Physics 252 – Reading Exercise #8

(due Tuesday, May 31)

Read the paper:

H. Albrecht, *et al.*,Phys. Lett. **B 192**, 245 (1987)

Write a brief summary of this paper. Include answers to the questions below.

1. What is the observation claimed in this paper? Draw a Feynman diagram that contributes to B^0–$\overline{B}^0$ mixing. Why is it necessary that V_{td} be nonzero for this effect to occur?

2. What is the source of B mesons for this analysis?

3. Explain the event shown in Fig. 2, and explain why this event implies B^0–$\overline{B}^0$ mixing. The authors claim that the final state of this event contains two missing neutrinos. Why? The neutrinos are unobserved, so why does this not confuse the interpretation of the event?

4. The authors search for like-sign dilepton pairs as a signal for B^0–$\overline{B}^0$ mixing. What are the dominant sources of background to this signal? How do the authors control for events with two lepton pairs (e.g., $e^+e^-\mu^+\mu^-$) in which only two leptons are observed?

5. The third method used in this paper correlates the decay products of a B on one side of the event with the sign of a lepton on the other side of the event. Describe this method in more detail. Why is it more robust against contamination by hadrons faking leptons?