

Search for 3N SRC in inclusive scattering at HallC (XEM2)

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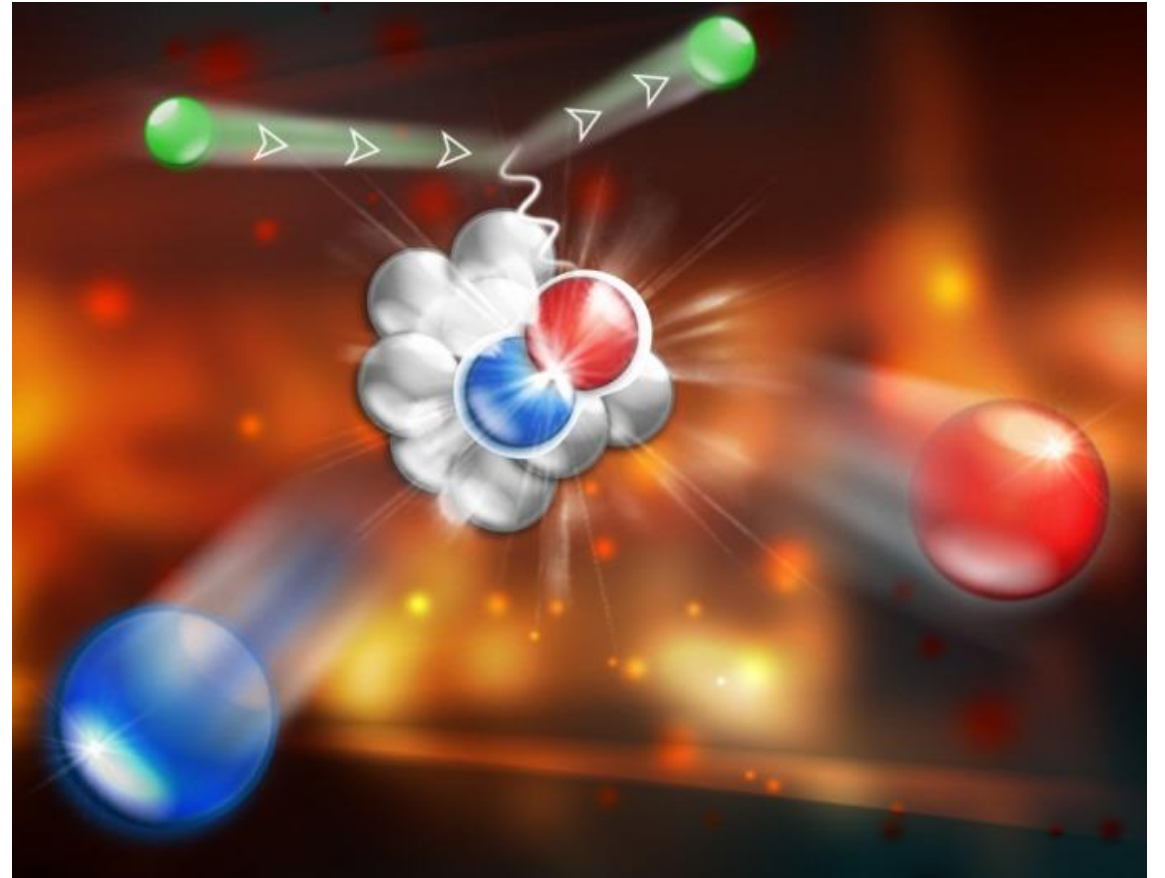
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Outline

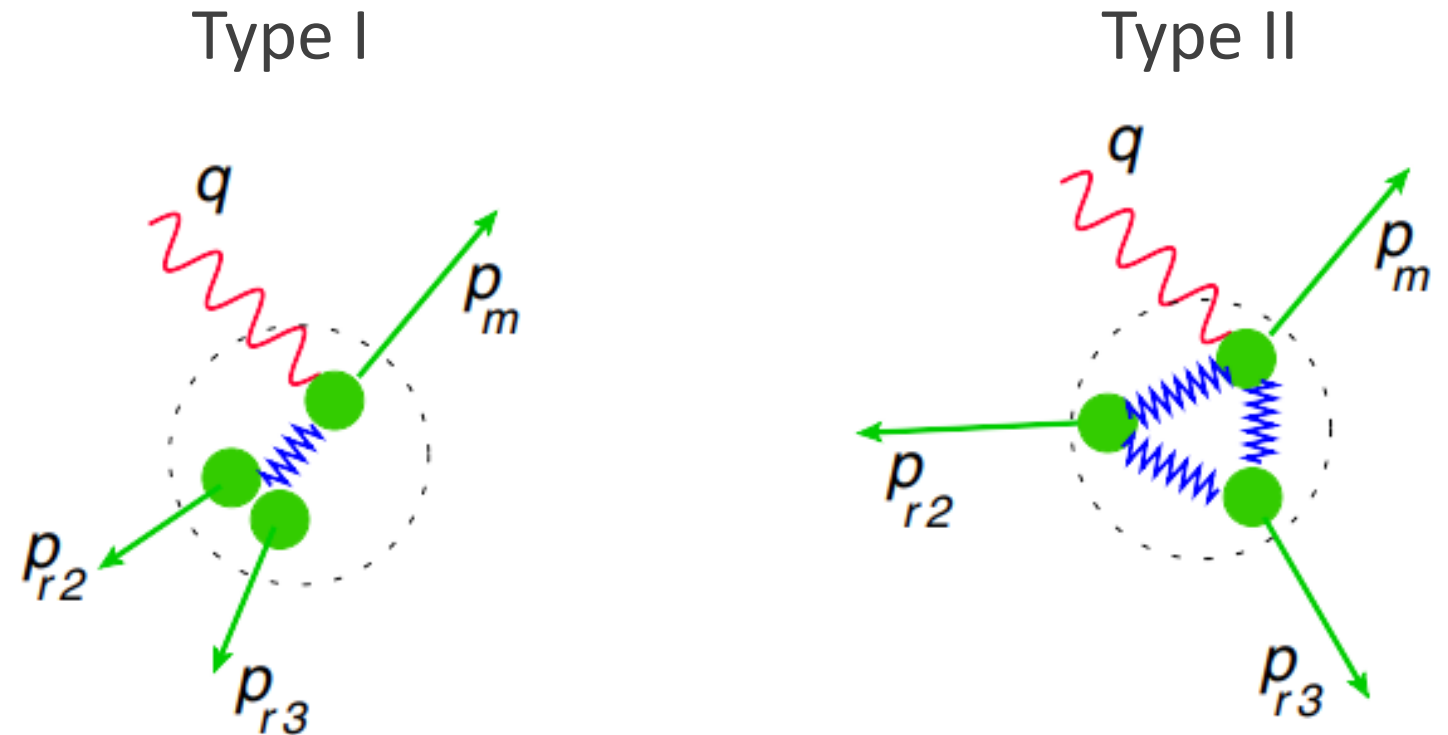
- Intro to 3N SRCs
- Where to look for 3N SRCs
- XEM2 experiment search regions
- Preliminary results
 - 3N ratios?
 - Cross sections



What are 3N SRCs?

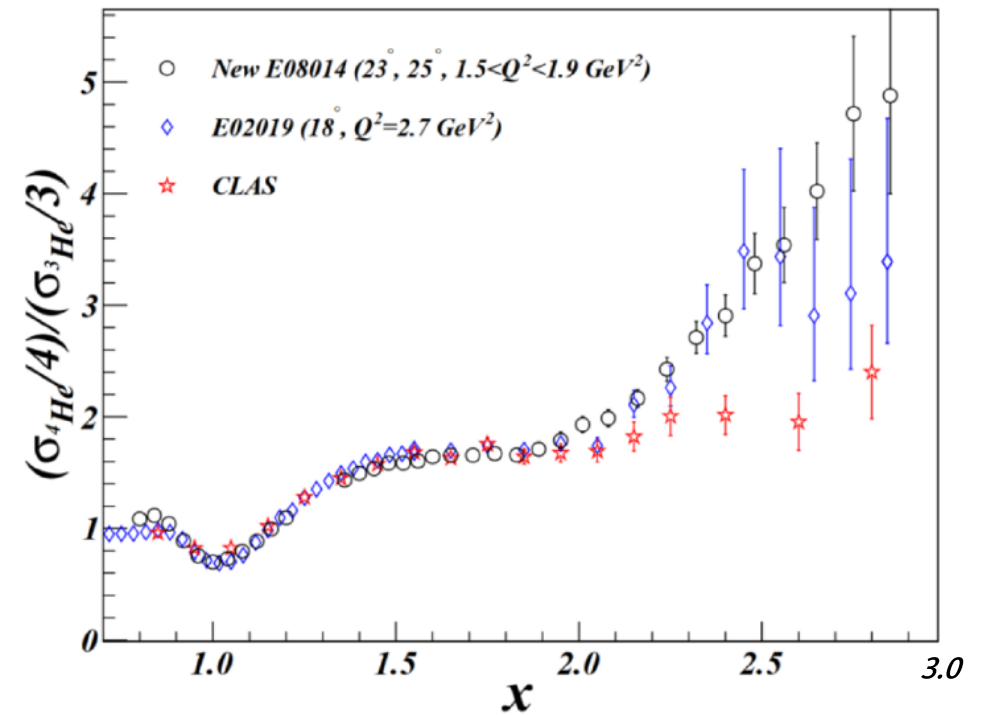
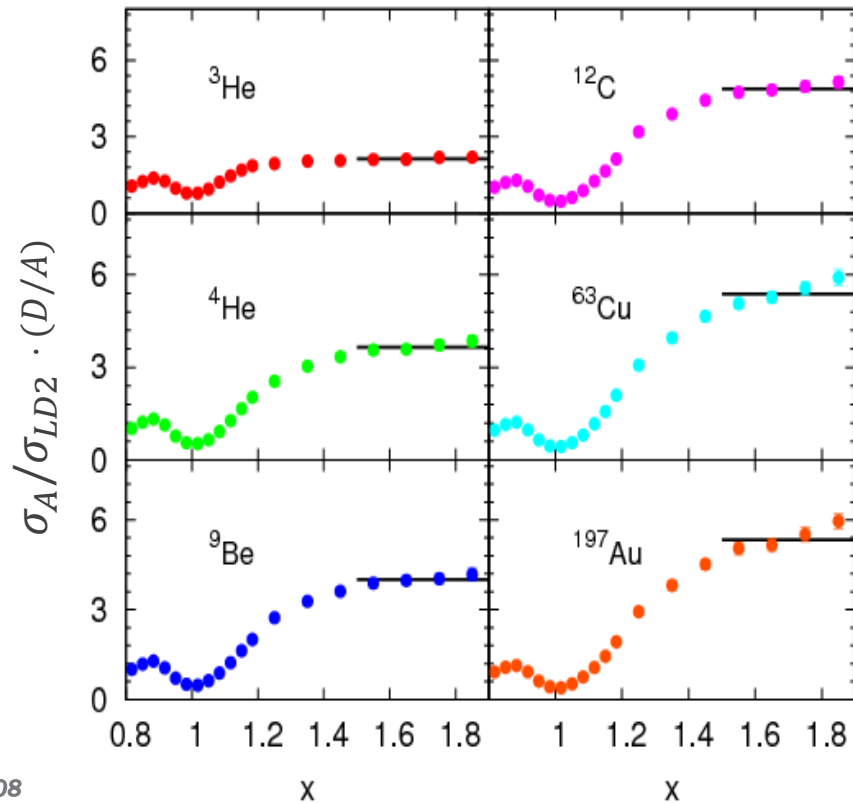
- 2N SRC typically have back-to-back relative momentum
- 3N SRCs can have a variety of configurations
- Type 1 configurations are the most prominent
 - Let's us derive the α_{3N} variable used for 3N SRCs

Example 3N SRC configurations



How do we look for 3N SRCs?

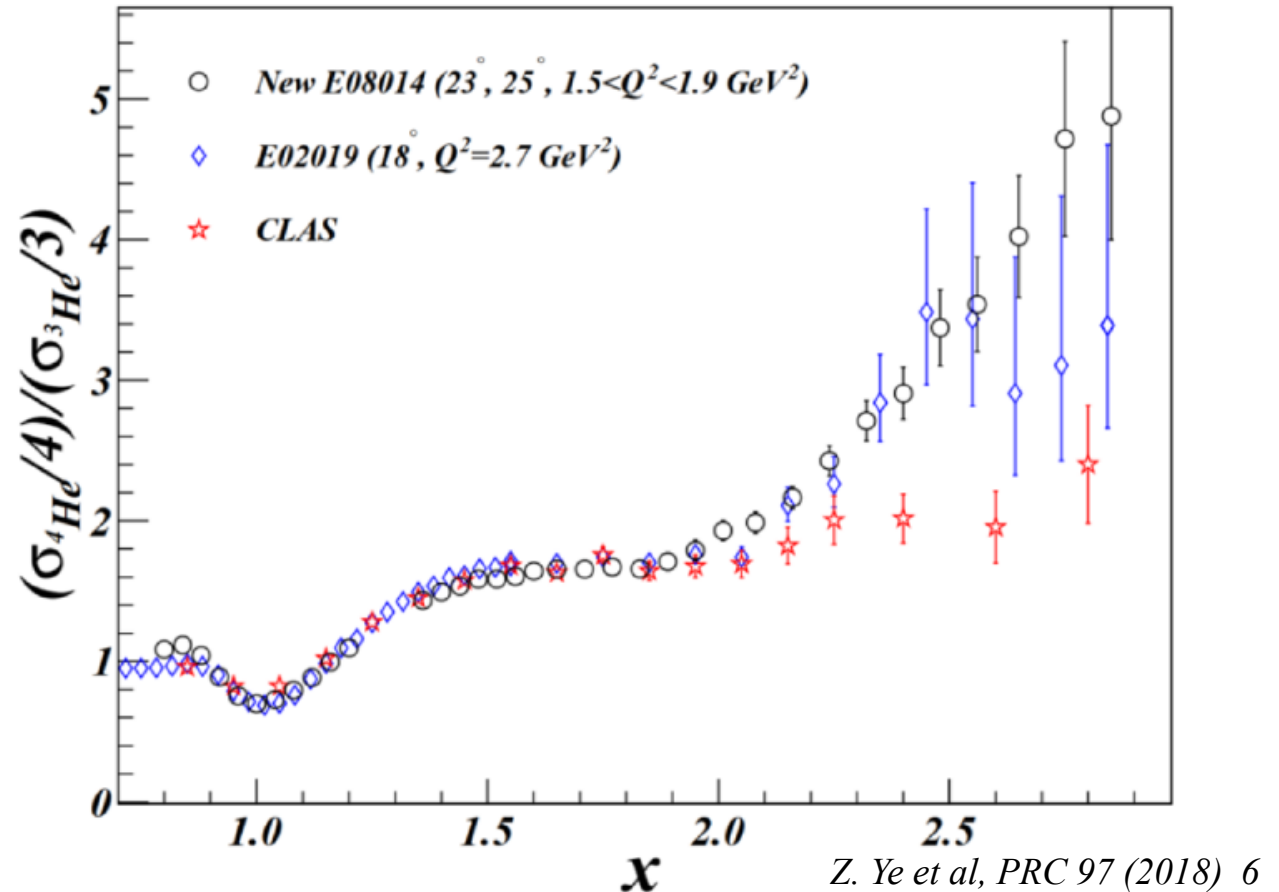
- From inclusive scattering, we see a plateau feature in the 2N scaling region
- Can we extend this past x_{bj} of 2 to see the formation of a 3N plateau?



Z. Ye et al, PRC 97 (2018) 6

Previous searches for 3N SRCs

- ^3He is a stable 3 nucleon system
- Measure by taking cross section ratios to ^3He
- See if a 3N plateau forms in x_{bj} leading up to 3

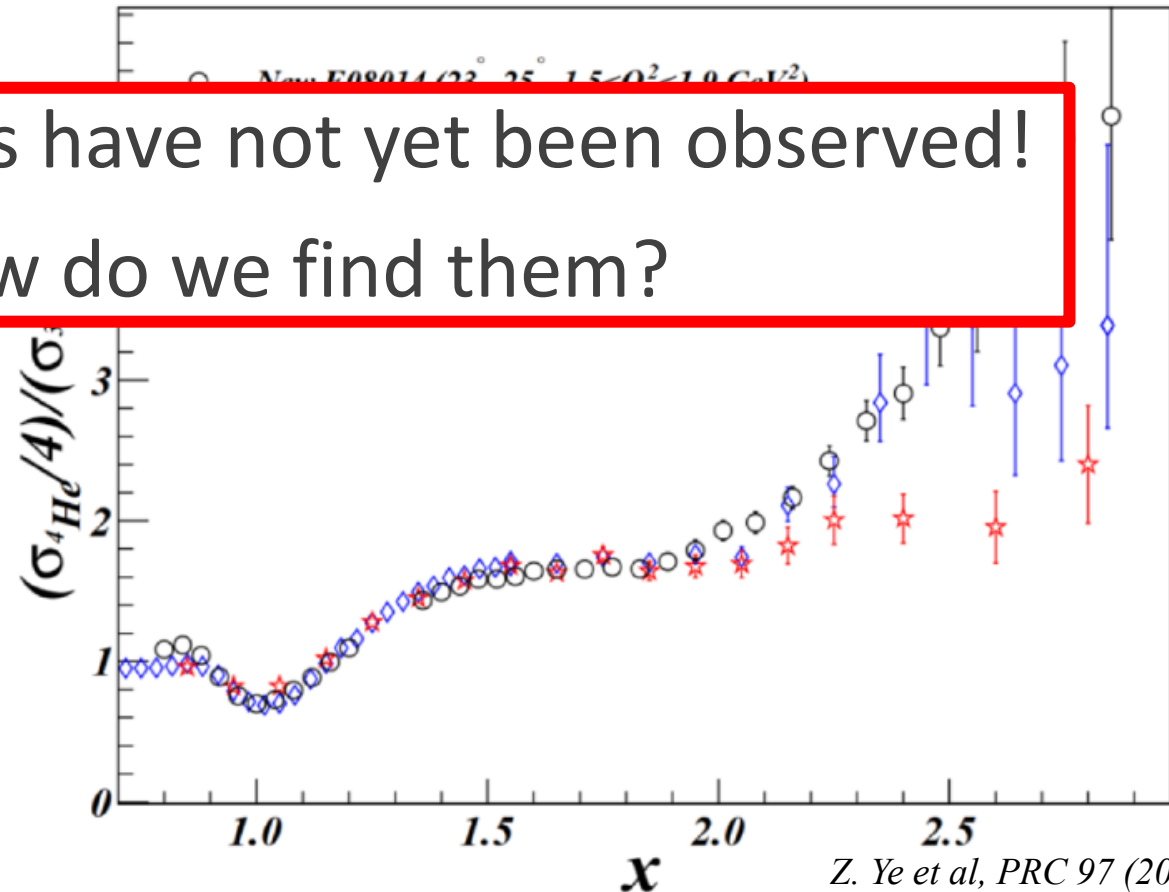


Previous searches for 3N SRCs

- ^3He is a stable 3 nucleon system
- Measure section ratios to ^4He
- See if a 3N plateau forms in x_{bj} leading up to 3

3N SRCs plateaus have not yet been observed!

So how do we find them?

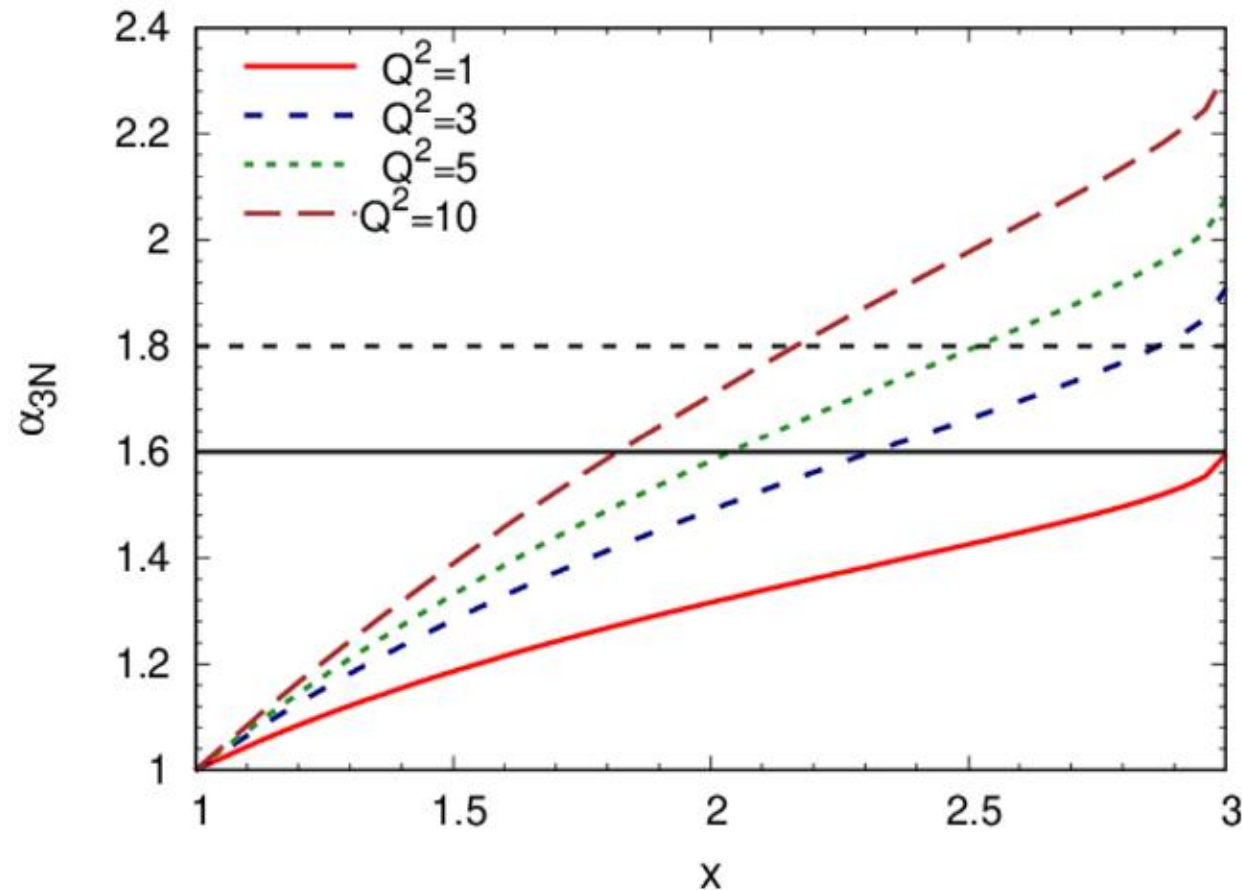
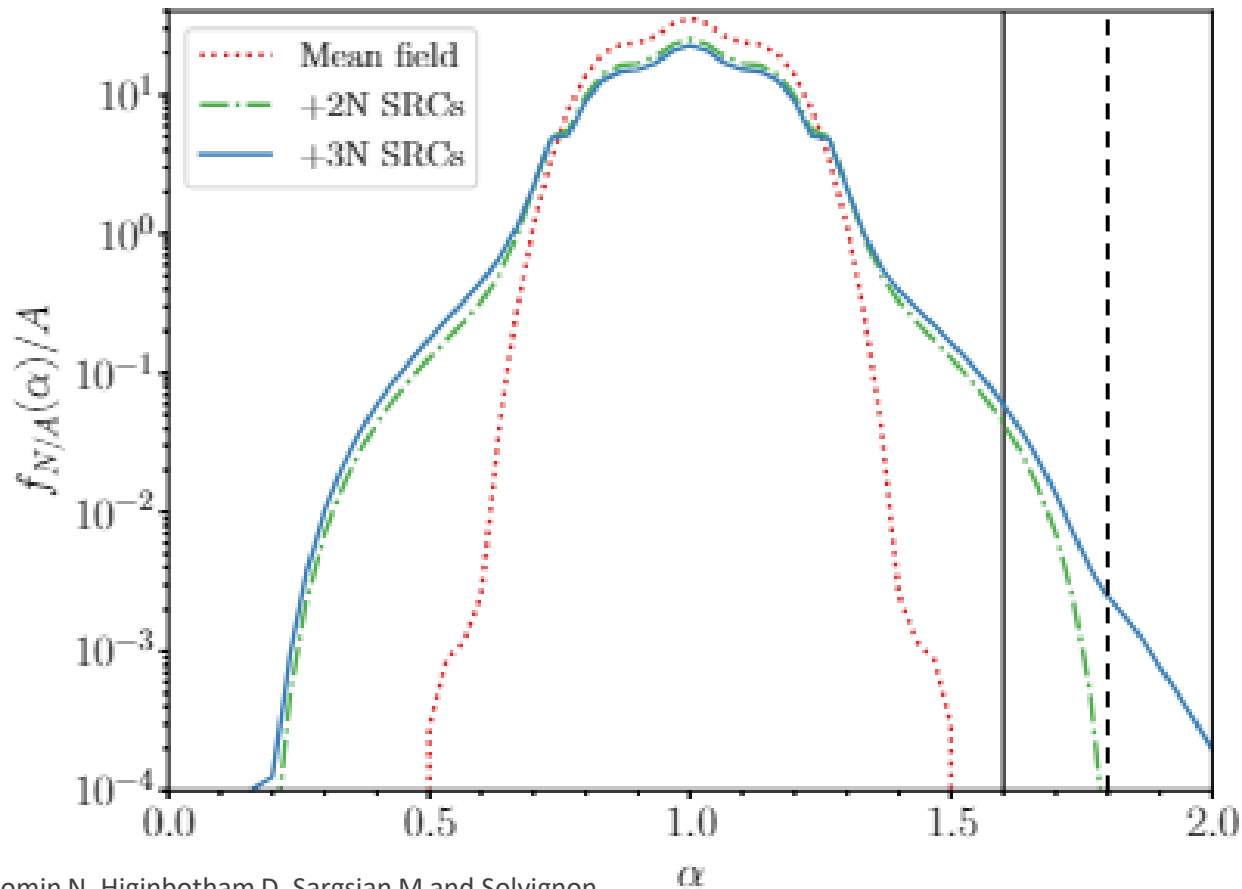


Let's consider another useful parameter

Light cone momentum fraction in a 3N system

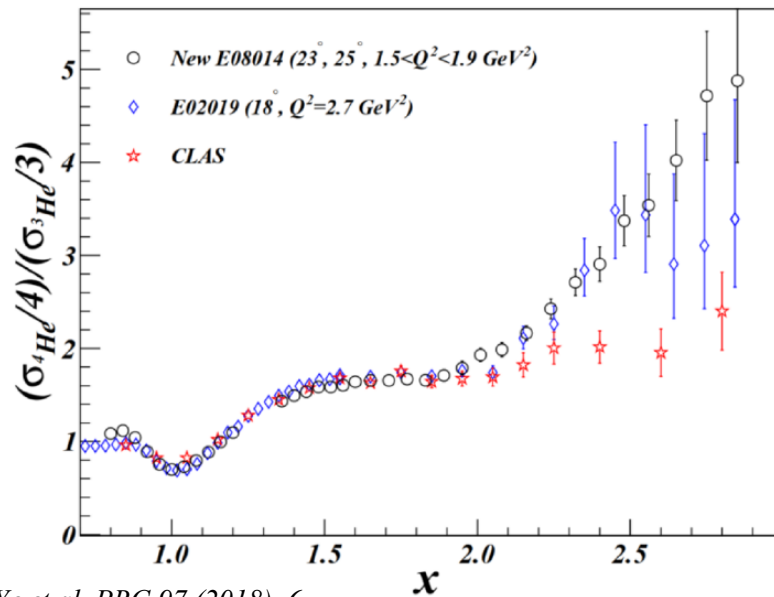


$$\alpha_{3N} = 3 - \frac{q_- + 3m_N}{2m_N} \left[1 + \frac{m_S^2 - m_N^2}{W_{3N}^2} + \sqrt{\left(1 - \frac{(m_S^2 + m_N^2)^2}{W_{3N}^2}\right) \left(1 - \frac{(m_S^2 - m_N^2)^2}{W_{3N}^2}\right)} \right]$$

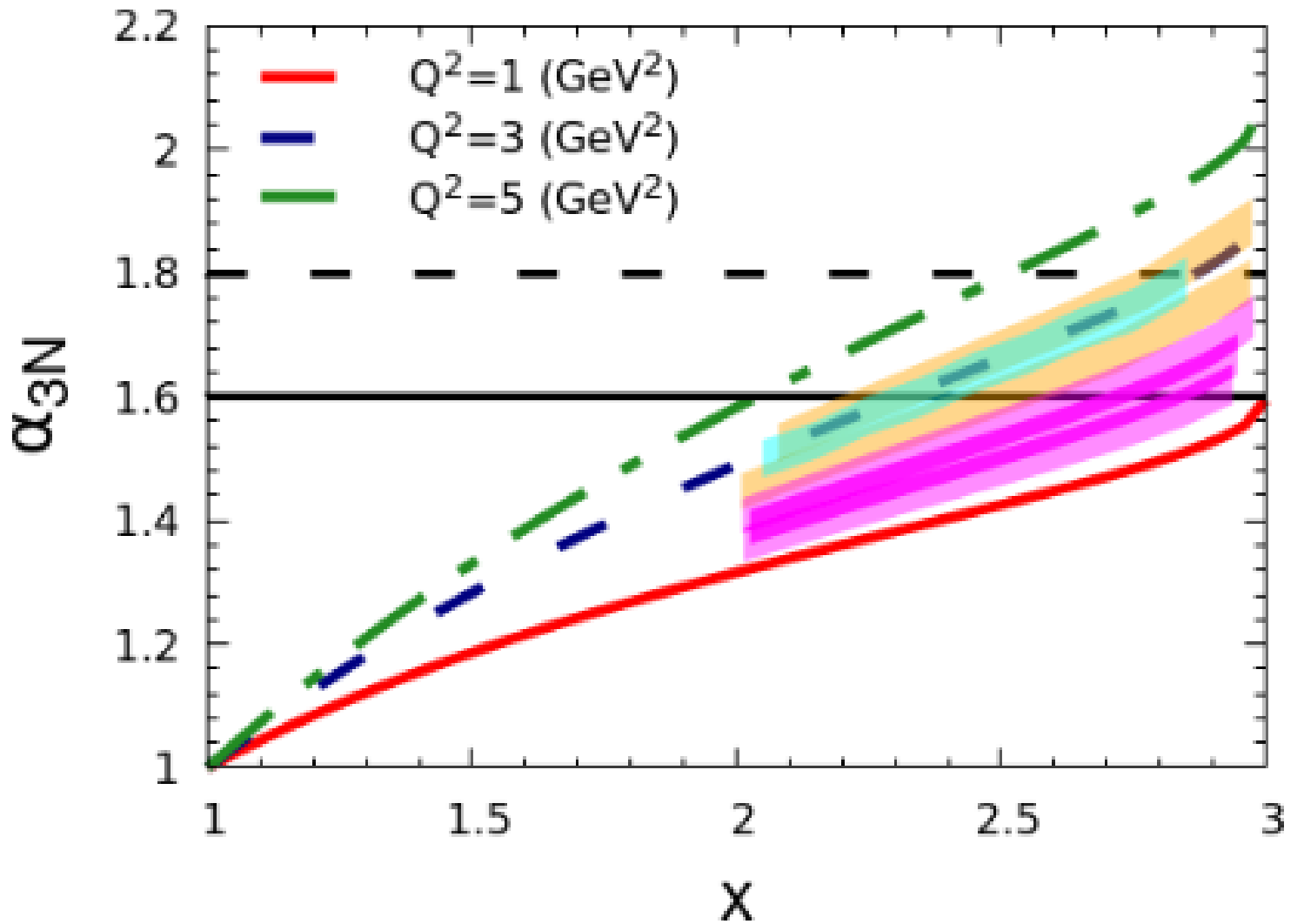


Where have we looked?

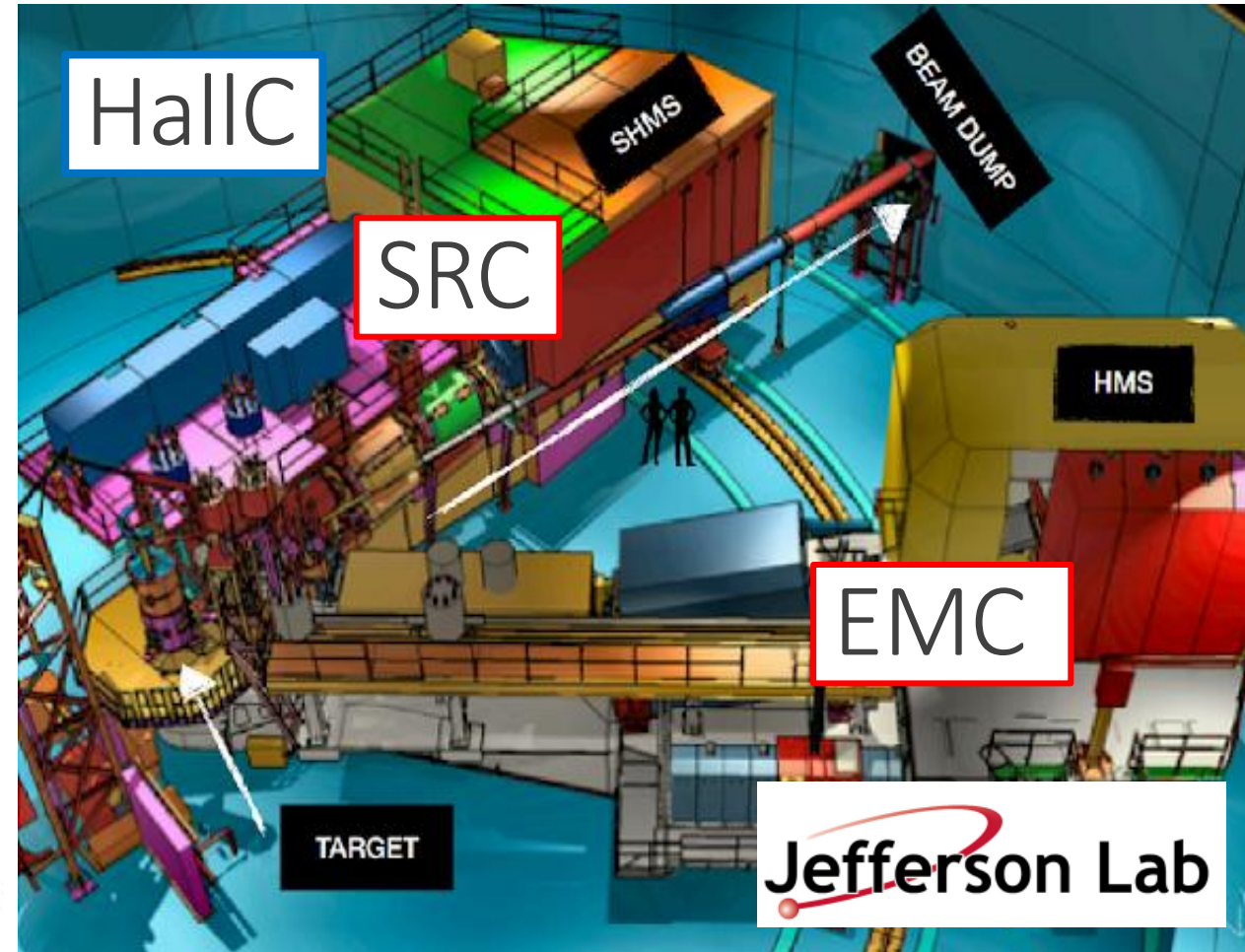
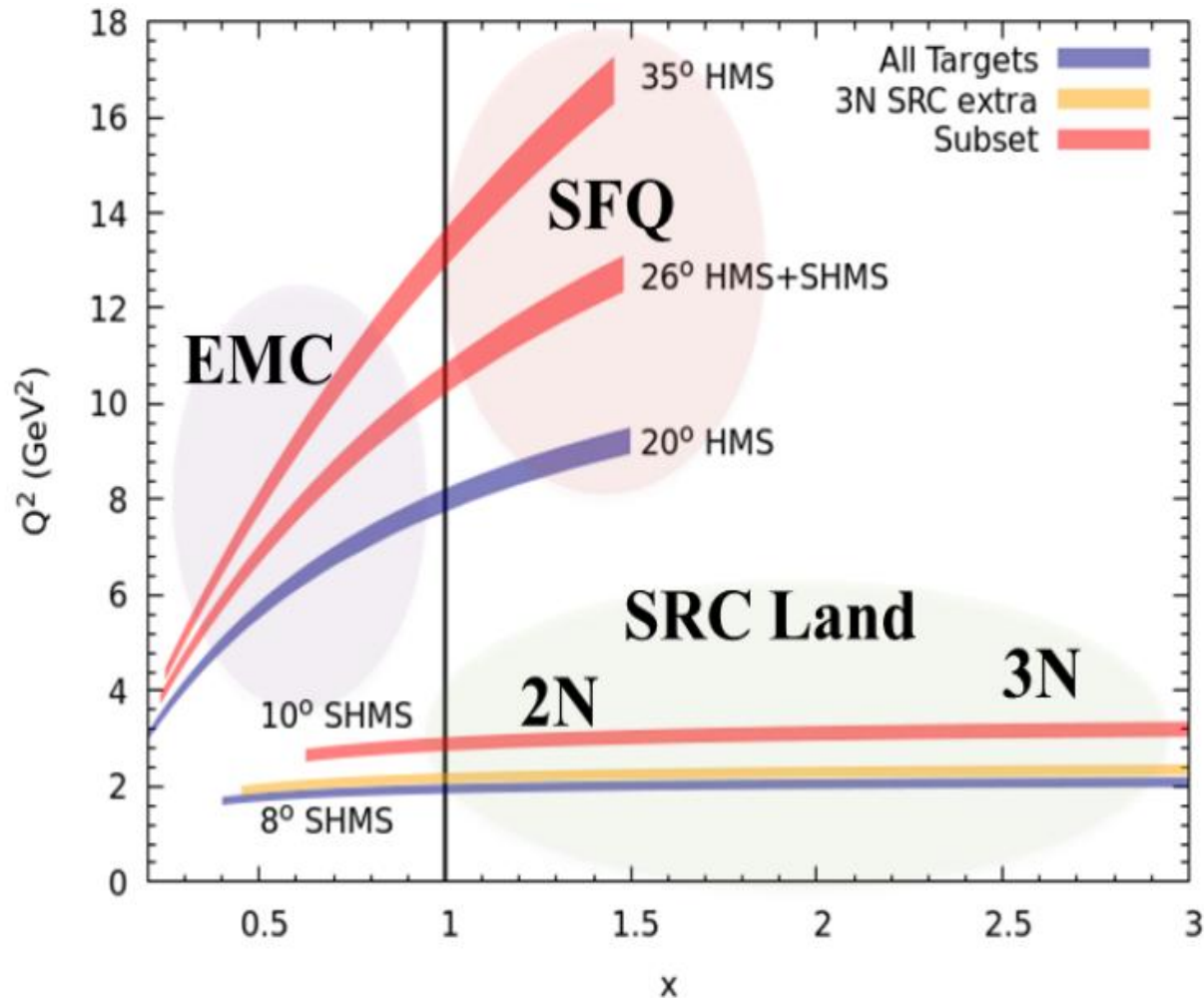
- Hall A data
- Hall C data
- Hall C (current) data



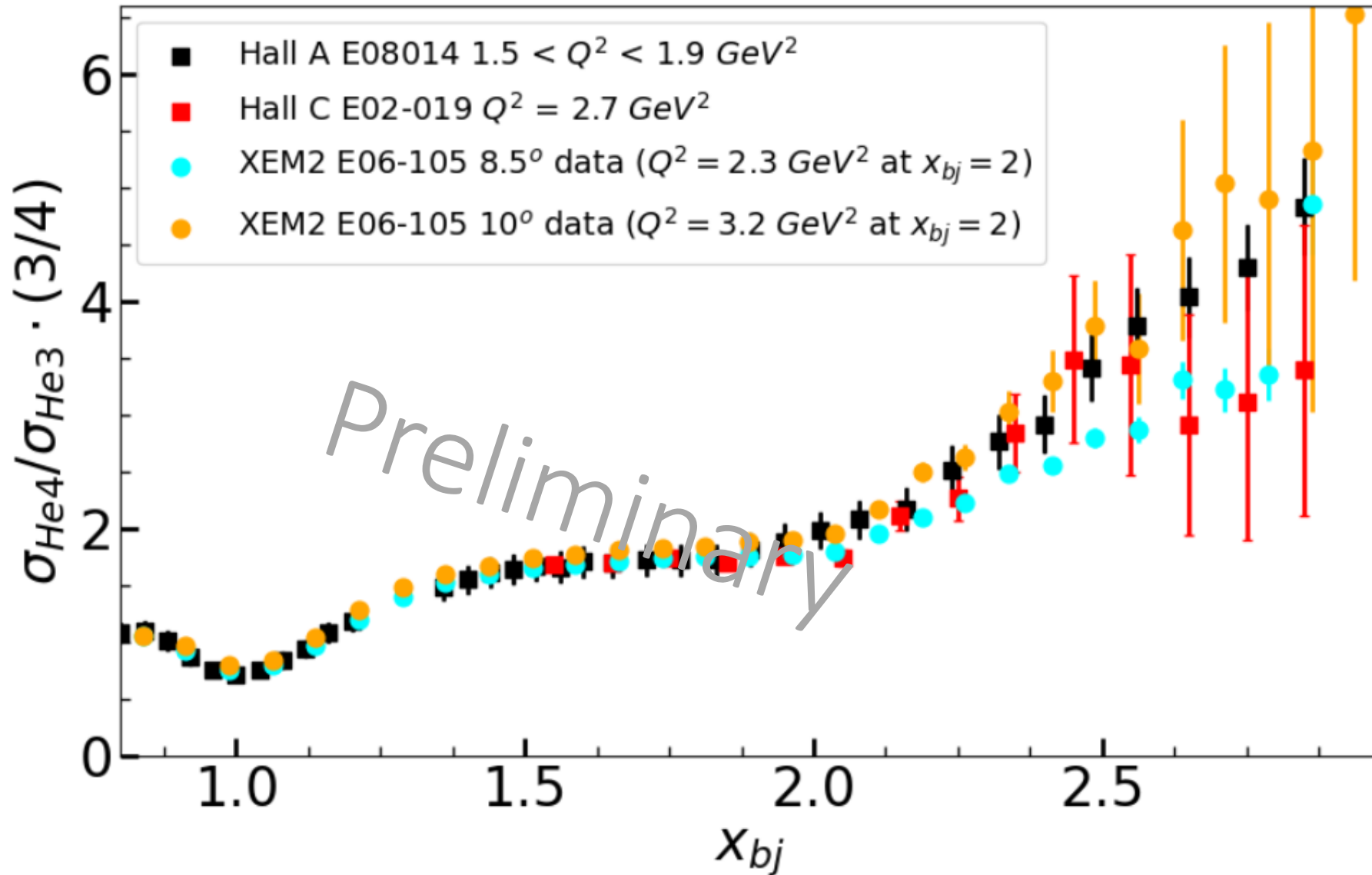
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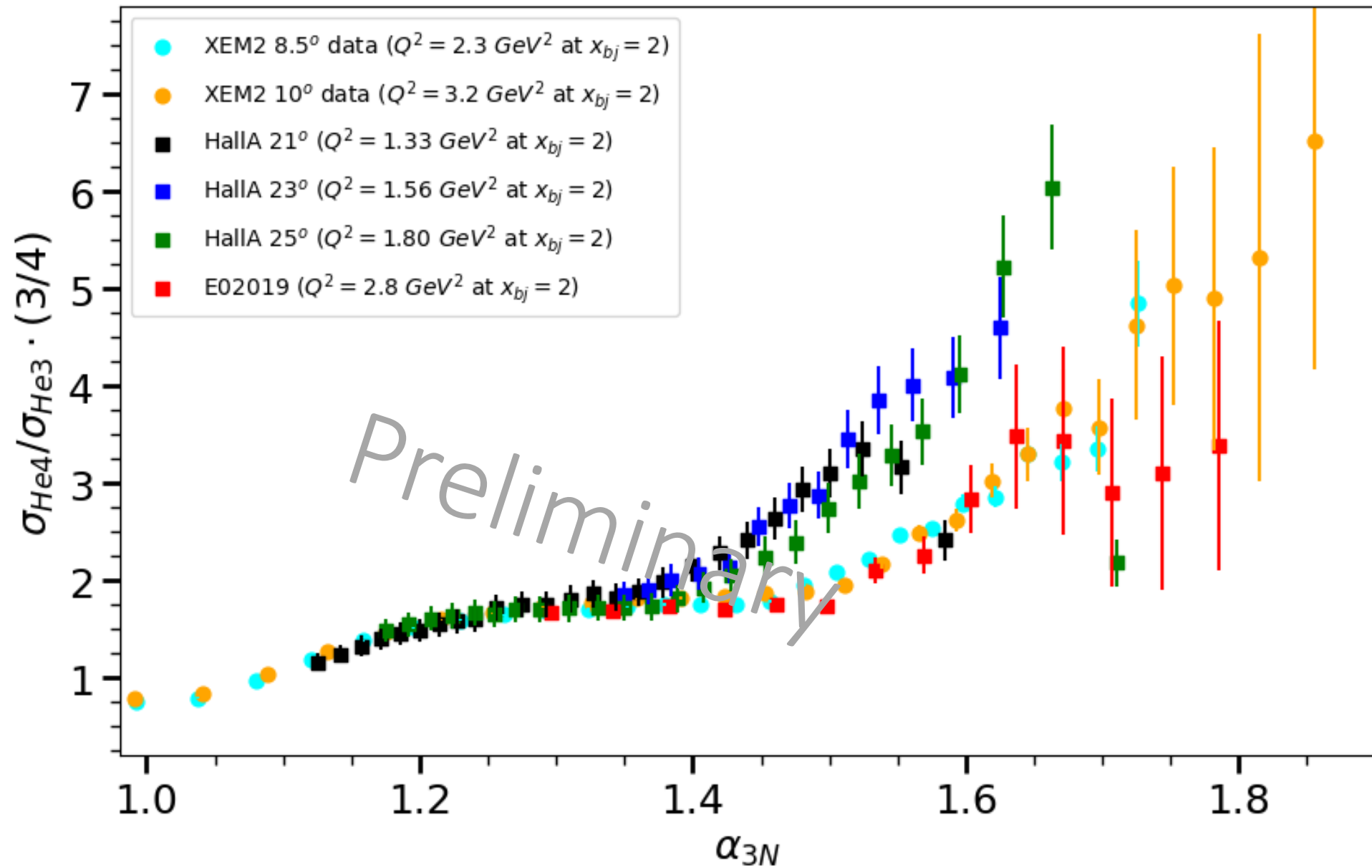
XEM2 experiment landscape:

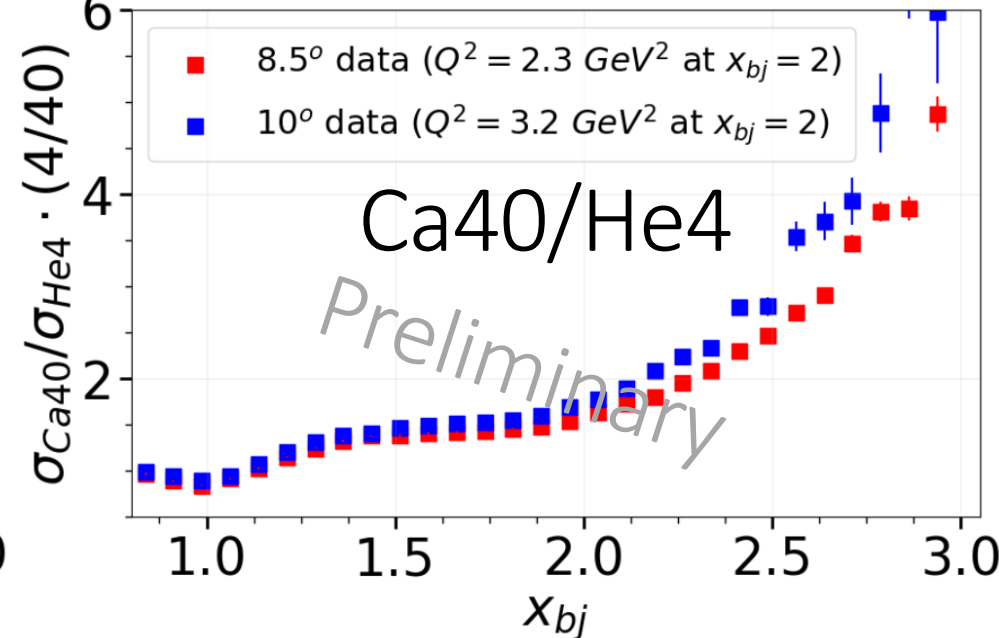
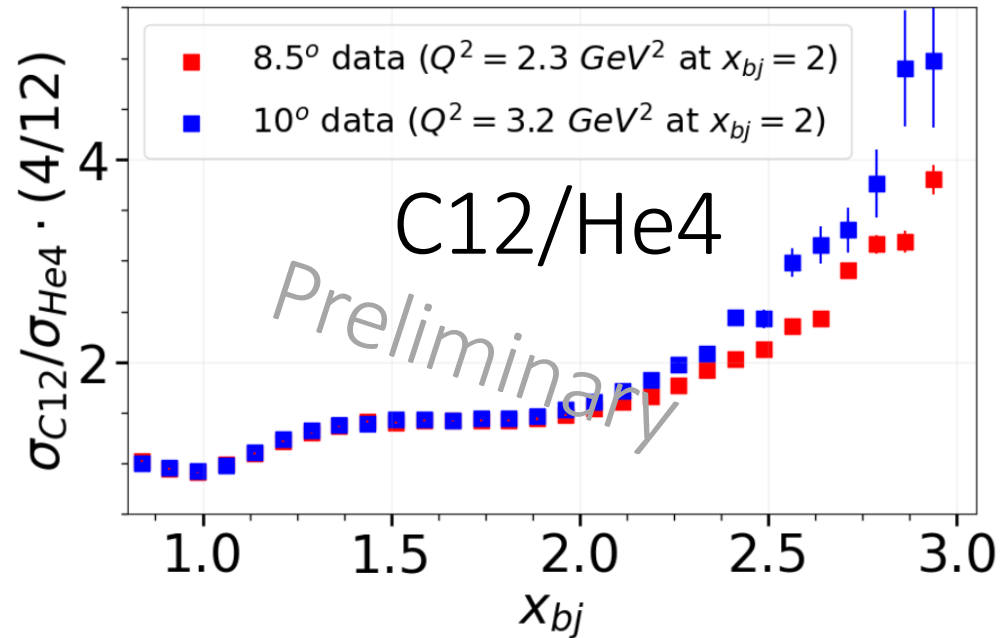
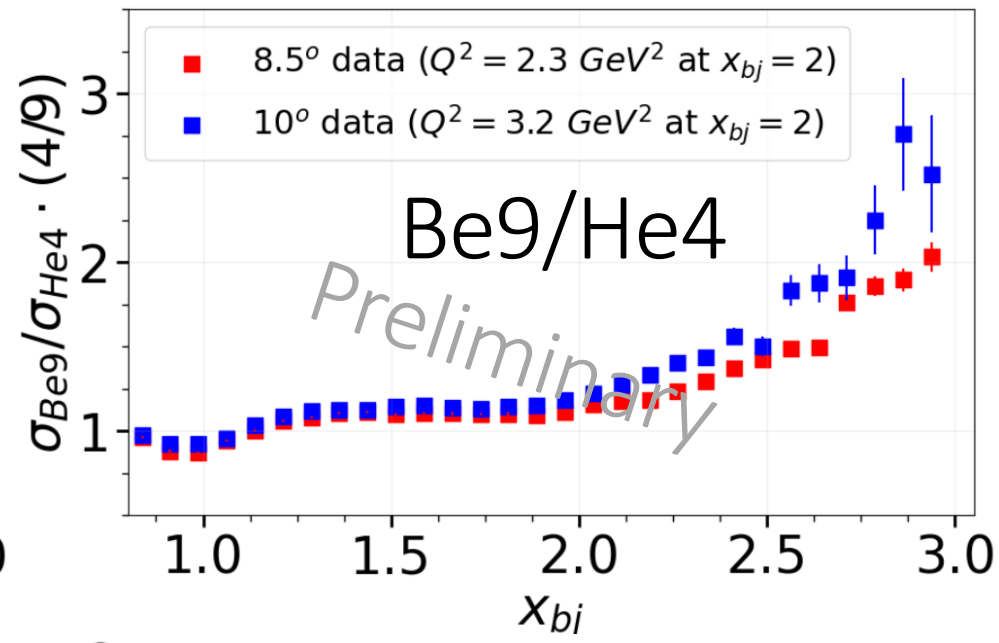
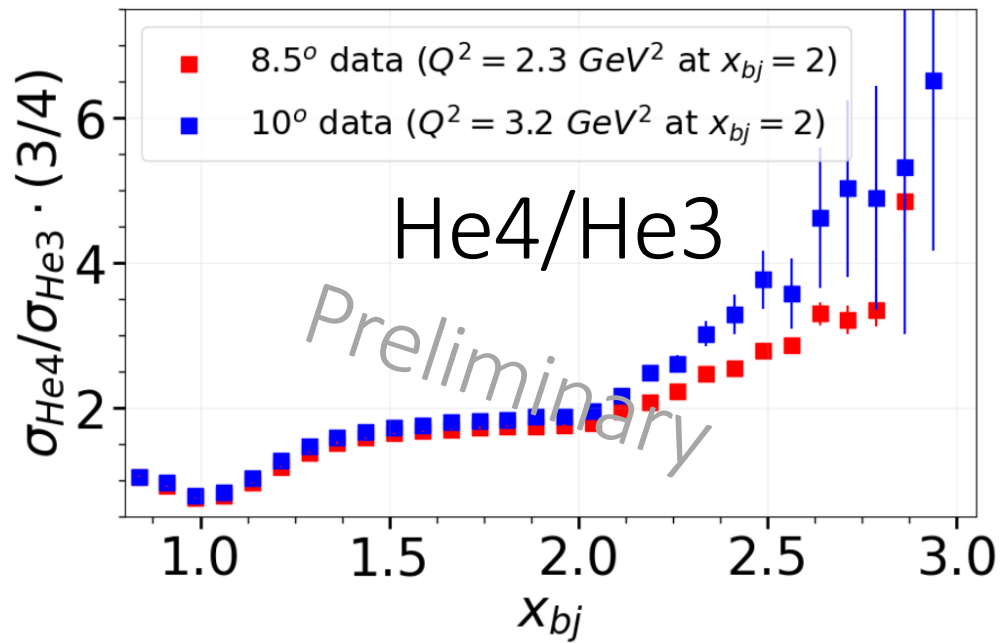


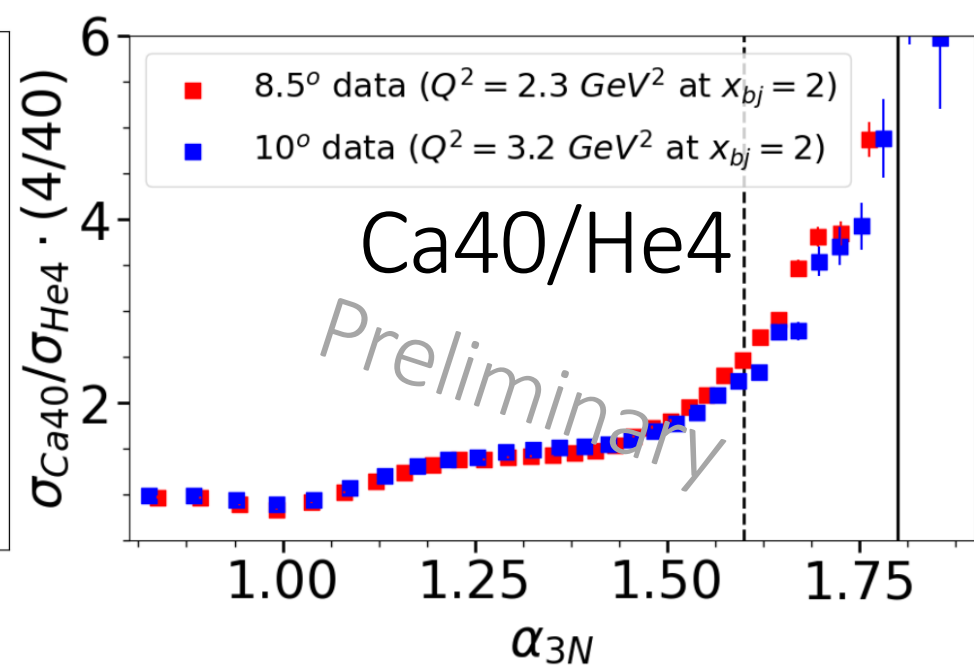
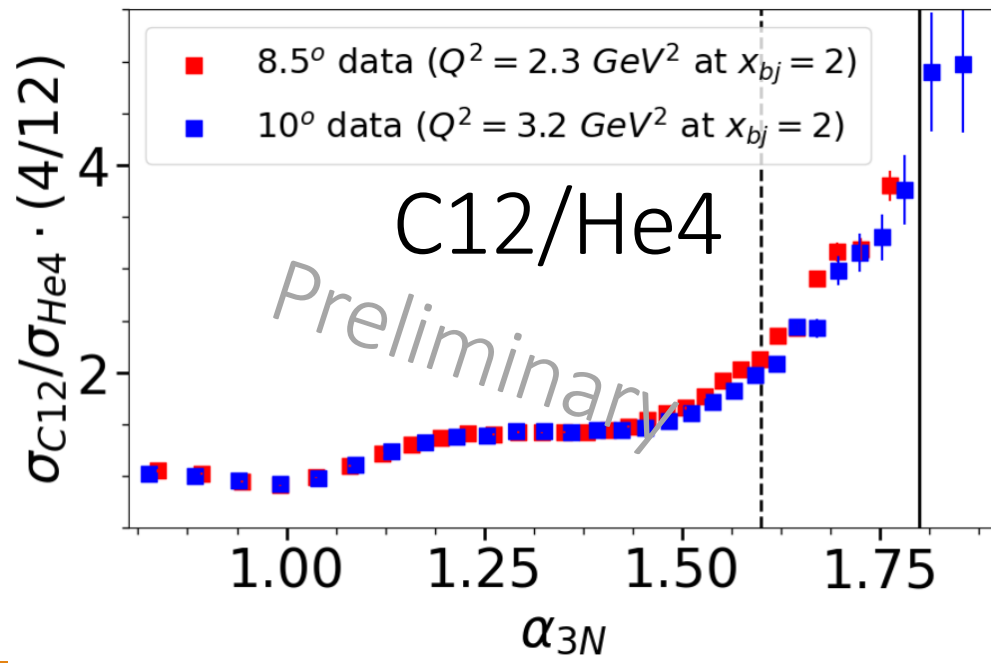
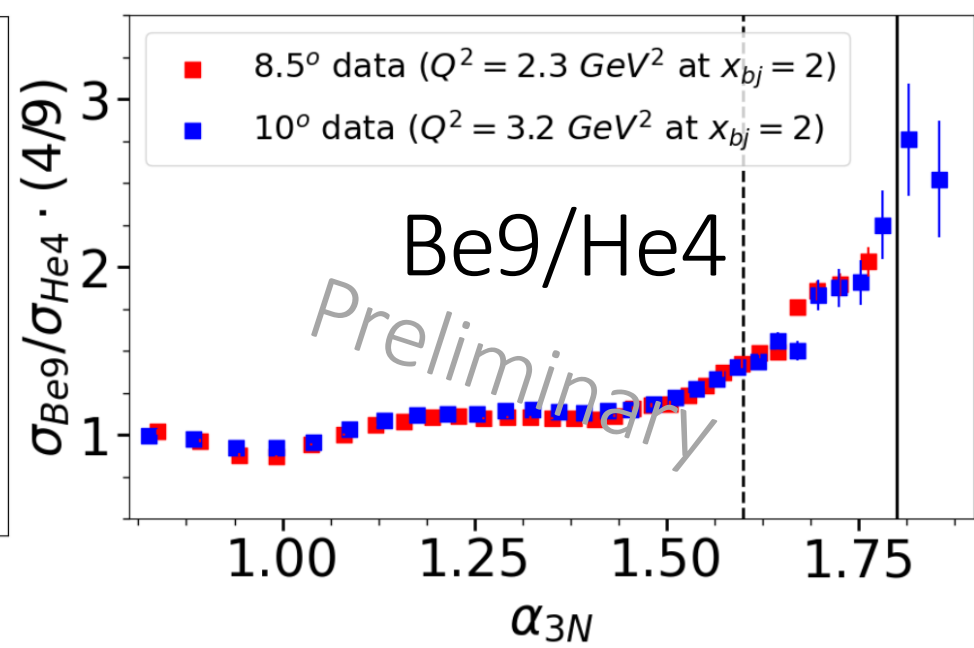
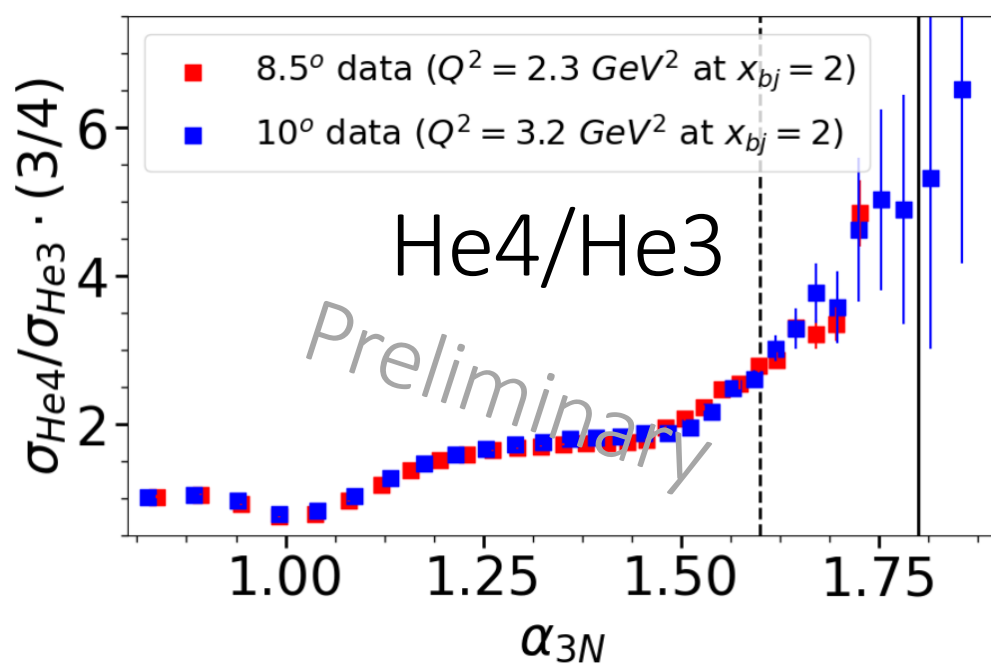
How does our data compare?

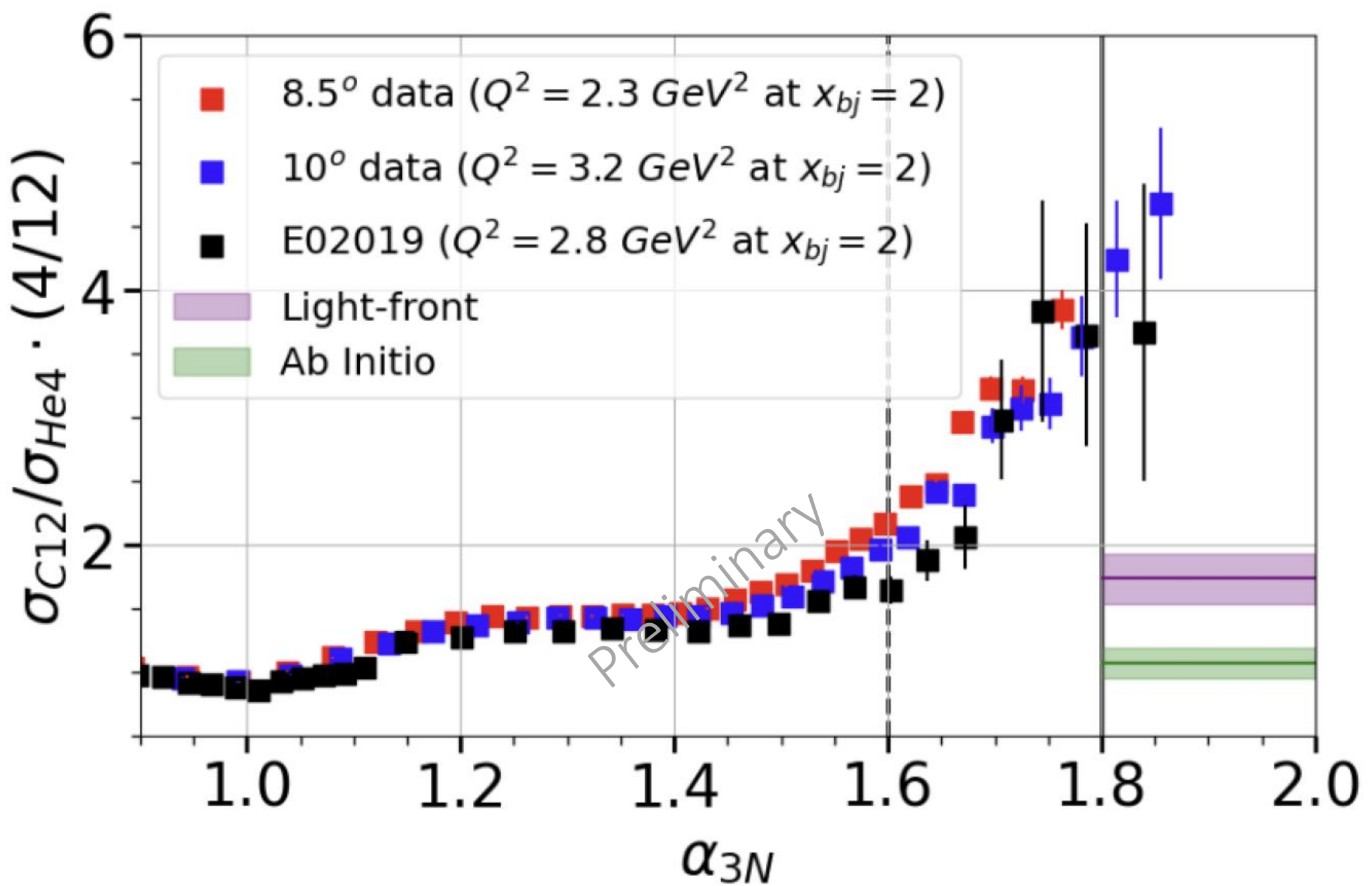


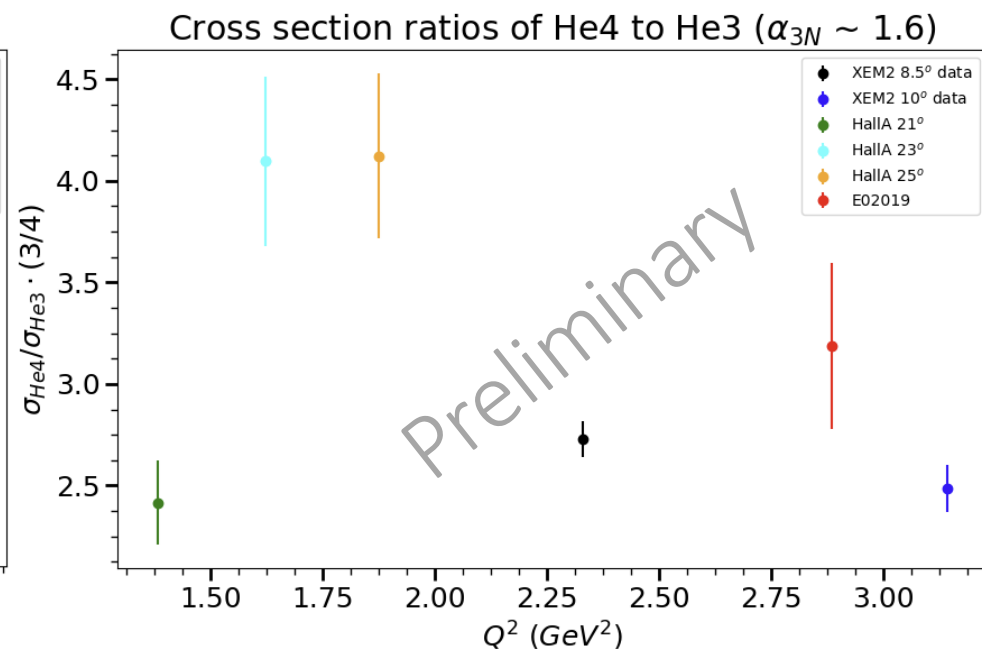
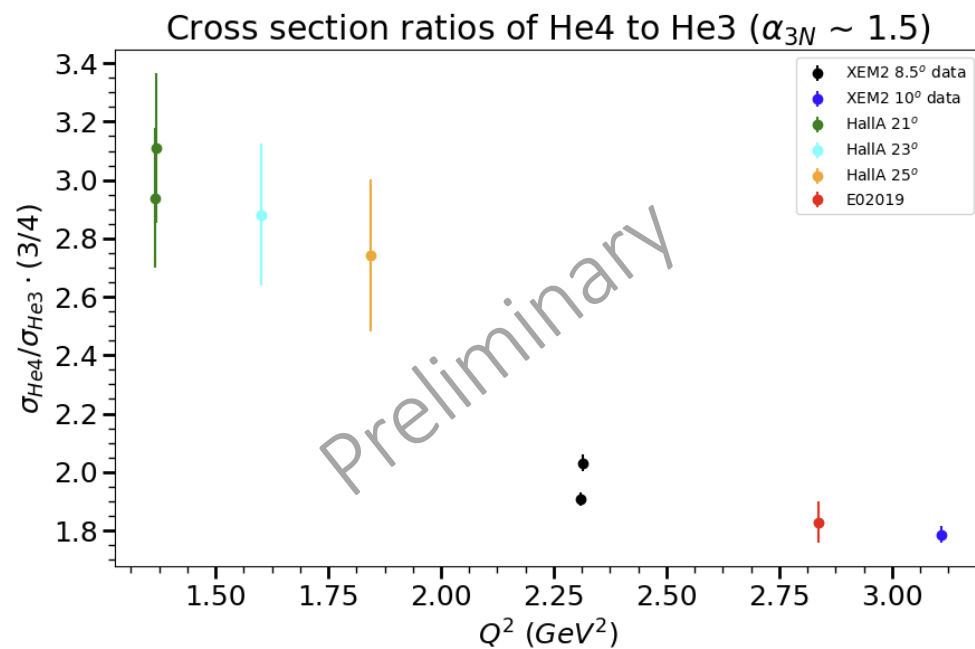
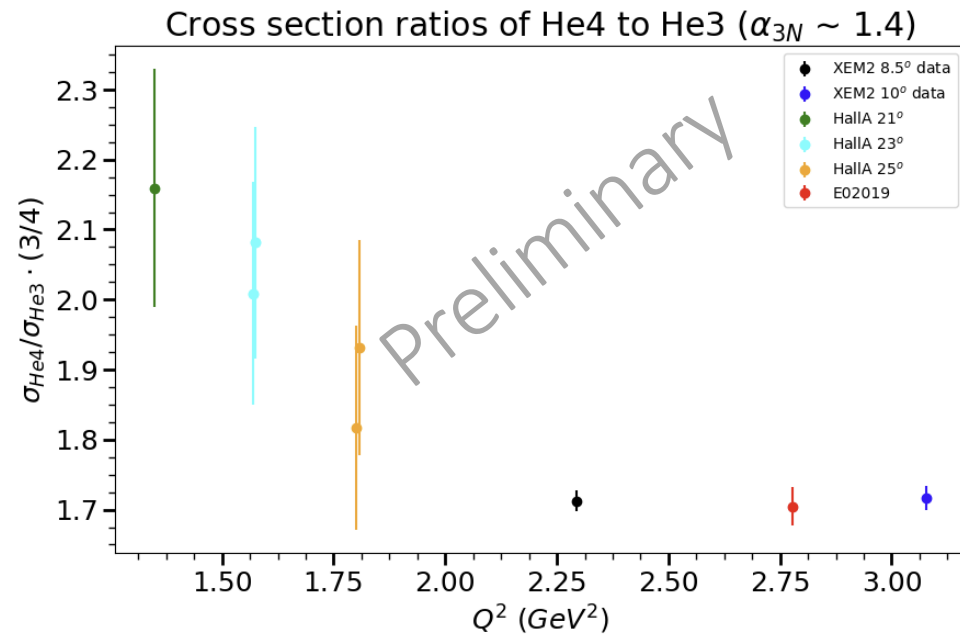
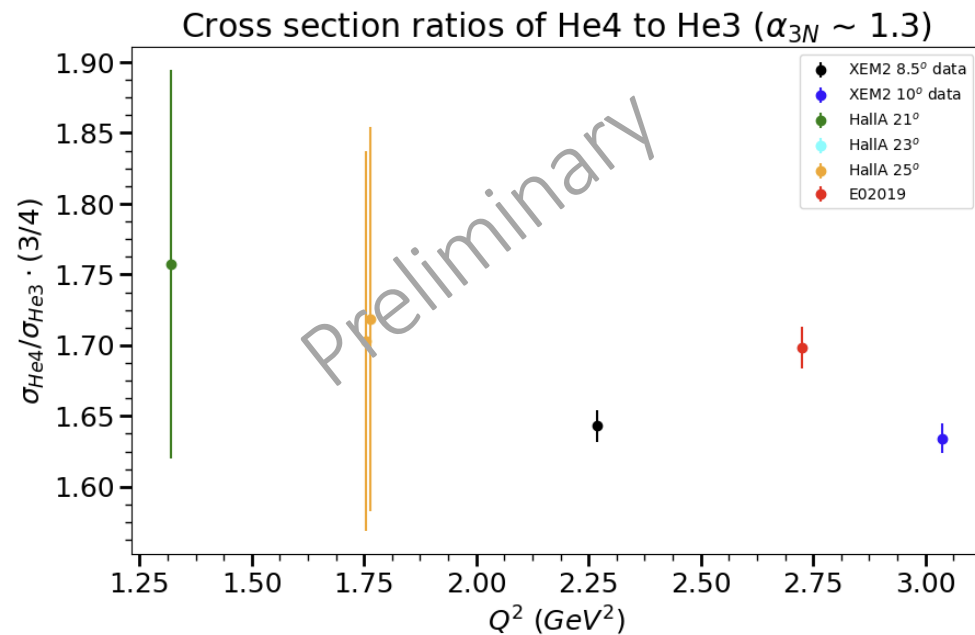
Cross section ratios of He4 to He3





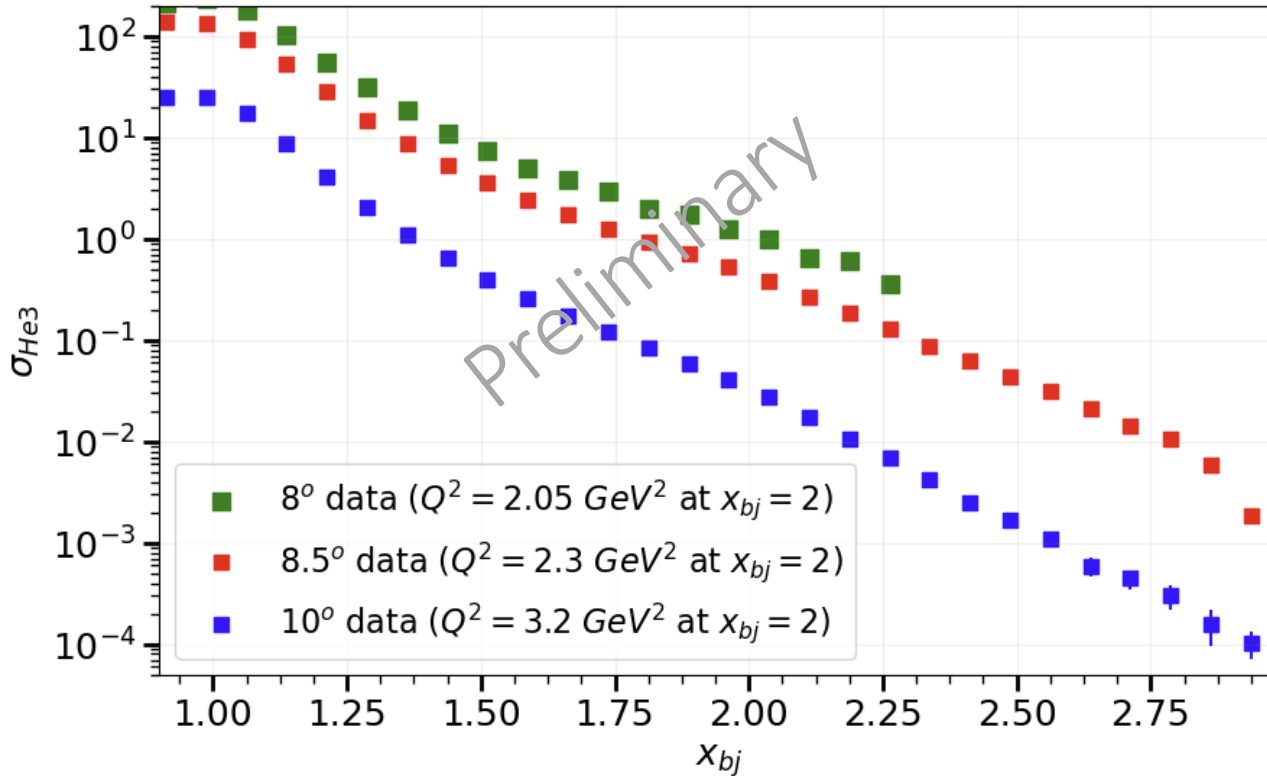




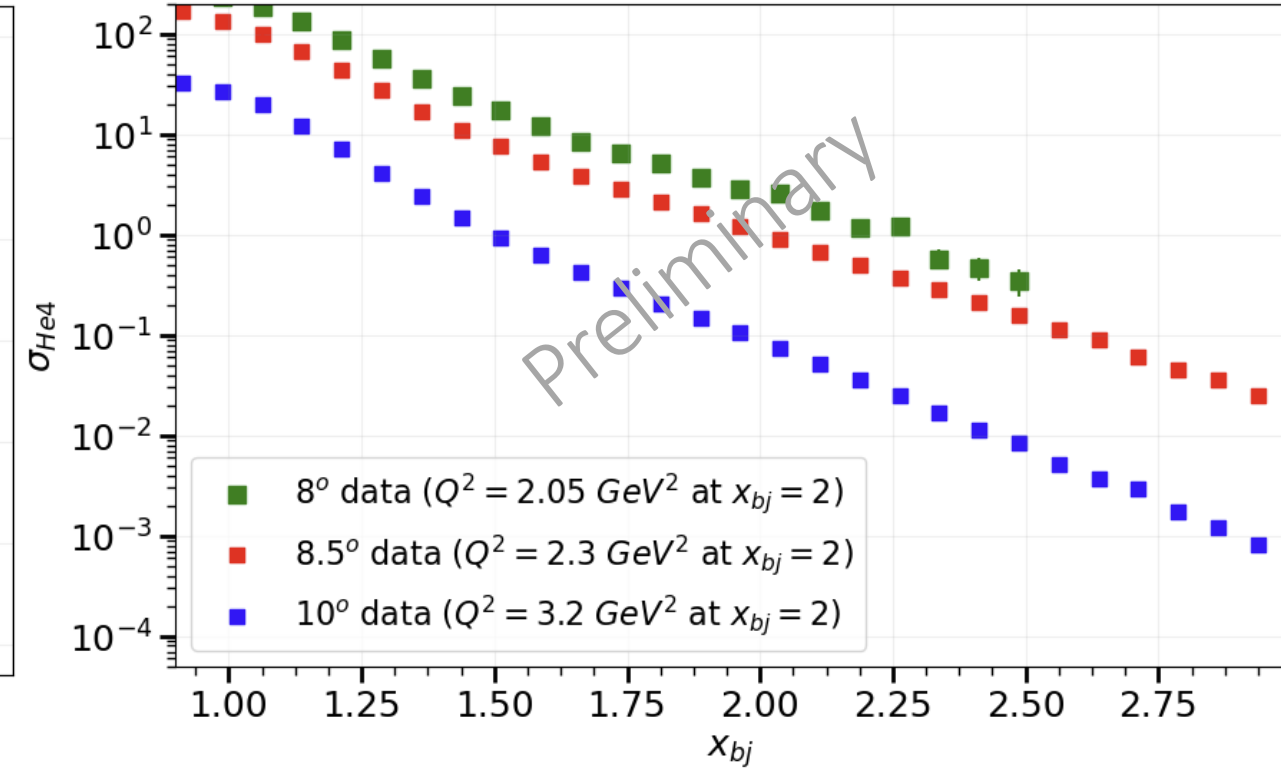


We measure cross sections!

Cross sections of Helium-3



Cross sections of Helium-4



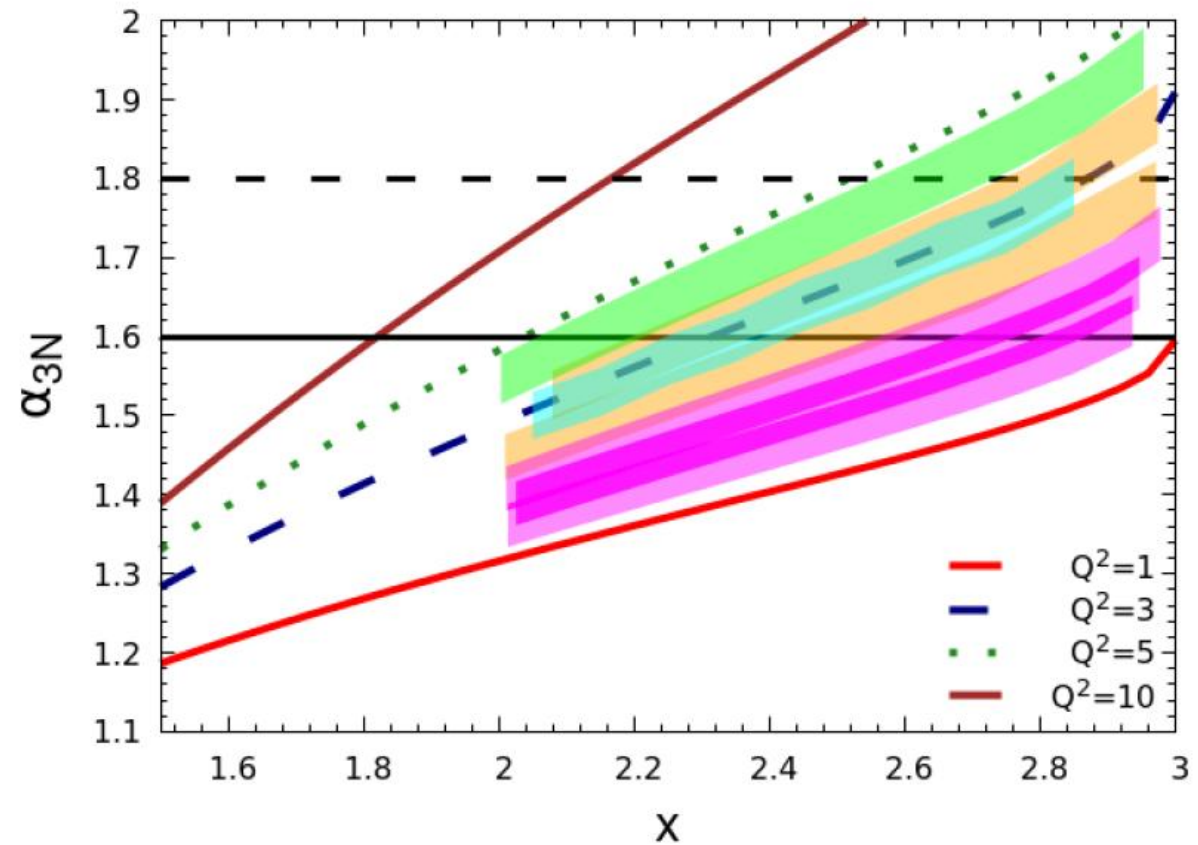
- We would like to compare this to calculable cross sections!
 - PWIA with available spectral functions
 - Any non-PWIA calculations available?

Summary

- 3N SRCs have not yet been observed
- Understanding α_{3N} tells us where to search
- XEM2 will extract the current highest precision cross sections in the 3N SRC region
- Current proposal to probe deeper into the α_{3N} region



Hall C: Proposed search region



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