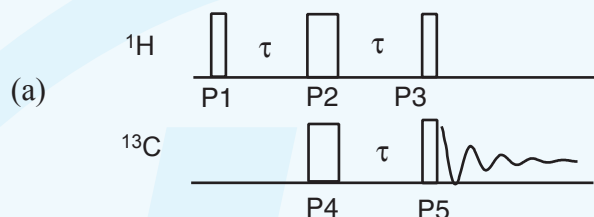


1. Introduction

The **In**sensitive **N**uclei **E**nhanced by **P**olarization **T**ransfer (INEPT) experiment is used to increase the signal strength of nuclei with low gyromagnetic ratio and low natural abundance. Sensitivity enhancement is described by γ_H/γ_X with γ_H and γ_X being the respective gyromagnetic ratio of H and X. It is achieved by polarization transfer from protons to a bonded nucleus X via X-H spin coupling. This example demonstrates the basic procedure of double resonance 1D NMR data acquisition and processing on Tecmag spectrometers.

2. Pulse sequence



(b)

Pulse width and phase cycle:

P1 (H90°): pH1 = 0, 0, 0, 0, 0, 0, 0, 0, 2, 2, 2, 2, 2, 2, 2, 2.

P2 (H180°): pH2 = 0, 2.

P3 (H90°): pH3 = 1, 1, 3, 3.

P4 (C180°): pHC1 = 0, 2.

P5 (C90°): pHC2 = 0, 0, 0, 0, 1, 1, 1, 1, 2, 2, 2, 2, 3, 3, 3, 3.

Receiver: phrx = 0, 0, 2, 2, 1, 1, 3, 3.

(pH2, pH3, pHC1, pHC2, and phrx are 1D phase tables. All tables are in 4 step mode.)

Event Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Name:															
Delay	1u	2u	H90	tau	H90'	C180	H90'	tau	H45'	C90	H45'	rd	ad	Acq. Time	Last Delay
F1_Ampl			F1 amp		F1 amp	F1 amp	F1 amp		F1 amp	F1 amp	F1 amp				
F1_PhMod															
F1_Ph			pH1		pH2	pH2	pH2		pH3	pH3	pH3				
F1_Attn			F1 attn		F1 attn	F1 attn	F1 attn		F1 attn	F1 attn	F1 attn				
F1_TxGate															
F1_PhRst															
F1_UnBlank															
Acq															
Acq_phase															
RX_Blank															
RX_PhRst															
F2_Ampl						F2 amp				F2 amp					
F2_PhMod															
F2_Ph						pHC1				pHC2					
F2_TxGate															
F2_UnBlank															
F2_PhRst															
F2_Attn										F2 attn					

Acquisition	Frequency	Multi Rec.	Processing	Grad. Preemph.	Misc.	Sequence	Global Variables
H90	18u	H45'	=[H90]-[C90]/2		Acq. Time	2.048s	F2 amp 100
tau	1180u	C90	4.2u		Last Delay	10s	F2 attn 16
H90'	=[H90]-[C90]	rd	25u		F1 amp	100	
C180	8.4u	ad	25u		F1 attn	8	

Fig. 1. (a) The ^{13}C INEPT sequence. (b) The sequence in the NTNMR sequence editor.

3. Experiment and Results

Sample: 5 % CHCl₃ in acetone-D₆
Spectrometer: 7 Tesla Magnet with Tecmag HF3 discovery
Probe: Naloac D300-5 OWB 5mm ¹H/¹³C Switchable probe
¹H hard pulse: 13.9 kHz (90° = 18 μs)
¹³C hard pulse: 59.5 kHz (90° = 4.2 μs)
τ: 1.18 ms (= 1/4J_{C,H} = 212 Hz)
SW +/-: ± 500 Hz
Last Delay: 10 s
Scans 1D: 128

Notes:

1. Before editing the sequence (Fig. 1b), calibrate the 90° pulse widths of ¹H and ¹³C using the nutation experiment (see note, "One Pulse Experiment and Pulse Calibration").
2. The center of pulses P2 and P4 (also P3 and P5) should be aligned. Since P2 > P4 (and P3 > P5) P2 (and P3) have to split into 3 pulses. The delay of P2's (and P3's) middle pulse equals to P4 (and P5), and the delay of both sides is (P2 - P4)/2 [and (P3 - P5)/2]. The middle pulse of P2 (and P3) falls on the same event as P4 (and P5).

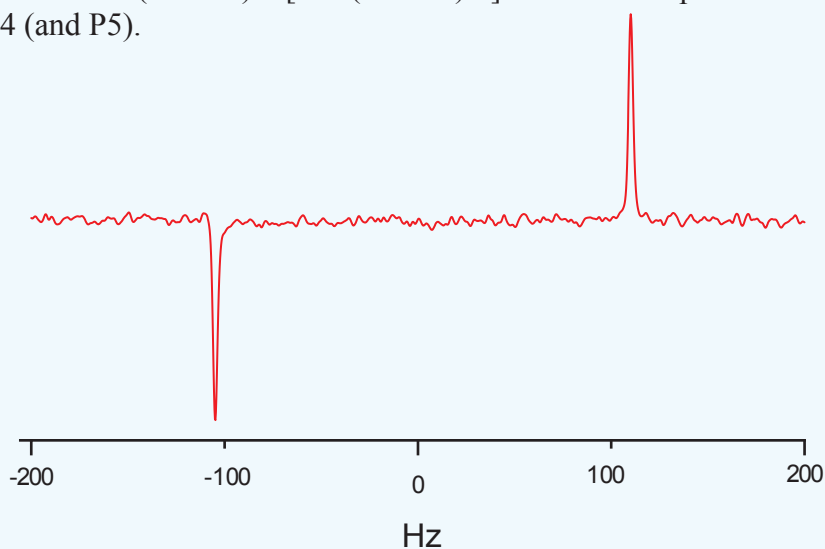


Fig. 2. The ¹³C INEPT spectrum of CHCl₃ as obtained using the sequence shown in Fig.1.

4. References

1. G.A. Morris, R. Freeman, *J. Am. Chem. Soc.* **1979**, *101*, 760-763.
2. S. Braun, H.-O. Kalinowski, S. Berger, "150 and More Basic NMR Experiments", Wiley-VCH, 1999, p.168-170.