Open Access MAGNETIC RESONANCE Discussions

Magn. Reson. Discuss., community comment CC2
https://doi.org/10.5194/mr-2021-65-CC2, 2022

Comment on mr-2021-65

Tom Barbara

Community comment on "Radiation damping strongly perturbs remote resonances in the presence of homonuclear mixing" by Philippe Pelupessy, Magn. Reson. Discuss., https://doi.org/10.5194/mr-2021-65-CC2, 2022

After reading the other comments, I was inspired to resurrect my old calculations. While I looked at nutation long ago, I did not consider locking, and of course initial condtions are important. The experiments involve locking a strong signal on resonance and off resonance by 2800 Hz and a locking field strength of about 4000 Hz. For a CW locking field, this is not a very good off resonance lock and the question of the bandwith of DIPSI raised by one of the reviewers is a good point. The paper states in the caption of Figure 5 that the radiation damping time constant is 33.4 * 2*pi "Hertz", but I am guessing this is actually radians/sec and so the time constatn is 33 Hz. Now one can work the numbers for various Q's and filling factors, and this appears reasonable. So indeed this is a weak coupling compared to a 4 kHz locking field and the dynamics of water under a CW locking field is very close to that without the radiation damping contribution. The dynamics of a second, weak (non-damped) signal should then be that for evolution augmented by a time dependent effective RF field generated by the strong precessing signal. One of the reviewers posed the question if the analysis was for the actual DIPSI sequence or that of a CW field and I agree that it is not clear in text, and since DIPSI has only 180 degree phase shifts, that simplifies the dynamics in equations 1-3 significantly.