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Reaction parameter studies of the ^{51}V beam onto deformed target: ^{51}V+^{159}Tb reaction

Pierre Brionnet

RIKEN Nishina Center for Accelerator-based Science, RIKEN, Japan

In the super heavy element synthesis, the use of ^{50}Ti, ^{51}V and ^{54}Cr are becoming mandatory to access to element beyond the Oganesson (Z = 118) due to the lack of target material beyond the Californium. However, the reaction parameters using these beams on deformed target are not yet studied as only reaction on Pb and Bi target have been performed using these beams. In addition, the different cross sections prediction can only be extrapolated from the reaction performed using the ^{48}Ca beam, leading to wide range of prediction based on the model used. The systematic studies of reaction parameters using these beams could thus improve the prediction in the case of new element search.

The search of the element Z = 119 is currently ongoing in RIKEN using the ^{248}Cm(^{51}V,xn)$^{299-x}$119 on the SRILAC + GARIS-III experimental setup [1]. As stated in [2], the selection of the beam energy for the search of new elements is crucial to the success of the experiment. The goal of this work is thus to extend the systematic study of reaction parameters with deformed target using the ^{51}V beam, by using lighter surrogate systems.

This work studied the effect of the incident beam energy and nuclear deformation in the reaction ^{159}Tb(51V,xn)$^{210-x}$Ra by producing both the barrier distribution and the detail excitation functions. The goal is to extend the systematic study of the quasielastic (QE) barrier distribution with ^{51}V and compared it to the results obtain in [2,3] as well as theoretical prediction and interpretation using the Couple Channel Calculation (CCFULL [4]).

In addition, the production of the full and detail excitation function for the *x*n, *px*n and *αx*n, also allow us to study the correlation between the barrier distribution and the maximum cross section of production. The main goal is to study the effect of the tip vs side collision effects on the maximum cross section of production.

The experimental setup, analysis and preliminary results of both studies will be presented in this presentation.

References

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[2] T. Tanaka *et al.*, Phys. Rev. Lett. 124, 052502 (2020).
[3] H. Sakai, H *et al.*, Eur. Phys. J. A 58, 238 (2022).
[4] K. Hagino *et al.*, Comput. Phys. Commun. 123, 143 (1999).