Study of π0 reconstruction efficiency for the polarimetry measurement

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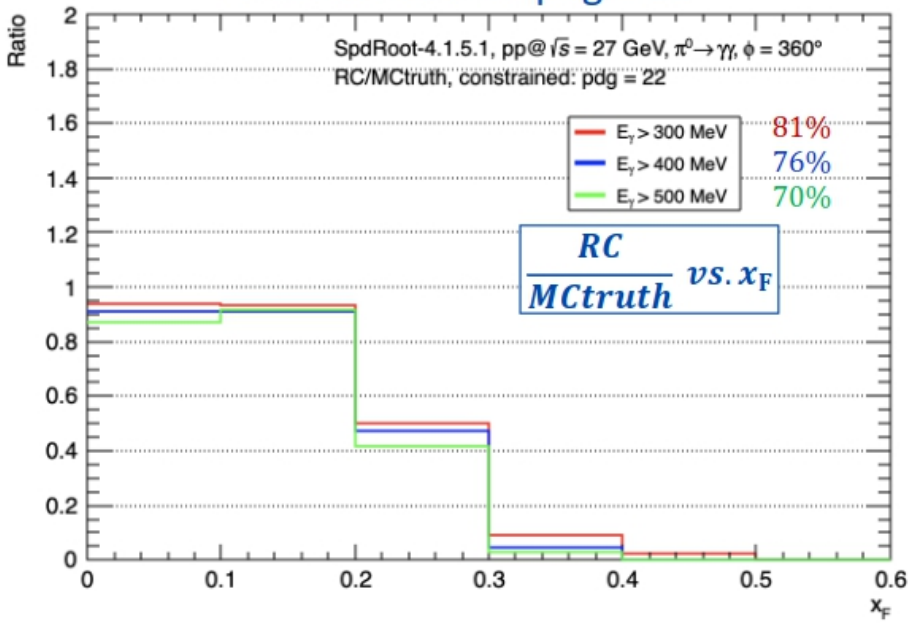
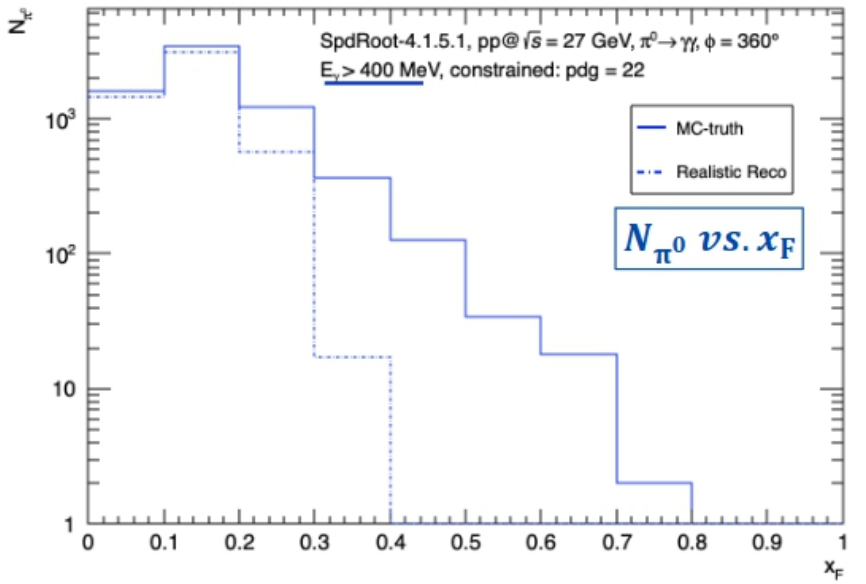
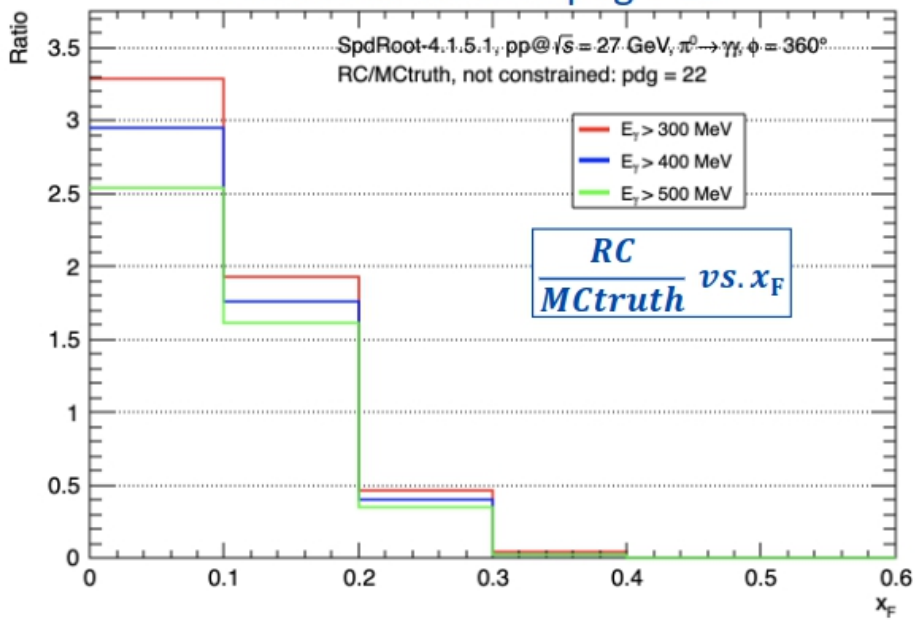
Katherin's study: π0 reconstruction vs x_F

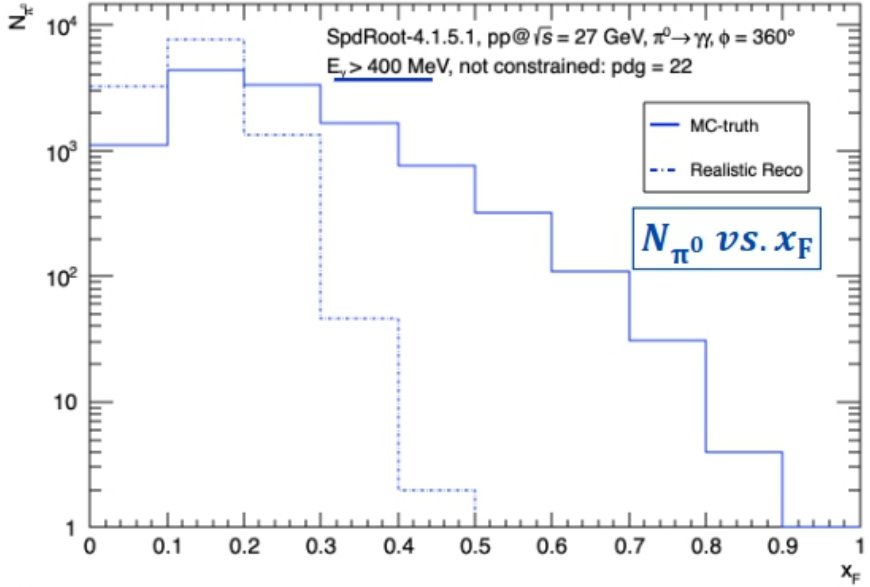
With constraint: pdg = 22





Without constraint: pdg = 22



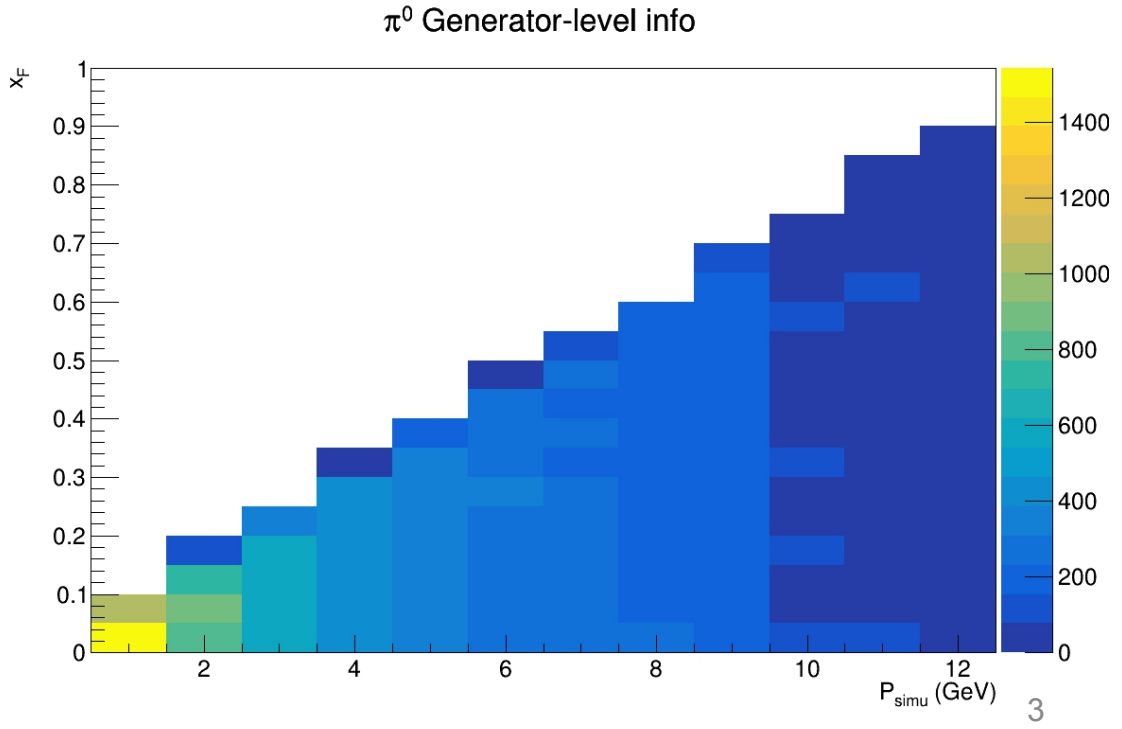


Realistic reconstruction: test sample

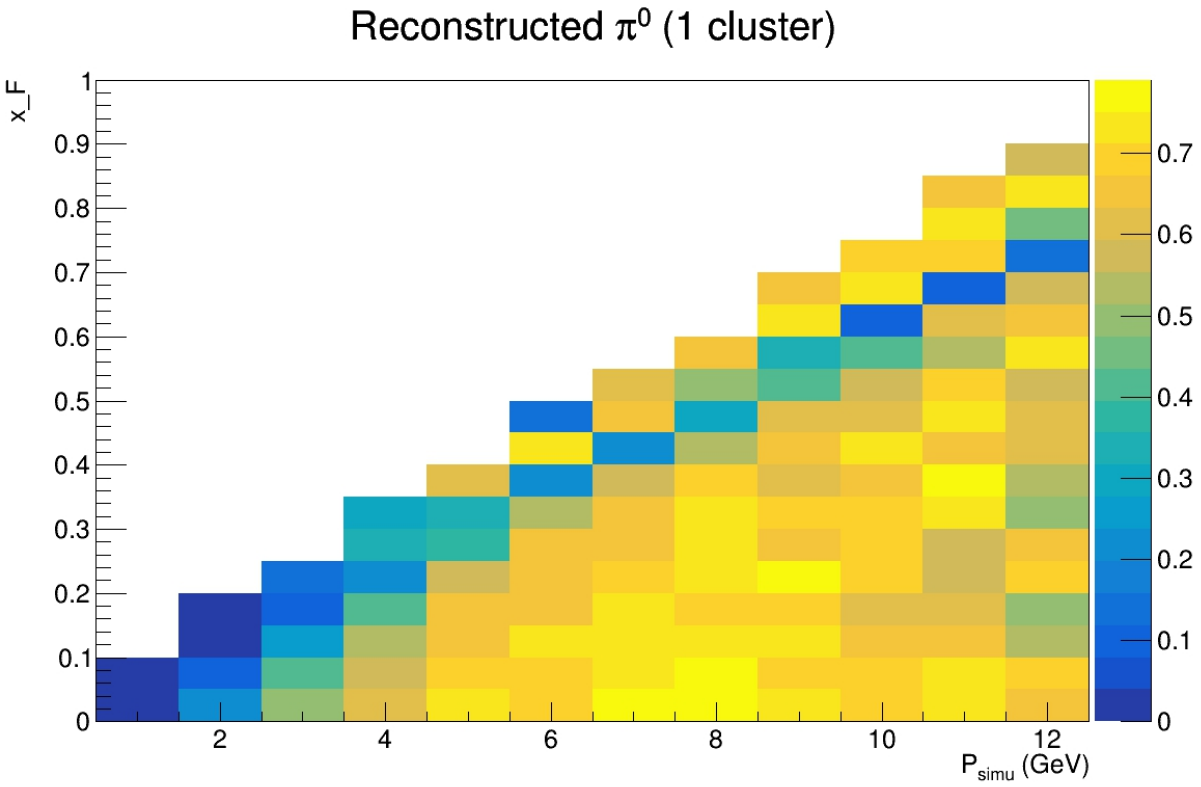
Questions for this study:

- what π^0 reconstruction efficiency do we expect for high x_F?
- are the π^0 reconstructed as a single or two clusters?
- how large is the effect of the beam hole?

Ideal case: only π^0 in event



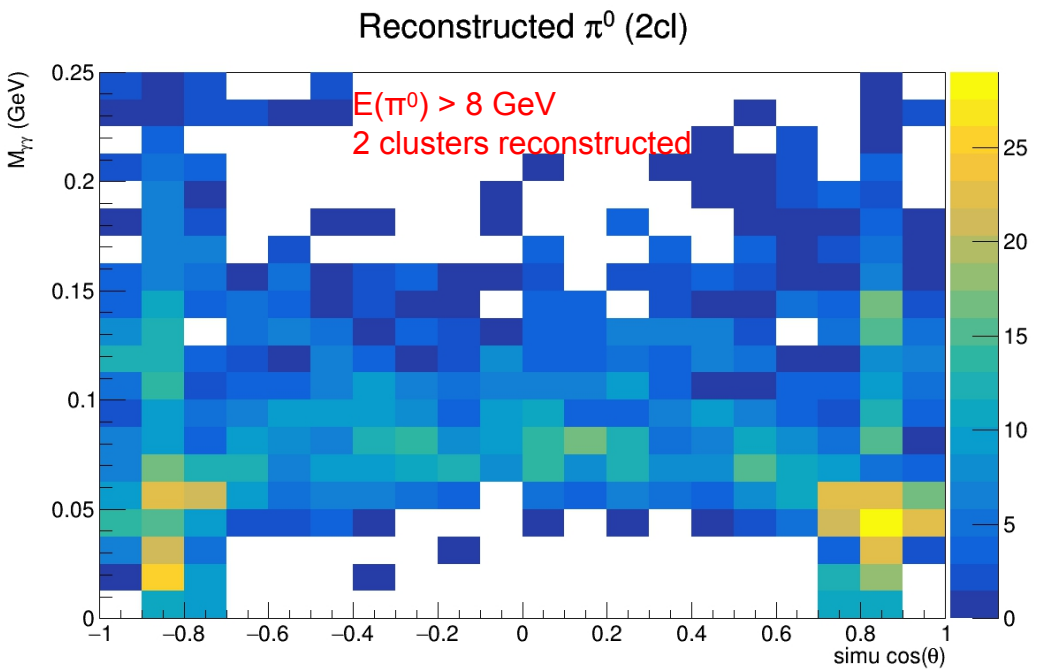
Realistic reconstruction: π0 detection efficiency

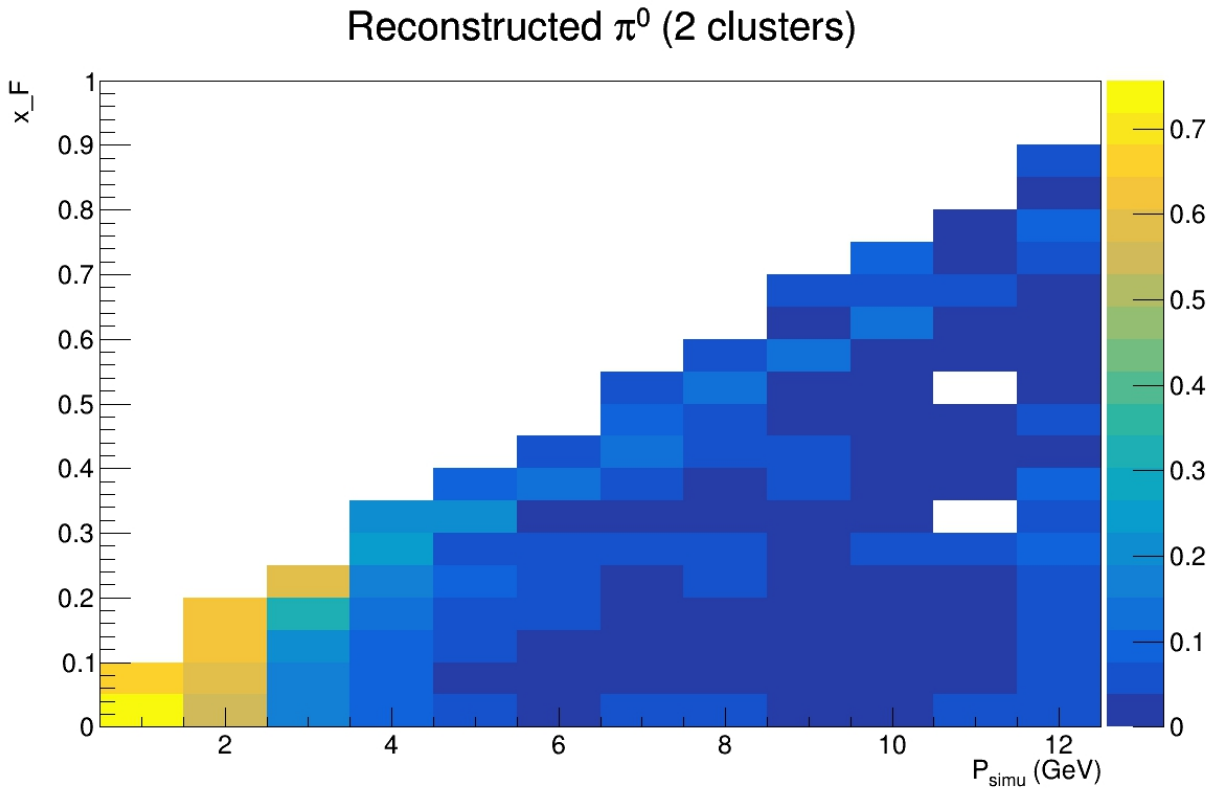


- Separation algorithm not trained for barrel-endcap gap
- 70-80% efficiency expected, but after $x_F > 0.4$ π^0 is mainly reconstructed as one single cluster
- In the ideal case, clusters are labelled as π^0

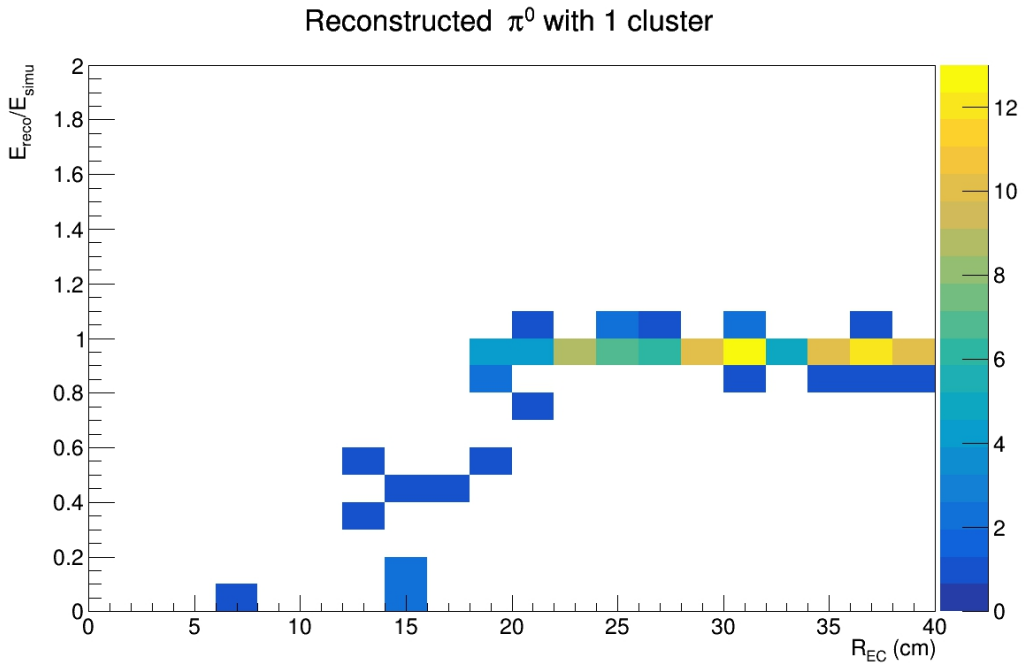
Realistic reconstruction: π0 detection efficiency

Rarely (for high energies), π^0 is reconstructed as two photons:
however, usually, it's one big merged π^0 cluster and a small one ~10 cm away



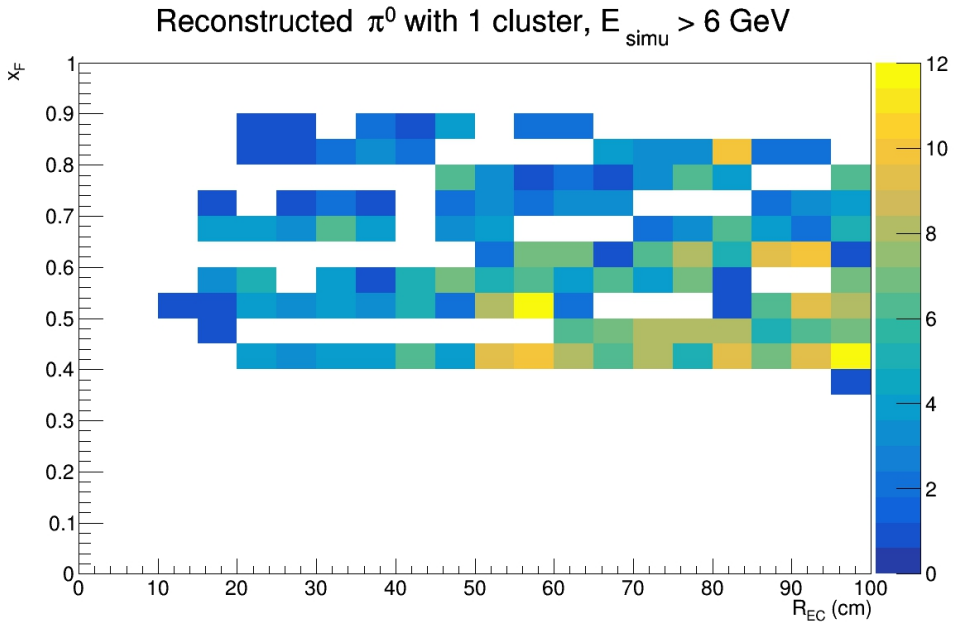


Understanding the beam hole impact



Hole with effective size ~ 20 cm
(leakage leakage for events with radius of photon hit @ endcap R_γ < 20 cm)

very few events with R < 20 cm expected (~1%)



Outlook and conclusions: other possible issues

- In an ideal case with no other particles, even for high x_F π^0, 70-80% efficiency is expected.
- For $x_F > 0.4$, most π^0 are reconstructed as single cluster: a simple version of gamma/pion separation is already installed in SPDROOT (SpdEcalRCParticle::GetPID());
- However, in minimum bias sample, there could be overlaps between “unrelated” particles: to be studied;
- Another issue: special case of gamma/pion separation in barrel/endcap gap: present approach (summing up energies) is not enough.