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Interactive comment on "Dipolar Order Mediated ^{1}H->^{13}C Cross-Polarization for Dissolution-Dynamic Nuclear Polarization" *by* Stuart J. Elliott et al.

Anonymous Referee #1

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The manuscript entitled "Dipolar Order Mediated 1H→13C Cross-Polarization for Dissolution-Dynamic Nuclear Polarization" by Stuart Elliott et al. entails a discussion of an alternative way, apart from Hartmann-Hahn cross polarization method, to harness the high nuclear polarization of hyperpolarized 1H spins and transfer it to 13C spins via simpler, low-power, and non-synchronized 1H and 13C RF pulses.

In my opinion, the experimental demonstration of 1H to 13C polarization transfer mediated by dipolar order is certainly a welcome addition to the technical developments in dissolution DNP, in pursuit of simpler alternative to DNP cross polarization in terms of RF hardware and pulses. One of the main advantages of this reported technique is the

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use of non-simultaneous 1H and 13C RF pulses in the DNP polarization transfer. This reported technique also opens up an avenue for polarizing larger DNP sample volumes with minimal probe arcing. For these and other reasons, I believe that this manuscript is significant in terms of scientific content and it brings some new technical insights to the magnetic resonance community, in particular to the rapidly growing dissolution DNP field. Therefore, I would like to recommend publication of this manuscript with minor revision addressing the following suggestions and comments:

(1) Page 1: In the title, should it be "Dipolar Order-Mediated..." with the dash? (2) Page 1: lines 37 and 43–please spell out "typ." to typically. (3) Page 4: line 26–same comment as #2. (4) page 4: line 29–should be "the microwave is deactivated" (5) Page 7: Figure 4 caption, line 17–"nuclear Larmor frequency" was used twice; I suggest to use symbol omega or make it concise.

(6) The authors mentioned that this dipolar order-mediated CP technique (∼8.7%) is only about a half as efficient compared to the conventional CP-DNP technique (∼20%) in terms of final 13C DNP_enhanced polarization obtained. Do the authors have 13C polarization value for direct 13C polarization (without CP or dipolar order CP) of this sample?

(7) I assume these numbers (8.7% for dipolar-order CP, 20% for conventional CP) are solid-state 13C polarizations. Do the authors have liquid-state 13C polarization numbers (post dissolution)? These are not a requirement for this paper, but I think it would be good to report them if the data are available.

(8) Obviously there's a lot of optimization to be done here in this preliminary technical report especially with DNP sample optimization. Can the authors expound on the possible effects of the efficiency of dipolar order-mediated CP if the 1H spin density is increased or decreased in the glassing matrix?

(9) The supplementary material is appropriate.

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Overall, I believe that this is a significant manuscript that merits publication in Magnetic Resonance pending this minor revision.

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