Questions for discussion, Nuclear Lunch, March 1, 2017

Paper: Kisamori et al., “Candidate resonant tetraneutron state populated by the $^4\text{He}(^8\text{He},^8\text{Be})$ reaction”, Phys. Rev. Lett. 116, 052501 (2016).

1. What is the SHARAQ spectrometer? What are its components? [Gula]

2. What fragmentation reaction produces the $^8\text{He}$ beam? How do they obtain a 99.3% $^8\text{He}$ beam? [Som]

3. Why are we focusing on the tetraneutron but not on di or trineutrons? [Tyler]

4. In fig. 3a, they have a component of the spectrum labeled ‘direct decay’. What does direct decay mean here? Are they suggesting the tetraneutron decays to a 2n-2n cluster configuration? Does this cluster exist? [Mamun]

5. What was the Marques et al. result and why was it not sufficient to establish the existence of a tetraneutron? [Andrea]

6. Why is the missing-mass resolution limited to 1.2 MeV? Can it be increased for this experiment? [Abinash]

7. What is the beam time based on the cross section and counts for the reaction? [Shiv]

8. How is $s_i$ calculated and how does it relate to the number of standard deviations? [Matt]

9. What are the differences between RI Beam factory and FRIB? What are their energy ranges and beam intensities? [Rekam]

10. Is there any possibility of studying the tetraneutron with other reaction channels? [Sudhanva]

11. What are hypernuclei? [Kristyn]

12. What is the likelihood ratio test? [Bishnu]

13. $E_{4n}=0$ MeV corresponds to the 4 neutron decay threshold. Does this mean that after decay the 4 neutrons will go off in perpendicular directions? [Taya]