1. Introduction

The time constant T_2 is the transverse or spin-spin relaxation time. Any process that causes loss of magnetization on the x-y plane contributes to T_2. The magnetization follows an exponential decay:

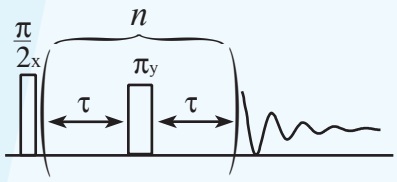
$$M = M_0 e^{-t/T_2} \qquad (1)$$

However, the inhomogeneity of the static field also causes a loss of the transverse magnetization, which is written as T_2^*. Since spin echoes remove the effects of inhomogeneity, the time constant that results from the decay envelope of a series of spin echoes approchs the real T_2. The classic experiment for this purpose is the Carr-Purcell-Meiboom-Gill (CPMG) experiment.

(Method 2)

2. Pulse sequence

In general, data acquisition time required for spectral resolution is longer then the delay between two π pulses required to cancel inhomogenity. Method 1 is only suitable for samples that result in one peak. Figure 2 shows a more general approach to implement CPMG. Again, a series of echoes is generated after the 90° pulse, but the signal is acquired only at the center of the last echo. The number of loops and thus number of echoes is given in a 2D table. Consequently, the specta with different numbers of echoes are stored as rows in the 2D matrix.



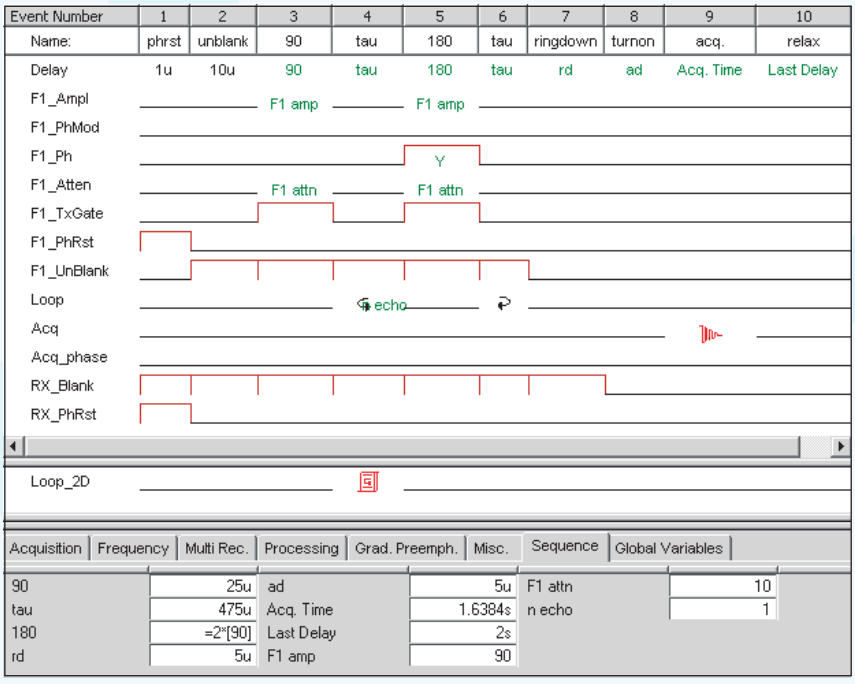


Fig. 3 The CPMG pulse sequence for Method 2.

3. Experiment and results

Sample: dibromopropionic acid in D_6-benzene
90^o pulse = 25 µs
τ = 475 µs
Max. number of echoes: 74

Data procesing:

1. Locate the cursor on the peak for T_2 calculation.

2. Open the NTNMR data Analysis window, and select "Auto" mode to input "X Values".

3. Select "Real" for the real part of the FT data and "Intensity" as "Y Values", and click "Draw".

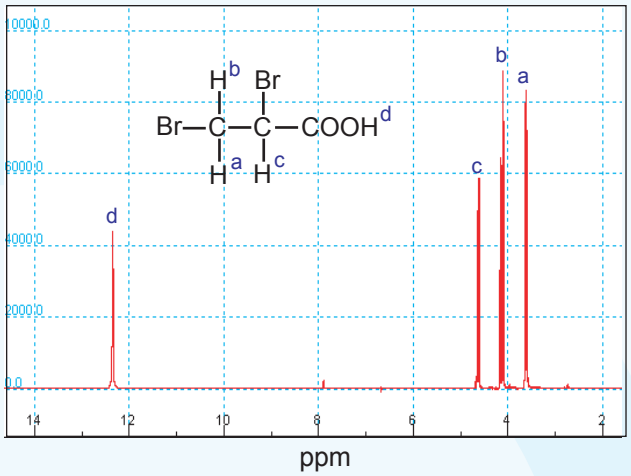


Fig. 2 ^{1}H NMR spectrum of dibromopropionic acid.

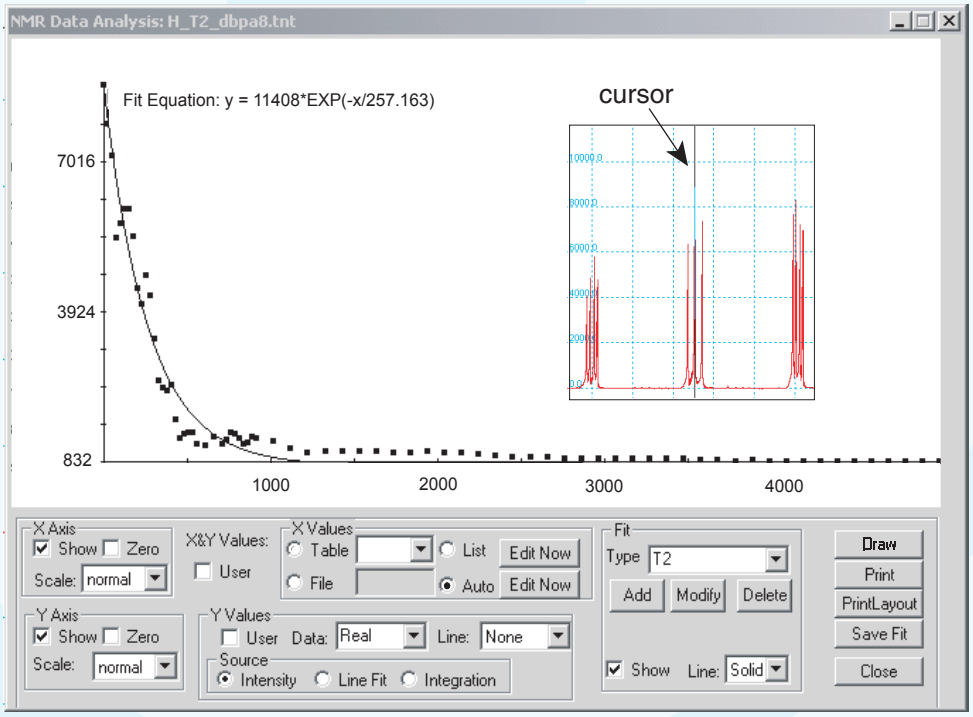


Fig. 3 NMR data Analysis window showing the T_2 fitting for dibromo-propionic acid and T_2 = 258 ms. Insertion: Part of the spectrum of dibromopropionic acid. The cursor is located at a peak, and its intensity is used for T_2 fitting.

4. Reference

1. Derome, A., "Modern NMR Techniques for Chemistry Research", Pergamon Press, New York, 1987.