

Magn. Reson. Discuss., referee comment RC3
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Comment on mr-2021-46

Anonymous Referee #3

Referee comment on "Rapid measurement of heteronuclear transverse relaxation rates using non-uniformly sampled $R_{1\rho}$ accordion experiments" by Sven Wernersson et al., Magn. Reson. Discuss., <https://doi.org/10.5194/mr-2021-46-RC3>, 2021

In the manuscript by Wernersson et al a method to rapidly measure heteronuclear ^{15}N transverse relaxations rates is shown. The method proposed makes use of both non-uniform sampling as well as accordion measurements.

The authors initially present an NMR pulse sequence, which allows the measurements of transverse ^{15}N relaxation rates using the accordion scheme. Subsequently the authors show an evaluation of the new method by recording conventional uniformly sampled spectra and compare the rates derived from those with rates obtained using their new methods.

In my opinion, the idea of combining accordion with NUS is very interesting and could allow for fast measurements of transverse ^{15}N relaxation rates. This could become particularly useful for unstable samples. As detailed below, I have a few points to be considered:

1. For the new method it is required to use constant-time in the indirect ^{15}N dimension. I could unfortunately not find the value used for the constant time, T , but assumed that it would match the acquisition time ($132 * 1/2006\text{Hz} \sim 66\text{ ms}$). This long constant time will in general lead to loss of signal due to relaxation. The authors should therefore comment on signal-to-noise of the constant-time sequence versus a non-constant time version of the pulse sequence.

2. It appears (top page 6) that a spectrum is required in order to generate the NUS schedule. This should be clarified.

3. In Figure 2 the authors compare R2 rates derived from R1ρ experiments with R2 rates derived from CPMG experiments. It is not clear if the authors have considered the off-resonance effect also present in CPMG experiments (see e.g. <https://doi.org/10.1023/a:1008348827208>)

4. The authors should show a few correlation spectra (processed accordion spectra) for the reader to judge the overlap of signals referred to. This will also allow the reader to judge potential artifacts in the NUS accordion spectra.

5. A recent paper by East, Delaglio, Lisi (<https://doi.org/10.1007/s10858-021-00369-7>) covers a similar topic and that paper could be cited.