Nuclear Lunch Questions from “Dark force detection in e-p collisions”
For discussion on February 6, 2013

1. Why could the excess microwave emission from the Galactic center and the high-energy e+ excess perhaps imply dark matter? (Youngshin)
2. What is the “WMAP Haze”? (Shamim)
3. Is there a difference between the “standard” WIMP particle and the one that can explain these astrophysical observations? Why is a boson that has a mass at (or below) the GeV scale favoured by those observations? (Nowo)
4. Does dark matter interact non-gravitationally with standard-model particles in such a scenario? If so, how does the strength of this interaction compare with, e.g. the gravitational attraction between dark matter and “ordinary” matter? (Cody)
5. What effects other than the ones the authors have considered could contribute to the background? Could effects they have ignored be mistaken for a signal? (Arbin)
6. What is a “beam dump” experiment? How does it constrain the mass and coupling of the X? (Sushil)
7. If the X exists, give some reasons why X → e- e+ has never been observed in other experiments. Alternatively, what are the special features of this experiment which allow it to probe regions of X parameter space that have not already been excluded? (Anthony)
8. How could you do this experiment with only detecting three particles in the final state? What would be the downside of proceeding in that way? (Dilu)
9. Why is the coupling of X to the proton expected to NOT contribute much to the result? [Hint: look at Appendix E.] (Linda)
10. How does a windowless gas target work? (Azamat)
11. Why are the authors interested in a signal to background that satisfies S/Sqrt(B) > 5? (Andrea)
12. What is kinematic mixing, and how is it relevant in the models considered here? (Bijaya)