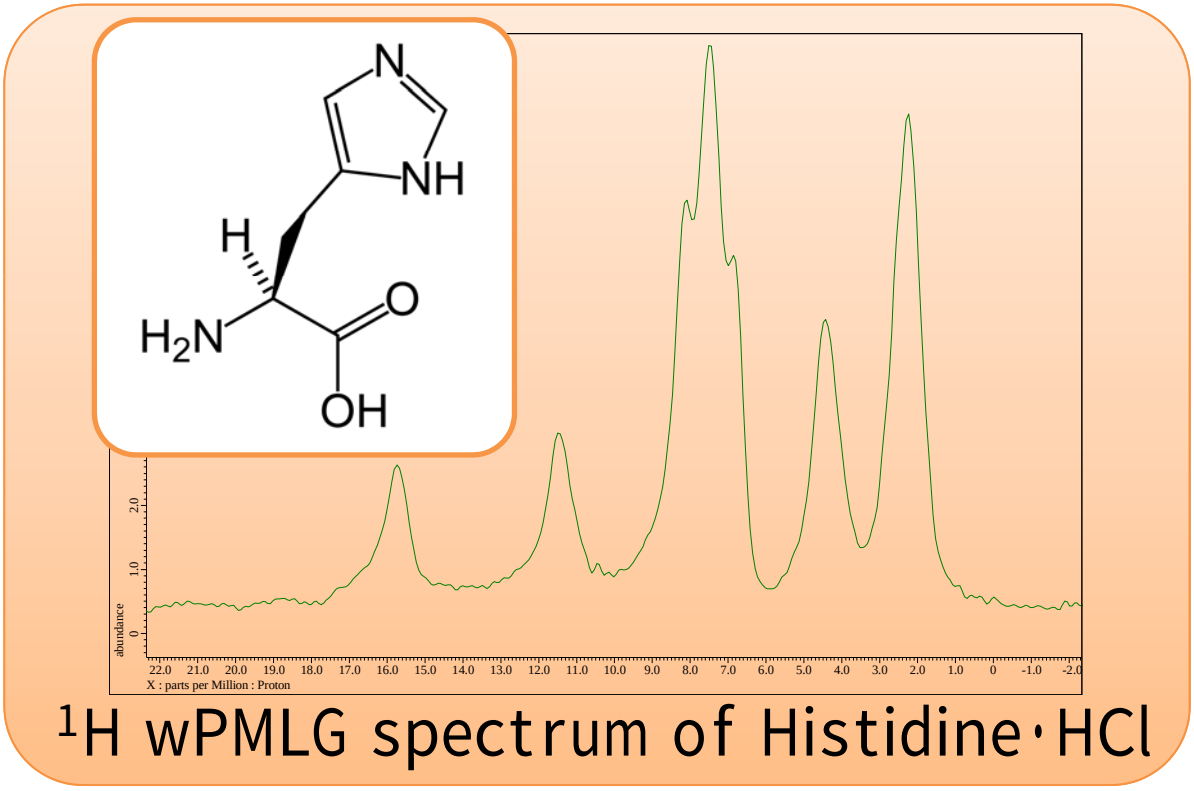
A practical guide to ^{1}H high resolution experiment: rf-field strength

Here we briefly introduce a tip for ^{1}H high resolution NMR experiments in solid-state, from a practical point of view. This method, in which ^{1}H homonuclear dipolar interactions are decoupled, has been known as 'Combination of Rotation And Multiple-Pulse Spectroscopy' (CRAMPS) for a long time. Although a special probe was originally required, a standard CPMAS probe enables us to perform cutting edge experiments now as only a moderate rf field is enough for a wPMLG experiment, which is one of the best CRAMPS sequences. As rf-field is increased up to 100 kHz, we can observe better resolution, but no further improvement is obtained when the rf-field is stronger than 100 kHz or with higher spinning frequency. The world's highest resolution is achieved with a standard CPMAS probe with an rf-field of 100 kHz and at a moderate spinning frequency.



^{1}H wPMLG spectrum of Histidine·HCl

L. Mafra et al., J. Magn. Reson. 197 (2009) 20-27.
M. Leskes et al., J. Magn. Reson. 199 (2009) 208-213.

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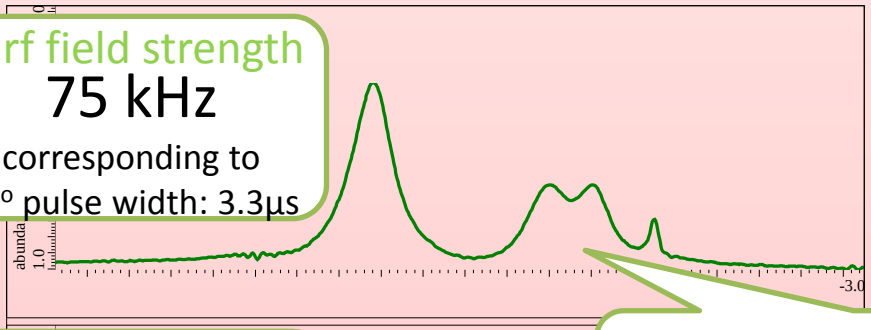
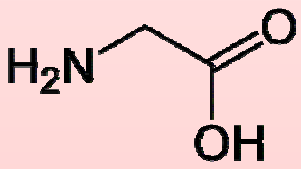
rf-field strength dependence of ^{1}H wPMLG spectrum

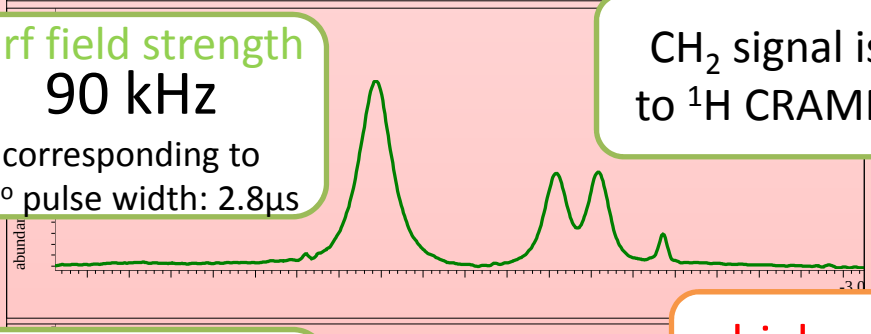
^{1}H rf field strength
75 kHz
corresponding to
90° pulse width: 3.3μs





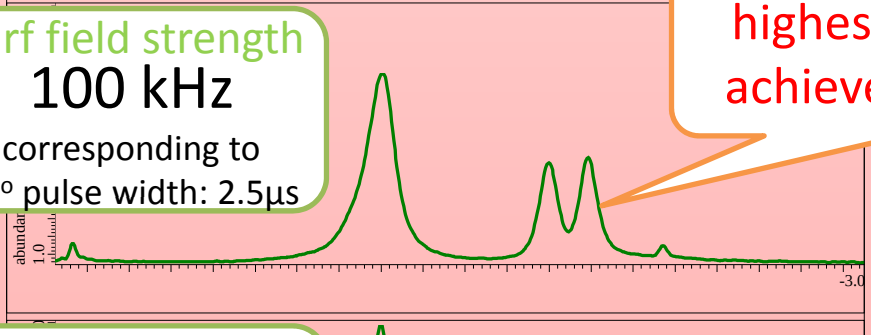
CH_2 signal is very sensitive to ^{1}H CRAMPS performance

^{1}H rf field strength
90 kHz
corresponding to
90° pulse width: 2.8μs

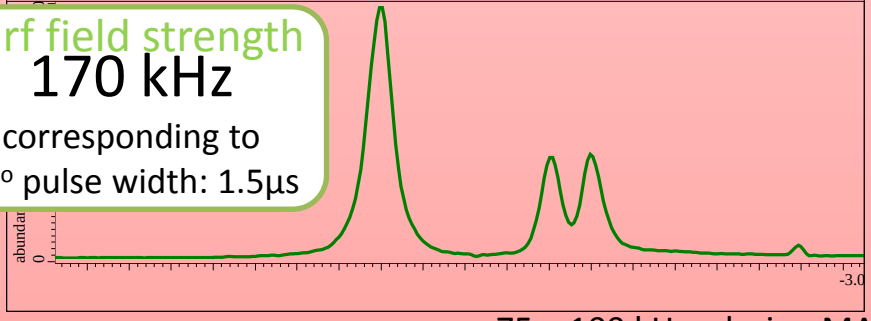


^{1}H rf field strength
100 kHz
corresponding to
90° pulse width: 2.5μs

highest resolution is achieved at 100 kHz!



^{1}H rf field strength
170 kHz
corresponding to
90° pulse width: 1.5μs



75 – 100 kHz: glycine MAS 15kHz
at ECA500 with 4.0mm CPMAS probe
170 kHz: glycine MAS 25kHz
at ECA500 with 2.5mm CPMAS probe

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