1.6: How does precession generate the macroscopic magnetization (Mo)?

If we now examine what we would expect for an ensemble of nuclei, the magnetic moments of the +½ spins will be aligned with the applied magnetic field, while the moments of the higher energy –½ spin state will be opposed to B_o. However, all the spins in our sample will be precessing randomly about B_o at their Larmor frequency as illustrated in the figure below. Because slightly more of our nuclei are in the lower energy +½ spin state, if we take the vector sum of all the magnetic moments we will realize a single vector pointing in the direction of the applied magnetic field called the macroscopic magnetization, M_o. The macroscopic magnetization then provides a way to visualize the population difference of our spins. It is this macroscopic magnetization vector that is manipulated in the NMR experiment.