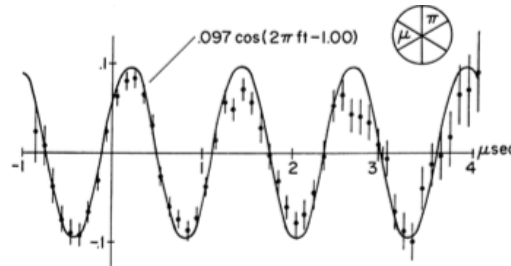# Physics 491: Recitation #9
October 23, 2015

1. From the data of Townsend Figure 4.3 – data from Sandweiss *etal.*, PRL 30, 1002 (1973) – on the precession of a muon in a magnetic field, determine the measured g-factor for the muon.

   The fit in the graph gives a period of 1.24 μs. The field was 60 G. The ratio of muon to electron masses is 210. The Bohr magneton is 5.8×10^{-11} MeV/T, and Plank's constant is 4.1×10^{-21} MeV·s.

2. Consider a spin-1 particle of positive charge q and g-factor g in a magnetic field $\vec{B} = B\hat{z}$. Take the initial state at $t = 0$ to be an eigenstate of $\hat{S}_y$ with eigenvalue $+\hbar$ which is in terms of the z-basis eigenstates:

$$|\psi(0)\rangle = \frac{1}{2} \left(|1,1\rangle + i\sqrt{2}\,|1,0\rangle - |1,-1\rangle \right)$$

   What is $|\psi(t)\rangle$? Calculate $\langle \hat{S}_z \rangle$ and Calculate $\langle \hat{S}_x \rangle$ as functions of time.

   Use the representation of $\hat{S}_x$ in the z-basis

$$\hat{S}_x \rightarrow \frac{\hbar}{\sqrt{2}} \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix}$$

   Check that the direction of the precession corresponds to what you get classically.