

Magn. Reson. Discuss., author comment AC5 https://doi.org/10.5194/mr-2022-9-AC5, 2022 © Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.

## **Reply on RC4**

Jingyan Xu et al.

Author comment on "Visualization of dynamics in coupled multi-spin systems" by Jingyan Xu et al., Magn. Reson. Discuss., https://doi.org/10.5194/mr-2022-9-AC5, 2022

Dear Steffen, we highly appreciate your constructive criticism and comments. The manuscript is now improved by citing the relevant literature you mentioned. In addition, the equivalence between the AMPS and the Husimi Q-function was indeed established and the proof is now presented in the Appendix G.

The manuscript was updated in multiple places. First, the terminology of AMC (angular momentum coherence) surfaces has been abandoned and now the visualization is based upon using general zero-quantum Hermitian operators for plotting the surfaces. This makes the surfaces represent measurable properties as now discussed in the section 3.2. The manuscript was updated in multiple places to use the correct terminology (DROPS representation).

Regarding differences and similarities of the presented approach and the DROPS representation. Decomposition of the density matrix into blocks corresponding to the total angular momentum quantum numbers F is the same as in (Garon et al., 2015, when using multipole tensor operator basis), however, the visualization procedure is different. DROPS approach is a Wigner-type representation (visualization is complete but the composed surfaces do not directly represent measurable properties of the density matrix), while our approach is measurement-based representation (visualization is complete and the radius of the surface directly represents a measurable property of the density matrix).

We performed additional simulations and now present a direct comparison between our visualization approach and the DROPS approach (see Section 3.5) when applied to the ZULF NMR experiment. While DROPS approach allows to fully describe the spin dynamics, it is less straightforward to convert color into the measurable property. We also point out that DROPS representation may be discriminatory with respect to color-blindness of some groups of the population while the presented approach avoids the use of the color map (since the plotted surfaces correspond to measurable properties which are real numbers).

We hope the updated version of the paper addresses all criticism and we thank you once again for expremely valuable comments.