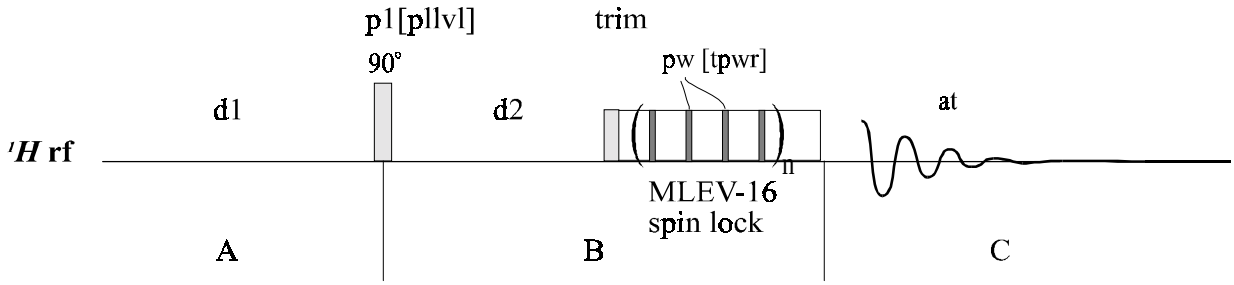
IX. TOCSY (or HOHAHA) – Total Correlation Spectroscopy

(17-Jul-00)

A. Discussion

- TOCSY provides COSY-like spectra, but with all ^1H connected appropriate with the mix time. Thus, mixtures and small molecular fragments can often be more easily identified with TOCSY.
- TOCSY spin-lock mixing provides Hartman-Hahn matching for coherence transfer. Strong coupling is required, and off-resonance effects can be troublesome. Use long-range COSY or DQCOSY to observe correlations involving small *J*-couplings.
- ROE's can be a problem with TOCSY spectra, especially as mix gets large. Clean-TOCSY, a variant not implemented in Varian's standard sequence, can offset ROE's by providing a similar NOE build-up, but this variation will only work for large MW where NOE's are negative.
- Watch the manual page [man('tocsy')] for changes in the TOCSY sequence(s). Implementation of DISPSI-2 spin-lock is underway, as well as gradient homospoils.
- Multiple mix times are often useful. These cannot be run arrayed with phase=1,2; phase=3 (TPPI) must be selected if arraying **mix** is desired. Queuing multiple experiments with different mix times and phase=1,2 is another method for this type of data collection, and is recommended.

2d TOCSY Spectroscopy (MLEV-16 Spin Lock)



B. Critical Parameters

p1, p1lvl = 90° pulse width at high power **p1lvl** (typically 52 to 60); recalibrate this parameter for all tocsy experiments (uses **pw, tpwr** from 1d to set **p1**, **p1lvl**)

pw, tpwr = 90° pulse width (~20 to 40 μs) at power **tpwr** (typically 46 to 52) used for MLEV spin lock; calibration of this parameter is also recommended

ni = number experiments, or number of points in t_1 ; should be set ok by macro, time allowing; must have F1 digital resolution ≡ sw1/(2ni) ≤ 12 Hz/pt but ~ 6 Hz/pt if time allows

mix = mixing time (length of spin lock), typically 30 to 100 ms

nt = multiple of 2 minimum, multiple of 4 if time allows

d1 = relaxation delay; set 1-2*T_1

np = number of points in t_2, usually want ≥ 1024 since costs nothing but disk space and gives better resolution in F2

phase = 1,2 is recommended (phase-sensitive acquisition)

trim = optimize by minimizing signal when **d2=0** and **phase=2**

C. TOCSY Acquisition

- prior to final setup, run **ni**=2 and carefully phase t_2 spectrum
  - then enter **calfa** and reacquire; observe baseline flattening
  - perform integrations on 1st increment if baseline correction is desired
- check that **nt**=multiple of 4 (2 can be used if time is critical)
- check that F1 dig resol ≡ **sw1**/2**ni** ≤ 12 Hz/pt, desire ~6 Hz/pt if time allows
- check that **p1,p1lvl** are set appropriately (should equal pw, tpwr from 1d ^1H experiment—I will likely change this confusing definition during the DIPSI implementation), and **pw,tpwr** are set to give **pw90** ≥ 20μs
- set **window = 2pw** (clean-tocsy only), and optimize **trim** by **mp(**current exp#+1), **phase=2** and **d2=0**, then choose **trim** giving minimized signal

D. Calibration

- recalibrate 90° pulses for **p1,p1lvl** and **pw,tpwr** (see ^1H section for instructions) for longer experiments; short/quick experiments can be run with *probe* file calibrations and macro setup

E. Data Workup and Plotting

- same as **dqcosy** (see DQCOSY section for phase-sensitive workup)