Manuscript: ref #28/Furumoto et al. (Resubmission letter)

Comment of the Reviewer – ref #28/Furumoto

This paper is concerned with the very old problem of obtaining an appropriate alpha-nucleus optical potential. The authors approach it by a single folding model in which a nucleon-alpha potential is first fitted to data in a large energy range and then by introducing the target density an alpha-nucleus potential is calculated. In spite of what is written in the text, there are several parameters used in what is basically a fit. First the standard Woods-Saxon parameters given in table 1, then the beta parameters of the density dependence given in table 2, finally the renormalization factor N_I of the imaginary potential given in Fig. (4a). N_I shows very large variation in its values, form close to 1 to 4. It seems to me that the model used by the present authors presents several weak points which the authors do not address and from which it is very difficult to learn anything useful for future applications. However the paper can be published after the corrections I have made as comments and bold face text in the pdf file are introduced. The deeper concerns that I have expressed above cannot be addressed in a conference proceeding such as the present work but I strongly suggest the authors to take them into account in the longer paper in preparation Ref.[28]. Finally I suggest the authors to look at the recent literature because a number of papers have been published in which the single folding model for the optical potential is used and discussed and several relevant differences between free nucleon-nucleon scattering and nucleon-nucleus scattering have been enlightened and the in-medium effects have been clarified.

First of all, we would like to thank the reviewer for giving the valueable comments. However, we felt that the reviewer may be making something misunderstanding. Therefore, one by one, we would like to clear up the reviewer's misunderstanding.

1. bold face text

Therefore, rather than the nucleon-nucleon interaction, it is reasonable to consider the alpha-nucleon interaction as the elementary process underlying the nucleus-nucleus scattering.

It is not nucleus-nucleus scattering. "nucleus-nucleus system" means "heavy-ion scattering" as mentioned in the introduction. When we compare the α-nucleus scattering with the nucleus-nucleus ones, there is an anomaly for the α-nucleus scattering. Then, we propose new interaction for α-nucleus scattering. We slightly modify the reviewer's suggestion as "Therefore, rather than the nucleon-nucleon interaction, it is reasonable to consider the alpha-nucleon interaction as the elementary process underlying the α-nucleus scattering.".

2. Section 2.1

- V(E/A)
- As it stands the notation can be missleading. I propose to substitute 4 with A_T and add " were A_T is that target mass number"
- over which the strenght parameter V depends

As mentioned by the reviewer, V has an energy dependence. However, not only V but also a and r have energy dependences. When we explicitly write the energy dependence in Eqs. (3) and (4), we have many (E/A) and Eqs. (3) and (4) become complicated. Then, we omited (E/A) in Eqs. (3) and (4). In order to satisfy this situation, we add the sentence in the text of Sec. 2.1 as, "We note that the notation of E/A in parameters is omitted to avoid the complication.".

In addition, we explain just the p + ^{4}He optical potential in Sec. 2.1. Namely, there is no information of target for the α-nucleus scattering. Therefore, $4^{(1/3)}$ is correct in Eq. (4).

3. Fig. 2

Considering that the results in Fig.2 are obtained via a fitting procedure one might wonddr why the authours did not try to obtain a better agreement with the data. in particular the old problem of the back angle scattering enhancement is still present.

The elastic scattering cross section at the backward angles is due to contributions of other reaction mechanisms, such as knock-on type exchange scattering of the proton with target nucleons. Such possible extra mechanisms are disregarded at present since we are concerned with the p + ^{4}He one-body potential.

We add the sentence of "It is known that the backward angles for the p + ^{4}He system cannot be fully described by the normal one-body potential. Therefore, we do not mention the backward angles.".

4. Summary

I do not agree that the fit is obtained with ony one parameter, namely the renormalization factor for the imaginary potential, because also the beta parameters 0f Eqs.[6-8] have fitted values, moreover to call global the potential eq. (5) is also missleading because it applies only to the nucleon-alpha scattering.

We just introduced the construction of the global density-dependent α-nucleon interaction in this paper. Namely, the application of the DD-αN interaction is not introduced. We already apply the DD-αN interaction to several α-nucleus elastic scatterings with the parameters fixed in this paper. Please see Fig. 1 in this reply. We think that the present DD-αN interaction globally reproduces the experimental data.

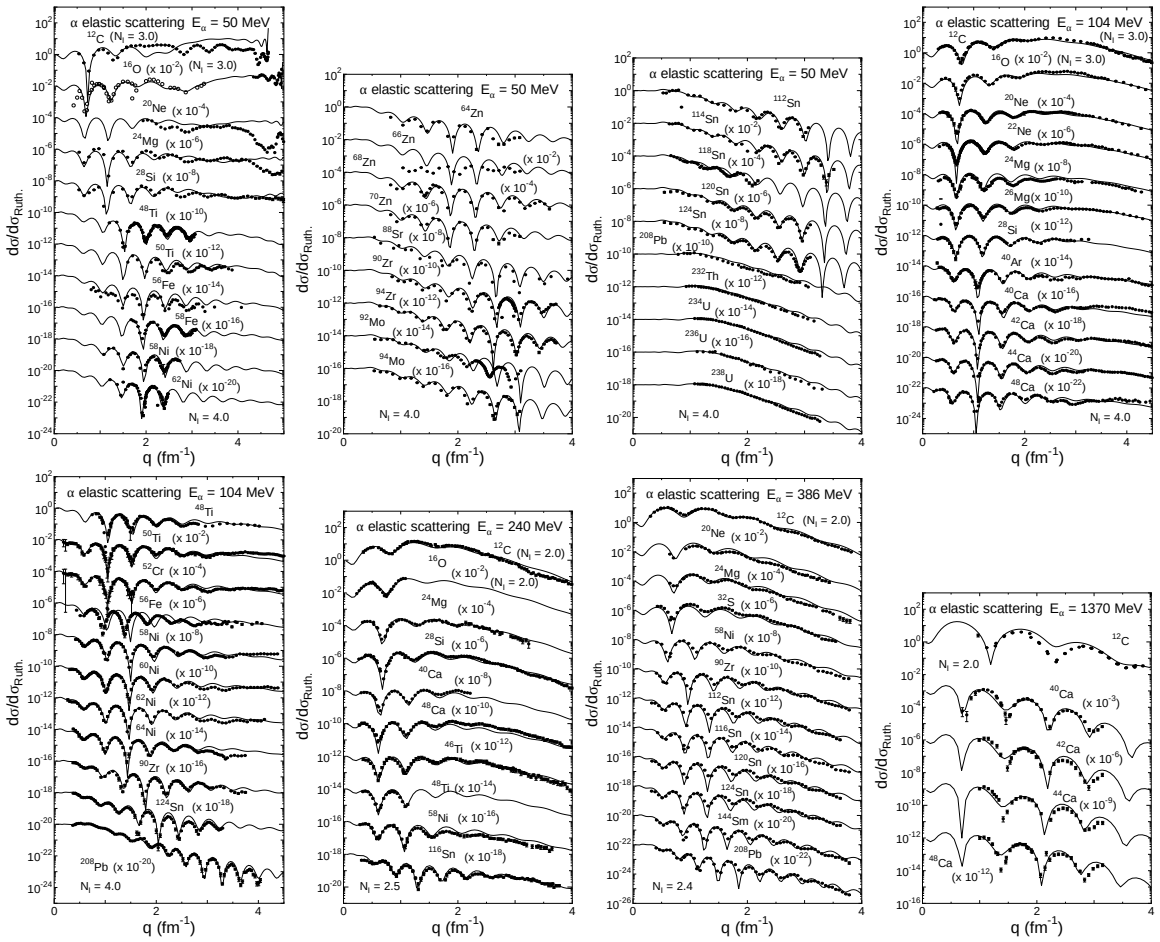

Figure 1: Application of the present DD-αN interaction to the α + nucleus system at E/A = 50–1370 MeV.

Lastly, we believe that the revised manuscript is now appropriate for acceptance by the EPJ Web of Conferences.