

Sigma Asymmetry

Anil

Cuts:

Description	Selection criteria
charged track p	$\text{thetaInCDCAcceptance}$ $\text{nCDCHits} > 0$
protonID (p)	> 0.9
γ	$E_{\text{forward}} > 0.080$ [GeV] $E_{\text{barrel}} > 0.030$ [GeV] $E_{\text{backward}} > 0.060$ [GeV]
π^0	$0.120 < M < 0.145$ [GeV/c ²]
Σ^+	$1.1 < M < 1.3$ [GeV/c ²]
vertex fit	Loose quality cut

Postcuts:

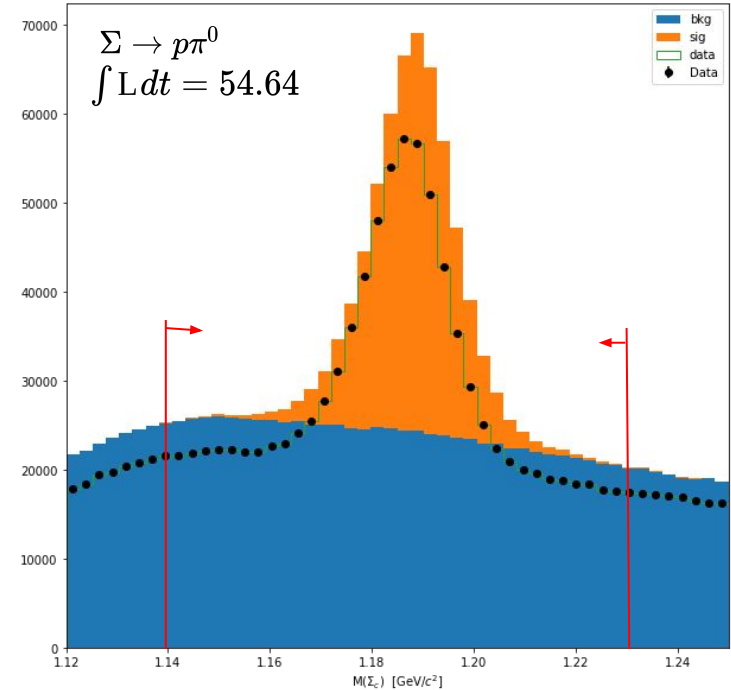
$\text{flightDistance} > 0.31$ cm
 $\text{CM}(p) (\Sigma) > 0.91$ GeV/c
 $\text{CM}(p) (\pi^0) > 0.31$ GeV/c

$\text{protonID}(p) > 0.9$

New fit:

Model : **signal Gauss + 1st order chebyshev**

Mass fit window: **$1.14 < M(\text{sigma}) < 1.23$**

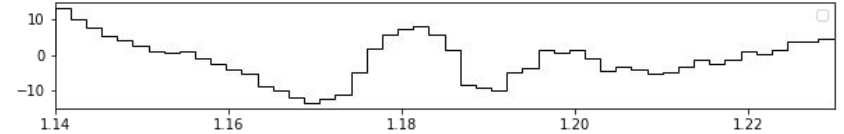
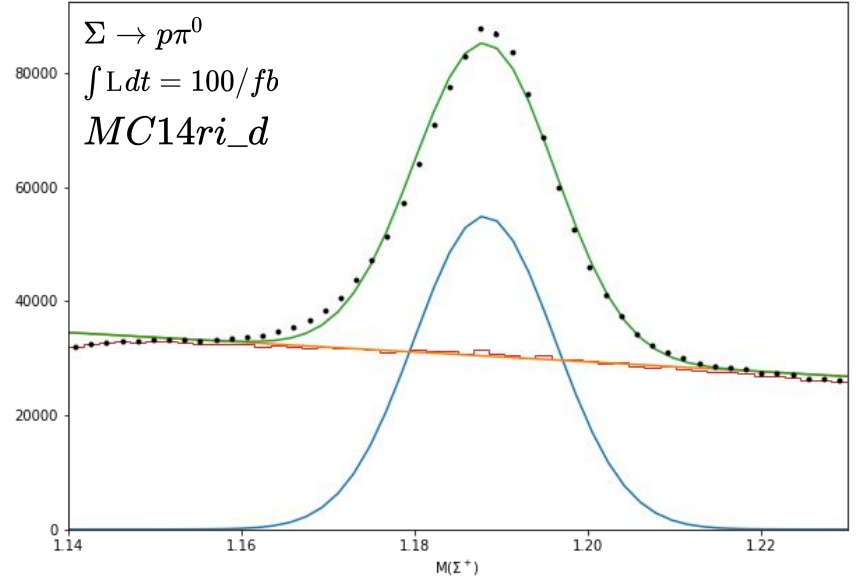


100/fb MC14ri_d Fit

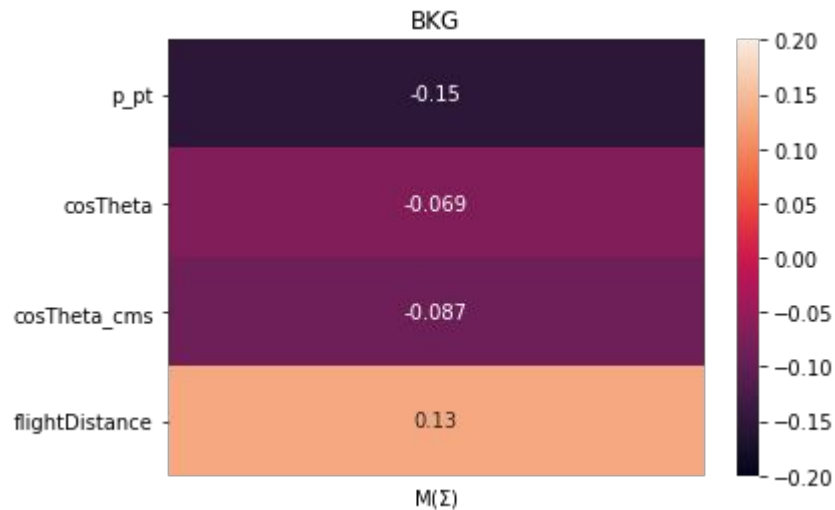
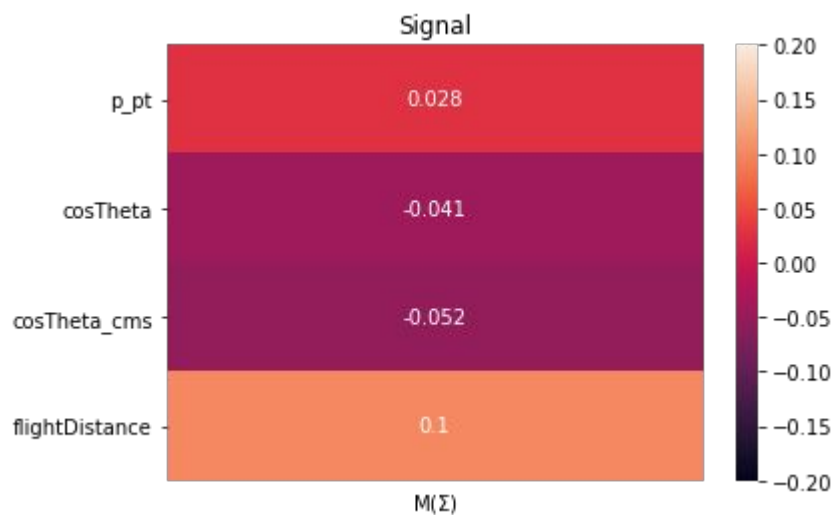
- Unbinned Maximum likelihood
- Model : **Gauss + 1st order poly**

name	value	minuit_hesse
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sig_yield	621000	+/- 1.5e+03
bkg_yield	1.532e+06	+/- 1.8e+03
mul	1.188	+/- 1.8e-05
s1	0.008127	+/- 2e-05
a	-0.1258	+/- 0.0015

Truth
signal: 636145
bkg: 1516644

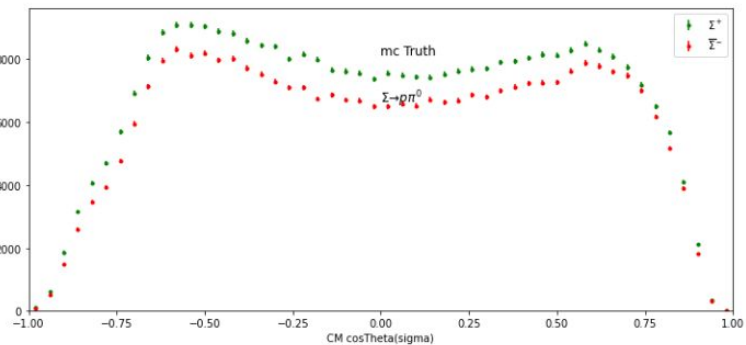
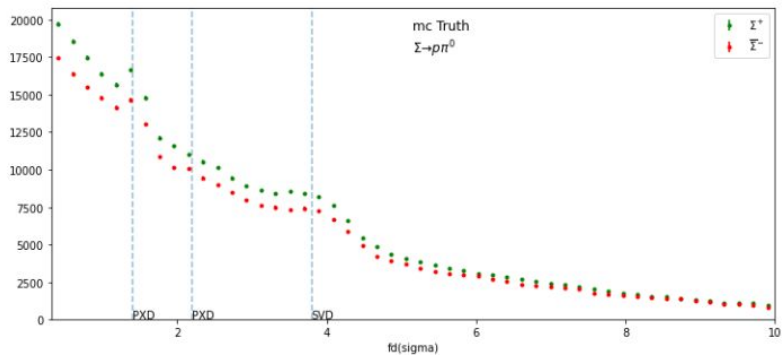
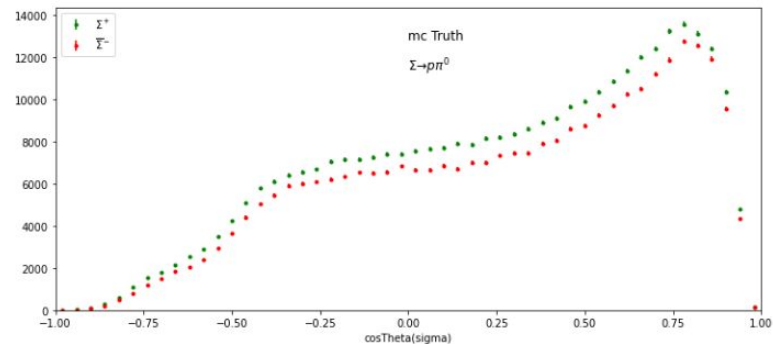
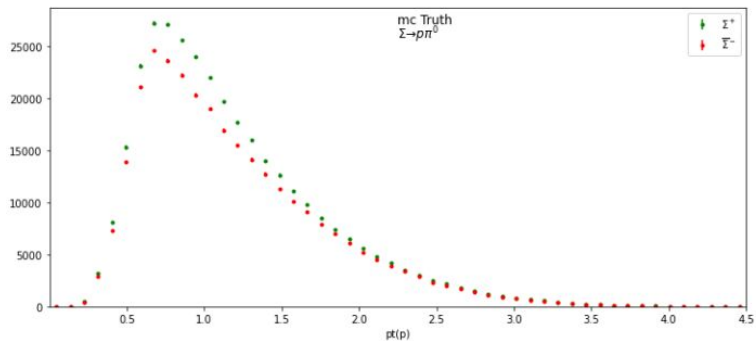


Correlation between var vs M

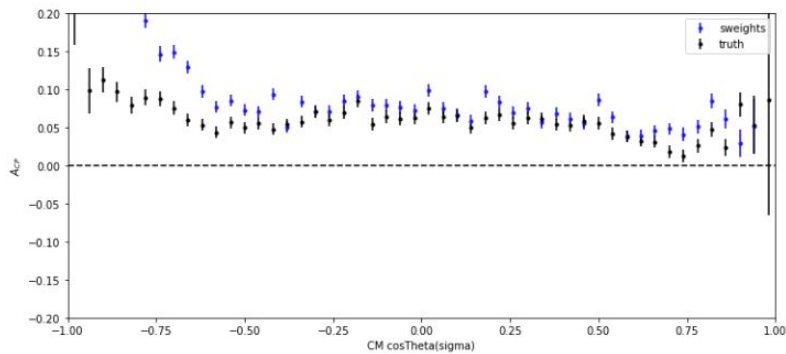
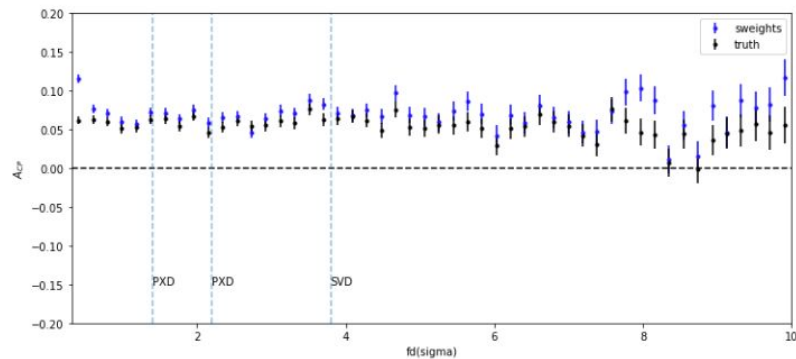
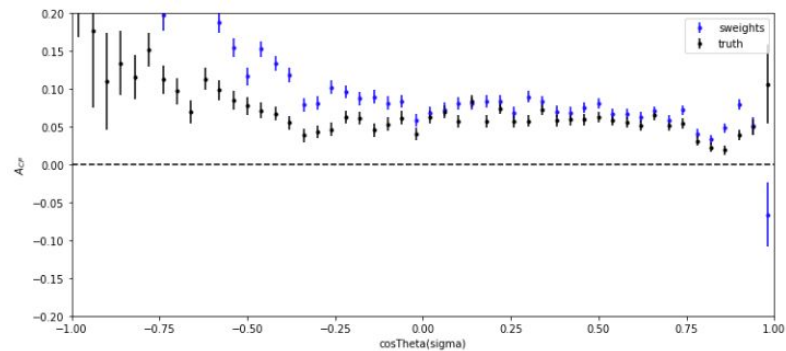
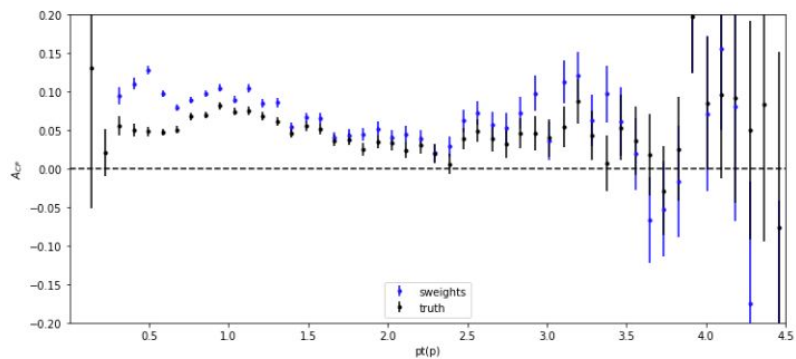


Pearson correlation coefficient

signal only 100/fb MC14ri_d :



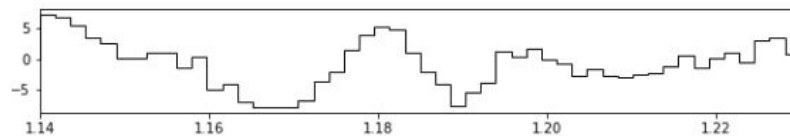
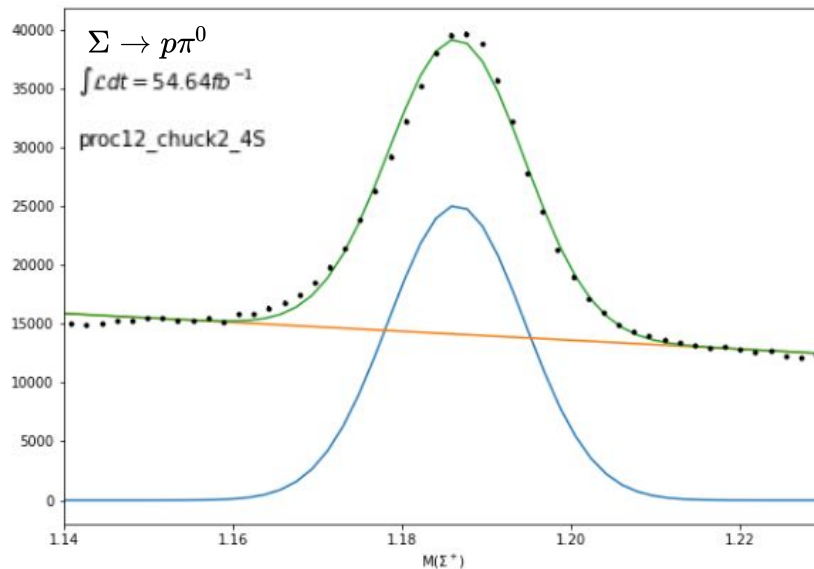
genericMC : Truth vs Sweights



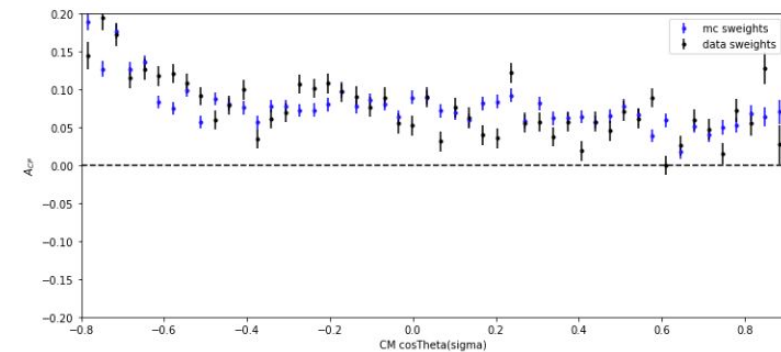
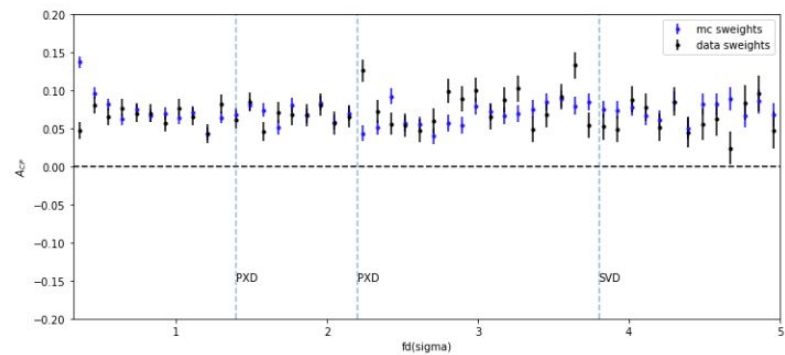
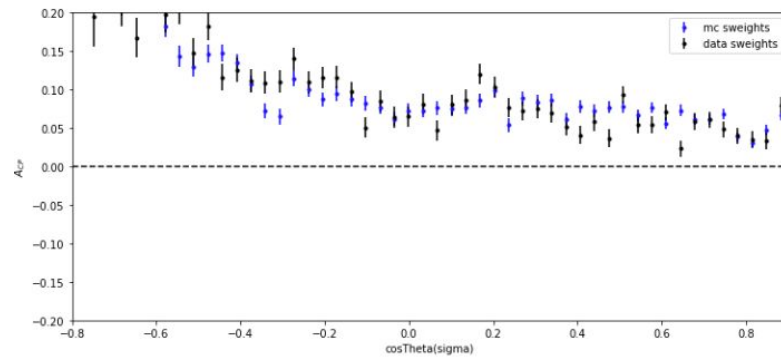
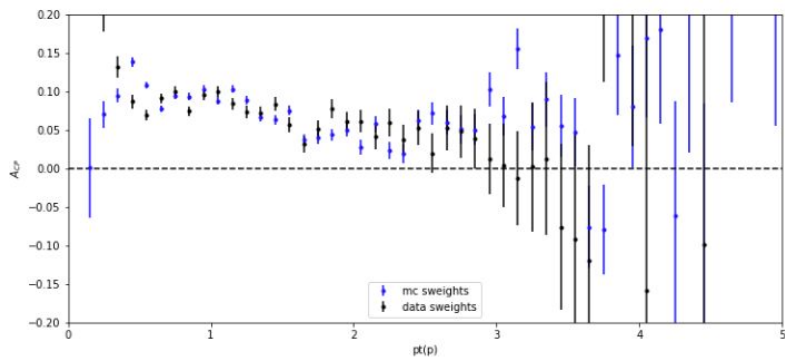
proc12_chunk2_4S Fit

- Unbinned Maximum likelihood
- Model : Gauss + 1st order poly

name	value	minuit_hesse
sig_yield	281800	+/- 1e+03
bkg_yield	709100	+/- 1.2e+03
mul	1.186	+/- 2.7e-05
s1	0.008069	+/- 2.9e-05
a	-0.1202	+/- 0.0021

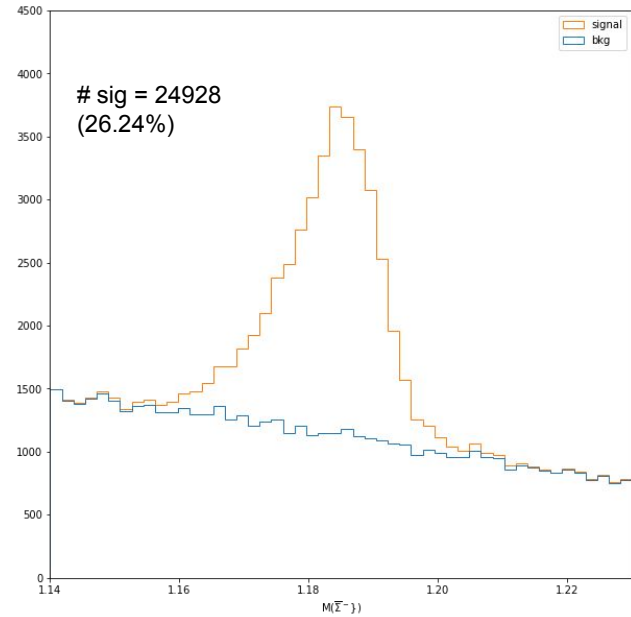
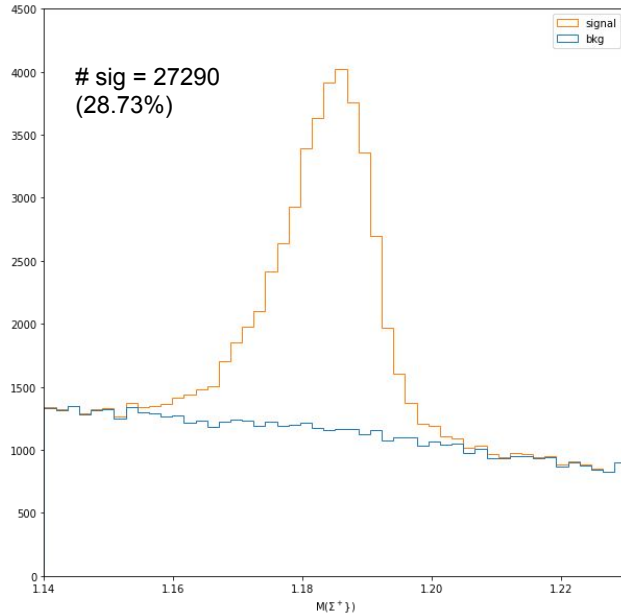


sweights: Data vs MC



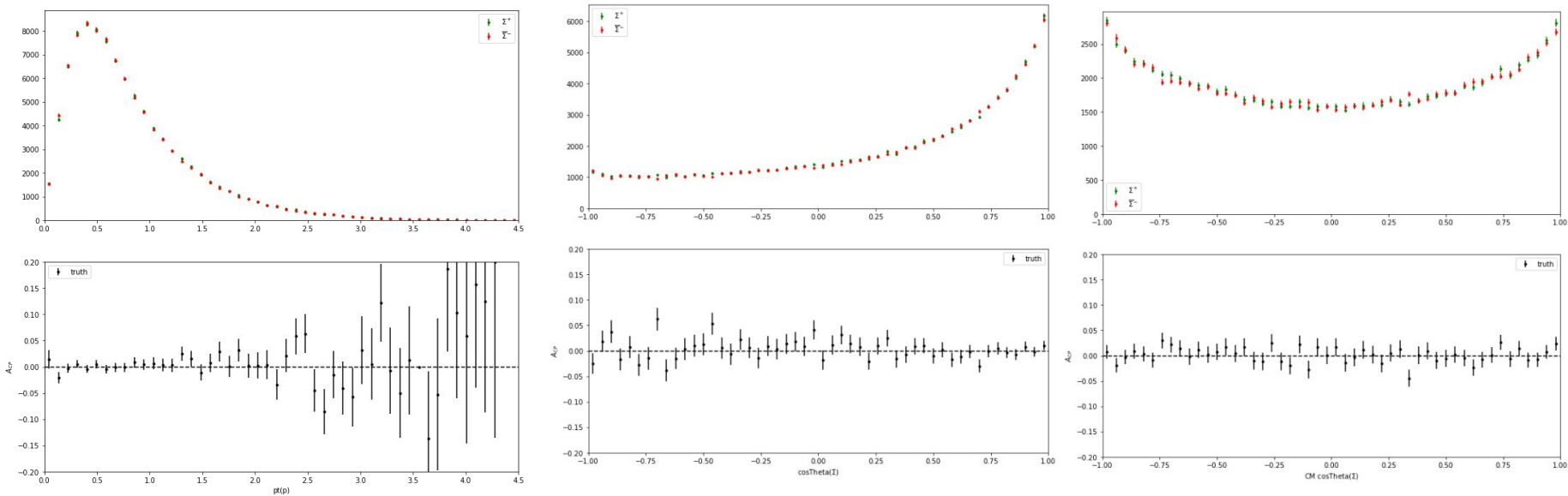
Signal MC

- Produced **95,000** events each for Σ^+ and $\bar{\Sigma}^-$.



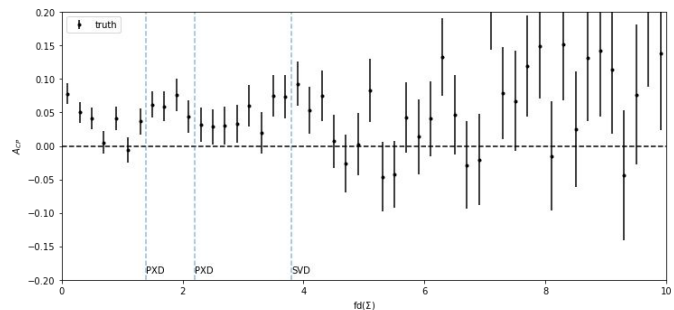
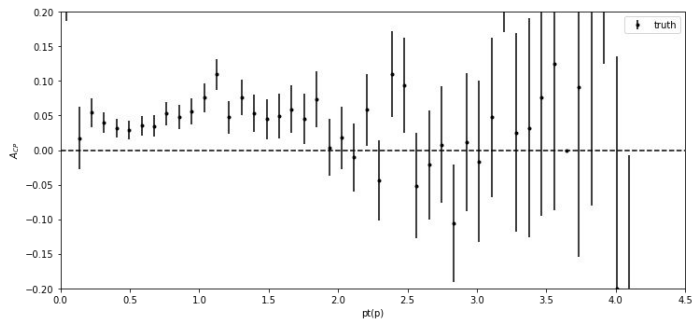
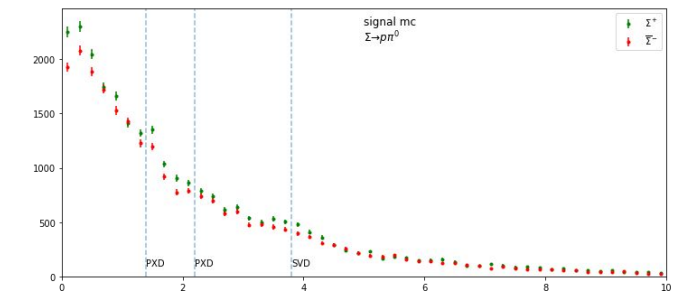
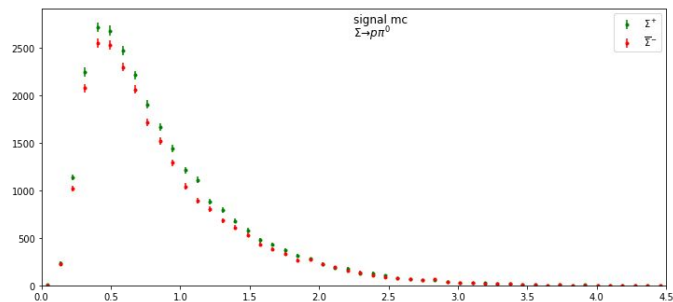
Signal MC Generator level Info.

- Take list from **FillParticleLevelFromMC**
- No asymmetry at generator level.



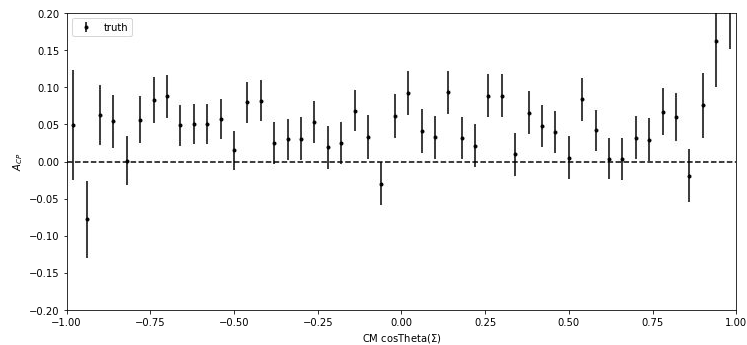
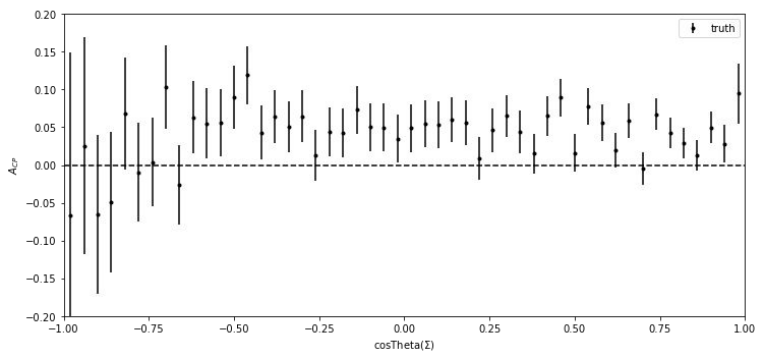
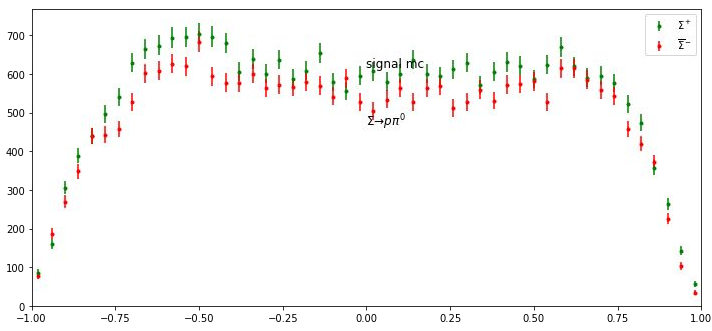
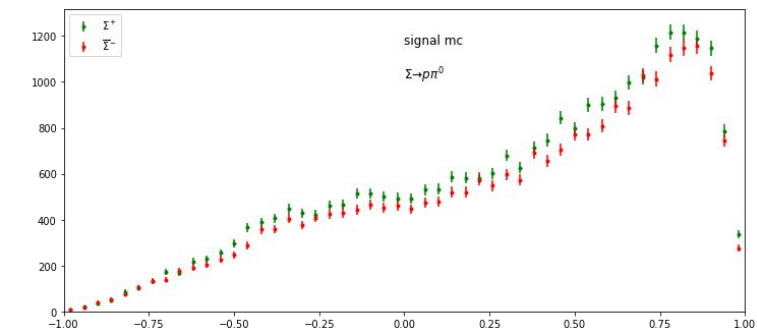
Signal MC Reconstruction level Asymmetry

Signal MC Truth



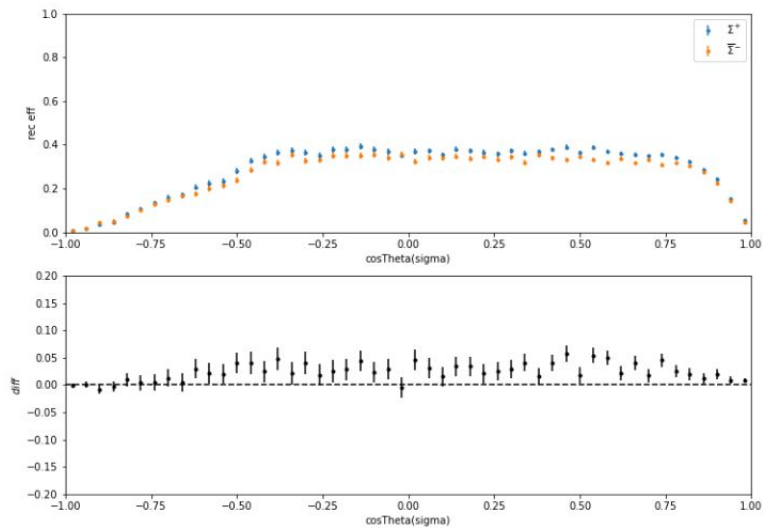
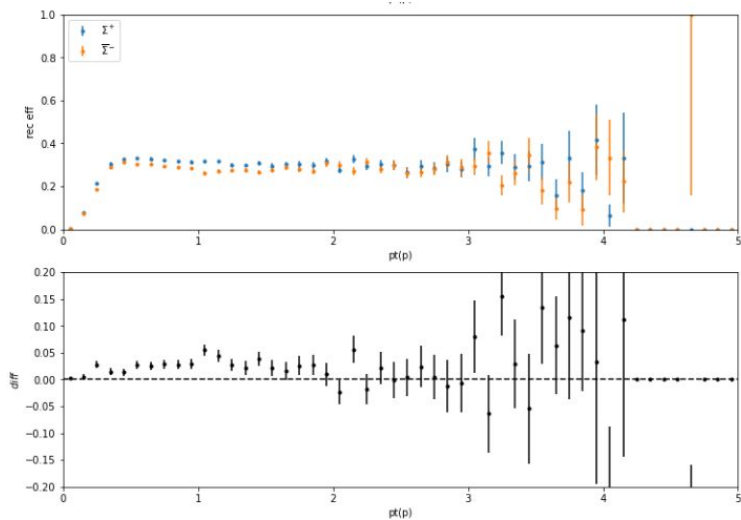
Signal MC Reconstruction level Asymmetry

Signal MC Truth



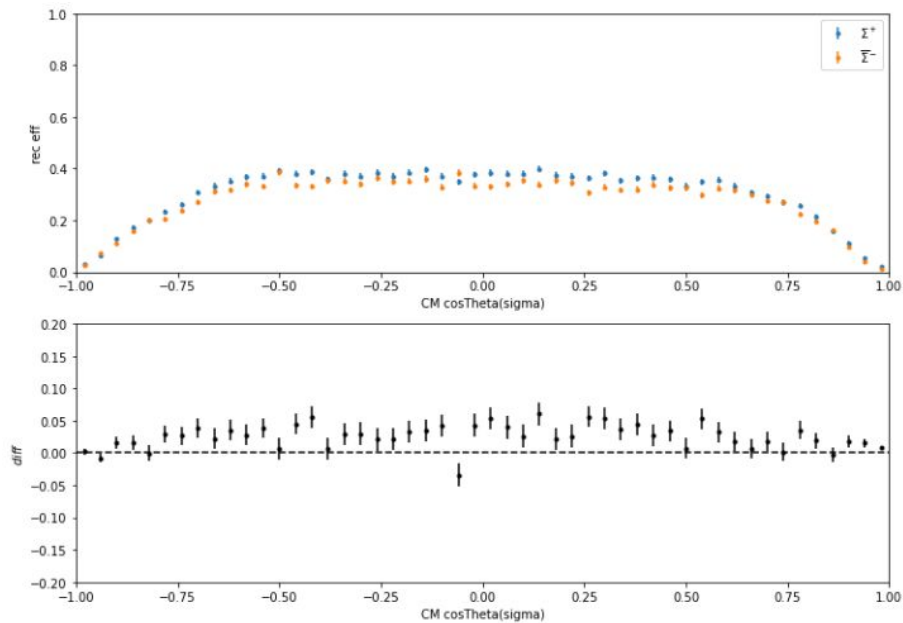
Reconstruction Efficiency

$$\frac{\# \text{reconstructed}}{\# \text{generated}}$$



Reconstruction Efficiency

$$\frac{\# \text{reconstructed}}{\# \text{generated}}$$



Next:

- Look at Multiple candidate per event.
- **Best Candidate Selection at random. [Its done, same shape of asymmetry vs var]**
- To do:
 - Also Best candidate selection by ranking on vertex fit quality.
 - Crunch the numbers and combine with signal mode.