

## Measuring T1

### T1 Measurement

Disclaimer: I'm not convinced that this is giving good data — some values that I'm getting feel good, but others seem too large.

The common method of measuring T1 is by an "inversion/recovery" procedure: one excites the sample with a 180° pulse, then lets the sample relax for a variable time ( $\tau$ ) before observing it with a 90° pulse. If the sample has relaxed completely by the end of  $\tau$ , you will see the result of the 90° pulse, as if the 180° pulse had never happened (ie, full positive intensity). If the sample has relaxed halfway, the  $M_z$  component will be zero, so there will be no intensity to observe after the 90° pulse. Lastly, if no relaxation has occurred, the 180° and 90° pulses together will be the equivalent of a 270° pulse (full negative intensity). The procedure is repeated for a variety of  $\tau$ -values, and the peak-heights are regressed vs  $\tau$ .

### Setup/Acquisition

1. Create a new experiment number in your dataset: "edc".
2. Recall the inversion/recovery experiment: "rpar protonT1 all".  
On the "Pulse Program" tab, click the  icon, to see the pulse-sequence diagram for the experiment. Ok to close the diagram window, but don't close the text window!
3. "getprosol"
4. In the "ased" parameters, set NS = 4, and verify that DS = 2 and D1 = 10. The  $\tau$ -values to be used (in seconds) are stored in the VDLIST. Click the -button next to VDLIST, and note the length of the list. From the command line, set L4 (# of loops) and the second field of TD (width of 2D dataset) to this value.
5. "rga" to set the receiver gain.
6. "zg" as usual, and hang out for 20 minutes. Individual 1D spectra will be acquired, but will be bundled into a pseudo-2D dataset.

### Processing / Analysis

7. "xf2" to transform the second domain of the pseudo-2D data.  
Click the "mountain range" button on the top row just because it's cool. You'll probably need to adjust the vertical scale (mouse wheel). The  and  buttons will let you vary the perspective.  
[optional: If you wish to adjust the phase of the 2-D spectrum, click the phase button () , right-click at the bottom of each (of one?) peak (vertical stripes) to establish places to view, then click the "phase rows" button (). Phase, then save-and-return ( button) as usual. ]
8. From the menus, choose Analysis : T1/T2 Relaxation. Follow the flowchart down the left-column of buttons:
  - a. Extract a slice from your data to phase. Either the FID or the spectrum is fine. The first slice (default) is fine. Phase the data (-button on top row), then save-and-return ( button within phase window).
  - b. Use the flow-chart's Peaks/Ranges button to define the ranges of the spectrum to regress. Integrate the spectrum () by dragging across the peaks, then export the data back to the T1/T2 routine (-button; export to Relaxation Module).
  - c. Use the flow-chart's Relaxation Window button to regress the peak intensity vs  $\tau$  data. On the big panel, be sure that the Fitting Function is "UXNMRT1", which is probably hidden at the top of the list. The + and - buttons will allow you to change which peak the plot displays data for. You

will probably need to delete the last data point or two ( -button). In this case, use the  and  buttons (left edge of bar) to recalculate the fit.