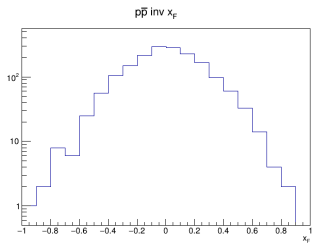# Signal and Background for $\eta_C \to p\bar{p}$

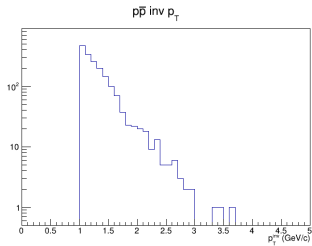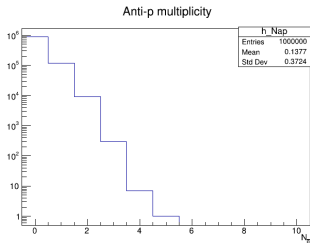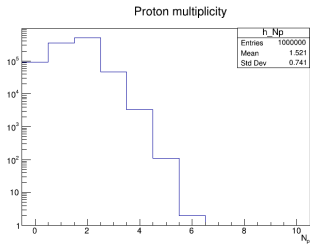Amaresh Datta
(amaresh@jinr.ru)

DLNP
Dubna, Russia

Jan 18, 2022

PYTHIA Details

- $m_{\eta_c} = 2.984$ GeV/c^2, BR ($\eta_C \to p\bar{p}$) : 1.45×10^{-3}
- PYTHIA does not hadronize η_C. J/Ψ used instead for study
- Only J/Ψ produced in $p + p$ collision : *Charmonium:gg2ccbar(3S1)[3S1(1)]g = on,off*
- $J/\Psi \to p\bar{p}$ decay forced : *443:oneChannel = 1 1 0 2212 -2212*
- Signal events normalized to 600K (expected events : SPD CDR) for one year of data at design luminosity
- MinBias (*SoftQCD:all = on)* studied for background : $p, \bar{p}$ NOT from J/Ψ are considered only
- Momentum resolution used : $\frac{\delta p}{p} = 0.02 + 0.002p$
- Each event, all possible combinations of p and $\bar{p}$ are stored as bkg
- For pT and xF distribution, candidates in 3σ mass window are used
- Selection criteria for $p, \bar{p}$: $p_T \geq 1$ GeV, $-2. \leq y \leq 2.$
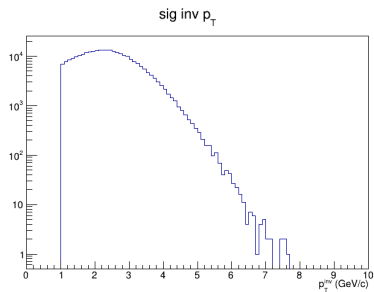
Background Distributions

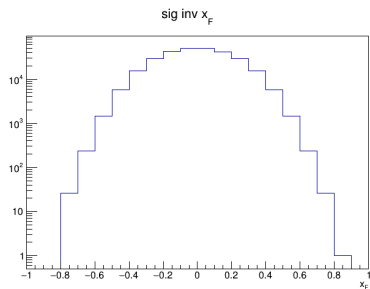Figure 1: Signal invariant pT distribution

Figure 2: Signal invariant xF distribution
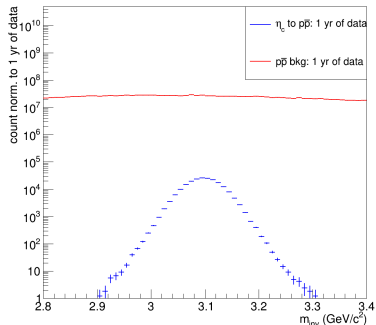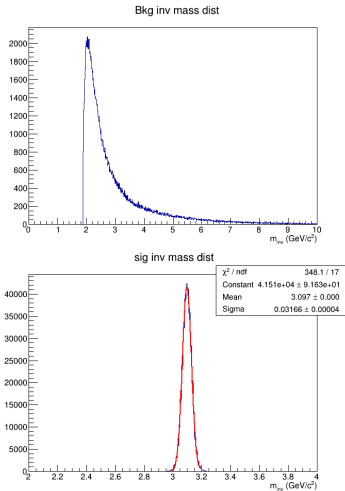
Invariant Mass Distributions

Figure 3: signal to background for $p\bar{p}$ invariant mass distribution

Outlook

- Distance of Common Approach (DCA) between the tracks were not very helpful as almost all p, $\bar{p}$ comes essentially from the primary vertex or VERY close to it
- Opening angle between the particles could be useful to eliminate background
- Looking at some events in SPDROOT might give more realistic variables to tweak