

## **Chapter 3**

### **Introduction to Conventional Spin Echo and the Conventional Gradient Echo Sequence**

The Conventional Spin Echo and Conventional Gradient Echo Sequence are two of the most common sequences used in MRI. Although these sequences will be further explained in more detail later, let's introduce them before we move ahead. It is important to understand the concepts of these two sequences before we proceed to Spatial Localization and K – Space.

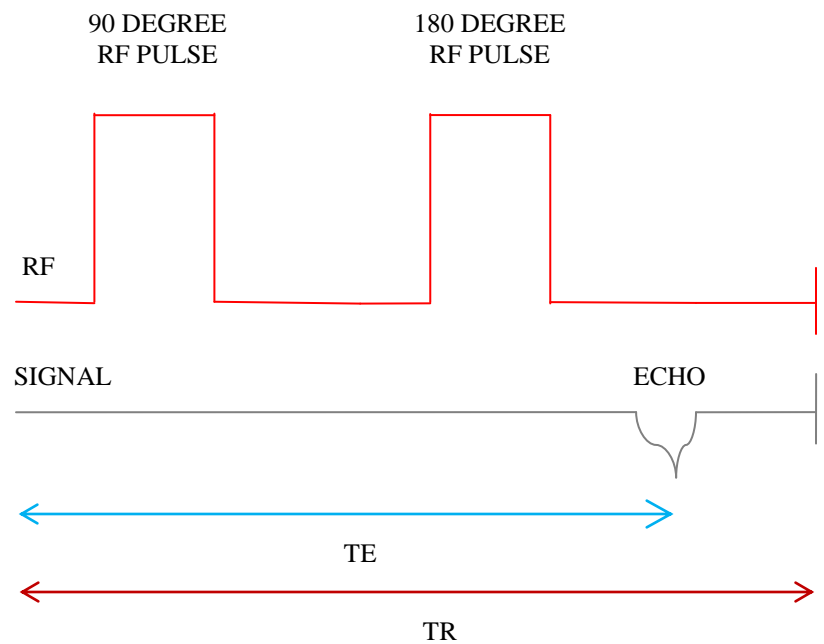
#### **Conventional Spin Echo Sequence**

Earlier in the book, the philosophy of magnetization relaxation was explained. Protons are randomly aligned in our bodies or space. Once these protons or spins are placed under the influence of a static magnetic field, some of them will align themselves parallel or anti parallel to  $B_0$  field. Following this event, the RF pulse is turned on and resonance occurs. The concept of resonance will force the spins, net magnetization, to move from the  $B_0$  field to the  $B_1$  field. Once the RF pulse is turned off, the spins will try to relax back to equilibrium. However, the spins are not refocused. Now let's look at the conventional spin echo sequence.

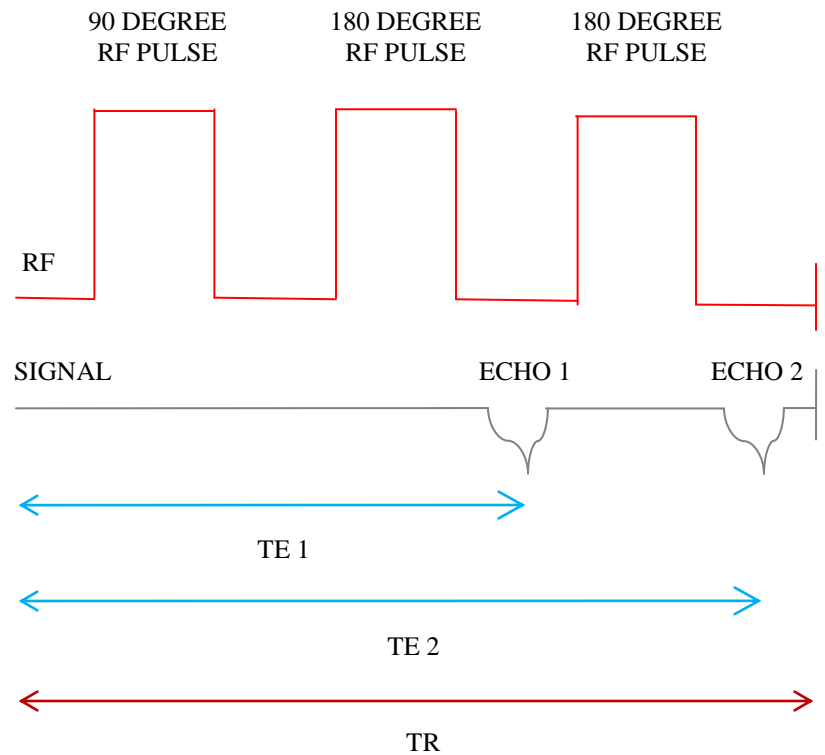
In conventional spin echo sequences, the net magnetization is forced out of the  $B_0$  field to the  $B_1$  field by the usage of a 90 degree flip angle or the optimal angle. Once this occurs, a second pulse is applied at 180 degree flip angle which

refocuses the spins. The signal that occurs from the refocusing pulse or relaxation is called the free induction decay (FID) or echo. This process is called spin echo.

- Listed is a diagram for the Convention Spin Echo Sequence.



- This principle applies to whether the spin echo sequence is a single echo or multiple spin echo sequence. A double echo collects two signals, one for each echo.



## Conventional Gradient Echo Sequence

Conventional gradient echo sequences utilize the same philosophy as the conventional spin echo sequences. The only difference between the two is the usage of a variable RF excitation pulse, flip angle, instead of a 90 degree excitation pulse. Conventional gradient echo sequences also use a gradient reversal to refocus the spin, instead of the 180 degree refocusing pulse used in the conventional spin echo sequences.

- Listed is a diagram for the Conventional Gradient Echo Sequence.

