CHAPTER B2
Radiofrequency Excitation and Reception

INTRODUCTION

The MR signal is generated when the proton spins are tipped into the transverse plane by the radiofrequency (rf) pulse. If the signal is then sampled without using any gradients, this is called a free induction decay experiment. In *UNIT B2.1*, this is discussed in detail, along with the basic physics behind how the signal is induced and picked up by the receive coil. The signal is usually demodulated and filtered before an MR image is reconstructed. In general, the signal is proportional to the square of the main magnetic field, although at high fields (B_0 >0.1 T) the signal-to-noise ratio is linearly proportional to the field.

With the appropriate timings, an rf pulse can be made to tip all the spins into the transverse plane; however, in order to excite a slice (or to obtain the signal from a finite slice), a slice select gradient must be turned on when the rf pulse is on. Unfortunately, the presence of the excitation gradient will dephase the spins and thus reduce the signal. To overcome this problem, a refocusing gradient is used to rephase the spins after the rf pulse. Along with the concept of "beam" excitation, these are the topics of *UNIT B2.2*.

In *UNIT B2.3*, several other slice select related topics are discussed, including spin dephasing, the rf slice profile, and rf power deposition. The latter is particularly important because the radiative power must be limited so that the patient will not receive too much energy from any given sequence.

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