Strangeness production (K^0, Λ^0) in diffractive pp collisions on STAR experiment at RHIC accelerator.

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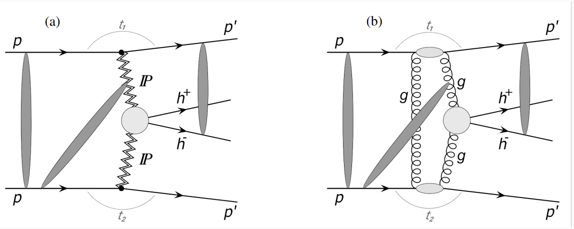
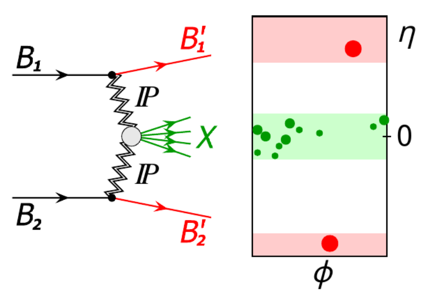
Introduction

- The goal: characterisation of diffractive interactions in central diffraction
- Main research subject is strange quark production (K^0_S and Λ^0 measurement through their most frequent decay channels):
  - $K^0_S \to \pi^+\pi^-$, 69%
  - $\Lambda^0 \to p^\pm\pi^\mp$, 64%



Double Pomeron Exchange (DPE) by (a) Regge theory and (b) QCD. Absorption effects denoted with dark grey.

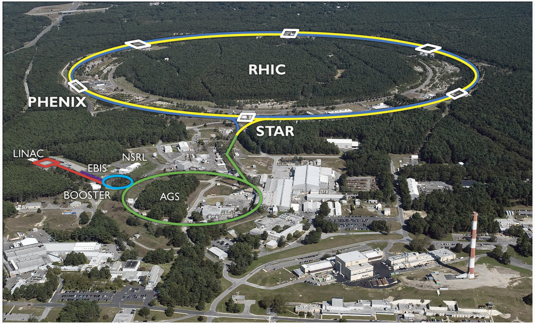


Central diffraction with protons(B_i, B_i') and DPE.

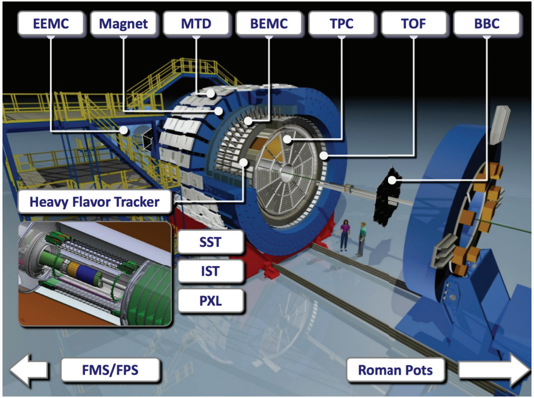
Why?

- Strong interactions conserve flavour - so strangeness production is interesting
- Inclusive production in this conditions wasn't researched

STAR detector and RHIC accelerator

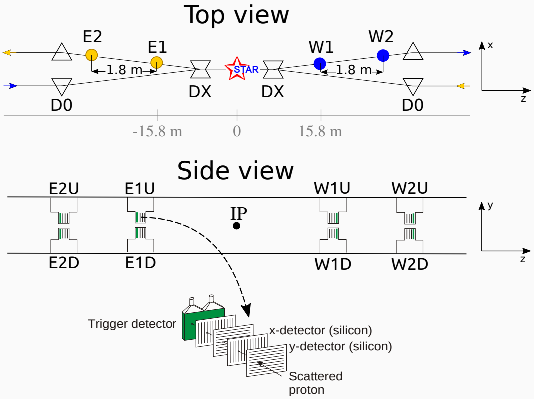


RHIC accelerator, aerial view

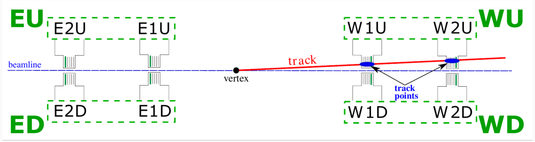


STAR detector, with modules noted

Roman Pot detectors



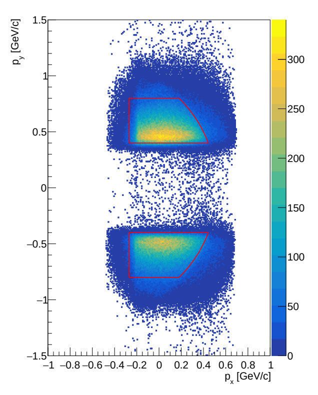
Structure and placement of Roman Pot detectors



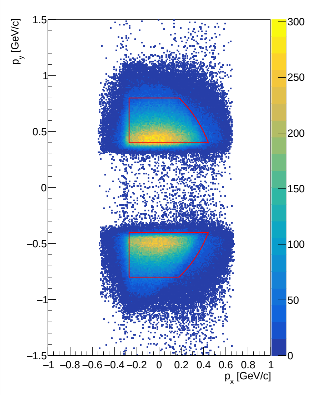
Roman Pot collision scheme

Cuts and simulations

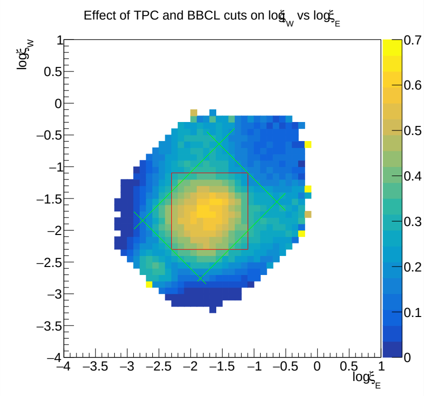
Roman Pots - west side



Roman Pots - east side



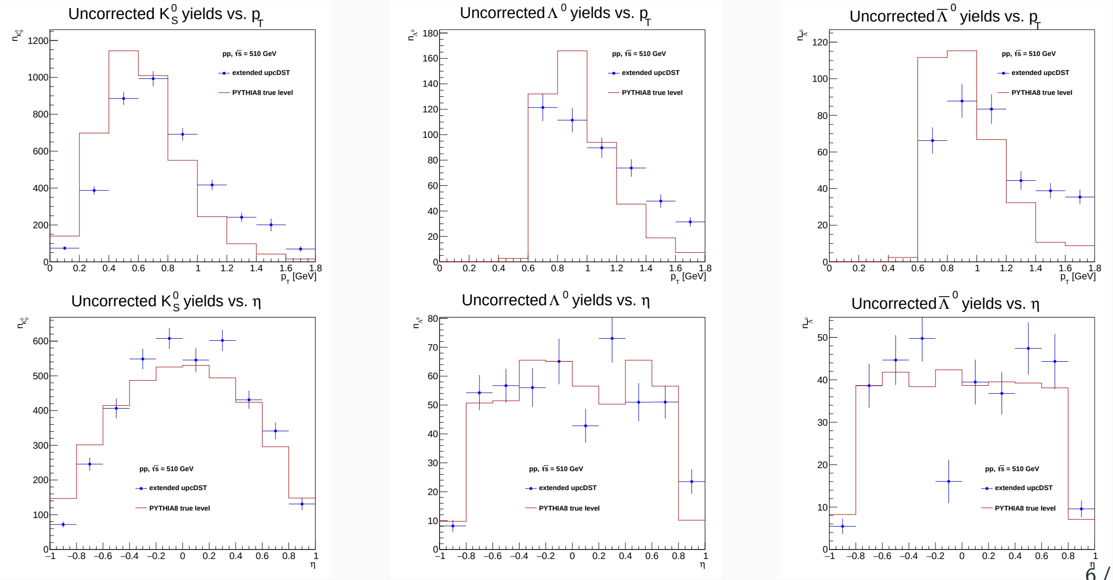
Pythia8 simulation results



Cuts taken from exclusive production analysis for $\sqrt{s} = 200$ GeV and scaled from $\sqrt{s} = 200$ to $\sqrt{s} = 510$ GeV.

Pythia8 simulation to determine best $\xi = \Delta p/p$ dependent fiducial region, with two suggestions outlined.

Towards diffractive crossection

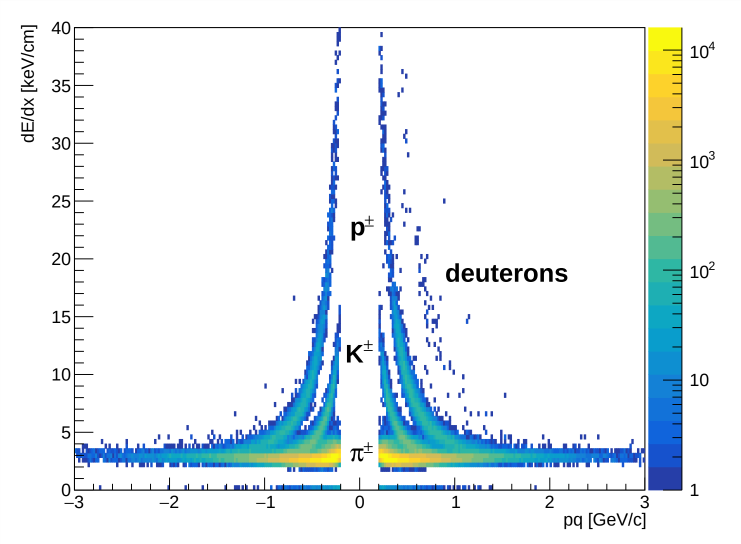


Conclusion and further development

- Current comparison with Pythia8 generator results show good agreement
- Differences should get smaller after taking into consideration detector efficiencies
- Further possibilities include investigating particle identification through energy loss and timing-based methods

Backup slides

Particle identification through energy loss

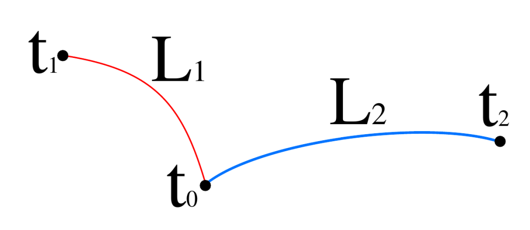


$$n\sigma_x = \frac{\ln\left(\frac{dE}{dx} \Big/ \frac{dE}{dx}^{teor}\right)}{\sigma_x^{teor}}$$

Energy loss of particles used in reconstruction

Particle identification through time-of-flight difference

- TOF detector provides both trigger and timing information
- Unfortunately, very small part of the data has full timing information
- So I make do with what I have



$$\begin{cases} t_1 - t_0 = \frac{L_1}{c}\sqrt{1 + \frac{m_1^2 c^2}{p_1^2}} \\ t_2 - t_0 = \frac{L_2}{c}\sqrt{1 + \frac{m_2^2 c^2}{p_2^2}} \end{cases}$$

$$\downarrow m_1 = m_2 = m$$

$$t_1 - t_2 = L_1\sqrt{1 + \frac{m^2 c^2}{p_1^2}} - L_2\sqrt{1 + \frac{m^2 c^2}{p_2^2}}$$

$$\downarrow$$

$$A(m^2)^2 + Bm^2 + C = 0$$