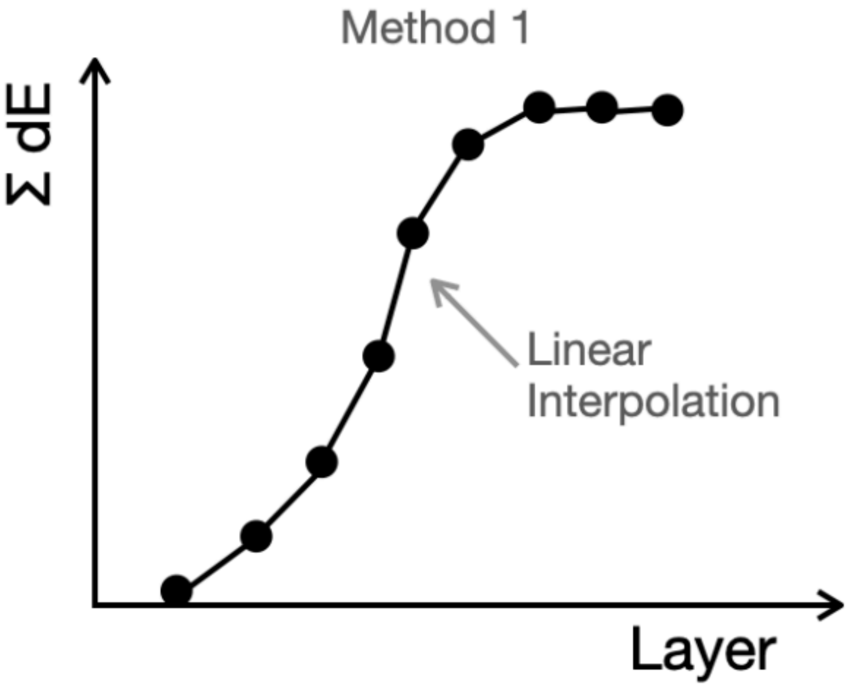
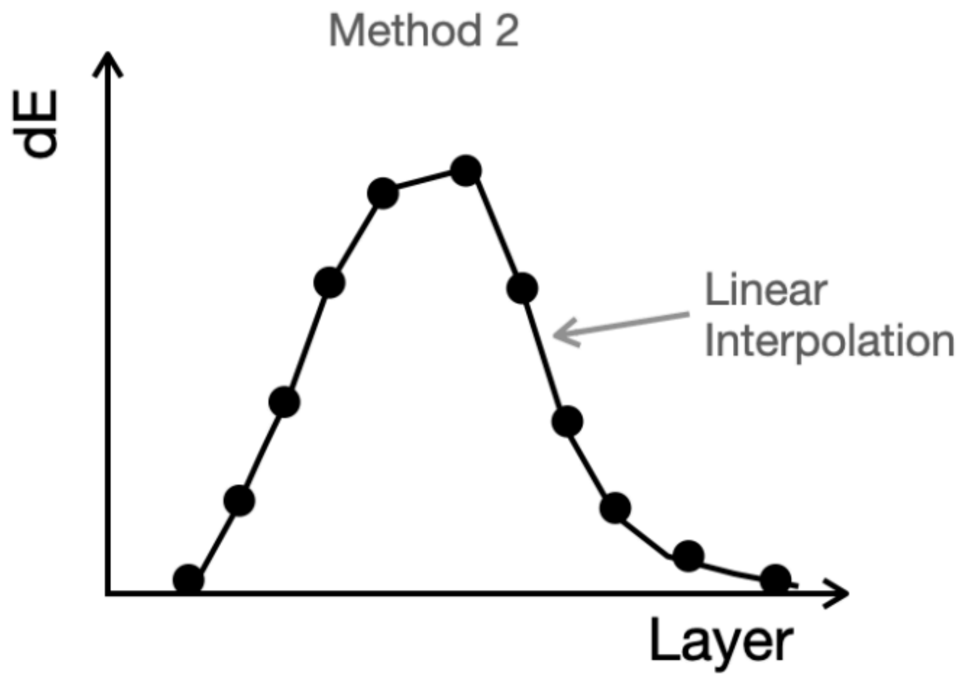
Update of neutron analysis

26 Aug 2021
Minho Kim

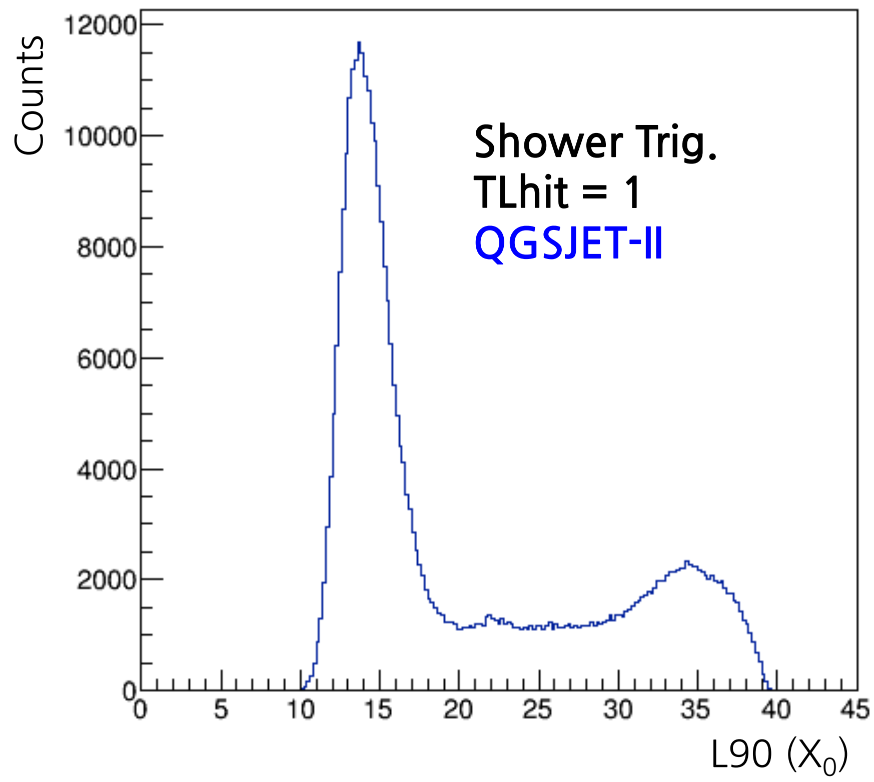
New L90 calculation





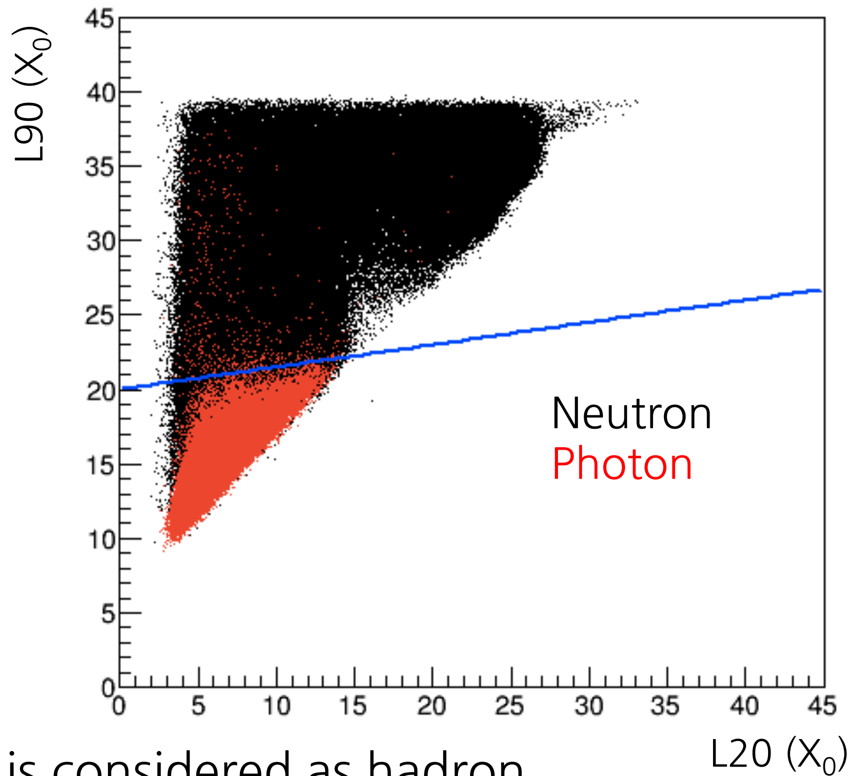
- Originally, the L90 was calculated as a meeting point between linear interpolation of ΣdE and 0.9xSumdE.
- It was changed that an integral of linear interpolation of dE becomes the 0.9xSumdE.

New L90 distribution



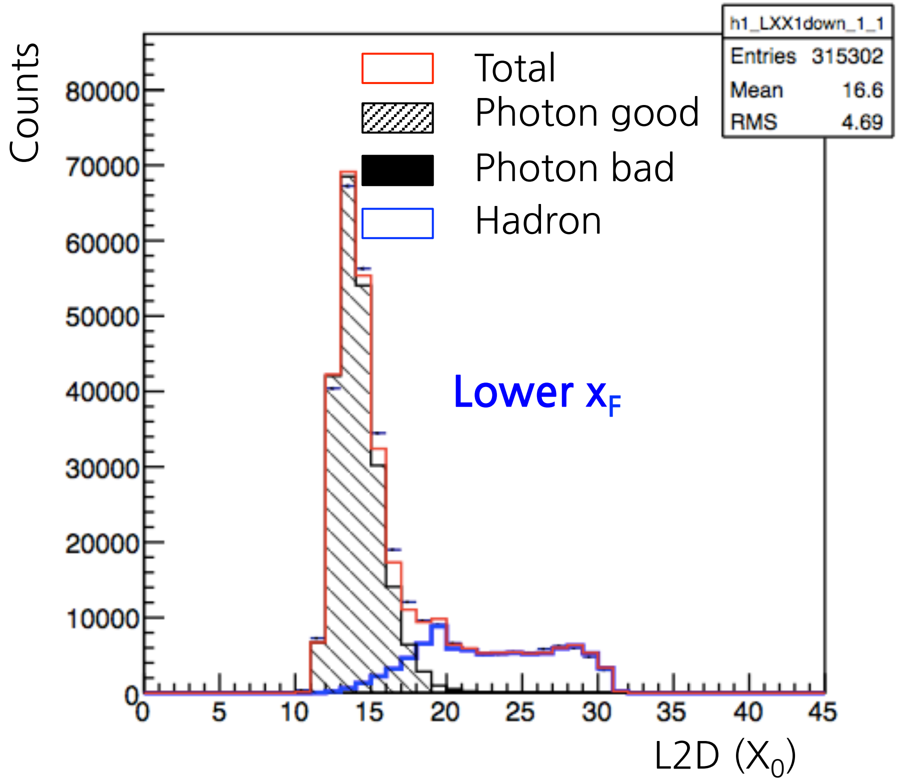
- The structure of many sharp peaks disappeared.

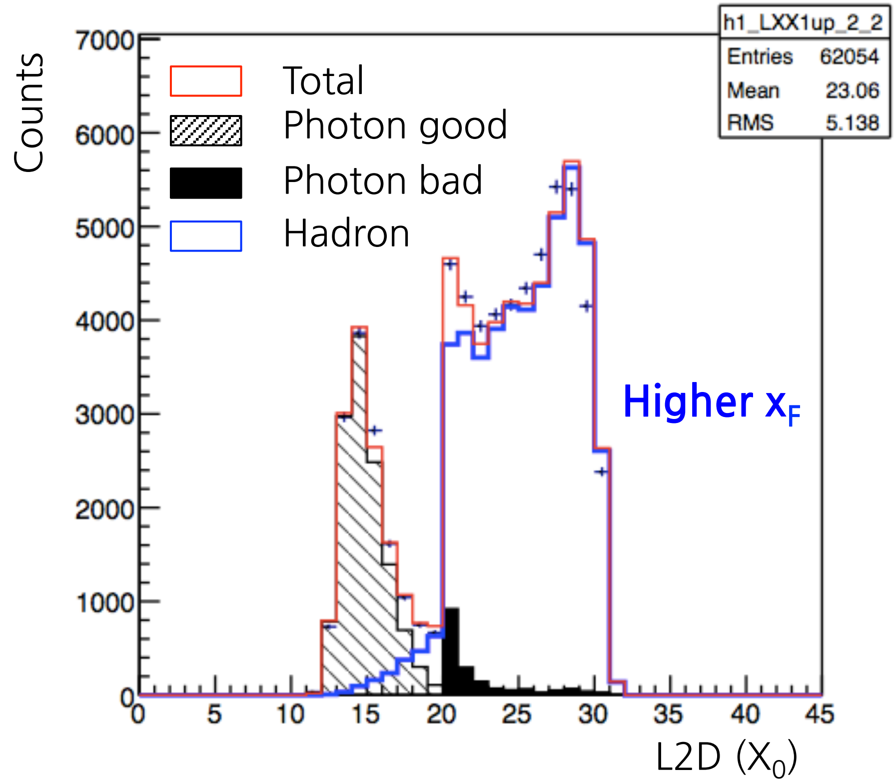
L2D definition and threshold



- L90 > a*L20 + b is considered as hadron.
- For (a, b) candidates which satisfies higher than 99% of neutron purity, they were fixed so that the neutron efficiency reaches the maximum.
- a = 0.15, b = 20 → purity: 99.8%, efficiency 89.7%
  L2D = L90 - 0.15*L20

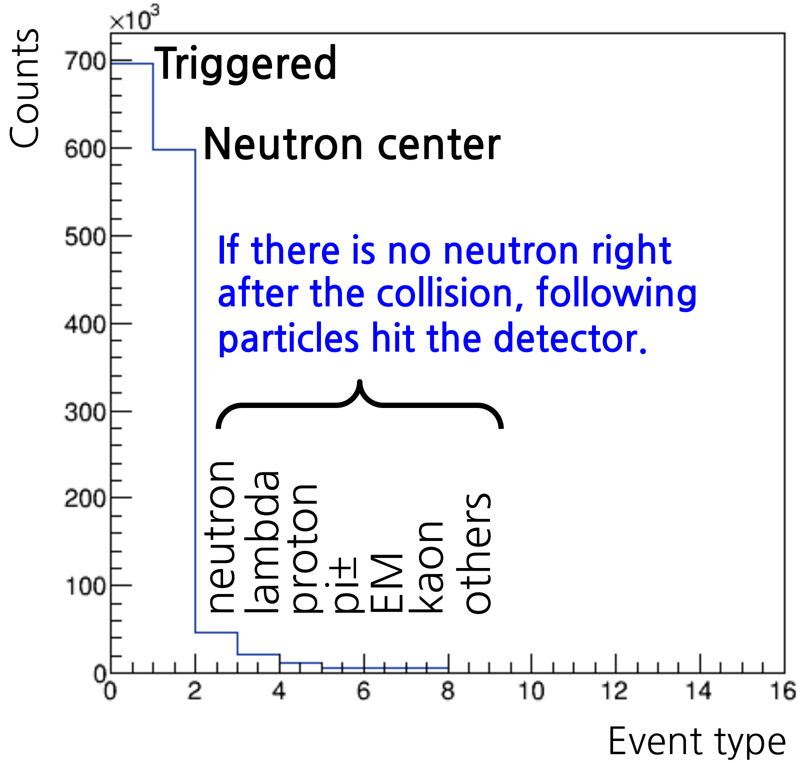
New template fitting

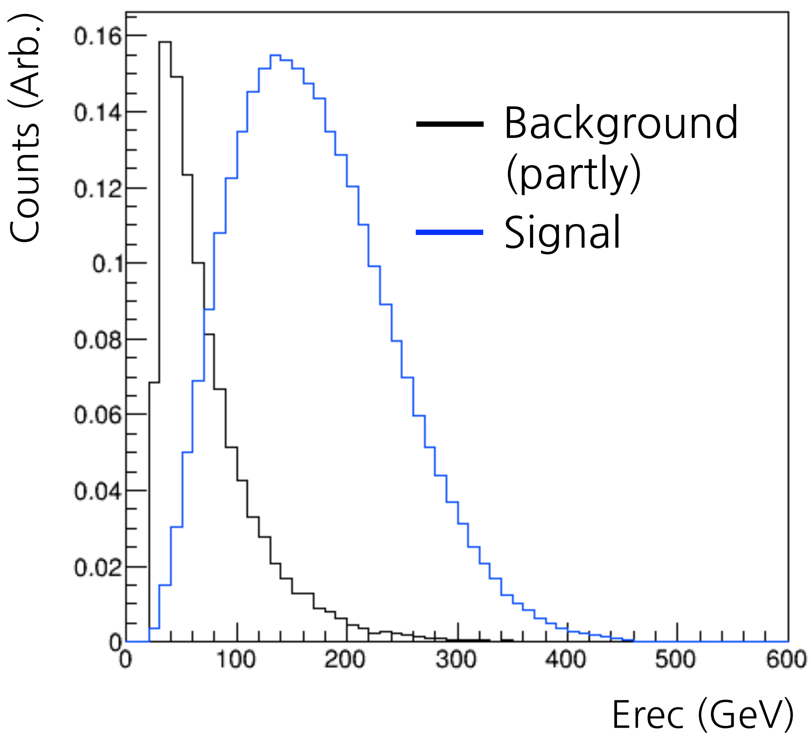




- L2D was used for the template fitting with its threshold = 20.
- Photon events reconstructed by hadron energy conversion function is inevitable.
- Number of hadrons were chosen with a threshold of L2D = 20.

Additional energy cut



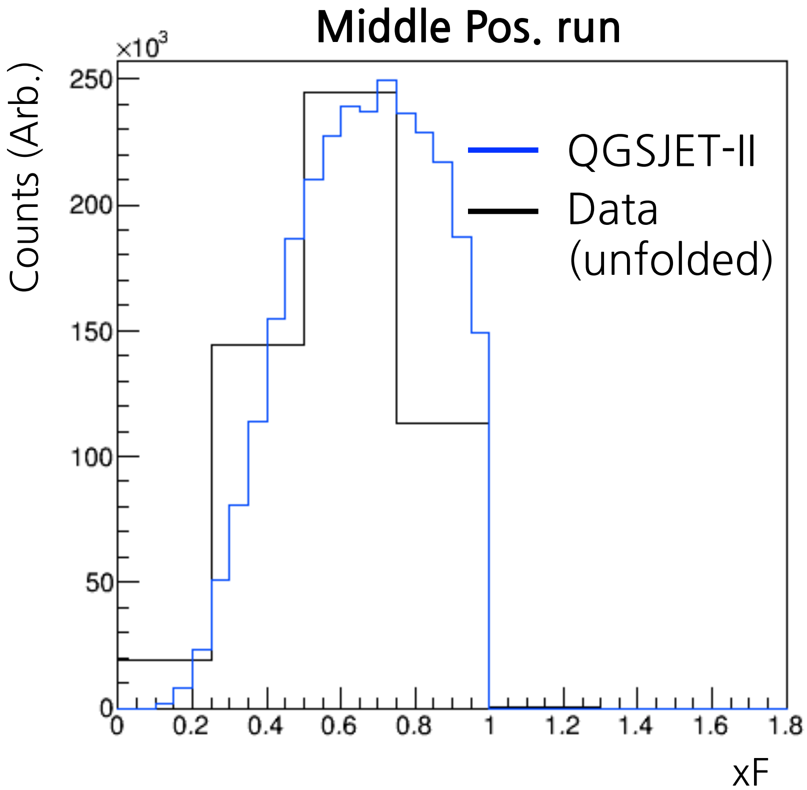


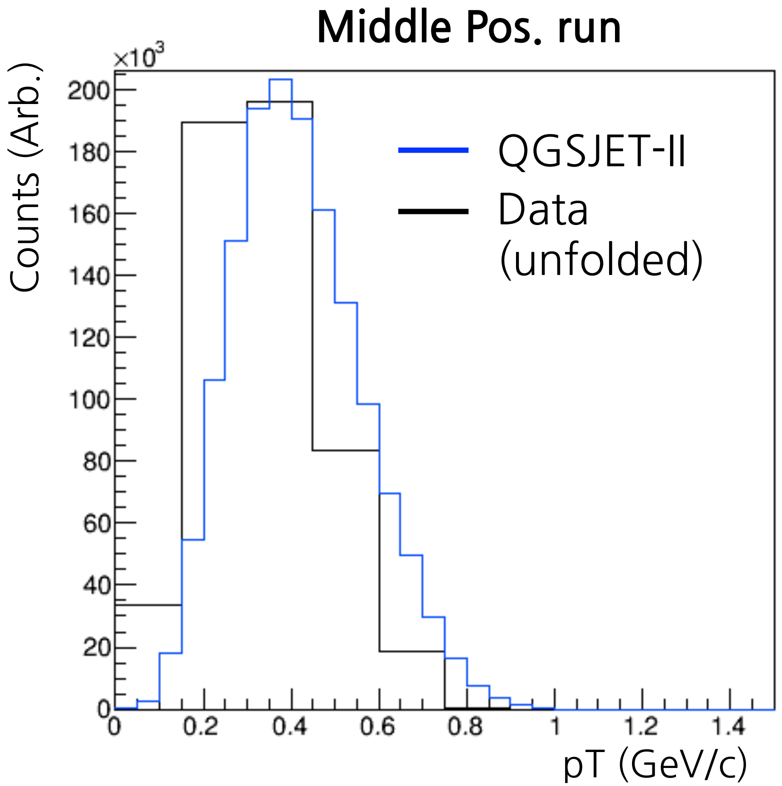
- If there is no photon heading to the RHICf detector in the central region but L2D > 20, it can be considered as neutron.

- Reconstructed energy is relatively small in the cases of pi±, EM, kaon, others.

- With higher energy cut of E > 60 GeV, the neutron fraction at low energy range was improved from 49% to 34%.

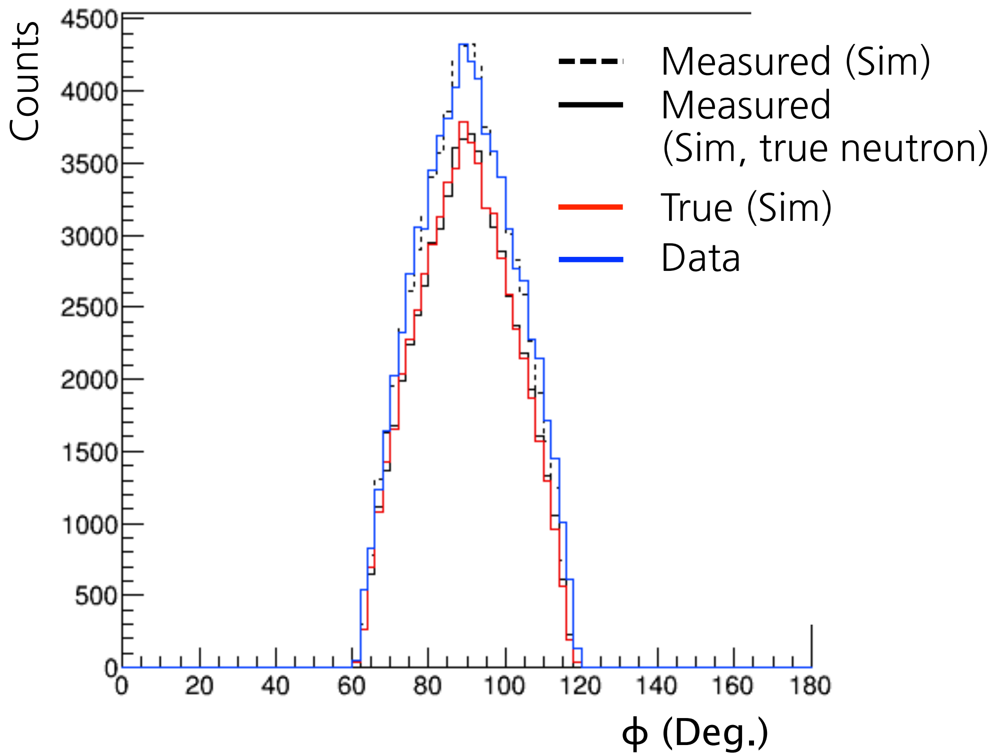
Comparison with QGSJET-II

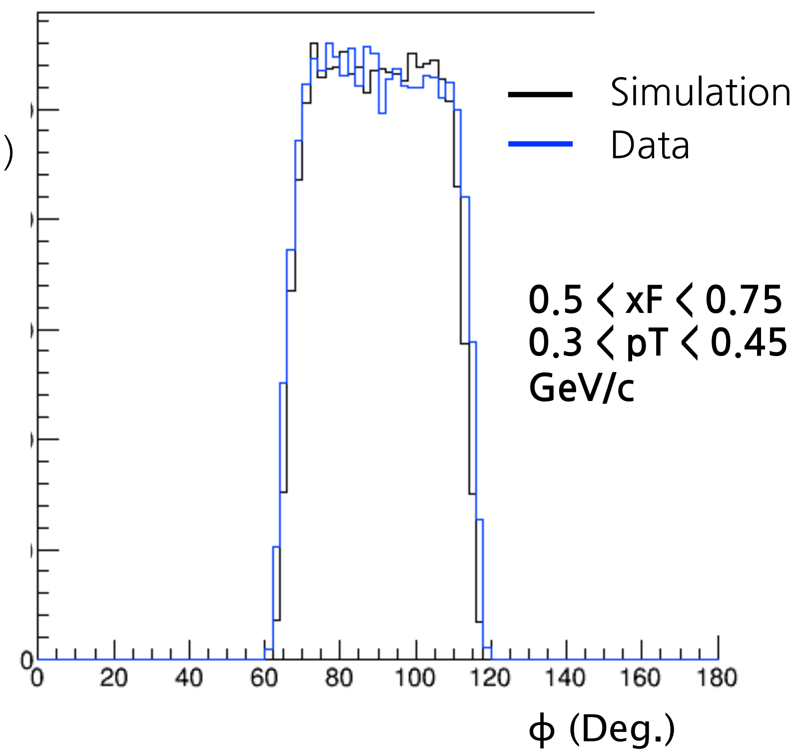




- The QGSJET-II distribution was arbitrarily scaled to be comparable with the unfolded one.
- It seems that the main difference is the energies of the generated neutrons at QGSJET-II are bigger than data → higher p_T distribution.

Azimuthal angle estimation





- One can say that the true neutron ϕ distribution follows QGSJET-II one.
- Since there can be a statistical issue for template fitting if 3D unfolding is done including the ϕ, the dilution factor is calculated referring to the QGSJET-II result.