

Magn. Reson. Discuss., referee comment RC1
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Comment on mr-2021-6

Anonymous Referee #1

Referee comment on "Simple rules for resolved level-crossing spectra in magnetic field effects on reaction yields" by Dmitri V. Stass et al., Magn. Reson. Discuss., <https://doi.org/10.5194/mr-2021-6-RC1>, 2021

In the paper very interesting and useful results on the detection of the EPR spectra of radicals by the MARY method are obtained. The idea is very similar to the transfer of a low frequency audio signal by means of radio carrier frequency modulation. The "carrier frequency" is the intersection of levels in a high field, caused by a radical with large hfi coupling constants. A detailed analysis of the position and width of the resonance caused by the level crossing is carried out. The hyperfine structure of the second radical of the radical pair acts as a "sound signal". The authors show that the level crossing in the zero field does not allow detecting the EPR signal of the second partner, which is similar to that the low-frequency audio signal is not transmitted directly, that is, without modulation by the carrier frequency. The authors carried out a detailed theoretical analysis of the detection of the EPR spectrum of the second partner for various configurations of the hfi spectrum of the first partner (with large hfi constants). The rules are formulated concerning this detection method. I consider the article very useful for the field of magnetic resonance (ESR) and recommend it for publication in the journal as it is. There are the following notes:

1. It is written: "Laplace transform of singlet state population as a function of applied static magnetic field ... "- it is necessary to clarify that the Laplace transform is done in time domain, otherwise it can be understood that the Laplace transform is done in the magnetic field domain.
2. It is written: "For the outermost blocks with $\Sigma = + -I...$ Real outermost states are with $\Sigma = + -(I+1)$. Of course, these states are triplet ones and they doesn't take part in spin dynamics since they are eigen states but may be it is worth to mention this (?).