

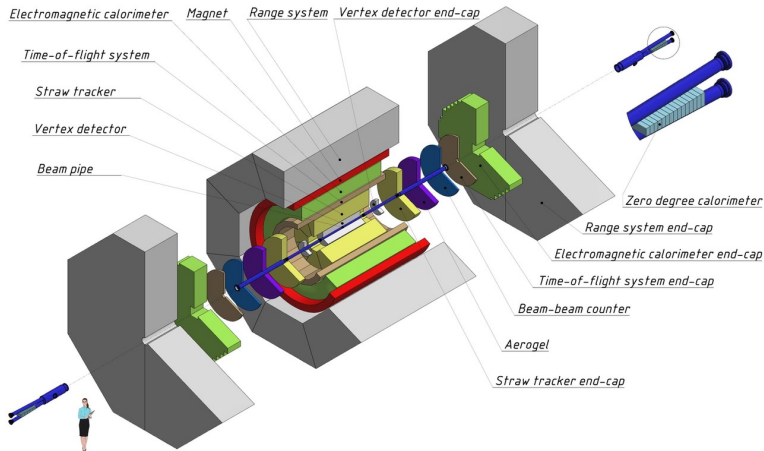
# $K_S^0$ reconstruction study.

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SPD collaboration meeting  
24-27 April 2023

# SPD and event sample for the $K_S^0$ analysis



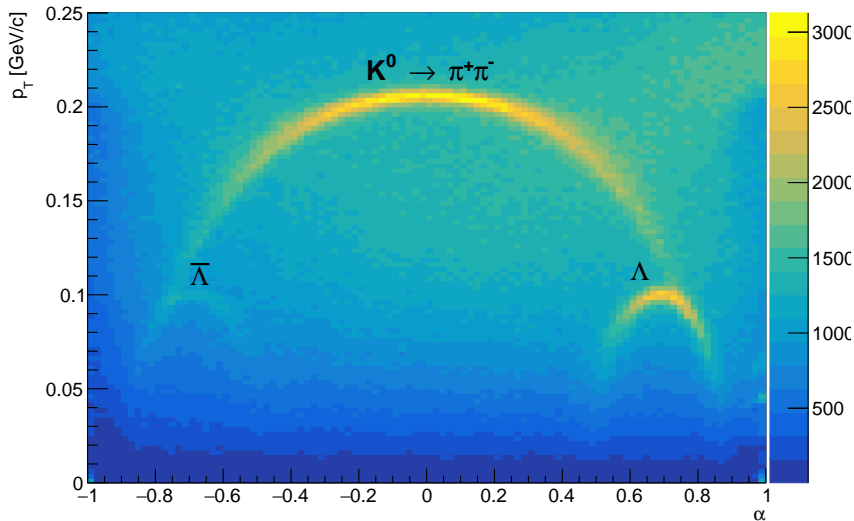
## Event sample

SpdRoot(March 2023)

Generation: Pythia 8, (p+p) at  $\sqrt{S}=27$  GeV, SoftQCD(MB).

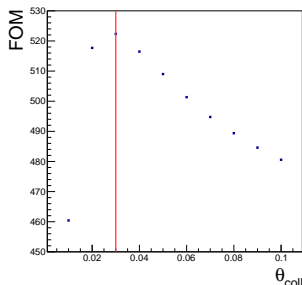
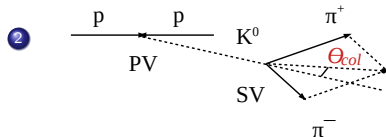
4 000 000 events (1 sec of data taking)

# Distributions of the $V^0$ candidates in the Podolanski-Armenteros without selection cuts



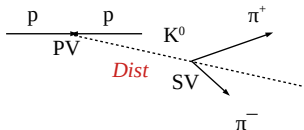
# Selection criteria

- 1 This cuts on the quality of the tracks  
(status of fit from GenFit and chi2/ndf, detailed list of cuts in talk of R.Akhudyanov)

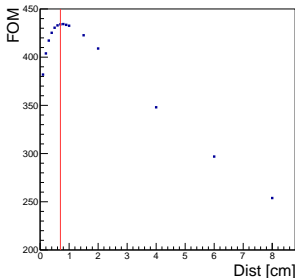
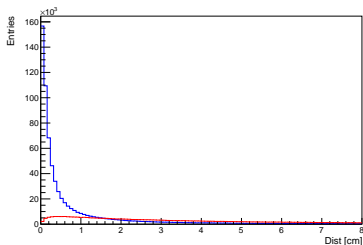


- $FOM = \frac{N_{sig}}{\sqrt{N_{sig} + N_{bg}}}$ ;
- This cut selects  $V^0$  events the momentum looking at the PV.  
 $\theta_{coll} < 0.03$  rad. for  $K^0$ .

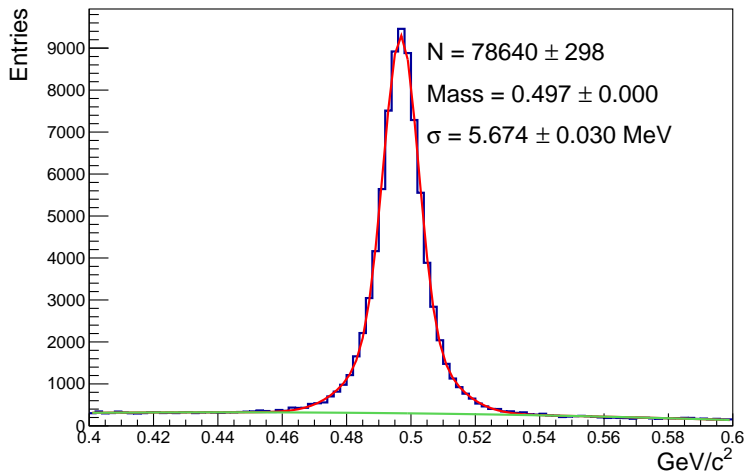
# Distance between PV and SV (V0 vertex)



- $Dist = \sqrt{(x_{SV} - x_{PV})^2 + (y_{SV} - y_{PV})^2 + (z_{SV} - z_{PV})^2}$ ;
- This cut selects  $V^0$  which decay close to PV.  
 $Dist > 0.7$  cm for  $K^0$ .



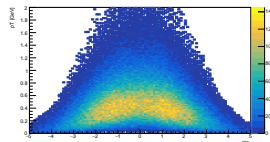
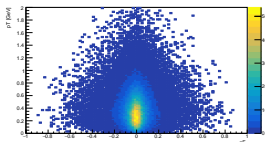
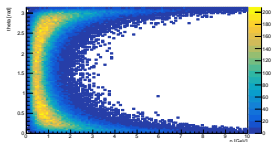
# Invariant mass of $K_S^0$ after all cuts



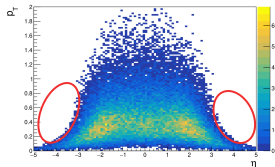
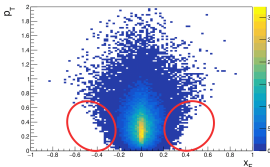
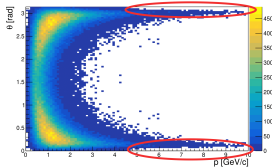
The shape of the  $K_S^0$  signal was parametrized by double Gaussian and background was parametrized by the second order polynomial.

The selected  $V^0$  candidates are plotted in  $(p, \theta)$ ,  $(x_F, p_T)$  and  $(\eta, p_T)$  phase space

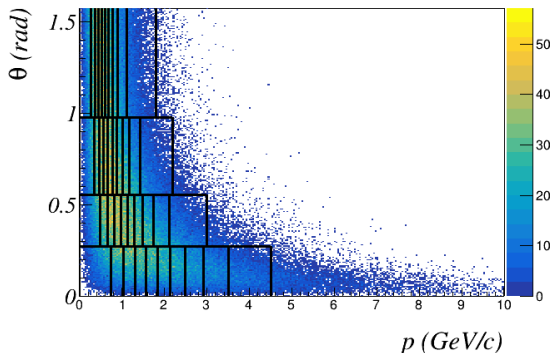
Pure Pythia 8,  $K^0$ :



Reconstruction data:



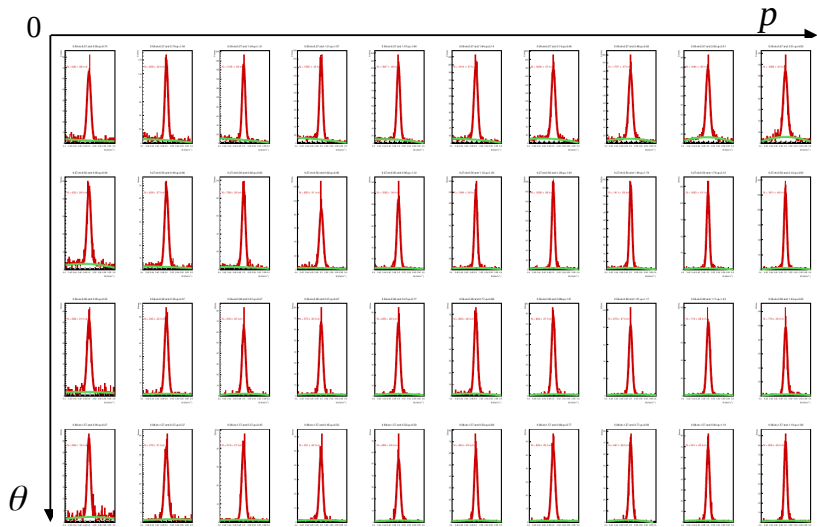
## Binning



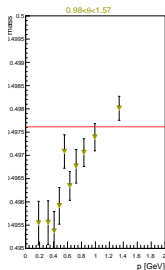
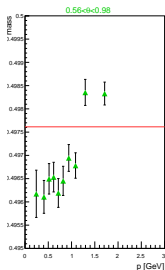
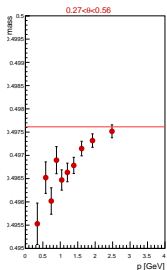
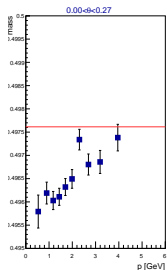
The choice of the binning scheme is obtained from distribution of  $K^0$  simulated in Pythia 8. It was done to have the similar number of  $K^0$  in bins ( $n_{bin}^\theta = 4, n_{bin}^p = 10$ ).



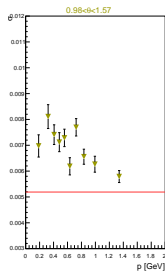
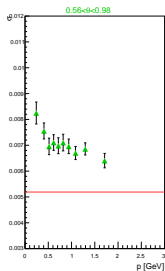
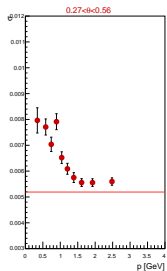
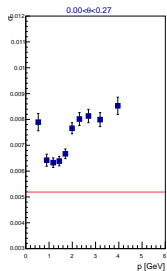
# Distributions of the $K^0$ candidates with all cuts



# Mass and sigma of $K^0$ (in $p$ for fixed $\theta$ interval)

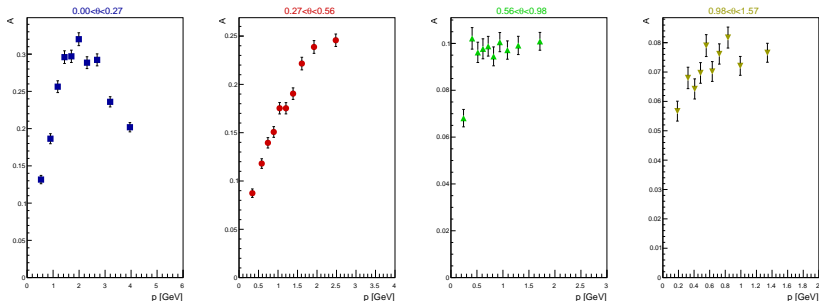


red line shows  
 $m(\text{PDG}) =$   
 0.497 GeV



red line shows  
 the sigma of  
 the  $K^0$  fit  
 using full  
 data sample

# $K^0$ reconstruction efficiency with all corrections included ( $A = N_{Rec}^{MC} / N_{pythia}^{MC}$ )



Total correction factor includes: geometrical acceptance, track and vertex reconstructed efficiency and fit-down contribution.

# Conclusion and TODO

- 1 Analysis the  $K_S^0$  reconstruction efficiency was performed.
- 2  $K_S^0$  reconstruction efficiency depends on  $p$  and  $\theta$  and in general is about 20%.
- 3 The next step is to study contribution of used selection criteria to the  $K^0$  rejection.