Improved template fitting

07 Oct 2021
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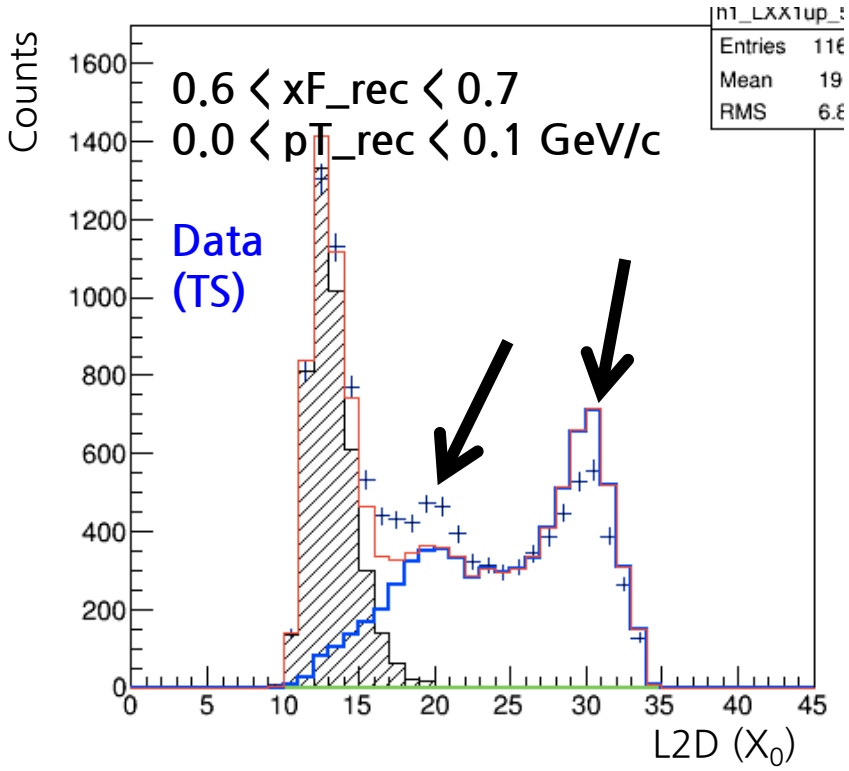
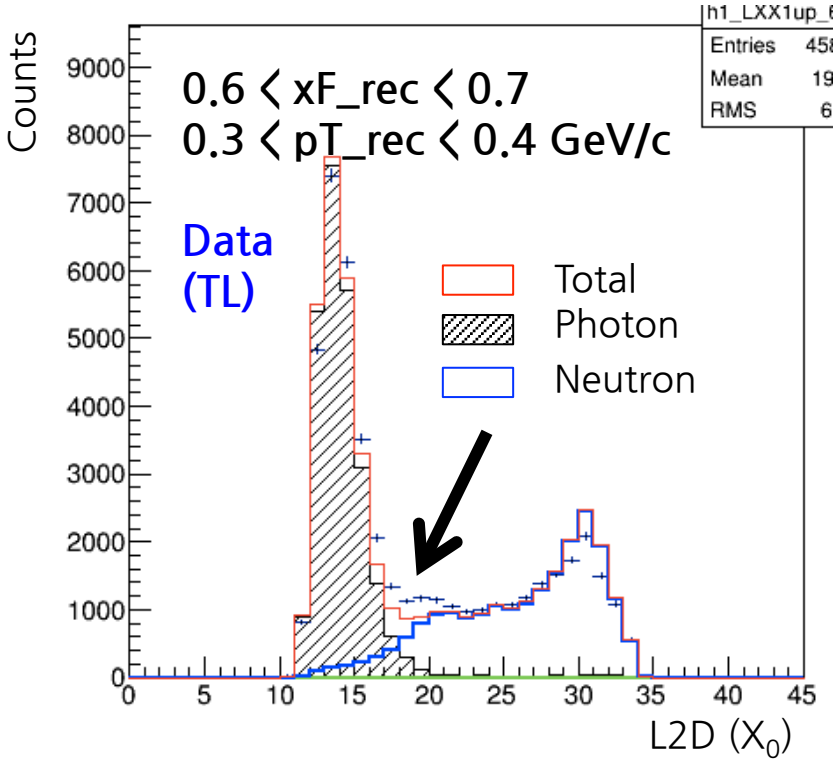
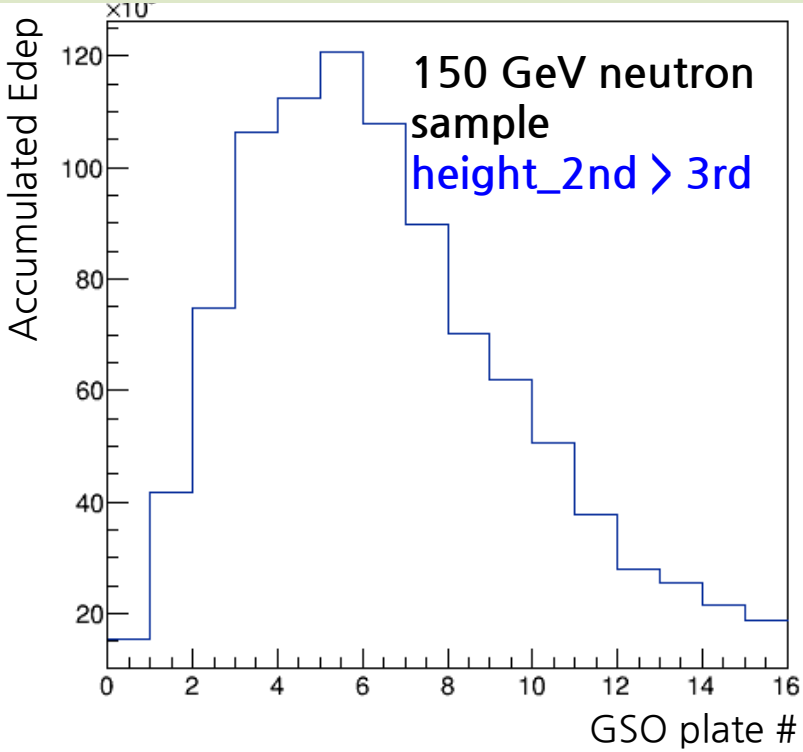
Problem at template fitting

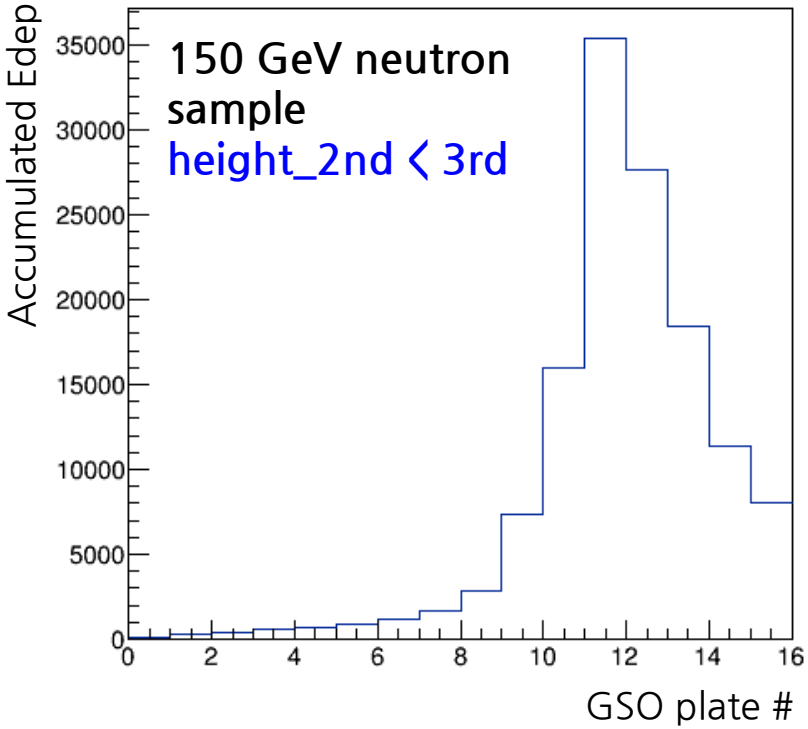


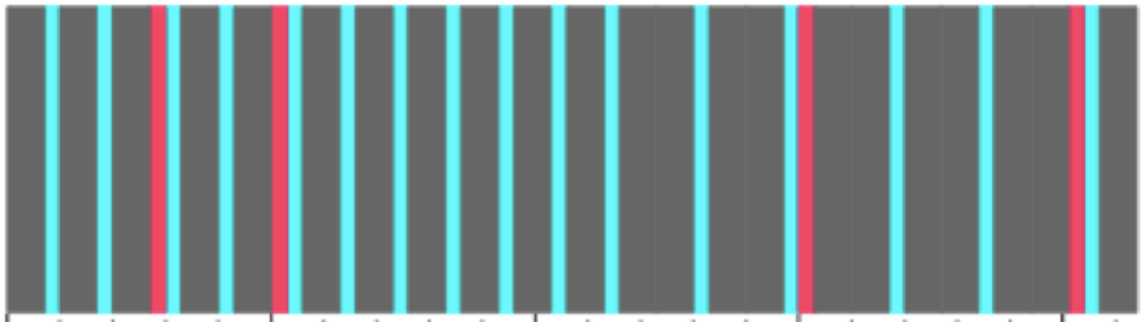


- This event sample is the one where a cut condition of L90 < 35 is applied.
- There is inconsistency in the hadronic part.
- This inconsistency gets more serious at TS.

Two types of shower development

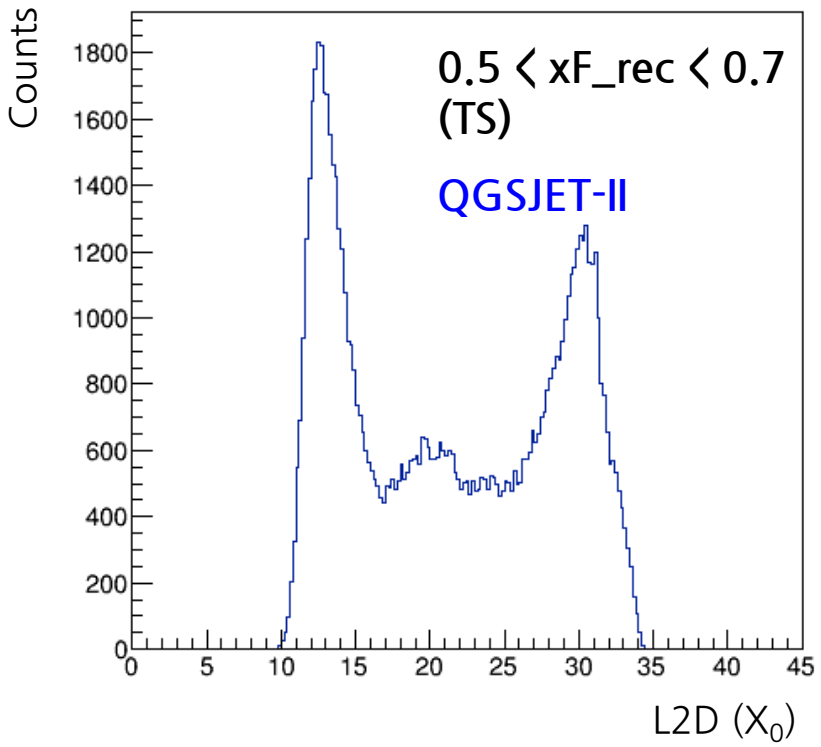


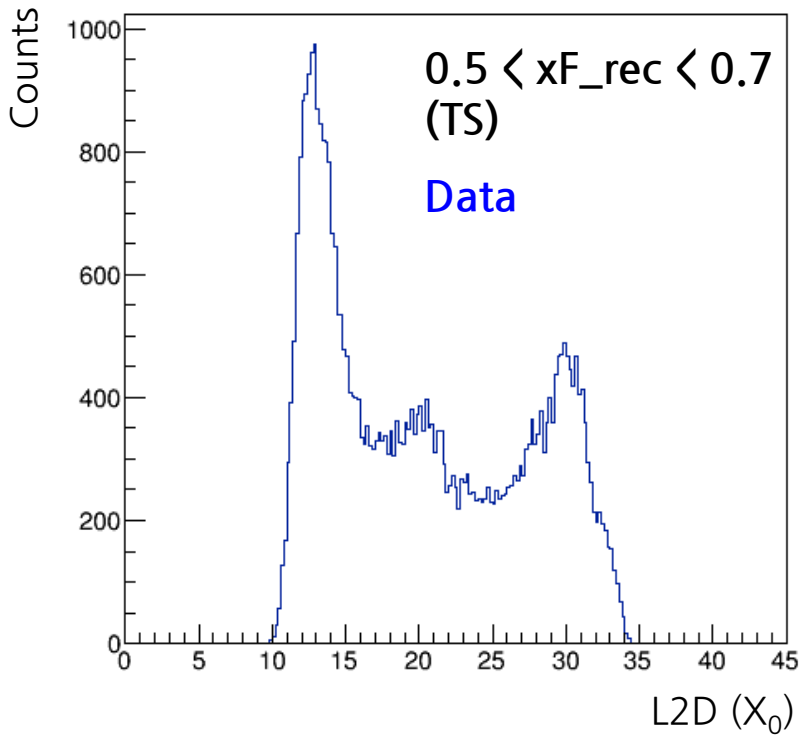




- We can separate the early and late shower developments by comparing the peak heights of 2nd and 3rd GSO bar layers.

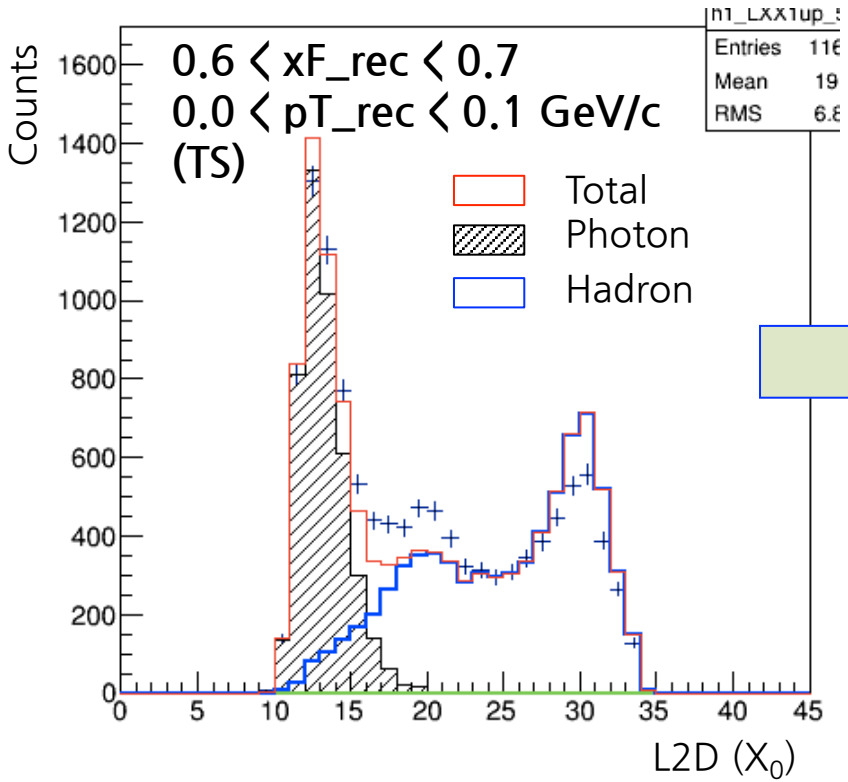
L90 distribution comparison

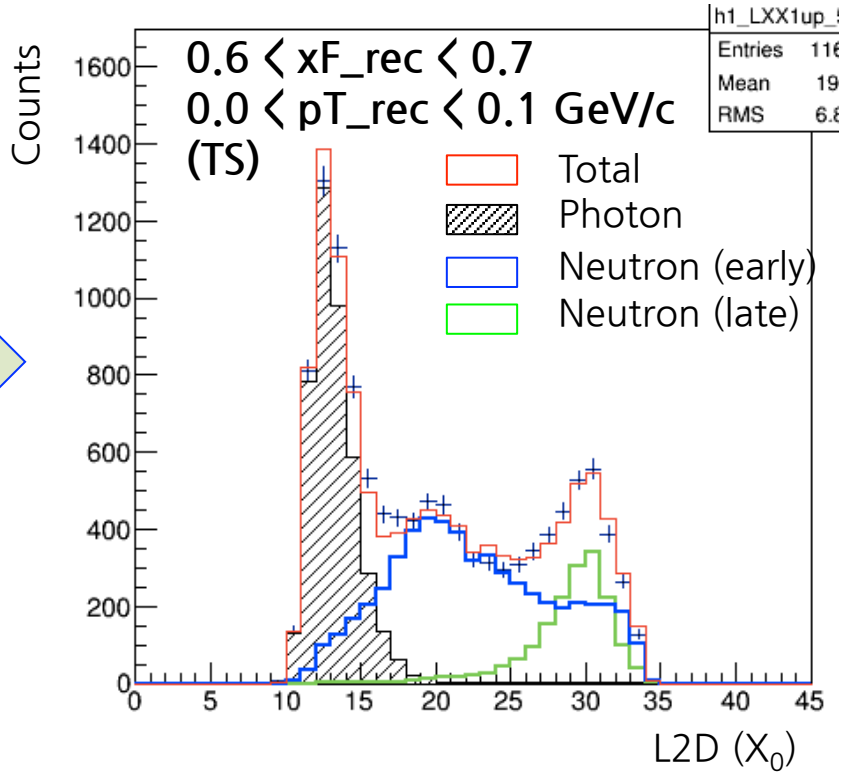




- Two neutron peaks can correspond to early and late shower development.
- It seems that the ratio of two events is different between simulation and data due to their different energy distributions.
- It is necessary to assign different weight for two types of shower developments.

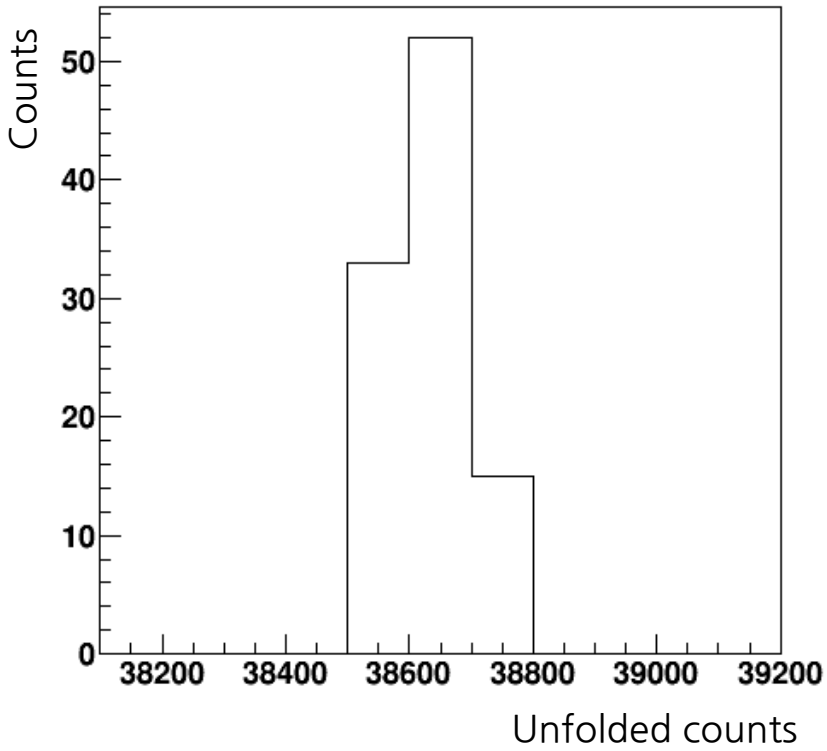
Improved template fitting

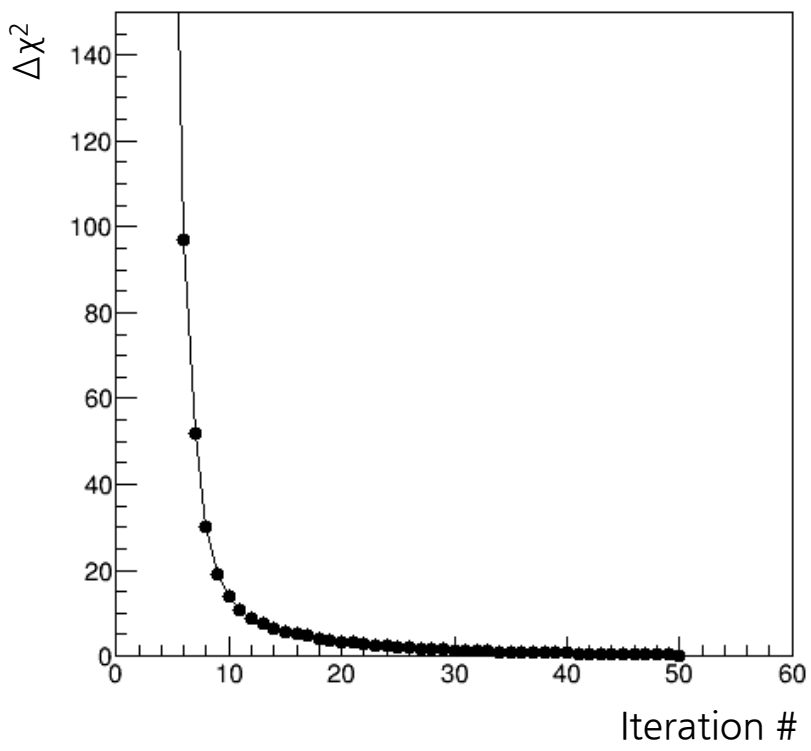




- One can see the template fitting result has been improved.
- For more precise energy reconstruction and unfolding, only the events of early shower development was counted with a L2D cut of L2D > 21.
- More detailed study is necessary to confirm if this shower development separation is reasonable.

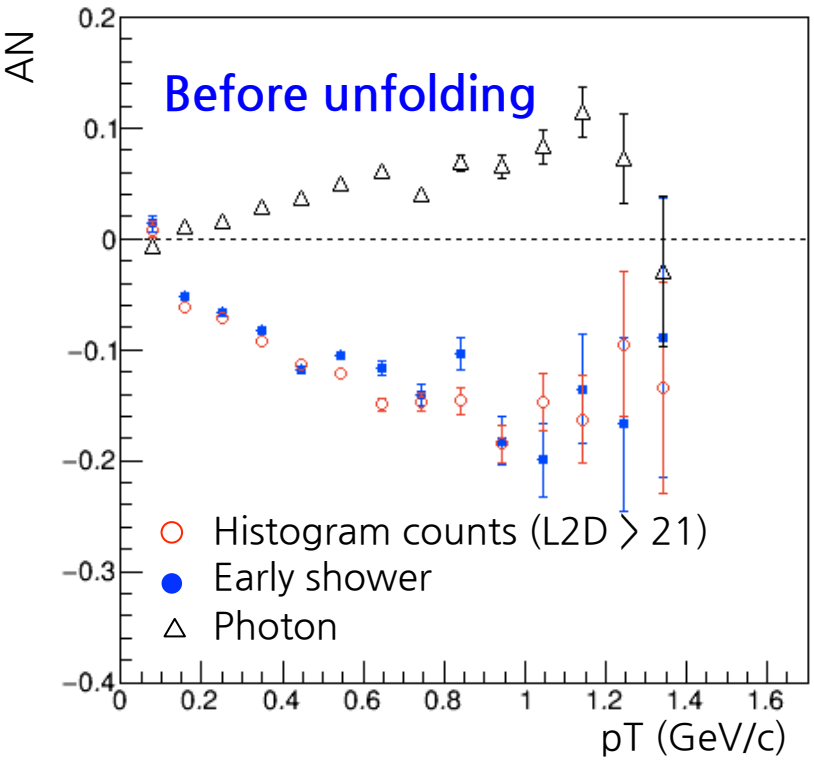
Uncertainty of unfolding

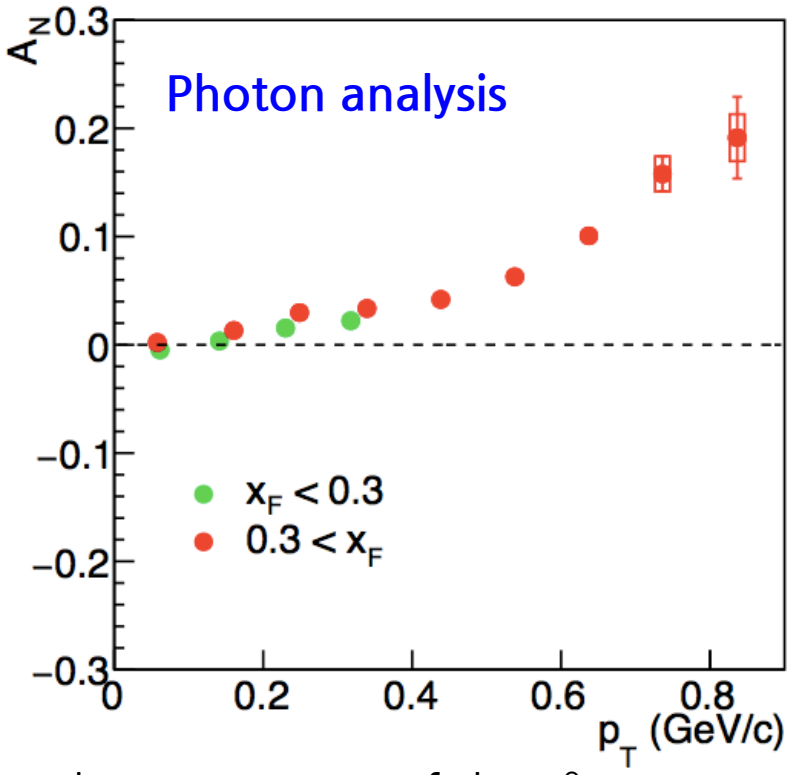




- Number of iteration was set (= N) as its corresponding $\Delta\chi^2$ starts smaller than 1.
- Fluctuation of the unfolded counts from the number of iteration from N to N+10 was assigned to the systematic uncertainty by the unfolding.

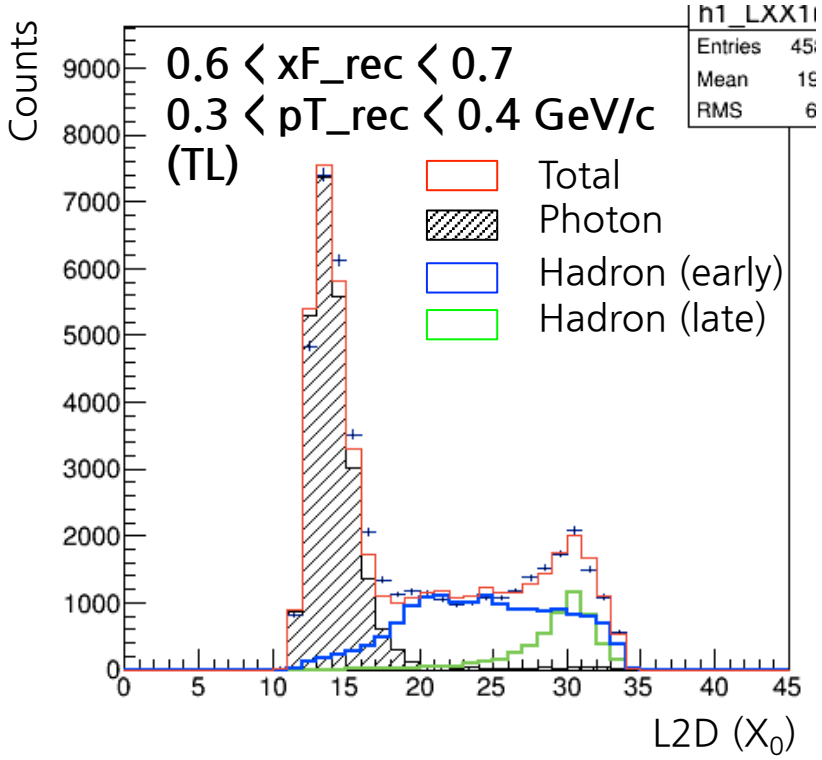
Photon asymmetry

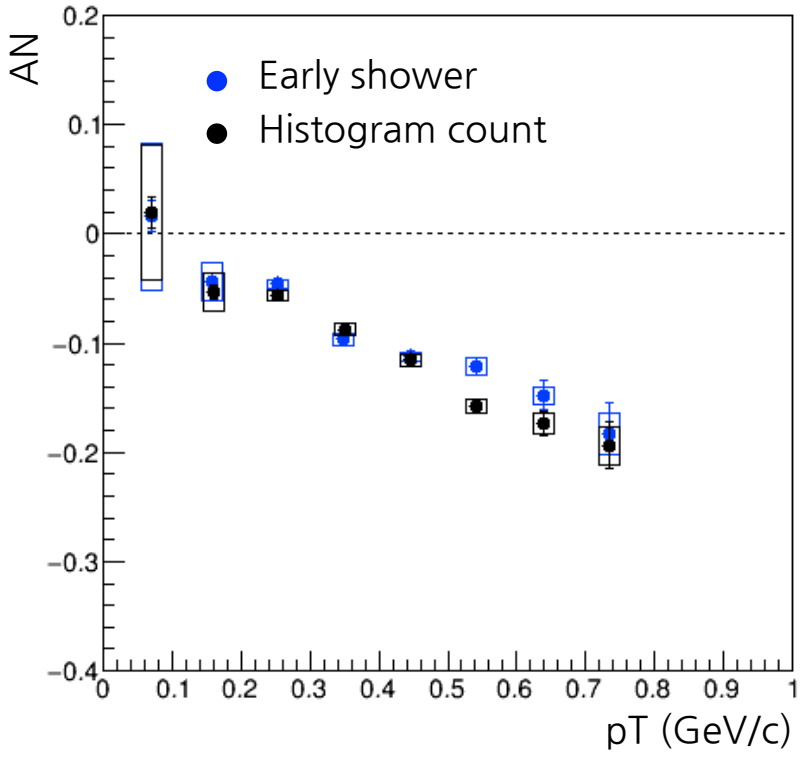




- Photon contamination already includes the asymmetry of the π^0.
- With the template fitting, if we count only the number of hadrons, we can be free from the photon asymmetry contamination.
- However, how to deal with the background photon A_N is under consideration yet.

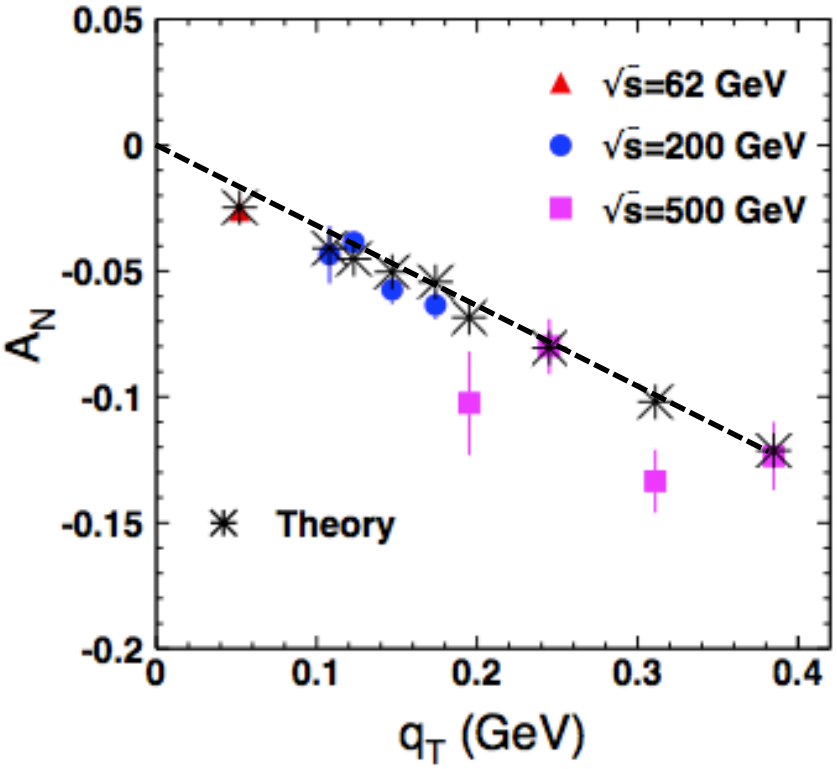
A_Ns of early shower and both

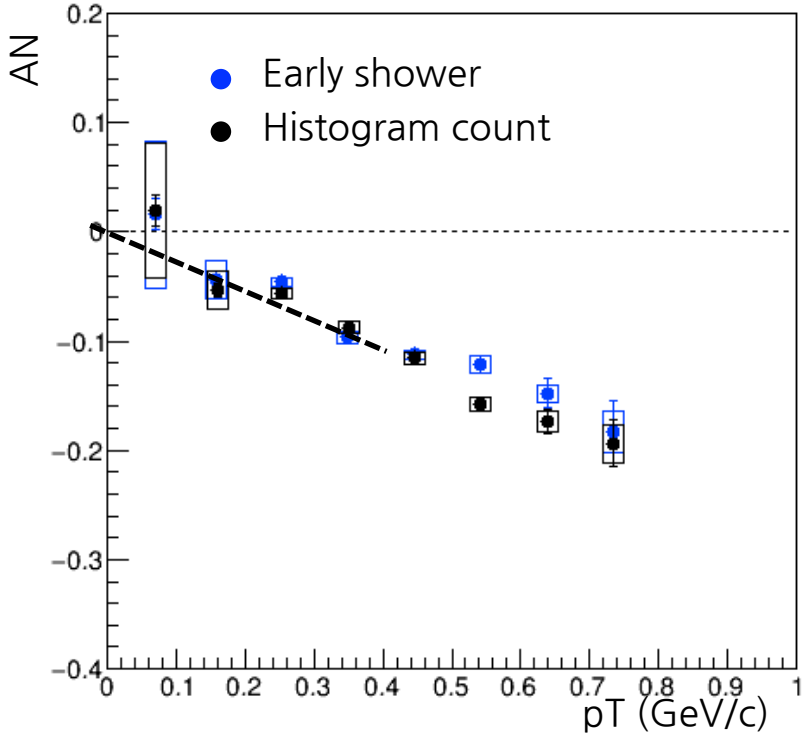




- Though the energy reconstruction of the late shower event is worse than the early one, it seems that there is no critical problem when estimating the A_N.
- Some differences between the two data points is being studied now.

Neutron A_N as a function of p_T





- As it was expected, the A_N increases as a function of p_T.
- The RHICf data looks consistent with previous results.
  ($\langle x_F \rangle_{PHENIX}$ = 0.7~0.8 and $\langle x_F \rangle_{RHICf}$ = 0.3~0.6)
- The neutron A_N will be estimated more comprehensively soon.