

Jet Studies with Machine Background (Gold Coating 10um and 5um)

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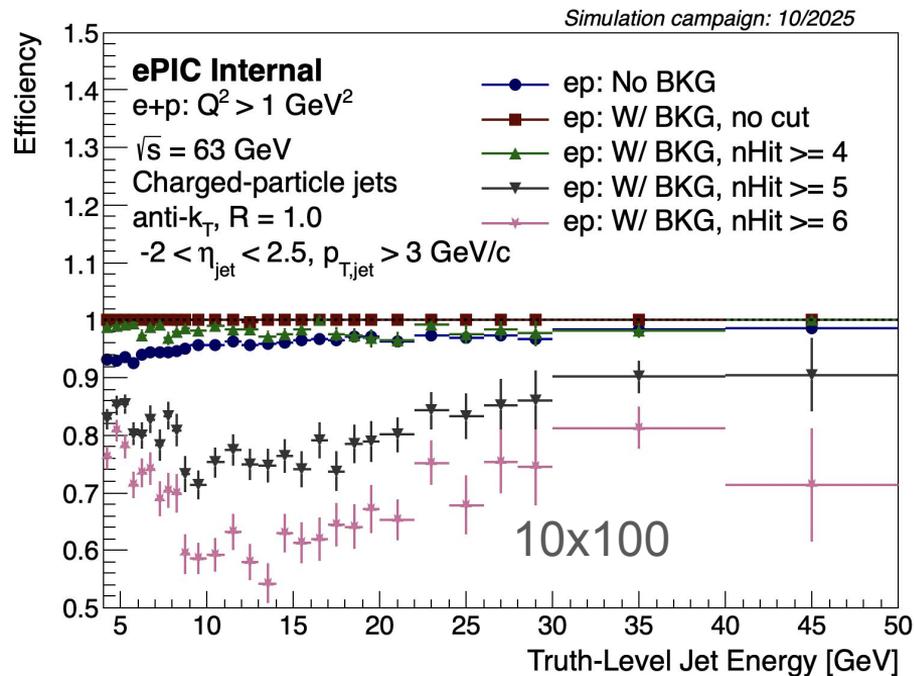
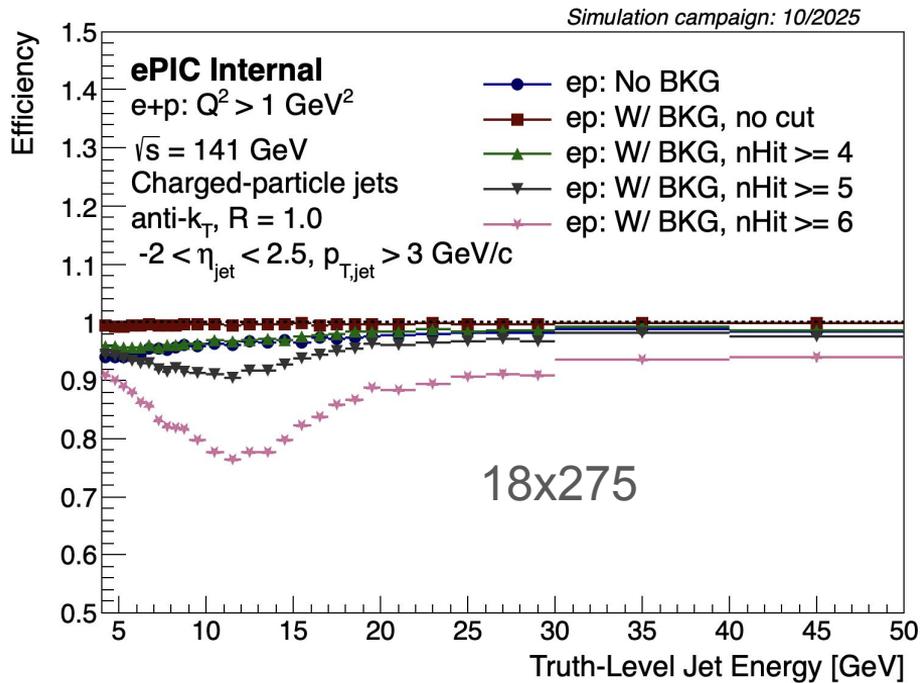
Dener De Souza Lemos (BNL)

Feb 25

- Jet Selection
 - Charged jets:
 - ReconstructedChargedJets
 - GeneratedChargedJets
 - Electron removed using true PID
 - Remove jets with 1 track inside
 - Jet $p_T > 3 \text{ GeV}/c$
 - $\eta = (-2, 2.5)$
 - anti- k_T with $R = 1.0$
 - Jet Tree maker:
 - <https://github.com/denerslemos/CHJetsReCluster>

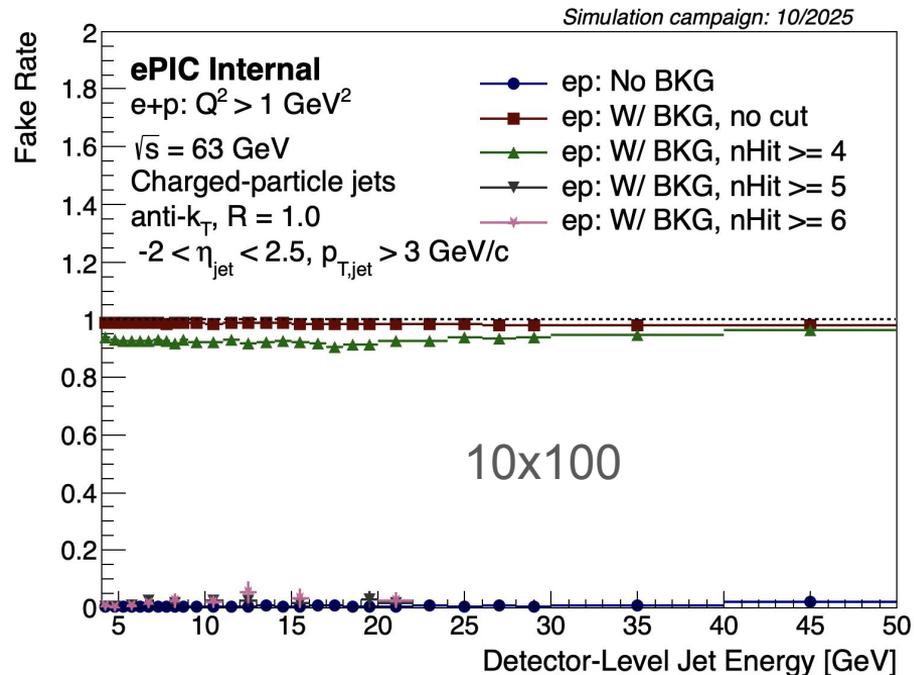
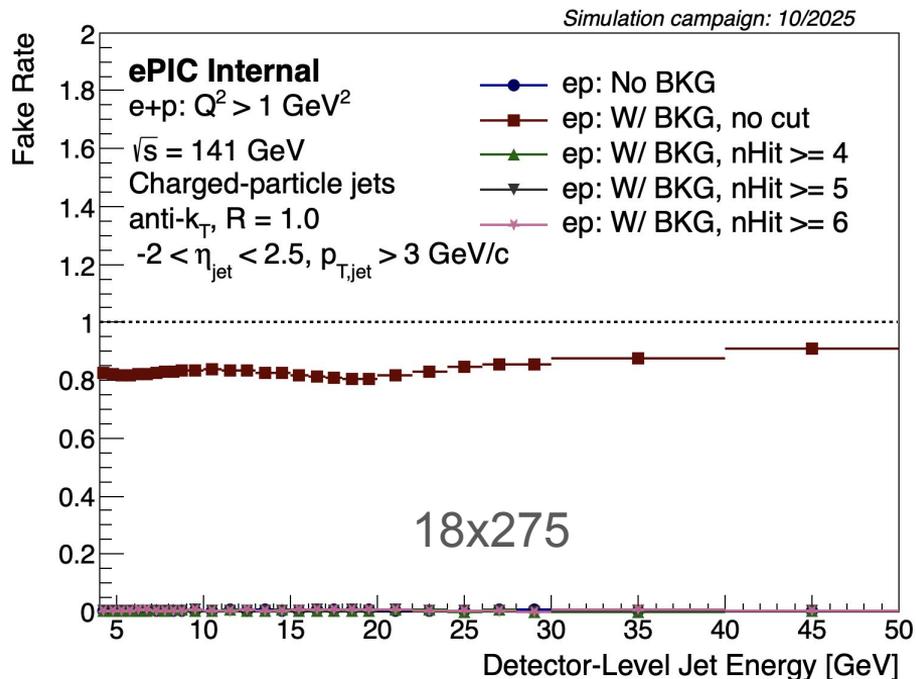
- Simulated datasets with PYTHIA8.306 and geometry 25.10 ($q^2 > 1 \text{ GeV}^2$):
 - Without machine background
 - 10x100 (~5M ev):
 - /volatile/eic/EPIC/RECO/25.10.0/epic_craterlake/DIS/NC/10x100/minQ2=1/
 - 18x275 (~5M ev):
 - /volatile/eic/EPIC/RECO/25.10.0/epic_craterlake/DIS/NC/18x275/minQ2=1/
 - With machine background
 - 10x100 (~240k ev):
 - /volatile/eic/EPIC/RECO/25.10.4/epic_craterlake/Bkg_1SignalPer2usFrame/DIS/NC/10x100/minQ2=1/
 - 18x275 (~5M ev):
 - /volatile/eic/EPIC/RECO/25.10.4/epic_craterlake/Bkg_1SignalPer2usFrame/Synrad_18GeV_Vac_10000Ahr_Runtime_50s_Egas_18GeV_Hgas_275GeV/DIS/NC/18x275/minQ2=1/

Jet finder efficiency



Efficiency is lower for 10x100 for different cuts (more bkg?)

Jet finder fake rate



Fake rate shows that nHit ≥ 5 is needed to remove bkg for 10x100

Files used:

root://dtn-eic.jlab.org//volatile/eic/EPIC/RECO/26.02.0/epic_craterlake/Bkg_Exact1S_2us/GoldCt/10um/DIS/NC/10x100/minQ2=1/pythia8NCDIS_10x100_minQ2=1_beamEffects_xAngle=-0.025_hiDiv_1.*.eicrecon.edm4eic.root

203K events

root://dtn-eic.jlab.org//volatile/eic/EPIC/RECO/26.02.0/epic_craterlake/Bkg_Exact1S_2us/GoldCt/5um/DIS/NC/10x100/minQ2=1/pythia8NCDIS_10x100_minQ2=1_beamEffects_xAngle=-0.025_hiDiv_1.0000.eicrecon.edm4eic.root

180K events

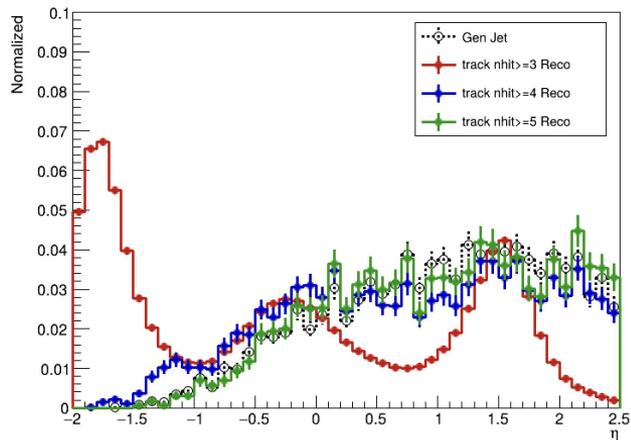
root://dtn-eic.jlab.org//volatile/eic/EPIC/RECO/26.02.0/epic_craterlake/Bkg_Exact1S_2us/GoldCt/10um/DIS/NC/10x275/5/minQ2=1/pythia8NCDIS_10x275_minQ2=1_beamEffects_xAngle=-0.025_hiDiv_1.0000.eicrecon.edm4eic.root

209K events

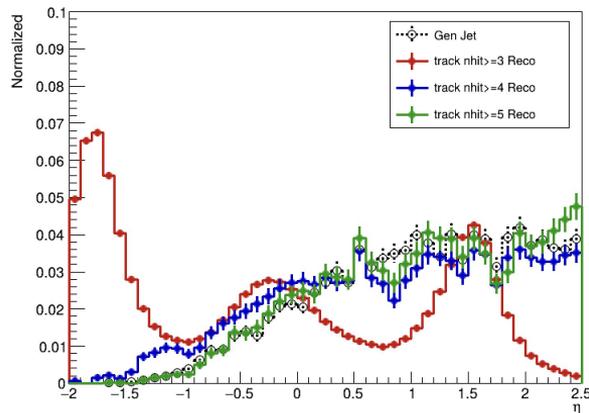
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205K events

10x100 10 μm

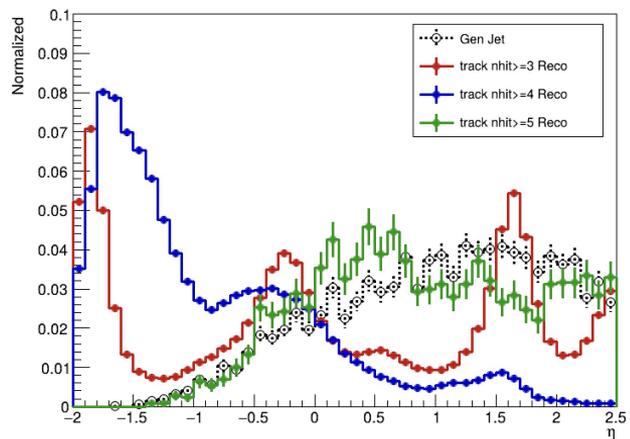


10x275 10 μm

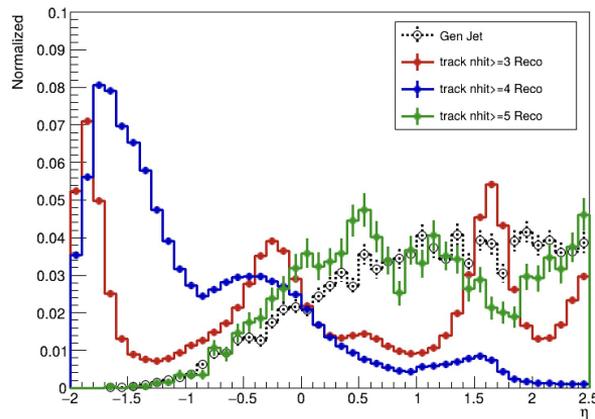


Jet η
Distribution

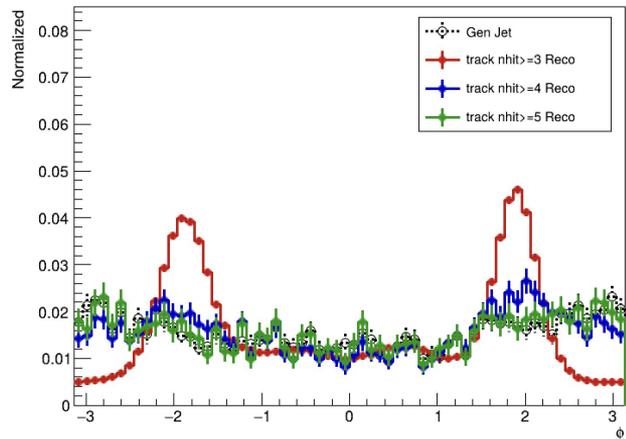
10x100 5 μm



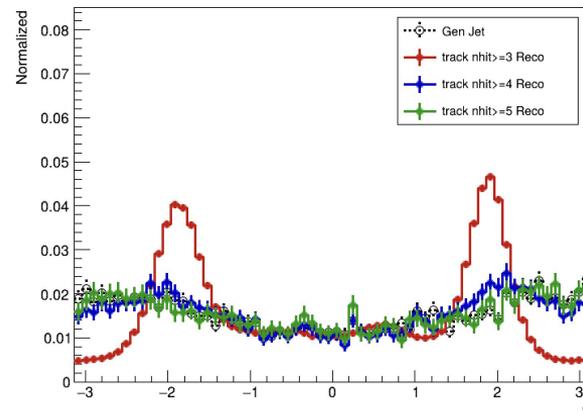
10x275 5 μm



10x100 10 μm

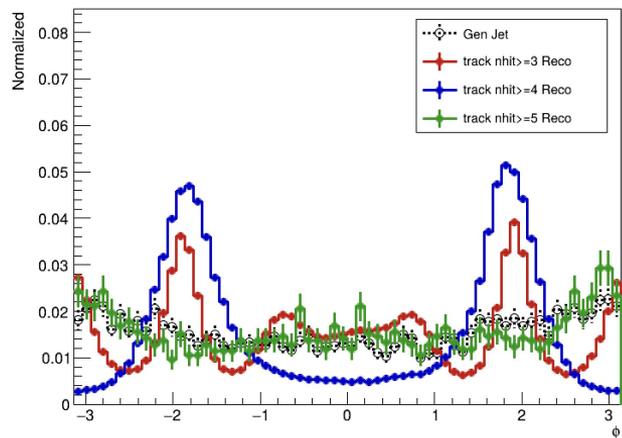


10x275 10 μm

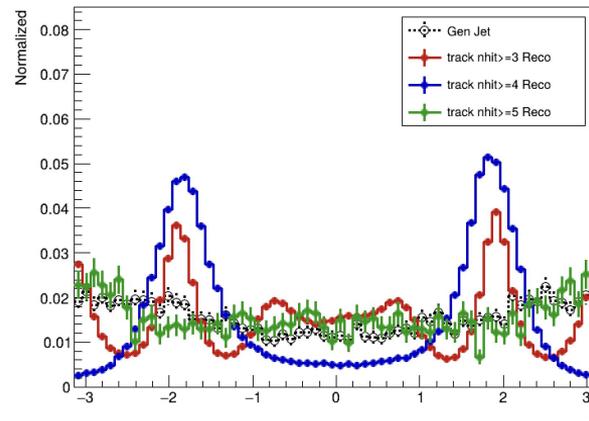


Jet ϕ
Distribution

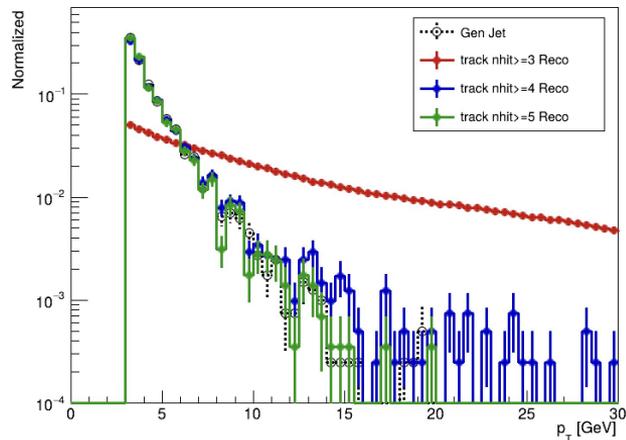
10x100 5 μm



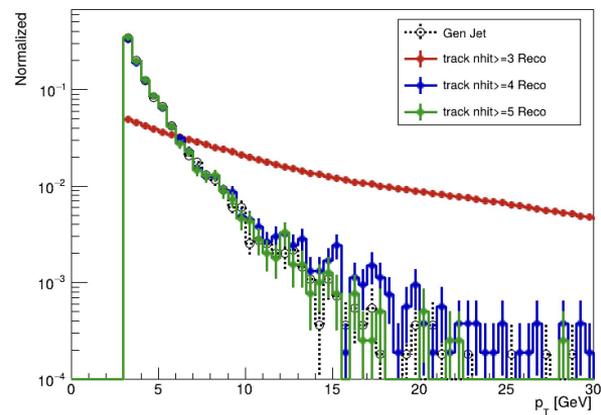
10x275 5 μm



10x100 10 um

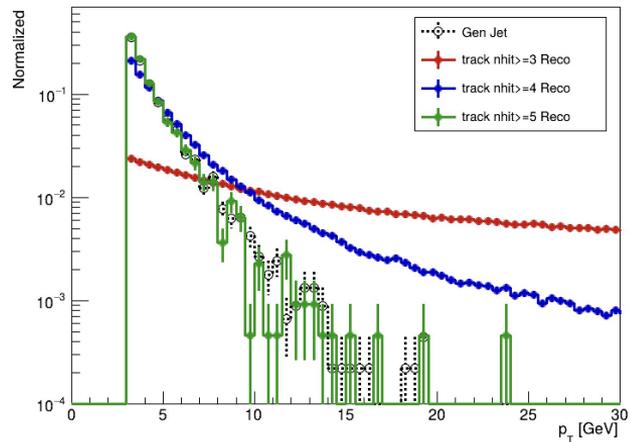


10x275 10 um

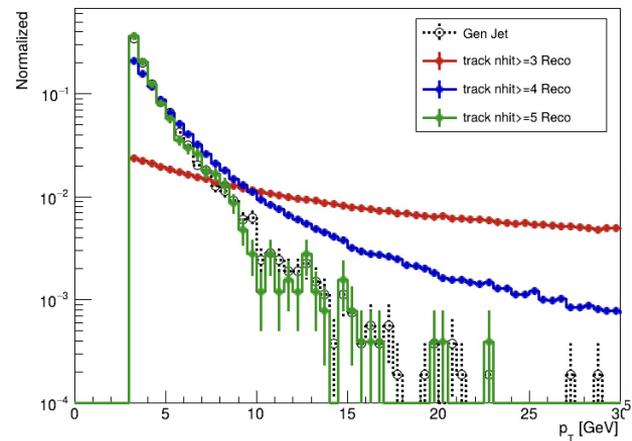


Jet p_T
Distribution

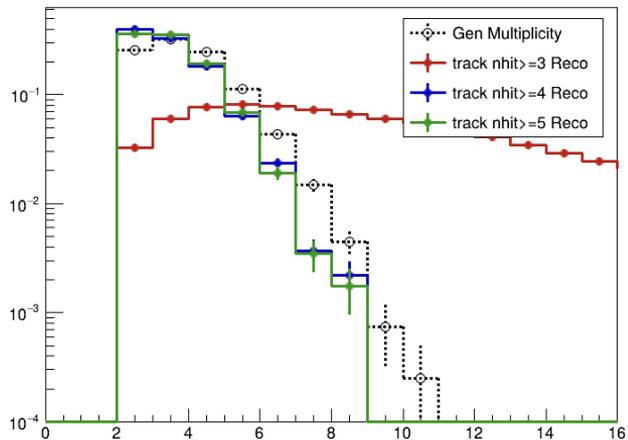
10x100 5 um



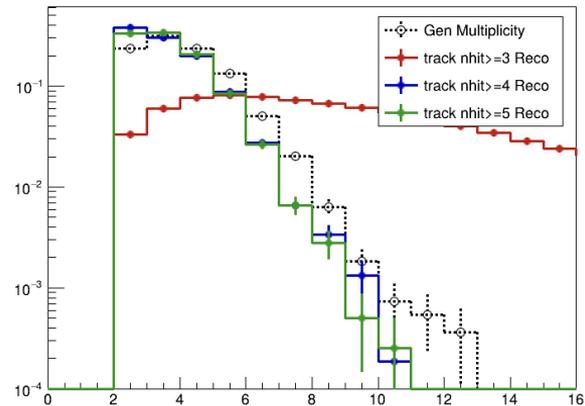
10x275 5 um



10x100 10 μm

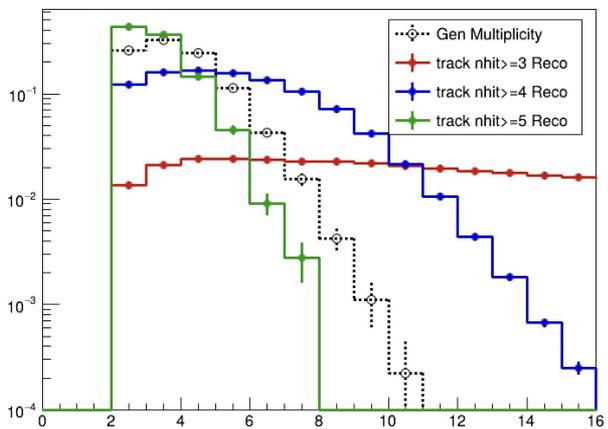


10x275 10 μm

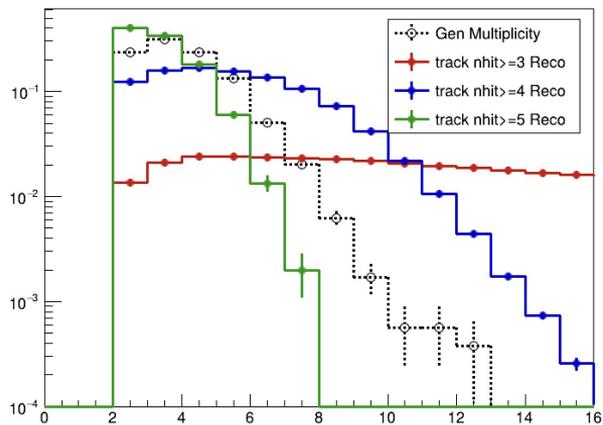


Multiplicity
(constituents/jet)

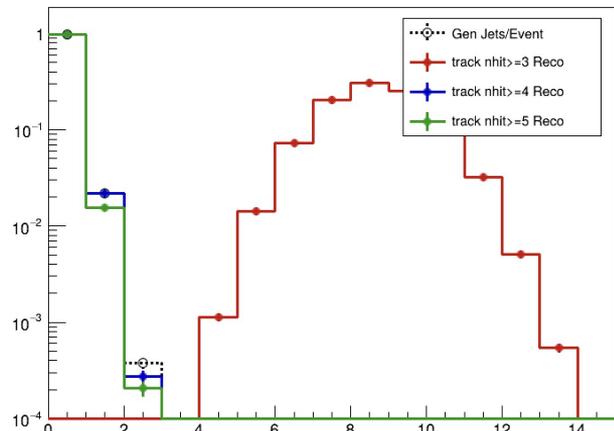
10x100 5 μm



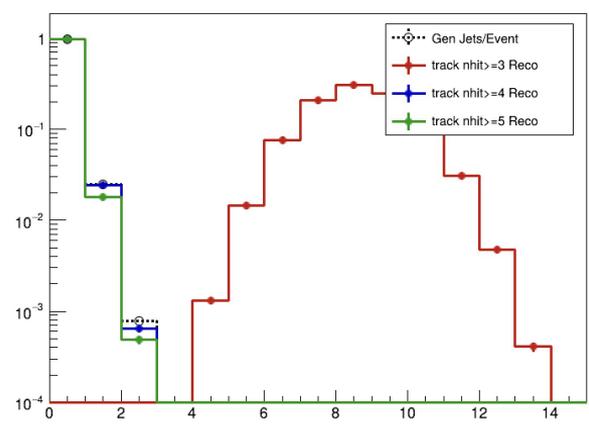
10x275 5 μm



10x100 10 μm

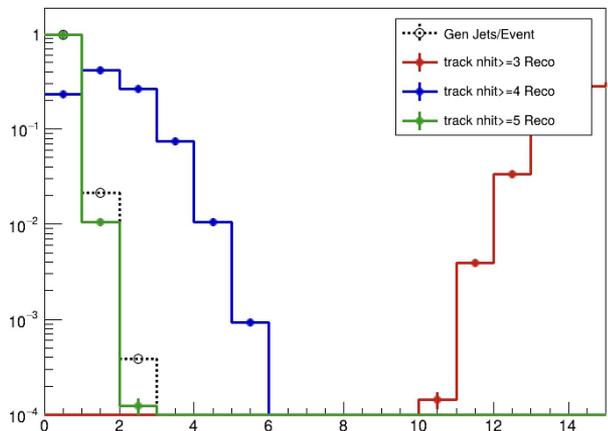


10x275 10 μm

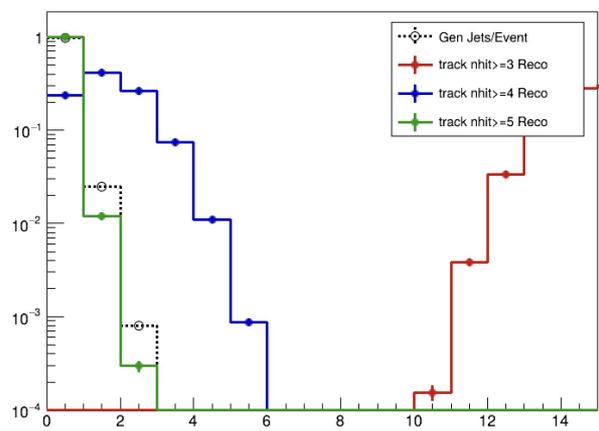


jets/events

10x100 5 μm

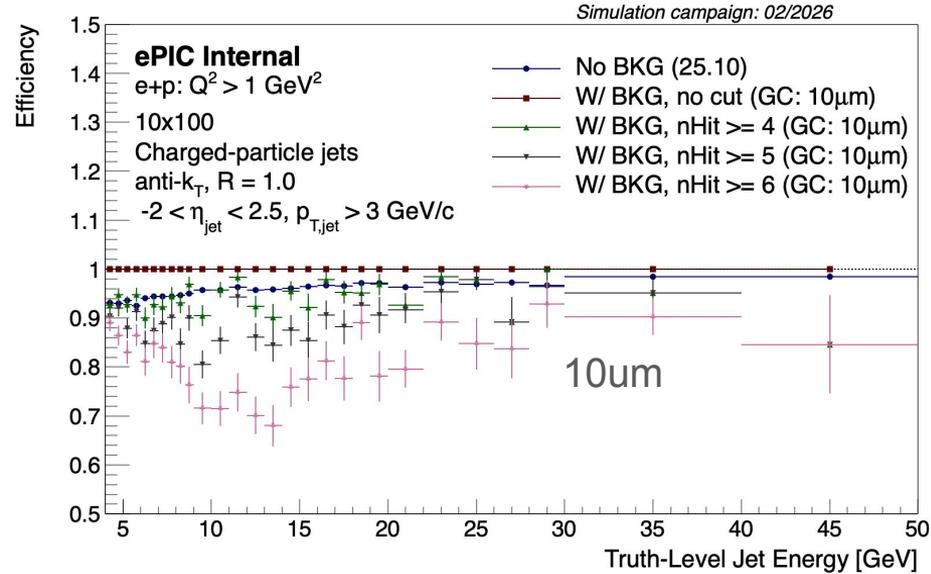


10x275 5 μm

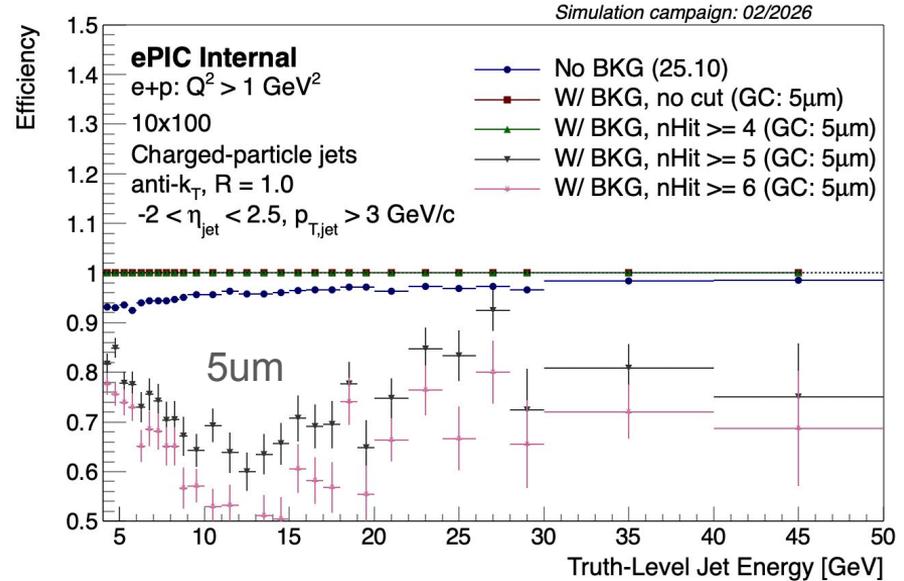


Jet finder efficiency

$$\epsilon_{\text{jet}} = \frac{N_{\text{match}}}{N_{\text{gen}}}$$

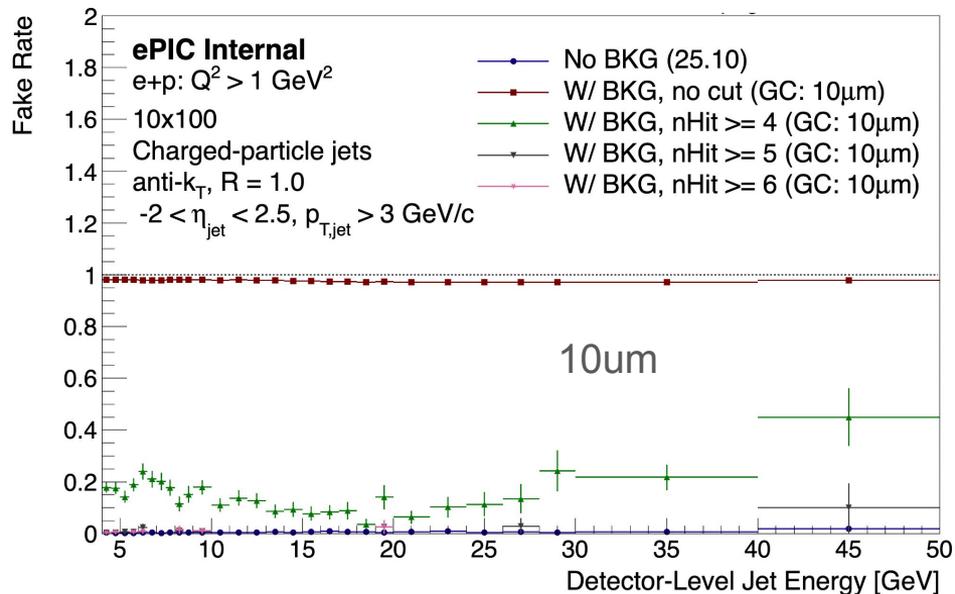


10x100

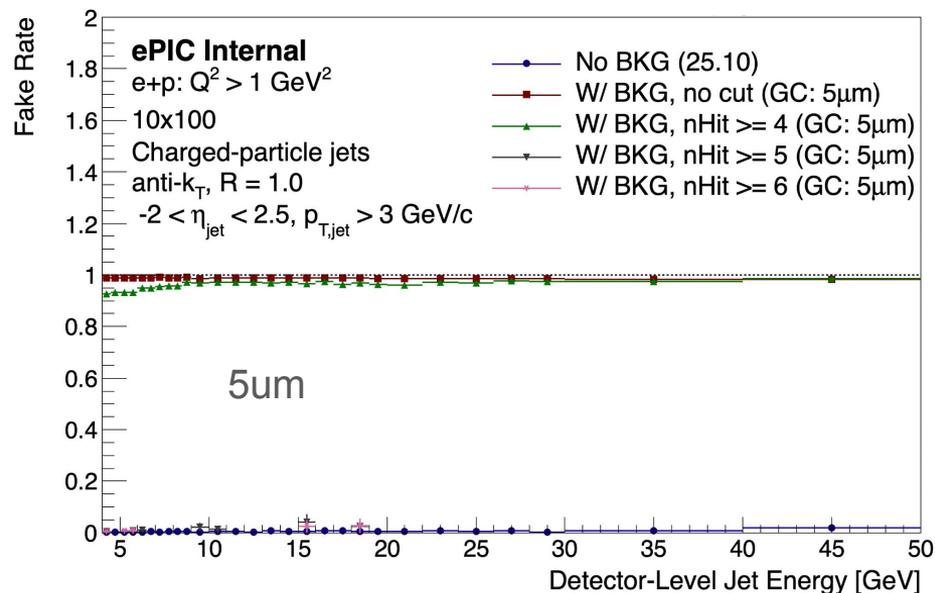


Jet finder fake rate

$$\text{fake rate} = \frac{N_{\text{unmatched reco}}}{N_{\text{total reco}}}$$

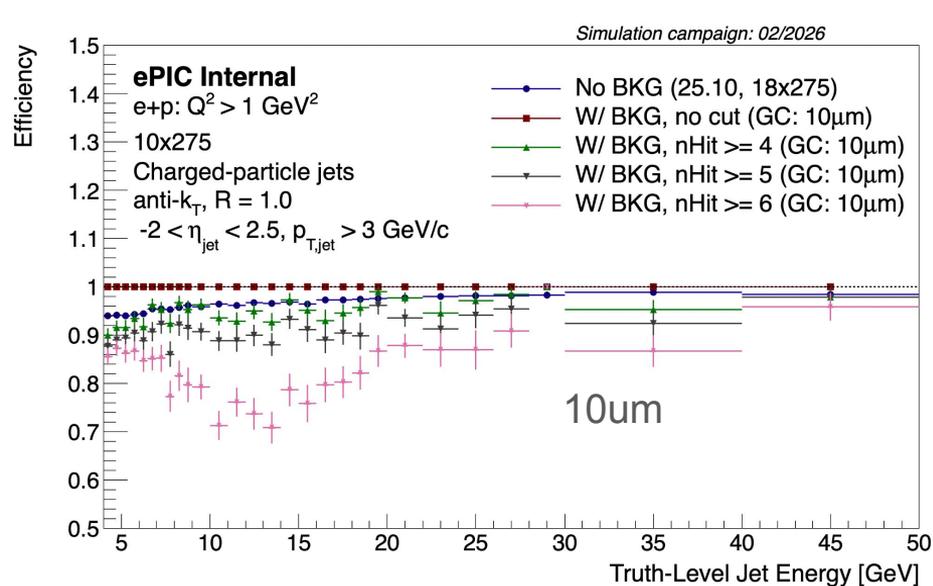


10x100

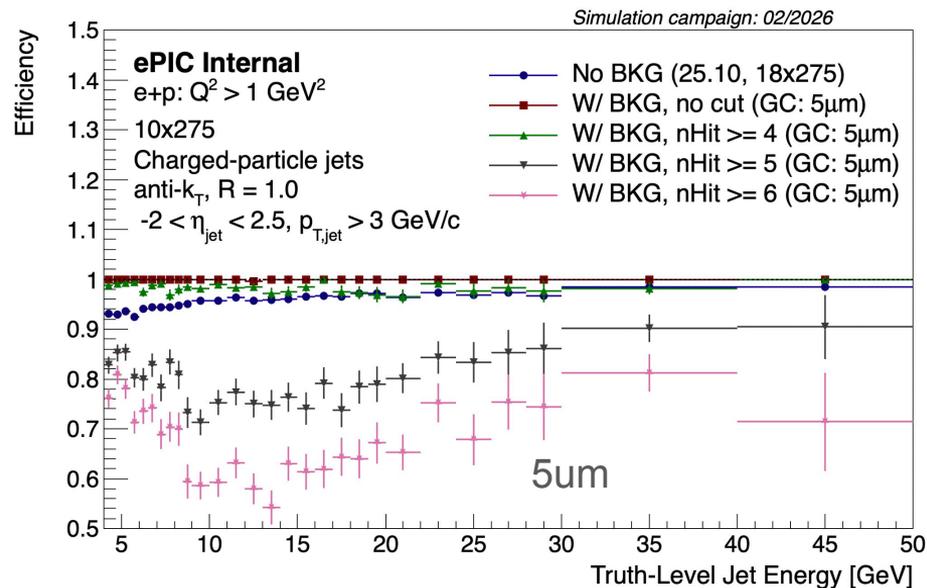


$$\epsilon_{\text{jet}} = \frac{N_{\text{match}}}{N_{\text{gen}}}$$

Jet finder efficiency

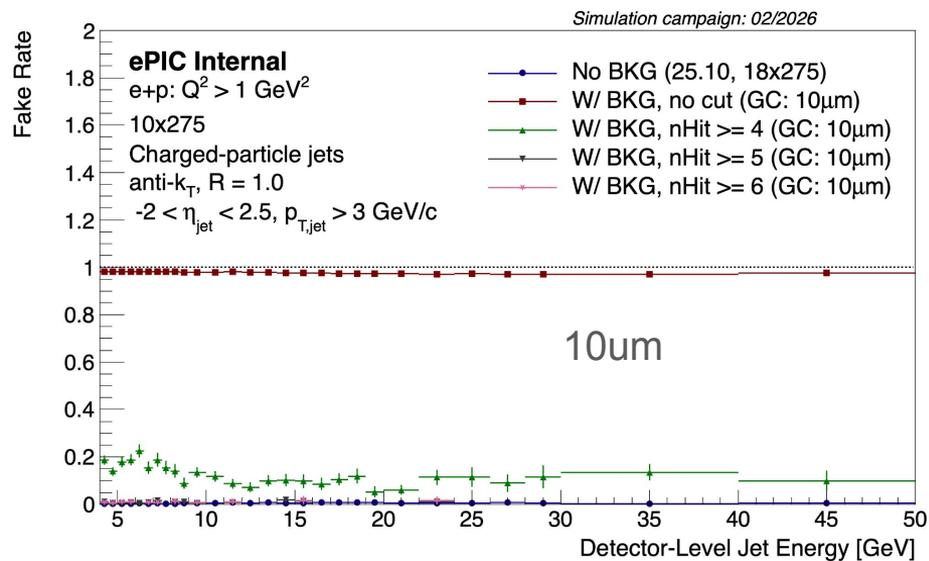


10x275

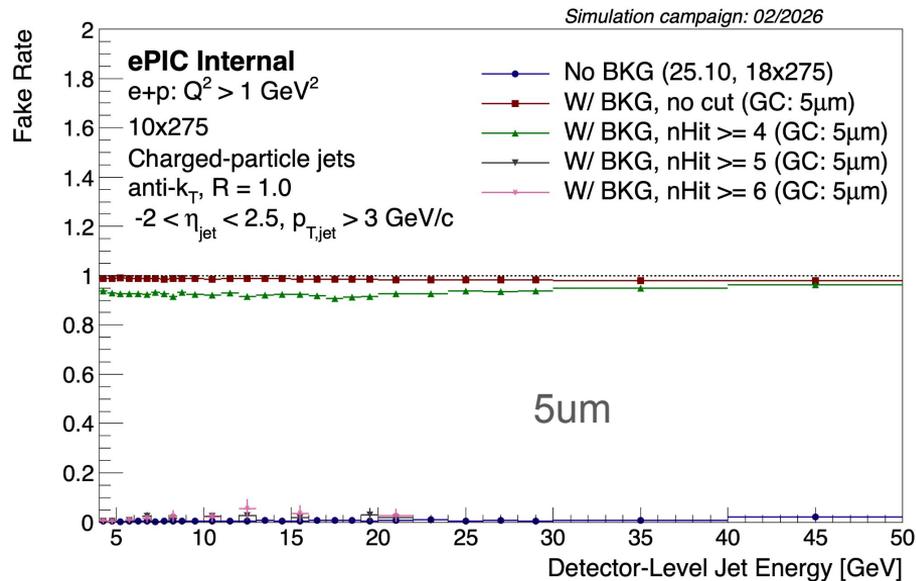


Jet finder fake rate

$$\text{fake rate} = \frac{N_{\text{unmatched reco}}}{N_{\text{total reco}}}$$



10x275



Summary

- The distributions for 10x100 (ep) and 10x275 (ep) look similar
- For 5um gold coating, jets with track having 3 and 4 measurements hits are affected, whereas track with 5 hits follow closely to gen
- For 10um gold coating, improvement is observed in jets with tracks with 4 measurement hits.
- An improvement in efficiency and fake rate is observed with 10um gold coating