**BME2104 -《生物医学影像技术》Home Work #4**

Due Date: June 5, 2024

***Note:*** *Please prepare your answers to the problems in a single PDF, and upload your PDF to Blackboard.*

1. What two factors determine the precession frequency of resonance?
2. How do we detect an NMR (or MRI) signal?
3. a. What is the Larmor equation?

b. The gyromagnetic ratio of a proton, *γ/*2*π*, is approximately 43 MHz/T. What is its precession frequency at 3T?

c. What ﬂip angle would be obtained with a *B*1 at 23.3 *μ*T applied for 0.5 ms?

4. Use the following *T*1 and *T*2 relaxation rates for gray matter and white matter for 1.5 T and 3 T.

Brain gray matter:

*T*1 920 ms (1.5 T), 1600 ms (3.0 T)

*T*2 100 ms 80 ms

Brain white matter:

*T*1 790 ms (1.5 T), 1100 ms (3.0 T)

*T*2 90 ms 60 ms

* 1. Write a program to plot (and label) the four *T*1 curves.
  2. Plot (and label) the four *T*2 curves.
  3. If faster T1 relaxation leads to brighter T1 images, which is brighter in a T1-weighted image - gray or white matter?
  4. If slower T2 relaxation leads to brighter T2 images, which is brighter in a T2-weighted image - gray or white matter?