Lesson 9 (B): Slice selection

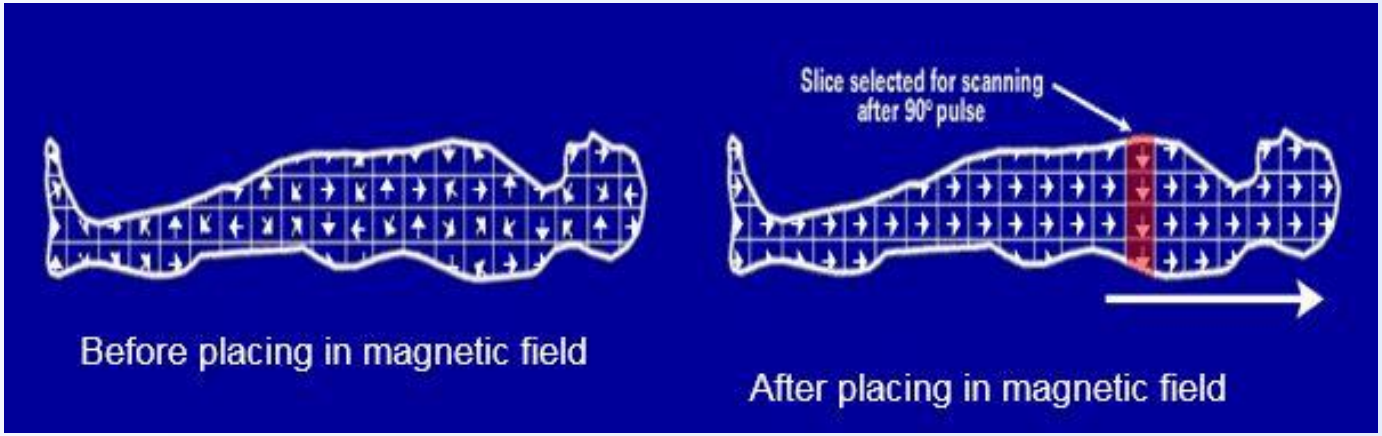
Aims

- Learning the following topics:
- Role of gradient coils in slice selection
- Selection of slice thickness
- Selection of slice location

Introduction

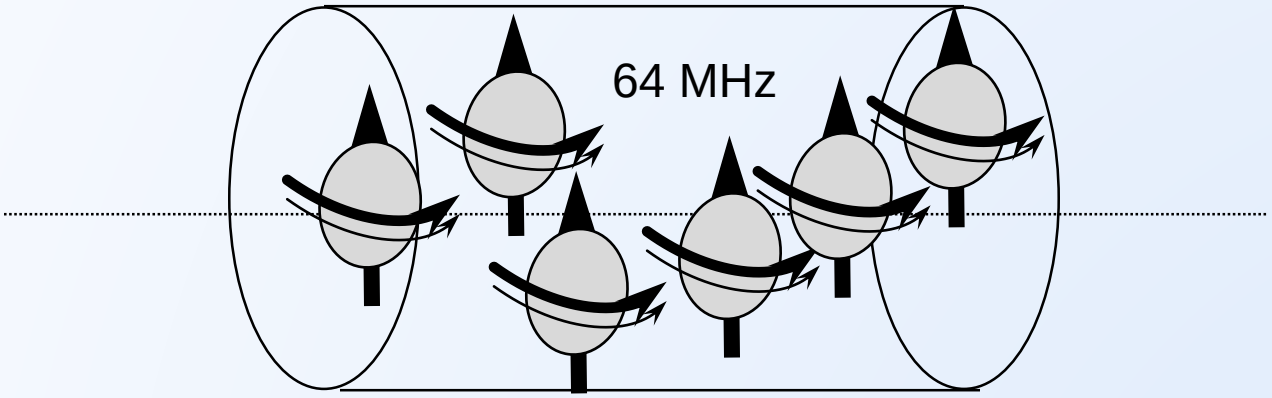
- Once a slice has been selected, we worry about the problem of in-plane spatial encoding, i.e., discriminating position within the slice.

- Determination the specific origin point of each component of the signal is the function of the gradients.



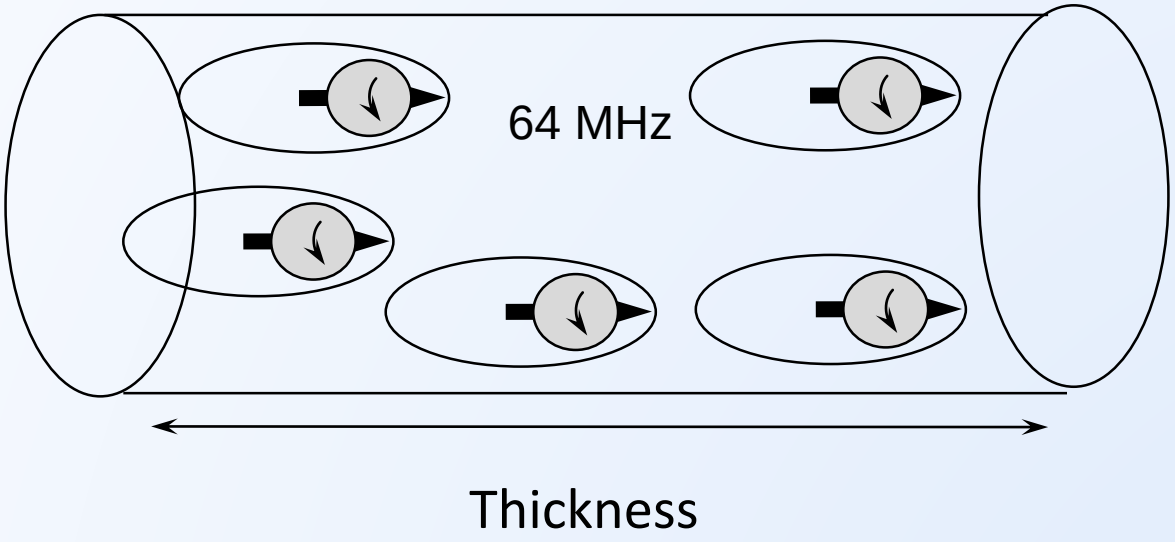
No magnetic gradient

- 1.5 T magnetic field intensity



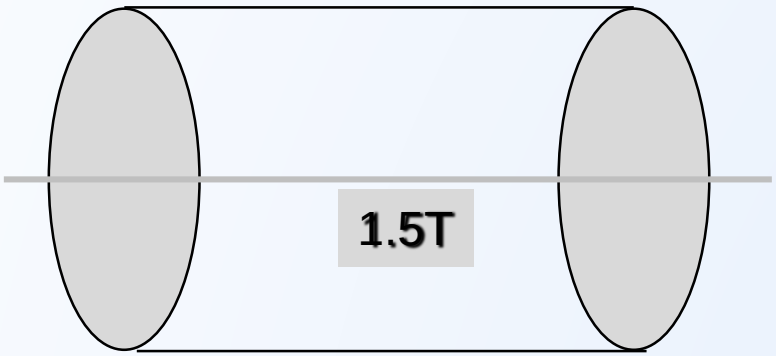
No magnetic gradient

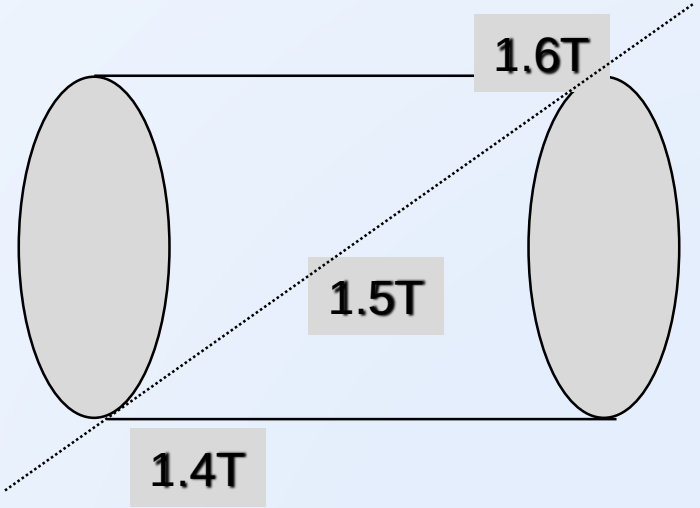
- Applying 90◦ RF pulse



Magnetic gradient

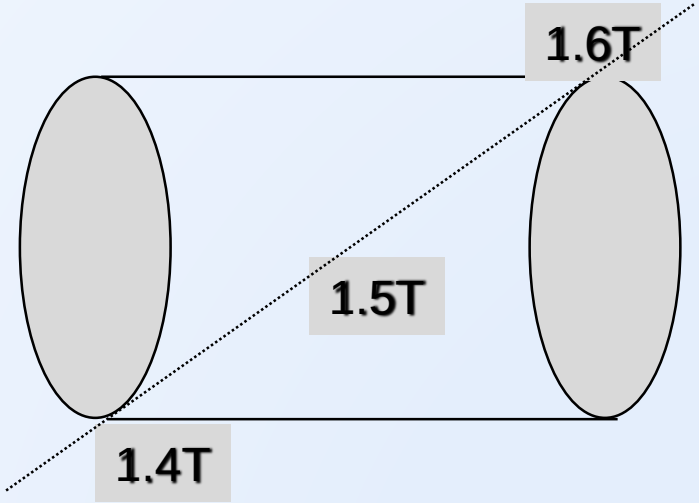
- A gradient is a magnetic field that changes from point to point in a linear manner.





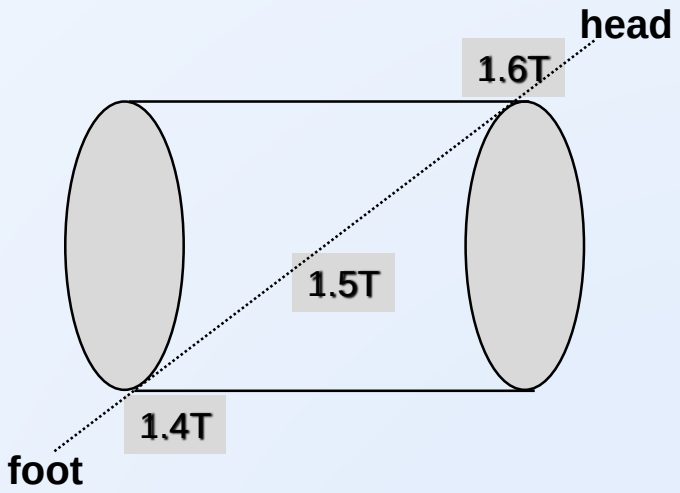
Magnetic gradient

- This variation in magnetic field is several orders of magnitude smaller than the external magnetic field but is significant enough to allow spatial encoding.



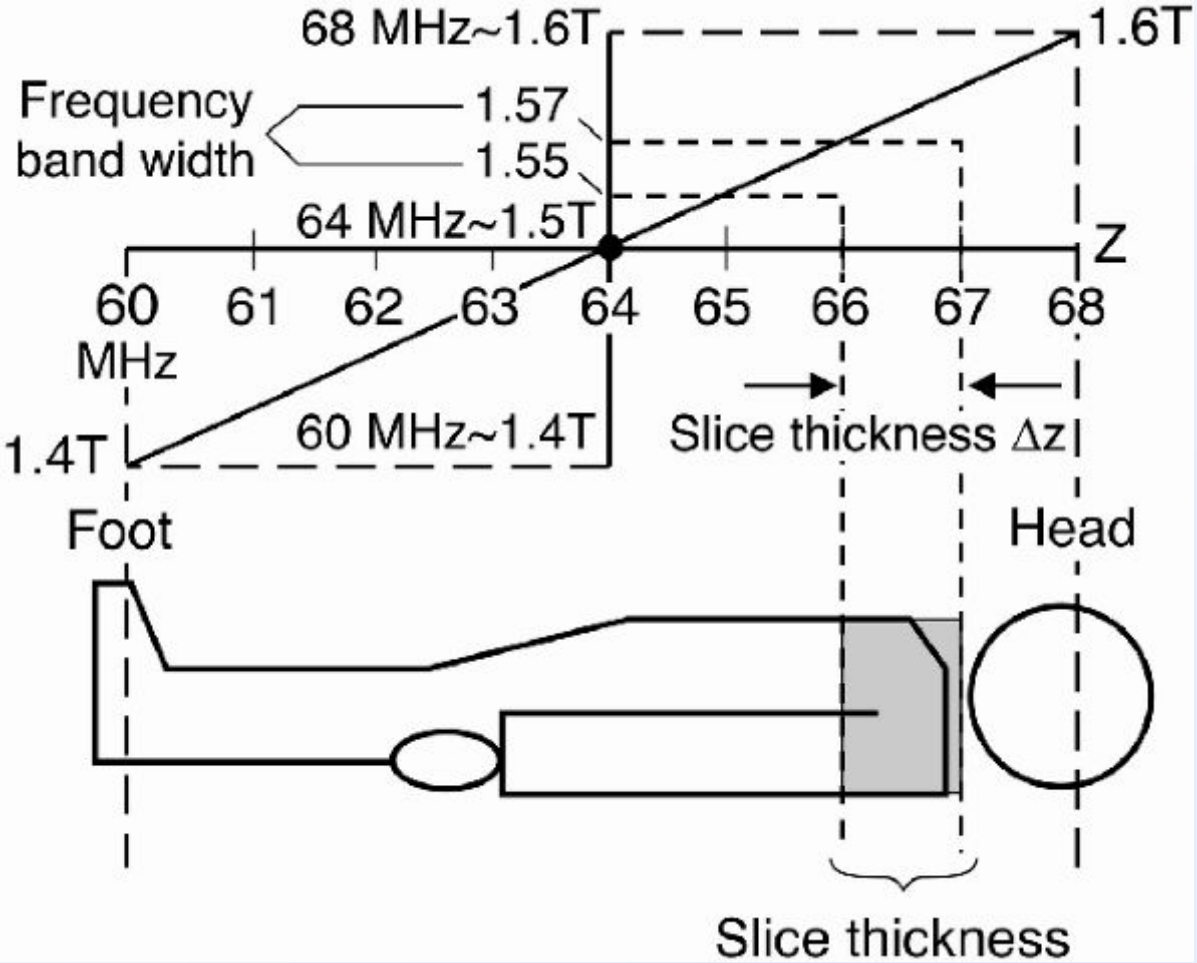
Slice selection gradient

- Using the Larmor equation ($\omega=\gamma B_o$):
- 1.4 T ~ 60 MHz
- 1.5 T ~ 64 MHz
- 1.6 T ~ 68 MHz



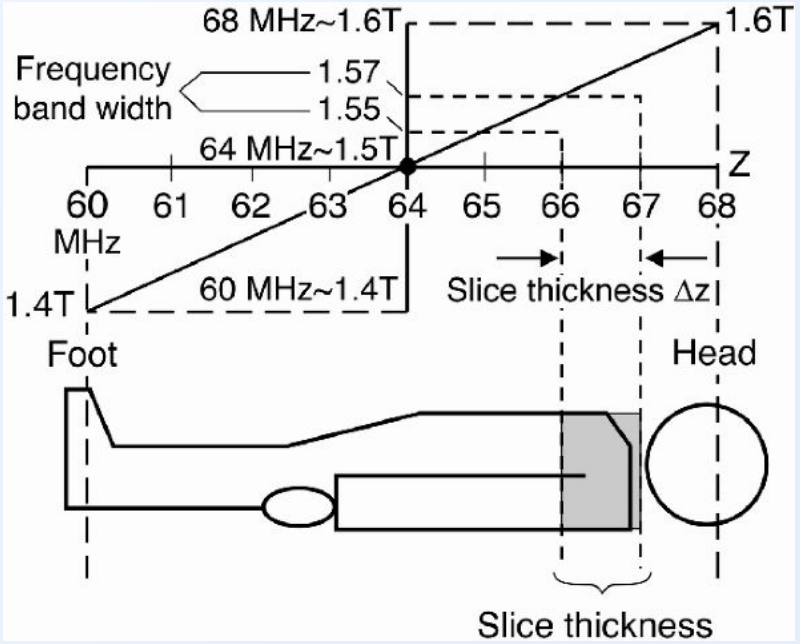
Selection of slice thickness and location

- Text

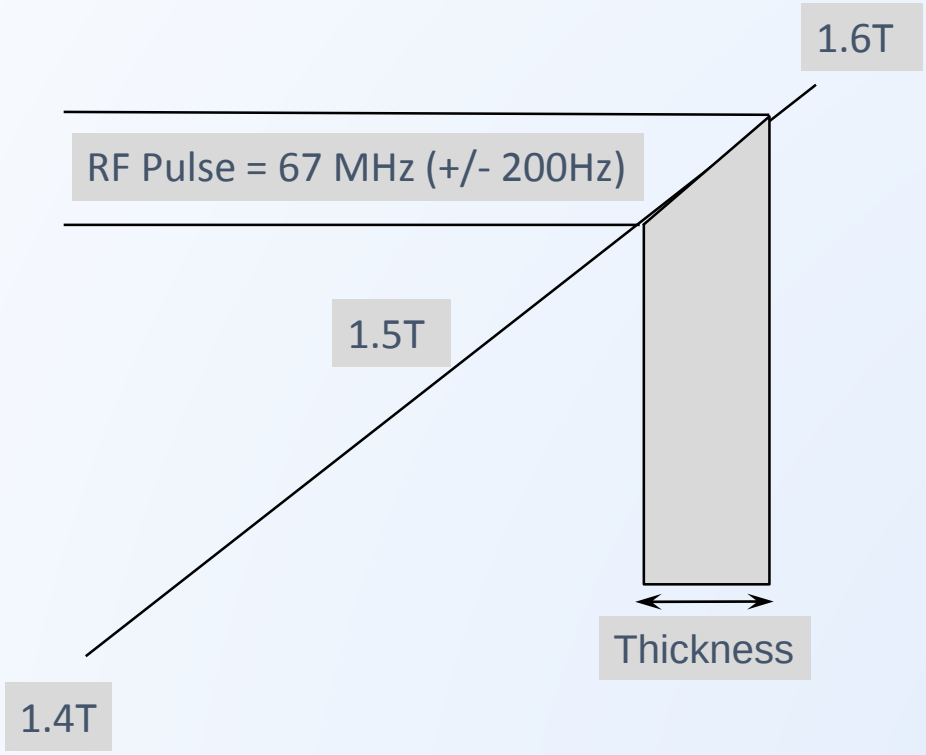


Slice selection

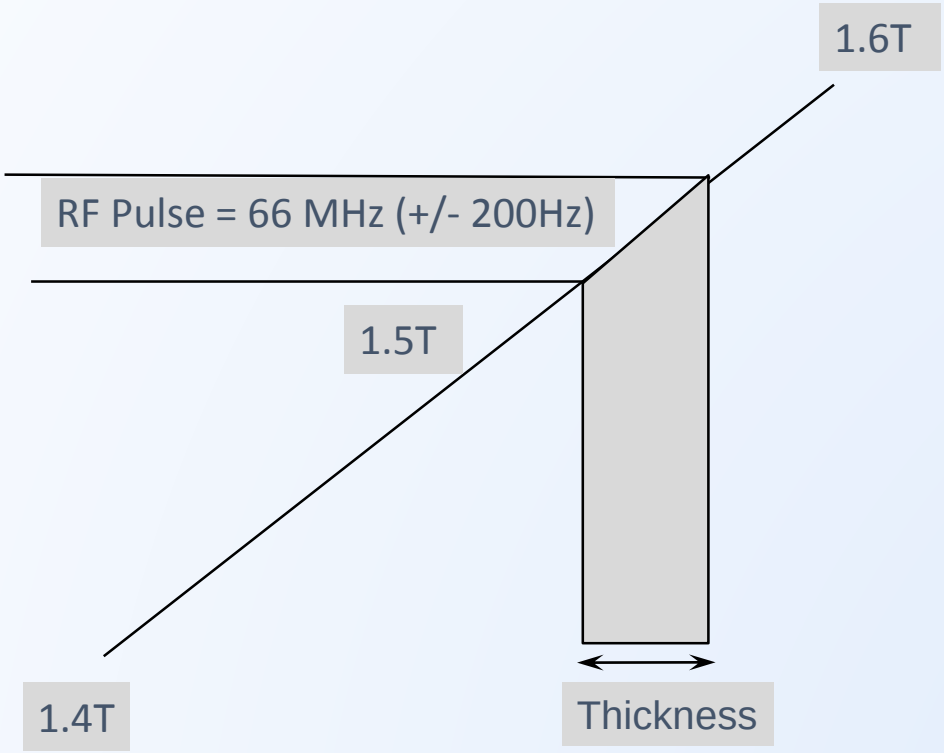
- When we transmit an RF pulse that matches the proton precessional frequency in a certain section of the body →
- Only the protons in this section will resonate; none of the other protons in any other portion of the body will resonate (i.e., flip into the transverse plane).



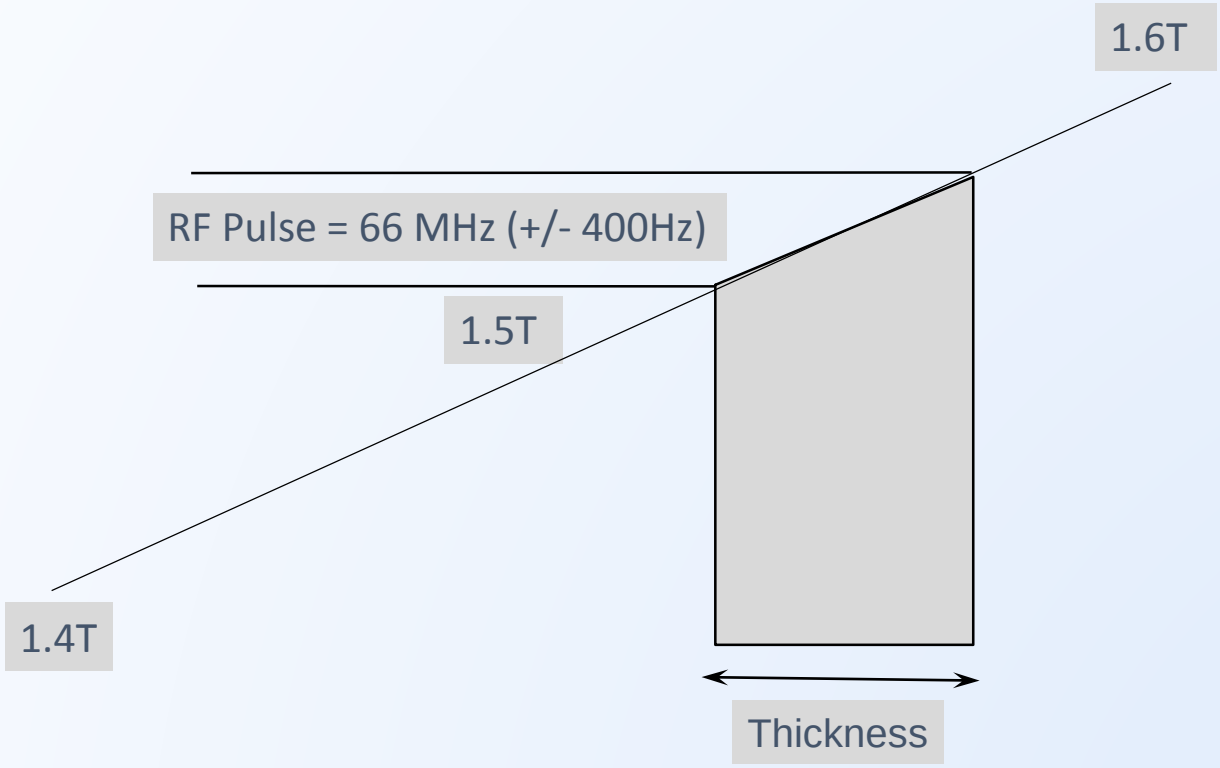
Selection of slice thickness and location



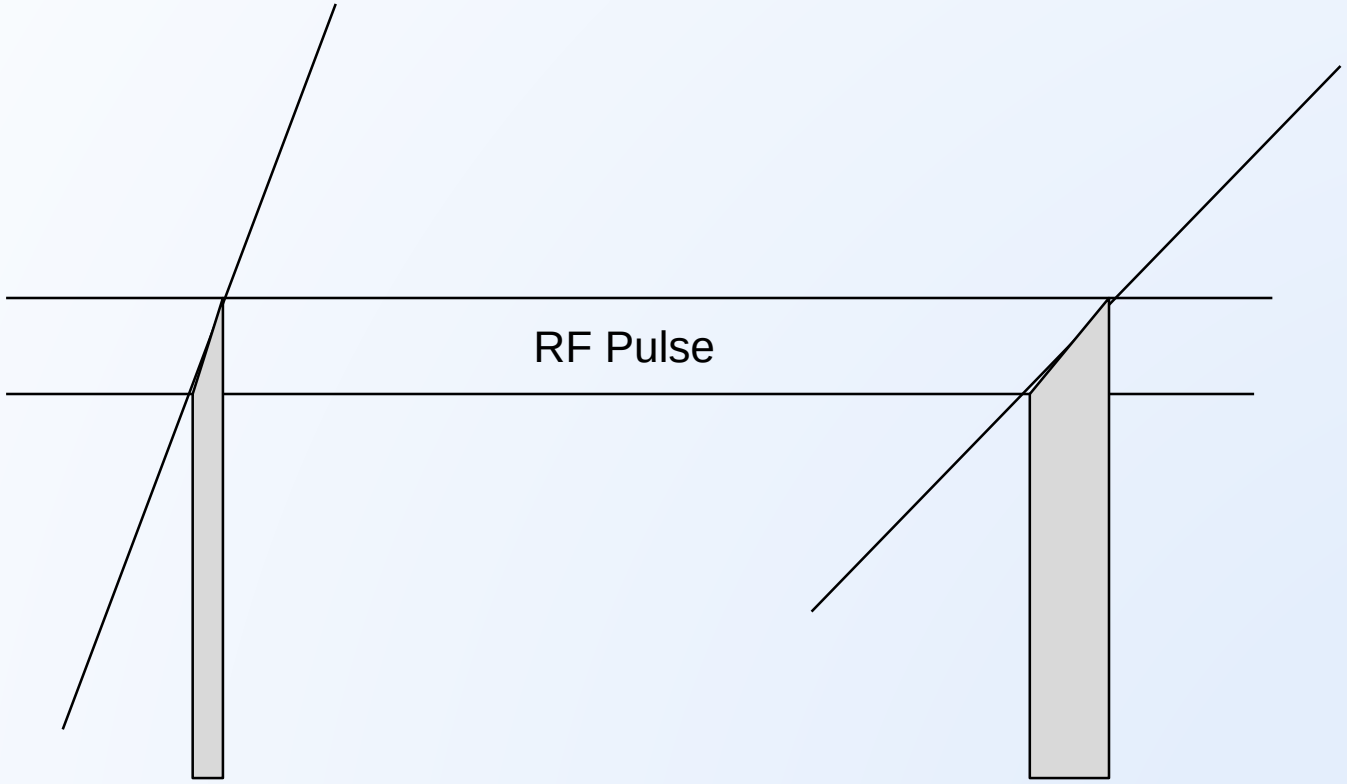
Selection of slice thickness and location



Selection of slice thickness and location



Control slice thickness by changing the slope of the slice selection gradient



Summary

- Role of gradient coils in slice selection
- Selection of slice thickness and location

References

- Hashemi RH and Brandy WG. MRI the Basics, Second Edition.