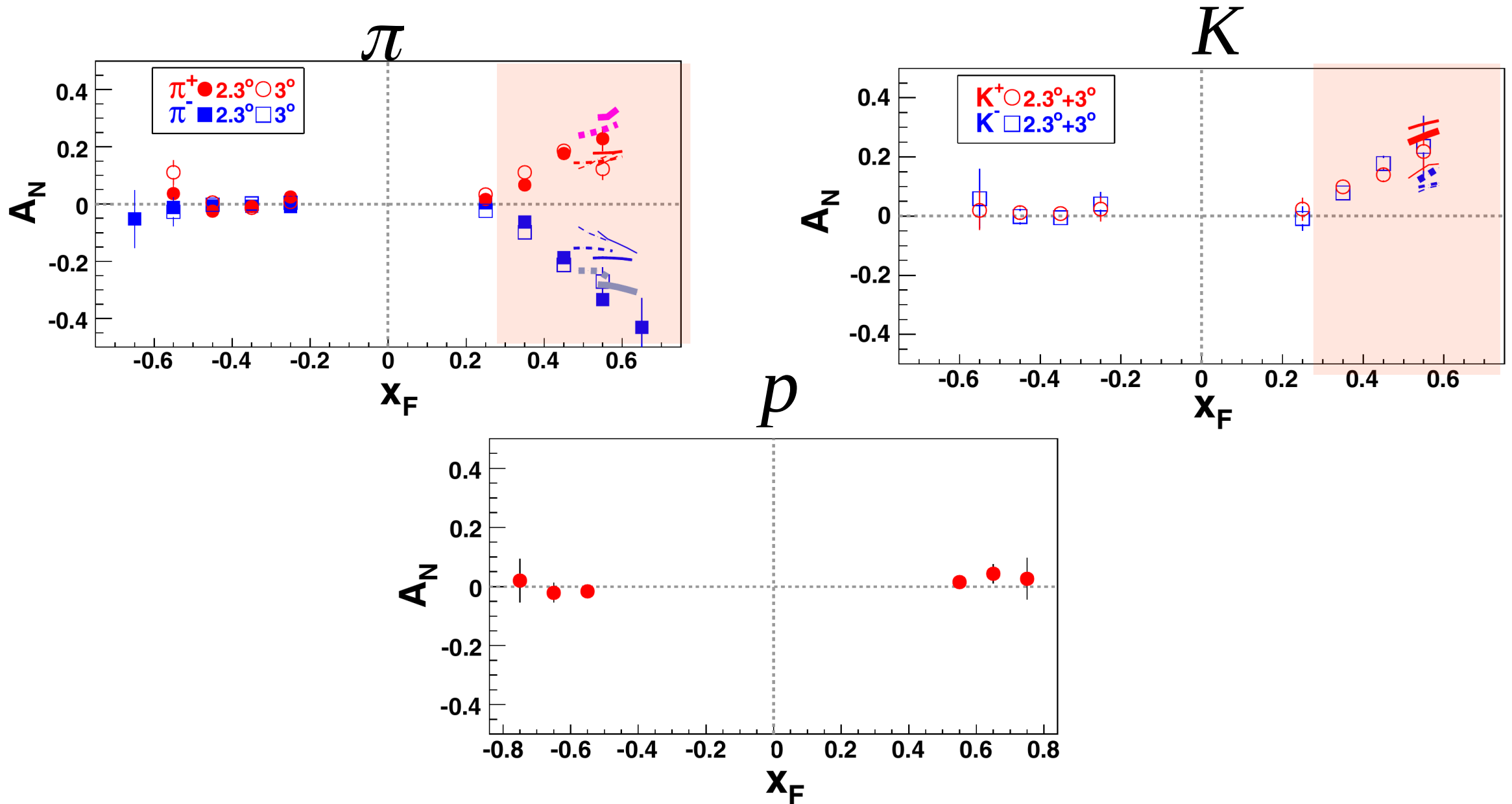# Study of the feasibility of the SPD setup for measuring SSA

Artem Ivanov, Elena Zemlyanichkina,
Natalia Rogacheva, Ruslan Akhunzyanov

SPD Physics & MC meeting
14.12.2022

SSA for π, K, p

Single Transverse Spin Asymmetries of Identified. Charged Hadrons in Polarized p + p Collisions at √s = 62.4 GeV,
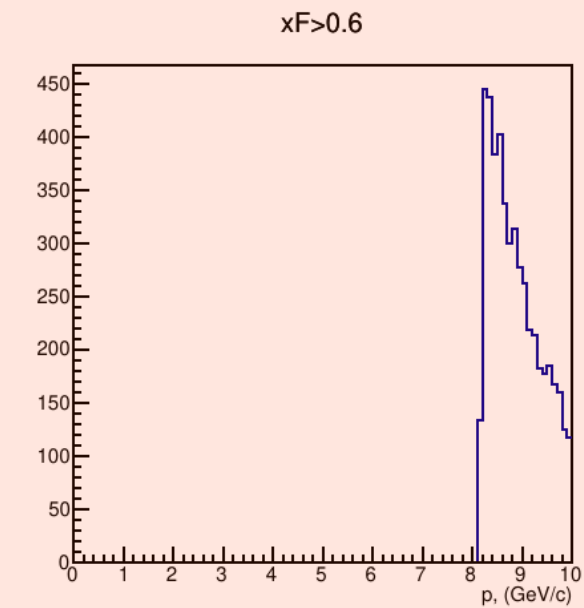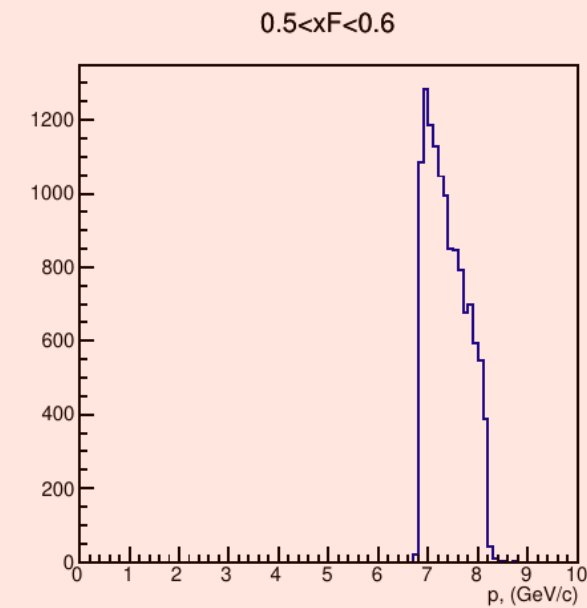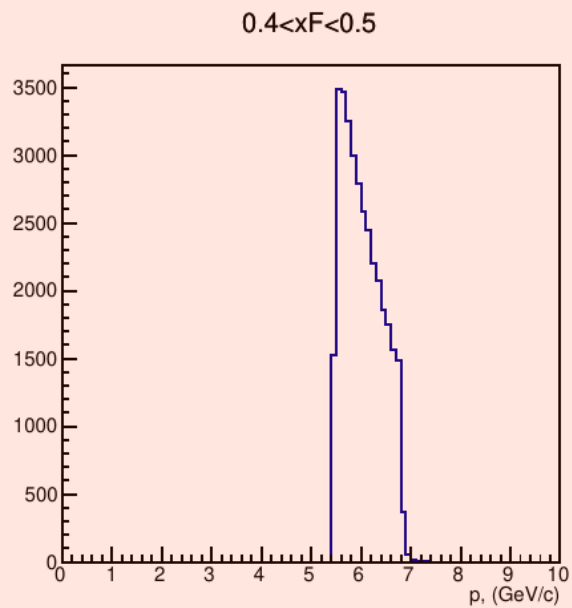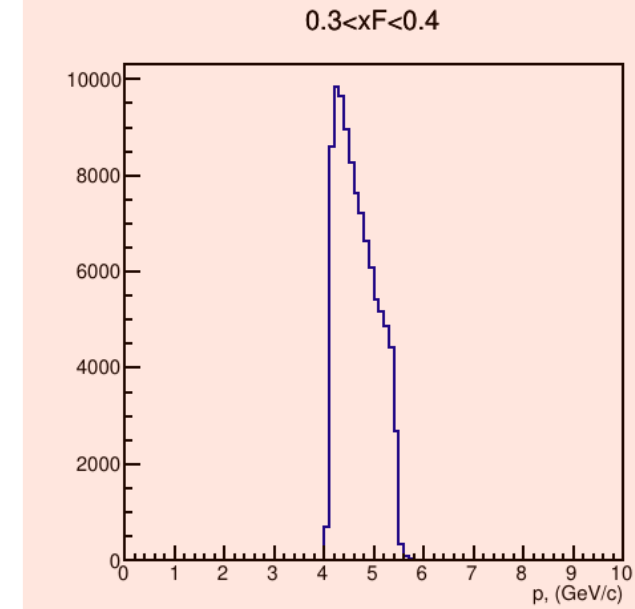Phys. Rev. Lett. 2008. V. 101. (BRAHMS Collaboration)

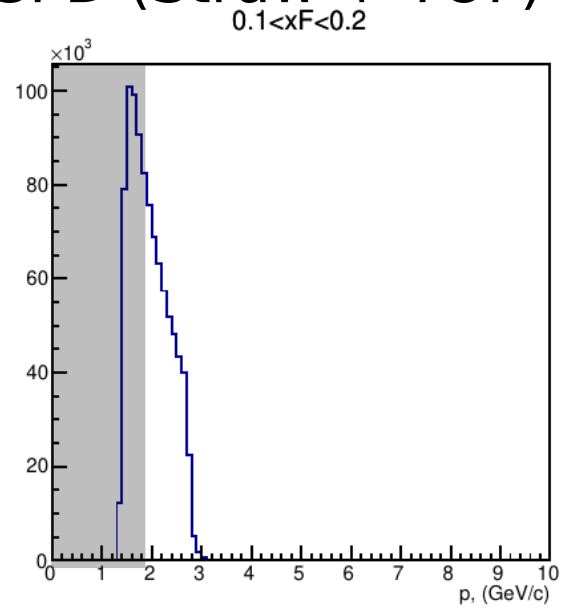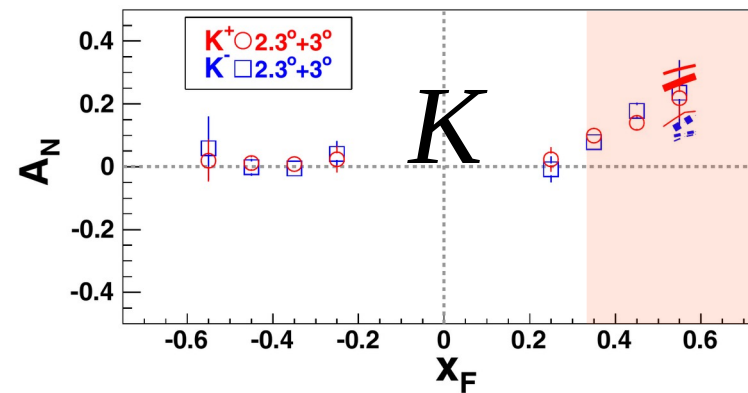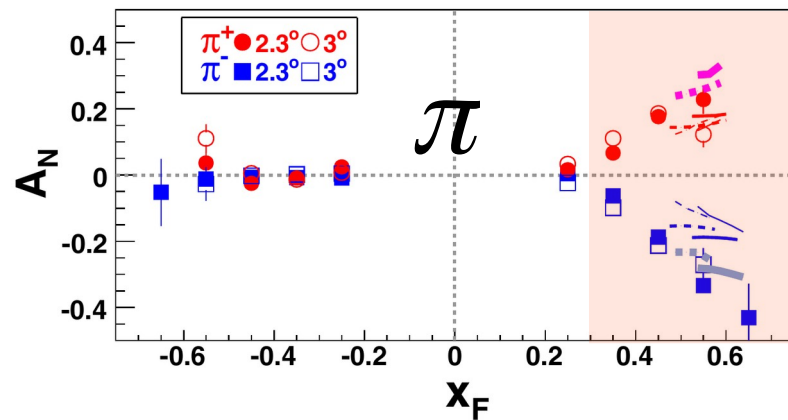# Momentum in bin xF

SoftQCD:all

PID in SPD (Straw + TOF)
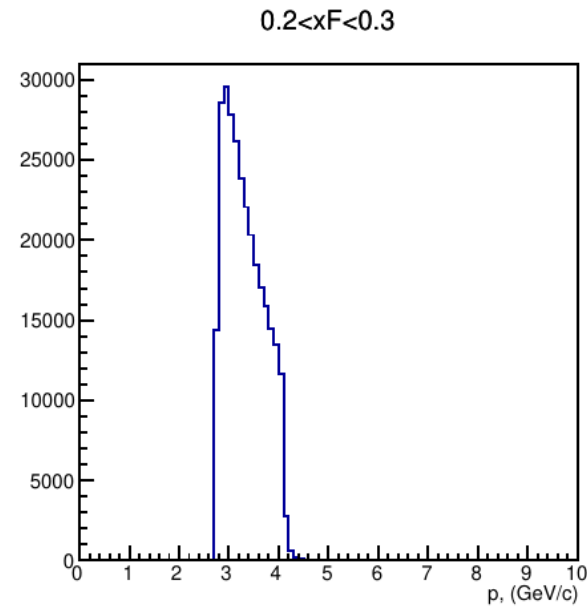
SSA for π, K, p

Single Transverse Spin Asymmetries of Identified. Charged Hadrons in Polarized p + p Collisions at √s = 62.4 GeV ,
Phys. Rev. Lett. 2008. V. 101. (BRAHMS Collaboration)
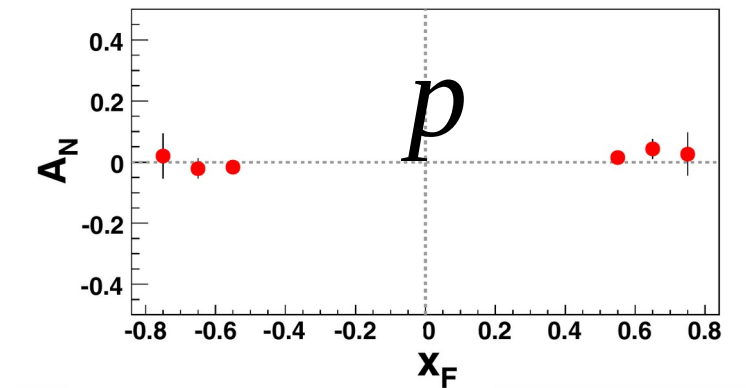
$$A^{h+} = \alpha A^{\pi+} + \beta A^{K+} + \gamma A^p$$

$$A^{h-} = \alpha A^{\pi-} + \beta A^{K-} + \gamma A^{\bar{p}}$$

SoftQCD:all

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SSA for π, K, p

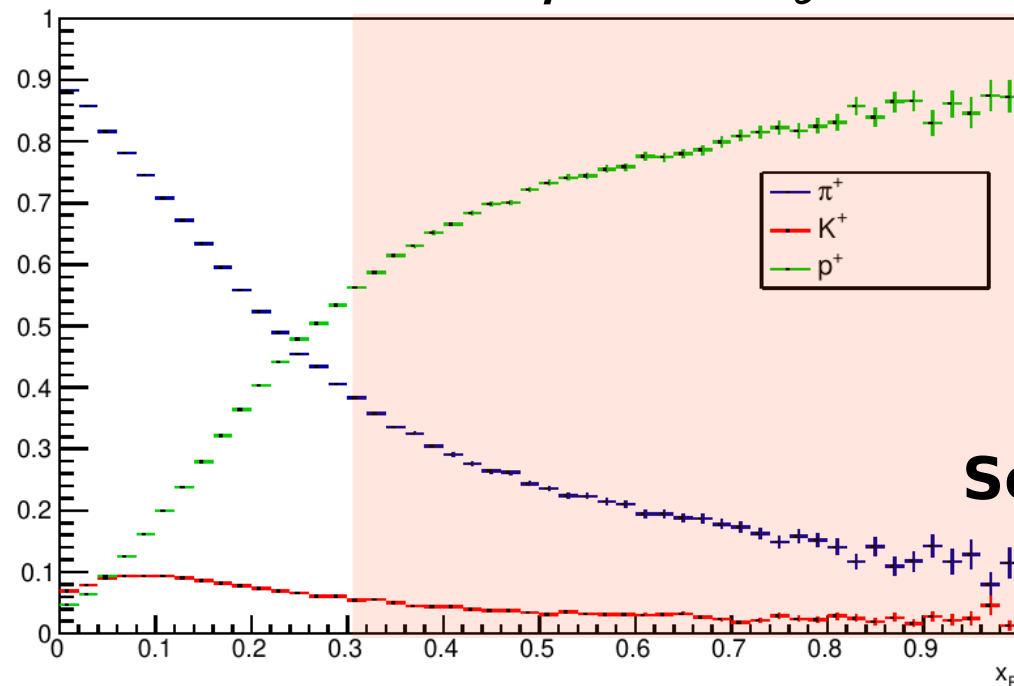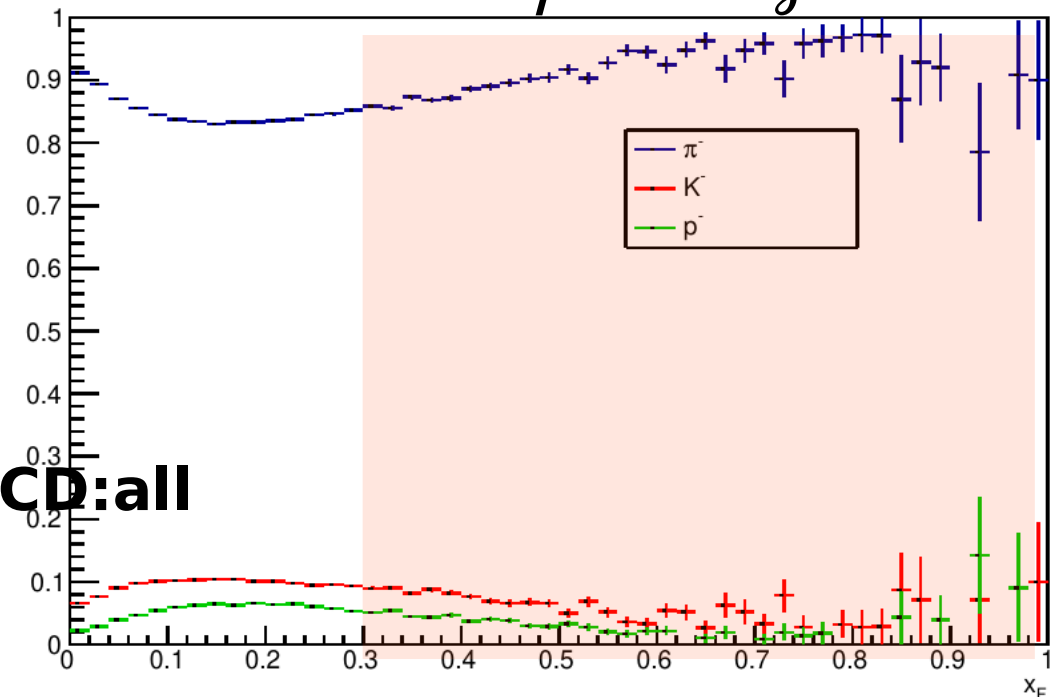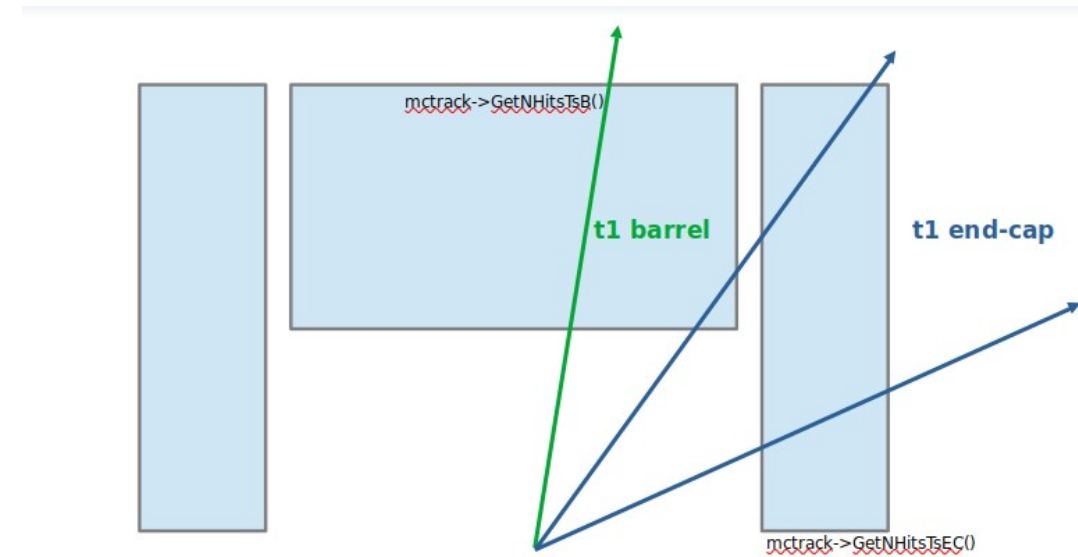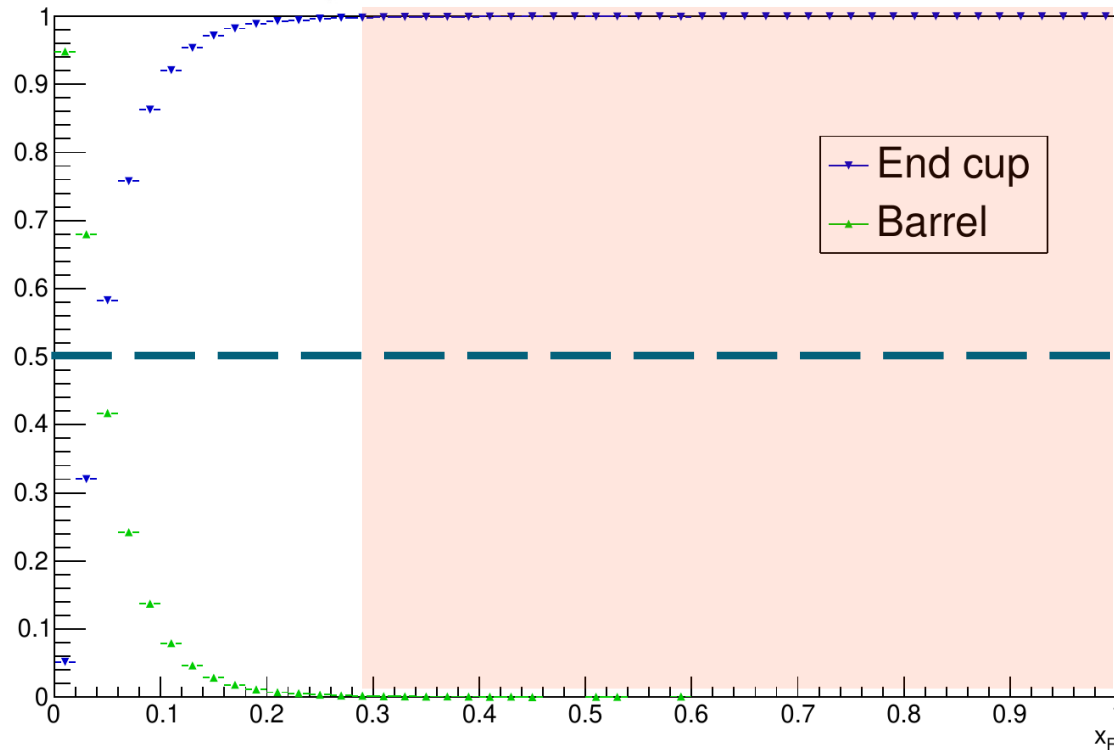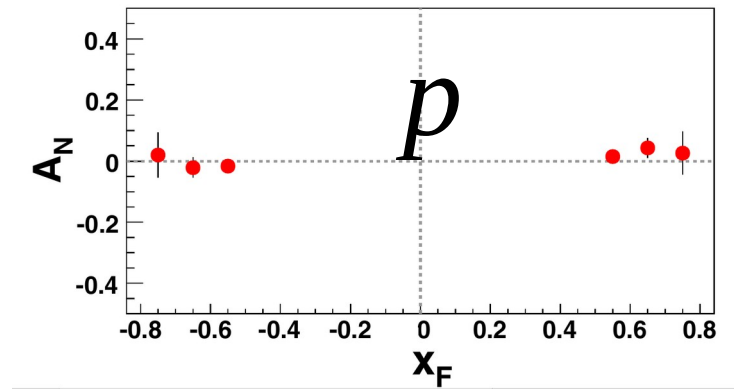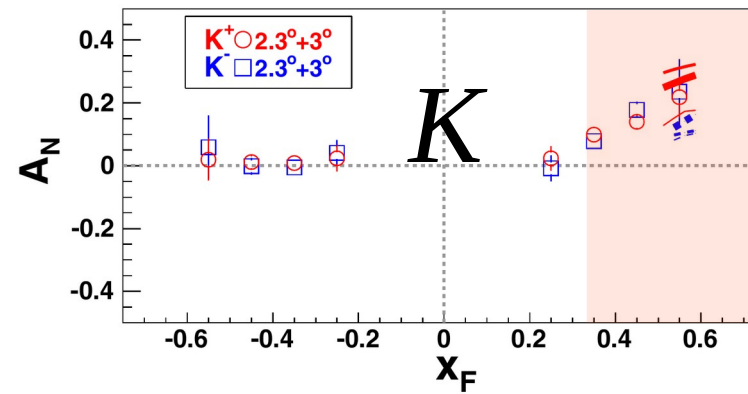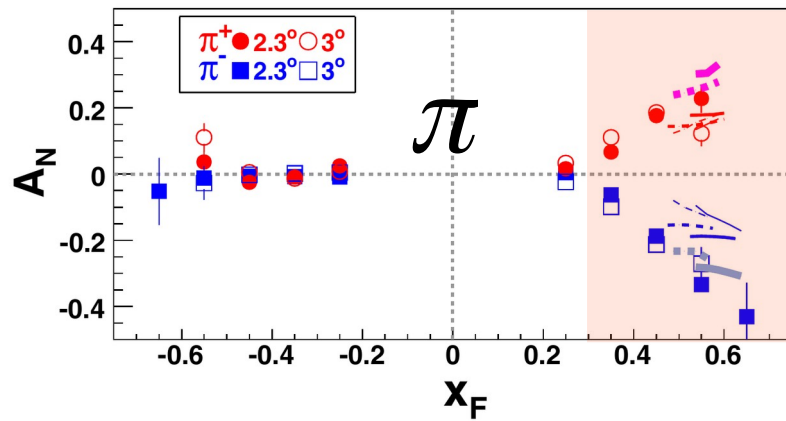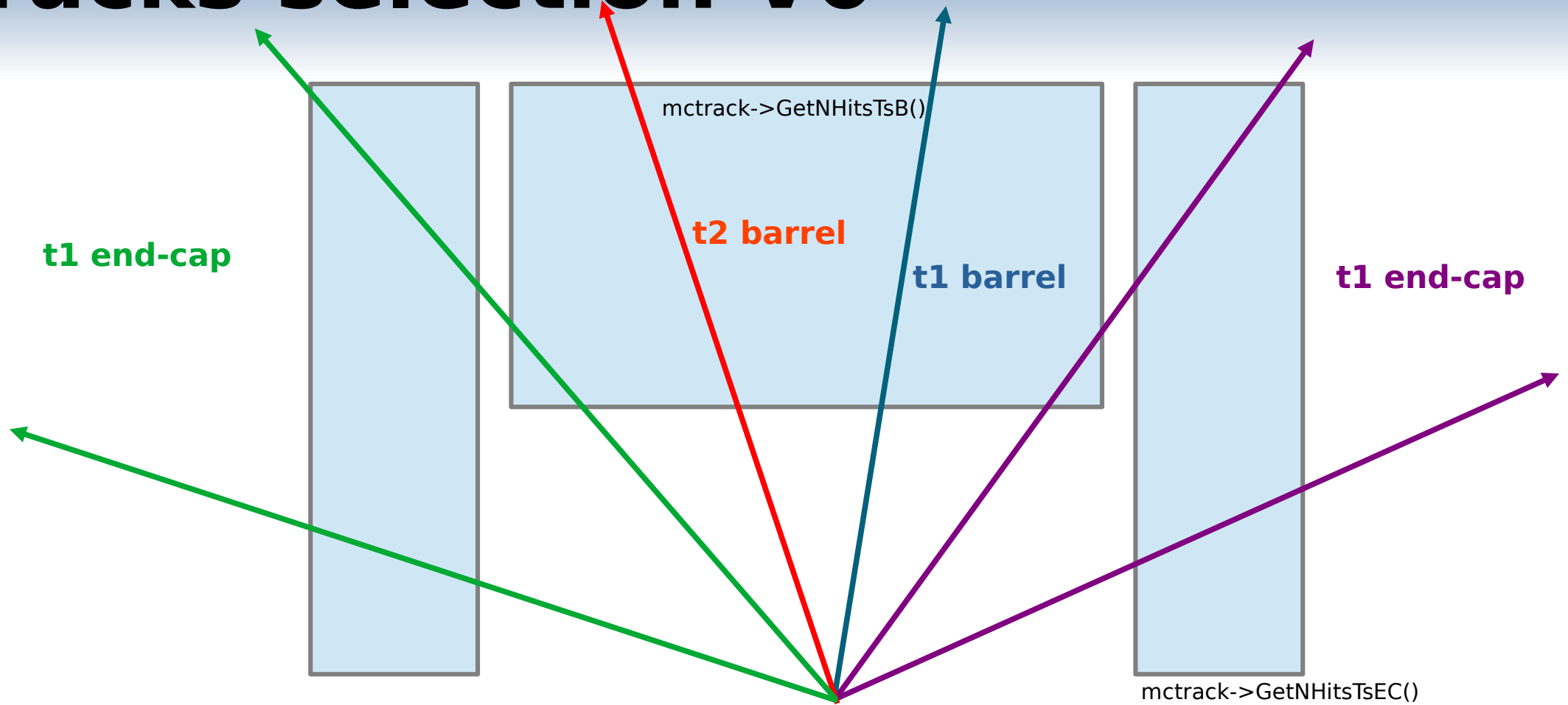*Single Transverse Spin Asymmetries of Identified. Charged Hadrons in Polarized p + p Collisions at √s = 62.4 GeV,*
Phys. Rev. Lett. 2008. V. 101. (BRAHMS Collaboration)

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Tracks selection V0

mctrack->GetNHitsTsB()

t1 end-cap

t2 barrel

t1 barrel

t1 end-cap

mctrack->GetNHitsTsEC()

$$J/\psi \rightarrow \mu^- + \mu^+ , p_T^* = 1.5 \ \ GeV$$

$$D^0 \rightarrow K^- + \pi^+ , p_T^* = 0.86 \ \ GeV$$

$$K^0 \rightarrow \pi^+ + \pi^- , p_T^* = 0.20 \ \ GeV$$

$$\Lambda \rightarrow p + \pi^- , p_T^* = 0.1 \ \ GeV$$

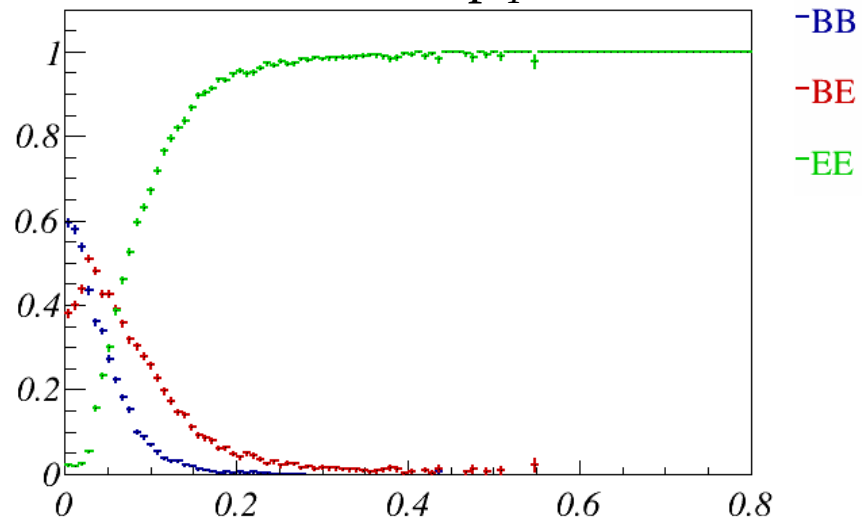$$\pi^0 \rightarrow \gamma + \gamma , p_T^* = 0.067 \ \ GeV$$

BB - t1 barrel and t2 barrel
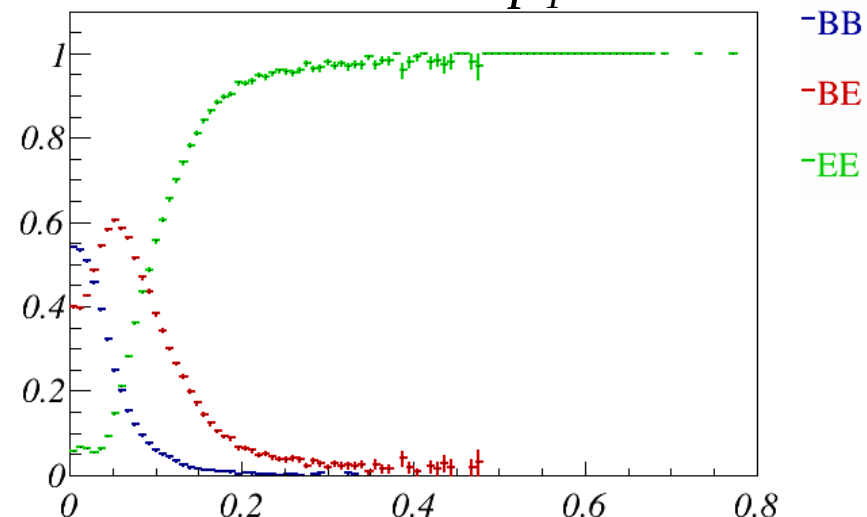**BE - (t1 barrel and t2 end-cap) or (t1 end-cap and t2 barrel)**
EE - t1 end-cap and t2 end-cap

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Made by Artem and Natalia

$$\sqrt{s}=27\,GeV$$

$\Lambda \quad p_T^*=0.1 \;\; GeV$

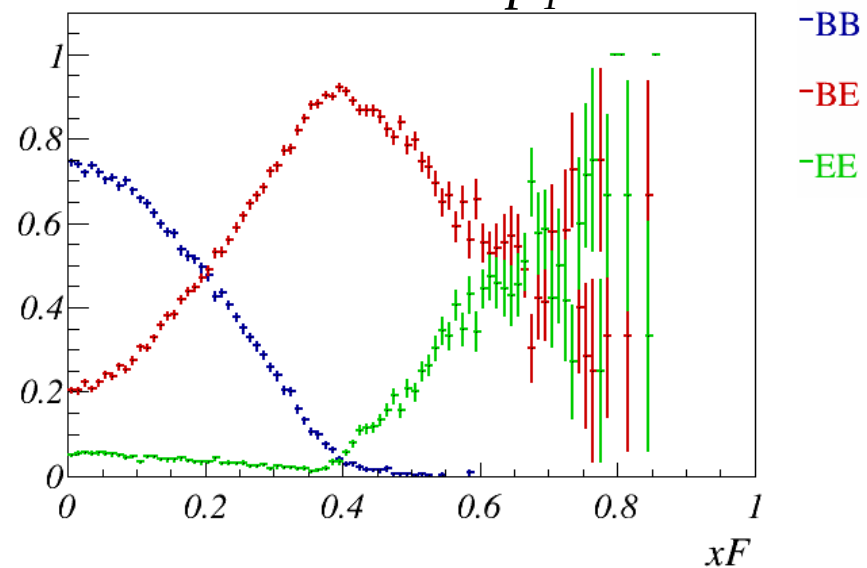$K^0 \quad p_T^*=0.2 \;\; GeV$
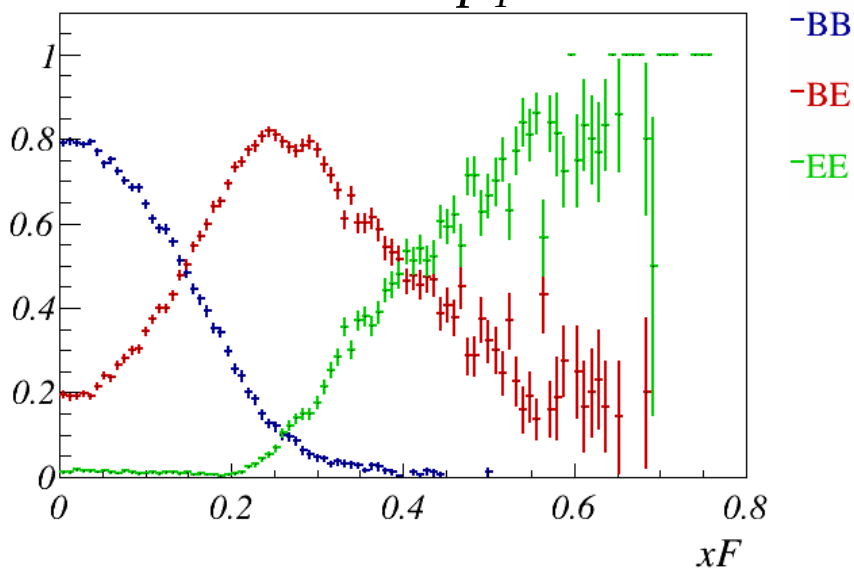
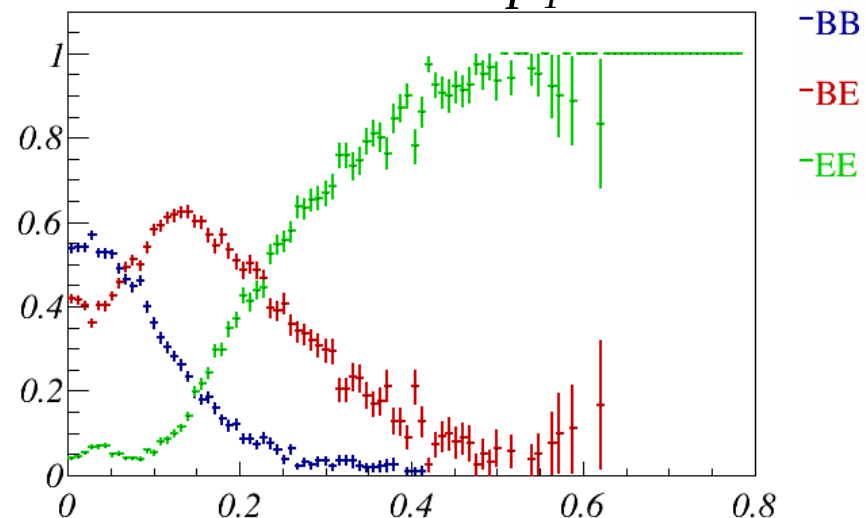$D^0 \quad p_T^*=0.86 \;\; GeV$

$J/\psi \quad p_T^*=1.5 \;\; GeV$

Made by Artem and Natalia

$$\sqrt{s}=10\,GeV$$
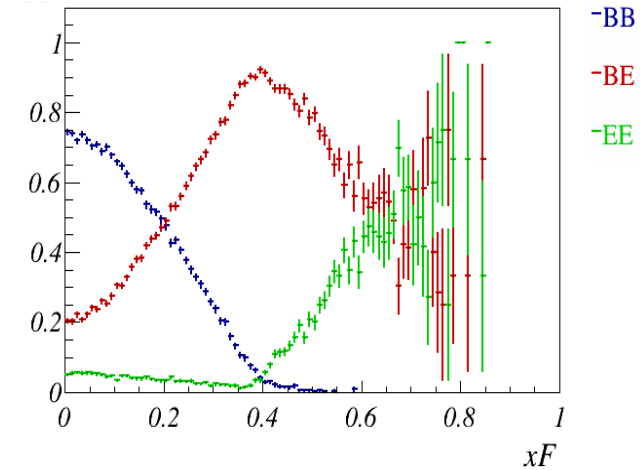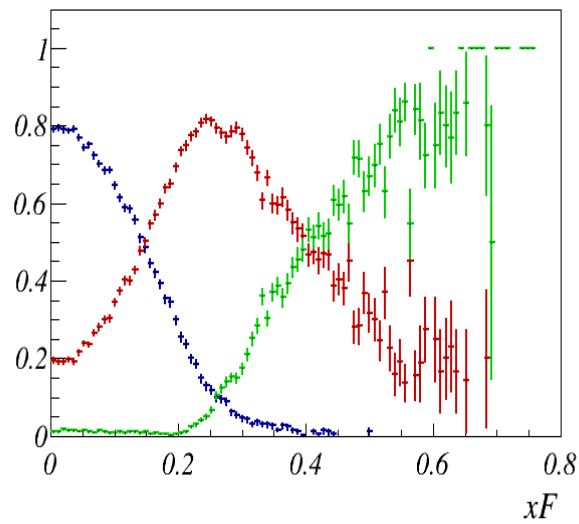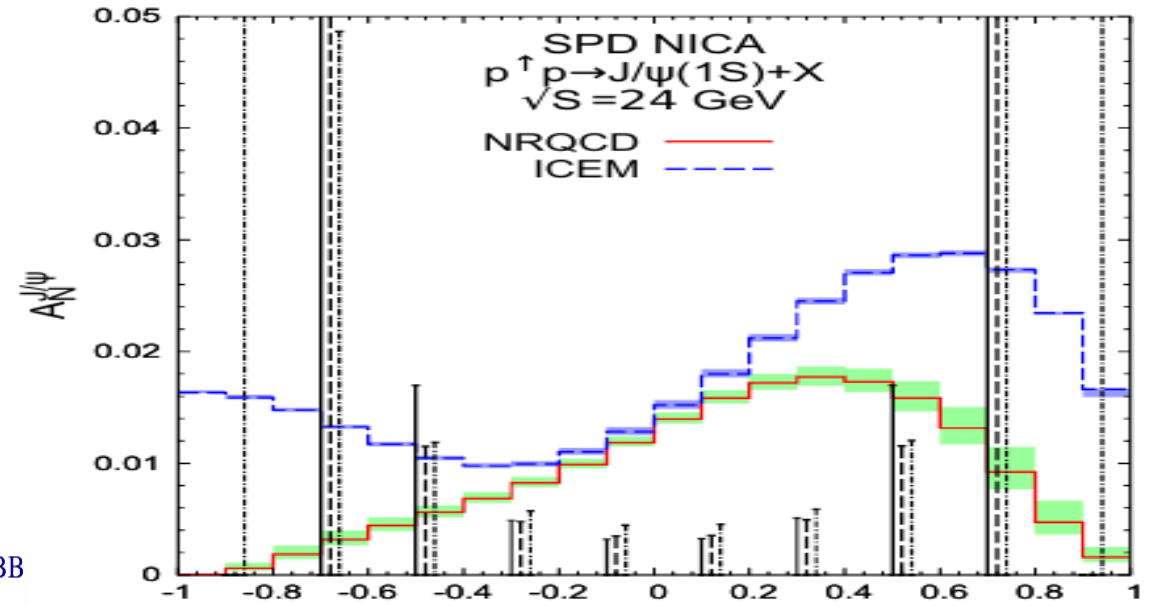
Λ $p_T^*=0.1\ GeV$

K^0 $p_T^*=0.2\ GeV$

D^0 $p_T^*=0.86\ GeV$
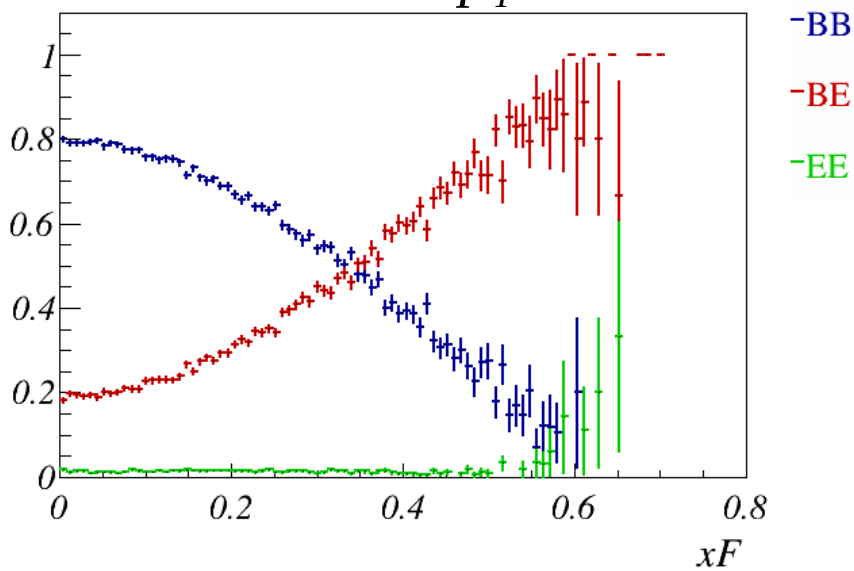
J/ψ $p_T^*=1.5\ GeV$
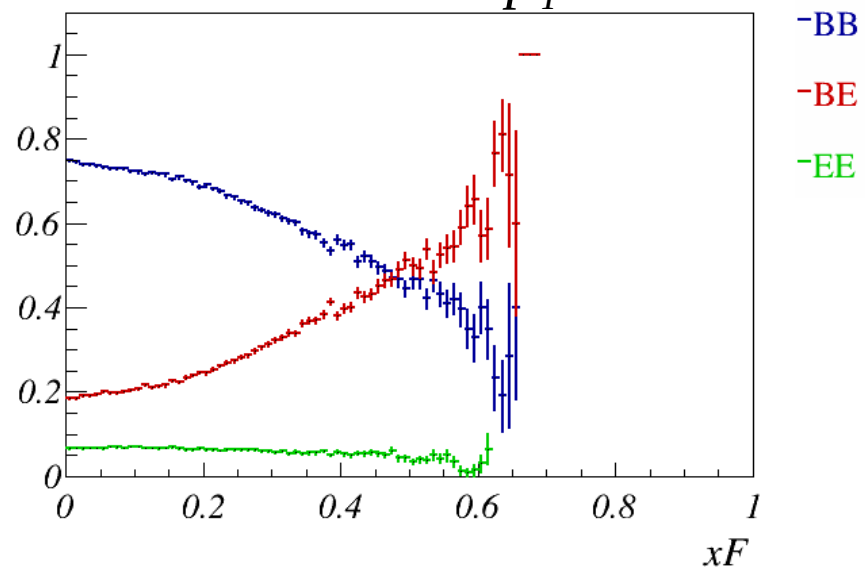
Prediction SSA for D⁰ and J/psi

D^0

SPD CDR

J/ψ

xF for π⁰
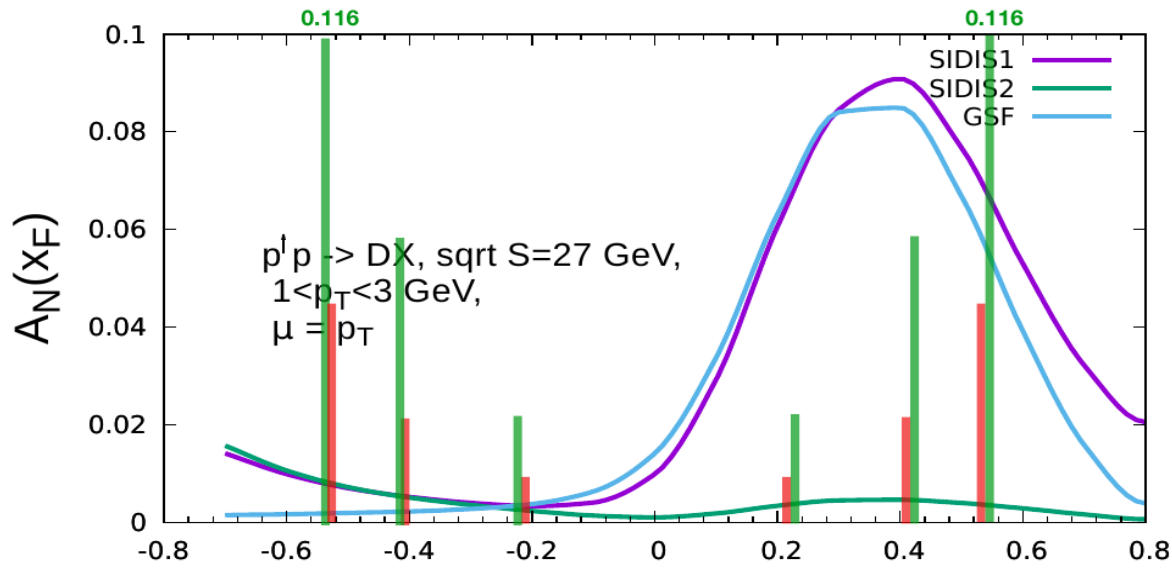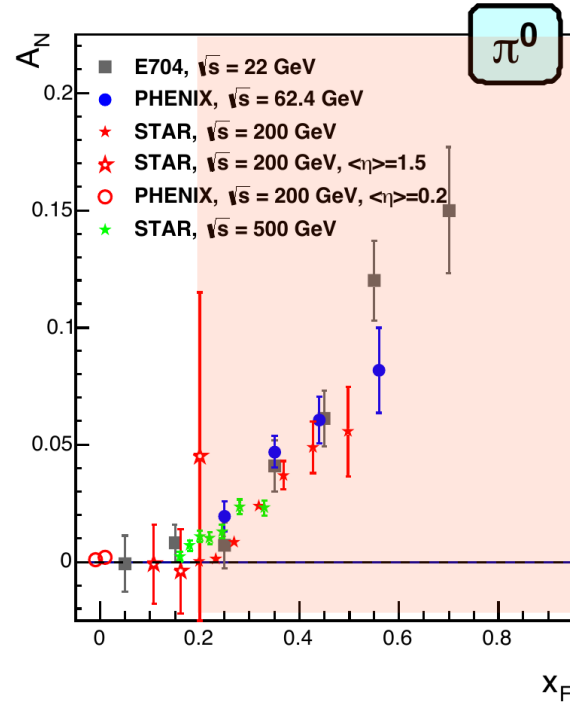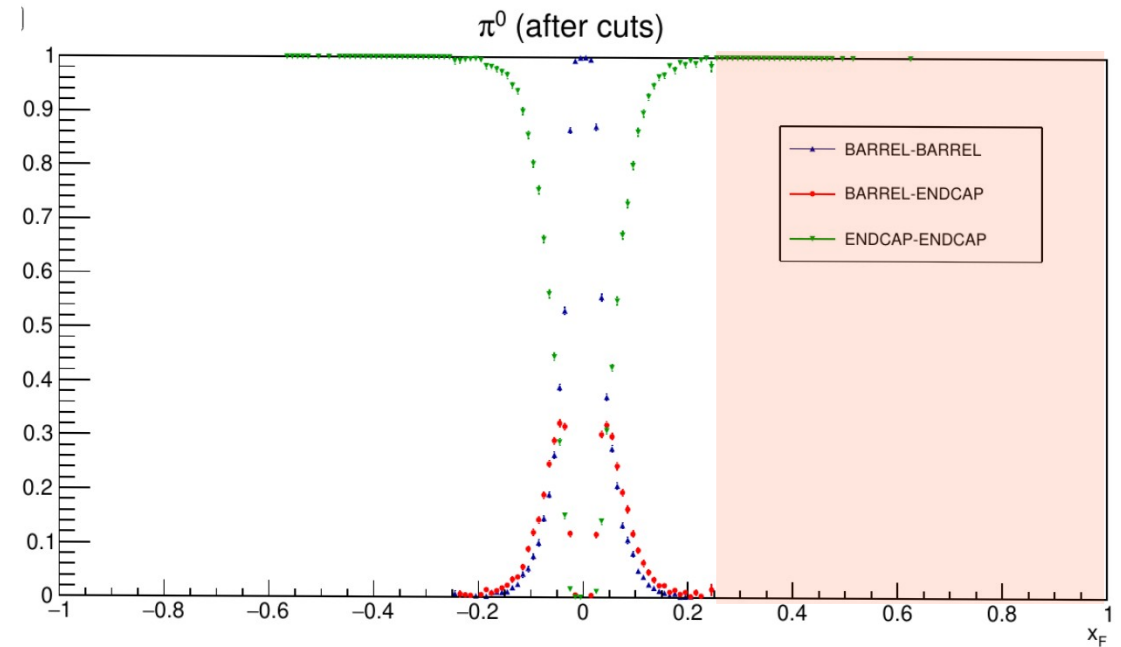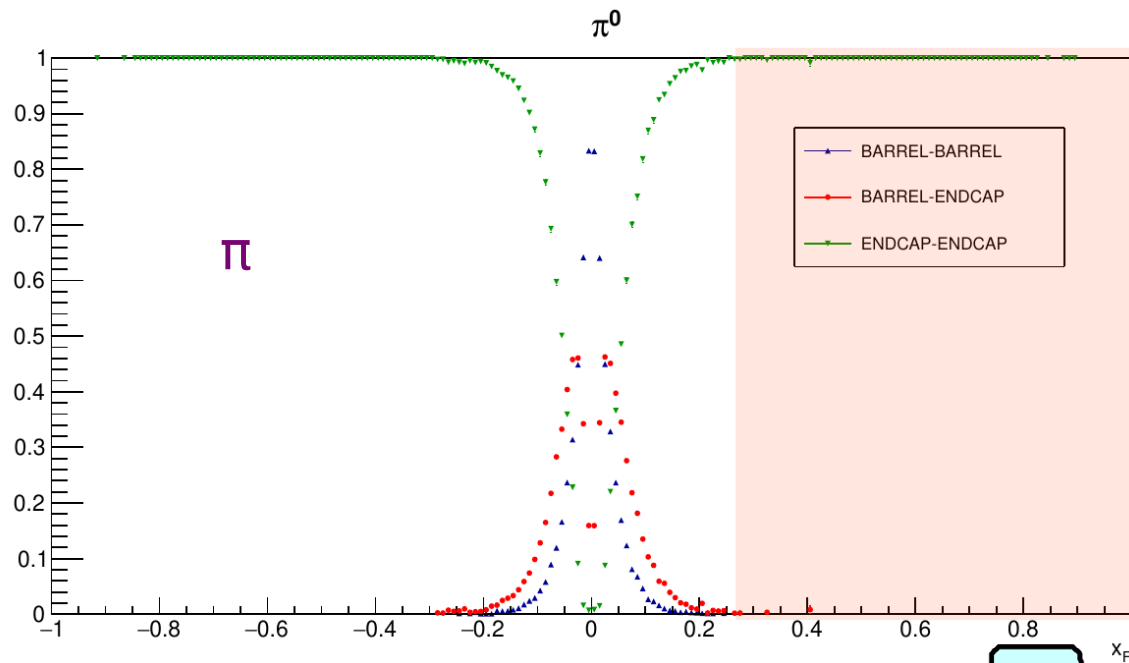
- Exclude «charged» multi-particle clusters

- $E_\gamma > 200\,\mathrm{MeV}$

- $\left|M_{inv} - \mu\right| < 3\,\sigma$
  $\left(\mu = 131\,\mathrm{MeV},\ \sigma = 10\,\mathrm{MeV}\right)$

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Summary table for Barrel/End-Cap

Particle	P*$_T$ (GeV)	Only Barrel	Only End-Cap
Λ	0.1	0.05	0.08
K^0	0.2	0.06	0.11
D^0	0.86	0.2	0.4
J/ψ	1.5	0.25	0.65

Value of xF for which the contribution of End-Cap(Barrel) is increased (decreased) by a factor of 2.

Summary

- Contribution of the Barrel and End-Cap for measuring charged hadrons, neutral pions, D^0 , J/psi, K^0 and Lambda SSAs was estimated.

- Contribution of End-Cap is decreased with increasing of p^*_T particle

- Contribution of End-Cap is increased with increasing of $\sqrt{s}$