ATHENA smearing and D^0 selection

- Single track smearing (Matt's plugin)
  - p (magnitude) smeared by p resolution along the true p direction
  - Vertex position smeared by $DCA_{r\phi}$ and DCA_z
- Primary vertex smearing (Matt's plugin)
  - Primary vertex smeared according to charged hadron multiplicity
- D^0 selection (all topological cuts in transverse plane)
  - Acceptance cut p > 0.5GeV
  - DCA_{pair} < 150um
  - decay L > 40um
  - $\cos\theta_{r\phi}$ > 0.98
  - Assumed detector matrix PID

Deterctor Matrix	
Barrel (|η|<1)	< 6 GeV
Forward (η>1)	< 10 GeV
Backward (η<-1)	< 50 GeV

arXiv: 2102.08337

TABLE IV. Cuts on the decay-topology variables used for different D^0 p_T bins.

p_T	Pair $DCA_{r\phi}$ (μm)	DecayLength (μm)	$\cos\theta_{r\phi}$
$0 < p_T < 1.0$ GeV/c	< 120	-	-
$1.0 < p_T < 2.0$ GeV/c	< 150	> 40	-
$p_T > 2.0$ GeV/c	< 150	> 40	> 0.98

ATHENA smearing and Λ_c selection

- Single track smearing (Matt's plugin)
  - p (magnitude) smeared by p resolution along the true p direction
  - Vertex position smeared by $DCA_{r\phi}$ and DCA_z
- Primary vertex smearing (Matt's plugin)
  - Primary vertex smeared according to charged hadron multiplicity
- Λ_c selection (all topological cuts in transverse plane)
  - Acceptance cut p > 0.5GeV
  - DCA_{pair} < 300um
  - **Λ_c DCA < 150um**
  - decay L > 10um
  - Assumed detector matrix PID

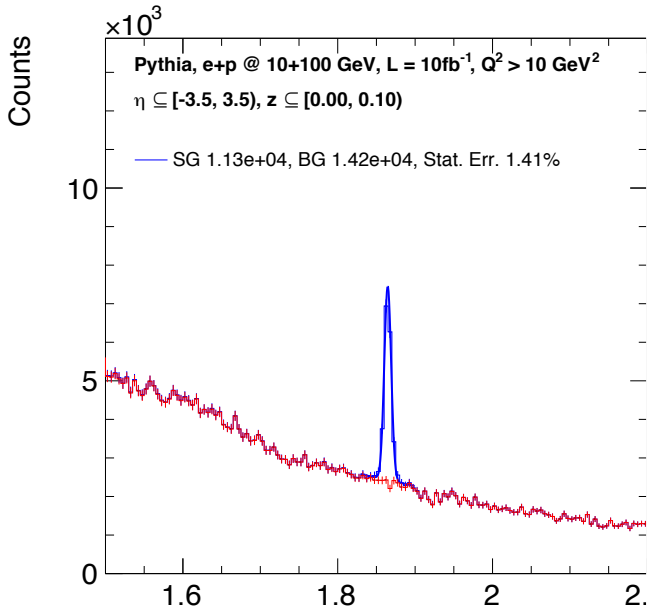
Deterctor Matrix	
Barrel (|η|<1)	< 6 GeV
Forward (η>1)	< 10 GeV
Backward (η<-1)	< 50 GeV

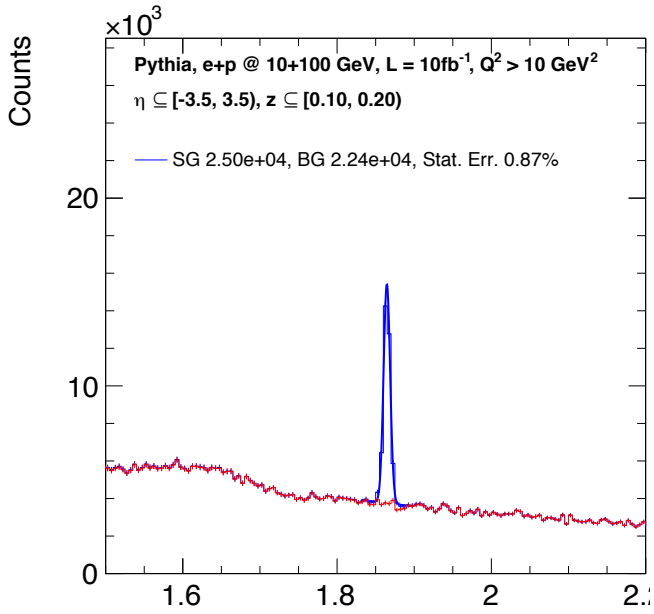
arXiv: 2102.08337

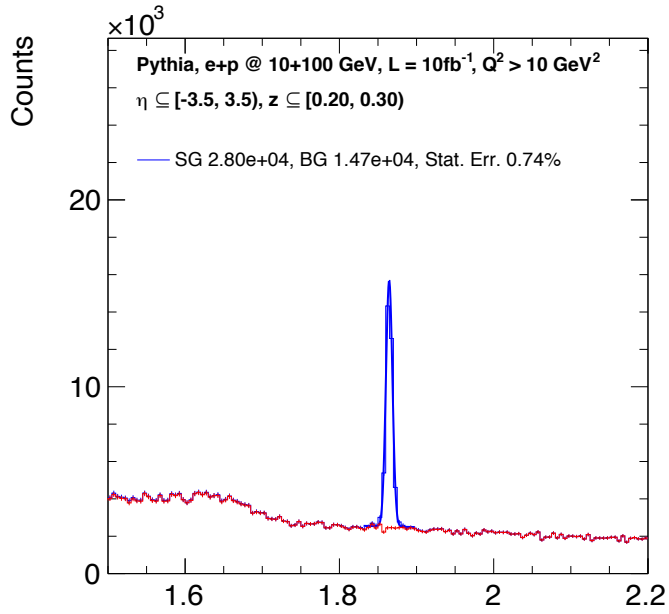
TABLE VIII. Decay topology cuts for $\Lambda_c^{\pm}$ signal reconstruction.

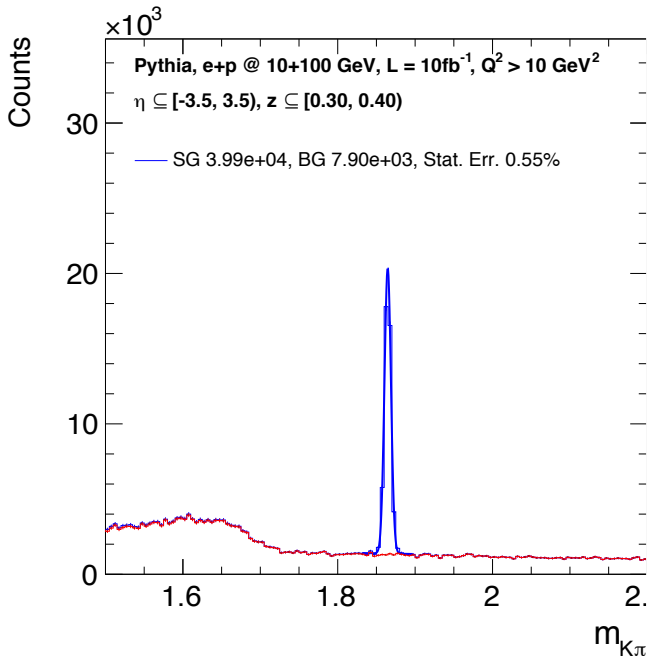
Selection criteria	$0<p_T<4\,\mathrm{GeV}/c$	$4<p_T<6\,\mathrm{GeV}/c$	$6<p_T<10\,\mathrm{GeV}/c$
Pair-$\mathrm{DCA}_{r\phi}$	$< 300\ \mu$m	$< 100\ \mu$m	$< 100\ \mu$m
Λ_c-$\mathrm{DCA}_{r\phi}$	$< 150\ \mu$m	$< 100\ \mu$m	$< 60\ \mu$m
Decay-$\mathrm{Length}_{r\phi}$	$> 10\ \mu$m	$> 20\ \mu$m	$> 30\ \mu$m

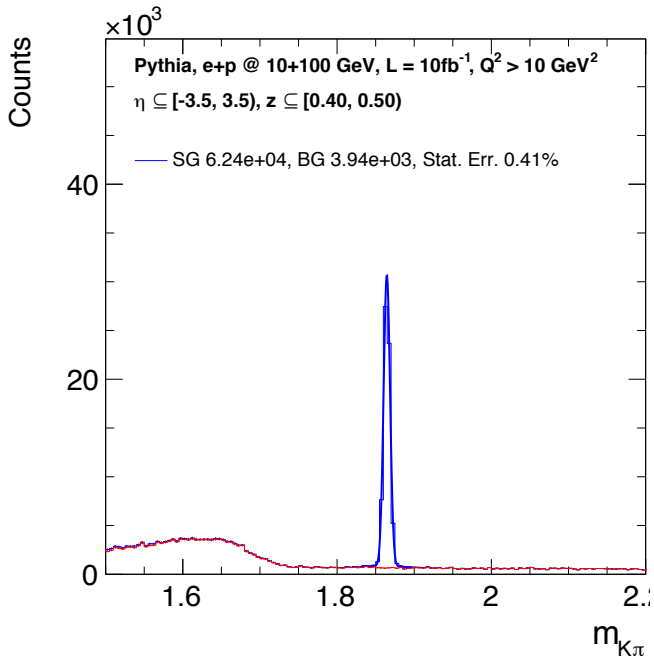
D^0 mass distribution in e+p

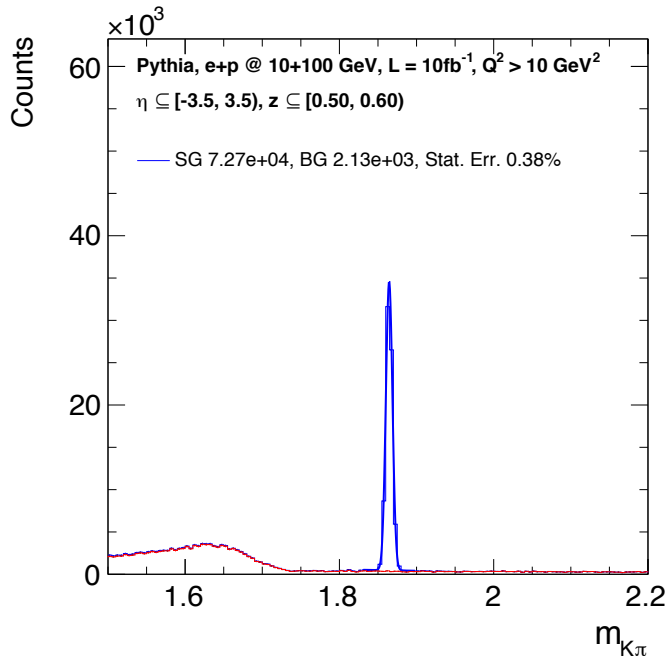




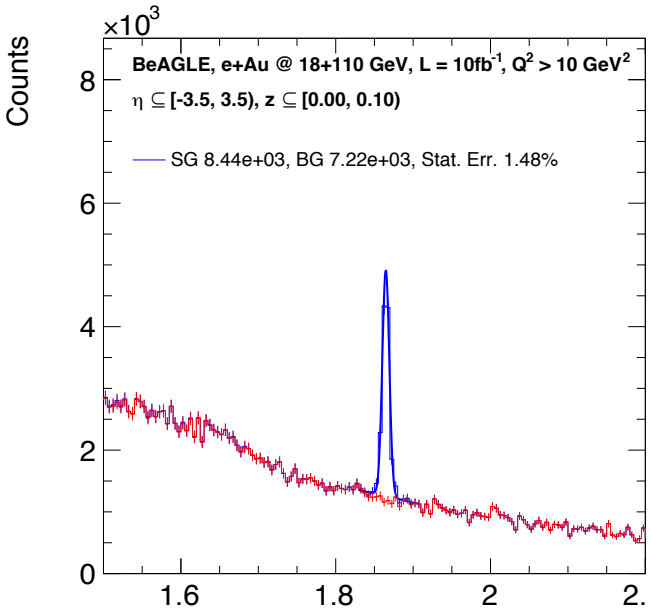


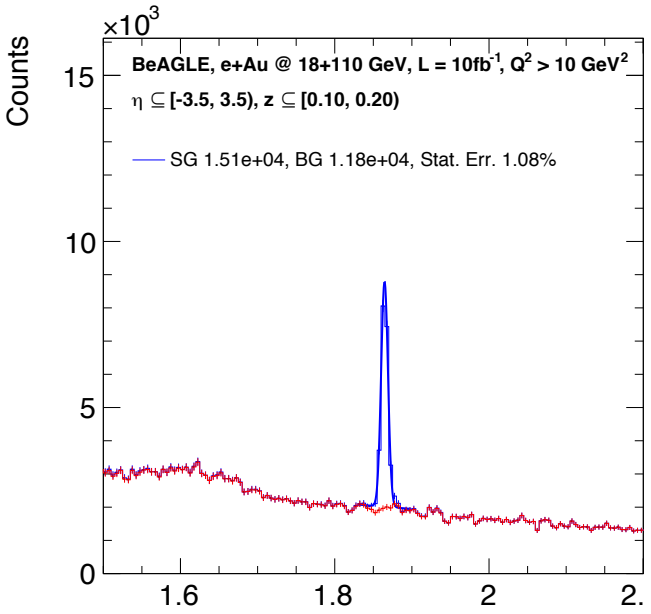


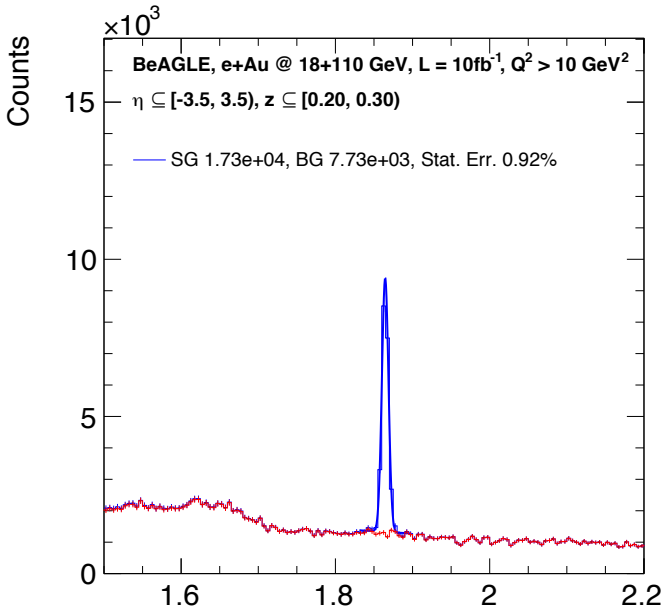


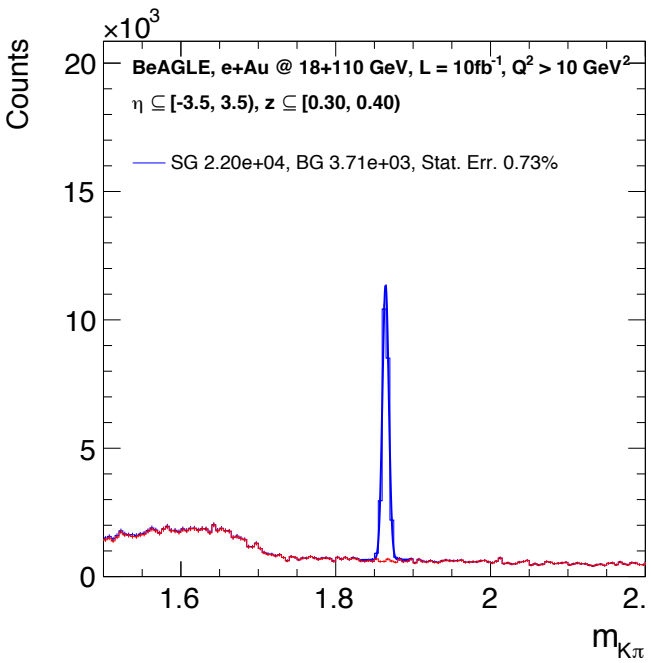


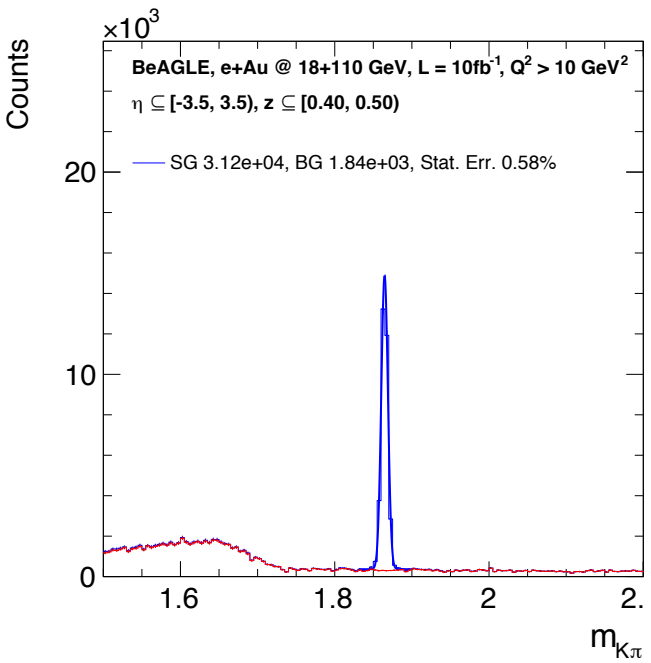
D^0 mass distribution in e+Au

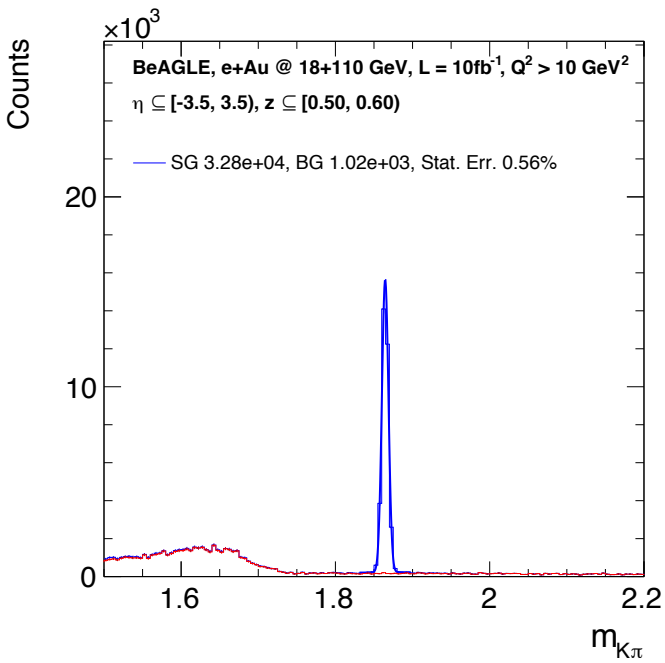




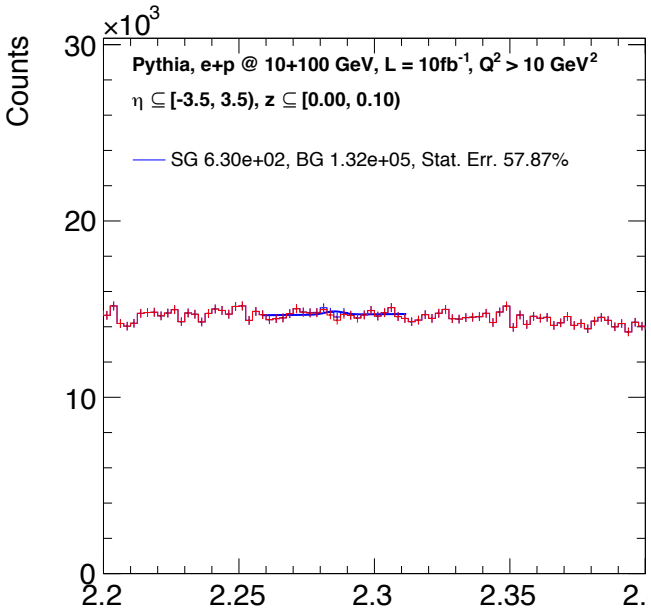


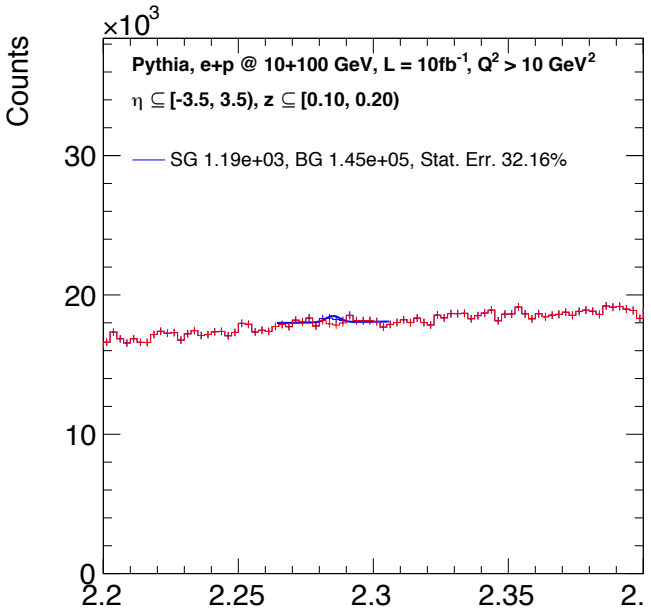


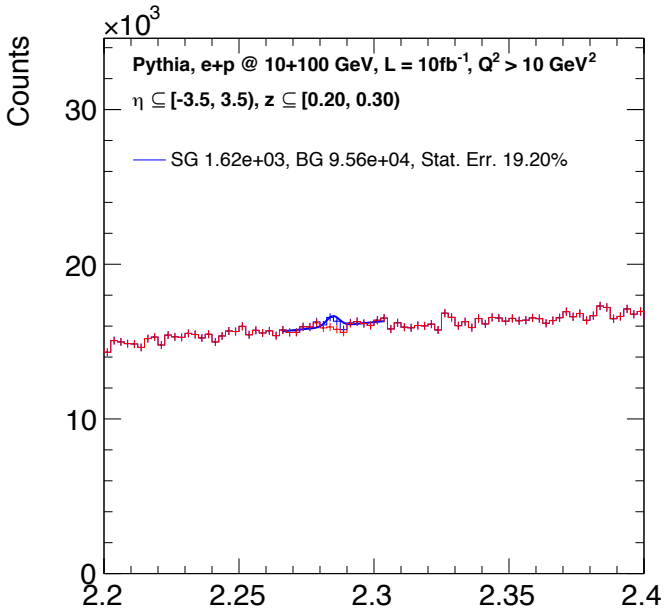


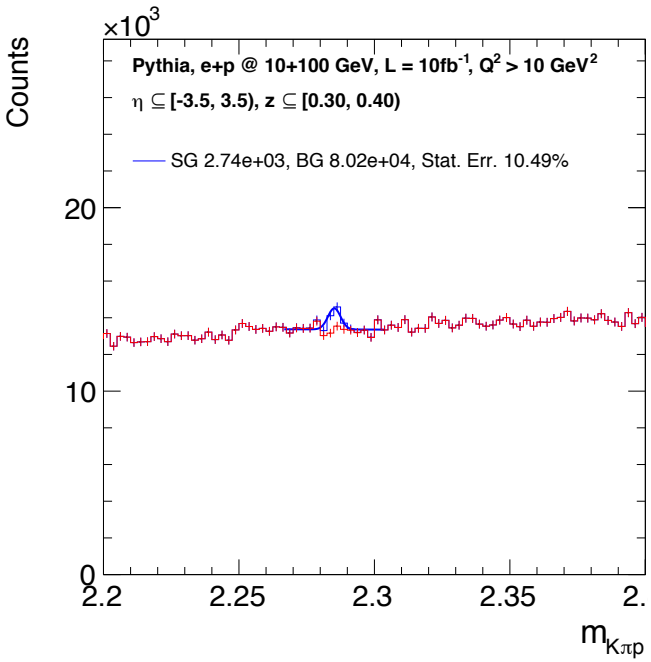


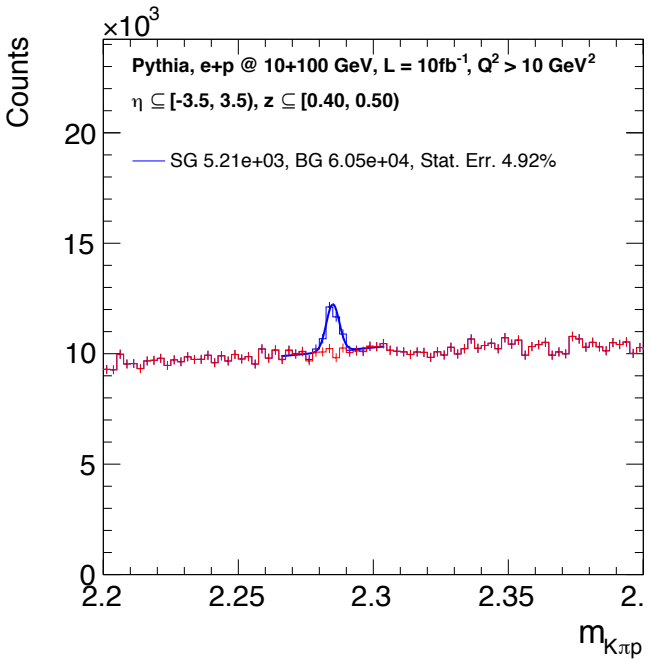
Λ_c mass distribution in e+p

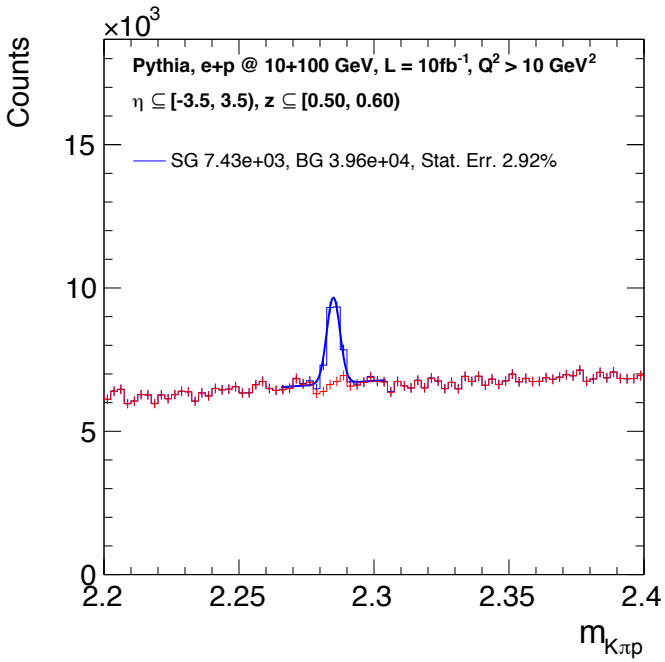




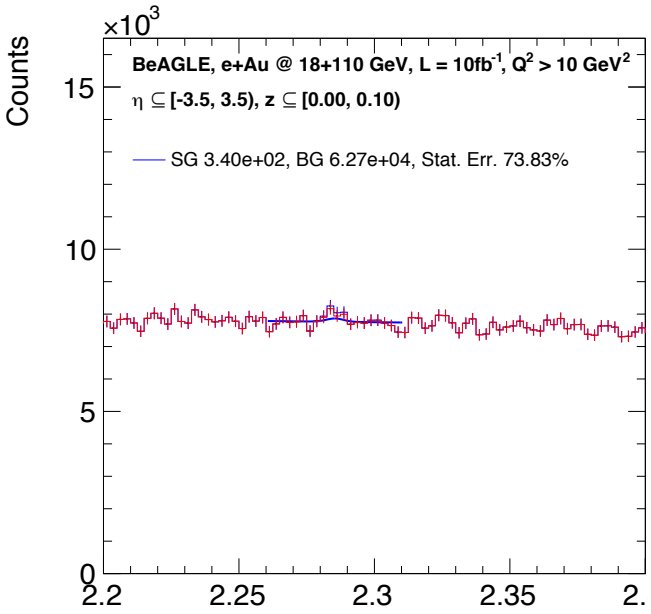


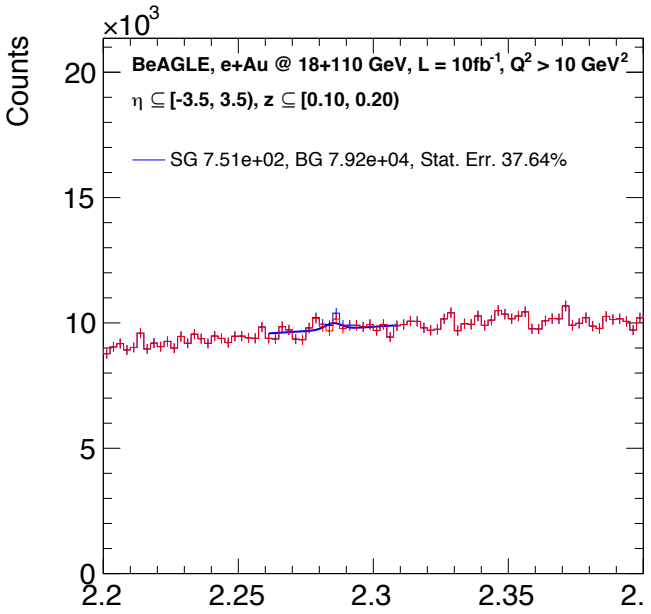


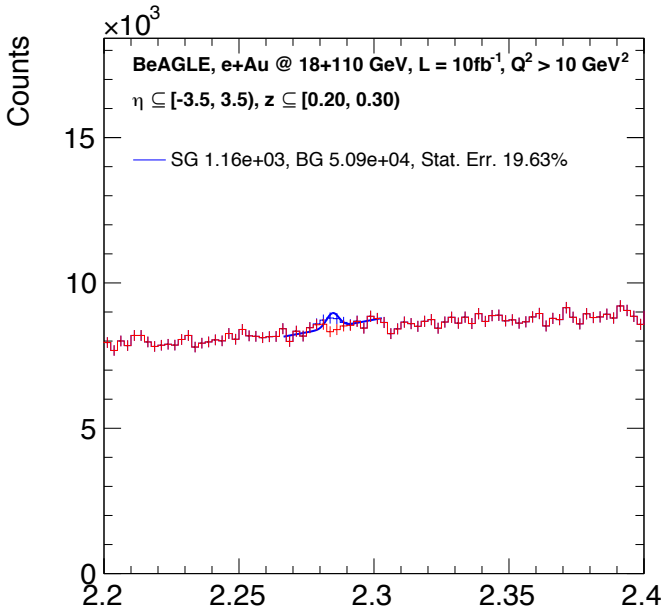


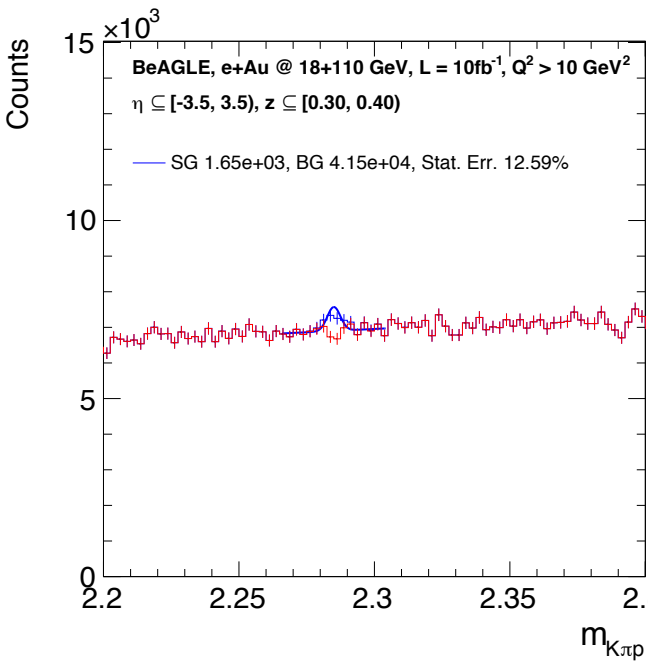


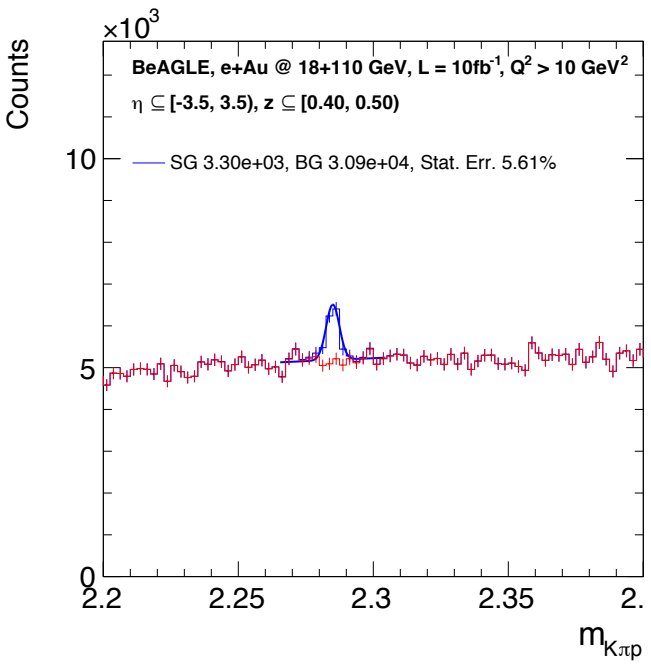
Λ_c mass distribution in e+Au

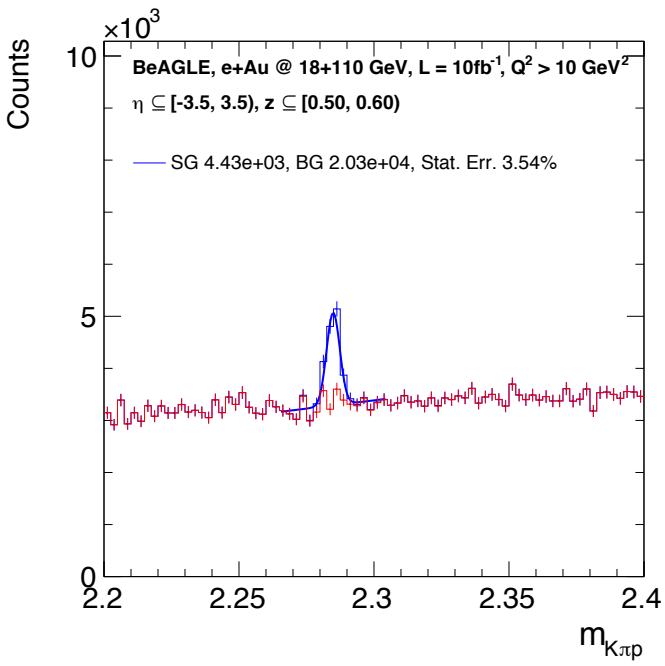








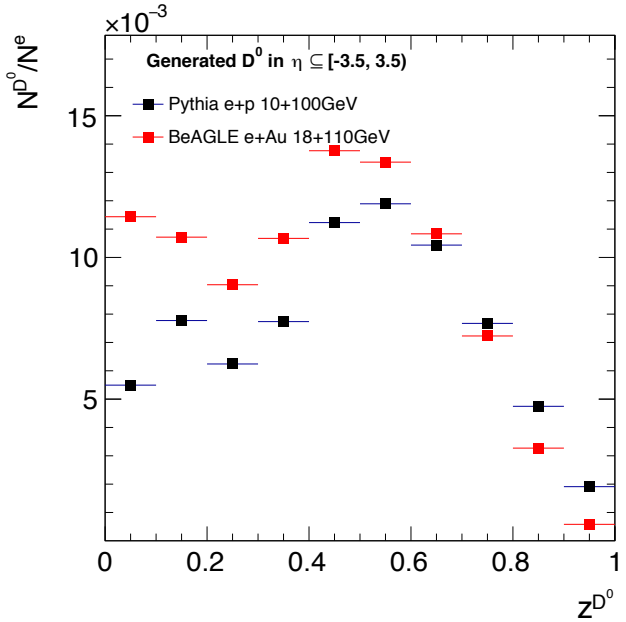


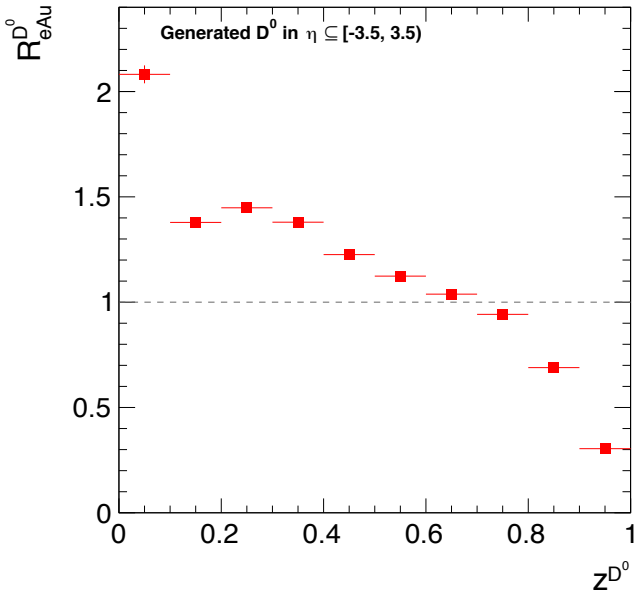


R_{eA} of c hadron with statistal uncertainty

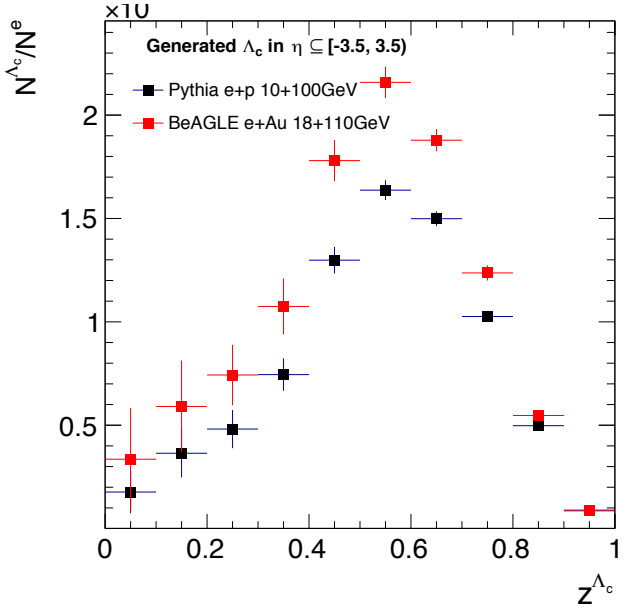
- Using the generator results as central value

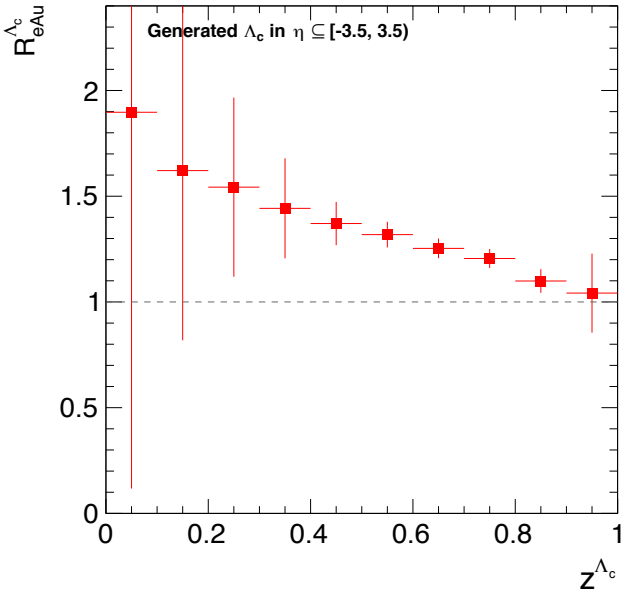
D^0





Λ_c

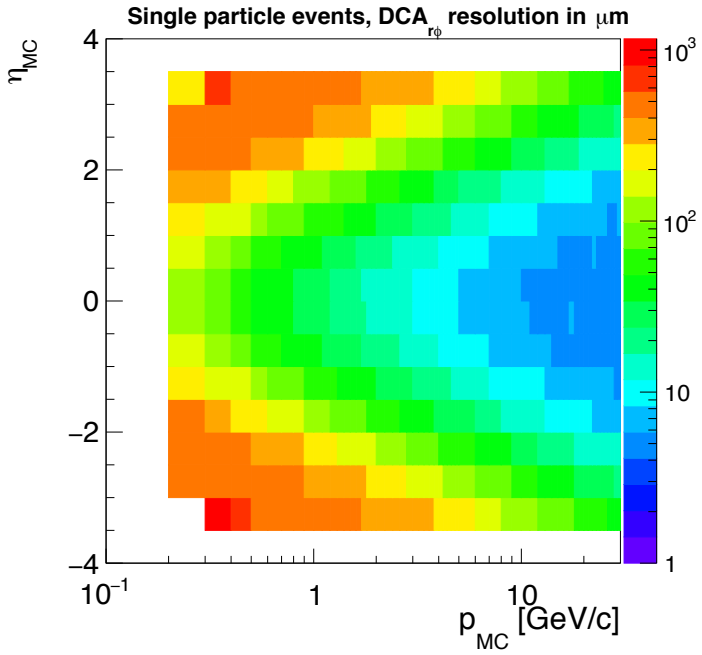


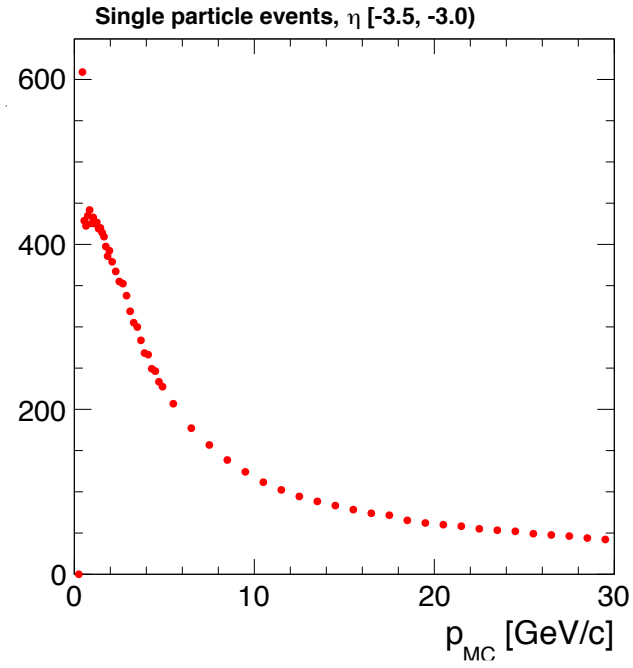


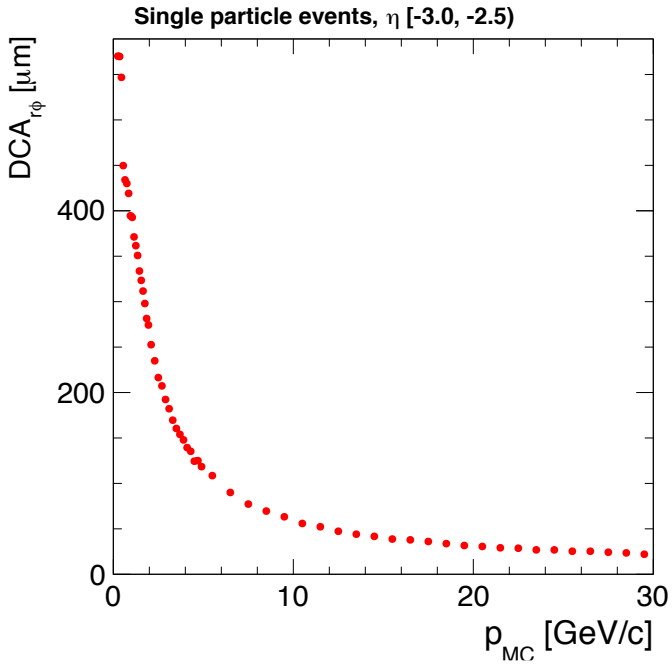
Next steps

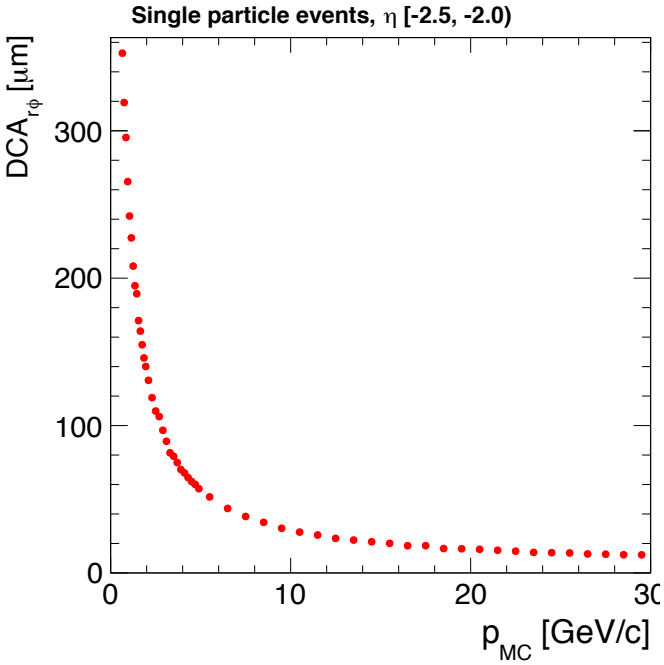
- Double check the toplogical cuts and smearing
  - Smear p direction?
  - Use full simulation to cross check? (DIS events)
- Look at lower beam energy
- Pions R_{eAu}
- Compare with Yuanjing

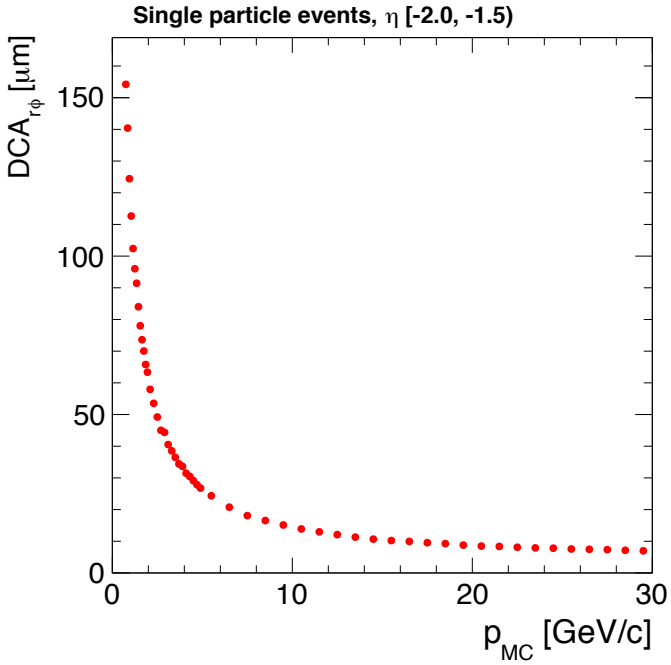
$DCA_{r\phi}$

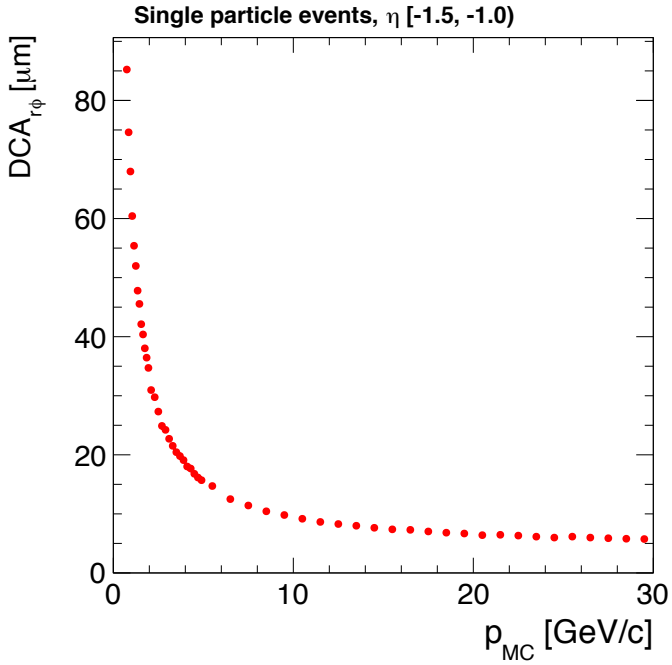

Single particle events, DCA$_{r\phi}$ resolution in μm
η_{MC}
p_{MC} [GeV/c]


Single particle events, η [-3.5, -3.0)
p_{MC} [GeV/c]

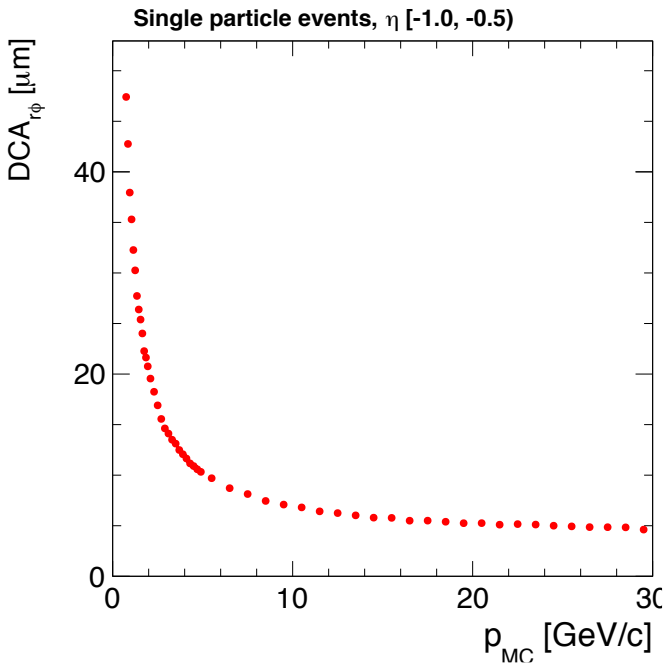

Single particle events, η [-3.0, -2.5)
DCA$_{r\phi}$ [μm]
p_{MC} [GeV/c]

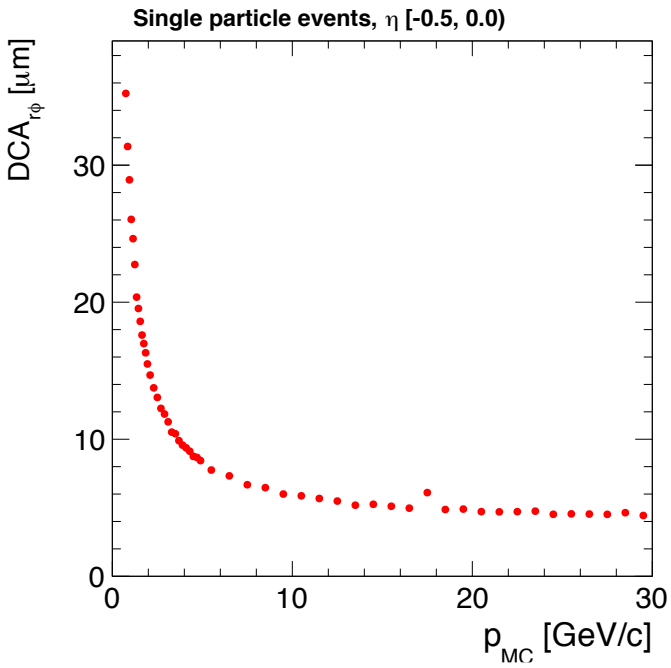

Single particle events, η [-2.5, -2.0)
DCA$_{r\phi}$ [μm]
p_{MC} [GeV/c]

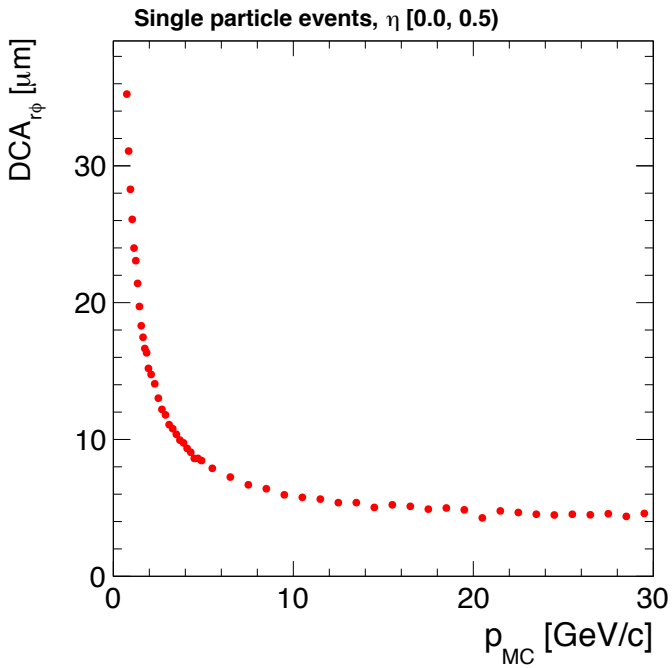

Single particle events, η [-2.0, -1.5)
DCA$_{r\phi}$ [μm]
p_{MC} [GeV/c]

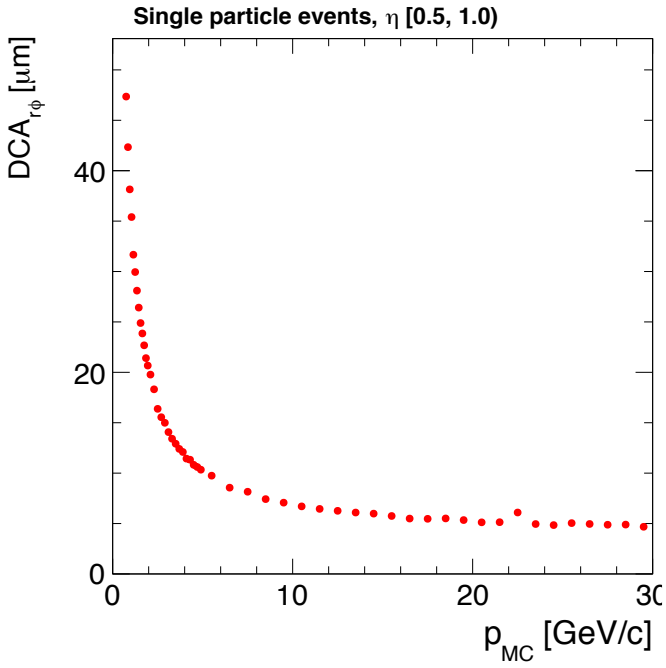

Single particle events, η [-1.5, -1.0)
DCA$_{r\phi}$ [μm]
p_{MC} [GeV/c]

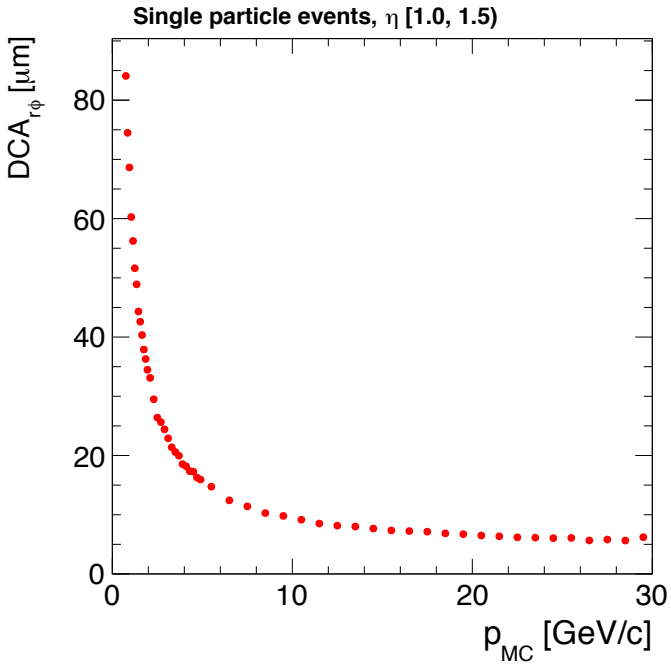
$DCA_{r\phi}$

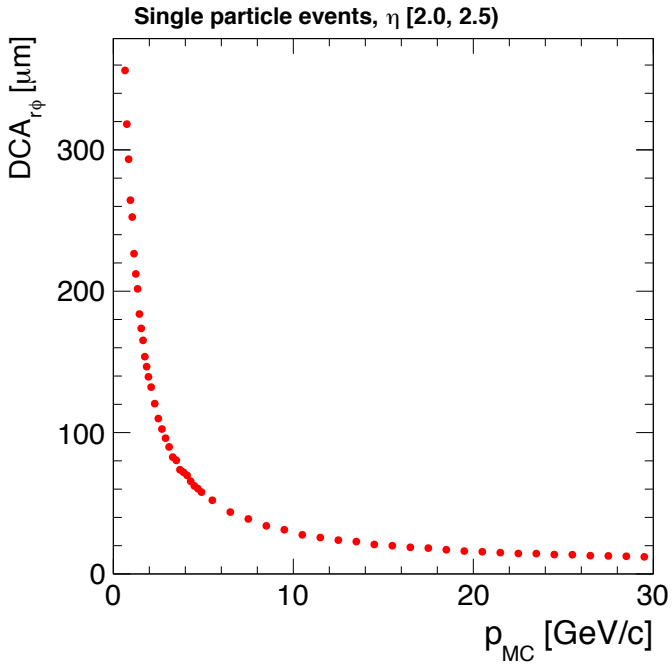

Single particle events, η [-1.0, -0.5)
DCA_rφ [μm]
p_MC [GeV/c]


Single particle events, η [-0.5, 0.0)
DCA_rφ [μm]
p_MC [GeV/c]

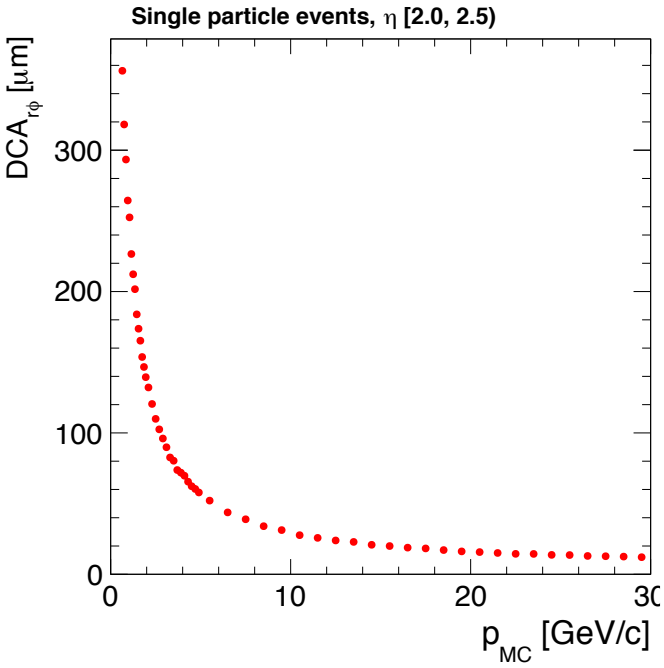

Single particle events, η [0.0, 0.5)
DCA_rφ [μm]
p_MC [GeV/c]

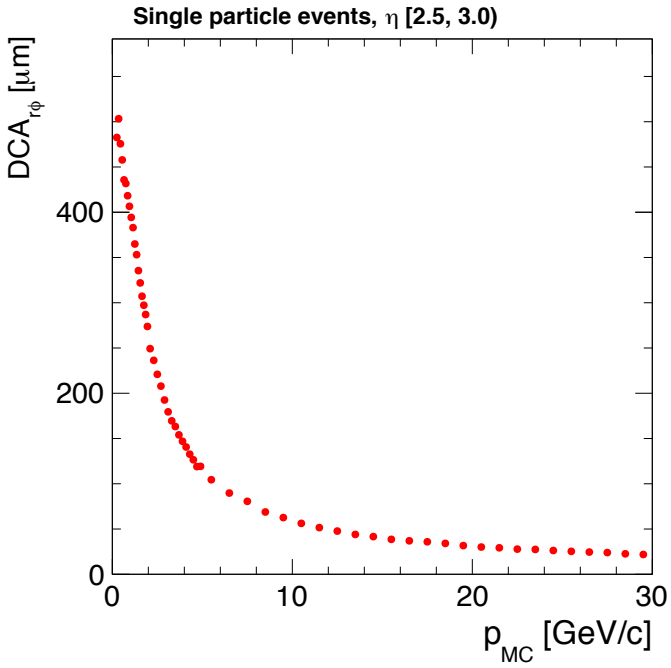

Single particle events, η [0.5, 1.0)
DCA_rφ [μm]
p_MC [GeV/c]

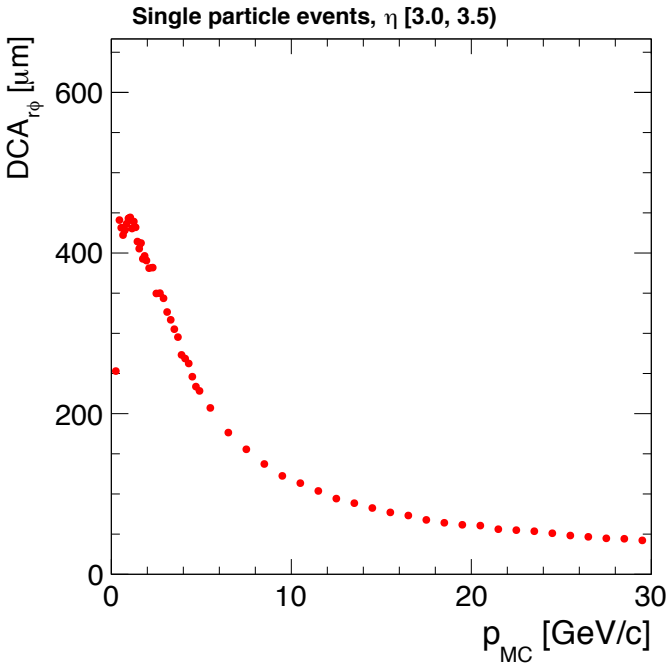

Single particle events, η [1.0, 1.5)
DCA_rφ [μm]
p_MC [GeV/c]


Single particle events, η [2.0, 2.5)
DCA_rφ [μm]
p_MC [GeV/c]

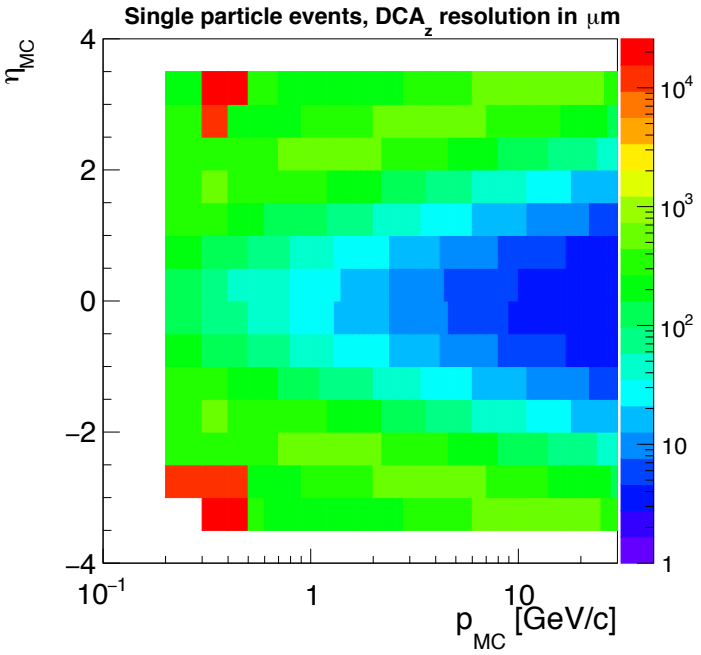
$DCA_{r\phi}$

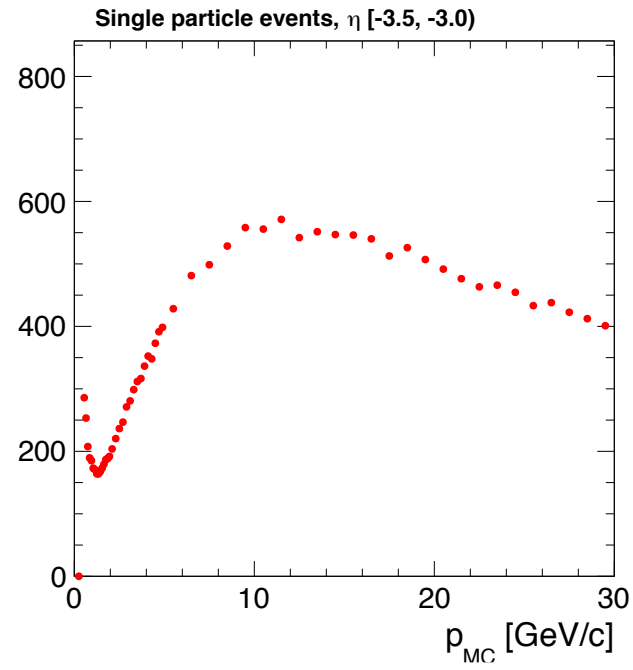

Single particle events, η [2.0, 2.5)
DCA_rφ [μm]
300
200
100
0
0
10
20
30
p_MC [GeV/c]

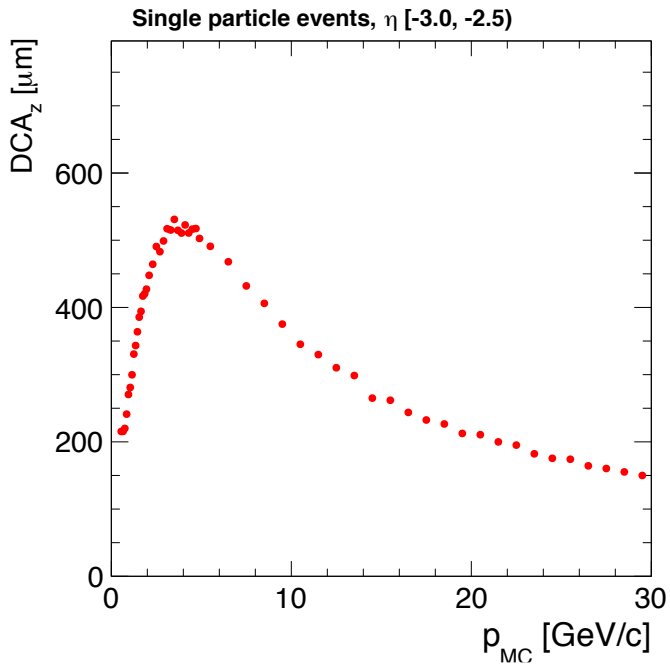

Single particle events, η [2.5, 3.0)
DCA_rφ [μm]
400
200
0
0
10
20
30
p_MC [GeV/c]

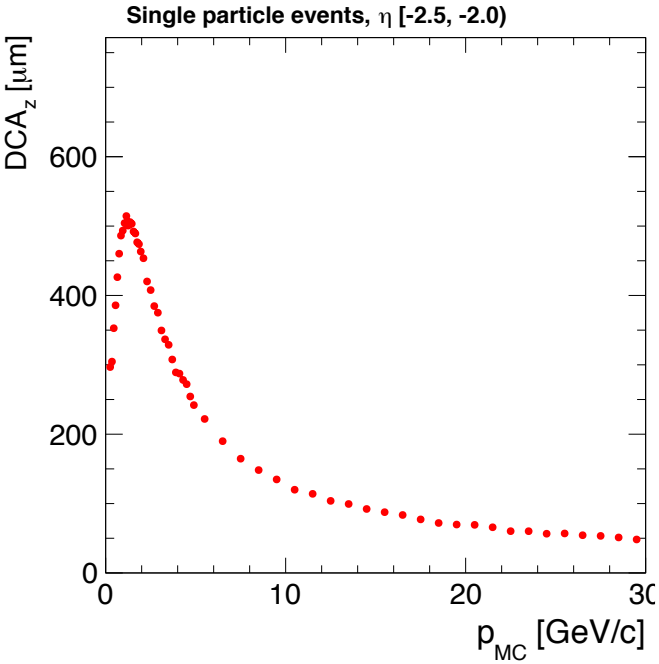

Single particle events, η [3.0, 3.5)
DCA_rφ [μm]
600
400
200
0
0
10
20
30
p_MC [GeV/c]

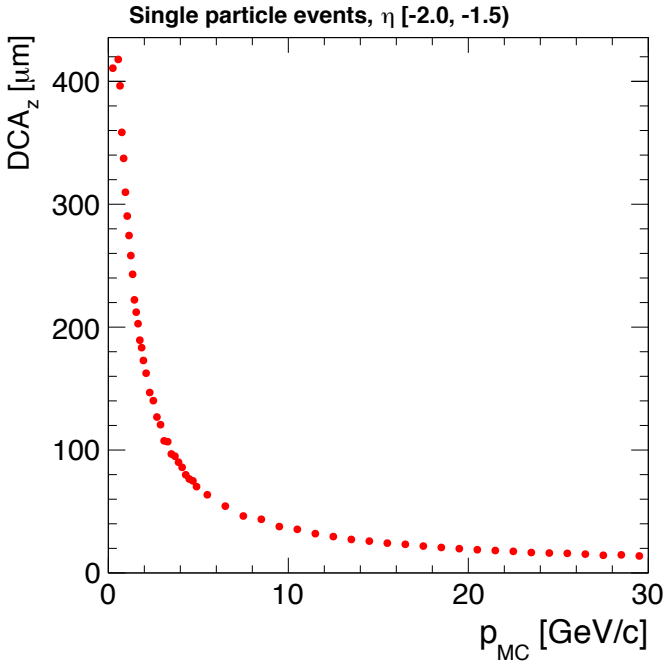
DCA_z

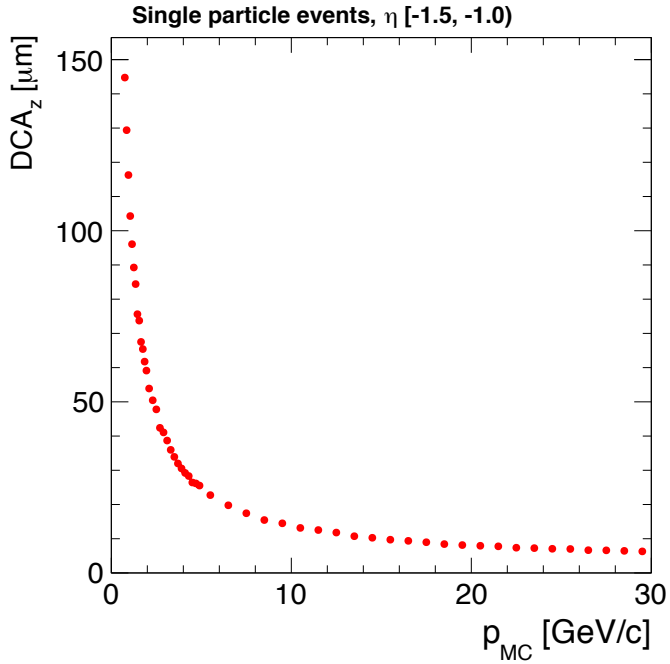

Single particle events, DCA$_z$ resolution in μm
η_{MC}
4
2
0
−2
−4
10^{-1}
1
10
p_{MC} [GeV/c]
10^4
10^3
10^2
10
1


Single particle events, η [-3.5, -3.0)
800
600
400
200
0
0
10
20
30
p_{MC} [GeV/c]

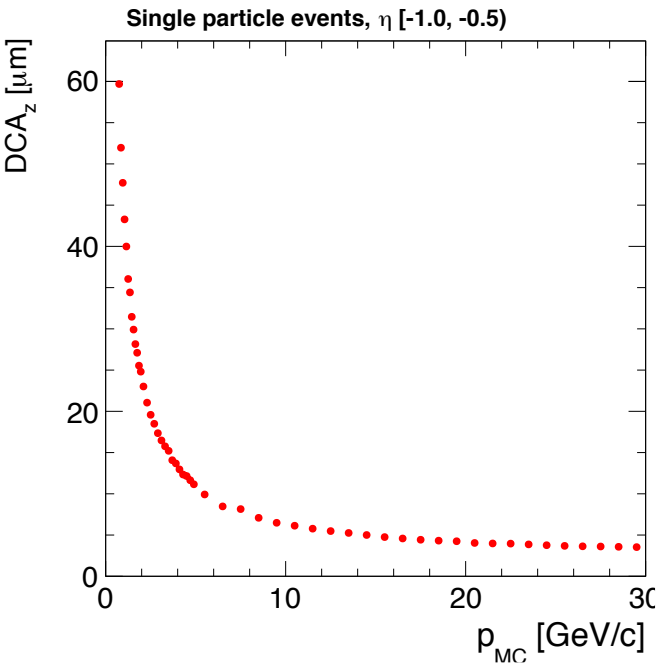

Single particle events, η [-3.0, -2.5)
DCA$_z$ [μm]
600
400
200
0
0
10
20
30
p_{MC} [GeV/c]

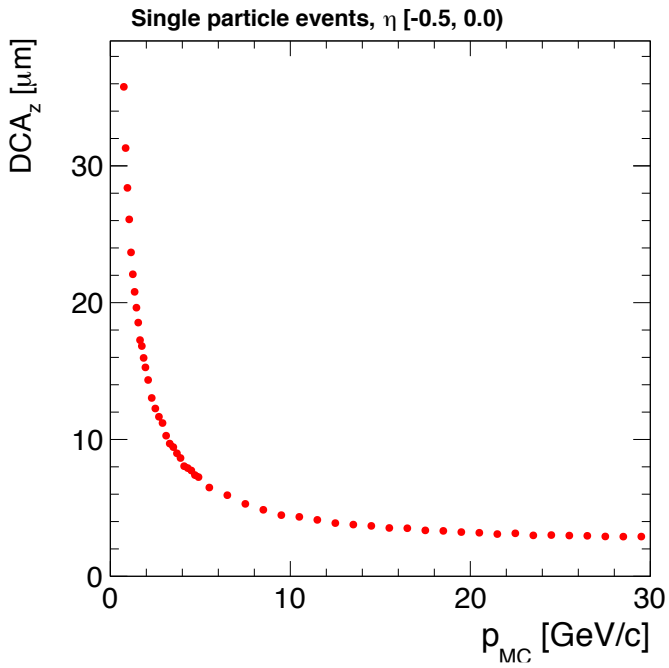

Single particle events, η [-2.5, -2.0)
DCA$_z$ [μm]
600
400
200
0
0
10
20
30
p_{MC} [GeV/c]

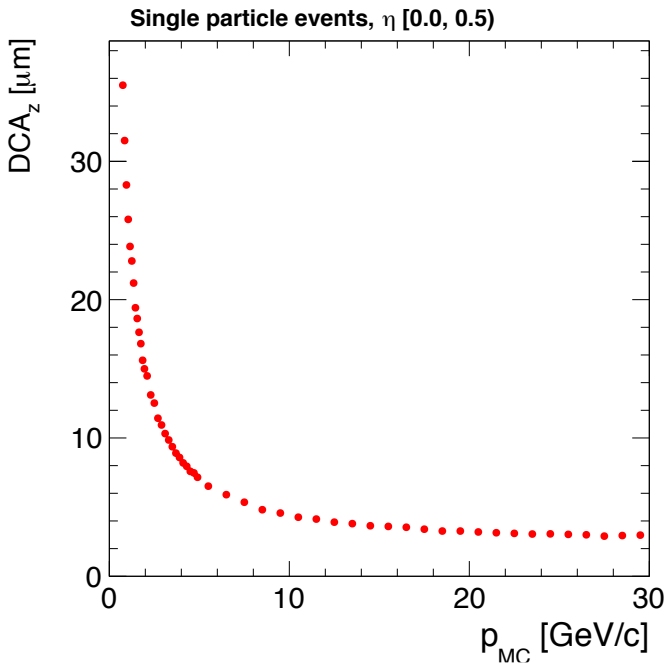

Single particle events, η [-2.0, -1.5)
DCA$_z$ [μm]
400
300
200
100
0
0
10
20
30
p_{MC} [GeV/c]

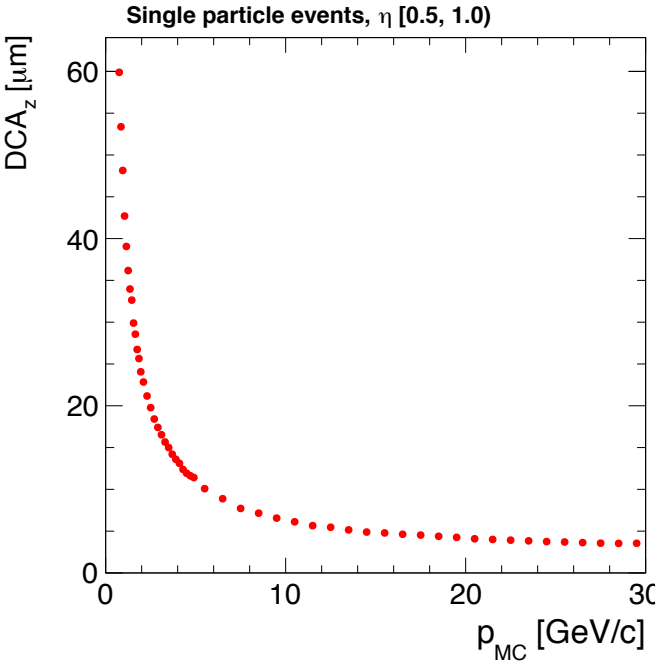

Single particle events, η [-1.5, -1.0)
DCA$_z$ [μm]
150
100
50
0
0
10
20
30
p_{MC} [GeV/c]

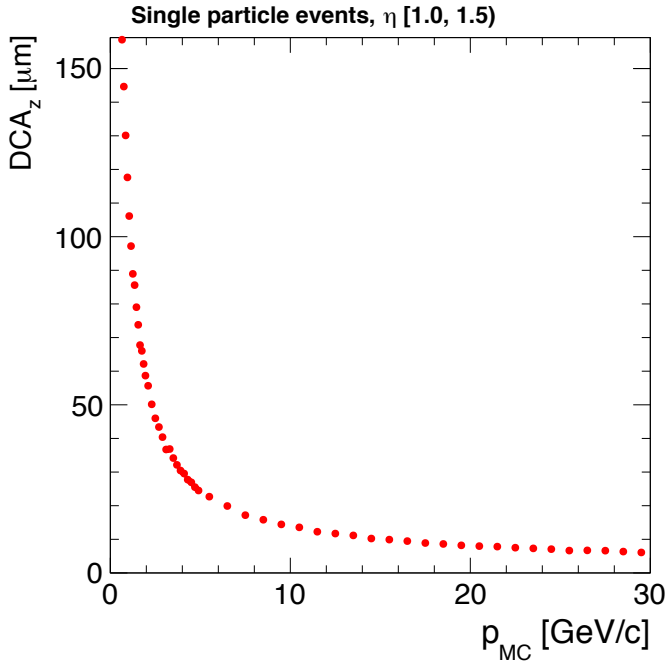
DCA_z

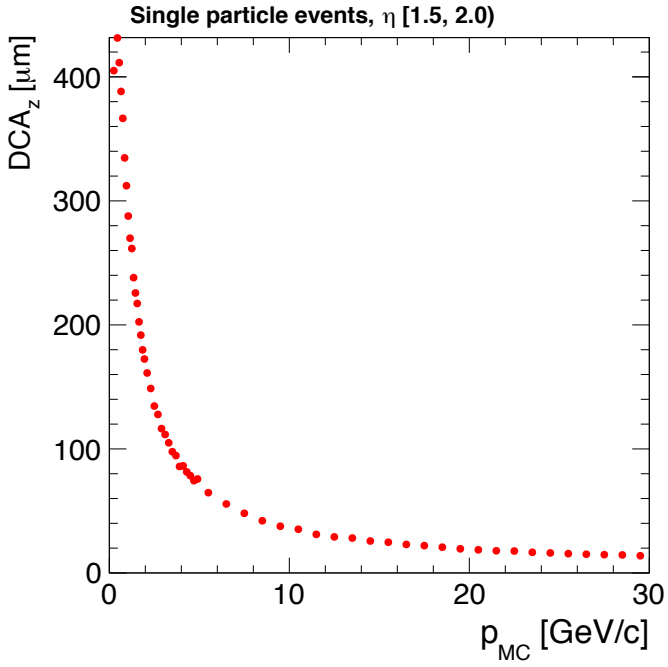

Single particle events, η [-1.0, -0.5)
DCA_z [μm]
p_MC [GeV/c]


Single particle events, η [-0.5, 0.0)
DCA_z [μm]
p_MC [GeV/c]

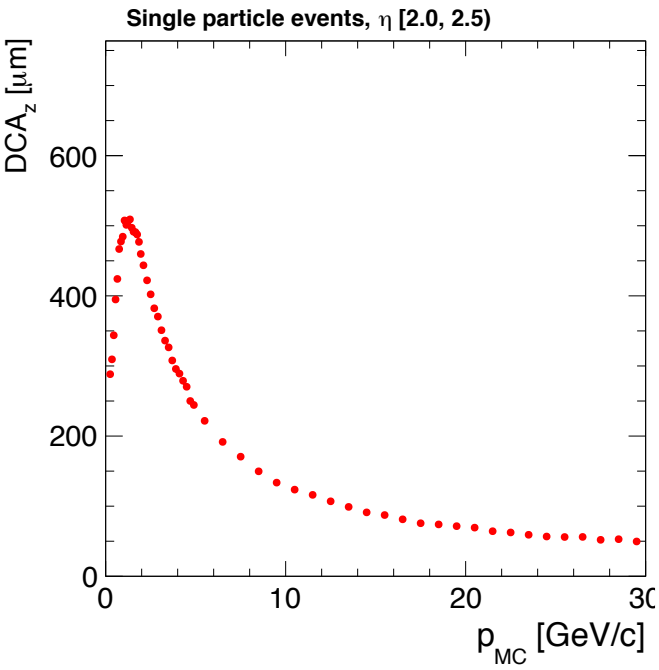

Single particle events, η [0.0, 0.5)
DCA_z [μm]
p_MC [GeV/c]

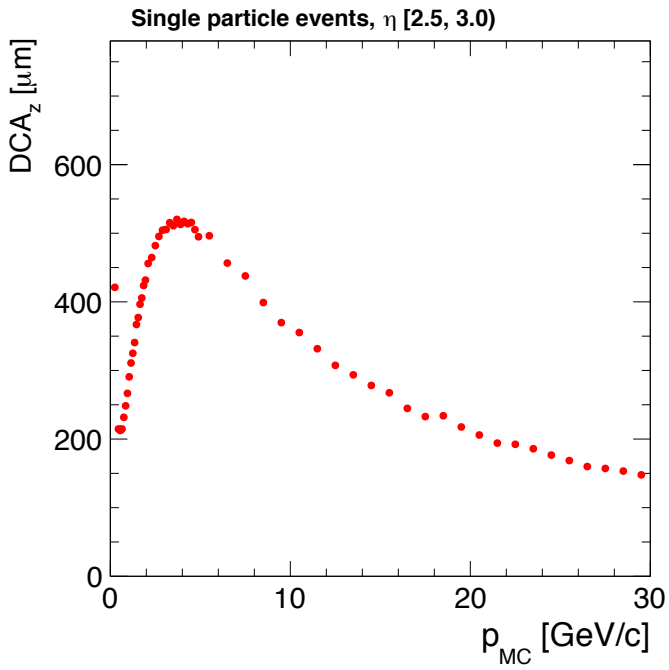

Single particle events, η [0.5, 1.0)
DCA_z [μm]
p_MC [GeV/c]

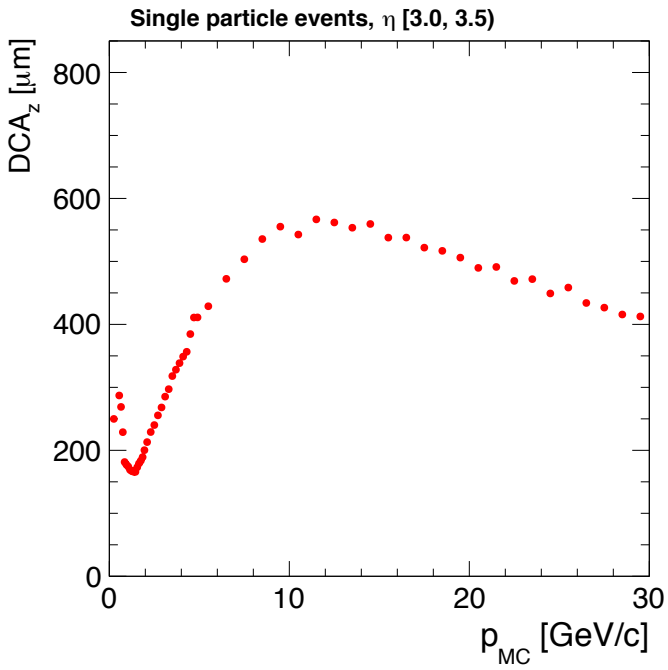

Single particle events, η [1.0, 1.5)
DCA_z [μm]
p_MC [GeV/c]


Single particle events, η [1.5, 2.0)
DCA_z [μm]
p_MC [GeV/c]

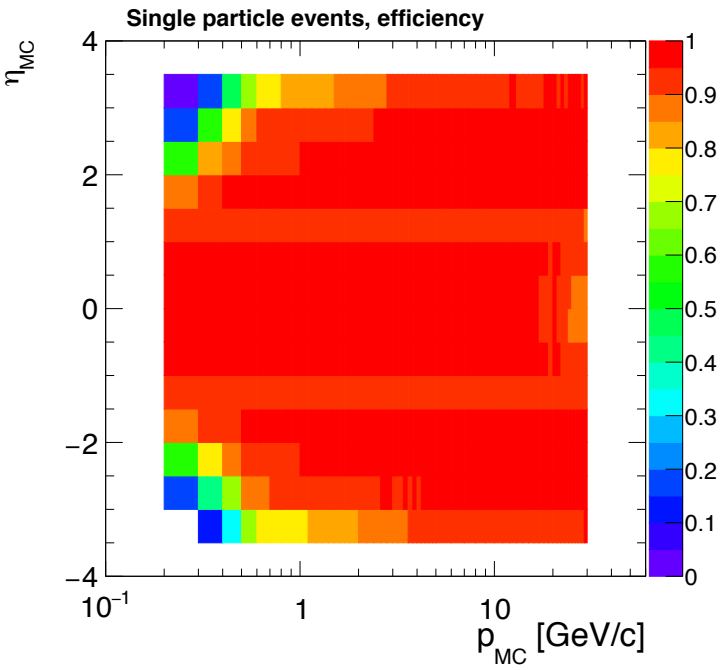
DCA_z

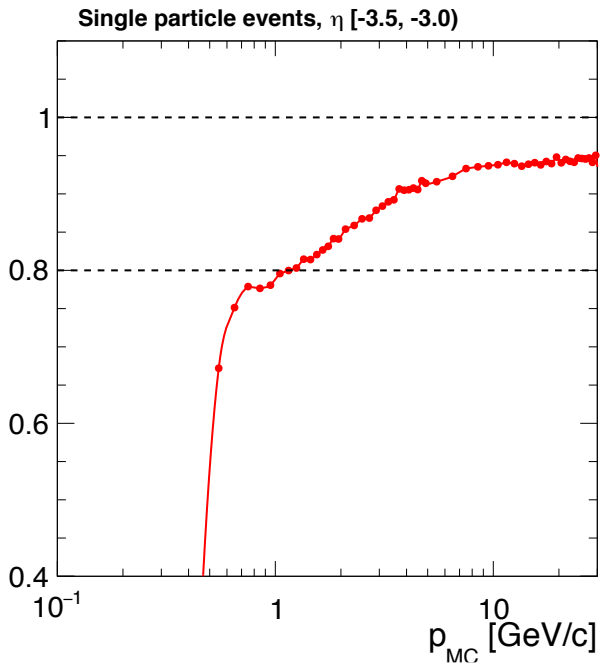

Single particle events, η [2.0, 2.5)
DCA_z [μm]
0
200
400
600
0
10
20
30
p_MC [GeV/c]

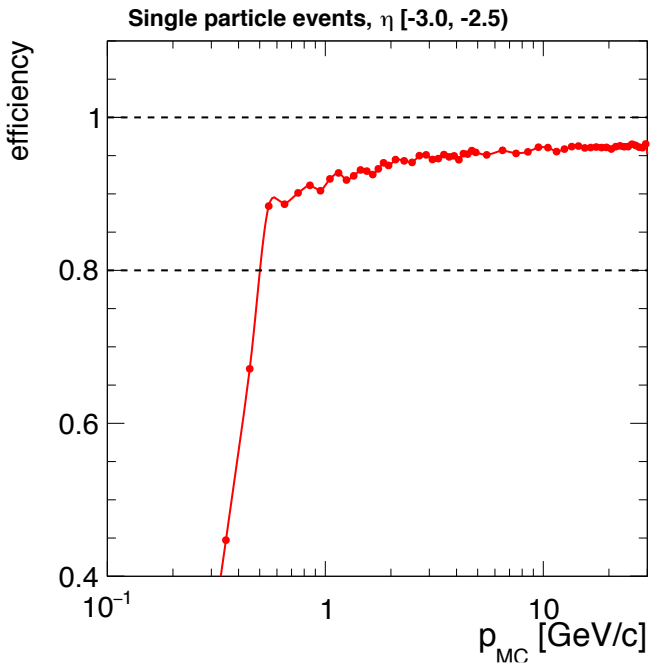

Single particle events, η [2.5, 3.0)
DCA_z [μm]
0
200
400
600
0
10
20
30
p_MC [GeV/c]

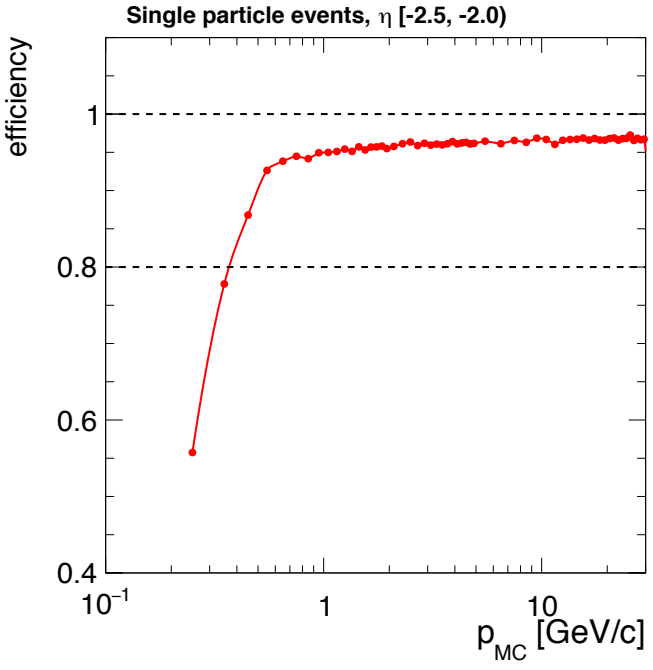

Single particle events, η [3.0, 3.5)
DCA_z [μm]
0
200
400
600
800
0
10
20
30
p_MC [GeV/c]

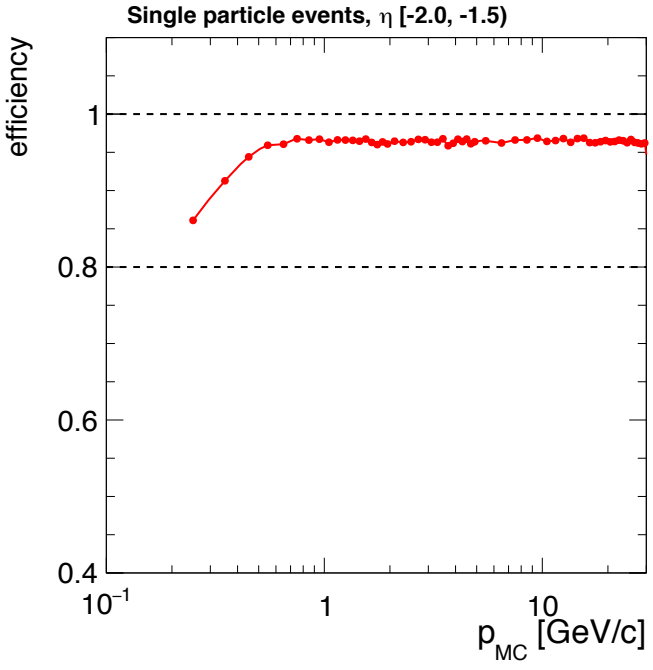
Efficiency

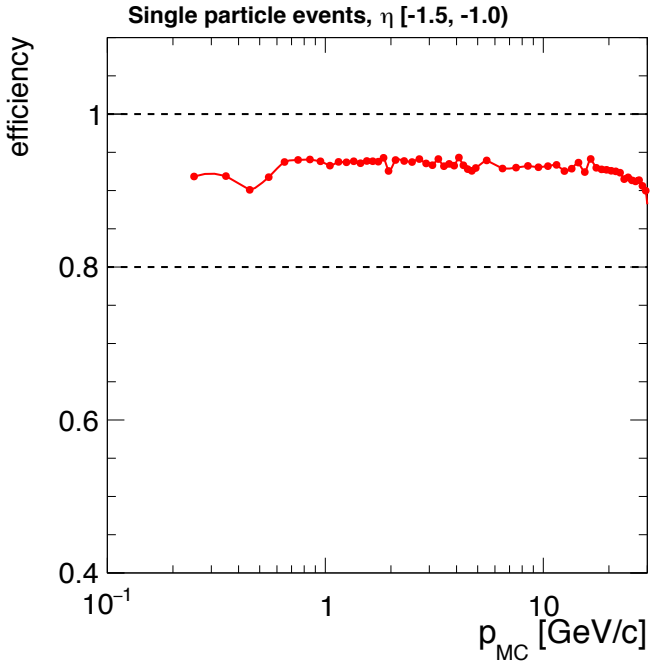

Single particle events, efficiency
η_{MC}
4
2
0
−2
−4
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
10^{-1}
1
10
p_{MC} [GeV/c]


Single particle events, η [-3.5, -3.0)
1
0.8
0.6
0.4
10^{-1}
1
10
p_{MC} [GeV/c]

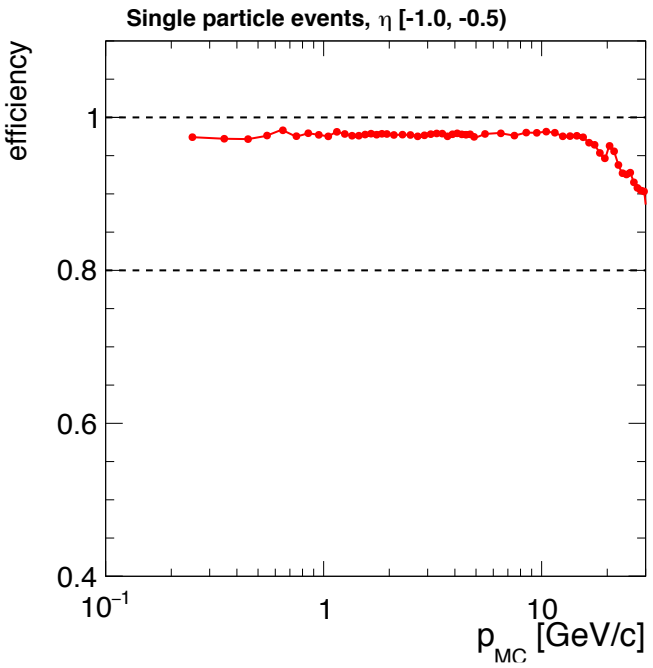

Single particle events, η [-3.0, -2.5)
efficiency
1
0.8
0.6
0.4
10^{-1}
1
10
p_{MC} [GeV/c]

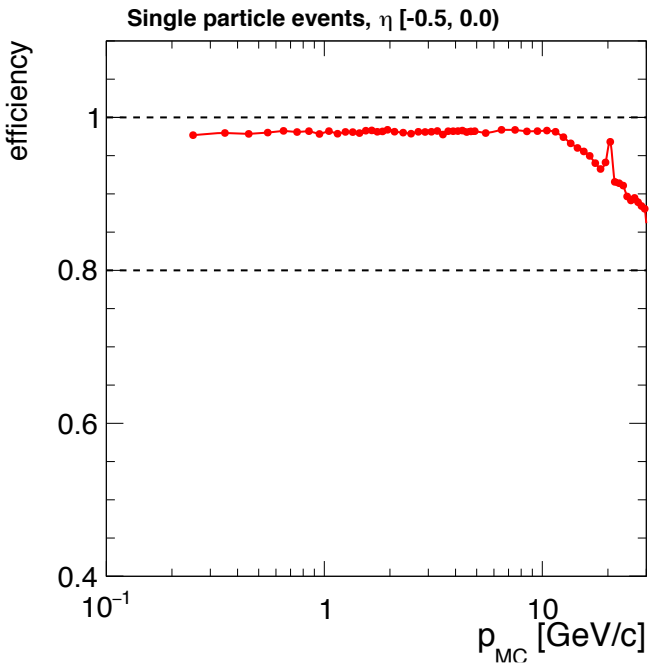

Single particle events, η [-2.5, -2.0)
efficiency
1
0.8
0.6
0.4
10^{-1}
1
10
p_{MC} [GeV/c]

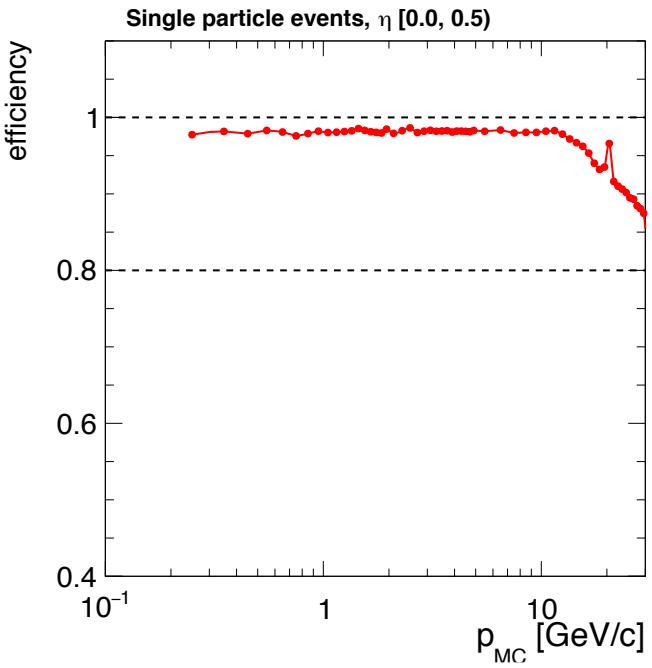

Single particle events, η [-2.0, -1.5)
efficiency
1
0.8
0.6
0.4
10^{-1}
1
10
p_{MC} [GeV/c]

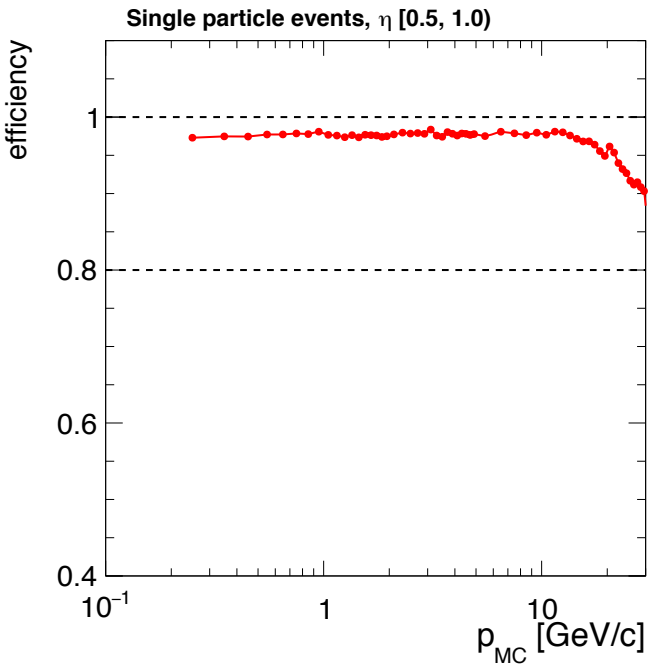

Single particle events, η [-1.5, -1.0)
efficiency
1
0.8
0.6
0.4
10^{-1}
1
10
p_{MC} [GeV/c]

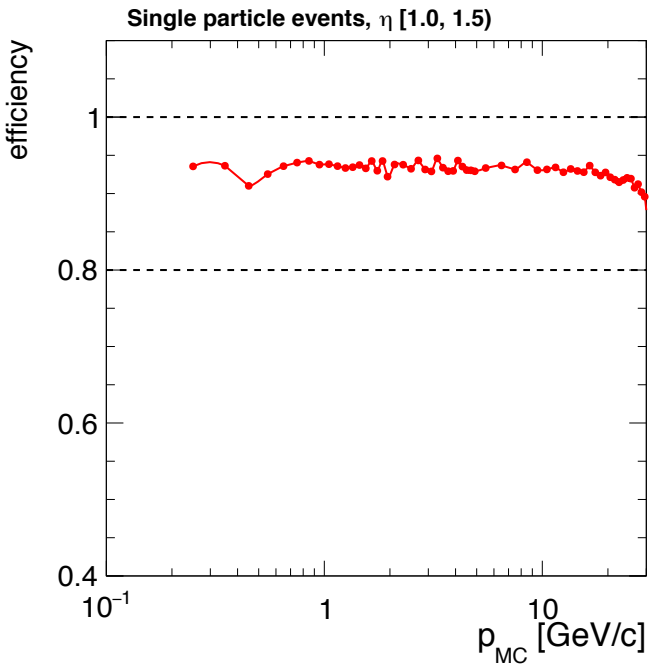
Efficiency

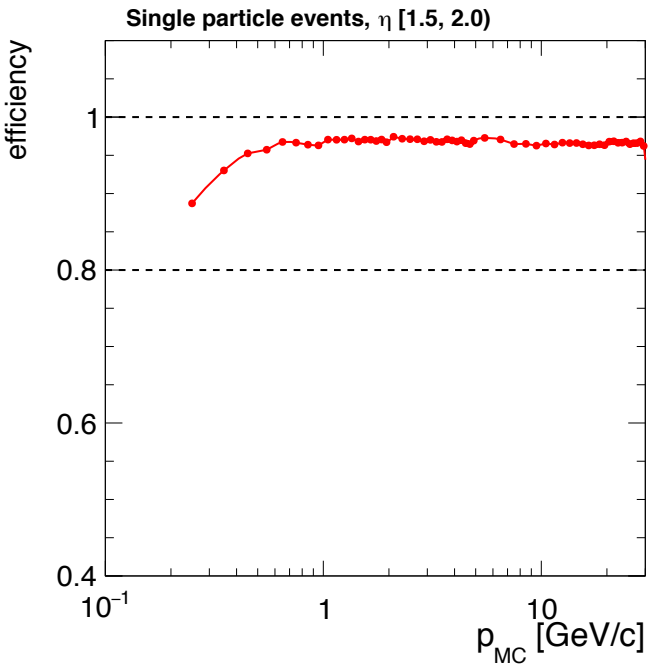

Single particle events, η [-1.0, -0.5)
efficiency
1
0.8
0.6
0.4
10⁻¹
1
10
p_MC [GeV/c]


Single particle events, η [-0.5, 0.0)
efficiency
1
0.8
0.6
0.4
10⁻¹
1
10
p_MC [GeV/c]

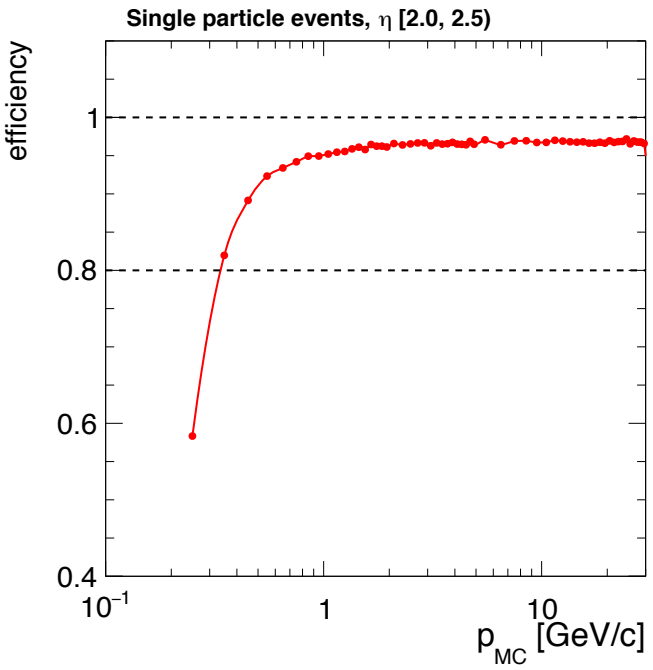

Single particle events, η [0.0, 0.5)
efficiency
1
0.8
0.6
0.4
10⁻¹
1
10
p_MC [GeV/c]

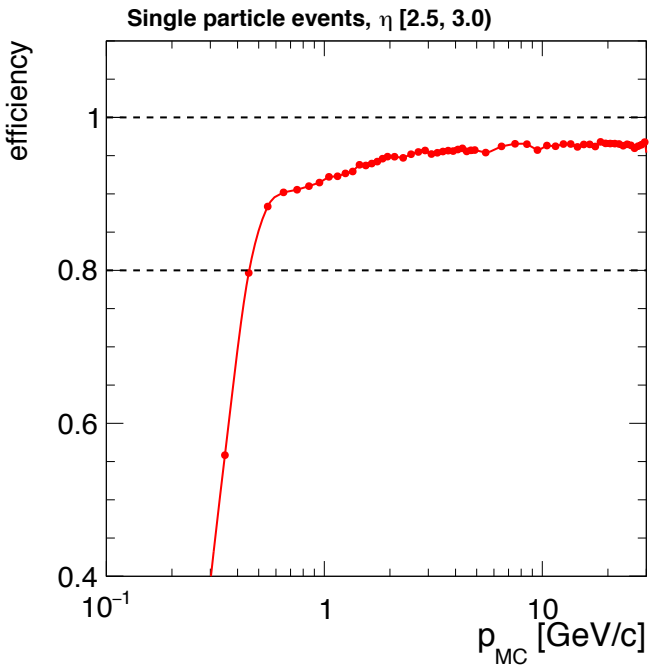

Single particle events, η [0.5, 1.0)
efficiency
1
0.8
0.6
0.4
10⁻¹
1
10
p_MC [GeV/c]

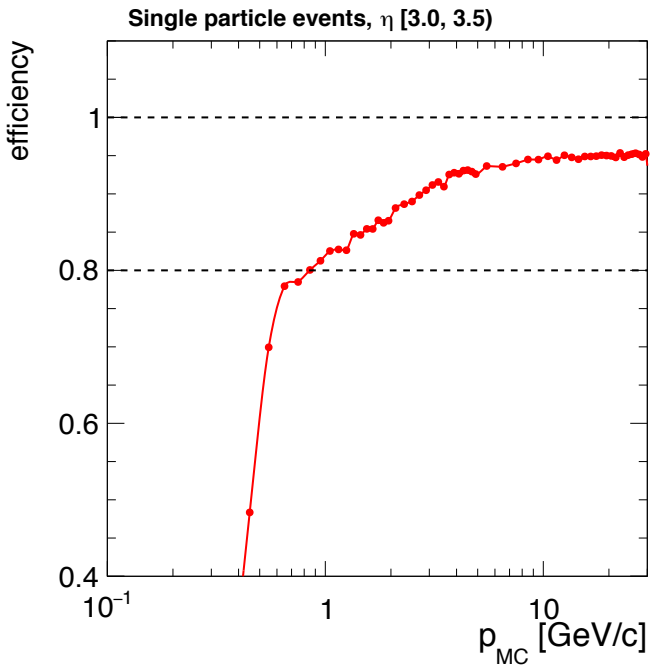

Single particle events, η [1.0, 1.5)
efficiency
1
0.8
0.6
0.4
10⁻¹
1
10
p_MC [GeV/c]


Single particle events, η [1.5, 2.0)
efficiency
1
0.8
0.6
0.4
10⁻¹
1
10
p_MC [GeV/c]

Efficiency


Single particle events, η [2.0, 2.5)
efficiency
1
0.8
0.6
0.4
10⁻¹
1
10
p_MC [GeV/c]


Single particle events, η [2.5, 3.0)
efficiency
1
0.8
0.6
0.4
10⁻¹
1
10
p_MC [GeV/c]


Single particle events, η [3.0, 3.5)
efficiency
1
0.8
0.6
0.4
10⁻¹
1
10
p_MC [GeV/c]