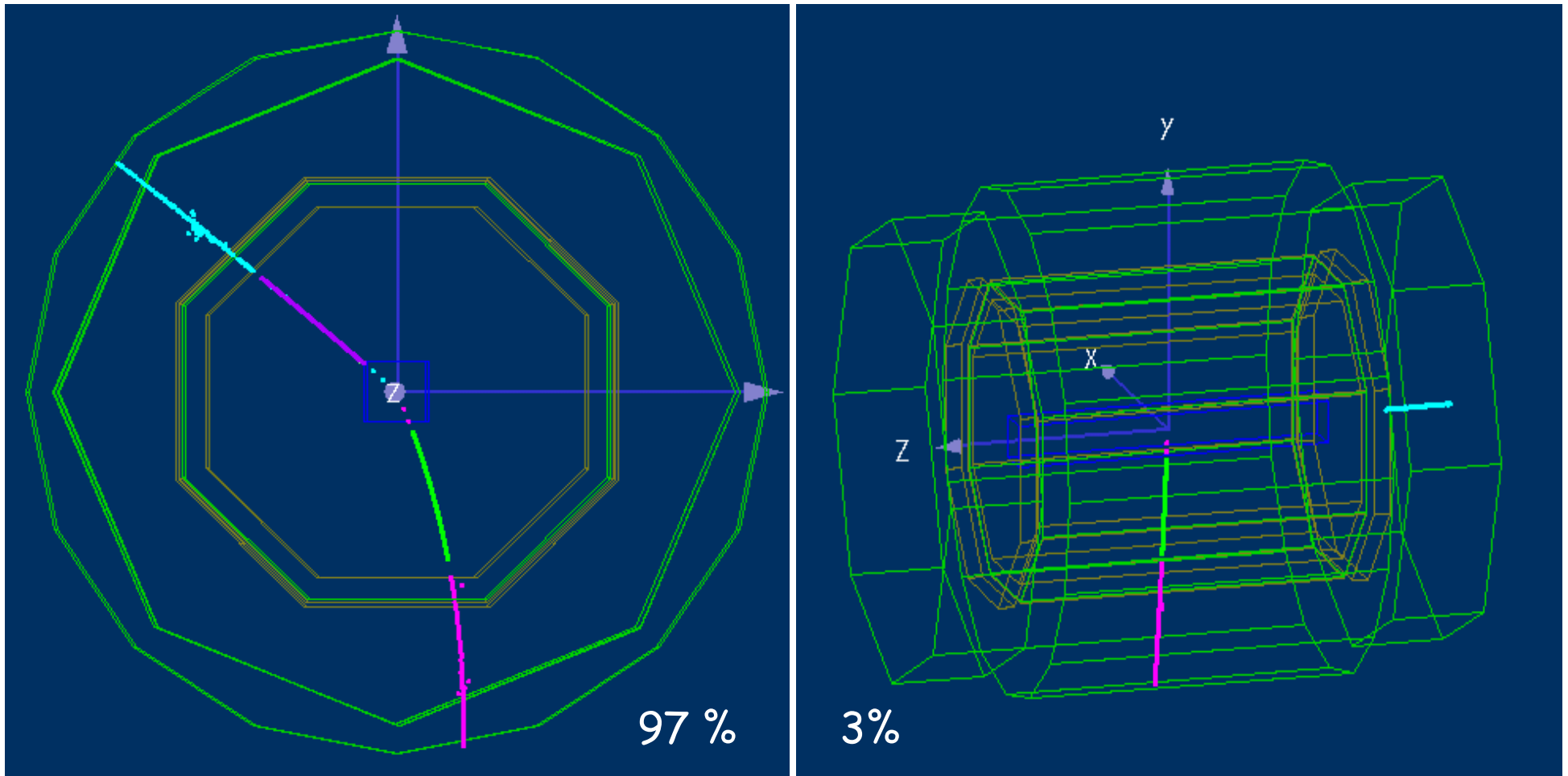
- $p_{\min} < 33 \text{ GeV}$
- Acollinearity $< 108 \text{ deg}$
- Angle between the minimum momentum muon and the reconstructed axis $> 30 \text{ deg}$
- Angle between the maximum momentum muon and the reconstructed axis $< 30 \text{ deg}$

Full detector simulation



- MOKKA, LDC_01_05_Sc
- It works without basic problems

Reconstruction



**MARLINRECO,
VTXDigiProcessor, TPCDigiProcessor, FTDDigiProcessor, SimpleCaloDigi
LepTrackingProcessor**

The lost events can be fully restored using the HCAL information (end cap) ?

Next steps

- Analysis:
 - Simulation of all the SM backgrounds
 - Improvements of cuts and efficiencies
- Software:
 - Processor for check plots almost available (HCAL)
 - Comparison between PHYTHIA and WHIZARD final states.
- Muon ID
 - Muon ID processor under construction (from test beam to application in Montecarlo)
 - Muon identification efficiencies...