

Faster 2D NMR – Non-Uniform Sampling (NUS)

Two-dimensional NMR experiments are typically performed by having the NMR spectrometer run hundreds of individual 1D experiments with systematic incremental changes of one parameter. Consequently, 2D experiments usually take a long time to record. Dilute samples may require running experiments for hours or overnight, if using traditional methods.

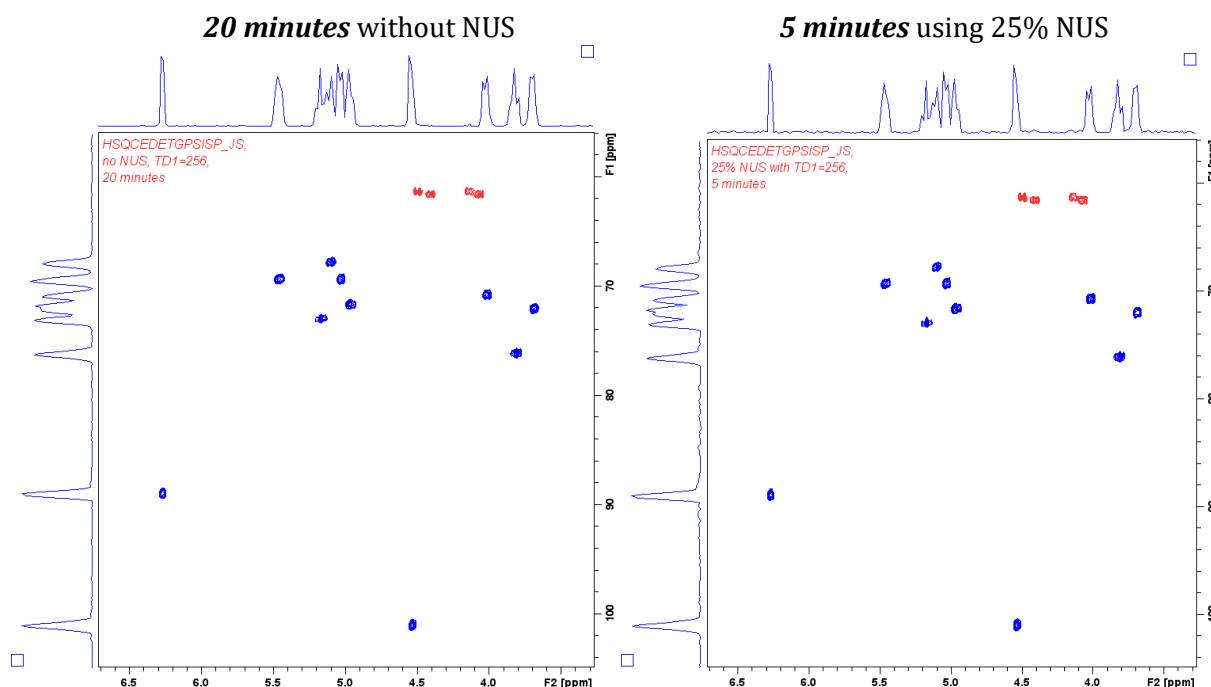
Non-uniform sampling will only record a small sub-set of these hundreds of individual 1D spectra and Topspin's processing will reliably interpolate the missing data points mathematically.

25% NUS will lead to 75% time savings, i.e. 2 hours instead of overnight.

Look for experiments with the “_NUS” tag.

Test Sample: 1 mM Cellobiose Octaacetate in CDCl₃

25% NUS-HSQC spectra are almost indistinguishable from the traditional experiment:



Benefits of NUS experiments:

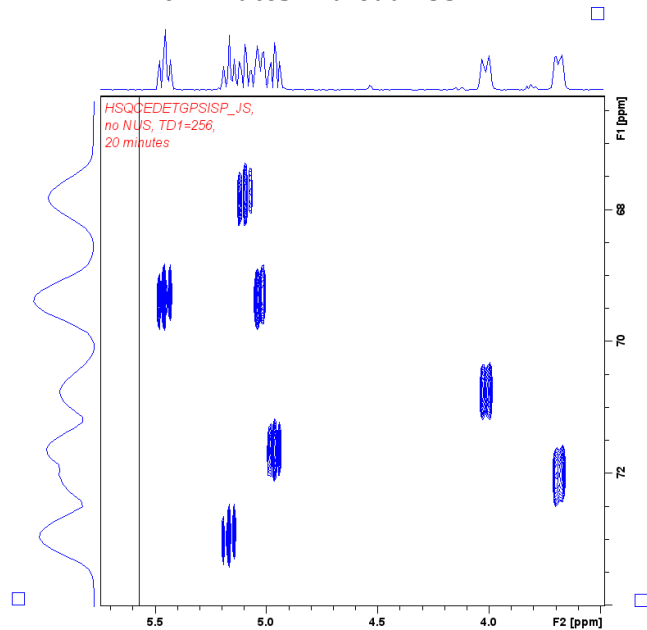
- Experiments will take less time.
→ more time for additional experiments / other users.
- Dilute samples can be run with 4X the default number of scans.
→ double sensitivity in the same time.
- Experiments can be run with 4X resolution in the same time.
→ clearer assignments of correlations in crowded spectra.
(see next page)

Resolution Enhancement using NUS:

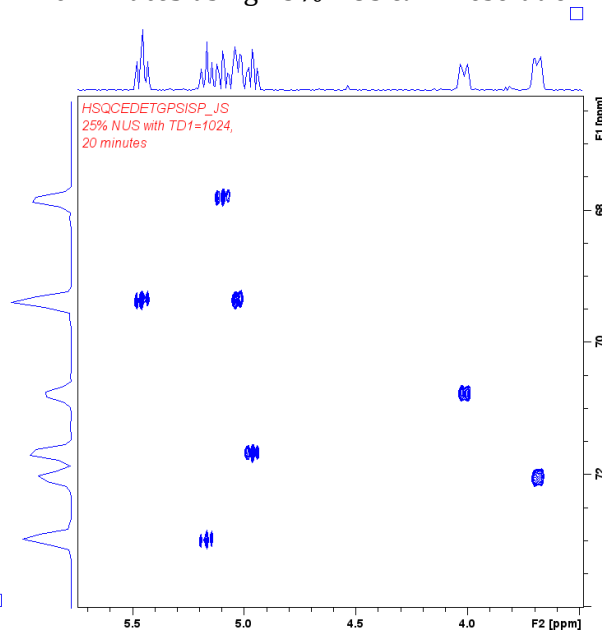
(These expansions were processed and printed with identical settings.)

HSQC:

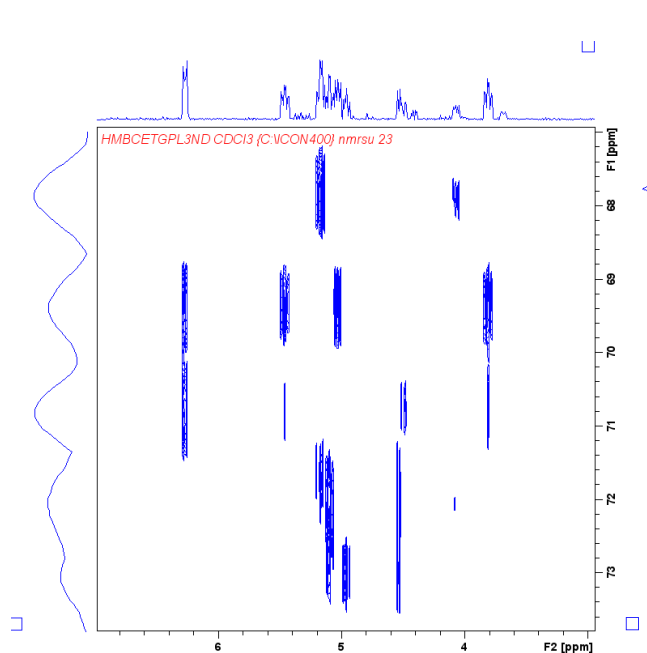
20 minutes without NUS



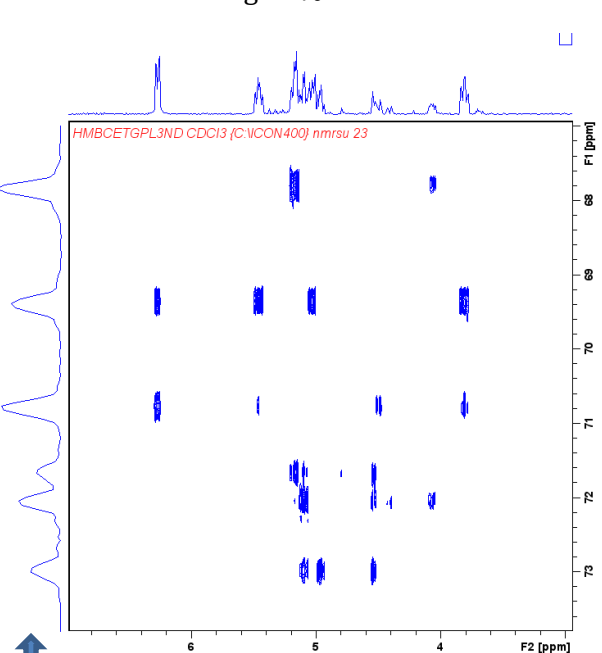
20 minutes using 25% NUS & 4X resolution

**HMBC:**

40 minutes without NUS



40 minutes using 25% NUS & 4X resolution



Note the improved resolution of the **vertical projections** in the NUS experiments.