Slice Thickness

What is Slice Thickness?

Slice thickness is a user controllable parameter in MRI that must be chosen for every acquisition. A 'slice' in MRI is a planar region of excited tissue, from which signal is recorded and images can be reconstructed. Images are viewed at the scanner, and appear to be perfectly thin 2D pixels cut through anatomy on the monitor, but really represent the summed signals of 'chunks' of tissue called voxels that we can view from different angles. It's a bit unintuitive, but it is important to understand- slice thickness has major impacts on both Signal to Noise Ratio and Volume Averaging artifact.

Slice Selective Excitation

In order to acquire a single slice, a discrete volume of tissue needs to be excited, while leaving any neighboring tissues unaffected so they don't corrupt the signal from the area of interest. The MR scanner achieves this with a combination of gradients and radiofrequency pulses. It is a multi-step process that occurs quickly- on the order of micro to milliseconds. Keeping in mind that once the patient is inside the magnet, some of the protons in their tissues become magnetized and generally align along the b0 field of the scanner and precess at a known frequency; ~63MHz for 1.5 Tesla or 128 MHz for 3 Tesla.

1. A gradient is imposed perpendicular to the desired slice; this changes the Larmor Frequency along that direction linearly. This is known as the slice select gradient.
2. At the same time as the Slice Select gradient is activated, a radiofrequency pulse will be played out over a few thousand hz, corresponding to the desired slice thickness. This is known as the RF transmit bandwidth.

By modifying either the transmit bandwidth and the strength of the slice select gradient, different slice thickness may be achieved. Typically the transmit bandwidth is not changed much, rather it is the slice select gradient that is primarily used to determine slice thickness.

{ {:library:slice_selection.png?600|}}

From:
https://wiki.virtual-scan.com/ - **Knowledge Portal**

Permanent link:
https://wiki.virtual-scan.com/doku.php?id=library:slice_thickness&rev=1751998333

Last update: **2025/07/08 18:12**