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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.

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This manuscript is interesting as it aims at the development of an alternative pathway (transfer via 1H) to enhance 13C polarization under dDNP conditions. The proposed 1H-13C transfer mechanism is different from that in the conventional Hartmann-Hahn CP, which is based on the idea of spin lock on both the channels. The new RF scheme requires non-simultaneous RF irradiation on the two channels.

Although the optimum RF power is not lower (compared to that in conventional CP), the duration of RF on 1H is significantly reduced. However that on 13C channel becomes significantly longer and the transfer efficiency also decreases by a factor of 2.

Overall, the new approach might still be better than Hartmann-Hahn CP for technical reasons as the authors claim. I have a few questions regarding the 1H-13C transfer mechanism

1. On page 2 line 31, the authors talk about conversion of 1H Zeeman polarization to I1z.I2z "dipolar order" using RF. How can the proposed rf on 1H convert Iz to I1z.I2z term, can authors provide some more insights?

2. For transfer of polarization from I to S, there has to be an effective ZQ or DQ IS dipolar Hamiltonian. Since there are RF pulses on both the channels, such Hamiltonian terms can be generated. But they seem to be of higher order perturbation term in the Hamiltonian. Maybe that's the reason why transfer rate is very slow. Can authors shed some light on this?

3. For the given rf scheme, generating a purely ZQ or a purely DQ (IS) dipolar Hamiltonian might be challenging. This in turn may lead to phase distortion of the 13C signal if there are multiple 13C resonances. Can authors provide some 13C spectra?

4. Since the method is based on 1H "dipolar order", what kind of spin-system is required for it to be efficient. Can the transfer mechanism be elucidated using a simple three-spin 1H-1H-13C model? How would 1H concentration in glassy matrix influence this transfer?

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