Dear Reviewer,

Thank you for your thoughtful consideration of our manuscript ID7861 *“The Effect of Different Numerical Approaches on the Accuracy of Calculating Relaxation Spectra for Polysaccharides*”. We appreciate your valuable comments, which have helped to improve our work.

Below you will find your comments repeated and our responses written in blue and inserted separately after each comment.

**Editor’s and reviewer’s comments, authors’ responses, and manuscript changes.**

**Reviewer D**

1. In extracting relaxation spectra, there is a loss of 1/2 decade of information on either end of the frequency range [see J Non-Newton Fluid Mech 73(1): 163-179]. Since the paper has about 3 decades of data, one would only expect the relaxation spectrum to be reliable only over the "central" two decades.

**Response**: We appreciate this comment and thank the reviewer for raising this point. Indeed, accordingly to the conclusion from the paper [J Non-Newton Fluid Mech 73(1): 163-179], the relaxation spectrum is determined on a shorter interval of relaxation times than the reciprocal frequency range. The authors of that paper performed vivid mathematical analysis and figured out that “the correct interval on which the relaxation spectrum is determined is the interval which is shorter than the reciprocal frequency range by 1.36 decades”. This is very important finding, and we added the notation on this reviewer’s comment in the highlighted revision of our manuscript. The added text is highlighted in yellow (see lines 313 to 319). As a result of this change, we have added additional reference to the highlighted revision (also highlighted as the last reference).

Nevertheless, our calculations of the relaxation spectra for all four materials showed that, on the first sight, the resulted spectra (obtained using three different methodologies) are quite reliable within about 3 decades. This is confirmed by error analysis performed in the manuscript based on the calculated relaxation spectra.

1. In light of the sampling localization effect mentioned above, the mismatch at long times in figure 2 (left) is not unexpected. In this figure, the mismatch may have also arisen because eqn (3) is an approximation.

Perhaps, the assumptions behind that approximation should be mentioned.

Response: We agree with this remark, and appreciate the comment of the reviewer. Indeed, the mismatch between experimental data and their approximation at long times for only one material of four, i.e. sodium carboxymethylcellulose, in figure 2 (left) is expected and can be justified. The added text related to the assumptions behind that approximation is highlighted in yellow (see lines 292 to 295 in the highlighted revision).

1. "Therefore, a discrete relaxation spectrum is not unique. One might consider that simply connecting the end points of a line spectrum by a continuous line, e.g., using cubic spline function would directly yield a continuous from a discrete spectrum. However, such an envelope over the endpoints cannot furnish a valid continuous spectrum." and also figure 3 and thereafter. The height of the discrete relaxation spectrum depends on the number of modes [see explanation on page 374 of Korea-Aust. Rheol. J. volume 34, 369–379 (2022)].

Response: We have addressed this comment and have updated the corresponding paragraph. The added text related to the assumptions behind that approximation is highlighted in yellow (see lines 98 to 101 in the highlighted revision). We also added above mentioned reference to the highlighted revision.

1. The journal reference for ReSpect software is Appl Rheol 23(2):24628 (2013). It may be noted that a superior version of this software called pyReSpect (https://github.com/shane5ul/pyReSpect-freq) has been developed in python, and described in Rheol. Acta, 2020, 59, 509. It still uses Tikhonov regularization like the Matlab code, but employs a Bayesian criterion for determining the level of regularization. It is quite possible that this version yields better results.

Response: We added above mentioned journal reference for ReSpect software to the highlighted revision. We agree with the reviewer’s comment that “it is quite possible that this version, i.e. pyReSpect, yields better results”. We assume that other methods and commercial softwares can also give “better results” in spectra calculations. However, in our work, the results obtained with ReSpect have shown that this approach provides significantly better prediction of the dynamic response in terms of better accuracy in approximating the dynamic moduli than the other two methods. This supports our conclusion that there is no unique mathematical approach for the calculation of relaxation spectra for polysaccharides that ensures a satisfactory approximation to the experimentally determined dynamic moduli for each polymeric material. As well, it is recommended applying combination of different numerical schemes in parallel, i.e., different methodologies, for calculating relaxation spectra. With respect to the main objective of our work there is no need for additional calculations using other methods and approaches.