

Observation of a correlated free four-neutron system

M. Duer et. al. *Nature* **606**, 678-682 (2022)

March 1st, 2023 Discussion

1. How is the ^8He beam produced? How does the BigRIPS fragment separator contribute to this process? (**Yenuel**)
2. Why was the SAMURAI spectrometer chosen for this experiment? (**Justin Bryan**)
3. What is the difference between a resonant $4n$ state and a bound $4n$ state? (**Mike**)
4. How was a total peak significance of 5σ determined for the resonant structure in Figure 3 (Left)? (**Justin Warren**)
5. What are the differences between quasi-elastic and elastic scattering? (**Jacob**)
6. Final state interaction: What is it and how does it differ from resonance? How does this affect the conclusion of the experiment? (**Andrius**)
7. Why is there no bound di-neutron state? How do we know there isn't one? (**Bikash**)
8. ^4He is $2n + 2p$ and is stable. $4n$ has a very short lifetime. Why do the two lifetimes differ so much if the only difference is a few quarks? (**Pramita**)
9. What are the implications of a tetra-neutron resonance? Why is this important? (**Joseph Foy**)
10. Have there been searches for tri-neutron ($3n$) bound states? If $4n$ states are possible then are $5n$, $6n$, etc. states possible? (**Nisha**)
11. What could be some of the reasons for the discrepancies in the energies/widths of the different theoretical models? (QMC, etc.) (**Chirag**)
12. What is COSMA? (**Bradley**)