O2 Analysis Tutorial 4.0

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PWG-EM Photons
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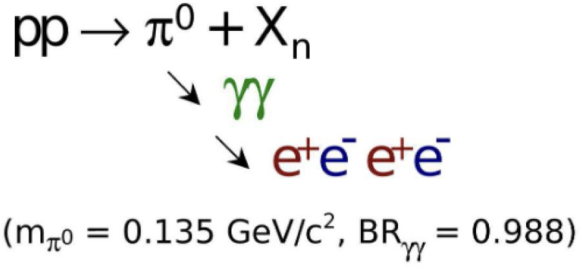
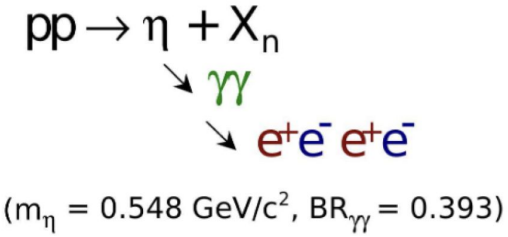
Photon and meson reconstruction

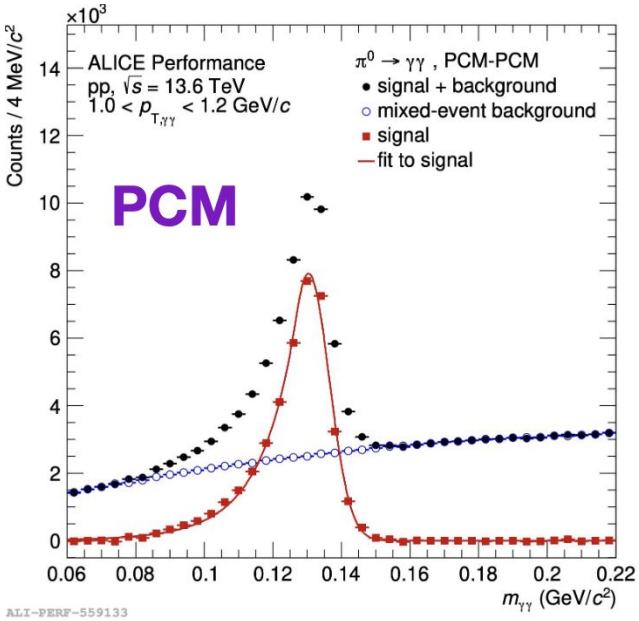
- Neutral-meson measurement **using PCM**
  - reconstruct decay photons via their conversion products down to low p_T

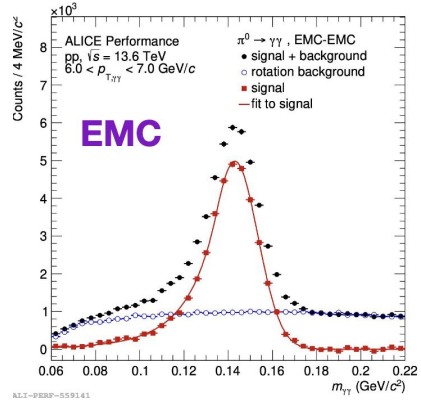
- Conversion as main interaction process of photons with ALICE detector material $P_{conv} \approx 11\ \%$
  - reconstruction possible by tracking produced electron-positron pairs

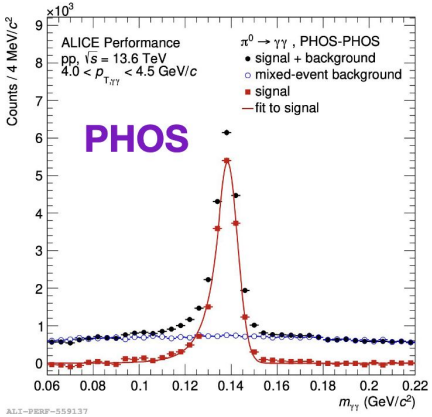




PCM vs calorimetry







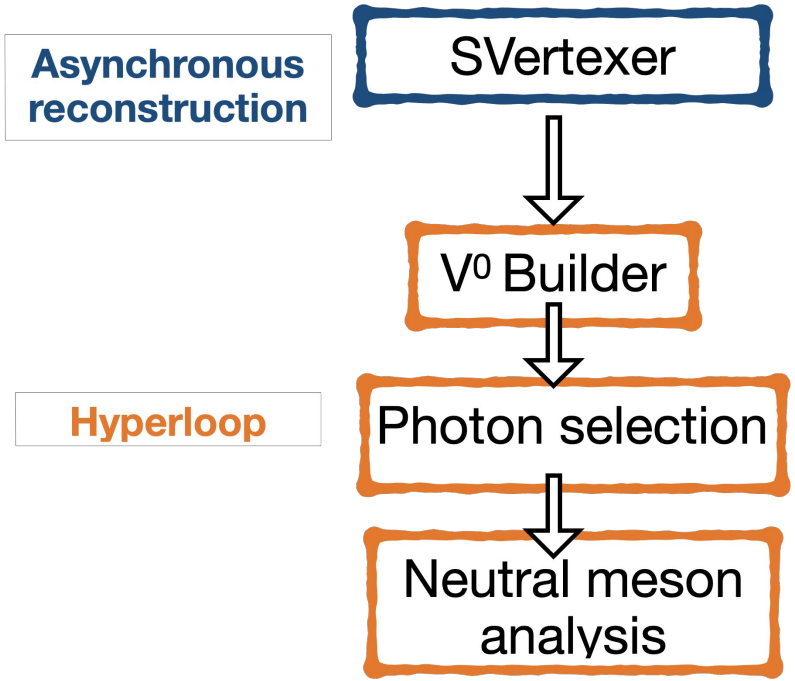
high resolution compared to EMCal

higher acceptance than PHOS

$|\eta| < 0.9, 0 < \phi < 2\pi$

Workflow in Run 3

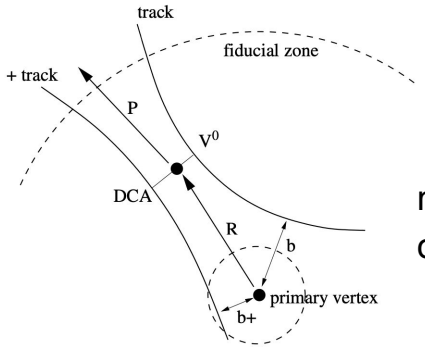
- Higher statistics in Run 3 thanks to
  - new continuous readout
  - more conversions with new calibration tungsten wires in ITS2



Workflow in Run 3

- Higher statistics in Run 3

1. **find secondary vertex: SVertexer**
   TPC-ITS tracks as input
2. **build V0 candidates: V0 Builder**



match displaced tracks
of opposite charge

Asynchronous reconstruction

SVertexer

V0 Builder

Hyperloop

Photon selection

Neutral meson analysis

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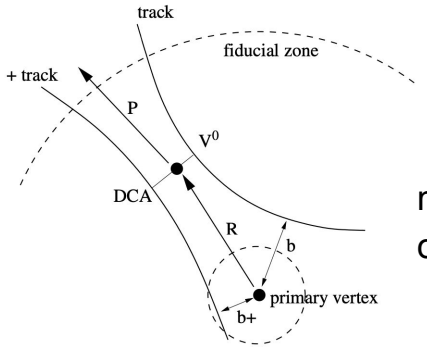

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Asynchronous reconstruction

SVertexer

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Workflow in Run 3

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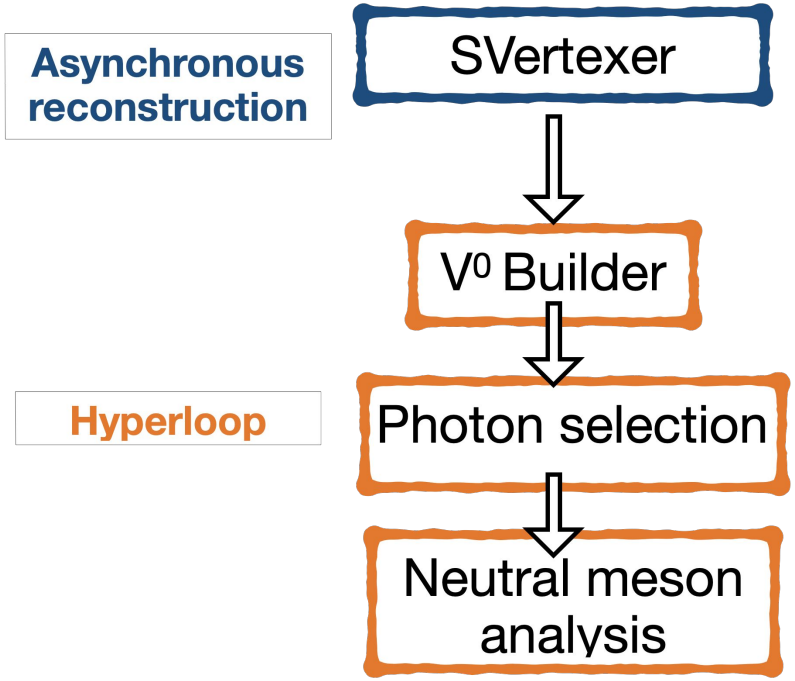
1. find secondary vertex: SVertexer
2. build V0 candidates: V0 Builder
3. **apply photon selection**
   → track cuts and electron identification via d*E*/d*x* with TPC
   → Armenteros-Podolaski plot
   → Ψ_{pair} variable



Workflow in Run 3

- Higher statistics in Run 3

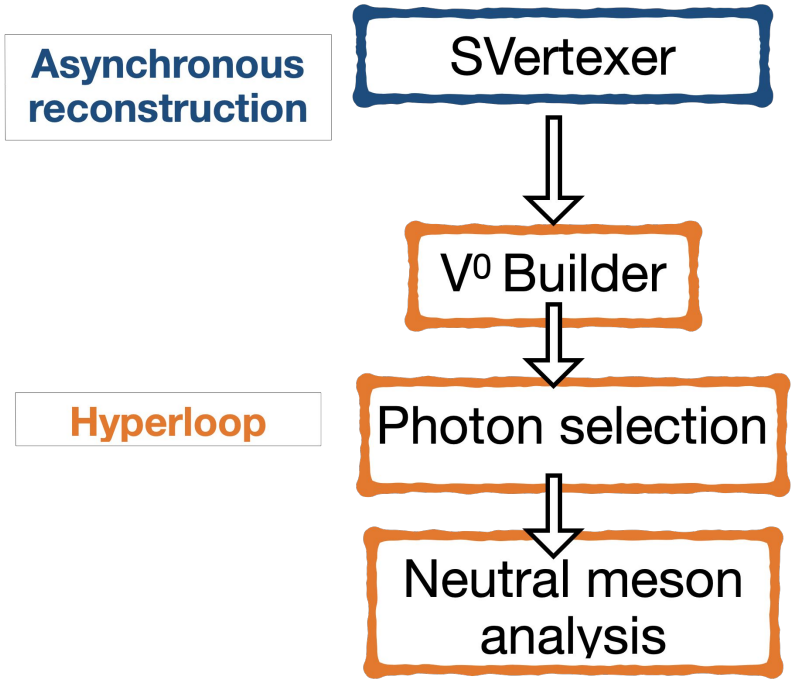
1. find secondary vertex: SVertexer
2. build V0 candidates: V0 Builder
3. apply photon selection
4. **neutral-meson reconstruction**

   → selected photons combined into pairs via

   $$M_{\gamma\gamma} = \sqrt{2E_{\gamma_1}E_{\gamma_2}(1-\cos\theta_{12})}$$

   → meson signals reconstructed from excess yields around rest mass

   → extraction combinatorial background with event-mixing method



Your turn!

- Code repository
  https://github.com/AliceO2Group/analysis-tutorials/tree/master/o2at-3/PWGEM

- Bash script run.sh contains the O2 workflow

  Hands-on session
  → get familiar with the task
  → download input data and run code
  → obtain Armenteros-Podolanski plot
  → retrieve information for pi0 candidates and reconstruct invariant-mass peak

Skimming workflow

```
time o2-analysis-timestamp --configuration json://config_skimming_photon.json -b |
o2-analysis-event-selection --configuration json://config_skimming_photon.json -b |
o2-analysis-multiplicity-table --configuration json://config_skimming_photon.json -b |
o2-analysis-centrality-table --configuration json://config_skimming_photon.json -b |
o2-analysis-track-propagation --configuration json://config_skimming_photon.json -b |
o2-analysis-pid-tpc-base --configuration json://config_skimming_photon.json -b | o2-analysis-pid-tpc
--configuration json://config_skimming_photon.json -b | o2-analysis-ft0-corrected-table
--configuration json://config_skimming_photon.json -b | o2-analysis-em-photon-conversion-builder
--configuration json://config_skimming_photon.json -b |
o2-analysis-em-skimmer-primary-electron-from-dalitzee --configuration
json://config_skimming_photon.json -b | o2-analysis-em-create-emevent-photon --configuration
json://config_skimming_photon.json --aod-writer-json writer_photon_table.json -b;
```