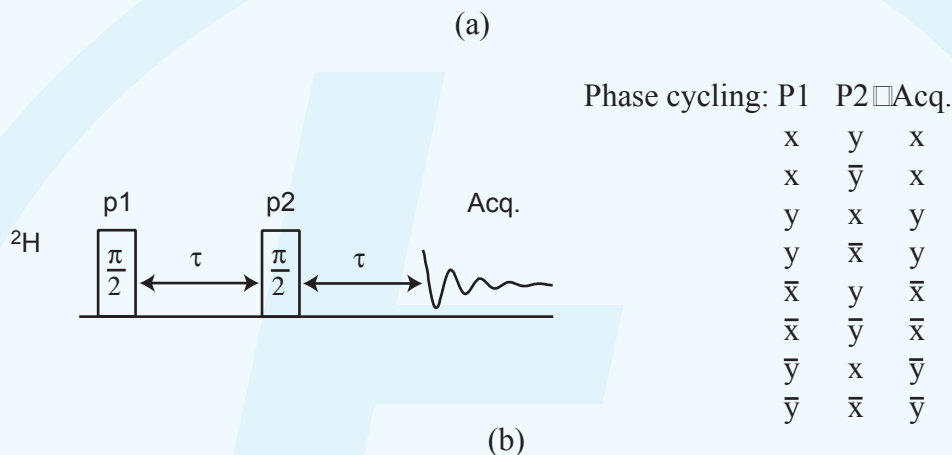


1. Introduction

A solid (quadrupolar) echo refocuses dipolar and quadrupolar couplings. It is generated by a 90° pulse applied at a time τ after the 90° excitation pulse (see Fig. 1a). The two 90° pulses must be 90° out of phase. The echo maximum is at a time τ after the second pulse. The echo delay τ should be smaller than the inverse coupling strength.

2. Pulse sequence



Event Number	1	2	3	4	5	6	7	8	9																								
Name:	phase reset	blank	D90_1	tau	D90_2	ringdown	turnon	Acq.	Relax																								
Delay	1u	2u	D90	tau	D90	rd	ad	Acq. Time	Last Delay																								
Acq																																	
Acq_phase																																	
RX_Blank																																	
RX_PhRst																																	
F3_Ampl			F3amp			F3amp																											
F3_PhMod																																	
F3_Ph																																	
F3_Atten			F3attn			F3attn																											
F3_H/L																																	
F3_Freq_I																																	
F3_Freq_Q																																	
F3_TxGate																																	
F3_PhRst																																	
F3_UnBlank																																	
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Acquisition</th> <th>Frequency</th> <th>Hardware</th> <th>Processing</th> <th>Grad. Preemph.</th> <th>B0 Compensation</th> <th>Misc.</th> <th>Sequence</th> </tr> </thead> <tbody> <tr> <td>D90</td> <td>1u</td> <td>rd</td> <td>10u</td> <td>Acq. Time</td> <td>10.24m</td> <td>F3amp</td> <td>80</td> </tr> <tr> <td>tau</td> <td>15u</td> <td>ad</td> <td>5u</td> <td>Last Delay</td> <td>3s</td> <td>F3attn</td> <td>8</td> </tr> </tbody> </table>										Acquisition	Frequency	Hardware	Processing	Grad. Preemph.	B0 Compensation	Misc.	Sequence	D90	1u	rd	10u	Acq. Time	10.24m	F3amp	80	tau	15u	ad	5u	Last Delay	3s	F3attn	8
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Fig. 1a: Solid echo pulse sequence. The phase cycle on the right side removes spurious signals that are generated if the flip angle of the second pulse deviates from 90°. b: the actual pulse sequence in the NTNMR sequence editor.

3. Experiments

Sample: \square Hexamethylbenzene (HMB)-D₁₈ or glycine-2, 2-D₂, ~20 mg

90° pulse width: 1 μ s

Solid-echo delay: 15 μ s

Spectrum window: \pm 50 kHz (HMB); \pm 500 kHz (glycine)

Recycling Delay: 3s (HMB); 15s (glycine)

Number of scans: 1024 (HMB), 4096 (glycine)

Magnet: \square 7 Tesla

Console: Discovery HF3

Probe: \square Home-built probe (original design by prof. Richard. J. Wittebort)

4. Results

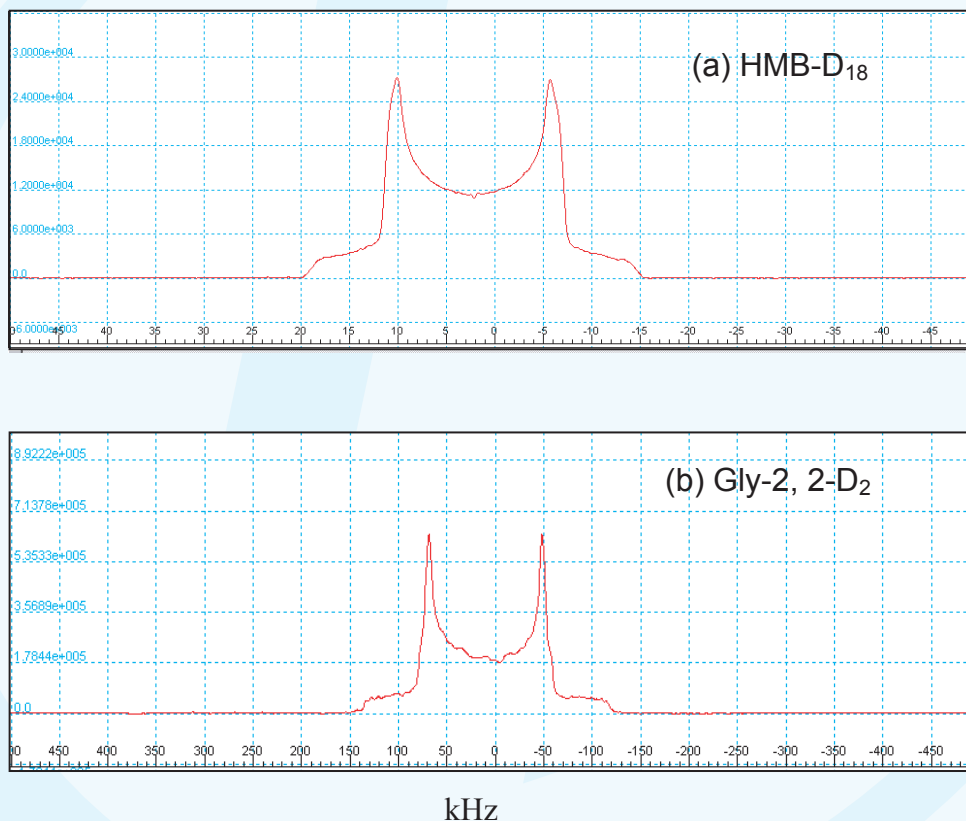


Fig. 2: ^2H spectra of HMB-D₁₈ (a) and glycine-2, 2-D₂ (b) obtained with sequence shown in Fig. 1.

5. References

- (1) K. Schmidt-Rohr & H. W. Spiess, "Multidimensional Solid-State NMR and Polymers" Academic Press Inc. San Diego, CA, 1999, p.63.
- (2) E. O. Stejskal and J. D. Memory, "High Resolution NMR in the Solid State", Oxford University Press, New York, 1994, p. 92.