Photonic electrons – DQ V0 selector

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DQ O2 tutorial, 08 November 2023

Electrons from photon conversions

- Select barrel tracks which belong to clean V0 particles: γ, Λ and K_S^0
- Clean electron samples from photon conversions:
  - PID QA
  - TPC PID post-calibration
  - Data-driven TPC PID efficiencies
- Tasks: PWGLF/TableProducer/lambdakzerobuilder.cxx (build V0s) and PWGDQ/Tasks/v0selector.cxx (select V0s and tracks from V0s)
- QA histograms within the task (V0s and tracks) + information on tagged tracks can be passed to tableMaker (or tableMakerMC) through V0Bits table (same principle as dalitzBits)

Commands to run V0 task

- Commands standalone:

o2-analysis-event-selection -b --configuration json://configPhotonConversion.json |
o2-analysis-ft0-corrected-table -b --configuration json:// configPhotonConversion.json |
o2-analysis-timestamp -b --configuration json:// configPhotonConversion.json |
o2-analysis-track-propagation -b --configuration json:// configPhotonConversion.json |
o2-analysis-tracks-extra-converter -b --configuration json:// configPhotonConversion.json |
o2-analysis-pid-tof-full -b --configuration json:// configPhotonConversion.json |
o2-analysis-pid-tof-beta -b --configuration json:// configPhotonConversion.json |
o2-analysis-pid-tof-base -b --configuration json:// configPhotonConversion.json |
o2-analysis-pid-tpc-full -b --configuration json:// configPhotonConversion.json |
o2-analysis-pid-tpc-base -b --configuration json:// configPhotonConversion.json |
o2-analysis-lf-lambdakzerobuilder -b --configuration json://configuration.json |
o2-analysis-dq-v0-selector -b --configuration json://configuration.json

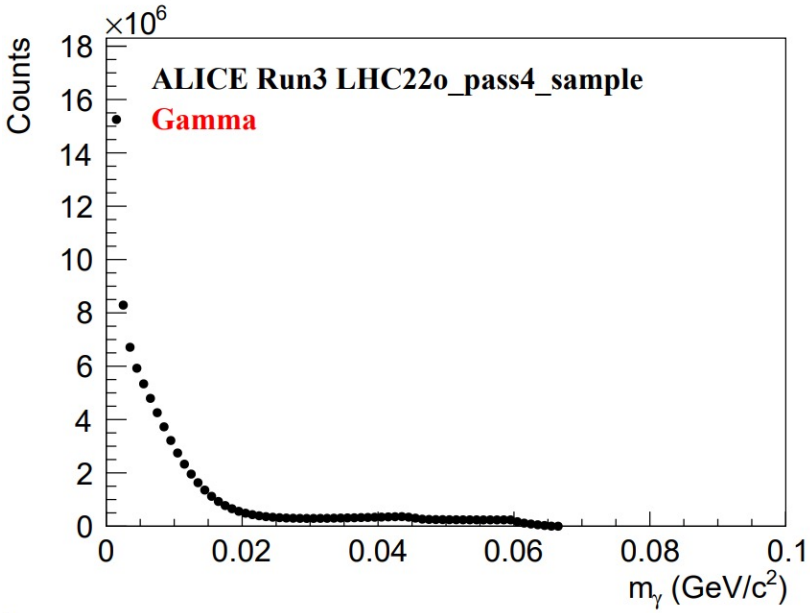
- Commands via python script together with table-maker:

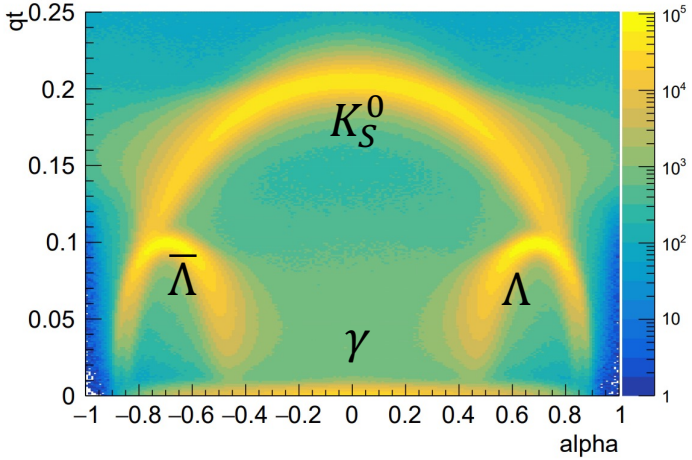
python3 O2DQworkflows/runTableMaker.py configDalitzSelection.json -runData --arg table-maker:
processBarrelOnlyWithV0Bits:true --add_track_prop

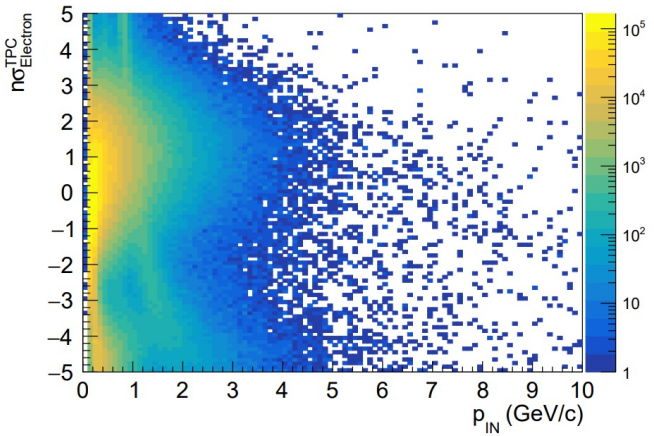
Will produce a ROOT file named AnalysisResults.root

Run V0 selector: output

- v0-selector
  - hV0Candidate;1
  - hMassGamma;1
  - hGammaRxy;1
  - hMassK0S;1
  - hMassLambda;1
  - hMassAntiLambda;1
  - hV0Pt;1
  - hV0EtaPhi;1
  - hV0Radius;1
  - hV0CosPA;1
  - hDCAxyPosToPV;1
  - hDCAxyNegToPV;1
  - hDCAzPosToPV;1
  - hDCAzNegToPV;1
  - hDCAV0Dau;1
  - hV0APplot;1
  - hV0Psi;1
- track-pid-qa
  - hEventCounter;1
  - hTrackPt_all;1
  - hTrackEtaPhi_all;1
  - h2TPCdEdx_Pin_all;1
  - h2TOFbeta_Pin_all;1
  - hTrackPt;1
  - hTrackEtaPhi;1
  - h2TPCdEdx_Pin;1
  - h2TPCdEdx_Pin_El;1
  - h2TPCdEdx_Pin_Pi;1
  - h2TPCdEdx_Pin_Ka;1
  - h2TPCdEdx_Pin_Pr;1
  - h2TPCnSigma_Pin_El;1
  - h2TPCnSigma_Pin_Pi;1
  - h2TPCnSigma_Pin_Ka;1
  - h2TPCnSigma_Pin_Pr;1

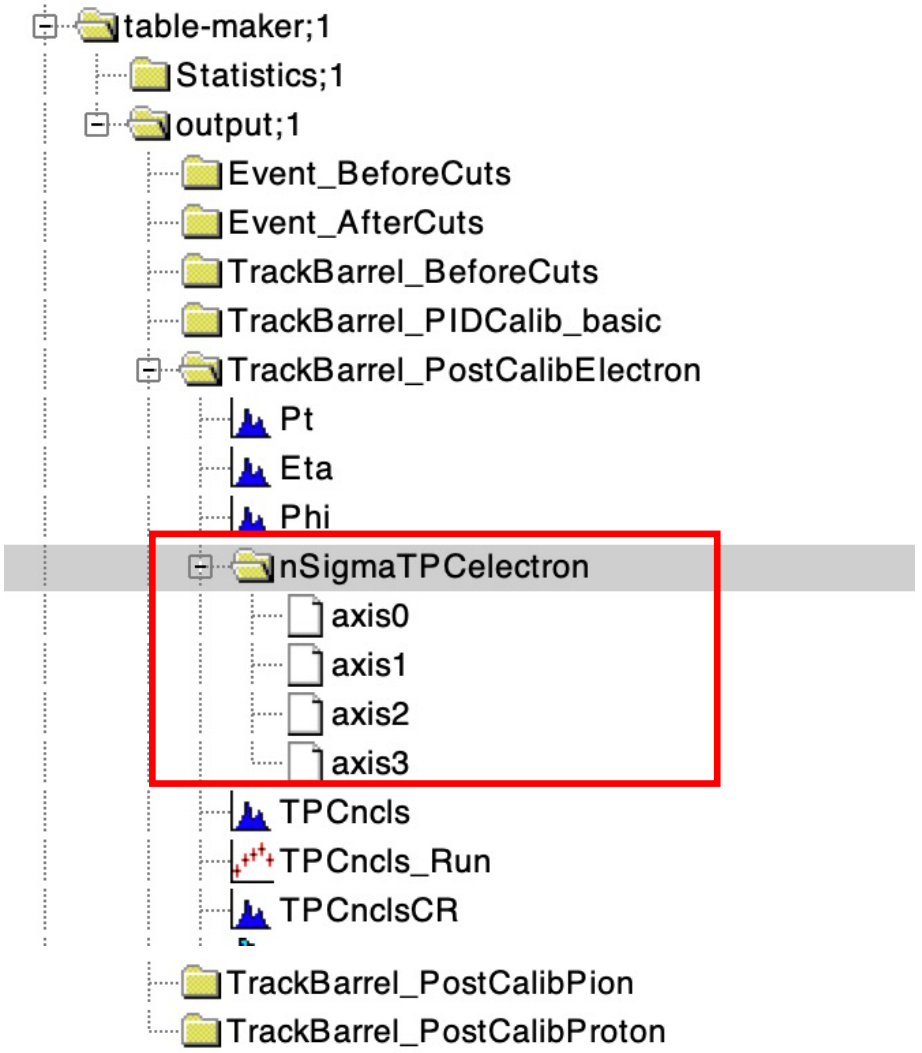


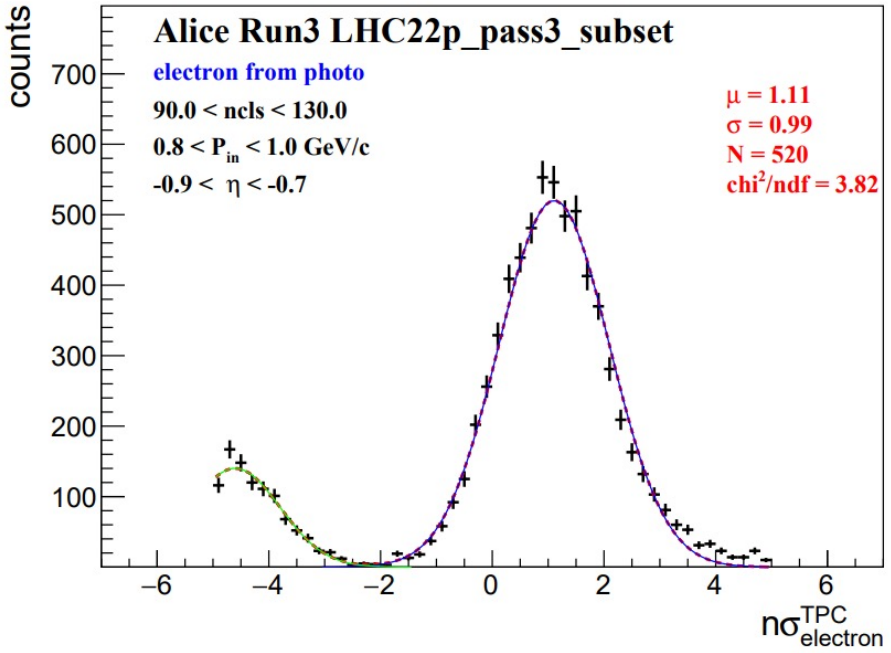




2-D histograms: $n\,\sigma_x$ vs. p_{in}

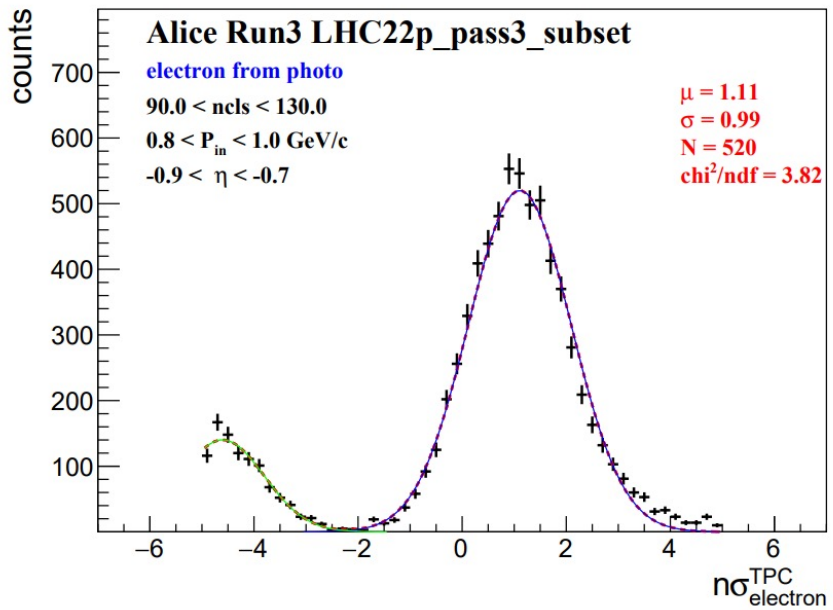
Run V0 selector and tableMaker: output



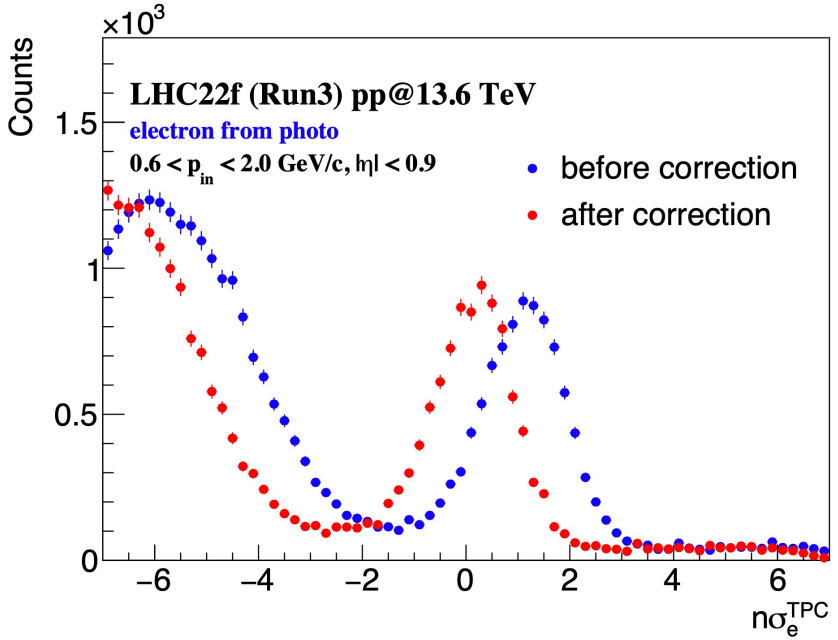


4-D histograms: $n\,\sigma_x$ vs. p_{in}, can be used for PID QA and PID post-calibration

TPC PID Post-calibration



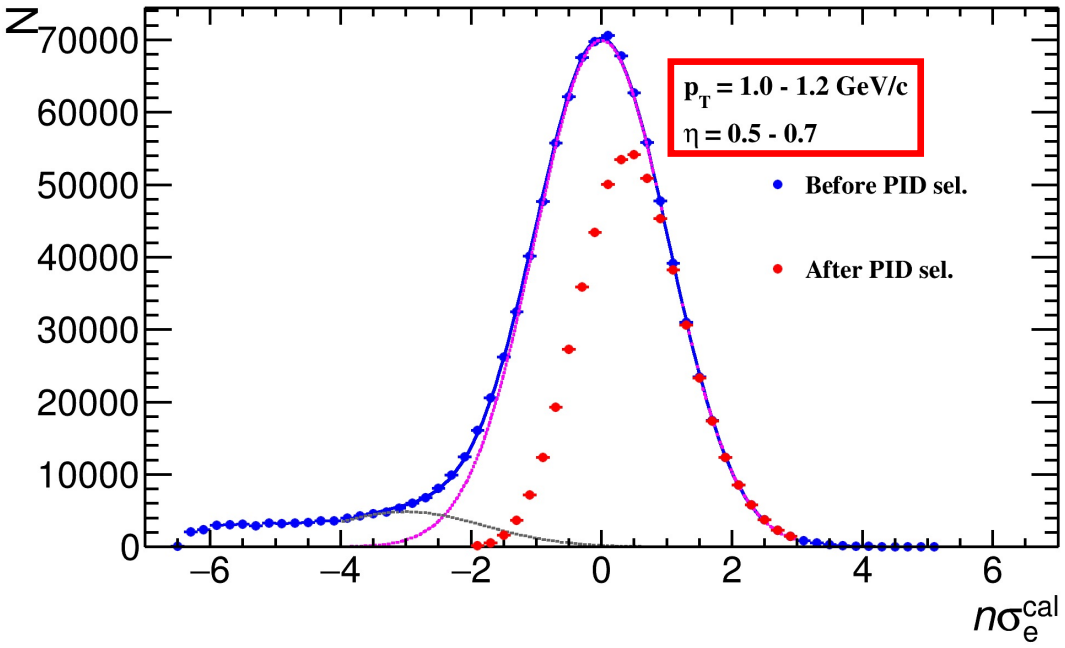
$$n\sigma_{cor} = \frac{n\sigma - mean}{width}$$



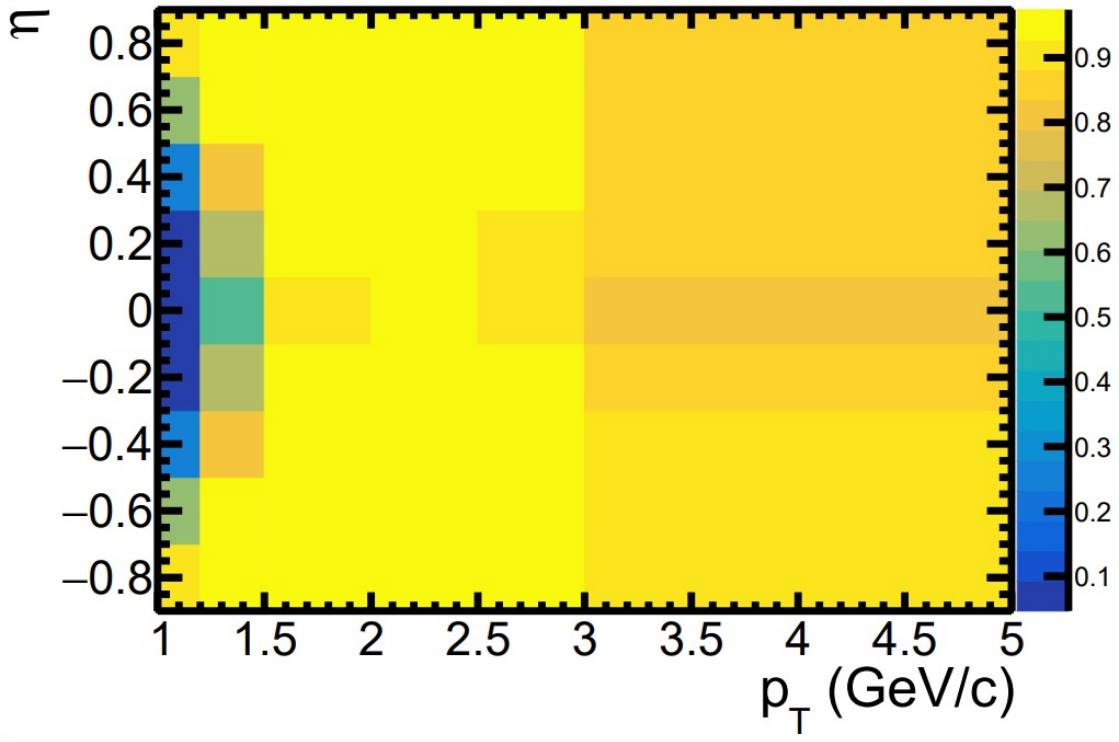
To be more like a Gaussian distribution

Data-drive TPC PID efficiencies

Electron from V0



Single track TPC PID efficiency



Use toy MC to get the pair PID efficiencies