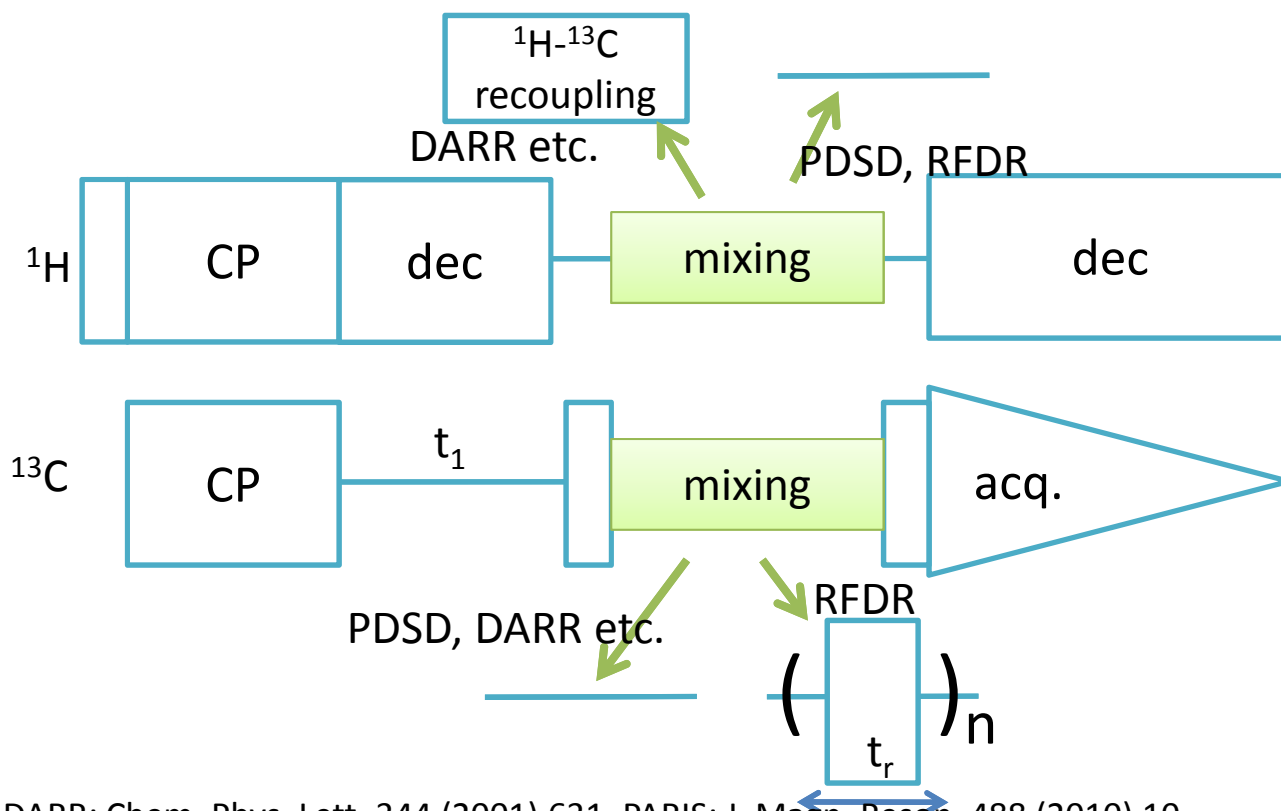
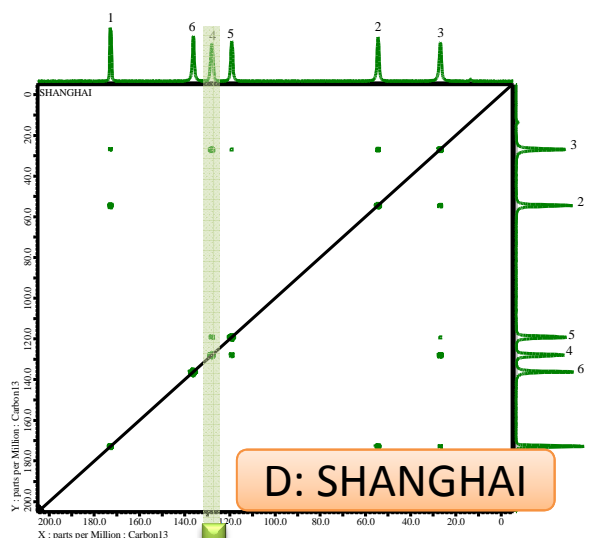
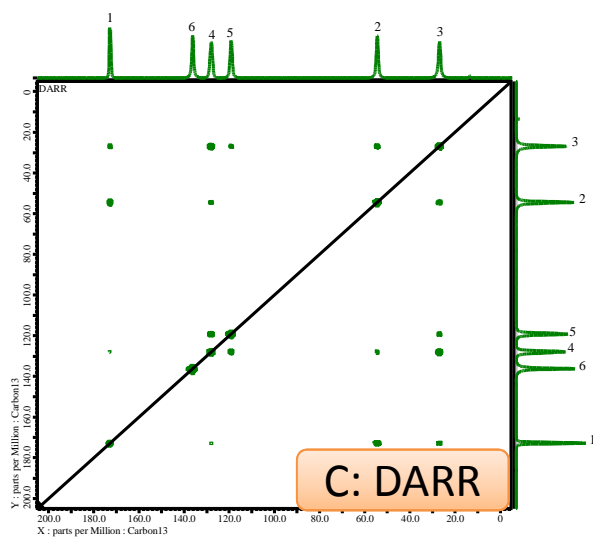
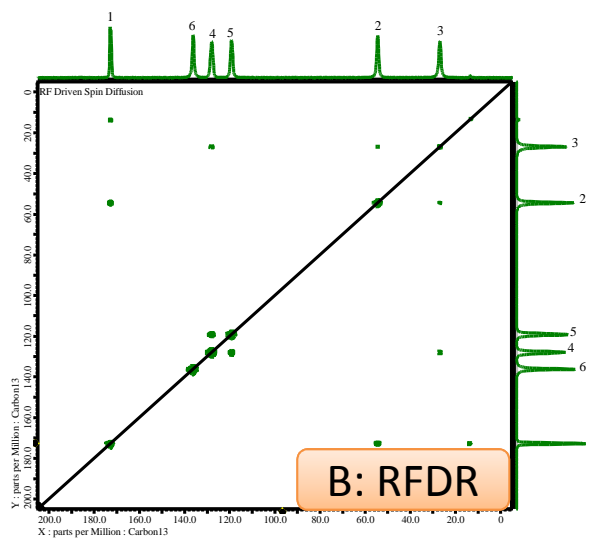
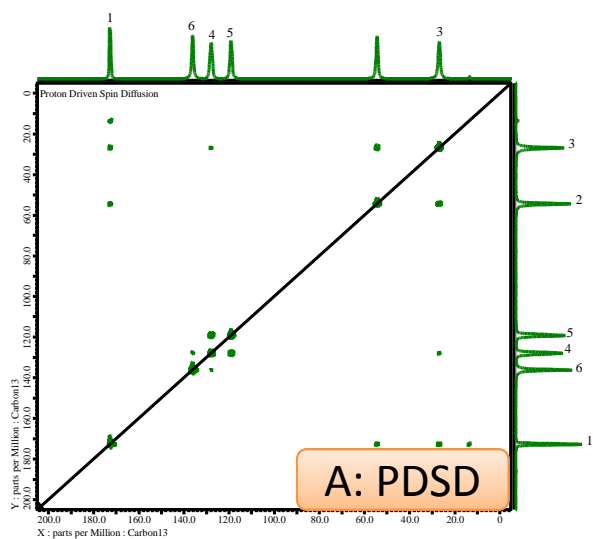


## $^{13}\text{C}$ – $^{13}\text{C}$ homonuclear correlations in solid-state NMR

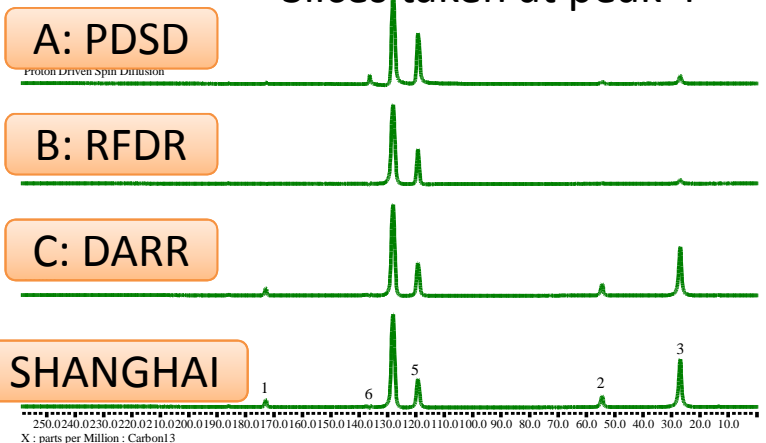
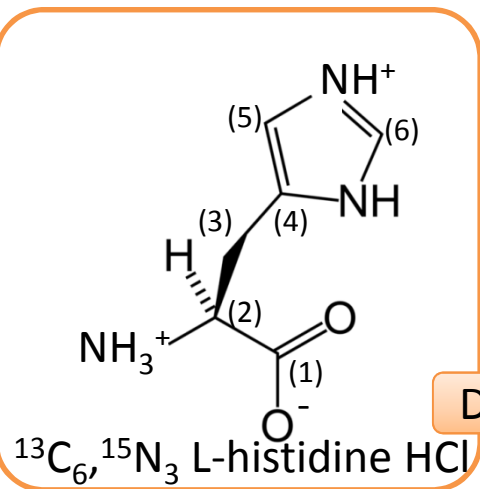
Magic angle spinning (MAS) suppresses anisotropic interactions, leading to high resolution and sensitivity. This also results in the suppression of  $^{13}\text{C}$ – $^{13}\text{C}$  spin diffusion even in uniformly  $^{13}\text{C}$  labeled samples.  $^{13}\text{C}$ – $^{13}\text{C}$  spin diffusion without any rf-field irradiation such as in PDS (Proton-Driven Spin Diffusion) experiments (Proton-Driven Spin Diffusion) is inefficient; a PDS spectrum (A) was obtained with a mixing time of 10 ms. The  $^{13}\text{C}$ – $^{13}\text{C}$  dipolar interactions can be re-introduced by rotor-synchronous rf-irradiation such as in Radio Frequency Driven Recoupling (RFDR) experiments. An RFDR spectrum (B) gives  $^{13}\text{C}$ – $^{13}\text{C}$  correlations with a much shorter mixing time of 1.6 ms. Although RFDR is a very efficient method to recouple  $^{13}\text{C}$ – $^{13}\text{C}$  interactions, the dipolar truncation hampers us to obtain two-bond correlations; only directly bonded  $^{13}\text{C}$ – $^{13}\text{C}$  correlations are observed in (B). This can be overcome by second-order recoupling methods like DARR, PARIS, SHANGHAI, etc. These methods achieve higher efficiency than PDS and give two-bond correlations as in (C) and (D). If the dipolar truncation is acceptable, RFDR gives the best efficiency; if not, second-order recoupling methods are the best.



DARR: Chem. Phys. Lett. 344 (2001) 631, PARIS: J. Magn. Reson. 488 (2010) 10, RFDR: J. Magn. Reson. 223 (2012) 107, SHANGHAI: J. Magn. Reson. 212 (2011) 320.



Slices taken at peak 4



ECA500, 3.2mm HXMAS, 20 kHz MAS