

Pion-Induced Leading Neutron Production

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From the last Slide of Last Talk on 5th June, 2026

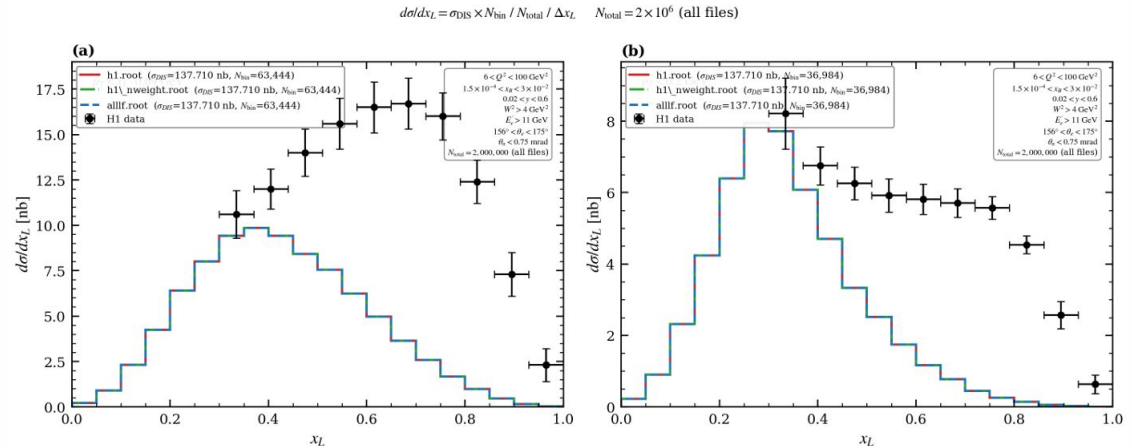
We convince ourselves that before and after the cuts on Pythia results remains the same.

$d\sigma/dx_L$: PYTHIA vs H1 Data

So, we carry with the

After cut methods,

For our next
calculations

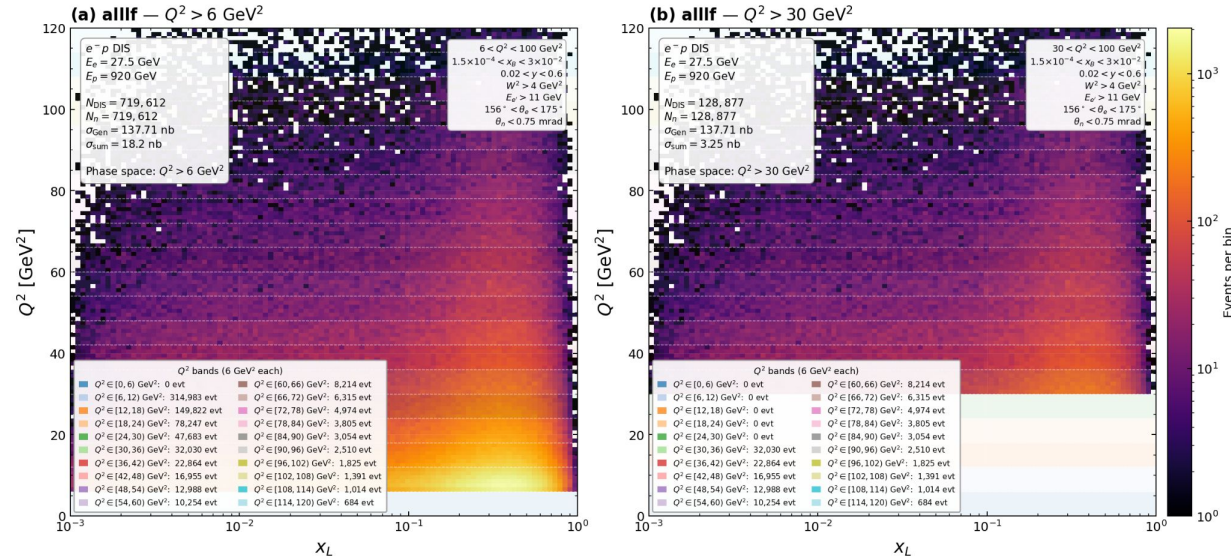


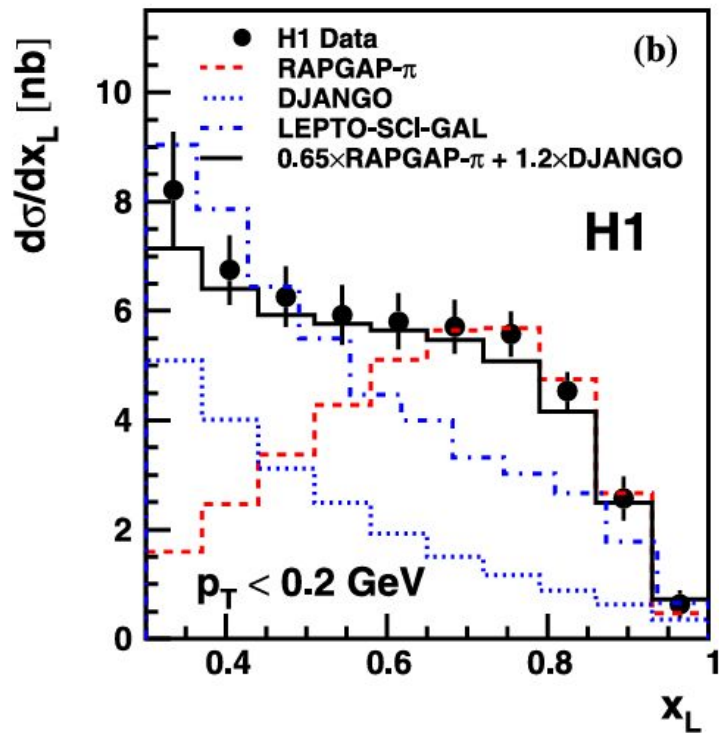
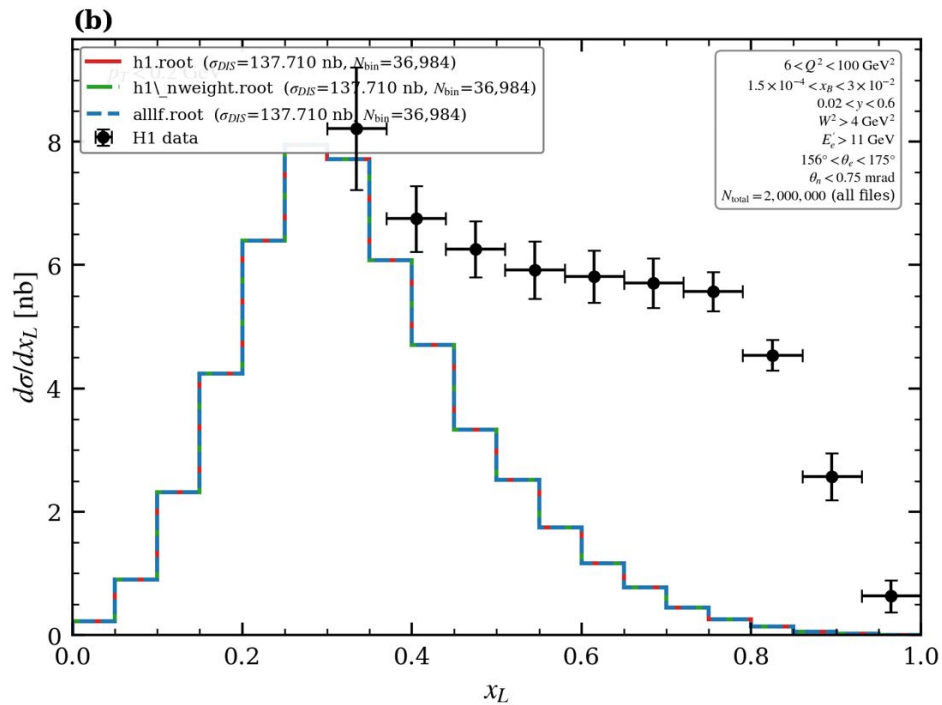
- (a) $p_T < x_L \cdot 0.69$ cut: broader x_L acceptance.
- (b) $p_T < 0.2$ GeV cut: tighter selection emphasising pion exchange.
- All three ROOT files give **identical** results, confirming normalisation consistency.

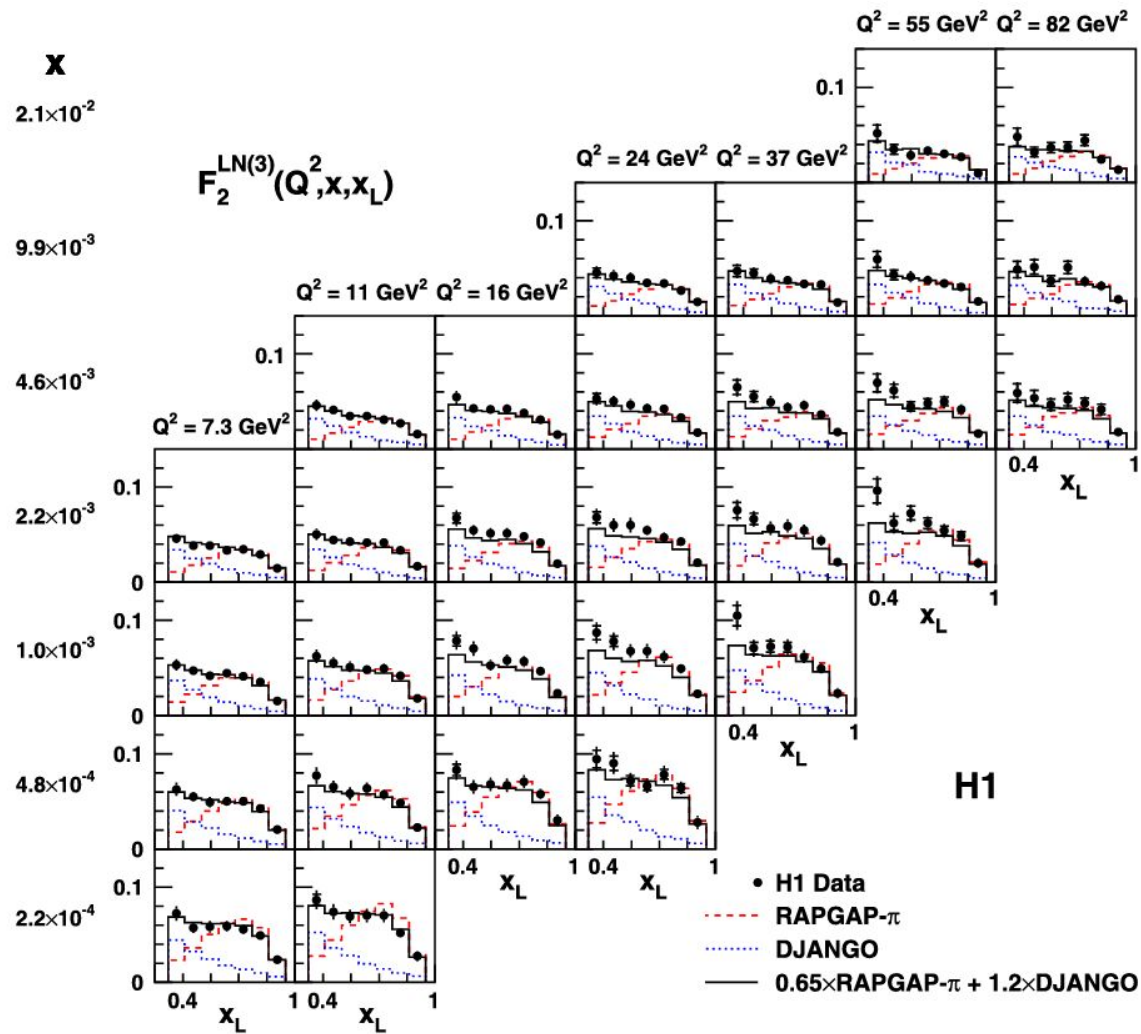
Issues on the last talk Slides on The Phase Space

Now, I took the same root file by taking then make the cuts for two different phase space phase space. Now, there is no events below that scales.

Q^2 vs x_L — event-density comparison (Q^2 : 0 → 120 GeV², 6-GeV² bands) [alllf.root]



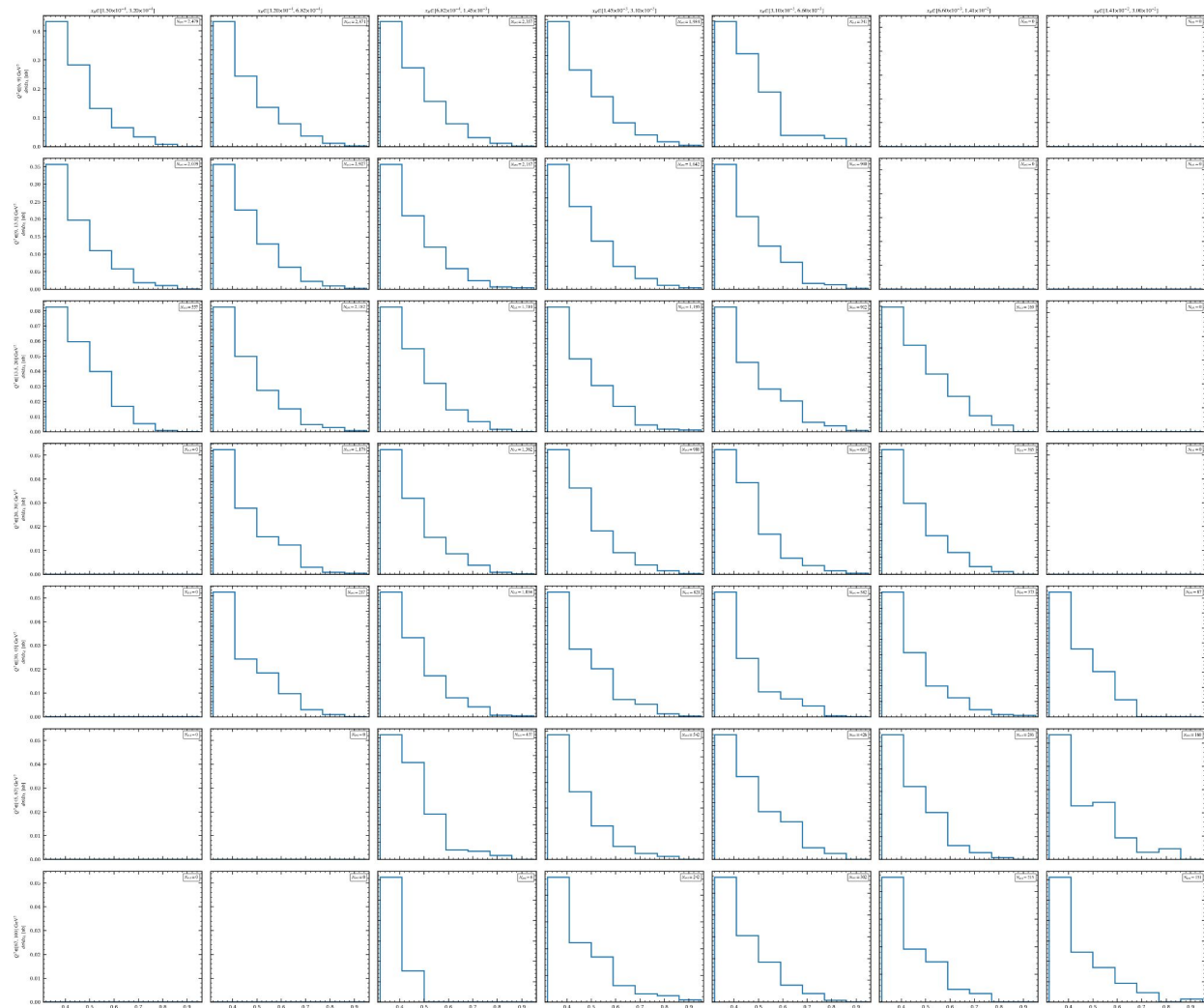


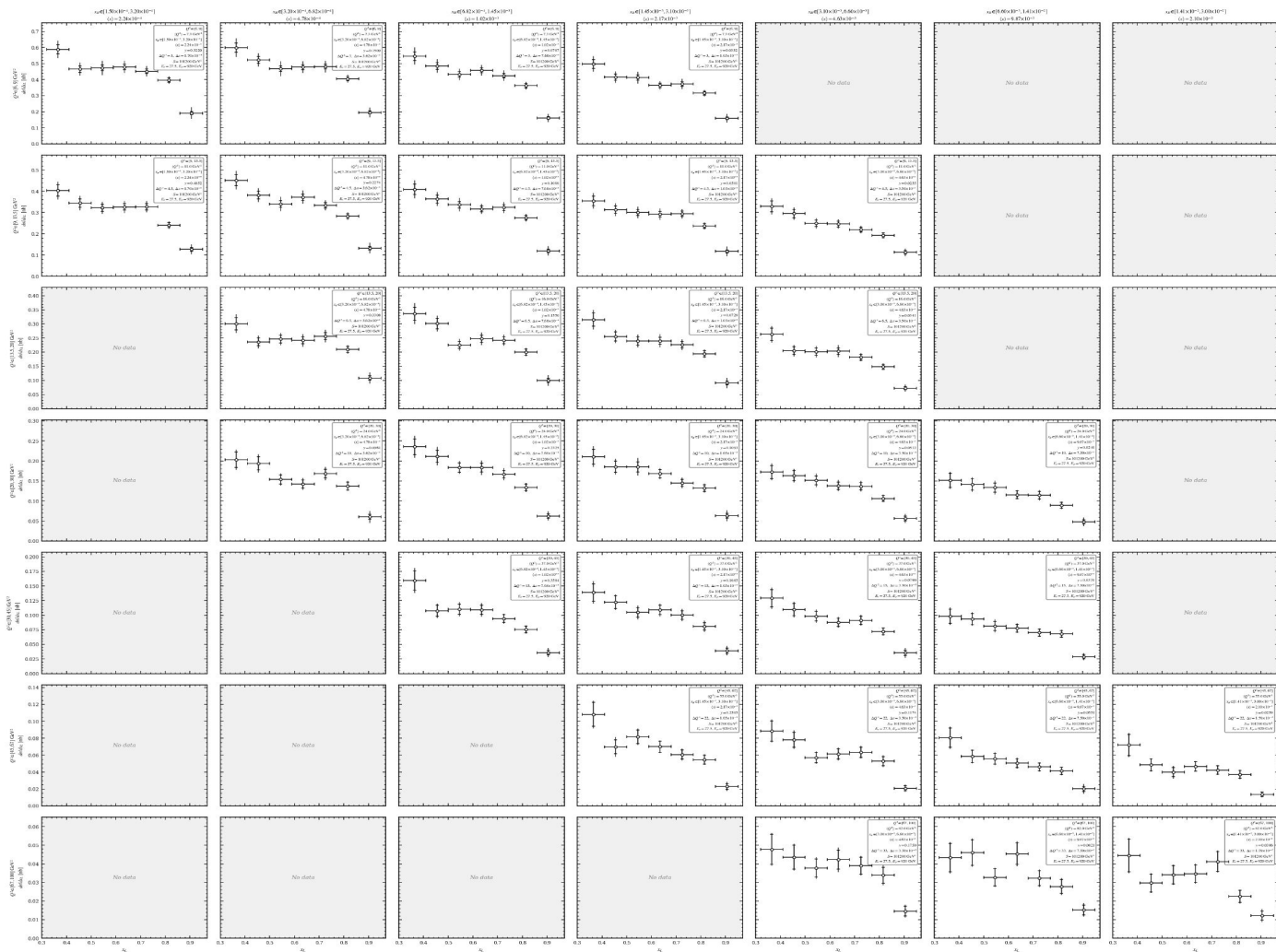


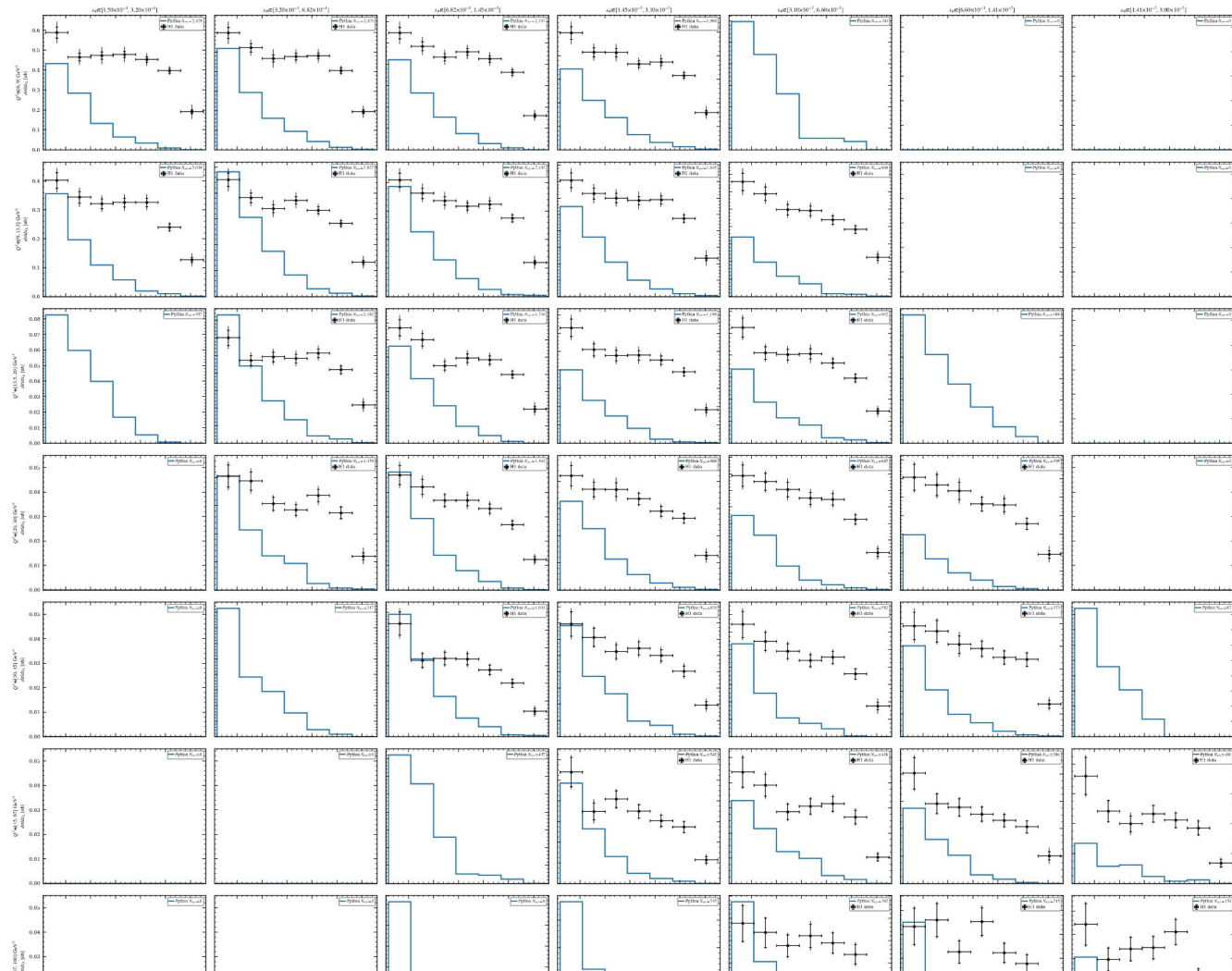
Next

Then, we rearrange all the Events with Q^2 and x_b Range bins. For

$d\sigma/dx_L$ for H1 case for $p_T < 0.2 \text{ GeV}$.





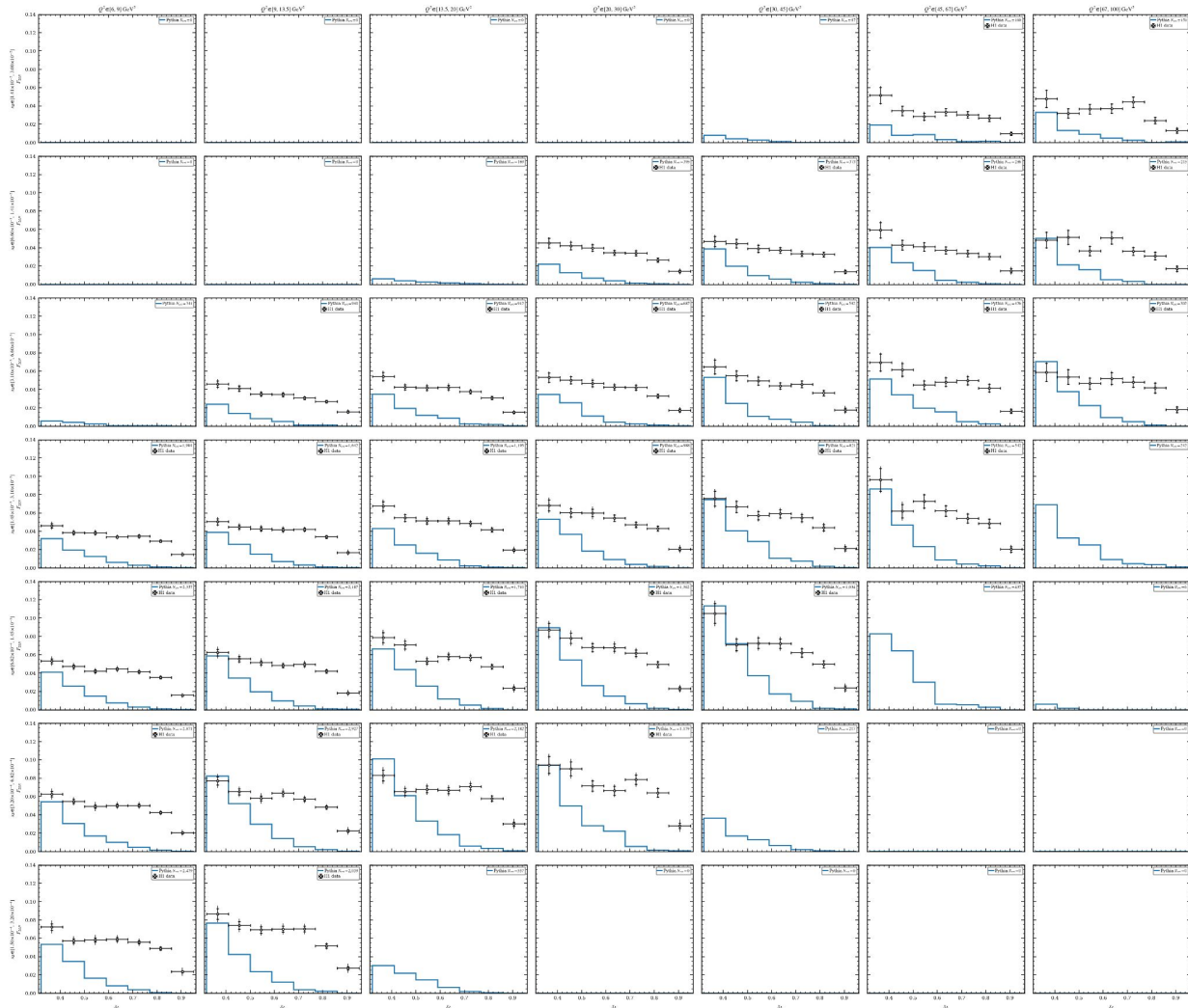


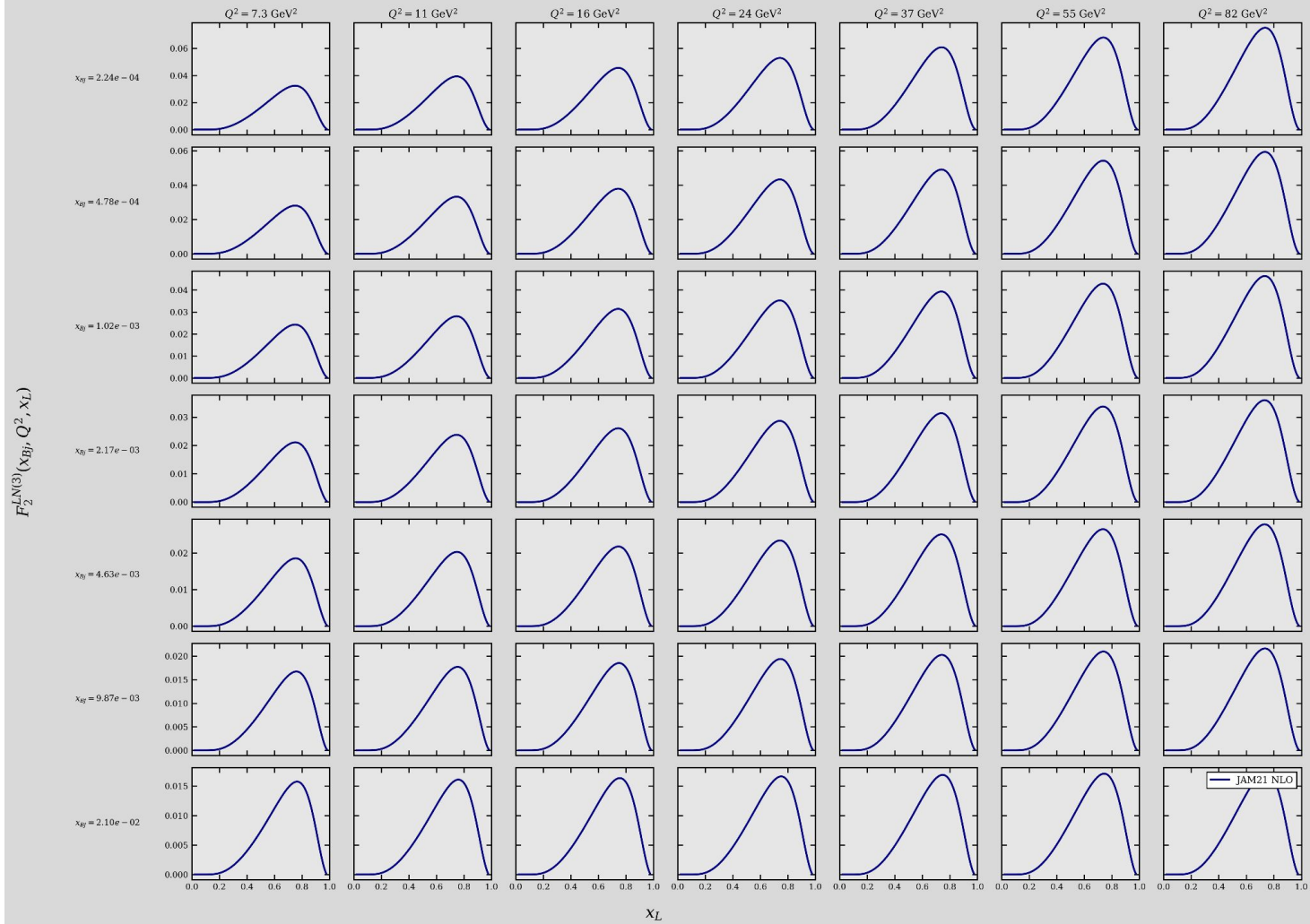
$$\frac{d^3\sigma(ep \rightarrow enX)}{dx dQ^2 dx_L}$$

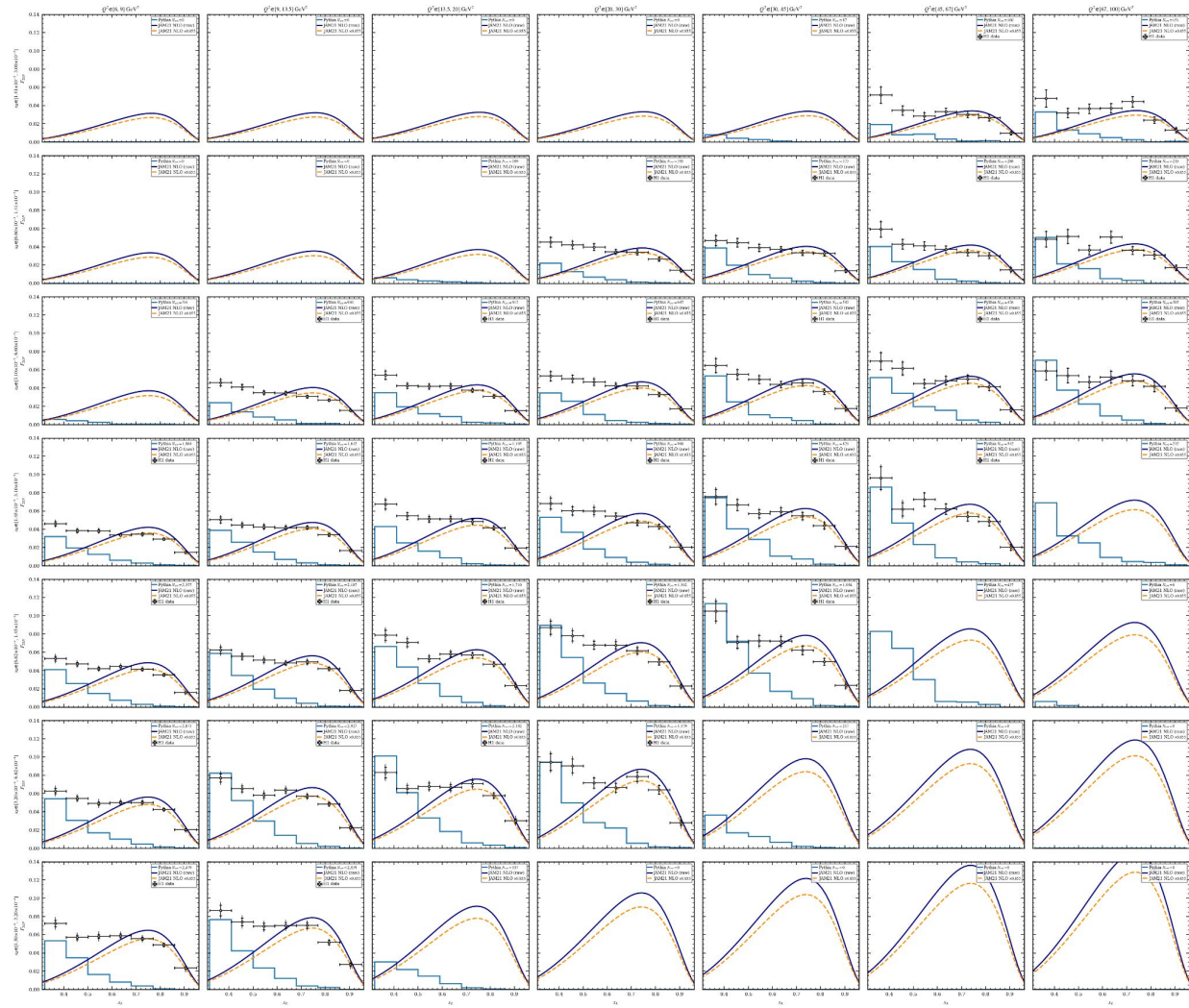
$$= \int_{t_0}^{t_{\text{min}}} \frac{d^4\sigma(ep \rightarrow enX)}{dx dQ^2 dx_L dt} dt$$

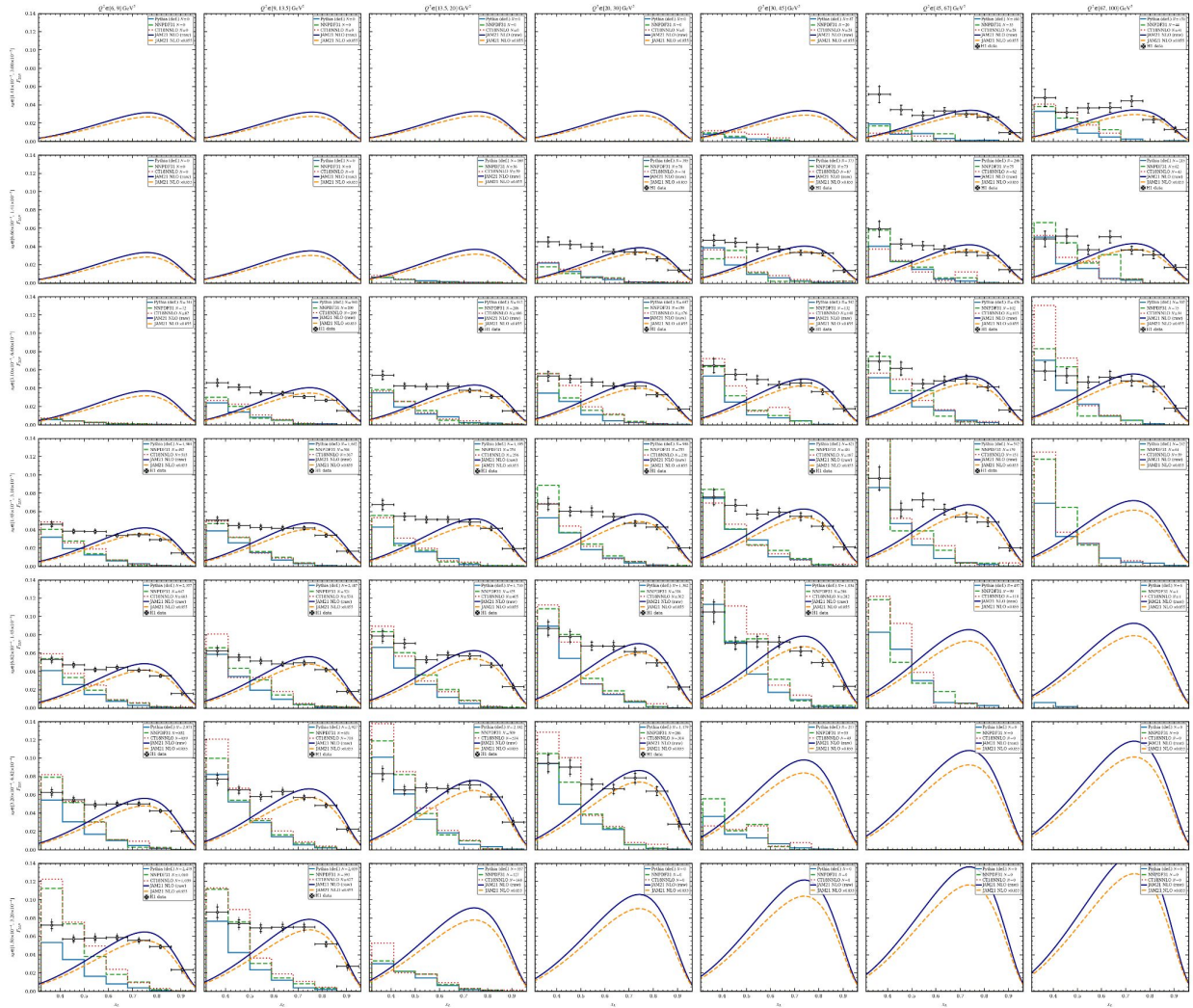
$$= \frac{4\pi\alpha^2}{x Q^4} \left(1 - y + \frac{y^2}{2}\right) F_2^{LN(3)}(Q^2, x, x_L),$$

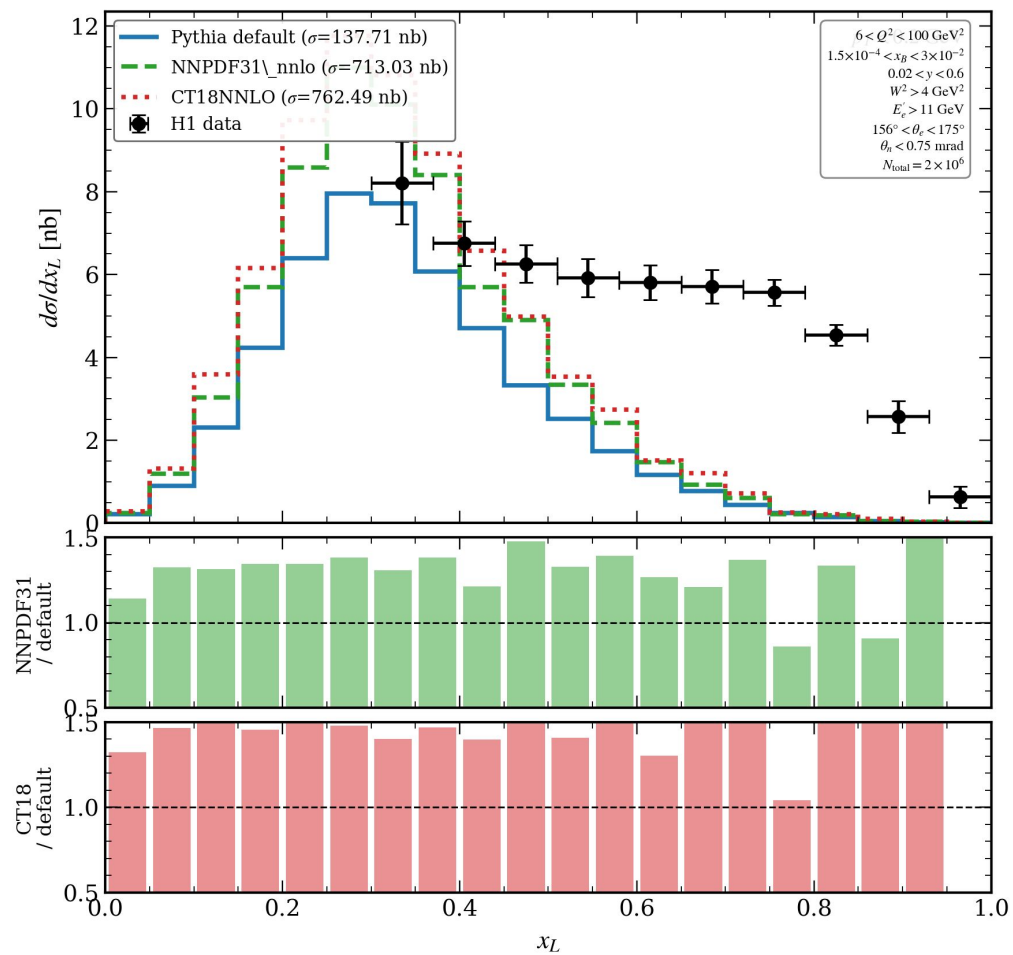
Q^2 -bin	Q^2 range [GeV 2]	x -bin	x range	x_L -bin	x_L range
1	$6.00 \div 9.00$	1	$1.50 \cdot 10^{-4} \div 3.20 \cdot 10^{-4}$	1	$0.32 \div 0.41$
2	$9.00 \div 13.5$	2	$3.20 \cdot 10^{-4} \div 6.82 \cdot 10^{-4}$	2	$0.41 \div 0.50$
3	$13.5 \div 20.0$	3	$6.82 \cdot 10^{-4} \div 1.45 \cdot 10^{-3}$	3	$0.50 \div 0.59$
4	$20.0 \div 30.0$	4	$1.45 \cdot 10^{-3} \div 3.10 \cdot 10^{-3}$	4	$0.59 \div 0.68$
5	$30.0 \div 45.0$	5	$3.10 \cdot 10^{-3} \div 6.60 \cdot 10^{-3}$	5	$0.68 \div 0.77$
6	$45.0 \div 67.0$	6	$6.60 \cdot 10^{-3} \div 1.41 \cdot 10^{-2}$	6	$0.77 \div 0.86$
7	$67.0 \div 100$	7	$1.41 \cdot 10^{-2} \div 3.00 \cdot 10^{-2}$	7	$0.86 \div 0.95$

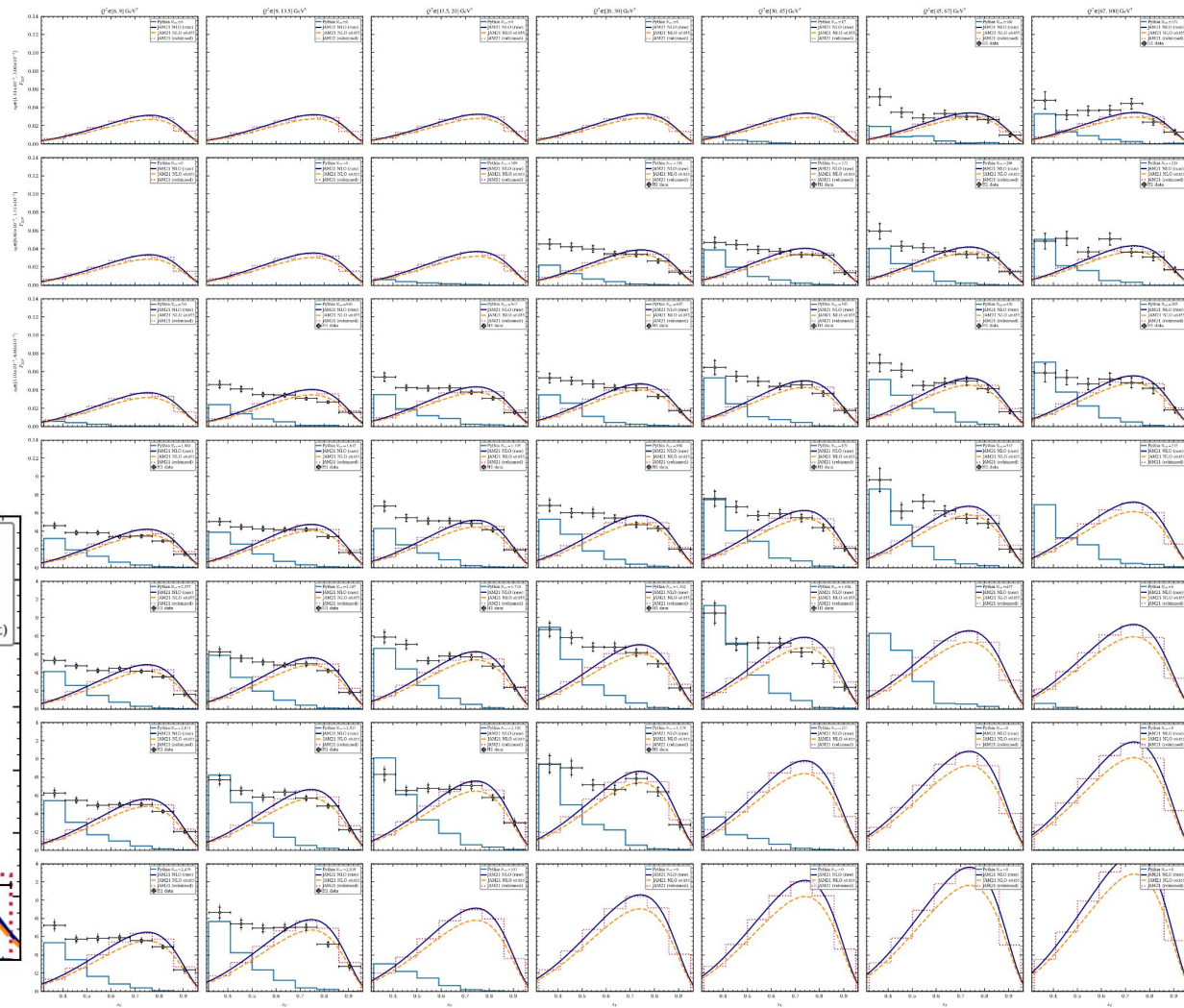
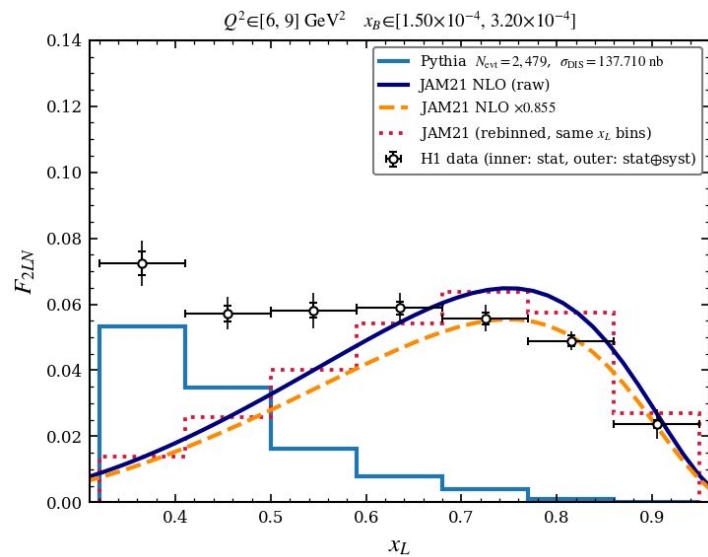


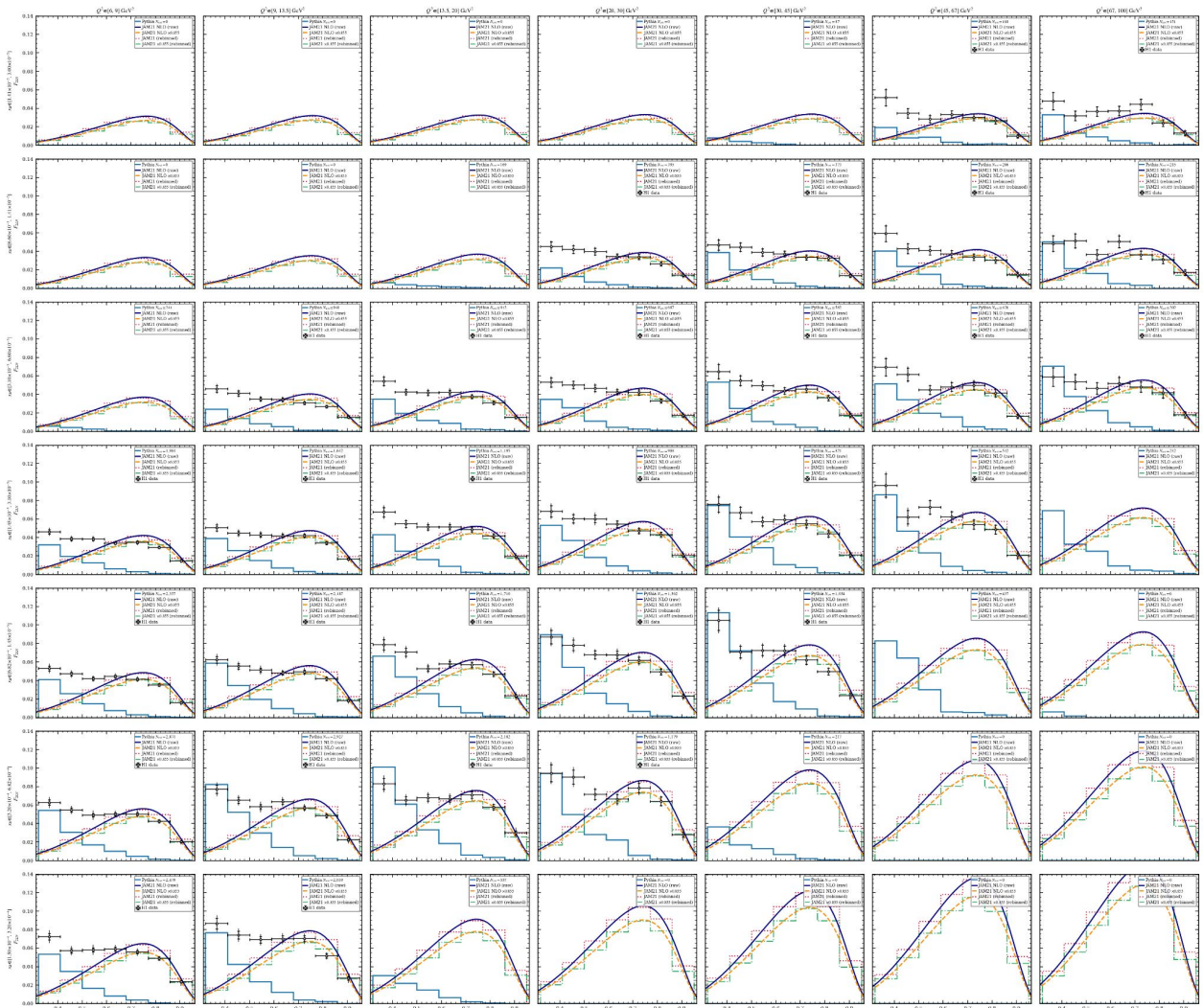
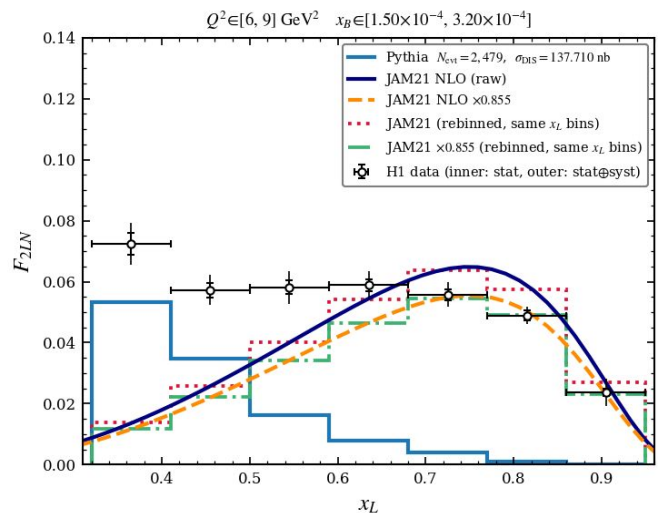


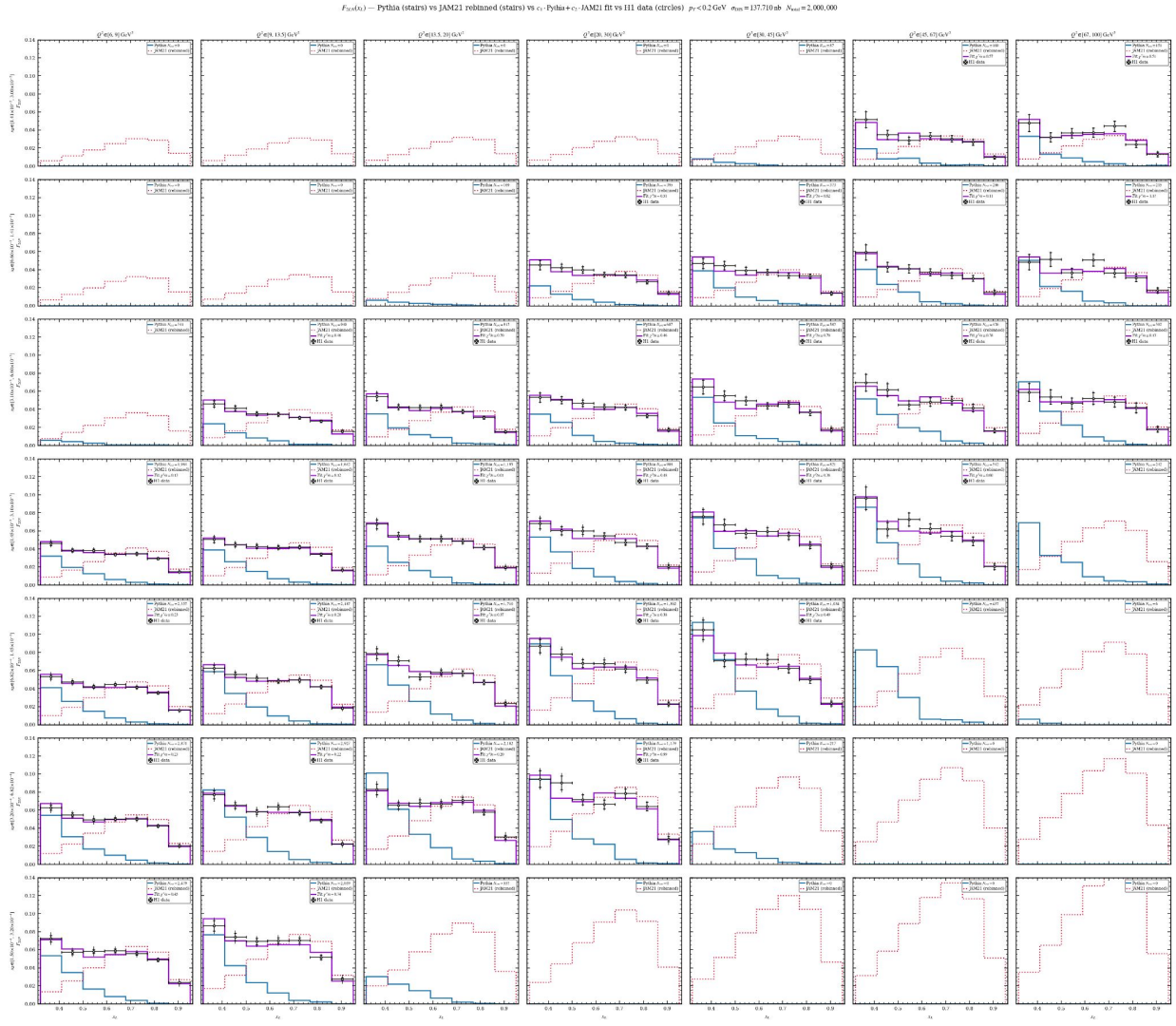
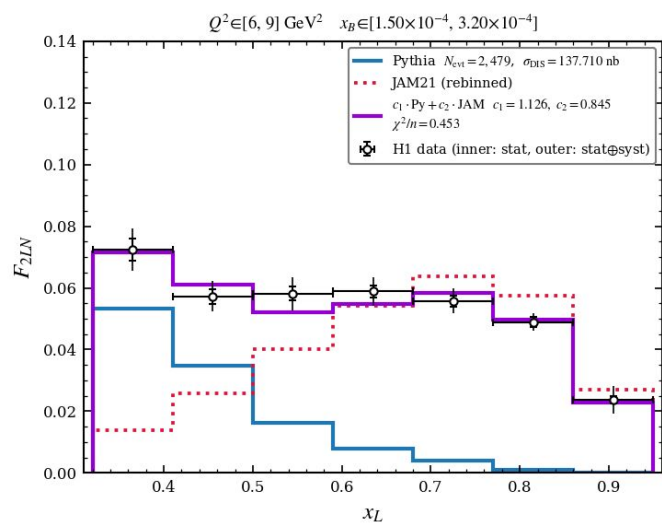
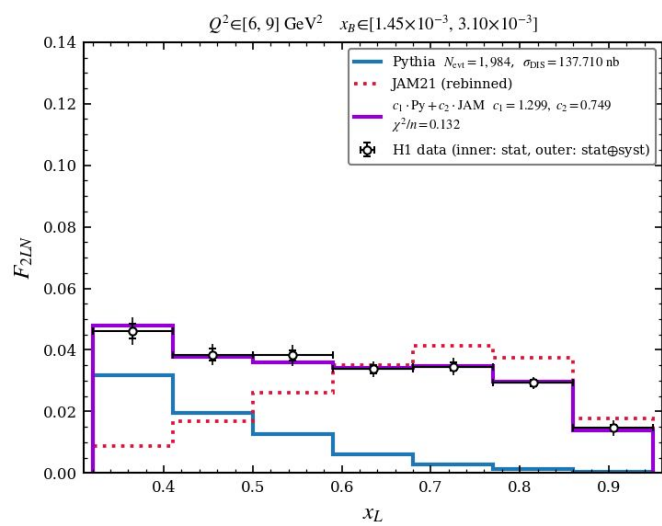


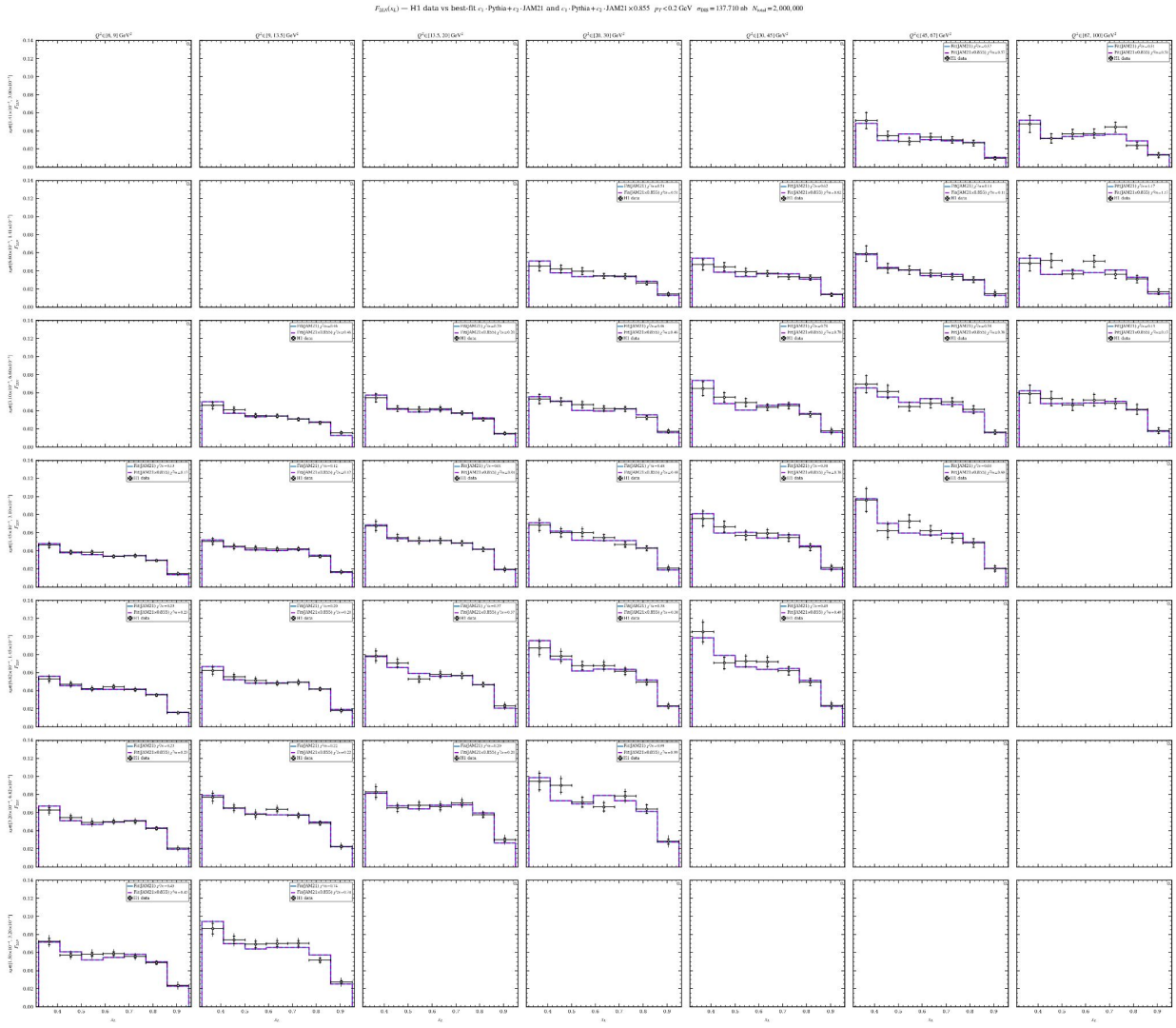
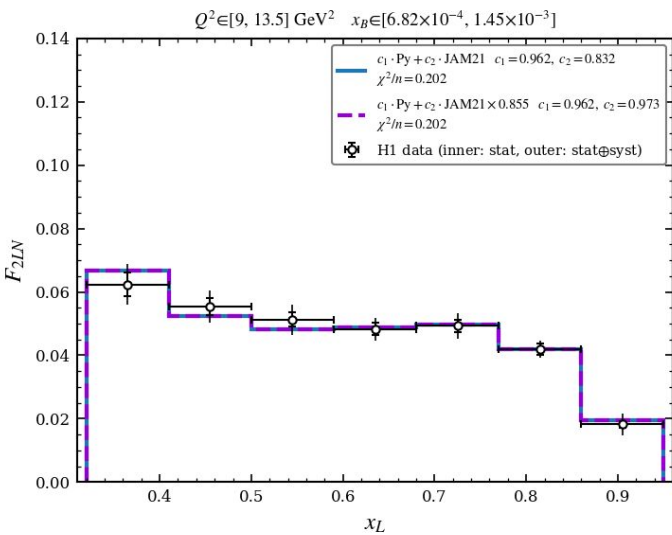
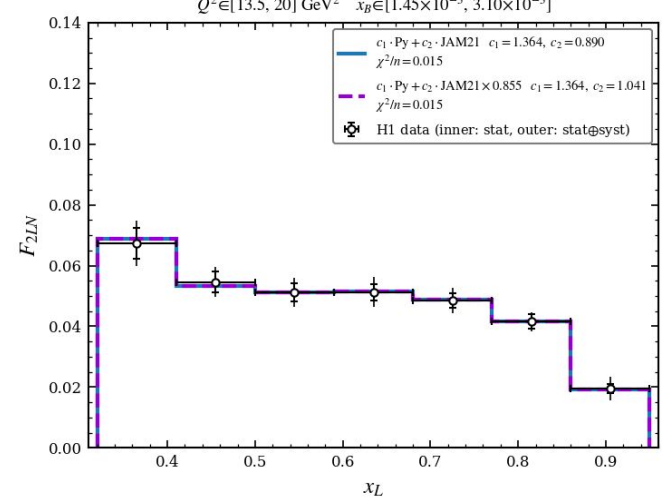


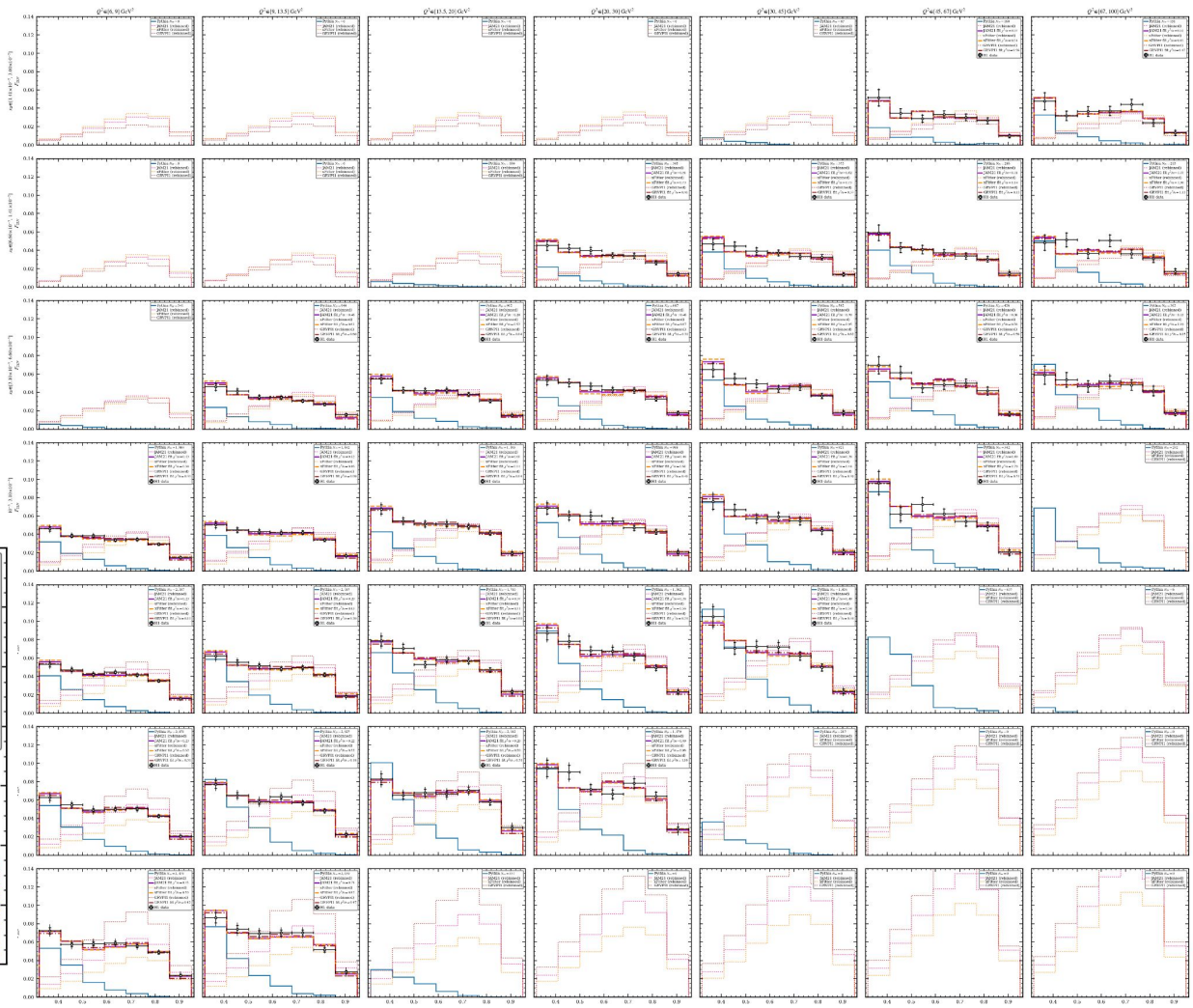
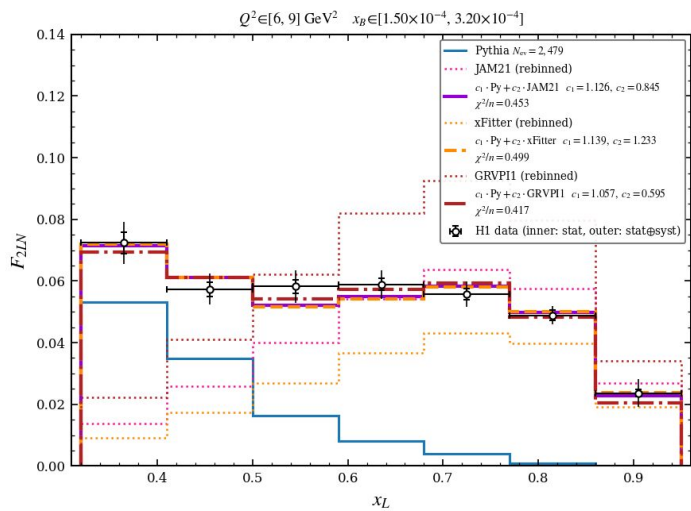
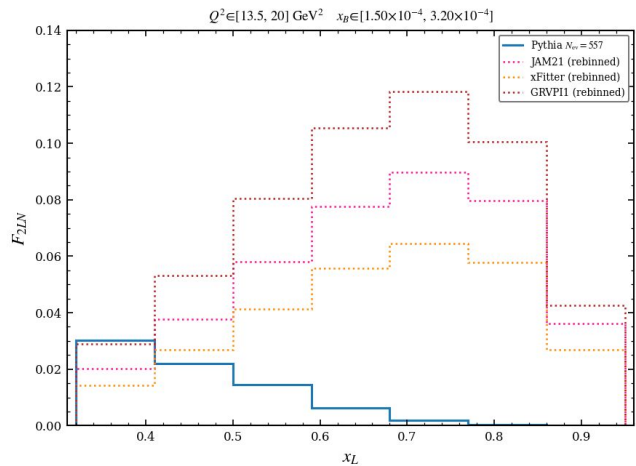


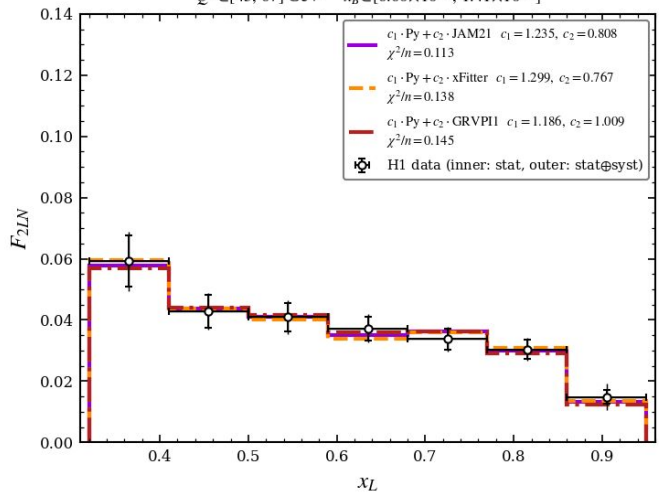
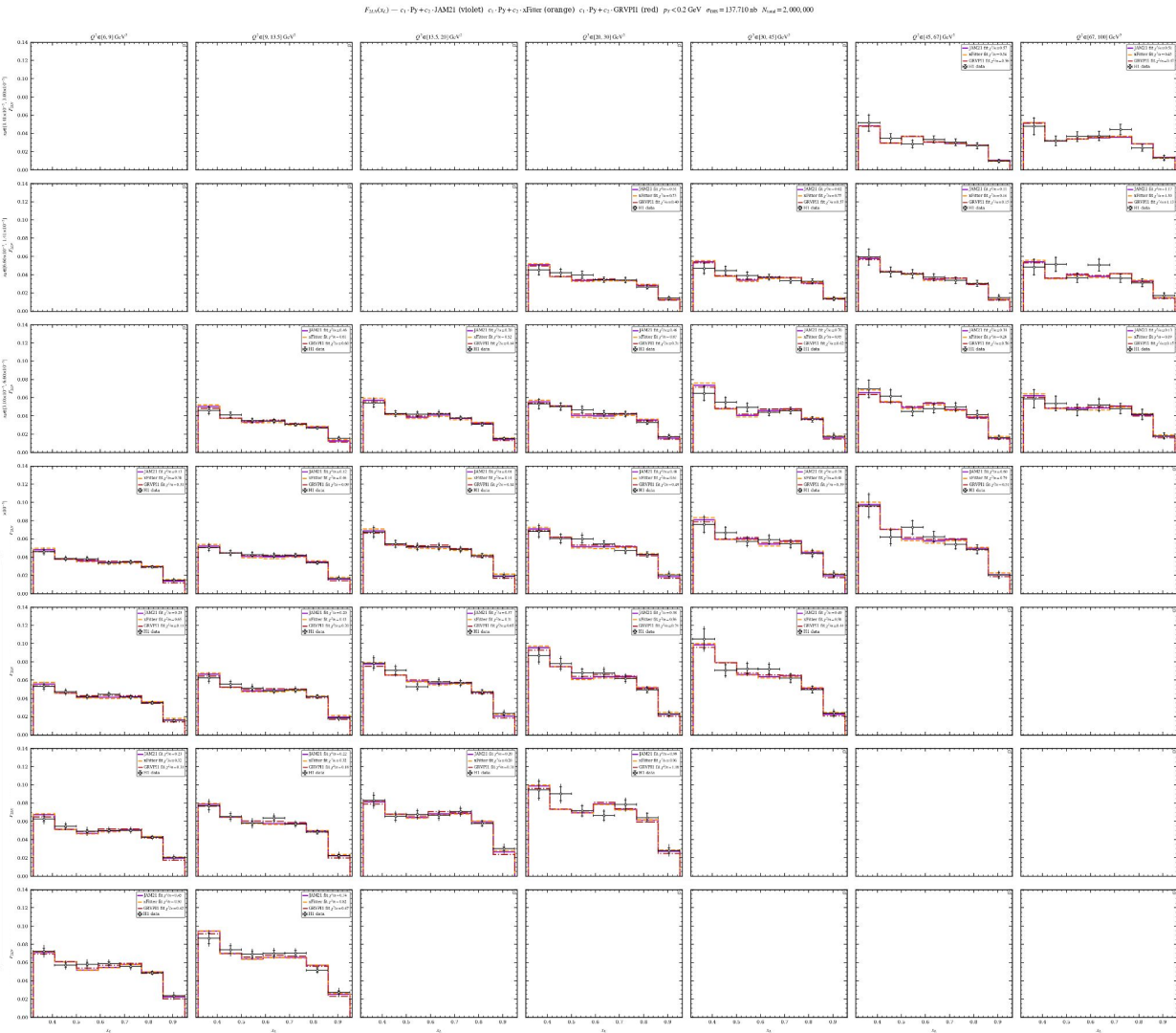
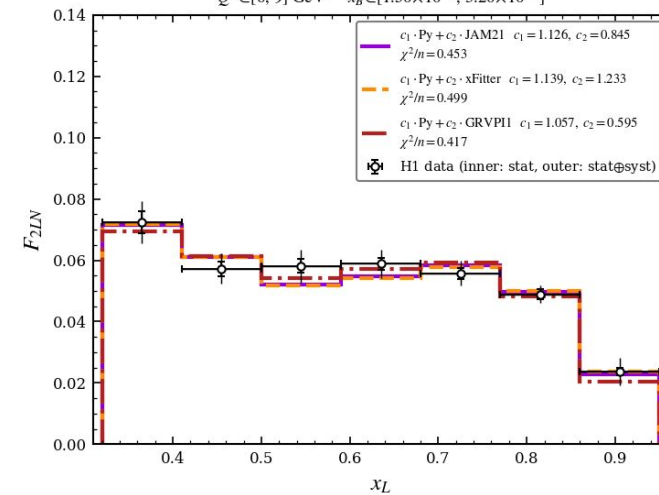




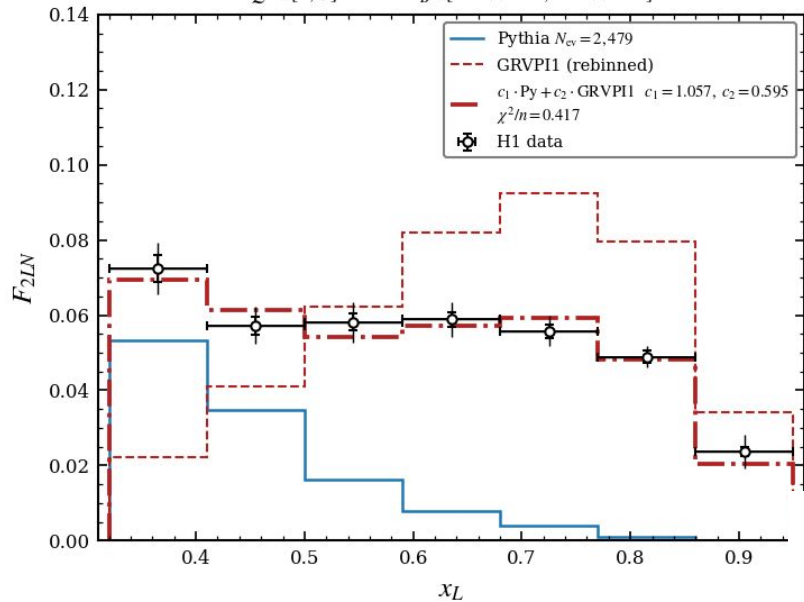




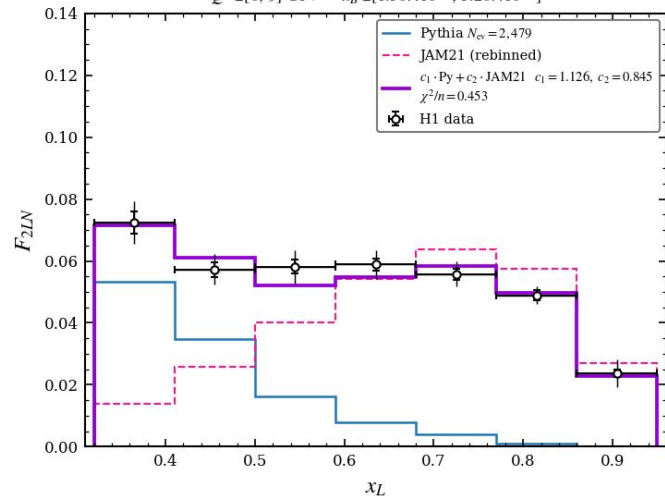


$Q^2 \in [45, 67] \text{ GeV}^2$ $x_B \in [6.60 \times 10^{-3}, 1.41 \times 10^{-2}]$  $Q^2 \in [6, 9] \text{ GeV}^2$ $x_B \in [1.50 \times 10^{-4}, 3.20 \times 10^{-4}]$ 

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