

Updates on K_S^0 analysis.

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Event and track selection for the K_S^0 analysis

Event sample

Generation: Pythia 8, (p+p) at $\sqrt{S}=27$ GeV, SoftQCD(MB).
4 000 000 events (1 sec of data taking)

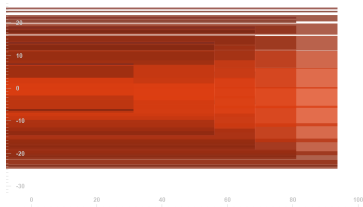
before (December 2022)	now
SpdRoot (July 2022)	SpdRoot (March 2023)

PV and V0 selection:

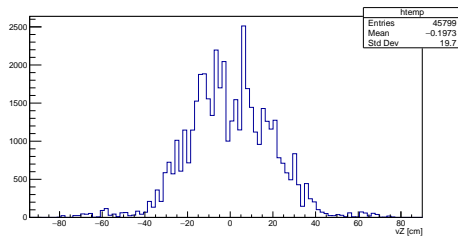
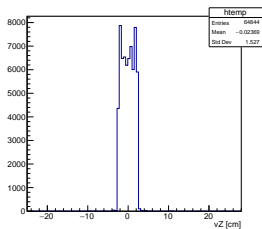
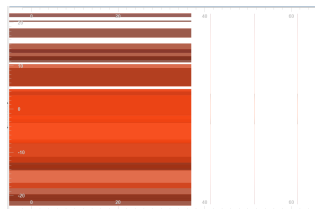
before (December 2022)	now	
SetBeam(0., 0., 0.1, 0.1)	SetBeam(0., 0., 0.025, 0.025)	X0,Y0,Xwidth,Ywidth: 250 microns std. dev.
SetTarget(0., 5.) SmearVertexZ	SetTarget(0., 30.) SmearGausVertexZ	Z0,Zwidth, 30 cm std. dev.
SpdMCKFpartRCV0Finder: fMinItsHists = 3 fDaughters = $K^0(-211, 211)$. Bg = (321,-321), (2212, -211), (-2212, 211),(-321, 211), (321, -211). fMinChi2PV = 2.0 fMaxChi2Part = 2.0	KFParticle: fMinItsHists = 1 the same fMinChi2PV = 0 fMaxChi2Part = 0	minimum Its hits for track selection minimum chi2 track to PV maximum chi2 between 2 tracks

Z-coordinate of interaction points

before (December 2022)



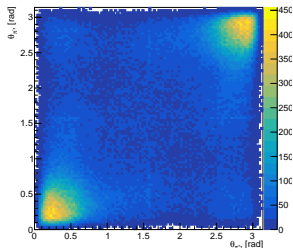
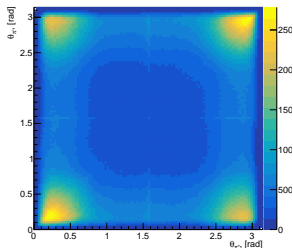
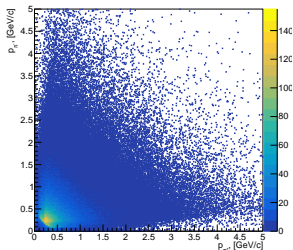
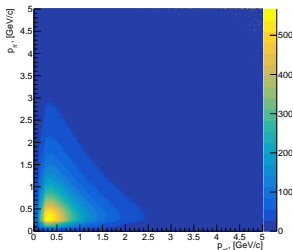
now



p_{π^+} vs p_{π^-} and θ_{π^+} vs θ_{π^-}

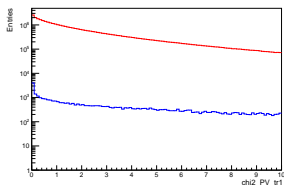
for

K_S^0 and \bar{K}_S^0

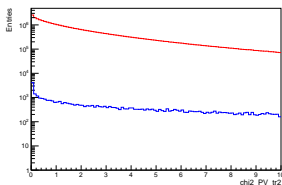


chi2 and Distance

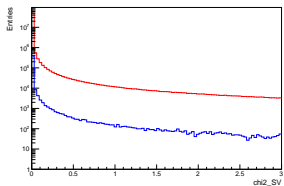
Chi2 of π^- to PV



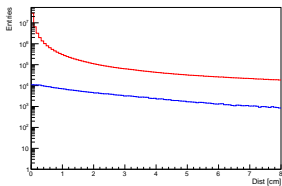
Chi2 of π^+ to PV



Chi2 of V0 to PV

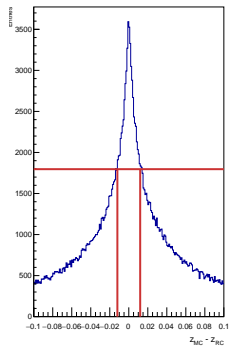
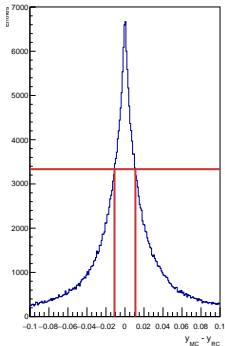
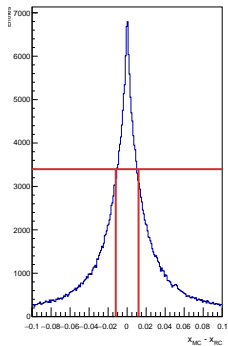


Dist



$$Dist = \sqrt{(x_{SV} - x_{PV})^2 + (y_{SV} - y_{PV})^2 + (z_{SV} - z_{PV})^2}$$

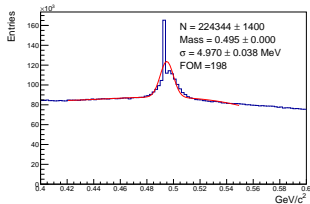
Spatial resolution V0 in cm for x, y and z



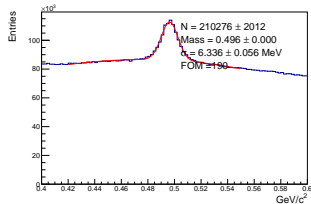
Invariant mass of K^0 for different cuts

V0.GetMass(mass, dmass)

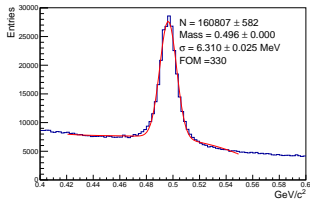
no cut



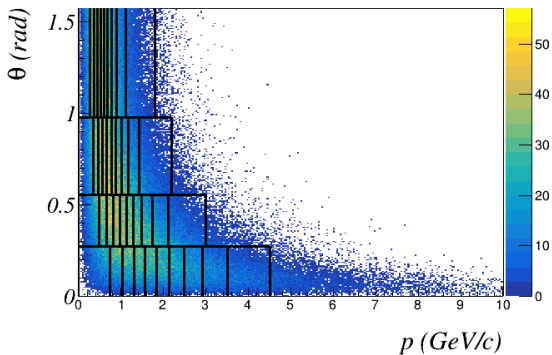
$\text{dmass} < 0.001$



cuts $\theta_{\text{coll}} < 0.03$ and $\text{Dist} > 0.7 \text{ cm}$

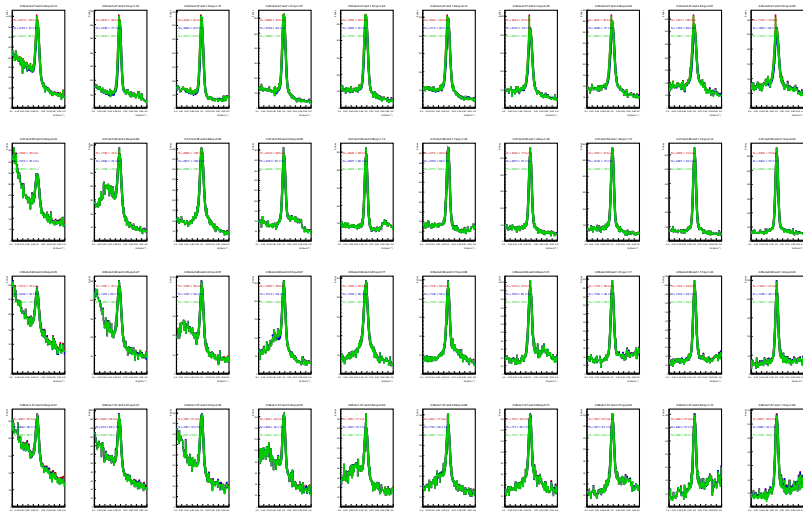


Binning

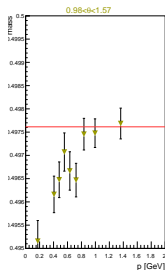
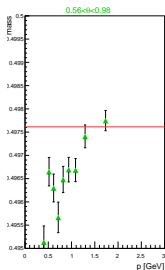
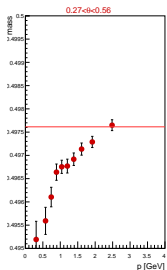
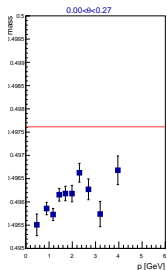


The choice of the binning scheme is obtained from distribution of K^0 simulated in Pythia 8. It was done to have the similar number of K^0 in bins ($n_{bin}^\theta = 4, n_{bin}^p = 10$).

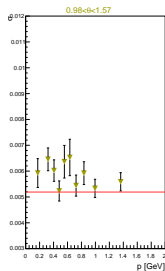
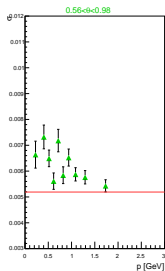
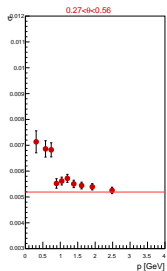
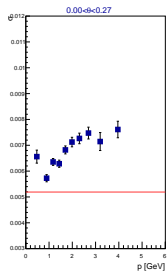
Distributions of the K^0 candidates with cut $\theta_{coll} < 0.03$ and $Dist > 0.7$ cm



Mass and sigma of K^0 (in p for fixed θ interval)



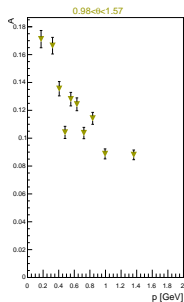
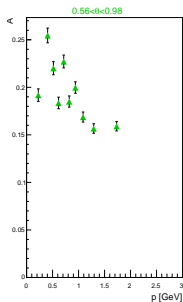
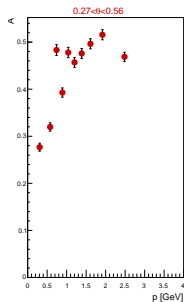
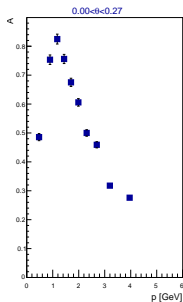
red line shows
 $m(\text{PDG}) =$
 0.497 GeV



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

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

$\theta_{coll} < 0.03 \text{ rad.}$ and $Dist > 0.7 \text{ cm}$



Non smooth distribution of points is due to the background issue.

Conclusion and TODO

- 1 Switched to new the version of SPDRoot (new geometry) and package KFparticle.
- 2 Analysis of various factors affecting the K_S^0 reconstruction efficiency was performed.
- 3 Unclear behaviors of background requiring investigation.

Backup slides

