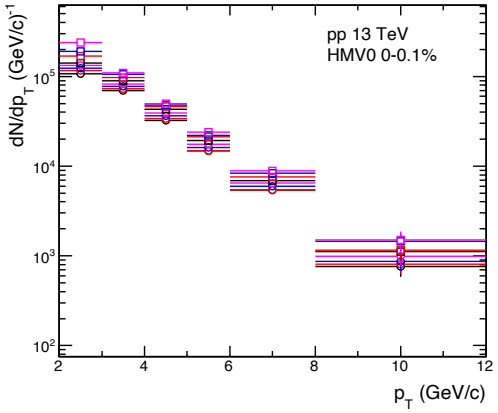
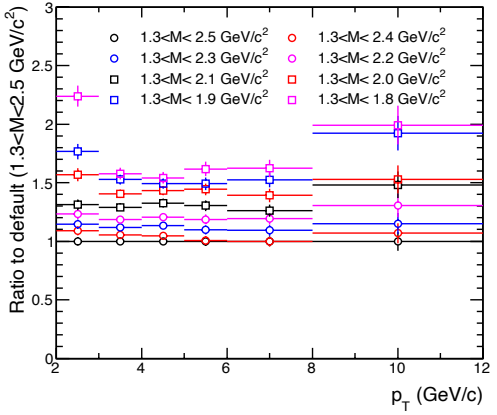
Multiplicity dependence on Xic0 via semileptonic decay in pp 13 TeV

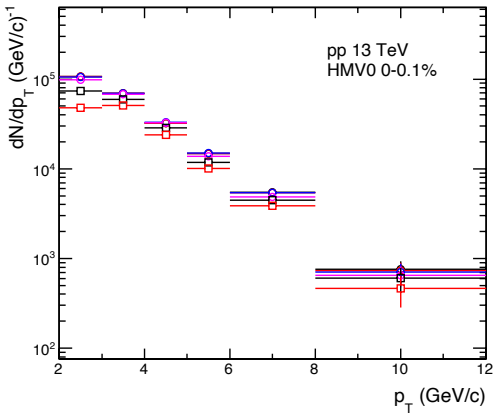
Sanghoon Lim

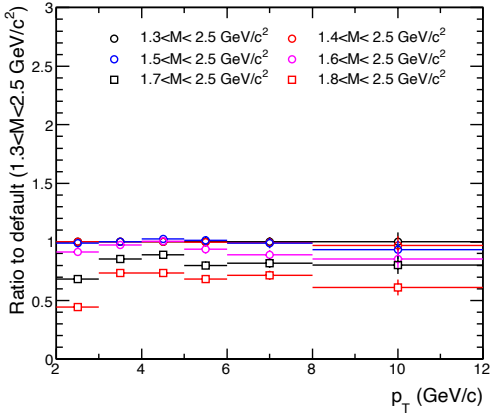
Pusan National University

- Reported a significant variation of corrected yields with different eXi mass cuts
- Analysis procedure:
  - (RS−WS) with analysis cuts (different eXi mass cuts)
  - Unfolding eXi p_T =⟩ Xic0 p_T
  - Efficiency correction
  - MC: PYTHIA8 with a fixed decay mode (Xic0→e nu Xi)
- Comments:
  - How about MB events?
  - Decay modes other than Xic0→e nu Xi ?









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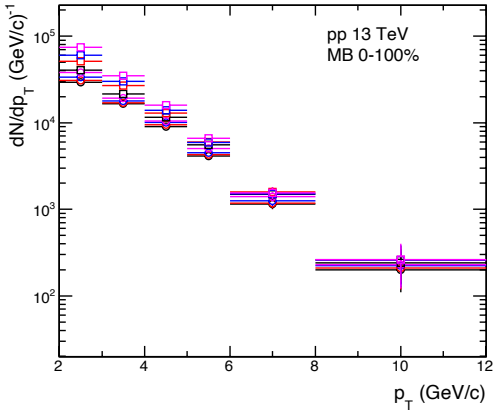

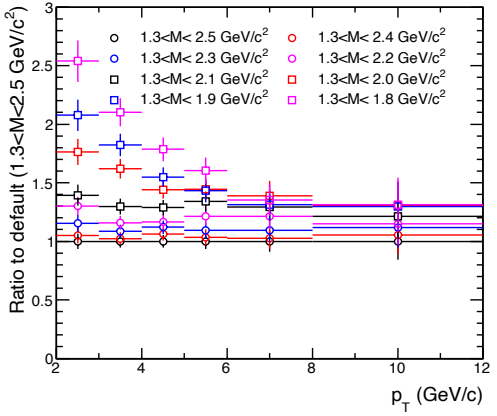

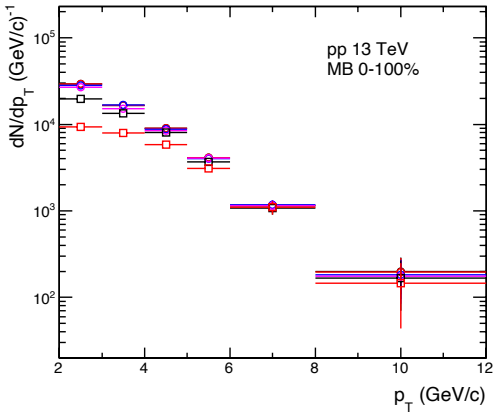

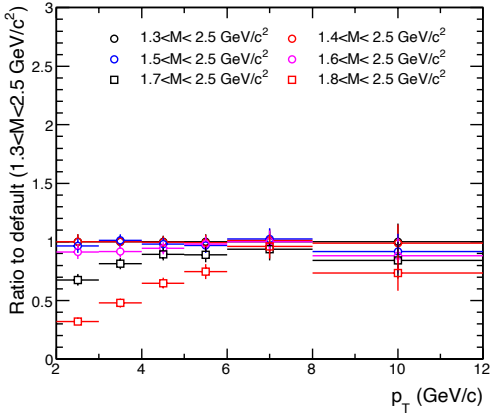

Corrected yields with different eXi mass cuts

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  - Unfolding eXi p_T => Xic0 p_T
  - Efficiency correction
  - MC: PYTHIA8 with a fixed decay mode (Xic0→e nu Xi)
- Comments:
  - How about MB events?
    ➔Simialr behavior is seen in MB events
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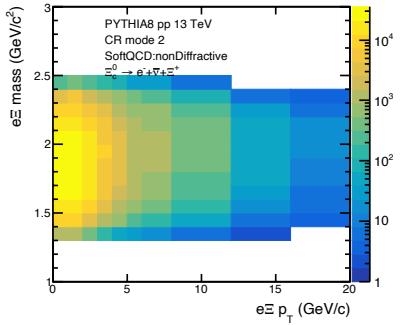
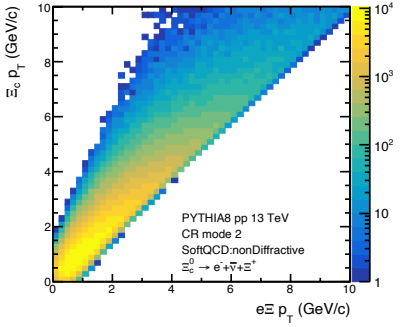
    ➔Run PYTHIA8 with the default decay
    ➔Look for e and Xi from Xic
    (not only mother but also grandmother)

4132	Xi_c0		Xi_cbar0		2	0	0	2.47088	0.00000
	0	0	0.0200000	22	−11		12	3	3101
	1	0	0.0050000	22	−11		12	3	3103
	2	0	0.0200000	22	−13		14	3	3101
	3	0	0.0050000	22	−13		14	3	3103
	4	0	0.5400000	42	2		−1	3	3101
	5	0	0.2100000	42	3		3201		
	6	0	0.1000000	42	3		3203		
	7	0	0.1000000	42	2		3303		
4232	Xi_c+		Xi_cbar−		2	3	0	2.46780	0.00000
	0	0	0.0280000	22	−11		12	3	3201
	1	0	0.0070000	22	−11		12	3	3203
	2	0	0.0280000	22	−13		14	3	3201
	3	0	0.0070000	22	−13		14	3	3203
	4	0	0.9300000	42	2		−1	3	3201

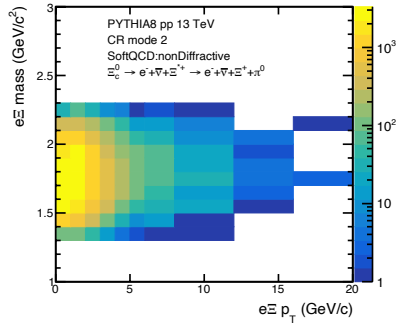
3101: $(sd)_0$, 3103: $(sd)_1$
3201: $(su)_0$, 3203: $(su)_1$

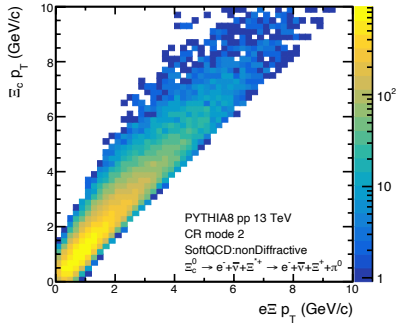
$\Xi_c^0 \to e^- + \bar{\nu} + \Xi^+$



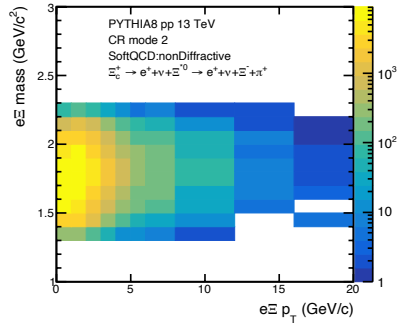


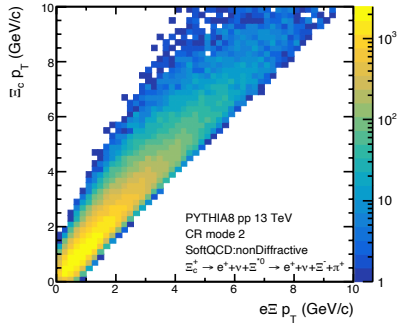
$\Xi_c^0 \to e^- + \bar{\nu} + \Xi^{*+}$
$\to e^- + \bar{\nu} + \Xi^+ + \pi^0$





$\Xi_c^+ \to e^+ + \nu + \Xi^{*0}$
$\to e^+ + \nu + \Xi^- + \pi^+$





Note: Only Xi(1530) is in PYTHIA

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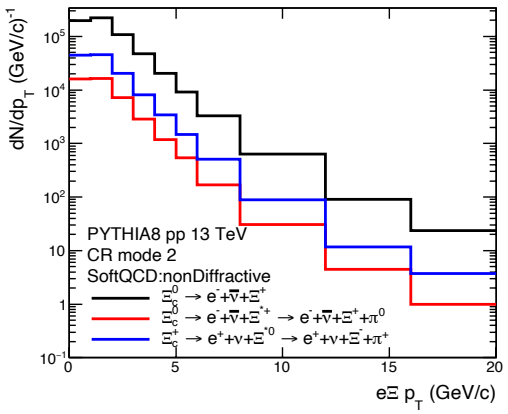

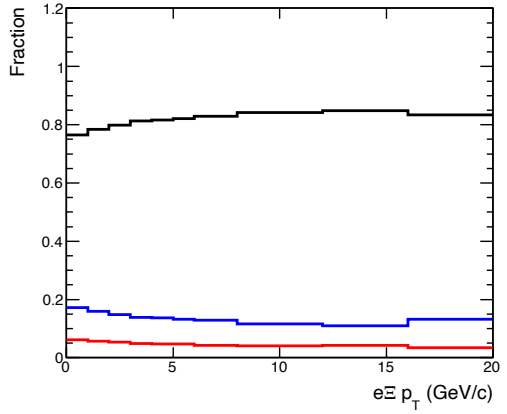

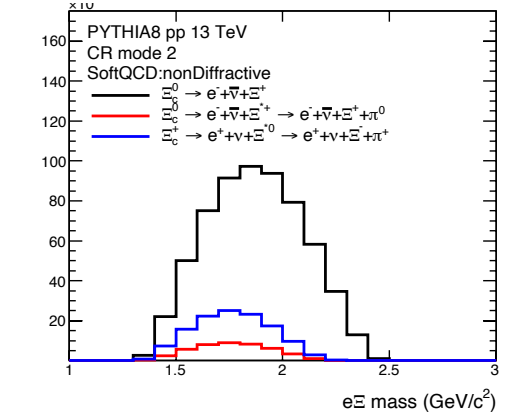

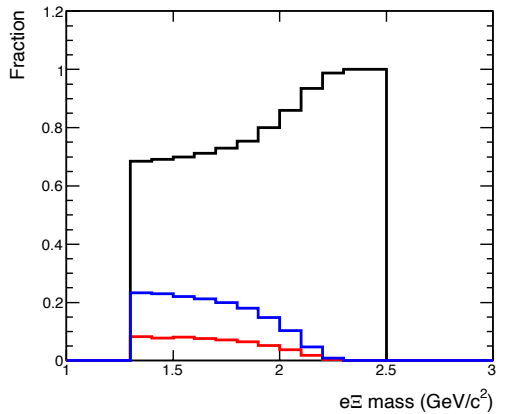

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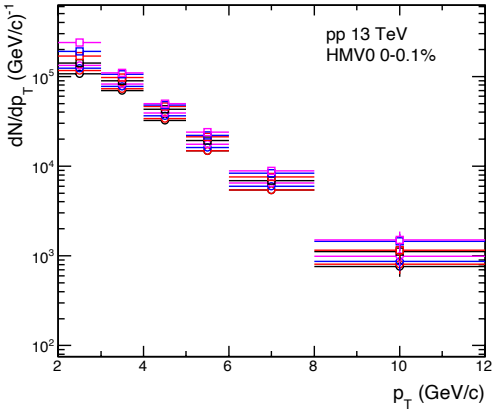
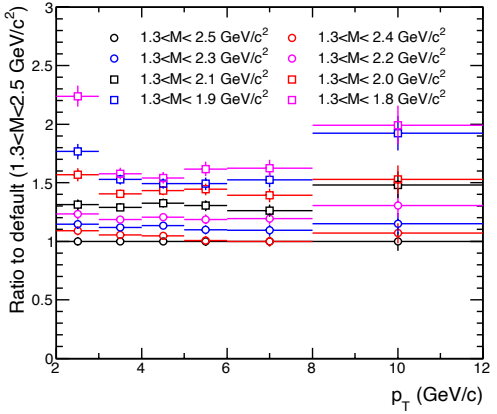
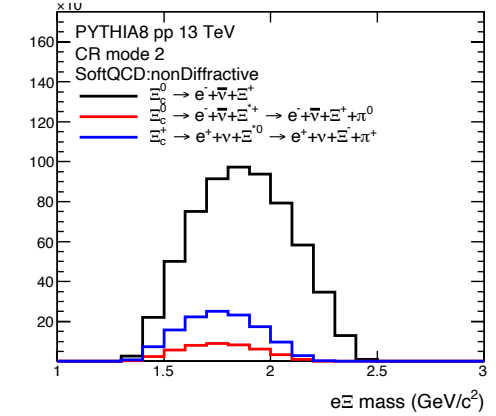
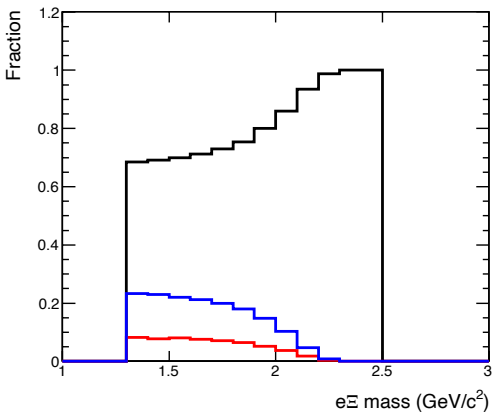
  - MC: PYTHIA8 with a fixed decay mode (Xic0→e nu Xi)
- Decrease the upper limit of eXi mass cut
  - Efficiency correction with MC for Xic0→e nu Xi
  - Signal loss is smaller for cases with Xi* ➔Over−correction with the efficiency for Xic0→e nu Xi









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- Incrase the lower limit of eXi mass cut
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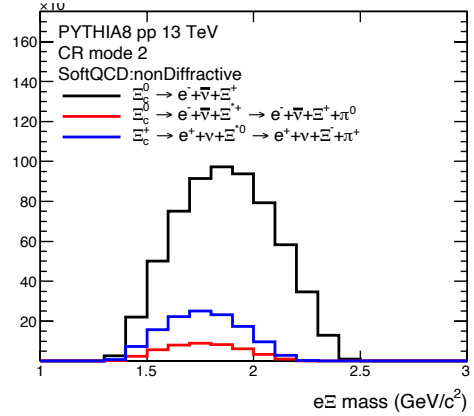
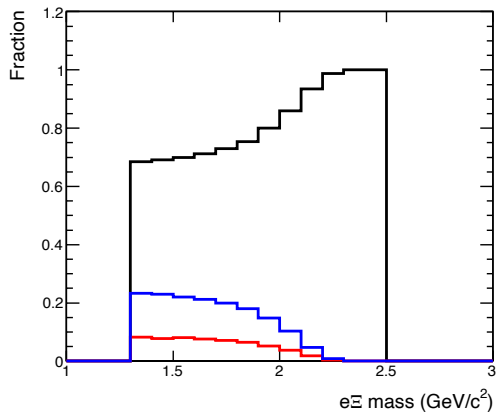
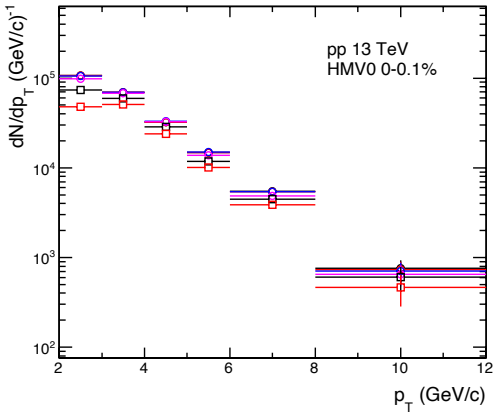
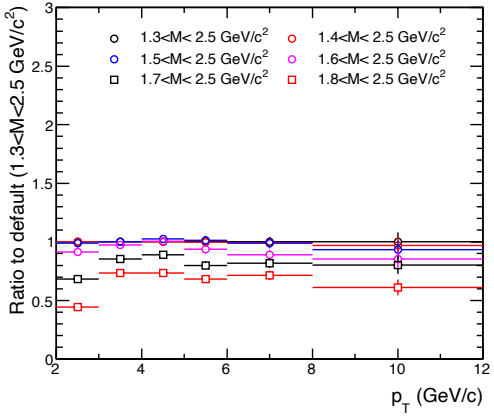






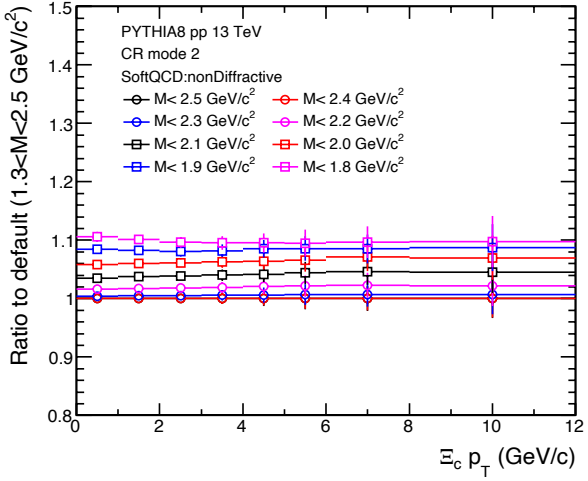


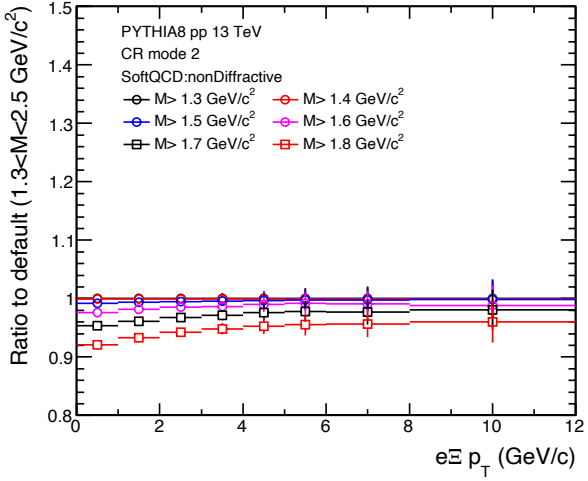
Corrected yields with different eXi mass cuts

- Toy MC (truth level analysis):
  Corrected yields with different eXi mass cuts (mixture of three decay modes)
  Efficiency with the decay mode, Xic0→e nu Xi
  Unfolding with the decay mode, Xic0→e nu Xi

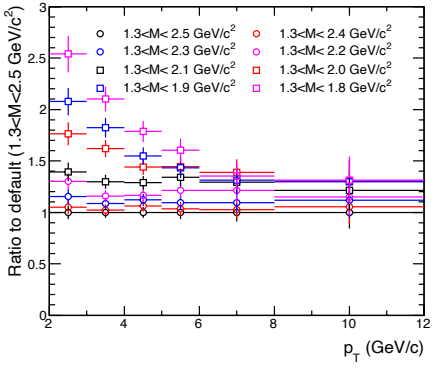
- Toy MC can reproduce the trend but underestimate the magnitude of the variation

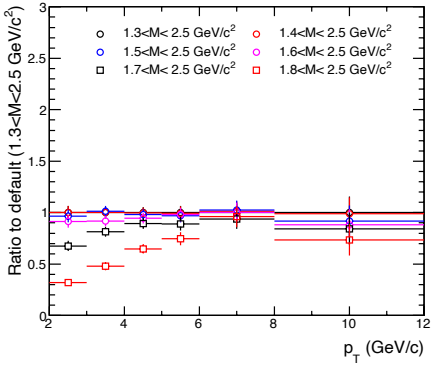
  Note: no other topological/kinematic cuts are applied





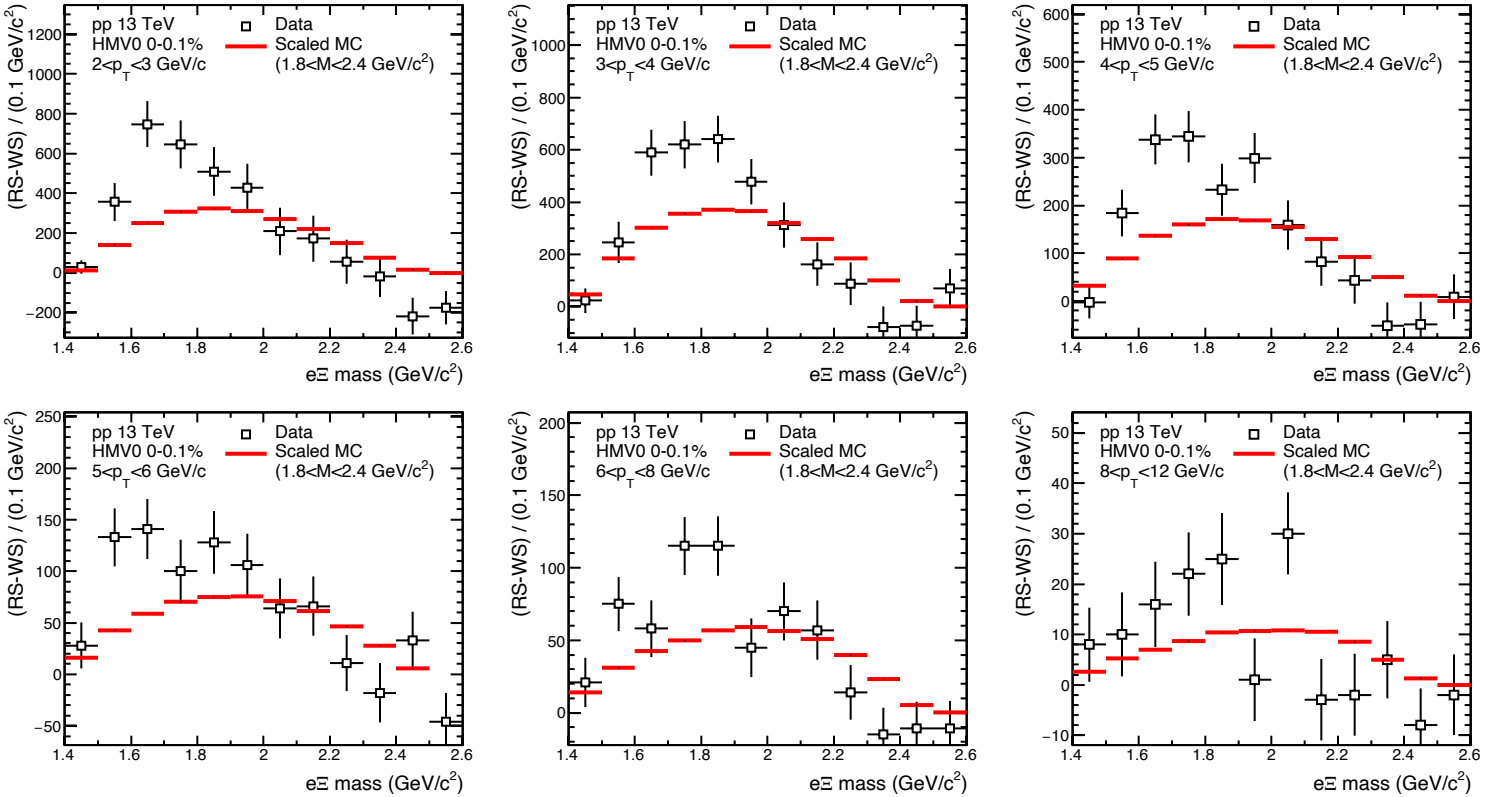
Data





eXi invariant mass (HMV0, 0-0.1%)

- MC distribution is scaled to match counts in 1.8⟨M⟨2.4 GeV/c^2 (where Xic0→e nu Xi is dominant)
- Clear and significant difference at low mass



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