

Review of: "Slow diffusion around pulsar γ -ray halos and its impact on cosmic rays propagation"

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Potential competing interests: No potential competing interests to declare.

Dear Dr Bi,

I read your paper and, if I understand well, this is a such a kind of review of your previous work on TeV halos, is it correct?

If it is so, I think that can be very useful in order to give a general look to your model and to the final, interesting conclusions. However, I have some suggestions that I hope could be improve this paper.

Thanks a lot for the work,

kind regards!

Introduction

- Please, explicit the acronym CMB because it is the first time that appears in the text
- Only a suggestion: even if the only firmly detected Pulsar halo from LHAASO is around PSR J0622, maybe you could you apply your model on other candidate TeV halos detected by LHAASO (see Cardillo&Giuliani 2023 for a review) not only to further verify your model but also to eventually excluder the TeV halo nature of some LHAASO sources.

Chapter 2

- The part from "As diffusive propagation" to "actually suppresses" is not clear in my opinion, maybe you should add some explanation on the "superluminal transport" and "electron suppression"
- What do you mean with "non-relativistic" equation? What are relativistic and no-relativistic regime? It is not clear
- According to me, the Figure 1 is not so clear:
 - In my opinion you should use "BL+diff and Slow Diff" as labels in the legend and not the values of D_0 (that you can write in the caption as you have done) → this is valid for all the figures where appear this kind of legend
 - I compare this figure with the Fig. 1 in Recchia+2021 and I would like to understand if I can interpretate the curves in the same way or not because I'm a bit confused. In Recchia we have "slow diffusion", "BL+Diff" and the total: here what are we seeing? → Also in the paragraph, the description of the figure is not clear in my opinion
- Why did you not verify your model also for Monogem halo?

- Why is it necessary to show Fig.4? I don't think that add some important information, right?
- When you talk about the right panel of Figure 3, maybe you should briefly explain how you compute the efficiency.

Chapter 3

- I think that the first part (up to “propagation globally”) should be the introduction of the other two parts; a chapter 3.1 dedicated to a single source and 3.2 dedicated to diffuse emission and DM
- In Fig.5, I think that could be better use the name of the model in the legend and specify the value of r in the caption
- Fig.6 is not so easy to understand reading only the caption. Please, explain it better.

Summarizing

Even if this is a review of your past work, you should be more clear in the explanation of figures and important concepts because you have to allow the reader to understand what have you done without the need to read the previous works.

Suggestion: Your conclusion on the DM contribution to the positron excess is very strong and important. Maybe you could add some sentence that invite someone else to reproduce your results and that explain that you will verify the model with other confirmed or candidate halos in order to enhance the significance of the result
