**HW8**

1. What are the proton and natural abundance ^{13}C densities in a 10% ethanol/90% water mixture? What would the relative sensitivities of ^1H and ^{13}C NMR experiments on this sample be, assuming all isotopes are present at natural abundance? How many distinct chemical shifts would be observed in the proton spectrum, and what would their relative amplitudes be? If a 14.1 T magnet is used to collect a proton FID from this sample, what is the minimum digitization rate required to resolve all of the proton peaks, assuming that the detector reference is placed at the chemical shift of water? You may need to look up some information to answer this problem.

2. Consider the following pulse sequence:
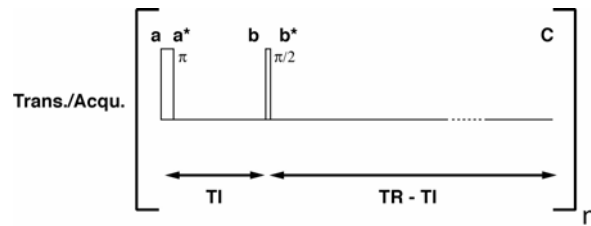
The sequence begins with a π pulse, followed by a delay TI, followed by a $\pi/2$ pulse and another delay $TR - TI$, such that the total repetition time for the sequence is TR. With respect to the longitudinal magnetization present before the π pulse, and assuming a homogenous $T1$ and $T2$ for the system under investigation, what are the longitudinal and transverse components of magnetization at points **a***, **b**, **b***, and **c**? At what point after the $\pi/2$ pulse will the signal be maximized? If the pulse sequence is repeated, what will be the steady state signal amplitude (*i.e.* transverse magnetization at the start of the FID) be, as a proportion of the equilibrium magnetization of the system M_{tot}?